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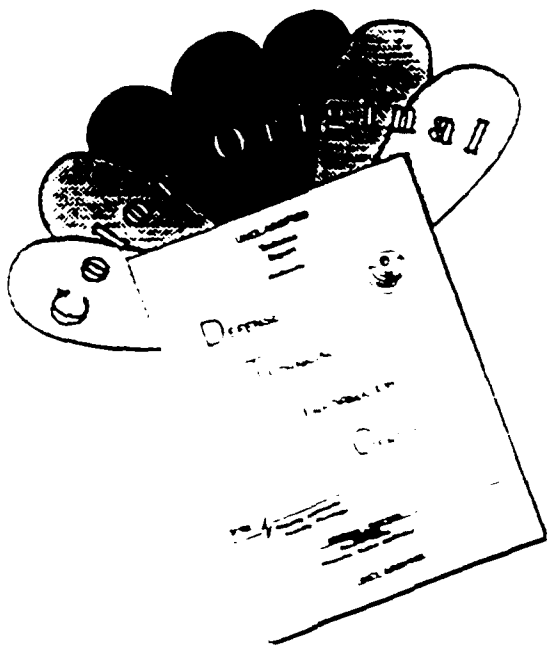

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE

11 MAR 1994

TO: ALL INTERESTED GOVERNMENT AGENCIES, PUBLIC GROUPS AND INDIVIDUALS

We are pleased to provide you the Draft Environmental Impact Statement (DEIS) for disposal and reuse of Carswell Air Force Base (AFB), Texas. The document is provided in compliance with the regulations of the President's Council on Environmental Quality.

In response to the Defense Secretary's Commission on Base Realignment and Closure and the legislative requirements in the Base Realignment and Closure Act (Public Law 101-510), it was decided to close Carswell AFB, TX. In accordance with the National Environmental Policy Act, the potential environmental consequences of the disposal and reasonable reuse alternatives have been analyzed and are described in the attached DEIS.

There will be a 45-day review period to provide individuals and organizations an opportunity to comment on the DEIS. A public hearing is scheduled for April 4, 1994 at 7:00 pm at the Will Rogers Memorial Center, Amon G. Carter, Jr., Exhibit Hall, South Texas Room, One Amon Carter Square, Fort Worth, Texas. The review and comment period ends on May 2, 1994.

If additional information is needed, please contact:

Lt Col Gary Baumgartel
Director, Environmental Conservation
and Planning
AFCEE/EC
8106 Chennault Road
Brooks AFB, TX 78235-5318
Telephone: (210) 536-3839

K. Reinertson

KENNETH L. REINERTSON
Acting Director, Environmental
Quality
Office of The Civil Engineer

Attachment:
Draft Environmental Impact Statement

DRAFT

ENVIRONMENTAL IMPACT STATEMENT

DISPOSAL AND REUSE OF CARSWELL AIR FORCE BASE, TEXAS

MARCH 1994

COVER SHEET

DRAFT ENVIRONMENTAL IMPACT STATEMENT
DISPOSAL AND REUSE OF CARSWELL AIR FORCE BASE, TEXAS

a. Lead Agency: U.S. Air Force

b. Cooperating Agencies: U.S. Navy
U.S. Department of Justice, Federal Bureau of Prisons

c. Proposed Action: Disposal and Reuse of Carswell Air Force Base (AFB), Tarrant County, Texas

d. Inquiries on this document should be received by May 2, 1994, and directed to: Lt Col Gary Baumgartel, Director, Environmental Conservation and Planning, HQ AFCEE-EC, 8106 Chennault Road, Brooks Air Force Base, Texas, 78235-5318, (210) 536-3907.

e. Designation: Draft Environmental Impact Statement.

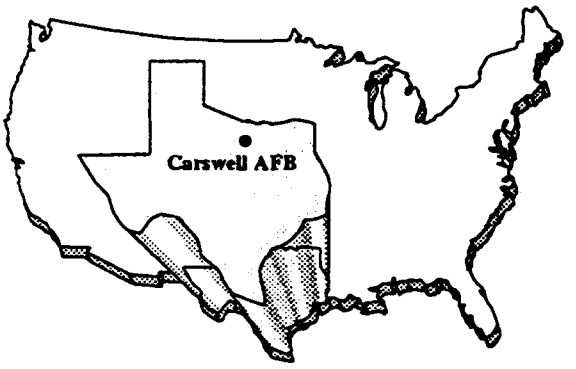
f. Abstract: Carswell AFB was recommended for closure as part of the 1991 Defense Base Closure and Realignment Commission Report. Pursuant to the 1990 Defense Base Closure and Realignment Act, the 1991 recommendations became law and the base officially closed on September 30, 1993. The 1991 base closure actions provided for the retention of continued military operations on Carswell AFB. The 1993 Defense Base Closure and Realignment Commission recommended several Department of Defense organizations to realign their functions to Carswell AFB. These realignment decisions were promulgated in September 30, 1993. Military realignment to Carswell AFB is scheduled to proceed in late 1994. This Environmental Impact Statement has been prepared in accordance with the National Environmental Policy Act to analyze the potential environmental consequences of disposal and reasonable reuse alternatives of Carswell AFB property. The document includes analyses of community setting, land use and aesthetics, transportation, utilities, hazardous material/wastes, geology and soils, water resources, air quality, noise, biological resources, and cultural resources.

When compared to closure conditions, potential environmental impacts would include increased noise levels, air traffic, land use incompatibilities, and emissions of air pollutants. Aircraft noise levels would remain below preclosure levels. However, aircraft noise mitigations would be implemented by the Navy, in accordance with DOD policies implemented in the Air Installation Compatible Use Zone (AICUZ) guidelines. Local planning agencies could also modify their zoning ordinances in accordance with the Navy's AICUZ guidelines to minimize future land use incompatibilities. Reuse-related air emissions would remain below preclosure levels and would not interfere with the region's progress in reaching or maintaining attainment of the standards for primary criteria pollutants.

Increased air traffic in the local airspace would be accommodated through air traffic control provisions.

Proper management of hazardous materials and wastes would preclude unacceptable impacts due to future reuse activities. Waste minimization and pollution prevention measures will be implemented for the military reuse activities, in accordance with DOD policy. Remediation of hazardous wastes sites under the Installation Restoration Program is, and will continue to be, the responsibility of DOD.

Redevelopment activities could alter drainage patterns and increase erosion that would be mitigated through proper engineering designs. Aircraft overflights in sensitive habitat areas would be avoided, as feasible, to minimize the impacts to migratory bird species. Cultural resources could be impacted by conveyance of the property to a non-federal entity. Preservation covenants with disposal documents could eliminate or reduce these effects to a non-adverse level. Because the Air Force is disposing of portions of the installation for civilian use, some of the civilian mitigation measures are beyond the control of the Air Force.



SUMMARY

SUMMARY

A Draft Environmental Impact Statement (EIS) for the disposal and reuse of Carswell Air Force Base (AFB) was released for public review in February 1993. However, due to the 1993 base closure and realignment decisions, the alternatives analyzed in that document are no longer feasible to support future disposal decisions. This EIS incorporates the realignment of several Department of Defense (DOD) organizations to Carswell AFB and includes analyses of reuse alternatives that are consistent with these mandated decisions. Therefore, this EIS document replaces the February 1993 Draft EIS publication in its entirety.

PURPOSE OF AND NEED FOR ACTION

Carswell AFB, Texas, was one of the bases recommended by the 1991 Defense Base Closure and Realignment Commission for closure. Pursuant to the Defense Base Closure and Realignment Act (DBCRA) of 1990 (Public Law 101-510, Title XXIX), the 1991 recommendations have become law. The base was officially closed on September 30, 1993. The 1991 Commission's recommendations, however, allowed for the retention of continued Air Force Reserve operations.

The DBCRA procedures were again implemented in 1993, and the Commission's recommendations became law on September 30, 1993. The 1993 Commission recommendations specifically called for the realignment of several military reserve and guard units from Naval Air Station (NAS) Dallas (Texas), NAS Glenview (Illinois), and NAS Memphis (Tennessee) to Carswell AFB. Therefore, portions of Carswell AFB will be retained within DOD, as required, to support the long-term operations associated with the realigning military units.

These DBCRA actions have resulted in the need to dispose of Carswell AFB real properties determined to be excess to the needs of DOD to support the retained and realigning military units.

The Air Force is required to comply with the National Environmental Policy Act in the implementation of the base disposal and reuse. The Air Force must now make a series of interrelated decisions concerning the disposition of base property. This EIS has been prepared to provide information on the potential environmental impacts resulting from disposal and proposed reuse of excess base property. The U.S. Navy and the U.S. Department of Justice Federal Bureau of Prisons (FBOP), cooperating agencies in the preparation of this EIS, will assist the Air Force in making related decisions concerning Carswell AFB property. Several alternative reuse concepts are studied to identify the range of potential direct and indirect environmental consequences of disposal.

After completion and consideration of this EIS, the Air Force will prepare decision documents stating what property is excess or surplus, and the terms and conditions under which the dispositions will be made. These decisions may affect the environment by influencing the nature of the future use of the property.

Other decision documents may be prepared by the aforementioned cooperating federal agencies for tiered decisions related to the subsequent reuse of the property.

ALTERNATIVES INCLUDING THE PROPOSED ACTION

Carswell AFB comprises a total of 2,555 acres of fee-owned property and an additional 64 acres leased from the city of Fort Worth. The base property includes three noncontiguous parcels: the main base with 2,264 acres of land used for aviation-related, commercial (administrative), industrial, residential, and open space/recreation purposes; a 44-acre property developed for residential use; and a 247-acre property with industrial and open space areas. Depending on the reuse alternative chosen, up to 747 acres could be available for disposal for civilian reuse, and at least 1,808 acres would be retained within DOD.

The 1991 Commission's recommendations provided for continued operations of the Air Force Reserve 301st Fighter Wing, White House Communications Agency, and Air Force (AF) Plant #4 engine testing activities on Carswell AFB. The 1993 Commission's recommendations provided for the realignment of several DOD organizations (Navy Reserve, Marine Reserve, Army Reserve/Guard, and Air National Guard units) from NAS Dallas, NAS Memphis, and NAS Glenview to Carswell AFB. Most of the military units will relocate from NAS Dallas. The Navy will become the host organization for the realigning reserve and guard tenant units.

The Carswell AFB property and facilities required to support these retained and realigning military units will be retained within DOD and designated as the NAS Fort Worth, Joint Reserve Base. Realignment and construction activities at NAS Fort Worth are scheduled to be complete and the base fully operational by 1998.

The realignment and establishment of NAS Fort Worth will occur, as mandated, regardless of the disposal and civilian reuse of the remaining portions of Carswell AFB. Therefore, these military land areas and reuse activities have been incorporated as part of the No-Action Alternative and all other reuse alternatives for analysis purposes.

For the purposes of evaluating potential environmental impacts resulting from the subsequent reuse of the base property, the Air Force has based its **Proposed Action** on the community's comprehensive reuse plan, which

reflects both the 1991 and 1993 closure and realignment actions. The reuse proposal represents the civilian reuse concepts of the Carswell Redevelopment Authority and FBOP. In addition to the military reuse activities associated with NAS Fort Worth, proposed civilian land uses would include reuse of the hospital by FBOP as a federal medical center complex, and a variety of industrial, commercial, residential, and public facilities/recreation uses.

The following alternatives to the Proposed Action are also being considered:

- The **Mixed Use Alternative** centers on civilian development of office/industrial park uses, limited aircraft maintenance operations, conversion of the existing base hospital into private medical use, and residential development, in addition to the military reuse associated with NAS Fort Worth.

- The No-Action Alternative (hereafter referred to as the **No-Action/Realignment Alternative**) includes the 1993 military realignment actions, as mandated under DBCRA. As such, the No-Action/Realignment Alternative includes the changes associated with NAS Fort Worth. The active military land use would absorb 72 percent of the base property. The remainder of the base would continue to be placed under caretaker status in the long term whether or not the U.S. Government retains title to the property.

Two other land use concepts have been identified for discrete residential facilities or areas of the base. These reuse plans have not been captured within the comprehensive reuse alternatives but could be implemented in conjunction with any of the reuse alternatives under consideration.

SCOPE OF STUDY

The Notice of Intent to prepare an EIS for the disposal and reuse of Carswell AFB was published in the Federal Register on October 9, 1991. Issues related to the disposal and reuse of Carswell AFB were identified during an ensuing scoping period. A public scoping meeting was held on October 29, 1991, at the Will Rogers Coliseum in Fort Worth, Texas. The comments and concerns expressed at this meeting and in written correspondence received by the Air Force, as well as information from other sources, were used to determine the scope and direction of studies and analyses to accomplish the EIS. Verbal comments received during the public hearing on March 9, 1993, and written comments received from February through April 1993 were used to further define the regional baseline conditions and to refine the scope and direction of the analysis for this EIS.

This EIS discusses the potential environmental impacts associated with the Proposed Action and reasonable alternatives. In order to establish the context in which these environmental impacts may occur, potential changes in population and employment, land use and aesthetics, transportation, and utility services are discussed as reuse-related influencing factors. Issues related to current and future management of hazardous materials and wastes are also discussed. Potential impacts to the physical and natural environment are evaluated for soils and geology, water resources, air quality, noise, biological resources, and cultural resources. These impacts may occur as a direct result of disposal and/or as an indirect result of changes due to reuse.

The baseline consists of the conditions at base closure on September 30, 1993. Although the baseline reflects a closed base, a reference to preclosure conditions is provided in several sections (e.g., air quality and noise) to allow a comparative analysis over time. This will assist the Air Force decision maker and other agencies that may be making decisions relating to disposal and reuse of Carswell AFB in understanding potential long-term trends in comparison to historic conditions when the installation was active.

The Air Force is also preparing a separate Socioeconomic Impact Analysis Study on the economic impacts expected in the region as a result of the disposal of Carswell AFB. That document, although not required by the National Environmental Policy Act will assist the local community in planning for the transition of portions of the base property from military to civilian use. Population and employment data developed for the Socioeconomic Impact Analysis Study were used to establish influencing factors in the EIS.

SUMMARY OF ENVIRONMENTAL IMPACTS

This EIS considers environmental impacts of the Air Force's disposal of the installation, as well as interim activities (e.g., interim outleases) that may be allowed by the Air Force before final disposal, and portrays a variety of potential land uses to cover reasonable future uses of the property and facilities by others. Several alternative scenarios, including the community's proposed plan, were used to group reasonable land uses and to examine the environmental effects of likely reuses of Carswell AFB.

Environmental impacts of the reuse alternatives are briefly described below. Influencing factors include projections of the total military and civilian reuse activities that would likely influence the biophysical environment, including ground disturbance, socioeconomic factors, and infrastructure demands and are summarized in Table S-1. The employment and population trends are depicted in Figures S-1 and S-2. Impacts of the reuse alternatives are summarized over a 20-year study period. Impacts for air quality are summarized over a 10-year period due to the speculative nature of projecting

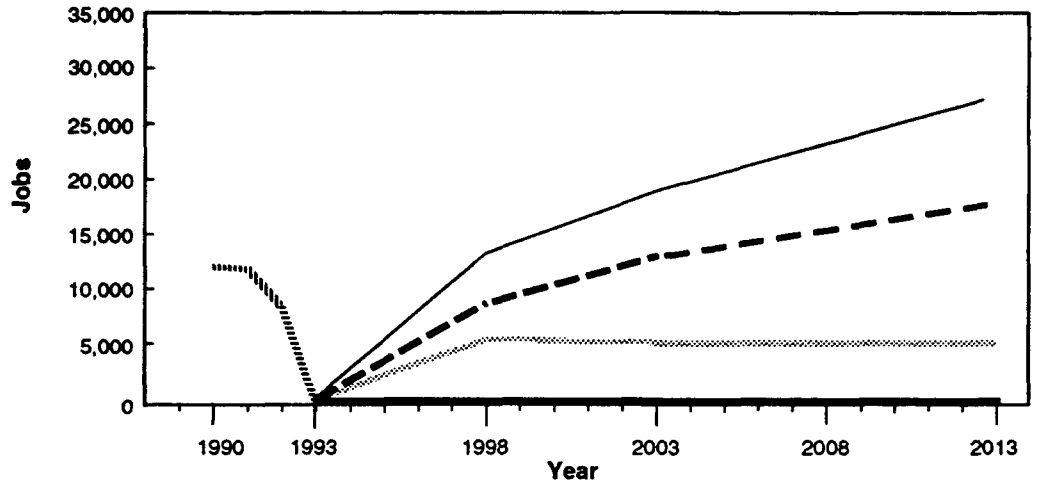
Table S-1. Summary of Total Reuse-Related Influencing Factors

Factor	No-Action/Realignment Alternative			Proposed Action			Mixed Use Alternative		
	1998	2003	2013	1998	2003	2013	1998	2003	2013
Ground disturbance (acres, by phase)	24	0	0	140	34	34	105	60	115
Direct employment	3,931	3,931	3,931	5,353	7,078	8,982	7,233	9,126	9,457
Secondary employment	3,313	3,187	3,187	5,421	7,559	9,830	8,134	10,369	15,435
In-migrating population	2,875	2,872	2,872	3,038	3,195	3,360	3,230	3,401	3,774
Traffic (average daily vehicular traffic)	7,000	7,000	7,000	15,350	24,850	34,250	24,300	31,150	44,550
Aircraft operations (annual)	108,188	108,188	108,188	108,604	108,604	108,604	108,548	108,548	108,548
ROI water consumption (MGD)	0.9	0.9	0.9	1.3	1.4	1.4	1.3	1.3	1.6
ROI wastewater treatment (MGD)	0.5	0.5	0.5	0.9	0.9	1.0	0.8	0.9	1.1
ROI solid waste disposal (tons/day)	19	19	19	24	27	30	28	33	42
ROI electricity consumption (MWH/day)	109	109	109	186	199	212	155	175	210
ROI natural gas consumption (MMCF/day)	0.4	0.4	0.4	1.5	1.7	1.8	1.2	1.4	1.9

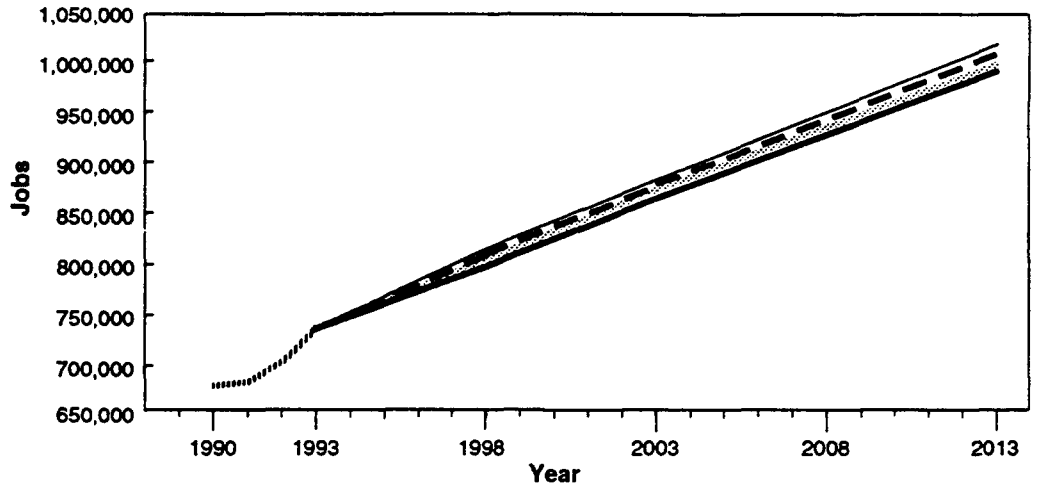
MGD = million gallons per day.
MMCF/day = million cubic feet per day.
MWH/day = megawatt-hours per day.
ROI = Region of Influence.

	1993[a]	1998	2003	2013
Post-Closure Conditions	1,497	1,497	1,497	1,497
ALTERNATIVE				
No-Action/Realignment	1,497	5,747	5,621	5,621
Proposed Action	1,497	9,535	13,355	17,315
Mixed Use	1,497	14,349	18,342	27,276

Reuse-Related Employment Effects(b)



Reuse-Related Employment Effects(b)



Total ROI Employment Including Reuse-Related Effects

EXPLANATION

- Preclosure
- Post-Closure Conditions
- No-Action/Realignment
- Proposed Action
- Mixed Use

(a) The 1993 values represent total base-related employment under the closure baseline.

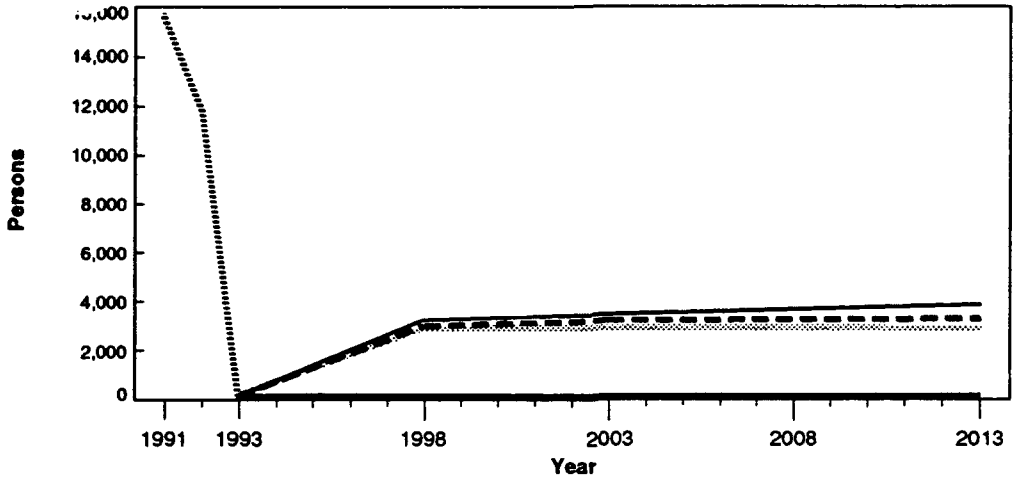
(b) Employment effects represent the change in employment relative to Post-Closure Conditions.

Reuse-Related Employment Effects

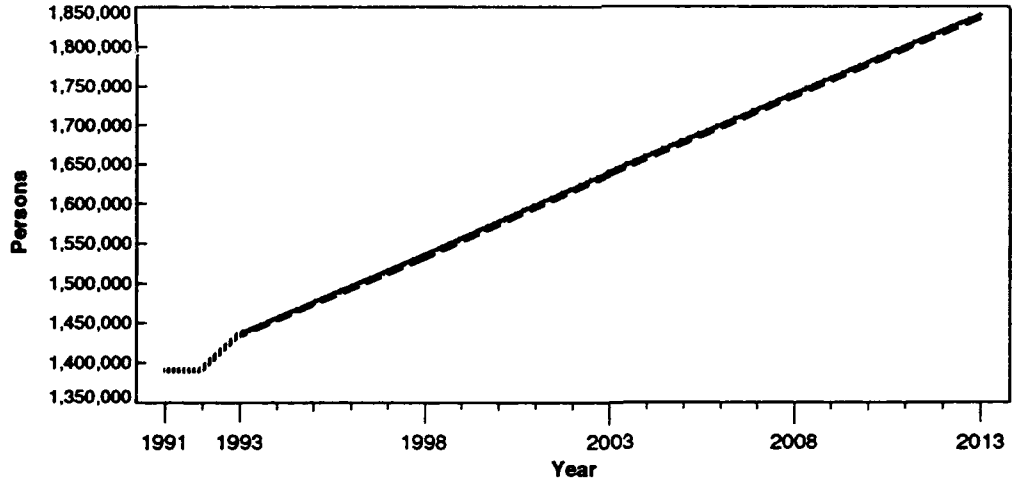
Figure S-1

ALTERNATIVE	1993 [a]	1998	2003	2013
No-Action/Realignment	0	2,875	2,872	2,872
Proposed Action	0	3,038	3,195	3,360
Mixed Use	0	3,230	3,401	3,774

Migratory-Related Population Effects (b)



Migratory-Related Population Effects (b)



Total ROI Population Including Migratory-Related Effects (c)

EXPLANATION

- Preclosure
- Post-Closure Conditions
- No-Action/Realignment
- Proposed Action
- Mixed Use

(a) 1993 represents closure baseline conditions.
(b) Migratory-related population effects are the persons that would move into the ROI solely as a result of reuse.
(c) Changes in alternatives are too small to be noticeable on graph.

Migratory-Related Population Effects

Figure S-2

pollutant concentrations far in the future. Environmental impacts are summarized in Table S-2. The table includes a summary of closure baseline conditions to provide a basis for comparison of reuse-related changes and associated impacts. Changes and associated impacts due to military realignment actions are also presented under the No-Action/Realignment Alternative to provide a comparative basis for future conditions.

Mitigations and Pollution Prevention. Mitigations for potential environmental impacts associated with the establishment of NAS Fort Worth are presented and discussed under the No-Action/Realignment Alternative. The Navy, acting as host unit, will be responsible for implementing these mitigations measures. Options of mitigating potential environmental impacts that may result from disposal and subsequent civilian reuse activities are also presented and discussed. Since most of the potential environmental impacts associated with disposal would be the direct result of reuse by other civilian property recipients, DOD is not typically responsible for implementing such mitigations. Full responsibility for the suggested mitigations under the Proposed Action and Mixed Use Alternative, would be primarily borne by future property recipients or local government agencies. Mitigations for affected resource areas are summarized along with the environmental impacts of the reuse alternatives in Table S-2.

NO-ACTION/REALIGNMENT ALTERNATIVE

Local Community. The No-Action/Realignment Alternative would increase employment levels in the Region of Influence (ROI) from 1,497 jobs in 1993 to approximately 7,118 jobs in 2013. Approximately 3,881 direct jobs and 3,129 secondary jobs would be associated with NAS Fort Worth. The remaining 108 jobs (50 direct and 58 secondary) would be associated with the caretaker activities of the Operating Location. The No-Action/ Realignment Alternative would increase the total ROI employment to 993,573, or 0.5 percent over post-closure conditions in 2013.

The No-Action Realignment Alternative would increase the ROI population by 2,872 persons, or a 0.2 percent increase, over post-closure conditions in the year 2013.

Military reuse of the base property would comprise approximately 1,887 acres; the remaining portions of the base would be held under caretaker status in the long term. The property would remain under federal control for DOD use, and therefore, would be exempt from the local jurisdiction's zoning. Due to changes in the noise contours, the amount of incompatible land use areas (i.e., residential and institutional) exposed to high levels of aircraft noise would be reduced when compared to preclosure conditions. However, military aircraft operations may generate additional off-base land use incompatibilities due to changes in airfield safety zones. Fort Worth, White Settlement, and Westworth Village should amend their zoning

Table S-2. Summary of Environmental Impacts and Suggested Mitigation from the No-Action/Realignment Alternative, the Proposed Action, and the Mixed Use Alternative

Resource Category	Closure Baseline	No-Action/Realignment Alternative[a]	Proposed Action[b]	Mixed Use Alternative[b]
Local Community				
• Land Use and Aesthetics	Conditions: Retained military activities totaling 1,198 acres. Remaining 1,421 acres of the base property placed under caretaker status.	• Impacts: Expansion of military land use to 1,887 acres for NAS Fort Worth activities. Remaining 732 acres maintained in caretaker status. Fewer land use incompatibilities due to aircraft noise contours, however, increased land use conflicts due to Navy APZ configuration. • Mitigations: Modifications of local community zoning ordinances according to Navy AICUZ criteria.	• Impacts: Civilian redevelopment of 735 acres. Revisions to local zoning and plans required to reflect non-federal civilian reuse. Minimal additional land use incompatibilities. Visual quality could be affected by proposed civilian development activities. • Mitigations: Retention of mature woods along SH 183 and Lake Worth through implementing development standards and design planning.	• Impacts: Civilian redevelopment of 747 acres. Revisions to local zoning and plans required to reflect non-federal civilian reuse. Minimal additional land use incompatibilities. Reduction in land use restrictions due to residential use of the Off-site WSA. Visual quality would be affected by proposed civilian development. • Mitigations: Retention of mature woods along SH 183 and Lake Worth through design planning and implementation of development standards.

Notes: (a) Impacts are based on the changes from post-closure conditions, which are projected to occur as a result of implementing the No-Action/Realignment Alternative.
(b) Impacts are based on the changes from the No-Action/Realignment Alternative that are projected to occur as a result of implementing that alternative. Total reuse effects are given on occasion to show the total reuse-related activity associated with the base property.

AICUZ = Air Installation Compatible Use Zone.
APZ = Accident Potential Zone.
NAS = Naval Air Station.
SH = State Highway.
WSA = Weapons Storage Area.

Table S-2. Summary of Environmental Impacts and Suggested Mitigation from the No-Action/Realignment Alternative, the Proposed Action, and the Mixed Use Alternative

Resource Category	Closure Baseline	No-Action/Realignment Alternative[a]	Proposed Action[b]	Mixed Use Alternative[b]
Local Community (Continued)				
• Transportation	Conditions:	• Impacts:	• Impacts:	• Impacts:
	1,100 daily trips. Three gates closed; access limited to Main Gate.	Increase to 7,000 daily vehicular trips. Access provided by all 4 existing gates. Military reuse-related traffic would degrade the LOS from A to B on SH 183. With programmed improvements, roadway segments would maintain acceptable LOS.	Additional 27,250 daily vehicular trips. Additional access provided at Green Oaks Blvd. and SH 183. Civilian reuse-related traffic on I-30 would degrade the LOS to C, and degrade the LOS on SH 183 to D.	Additional 37,550 daily vehicular trips. Additional access provided at Green Oaks Blvd. and SH 183. Civilian reuse-related traffic on I-30 would degrade the LOS to C, and degrade the LOS on SH 183 to D.
	20,930 annual aircraft operations associated with retained military activities.	Increase of 87,258 annual aircraft operations. Relocation or modification to the existing ATCT may be required to improve line of sight to the runway and taxiway areas. No adverse impacts to airspace or air traffic within the ROI is anticipated.	Additional 416 annual aviation operations. No additional airspace conflicts or air transportation impacts.	Additional 360 annual aircraft operations. No additional airspace conflicts or air transportation impacts.
• Utilities Use	Conditions:	• Impacts:	• Impacts:	• Impacts:
	Water: 0.01 MGD Wastewater: 0.01 MGD Solid Waste: 1.60 tons/day Electricity: 18.95 MWH/day Natural Gas: 0.04 MMCF/day	Less than 1 percent increase in ROI utility use. Current systems, with planned improvements, would be able to accommodate these increased demands. Interconnections required to provide service to on-base users. Pretreatment of industrial wastewater may be required. Waste minimization program would be implemented by NAS Fort Worth to further minimize potential impacts.	Up to 2.0 percent increase in ROI utility use. Current systems, with planned improvements, would be able to accommodate these increased demands. Interconnections required to provide service to on-base users. Pretreatment of industrial wastewater may be required.	Up to 2.1 percent increase in ROI utility use. Current systems with planned improvements would be able to accommodate the increases in utility demands. Interconnection required to provide service to on-base users. Pretreatment of industrial wastewater may be required.

Notes: (a) Impacts are based on the changes from post-closure conditions, which are projected to occur as a result of implementing the No-Action/Realignment Alternative.
(b) Impacts are based on the changes from the No-Action/Realignment Alternative that are projected to occur as a result of implementing that alternative. Total reuse effects are given on occasion to show the total reuse-related activity associated with the base property.

ATCT = Air Traffic Control Tower.
I = Interstate.
LOS = Level of Service.
MGD = million gallons per day.
MMCF/day = million cubic feet per day.
MWH/day = megawatt-hours per day.
ROI = Region of Influence.
SH = State Highway.

Table S-2. Summary of Environmental Impacts and Suggested Mitigation from the No-Action/Realignment Alternative, the Proposed Action, and the Mixed Use Alternative
Page 3 of 12

Resource Category	Closure Baseline	No-Action/Realignment Alternative[a]	Proposed Action[b]	Mixed Use Alternative[b]
Local Community (Continued)				
		• Mitigations: Provide industrial wastewater pretreatment in accordance with applicable permit requirements. Recycle or reuse construction/demolition debris.	• Mitigations: Provide industrial wastewater pretreatment in accordance with applicable permit requirements. Recycle or reuse construction/demolition debris.	• Mitigations: Provide industrial wastewater pretreatment in accordance with applicable permit requirements. Recycle or reuse construction/demolition debris.
Hazardous Materials and Hazardous Waste Management				
• Hazardous Materials Management	Conditions: Materials used for retained military activities and caretaker activities managed in compliance with applicable regulations.	• Impacts: Increase in types and quantities of materials used over closure conditions. Implementation of pollution prevention measures would likely reduce quantities of materials used to levels below preclosure conditions. Compliance with applicable regulations would preclude adverse impacts.	• Impacts: Increase in types and quantities of materials used. Compliance with applicable regulations would preclude adverse impacts.	• Impacts: Increase in types and quantities of materials used. Compliance with applicable regulations would preclude adverse impacts.
			• Mitigations: Establish a cooperative planning body to reduce impacts associated with civilian reuse.	• Mitigations: Establish a cooperative planning body to reduce impacts associated with civilian reuse.

Notes: (a) Impacts are based on the changes from post-closure conditions, which are projected to occur as a result of implementing the No-Action/Realignment Alternative.
(b) Impacts are based on the changes from the No-Action/Realignment Alternative that are projected to occur as a result of implementing that alternative. Total reuse effects are given on occasion to show the total reuse-related activity associated with the base property.

Table S-2. Summary of Environmental Impacts and Suggested Mitigation from the No-Action/Realignment Alternative, the Proposed Action, and the Mixed Use Alternative
Page 4 of 12

Resource Category	Closure Baseline	No-Action/Realignment Alternative[a]	Proposed Action[b]	Mixed Use Alternative[b]
Hazardous Materials and Hazardous Waste Management (Continued)				
• Hazardous Waste Management	Conditions: Wastes generated by retained military activities and caretaker activities managed in accordance with applicable regulations.	• Impacts: Increases in types and quantities of wastes generated over closure conditions. Pollution prevention measures would be implemented to reduce quantities to levels below preclosure conditions. Compliance with applicable regulations would preclude unacceptable impacts. • Mitigations: Collection of hazardous household products; educational programs on recycling, waste minimization, and waste disposal.	• Impacts: Increase in quantities of wastes generated. Compliance with applicable regulations would preclude unacceptable impacts. • Mitigations: Establish a cooperative planning body. Collection of hazardous household products; educational programs on recycling, waste minimization, and waste disposal.	• Impacts: Increase in quantities of wastes generated. Compliance with applicable regulations would preclude unacceptable impacts. • Mitigations: Establish a cooperative planning body. Collection of hazardous household products; educational programs on recycling, waste minimization, and waste disposal.
• IRP	Conditions: IRP activities continued regardless of base closure and reuse. IRP remediation activities continued in accordance with applicable regulations.	• Impacts: Short-term impacts to flightline activities may occur due to site remediation activities. Coordination between NAS Fort Worth, the OL, and AF Plant #4 to address remediation activities would further minimize land use restrictions.	• Impacts: Possible land use restrictions and civilian redevelopment delays due to current and future remediation. Coordination between interested parties would reduce potential impacts that may arise with IRP sites located on properties scheduled for civilian reuse.	• Impacts: Possible land use restrictions and civilian redevelopment delays due to current and future remediation. Coordination between interested parties would reduce potential impacts that may arise for IRP sites located on properties scheduled for civilian reuse.

Notes: (a) Impacts are based on the changes from post-closure conditions, which are projected to occur as a result of implementing the No-Action/Realignment Alternative.
(b) Impacts are based on the changes from the No-Action/Realignment Alternative that are projected to occur as a result of implementing that alternative. Total reuse effects are given on occasion to show the total reuse-related activity associated with the base property.
AF = Air Force.
IRP = Installation Restoration Program.
NAS = Naval Air Station.
OL = Operating Location.

Table S-2. Summary of Environmental Impacts and Suggested Mitigation from the No-Action/Realignment Alternative, the Proposed Action, and the Mixed Use Alternative

Resource Category	Closure Baseline	No-Action/Realignment Alternative[a]	Proposed Action[b]	Mixed Use Alternative[b]
Hazardous Materials and Hazardous Waste Management (Continued)				
• Storage Tanks	Conditions: Storage tanks for retained military activities managed in accordance with applicable regulations. Unused tanks removed or maintained in place in accordance with applicable standards.	• Impacts: Storage tanks required by NAS Fort Worth would be subject to Navy policy and applicable regulations. Other remaining USTs would be removed or managed by OL in accordance with applicable regulations. • Mitigations: Coordination between NAS Fort Worth and the OL to avoid damage to remaining USTs and piping systems during military realignment construction.	• Impacts: Storage tanks required by civilian owner/operator would be subject to applicable regulations to avoid unacceptable impacts. • Mitigations: Coordination between the reuse planning agencies and NAS Fort Worth to avoid damage to remaining USTs and piping systems during civilian reuse-related construction.	• Impacts: Storage tanks required by civilian owner/operator would be subject to applicable regulations to avoid unacceptable impacts. • Mitigations: Coordination between the reuse planning agencies and NAS Fort Worth to avoid damage to remaining USTs and piping systems during civilian reuse-related construction.

Notes: (a) Impacts are based on the changes from post-closure conditions, which are projected to occur as a result of implementing the No-Action/Realignment Alternative.
(b) Impacts are based on the changes from the No-Action/Realignment Alternative that are projected to occur as a result of implementing that alternative. Total reuse effects are given on occasion to show the total reuse-related activity associated with the base property.
NAS = Naval Air Station.
OL = Operating Location.
UST = underground storage tank.

Table S-2. Summary of Environmental Impacts and Suggested Mitigation from the No-Action/Realignment Alternative, the Proposed Action, and the Mixed Use Alternative
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Resource Category	Closure Baseline	No-Action/Realignment Alternative[a]	Proposed Action[b]	Mixed Use Alternative[b]
Hazardous Materials and Hazardous Waste Management (Continued)				
• Asbestos	Conditions: ACM posing a health risk removed. Remaining ACM managed in accordance with Air Force policy. Unoccupied buildings secured by the OL to prevent contact with ACM.	• Impacts: Management of ACM during military demolition and renovation activities would be in accordance with NESHAP and applicable regulations.	• Impacts: Management of ACM during demolition and renovation activities would be subject to NESHAP and applicable regulations. Remaining ACM would be managed in accordance with applicable regulations to minimize potential risk to human health or the environment.	• Impacts: Management of ACM during demolition and renovation activities would be subject to NESHAP and applicable regulations. Remaining ACM would be managed in accordance with applicable regulations to minimize potential risk to human health or the environment.
• Pesticide Usage	Conditions: Pesticides used by retained military activities and caretaker activities managed in compliance with applicable standards.	• Impacts: No appreciable increase in use of pesticides. Application and management in accordance with FIFRA and other guidelines would preclude unacceptable impacts.	• Impacts: Increased use associated with civilian development. Management in accordance with FIFRA and state guidelines would preclude unacceptable impacts.	• Impacts: Increased use associated with civilian development. Management in accordance with FIFRA and state guidelines would preclude unacceptable impacts.
• PCBs	Conditions: All federally regulated PCBs removed and properly disposed of prior to closure.	• No Impact.	• No Impact.	• No Impact.

Notes: (a) Impacts are based on the changes from post-closure conditions, which are projected to occur as a result of implementing the No-Action/Realignment Alternative.
(b) Impacts are based on the changes from the No-Action/Realignment Alternative that are projected to occur as a result of implementing that alternative. Total reuse effects are given on occasion to show the total reuse-related activity associated with the base property.
ACM = asbestos-containing material.
FIFRA = Federal Insecticide, Fungicide, and Rodenticide Act.
NESHAP = National Emissions Standards for Hazardous Air Pollutants.
OL = Operating Location.
PCB = polychlorinated biphenyls.

Table S-2. Summary of Environmental Impacts and Suggested Mitigation from the No-Action/Realignment Alternative, the Proposed Action, and the Mixed Use Alternative

Resource Category	Closure Baseline	No-Action/Realignment Alternative[a]	Proposed Action[b]	Mixed Use Alternative[b]
Hazardous Materials and Hazardous Waste Management (Continued)				
• Radon	Conditions: No occupancy of facilities with registered radon levels above 4 pCi/l is expected.	• Impacts: Navy policy requires all buildings and housing units occupied over 4 hours per day to be tested for presence of radon. Levels of or exceeding 4 pCi/l would be mitigated using U.S. EPA-recommended guidelines.	• Impacts: Potential exposure to levels greater than the standard (4 pCi/l). Prior to reuse, reuse planning agencies would identify structures known to exceed the U.S. EPA recommended level of 4 pCi/l.	• Impacts: Potential exposure to levels greater than the standard (4 pCi/l). Prior to reuse, reuse planning agencies would identify structures known to exceed the U.S. EPA recommended level of 4 pCi/l.
• Medical/ Biohazardous Waste	Conditions: Existing wastes removed by OL in accordance with applicable regulations.	• Impacts: Slight increase in amounts generated over closure conditions due to military medical clinic. Quantity of wastes generated would remain below preclosure levels. Proper management under Navy policy and applicable regulations would avoid unacceptable impacts.	• Impacts: Increase in amounts generated. Proper management under applicable regulations would avoid adverse impacts.	• Impacts: Increase in amounts generated. Proper management under applicable regulations would avoid adverse impacts.
• Ordnance	Conditions: All unexploded ordnance removed from the Off-Site WSA (including the EOD area) and WSA in the central flightline area prior to closure. Ordnance stored in the northern WSA and used at the firing range in conjunction with the retained military activities.	• Impacts: Continued use and maintenance of small arms firing range and northern main base WSA for NAS Fort Worth. Management of these facilities under Navy policy and applicable regulations would preclude adverse impacts.	• Impacts: Possible increase in types and quantities of ordnance due to civilian reuse of Off-Site WSA. Compliance with applicable regulations would preclude adverse impacts.	• No additional impact.

Notes: (a) Impacts are based on the changes from post-closure conditions, which are projected to occur as a result of implementing the No-Action/Realignment Alternative.
(b) Impacts are based on the changes from the No-Action/Realignment Alternative that are projected to occur as a result of implementing that alternative. Total reuse effects are given on occasion to show the total reuse-related activity associated with the base property.

EOD = Explosive Ordnance Disposal.
EPA = Environmental Protection Agency.
NAS = Naval Air Station.
OL = Operating Location
pCi/l = picocuries per liter.
WSA = Weapons Storage Area.

Table S-2. Summary of Environmental Impacts and Suggested Mitigation from the No-Action/Realignment Alternative, the Proposed Action, and the Mixed Use Alternative
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Resource Category	Closure Baseline	No-Action/Realignment Alternative[a]	Proposed Action[b]	Mixed Use Alternative[b]
Hazardous Material and Hazardous Waste Management (Continued)				
• Lead-based Paint	Conditions: Lead-based paint assumed to be present in all facilities built prior to or during 1978. A survey will be conducted at high-priority facilities, in accordance with Air Force policy, to assess the presence of lead-based paint.	• Impacts: Lead-based paint would be remediated, as necessary, from facilities planned for renovation or demolition. Disposal in accordance with applicable regulations would preclude any unacceptable impacts.	• Impacts: Lead-based paint would be remediated, as necessary, from facilities planned for renovation or demolition. Disposal in accordance with applicable regulations would preclude any unacceptable impacts.	• Impacts: Lead-based paint would be remediated as necessary, from facilities planned for renovation or demolition. Disposal in accordance with applicable regulations would preclude any unacceptable impacts.
Natural Environment				
• Soils and Geology	Conditions: No ground disturbance.	• Impacts: Minor erosion effects from 24 acres of ground disturbance due to military construction activities. • Mitigations: Preventive measures and proper design, such as protective cover and diversion dikes, to minimize erosion during and after construction.	• Impacts: Minor erosion effects from an additional 184 acres of ground disturbance. • Mitigations: Preventive measures and proper design, such as protective cover and diversion dikes, to minimize erosion during and after construction.	• Impacts: Minor erosion effects from an additional 256 acres of ground disturbance. • Mitigations: Preventive measures and proper design, such as protective cover and diversion dikes, to minimize erosion during and after construction.

Notes: (a) Impacts are based on the changes from post-closure conditions, which are projected to occur as a result of implementing the No-Action/Realignment Alternative.
(b) Impacts are based on the changes from the No-Action/Realignment Alternative that are projected to occur as a result of implementing that alternative. Total reuse effects are given on occasion to show the total reuse-related activity associated with the base property.

Table S-2. Summary of Environmental Impacts and Suggested Mitigation from the No-Action/Realignment Alternative, the Proposed Action, and the Mixed Use Alternative
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Resource Category	Closure Baseline	No-Action/Realignment Alternative[a]	Proposed Action[b]	Mixed Use Alternative[b]
Natural Environment (Continued)				
• Water Resources	Conditions: No ground disturbance. Adequate water supply for limited on-base demand.	• Impacts: Military construction activities on 24 acres could affect surface water flow and water quality. Compliance with NPDES and local permit requirements for storm water and wastewater discharge and pollution prevention requirements would further minimize water quality impacts. 0.4 percent increase in water demands would not affect water supply. • Mitigations: Use of proper construction techniques, control of site runoff, minimizing of surface disturbance and length of exposure time.	• Impacts: Additional disturbance and civilian development of 184 acres could affect surface water flow and water quality. Compliance with NPDES and local permit requirements for storm water and wastewater discharge and pollution prevention requirements would further minimize water quality impacts. Additional 0.2 percent increase in water demand would not affect water supply. • Mitigations: Use of proper construction techniques, control of site runoff, minimizing of surface disturbance and length of exposure time.	• Impacts: Additional disturbance and civilian development of 256 acres could affect surface water flow and water quality. Compliance with NPDES and local permit requirements for storm water and wastewater discharge and pollution prevention requirements would further minimize water quality impacts. Additional 0.3 percent increase in water demand would not affect water supply. • Mitigations: Use of proper construction techniques, control of site runoff, minimizing of surface disturbance and length of exposure time.

Notes: (a) Impacts are based on the changes from post-closure conditions, which are projected to occur as a result of implementing the No-Action/Realignment Alternative.
(b) Impacts are based on the changes from the No-Action/Realignment Alternative that are projected to occur as a result of implementing that alternative. Total reuse effects are given on occasion to show the total reuse-related activity associated with the base property.
NPDES = National Pollutant Discharge Elimination System.

Table S-2. Summary of Environmental Impacts and Suggested Mitigation from the No-Action/Realignment Alternative, the Proposed Action, and the Mixed Use Alternative
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Resource Category	Closure Baseline	No-Action/Realignment Alternative[a]	Proposed Action[b]	Mixed Use Alternative[b]
Natural Environment (Continued)				
• Air Quality	Conditions: NO_x: 0.17 ton/day VOC: 0.13 ton/day PM_{10}: 0.01 ton/day SO_2: 0.01 ton/day CO: 0.44 ton/day Limited air pollutant emissions generated from retained military activities and caretaker activities. Air Force to implement air emission controls in SIP as appropriate.	• Impacts: Increased air emissions due to military realignment in 2003: NO_x: 0.70 ton/day VOC: 0.52 ton/day PM_{10}: 0.09 ton/day SO_2: 0.03 ton/day CO: 3.40 tons/day Reuse-related emissions would remain below preclosure conditions. With implementation of SIP control measures, reuse activities would not affect the region's progress to reach and maintain attainment of the ozone standard. No adverse impacts for the other criteria pollutants. • Mitigations: Control of fugitive dust and combustion emissions during construction. No additional mitigations required beyond the control measures identified in the SIP.	• Impacts: Additional air emissions due to civilian reuse in 2003: NO_x: 0.38 ton/day VOC: 0.35 ton/day PM_{10}: 0.02 ton/day SO_2: 0.01 ton/day CO: 3.10 tons/day Reuse-related emissions would remain below preclosure conditions. With implementation of SIP control measures, reuse activities would not affect the region's progress to reach and maintain attainment of the ozone standard. No adverse impacts for other criteria pollutants. • Mitigations: Control of fugitive dust and combustion emissions during construction. No additional mitigations required beyond the control measures identified in the SIP.	• Impacts: Additional air emissions due to civilian reuse in 2003: NO_x: 0.63 ton/day VOC: 0.59 ton/day PM_{10}: 0.04 ton/day SO_2: 0.01 ton/day CO: 6.29 tons/day Reuse-related emissions would remain below preclosure conditions. With implementation of SIP control measures, reuse activities would not affect the region's progress to reach and maintain attainment of the ozone standard. No adverse impacts for other criteria pollutants. • Mitigations: Control of fugitive dust and combustion emissions during construction. No additional mitigations required beyond the control measures identified in the SIP.

Notes: (a) Impacts are based on the changes from post-closure conditions, which are projected to occur as a result of implementing the No-Action/Realignment Alternative.
(b) Impacts are based on the changes from the No-Action/Realignment Alternative that are projected to occur as a result of implementing that alternative. Total reuse effects are given on occasion to show the total reuse-related activity associated with the base property.
CO = carbon monoxide.
NO_x = nitrogen oxide.
PM_{10} = particulate matter equal to or less than 10 microns in diameter.
SIP = State Implementation Plan.
SO_2 = sulfur dioxide.
VOC = volatile organic compounds.

Table S-2. Summary of Environmental Impacts and Suggested Mitigation from the No-Action/Realignment Alternative, the Proposed Action, and the Mixed Use Alternative
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Resource Category	Closure Baseline	No-Action/Realignment Alternative[a]	Proposed Action[b]	Mixed Use Alternative[b]
Natural Environment (Continued)				
• Noise	Conditions: 8,436 acres and 10,200 residents exposed to DNL 65 dB or greater due to continued military aircraft operations.	• Impacts: Although aircraft noise levels would increase over closure conditions, the area exposed to DNL 65 dB or greater would decrease by 2,605 acres and affect 2,300 fewer residents when compared to preclosure conditions. No additional residents exposed to surface traffic noise levels. • Mitigations: Implementation of Navy AICUZ guidelines and appropriate mitigations.	• Impacts: Aircraft noise impacts similar to No-Action/Realignment Alternative. An additional 110 residents exposed to surface traffic noise levels of DNL 65 dB or greater. • Mitigations: Implementation of Navy AICUZ guidelines and appropriate mitigations.	• Impacts: Aircraft noise impacts similar to No-Action/Realignment Alternative. An additional 400 residents exposed to surface traffic noise levels of DNL 65 dB or greater. • Mitigations: Implementation of Navy AICUZ guidelines and appropriate mitigations.
• Biological Resources	Conditions: No ground disturbance. No threatened or endangered species on base. Two candidate species may occur on base. 0.6 acres of jurisdictional wetlands present. Migratory bird habitat present along Lake Worth shoreline.	• Impacts: 24 acres of disturbance due to military realignment activities. Biological resources affected primarily through human interaction. Increased impacts to wildlife due to additional flight operations. No impact to wetlands or threatened or endangered species.	• Impacts: Additional 184 acres of ground disturbance. No additional impact to wetlands or threatened or endangered species.	• Impacts: Additional 256 acres of disturbance. No additional impact to threatened or endangered species. Potential impact to approximately 0.1 acre of low quality wetlands at the Off-Site WSA. • Mitigations: Site planning at Off-Site WSA could minimize minor effects to wetlands. Mitigation measures, if necessary, would be determined by the Corps of Engineers.

Notes: (a) Impacts are based on the changes from post-closure conditions, which are projected to occur as a result of implementing the No-Action/Realignment Alternative.
(b) Impacts are based on the changes from the No-Action/Realignment Alternative that are projected to occur as a result of implementing that alternative. Total reuse effects are given on occasion to show the reuse-related activity associated with the base property.
AICUZ = Air Installation Compatible Use Zone.
dB = decibel.
DNL = day-night average sound level.
WSA = Weapons Storage Area.

Table S-2. Summary of Environmental Impacts and Suggested Mitigation from the No-Action/Realignment Alternative, the Proposed Action, and the Mixed Use Alternative
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Resource Category	Closure Baseline	No-Action/Realignment Alternative[a]	Proposed Action[b]	Mixed Use Alternative[b]
Natural Environment (Continued)				
• Cultural Resources	Conditions: No ground disturbance. One historic property currently listed on NRHP. Additional properties may be eligible for listing on the NRHP; a survey is in progress.	• Impacts: No adverse impacts to archaeological, Native American, or paleontological resources. Potential adverse effects to historic properties listed on or potentially eligible for listing on the NRHP. • Mitigations: SHPO and Advisory Council would be consulted during development and implementation of procedures and mitigation strategies. Prepare agreement document to establish acceptable mitigation measures. Consult with archaeologist if cultural resources are discovered during redevelopment activities.	• Impacts: No adverse impacts to archaeological, Native American, or paleontological resources. Potential adverse effects to historic properties listed on or potentially eligible for listing on the NRHP. • Mitigations: Properties may be conveyed to non-federal owners with preservation covenants. SHPO and Advisory Council would be consulted during development and implementation of procedures and mitigation strategies. Prepare agreement document to establish acceptable mitigation measures. Consult with archaeologist if cultural resources are discovered during redevelopment activities.	• Impacts: No adverse impacts to archaeological, Native American, or paleontological resources. Potential adverse effects to historic properties listed on or potentially eligible for listing on the NRHP. • Mitigations: Properties may be conveyed to non-federal owners with preservation covenants. SHPO and Advisory Council would be consulted during development and implementation of procedures and mitigation strategies. Prepare agreement document to establish acceptable mitigation measures. Consult with archaeologist if cultural resources are discovered during redevelopment activities.

Notes: (a) Impacts are based on the changes from post-closure conditions, which are projected to occur as a result of implementing the No-Action/Realignment Alternative.
(b) Impacts are based on the changes from the No-Action/Realignment Alternative that are projected to occur as a result of implementing that alternative. Total reuse effects are given on occasion to show the reuse-related activity associated with the base property.
NRHP = National Register of Historic Places.
SHPO = State Historic Preservation Officer.

ordinances according to Navy Air Installation Compatible Use Zone (AICUZ) criteria in order to implement planning policies for areas surrounding the base impacted by noise, height restrictions, and safety hazards; and to define compatible types and patterns of future land uses.

Traffic associated with the No-Action/Realignment Alternative would degrade the Level of Service (LOS) from A to B on State Highway 183 adjacent to the base. The No-Action/Realignment Alternative would not affect the projected LOS along any of the other key roadways. With planned improvements, key roadway segments would maintain an acceptable LOS of D or better. Relocation or modification to the existing Air Traffic Control Tower may be required to improve line of sight to the runway and taxiway areas. Adverse impacts to airspace or air transportation within the ROI are not anticipated. DOD will continue to coordinate with the Federal Aviation Administration to ensure the adequacy of airspace in conjunction with NAS Fort Worth activities.

The No-Action/Realignment Alternative would increase the ROI utility demand by less than 1 percent over post-closure conditions. Current systems with planned improvements would be able to accommodate the increased demands. Pretreatment of industrial wastewater may be required in accordance with Section 307(b)(c) of the Clean Water Act prior to discharging to the city's wastewater collection system. Pollution prevention and waste minimization plans would be implemented at NAS Fort Worth to further minimize potential impacts.

Hazardous Materials and Hazardous Waste Management. Increased quantities of hazardous materials and wastes would be generated over closure conditions; however, pollution prevention in measures would be implemented in accordance with Navy policy to minimize the types and quantities of hazardous materials/wastes to levels below pre-closure conditions. NAS Fort Worth and DOD tenants would be individually responsible for hazardous materials management in accordance with applicable regulations to minimize potential impacts. As long as the Resource Conservation and Recovery Act permit remains in effect, the permit holder would ultimately be responsible for hazardous waste management. To further minimize impacts from hazardous materials and wastes, a cooperative planning body for hazardous materials and waste management on NAS Fort Worth would be established by the Navy host unit.

NAS Fort Worth activities are not expected to affect or be adversely affected in the long term by remediation activities under the Installation Restoration Program (IRP). Short-term impacts to flightline activities would be minimized through coordination between affected parties. DOD is committed to continue IRP activities at Carswell AFB under the Defense Environmental Restoration Program, the Comprehensive Environmental

Response, Compensation and Liability Act, the Defense-State Memorandum of Agreement, the Partnering Agreement, and the AF Plant #4 Federal Facility Agreement.

Storage tanks required by NAS Fort Worth would be managed under Navy policy and applicable regulations. The remaining underground storage tanks would be removed or maintained in place by the Operating Location according to required standards.

Asbestos-containing materials would be managed in accordance with National Emissions Standards for Hazardous Air Pollutants and applicable regulations to protect human health and the environment.

Pesticide usage would continue to be managed in accordance with the Federal Insecticide, Fungicide, and Rodenticide Act, and state and Navy guidelines.

All polychlorinated biphenyl equipment and polychlorinated biphenyl-contaminated equipment under Air Force control, except for eight capacitors that are exempt under Toxic Substances Control Act, were removed from the base by the time of closure.

Navy policy calls for all building and housing units occupied over 4 hours per day to be tested for the presence of radon. Levels of or exceeding 4 picocuries per liter would be mitigated using U.S. Environmental Protection Agency recommended guidelines.

Although the No-Action/Realignment Alternative would increase the amounts of medical/biohazardous waste generated over closure conditions, the amounts of wastes generated from the proposed military medical clinic operation at NAS Fort Worth would remain well below preclosure levels. Potential impacts would be minimized with proper management practices established under applicable regulations.

NAS Fort Worth would utilize the existing small arms firing range and the Weapons Storage Area (WSA) on the northern end of the base in accordance with Navy policy and applicable regulations.

Lead-based paints would be remediated, as necessary, from facilities planned for renovation or demolition, in accordance with Navy policy and applicable regulations.

Natural Environment. The No-Action/Realignment Alternative could disturb or alter about 24 acres of land. Preventative measures would be implemented to minimize the short-term erosion impacts and proper design would preclude long-term erosion impacts. Development would cause changes to surface flow rates and patterns. Compliance with National

Pollutant Discharge Elimination System and pollution prevention requirements would minimize surface water quality impacts. Adequate water supplies are expected to be available to satisfy the 0.4 percent increase in water demand.

Throughout the 10-year analysis period, reuse-related air emissions of primary criteria pollutants would remain below Carswell AFB preclosure emission rates and concentrations. With the implementation of the 1993 State Implementation Plan control measures, reuse activities are not expected to interfere with the region's ability to reach attainment of the ozone standard. Emissions would not affect the attainment status of the other criteria pollutants or have an adverse impact on the local air quality.

The amount of land exposed to aircraft noise levels of day-night average sound level (DNL) 65 decibels (dB) or greater is expected to increase by 1,927 acres over closure conditions, but decrease by 2,605 acres when compared to preclosure conditions. Under the No-Action/Realignment Alternative, the number of residents exposed to aircraft noise levels of DNL 65 dB or greater would increase by 1,500 over closure conditions, and decrease by 2,300 when compared to preclosure conditions. The Navy would implement appropriate provisions in their AICUZ program to reduce the effects of aircraft noise associated with the military realignment.

Biological resources could be affected by realignment activities and establishment of NAS Fort Worth, primarily through human activity, minor ground disturbance, and increased flight operations. Impacts to vegetation, wildlife, threatened and endangered species, and sensitive habitats would be minimal under the No-Action/ Realignment Alternative. The wildlife located at and around Carswell AFB is expected to be sensitized to aircraft noise and would habituate to changes in aircraft noise conditions.

There would be no adverse impacts to archaeological, Native American, or paleontological resources. Potential adverse effects to historic properties that are either listed on, or potentially eligible to, the National Register of Historic Places (NRHP), could occur due to realignment activities. Section 106 consultation with the Texas State Historic Preservation Office (SHPO) has been initiated and results of ongoing historic evaluation and coordination will be provided in the Final EIS. All buildings and structures ultimately determined to be eligible to the NRHP will be analyzed according to the potential impacts from each alternative.

PROPOSED ACTION

Local Community. In addition to the 7,010 jobs associated with military reuse, civilian redevelopment of the base property under the Proposed Action would increase reuse-related employment by approximately 11,802 additional jobs (5,101 direct and 6,701 secondary jobs) by the year 2013.

The total ROI employment would reach 1,005,267 in 2013, or 1.2 percent over the No-Action/Realignment Alternative. The Proposed Action would increase ROI population by 488 persons due to civilian reuse.

Changes to on-base land uses would occur due to 735 acres of civilian redevelopment. Proposed on-base land uses would generally be compatible with each other. Appropriate security fencing and buffers would be provided to minimize incompatibility between the institutional (prison) and military uses. Aircraft safety- and noise-related land use incompatibilities would be similar to those discussed under the No-Action/Realignment Alternative. The proposed federal medical center complex would be under federal control and, therefore, would continue to be exempt from local zoning. Other proposed civilian land uses would require modification of the communities' current general plans and zoning. Removal of mature landscaping for new construction could reduce the visual quality; however, the replacement of existing facilities with new residential development within Kings Branch would create positive visual effects.

The Proposed Action would incorporate one improved entry point to enhance access to the commercial areas on the east side of the base. Traffic associated with civilian reuse would degrade State Highway 183 from LOS B to D, and degrade the LOS on Interstate 30 from B to C. With planned improvements, the key roadway segments would operate at an acceptable LOS of D or above. Additional airspace conflicts or air transportation impacts are not anticipated under the Proposed Action.

Civilian reuse associated with the Proposed Action would cause up to a 2 percent increase in the ROI utility demand over the No-Action/Realignment Alternative and could be accommodated by existing and future system capacities. Local utility systems may need to be interconnected to on-base systems and facilities to provide required service. The Off-Site WSA may also need to be interconnected to the city water, wastewater, and natural gas distribution systems to provide adequate service. Pretreatment of industrial wastewater on site may be required prior to discharge in accordance with applicable wastewater discharge permits.

Hazardous Materials and Hazardous Waste Management. The quantities of hazardous materials and wastes used and generated by the Proposed Action are expected to be greater than the No-Action/Realignment Alternative. The responsibility for managing hazardous materials and wastes would shift from a single user to multiple, independent users. This may degrade the capability of responding to hazardous materials and waste spills, and would also increase the regulatory burden. Management under all applicable regulations would preclude any unacceptable impacts. Establishment of a cooperative planning body could help mitigate any potential impacts from the management of hazardous materials and wastes.

DOD is committed to continue remediation at all IRP sites at Carswell AFB and AF Plant #4, as discussed under the No-Action/Realignment Alternative. However, civilian redevelopment of some properties may be delayed. Land use restrictions may be required due to the extent and type of site contamination, and by current and future IRP remediation activities. Based on the results of IRP investigations, the Air Force may, where appropriate, place limits on civilian land reuse through deed restrictions on conveyances and use restriction on leases.

New and existing storage tanks required by civilian reuse parties would be subject to the same regulations, except for Navy policy requirements, as under the No-Action/Realignment Alternative. Appropriate precautions to avoid damage to storage tanks and distribution lines should be implemented during civilian construction and operations.

Proper management of asbestos remaining in existing buildings would minimize the potential risk to human health and the environment. Demolition or renovation of structures with asbestos-containing material would be subject to applicable regulations and National Emissions Standards for Hazardous Air Pollutants.

Increased pesticide usage would be subject to the Federal Insecticide, Fungicide, and Rodenticide Act and state guidelines.

Potential recipients of facilities with measured radon levels above 4 picocuries per liter would be advised of this condition prior to property conveyance.

Quantities of medical/biohazardous materials generated under the Proposed Action would increase over the No-Action/Realignment Alternative, and would be managed under all applicable regulations.

Due to the possibility of conventional munitions storage at the Off-Site WSA, the types and quantities of ordnance could increase over the No-Action/Realignment Alternative. Compliance with applicable regulations would preclude adverse impacts.

Management practices regarding lead-based paint for the Proposed Action would be similar to those described under the No-Action/Realignment Alternative.

Natural Environment. The additional effects to soils, geology, and water resources due to the Proposed Action would be minimal when compared to the No-Action/Realignment Alternative. The reuse would include construction of new facilities and infrastructure that would disturb or alter an additional 184 acres of land. Additional development and ground disturbance would cause minor changes to surface drainage flows and may

increase the amount of impervious surface. Degradation to surface water quality may result from increased storm water runoff and increased wastewater discharge. Compliance practices, as described under the No-Action/Realignment Alternative, would minimize water quality impacts. The additional 0.2 percent increase in water demand would not affect the availability of water supplies.

Civilian reuse activities would increase air emissions over the No-Action/Realignment Alternative, however total reuse-related emissions would remain below Carswell AFB preclosure emission levels. Impacts would be similar to those described under the No-Action/Realignment Alternative. No adverse air quality impacts are expected under this alternative.

Aircraft noise impacts would be similar to those described under the No-Action/Realignment Alternative. Civilian reuse would increase surface traffic noise levels, resulting in an additional 110 residents exposed to DNL 65 dB or greater along the roadway segments analyzed.

Effects to biological resources under the Proposed Action, in addition to those experienced under the No-Action/Realignment Alternative, would be minimal. Impacts would be primarily due to the additional 184 acres of ground disturbance.

No significant archaeological, Native American, or paleontological resources are known to occur on the base property. As discussed under the No-Action/Realignment Alternative, disposal activities have the potential to adversely affect historic properties that are either already listed on, or potentially eligible for listing on the NRHP.

MIXED USE ALTERNATIVE

Local Community. In addition to the 7,010 jobs associated with the No-Action/Realignment Alternative, this alternative would increase employment levels by approximately 21,763 jobs (9,457 direct and 12,306 secondary jobs) by the year 2013. Total ROI employment would reach 1,015,228 in 2013, or 2.2 percent over the No-Action/Realignment Alternative. The Mixed Use Alternative would increase ROI population by 902 persons due to civilian reuse.

Proposed civilian land uses under this alternative would generally be similar to the Proposed Action. The Mixed Use Alternative would include the disposal of 15 acres of military land use to civilian aviation support land use, and would result in a net total of 747 acres for civilian development. Appropriate security fencing and buffers would be provided to minimize incompatibility between office/industrial park, aviation support, and military uses. This alternative is generally compatible with the residential nature of the current general plans and zoning, although some modifications to the

community's plans may be required. The reuse of the Off-Site WSA for residential use would reduce land use restrictions of the surrounding area. Off-base land use incompatibilities associated with the aircraft noise contours and safety zones would be similar to those described under the No-Action/Realignment Alternative. Visual impacts would be similar to the Proposed Action.

As under the Proposed Action, one existing entry point would be improved to enhance access to the commercial development on the east side of the base. Impacts to the LOS on key roadways would be similar to those described under the Proposed Action. With planned roadway improvements, conditions would remain at LOS D or above along key roadway segments, despite reuse-related traffic increases. Additional airspace conflicts or air transportation impacts under this alternative are not anticipated.

Civilian reuse associated with the Mixed Use Alternative would cause up to a 2.1 percent increase in the ROI utility demand over the No-Action/ Realignment Alternative, and no impacts due to system capacities are expected. System distribution improvements to provide required service, including those at the Off-Site WSA, would be similar to the Proposed Action.

Hazardous Materials and Hazardous Waste Management. Quantities and types of hazardous materials and wastes utilized would increase over the No-Action/Realignment Alternative, but amounts would generally be similar to those utilized under the Proposed Action. IRP site remediation could cause delays in disposal or restricted land use. Other aspects of hazardous materials and waste management associated with this alternative would be similar to those discussed under the Proposed Action.

Natural Environment. Effects to soils, geology, and water resources would be similar to those described under the Proposed Action, but slightly more land would be disturbed. Approximately 256 additional acres of ground disturbance would occur over the No-Action/Realignment Alternative due to civilian reuse. The additional 0.3 percent increase in water demand would not affect the availability of water supplies.

Civilian reuse activities would increase air emissions over the No-Action/ Realignment Alternative, however total reuse-related emissions would remain below Carswell AFB preclosure emission levels. Impacts would be similar to those described under the No-Action/Realignment Alternative. No adverse air quality impacts are expected under this alternative.

Noise impacts would be similar to those described under the Proposed Action. Civilian reuse-related activities would expose approximately 400 additional residents to surface traffic noise levels of DNL 65 dB or greater along the key roadway segments analyzed.

Impacts to biological resources would be similar to the Proposed Action. Potential impact to approximately 0.1 acre of low-quality wetland could occur at the Off-Site WSA. Compliance with Executive Order 11990 and Section 404 of the Clean Water Act would preclude adverse impacts. Due to the small size and low quality of the wetland to be affected, it is unlikely that mitigations would be required by the U.S. Army Corps of Engineers. However, each case is separately evaluated before final mitigation needs are determined.

As discussed under the Proposed Action, adverse impacts to historic properties may result from disposal activities.

OTHER LAND USE CONCEPTS

Other land use concepts are analyzed in terms of their effects on employment, population, and the environment when combined with the reuse alternatives, including the No-Action/Realignment Alternative. Impacts on the local community and the environment associated with the implementation of the other land use concepts are summarized in Table S-3.

Health and Human Services. Under this land use concept, 20 dwelling units along the eastern edge of the Kings Branch housing complex would be renovated and reused as housing for the handicapped. It is assumed these units would support approximately 50 persons. There would be no measurable effects to any resource area if this land use concept were implemented with any reuse alternative.

Retained Residential Areas. Under this land use concept approximately 550 existing housing units on Carswell AFB would be converted for civilian reuse. The residential land use areas would include the single family units in Kings Branch, the single-family units along SH 183, and 13 individual single-family units scattered throughout the golf course. The existing residential units could be renovated to provide for single-family residences, as well as potential special housing needs, including public-assisted, retirement, low- to moderate-income, or homeless-assisted housing. For analysis purposes, it is assumed the residential areas would be fully occupied by 10 years after base disposal with up to 1,375 residents. Little to no ground disturbance would be required because no new facility construction would be anticipated.

In general, implementation of this land use concept in combination with any of the reuse alternatives would not substantially increase the impacts to any resource, except for noise-related impacts. Approximately 700 residents living in these retained housing units would be exposed to aircraft noise levels of DNL 65 dB or greater. The affected residential areas, with about 260 housing units, would be incompatible with the Navy AICUZ guidelines and other land use compatibility guidelines for noise.

Table S-3. Summary of Impacts from Other Land Use Concepts

Resource Category	Health and Human Services	Retained Residential Areas
Local Community		
Land Use and Aesthetics	No impact	Generally compatible with adjacent land uses. Revisions to local zoning would be required. 260 housing units would be incompatible with aircraft noise levels of DNL 65 dB or above.
Transportation	Minimal daily trips	5,250 daily trips. Potential changes in traffic volumes would not affect level of service.
Utilities	Negligible increase in ROI utility use	Net increases in ROI utility use would not affect utility systems or supplies
Hazardous Materials and Hazardous Waste Management		
Hazardous Material Management	Minor quantities used	Small quantities used
Hazardous Waste Management	Minor quantities generated	Small quantities generated
Installation Restoration Program	No disposal delays or land use restrictions expected	No disposal delays or land use restrictions expected
Storage Tanks	No impact	No impact
Asbestos	Property recipients would be notified of ACM prior to disposal	Property recipients would be notified of ACM prior to disposal
Pesticides Usage	No impact	No impact
Polychlorinated Biphenyls	No impact	No impact
Radon	No impact	Property recipients would be notified of structures with measured radon levels exceeding 4 pCi/l prior to reuse
Medical/Biohazardous Waste	No impact	No impact
Ordnance	No impact	No impact
Lead-Based Paint	Recipients to be advised of potential lead hazards.	Recipients to be advised of potential lead hazards.
Natural Environment		
Soils and Geology	No impact	No impact
Water Resources	No impact	No adverse impacts due to potential increase in water demand
Air Quality	No impact	No adverse impacts due to potential increase in air emissions
Noise	No impact	Approximately 700 residents exposed to aircraft noise levels of DNL 65 dB or greater
Biological Resources	No impact	No impact
Cultural Resources	No impact	No impact

ACM = asbestos-containing material.
dB = decibel.
DNL = day-night average sound level.
pCi/l = picocuries per liter.

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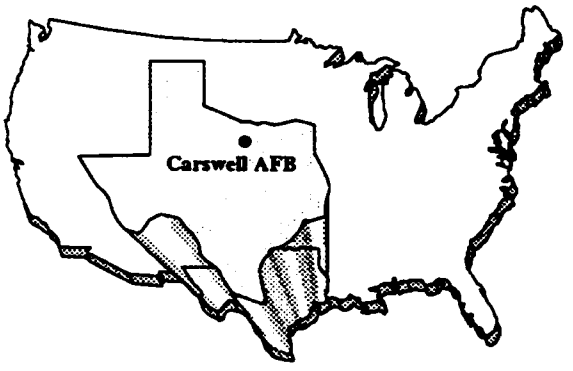

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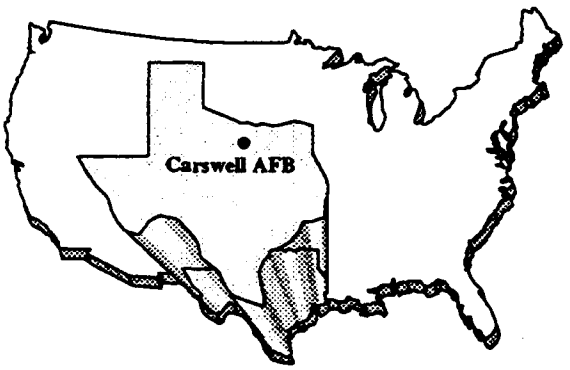

CHAPTER 1
PURPOSE OF AND NEED FOR ACTION

1.0 PURPOSE OF AND NEED FOR ACTION

This environmental impact statement (EIS) examines the potential for impacts to the environment as a result of the disposal and reuse of Carswell Air Force Base (AFB), Texas, as well as interim activities (e.g., interim outleases) that may be allowed by the Air Force before final disposition. This document has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 and the Council on Environmental Quality (CEQ) regulations implementing NEPA. Appendix A presents a glossary of terms, acronyms, and abbreviations used in this document.

A Draft EIS (DEIS) for the disposal and reuse of Carswell AFB was released for public review in February 1993. However, due to the 1993 base closure and realignment decisions, the alternatives analyzed in that document are no longer feasible to support future disposal decisions. This EIS incorporates the realignment of several Department of Defense (DOD) organizations to Carswell AFB and includes analyses of reuse alternatives that are consistent with these mandated decisions. Therefore, this EIS document replaces the February 1993 DEIS publication in its entirety.

1.1 PURPOSE OF AND NEED FOR

Due to the changing international political scene and the resultant shift toward a reduction in defense spending, DOD must realign and reduce its military forces pursuant to the Defense Base Closure and Realignment Act (DBCRA) of 1990 (Public Law [P.L.] 101-510, Title XXIX). DBCRA established new procedures for closing or realigning military installations in the United States.

DBCRA established independent Defense Base Closure and Realignment Commissions (hereafter "Commission") to review the Secretary of Defense's base closure and realignment recommendations for 1991, 1993, and 1995 (a separate Commission for each year). After reviewing the 1991 recommendations, the Commission forwarded its recommended list of base closures and realignments to the President, who accepted the recommendations and submitted them to Congress on July 12, 1991. Since Congress did not disapprove the recommendations within the time period provided under DBCRA, the recommendations have become law.

The closure of Carswell AFB was included in the 1991 Commission's list and, therefore, Carswell AFB was officially closed on September 30, 1993. The Commission's list and recommendations, however, included the retention of base property for continued Air Force Reserve (AFRES) operations.

The DBCRA procedures were again implemented in 1993, and the Commission's recommendations became law on September 30, 1993. The 1993 Commission recommendations specifically called for the realignment of several military reserve and guard units from Naval Air Station (NAS) Dallas (Texas), NAS Glenview (Illinois), and NAS Memphis (Tennessee) to Carswell AFB. Therefore, portions of Carswell AFB will be retained within DOD, as required, to support the long-term operations associated with the realigning military units. Property and facilities that are not retained within DOD will be considered excess.

To fulfill the requirement of reducing defense expenditures, the Air Force plans to dispose of excess real property and facilities at Carswell AFB. DBCRA requirements relating to disposal of excess property include:

- Environmental restoration of the property as soon as possible with funds made available for such restoration
- Consideration of the local community's reuse plan prior to Air Force disposal of the property
- Compliance with specific federal property disposal laws and regulations.

The Air Force action, therefore, is to dispose of the excess property and facilities at Carswell AFB for subsequent civilian reuse. Usually, this action is taken by the Administrator of General Services. However, DBCRA required the Administrator to delegate to the Secretary of Defense the authorities to utilize excess property, dispose of surplus property, convey airport and airport-related property, and determine the availability of excess or surplus real property for wildlife conservation purposes. The Secretary of Defense has since redelegated these authorities to the respective Service Secretaries.

1.2 DECISIONS TO BE MADE

The purpose of this EIS is to provide information for interrelated decisions concerning the disposition of Carswell AFB. The EIS is to provide the decision maker and the public the information required to understand the future potential environmental consequences of disposal as a result of military realignment actions and civilian reuse options at Carswell AFB.

After completion of this EIS, the Air Force will issue a Record of Decision (ROD) on the Disposal of Carswell AFB. The ROD will determine the following:

- What property is excess to the needs of DOD and what property is surplus to the needs of the United States of America

- The methods of disposal to be followed by the Air Force
- The terms and conditions of disposal.

The methods of disposal granted by the Federal Property and Administrative Services Act of 1949 and the Surplus Property Act of 1944 and implemented in the Federal Property Management Regulations (FPMR) are:

- Transfer to another federal agency
- Public benefit conveyance to an eligible entity
- Negotiated sale to a public body for a public purpose
- Competitive sale by sealed bid or auction.

Other RODs may be issued by cooperating federal agencies for tiered decisions relating to the subsequent reuse of the property.

The EIS considers environmental impacts of the Air Force's disposal of the base property designated as excess or surplus using one or all of the above-mentioned procedures and by portraying a variety of potential land uses to cover reasonable future uses of the property and facilities by others. Alternative scenarios were used to group reasonable land uses and to examine the environmental effects of the redevelopment of Carswell AFB. This methodology was employed because although the disposal will have few, if any, direct effects, future use and control of use by others will create indirect effects. This EIS, therefore, seeks to analyze reasonable redevelopment scenarios to determine the potential indirect environmental effects of Air Force decisions.

A range of reasonable redevelopment scenarios were considered in the preparation of this EIS. Each redevelopment scenario incorporated the retained and realigned military reuse activities pursuant to the closure and realignment actions authorized under P.L. 101-510. In addition, the scenarios incorporated a variety of civilian land uses and development associated with the remaining portions of the base available for disposal.

1.3 DISPOSAL PROCESS AND REUSE PLANNING

DBCRA requires compliance with NEPA (with some exceptions) in the implementation of the base closures and realignments. Among the issues that were excluded from NEPA compliance in DBCRA actions are:

- The selection of installations for closure or realignment
- The selection of installations receiving the transferred functions
- Analysis of closure impacts.

Therefore, DBCRA exempts the decision to realign selected military reserve and guard units to Carswell AFB from NEPA compliance. The real property required to support the retained and realigning military units in a consolidated joint service reserve base at Carswell AFB has been defined through intensive planning efforts by DOD. These requirements, as well as the communities' reuse goals and priorities, have been considered in determining the portions of Carswell AFB that could be considered as surplus or excess property.

The Air Force goal is to dispose of excess or surplus property at Carswell AFB through transfer and/or conveyance to other government agencies, state or local government bodies, or private parties. The Proposed Action in the EIS is based upon the communities' civilian reuse goals and DOD's military reuse goals for the base property.

The Air Force has based its Proposed Action on plans developed by the Carswell Redevelopment Authority (CRA) for the purpose of conducting the environmental analysis. The Air Force also developed additional reasonable alternatives to provide the basis for a broad environmental analysis, thus ensuring that reasonably foreseeable impacts resulting from potential reuse have been identified and the decision maker has multiple options regarding ultimate property disposition. Subject to the terms of transfer or conveyance, the recipients of the property, planning and zoning agencies, and elected officials will ultimately determine the reuse of the excess property.

The Secretary of the Air Force has discretion in determining how the Air Force will identify excess property and how the Air Force will dispose of those properties. DBCRA requires the Air Force to comply with federal property disposal laws and FPMR (41 Code of Federal Regulations [CFR] 101-47). The services were authorized to issue additional regulations, if required, to implement their delegated authorities and the Air Force has issued supplemental regulations (41 CFR 132). Another provision of the Act requires the Air Force to consult with the state governor, Native American tribes, heads of local governments, or equivalent political organizations for the purpose of considering any plan for the use of such property by the local community concerned. Accordingly, the Air Force is working with state authorities and the CRA to meet this requirement.

In some cases, compliance with environmental laws may delay the Air Force's final disposal of some parts of the base. Until property can be disposed, the Air Force may execute interim or long-term leases to allow reuse to begin as quickly as possible. The Air Force would structure the leases to provide the lessees with maximum control over the property, consistent with the terms of the final disposal. Restrictions may be necessary to ensure protection of human health and to allow implementation

of required remedial actions. Environmental analysis in this EIS encompasses those possible interim or long-term leasing decisions.

Due to their direct involvement with the military realignment requirements and reuse plans at Carswell AFB, the Navy is serving as a cooperating agency in the preparation of the EIS. The Navy will become the host organization responsible for supporting the military reserve and guard units operating within DOD-retained property. The Navy may adopt this EIS or use this document in tiering more site-specific environmental analysis to fulfill their NEPA requirements for establishing a joint reserve base for the realigning units.

The U.S. Department of Justice, Federal Bureau of Prisons (FBOP) is also a cooperating agency in the preparation of this EIS. FBOP has a long history of utilizing former, as well as active, military bases for housing federal inmates. In this instance, FBOP has expressed interest in a portion of Carswell AFB for conversion to a federal medical center complex (FMCC) with associated housing units and other related functions. Conveyance of these federal facilities to FBOP would be one means of meeting the anticipated increase of federal offenders with medical needs. These facilities would substantially contribute to the programs and goals of the FBOP.

1.4 ENVIRONMENTAL IMPACT ANALYSIS PROCESS

NEPA established a national policy to protect the environment and ensure that federal agencies consider the environmental effects of actions in their decision making. CEQ was authorized to oversee and recommend national policies to improve the quality of the environment. Subsequently, CEQ published regulations that described how NEPA should be implemented. The CEQ regulations encourage federal agencies to develop and implement procedures that address the NEPA process in order to avoid or minimize adverse effects on the environment. Air Force Regulation (AFR) 19-2, Environmental Impact Analysis Process (EIAP), addresses implementation of NEPA as part of the Air Force planning and decision-making process. Office of the Chief of Naval Operations Instruction (OPNAVINST) 5090.1A addresses implementation of NEPA as part of the Navy planning process.

NEPA, CEQ regulations, AFR 19-2, and OPNAVINST 5090.1A provide guidance on the types of actions for which an EIS must be prepared. Once it has been determined that an EIS must be prepared, the proponent must publish a Notice of Intent (NOI) to prepare an EIS. This formal announcement signifies the beginning of the scoping period, during which the major environmental issues to be addressed in the EIS are identified. A DEIS is prepared, which includes the following:

- A statement of the purpose of and need for the action
- A description of the Proposed Action and alternatives

- A description of the environment that would be affected by the action and alternatives

- A description of the potential environmental consequences of the action and alternatives.

The DEIS is filed with the U.S. Environmental Protection Agency (EPA), and is circulated to the interested public and government agencies for a period of at least 45 days for review and comments. During this period, a public hearing is held so that the proponent can summarize the findings of the analysis and receive input from the affected public. At the end of the review period, all substantive comments received must be addressed. A Final EIS (FEIS) is produced that contains responses to comments, as well as changes to the document, if necessary.

The FEIS is then filed with U.S. EPA and distributed in the same manner as the DEIS. Once the FEIS has been available for at least 30 days, the Air Force may publish its ROD for the action.

The NEPA process for the disposal and reuse of Carswell AFB was initiated in 1991 in response to the 1991 Commission's base closure decisions. A DEIS was prepared to analyze the effects of disposal and reuse plans associated only with the 1991 Commission decisions. The DEIS was filed with the U.S. EPA in February 1993, and followed by a 45-day public review period, including a public hearing held on March 9, 1993, in Fort Worth, Texas.

After the 1993 DOD recommendations for base closures and realignments were announced, development of the FEIS was suspended due to the potential change in disposal actions and reuse planning at Carswell AFB.

The 1993 Commission's decisions for realignment of military units to Carswell AFB caused significant changes to the reuse scenarios presented in the Proposed Action and alternatives of the published DEIS (February 1993). Therefore, development of a revised DEIS was pursued to analyze modified reuse alternatives in order to support the mandated disposal and realignment actions at Carswell AFB.

1.4.1 Scoping Process

The scoping process identifies the significant environmental issues relevant to disposal and reuse, and provides an opportunity for public involvement in the development of the EIS. The NOI (Appendix B) to prepare an EIS for disposal and reuse of Carswell AFB was published in the Federal Register on October 9, 1991. Notification of public scoping was also made through local media, as well as through letters to federal, state, and local agency officials, and interested groups and individuals.

The scoping period for the disposal and reuse of Carswell AFB began on October 9, 1991. A public meeting was held on October 29, 1991, at the Will Rogers Coliseum in Fort Worth, Texas, to solicit comments and concerns from the general public on the disposal and reuse of Carswell AFB. Approximately 90 people attended the meeting. Representatives of the Air Force presented an overview of the meeting's objectives, agenda, and procedures, and described the process and purpose for the development of a disposal and reuse EIS. In addition to verbal comments, written comments were received during the scoping process. These comments, as well as information from the local community, experience with similar programs, and NEPA requirements, were used to determine the scope and direction of studies/analyses to accomplish this EIS. Public review comments to the February 1993 DEIS were also considered in the scoping process. Both verbal comments received during the public hearing on March 9, 1993, and written comments received from February through April 1993 were used to further define the regional baseline conditions and to refine the scope and direction of the analysis.

Concurrently with preparation of this EIS, the Air Force is conducting two other studies in support of the disposal and reuse of Carswell AFB. The Environmental Baseline Survey provides information on the condition of property to be disposed, in compliance with the federal Community Environmental Response Facilitation Act (P.L. 101-42, 42 U.S. Code [U.S.C.] §9620[h]). An Environmental Baseline Survey is required by DOD policy before any property can be sold, leased, transferred, or acquired. The Socioeconomic Impact Analysis Study (SIAS) (U.S. Air Force, 1994) describes the socioeconomic effects of disposal and reuse on local communities. Population and employment projections developed for the socioeconomic study are used in this EIS.

1.5 ORGANIZATION OF THIS EIS

This EIS is organized into the following chapters and appendices. Chapter 2 provides a description of the Proposed Action, reasonable alternatives to the Proposed Action, and other land use concepts that have been identified for reuse of Carswell AFB property. Chapter 2 also briefly discusses alternatives eliminated from further consideration. Finally, Chapter 2 provides a comparative summary of the effects of the Proposed Action and alternatives on the local community and the natural environment. Chapter 3 presents the affected environment under the baseline conditions of base closure, providing a basis for analyzing the impacts of the Proposed Action and alternatives. When needed for analytical comparisons, a preclosure reference is provided for certain resource areas. It describes a point in time at or near the closure announcement, and depicts an active base condition. The results of this analysis are presented in Chapter 4. Chapter 5 lists individuals and organizations consulted during the preparation of the EIS;

Chapter 6 provides a list of the document's preparers; Chapter 7 contains references; and Chapter 8 contains an index.

In addition to the main text, the following appendices are included in this document:

- Appendix A - a glossary of terms, acronyms, and abbreviations used in this document
- Appendix B - the NOI to prepare this disposal/reuse EIS
- Appendix C - a list of individuals and organizations who were sent a copy of the DEIS
- Appendix D - an Installation Restoration Program (IRP) bibliography
- Appendix E - a description of the methods used to evaluate the impacts of base reuse on resources of the local community and the environment
- Appendix F - environmental permits held by Carswell AFB in 1992, prior to full initiation of base closure actions
- Appendix G - Air Force policy regarding management of asbestos at bases that are closing, and a list of buildings at Carswell AFB that were included in a visual inspection of potential asbestos-containing materials (ACMs)
- Appendix H - a detailed description of issues and assumptions related to noise effects
- Appendix I - an inventory of cultural resources on Carswell AFB
- Appendix J - a detailed description of methods and assumptions related to air quality analysis
- Appendix K - agency letters and certifications regarding conditions at Carswell AFB relevant to its disposal and subsequent reuse.

1.6 FEDERAL PERMITS, LICENSES, AND ENTITLEMENTS

Representative federal permits, licenses, and entitlements that may be required by reusers or developers are presented in Table 1.6-1.

Table 1.6-1. Representative Federal Permits, Licenses, and Entitlements Potentially Required for Reusers or Developers of Disposed Base Property

Federal Permit, License, or Entitlement	Typical Activity, Facility, or Category of Persons Required to Obtain the Federal Permit, License, or Entitlement	Authority	Regulatory Agency
Title V permit under the CAA	Any major source (source that emits more than 100 tons/year of criteria pollutant in nonattainment area for that pollutant or is otherwise defined in Title I of CAA as a major source); affected sources as defined in Title IV of CAA; sources subject to Section 111 regarding New Source Performance Standards; sources of air toxics regulated under Section 112 of CAA; sources required to have new source or modification permits under Parts C or D of Title I of CAA; and any other source designated by U.S. EPA regulations.	Title V of CAA, as amended by the 1990 CAAA, Title V of CAA	U.S. EPA; TNRCC
NPDES permit	Discharge of pollutant from any point source into waters of the United States.	Section 402 of CWA, 33 U.S.C. §1342	U.S. EPA; TNRCC
Section 404 (Dredge and Fill) Permit	Any project activities resulting in the discharge of dredged or fill material into bodies of water, including wetlands, within the United States.	Section 404 of CWA, 33 U.S.C. §1344	U.S. Army COE in consultation with U.S. EPA
Hazardous waste TSD facility permit	Owners or operators of a new or existing hazardous waste TSD facility (e.g., RCRA permit holders)	RCRA, as amended, 42 U.S.C. §6901; 40 CFR 270	U.S. EPA
U.S. EPA manifest identification number	Generators or transporters (off-site transport) of hazardous waste.	40 CFR 262.10 (generators); 40 CFR 263, Subpart B (transporters)	U.S. EPA
Antiquities permit	Excavation and/or removal of archaeological resources from public lands or Indian lands and carrying out activities associated with such excavation and/or removal.	Archaeological Resource Protection Act of 1979, 16 U.S.C. §470cc	U.S. Department of the Interior, NPS

CAA = Clean Air Act.
CAAA = Clean Air Act Amendments.
CFR = Code of Federal Regulations.
COE = Corps of Engineers.
CWA = Clean Water Act.
EPA = Environmental Protection Agency.
NPS = National Park Service.
RCRA = Resource Conservation and Recovery Act.
TNRCC = Texas Natural Resources Conservation Commission.
TSD = treatment, storage, or disposal.
U.S.C. = U.S. Code.

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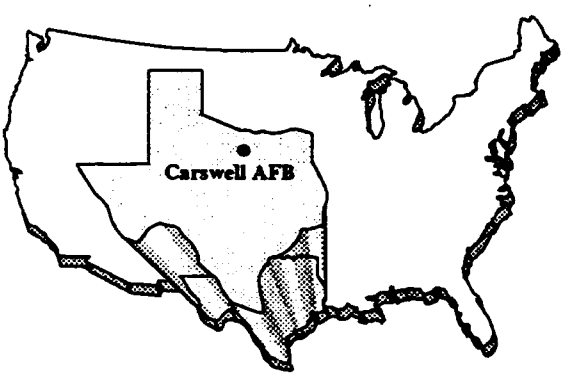


CHAPTER 2
ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 INTRODUCTION

This section describes the Proposed Action, a range of reasonable alternatives to the Proposed Action, and the No-Action Alternative. In addition, potential public benefit conveyances of Carswell AFB properties and independent land use concepts, which are not part of a complete reuse plan, are described. Other alternatives that were identified but eliminated from further consideration, are briefly described. The potential environmental impacts of the Proposed Action and alternatives are summarized in table form.

Generally, the Administrator of the General Services Administration (GSA) has authority to dispose of excess and surplus real property belonging to the federal government. With regard to closure bases, however, the DBCRA requires the Administrator to delegate disposal authority to the Secretary of Defense. FPMR, which govern property disposal methods associated with base closure, allow the Secretary of Defense to dispose of closure property by transfer to another federal agency, by public benefit conveyance, by negotiated sale to state or local government, and by public sale at auction or sealed bid. These methods, or a combination of them, could be used to dispose of excess and surplus property and facilities at Carswell AFB.

Provisions of DBCRA and FPMR require that the Air Force first notify other DOD departments that Carswell AFB properties are excess to the needs of the Air Force. Any proposals from these departments for the transfer of Carswell AFB property would be given priority consideration.

Pursuant to the McKinney Act, 42 U.S.C. §11411, the Air Force is required to provide the Department of Housing and Urban Development (HUD) with information regarding properties being disposed of at Carswell AFB. HUD makes a determination about the suitability of these properties for homeless assistance programs. HUD has reported the suitability and potential availability of facilities at Carswell AFB in the Federal Register and will continue to do so in accordance with recently enacted provisions of the National Defense Authorization Act for fiscal year (FY) 1994, which provides that property will be made available to assist the homeless as follows. Homeless assistance providers must express written interest to the Department of Health and Human Services (HHS) within 60 days of publication, and submit a complete application within 150 days. After determination that the application is complete, HHS is required to approve or disapprove the application within 25 days. If no interest has been expressed in the property for homeless uses, such property will only be made available for the purposes of permitting the redevelopment authority to express, in

writing, an interest to use the property, or to use the property according to its redevelopment plan, during the 1-year period on the first day after the 60-day screening period. Similarly, property will be available to the redevelopment authority during the 1-year period on the first day after the 90-day application period expires and no application has been received, or 1 year from the date of rejection of the application. In disposing surplus real property, the Air Force must give priority of consideration to uses that assist the homeless, although "other compelling and meritorious uses may be considered." To date, there has been no formal request by a homeless assistance provider for facilities or real property at Carswell AFB.

An Air Force Base Conversion Agency (AFBCA) Operating Location (OL) has been established at Carswell AFB. The responsibilities of the OL include coordinating post-closure activities, administering a caretaker force to maintain Air Force-controlled properties after closure, coordinating caretaker activities with military realignment activities, and serving as the Air Force local liaison to community reuse groups until lease termination or disposal (as appropriate) of the Air Force-controlled property has been completed. This team consists of approximately 50 people composed of both Air Force employees and nonfederal supporting personnel. The OL, as used in this document, may refer to either the AFBCA or nonfederal personnel.

In some cases, each group may have distinct responsibilities. For example, under the closure baseline, the nonfederal personnel are responsible for the management and disposition of their own hazardous materials and waste. The Air Force OL is responsible for inspection and oversight to ensure that hazardous substance practices on Air Force-controlled property are in compliance with pertinent regulations.

The 1991 and 1993 Commission's recommendations, as mandated under P.L. 101-510, provided for the retention of several Carswell AFB tenant units and the realignment of several other military units to Carswell AFB. The 1991 Commission's recommendations provided for continued operations of the AFRES 301st Fighter Wing (FW), White House Communications Agency (WHCA), and Air Force (AF) Plant #4 engine-testing activities on Carswell AFB. The 1993 Commission's recommendations provided for the realignment of several DOD organizations (Navy Reserve, Marine Reserve, Army Reserve/Guard, and Air National Guard units) from NAS Dallas, NAS Memphis and NAS Glenview to Carswell AFB. Most of the military units will relocate from NAS Dallas, and the Navy will become the host organization for the retained and realigning reserve and guard tenant units.

The Carswell AFB property and facilities required to support these military realignment actions will be retained within DOD and designated as the NAS Fort Worth, Joint Reserve Base. Realignment activities at NAS Fort Worth are scheduled to be complete and the base fully operational by 1998.

The realignment and establishment of NAS Fort Worth will occur, as mandated, regardless of the disposal and reuse of the remaining portions of Carswell AFB. Therefore, these military land areas and reuse activities have been incorporated as part of the No-Action Alternative (hereafter referred to as the No-Action/Realignment Alternative) and all reuse alternatives for analysis. The remainder of the base property would be considered excess and would become available for civilian reuse. Civilian reuse, as defined in this document, refers to the nonmilitary activities associated with the recipients of the excess or surplus property (i.e., other federal agencies and nonfederal entities).

One comprehensive reuse plan, which reflects both the 1991 closure and the 1993 realignment actions, has been provided to the Air Force for the base property available for disposal, and adopted as the Proposed Action for purposes of analysis. The reuse proposal represents the civilian reuse concepts of the CRA and the U.S. Department of Justice, FBOP. Proposed civilian land uses would include the FMCC, and a variety of industrial, commercial, residential, and public facilities/recreation uses.

An additional plan, the Mixed Use Alternative, was developed by the Air Force in order to analyze a range of reasonable civilian reuse options. The alternative focuses on civilian development of office/industrial park uses, limited aircraft maintenance operations, conversion of the existing base hospital into private or public medical use, and residential development.

The No-Action/Realignment Alternative includes an increase in the type and intensity of land use within the first 5 years after base closure due to the military realignment actions. The remainder of the base property would continue to be held in caretaker status in the long term.

In order to accomplish impact analyses, a set of general assumptions was made. Details regarding the generation of these assumptions are found in Appendix E. Specific assumptions developed for individual reuse plans are identified in the discussion of each proposal, within Sections 2.2 and 2.3.

During the development of alternatives addressed in the EIS, the Air Force considered the compatibility of future land uses with current site conditions that may restrict reuse activities to protect human health and the environment. These conditions include potential contamination from releases of hazardous substances and Air Force efforts to remediate the contamination under the IRP. IRP remediation at Carswell AFB and other environmental studies may result in lease/deed restrictions that limit civilian redevelopment at certain locations within the base. Additionally, the Air Force may retain access rights to these sites to implement IRP remediation (e.g., temporary easement for access to monitoring wells).

2.2 DESCRIPTION OF THE PROPOSED ACTION

Section 2905(b)(2)(E) of DBCRA requires the Air Force, as part of the disposal process, to consult with the applicable state governor and heads of local governments, or equivalent political organizations for the purposes of considering any plan for the use of such property by the concerned local community. Air Force policy is to encourage timely community reuse planning by offering to use the community's plan for reuse or development of land and facilities as part of the Air Force's Proposed Action in the EIS.

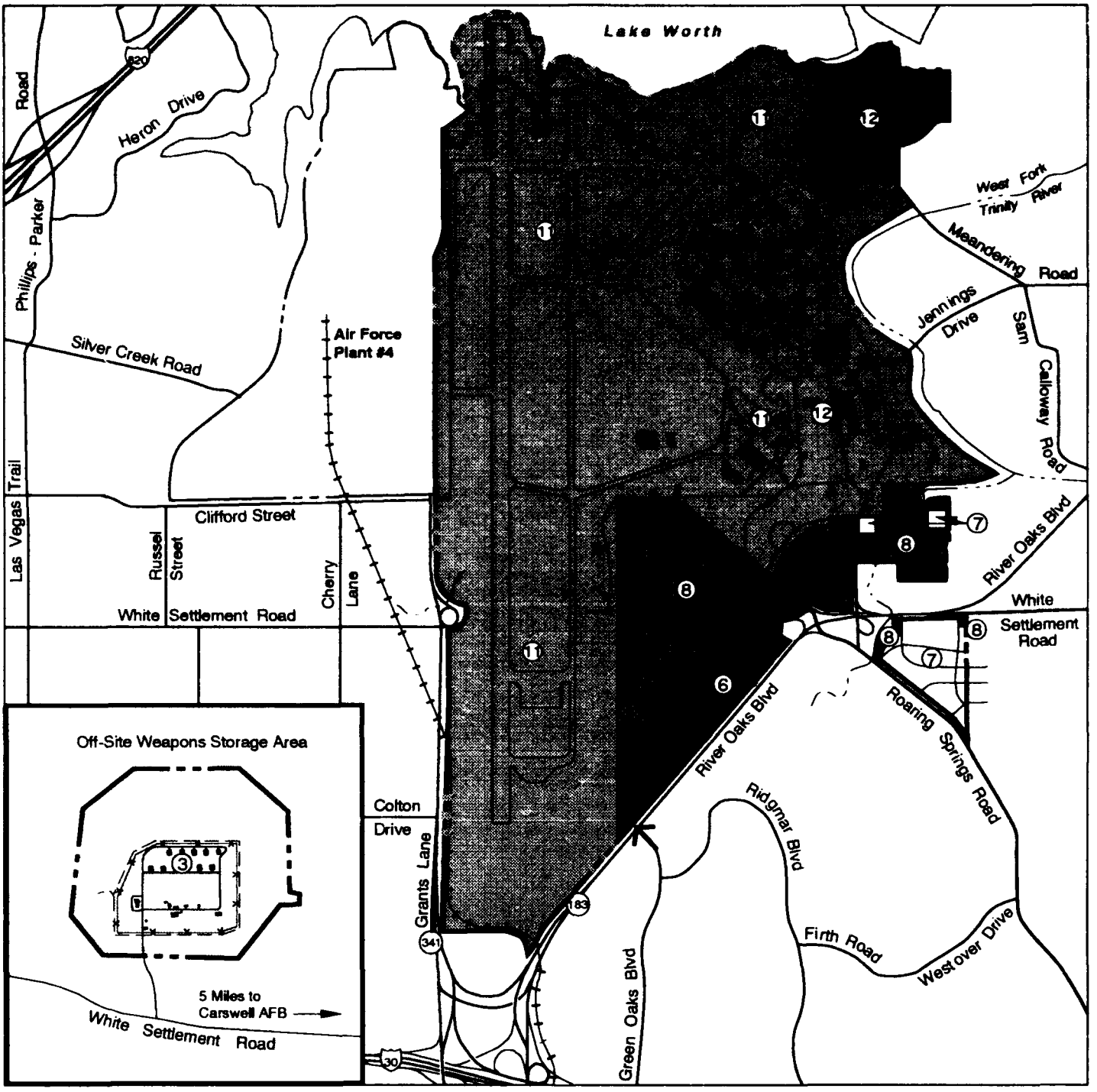
The CRA, comprising Tarrant County and the cities of Fort Worth, White Settlement, and Westworth Village, was formed to provide a single local agency to coordinate the redevelopment efforts associated with the reuse of Carswell AFB.

The CRA contracted with consulting firms to assess existing land, facilities, and infrastructure on Carswell AFB and evaluate their potential for civilian reuse. In addition, the CRA worked closely with the FBOP to integrate their reuse plans into one comprehensive development plan. The CRA also coordinated with DOD to identify the potential excess or surplus property available for disposal and civilian reuse. The CRA developed civilian land use plans that would be compatible, to the extent possible, with the adjacent military land uses associated with NAS Fort Worth.

The Air Force has used these land use goals in developing the Proposed Action for analysis. In order to provide a comprehensive and complete reuse scenario for analysis, the Proposed Action also integrates the military reuse activities associated with DOD-retained property at Carswell AFB.

The comprehensive reuse plan addresses the main base property (2,264 acres) and the noncontiguous parcel southeast of the base, referred to as Kings Branch (44 acres). A third parcel of Carswell AFB property, referred to as the Off-Site Weapons Storage Area (WSA) (also referred to as Carswell's Ammunition Storage Annex), is located about 5 miles west of the main base and consists of 247 acres. The reuse plan also addresses an additional 64 acres of land adjacent to the Lake Worth shoreline that is leased from the city of Fort Worth.

The land uses presented in the Proposed Action (Figure 2.2-1) provide a framework for development within general guidelines: the military reuse areas comprise a total of 1,884 acres of base property and leased land; the remaining 735 acres on base would include residential, commercial, industrial, institutional, and public facilities/recreation land uses. The acreage associated with each land use category is provided in Table 2.2-1. All acreages used in this document are approximate.



EXPLANATION

- ① Airfield *
- ② Aviation Support *
- ③ Industrial
- ③ Office/Industrial Park *
- ④ Institutional (Medical) *
- ⑤ Institutional (Educational) *
- ⑥ Commercial
- ⑦ Residential
- ⑧ Public Facilities/ Recreation
- ⑨ Agriculture *
- ⑩ Vacant Land *
- ⑪ Military
- ⑫ Institutional (Prison)
- Carswell AFB Boundary
- Air Force Plant #4 Boundary
- Leased Property
- Improved Access

0 650 1300 2600 Feet

* Standard land use designation not applicable to this figure.

Proposed Action

Figure 2.2-1

Table 2.2-1. Land Use Acreage - Proposed Action

Land Use	Acreage
Base Property (including Kings Branch and Off-Site WSA)	
Military	1,820
Industrial	247
Institutional (prison)	95
Commercial	100
Residential	45
Public facilities/recreation	248
Subtotal	2,555
Retained Leased Property	
Military	64
Total	2,619

WSA = Weapons Storage Area.

The following types of data were provided by the reuse proponents for the Proposed Action:

- Proposed military construction activities
- Proposed military use for the airfield
- Projected fleet mix and annual aircraft operations
- General layout of proposed land uses
- Proposed roadway access points to the base
- Phasing plans for long-range development
- Direct employment associated with base reuse.

When specific data were not available from the reuse proposals, assumptions were generated to support analyses as follows:

- Equal areas of retail, office, and light industrial for the commercial land use category
- Utility use projections for on-site demands
- Traffic generation and daily trip projections
- Amount of civilian development (i.e., demolition, construction)

- Percent of each land use area disturbed by construction and operational activities.

The amount of development, including existing facility demolition and reuse, and new facility construction for each land use under the Proposed Action, is provided in Table 2.2-2.

Table 2.2-2. Facility Development - Proposed Action

Land Use	Existing Facility Demolition	Existing Facility Reuse	New Facility Construction
	(thousands of square feet of floor space)		
Military	172	2,565	518
Industrial	0	39	0
Institutional (prison)	155	546	500
Commercial	356	5	1,293
Residential	253	14	387
Public facilities/ recreation	28	47	0
Total	964	3,216	2,698

The acreages within each land use assumed to be disturbed by construction of facilities, infrastructure improvements, or other operational activities under the Proposed Action, are provided in Table 2.2-3 for three phases of development: 1993 to 1998, 1998 to 2003, and 2003 to 2013.

Table 2.2-3. Acres Disturbed by the Proposed Action

Land Use	Acres Disturbed (by phase)			
	1993-1998	1998-2003	2003-2013	Total
Military	24	0	0	24
Industrial	0	0	0	0
Institutional (prison)	49	0	0	49
Commercial	17	34	34	85
Residential	34	0	0	34
Public facilities/recreation	16	0	0	16
Total	140	34	34	208

2.2.1 Military

The military land use area consists of 1,820 acres of property that would be retained within DOD. In addition, it is assumed that a 64-acre parcel adjacent to Lake Worth on the northern base boundary would continue to be leased to support military operations.

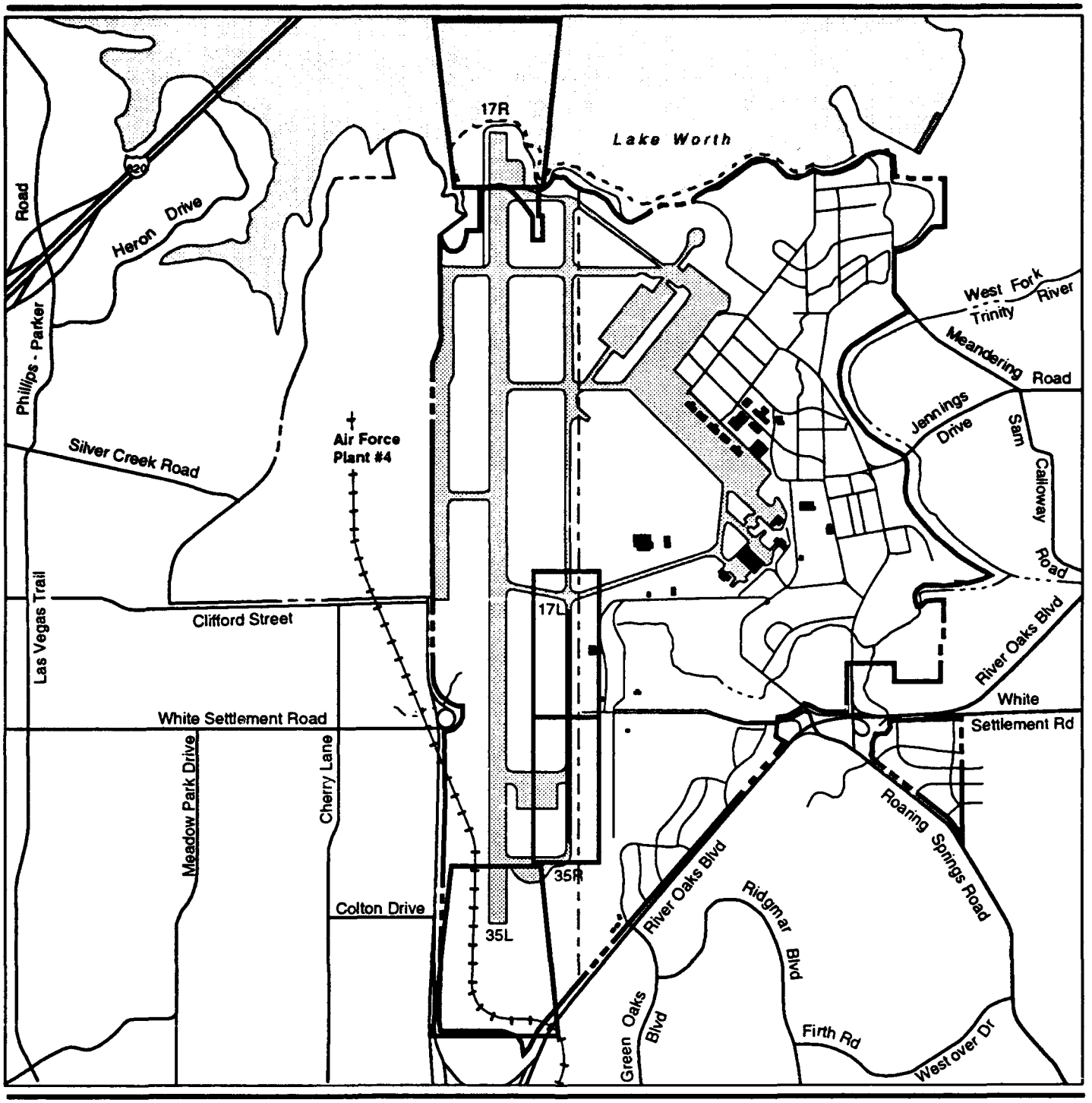
The existing run-up stations and related property west of the airfield would be transferred within the Air Force for continued use by AF Plant #4. The remaining military land use area would be transferred to the U.S. Navy for the establishment of a new naval air station (NAS Fort Worth, Joint Reserve Base). The new air station would become a government defense facility to train and equip military reserve and guard air crews and aviation ground support crews.

The military land use area would include the airfield and the central portion of the base area to support the military guard and reserve units. The military land use area includes the aircraft parking apron, hangars, Air Traffic Control Tower (ATCT), Airport Rescue and Fire Fighting (ARFF) facilities, base operations and logistics facilities, the northern-base WSA, small arms firing range, dormitories, recreational areas, and other facilities.

Although the retained AFRES construction requirements would be minimal, additional construction would be required to support the realigned DOD organizations. Planned construction includes modifications to existing facilities, including nose-dock hangars, maintenance shops, airfield infrastructure, medical clinic, and child care center. New construction would include a reserve training center, guard training facilities, a jet-engine hush house and test cell, and other support facilities. Perimeter fences and/or security entry gates would be provided to ensure security within the naval air station. These projects would be complete and fully operational by 1998.

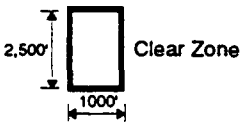
The airfield would incorporate the existing 12,000-feet by 300-feet runway and taxiways (Figure 2.2-2). In addition, a portion of the existing taxiway would be converted to an assault strip for specialized training. The airfield would be operated by the Navy, which would manage the development and operations of the airfield in accordance with Navy regulations. The Navy ATCT would accommodate limited civilian transient operations associated with the FBOP.

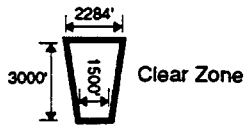
Projected military and civilian aircraft operations are provided in Table 2.2-4 for all years. An operation is defined as one landing or one takeoff. The majority of these operations would depart to the south (Runway 17) due to wind direction.



EXPLANATION

- Carswell AFB Boundary
- Leased Property
- Airfield Pavement
- 4000-foot Paved Assault Strip
- Building Restriction Line





Proposed Airfield Layout

Figure 2.2-2

Table 2.2-4. Projected Flight Operations - Proposed Action - (All Years)

Type	Operations	%	Fleet Mix	Average Annual Operations[a]
Military	Marine Air Group, 41st	58	F/A-18A	6,446
		42	KC-130T	4,683
	Navy Reserve VF-201 Fighter Squadron	100	F-14A	8,943
	Navy Reserve VF-202 Fighter Squadron	100	F-14A	5,044
	Navy Reserve VP-67 Navy Patrol	100	P-3B	3,898
	Navy Reserve VR-59 Fleet Logistics	100	C-9B	3,431
	Texas Air National Guard 136th Tactical Airlift Wing	100	C-130H	11,965
	Army Reserves, 90th	44	OH-58	7,278
		44	UH-1	7,278
		12	U-21	2,081
	Texas Army National Guard	10	UH-1H	1,029
		25	UH-60L	2,577
		65	CH-47D	6,694
	AFRES 301st FW	100	F-16	7,855
	AF Plant #4	100	F-16	1,000
	Military Transients			
		32	Attack/Fighters	8,858
		2	Large Cargo/Transport, Propeller	592
		8	Large Cargo/Transport, Jet	2,228
		7	Small Cargo/Transport	1,872
		42	Trainer, Jet	11,885
		5	Trainer, Propeller	1,547
		4	Helicopter	1,004
	Subtotal			108,188
Civilian	FBOP	75	Lear 35	312
		25	Boeing 727[b]	104
	Subtotal			416
			Total	108,604

Notes: (a) An operation is defined as one takeoff or one landing.
(b) Aircraft would convert to Stage 3 engine by the year 2000.
AF = Air Force.
AFRES = Air Force Reserve.
FBOP = Federal Bureau of Prisons.
FW = Fighter Wing.

Military flight operations would include military training operations associated with the military reserve and guard units, military flight tests associated with AF Plant #4, and other military transient operations. For analysis purposes, 99 percent of the operations are projected to occur during daytime hours (7 a.m. to 10 p.m.).

Limited FBOP flight operations would be associated with the reuse of the base hospital. These activities would include up to eight aviation operations per weekday during daytime hours.

Existing flight tracks for military operations would be retained and additional flight tracks would be developed based on airspace availability, traffic volume, and aircraft performance. Flight tracks associated with the Proposed Action are discussed in Appendix H.

2.2.2 Industrial

The proposed industrial land use covers 247 acres and comprises the Off-Site WSA. The Off-Site WSA would be reused for specialized storage (i.e., munitions storage, microfilm/records storage) that requires secured facilities, limited access, and minimal facility modification. It has been assumed for analysis purposes that munitions stored at the Off-Site WSA would require safety buffer zones similar to the 2,100-feet radius explosive safety quantity distances (QDs) that are currently in place at the Off-Site WSA. These QDs extend outside the base property, covering about 264 acres. Land use restrictions within the off-base safety buffer zones would be established, as required, similar to the easements in effect under preclosure conditions. In addition, it is assumed that the munitions would contain solid state fuel propellant and conventional ordnance. Transportation, handling, and storage of these munitions would be managed in accordance with all application regulations. All of the existing building square footage in the area would be retained and the land area would be fully operational by 1998.

2.2.3 Institutional (Prison)

The institutional (prison) land use category includes the U.S. Department of Justice FBOP's reuse of the base hospital for an FMCC and the development of minimum and medium security housing on a 92-acre parcel in the northeast quadrant of the base. In addition, FBOP has requested 3 acres, including Building 1231, in the central portion of the base for a regional showroom, regional distribution center, and warehouse of products produced by Federal Prison Industries (UNICOR).

The FMCC would provide inpatient medical care for approximately 300 federal inmates. The existing hospital would be renovated to provide security. Some of the existing housing units would be demolished and the

remaining units would be used by federal inmates receiving outpatient care from the medical center or awaiting transfer back to their original institution. New construction would provide for additional housing and other support facilities to accommodate a total of about 800 minimum- and medium-security inmates.

The FMCC buildings would be surrounded by security fencing, except for the minimum security housing area west of the hospital. Security for the buildings would include two fences, a buffer zone where feasible, electronic alarm systems, vehicular patrol, outdoor ground illumination, and a perimeter road. The existing mature trees on the site would be retained to the maximum extent possible to provide additional security provisions. The FMCC would be complete and operational by 1998.

The FBOP proposal would include use of the airfield for limited flight activity associated with the FMCC, as discussed in Section 2.2.1.

2.2.4 Commercial

The commercial use of 100 acres would be in the southern portion of the base between State Highway (SH) 183 and the golf course. The area would be developed for office, retail, and light industrial uses. Office development would consist of single- to multiple-story buildings adjacent to the golf course. Retail and light industrial uses would be along SH 183. The only building retained within the proposed commercial area would be a single-family residence listed on the *National* Register of Historic Places (NRHP). The other existing facilities would be demolished and replaced with new development. Commercial development would be completed by 2013.

2.2.5 Residential

The residential land use would cover 45 acres, located within three areas. The first area is Kings Branch, a noncontiguous parcel southeast of the base. Two other small areas, located in the southeast portion of the base, include two existing houses, which would be reused. The existing housing units within Kings Branch would either be sold and relocated off site, or demolished. The replacement housing would include up to 130 single-family units. The development of the residential areas is projected to be completed by 1998.

2.2.6 Public Facilities/Recreation

The public facilities/recreation land uses include three areas on base consisting of 248 acres. The first public facilities/recreation area is the golf course, related open space, and the flood-prone areas associated with the Farmers Branch Creek in the south-central portion of the base. The existing golf course and open area surrounds two single-family residences (previously

described in Section 2.2.5) and includes a private cemetery and a child care center. The cemetery would be left undisturbed, and the child care center would be converted for a city hall complex. A driving range would be developed on the golf course adjacent to the south side of White Settlement Road. The second area is a narrow parcel of land along the western boundary of the Kings Branch housing area, which includes a portion of the 100-year floodplain associated with the Kings Branch of the West Fork Trinity River. The third parcel includes a house in the northeastern corner of the Kings Branch housing area, which would be reused as a public library. No new building construction is associated with these areas.

2.2.7 Employment and Population

By the year 2013, the Proposed Action would include a total on-site employment of about 8,982 direct jobs, including 3,881 jobs associated with the military land use and 500 jobs associated with the FMCC (Table 2.2-5). This represents an increase of 8,308 jobs over the closure baseline conditions.

Table 2.2-5. Total On-Site Employment and Population - Proposed Action

	Closure	1998	2003	2013
Direct employment				
Military use[a]	674[b]	3,881	3,881	3,881
Civilian use	0	1,472	3,197	5,101
Total	674	5,353	7,078	8,982
On-base population				
Military use[c]	1,270	1,270	1,270	1,270
Civilian use[d]	0	328	328	328
Total	1,270	1,598	1,598	1,598

Notes: (a) Represents weekday military employment levels. Average weekend reservist base loading would remain below weekday military employment levels.
(b) Military use includes 50 OL employees under the closure baseline in 1993.
(c) Represents weekend conditions, including about 680 persons permanently residing on base, as well as weekend reservists temporarily residing on base within the dormitories. Weekday military population levels would remain below weekend conditions.
(d) Does not include the 1,100 federal inmates.
OL = Operating Location.

Approximately 1,598 persons would reside on the base property in the residential areas. The military use would include an on-site population of 1,270 within the dormitory and family housing units, and the remaining on-site population would consist of on-base civilian residents.

2.2.8 Transportation

Under the Proposed Action, SH 183 (River Oaks Boulevard) would continue to be one of the major access routes to the base property. Existing access to the southeast side of the base from SH 183 would continue to be provided by Rogner Drive. Existing access to the east side of the base would continue to be provided by Meandering Road and Jennings Drive. The existing unused access point to the south side of the base at Green Oaks Boulevard and SH 183 intersection would be improved to provide access to the southern portion of the base property.

Based on land use and employment projections, average daily vehicular traffic to and from base property would be approximately 34,250 trips by the year 2013. On-base roadway improvements, if needed, would be accomplished to meet regional Level of Service (LOS) requirements.

2.2.9 Utilities

By the year 2013, the projected on-site activities associated with the Proposed Action would generate the following total on-site utility uses:

- Water - 0.8 million gallons per day (MGD)
- Wastewater - 0.6 MGD
- Solid Waste - 18 tons per day (tons/day)
- Electricity - 165 megawatt-hours per day (MWH/day)
- Natural Gas - 1.6 million cubic feet per day (MMCF/day).

Improvements to some utility systems would be required to provide adequate service to proposed new facilities. A brief description of the utility systems and required improvements associated with the Proposed Action is provided below.

Water Supply. All potable water would continue to be primarily supplied by the city of Fort Worth. The existing system would be retained, including all elevated storage tanks. Hook-ups and individual facility meters would need to be installed.

Wastewater. Base wastewater would continue to be treated at the city of Fort Worth's Village Creek Plant. A pretreatment system for industrial waste may be required of the new owner to meet applicable permitting requirements.

Solid Waste. Refuse disposal services are currently provided by a private contractor who disposes solid waste at his landfill. This service is assumed to be available to the new users under the Proposed Action.

Electricity. Electrical power would continue to be provided by Texas Utilities (TU) Electric Service Company. Individual facility meters would need to be installed to measure usage by the new users.

Natural Gas. Natural gas would continue to be provided by Lone Star Gas Company. Some modifications would be required, however, to meet the needs of new users. This would include the installation of meters for individual users.

2.3 DESCRIPTION OF ALTERNATIVES

2.3.1 Mixed Use Alternative

Under the Mixed Use Alternative, the property available for disposal and civilian reuse would be slightly increased to allow for civilian use of existing facilities for aircraft maintenance activities on an 18-acre parcel (Figure 2.3-1). In addition, the Mixed Use Alternative focuses on residential and office/industrial park development and the conversion of the base hospital for public or private use. As discussed under the Proposed Action, this alternative includes the military land uses associated with the base property retained within DOD, in accordance with the mandated base closure and realignment actions. The total acreage for each land use category is shown in Table 2.3-1.

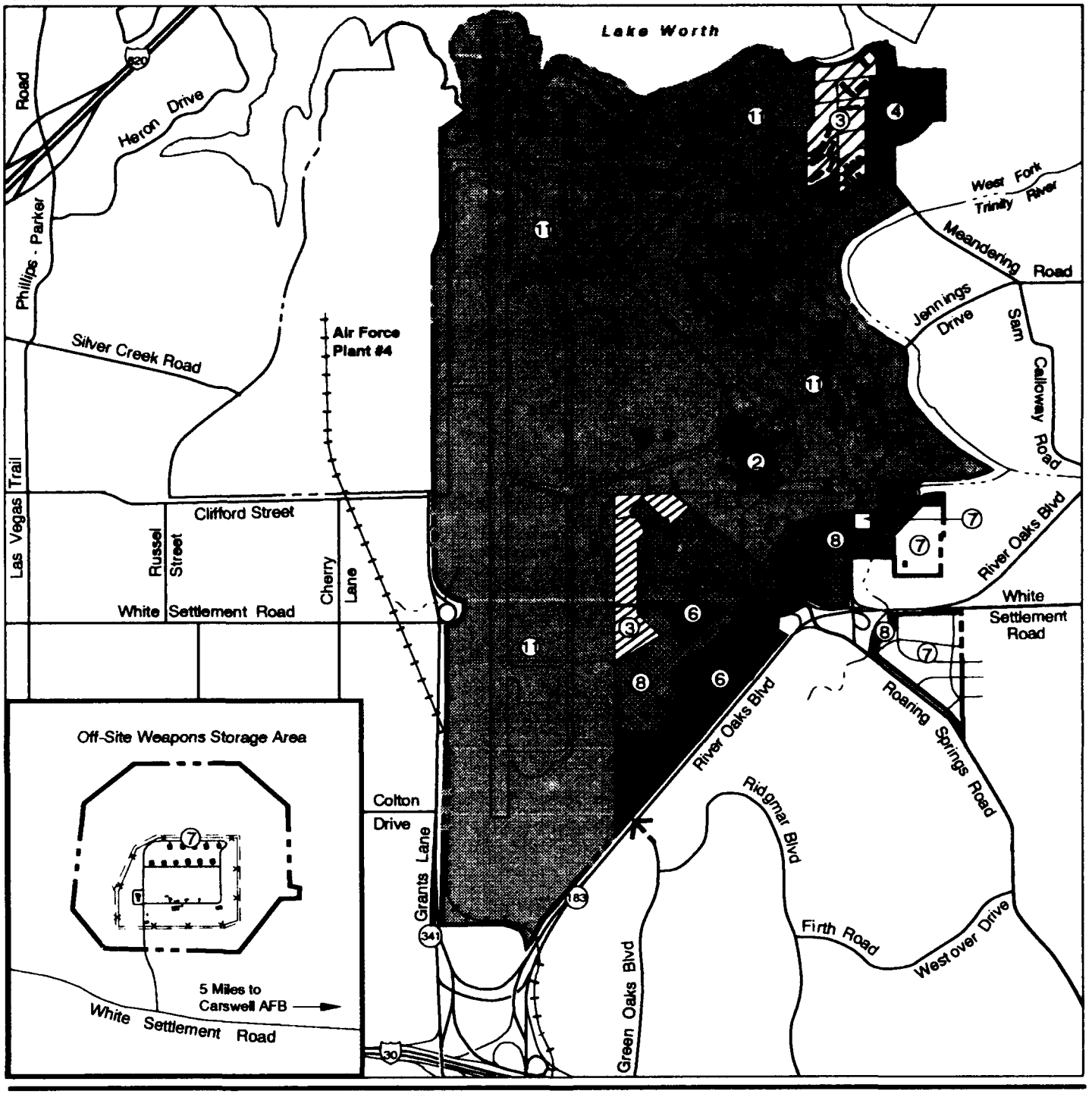
The following types of assumptions were used to develop the civilian portions of the Mixed Use Alternative:

- Amount and type of land use acreage
- Anticipated construction/demolition activities
- Employment and population projections
- Areas disturbed by construction/demolition
- Phasing plans for reuse
- Traffic generation and daily trip projections
- Utility requirement projections
- Proposed transportation access points.

The amount of development, including existing facility demolition, facility reuse, and new facility construction of each land use under the Mixed Use Alternative is provided in Table 2.3-2.

Table 2.3-3 summarizes acreages assumed to be disturbed by construction or other operational activities during each phase of development, and the following sections describe activities associated with each land use category.

2.3.1.1 Military. The military land use of approximately 1,869 acres would be as described in the Proposed Action, except for a small reduction in the



EXPLANATION

- ① Airfield *
- ② Aviation Support
- ③ Industrial*
- ③ Office/Industrial Park
- ④ Institutional (Medical)
- ⑤ Institutional (Educational)*
- ⑥ Commercial
- ⑦ Residential
- ⑧ Public Facilities/ Recreation
- ⑨ Agriculture *
- ⑩ Vacant Land *
- ⑪ Military
- ⑫ Institutional (Prison)*
- Carswell AFB Boundary
- Air Force Plant #4 Boundary
- Leased Property
- Improved Access

0 650 1300 2600 Feet

* Standard land use designation not applicable to this figure.

Mixed Use Alternative

Figure 2.3-1

Table 2.3-1. Land Use Acreage - Mixed Use Alternative

Land Use		Acreage
Base Property (including Kings Branch and Off-Site WSA)		
Military		1,805
Aviation support		18
Office/industrial park		90
Institutional (medical)		44
Commercial		116
Residential		308
Public facilities/recreation		174
	Subtotal	2,555
Retained Leased Property		
Military		64
	Total	2,619

WSA = Weapons Storage Area.

Table 2.3-2. Facility Development - Mixed Use Alternative

Land Use	Existing Facility Demolition	Existing Facility Reuse	New Facility Construction
	(thousands of square feet of floor space)		
Military	172	2,386	518
Aviation support	0	221	0
Office/industrial park	204	0	1,176
Institutional (medical)	97	365	244
Commercial	360	5	1,047
Residential	302	14	1,402
Public facilities/recreation	10	44	0
Total	1,145	3,035	4,387

land use area and a slight increase in construction activities. The amount of military land area retained within DOD would be 15 acres less than the Proposed Action. This decrease in land area would allow for disposal and civilian reuse of several aviation-related facilities (18 acres) and the retention of Building 1231 (3 acres) for continued military use. Additional construction would be required over the Proposed Action due to the net loss in available facility space within the military land area.

The airfield layout and ATCT would be similar to the Proposed Action (see Section 2.2.1). Limited civilian use of the airfield for maintenance operation

Table 2.3-3. Acres Disturbed by the Mixed Use Alternative

Land Use	Acres Disturbed (by Phase)			
	1993-1998	1998-2003	2003-2013	Total
Military	24	0	0	24
Aviation support	2	0	0	2
Office/industrial park	19	19	41	79
Institutional (medical)	3	3	6	12
Commercial	19	9	17	45
Residential	33	29	51	113
Public facilities/recreation	5	0	0	5
Total	105	60	115	280

would be controlled by the Navy ATCT. Projected aircraft operations are provided in Table 2.3-4 for all years. There would be a minor increase of one operation per day for the aircraft associated with civilian aircraft maintenance activities.

The majority of these operations would depart to the south (Runway 17) due to the wind direction. Flight operations would include military training operations associated with the military reserve and guard units, military flight tests associated with AF Plant #4, other military transient operations, and limited civilian flight operations. For analysis purposes, 99 percent of the operations are projected to occur during daytime hours (7 a.m. to 10 p.m.).

2.3.1.2 Aviation Support. The aviation support land use area comprises 18 acres and includes an existing maintenance hangar, avionics shop, and other related facilities. Reuse activities and functions would include maintenance and modification of turboprop and jet air-carrier aircraft. No demolition or new construction activities are anticipated and the development would be operational by 1998.

2.3.1.3 Office/Industrial Park. The office/industrial park land use includes 90 acres located in two areas. The first is adjacent to the golf course, and the second is adjacent to the west side of the base hospital. The office/industrial park uses could include corporate office, research and development, and light industrial/manufacturing, and would be organized in a campus- or park-like setting. All of the existing facilities would be demolished. New office construction would probably range from one- to three-story structures. Each area would likely be developed by a single entity for a mixed use office/industrial park. The area adjacent to the golf course would be developed by the year 2003, and the area west of the base hospital would be developed by the year 2013.

Table 2.3-4. Projected Flight Operations - Mixed Use Alternative (All Years)

Type	Operations	%	Fleet Mix	Average Annual Operations[a]
Military	Marine Air Group, 41st	58	F/A-18A	6,446
		42	KC-130T	4,683
	Navy Reserve VF-201 Fighter Squadron	100	F-14A	8,943
	Navy Reserve VF-202 Fighter Squadron	100	F-14A	5,044
	Navy Reserve VP-67 Navy Patrol	100	P-3B	3,898
	Navy Reserve VR-59 Fleet Logistics	100	C-9B	3,431
	Texas Air National Guard 136th Tactical Airlift Wing	100	C-130H	11,965
	Army Reserves, 90th	44	OH-58	7,278
		44	UH-1	7,278
		12	U-21	2,081
	Texas Army National Guard	10	UH-1H	1,029
		25	UH-60L	2,577
		65	CH-47D	6,694
	AFRES 301st FW	100	F-16	7,855
	AF Plant #4	100	F-16	1,000
	Military Transients			
		32	Attack/Fighters	8,858
		2	Large Cargo/Transport, Propeller	592
		8	Large Cargo/Transport, Jet	2,228
		7	Small Cargo/Transport	1,872
		42	Trainer, Jet	11,885
		5	Trainer, Propeller	1,547
		4	Helicopter	1,004
	Subtotal			108,188
Civilian	Aircraft Maintenance	33	DC-9	120
		33	MD-80	120
		34	Boeing 727[b]	120
	Subtotal			360
			Total	108,548

Note: (a) An operation is defined as one takeoff or one landing.
(b) Aircraft would convert to Stage 3 engines by the year 2000.
AF = Air Force.
AFRES = Air Force Reserves.
FW = Fighter Wing.

2.3.1.4 Institutional (Medical). The institutional land use consists of 44 acres in the northeast portion of the base and would include the base hospital and other existing buildings as a public or private hospital with associated medical and medical training uses capable of supporting up to about 300 persons on an inpatient basis. The hospital could be used soon after property disposal and new development would continue throughout the 20-year analysis period.

2.3.1.5 Commercial. The area proposed for commercial reuse covers 116 acres and is located between the golf course and SH 183. The commercial area would include a neighborhood retail center of approximately 12 acres. This retail center would likely be located adjacent to the north side of SH 183 at the Green Oaks Boulevard intersection. The remaining area would be devoted to typical suburban offices ranging from one to three stories. All of the existing facilities and residential units, except one single-family residence listed on the NRHP, would be demolished. Development of the neighborhood retail center is expected to be complete by 1998. Office development could begin soon after disposal of the property and would be approximately 40 percent complete by the year 2013.

2.3.1.6 Residential. The proposed residential land use covers 308 acres and includes four separate parcels. The Off-Site WSA would be developed for 50 single-family ranchettes. The existing storage igloos would be demolished, with development of the ranchettes projected to be complete by the year 2013. Kings Branch housing area would be developed with up to 500 multi-family units. The existing housing units would either be sold and relocated off site, or demolished. The development of this new housing is projected to be completed by the year 2013. The residential area in the southeast portion of the base contains one house, which would be converted to civilian use. In addition to this residence, up to 60 additional single-family residences would be constructed within 10 years after base disposal.

2.3.1.7 Public Facilities/Recreation. The proposed public facilities/recreation land uses include two areas consisting of 174 acres. The first area in the southeastern portion of the base includes the golf course, the child care center, and a floodplain associated with Farmers Branch Creek. The golf course area could be reused soon after disposal of the property. The child care center would be reused as a city hall and public library, and the floodplain would be retained as open space. An existing private cemetery would be left undisturbed; however, the existing single-family residences surrounded by the golf course area would be demolished.

The second area is a narrow parcel along the western boundary of the Kings Branch housing area, which includes a portion of the 100-year floodplain associated with the Farmers Branch Creek. This land would be left as open space for civilian reuse.

2.3.1.8 Employment and Population. By the year 2013, the Mixed Use Alternative would include a total on-site employment of about 13,338 direct jobs, including 3,881 jobs associated with military use. This represents an increase of 12,664 jobs over closure baseline conditions. Total direct employment, including military employment, is shown in Table 2.3-5. The projected on-site population would total approximately 2,869 residents by the year 2013. The military use would include an on-site population of 1,270 within the dormitories and family housing units. The remaining on-site population would consist of civilian residents within on-base housing areas.

Table 2.3-5. Total On-Site Employment and Population - Mixed Use Alternative

	Closure	1998	2003	2013
Direct employment				
Military use[a]	674[b]	3,881	3,881	3,881
Civilian use	0	3,352	5,245	9,457
Total	674	7,233	9,126	13,338
On-base population				
Military use[c]	1,270	1,270	1,270	1,270
Civilian use	0	471	877	1,599
Total	1,270	1,741	2,147	2,869

NoteS: (a) Represents weekday military employment levels. Average weekend reservist base loading would remain below weekday military employment levels.
(b) Military use includes 50 OL employees under the closure baseline in 1993.
(c) Represents weekend conditions, including about 680 persons permanently residing on base, as well as weekend reservists temporarily residing on base within the dormitories. Weekday military population levels would remain below weekend conditions.
OL = Operating Location.

2.3.1.9 Transportation. Existing access to the base would be retained as described under the Proposed Action. The existing access point to the south side of the base at the intersection of Green Oaks Boulevard and SH 183 would be improved to provide access to the southern portion of the base property.

Based on land use and employment projections, average daily vehicular traffic to and from base property would be approximately 44,550 trips by the year 2013. On-base roadway improvement, if needed, would be accomplished to meet regional LOS requirements.

2.3.1.10 Utilities. By the year 2013, the projected activities associated with the Mixed Use Alternative would generate the following total on-site utility uses:

- Water - 0.9 MGD
- Wastewater - 0.6 MGD
- Solid Waste - 28 tons/day
- Electricity - 158 MWH/day
- Natural Gas - 1.6 MMCF/day.

Some utility systems would have to be improved to provide adequate service to proposed new facilities. Required utility improvements would generally be the same as identified in the Proposed Action.

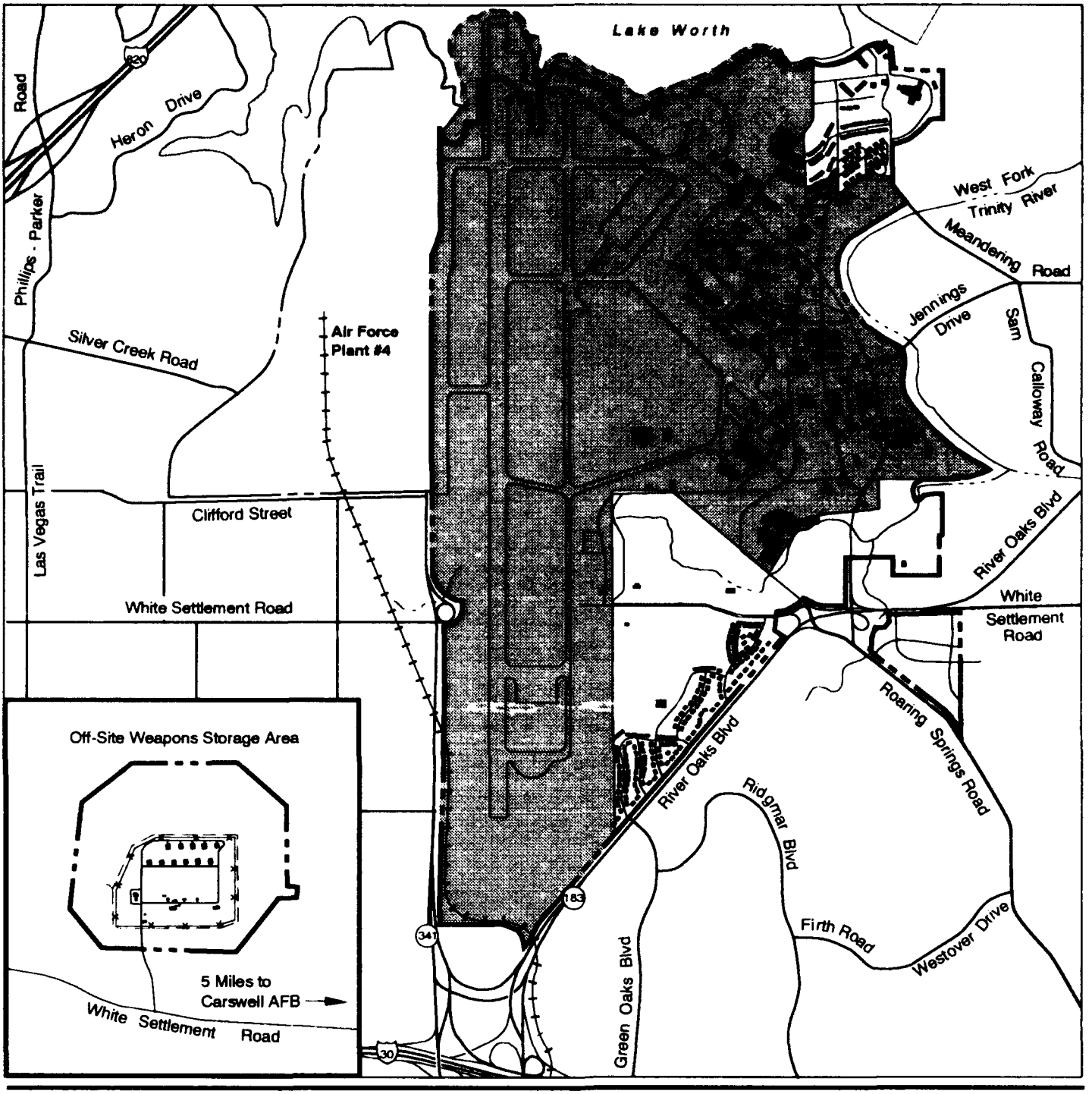
2.3.2 No-Action/Realignment Alternative

The description of the traditional No-Action Alternative, as defined for environmental analysis purposes, assumes the long-term continuation of baseline conditions without the implementation of the proposed project. This traditional No-Action scenario describes the future ambient growth conditions to assess the incremental changes caused by the proposed project. The No-Action/Realignment Alternative for this EIS includes the 1991 and 1993 Commissions' actions, as mandated under DBCRA. As such, the No-Action/Realignment Alternative includes the change in conditions over the closure conditions caused by military realignment activities and establishment of NAS Fort Worth, Joint Reserve Base.

The military land use would be similar to the military activities described under the Proposed Action and would absorb 72 percent of the base property. The remainder of the base would continue to be placed under caretaker status in the long term, whether or not the U.S. Government retains title to the property (Figure 2.3-2).

DOD would utilize 1,884 acres of the base (including the 64-acre leased property) to support retained and realigned military activities. The military land area would consist of slightly more property and facilities than either the Proposed Action or Mixed Use Alternative because consideration of civilian reuse goals and priorities would be unnecessary and the remainder of the base would be maintained in caretaker status. The existing run-up stations and pavement west of the airfield would be transferred to AF Plant #4 for continued use with no change in operations.

NAS Fort Worth would reuse approximately 2,607,000 square feet (94 percent) of existing facility space; 40 percent of this facility space would undergo some renovation. The remaining facilities would be demolished and replaced with approximately 518,000 square feet of new facility construction to support full operations. In addition, infrastructure upgrades/connections would be conducted to provide required service and security. Development would disturb a total of 24 acres and would be complete by 1998.



EXPLANATION

- Military
- Caretaker Status
- Carswell AFB Boundary
- Air Force Plant #4 Boundary
- Leased Property

0 650 1300 2600 Feet

No-Action/Realignment Alternative

Figure 2.3-2

The airfield would be operated by the Navy, which would manage the development and operations in accordance with Navy regulations. The military aircraft operations would be similar to the Proposed Action, totaling approximately 108,200 operations annually (see Table 2.2-4). No civilian aviation activities would occur under the No-Action/Realignment Alternative.

The remaining 735 acres of the base would be preserved by being placed in a condition intended to limit deterioration and ensure public safety. Caretaker activities would consist of resource protection, grounds maintenance, existing utilities operations, as necessary, and building care. The future land uses and levels of maintenance within these portions of the base would be as follows:

- Maintain structures to limit deterioration
- Isolate or deactivate utility distribution lines on base
- Provide limited maintenance of roads to ensure access
- Provide limited grounds maintenance of open areas to eliminate fire, health, and safety hazards
- Maintain the golf course in such a manner as to facilitate economical resumption of use.

By 1998, the No-Action/Realignment Alternative would include a total on-site employment of 3,931 direct jobs, including 3,881 jobs associated with NAS Fort Worth and 50 jobs associated with the OL. This represents an increase of 3,257 jobs over the 1993 closure baseline conditions. The military use would include an on-site population of 1,270 within the dormitories and family housing units.

The No-Action/Realignment Alternative would generate an average of about 7,000 daily trips throughout the 20-year analysis period. Access to the base would continue through the Southwest, Main, East, and Hospital gates (as described for on-base roadways in Section 3.2.3.1).

The following utility uses would also be generated by the No-Action/ Realignment Alternative:

- Water - 0.3 MGD
- Wastewater - 0.2 MGD
- Solid Waste - 8 T/day
- Electricity - 68 MWH/day
- Natural Gas - 0.2 MMCF/day.

The base would continue to fulfill its water requirements from the city of Fort Worth's system. Nonessential water lines would be drained and shut off. The Village Creek Plant would continue to provide treatment for the flow of wastewater. Solid waste collection from the base would continue through private contractors. The existing power and heating systems serving Carswell AFB would likely be utilized. Electrical power would be required for NAS Fort Worth, security lighting, and other essential systems. Natural gas would also be required for NAS Fort Worth and vacant facilities during winter months to maintain minimal heating in mothballed facilities.

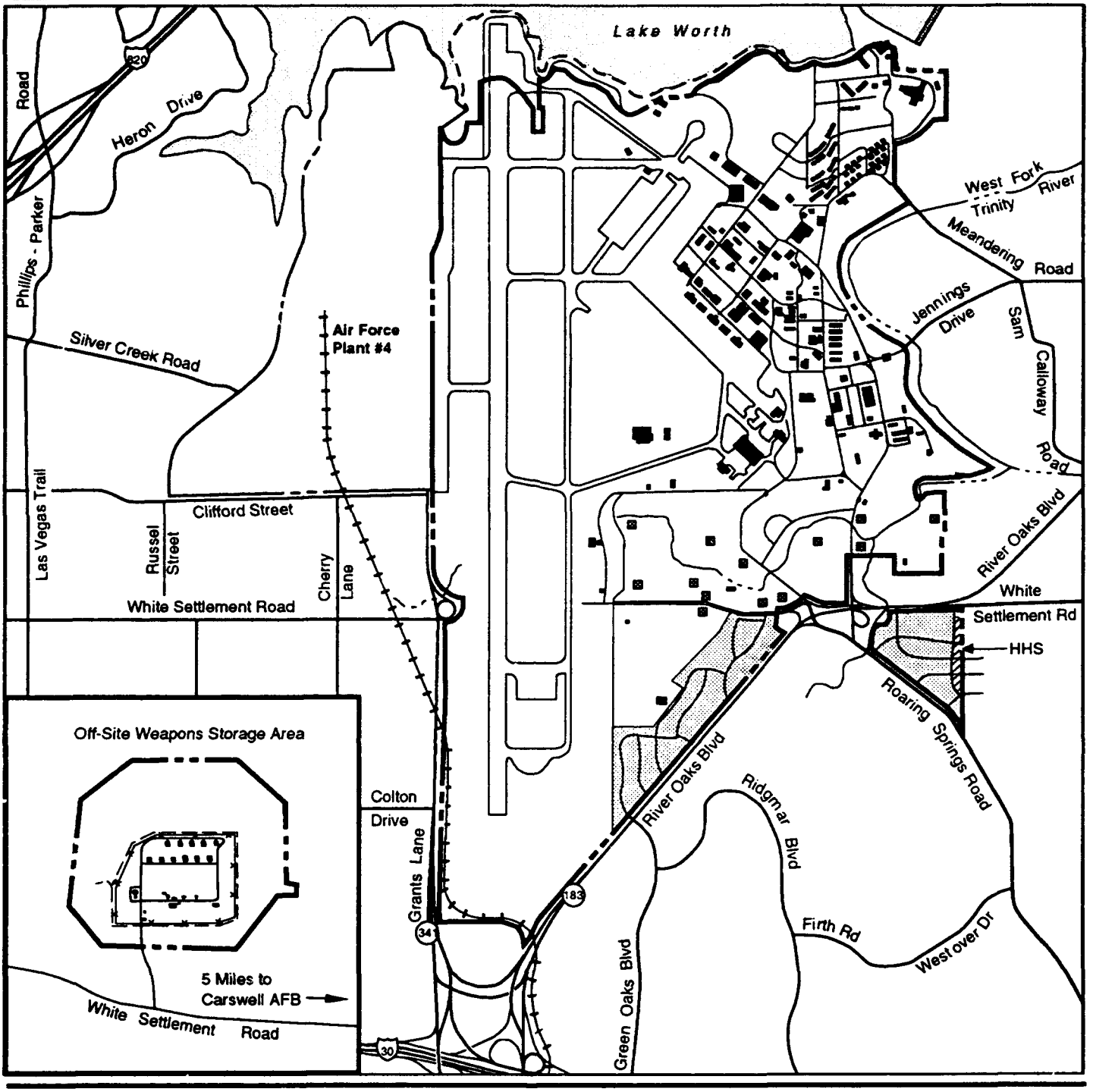
2.3.3 Other Land Use Concepts

In compliance with the Federal Property and Administrative Services Act of 1949, the Air Force solicited proposals from other federal agencies regarding their interest in acquiring any excess lands or facilities identified for disposal at Carswell AFB. Several land use concepts were provided to the Air Force during the scoping process; however, only those proposals for property or facilities determined to be potentially excess to the needs of DOD were considered in this analysis. Land use concepts for parcels located within DOD-retained property were determined not to be viable and were, therefore, dismissed from further consideration.

Land use concepts analyzed in this document could be individually implemented or in combination with any of the alternatives, including the Proposed Action. Figure 2.3-3 shows the locations of proposed land use concepts described below.

2.3.3.1 Health and Human Services. Approximately 20 dwelling units along the east side of the Kings Branch parcel have been requested for renovation as housing for the handicapped. It is assumed these units would support about 50 persons. Potable water use is estimated to equal 0.01 MGD. Wastewater generation is estimated to equal 0.004 MGD. Solid waste is anticipated to equal 0.1 ton/day. The use of 20 housing units would consume 0.45 MWH/day of electricity and 0.01 MMCF/day of natural gas. Little to no ground disturbance would be required because no new facility construction is anticipated.

2.3.3.2 Retained Residential Areas. Under this land use concept, approximately 550 existing housing units on Carswell AFB would be converted for civilian reuse (see Figure 2.3-3). The residential land use areas would include the single family units in Kings Branch, the single-family units along SH 183, and 13 individual single-family units scattered throughout the golf course. The existing residential units could be renovated to provide for single-family residences, as well as potential special housing needs, including public-assisted, retirement, low- to moderate-income, or homeless-assisted housing. For analysis purposes, it is assumed the residential areas would be fully occupied by 10 years after base disposal



EXPLANATION

- Health and Human Services (HHS)
- Retained Residential Areas
- Carswell AFB Boundary
- Leased Property
- Air Force Plant #4 Boundary

0 350 650 1300 Feet

Other Land Use Concepts

Figure 2.3-3

with up to 1,375 residents. Little to no ground disturbance would be required because no new facility construction would be anticipated.

The projected on-site activities associated with the residential areas would generate the following utility usage:

- Water - 0.3 MGD
- Wastewater - 0.1 MGD
- Solid Waste - 3 tons/day
- Electricity - 10 MWH/day
- Natural Gas - 0.2 MMCF/day.

Traffic generated by the retained residential areas would total 5,250 average daily trips by the year 2003. Access would be provided by existing entry points and an improved access point along Green Oaks Boulevard.

2.4 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

The 1993 Commission recommendations provided for the realignment of several additional DOD organizations to Carswell AFB. The relocation of these organizations resulted in a significant increase in the property to be retained within DOD for continued military use. The realignment action also increased the future military aviation activities on base, thus preventing civilian joint use of the airfield. Therefore, the alternatives developed from the 1991 Commission's closure recommendations, as presented in the DEIS filed with the U.S. EPA in March 1993, have been eliminated. In addition to reuse proposals received, the Air Force identified potential reuse alternatives that would be reasonable for Carswell AFB.

2.5 INTERIM USES

Interim uses include predisposal short-term uses of the base facilities and properties. Predisposal interim uses are conducted under lease agreements with the Air Force. The terms and conditions of each lease would be arranged to ensure that the predisposal interim uses do not prejudice future disposal and reuse plans of the base. The continuation of interim uses beyond disposal would be arranged through agreements with the new property owner(s).

A baseline representing conditions at the point of closure is used for the environmental analysis. The predisposal interim uses are not considered within this closure baseline; inclusion of these predisposal interim uses could presuppose a disposal or leasing decision.

2.6 OTHER FUTURE ACTIONS IN THE REGION

Other actions within the region were evaluated to determine whether cumulative environmental impacts could result due to the implementation of the base disposal action in conjunction with other past, present, or reasonably foreseeable future actions. No actions within the geographic region were determined to cause cumulative impacts in combination with the Proposed Action or alternatives.

2.7 COMPARISON OF ENVIRONMENTAL IMPACTS

A summary comparison of the influencing factors and environmental impacts and potential mitigations for each biophysical resource affected by the Proposed Action and alternatives over the 20-year study period is presented in Tables 2.7-1 and 2.7-2. Impacts for air quality are summarized over a 10-year period due to the speculative nature of projecting pollutant emissions and concentrations far into the future under changing regulatory and climatic conditions. Table 2.7-2 also includes a summary of closure conditions to provide a basis for comparison of reuse-related changes and associated impacts. Changes and associated impacts due to military realignment actions are also presented under the No-Action/Realignment Alternative and provide a comparative basis for future conditions. Influencing factors are nonbiophysical elements, such as population, employment, land use, aesthetics, public utility systems, and transportation networks, that directly impact the environment. These activities have been analyzed to determine their effects on the environment. Impacts to the environment are briefly described in the summary and discussed in detail in Chapter 4. Table 2.7-3 presents environmental impacts of other land use concepts.

Table 2.7-1. Summary of Total Reuse-Related Influencing Factors

Factor	No-Action/Realignment Alternative			Proposed Action			Mixed Use Alternative		
	1998	2003	2013	1998	2003	2013	1998	2003	2013
Ground disturbance (acres, by phase)	24	0	0	140	34	34	105	60	115
Direct employment	3,931	3,931	3,931	5,353	7,078	8,982	7,233	9,126	9,457
Secondary employment	3,313	3,187	3,187	5,421	7,559	9,830	8,134	10,369	15,435
In-migrating population	2,875	2,872	2,872	3,038	3,195	3,360	3,230	3,401	3,774
Traffic (average daily vehicular traffic)	7,000	7,000	7,000	15,350	24,850	34,250	24,300	31,150	44,550
Aircraft operations (annual)	108,188	108,188	108,188	108,604	108,604	108,604	108,548	108,548	108,548
ROI water consumption (MGD)	0.9	0.9	0.9	1.3	1.4	1.4	1.3	1.3	1.6
ROI wastewater treatment (MGD)	0.5	0.5	0.5	0.9	0.9	1.0	0.8	0.9	1.1
ROI solid waste disposal (tons/day)	19	19	19	24	27	30	28	33	42
ROI electricity consumption (MWH/day)	109	109	109	186	199	212	155	175	210
ROI natural gas consumption (MMCF/day)	0.4	0.4	0.4	1.5	1.7	1.8	1.2	1.4	1.9

MGD = million gallons per day.
MMCF/day = million cubic feet per day.
MWH/day = megawatt-hours per day.
ROI = Region of Influence.

Table 2.7-2. Summary of Environmental Impacts and Suggested Mitigation from the No-Action/Realignment Alternative, the Proposed Action, and the Mixed Use Alternative
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Resource Category	Closure Baseline	No-Action/Realignment Alternative[a]	Proposed Action[b]	Mixed Use Alternative[b]
Local Community				
• Land Use and Aesthetics	Conditions: Retained military activities totaling 1,198 acres. Remaining 1,421 acres of the base property placed under caretaker status.	• Impacts: Expansion of military land use to 1,887 acres for NAS Fort Worth activities. Remaining 732 acres maintained in caretaker status. Fewer land use incompatibilities due to aircraft noise contours, however, increased land use conflicts due to Navy APZ configuration. • Mitigations: Modifications of local community zoning ordinances according to Navy AICUZ criteria.	• Impacts: Civilian redevelopment of 735 acres. Revisions to local zoning and plans required to reflect non-federal civilian reuse. Minimal additional land use incompatibilities. Visual quality could be affected by proposed civilian development activities. • Mitigations: Retention of mature woods along SH 183 and Lake Worth through implementing development standards and design planning.	• Impacts: Civilian redevelopment of 747 acres. Revisions to local zoning and plans required to reflect non-federal civilian reuse. Minimal additional land use incompatibilities. Reduction in land use restrictions due to residential use of the Off-site WSA. Visual quality would be affected by proposed civilian development. • Mitigations: Retention of mature woods along SH 183 and Lake Worth through design planning and implementation of development standards.

Notes: (a) Impacts are based on the changes from post-closure conditions, which are projected to occur as a result of implementing the No-Action/Realignment Alternative.
(b) Impacts are based on the changes from the No-Action/Realignment Alternative that are projected to occur as a result of implementing that alternative. Total reuse effects are given on occasion to show the total reuse-related activity associated with the base property.

AICUZ = Air Installation Compatible Use Zone.
APZ = Accident Potential Zone.
NAS = Naval Air Station.
SH = State Highway.
WSA = Weapons Storage Area.

Table 2.7-2. Summary of Environmental Impacts and Suggested Mitigation from the No-Action/Realignment Alternative, the Proposed Action, and the Mixed Use Alternative
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Resource Category	Closure Baseline	No-Action/Realignment Alternative[a]	Proposed Action[b]	Mixed Use Alternative[b]
Local Community (Continued)				
• Transportation	Conditions:	• Impacts:	• Impacts:	• Impacts:
	1,100 daily trips. Three gates closed; access limited to Main Gate.	Increase to 7,000 daily vehicular trips. Access provided by all 4 existing gates. Military reuse-related traffic would degrade the LOS from A to B on SH 183. With programmed improvements, roadway segments would maintain acceptable LOS.	Additional 27,250 daily vehicular trips. Additional access provided at Green Oaks Blvd. and SH 183. Civilian reuse-related traffic on I-30 would degrade the LOS to C, and degrade the LOS on SH 183 to D.	Additional 37,550 daily vehicular trips. Additional access provided at Green Oaks Blvd. and SH 183. Civilian reuse-related traffic on I-30 would degrade the LOS to C, and degrade the LOS on SH 183 to D.
	20,930 annual aircraft operations associated with retained military activities.	Increase of 87,258 annual aircraft operations. Relocation or modification to the existing ATCT may be required to improve line of sight to the runway and taxiway areas. No adverse impacts to airspace or air traffic within the ROI is anticipated.	Additional 416 annual aviation operations. No additional airspace conflicts or air transportation impacts.	Additional 360 annual aircraft operations. No additional airspace conflicts or air transportation impacts.
• Utilities Use	Conditions:	• Impacts:	• Impacts:	• Impacts:
	Water: 0.01 MGD Wastewater: 0.01 MGD Solid Waste: 1.60 tons/day Electricity: 18.95 MWH/day Natural Gas: 0.04 MMCF/day	Less than 1 percent increase in ROI utility use. Current systems, with planned improvements, would be able to accommodate these increased demands. Interconnections required to provide service to on-base users. Pretreatment of industrial wastewater may be required. Waste minimization program would be implemented by NAS Fort Worth to further minimize potential impacts.	Up to 2.0 percent increase in ROI utility use. Current systems, with planned improvements, would be able to accommodate these increased demands. Interconnections required to provide service to on-base users. Pretreatment of industrial wastewater may be required.	Up to 2.1 percent increase in ROI utility use. Current systems with planned improvements would be able to accommodate the increases in utility demands. Interconnection required to provide service to on-base users. Pretreatment of industrial wastewater may be required.

Notes: (a) Impacts are based on the changes from post-closure conditions, which are projected to occur as a result of implementing the No-Action/Realignment Alternative
(b) Impacts are based on the changes from the No-Action/Realignment Alternative that are projected to occur as a result of implementing that alternative. Total reuse effects are given on occasion to show the total reuse-related activity associated with the base property.

ATCT = Air Traffic Control Tower.
I = Interstate.
LOS = Level of Service.
MGD = million gallons per day.
MMCF/day = million cubic feet per day.
MWH/day = megawatt-hours per day.
ROI = Region of Influence.
SH = State Highway.

Table 2.7-2. Summary of Environmental Impacts and Suggested Mitigation from the No-Action/Realignment Alternative, the Proposed Action, and the Mixed Use Alternative
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Resource Category	Closure Baseline	No-Action/Realignment Alternative[a]	Proposed Action[b]	Mixed Use Alternative[b]
Local Community (Continued)				
		• Mitigations: Provide industrial wastewater pretreatment in accordance with applicable permit requirements. Recycle or reuse construction/demolition debris.	• Mitigations: Provide industrial wastewater pretreatment in accordance with applicable permit requirements. Recycle or reuse construction/demolition debris.	• Mitigations: Provide industrial wastewater pretreatment in accordance with applicable permit requirements. Recycle or reuse construction/demolition debris.
Hazardous Materials and Hazardous Waste Management				
• Hazardous Materials Management	Conditions: Materials used for retained military activities and caretaker activities managed in compliance with applicable regulations.	• Impacts: Increase in types and quantities of materials used over closure conditions. Implementation of pollution prevention measures would likely reduce quantities of materials used to levels below preclosure conditions. Compliance with applicable regulations would preclude adverse impacts.	• Impacts: Increase in types and quantities of materials used. Compliance with applicable regulations would preclude adverse impacts.	• Impacts: Increase in types and quantities of materials used. Compliance with applicable regulations would preclude adverse impacts.
			• Mitigations: Establish a cooperative planning body to reduce impacts associated with civilian reuse.	• Mitigations: Establish a cooperative planning body to reduce impacts associated with civilian reuse.

Notes: (a) Impacts are based on the changes from post-closure conditions, which are projected to occur as a result of implementing the No-Action/Realignment Alternative.
(b) Impacts are based on the changes from the No-Action/Realignment Alternative that are projected to occur as a result of implementing that alternative. Total reuse effects are given on occasion to show the total reuse-related activity associated with the base property.

Table 2.7-2. Summary of Environmental Impacts and Suggested Mitigation from the No-Action/Realignment Alternative, the Proposed Action, and the Mixed Use Alternative

Resource Category	Closure Baseline	No-Action/Realignment Alternative[a]	Proposed Action[b]	Mixed Use Alternative[b]
Hazardous Materials and Hazardous Waste Management (Continued)				
• Hazardous Waste Management	Conditions: Wastes generated by retained military activities and caretaker activities managed in accordance with applicable regulations.	• Impacts: Increases in types and quantities of wastes generated over closure conditions. Pollution prevention measures would be implemented to reduce quantities to levels below preclosure conditions. Compliance with applicable regulations would preclude unacceptable impacts. • Mitigations: Collection of hazardous household products; educational programs on recycling, waste minimization, and waste disposal.	• Impacts: Increase in quantities of wastes generated. Compliance with applicable regulations would preclude unacceptable impacts. • Mitigations: Establish a cooperative planning body. Collection of hazardous household products; educational programs on recycling, waste minimization, and waste disposal.	• Impacts: Increase in quantities of wastes generated. Compliance with applicable regulations would preclude unacceptable impacts. • Mitigations: Establish a cooperative planning body. Collection of hazardous household products; educational programs on recycling, waste minimization, and waste disposal.
• IRP	Conditions: IRP activities continued regardless of base closure and reuse. IRP remediation activities continued in accordance with applicable regulations.	• Impacts: Short-term impacts to flightline activities may occur due to site remediation activities. Coordination between NAS Fort Worth, the OL, and AF Plant #4 to address remediation activities would further minimize land use restrictions.	• Impacts: Possible land use restrictions and civilian redevelopment delays due to current and future remediation. Coordination between interested parties would reduce potential impacts that may arise with IRP sites located on properties scheduled for civilian reuse.	• Impacts: Possible land use restrictions and civilian redevelopment delays due to current and future remediation. Coordination between interested parties would reduce potential impacts that may arise for IRP sites located on properties scheduled for civilian reuse.

Notes: (a) Impacts are based on the changes from post-closure conditions, which are projected to occur as a result of implementing the No-Action/Realignment Alternative.
(b) Impacts are based on the changes from the No-Action/Realignment Alternative that are projected to occur as a result of implementing that alternative. Total reuse effects are given on occasion to show the total reuse-related activity associated with the base property.
AF = Air Force.
IRP = Installation Restoration Program.
NAS = Naval Air Station.
OL = Operating Location.

Table 2.7-2. Summary of Environmental Impacts and Suggested Mitigation from the No-Action/Realignment Alternative, the Proposed Action, and the Mixed Use Alternative
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Resource Category	Closure Baseline	No-Action/Realignment Alternative[a]	Proposed Action[b]	Mixed Use Alternative[b]
Hazardous Materials and Hazardous Waste Management (Continued)				
• Storage Tanks	Conditions: Storage tanks for retained military activities managed in accordance with applicable regulations. Unused tanks removed or maintained in place in accordance with applicable standards.	• Impacts: Storage tanks required by NAS Fort Worth would be subject to Navy policy and applicable regulations. Other remaining USTs would be removed or managed by OL in accordance with applicable regulations. • Mitigations: Coordination between NAS Fort Worth and the OL to avoid damage to remaining USTs and piping systems during military realignment construction.	• Impacts: Storage tanks required by civilian owner/operator would be subject to applicable regulations to avoid unacceptable impacts. • Mitigations: Coordination between the reuse planning agencies and NAS Fort Worth to avoid damage to remaining USTs and piping systems during civilian reuse-related construction.	• Impacts: Storage tanks required by civilian owner/operator would be subject to applicable regulations to avoid unacceptable impacts. • Mitigations: Coordination between the reuse planning agencies and NAS Fort Worth to avoid damage to remaining USTs and piping systems during civilian reuse-related construction.

Notes: (a) Impacts are based on the changes from post-closure conditions, which are projected to occur as a result of implementing the No-Action/Realignment Alternative.
(b) Impacts are based on the changes from the No-Action/Realignment Alternative that are projected to occur as a result of implementing that alternative. Total reuse effects are given on occasion to show the total reuse-related activity associated with the base property.
NAS = Naval Air Station.
OL = Operating Location.
UST = underground storage tank.

Table 2.7-2. Summary of Environmental Impacts and Suggested Mitigation from the No-Action/Realignment Alternative, the Proposed Action, and the Mixed Use Alternative

Resource Category	Closure Baseline	No-Action/Realignment Alternative[a]	Proposed Action[b]	Mixed Use Alternative[b]
Hazardous Materials and Hazardous Waste Management (Continued)				
• Asbestos	Conditions: ACM posing a health risk removed. Remaining ACM managed in accordance with Air Force policy. Unoccupied buildings secured by the OL to prevent contact with ACM.	• Impacts: Management of ACM during military demolition and renovation activities would be in accordance with NESHAP and applicable regulations.	• Impacts: Management of ACM during demolition and renovation activities would be subject to NESHAP and applicable regulations. Remaining ACM would be managed in accordance with applicable regulations to minimize potential risk to human health or the environment.	• Impacts: Management of ACM during demolition and renovation activities would be subject to NESHAP and applicable regulations. Remaining ACM would be managed in accordance with applicable regulations to minimize potential risk to human health or the environment.
• Pesticide Usage	Conditions: Pesticides used by retained military activities and caretaker activities managed in compliance with applicable standards.	• Impacts: No appreciable increase in use of pesticides. Application and management in accordance with FIFRA and other guidelines would preclude unacceptable impacts.	• Impacts: Increased use associated with civilian development. Management in accordance with FIFRA and state guidelines would preclude unacceptable impacts.	• Impacts: Increased use associated with civilian development. Management in accordance with FIFRA and state guidelines would preclude unacceptable impacts.
• PCBs	Conditions: All federally regulated PCBs removed and properly disposed of prior to closure.	• No Impact.	• No Impact.	• No Impact.

Notes: (a) Impacts are based on the changes from post-closure conditions, which are projected to occur as a result of implementing the No-Action/Realignment Alternative.
(b) Impacts are based on the changes from the No-Action/Realignment Alternative that are projected to occur as a result of implementing that alternative. Total reuse effects are given on occasion to show the total reuse-related activity associated with the base property.
ACM = asbestos-containing material.
FIFRA = Federal Insecticide, Fungicide, and Rodenticide Act.
NESHAP = National Emissions Standards for Hazardous Air Pollutants.
OL = Operating Location.
PCB = polychlorinated biphenyls.

Table 2.7-2. Summary of Environmental Impacts and Suggested Mitigation from the No-Action/Realignment Alternative, the Proposed Action, and the Mixed Use Alternative
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Resource Category	Closure Baseline	No-Action/Realignment Alternative[a]	Proposed Action[b]	Mixed Use Alternative[b]
Hazardous Materials and Hazardous Waste Management (Continued)				
• Radon	Conditions: No occupancy of facilities with registered radon levels above 4 pCi/l is expected.	• Impacts: Navy policy requires all buildings and housing units occupied over 4 hours per day to be tested for presence of radon. Levels of or exceeding 4 pCi/l would be mitigated using U.S. EPA-recommended guidelines.	• Impacts: Potential exposure to levels greater than the standard (4 pCi/l). Prior to reuse, reuse planning agencies would identify structures known to exceed the U.S. EPA recommended level of 4 pCi/l.	• Impacts: Potential exposure to levels greater than the standard (4 pCi/l). Prior to reuse, reuse planning agencies would identify structures known to exceed the U.S. EPA recommended level of 4 pCi/l.
• Medical/ Biohazardous Waste	Conditions: Existing wastes removed by OL in accordance with applicable regulations.	• Impacts: Slight increase in amounts generated over closure conditions due to military medical clinic. Quantity of wastes generated would remain below pre-closure levels. Proper management under Navy policy and applicable regulations would avoid unacceptable impacts.	• Impacts: Increase in amounts generated. Proper management under applicable regulations would avoid adverse impacts.	• Impacts: Increase in amounts generated. Proper management under applicable regulations would avoid adverse impacts.
• Ordnance	Conditions: All unexploded ordnance removed from the Off-Site WSA (including the EOD area) and WSA in the central flightline area prior to closure. Ordnance stored in the northern WSA and used at the firing range in conjunction with the retained military activities.	• Impacts: Continued use and maintenance of small arms firing range and northern main base WSA for NAS Fort Worth. Management of these facilities under Navy policy and applicable regulations would preclude adverse impacts.	• Impacts: Possible increase in types and quantities of ordnance due to civilian reuse of Off-Site WSA. Compliance with applicable regulations would preclude adverse impacts.	• No additional impact.

Notes: (a) Impacts are based on the changes from post-closure conditions, which are projected to occur as a result of implementing the No-Action/Realignment Alternative.
(b) Impacts are based on the changes from the No-Action/Realignment Alternative that are projected to occur as a result of implementing that alternative. Total reuse effects are given on occasion to show the total reuse-related activity associated with the base property.
EOD = Explosive Ordnance Disposal.
EPA = Environmental Protection Agency.
NAS = Naval Air Station.
OL = Operating Location
pCi/l = picocuries per liter.
WSA = Weapons Storage Area.

Table 2.7-2. Summary of Environmental Impacts and Suggested Mitigation from the No-Action/Realignment Alternative, the Proposed Action, and the Mixed Use Alternative
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Resource Category	Closure Baseline	No-Action/Realignment Alternative[a]	Proposed Action[b]	Mixed Use Alternative[b]
Hazardous Material and Hazardous Waste Management (Continued)				
• Lead-based Paint	Conditions: Lead-based paint assumed to be present in all facilities built prior to or during 1978. A survey will be conducted at high-priority facilities, in accordance with Air Force policy, to assess the presence of lead-based paint.	• Impacts: Lead-based paint would be remediated, as necessary, from facilities planned for renovation or demolition. Disposal in accordance with applicable regulations would preclude any unacceptable impacts.	• Impacts: Lead-based paint would be remediated, as necessary, from facilities planned for renovation or demolition. Disposal in accordance with applicable regulations would preclude any unacceptable impacts.	• Impacts: Lead-based paint would be remediated as necessary, from facilities planned for renovation or demolition. Disposal in accordance with applicable regulations would preclude any unacceptable impacts.
Natural Environment				
• Soils and Geology	Conditions: No ground disturbance.	• Impacts: Minor erosion effects from 24 acres of ground disturbance due to military construction activities.	• Impacts: Minor erosion effects from an additional 184 acres of ground disturbance.	• Impacts: Minor erosion effects from an additional 256 acres of ground disturbance.
		• Mitigations: Preventive measures and proper design, such as protective cover and diversion dikes, to minimize erosion during and after construction.	• Mitigations: Preventive measures and proper design, such as protective cover and diversion dikes, to minimize erosion during and after construction.	• Mitigations: Preventive measures and proper design, such as protective cover and diversion dikes, to minimize erosion during and after construction.

Notes: (a) Impacts are based on the changes from post-closure conditions, which are projected to occur as a result of implementing the No-Action/Realignment Alternative.
(b) Impacts are based on the changes from the No-Action/Realignment Alternative that are projected to occur as a result of implementing that alternative. Total reuse effects are given on occasion to show the total reuse-related activity associated with the base property.

Table 2.7-2. Summary of Environmental Impacts and Suggested Mitigation from the No-Action/Realignment Alternative, the Proposed Action, and the Mixed Use Alternative
Page 9 of 12

Resource Category	Closure Baseline	No-Action/Realignment Alternative[a]	Proposed Action[b]	Mixed Use Alternative[b]
Natural Environment (Continued)				
• Water Resources	Conditions: No ground disturbance. Adequate water supply for limited on-base demand.	• Impacts: Military construction activities on 24 acres could affect surface water flow and water quality. Compliance with NPDES and local permit requirements for storm water and wastewater discharge and pollution prevention requirements would further minimize water quality impacts. 0.4 percent increase in water demands would not affect water supply. • Mitigations: Use of proper construction techniques, control of site runoff, minimizing of surface disturbance and length of exposure time.	• Impacts: Additional disturbance and civilian development of 184 acres could affect surface water flow and water quality. Compliance with NPDES and local permit requirements for storm water and wastewater discharge and pollution prevention requirements would further minimize water quality impacts. Additional 0.2 percent increase in water demand would not affect water supply. • Mitigations: Use of proper construction techniques, control of site runoff, minimizing of surface disturbance and length of exposure time.	• Impacts: Additional disturbance and civilian development of 256 acres could affect surface water flow and water quality. Compliance with NPDES and local permit requirements for storm water and wastewater discharge and pollution prevention requirements would further minimize water quality impacts. Additional 0.3 percent increase in water demand would not affect water supply. • Mitigations: Use of proper construction techniques, control of site runoff, minimizing of surface disturbance and length of exposure time.

Notes: (a) Impacts are based on the changes from post-closure conditions, which are projected to occur as a result of implementing the No-Action/Realignment Alternative.
(b) Impacts are based on the changes from the No-Action/Realignment Alternative that are projected to occur as a result of implementing that alternative. Total reuse effects are given on occasion to show the total reuse-related activity associated with the base property.
NPDES = National Pollutant Discharge Elimination System.

Table 2.7-2. Summary of Environmental Impacts and Suggested Mitigation from the No-Action/Realignment Alternative, the Proposed Action, and the Mixed Use Alternative

Resource Category	Closure Baseline	No-Action/Realignment Alternative[a]	Proposed Action[b]	Mixed Use Alternative[b]
Natural Environment (Continued)				
• Air Quality	Conditions: NO_x: 0.17 ton/day VOC: 0.13 ton/day PM_{10}: 0.01 ton/day SO_2: 0.01 ton/day CO: 0.44 ton/day Limited air pollutant emissions generated from retained military activities and caretaker activities. Air Force to implement air emission controls in SIP as appropriate.	• Impacts: Increased air emissions due to military realignment in 2003: NO_x: 0.70 ton/day VOC: 0.52 ton/day PM_{10}: 0.09 ton/day SO_2: 0.03 ton/day CO: 3.40 tons/day Reuse-related emissions would remain below preclosure conditions. With implementation of SIP control measures, reuse activities would not affect the region's progress to reach and maintain attainment of the ozone standard. No adverse impacts for the other criteria pollutants. • Mitigations: Control of fugitive dust and combustion emissions during construction. No additional mitigations required beyond the control measures identified in the SIP.	• Impacts: Additional air emissions due to civilian reuse in 2003: NO_x: 0.38 ton/day VOC: 0.35 ton/day PM_{10}: 0.02 ton/day SO_2: 0.01 ton/day CO: 3.10 tons/day Reuse-related emissions would remain below preclosure conditions. With implementation of SIP control measures, reuse activities would not affect the region's progress to reach and maintain attainment of the ozone standard. No adverse impacts for other criteria pollutants. • Mitigations: Control of fugitive dust and combustion emissions during construction. No additional mitigations required beyond the control measures identified in the SIP.	• Impacts: Additional air emissions due to civilian reuse in 2003: NO_x: 0.63 ton/day VOC: 0.59 ton/day PM_{10}: 0.04 ton/day SO_2: 0.01 ton/day CO: 6.29 tons/day Reuse-related emissions would remain below preclosure conditions. With implementation of SIP control measures, reuse activities would not affect the region's progress to reach and maintain attainment of the ozone standard. No adverse impacts for other criteria pollutants. • Mitigations: Control of fugitive dust and combustion emissions during construction. No additional mitigations required beyond the control measures identified in the SIP.

Notes: (a) Impacts are based on the changes from post-closure conditions, which are projected to occur as a result of implementing the No-Action/Realignment Alternative.
(b) Impacts are based on the changes from the No-Action/Realignment Alternative that are projected to occur as a result of implementing that alternative. Total reuse effects are given on occasion to show the total reuse-related activity associated with the base property.
CO = carbon monoxide.
NO_x = nitrogen oxide.
PM_{10} = particulate matter equal to or less than 10 microns in diameter.
SIP = State Implementation Plan.
SO_2 = sulfur dioxide.
VOC = volatile organic compounds.

Table 2.7-2. Summary of Environmental Impacts and Suggested Mitigation from the No-Action/Realignment Alternative, the Proposed Action, and the Mixed Use Alternative

Resource Category	Closure Baseline	No-Action/Realignment Alternative[a]	Proposed Action[b]	Mixed Use Alternative[b]
Natural Environment (Continued)				
• Noise	Conditions: 8,436 acres and 10,200 residents exposed to DNL 65 dB or greater due to continued military aircraft operations.	• Impacts: Although aircraft noise levels would increase over closure conditions, the area exposed to DNL 65 dB or greater would decrease by 2,605 acres and affect 2,300 fewer residents when compared to preclosure conditions. No additional residents exposed to surface traffic noise levels. • Mitigations: Implementation of Navy AICUZ guidelines and appropriate mitigations.	• Impacts: Aircraft noise impacts similar to No-Action/Realignment Alternative. An additional 110 residents exposed to surface traffic noise levels of DNL 65 dB or greater. • Mitigations: Implementation of Navy AICUZ guidelines and appropriate mitigations.	• Impacts: Aircraft noise impacts similar to No-Action/Realignment Alternative. An additional 400 residents exposed to surface traffic noise levels of DNL 65 dB or greater. • Mitigations: Implementation of Navy AICUZ guidelines and appropriate mitigations.
• Biological Resources	Conditions: No ground disturbance. No threatened or endangered species on base. Two candidate species may occur on base. 0.6 acres of jurisdictional wetlands present. Migratory bird habitat present along Lake Worth shoreline.	• Impacts: 24 acres of disturbance due to military realignment activities. Biological resources affected primarily through human interaction. Increased impacts to wildlife due to additional flight operations. No impact to wetlands or threatened or endangered species.	• Impacts: Additional 184 acres of ground disturbance. No additional impact to wetlands or threatened or endangered species.	• Impacts: Additional 256 acres of disturbance. No additional impact to threatened or endangered species. Potential impact to approximately 0.1 acre of low quality wetlands at the Off-Site WSA. • Mitigations: Site planning at Off-Site WSA could minimize minor effects to wetlands. Mitigation measures, if necessary, would be determined by the Corps of Engineers.

Notes: (a) Impacts are based on the changes from post-closure conditions, which are projected to occur as a result of implementing the No-Action/Realignment Alternative.
(b) Impacts are based on the changes from the No-Action/Realignment Alternative that are projected to occur as a result of implementing that alternative. Total reuse effects are given on occasion to show the reuse-related activity associated with the base property.
AICUZ = Air Installation Compatible Use Zone.
dB = decibel.
DNL = day-night average sound level.
WSA = Weapons Storage Area.

Table 2.7-2. Summary of Environmental Impacts and Suggested Mitigation from the No-Action/Realignment Alternative, the Proposed Action, and the Mixed Use Alternative

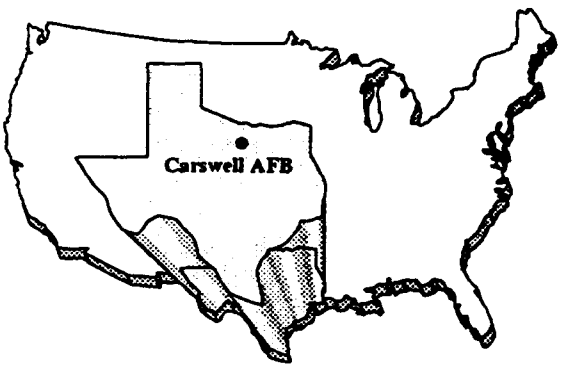
Resource Category	Closure Baseline	No-Action/Realignment Alternative[a]	Proposed Action[b]	Mixed Use Alternative[b]
Natural Environment (Continued)				
• Cultural Resources	Conditions: No ground disturbance. One historic property currently listed on NRHP. Additional properties may be eligible for listing on the NRHP; a survey is in progress.	• Impacts: No adverse impacts to archaeological, Native American, or paleontological resources. Potential adverse effects to historic properties listed on or potentially eligible for listing on the NRHP. • Mitigations: SHPO and Advisory Council would be consulted during development and implementation of procedures and mitigation strategies. Prepare agreement document to establish acceptable mitigation measures. Consult with archaeologist if cultural resources are discovered during redevelopment activities.	• Impacts: No adverse impacts to archaeological, Native American, or paleontological resources. Potential adverse effects to historic properties listed on or potentially eligible for listing on the NRHP. • Mitigations: Properties may be conveyed to non-federal owners with preservation covenants. SHPO and Advisory Council would be consulted during development and implementation of procedures and mitigation strategies. Prepare agreement document to establish acceptable mitigation measures. Consult with archaeologist if cultural resources are discovered during redevelopment activities.	• Impacts: No adverse impacts to archaeological, Native American, or paleontological resources. Potential adverse effects to historic properties listed on or potentially eligible for listing on the NRHP. • Mitigations: Properties may be conveyed to non-federal owners with preservation covenants. SHPO and Advisory Council would be consulted during development and implementation of procedures and mitigation strategies. Prepare agreement document to establish acceptable mitigation measures. Consult with archaeologist if cultural resources are discovered during redevelopment activities.

Notes: (a) Impacts are based on the changes from post-closure conditions, which are projected to occur as a result of implementing the No-Action/Realignment Alternative.
(b) Impacts are based on the changes from the No-Action/Realignment Alternative that are projected to occur as a result of implementing that alternative. Total reuse effects are given on occasion to show the reuse-related activity associated with the base property.
NRHP = National Register of Historic Places.
SHPO = State Historic Preservation Officer.

Table 2.7-3. Summary of Impacts from Other Land Use Concepts

Resource Category	Health and Human Services	Retained Residential Areas
Local Community		
Land Use and Aesthetics	No impact	Generally compatible with adjacent land uses. Revisions to local zoning would be required. 260 housing units would be incompatible with aircraft noise levels of DNL 65 dB or above.
Transportation	Minimal daily trips	5,250 daily trips. Potential changes in traffic volumes would not affect level of service.
Utilities	Negligible increase in ROI utility use	Net increases in ROI utility use would not affect utility systems or supplies
Hazardous Materials and Hazardous Waste Management		
Hazardous Material Management	Minor quantities used	Small quantities used
Hazardous Waste Management	Minor quantities generated	Small quantities generated
Installation Restoration Program	No disposal delays or land use restrictions expected	No disposal delays or land use restrictions expected
Storage Tanks	No impact	No impact
Asbestos	Property recipients would be notified of ACM prior to disposal	Property recipients would be notified of ACM prior to disposal
Pesticides Usage	No impact	No impact
Polychlorinated Biphenyls	No impact	No impact
Radon	No impact	Property recipients would be notified of structures with measured radon levels exceeding 4 pCi/l prior to reuse
Medical/Biohazardous Waste	No impact	No impact
Ordnance	No impact	No impact
Lead-Based Paint	Recipients to be advised of potential lead hazards.	Recipients to be advised of potential lead hazards.
Natural Environment		
Soils and Geology	No impact	No impact
Water Resources	No impact	No adverse impacts due to potential increase in water demand
Air Quality	No impact	No adverse impacts due to potential increase in air emissions
Noise	No impact	Approximately 700 residents exposed to aircraft noise levels of DNL 65 dB or greater
Biological Resources	No impact	No impact
Cultural Resources	No impact	No impact

ACM = asbestos-containing material.
dB = decibel.
DNL = day-night average sound level.
pCi/l = picocuries per liter.



CHAPTER 3
AFFECTED ENVIRONMENT

3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

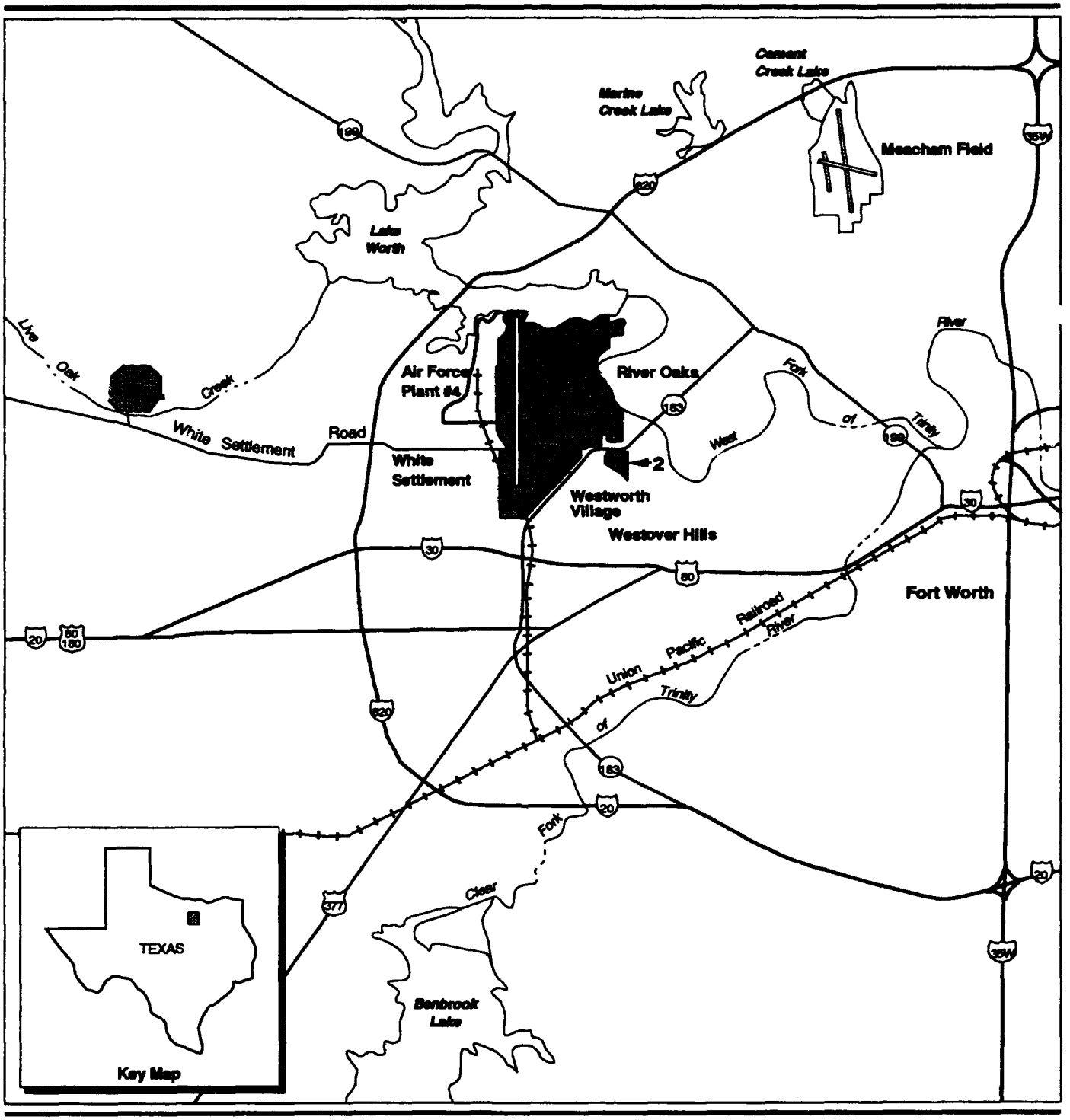
This chapter describes the environmental conditions of Carswell AFB and its Region of Influence (ROI) as it was at the time of base closure. It provides information to serve as a baseline from which to identify and evaluate environmental changes resulting from disposal and reuse of Carswell AFB. Although this EIS focuses on the biophysical environment, some nonbiophysical elements are addressed. The nonbiophysical elements (influencing factors) of population and employment, land use and aesthetics, transportation networks, and public utility systems in the region and local communities are addressed. This chapter also describes the storage, use, and management of hazardous materials found on base, including storage tanks, asbestos, pesticides, polychlorinated biphenyls (PCBs), radon, medical/biohazardous waste, ordnance, and lead-based paints. The current status of the IRP is also described. Finally, the chapter describes the pertinent natural resources of geology and soils, water resources, air quality, noise, biological resources, and cultural resources.

The ROI to be studied will be defined for each resource area affected by each reuse alternative. The ROI determines the geographical area to be addressed as the Affected Environment. Although the base boundary may constitute the ROI limit for many resources, potential impacts associated with certain issues (e.g., air quality, utility systems, water resources, biological resources) transcend these limits.

The baseline conditions assumed for the purposes of analysis are the representative conditions at base closure on September 30, 1993. These conditions include the retained AFRES activities prior to the military realignment and establishment of NAS Fort Worth. Impacts associated with disposal and/or reuse activities may then be addressed by comparing projected conditions under various reuses to the 1993 closure conditions. A reference to preclosure conditions is provided, where appropriate (e.g., air quality) in this document, in order to provide a comparative analysis over time. Data used to describe the preclosure reference point is that which depicts conditions as close as possible to the closure announcement date. This will assist the decision maker and agencies in understanding potential long-term impacts in comparison to conditions when the installation was active.

3.2 LOCAL COMMUNITY

Carswell AFB is located in north-central Texas in Tarrant County, 8 miles west of downtown Fort Worth (Figure 3.2-1). The base property, totaling 2,555 acres, consists of the main base and two noncontiguous parcels



EXPLANATION

- Interstate Highway
- U. S. Highway
- State Highway
- Base Boundary
- Carswell AFB Property
- 1 Main Base
- 2 Kings Branch
- 3 Off-Site WSA

Regional Map

0 .5 1 2 Miles

Figure 3.2-1

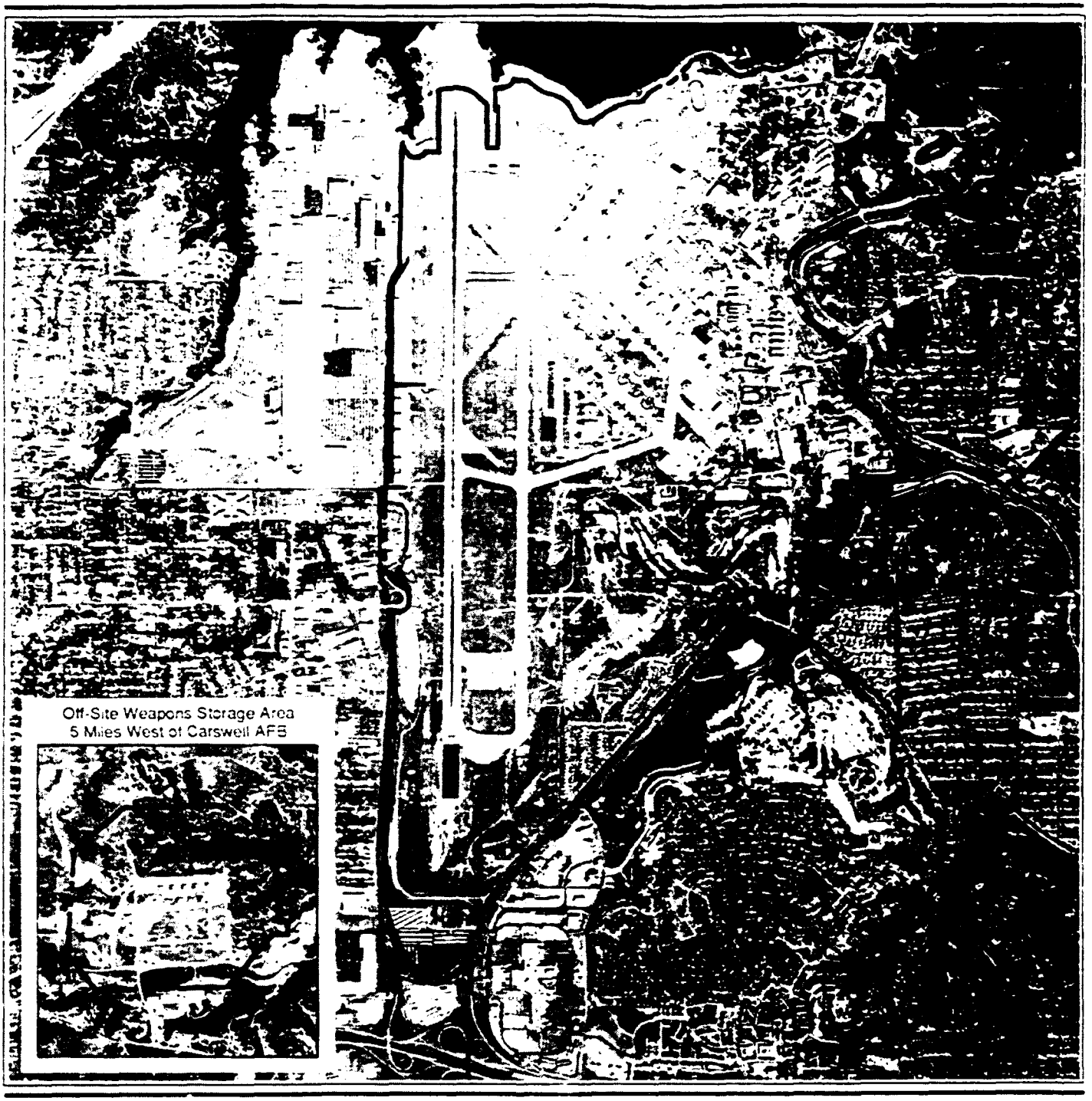
(Figure 3.2-2). The main base comprises 2,264 acres, the parcel located 5 miles west of the main base (referred to in this document as the Off-Site WSA) comprises 247 acres, and a residential parcel adjacent to the southeast base boundary (referred to as Kings Branch) comprises 44 acres. The majority of the base area (58 percent) falls within the jurisdiction of the city of Fort Worth. About 25 percent of the base area falls within the city of Westworth Village, 8 percent is located within the city of White Settlement, and the remaining 9 percent falls within an unincorporated portion of Tarrant County. The main base is bordered by Lake Worth to the north, the West Fork of the Trinity River and Westworth Village to the east, Fort Worth to the northeast and southeast, White Settlement to the west and southwest, and AF Plant #4 to the west.

Carswell AFB is located within the Grand Prairie section of the Central Lowlands Physiographic Province. The area is characterized by broad terrace surfaces gently sloping eastward, interrupted by westward-facing escarpments. The topography of the base is fairly flat, except for areas near Farmers Branch Creek and the Trinity River. Elevations average 650 feet mean sea level (MSL), and range from 550 feet MSL in the east to 690 feet MSL in the southwest.

The climate in the Fort Worth region is subhumid, with mild winters and hot, humid summers. The average annual precipitation is 31.5 inches with the majority falling between April and October. The average annual temperature is 66 degrees Fahrenheit (°F). July is the hottest month with an average monthly temperature of 86°F, while January is the coldest month with an average monthly temperature of 45°F. Temperature changes are rapid and often fluctuate 20 to 30 degrees in several hours. The average annual relative humidity is 63 percent.

Prevailing winds are primarily southerly from March through November and northerly from December through February; the average wind speed is 8 knots. Hail storms and severe thunderstorms with windspeeds of 65 knots are common. Climate conditions in summer make tornado formation possible, although there is more property damage each year due to hail than to tornadoes.

The main transportation network around Carswell AFB consists of Interstate 820, which circles around the base from the north, passes just west of the main base, and continues eastward south of the base towards Fort Worth (see Figure 3.2-1). Interstate 30 is the main thoroughfare leaving Fort Worth and passes just south of the base. SH 183 passes along the southeastern base boundary and continues north. The closest commercial airport with passenger service is Dallas/Fort Worth International Airport (DFW), located 21 miles northeast of Carswell AFB. No major railroad service is available to the base. However, a spur services AF Plant #4 and connects to a Union Pacific main line 4 miles south of the base.



EXPLANATION

Base Boundary

Carswell AFB and Vicinity

0 650 1300 2600 Feet

Figure 3.2-2

Installation Background

The area known as Carswell AFB was originally a modest dirt runway built to service an aircraft manufacturing plant located where AF Plant #4 is situated. When it was established in 1942, the installation was referred to as the Tarrant Field Airdrome and was originally under the jurisdiction of the Gulf Coast Army Air Field Training Command. Its mission was to provide transition training for the B-24 bomber pilots; it has served as a heavy bomber base ever since. The Strategic Air Command (SAC) assumed control of the installation in 1946 and the base served as headquarters for the Eighth Air Force. The base was renamed Carswell AFB in 1948 in honor of Fort Worth native, Major Horace S. Carswell. At that time, the 7th Bomb Wing became the base host unit. In 1951, Headquarters 19th Air Division was located at Carswell AFB where it remained until September 1988, the longest tenure of any air division in SAC. Carswell AFB became home base for its first B-52s and KC-135s in 1956. The Air Combat Command (ACC) assumed control of the base in 1992 with the disestablishment of SAC.

3.2.1 Community Setting

Most of the area surrounding Carswell AFB is suburban, including the residential areas of the cities of Fort Worth, Westworth Village, and White Settlement. A three-county area (Johnson, Parker, and Tarrant counties) is considered the ROI for purposes of describing and analyzing employment and population effects. The broader three-county ROI is meant to fully capture the region's economic interdependence, while at the same time attempting to measure the widest area possible for reuse effects. However, this should not be misinterpreted as meaning that reuse effects are expected to proportionally occur among all three counties. Rather, the substantial number of population and employment effects from disposal and reuse of the base are projected to occur in Tarrant County, primarily in the communities of Fort Worth, White Settlement, and Westworth Village. These adjacent communities are, therefore, highlighted in the analysis as appropriate.

The total employment in the three-county ROI was 662,744 in 1989, and was estimated to reach 730,956 by 1993, the year of base closure. Employment growth in the ROI was 3.6 percent over the period 1970-1989, compared to the state of Texas and the nation, 3.0 and 2.2 percent, respectively. The sectors showing the most growth during the last decade were services and retail, while the manufacturing and government sectors decreased during the same period.

The base-related employment in 1991 consisted of 7,166 direct and 4,274 secondary jobs. In September 1993, the direct employment associated with the base decreased to 674 military and civilian jobs. Approximately 50 of these jobs were associated with the caretaker activities of the OL. The remaining direct jobs were associated with the retained operations of the

301st FW (594 jobs), and the WHCA (30 jobs). A total of 823 secondary jobs were associated with Carswell AFB, including 765 secondary jobs related to the retained military activities and 58 secondary jobs related to the caretaker activities.

The total site-related ROI population (direct and indirect workers and their dependents) associated with Carswell AFB decreased from 27,420 persons in 1991, to an estimated 2,845 persons at the time of base closure in 1993. The site-related ROI population at closure represents those persons associated with the retained military activities and the OL. Approximately 15,640 persons were expected to leave (out-migrate) the ROI due to the base closure.

Population in the ROI increased from 974,095 in 1980 to 1,332,053 in 1990, an average annual rate of 3.2 percent. The ROI population for 1993 was projected to be 1,436,347 (adjusted for closure). The population of Tarrant County at base closure was expected to be 1,253,125 with 442,499 residing in Fort Worth, 14,419 residing in White Settlement, and 582 residing in Westworth Village.

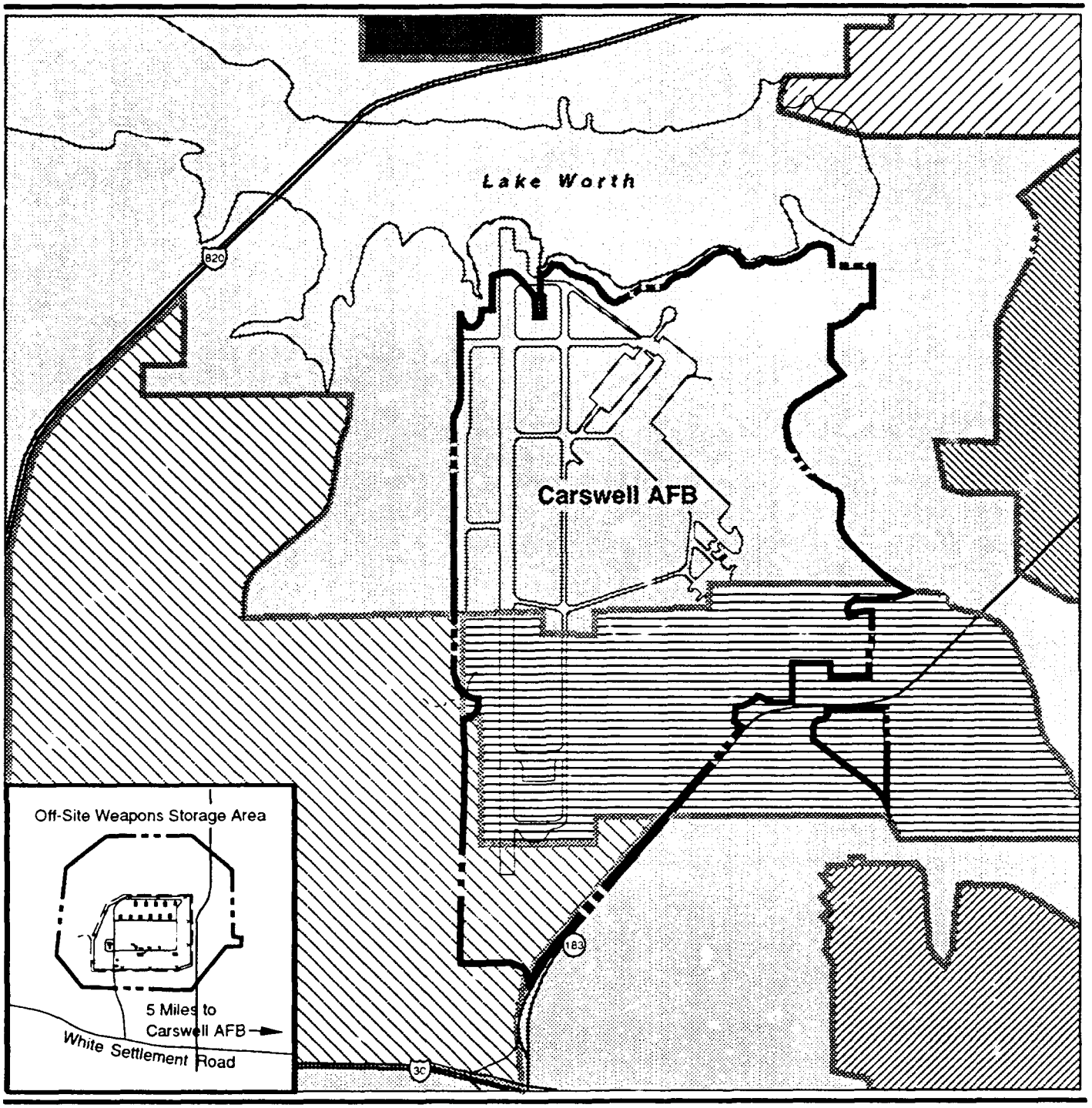
3.2.2 Land Use and Aesthetics

This section describes the land uses and aesthetics for the base property and the surrounding areas of Carswell AFB. Off-base land uses at closure were assumed to be similar to 1992 conditions unless specific development plans indicated a change. The ROI includes the base property and potentially affected adjacent properties that are within the jurisdiction of the cities of Fort Worth, Lake Worth, Westover Hills, Westworth Village, and White Settlement, and an unincorporated area of Tarrant County (Figure 3.2-3).

Carswell AFB is located in the west Fort Worth area on the southern shore of Lake Worth. The northern one-half of the base is under the jurisdiction of the city of Fort Worth. The central one-third of the base, including the noncontiguous Kings Branch housing tract, falls within the city of Westworth Village. The remaining southern portion of the base is under the jurisdiction of White Settlement. The Off-Site WSA falls within an unincorporated area of Tarrant County.

3.2.2.1 Land Use

Land Use Plans and Regulations. The general plan for a jurisdiction represents the official position on long-range development and resource management. The position is expressed in goals, policies, plans, and actions regarding the physical, social, and economic environments, both current and long term.



EXPLANATION

- White Settlement
- Westover Hills
- Fort Worth
- Westworth Village
- Lake Worth
- Sansom Park Village
- River Oaks
- Unincorporated Tarrant County
- Carswell AFB Boundary

City Boundaries

0 800 1600 3200 Feet

Figure 3.2-3

At the municipal level, land use policies in the vicinity of Carswell AFB are defined only by the Comprehensive Plans of the cities of Fort Worth and White Settlement. The city of Fort Worth's Unified Summary of the Comprehensive Plan (1989-1991 Update) generally indicates neighborhood development that includes housing, schools, open space, and neighborhood commercial centers to the east and south of Carswell AFB. Both residential and park/open space uses are indicated to the north of the base. A greenway project and nature preserve are planned for the West Fork Trinity River floodplain bordering the eastern edge of the base. The White Settlement Comprehensive Plan (1968) and Land Use Review (1985) primarily depict residential development to the west of the base with commercial development along major streets, such as White Settlement Road and Cherry Lane, and small industrial development adjacent to the base.

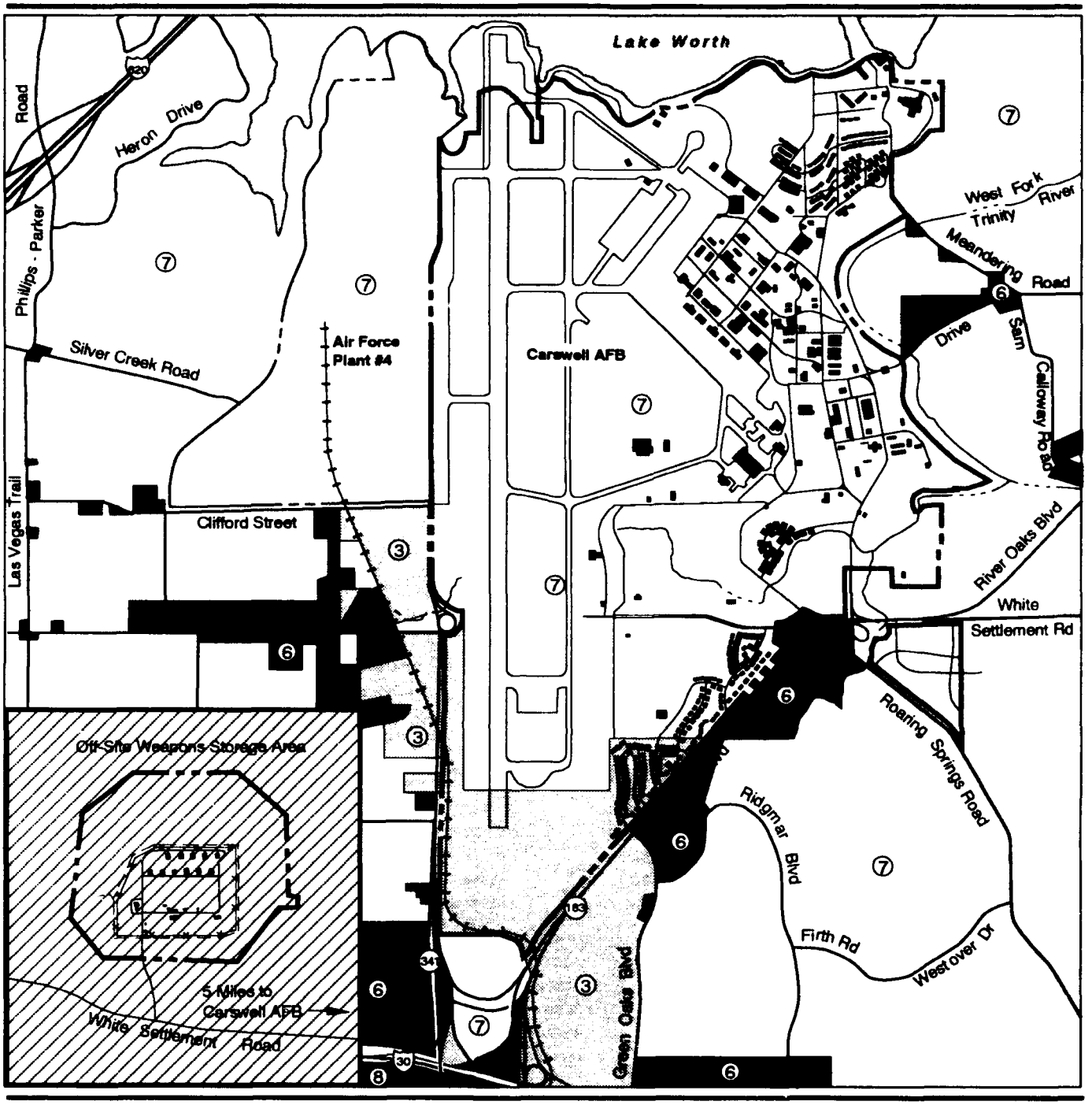
Zoning. Basically, zoning provides for the division of the jurisdiction, in conformity with the general plan, into districts within which the height, open space, building coverage, density, and type of future land uses are set forth. Zoning is a means of insuring that the land uses of a community are properly situated in relation to one another as it acts as the legal device to implement community plans.

The base property is under federal ownership and responsibility and, therefore, is exempt from local zoning ordinances. However, the property has been zoned by local jurisdictions and is presented in Figure 3.2-4. The southern portion of the base, which falls under the zoning jurisdiction of White Settlement, is zoned for light industrial uses (City of White Settlement, 1982). The central portion of the base, which falls under the zoning jurisdiction of Westworth Village, is zoned for residential uses (City of Westworth Village, 1989). The remaining portion of the base falls under the zoning jurisdiction of Forth Worth and is zoned for single- and multi-family residential use (City of Fort Worth, 1992b).

The area in White Settlement, west of the base, is zoned for residential and industrial uses, with commercial zoning along the major streets, such as White Settlement Road and Cherry Lane. The property in Westover Hills, southeast of the base, is zoned for residential use. Westworth Village is generally zoned for residential use with an area for commercial use south of the intersection of River Oaks Boulevard and Roaring Springs Road.

Fort Worth zoned the property adjacent to the base and south of SH 183 for commercial and industrial uses. The property east of the base within Fort Worth is zoned for residential use, with the exception of commercial use on Jennings Drive and Meandering Road to the northeast of the base.

Air Force Policies Affecting Land Uses. In accordance with DOD instructions, the Air Force developed the Air Installation Compatible Use Zone (AICUZ) program to minimize development that is incompatible with



EXPLANATION

- ① Airfield *
- ② Aviation Support *
- ③ Industrial
- ④ Institutional (Medical) *
- ⑤ Institutional (Educational) *
- ⑥ Commercial
- ⑦ Residential
- ⑧ Public/Recreation
- ⑨ Agriculture *
- ⑩ Vacant Land *
- No Formal Zoning Code
- Base Boundary

0 650 1300 2600 Feet

* Standard land use designation not applicable to this figure

Local Zoning

Figure 3.2-4

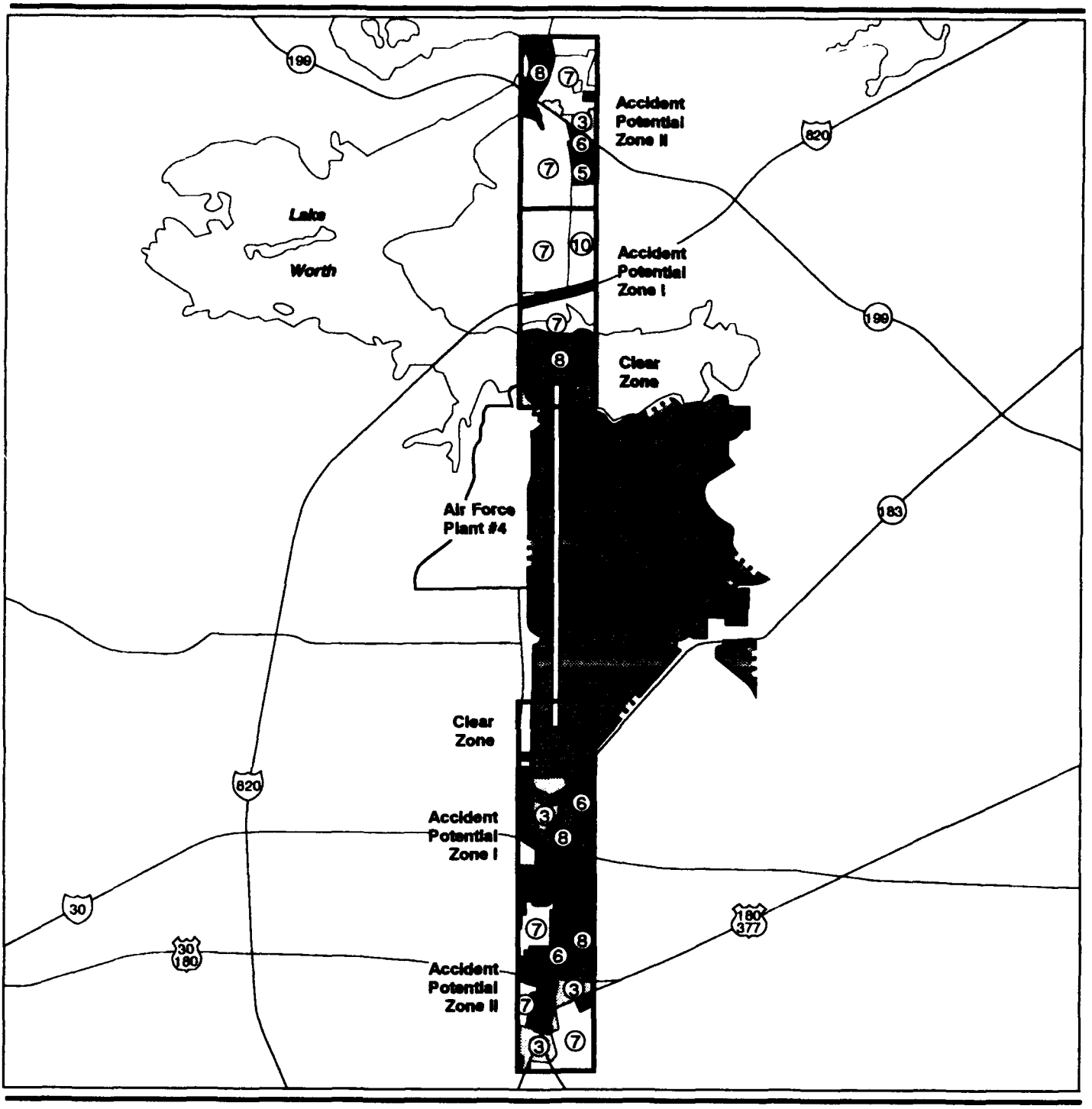
aviation operations in areas on and adjacent to military airfields. The AICUZ land use recommendations are based on (1) land uses compatible with exposure to aircraft noise, and (2) safety considerations. Recommended compatible land use districts are derived from the AICUZ noise contours and safety zones (Accident Potential Zones [APZs]). An AICUZ report for Carswell AFB was issued in 1978 and revised in 1981 and 1986 (U.S. Air Force, 1986a).

Under the Air Force AICUZ guidelines, industrial land uses, such as manufacturing and transportation, are compatible with all noise levels. Institutional uses, such as hospitals and schools, are compatible with noise levels up to 65 decibels (dB). Commercial land uses are generally compatible up to noise levels of 70 dB. Residential land uses are compatible up to 65 dB. The Air Force discourages new residential development within areas with noise levels higher than 65 dB, unless a need for housing in these areas is demonstrated by the community. Recreation land uses, such as golf courses and parks, traditionally have been thought of as being compatible with all noise levels, as long as the noise level does not interfere with the activity, such as nature walks or outdoor concerts. These land uses are compatible in areas with higher noise levels, as long as noise attenuation measures are implemented to reduce indoor sound levels.

AICUZ noise contours are based on standard noise ratings that are calculated from types of aircraft, number of aircraft daily operations, time of day flown, aircraft flight patterns, power, settings, air speeds, altitudes, and climatic conditions (U.S. Air Force, 1986). A day-night weighted average sound level (DNL) is used to describe the noise environment. Noise contours for preclosure and closure conditions at Carswell AFB are presented and discussed in Section 3.4.4. A total of 12,968 acres of land were exposed to a noise level of DNL 65 or above under preclosure conditions. By base closure, the level of aircraft activity was reduced to only those operations associated with the AFRES and AF Plant #4. Accordingly, the noise levels were reduced, exposing an area of 8,436 acres to noise levels of DNL 65 dB and above.

With respect to safety, the AICUZ delineates areas at both ends of the runway where the probability of aircraft accidents is highest, based on the locations of past aircraft accidents. The risk of accidents is so high in the area at the immediate end of the runway (known as the Clear Zone [CZ]) that the Air Force has a program to purchase property or acquire easements to preclude most land uses and structures. At Carswell AFB, the Air Force purchased most of the property located in the CZ at the southern end of the airfield; the CZ at the north end extends over Lake Worth.

Certain land use restrictions are recommended in lower risk zones, identified as APZ I and APZ II (Figure 3.2-5). Industrial, agricultural, recreation, and vacant land uses are compatible with APZ I, but residential and high



EXPLANATION

- ① Airfield *
- ② Aviation Support *
- ③ Industrial
- ④ Institutional (Medical) *
- ⑤ Institutional (Educational)
- ⑥ Commercial
- ⑦ Residential
- ⑧ Public Facilities/ Recreation
- ⑨ Agriculture *
- ⑩ Vacant Land
- Base Property
- Carswell AFB Boundary

0 1500 3000 6000 Feet

* Standard land use designation not applicable to this figure.

Carswell AFB Accident Potential Zones

Figure 3.2-5

population density land uses are discouraged. Low density residential (less than one residence per acre) and low-density commercial uses (maximum of 20 percent building coverage per acre) are compatible with APZ II, in addition to those uses listed for APZ I.

Municipalities with jurisdiction over adjacent lands may zone this land in accordance with AICUZ recommendations, but they are not required to follow these recommendations. The local communities within the Carswell AFB CZs and APZs include Forth Worth, White Settlement, and Lake Worth. These communities have not implemented the AICUZ and only utilized the Air Force AICUZ as guidelines for future development in the area around Carswell AFB.

The APZs and CZs established under preclosure conditions continued to be in effect under closure conditions due to continued aircraft activity. The CZ at the north end of the runway extended off base over Lake Worth. There are no existing land use conflicts within this CZ. About 85 percent of the CZ at the south end of the runway is on base. The remaining 15 percent of the CZ extends off base into White Settlement. The off-base industrial, commercial, and residential uses within the southern CZ are incompatible with Air Force AICUZ guidelines.

The APZ I at the north end of the runway extends into the cities of Lake Worth and Fort Worth. Portions of the northern APZ I include incompatible residential land uses. The southern APZ I covers land areas in Fort Worth and White Settlement. This APZ I contains incompatible commercial land uses.

The northern APZ II is primarily contained in the city of Lake Worth. This APZ II is compatible with most land uses; however, portions of the northern APZ II includes incompatible educational and high-density residential uses. The southern APZ II is located in Fort Worth and contains incompatible land uses of both high-density commercial and residential uses.

On-Base Land Use. Land use for an area is defined by the actual utilization of facilities and grounds. Each existing land use is identified by various general categories. Preclosure land uses on the base property and land uses remaining at base closure are described in this section.

Preclosure Reference. The base property includes the following preclosure land uses and acreages:

Land Use	Acreage
Base Property	
Airfield	856
Aviation support	525
Industrial	355
Institutional	33
Commercial	90
Residential	230
Public facilities/recreation	466
Existing Lease (Lake Worth Shoreline)	64
Total	2,619

These preclosure land uses for Carswell AFB are shown in Figure 3.2-6 and described below.

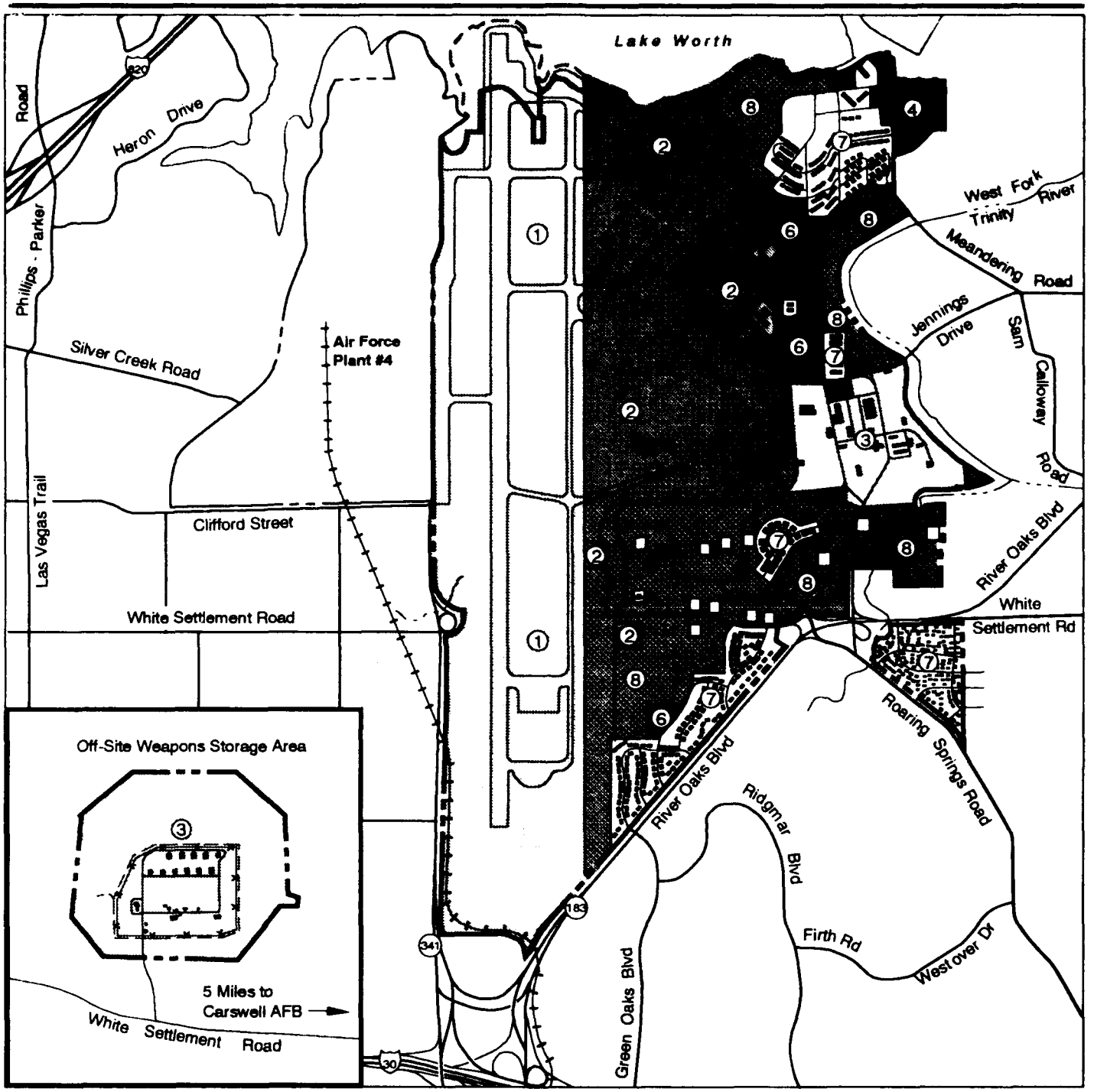
The **airfield** land use at Carswell AFB contains facilities that supported an active military flying installation with an operational airfield. The airfield consists of one runway (Runway 17/35) that is 12,000 feet long and 300 feet wide. Navigational aids on Runway 17/35 include tactical air navigation (TACAN), Precision Radar Approach, and visual approach lights. Although the airfield equipment is generally well maintained and in good condition, most of the equipment does not meet Federal Aviation Administration (FAA) standards. A parcel located adjacent to the west side of the airfield includes the engine run-up stations used by AF Plant #4 for engine testing.

The **aviation support** land use, adjacent to the east side of the airfield, incorporates the support facilities used for the flying mission, including aircraft parking ramps, taxiways, alert apron, and hangars. The ATCT and ARFF are also located adjacent to the flightline. This land use also includes WSAs and squadron operation facilities associated with the 7th Bomb Wing and 301st FW.

Industrial land uses are primarily located in the center of the base, east of the flightline and aviation support area. Industrial land use areas include the WHCA facilities, as well as warehousing and supply storage, the fuel storage facility in the center of the base, and the Off-Site WSA.

The Off-Site WSA property is surrounded by a 264-acre restrictive-use easement required for the explosive safety QDs. These safety QDs were based on 140,000 pounds of class 1.1 explosives within each of the 11 weapon storage igloos.

The **institutional** land uses are located in the northeast quadrant of the base and consist of both medical and educational facilities. This area includes the hospital and medical complex, the flight simulation facilities, and ancillary buildings needed to support these functions. Also included are the Reserve Officer Training Corps (ROTC) facilities and college classrooms.



EXPLANATION

- ① Airfield
- ② Aviation Support
- ③ Industrial
- ④ Institutional (Medical)
- ⑤ Institutional (Educational)
- ⑥ Commercial
- ⑦ Residential
- ⑧ Public/Recreation
- ⑨ Agriculture *
- ⑩ Vacant Land *
- Base Boundary
- Leased Property

0 650 1300 2600 Feet

* Standard land use designation not applicable to this figure

Preclosure On-Base Land Use

Figure 3.2-6

Commercial land uses are primarily located in the "community" section of the base in the northeast quadrant, and include the Commissary, dining halls, and Base Exchange. Miscellaneous buildings, such as the child care center and hobby shops, were located in the southern half of the base adjacent to the golf course.

The **residential** land uses on base are located in a number of different areas, and include approximately 800 accompanied housing units. The Kings Branch housing tract southeast of the base includes 174 residences, some divided into duplex and triplex units, for a total of 286 units. These residences have been vacant since approximately 1990 and are in various stages of disrepair.

Contained in the southern half of the base are 301 Wherry-style, single-family houses that are in good condition. In the vicinity of and adjacent to the golf course are 13 other single-family houses, built prior to development of Carswell AFB, that were used as family housing and Officers' Quarters. In addition, there are three more single-family houses that were used for other purposes. These homes are in good condition.

Four additional single-family residences are located in the northeast quadrant of the base adjacent to the 301st FW operations and on-base commercial areas. There are also 17 multi-family units in this quadrant and 45 duplexes that were in various stages of renovation for conversion to single-family units.

Other residential facilities on base include eight dormitories, Visiting Officers' Quarters (VOQ), Visiting Airmen's Quarters (VAQ), and temporary lodging facility (TLF), capable of housing approximately 1,500 people. Two dormitories are located near the WHCA facilities; the others are located in the built-up area of the base adjacent to education and public facilities/ recreation land uses. The VOQ, VAQ, and TLF are located in the northeast quadrant of the base.

Public facilities/recreation land uses are located throughout the base. The largest parcel is the golf course in the southern half of the base. In the northeast quadrant of the base, public facilities/recreation land use includes open space located along the floodplain of the West Fork Trinity River and the south shore of Lake Worth, and ball fields just south of the lake.

Closure Baseline. In September 1993, the installation was closed and all military activities on base were terminated, except those associated with the retained military and the OL.

At closure, airfield usage was reduced to continuing activities associated with the 301st FW, AF Plant #4, and other military transient operations. The retained military activities included reuse of approximately 1,198 acres, including the existing 301st FW facilities, as well as the existing firing

ranges, WHCA facilities, noise suppression facility (Hush House), noncommissioned officers club, various supply/warehouse and fuel storage facilities, and engine run-up stations (Figure 3.2-7). The remaining base property was vacated and maintained in caretaker status. The land leases on the north side of the base were retained as ingrants for aviation safety and mission activities. The restrictive easement associated with the Off-Site WSA was also retained for potential reuse. In addition, the Air Force held ingrants to use property outside the base boundaries for purposes other than avigation and safety easements. These included primarily lease of property adjacent to Lake Worth and right-of-way easements for utilities. Ingrants in effect at closure are presented in Table 3.2-1.

Table 3.2-1. Ingrants in Effect at Base Closure

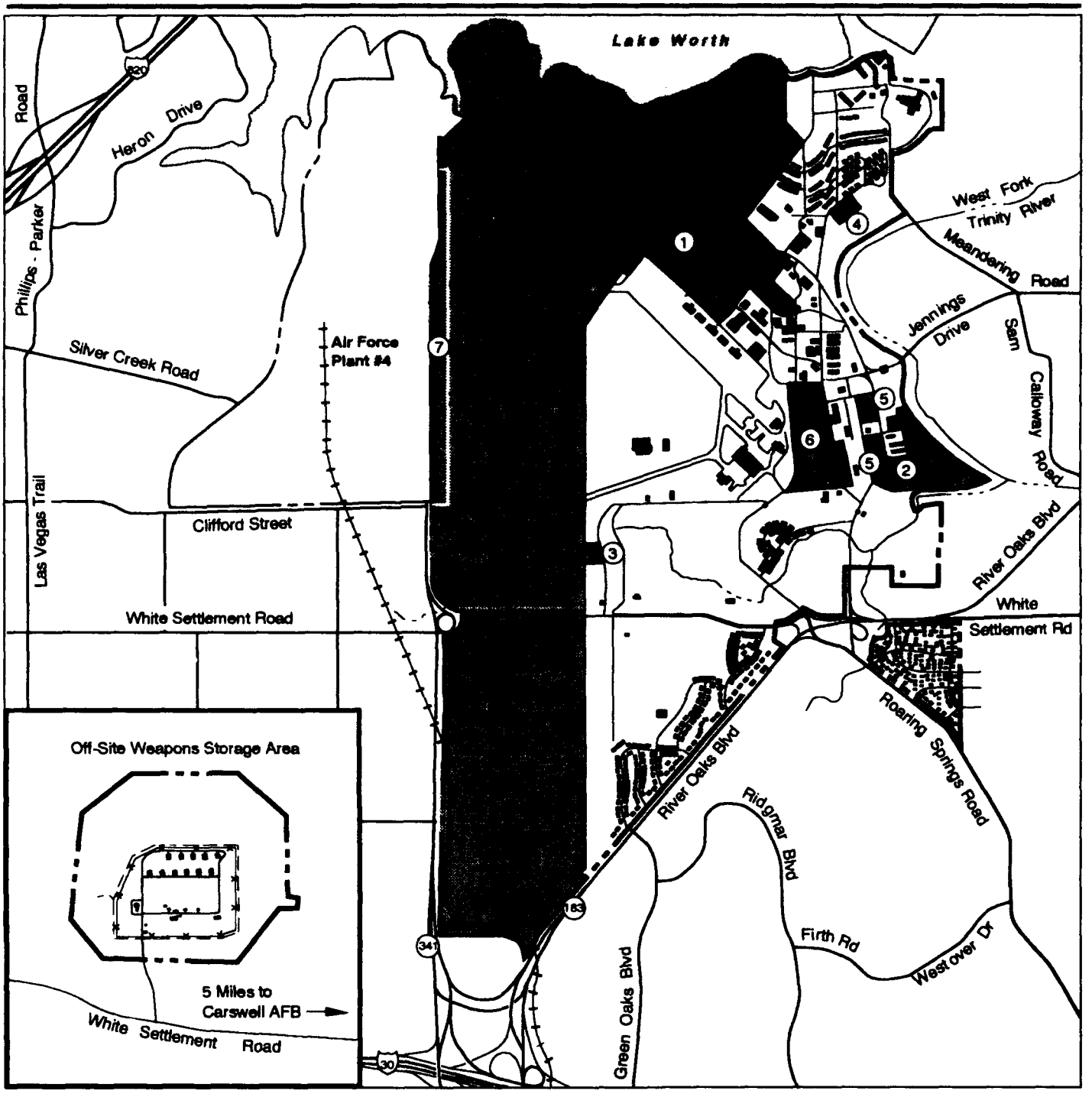
Document Number	Expiration Date	Description/Location	Responsible Party
DACA 1443ENG7287	02/11/2013	Submerged Cable	City of Fort Worth
DACA 635730020	06/30/1996	Use of Land and Facs in Case of War	Midwest Oklahoma Dev't Authority
DACA 635880313	60/30/2012	Control of Lake Front	City of Fort Worth
DACA 636830061	03/17/2083	Club	Private Individual
DACA 63969218	02/16/1994	Obstruction & Warning Lights	City of Fort Worth
DACA 639700147	04/05/2020	Safety Zone	City of Fort Worth
DACA 639740077	09/12/2073	Electrical Power Line	City of Westworth Village
DACA 639820045	01/14/2082	UG Cable	Texas State Highway Dept.
F41613/8C0050	02/11/2013	Road	City of Fort Worth
RE 63C339	02/01/2013	Ceilometer Fac & Row	City of Fort Worth
N/A	12/20/2005	Approach Lights	City of Fort Worth
N/A	Perpetual	Avigation Easement	City of Fort Worth and various property owners
N/A	04/06/2000	On-Base WSA Safety Easement	City of Fort Worth
N/A	Perpetual	Off-Site WSA Safety Easement	Various Property Owners

N/A = Not available.
WSA = Weapons Storage Area.

Source: U.S. Air Force, 1992.

The Air Force typically outgrants base real estate and facilities to other agencies and organizations for use of the base property. At closure, the majority of these outgrants were for utilities (Table 3.2-2).

Adjacent Land Uses. At the time of base closure, the suburban land uses surrounding Carswell AFB were generally consistent with their zoning designations. The land uses under closure conditions in the immediate vicinity of the base are illustrated in Figure 3.2-8.



EXPLANATION

- Military Retention
- Caretaker Status
- Carswell AFB Boundary
- Air Force Plant #4 Boundary
- Leased Property

1. 301st FW, Airfield
2. WHCA and Firing Range
3. Hush House
4. Noncommissioned Officer's Club
5. Warehouse/Supply, BCE Complex
6. Jet Fuel Tank Complex
7. AF Plant #4 Engine Run Up Stations

0 650 1300 2600 Feet

Closure On-Base Land Use

Figure 3.2-7

Table 3.2-2. Outgrants in Effect at Base Closure

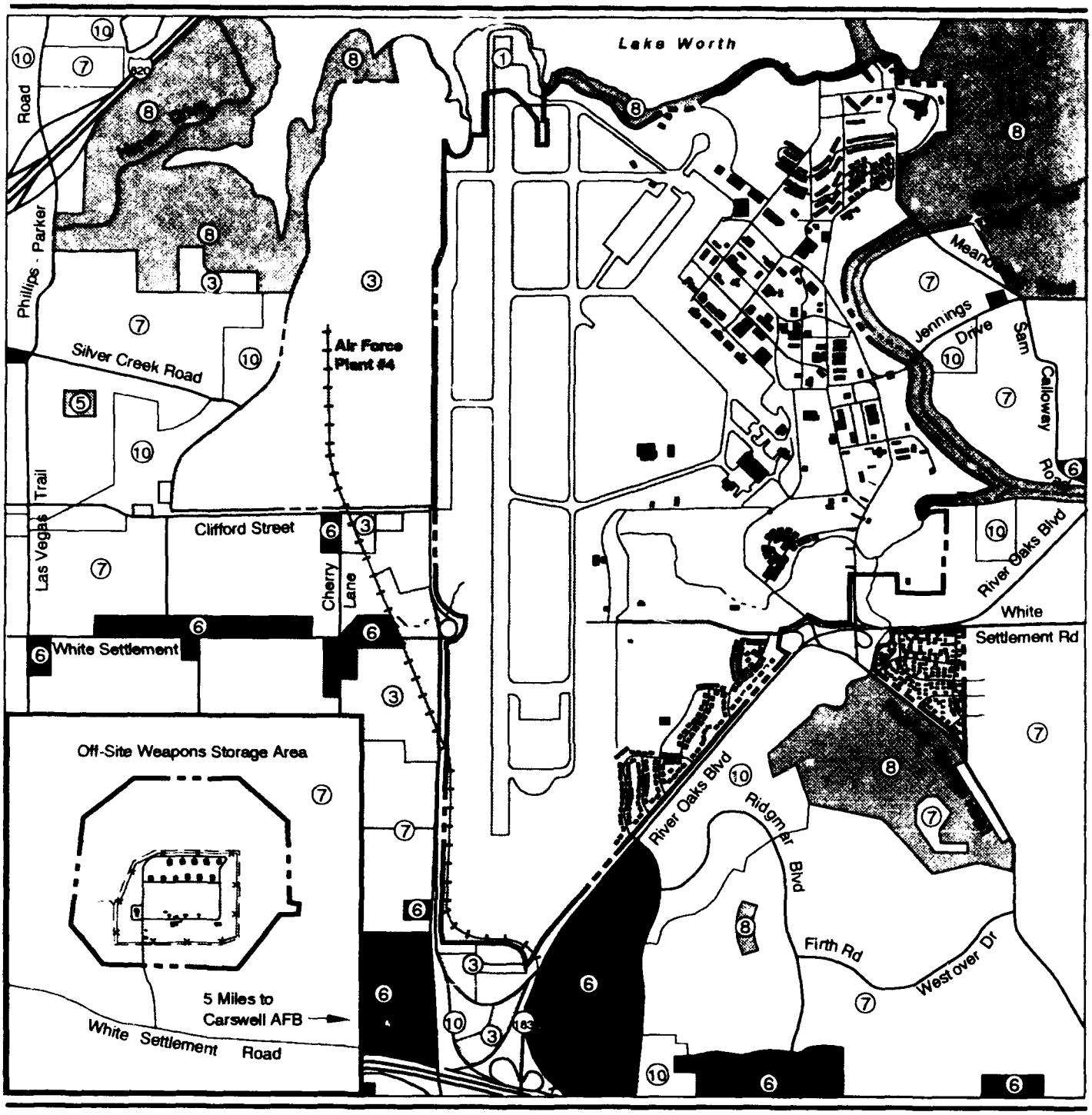
Document Number	Expiration Date	Description/Location	Responsible Party
DA41191259	01/23/2026	Gas Line	Lone Star Gas Co
DA41443ENG5132	10/24/2055	Telephone Lines	Southwestern Bell
DA41443ENG5135	06/18/2056	Transmission Lines	Texas Electric Co.
DA41443ENG5134	07/05/2055	Transmission Lines	Texas Electric Co.
DA41443ENG5147	11/10/2055	Water Line	City of Fort Worth
DA41443ENG5494	02/17/2059	Telephone Line	Southwestern Bell
DA41443ENG5707	01/20/2060	Gas Line	Lone Star Gas Co.
DA41443ENG5849	03/23/2060	Utility Row	Texas Electric Co.
DA41443ENG6039	02/16/2011	Sewer Line	City of Lake Worth
DA41443ENG6076	03/12/2060	Road	City of Fort Worth
DA41443ENG6153	11/20/2011	Electric Lines	Texas Electric Co.
DA41ENG5146	01/24/2068	Water Pipeline	City of Fort Worth
DACA 631750192	01/31/1995	Telephone Poles	Southwestern Bell
DACA 631890517	05/27/1994	Banking Services	Texas American Bank
DACA 632680227	11/23/2067	Sewer Line	City of White Settlement
DACA 632690217	12/22/2068	Fence	TC Water Contracting
DACA 632720440	04/18/2072	Water Main	City of Fort Worth
DACA 632740034	07/27/2023	Pipeline	City of Fort Worth
DACA 632840551	03/04/2009	Jet Fuel Pipe	Carswell Pipeline Co.
DACA 632850661	06/11/2015	UG Petrol	Carswell Pipeline Co.
DACA 633810513	10/31/1995	Cattleguards	Private Individual
DACA 639890504	11/29/2088	Electrical Line	City of Fort Worth
USAF CRS391001	01/01/2042	Electric Service	Texas Electric Co.

Source: U.S. Air Force, 1992.

The land uses west of the base are predominantly residential, commercial, and industrial. These include single-family residences, commercial development, AF Plant #4, and an industrial complex in White Settlement.

The predominant development south of the base is the commercial area located at the Interstate 30 and SH 183 interchange. This area includes a discount-oriented retail center, a regional shopping mall, and a convenience center.

Southeast of the base, various types of residential development occur between the base and Interstate 30. South of River Oaks Boulevard and Roaring Springs Road are residential estates and townhouses. Further south are single-family housing and multi-family units mixed with commercial office development. Single-family housing is also found on the east side of the base, from the Kings Branch housing tract north to Meandering Road.



EXPLANATION

① Airfield		⑤ Institutional (Educational)		⑨ Agriculture *	
② Aviation Support *		⑥ Commercial		⑩ Vacant Land	
③ Industrial		⑦ Residential		Base Property	
④ Institutional *		⑧ Public/Recreation		Base Boundary	

0 650 1300 2600 Feet

* Standard land use designation not applicable to this figure

Existing Off-Base Land Use

Figure 3.2-8

Public facilities/recreation land uses occur north of the base, at Lake Worth. A fish hatchery, YMCA camp, and private recreation lands are located along the West Fork of the Trinity River northeast of the base.

The Off-Site WSA is located in a rural, low-density residential area and is buffered by a 264-acre restrictive-use easement.

3.2.2.2 Aesthetics. Visual resources include natural and man-made features that give a particular environment its aesthetic qualities. Criteria used in the analysis of these resources include visual sensitivity, which is the degree of public interest in a visual resource and concern over adverse changes in its quality.

High visual sensitivity exists in areas where views are rare, unique, or in other ways special, such as in remote or pristine environments. High-sensitivity views would include landscapes that have landforms, vegetative patterns, water bodies, or rock formations of unusual or outstanding quality.

The view of Lake Worth, with tree-covered rolling hills in the background, creates an area of high visual sensitivity from the north side of the base. Trees provide a canopy and pleasant setting for the multi-family units in the northeast quadrant (Texas Tech University, 1990) of the base, creating an on-base area of high visual sensitivity. Stands of mature trees exist southeast of the base, adjacent to SH 183 near the Rogner Drive base entrance, which also create an area of high visual sensitivity.

3.2.3 Transportation

Transportation addresses roadways, airspace and air transportation, and railroads. The ROI for the transportation analysis includes the existing principal road, air, and rail networks in the local communities of Fort Worth, Westworth Village, and White Settlement with emphasis on the immediate area surrounding Carswell AFB. Within this geographic area, the analysis focuses on the segments of the transportation networks that serve as key linkages to the base that were commonly used by Carswell AFB personnel under preclosure conditions.

3.2.3.1 Roadways. The evaluation of the existing roadway conditions focuses on capacity, which reflects the ability of the network to serve the traffic volume. The capacity of a roadway mainly depends on the width, number of lanes, intersection control, and other physical factors. Traffic volumes are typically reported, depending on the project and database available, as the daily number of vehicular movements in both directions on a segment of roadway averaged over a full calendar year (average annual daily traffic [AADT]), the number of vehicular movements in both directions on a segment of roadway averaged over a period of time less than a year (average daily traffic [ADT]), or the number of vehicular movements on a

road segment during the peak hour. The peak-hour volume on urban arterials is typically about 10 percent of the AADT and for rural highways may be as high as 25 percent (Transportation Research Board, 1985). These values are useful indicators in determining the extent to which the roadway segment is used and in assessing the potential for congestion and other problems.

The performance of a roadway segment is generally expressed in terms of LOS. The LOS scale ranges from A to F with each level defined by a range of volume-to-capacity ratios. LOS A, B, and C are considered good operating conditions where minor or tolerable delays are experienced by motorists. LOS D and E represent acceptable, but below average conditions. LOS F represents an unacceptable situation of unstable stop-and-go traffic. Table 3.2-3 presents the LOS designations and their representative volume/capacity ratios. These levels are described in the Highway Capacity Manual (Transportation Research Board, 1985).

Table 3.2-3. Road Transportation Levels of Service

		Criteria (Volume/Capacity)		
LOS	Description	Freeway[a]	4-Lane[b] Arterial	2-Lane[c] Highway
A	Free flow with users unaffected by presence of other users of roadway	0-0.35	0-0.28	0-0.10
B	Stable flow, but presence of the users in traffic stream becomes noticeable	0.36-0.54	0.29-0.45	0.11-0.23
C	Stable flow, but operation of single users becomes affected by interactions with others in traffic stream	0.55-0.77	0.46-0.60	0.24-0.39
D	High density, but stable flow; speed and freedom of movement are severely restricted; poor level of comfort and convenience	0.78-0.93	0.61-0.76	0.40-0.57
E	Unstable flow; operating conditions at capacity with reduced speeds, maneuvering difficulty, and extremely poor levels of comfort and convenience	0.94-1.00	0.77-1.00	0.58-0.94
F	Forced or breakdown flow with traffic demand exceeding capacity; unstable stop-and-go traffic	1.00	1.00	0.94-1.00

Notes:
(a) Table 3-1, Levels of Service for Basic Freeway Section, Highway Capacity Manual, Transportation Research Board, 1985.
(b) Table 7-1, Levels of Service Criteria for Multilane Highways 1 4-lane arterial, 50 miles per hour Design Speed, Highway Capacity Manual, Transportation Research Board, 1985.
(c) Table 8-1, Level of Service Criteria for General two lane Highway Segments, Rolling Terrain, 20 per car no passing zones, Highway Capacity Manual, Transportation Research Board, 1985.
LOS = Level of Service.

Existing roads and highways within the ROI are described at three levels: (1) regional, representing the major links within Tarrant County; (2) local, representing key community roads; and (3) on-base roads.

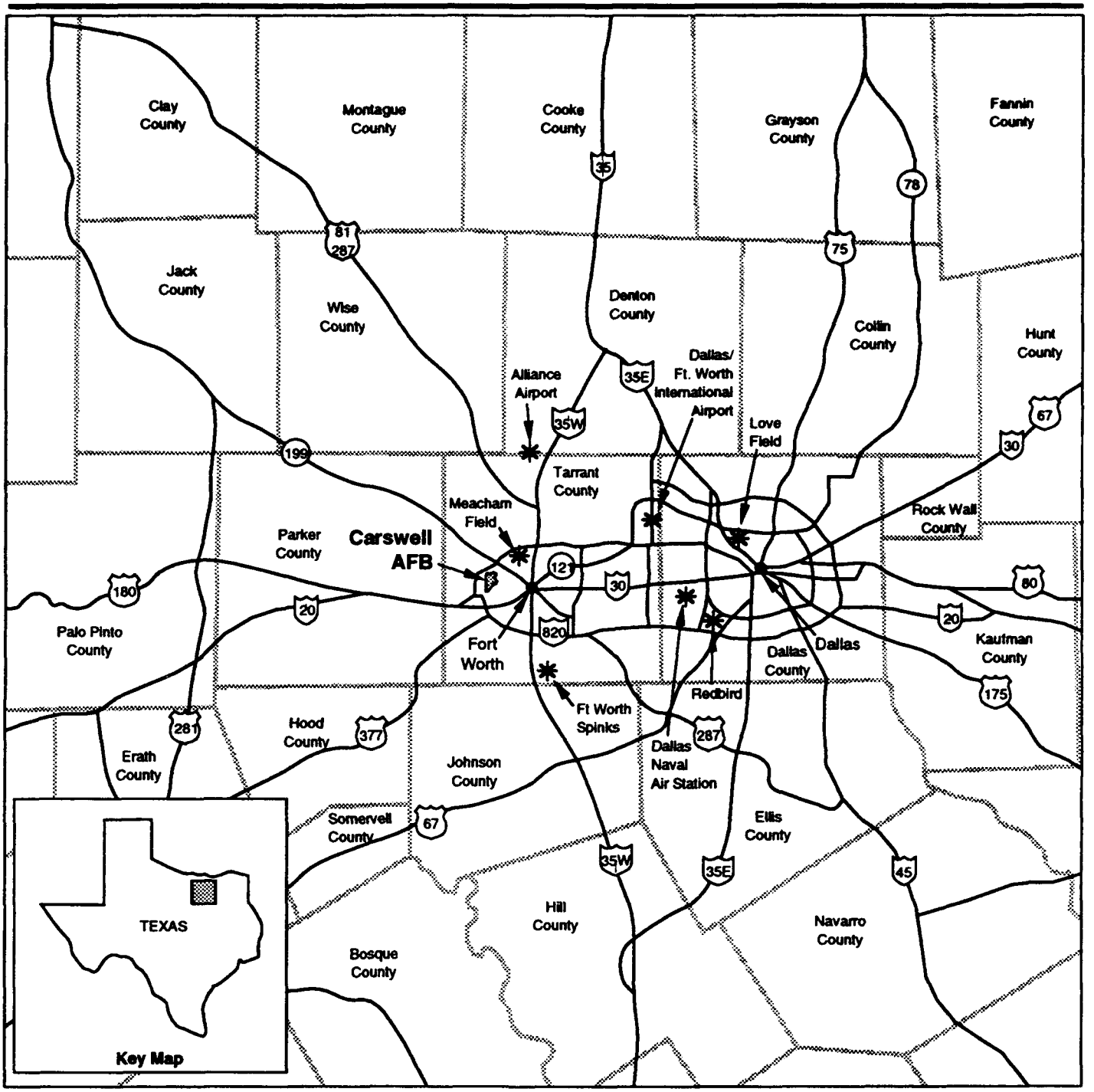
Regional. The Dallas/Fort Worth area is a major hub for several Interstate highways, and the area surrounding Carswell AFB is well served by this network of regional highways (Figure 3.2-9). Interstate 30 is located south of the base, runs in an east-west direction, and provides direct access to the Fort Worth and Dallas Central Business Districts, as well as to several smaller cities in between. East of Dallas, Interstate 30 connects the Dallas/ Fort Worth area with states in the Mid-South (Arkansas and Tennessee). Interstate 30 terminates west of the base where it joins Interstate 20, connecting the region to points in the southwestern United States (New Mexico and beyond) and the Deep South (Louisiana and southern Mississippi). To the north, Interstate 35W continues into Oklahoma and Kansas; to the south, it connects the region with Austin and San Antonio.

Fort Worth's beltway, Interstate 820, located just west and north of the base, connects all the Interstates in the region. Interchanges on Interstate 30 in the vicinity of the base are all well constructed and have high capacities, either through the use of an extensive frontage road system or fully directional ramps. According to the 1992 Transportation Improvement Program (TIP) for the Dallas/Fort Worth area, Interstate 30, between SH 183 and Interstate 820, is to be widened from four lanes to six lanes by 1997.

In addition to the Interstates, two major regional arterials also serve the Carswell AFB area: SH 183 and SH 199 (Figure 3.2-10). Both of these are four-lane, median-divided, non-access controlled facilities with signalized intersections at major cross streets. SH 183, also known by the local names of Alta Mere Drive, Westworth Boulevard, and River Oaks Boulevard, provides the primary access to Carswell AFB from the east and south. Between Interstate 30 and Roaring Springs Road, a distance of about 1.7 miles, there are four signalized intersections. Three of the intersections are associated with the Ridgmar Mall entrances. All four intersections have exclusive turn lanes and phasing to accommodate left turns. The three signals around Ridgmar Mall experience periods of delay during the afternoon peak hour, and also during times of seasonal demand, such as Christmas.

Mobility 2010, a long-range plan for the region designed to "red flag" arterials that will experience congestion/problems at some point in the future, anticipates that SH 183 will require an upgrade to the status of a "strategic regional arterial." Mobility 2010 upgrades to SH 183 are not included in regional capital improvement plans.

The second regional arterial, SH 199, or Jacksboro Highway, links SH 183 to Interstate 820 and provides access from the base to locations north of the area. SH 199, between SH 121 and Interstate 820, is to be upgraded to freeway standards in FY 1996 (access control and removal of signalized intersections). Further information, including operating characteristics of regional, local, and on-base roads, are summarized in Table 3.2-4.



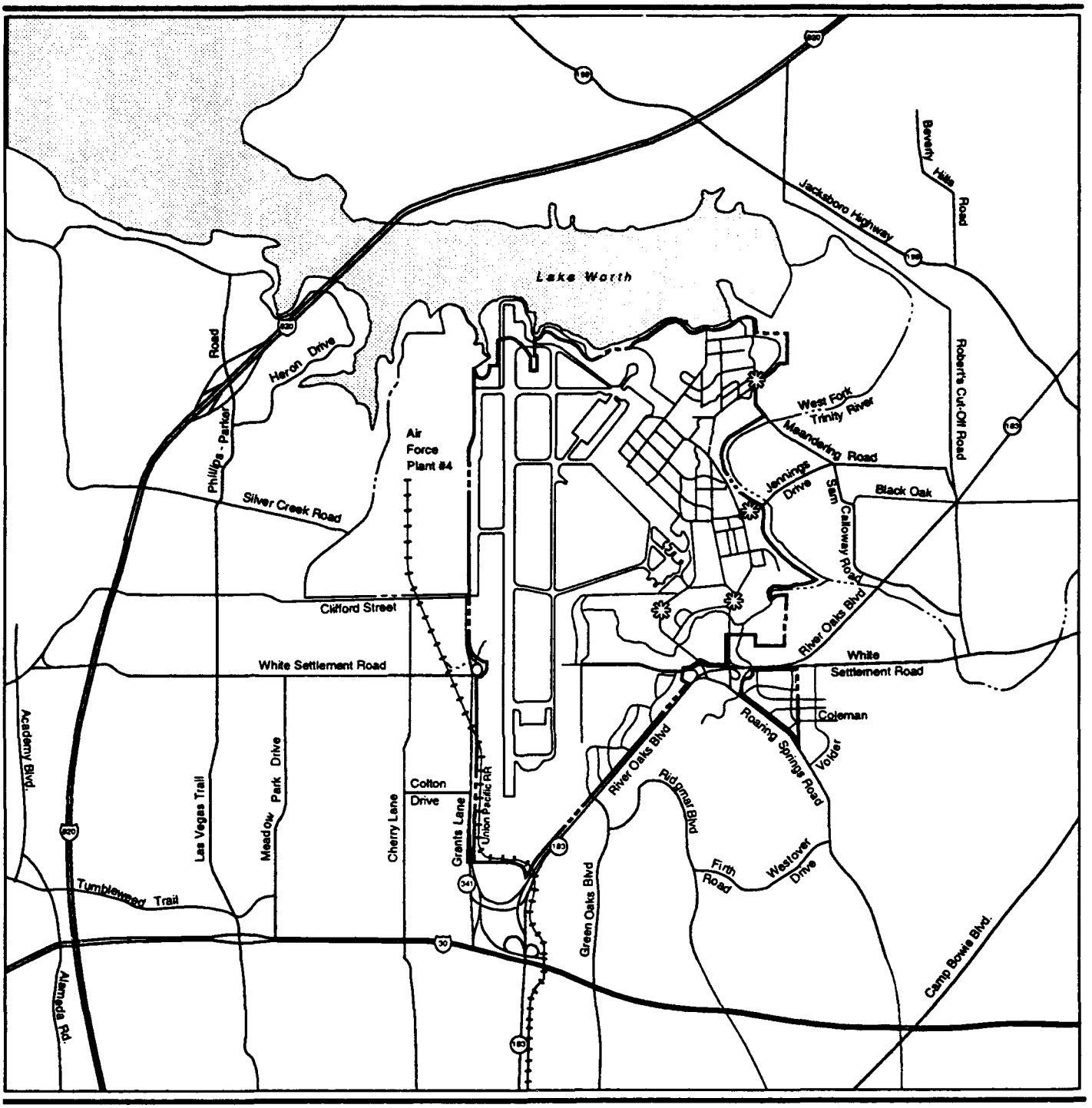
EXPLANATION

- Major Airports
- Interstate Highways
- U.S. Highways
- State Highways

0 5 10 20 Miles

Regional Transportation System

Figure 3.2-9



EXPLANATION

- State Highways
- Interstate Highways
- Carswell AFB Boundary
- Base Gate
- Air Force Plant #4 Boundary

0 1050 2100 4200 Feet

Local Transportation System

Figure 3.2-10

Table 3.2-4. Geometric and Operating Characteristics of Carswell AFB Area Roadways

Roadway	Segment	Roadway Type	ADT
I-30	Between SH 183 and I-820	Interstate	60,000[a]
I-30	Between Camp Bowie Boulevard and SH 183	Interstate	65,000[a]
I-820	Between I-30 and White Settlement Road	Interstate	50,000[a]
I-820	Between White Settlement Road and Lake Worth	Interstate	48,000[a]
SH 183	Between I-30 and Ridgmar Boulevard	Divided	29,000[a]
SH 183	Between Ridgmar Boulevard and SH 199	Divided	21,900[a]
SH 199	Between SH 183 and Beverly Hills Road	Divided	26,100[a]
Spur 341	Between I-30 and White Settlement Road	Divided	39,000[a]
White Settlement Road	Between I-820 and Spur 341	Undivided	16,200[b]
White Settlement Road	Between Clifford Street and Academy Boulevard	Divided	11,800[c]
Clifford Street	Between I-820 and White Settlement Road	Undivided	8,600[c]
Roaring Springs	Between SH 183 and I-30	Undivided	10,000[a]
Rogner Drive	At Main Gate	Undivided	17,000[d]
Jennings Drive	At East Gate	Undivided	3,400[d]
Meandering Road	At Hospital Gate	Undivided	4,200[d]

Notes: (a) 1990 Traffic Count.
(b) 1987 Traffic Count
(c) 1989 Traffic Count.
(d) From "Traffic Engineering Study: Carswell Air Force Base", MTMC Report TE 77-6, October 1977. Counts from this study are believed to be still relevant as base activity has changed little.
ADT = average daily traffic.
I = Interstate.
SH = State Highway.

Local. Figure 3.2-10 also identifies the general road network in the immediate vicinity of Carswell AFB. Access to Carswell AFB can be obtained through the Main Gate or through three other gates. The Main Gate is located on Rogner Drive, which intersects with SH 183. The three other gates are located on extensions of local roadways (Roaring Springs Road, Meandering Road, and Jennings Drive) providing access to the neighboring communities of River Oaks and Westworth Village. The local roads of concern around Carswell AFB include the following:

- Roaring Springs Road connects with SH 183 and Pumphrey Drive (which turns into Rogner Drive at the base's Main Gate) on the north and into Interstate 30's frontage road system on the south. The two-lane, undivided road passes through the residential areas of Westworth Village and Westover Hills.

- Meandering Road connects SH 183 and the East and Hospital Gates and passes through the residential area of River Oaks. It is a four-lane facility between SH 183 and Jennings Drive (Carswell Access Road). It becomes two lanes between Jennings Drive and the Hospital Gate.

- Jennings Drive (Carswell Access Road) provides access to the base via the East Gate. The two-lane roadway connects the city of River Oaks to the base and extends to SH 183.

- Spur 341 provides direct access to AF Plant #4 from Interstate 30, in that it is directly linked to the interchange or frontage road system. Spur 341 has several at-grade intersections (none signalized) with local streets in the city of White Settlement, and a partial interchange with White Settlement Road. Its six-lane, median-divided design provides for high operating speeds and high capacity.

- White Settlement Road, west of the base, provides east-west movement through the city of White Settlement. At its eastern terminus it has a partial interchange with Spur 341 and an interchange with Interstate 820. Within the city of White Settlement it consists of four undivided lanes on the eastern and western ends with a two-lane section in between. Three signalized intersections exist within the city of White Settlement, none of which appear to experience any significant delay. West of Interstate 820, White Settlement Road is four lanes until the intersection with Chapel Creek Road, where it tapers to two lanes. A few miles beyond that intersection is the entrance to the Off-Site WSA. White Settlement Road, between Chapel Creek Road and Fort Worth city limits, is planned to be widened to four lanes by the year 2010.

- Clifford Street runs parallel to White Settlement Road in the city of White Settlement. The four-lane road connects to the northern terminus of Spur 341 on the east, and crosses under Interstate 820

and connects with White Settlement Road on the west. Four signalized intersections exist, none of which appear to experience significant delays. As of 1992, Clifford Street, between Interstate 820 and Spur 341, was upgraded to four undivided lanes by the Texas Department of Transportation (TXDOT).

On-Base. Figure 3.2-11 shows the street network within the cantonment. Based on the gate traffic counts identified in Table 3.2-4, operation of Carswell AFB contributed approximately 25,000 vehicles per day to the surrounding road network. Access to the active base was through one of four gates. The Main Gate, located on Rogner Drive just north of its interchange with SH 183, was open 24 hours and consists of two in- and out-bound lanes. The East Gate, on Jennings Drive, was open from 6:00 a.m. to 6:00 p.m. The Hospital Gate on Meandering Road was open during morning and evening rush hours. The Southwest Gate, located on Haile Drive (an extension of Roaring Springs Drive), was also open during morning and evening rush hours. The southwest gate did not carry much of the total base traffic, but handled much of the flightline traffic, which was relatively light.

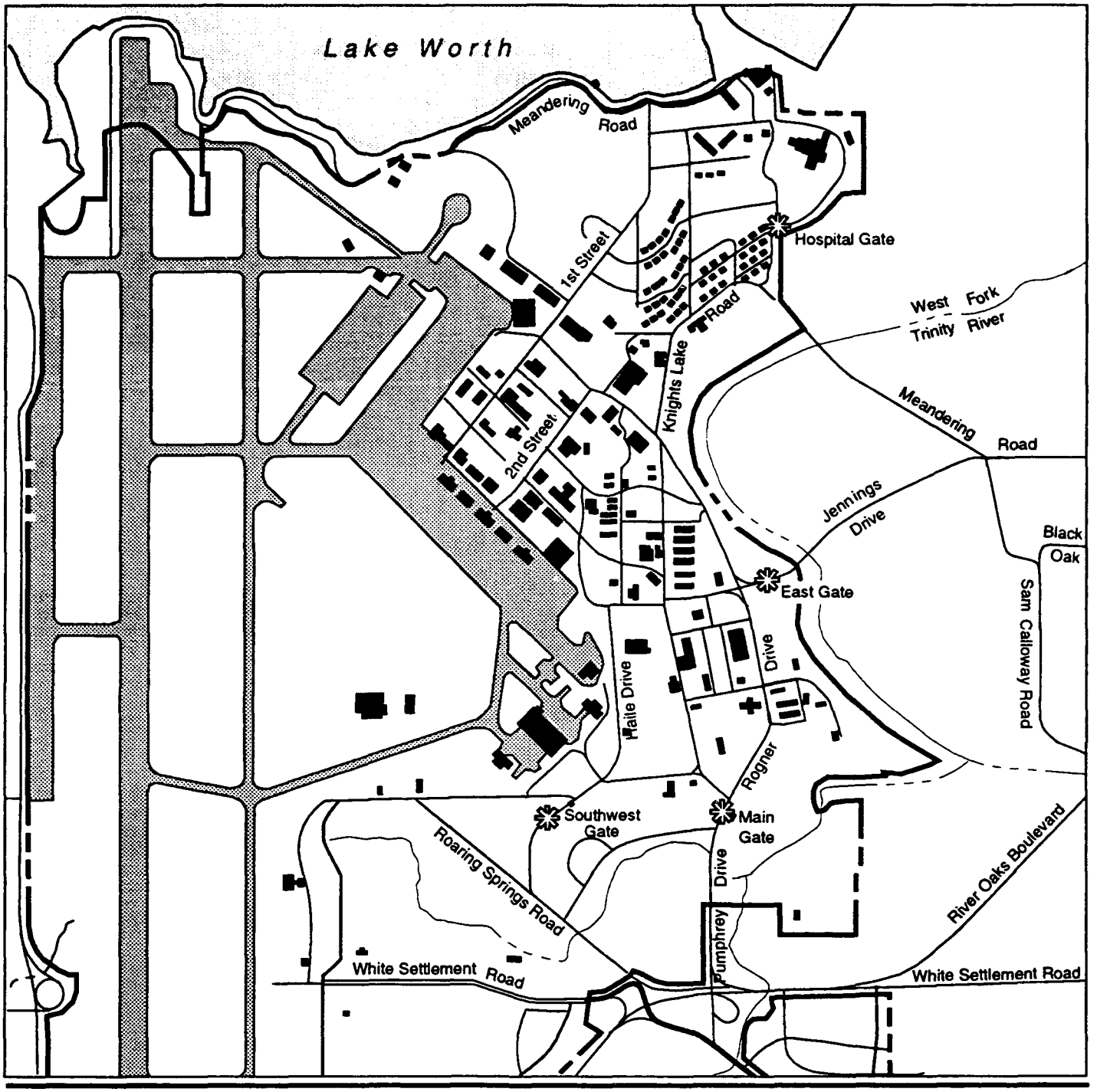
The primary on-base road is Rogner Drive. It is four lanes, undivided, and has signalized intersections at Jennings Drive (near East Gate) and Knights Lake Road. The Rogner/Jennings intersection is well designed with left turn lanes and channelized right turns on the Jennings approaches. Because of the skewed alignment of the Rogner/Knights Lake intersection, left turns on the northern Rogner Drive approach are prohibited.

Knights Lake Road connects to Rogner Drive near the Main Gate and, along with Rogner Drive, provides internal north-south circulation on the base, as well as linking most of the base buildings with the hospital.

Meandering Road provides access via the Hospital Gate and circulation around the northern boundary of the base. It extends off base into the city of River Oaks and connects with SH 183.

Preclosure Reference. Preclosure (1991) peak-hour traffic volume (PHV), capacities and LOS on key community roadways and key on-base roads are shown in Table 3.2-5. The 12 off-base roadway segments shown on Table 3.2-5 are identified for this study as key community roads because they would provide the most direct access to the Carswell AFB area upon reuse.

Interstate 30, between SH 183 and Interstate 820, was the only Interstate segment to experience LOS D; however, the widening to six lanes will bring it into the LOS C range. Roaring Springs Road was the only other segment to experience LOS D.



EXPLANATION

Carswell AFB Boundary

Base Gate

Airfield Pavement

0 400 800 1600 Feet

Key On-Base Roads

Figure 3.2-11

Table 3.2-5. Peak-Hour Traffic Volumes and LOS on Key Roads

Road	Capacity (PHV)	Preclosure (1991) Traffic (PHV)	LOS	Closure (1993) Traffic (PHV)	LOS
Regional					
I-30					
Between SH 183 and I-820	3,650	2,900	D	2,750	C
Between Camp Bowie Boulevard and SH 183	5,550	3,150	C	3,100	C
I-820					
Between I-30 and White Settlement Road	5,600	2,450	B	2,450	B
Between White Settlement Road and Lake Worth	5,600	2,330	B	2,350	B
SH 183					
Between I-30 and Ridgmar Boulevard	3,400	1,600	B	700	A
Between Ridgmar Boulevard and SH 199	3,200	1,200	B	1,050	A
SH 199					
Between SH 183 and Beverly Hills Road	3,200	1,450	B	1,250	B
Spur 341					
Between I-30 and White Settlement Road	5,100	2,150	B	2,000	B
Local					
White Settlement Road					
Between I-820 and Spur 341	2,750	1,050	B	1,000	B
Between Clifford Street and Academy Boulevard	3,100	650	B	600	B
Clifford Street					
Between I-820 and White Settlement Road	2,600	550	B	550	B
Roaring Springs Road					
Between SH 183 and I-30	2,300	1,000	D	950	D
On-base					
Rogner Drive, at Main Gate	2,600	1,150	B	350	B
Jennings Drive, at East Gate	2,100	350	C	0	NA
Meandering Road, at Hospital Gate	2,100	400	C	0	NA

I = Interstate.
NA = Not applicable.
LOS = Level of Service.
PHV = peak hour volume.
SH = State Highway.

Closure Baseline. Table 3.2-5 also provides summaries of the expected LOS for roadways in the affected area at the time of closure. Traffic volumes from the base reflect only the retained military and caretaker activities.

At closure of Carswell AFB, the Main Gate became the only access point to the base. Carswell AFB was expected to generate a total of 1,100 daily trips and a PHV of 350 vehicles at the Main Gate of which less than 50 vehicles were expected to be associated with the OL.

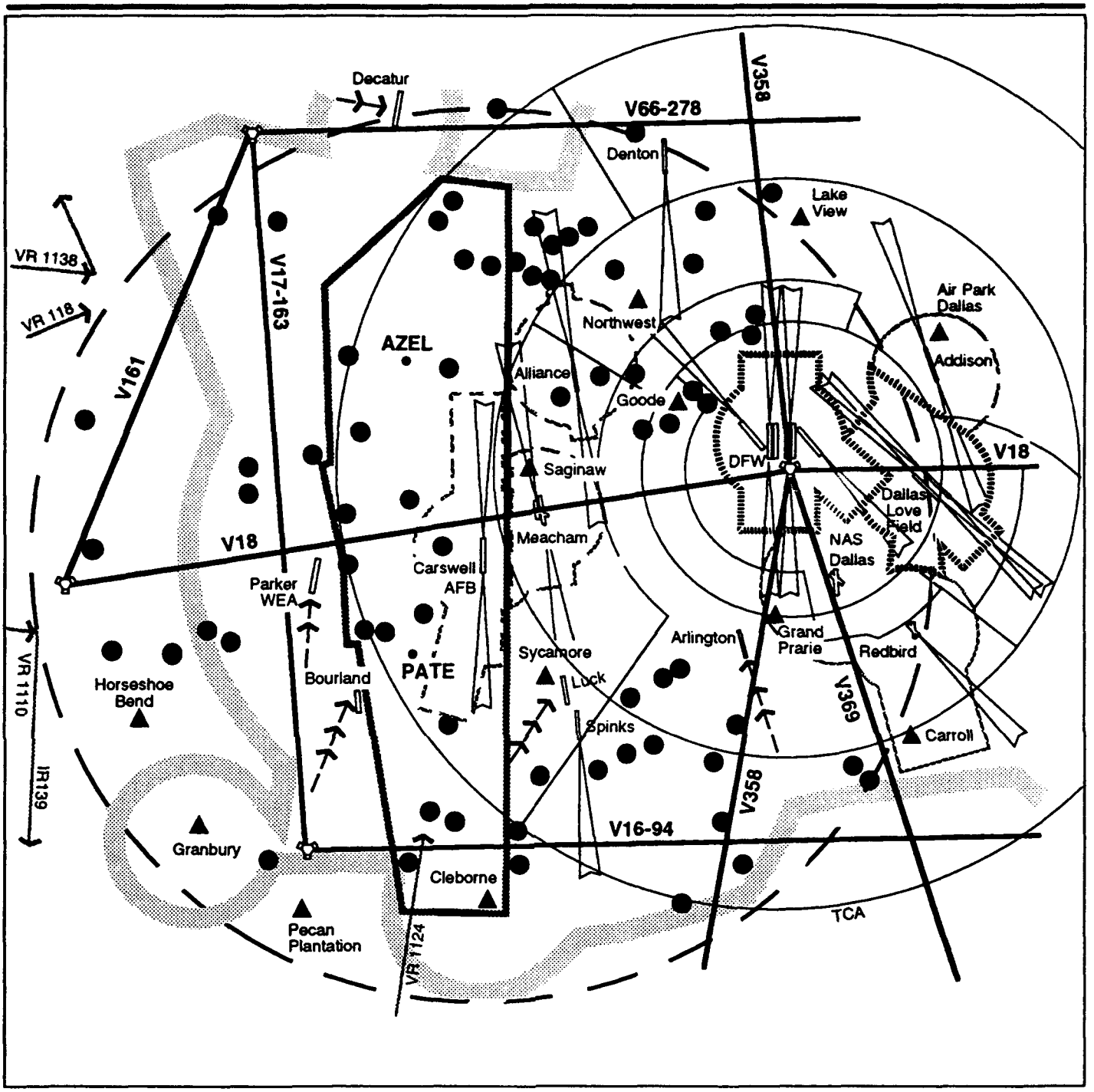
Off-base traffic volumes were expected to drop on SH 183 in the Ridgmar Mall area. As a result, the LOS on SH 183 was expected to improve from B to A except for the intersection with Ridgmar Boulevard, which was

expected to operate at LOS B. Interstate 30, between SH 183 and Interstate 820, was expected to improve its operation to LOS C.

3.2.3.2 Airspace/Air Traffic. Airspace is a finite resource that can be defined vertically and horizontally, as well as temporally, when describing its use for aviation purposes. As such, it must be managed and utilized in a manner that best serves the competing needs of commercial, general, and military aviation interests. The FAA is responsible for the overall management of airspace and has established different airspace designations to protect aircraft operating to or from an airport, transitioning en route between airports, or operating within "special use" areas identified for defense-related purposes. Rules of Flight and Air Traffic Control (ATC) Procedures, which govern how aircraft must operate within each type of designated airspace, have been established by the FAA. All aircraft operate under either Instrument Flight Rules (IFR) or Visual Flight Rules (VFR).

The type and dimension of individual airspace areas established within a given region and their spatial and procedural relationship to one another are contingent upon the different aviation activities conducted in that region. When any significant change is planned for this region, such as an airport expansion, a new military flight mission, etc., the FAA will reassess the airspace configuration to determine if such changes will adversely affect (1) ATC systems and/or facilities; (2) movement of other air traffic in the area; or (3) airspace already designated and used for other purposes (i.e., Military Operating Areas [MOAs] or Restricted Areas). The ROI selected for this airspace analysis is an area within a 30-nautical mile (NM) radius of Carswell AFB from the surface up to 3,000 feet MSL (Figure 3.2-12). The ROI selected for Carswell AFB encompasses the airspace that was delegated to Carswell Ground Controlled Approach (GCA) prior to closure for providing radar flight-following services, vector services, and also Terminal Radar Approach Control (TRACON), instrument landing system (ILS), approach surveillance radar (ASR), and visual approach services to aircraft arriving at Carswell AFB. Additionally, the Carswell ATCT is responsible for providing airport traffic control and clearance delivery services. When active, the Carswell AFB GCA airspace was activated Monday through Friday, 8:00 a.m. to 8:00 p.m. local time, excluding federal holidays, by the Dallas/Fort Worth TRACON. At all other times, the airport was on 5-minute standby from the Dallas/Fort Worth TRACON. The Dallas/Fort Worth TRACON provides approach/departure control to all participating aircraft within its delegated airspace. Airspace beyond the Dallas/Fort Worth TRACON's delegated control area is controlled by Fort Worth Air Route Traffic Control Center (ARTCC). The ARTCC provides ATC to aircraft between terminal areas.

There are two categories of airspace or airspace areas: regulatory and nonregulatory. Within these two categories there are controlled, Class G, special use, and other airspace area types. Controlled airspace within the



EXPLANATION

- Fixed Wing Special VFR Flight Prohibited
- Class B Airspace
- GCA (Ground Control Approach Radar Traffic Area)
- Transition Area (Floor at 700' AGL)
- Military Training Routes
- Victor Airways
- Non-Precision Approach
- IFR Precision Approach
- VFR Public Use Airport
- Restricted/Private Use Airport
- Carswell AFB Region of Influence, (30nm/35 statute mile)
- Class D Airspace
- Arrival/Departure Handoff Point

0 2.5 5 10 Nautical Miles

Airspace Region of Influence

Figure 3.2-12

Carswell ROI consists of Class B, C, D, and E airspace. Within these areas, some or all aircraft may be subject to ATC. The categories and types of airspace are dictated by: (1) the complexity or density of aircraft movements, (2) the nature of operations conducted within the airspace, (3) the level of safety required, and (4) the national and public interest (FAA, 1993). These factors are the main justifications for imposing ATC on aircraft. Controlled airspace is supported by ground communications, navigational aids, and air traffic services. Class G airspace (i.e., that portion that is not designated as either Class A, B, C, D, or E airspace) has fewer users' needs and flight operations than controlled airspace. Aircraft operating in Class G airspace are not subject to any ATC. Other airspace areas located within Carswell's ROI include airport advisory areas, military training routes and VFR flyways. There is no special-use airspace delineated for military flight training within the Carswell AFB ROI. Additionally, no special use airspace located outside the ROI is owned by Carswell AFB.

There are 25 public-use airports and 70 restricted/private-use airports located within the Carswell ROI. A public-use airport is a facility where any aircraft can land without prior permission. Restricted/private-use airports require permission of the airport operator prior to landing. As indicated in Table 3.2-6, air traffic activity greatly varies at public-use airports. These airports range from small recreational-use, general aviation airports, such as Decatur, to large air carrier airports, such as DFW. Restricted/private-use airports normally have fewer operations than small, general aviation airports. Typically, these facilities are individually owned and are for the owner's sole use.

Seven of the busiest airports within Carswell's ROI have ATCTs to provide control within their airport traffic areas:

- Fort Worth Alliance
- Fort Worth Meacham
- DFW
- Fort Worth Spinks
- Love Field (DAL)
- Redbird
- Naval Air Station.

Meacham Field is located approximately 3 NM northeast of Carswell AFB. Due to the close proximity of these two airports, special operating procedures have been established to ensure that conflicts do not occur. These procedures include an agreement between Carswell's and Meacham's ATCTs on areas of control, responsibilities for handling aircraft that intend on transitioning from one airport's airspace to another's, and flight paths for arriving/departing and pattern aircraft.

Table 3.2-6. Annual Aircraft Operations for Civil Public-Use Airports in the Vicinity of Carswell AFB

Airport	Annual Operations 1990	Annual Operations 1993[b]
Arlington	110,000	119,000
Bourland	40,000	42,000
Bridgeport	27,000	30,000
Cleburne	60,000	54,000
Dallas Love Field (DAL)	212,000	221,000
Dallas/Fort Worth (DFW)	731,000	788,000
Dallas Redbird	146,000	164,000
Decatur	6,000	6,000
Denton	120,000	132,000
Fort Worth Alliance	140,000	140,000
Fort Worth Meacham	500,000	544,000
Fort Worth Spinks	90,000	99,000
Goode	26,400	33,000
Granbury	10,000	23,000
Grand Prairie	199,000	217,000
Hicks	16,000	25,000
Horseshoe Bend	3,000	3,000
Lakeview (Lake Dallas)	22,500	25,000
Luck	15,900	15,900
Northwest	25,000	28,000
Palmer	75	75
Pecan Plantation	50	50
Post Oak	150	150
Saginaw	9,500	10,000
Sycamore[a]	1,000	1,000

Notes: (a) Data not available from sources; therefore, the annual operations were estimated for the purpose of analysis.
(b) Operations based on available forecasts, as of 1992.

Sources: FAA, 1992; NCTCOG, 1991c.

Published IFR approaches are shown on Figure 3.2-12. Where more than one IFR approach to the same runway exists, the most critical approach is shown. It should be noted that an IFR departure can be conducted from a VFR airport. Figure 3.2-12 also differentiates between precision and non-precision approaches. A precision approach, by definition, provides vertical guidance to the pilot, as well as lateral guidance. A non-precision approach provides lateral guidance only. With a precision instrument approach, exact navigational information is provided, which allows a pilot to fly to a lower altitude and be more closely aligned with the runway than

with a non-precision approach. During periods of poor weather, aircraft attempting to land at an airport served with only a non-precision approach may have to wait until the weather improves or land at an airport with a precision approach. For airports with a precision approach, standards dictating the height of objects surrounding the airport are more stringent than for those facilities without non-precision approaches.

Preclosure Reference. An understanding of the airspace/air traffic environment and its use under the preclosure reference is necessary to help determine its capability and capacity to assimilate future aviation activities into the National Airspace System.

When active, the Carswell GCA provided radar service to all IFR aircraft within the GCA that intended to land at the base. When the GCA was not active, Dallas/Fort Worth TRACON provided radar services to all military and civilian IFR aircraft landing at Carswell AFB. The Dallas/Fort Worth TRACON provided radar service to all civilian and military traffic within the GCA when these aircraft were not landing at Carswell AFB. Carswell Tower provided ATC to all aircraft within its Class D airspace. The tower provided all-weather service to aircraft landing at the base, and was responsible for providing aircraft separation for all IFR, VFR, and special VFR (SVFR) arrivals and departures. Due to the proximity of Meacham Airport, its Class D airspace overlaps with Carswell's. To provide for the safe and efficient ATC of aircraft operating at either of these two airports, each Class D airspace has been limited. This allows for single control of aircraft. The wide array of services provided by Carswell Tower and GCA allowed the Dallas/Fort Worth TRACON to handle more aircraft operations, given existing staffing levels, than would have been possible without these services at Carswell AFB. Listed in Table 3.2-7 are the approximate number of operations that were conducted at Carswell AFB in 1991.

Table 3.2-7. Carswell AFB Annual Aircraft Operations, 1991

		Aircraft Operations[a]		
Assignment	Type	Day	Night	Total
Carswell AFB	B-52	31,033	6,311	37,344
	F-16[b]	10,170	630	10,800
	KC-135	24,619	2,375	26,994
Primary Transients	T-38	4,179	496	4,675
	T-37	959	151	1,110
	C-130	546	104	650
	Corporate jet[b]	960	0	960
Other Transients	Misc.	2,496	239	2,735
Totals		74,962	10,306	85,268

Notes: (a) An aircraft operation is one takeoff or one landing.
(b) Includes operations associated with AF Plant #4.

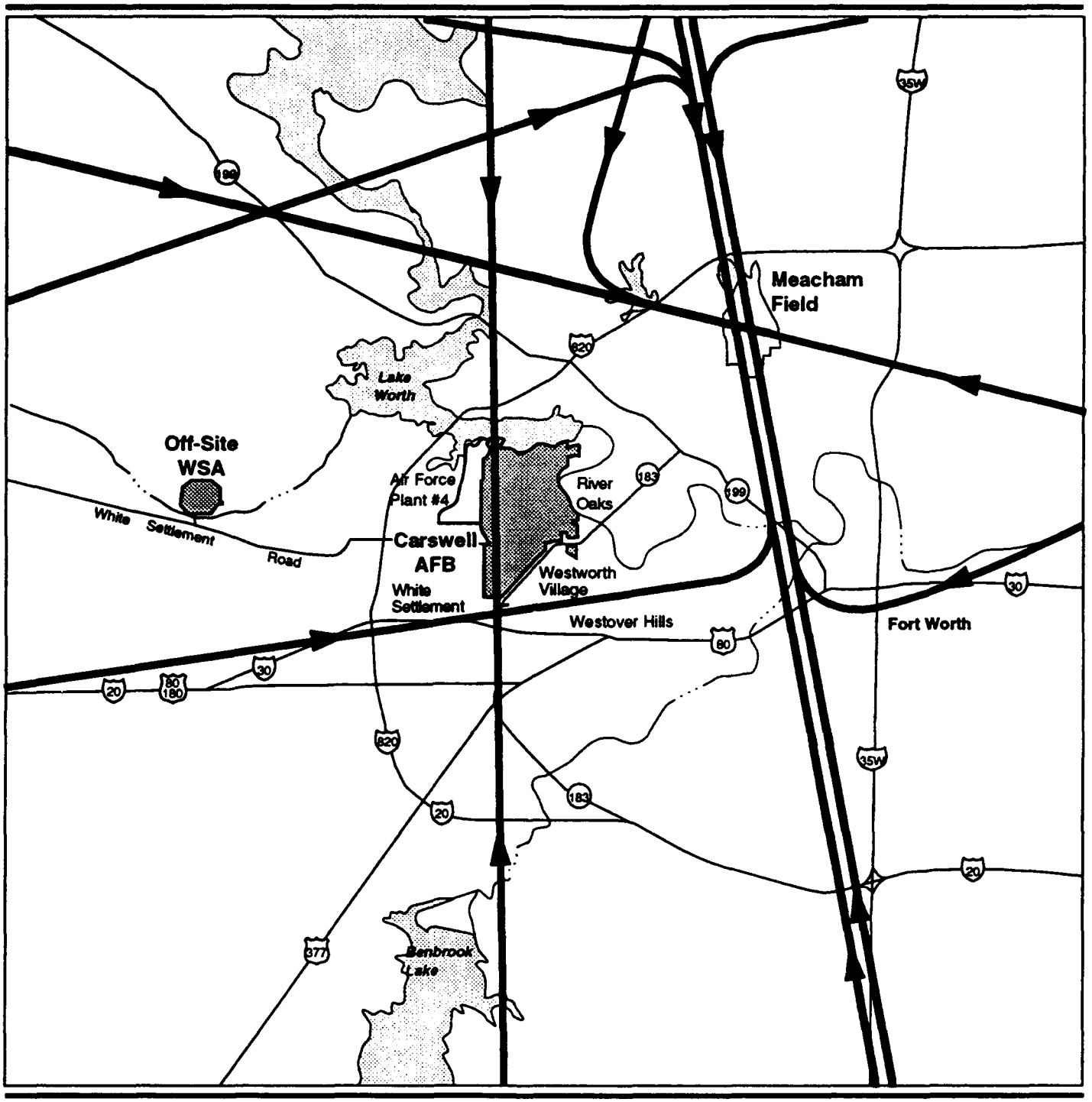
As shown in Figure 3.2-12, there were two arrival/departure handoff points (Azel and Pate) that were established for transitioning to/from Dallas/Fort Worth TRACON and Carswell GCA. The following example illustrates how these procedures worked and typical delineation of responsibility for control of aircraft landing or departing Carswell AFB:

- During use of Runway 35 at Carswell AFB for departures, an IFR clearance was given to the flight prior to departure. This included an initial prescribed route, an initial altitude, and an initial heading for radar vectors toward the initial route fix. For Carswell AFB, the primary departure instructions for Runway 35 were climb and maintain 3,000 feet, heading 330 degrees.

- If the departing aircraft did not intend to stay within the GCA to practice multiple approaches and coordination, transfer of control of the aircraft was required between the Dallas/Fort Worth TRACON and Carswell GCA/Tower prior to the arrival/departure points. Once the aircraft had been transferred to TRACON, it was given further heading and altitude clearances. If the aircraft intended to stay within the GCA, the GCA continued to provide radar services to the aircraft. If the aircraft intended on entering the en route airspace, it was transferred to the Fort Worth ARTCC when above 16,000 feet. The ARTCC, upon assuming control of the aircraft, assigned higher altitudes and instructions as appropriate. The flight was then controlled until "handed off" to the next adjacent ARTCC. Upon approaching the terminal airspace for the trip's final destination, the process was reversed.

Figures 3.2-13 and 3.2-14 show the generalized routes that had been established by DFW TRACON and Carswell GCA for arriving and departing aircraft during preclosure conditions. In the Carswell AFB ROI, lower performance aircraft (i.e., propeller aircraft) operating at lower en route altitudes were kept below or clear of the routes established for turbine aircraft. Lower performance aircraft were mixed into the arrival routes close to the airport to improve capacity. FAA requirements stipulate that in addition to the radar separation provided by TRACON, increased longitudinal separation is required for various combinations of aircraft size to avoid wake turbulence. By maintaining separate routes for aircraft with similar sizes and operational characteristics (i.e., speed) aircraft spacing is kept to a minimum. As a result of more closely-spaced aircraft, an airport can have the ability to land more aircraft in a given period of time. Without this route segregation, aircraft separation would dramatically increase.

Navigation of IFR aircraft within the radar environment of TRACON's or GCA's airspace is generally provided by radar vectors. Departing aircraft are cleared to resume pilot navigation when traffic interactions are resolved and the aircraft is in a location to receive adequate navigational aid signals. Unless visual separation was applied, the controlling agency would provide all IFR aircraft with a radar separation of at least 3 NM and/or 1,000 feet of



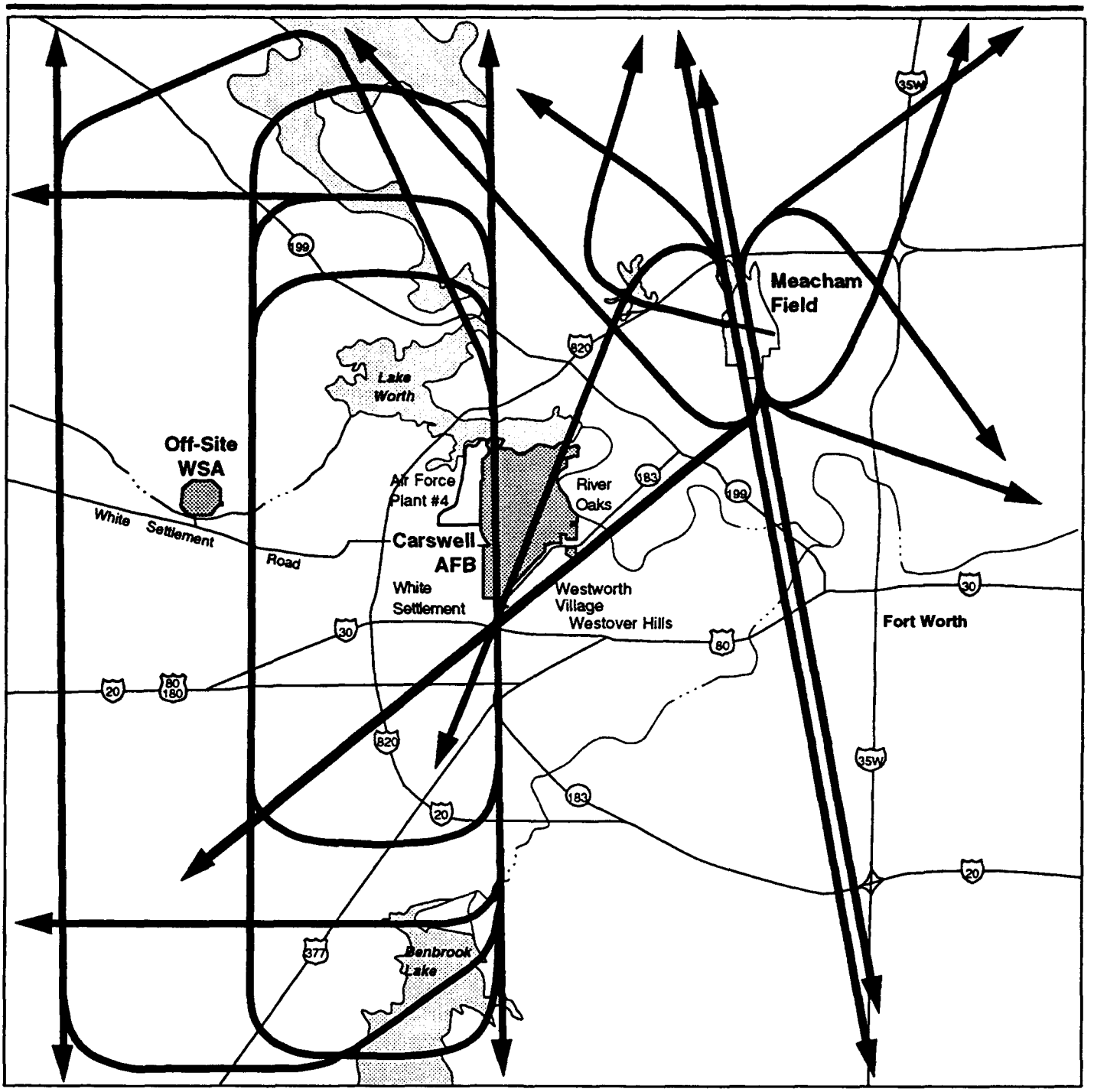
EXPLANATION

Arriving Aircraft Flight Paths for Carswell AFB and Meacham Field

Primary Arriving Aircraft Flight Paths

0 .75 1.5 3 Nautical Miles

Figure 3.2-13



EXPLANATION

Departing Aircraft Flight Paths for Carswell AFB and Meacham Field

Departure Aircraft Flight Paths

0 .75 1.5 3 Nautical Miles

Figure 3.2-14

vertical separation throughout their airspace. For participating VFR aircraft, separations are reduced to 1.5 NM and/or 500 feet of vertical separation.

For aircraft arriving at Carswell AFB prior to closure, the Carswell GCA handled vectors and descent instructions until aircraft were approximately 1,500 feet above airport elevation and approximately 5 NM from the runway on final approach. At this point, the Carswell GCA cleared aircraft for approach and instructed the pilot to contact Carswell Tower. For aircraft departing Carswell AFB, the ATCT gave the pilot heading and altitude instructions. Shortly after the departure aircraft was airborne, the ATCT instructed the aircraft to contact the Carswell GCA if the aircraft was remaining in GCA airspace, or TRACON if it was leaving the immediate area. Aircraft operating at the 25 public airports within the Carswell AFB ROI were generally unaffected by flight operations at Carswell AFB; however, operations at Meacham Field were impacted by the base. Because of the close proximity of the two airports, restrictions were placed on aircraft traffic patterns at both airports.

Although only one Military Training Route (MTR) transits the Carswell AFB ROI, a total of six MTRs are owned by the base. VR118, VR1110, and VR1124 are all for flight training of military aircraft at or below 1,500 feet above ground level. These routes are only used in VFR weather conditions. MTRs IR103, IR104, and IR105 are also used for flight training; however, these routes are used for instrument flying. All of these routes were used by F-16s under preclosure conditions.

Closure Baseline. By base closure, military aviation activity by the 7th Bomb Wing had ceased and aviation activities by the 301st FW, AF Plant #4, and military transients remained similar to preclosure conditions. The loss of B-52 and KC-135 flight activities resulted in a net decrease of 64,338 annual operations at Carswell AFB, or less than a 3 percent reduction in total ROI operations. Table 3.2-8 shows the number of operations that were expected to occur at Carswell at the time of base closure. All airfield pavement and airfield support facilities have been retained for military use, including the ATCT, ARFF, numerous hangars, airfield operations building, and other various facilities. Due to the continued flight operations at the base, the majority of controlled airspace has been retained. The exception is the Carswell GCA airspace, which was withdrawn prior to base closure. Services previously provided by the Carswell GCA are handled by Dallas/Fort Worth TRACON. With the continued operation of the 301st FW and AF Plant #4, all MTRs owned by the base remain active. Restrictions on aircraft traffic patterns at Carswell AFB and Meacham continue due to the close proximity of the two airports.

3.2.3.3 Air Transportation. Air transportation includes passenger travel by commercial airline and charter flights, business and recreational travel by

Table 3.2-8. Annual Aircraft Operations at Carswell AFB, 1993 Closure Baseline

Assignment	Type	Aircraft Operations Day	Night	Total
301st FW	F-16	8,820	180	9,000
AF Plant #4	F-16	1,350	450	1,800
Primary Transients	T-38	4,179	496	4,675
	T-37	959	151	1,110
	C-130	546	104	650
AF Plant #4 Transients	Corporate Jet	960	0	960
Other Transients		2,496	239	2,735
Totals		19,310	1,620	20,930

AF = Air Force.
FW = Fighter Wing.

private (general) aviation, and priority package and freight delivery by commercial carriers.

There are two commercial service airports within Carswell AFB's ROI: DFW and DAL. DFW is approximately 21 statute miles from Carswell AFB, and DAL is approximately 30 statute miles from Carswell AFB. Together, these two airports represent one of the largest FAA traffic hubs in the United States. In 1990, DFW and DAL recorded approximately 24,257,000 and 2,879,000 enplanements, respectively. In the same year, DFW recorded 132,914,000 enplaned pounds of freight and mail. DAL did not record any enplaned cargo in 1990.

The closure of Carswell AFB had a minimal impact on scheduled air transportation in Carswell AFB's ROI. Because the proportion of DFW and DAL enplanements attributable to Carswell AFB was very small, the loss of these enplanements by closure was estimated to result in the loss of less than one enplanement per departure at these airports. Therefore, operations at DFW and DAL were not expected to decrease due to a reduction in travel related to Carswell AFB. Because DFW is a hub airport for two major airlines, it is likely as well that many seats currently filled by Carswell-related travelers were filled by other passenger demands.

The level of general aviation activity in the ROI is significantly large, as the Dallas/Fort Worth Metroplex is one of the busiest regions for general aviation in the United States. As a result, a significant level of passenger activity occurs at general aviation airports in the ROI (see Table 3.2-6). These general aviation passenger levels are not typically recorded by the operators, so specific annual totals are not available. However, the typical traveler associated with Carswell AFB utilized scheduled military transportation or scheduled commercial airlines; therefore, general aviation operations and

related passenger activity were expected to be minimally affected by closure.

3.2.3.4 Other Transportation Modes. Rail service was not available at Carswell AFB, but an operational rail network exists in the region. A Union Pacific freight line that services AF Plant #4 is located along the western edge of the base. It connects with the main line 4 miles south of the base. No commuter and light rail systems exist or are proposed within the ROI.

3.2.4 Utilities

The utility systems addressed in this analysis include the facilities and infrastructure used for:

- Potable water pumping, treatment, storage, and distribution
- Wastewater collection and treatment
- Solid waste disposal
- Energy consumption and distribution, including the provision of electricity and natural gas.

The ROI for utilities is made up of the service areas of each utility provider servicing the base and local community. The major attributes of utility systems in the ROI are processing, distribution, and storage capacities, and related factors, such as average daily consumption and peak demand, required in making a determination of adequacy of such systems to provide services in the future.

Utility use at the time of base closure (1993) for water, wastewater, and solid waste purveyors was developed from purveyor projections provided in 1992. Utility use at closure for energy purveyors was developed using historic consumption patterns and systemwide average annual growth rates. All projections were adjusted to reflect the decrease in use associated with base closure and are presented in Table 3.2-9.

3.2.4.1 Water Supply. The ROI for water supply and distribution consists of the service area of the city of Fort Worth's water supply system and the cities of River Oaks, Sansom Park, Westworth Village, and White Settlement. Total capacity of these systems is currently estimated to be 356 MGD.

On-Base. Potable water is supplied to the base through two interconnections with the city of Fort Worth's water system. The interconnections include a 12-inch, city-owned pipeline that follows the alignment of White Settlement Road and provides water to the former Kings

Table 3.2-9. Estimated Daily Utility Use in the ROI

	1990	1991	1992	1993 (closure)
Water Consumption (MGD)	123.1	130.2	133.8	156.3
Wastewater Treatment (MGD)	124.4	112.4	119.8	123.9
Solid Waste Disposal (tons/day)	4,461	4,549	4,638	4,730
Electrical Consumption (MWH/day)	34,375	35,062	35,460	35,732
Natural Gas Consumption (MMCF/day)	57.6	64.3	65.4	66.3

MGD = million gallons per day.
MMCF/day = million cubic feet per day.
MWH/day = megawatt-hours per day.
ROI = Region of Influence.

Sources: Cunningham, 1992; Dinyarian, 1992; Moltz, 1992; NCTCOG, 1992a; Russell, 1992; Staggs, 1992; TU Electric, 1992.

Branch housing areas south of the road. The pipeline also connects to the main base system west of the Main Gate and extends to the water booster station in Building 1082. The second interconnection is a 20-inch, city-owned, main pipeline that enters the base from the east in the vicinity of Building 1348 (Defense Reutilization and Marketing Office [DRMO]), traverses the base westward and exits near Clifford Street. A 12-inch, base-owned line branches off this pipeline and connects to the main base system.

Potable water is pumped by the booster station through the military-owned system that includes 695,000 gallons of active storage. Two additional facilities with a capacity of 550,000 gallons of storage are unavailable due to cracks and other repair problems. Another 225,000-gallon storage tank is available for protection.

The Off-Site WSA does not have a potable water source available, but was provided bottled water. Two wells provide non-potable water to the Off-Site WSA for toilet flushing and other noncontact uses. Non-potable water from the Farmers Branch Creek is used to irrigate the golf course. Table 3.2-10 shows the amount of water used on base prior to closure.

Off-Base. The city of Fort Worth obtains its water from a surface water supply system that principally relies on the runoff from the West Fork of the Trinity River. The runoff is captured in a series of reservoirs, including Lake Worth, immediately north of the base. The city's five reservoirs have a total capacity of 1,380,823 acre-feet, or 450 billion gallons. The system also has 17 treated water storage tanks with a combined capacity of 59.2 million gallons.

The city of Fort Worth supplies water to its residents, estimated at 448,626 persons, and 25 other wholesale customers, including the cities of

Table 3.2-10. Estimated On-Base Daily Utility Use

	Preclosure (1991)	Closure (1993)		
	Total	Retained Military	OL	Total
Potable Water Consumption (MGD)	0.76	0.01	0.001	0.01
Nonpotable Consumption (MGD)	<0.001	<0.001	<0.001	<0.001
Wastewater Treatment (MGD)	0.56	<0.01	<0.001	0.01
Solid Waste Disposal (tons/day)	14.25	1.55	0.05	1.60
Electrical Consumption (MWH/day)	177.00	18.95	<0.001	18.95
Natural Gas Consumption (MMCF/day)	0.51	0.04	<0.001	0.04

Note: Estimates of daily consumption at closure based on Rau, and Wooten 1980.
MGD = million gallons per day.
MMCF/day = million cubic feet per day.
MWH = megawatt-hours per day.
OL = Operating Location.

River Oaks, Sansom Park, White Settlement, and Westworth Village. The city of Fort Worth has a treatment capacity of 350 MGD. The city's capital improvement program has identified improvements to the system through 1996, including increasing treatment capacity to 380 MGD by the year 2000, and 450 MGD by the year 2007.

Potable water supplies in the city of White Settlement are supplemented with water from 12 wells drilled into the Paluxy and Twin Mountain aquifers with an estimated capacity of 1.2 MGD. Average daily use for the entire city during 1988-1990 ranged from 2.0 MGD to 2.3 MGD. The city has 0.25 million gallons of storage to meet peak demands and fighting needs.

The city of Sansom Park obtains its potable water from nine wells with an interconnection with the city of Fort Worth for emergency purposes. City personnel indicated that when peak demands exceed 1.5 MGD, the interconnection with Fort Worth is used. The city's average daily use for 1988-1991 ranged from 0.38 MGD to 0.44 MGD.

Potable water supplies in the city of River Oaks are obtained from Lake Worth and processed by a 3.0 MGD treatment plant. The city's average daily use for 1988-1991 ranged from 0.99 MGD to 1.1 MGD.

Preclosure Reference. Average daily potable water consumption in the ROI and on base under preclosure conditions is presented in Tables 3.2-9 and 3.2-10, respectively. The city of Fort Worth and its service area consumed approximately 97 percent of the potable water used in the ROI. The remaining 3 percent was consumed by the other communities in the ROI and by the base. The average daily water use for the base constituted less than 1 percent of the potable water consumed in the ROI. Average daily water use for the base was 0.76 MGD in 1991. The base pumped 6.2 million gallons of non-potable water annually for irrigation.

Closure Baseline. Potable water consumption in the ROI was projected to increase to 156.3 MGD by 1993. The city of Fort Worth's projection was developed 4 years ago and is 19 MGD higher than 1992 water consumption. Current water use trends would suggest that actual demands in 1993 may be approximately 10 to 15 percent less than projected. Water consumption at Carswell AFB decreased as the drawdown of personnel occurred from 1992 to closure. At closure, retained military and OL activities were estimated to require 0.01 MGD and 0.001 MGD, respectively.

3.2.4.2 Wastewater. The ROI for wastewater consists of the service area of the city of Fort Worth's wastewater collection and treatment system. This system collects and processes wastewater for the city and 22 wholesale customers, including the cities of Sansom Park, River Oaks, Westworth Village, and White Settlement, as well as the base. The total treatment capacity of the system is 120 MGD.

On-Base. All wastewater generated on Carswell AFB is treated by the city of Fort Worth. The base discharged to the city's system in accordance with Industrial Waste Discharge permit No. I-049. The base does not have an industrial wastewater pretreatment system; however oil/water separators are located at various industrial facilities (see Section 3.3-4 for further discussion). On-base wastewater flows are directed to the city's treatment plant through three operating main sewer lines.

Wastewater from the former Kings Branch housing tract is directed to an operating, 10-inch sewer that enters the city's system servicing Westworth Village. The Kings Branch housing and base facilities generally south of the petroleum, oil, and lubricant (POL) storage facility are serviced by an operating, 36-inch, city-owned sewer that follows the Farmers Branch Creek. This sewer also handles wastewater flows from areas west of the base. A 24-inch sewer parallels the 36-inch line, but is out of service. The third operating sewer provides service to all base facilities located north of North Warehouse Road. The 15-inch sewer runs under the Trinity River to a 14-inch, inverted siphon connected to an 18-inch city sewer. Base personnel have noted that during times of heavy rainfall the sewers on base have backed up as a result of the amount of inflow to the system.

Wastewater flows at the Off-Site WSA are serviced by a septic system. Presently, the city of Fort Worth has a 15-inch sewer main within 1,000 feet of the Off-Site WSA.

Off-Base. The city of Fort Worth provides wastewater treatment to its residents and 22 wholesale customers. The city has a single wastewater treatment plant with a permitted capacity of 120 MGD. This plant uses an activated sludge process and operates under a Texas Natural Resources Conservation Commission (TNRCC) discharge permit with effluent limits of 10 milligrams per liter (mg/l) biological oxygen demand (BOD) and 15 mg/l suspended solids. The effluent is discharged into the West Fork of the Trinity River and complies with all parameters of the permit. The plant did exceed the average daily flow parameter for 7 months as a result of abnormally heavy rainfall and inflow into the system in 1990.

The city has an expansion program underway at its Village Creek treatment plant that will increase its treatment capacity to 144 MGD by 1994. In addition, there are plans to increase treatment capacity to 161 MGD by 2000. The city also has various projects in the capital improvement program to upgrade the sewer system downstream from the base.

Preclosure Reference. Tables 3.2-9 and 3.2-10 present wastewater generation in the ROI and on base, respectively. In 1991 the base's flow constituted less than 1 percent of the wastewater generated in the ROI. Actual wastewater flows from the base are not measured; estimates of flow for billing purposes are based on water consumption. Recent flow estimates for Carswell AFB have ranged from 0.68 MGD in FY 1989 to 0.56 MGD in FY 1991.

Closure Baseline. At closure, on-base wastewater flows were estimated to decrease to 0.01 MGD. Wastewater flows from retained military activities were estimated to be 0.01 MGD and less than 0.001 MGD was estimated to be associated with OL activities.

Wastewater generation in the ROI was estimated to increase to a level of 123.9 MGD at closure. The increase was a result of continued growth in other sectors of the ROI.

3.2.4.3 Solid Waste. The ROI for solid waste disposal consists of the waste disposal facilities that serve the Tarrant County area.

On-Base. Solid waste is hauled off base by Waste Management, Inc. and placed in the firm's Westside landfill in Tarrant County. The Westside landfill had 6,692,000 tons of available capacity in 1992, and is anticipated to close in 2011. When active, the base recycled scrap metals (steel, copper, stainless steel) through the DRMO. Hospital wastes were hauled off base under contract by American Medical Transport (AMT). AMT hauled the

wastes to Stroud, Oklahoma, where it was incinerated in a treatment facility operated by Midway Environmental Management.

Off-Base. The disposal of solid waste in Tarrant County is handled by municipal and private collection systems and landfill facilities. The county currently has six landfills that handle solid waste and two more were pending facility permits as of 1992. Four of the six landfills are owned by private companies and the cities of Fort Worth and Arlington operate their own landfills. The six landfills had a total remaining capacity of 18,976,000 tons in 1992 and an expected closure date of 2011. The North Central Texas Council of Governments (NCTCOG) is currently evaluating disposal capacity in its 16-county region. In 1992, NCTCOG indicated that both city landfills would run out of capacity by 2006 and that two private landfills would close in 1993. One of these two private landfills was given a permit extension, and will close in 1995; the other was closed in 1993.

Preclosure Reference. Tables 3.2-9 and 3.2-10 present the amount of solid waste generated in the ROI and on base, respectively. Carswell AFB generated approximately 14.25 tons/day in 1991. This amount constituted less than 1 percent of the solid waste generated in the ROI.

Closure Baseline. Solid waste generation at closure was estimated to be reduced to 1.6 tons/day with 1.55 tons/day attributable to retained military activities and 0.05 ton/day from the OL. Solid waste generation in the ROI was estimated to increase to a level of 4,730 tons/day as a result of growth in Tarrant County.

3.2.4.4 Energy. The ROI for energy consists of the local service areas for TU Electric and Lone Star Gas Company. The local service area for TU Electric consists of 33 cities in and around Tarrant County. The service area for Lone Star Gas Company encompasses Tarrant County and a number of other communities in the area.

Electricity

On-Base. Electricity is provided to Carswell AFB and the Off-Site WSA by TU Electric. Electrical power is delivered to Carswell AFB through a 138-kilovolt (kV) transmission line that enters the east side of the base near Farmers Branch. The on-base substation is owned by TU Electric, and the distribution system is owned by the Air Force. Eight feeder lines emanate from the substation and supply electricity throughout the base via overhead and underground services.

Off-Base. TU Electric provides electrical power to a population of over 5.5 million persons in 87 counties in Texas. Their system has the capability to meet a peak demand of 16,952 megawatts (MW) and in 1991 had electrical sales of 82,357,539 MWH. In the greater Fort Worth ROI, their

customers used 12,797,800 MWH, with Carswell AFB consuming 64,510 MWH in 1991. TU Electric does not anticipate any problems in meeting the level of demand they have experienced in recent years.

Preclosure Reference. Tables 3.2-9 and 3.2-10 present electrical consumption in the ROI and on base, respectively, for representative preclosure conditions. Carswell AFB consumed approximately 177 MWH/day in 1991. This amount constituted approximately 0.5 percent of the electricity consumed in the ROI in 1991.

Closure Baseline. Electrical consumption in the ROI was estimated to increase as the drawdown of personnel occurred at Carswell AFB. This increase is a result of the overall increase in electrical consumption in the greater Fort Worth region. The demand for electricity at Carswell AFB was estimated to decrease to 18.95 MWH/day at closure, or about 0.05 percent of the projected electricity demand in the ROI. Retained military activities were estimated to use 18.95 MWH/day and the OL was estimated to consume negligible amounts of electricity.

Natural Gas

On-Base. Service to Carswell AFB is provided by Lone Star Natural Gas Company. Natural gas is supplied via a 16-inch, company-owned line entering the west side of the base at Clifford Street. Natural gas enters the base system through the gas regulator station near Building 1149 and is supplied to the majority of heating systems on base. The Off-Site WSA does not presently have natural gas service.

Off-Base. Lone Star Natural Gas Company provides natural gas to a large portion of northern Texas. In the Tarrant County area, they had approximately 151,600 customers, with residential connections accounting for 91 percent of all customers.

Preclosure Reference. Tables 3.2-9 and 3.2-10 present natural gas consumption in the ROI and on base, respectively, under preclosure conditions. Carswell AFB consumed approximately 188 MMCF in 1991. This amount constituted less than 1 percent of the natural gas consumed in the ROI in 1991.

Closure Baseline. Natural gas consumption in the ROI was estimated to increase by the time of base closure due to the overall population increase in the greater Fort Worth region. Natural gas consumption at Carswell was estimated to decrease to 0.04 MMCF/day at closure, or less than 0.1 percent of the ROI demand. Retained military activities were estimated to consume 0.04 MMCF/day and the OL was estimated to consume negligible amounts of natural gas.

3.3 HAZARDOUS MATERIALS AND HAZARDOUS WASTE MANAGEMENT

Hazardous materials and hazardous waste management activities at Carswell AFB are governed by specific environmental regulations. For the purpose of the following analysis, the term hazardous waste or hazardous materials will mean those substances defined as hazardous by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. §§9601 et seq., as amended, and the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. §§6901-6992, as amended. In general, this includes substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to public health or welfare or the environment when released into the environment. Additionally, the U.S. EPA, as allowed by RCRA, has authorized the state to operate a hazardous waste program in lieu of the federal program. The state hazardous waste regulations are outlined in the Texas Administrative Code (TAC), Title 31, Chapter 335 - Industrial Solid Waste and Municipal Hazardous Waste.

Transportation of hazardous materials is regulated by the federal Department of Transportation (DOT) regulations within 49 CFR.

Treatment and disposal of nonhazardous waste, including wastewater, is discussed in Section 3.2.4, Utilities.

The ROI encompasses all geographic areas that are exposed to the possibility of a release of hazardous materials or hazardous wastes. The ROI for known contaminated sites extends beyond the base boundaries and includes the groundwater contamination from AF Plant #4, which currently extends onto Carswell AFB property. Specific geographic areas affected by past and current hazardous waste operations, including cleanup activities, are presented in detail in the following sections.

The preclosure reference for the purposes of this analysis was established to represent conditions of full mission operation prior to initiation of drawdown activities.

3.3.1 Hazardous Materials Management

Preclosure Reference. The hazardous materials most commonly utilized by Carswell AFB included petroleum products, such as fuels, motor oils, lubricants and hydraulic fluids, industrial solvents, paints, thinners, and pesticides, which are described in Section 3.3.6. Most of these materials were delivered to Base Supply (Building 251), and then distributed to the workplace where they were utilized. However, many base organizations directly purchased items from local outlets. Bulk fuel distribution is discussed in Section 3.3.4.

The Hazardous Materials Management Plan for Carswell AFB provided an outline to properly obtain, store, transport, and dispose of hazardous materials on base. Carswell AFB also had an Oil and Hazardous Substance Spill Prevention and Response Plan (SPRP), which established responsibilities, discussed spill prevention countermeasures, provided a detailed spill contingency plan, and identified training requirements for base personnel. The implementation of these plans was the responsibility of the base Environmental Protection Committee with members representing all organizations on the installation.

Material Safety Data Sheets (MSDSs) for all hazardous materials used on base were filed at the Bioenvironmental Engineering Office, located at the Robert L. Thompson Strategic Hospital (Building 3000). An MSDS was also available in each workplace for all hazardous material utilized at that particular workplace.

Closure Baseline. Hazardous materials continue to be utilized by the OL, WHCA, AF Plant #4, 301st FW, and the golf course operator. All parties are responsible for managing these materials in accordance with federal, state, and local regulations to protect their employees from occupational exposure to hazardous materials and to protect the public health of the surrounding community. Pursuant to Air Force policy, the parties generally comply with the federal Emergency Planning and Community Right-to-Know Act (EPCRA), 42 U.S.C. §§11001 et seq. The parties also comply with the Texas Hazardous Communication Act, which is administered by the Texas Department of Health.

The OL is responsible for the safe storage and handling of hazardous materials used in conjunction with preventive and regular maintenance activities, grounds maintenance, and water and wastewater treatment for the WHCA and facilities identified for disposal; the OL has retained private contractors to conduct these services. Hazardous materials utilized by maintenance contractors may include paint, thinners, solvents, corrosives, ignitables, pesticides, and miscellaneous materials associated with vehicle and machinery maintenance (motor oils/fuels). These materials are purchased by the individual contractors. The WHCA utilizes small amounts of hazardous materials to maintain communications equipment, and some household products. The 301st FW utilizes many types of hazardous materials during operations similar to preclosure conditions, including aviation and motor vehicle fuels, POL, solvents, degreasers, paints, thinners, corrosives, heating oil, and pesticides. The same types of materials were used during normal base operations; however, the 301st FW utilizes lesser quantities than the total preclosure base usage. These materials are ordered through the Air Force supply system and delivered to the base in compliance with the Hazardous Materials Transportation Act (HMTA) under 49 CFR. Hazardous materials used at the AF Plant #4 engine run-up stations are similar in type and quantity to those used during normal base operations.

Hazardous materials are utilized for grounds and facility maintenance at the golf course. All hazardous materials are obtained by a private operator and could include paint, thinners, cleaners, fuels, POL, lead batteries, pesticides, and household products.

3.3.2 Hazardous Waste Management

Preclosure Reference. Normal operations at Carswell AFB produced wastes defined as hazardous by RCRA, 40 CFR 261-265, and under Title 31, Chapter 335 of TAC.

Hazardous wastes generated on base were collected at 24 accumulation points and 6 satellite accumulation points located throughout the industrial areas of the base (Table 3.3-1). Sites designated as accumulation points could store an unlimited amount of hazardous waste up to 90 days, while those designated as satellite accumulation points could store up to 55 gallons of hazardous wastes for an indefinite period of time. Immediate management of individual accumulation or satellite accumulation points was the responsibility of the individual industrial shops. These responsibilities included weekly inspections. The Environmental Flight (previously known as Base Environmental Branch) randomly conducted quarterly inspections of all points. Waste was transferred to either an accumulation point or directly to the DRMO-operated hazardous waste transfer, storage, and disposal (TSD) facility (Building 1359) from a satellite accumulation point prior to reaching its 55-gallon limit. All wastes were transferred directly to the TSD facility from accumulation points prior to reaching their 90-day limit.

The DRMO collected and stored all wastes generated on base prior to final disposal off base. The TSD facility operated under the base RCRA Part B permit (Permit No. HW-50289), originally issued by the Texas Water Commission (TWC), now known as the TNRCC, allowing storage of approximately 27,000 pounds of hazardous waste for up to 1 year.

Management of hazardous wastes at Carswell AFB was outlined in the Hazardous Waste Management Plan and the SPRP. These plans provided guidance for all areas of managing hazardous wastes, including waste packaging and manifesting, and identifying individual responsibilities, accumulation point management, and emergency response procedures. In 1991, Carswell AFB generated 45,000 pounds of hazardous wastes mainly consisting of industrial solvents, paints, and batteries. Of these, approximately 20,000 pounds of waste solvents were recycled. Petroleum wastes, such as oils and fuels, are not regulated as hazardous waste by the state. Carswell AFB generated and recycled approximately 94,000 pounds of these wastes in 1991. In 1992, hazardous waste generation at Carswell AFB temporarily increased over 1991 totals due to housekeeping activities associated with base drawdown activities, as well as the implementation of a household hazardous products collection program.

Table 3.3-1. Hazardous Waste Accumulation Points

Site	Building No./Location	Description
Accumulation Points (90 days storage)		
1	1048	Fuel Cell Repair
2	1059	Fabrication Branch
3	1059	Organizational Maintenance Squadron
4	1101	Base Supply
5	1187	Environmental Planning
6[a]	1190	AFBCA/OL-H
7[a]	1191	Vehicle Maintenance
8[a]	1213	Power Production
9[a]	1250	Base Supply
10	1319	Power Production
11	1413	Propulsion Branch
12	1413	Wheel and Tire Shop
13	1415	AGE Shop
14	1436	Equipment Maintenance
15[a]	1602	AGE Shop
16	1618	Paint/Electrical Shop
17[a][a]	1628	Corrosion Control
18	1642	Aircraft Maintenance Shop
19[a]	1643	Electrical Shops
20	1647	Corrosion Control
21	1647	Engine Shop
22	4213	Weapons Storage Area
23	4214	Weapons Storage Area
24	8512	BDU-38 Maintenance
Satellite Accumulation Points		
1	1055	ECM Shop
2	1060	Pneudraulic Shop
3	1189	Reprographics
4	1414	NDI Shop
5[a]	1648	Weapons Flight
6	3367	Conventional Munitions Maintenance
TSD Facility		
1	1359	DRMO

Notes: Inventory represents preclosure conditions in 1992.
(a) Accumulation points to be retained within DOD at base closure .
AFBCA = Air Force Base Conversion Agency.
AGE = aerospace ground equipment.
BDU = bomb dummy unit.
DOD = Department of Defense.
DRMO = Defense Reutilization and Marketing Office.
ECM = electronic counter-measures shop.
NDI = nondestructive inspection shop.
OL = Operating Location.
TSD = treatment, storage, or disposal.

An RCRA facility assessment (RFA) was conducted at Carswell AFB in 1989. The purpose of the RFA was to identify solid waste management units (SWMUs) that are areas of known or potential hazardous substance releases. The RFA consisted of a records search and facility inspections and resulted in the identification of 69 SWMUs. Following a review of the RFA by U.S. EPA and TNRCC, 20 SWMUs were determined to require further investigation; the remaining sites were identified as requiring no further action.

Site investigation and remediation procedures for the 20 SWMUs were established in the base RCRA Part B permit issued by the state in 1991. Fifteen of the 20 SWMUs identified as requiring additional site studies were previously identified as CERCLA sites and were undergoing remedial investigations as part of the Carswell AFB IRP. In 1992, an additional RCRA-regulated IRP site was added (the East Area Groundwater site). These sites are further discussed in Section 3.3.3. The other SWMUs included waste accumulation points at Buildings 1060 (SWMU 16), 1191 (SWMU 36), 1320 (SWMU 61), and 1410 (SWMU 32) and an oil/water separator at Building 1194 (SWMU 35).

Closure Baseline. At the time of base closure, all of the known hazardous wastes generated by the closing base operations were collected from designated accumulation and satellite accumulation points, and sent to the TSD facility for final disposal. The TSD facility remains on base and continues to operate under the base RCRA Part B permit.

The OL will continue to operate a 90-day accumulation point (Building 1190) for storage of hazardous wastes generated by ongoing caretaker activities. These hazardous wastes are contracted for disposal by the OL. Hazardous wastes are also generated by the contracted maintenance services and by the golf course grounds maintenance activity. These hazardous wastes are disposed by the individual generators.

Nine hazardous waste accumulation points were operational at base closure to support DOD flight and maintenance operations. These sites are identified in Table 3.3-1. Wastes generated by the 301st FW and WHCA are collected at the hazardous waste accumulation points and disposed by the 301st FW. No hazardous wastes are generated at the AF Plant #4 run-up stations.

Closure for all other accumulation points, satellite accumulation points, including SWMUs 16, 32, 36, and 61, and an oil/water separator (SWMU 35), were implemented in accordance with the closure plan submitted to the state under the base RCRA Part B permit.

3.3.3 Installation Restoration Program Sites

The IRP is an Air Force program to identify, characterize, and remediate past environmental contamination on its installations. Although widely accepted at the time, procedures followed prior to the mid-1970s for managing and disposing many wastes often resulted in contamination of the environment. The program has established a process to evaluate past disposal sites, control the migration of contaminants, and control potential hazards to human health and the environment. Section 211 of Superfund Amendments and Reauthorization Act (SARA), codified as the Defense Environmental Restoration Program (DERP), of which the Air Force IRP is a subset, ensures that DOD has the authority to conduct its own environmental restoration programs. DOD coordinates IRP activities with U.S. EPA and appropriate state agencies.

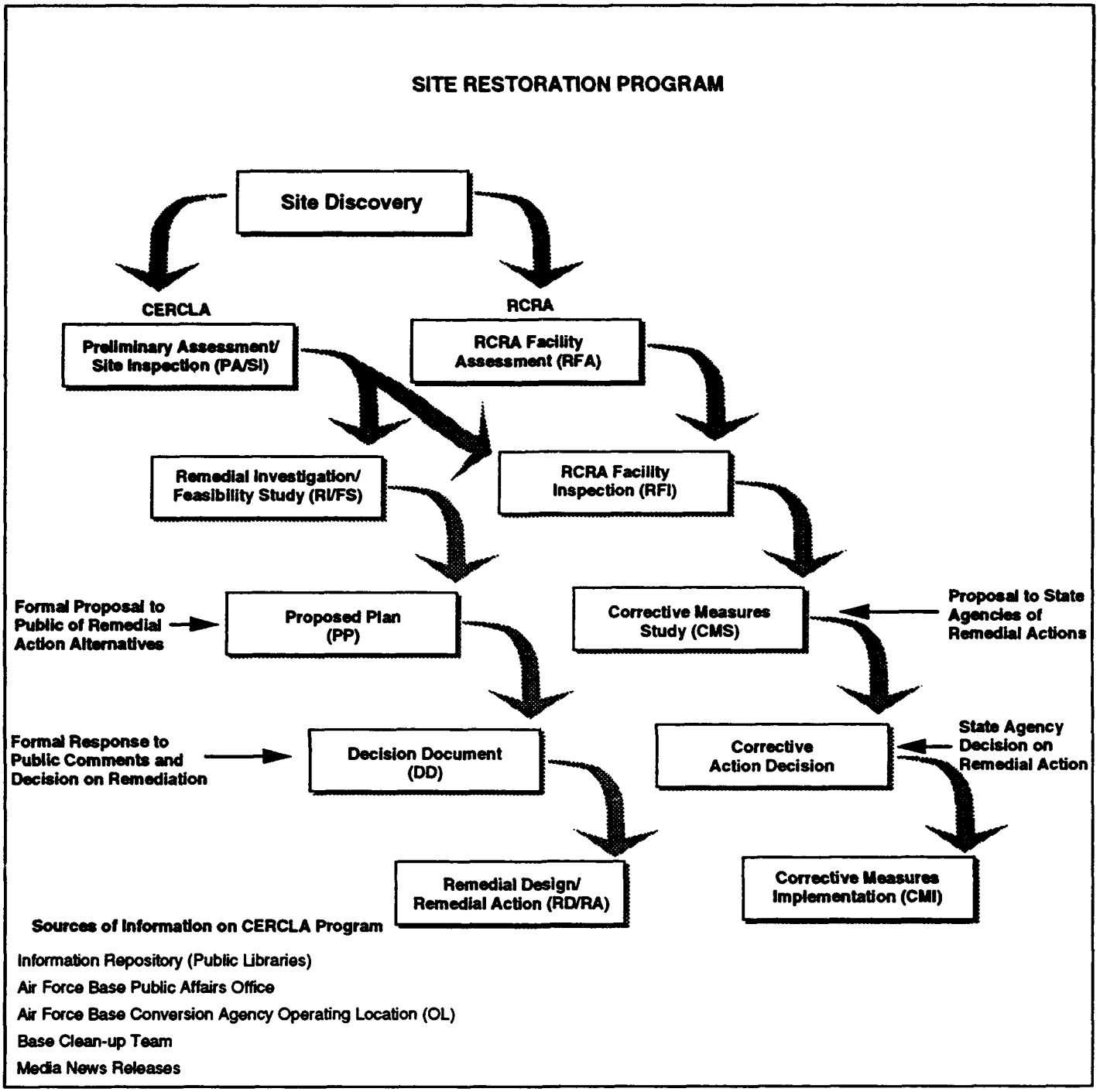
Prior to passage of SARA and the establishment of the National Contingency Plan (NCP) for hazardous waste sites, Air Force IRP procedures followed DOD policy guidelines mirroring the U.S. EPA's Superfund Program. Since SARA was passed, many federal facilities have been placed on a federal docket and the U.S. EPA has been evaluating the facilities' waste sites for possible inclusion on the National Priorities List (NPL). The U.S. EPA has not proposed Carswell AFB for listing on the NPL; however, the base is being reevaluated for NPL consideration under new scoring criteria.

AF Plant #4, located immediately west of Carswell AFB, was placed on the NPL on October 15, 1984, due to trichloroethylene (TCE) groundwater contamination. AF Plant #4 has been incorporated into the Carswell AFB ROI due to the migration of the TCE groundwater contamination onto Carswell AFB. As established under the Partnering Agreement between the OL, AF Plant #4, regulatory agencies, and contractors associated with the remediation projects, AF Plant #4 is responsible for groundwater remediation as it relates to the TCE plume migrating from AF Plant #4; while Carswell AFB is responsible for remediation of the surface sites overlying the plume.

Ongoing activities at identified IRP sites may delay the disposal or restrict some proposed land uses at or near those sites. Future land uses by the recipients on a site-specific level may be, to a certain extent, restricted by the severity of contamination or level of remediation effort at these IRP sites. Reasonably foreseeable land use constraints are discussed in this EIS. Regulatory review, as required by Air Force programs, will also ensure that any site-specific land use limitations are identified and considered. A representation of the IRP management process followed by Carswell AFB is shown in Figure 3.3-1.

The original IRP was divided into four phases, consistent with CERCLA:

- Phase I: Problem Identification and Records Search
- Phase II: Problem Confirmation and Quantification



Pictorial Presentation of Site Restoration Program Process

Figure 3.3-1

- Phase III: Technology Development
- Phase IV: Corrective Action.

After SARA was passed in 1986, the IRP was realigned to incorporate the terminology used by the U.S. EPA and to integrate the new requirements in the NCP. The result was the creation of three action stages:

- Preliminary Assessment/Site Inspection (PA/SI)
- Remedial Investigation/Feasibility Study (RI/FS)
- Remedial Design/Remedial Action (RD/RA).

The PA portion of the first stage under the NCP is comparable to the original IRP Phase I and consists of a records search and interviews to determine whether potential problems exist. A brief SI that may include soil and water sampling is performed to give an initial characterization or confirm the presence of contamination at a potential site.

An RI is similar to the original Phase II and consists of additional field work and evaluations in order to assess the nature and extent of contamination. It includes a risk assessment and determines the need for site remediation.

The original IRP Phase IV has been replaced by the FS and the RD within the third stage. The FS documents the development, evaluation, and selection of alternatives to remediate the site. The selected alternative is then designed (RD) and implemented (RA). Long-term monitoring is often performed in association with site remediation to assure future compliance with contaminant standards or achievement of remediation goals. The Phase III portion of the IRP process is not included in the normal SARA process. Technology Development (TD) under SARA is done under separate processes including the Superfund Innovative Technology Evaluation program. The Air Force has an active TD program in cooperation with the U.S. EPA to find solutions to problems common to Air Force facilities.

Under the regulatory process currently in place at Carswell AFB, an initial site investigation is generally conducted under the CERCLA procedures. Sites identified as requiring remedial action are generally addressed under the RCRA Part B permit, and therefore undergo RCRA investigation, corrective action, and closure procedures. Known exceptions to this process are described in this text as appropriate.

The closure of Carswell AFB has not affected the ongoing IRP activity. These IRP activities, managed by the OL, will continue in accordance with federal, state, and local regulations to protect human health and the environment, regardless of the disposal decision. The Air Force has entered

into a Defense-State Memorandum of Agreement (DSMOA) signed by the U.S. EPA, TNRCC, and DOD regarding the remediation actions at military installations in Texas, including Carswell AFB. This agreement addresses Carswell AFB IRP objectives, responsibilities, procedures, and remediation alternatives and scheduling. The TNRCC, acting as lead agency under this agreement initiated established regulatory mechanisms through the 1989 RFA, implemented site investigation and remediation measures as part of the Part B permit, and ensured compliance by enforcement of the permit.

Because AF Plant #4 was placed on the NPL, the Air Force has entered into a Federal Facility Agreement (FFA) with the U.S. EPA Region VI and the TNRCC. This FFA formalizes the joint involvement by all parties in the AF Plant #4 IRP. The activities of the AF Plant #4 IRP, including remediation of the TCE groundwater contamination plume, are managed and coordinated by the Aero Systems Center Environmental Management Restoration (ASC/EMVR) office at Wright-Patterson AFB. In addition, the Partnering Agreement is also in place to coordinate ongoing restoration activities. A multi-phase plan to remediate the TCE groundwater contamination was approved in 1992 and an emergency groundwater pump and treat system was brought on line in fall 1993.

The public may keep abreast of the IRP at Carswell AFB and AF Plant #4 through various sources of information (see Figure 3.3-1). Additionally, the IRP, as mandated by CERCLA and the NCP, has a public participatory program much like the one in the preparation of this EIS. Base Clean-up Teams have been established as part of the Carswell AFB and AF Plant #4 IRP process to serve as advisory committees to the Air Force. These committees consist of representatives from regulatory agencies and local communities. The Air Force will, with the acceptance of each RI/FS by the regulatory community, prepare a proposed plan for the remediation of a site(s), which will include a discussion of alternatives considered. The proposed plan will be distributed to the public for comment; a public meeting will be held to discuss the plan and comments on it will be accepted by the Air Force. The Air Force will then respond to all comments, making those responses part of a decision document on what the remediation will entail prior to implementing any RA (see Figure 3.3-1).

Preclosure Reference. IRP activities for Carswell AFB and AF Plant #4 will be individually discussed below.

Carswell AFB. Because the Air Force began the IRP process at Carswell AFB in 1983, prior to terminology and procedural changes, both phases and stages are contained in the IRP administrative record. The IRP Phase I Records Search was published in February 1984. It initially identified 17 potential disposal sites on the main base, including 9 landfills, 2 fire department training areas (FDTAs), 2 spill sites, 2 dump sites, and 2 areas of contaminated surface drainage, and a low-level radioactive waste burial

site on the Off-Site WSA property. The Phase I Records Search recommended ten sites on the main base and one site in the Off-Site WSA for further evaluation. The ten main base sites were grouped into six primary areas of concern that included: the Flightline Drainage Ditch (SD-10), POL Tank Farm (ST-14), Unnamed Stream (SD-13), Entomology Dry Well (OT-12), Landfill 1 (LF-01), and an area of zone monitoring that incorporates Landfill 4 (LF-04), Landfill 5 (LF-05), Waste Burial Area (WP-07), FDTA 1 (FT-08) and FDTA 2 (FT-09). The 11 sites recommended for further investigation under the Phase I Record Search and 3 additional sites were included as part of the 1986 Phase II, Stage 1 investigation. The additional sites included Landfills 3 and 6 (LF-03 and LF-06) and the pesticide rinse areas (WP-11). These sites are further described as part of Table 3.3-2 and shown in Figure 3.3-2.

Based on the Phase II investigations, the Air Force initiated an RI in December 1987 to collect, analyze, and evaluate additional site characterization data for 13 sites. All sites investigated under Phase II, except LF-06 and WP-11, were included in the RI. Two additional sites, the Base Exchange service station (ST-16) and the Off-Site WSA Disposal Site (extension to OT-15), were also further evaluated under the RI. The RI was conducted in stages from 1988 to 1991. Data obtained during the RI and subsequent IRP investigation were sufficient to recommend remedial alternatives and RDs for site SD-10 and remedial alternatives for FT-09. Investigations also showed no evidence that sites LF-03, FT-08, and OT-12 had released any hazardous waste in quantities that could endanger human health or the environment (HQ/SAC DE, 1991).

The RI identified an area of groundwater contamination between the main taxiway and the golf course (see Figure 3.3-2). The contaminants exceeding their maximum contaminant levels (MCLs) include TCE, vinyl chloride, and tetrachloroethane (PCE). The source of this contamination is believed to be from four Carswell AFB sites (LF-04, LF-05, LF-07, and WP-07) and AF Plant #4.

As described in Section 3.3.2, Hazardous Waste Management, a separate RFA was conducted in 1989 in accordance with RCRA guidelines. All sites identified during the previous CERCLA investigations and those concurrently undergoing RI, were evaluated in the RFA. As a result of the RFA, sites LF-02, LF-03, FT-08, and WP-11 were eliminated from further evaluation. There were 15 SWMUs identified at the remaining 12 IRP sites. Table 3.3-2 references the associated SWMU designation number assigned to each IRP site.

An RCRA Facility Inspection (RFI) conducted in 1991 eliminated sites LF-01 and OT-12 from further evaluation, resulting in ten active IRP sites.

Table 3.3-2. Waste Sites and Disposal Area Investigations
Page 1 of 6

Site	Site Description/(SWMU No.)	Location and Waste Description	Operable Unit No.
Carswell AFB			
LF-01	Landfill 1 (SWMU 28)	Located in the southeast portion of the base, adjacent to the Trinity River and the TSD Facility Site was utilized as the main base landfill during the 1940s; no disposal data are available. Chromium, cadmium, silver, and arsenic were found in soil samples but not in groundwater samples. Site is awaiting approval for no further action pending results of additional sampling.	2
LF-02	Landfill 2	Building 1055 occupies this site, between Building 1050 and Haile Road. LF-02 was utilized for disposal of runway construction materials during the 1940s and as a landfill between 1952 and 1956. No Further Action was recommended following the 1989 RCRA facility assessment.	NA
LF-03	Landfill 3	Site was utilized primarily for construction material disposal between 1950 and 1952, although other types of materials, including hazardous wastes, were disposed at this site. A ravine immediately south of Farmers Branch Creek was used as a fill site. Construction associated with runway extension later covered the site. No Further Action was recommended following the 1989 RCRA facility assessment.	NA
LF-04	Landfill 4 (SWMU 22)	Active from 1956 to 1973 as the main base landfill. Refuse of all types including waste solvents, paints, thinners, and batteries, were burned and/or buried in trenches. TCE has been identified as the primary contaminant in the soil. Site is approximately 10 acres in size located between the golf course and the southern portion of the main taxiway. The site is scheduled to undergo RCRA Facility Investigation in 1995.	1

LF = landfill.
NA = Not applicable.
RCRA = Resource Conservation and Recovery Act.
SWMU = solid waste management unit.
TCE = trichloroethylene.
TSD = treatment, storage, or disposal.

Table 3.3-2. Waste Sites and Disposal Area Investigations
Page 2 of 6

Site	Site Description/(SWMU No.)	Location and Waste Description	Operable Unit No.
LF-05	Landfill 5 (SWMU 23)	Site is located immediately north of LF-04 and was utilized from 1963 through the 1970s for disposal of flightline wastes. The landfill was created by blocking a small tributary of Farmers Branch Creek and filling the area with flightline refuse and wastes, which were frequently burned prior to covering. Groundwater sampling has detected TCE, toluene, arsenic, lead, chromium, and barium. The site is scheduled to undergo an RCRA Facility Investigation in 1995.	1
LF-06	Landfill 6 (SWMU 62)	Site was utilized from 1975 to 1978 and is located between the flightline perimeter road and the northeast corner of the golf course. Hydraulic fluid was reportedly disposed of at this site. The site is currently utilized as a contractor storage and heavy equipment parking area. Some construction rubble currently exists on site. The site is scheduled to undergo an RCRA Facility Investigation in 1995.	1
WP-07	Waste Burial Area (SWMU 24)	Located on the north side of White Settlement Road between LF-04 and LF-05. Drums of hazardous wastes were disposed of during the 1960s and include solvents, leaded sludge, and possible ordnance. TCE, chromium, and barium are the principal contaminants associated with this site. Drums were removed in 1991. The site is scheduled to undergo a risk assessment.	1
FT-08	Fire Department Training Area 1 (SWMU 18)	Located in the south base area between the golf course and the main taxiway. Site was utilized as the fire training area prior to 1963. Several live fire exercises took place monthly using waste oils and waste fuels as well as small quantities of solvents as ignition sources. Site consists of a gravel-lined pit with an earthen berm around it. Traces of contamination were identified in soil samples. NFADD was approved by TNRCC in December 1991.	NA

FT = Fire Training.
LF = landfill.
NA = Not applicable.
NFADD = No Further Action Decision Document.
RCRA = Resource, Conservation and Recovery Act.
SWMU = solid waste management units.
TCE = trichloroethylene.
TNRCC = Texas National Resources Conservation Commission.
WP = waste pit.

Table 3.3-2. Waste Sites and Disposal Area Investigations
Page 3 of 6

Site	Site Description/(SWMU No.)	Location and Waste Description	Operable Unit No.
FT-09	Fire Department Training Area 2 (SWMUs 19, 20, and 21)	Fire training exercises have been conducted at this site on a monthly to bi-monthly basis from 1963 to 1989. Exercises used waste oils and fuels, as well as small quantities of waste solvents. Site consists of a gravel area surrounded by an earthen berm. TCE, arsenic, lead, cadmium, and chromium have been detected in the local groundwater. Soil contamination includes various fuel constituents such as benzene, ethyl benzene, xylenes, phenols, and naphthalene. Petroleum hydrocarbons have also been detected in the soil. Site is located between LF-04 and the south end of the main taxiway. Site is currently undergoing removal of contaminated soils. A risk assessment is scheduled for 1994.	1
SD-10	Flightline Drainage Ditch (SWMU 53)	Waste JP-4 from the fuels system shop and solvents from the aircraft washracks 18 and 19 were discharged into the ditch behind Building 1048 and north of the POL tank farm (ST-14). Soil sampling identified JP-4; while no contamination of the groundwater has been identified. Specific dates of use are unknown. Removal action for contaminated soil and lining of drainage ditch on-going.	1
WP-11	Pesticide Rinse Area	Located at the golf course maintenance area adjacent to Farmers Branch Creek. Site consists of a small concrete pad utilized for cleaning pesticide spray equipment used for golf course maintenance. Rinse water ran over a grassy area into Farmers Branch Creek. Site used in this manner for an unknown period of time. No visible signs of vegetation stress associated with this site. No Further Action was recommended following the 1989 RFA.	NA

FT = Fire Training.
LF = landfill.
NA = Not applicable.
POL = petroleum, oils, and lubricants.
RFA = Resource Conservation and Recovery Act Facility Assessment.
SD = surface drainage.
ST = storage tank.
SWMU = solid waste management unit.
TCE = trichloroethylene.
WP = waste pit.

Table 3.3-2. Waste Sites and Disposal Area Investigations
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Site	Site Description/(SWMU No.)	Location and Waste Description	Operable Unit No.
OT-12	Entomology Dry Well (SWMU 63)	Located between Rogner Drive and Farmers Branch Creek in the southeast corner of the base. Site utilized between 1965 and 1981 for disposal of rinse water produced from pesticide equipment cleaning. Recent soil sampling revealed no appreciable contamination; as a result site was declared clean and area has since been regraded. No further action was approved by TNRCC in December 1991.	NA
SD-13	Unnamed Stream (SWMUs 64 and 67)	Consists of discharge from a holding tank, which may or may not originate from the POL tank farm (ST-14). Arsenic, benzene, and chromium were identified in surface water samples. Discharge occurred from 1965 to present. Site is approximately 3 acres in size and is located immediately south of Building 1347 in the southeast portion of the base. Focused site RCRA Facility Investigation is underway.	2
ST-14	POL Tank Farm (SWMU 68)	Located between Knights Lane Road, Haile Drive, and Hobby Shop Road. Three aboveground storage tanks currently located on site. Contaminated fuels discovered on site and downgradient during the early 1960s; source believed to be piping associated with three former aboveground storage tanks. Piping was replaced and an oil/waste separator (SD-13) was constructed in 1965. A well and skimmer were installed in August 1992 for removal of free product from the water table as an interim RA; system removed in April 1993. Treatability study completed in 1993; RA underway.	1

NA = Not applicable.
OT = other.
POL = petroleum, oils, and lubricants.
RA = Remedial Action.
RCRA = Resource Conservation and Recovery Act.
SD = surface drainage.
ST = storage tank.
SWMU = solid waste management unit.
TNRCC = Texas Natural Resources Conservation Commission.

Table 3.3-2. Waste Sites and Disposal Area Investigations
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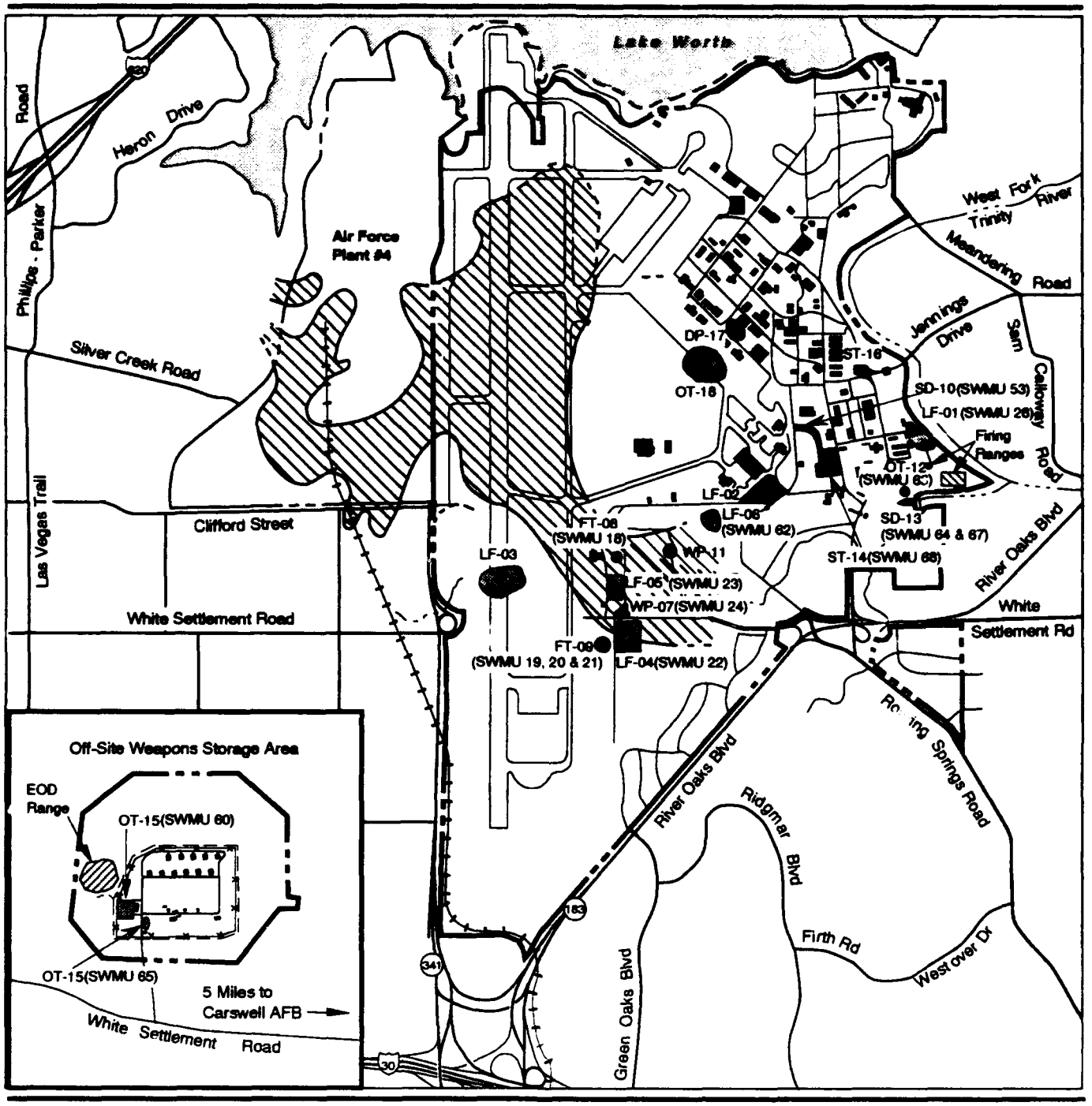
Site	Site Description/(SWMU No.)	Location and Waste Description	Operable Unit No.
OT-15	Weapons Storage Area (SWMU 60)	Located at the Off-Site WSA, adjacent to Building 8503. Site consists of three 12-inch diameter pipes vertically embedded 18 feet in the ground, which contain rags, gloves, and other materials that may be contaminated with trace amounts of low-level radioactive waste. An IRA is scheduled for summer 1994 with sampling to follow to determine the absence or presence of soil and groundwater contamination.	3
OT-15	WSA Disposal Site (SWMU 65)	A site believed to have been utilized for the disposal of waste solvents, thinners, and cleaners. No further action was recommended following the 1989 RFA.	NA
ST-16	Base Exchange Service Station	Located on the corner of Rogner Drive and Jennings Drive; has been in service since the early 1970s. Elevated levels of petroleum hydrocarbons were detected in the local groundwater during the RI. Storage tanks removed in spring 1993. RI/FS is under way, and groundwater monitoring is being conducted as part of the East Area Groundwater Site.	2
DP-17	Waste Oil Dump	Located at Building 1414, immediately behind the parking apron in the central portion of the base. Waste oil contamination reported by facility personnel. An RI is underway.	1
OT-18	Airfield Groundwater Contamination	A petroleum contamination groundwater plume exists beneath the tanker parking apron, located in the central portion of the flightline. Contamination is believed to be from the underground hydrant fueling system. An RI is underway.	1

DP = disposal pit.
IRA = Interim Removal Action.
OT = other.
RI = Remedial Investigation.
RI/FS = Remedial Investigation/Feasibility Study.
RFA = Resource Conservation and Recovery Act Facility Assessment.
ST = storage tank.
SWMU = solid waste management unit.
WSA = Weapons Storage Area.

Table 3.3-2. Waste Sites and Disposal Area Investigations
Page 6 of 6

Site	Site Description/(SWMU No.)	Location and Waste Description	Operable Unit No.
NA	East Area Groundwater	A groundwater monitoring program was implemented in late 1992 to determine the extent of the AF Plant #4 TCE plume into the golf course in the southeast corner of Carswell AFB and to characterize the plume in that area. Additional groundwater monitoring is ongoing at the POL tank farm, the underground fuel hydrant system, and the Base Exchange service station located in the eastern portion of the base to identify and, if necessary, characterize the contamination. Currently awaiting groundwater sampling results.	2
AF Plant #4	TCE Groundwater Contamination	A TCE groundwater contamination plume in the southeast corner of AF Plant #4 extends northeasterly and southeasterly into Carswell AFB. A multi-phase plan has been initiated to install an emergency remediation system as well as provide further site characterization for final remediation in 1992. An emergency groundwater pump and treatment system and soil vapor extraction system are in operation.	NA

AF = Air Force.
NA = Not applicable.
SWMU = solid waste management unit.
TCE = trichloroethylene.



EXPLANATION

- IRP Site
- Probable TCE Groundwater Contamination Plume-5 ppb level-upper aquifer (plume boundary not fully characterized)
- EOD and Firing Range
- Carswell AFB Boundary
- Air Force Plant #4 Boundary
- Leased Property

0 650 1300 2600 Feet

Notes: Figure represents known conditions as of June 1993. Figure does not show all SWMUs identified during 1989 RFA.

Installation Restoration Program Sites, EOD and Firing Ranges

Figure 3.3-2

Additional assessments identified groundwater contaminated with JP-4 as a result of a leak in the underground flightline hydrant system located in the central flightline area. A waste oil dump site near Building 1414 has also been identified. These spill areas are designated as IRP sites OT-18 and DP-17, respectively, and are further discussed in Table 3.3-2.

In 1992, the base added the East Area Groundwater Site by implementing a monitoring program to identify and characterize groundwater contamination associated with the BX service station (ST-16), the POL tank farm (ST-14), and the fuel hydrant system (OT-18). The monitoring program is also used to better characterize the AF Plant #4 TCE contamination at the golf course.

No Further Actions for sites FT-08 and OT-12 have been approved by the state under RCRA authority. Sites LF-02, LF-03, WP-11, and OT-15 (Waste Disposal Site) were recommended for No Further Action following the 1989 RFA and are awaiting approval from the state. No Further Action for site LF-01 is awaiting approval pending the results of an additional round of sampling. Removal of contaminated soils at sites FT-09 and SD-10 are on-going, a risk assessment at site FT-09 is scheduled for 1994. Interim soil removal actions for sites LF-04, LF-05, and LF-06 are scheduled for 1995. Sites WP-07 and ST-14 underwent interim RAs in 1991. The interim RA for ST-14 was deactivated in 1993 and an RA is underway. A risk assessment for WP-07 is programmed for 1995. The low-level radioactive waste site (OT-15) is programmed to undergo an interim RA in 1994. Site SD-13 is presently undergoing an RFI. The remaining sites are undergoing RI/FSs, ST-16, DP-17, OT-18, and the East Area Groundwater Site.

Operable units, which group IRP sites by geographic extent and type of contamination, were established at Carswell AFB to more effectively manage remediation efforts. Table 3.3-2 identifies the operable units associated with Carswell AFB IRP sites that are recommended for further remediation action.

AF Plant #4. A TCE-contaminated groundwater plume, detected in the southeast corner of AF Plant #4, extends to the northeast and southeast onto Carswell AFB (see Figure 3.3-2). The TCE Groundwater Contamination may be comingled with the groundwater contamination associated with Carswell IRP sites LF-04, LF-05, LF-07, and WP-07 west of the golf course. With the combined contamination, the Partnering Agreement transfers remediation responsibility of the groundwater contamination associated with the TCE plume to the AF Plant #4 IRP and remediation of the surface sites to the Carswell AFB IRP. The multi-phase remediation plan called for emergency remediation by installing a groundwater pump and treat system, while conducting source remediation and further site characterization. The additional site investigations will support a final remediation effort. A pump and treat system was constructed on Carswell AFB adjacent to White Settlement Road and is currently in operation. The treated outfall is

discharged to the sanitary sewer. Additional pump and treat systems and a soil vapor extraction system at AF Plant #4 became operational at the end of 1993.

Prior to the transfer of any property at Carswell AFB, the Air Force must also comply with the provisions of CERCLA §120(h). CERCLA §120(h) requires that before property can be transferred from federal ownership, the United States must provide notice of specific hazardous substance activities and conditions on the property and, when there have been any such hazardous substance activities, include in the deed a covenant warranting that all remedial action necessary to protect human health and the environment, with respect to any hazardous substance remaining on the property has been taken before the date of such transfer. Furthermore, for all government property transfers by deed, a covenant must also warrant that any additional remedial action found to be necessary after the date of such transfer shall be conducted by the United States.

The Air Force must complete the IRP for the contaminated sites on Carswell AFB and provide the assurances required by CERCLA §120(h) for all properties transferred. The combination of these requirements may delay parcel disposition or conveyance and affect reuse.

The Air Force is committed to the identification, assessment, and remediation of the contamination from hazardous substances at Carswell AFB and AF Plant #4. This commitment will assure the protection of public health as well as restoration of the environment. Additionally, the Air Force will aggressively work with the regulatory community to ensure that parcel disposition or conveyance occurs at the earliest reasonable date so as not to impede the economic redevelopment of the area through reuse of Carswell AFB. Quantification of those delays, based on the conceptual plans for all redevelopment alternatives and what is currently known at this stage of the IRP, is not possible.

Closure Baseline. The closure of Carswell AFB has not affected the ongoing IRP activity. These IRP activities will continue in accordance with U.S. EPA, state, and local regulatory agency regulations to protect human health and the environment, regardless of the alternative chosen for reuse. The Partnering Agreement, DSMOA, FFA, and the RCRA Part B permit will continue to assure that respective parties are involved in IRP activities at Carswell AFB and AF Plant #4.

IRP remedial activities will continue well past the September 1993 closure date for Carswell AFB. The OL will oversee the coordination of the remediation contractors and assure that U.S. EPA, TNRCC, and local regulatory agency concerns are addressed. The Air Force will retain necessary interests (i.e., easements) in order to perform operations and maintenance on all remediation systems.

3.3.4 Storage Tanks

Underground storage tanks (USTs) are subject to federal regulations within RCRA, 42 U.S.C. 6991, and U.S. EPA implementing regulations 40 CFR 280. In addition, some storage tanks may be regulated under 40 CFR 60.110b. These regulations were mandated by the Hazardous and Solid Waste Amendments of 1984. The state regulates both underground and aboveground storage tanks under TAC Title 31 Chapter 334 et seq.; these regulations are enforced by the TNRCC. Additionally, the TNRCC regulates storage tanks that are considered a stationary source of volatile organic compounds (VOCs) under 31 TAC 115.112.

Preclosure Reference. The Underground Storage Tank Management Plan for Carswell AFB outlined the activities necessary to effectively maintain and manage USTs in an environmentally safe and responsible manner (U.S. Air Force, 1990a). The plan discussed regulatory requirements, organizational responsibilities, and leak detection requirements. Tanks exempt from regulations are those with 1,100 gallons or less capacity or those that store heating oil for use on the premises (Table 3.3-3).

The largest aboveground storage tanks on base are located in the POL storage areas between Haile Drive and Knights Lake Road. Three tanks were utilized for storage of JP-4 and have a combined capacity of 6.6 million gallons; the tanks supply 24 USTs, which feed the underground fuel hydrant system (Table 3.3-4). These tanks were maintained by the Fuels Management Squadron, and were supplied by a 12-mile pipeline that originates in Aledo and is operated by Pride Oil Company.

Oil/water separators at Carswell AFB ranged in size from 115 to 18,500 gallons and were located throughout the industrial areas of the base (Table 3.3-5).

Closure Baseline. At the time of base closure, 56 regulated USTs, 15 nonregulated heating oil USTs (see Table 3.3-3), and 29 aboveground storage tanks (see Table 3.3-4) were active at Carswell AFB. There are 17 USTs and nine aboveground storage tanks remaining in service to support the continuing operations associated with the 301st FW. The main POL storage facility also remains in use. Since the flightline area utilized by the 301st FW has no underground fuel hydrant system, fuel trucks transport JP-4 from the existing POL storage facility to the flightline. Operations associated with the 301st FW utilize six existing oil/water separators (see Table 3.3-5). The remaining oil/water separators were pumped and cleaned of contaminants.

No storage tanks at Carswell AFB were utilized by AF Plant #4 or the WHCA. All remaining USTs not in compliance with applicable regulations are scheduled to be deactivated and removed. All remaining USTs that meet

Table 3.3-3. Inventory of Active Underground Storage Tanks
Page 1 of 2

Facility No.	Capacity (Gallons)	Contents	Installation Date	Construction Materials
1015[a,b]	3,000	JP-4	1967	Coal Tar Steel
1040[a,b]	400	Diesel	1955	Coal Tar Steel
1050[a]	15,000	Fuel Oil	1982	Coal Tar Steel
1064[a]	10,000	Gasoline	1988	Coal Tar Steel
1064[a,b]	10,000	Gasoline	1988	Coal Tar Steel
1064[a,b]	10,000	Diesel	1988	Coal Tar Steel
1064[a,b]	10,000	Diesel	1988	Coal Tar Steel
1170[a,b]	2,000	JP-4	1961	Unknown
1170[a,b]	2,000	JP-4	1961	Unknown
1191[b]	500	Waste Oil	1983	Coal Tar Steel
1194[a,b]	2,000	Waste Oil	1983	Coal Tar Steel
1411[a,b]	2,000	Gasoline	1963	Coal Tar Steel
1411[a,b]	2,000	JP-4	1963	Coal Tar Steel
1411[a,b]	2,000	Diesel Fuel	1963	Coal Tar Steel
1420[b]	2,000	Waste Oil Slop	1985	Fiberglass
1423[b]	500	Waste Oil Slop	1976	Fiberglass
1425[a,b]	1,000	Diesel	1955	Coal Tar Steel
1427[a]	1,000	Diesel	1976	Coal Tar Steel
1518	600	Waste Oil (Empty)	1970	Unknown
1643[b]	8,500	Fuel Oil	1982	Coal Tar Steel
1750[a]	8,000	Diesel	1986	Fiberglass (Coated Steel)
1750[a]	20,000	Diesel (Empty)	1957	Coal Tar Steel
3000[a]	15,000	Diesel	1985	Fiberglass Coated Steel
3000[a]	15,000	Diesel	1985	Fiberglass Coated Steel
3001	20,000	Fuel Oil	1959	Coal Tar Steel
3001	20,000	Fuel Oil	1959	Coal Tar Steel
3001[a]	10,000	Diesel	1958	Fiberglass Coated Steel
3190	2,000	Fuel Oil	1980	Fiberglass Coated Steel
3359[a,b]	2,000	Diesel	1979	Coal Tar Steel
3360[a,b]	5,000	Diesel	1978	Coal Tar Steel
4102[a]	315	Diesel (Empty)	1980	Coal Tar Steel
4102	100	Fuel Oil	1980	Coal Tar Steel
4111[a]	500	Diesel	1979	Coal Tar Steel
4127[a]	500	Diesel	1959	Steel
4136	300	Diesel	1991	Fiberglass Coated Steel
4141[a]	250	Diesel	1959	Coal Tar Steel
4143[a]	500	Diesel	1964	Coal Tar Steel

Notes: Data current as of September 1993.
(a) Regulated by TNRCC.
(b) To remain in service at base closure for DOD use.
DOD = Department of Defense.
JP = jet fuel.
TNRCC = Texas Natural Resources Conservation Commission.

Table 3.3-3. Inventory of Active Underground Storage Tanks
Page 2 of 2

Facility No.	Capacity (Gallons)	Contents	Installation Date	Construction Materials
4145[a]	500	Diesel	1981	Coal Tar Steel
4150[a]	25,000	JP-4 (Empty)	1951	Coal Tar Steel
4150[a]	25,000	JP-4 (Empty)	1951	Coal Tar Steel
4150[a]	25,000	JP-4 (Empty)	1951	Coal Tar Steel
4150[a]	25,000	JP-4 (Empty)	1951	Coal Tar Steel
4150[a]	25,000	JP-4 (Empty)	1951	Coal Tar Steel
4150[a]	25,000	JP-4 (Empty)	1951	Coal Tar Steel
4152[a]	25,000	JP-4 (Empty)	1951	Coal Tar Steel
4152[a]	25,000	JP-4 (Empty)	1951	Coal Tar Steel
4152[a]	25,000	JP-4 (Empty)	1951	Coal Tar Steel
4152[a]	25,000	JP-4 (Empty)	1951	Coal Tar Steel
4152[a]	25,000	JP-4 (Empty)	1951	Coal Tar Steel
4152[a]	25,000	JP-4 (Empty)	1951	Coal Tar Steel
4153[a]	25,000	JP-4 (Empty)	1953	Coal Tar Steel
4153[a]	25,000	JP-4 (Empty)	1951	Coal Tar Steel
4153[a]	25,000	JP-4 (Empty)	1951	Coal Tar Steel
4153[a]	25,000	JP-4 (Empty)	1951	Coal Tar Steel
4153[a]	25,000	JP-4 (Empty)	1951	Coal Tar Steel
4153[a]	25,000	JP-4 (Empty)	1951	Coal Tar Steel
4154[a]	25,000	JP-4 (Empty)	1951	Coal Tar Steel
4154[a]	25,000	JP-4 (Empty)	1951	Coal Tar Steel
4154[a]	25,000	JP-4 (Empty)	1951	Coal Tar Steel
4154[a]	25,000	JP-4 (Empty)	1951	Coal Tar Steel
4154[a]	25,000	JP-4 (Empty)	1951	Coal Tar Steel
4154[a]	25,000	JP-4 (Empty)	1951	Coal Tar Steel
4155[a]	1,000	Diesel	1955	Coal Tar Steel
4171[a]	5,000	Diesel	1976	Coal Tar Steel
4205	550	Waste Oil	1985	Fiberglass
4210	1,000	Waste Oil (Empty)	1985	Fiberglass Coated Steel
4210[a]	2,000	Waste Oil (Empty)	1985	Fiberglass Coated Steel
4210	6,000	Fuel Oil	1985	Fiberglass Coated Steel
4215	2,000	Fuel Oil	1985	Fiberglass Coated Steel
4216[a]	5,000	Diesel	1983	Fiberglass Coated Steel
8514	1,000	Fuel Oil	1957	Steel

Notes: Data current as of September 1993.
(a) Regulated by TNRCC
(b) To remain in service at base closure for DOD use.
DOD = Department of Defense.
JP = jet fuel.
TNRCC = Texas Natural Resources Conservation Commission.

Table 3.3-4. Inventory of Aboveground Tanks

Facility No.	Capacity (Gallons)	Contents
1000	275	Diesel
1002[a]	150,000	Water (Fire Protection)
1039[a]	500,000	Water (Fire Protection)
1050	55	Diesel
1062[b]	25	Diesel
1156[a,b]	840,000	JP-4
1157[a,b]	840,000	JP-4
1159[a,b]	4,920,000	JP-4
1215[b]	25	Diesel
1258[a]	5,000	Gasoline
1259[a]	11,000	Gasoline
1261[a]	11,000	Gasoline
1263[a]	11,000	Diesel
1264[a]	12,000	Gasoline
1265[a]	11,000	Gasoline
1418[b]	50	Diesel
1423[b]	100	Diesel
1504	25	Diesel
1510	275	Diesel
1658	55	Diesel
1720[b]	300	Diesel
1730[b]	275	Diesel
1765	25	Diesel
4150	275	Diesel
4152	275	Diesel
4153	275	Diesel
4154	275	Diesel
4155	275	Diesel
4175	275	Diesel

Notes: Data current as of September 1993.
(a) Regulated by TNRCC.
(b) To remain in service at base closure for DOD use.
DOD = Department of Defense.
JP = jet fuel.
TNRCC = Texas Natural Resources Conservation Commission.

applicable regulations may be left in place to support reuse activities. The underground fuel hydrant system is scheduled to undergo closure in 1994. All unused aboveground storage tanks are purged to minimize fire hazards at base closure. Oil/water separators not retained for DOD use were closed in

Table 3.3-5. Inventory of Oil/Water Separators at Carswell AFB

Location	Description	Capacity (Gallons)
38	Industrial Waste Treatment and Disposal	1,000
1015	Engine Test Cell	1,068
1027	Corrosion Control	879
1060	Aircraft Maintenance	115
1064	Service Station	18,524
1145	Auto Hobby Shop	500
1190	Aircraft Maintenance	5,285
1191	Vehicle Maintenance	550
1194	Refueling Vehicle Maintenance	375
1320	Power Production	400
1414	Aircraft Maintenance	1,000
1423[a]	Air Freight Terminal	3,503
1602[a]	AGE Shop	18,524
1628[a]	Inspection Shop	5,113
1643[a]	Aircraft Maintenance	12,730
1643[a]	Aircraft Maintenance	12,730
1656[a]	Maintenance Dock	18,524
4210	Munitions Maintenance	7,920

Notes: Data current as of September 1993.
(a) To remain in service at base closure for DOD use.
AGE = aerospace ground equipment.
DOD = Department of Defense.

accordance with closure plans submitted to the state under the RCRA Part B permit.

3.3.5 Asbestos

ACM remediation is regulated by the U.S. EPA and the Occupational Safety and Health Administration (OSHA). Asbestos fiber emissions into the ambient air are regulated in accordance with Section 112 of the Clean Air Act (CAA), which established the National Emissions Standards for Hazardous Air Pollutants (NESHAP). The NESHAP regulations address the demolition or renovation of buildings with ACM. The Toxic Substances Control Act (TSCA) 15 U.S.C. §§2601 et seq., and the Asbestos Hazard Emergency Response Act (AHERA) P.L. 99-519 and P.L. 101-637 provide the regulatory basis for handling ACM in kindergarten through 12th grade school buildings. AHERA and OSHA regulations cover worker protection for employees who work around or remediate ACM.

Renovation or demolition of buildings with ACM has a potential for releasing asbestos fibers into the air. Asbestos fibers could be released due to disturbance or damage from various building materials, such as pipe and boiler insulation, acoustical ceilings, sprayed-on fireproofing, and other material used for soundproofing or insulation.

There are two primary categories that describe ACM: Friable ACM is defined as any material containing more than 1 percent asbestos (as determined using the method specified in Appendix A, Subpart F, 40 CFR 763, Section 1, polarized light microscopy) that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. Non-friable ACMs are those materials that contain more than 1 percent asbestos, but do not meet the rest of the criteria for friable ACM.

Preclosure Reference. The current Air Force practice is to manage or remove ACM in active facilities, and remove ACM following regulatory requirements prior to facility demolition. Removal of ACM occurs when there is a potential for asbestos fiber release that would affect the environment or human health. The Air Force policy concerning the management of asbestos for base closures can be found in Appendix G.

The basewide survey for ACM was conducted in late 1992. Final results were published in spring 1993 and are summarized in Appendix G.

During normal base operations, friable asbestos was removed or remediated, as necessary, to protect human health. The Carswell AFB Asbestos Management Plan (AMP) was designed to establish management and organizational responsibilities and procedures for ensuring that personnel are not exposed to excessive levels of airborne asbestos. The Asbestos Operational Plan was developed to implement the policies established in the AMP (U.S. Air Force, 1992a). The development and implementation of these plans was the responsibility of the Environmental Management Flight. Bioenvironmental Engineering provided support on site surveys, bulk sampling, and monitoring in-house removal projects performed by both the on-base asbestos team and outside contractors.

Closure Baseline. An analysis will be conducted to determine the cost effectiveness of removing ACM versus considering the impacts of ACM on the market value of the property when sale of the property is planned. ACM will be removed if a building is, or is intended to be, used as a school or child care facility. Exposed friable asbestos will be removed or remediated in accordance with Air Force policy (Appendix G) and applicable health laws, regulations, and standards.

3.3.6 Pesticide Usage

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) 7 U.S.C. §§136-136y regulates the registration and use of pesticides. Pesticide management activities are subject to federal regulations contained in 40 CFR 162, 165, 166, 170, and 171.

All pest management activities at Carswell AFB were conducted in accordance with Air Force regulations and management recommendations, which follow FIFRA regulations.

Preclosure Reference. The Pest Management Program at Carswell AFB was the responsibility of the Base Entomologist. Golf course maintenance was the responsibility of the Morale, Welfare, and Recreation Office. Two contractors utilized pesticides on base; one provided daily ground maintenance services, while the other provided bimonthly pest control services for the hospital. Applications of pesticide for the previously mentioned activities were supervised by certified applicators, and were frequently inspected by Bioenvironmental Engineering and Environmental Health Offices. Table 3.3-6 provides an inventory of pesticides commonly used by Carswell AFB personnel during normal base operations. Many pesticides were purchased on an as-needed basis, and were directly obtained from local merchants or procured through base supply. Pesticides used on Carswell AFB were stored in three locations: the Entomology Shop (Building 1213), the golf course maintenance area (Building 1339), and the Pavement and Grounds Facility (Building 234).

Closure Baseline. At the time of closure, pesticides were used by pest management and grounds maintenance services by the OL and by grounds maintenance personnel associated with the golf course under a lease agreement. Pest management and grounds maintenance for the 301st FW, AF Plant #4, and the WHCA is provided by the OL contractors.

3.3.7 Polychlorinated Biphenyls

Commercial PCBs are industrial compounds produced by chlorination of biphenyls. PCBs are used in electrical equipment, primarily in capacitors and transformers, because they are electrically nonconductive and stable at high temperatures. PCBs persist in the environment, accumulate in organisms, and concentrate in the food chain.

The disposal of these compounds is regulated under TSCA, 15 U.S.C. §§2601-2671, which banned the manufacture and distribution of PCBs, with the exception of PCBs used in enclosed systems. By federal definition, PCB equipment contains 500 parts per million (ppm) PCBs or more, whereas PCB-contaminated equipment contains PCB concentrations of 50 ppm or

Table 3.3-6. Pesticide Storage (Pest Management, Grounds Management, and Golf Course Management)
Page 1 of 2

Name	Quantity	Location
Insecticides		
B-1 Insect Spray	8 gallons	1213
Baygon, PT-250	60-28 oz. cans	1213
BP-300 Pyrethrum	1 gallon	1213
Carbamate 1.5 EC	7 gallons	1213
Combat	5 pounds	1213
DEET Repellent	288 fluid ounces	1213
D Phenothrin 2%	240 - 12 oz. cans	1213
Dursban, Pt 270	6-30 oz. cans	1213
Dursban, Pt 270	3-15 lb cylinders	1213
Dursban, 4 E	7 gallons	1213
Dursban, 10 CR	20 pounds	1213
FICAM 2.5 G	16 pounds	1213
FICAM W	5 pounds	1213
FLYTEK, FLYBAIT	30 pounds	1213
Fumitoxic	5 pounds	1213
FVS Insect Fogger	60 - 6 oz. cans	1213
Gencor 9%	90 fluid ounces	1213
Logic	75 pounds	1213
Malathion ULV	35 gallons	1213
Orthene	8 gallons	1213
Orthene T&T	32 pounds	1213
Perma Dust PT-240	87 - 20 oz. cans	1213
Plus Pyrethrum, PT-565	33 - 23 oz. cans	1213
Precor 5E	29 fluid ounces	1213
Pyrenone	25 pounds	1213
Safrotin EC	2.25 gallons	1213
Sevin 80S	70 pounds	1213
Tempo 20 W	30 pounds	1213
Tribute	18 gallons	1213
Wasp Freeze	21 - 14 oz. cans	1213
Herbicides		
Arsenal	22 fluid ounces	1339
Bueno 6	12.5 gallons	1339
Diquat	2.25 gallons	1339

Note: Data represents preclosure conditions in June 1992.

Table 3.3-6. Pesticide Storage (Pest Management, Grounds Management, and Golf Course Management)
Page 2 of 2

Name	Quantity	Location
Herbicides (continued)		
Embark	0.25 gallons	1339
Fusilade 2000	118 fluid ounces	1339
Grozyme	2 gallons	234
MSMA	12 gallons	234
Rodeo	3 gallons	1339
Round-up (concentrate)	40 gallons	234/1213/1339
Round-up (ready-use)	5 gallons	1213
Sencor	2 pounds	234
Surflan	24 gallons	1213/1339
Trimec Classic	62 gallons	234/1213/1339
Trimec Southern	2 gallons	1213
Fungicides		
Chipco 26019	7 gallons	234
FORE	56 pounds	234
Rodenticides		
MAKI	33 pounds	1213
PIVAL	5 pounds	1213
Avicides		
Roost No More	20 gallons	1213

Note: Data represents preclosure conditions in June 1992.

greater, but less than 500 ppm. The U.S. EPA, under TSCA, regulates the removal and disposal of all sources of PCBs containing 50 ppm or more; the regulations are more stringent for PCB equipment than for PCB-contaminated equipment.

Preclosure Reference. The Bioenvironmental Engineering Office at Carswell AFB tested all transformers and capacitors on base to determine PCB content. Equipment with PCB concentrations of 50 ppm or greater were removed or retrofilled prior to base closure, with the exception of eight capacitors located at Building 4155. The eight capacitors are enclosed systems and are in compliance under TSCA. Additionally, the capacitors were labeled and the building secured by base personnel. A transformer was retrofilled and placed in service immediately prior to base closure. To

ensure a successful retrofill to levels below 50 ppm PCBs, additional samplings are conducted following 90 days of service.

Closure Baseline. Except for the eight capacitors located in Building 4155 and the transformer requiring additional sampling, no federally regulated PCB equipment or PCB-contaminated equipment under control of the Air Force were left on base at the time of base closure.

3.3.8 Radon

Radon is a naturally occurring, colorless, and odorless radioactive gas that is produced by radioactive decay of naturally occurring uranium. Uranium decays to radium, of which radon gas is a by-product. Radon is found in high concentration in rocks containing uranium, such as granite, shale, phosphate, and pitchblende. Atmospheric radon is diluted to insignificant concentrations. Radon that is present in soil, however, can enter a building through small spaces and openings, accumulating in enclosed areas, such as basements. The cancer risk caused by exposure, through the inhalation of radon, is currently a topic of concern.

There are no federal or state standards regulating radon exposure at the present time. The U.S. EPA offers a pamphlet, "A Citizen's Guide to Radon" (U.S. EPA, 1992), which offers advice to persons concerned with radon in their homes. Air Force policy requires implementation of the Air Force Radon Assessment and Mitigation Program to determine levels of radon exposure of military personnel and their dependents. The U.S. EPA has made testing recommendations for both residential structures and schools. For residential structures, using a 2- to 7-day charcoal canister test, a level between 4 and 20 picocuries per liter (pCi/l) should lead to additional screening within a few years. For levels of 20 to 200 pCi/l, additional confirmation sampling should be accomplished within a few months. If the level is in excess of 200 pCi/l, the structure should be evacuated immediately. Schools are to use a 2-day charcoal canister test; if readings are 4 to 20 pCi/l, a 9-month school year survey is required. Table 3.3-7 summarizes the recommended radon surveys and action levels.

Preclosure Reference. Air Force policy requires a detailed radon assessment program for levels of 4 pCi/l or greater. The initial screening for radon at Carswell AFB was performed in March 1989 by the base Bioenvironmental Engineering Office. Samples were taken from a number of military family housing units, the child care center, on-base billeting, and the airman's dormitories. Two of the 33 samples taken were above the U.S. EPA's recommended mitigation level of 4 pCi/l. Having exceeded this level, an additional screening was conducted for on-base living quarters in 1991. Twenty-five samples of the 644 taken during the second screening registered above the recommended mitigation level.

Table 3.3-7. Recommended Radon Surveys and Mitigations

Facility	U.S. EPA Action Level	Recommendation
Residential	4 to 20 pCi/l	Additional screening. Expose detector for 1 year. Reduce radon levels within 3 years if confirmed high readings exist.
Residential	20 to 200 pCi/l	Perform follow-up measurements. Expose detectors for no more than 6 months.
Residential	Above 200 pCi/l	Follow-up measurements. Expose detectors for no more than 1 week. Immediately reduce radon levels.
	Two-Day Weekend Measurement	
School	4 to 20 pCi/l	Confirmatory 9-month survey. Alpha track or ion chamber survey.
School	Greater than 20 pCi/l	Diagnostic survey or mitigation.

Note: Congress has set a national goal for indoor radon concentration equal to the outdoor ambient levels of 0.2 to 0.7 pCi/l.
EPA = Environmental Protection Agency.
pCi/l = picocuries per liter.

Closure Baseline. None of the facilities that registered radon levels above 4 pCi/l were occupied at closure. An analysis may be performed to evaluate the impacts of radon on the market value of the property when conveyance of the property is planned.

3.3.9 *Medical/Biohazardous Waste*

Current federal regulations do not provide for regulation of medical wastes, but do allow for states to individually regulate medical wastes. The state of Texas regulates medical waste under TAC Title 25, Chapter 325, Subchapter Y - Medical Waste Management. Nuclear medical materials are regulated under the Air Force Radioisotope Committee and the Nuclear Regulatory Commission regulations.

Preclosure Reference. Carswell AFB operated the Robert L. Thompson Regional Hospital, a 140-bed hospital offering a number of services to both active and retired military personnel and their dependents. These services included general surgery, maternity, radiology, and pharmacy.

A dental clinic, a Civilian Health and Medical Program of the Uniformed Services (CHAMPUS) outpatient clinic, and a full-time veterinary clinic were also in operation at Carswell AFB. Approximately 14,400 pounds of medical waste was generated annually by the hospital and the previously mentioned

on-base clinics. Prior to 1991, all medical waste was destroyed using an on-base incinerator; the ash was then disposed as municipal refuse. Beginning in 1991, the medical waste generated at Carswell AFB was picked up twice weekly and disposed off base at a permitted facility in accordance with state regulations. The amount of medical waste declined with the approach of base closure as services were phased out.

The hospital also dispensed oral doses of chemotherapeutic drugs and engaged in radiation treatment. The radioactive materials utilized for these procedures and all remaining residues were supplied and disposed of by a single pharmaceutical company. Minute amounts of residue remaining after treatment were diluted and disposed of through the sanitary sewer.

Medical and dental X-ray operations, as well as photographic operations, produced photochemical wastes and utilized silver recovery units. The silver recovered from these units was sent to DRMO for disposal, while the remaining solution was randomly sampled by Bioenvironmental Engineering prior to discharge to the sanitary sewer.

Closure Baseline. The hospital was inactive and no medical waste was generated at base closure. Existing medical waste was processed and removed within 6 months after closure in accordance with appropriate federal, state, and local regulations.

3.3.10 Ordnance

Three WSAs were utilized by the base. The Off-Site WSA is located 5 miles west of the main base and consists of 11 concrete storage igloos and numerous munitions maintenance facilities. A second WSA is located on the north end of the base near Lake Worth and consists of 16 storage igloos and support facilities. The Air Launch Cruise Missile (ALCM) Storage Area is located in the central flightline area. The facility consists of 25 concrete storage igloos, a 68,000 square foot missile assembly building (Building 4210), and additional support facilities.

Carswell AFB operated an explosive ordnance disposal (D) proficiency range since the late 1950s. The D range is located near the southern edge and used on the west end of the Off-Site WSA (see Figure 3.3-2). The range consists of a large grass field with an earthen berm located for protection of personnel.

Two small arms firing ranges (Buildings 1340 and 1341) are located near the confluence of the Trinity River and Farmers Branch Creek (see Figure 3.3-2). The outdoor firing range consists of three earthen berms forming an open rectangle; several wooden baffles dissect the range. The second facility is an indoor range approximately 3,800 square feet in size.

Any ordnance remaining after disposal will be regulated under RCRA; the transportation of any ordnance falls within U.S. DOT regulations.

Preclosure Reference. All WSAs associated with Carswell AFB were used by the 7th Bomb Wing and tenants. The D range was utilized on an irregular basis as a training area for the base D team. Training exercises simulated the placement of an explosive charge on a piece of ordnance (coffee cans were used as practice ordnance). Approximately 1 pound of explosive was used per practice charge.

The small arms firing ranges were utilized on a regular basis to qualify both military and local law enforcement agency personnel in small arms proficiency.

Closure Baseline. All ordnance was removed from the Off-Site WSA and the ALCM Storage Area, located in the central flightline area. The northern WSA is utilized to support 301st FW operations. The EOD range will be cleared of all unexploded ordnance prior to disposal of that parcel. Soil testing for contamination will also be conducted.

The firing ranges remain in operation for use by the 301st FW military and local law enforcement personnel.

3.3.11 Lead-Based Paint

Human exposure to lead has been determined to be an adverse health risk by agencies, such as OSHA and U.S. EPA. Sources of exposure to lead are through dust, soils, and paint. Waste containing levels of lead exceeding a maximum concentration of 5.0 milligrams per liter, as determined using the U.S. EPA Toxic Characteristic Leaching Procedure, which simulates the leaching behavior of landfill wastes, are defined as hazardous under 40 CFR 261 and 31 TAC 335. If a waste is classified as hazardous, disposal must take place in accordance with U.S. EPA and state hazardous wastes rules.

In 1973, the Consumer Product Safety Commission (CPSC) established a maximum lead content in paint of 0.5 percent by weight in a dry film of newly applied paint; in 1978, under the Consumer Product Safety Act P.L. 101-608, as implemented by 16 CFR 1303, the CPSC lowered the allowable lead level in paint to 0.06 percent. The act also restricted the use of lead-based paints in nonindustrial facilities. In 1989, the U.S. EPA established a cleanup criterion for lead in soil of 500 to 1,000 ppm total lead when the possibility of child contact exists. Specific cleanup levels are based on the characteristics of individual sites. The Lead-Based Paint Poisoning Prevention Act (LBPPPA), 42 U.S.C. 4821, et seq., as amended by the Residential Lead-Based Paint Hazard Reduction Act of 1992, requires that lead-based paint hazards in federal housing facilities be identified and eliminated. In 1993, the federal OSHA, under 29 CFR 1926, extended the

permissible exposure limit for general industrial workers of 50 micrograms per cubic meter ($\mu g/m^3$) of air to include workers in the construction field.

To ensure that any threat to human health and the environment from lead-based paints has been identified, Air Force policy requires that a lead-based paint survey of high-priority facilities be conducted at Carswell AFB. High-priority facilities consist of military family housing, transient lodging facilities, schools, and other facilities frequented by children, including day care facilities.

Preclosure Reference. No surveys had been conducted for lead-based paints at Carswell AFB prior to base closure.

Closure Baseline. A survey to assess the presence of lead-based paint at high-priority facilities or its associated soil contamination has been scheduled for 1994. The survey will be conducted in accordance with the Air Force policy for lead-based paint instructions for facilities at closing bases. Lead-based paints are assumed to be present in all facilities constructed prior to or during 1978.

3.4 NATURAL ENVIRONMENT

This section describes the affected environment for natural resources: geology and soils, water resources, air quality, noise, biological resources, and cultural resources.

3.4.1 Geology and Soils

Physiography, geology, natural hazards, mineral resources, and soils (primarily seismic potential) are addressed in this section. The ROI for geology and natural hazards includes the general tectonic framework that encompasses Tarrant County to provide context to specific issues at Carswell AFB. For mineral resources, the ROI includes the regional market for sand and gravel resources. The ROI for soils is localized and limited to Carswell AFB property.

3.4.1.1 Geology

Physiography

Carswell AFB is located in the Grand Prairie section of the Central Lowlands physiographic province of the Texas Coastal Plain (Hill, 1901). The base is underlain by alternating limestones and marls that produce a terrace topography. The Grand Prairie section typically is a broad, gently sloping terrace (Hargis & Associates, 1989). Elevations at the base range from 550 feet MSL in the east to 690 feet MSL in the southwest.

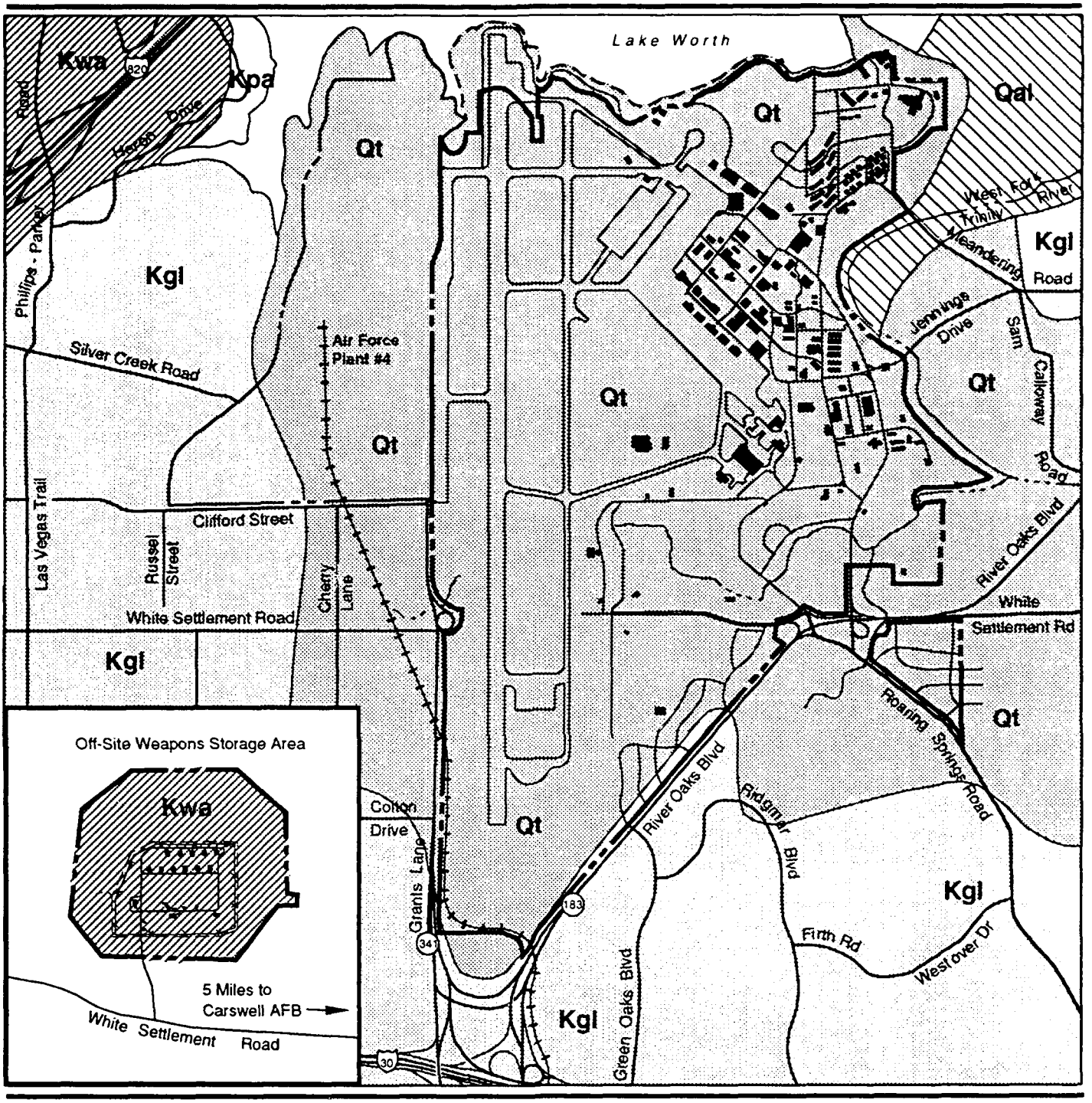
Geology

The surficial geology in the Carswell AFB vicinity is characterized by Lower Cretaceous sedimentary formations underlain by undifferentiated Paleozoic rocks. In river floodplains, the Cretaceous rocks are overlain by much younger alluvium and fluvial terrace deposits as shown in Figure 3.4-1 (Bureau of Economic Geology, 1987). Carswell AFB is underlain by seven geologic formations, from youngest to oldest (and in order of increasing depth): Quaternary alluvium and fluvial terraces, five lower Cretaceous formations (the Goodland Limestone, the Walnut Formation, Paluxy Formation, the Glen Rose Formation, and Twin Mountain Formation), and undifferentiated Paleozoic rocks (Leggat, 1957).

The Quaternary alluvial deposits and fluvial terrace deposits generally are unconsolidated and consist of poorly-sorted to well-sorted clay, silt, sand, and gravel. The alluvium at Carswell AFB was deposited by the Trinity River during flood stages over the past million years (Nordstrom, 1982).
The Goodland Limestone and the underlying Walnut Formation are part of the Fredericksburg Group. The Goodland Limestone consists of chalky, fossiliferous, nonresistant limestone. The Walnut Formation is characterized as fossiliferous limestone interbedded with brown sandy clay, thin-bedded fossiliferous clay, fissile shale, and iron-stained earthy limestone (Leggat, 1957). The Fredricksburg Group has a maximum thickness of 250 feet.

The Paluxy, Glen Rose, and Twin Mountains formations comprise the Trinity Group. The Paluxy Formation consists of fine- to coarse-grained white quartz sandstone interbedded with sandy to silty, calcareous, waxy claystone and shale (Nordstrom, 1982). This formation grades upward from coarse- to fine-grained sand with variable thicknesses of interbedded shale and clay. Typically, the sand is well sorted, poorly consolidated, and cross-bedded. The Paluxy Formation forms the bed of Lake Worth (Nordstrom, 1982). The Glen Rose Formation consists of limestone with some sand, clay, sandy clay, and anhydrite, while the Twin Mountains Formation grades upward from a basal conglomerate of chert and quartz to a fine- to coarse-grained sand interbedded with shale and clay (Leggat, 1957). These three formations have a maximum thickness of approximately 2,500 feet.

Undifferentiated Paleozoic rocks (Pennsylvanian and earlier), which underlie the Twin Mountains Formation, are not exposed in Tarrant County. The rocks consist of shales, limestones, and sandstones, which are tightly cemented (Leggat, 1957). The Paleozoic sequence is 6,000 to 7,000 feet thick.



EXPLANATION

- Qal — Quaternary Alluvium
- Qt — Fluvial Terrace Deposits
- Kgl — Goodland Limestone
- Kwa — Walnut Formation
- Kpa — Paluxy Formation

- Carswell AFB Boundary
- Air Force Plant #4 Boundary
- Leased Property

0 650 1300 2600 Feet

Source: Bureau of Economic Geology, 1987

Surface Geology

Figure 3.4-1

Natural Hazards

The structural geology underlying Carswell AFB is characterized by the relatively stable Texas Craton, which lies west of the faults associated with the Ouachita Structural Belt. Carswell AFB lies within Seismic Zone 0, as defined by the Uniform Building Code (International Conference of Building Officials, 1991). Seismic Zone 0 represents a minimal potential risk for damage caused from large seismic events. No major faults or fracture zones have been mapped near the base (Bureau of Economic Geology, 1987).

Because of the relatively flat terrain in the immediate vicinity of the base, the potential for landslides is minimal. The area is not susceptible to liquefaction.

Mineral Resources

Mineral resources at Carswell AFB include cement material, sand, and gravel resources. The Goodland Formation provides a relatively soft limestone that is suitable for cement manufacturing. The alluvium and related terrace deposits contain sand and gravel resources. Mineral resources at Carswell AFB are not unique to the area; several cement, limestone, and sand and gravel mining operations are located within 10 miles of Carswell AFB.

No energy resources, such as oil, gas, lignite, or coal, were identified in the vicinity of Carswell AFB. No uranium mines/leases, Known Geothermal Resource Areas, or critical and strategic metallic/nonmetallic mineral resource mining or leasing activities occur at or near the base (Bureau of Economic Geology, 1976).

3.4.1.2 Soils. Soils in the vicinity of Carswell AFB generally are either clayey soils on nearly level or gently sloping uplands, or are deep loamy soils on level to sloping stream terraces. The soils are moderately susceptible to erosion by wind and water (U.S. Department of Agriculture [USDA], 1981). The soils at Carswell AFB have a moderate to high shrink/swell potential, which is not well suited for the construction of buildings. However, limits on construction of buildings can be overcome by engineering practices, including stronger foundations in building construction. The soils on base have been described by the USDA Soil Conservation Service (SCS) as "urban land". Urban land consists of areas that are 85 to 100 percent built up with structures, such as office buildings, airfields, aviation support, multiple-unit dwellings, shopping centers, streets, sidewalks, and paved parking lots. The soils that make up urban land have been altered and obscured to the extent that they cannot be classified (USDA, 1981). The soils at the Off-Site WSA consist of gently sloping, very shallow to deep, loamy and clayey soils.

The USDA has determined that the Carswell AFB vicinity contains some prime farmland soils; however, because the base has been designated as

urban land, it is no longer considered as prime farmland. No unique farmland, important rangeland, or protected forest lands are present on Carswell AFB (Oneth, 1992).

The permeability of the soils at Carswell AFB is slow to moderately slow, which promotes rapid runoff of rain with little infiltration. Under these circumstances, surface spills would normally be transported downstream and into the surface drainage with each rainstorm.

There are several locations on Carswell AFB where soils are known to be contaminated. Each of these areas is under investigation under the IRP to determine the extent of contamination. Descriptions and locations of these areas are found in Section 3.3, Hazardous Materials and Hazardous Waste Management.

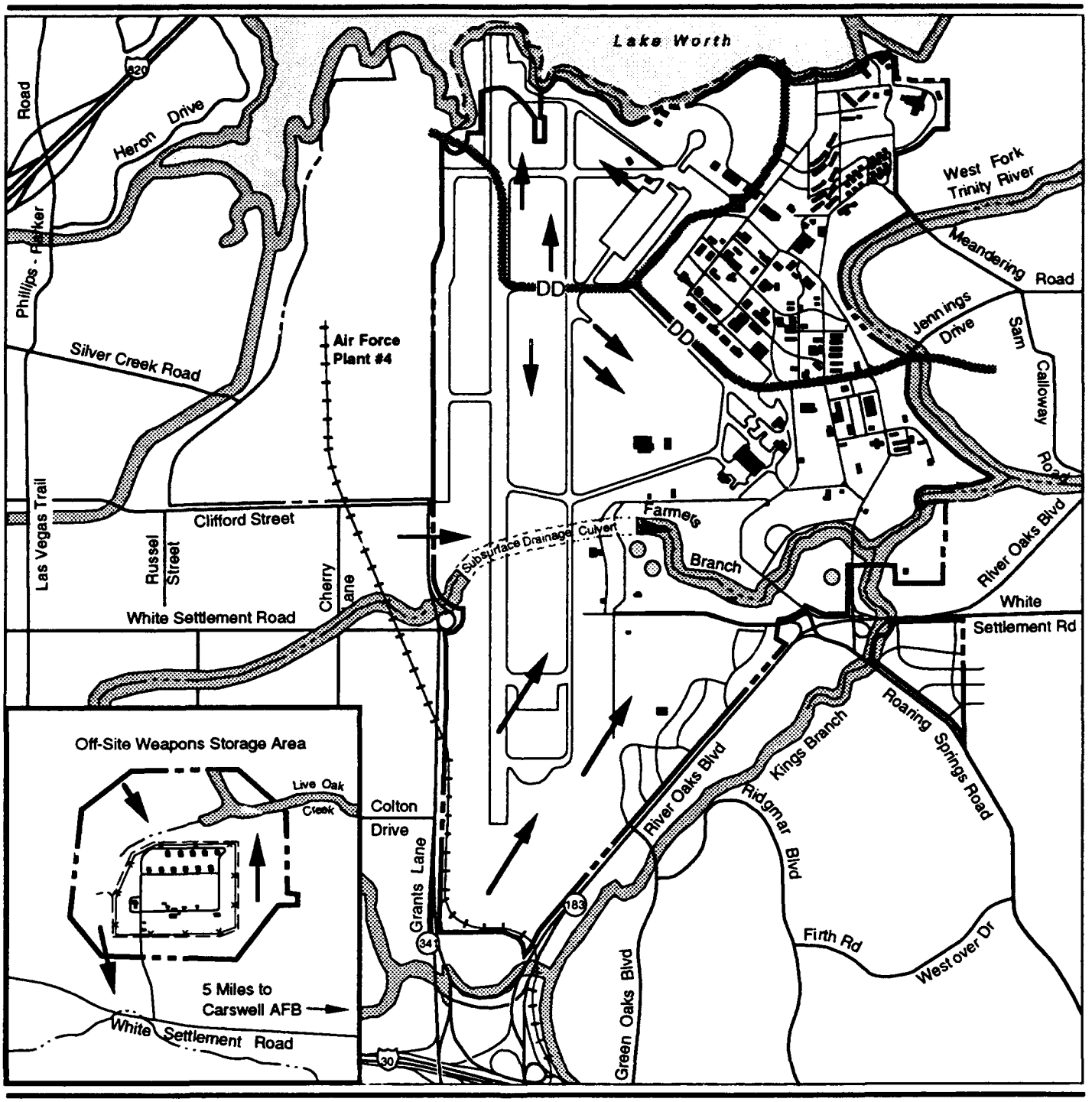
3.4.2 Water Resources

The ROI for surface water and groundwater extends beyond the base property to include the hydrologic conditions for water supply districts in the Carswell AFB vicinity. There are no coastal areas or wild and scenic rivers within the ROI.

3.4.2.1 Surface Water. Carswell AFB and all of Tarrant County are located within the Trinity River watershed. Surface water resources in the vicinity of the base include the West Fork, Farmers Branch Creek, and Kings Branch of the Trinity River, Lake Worth, three ponds located in the golf course area, and one small pond in the Off-Site WSA (Figure 3.4-2).

The amount of water the Trinity River receives is controlled by the watershed runoff from impervious areas during storms, by releases and overflows from the series of man-made reservoirs along the forks and tributaries by natural runoff, and by the discharge of effluent from sewage treatment plants. Lake Worth, a man-made reservoir on the West Fork of the Trinity River, is located north of Carswell AFB and is owned and operated by the city of Fort Worth. These waters are used for public water supply and recreation. Lake Worth covers an area of 3,558 acres and is 12 miles long. The lake has a conservation storage capacity of 38,130 acre-feet (or approximately 12.4 billion gallons) (NCTCOG, 1992a).

Surface water is the main source of water in the vicinity of Carswell AFB. The City of Fort Worth Water Department is the primary supplier to the areas surrounding and including the base. Water from the Farmers Branch Creek is used to irrigate the on-base golf course. White Settlement and Sansom Park obtain water from 12 and 9 groundwater wells, respectively; but when required, they purchase surface water from the city of Fort Worth to supplement their water supplies. Carswell AFB purchased 0.93 MGD, 0.77 MGD, and 0.76 MGD of water from Fort Worth in 1989, 1990, and



EXPLANATION

- 100-Year Floodplain
- Surface Drainage Direction
- DD Drainage Divide
- Creeks
- Ponds
- Carswell AFB Boundary
- Air Force Plant #4 Boundary
- Leased Property

0 650 1300 2600 Feet

Sources: CH_2M Hill, 1984, RDN, 1988, National Flood Insurance Program, 1981

Surface Hydrology and Drainage Patterns

Figure 3.4-2

1991, respectively. The availability of surface water was adequate at the time of closure.

The potential for contamination of surface water is present at several locations on Carswell AFB. Descriptions and locations of these areas are found in Section 3.3, Hazardous Materials and Hazardous Waste Management.

The potential for surface water migration of hazardous contaminants is considered high, primarily due to the proximity of identified sites to Farmers Branch Creek and Lake Worth (see Section 3.3). In addition, shallow groundwater carrying dissolved contaminants may discharge to these surface waters (CH_2M Hill, 1984).

Surface drainage at Carswell AFB is collected by the storm drainage system and routed into the sewer system, or as outfall into Lake Worth. An underground drainage culvert conducts surface runoff generated from areas west of the base eastward to Farmers Branch Creek. General drainage patterns are shown in Figure 3.4-2 and discussed in Section 3.4.2.2.

Portions of Carswell AFB lie within the 100-year floodplain, as shown in Figure 3.4-2. The areas within the floodplain occur along the peripheries of the West Fork of the Trinity River, Lake Worth, Farmers Branch Creek, the Off-Site WSA, and Kings Branch. Localized flooding occurs during heavy rainfall along the northern base perimeter and local depressions.

Surface Water Quality

The Trinity River drainage area has been identified by the Governor of Texas as the Dallas/Fort Worth designated area for water quality management planning. This action was taken pursuant to Section 208 of the federal CWA. In addition, the NCTCOG was formally designated as the "208" areawide water quality management planning agency. The NCTCOG is required to maintain a continuing areawide planning process and to develop annual water quality management plans that are tailored to the water resource needs of the area. The TNRCC is the state-level agency charged with the protection of Texas waters.

The NCTCOG has implemented the Continuous Automated Monitoring (CAM) System. Two monitoring stations are located along the West Fork of the Trinity River downstream from Carswell AFB. In 1992, results of analyses of water from the first CAM station downstream from the base showed that 100 percent of the samples were below the criteria value of 5.5 mg/l for dissolved oxygen, and that pH values range from 6.6 to 9.8 due to the presence of substantial attached algal communities (NCTCOG, 1992b). The U.S. EPA secondary drinking water standard for pH is a range from 6.5 to 8.5 (which is a guideline, not a requirement).

The waters of Lake Worth are moderately hard, and contain slightly elevated salt levels during the warm summer season. Historically, Lake Worth has experienced problems with high sediment loads. Lake Worth was included in the 1990 Nonpoint Source Report for having known problems with sedimentation from agricultural and vacant lands (NCTCOG, 1992a). The sedimentation problems have been reduced by using Eagle Mountain Lake as a sediment trap.

Storm water runoff from the base that is not routed to the base or city sewer system is discharged into Lake Worth. The outfall is permitted under the National Pollutant Discharge Elimination System (NPDES) and monitoring results document compliance with permit discharge limitations.

3.4.2.2 Wetlands. Wetlands are protected under federal regulations because of their ecologic value. Wetlands on base are discussed in Section 3.4.5.4, Sensitive Habitats.

3.4.2.3 Surface Drainage. General surface water and drainage patterns are shown in Figure 3.4-2. The on-base storm drain system consists of curb inlets, airfield drainage inlets, and pipes ranging in size from 15 to 60 inches (Pierce, Goodwin, Alexander, 1986b). Runoff from the northern portion of the base is directed into Lake Worth. Runoff water from the remaining portion of the base is conveyed in piping under Farmers Branch Creek and the West Fork of the Trinity River into the city of Fort Worth sewage system. As previously stated, the storm water discharges are permitted under the NPDES, and wastewater discharge into the city's sewage system is permitted by the Fort Worth Water Department.

3.4.2.4 Groundwater. Five major hydrogeologic units underlie Carswell AFB. From shallowest to deepest the units are (1) an Upper Zone of perched water in alluvial terrace deposits; (2) an aquitard of predominantly dry limestone of the Goodland, Limestone, and Walnut formations; (3) an aquifer in the Paluxy Formation; (4) an aquitard of relatively impermeable limestone in the Glen Rose Formation; and (5) a major sandstone aquifer in the Twin Mountains Formation.

The Upper Zone groundwater occurs within the alluvial deposits at Carswell AFB. The alluvium has a low permeability because of the large amounts of silt and clay. However, there are zones of greater permeability in the sands and gravels of former channel deposits that underlie the base.

Water from the alluvium close to the Trinity River is used for irrigation and residential use. It is not economical, however, to develop the groundwater because the water's distribution is limited and the water is vulnerable to surface and storm water pollution.

The groundwater in the alluvium is separated from the aquifers below by the low permeability limestones and shales of the Goodland, Limestone, and Walnut Formation. The aquitard consists of moist clay and shale layers interbedded with dry limestone beds. The formations are primarily dry, but small amounts of water were encountered during drilling, suggesting that groundwater may be moving through the Walnut Formation along bedding planes (Hargis & Associates, 1985). The Goodland/Walnut aquitard is approximately 30 to 40 feet thick beneath Carswell AFB (Hargis & Associates, 1989).

In the vicinity of Carswell AFB, water in the uppermost part of the Paluxy Formation would naturally occur under confined conditions beneath the Goodland/Walnut aquitard. However, extensive groundwater pumping in the Fort Worth area, including White Settlement, has lowered the Paluxy aquifer potentiometric surface below the top of the formation, resulting in unconfined conditions beneath the base (Hargis & Associates, 1989). The Paluxy Formation has an upper and lower sand member. The lower member contains larger grain size sand and a higher permeability. Therefore, most water wells are completed in the lower section of the Paluxy aquifer. The Paluxy aquifer is an important source of potable groundwater and has experienced extensive pumping in the Fort Worth area. Communities surrounding Carswell AFB, especially White Settlement and Sansom Park, rely on the Paluxy aquifer as their primary water source. Of the 12 groundwater wells in White Settlement, 7 are drilled into the Paluxy aquifer and have a total capacity of 1.2 MGD. The nine Sansom Park groundwater wells drilled into the Paluxy aquifer have a total capacity of 1.5 MGD. However, there are no active or open wells on the base for potable water supplies (CH_2M Hill, 1984).

Rainfall and infiltration provide recharge to the Paluxy aquifer. In addition, Lake Worth is a major recharge point for the aquifer and creates a potentiometric high in its vicinity. Regional groundwater flow in the Paluxy aquifer is southeastward. However, groundwater flow at the base is influenced by recharge from Lake Worth and by groundwater withdrawals by White Settlement. Therefore, local groundwater flow is in a more southerly direction.

Underlying the Paluxy Formation are the fine-grained limestone, shale, marl, and sandstone beds of the Glen Rose Formation. Although the sands in the Glen Rose Formation yield small amounts of water to wells in Fort Worth and western Tarrant County, the relatively impermeable limestone is an aquitard restricting water movement between the Paluxy aquifer above and the Twin Mountains aquifer below (Nordstrom, 1982). The Glen Rose Limestone is not an important source of water in Tarrant County (Leggat, 1957).

The geologically-oldest formation used for water supply in the Carswell AFB area is the Twin Mountains Formation. Of the 12 groundwater wells used in the city of White Settlement, 5 draw water from the Twin Mountains Formation. Groundwater moves eastward and occurs under water table conditions in the recharge area and becomes confined as it moves east (Nordstrom, 1982). Water from the Twin Mountains Formation generally is satisfactory for most purposes; however, some sand strata may contain highly mineralized water.

Recharge to the groundwater in the vicinity of Carswell AFB is derived from precipitation that falls on the outcrop area of the water-bearing formations. In addition to recharge from precipitation, water enters the formations by seepage from lakes and streams that flow across the areas of outcrop (Leggat, 1957).

Groundwater withdrawals in excess of recharge in the Fort Worth area have resulted in a general decline of groundwater levels in the Paluxy aquifer (Hargis & Associates, 1989). Adequate supplies of potable water from groundwater sources are not expected to be available to meet forecasted demands. However, the increasing use of surface water is offsetting use of groundwater in the vicinity of Carswell AFB.

Groundwater Quality. Where groundwater is close to the surface in the alluvial aquifer, the potential for contamination is high because there is no confining layer to prevent pollution from street runoff, fertilizer, septic tanks, and seepage systems (CH_2M Hill, 1984).

In addition, there are several areas on Carswell AFB where the potential for groundwater contamination is present. Each of these areas is under investigation independently to determine the extent of contamination, if any. Descriptions and locations of these areas are also found in Section 3.3, Hazardous Materials and Hazardous Waste Management.

Water quality within the Paluxy aquifer, an important source of potable groundwater in the vicinity of Carswell AFB, is generally good (CH_2M Hill, 1984). However, the potential may also exist for contaminant migration from the alluvial aquifer into the deeper aquifers because of the variable nature of confining beds, and because of the proximity of the base to recharge areas, such as Lake Worth.

3.4.3 Air Quality

Air quality in a given location is described by the concentration of various pollutants in the atmosphere, generally expressed in units of ppm or $\mu g/m^3$. Air quality is determined by the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions. The significance of a pollutant concentration is

determined by comparing it to federal and/or state ambient air quality standards. These standards represent the maximum allowable atmospheric concentrations that may occur and still protect public health and welfare, with a reasonable margin of safety. The federal standards are established by the U.S. EPA and termed the National Ambient Air Quality Standards (NAAQS). The state of Texas has adopted the NAAQS as their representative air quality standards. The NAAQS are presented in Table 3.4-1.

The main pollutants of concern in this EIS are ozone (O_3), carbon monoxide (CO), nitrogen oxides (NO_x), nitrogen dioxide (NO_2), sulfur dioxide (SO_2) and particulate matter equal to or less than 10 microns in diameter (PM_{10}). The previous NAAQS for particulate matter was based upon total suspended particulate (TSP) levels; it was replaced in 1987 by an ambient standard based only on the PM_{10} fraction of TSP.

Lead is not addressed in this EIS because there are no known lead emission sources in the region or included in the reuse alternatives. Lead concentrations are monitored in a number of high population density areas elsewhere in the state, and all sites meet the quarterly primary and secondary standard of 1.5 $\mu g/m^3$.

The existing air quality of the affected environment is defined by air quality data and emissions information. Air quality data were obtained by examining air quality monitoring records from monitoring stations maintained by the TNRCC, formerly the Texas Air Control Board. Information on pollutant concentrations measured for short-term (24 hours or less) and long-term (annual) averaging periods is extracted from the monitoring station data in order to characterize the existing air quality background of the area. Emission inventory information for the affected environment was obtained from the TNRCC and from Carswell AFB. Inventory data were separated by pollutant type and reported in tons/year in order to describe the baseline conditions of pollutant emissions in the area.

Identifying the ROI for an air quality assessment requires knowledge of the pollutant types, source emission rates and release parameters, the proximity relationships of project emission sources to other emission sources, and local and regional meteorological conditions. For inert pollutants (all pollutants other than ozone, its precursors, and NO_2), the ROI for ambient air quality effects is generally limited to an area within a few miles downwind from the source.

Ozone is a secondary pollutant formed in the atmosphere by photochemical reactions of previously emitted pollutants, or precursors. Ozone precursors are mainly reactive organic gases (ROG) and NO_x. ROG are VOCs, but do not include CO, carbon dioxide (CO_2), carbonic acid, metallic carbides, metallic carbonates, and ammonium carbonate. NO_x is the designation given

Table 3.4-1. National and Texas Ambient Air Quality Standards

Pollutant	Averaging Time	----National/Texas Standards[a]---- Primary[b,c]	Secondary[b,d]
Ozone	1-hour	0.12 ppm (235 $\mu g/m^3$)	Same as primary standard
Carbon monoxide	8-hour	9 ppm (10,000 $\mu g/m^3$)	---
	1-hour	35 ppm (40,000 $\mu g/m^3$	---
Nitrogen dioxide	Annual	0.053 ppm (100 $\mu g/m^3$)	Same as primary standard
Sulfur dioxide	Annual	80 $\mu g/m^3$ (0.03 ppm)	---
	24-hour	365 $\mu g/m^3$ (0.14 ppm)	---
	3-hour	---	1,300 $\mu g/m^3$ (0.5 ppm)
PM_{10}	Annual	50 $\mu g/m^{3(e)}$	Same as primary standard
	24-hour	150 $\mu g/m^3$	
Lead	Quarterly	1.5 $\mu g/m^3$	Same as primary standard

Notes: (a) Standards, other than ozone and those based on annual averages or annual arithmetic means, are not to be exceeded more than once a year. The ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than one.

(b) Concentration expressed first in units in which it was promulgated. Equivalent units given in parenthesis are based on a reference temperature of 25°C and a reference pressure of 760 mm of mercury. All measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 mm of mercury (1,013.2 millibar); ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

(c) Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

(d) Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Each state must attain the secondary standards within a "reasonable time" after the implementation plan is approved by the EPA.

(e) Calculated as arithmetic mean.

$\mu g/m^3$ = micrograms per cubic meter.

PM_{10} = particulate matter equal to or less than 10 microns in diameter.

ppm = parts per million.

Sources: Clean Air Act, Title 42 U.S.C. §§7401 - 7671; Texas Air Control Board General Rules (31 TAC Chapter 101.21)

to the group of all oxygenated nitrogen species, including nitrous oxide (N_2O), nitric oxide (NO), NO_2, nitrogen trioxide (NO_3), nitrogen tetroxide (N_2O_4), nitric anhydride (N_2O_5), and nitrous anhydride (N_2O_3). These compounds can exist in air. However, only three (N_2O, NO, and NO_2) are found in any appreciable quantities.

The ROI for ozone may extend much farther downwind than the ROI for inert pollutants. In the presence of solar radiation, the maximum effect of precursor emissions on ozone levels usually occurs several hours after they are emitted and, therefore, many miles from the source. Ozone and its precursors transported from other regions can also combine with local emissions to produce high local ozone concentrations. Ozone concentrations generally are the highest during the summer months and coincide with periods of maximum solar radiation. Maximum ozone concentrations tend to be regionally distributed because precursor emissions are homogeneously dispersed in the atmosphere.

Like ozone, NO_2 emissions related to the Proposed Action and alternatives are also regionally distributed. NO_2 is primarily formed by the conversion of NO to NO_2 in the presence of oxygen (either during combustion or in the atmosphere). NO is produced by fuel combustion in both stationary and mobile sources, such as automobiles and aircraft. The amount of production is dependent upon the combustion temperature conditions and the rate of exhaust gas cooling. Higher temperatures and rapid cooling rates produce greater quantities of NO. Where higher NO concentrations and temperatures exist, some of the NO is immediately oxidized to NO_2. The amount of immediate NO_2 combustion generation generally varies from 0.5 to 10 percent of the NO present (U.S. EPA, 1971). The remaining unconverted NO is oxidized to NO_2 in the atmosphere primarily through photochemical secondary reactions initiated by the presence of sunlight. These photochemical reactions may take place hours after the initial NO release and many miles from the original source, dependent upon the prevailing meteorological conditions.

For the purpose of air quality analysis, the ROI for reuse-related emission sources include Tarrant County. Air quality effects of ozone precursors and NO_2 emissions from the reuse-related construction and operational activities would be the existing airshed within Tarrant County. Air quality effects of the inert pollutants (CO, SO_2, and PM_{10}) would be limited to the immediate area surrounding the emission sources and would be greatest within the Carswell AFB area.

The federal CAA, as amended in August 1977 and November 1990, dictates that project emission sources must comply with the air quality standards and regulations that have been established by federal, state, and county regulatory agencies. These standards and regulations focus on (1) the maximum allowable ambient pollutant concentrations resulting from project

emissions, both separately and combined with other surrounding sources, and (2) the maximum allowable emissions from the project.

Prior to the 1990 Amendments to the CAA, federal regulation of hazardous air emissions was very limited. However, Section 112, as amended in 1990, required the U.S. EPA to regulate a greatly expanded list of hazardous air pollutants (HAPs). Additionally, the U.S. EPA must publish a list of all categories and subcategories of emission sources of HAPs. After identifying and listing sources of HAPs, U.S. EPA must promulgate emission standards that are equivalent to maximum achievable control technology (MACT). By the year 2000, most medium- and large-sized sources of HAPs can expect final U.S. EPA regulations that will limit HAP emissions and require adoption of costly control measures.

3.4.3.1 Regional Air Quality. Climate conditions around Carswell AFB are subhumid with an average yearly rainfall of 31.5 inches. Moisture absorption around the Carswell area is less effective, as compared to other areas with similar precipitation patterns, due to losses associated with evaporation during periods of high temperature or hot southwest winds. Average temperatures in the Carswell area can range anywhere from a mean low of 56° F to an extreme high of 110° F. Prevailing winds are primarily southerly from March through November and northerly from December through February. During the summer and fall months, wind speeds remain fairly consistent averaging about 8 knots. During winter and spring months, average wind speeds increase from 9 to 11 knots.

According to the U.S. EPA guidelines, an area with air quality better than the NAAQS is designated as being in attainment; areas with worse air quality are classified as non-attainment areas. The NAAQS, other than for ozone and those based on annual averages or annual arithmetic means, are considered to be in attainment if they are not exceeded more than once a year. The ozone standard is attained when the expected number of days per calendar year with maximum hourly concentration above the standard is equal to or less than one. Pollutants in an area may be designated as unclassified when there is a lack of data for the U.S. EPA to form a basis of attainment status. An area designated as unclassified is assumed to be in attainment.

Tarrant County has been designated by the U.S. EPA as being in attainment of the NAAQS for SO_2, CO, and NO_2, in non-attainment for O_3, and unclassified for PM_{10} ((Texas Air Control Board, 1992a). Tarrant County is part of the Dallas/Fort Worth ozone non-attainment area (which includes Tarrant, Collin, Dallas, and Denton counties) that has been designated by the U.S. EPA as being in "moderate" non-attainment. Moderate non-attainment areas are required to attain the federal standard by November 15, 1996. To ensure attainment, TNRCC has submitted a State Implementation Plan (SIP) revision to reduce VOC emissions (from 1990 levels) by 15 percent by this

deadline. The TNRCC has until November 1994 to submit a plan that demonstrates attainment with the federal ozone standard by November 1996 using the more sophisticated Urban Airshed Model.

Carswell AFB was operating under a compliance agreement with the U.S. EPA for VOC emissions from aircraft refueling operations. The base was required under terms of this agreement to submit a monthly vapor recovery system status report for these operations.

The federal standard of PM_{10} was promulgated in July 1987. Sufficient PM_{10} monitoring data are not yet available to classify many areas of the country. The U.S. EPA, therefore, designates areas according to the likelihood of violating the standard. Group 1 status is assigned to those areas having a 95 percent probability of exceeding the standard, Group 2 to those areas having 20 to 95 percent probability, and Group 3 to areas with less than 20 percent probability. These group classifications will be changed to attainment/non-attainment designations as sufficient monitoring data become available. Tarrant County has been designated with a Group 3 status.

The TNRCC operates air quality monitoring stations throughout Tarrant County. However, ambient air quality is not measured within the boundary of Carswell AFB. The nearest monitoring stations are Fort Worth Northwest Station (approximately 2 miles northeast of Carswell AFB) and Fort Worth Geddes Station (approximately 1.5 miles southeast of Carswell AFB). The Fort Worth Northwest Station monitors levels of CO, NO_2, O_3, and SO_2. The Fort Worth Geddes Station measures only PM_{10} concentrations. The federal ozone standard was exceeded 9 days at the Fort Worth Northwest Station during the period 1989 through 1991 (Table 3.4-2). All other pollutants were measured at levels below the NAAQS.

New or modified major stationary sources of attainment pollutants in the area of Carswell AFB are subject to Prevention of Significant Deterioration (PSD) review to ensure that these sources are constructed without significant adverse deterioration of the clean air in the area. Emissions from any new or modified source must be controlled using Best Available Control Technology (BACT). The air quality impacts in combination with other PSD sources in the area must not exceed the maximum allowable incremental increases identified in Table 3.4-3. Certain national parks and wilderness areas are designated as Class I areas, where any appreciable deterioration in air quality is considered significant. Class II areas are those where moderate, well controlled industrial growth could be permitted. Class III areas allow for greater industrial development. The area surrounding Carswell AFB is designated by the U.S. EPA as Class II.

In addition, under the New Source Review provisions of the CAA, any new or modified major source emitting more than 100 tons per year of VOC or

Table 3.4-2. Maximum Pollutant Concentrations Monitored near Carswell AFB, 1989-1991

Pollutant Category	Averaging Time	Federal Limiting Standard, ppm ($\mu g/m^3$)	Maximum Concentration by Year ppm ($\mu g/m^3$)			Number of Days Federal Standard Exceeded		
			1989	1990	1991	1989	1990	1991
Ozone[a]	1-hour	0.12 (235)	0.13 (258.7)	0.13 (258.7)	0.15 (298.5)	1	2	6
Nitrogen dioxide[a]	Annual	0.053 (100)	0.012 (22.92)	0.012 (22.92)	0.014 (26.74)	0	0	0
Carbon monoxide[a]	8-hour	9 (10,000)	3.4 (3,944)	3.6 (4,176)	3.3 (3,828)	0	0	0
	1-hour	35 (40,000)	5.6 (6,496)	5.6 (6,496)	5.4 (6,264)	0	0	0
Sulfur dioxide[a]	Annual	0.03 (80)	<0.0005 (<1.33)	0.001 (2.65)	0.001 (2.65)	0	0	0
	24-hour	0.14 (365)	<0.005 (<13.3)	0.01 (26.5)	0.01 (26.5)	0	0	0
	3-hour	0.50 (1,300)	0.01 (26.5)	0.02 (53.0)	0.01 (26.5)	0	0	0
PM_{10}[b]	Annual	50 $\mu g/m^3$	23.3 $\mu g/m^3$	24.8 $\mu g/m^3$	23.3 $\mu g/m^3$	0	0	0
	24-hour	150 $\mu g/m^3$	54.0 $\mu g/m^3$	50.0 $\mu g/m^3$	101.0 $\mu g/m^3$	0	0	0

Notes: (a) Concentrations measured at Fort Worth Northwest Monitoring Station.
(b) Concentrations measured at Fort Worth City, Geddes Monitoring Station.
$\mu g/m^3$ = micrograms per cubic meter.
PM_{10} = particulate matter equal to or less than 10 microns in diameter.
ppm = parts per million.

Sources: Texas Air Control Board, 1989, 1990, 1991.

Table 3.4-3. Maximum Allowable Pollutant Concentration Increases under PSD Regulations

Pollutant	Averaging Time	Maximum Allowable Increment ($\mu g/m^3$)		
		Class I	Class II	Class III
PM_{10}	Annual	4	17	34
	24-Hour	8	30	60
Sulfur dioxide	Annual	2	20	40
	24-Hour	5	91	182
	3-Hour	25	512	700
Nitrogen dioxide	Annual	2.5	25	50

Notes: Class I areas are regions in which the Air Quality is intended to be kept pristine, such as national parks and wilderness areas. All other lands are initially designated Class II. Individual states have the authority to redesignate Class II lands to Class III to allow for maximum industrial use.
$\mu g/m^3$ = micrograms per cubic meter.
PM_{10} = particulate matter equal to or less than 10 microns in diameter.
PSD = Prevention of Significant Deterioration.

Source: 40 CFR 51 and 52, as revised June 3, 1993.

NO_x in a moderate ozone non-attainment area must satisfy technology standards reflecting the lowest achievable emission rates (LAER) and must provide offsets representing emission reductions from other sources at a rate of at least 1.5 to 1.0.

Preclosure Reference. Preclosure pollutant concentrations due to aircraft emissions in the immediate area of the base runways were estimated with the Emission and Dispersion Modeling System (EDMS). The results of the EDMS modeling are provided in Table 3.4-4. The values in Table 3.4-4 represent the maximum concentrations that occurred at a receptor located north of the end of the runway as the result of aircraft operations in 1990. The largest contributor to the ambient air quality was the B-52 aircraft.

Closure Baseline. It can reasonably be assumed that pollutant concentrations in the region surrounding Carswell AFB at base closure were less than concentrations experienced under preclosure conditions due to regional air emission control measures. Pollutant concentrations in the area of the base itself were less than preclosure levels due to the reduction or elimination of numerous emission sources associated with normal base activities (e.g., all current aircraft and aerospace ground activities were eliminated, except those associated with the 301st FW, AF Plant #4, and military transient aircraft). The closure also reduced the number of motor vehicles operating in the surrounding area. Emissions associated with motor vehicles associated with active base operations were eliminated, with the exception of those vehicles associated with the OL or retained military activities.

The pollutant concentrations in the vicinity of the runways associated with the 301st FW, AF Plant #4, and military transient aircraft operations at base

Table 3.4-4. Air Quality Modeling Results for Preclosure Conditions in the Vicinity of the Runways at Carswell AFB ($\mu g/m^3$)

Pollutant	Averaging Time	Maximum Impact[a]	Background Concentration[b]	Limiting Standard
Carbon monoxide	8-hour	1,778	3,983	10,000
	1-hour	2,540	6,419	40,000
Sulfur dioxide	Annual	21.8	2	80
	24-hour	87.2	22	365
	3-hour	196.2	35	1,300
PM_{10}	Annual	221	24	50
	24-hour	884	68	150

Notes: (a) Maximum impact in all cases occurred at a receptor located north of the end of the runway near Lake Worth.
(b) Background concentrations are assumed to equal the mean of first-high values monitored at the Fort Worth Northwest monitoring station (CO and SO_2) and Fort Worth City stations (PM_{10}) during 1989 to 1991 (refer to Table 3.4-2).
CO = carbon monoxide.
$\mu g/m^3$ = micrograms per cubic meter.
PM_{10} = particulate matter equal to or less than 10 microns in diameter.
$SO_{(2)}$ = sulfur dioxide.

closure were estimated with the EDMS model and are contained in Table 3.4-5. Emissions at the receptor locations are below the limiting standard for all criteria pollutants. The relatively large difference between the concentration impacts determined for preclosure and closure conditions is due to the elimination of aircraft that generate larger quantities of pollutants, such as the B-52s and KC-135s.

Table 3.4-5. Air Quality Modeling Results for Closure Conditions in the Vicinity of the Runways at Carswell AFB ($\mu g/m^3$)

Pollutant	Averaging Time	Maximum Impact[a]	Background Concentration[b]	Limiting Standard
Carbon monoxide	8-hour	166	3,983	10,000
	1-hour	237	6,419	40,000
Sulfur dioxide	Annual	2	2	80
	24-hour	7.9	22	365
	3-hour	17.7	35	1,300
PM_{10}	Annual	1	24	50
	24-hour	2	68	150

Notes: (a) Maximum impact in all cases occurred at a receptor located north of the end of the runway near Lake Worth.
(b) Background concentrations are assumed to equal the mean of first-high values monitored at the Fort Worth Northwest monitoring station (CO and SO_2) and Fort Worth City stations (PM_{10}) during 1989 to 1991 (refer to Table 3.4-2).
CO = carbon monoxide.
$\mu g/m^3$ = micrograms per cubic meter.
PM_{10} = particulate matter equal to or less than 10 microns in diameter.
$SO_{(2)}$ = sulfur dioxide.

3.4.3.2 Air Pollutant Emission Sources

Preclosure Reference. The base emissions inventory represented in Tables 3.4-6 and 3.4-7 are based on calculations for direct sources within the base boundary. The 1990 Carswell AFB and Tarrant County emissions inventories are presented in Table 3.4-6. Total emissions associated with the retained military activities are separately presented in Table 3.4-7. The primary direct emission sources from the base include aircraft flying operations, aerospace ground equipment, aircraft ground operations, and motor vehicles. Fuel evaporation losses, fire training exercises and surface coating substantially contribute to the amount of direct VOC emissions released at Carswell AFB.

Table 3.4-6. Preclosure Emissions Inventory for 1990 (tons per year)

Source	PM_{10}	SO_2	CO	VOC	NO_x
Carswell AFB (not including AFRES activities [a])					
Aircraft flying operations	601.10	57.62	3,507.72	3,057.88	567.82
Aircraft ground operations	0.44	0.43	11.08	8.13	2.77
Aerospace ground equipment	4.16	2.42	92.06	6.81	58.54
Incinerators	0.34	0.12	0.49	0.15	0.15
Heating and power production	0.94	0.06	1.88	0.11	11.30
Motor vehicles (military and civilian)	4.16	1.97	117.33	19.68	20.77
Fire fighting practices	7.22	0.02	31.60	18.05	0.23
Surface coating	-	-	-	13.07	-
Fuel evaporation losses	-	-	-	122.25	-
Solvent tank degreasing	-	-	-	0.28	-
Generator testing	0.04	0.03	0.78	0.06	0.47
Subtotal	618.40	62.67	3,762.94	3,246.47	662.05
Carswell AFB (including AFRES activities[a])	621.58	66.77	3,923.78	3,292.71	724.55
Tarrant County					
Point sources	N/A	N/A	812.00	9,798.00	8,993.00
Area sources	N/A	N/A	943.29	17,996.30	2,870.46
Non-road mobile sources	N/A	N/A	112,745.44	10,944.53	17,290.00
On-road mobile sources	N/A	N/A	349,746.44	37,394.25	35,773.65
Subtotal	N/A	N/A	464,247.38	76,133.08	64,927.11

Notes: (a) AFRES activities includes 301st FW, AF Plant #4 (aircraft operations and run-up stations only), and WHCA.
AF = Air Force.
AFRES = Air Force Reserve.
CO = carbon monoxide.
FW = Fighter Wing.
N/A = Not available.
NO_x = nitrogen oxides.
PM_{10} = particulate matter equal to or less than 10 microns in diameter.
SO_2 = sulfur dioxide.
VOC = volatile organic compounds.
WHCA = White House Communications Agency.

Sources: Texas Air Control Board, 1992a; U.S. Air Force, 1991a.

Table 3.4-7. Preclosure Emissions Inventory for Retained Military Activities (tons/year)

Source	PM_{10}	SO_2	CO	VOC	NO_x
Aircraft flying operations[a]	1.31	3.29	137.57	27.44	36.34
Aircraft ground operations	0.07	0.36	4.62	1.55	1.27
Aerospace ground equipment	1.68	0.40	17.00	2.03	23.50
Incinerators	-	-	-	-	-
Heating and Power Production	0.066	0.004	0.13	0.01	0.20
Motor vehicles	0.026	0.013	0.75	0.13	0.15
Fire fighting practices	-	-	-	-	-
Surface coating	-	-	-	8.97	-
Fuel evaporation losses	-	-	-	0.94	-
Tank farms	-	-	-	5.11	-
Solvent tank degreasing	-	-	-	-	-
Generator testing	0.03	0.03	0.77	0.06	0.46
Total	3.18	4.10	160.84	46.24	62.50

Notes: (a) Aircraft flying operation emissions were estimated with the EDMS model.
CO = carbon monoxide.
EDMS = Emissions and Dispersion Modeling System.
NO_x = nitrogen oxides.
PM_{10} = particulate matter equal to or less than 10 microns in diameter.
SO_2 = sulfur dioxide.
VOC = volatile organic compounds.

Source: U.S. Air Force, 1991a.

The 1990 emissions inventory reported for Tarrant County is grouped into the categories of point sources, area sources, non-road mobile sources, and on-road mobile sources (see Table 3.4-6). The point source category includes emissions from permitted stationary sources within the county. The area source category includes emissions from such sources as oil and gas production; service station fueling, unloading and breathing losses; dry cleaning operations; solvent use; municipal wastewater treatment; natural gas use; structure fires; and pesticide application. The non-road mobile source category includes emissions from trains, aircraft, boats, agricultural equipment, construction equipment, industrial equipment, off-road vehicles, and lawn and garden equipment. The on-road mobile source category includes emissions from trucks, automobiles, buses, and motorcycles.

Closure Baseline. The base-related emissions for Carswell AFB at closure (1993) are assumed to be essentially equivalent to the retained military emissions during preclosure conditions (see Table 3.4-7). OL activities would contribute negligible emissions. The reduction in base-related emissions from preclosure conditions reflects the loss of sources due to reduced on-base activities, limited facility heating and power requirements, and the reduction in the population associated with Carswell AFB at the time of closure.

3.4.4 Noise

The ROI for noise sources at Carswell AFB is defined using FAA developed land use compatibility guidelines. The area most affected by noise due to the base disposal and reuse is limited to the area in and around the base within the 65 DNL contour. This includes, but is not limited, to the communities of Fort Worth, White Settlement, Lake Worth, Benbrook, and Westworth Village.

The characteristics of sound include parameters, such as amplitude, frequency, and duration. Sound can vary over an extremely large range of amplitudes. The dB, a logarithmic unit that accounts for the large variations in amplitude, is the accepted standard unit measurement of sound. Table 3.4-8 presents examples of typical sound levels. Different sounds may have different frequency contents. When measuring sound to determine its effects on a human population, A-weighted sound levels are typically used to account for the response of the human ear. A-weighted sound levels represent adjusted sound levels. The adjustments, established by the American National Standards Institute (ANSI,1983) are applied to the frequency content of the sound.

Noise is usually defined as sound that is undesirable because it interferes with speech communication and hearing, is intense enough to damage hearing, or is otherwise annoying. Noise levels often change with time; therefore, to compare levels over different time periods, several descriptors were developed that take into account this time-varying nature. These descriptors are used to assess and correlate the various effects of noise on man and animals, including land-use compatibility, sleep interference, annoyance, hearing loss, speech interference, and startle effects.

DNL was developed to evaluate the total community noise environment. DNL (sometimes abbreviated as L_{dn}) is the average A-weighted acoustical energy during a 24-hour period with a 10 dB adjustment added to the nighttime levels (between 10 p.m. and 7 a.m.). This adjustment is an effort to account for the increased sensitivity to nighttime noise events. DNL was endorsed by the U.S. EPA for use by federal agencies and has been adopted by HUD, FAA, and DOD.

DNL is an accepted unit for quantifying human annoyance to general environmental noise, which includes aircraft noise. The Federal Interagency Committee on Urban Noise developed land use compatibility guidelines for noise in terms of DNL (U.S. DOT, 1980). Table 3.4-9 provides FAA recommended DNL ranges for various landuse categories based upon the committee's guidelines. The FAA guidelines were used in this study to determine noise impacts.

Table 3.4-8. Comparative Sound Levels

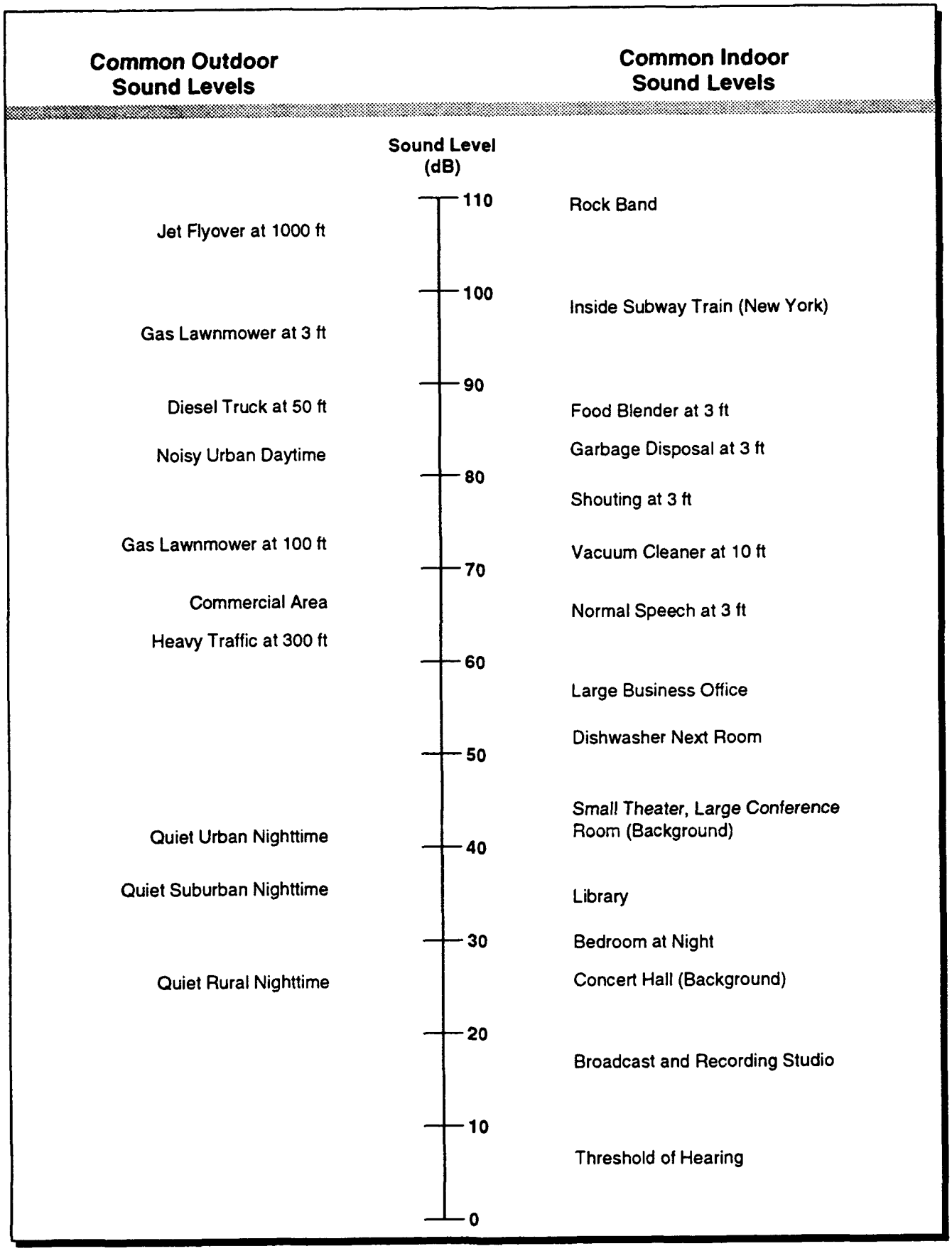


Table 3.4-9. Land Use Compatibility with Yearly Day-Night Average Sound Levels
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Land Use	Yearly DNL					
	Below 65 dB	65-70 dB	70-75 dB	75-80 dB	80-85 dB	Over 85 dB
Residential						
Residential, other than mobile homes and transient lodgings	Y	N[a]	N[a]	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N[a]	N[a]	N[a]	N	N
Public Use						
Schools	Y	N[a]	N[a]	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	Y N
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Governmental services	Y	Y	25	30	N	N
Transportation	Y	Y	Y[b]	Y[c]	Y[d]	Y[d]
Parking	Y	Y	Y[b]	Y[c]	Y[d]	N
Commercial Use						
Offices, business, and professional	Y	Y	25	30	N	N
Wholesale and retail--building materials, hardware, and farm equipment	Y	Y	Y[b]	Y[c]	Y[d]	N
Retail trade--general	Y	Y	25	30	N	N
Utilities	Y	Y	Y[b]	Y[c]	Y[d]	N
Communication	Y	Y	25	30	N	N
Manufacturing and Production						
Manufacturing, general	Y	Y	Y[b]	Y[c]	Y[d]	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y[f]	Y[g]	Y[h]	Y[h]	Y[h]
Livestock farming and breeding	Y	Y[f]	Y[g]	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
Recreational						
Outdoor sports arenas and spectator sports	Y	Y[e]	Y[e]	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts, and camps	Y	Y	Y	N	N	N
Golf courses, riding stables, and water recreation	Y	Y	25	30	N	N

Letters in parentheses refer to notes (see next page). The designations contained in this table do not constitute a federal determination that any use of land covered by the program is acceptable or unacceptable under federal, state, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise compatible land uses.

Key

Y (Yes) Land use and related structures compatible without restrictions.
N (No) Land use and related structures are not compatible and should be prohibited.
25, 30, or 35 Land use and related structures generally compatible; measures to achieve Noise Level Reduction (NLR) of 25, 30, or 35 dB must be incorporated into design and construction of structure.

dB = decibel.
DNL = day-night average sound level.
FAA = Federal Aviation Administration.

Table 3.4-9. Land Use Compatibility with Yearly Day-Night Average Sound Levels
Page 2 of 2

Notes

(a) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor to indoor NLR of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide an NLR of 20 dB, thus, the reduction requirements are often stated as 5, 10, or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. However, the use of NLR criteria will not eliminate outdoor noise problems.
(b) Measures to achieve an NLR of 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas or where the normal noise level is low.
(c) Measures to achieve an NLR of 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office, areas, noise-sensitive areas, or where the normal noise level is low.
(d) Measures to achieve an NLR of 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office area, noise-sensitive areas, or where the normal noise level is low.
(e) Land use compatible provided special sound reinforcement systems are installed.
(f) Residential buildings require an NLR of 25.
(g) Residential buildings require an NLR of 30.
(h) Residential buildings not permitted.
dB = decibel.
FAR = Federal Aviation Regulation.
NLR = Noise Level Reduction.

Source: Derived from FAR Part 150 Airport Noise Compatibility Planning (FAA, 1989).

DNL is used in this report because it is the noise descriptor recognized by the FAA and DOD for airfield environments. DNL is sometimes supplemented with other metrics, primarily the equivalent sound level (L_{eq}). The L_{eq} is the equivalent, steady-state level that would contain the same acoustical energy as the time-varying level during the same time interval. Occasionally, the Sound Exposure Level (SEL) is used to supplement DNL, especially where sleep disturbance is a concern. The SEL value represents the A-weighted sound level integrated over the entire duration of the noise event and referenced to a duration of 1 second. When an event lasts longer than 1 second, the SEL value will be higher than the highest sound level during the event. SEL is used in this report when discussing sleep disturbance effects.

Appendix H provides additional information about the measurement and prediction of noise. This appendix also provides more information on the units used in describing noise, as well as information about the effects of noise such as annoyance, sleep interference, speech interference, health effects, and effects on animals.

3.4.4.1 Existing Noise Levels. Typical noise sources in and around airfields usually include aircraft, surface traffic, and other human activities. Military aircraft operations and surface traffic on local streets and highways are the

existing primary sources of noise in the vicinity of Carswell AFB. Other noise sources that were identified in the vicinity of Carswell AFB include an on-base firing range.

In airport analyses, areas with DNL above 65 dB are often considered in land use compatibility planning and impact assessment; therefore, the contours of DNL greater than 65 dB are of particular interest. Contours above DNL 65 dB are modeled and presented in 5 dB intervals.

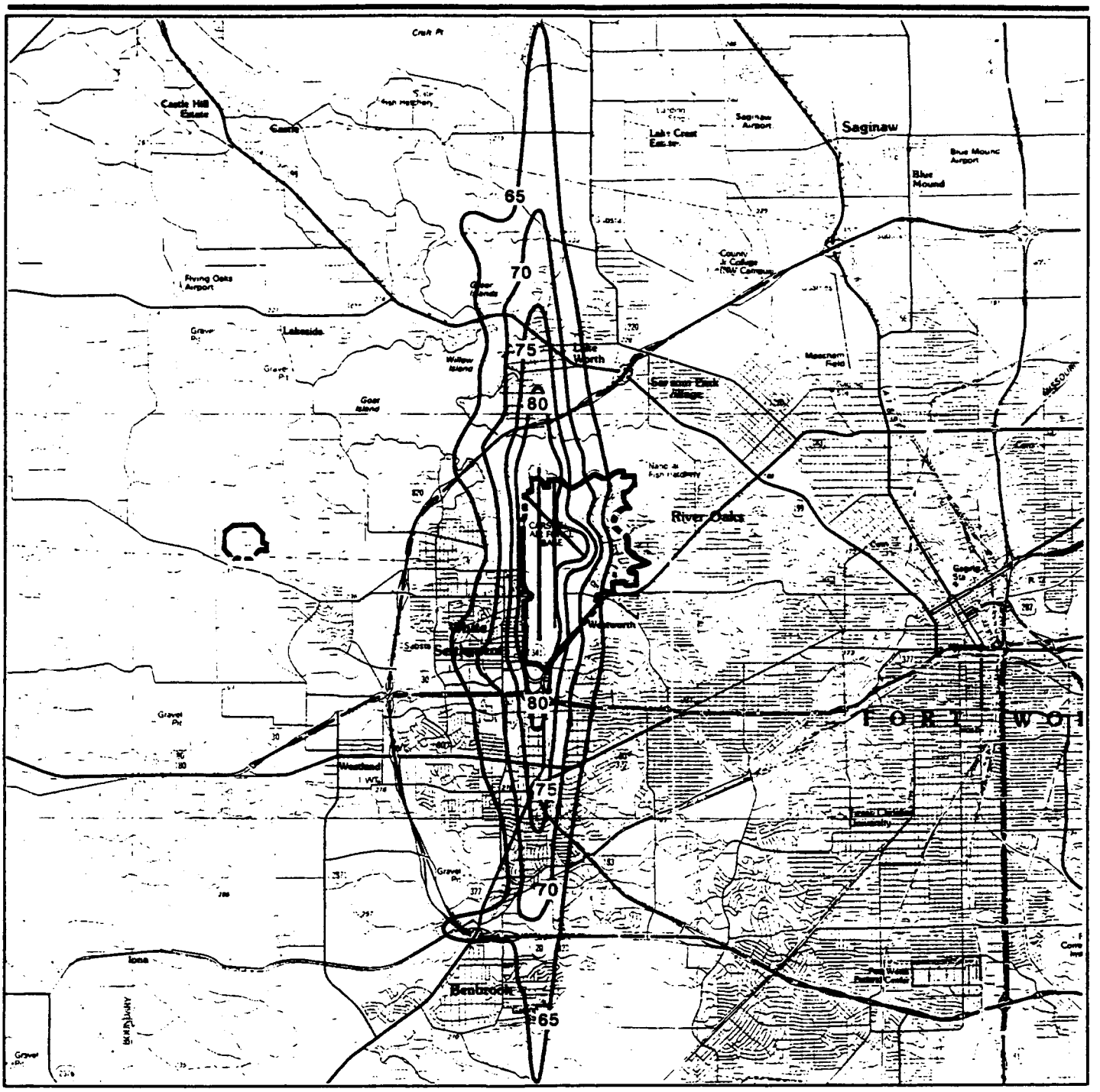
Preclosure Reference. Aircraft noise at Carswell AFB occurs during aircraft engine warmup, maintenance and testing, taxiing, takeoff, approach, and landing. The preclosure noise contours for the most recent AICUZ (U.S. Air Force, 1986a) are shown in Figure 3.4-3. Noise contours represent flight activities from various aircraft including B-52H, KC-135A, F-4D, T-37, and F-16.

Surface vehicle traffic noise levels for roadways in the vicinity of Carswell AFB were estimated using the Federal Highway Administration's Highway Noise Model (1978). This model incorporates vehicle mix, traffic volume projections, and speed to generate DNL. The noise levels are then presented as a function of distance from the centerline of the nearest road. The results of the modeling for surface traffic are presented in Table 3.4-10. The actual distances to the DNLs may be less than those presented in the table because the screening effects of intervening buildings, terrain, and walls were not accounted for in the modeling. Appendix H contains the data used in the surface traffic analysis. These data include AADTs, traffic mix, and speeds.

Noise levels for activity associated with the on-base firing range were calculated for the nearest residences utilizing historic types and frequency of usage (see Appendix H). Noise levels at the nearest residences were estimated to be below DNL 65 dB.

Closure Baseline. In order to define the noise environment due to aircraft operations at Carswell AFB for the closure baseline, the Noise Exposure Model (NOISEMAP) version 6.1 was used to estimate 65, 70, and 75 DNL noise contours. Input data to NOISEMAP includes information on aircraft types; runway use; takeoff and landing flight tracks; aircraft altitudes, speeds, and power settings; engine run-ups; and number of daytime (7 a.m. to 10 p.m.) and nighttime (10 p.m. to 7 a.m.) operations. These noise contours reflect a total of about 20,930 annual operations consisting of various military aircraft including F-16, T-38, and T-37. These data are included in Appendix H. The results of the closure aircraft noise modeling are presented as noise contours in Figure 3.4-4.

The surface traffic noise levels for the closure baseline were calculated using the traffic volumes described in Section 3.2.3.1 Roadways (see



EXPLANATION

DNL Noise Contours (in 5 dB intervals)

Base Boundary

Preclosure Noise Contours

0 3000 6000 12000 Feet

Source: U.S. Air Force, 1986
Base Map:
U.S.G.S. 30 X 60 min., Fort Worth, TX, 1985

Figure 3.4-3

Table 3.4-10. Distance to DNL from Roadway Centerline for the Preclosure Reference and Closure Baseline[a]

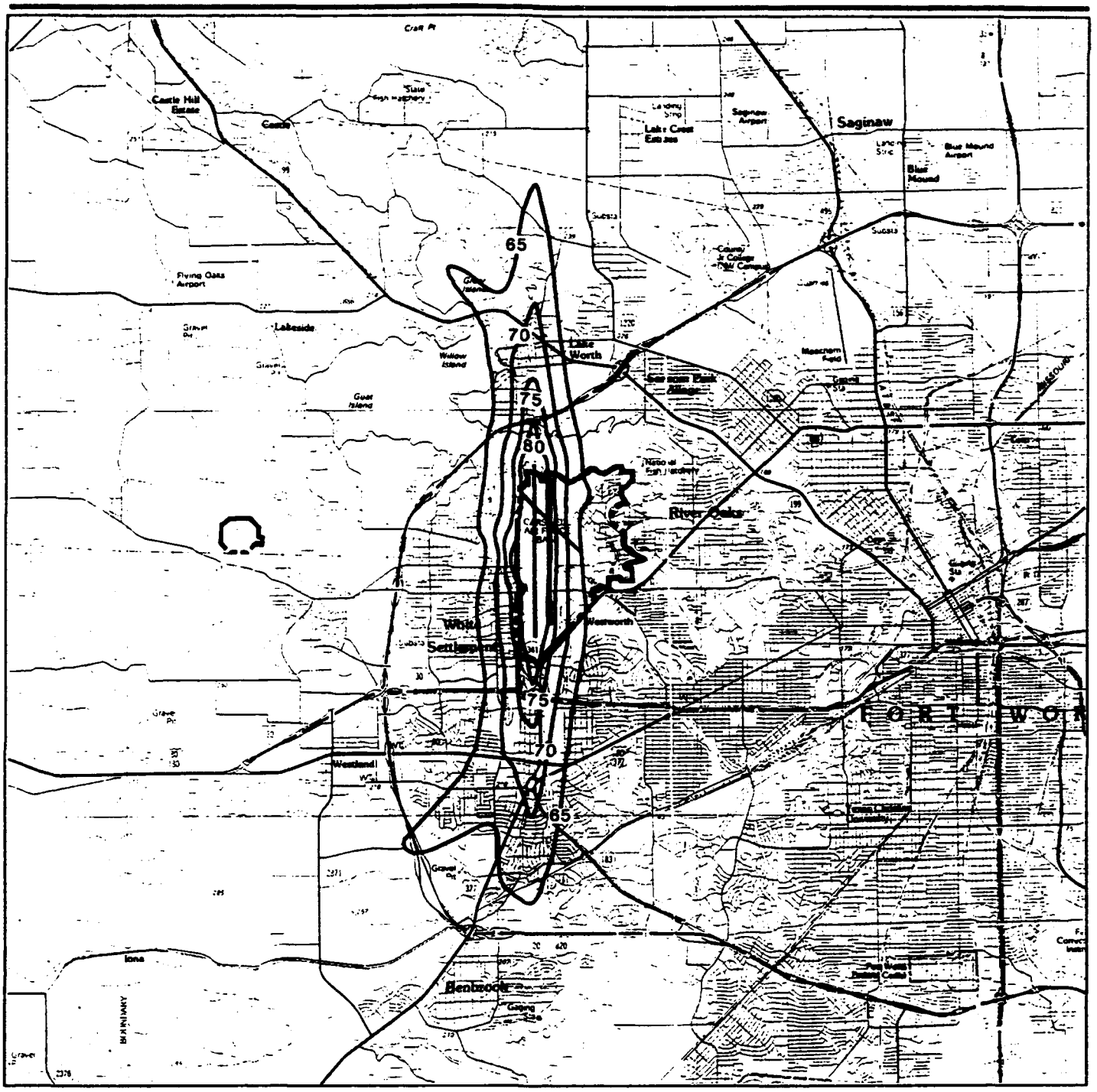
Roadway	From/To	Distance (feet) DNL 65	DNL 70	DNL 75
Preclosure				
I-30	SH 183 to I-820	450	210	100
I-30	Camp Bowie Rd to SH 183	480	230	110
I-820	I-30 to White Settlement Rd	400	190	100
I-820	White Settlement Rd to Navajo Trail	390	190	100
SH 183	I-30 to Ridgmar Blvd	160	80	50
SH 183	Ridgmar Blvd to Roaring Springs Rd	150	70	40
SH 183	White Settlement Rd to Black Oak	110	60	40
SH 199	SH 183 to Beverly Hills	120	60	40
Spur 341	I-30 to White Settlement Rd	270	130	70
White Settlement Rd	Meyers Dr to Spur 341	50	30	(b)
White Settlement Rd	Clifford St to Academy Blvd	80	40	(b)
Clifford St	I-820 to White Settlement Rd	60	30	(b)
Roaring Springs Rd	Rogner Dr to Byers Ave	60	30	(b)
Closure				
I-30	SH 183 to I-820	440	210	100
I-30	Camp Bowie Rd to SH 183	470	230	110
I-820	I-30 to White Settlement Rd	400	190	100
I-820	White Settlement Rd to Navajo Trail	390	190	100
SH 183	I-30 to Ridgmar Blvd	100	50	40
SH 183	Ridgmar Blvd to Roaring Springs Rd	110	60	40
SH 183	White Settlement Rd to Black Oak	110	50	(b)
SH 199	SH 183 to Beverly Hills	110	60	40
Spur 341	I-30 to White Settlement Rd	260	130	70
White Settlement Rd	Meyers Dr to Spur 341	50	30	(b)
White Settlement Rd	Clifford St to Academy Blvd	80	40	(b)
Clifford St	I-820 to White Settlement Rd	60	30	(b)
Roaring Springs Rd	Rogner Dr to Byers Ave	60	30	20

Notes: (a) Values shown represent the noise levels associated with total surface traffic volumes, including base-related and non-base related traffic.
(b) Contained within roadway.
DNL = day-night average sound level.
I = Interstate.
SH = State Highway.

Appendix H). The results of the noise modeling for the affected roadways are presented in Table 3.4-10. Again, the actual distances to the DNLs may be less than those presented in the table because the model does not account for screening effects of intervening buildings, terrain, and walls. Noise levels associated with the on-base firing range were similar to preclosure levels due to continued operations.

3.4.4.2 Noise-Sensitive Areas. The preclosure and closure ROIs for Carswell AFB include noise-sensitive receptors, such as schools, hospitals, residences, and motels that are within the DNL 65 dB contours.

Table 3.4-11 presents the approximate number of acres and estimated population within each DNL range. Approximately 12,968 acres and 14,000



EXPLANATION

DNL Noise Contours (in 5 dB intervals)

Base Boundary

Closure Noise Contours

0 3000 6000 12000 Feet

Base Map Source:
U.S.G.S. 30 X 60 min., Fort Worth, TX, 1985.

Figure 3.4-4

Table 3.4-11. DNL Exposure from Aircraft Operations - Preclosure and Closure

	65-70 dB		70-75 dB		Over 75 dB		Total	
	Acres	Persons	Acres	Persons	Acres	Persons	Acres	Persons
Preclosure (1986)	6,387	7,600	3,177	3,800	3,404	2,600	12,968	14,000
Closure (1993)	4,819	7,600	1,895	2,100	1,722	500	8,436	10,200

dB = decibel.
DNL = day-night average sound level.

residents were exposed to noise levels of DNL 65 dB or greater under preclosure conditions. The exposed areas were reduced at the time of base closure due to the removal of the KC-135 and B-52 flight operations. Based on the use patterns in 1992, approximately 8,436 acres and 10,200 residents were estimated to be exposed to noise levels of DNL 65 dB or greater due to the military aircraft activity under closure conditions.

The hospital in White Settlement is located within an area exposed to DNL 70 dB or greater under both preclosure and closure conditions. Land use guidelines (see Table 3.4-9) suggest that this structure incorporate noise level conditions of 30 dB. Section 3.2.2, Land Use and Aesthetics, describes other land uses on and near the base.

3.4.5 Biological Resources

Biological resources include the native and introduced plants and animals in the project area. For discussion purposes, biological resources are divided into vegetation, wildlife (including aquatic biota), threatened and endangered species, and sensitive habitats.

The ROI for biological resources includes all areas on the base (including the Off-Site WSA), sensitive habitats located near the base and the off-base easement areas surrounding the Off-Site WSA and any off-base areas potentially disturbed as a direct or indirect result of reuse activities. These are the areas within which potential impacts could occur and that provide a basis for evaluating the level of impact to biological resources.

Information on the affected environment was obtained from a reconnaissance survey of the base in early June 1992, supplemented by a U.S. Fish and Wildlife Service (USFWS) threatened and endangered species input dated April 1, 1992; the Texas Parks and Wildlife Department Special Species and Other Significant Features input dated May 8, 1992; and additional concerns raised by the USFWS in a letter dated August 6, 1992. Aerial photographs taken in November 1990 and the 1986 Carswell AFB Base Comprehensive Plan were also used to assist in the biological analysis. An extensive literature search was conducted and field verified.

3.4.5.1 Vegetation. Carswell AFB is located in a transition zone between the Cross Timbers and Prairie vegetational area of north-central Texas. The vegetation in the ROI is predominantly disturbed (mowed) grassland (Figure 3.4-5), although there are developed areas, landscaped areas, stands of trees (designated as forested), open water, and areas with hydrophytic vegetation, (designated as swamp/marsh) located at the base. Most of the native species on the base have been replaced by introduced grasses and ornamental trees. A representative species list for Carswell AFB is provided in Table 3.4-12.

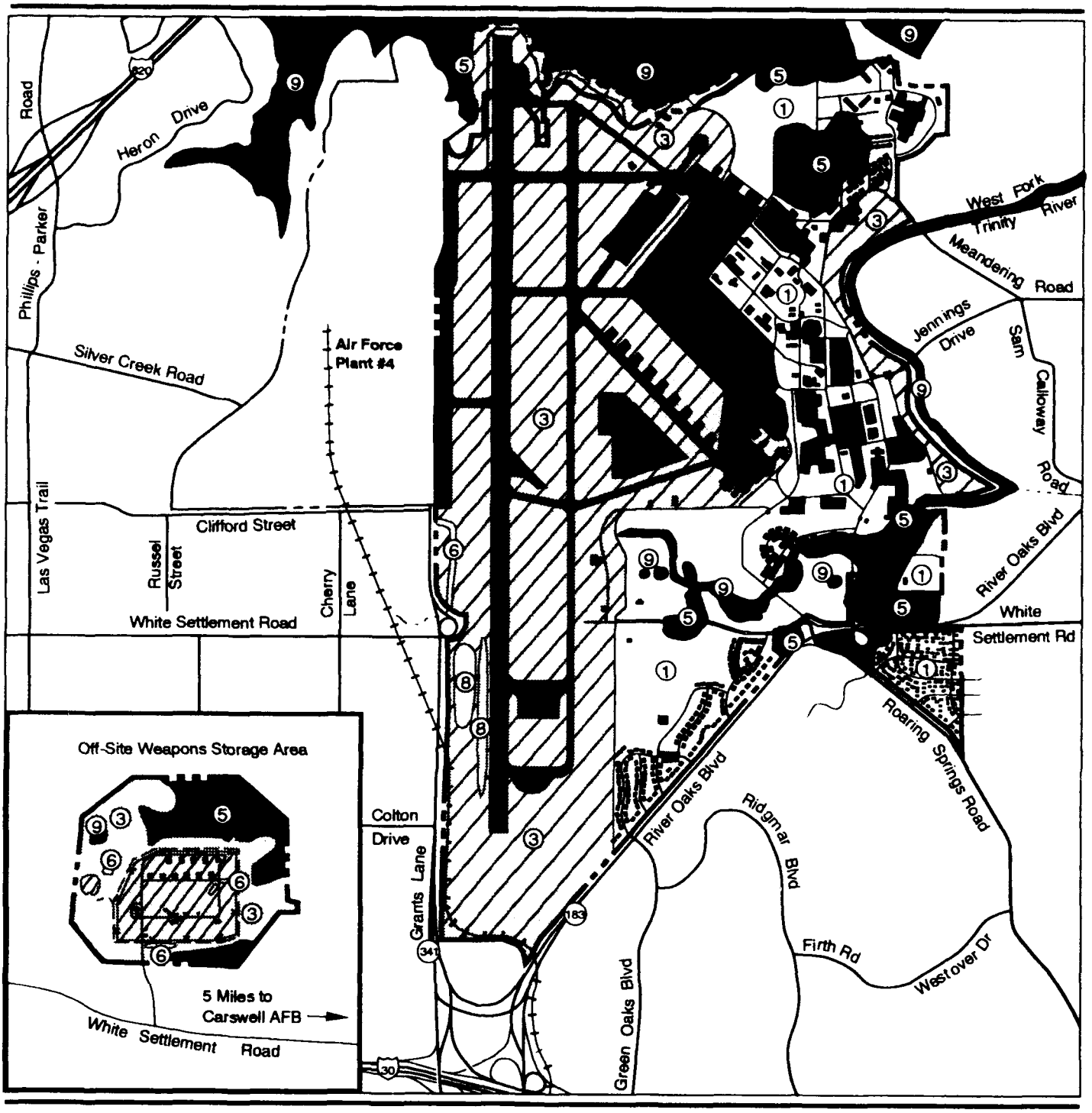
Human activities in the immediate vicinity of Carswell AFB have altered the natural environment primarily through urbanization. Carswell AFB is surrounded by developed land on the east, south, and west sides. Lake Worth borders the northern base boundary, and the West Fork of the Trinity River separates the eastern boundary of the base from the developed off-base land. Approximately 1,100 acres (43 percent) of Carswell AFB are covered by planted grassland, 750 acres (29 percent) are landscaped, and 680 acres (27 percent) are developed. Open water in the form of golf course ponds and streams is also found on Carswell AFB, with both Lake Worth and the West Fork of the Trinity River providing hydrological influences to the base due to their close proximity. A 0.5-acre swamp/ marsh (wetland) area with cattails, rushes, and willows is located on the west side of the base.

Much of the grassland vegetation is periodically mowed so that only the small fraction near lakes and streams is left undisturbed. The grassland areas consist of little bluestem, Indian grass, big bluestem, and buffalo grass.

Stands of trees on Carswell AFB are found near the streams and on the shore of Lake Worth. Dominant species include post oak, black jack oak, cedar elm, American elm, hackberry, and sumac. A thick understory of trumpet vine and honeysuckle often grow along the edge of the streams. Scattered emergent rush individuals are found along the lake shore.

Landscaped areas of Carswell AFB consist of lawns, landscape plantings, athletic facilities, cemeteries, and the golf course. The vegetative cover consists of bermuda grass and buffalo grass; bermuda grass is dominant on all lawn and athletic areas. Introduced tree species in this area include catalpa and chinaberry.

A pesticide-use program (see Section 3.3.6) was in place at Carswell AFB to control vegetation, fungi, and insects along shallow drainage channels on the base. Other pesticides were used to control rats, flies, fire ants, termites, and cockroaches. Pesticide operations at or near Carswell AFB has been noted as a possible cause for the absence of vegetation adjacent to IRP sites WP-11 and OT-12 (see Section 3.3.3).



EXPLANATION

- ① Landscaped
- ② Agriculture*
- ③ Grassland
- ④ Shrubland*
- ⑤ Forest
- ⑥ Swamp/Marsh
- ⑦ Tundra*
- ⑧ Barren
- ⑨ Water
- Developed
- Disturbed
- Carswell AFB Boundary
- Air Force Plant #4 Boundary

0 650 1300 2600 Feet

* Standard land use designation not applicable to this figure.

Vegetation Map

Figure 3.4-5

Table 3.4-12. Vegetation and Wildlife Species of Carswell AFB
Page 1 of 3

	Common Name	Scientific Name
Vegetation		
• Grass	Big bluestem	*Andropogon gerardi*
	Three-awn grass	*Aristida* spp.
	Gramma grass	*Boutelolia* spp.
	Buffalo grass	*Buchloe dactyloides*
	Windmill fingergrass	*Chloris verticillata*
	Bermuda grass	*Cynodon dactylon*
	Lovegrass	*Eragrostis* spp.
	Little barley	*Hordeum pusillum*
	Ozark grass	*Limnodea ardansana*
	Panic grass	*Panicum* spp.
	Dallis grass	*Paspalum dilatatum*
	Tumble grass	*Schedonnardus paniculatus*
	Little bluestem	*Schizachyrium scoparium*
	Indian grass	*Sorghastrum avenaceum*
	Johnson grass	*Sorghum halepense*
	Tall dropseed	*Sporobolus asper*
	Texas speargrass	*Stipa leucotricha*
• Herbs and Shrubs	Ragweed	*Amerosia* spp.
	Milkweed	*Asclepias* spp.
	Trumpet creeper	*Campsis radicans*
	Water hemlock	*Cicuta* spp.
	Thistle	*Cirsium* spp.
	Bull thistle	*Cirsium horridulum*
	Rain lily, cebollita	*Cooperia drummondi*
	Queen Ann's lace	*Dalicus carota*
	Beggar's ticks	*Desmodium* spp.
	Snake cotton	*Frelichia* spp.
	Indian blanket	*Gaillardia pulchella*
	Evening primrose family	*Gaura* spp.
	Sneezeweed	*Helenium* spp.
	Sunflower	*Helianthus annuus*
	Camphor weed	*Heterotheca subaxillaris*
	Wild morning glory	*Ipomoea tricholarpa*
	Rush	*Juncus* spp.

Table 3.4-12. Vegetation and Wildlife Species of Carswell AFB
Page 2 of 3

	Common Name	Scientific Name
• Herbs and Shrubs (continued)		
	Honeysuckle	*Lonicera* spp.
	Phlox	*Phlox* spp.
	Texas dandelion	*Pyrrhopappus hulticaulis*
	Mexican hat	*Ratibida columnaris*
	Greenthread	*Thelesperma filifolium*
	Cattail	*Typha* spp.
	Prairie verbena	*Verbena bipinnatifida*
	Broomweed	*Xanthocephalum* spp.
• Trees	Pecan	*Carya illinoinensis*
	Catalpa	*Catalpa bignonioides*
	Hackberry	*Celtis laevigata*
	Beech	*Fagus grandifolia*
	Chinaberry	*Melia azedarach*
	Mulberry	*Morus* spp.
	Elderberry	*Sambucus canadensis*
	Sumac	*Rhus* spp.
	American elm	*Ulmus americana*
	Cedar elm	*Ulmus crassifolia*
	Blackjack oak	*Quercus marilandica*
	Plateau live oak	*Quercus fusiformis*
	Shumard red oak	*Quercus shumardii*
	Post oak	*Quercus stellata*
Wildlife		
• Mammals	Coyote	*Canis latrans*
	Nine-banded armadillo	*Dasypus novemcinctus*
	Opossum	*Didelphis virginiana*
	Black-tailed hare	*Lepus californicus*
	Raccoon	*Procyon lotor*
	Striped skunk	*Mephitis mephitis*
	Eastern cottontail	*Sylvilagus floridanus*
	Red fox	*Vulpes fulva*
	Fox squirrel	*Sciurus niger*
	Thirteen-lined ground squirrel	*Spermophilus tridecemlineatus*
	Gray fox	*Urocyon cinereoargenteus*

Table 3.4-12. Vegetation and Wildlife Species of Carswell AFB
Page 3 of 3

	Common Name	Scientific Name
• Birds		
- General	Grackle	*Quiscalus quiscula*
	Cardinal	*Richmondena cardinalis*
	Starling	*Starnus vulgaris*
	Mourning dove	*Zenaidura macroura*
- Cropland/Grassland Habit	Meadowlark, western	*Sturnella neglecta*
- Wetland Species	Red-winged blackbird	*Agelaius phoeniceus*
- Shorebirds	Killdeer	*Charadrius vociferus*
	Great blue heron	*Ardea herodias*
- Waterbirds	Wood duck	*Aix sponsa*
	Pintail duck	*Anas acuta*
	Mallard	*Anas platyphynchos*
	American golden-eye	*Buchepala clangula*
	Merganser (fish duck)	*Mergus merganser*
• Reptiles		
- Snakes	Broad-banded copperhead	*Agkistrondon contortrix laticinctus*
	Western cottonmouth	*Agkistrodon piscivorus leucostoma*
	Western diamondback rattlesnake	*Crotalus atrox*
	Canebrake rattlesnake	*Crotalus horridus atricaudatus*
	Western milk snake	*Lampropeltis triangulum gentilis*
	Western ribbon snake	*Thamnophis proximus proximus*
- Turtles	Softshell turtle	*Trionyx* spp.
• Amphibians	Bullfrog	*Rana catesbeiana*
• Fish	Black bass	*Micropterus* sp.
	Bluegill sunfish	*Lepomis macrochirus*
	Carp	*Cyprinus carpio*
	Channel catfish	*Ictaluras punctatus*

The Off-Site WSA includes 80 acres of mowed grassland inside the fenced area. Most of the area outside the fence is grassland showing evidence of heavy grazing. A thick forested arroyo lies north of the easement of the Off-Site WSA facilities. Located at the Off-Site WSA are several drainage ditches containing hydrophilic vegetation totalling approximately 0.3 acre in the fenced area and 0.4 acre in the unfenced area. Rushes are evident and growing in the drainages. Vegetation in the unfenced drainage areas is relatively lush, but is subject to maintenance dredging.

None of the vegetation present is protected by federal, state, or local regulations, with the exception of the wetland areas discussed under Sensitive Habitats, Section 3.4.5.4.

3.4.5.2 Wildlife. Wildlife in the vicinity of Carswell AFB includes numerous birds, reptiles and small mammals (see Table 3.4-11). Typical wildlife in the upland grassy areas and along the airfield includes various bird species, coyotes, and black-tailed hare. The wooded lowlands are occupied by cotton-tailed rabbit, fox squirrel, and opossum. Other mammals common to the area include raccoon, striped skunk, armadillo, and fox. Hunting and trapping are not permitted on or near Carswell AFB. The Allen Wildlife Sanctuary, Fort Worth Nature Center, and an abandoned fish hatchery are all important nearby wildlife areas.

Carswell AFB is in the Central North American Migratory Flyway. Large numbers of birds frequent Lake Worth, despite periodic disturbances by aircraft flight activities. Flocks of waterfowl are known to rest at Lake Worth to wait for favorable weather conditions; these birds include the wood duck, mallard, pintail, golden eye, and merganser. Other birds include mourning dove, meadow lark, grackle, and starling. Raptors nest in the trees in the southeast corner of the base. The great blue heron is a sensitive species known to nest near the Fort Worth Nature Center, more than 4 miles north of Carswell AFB. These nesting areas are in close proximity to the preclosure noise contours for Carswell AFB.

Carswell AFB maintained a Bird Aircraft Strike Hazard (BASH) Reduction Plan, which modified conditions surrounding the airfield to make the area less attractive to birds. Some of these practices included managing the grass height and species composition, reducing the potential for standing water, creating uniform vegetation in the airfield to remove the "edge effect" attractive to birds, and eliminating roosting sites. These practices reduced, but did not eliminate, the potential for bird/aircraft collisions. In 1991, the number of bird/aircraft strikes averaged approximately 20 collisions per year, many of which occurred while the plane was on the ground. The average collision rate at the height of aircraft operations was estimated to be 1 strike per 4,300 aircraft operations.

The northern portion of Carswell AFB borders approximately 1 mile of Lake Worth's shoreline, and is also bounded by the West Fork of the Trinity River to the east. Bodies of water in the ROI include Lake Worth and the Trinity River off the base, and Farmers Branch Creek and three man-made ponds on the base. Three ponds are on the main base, two between Farmers Branch Creek and the Hush House, and the other on the eastern portion of the golf course; a fourth pond is located near the west boundary of the Off-Site WSA. The ponds contain carp and minnows. A soft-shell turtle was identified in the pond northwest of the golf course.

Compared to the surrounding mowed landscape, the streams on the base are densely vegetated and provide suitable habitat for native species. The streams have, however, been subject to environmental stress over the years. A fish kill, thought to be caused by an off-base source, occurred in 1992. Other spills may have occurred in the past due to sanitary wastewater overflows from a sewer line owned by the city of Fort Worth. Fish kills associated with wastewater overflow events have been attributed to the high oxygen demand of the wastewater. This is apparent from the reported rapid recovery of fish populations in Farmers Branch Creek following these episodes.

The Off-Site WSA is mostly fenced and areas within the fence are highly disturbed. Few wildlife species are expected to occur within the disturbed, fenced area. The unfenced areas of the Off-Site WSA and associated easement are used for cattle grazing, but also provide a fairly undisturbed suitable habitat for many mammals, reptiles, and birds.

3.4.5.3 Threatened and Endangered Species. The Air Force has conducted informal consultations with the USFWS and the Texas Department of Parks and Wildlife (TDPW) concerning threatened and endangered species potentially occurring in the vicinity of Carswell AFB. These two agencies identified 12 bird, 2 reptile, and 1 sensitive plant species potentially occurring in Tarrant County (Table 3.4-13) although no state or federally listed threatened or endangered species is known to permanently live on Carswell AFB.

The TDPW identified the auriculate false foxglove plant as historically being present in Tarrant County. However, no suitable habitat exists within the ROI for this plant and TDPW believes the plant may have been extirpated from the state. None of the federally listed plant species for Texas are known to occur within 100 miles of Tarrant County (CH_2M Hill, 1984).

Of the 12 listed bird species that may occur in Tarrant County, 10 are migrants attracted by Lake Worth. These migrants include the Arctic peregrine falcon (threatened), American Peregrine falcon (endangered), bald eagle (endangered), piping plover (threatened), reddish egret (federal candidate, Category 2 and state threatened), whooping crane (endangered),

Table 3.4-13. Threatened, Endangered, and State Ranked Species Potentially Occurring in the Vicinity of Carswell AFB

Common Name	Species Name	Status	
		Federal	State
Piping plover	*Charadrius melodus*	T	T
Golden-cheeked warbler	*Dendroica chrysoparia*	E	E
Reddish egret	*Egretta rufescens*	C2	T
American peregrine falcon	*Falco peregrinus anatum*	E	E
Arctic peregrine falcon	*Falco peregrinus tundrius*	T	T
Whooping crane	*Grus americana*	E	E
Bald eagle	*Haliaeetus leucocephalus*	E	E
Wood stork	*Mycteria americana*	—	T
Brown pelican	*Pelecanus occidentalis*	E	E
White-faced ibis	*Plegadis chichi*	C2	T
Interior least tern	*Sterna antillarum*	E	E
Black-capped vireo	*Vireo atricapillus*	E	E
Texas horned lizard	*Phrynosoma cornutum*	C2	T
Texas garter snake	*Thamnophis sirtalis annectens*	C2	—
Auriculate false foxglove	*Agalinis auriculata*	C2	X*

Notes: E = Listed as endangered.
T = Listed as threatened.
C2 = Candidate, Category 2. Information indicates that proposing to list as endangered or threatened is possibly appropriate, but substantial data on biological vulnerability and threats are not currently known to support immediate preparation of rules. Further biological research and field study is necessary to ascertain status and/or taxonomic validity.
X = Apparently extirpated from state.
* Global rank: Imperiled globally, very rare, 6 to 20 occurrences (Endangered throughout range).

Source: Texas Parks and Wildlife Department, 1992; U.S. Fish and Wildlife Service, 1991, 1992.

wood stork (state threatened), brown pelican (endangered), white-faced ibis (federal candidate, Category 2 and state threatened), and the interior least tern (endangered). None of these migrants are expected to reside in the vicinity of the main base or at the Off-Site WSA. Two other federally endangered bird species require specific habitats that are not present within the ROI. The golden-cheeked warbler (endangered) needs old, mature juniper stands; the black-capped vireo (endangered) requires a specific habitat structure of wooded thickets and live oaks.

Two federally listed candidate reptile species may occur in Tarrant County. One is the Texas horned lizard, which lives on grassy hillsides. The other is the Texas garter snake, which prefers prairie seeps and wet grassy swales. There is a slight potential that these reptile species could be present in the 4-acre, unmowed horse pasture on the eastern side of the main base. The

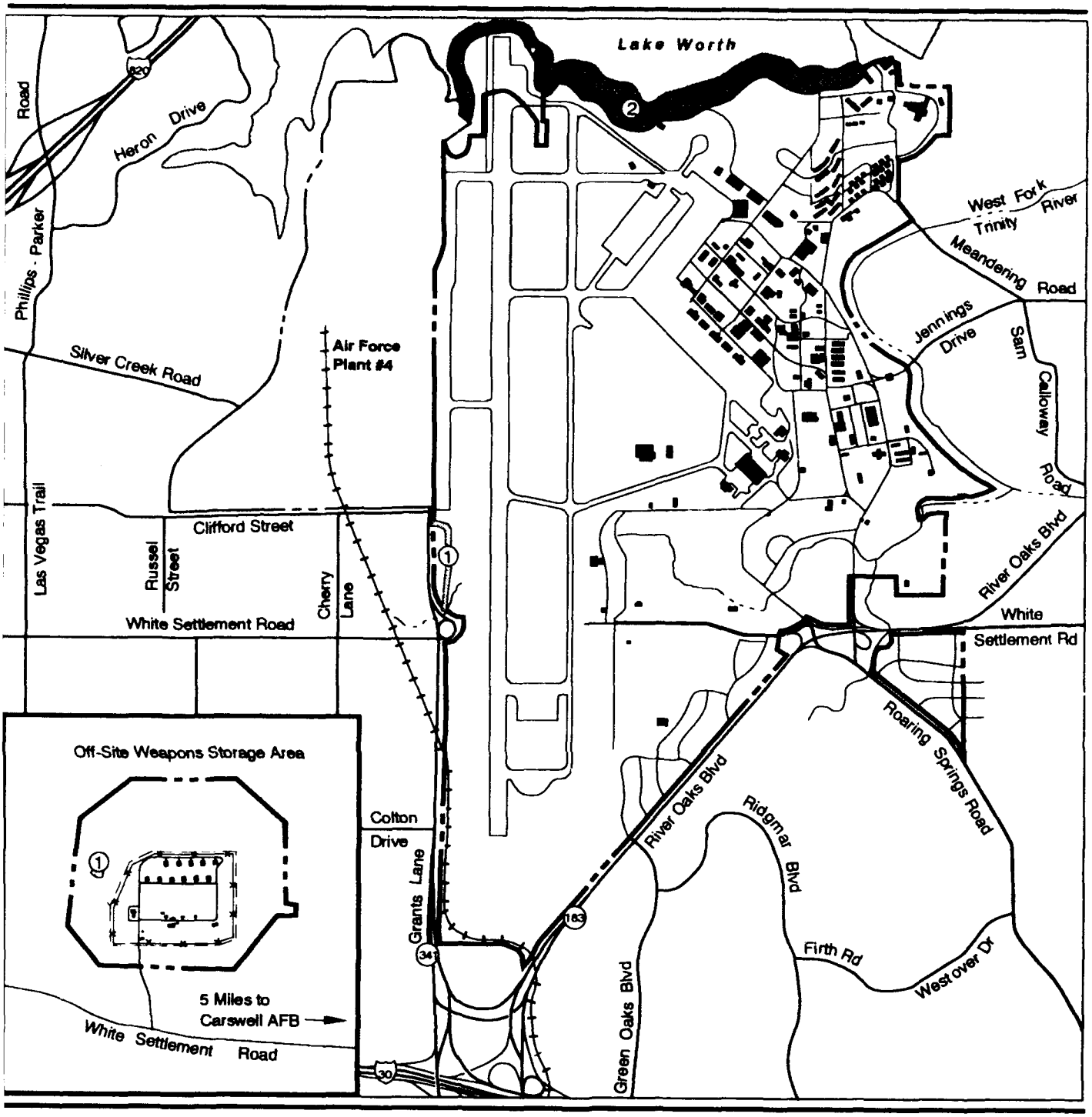
garter snake may also reside along the drainages on the main base, but prefers grassy areas to woody vegetation. Neither of the species were observed on the main base or at the Off-Site WSA. Suitable habitat has been fragmented on the base and much of it had been repeatedly mowed or heavily grazed; as a result, the grassland habitat on Carswell AFB is not expected to contain either of the Category 2 reptiles. These same reptile species are not expected to occur in the fenced WSA but may be present in the pasture lands outside the fences.

3.4.5.4 Sensitive Habitats. Sensitive habitats include those areas that can potentially restrict the reuse of the land, such as wetlands, under the jurisdiction of the CWA, plant communities that are designated as unusual or of limited distribution, and important seasonal use areas for wildlife (e.g., migration routes, breeding areas, or crucial summer/winter habitat that are of agency concern). This includes areas protected by regulation, those areas associated with a protected species, or those areas critical for a life need of a species or population.

Carswell AFB has a total of 0.6 acre of jurisdictional wetlands designated by Corps of Engineers (COE) (Figure 3.4-6). Wetlands are defined as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (U.S. Army COE, 1987). Areas that are periodically wet, but do not meet all three criteria (hydrophytic vegetation, hydric soils, and wetland hydrology), may still be jurisdictional wetlands subject to Section 404 of the federal CWA if they qualify as problem wetlands. Drainage ditches are not considered as "waters of the United States" and are not classified as "jurisdictional" for protection under Section 404 of the CWA by the Fort Worth U.S. Army COE.

Although water flows through Farmers Branch and is found in various small ponds on the golf course, very little wetland vegetation is associated with these areas. Likewise, wetland vegetation along Lake Worth is infrequent and usually emergent when present. These areas do not support enough wetland cover to be classified as jurisdictional wetlands.

Jurisdictional wetland areas on base are found in the natural drainage stream southeast of AF Plant #4 totaling approximately 0.5 acre, on the west side of the Off-Site WSA, totaling approximately 0.1 acre. The Off-Site WSA wetland is of low quality in value due to its lack of species diversity. The rest of the hydrophytic vegetation at the Off-Site WSA is located in man-made drainage ditches and, therefore, does not qualify as jurisdictional wetlands.



EXPLANATION

- ① Jurisdictional Wetlands
- ② Migratory Bird Habitat
- Carswell AFB Boundary
- Air Force Plant #4 Boundary

0 650 1300 2600 Feet

Sensitive Habitats

Figure 3.4-6

The shore of Lake Worth is considered sensitive habitat due to its importance to migratory birds, including state and federally listed species. The great blue heron rookeries, near the Fort Worth Nature Center, are sensitive nesting areas north of the base along the northern banks of Lake Worth. The birds are especially vulnerable to human intrusion during the nesting season. These rookeries are protected as sensitive wildlife areas by the Texas Parks and Wildlife Department.

3.4.6 Cultural Resources

Cultural resources are prehistoric and historic sites, structures, districts, artifacts, or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious or other reasons. Cultural resources have been divided for ease of discussion into three main categories: prehistoric resources, historic structures and resources, and traditional resources. These types of resources are defined in Appendix E, Methods. For the purposes of this analysis, paleontological remains, the fossil evidence of past plant and animal life, have been included within the cultural resources category.

For this analysis, the ROI is synonymous with the Area of Potential Effect as defined by regulations implementing the National Historic Preservation Act (NHPA). The ROI for the analysis of cultural resources at Carswell AFB includes all areas within the base boundaries (including the Off-Site WSA and the Kings Branch housing area), whether or not certain parcels would be subject to ground disturbance or other impacts. The ROI would also include any off-site areas that may be disturbed as a direct or indirect result of reuse activities (i.e., the potential interconnections for water and sewer service at the Off-site WSA).

The conveyance of federal property to a private party or nonfederal agency constitutes an undertaking, or a project that falls under the requirements of cultural resources legislative mandates. Any historic properties located on that property would then cease to be protected by federal law. However, impacts resulting from conveyance could be mitigated by placing preservation covenants in the deeds and lease conditions. Reuse activities within designated parcels would be required to be in compliance with the requirements contained in the preservation covenants.

Numerous laws and regulations require federal agencies to consider the effects of a proposed project on cultural resources. These laws and regulations stipulate a process for compliance, define the responsibilities of the federal agency proposing the action, and prescribe the relationship among other involved agencies (e.g., State Historic Preservation Office [SHPO] and the Advisory Council on Historic Preservation). Methods used to achieve compliance with these requirements are presented in Appendix E.

Only those potential historic properties determined to be significant under cultural resource legislation are subject to protection or consideration by a federal agency. The quality of significance, in terms of applicability to NRHP criteria and of integrity is determined in consultation with the SHPO and the process is discussed in Appendix E, Methods. Significant cultural resources, either prehistoric or historic in age, are referred to as "historic properties".

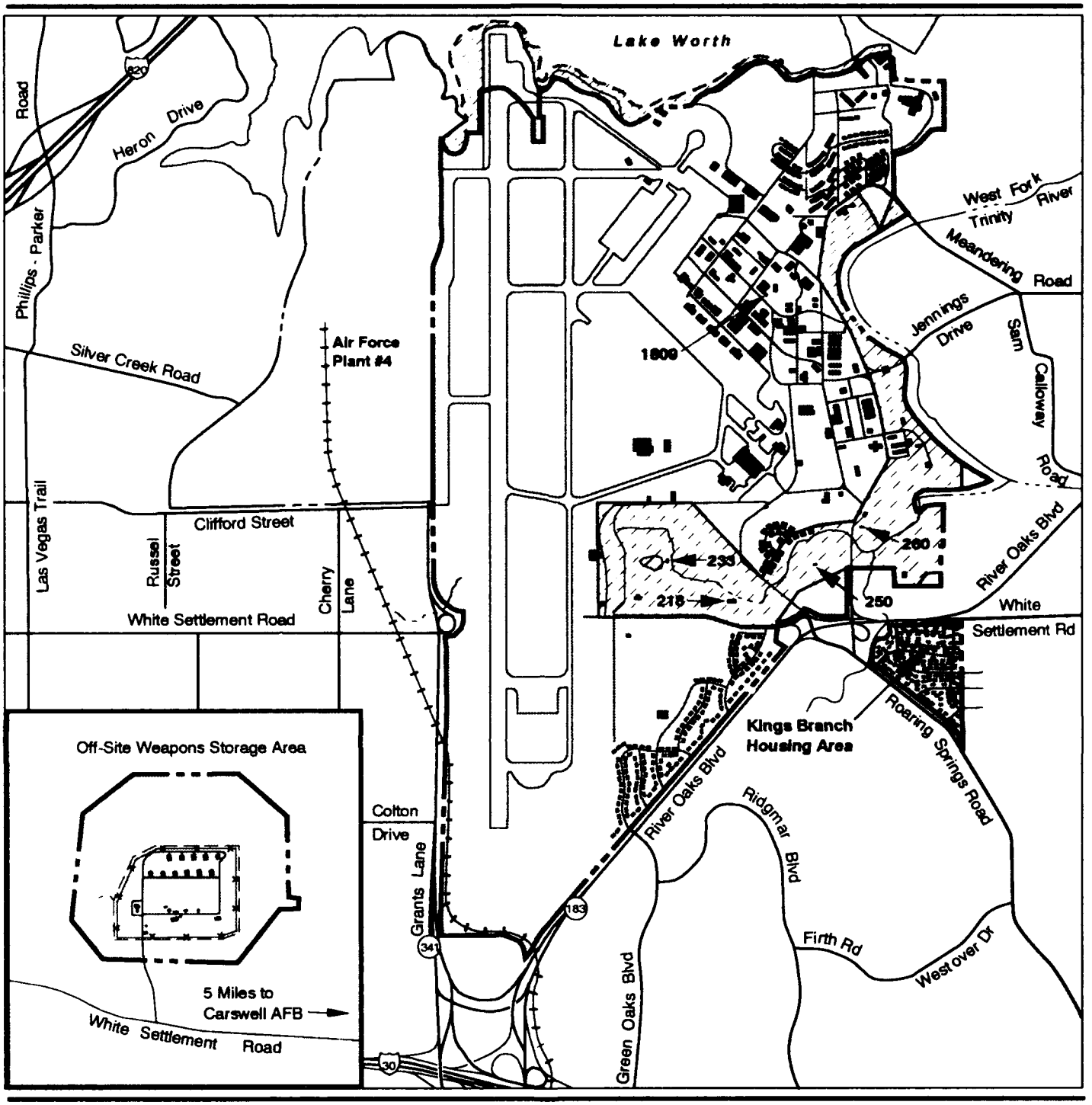
In compliance with the NHPA, the Air Force has initiated the Section 106 review process with the Texas SHPO (Texas Historical Commission). Record and literature searches were performed using documents from this office and at Carswell AFB in June 1992. Results are discussed under the appropriate resource category.

3.4.6.1 Prehistoric Resources. The physiography and climate of north-central Texas have supported a cultural resources chronology that extends into the past for nearly 12,000 years (Jennings, 1978). Some of the earliest known archaeological sites in North America have been discovered in this region, including a 9000-year-old burial site near Leander and the Lewisville Site located along the Trinity River (Texas Historical Commission, 1985). The three major divisions of prehistory represented in this region are: the Paleo-Indian Period (10,000-6,000 B.C.), the Archaic Period (6,000 B.C. - A.D. 500), and the Late Prehistoric Period (A.D. 500 - A.D. 1500).

In April 1990, the Texas SHPO toured Carswell AFB to assess the status of cultural resources. Observations confirmed that many areas of the base have been heavily altered by previous construction activities and that any archaeological sites in those areas have been destroyed. The SHPO recommended, however, that three potentially sensitive areas of the base be surveyed.

In November 1990, the National Park Service (NPS), Rocky Mountain Region, intensively surveyed approximately 320 acres that incorporated these sensitive areas (Figure 3.4-7). Five sites were identified (see Appendix I); one prehistoric (Site 41TR125 [CAFB-03]) and four historic (see Section 3.4.6.2); none were considered eligible to the NRHP (NPS, 1990). The SHPO concurred with the findings on the five sites and concluded that no further archaeological investigations would be required for Carswell AFB (see Appendix K). The only other cultural resources survey of the base (U.S. Air Force, 1988) was of the Kings Branch housing area (36 acres) and a 9-acre tract adjacent to the Noncommissioned Officers' club in the northeast corner of the base; no cultural resources were identified during this survey (see Figure 3.4-7).

3.4.6.2 Historic Structures and Resources. The historic period in Texas began in the 16th century with the arrival of the Spanish and the construction of numerous presidios and missions. Anglo-American



EXPLANATION

- Carswell AFB Boundary
- Air Force Plant #4 Boundary
- Leased Property

- Cultural Resources Survey (U.S. Air Force, 1988)
- Cultural Resources Survey (NPS, 1990)
- Properties That May Be Eligible to the NRHP (Buildings 218, 233, 260, and Structure 1809)*
- Buck Oaks Farm- NRHP Listed (Building 250)
- Area Reviewed by SHPO and Determined to Require No Cultural Resources Survey

0 650 1300 2600 Feet

*Study in progress.

Cultural Resources

Figure 3.4-7

settlement began in the 19th century as the Chisholm Trail opened west through Fort Worth, the last major stop before cattle herds were driven north to Kansas (Fort Worth Star-Telegram, 1992).

Early settlement in Tarrant County and the area that is now Carswell AFB, began with homesteading in the late 1850s by the Farmer, Thompson, and other families (U.S. Department of the Interior, 1987). Buck Oaks Farm (Building 250), built by the Buck family in 1932, is located within the boundary of Carswell AFB and is currently the only NRHP-listed property on the base. Other residences and the Thompson family cemetery, which is on a parcel of privately-owned land, that pre-date establishment of the base are also located within the Carswell AFB boundaries.

During the NPS survey in 1990, four historic sites were identified, all of which date from the Anglo-American period of settlement and none of which were considered eligible to the NRHP, with SHPO concurrence (NPS, 1990) (see Appendix K). The sites include:

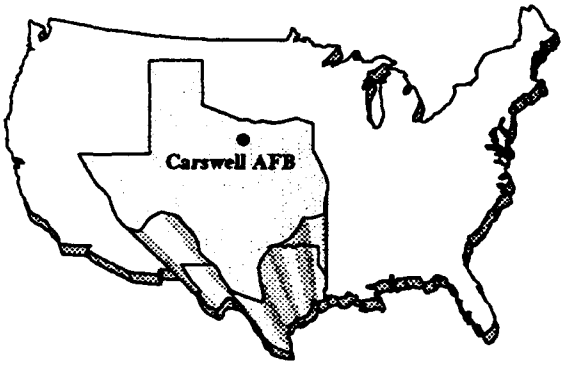
- CAFB-01 - a dwelling foundation footing
- CAFB-02 - a bridge/water crossing
- CAFB-04 - a trash dump/scatter
- CAFB-05 - a trash dump.

First called the Tarrant Field Airdrome, Carswell AFB was authorized in early 1942 as a result of World War II; construction was completed by December of that year and the base was placed under the jurisdiction of the Gulf Coast Army Air Field Training Command (U.S. Air Force, n.d.). Numerous temporary wood-frame, mobilization-type facilities were built throughout the base during the World War II period, some of which are still utilized. Facilities constructed at the Off-Site WSA were built in 1956 and the Kings Branch area of Wherry-style housing was constructed in 1951.

In 1992, Texas Tech University conducted a historic buildings and structures survey of Carswell AFB. Thirty-one buildings, one structure, and the Thompson family cemetery were evaluated and photographed during the survey. Of these, the survey concluded that three could be eligible to the National Register: Building 233, the Golf Course Maintenance Shop; Building 260, a single-family residence; and Structure 1809, a concrete water tower. A fourth building, the Golf Course Clubhouse (Building 218), was considered marginal because of its loss of integrity. Subsequent to this survey, comments from the Texas SHPO on the Texas Tech report, and changes in Air Force policy regarding the eligibility of some World War II and Cold War facilities, have necessitated a reevaluation of the Carswell AFB buildings and structures. A revision of the initial survey report is currently in progress and a final determination on NRHP-eligible properties will be coordinated with the Texas SHPO and incorporated into the text of the FEIS.

3.4.6.3 Traditional Resources. In historic times, the area of Carswell AFB was inhabited by the Comanche, the Kiowa-Apache, the Tonkawa, and the Caddo Indian tribes. Currently, the majority of Native Americans that live in the state of Texas are nonnative with most descendants of the native tribes residing in Oklahoma and Kansas. The only traditional group to express interest in Carswell AFB conversion and reuse activities has been the Tonkawa Tribe of Oklahoma; their letter of interest is provided in Appendix K.

3.4.6.4 Paleontological Resources. During the Cretaceous period (65 to 145 million years ago), most of Texas was covered by an enlarged Gulf of Mexico (Finsley, 1989). As a result, paleontological remains from this period are common to the Carswell AFB area. Literature searches and field reconnaissance in June 1992 confirmed the presence of fossils along the western boundary of the base and at the Off-Site WSA. Identified fossils types include cephalopods (ammonites), bivalves (*Cyprimeria, Gryph[illegible], Ostrea*), and worm tubes (*Serpula*). Identification was not made to the species level, and no samples were collected for salvage/repository. There are no listed or eligible National Natural Landmarks on the base.



CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter discusses the potential environmental consequences associated with the reuse alternatives. To provide the context in which potential environmental impacts may occur, discussions of potential changes to the local communities, including population, land use and aesthetics, transportation, and community and public utility services are included in this EIS. In addition, issues related to current and future management of hazardous materials and wastes are discussed. Impacts to the physical and natural environment are evaluated for geology and soils, water resources, air quality, noise, biological resources, and cultural resources. These impacts may occur as a direct result of military realignment and civilian reuse activities, or as an indirect result caused by changes within the local communities. Possible mitigation measures to minimize or eliminate the adverse environmental impacts are also presented.

Cumulative impacts result from "the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (Council on Environmental Quality, 1978). No actions were identified that would contribute to a potential cumulative impact on the military or civilian reuse of Carswell AFB.

Means of mitigating adverse environmental impacts that may result from implementation of one of the reuse alternatives by property recipients are discussed as required by NEPA. Mitigation measures are suggested for those components likely to experience substantial and adverse changes under any or all of these alternatives. Potential mitigation measures depend upon the particular resource affected. In general, however, mitigation measures are defined in CEQ regulations as actions that include:

(a) Avoiding the impact altogether by not taking an action or certain aspect of the action

(b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation

(c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment

(d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action

(e) Compensating for the impact by replacing or providing substitute resources or environments.

A discussion of the effectiveness of mitigation measures is included for those resource areas where it is applicable. Where appropriate, a discussion regarding the probability of success associated with a particular mitigation is included.

Alternatives are defined for this analysis on the basis of (1) DOD-generated plans to establish NAS Fort Worth for realigning military units, (2) plans of local communities and interested individuals, (3) general land use planning considerations, and (4) Air Force-generated civilian development plans to provide a broad range of civilian reuse options. Reuse scenarios considered in this EIS must be sufficiently detailed to permit environmental analysis. Initial concepts and plans are taken as starting points for scenarios to be analyzed. Available information on any reuse alternative is then supplemented with economic, demographic, transportation, and other planning data to provide a reuse scenario for analysis.

This chapter presents the environmental effects to the post-closure conditions that would result from the military reuse associated with the No-Action/Realignment Alternative. The post-closure conditions represent the natural conditions of the growth in employment and population that the ROI would experience without military realignment or civilian reuse. The discussion then focuses on the additional effects over the No-Action/ Realignment Alternative from the civilian reuse activities associated with the Proposed Action and Mixed Use Alternative. The total reuse-related impacts are also presented for the Proposed Action and Mixed Use Alternative to provide references to the total effects related to both military and civilian reuse of the entire base property.

4.2 LOCAL COMMUNITY

This section discusses potential effects on local communities as a result of disposal and reuse of Carswell AFB.

4.2.1 Community Setting

Socioeconomic effects will be addressed only to the extent that they are interrelated with the biophysical environment. A complete assessment of socioeconomic effects is presented in the Socioeconomic Impact Analysis Study.

This analysis also recognizes the potential for community effects stemming from "announcement effects" of information regarding the base's closure or reuse. Such announcements may affect the communities' or individuals' perceptions and, thus, could have important local economic consequences.

An example of one such effect would be the in-migration of people anticipating employment under one of the reuse options. If it were announced later that the base would remain closed and unused, many of these newcomers would leave the area to seek employment elsewhere. This announcement effect would, thus, include (1) a temporary increase in population in anticipation of future employment and (2) a subsequent decline in population, as people leave the area after the announcement. Bases with more than one closure announcement may not experience as severe an announcement effect. Changes associated with announcement effects, while potentially important, are highly unpredictable and difficult to quantify; therefore, such effects were excluded from the quantitative analysis in this study, and are not included in the numeric data presented in this report.

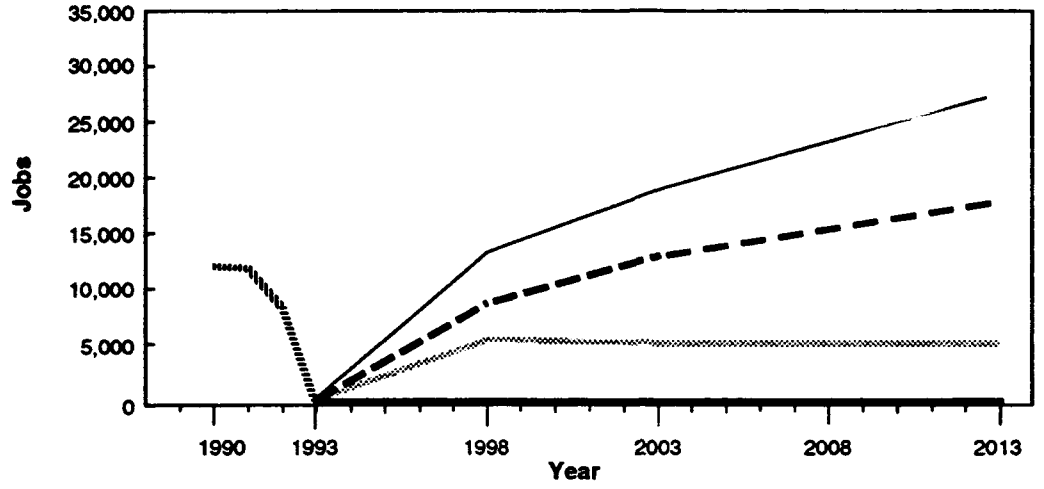
4.2.1.1 No-Action/Realignment Alternative. The military realignment activities under this alternative would increase employment levels in the ROI from 1,497 jobs in 1993 to approximately 7,118 jobs in 2013. Approximately 3,881 direct jobs and 3,129 secondary jobs would be associated with NAS Fort Worth. The additional 108 jobs (50 direct and 58 secondary) would be associated with the caretaker activities of the OL. Under post-closure conditions (conditions without base reuse), the total ROI employment is estimated to increase from 730,956 at closure to 987,952 in 2013. The employment generated under the No-Action/Realignment Alternative would increase the total ROI employment in the year 2013 to 993,573. This would represent an increase of 0.5 percent over the post-closure conditions in 2013. Figure 4.2-1 shows the effects of the No-Action/Realignment Alternative and the other alternatives on employment in the ROI.

Post-closure conditions for population are estimated to increase from 1,436,347 in 1993, to 1,832,313 in the year 2013. The No-Action/ Realignment Alternative would result in a total site-related population (direct and secondary employees and their dependents in the ROI) of 12,935 by the year 2013. Of the total site-related population, approximately 2,872 persons are expected to enter, or in-migrate, into the ROI. The 2,872 in-migrating persons represent an increase of 0.2 percent over the post-closure ROI population levels in the year 2013, and would cause the total ROI population to reach 1,835,185 by the year 2013. Of the in-migrating persons, 1,862 are expected to reside within Fort Worth; while 81 and 252 are expected to reside within White Settlement and Westworth Village, respectively. Figure 4.2-2 shows the effects of the No-Action/Realignment Alternative and the other alternatives on population in the ROI.

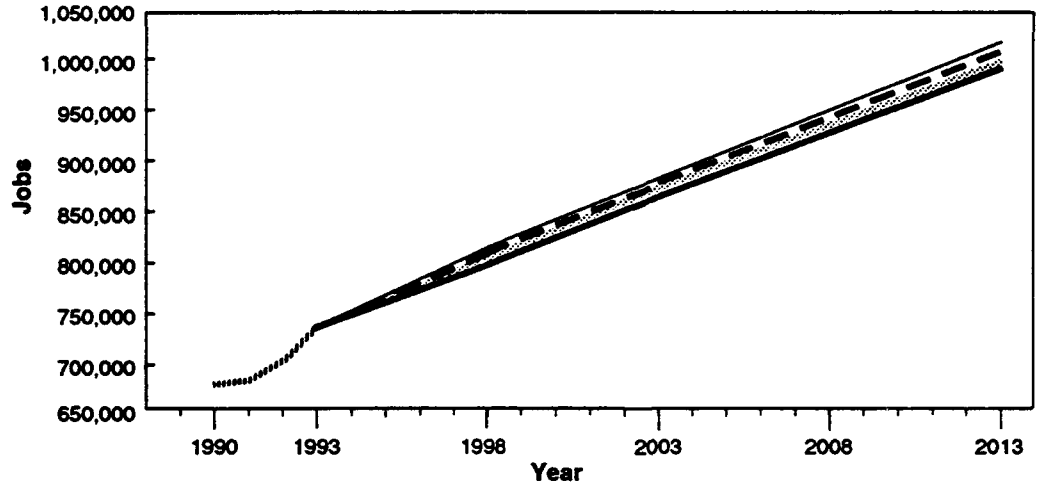
4.2.1.2 Proposed Action. In addition to the 7,010 jobs associated with the military reuse (NAS Fort Worth), the Proposed Action would generate an additional 11,802 (5,101 direct and 6,701 secondary) jobs associated with civilian reuse activities by the year 2013. Total employment associated with military and civilian reuse of the base would reach 18,812 jobs by the year

	1993[a]	1998	2003	2013
Post-Closure Conditions	1,497	1,497	1,497	1,497
ALTERNATIVE				
No-Action/Realignment	1,497	5,747	5,621	5,621
Proposed Action	1,497	9,535	13,355	17,315
Mixed Use	1,497	14,349	18,342	27,276

Reuse-Related Employment Effects(b)



Reuse-Related Employment Effects(b)



Total ROI Employment Including Reuse-Related Effects

EXPLANATION

- Preclosure
- Post-Closure Conditions
- No-Action/Realignment
- Proposed Action
- Mixed Use

(a) The 1993 values represent total base-related employment under the closure baseline.

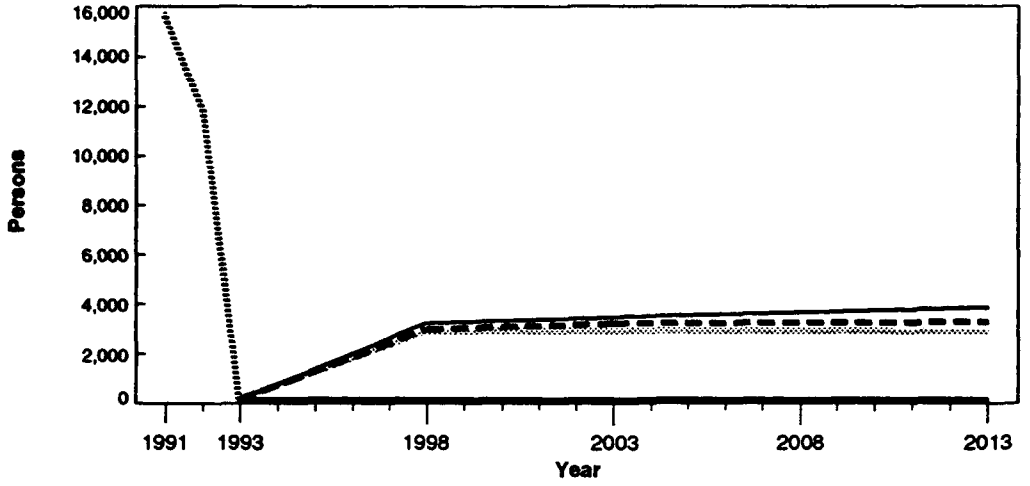
(b) Employment effects represent the change in employment relative to Post-Closure Conditions.

Reuse-Related Employment Effects

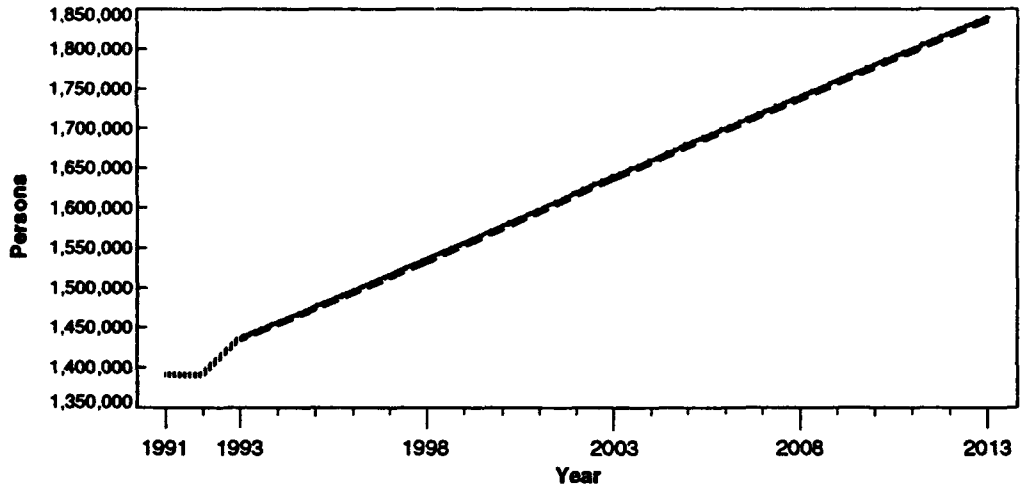
Figure 4.2-1

ALTERNATIVE	1993 (a)	1998	2003	2013
No-Action/Realignment	0	2,875	2,872	2,872
Proposed Action	0	3,038	3,195	3,360
Mixed Use	0	3,230	3,401	3,774

Migratory-Related Population Effects (b)



Migratory-Related Population Effects (b)



Total ROI Population Including Migratory-Related Effects (c)

EXPLANATION

- Preclosure
- Post-Closure Conditions
- No-Action/Realignment
- Proposed Action
- Mixed Use

(a) 1993 represents closure baseline conditions.
(b) Migratory-related population effects are the persons that would move into the ROI solely as a result of reuse.
(c) Changes in alternatives are too small to be noticeable on graph.

Migratory-Related Population Effects

Figure 4.2-2

2013. Under the Proposed Action, the total ROI employment would reach 1,005,267 by the year 2013, which is approximately a 1.2 percent increase over the No-Action/Realignment Alternative.

Under the Proposed Action, the site-related population in the ROI would increase by approximately 31,010 over the No-Action/Realignment Alternative, for a total site-related population of 43,945 in the year 2013. By 2013, there would be a total of 3,360 in-migrating persons entering the ROI due to the Proposed Action. Only 488 in-migrants would be associated with civilian reuse of the base property; the remainder would be associated with the military realignment activities, as discussed in Section 4.2.1.1, No-Action/Realignment Alternative. The 488 additional in-migrants associated with the Proposed Action would represent a 17 percent increase in migratory population over the No-Action/Realignment Alternative. By 2013, 195 of the 488 in-migrating persons are expected to reside within Fort Worth, and 6 are expected to reside within White Settlement. Under the Proposed Action, no additional in-migrating persons are expected to reside within Westworth Village. The majority of the other 287 in-migrating persons are expected to reside within Tarrant County. Total ROI population under the Proposed Action is expected to reach 1,835,673 by 2013, representing an increase of less than 0.1 percent over the No-Action/Realignment Alternative.

4.2.1.3 Mixed Use Alternative. In addition to the 7,010 jobs associated with the military reuse, the Mixed Use Alternative would generate 21,763 (9,457 direct and 12,306 secondary) jobs associated with civilian reuse by 2013, for a total reuse-related employment of 28,773 jobs. Under the Mixed Use Alternative, the total ROI employment would reach 1,015,228 by the year 2013, which is approximately a 2.2 percent increase over the No-Action/Realignment Alternative.

Under the Mixed Use Alternative, the site-related population in the ROI would increase by 57,417 over the No-Action/Realignment Alternative, for a total site-related population of 70,352 in the year 2013. By 2013, there would be a total of 3,774 in-migrating persons entering the ROI due to the Mixed Use Alternative. Only 902 would be due to civilian reuse; the remainder would be associated with the military realignment activities. The 902 additional in-migrants associated with the Mixed Use Alternative would represent a 31 percent increase in migratory population over the No-Action/ Realignment Alternative. By 2013, 363 of the 902 in-migrating persons are expected to reside within Fort Worth; while 12 and 3 are expected to reside within White Settlement and Westworth Village, respectively. The majority of the other 524 in-migrating persons are expected to reside within Tarrant County. Total ROI population under the Mixed Use Alternative is expected to reach 1,836,087 by 2013, or an increase of less than 0.1 percent over the No-Action/Realignment Alternative.

4.2.1.4 Other Land Use Concepts. The potential effects of federal transfers and independent land use concepts will be discussed in relation to their net effects to the reuse alternatives.

Health and Human Services. The area chosen for analysis under this land use concept has the potential to accommodate up to 50 persons in approximately 20 dwelling units along the east side of the Kings Branch parcel. There would be no measurable net effect in either employment or population if this proposal were implemented with any of the reuse alternatives. In each reuse alternative the area would be developed for residential use, except the No-Action/Realignment Alternative under which the area would be vacant and under caretaker status.

Retained Residential Areas. The areas chosen for analysis under this land use concept have the potential to accommodate up to 1,375 persons in approximately 550 dwelling units. If implemented, this reuse concept would affect the employment and population associated with the reuse alternatives. If this land use concept were implemented in conjunction with the No-Action/Realignment Alternative, the on-site population would increase by 1,375 persons and direct employment would not change. If implemented with the Proposed Action, there would be a net decrease of 3,800 direct commercial jobs and a net increase in population of 1,050 persons residing on base. If this concept were implemented in combination with the Mixed Use Alternative, there would be a net decrease of 60 direct office/industrial park jobs and 3,400 direct commercial jobs, as well as a net increase in population of 55 persons residing on base.

4.2.2 Land Use and Aesthetics

This section compares the reuse alternatives to land use plans and zoning to determine potential impacts in terms of general plans, zoning, land use, and aesthetics.

4.2.2.1 No-Action/Realignment Alternative

Land Use Plans and Regulations. The current community general plans do not reflect the military realignment actions for Carswell AFB; however, the local planning authorities may determine that revisions are unnecessary due to the continued DOD operation of the base property under the No-Action/ Realignment Alternative. The Navy will develop an AICUZ program for NAS Fort Worth detailing compatible land uses within both noise exposure contours and aircraft safety zones. Communities advocating new development within the DNL 65 dB noise contours and safety zones would need to take into consideration the Navy AICUZ recommendations regarding land use compatibility, attenuation, and siting in order to effectively minimize noise and safety impacts to future development.

Zoning. The base property would be retained under federal ownership and control and, therefore, would continue to be exempt from the local jurisdiction's current zoning ordinances. The establishment of NAS Fort Worth on the base property would likely be reflected in future revisions in the official zoning maps.

Land Uses. Under the No-Action/Realignment Alternative, military activities would utilize an additional 686 acres of base property over closure conditions, or a total of 1,884 acres, to support NAS Fort Worth operations. NAS Fort Worth would continue to utilize the 64 acres of land leased from the city of Fort Worth to support their operations. The other 735 acres of base property would remain vacant under caretaker status in the long term.

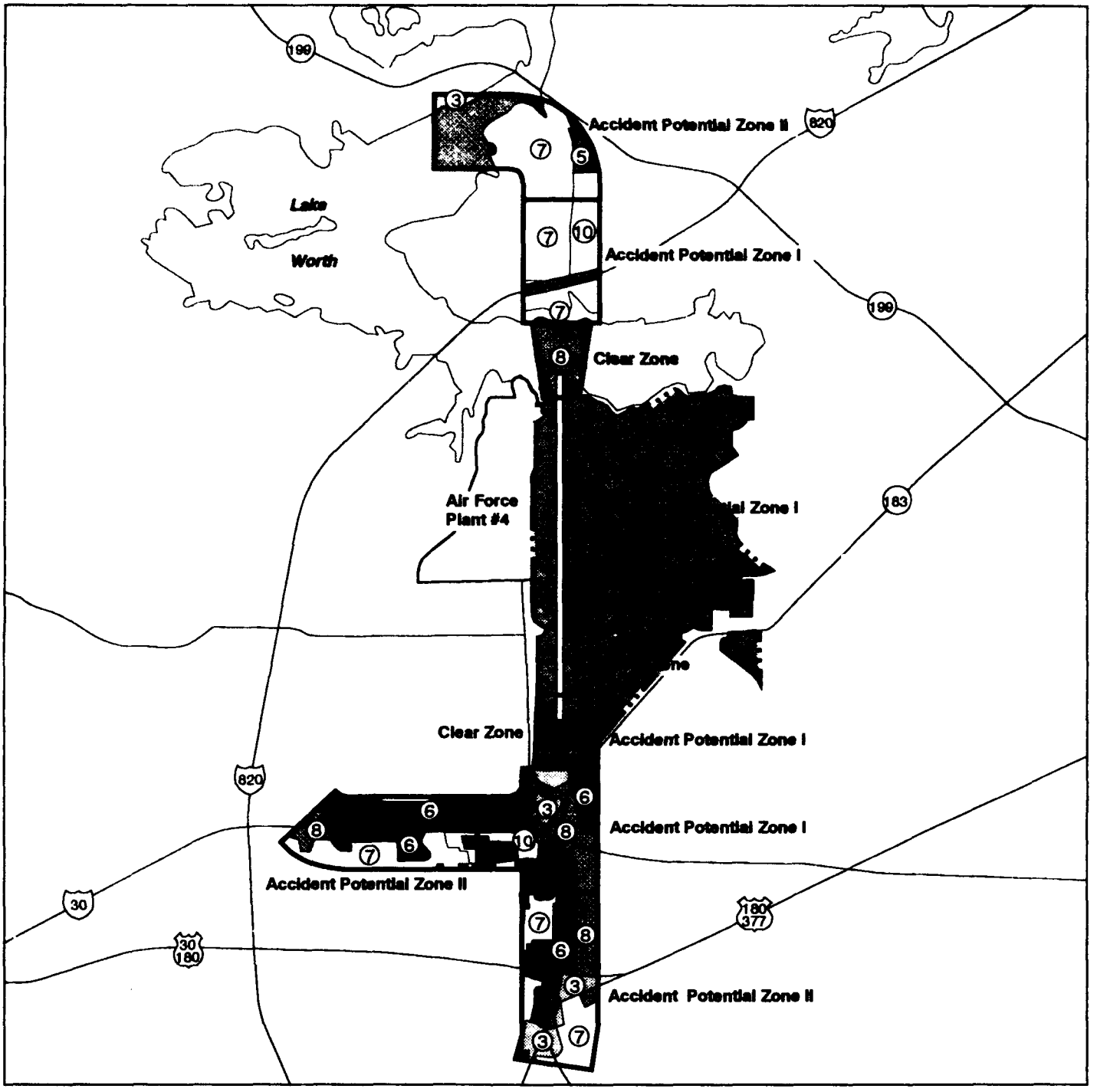
Land uses within the base property would be compatible with each other due to the continued DOD control of the property. The area exposed to NAS Fort Worth aircraft noise contours of DNL 65 dB or greater would decrease by 2,605 acres when compared to preclosure conditions. In addition, the acreage of existing off-base sensitive land uses, such as residential and institutional, exposed to aircraft noise contours of DNL 65 dB or greater would decrease by 555 acres from preclosure conditions.

Although both Air Force and Navy AICUZ programs are in accordance with DOD instructions, the Navy guidelines deviate from the Air Force in the development of APZs. The Navy utilize smaller CZs, and the Navy APZ I and II are curved to follow the primary (5,000 or more annual operations) flight paths (Figure 4.2-3). As a result, the APZs for NAS Fort Worth would increase by approximately 650 acres over the pre-closure APZs for Carswell AFB.

The APZ criteria and noise levels recommended for certain land uses are essentially the same for both Air Force and Navy AICUZ guidelines (see Section 3.2.2.1). Approximately 5 percent of the CZ at the southern end of the runway would extend over incompatible commercial and industrial land uses. However, when compared to preclosure conditions, there would be a decrease in the amount of incompatible off-base land uses within the CZ.

The northern APZ I would include incompatible residential land uses. The APZ I at the southern end of the runway would include incompatible residential and high-density commercial land uses. When compared to preclosure conditions, there would be an increase in the amount of incompatible off-base land uses within APZ I.

The APZ II at the northern end of the runway would include incompatible institutional (educational) land uses. The southern APZ II would include incompatible high density commercial and residential uses. When compared to preclosure conditions, there would be a moderate increase in the amount



EXPLANATION

- ① Airfield *
- ② Aviation Support *
- ③ Industrial
- ④ Institutional (Medical) *
- ⑤ Institutional (Educational)
- ⑥ Commercial
- ⑦ Residential
- ⑧ Public Facilities/ Recreation
- ⑨ Agriculture *
- ⑩ Vacant Land
- Carswell AFB Property
- Carswell AFB Boundary

0 1500 3000 6000 Feet

* Standard land use designation not applicable to this figure.

NAS Fort Worth Accident Potential Zones

Figure 4.2-3

of incompatible residential and commercial off-base land uses within the APZ II.

Aesthetics. The establishment of NAS Fort Worth would likely improve the visual quality of the base over closure conditions by converting vacant land areas to an active military installation with appropriate programs in place to preserve the aesthetic character of the base property.

Mitigations. The surrounding local communities should amend their zoning and general plans according to the NAS Fort Worth AICUZ recommendations in order to implement planning policies for surrounding areas impacted by noise, height restrictions, and safety hazards; and to define compatible types and patterns of future land uses. The Navy should ensure that proper waivers are obtained for buildings located within the building restriction line. Section 4.4.4, Noise, addresses mitigations for existing land uses affected by increased aircraft noise levels.

4.2.2.2 Proposed Action

Land Use Plans and Regulations. The current general plans do not reflect the redevelopment plans for Carswell AFB; however, formal revisions to the general plans for Fort Worth and White Settlement would likely be adopted to reflect the future civilian redevelopment plans for the base property. Revisions could potentially include provisions for commercial, public facilities/recreation and institutional (prison) uses for on-base property, and a reconsideration of future land uses for off-base property occurring within aircraft noise and safety zones.

Zoning. The current local zoning ordinances would require modifications to reflect the civilian redevelopment. Westworth Village's current zoning for single-family residential use would need to be modified to allow for the proposed public facilities/recreation and commercial land uses. In addition, White Settlement's zoning would need to be modified for the proposed commercial uses. The FMCC would remain under federal control, and, therefore,would be exempt from local zoning. The FMCC would likely be incorporated into the local zoning ordinances. Additional revisions to the communities' zoning for adjacent land uses may be required to ensure compatible land uses.

Land Uses. The impacts associated with the military land uses and AICUZ policies would be the same as those described under the No-Action/ Realignment Alternative. The additional land use impacts associated with the proposed civilian reuse would be minimal. The proposed civilian land uses would be compatible with one another. The communities' development review and approval process would ensure that proper land use planning includes provisions to minimize conflicts. The golf course would provide a suitable buffer between the military and civilian commercial uses.

Appropriate security fencing and buffers would be provided to minimize potential incompatibilities between the institutional (prison) and military uses. The civilian land uses in Kings Branch and the Off-Site WSA would be similar to the uses described under preclosure conditions.

Aesthetics. The overall character of the majority of base property could be enhanced with appropriate planning and design of civilian development. Specifically, the visual quality of Kings Branch would be improved under the Proposed Action by replacing the existing housing with new single-family residences. However, the appearance of the wooded area along SH 183 could be degraded by the proposed commercial office and retail uses unless new development is carefully integrated to retain the wooded character of the area. The FMCC would be designed to retain most of the existing stands of mature trees within the institutional (prison) land area, and along Lake Worth to maintain the aesthetic quality. The Proposed Action would not have any affect on the visual quality in the floodplain areas, since no development would occur to those areas.

Mitigations. Mitigations would be similar to those described under the No-Action/Realignment Alternative. Proper noise attenuation and/or siting measures could be taken to ensure that noise levels would not impact the proposed on-base land uses under the Proposed Action. In addition, the wooded appearance along SH 183 and Lake Worth could be retained by careful integration of the development to facilitate retention of the mature woods.

4.2.2.3 Mixed Use Alternative

Land Use Plans and Regulations. The current general plans do not reflect the redevelopment plans for Carswell AFB; however, formal revisions to the general plans for Fort Worth and White Settlement would likely be adopted to reflect the future civilian redevelopment plans for the base property. Revisions could potentially include provisions for aviation support, office/industrial park, and commercial uses for on-base property, and a reconsideration of future land use for off-base property occurring within aircraft noise and safety zones.

Zoning. In addition to the military reuse, the proposed civilian redevelopment plans would likely be reflected in the local zoning ordinances through formal zoning modifications. Modifications in the communities' zoning ordinances would likely be adopted to allow for the proposed aviation support, commercial, office/industrial park, public facilities/recreation, and institutional uses. Additional revisions to the communities' zoning for adjacent land uses may be required to ensure compatible land use planning.

Land Uses. The impacts associated with the military land uses and AICUZ policies would be the same as those described under the No-Action/

Realignment Alternative. The additional land use impacts associated with the proposed civilian reuse would be minimal. The golf course would provide a suitable buffer between the military and civilian commercial uses. Appropriate security fencing and buffers would be provided to minimize potential incompatibilities between the office/industrial park, aviation support, and military uses. The civilian land uses in Kings Branch would be similar to uses under preclosure conditions. The proposed residential development of the Off-Site WSA and elimination of the restrictive use easement would improve the compatibility with the surrounding areas. The proposed civilian land uses generally would be compatible with one another. The communities' development review and approval process would include proper land use planning provisions to minimize land use conflicts.

Aesthetics. The overall character of the majority of base property could be enhanced with appropriate planning and design of civilian development. Specifically, the visual quality of Kings Branch and Off-Site WSA would be improved under the Mixed Use Alternative by developing new single-family residences that are more consistent with the surrounding residential uses. However, the appearance of the wooded area along SH 183 and Lake Worth could be degraded by the proposed civilian development unless new development is carefully integrated with the wooded character of the area. The Mixed Use Alternative would not have any effect on the visual quality in the floodplain areas.

Mitigations. Mitigations would be similar to those described under the No-Action/Realignment Alternative. As under the Proposed Action, a combination of siting and noise attenuation measures could be made in the design and development of proposed land uses so as to avoid noise conflicts under the Mixed Use Alternative. In addition, the wooded appearance along SH 183 and Lake Worth could be retained by careful integration of the development to facilitate retention of the mature woods.

4.2.2.4 Other Land Use Concepts. Impacts of each proposed federal transfer and other independent land use concepts are evaluated for compatibility with land use plans and regulations, impacts to on- and off-base land uses, and general land use trends in the region.

Health and Human Services. The reuse of dwelling units along the east side of the Kings Branch parcel, that have been requested for reuse as housing for the handicapped, would be consistent with the residential character of the community's general plans. The proposal would also be consistent with Westworth Village's zoning for residential use. It would be compatible with both the Proposed Action and the Mixed Use Alternative since residential development is proposed for the Kings Branch parcel. In addition, this proposal would be compatible with the No-Action/Realignment Alternative since the existing residential structures would remain in place. No impacts to aesthetics are expected to occur.

Retained Residential Areas. This land use concept would be compatible with the communities' general plans. Westworth Village and White Settlement would be required to modify their local zoning ordinances to reflect single- and multi-family housing.

Under all alternatives, civilian reuse of the majority of residential area within the main base would be incompatible with the NAS Fort Worth AICUZ recommendations for development within areas impacted by aircraft noise. Approximately 260 housing units would be exposed to noise levels of DNL 65 dB or greater. Section 4.4.4, Noise, addresses potential mitigations for land uses impacted by high noise levels.

If implemented in conjunction with any of the alternatives, the proposed residential uses would generally be compatible with the surrounding land uses. Landscaping or fences around the isolated residences within the golf course could minimize potential land use conflicts between adjacent commercial or industrial land uses under the Proposed Action and Mixed Use Alternatives, respectively.

4.2.3 Transportation

The effects of the reuse alternatives on each component of the transportation system, including roadways, airspace, and air transportation, are presented in this section. Possible mitigation measures are discussed for those components likely to experience substantial adverse impacts under any of the reuse alternatives.

Roadways. Reuse-related effects on roadway traffic were assessed by estimating the number of trips generated by each land use considering employees, visitors, residents, and service vehicles associated with construction and long-term activities for each alternative. Principal trip-generating land uses included industrial, office, commercial, residential, and military uses. These trips were distributed to the roadway system based on existing travel patterns and those associated with NAS Dallas. This analysis is based on existing data on roadway capacities, existing and projected traffic volumes and patterns (independent of the base reuse), daily traffic volumes and patterns related to each alternative, and standards established by state and local transportation agencies. Trip generation was based on applying the trip rates from the ITE Trip Generation Manual, 5th Edition, to the proposed land uses to obtain daily reuse-related traffic volumes.

To determine reuse-related effects on local roadways, traffic volumes under closure conditions (estimated 1993 volumes without base reuse) were added to the growth in traffic projected between the years 1990 and 2010 by the Regional Planning Office of the Texas State Department of Highways and Public Transportation in the Dallas/Fort Worth Regional Transportation Study

to predict post-closure traffic volumes. This study was performed prior to the announcement of the Carswell AFB closure; however, it has been assumed that traffic patterns after base closure would be similar to those expected without base closure due to the relatively static nature of base-related traffic patterns over time. Projected traffic volumes in the Regional Transportation Study were adjusted to exclude Carswell AFB traffic volumes, where necessary.

The Dallas/Fort Worth Regional Transportation Study projected a shift in some traffic patterns due to planned improvements to several roadways and an increase in population west and north of the base. Two roadways particularly affected by the planned improvements include Interstate 820, where traffic is projected to increase from 50 to 75 percent over the next 20 years, and SH 199, where increases in traffic of nearly 200 percent are expected during the same time period. The shifting of traffic to Interstate 820 and SH 199 roadways would also result in reduction or no growth of traffic on SH 183, Spur 341, White Settlement Road, and Clifford Street according to the traffic assignment model used in the Dallas/Fort Worth Regional Transportation Study.

The reuse-related traffic volumes were then added to the post-closure traffic volume projections. Traffic impacts were determined based on LOS changes for each of the key roads (see Table 3.2-1 for definitions of LOS).

The trip distribution analysis was based on the existing and improved access points described in Chapter 2, and the relative location of the proposed land uses. For all reuse alternatives, development would be situated on the east side of the airfield, which places the greatest amount of reuse-generated traffic on the existing east side roadways. The distribution of reuse-generated trips was also based on the zip code analysis used in Chapter 3 for the closure conditions trip distribution, as well as zip code analysis of AF Plant #4 and NAS Dallas. It was assumed that the residential choices of the reuse-related civilian and in-migrating employees would closely correspond to those of base personnel. In addition, it was assumed that most employees realigned from NAS Dallas to NAS Fort Worth would commute from their existing residences. Finally, the distributed trips were assigned to the surrounding road network.

Airspace/Air Traffic. The airspace analysis examines the type and level of aircraft operations projected for the reuse alternatives and compares them to how the airspace was configured and used under closure conditions and preclosure reference. The impact analysis considers the relationship of the projected aircraft operations to the operational capacity of the airport, using criteria that have been established by the FAA for determining airport service volumes. Potential effects on airspace use were assessed, based on the extent to which the reuse alternatives could (1) require modifications to the airspace structure or air traffic control systems and/or facilities; (2) restrict,

limit, or otherwise delay other air traffic in the region; or (3) encroach on other airspace areas and uses.

The FAA is ultimately responsible for evaluating the specific effects that the reuse activities will have on the safe and efficient use of navigable airspace by aircraft. Such a study is based on an airspace analysis, a flight safety review, and a review of the potential effect on air traffic control and air navigational facilities. Once this evaluation is completed, the FAA can then determine the actual requirements for facilities, terminal and en route airspace, and instrument flight procedures.

Other Transportation Modes. Because none of the alternatives assumes direct use of the local railroads, direct effects on the rail system are expected to be minimal.

4.2.3.1 No-Action/Realignment Alternative

Roadways. By the year 2013, the major traffic generators would be the 3,931 projected employees associated with NAS Fort Worth and the OL. Access to the base would continue through the Southwest, Main, East, and Hospital gates.

It is estimated that a total of 7,000 average daily trips would be generated by the No-Action/Realignment Alternative on an average weekday. The numbers of estimated daily trips distributed on local key roadways within the ROI by the military reuse are depicted in Table 4.2-1. Potential indirect effects that could occur within the ROI are expected to be minimal due to dispersion and are included within traffic growth projections for the region. Table 4.2-2 shows the post-closure conditions and reuse-generated peak-hour traffic for the years 1998, 2003, and 2013 and the associated LOS on key roadways.

Table 4.2-1. Total Average Daily Trips Generated by Reuse Alternatives

Alternative	1998	2003	2013
No-Action/Realignment	7,000	7,000	7,000
Proposed Action	15,350	24,850	34,250
Mixed Use	24,300	31,150	44,550

Regional. By the year 2013, traffic generated by the No-Action/Realignment Alternative would increase the daily traffic volumes on Interstate 30, between SH 183 and Interstate 820 by approximately 1.8 percent over post-closure conditions. This increase would not change the projected LOS of B. The 1992 TIP for the Dallas/Fort Worth Metropolitan Area identifies

Table 4.2-2. Peak Hour Traffic Volumes in 2013 - All Alternatives

Roadway/Segment	Capacity	Closure (1993)		Post-closure Conditions		No-Action/ Realignment		Proposed Action		Mixed Use	
		Peak Hour Volume	LOS	Peak Hour Volume	LOS	Peak Hour Volume	LOS	Peak Hour Volume	LOS	Peak Hour Volume	LOS
I-30; SH 183 to I-820	3,650	2,750	C	2,800	B[a]	2,850	B[a]	3,150	C[a]	3,300	C[a]
I-30; SH 183 to Camp Bowie Boulevard	5,550	3,100	C	4,300	D	4,450	D	4,650	D	4,700	D
I-820; I-30 to White Settlement Road	5,600	2,400	B	3,750	C	3,750	C	3,850	C	3,900	C
I-820; White Settlement Road to Lake Worth	5,600	2,350	B	4,100	C	4,100	C	4,100	C	4,100	C
SH 183; I-30 to Ridgemar Boulevard	3,400	700	A	650	A	950	B	2,150	D	2,600	D
SH 183; Ridgemar Boulevard to SH 199	3,200	1,050	A	950	A	1,000	A	1,150	B	1,150	B
SH 199; SH 183 to Beverly Hills Road	1,450	1,250	B	3,750	B[a]	3,750	B[a]	3,850	B[a]	3,900	B[a]
Spur 341; I-30 to White Settlement Road	5,100	2,000	B	1,900	B	1,950	B	2,150	B	2,200	B
White Settlement Road; Between I-820 to Spur 341	2,750	1,000	B	1,000	B	1,000	B	1,100	B	1,150	B
White Settlement Road; Between Clifford and Academy	3,100	600	B	350	B	350	B	400	B	450	B
Clifford Street; Between I-820 and White Settlement Road	2,600	550	B	350	B	400	B	450	B	450	B
Roaring Springs Road; Between SH 183 to I-30	2,300	950	D	1,050	D	1,100	D	1,200	D	1,250	D

Note: (a) Assumes programmed roadway improvements.
I = Interstate.
LOS = Level of Service.
SH = State Highway.

The roadway would be increased from four lanes to six lanes during the 1993 to 1996 time period. With this improvement, the roadway would operate at LOS B through the year 2013. On Interstate 30, between SH 183 and Camp Bowie Boulevard, traffic generated by the No-Action/ Realignment Alternative would increase daily traffic volumes by 3.5 percent over post-closure conditions in 2013. This increase would not affect the projected LOS. The roadway would continue to operate at LOS D in 2013.

On Interstate 820, the No-Action/Realignment Alternative would increase traffic volumes by less than 0.5 percent over post-closure conditions in the year 2013. This increase would not affect the projected LOS of C on either of the Interstate 820 segments evaluated.

Traffic on SH 183 generated by the No-Action/Realignment Alternative would increase traffic volumes by 46 percent over post-closure conditions in the year 2013. By 2013, the military reuse-generated traffic increases would degrade traffic flow on SH 183, between Interstate 30 and Ridgemar Boulevard, from LOS A to B. However, the LOS of B would still remain above an acceptable threshold.

Traffic generated by the No-Action/Realignment Alternative would increase projected traffic volumes on SH 199 by less than 0.5 percent from post-closure conditions in the year 2013. Based on the Dallas/Fort Worth Regional Transportation Study, SH 199 is planned for an upgrade to an eight-lane freeway in the TIP. With these improvements the roadway would operate at LOS B in 2013, regardless of the military realignment.

Local. Table 4.2-2 also shows reuse-related and post-closure condition peak-hour traffic volumes and LOS for key local roadways. Generally, these roadways would operate at LOS D or better. The LOS on Spur 341, White Settlement Road, and Clifford Street is not anticipated to change from their current LOS B. Reuse-generated traffic on Roaring Springs Road would increase daily volumes by 4.8 percent over post-closure conditions; however, the roadway would maintain an LOS of D.

On-Base. The No-Action/Realignment Alternative assumes that existing on-base roadways would be used in the short term during the construction period. As part of the military construction program, internal circulation would accommodate the intensity of vehicular and pedestrian activities and provide acceptable LOS including access to and from the local road network.

Airspace/Air Traffic. Under the No-Action/Realignment Alternative, aircraft associated with the Navy Reserves, Marine Reserves, Texas Air National Guard, U.S. Army Reserve, and Texas Army National Guard would operate at NAS Fort Worth, in addition to the continued operations by the 301st FW, AF Plant #4, and military transients. All of the existing airspace and ATC services associated with the installation at closure would be retained to

provide ATC for the wide diversity of aircraft associated with the realigning military units. In addition, all of the MTR's associated with Carswell AFB under preclosure conditions would continue to be owned by the Air Force. DOD will continue to coordinate with the FAA to assess the adequacy of the airspace in context with projected NAS Fort Worth activities.

Most of the increased aircraft operations associated with the military realignment would be relocated from NAS Dallas. The realignment to NAS Fort Worth would reduce the military air traffic in the DFW region and, therefore, improve civilian aircraft routing in the vicinity of DFW airport. Specifically, conflicts between arrival and departure routes at DFW and military arrival and departure routes at NAS Dallas would be significantly reduced.

The FAA may offer to expand the installation's airspace upon implementation of the DFW metroplex airspace plan in 1996. The airspace expansion would be the result of the metroplex plan and would be independent of the military realignment action. The additional airspace would be considered either an expansion of the existing GCA airspace or approach control airspace, depending on the type of ATC equipment in use.

Reuse of the airfield by the variety of aircraft types associated with the military realignment would not result in any adverse airspace or air traffic impacts in the ROI. The increase in aircraft operations under the No-Action/Realignment Alternative would result in approximately three additional overflights per day within Meacham Field airspace.

The ATCT would be retained and operated by DOD to maintain control of the aircraft in the vicinity and operating at NAS Fort Worth. Communication between aircraft and the ATCT would continue to occur in a manner similar to preclosure conditions. Depending on the location and design of the new facilities near the flightline, relocation or modifications to the existing ATCT may be required to improve the line-of-sight to the runway, taxiway and ramp areas. Evaluation of the required ATCT location is in progress as part of the realignment planning process.

Radar services for aircraft utilizing NAS Fort Worth would be transferred from DFW TRACON, under closure conditions, to DOD. Radar facilities would consist of a mobile ATC unit in the short term and a fixed radar unit by 1995. The radar equipment would be capable of providing any type of ATC services required for an airport.

Based on FAA guidelines, NAS Fort Worth can accommodate approximately 200,000 annual aircraft operations. By the first year of operation, activity projected under the No-Action/Realignment Alternative would account for

approximately 53 percent of the total airfield capacity and would remain constant thereafter. Actual capacity of the runway may be higher than FAA guidelines indicate due to the type of military flight operations.

The No-Action/Realignment Alternative would also include use of a 4,000-feet long assault strip located on an existing taxiway. The assault strip would be utilized by C-130 aircraft and helicopters. No adverse impacts to the ROI's airspace or air traffic would result from the use of this new strip.

Air Transportation. Implementation of the No-Action/Realignment Alternative would not provide commercial passenger or cargo service at NAS Fort Worth. Passenger traffic at DAL and DFW would likely not be impacted in measurable amounts, as the similar traffic associated with Carswell AFB under the preclosure reference did not contribute a substantial portion of the total traffic associated with these airports. The No-Action/Realignment Alternative does not include general aviation activity in any of the projection periods. As such, it is not anticipated that any impact to the local general aviation passenger base would result.

Although there would be indirect population and housing increases associated with the No-Action/Realignment Alternative, no affect to air transportation in the ROI is expected.

The No-Action/Realignment Alternative does not provide cargo operations at NAS Fort Worth during the analysis period. Cargo activity at airports within the ROI, therefore, would not be impacted by implementation of the No-Action/Realignment Alternative.

Mitigation Measures. No adverse impacts are expected from this alternative, and no mitigation measures would be necessary.

4.2.3.2 Proposed Action

Roadways. By the year 2013, the major traffic generators would be the 8,982 projected employees associated with the Proposed Action. Included in these figures are the military activities identified in the No-Action/Realignment Alternative. Access would continue through the existing gates. An improved access point would also be provided at the intersection of Green Oaks Boulevard and SH 183. This entry would provide immediate access to commercial areas adjacent to SH 183.

It is estimated that a total of 34,250 average daily trips (including 27,250 civilian reuse-generated trips) would be generated by the Proposed Action on an average weekday. The number of estimated reuse-related trips distributed on key local roadways within the ROI are depicted in Table 4.2-1. Table 4.2-2 shows the post-closure conditions and reuse-generated peak-

hour traffic for the years 1998, 2003, and 2013 and the associated LOS on key roadways.

Regional. By the year 2013, reuse-generated traffic would increase the peak-hour volume by 300 vehicles over the No-Action/Realignment Alternative on Interstate 30, between SH 183 and Interstate 820. This increase would result in a change in the LOS from B under the No-Action/ Realignment Alternative to LOS to C due to civilian reuse activities.

On Interstate 30, between SH 183 and Camp Bowie Boulevard, traffic generated by the Proposed Action would increase daily traffic volumes by 200 vehicles over the No-Action/Realignment Alternative in the year 2013. This increase would not affect the projected LOS. The roadway would continue to operate at LOS D in 2013.

Reuse-generated traffic on Interstate 820, between Interstate 30 and White Settlement Road, would increase the peak hour volumes by 100 vehicles over the No-Action/Realignment Alternative in the year 2013. This increase would not result in any change in projected LOS. Reuse-generated traffic on Interstate 820, between White Settlement Road and Lake Worth, would increase the peak hour volumes by less than 50 vehicles over the No-Action/ Realignment Alternative in 2013. By 2013, this segment would remain at LOS C as a result of post-closure conditions regardless of reuse.

Traffic generated by reuse activities along the segment of SH 183 adjacent to the base would increase the peak hour volumes by 1,200 vehicles over the No-Action/Realignment Alternative in the year 2013. By the year 2013, the Proposed Action would reduce the LOS from B (under the No-Action/ Realignment Alterative) to D along the section of SH 183 adjacent to the base due to civilian reuse. As noted in Section 3.2.3.1, this roadway is identified in Mobility 2010 for widening; however, no specific plans or timetable exists for the improvement.

Reuse-generated traffic would increase the peak hour volumes on SH 199 by 100 vehicles over the No-Action/Realignment Alternative in the year 2013. This increase would not change the projected LOS B under post-closure conditions. With the planned improvements to SH 199, the roadway would operate at LOS B in 2013.

Local. Table 4.2-2 also shows reuse-generated peak-hour traffic volumes and LOS for key local roadways. Generally, these roadways would operate at LOS D or better. Spur 341, which provides access from Interstate 30 to AF Plant #4, would continue to operate at LOS B through the year 2013. The current LOS B on White Settlement Road and Clifford Street is not anticipated to change. The peak-hour volume on Roaring Springs Road is projected to increase by 100 vehicles over the No-Action/Realignment

Alternative. The roadway would continue to operate at LOS D through 2013.

On-Base. The Proposed Action assumes that existing on-base roadways would be used in the short term during the construction period. As part of the military construction program, internal circulation must accommodate the intensity of vehicular and pedestrian activities and provide acceptable LOS including access from the local road network. Civilian redevelopment plans are expected to incorporate internal circulation requirements that meet local planning objectives.

Airspace/Air Traffic. The Proposed Action assumes the same military activity as the No-Action/Realignment Alternative. This alternative differs from the No-Action/Realignment Alternative only in the limited civilian aircraft activity associated with the FBOP. Control and communication of aircraft would occur as described under the No-Action/Realignment Alternative. In addition, the precision approach radar operated by NAS Fort Worth would support the limited civilian aviation operations during inclement weather conditions. Additional instrument approach procedures (IAPs) may be available from existing civilian NAVAIDs in the area to provide further ATC services.

It is anticipated that the military and increase in civilian aircraft operations would not impact any of the ROI airspace or air traffic.

Air Transportation. The additional civilian aviation activity at NAS Fort Worth is not expected to impact air transportation in the ROI. The air transportation impacts for the Proposed Action are as described for the No-Action/Realignment Alternative.

Mitigation Measures. No adverse impacts are expected from this alternative, and no mitigation measures would be necessary.

4.2.3.3 Mixed Use Alternative

Roadways. By the year 2013, the major traffic generators would be the 13,338 projected employees associated with the Mixed Use Alternative. In addition to the existing access points, an improved access point would be included for the intersection of Green Oaks Boulevard and SH 183, as discussed under the Proposed Action. This access would provide immediate access to industrial areas and the commercial areas adjacent to SH 183.

It is estimated that a total of 44,550 average daily trips (including 37,550 civilian reuse-generated trips) would be generated by the Mixed Use Alternative on an average weekday. The number of estimated trips distributed on key local roadways within the ROI is depicted in Table 4.2-1.

Table 4.2-2 shows the post-closure conditions and reuse-generated peak-hour traffic throughout the 20-year analysis period.

Regional. By the year 2013, traffic generated by reuse activities would increase the peak hour volume by 450 vehicles over the No-Action/ Realignment Alternative on Interstate 30, between SH 183 and Interstate 820. This increase would degrade the LOS from B under the No-Action/ Realignment Alternative to LOS C due to civilian reuse.

On Interstate 30, between SH 183 and Camp Bowie Boulevard, traffic generated by the reuse activities would increase daily traffic volumes by 250 vehicles over the No-Action/Realignment Alternative in the year 2013. This increase would not affect the projected LOS under the No-Action/ Realignment Alternative. The roadway would continue to operate at LOS D in 2013.

Traffic on Interstate 820, between Interstate 30 and White Settlement Road, generated by reuse activities would increase the peak hour volume by less than 50 vehicles in the year 2013. This increase would not affect the projected LOS of C under the No-Action/Realignment Alterative for both road segments evaluated.

Reuse-generated traffic on SH 183 would increase the peak hour volume by 1,650 vehicles over the No-Action/Realignment Alternative in 2013. By the year 2013, the civilian reuse-related traffic would degrade the LOS from B under the No-Action/Realignment Alternative to LOS D along the section of SH 183 adjacent to the base. As noted in Section 3.2.3.1, this roadway is identified in Mobility 2010 for widening; however, no specific plans or timetable exists for the improvement.

Reuse-generated traffic would increase the peak hour volume on SH 199 by 150 vehicles over the No-Action/Realignment Alternative in the year 2013. With the planned improvements to SH 199, the roadway would operate at LOS B in 2013, regardless of reuse.

Local. Figure 4.2-2 also shows reuse-generated peak-hour traffic volumes and LOS for several key local roadways. Generally, these roadways operate at LOS D or better. Spur 341, which provides access from Interstate 30 to AF Plant #4, would continue to operate at LOS B through the year 2013. The LOS on White Settlement Road and Clifford Street is not anticipated to change from their current LOS B. The peak-hour volume on Roaring Springs Road is projected to increase by 150 vehicles over the No-Action/Realignment Alternative. The roadway would continue to operate at LOS D through 2013.

On-Base. The Mixed Use Alternative assumes that existing on-base roadways would be used in the short term during the construction period.

As part of the military construction program, internal circulation must accommodate the intensity of vehicular and pedestrian activities and provide acceptable LOS, including access from the local road network. Civilian redevelopment plans are expected to incorporate internal circulation requirements that meet local planning objectives.

Airspace/Air Traffic. The Mixed-Use Alternative would include the same military aircraft activities as described under the No-Action/Realignment Alternative. In addition, there would be a small amount of activity by civilian airline maintenance conducted on the base property. As civilian activity would be a very limited percentage of the total airfield activity, airspace and air traffic impacts would be identical to those described in the Proposed Action.

Air Transportation. This additional civilian aircraft activity would not impact the transportation of passengers or cargo to and from the ROI. Impacts to the region's air transportation would, therefore, be similar to those described under the No-Action/Realignment Alternative.

Mitigation Measures. No adverse impacts are anticipated; therefore, no mitigation measures would be necessary.

4.2.3.4 Other Land Use Concepts. The analysis considers the impact of the implementation of other land use concepts in conjunction with the reuse alternatives. The net change in traffic generated is presented.

Health and Human Services. The use of 20 dwelling units in Kings Branch for housing the handicapped would result in no net increase in traffic volumes compared to the traffic generated for either the Proposed Action or Mixed Use Alternative. There would be a slight increase in traffic from this concept when compared to the use proposed under the No-Action/ Realignment Alternative. The slight increase would not affect the LOS on adjacent roadways.

Retained Residential Areas. The civilian reuse of 550 existing dwelling units would generate approximately 5,250 daily trips by the year 2003. Implementation of this land use concept in combination with the Proposed Action or Mixed Use Aiternative would result in a net decrease in projected traffic volumes and no additional impacts to the LOS on key roadway segments. This land use concept would result in a 75 percent increase in reuse-generated traffic volumes, if implemented in conjunction with the No-Action/Realignment Alternative. However, the net increase would remain below the traffic volumes generated under preclosure conditions. Impacts and mitigations would be similar to those described under the Mixed Use Alternative.

4.2.4 Utilities

Direct and indirect changes in future utility demand for each alternative were estimated based on a per-capita average daily use on Carswell AFB and in the Fort Worth area. These factors were applied to projections of numbers of future residents and employees associated with each of the alternatives. Table 4.2-3 shows the projected changes in utility demand for 5, 10, and 20 years after closure. The figures shown for post-closure conditions represent the expected utility use in the ROI without military realignment or civilian reuse of the base property. The utility use associated with the No-Action/Realignment Alternative generally reflects the changes expected in the ROI due to the military realignment action. The other alternatives reflect the total ROI demand anticipated due to both military realignment and civilian reuse.

4.2.4.1 No-Action/Realignment Alternative. Table 4.2-3 presents a summary of ROI utility use associated with the military realignment and caretaker activities.

Water. The No-Action/Realignment Alternative would increase the total projected potable water demand in the ROI by 0.9 MGD, to reach a total of 233.9 MGD in 2013. With the capacity to process 456 MGD of potable water, cities in the ROI would be able to meet the 0.4 percent increase in demand over post-closure conditions in 2013.

On-base potable water demands would equal 0.3 MGD by 1998 and remain at that level through the year 2013. With the No-Action/Realignment Alternative, on-base potable water use would be less than on-base use under preclosure conditions.

Wastewater. The No-Action/Realignment Alternative would increase the total projected wastewater flow in the ROI by 0.5 MGD to reach a total of 157.7 MGD by 2013. This represents an increase of 0.3 percent over post-closure conditions. The city of Fort Worth's Village Creek plant is anticipated to process the entire wastewater flow in the ROI. The city is planning to have a treatment capacity of 161 MGD by the year 2000 and will have to continue to program facility expansions to be able to satisfy the demand.

Wastewater flows on base would reach 0.2 MGD by 1998 and remain at that level through the year 2013. With the No-Action/Realignment Alternative, on-base wastewater flows would be less than flows generated on base under preclosure conditions. The existing collection system would be able to handle the proposed flow. New industrial users may find it necessary to provide industrial pretreatment, in accordance with Section 307(b) and (c) of the CWA, prior to discharging to the city of Fort Worth's system.

Table 4.2-3. Total Projected Daily Utility Use in ROI
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	1998		2003		2013	
	Total ROI	Reuse-Related	Total ROI	Reuse-Related	Total ROI	Reuse-Related
Water Consumption (MGD)						
Post-closure Conditions	172.1		188.5		233.0	
No-Action/Realignment Alternative	173.0	0.9	189.4	0.9	233.9	0.9
Proposed Action	173.4	1.3	189.9	1.4	234.4	1.4
Mixed Use Alternative	173.4	1.3	189.8	1.3	234.6	1.6
Wastewater Treatment (MGD)						
Post-closure Conditions	133.4		141.7		157.2	
No-Action/Realignment Alternative	133.9	0.5	142.2	0.5	157.7	0.5
Proposed Action	134.3	0.9	142.6	0.9	158.2	1.0
Mixed Use Alternative	134.2	0.8	142.6	0.9	158.3	1.1
Solid Waste Disposal (tons/day)						
Post-closure Conditions	5,211		5,745		6,983	
No-Action/Realignment Alternative	5,230	19	5,764	19	7,002	19
Proposed Action	5,235	24	5,772	27	7,013	30
Mixed Use Alternative	5,239	28	5,778	33	7,025	42

MGD = million gallons per day.
ROI = Region of Influence.

Table 4.2-3. Total Projected Daily Utility Use in ROI
Page 2 of 2

	1998		2003		2013	
	Total ROI	Reuse-Related	Total ROI	Reuse-Related	Total ROI	Reuse-Related
Electrical Consumption (MWH/day)						
Post-closure Conditions	38,473		41,446		48,100	
No-Action/Realignment Alternative	38,582	109	41,555	109	48,209	109
Proposed Action	38,659	186	41,645	199	48,312	212
Mixed Use Alternative	38,628	155	41,621	175	48,310	210
Natural Gas Consumption (MMCF/day)						
Post-closure Conditions	71.2		76.7		89.0	
No-Action/Realignment Alternative	71.6	0.4	77.0	0.3	89.4	0.4
Proposed Action	72.7	1.5	78.4	1.7	90.8	1.8
Mixed Use Alternative	72.4	1.2	78.1	1.4	90.9	1.9

MMCF/day = million cubic feet per day.
MWH/day = megawatt-hours per day.
ROI = Region of Influence.

Solid Waste. Under the No-Action/Realignment Alternative, solid waste disposal rates in Tarrant County would increase by 19 tons/day to reach a total of 7,002 tons/day by the year 2013. Solid waste generated by this alternative would increase the amount directed to Tarrant County landfills by 0.3 percent.

With the No-Action/Realignment Alternative, on-base solid waste generation would be less than amounts generated on base under preclosure conditions.

Solid waste generated on base would equal 8 tons/day by 1998 and remain at that level through the year 2013. NAS Fort Worth, under the auspices of Navy Policy, would implement a waste minimization program in accordance with federal, state, and local regulations. This program would further reduce solid waste disposal rates under the No-Action/Realignment Alternative by implementing solid waste disposal programs with the following priority: source reduction, recycling, energy recovery, waste treatment, and contained disposal.

Energy

Electricity. Military reuse-related demands totaling 109 MWH/day would increase consumption in TU Electric's Fort Worth District to 48,209 MWH/day by the year 2013. The increase of 0.2 percent over post-closure conditions should be adequately met by generation facilities that TU Electric would have in place to satisfy projected demands.

By 1998, this alternative would increase consumption to 68 MWH/day on base and would maintain that requirement throughout the analysis period (2013). On-base electrical demand under this alternative would be less than on-base demand under preclosure conditions. The existing on-base substation and distribution would continue to be able to support the reuse of NAS Fort Worth. Individual facilities would need to be metered to monitor costs and charge individual users.

Natural Gas. The No-Action/Realignment Alternative would increase the demand on Lone Star Natural Gas Company's Fort Worth district by 0.4 MMCF/day, to reach a total of 89.4 MMCF/day in the year 2013. The 0.5 percent increase would be adequately met by supplies that Lone Star would have in place to satisfy projected demands.

On-base demands would account for 0.2 MMCF/day by 1998 and remain at that level through the year 2013. On-base natural gas demand under this alternative would be less than on-base demand under preclosure conditions. Individual gas meters would be required at some facilities to charge individual users.

Mitigation Measures. The following are potential mitigation measures for reducing impacts due to the No-Action/Realignment Alternative:

Water. No adverse impacts are expected from the No-Action/Realignment Alternative, and no mitigation measures would be necessary.

Wastewater. Mitigation measures would need to address industrial pretreatment of wastewater generated by future industrial and commercial reuses of the site. The type(s) and extent of mitigation measures cannot be specified at the present time because they would be dependent on the chemical and physical characteristics of the wastewater. New users would also be required to obtain discharge permits from the city of Fort Worth Water Department, Industrial Waste Section.

Solid Waste. Recycling and/or reuse of inert demolition/construction wastes, such as wood, metals, concrete, and asphalt, would decrease the potential impact on landfills. As previously mentioned, NAS Fort Worth would implement a waste minimization program to reduce solid waste generation on base.

Energy. No adverse impacts are anticipated to energy utilities; therefore, no mitigation measures would be necessary.

4.2.4.2 Proposed Action. Table 4.2-3 includes a summary of total ROI utility use associated with the military and civilian reuse activities under the Proposed Action.

Water. The Proposed Action would increase the total projected potable water demand in the ROI to 234.4 MGD, or an increase of 0.5 MGD over the No-Action/Realignment Alternative in the year 2013. The demands associated with the military and civilian reuse would reach 1.4 MGD by 2013. With the capacity to process 456 MGD of potable water, cities in the ROI would be able to meet the increased demand of 0.6 percent over post-closure conditions.

Potable water demands on base would total 0.8 MGD by the year 2013, or increase 0.5 MGD over the No-Action/Realignment Alternative. On-base water demand in 2013 under the Proposed Action would be similar to on-base demands under preclosure conditions. Reuse of the on-base system may require certain improvements depending on the type and location of redevelopment that occurs. Also, the current well and storage facilities at the Off-Site WSA may not be adequate to meet daily demands and firefighting requirements. An alternative to the use of groundwater would be to develop an interconnection with the city of Fort Worth's system. Currently, the closest water main is 8,000 feet southeast, at the intersection of White Settlement Road and Chapel Creek Road. Once development

proposals are identified, specific improvements can be designed through coordination with the local purveyor.

Wastewater. The Proposed Action would increase the total projected wastewater flow in the ROI to 158.2 MGD, or an increase of 0.5 MGD over the No-Action/Realignment Alternative by the year 2013. The total military and civilian reuse-related demands would reach 1.0 MGD by 2013. The city of Fort Worth's Village Creek plant is anticipated to process the entire wastewater flow in the ROI. The city is planning to have a treatment capacity of 161 MGD by the year 2000 and would have to continue to program facility expansions to be able to satisfy the projected demand. The Proposed Action would increase the projected demand in the ROI by less than 0.6 percent over post-closure ROI conditions in 2013.

Wastewater flows on base would total 0.6 MGD by the year 2013, or an increase of 0.4 MGD over the No-Action/Realignment Alternative. With the Proposed Action, on-base wastewater flows in 2013 would be similar to flows generated on base under preclosure conditions. The existing collection system would be able to handle the proposed flow. New industrial users may find it necessary to provide industrial pretreatment, in accordance with Section 307(b) and (c) of the CWA, prior to discharging to the city of Fort Worth's system. Also the construction of a new sewer or an on-site sewage treatment system at the Off-Site WSA may be necessary to provide service to the proposed industrial development. Currently, the closest sewer main is approximately 1,000 feet from the site.

Solid Waste. The Proposed Action would increase the total projected solid waste generation in Tarrant County to 7,013 tons/day, or an increase of 11 tons/day, over the No-Action/Realignment Alternative by the year 2013. This increase represents an increase of 0.4 percent over post-closure conditions in 2013. The demands associated with military and civilian reuse would reach 30 tons/day. This waste would reduce the lifespan of landfills by less than one year for the analysis period (1993-2013). Planning efforts are underway to identify expansions or new landfill locations to serve Tarrant County.

Total solid waste generated on base would total 18 tons/day by the year 2013, or an increase of 10 tons/day over the No-Action/Realignment Alternative. The amount of solid waste generated on base under this alternative in 2013 would increase over on-base generation under preclosure conditions.

Energy

Electricity. Reuse-related demands would increase consumption in TU Electric's Fort Worth District to 48,312 MWH/day, or increase by 103 MWH/day over the No-Action/Realignment Alternative by the year

2013. The total military and civilian reuse related demands would reach 212 MWH/day by the year 2013. The total increase of 0.4 percent over post-closure conditions should be adequately met by generation facilities that TU Electric will have in place to satisfy projected demands.

By the year 2013, the Proposed Action would result in a total on-base consumption of 165 MWH/day, or a 97 MWH/day increase over the No-Action/Realignment Alternative. On-base demand in the year 2013 under the Proposed Action would be less than on-base demand under preclosure conditions. The existing on-base substation and distribution would continue to be able to support reuse activities; however, a new distribution system may need to be established to support the additional civilian reuse requirements. Once specific proposals are identified, then specific improvements can be negotiated with the local utility purveyor. Individual civilian facilities would need to be metered to monitor usage and to charge individual users, and appropriate utility corridors and easements would also need to be established.

Natural Gas. The Proposed Action would increase the demand on Lone Star Natural Gas Company's Fort Worth district to 90.8 MMCF/day, or 1.4 MMCF/day over the No-Action/Realignment Alternative by the year 2013. The total military and civilian reuse-related demands would reach 1.8 MMCF/day by 2013. The increase of 2.0 percent over post-closure conditions would be adequately met by supplies that Lone Star would have in place to satisfy projected demands.

On-base consumption would account for 1.6 MMCF/day of the total reuse demand. Natural gas use would increase by 1.4 MMCF/day over the No-Action/Realignment Alternative. On-base natural gas demand in the year 2013 under the Proposed Action would be greater than on-base demand under preclosure conditions. The existing on-base natural gas distribution system would require some changes to accommodate the civilian reuse of the base. Individual gas meters would be required at some facilities. Establishment of appropriate utility corridors and easements would also be required. New natural gas service may have to be established for the proposed facilities at the Off-Site WSA. If needed, the new gas main would extend along the White Settlement Road corridor for a distance of 4 miles.

Mitigation Measures. Following are potential mitigation measures for reducing impacts due to the Proposed Action:

Water. No adverse impacts are expected from the Proposed Action, and no mitigation measures would be necessary.

Wastewater. Mitigation measures would need to address industrial pretreatment of wastewater generated by future industrial and commercial reuses of the site. New users would also be required to obtain discharge

permits from the city of Fort Worth Water Department, Industrial Waste Section. The type(s) and extent of mitigation measures cannot be specified at the present time, because they would be dependent on the chemical and physical characteristics of the wastewater.

Solid Waste. Recycling and/or reuse of inert demolition/construction wastes, such as wood, metals, concrete, and asphalt, would decrease the potential impact on landfills.

Energy. No adverse impacts are anticipated to energy utilities; therefore, no mitigation measures would be necessary.

4.2.4.3 Mixed Use Alternative. Table 4.2-3 presents a summary of total ROI utility demands associated with the military and civilian reuse activities under the Mixed Use Alternative.

Water. The Mixed Use Alternative would increase the total projected potable water demand in the ROI to 234.6 MGD, or increase 0.7 MGD over the No-Action/Realignment Alternative in 2013. The demands associated with the military and civilian reuse would reach 1.6 MGD by the year 2013. With the capacity to process 456 MGD of potable water, cities in the ROI would be able to meet the increased demand of 0.7 percent over post-closure conditions.

On-base potable water demands would total 0.9 MGD by the year 2013, or increase 0.6 MGD over the No-Action/Realignment Alternative. On-base water demand in 2013 associated with this alternative would be greater than on-base demand under preclosure conditions. Reuse of the on-base system may require certain improvements depending on the type and location of commercial and industrial development that will occur. Also, the current well and storage facilities at the Off-Site WSA may not be adequate to meet daily demands and firefighting requirements. An alternative to the use of groundwater would be to develop an interconnection with the city of Fort Worth's system. Currently the closest water main is 8,000 feet southeast at the intersection of White Settlement Road and Chapel Creek Road. Once specific development proposals are identified, specific improvements can be designed through coordination with the local purveyor.

Wastewater. The Mixed Use Alternative would increase the total projected wastewater flow in the ROI to 158.3 MGD, or 0.6 MGD over the No-Action/Realignment Alternative by the year 2013. The total military and civilian reuse-related demand would reach 1.1 MGD by 2013. The city of Fort Worth's Village Creek plant is anticipated to process the entire wastewater flow in the ROI. The city is planning to have a treatment capacity of 161 MGD by the year 2000 and would have to continue to program facility expansions to be able to satisfy the projected demand. The

Mixed Use Alternative would increase the projected demand by less than 0.7 percent over post-closure ROI conditions in 2013.

Wastewater flows on base would total 0.6 MGD by 2013, or an increase of 0.4 MGD over the No-Action/Realignment Alternative. With the Mixed Use Alternative, on base wastewater flows in the year 2013 would be similar to flows generated on-base under preclosure conditions. The existing collection system would be able to handle the proposed flow. New industrial users may find it necessary to provide industrial pretreatment, in accordance with Section 307(b) and (c) of the CWA, prior to discharging to the city of Fort Worth's system. Also the construction of a new sewer or an on-site sewage treatment system at the Off-Site WSA would likely be necessary to provide service to the proposed residential development. Currently the closest sewer main is approximately 1,000 feet from the site.

Solid Waste. This alternative would increase the total projected disposal rates in Tarrant County to 7,025 tons/day, or an increase of 23 tons/day over the No-Action/Realignment Alternative by the year 2013. The increase associated with this alternative would represent a 0.6 percent increase over post-closure conditions in the year 2013. The demand associated with military and civilian reuse would reach 42 tons/day by 2013. The lifespan of existing Tarrant County landfills would be reduced by less than one year due to the increase. Planning efforts are underway to identify expansions or new landfill locations to serve Tarrant County.

Total solid waste generated on base would total 28 tons/day by the year 2013, or an increase of 20 tons/day over the No-Action/Realignment Alternative in 2013. Solid waste amounts generated on base under this alternative would be greater than amounts generated on base under preclosure conditions.

Energy

Electricity. Reuse-related demands would increase consumption in TU Electric's Fort Worth District to 48,310 MWH/day, an increase of 101 MWH/day over the No-Action/Realignment Alternative by the year 2013. The total military and civilian reuse-related demands would reach 210 MWH/day by 2013. The total increase of 0.4 percent over post-closure conditions should be adequately met by generation facilities that TU Electric would have in place to satisfy projected demands.

By the year 2013, the Mixed Use Alternative would result in total consumption of 358 MWH/day on base (90 MWH/day increase over the No-Action/Realignment Alternative in 2013). The on-base demand in 2013 under the Mixed Use Alternative would be greater than preclosure on-base demand. The existing on-base substation and distribution would continue to be able to support the reuse activities; however, a new distribution system

may need to be established for the civilian reuse. Once specific proposals are identified, then specific improvements can be negotiated with the local utility purveyor. Individual civilian facilities would need to be metered to monitor usage and to charge individual users, and appropriate utility corridors and easements would also need to be established.

Natural Gas. This alternative would increase the demand on Lone Star Natural Gas Company's Fort Worth district to 90.9 MMCF/day, or 1.5 MMCF/day over the No-Action/Realignment Alternative by the year 2013. The total military and civilian reuse-related demand would reach 1.9 MMCF/day by 2013. The increase of 2.1 percent over post-closure conditions would be adequately met by supplies that Lone Star would have in place to satisfy projected demands.

On-base consumption would account for 1.6 MMCF/day of the total reuse demand. Natural gas use would increase by 1.4 MMCF/day over the No-Action/Realignment Alternative. On-base natural gas demand in the year 2013 under this alternative would be greater than on-base demand under preclosure conditions. The existing on-base natural gas distribution system would require some changes to accommodate the civilian reuse of the base. Individual gas meters would be required at some facilities. Establishment of appropriate utility corridors and easements would also be required. New natural gas service would likely be established for the proposed residences at the Off-Site WSA. The new gas main would likely be extended along White Settlement Road, a distance of 4 miles.

Mitigation Measures. Potential mitigation measures for reducing impacts due to this Alternative would be the same as identified for the Proposed Action.

4.2.4.4 Other Land Use Concepts. Changes in utility demand caused by other land use concepts are measured by the population projection associated with a given plan.

Human and Health Services. The use of 20 dwelling units in the Kings Branch parcel would result in no increase to utility demands over the uses proposed for either the Proposed Action or the Mixed Use Alternative. There would be a slight increase in utility use as compared to the No-Action/Realignment Alternative. Utility use would equal the amounts identified in Section 2.3.3.1.

Retained Residential Areas. Implementation of this land use concept in combination with any of the alternatives would not result in any additional impacts. Net increases in on-site water use would range from 25 percent under the Mixed Use Alternative, 27 percent under the Proposed Action, to 93 percent under the No-Action/Realignment Alternative. However, the city of Fort Worth would be able to meet the increased water demands.

Similarly, net increases in wastewater flow would be accommodated by existing and planned collection and treatment systems. Net increases in the usage of other utilities would occur only in conjunction with the No-Action/ Realignment Alternative. Impacts and mitigations would be similar to those described under the reuse alternatives.

4.3 HAZARDOUS MATERIALS AND HAZARDOUS WASTE MANAGEMENT

This section addresses the potential impacts of existing contaminated sites on the various reuse options, and the potential for environmental impacts caused by hazardous materials/waste management practices associated with the reuse alternatives. Hazardous materials/wastes, IRP sites, storage tanks, asbestos, pesticides, PCBs, radon, medical/biohazardous wastes, ordnance, and lead-based paint will be discussed within this section.

The Air Force is committed to the remediation of all contamination at Carswell AFB due to past Air Force activities. The OL will remain after base closure to coordinate remediation activities. Delays in disposal or restrictions in reuse of property may occur due to the extent of contamination and the results of both the risk assessment and remedial designs determined for contaminated sites. Examples of conditions resulting in land use restrictions would be the capping of landfills and the constraints from methane generation and cap integrity, as well as the location of long-term monitoring wells. These conditions would have to be considered in the layout of future development. Options to recipients include creation of parks, greenbelts, or open spaces over these areas.

Regulatory standards and guidelines have been applied in determining the impacts caused by hazardous materials/waste. The following criteria were used to identify potential impacts:

- Accidental release of friable asbestos during the demolition or modification of a structure
- Generation of 1,000 kilograms or more of hazardous waste (Texas Administrative Code Title 31 Chapter 335.1) in a calendar month, resulting in increased regulatory requirements
- New operational requirements or service for all UST and tank systems
- Any spill or release of a reportable quantity of a hazardous material
- Manufacturing of any compound that requires notifying the pertinent regulatory agency
- Exposure of the environment or public to any hazardous material through release or disposal practices.

4.3.1 No-Action/Realignment Alternative

4.3.1.1 Hazardous Materials Management. The hazardous materials likely to be utilized by military activities include aviation fuels, motor fuels, POL, hydraulic fluids, solvents, glycols, cleaners, corrosives, aerosols, degreasers, paints, thinners, and other materials. The types of hazardous materials utilized would be similar to those used by the base prior to closure. The quantities of hazardous materials utilized under the No-Action/Realignment Alternative may increase over closure conditions due to the realignment activities and increased aircraft operations. However, quantities would decrease compared to preclosure conditions due to pollution prevention provisions implemented in accordance with Navy policy. Hazardous materials would be utilized by the caretaker for preventive and regular maintenance activities, grounds maintenance, and water treatment. The hazardous materials likely to be utilized for activities associated with both the military and caretaker activities are identified in Table 4.3-1.

Table 4.3-1. Hazardous Material Usage by Land Use - No-Action/Realignment Alternative

Land Use	Operation Process	Hazardous Materials
Military	Airfield and airfield support, operations, light industrial, commercial, recreational, POL storage, munitions storage	Aviation fuels, motor fuels, glycols, POL, heating oil, heavy metals, paint thinners, solvents, degreasers, hydraulic fluids, ignitables, corrosives, pesticides, household products, ordnance
Caretaker	Activities associated with preventive and regular facility maintenance, grounds maintenance, and water treatment	Paints, thinners, POL, motor fuels, pesticides, fertilizers, aerosols, heating oils, corrosives, cleaners, chlorine

POL = petroleum, oils, and lubricants.

The OL, NAS Fort Worth, and DOD tenants would be individually responsible for the management of hazardous materials according to applicable regulations.

To further minimize adverse impacts, an ultimate cooperative planning body for hazardous materials and waste management hosted by NAS Fort Worth would be established with the support of the military tenant units on the base. Establishment of such a body would reduce the costs and manpower involved in environmental compliance training, health and safety training, and waste management, and could increase recycling, minimize waste, and assist in mutual spill responses.

In compliance with Navy policy, NAS Forth Worth would manage hazardous materials in accordance with a Hazardous Materials Control and

Management (HMC&M) program that considers all aspects of health, safety and protection of the environment. An oil Spill Prevention Control and Countermeasures (SPCC) Plan would address both response to hazardous material releases and organizational responsibilities. All hazardous materials will be transported to NAS Fort Worth under U.S. DOT regulations. Additionally, each organization would have to comply with EPCRA, Title III, and/or the Texas Hazardous Communication Act that requires that local communities be informed of the use of hazardous materials.

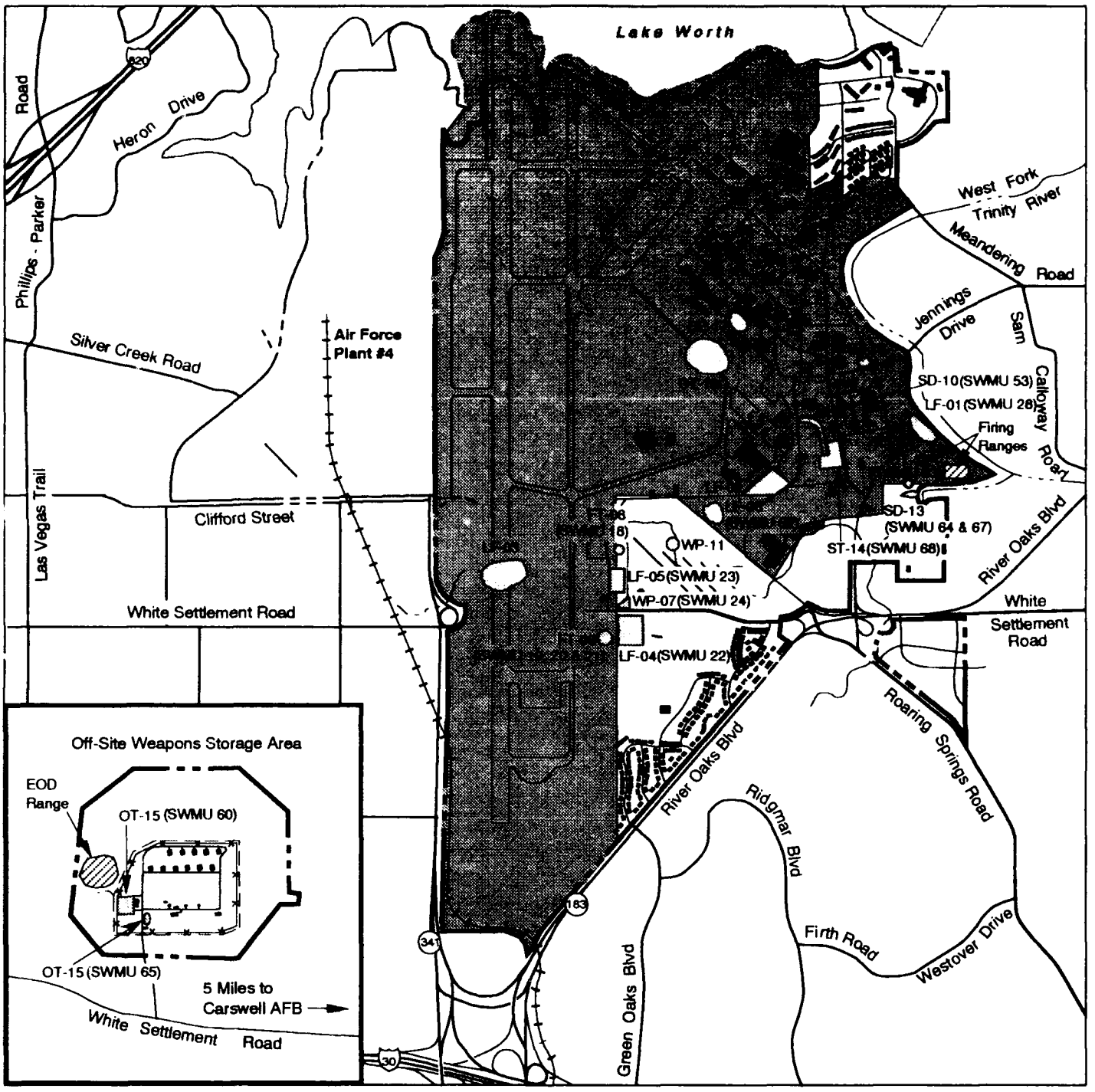
4.3.1.2 Hazardous Waste Management. Hazardous wastes would be generated under the No-Action/Realignment Alternative. These wastes would include solvents, paints, thinners, heavy metals, and batteries. Blended fuels and waste petroleum would also be generated, but are considered non-hazardous under Texas law. The quantities of hazardous waste generated under the No-Action/Realignment Alternative would increase over the closure baseline due to military realignment. However, with the implementation of NAS Fort Worth's pollution prevention program, quantities would be reduced to levels below preclosure conditions.

As long as an RCRA permit remains in effect, the permit holder would be officially responsible for hazardous waste management. NAS Fort Worth would store hazardous waste for disposal at the TSD facility.

A component within the HMC&M Plan would provide for the proper management and disposal of hazardous wastes. This component would include a section for a plan of action and milestones for a waste minimization program. Releases of hazardous wastes would be addressed in the SPCC. Establishment of a cooperative planning body, as discussed under **4.3.1.1 Hazardous Materials Management**, would further minimize adverse impacts.

4.3.1.3 Installation Restoration Program Sites. The Air Force is responsible for remediation of all IRP sites at Carswell AFB and AF Plant #4 (Figure 4.3-1). The Air Force is committed to continue IRP activities at Carswell AFB under DERP, CERCLA, the DSMOA, the Partnering Agreement, the AF Plant #4 FFA, and the RCRA Part B permit. The DSMOA between the Air Force and TNRCC commits the Air Force to remediation of all Carswell AFB IRP sites and SWMUs. Coordination and management of these activities will be the responsibility of the OL. The FFA among the Air Force, TNRCC, and the U.S. EPA commits the Air Force to remediation of all AF Plant #4 IRP sites, including the TCE groundwater contamination plume, which has migrated onto Carswell AFB. The IRP sites within NAS Fort Worth or associated with the base caretaker property are provided in Table 4.3-2.

Military. Ongoing site investigation and remediation activities at sites SD-10, ST-14, ST-16, and the East Area Groundwater Site should not



EXPLANATION

- Military
- Caretaker Status
- Carswell AFB Boundary
- Air Force Plant #4 Boundary
- Leased Property
- IRP Site
- EOD and Firing Range
- Probable TCE Groundwater Contamination Plume-5 ppb level (plume boundary not fully characterized)

0 650 1300 2600 Feet

Notes: Figure represents known conditions as of June 1993. Figure does not show all SWMUs identified during 1989 RFA.

IRP Sites No-Action/Realignment Alternative

Figure 4.3-1

Table 4.3-2 IRP Sites Within Land Use Areas - No-Action/Realignment Alternative

Proposed Land Use	IRP (RCRA) Sites
Military	DP-17, FT-08 (SWMU 18), FT-09 (SWMUs 19, 20, and 21), LF-01 (SWMU 28), LF-02, LF-03, LF-05 (SWMU 23), LF-06 (SWMU 62), OT-12 (SWMU 63), OT-18, SD-10 (SWMU 53), ST-14 (SWMU 68), ST-16, AF Plant #4 TCE Groundwater Contamination, East Area Groundwater
Caretaker	FT-08 (SWMU 18), LF-04 (SWMU 22), LF-05 (SWMU 23), OT-12 (SWMU 63), OT-15 (SWMUs 60 and 65), SD-13 (SWMUs 64 and 67), WP-07 (SWMU 24), WP-11, AF Plant #4 TCE Groundwater Contamination, East Area Groundwater

Note: Table contains only RCRA/IRP process sites and does not include all SWMUs identified during the 1989 RFA.
IRP = Installation Restoration Program.
RCRA = Resource Conservation and Recovery Act.
SWMU = solid waste management unit.
TCE = trichloroethylene.

impact military reuse operations in the central and eastern portions of the base. Short-term impacts to flightline activities may occur as a result of site investigation and remediation associated with site OT-18. However, similar activities associated with sites FT-08, FT-09, LF-05, WP-07, located between the golf course and the main taxiway, and sites LF-06, and DP-17 should not impact flightline operations. In addition, remediation activities associated with the AF Plant #4 TCE Groundwater Contamination in the northern and western portions of Carswell AFB should not impact military flight operations or other military reuse activities. Site LF-01, LF-02, and LF-03 have been recommended for No Further Action sites and should not impact military reuse activities. No land use restrictions should occur since the property associated with this land use would remain within DOD control.

Caretaker. Ongoing Air Force sampling and remedial design activities would be continued. The caretaker would support the utility requirements and provide security for the IRP areas on Carswell AFB. The caretaker, under the Partnering Agreement, would also provide similar support to remediation activities associated with the AF Plant #4 TCE Groundwater Contamination.

Ongoing IRP investigation and remediation activities associated with the AF Plant #4 TCE Groundwater Contamination and the other sites within the caretaker land use area (see Table 4.3-2) would not result in impacts to caretaker activities. All of the IRP sites may not require remediation; however, all of them must be addressed and properly closed out. Active coordination between the OL, NAS Fort Worth, and AF Plant #4 would

coordination between the OL, NAS Fort Worth, and AF Plant #4 would minimize potential land use restrictions or schedule delays. The presence of IRP sites may limit certain land uses within overlying areas.

4.3.1.4 Storage Tanks. Flight and maintenance operations under the No-Action/Realignment Alternative would require the use of existing and new aboveground storage tanks, including the POL storage facility and USTs. NAS Fort Worth would, in accordance with Navy policy, be subject to all applicable federal, state, and local regulations for acceptable leak detection methodologies, spill and overfill protection, cathodic protection, secondary containment for the tank systems, including the piping, air emission controls and technology standards, and liability insurance. Navy policy calls for the removal and/or replacement of older USTs whenever possible, and federal regulations require the permanent closure of storage tanks out of service for 1 year or longer. USTs remaining, but not utilized by NAS Fort Worth, would be managed by the caretaker. Cathodic protection and leak detection systems on the USTs would be performed by the caretaker in compliance with applicable regulations. Coordination between the OL and NAS Fort Worth regarding the use of remaining USTs would preclude any adverse impacts to the integrity of the tanks or piping systems. All oil/water separators utilized by NAS Fort Worth would be managed by the Navy and tenant units in accordance with applicable regulations and Navy standards.

Aboveground fuel storage tanks that would not be utilized to support the military reuse activities would be purged of fumes to preclude fire hazards. Section 79.116 of the Uniform Fire Code recommends that storage tanks out of service for 1 year be removed from the property, unless a waiver is granted by the state. The permanent closure of these tanks would be subject to the requirements of the TNRCC. Therefore, management under Navy policy would preclude unacceptable impacts. The caretaker would provide cathodic protection, repair, and general maintenance for all remaining aboveground storage tanks and piping not utilized by NAS Fort Worth.

4.3.1.5 Asbestos. The impacts from the No-Action/Realignment Alternative would be minimal. NAS Fort Worth would be advised of ACM associated with facilities identified for military reuse. Management of asbestos during military realignment demolition and renovation activities would be in accordance with NESHAP and all applicable state regulations, and would preclude asbestos exposure. Unoccupied buildings would be secured by the caretaker to prevent contact with ACM under the No-Action/Realignment Alternative. Management of ACM within the caretaker land use area would be in accordance with Air Force Policy to minimize potential risks to human health and the environment.

4.3.1.6 Pesticide Usage. Pesticides for ground maintenance would be utilized under the No-Action/Realignment Alternative. In accordance with Navy policy, all federal, state, and local pesticide pollution prevention and management regulations would be adhered to, and addressed in a pest management plan. Additionally, all pesticide applications would be conducted by a DOD-certified applicator. There should not be an appreciable increase in the use of pesticides from preclosure or closure conditions. Application of pesticides would be conducted in accordance with FIFRA and state regulations to assure the proper and safe handling and application of all chemicals.

4.3.1.7 Polychlorinated Biphenyls. All federally regulated PCB equipment and PCB-contaminated equipment regulated under TSCA were removed and properly disposed prior to base closure. Therefore, these materials would not create any impacts.

4.3.1.8 Radon. Extensive radon surveys have identified some facilities with radon levels above 4 pCi/l. Construction associated with military realignment could eliminate radon exposure in facilities with elevated radon levels by demolishing such structures and constructing new ones. Currently, no radon exposure action levels have been established by federal or state regulatory agencies for buildings other than schools or residences. Navy policy calls for all building and housing units occupied over 4 hours per day to be tested for the presence of radon. Levels of or exceeding 4 pCi/l would be mitigated using U.S. EPA recommended guidelines. Comprehensive data available from the prior surveys indicate that no facilities with radon levels at 4 pCi/l or greater would be associated with the military realignment; therefore, radon would not create any unacceptable impacts under this reuse alternative.

4.3.1.9 Medical/Biohazardous Waste. Quantities of medical/biohazardous wastes generated by NAS Fort Worth would represent an increase over closure conditions due to the establishment and operation of a military medical clinic. However, quantities would remain well below the quantities of wastes generated by the hospital during preclosure conditions. These wastes would be managed and disposed in accordance with all applicable state regulations, thereby minimizing potential impacts.

4.3.1.10 Ordnance. NAS Fort Worth would operate the small arms firing ranges and the WSA in the northern portion of the base. Management of these facilities, in accordance with applicable regulations and Navy standards, would preclude any unacceptable impacts.

4.3.1.11 Lead-Based Paint. Military realignment activities may involve the demolition or renovation of existing structures that may contain lead-based paint. Lead-based paint would be remediated from these facilities, as necessary and disposed in accordance with applicable federal, state, and

paint survey or notified of the potential of lead-based paint in facilities constructed prior to or during 1978.

4.3.1.12 Mitigation Measures. Household product collection days and/or collection sites for military family residences would be established to reduce the potential to improperly dispose into either the storm water or sanitary sewers. Household products collected could include paints, pesticides, fuels, oils, and cleaners.

4.3.2 Proposed Action

4.3.2.1 Hazardous Materials Management. The types of hazardous materials utilized under the Proposed Action (Table 4.3-3) would be similar to those utilized under the No-Action/Realignment Alternative. The quantities utilized would be greater than those utilized under the No-Action/ Realignment Alternative due to the civilian reuse activities associated with residential, commercial, industrial, and institutional (prison) land uses. Management of these materials, utilizing all applicable regulations, would not create any unacceptable impacts.

Table 4.3-3. Hazardous Material Usage by Land Use - Proposed Action

Land Use	Operation Process	Hazardous Materials
Industrial	Specialized storage	Paints, thinners, cleaners, solvents, heating oils, pesticides, conventional munitions, rocket fuels
Commercial	Activities associated with offices, light industrial, retail, service industries, restaurants	Heating oils, pesticides, paints, thinners, cleaners, aerosols, POL, corrosives, heavy metals, pesticides
Residential	Utilization/maintenance of single-family units, landscaping	Pesticides, fertilizers, fuels, POL, heating oils, paints, thinners, household products
Public facilities/ recreation	Maintenance of golf course, public library, and City Hall complex	Pesticides, fertilizers, heating oils, paints, thinners, cleaners, aerosols, fuels, POL, household products
Military	Airfield and airfield support, operations, light industrial, commercial, recreational, POL storage, munitions storage	Aviation fuels, motor fuels, glycols, POL, heating oil, heavy metals, paints, thinners, solvents, degreasers, hydraulic fluids, ignitables, corrosives, pesticides, fertilizers, ordnance
Institutional (prison)	Federal medical center complex, security housing	Pharmaceuticals, radiological sources, heavy metals, paints, thinners, cleaners, fuels, heating oils, pesticides, fertilizers, household products

POL = petroleum, oils, and lubricants.

4.3.2.2 Hazardous Waste Management. Hazardous wastes generated under the Proposed Action would consist of mainly solvents, paints, thinners, and heavy metals. Blended fuels and waste petroleum would also be generated under this alternative; however, these wastes are considered non-hazardous by the state. Quantities of waste would be greater than the No-Action/Realignment Alternative due to civilian reuse activities. Upon receipt of parcels, hazardous waste management would fall under the control of the civilian recipients. Once the responsibilities of hazardous waste management are allocated to individual organizations, proficiency with those materials and spill responses is required by OSHA regulations (29 CFR). Mutual aid agreements with local communities may require additional scrutiny and training of emergency staff.

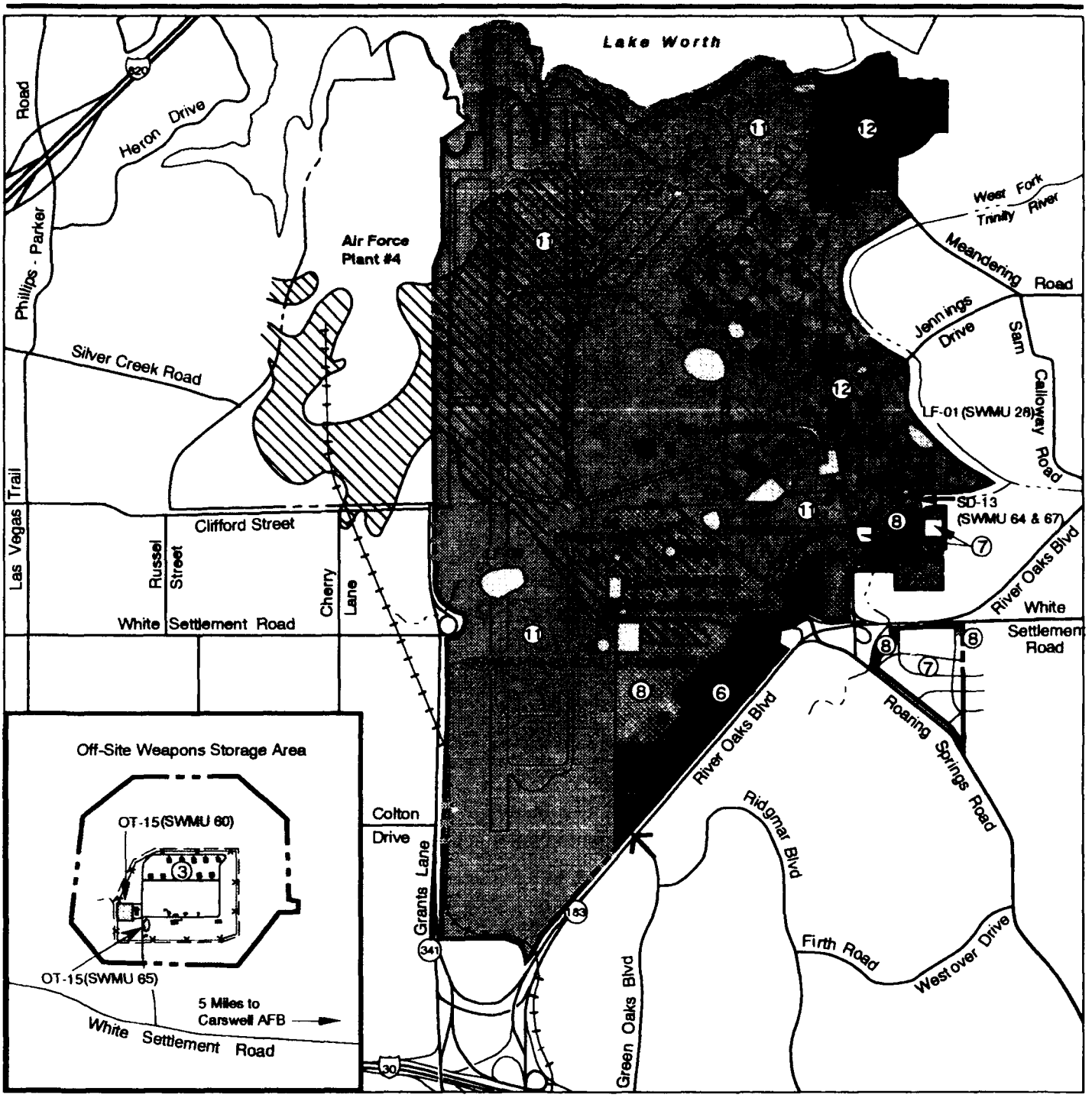
The presence of numerous independent civilian owners/operators would change the regulatory requirements and probably increase the regulatory burden relative to hazardous waste management. However, hazardous wastes management by all independent owner/operators in accordance with all applicable regulations would preclude any unacceptable impacts.

4.3.2.3 Installation Restoration Program Sites. The Air Force is committed to continue remediation at all IRP sites at Carswell AFB and AF Plant #4 as discussed under the No-Action/Realignment Alternative.

Delays in disposal or restrictions in land use may be required due to the extent and type of contamination at IRP sites and by current and future IRP remediation activities (Figure 4.3-2). Based on the results of IRP investigations, the Air Force may, where appropriate, place restrictions on civilian reuse activities through deed restrictions on conveyances and use restrictions on leases. The Air Force may also retain right of access to other properties to inspect monitoring wells or conduct other remedial activities. Coordination between reuse planning agencies, NAS Fort Worth, and AF Plant #4 could mitigate potential land use restrictions or reuse delays that may arise during IRP site investigation and remediation activities associated with IRP sites located on properties scheduled for civilian reuse. The IRP sites within each land use area under the Proposed Action are summarized in Table 4.3-4 and identified in Figure 4.3-2.

Industrial. Delays in property disposal may result due to remediation activities and long-term monitoring associated with site OT-15 (low-level radioactive burial site), located at the Off-Site WSA. No Further Action for site OT-15 (Waste Disposal Site) is awaiting approval by the state.

Commercial. The East Area Groundwater Site could impact civilian reuse of the commercial land use areas in this portion of the base. Remediation activities and the location of long-term monitoring wells associated with the groundwater contamination could cause delays in property disposal and possible restrictions on civilian land uses.



EXPLANATION

- ① Airfield *
- ② Aviation Support *
- ③ Industrial
- ③ Office/Industrial Park *
- ④ Institutional (Medical) *
- ⑤ Institutional (Educational) *
- ⑥ Commercial
- ⑦ Residential
- ⑧ Public/Recreation
- ⑨ Agriculture *
- ⑩ Vacant Land *
- ⑪ Military
- ⑫ Institutional (Prison)

- IRP Site
- Probable TCE Groundwater Contamination Plume-5 ppb level(plume boundary not fully characterized)
- EOD and Firing Range
- Carswell AFB Boundary
- Air Force Plant #4 Boundary
- Leased Property

0 650 1300 2600 Feet

* Standard land use designation not applicable to this figure.
Notes: Figure represents known conditions as of June 1993.
Figure does not show all SWMUs identified during 1989 RFA.

IRP Sites- Proposed Action

Figure 4.3-2

Table 4.3-4. IRP Sites Within Land Use Areas - Proposed Action

Proposed Land Use	IRP (RCRA) Sites
Industrial	OT-15 (SWMUs 60 and 65)
Commercial	East Area Groundwater Contamination
Residential	None
Public facilities/recreation	FT-08 (SWMU 18), LF-04 (SWMU 22), LF-05 (SWMU 23), OT-12 (SWMU 63), SD-13 (SWMUs 64 AND 67), WP-07 (SWMU 24), WP-11, East Area Groundwater Contamination, AF Plant #4 TCE Groundwater Contamination
Institutional (prison)	None
Military	DP-17, FT-08 (SWMU 18), FT-09 (SWMUs 19, 20, and 21), LF-01 (SWMU 28), LF-02, LF-03, LF-05 (SWMU 23), LF-06 (SWMU 62), OT-12 (SWMU 63), OT-18, SD-10 (SWMU 53), ST-14 (SWMU 68), ST-16, AF Plant #4 TCE Groundwater Contamination, East Area Groundwater Contamination

Note: Table contains only RCRA/IRP process sites and does not include all SWMUs identified during the 1989 RFA.
IRP = Installation Restoration Program.
RCRA = Resource Conservation and Recovery Act.
RFA = RCRA Facility Assessment.
SWMU = Solid waste management unit.
TCE = trichloroethylene.

Residential. No IRP sites are located within the residential land use under the Proposed Action.

Public Facilities/Recreation. The golf course is presently operational with an active groundwater pump and treat system in place. However, future remediation programs or long-term monitoring of the AF Plant #4 TCE Groundwater Contamination may result in restricted civilian reuse for portions of the golf course. Similar impacts may occur in the eastern portion of the base as a result of ongoing site investigations and groundwater monitoring activities associated with the East Area Groundwater Site. Site WP-11 is pending approval from the state as a No Further Action site, while sites FT-08 and OT-12 have received state approval for No Further Action. These sites should not impact civilian redevelopment. Delays in property disposal may result from remediation activities associated with site SD-13, in the east base area and site LF-04, LF-05, and WP-07, located on the golf course.

Institutional (Prison). No IRP sites are located within this land use area under the Proposed Action.

Military. The IRP sites and impacts associated with this land use area are similar to those discussed under the No-Action/Realignment Alternative.

Determination of future base land uses will be, to a certain extent, dependent upon a regulatory review of the remedial design of the IRP sites. This review will identify current monitoring well locations and future land use limitations as a result of their presence.

4.3.2.4 Storage Tanks. New and existing tanks required by the civilian owners/operators would be subject to the same federal, state, and local regulations discussed under the No-Action/Realignment Alternative.

Aboveground fuel storage tanks not utilized to support reuse activities would be purged of fumes to preclude fire hazards. Under this alternative, the TNRCC and the Uniform Fire Code requirements would be similar to those stated under the No-Action/Realignment Alternative. Proper management under this alternative would preclude unacceptable impacts.

4.3.2.5 Asbestos. Renovation and demolition of existing structures with ACM may occur with civilian reuse development. As was mentioned in the No-Action/Realignment Alternative, such activities would be subject to all applicable federal, state, and local regulations to minimize the potential risk to human health and the environment.

4.3.2.6 Pesticide Usage. Pesticide usage associated with the Proposed Action would increase from amounts used under the No-Action/Realignment Alternative due to civilian development of residential, office/industrial park, commercial, and public facilities/recreation land use zones. Management practices would be subject to FIFRA and state guidelines and would preclude unacceptable impacts.

4.3.2.7 Polychlorinated Biphenyls. Management of PCBs under the Proposed Action would be similar to those identified under the No-Action/ Realignment Alternative.

4.3.2.8 Radon. Radon management practices for military reuse would be similar to those identified under the No-Action/Realignment Alternative. Under the Proposed Action, reuse planning agencies would identify structures known to exceed the U.S. EPA recommended level of 4 pCi/l prior to reuse.

4.3.2.9 Medical/Biohazardous Waste. Biohazardous materials generated under this alternative would increase over the No-Action/Realignment Alternative due to civilian reuse of the hospital. These wastes would not cause unacceptable impacts if properly managed under all applicable regulations.

4.3.2.10 Ordnance. The small arms firing ranges and the northern WSA would be operated by NAS Fort Worth, as discussed under the No-Action/ Realignment Alternative. The types and amounts of ordnance stored at

Carswell AFB could increase over the No-Action/Realignment Alternative due to the possibility of conventional munitions storage at the Off-Site WSA; however, compliance with applicable regulations would preclude any unacceptable impacts.

4.3.2.11 Lead-Based Paint. Management practices regarding lead-based paint for military facilities would be similar to those identified under the No-Action/Realignment Alternative.

4.3.2.12 Mitigation Measures. A hazardous materials and waste management cooperative planning body, similar to that established by NAS Fort Worth, could be established to effectively reduce waste management and environmental, health, and safety training costs. The planning body could also oversee mutual aid agreements and coordinate waste minimization and recycling programs.

The scheduling of collection days for household products, such as paints, pesticides, and cleaners, could mitigate publicly-owned treatment works and storm water discharge concerns. Articles in the local papers and classes offered by community educational programs could increase public awareness on recycling, appropriate use of pesticides, waste minimization, and waste disposal.

Reuse planning agencies should coordinate with NAS Form Worth prior to construction or demolition to reduce the potential to disturb existing USTs or piping systems that would remain in place for reuse.

4.3.3 Mixed Use Alternative

4.3.3.1 Hazardous Materials Management. Hazardous materials utilized under the Mixed Use Alternative are listed in Table 4.3-5. The types and quantities would increase over the No-Action/Realignment Alternative due to civilian reuse activities. No unacceptable impacts would result under this alternative due to compliance with applicable regulations.

4.3.3.2 Hazardous Waste Management. Hazardous wastes generated under the Mixed Use Alternative would increase over the No-Action/ Realignment Alternative due to the increase in aviation support, office/ industrial park, commercial, and institutional (medical) land use areas associated with civilian reuse. The regulatory burden of hazardous waste management would increase due to the increased numbers of independent owner/operators associated with this alternative. Management of hazardous wastes under all applicable regulations would preclude unacceptable impacts.

4.3.3.3 Installation Restoration Program Sites. The IRP sites within each land use area for the Mixed Use Alternative are identified in Figure 4.3-3 and

Table 4.3-5. Hazardous Materials Usage by Land Use - Mixed Use Alternative

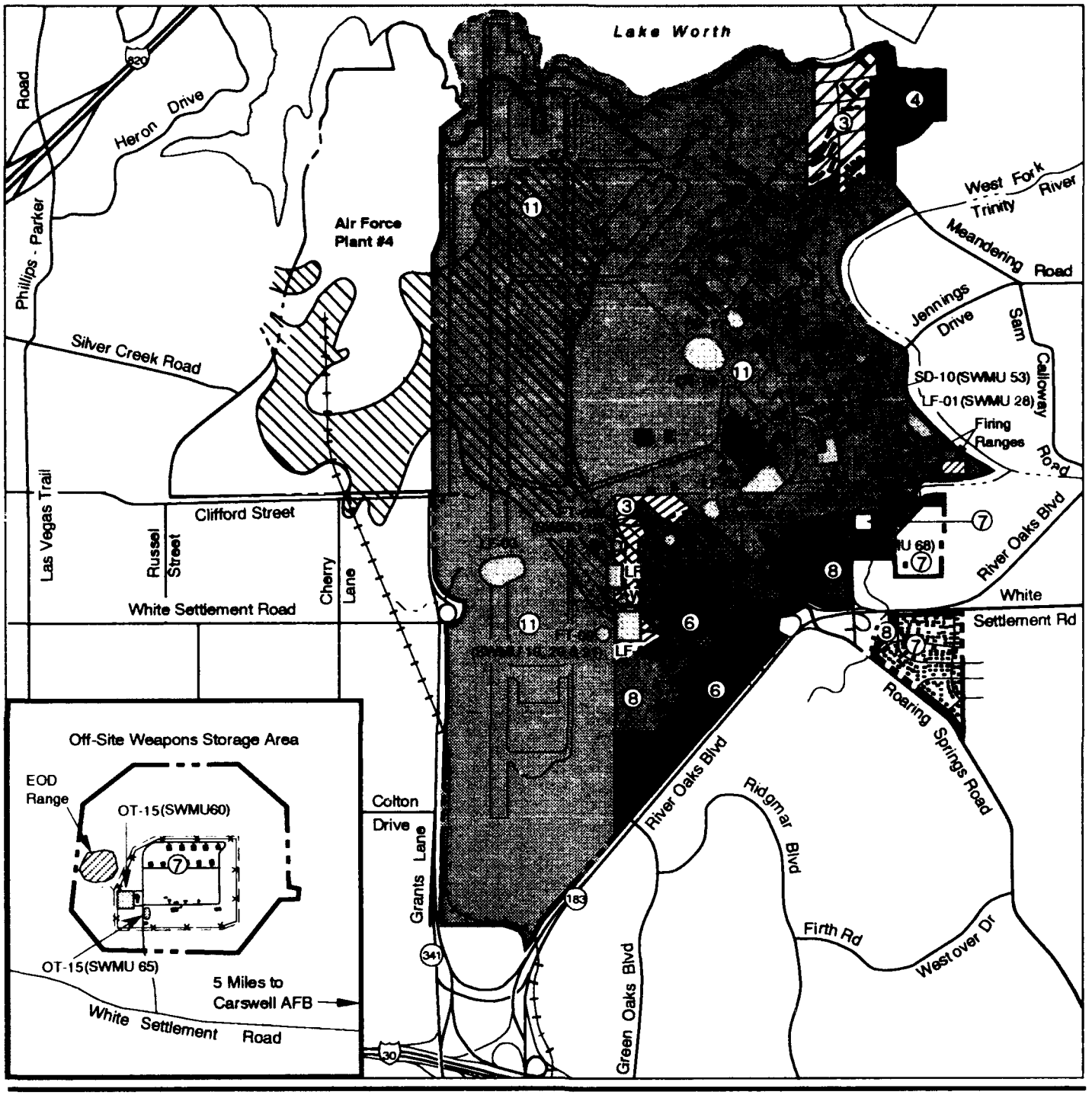
Land Use Zones	Operation Process	Hazardous Materials
Aviation support	Operations associated with aircraft maintenance and modifications	Aviation fuels, POL, hydraulic fluids, solvents, corrosives, degreasers, heavy metals, paints, thinners, glycols, ignitables, aerosols
Office/industrial park	Activities associated with offices, light industry, and manufacturing research and development, warehousing distribution center	Paints, thinners, cleaners, fuels, POL, solvents, corrosives, ignitables, heating oils, pesticides, household products
Institutional (medical)	Hospital/clinic, rehabilitation facilities, x-ray units	Pharmaceuticals, chemotherapeutic drugs, radiological sources, cleaners, household products
Commercial	Activities associated with neighborhood retail center, offices, service industries, restaurants	Heating oils, pesticides, paints, thinners, cleaners, solvents, heavy metals, aerosols, household products
Residential	Utilization of single-family ranchettes and multi-family units	Fuels, POL, heating oil, cleaners, pesticides, fertilizers, household products, chlorine
Public facilities/ recreation	Maintenance of golf course, public library, child care center, and undeveloped open area	Pesticides, fertilizers, heating, oils, fuels, POL, cleaners, paints, thinners, aerosols, household products
Military	Airfield and airfield support, operations, light industrial, commercial, recreational, vacant lands, POL storage, munitions storage	Aviation fuels, motor fuels, glycols, POL, heating oil, heavy metals, paints, thinners, solvents, degreasers, hydraulic fluids, ignitables, corrosives, pesticides, fertilizers, ordnance

POL = petroleum, oils, and lubricants.

summarized in Table 4.3-6. Coordination between reuse planning agencies, NAS Fort Worth, and AF Plant #4 could mitigate potential land use restrictions or delays in property disposal that may arise during IRP site investigation and remediation activities associated with IRP sites located on properties scheduled for civilian reuse.

Aviation Support. LF-02 has been recommended as a No Further Action site and is awaiting approval by the state; therefore, no impacts to civilian redevelopment are anticipated.

Office/Industrial Park. Four Carswell AFB IRP sites and the AF Plant #4 TCE Groundwater Contamination are located within this land use zone. Under the Partnering Agreement, AF Plant #4 is responsible for remediation of the groundwater contamination associated with the TCE plume that has also migrated into this area; Carswell AFB is responsible for remediation of sites



EXPLANATION

- ① Airfield*
- ② Aviation Support
- ③ Industrial*
- ③ Office/Industrial Park
- ④ Institutional (Medical)
- ⑤ Institutional (Educational)*
- ⑥ Commercial
- ⑦ Residential
- ⑧ Public/Recreation
- ⑨ Agriculture*
- ⑩ Vacant Land*
- ⑪ Military
- ⑫ Institutional (Prison)*

- IRP Site
- Probable TCE Groundwater Contamination Plume-5 ppb level(plume boundary not fully characterized)
- EOD and Firing Range
- Carswell AFB Boundary
- Air Force Plant #4 Boundary
- Leased Property

0 650 1300 2600 Feet

* Standard land use designation not applicable to this figure.
Notes: Figure represents known conditions as of June 1993.
Figure does not show all SWMUs identified during 1989 RFA.

IRP Sites- Mixed Use Alternative

Figure 4.3-3

Table 4.3-6. IRP Sites Within Land Use Areas - Mixed Use Alternative

Proposed Land Use	IRP (RCRA) Sites
Aviation support	LF-02
Office/industrial park	FT-08 (SWMU 18), LF-04 (SWMU 22), LF-05 (SWMU 23), WP-07 (SWMU 24), AF Plant #4 TCE Groundwater Contamination
Institutional (medical)	None
Commercial	East Area Groundwater, AF Plant #4 TCE Groundwater Contamination
Residential	OT-15 (SWMUs 60 and 65)
Public facilities/recreation	OT-12 (SWMU 63), SD-13 (SWMUs 64 and 67), WP-11, East Area Groundwater, AF Plant #4 TCE Groundwater Contamination
Military	DP-17, FT-08 (SWMU 18), FT-09 (SWMU 19, 20, and 21), LF-01 (SWMU 28), LF-03, LF-05 (SWMU 23), LF-06 (SWMU 62), OT-12 (SWMU 63), OT-18, SD-10 (SWMU 53), ST-14 (SWMU 68), ST-16, AF Plant #4 TCE Groundwater Contamination, East Area Groundwater

Note: Table contains only RCRA/IRP process sites and does not include all SWMUs identified during the 1989 RFA.
IRP = Installation Restoration Program.
RCRA = Resource Conservation and Recovery Act.
SWMU = solid waste management waste.
TCE = trichloroethylene.

FT-08, LF-04, LF-05, and WP-07 that are all located in the western portion of the golf course adjacent to the flightline. FT-08 has been approved for No Further Action by the state and, therefore, should not impact civilian development. Remediation and long term monitoring activities for the other sites could delay property disposal and cause land use restrictions for civilian reuse.

Institutional (Medical). No IRP sites are located within this land use area.

Commercial. Delays in disposal and land use restrictions may result from remediation, site investigations and long-term monitoring activities associated with the AF Plant #4 TCE Groundwater Contamination, and the East Area Groundwater Site.

Residential. Remediation and long-term monitoring associated with Site OT-15 (low-level radioactive burial site) could result in disposal delays or land use restrictions. No Further Action for OT-15 (Waste Disposal Site) is awaiting approval by the state.

Public Facilities/Recreation. A portion of the AF Plant #4 TCE Groundwater Contamination plume lies beneath a major portion of this land use zone in the southern part of Carswell AFB. Remediation and long term monitoring at this site, the East Area Groundwater site, and site SD-13, also located in the

eastern portion of the base, could delay property disposal and create land use restrictions for civilian reuse; such activities could also affect the civilian reuse of the golf course.

Site WP-11, located in the western portion of the golf course adjacent to Farmers Branch Creek, is awaiting No Further Action approval from the state. Site OT-12, located adjacent to the Farmers Branch Creek in the east base area, have been approved for No Further Action by the state. No impacts to civilian redevelopment should occur from these sites.

Military. The IRP sites and impacts associated with this land use area are similar to those discussed under the No-Action/Realignment Alternative.

4.3.3.4 Storage Tanks. Flight and maintenance operations under the Mixed Use Alternative would require both aboveground tanks and USTs. Impacts from the civilian reuse of USTs, aboveground storage tanks, and oil/water separators would be similar to those described under the Proposed Action.

4.3.3.5 Asbestos. Renovation and demolition of existing structures with ACM may occur with civilian reuse development, as was discussed under the Proposed Action. Such activities would be subject to all applicable federal, state, and local regulations to minimize potential risk to human health and the environment, as was discussed under the Proposed Action.

4.3.3.6 Pesticide Usage. The use of pesticides under the Mixed Use Alternative would increase over the No-Action/Realignment Alternative due to civilian redevelopment of public facilities/recreation, residential, commercial, office/industrial park, and institutional (medical) land uses. The types of pesticides used under the Mixed Use Alternative would be different than under the No-Action/Realignment Alternative. This is due to the conversion of industrial land to residential at the Off-Site WSA, portions of the golf course to industrial land use, and the residential areas along SH 183 to commercial. Management practices would be subject to FIFRA and state guidelines; therefore, no unacceptable impacts are anticipated.

4.3.3.7 Polychlorinated Biphenyls. Management of PCBs under the Mixed Use Alternative would be similar to those identified under the No-Action/ Realignment Alternative and the Proposed Action.

4.3.3.8 Radon. Radon management practices would be similar to those identified under the No-Action/Realignment Alternative and Proposed Action.

4.3.3.9 Medical/Biohazardous Waste. Biohazardous materials generated due to the civilian reuse of the hospital would be subject to conformance with state regulations. The amount of wastes generated would increase over the No-Action/Realignment Alternative due to civilian reuse of the hospital. Materials generated under this reuse alternative would not

represent any unacceptable impacts if properly managed under all applicable regulations.

4.3.3.10 Ordnance. The small arms firing ranges and the northern WSA would be operated by NAS Fort Worth, as was discussed under the No-Action/Realignment Alternative. Therefore, no impacts on civilian reuse activities would occur under the Mixed Use Alternative.

4.3.3.11 Lead-Based Paint. Management practices regarding lead-based paint for military facilities would be similar to those identified under the No-Action/Realignment Alternative.

4.3.3.12 Mitigation Measures. Mitigation measures for this alternative are similar to those identified under the Proposed Action.

4.3.4 Other Land Use Concepts

This section will discuss transfers/conveyances within the framework of the IRP and within the context of the hazardous materials and wastes typically associated with their proposed reuses.

Health and Human Services. No IRP sites exist within the area identified for housing for the handicapped. Hazardous materials utilized for the purpose of maintaining the housing units would include paints, thinners, pesticides, some oils, fuels, and household products. Management of ACM would be accomplished to minimize potential risk to human health and the environment. No radon levels above 4 pCi/l have been detected in housing units identified for this land use concept. A lead-based paint survey of military units is scheduled to be conducted in 1994, and owners would be provided with the survey results.

Retained Residential Areas. No IRP sites exist within the areas identified under this land use concept, except for a portion of the AF Plant #4 TCE Groundwater Contamination. Potential reuse of housing units on or adjacent to the golf course is not expected to be impacted by remediation or long-term monitoring activity associated with this site. Hazardous materials utilized for the purpose of maintaining the housing units would include paints, thinners, pesticides, some oils, fuels, and household products. Management of ACM would be accomplished to minimize potential risk to human health and the environment. Radon levels above 4 pCi/l have been detected in some of the housing units identified for this reuse alternative; recipients would be notified prior to reuse. A lead-based paint survey of military units is scheduled to be conducted in 1994, and owners would be provided with the survey results.

4.4 NATURAL ENVIRONMENT

This section describes the potential effects on the natural resources of the Proposed Action and alternatives on the natural resources of geology and soils, water resources, noise, biological resources, and cultural resources in the base area and the surrounding region.

4.4.1 Geology and Soils

The potential effects of the reuse alternatives on the local soils and geology have been analyzed based on review of published literature. Geology and soils would be affected largely during ground-disturbing activities, when local soil profiles would be altered. Soils would remain relatively stable in the long term because they would be overlain by facilities or pavements, or would be managed following SCS recommendations to minimize erosion.

4.4.1.1 No-Action/Realignment Alternative. The NAS Fort Worth realignment and caretaker activities would result in minor impacts to geology and soils. Effects on local soils and geology would primarily result from the construction activities, such as limited grading, excavating, and recontouring the soils. These activities could alter the soil profiles and local topography. Because the entire base has been identified as "urban land" by the SCS, additional construction would not result in the destruction of prime, unique, or important soils. Approximately 24 acres would be impacted by ground-disturbing activities by 1998.

Use of sand and gravel, and aggregate resources (e.g., for construction material and concrete) for new facilities and roadways would not be expected to reduce availability of these materials to the local area. The No-Action/Realignment Alternative would develop and pave over some existing vacant areas containing potential aggregate resources; however, the region offers adequate reserves to meet projected regional demands.

Impacts from soil erosion likely would be short term. During construction, removal of vegetative cover and grading activities would increase the potential for erosion by wind and water. However, once the construction phase is complete, most areas would be covered with pavement or landscaped, thus reducing the erosion potential.

Most of the soils at Carswell AFB, including the Off-Site WSA, have a moderate to high shrink/swell potential. Therefore, the soils are generally not well suited for the construction of buildings and roadways. Engineering and design provisions (i.e., deep pilings, reinforced foundations) would be required in accordance with applicable regulations and standards to mitigate the effect of the shrink and swell of soils or other geotechnical limitations.

As described in Section 3.4.1, the likelihood of building damage due to seismic events is very low and, therefore, resultant impacts are not likely. However, in compliance with the Earthquake Hazards Reduction Act (42-U.S.C. §§7704-7706) and EO 12699 (Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction), construction/building refurbishment of military facilities would follow applicable federal, state, and local seismic design standards for seismic zone 1.

Mitigation Measures. Mitigation measures are available to minimize erosion problems associated with wind and water, especially during the construction phase when trenches and cut slopes are exposed. During construction, the length of time vegetation and other cover is absent should be minimized. When cut slopes are exposed, any of the following measures may be useful in limiting erosion:

- Design facility construction to avoid areas susceptible to erosion and areas that require extensive grading
- Add protective covering, such as mulch, straw, or other material (tacking would be required)
- Limit the amount of area disturbed and the length of time slopes and barren ground are left exposed
- Construct diversion dikes and interceptor ditches to divert water away from construction areas
- Install slope drains (conduits) and/or water velocity-control devices to reduce concentrated high velocity streams from developing.

Although mitigation measures would help reduce the amount of erosion that could occur as a result of construction-related activities, erosion by wind and water cannot be completely eliminated. Application of mulch, straw, or synthetic material has proven very effective over the short term for controlling erosion. After construction, long-term erosion control can be accomplished by keeping soils under vegetative cover and planting wind breaks. After construction, soils underlying facilities and pavements would not be subject to erosion.

Mitigation measures are available to minimize the problems associated with soil properties. The use of appropriate engineering practices, such as stronger foundations and deeper pilings, would reduce the effect of the shrinking and swelling of soils.

4.4.1.2 Proposed Action. Impacts due to implementation of the Proposed Action would be similar in type, but in somewhat greater amounts, than for the No-Action/Realignment Alternative. Construction activities associated

with the Proposed Action would involve approximately 208 acres of construction ground disturbance by the year 2013, with proportionally greater amounts of soil erosion, use of natural resources, etc.

Mitigation Measures. Potential mitigation measures would be the same as the No-Action/Realignment Alternative.

4.4.1.3 Mixed Use Alternative. Types of impacts associated with geology and soils under this alternative would be similar to those under the No-Action/Realignment Alternative, except that more land would be disturbed. Under this alternative, 280 acres of land potentially would be disturbed during construction activities. A corresponding increase in soil erosion and runoff would be expected.

Mitigation Measures. Potential mitigation measures would be similar to those discussed for the No-Action/Realignment Alternative.

4.4.1.4 Other Land Use Concepts.

Health and Human Services. The implementation of housing for the handicapped by the HHS would not affect geology and soils, because it would not be required.

Retained Residential Areas. The reuse of existing housing units for residential needs would not affect geology and soils because new construction would not be required.

4.4.2 Water Resources

The following section describes the potential impacts on water resources as a result of the reuse alternatives. Impacts on the water quality aspect of hazardous waste contamination are addressed in Section 4.3, "Hazardous Materials and Hazardous Waste Management." Table 4.4-1 summarizes the projected water consumption requirements for each alternative, generally showing small differences between the alternatives.

4.4.2.1 No-Action/Realignment Alternative

Surface Water. Under the No-Action/Realignment Alternative, military construction activities on approximately 24 acres could alter soil profiles and natural drainages, which, in turn, may temporarily alter water flow patterns and rates. In addition, soils could be compacted during new construction and overlain by asphalt, asphaltic concrete, or buildings, creating impervious surfaces that would cause increased storm water runoff to local storm drains and sewage systems. As a result, drainage patterns would be altered to divert water away from facilities and airfield pavements. However, the total amount of disturbance and creation of impermeable areas would be

Table 4.4-1. Water Consumption Summary for Reuse Alternatives in 2013

	Projected Regional Demands in 2013 (MGD)	Percent Increase Over No-Action/ Realignment	Percent Increase over Post-closure Conditions
Post-closure Conditions	233	---	---
No-Action			
Reuse-Related	0.9	---	0.4
Total ROI	233.9		
Proposed Action			
Reuse-Related	1.4	0.2	0.6
Total ROI	234.4		
Mixed Use			
Reuse-Related	1.6		
Total ROI	234.6	0.3	0.7

MGD = million gallons per day.
ROI = Region of Influence.

very small in comparison to existing development, and, therefore, the amount of change from baseline conditions is not expected to be adverse.

Storm water discharge (non-point source) from the airfield, airfield support areas, and other heavy industrial areas may contain fuels, oils, and other residual contaminants that could degrade surface water resources in the West Fork, Farmers Branch Creek, and Kings Branch of the Trinity River, and in Lake Worth. In addition, the increased non-point source runoff from increased development could cause higher sediment loads in drainage systems. The military reuse would be subject to NPDES permit requirements for storm water discharges during the construction period and for the duration of operations similar to current requirements. This provision is contained in the NPDES Permit Application Regulations for Storm Water Discharges issued by U.S. EPA as a final rule on November 16, 1990. Potential transfer of the existing NPDES permit to the Navy would be determined through on-going coordination between DOD, U.S. EPA, and the TNRCC. Specific measures to improve the water quality of storm water discharge may be identified as part of the NPDES permit revision/transfer process. In addition, pollution prevention provisions would be implemented by NAS Fort Worth, in accordance with Navy policy, to further reduce potential water quality impacts.

Military reuse-related water demand in the ROI is expected to be 0.9 MGD (1,008-acre-feet per year) in the year 2013, which is a 0.4 percent increase over the post-closure conditions in 2013. It is assumed the water would continue to be supplied by the city of Fort Worth from surface water sources to meet the military reuse-related and regional demands. The city's

surface water supply system has a total capacity of 450 billion gallons of water and a projected treatment capacity of 456 MGD (see Section 3.2.4.1). The increase of water demand in 2013 due to the No-Action/Realignment Alternative would be a negligible portion of the overall Fort Worth capacity and, therefore, would not create adverse effects. Any water use needs at the Off-Site WSA (under caretaker status) would be minimal, and could be provided through bottled water delivery. The projected water demand for the military reuse under the No-Action/Realignment Alternative could be met by the use of surface water provided by Fort Worth.

The on-base areas along the peripheries of the West Fork of the Trinity River, Lake Worth, Farmers Branch Creek, and Kings Branch are subject to inundation by the 100-year flood and localized flooding as discussed in Section 3.4.2.1. Existing facilities within these areas would continue to be affected by these flooding hazards. Much of the 100-year floodplain on base is in areas that would be placed in caretaker status; new construction in the remainder of the base is not expected to occur within the flood zones, or to alter the existing flood control area. Military construction planning and design would comply with EO 11988 (Floodplain Management) and applicable implementing regulations, which require federal agencies to consider the effects of actions on floodplains, and perform a specific set of procedures to minimize effects.

Groundwater. Under the No-Action/Realignment Alternative, there would be no adverse impacts to groundwater resources. The necessary water likely would be supplied from surface water sources. Impacts to groundwater quality would be minimal through proper management of hazardous materials and wastes and proper maintenance of drainage and sewer systems, and implementation of pollution prevention measures.

Mitigation Measures. To minimize potential impacts to surface water from runoff, construction designs should incorporate provisions to reduce storm water runoff and accommodate increased surface drainage. The following measures could be implemented to reduce the impacts to surface water quality during construction:

- Create landscaped areas that are pervious to surface water
- Minimize or avoid areas that require surface disturbance
- Control site runoff by temporarily diverting drainages upslope of construction sites, creating ponds to collect runoff (and allow sediment to settle), or other similar measures

- Minimize time that disturbed areas are exposed to erosion
- Provide regular street sweeping.

To minimize the impacts of flooding hazards, construction designs should incorporate provisions, such as sloped parking areas, to divert water away from structures. Compliance with EO 11988 would reduce potential impacts to floodplains.

4.4.2.2 Proposed Action. Impacts caused by the Proposed Action would be similar to those resulting from the No-Action/Realignment Alternative; however, differences would include greater quantities of water used and ground disturbance and the types of regulatory mechanisms associated with civilian reuse.

Surface Water. Approximately 208 acres of ground would be disturbed during civilian and military reuse, over a 20-year period under the Proposed Action. Most of this area would be converted to impermeable surfaces. The four-fold increase in disturbed area over the No-Action/Realignment Alternative would result in corresponding increases in sediment load and other water quality issues. Increased sediment load typically is localized (from a specific source) and temporary (by exposure of erodible soils during construction activities). Contamination from chemical residues could be more long-term because of the association of chemicals with ongoing operations.

Some civilian reuses (e.g., some regional industrial and commercial operations) may require new or additional NPDES permits (and compliance with state and local water quality requirements) during both construction and operations. Transfer of applicable portions of the Air Force NPDES permit may be possible, but the civilian reuses may require substantive changes to existing permit allowances. Any new permits would include restrictions consistent with the "208" areawide water quality management planning area (the Trinity River) requirements.

Total reuse-related water demand in the ROI is expected to be 1.4 MGD (1,408 acre-feet per year) in the year 2013, or a 0.2 percent increase over the No-Action/Realignment Alternative. Although the Proposed Action would use more than twice the amount of water as the No-Action/Realignment Alternative, it is still a very small amount compared to the Fort Worth capacity. Therefore, overall impacts to the water supply source from the Proposed Action would be minimal. As discussed in Section 4.2.4, water supplies for the Off-Site WSA would need to be developed to support civilian reuse for industrial purposes. Connections to surface water suppliers would cause fewer impacts than construction of wells at the site.

Disposal of Carswell AFB to other federal and non-federal entities requires the Air Force to comply with EO 11988 (Floodplain Management) and Air Force Regulation 19-9 (which implements EO 11988 for the Air Force). In addition to requirements mentioned in Section 4.4.2.1, EO 11988 requires analysis of alternatives to determine minimal impact to floodplains, disclosure of the presence of 100-year floodplains during the land-transfer process, and identification of federal, state, and local land use restrictions/ regulations that would affect the property during reuse. For the city of Fort Worth, civilian reuse agencies must provide development plans to the floodplain administrator, who reviews documents and assures compliance with applicable laws (in particular, the National Flood Insurance Program).

Groundwater. As described above, new sources for water at the Off-Site WSA would be required. Construction of new water wells into the Paluxy aquifer would increase the amount of overpumping in the aquifer. Alternative water sources (e.g., Fort Worth water taken from Lake Worth) would eliminate the increased pumpage rates.

Mitigation Measures. Mitigation measures would be similar to those discussed for the No-Action/Realignment Alternative.

4.4.2.3 Mixed Use Alternative

Surface Water. The quantity of water required under this alternative would be slightly greater than the Proposed Action and would create negligible effects. Total reuse-related water demand in the ROI in the year 2013 is expected to be 1.6 MGD (1,575 acre-feet per year), which is about a 0.3 percent increase over the No-Action/Realignment Alternative. Approximately 280 acres of ground would be disturbed; most of the area would be covered with impermeable surface during construction for both military and civilian reuse over the next 20-year period. Effects from increased storm water runoff and changes in drainage patterns and flow rates are expected to be similar to those for the Proposed Action. Water use impacts due to the civilian residential use of the Off-Site WSA and floodplain impacts for the entire base would be similar to those described for the Proposed Action.

Groundwater. The types of impacts to groundwater resources under this alternative would be similar to those discussed for the Proposed Action.

Mitigation Measures. Potential mitigation measures would be similar to those discussed for the Proposed Action.

4.4.2.4 Other Land Use Concepts.

Health and Human Services. The housing for the handicapped proposal would cause no change to the impacts described for each alternative. No

new construction would be needed and the net change in water use would be negligible.

Retained Residential Areas. This land use concept would result in a slight net increase in the on-site water demand if implemented in conjunction with any reuse alternative. Impacts would be similar to those described for each reuse alternative.

4.4.3 Air Quality

Air quality impacts would occur during construction and operations associated with the Proposed Action and alternatives for the reuse of Carswell AFB. Intermittent construction-related impacts could result from fugitive dust (particulate matter) and construction equipment emissions. Operational impacts would occur from (1) mobile sources such as aircraft, aircraft operation support equipment, commercial transport vehicles, and personal vehicles; (2) point sources such as heating/power plants, generators, incinerators, and storage tanks; and (3) secondary emission sources associated with population increase, such as residential heating.

The methods selected to analyze impacts depend upon the type of emission source being examined. Air quality analytical methods are summarized here and presented in detail in Appendix J. Analysis during the construction phase consists of estimating the amount of uncontrolled fugitive dust emitted from disturbed areas and the combustion emissions associated with construction equipment. Analysis during the operation phase consists of quantifying the emissions associated with military and civilian aircraft operations, ground operations, and vehicle traffic. These emissions are then evaluated to determine how they would affect progress toward attainment or maintenance of the NAAQS.

Ambient effects to local air quality are analyzed by modeling pollutant concentrations at receptor locations likely to receive maximum air quality impacts. For aviation-related alternatives, maximum impact is associated with aircraft operations. A number of receptors are therefore typically selected at the downwind end of the runway for modeling purposes. Other non-aviation activities on base would not significantly contribute to the air quality impacts at those receptor locations.

The ambient effects of aircraft operations are analyzed by modeling with the EDMS (Segal, 1991). EDMS was developed jointly by the FAA and the U.S. Air Force specifically for the purpose of generating airport and airbase emissions inventories, and for calculating the ambient concentrations caused by these emissions as they disperse downwind. The model uses U.S. EPA and U.S. military aircraft emission factors and information on annual and peak hour landing and takeoff cycles to produce an emissions inventory of aircraft operations. Typical aircraft operations include takeoff, runway climb

and approach, runway queuing, taxi-in and taxi-out, engine-testing and idling at the gates. Air quality modeling is presented for the No-Action/ Realignment Alternative and Reuse Alternatives through the year 2003 (10 years of analysis after closure). The effects of the 1990 Clean Air Act Amendments (CAAA), such as electric and other low emission vehicle ownership percentages, cannot be accurately predicted very far into the twenty-first century. The uncertainties of long range population and traffic projections, future Clean Air Act changes, and the complex interaction of meteorology with emission inventories make emission and pollution concentration projections beyond 10 years too speculative.

The following assumptions were made in estimating the emissions and effects of the No-Action/Realignment Alternative and reuse alternatives:

- For construction, fugitive dust emissions were based on the acreage graded each year. Grading activity was assumed to occur 115 days per year. Combustion emissions from construction equipment were based on per-acre emission factors developed for a generic construction scenario. Construction equipment were assumed to be active 230 days per year.

- EDMS was used to calculate annual aircraft emissions for the airport operations.

- Emissions from realigning units were assumed to be similar to NAS Dallas emissions on a per-employee basis.

- Future long-term emissions from in-migrant sources and civilian employee sources were derived using per-capita emission factors. Future emissions were estimated by multiplying per-capita emission factors by the in-migrants and direct civilian employees to reflect motor vehicle, industrial, energy consumption, as well as other area and non-road mobile sources associated with the alternative under consideration. (See Appendix J for a complete description of the methodologies used to forecast emissions.)

In addition, under the New Source Review provisions of the CAAA, any new or modified major source associated with reuse that would emit more than 100 tons per year of VOC or NO_x must satisfy technology standards reflecting the LAER and must provide offsets representing emission reductions from other sources at a ratio of at least 1.15 to 1.0. Another major effect of the CAAA is the establishment of new permitting requirements for new source construction. The new requirements will necessitate permit approval from the TNRCC not only for projects which historically would have required a New Source Review permit, but also for other smaller sources that in the past would not have required a permit.

The New Source Review requirements governing the control of attainment pollutants (NO_2, CO, SO_2, and PM_{10}) differ somewhat from the requirements for non-attainment pollutants described above. Except for CO, the process by which emissions of attainment pollutants are prevented from creating a non-attainment condition is called PSD. This process limits the allowable ambient impact of NO_2, SO_2, and PM_{10} emissions from new or modified major stationary sources to specific increments. These increments are designed to prevent new or modified sources from causing significant degradation of an area's air quality. For PSD purposes, major stationary sources are generally defined as those sources which emit more than 100 tons/year of an attainment pollutant. Ambient impacts from new or modified air pollution sources are generally determined through air quality modeling. Although the PSD process provides adequate means for assessing and regulating impacts from stationary sources of air pollution, this process does not provide a mechanism for dealing with nonstationary sources such as motor vehicles and aircraft.

Section 176(c) of the CAA provides that a federal agency cannot support an activity in any way unless the federal agency determines that the activity will conform to the SIPs purpose of attaining and maintaining the NAAQS. In accordance with this part of the Act, the U.S. EPA announced promulgation of its final conformity rule for general federal actions in the November 30, 1993 Federal Register (40 CFR 51). While effective immediately, the final rule also directs states to revise their SIPs to institute more detailed conformity procedures. In addition, the rule contains several exemptions from the conformity requirement for certain actions, on the basis that they are clearly below the threshold of significance (de minimis). These exemptions include the transfer of ownership of real property (40 CFR 51.853 (c)(2)(xiv) and (xx)) as well as leasing agreements pending environmental restoration under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (40 CFR 51.853 (c)(2)(xix)). As such, it is not necessary for the Air Force to prepare a conformity determination for disposal of the property. The Navy and the FBOP, however, as the primary reusers of the base, will comply with the conformity rule and will prepare conformity determinations, if necessary, prior to implementing the proposed action.

4.4.3.1 No-Action/Realignment Alternative

Construction. Fugitive dust would be generated during the construction and renovation of military facilities and infrastructure, proposed as part of this alternative. These emissions would be greatest during site clearing and grading activities. Uncontrolled fugitive dust (particulate matter) emissions from ground-disturbing activities are estimated to be emitted at a rate of 1.2 tons per acre per month, or 110 pounds per acre per working day (U.S. EPA, 1985). The PM_{10} fraction of the total fugitive dust emissions is assumed to be 50 percent, or 55 pounds per acre per working day.

Construction activities would disturb a total of 24 acres in the first 5 years of realignment (1993-1998), with an average disturbance of 0.38 acres per day. The amount of PM_{10} generated would be 21.0 pounds (0.011 ton) per day. Based on the assumption that 115 days per year are used for site preparation, total fugitive PM_{10} emissions from construction activity would be 1.21 tons/year. The impact of these PM_{10} emissions would cause elevated short-term concentrations at receptors located close to the construction areas. However, the elevated concentrations would be temporary and would fall off rapidly with distance from the site.

Combustive emissions from construction equipment associated with the new development activities are calculated based on average emission factors and the amount of land to be developed per time interval. For each acre of land developed, 3,820 lbs of CO, 1,095 lbs of NO_x, 85 lbs of PM_{10}, 290 lbs of VOC, and 100 lbs of sulfur oxide (SO_x) would be emitted from construction equipment. The total combustive emissions due to construction would be 21.01 tons/year of CO, 6.02 tons/year of NO_x, 0.47 ton/year of PM_{10}, 1.60 tons/year of VOC, and 0.55 ton/year of SO_x during the time period from 1993 to 1998. Based on the assumption that construction equipment is active 230 days per year, the daily combustive emissions in the period would be 0.091, 0.026, 0.002, 0.007, and 0.002 ton/day for the same pollutants, respectively.

Operation. A summary of construction and operation emissions for the No-Action/Realignment Alternative is presented in Table 4.4-2 for the years 1998 and 2003. Fugitive dust and construction combustive emissions were calculated as described above. Aircraft operation emissions were calculated using the EDMS model. Estimates for all other categories of emissions were calculated using the methodologies as described in Appendix J.

Potential impacts to air quality as a result of operational emissions from the No-Action/Realignment Alternative were evaluated in terms of two spatial scales: regional and local. The regional-scale analysis considered the potential for total reuse-related emissions to affect the schedule for attainment of the federal ozone standard (VOC and NO_x emissions) or cause large increases in the regional pollutant inventories (NO_2, CO, SO_2, and PM_{10} emissions). The local-scale analysis evaluated the potential for aircraft-related emissions to exceed the NAAQS in the immediate vicinity of the base. If one of these conditions were to occur, the No-Action/Realignment Alternative would have an adverse impact on air quality.

Regional Scale. Emissions of ozone precursors from the No-Action/ Realignment Alternative would contribute to regional ozone levels. However, with the application of mitigation measures identified in the 1993 SIP, the impacts of the action would be minimized. It is not expected that the No-Action/Realignment Alternative would delay regional progress toward attainment of the ozone standard.

Table 4.4-2. Emissions Associated with Tarrant County, Carswell AFB (Preclosure), Carswell AFB (Closure), No-Action/Realignment Alternative, Proposed Action, and Mixed Use Alternative

Source/Year	Emissions[a] (tons/day)				
	VOC	NO_x	CO	SO_2	PM_{10}
Tarrant Co.[b] 1990	208.58	177.88	1,271.91	--[c]	--[c]
Carswell AFB (Preclosure) 1990	9.021	1.985	10.750	0.183	1.702
Carswell AFB (Closure) 1993	0.126	0.171	0.441	0.011	0.009
No-Action/ Realignment					
1998	0.677	0.896	3.964	0.045	0.114
2003	0.646	0.870	3.870	0.043	0.101
Proposed Action					
1998	0.871	1.137	6 75	0.055	0.148
2003	0.997	1.250	7.707	0.051	0.124
Mixed Use					
1998	1.097	1.352	8.344	0.056	0.150
2003	1.224	1.502	10.162	0.056	0.140

Notes:
(a) Emissions are total emissions from all sources, as described in Appendix J.
(b) Emissions of VOC, NO_x, and CO are based on ton/year values from the 1990 Tarrant County Emission Inventory (TNRCC, 1993). Ton/day emissions were calculated as 365 day/year averages.
(c) Emission inventories for PM_{10} and SO_2 not prepared by the TNRCC.

CO = carbon monoxide.
NO_x = nitrogen oxides.
PM_{10} = particulate matter less than 10 microns in diameter.
SO_2 = sulfur dioxide.
TNRCC = Texas Natural Resources Conservation Commission.
VOC = volatile organic compound.

Ozone Precursors. Table 4.4-2 provides a comparison of emission estimates for Tarrant County in 1990 (preclosure), the total preclosure and closure emissions associated with Carswell AFB (base-related emissions), and the total No-Action/Realignment Alternative emissions. Table 4.4-2 shows that, although the total VOC emissions associated with this alternative would increase from closure conditions by 0.520 tons/day in the year 2003, the

emissions would remain below preclosure levels throughout the 10-year analysis period. By 2003, the total VOC emissions would be only 7 percent of the total preclosure VOC emissions associated with Carswell AFB. By 2003, emissions for NO_x associated with this alternative would increase by 0.699 tons/day over closure conditions. Total emissions of NO_x in 2003 would be approximately 44 percent of the preclosure level of NO_x emissions associated with Carswell AFB.

The objective of the SIP is to bring the region into attainment through the reduction of VOC emissions. Because of the reduced level of emissions associated with the No-Action/Realignment Alternative compared to preclosure conditions (primarily aircraft operation emission reductions), and because of formal commitments by the TNRCC to implement VOC control measures identified in the current SIP, VOC emissions would be reduced from preclosure conditions and the No-Action/Realignment Alternative would not interfere with the attainment of the ozone standard.

NO_2, CO, SO_2, and PM_{10}. Table 4.4-2 provides a means to compare emissions from the No-Action/Realignment Alternative to 1990 Tarrant County emissions and base-related preclosure and closure emission levels. All NO_x emissions in Table 4.4-2 are assumed to convert to NO_2 emissions on a regional basis. Baseline data for PM_{10} and SO_2 were not prepared by the TNRCC, so Carswell AFB preclosure emissions were used to forecast these pollutants under the No-Action/Realignment Alternative.

Emissions of NO_2, CO, SO_2, and PM_{10} associated with the No-Action/ Realignment Alternative would increase by 0.699 tons/day, 3.429 tons/day, 0.032 tons/day, and 0.092 tons/day, respectively, over closure conditions. However, all emissions would be less than preclosure levels. In the year 2003, total emissions of NO_2, CO, SO_2 and PM_{10} would represent 44, 36 23, and 6 percent, respectively, of the 1990 preclosure emissions related to Carswell AFB. Since emissions from the No-Action/Realignment Alternative would be lower than existing preclosure levels, air quality impacts from each of these primary pollutants are not expected to affect maintenance of the current attainment status of the respective pollutant standards.

Local Scale. A summary of the EDMS analysis for the No-Action/ Realignment Alternative is presented in Table 4.4-3. The modeling results show that during peak hours of airport operation, the maximum pollutant concentrations would occur at a receptor located near Lake Worth along the centerline of the runway, assuming a wind direction of 180 degrees (parallel to the runway). The primary contributing factor at this location would be aircraft exhaust emitted during takeoffs. The modeling results indicate that the maximum concentrations when added to representative background concentrations would not exceed the NAAQS in the area surrounding the airport. Emissions from airport activities under the No-Action/Realignment Alternative would, therefore, have no adverse impact on the local air quality.

Table 4.4-3. Air Quality Modeling Results for Airport Operations Associated with the No-Action/Realignment Alternative ($\mu g/m^3$)

		Carswell AFB		Alternative			
Pollutant	Averaging Time	Preclosure Conditions[a] 1990	Closure Conditions[a] 1993	No-Action/ Realignment[a] 1998	2003	Preclosure Background Concentration[b]	Limiting Standard[c]
Carbon Monoxide	8-hour	1,778	166	1,778	1,778	3,983	10,000
	1-hour	2,540	237	2,540	2,540	6,419	40,000
Sulfur Dioxide	Annual	21.8	2.0	8.1	8.1	2	80
	24-hour	87.2	7.9	32.5	32.5	22	365
	3-hour	196.2	17.7	73.2	73.2	35	1,300
PM_{10}	Annual	221	1	6	6	24	50
	24-hour	884	2	23	23	68	150

Notes:
(a) Projected values are maximum pollutant concentrations determined from EDMS modeling results.
(b) Background concentrations assumed to equal the mean of first-high values monitored at the Fort Worth Northwest monitoring station (CO, and SO_2) and Fort Worth City stations (PM_{10}) during 1989 to 1991 (refer to Table 3.4-2).
(c) Limiting standard is equal to the NAAQS. Impacts determined by comparing the aggregate of No-Action/Realignment Alternative impact and background concentrations to the limiting standard.

CO = carbon monoxide.
EDMS = Emissions and Dispersion Modeling System.
NAAQS = National Ambient Air Quality Standards.
PM_{10} = particulate matter equal to or less than 10 microns in diameter.
SO_2 = sulfur dioxide.
$\mu g/m^3$ = micrograms per cubic meter.

Mitigation Measures. Air quality impacts during construction would occur from fugitive dust emissions from ground-disturbing activities, and from combustion emissions emitted by construction equipment. Application of water during ground-disturbing activities is estimated to reduce fugitive dust emissions by at least 50 percent (U.S. EPA, 1985). Other measures such as reducing vehicle speeds and paving dirt roads could reduce dust emissions as well. Combustion emission impacts could be mitigated by efficient scheduling of equipment use, reducing the number of units operating simultaneously, and performing regular vehicle engine maintenance. Implementation of these measures would substantially reduce air quality impacts from construction activities associated with the No-Action/ Realignment Alternative.

The modeling results in Table 4.4-3 show that localized project impacts would not be adverse. Mitigation of these impacts would, therefore, not be required. Assuming the control measures in the SIP would be applied, additional mitigation of regional ozone impacts would not be required, since the No-Action/Realignment Alternative VOC emissions in future years would be lower than preclosure levels. Control measures in the SIP that would reduce operational VOC emissions focus on specific emission source types and transportation control measures (TCMs). The TCMs are intended to

reduce emissions by reducing vehicle miles travelled, vehicle trips, and peak hour travel. Examples of the types of TCMs that would be implemented by the TNRCC include: (1) intersection signal improvements (traffic signal timing; traffic signal progression; low-cost intersection improvements); and (2) travel demand management programs for employers with over 100 employees (carpool/vanpool programs; parking incentive programs; variable work hour programs; transit fare subsidy programs).

4.4.3.2 Proposed Action

Construction. Construction impacts from the Proposed Action would occur due to the generation of fugitive dust during the development of the aviation support, institutional, commercial, residential, and recreational land use areas. It is estimated that a total of 174 acres would be disturbed by construction in the 10 years after closure, with an average disturbance of 1.19 acres per day during the period from 1993 to 1998, and 0.24 acres per day from the year 1998 to 2003. These levels of disturbance would release an estimated 65.4 pounds (0.033 ton) per day from 1993 to 1998 and 13.0 pounds (0.007 ton) per day from 1998 to 2003. Based on the assumption that 115 days per year are used for site preparation, total fugitive PM_{10} emissions from construction activity would be 3.76 tons and 0.75 ton per year (tons/year) for the same two time periods, respectively. The impact of these emissions would cause elevated short-term particulate concentrations at receptors located close to the construction areas. However, the elevated concentrations would be temporary and would decrease rapidly with distance from the site.

Combustive emissions from construction equipment associated with the Proposed Action were calculated based on the same average emission factors and assumptions as previously described for the No-Action/ Realignment Alternative. The total combustive emissions due to construction were determined to be 65.32 tons/year of CO, 18.73 tons/year of NO_x, 1.45 tons/year of PM_{10}, 4.96 tons/year of VOC, and 1.71 tons/year of SO_x during the time period from 1993 to 1998. Based on the assumption that construction equipment is active 230 days per year, the daily combustive emissions in the period would be 0.284, 0.081, 0.006, 0.022, and 0.007 ton/day for the same pollutants, respectively. Emissions of CO, NO_x, PM_{10}, VOC, and SO_x in the period from 1998 to 2003 would be 12.99 tons/year (0.056 ton/day), 3.72 tons/year (0.016 ton/day), 0.29 ton/year (0.001 ton/day), 0.99 ton/year (0.004 ton/day), and 0.34 ton/year (0.001 ton/day), respectively.

Operation. A summary of construction and operation emissions for the Proposed Action is presented in Table 4.4-2 for the years 1998 and 2003.

Regional Scale. Emissions of ozone precursors from the Proposed Action would contribute to regional ozone levels. However, with the application of

mitigation measures identified in the SiP, the impacts of the Proposed Action would be minimized. It is not expected that the Proposed Action would delay regional progress toward attainment of the ozone standard.

Ozone Precursors. Table 4.4-2 shows that, although the total Proposed Action emissions of VOC would increase from No-Action/Realignment Alternative conditions by 0.351 tons/day in the year 2003, the emissions would remain below preclosure levels throughout the 10-year analysis period. By 2003, the total Proposed Action VOC emissions would be only 11 percent of the total preclosure VOC emissions associated with Carswell AFB. By 2003, Proposed Action emissions for NO_x would increase by 0.380 tons/day over No-Action/Realignment Alternative conditions. Total Proposed Action emissions of NO_x in the year 2003 would be approximately 63 percent of the preclosure level of NO_x emissions associated with Carswell AFB.

The objective of the current SIP is to bring the region into attainment through the reduction of VOC emissions. Because of the reduced level of emissions associated with the Proposed Action compared to preclosure conditions (primarily aircraft operation emission reductions), and because of formal commitments by the TNRCC to implement VOC control measures identified in the SIP, VOC emissions would be reduced from preclosure conditions and the Proposed Action would not interfere with the attainment of the ozone standard.

NO_2, CO, SO_2, and PM_{10}. Table 4.4-2 provides a means to compare emissions from the Proposed Action to 1990 Tarrant County emissions, base-related preclosure emissions, and No-Action/Realignment Alternative emissions. All NO_x emissions in Table 4.4-2 are assumed to convert to NO_2 emissions on a regional basis. Proposed Action NO_2, CO, SO_2, and PM_{10} emissions would increase by 0.380 tons/day, 3.837 tons/day, 0.008 tons/day, and 0.023 tons/day, respectively, over No-Action/ Realignment conditions. However, all Proposed Action emissions would be less than preclosure emission levels. In 2003, total Proposed Action emissions of NO_2, CO, SO_2 and PM_{10} would represent 63, 72, 28, and 7 percent, respectively, of the 1990 preclosure Carswell AFB emissions. Since Proposed Action emissions would be lower than existing preclosure levels, air quality impacts from each of these primary pollutants are not expected to affect maintenance of the current attainment status of the respective pollutant standards.

Local Scale. A summary of the EDMS analysis for the Proposed Action is presented in Table 4.4-4. The modeling results indicate that during peak hours of airport operation, the maximum pollutant concentrations would occur at the same receptor location as determined for the No-Action/ Realignment Alternative. The modeling results indicate that the maximum concentrations when added to representative background concentrations

Table 4.4-4. Air Quality Modeling Results for Airport Operations Associated with the Proposed Action ($\mu g/m^3$)

Pollutant	Averaging Time	Carswell AFB Preclosure Conditions[a] 1990	Carswell AFB Closure Conditions[a] 1993	Alternative Proposed Action[a] 1998	Alternative Proposed Action[a] 2003	Preclosure Background Concentration[b]	Limiting Standard[c]
Carbon Monoxide	8-hour	1,778	166	1,785	1,785	3,983	10,000
	1-hour	2,540	237	2,550	2,550	6,419	40,000
Sulfur Dioxide	Annual	21.8	2.0	8.2	8.2	2	80
	24-hour	87.2	7.9	32.6	32.6	22	365
	3-hour	196.2	17.7	73.4	73.4	35	1,300
PM_{10}	Annual	221	1	6	6	24	50
	24-hour	884	2	24	24	68	150

Notes:
(a) Projected values are maximum pollutant concentrations determined from EDMS modeling results.
(b) Background concentrations assumed to equal the mean of first-high values monitored at the Fort Worth Northwest monitoring station (CO, and SO_2) and Fort Worth City stations (PM_{10}) during 1989 to 1991 (refer to Table 3.4-2).
(c) Limiting standard is equal to the NAAQS. Impacts determined by comparing the aggregate of Proposed Action impact and background concentrations to the limiting standard.

CO = carbon monoxide.
EDMS = Emissions and Dispersion Modeling System.
$\mu g/m^3$ = micrograms per cubic meter.
NAAQS = National Ambient Air Quality Standards.
PM_{10} = particulate matter equal to or less than 10 microns in diameter.
SO_2 = sulfur dioxide.

would not exceed the NAAQS in the area surrounding the airport. Emissions from airport activities under the Proposed Action would, therefore, have no adverse impact on the local air quality.

Mitigation Measures. The construction-related mitigation measures described under the No-Action/Realignment Alternative could be used to substantially reduce air quality impacts from construction activities associated with this alternative.

4.4.3.3 Mixed Use Alternative

Construction. Construction impacts from the Mixed Use Alternative would occur due to the generation of fugitive dust during the development of the military, aviation support, office/industrial, institutional, commercial, residential, and recreational land use areas. It is estimated that a total of 165 acres would be disturbed by construction in the 10 years after closure, with an average disturbance of 0.94 acres per day during the period from 1993 to 1998, and 0.42 acres per day from the year 1998 to 2003. These levels of disturbance would release an estimated 51.65 pounds (0.026 ton) per day from 1993 to 1998 and 22.96 pounds (0.011 ton) per day from 1998 to 2003. Based on the assumption that 115 days per year are used

for site preparation, total fugitive PM_{10} emissions from construction activity would be 2.97 tons and 1.32 tons/year for the same two time periods, respectively. The impact of these emissions would cause elevated short-term particulate concentrations at receptors located close to the construction areas. However, the elevated concentrations would be temporary and would decrease rapidly with distance from the site.

Combustive emissions from construction equipment associated with the Mixed Use Alternative were calculated based on the same average emission factors and assumptions as previously described for the No-Action/ Realignment Alternative. The total combustive emissions due to construction were determined to be 51.57 tons/year of CO, 14.78 tons/year of NO_x, 1.15 tons/year of PM_{10}, 3.92 tons/year of ROG, and 1.35 tons/year of SO_x during the time period from 1993 to 1998. Based on the assumption that construction equipment is active 230 days per year, the daily combustive emissions in the period would be 0.224, 0.064, 0.005, 0.017, and 0.006 ton/day for the same pollutants, respectively. Emissions of CO, NO_x, PM_{10}, ROG, and SO_x in the period from 1998 to 2003 would be 22.92 tons/year (0.100 ton/day), 6.57 tons/year (0.029 ton/day), 0.51 ton/year (0.002 ton/day), 1.74 tons/year (0.008 ton/day), and 0.60 ton/year (0.003 ton/day), respectively.

Operation. Table 4.4-2 summarizes the results of the construction and operation emission calculations for the Mixed Use Alternative for the years 1998 and 2003.

Regional Scale. The Mixed Use Alternative would generate emissions of ozone precursors, and would, therefore, impact regional ozone levels. However, with the application of mitigation measures identified in the SIP, this alternative would not delay attainment of the ozone standard. The following paragraphs summarize the results of the regional-scale impact analysis on a pollutant-by-pollutant basis.

Ozone Precursors. Table 4.4-2 indicates that, although the total Mixed Use Alternative emissions of VOC would increase from No-Action/ Realignment Alternative conditions by 0.578 tons/day in 2003, the emissions would remain below preclosure levels throughout the 10-year analysis period. By the year 2003, the total Mixed Use Alternative VOC emissions would be 14 percent of the total preclosure VOC emissions associated with Carswell AFB. By 2003, Mixed Use Alternative emissions for NO_x would increase by 0.632 tons/day over No-Action/Realignment Alternative conditions. Total Mixed Use Alternative emissions of NO_x in the year 2003 would be approximately 76 percent of the preclosure level of NO_x emissions associated with Carswell AFB.

Because of the reduced level of emissions associated with the Mixed Use Alternative compared to preclosure conditions (primarily aircraft operation

emission reductions), and because of formal commitments by the TNRCC to implement VOC control measures identified in the SIP, VOC emissions would be reduced from preclosure conditions and the Mixed Use Alternative would not interfere with the attainment of the ozone standard.

NO_2, CO, SO_2, and PM_{10}. As shown in Table 4.4-2, Mixed Use Alternative NO_2, CO, SO_2, and PM_{10} emissions would increase by 0.632 tons/day, 6.292 tons/day, 0.013 tons/day, and 0.041 tons/day, respectively, over No-Action/Realignment conditions. (All NO_x assumed to convert to NO_2 on a regional basis.) However, all Mixed Use Alternative emissions would be less than preclosure emission levels. In the year 2003, total Mixed Use Alternative emissions of NO_2, CO, SO_2 and PM_{10} would represent 76, 95, 31, and 8 percent, respectively, of the 1990 preclosure Carswell AFB emissions. Since Mixed Use Alternative emissions would be lower than existing preclosure levels, air quality impacts from each of these primary pollutants are not expected to affect maintenance of the current attainment status of the respective pollutant standards.

Local Scale. A summary of the EDMS analysis for the Mixed Use Alternative is presented in Table 4.4-5. The modeling results indicate that during peak hours of airport operation, the maximum pollutant concentrations would occur at the same receptor location as determined for the No-Action/ Realignment Alternative. The modeling results indicate that the maximum concentrations when added to representative background concentrations would not exceed the NAAQS in the area surrounding the airport. Emissions from airport activities under the Mixed Use Alternative would, therefore, have no adverse impact on the local air quality.

Mitigation Measures. Construction-related mitigation measures would be the similar to those described under the No-Action/Realignment Alternative.

4.4.3.4 Other Land Use Concepts. Potential changes in air quality resulting from implementation of an additional land use concept in conjunction with that of the Proposed Action or alternatives are described below. Implementation of the independent land use proposals are not expected to affect the attainment status of the region if mitigation measures recommended in the SIP are implemented.

Health and Human Services. The housing complex would generate stationary source emissions associated with domestic space heating, water heating, and cooking, as well as mobile source emissions related to resident and service vehicle traffic. Implementation of this land use concept in conjunction with any alternative would not increase total emissions beyond preclosure emissions levels associated with Carswell AFB. Impacts and mitigations would be similar to those described under each alternative.

Table 4.4-5. Air Quality Modeling Results for Airport Operations Associated with the Mixed Use Alternative ($\mu g/m^3$)

Pollutant	Averaging Time	Carswell AFB Preclosure Conditions[a] 1990	Carswell AFB Closure Conditions[a] 1993	Alternative Mixed Use Alternative[a] 1998	Alternative Mixed Use Alternative[a] 2003	Preclosure Background Concentration[b]	Limiting Standard[c]
Carbon Monoxide	8-hour	1,778	166	1,778	1,778	3,983	10,000
	1-hour	2,540	237	2,540	2,540	6,419	40,000
Sulfur Dioxide	Annual	21.8	2.0	8.2	8.2	2	80
	24-hour	87.2	7.9	33.0	33.0	22	365
	3-hour	196.2	17.7	74.2	74.2	35	1,300
PM_{10}	Annual	221	1	6	6	24	50
	24-hour	884	2	23	23	68	150

Notes:
(a) Projected values are maximum pollutant concentrations determined from EDMS modeling results.
(b) Background concentrations assumed to equal the mean of first-high values monitored at the Fort Worth Northwest monitoring station (CO, and SO_2) and Fort Worth City stations (PM_{10}) during 1989 to 1991 (refer to Table 3.4-2).
(c) Limiting standard is equal to the NAAQS. Impacts determined by comparing the aggregate of Mixed Use Alternative impact and background concentrations to the limiting standard.
CO = carbon monoxide.
EDMS = Emissions and Dispersion Modeling System.
$\mu g/m^3$ = micrograms per cubic meter.
NAAQS = National Ambient Air Quality Standards.
PM_{10} = particulate matter equal to or less than 10 microns in diameter.
SO_2 = sulfur dioxide.

Retained Residential Areas. This land use concept would generate source emissions associated with residential space heating, water heating, cooking, and vehicle traffic. Implementation of this land use concept in conjunction with any alternative would not increase total emissions beyond preclosure emission levels associated with Carswell AFB. Impacts and mitigations would be similar to those described under each alternative.

4.4.4 Noise

Environmental impact analysis related to noise includes the potential effects on the local human and animal populations. This analysis will estimate the extent and magnitude of noise levels generated by the Proposed Action and alternatives, using the predictive models discussed below. The baseline noise conditions and predicted noise levels will then be assessed with respect to land use impacts. Other effects of noise, such as annoyance, speech interference, sleep disturbance, hearing loss, and health are discussed below or in Appendix H. The metrics used to evaluate noise are DNL and equivalent sound level (L_{eq}), which are supplemented occasionally by SEL and maximum instantaneous sound level (L_{max}). See Appendix H for an expanded discussion of these metrics.

Methods used to quantify the effects of noise, such as annoyance, speech interference, sleep disturbance, health, and hearing loss, have undergone extensive scientific development during the past several decades. The most reliable measures at present are noise-induced hearing loss and annoyance. Extra-auditory effects (those not directly related to hearing capability) are also important, although they are not as well understood. The current scientific consensus is that "evidence from available research reports is suggestive, but it does not provide definitive answers to the question of health effects, other than to the auditory system, of long-term exposure to noise" (National Academy of Sciences, 1981). The effects of noise are summarized within this section and a detailed description is provided in Appendix H.

Annoyance. Noise annoyance is defined by the EPA as any negative subjective reaction to noise on the part of an individual or group. Table 4.4-6 presents the results of over a dozen studies of transportation modes, including airports, investigating the relationship between noise and annoyance levels. This relationship has been suggested by the National Academy of Sciences (National Academy of Sciences, 1977) and recently reevaluated (Fidell et al., 1989) for use in describing peoples' reaction to semi-continuous (transportation) noise. These data are shown to provide a perspective on the level of annoyance that might be anticipated. For example, 15 to 25 percent of persons exposed to DNL of 65 to 70 dB are expected to be highly annoyed by the noise levels.

Table 4.4-6. Percentage of Population Highly Annoyed by Noise Exposure

DNL Interval in dB	Percentage of Persons Highly Annoyed
<65	<15
65-70	15-25
70-75	25-37
75-80	37-52

dB = decibel.
DNL = day-night average sound level.

Source: Adapted from National Academy of Sciences, 1977.

Speech Interference. One of the ways that noise affects daily life is by prevention or impairment of speech communication. In a noisy environment, understanding speech is diminished when speech signals are masked by intruding noises. Reduced intelligibility of speech may also have other effects; for example, if the understanding of speech is interrupted, performance may be reduced, annoyance may increase, and learning may be impaired. Research suggests that aircraft flyover noises that exceed approximately 60 dB (L_{max}) interfere with speech communication (Pearsons

and Bennett, 1974; Crook and Langdon, 1974). Increasing the level of the flyover noise maximum to 80 dB will reduce the intelligibility to zero, even if the person speaks in a loud voice. This interference lasts as long as the event, which is momentary for a flyover.

Sleep Interference. The effects of noise on sleep are of concern, primarily in assuring suitable residential environments. DNL incorporates consideration of sleep disturbance by assigning a 10 dB penalty to nighttime noise events. SEL may be used to supplement DNL in evaluating sleep disturbance. When evaluating sleep disturbance, studies have correlated SEL values with the percent of people awakened. The relationships between percent awakened and SEL are presented in Appendix H. Most of these relationships, however, do not reflect habituation and, therefore, would not address long-term sleep disturbance effects. SEL takes into account an event's sound intensity, frequency content, and time duration, by measuring the total A-weighted sound energy of the event and incorporating it into a single number. Unlike DNL, which describes the daily average noise exposure, SEL describes the normalized noise from a single flyover, called an event.

Studies (Lukas, 1975; Goldstein and Lukas, 1980) show great variability in the percentage of people awakened by exposure to noise. A recent review (Pearsons et al., 1989) of the literature related to sleep disturbance, including field as well as laboratory studies, suggests that habituation may reduce the effect of noise on sleep. The authors point out that the relationship between noise exposure and sleep disturbance is complex and affected by the interaction of many variables. The large differences between the findings of the laboratory and field studies make it difficult to determine the best relationship to use. The method developed by Lukas would estimate seven times more awakening than the field results reported by Pearsons.

Land Use Compatibility. Estimates of total noise exposure resulting from aircraft operations, as expressed using DNL, can be interpreted in terms of the compatibility with designated land uses. The Federal Interagency Committee on Urban Noise developed land-use compatibility guidelines for noise (U.S. DOT, 1980). Based upon these guidelines, suggested compatibility guidelines for evaluating land uses in aircraft noise exposure areas were developed by the FAA and are presented in Section 3.4.4. The land use compatibility guidelines are primarily based on annoyance and hearing loss considerations described in Appendix H. Part 150 of the FAA regulations describes the procedures, standards, and methodology governing the development, submission and review of airport noise exposure maps and airport noise compatibility programs. It prescribes use of yearly DNL in the evaluation of airport noise environments. It also identifies those land-use types that normally are compatible with various levels of exposure. Compatible or incompatible land use is determined by comparing the predicted DNL level at a site with the recommended land uses.

Noise Modeling. In order to define the noise impacts from aircraft takeoff, landing, and touch-and-go operations at Carswell AFB, the FAA-approved NOISEMAP versions 6.1 and 6.3 were utilized to predict 65, 70, and 75 DNL noise contours and SEL values for noise-sensitive receptors. Appendix H defines these descriptors. The contours were generated for the closure baseline year, 1993 (see Section 3.4.4), and for the reuse activities projected within a 20-year study period for the reuse alternatives. Input data to NOISEMAP include information on aircraft types; runway use; takeoff and landing flight tracks; aircraft altitude, speeds, and engine power settings; and number of daytime (7 a.m. to 10 p.m.) and nighttime (10 p.m. to 7 a.m.) operations.

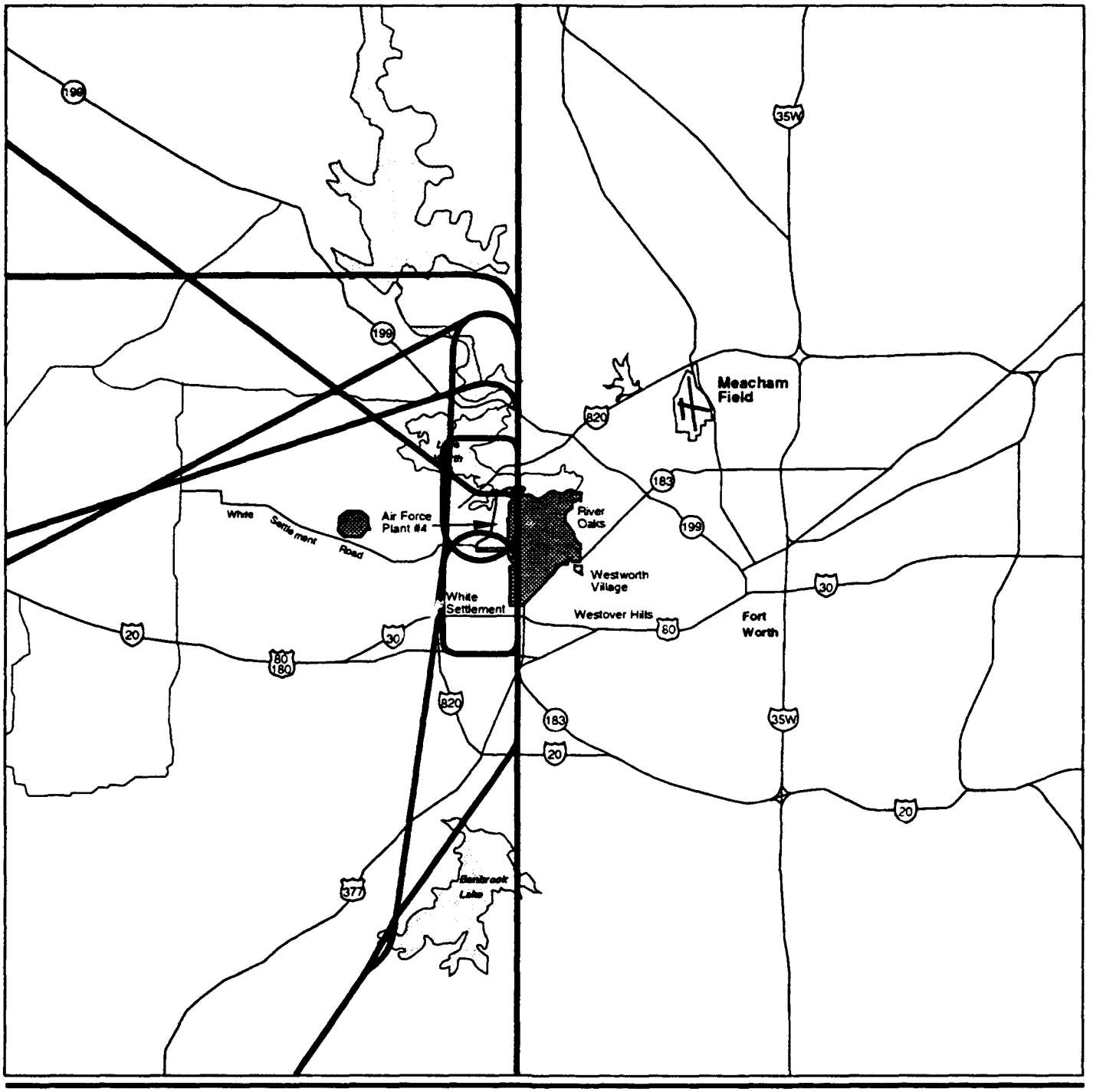
Surface vehicle traffic-noise levels for roadways in the vicinity of Carswell AFB were analyzed using the Federal Highway Administration's Highway Noise Model (Federal Highway Administration, 1978). This model incorporates vehicle mix, traffic volume projections, day/night split, and speed to generate DNL.

Major Assumptions. Half of all aircraft operations were assumed to be takeoffs and half were landings. Flight tracks (incoming and outgoing), aircraft operations, and mix are included in Appendix H. Primary flight paths (those flight paths with 1,000 or more annual operations) assumed for modeling are shown in Figures 4.4-1, 4.4-2, and 4.4-3. Military aircraft operations were modeled according to data generated and provided by Navy personnel and other DOD organizations. All civilian operations were assumed to follow standard glide slopes and takeoff profiles provided by the FAA's Integrated Noise Model Database 3.10. The phasing out of Stage 2 aircraft and subsequent replacement with Stage 3 aircraft are reflected in the civilian aircraft operations. Military aircraft are not subject to the Stage 2 phaseout.

Major roads leading to or around the base were analyzed. Traffic data used to project future noise levels were derived from information gathered in the traffic analysis presented in Section 4.2.3. Traffic data used in this analysis are presented in Appendix H.

4.4.4.1 No-Action/Realignment Alternative. The results of the aircraft noise modeling for the No-Action/Realignment Alternative are presented as noise contours in Figure 4.4-4.

Table 4.4-7 presents the approximate number of acres and estimated population within each DNL range within the 20-year analysis period. Noise contours would remain unchanged over time due to the projected constant aircraft operations. Compared to the preclosure reference, this represents a decrease of 2,605 acres within the DNL 65 dB noise contour for all modeled years. When compared to the 1993 closure baseline conditions, there is an increase of 1,927 acres within the DNL 65 dB noise contour.



EXPLANATION

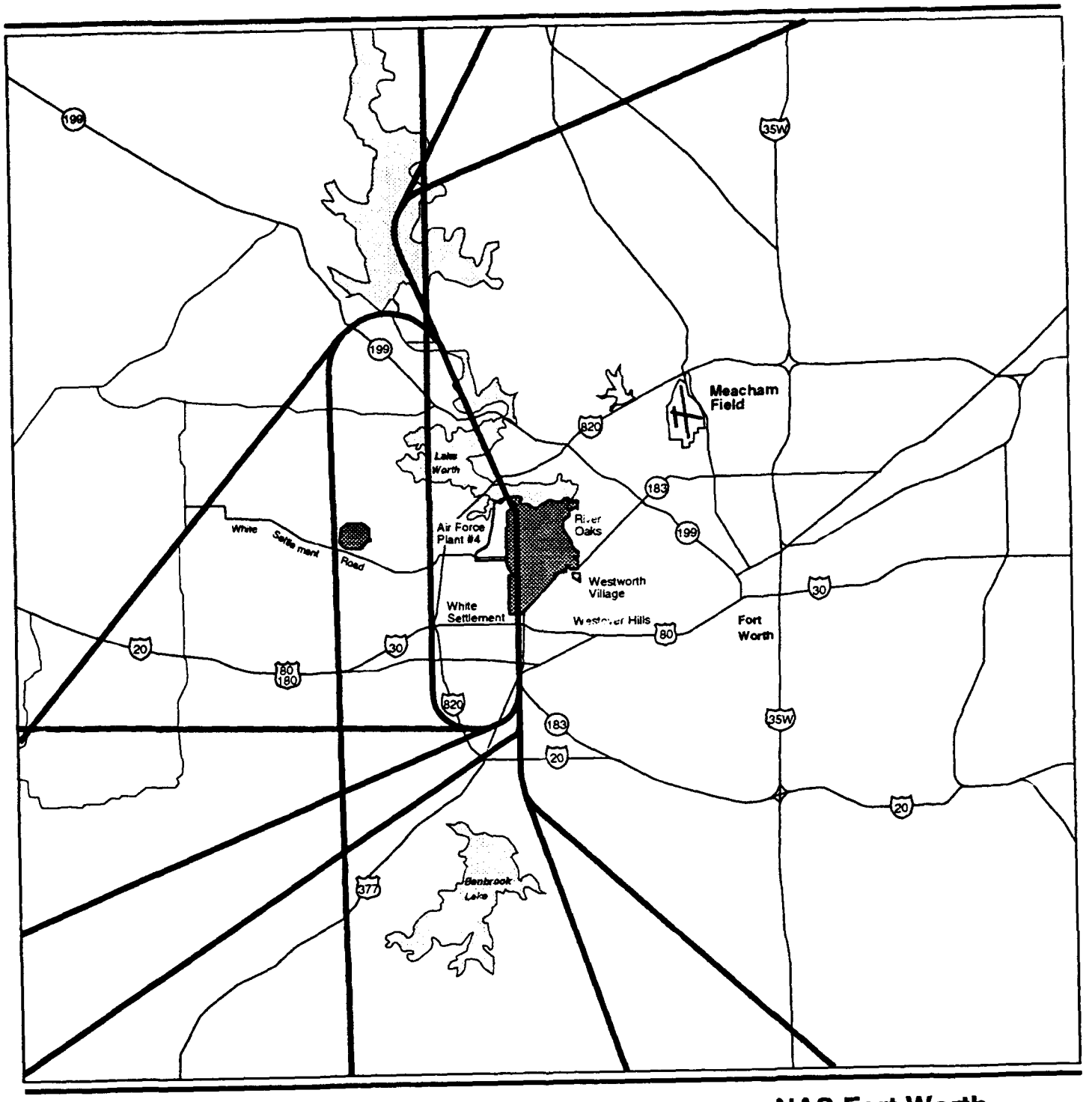
Primary Arrival Flight Paths for NAS Fort Worth

Carswell AFB Property

0 1 2 4 Miles

NAS Fort Worth Primary Arrival Flight Paths

Figure 4.4-1



EXPLANATION

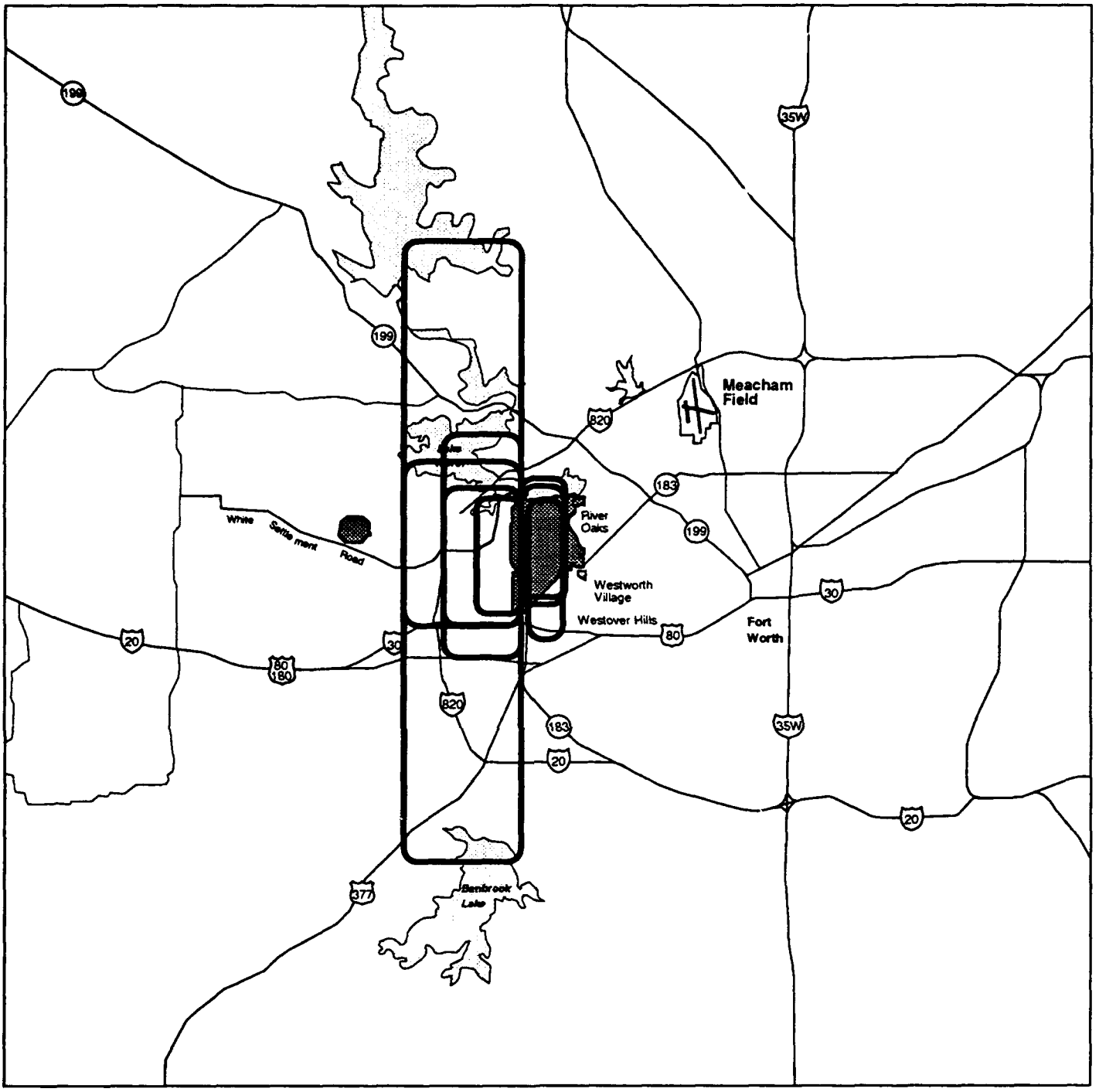
Primary Departure Flight Paths for NAS Fort Worth

Carswell AFB Property

NAS Fort Worth Primary Departure Flight Paths

0 1 2 4 Miles

Figure 4.4-2



EXPLANATION

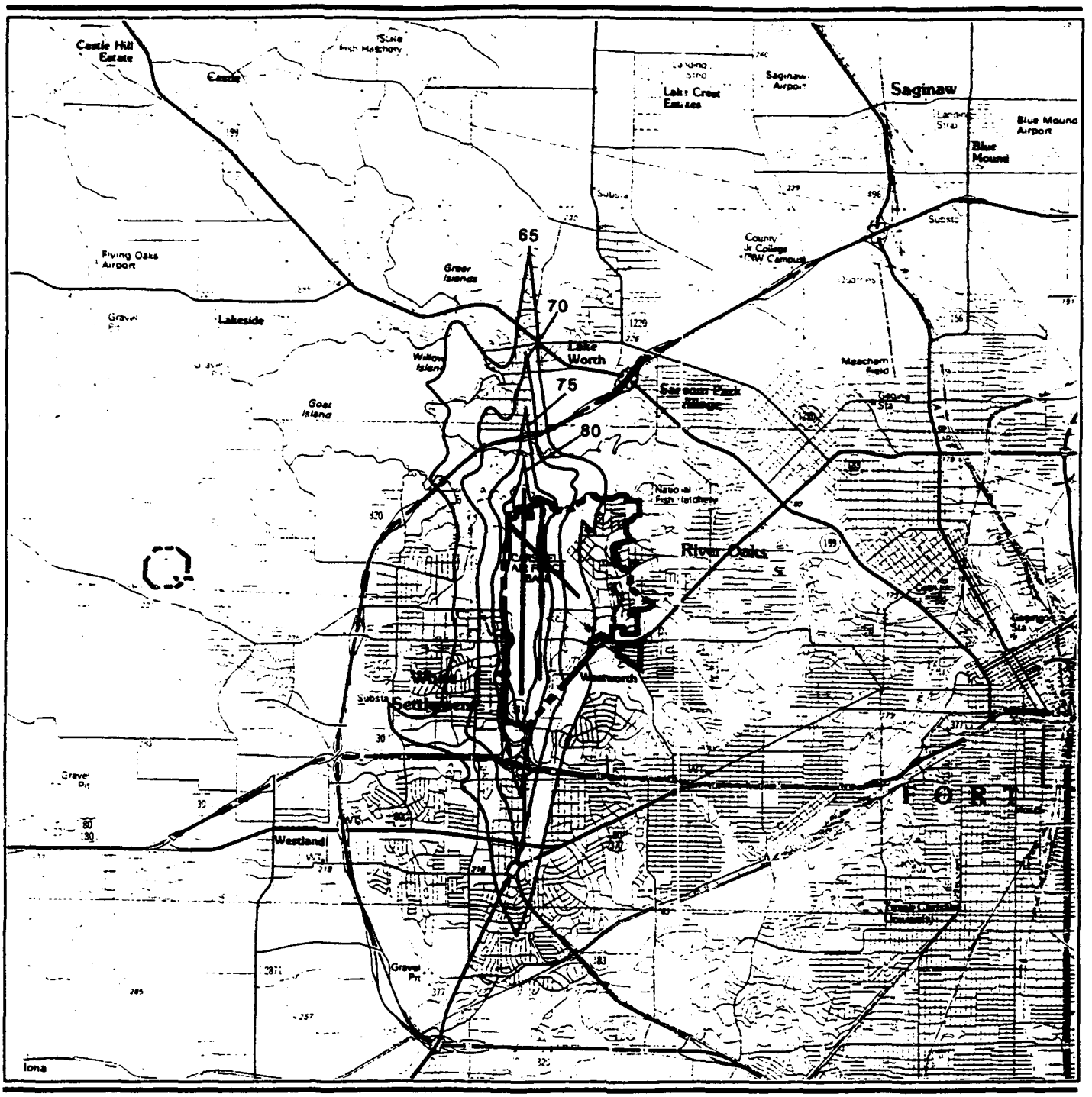
Primary Closed Flight Paths for NAS Fort Worth

Carswell AFB Property

0 1 2 4 Miles

NAS Fort Worth Primary Closed Flight Paths

Figure 4.4-3



EXPLANATION

DNL Noise Contours
(in 5 dB intervals)

Carswell AFB Boundary

No-Action/Realignment Noise Contours

0 3000 6000 12000 feet

Source: U.S. Navy, 1993
Base Map:
U.S.G.S. 30 X 60 min., Fort Worth, TX, 1985

Figure 4.4-4

Table 4.4-7. Area and Population Exposed to Aircraft Noise Due to the Reuse Alternatives[a]

	DNL Noise Contours							
	65-70 dB		70-75 dB		>75 dB		Total	
	Acres	Persons	Acres	Persons	Acres	Persons	Acres	Persons
Preclosure Reference (1986)	6,387	7,600	3,177	3,800	3,404	2,600	12,968	14,000
Closure Baseline (1993)	4,819	7,600	1,895	2,100	1,722	500	8,436	10,200
Reuse Alternatives	5,487	8,100	2,566	2,800	2,310	800	10,363	11,700

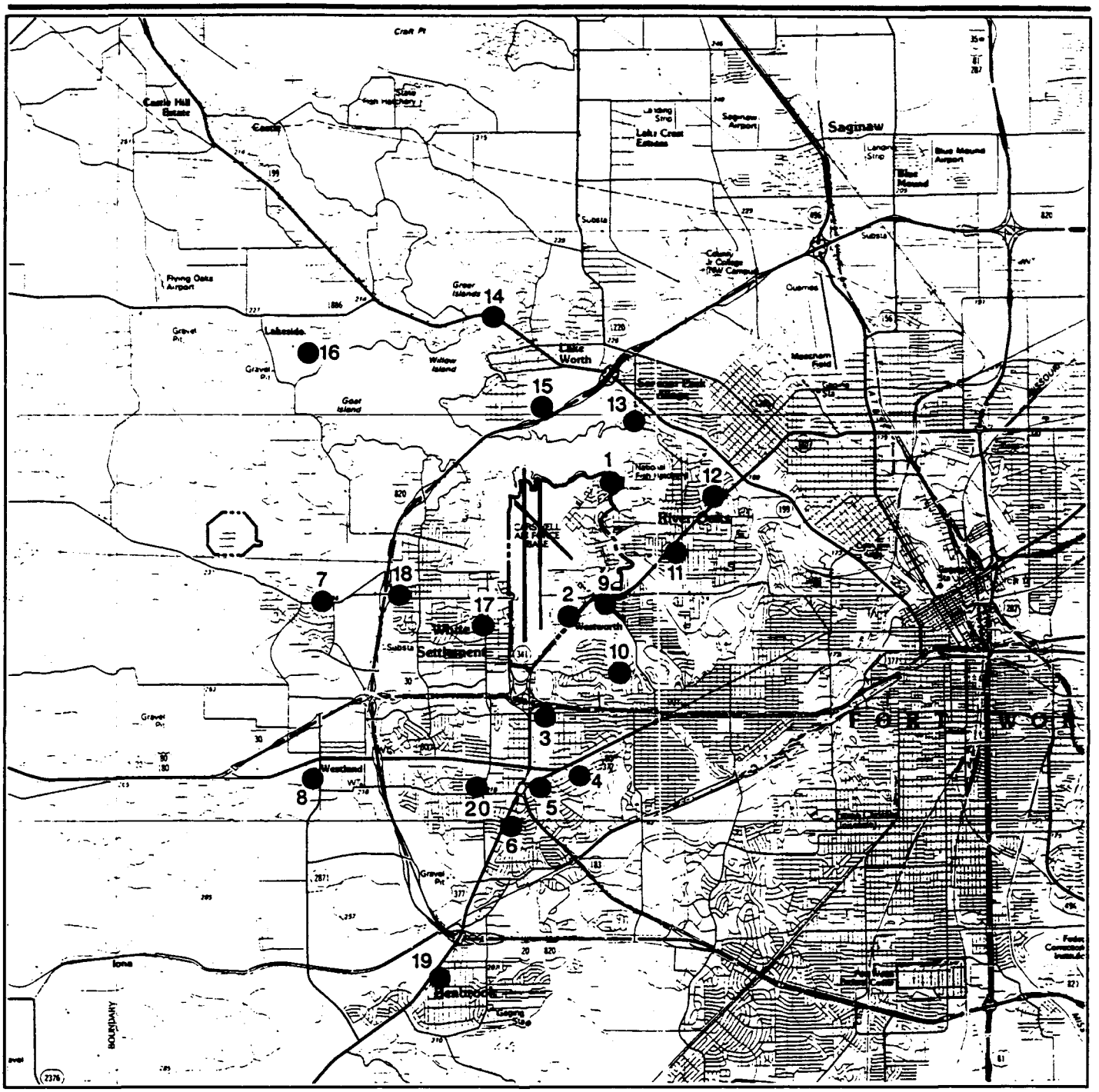
Note: (a) The civilian aircraft operations associated with the Proposed Action and Mixed Use Alternative have a negligible effect to the off-base acreage of each noise contour interval when combined with the military aircraft operations modeled for the No-Action/Realignment Alternative.
dB = decibel.
DNL = day-night average sound level.

Aircraft noise levels associated with military reuse would expose approximately 11,700 residents to a noise level of DNL 65 dB or greater. This represents an increase of 1,500 over the number of persons exposed under closure conditions and a decrease of 2,300 from the number of persons exposed under preclosure conditions.

SEL was calculated at representative residential and other noise sensitive locations shown in Figure 4.4-5 for the noisiest and most common jet aircraft associated with this alternative; the results are presented in Table 4.4-8. For all model years, the F-18 would be the noisiest aircraft, and the F-14A would be the most common jet aircraft. The noisiest aircraft was determined using information provided in the NOISEMAP database. The analysis suggests that some aircraft overflights could affect the sleep of some residents in the area.

Surface traffic sound levels for several road segments are presented in Table 4.4-9. These levels are presented in terms of DNL as a function of distance from the centerline of the roadways analyzed. There would be an estimated 770 residents in areas exposed to noise levels of DNL 65 dB or greater due to surface traffic by the year 2013 under the No-Action/ Realignment Alternative. Military realignment activities would not increase the total number of residents exposed to DNL 65 dB or greater due to surface traffic along the key roadway segments analyzed under post-closure conditions.

Mitigation Measures. Although the No-Action/Realignment Alternative would generate fewer noise impacts than preclosure conditions, it would be appropriate to follow the guidelines presented in the Navy's AICUZ program for NAS Fort Worth. The Navy will perform additional refined analyses to support development of specific mitigations for the NAS Fort Worth AICUZ program. Since the airfield would be operated by the Navy, it would be managed in accordance with Navy regulations.



EXPLANATION

- SEL Receptor Location
- Base Boundary

Refer to Table 4.4-6 for location names

Sound Exposure Level (SEL) Receptor Location

0 3000 6000 12000 Feet

Source: Acentech Inc., 1992
Base Map:
U.S.G.S. 30 X 60 min., Fort Worth, TX, 1985

Figure 4.4-5

Table 4.4-8. Sound Exposure Levels at Representative Noise Receptors

Receptor[a] Number	Receptor Location	Sound Exposure Level (dB) Aircraft Type						
		F-18	F-14	B-727	DC-9	MD-80	Retrofit B-727	Learjet 35
1	Hospital at Meandering Road and J Street	100	102	82	81	71	81	70
2	Southern Housing at Fairchild and SH 183	110	108	92	92	82	91	81
3	Motel at Intersection of SH 183 and I-30	118	112	107	101	91	103	90
4	Residential area at Clayton and Indale	101	89	91	86	76	89	76
5	Residential area at Desert Ridge and Camp Bowie	114	109	104	93	86	100	87
6	Residential area at Benbrook and Pensacola	109	97	101	91	84	98	83
7	Residential area at White Settlement and Bugle	108	86	68	66	55	68	54
8	Residential area at Fairland and Kenwood	107	88	70	67	56	69	54
9	Residential area at Roaring Springs and Pollard	98	97	80	80	70	79	69
10	Residential area at Deepdale and Westover Drive	103	104	81	80	69	80	68
11	Residential area at SH 183 and Long Road	83	82	69	68	57	69	55
12	Residential area at SH 183 and Coates	90	87	73	72	62	72	60
13	Residential area at Roberts Cut-off and Cahoba Drive	101	101	79	78	67	79	66
14	Mobile home park at SH 199 and Love Circle	104	91	99	90	83	96	83
15	Residential area at Navajo and Caddo Trails	122	116	107	102	93	103	91
16	Residential area at Lakeridge and Emily	107	90	71	68	57	70	55
17	Hospital at Cherry Lane and Skyline Park	111	108	93	92	84	92	82
18	Residential area at White Settlement Road and I-820	110	94	74	73	63	73	61
19	Residential area at Sproles Drive and U.S. Highway 377	97	76	81	76	67	78	65
20	Residential area at Boston and Longford	105	88	92	86	78	91	77

Note: (a) Number corresponds to locations on Figure 4.4-5.
dB = decibel.
I = Interstate.
SH = State Highway.

Source: U.S. Air Force, 1992a.

Table 4.4-9. Distance to Roadway Centerline for the No-Action/Realignment Alternative[a]

	Roadway	Segment	Distance (ft) DNL 65 dB	Num. of Residents	Distance (ft) DNL 70 dB	Num. of Residents	Distance (ft) DNL 75 dB	Num. of Residents
1998	I-30	SH 183 to I-820	440	40	210	0	110	0
	I-30	Camp Bowie to SH 183	510	40	240	0	120	0
	I-820	I-30 to White Settlement Rd	430	0	210	0	110	0
	I-820	White Settlement Rd to Navajo	440	80	210	0	110	0
	SH 183	I-30 to Ridgmar	120	0	60	0	40	0
	SH 183	Ridgmar to Roaring Springs	120	0	60	0	40	0
	SH 183	White Settlement Rd to SH 199	100	0	50	0	30	0
	SH 199	SH 183 to Beverly Hills	140	0	70	0	40	0
	Spur 341	I-30 to White Settlement Rd	260	20	130	0	70	0
	White Settlement Road	Meyers to Spur 341	60	0	30	0	(b)	0
	White Settlement Road	Clifford to Academy	70	0	40	0	(b)	0
	Clifford	I-820 to White Settlement Rd	50	0	30	0	(b)	0
	Roaring Springs	Rogner to Byers	60	0	30	0	20	0
2003	I-30	SH 183 to I-820	440	40	210	0	110	0
	I-30	Camp Bowie to SH 183	540	580	260	190	130	0
	I-820	I-30 to White Settlement Rd	460	0	220	0	110	0
	I-820	White Settlement Rd to Navajo	480	80	230	0	110	0
	SH 183	I-30 to Ridgmar	120	0	60	0	40	0
	SH 183	Ridgmar to Roaring Springs	120	0	60	0	40	0
	SH 183	White Settlement Rd to SH 199	100	0	50	0	30	0
	SH 199	SH 183 to Beverly Hills	160	0	80	0	40	0
	Spur 341	I-30 to White Settlement Rd	260	20	130	0	70	0
	White Settlement Road	Meyers to Spur 341	60	0	30	0	(b)	0
	White Settlement Road	Clifford to Academy	60	0	40	0	(b)	0
	Clifford	I-820 to White Settlement Rd	50	0	30	0	(b)	0
	Roaring Springs	Rogner to Byers	60	0	30	0	20	0
2013	I-30	SH 183 to I-820	450	40	210	0	110	0
	I-30	Camp Bowie to SH 183	600	580	280	190	140	0
	I-820	I-30 to White Settlement Rd	530	0	250	0	130	0
	I-820	White Settlement Rd to Navajo	570	130	270	10	130	0
	SH 183	I 30 to Ridgmar	150	0	70	0	40	0
	SH 183	Ridgmar to Roaring Springs	130	0	70	0	40	0
	SH 183	White Settlement Rd to SH 199	100	0	50	0	30	0
	SH 199	SH 183 to Beverly Hills	230	0	110	0	60	0
	Spur 341	I-30 to White Settlement Rd	260	20	130	0	70	0
	White Settlement Road	Meyers to Spur 341	60	0	30	0	(b)	0
	White Settlement Road	Clifford to Academy	50	0	30	0	(b)	0
	Clifford	I-820 to White Settlement Rd	40	0	30	0	(b)	0
	Roaring Springs	Rogner to Byers	60	0	30	0	20	0

Notes: (a) Distance and associated number of residents based on total project and nonproject-related traffic.
(b) Contained within roadway.
dB = decibel.
DNL = day-night average sound level.
ft = feet.
I = Interstate.
SH = State Highway.

The Navy document OPNAVINST 11010.36A, "Air Installations Compatible Use Zones (AICUZ) Program," presents elements that could be incorporated into a mitigation program. Program implementation may include elements, such as soliciting the cooperation of local governments, operational modifications, complaint response programs for residents of the surrounding communities and the acquisition of land or interests therein, to protect operational capability (U.S. Navy, 1988). These measures include:

- **Local Governments Cooperation.** Develop zoning ordinance, building codes, subdivision regulations, permitting authority, disclosure statements, and public acquisition that allow surrounding areas to be developed to their most compatible uses (see Table 3.4-10).

- **Operational Modification.** When compatible with the current mission, limit nighttime operations, revise flying patterns or modify aircraft operational parameters to minimize impacts.

- **Community Liaison.** A community liaison officer should be designated. Their function would be to coordinate public information meetings, interface with community leaders and citizens, respond to complaints and inquiries about noise, and work to counteract incompatible development.

- **Property Acquisition.** When the current mission is threatened by incompatible land uses, and the local governments are unwilling or unable to resolve these conflicts, consideration can be given to land acquisition.

No surface traffic noise impacts along roadways are expected; therefore, no mitigations would be required.

4.4.4.2 Proposed Action. The results of the aircraft noise modeling for the Proposed Action are similar to the No-Action/Realignment Alternative and are presented as noise contours in Figure 4.4-4. The FAA-required conversion of Stage 2 to quieter Stage 3 aircraft are reflected in civilian aircraft operations after the year 2000. The criteria that define Stage 2 and Stage 3 aircraft are described in FAA Part 36 (FAA, 1988b).

Table 4.4-7 presents the approximate number of acres and estimated population within each DNL range for each reuse alternative, including the Proposed Action. The civilian aircraft operations would have a negligible effect on the DNL contours generated from NAS Fort Worth military aircraft operations. As with the No-Action/Realignment Alternative, there would be a decrease of 2,605 acres within DNL 65 dB compared to preclosure conditions. Compared to closure conditions, the Proposed Action represents an increase of 1,927 acres within DNL 65 dB or greater.

As discussed under the No-Action/Realignment Alternative, the Proposed Action would result in a net decrease of 2,300 residents exposed to DNL 65 dB or greater under preclosure conditions and a net increase of 1,500 residents exposed under closure conditions.

SEL was calculated at representative residential locations shown in Figure 4.4-5 for the noisiest and most common jet aircraft; the results are presented in Table 4.4-8. The analysis suggests that, for the Proposed Action, some aircraft overflights could affect the sleep of some residents in the area, similar to the No-Action/Realignment Alternative.

For the model year 1998, the noisiest civilian aircraft would be the B-727-200, with the most common aircraft being the Lear 35 corporate jet. After phaseout in the year 2000, the re-engined B-727 would become the noisiest aircraft, with the Lear 35 remaining the most common aircraft. The noisiest aircraft were determined from the A-weighted maximum sound level (L_{max}) as presented in FAA Advisory Circular AC 36-3F (Federal Aviation Administration, 1990).

Surface traffic sound levels for several road segments are presented in Table 4.4-10. These levels are presented in terms of DNL as a function of distance from the centerline of the roadways analyzed. There would be an estimated 880 residents, or an increase of 110 residents over the No-Action/Realignment Alternative, in areas exposed to noise levels of DNL 65 dB or greater due to surface traffic by the year 2013.

Mitigation Measures. Since the civilian aviation operations are minimal when compared to the military flight operations, no additional mitigations for the civilian operations would be needed. Mitigation measures for the military would be the same as described for the No-Action/Realignment Alternative.

Surface traffic noise impacts associated with civilian reuse-related activities could be mitigated using barrier walls along roadways. A noise barrier analysis would be necessary to determine the optimum locations, height, and/or feasibility of the barrier walls. Other mitigation measures, such as a sound insulation program, could be implemented to reduce interior noise levels for sensitive receptors exposed to DNL 65 dB or greater. For future development, land use planning should incorporate noise compatibility measures when establishing residential zoning. Measures such as restricting residential development to areas outside DNL 65 dB and incorporating barriers and buffer zones into community development can be used. The effectiveness of the operational and management noise mitigation measures presented here cannot be completely determined without extensive modeling and/or noise measurements.

4.4.4.3 Mixed Use Alternative. The results of the aircraft noise modeling for the Mixed Use Alternative are presented as noise contours in

Table 4.4-10. Distance to Roadway Centerline for the Proposed Action[a]

	Roadway	Segment	Distance (ft) DNL 65 dB	Num. of Residents	Distance (ft) DNL 70 dB	Num. of Residents	Distance (ft) DNL 75 dB	Num. of Residents
1998	I-30	SH 183 to I-820	450	40	220	0	110	0
	I-30	Camp Bowie to SH 183	520	580	250	0	120	0
	I-820	I-30 to White Settlement Rd	440	0	210	0	110	0
	I-820	White Settlement Rd to Navajo	440	80	210	0	110	0
	SH 183	I-30 to Ridgmar	150	0	70	0	40	0
	SH 183	Ridgmar to Roaring Springs	140	0	70	0	40	0
	SH 183	White Settlement Rd to SH 199	110	20	50	0	30	0
	SH 199	SH 183 to Beverly Hills	140	0	70	0	40	0
	Spur 341	I-30 to White Settlement Rd	260	20	130	0	70	0
	White Settlement Road	Meyers to Spur 341	60	0	30	0	(b)	0
	White Settlement Road	Clifford to Academy	70	0	40	0	(b)	0
	Clifford	I-820 to White Settlement Rd	50	0	30	0	(b)	0
	Roaring Springs	Rogner to Byers	60	0	30	0	20	0
2003	I-30	SH 183 to I-820	470	40	220	0	110	0
	I-30	Camp Bowie to SH 183	550	580	260	190	130	0
	I-820	I-30 to White Settlement Rd	470	0	220	0	110	0
	I-820	White Settlement Rd to Navajo	480	80	230	0	110	0
	SH 183	I-30 to Ridgmar	170	50	80	0	50	0
	SH 183	Ridgmar to Roaring Springs	150	0	80	0	40	0
	SH 183	White Settlement Rd to SH 199	110	20	60	0	30	0
	SH 199	SH 183 to Beverly Hills	170	0	80	0	40	0
	Spur 341	I-30 to White Settlement Rd	270	20	130	0	70	0
	White Settlement Road	Meyers to Spur 341	60	0	30	0	(b)	0
	White Settlement Road	Clifford to Academy	70	0	40	0	(b)	0
	Clifford	I-820 to White Settlement Rd	50	0	30	0	(b)	0
	Roaring Springs	Rogner to Byers	60	0	30	0	20	0
2013	I-30	SH 183 to I-820	480	40	230	0	110	0
	I-30	Camp Bowie to SH 183	610	580	290	190	140	0
	I-820	I-30 to White Settlement Rd	540	0	260	0	130	0
	I-820	White Settlement Rd to Navajo	570	130	270	10	130	0
	SH 183	I-30 to Ridgmar	200	50	100	0	50	0
	SH 183	Ridgmar to Roaring Springs	160	0	80	0	50	0
	SH 183	White Settlement Rd to SH 199	110	20	60	0	30	0
	SH 199	SH 183 to Beverly Hills	230	0	110	0	60	0
	Spur 341	I-30 to White Settlement Rd	270	20	130	0	70	0
	White Settlement Road	Meyers to Spur 341	60	0	30	0	(b)	0
	White Settlement Road	Clifford to Academy	60	0	30	0	(b)	0
	Clifford	I-820 to White Settlement Rd	50	0	30	0	(b)	0
	Roaring Springs	Rogner to Byers	70	40	30	0	20	0

Notes: (a) Distance and associated number of residents based on total project and nonproject-related traffic.
(b) Contained within roadway.
dB = decibel.
DNL = day-night average sound level.
ft = feet.
I = Interstate.
SH = State Highway.

Figure 4.4-4. As discussed under the Proposed Action, civilian aircraft operations would have a negligible effect on contours modeled under the No-Action/Realignment Alternative. Table 4.4-7 presents the approximate number of acres and estimated population within each DNL range for each reuse alternative, including the Mixed Use Alternative. Under the Mixed Use Alternative, the amount of area and the number of residents exposed to noise levels of 65 dB or greater would be the same as the Proposed Action and the No-Action/Realignment Alternative.

SEL was calculated at representative residential locations shown in Figure 4.4-5 for the noisiest and most common jet aircraft; the results are presented in Table 4.4-8. The analysis suggests that, for the Mixed Use Alternative, some aircraft overflights could affect the sleep of some residents in the area, similar to the No-Action/Realignment Alternative.

For the model year 1998, the noisiest civilian aircraft would be the B-727-200, with the DC-9, MD-80 and B-727 being the most common civilian aircraft. After phaseout in the year 2000, the re-engined B-727 would become the noisiest aircraft. The noisiest aircraft were determined from the A-weighted maximum sound level (L_{max}) as presented in FAA Advisory Circular AC 36-3F (Federal Aviation Administration, 1990).

Surface traffic sound levels for several road segments are presented in Table 4.4-11. These levels are presented in terms of DNL as a function of distance from the centerline of the roadways analyzed. There would be an estimated 1,170 residents, or an increase of 400 residents over the No-Action/Realignment Alternative, in areas exposed to noise levels of DNL 65 dB or greater due to surface traffic by the year 2013.

Mitigation Measures. Mitigation measures would be the same as those described for the Proposed Action.

4.4.4.4 Other Land Use Concepts.

Health and Human Services. No noise impacts are expected to occur from this land use concept.

Retained Residential Areas. This land use concept would utilize existing on-site housing units to accommodate approximately 1,375 residents by the year 2003. If this land use concept were implemented in conjunction with any of the alternatives, approximately 700 additional residents would be exposed to aircraft noise levels of DNL 65 or greater. The net increase in persons exposed to high noise levels would remain below preclosure aircraft noise conditions associated with Carswell AFB. There would be little to no change in the number of residents exposed to surface traffic noise levels of DNL 65 or greater under any of the alternatives. Impacts and mitigations would be similar to those described under each alternative.

Table 4.4-11. Distance to Roadway Centerline for the Mixed Use Alternative[a]

Roadway		Segment	Distance (ft) DNL 65 dB	Num. of Residents	Distance (ft) DNL 70 dB	Num. of Residents	Distance (ft) DNL 75 dB	Num. of Residents
1998	I-30	SH 183 to I-820	460	40	220	0	110	0
	I-30	Camp Bowie to SH 183	530	580	250	0	120	0
	I-820	I-30 to White Settlement Rd	440	0	210	0	110	0
	I-820	White Settlement Rd to Navajo	440	80	210	0	110	0
	SH 183	I-30 to Ridgmar	170	50	80	0	50	0
	SH 183	Ridgmar to Roaring Springs	150	0	80	0	40	0
	SH 183	White Settlement Rd to SH 199	110	20	60	0	30	0
	SH 199	SH 183 to Beverly Hills	140	0	70	0	[illegible]	0
	Spur 341	I-30 to White Settlement Rd	270	20	130	0	70	0
	White Settlement Road	Meyers to Spur 341	60	0	30	0	(b)	0
	White Settlement Road	Clifford to Academy	70	0	40	0	(b)	0
	Clifford	I-820 to White Settlement Rd	50	0	30	0	(b)	0
	Roaring Springs	Rogner to Byers	60	0	30	0	20	0
2003	I-30	SH 183 to I-820	470	40	220	0	110	0
	I-30	Camp Bowie to SH 183	560	580	260	190	130	0
	I-820	I-30 to White Settlement Rd	470	0	230	0	110	0
	I-820	White Settlement Rd to Navajo	480	80	230	0	110	0
	SH 183	I-30 to Ridgmar	190	50	90	0	50	0
	SH 183	Ridgmar to Roaring Springs	160	0	80	0	50	0
	SH 183	White Settlement Rd to SH 199	110	20	60	0	30	0
	SH 199	SH 183 to Beverly Hills	170	0	80	0	40	0
	Spur 341	I-30 to White Settlement Rd	270	20	130	0	70	0
	White Settlement Road	Meyers to Spur 341	60	0	30	0	(b)	0
	White Settlement Road	Clifford to Academy	70	0	40	0	(b)	0
	Clifford	I-820 to White Settlement Rd	50	0	30	0	(b)	0
	Roaring Springs	Rogner to Byers	70	40	30	0	20	0
2013	I-30	SH 183 to I-820	490	40	230	0	120	0
	I-30	Camp Bowie to SH 183	620	870	290	190	140	0
	I-820	I-30 to White Settlement Rd	540	0	260	0	130	0
	I-820	White Settlement Rd to Navajo	570	130	270	10	130	0
	SH 183	I-30 to Ridgmar	220	50	110	0	60	0
	SH 183	Ridgmar to Roaring Springs	180	0	90	0	50	0
	SH 183	White Settlement Rd to SH 199	110	20	60	0	30	0
	SH 199	SH 183 to Beverly Hills	240	0	110	0	60	0
	Spur 341	I-30 to White Settlement Rd	280	20	130	0	70	0
	White Settlement Road	Meyers to Spur 341	60	0	30	0	(b)	0
	White Settlement Road	Clifford to Academy	60	0	30	0	(b)	0
	Clifford	I-820 to White Settlement Rd	50	0	30	0	(b)	0
	Roaring Springs	Rogner to Byers	70	40	30	0	20	0

Notes: (a) Distance and associated number of residents based on total project and nonproject-related traffic.
(b) Contained within roadway.
dB = decibel.
DNL = day-night average sound level.
ft = feet.
I = Interstate.
SH = State Highway.

4.4.5 Biological Resources

The reuse alternatives potentially could affect biological resources through alteration or loss of vegetation and wildlife habitat. These impacts are described below for each alternative.

Assumptions used in analyzing the effects of the reuse alternatives include:

- All staging and other areas temporarily disturbed by construction would be placed in previously disturbed areas (e.g., paved or cleared area), to the fullest extent possible.

- Proportions of disturbance associated with each land use category were determined based on accepted land use planning concepts. Development could occur at one or more locations anywhere within that land use category, unless designated as vacant land in the reuse alternative.

4.4.5.1 No-Action/Realignment Alternative. The realignment and the establishment of NAS Forth Worth could have an effect on the biological resources primarily through human interaction, including an increase in aircraft overflight and the minimal loss of vegetation and wildlife habitat.

Vegetation. Overall the No-Action/Realignment Alternative would result in a potential disturbance of approximately 24 acres by 1998. These losses would result from facility construction activities. The vegetation in areas of potential disturbance consists of mostly low quality, nonnative habitat. The undisturbed vegetation along the stream corridor that could be habitat to sensitive species is not expected to be impacted due to the low engineering suitability for the site.

Wildlife. The effects on wildlife are related to minimal loss of low-quality habitat, disturbance due to construction activity, and visual and noise disturbance from increased flight operations. Much of the vegetative cover planned for disturbance is mowed grassland (developed or landscaped), which tends to have low wildlife habitat value. The overall effect on wildlife from habitat loss and construction would be minimal.

Noise and activity resulting from construction would have minimal short-term effects on wildlife due to the loss or alteration of low-quality habitat. Common wildlife species would be affected by displacement of mobile species to adjacent areas and mortality of less mobile species. If the adjacent habitat is already at its carrying capacity, displaced animals would compete with the residents for available resources, causing ecological disruption until the populations decrease and equilibrium is reestablished. Species that would be affected, if present, include those with relatively small home ranges, such as small mammals (e.g., black-tailed hare and armadillo), and reptiles. The loss of habitat could also affect wider-ranging

species that forage in the area, such as raptors (e.g., red-tailed hawk) and predatory mammals (e.g., coyote and grey fox). The immediate effect would be a minor decrease in local populations of these species due to limited loss of low-quality habitat loss. Fish and amphibian species affected by runoff and increased stream turbidity from construction activity potentially could migrate along waterways to less disturbed areas; however, aquatic animals confined to standing water areas would have higher mortality rates.

Lake Worth, just north of Carswell AFB, is used both as a stop-over point and breeding area for migratory birds. Great blue heron rookeries are located beyond the influence of the military realignment activities. Less disturbance to these rookeries would result from the No-Action/Realignment Alternative when compared to preclosure conditions.

The birds at Lake Worth are already sensitized to overflight noise due to the continuation of aircraft flight operations from the closure baseline. Although the helicopter traffic would be a relatively new noise source, the birds probably would habituate to this disturbance over time. The effects on other wildlife from increased noise levels would be temporary stress that would be expected to subside as the animals habituate to the additional noise. The long-term effects from noise are expected to be minor.

Additional air traffic resulting from the No-Action/Realignment Alternative would increase the potential for bird-aircraft collisions. Carswell AFB had 20 bird-aircraft collisions during 1991, or an average of one strike per 4,300 aircraft operations. It is estimated that approximately 103,000 annual flights under the No-Action/Realignment Alternative would result in only four additional bird-aircraft collisions annually if the airfield is maintained to discourage birds. Impacts on all bird species would be negligible.

Threatened and Endangered Species. Of the federally listed species (see Table 3.4-14), only the Arctic peregrine falcon (threatened), bald eagle, and whooping crane (both endangered species) are known to occasionally occur in the Lake Worth area. None of these migrants are expected to reside on Carswell AFB property. The Air Force has received a response from an informal Section 7 consultation with the USFWS regarding the No-Action/ Realignment Alternative and for potential land conveyance to private parties under any other reuse alternative. A no-jeopardy opinion for all potentially occurring listed species was delivered for the disposal and reuse of Carswell AFB. Therefore, unacceptable impacts to threatened and endangered species are not expected. The only potential direct impact to threatened and endangered species on the base would be through collision of a federally or state listed bird species with an aircraft. However, no endangered species have been recorded as a victim of a BASH incident at Carswell AFB. The chance for such an incident is expected to remain low and not likely to adversely affect any threatened, endangered, or candidate species.

Habitat is present at Carswell AFB for the Texas garter snake and Texas horned lizard (both federal Category 2); however, the level of disturbance to the habitat and the fragmentation and isolation of the less disturbed areas make the base less suitable for their existence. Impacts to these species are expected to be minimal.

The Off-Site WSA also contains poor quality habitat for the Texas garter snake and the Texas horned lizard. Impacts to these species are expected to be minimal.

Sensitive Habitats. Three categories of sensitive habitats occur in the ROI, including on-base wetlands, migratory bird habitat, and the off-base great blue heron nesting areas. Development under the No-Action/Realignment Alternative would not affect any jurisdictional wetlands on Carswell AFB.

The migratory bird habitat and nearby great blue heron rookeries are located along the shores of Lake Worth. Impacts to the species using the lake as a stopover or nesting area could increase slightly from the additional flight operations, particularly any low-level helicopter operations. Unacceptable disturbances to migratory birds caused by the No-Action/Realignment Alternative are not expected.

The great blue heron rookeries are located over 4 miles north of Carswell AFB and would not be affected by the No-Action/Realignment Alternative. The rookeries may benefit from the lower noise levels anticipated under the No-Action/Realignment Alternative than those experienced under preclosure conditions.

Mitigation Measures. No mitigations would be necessary.

4.4.5.2 Proposed Action. Development under the Proposed Action could have an effect on biological resources primarily through human interaction and an additional loss of 184 acres of vegetation and wildlife habitat over the No-Action/Realignment Alternative. In all, 208 acres would be disturbed by the year 2013.

These losses would result from new construction and renovation of the industrial, institutional (prison), commercial, residential, and public facilities/recreation land uses.

Vegetation. The vegetation in areas of potential disturbance consists mostly of low quality, nonnative habitat. The effects of the Proposed Action on vegetation would be minimal, and similar to the No-Action/Realignment Alternative.

Wildlife. The effects on wildlife are related to low-quality habitat loss, disturbance due to construction activity and increased human presence.

Much of the vegetative cover planned for disturbance is mowed grassland, developed, or landscaped, which tends to have low wildlife habitat value. Effects over the No-Action/Realignment Alternative are expected to be minimal due to the low habitat values of the additional area to be impacted from civilian reuse activities.

Threatened and Endangered Species. Impacts of the Proposed Action on threatened, endangered, and candidate species would be similar to those described under the No-Action/Realignment Alternative.

Sensitive Habitats. Sensitive habitat impacts would be similar to those described under the No-Action/Realignment Alternative. Construction associated with the prison hospital along the shores of Lake Worth could encroach on migratory bird habitat; however, flood restrictions on the leased land immediately adjacent to Lake Worth would probably limit facility construction near the shoreline.

Mitigation Measures. No mitigations would be necessary.

The future property recipient may be required to perform further evaluation of potential biological impacts as specific utility requirements and designs are identified for the subsequent civilian reuse of the Off-Site WSA. These biological studies would be performed in accordance with applicable state and federal regulations and requirements to identify potential impacts and appropriate mitigation measures.

4.4.5.3 Mixed Use Alternative. Development under the Mixed Use Alternative would primarily affect biological resources through increased human interaction, and an additional loss of 256 acres of vegetation and associated wildlife habitat over the No-Action/Realignment Alternative, for a total loss of 280 acres, by the year 2013. Additional effects could occur from increased access to the migratory bird habitat and associated natural habitat at and near the Lake Worth Shoreline. A 0.1 acre low quality wetland could be affected from the civilian development of residential land use at the Off-Site WSA.

Vegetation. Overall, this alternative would result in a potential loss of about 280 acres. The Off-Site WSA would be developed for residential purposes under this alternative. Due to the low quality of the vegetation in the areas likely to be disturbed, the effects of the Mixed Use Alternative on vegetation is expected to be minimal.

Wildlife. The effects on wildlife would be related to low-quality habitat loss, disturbance due to construction activity, and increased human activities. The construction and human activity effects would be similar to the Proposed Action. In addition, potential adverse impacts to wildlife associated with civilian residential development at the Off-Site WSA could

include predation by domestic dogs and cats, handling by humans, and construction activity. However, these effects are expected to be minor.

Threatened and Endangered Species. Impacts of the Mixed Use Alternative on the threatened and endangered species would be similar to those described under the No-Action/Realignment Alternative. Potential impacts could occur to federal Category 2 Texas horned lizard and Texas garter snake due to the residential development of the Off-Site WSA. If present, construction activities could cause direct mortality of potential species in the area. Since the habitat suitability of the site has been decreased through heavy grazing and other weed control activities, the overall effect to potential sensitive reptile populations is expected to be minimal.

Sensitive Habitats. Development under the Mixed Use Alternative at the Off-Site WSA could result in a potential loss of approximately 0.1 acre of low quality jurisdictional wetlands habitat. However, planning and design of the development could further minimize any effects.

Mitigation Measures. Although it is unlikely mitigations will be required by the COE for a wetland fill permit because of the small size and low quality of the wetland to be affected, each case is separately evaluated before final mitigation needs are determined. Mitigations could include avoidance, off-site wetland restoration and/or wetland enhancement.

As mentioned under the Proposed Action, additional studies may be required by the reuse recipient if off-site utility connection lines are determined to be necessary for civilian redevelopment. Appropriate mitigation measures would be determined in accordance with federal and state regulations and requirements.

4.4.5.4 Other Land Use Concepts.

Health and Human Services. No effects to biological resources are anticipated from the renovation of 20 houses in Kings Branch because no ground disturbance would occur.

Retained Residential Areas. Civilian reuse of existing residential areas would not require any ground-disturbing activities; therefore, no adverse impacts to biological resources are anticipated.

4.4.6 Cultural Resources

Potential impacts are assessed by (1) identifying types and possible locations of reuse activities that directly or indirectly could affect cultural resources, and (2) identifying the nature and potential significance of cultural resources in potentially affected areas (in progress). Pursuant to the NHPA,

consultation, as directed by the Section 106 review process, has been initiated with the Texas SHPO.

Historic properties, under 36 CFR 800, are defined as any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP. This term includes (for the purposes of these regulations) artifacts, records, and remains that are related to and located within such properties. The term "eligible for inclusion in the NRHP" includes both properties formally determined as such by the Secretary of the Interior and all other properties that meet NRHP listing criteria. Therefore, sites not yet evaluated are potentially considered eligible to the NRHP and, as such, are afforded the same regulatory consideration as nominated historic properties.

As a federal agency, the Air Force is responsible for identifying any historic properties at Carswell AFB. This identification process includes not only field surveys and recording of cultural resources, but also evaluations to develop determinations of significance in terms of NRHP criteria. Criteria and related qualities of significance are discussed in Appendix E, Methods of Analysis. Completion of this process results in a listing of historic properties subject to federal regulations regarding the treatment of cultural resources.

As described in Section 3.4.6, five archaeological sites (one prehistoric site and four historic sites) have been identified within the boundary of Carswell AFB (see Appendix I). None of the five sites are considered eligible to the NRHP and the Texas SHPO has concurred (see Appendix K). The Buck Oaks Farm, Building 250, is listed on the NRHP. Three buildings (Buildings 218, 233, and 260) and one structure (a concrete water tower - Structure 1809) have been evaluated and may be eligible to the NRHP; however, the evaluation and consultation process is still in progress. Results of this evaluation will be coordinated with the Texas SHPO and incorporated into the text of the FEIS.

No significant archaeological, Native American, or paleontological resources have been identified on Carswell AFB that would be adversely affected by disposal and reuse activities. Interest expressed by the Tonkawa Tribe of Oklahoma regarding the conveyance and reuse of Carswell AFB (see Appendix K) is currently under review. Disposal or conveyance activities, however, do have the potential to adversely affect historic properties that are either listed on, or potentially eligible to, the NRHP.

Regulations for implementing Section 106 of the NHPA indicate that the conveyance of a historic property without adequate measures to ensure preservation is considered an adverse impact, thereby ensuring full regulatory consideration in federal project planning and execution. Because of this, Buildings 218, 233, and 260; structure 1809; and all other facilities at Carswell AFB that may be determined eligible to the NRHP through the

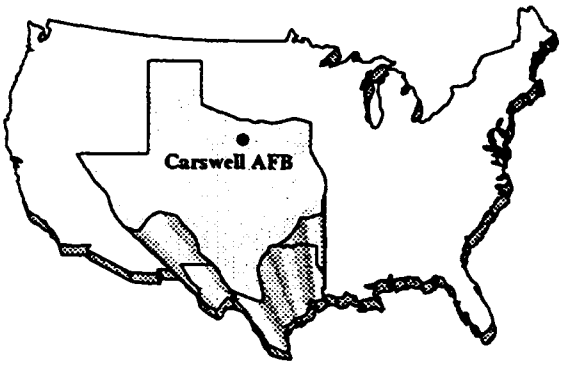
ongoing evaluation and consultation process could be impacted by conveyance. Building 250, which is already listed, could also be affected. All buildings and structures ultimately determined to be eligible to the NRHP will be analyzed according to the potential impacts from each alternative (including the No-Action/Realignment Alternative) and the results presented in the FEIS. In general, to reduce or eliminate any impacts associated with conveyance to non-federal owners, the mitigation procedures described below would be employed.

Mitigation Measures. Properties may be conveyed to non-federal owners with preservation covenants to ensure that future owners will abide by cultural resource management procedures dictated by the NHPA, or their equivalent, as approved by the SHPO and the Advisory Council on Historic Preservation. Impacts due to conveyance can thus be reduced to a non-adverse level.

In accordance with Section 106 of the NHPA and its implementing regulations, the agency or reuse proponent, as appropriate, would consult with the SHPO and the Advisory Council on Historic Preservation during the development and implementation of specific procedures and mitigation strategies. Mitigation proposed would comply with the appropriate standards and guidelines established for historic preservation activities by the Secretary of the Interior and other federal, state, and local regulations, as applicable.

An agreement document may be prepared to establish acceptable mitigation measures. A Memorandum of Agreement or Programmatic Agreement must be coordinated with, at a minimum, the SHPO, the Advisory Council on Historic Preservation, and the Air Force; other parties would be included as appropriate.

Although the known archaeological resources located on Carswell AFB are not considered significant, the presence of sites does indicate some potential for cultural resources to be discovered during the course of project activities. In the event that archaeological, paleontological, or Native American resources are discovered, ground disturbing activities should cease in the immediate area and a qualified archaeologist should be consulted (Appendix K); all subsequent actions would comply with 36 CFR 800.11 and the Native American Graves Protection and Repatriation Act. In addition, once the specific details of the reuse alternatives are determined, archaeological studies may be required to identify sensitive resources that could be affected by construction of any off-site interconnections for water and sewer at the Off-Site WSA. As applicable, these studies would be performed according to state and/or local statutes (e.g., the Antiquities Code of Texas).



CHAPTER 5
CONSULTATION AND COORDINATION

5.0 CONSULTATION AND COORDINATION

The federal, state, and local agencies and private agencies/organizations that were contacted during the course of preparing this Environmental Impact Statement are listed below.

FEDERAL AGENCIES

Army Corps of Engineers
Bureau of Mines
Environmental Protection Agency (Region VI)
Federal Aviation Administration
Federal Emergency Management Agency
Federal Highway Administration
Fish and Wildlife Service
Health and Human Services
National Park Service
Soil Conservation Service

STATE AGENCIES

State Office of Historic Preservation
Texas Bureau of Economic Geology
Texas Department of Transportation, Division of Aviation
Texas General Lands Office
Texas Natural Resources Conservation Commission (formerly Texas Air Control Board, Texas Water Commission)
Texas Parks and Wildlife Department
Texas Water Development Board

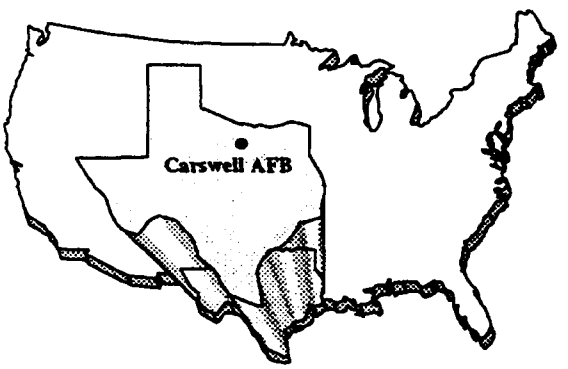
LOCAL/REGIONAL AGENCIES

Arlington Municipal Airport
Carswell Redevelopment Authority
City of Westworth Village, Mayor's Office
Dallas/Fort Worth International Airport
Decatur Municipal Airport
Denton Municipal Airport
Fort Worth Aviation Department
Fort Worth Chamber of Commerce

Fort Worth Environmental Management Department
Fort Worth Department of Public Works and Transportation
Fort Worth Planning Department
Fort Worth Research and Economic Development Division
Fort Worth Water Department
Grand Prairie Municipal Airport
Meacham Airport
North Central Texas Council of Governments
River Oaks Utility Department
Sansom Park Utility Department
Tarrant County Emergency Management Office
Tarrant County Planning Department
Tarrant County Tax Office
Tarrant County Transportation/Public Works Department
White Settlement Public Works Department

PRIVATE ORGANIZATIONS AND INDIVIDUALS

Aerodata
Agency Information Consultants, Inc.
Aircraft Owners and Pilots Association
Airport Corporation of America
Audubon Society
Mrs. Sally Blair
Carswell Off-Base Housing Committee
Freese and Nichols, Inc.
Gospel Inspirational Fellowship
Historic Preservation Council for Tarrant County
Huguley Hospital
Lockheed Corporation
Lone Star Gas Company
National Business Aircraft Association
Nature Center
Tarrant County Historical Association
Texas College of Osteopathic Medicine
Texas Employment Commission
Texas Hospital Association
T.U. Electric
Waste Management, Inc.
Wylie Laboratories



CHAPTER 6
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6.0 LIST OF PREPARERS AND CONTRIBUTORS

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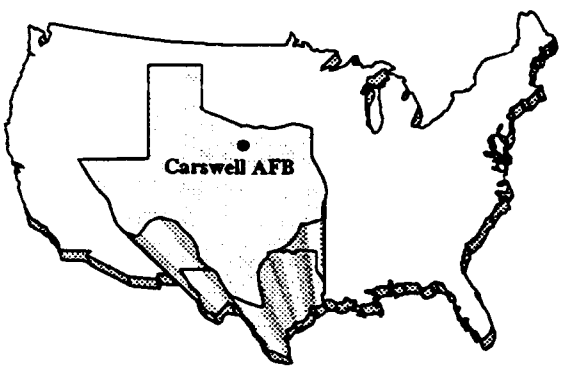

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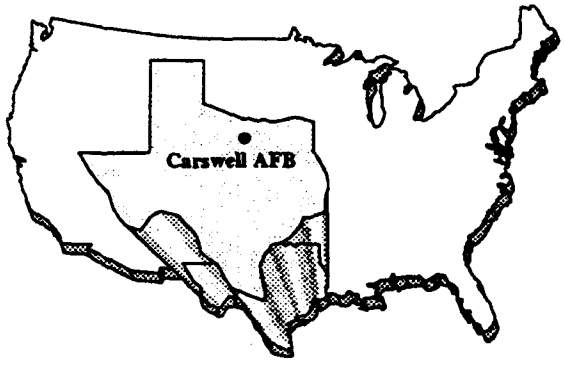

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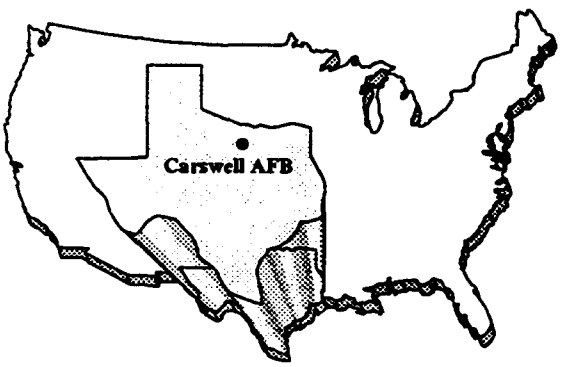

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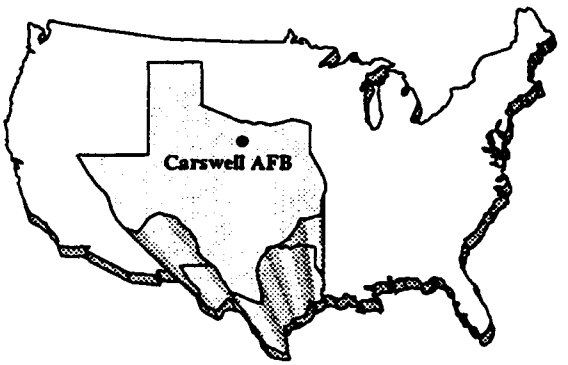


APPENDIX A

APPENDIX A

GLOSSARY OF TERMS AND ACRONYMS/ABBREVIATIONS

APPENDIX A

GLOSSARY OF TERMS AND ACRONYMS/ABBREVIATIONS

GLOSSARY OF TERMS

A-Weighted Sound Level (dBA). A number representing the sound level that is frequency weighted according to a prescribed frequency response established by the American National Standards Institute (ANSI S1.4-1971) and accounts for the response of the human ear.

Acoustics. The science of sound that includes the generation, transmission, and effects of sound waves, both audible and inaudible.

Advisory Council on Historic Preservation. A 19-member body appointed, in part, by the President of the United States to advise the President and Congress and to coordinate the actions of federal agencies on matters relating to historic preservation, to comment on the effects of such actions on historic and archaeological cultural resources, and to perform other duties as required by law (Public Law 89-655; 16 U.S. Code §470).

Aesthetics. Referring to the perception of beauty.

Aggregate. Materials, such as sand, gravel, or crusted stone, used for mixing with a cementing material to form concrete or alone as railroad ballast or graded fill.

Aircraft operation. A takeoff or landing at an airport.

Airport Traffic Area. Airspace within a radius of five statute miles of an airport with an operating control tower, encompassing altitudes between the surface and 3,000 feet aboveground level (AGL), in which an aircraft cannot operate without prior authorization from the control tower.

Alluvium. Clay, silt, sand, gravel or similar material deposited by running water.

Ambient Air Quality Standards. Standards established on a state or federal level that define the limits for airborne concentrations of designated "criteria" pollutants (nitrogen dioxide, sulfur dioxide, carbon monoxide, total suspended particulates, ozone and lead), to protect public health with an adequate margin of safety (primary standards) and to protect public welfare, including plant and animal life, visibility, and materials (secondary standards).

Aquifer. The water-bearing portion of subsurface earth material that yields or is capable of yielding useful quantities of water to wells.

Arterial. Signalized street that serves primarily through-traffic and provides access to abutting properties as a secondary function.

Asbestos. A carcinogenic substance formerly used widely as an insulation material by the construction industry; often found in older buildings.

Assault strip. A runway of shorter than normal length used to practice specialized military take-offs and landings.

Attainment area. A region that meets the National Ambient Air Quality Standards for a criteria pollutant under the Clean Air Act.

Average Annual Daily Traffic (AADT). For a 1-year period, the total volume passing a point or segment of a highway facility in both directions, divided by the number of days in the year.

Benzene. Colorless, volatile, flammable, toxic liquid aromatic hydrocarbon.

Biophysical. Pertaining to the physical and biological environment, including the environmental conditions crafted by man.

Biota. The plant and animal life of a region.

Capacity. The maximum rate of flow at which vehicles can be reasonably expected to traverse a point or uniform segment of a lane or roadway during a specified time period under prevailing roadway, traffic, and control conditions.

Carbon disulfide. Colorless, flammable, poisonous liquid, used as a solvent.

Carbon monoxide (CO). A colorless, odorless, poisonous gas produced by incomplete fossil-fuel combustion. One of the six pollutants for which there is a national ambient standard. See criteria pollutants.

Chlorobenzene. Flammable, volatile, toxic liquid used as a solvent.

Civilian Health and Medical Program of the Uniformed Services (CHAMPUS). A co-payment medical plan that provides coverage for specific medical services to eligible dependents of active duty, retired, or deceased military personnel.

Class I, II, and III Areas. Area classifications, defined by the Clean Air Act, for which there are established limits to the annual amount of air pollution increase. Class I areas include international parks and certain national parks and wilderness areas; allowable increases in air pollution are very limited. Air pollution increases in Class II areas are less limited, and are least limited in Class III areas. Areas not designated as Class I start out as Class II and may be reclassified up or down by the state, subject to federal requirements.

Commercial aviation. Aircraft activity licensed by state or federal authority to transport passengers and/or cargo for hire on a scheduled or nonscheduled basis.

Comprehensive Plan. A public document, usually consisting of maps, text, and supporting materials, adopted and approved by a local government legislative body, which describes future land uses, goals, and policies.

Contaminants. Undesirable substances rendering something unfit for use.

Continental Control Area. The airspace of the 48 contiguous States, the District of Columbia, and Alaska (excluding the Alaska peninsula west of Longitude 160° 00'00" W), at and above 14,500 feet above mean sea level, but does not include (1) the airspace less than 15,000 feet above the surface of the earth or (2) prohibited and restricted areas, other than those listed in Federal Aviation Regulation Part 71.

Control Zone. Controlled airspace which extends upward from the surface of the earth and terminates at the base of the continental control area. Control zones that do not underlie the continental control area have no upper limit. A control zone may include one or more airports and is normally a circular area with a radius of 5 statute miles and any extensions necessary to include instrument approach and departure paths.

Convey. To deliver title of property.

Council on Environmental Quality (CEQ). Established by the National Environmental Policy Act (NEPA), the CEQ consists of three members appointed by the President. CEQ regulations (40 Code of Federal Regulations (CFR) 1500-1508, as of July 1, 1986) described the process for implementing NEPA, including preparation of environmental assessments and environmental impact statements, and the timing and extent of public participation.

Corrosive. A material that has the ability to cause visible destruction of living tissue and has a destructive effect on other substances. An acid or a base.

Craton. A relatively immobile part of the earth, generally of large size.

Criteria pollutants. The Clean Air Act required the Environmental Protection Agency to set air quality standards for common and widespread pollutants after preparing "criteria documents" summarizing scientific knowledge on their health effects. Today there are standards in effect for six "criteria pollutants":sulfur dioxide (SO_2), carbon monoxide (CO), particulate matter less than 10 microns in diameter (PM_{10}), nitrogen dioxide (NO_2), ozone (O_3), and lead (Pb).

Cultural resources. Prehistoric and historic districts, sites, buildings, objects, or any other physical evidence of human activity considered important to a culture, subculture, or a community for scientific, traditional, religious, or any other reason.

Cumulative impacts. The combined impacts resulting from all activities occurring concurrently at a given location.

Day-Night Average Sound Level (DNL). The 24-hour average-energy sound level expressed in decibels, with a 10-decibel penalty added to sound levels between 10:00 p.m. and 7:00 a.m. to account for increased annoyance due to noise during night hours.

Decibel (dB). A unit of measurement on a logarithmic scale which describes the magnitude of a particular quantity of sound pressure or power with respect to a standard reference value.

Defense Environmental Restoration Account (DERA). Department of Defense (DOD) account from which IRP activities are funded.

Disposal. Orderly placement or distribution of property.

Duplex. A two-family residential structure.

Easement. A right or privilege that a person may have on another's property.

Effluent. Waste material discharged into the environment.

Endangered Species. A species that is threatened with extinction throughout all or a significant portion of its range.

Enplanement. One person boarding an aircraft for the purpose of air travel. Includes both originating and connecting passengers.

Environmental Impact Analysis Process. The process of conducting environmental studies as outlined in Air Force Regulation 19-2.

Erosion. Wearing away of soil and rock by weathering and the action of streams, wind, and underground water.

Excess Property. Property that is no longer required by a federal agency. Excess property is made available to all other federal agencies.

Ethylbenzene. Liquid aromatic hydrocarbon used as a solvent.

Faults. Fracture in earth's crust accompanied by a displacement of one side of the fracture with respect to the other and in direction parallel to the fracture.

Fault block. Crustal units bounded by faults.

Fleet mix. Combination of aircraft used by a given agency.

Frequency. The time rate (number of times per second) that the wave of sound repeats itself, or that a vibrating object repeats itself--now expressed in Hertz (Hz), formerly in cycles per second (cps).

Friable. Easily crumbled or reduced to powder.

Fungicide. Any substance that kills or inhibits the growth of fungi.

General aviation. All aircraft that are not commercial or military aircraft.

Geomorphic. Pertaining to the form of the earth or its surface features.

Groundwater. Water within the earth that supplies wells and springs.

Groundwater basin. Subsurface structure having the character of a basin with respect to collection, retention, and outflow of water.

Habituate. To become accustomed to frequent repetition or prolonged exposure.

Hazardous material. Generally, a substance or mixture of substances that has the capability of either causing or significantly contributing to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness; or posing a substantial present or potential risk to human health or the environment.

Hazardous waste. A waste, or combination of wastes, which, because of its quantity, concentration, or physical, chemical, or infectious characteristics, may either cause or significantly contribute to, an increase in mortality or an increase in serious irreversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed. Regulated under the Resource Conservation and Recovery Act (RCRA).

Herbicide. A pesticide, either organic or inorganic, used to destroy unwanted vegetation, especially various types of weeds, grasses, and woody plants.

Hydrocarbons. Any of a vast family of compounds containing hydrogen and carbon. Used loosely to include many organic compounds in various combinations; most fossil fuels are composed predominately of hydrocarbons. When hydrocarbons mix with nitrogen oxides in the presence of sunlight, ozone is formed; hydrocarbons in the atmosphere contribute to the formation of ozone.

Impacts (effects). An assessment of the meaning of changes in all attributes being studied for a given resource; an aggregation of all the adverse effects, usually measured using a qualitative and nominally subjective technique. In this Environmental Impact Statement (EIS), as well as in the CEQ regulations, the word impact is used synonymously with the word effect.

Infrastructure. The basic installations and facilities on which the continuance and growth of a locale depend (roads, schools, power plants, transportation and communication systems, etc.)

Interstate. The designated National System of Interstate and Defense Highways located in both rural and urban areas; they connect the East and West coasts and extend from points on the Canadian border to various points on the Mexican border.

L_{eq}. The equivalent steady state sound level that in a stated period of time would contain the same acoustical energy as time-varying sound level during the same period.

L_{max}. The highest A-weighted sound level observed during a single event of any duration.

Lead (Pb). A heavy metal used in many industries, which can accumulate in the body and cause a variety of negative effects. One of the six pollutants for which there is a national ambient air quality standard. See criteria pollutants.

Level of service (LOS). In transportation analyses, a qualitative measure describing operational conditions within a traffic stream and how they are perceived by motorists and/or passengers. In public services, a measure describing the amount of public services (e.g., fire protection and law enforcement services) available to community residents, generally expressed as the number of personnel providing the services per 1,000 population.

Lithic. Pertaining to stone material.

Loam, loamy. Rich, permeable soil composed of a mixture of clay, silt, sand, and organic matter.

Loudness. The qualitative judgement of intensity of a sound by a human being.

Magnitude. Richter scale logarithmic measurement of the energy released by an earthquake.

Masking. The action of bringing one sound (audible when heard alone) to inaudibility or to unintelligibility by the introduction of another sound.

Military Operations Areas. Airspace areas of defined vertical and lateral limits established for the purpose of separating certain training activities, such as air combat maneuvers, air intercepts, and acrobatics, from other air traffic operating under instrument flight rules.

Mineral. Naturally occurring inorganic element or compound.

Mineral resources. Any mass of ore or deposits of known or potential economic value that may become available for use.

Mitigation. A method or action to reduce or eliminate program impacts.

Multi-family housing. Townhouse or apartment units that accommodate more than one family though each dwelling unit is only occupied by one household.

National Ambient Air Quality Standards (NAAQS). Section 109 of the Clean Air Act requires Environmental Protection Agency (EPA) to set nationwide standards, the National Ambient Air Quality Standards, for widespread air pollutants. Currently, six pollutants are regulated by primary and secondary NAAQS: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter (PM_{10}), and sulfur dioxide. See criteria pollutants.

National Environmental Policy Act (NEPA). Public Law 91-190, passed by Congress in 1969. The Act established a national policy designed to encourage consideration of the influences of human activities (e.g., population growth, high-density urbanization, industrial development) on the natural environment. NEPA also established the Council on Environmental Quality. NEPA procedures require that environmental information be made available to the public before decisions are made. Information contained in NEPA documents must focus on the relevant issues in order to facilitate the decision-making process.

National Priorities List (NPL). A list of sites (created and maintained by the U.S. Environmental Protection Agency) where releases of hazardous materials may have occurred and may cause an unreasonable risk to the health and safety of individuals, property, or the environment.

National Register of Historic Places (NRHP). A register of districts, sites, buildings, structures, and objects important in American history, architecture, archaeology, and culture, maintained by the Secretary of the Interior under authority of Section 2(b) of the Historic Sites Act of 1935 and Section 101(a)(1) of the National Historic Preservation Act of 1966, as amended.

Native Americans. Used in a collective sense to refer to individuals, bands, or tribes who trace their ancestry to indigenous populations of North America prior to Euro-American contact.

Native vegetation. Plant life that occurs naturally in an area without agricultural or cultivational efforts. It does not include species that have been introduced from other geographical areas and become naturalized.

Nitrogen dioxide (NO_2). Gas formed primarily from atmospheric nitrogen and oxygen when combustion takes place at high temperature. NO_2 emissions contribute to acid deposition and formation of atmosphere ozone. One of the six pollutants for which there is a national ambient standard. See Criteria Pollutants.

Nitrogen oxides (NO_x). Gases formed primarily by fuel combustion, which contribute to the formation of acid rain. Hydrocarbons and nitrogen oxides combine in the presence of sunlight to form ozone, a major constituent of smog.

Noise. Any sound that is undesirable because it interferes with speech and hearing, or is intense enough to damage hearing, or is otherwise annoying (unwanted sound).

Noise attenuation. The reduction of a noise level from a source by such means as distance, ground effects, or shielding.

Noise contour. A line connecting points of equal noise exposure on a map. Noise exposure is often expressed using the average day-night sound level, DNL.

Non-attainment area. An area that has been designated by the EPA or the appropriate state air quality agency, as exceeding one or more National or State Ambient Air Quality Standards.

100-year flood zone. Land area having a 1-percent chance of being flooded during a given year.

Operating Location (OL). An organizational element of the Air Force Base Conversion Agency (AFBCA) located at a closing base. The OL is responsible for the care and custody of closed areas of the base, administration of real and related personal property and environmental cleanup. This office is the primary point of contact for local community reuse organizations and the general public who deal with the disposal and reuse of the base.

Outlease. A real estate interest by which the government gives exclusive possession of real estate or facilities for a specified term.

Ozone (ground level). A major ingredient of smog. Ozone is produced from reactions of hydrocarbons and nitrogen oxides in the presence of sunlight and heat. Approximately 68 areas, mostly metropolitan areas, did not meet a 31 December 1987 deadline in the Clean Air Act (CAA) for attaining the ambient air quality standard for ozone.

Passenger Car Equivalent. The number of passenger cars that are displaced by a single heavy vehicle of a particular type under prevailing roadway, traffic, and control conditions.

PCB-contaminated equipment. Equipment that contains a concentration of polychlorinated byphenyls (PCBs) (see definition) from 50 to 499 ppm and regulated by the U.S. EPA.

PCB equipment. Equipment that contains a concentration of PCBs of 500 ppm or greater and regulated by the U.S. EPA.

Permeability. The capacity of a porous rock or sediment to transmit a fluid.

Pesticides. Any substance, organic or inorganic, used to destroy or inhibit the action of plant or animal pests; the term thus includes insecticides, herbicides, fungicides, rodenticides, miticides, fumigants, and repellents. All pesticides are toxic to humans to a greater or lesser degree. Pesticides vary in biodegradability.

pH. A measure of acidity or alkalinity of a substance on a scale of 0-14. Pure water (neutral) has a pH of 7. Acids have a pH less than 7; bases have a pH greater than 7.

Physiographic Province. A region in which all parts are similar in geologic structure and climate.

Pickled. Preserved for future use by cleaning out, etc.

Pleistocene. An earlier epoch of the Quaternary period during the "ice age" beginning approximately 3 million years ago and ending 10,000 years ago. Also refers to the rocks and sediments deposited during that time.

Plume. An elongated mass of contaminated fluid moving with the flow of groundwater.

Polychlorinated Biphenyls (PCBs). Any of a family of industrial compounds produced by chlorination of biphenyl. These compounds are noted chiefly as an environmental pollutant that accumulates in organisms and concentrates in the food chain with resultant pathogenic and teratogenic effects. They also decompose very slowly.

Potable water. Suitable for drinking.

Prehistoric. The period of time before the written record.

Prevention of Significant Deterioration (PSD). In the 1977 Amendments to the Clean Air Act, Congress mandated that areas with air cleaner than required by National Ambient Air Quality Standards must be protected from significant deterioration. The Clean Air Act's PSD program consists of two elements: requirements for best available control technology on major new or modified sources, and compliance with an air quality increment system.

Prevention of Significant Deterioration Area. A requirement of the Clean Air Act that limits the increases in ambient air pollutant concentrations in attainment areas to certain increments even though ambient air quality standards are met.

Prime farmland. Agricultural lands protected from conversion by the U.S. Department of Agricultural due to their optimal physical and chemical characteristics for production of crops.

Primary roads. A consolidated system of connected main roads important to regional, statewide, and interstate travel; they consist of rural arterial routes and their extensions into and through urban areas of 5,000 or more population.

Quartz. Monzonite (basement complex), coarse-grained igneous rock containing quartz, feldspar, and mafic minerals.

Quaternary. The portion of the geological time table/stratigraphic classification system referring to the second (or upper) period of the Cenozoic Era. The Quaternary Period began 2 to 3 million years ago and extends to the present. Also refers to the rocks and sediment deposited during that time.

Recent. The geologic time period from approximately 10,000 years ago to the present and the rocks and sediment deposited during that time.

Riparian. Of or on the bank of a natural course of water.

Rookery. A breeding ground of certain birds and animals.

Sediment. Material deposited by wind or water.

Seismicity. Relative frequency and distribution of earthquakes.

Seismic Zone. Portions of the United States defined in a numeric system (0 thru 4) representing (generally) the likelihood of structural damage from earthquakes. Areas in Zone 0 are expected to experience little or no effects from seismic events. Areas in Zone 4 may experience severe effects. The zones are defined by and used in the Uniform Building Code to incorporate increasing amounts of structural strength into buildings, as a preventive measure to structural damage.

Shrink/Swell Potential. Volume change in soils possible upon wetting or drying.

Site. As it relates to cultural resources, any location where humans have altered the terrain or discarded artifacts. When in reference to hazardous materials or hazardous wastes management, a site is an area of known or potential contamination resulting from past hazardous materials/wastes storage, handling, and disposal practices.

Sludge. A heavy, slimy deposit, sediment, or mass resulting from industrial activity; solids removed from wastewater.

Soil Association. Two or more soils occurring together in a characteristic pattern.

Soil Series. A group of soils having similar parent materials, genetic horizons, and arrangement in the soil profile.

Solvent. A substance that dissolves or can dissolve another substance.

State Historic Preservation Officer (SHPO). The official within each state, authorized by the state at the request of the Secretary of the Interior, to act as liaison for purposes of implementing the National Historic Preservation Act.

Sulfur dioxide (SO_2). A toxic gas that is produced when fossil fuels, such as coal and oil, are burned. SO_2 is the main pollutant involved in the formation of acid rain. SO_2 also can irritate the upper respiratory tract and cause lung damage. During 1980, some 27 million tons of sulfur dioxide were emitted in the U.S., according the Office of Technology Assessment. The major source of SO_2 in the U.S. is coal-burning electric utilities.

Surplus Property. Property that is of no interest to the federal government. These properties are made available to state, local or non-profit organizations or sold to the public.

Tectonic framework. Structural geologic elements of a region including the rising, stable, and subsiding areas.

Terminal Control Area (TCA). Controlled airspace extending upward from the surface or higher to specified altitudes, within which all aircraft are subject to operating rules (i.e., altitudes, direction of flight, etc.) and equipment requirements.

Tetrachoroethene (PCE). Colorless corrosive liquid, used as a solvent.

Therm. A measurement of units of heat.

Threatened Species. Plant and wildlife species likely to become endangered in the foreseeable future.

Tiering. Tiering refers to the coverage of general matters in broader environmental impact statements (such as national program or policy statements) with subsequent narrower statements or environmental analyses (such as regional or basinwide program statements or ultimately site-specific statements) incorporating by reference the general discussions and concentrating solely on the issues specific to the statement subsequently prepared.

Toluene. Liquid aromatic hydrocarbon used as solvent.

Total Suspended Particulates (TSP). The particulate matter in the ambient air. The previous national ambient air quality standard for particulates was based on TSP levels; it was replaced in 1987 by an ambient standard based on PM_{10} levels.

Transfer. Deliver U.S. government property accountability to another federal agency.

Transition Area. Controlled airspace extending 700 feet or more upward from the surface of the earth when designated in conjunction with an airport for which an approved instrument approach procedure has been prescribed; or from 1,200 feet or more above the surface of the earth when designated in conjunction with airway route structures or segments. Unless otherwise specified, transition areas terminate at the base of the overlying controlled airspace.

Trichloroethylene (TCE). A nonflammable, halogenated liquid, C_2HCl_3 used especially as a solvent for the removal of grease from metal.

Unified Soil Classification System. A rapid method for identifying and grouping soils for construction. Soils are grouped by grain size, distribution, and liquid limit.

Unique Farmland. Agricultural lands that may be subject to protection from conversion by the U.S. Department of Agricultural due to their value for production of specific or high economic value crops.

U.S. Environmental Protection Agency (U.S. EPA). The independent federal agency, established in 1970, that regulates federal environmental matters and oversees the implementation of federal environmental laws.

Waters of the United States. Waters that are subject to Section 404 of the Clean Water Act. These include both deep water aquatic habitats and special aquatic sites, including wetlands. Jurisdictional wetlands include those that are isolated, part of intermittent streams, or that are adjacent to waters that are, or eventually flow into, interstate or navigable waters.

Wetlands. Areas that are inundated or saturated with surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil. This classification includes swamps, marshes, bogs, and similar areas. Jurisdictional wetlands are those wetlands that meet the hydrophytic vegetation, hydric soils, and wetland hydrology criteria under normal circumstances (or meet the special circumstances as described in the Civil Engineering, 1987 wetland delineation manual where one or more of these criteria may be absent) and are a subset of "waters of the United States."

Xylene. Liquid aromatic hydrocarbon used as a solvent.

Zoning. The division of a municipality (or county) into districts for the purpose of regulating land use, types of building, required lot size, necessary off-street parking, and other prerequisites to development. Zones are generally shown on a map and the text of the zoning ordinance specifies requirements for each zoning category.

ACRONYMS/ABBREVIATIONS

AADT	average annual daily traffic
ACC	Air Combat Command
ACM	asbestos-containing materials
ADT	average daily traffic
AF	Air Force
AFB	Air Force Base
AFBCA	Air Force Base Conversion Agency
AFR	Air Force Regulation
AFRES	Air Force Reserve
af/yr	acre-feet per year
AGE	Aerospace Ground Equipment
AHERA	Asbestos Hazard Emergency Response Act
AICUZ	Air Installation Compatible Use Zone
ALCM	Air Launch Cruise Missile
AMP	Asbestos Management Plan
AMT	American Medical Transport
ANSI	American National Standards Institute
APZ	Accident Potential Zone
ARFF	Airport Rescue and Fire Fighting
ARTCC	Air Route Traffic Control Center
ASC/EMVR	Aero Systems Center/Environmental Management Restoration
ASR	approach surveillance radar
ATA	airport traffic area
ATC	air traffic control
ATCT	air traffic control tower
BACT	Best Available Control Technology
BASH	Bird Aircraft Strike Hazard
BCE	Base Civil Engineering
BOD	biological oxygen demand
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CAM	Continuing Automated Monitoring
CE	Civil Engineering
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CHAMPUS	Civilian Health and Medical Program of the Uniformed Services
CO	carbon monoxide
CO_2	carbon dioxide
COE	Corps of Engineers

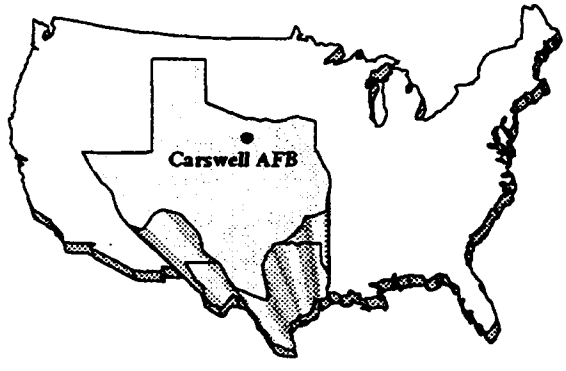
CPSC	Consumer Product Safety Commission
CRA	Carswell Redevelopment Authority
CWA	Clean Water Act
CZ	Clear Zone
DAL	Dallas Love Field
dB	decibel
dBA	A-weighted decibel
DBCRA	Defense Base Closure and Realignment Act
DEIS	Draft Environmental Impact Statement
DERA	Defense Environmental Restoration Account
DERP	Defense Environmental Restoration Program
DFW	Dallas/Fort Worth International Airport
DNL	Day-night average sound level
DOD	Department of Defense
DOT	Department of Transportation
DRMO	Defense Reutilization and Marketing Office
DSMOA	Defense-State Memorandum of Agreement
EDMS	Emissions and Dispersion Modeling System
EEG	electroencephalogram
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement
EO	Executive Order
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
F	Fahrenheit
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
FBOP	Federal Bureau of Prisons
FDTA	Fire Department Training Area
FEIS	Final Environmental Impact Statement
FFA	Federal Facilities Agreement
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FMCC	Federal Medical Center Complex
FPMR	Federal Property Management Regulations
FS	Feasibility Study
ft	feet
FW	Fighter Wing
FY	fiscal year
GCA	Ground Controlled Approach
GSA	General Services Administration
HAP	hazardous air pollutant
HHS	U.S. Department of Health and Human Services

HMC&M	Hazardous Materials Control and Management
HMTA	Hazardous Materials Transportation Act
HP	horsepower
HUD	U.S. Department of Housing and Urban Development
Hz	Hertz
I	Interstate
IAP	instrument approach procedure
IFR	instrument flight rules
ILS	instrument landing system
IRP	Installation Restoration Program
kV	kilovolt
LAER	lowest achievable emission rate
LBPPPA	Lead-Based Paint Poisoning Prevention Act
L_{dn}	day-night average sound level
L_{eq}	equivalent sound level
L_{max}	maximum instantaneous sound level
LOS	level of service
MACT	maximum achievable control technology
MCL	maximum contaminant level
$\mu g/m^3$	micrograms per cubic meter
mg/l	milligrams per liter
MGD	million gallons per day
MMCF/day	million cubic feet per day
mg/m^3	milligrams per cubic meter
mm Hg	millimeters Mercury
MOA	Military Operations Area
MSDS	Material Safety Data Sheet
MSL	mean sea level
MTR	military training routes
MW	megawatt
MWH/day	megawatt-hours per day
N_2O	nitrous oxide
N_2O_3	nitrous anhydride
N_2O_4	nitrogen tetroxide
N_2O_5	nitric anhydride
NAAQS	National Ambient Air Quality Standards
NAS	Naval Air Station
NAVAID	navigational aid
NCP	National Contingency Plan
NCTCOG	North Central Texas Council of Governments
NEPA	National Environmental Policy Act of 1969
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act

NLR	Noise Level Reduction
NM	nautical mile
NO	nitric oxide
NO_2	nitrogen dioxide
NO_3	nitrogen trioxide
NOI	Notice of Intent
NOISEMAP	Noise Exposure Model
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPS	National Park Service
NRHP	National Register of Historic Places
O_3	ozone
OL	Operating Location
OPNAVINST	Office of the Chief Naval Operations Instruction
OSHA	Occupational Safety and Health Administration
P.L.	Public Law
PA	Preliminary Assessment
PA/SI	Preliminary Assessment/Site Inspection
PCB	polychlorinated biphenyls
PCE	tetrachloroethane
pCi/l	picocuries per liter
PHV	peak hour volume
P.L.	Public Law
PM_{10}	particulate matter equal to or less than 10 microns in diameter
POL	petroleum, oils, and lubricants
ppm	parts per million
PSD	Prevention of Significant Deterioration
QD	quantity distance
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RD/RA	Remedial Design/Remedial Action
RFA	RCRA facility assessment
RFI	RCRA facility inspection
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
ROG	reactive organic gases
ROI	Region of influence
ROTC	Reserve Officers Training Corps
RPZ	Runway Protection Zone
SAC	Strategic Air Command

SARA	Superfund Amendments and Reauthorization Act
SCS	Soil Conservation Service
SEL	sound exposure level
SH	State Highway
SHPO	State Historic Preservation Officer
SI	Site Inspection
SIAS	Socioeconomic Impact Analysis Study
SIP	State Implementation Plan
SO_2	sulfur dioxide
SO_x	sulfur oxide
SPCC	Spill Prevention Control and Countermeasures
SPRP	Spill Prevention and Response Plan
SVFR	Special Visual Flight Rules
SWMU	solid waste management units
TAC	Texas Administrative Code
TACAN	tactical air navigation
TACB	Texas Air Control Board
TCA	Terminal control area
TCE	trichloroethylene
TCM	transportation control measures
TD	technology development
TDPW	Texas Department of Parks and Wildlife
TIP	Transportation Improvement Program
TLF	temporary lodging facility
TNRCC	Texas Natural Resources Conservation Commission
tons/day	tons per day
tons/year	tons per year
TRACON	Terminal Radar Approach Control
TSCA	Toxic Substances Control Act
TSD	Transfer, storage and disposal
TSP	total suspended particulate
TSS	total suspended solids
TU	Texas Utilities
TWC	Texas Water Commission
TXDOT	Texas Department of Transportation
UNICOR	Federal Prison Industries
U.S. EPA	U.S. Environmental Protection Agency
U.S.C.	U.S. Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USN	U.S. Navy
UST	underground storage tank

VAQ	visiting airmen's quarters
VFR	visual flight rules
VOC	volatile organic compounds
VOQ	visiting officer's quarters
WHCA	White House Communications Agency
WSA	Weapons Storage Area



APPENDIX B

APPENDIX B

NOTICE OF INTENT

APPENDIX B

NOTICE OF INTENT

The following notice of intent was circulated and published by the Air Force in the October 9, 1991 Federal Register in order to provide public notice of the Air Force's intent to prepare an Environmental Impact Statement (EIS) of disposal and reuse of Carswell Air Force Base. This Notice of Intent has been retyped for clarity and legibility.

Please note: The point of contact for information on the disposal and reuse EISs has been changed. The new point of contact is:

Lt Colonel Gary Baumgartel
Director, Environmental Conservation and Planning
HQ AFCEE/EC
8106 Chennault Road
Brooks AFB, Texas 78235-5318

NOTICE OF INTENT
TO PREPARE ENVIRONMENTAL IMPACT STATEMENTS
FOR DISPOSAL AND REUSE OF THIRTEEN AIR FORCE BASES

The United States Air Force will prepare thirteen environmental impact statements (EISs) to assess the potential environmental impacts of disposal and reuse of the following Air Force bases recently directed to be closed under the provisions of the Defense Base Closure and Realignment Act of 1990 (Public Law 101-510, Title XXIX):

Closing Base

Bergstrom AFB, Austin, Texas

Carswell AFB, Fort Worth, Texas

Castle AFB, Merced, California

Eaker AFB, Blytheville, Arkansas

England AFB, Alexandria, Louisiana

Grissom AFB, Peru, Indiana

Loring AFB, Limestone, Maine

Lowry AFB, Denver, Colorado

Myrtle Beach AFB, Myrtle Beach, South Carolina

Richards Gebaur ARS, Kansas City, Missouri

Rickenbacker AGB, Columbus, Ohio

Williams AFB, Chandler, Arizona

Wurtsmith AFB, Oscoda, Michigan

Each EIS will address the disposal of the property to public or private entities and the potential impacts of reuse alternatives. All available property will be disposed of in accordance with provisions of Public Law 101-510 and applicable federal property disposal regulations.

The Air Force plans to conduct a scoping and screening meeting within the local area for each base during October and November 1991. Notice of the time and place of each meeting will be made available to public officials and local news media outlets once it has been finalized. The purpose of each meeting is to determine the environmental issues and concerns to be analyzed for the base disposal and reuse in that area, to solicit comments on the proposed action and to solicit proposed disposal and reuse alternatives that should be addressed in the EIS for that base. In soliciting disposal and reuse inputs, the Air Force intends to consider all reasonable alternatives offered by any federal, state, or local government agency and any federally-sponsored or private entity or individual with an interest in acquiring available property at one of the listed closing bases. The

resulting environmental impacts will be considered in making disposal decisions to be documented in the Air Force's final disposal plan for each base.

To ensure the Air Force will have sufficient time to consider public inputs on issues to be included in the EISs, and disposal alternatives to be included in the final disposal plans, comments and reuse proposals should be forwarded to the address listed below by December 1, 1991. However, the Air Force will accept comments at the address below at any time during the environmental impact analysis process.

For further information concerning the study of these base disposal and reuse EIS activities, contact:

Lt. Colonel Tom Bartol
AFCEE/ESE
Norton AFB, California 92409-6448

Note: Comment date was extended from December 1, 1991 to January 2, 1992 after processing and publication of this Notice of Intent.

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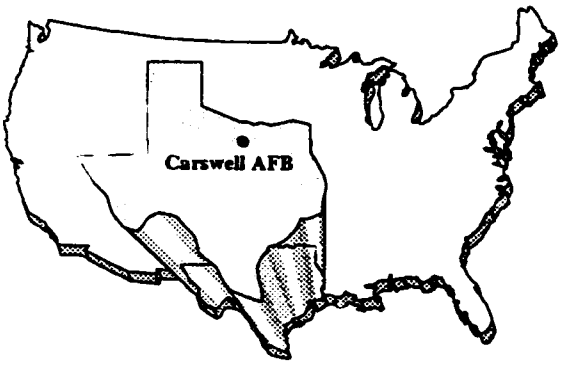

APPENDIX C

APPENDIX C

DRAFT ENVIRONMENTAL IMPACT STATEMENT MAILING LIST

APPENDIX C

DRAFT ENVIRONMENTAL IMPACT STATEMENT MAILING LIST

This list of recipients includes interested federal, state, and local agencies and individuals who have expressed an interest in receiving the document. This list also includes the Governor of Texas, as well as United States senators and representatives and state legislators.

ELECTED OFFICIALS

Federal Officials

U.S. Senate

The Honorable Phil Gramm
The Honorable Kay Bailey Hutchison

U.S. House of Representatives

The Honorable Joe Barton
The Honorable Pete Geren

State of Texas Officials

Governor

The Honorable Ann E. Richards

State Legislature

The Honorable Kenneth Brimer
The Honorable Bill G. Carter
The Honorable Homer Dear
The Honorable Toby Goodman
The Honorable Kent Grusendorf
The Honorable Chris Harris
The Honorable Mike Moncrief
The Honorable Anna Mowery
The Honorable Jay Nelson
The Honorable Carolyn Park
The Honorable Garfield Thompson
The Honorable Royce West
The Honorable Doyle Willis

Local Officials

The Honorable Sam Berry
Mayor of Westover Hills

The Honorable J.T. Cockerham
Mayor of River Oaks

The Honorable Merle Easterling
Mayor of Sansom Park Village

The Honorable Kay Granger
Mayor of Fort Worth

The Honorable Ray Landy
Mayor of Westworth Village

The Honorable James Herring
Mayor of White Settlement

The Honorable J.T. Hinkle
Mayor of Lake Worth

GOVERNMENT AGENCIES

Federal Agencies

Administrative Services and Property Management
Office of the Secretary of Transportation
Deputy Director

Advisory Council on Historic Preservation

Army Corps of Engineers
Commander

Bureau of Mines
Director

Council of Economic Advisors

Department of Commerce
Director, Economic Adjustment Division

Federal Agencies (Continued)

Department of Commerce
Director, Office of Intergovernmental Affairs

Department of Defense (FM&P)
Director, Office of Economic Adjustment, Pentagon

Department of Veterans Affairs
Office of the Secretary

Department of Education
Assistant to the Deputy Under Secretary
for Intergovernmental and Interagency Affairs

Department of Transportation
Federal Aviation Administration

Department of Energy
Division of Intergovernmental Affairs

Department of Health and Human Services
Office of Human Development Services

Department of Housing and Urban Development
Director, Community Management Division

Department of the Interior
National Park Service

Department of the Interior
Director, Office of Environmental Affairs

Department of Labor
Intergovernmental Affairs

Environmental Protection Agency
Director, Office of Federal Activities

Small Business Administration
Director, Office of Procurement

Regional Offices of Federal Agencies

Advisory Council on Historic Preservation
Director, Western Office of Project Review

Department of Commerce
Regional Director, Economic Development Administration

Department of Health and Human Services
Region 6
Environmental Review Officer

Department of Housing and Urban Development
Environment Officer

Department of the Interior
Office of Environmental Affairs

Department of the Interior
Federal Aviation Administration
Southwest Region

Environmental Protection Agency
Region VI
Chief, Federal Activities Branch

Federal Emergency Management Administration

Federal Energy Regulating Commission
Regional Director

Fish and Wildlife Service
Director

General Services Administration
Regional Offices of Real Estate Sales
Director, Real Estate Division
Region 7

Soil Conservation Service
Director

Native American Groups

Tonkawa Tribe of Oklahoma

State of Texas Agencies

Bureau of Economic Geology
Director

Community Affairs Department
Executive Director

Education Agency
Commissioner

Employment Commission
Chairman

General Land Office
Commissioner

Governor's Office of Budget and Planning
State Single Point of Contact

Higher Education Coordinating Board
Commissioner of Higher Education

Municipal Power Agency
General Manager

Texas Department of Commerce
Executive Director

Office of the Governor
Director of Environmental Policy

Parks and Wildlife Department
Chairman

Public Utility Commission
Executive Director

Real Estate Commission
Administrator

Soil and Water Conservation Board
Executive Director

State of Texas Agencies (Continued)

Texas Department of Transportation
District Engineer

Texas Historical Commission
Executive Director

Texas Natural Resources Conservation Commission
Executive Director

Water Development Board
Executive Administrator

Local Government Agencies

Castleberry Independent School District
School Superintendent

City of Benbrook
City Manager

City of Dallas
Economic Development Department

City of Fort Worth
Research and Economic Development Department
Ann Dively

City Manager, Fort Worth
David Ivory

Fort Worth Aviation Department
Gary Curtiss

Fort Worth Chamber of Commerce
Mike Rossa

Fort Worth Department of Public Works and Transportation
Walt A. Cooper

Local Government Agencies (Continued)

Fort Worth Independent School District
School Superintendent

Fort Worth Independent School District
Assistant School Superintendent

Fort Worth Environmental Management Department
Rick Hay

Fort Worth Planning Department
Emil Moncivis

Fort Worth Water Department
Bertha Davis

Historic Preservation Council
Marty Craddock

Intergovernmental Affairs Coordinator, Fort Worth
Joe Paniagua

Lake Worth Independent School District
School Superintendent

North Central Texas Council of Governments
Alice Tate

North Texas Commission
Chairman

River Oaks Utility Department
Mayor's Office

Sansom Park Utility Department
Mayor's Office

Tarrant County Commissioner
Court Administrator

Tarrant County Historical Commission
Lila Standifer

Tarrant County Planning Department
County Administrator

Local Government Agencies (Continued)

Tarrant County Transportation/Public Works Department

White Settlement Independent School District
School Superintendent

White Settlement Public Works Department
Paul Bounds

Libraries

Fort Worth Central Library

Texas Christian University
Main Library

University of Texas, Arlington
Library, Government Documents Section

White Settlement Public Library

Other Organizations/Individuals

American Operations Corporation

Base Closure Engineering Group

BNA Plus

Carswell Redevelopment Authority

Dallas/Fort Worth International Airport Board
Executive Office

Richard DeLong

Economic Transition Office

The Environmental Company

Other Organizations/Individuals (Continued)

John Harms

Huguley Memorial Hospital Corporation

Labat Anderson, Inc.

Lockheed Corporation

National Audubon Society

National Wildlife Federation

Nature Conservancy

Sherwood Associates

Charles Willis & Associates

Wylie Laboratories

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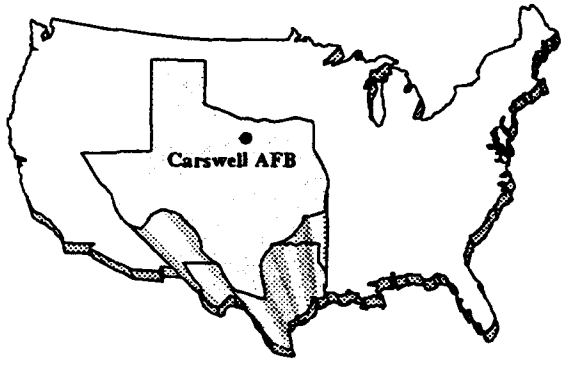

APPENDIX D

APPENDIX D

CARSWELL AFB INSTALLATION RESTORATION PROGRAM (IRP) BIBLIOGRAPHY

APPENDIX D

CARSWELL AFB INSTALLATION RESTORATION PROGRAM (IRP) BIBLIOGRAPHY

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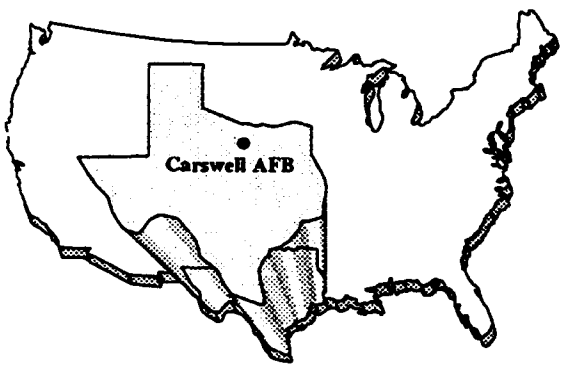

APPENDIX E

APPENDIX E

METHODS OF ANALYSIS

APPENDIX E
METHODS OF ANALYSIS

1.0 INTRODUCTION

This section describes the methods used in preparing this environmental impact statement (EIS). These methods were designed and implemented to evaluate the potential environmental impacts of disposal of Carswell Air Force Base (AFB) and incident reuse. Since future civilian reuse of the site is uncertain in its scope, activities, and timing, the analysis considered several alternative reuse scenarios and evaluated their associated environmental impacts. The reuse scenarios analyzed in this EIS were defined for this study to span the anticipated range of civilian reuse activities that are reasonably likely to occur due to disposal of the base.

The various analysis methods used to develop this EIS are summarized here by resource. In some instances, more detail is included in another appendix. These instances are noted for each resource in its respective subsection below.

2.0 LOCAL COMMUNITY

2.1 COMMUNITY SETTING

The section on community setting was developed to provide the context within which other biophysical impacts could be assessed. Community setting impacts were based on projected direct and secondary employment and resulting population changes related to reuse of Carswell AFB. These projections were used to quantify and evaluate changes in demand on community services, demand on transportation systems, air quality, and noise. A complete assessment of socioeconomic effects was conducted through a separate Socioeconomic Impact Analysis Study (SIAS) for the Disposal and Reuse of Carswell AFB, which is the source for baseline and projected statistics used in this EIS.

The SIAS used information from sources including the U.S. Bureau of Economic Analysis, U.S. Bureau of Labor Statistics, U.S. Council of Economic Advisors, and the cities of Fort Worth, White Settlement, Westworth Village, and several other smaller communities located near the base. The analysis used the Regional Input-Output Modeling System (RIMS II) model to generate demographic and economic projections associated with the reuse alternatives.

2.2 LAND USE AND AESTHETICS

Potential land use impacts were projected based on compatibility of land uses associated with the reuse alternatives with adjacent land uses and

zoning, consistency with general plans and other land use plans and regulations, and effects of aircraft noise and safety restrictions on land uses.

The region of influence (ROI) for the majority of direct land use impacts for this study consisted of Carswell AFB, and portions of the cities of Fort Worth, White Settlement, Lake Worth, and Westworth Village surrounding the base.

U.S. Air Force Tabs and aerial photographs from both 1990 and 1992 were used to characterize on- and off-base land uses. Applicable policies, regulations, and land use restrictions were identified from the available land use plans and ordinances of the cities of Fort Worth, White Settlement, and Westworth Village. The alternatives were compared to existing land use and zoning to identify areas of conflict; they were also compared to local subdivision regulations.

Land uses were examined for consistency with Department of Defense (DOD) guidelines concerning recommended land uses in the vicinity of airfields. Impacts of airfield-generated noise were assessed by comparing the extent of noise-affected areas under reuse against preclosure and closure conditions.

For the aesthetics analysis, the affected environment was described based upon the visual sensitivity of areas within and visible from the base. These areas were classified by a "windshield" survey in spring 1992 and a review of 1990 aerial photographs. These areas were categorized as high, medium, and low sensitivity. The reuse alternatives were then evaluated to identify land uses to be developed, visual modifications that would occur, and new areas of visual sensitivity and determine whether modification of unique or otherwise irreplaceable visual resources would occur and detract from the visual qualities or setting. Consistency with applicable plans that protect visual resources was also examined.

2.3 TRANSPORTATION

Potential impacts to transportation due to the reuse alternatives focus on key roads and local airport use in the area, including those segments of the transportation networks in the region that serve as linkages to the base. The need for improvements to on-base roads, off-base access, and regional arterials was considered. The analysis was derived using information from state and local government agencies, including the Texas Department of Highways and Public Transportation, City of Fort Worth, and the North Central Texas Council of Governments; and local airport authorities. Other data sources used for the roadway analysis include the Institute of Transportation Engineers and the Transportation Research Board. The ROI for the transportation analysis includes portions of Tarrant County with emphasis on the area surrounding Carswell AFB.

The number of vehicle trips expected as a result of specific land uses on the site was estimated for the years 1993, 1998, 2003, and 2013 on the basis of direct on-site jobs and other attributes of on-site land uses (such as the number of dwelling units, commercial and industrial development, and other factors). Trip Generation Data from the Institute of Transportation Engineers was used to determine vehicle trips. Vehicle trips were then allocated to the local road network using prior patterns and expected destinations and sources of trips. Traffic generated by Naval Air Station (NAS) Dallas was assumed to originate at the current residence locations of NAS Dallas employees. When appropriate, the local road network was adjusted to account for changes over time from presently planned road capacity improvements and improvements required by the proposed reuse scenarios. Changes in work and associated travel patterns were derived by assigning or removing traffic to or from the most direct commuting routes. Freeway-bound traffic was determined as a percentage of total trips, then distributed to key regional roads based on trip length distribution. Changes in traffic volumes arising from reuse alternatives at Carswell AFB were estimated and resulting volume changes on key local, regional, and on-base roadway segments were then determined.

The transportation network in the ROI was then examined to identify potential impacts to Levels of Service (LOSs) arising from post-closure conditions and the effects of reuse alternatives. The planning application from the Highway Capacity Manual provided estimates of traffic and anticipated LOS. The planning procedures used in this analysis were based on forecasts of peak hour volumes and on assumed traffic, roadway, and control conditions. Intersections were considered where appropriate. The results provided an estimate of the changes in LOS ratings expected as a result of traffic volume changes on key local and regional roadway segments.

Airspace use in the vicinity of an airport is driven primarily by such factors as runway alignment, surrounding obstacles and terrain, air traffic control and navigational aid capabilities, proximity of other airports/airspace uses in the area, and noise considerations. These same factors normally apply regardless of whether the airport is used for military or civil aircraft operations. For this reason, a preclosure reference and closure conditions were used in characterizing these factors related to airspace use at Carswell AFB.

Historic data on military aircraft operations used to characterize airspace use at and around Carswell AFB were obtained from the base. Airport owners/ operators were contacted to obtain information on civil airport use. Aviation forecasts were derived from the North Central Texas Council of Government Studies and, where necessary, assumptions were made based on other similar airport operational environments.

The ROI selected for this airspace analysis is an area within a 30-nautical mile (NM) radius of Carswell AFB from the surface up to 3,000 feet mean sea level (MSL). The ROI selected for Carswell AFB encompasses the airspace that is delegated to Carswell Ground Controlled Approach (GCA) for providing radar flight-following services, vector services, and also terminal radar approach control (TRACON), instrument landing system (ILS), approach surveillance radar (ASR), and visual approach services to aircraft arriving at Carswell AFB.

The types and levels of aircraft operations projected for the reuse alternatives were compared to the preclosure and projected airspace configuration. The capacity of the airport to accommodate the projected aircraft fleet and operations was assessed by calculating the airport service volume using the criteria in the Federal Aviation Administration (FAA) Advisory Circular 150/5060-5. Potential effects on airspace use were assessed based on the extent to which projected operations could (1) require modifications to the airspace structure or air traffic control systems and/or facilities; (2) restrict, limit, or otherwise delay other air traffic in the region; or (3) encroach on other airspace areas and uses. It was recognized throughout the analysis process that a more in-depth study would be conducted by the FAA, and appropriate actions that would be required to support the projected aircraft operations would be identified. Therefore, this analysis was only used to consider the level of operations that could likely be accommodated under the existing airspace structure and to identify potential impacts if operational capacities were exceeded.

Data addressing private, passenger, and cargo air service in the region were directly acquired from air transportation studies of the area. The effect of base closure on local airports was derived by subtracting current base-related enplanements from current total enplanements.

2.4 UTILITIES

Utility usage was determined based on land uses and projected area population increases. The utility systems addressed in this analysis include the facilities and infrastructure used for potable water (pumping, treatment, storage, and distribution), wastewater (collection and treatment), solid waste disposal, and energy distribution (electricity and natural gas). Historic consumption data, service curtailment data, peak demand characteristics, storage and distribution capacities, and related information for base utilities (including projections of future utility demand for each utility provider's particular service area) were extracted from various engineering reports and the Carswell AFB Comprehensive Plan. Information was also obtained from public and private utility purveyors and related county and city agencies.

The ROI for this analysis comprised the service areas of the local purveyors of potable water, wastewater treatment, and energy that serve Carswell AFB and the surrounding area. It was assumed that these local purveyors would provide services within the area of the existing base after disposal/ reuse.

Potential impacts were evaluated based on long-term projections of demand and population obtained from the various utility purveyors within the region (through 2013) for each of their respective service areas. In each case, purveyors provided the most recent comprehensive projections that were made either prior to the base closure announcement or that did not take into account a change in demand from the base. These projections were then adjusted to reflect the decrease in demand associated with the future activities at Carswell AFB. These adjusted forecasts were then considered the post-closure conditions for comparison with potential reuse alternatives.

The potential effects of reuse alternatives were evaluated by estimating and comparing the additional direct and indirect demand associated with each alternative to the existing and projected operating capabilities of each utility system. Estimates of direct utility demands on site were used to identify the effects of the reuse activities on site-related utility systems. All changes to the utility purveyors' long-term forecasts were based on estimated reuse-related population changes in the region and the future rates of per capita demand explicitly indicated by each purveyor's projections or derived from those projections. It was assumed that the regional per-capita demand rates were representative of the reuse activities, based on assumed similarities between proposed land uses and existing or projected uses in the region. Projections in the utilities analysis include direct demand associated with activities planned on base property, as well as resulting changes in domestic demand associated with population changes in the region.

3.0 HAZARDOUS MATERIALS AND HAZARDOUS WASTE MANAGEMENT

Two categories of hazardous materials and hazardous waste management issues were addressed for this analysis: (1) impacts of hazardous materials utilized and hazardous wastes generated by NAS Fort Worth and each civilian reuse proposal and (2) residual impacts associated with past Air Force practices including delays due to Installation Restoration Program (IRP) site remediation. IRP sites were identified as part of the affected environment (Chapter 3), while remediation impacts associated with these sites were addressed as environmental consequences (Chapter 4). Primary sources of data were existing published reports, such as IRP documents, DOD management plans for various toxic or hazardous substances (e.g., spill response, hazardous waste, asbestos), the Carswell closure evaluation, and survey results (e.g., radon). Pertinent federal, state, and local regulations and standards were reviewed for applicability to the reuse alternatives. Hazardous materials and waste management plans and inventories were

obtained from Carswell AFB. Interviews with personnel associated with these on-base agencies provided the information necessary to fill any data gaps. City and county agencies were also contacted regarding regulations that would apply to both current and future activities associated with Carswell AFB.

The ROI includes the current base property and all geographical areas that have been affected by an on-base release of a hazardous material or waste. The IRP sites are located within the base boundary, but groundwater contamination associated with numerous sites may extend beyond the base boundary. Additionally, groundwater contaminated with trichloroethylene (TCE) has migrated onto Carswell AFB from an off-base source.

Baseline conditions, as defined for this study, include current hazardous materials/waste management practices and inventories pertaining to the following areas: hazardous materials, hazardous waste, IRP sites, aboveground and underground storage tanks, asbestos, pesticides, polychlorinated biphenyls (PCBs), radon, medical/biohazardous waste, ordnance and lead-based points. The impact analysis considered (1) the amount and type of hazardous materials/waste currently associated with specific facilities and/or areas proposed under each reuse alternative; (2) the regulatory requirements or restrictions associated with property transfer and reuse; (3) delays to development and land use restrictions due to IRP remediation activities; and (4) remediation schedules of specific hazardous materials/waste (i.e., PCBs, medical/biohazardous waste) currently used by the Air Force.

4.0 NATURAL ENVIRONMENT

4.1 SOILS AND GEOLOGY

Evaluation of soils impacts addressed erosion potential, construction related dust generation and other soils problems (low soil strength, expansive soils, etc.), and disturbance of unique soil types. Information was obtained from several federal, state, and local agencies. Assessment of potential impacts to geology from the reuse alternatives included evaluation of resource potential (especially aggregates), geologic hazards (particularly potential for seismicity, liquefaction, and subsidence), and flooding potential.

The ROI for the geologic analysis included the region surrounding Carswell AFB relative to seismic activity, mineral resources, and flooding potential. The ROI for the soils analysis was limited to the base and specific areas designated for construction or renovation.

The soils analysis was based on a review of Soil Conservation Service (SCS) documents for soil properties. The soils in the ROI were then evaluated for erosion potential, permeability, evidence of hardpans, expansive soil

characteristics, etc., as these relate to construction problems and erosion potential during construction. Mitigations were evaluated based on county ordinances and SCS recommendations. Common engineering practices were reviewed to determine poor soil characteristics and recommended mitigation measures.

The geologic analysis was based on a review of existing literature for construction problems associated with geologic hazards, availability of construction aggregate, and whether reuse would impact the availability of known mineral resources.

4.2 WATER RESOURCES

Analysis of impacts of the reuse alternatives on water resources considered groundwater quality surface water quality (effects from erosion or sedimentation and contamination), surface water drainage diversion, non-point source surface runoff and water availability.

Impacts to water quality resources resulting from IRP activities were addressed under Hazardous Materials and Waste Management. Information was obtained from several federal, state, and local agencies. The ROI for water resources included the water supply basin, the surface drainage directly affected by runoff from the base, and the 100-year floodplain in the vicinity of the base.

Existing surface water conditions were evaluated for flood potential, non-point source discharge and transportation of contaminants, and surface water quality. Groundwater quality and its potential as a potable water source for each reuse alternative was documented. The existing storm water drainage system was evaluated based on available literature, and the impacts to this system from each of the reuse alternatives were determined.

4.3 AIR QUALITY

The air quality resource is defined as the condition of the atmosphere, expressed in terms of the concentrations of air pollutants occurring in an area as the result of emissions from natural and/or man-made sources. Reuse alternatives have the potential to affect air quality depending on net changes in the release of both gaseous and particulate matter emissions. The impact significance of these emission changes were determined by comparing the resulting atmospheric concentrations to state and federal ambient air quality standards. This analysis drew from baseline-emission inventory information, construction scheduling information, reuse-related source information, and transportation data. Principal sources of these data were the U.S. Environmental Protection Agency, the Carswell AFB environmental coordinator, the NAS Dallas environmental coordinator, FBOP representatives, and the base civil engineer.

The ROI was determined by emissions from sources associated with construction and operation of the reuse alternatives. For inert pollutant emissions (all pollutants other than ozone and its precursors), the measurable ROI is limited to a few miles downwind from the source (i.e., primarily within the immediate area of Carswell AFB). The ROI for ozone impacts included Tarrant County.

Emissions predicted to result from the proposed alternatives were compared to existing baseline emissions to determine the potential for adverse air quality impact. Impacts were also assessed by modeling, where appropriate, and compared to air quality standards. Appendix J contains the projected emissions inventory information and methods. Estimated background concentrations were added to the reuse-related impacts for comparison with the standards. Impacts were considered significant if reuse-related emissions would (1) cause or contribute to any new off-site violation of a federal, state, or local ambient air quality standard; (2) increase the frequency or severity of any existing violation; (3) delay timely attainment of the National Ambient Air Quality Standards (NAAQS) for ozone or any other required emission reductions or milestones; (4) interfere with efforts to maintain attainment of the standards for pollutants other than ozone; or (5) expose sensitive receptors (such as schools or hospitals) to substantial pollutant concentrations.

4.4 NOISE

The noise analysis addressed potential noise impacts from reuse-generated aircraft operations, surface traffic, and other identified noise sources on communities surrounding Carswell AFB. Most of the data were obtained from the aircraft operations and traffic data prepared for the reuse alternatives. Day-night average sound levels (DNL) were used to determine noise impacts. A single-event noise analysis using sound exposure levels (SEL) was also performed. Scientific literature on noise effects was also referenced.

The ROI for noise was defined as the area within DNL 65 decibels (dB) contours based on land use compatibility guidelines developed from FAA regulations (Federal Aviation Administration, 1989). The ROI for surface traffic noise impacts incorporated key road segments identified in the Transportation Analysis.

Noise levels from aircraft operations were estimated by the Navy using the FAA-approved Noise Exposure Model (NOISEMAP), version 6.1 and 6.3. Noise contours for DNL 65 dB and above were depicted. Noise levels due to surface traffic were estimated using the Federal Highway Administration's Highway Noise Model (Federal Highway Administration, 1978). Potential noise impacts were identified by overlaying the noise contours with land use and population information to determine the number of residents who would

be exposed to DNL above 65 dB. Population densities were assigned by using an average number of dwelling units per acre of residential land use, and an average number of persons per dwelling unit.

SELs related to reuse alternatives were provided for representative noise sensitive receptors exposed to aircraft noise from the Carswell airfield. The SELs presented were outdoor levels and took into account the location of the receptors relative to the various flight tracks and aircraft profiles used. Noise reduction effects for common construction were included in the sleep interference analysis; however, evaluation of noise reduction of specific structures was not performed.

Methods used to analyze noise impacts under each reuse scenario are *presented in detail in Appendix H of this EIS.*

4.5 BIOLOGICAL RESOURCES

The biology analysis addresses impacts to vegetation from management practices, construction disturbance, herbicide use, and possible toxic contamination. Wildlife impacts addressed are habitat destruction, increased stress from noise or human presence, and individual mortality from airplane collisions. Threatened, endangered, and sensitive species impacts are especially noted where applicable. Sensitive habitats are those protected by regulation, those areas associated with a protected species, wetland areas, or those areas critical for a life need of species or population. Because of the special role these sensitive habitats play in the ecology of flora and fauna populations, impacts to these areas are also closely noted: habitat loss or degradation, noise impacts, increase in human use of an area, etc. Indirect impacts are as important as direct impacts. Some potential indirect impacts are erosion (habitat loss, water pollution), and increased recreational use of wildlife areas (animal stress, illegal collecting). Cumulative impacts include effects from the base reuse in combination with other development activities in the area, and compared against a baseline.

Standard biology regulations, such as the Endangered Species Act, Clean Water Act (CWA) (wetland protection), Bald and Golden Eagle Protection Act, and the Migratory Bird Treaty Act will apply to this program. The State of Texas has its own regulation which also applies: Texas Wetlands Act (TX Code, Ch11, SubChJ) under the jurisdiction of the Texas Natural Resources Conservation Commission.

The ROI for direct land use impacts (construction and demolition) is the base boundaries. Most biological impacts will come from this ground disturbance. The ROI for threatened, endangered, and sensitive species (in this case, sensitive species also include those wildlife populations requiring a particular habitat on or near the base for wintering or breeding), includes the base and the airspace and associated ground area for takeoff and approaches.

Sensitive habitat region of influence includes the base, areas mentioned for threatened and endangered species, and a sphere of 3-5 miles around the base which could be influenced by increased human contact.

Data sources include Environmental Assessments (EAs) or EISs written for the base; general plans; aerial photographs; environmental evaluations, inventories or descriptions of the base; wetlands inventory list; threatened and endangered species list and general information from federal, and state and local agencies; Texas plant book; The Mammals of Texas book; The Birds of Texas book; Wildflowers, Trees, and Shrubs of Texas book; and inputs from other resources (land use, noise, hazardous materials and safety, and water). A site visit and reconnaissance survey was conducted to map vegetation, wetlands, and sensitive habitats.

Information on baseline conditions was collected from the base, Texas Parks and Wildlife Department, and U.S. Fish and Wildlife Service (USFWS). Maps were brought to the field and a survey verified plant assemblages and other data collected. Problem areas, such as unidentified wetlands, were identified in the field during the survey.

Current and future uses were compared to show changes in conditions for biology. Acreage of vegetation/habitat loss were assessed. Other resource effects were overlaid on biology to note changes and conditions stressful to plant or animal life. A letter of informal consultation has been written to the USFWS to verify the findings of the analysis concerning threatened and endangered species. Mitigations have been suggested where appropriate.

4.6 CULTURAL RESOURCES

Cultural resources generally include three main categories: prehistoric resources, historic structures and resources, and traditional resources. For the purposes of this EIS, cultural resources were defined to also include paleontological resources: the fossil evidence of past plant and animal life. Prehistoric resources are places where human activity has measurably altered the earth or left deposits of physical remains. Historic structures and resources include standing structures and other physical remains of historic significance. Traditional resources are topographical areas, features, habitats, plants, animals, minerals, or archaeological sites that contemporary Native Americans or other groups value presently, or did so in the past, and consider essential for the persistence of their traditional culture. Cultural resources of particular concern include properties listed on the National Register of Historic Places (NRHP), properties potentially eligible for the NRHP, and sacred Native American sites and areas.

- Data used to compile information on these resources were obtained from existing environmental documents; material on file at Carswell AFB; recent cultural resource reports pertaining to the base; interviews with individuals

familiar with the history, archaeology, or paleontology of the Fort Worth area; and records of the Texas Historical Commission. The ROI for cultural resources includes all areas within the boundaries of Carswell AFB. Off-base areas include the Off-Site WSA, the Kings Branch housing area, and any area where ground disturbing activities (such as road construction or widening) have been incorporated into potential reuse plans.

The EIS contains the most up-to-date information on the importance of cultural resources on Carswell AFB, based on existing information regarding evaluation of eligibility for the NRHP. Cultural resources for which eligibility information was unavailable were assumed to be eligible for the National Register, as is stipulated in the National Historic Preservation Act (NHPA).

According to NRHP criteria (36 Code of Federal Regulations (CFR) 60.4), the quality of significance is present in districts, sites, buildings, structures, and objects that:

- Are associated with events that have made a significant contribution to the broad patterns of history
- Are associated with the lives of persons significant in the past
- Embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; possess high artistic value; or represent a significant and distinguishable entity whose components may lack individual distinction
- Have yielded, or may be likely to yield, information important in prehistory or history.

To be listed in or considered eligible for listing in the NRHP, a cultural resource must meet at least one of the above criteria and must also possess integrity of location, design, setting, materials, workmanship, feeling, and association. Integrity is defined as the authenticity of a property's historic identity, as evidenced by the survival of physical characteristics that existed during the property's historic or prehistoric occupation or use. If a resource retains the physical characteristics it possessed in the past, it has the capacity to convey information about a culture or people, historical patterns, or architectural or engineering design and technology.

Compliance with requirements of cultural resource laws and regulations ideally involves four basic steps: (1) identification of significant cultural resources that could be affected by the Proposed Action or its alternatives, (2) assessment of the impacts or effects of these actions, (3) determination of significance of potential historic properties within the ROI, and (4) development and implementation of measures to eliminate or reduce adverse impacts. The primary law governing cultural resources in terms of their treatment in an environmental analysis is the NHPA, which addresses the protection of archaeological, historic, and Native American resources. In

compliance with the NHPA, the Air Force is in the process of consultation with the State Historic Preservation Officer (SHPO), as required under Section 106 of the Act.

Adverse effects that may occur as a result of base reuse are those that have a negative impact on characteristics that make a resource eligible for listing on the NRHP. Actions that can diminish the integrity, research potential, or other important characteristics of a historic property include the following (36 CFR 800.9):

- Physical destruction, damage, or alteration of all or part of the property
- Isolating the property from its setting or altering the character of the property's setting when that character contributes to the property's qualification for the NRHP
- Introduction of visual or auditory elements that are out of character with the property or that alter its setting
- Conveyance of a federally-owned property without adequate conditions or restrictions regarding its preservation, maintenance, or use
- Neglect of a property, resulting in its deterioration or destruction.

Regulations for implementing Section 106 of the NHPA indicate that the transfer, conveyance, lease, or sale of a historic property are procedurally considered to be adverse effects, thereby ensuring full regulatory consideration in federal project planning and execution. However, effects of a project that would otherwise be found to be adverse may not be considered adverse if one of the following conditions exists:

- When the historic property is of value only for its potential contribution to archaeological, historical, or architectural research, and when such value can be substantially preserved through the conduct of appropriate research, and such research is conducted in accordance with applicable professional standards and guidelines
- When the undertaking is limited to the rehabilitation of buildings and structures and is conducted in a manner that preserves the historical and architectural value of the affected historic property through conformance with the Secretary's Standards for Rehabilitation and Guidelines for Rehabilitation of Historic Buildings

- When the undertaking is limited to the transfer, conveyance, lease, or sale of a historic property, and adequate restrictions or conditions are included to ensure preservation of the property's significant historic features.

The treatment of paleontological resources is governed by Public Law (P.L.) 74-292 (the National Natural Landmarks Program, implemented by 36 CFR Part 62). Only paleontological remains determined to be significant are subject to consideration and protection by a federal agency. Among the criteria used for National Natural Landmark designation are illustrative character, present condition, diversity, rarity, and value for science and education.

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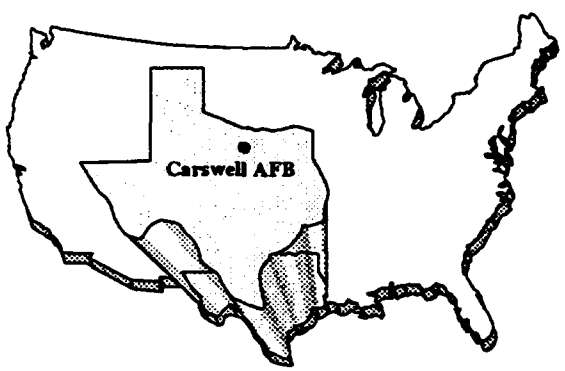

APPENDIX F

APPENDIX F

ENVIRONMENTAL PERMITS FOR CARSWELL AFB, 1992

APPENDIX F

ENVIRONMENTAL PERMITS FOR CARSWELL AFB, 1992

Permit No.	Permitted Facility/ Equipment	Issuing Agency	Original Date Issued	Date of Expiration
HW-50289	Hazardous Waste Generator (RCRA Part B)	TWC	7 February 1991	Open-ended
I-049	Industrial Waste Discharge, 3 points	Fort Worth Water Department	11 March 1992	11 March 1997
TX-0001783	Stormwater Outfall Locations, 6 points	U.S. EPA	15 August 1976	30 September 1979[a]

Note: (a) Extension of original permit has been authorized by U.S. EPA until issuance of new permit.
EPA = Environmental Protection Agency.
RCRA = Resource Conservation and Recovery Act.
TWC = Texas Water Commission.

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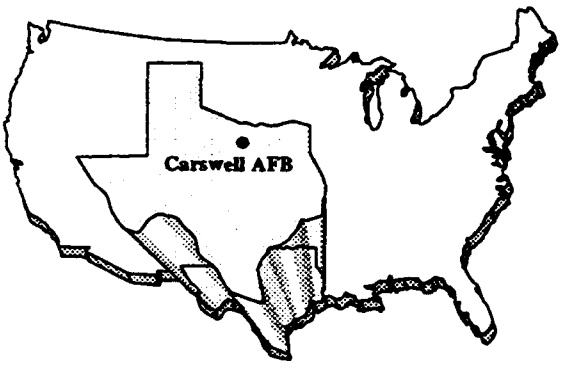


APPENDIX G

APPENDIX G

AIR FORCE POLICY
MANAGEMENT OF ASBESTOS AT CLOSING BASES
AND BUILDINGS SURVEYED FOR ASBESTOS AT CARSWELL AFB

APPENDIX G

AIR FORCE POLICY
MANAGEMENT OF ASBESTOS AT CLOSING BASES AND BUILDINGS SURVEYED FOR ASBESTOS AT CARSWELL AFB

INTRODUCTION

Asbestos in building facilities is managed because of potential adverse human health effects. Asbestos must be removed or controlled if it is in a location and condition that constitutes a health hazard or a potential health hazard or it is otherwise required by law (e.g., schools). The hazard determination must be made by a health professional (in the case of the Air Force, a Bioenvironmental Engineer) trained to make such determinations. While removal is a remedy, in many cases management alternatives (such as encapsulation within the building) are acceptable and cost effective methods of dealing with asbestos. The keys to dealing with asbestos are knowing its location and condition and having a management plan to prevent asbestos containing materials that continue to serve their intended purpose from becoming a health hazard. There is no alternative to such management, because society does not have the resources to remove and dispose of all asbestos in all buildings in the United States. Most asbestos is not now nor will it become a health hazard if it is properly managed.

There are no laws applicable to the closure bases that specifically mandate the removal or management of asbestos in buildings other than the law addressing asbestos in schools (P.L. 99-519). Statutory or regulatory requirements that result in removal or management of asbestos are based on human exposure or the potential for human exposure (i.e. National Emission Standards for Hazardous Air Pollutants (NESHAP) = no visible emissions, Occupational Safety and Health Administration (OSHA) = number of airborne fibers per cc). There are no statutory or other mandatory standards, criteria, or procedures for deciding what to do with asbestos. Thus, health professional judgement based on exposure levels or potential exposure levels must be the primary determinant of what should be done with asbestos. Apart from this professional and scientific approach, closing bases present the additional problem of obtaining an economic return to the Government for its property. Asbestos in closing base properties must also be analyzed to determine the most prudent course in terms of removal or remediation cost and the price that can be obtained as a result.

The following specific policies will apply to bases closed or realigned (so that there are excess facilities to be sold) under the base closure laws, Public Law (P.L.) 100-526 and P.L. 101-510.

1. Asbestos will be removed if:

   (a) The protection of human health as determined by the Bioenvironmental Engineer requires removal (e.g., exposed friable asbestos within a building) in accordance with applicable health laws, regulations and standards.

   (b) A building is unsalable without removal, or removal prior to sale is cost-effective; that is, the removal cost is low enough compared to value that would be received for a "clean" building that removal is a good investment for the Government. Prior to the decision to remove asbestos solely for economic reasons, an economic analysis will be conducted to determine if demolition, removal of some types of asbestos but not others,

or asbestos removal and sale would be in the best interests of the Government.

(c) A building is, or is intended to be, used as a school or child care facility.

2. When asbestos is present but none of the above applies, the asbestos will be managed using commonly accepted standards, criteria and procedures to assure sufficient protection of human health and the environment, in accordance with applicable and developing health standards.

3. A thorough survey for asbestos (including review of facility records, visual inspection, and where appropriate as determined by the Bioenvironmental Engineer and the Base Civil Engineer, intrusive inspection) will be conducted by the Air Force prior to sale.

4. Appraisal instructions, advertisements for sale, and deeds will contain accurate descriptions of the types, quantities, locations, and condition of asbestos in any real property to be sold or otherwise transferred outside the Federal Government. Appraisals will indicate what discount the market would apply if the building were to be sold with the asbestos in place.

5. Encapsulated asbestos in a building structure, friable or not, is not regarded as hazardous waste by the Air Force, nor does encapsulation within the structure of a building constitute "storing" or "disposing of" hazardous waste. Asbestos incorporated into a building as part of the structure has not been "stored" or "disposed of."

6. Friable asbestos, or asbestos that will probably become friable, that has been stored or disposed of underground or elsewhere on the property to be sold will be properly disposed of, unless the location is a landfill or other disposal facility property permitted for friable asbestos disposal.

7. The final Air Force determination regarding the disposition of asbestos will be dependent on the plan for disposal and any reuse of the building. Decisions will take into account the proposed community reuse plan and the economic analysis of alternatives (see para 4). The course of action to be followed with respect to asbestos at each closing installation will be analyzed in the Conversion Disposal and Reuse Environmental Impact Statement (EIS), and will be included in the record of decision (ROD). Any buildings or facilities where the proposed asbestos plan is controversial will be addressed in the ROD, whether individually or as a class of closely related facilities.

8. Since other considerations must be taken into account at bases that are continuing to operate, this policy does not apply to them, nor is it necessarily a precedent for asbestos removal policy on them.

This Air Force Policy on the Management of Asbestos at Closing Bases, dated 6 November 1990 and updated May 1, 1992, has been retyped for the purposes of clarity and legibility.

Table G-1. Facilities Surveyed for Asbestos, Carswell AFB, 1993
Page 1 of 6

Facility (Use)	Year of Construction	Suspected or Known Asbestos-Containing Material (ACM) Identified
208 (Pavement and Ground Facility)	1972	Exterior shingles
209 (Pavement and Ground Facility)	1972	Exterior shingles
212 (Golf Equipment)	1973	No ACM identified
213 (Golf Equipment)	1977	No ACM identified
234 (Pavement and Ground Facility)	1988	Ceiling tile, sheetrock
240 (Security Police Kennel)	1956	No ACM identified
241 (Kennel Support)	1956	Floor tile, sheetrock
260 (Family Housing)	1938	Insulation
272 (Riding Stables)	1983	Exterior shingles, sheetrock
292 (Unknown)	Unknown	Interior wall
390 (Child Care Center)	1951	Boiler insulation, hot water tank insulation, floor tile
391 (Airport Surveillance Radar)	1978	Floor tile, sheetrock
1015 (Test Cell)	1968	Floor tile, ceiling tile, furnace material, mechanical equipment
1020 (Traffic Gate)	1951	Floor tile, exterior shingles
1021 (Support Structure)	1986	No ACM identified
1040 (Water Fire Pump)	1955	Insulation
1046 (Maintenance Dock)	1982	Floor tile, sheetrock
1048 (Maintenance Dock)	1958	Flexible duct, boiler flue, sheetrock, ceiling tile, floor tile, exterior shingles
1049 (Maintenance Dock)	1958	Boiler flue, flexible duct, sheetrock
1050 (Maintenance Hangar)	1955	Unspecified pipe, boiler flue, mechanical equipment, steam piping and fitting, unspecified fitting, wall transite, exterior material, furnace piping and fitting, ceiling tile, floor tile, sheetrock (wall and ceiling), duct joint tape, flexible duct
1055 (Avionics)	1956	Mechanical equipment, steam piping and fitting, water pipe and fitting insulation, sheetrock, furnace piping and fitting, chilled water system fitting, floor tile, ceiling tile, wall transite, exterior shingles
1058 (Petroleum Operations)	1986	Floor tile, sheetrock
1060 (General Purpose Aircraft)	1986	Sheetrock, floor tile, ceiling tile
1062 (Petroleum Operations)	1986	Ceiling tile, sheetrock, rolled sheet-type roof
1063 (Petroleum Operations)	1986	Floor tile, ceiling tile, sheetrock
1082 (Water Supply)	1942	Floor tile, sheetrock, ceiling tile
1101 (Petroleum Operations)	1971	Sheetrock, floor tile, ceiling tile, rolled sheet-type roof
1149 (Headquarters Wing)	1987	Sheetfloor, sheetrock

Note: This list does not include those buildings assigned as family housing.

Table G-1. Facilities Surveyed for Asbestos, Carswell AFB, 1993
Page 2 of 6

Facility (Use)	Year of Construction	Suspected or Known Asbestos-Containing Material (ACM) Identified
1170 (Petroleum Operations)	1957	Sheetrock, floor tile
1172 (Petroleum Operations)	1986	Sheetrock, ceiling tile, exterior shingles
1189 (Headquarters Group)	1942	Wall transite, sheetrock, floor tile, ceiling tile, exterior shingles
1214 (Maintenance Shop)	1942	Exterior material, sheetrock, ceiling glued tile, ceiling tile, floor tile, exterior shingles
1215 (Administration)	1981	Sheetrock, ceiling tile, floor tile
1217 (Maintenance)	1981	Ceiling tile, floor tile, sheetrock
1219 (Offices)	1981	Sheetrock, floor tile, ceiling tile
1229 (Storage Warehouse)	1942	Piping, sheetrock, wall transite, floor tile
1231 (Storage Warehouse)	1989	Mechanical equipment (boiler), steam piping and fitting, sheetrock, wall transite, water fitting insulation, rolled sheet-type roof, exterior insulation, refrigeration piping and fitting, ceiling insulation, floor tile, ceiling tile
1233 (Warehouse Publications)	1942	Wall transite, sheetrock, floor tile, ceiling tile
1236 (Warehouse Packing)	1972	Ceiling tile, sheet rock, floor tile
1237 (Warehouse Supply)	1942	Wall transite, floor tile, sheetrock, exterior shingles
1238 (Warehouse Retail)	1942	Wall transite, exterior shingles, floor tile
1241 (Laundry Supply)	1945	Wall transite, sheet floor, sheetrock, floor tile, exterior shingles
1251 (Base Supply)	1953	Exterior material, ceiling tile, sheetrock, floor tile, glued wall tile, boiler flue, glued ceiling tile
1267 (Hazard Storage)	1978	Ceiling transite, wall transite
1270 (Hazard Storage)	1955	Exterior shingles, sheetrock
1300 (Main Gate)	1955	Floor tile
1301 (Bus Shelter)	1983	Rolled sheet-type roof
1302 (Main Office)	1955	Water pipe insulation, sheetrock, ceiling tile
1320 (Maintenance Shop)	1953	Wall transite, ceiling transite, ceiling tile, floor tile, sheetrock, water pipe and fitting insulation, rolled sheet-type roof, piping transite
1330 (Contract Office)	1954	Ceiling transite, furnace fitting, pipe insulation, fitting insulation, ceiling tile, sheetrock, floor tile
1332 (Entrance Gate)	1955	Floor tile
1336 (Maintenance Trailer)	1972	Floor tile
1337 (White House Communications)	1984	Sheetrock, ceiling tile, floor tile

Note: This list does not include those buildings assigned as family housing.

Table G-1. Facilities Surveyed for Asbestos, Carswell AFB, 1993
Page 3 of 6

Facility (Use)	Year of Construction	Suspected or Known Asbestos-Containing Material (ACM) Identified
1348 (Small Arms Maintenance)	1979	Sheetrock, ceiling tile, floor tile
1360 (Supply Warehouse)	1963	Sheetrock, floor tile, ceiling tile
1370 (Supply Warehouse)	1962	No ACM identified
1372 (Supply Warehouse)	1973	No ACM identified
1401 (Supply Warehouse)	1958	Ceiling tile
1402 (Weapons Systems Shop)	1958	Ceiling tile
1403 (Shop Storage)	1958	No ACM identified
1404 (Supply Warehouse)	1958	Ceiling tile, sheetrock, floor tile
1405 (Maintenance Dock)	1958	No ACM identified
1407 (Aircraft Shop)	1986	Ceiling tile, floor tile
1410 (Aircraft Shop)	1946	Steam piping and fitting, duct, flexible duct, ceiling tile, floor tile, sheetrock, unspecified debris, roof-tar on concrete
1412 (Unknown)	Unknown	Heater corrugated insulation
1414 (Aircraft Shop)	1942	Wall transite, sheetrock, flexible duct, floor tile, ceiling tile, exterior material
1416 (Survey Equipment Shop)	1942	Boiler & pipe insulation, overhead duct wall transite, air duct insulation, exterior shingle
1425 (Fire Station)	1955	Wall transite, ceiling tile, water tank and pipe insulation
1427 (Ground Controlled Approach RAPCON Support Building)	1952	Heater insulation, joints, latrine
1428 (Special Operations)	1942	Exterior shingles
1430 (Squadron Operations)	1946	Furnace fitting, sheetrock, ceiling tile, floor tile, rolled sheet-type roof
1445 (Field Training)	1959	Flexible duct, mechanical equipment (boiler), ceiling tile, sheetrock, floor tile
1450 (Data Processing Installation)	1983	Ceiling tile, sheetrock, floor tile
1500 (Library)	1943	Floor and ceiling pipe insulation
1504 (Special Operations)	1953	Hot water and joint pipe insulation
1510 (Wing Headquarters)	1959	Boiler room duct and pipe insulation, floor tile, mechanical equipment
1515 (Security Police Operations)	1942	Pipe insulation
1518 (Exchange Service Station)	1972	Ceiling tiles possibly ACM
1520 (Dormitory)	1983	Mechanical equipment, tank and piping
1521 (Dormitory)	1984	Exhaust flue, tank and duct insulation possible ACM
1522 (Dormitory)	1984	Exhaust flue, tank and duct insulation possible ACM
1525 (Base Personnel Office)	1953	Transite pipes and overhead piping

Note: This list does not include those buildings assigned as family housing.
RAPCON = Radar Approach Control.

Table G-1. Facilities Surveyed for Asbestos, Carswell AFB, 1993
Page 4 of 6

Facility (Use)	Year of Construction	Suspected or Known Asbestos-Containing Material (ACM) Identified
1550 (Dining Hall)	1953	Water pipe
1560 (Headquarters)	1951	Water fitting insulation, wall and ceiling tiles
1561 (Traffic Management Facility)	1951	Ceiling material, tank insulation, pipe insulation
1562 (Wing Headquarters)	1951	Boiler room insulation, pipe fitting
1563 (Group Headquarters)	1951	Pipe insulation
1564 (Disaster Preparation)	1951	Mechanical room wall, pipe fitting
1615 (Specified Headquarters)	1943	Boiler room insulation
1617 (Training Aid Shop)	1953	Wall transite, wall and ceiling material, floor tiles
1619 (Training Aid Shop)	1942	Exterior shingles
1628 (Aircraft Support Equipment Shop Storage Facility)	1981	Ceiling tiles possible ACM
1630 (Squadron Operations)	1945	Sheetrock, shingled roof, wall and ceiling material
1642 (Weapon Systems Shop)	1953	Tile floor, ceiling tiles, sheetrock
1648 (Weapons and Release System Shop)	1981	Insulation and sheetrock
1654 (Reserve Forces Training Facility)	1963	Pipe insulation
1720 (Wing Headquarters)	1953	Wall tile, pipe and fittings, pipe insulation
1730 (Communications Facility)	1951	Pipe and fittings
1739 (Squadron Operations)	1981	Ceiling tile
1740 (Squadron Operations)	1990	Exterior material, ceiling tile
1766 (Base Package Store)	1986	Wall and ceiling material, ceiling tile, floor tile
1780 (Specified Headquarters)	1969	Floor tile, wall texture, acoustic tile
1792 (Flight Simulator Training)	1978	Floor tile, sealing tape
1805 (Swimmers' Bath House)	1949	Pipe and tank insulation
1810 (Gymnasium)	1965	Pipe and tank insulation
1820 (Recreation Center)	1953	Wall transite, ceiling tiles, floor tiles, wall insulation, boiler room air handler, pipe fittings and insulation
1825 (Education Center)	1978	Floor tiles
1826 (Education Center)	1978	Floor tiles
1827 (Education Center)	1979	Floor tiles
1828 (Education Center)	1979	Floor tiles
1829 (Education Center)	1981	Floor tiles
1830 (Education Center)	1981	Sheetrock, floor tiles

Note: This list does not include those buildings assigned as family housing.

Table G-1. Facilities Surveyed for Asbestos, Carswell AFB, 1993
Page 5 of 6

Facility (Use)	Year of Construction	Suspected or Known Asbestos-Containing Material (ACM) Identified
1835 (Exchange Service Outlet)	1942	Ceiling tiles, floor tiles, pipe and fittings insulation
1837 (Exchange Service Outlet)	1942	Possible ACM in exterior shingles
1838 (Chapel)	1942	Pipe insulation
1840 (Clothing Store)	1978	Floor tile, ceiling tile, sheetrock
1845 (Theater)	1970	Pipe fittings, floor tiles, pipe insulation, tank, asphalt & gravel, sheetrock
2570 (Non-Commissioned Officers' Dining Hall)	1957	Tank and pipe insulation, steam line insulation
2573 (Bath House)	1962	Pipe fittings, tank, asphalt & gravel
3000 (Composite Medical Clinic)	1987	Mechanical equipment, floor insulation, pipe insulation, pipe fittings
3001 (Steam Facility)	1958	Hot and cold water pipes, air handler, hot water tank, pipe insulation
3100 (Animal Clinic)	1956	Sheetrock, floor tiles, asphalt & gravel
3102 (Officers' Dining Hall)	1942	Exterior pipe insulation
3103 (Dining Hall)	1951	Wall transite, roof, sheetrock, floor tiles
3106 (Swimmers' Bath House)	1952	Transite walls
3110 (Visiting Officers' Quarters)	1969	Ceiling, storage tank and insulation
3113 (Temporary Housing)	1984	Possible-boiler room
3138 (Social Activity Facility)	1984	Sheetrock, ceiling tile, floor tile
3139 (Air Force Clinic)	1982	Floor tiles
3140 (Temporary Housing)	1959	Steamline insulation, ceiling
3153 (Pharmacy)	1988	Shingle roof
3260 (Family Housing Appropriated)	1960	Pipe insulation, attic transite flue
3335 (Recreation Facility)	1961	Floor tiles
3337 (MWR Storage)	1979	Sheetrock, floor tiles
3340 (Recreational Building)	1959	Sheetrock, floor tile, roof
3341 (Readiness Crew)	1976	Sheetrock, floor & ceiling tiles
3346 (Readiness Crew)	1986	Roof, floor, sheetrock
4102 (Airport Surveillance Radar)	1982	Floor tile, asphalt & gravel
4143 (Communications Transmitter)	1964	Duct, fitting insulation, sheetrock, floor tiles, asphalt & gravel
4150 (Hydrant Fuel Facility)	1954	Floor tiles, duct, asphalt & gravel
4152 (Hydrant Fuel)	1954	Floor tiles, asphalt & gravel
4157 (Maintenance Shop)	1984	Ceiling and floor tiles, sheetrock
4160 (Storage)	1977	Floor tiles

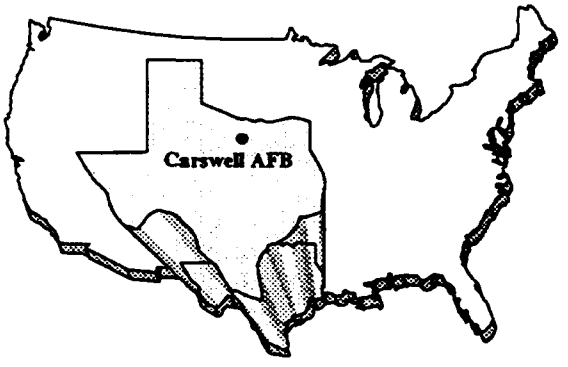
Note: This list does not include those buildings assigned as family housing.
MWR = Morale, Welfare, and Recreation.
TACAN = Tactical Air Navigation.

Table G-1. Facilities Surveyed for Asbestos, Carswell AFB, 1993
Page 6 of 6

Facility (Use)	Year of Construction	Suspected or Known Asbestos-Containing Material (ACM) Identified
4171 (Electric Power Generator Plant)	1978	Possible ACM on vibration joint
4173 (Security Guard Tower)	1983	Pipe insulation
4175 (Readiness Crew Surveillance)	1961	Pipe insulation
4180 (Reserve Forces Team Building)	1981	Floor & ceiling tiles, sheetrock, asphalt & gravel
4215 (Surveillance Inspection Shop)	1984	Floor & ceiling tiles, sheetrock
4217 (Resource Forces Team Building)	1984	Floor & ceiling tiles, sheetrock, asphalt & gravel
8500 (Safety, Control and Identification)	1956	Sheetrock, piping, fittings, floor tiles, asphalt & gravel
8502 (Water Supply Building)	1956	Pipe insulation
8503 (Inspection Shipping)	1956	Unknown
8505 (Electric Power Station)	1956	Pipe insulation
8506 (Ammunition Storage)	1956	Roof
8514 (Munitions Shop)	1956	Piping, asphalt & gravel
9999 (Wherry Housing)	Unknown	Insulation

Note: This list does not include those buildings assigned as family housing.

Source: Carswell AFB, 1992a; Galson Corporation, 1993.



APPENDIX H

APPENDIX H

NOISE

APPENDIX H
NOISE

1.0 DESCRIPTION OF NOISE SOURCES

1.1 PRECLOSURE

Typical noise sources on and around airfields usually include aircraft, surface traffic and other human activities.

Military aircraft operations are the primary source of noise in the vicinity of Carswell Air Force Base (AFB). The air operations and noise contours for preclosure are taken from the Air Installation Compatibility Use Zone (AICUZ) study (U.S. Air Force, 1986) for Carswell AFB. The contours for preclosure operations are shown in Figure 3.4-3 in the Affected Environment chapter of this EIS. In airport analyses, areas exposed to a day-night average sound level (DNL) of 65 A-weighted decibels (dB) are considered in land use compatibility planning and impact assessment; therefore, the distances to areas with DNLs greater than 65 dB were of particular interest.

The number of residents exposed to noise levels of DNL 65 dB or greater were based on estimating densities and distribution of residential areas interpreted from aerial photos (1:36,000 scale) taken in 1992. The acreage of residential areas located within the aircraft noise contours were calculated and applied to an average residential population density factor of 1.63 dwelling units per acre and 2.5 residents per dwelling unit. These factors were based on density samples of the local area.

The surface traffic noise levels in the vicinity of the base were established in terms of DNL by modeling the arterial roadways near the base using traffic and speed characteristics representative of conditions observed in 1992. Average annual daily traffic (AADT) and peak hour traffic data, traffic mix, road width, speed and day/night split were developed in the traffic engineering study presented in Section 3.2.4, Transportation, and were used to estimate preclosure noise levels. The traffic data used in the analysis are presented in Table H-1. The noise levels generated by surface traffic were predicted using the model published by the Federal Highway Administration (Federal Highway Administration, 1978). The noise levels are estimated as a function of distance from the centerline of the nearest road. Number of residents impacted were determined from estimated densities of persons living in housing units located on aerial photographs dated January 1, 1990.

1.2 CLOSURE BASELINE

Military operations from military transients, Air Force Reserve (AFRES), and Air Force (AF) Plant #4 would continue after closure. Activities associated

Table H-1. Surface Traffic Operations for Total Traffic Volumes

Roadway	From/To	ADT	Peak Hour Traffic	Speed Assumed (mph)	Road Width Assumed (lanes)	Day/Night Split (percent)
Preclosure						
I-30	SH 183 to I-820	60,000	2,910	55	4	86.8/13.2
I-30	Camp Bowie to SH 183	65,000	3,155	55	6	86.8/13.2
I-820	I-30 to White Settlement Rd	50,000	2,425	55	6	87/13
I-820	White Settlement Rd to Navajo Trail	48,000	2,330	55	6	87/13
SH 183	I-30 to Ridgmar Blvd	29,000	1,590	45	4	88.9/11.1
SH 183	Ridgmar Blvd to Roaring Springs Rd	25,450	1,395	45	4	88.9/11.1
SH 183	White Settlement Rd to Black Oak	21,900	1,200	40	4	88.9/11.1
SH 199	SH 183 to Beverly Hills	26,100	1,425	40	4	88.9/11.1
Spur 341	I-30 to White Settlement Rd	39,000	2,130	55	6	88.9/11.1
White Settlement Rd	Meyers to Spur 341	10,200	674	30	4	87.5/12.5
White Settlement Rd	Clifford to Academy Blvd	11,800	650	45	4	87.5/12.5
Clifford	I-820 to White Settlement Rd	8,600	570	40	4	87.5/12.5
Roaring Springs Rd	Rogner Dr to Byers	10,000	1,000	40	2	87.5/12.5
Closure						
I-30	SH 183 to I-820	56,240	2,725	55	4	86.8/13.2
I-30	Camp Bowie to SH 183	63,820	3,095	55	6	86.8/13.2
I-820	I-30 to White Settlement Rd	50,000	2,425	55	6	87/13
I-820	White Settlement Rd to Navajo Trail	48,000	2,330	55	6	87/13
SH 183	I-30 to Ridgmar Blvd	12,700	700	45	4	88.9/11.1
SH 183	Ridgmar Blvd to Roaring Springs Rd	15,935	875	45	4	88.9/11.1
SH 183	White Settlement Rd to Black Oak	19,170	1,050	40	4	88.9/11.1
SH 199	SH 183 to Beverly Hills	22,700	1,240	40	4	88.9/11.1
Spur 341	I-30 to White Settlement Rd	36,320	1,990	55	6	88.9/11.1
White Settlement Rd	Meyers to Spur 341	10,200	674	30	4	87.5/12.5
White Settlement Rd	Clifford to Academy Blvd	10,730	590	45	4	87.5/12.5
Clifford	I-820 to White Settlement Rd	8,600	570	40	4	87.5/12.5
Roaring Springs Rd	Rogner Dr to Byers	9,680	970	40	2	87.5/12.5

ADT = average daily traffic.
I = Interstate.
SH = State Highway.

with closure include test flight, presidential fleet, training, maintenance, and transient operations.

Estimated annual operations were derived from air traffic flight logs, and discussions with Carswell AFB and AF Plant #4 personnel in 1992 and verified in August 1993. Flight track and runway utilization were determined from existing operating conditions as defined by base operations personnel. Table H-2 shows the modeled aircraft for the closure baseline. The noise contours for closure operations are presented in Figure 3.4-4 of this EIS. The assumed number of runup operations and a description of engine performance during the runups are summarized in Table H-3.

Table H-2. Annual Aircraft Operations for Closure Baseline (1993)

Type of Aircraft	Number of Operations	Percent of Category	Total for Category	Category Percent of Total
Military Training			9,000	43
F-16	9,000	100		
Military Aircraft Manufacturing			1,800	9
F-16	1,800	100		
Military Transient			10,130	48
T-38	4,675	46		
T-37	1,110	11		
C-130	650	6		
Rotocraft	70	1		
Gulfstream III	320	3		
Gulfstream IV	320	3		
Cessna Citation	320	3		
L-188 Electra	577	6		
KC-135	634	6		
B-707	461	5		
F-111	230	2		
F-15	230	2		
C-9	230	2		
T-2C	230	2		
B-747-400	3	<1		
C-141	50	1		
B-727-200	20	<1		
Total			20,930	100

Engine runup operations would result from AFRES and AF Plant #4 activity. AFRES runups were assumed to occur at the current location of the Hush House (east of the parallel taxiway with a heading of 260 degrees) and the tiedown area (on the northeast apron with headings of 25 and 205 degrees). AF Plant #4 runup activity would occur at the runup pad located west of the

Table H-3. Summary of Engine Run-up Operations and Profiles for All Alternatives (All Years)

Aircraft	Number of Daily Operations	Location	Duration	Power Setting
Closure				
F-16 (AFRES)	0.86	Hush House	4 hours	100% + A/B
F-16 (AFRES)	1.07	AFRES Apron	15 minutes	80%
F-16 (AF Plant #4)	0.86	Test Area	30 minutes	74% NC
			24 minutes	89% NC
			6 minutes	95% NC (A/B)
Proposed Action and Alternatives (Military Aircraft)				
F-18	0.07	R/W 35 Pad	10 minutes	Idle*
	0.03		20 seconds	94% NC
F-18	0.05	R/W 17 Pad	20 seconds	94% NC
KC-130	0.29	R/W 35 Pad	6.5 minutes	Idle*
	0.10		5 minutes	970°C TIT
KC-130	0.19	R/W 17 Pad	5 minutes	970°C TIT
F-16 (AFRES)	0.29	Hush House	13 minutes	Idle*
	0.29		1 minute	85% RPM
	0.29		5 minutes	92% RPM (A/B)
F-14A (USN)	0.10	R/W 35 Pad	12.5 minutes	102% NC (A/B)
F-14A (USN)	0.19	R/W 17 Pad	12.5 minutes	102% NC (A/B)
P-3B (USN)	0.10	R/W 35 Pad	8.5 minutes	4600 SHP*
P-3B (USN)	0.24	R/W 17 Pad	8.5 minutes	4600 SHP*
F-16 (AF Plant #4)	0.29	Test Area	30 minutes	74% NC
	0.29		24 minutes	89% NC
	0.29		6 minutes	95% NC (A/B)
Mixed Use Alternative (Civilian Aircraft)				
Boeing 727	0.16	Maintenance	72 minutes	1.05 EPR
		Runup Area	18 minutes	2.00 EPR
McDonnell Douglas MD-80	0.16	Maintenance	72 minutes	1.05 EPR
		Runup Area	18 minutes	2.00 EPR
McDonnell Douglas DC-9	0.16	Maintenance	72 minutes	1.05 EPR
		Runup Area	18 minutes	2.00 EPR

Note: * Events were assumed to take place during daytime hours.
A/B = afterburner.
AF = Air Force.
AFRES = Air Force Reserve.
C TIT = degrees Celcius of turbine intake temperature.
EPR = exhaust pressure ratio.
NC = revolutions per minute (RPM) of compressor core.
R/W = runway.
USN = U.S. Navy.

midpoint of the primary runway (having a heading of 80 degrees). The assumed number of runup operations and a description of engine performance during the runups are summarized in Table H-3.

The noise levels projected for the closure baseline for surface traffic were calculated using the traffic projections at base closure. The traffic data used for the analysis are presented in Table H-1. The number of residents exposed to aircraft noise and surface traffic noise levels under the closure baseline was estimated using the same methods described in Section 1.1 of this appendix.

The on-base firing range was assumed to continue operating at the same levels as it had in the past. For modeling purposes, it was assumed that a typical day's activity consisted of 1,760 rounds being fired from .223 caliber rifles. All events were assumed to take place during daytime hours.

1.3 PROPOSED ACTION

The Proposed Action for the reuse of Carswell AFB would result in operations for Air Force Plant #4, and a new naval air station ([NAS] Fort Worth, Joint Reserve Base) and limited civilian aviation operations associated with Federal Bureau of Prisons (FBOP). Activity associated with NAS Fort Worth and AF Plant #4 would continue to include pilot training, maintenance, and transient military operations. Runup operations, as presented in Table H-3, are assumed to occur at locations provided by Navy and Air Force personnel.

The fleet mix and annual aircraft operations for each of the modeled years are contained in Table H-4. The DNL contours for the proposed operations and the proposed flight tracks modeled are presented in Section 4.4.4, Noise. The estimated residents exposed to each aircraft noise contour under the Proposed Action and other alternatives were based on existing land use patterns using the methods described in Section 1.1 of this appendix. The day-night split for all aircraft operations is shown in Table H-5. Stage lengths assumed for aircraft operations for the Proposed Action and Alternatives are presented in Table H-6. Runups were assumed to occur at locations provided by Navy and Air Force personnel.

The touch-and-go patterns and the initial departure and final approach flight tracks used in the modeling are shown in Figures H-1a, H-1b, and H-1c. The flight tracks were developed according to data supplied by Navy personnel. Daily operations assigned to each flight track and time period for the Proposed Action are provided in Table H-7 for all of the study years.

Standard approach glide slopes and departure profiles were provided by Navy and Air Force personnel (as described in the Terminal Procedures for Carswell AFB).

Table H-4. Annual Aircraft Operations Modeled for Proposed Action (All Years)

Type of Aircraft	Number of Operations	Percent of Category	Total for Category	Category Percent of Total
Marine Air Group, 41st			11,129	10
F/A-18A	6,446	58		
KC-130T	4,683	42		
Navy Reserve VF-201 Fighter Squadron			8,943	8
F-14A	8,943	100		
Navy Reserve VF-202 Fighter Squadron			5,044	5
F-14A	5,044	100		
Texas Air National Guard - 136th Tactical Airlift Wing			11,965	11
C-130H	11,965	100		
U.S. Army Reserves 90th			14,566	15
OH-58	7,278	50		
UH-1	7,278	50		
U-21[a]	0			
Texas Army National Guard			10,300	9
UH-1H	1,029	10		
UH-60L	2,577	5		
CH-47D	6,694	6		
Navy Reserve VP-67 Patrol			3,898	4
P-3B	3,898	100		
Navy Reserve VR-59 Fleet Logistics			3,431	3
C-9B	3,431	100		
301st Fighter Wing			7,855	7
F-16	7,855	100		
AF Plant #4 (Lockheed)			1,000	1
F-16	1,000	100		
Military Transients			27,986	26
FBOP			416	<1
Learjet 35	312	75		
Boeing 727	104	25		
TOTAL			106,523	100

Note: (a) Annual U-21 operations totaling 2,081 were not modeled due to minor contribution to over-all noise environment.

Table H-5. Day-Night Split of Aircraft Operations for Proposed Action and Alternatives

Aircraft Type		Percent Daytime	Percent Nighttime
Proposed Action			
Military			
	U-21 and F-14	95	5
	All Others	99-100	0-1
Civilian		100	0
Mixed Use Alternative			
Military			
	U-21 and F-14	95	5
	All Others	99-100	0-1
Civilian		100	0
No-Action/Realignment Alternative			
Military			
	U-21 and F-14	95	5
	All Others	99-100	0-1

Note: Percentages are approximate for each category. Different aircraft within each category may have different day-night splits. For actual number of operations of each aircraft, for each time period, refer to Table H-7. Splits for alternatives are similar to those of the Proposed Action.

Table H-6. Stage Lengths Assumed for Aircraft Operations for Proposed Action and Alternatives[a]

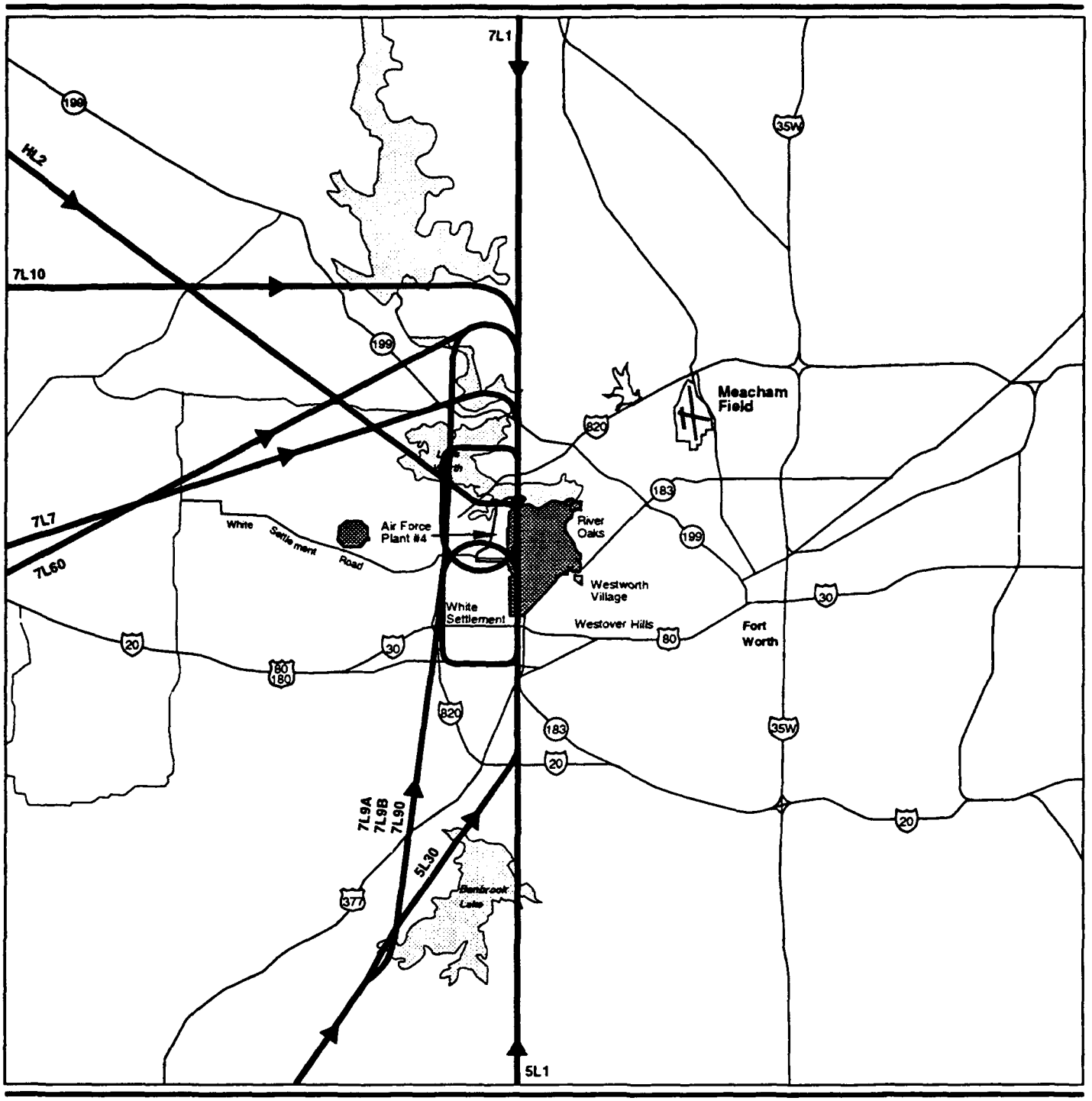
Group	1998	2003	2013
Civilian (maintenance)	1	1	1
Military	(b)	(b)	(b)

Notes: (a) Stage length may affect operational parameters, such as takeoff or landing profiles, engine thrust settings, and aircraft speed of some aircraft; these parameters may, in turn, affect aircraft noise exposure. Stage lengths correspond to the distance flown in increments of 500 miles (e.g., stage length 1 corresponds to flights between 1 and 500 miles; 2 corresponds to flights between 500 and 1,000 miles, etc.) The maximum stage length used in modeling is 7 (over 4,500 miles).

(b) Military aircraft do not have corresponding stage lengths associated with operations.

Surface traffic data used in the modeling were developed from the projected total traffic presented in Section 4.2.3, Transportation, and are shown in Table H-8. The traffic mix, day/night split, and speed were assumed to remain the same as for the preclosure reference. The number of residents impacted were determined from aerial photographs dated January 1, 1990.

The on-base firing range was assumed to increase activity to an annual average of approximately 2,930 rounds per day. The majority of this activity is associated with 9mm and M-16 weapons. Noise levels would increase for areas near the firing range.



EXPLANATION

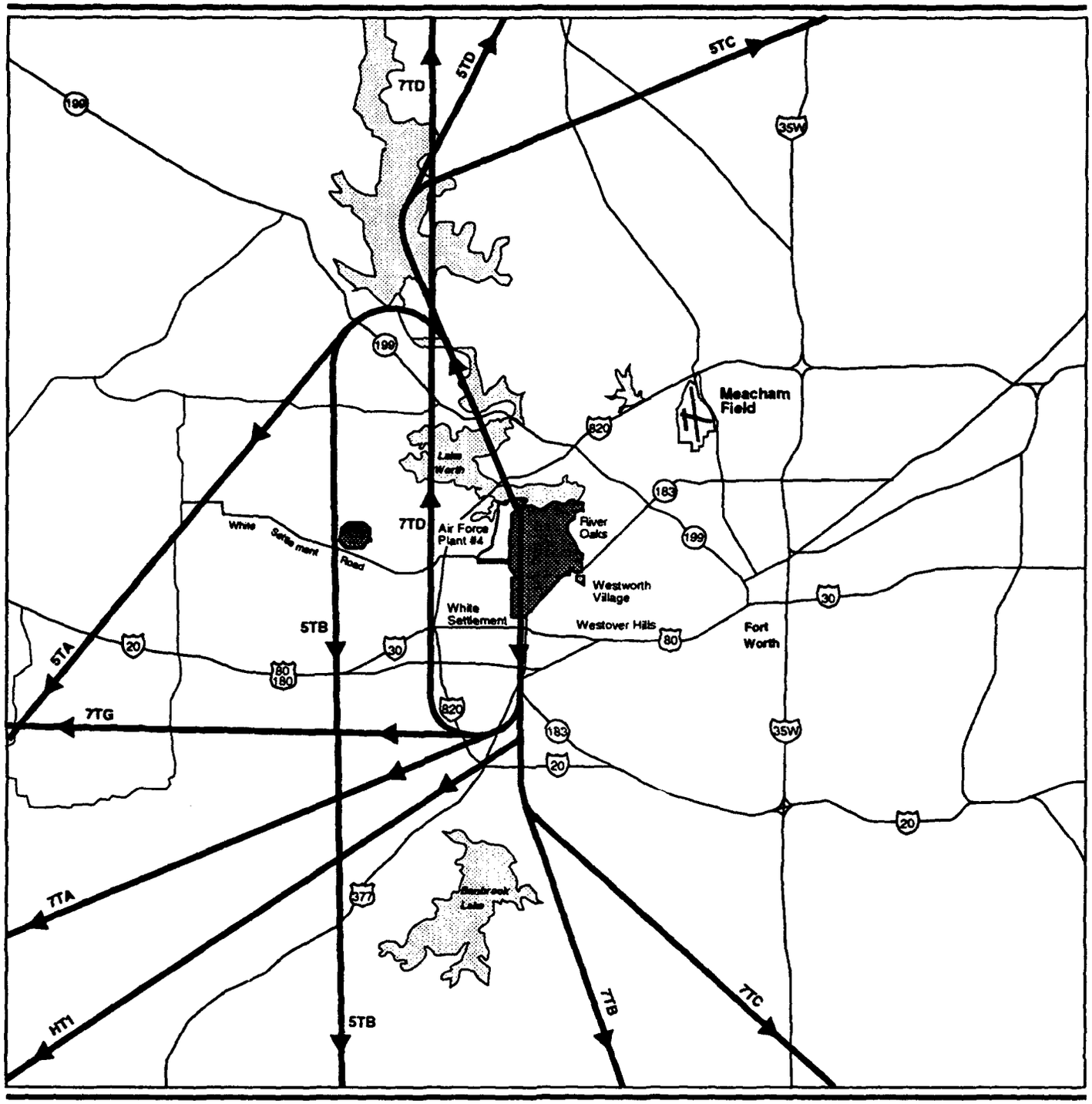
Primary Arrival Flight Paths for NAS Fort Worth

Carswell AFB Property

0 1 2 4 Miles

NAS Fort Worth Primary Arrival Flight Paths

Figure H-1a



EXPLANATION

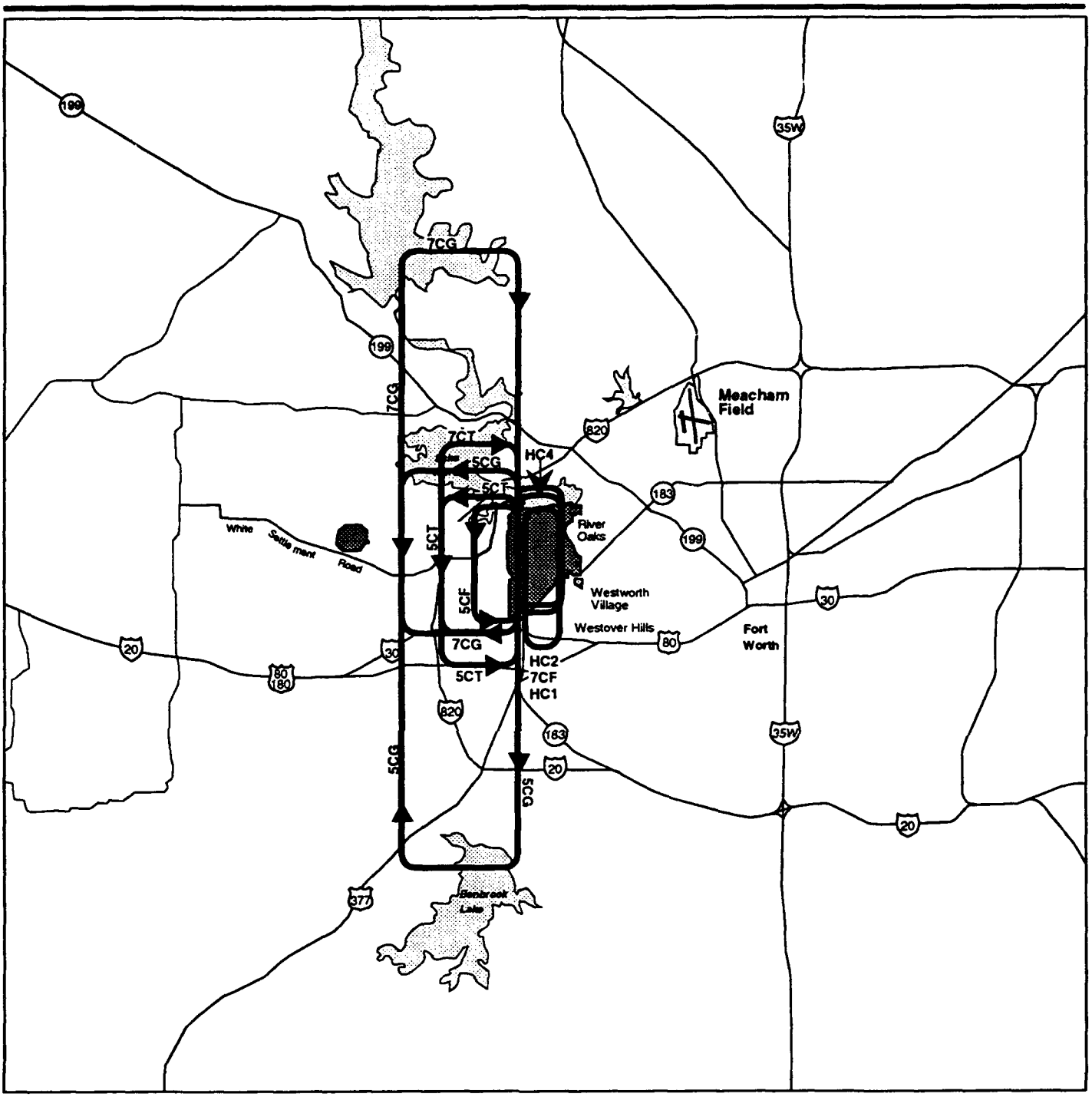
Primary Departure Flight Paths for NAS Fort Worth

Carswell AFB Property

NAS Fort Worth Primary Departure Flight Paths

0 1 2 4 Miles

Figure H-1b



EXPLANATION

Primary Closed Flight Paths for NAS Fort Worth

Carswell AFB Property

NAS Fort Worth Primary Closed Flight Paths

0 1 2 4 Miles

Figure H-1c

Table H-7. Assignment of Operations for the Proposed Action - All Years
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	Arrival Flight Tracks											
	7L1		7L2		7L3		7L4		7L5		7L6	
Aircraft	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
F-18	0.00	0.00	0.03	0.00	0.00	0.00	1.18	0.00	0.00	0.00	0.00	0.00
KC-130	0.42	0.00	0.00	0.00	0.00	0.00	0.35	0.00	0.00	0.00	0.00	0.00
F-16	0.09	0.00	0.38	0.00	0.00	0.00	0.09	0.00	0.38	0.00	0.00	0.00
C-130H	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
U-21	0.12	0.01	0.12	0.01	0.06	0.01	0.00	0.00	0.00	0.00	0.06	0.01
F-14A (VF-201)	0.31	0.01	0.31	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
F-14A (VF-202)	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.01	0.00	0.00	0.00	0.00
C-9B	0.26	0.01	0.23	0.01	0.23	0.01	0.23	0.01	0.23	0.01	0.23	0.01
P-3B	0.24	0.01	0.04	0.00	0.04	0.00	0.16	0.00	0.00	0.00	0.00	0.00
Learjet 35	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B-727	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Arrival Flight Tracks											
	7L7		7L8A		7L8B		7L9A		7L9B		710	
Aircraft	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
F-18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
KC-130	0.42	0.00	0.11	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
F-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	4.71	0.00
C-130H	2.41	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
U-21	0.12	0.01	0.06	0.01	0.06	0.01	0.00	0.00	0.00	0.00	0.00	0.00
F-14A (VF-201)	0.00	0.00	0.22	0.02	0.22	0.02	0.00	0.00	0.00	0.00	0.00	0.00
F-14A (VF-202)	0.00	0.00	0.07	0.03	0.07	0.03	0.00	0.00	0.00	0.00	0.00	0.00
C-9B	0.23	0.01	0.12	0.01	0.12	0.01	0.12	0.01	0.23	0.01	0.00	0.00
P-3B	0.24	0.01	0.02	0.00	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00
Learjet 35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B-727	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: Daytime operations are assumed to occur between the hours of 7:00 a.m. and 10:00 p.m. Nighttime operations are assumed to occur between the hours of 10:00 p.m. and 7:00 a.m.

Table H-7. Assignment of Operations for the Proposed Action - All Years
Page 2 of 7

	Arrival Flight Tracks													
	5L1		5L2		5L3A		5L3B		5L4		5L5		5L6	
Aircraft	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
F-18	0.00	0.00	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
KC-130	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.15	0.00	0.00	0.00
F-16	0.04	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.17	0.00	0.00	0.00
C-130H	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
U-21	0.06	0.01	0.06	0.01	0.02	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.03	0.00
F-14A (VF-201)	0.32	0.02	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
F-14A (VF-202)	0.00	0.00	0.08	0.04	0.00	0.00	0.00	0.00	0.08	0.01	0.00	0.00	0.00	0.00
C-9B	0.14	0.01	0.13	0.01	0.06	0.01	0.06	0.00	0.13	0.01	0.13	0.01	0.13	0.01
P-3B	0.14	0.01	0.04	0.00	0.03	0.00	0.00	0.00	0.03	0.00	0.03	0.00	0.00	0.00
Learjet 35	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B-727	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Arrival Flight Tracks											
	5L7		5L8A		5L8B		5L9A		5L9B		5L10	
Aircraft	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
F-18	0.00	0.00	0.00	0.00	0.32	0.00	0.37	0.00	0.16	0.00	0.00	0.00
KC-130	0.00	0.00	0.08	0 00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
F-16	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.38	0.00	1.46	0.00
C-130H	1.22	0.01	0.00	0.00	0.00	0.00	0.21	0.00	0.00	0.00	0.00	0.00
U-21	0.06	0.01	0.03	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00
F-14A (VF-201)	0.00	0.00	0.00	0.00	0.09	0.01	0.00	0.00	0.00	0.00	0.00	0.00
F-14A (VF-202)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C-9B	0.13	0.01	0.06	0.00	0.06	0.00	0.13	0.00	0.06	0.00	0.00	0.00
P-3B	0.00	0.00	0.01	0.00	0.01	0.00	0.14	0.00	0.07	0.00	0.00	0.00
Learjet 35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B-727	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table H-7. Assignment of Operations for the Proposed Action - All Years
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	Departure Flight Tracks															
	7TA		7TB		7TC		7TD		7TE		7TF		7TG		7T1	
Aircraft	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
F-18	3.48	0.00	0.00	0.00	0.24	0.00	0.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
KC-130	0.56	0.00	0.14	0.00	0.28	0.00	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
F-16	3.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.07	0.00	3.12	0.00	0.00	0.00
C-130H	3.83	0.01	2.29	0.01	0.76	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
U-21	0.10	0.01	0.19	0.01	0.19	0.01	0.10	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
F-14A (VF-201)	2.37	0.11	0.34	0.01	0.34	0.01	0.34	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
F-14A (VF-202)	1.50	0.06	0.19	0.00	0.09	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C-9B	0.53	0.00	0.53	0.00	0.53	0.00	0.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P-3B	0.16	0.03	0.04	0.00	0.49	0.01	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Learjet 35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.00
B-727	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00

	Departure Flight Tracks											
	5TA		5TB		5TC		5TD		5TH		5T1	
Aircraft	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
F-18	1.87	0.00	0.00	0.00	0.13	0.00	0.50	0.00	0.00	0.00	0.00	0.00
KC-130	0.30	0.00	0.08	0.00	0.08	0.00	0.30	0.00	0.00	0.00	0.00	0.00
F-16	1.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.71	0.00	0.00	0.00
C-130H	2.06	0.01	1.24	0.01	0.41	0.00	0.41	0.00	0.00	0.00	0.00	0.00
U-21	0.06	0.01	0.19	0.01	0.03	0.00	0.03	0.00	0.00	0.00	0.00	0.00
F-14A (VF-201)	1.47	0.06	0.09	0.00	0.09	0.00	0.18	0.00	0.00	0.00	0.00	0.00
F-14A (VF-202)	0.80	0.04	0.05	0.00	0.05	0.00	0.10	0.00	0.00	0.00	0.00	0.00
C-9B	0.29	0.00	0.29	0.01	0.29	0.00	0.29	0.00	0.00	0.00	0.00	0.00
P-3B	0.07	0.01	0.03	0.00	0.26	0.00	0.09	0.00	0.00	0.00	0.00	0.00
Learjet 35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00
B-727	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00

Table H-7. Assignment of Operations for the Proposed Action - All Years

	Overhead Approach Tracks											
	7L30		7L60		7L90		5L30		5L60		5L90	
Aircraft	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
F-18	0.22	0.00	2.93	0.00	0.00	0.00	1.70	0.00	0.00	0.00	0.00	0.00
KC-130	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
F-16	0.00	0.00	0.60	0.00	0.11	0.00	1.46	0.00	0.00	0.00	0.00	0.00
C-130H	0.57	0.00	4.60	0.01	0.00	0.00	0.00	0.00	2.48	0.01	0.31	0.00
U-21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
F-14A (VF-201)	0.00	0.00	0.19	0.01	2.15	0.00	1.10	0.04	0.08	0.00	0.08	0.00
F-14A (VF-202)	0.00	0.00	0.19	0.00	1.38	0.00	0.75	0.00	0.10	0.00	0.00	0.00
C-9B	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00
P-3B	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Learjet 35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B-727	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Pattern Tracks															
	7COA		7CT		7CF		7CG		5CO		5CT		5CF		5CG	
Aircraft	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
F-18	0.00	0.00	1.11	0.00	0.00	0.00	1.11	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.60	0.00
KC-130	0.00	0.00	2.78	0.00	0.00	0.00	2.78	0.00	0.00	0.00	1.50	0.00	0.00	0.00	1.50	0.00
F-16	0.62	0.00	0.00	0.00	0.00	0.00	0.62	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.33	0.00
C-130H	0.00	0.00	5.90	0.03	0.00	0.00	0.00	0.00	0.00	0.00	3.18	0.01	0.00	0.00	0.00	0.00
U-21	0.00	0.00	1.76	0.09	0.00	0.00	0.59	0.03	0.00	0.00	0.95	0.05	0.00	0.00	0.31	0.02
F-14A (VF-201)	0.00	0.00	0.00	0.00	5.76	0.33	2.43	0.16	0.00	0.00	0.00	0.00	5.21	0.17	1.31	0.09
F-14A (VF-202)	0.00	0.00	0.00	0.00	3.74	0.15	1.05	0.15	0.00	0.00	0.00	0.00	2.01	0.09	0.56	0.09
C-9B	0.00	0.00	1.11	0.00	0.00	0.00	0.56	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.30	0.00
P-3B	0.00	0.00	4.14	0.03	0.00	0.00	1.11	0.00	0.00	0.00	2.23	0.02	0.00	0.00	0.60	0.00
Learjet 35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B-727	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table H-7. Assignment of Operations for the Proposed Action - All Years
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	Departure Tracks									
	HT1		HT2		HT3		HT4		HT5	
Aircraft	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
OH-58	0.22	0.00	2.93	0.00	0.00	0.00	1.70	0.00	0.00	0.00
UH-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UH-1H	0.00	0.00	0.60	0.00	0.11	0.00	1.46	0.00	0.00	0.00
UH-60L	0.57	0.00	4.60	0.01	0.00	0.00	0.00	0.00	2.48	0.01
CH-47D	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Arrival Tracks									
	HL1		HL2		HL3		HL4		HL5	
Aircraft	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
OH-58	0.22	0.00	2.93	0.00	0.00	0.00	1.70	0.00	0.00	0.00
UH-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UH-1H	0.00	0.00	0.60	0.00	0.11	0.00	1.46	0.00	0.00	0.00
UH-60L	0.57	0.00	4.60	0.01	0.00	0.00	0.00	0.00	2.48	0.01
CH-47D	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Pattern Tracks							
	HC1		HC2		HC3		HC4	
Aircraft	Day	Night	Day	Night	Day	Night	Day	Night
OH-58	7.33	0.07	1.83	0.02	0.99	0.01	3.95	0.04
UH-1	7.33	0.07	1.83	0.02	0.99	0.02	3.95	0.04
UH-1H	1.14	0.00	0.14	0.00	0.00	0.00	0.71	0.00
UH-60L	2.85	0.00	0.28	0.00	0.00	0.00	1.42	0.00
CH-47D	7.41	0.07	0.71	0.00	0.71	0.00	4.27	0.00

Table H-7. Assignment of Operations for the Proposed Action - All Years
Page 6 of 7

Aircraft	Departure Flight Tracks							
	7TA	7TB	7TC	7TD	5TA	5TB	5TC	5TD
T-38	0.67	0.67	0.67	0.67	0.36	0.36	0.36	0.36
T-37	0.48	0.48	0.48	0.48	0.26	0.26	0.26	0.26
F-16	0.41	0.41	0.41	0.41	0.22	0.22	0.22	0.22
F-18	0.36	0.36	0.36	0.36	0.20	0.20	0.20	0.20
A-4	0.19	0.19	0.19	0.19	0.10	0.10	0.10	0.10
T-34	0.16	0.16	0.16	0.16	0.09	0.09	0.09	0.09
C-9	0.28	0.28	0.28	0.28	0.15	0.15	0.15	0.15
T-2	0.11	0.11	0.11	0.11	0.06	0.06	0.06	0.06
T-45	0.09	0.09	0.09	0.09	0.05	0.05	0.05	0.05
C-12	0.19	0.19	0.19	0.19	0.10	0.10	0.10	0.10
F-14	0.14	0.14	0.14	0.14	0.08	0.08	0.08	0.08
C-21	0.10	0.10	0.10	0.10	0.05	0.05	0.05	0.05
F-15	0.09	0.09	0.09	0.09	0.05	0.05	0.05	0.05
F-5	0.09	0.09	0.09	0.09	0.05	0.05	0.05	0.05
A-6	0.07	0.07	0.07	0.07	0.04	0.04	0.04	0.04
C-130	0.07	0.07	0.07	0.07	0.04	0.04	0.04	0.04
T-44	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02
All Others	0.84	0.84	0.84	0.84	0.45	0.45	0.45	0.45

Aircraft	Arrival Flight Tracks					
	7L1	7L9A	7L9B	5L1	5L9A	5L9B
T-38	1.34	0.67	0.67	0.72	0.36	0.36
T-37	0.96	0.48	0.48	0.52	0.26	0.26
F-16	0.81	0.41	0.41	0.44	0.22	0.22
F-18	0.72	0.36	0.36	0.39	0.20	0.20
A-4	0.37	0.19	0.19	0.20	0.10	0.10
T-34	0.33	0.16	0.16	0.18	0.09	0.09
C-9	0.56	0.28	0.28	0.30	0.15	0.15
T-2	0.23	0.11	0.11	0.12	0.06	0.06
T-45	0.18	0.09	0.09	0.10	0.05	0.05
C-12	0.38	0.19	0.19	0.20	0.10	0.10
F-14	0.28	0.14	0.14	0.15	0.08	0.08
C-21	0.19	0.10	0.10	0.10	0.05	0.05
F-15	0.18	0.09	0.09	0.10	0.05	0.05
F-5	0.18	0.09	0.09	0.10	0.05	0.05
A-6	0.15	0.07	0.07	0.08	0.04	0.04
C-130	0.15	0.07	0.07	0.08	0.04	0.04
T-44	0.06	0.03	0.03	0.03	0.02	0.02
All Others	1.68	0.84	0.84	0.90	0.45	0.45

Table H-7. Assignment of Operations for the Proposed Action - All Years
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Aircraft	Pattern Tracks 7CT	7LCG	5CT	5CG
T-38	3.42	1.14	1.84	0.61
T-37	2.36	0.79	1.27	0.42
F-16	2.25	0.75	1.21	0.40
F-18	0.00	0.00	0.00	0.00
A-4	0.65	0.22	0.35	0.12
T-34	0.69	0.23	0.37	0.12
C-9	0.00	0.00	0.00	0.00
T-2	0.75	0.25	0.40	0.13
T-45	0.67	0.22	0.36	0.12
C-12	0.00	0.00	0.00	0.00
F-14	0.00	0.00	0.00	0.00
C-21	0.00	0.00	0.00	0.00
F-15	0.00	0.00	0.00	0.00
F-5	0.00	0.00	0.00	0.00
A-6	0.00	0.00	0.00	0.00
C-130	0.00	0.00	0.00	0.00
T-44	0.20	0.07	0.11	0.04
All Others	0.82	0.27	0.44	0.15

Aircraft	Maintenance Operations 7C61 Day	7C61 Night	5C01 Day	5C01 Night
F-16 (AF Plant #4)	1.76	0.02	0.95	0.01

Table H-8. Annual Aircraft Operations Modeled for Mixed Use Alternative (All Years)

Type of Aircraft	Number of Operations	Percent of Category	Total for Category	Category Percent of Total
Marine Air Group, 41st			11,129	10
F/A-18A	6,446	58		
KC-130T	4,683	42		
Navy Reserve VF-201 Fighter Squadron			8,943	8
F-14A	8,943	100		
Navy Reserve VF-202 Fighter Squadron			5,044	5
F-14A	5,044	100		
Texas Air National Guard - 136th Tactical Airlift Wing			11,965	11
C-130H	11,965	100		
U.S. Army Reserves 90th			14,556	15
OH-58	7,278	50		
UH-1	7,278	50		
U-21[a]	0			
Texas Army National Guard			10,300	9
UH-1H	1,029	10		
UH-60L	2,577	5		
CH-47D	6,694	5		
Navy Reserve VP-67 Patrol			3,898	4
P-3B	3,898	100		
Navy Reserve VR-59 Fleet Logistics			3,431	3
C-9B	3,431	100		
301st Fighter Wing			7,855	7
F-16	7,855	100		
AF Plant #4 (Lockheed)			1,000	1
F-16	1,000	100		
Military Transients			*27,986*	*26*
Civilian Maintenance			360	<1
B-727	120	33		
MD-80	120	33		
DC-9	120	33		
TOTAL			106,467	100

Note: (a) Annual U-21 operations totaling 2,081 were not modeled due to minor contribution to over-all noise environment.

Table H-9. Surface Traffic for Total Traffic Volumes
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Roadway	From/To	ADT 1998	ADT 2003	ADT 2013	Speed Assumed (mph)	Road Width Assumed (Lanes)
Proposed Action						
I-30	SH 183 to I-820	59,743	62,398	65,182	55	6*
I-30	Camp Bowie to SH 183	73,881	81,024	95,437	55	6
I-820	I-30 to White Settlement Rd	57,492	64,311	79,449	55	6
I-820	White Settlement Rd to Navajo Trail	56,625	64,567	84,739	55	6
SH 183	I-30 to Ridgmar Blvd	24,746	32,269	39,702	45	4
SH 183	Ridgmar Blvd to Roaring Springs Rd	22,477	26,516	30,330	45	4
SH 183	White Settlement Rd to Black Oak	20,208	20,762	20,958	40	4
SH 199	SH 183 to Beverly Hills	32,077	42,151	70,845	40	6*
Spur 341	I-30 to White Settlement Rd	37,557	38,406	38,906	55	6
White Settlement Rd	Meyers to Spur 341	15,864	16,396	16,928	30	4
White Settlement Rd	Clifford to Academy Blvd	9,117	8,019	6,151	45	4
Clifford	I-820 to White Settlement Rd	7,968	7,490	6,482	40	4
Roaring Springs Rd	Rogner Dr to Byers	10,619	11,201	12,004	40	2
Mixed Use Alternative						
I-30	SH 183 to I-820	61,917	63,848	67,671	55	6*
I-30	Camp Bowie to SH 183	75,153	81,920	96,895	55	6
I-820	I-30 to White Settlement Rd	58,078	64,723	80,120	55	6
I-820	White Settlement Rd to Navajo Trail	56,835	65,015	84,979	55	6
SH 183	I-30 to Ridgmar Blvd	31,996	37,372	48,003	45	4
SH 183	Ridgmar Blvd to Roaring Springs Rd	26,403	29,202	34,731	45	4
SH 183	White Settlement Rd to Black Oak	20,810	21,032	21,459	40	4
SH 199	SH 183 to Beverly Hills	32,734	42,613	71,597	40	6*
Spur 341	I-30 to White Settlement Rd	38,703	39,213	40,217	55	6
White Settlement Rd	Meyers to Spur 341	16,368	16,751	17,505	30	4
White Settlement Rd	Clifford to Academy Blvd	9,356	8,187	6,424	45	4
Clifford	I-820 to White Settlement Rd	8,206	7,657	6,754	40	4
Roaring Springs Rd	Rogner Dr to Byers	10,981	11,456	12,418	40	2

Note: * Assumes programmed traffic improvements.

Table H-9. *Surface Traffic Operations for Total Traffic Volumes*
Page 2 of 2

Roadway	From/To	ADT 1998	ADT 2003	ADT 2013	Speed Assumed (mph)	Road Width Assumed (Lanes)
No-Action/Realignment Alternative						
I-30	SH 183 to I-820	57,700	57,980	58,550	55	6*
I-30	Camp Bowie to SH 183	72,685	78,485	91,555	55	6
I-820	I-30 to White Settlement Rd	56,942	63,142	77,662	55	6
I-820	White Settlement Rd to Navajo Trail	66,428	64,448	84,098	55	6
SH 183	I-30 to Ridgmar Blvd	17,932	17,802	17,682	45	4
SH 183	Ridgmar Blvd to Roaring Springs Rd	18,628	18,383	17,963	45	4
SH 183	White Settlement Rd to Black Oak	19,324	18,964	18,244	40	4
SH 199	SH 183 to Beverly Hills	31,459	40,839	68,839	40	6*
Spur 341	I-30 to White Settlement Rd	36,480	36,120	35,410	55	6
White Settlement Rd	Meyers to Spur 341	15,390	15,390	16,390	30	4
White Settlement Rd	Clifford to Academy Blvd	8,893	7,543	5,423	45	4
Clifford	I-820 to White Settlement Rd	7,744	7,014	5,754	40	4
Roaring Springs Rd	Rogner Dr to Byers	10,279	10,479	10,899	40	2
Post-Closure						
I-30	SH 183 to I-820	56,632	56,921	57,478	55	6*
I-30	Camp Bowie to SH 183	70,212	76,007	8,980	55	6
I-820	I-30 to White Settlement Rd	56,639	62,845	77,361	55	6
I-820	White Settlement Rd to Navajo Trail	56,282	64,295	83,928	55	6
SH 183	I-30 to Ridgmar Blvd	12,428	12,301	12,083	45	4
SH 183	Ridgmar Blvd to Roaring Springs Rd	15,534	15,297	14,823	45	4
SH 183	White Settlement Rd to Black Oak	18,641	18,294	17,563	40	4
SH 199	SH 183 to Beverly Hills	31,121	40,494	68,503	40	6*
Spur 341	I-30 to White Settlement Rd	35,772	35,426	34,714	55	6
White Settlement Rd	Meyers to Spur 341	10,197	10,499	11,150	30	4
White Settlement Rd	Clifford to Academy Blvd	10,548	8,930	6,365	45	4
Clifford	I-820 to White Settlement Rd	7,604	6,880	5,613	40	4
Roaring Springs Rd	Rogner Dr to Byers	9,890	10,089	10,508	40	2

Note: * Assumes programmed traffic improvements.

1.5 MIXED USE ALTERNATIVE

For the Mixed Use Alternative, NAS Fort Worth and AF Plant #4 operations would operate at the levels described for the Proposed Action. In addition, civilian aircraft maintenance operations would be conducted under this alternative. The fleet mix and annual aircraft operations for each of the modeled years are contained in Table H-8. Assumptions concerning military and civilian aircraft flight and runup operations are described in Section 1.2 of this appendix.

Surface traffic data used in the modeling were developed from the projected total traffic shown in Table H-9. The traffic mix, day/night split, and speed were assumed to remain the same as for the preclosure reference. The number of residents impacted was determined as described in Section 1.1 of this appendix. In addition, civilian operations presented in Table H-3 would be conducted under this alternative.

The on-base firing range was assumed to continue operating at the same levels as the Proposed Action.

1.6 NO-ACTION/REALIGNMENT ALTERNATIVE

Under the No-Action/Realignment Alternative, NAS Fort Worth and AF Plant #4 operations would continue at the levels described for the Proposed Action (Table H-10). Assumptions concerning aircraft flight and runup operations are described in Section 1.2 of this appendix. Surface traffic data used in the modeling were developed from the projected traffic presented in Table H-9. The traffic mix, day/night split, and speed were assumed to remain the same as for the preclosure reference. The number of residents impacted was determined using methods described in Section 1.1 of this appendix.

The on-base firing range was assumed to continue operating at the same levels as the Proposed Action.

2.0 NOISE METRICS

Noise, as used in this context, refers to sound pressure variations audible to the ear. The audibility of a sound depends on the amplitude and frequency of the sound and the individual's capability to hear the sound. Whether the sound is judged as noise largely depends on the listener's current activity and attitude toward the sound source, as well as the amplitude and frequency of the sound. The range in sound pressures that the human ear can comfortably detect encompasses a wide range of amplitudes, typically a factor larger than a million. To obtain convenient measurements and sensitivities at extremely low and high sound pressures, sound is measured

Table H-10. Annual Aircraft Operations Modeled for No-Action/Realignment Alternative

Type of Aircraft	Number of Operations	Percent of Category	Total for Category	Category Percent of Total
Marine Air Group, 41st			11,129	10
F/A-18A	6,446	58		
KC-130T	4,683	42		
Navy Reserve VF-201 Fighter Squadron			8,943	8
F-14A	8,943	100		
Navy Reserve VF-202 Fighter Squadron			5,044	5
F-14A	5,044	100		
Texas Air National Guard - 136th Tactical Airlift Wing			11,965	11
C-130H	11,965	100		
U.S. Army Reserves 90th			14,556	15
OH-58	7,278	50		
UH-1	7,278	50		
U-21[a]	0	0		
Texas Army National Guard			10,300	9
UH-1H	1,029	10		
UH-60L	2,577	25		
CH-47D	6,694	65		
Navy Reserve VP-67 Patrol			3,898	4
P-3B	3,898	100		
Navy Reserve VR-59 Fleet Logistics			3,431	3
C-9B	3,431	100		
301st Fighter Wing			7,855	7
F-16	7,855	100		
AF Plant #4 (Lockheed)			1,000	1
F-16	1,000	100		
Military Transients			27,986	27
TOTAL			106,107	100

Note: (a) Annual U-21 operations totaling 2,081 were not modeled due to minor contribution to over-all noise environment.

in units of the dB. The dB is a dimensionless unit related to the logarithm of the ratio of the measured level to a reference level.

Because the logarithmic nature of the decibel unit, sound levels cannot be directly added or subtracted. However, the following shortcut method can be used to combine sound levels:

Difference between two dB values	Add the following to the higher level
0 to 1	3
2 to 3	2
4 to 9	1
10 or more	0

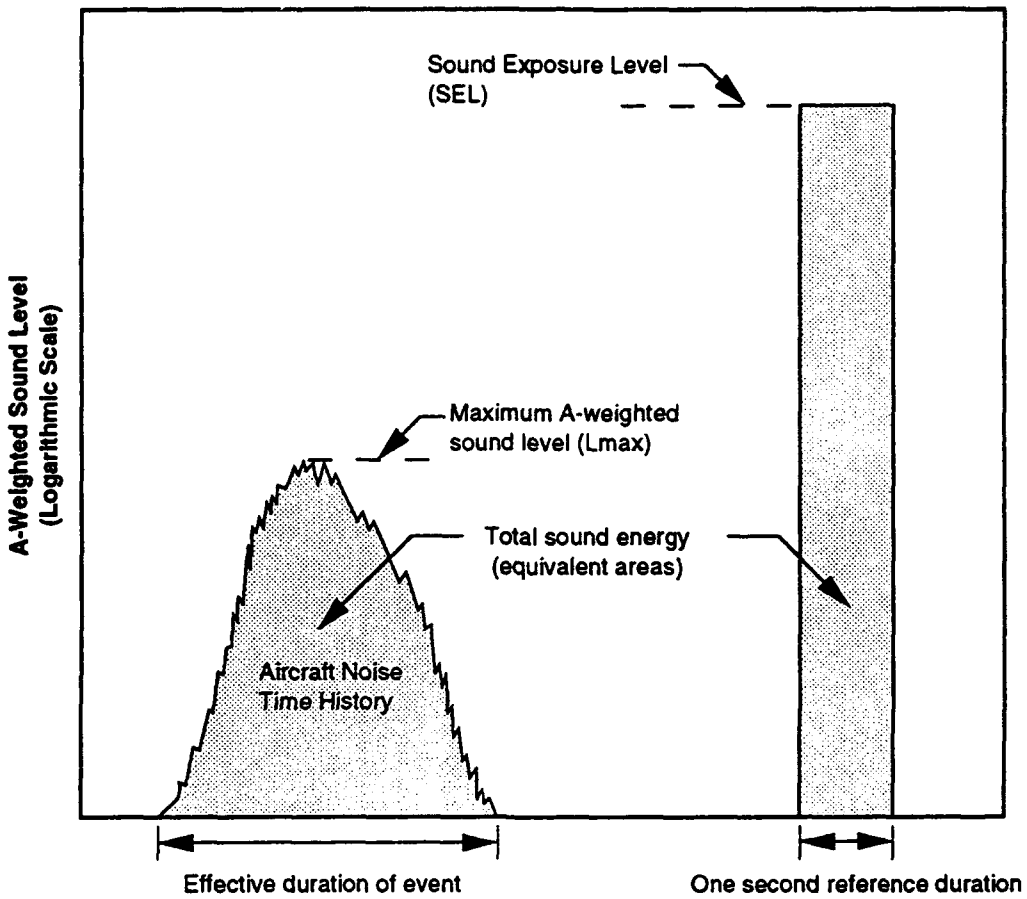
The ear is not equally sensitive at all frequencies of sound. At low frequencies, characterized as a rumble or roar, the ear is not very sensitive; while at higher frequencies, characterized as a screech or a whine, the ear is most sensitive. The A-weighted level was developed to measure and report sound levels in a way that would more closely approach how people perceive the sound. All sound levels reported herein are in terms of A-weighted sound levels.

Environmental sound levels typically vary with time. This is especially true for areas near airports where noise levels will substantially increase as the aircraft passes overhead and afterwards diminish to typical community levels. Both the Department of Defense (DOD) and the Federal Aviation Administration (FAA) have specified the following three noise metrics to describe aviation noise.

Day-Night Average Sound Level (DNL) is the 24-hour energy average A-weighted sound level with a 10 dB weighting added to those levels occurring between 10 p.m. and 7 a.m. the following morning. The 10 dB weighting is a penalty representing the added intrusiveness of noise during normal sleeping hours. DNL is used to determine land use compatibility with noise from aircraft and surface traffic. The expression L_{dn} is often used in equations to designate day-night average sound level.

Maximum Sound Level is the highest instantaneous sound level observed during a single noise event, no matter how long the sound may persist (Figure H-2).

Sound Exposure Level (SEL) value represents the A-weighted sound level integrated over the entire duration of the event and referenced to a duration of 1 second. Hence, it normalizes the event to a 1-second event. Typically, most events (aircraft flyover) last longer than 1 second, and the SEL value will be higher than the maximum sound level of the event. Figure H-2 illustrates the relationship between the maximum sound level and SEL.



Sound Exposure Level (SEL) and Comparison to Aircraft Noise Time History

Figure H-2

3.0 NOISE MODELS

3.1 AIR TRAFFIC

The FAA-approved Noise Exposure Model (NOISEMAP), Version 6.1 and Version 6.3 (Moulton, 1990), were used to predict aircraft noise levels. Since the early 1970s, DOD has been actively developing and refining the NOISEMAP program and its associated data base. The NOISEMAP computer program is a comprehensive set of computer routines for calculating noise contours from aircraft flight and ground runup operations, using aircraft unique noise data for both fixed- and rotary-wing aircraft. The program requires specific input data, consisting of runway layout, aircraft types, number of operations, flight tracks, and noise performance data, to compute a grid of DNL values at uniform intervals. The grid is then processed by a contouring program which draws the contours at selected intervals.

3.2 SURFACE TRAFFIC

The Federal Highway Administration Highway Traffic Noise Prediction Noise Model was used to predict surface traffic noise. The model uses traffic volumes, vehicular mix, traffic speed, traffic distribution and roadway length to estimate traffic noise levels.

3.3 ON-BASE FIRING RANGE

Noise levels due to firing range activity were estimated based on operations information obtained from base personnel and available noise data for firearms. A spherical spreading model was used (i.e., a 6 dB decrease for each doubling of distance). Characteristics incorporated into the model were directivity and Environmental Protection Agency (EPA) penalty for impulsive noise (EPA, 1974). It was assumed that the safety "berm" surrounding the range would not cause a barrier effect.

4.0 ASSESSMENT CRITERIA

Criteria for assessing the effects of noise include annoyance, speech interference, sleep disturbance, noise-induced hearing loss, possible non-auditory health effects, reaction by animals, and land use compatibility. These criteria are often developed using statistical methods. The validity of generalizing statistics devised from large populations are suspect when applied to small sample sizes as we have in the affected areas near Carswell AFB. Caution should be employed when interpreting the results of the impact analysis.

4.1 ANNOYANCE DUE TO SUBSONIC AIRCRAFT NOISE

Noise-induced annoyance is an attitude or mental process with both acoustic and non-acoustic determinants (Fidell et al., 1988). Noise-induced annoyance is perhaps most often defined as a generalized adverse attitude toward noise exposure. Noise annoyance is affected by many factors, including sleep and speech interference and task interruption. The level of annoyance may also be affected by many non-acoustic factors.

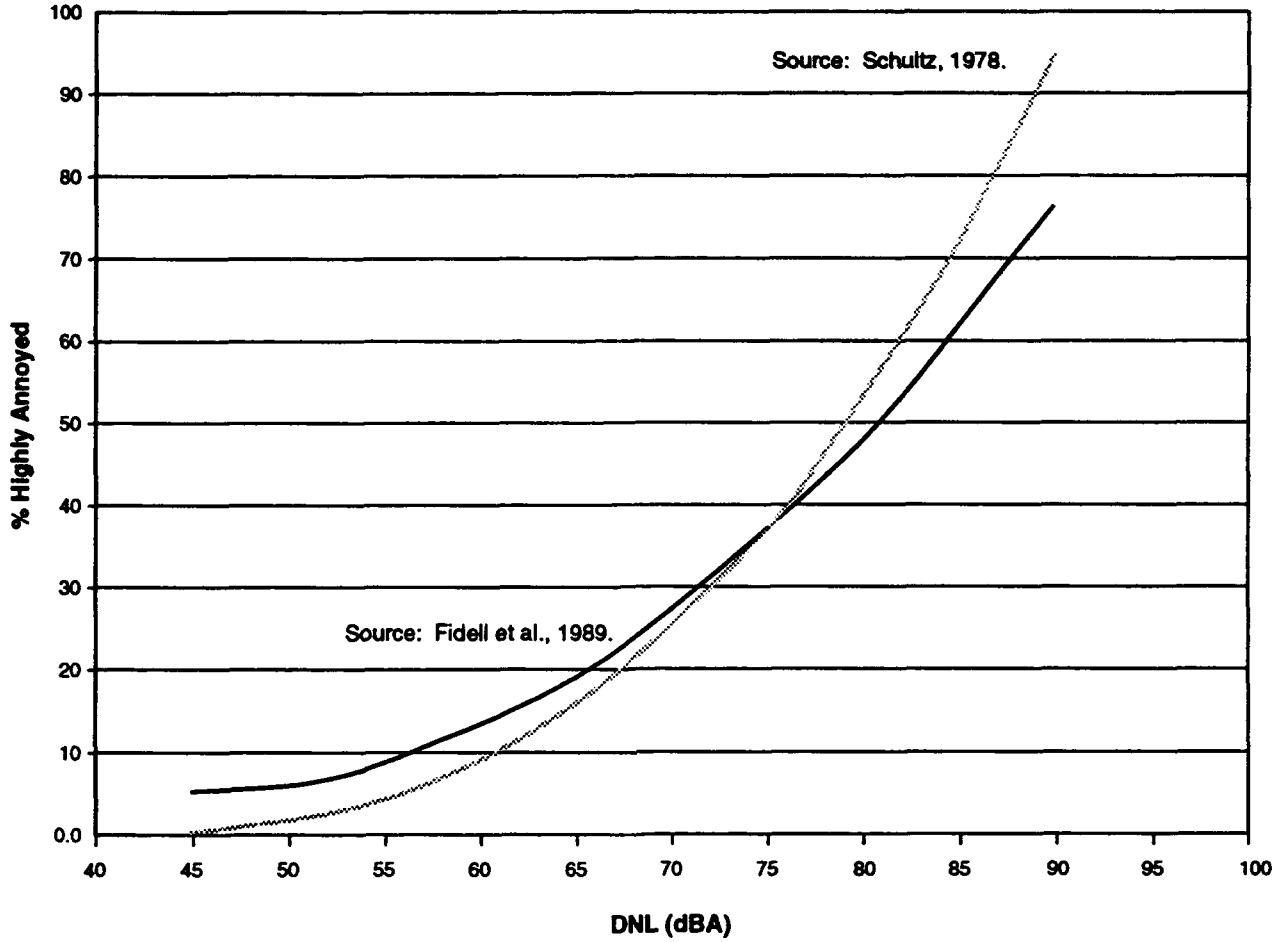
In communities in which the prevalence of annoyance is affected primarily by noise, reductions in exposure can be expected to lead to reductions in prevalence of annoyance. In communities in which the prevalence of annoyance is controlled by nonacoustic factors, such as odor, traffic congestion, etc., there may be little or no reduction in annoyance associated with reductions in exposure. The intensity of community response to noise exposure may even, in some cases, be essentially independent of physical exposure. In the case of community response to actions, such as airport siting or scheduling of supersonic transport aircraft, vigorous reaction has been encountered at the mere threat of exposure, or minor increases in exposure.

The standard method for determining the prevalence of annoyance in noise-exposed communities is by attitudinal survey. Surveys generally solicit self-reports of annoyance through one or more questions of the form "How bothered or annoyed have you been by the noise of (noise source) over the last (time period)?" Respondents are typically constrained in structured interviews to select one of a number of response alternatives, often named categories such as "Not At All Annoyed," "Slightly Annoyed," "Moderately Annoyed," "Very Annoyed," or "Extremely Annoyed." Other means are sometimes used to infer the prevalence of annoyance from survey data (for example, by interpretation of responses to activity interference questions or by construction of elaborate composite indices), with varying degrees of face validity and success.

Predictions of the prevalence of annoyance in a community can be made by extrapolation from an empirical dosage-effect relationship. Based on the results of a number of sound surveys, Schultz (1978) developed a relationship between percent highly annoyed and DNL:

$$\%\ \textit{Highly Annoyed} = 0.8553\ DNL - 0.0401\ DNL^2 + 0.00047\ DNL^3$$

Note that this relationship should not be evaluated outside the range of DNL = 45 to 90 dB. Figure H-3 presents this equation graphically. Less than 20 percent of the population would be predicted to be annoyed by DNL values less than 65 dB; whereas, over 37 percent of the population would



Community Noise Annoyance Curves

Figure H-3

be predicted to be annoyed from DNL values greater than 75 dB. The relationship developed by Schultz was presented in the Guidelines for Preparing Environmental Impact Statements on Noise (NAS, 1977).

These results were recently reviewed (Fidell et al., 1989) and the original findings updated with results of more recent social surveys, bringing the number of data points used in defining the relationship to over 400. The findings of the new study differ only slightly from those of the original study.

4.2 SPEECH INTERFERENCE AND RELATED EFFECTS DUE TO AIRCRAFT FLYOVER NOISE

One of the ways that noise affects daily life is by preventing or impairing speech communication. In a noisy environment, understanding of speech is diminished by masking of speech signals by intruding noises. Speakers generally raise their voices or move closer to listeners to compensate for masking noise in face-to-face communications, thereby increasing the level of speech at the listener's ear. As intruding noise levels rise higher and higher, speakers may cease talking altogether until conversation can be resumed at comfortable levels of vocal effort after noise intrusions end.

If the speech source is a radio or television, the listener may increase the volume during a noise intrusion. If noise intrusions occur repeatedly, the listener may choose to set the volume at a high level so that the program material can be heard even during noise intrusions.

In addition to losing information contained in the masked speech material, the listener may lose concentration because of the interruptions and, thus, become annoyed. If the speech message is some type of warning, the consequences could be serious.

Current practice in quantification of the magnitude of speech interference and predicting speech intelligibility ranges from metrics based on A-weighted sound pressure levels of the intruding noise alone to more complex metrics requiring detailed spectral information about both speech and noise intrusions. There are other effects of the reduced intelligibility of speech caused by noise intrusions. For example, if the understanding of speech is interrupted, performance may be reduced, annoyance may increase, and learning may be impaired.

As the noise level of an environment increases, people automatically raise their voices. The effect does not take place, however, if the noise event were to very suddenly rise to a high level.

4.2.1 Speech Interference Effects from Time-Varying Noise

Most research on speech interference due to noise has included the study of steady state noise. As a result, reviews and summaries of noise effects on speech communications concentrate on continuous or at least long duration noises (Miller, 1974). However, noise intrusions are not always continuous or of long duration, but are frequently transient in nature. Transportation noise generates many such noise intrusions, consisting primarily of individual vehicle pass-bys, such as aircraft flyovers. Noise emitted by other vehicles (motorboats, snowmobiles, and off-highway vehicles) is also transient in nature.

It has been shown, at least for aircraft flyover noise, that accuracy of predictors of speech intelligibility are ranked in a similar fashion for both steady state and time-varying or transient sounds (Williams et al., 1971; Kryter and Williams, 1966). Of course, if one measures the noise of a flyover by the maximum A-weighted level then intelligibility associated with this level would be higher than for a steady noise of the same value, simply because the level is less than the maximum for much of the duration of the flyover.

4.2.2 Other Effects of Noise Which Relate to Speech Intelligibility

Aside from the direct effects of reduction in speech intelligibility, related effects may occur that tend to compound the loss of speech intelligibility itself.

Learning. One of the environments in which speech intelligibility plays a critical role is the classroom. In classrooms of schools exposed to aircraft flyover noise, speech becomes masked or the teacher stops talking altogether during an aircraft flyover (Crook and Langdon, 1974). Pauses begin to occur when instantaneous flyover levels exceed 60 dBA. Masking of the speech of teachers who do not pause starts at about the same level.

At levels of 75 dB some masking occurs for 15 percent of the flyovers and increases to nearly 100 percent at 82 dB. Pauses occur for about 80 percent of the flyovers at this noise level. Since a marked increase in pauses and masking occurs when levels exceed 75 dB, this level is sometimes considered as one above which teaching is impaired due to disruption of speech communication. The effect that this may have on learning is unclear at this time. However, one study (Arnoult et al., 1986) could find no effect of noise on cognitive tasks from jet or helicopter noise over a range from 60 to 80 dBA, even though intelligibility scores indicated a continuous decline starting at the 60 dB level. In a Japanese study (Ando et al., 1975) researchers failed to find differences in mental task performance among children from communities with different aircraft noise exposure.

Although there seems to be no proof that noise from aircraft flyovers affects learning, it is reported by Mills (1975) that children are not as able to understand speech in the presence of noise as are adults. It is hypothesized that part of the reason is due to the increased vocabulary which the adult can draw on as compared to the more limited vocabulary available to the young student. Also, when one is learning a language, it is more critical that all words be heard rather than only enough to attain 95 percent sentence intelligibility, which may be sufficient for general conversations. It was mentioned above that when the maximum A-level for aircraft flyovers heard in a classroom exceeds 75 dB, masking of speech increases rapidly. However, it was also noted that pausing during flyovers and masking of speech for those teachers who continue to lecture during a flyover start at levels around 60 dB (Pearsons and Bennett, 1974).

Annoyance. Klatt, Stevens, and Williams (1969) studied the annoyance of speech interference by asking people to judge the annoyance of aircraft noise in the presence and absence of speech material. The speech material was composed of passages from newspaper and magazine articles. In addition to rating aircraft noise on an acceptability scale (unacceptable, barely acceptable, acceptable, and of no concern), the subjects were required to answer questions about the speech material. The voice level was considered to represent a raised voice level (assumed to be 68 dB). In general, for the raised voice talker, the rating of barely acceptable was given to flyover noise levels of 73 to 76 dB. However, if the speech level was reduced, the rating of the aircraft tended more toward unacceptable. The results suggested that if the speech level were such that 95 percent or better sentence intelligibility was maintained, then a barely acceptable rating or better acceptability rating could be expected. This result is in general agreement with the finding in schools that teachers pause or have their speech masked at levels above 75 dB (Crook and Langdon, 1974).

Hall, Taylor, and Birnie (1985) recently tried to relate various types of activity interference in the home, related to speech and sleeping, to annoyance. The study found that there is a 50 percent chance that people's speech would be interfered with at a level of 58 dB. This result is in agreement with the other results, considering that the speech levels in the school environment of the Cook study are higher than the levels typically used in the home. Also, in a classroom situation the teacher raises his or her voice as the flyover noise increases in intensity.

4.2.3 Predicting Speech Intelligibility and Related Effects Due to Aircraft Flyover Noise

It appears, from the above discussions, that when aircraft flyover noises exceed approximately 60 dB, speech communication may be interfered with either by masking or by pausing on the part of the talker. Increasing the

level of the flyover noise to 80 dB would reduce the intelligibility to zero even if a loud voice is used by those attempting to communicate.

The levels mentioned above refer to noise levels measured indoors. The same noises measured outdoors would be 15 to 25 dB higher than these indoor levels during summer (windows open) and winter months (windows closed), respectively. These estimates are taken from EPA reviews of available data (EPA, 1974).

Levels of the aircraft noise measured inside dwellings and schools near the ends of runways at airports may exceed 60 dB inside (75 dB outside). During flyovers, speech intelligibility would be degraded. However, since the total duration is short, no more than a few seconds during each flyover, only a few syllables may be lost. People may be annoyed, but the annoyance may not be due to loss in speech communication, but rather due to startle or sleep disturbance as discussed below.

4.3 SLEEP DISTURBANCE DUE TO NOISE

The effects of noise on sleep have long been a concern of parties interested in assuring suitable residential noise environments. Early studies noted background levels in people's bedrooms in which sleep was apparently undisturbed by noise. Various levels between 25 to 50 dB were observed to be associated with an absence of sleep disturbance. The bulk of the research on noise effects on which the current relationship is based was conducted in the 1970s. The tests were conducted in a laboratory environment in which awakening was measured either by a verbal response or by a button push, or by brain wave recordings (electroencephalogram [EEG]) indicating stages of sleep (and awakening). Various types of noise were presented to the sleeping subjects throughout the night. These noises consisted primarily of transportation noises including those produced by aircraft, trucks, cars, and trains. The aircraft noises included both flyover noises as well as sonic booms. Synthetic noises, including laboratory-generated sounds consisting of shaped noises and tones, were also studied.

Lukas (1975) and Goldstein and Lukas (1980) both reviewed data available in the 1970s on sleep-stage changes and waking effects of different levels of noise. Since no known health effects were associated with either waking or sleep-stage changes, either measure was potentially useful as a metric of sleep disturbance. However, since waking, unlike sleep-stage changes, is simple to quantify, it is often selected as the metric for estimating the effects of noise on sleep. These two reviews showed great variability in the percentage of people awakened by exposure to noise. The variability is not merely random error, but reflects individual differences in adaptation or habituation, and also interpretation of the meaning of the sounds. Such factors cannot be estimated from the purely acoustic measures in noise exposure.

Another major review, by Griefahn and Muzet (1978), provided similar information for effects of noise on waking. However, Griefahn and Muzet's results suggested less waking for a given level of noise than predicted by Lukas.

A recent review (Pearsons et al., 1989) of the literature related to sleep disturbance demonstrated that the relationship, based exclusively on laboratory studies, predicts greater sleep disturbance than that likely to occur in a real-life situation in which some adaptation has occurred. The prediction relationships developed in this review should not be considered to yield precise estimates of sleep disturbance because of the great variability in the data sets from which they were developed. The relationships include only the duration and level components of "noise exposure." Increasing the precision of prediction would depend on quantification of some of the nonacoustic factors. Further, a recent review of field, as well as laboratory studies, suggests that habituation may reduce the effect of noise on sleep (Pearsons et al., 1989).

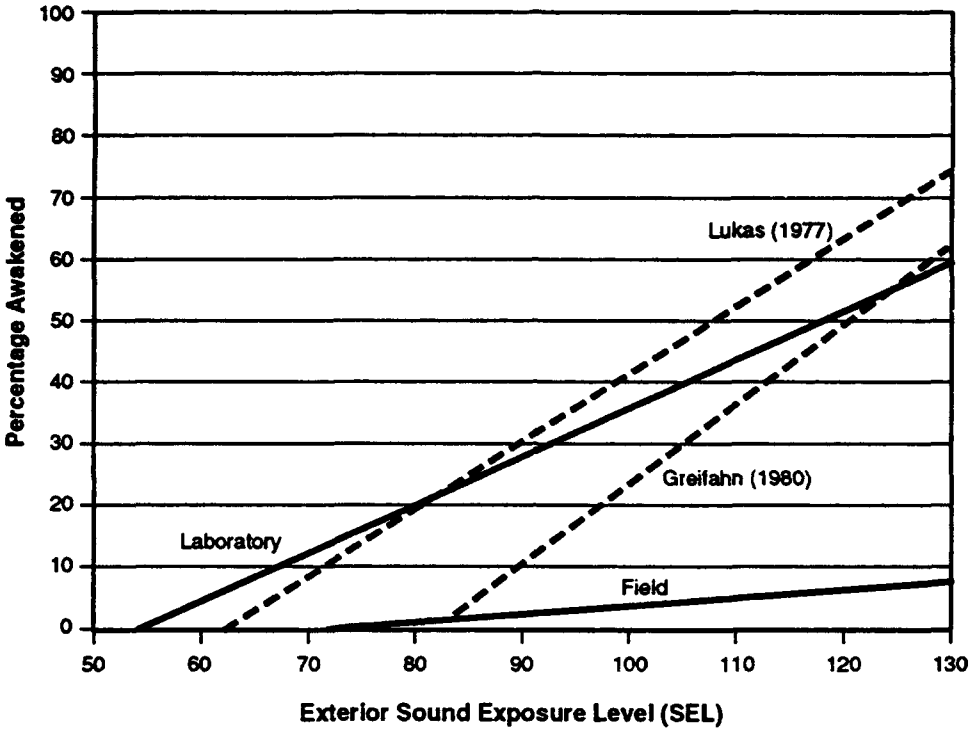
Noise must penetrate the home to disturb sleep. Interior noise levels are lower than exterior levels due to the attenuation of the sound energy by the structure. The amount of attenuation provided by the building is dependent on the type of construction and whether the windows are open or closed. The approximate national average attenuation factors are 15 dB for open windows and 25 dB for closed windows (EPA, 1974).

Incorporating these attenuation factors, the percent awakened relationships previously discussed under summer conditions are presented in Figure H-4. In conclusion, the scientific literature does not provide a consensus on sleep disturbance. There is no recognized criteria or standard which provides guidance to assess sleep disturbance due to noise.

4.4 NOISE-INDUCED HEARING LOSS

Hearing loss is measured in decibels and refers to the permanent auditory threshold shift of an individual's hearing in an ear. Auditory threshold refers to the minimum acoustic signal that evokes an auditory sensation, i.e., the quietest sound a person can hear. When a threshold shift occurs a person's hearing is not as sensitive as before and the minimum sound that a person can hear must be louder. The threshold shift which naturally occurs with age is called presbycusis. Exposure to high levels of sound can cause temporary and permanent threshold shifts usually referred to as noise-induced hearing loss. Permanent hearing loss is generally associated with destruction of the hair cells of the inner ear.

The EPA (1974) and the Committee on Hearing, Bioacoustics, and Biomechanics (National Academy of Sciences, 1981) have addressed the risk of outdoor hearing loss. They have concluded that hearing loss would



Source: Pearsons (1985)

Sleep Disruption (Awakening)

Figure H-4

not be expected for people living outside the noise contour of 75 DNL. Several studies of populations near existing airports in the U.S. and the United Kingdom (U.K.) have shown that the possibility for permanent hearing loss in communities near intense commercial take-off and landing patterns is remote. An FAA-funded study compared the hearing of the population near the Los Angeles International Airport to that of the population in a quiet area away from aircraft noise (Parnel et al., 1972). A similar study was performed in the vicinity of London Heathrow Airport (Ward et al., 1972). Both studies concluded that there was no significant difference between the hearing loss of the two populations, and no correlation between the hearing level with the length of time people lived in the airport neighborhood.

4.5 NONAUDITORY HEALTH EFFECTS OF AIRCRAFT NOISE

Based on summaries of previous research in the field (Thompson, 1981; Thompson and Fidell, 1989), predictions of nonauditory health effects of aircraft noise cannot be made. A valid predictive procedure requires: (1) evidence for causality between aircraft noise exposure and adverse nonauditory health consequences, and (2) knowledge of a quantitative relationship between amounts of noise exposure (dose) and specific health effects. Because results of studies of aircraft noise on health are equivocal, there is no sound scientific basis for making adequate risk assessments.

Alleged nonauditory health consequences of aircraft noise exposure that have been studied include birth defects, low birth weight, psychological illness, cancer, stroke, hypertension, sudden cardiac death, myocardial infarction, and cardiac arrhythmias. Of these, hypertension is the most biologically plausible effect of noise exposure. Noise appears to cause many of the same biochemical and physiological reactions, including temporary elevation of blood pressure, as do many other environmental stressors. These temporary increases in blood pressure are believed to lead to a gradual resetting of the body's blood pressure control system. Over a period of years, permanent hypertension may develop (Peterson et al., 1984).

Studies of residential aircraft noise have produced contradictory results. Early investigations indicated that hypertension was from two to four times higher in areas near airports than in areas located away from airports (Karagodina et al., 1969). Although Meecham and Shaw (1988) continue to report excessive cardiovascular mortality among individuals 75 years or older living near the Los Angeles International Airport, their findings cannot be replicated (Frerichs et al., 1980). In fact, noise exposure increased over the years while there was a decline in all cause, age-adjusted death rates and inconsistent changes in age-adjusted cardiovascular, hypertension, and cerebrovascular disease rates.

Studies that have controlled for multiple factors have shown no, or a very weak, association between noise exposure and nonauditory health effects. This observation holds for studies of occupational and traffic noise as well as for aircraft noise exposure. In contrast to the early reports of two- to six-fold increases in hypertension due to high industrial noise (Thompson and Fidell, 1989), the more rigorously controlled studies of Talbott et al. (1985) and van Dijk et al. (1987) show no association between hypertension and prolonged exposure to high levels of occupational noise.

In the aggregate, studies indicate no association exists between street traffic noise and blood pressure or other cardiovascular changes. Two large prospective collaborative studies of heart disease are of particular interest. To date, cross-sectional data from these cohorts offer contradictory results. Data from one cohort show a slight increase in mean systolic blood pressure (2.4 millimeters Mercury [mm Hg]) in the noisiest compared to the quietest area; while data from the second cohort show the lowest mean systolic blood pressure and highest high-density lipoprotein cholesterol (lipoprotein protective of heart disease) for men in the noisiest area (Babisch and Gallacher, 1990). These effects of traffic noise on blood pressure and blood lipids were more pronounced in men who were also exposed to high levels of noise at work.

It is clear from the foregoing that the current state of technical knowledge cannot support inference of a causal or consistent relationship, nor a quantitative dose-response, between residential aircraft noise exposure and health consequences. Thus, no technical means are available for predicting extra-auditory health effects of noise exposure. This conclusion cannot be construed as evidence of no effect of residential aircraft noise exposure on nonauditory health. Current findings, taken in sum, only indicate that further rigorous studies are needed.

4.6 DOMESTIC ANIMALS AND WILDLIFE

A recent study was published on the effects of aircraft noise on domestic animals that provided a review of the literature and a review of 209 claims pertinent to aircraft noise over a period spanning 32 years (Bowles et al., 1990). Studies since the late 1950s were motivated both by public concerns about what was, at that time, a relatively novel technology, supersonic flight, and by claims leveled against the U. S. Air Force for damage done to farm animals by very low-level subsonic overflights. Since that time, over 40 studies of aircraft noise and sonic booms, both in the U.S. and overseas, have addressed acute effects, including effects of startle responses (sheep, horses, cattle, fowl), and effects on reproduction and growth (sheep, cattle, fowl, swine), parental behaviors (fowl, mink), milk letdown (dairy cattle, dairy goats, swine), and egg production.

The literature on the effects of noise on domestic animals is not large, and most of the studies have focused on the relation between dosages of continuous noise and effects (Belanouski and Omel 'Yanenko, 1982; Amos, 1974). Chronic noises are not a good model for aircraft noise, which lasts only a few seconds, but which is often very startling. The review of claims suggest that a major source of loss was panic induced in naive animals.

Aircraft noise may have effects because it might trigger a startle response, a sequence of physiological and behavioral events that once helped animals avoid predators. There are good dose-response relations describing the tendency to startle to various levels of noise, and the effect of habituation on the startle response.

The link between startles and serious effects, i.e., effects on productivity, is less certain. Here, we will define an effect as any change in a domestic animal that alters its economic value, including changes in body weight or weight gain, numbers of young produced, weight of young produced, fertility, milk production, general health, longevity, or tractability. At this point, changes in productivity are usually considered an adequate indirect measure of changes in well being, at least until objective legal guidelines are provided.

Recent focus on the effects on production runs counter to a trend in the literature toward measuring the relation between noise and physiological effects, such as changes in corticosteroid levels, and in measures of immune system function. As a result, it is difficult to determine the relation between dosages of noise and serious effects using only physiological measures. A literature survey (Kull and Fisher, 1986) found that the literature is inadequate to document long-term or subtle effects of noise on animals. No controlled study has documented any serious accident or mortality in livestock despite extreme exposure to noise.

4.7 LAND USE COMPATIBILITY GUIDELINES

Widespread concern about the noise impacts of aircraft noise essentially began in the 1950s that saw the major introduction of high power jet aircraft into military service. The concern about noise impacts in the communities around airbases, and also within the airbases themselves, led the Air Force to conduct major investigations into the noise properties of jets, methods of noise control for test operations, and the effects of noise from aircraft operations in communities surrounding airbases. These studies established an operational framework of investigation and identified the basic parameters affecting community response to noise. These studies also resulted in the first detailed procedures for estimating community response to aircraft noise (Stevens and Pietrasanta, 1957).

Although most attention was given to establishing methods of estimating residential community response to noise (and establishing the conditions of noise "acceptability" for residential use), community development involves a variety of land uses with varying sensitivity to noise. Thus, land planning with respect to noise requires the establishment of noise criteria for different land uses. This need was met with the initial development of aircraft noise compatibility guidelines for varied land uses in the mid-1960s (Bishop, 1964).

In residential areas, noise intrusions generate feelings of annoyance on the part of individuals. Increasing degrees of annoyance lead to the increasing potential for complaints and community actions (most typically, threats of legal actions, drafting of noise ordinances, etc.). Annoyance is largely based upon noise interference with speech communication, listening to radio and television, and sleep. Annoyance in the home may also be based upon dislike of "outside" intrusions of noise even though no specific task is interrupted.

Residential land use guidelines have developed from consideration of two related factors:

(a) Accumulated case history experience of noise complaints and community actions near civil and military airports

(b) Relationships between environmental noise levels and degrees of annoyance (largely derived from social surveys in a number of communities).

In the establishment of land use guidelines for other land uses, the prime consideration is task interference. For many land uses, this translates into the degree of speech interference, after taking into consideration the importance of speech communication and the presence of non-aircraft noise sources related directly to the specific land use considered. For some noise-sensitive land uses where any detectable noise signals that rise above the ambient noise are unwanted (such as music halls), detectability may be the criterion rather than speech interference.

A final factor to be considered in all land uses involving indoor activities is the degree of noise insulation provided by the building structures. The land use guideline limits for unrestricted development within a specific land use assume noise insulation properties provided by typical commercial building construction. The detailed land use guidelines may also define a range of higher noise exposure where construction or development can be undertaken, provided a specified amount of noise insulation is included in the buildings. Special noise studies, undertaken by architectural or engineering specialists, may be needed to define the special noise insulation requirements for construction in these guideline ranges.

Estimates of total noise exposure resulting from aircraft operations, as expressed in DNL values, can be interpreted in terms of the probable effect on land uses. Suggested compatibility guidelines for evaluating land uses in aircraft noise exposure areas originally were developed by the FAA as presented in Section 3.4.4, Noise. Part 150 of the FAA regulations prescribes the procedures, standards, and methodology governing the development, submission, and review of airport noise exposure maps and airport noise compatibility programs. It prescribes the use of yearly DNL in the evaluation of airport noise environments. It also identifies those land use types that are normally compatible with various levels of noise exposure. Compatible or incompatible land use is determined by comparing the predicted or measured DNL level at a site with the values given in the table. The guidelines reflect the statistical variability of the responses of large groups of people to noise. Therefore, any particular level might not accurately assess an individual's perception of an actual noise environment.

While the FAA guidelines specifically apply to aircraft noise, it should be noted that DNL is also used to describe the noise environment due to other community noise sources, including motor vehicles and railroads. The use of DNL is endorsed by the scientific community to assess land use compatibility as it pertains to noise (American National Standards Institute [ANSI], 1990). Hence, the land use guidelines presented by the FAA can also be used to assess the noise impact from community noise sources other than aircraft.

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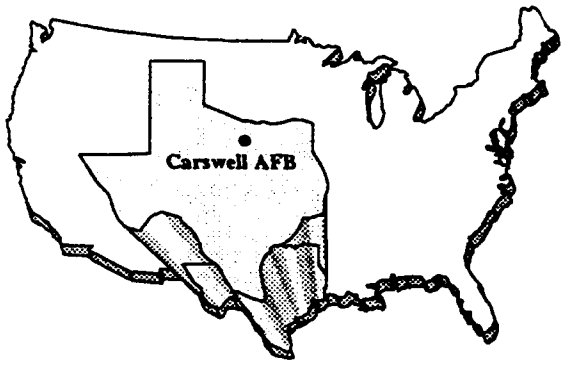

APPENDIX I

APPENDIX I

CULTURAL RESOURCES

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CULTURAL RESOURCES

Of the five recorded sites on Carswell AFB, one is prehistoric and four are historic. A brief description of each site is given below.

Prehistoric Site:

41TR125 (CAFB-03) - one non-diagnostic, isolated, secondary chert flake

Historic Sites:

CAFB-01 - a granite-and-mortar residential dwelling foundation footing approximately 0.60 meter by 0.60 meter that extends approximately 0.60 meter below the ground surface.

CAFB-02 - a partially destroyed bridge or water crossing constructed of concrete approximately 6 meters by 3 meters.

CAFB-04 - a light scatter of historic debris that includes nails, melted glass, metal plate fragments, drain fragments, and plumbing fixtures.

CAFB-05 - a trash dump containing cement slabs, bricks, brass fitting, and melted bottle glass fragments.

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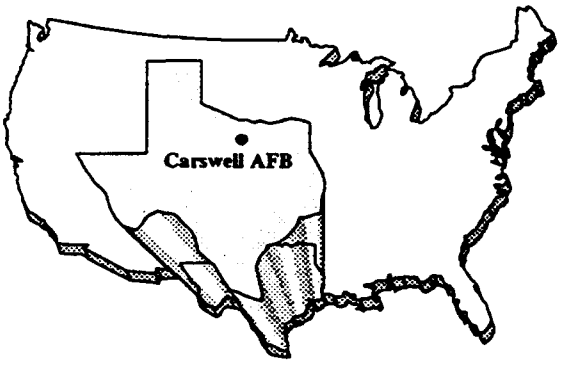


APPENDIX J

APPENDIX J

AIR QUALITY ANALYSIS METHODS

AND AIR EMISSIONS INVENTORY FOR CARSWELL AFB

APPENDIX J

AIR QUALITY ANALYSIS METHODS AND AIR EMISSIONS INVENTORY FOR CARSWELL AFB

Construction Emissions.

Construction activities would generate combustive emissions from heavy equipment usage and fugitive dust emissions from ground disturbing activities. Fugitive dust would be generated during construction activities associated with institutional, residential, public facilities/recreational, commercial, industrial, and military land uses. These emissions would be greatest during site clearing and grading activities. Uncontrolled fugitive dust (particulate matter) emissions from ground-disturbing activities are emitted at a rate of 110 pounds per acre per day (EPA, 1985). The particulate matter less than 10 microns (PM_{10}) portion of fugitive dust emissions is assumed to be 50 percent, or 55 pounds per acre per working day.

Construction for the No-Action/Realignment Alternative would disturb a total of approximately 24 acres over the first 5 year period of activity (1993-1998). Assuming that the amount of disturbed area is spread evenly throughout a 26-month period, an average of 11.0 acres per year would be disturbed. The analysis of fugitive dust emissions from construction activities assumes that on the average there are 230 working days per year (accounting for weekends, weather, and holidays), and that half of these days (115) would be used for site preparation. Additionally, 4 acre-days of disturbance are assumed per acre, which represents the area and duration of disturbing activities for each acre. Thus, for the No-Action/Realignment Alternative years 1993-1998, the amount of PM_{10} emissions are calculated as follows:

Average daily disturbed acreage:

$$\frac{11.0 \text{ acres disturbed}}{\text{year}} \times \frac{4 \text{ acre-days of disturbance}}{\text{acre}} \times \frac{1 \text{ year}}{115 \text{ days}} = 0.383 \text{ acres}$$

Average daily PM_{10} emissions:

$$0.383 \text{ acres} \times \frac{55 \text{ pounds } PM_{10}}{\text{acre-day}} = \frac{21.0 \text{ pounds } PM_{10}}{\text{day}}$$

Total annual PM_{10} emissions:

$$\frac{21.0 \text{ pounds } PM_{10}}{\text{day}} \times \frac{115 \text{ days}}{\text{year}} \times \frac{\text{ton}}{2000 \text{ pounds}} = 1.21 \text{ tons}$$

Therefore, the amount of PM_{10} emitted would be 21.0 pounds per day (0.011 ton/day) for 1993-1998. These emissions would produce elevated short-term PM_{10} concentrations, would be temporary, and would fall off rapidly with distance from the source. Similar calculations for fugitive dust emissions were performed for construction activities related to other alternatives. The results of these PM_{10} fugitive dust calculations are summarized in Table J-1.

Construction combustive emissions are estimated using the following pound per acre emission factors developed for a medium-scaled construction scenario, including site preparation, new facility construction and related infrastructure development:

Pollutant	Pounds Per Acre
CO	3,820
NO_x	1,095
PM_{10}	85
SO_x	100
VOC	290

Construction combustive emissions associated with each alternative are summarized by time period in Table J-1.

Aircraft Operations.

Emissions for the following aircraft activities were calculated from fleet mix and operational information predicted for each alternative: touch and go, aircraft queuing, takeoff and landings, and engine run-ups. All aircraft emissions were calculated with the Emissions and Dispersion Modeling System (EDMS) model (Segal, 1991), which contains a built-in data base of U.S. Environmental Protection Agency (EPA) AP-42 emission factors for various types of aircraft. EDMS was also used to calculate downwind pollutant concentrations that would occur from aircraft operations during a "busy day" scenario for each alternative. Aircraft operation input data are summarized in Table J-2. Aircraft-related emissions are presented in Table J-3.

Other Operations Emission Calculations.

Emissions from sources other than construction activities or aircraft operations are lumped together and called "other operation emissions." These other operation emissions occur from a variety of direct and indirect point, area, and mobile sources. The other operations emissions associated with Carswell AFB during preclosure conditions are presented in Table 3.4-6 of the EIS. Under closure conditions, other operations emissions would occur only from the OL and the retained 301st FW and AF Plant #4 activities. Closure emissions from these sources are shown in Table 3.4-7 of the EIS. Under the No-Action/Realignment Alternative other operations emissions would occur from: (1) the retained 301st FW and AF Plant #4 activities at Carswell AFB, (2) the NAS Dallas operation activities to be realigned to Carswell AFB, (3) the other military units outside NAS Dallas to be realigned to Carswell AFB, and (4) the new in-migrant population induced to move to the area as a result of realignment. In addition to these sources, emissions would also occur from civilian-related employees and in-migrating population under the Proposed Action and Mixed Use Alternatives. The following is a presentation of the methods used to calculate the "other operation emissions" from each source type.

Retained Carswell AFB Activity. With the exception of Aircraft Flying Operations and Aircraft Ground Operations, "other operation emissions" associated with the retained 301st FW and AF Plant #4 are assumed to represent the same sources as those presented in Table 3.4-7 of the EIS. All emissions, except VOC, are assumed to remain approximately constant in future years.

VOC emissions are assumed to be reduced 15 percent by the year 1996 due to Mandated, Phase I, and Phase II VOC Rules as contained in the 1993 Rate-Of-Progress SIP for Dallas/Fort Worth, El Paso, Beaumont/Port Arthur, and Houston/Galveston Ozone Non-attainment Areas, (TNRCC, 1993). The rules contained in the 1993 SIP are designed to achieve attainment of the ozone standards by 1996. VOC emissions in the years after 1996 are therefore assumed to remain constant at 1996 levels due to measures designed to maintain the attainment status.

NAS Dallas Activity. NAS Dallas will be the largest component of the realignment. NAS Dallas emissions from sources other than aircraft realigned to NAS Fort Worth are assumed to be similar to existing emissions at NAS Dallas (i.e., a direct transfer of emissions to the new location would occur). A summary of the NAS Dallas 1992 baseline emissions is provided in Table J-4.

Other Realigning Units. Emission inventories for "other realigning units" at Carswell AFB (i.e., NAS Glenview and NAS Memphis) are not itemized from the host base inventories. Therefore, these other realignment units are assumed to have emission inventories which contain emission sources similar to those that occur at NAS Dallas. The amount of other realigning unit's emissions are determined as a portion of the NAS Dallas inventory that is directly proportional to the number of personnel at the two locations (i.e., number of other realigning unit personnel/number of NAS Dallas personnel x NAS Dallas inventory = other realigning unit inventory). The total number of full-time on-base personnel at NAS Dallas in 1990 was 3,434 persons. This number is assumed to be representative of the number of personnel on-base in 1992, the emissions baseline year. The total number of full-time personnel to be realigned to Carswell AFB from NAS Glenview and NAS Memphis are 25 persons and 200 persons, respectively. The "other operation emissions" associated with these personnel are shown in Table J-4.

All realigning unit emissions, except VOC, are assumed to remain approximately constant in future years after the baseline year. VOC emissions are assumed to be reduced 15 percent by the year 1996 due to Mandated, Phase I, and Phase II VOC Rules as contained in the 1993 Rate-Of-Progress SIP, (Texas Natural Resource Conservation Commission [TNRCC], 1993) (e.g., JP-8 fuel usage, pollution prevention measures, control technologies). VOC emissions in the years 1998 and 2003 are assumed to remain constant at 1996 levels due to measures designed to maintain the attainment status.

In-Migrant Population. Emissions from the new in-migrant population are calculated based on per-capita emission factors developed from the best available data. The in-migrant population of concern is the new population induced to move into Tarrant County as a result of the alternative actions. The data available to calculate these in-migrant emissions varies by pollutant. For VOC, NO_x, and CO, year 1990 emissions are available by source type for Tarrant County from the TNRCC. For VOC, emission projections for the year 1996 are also available for the four-county ozone nonattainment area (Collin, Dallas, Denton, and Tarrant counties). These projections consider the effect of currently Mandated Rules and Phase I and Phase II Rules proposed as part of the updated State Implementation Plan (SIP). For SO_2 and PM_{10}, the only applicable inventory data which appear to be available are those contained in the 1990 Carswell AFB and NAS Dallas inventories. Because of the differences in available data, three different approaches are used to calculate in-migrant pollutant emissions, as outlined below.

VOC Emission Projections.

Step 1 — Determine the Area source, Non-Road Mobile Source, and Other Non-Road Engine Source 1990 Tarrant County VOC emission source types that do not apply to activities associated with the in-migrating population (for example, "Leaking Underground Tank" or "Railroad Locomotive" emissions would not be expected to increase as a result of new in-migrant population). The sources assumed to not apply to in-migrant population are shown as highlighted values in Table J-5.

Step 2 — Sum up the 1990 VOC emissions from Tarrant County sources remaining after deduction of those sources determined to not apply in Step 1. (See Table J-6.) Only sources related to residential, recreational, and municipal activities are included in Table J-6. Work-related emissions for the in-migrants are included as part of the military and reuser-related employee emissions.

Step 3 — For source types remaining after Step 1, determine the 1996 emissions by application of the appropriate growth factors from the 1993 Rate-Of-Progress SIP for Dallas/Fort Worth, El Paso, Beaumont/Port Arthur, and Houston/Galveston Nonattainment Areas, (TNRCC, 1993). (See Table J-7.)

Step 4 — Determine the applicability and amount of emission reductions expected by 1996 from Mandated Rules and SIP-Proposed Phase I and Phase II Rules. Since these reductions are available only for the four-county Dallas/Fort Worth non-attainment area, assume that the reduction percentages in Tarrant County will be similar to the reduction percentages in the four-county non-attainment area.

Step 5 — Calculate controlled 1996 Tarrant County VOC emission totals by deducting the emission reductions determined in Step 4 from the uncontrolled 1996 emissions determined in Step 3. (The results of these calculations are shown in Table J-7.)

Step 6 — Assume that the 1996 emissions calculated in Step 5 will be held constant in the years of concern after 1996 (i.e., 1998 and 2003) by control measures designed to maintain attainment.

Step 7 — Calculate 1998 and 2003 per-capita VOC emission factors by dividing the respective VOC totals by the respective Tarrant County populations projected for those years. (Tarrant County population projections and per-capita emission factors are shown in Table J-8.)

Step 8 — Multiply the 1998 and 2003 per-capita factors by the respective Tarrant County in-migrant population totals to determine the total "In-Migrant Emissions" of VOC. (The resulting in-migrant VOC emissions are contained in Table J-9.)

Step 9 — Determine "Total" VOC emissions by adding the results from Step 8 to the respective 1998 and 2003 VOC Construction Emissions, Aircraft Operation Emissions, Retained Activity Emissions, and Realigning Unit Emissions. (Total

emissions are summarized by pollutant in tables at the end of this appendix. See Table J-221 for total VOC emissions.)

NO_x and CO Emission Projections.

Step 1 Determine the Area source, Non-Road Mobile Source, and Other Non-Road Engine Source 1990 Tarrant County NO_x and CO emission source types that do not apply to activities associated with the in-migrating population. (Same as shown previously in Table J-5.)

Step 2 Sum up the 1990 NO_x and CO emissions from Tarrant County sources remaining after deduction of those sources determined in Step 1. (See Table J-6.)

Step 3 Calculate 1998 and 2003 Tarrant County NO_x and CO emissions totals by increasing the 1990 emission sums determined in Step 2 in proportion to projected Tarrant County population increases. (The results of these calculations are shown in Table J-10.)

Step 4 Calculate 1998 and 2003 per-capita NO_x and CO emission factors by dividing the respective NO_x and CO totals by the respective Tarrant County populations projected for those years. (See Table J-10.)

Step 5 Multiply the 1998 and 2003 per-capita factors by the respective Tarrant County in-migrant population totals to determine the total "In-Migrant Emissions" of NO_x and CO. (The resulting in-migrant NO_x and CO emissions are contained in Table J-11.)

Step 6 Determine "Total" NO_x and CO emissions by adding the results from Step 5 to the respective 1998 and 2003 NO_x and CO Construction Emissions, Aircraft Operation Emissions, Retained Activity Emissions, and Realignment User Emissions. (Total emissions are summarized by pollutant in tables at the end of this appendix. See Tables J-22 and J-23 for total NO_x and total CO emissions, respectively.)

SO_2 and PM_{10} Emission Projections.

Step 1 Deduct 1990 "Aircraft Flying Operation" and "Aircraft Ground Operation" SO_2 and PM_{10} emissions (Tables 3.4-6 and 3.4-7) from the total "Carswell AFB (including retained military)" SO_2 and PM_{10} emissions (Table 3.4-6).

Step 2 Calculate SO_2 and PM_{10} per-capita emission factors by dividing the results from Step 1 by the 1990 Carswell AFB on-base population (12,409 persons). (See Table J-12.)

Step 3 Assume that the per-capita factors developed in Step 2 remain constant for future years 1998 and 2003.

Step 4 Multiply the per-capita factors by the 1998 and 2003 Tarrant County in-migrant population totals to determine the total "In-Migrant Emissions" of SO_2 and PM_{10}. (The resulting in-migrant SO_2 and PM_{10} emissions are contained in Table J-13.)

Step 5 Determine "Total" SO_2 and PM_{10} emissions by adding the results from Step 4 to the respective 1998 and 2003 SO_2 and PM_{10} Construction Emissions, Aircraft Operation Emissions, Retained Activity Emissions, and Realignment User Emissions. (Total emissions are summarized by pollutant in tables at the end of this appendix. See Tables J-24 and J-25 for total SO_2 and total PM_{10} emissions, respectively.)

Reuse-Related Employees. Emissions from the new workers associated with civilian reuse activities are calculated using the same basic methodology as described above for the in-migrant population. The only differences are that 1) employees rather than population are used to determine the per-employee factors and emissions for area and non-road mobile sources, and 2) the source types determined to not apply in Step 1 of the VOC, NO_x, and CO methodologies are different for reuse-related employment activity than they were for in-migrant population emissions. Reuse-related employment activity and source types included only those sources expected to increase as a result of employment, excluding those related to residential, recreational, or general municipal activity. A summary of the 1990 Tarrant County emission source types assumed to apply to the reuse-related employment activities is provided in Table J-14. Year 1996 emissions for VOC sources associated with reuse-related employment are calculated in Table J-15 using appropriate growth factors and VOC emission reductions expected due to Mandated, Phase I, and Phase II Rules. Per-employee VOC emission factors for area, non-road mobile, and on-road mobile sources are calculated as shown in Table J-16. The area and non-road mobile source factors are based on the total employment of Tarrant County while the on-road mobile source factors are assumed to be the same as previously determined for the in-migrant emissions. The reuse-related employee VOC emissions associated with the Proposed Action and Mixed Use Alternatives are provided in Table J-17. Emission factors and emissions for NO_x and CO are provided in Tables J-18 and J-19. Reuse-related employee emissions for SO_2 and PM_{10} are contained in Table J-20. The same emission factors used for calculation of in-migrant population SO_2 and PM_{10} emissions are used for calculation of the reuse-related employee SO_2 and PM_{10} emissions.

Summary

VOC emissions associated with Preclosure, Closure, and the No-Action/Realignment, Proposed Action, and Mixed Use Alternatives are summarized in Table J-21. Table J-21 includes a breakdown of the emissions contributed by both military and civilian sources. The same type of summary and breakdown of military and civilian emissions is shown in Table J-22 for NO_x, Table J-23 for CO, Table J-24 for SO_2, and Table J-25 for PM_{10}.

Table J-1. Construction Fugitive Dust and Combustive Emissions Associated with the No-Action, Proposed Action, and Mixed Use Alternatives, (tons/day)

Pollutant	Source	No-Action/ Realignment Alternative[a] 1998	No-Action/ Realignment Alternative[a] 2003	Proposed Action[b] 1998	Proposed Action[b] 2003	Mixed Use Alternative[c] 1998	Mixed Use Alternative[c] 2003
VOC	Combustive Emissions						
	- Military	0.007	0.000	0.007	0.000	0.007	0.000
	- Civilian	NA	NA	0.015	0.004	0.010	0.008
	Total	0.007	0.000	0.022	0.004	0.017	0.008
NO_x	Combustive Emissions						
	- Military	0.026	0.000	0.026	0.000	0.026	0.000
	- Civilian	NA	NA	0.055	0.016	0.038	0.029
	Total	0.026	0.000	0.081	0.016	0.064	0.029
CO	Combustive Emissions						
	- Military	0.091	0.000	0.091	0.000	0.091	0.000
	- Civilian	NA	NA	0.193	0.056	0.133	0.100
	Total	0.091	0.000	0.284	0.056	0.224	0.100
SO_2	Combustive Emissions						
	- Military	0.002	0.000	0.002	0.000	0.002	0.000
	- Civilian	NA	NA	0.005	0.001	0.004	0.003
	Total	0.002	0.000	0.007	0.001	0.006	0.003
PM_{10}	Fugitive Dust Emissions						
	- Military	0.011	0.000	0.011	0.000	0.011	0.000
	- Civilian	NA	NA	0.022	0.007	0.015	0.011
	Combustive Emissions						
	- Military	0.002	0.000	0.002	0.000	0.002	0.000
	- Civilian	NA	NA	0.004	0.001	0.003	0.002
	Total	0.013	0.000	0.039	0.008	0.031	0.013

Notes: (a) No-Action/Realignment Alternative emissions based on a total of 24 acres disturbed by construction during the period from 1993-1998.

(b) Proposed Action emissions based on a total disturbance areas of 24 acres (military-related) and 171 acres (civilian-related) during the period from 1993-1998, and 34 acres (civilian-related) during the period 1998-2003.

(c) Mixed Use Alternative emissions based on a total disturbance areas of 24 acres (military-related) and 135 acres (civilian-related) during the period from 1993-1998, and 60 acres (civilian-related) during the period 1998-2003.

CO = carbon monoxide.
NA = Not applicable.
NO_x = nitrogen oxide.
PM_{10} = particulate matter equal to or less than 10 microns in diameter.
SO_2 = sulfur dioxide.
VOC = volatile organic compound.

J-2. Aircraft Fleet Mix and Frequency Data

Aircraft	EDMS Substitute (if required)	Aircraft Operations Annual	Aircraft Operations Busy Day
MILITARY			
No-Action/Realignment Alternative			
F/A-18A		6,446	1.44
KC-130T		4,683	1.46
F-14	F-14A	8,943	2.61
F-14	F-14A	5,044	1.47
P-3B		3,898	1.07
C-9B		3,431	0.59
C-130H		11,965	2.86
OH-58		7,278	2.92
UH-1	UH-1H	7,278	2.91
U-21	King Air (Civilian)	2,081	0.81
UH-1H		1,029	0.33
UH-60L		2,577	0.81
CH-47D		6,694	2.12
F-16		7,855	2.00
F-16		1,000	0.13
Attack/Fighter	A-4F	1,409	0.25
	A-6E	362	0.05
	F-14A	698	0.09
	F-15	451	0.06
	F-16	3,698	0.72
	F-18	1,798	0.24
	F-SE/F	442	0.06
Large Cargo/Transport-Propeller	C-130H	592	0.08
Large Cargo/Transport-Jet	C-9	2,228	0.30
Small Cargo/Transport	C-12J	1,236	0.17
	Lear 35 (military)	636	0.08
Trainer, Jet	T-2	1,111	0.23
	T-37	4,075	0.79
	T-38	5,768	1.12
	T-45A	932	0.19
Trainer, Propeller			
	T-34C	1,258	0.24
	T-44	289	0.06
Helicopter		1,004	0.23
CIVILIAN			
Proposed Action			
B727	B727-200	104	0.01
Lear 35		312	0.04
Mixed Use			
DC-9	DC-9-20	120	0.02
MD-80		120	0.02
B727	B727-200	120	0.02

EDMS = Emission and Dispersion Modeling System.

Table J-3. Aircraft Operation Emissions, (tons/day)
Page 1 of 2

Pollutant	Source	Preclosure 1990	Closure 1993	No-Action/ Realignment Alternative 1998	No-Action/ Realignment Alternative 2003	Proposed Action 1998	Proposed Action 2003	Mixed Use Alternative 1998	Mixed Use Alternative 2003
VOC	Aircraft Flying Operations								
	- Military	8.453	0.075	0.353	0.353	0.354	0.354	0.354	0.354
	- Civilian	NA	NA	NA	NA	0.000	0.000	0.001	0.001
	Aircraft Ground Operations								
	- Military	0.027	0.004	0.007	0.007	0.007	0.007	0.007	0.007
	- Civilian	NA	NA	NA	NA	0.000	0.000	0.000	0.000
	Total Aircraft Operations	8.480	0.079	0.360	0.360	0.361	0.361	0.362	0.362
NO_x	Aircraft Flying Operations								
	- Military	1.655	0.100	0.456	0.456	0.456	0.456	0.456	0.456
	- Civilian	NA	NA	NA	NA	0.002	0.002	0.007	0.007
	Aircraft Ground Operations								
	- Military	0.011	0.003	0.077	0.077	0.077	0.077	0.077	0.077
	- Civilian	NA	NA	NA	NA	0.000	0.000	0.000	0.000
	Total Aircraft Operations	1.666	0.103	0.533	0.533	0.535	0.535	0.540	0.540
CO	Aircraft Flying Operations								
	- Military	9.987	0.377	1.071	1.071	1.072	1.072	1.072	1.072
	- Civilian	NA	NA	NA	NA	0.002	0.002	0.004	0.004
	Aircraft Ground Operations								
	- Military	0.043	0.013	0.062	0.062	0.062	0.062	0.062	0.062
	- Civilian	NA	NA	NA	NA	0.000	0.000	0.000	0.000
	Total Aircraft Operations	10.030	0.390	1.133	1.133	1.136	1.136	1.138	1.138

CO = carbon monoxide.
NA = Not applicable.
NO_x = nitorgen oxide.
VOC = volatile organic compound.

Table J-3. Aircraft Operation Emissions, (tons/day)
Page 2 of 2

Pollutant	Source	Preclosure 1990	Closure 1993	No-Action/ Realignment Alternative 1998	No-Action/ Realignment Alternative 2003	Proposed Action 1998	Proposed Action 2003	Mixed Use Alternative 1998	Mixed Use Alternative 2003
SO_x	Aircraft Flying Operations								
	- Military	0.167	0.009	0.033	0.033	0.033	0.033	0.033	0.033
	- Civilian	NA	NA	NA	NA	0.001	0.001	0.001	0.001
	Aircraft Ground Operations								
	- Military	0.002	0.001	0.005	0.005	0.005	0.005	0.005	0.005
	- Civilian	NA	NA	NA	NA	0.000	0.000	0.000	0.000
	Total Aircraft Operations	0.169	0.010	0.038	0.038	0.039	0.039	0.039	0.039
PM_{10}	Aircraft Flying Operations								
	- Military	1.650	0.004	0.078	0.078	0.078	0.078	0.078	0.078
	- Civilian	NA	NA	NA	NA	0.000	0.000	0.001	0.001
	Aircraft Ground Operations								
	- Military	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.001
	- Civilian	NA	NA	NA	NA	0.000	0.000	0.000	0.000
	Total Aircraft Operations	1.651	0.004	0.079	0.079	0.079	0.079	0.080	0.080

N/A = Not applicable.
PM_{10} = particulate matter equal to or less than 10 microns in diameter.
SO_x = sulfur oxide.

Table J-4. Dallas NAS and Other Realigning Unit Emissions

Emission Source	VOC		NO_x		CO		SO_2		PM_{10}	
	Tons/Year	Tons/Day	Tons/Year	Tons/Day	Tons/Year	Tons/Day	Tons/Year	Tons/Day	Tons/Year	Tons/Day
NAS DALLAS (a)										
Fuel Burning Equip.	0.296	0.001	3.696	0.010	0.740	0.002	0.022	0.000	1.109	0.003
Internal Combustion	0.379	0.001	4.744	0.013	1.025	0.003	0.315	0.001	0.338	0.001
Surface Coating	3.695	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.095	0.000
Solvent Use	0.080	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Storage Tanks	8.155	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Miscellaneous	0.358	0.001	1.799	0.005	0.555	0.001	0.164	0.000	0.402	0.001
SUBTOTAL	12.963	0.036	10.239	0.028	2.320	0.006	0.501	0.001	1.944	0.005
NAS GLENVIEW (b)										
Fuel Burning Equip.	0.002	0.000	0.027	0.000	0.005	0.000	0.000	0.000	0.008	0.000
Internal Combustion	0.003	0.000	0.035	0.000	0.007	0.000	0.002	0.000	0.002	0.000
Surface Coating	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
Solvent Use	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Storage Tanks	0.059	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Miscellaneous	0.003	0.000	0.013	0.000	0.005	0.000	0.002	0.000	0.003	0.000
SUBTOTAL	0.094	0.000	0.075	0.000	0.017	0.000	0.004	0.000	0.014	0.000
NAS MEMPHIS (c)										
	0.017	0.000	0.215	0.001	0.043	0.001	0.001	0.000	0.064	0.001
Fuel Burning Equip.	0.022	0.000	0.276	0.001	0.060	0.000	0.018	0.000	0.020	0.000
Internal Combustion	0.215	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.000
Surface Coating	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Solvent Use	0.475	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Storage Tanks	0.021	0.000	0.105	0.000	0.032	0.000	0.010	0.000	0.023	0.000
Miscellaneous										
SUBTOTAL	0.755	0.002	0.596	0.002	0.135	0.001	0.029	0.000	0.113	0.001
TOTAL	13.812	0.038	10.910	0.030	2.472	0.007	0.534	0.001	2.071	0.006

Notes: (a) NAS Dallas ton/year emissions obtained from the "Emissions Inventory and Compliance Analysis," (Davis & Floyd, 1993). Ton/day values calculated as 365 day per year averages.

(b) NAS Glenview emissions assumed to be directly proportional to the number of personnel at the NAS Glenview and NAS Dallas, i.e., 25 persons at NAS Glenview and 3,434 persons at NAS Dallas.

(c) NAS Memphis emissions assumed to be directly proportional to the number of personnel at the NAS Memphis and NAS Dallas, i.e., 200 persons at NAS Memphis and 3,434 persons at NAS Dallas.

CO = carbon monoxide.
NAS = Naval Air Station.
NO_x = nitrogen oxide.
PM_{10} = particulate matter equal to or less than 10 microns.
SO_2 = sulfur dioxide.
VOC = volatile organic compound.

Table J-5. Summary of Year 1990 Emissions By Source Type for Tarrant County[a] (Page 1 of 3)

Source Type	VOC Emissions		NO_x Emissions		CO Emissions	
	Tons/Year	Tons/Day	Tons/Year	Tons/Day	Tons/Year	Tons/Day
POINT SOURCES	**9,798.00**	**26.84**	**8,993.00**	**24.64**	**812.00**	**2.22**
AREA SOURCES						
Oil & Gas Production	0.00	0.00	0.00	0.00	0.00	0.00
Service Stations - Vehicle Refueling	2,090.48	5.73	0.00	0.00	0.00	0.00
Service Stations - Tank Truck Unloading	753.04	2.06	0.00	0.00	0.00	0.00
Service Stations - Tank Trucks in Transit	10.60	0.03	0.00	0.00	0.00	0.00
Service Stations - Tank Breathing Losses	294.43	0.81	0.00	0.00	0.00	0.00
Service Stations - Other	206.10	0.56	0.00	0.00	0.00	0.00
Aircraft Refueling	109.85	0.30	0.00	0.00	0.00	0.00
Synthetic Organic Chemical Storage Tanks	0.00	0.00	0.00	0.00	0.00	0.00
Leaking Underground Tanks	894.25	2.45	0.00	0.00	0.00	0.00
Architectural Coatings	2,660.96	7.29	0.00	0.00	0.00	0.00
Auto Refinishing	1,130.32	3.10	0.00	0.00	0.00	0.00
Traffic Markings	292.53	0.80	0.00	0.00	0.00	0.00
Furniture & Fixtures	826.00	2.26	0.00	0.00	0.00	0.00
Metal Containers	279.41	0.77	0.00	0.00	0.00	0.00
Automobiles (new)	459.16	1.26	0.00	0.00	0.00	0.00
Machinery & Equipment	350.95	0.96	0.00	0.00	0.00	0.00
Appliances	61.55	0.17	0.00	0.00	0.00	0.00
Other Transportation Equipment	419.84	1.15	0.00	0.00	0.00	0.00
Sheet, Strip, & Coil	91.40	0.25	0.00	0.00	0.00	0.00
Factory Finished Wood	3.36	0.20	0.00	0.00	0.00	0.00
Electrical Insulation	76.99	0.21	0.00	0.00	0.00	0.00
Other Product Coatings	0.00	0.00	0.00	0.00	0.00	0.00
High-Performance Maintenance	468.04	1.28	0.00	0.00	0.00	0.00
Marine Coatings	0.00	0.00	0.00	0.00	0.00	0.00
Other Spec. Purpose Coatings	468.04	1.28	0.00	0.00	0.00	0.00
Barge, Tank Truck, Rail Car, Drum Clean.	0.00	0.00	0.00	0.00	0.00	0.00
Breweries	0.00	0.00	0.00	0.00	0.00	0.00
Wineries	0.00	0.00	0.00	0.00	0.00	0.00
Distilleries	0.00	0.00	0.00	0.00	0.00	0.00
Catastrophic/Accidental Releases	9.80	0.03	0.00	0.00	0.00	0.00
Surface Cleaning	504.48	1.38	0.00	0.00	0.00	0.00
Dry Cleaning	276.44	0.76	0.00	0.00	0.00	0.00
Graphic Arts	383.09	1.05	0.00	0.00	0.00	0.00
Cutback Asphalt	121.76	0.33	0.00	0.00	0.00	0.00
Emulsified Asphalt	55.00	0.15	0.00	0.00	0.00	0.00
Consumer/Commercial Solvent Use	3,557.70	9.75	0.00	0.00	0.00	0.00
Pesticide Application	91.00	0.25	0.00	0.00	0.00	0.00
Municipal Waste Landfills	744.83	2.04	0.00	0.00	0.00	0.00
Municipal Wastewater Treatment (POTW)	13.82	0.04	0.00	0.00	0.00	0.00
Industrial Wastewater Treatment	2.85	0.01	0.00	0.00	0.00	0.00
Wastewater Package Plants	0.00	0.00	0.00	0.00	0.00	0.00
Commercial Bakeries	80.72	0.22	0.00	0.00	0.00	0.00
On-Site Incineration	0.00	0.00	0.00	0.00	0.00	0.00
Stationary Source Fuel Combustion						
Fuel Oil-Residential	0.00	0.00	0.01	0.00	0.00	0.00
Fuel Oil-Commercial/Distillate	1.69	0.00	99.16	0.27	24.80	0.07
Fuel Oil-Commercial/Residual	0.12	0.00	5.91	0.02	0.54	0.00
Fuel Oil-Industrial/Distillate	7.88	0.02	789.66	2.16	197.41	0.54
Fuel Oil-Industrial/Residual	0.55	0.00	107.61	0.29	9.78	0.03
Coal-Residential	0.71	0.00	0.21	0.00	6.36	0.02
Natural Gas-Residential	46.55	0.13	878.37	2.41	175.67	0.48
Natural Gas-Commercial	32.88	0.09	607.69	1.66	121.60	0.33

Note: (a) *Tons/year values were obtained from the TNRCC, 1993.* Tons/day values are calculated as 365 days per year averages. Highlighting is used to indicate source types that are assumed to remain constant and not increase as a result of in-migrating population. (TOTAL 1 = Sum of all sources. TOTAL 2 = Sum of non-highlighted sources only.)

CO = carbon monoxide.
NO_x = nitrogen oxide.
VOC = volatile organic compound.

Table J-5. Summary of Year 1990 Emissions By Source Type for Tarrant County[a] (Page 2 of 3)

Source Type	VOC Emissions Tons/Year	VOC Emissions Tons/Day	NO_x Emissions Tons/Year	NO_x Emissions Tons/Day	CO Emissions Tons/Year	CO Emissions Tons/Day
Stationary Source Fuel Comb. (cont.)						
Natural Gas-Industrial	5.62	0.02	280.99	0.77	70.25	0.19
LPG-Residential	1.20	0.00	22.57	0.06	4.56	0.01
LPG-Commercial	0.82	0.00	15.41	0.04	3.11	0.01
LPG-Industrial	1.16	0.00	59.05	0.16	14.76	0.04
Wood-Residential	37.97	0.10	3.79	0.01	313.02	0.86
Structure Fires	0.26	0.00	0.03	0.00	1.43	0.00
Forest Fires	0.00	0.00	0.00	0.00	0.00	0.00
Prescribed Burning	0.00	0.00	0.00	0.00	0.00	0.00
Slash Burning	0.00	0.00	0.00	0.00	0.00	0.00
Open Burning	0.00	0.00	0.00	0.00	0.00	0.00
Orchard Heaters	0.00	0.00	0.00	0.00	0.00	0.00
Agricultural Burning	0.00	0.00	0.00	0.00	0.00	0.00
SUBTOTAL	**17,996.30**	**49.30**	**2,870.46**	**7.86**	**943.29**	**2.58**
NON-ROAD MOBILE SOURCES						
Railroad Locomotives	138.02	0.38	2,314.52	6.34	327.32	0.90
Commercial Aircraft	851.39	2.33	2,046.31	5.61	4,133.80	11.33
Military Aircraft	282.30	0.77	40.97	0.11	290.29	0.80
General Aircraft	96.91	0.27	17.91	0.05	3,074.05	8.42
Vessels	0.00	0.00	0.00	0.00	0.00	0.00
Other Non-road Engines						
Trimmers/edgers/brush cutters	440.26	1.21	0.79	0.00	1,205.35	3.30
Lawn mowers	2,217.56	6.08	14.98	0.04	16,665.32	45.66
Leaf blowers/vacuums	146.67	0.40	0.30	0.00	429.53	1.18
Rear engine riding mowers	44.83	0.12	1.45	0.00	1,107.80	3.04
Front mowers	16.13	0.04	0.37	0.00	301.83	0.83
Chainsaws (< 4 HP)	360.11	0.99	0.52	0.00	719.53	1.97
Shredders (< 5 HP)	3.76	0.01	0.03	0.00	29.01	0.08
Tillers (< 5 HP)	61.40	0.17	0.51	0.00	514.45	1.41
Lawn & garden tractors	251.22	0.69	23.31	0.06	6,381.61	17.48
Wood splitters	16.54	0.05	0.15	0.00	146.00	0.40
Snowblowers	0.00	0.00	0.00	0.00	0.00	0.00
Chippers/stump grinders	107.01	0.29	20.91	0.06	861.96	2.36
Commercial turf equipment	443.78	1.22	17.20	0.05	13,740.65	37.65
Other lawn & garden equipment	13.10	0.04	0.05	0.00	56.00	0.15
Aircraft support equipment	16.50	0.05	83.66	0.23	177.18	0.49
Terminal tractors	168.01	0.46	1,055.37	2.89	1,462.85	4.01
All terrain vehicles (ATV)	0.00	0.00	0.00	0.00	0.00	0.00
Minibikes	0.00	0.00	0.00	0.00	0.00	0.00
Off-road motorcycles	0.00	0.00	0.00	0.00	0.00	0.00
Golf carts	0.00	0.00	0.00	0.00	0.00	0.00
Snowbmobiles	0.00	0.00	0.00	0.00	0.00	0.00
Specialty vehicle carts	0.00	0.00	0.00	0.00	0.00	0.00
Vessels w/inboard engines	20.96	0.06	5.47	0.01	135.76	0.37
Vessels w/outboard engines	592.10	1.62	6.07	0.02	1,097.23	3.01
Vessels w/sterndrive engines	46.79	0.13	14.55	0.04	501.61	1.37
Sailboat auxiliary inboard engines	0.07	0.00	0.08	0.00	0.16	0.00
Sailboat auxiliary outboard engines	0.30	0.00	0.00	0.00	0.56	0.00
Generator sets (< 50 HP)	1,562.55	4.28	140.34	0.38	22,704.80	62.20
Pumps (< 50 HP)	273.59	0.75	58.18	0.16	5,946.07	16.29
Air compressors (< 50 HP)	153.48	0.42	29.35	0.08	3,919.93	10.74
Gas compressors (< 50 HP)	6.43	0.02	5.78	0.02	120.57	0.33
Welders (< 50 HP)	257.60	0.71	119.10	0.33	6,545.99	17.93
Pressure washers (< 50 HP)	79.53	0.22	2.60	0.01	1,825.14	5.00
Aerial lifts	44.10	0.12	47.12	0.13	816.32	2.24

Note: (a) Tons/year values were obtained from the TNRCC, 1993. Tons/day values are calculated as 365 days per year averages. Highlighting is used to indicate source types that are assumed to remain constant and not increase as a result of in-migrating population. (TOTAL 1 = Sum of all sources. TOTAL 2 = Sum of non-highlighted sources only.)

CO = carbon monoxide.
HP = horsepower.
NO_x = nitrogen oxide.
VOC = volatile organic compound.

Table J-5. Summary of Year 1990 Emissions By Source Type for Tarrant County[a] (Page 3 of 3)

Source Type	VOC Emissions		NO_x Emissions		CO Emissions	
	Tons/Year	Tons/Day	Tons/Year	Tons/Day	Tons/Year	Tons/Day
Forklifts	358.09	0.98	706.88	1.94	5,582.34	615.29
Sweepers/scrubbers	51.96	0.14	263.39	0.72	529.77	1.45
Other general industrial equipment	53.95	0.15	87.84	0.24	371.15	1.02
Other material handing equipment	3.15	0.01	12.77	0.03	38.05	0.10
Asphalt pavers	5.09	0.01	51.87	0.14	55.30	0.15
Tampers/rammers	50.14	0.14	0.[illegible]	0.00	106.07	0.29
Plate compactors	104.44	0.29	2.20	0.01	491.45	1.35
Concrete pavers	3.22	0.01	28.48	0.08	12.99	0.04
Rollers	31.01	0.08	112.60	0.31	381.09	1.04
Scrapers	34.15	0.09	412.75	1.13	237.21	0.65
Paving equipment	122.15	0.33	226.75	0.62	1,050.27	2.88
Surfacing equipment	15.43	0.04	1.45	0.00	284.96	0.78
Signal boards	2.18	0.01	9.65	0.03	18.68	0.05
Trenchers	33.69	0.09	113.17	0.31	434.03	1.19
Bore/drill rigs	23.50	0.06	92.55	0.25	224.26	0.61
Excavators	37.28	0.10	556.54	1.52	269.21	0.74
Concrete/industrial saws	52.54	0.14	6.07	0.02	1,092.44	2.99
Cement and mortar mixers	23.63	0.06	3.11	0.01	411.91	1.13
Cranes	110.98	0.30	843.41	2.31	430.55	1.18
Graders	79.14	0.22	478.90	1.31	189.57	0.52
Off-highway trucks	63.17	0.17	697.64	1.91	203.48	0.56
Crushing/proc. equipment	17.24	0.05	113.03	0.31	140.57	0.39
Rough terrain forklifts	46.76	0.13	194.44	0.53	333.98	0.92
Rubber-tired loaders	123.32	0.34	1,402.56	3.84	749.15	2.05
Rubber-tired dozers	17.86	0.05	197.41	0.54	57.58	0.16
Tractors/loaders/backhoes	148.76	0.41	1,021.14	2.80	744.24	2.04
Crawler tractors	276.99	0.76	2,189.72	6.00	1,020.45	2.80
Skid steer loaders	58.84	0.16	206.24	0.57	460.90	1.26
Off-highway tractors	166.57	0.46	782.36	2.14	964.32	2.64
Dumpers/tenders	3.48	0.01	0.47	0.00	63.49	0.17
Other construction equipment	18.19	0.05	101.37	0.28	176.99	0.48
Two-wheel tractors	0.09	0.00	0.01	0.00	1.46	0.00
Agricultural tractors	57.28	0.16	277.94	0.76	229.88	0.63
Agricultural mowers	0.08	0.00	0.01	0.00	1.65	0.00
Combines	2.06	0.01	17.15	0.05	8.33	0.02
Sprayers	0.37	0.00	0.23	0.00	6.53	0.02
Balers	0.03	0.00	0.10	0.00	0.05	0.00
Tillers (> 5 HP)	3.64	0.01	0.03	0.00	31.19	0.09
Swathers	1.72	0.00	6.66	0.02	9.32	0.03
Hydro power units	0.31	0.00	0.08	0.00	6.38	0.02
Other agricultural equipment	0.63	0.00	2.94	0.01	3.45	0.01
Chainsaws (> 4HP)	28.44	0.08	0.08	0.00	82.11	0.22
Shredders (> 5HP)	0.00	0.00	0.00	0.00	0.00	0.00
Skidders	0.00	0.00	0.00	0.00	0.00	0.00
Fellers/bunchers	0.00	0.00	0.00	0.00	0.00	0.00
SUBTOTAL	**10,944.53**	**29.99**	**17,290.00**	**47.37**	**112,745.44**	**308.89**
ON-ROAD MOBILE SOURCES	**37,394.25**	**102.45**	**35,773.65**	**98.01**	**349,746.65**	**958.21**
TOTAL 1	**76,133.08**	**208.58**	**64,927.11**	**177.88**	**464,247.38**	**1,271.91**
TOTAL 2	**51,233.07**	**140.36**	**36,993.01**	**101.35**	**415,155.28**	**1,137.41**

Note: (a) Tons/year values were obtained from the TNRCC, 1993. Tons/Day values are calculated as 365 days per year averages. *Highlighting is used to indicate source types that are assumed to remain constant and not increase as a result of in-migrating population.* (TOTAL 1 = Sum of all sources. TOTAL 2 = Sum of non-highlighted sources only.)

CO = cargon monoxide.
HP = horsepower.
NO_x = nitrogen oxide.
VOC = volatile organic compound.

Table J-6. Summary of Year 1990 Tarrant County Emissions By Source Type for Those Sources Assumed to Apply to the In-Migrating Population

Source Type	VOC Emissions		NOx Emissions		CO Emissions	
	Tons/Year	Tons/Day	Tons/Year	Tons/Day	Tons/Year	Tons/Day
AREA SOURCES						
Service Stations - Vehicle Refueling	2,090.48	5.73	0.00	0.00	0.00	0.00
Architectural Coatings	2,660.96	7.29	0.00	0.00	0.00	0.00
Auto Refinishing	1,130.32	3.10	0.00	0.00	0.00	0.00
Automobiles (new)	459.16	1.26	0.00	0.00	0.00	0.00
Appliances	61.55	0.17	0.00	0.00	0.00	0.00
Dry Cleaning	276.44	0.76	0.00	0.00	0.00	0.00
Municipal Waste Landfills	744.83	2.04	0.00	0.00	0.00	0.00
Municipal Wastewater Treatment (POTW)	13.82	0.04	0.00	0.00	0.00	0.00
Stationary Source Fuel Combustion						
Fuel Oil-Residential	0.00	0.00	0.01	0.00	0.00	0.00
Coal-Residential	0.71	0.00	0.21	0.00	6.36	0.02
Natural Gas-Residential	46.55	0.13	878.37	2.41	175.67	0.48
LPG-Residential	1.20	0.00	22.57	0.06	4.56	0.01
Wood-Residential	37.97	0.10	3.79	0.01	313.02	0.86
Structure Fires	0.26	0.00	0.03	0.00	1.43	0.00
SUBTOTAL	**7,524.25**	**20.61**	**904.98**	**2.48**	**501.04**	**1.37**
NON-ROAD MOBILE SOURCES						
General Aircraft	96.91	0.27	17.91	0.05	3,074.05	8.42
Vessels	0.00	0.00	0.00	0.00	0.00	0.00
Other Non-Road Engines						
Trimmers/edgers/brush cutters	440.26	1.21	0.79	0.00	1,205.35	3.30
Lawn mowers	2,217.56	6.08	14.98	0.04	16,665.32	45.66
Leaf blowers/vacuums	146.67	0.40	0.30	0.00	429.53	1.18
Rear engine riding mowers	44.83	0.12	1.45	0.00	1,107.80	3.04
Front mowers	16.13	0.04	0.37	0.00	301.83	0.83
Chainsaws (< 4 HP)	360.11	0.99	0.52	0.00	719.53	1.97
Tillers (< 5 HP)	61.40	0.17	0.51	0.00	514.45	1.41
Lawn & garden tractors	251.22	0.69	23.31	0.06	6,381.61	17.48
Wood splitters	16.54	0.05	0.15	0.00	146.00	0.40
Snowblowers	0.00	0.00	0.00	0.00	0.00	0.00
Other lawn & garden equipment	13.10	0.04	0.05	0.00	56.0	0.15
All terrain vehicles (ATV)	0.00	0.00	0.00	0.00	0.00	0.00
Minibikes	0.00	0.00	0.00	0.00	0.00	0.00
Off-road motorcycles	0.00	0.00	0.00	0.00	0.00	0.00
Golf carts	0.00	0.00	0.00	0.00	0.00	0.00
Snowbmobiles	0.00	0.00	0.00	0.00	0.00	0.00
Specialty vehicle carts	0.00	0.00	0.00	0.00	0.00	0.00
Vessels w/inboard engines	20.96	0.06	5.47	0.01	135.76	0.37
Vessels w/outboard engines	592.10	1.62	6.07	0.02	1,097.23	3.01
Vessels w/sterndrive engines	46.79	0.13	14.55	0.04	501.61	1.37
Sailboat auxiliary inboard engines	0.07	0.00	0.08	0.00	0.16	0.00
Sailboat auxiliary outboard engines	0.30	0.00	0.00	0.00	0.56	0.00
Generator sets (< 50 HP)	1,562.55	4.28	140.34	0.38	22,704.80	62.20
Pumps (< 50 HP)	273.59	0.75	58.18	0.16	5,946.07	16.29
Air compressors (< 50 HP)	153.48	0.42	29.35	0.08	3,919.93	10.74
SUBTOTAL	**6,314.57**	**17.30**	**314.38**	**0.86**	**64,907.59**	**177.83**
ON-ROAD MOBILE SOURCES	**37,394.25**	**102.45**	**35,773.65**	**98.01**	**349,746.65**	**958.21**
TOTAL	**51,233.07**	**140.36**	**36,993.01**	**101.35**	**415,155.28**	**1,137.41**

CO = cargon monoxide.
HP = horsepower.
NO_x = nitrogen oxide.
VOC = volatile organic compound.

Table J-7. Year 1996 Tarrant County VOC Emissions for Those Sources Assumed to Apply to the In-Migrating Population

Source Type	1990 Tons/Day Emissions	Growth Factor (a)	1996 Projected Tons/Day	Percent Reduction (b)	1996 Emissions
AREA SOURCES					
Service Stations - Vehicle Refueling	5.73	1.0002	5.73	81.24%	1.07
Architectural Coatings	7.29	1.0757	7.84	23.04%	6.04
Auto Refinishing	3.10	1.0832	3.35	30.60%	2.33
Automobiles (new)	1.26	1.0600	1.33	--	1.33
Appliances	0.17	1.0600	0.18	--	0.18
Dry Cleaning	0.76	1.0983	0.83	61.41%	0.32
Municipal Waste Landfills	2.04	1.0382	2.12	54.87%	0.96
Municipal Wastewater Treatment (POTW)	0.04	1.0600	0.04	--	0.04
Stationary Source Fuel Combustion					
Fuel Oil-Residential	0.00	1.0600	0.00	--	0.00
Coal-Residential	0.00	1.0600	0.00	--	0.00
Natural Gas-Residential	0.13	1.0600	0.14	--	0.14
LPG-Residential	0.00	1.0600	0.00	--	0.00
Wood-Residential	0.10	1.0600	0.11	--	0.11
Structure Fires	0.00	1.0600	0.00	--	0.00
SUBTOTAL	20.61		21.68		12.52
NON-ROAD MOBILE SOURCES					
General Aircraft	0.27	1.1100	0.29	10.01%	0.27
Vessels	0.00	1.1100	0.00	--	0.00
Other Non-road Engines					
Trimmers/edgers/brush cutters	1.21	1.1103	1.34	10.01%	1.21
Lawn mowers	6.08	1.1103	6.75	10.01%	6.07
Leaf blowers/vacuums	0.40	1.1103	0.45	10.01%	0.40
Rear engine riding mowers	0.12	1.1103	0.14	3.92%	0.13
Front mowers	0.04	1.1103	0.05	10.01%	0.04
Chainsaws (< 4 HP)	0.99	1.1103	1.10	10.01%	0.99
Tillers (< 5 HP)	0.17	1.1103	0.19	10.01%	0.17
Lawn & garden tractors	0.69	1.1103	0.76	3.92%	0.73
Wood splitters	0.05	1.1103	0.05	10.01%	0.05
Snowblowers	0.00	1.1103	0.00	10.01%	0.00
Other lawn & garden equipment	0.04	1.1103	0.04	10.01%	0.04
All terrain vehicles (ATV)	0.00	1.1103	0.00	3.92%	0.00
Minibikes	0.00	1.1103	0.00	3.92%	0.00
Off-road motorcycles	0.00	1.1103	0.00	3.92%	0.00
Golf carts	0.00	1.1103	0.00	3.92%	0.00
Snowbmobiles	0.00	1.1103	0.00	3.92%	0.00
Specialty vehicle carts	0.00	1.1103	0.00	3.92%	0.00
Vessels w/inboard engines	0.06	1.1103	0.06	3.92%	0.06
Vessels w/outboard engines	1.62	1.1103	1.80	3.92%	1.73
Vessels w/sterndrive engines	0.13	1.1103	0.14	3.92%	0.14
Sailboat auxiliary inboard engines	0.00	1.1103	0.00	3.92%	0.00
Sailboat auxiliary outboard engines	0.00	1.1103	0.00	3.92%	0.00
Generator sets (< 50 HP)	4.28	1.1103	4.75	3.92%	4.57
Pumps (< 50 HP)	0.75	1.1103	0.83	3.92%	0.80
Air compressors (< 50 HP)	0.42	1.1103	0.47	3.92%	0.45
SUBTOTAL	17.30		19.21		17.83
ON-ROAD MOBILE SOURCES	102.45	1.2330	126.32	36.99%	79.59
TOTAL	140.36		167.21		109.94

Notes: (a) Growth factors for specific source types were obtained from Appendix I of the "1993 Rate-Of-Progress SIP for Dallas/Fort Worth, El Paso, Beaumont/Port Arthur, and Houston/Galveston Ozone Non-attainment Areas," (TNRCC, 1993). Where specific source type growth factors were not available, the following growth rates were used as obtained from Table 17 of the 1993 Rate-Of-Progress SIP (TNRCC,1993): Area Sources = 6.0 %; Off-Road Mobile Sources = 11.0 %; and On-Road Mobile Sources = 23.3 %.

(b) Reduction percentages due to Mandated, Phase I, and Phase II Rules were obtained from Table 17 of the 1993 Rate-Of-Progress SIP (TNRCC, 1993).

SIP = State Implementation Plan.
TNRCC = Texas Natural Resources Conservation Commission.
VOC = volatile organic compound.

Table J-8. Per-Capita VOC Emission Factors for Those Tarrant County Source Types Assumed to Apply to the In-Migrating Population

	Year			
	1990	1996[a]	1998[b]	2003[b]
Tarrant County Population Projection[c]	1,170,103	1,296,311	1,329,926	1,415,208
Area Source Emissions, (tons/day)	20.61	12.52	12.52	12.52
Per-Capita Emission Factor[d]	--	--	9.414E-06	8.847E-06
Non-Road Mobile Source Emissions, (tons/day)	17.30	17.83	17.83	17.83
Per-Capita Emission Factor[d]	--	--	1.341E-05	1.260E-05
On-Road Mobile Source Emissions, (tons/day)	102.45	79.59	79.59	79.59
Per-Capita Emission Factor[d]	--	--	5.985E-05	5.624E-05

Notes: (a) Year 1996 population interpolated from 1993 and 1998 population values.
(b) Emissions after 1996 are assumed to be held constant by control measures designed to maintain attainment.
(c) Population projection information obtained from Tables 3.3-4 and 4.3-2 of the Carswell AFB SIAS, 1994.
(d) Per-Capita emission factors calculated by dividing emissions by population, (tons/person/day).
SIAS = Socioeconomic Impact Analysis Study.
VOC = volatile organic compound.

Table J-9. In-Migrant Population VOC Emissions Associated with the Reuse Alternatives, (tons/day)

	Year	
	1998	2003
NO-ACTION/REALIGNMENT ALTERNATIVE		
Military In-Migrant Emissions[a]		
Area sources	0.026	0.024
Non-road mobile sources	0.037	0.035
On-road mobile sources	0.165	0.155
TOTAL	0.228	0.214
PROPOSED ACTION		
Military In-Migrant Emissions[b]		
Area sources	0.026	0.024
Non-road mobile sources	0.037	0.035
On-road mobile sources	0.165	0.155
SUBTOTAL	0.228	0.214
Civilian In-Migrant Emissions[b]		
Area sources	0.001	0.003
Non-road mobile sources	0.002	0.003
On-road mobile sources	0.008	0.015
SUBTOTAL	0.011	0.021
TOTAL	0.239	0.235
MIXED USE ALTERNATIVE		
Military In-Migrant Emissions[c]		
Area sources	0.026	0.024
Non-road mobile sources	0.037	0.035
On-road mobile sources	0.165	0.155
SUBTOTAL	0.228	0.214
Civilian In-Migrant Emissions[c]		
Area sources	0.003	0.004
Non-road mobile sources	0.004	0.005
On-road mobile sources	0.018	0.025
SUBTOTAL	0.025	0.034
TOTAL	0.253	0.248

Notes: (a) In-Migrant emissions for the No-Action/Realignment Alternative are based on 2,759 military in-migrants to Tarrant County by 1998 and 2,756 military in-migrants by the year 2003 (Table 4.3-2 of the Carswell AFB SIAS, 1994).

(b) In-Migrant emissions for the Proposed Action are based on 2,759 military and 136 civilian in-migrants to Tarrant County by 1998 and 2,756 military and 270 civilian in-migrants by the year 2003 (Table 4.3-4 of the Carswell AFB SIAS, 1994).

(c) In-Migrant emissions for the Mixed Use Alternative are based on 2,759 military and 302 civilian in-migrants to Tarrant County by 1998 and 2,756 military and 441 civilian in-migrants by the year 2003 (Table 4.3-6 of the Carswell AFB SIAS, 1994).

SIAS = Socioeconomic Impact Analysis Study.

VOC = volatile organic compound.

Table J-10. Per-Capita NOx and CO Emission Factors for Those Tarrant County Source Types Assumed to Apply to the In-Migrating Population

	Year		
	1990	1998[a]	2003[a]
Tarrant County Population Projection[b]	1,170,103	1,329,926	1,415,208
NO_x			
Area Source Emissions, (tons/day)	2.48	2.82	3.00
Per-Capita Emission Factor[c]	--	2.119E-06	2.119E-06
Non-Road Mobile Source Emissions, (tons/day)	0.86	0.98	1.04
Per-Capita Emission Factor[c]	--	7.361E-07	7.361E-07
On-Road Mobile Source Emissions, (tons/day)	98.01	111.40	118.54
Per-Capita Emission Factor[c]	--	8.376E-05	8.376E-05
CO			
Area Source Emissions, (tons/day)	1.37	1.56	1.66
Per-Capita Emission Factor[c]	--	1.173E-06	1.173E-06
Non-Road Mobile Source Emissions, (tons/day)	177.83	202.12	215.08
Per-Capita Emission Factor[c]	--	1.520E-04	1.520E-04
On-Road Mobile Source Emissions, (tons/day)	958.21	1,089.09	1,158.93
Per-Capita Emission Factor[c]	--	8.189E-04	8.189E-04

Notes:
(a) Year 1998 and 2003 emissions are assumed to increase in proportion to Tarrant County population growth.
(b) Population projection information obtained from Tables 3.3-4 and 4.3-2 of the Carswell AFB SIAS, 1994.
(c) Per-Capita emission factors calculated by dividing emissions by population, (tons/person/day).
CO = carbon monoxide.
NO_x = nitrogen oxide.
SIAS = Socioeconomic Impact Analysis Study.

Table J-11. In-Migrant Population NO_x and CO Emissions Associated with the Reuse Alternatives, (tons/day)

	NO_x		CO	
	1998	2003	1998	2003
NO-ACTION/REALIGNMENT ALTERNATIVE				
Military In-Migrant Emissions[a]	0.006	0.006	0.003	0.003
Area sources	0.002	0.002	0.419	0.419
Non-road mobile sources	0.231	0.231	2.260	2.257
On-road mobile sources	0.239	0.239	2.682	2.679
TOTAL				
PROPOSED ACTION				
Military In-Migrant Emissions[b]				
Area sources	0.006	0.006	0.003	0.003
Non-road mobile sources	0.002	0.002	0.419	0.419
On-road mobile sources	0.231	0.231	2.260	2.257
SUBTOTAL	0.239	0.239	2.682	2.679
Civilian In-Migrant Emissions[b]				
Area sources	0.000	0.000	0.000	0.001
Non-road mobile sources	0.000	0.000	0.021	0.041
On-road mobile sources	0.012	0.023	0.111	0.220
SUBTOTAL	0.012	0.023	0.132	0.262
TOTAL	0.251	0.262	2.814	2.941
MIXED USE ALTERNATIVE				
Military In-Migrant Emissions[c]				
Area sources	0.006	0.006	0.003	0.003
Non-road mobile sources	0.002	0.002	0.419	0.419
On-road mobile sources	0.231	0.231	2.260	2.257
SUBTOTAL	0.239	0.239	2.682	2.679
Civilian In-Migrant Emissions[c]				
Area sources	0.001	0.001	0.001	0.001
Non-road mobile sources	0.000	0.000	0.046	0.067
On-road mobile sources	0.025	0.037	0.247	0.361
SUBTOTAL	0.026	0.038	0.294	0.429
TOTAL	0.265	0.277	2.976	3.108

Notes:
(a) In-Migrant emissions for the No-Action/Realignment Alternative are based on 2,759 military in-migrants to Tarrant County in 1998 and 2,756 military in-migrants in the year 2003 (Table 4.3-2 of the Carswell AFB SIAS, 1994).
(b) In-Migrant emissions for the Proposed Action are based on 2,759 military and 136 civilian in-migrants to Tarrant County in 1998 and 2,756 military and 270 civilian in-migrants in the year 2003 (Table 4.3-4 of the Carswell AFB SIAS, 1994).
(c) In-Migrant emissions for the Mixed Use Alternative are based on 2,759 military and 302 civilian in-migrants to Tarrant County in 1998 and 2,756 military and 441 civilian in-migrants in the year 2003 (Table 4.3-6 of the Carswell AFB SIAS, 1994).
CO = carbon monoxide.
NO_x = nitrogen oxide.
SIAS = Socioeconomic Impact Analysis Study.

Table J-12. Per-Capita SO_2 and PM_{10} Emission Factors Assumed to Apply to the In-Migrating Population

	1990	
	SO_2	PM_{10}
Carswell AFB Emissions, (tons/day)[a] (not including Aircraft Operations)	0.014	0.051
Per-Capita Emission Factor[b]	1.119E-06	4.120E-06

Notes: (a) Carswell AFB tons/year emissions obtained from Table 3.4-6 of the EIS. Tons/day emissions equal tons/year emissions from Table 3.4-6 divided by 365 days/year.

(b) Per-Capita emission factors calculated by dividing emissions by the on-base population of 12,409 persons, (tons/person/day).

EIS = Environmental Impact Statement.

PM_{10} = particulate matter equal to or less than 10 microns.

SO_2 = sulfur oxide.

Table J-13. In-Migrant Population SO_2 and PM_{10} Emissions Associated with the Reuse Alternatives, (tons/day)

	SO_2		PM_{10}	
	1998	2003	1998	2003
NO-ACTION/REALIGNMENT ALTERNATIVE				
Military In-Migrant Emissions[a]	0.003	0.003	0.011	0.011
PROPOSED ACTION				
Military In-Migrant Emissions[b]	0.003	0.003	0.011	0.011
Civilian In-Migrant Emissions[b]	0.000	0.000	0.001	0.002
TOTAL	0.003	0.003	0.012	0.013
MIXED USE ALTERNATIVE				
Military In-Migrant Emissions[c]	0.003	0.003	0.011	0.011
Civilian In-Migrant Emissions[c]	0.000	0.000	0.001	0.002
TOTAL	0.003	0.003	0.012	0.013

Notes: (a) In-Migrant emissions for the No-Action/Realignment Alternative are based on 2,759 military in-migrants to Tarrant County in 1998 and 2,756 military in-migrants in the year 2003 (Table 4.3-2 of the Carswell AFB SIAS, 1994).

(b) In-Migrant emissions for the Proposed Action are based on 2,759 military and 136 civilian in-migrants to Tarrant County in 1998 and 2,756 military and 270 civilian in-migrants in the year 2003 (Table 4.3-4 of the Carswell AFB SIAS, 1994).

(c) In-Migrant emissions for the Mixed Use Alternative are based on 2,759 military and 302 civilian in-migrants to Tarrant County in 1998 and 2,756 military and 441 civilian in-migrants in the year 2003 (Table 4.3-6 of the Carswell AFB SIAS, 1994).

SIAS = Socioeconomic Impact Analysis Study.
PM_{10} = particulate matter equal to or less than 10 microns in diameter.
SO_2 = sulfur oxide.

Table J-14. Summary of Year 1990 Tarrant County Emissions By Source Type for Those Sources Assumed to Apply to the Reuse-Related Employees

Source Type	VOC Emissions		NO_x Emissions		CO Emissions	
	Tons/Year	Tons/Day	Tons/Year	Tons/Day	Tons/Year	Tons/Day
AREA SOURCES						
Architectural Coatings	2,660.96	7.29	0.00	0.00	0.00	0.00
Furniture & Fixtures	826.00	2.26	0.00	0.00	0.00	0.00
Metal Containers	279.41	0.77	0.00	0.00	0.00	0.00
Machinery & Equipment	350.95	0.96	0.00	0.00	0.00	0.00
Other Transportation Equipment	419.84	1.15	0.00	0.00	0.00	0.00
Sheet, Strip, & Coil	91.40	0.25	0.00	0.00	0.00	0.00
Factory Finished Wood	73.36	0.20	0.00	0.00	0.00	0.00
Electrical Insulation	76.99	0.21	0.00	0.00	0.00	0.00
Other Product Coatings	0.00	0.00	0.00	0.00	0.00	0.00
High-Performance Maintenance	468.04	1.28	0.00	0.00	0.00	0.00
Other Special Purpose Coatings	468.04	1.28	0.00	0.00	0.00	0.00
Surface Cleaning	504.48	1.38	0.00	0.00	0.00	0.00
Graphic Arts	383.09	1.05	0.00	0.00	0.00	0.00
Consumer/Commercial Solvent Use	3,557.70	9.75	0.00	0.00	0.00	0.00
Stationary Source Fuel Combustion						
Fuel Oil-Commercial/Distillate	1.69	0.00	99.16	0.27	24.80	0.07
Fuel Oil-Commercial/Residual	0.12	0.00	5.91	0.02	0.54	0.00
Fuel Oil-Industrial/Distillate	7.88	0.02	789.66	2.16	197.41	0.54
Fuel Oil-Industrial/Residual	0.55	0.00	107.61	0.29	9.78	0.03
Natural Gas-Commercial	32.88	0.09	607.69	1.66	121.60	0.33
Natural Gas-Industrial	5.62	0.02	280.99	0.77	70.25	0.19
LPG-Commercial	0.82	0.00	15.41	0.04	3.11	0.01
LPG-Industrial	1.16	0.00	59.05	0.16	14.76	0.04
SUBTOTAL	**10,210.98**	**27.98**	**1,965.48**	**5.38**	**442.25**	**1.21**
NON-ROAD MOBILE SOURCES						
Other Non-road Engines						
Generator sets (< 50 HP)	1,562.55	4.28	140.34	0.38	22,704.80	62.20
Pumps (< 50 HP)	273.59	0.75	58.18	0.16	5,946.07	16.29
Air compressors (< 50 HP)	153.48	0.42	29.35	0.08	3,919.93	10.74
Gas compressors (< 50 HP)	6.43	0.02	5.78	0.02	120.57	0.33
Welders (< 50 HP)	257.60	0.71	119.10	0.33	6,545.99	17.93
Pressure washers (< 50 HP)	79.53	0.22	2.60	0.01	1,825.14	5.00
Aerial lifts	44.10	0.12	47.12	0.13	816.32	2.24
Forklifts	358.09	0.98	706.88	1.94	5,582.34	15.29
Sweepers/scrubbers	51.96	0.14	263.39	0.72	529.77	1.45
Other general industrial equipment	53.95	0.15	87.84	0.24	371.15	1.02
Other material handing equipment	3.15	0.01	12.77	0.03	38.05	0.10
SUBTOTAL	**2,844.43**	**7.79**	**1,473.35**	**4.04**	**48,400.13**	**132.60**
ON-ROAD MOBILE SOURCES	**37,394.25**	**102.45**	**35,773.65**	**98.01**	**349,746.65**	**958.21**
TOTAL	**50,449.66**	**138.22**	**39,212.48**	**107.43**	**398,589.03**	**1,092.02**

CO = carbon monoxide.
HP = horsepower.
LPG = liquid petroleum gas.
NO_x = nitrogen oxide.
VOC = volatile organic compound.

Table J-15. Year 1996 Tarrant County VOC Emissions for Those Sources Assumed to Apply to the Reuse-Related Employees

Source Type	1990 Tons/Day Emissions	Growth Factor[a]	1996 Projected Tons/Day	Percent Reduction[b]	1996 Tons/Day Emissions
AREA SOURCES					
Architectural Coatings	7.29	1.0757	7.84	81.24%	1.47
Furniture & Fixtures	2.26	1.0832	2.45	13.01%	2.13
Metal Containers	0.77	1.0600	0.81	--	0.81
Machinery & Equipment	0.96	1.0600	1.02	--	1.02
Other Transportation Equipment	1.15	1.0600	1.22	--	1.22
Sheet, Strip, & Coil	0.25	1.0600	0.27	--	0.27
Factory Finished Wood	0.20	1.0832	0.22	13.01%	0.19
Electrical Insulation	0.21	1.0600	0.22	--	0.22
Other Product Coatings	0.00	1.0757	0.00	--	0.00
High-Performance Maintenance	1.28	1.0600	1.36	--	1.36
Other Spec. Purpose Coatings	1.28	1.0600	1.36	--	1.36
Surface Cleaning	1.38	1.0600	1.47	--	1.47
Graphic Arts	1.05	1.0600	1.11	--	1.11
Consumer/Commercial Solvent Use	9.75	1.0600	10.33	--	10.33
Stationary Source Fuel Combustion					
Fuel Oil-Commercial/Distillate	0.00	1.0600	0.00	--	0.00
Fuel Oil-Commercial/Residual	0.00	1.0600	0.00	--	0.00
Fuel Oil-Industrial/Distillate	0.02	1.0600	0.02	--	0.00
Fuel Oil-Industrial/Residual	0.00	1.0600	0.00	--	0.02
Natural Gas-Commercial	0.09	1.0600	0.10	--	0.00
Natural Gas-Industrial	0.02	1.0600	0.02	--	0.10
LPG-Commercial	0.00	1.0600	0.00	--	0.02
LPG-Industrial	0.00	1.0600	0.00	--	0.00
SUBTOTAL	**27.98**		**29.83**		0.00
					23.11
NON-ROAD MOBILE SOURCES					
Other Non-road Engines					
Generator sets (< 50 HP)	4.28	1.1100	4.75	3.92%	4.57
Pumps (< 50 HP)	0.75	1.1100	0.83	3.92%	0.80
Air compressors (< 50 HP)	0.42	1.1100	0.47	3.92%	0.45
Gas compressors (< 50 HP)	0.02	1.1100	0.02	3.92%	0.02
Welders (< 50 HP)	0.71	1.1100	0.78	3.92%	0.75
Pressure washers (< 50 HP)	0.22	1.1100	0.24	3.92%	0.23
Aerial lifts	0.12	1.1100	0.13	3.92%	0.13
Forklifts	0.98	1.1100	1.09	3.92%	1.05
Sweepers/scrubbers	0.14	1.1100	0.16	3.92%	0.15
Other general industrial equipment	0.15	1.1100	0.16	3.92%	0.16
Other material handing equipment	0.01	1.1100	0.01	3.92%	0.01
SUBTOTAL	**7.79**		**8.65**		**8.31**
ON-ROAD MOBILE SOURCES	102.45	1.2330	126.32	36.99%	**79.59**
TOTAL	**138.22**		**164.80**		**111.01**

Notes: (a) Growth factors for specific source types were obtained from Appendix I of the "1993 Rate-Of-Progress SIP for Dallas/Fort Worth, El Paso, Beaumont/Port Arthur, and Houston/Galveston Ozone Non-attainment Areas," (TNRCC, 1993). Where specific source type growth factors were not available, the following growth rates were used as obtained from Table 17 of the 1993 Rate-Of-Progress SIP (TNRCC,1993): Area Sources = 6.0%; Off-Road Mobile Sources = 11.0%; and On-Road Mobile Sources = 23.3%.

(b) Reduction percentages due to Mandated, Phase I, and Phase II Rules were obtained from Table 17 of the 1993 Rate-Of-Progress SIP (TNRCC, 1993).

HP = horsepower.
SIP = State Implementation Plan.
TNRCC = Texas Natural Resources Conservation Commission.
VOC = volatile organic compound.

Table J-16. Per-Employee VOC Emission Factors for Those Tarrant County Source Types Assumed to Apply to the Reuse-Related Employees

	Year			
	1990	1996	1998[a]	2003[a]
Tarrant County Employment Projections[b]	NA	NA	740,936	803,927
Area Source Emissions, (tons/day)	27.98	23.11	23.11	23.11
Per-Employee Emission Factor[c]	--	--	3.119E-05	2.874E-05
Non-Road Mobile Source Emissions, (tons/day)	7.79	8.31	8.31	8.31
Per-Employee Emission Factor[c]	--	--	1.122E-05	1.034E-05
On-Road Mobile Source Emissions, (tons/day)	102.45	79.59	79.59	79.59
Per-Employee Emission Factor[d]	--	--	5.985E-05	5.624E-05

Notes:
(a) Emissions after 1996 are assumed to be held constant by control measures designed to maintain attainment.
(b) Employment projection information obtained from Table 4.2-2 of the Carswell AFB SIAS, 1994. The Tarrant County portion of the total ROI employment is assumed to be the same in 1998 and 2003 as it was in 1989 (see Table 3.2-1 of the SIAS, 1994).
(c) Per-Employee emission factors calculated by dividing emissions by employees, (tons/employee/day).
(d) On-Road Mobile Per-Employee emission factors are assumed to equal the Per-Capita emission factors calculated previously in Table J-8.

ROI = Region of Influence.
SIAS = Socioeconomic Impact Analysis Study.
VOC = volatile organic compound.

Table J-17. Reuse-Related Employee VOC Emissions Associated with the Proposed Action and Mixed Use Alternatives, (tons/day)

	Year	
	1998	2003
PROPOSED ACTION		
Reuse-Related Employee Emissions[a]		
Area sources	0.054	0.098
Non-road mobile sources	0.019	0.035
On-road mobile sources	0.104	0.192
TOTAL	0.177	0.325
MIXED USE ALTERNATIVE		
Reuse-Related Employee Emissions[b]		
Area sources	0.119	0.161
Non-road mobile sources	0.043	0.058
On-road mobile sources	0.230	0.314
TOTAL	0.392	0.533

Notes: (a) Employee emissions for the Proposed Action are based on 1,730 direct employees in 1998 and 3,412 employees in 2003 (Table 4.2-2 of the Carswell AFB SIAS, 1994).

(b) Employee emissions for the Mixed Use Alternative are based on 3,831 direct employees in 1998 and 5,589 employees in 2003 (Table 4.2-3 of the Carswell AFB SIAS, 1994).

SIAS = Socioeconomic Impact Analysis Study.

VOC = volatile organic compound.

Table J-18. Per-Employee NO_x and CO Emission Factors for Those Tarrant County Source Types Assumed to Apply to the Reuse-Related Employees

	Year		
	1990	1998[a]	2003[a]
Tarrant County Employment Projections[b]	634,978	740,936	803,927
NO_x			
Area Source Emissions, (tons/day)	5.38	6.28	6.82
Per-Employee Emission Factor[c]	--	8.480E-06	8.480E-06
Non-Road Mobile Source Emissions, (tons/day)	4.04	4.71	5.11
Per-Employee Emission Factor[c]	--	6357E-06	6357E-06
On-Road Mobile Source Emissions, (tons/day)	98.01	111.40	118.54
Per-Employee Emission Factor[d]	--	8.376E-05	8.376E-05
CO			
Area Source Emissions, (tons/day)	1.21	1.41	1.53
Per-Employee Emission Factor[c]	--	1.908E-06	1.908E-06
Non-Road Mobile Source Emissions, (tons/day)	132.60	154.73	167.88
Per-Employee Emission Factor[c]	--	2.088E-04	2.088E-04
On-Road Mobile Source Emissions, (tons/day)	958.21	1,089.09	1,158.93
Per-Employee Emission Factor[d]	--	8.189E-04	8.189E-04

Notes:
(a) Year 1998 and 2003 emissions are assumed to increase in proportion to Tarrant County employment growth.
(b) Employment projection information obtained from Tables 3.2-1 and 4.2-2 of the Carswell AFB SIAS, 1994.
(c) Per-Employee emission factors calculated by dividing emissions by employees, (tons/employee/day).
(d) On-Road Mobile Per-Employee emission factors are assumed to equal the Per-Capita factors calculated previously in Table J-8.
CO = carbon monoxide.
NO_x = nitrogen oxide.
SIAS = Socioeconomic Impact Analysis Study.

Table J-19. Reuse-Related Employee NO_x and CO Emissions Associated with the Proposed Action and Mixed Use Alternatives, (tons/day)

	NO_x		CO	
	1998	2003	1998	2003
PROPOSED ACTION				
Reuse-Related Employee Emissions[a]				
Area sources	0.015	0.029	0.003	0.007
Non-road mobile sources	0.011	0.022	0.361	0.713
On-road mobile sources	0.145	0.286	1.417	2.794
TOTAL	0.171	0.336	1.781	3.513
MIXED USE ALTERNATIVE				
Reuse-Related Employee Emissions[b]				
Area sources	0.032	0.047	0.007	0.011
Non-road mobile sources	0.024	0.036	0.800	1.167
On-road mobile sources	0.321	0.468	3.137	4.577
TOTAL	0.378	0.551	3.945	5.755

Notes: (a) Employee emissions for the Proposed Action are based on 1,730 direct employees in 1998 and 3,412 employees in 2003 (Table 4.2-2 of the Carswell AFB SIAS, 1994).

(b) Employee emissions for the Mixed Use Alternative are based on 3,831 direct employees in 1998 and 5,589 employees in 2003 (Table 4.2-3 of the Carswell AFB SIAS, 1994).

CO = carbon monoxide.

NO_x = nitrogen oxide.

SIAS = Socioeconomic Impact Analysis Study.

Table J-20. Reuse-Related Employee SO_2 and PM_{10} Emissions Associated with the Proposed Action and Mixed Use Alternatives, (tons/day)

	SO_2		PM_{10}	
	1998	2003	1998	2003
PROPOSED ACTION				
Reuse-Related Employee Emissions[a]	0.002	0.004	0.007	0.014
MIXED USE ALTERNATIVE				
Reuse-Related Employee Emissions[b]	0.004	0.006	0.016	0.023

Notes: (a) Employee emissions for the Proposed Action are based on 1,730 direct employees in 1998 and 3,412 employees in 2003 (Table 4.2-2 of the Carswell AFB SIAS, 1994).

(b) Employee emissions for the Mixed Use Alternative are based on 3,831 direct employees in 1998 and 5,589 employees in 2003 (Table 4.2-3 of the Carswell AFB SIAS, 1994).

PM_{10} = particulate matter equal to or less than 10 microns in diameter.

SIAS = Socioeconomic Impact Analysis Study.

SO_2 = sulfur dioxide.

Table J-21. Summary of VOC Emissions, (tons/day)

Source	Preclosure 1990	Closure 1993	No-Action/Realignment Alternative 1998	No-Action/Realignment Alternative 2003	Proposed Action 1998	Proposed Action 2003	Mixed Use Alternative 1998	Mixed Use Alternative 2003
MILITARY								
Construction	NA	NA	0.007	0.000	0.007	0.000	0.007	0.000
Aircraft	8.480	0.079	0.360	0.360	0.361	0.361	0.362	0.362
Preclosure Base Emissions[a]	0.494	NA	NA	NA	NA	NA	NA	NA
Retained Units	0.047	0.047	0.040	0.040	0.040	0.040	0.040	0.040
Realignment Units	NA	NA	0.032	0.032	0.032	0.032	0.032	0.032
In-Migrants	NA	NA	0.228	0.214	0.228	0.214	0.228	0.214
SUBTOTAL	9.021	0.126	0.667	0.646	0.668	0.647	0.669	0.648
CIVILIAN								
Construction	NA	NA	NA	NA	0.015	0.004	0.010	0.008
Aircraft	NA	NA	NA	NA	0.000	0.000	0.001	0.001
In-Migrants	NA	NA	NA	NA	0.011	0.021	0.025	0.034
Reuse-Related Employees	NA	NA	NA	NA	0.177	0.325	0.392	0.533
SUBTOTAL	NA	NA	NA	NA	0.203	0.350	0.428	0.576
TOTAL	9.021	0.126	0.667	0.646	0.871	0.997	1.097	1.224

Note: (a) Includes all Carswell AFB preclosure year emissions except aircraft operations and retained military units (from Table 3.4-6 of the EIS).
EIS = Environmental Impact Statement.
NA = Not applicable.
VOC = volatile organic compound.

Table J-22. Summary of NOx Emissions, (tons/day)

Source	Preclosure	Closure	No-Action/Realignment Alternative		Proposed Action		Mixed Use Alternative	
	1990	1993	1998	2003	1998	2003	1998	2003
MILITARY								
Construction	NA	NA	0.026	0.000	0.026	0.000	0.026	0.000
Aircraft	1.666	0.103	0.533	0.535	0.535	0.535	0.540	0.540
Preclosure Base Emissions[a]	0.251	NA	NA	NA	NA	NA	NA	NA
Retained Units	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068
Realignment Units	NA	NA	0.030	0.030	0.030	0.030	0.030	0.030
In-Migrants	NA	NA	0.239	0.239	0.239	0.239	0.239	0.239
SUBTOTAL	1.985	0.171	0.896	0.870	0.898	0.872	0.903	0.877
CIVILIAN								
Construction	NA	NA	NA	NA	0.055	0.016	0.038	0.029
Aircraft	NA	NA	NA	NA	0.002	0.002	0.007	0.007
In-Migrants	NA	NA	NA	NA	0.012	0.023	0.026	0.038
Reuse-Related Employees	NA	NA	NA	NA	0.171	0.336	0.378	0.551
SUBTOTAL	NA	NA	NA	NA	0.239	0.378	0.449	0.625
TOTAL	1.985	0.171	0.896	0.870	1.137	1.250	1.352	1.502

Note: *(a) Includes all Carswell AFB preclosure year emissions except aircraft operations and retained military units (from Table 3.4-6 of the EIS).*
EIS = Environmental Impact Statement.
NA = Not applicable.
NO_x = nitrogen oxide.

Table J-23. Summary of CO Emissions, (tons/day)

Source	Preclosure 1990	Closure 1993	No-Action/Realignment Alternative 1998	No-Action/Realignment Alternative 2003	Proposed Action 1998	Proposed Action 2003	Mixed Use Alternative 1998	Mixed Use Alternative 2003
MILITARY								
Construction	NA	NA	0.091	0.000	0.091	0.000	0.091	0.000
Aircraft	10.030	0.390	1.133	1.133	1.136	1.136	1.138	1.138
Preclosure Base Emissions[a]	0.669	NA	NA	NA	NA	NA	NA	NA
Retained Units	0.051	0.051	0.051	0.051	0.051	0.051	0.051	0.051
Realignment Units	NA	NA	0.007	0.007	0.007	0.007	0.007	0.007
In-Migrants	NA	NA	2.682	2.679	2.682	2.679	2.682	2.679
SUBTOTAL	10.750	0.441	3.964	3.870	3.967	3.813	3.969	3.875
CIVILIAN								
Construction	NA	NA	NA	NA	0.193	0.056	0.133	0.100
Aircraft	NA	NA	NA	NA	0.002	0.002	0.004	0.004
In-Migrants	NA	NA	NA	NA	0.132	0.262	0.294	0.429
Reuse-Related Employees	NA	NA	NA	NA	1.781	3.514	3.944	5.756
SUBTOTAL	NA	NA	NA	NA	2.108	3.834	4.375	6.287
TOTAL	10.750	0.441	3.964	3.870	6.075	7.707	8.344	10.162

Note: (a) Includes all Carswell AFB preclosure year emissions except aircraft operations and retained military units (from Table 3.4-6 of the EIS).
CO = carbon monoxide.
EIS = Environmental Impact Statement.
NA = Not applicable.

Table J-24. Summary of SO_2 Emissions, (tons/day)

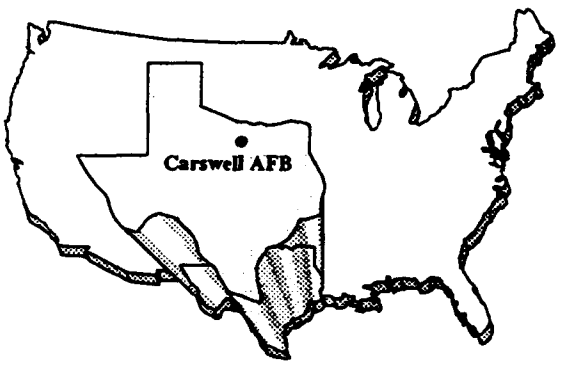
Source	Preclosure 1990	Closure 1993	No-Action/Realignment Alternative 1998	No-Action/Realignment Alternative 2003	Proposed Action 1998	Proposed Action 2003	Mixed Use Alternative 1998	Mixed Use Alternative 2003
MILITARY								
Construction	NA	NA	0.002	0.000	0.002	0.000	0.002	0.000
Aircraft	0.169	0.010	0.038	0.038	0.039	0.039	0.039	0.039
Preclosure Base Emissions[a]	0.013	NA	NA	NA	NA	NA	NA	NA
Retained Units	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Realignment Units	NA	NA	0.001	0.001	0.001	0.001	0.001	0.001
In-Migrants	NA	NA	0.003	0.003	0.003	0.003	0.003	0.003
SUBTOTAL	0.183	0.011	0.045	0.043	0.046	0.044	0.046	0.044
CIVILIAN								
Construction	NA	NA	NA	NA	0.005	0.001	0.004	0.003
Aircraft	NA	NA	NA	NA	0.001	0.001	0.001	0.001
In-Migrants	NA	NA	NA	NA	0.000	0.001	0.000	0.001
Reuse-Related Employees	NA	NA	NA	NA	0.003	0.004	0.005	0.007
SUBTOTAL	NA	NA	NA	NA	0.009	0.006	0.010	0.011
TOTAL	0.183	0.011	0.045	0.043	0.055	0.051	0.056	0.056

Note: (a) Includes all Carswell AFB preclosure year emissions except aircraft operations and retained military units (from Table 3.4-6 of the EIS).
EIS = Environmental Impact Statement.
NA = Not applicable.
SO_2 = sulfur dioxide.

Table J-25. Summary of PM_{10} Emissions, (tons/day)

Source	Preclosure 1990	Closure 1993	No-Action/Realignment Alternative 1998	No-Action/Realignment Alternative 2003	Proposed Action 1998	Proposed Action 2003	Mixed Use Alternative 1998	Mixed Use Alternative 2003
MILITARY								
Construction	NA	NA	0.013	0.000	0.013	0.000	0.013	0.000
Aircraft	1.651	0.004	0.079	0.079	0.079	0.079	0.080	0.080
Preclosure Base Emissions[a]	0.046	NA	NA	NA	NA	NA	NA	NA
Retained Units	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Realignment Units	NA	NA	0.006	0.006	0.006	0.006	0.006	0.006
In-Migrants	NA	NA	0.011	0.011	0.011	0.011	0.011	0.011
SUBTOTAL	1.702	0.009	0.114	0.101	0.114	0.101	0.115	0.102
CIVILIAN								
Construction	NA	NA	NA	NA	0.026	0.008	0.018	0.013
Aircraft	NA	NA	NA	NA	0.000	0.000	0.000	0.000
In-Migrants	NA	NA	NA	NA	0.001	0.001	0.001	0.002
Reuse-Related Employees	NA	NA	NA	NA	0.007	0.014	0.016	0.023
SUBTOTAL	NA	NA	NA	NA	0.034	0.023	0.035	0.038
TOTAL	1.702	0.009	0.114	0.101	0.148	0.124	0.150	0.140

Note: (a) Includes all Carswell AFB preclosure year emissions except aircraft operations and retained military units (from Table 3.4-6 of the EIS).
EIS = Environmental Impact Statement.
NA = Not applicable.
PM_{10} = particulate matter equal to or less than 10 microns in diameter.



APPENDIX K

APPENDIX K

AGENCY LETTERS AND CERTIFICATIONS

THE STATE OF TEXAS

CURTIS TUNNELL
EXECUTIVE DIRECTOR

TEXAS HISTORICAL COMMISSION

P.O. BOX 12276 AUSTIN, TEXAS 78711 (512)463-6100

DEPARTMENT OF ANTIQUITIES PROTECTION

September 30, 1992

Mr. Roberto Hernandez
Community Planner
Department of the Air Force
Carswell Air Force Base (SAC)
7CSG/DEV
Fort Worth, TX 76127-5000

Re: Archeological Assessment of Auxiliary Land, Proposed Closure of Carswell Air Force Base, Tarrant County, Texas (AF, F2, F30)

Dear Sir:

Thank you for providing the maps of the auxiliary land located west of Carswell Air Force Base. We have no record of properties listed or eligible for listing on the National Register of Historic Places within the project or affected area. To our knowledge, an archeological survey has never been performed in the project area. Because of the low potential for archeological sites to be present within the auxiliary area, this project may continue without further consultation with our office on archeology. It is our understanding that separate information will be submitted on architectural properties for our review.

It is possible, however, that buried archeological materials may be present in the project area. If such materials are encountered during construction or disturbance activities, work should cease in the immediate area; work may continue in the project area where no archeological deposits are present. The Advisory Council on Historic Preservation should be contacted in accordance with 36 CFR 800.11 (b) (2). Please also notify the State Historic Preservation Officer at 512/463-6096.

Sincerely,

James E. Bruseth, Ph.D.
Deputy State Historic Preservation Officer

Sincerely,

Timothy K. Perttula, Ph.D.
Assistant Director for Antiquities Review

DJP/TKP/JEB/dip

The State Agency for Historic Preservation

THE STATE OF TEXAS

CURTIS TUNNELL
EXECUTIVE DIRECTOR

TEXAS HISTORICAL COMMISSION

P.O. BOX 12276 AUSTIN, TEXAS 78711 (512)463-6100

March 5, 1991

Charles A. Jackson, Colonel, USAF
Base Civil Engineer
Attn: Roberto Y. Hernandez
Department of the Air Force
Headquarters 7th Combat Support Group (SAC)
Carswell Air Force Base, Texas 76127-5000

Re: Archeological Survey of High Probability Areas Report, Carswell Air Force Base, Tarrant County, Texas (AF, A5, A6, D1

Dear Sir:

Thank you for providing a copy of the above referenced document for our review. Mr. De Vore's report is very good, and we commend him for his efforts. Based on the information presented in the report, we concur with Mr. De Vore's assessment that neither the prehistoric site (41TR125) nor the four historic sites recorded during the survey are eligible for inclusion within the National Register of Historic Places. The Air Force need not to proceed with any construction plans in these site areas without further consultation with our office.

Overall, it appears that previous construction activities, periodic flooding of Farmers Branch, and channelization work may have destroyed other archeological sites once present in the area. While we do not recommend any further cultural resources investigations at Carswell at this time, it is always possible that buried, unrecorded archeological sites may be discovered during future construction activities. Should any such unrecorded sites be found during construction, work should cease in the immediate area; work can continue in the project area where no cultural materials are present. The Advisory Council on Historic Preservation should be contacted in accordance with 36CFR800.11.b.2. Please also notify the State Historic Preservation Officer at (512) 463-6096.

If we may be of further service, please advise.

Sincerely,

James E. Bruseth, Ph.D.
Deputy State Historic Preservation Officer

DP/JB/lft

cc: Steven De Vore, NPS

K-2

United States Department of Agriculture
Soil Conservation Service
101 South Main Street
Temple, Texas
76501-7682

September 15, 1992

Mr. Bruce R. Leighton, P.E.
Technical Assistant
Environmental Planning Division
Department of the Air Force
Air Force Center for Environmental Excellence
Brooks Air Force Base, TX 78235

Re: Submittal of AD Form 1006 for Reuse and Disposal of Carswell AFB and the Offsite Weapons Storage Area (WSA), Tarrant County, Texas

Dear Mr. Leighton:

We have reviewed your letter pertaining to the above referenced topic. It is our opinion these lands are not subject to the Farmland Protection Policy Act. They have previously been dedicated to urban/industrial land use; therefore, they are not longer considered agricultural lands.

If we may be of further assistance, please let us know.

Sincerely,

JAMES HENSON
State Biologist/Environmental Specialist

cc: Bob Leerskov, AC, SCS, Terrell, TX
Wil Fontenot, Natl. Env. Coord., SCS, Washington, DC

TONKAWA TRIBE OF OKLAHOMA

TONKAWA TRIBAL COUNCIL

P.O. Box 70 — PHONE (405) 628-2561

TONKAWA, OKLAHOMA 74653

January 22, 1993

Mr. Olen R. Long
Air Force Base Disposal Agency
AFBDA/SWH
Building 1215
Carswell AFB, TX 76127-5000

RE: Enviromental Impact Statement (EIS) Carswell AFB

Dear Mr. Long,

Our Tribe is an Aboriginal Tribe of Texas and the disposal and reuse of Carswell AFB is of great importance to our Tribe. Homelands are very sacred to our Tribe. Also, for our Tribal culture to continue; we must acquire additional land.

The United States first gained federal soverignty over Texas upon Texas being admited to the union on 1-1-1846. Unlike other states when admitted, the United States allowed Texas to retain the ownership of all public lands located within its boundaries. The State of Texas passed a law 11-1-1866 to provide our Tribe one league of land (4,428.4 acres) along the line of the frontier. Carswell AFB is located along the line of the 1866 Texas frontier. This 4,428.4 acres of land has not been surveyed or granted to our Tribe; therefore on 6-12-1992 we initiated a claim with Texas for this land entitled to us by the 1866 Texas law.

Since the United States maintains sovereignty over our Tribe and the State of Texas; it is our intent to request the Department of the Air Force to delay the disposal and reuse of Carswell AFB until a settlement of our land claim is negotiated with the State of Texas. If the State of Texas fails to negotiate, we will request the United States to intervene since Carswell aFB is located along the line of the 1866 Texas frontier and the land is not in the public domain of the State of Texas.

Our Tribe is a federally recognized Tribe of American Indians and are entitled to all provisions allowed under the United States Constitution. We request the informaion contained herein be included in the United States Aire Force's environmental impact statement/Carswell AFB.

Yours Truly,

Virginia Combrink
President

Enclosures: 1866 Texas law-Texas map-Texas Governor's letter 6-25-1992
Tonkawa President's letter 8-12-1992