CHAPTER 3

AFFECTED ENVIRONMENT

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3.1 ANALYSIS APPROACH

The National Environmental Policy Act (NEPA) requires focused analysis of the areas and resources potentially affected by an action or alternative. It also indicates that an EA should consider, but not analyze in detail, those areas or resources not potentially affected by the proposal. Therefore, an EA should not be encyclopedic; rather, it should try to be "to the point." NEPA also requires a comparative analysis that allows decisionmakers and the public to differentiate among the alternatives. Combined, the affected areas and affected resources defined through scoping and analyses comprise the affected environment for each of the alternatives.

AFFECTED AREAS

The affected area includes the base and the general area around the base.

The affected areas at any of the five alternative bases for the Global Hawk beddown include the following elements:

Base - The entire base could be affected by the aircraft beddown and airfield flight operations, construction of facilities, equipment use, personnel changes, and associated effects.

Base Environs - Base environs include the airspace and lands surrounding the base. Airfield flight operations (e.g., noise) and indirect impacts of personnel changes (e.g., housing demand) would affect this area. The affected airspace has been divided into several parts corresponding to analytical units (e.g, 5,000 feet AGL is usually the mixing altitude for air quality analysis; 18,000 feet MSL marks the entry into controlled Class A airspace).

These affected areas provide the focus for data collection and analysis. For some resources, such as air quality, the base and base environs are examined together as a single affected area. For other resources, such as hazardous materials and waste, only the base is considered since it represents the single location where an element of the proposed action (i.e., maintenance) could affect the resource.

Once the affected environment was defined, detailed and current data were collected by

- Reviewing previous studies, such as technical publications, agency databases, management plans, and other NEPA documents.
- Talking to agencies and others with information on specific resources, such as the U.S. Fish and Wildlife Service (USFWS), Bureau of Land Management, and community planners.
- Reviewing public input during the scoping process.

RESOURCES DISCUSSED AND RESOURCES ELIMINATED FROM FURTHER DETAILED ANALYSIS

Table 3.1-1 lists the order in which this EA discusses the affected resources. Further detailed analysis of some resource categories has been limited in this EA because they would not be affected by the proposed action or were not identified during the public scoping process. The topics that did not warrant further detailed discussion include transportation, environmental justice, recreation, visual resources, and asbestos.

Transportation. Implementation of the proposed action is not expected to affect transportation resources. No roads would be constructed or modified due to the Global Hawk beddown, the influx of people would be minimal relative to current population, and no effects to transportation networks are expected. Traffic studies at each of the five bases (USAF 1994b, 1996, 1998g, 2000g,h) established that local and regional road networks provide acceptable levels of service. These studies also indicated that the local and regional road networks had capacity to accommodate the

Traffic on or near the bases would not be affected.

Table 3.1-1 Resources and Issues Considered in the Environmental Impact Process

Resource	*Location in EA*
Airspace Management	Section 3.2 Airspace Management and Air Safety
Air Safety	Section 3.2 Airspace Management and Air Safety
Noise	Section 3.3 Noise and Land Use
Land Use	Section 3.3 Noise and Land Use
Socioeconomics	Section 3.4 Human Resources
Air Quality	Section 3.5 Physical Resources
Hazardous Materials and Waste	Section 3.5 Physical Resources
Soils	Section 3.5 Physical Resources
Water Resources	Section 3.5 Physical Resources
Biological Resources	Section 3.6 Natural Resources
Cultural Resources	Section 3.7 Cultural Resources
Transportation	Eliminated from Further Study
Environmental Justice	Eliminated from Further Study
Recreation	Eliminated from Further Study
Visual Resources	Eliminated from Further Study
Asbestos	Eliminated from Further Study

levels of additional traffic comparable to those resulting from the proposed beddown. The five bases also contain sufficient on-base access and roadways to support the proposed beddown without degradation of service. A 1998 traffic study at Beale AFB (USAF 1998g) concluded that an additional 1,500 military personnel could be accommodated at the base without roadway improvements. The proposed beddown would account for 918 personnel. Edwards, Ellsworth, and Wright-Patterson AFBs and their transportation networks have supported much larger populations (refer to Figure 2.2-8) than would result from the proposed Global Hawk beddown. Tinker AFB (USAF 2000g) previously noted traffic congestion near several gates during peak morning and afternoon periods; however, the installation has enacted several initiatives to improve traffic flow on base by opening additional gates during peak

hours and developing alternative roadways. The Global Hawk beddown would increase the population at Tinker AFB by approximately 3 percent. Even with this increase, the base population and use of the roadways would remain at the levels occurring in the recent past (refer to Figure 2.2-8). Because of the lack of impacts, transportation resources were eliminated from further analysis.

Environmental Justice. Environmental justice concerns the disproportionate effect of a federal action on low-income or minority populations. The existence of disproportionately high and adverse impacts depends on the nature and magnitude of the effects identified for each of the individual resources. If implementation of the proposed action were to have the potential to significantly affect people, those effects would have to be evaluated for how they adversely or disproportionately affect low-income or minority communities. Since no adverse effects occur because of the proposed action, including changes to the level of noise around the base, neither minority nor low-income groups would be affected disproportionately. Therefore, environmental justice was eliminated from further analysis.

No aspects of the proposed beddown would impact environmental justice, recreation, or visual resources.

Recreation. Issues and concerns regarding recreation typically arise about the direct effect on or overcrowding of recreational facilities. The use or location of recreational facilities are not expected to change because of the implementation of the proposed action. Recreational facilities would not be affected by additional noise, construction, or ground operations. Direct and indirect increases in population resulting from the beddown (see Section 4.4) would be minor and would not raise overall base populations near to those supported in the recent past (refer to Figure 2.2-8). As such, demand on local and regional recreation facilities would not differ noticeably from the current situation. Therefore, recreational resources were eliminated from further analysis.

Visual Resources. All proposed facilities would be sited on previously disturbed land on the industrially developed portion of each base. They would be built of similar materials and landscaped as other structures on base. Aircraft would be flying in the same areas that are now overflown. Therefore, the proposed action is not expected to impact the visual environment of the base or its surrounding area or require further analysis.

Asbestos-containing Materials. Under the proposed action, new construction and use of existing buildings with minor interior upgrades (such as improved communication lines) would predominantly provide the facilities required to support the Global Hawk. Neither new construction nor minor upgrades have the potential to affect asbestos-containing materials. Only at Beale AFB would two existing structures (Buildings 1025 and 1086) be substantially renovated. Surveys in 1997 and 1998 found asbestos-containing materials in both buildings (Richard Duffin, personal communication, 2000). Renovation of these two structures would be reviewed by Beale AFB civil engineering personnel to ensure appropriate measures are taken to reduce potential exposure to, and release of, friable asbestos. The Air Force would follow its current practices to remove friable asbestos and manage other asbestos-containing materials associated with these two buildings. Friable asbestos would be removed and disposed of at an asbestos-permitted landfill. Because the beddown might affect asbestos-containing materials at only two buildings on one of the five bases, and existing procedures would effectively deal with the asbestos-containing materials, this topic requires no further analysis in the EA.

3.2 AIRSPACE MANAGEMENT AND AIR SAFETY

Airspace management and air safety are interrelated topics for the proposed action. Airspace management addresses how and in what airspace the Global Hawk aircraft would fly. This section of the EA examines the rules, regulations, and procedures to permit Global Hawk to operate safely among all other aircraft in the National Airspace System. Air safety evaluation criteria include airspace operations and traffic management as well as aircraft systems reliability. Additional safety topics considered for the proposed action include aircraft mishaps and bird-aircraft strikes.

The affected environment for the proposed action consists of the types of airspace through which the Global Hawk would fly during a typical mission. During its climb to cruise altitude, the Global Hawk aircraft would traverse three blocks of airspace (refer to Figure 3.2-1) that have different airspace management and safety considerations: 1) surface to 18,000 feet MSL; 2) 18,000 feet MSL through 45,000 MSL; and 3) 45,000 feet MSL through 60,000 feet MSL. The airspace from the surface through 18,000 feet MSL is the most heavily used airspace in the National Airspace System. The Global Hawk would fly through this block during its departure from the base and climb-out. If flown straight out from base, the Global Hawk would reach 18,000 feet MSL in about 18 nautical miles (NM) (refer to Section 1.2-2). On descent and approach, the Global Hawk would fly through this altitude block, starting approximately 38 NM from the base. Therefore, this analysis uses the distance of 38 NM as the affected environment for Global Hawk flight activities below 18,000 feet MSL.

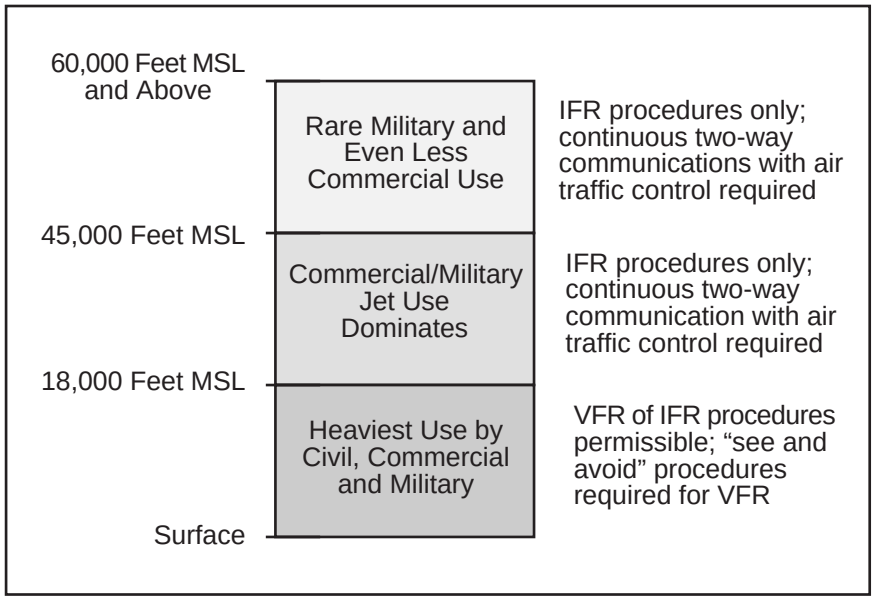


Figure 3.2-1 Airspace Blocks and Procedures

Aircraft can fly from the surface to the 18,000 feet MSL altitude block under visual flight rules (VFR) or instrument flight rules (IFR). Under VFR, pilots must avoid other aircraft while complying with altitude rules mandated by the Federal Aviation Administration (FAA), cloud, and obstruction clearance regulations, and airport avoidance criteria. All pilots use "see and avoid" procedures to ensure that their flight paths do not conflict. Flight below 18,000 feet MSL can be conducted along Victor Routes (refer to Appendix E for definition); between electronic navigation

aids; or by following familiar landmarks such as roads, structures, and other objects identifiable from the air.

Flight above 18,000 feet MSL requires flying under IFR. When flying under IFR, the pilot must have continuous two-way radio communications with air traffic control personnel who are responsible for aircraft separation. Flights above 18,000 feet MSL are frequently flown using Jet Routes (refer to Appendix E). When flying in Jet Routes, air traffic controllers authorize the heading, altitude, and airspeed to ensure aircraft maintain safe separation among aircraft. Aircraft in this controlled airspace are most commonly operated between 18,000 feet MSL and 45,000 feet MSL.

Above 18,000 feet MSL, air traffic controllers constantly monitor and direct all flights.

While the same IFR procedures apply at all altitudes above 18,000 feet MSL, very few aircraft are designed to or can fly above 45,000 feet MSL. This altitude block could be considered the safest airspace in which to fly because of its very low traffic density.

The FAA has the overall responsibility for managing the National Airspace System through a set of flight rules and regulations, airspace management actions, and air traffic control procedures. The FAA accomplishes this responsibility through close coordination with state aviation officials and airport planners, military airspace managers, and other entities to determine how airspace can be used most effectively to serve all interests.

FAA rules and regulations govern all civilian and military airspace use over the U.S.

The FAA has designated three types of airspace over the United States: controlled, special use, and other. The affected environment for the Global Hawk beddown includes all three types of airspace, depending on the base.

1. Controlled airspace is a generic category that includes all airspace in which air traffic control procedures are applied.

2. Special use airspace includes restricted areas; military operations areas (MOAs); and warning, prohibited, alert, and controlled firing areas.

3. Other airspace areas include military training routes, airport advisory areas, temporary flight restricted areas, and other special designated areas.

The affected area for Global Hawk operations for each of the five alternative bases includes controlled airspace. For Edwards and Beale AFBs, the affected area also contains special use airspace. All Edwards AFB airfield operations occur within Restricted Area-2515 (R-2515). With the exception of Ellsworth AFB, military training routes also occur within the affected areas for the bases.

Airspace Management. The airspace and airfield operating environment differ around each base. As noted above, the area surrounding the base out to 38 NM and from the surface to 18,000 feet MSL is defined as the affected environment for this assessment. This "cylinder" defines the region of most concern to the FAA regarding operational issues with civil and commercial aviation (refer to Appendix E). Within 38 NM, airports (public, corporate, and private), Victor Routes, military training routes, and special use airspace exist (Table 3.2-1). Appendix E presents detailed information about this airspace.

Table 3.2-1 Comparison of Airspace and Airfield Environment				
Base	*Airports*	*Victor Routes*	*Military Training Routes*	*Special Use Airspace*
Beale	13	7	2	1
Edwards	14	7	7	7
Ellsworth	3	5	0	0
Tinker	16	14	4	0
Wright-Patterson	27	12	1	0

All five bases currently conduct between 40,000 and 60,000 aircraft operations (including departures and arrivals) annually that effectively and safely deal with the aircraft traveling through these various elements of the airspace without incident. This level of safety is achieved through direct and constant coordination with air traffic control personnel and adherence to FAA rules and directives.

Air Safety. The Air Force defines four categories of aircraft mishaps: Class A, B, C, and High Accident Potential. Class A mishaps result in a loss of life, permanent total disability, destruction of an aircraft, damage to an aircraft beyond economical repair, or a total cost exceeding $1 million. As the most serious type, Class A mishaps form the focus of this analysis.

Overall, Air Force data on mishaps within 10 NM of an airfield reveal that 75 percent of aircraft accidents occur on or adjacent to the runway, or in a corridor extending from the end of a runway for 15,000 feet. Based on aircraft mishap patterns, three zones within this corridor are established at the end of the runways: the Clear Zone (CZ), Accident Potential Zone I (APZ I), and APZ II. Section 3.3 (Noise and Land Use) discusses these land-use classifications.

Class A mishap rates vary from 0.19 at Tinker AFB to 7.17 at Beale AFB per 100,000 flying hours.

To characterize aircraft safety at the five alternative bases, the Class A mishap rates for the dominant aircraft (most airfield operations) are depicted in Table 3.2-2. Another safety concern is the bird-aircraft strike hazard (BASH). Over 75 percent of bird strikes occur in the airfield and airspace environment below 3,000 feet AGL, although birds can be encountered at higher altitudes. Any gain in altitude represents a reduced threat of bird strike. The potential for bird-aircraft strikes is greatest in areas used as migration corridors (flyways) or where birds congregate for foraging or resting (e.g., open water bodies, rivers, and wetlands).
Because of these potential adverse effects, the Air Force devotes considerable

Table 3.2-2 Class A Mishap Rates for Dominant Aircraft		
Base	*Dominant Aircraft*	*Class A Mishap Rate*[1]
Beale	U-2	7.17
Edwards	F-16	4.43
Ellsworth	B-1	3.75
Tinker	E-3	0.19
Wright-Patterson	C-141	0.33

[1]Per 100,000 flying hours.

attention to avoiding the possibility of bird-aircraft strikes. It has conducted a worldwide program for decades to track bird migrations, bird flight patterns, and past strikes to develop predictions of when and where bird-aircraft strikes might occur. This program, which consistently updates the data, also defines avoidance procedures through a bird avoidance model. In addition to this model, each military installation develops and implements a BASH plan focusing on its local area. These plans detail a coordinated program that minimizes the bird strike hazard to aircraft in each base area. A BASH plan includes maps and charts of bird flight pattern and use areas, specific procedures for avoiding bird-aircraft hits, and procedures for reporting strikes.

Bird-aircraft strikes occur infrequently at the five bases.

Between 1985 and 1999, the Air Force recorded 39,854 strikes, or an average of 2,847 per year. During 1999, a total of 1,045 bird strikes were reported. Available bird-aircraft strike data for the alternatives are presented in Table 3.2-3. These data include bird strikes both at the airfield and in the airspace used by aircraft from that base.

Table 3.2-3 Comparison of Baseline Bird-Aircraft Strikes Among Alternative Bases

Base	*Baseline Annual Airfield Operations*	*Average Bird-Aircraft Strikes/Year*[1]	*Bird-Aircraft Strike per Airfield Operation*
Beale	51,825	13.8	1/3,755
Edwards	52,607	17	1/3,095
Ellsworth	54,600	16	1/3,413
Tinker	57,000	45	1/1,267
Wright-Patterson	40,251	32	1/1,258

[1] 1995 to 1999 data include strikes that occurred at and away from the airfield.

3.3 NOISE AND LAND USE

The potential effects of aircraft noise from the beddown of any aircraft, including the Global Hawk, is an important consideration in the environmental analysis. Aircraft operations generate noise at and around bases, and off-base land uses experience such noise. Noise and land use are discussed together in this section for the following reasons:

- Noise from aircraft operations represents a potential source of effects on land use.
- Knowledge of noise conditions often provides cities and other agencies a way to evaluate and guide land-use policies.

Noise is often defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, diminishes the quality of the environment, or is otherwise annoying. Response to noise varies by the type and characteristics of the noise source, distance from the source, receptor sensitivity, and time of day. Noise can be intermittent or continuous, steady or impulsive, and it may be generated by stationary or mobile sources. Although aircraft are not the only source of noise in any area, they are readily identifiable to those affected by their noise emissions and are routinely singled out for special attention and criticism. The kind of noise discussed in this section is conventional subsonic noise as

generated by an aircraft's engines and airframe. This noise is heard while an aircraft is within some distance of a receptor (e.g., person). Assessment of subsonic aircraft noise requires a general understanding of the measurement and effects of this kind of noise. Appendix A contains additional discussion of noise, the quantities used to describe it, and its effects.

A-weighted sound levels best approximate human hearing.

Noise is represented by a variety of quantities, or "metrics." Each noise metric was developed to account for the type of noise and the nature of receptor of the noise. Human hearing is more sensitive to medium and high frequencies than to low and very high frequencies, so it is common to use "A-weighted" metrics, which account for this sensitivity.

Time also plays a role with regard to noise. Because people hear a sound, such as an aircraft flyover, at a given time, they think the noise is instantaneous. However, the effects of noise over a period of time depend on the total noise exposure over extended periods, so "cumulative" noise metrics are used to assess the impact of ongoing activities such as those that occur at the five alternative bases.

Within this EA, noise is described by the Sound Exposure Level (SEL) and Day-Night Average Sound Level (DNL). A-weighted levels are used for subsonic aircraft noise. Sound levels are on a logarithmic decibel scale; a sound level that is 10 decibels (dB) louder than another will be perceived as twice as loud. Each of these metrics is summarized below and discussed in detail in Appendix A.

- Sound Exposure Level accounts for both the maximum sound level and duration of a sound. SEL does not directly represent the sound level heard at any given time. Rather, it provides a measure of the total sound exposure for an entire event.

- Day-Night Average Sound Level combines the levels and duration of noise events and the number of events over an extended period. It is a cumulative average computed over a given period, such as a year, to represent total noise exposure. DNL also accounts for more intrusive nighttime noise, adding a 10 dB penalty for sounds after 10:00 p.m. and before 7:00 a.m. DNL is the appropriate measure to account for total noise exposure around airfields.

Land use generally refers to human modification of the land, often for residential or economic purposes. It also refers to use of land for preservation or protection of natural resources such as wildlife habitat, vegetation, or unique features. Human land uses include residential, commercial, industrial, agricultural, or recreational uses; natural features are protected under designations such as national parks, national forests, wilderness areas, or other designated areas. Land uses are frequently regulated by management plans, policies, ordinances, and regulations that determine the types of uses that are allowable or protect specially designated or environmentally sensitive uses. Special land-use management areas are identified by agencies as being worthy of more rigorous management.

The affected environment for noise and land use is similar at each alternative base for the proposed Global Hawk beddown. It extends to the area outside the base that is affected by noise from aircraft operations. This area varies for each base. Lands beyond the limits of the areas affected by noise do not warrant examination for two reasons. First, because the Global Hawk operates at altitudes of 60,000 feet MSL

most of the time, noise levels would be imperceptible on the ground. Second, the Global Hawk would spend less than 0.3 percent of its time at lower altitudes (i.e., below 5,000 feet AGL) where it could affect noise conditions.

Noise studies, including those completed under the Air Installation Compatible Use Zone (AICUZ) program, show that noise levels above 65 DNL affect areas of differing size for the five alternative bases (Table 3.3-1). These studies expressed noise levels (in DNL) as contours developed from the following data: aircraft types, runway-use patterns, engine power settings, altitude profiles, flight-track locations, airspeed, number of operations per flight track, engine maintenance, and time of day. These studies were based on an average busy day, which represents airfield activity during a 24-hour period when the airfield is in full operation. The advantage of the "average busy day" approach is that it is unaffected by daily, monthly, and yearly fluctuations in the rate of use by individual aircraft at the base. The differences in the size of the areas affected by noise stem from variances in the number of airfield operations and in the mix of aircraft flying at the bases.

Table 3.3-1 Acres under Noise Contours

Contour (DNL)	*Beale*[1]	*Edwards*[2] *	*Ellsworth*[3]	*Tinker*[4]	*Wright-Patterson*[5]
Average Daily Airfield Operations	199	202	210	219	155
65-70	18,594	20,201	18,135	6,559	3,436
70-75	7,094	11,221	8,801	3,477	1,418
75-80	3,350	5,987	3,905	1,712	758
80-85	1,590	2,644	1,806	824	710
85+	659	1,011	911	414	0
Total	31,287	41,064	33,558	12,986	6,322

* Entirely within base boundaries.

[1] 1998 AICUZ Study

[2] 1993 AICUZ Study

[3] 1994 AICUZ Study

[4] 1998 AICUZ Study

[5] 1995 AICUZ Study

Edwards AFB has the largest area affected by noise levels of 65 DNL or greater, but the affected area lies totally within the boundaries of the 470-square mile base. The area affected by noise levels of 65 DNL or greater is larger at Ellsworth AFB than at Beale, Tinker, and Wright-Patterson AFBs because B-1 bomber aircraft, which are among the louder aircraft in the Air Force inventory, dominate the airfield operations (22 percent) at Ellsworth AFB. Wright-Patterson AFB has the smallest total area affected by a noise level of 65 DNL or greater.

Although DNL provides the most widely accepted cumulative metric for quantifying noise impacts, it does not offer an intuitive description of noise conditions. People often desire to know the loudness of individual aircraft during a flyover (refer to Figure A-1, Appendix A). The SEL metric, as a single-number representation of a noise energy dose, meets this need. This measure accounts for the effect of both the duration and intensity of a noise event. During an aircraft flyover, SEL would include both the maximum noise level and the 10 dB lower levels produced during the onset and recess periods of the flyover (which is also known as 10 dB down). Because an individual overflight takes seconds and the maximum sound level occurs instantaneously, SEL is the best metric for comparing noise levels from overflights. SELs decrease as altitude increases and vary according to the type of aircraft, its altitude or distance from the receptor, and its speed. A maximum noise level during

an overflight is typically 0 to 15 dB lower than the SEL with flights above an altitude of 500 feet AGL.

Table 3.3-2 presents SELs at representative altitudes (feet AGL) for the aircraft that performs, on average, the most airfield operations at each of the five bases. Typically, the noise environment is dominated by the aircraft performing the majority of operations, although it could be dominated by few operations of louder aircraft. SELs generated by the dominant aircraft at the other bases are similar except at Wright-Patterson AFB where the C-141 provides SELs 3 to 4 dB lower.

Table 3.3-2 SELs at Representative Altitudes (Feet AGL)[1]

Base	*Aircraft Type*	*500 AGL*	*1,000 AGL*	*2,000 AGL*
Beale	U-2	116	110	104
Edwards	F-16	116	110	104
Ellsworth	B-1	119	113	106
Tinker	E-3	115	109	102
Wright-Patterson	C-141	112	106	99

[1] Uses takeoff power settings

On-Base Land Use. Comprehensive and general plans, along with management plans for natural and cultural resources, document and guide land use on each of the bases. The primary planning documents applicable to each base include the following: *Beale AFB General Plan* (USAF 1998g); *Edwards AFB Base Comprehensive Plan* (USAF 1994b); *Ellsworth AFB General Plan* (USAF 1996); *Tinker AFB Base Comprehensive Plan* (USAF 1992); and *Wright-Patterson AFB General Plan* (USAF 2000h).

The nature and basic patterning of land use on the five bases are similar. All the bases include developed and undeveloped lands. Main categories of developed land uses include airfield and flight line, industrial areas, administrative facilities, housing, recreation sites, and medical facilities. Undeveloped lands are commonly called open space in planning documents and may include grazing areas, natural or cultural resource preservation sites, safety buffers, or other similar land uses.

Each of the five bases include lands managed for the protection of natural and cultural resources.

Table 3.3-3 presents the acres of developed and undeveloped land use on each base. Edwards AFB contains the most acres of developed lands. Overall, Edwards AFB covers 300,000 acres, most (282,000 acres) of which consists of open lands used for aircraft test ranges, non-maintained lakebed landing sites, and engineering test sites. Beale AFB also contains substantial open space (18,472 acres) used for leased cattle grazing and for vernal pool management and protection. Through consultation with the U.S. Fish and Wildlife Service, Beale AFB has defined areas in which development is permitted and areas in which it is precluded to protect the vernal pools and riparian areas. Open space at Ellsworth, Tinker, and Wright-Patterson AFBs also includes areas where protection of natural and cultural resources constrain development.

Safety for airfield operations also constrains development on the bases. Under the Air Force's AICUZ program, land use is designed to minimize the effects of a potential aircraft accident. For each runway at each base, a Clear Zone (CZ) and

Table 3.3-3 Developed and Undeveloped Land Uses on Base

Base	*Developed Lands (Acres)*	*% Total*	*Undeveloped Lands (Acres)*	*% Total*	*Total Lands (Acres)*
Beale	4,472	19	18,472	81	22,944
Edwards[1]	11,197	61	7,130	39	18,327
Ellsworth	4,971	92	440	8	5,411
Tinker	2,848	56	2,193	44	5,041
Wright-Patterson	5,956	73	2,189	27	8,145

[1] Applies to land use associated with developed areas of base; another 282,000 acres lie within Edwards AFB and provide test ranges, landing sites, and similar facilities.

Accident Potential Zones (APZs) have been established. One CZ and two APZs extend from each end of the runways, encompassing the areas where historic Air Force data had demonstrated there is highter potential for aircraft accidents.

For Beale, Edwards, and Wright-Patterson AFBs, the CZs are wholly contained within the base boundaries, and land uses are compatible with recommendations. At Ellsworth and Tinker AFBs, the CZs overlie both on-base and off-base lands. On-base land uses within the CZs for Ellsworth and Tinker AFBs generally consist of open space, although some potentially incompatible industrial facilities lie within the CZs for Tinker AFB.

With the exception of two facilies within one APZ I at Beale AFB, compatible land uses occur in the on-base portions of the APZs of all five bases. Open space dominates the land uses within on-base portions of these zones. At Beale AFB, buildings 355 and 502 occur in APZ I at the southern end of the runway. They house a U.S. Army counter drug unit, Team Wolf, and the radar/radio maintenance functions of the 9th Communications Squadron, respectively. Beale AFB plans to move these facilities to more suitable areas as funding permits.

Off-Base Land Use. Under the AICUZ program, the Air Force assesses the safety requirements and noise conditions around bases and provides recommendations on off-base land-use compatibility to local governments responsible for land-use decisions. These local governments can use these recommendations, along with other factors, to designate land uses, establish zoning ordinances, and manage lands.

The communities and local governments surrounding Beale, Ellsworth, Tinker, and Wright-Patterson AFBs have used AICUZ and other data to develop and implement land-use plans and zoning ordinances (Table 3.3-4). Edwards AFB requires no such off-base plans or ordinances since the effects of noise from airfield operations do not extend outside the base boundaries. The following highlights off-base land-use conditions for the four bases (except Edwards AFB), emphasizing the effects of aircraft noise.

Table 3.3-4 Plans and Ordinances for Off-Base Land Use

Base	*Plan or Ordinance*	*Effect on Land Use around Base*
Beale	Yuba County Zoning Ordinance	Restricts land use to those compatible with AICUZ guidelines for safety and noise based on 1982 noise contours.
	Sacramento Area Council of Governments Beale AFB Comprehensive Land use Plan (1987)	Establishes an area of influence roughly matching furthest extent of 1982 noise contours and precludes land uses involving assemblies of people.
	River Highlands Community Plan	Permits rural residential development consistent with AICUZ guidelines
Edwards	Not Applicable - All effects are contained within base	
Ellsworth	*Ellsworth AFB Joint Land Use Study* (1994)	Develops plans to relocated incompatible off-base land uses and preclude future encroachment.
Tinker	Midwest City, Del City, Oklahoma City, and Oklahoma County Zoning Ordinances	Establishes zoning requirements consistent with AICUZ recommendations.
Wright-Patterson	*Joint Land Use Study* (1996)	Defines airport zoning districts.
	Wright-Patterson Airport Zoning Regulation (1997)	Controls development within off-base areas affected by airfield operations noise and safety requirements.

Compatible land uses surround Beale AFB (Figure 3.3-1). Large tracts of agricultural land abut the base to the south and west. North of the base lie the Yuba Gold Fields, an industrial mining operation, and a development area controlled by the *River Highlands Community Plan*. Spenceville Wildlife Management and Recreation Area abuts the east edge of the base, but lies outside the area affected by noise levels of 65 DNL or greater. In this area surrounding the base, Yuba County and the Sacramento Area Council of Governments use noise contours generated in 1982 (when more aircraft were based at Beale AFB) to guide land-use management. The geographic extent of these contours far exceeds current actual noise conditions, but they serve to meet the county's need to prevent encroachment around Beale AFB (USAF 1998g).

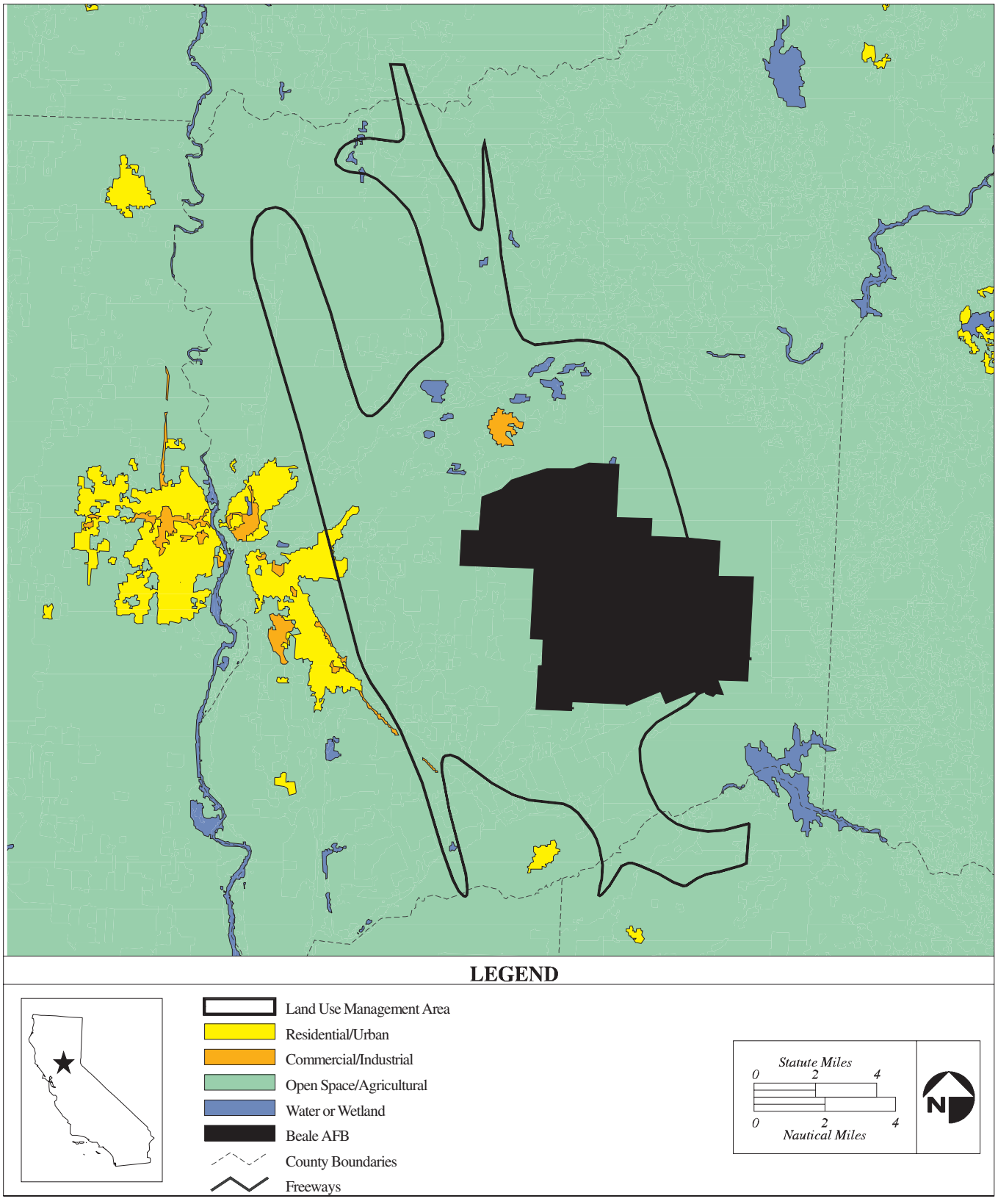


Figure 3.3-1 Community Land Use Management Areas Associated with Beale AFB, California

Northeast, north, and northwest of Ellsworth AFB, agriculture with associated low-density rural residential development characterize off-base land use (Figure 3.3-2). These land uses are compatible with both the noise levels and safety requirements. To the south, southeast, and southwest, the community of Box Elder abuts the base. Residential, commercial, and public land uses associated with Box Elder lie within areas subject to noise levels of 65 DNL to 80 DNL. These land uses, along with those within APZ I and APZ II, are currently incompatible. The *Ellsworth AFB Joint Land Use Study* (USAF 1995d) has recommended actions to remedy this situation.

Relatively little off-base land is affected by noise levels of 65 DNL or greater at Tinker AFB. Most of the affected lands extend north and south of the base (Figure 3.3-3), including the residential acreage that lies north of the base in Midwest City (Tinker AFB 1998 AICUZ). Several residential areas, an apartment complex, and mobile home parks are subject to noise levels of 70 DNL or greater. Much of this residential land use, and particularly the mobile home parks, are considered incompatible with the noise levels.

Based on the 1996 *Joint Land Use Study* (Wyle 1996), the counties and communities associated with Wright-Patterson AFB redefined the airport zoning district first established in 1975. Designed to control for compatible land uses around the base, these districts were incorporated into zoning regulations in 1997. These regulations use noise contours (Figure 3.3-4) (Wyle 1997) that reflect much greater numbers of airfield operations than occur under baseline conditions. As such, the large contours encompass more lands than are actually affected in order to provide better, more consistent planning. About 8 percent (1,696 acres) of the total lands within the zoning districts consist of residential lands subject to noise levels of 65 to 80 DNL. However, baseline noise levels of 65 to 75 DNL affect only 123 acres. The zoning districts provide for planning of residential land uses on far more acres than are actually affected by airfield noise.

Around most bases, issues with the compatibility of land uses and aircraft noise focus on residential areas where people tend to be most affected. Comparison of the five alternative bases (Table 3.3-5) indicates that Ellsworth AFB's operations affect the most residential lands with the highest noise levels.

Table 3.3-5 Comparison of Off-Base Residential Land Uses under Noise Contours

Base	*Residential Acres under Noise Contours (DNL)*				
	65-70	70-75	75-80	80-85	>85
Beale	215	91	3	3	0
Edwards	0	0	0	0	0
Ellsworth	220	161	274	221	0
Tinker	557	251	71	0	0
Wright-Patterson[1]	112	11	0	0	0

[1] Based on baseline noise levels, not airport zoning districts.

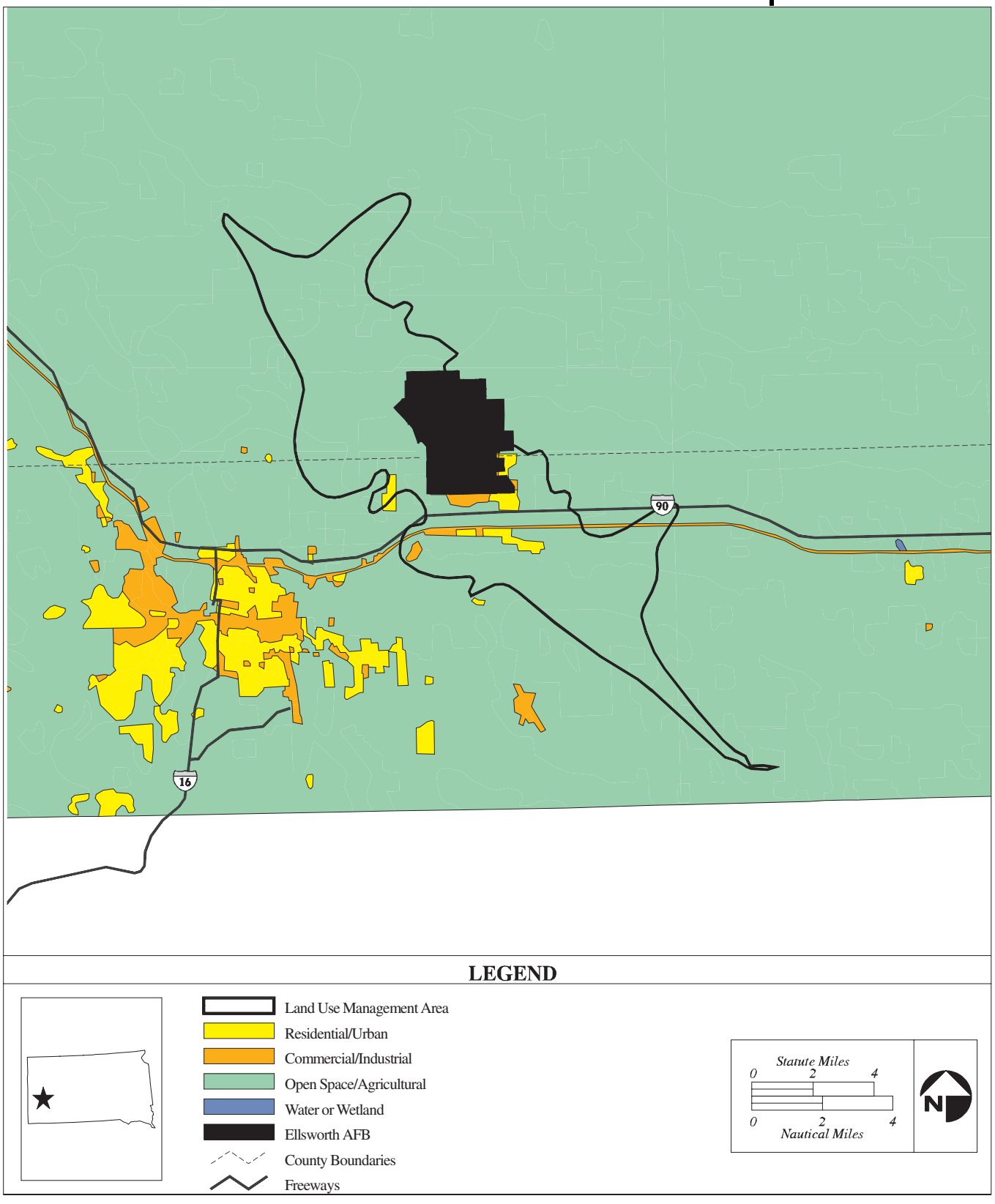


Figure 3.3-2 Community Land Use Management Areas Associated with Ellsworth AFB, South Dakota

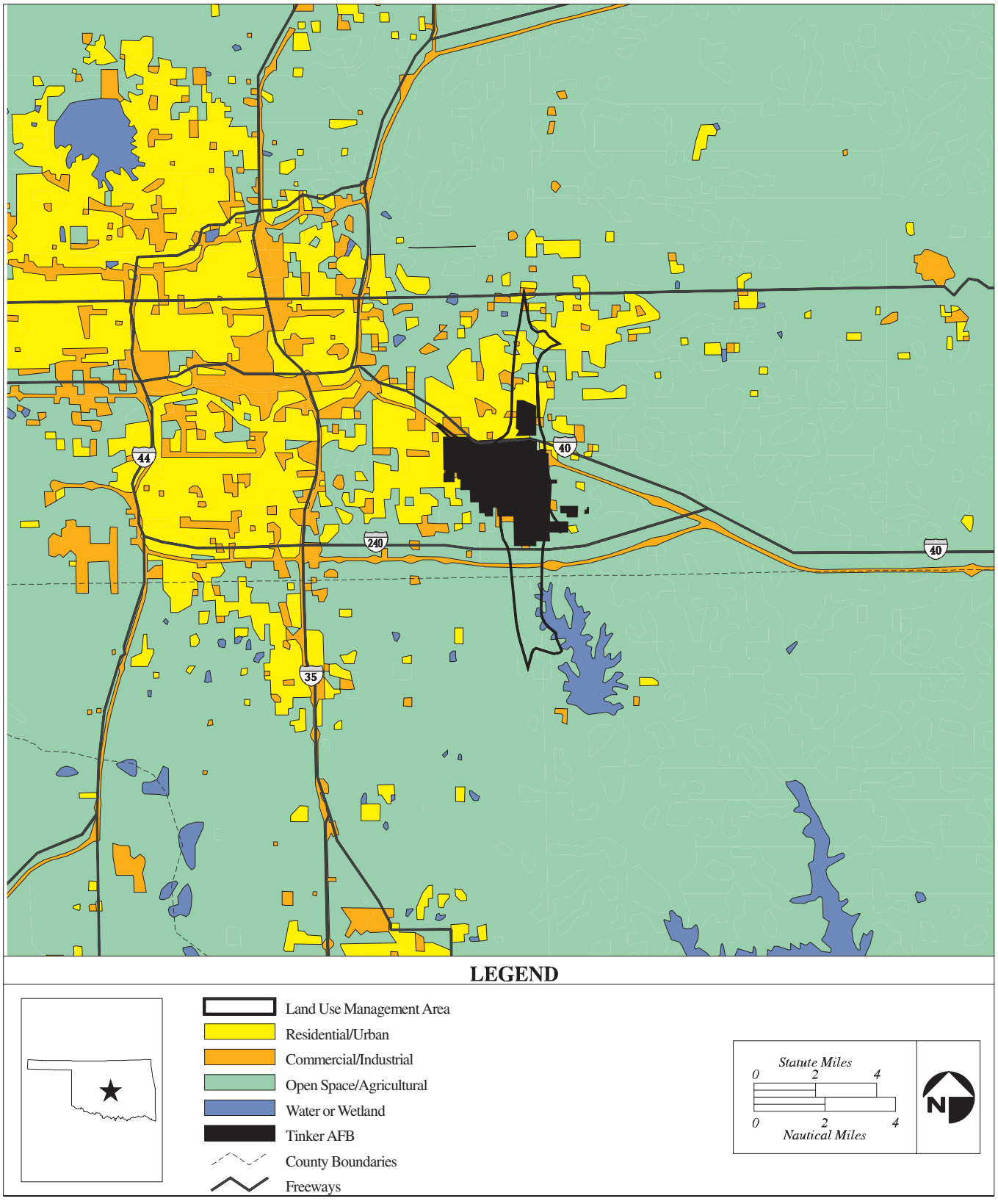


Figure 3.3-3 Community Land Use Management Areas Associated with Tinker AFB, Oklahoma

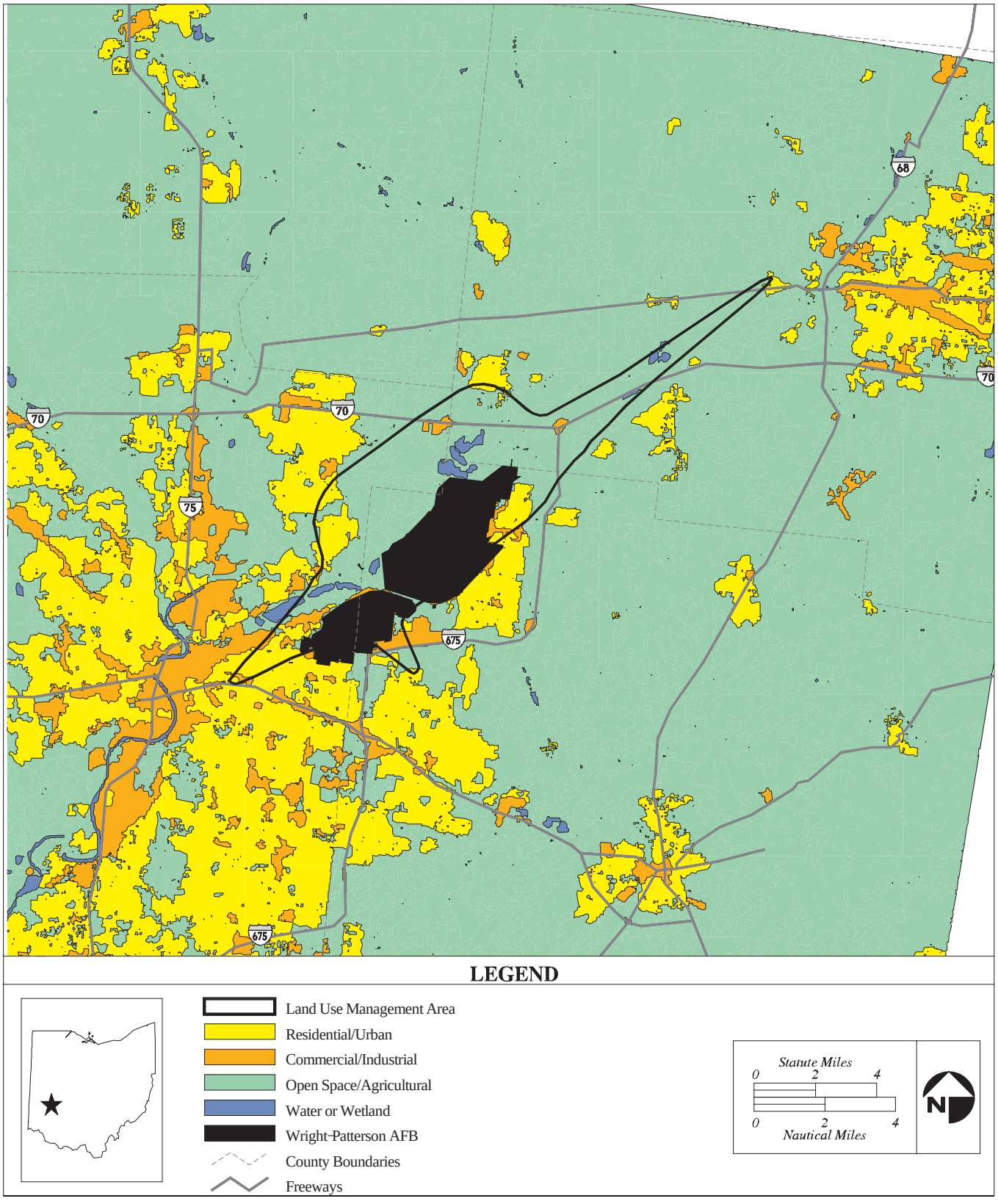


Figure 3.3-4 Community Land Use Management Areas Associated with Wright-Patterson AFB, Ohio

3.4 HUMAN RESOURCES

Human resources include an analysis of the economy, population, employment, and income.

This section of the EA focuses on the general features of the economy, population, employment, and income that could be affected by the proposed action. Except for Edwards AFB, the affected environment for each base is defined as the multi-county area in which most socioeconomic effects would be experienced. For Edwards AFB, the affected environment is defined as the Greater Antelope Valley. Economic indicators described for the affected areas--population, populations growth rate, employment, unemployment rate, and median household income--represent primary factors potentially affected by influxes of new personnel to a base and by short-duration construction costs. Figures 3.4-1 through 3.4-5 portray the affected areas and present data on individual economic indicators for the areas.

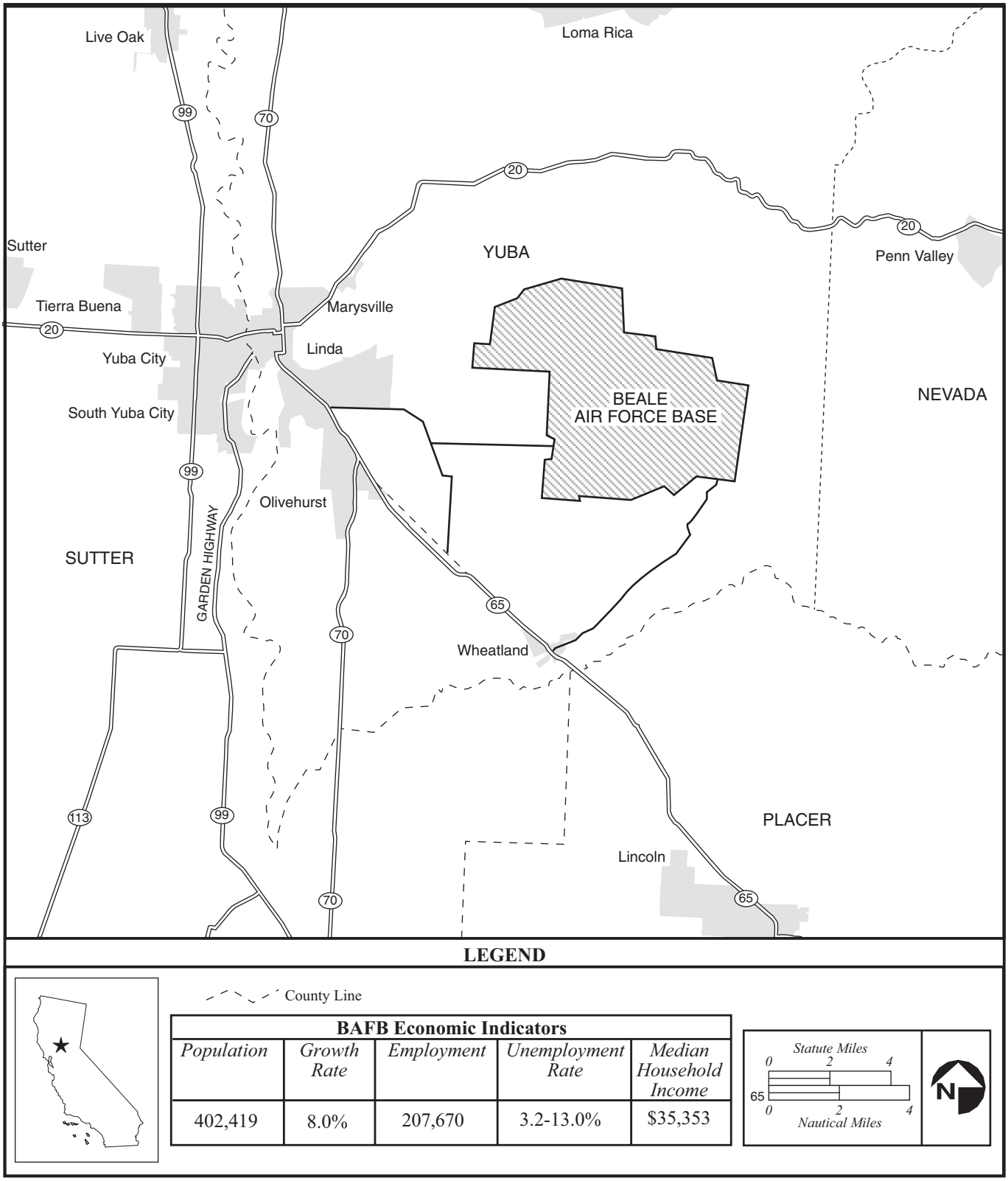


Figure 3.4-1 Beale Air Force Base, California
Affected Areas: Human Resources

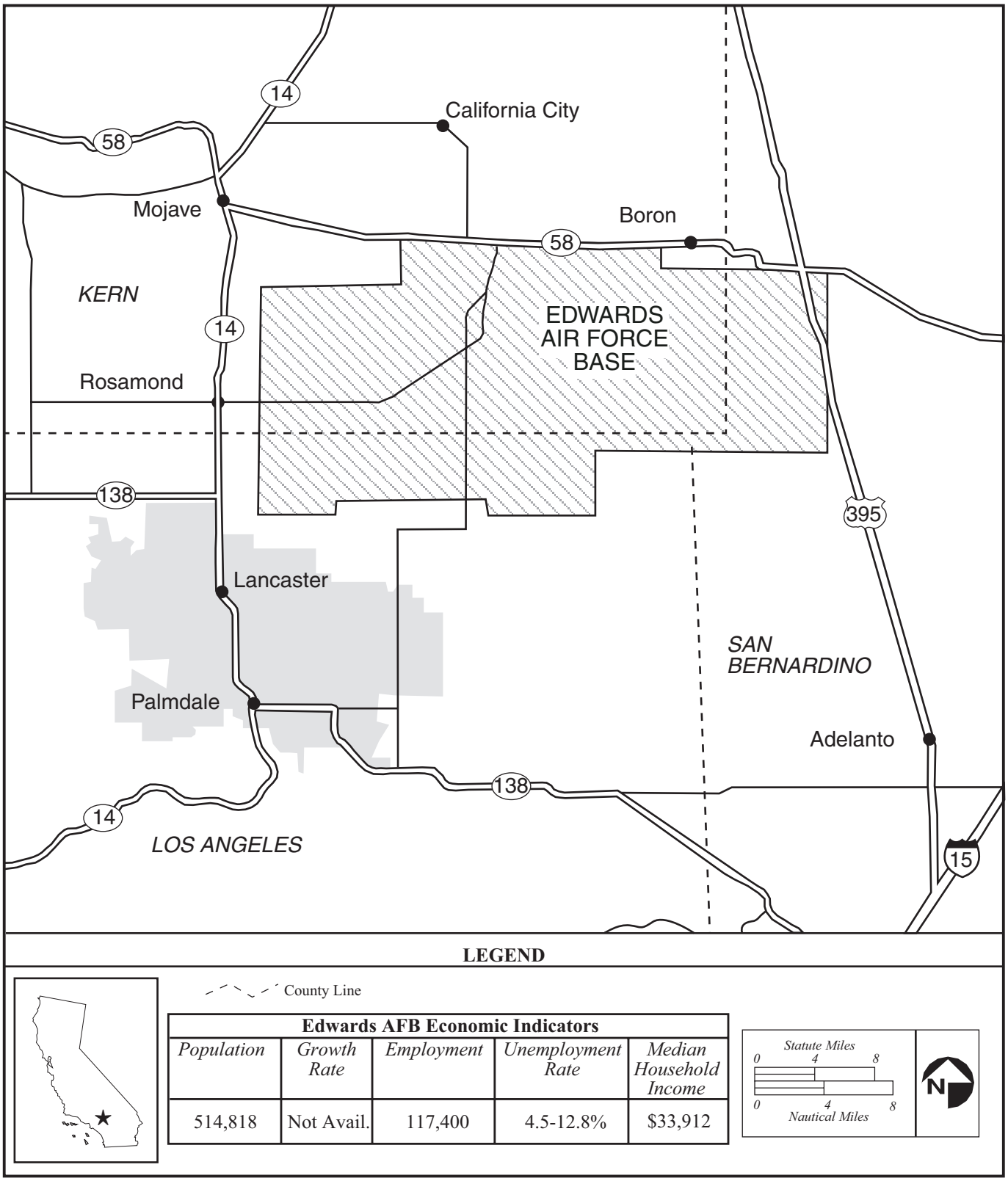


Figure 3.4-2 Edwards Air Force Base, California
Affected Areas: Human Resources

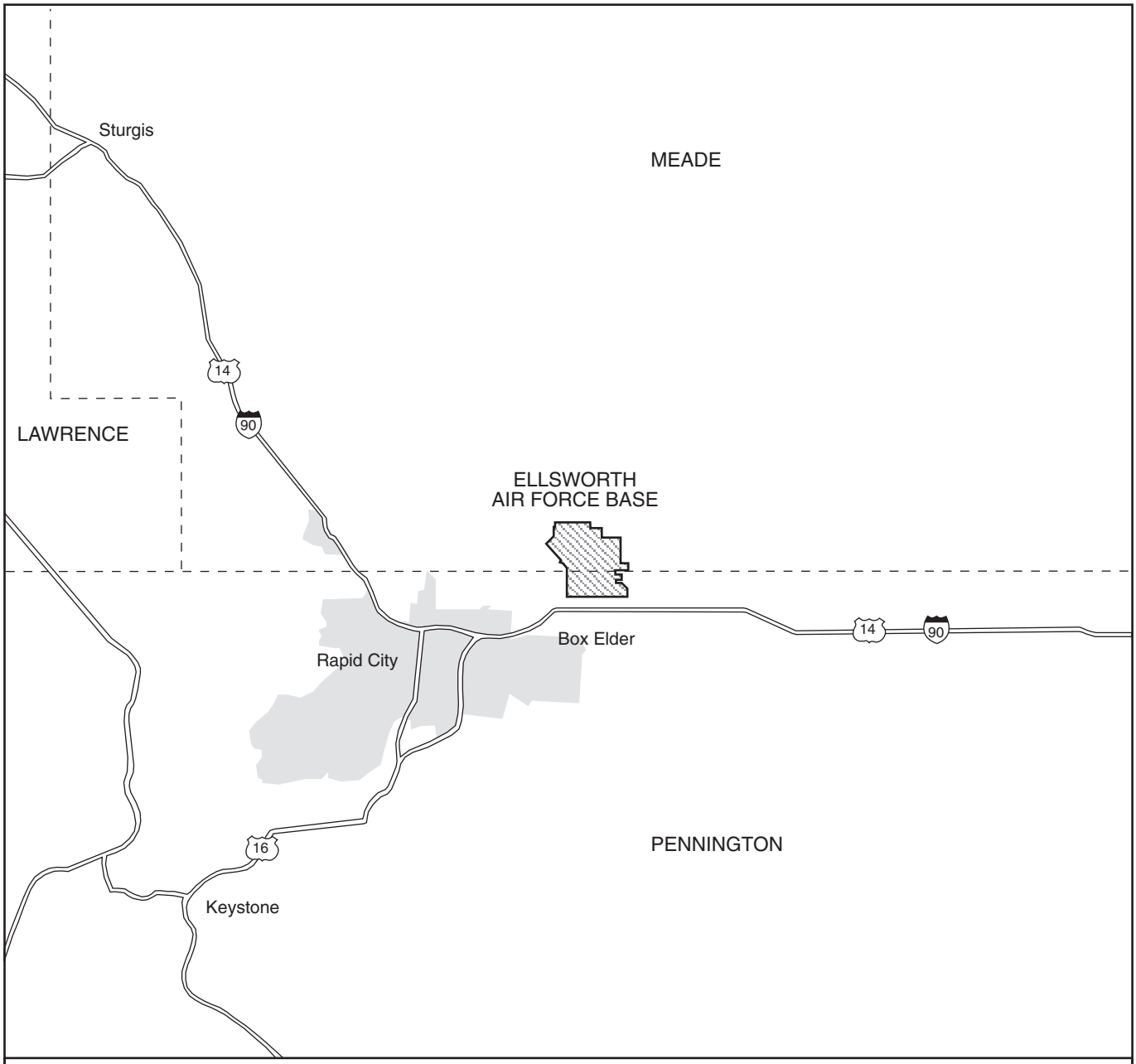


Figure 3.4-3 Ellsworth Air Force Base, South Dakota Affected Areas: Human Resources

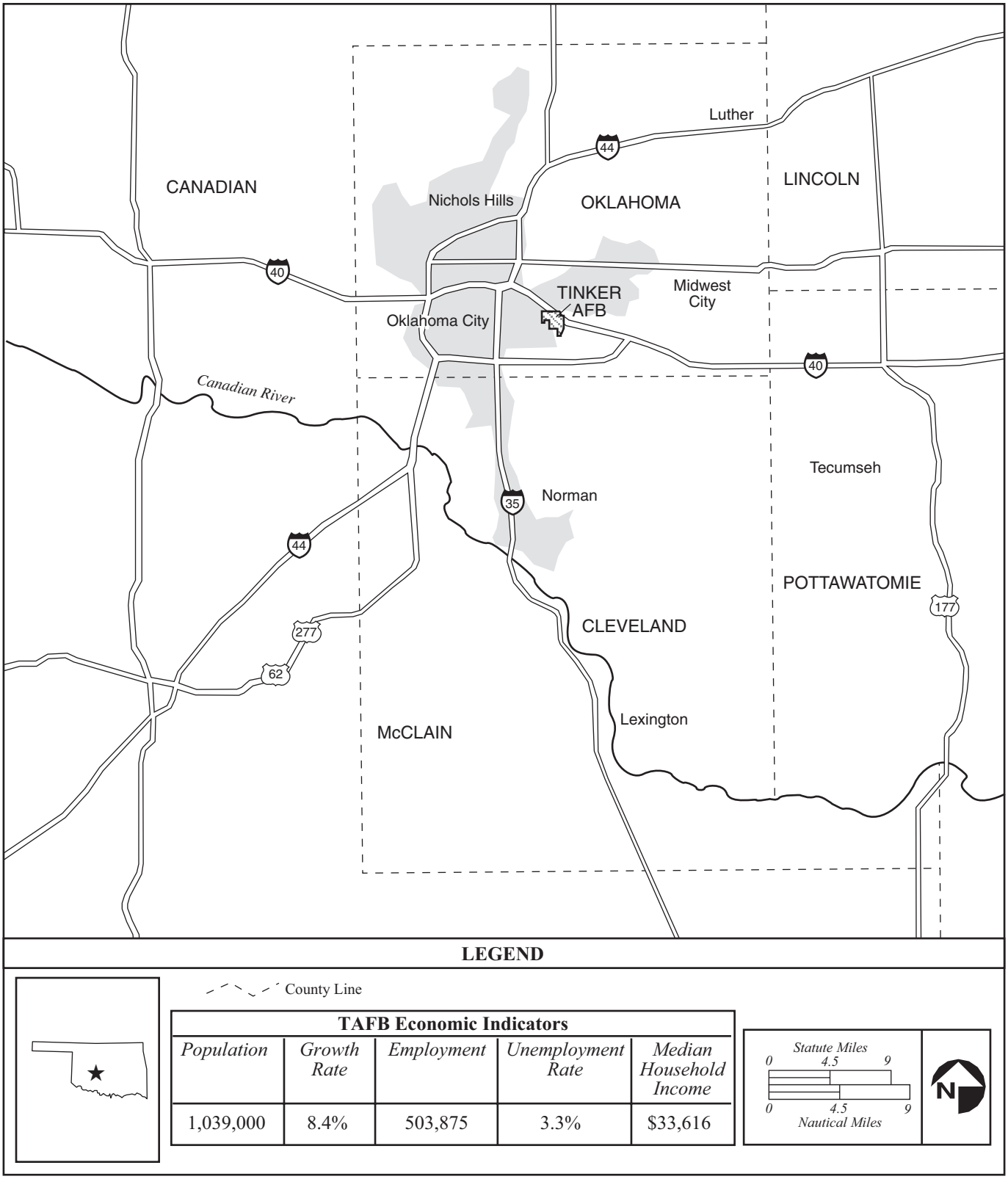
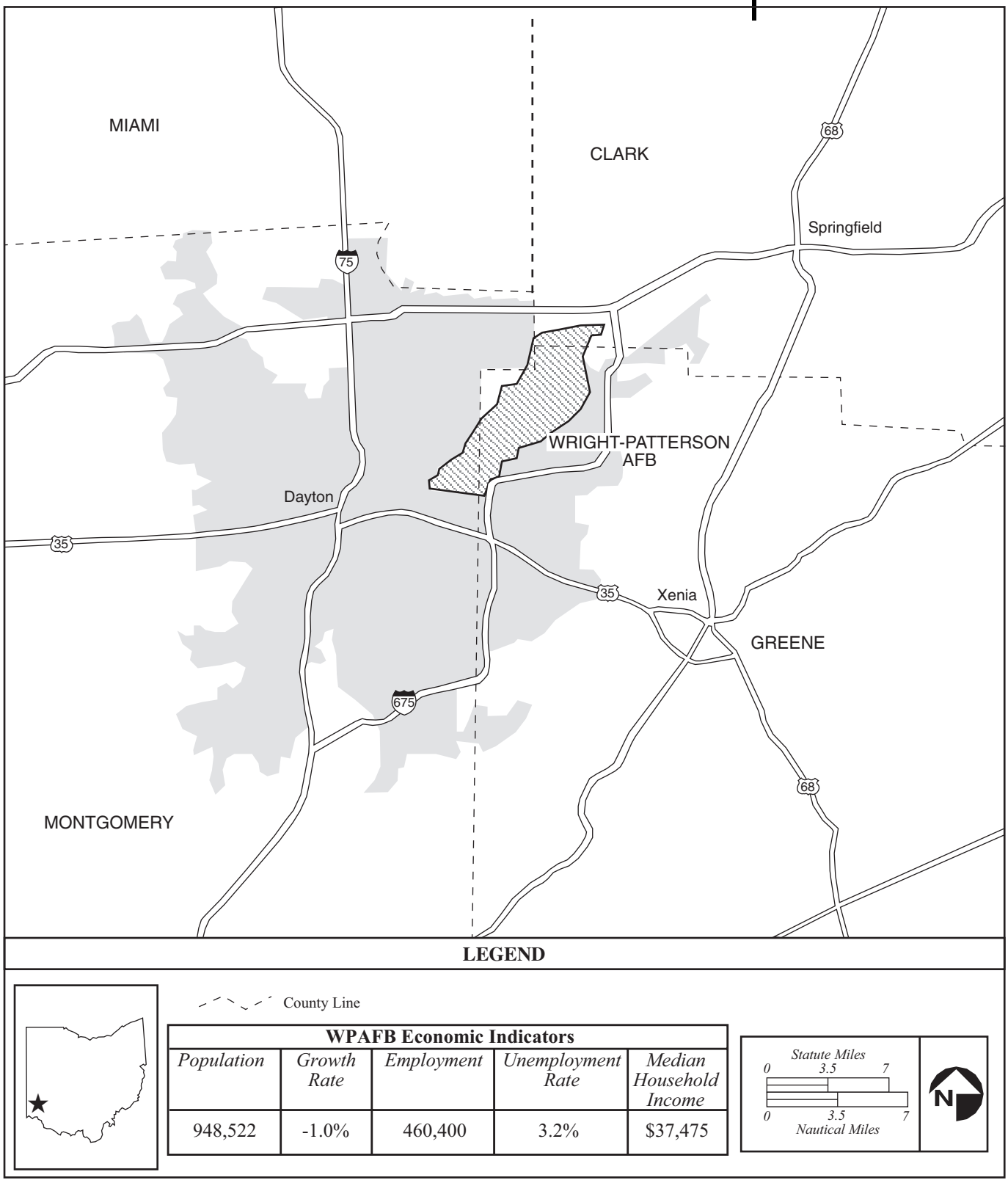


Figure 3.4-4 Tinker Air Force Base, Oklahoma
Affected Areas: Human Resources



WPAFB Economic Indicators

Population	*Growth Rate*	*Employment*	*Unemployment Rate*	*Median Household Income*
948,522	-1.0%	460,400	3.2%	$37,475

Figure 3.4-5 Wright-Patterson Air Force Base, Ohio
Affected Areas: Human Resources

3.5 PHYSICAL RESOURCES

This section includes discussions of air quality, hazardous materials and waste, and soils and water.

- The air quality assessment analyzes emissions from the aircraft, ground equipment associated with the aircraft, and transportation of personnel.
- The assessment of hazardous materials and waste examines the effects of materials used and waste generated during ground operations and maintenance activities.
- The soils and water assessment considers the effects of construction on soils, especially soil erosion, and on water quality.

Physical resources include discussions of air quality, hazardous materials and waste, soils, and water.

The affected area for hazardous materials and wastes includes each of the bases being considered in this EA, with an emphasis on aircraft storage and maintenance areas, hazardous material storage areas, and hazardous waste accumulation areas. Since the proposed Global Hawk aircraft operations would not generate or dispose of hazardous wastes in the operational airspace, a discussion of hazardous materials and wastes with respect to airspace is not addressed. Because of likely effects from ground disturbance, the affected area for soils and water centers around the construction locations.

Defining an affected environment for air quality requires knowledge of 1) the types of emissions, 2) location(s) of the sources of emissions (for stationary sources) and the horizontal and vertical extent of emissions from mobile sources such as aircraft or automobiles, 3) emission rates of the pollutant sources, 4) the proximity of existing emission sources to those sources associated with the proposed action, and 5) local and regional climate conditions. The affected environment for emissions can vary from less than a mile to over 30 miles, depending on the pollutant. The affected area for emissions of inert pollutants (pollutants other than O_3[ozone], its precursors, or NO_2 [nitrogen dioxide]) is generally limited to a few miles downwind of the source, while O_3 and NO_2 generally extend much farther downwind.

An affected area for air quality also has a vertical dimension since the emissions occur in a volume of air. This vertical dimension depends upon climatic conditions. The upper vertical limits of the affected area equate to the mixing height for emission, which varies by region based on daily temperature changes, amount of sunlight, winds, and other climatic factors. Emissions released above the mixing height become so widely dispersed before reaching ground level that any potential ground-level effects would not be measurable.

The quality of air between ground level and 3,000 to 5,000 feet above ground level (AGL) is the issue of most concern to the human environment. Below 3,000 to 5,000 feet AGL there is less mixing of the atmosphere, so airflow stagnates and emissions are not as easily dispersed into the upper atmosphere. Pollutants emitted above the mixing height become diluted in the large volume of air before they are slowly transported to ground level. These emissions have little or no effect on ambient air quality. Therefore, the air quality section of this EA focuses on emissions below the mixing height. The U.S. Environmental Protection Agency

(EPA) generally uses 3,000 feet AGL as the default-mixing height (or depth) across the United States. However, some regions have mixing heights considerably higher; therefore, a more conservative estimate of 5,000 feet AGL was used as the mixing height for this EA for all AFBs except Edwards AFB. A mixing height of 3,000 feet was used for Edwards AFB, consistent with the assumption used in other EAs for the base.

AIR QUALITY

Air quality in a given location is described by the concentration of various pollutants in the atmosphere. The type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing weather conditions determine air quality. The 1970 Clean Air Act (CAA) and the 1990 Clean Air Act Amendments regulate air pollution emissions from stationary (such as boilers and generators) and mobile sources (such as motor vehicles and aircraft) to protect public health and welfare.

The significance of a pollutant concentration is determined by comparing it to federal (national) and state air quality standards. National Ambient Air Quality Standards (NAAQS) are established by the EPA for criteria pollutants, including ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter equal to or less than ten micrometers in diameter (PM_{10}), and lead (Pb). NAAQS represent the maximum levels of background pollution that are considered safe, with an adequate margin of safety, to protect public health and welfare. Short-term standards (1-, 8-, and 24-hour periods) are established for pollutants contributing to acute health effects, while long-term standards (annual averages) are established for pollutants contributing to chronic health effects. California, Ohio, Oklahoma, and South Dakota have adopted the NAAQS to regulate air pollutant levels within the states, with the following exceptions for California: the annual average and 24-hour PM_{10} standard, the 1-hour ozone standard, and the 1-hour CO standards. The national and California ambient air quality standards are shown in Table 3.5-1.

National and state standards preserve air quality.

Table 3.5-1 Federal National and State Ambient Air Quality Standards

Pollutant	*Averaging Time*	*National Standards*[1]	*California Standards*
Ozone (O_3)	8-hour	0.08 ppm	Same
	1-hour	0.12 ppm (235 µg/m3)	0.09 ppm (180 µg/m3)
Carbon Monoxide (CO)	8-hour	9.00 ppm (10 µg/m3)	Same
	1-hour	35.00 ppm (40 µg/m3)	20.00 ppm (23 µg/m3)
Nitrogen Dioxide (NO_2)	Annual Average	0.053 ppm (100 µg/m3)	Same
Sulfur Dioxide (SO_2)	Annual Average	0.03 ppm (80 µg/m3)	Same
Particulate Matter (PM_{10})	Annual Arithmetic Mean	50 µg/m3	30 µg/m3
	24-hour	150 µg/m3	50 µg/m3
Lead (Pb)	Calendar Quarter	1.50 µg/m3	Same

[1] Ohio, Oklahoma, and South Dakota standards are the same as the national standards.

Table 3.5-1 also includes the new 8-hour NAAQS for ozone. Although the future implementation of the 8-hour standard is uncertain, many states and air districts are considering their status under both standards. A discussion of the attainment status in the vicinity of the five alternative bases is included for both the 1-hour and 8-hour standard.

Pollutants considered in the analysis for this EA include the criteria pollutants measured by federal and state standards. These include volatile organic compounds (VOCs), which are precursors to (indicators of) O_3; nitrogen oxides (NO_x), which are also precursors to O_3 and include NO_2 and other compounds; CO; and PM_{10}. The methods used in the air quality analysis to determine current air emissions and projected emissions are presented in Appendix C, but include analyzing emissions from aircraft, motor vehicles, fugitive dust from construction, and construction vehicles.

Pollutants considered in the analysis include VOCs, NO_x, CO, SO_x, and PM_{10}.

Based on measured ambient criteria pollutant data, the EPA designates all areas of the United States as having air quality better than (attainment) or worse than (nonattainment) the NAAQS. An area is often designated as unclassified when ambient criteria pollutant data are insufficient for the EPA to form a basis for attainment status. Once an area is classified as nonattainment, the degree of nonattainment is divided into categories of marginal, moderate, serious, severe, or extreme. A maintenance area is an area that was previously designated as a nonattainment area and subsequently redesignated to attainment. The assignment of a nonattainment category is based on measured criteria pollutant concentrations in a given location and varies according to the criteria pollutant of concern.

Each state is required to develop a state implementation plan (SIP) that sets forth how the CAA provisions will be implemented within that state. The SIP is the primary means for the implementation, maintenance, and enforcement of the measures needed to attain and maintain the NAAQS within each state. The purpose of the SIP is twofold. First, it must provide a strategy that will result in the attainment and maintenance of the NAAQS. Second, it must demonstrate that progress is being made in attaining the standards in each nonattainment area. The California O_3 SIP was approved by the EPA in September 1996 and codified as law in 40 CFR 52, Subpart F. Ozone maintenance plans for the Ohio Dayton/Springfield region (Wright-Patterson AFB) were approved by EPA and revised in 1999. The *Feather River Air Quality Plan* (Beale AFB) and PM_{10} maintenance plans for Mojave Desert Area of California (Edwards AFB) have also been approved by EPA.

Federal regulations have defined air quality control regions (AQCRs) designated originally according to population and closely approximating air basins. Effects on air quality from aircraft emissions would typically be confined to the air basin in which the emissions occur, so aircraft emissions were summed by AQCR for Ellsworth, Tinker, and Wright-Patterson AFBs.

Within the state of California, the authority to regulate sources of air emissions resides with the California Air Resources Board (CARB) and is relegated by local air pollution control and air quality management districts. Local districts enact rules and regulations to achieve SIP requirements. To ensure compliance with all relevant federal and state air laws, each district enacts its own rules and regulations. Local air districts use construction and operation permits as one method of implementing

these rules and regulations. Air quality at Beale and Edwards AFBs are managed through local air quality management districts.

All air pollution agencies have requirements to ensure that fugitive dust emissions do not lead to excessive concentrations of PM_{10} emissions. In regions where fugitive dust is not considered a significant problem, this requirement is typically addressed through standard requirements for attaining the PM_{10} NAAQS and also through visible emissions or nuisance rules. However, air pollution agencies may also have fugitive dust regulations that address specific control measures that should be used during construction that involves disturbance, movement and transport of soil, and construction debris. These regulations are most common for areas where windblown fugitive dust is a problem.

Federal actions in nonattainment areas must comply with the General Conformity Rule.

Federal facilities located in NAAQS nonattainment (Table 3.5-2) and maintenance areas (Table 3.5-3) must comply with Federal General Air Conformity rules and regulations of 40 CFR 51. Under Air Conformity, a facility that initiates a new action (such as this proposed action) must quantify air emissions from stationary and mobile sources associated with that action. Calculated emissions are first compared with established *de minimis* emission levels (based on the nonattainment status for each applicable criteria pollutant in the area of concern) to determine the relevant compliance requirements. In addition, the action's emissions must be compared with the regional inventory to determine whether the emissions are "regionally significant." A project is considered "regionally significant" if the total of direct and indirect emissions of any pollutant from the proposed action exceeds 10 percent of a maintenance or nonattainment area's total emissions of that pollutant. For all of the AFBs considered for this action, the *de minimis* thresholds are well below the 10 percent regional significance level. Therefore, if the calculated emissions are equal to or less than *de minimis* levels, a formal conformity determination to show accordance with the SIP in accordance with 40 CFR 91.153 (c)(1) is not required.

Table 3.5-2 Threshold Levels for Nonattainment Areas

Criteria Pollutant of Concern	*Nonattainment Status*	*Tons/year*
Ozone (VOCs or NO_x)	Serious nonattainment	50
	Severe nonattainment	25
	Extreme nonattainment	10
	Other ozone nonattainment areas outside an ozone transport region	100
	Marginal and Moderate nonattainment areas inside an ozone transport region	
	VOCs	50
	NO_x	100
PM_{10}	Moderate nonattainment	100
	Serious nonattainment	70

Table 3.5-3 Threshold Levels for Maintenance Areas

Criteria Pollutant	*Nonattainment Status*	*Tons/year*
Ozone (VOCs or NO_x)	Maintenance areas inside an ozone transport region	50
	Maintenance areas outside an ozone transport region	100
Ozone (NO_x)	All maintenance areas	100
PM_{10}	All maintenance areas	100

The CAA also establishes a national goal of preventing degradation or impairment in federally designated Class I attainment areas. As part of the Prevention of Significant Deterioration (PSD) program, mandatory Class I status was assigned by Congress to all national parks, national wilderness areas (not wilderness study areas or wild and scenic rivers), memorial (such as battlefield) parks larger than 5,000 acres, and national parks larger than 6,000 acres. In Class I areas, visibility impairment is defined as a reduction in regional visual range and atmospheric discoloration (such as from an industrial smokestack). Stationary sources, such as industrial areas, are typically the issue with impairment of visibility in PSD I areas. Mobile sources, including aircraft, are generally exempt from review under this regulation. The only base with Class I areas within 100 km (62 miles) is Ellsworth AFB. Two Class I areas exist: Badlands National Park and Wind Caves National Park in South Dakota.

The Clean Air Act provides stringent regulations on hazardous air pollutants.

The CAA also has regulations to control emissions of hazardous air pollutants (HAPs). The HAPs are defined as air pollutants that cause serious human health effects, including mortality. Title III of the CAA lists 17 compounds and 171 chemicals (188 total pollutants) that are defined as HAPs and regulated by the EPA. Since pollutants can be added to or deleted from this list, the 188 pollutants comprise the initial list and not the ultimate list of HAPs. Chemicals listed range from trace metals, which are inherent in fuel combustion, to solvents, which are used in a variety of painting, degreasing, and cleaning operations, to chemical intermediates used to produce a variety of everyday products.

Title III of the CAA requires the EPA to develop a set of rules and regulations designed to implement control technologies and procedures that limit HAP emissions. These rules and regulations are collectively known as National Emissions Standards for Hazardous Air Pollutants (NESHAP). The EPA must develop specific NESHAP for a wide range of industrial source categories. A NESHAP that applies to Edwards, Tinker, and Wright-Patterson AFBs is the Aerospace NESHAP (40 CFR Part 63, Subpart GG). This NESHAP controls HAP emissions created by aerospace manufacturing and rework facilities. The HAPs potential to emit threshold values for all local districts are 10 tons per year for a single HAP and 25 tons per year for any two or more HAPs. Edwards, Tinker, and Wright-Patterson AFBs are major sources of HAPs and must comply with the Aerospace NESHAP. Beale AFB is not a major source of HAP emissions. Ellsworth AFB is a minor source of synthetic HAPs.

The California Air Toxic Hot Spots Program was created by the Air Toxic "Hot Spots" Information and Assessment Act of 1987 (Assembly Bill [AB] 2588, California State Health and Safety Code Sections 44300 through 44384). The act establishes a program to inventory routine emissions of toxic substances into the air and assess the public health risk to those who are exposed. As of 1998, over 450 toxic substances were listed under AB 2588. Toxics can be added to or deleted from this list. At Edwards and Beale AFBs, toxic substances can be generated by various

processes including aircraft cleaning and painting, lubricating, operation of internal and external combustion engines (e.g., aerospace ground equipment [AGE], boilers, turbine engines), and adhesives or sealant applications.

California AB 2588 requires facilities to submit emission inventory plans and reports to local air districts. These plans and reports track the emissions of the listed air toxics. Based on these reports, facilities are designated by the local air district as high, medium, or low priority. This designation is then used to determine the specific requirements needed to comply with AB 2588. In 1994, Kern County Air Pollution Control District (APCD) rated Edwards AFB as a medium-priority facility. The Mojave Desert Air Quality Management District (AQMD) has not established a rating for the portion of the district on Edwards AFB. There are no sources of concern in Antelope Valley APCD.

In addition to adopting, by reference, the federal NESHAPs promulgated under the CAA, the Oklahoma Department of Environmental Quality has enacted air toxic regulation 252:100, Subchapter 41 Part 5, that requires facilities to inventory toxic air contaminants. No source should emit toxic air contaminants in amounts that contribute to or cause the maximum acceptable ambient concentration to be exceeded.

Table 3.5-4 provides a summary of baseline air emissions associated with each of the five bases. This summary includes a combination of mobile and stationary sources calculated for each base as part of the air emissions inventory, as well as engine testing, aircraft support equipment, airfield operations, and vehicles. Table 3.5-5 summarizes the attainment status for the regions surrounding each of the five bases.

Current air quality conditions for each base were analyzed in detail.

Table 3.5-4 Total Base Emissions

Base	*Total Baseline Emission (tons/year)*				
	CO	*NO_x*	*VOCs*	*SO_x*	*PM_{10}*
Beale[1]	987.79	216.68	703.29	26.81	23.58
Edwards[2]	1519.70	377.00	393.00	37.90	18.90
Ellsworth[3]	266.52	305.37	32.64	8.52	15.86
Tinker[4]	1515.21	421.54	616.02	10.12	53.12
Wright-Patterson[5]	3106.80	387.60	1169.10	31.50	209.70

[1] USAF 1998a.
[2] Personal communication. H. Beutelman, September 2000.
[3] USAF 2000a.
[4] USAF 1999j.
[5] USAF 1999l.

Table 3.5-5 Attainment Classification for Selected Criteria Pollutants[1]

Proposed Location	*County*	*District*	*Ozone (1-hr)*	*PM_{10}*
Beale	Yuba County	Feather River AQMD	Maintenance[2]	Attainment
Edwards	Kern County (East)	Kern County APCD	Serious Nonattainment[3]	Attainment[3]
	San Bernardino County	Mojave Desert AQMD	Severe Nonattainment	Moderate Nonattainment
	Los Angeles County (North)	Antelope Valley APCD	Severe Nonattainment	Unclassified
Ellsworth	Pennington County	South Dakota Department of Environment/ Natural Resources	Attainment	Attainment
Tinker	Oklahoma County	Oklahoma Department of Environmental Quality	Attainment	Attainment
Wright-Patterson	Greene, Montgomery, and Clark Counties	Ohio EPA Regional Air Pollution Control Agency	Maintenance	Attainment

[1] Summary includes comparison only for those criteria pollutants (ozone and PM_{10}) for which the district is either in nonattainment or is a maintenance area.

[2] The southern portion of the Feather River AQMD (southern Sutter County) is in severe nonattainment with the one-hour federal ozone standard. The remainder of the air quality management district, including Beale AFB is a maintenance area.

[3] Nonattainment status is indicated for the portion of Kern County that includes Edwards AFB.

Beale AFB. Air quality at Beale AFB is managed by the Feather River AQMD (Figure 3.5-1). The base is located in the Sacramento Valley within Sacramento Intrastate Air Quality Control Region (AQCR) 28. The AQCR includes all of Butte, Colusa, Glenn, Sacramento, Sutter, Tehama, Yolo, Yuba Counties and portions of Solano and Shasta Counties.

Because the Sacramento Valley is shaped like a bowl, smog (ozone) is a critical problem in the summer months when an inversion layer traps pollutants close to the ground, causing unhealthy air quality levels. Vehicles and other mobile sources of air pollution contribute up to 70 percent of the region's air pollution.

Climate in the Sacramento Valley is strongly affected by "delta breezes," which are characterized by moist air that moves from San Francisco Bay eastward through the Sacramento-San Joaquin River Delta and into the Sacramento area. While most of the ozone-forming emissions are produced in the Sacramento metropolitan area, these prevailing "delta breezes" usually carry the emissions from cars and other sources up into the foothills. During this transport time, the polluted air continuously reacts to form ozone. By the time the polluted air reaches the foothills, most of the emissions have been converted to ozone. Therefore, the foothills have the some of the highest ozone levels in the region.

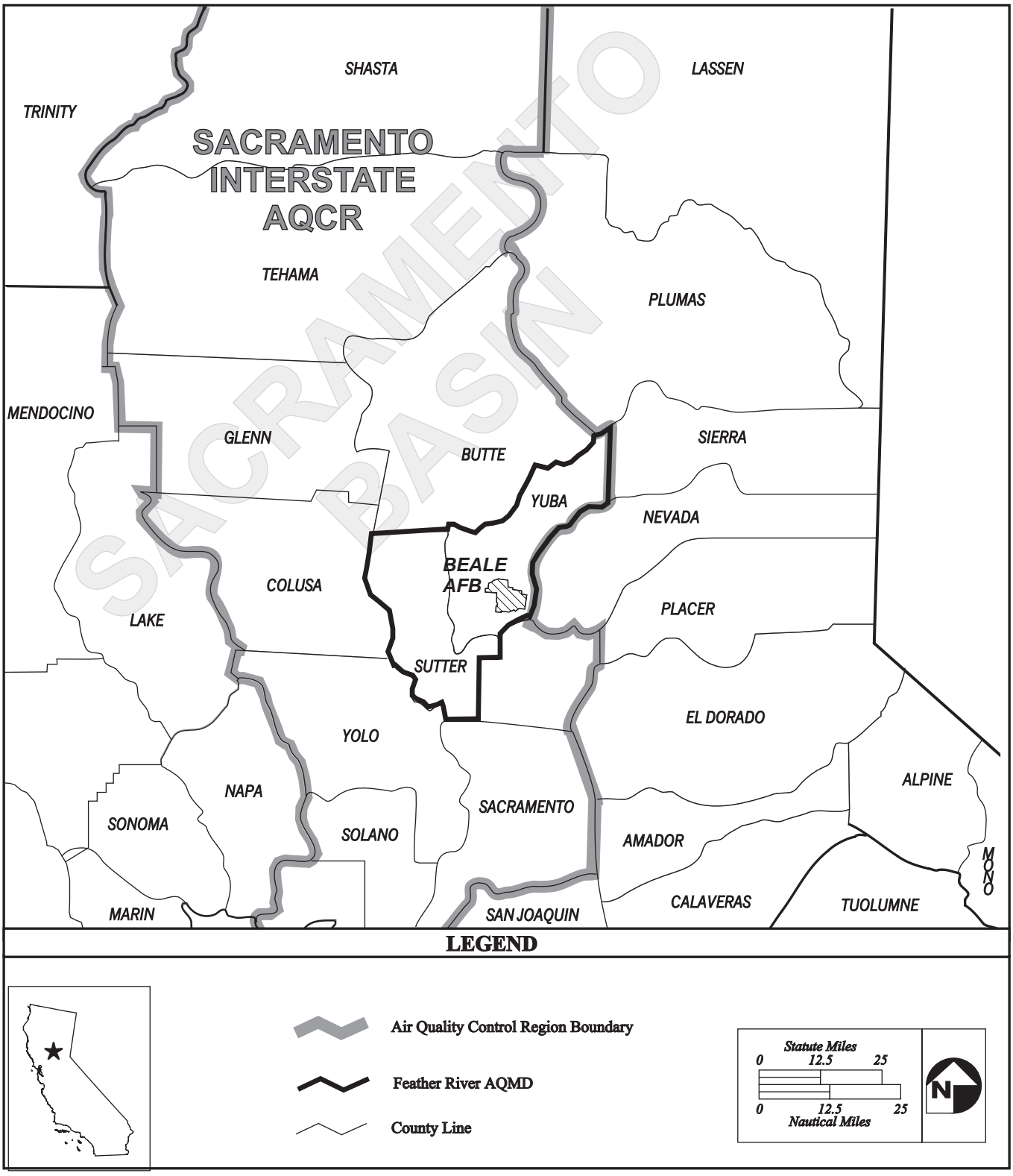


Figure 3.5-1 Beale Air Force Base, California
Air Basins and Air Districts

In Yuba County, PM_{10} emissions are generated by a variety of sources, the primary sources of which are road dust, farming operations, and agricultural burning. Traffic generates particulate matter and PM_{10} emissions by transmitting dust and dirt particles that settle into roadways and parking lots. Burning of wood in residential fireplaces and open burning of residential and agricultural waste also contribute to PM_{10} emissions.

The area encompassing Beale AFB is in transitional nonattainment for ozone.

Although the Feather River AQMD is in severe nonattainment for the federal 1-hour ozone standard in southern Sutter County, it is in "transitional nonattainment" (maintenance area) for the 1-hour ozone standard for the rest of Sutter County and all of Yuba County, an area that includes Beale AFB. The Feather River AQMD is working with the CARB and the EPA to enact a maintenance plan, which will place the area around Beale AFB in an attainment zone by Fall, 2001. All of Feather River AQMD is expected to be in attainment of the new 8-hour ozone standard.

Edwards AFB. Edwards AFB extends into Kern, San Bernardino, and Los Angeles Counties within the Mojave Desert Air Basin of California (Figure 3.5-2) and is located within the jurisdiction of three local air districts: Kern County APCD, Mojave Desert AQMD, and Antelope Valley APCD. This air basin is impacted by both ozone and fugitive dust emissions. The nonattainment status of each of the three air districts is shown in Figure 3.5-3.

Edwards AFB is located within three air districts.

The main base at Edwards AFB is located in the eastern portion of Kern County, which is under the jurisdiction of the Kern County APCD. Since most of the activities associated with the beddown would occur on the main base, discussions of environmental effects to air quality are analyzed in realtion to baseline air quality in the Kern County APCD.

The base is located within the Southeast Desert AQCR 33. This AQCR includes all of Imperial County and portions of Kern, Los Angeles, Riverside, and San Bernardino Counties. Since the original designation of this AQCR, California has defined several new air pollution jurisdictions and redefined air basins. AQCR 33 is now defined by two separate air basins: Mojave Desert and Salton Sea Air Basins. The Salton Sea Air Basin is comprised of Imperial County and the central portion of Riverside County and is outside of the affected area.

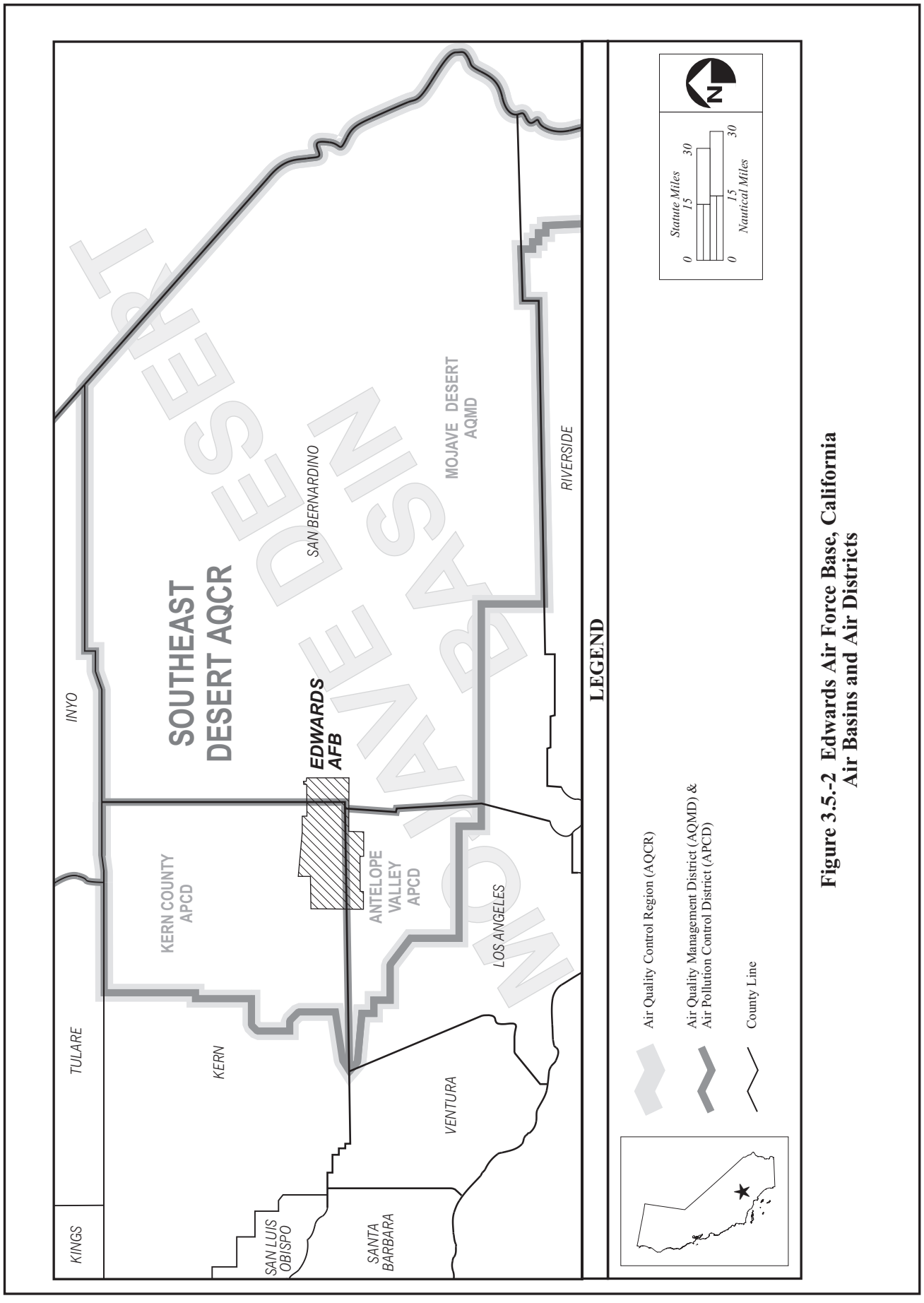


Figure 3.5.-2 Edwards Air Force Base, California Air Basins and Air Districts

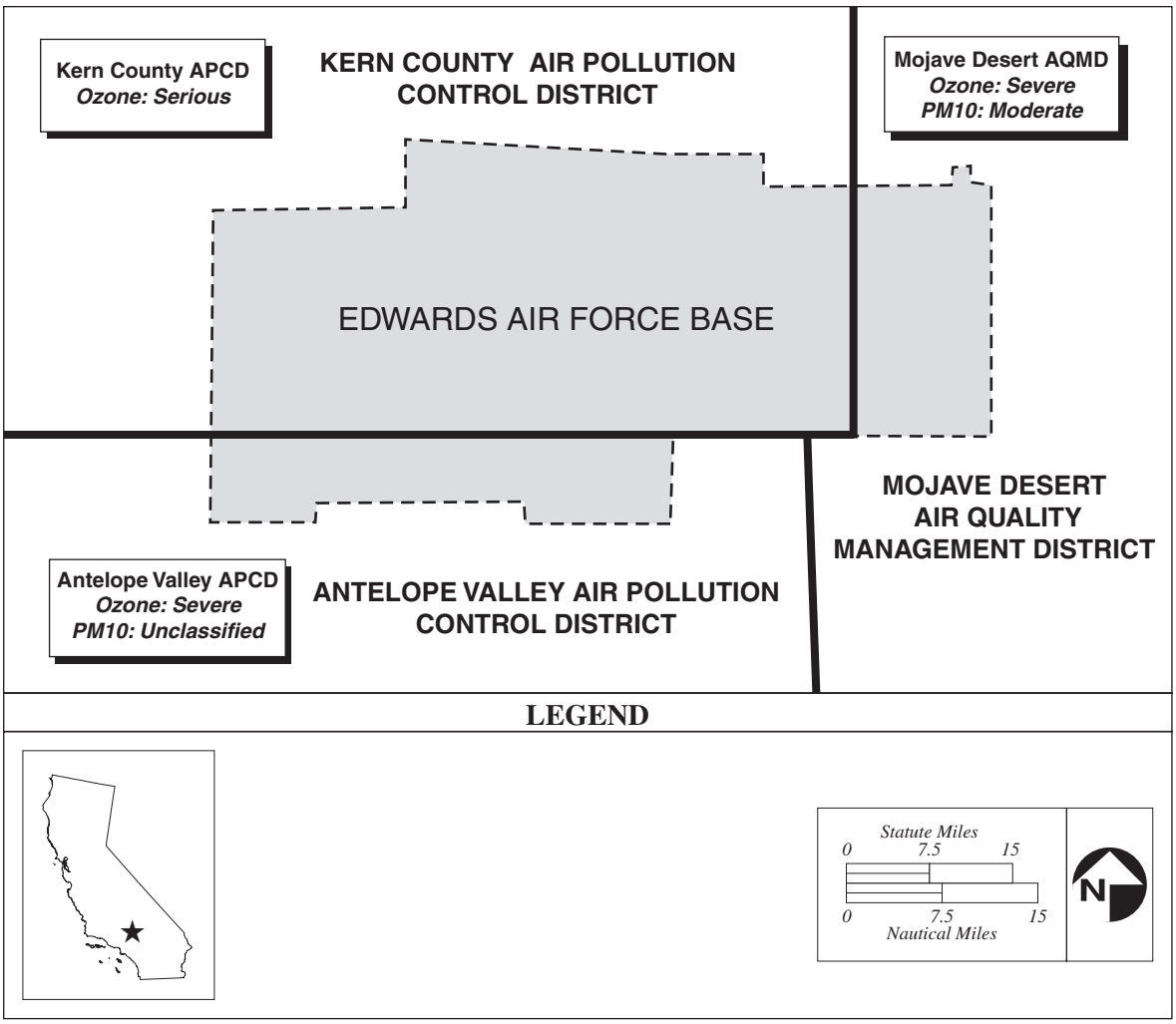


Figure 3.5-3 Attainment Status in the Vicinity of Edwards Air Force Base

Eastern Kern County is located on the western edge of the Mojave Desert. The desert is separated from populated valleys and coastal areas to the west by several mountain ranges. These valleys and coastal areas are the major source of ozone precursor emissions affecting ozone exceedances within Kern's part of the Southeast Desert. Although the sources of pollution in eastern Kern County do not by themselves result in exceedances of the federal ozone standards, this region is largely impacted by ozone transport from both the San Joaquin Valley Air Basin and the South Coast Air Basin.

Edwards AFB also extends into the Mojave Desert AQMD where emissions from fugitive dust result in pollution episodes during moderate and high winds. Major sources of fugitive dust include: county, city, and BLM unpaved road travel and wind erosion; city and county disturbed areas; construction; and dust along paved roads.

Ellsworth AFB. Ellsworth AFB is located approximately 12 miles northeast of Rapid City and extends into Meade and Pennington Counties of South Dakota (Figure 3.5-4). South Dakota Department of Environment/Natural Resources has primary jurisdiction over the base. The base is located within the Black Hills-Rapid City Intrastate AQCR 205. This AQCR includes the following counties: Butte,

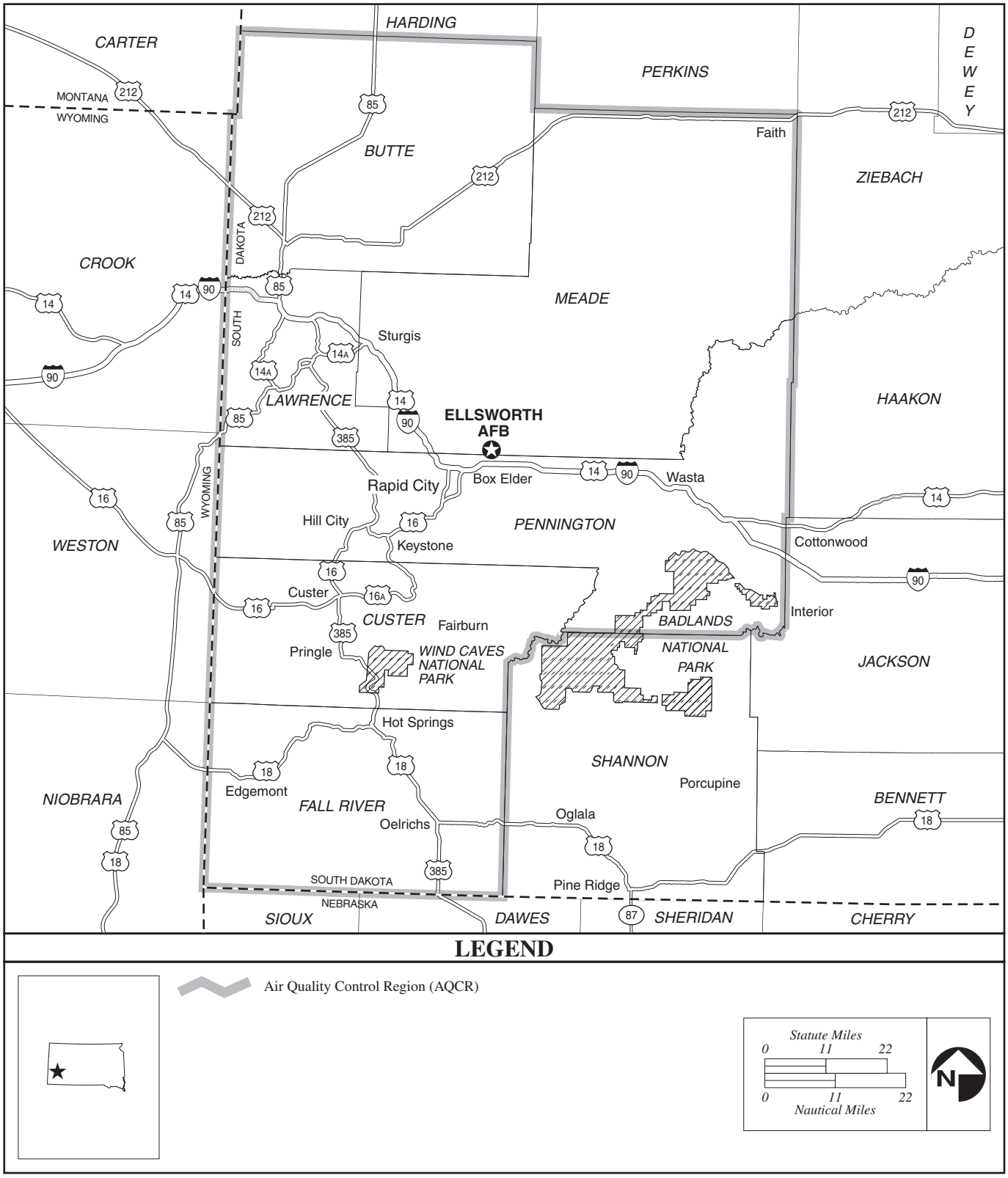


Figure 3.5-4 Ellsworth Air Force Base, South Dakota Black Hills-Rapid City Intrastate AQCR and Class I Areas

Custer, Fall River, Lawrence, Meade, and Pennington. It is in attainment with NAAQS for all criteria pollutants. While particulate matter in the form of windblown dust is a significant problem in Rapid City, it is not a problem at Ellsworth AFB. Furthermore, Ellsworth AFB is down-gradient from the prevailing winds, and particulate matter emissions from the base do not contribute to Rapid City's particulate dust problem. These wind-related exceedances for PM_{10}, have not been considered violations by EPA since they were due to natural events.

The area surrounding Ellsworth AFB is in attainment for air quality standards.

Tinker AFB. Tinker AFB is located approximately 3 miles southeast of Oklahoma City in Oklahoma County (Figure 3.5-5). Air quality at Tinker AFB is regulated by the Oklahoma Department of Environmental Quality. The base is located within the Central Oklahoma Intrastate AQCR 184. The AQCR includes Canadian, Cleveland, Grady, Lincoln, Logan, Kingfisher, McClain, Oklahoma, and Pottawatomie Counties. During the summer, conditions with periods of very high temperatures and stagnant wind conditions create above normal ground-level ozone in the Oklahoma City area and throughout the state.

Oklahoma City exceeded the NAAQS for CO several times in the early 1980s. While never officially designated a nonattainment area, the SIP was voluntarily revised to reduce the levels of CO. With implementation of the new 8-hour O_3 standard, Oklahoma City is close to nonattainment designations.

Tinker AFB is in attainment for all criteria pollutants.

Wright-Patterson AFB. Wright-Patterson AFB is located approximately 12 miles northeast of Dayton, Ohio, extending into Montgomery, Greene, and Clark Counties (Figure 3.5-6). The base is located in a region of the state that is a maintenance area for ozone attainment. Ozone (smog) has historically been a problem in the Dayton and Springfield areas from April through October, although the region has continued to meet federal standards since 1991. Control strategies that have been implemented to maintain compliance with clean air standards include stage II vapor recovery, reformulated (clean) gasoline, and enhanced vehicle inspection and maintenance programs. It is under the jurisdiction of the Ohio EPA, Division of Air Pollution Control. The base is located in the Dayton Metropolitan Intrastate AQCR 173. This AQCR includes Clark, Darke, Green, Miami, Montgomery, and Preble Counties.

Wright-Patterson AFB is in a maintenance area for ozone.

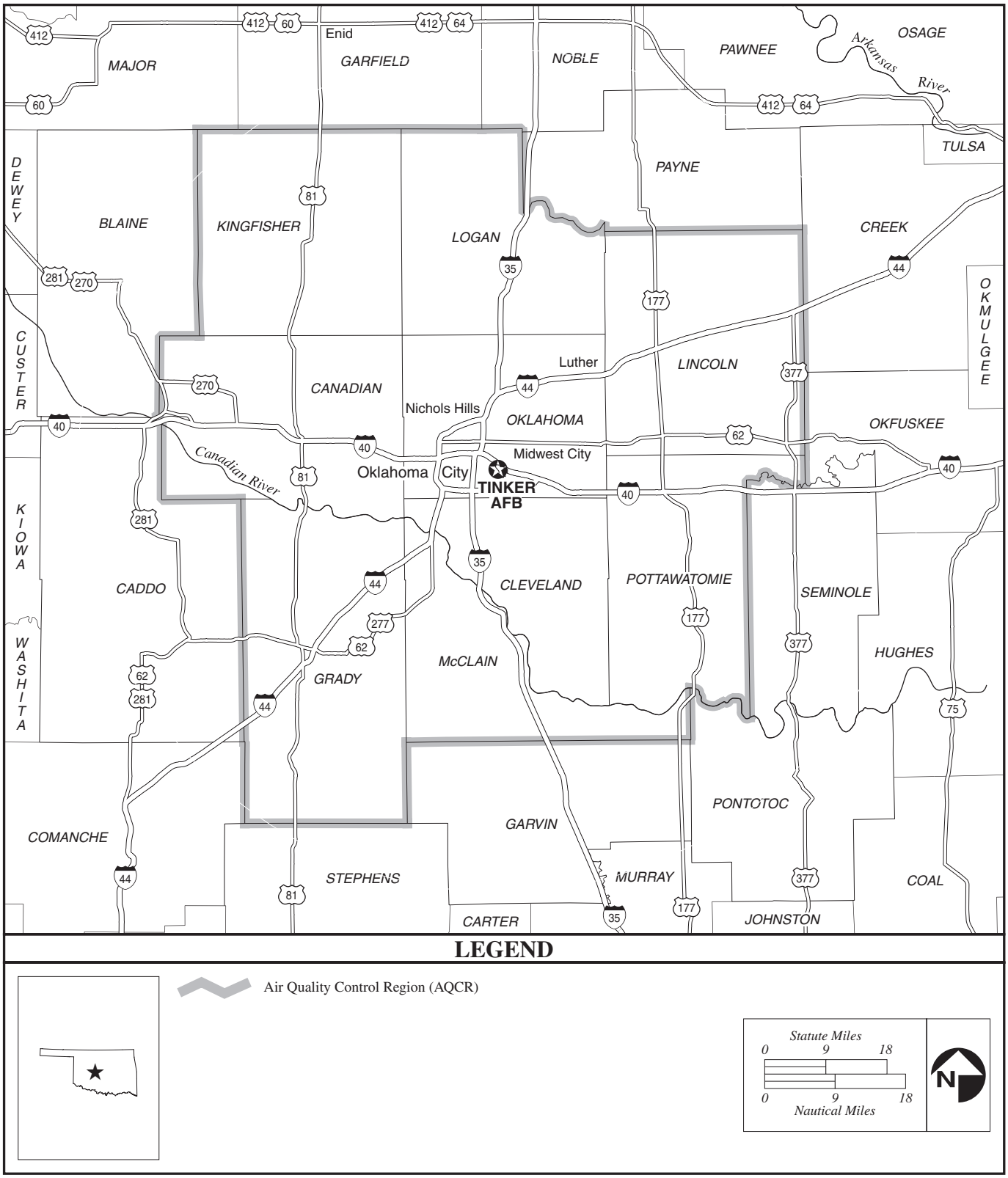


Figure 3.5-5 Tinker Air Force Base, Oklahoma
Central Oklahoma Intrastate AQCR

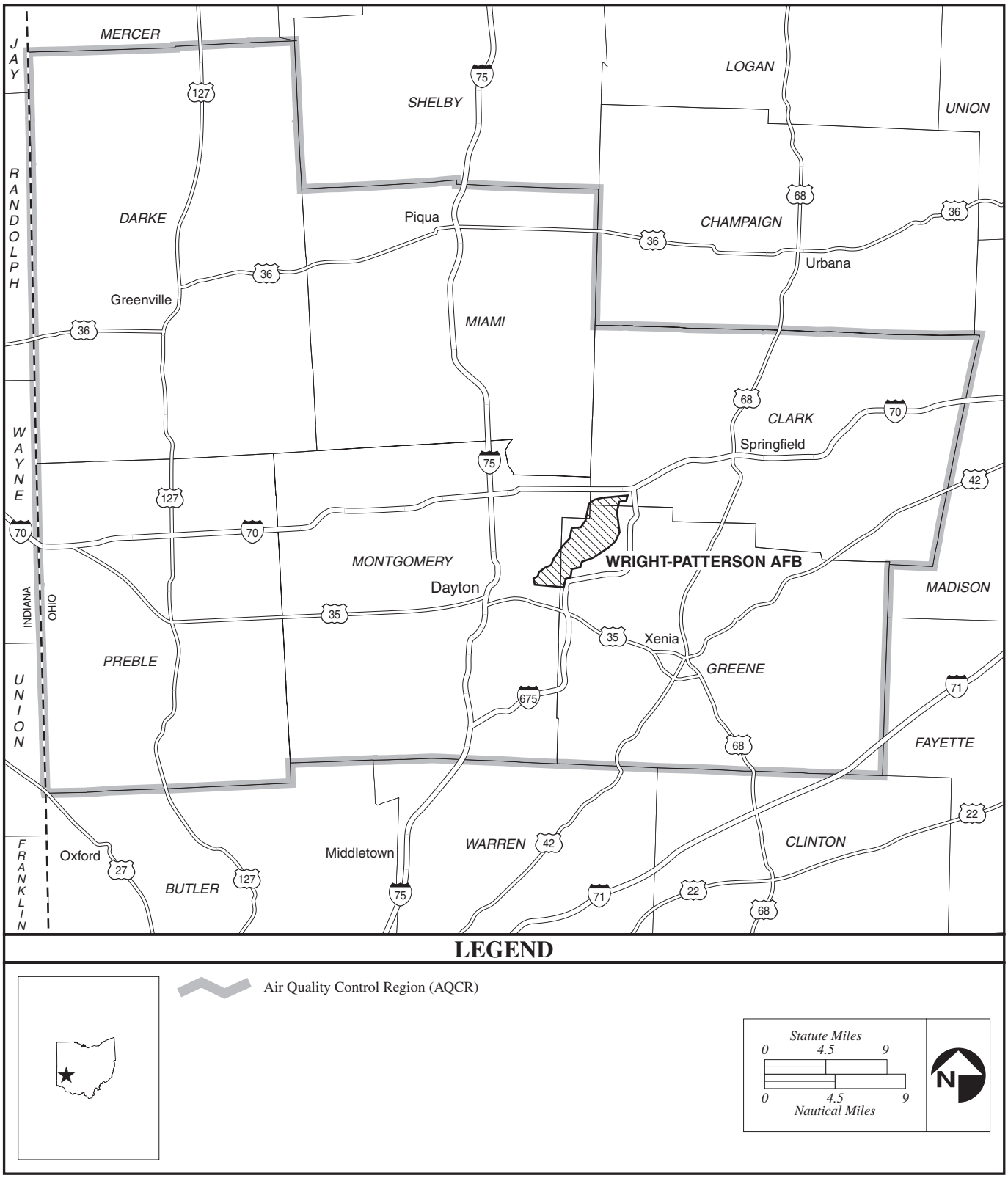


Figure 3.5-6 Wright-Patterson Air Force Base, Ohio
Metropolitan Dayton Intrastate AQCR

HAZARDOUS MATERIALS AND WASTE

Hazardous materials are identified and regulated under the Comprehensive Environmental Response, Compensation, and Liability Act; the Occupational Safety and Health Act; and the Emergency Planning and Community Right-to-Know Act. Hazardous materials have been defined in AFI 32-7086, *Hazardous Materials Management*, to include any substance with special characteristics that could harm people, plants, or animals when released.

Aircraft flight operations and maintenance at each base, as well as many other activities, require the use and storage of a variety of hazardous materials which include flammable and combustible liquids, acids, corrosives, caustics, anti-icing chemicals, compressed gases, solvents, paints, paint thinners, pesticides, petroleum hydrocarbons, batteries, hydraulic fluids, fire retardant, and photographic chemicals. Each base inventories and tracks all hazardous materials and established waste streams. Hazardous wastes are accumulated at storage facilities and handled according to state, federal, and Air Force policy and law.

Air Force procedures emphasize minimizing use of hazardous materials and recycling.

Each base is responsible for developing and maintaining a *Hazardous Materials Emergency Planning and Response Plan*, updated annually, that addresses storage locations on base and proper handling procedures for all hazardous materials to minimize the potential for spills and releases. If a spill occurs, the plans also outline how base personnel should respond, including notification, containment, decontamination, and cleanup of spilled materials to minimize the adverse effects of a spill.

Hazardous waste is defined in the Resource Conservation and Recovery Act as any solid, liquid, contained gaseous or semisolid waste, or any combination of wastes that could or do pose a substantial hazard to human health or the environment. Waste may be classified as hazardous because of its toxicity, reactivity, ignitibility, or corrosivity. In addition, certain types of waste are "listed" or identified as hazardous in 40 CFR 263.

Hazardous wastes are generated from a variety of functions on each base, including aircraft support; wastewater treatment; soil and groundwater remediation; training exercises; civil engineering; printing; medical facilities; services; and security. Because of the magnitude of flight operations, aircraft support functions are typically major sources of hazardous waste at Air Force bases. Aircraft maintenance support shops, which generate significant hazardous waste streams, include the following: Aerospace Ground Equipment, Corrosion Control, Fuels Management, Non-Destructive Inspection, Munitions and Armament Shops, In-Squadron Maintenance, AGE, and Wheel and Tire Shops. Numerous other shops (e.g., avionics, egress systems, electrical, metals, hydraulics, radio, jet engine, and structural maintenance) collectively add to hazardous waste streams.

Waste minimization programs are mandated by law and Air Force policy. The Air Force has implemented a continuous process for minimizing waste, which includes identifying opportunities for substitution of nonhazardous materials.

Generators of hazardous wastes are responsible for properly segregating, storing, characterizing, labeling, marking, packaging, and transferring all hazardous waste for

disposal from their sections to accumulation points according to federal state, local, and Air Force regulations. They are also responsible for transferring storage material from the satellite or initial accumulation points to established 90-day storage areas, ensuring that waste is accurately weighed and labeled before transfer.

Facilities that generate more than 2,200 pounds of hazardous waste or 2.2 pounds of acute hazardous waste per month are considered to be large-quantity generators by the EPA. All bases considered in this EA are currently registered as large-quantity generators (USAF 1997d, 1999h, 1999f, 1999g). Wastes generated on a base are typically moved to the Defense Reutilization and Marketing Office (DRMO) storage facility and managed under regulations in DRMO's Part B storage permit. Table 3.5-6 provides a summary of the annual hazardous waste generated by base.

Table 3.5-6 Annual Amount of Hazardous Waste Generated Annually by Base

Base	*Pounds Generated Per Year*
Beale[1]	1,145,789
Edwards[2]	604,014
Ellsworth[3]	45,838
Tinker[4]	9,337,400
Wright-Patterson[5]	379,179

[1] USAF 1999m.
[2] USAF 1999f.
[3] USAF 1999g.
[4] Personal communication L. Harris. Julv 2000.
[5] EPA 2000a.

The Air Force Environmental Restoration Program (ERP) is designed to identify, investigate, and clean up contamination associated with past Air Force activities. ERP activities are conducted according to either the required federal cleanup process or the corrective action process, as appropriate. All Air Force bases considered in this EA have undertaken base-wide investigations to identify sites of potential contamination and conduct remediation under the ERP process. If ERP sites were to occur within any construction sites, then appropriate measures would be undertaken to avoid effects and mitigate any impacts. Ellsworth AFB has completed ERP remediation and is in long-term operation and maintenance status.

SOILS AND WATER

Earth resources--soil (unconsolidated) and bedrock (consolidated) materials--have been narrowed by the scoping process to an analysis of soil and soil erosion. Water resources--the occurrence, circulation, and distribution of surface water and groundwater--have been narrowed to water quality issues. Potential adverse effects to soils could result from ground disturbance leading to soil erosion, fugitive dust propagation, and sedimentation. Adverse effects to water resources could result from erosion, runoff, and surface contamination. Effects to soils and water are most likely to occur from construction activities.

Beale AFB. The topography of Beale AFB is characterized by flat to gently rolling alluvial plains in the west and south, uplands in the north and central portions, and increasing steepness approaching the Sierra Nevada foothills to the east where elevations reach over 500 feet AGL. Soil types consist of shallow loams derived from metavolcanic rock in the east, gravely and cobbly alluvium in the northeast, clay rich alluvial soils in the central (flight line and cantonment areas), and clayey loams in the western portions of the base. Soils are generally acidic, and water erosion potential is slight to moderate (refer to Table 3.5-7). Shrink-swell potential is higher in the central alluvial soils and western loams because of the higher clay content.

Table 3.5-7 Erosion Potential of Soils	
Base	*Erosion Potential*
Beale	slight to moderate
Edwards	slight to moderate (water)
Ellsworth	moderate (85 percent of base)
Tinker	slight to moderate
Wright-Patterson	severe erosion hazard (east) moderate (west)

Beale AFB has three main creeks that serve as the principal drainage system for the area: Reeds Creek along the northwest border of the base, Hutchinson Creek in the central portion, and Dry Creek in the southeast. Hutchinson Creek tributaries drain portions of the flight line, training, and main base areas, while Dry Creek tributaries receive runoff from the family housing area. The creeks are naturally intermittent; however, Dry Creek receives supplemental releases from the Nevada Irrigation District upstream of Beale AFB and thus maintains flow all year. These creeks originate in the north and east and generally flow across the base from northeast to southwest. Twenty surface impoundments (lakes and stock ponds), covering approximately 238 acres, were formed by dams constructed along creeks and tributaries. Runoff in all three creeks ultimately flows to the Bear River.

Treated wastewater is discharged from the base to Hutchinson Creek or to several storage ponds. The treatment plant is permitted under the National Pollutant Discharge Elimination System (NPDES) as administered by the Central Valley Regional Water Quality Control Board. Plant effluent complies with permit limits.

Surface water on base supports a variety of wetland habitats including vernal pools, riparian areas, and freshwater marsh, as detailed in section 3.6.

Edwards AFB. Topography of Edwards AFB is characterized by broad expanses of flat to gently sloping plains interrupted by a few broad domes and hills. Slopes are generally less than 5 percent, with slopes of 10 to 20 percent occurring on hills. Based on generalized geomorphic mapping of the area, soils at the base are characterized by loams, sandy loams, and loamy sands. Some soils, especially those in basins developed on lakebeds, contain significant clay content. Soils are generally alkaline, with a high corrosion hazard for steel. In general, soils on Edwards AFB are moderately to highly susceptible to erosion by wind, especially if disturbed by construction or vehicular traffic. Water erosion potential for soils ranges from slight to moderate, depending on soil composition and slope.

Edwards AFB has implemented measures to prevent pollution of Rogers Dry Lake from stormwater runoff.

Stormwater at Edwards AFB is conveyed toward several dry lakebeds located on the base: Rogers Dry Lake, Rosamond Dry Lake, and Buckhorn Dry Lake. In general, base drainage flows toward the nearest lakebed along washes, which are dry except during and following heavy rain. Flow entering Rosamond and Buckhorn Dry Lakes also goes into Rogers Dry Lake. Water reaching dry lakebeds is trapped and lost to evaporation. Stormwater runoff in developed areas of the base is directed into industrial evaporation ponds to prevent pollution of Rogers Dry Lake.

Ellsworth AFB. The topography of Ellsworth AFB is level to gently sloping toward the south, except for steep northerly sloping areas in the north. Soils on the base are primarily clays and clay-loams. Approximately 85 percent of the base contains thick alluvial soils that are nearly level to gently sloping. These are well drained and have a moderate erosion hazard. The extreme north portion of the base is dominated by steeply sloped (15 to 40 percent) clay, characterized by low permeability, rapid runoff, and severe erosion hazard.

Ellsworth AFB is primarily level to gently sloping with a moderate erosion potential.

Ellsworth AFB is situated on a gently sloping north-south upland plateau between Elk Creek to the north and Box Elder Creek to the south. Box Elder Creek is an ephemeral stream, while Elk Creek is a perennial stream. These drainages are within the Missouri River Basin and ultimately contribute to that river system. Box Elder and Elk Creeks join the Cheyenne River southeast and northeast of the base, respectively. The extreme northern portion of the base is drained via seven unnamed ephemeral drainages on a northward-facing escarpment to Elk Creek approximately 5 miles to the northeast. To the south, surface drainage on the plateau follows a topographic slope toward the southeast via retention ponds, ditches, storm sewers, and ephemeral streams. Runoff then discharges into Box Elder Creek, 1 mile south of the installation boundary. In total, there are seven primary drainages on Ellsworth AFB, each corresponding to an outfall permitted under a South Dakota Surface Water Discharge permit.

Four lakes and several small surface impoundments on the base are linked with drainage creeks. Three of the lakes are stocked for recreational fishing. Ellsworth AFB has approximately 39 acres of jurisdictional wetlands that include drainage channels, impoundments, and swales.

Tinker AFB. Soils at Tinker AFB consist of three major associations: 1) shallow to deep sandy upland soils in the east, with primarily gentle to moderate slopes and some steeper slopes, 2) deep loamy upland soils with clayey subsoils over most of the central portion of the base, which is nearly level to moderately steep, and 3) deep loamy alluvial soils in bottomlands along watercourses in the far west portion of the base. Based on soil types and slopes, erosion hazard is slight to moderate. Shrink-swell is likely higher in clayey soils found in the central portion of the base.

Soils at Tinker AFB have a slight to moderate erosion potential.

Drainage patterns have changed dramatically with urbanization near Tinker AFB. Today, Tinker AFB's surface drainage occurs in three primary drainage basins: 1) Crutcho Creek Drainage Basin, 2) Elm Creek Drainage Basin, and 3) Hog Creek Drainage Basin. These are further divided into ten subbasins or watersheds. The majority of Tinker AFB land is drained by the Crutcho Creek Drainage Basin. On-base streams comprise about 8 linear miles, with first- and second-order segments typically ephemeral or intermittent and third-order segments perennial. All base creek flows are the result of stormwater runoff. No significant industrial point sources discharge to any waterway on Tinker AFB. In 1996, the base industrial wastewater treatment plant and sanitary treatment plant discharges were rerouted to the Oklahoma City public-owned treatment works. These eliminated flows of 1.3 million gallons per day to the on-base portion of Soldier Creek (i.e., east Soldier Creek).

Water quality on Tinker AFB is considered fair overall with NPDES permit exceedance occurring occasionally in total suspended solids and chemical oxygen demand. Surface water degradation is primarily due to non-point-source pollution such as eroded sediment from construction and demolition activities; automobile oil and fluid runoff from parking lots; runoff from areas treated with fertilizers and pesticides; chemical substances from spills associated with industrial activities; and de-icing compounds from paved surfaces. Some indications of non-point-source pollution include periodic fish kills and depauperate aquatic floral and faunal communities.

Wright-Patterson AFB is highly developed with fill deposited over native soils.

Wright-Patterson AFB. The topography of Wright-Patterson AFB is generally near level in the west to gently sloping in the east, with some areas of steeper slopes on the eastern portion. Slope direction is generally to the southwest toward the Mad River. Soils at the base are largely composed of fill over native soils and are described as disturbed or urban land complexes. Since the area is highly developed, soil properties are difficult to characterize. However, there are few limitations to nonagricultural uses, except on the sloped areas to the east where gentle to steep slopes (6 to 12 percent) are subject to severe erosion hazard.

Most of Wright-Patterson AFB lies within the floodplain of the Mad River, which adjoins the base on the northwest boundary. Surface water flows from the base within several drainages that run southwest into the Mad River. Several wetlands and marginal wetlands are located in the western portion of the base. Watershed management at Wright Patterson AFB is primarily concerned with protecting water quality for biological habitat, aquifer water quality, fishing, and contact recreation along the Mad River.

3.6 NATURAL RESOURCES

Natural resources within the affected areas are plant and animal species and wetlands.

The analysis for this section included data from numerous surveys, wetland delineation reports, natural resources or habitat management plans, base comprehensive plans, maps, Natural Heritage databases, various base environmental assessments, and interviews with local experts.

The affected environment for natural resources includes the native and introduced plants and animals within the base environs that could be affected by construction activities and in those lands under the flight path where the Global Hawk would fly below 2,000 feet AGL (within approximately 5 miles of the runway). For discussion purposes, resources are divided into two categories: 1) vegetation and wildlife (including wetlands), and 2) threatened and endangered species. Federal and state listed threatened and endangered species are discussed under a separate subsection.

Vegetation and Wildlife. The vegetation and wildlife section focuses on plant and animal species expected to be on or adjacent to the affected area. This includes wetlands, aquatic species potentially impacted by water quality changes, and species of concern. The threatened and endangered species section will discuss federal and state listed threatened and endangered species.

Table 3.6-1 compares vegetation and wildlife resources for the five alternatives, summarizing biological concerns such as species of concern, wetlands, and the amount of undeveloped and developed areas available for plant and animal habitat, both on base and within a 5-mile radius from the runway. Figures 3.6-1 to 3.6-5 show possible construction areas in relation to developed and undeveloped areas on the base.

Table 3.6-1 Summary of Biological Data by Base

Base	*Species of Concern Observed on Base*	*Wetlands on Base (Approximate Acres)*	*Developed Acres (on base/within 5 miles)*	*Natural Vegetation Acres (on base/within 5 miles)*
Beale	Northwestern pond turtle, western burrowing owl, golden eagle, ferruginous hawk, tri-colored blackbird, yellow-breasted chat, Greene's legenere, dwarf downingia, stink bells	800	4,284/31,000	18,660/21,200
Edwards	Burrowing owl	200[1]	11, 200[2]	9,737[2]
Ellsworth	Burrowing owl, Swainson's hawk, loggerhead shrike, and silver-haired bat	40	3,500/45,160	1,780/40,500
Tinker	Swainson's hawk, burrowing owl, orchard oriole, Texas horned lizard, loggerhead shrike, barn owl	16	4,995/69,500	45/16,300
Wright-Patterson	Sharp-shinned hawk, eastern box turtle, Great Plains ladies' tresses, pigeon grape, butternut, Crawe's sedge, radiate sedge, western false gromwell	22	7,385/96,160	760/15,000

[1] Nonjurisdictional; manmade water retention basin.

[2] All potential impact areas within the 2,000 feet AGL footprint are included in Edwards AFB due to its large size.

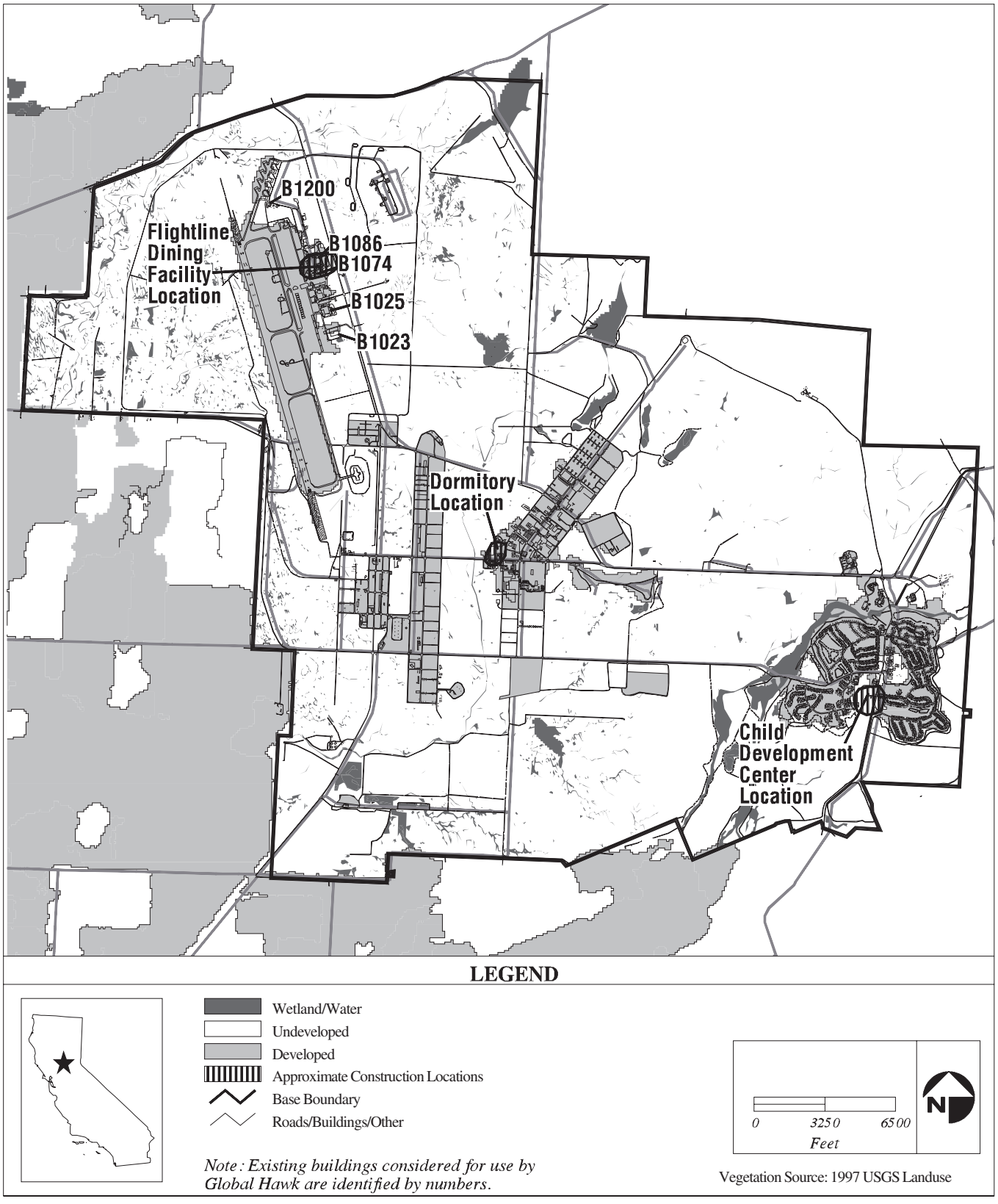


Figure 3.6-1 Natural Resource Constraints, Beale AFB, California

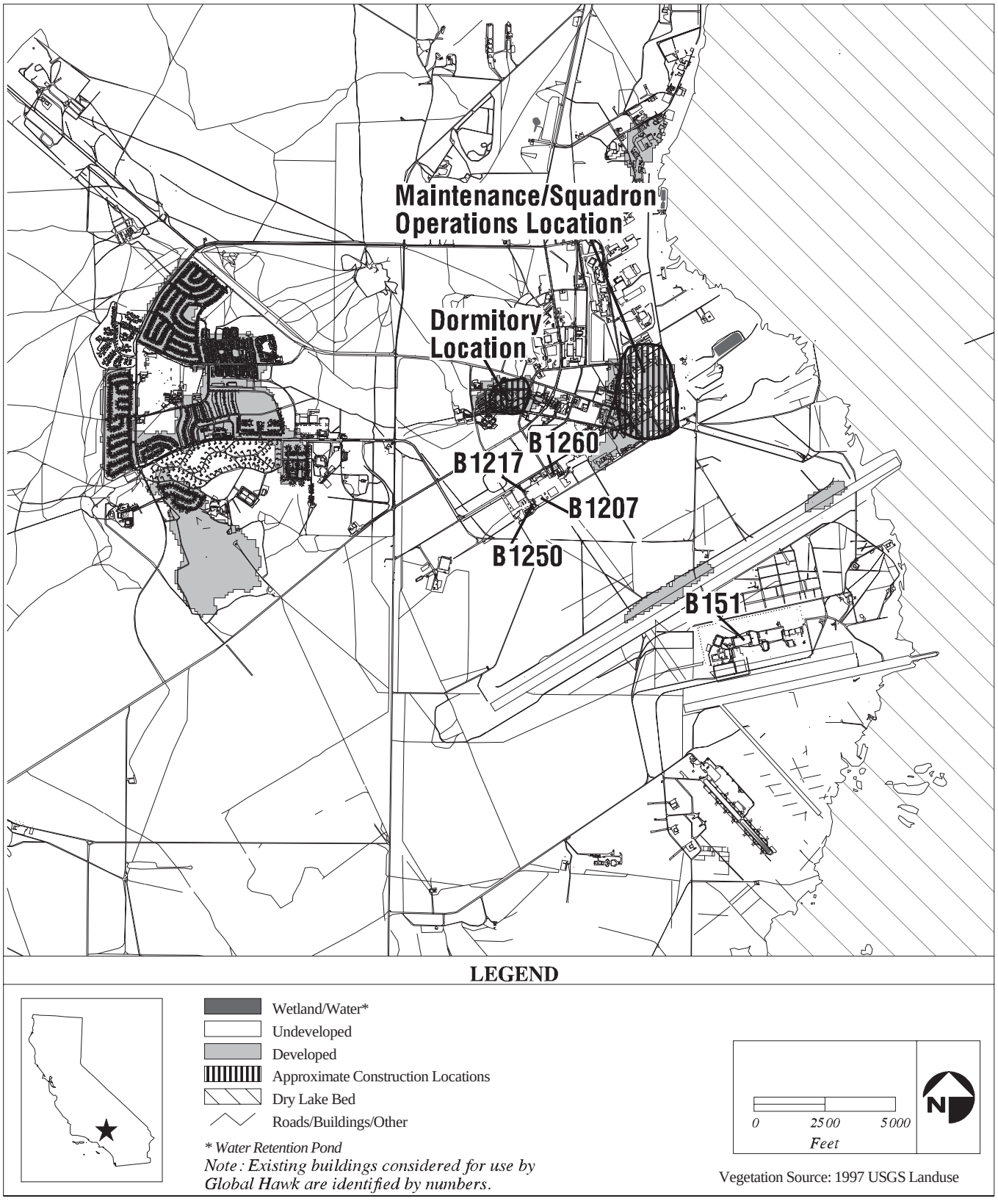


Figure 3.6-2 Natural Resource Constraints, Edwards AFB, California

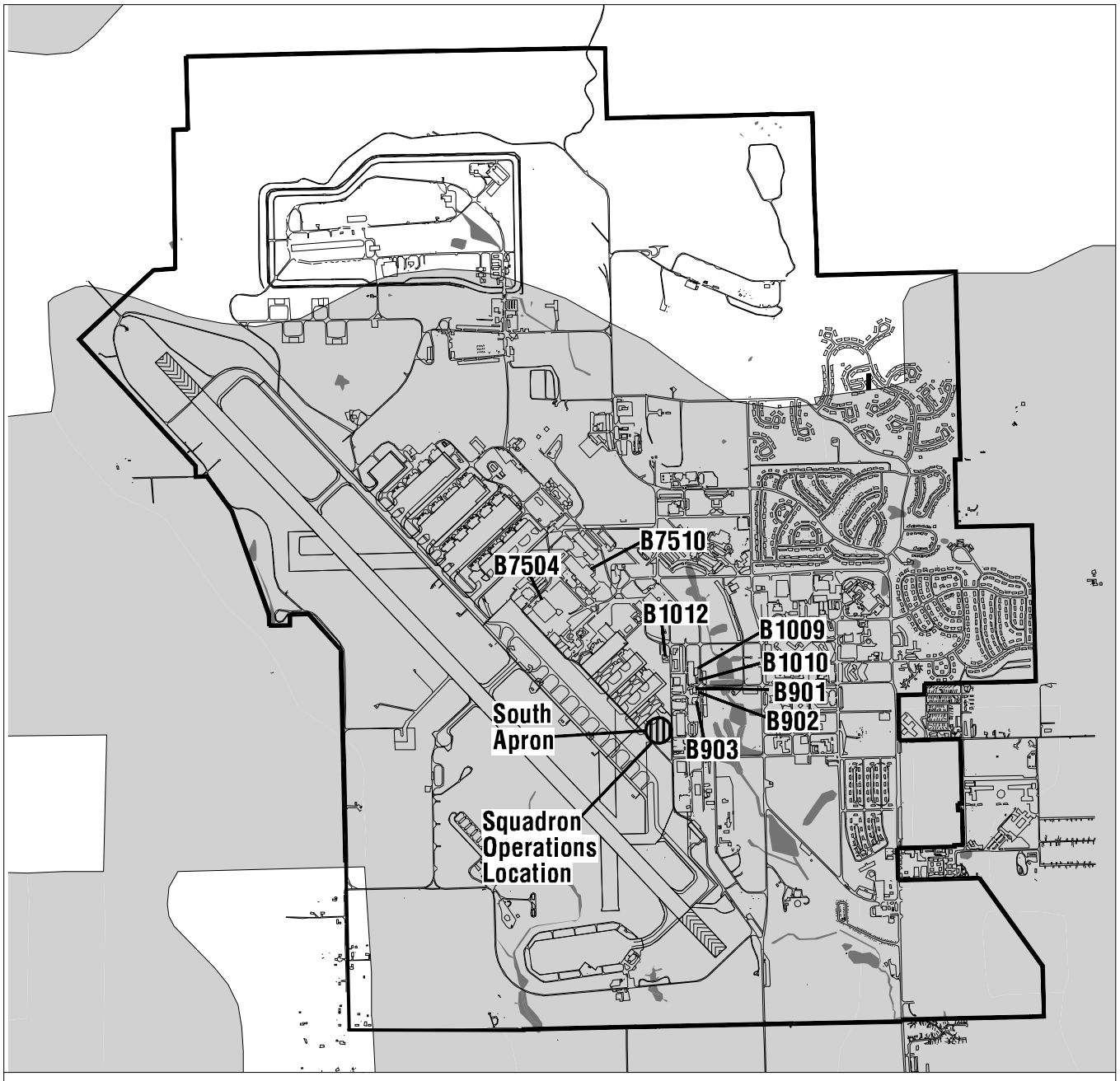


Figure 3.6-3 Natural Resource Constraints, Ellsworth AFB, South Dakota

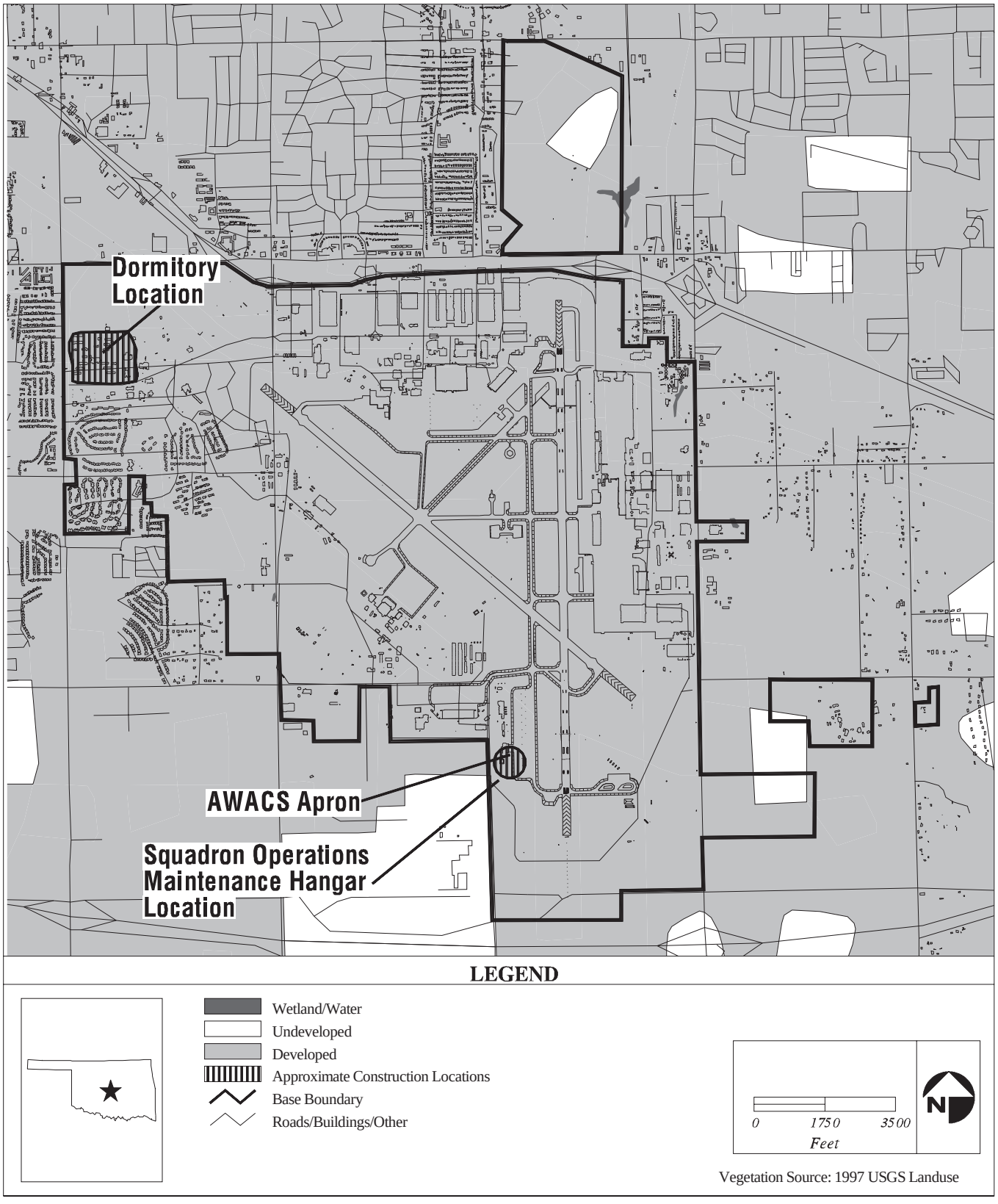


Figure 3.6-4 Natural Resource Constraints, Tinker AFB, Oklahoma

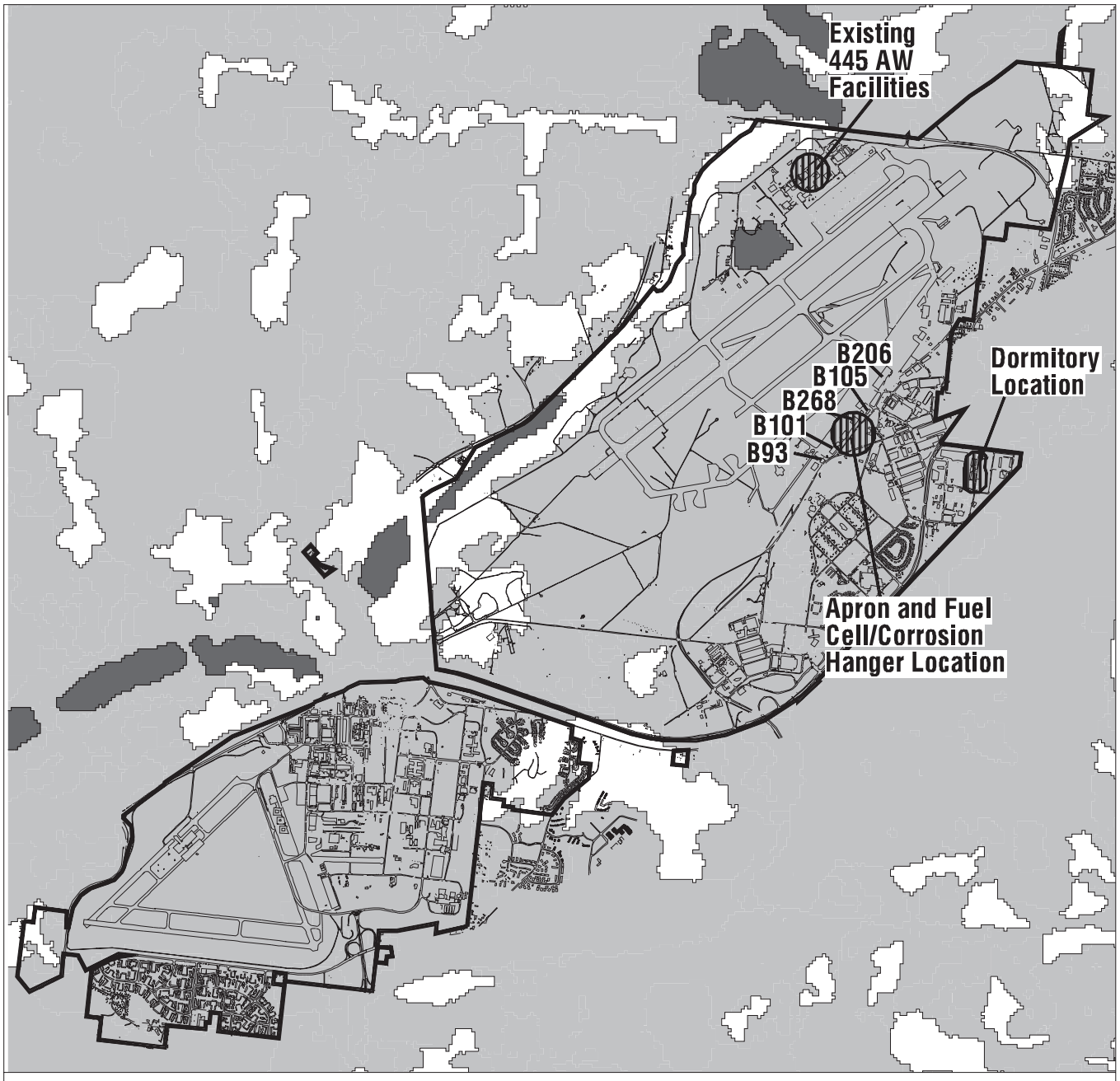


Figure 3.6-5 Natural Resource Constraints, Wright-Patterson AFB, Ohio

All alternatives have species of concern located on their bases. In addition, many species of concern are located within the 5-mile flight radius. However, only those species located on the base are discussed, since the anticipated potential impacts would be from construction.

According to current data, no species of concern are located on any construction sites. However, two bases have species of concern or sensitive habitats located in the general area of construction. Ellsworth AFB has known Swainson's hawk and loggerhead shrike habitat located north of the construction site, across the apron (USAF 1997c). Tinker AFB has known locations of Oklahoma penstemon and remnants of prairie grasslands located in undeveloped areas to the west and east of the construction sites (USAF 1999k).

No wetlands are located on any construction sites.

Activities affecting federal jurisdictional wetlands would be subject to Executive Order 11990 for the Protection of Wetlands and Section 404 of the Clean Water Act (CWA). Under the CWA, any action that would directly involve the placement of fill material in wetlands or other waters of the United States is subject to the permit requirements of Section 404. According to the EPA regulations issued under Section 404(b)(1), the permitting of fill activities will not be approved unless the following conditions are met: no practicable, less environmentally damaging alternative to the action exists; the activity does not cause or contribute to violations of state water quality standards or jeopardize endangered or threatened species; the activity does not contribute to significant degradation of waters of the United States; and all practical and appropriate steps have been taken to minimize potential adverse impacts to the aquatic ecosystem (Title 40 CFR 230.10). Further, the guidelines establish a presumption, which any applicant can rebut, that for projects that do not depend on water, a practical alternative to the filling of wetlands exists.

Amounts of potential native habitat on the five bases range from 1 percent to 90 percent.

There are no wetlands located on any of the construction sites. However, wetlands are located in the general area of construction on Ellsworth and Beale AFBs. On Ellsworth AFB, drainages border the west and east sides of the apron near the construction area (Figure 3.6-3). These wetlands have jurisdiction status and contain running water most of the year (USAF 1994c). Wetlands located on Beale AFB include vernal pools (seasonal wetlands), east of the dormitory construction area and Hutchinson Creek to the west (Figure 3.6-1). Vernal pools are small, shallow seasonal bodies of water over an impervious bottom. Hutchinson Creek contains riparian woodland vegetation intermingled with freshwater marshes (USAF 1999b). Both are considered jurisdictional wetlands; however, they are located beyond the construction impact zone.

Potential habitat for wildlife was categorized as agricultural, wetland, developed, and undeveloped lands. Because natural vegetation such as grasslands, woodlands, and forests is undeveloped, it has a higher potential as wildlife habitat. Urban, residential, and commercial areas are considered developed and have a lower habitat potential for wildlife. Areas available as potential wildlife habitat both within the base and within the 5-mile potential impact area are examined.

Wright-Patterson and Tinker AFBs have the least amount of undeveloped, or potential, native wildlife habitat left within base boundaries (Figures 3.6-4 and 3.6-5). Tinker AFB has approximately 1 percent on-base lands available as wildlife habitat. The undeveloped areas consist of scattered post oak/blackjack oak forests and remnant prairie grasslands. Construction would occur in a previously developed area. Within Wright-Patterson AFB, 13 percent of the land is undeveloped forested wetlands and uplands, the Huffman prairie, and riparian areas. Although the

construction site is in a developed area, it lies adjacent to potential wildlife habitat (refer to Figure 3.6-5).

Within Ellsworth AFB, approximately 34 percent of the land remains as undeveloped in Kentucky bluegrass, smoothbrome, native mixed grass prairie, and riparian wildlife habitat (Figure 3.6-3). Construction would take place in a previously disturbed or developed area.

Construction would occur in developed or landscaped areas.

Approximately 90 percent of the lands within Beale and Edwards AFBs are undeveloped (Figures 3.6-1 and 3.6-2). The major vegetation types remaining on Beale AFB are annual grasslands, oak woodlands, riparian, marshes, and vernal pools. Global Hawk facilities would be constructed in developed or landscaped areas. The native habitat on Edwards AFB consists of broad categories of saltbush scrub shrublands, creosote bush scrub shrublands, Joshua tree woodlands, grasslands, and sand or bare areas. Construction would take place in developed urban landscape at Edwards AFB.

The potential impact areas contained within the 5-mile radius of the runways vary in the percentage of available wildlife habitat. The area surrounding Ellsworth AFB contains approximately 50 percent undeveloped land, potentially providing wildlife habitat. The area is predominately Northern Great Plains Grassland, consisting of moderately dense, short to medium grasses (USAF 1997c). The potential impact radius around Beale AFB contains approximately 33 percent undeveloped lands. These areas were historically comprised of bunchgrasses; however, because of heavy grazing, agriculture, suppression of fire, and introduction of invasive exotic species, the area is now non-native annual grasslands. Other vegetation types include oak and riparian woodlands and freshwater marshes. Vernal pools are also found frequently throughout the area (USAF 1999b).

The areas surrounding Tinker and Wright-Patterson AFBs are primarily urban and agriculturally developed areas, with the remaining 19 and 13 percent, respectively, as undeveloped lands. Scattered remnants of post oak/blackjack oak forests and mixed-grass plains surround Tinker AFB. The Wright-Patterson AFB area historically contained beech-maple, swamp, oak/ash forests, tall grass prairie, and oak savannas. Much of the region is now urbanized or agriculture, with only small, scattered forest and prairie fragments remaining.

None of the areas affected by construction contain known threatened and endangered species.

Because all potential impacts to wildlife at Edwards AFB are contained within the base limits, no additional impacts are discussed.

THREATENED AND ENDANGERED SPECIES

Numerous federal and state listed species are known to occur within the affected environment. Appendix D includes all threatened and endangered species that are, or could be, found within this area. However, since potential impacts are anticipated to be limited to construction, only the listed species located on the base are discussed in this section. The listed species located on base are summarized in Table 3.6-2, along with federal and state status and habitat requirements.

There are no known threatened and endangered species at any of the construction sites. Known occurrences of threatened and endangered species are generally located in undeveloped areas, away from the possible construction sites. However, while no populations are known to exist at the sites, the desert tortoise (Edwards AFB) may occur in areas slated for Global Hawk construction. This species is

mobile, and its habitat requirements can include disturbed areas.

At Wright-Patterson AFB, the upland sandpiper and Indiana bat are known to occur approximately 2,000 feet from the proposed construction activities. The upland sandpiper is a summer migrant that nests on the ground from May to July. Its preferred habitat consists of flat, open grasslands reaching a height of about 2 feet (USAF 1999e). The Indiana bat occurs along the southern half of the river, although its habitat extends north to the construction site. Habitat includes nursery trees, or dead trees with loose bark in which young are raised. No potential bat habitat would be impacted during construction activities.

Neither Ellsworth nor Tinker AFB are known to have any threatened and endangered species on base, although numerous species are known to occur near the bases (refer to Appendix D).

Table 3.6-2 Federal and State Threatened and Endangered Species Located within Base Areas (Page 1 of 2)

	Name	**Status**		
Base	*Common*	*Federal*	*State*	*Habitat*
Beale	Swainson's hawk		T	Plains, prairies, riparian and dry meadows
	Peregrine falcon		E	Open areas for foraging with cliffs or other vertical components
	Bald eagle	T	E	Larger rivers and lakes, coastlines
	Black rail		T	Brackish or freshwater marshes (inland)
	Central Valley steelhead	T		Perennial and intermittent streams
	Chinook salmon	PT		Central Valley below natural and human-made barriers in perennial and intermittent streams
	Vernal pool fairy shrimp	T		Vernal pools
	Vernal pool tadpole shrimp	E		Vernal pools
Edwards	Peregrine falcon		E	Open areas for foraging with cliffs or other vertical components, Piute Ponds area
	Bald eagle	T	E	Large bodies of water on base such as Piute Ponds
	Mohave ground squirrel		T	Desert scrub and alluvial valleys of the Mojave Desert
	Desert tortoise	T	T	Arid and semiarid deserts with soils suitable for burrowing

Table 3.6-2 Federal and State Threatened and Endangered Species Located within Base Areas (Page 2 of 2)

	Name	Status		
Base	*Common*	*Federal*	*State*	*Habitat*
Ellsworth	No T and E Species Observed on base			
Tinker	No T and E Species Observed on base			
Wright-Patterson	Indiana bat	E	E	Caves, behind loose bark
	Upland sandpiper		T	Grasslands, prairies
	Bald eagle	T	E	Larger rivers and lakes, coastlines
	Sedge wren		E	Sedge meadows, wet prairies, grassy border of wetland
	Peregrine falcon		E	Open areas for foraging with cliffs or other vertical components
	Osprey		E	Large rivers and lakes, coast
	King rail		E	Freshwater swamps and marshes
	Common tern		E	Near bodies of water
	Eastern massasauga (rattlesnake)	C	E	Wetlands, prairies, dry woodlands
	Beer's noctuid		E	Prairie endemic-host plant *Laitris* spp.
	Clubshell	E	E	Medium to large rivers with gravel or mixed gravel and sand
	Whorled water milfoil		E	Wetlands, swamps and lakes

E = Listed as Endangered
T = Listed as Threatened
C = Candidate for listing
PT = Proposed for threatened status

Note: Planted threatened or endangered species were not included

Sources: CDFG. 1999, 2000.
USAF, 1999k, 1998e, 1999a, 2000i, 1997c.
South Dakota Dept. of Game, Fish and Parks, 2000.
Oklahoma Natural Heritage Inventory, 2000.
Ohio Department of Natural Resources, 2000.
International Consultants Incorporated, 1999.

3.7 CULTURAL RESOURCES

Cultural resources are prehistoric and historic sites, buildings, districts, or objects that are important to a culture or community. Cultural resources are divided into three categories: archaeological resources, architectural resources, and traditional cultural resources or properties.

Archaeological resources are places where people changed the ground surface or left artifacts or other physical remains (e.g., arrowheads or bottles). Archaeological resources can be classed as either sites or isolates and may be either prehistoric or historic in age. Isolates often contain only one or two artifacts, while sites are usually larger and contain more artifacts.

Architectural resources are standing buildings, dams, canals, bridges, and other structures.

Traditional cultural properties are resources associated with the cultural practices and beliefs of a living community that link that community to its past and help maintain its cultural identity. Most traditional cultural resources in the affected environment are associated with Native Americans. Traditional cultural properties may include archaeological resources, locations of historic events, sacred areas, sources of raw materials for making tools, sacred objects, or traditional hunting and gathering areas.

Under the National Historic Preservation Act and various federal regulations, only significant cultural resources are considered when assessing the possible impacts of a federal action. Significant archaeological, architectural, and traditional cultural resources include those that are eligible or are recommended as eligible for inclusion in the National Register of Historic Places (National Register). The significance of archaeological and architectural resources is usually determined by using specific criteria (listed in 36 CFR 60.4), including: association with an important events, association with a famous individual, embodiment of the characteristics of a period, and ability to contribute to scientific research. Cultural resources must usually be at least 50 years old to be considered eligible for listing. However, more recent structures, such as Cold War-era resources, may warrant protection if they manifest "exceptional significance." Traditional cultural resources can be evaluated for National Register eligibility as well. However, even if a traditional cultural resource is determined to be not eligible for the National Register, it may still be significant to a particular Native American tribe. In this case, such resources may be protected under the Native American Graves Protection and Repatriation Act, the American Religious Freedom Act and Executive Order 13007, which addresses sacred Indian sites. The significance of a Native American traditional cultural property is determined by consulting with the appropriate Native American tribes.

The affected area for cultural resources includes the base and 5 NM surrounding the base.

The affected environment for cultural resources includes each of the five bases and a zone within 5 NM from the base. On the base, the affected environment was limited to areas subject to construction or buildings being used or renovated. Within 5 NM of the runway, only those cultural resources that were listed on the National Register were considered. Aircraft operations are most likely to affect historic structures and districts where setting is an important criterion for significance. These resources are typically found on the National Register. The methodology for determining the presence of significant cultural resources within the affected environment was based on existing data. Extensive data searches on known cultural resources within the affected environment for each base provided information on the number, types, locations, and significance of archaeological and architectural resources (Table 3.7-1). Past discussions with Native American groups at each of the bases and during this project provided information on Native American issues and traditional cultural resources.

The Air Force is consulting with Native American groups according to the *Presidential Memorandum on Government-to-Government Relations with Native American Tribal Governments*, *Executive Order 13084*, and *DOD Policy on Indian and Native Alaskan Consultation*. Groups contacted include federally recognized tribes who live in the vicinity of the affected environment or those who lived there in the past (Table 3.7-2) and who have been contacted by the bases and expressed interest in the base's resources. Each of these groups was sent information about the proposal and concerns were solicited (refer to Appendix F).

Table 3.7-1 Cultural Resources Data Sources

Base	*Primary Cultural Resource Documents*
Beale	Cultural Resource Management Plan (USAF 1998d), General Plan (USAF 1998g)
Edwards	Cultural Resource Management Plan (USAF 1998e), Comprehensive Plan (USAF, 1994b)
Ellsworth	Cultural Resource Management Plan (USAF no date), General Plan (USAF 1996), Ellsworth AFB Cultural Resources Survey Report (USAF 1997b)
Tinker	Integrated Historic Preservation Plan (USAF 1997f), Base Comprehensive Plan (USAF 1992)
Wright-Patterson	Cultural Resource Management Plan (USAF 1999i), Native American Consultation Plan (USAF 2000b)

Table 3.7-2 Native American Groups Contacted by the Air Force

Base	*Federally Recognized Native American Group*
Beale	Berry Creek Rancheria of Maidu Indians Shingle Springs Band of Miwok Indians Susanville Indian Rancheria United Auburn Indian Community Enterprise Rancheria of Maidu Indians Greenville Rancheria of Maidu Indians Mooretown Rancheria of Maidu Indians
Edwards	Chemehuevi Tribe San Manuel Band of Serrano Mission Indians
Ellsworth	Cheyenne River Sioux Rosebud Sioux Oglala Sioux Tribe Standing Rock Sioux Tribe
Tinker	Osage Nation of Oklahoma Muscogee Creek Nation of Oklahoma Seminole Nation of Oklahoma
Wright-Patterson	Ottawa Tribe of Oklahoma Eastern Shawnee Tribe Eastern Band of the Cherokee Delaware Tribe of Indians Wyandotte Tribe

A summary of the cultural resources that are listed, eligible, or potentially eligible for listing on the National Register is presented in Table 3.7-3. Each of the bases has a unique history and varies in the numbers and types of resources found there.

Beale AFB. Beale AFB was founded in 1942. However, it contains archaeological materials indicating prehistoric occupation by the Southern Maidu, Euroamerican farming and ranching sites from the mid 1800s, and mining and transportation sites from 1850 to 1942. Significant architectural resources include a Cold War-era missile detection radar facility (Table 3.7-4). Most of the significant archaeological resources are located around the edges of the base, outside the main developed area. No Native American traditional cultural resources have been recorded although consultation is ongoing. No National Register properties have been recorded within 5 NM outside of the base.

The number of cultural resources on the bases range from 1 (Tinker AFB) to 2,471 (Edwards AFB).

Edwards AFB. Over 2,700 archaeological sites have been recorded on Edwards AFB. The base is large and contains sites dating from the early prehistoric period to the Space Age. The base also contains a National Historic Landmark consisting of the northern third of Rogers Dry Lake that is associated with early flight testing. Only one hangar in the main base is eligible for inclusion to the National Register (Building 1830), and one set of support buildings may be eligible (the X-15 complex). No Native American traditional cultural resources have been recorded although consultation is ongoing. The affected area (5 NM from the runway) for Edwards AFB is wholly within base boundaries.

Table 3.7-3 Summary of Cultural Resources at Each Base

Base	*Amount Surveyed*	*Total Cultural Resources Recorded*	*Types of Resources*	*National Register Sites and Districts*
Beale	84%	124	Native American sites, petroglyphs, campsites, ranches, mining camp	2 Archaeological Sites
Edwards	30%	2,741	Villages, campsites, rockshelters, mining camps, ranches	1 Historic Landmark (Space Program)
Ellsworth	100% of open area	3	Lithic flakes and railroad spurs	4 Proposed Historic Districts (structures)
Tinker	100% of open area	1	Farmstead	1 Historic District (structures)
Wright-Patterson	24%	131	Mounds, campsites, farms, church, cemetery, bridge, school	4 Historic Districts (structures and facilities), 2 sites

Table 3.7-4 Historic Structures	
Base	*Potentially Eligible or Eligible Structures and Facilities*
Beale	5760
Edwards	118 eligible structures: 501, 502, 503, 510, 512, 513, 516, 520, 521, 531, 540, 545, 1635, 1830, 1926, 1928, 1929, 1930, 1931, 1932, 1933, 1934, 4200, 4202, 4203, 4208, 4209, 4210, 4213, 4214, 4215, 4216, 4217, 4218, 4219, 4220, 4221, 4222, 4223, 4224, 4225, 4226, 4227, 4229, 4230, 4231, 4232, 4233, 4234, 4235, 4237, 4238, 4239, 4240, 4241, 4242, 4243, 4244, 4245, 4246, 4247, 4248, 4249, 4250, 4251, 4252, 4253, 4254, 4255, 4256, 4257, 4258, 4259, 4260, 4261, 4262, 4263, 4264, 4265, 4266, 4267, 4268, 4269, 4270, 4271, 4272, 4273, 4274, 4275, 4279, 4280, 4281, 4284, 4285, 4305, 4306, 4311, 4316, 4317, 4318, 4328, 4330, 4331, 4401, 4402, 4451, 4452, 4456, 4500, 4503, 4504, 4505, 8668, 8698, 8955, Aircraft Revetment No. 9, X-1 Loading Pit. 37 potentially eligible structures: 1207, 1210, 1220, 1414, 8359, 8424, 8472, 8473, 8620, 8624, 8626, 8635, 8641, 8642, 8649, 8752, 8762, 8765, 8780, 8781, 8804, 8810, 8814, 8816, 8820, 8822, 8824, 8832, 8844, 8911, 8912, 8959, 8960, 9623, 9625, 9628, 9630
Ellsworth	601, 6904, 6905, 6908, 805, 3005, 7504, 88106, 7430, 88289, 6401
Tinker	1, 208, 230, 240, 3001, 3102, 3105, 3108, 3113, 3202, 3203, 3204, 3303, 4029
Wright-Patterson	Wright Field Historic District, Huffman Field National Historic Landmark, Brick Quarters Historic District, Fairfield Air Depot Historic District

Ellsworth AFB. Ellsworth AFB was founded in 1942. Originally, the site of the Rushmore Air Force Station, a nuclear weapons ordnance facility operated by the Atomic Energy Commission, it was a major unit of the Strategic Air Command during the Cold War. The base contains few archaeological sites; 11 historic buildings are considered to be eligible or potentially eligible to the National Register. No Native American traditional resources have been recorded although consultation is ongoing. No National Register-listed properties have been recorded on the base or within 5 NM of the base.

Tinker AFB. Tinker AFB was established in 1942 as the Midwest Air Depot and Tinker Air Field in Oklahoma City. The base is largely developed, with only 19 percent of the base in open space. In addition, Tinker AFB contains one historic district, the Douglas Cargo Aircraft Manufacturing Historic District. Facilities associated with the Cuban Missile Crisis are also considered to be historically significant. No prehistoric archaeological sites have been recorded on base; one historic trash scatter has been recorded. No Native American traditional cultural resources have been recorded although consultation is ongoing. Over 80 National Register sites have been documented in the areas around Tinker AFB. Most of these properties are historic buildings.

Wright-Patterson AFB. Over 300 properties eligible for the National Register have been documented at Wright-Patterson AFB. The base was founded in World War I, but flying activities go back to 1904 when the Wright Brothers used the Huffman Prairie Flying Field. Wilbur Wright Field and the Fairfield Aviation General Supply

Depot were established in 1917. Prehistoric archaeological sites include two mound sites on base. Although most of the significant archaeological sites are located on the edges of developed areas, some do occur adjacent to the flight line. Significant structures are grouped into three National Register Historic Districts and a National Historic Landmark (Huffman Prairie Flying Field). No Native American traditional cultural resources have been recorded although consultation is ongoing. Over 85 National Register properties have been documented in the area surrounding Wright-Patterson AFB. Most of these properties are historic buildings.