LAUGHLIN AIR FORCE BASE

Final Report

June 2008

AICUZ Update

Air Installation Compatible Use Zone

DEPARTMENT OF THE AIR FORCE
47TH FLYING TRAINING WING (AETC)

JUN 18 2008

MEMORANDUM FOR AREA GOVERNMENTS

FROM: 47 FTW/CC
561 Liberty, Suite 1
Laughlin AFB TX 78843-5230

SUBJECT: 2008 Laughlin Air Force Base (AFB) Air Installation Compatible Use Zone (AICUZ) Study

1. Laughlin AFB recently completed an update of the last AICUZ study dated April 2000. The revision was initiated because of the recent mission increase to Student Undergraduate Pilot Training and the addition of the Introduction of Fighter Fundamentals mission brought about by the 2005 Base Realignment and Closure.

2. The purpose of the AICUZ program is to examine and evaluate aircraft noise and accident potential associated with the installation's flying mission. The resulting data is then used to develop local planning guidance that will ensure public safety and well-being as well as preserve the operational capabilities of Laughlin AFB. In more specific terms, the report contains a description of the affected local area and discusses the locations and definitions of runway Clear Zones, aircraft Accident Potential Zones, and noise contours. For property located in these areas it also provides a list of land uses deemed compatible with airfield operations.

3. We greatly value the positive relationship Laughlin AFB has experienced with its neighbors over the years. As Val Verde County, Kinney County, and the City of Del Rio continue to grow and prosper, we believe it is important that we join with government and business leaders in a cooperative effort to implement mutually beneficial planning for the future. It is our hope that you will consider incorporating our recommendations into your communities' land use plans, zoning ordinances, subdivision regulations, codes, and other related documents. For technical inquiries contact Ms. Jennifer Harris at 830-298-5067.

JOHN W. DOUCETTE, Colonel, USAF
Commander

Laughlin Air Force Base, Texas
AICUZ Update
Air Installation Compatible Use Zone

FINAL REPORT
JUNE 2008

LAUGHLIN AIR FORCE BASE
TEXAS

V O L U M E I

AIR INSTALLATION COMPATIBLE USE ZONE

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ACRONYMS and ABBREVIATIONS

AFB	Air Force Base
AFH	Air Force Handbook
AGL	above ground level
AICUZ	Air Installation Compatible Use Zone
APZ	accident potential zone
ATC	air traffic control
AETC	Air Education and Training Command
BRAC	Base Re-alignment and Closure Commission
BX	Base Exchange
CFR	Code of Federal Regulation
CNS	communications, navigation, surveillance
CZ	clear zone
dB	decibel
DNL	day-night average A-weighted sound level
DoD	Department of Defense
DoT	Department of Transportation
EIS	Economic Impact Statement
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FTS	flying training squadrons
FTW	Flying Training Wing
FY	fiscal year
GA	Georgia
HUD	Housing and Urban Development
IFR	instrument flight rules
INM	Integrated Noise Model
MOA	military operations area
MSL	mean sea level
OE/AAA	obstruction evaluation/airport airspace analysis
OG	Operations Group
RAPCON	radar approach control
SLUCM	Standard Land Use Coding Manual
SUA	special use airspace
VFR	visual flight rules
UFC	Unified Facility Criteria
USCB	U.S. Census Bureau

1.0 PURPOSE AND NEED

1.1 Introduction

The purpose of the Department of Defense's (DoD) long-standing Air Installation Compatible Use Zone (AICUZ) program is to promote compatible land development in areas subject to increased noise exposure and accident potential due to aircraft operations. In addition, the AICUZ program's goal is to protect military airfields and navigable airspace leading to them from encroachment by incompatible uses and structures. Recommendations from this updated AICUZ study should be included in any planning process undertaken by the city of Del Rio, TX, Val Verde or Kinney counties. Other planning, zoning, or utility authorities established under Texas law should also consider the recommendations with the goal of preventing incompatibilities that might compromise Laughlin Air Force Base's (AFB) ability to fulfill its mission requirements. Accident potential and aircraft noise in the vicinity of military airfields should be major considerations in any planning process that the local municipal authorities may wish to undertake.

Land use recommendations for Air Force AICUZ outlined in Air Force Handbook (AFH) 32-7084 *AICUZ Program Manager's Guide* reflect preferred land uses for areas underlying clear zones (CZs), accident potential zones (APZs) I and II, as well as for four noise exposure zones (a description of these areas can be found in Chapter 3):

- 65-70 decibel (dB) day-night average A-weighted sound level (DNL);
- 70-75 dB DNL;
- 75-80 dB DNL; and
- 80+ dB DNL.

The noise zones are delineated by connecting points of equal noise exposure (contours). Preferred land uses for these noise exposure zones have been established on the basis of sociological studies prepared and sponsored by several federal agencies, including the U.S. Department of Housing and Urban Development (HUD), the U.S. Environmental Protection Agency (EPA), the U.S. Department of Transportation (DoT), and the Air Force, as well as state and local agencies. The guidelines recommend land uses that are compatible with airfield operations while allowing maximum beneficial use of adjacent properties. Additionally, guidelines for maximum height of man-made structures are provided to protect the navigable airspace around an airfield, particularly the approach/departure corridors extending along the axes of the runways. The Air Force has no desire to recommend land use regulations that would render property economically useless. The Air Force does, however, have an obligation to the citizens of the United States, especially those residing in the vicinity of the Laughlin AFB environs (Figure 1-1) to point out ways to protect the adjacent communities. A similar obligation exists to serve as a prudent steward of the public investment in the installation itself.

The AICUZ program uses the latest technology to define noise levels in areas near Air Force installations. An analysis of Laughlin AFB's anticipated flying operations was performed, including types of aircraft, flight patterns, variations in altitude, power settings, number of

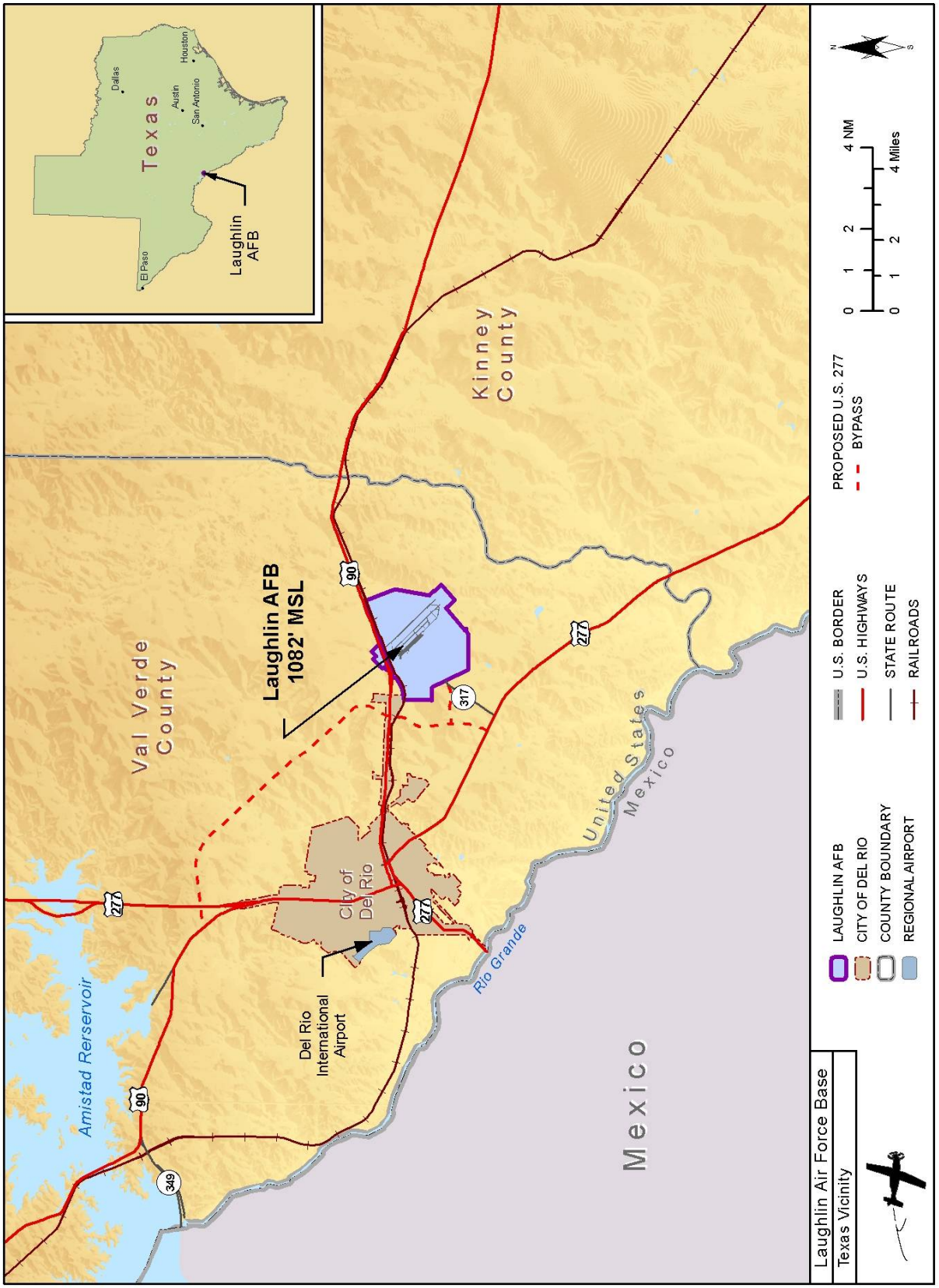

Figure 1-1. Laughlin AFB Vicinity.

operations, and hours of operations. This information was used to develop the noise contours contained in this study. The DoD NOISEMAP modeling software and the previously mentioned DNL metrics were used to define the noise exposure zones at Laughlin AFB.

1.2 Process and Procedure

Since the 1960s, Laughlin AFB has worked proactively with the local community to disclose impacts related from aircraft operations. AICUZ studies or their predecessors were conducted in 1968, 1977, 1994, and 2000. This study is an update of the previous 2000 Laughlin AFB AICUZ study. The update reflects changes to aircraft operations at Laughlin that occurred during the period of 2000 to 2007. These changes primarily consist of two types:

- Changes to the mix of aircraft using Laughlin AFB (both transient and based) and
- Changes to the operational tempo resulting from the advent of the Global War on Terrorism in 2001.

Specifically, the Air Force has begun flying the T-6A *Texan II* at Laughlin AFB as its predecessor trainer, the T-37 *Tweet* was retired from the inventory. In 2000, the Air Force released anticipated noise exposure (contours) prior to the beddown of the T-6A. Now that the T-6A is operational, contours reflecting actual operational experience are warranted. Additionally, the Air Force relocated pilot training missions formerly based at Moody AFB, Georgia (GA) to Laughlin AFB as part of the 2005 Base Re-alignment and Closure Commission (BRAC) process.

The T-6A Texan II is a two-seat primary trainer designed to train Joint Primary Pilot Training (JPPT) students in basic flying skills.

This AICUZ study reaffirms Air Force policy of promoting public health, safety, and general welfare in areas surrounding Laughlin AFB. It is part of the continuing Air Force participation in the local planning process. The Air Force recognizes that it has the responsibility of providing information on its activities that potentially affect the community. As local communities prepare land use plans and zoning ordinances, Laughlin AFB presents this study in the spirit of mutual cooperation and respect with the intent of assisting in the local land use planning process.

Baseline aircraft operations data were collected at Laughlin AFB in June 2006 with additional data collected during the fall of 2007 to validate the findings. On-site interviews were performed to obtain aircraft operational and maintenance data. Using these data, average daily operations by runway and type of aircraft were derived.

These data are supplemented by flight track information (where we fly), flight profile information (how we fly), and maintenance engine runs occurring while the aircraft is stationary (static run-ups). After verification of accuracy, data were input into the NOISEMAP program (Version 7.0) and predicted noise exposure was calculated. The results are expressed in terms of DNL and shown as contours were then plotted on an area map. Overlaid with the contours, clear

zone and accident potential zone areas were shown. In addition, the Federal Aviation Administration (FAA) defined imaginary surfaces indicating maximum structure heights were depicted. These imaginary surfaces are designated to promote and maintain clear navigable airspace for safe flight operations near the airfield. Objects that penetrate these surfaces are considered obstructions to air navigation. The sum of all three elements, (noise exposure, accident potential, and obstruction evaluation), constitute the AICUZ environs for a given airfield. Appendix A of Volume II contains detailed information on the development of the AICUZ report.

1.3 Computerized Noise Exposure Models

The Air Force has adopted the NOISEMAP computer program for use in predicting noise exposure that would result from aircraft operations in the vicinity of an airfield.

2.0 INSTALLATION DESCRIPTION

2.1 Location, Geography, and Airspace

Laughlin AFB is located six miles east of Del Rio, Texas on US Highway 90 in the southeast corner of Val Verde County. The region abuts the Rio Grande river, the international boundary between Mexico and the United States (Figure 2-1). In 2006, the U.S. Census Bureau estimated that Del Rio had a population of 36,491 persons making it the greater part of the population of Val Verde County (46,567 persons) for which it is the county seat. The region is approximately 150 miles west of San Antonio and 450 miles southeast of El Paso.

Laughlin AFB is the home of the 47th Flying Training Wing, one of the world's leading pilot training wings. Nearly 400 new military pilots earn their silver wings at Laughlin each year after an intensive 52-week course where they learn to fly using the T-6A Texan II, T-38 Talon, and T-1A Jayhawk trainers. Laughlin is named after 2nd Lt. Jack Thomas Laughlin, a Del Rio native killed over Java in the South Pacific in the early days of World War II.

In the immediate vicinity of Del Rio the terrain is generally flat with an elevation of approximately 1,100 feet above mean sea level (MSL). The terrain falls off gradually toward the south and east and rises in a more pronounced fashion to the north and especially to the west in Mexico. Coming from San Antonio, with the gradual increase in elevation a change in vegetation becomes noticeable, particularly from Uvalde to Del Rio. This corresponds to a difference in soils as the gentle rolling hills begin transitioning toward the desert topography found in West Texas at the western margin of the Edwards Plateau. Average annual rainfall in Del Rio is approximately 20 inches, consistent with a semi-arid climate. However, it is important to note that rainfall does not occur uniformly throughout the year. The bulk of the rainfall occurs between October and April. This climate allows for nearly ideal weather for primary flight training in visual conditions.

The major transportation corridors generally follow the terrain with US 90 extending east/west along southern end of the Edwards Plateau and Hill Country and with US 277 extending northwest/southeast paralleling the Rio Grande (Figure 2-1). Outside of the city limits, secondary two-lane roads and numerous unimproved roads provide access to ranches and other large tracts of land. Freight and passenger rail service provided by Union Pacific and Amtrak, respectively, connect the region with the western, mid-western and southeastern regions of the US. A municipal airport, Del Rio International, is served by daily scheduled air carrier connections to Houston. An international bridge over the Rio Grande provides pedestrian and vehicular access to Ciudad Acuna (2005 population: 126,238), an adjacent border city in Coahuila, Mexico.

The rate of growth in the Val Verde area population has not generally correlated with statewide population growth. Recently it has lagged the statewide average; it appears that the population has correlated more to the mission expansions at Laughlin AFB during the 1950s, the 1970s, and

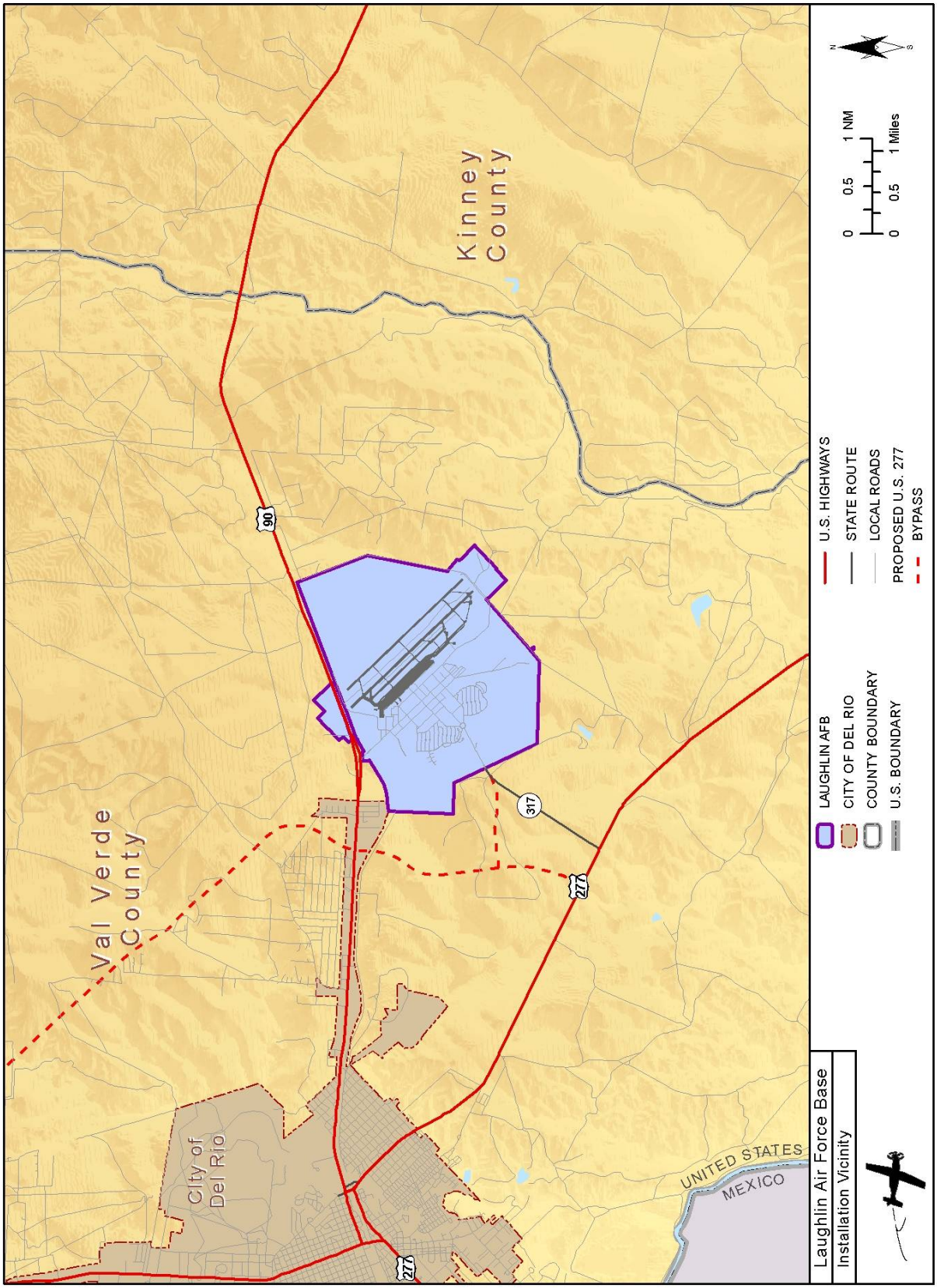

Figure 2-1. Installation Vicinity.

more recently, this decade. Other influences may be tied to increased economic activity occurring as a result of trade agreements with Mexico. The current estimated growth rate for the period of 2000 to 2006 is 7.33% for Val Verde County and 7.74% for Del Rio (Table 2-1).

Table 2-1. Population and Projections.

AREA	2000 Census	2006 Estimated	2000-2006 Rate of Change %	2015 Projection
State of Texas	20,851,820	23,407,629	12.25	26,156,715
Val Verde County	44,856	48,145	7.33	55,655
City of Del Rio	33,867	36,491	7.74	N/A

Source: U.S. Census Bureau (USCB) 2000, 2006
Texas State Data Center & Office of the State Demographer (2006)

The T-38C Talon is a supersonic jet trainer used in a variety of roles because of its design, economy of operations, ease of maintenance, high performance, and exceptional safety record.

Laughlin AFB occupies approximately 5,343 acres, primarily on the south side of US 90 and the Union Pacific railroad line. The land is flat with very little change in elevation; only 20 feet separate the highest and lowest points on the installation. An airfield consisting of three parallel runways (13/31) oriented along a northwest/southeast axis with associated taxiways and aircraft parking ramps is the dominant feature of the base. Runway 13L/31R is 8,311 feet long by 150 feet wide, and is primarily used by the T-38C *Talon*, a trainer used to instruct pilots in fighter aircraft characteristics and procedures. This runway is also known as the outside runway as it lies furthest from the aircraft parking, hangars and base buildings. West of the outside runway, separated by 1,000 feet, the center runway (13C/31C) is 8,857 feet long by 150 feet wide. The T-1 *Jayhawk*, a training aircraft similar to a business jet used to instruct pilots in airlift and tanker aircraft characteristics and procedures, uses this runway primarily. In addition, transient aircraft use this runway. Further west, separated by 500 feet, is the inside runway (13R/31L). Considerably shorter in length than the other two at 6,246 feet long by 150 feet wide, it is used by the T-6A, a single-engine turbo-propeller powered primary trainer. This is the first aircraft in which student pilots would be trained while completing the Specialized Undergraduate Pilot Training syllabus at Laughlin; after earning their initial rating they typically transition on either a fighter track or an airlift/tanker track.

The runway ends are accessed from parallel and intersecting taxiways. All aircraft parking, maintenance, and squadron operations facilities are located on the west side of the airfield. Aircraft maintenance and static engine runs occur either in the parking areas, at the ends of the runways, or in test cells or hush houses located near the arrival end of runway 13R on the northern side of the airfield. The parking areas are located along the west side of the runway complex (Figure 2-2). The airfield elevation is 1,082 feet above MSL.

The airfield at Laughlin AFB lies within controlled airspace. This is a generic term referring to airspace within which aircraft separation (i.e. air traffic control [ATC]) is provided by FAA or military air traffic controllers. Separation of aircraft is achieved through a combination of the Laughlin radar approach control (RAPCON) facility and a control tower, both of which are co-located at the airfield. The Laughlin RAPCON also provides radar approach control services to Del Rio International airport; in addition, it controls the Laughlin Military Operations Areas (MOA) that lie to the northwest and southeast of the airfield.

Controlled airspace has several variations that correlate with air traffic density and other operational considerations. As a result, the minimum pilot certification requirements, the minimum required equipment installed in the aircraft, and the minimum weather (cloud ceiling and prevailing visibility) vary with the airspace classification. For example, the airspace around San Antonio International airport is Class C. This airspace classification is similar to those found at medium to large non-hub airports served by scheduled air carrier service. This type of airspace requires two-way communication prior to entry, as well as certain equipment on-board the aircraft to facilitate radar identification of aircraft. The communication requirement allows ATCs to provide separation service to participating aircraft operating under instrument flight rules (IFR), permitting operations to occur during periods of less favorable weather. In addition, aircraft operating under visual flight rules (VFR), where the pilots provide their own separation using “see and avoid” are also a common occurrence.

The airfield at Laughlin AFB also lies within a Class C airspace area, due to the density and magnitude of the operations occurring daily. The Laughlin Class C airspace extends outward from the airfield for approximately 5 miles and upward to 5,100 feet MSL. An outer shelf of Class C airspace extends from the 5-mile ring out to 10 miles with a floor of 2,500 feet MSL (approximately 1,200 feet AGL) up to 5,100 feet MSL (Figure 2-3). The Del Rio International airport underlies this shelf; however, it is not located within Class C airspace. The number of air carrier and general aviation operations there does not warrant the same airspace classification. Instead, that airfield lies within Class G (uncontrolled) airspace at the surface with an overlying band of Class E airspace that begins at 700 feet above ground level (AGL) and ends at 2,500 feet MSL where it joins the Class C airspace above it.

Apart from controlled or uncontrolled airspace, the FAA designates special use airspace (SUA). One type, a MOA, is airspace within which IFR traffic is not permitted and VFR traffic operates at its own risk. A MOA is typically designated around military airfields where high speed and aerobatic maneuvers occur in order to provide notice to nonparticipating civilian aircraft. Often civilian pilots operating under VFR will simply avoid MOAs, circumnavigating them as needed to stay clear of them. If operations permit and air to ground communications facilities exist, the controlling agency for the SUA can authorize transit to IFR traffic or provide traffic advisories to VFR traffic. The FAA has designated three MOAs in the vicinity of Laughlin AFB that serve as training areas for the squadrons assigned to Laughlin (Figures 2-4).

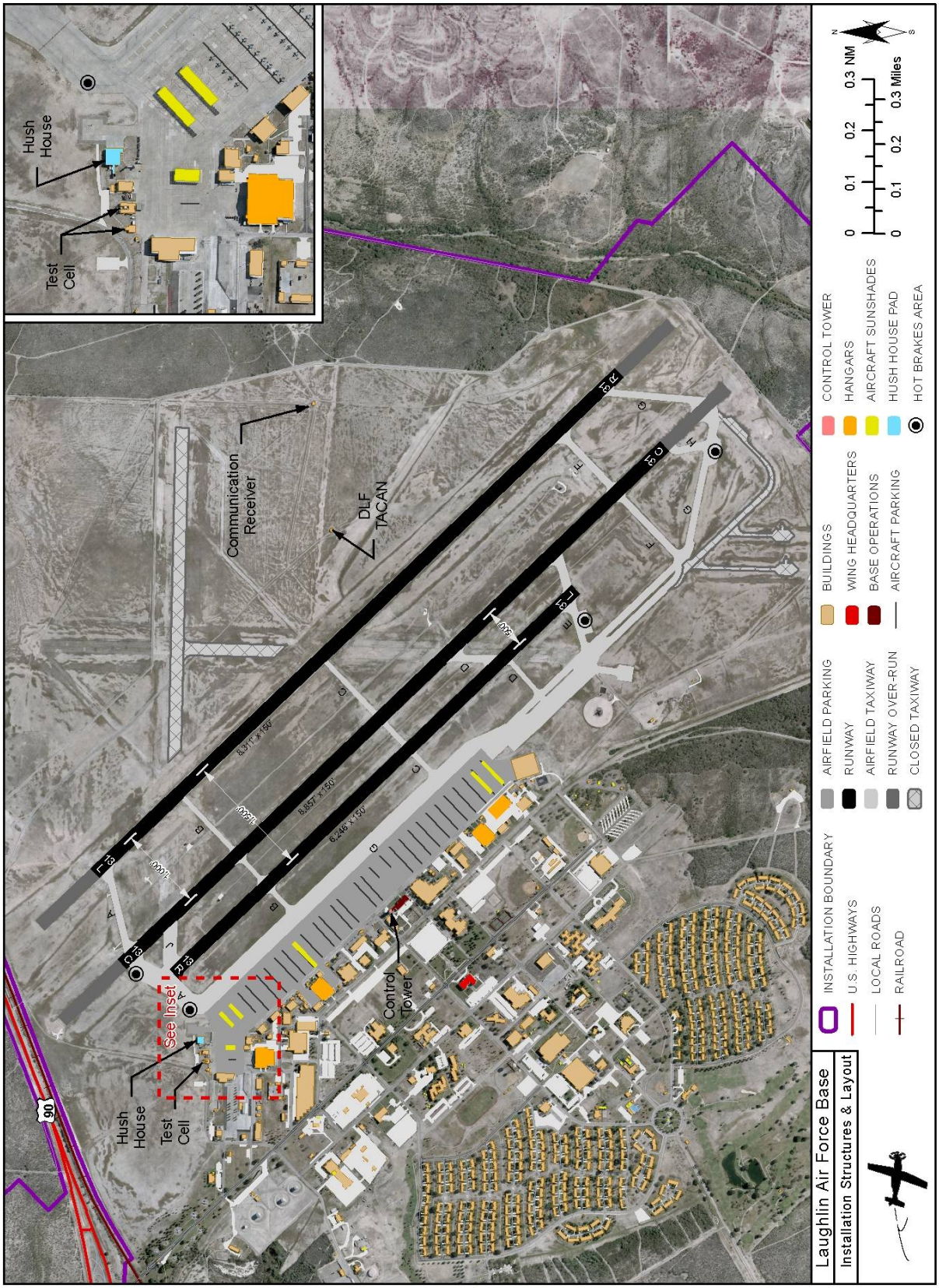

Figure 2-2. Installation Structures and Layout.

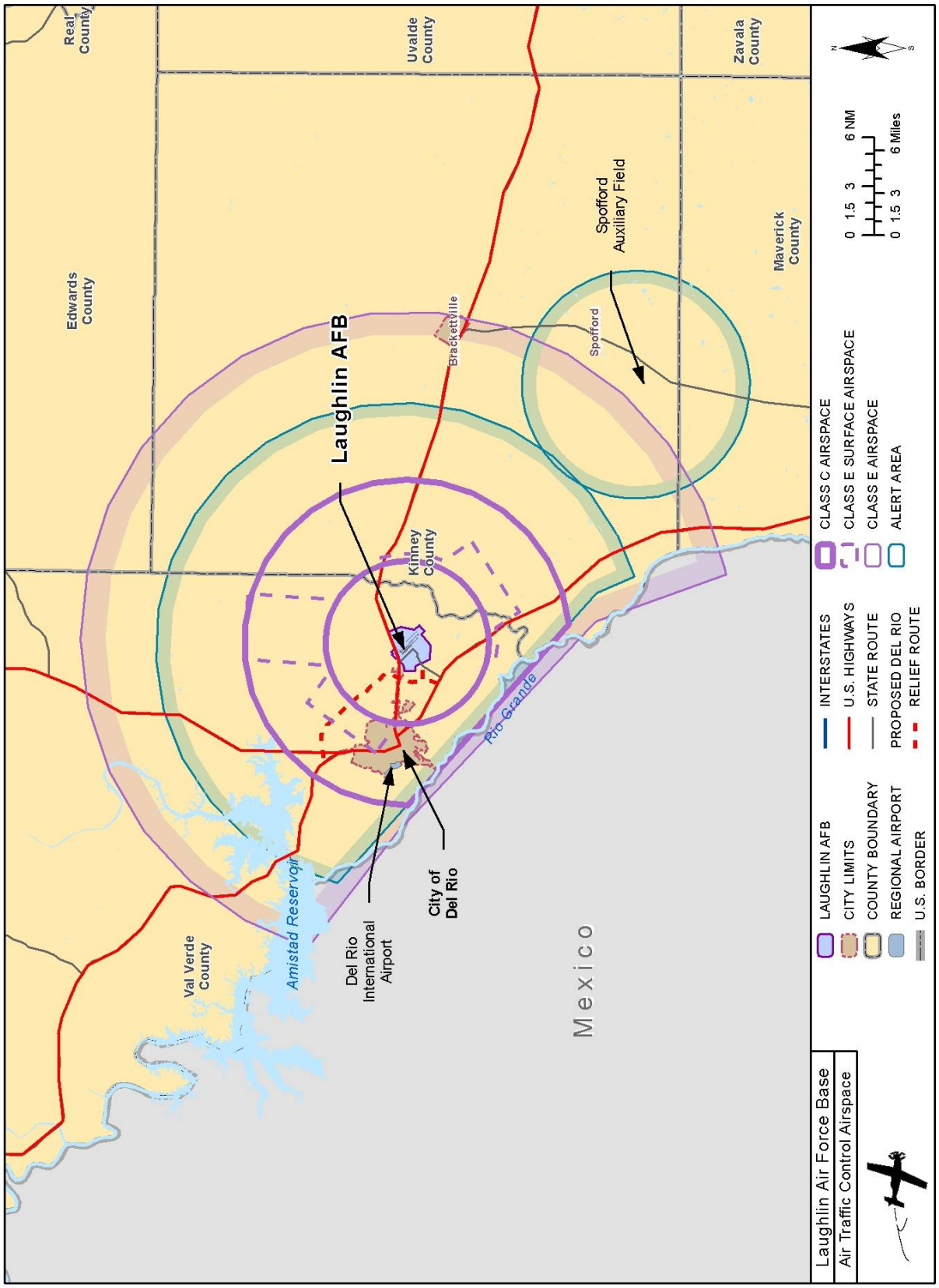

Figure 2-3. ATC Airspace.

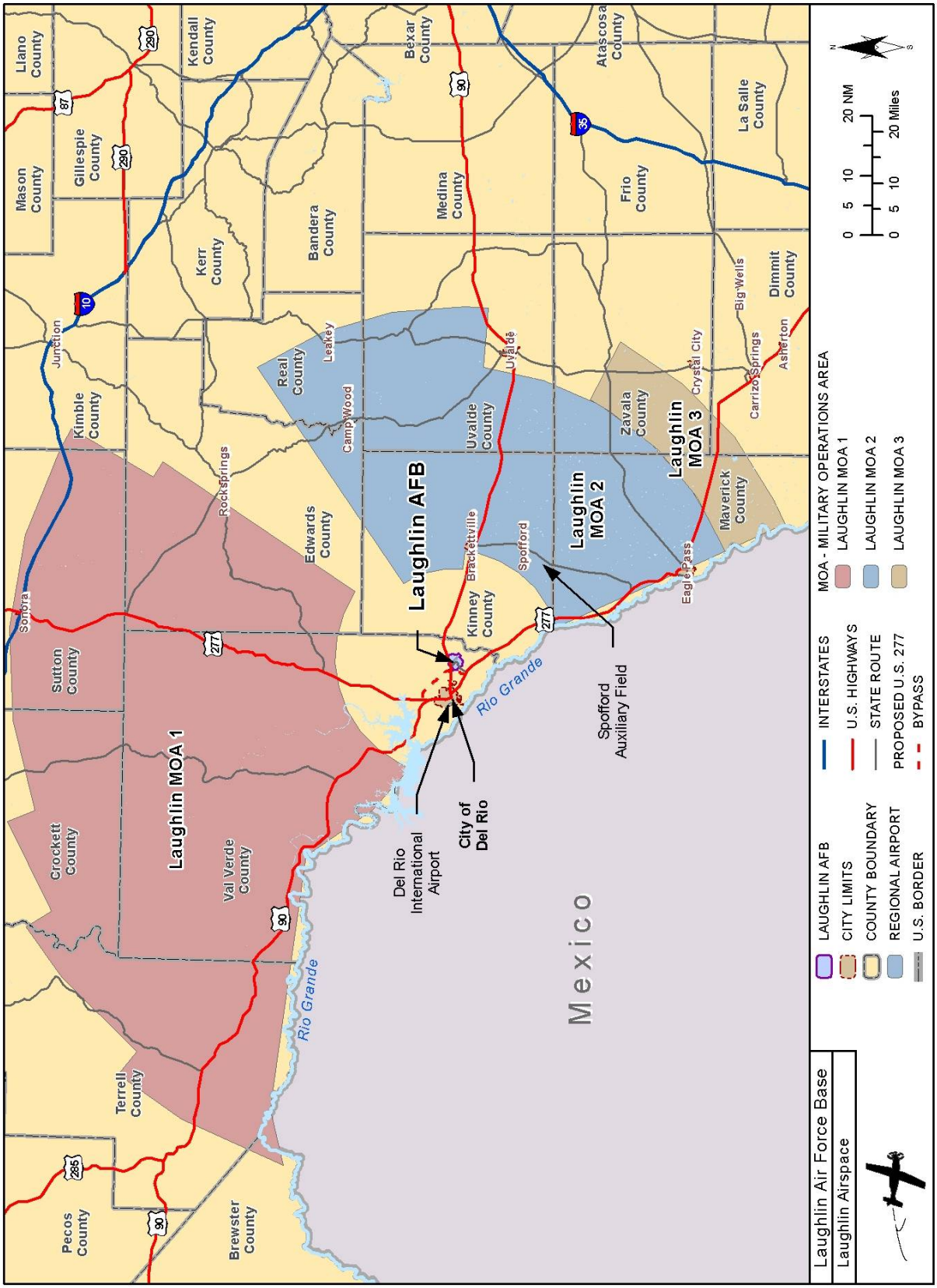

Figure 2-4. Laughlin Special Use Airspace.

2.2 History of Laughlin Air Force Base

Laughlin AFB is named after 2nd Lieutenant Jack T. Laughlin, a Del Rio native killed over Java in the South Pacific in the early days of World War II. The base opened in the early 1940s. It was the Army Air Force B-26 training base during the war and was closed in 1947. It reopened during the Korean Conflict as a jet fighter training base. From the late 1950s until 1963 it was the home of the Strategic Air Command's 4080th Strategic Reconnaissance Wing. In 1962, the base became an Air Training Command base and its mission for the past 44 years has been to train new pilots for the United States Air Force and allied nations.

2.3 Mission of Laughlin Air Force Base

The primary mission performed at Laughlin AFB is that of the base's host command, the 47th Flying Training Wing (FTW) a subordinate unit to Air Education and Training Command (AETC) which is headquartered in San Antonio, TX. The AETC mission is to provide basic military training, initial and advanced technical training, flying training, and professional military and degree-granting professional education. The mission of the 47 FTW is to conduct specialized undergraduate pilot training for the United States Air Force, Air Force Reserve, Air National Guard and allied nation air forces. To conduct that mission, a variety of subordinate wing units operate the many and varied facilities on the base, making it a small city unto itself with its own police, fire, library, shopping center, and housing area.

Subordinate to the 47 FTW is the 47 Operations Group (OG), to which five flying training squadrons (FTS) are assigned that have aircraft: two (84 and 85 FTS) fly the T-6A, one (86 FTS) flies the T-1A, and two (87 and 434 FTS) fly the T-38C. In addition, a squadron of reserve instructors (96 FTS) augments the active duty instructor force. Approximately 400 new military pilots earn their silver wings at Laughlin each year after a 52-week course where they learn to fly using the T-6A, T-38C, and T-1A trainers (Table 2-2).

Table 2-2. Aircraft Assigned to Laughlin AFB in Fiscal Year 2007.

Unit Designation	Aircraft Type	Number of Aircraft
84 & 85 FTS	T-6A	110
86 FTS	T-1A	52
87 FTS & 434 FTS	T-38C	92

Source: Laughlin AFB Economic Impact Statement (EIS) 2007

The T-6A is a primary aircraft trainer used by students first learning to fly. Despite that, it is a fairly complex aircraft compared to civilian aircraft found at a flight school. It has a pressurized cockpit and advanced digital instrumentation and is powered by a single-engine turboprop. After becoming rated pilots, students then transition to a more advanced aircraft that more faithfully replicates the performance of the operational aircraft they would fly.

Students may be selected to fly airlift or tanker aircraft and would therefore transition to the T-1A. The military version of a Beech 400A business jet, it is a medium-range, twin-engine jet trainer. Alternatively, students may be selected to fly fighter or bomber aircraft and would

transition to the T-38C. Manufactured by Northrop Corporation between 1961 and 1972, it is a twin-engine, high altitude, supersonic jet trainer.

2.4 Economic Impact

As noted above, Laughlin AFB is located in Val Verde County, just west of Del Rio, Texas. The base's economic region of influence is thought to extend outward 50 miles, excluding that portion lying in Mexico. The general economic health of the region is good and the presence of Laughlin AFB is undoubtedly significant to the local economy. Even so, the local economy is a reasonably well-diversified one based on education, health service and public administration, manufacturing, wholesaling, and retail trade all of which account for 69 percent of its civilian employment. The local economy also relies on leisure and hospitality, financial services, and professional services employers (Table 2-3). The 2000 census data indicate that the average household income in Val Verde County was $28,276 compared to a national average of $41,994 and statewide average of $39,927.

Table 2-3. Total Employment by Industry.

Sector	2000 Census (# of persons)
Civilian Workforce	17,018
Employment	15,097
Unemployment (#)	1,921
Unemployment (%)	6.0
Agriculture, Forestry, Fishing, & Mining	425
Non-Farm Wage & Salaried Employment	14,672
Construction	1,128
Manufacturing	1,621
Wholesale Trade	316
Retail Trade	2,082
Transportation, Warehousing and Utilities	911
Information	155
Financial Activities, Insurance & Real Estate	551
Public Administration	1,793
Professional, Scientific & Management Services	825
Educational and Health Services	3,228
Leisure and Hospitality	1,269
Other	793

Note: Civilian Workforce, Employment and Unemployment Data are from April 2000 Census data

Source: U.S. Census Bureau (USCB); 2000 Census Summary File 3, DP-3 *Profile of Selected Economic Characteristics: 2000. Geographic Area: Val Verde County, Texas*

Aside from physical proximity, numerous factors link Laughlin AFB, the city of Del Rio, and nearby residents of Val Verde County as interdependent entities. The relationship between base personnel and the city and county has historically been one of cooperation, mutual respect, and support. Strong ties between the local governments, the business community, and the military have existed for decades. Laughlin AFB hosts air shows every 2 to 3 years along with an open house. Base personnel are actively involved in town affairs, frequently attending city meetings to discuss any Laughlin AFB issues that could potentially affect the city.

The economic impact of Laughlin AFB on this region of Texas is significant, especially within the 50-mile radius of the economic impact region generally associated with military installations. In 2007, Laughlin AFB employed 2,871 personnel on base making it the leading employer in the region. These personnel include active duty military, appropriated fund civilians, non-appropriated fund contracts, and private business civilians. Approximately 47 percent of the military personnel stationed at Laughlin AFB reside on base, with the remainder living in the local area. The annual total payroll is approximately $123.4 million.

The population associated directly with Laughlin AFB in fiscal year (FY) 2007 (07) totaled 5,407 persons; including 1,482 permanent military personnel, 92 reservists, 2,536 dependents, and 1,297 civilians (Table 2-4). Through commodity, service, and construction contracts, an additional $103 million entered the local economy in 2007 (Table 2-5).

Table 2-4. Population Associated with Laughlin AFB.

Classification	Living on-base	Living off-base	Total
Active Duty Permanent Party	745	737	1,482
Air Force Reserve / Air National Guard Permanent Party	2	90	92
Individual Mobilization Augmentees			
Total Military	747	827	1,574
Active Duty Dependents[1]	1,276	1,260	2,536
Appropriated Funds Civilian –, GS, WG, NSPS			1,094
Non Appropriated Fund, Contract Civilians, and Private Business			
Civilians Non-appropriated			148
Contractor			8
Civilians, Base Exchange & Commissary			35
Private Business			12
Total Civilian Personnel			**1,297**
Grand Total			**5,407**

[1]No civilian employees are assumed to live on base
Source: Laughlin AFB Economic Impact Statement (EIS) 2007

Table 2-5. Annual Expenditures for Procurement and Contracts.

Procurements	Expenditure ($)
Services (Services Contracts, Government Purchase Card, Utilities)	
Communications	$1,059,544
Equipment	$1,755,119
Other Expenses	$252,911
Purchased Services	$30,628,358
Supplies	$53,731,183
Printing & Reproduction	$134,721
Purchased Equipment Maintenance	$6,108,137
Transportation of Things	$884,177
Travel of Personnel	$1,830,747
Utilities	$4,971,721
Total	$101,356,618
Other Procurement Types	
Education: Tuition Assistance	$592,807
Commissary (Inventory)	$49,314
Base Exchange (BX) Inventory	$200,489
Health Care (Tri-Care – Government Share only)	$1,123,454
Total	1,966,064
Grand Total	**$103,322,682**

Source: Laughlin AFB Economic Impact Statement (EIS) 2007

The FY07 total direct economic impact of Laughlin AFB on the local economy was $263 million dollars (Table 2-6).

Table 2-6. Estimated Economic Impact.

Category		
Annual Payroll		
Military		$67,343,023
DoD Civilian		$52,542,132
Other Civilian		$3,517,543
	Total	**$123,402,608**
Annual Expenditures (see Table 2-5)	**Total**	**$103,322,682**
Estimated Indirect Impact	**Total**	**$36,389,975**
	Grand Total	**$263,115,265**

Source: Laughlin AFB Economic Impact Statement (EIS) 2007

2.5 Flying Activity

Prior to the data collection that occurred in June 2006, the most recent AICUZ study for Laughlin AFB was accomplished in 2000 along with an environmental assessment for the beddown of T-6A. Since that previous AICUZ study, the aircraft types based at Laughlin AFB have changed, notably with the T-6A replacing the T-37 *Tweet* in two of the five squadrons (84 FTS, 85 FTS). The data collection and interim noise analysis that occurred in 2006 was in conjunction with an environmental assessment for operational changes and associated construction occurring as a result of relocating aircraft from Moody AFB, GA. Given these changes in aircraft fleet mix and numbers, a new study is warranted.

The mix of transient aircraft also can and usually does change from year to year. Transient aircraft generally fall into one of three categories: VIP transport (light business turboprop aircraft, such as the C-12 *Huron*), heavy airlift (including passenger jets such as DC-10s), or fighter aircraft based elsewhere that are temporarily visiting Laughlin AFB or using it as an emergency divert field (e.g., F-16 *Fighting Falcon).* The number of transient aircraft sorties also varies over time as operational requirements dictate; however, they represent a small fraction of airfield operations compared to activity from based aircraft.

2.5.1 Flight Operations by Aircraft Type

An operation is defined as one takeoff, one arrival, or half of a closed pattern. A closed pattern consists of both a departure portion and an approach portion (i.e., two operations). In addition to the based aircraft types (T-6A, T-1A and T-38C), transient aircraft from other military installations often land and take off at Laughlin AFB.

While the number of assigned, transient, and civil aircraft operations varies from day to day at an installation, the NOISEMAP computer program requires input of a specific number of daily flights and of aircraft maintenance engine run-up operations. For purposes of an AICUZ study, the "average busy day" is modeled in recognition that the level of flight operations can vary over the course of a year (Table 2-7). For example, at most bases, weekend flying operations are typically much less common. The use of an average busy day concept simply entails

normalizing the data so that they are representative of the activity occurring when the 47 FTW is flying (i.e., seldom on holidays and weekends).

Table 2-7. Baseline + Average Busy-Day Aircraft Operations* at Laughlin AFB.

Unit	Aircraft Type	Flying Days Per Year	Average Daily Operations	Average Annual Operations
86th FTS	T-1A	244	103.28	25,200.32
84th & 85th FTS	T-6A	233	1,653.59	385,286.47
87th FTS	T-38C	242	387.81	93,850.02
Transients	multiple	365	1.176	429.24
		TOTAL	**2,145.86**	**504,766.05**

Note: Baseline indicates data collected/validated during 2006 AICUZ collection and re-validated in 2007
Note: An operation is one departure (take-off) or one arrival (landing). A closed pattern consists of two operations (i.e., one departure and one arrival)
Source: GMI 2006, 2007

The typical T-6A, T-1A, or T-38C sortie consists of a departure from Laughlin AFB on a heading toward the training airspace followed with air work in the MOA, an arrival back at Laughlin AFB followed by radar and visual closed pattern work. The T-6A also will depart toward Spofford Auxiliary Airfield in Spofford, TX. Student pilots use this airfield to develop and maintain proficiency at takeoffs and landings.

The flight patterns (also referred to as flight tracks) are designed taking several factors into account and the operations most commonly observed along these tracks are a function of several factors including:

- The mission or purpose for which the sortie is being flown, and, closely related, the locations of the most commonly used training airspace units;
- The availability of training airspace;
- Noise abatement considerations;
- The prevailing weather conditions and winds; and
- Separation requirements from other aircraft in the vicinity.

Of these factors, the prevailing winds (which influences whether operations occur on Runways 13L/13C/13R or Runways 31R/31L/31C) and the mission (i.e., what training or operational scenario is being flown) are the predominant factors that influence which of the many flight tracks possible are the ones most commonly observed.

2.5.2 Runway and Flight Track Utilization

As noted, Laughlin AFB has three runways (13L/31R, 13C/31C, 13R/31L) oriented northwest/southeast. Traffic patterns for departures from and arrivals to the runways generally correspond to the training airspace in use by the sortie. Further, the closed pattern traffic is generally kept to each side of the runway complex to segregate aircraft having dissimilar characteristics. The T-6A primarily uses the inside runway (13L/31R) and occasionally uses the center runway, primarily for instrument approaches. The closed pattern traffic for this aircraft

overflies the main base area to the west of the runway. Similarly, the T-38C primarily uses the outside runway (13R/31L) and occasionally uses the center runway, again primarily for instrument approaches. The closed pattern traffic for this aircraft overflies the area east of the runways. The T-1A and transient aircraft use the center runway (13C/31C) and seldom perform closed pattern operations.

Generally, Runway 13 is used due to the prevailing winds, noise abatement, and other operational considerations. It is the preferred calm wind runway.

Other factors influencing the flight tracks observed at Laughlin AFB include:

- Takeoff patterns routed to avoid densely populated areas as much as practicable;
- Air Force criteria governing the speed, rate of climb, and turning radius for each type of aircraft;
- Efforts to control and schedule missions to keep noise levels low, especially at night; and
- Coordination with the FAA to minimize conflict with civilian air carrier and general aviation aircraft operations in the region.

As a result, aircraft operating at Laughlin AFB use the following basic flight patterns:

- Turning departures (departing southeast on Runways 13L/13C/13R followed by a turn north and then east toward the training areas);
- Straight out departure off Runway 13R toward Spofford Auxiliary Airfield (T-6A only);
- Straight in approach (typically used by transient aircraft); and
- Overhead landing pattern during which aircraft overfly the landing threshold at approximately 1,500 feet AGL, turn 180 degrees, fly outbound briefly, and then begin a continuous turn and descent while intercepting the final approach course. The overhead landing pattern describes an oval racetrack shaped course with about a 1-mile final approach segment. Compared to the straight-in approach, this is the most common arrival pattern.

Static engine run-ups are performed at Laughlin AFB, most often in conjunction with maintenance activities. To the maximum extent possible, engine runup locations have been established in areas that minimize noise exposure for people on-base as well as for those in the surrounding communities. Normal base operations may include a limited number of late night (after 10 PM and before 7 AM) engine runups. A “hush house”, an enclosed building with noise suppressors is used by the T-38C for high power static engine runs. Additionally, test cells are used. Both are located on the north side of the base, west of the runway complex.

The area of influence for airfield planning is concerned with three primary aircraft operational/land use determinants: (1) accident potential to occupants on the ground; (2) aircraft noise; and (3) hazards to operations from land uses (height obstructions, increased potential for bird-aircraft strike hazards, operations such as factories that emit smoke, dust, or light that adversely affect flight operations). Each of these concerns is addressed in conjunction with

mission requirements and safe aircraft operation to determine the optimum flight profile for each aircraft type. The flight tracks (Figures 2-5 through 2-11) are the result of such planning.

Runway 13/31 departure tracks reflect the training missions of the aircraft stationed at Laughlin AFB. For example, the T-6A and T-38C tracks generally are the result of a requirement to get to the training areas expeditiously. The T-6A training areas are south of the airfield in the Laughlin 2 MOA; additionally, the T-6A has departure tracks taking the aircraft toward Spofford Auxilairy Airfield. The T-38C training areas are north of the airfield, so turnout to the north occurs fairly quickly after takeoff when using Runway 13R. The T-38C also frequently uses a range to the east; a departure track that runs between the Laughlin 1 and Laughlin 2 MOA facilitates departures and de-conflicts them with ongoing training activity occurring within the MOAs. Transient departures typically turn east toward their destination, again going between the Laughlin 1 and 2 MOAs. Normally, departure rolls begin from the runway ends.

Arrivals to Laughlin AFB include both visual straight-in and overhead approaches to Runways 13/31; the overhead arrival turn away from the runway to the downwind leg (known as a “break” or “pitch”) usually occurs near the runway threshold, but in formation flights, the second ship typically turns about 5 seconds after the first (approximately 3,000 feet after the first ship turns), resulting in a break closer to mid-field. Breaks typically occur to the same side of the runway – that is, a T-6A break occurs to the west away from the center of the airfield and a T-38C break occurs to the east, again away from the center of the airfield. This practice provides separation and prevents dissimilar aircraft types from turning toward each other

The closed pattern flight tracks used by T-6A and T-38C traffic are similarly designed to de-conflict operations with each other by keeping them on opposite sides of the airfield. The closed patterns on Runway 13/31 are normally flown at 1,500 feet AGL for the T-38C and 1,000 feet AGL for the T-6A. Depending on the purpose of the maneuver, other altitudes may also be used. Closed patterns are often used to maintain pilot proficiency because they offer the greatest number of take-offs and arrivals in the shortest period of time.

2.5.3 Pre-Takeoff and Aircraft Maintenance Runup Operations

Pre-takeoff aircraft engine runs occur with every sortie. These runs usually occur in the parking space while the pre-flight checks are being performed and on taxiways at the ends of the runways while additional checks take place. Post-landing engine runs may also occur, again at the taxiways near the ends of the runway and in the parking space prior to shutdown at the end of a sortie. Additionally, engine maintenance run-ups occur in the parking area. If a runup with a higher power setting is required for testing or diagnostics, a location that is suitably designed for such purpose, such as a test stand, test cell, or hush house is used.

While the pre-takeoff and post-landing engine runs occur generally during the same timeframe as the sorties (i.e., day versus night), the maintenance runs have a greater night-time count than do flight operations. The maintenance personnel often use the period after the aircraft are finished flying for the day to perform required checks and maintenance so that aircraft are operational for the next day’s flying activities.

2.5.4 Aircraft Flight Profiles and Noise Data

For the purposes of this AICUZ study, an aircraft flight profile denotes the engine power settings, altitudes above ground level, and aircraft airspeeds along a flight track. All Laughlin AFB aircraft flight profiles were obtained by interviewing pilots assigned to units based at

Laughlin AFB that operate the aircraft. Flight simulators also were used in some cases to help identify flight profile data. The data is then put into the NOISEMAP computer program and DNL contours are computed. NOISEMAP computes DNLs by either interpolating or extrapolating sound levels from a standard noise library to match the aircraft's configuration. The standard noise library is the result of controlled field measurements for each aircraft type.

Atmospheric temperature and relative humidity are important factors in the propagation of noise since they affect the ability of the atmosphere to absorb or attenuate noise. Laughlin AFB's climate is temperate, characterized by long hot summers and shorter, usually mild winters. As a semi-arid climate, it has fairly broad daily temperature swings compared to other parts of the country due to a low relative humidity.

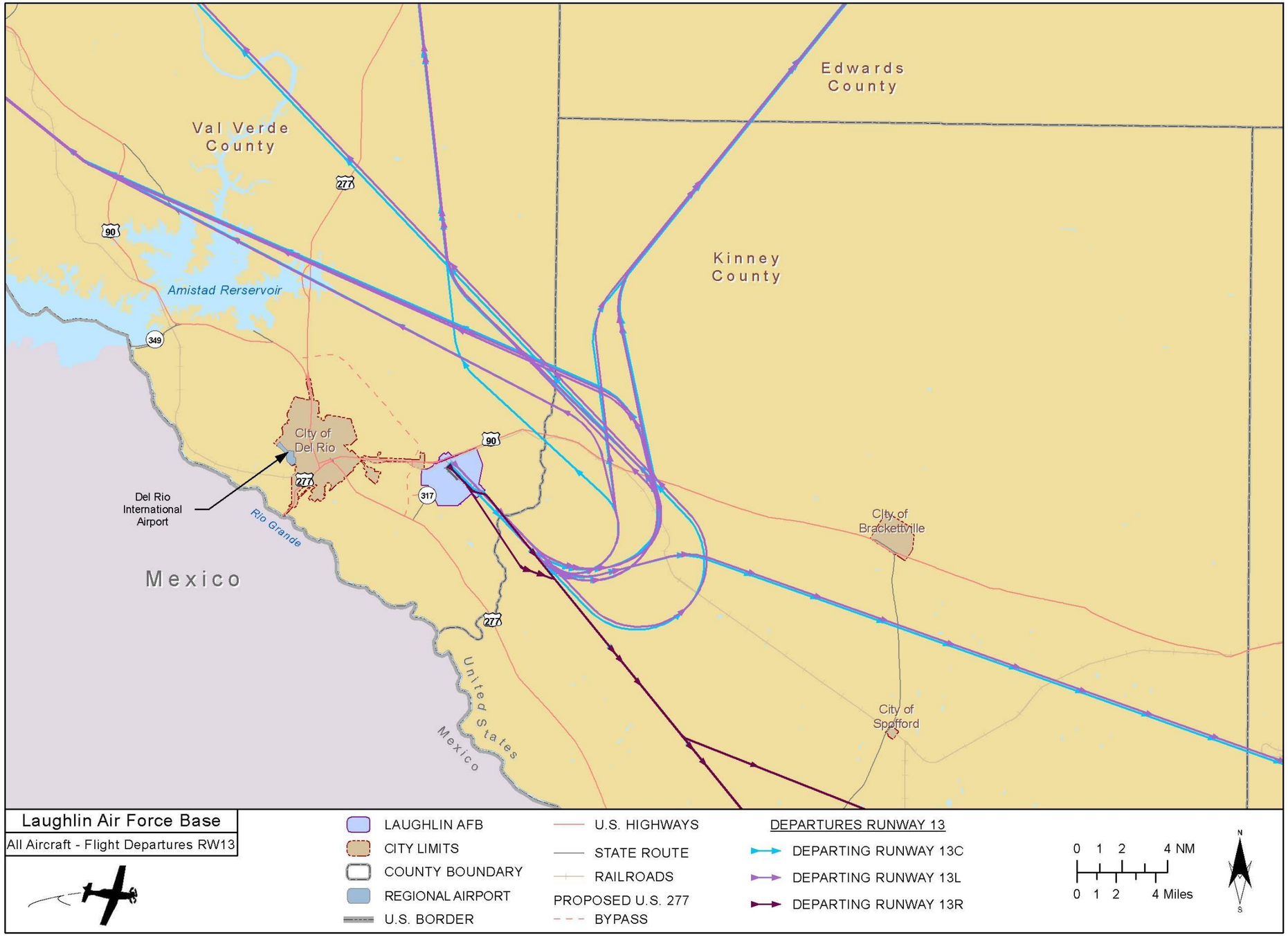

Figure 2-5. All Aircraft Flight Departures Runways 13L/13C/13R .

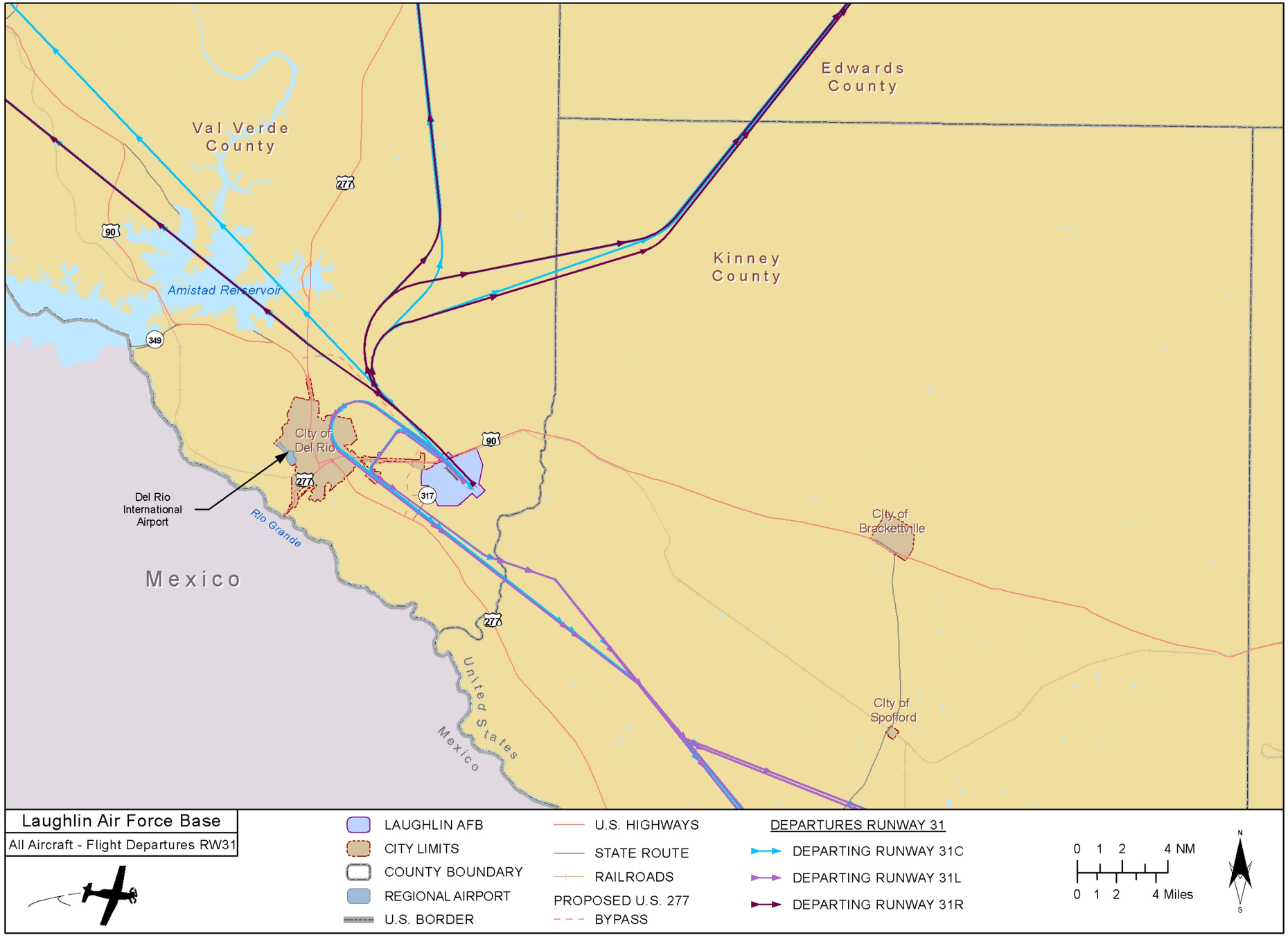

Figure 2-6. All Aircraft Flight Departures 31R/31C/31L.

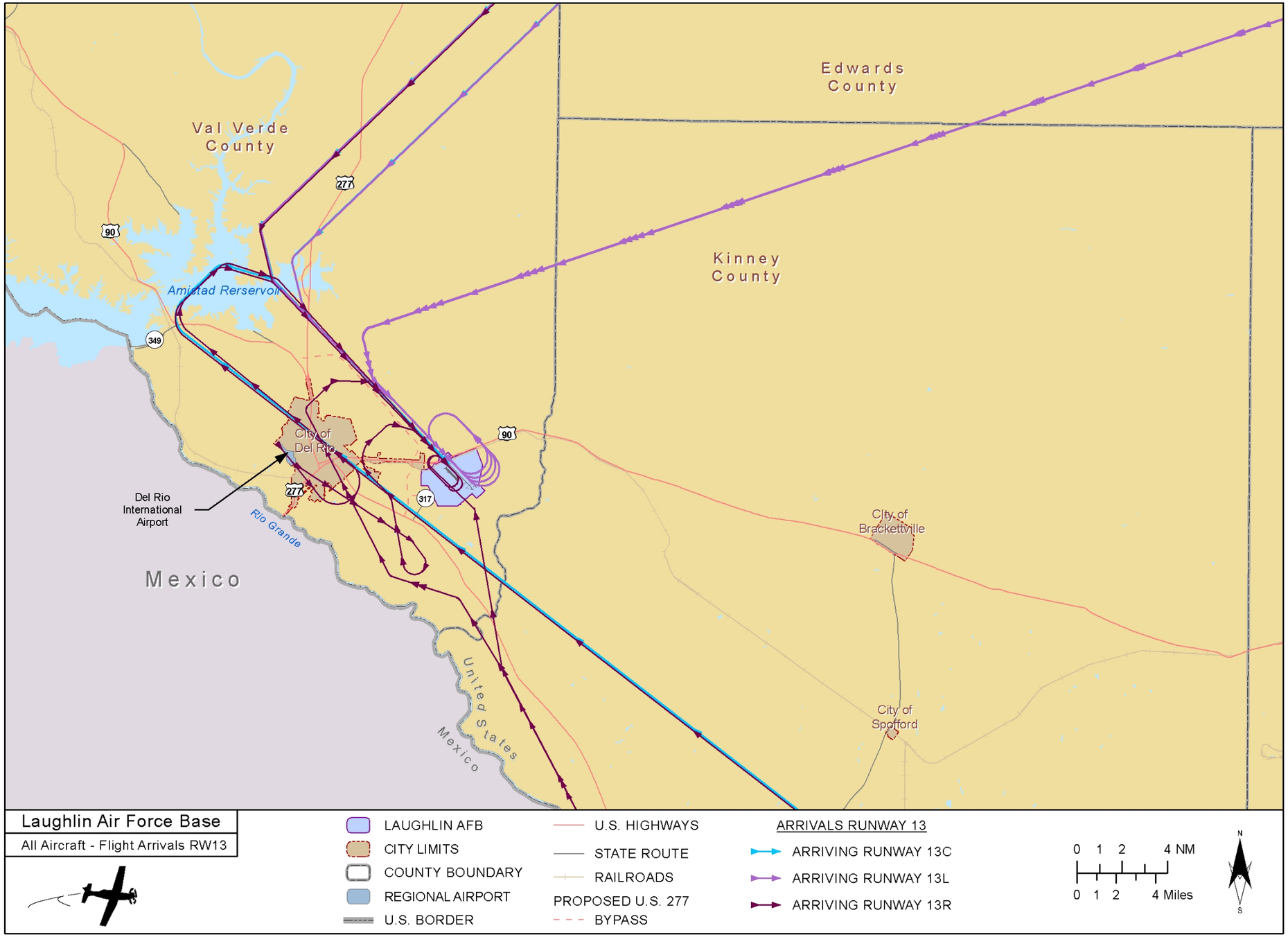

Figure 2-7. All Aircraft Flight Arrivals Runways 13L/13C/13R.

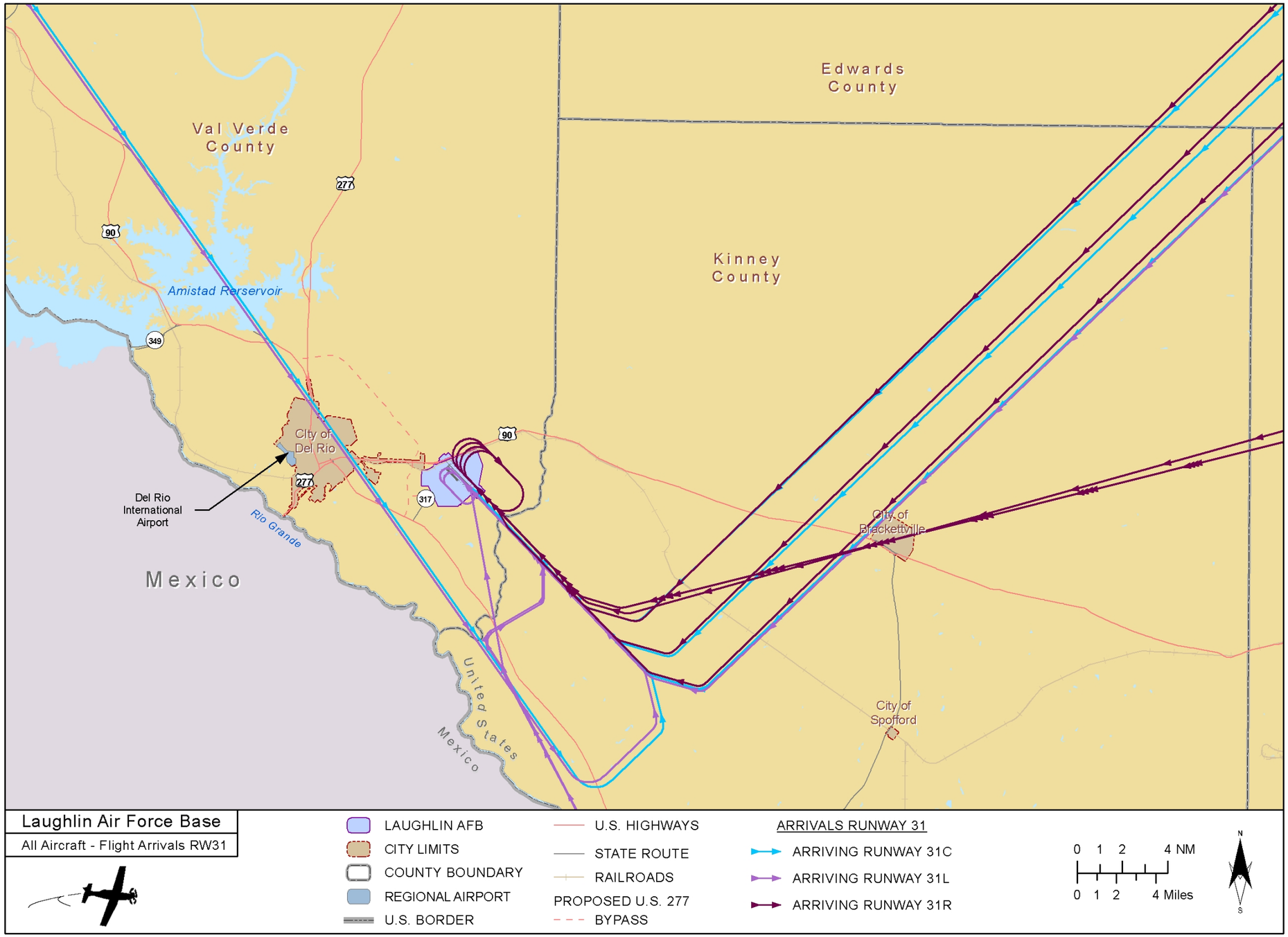

Figure 2-8. All Aircraft Flight Arrivals Runways 31R/31C/31L.

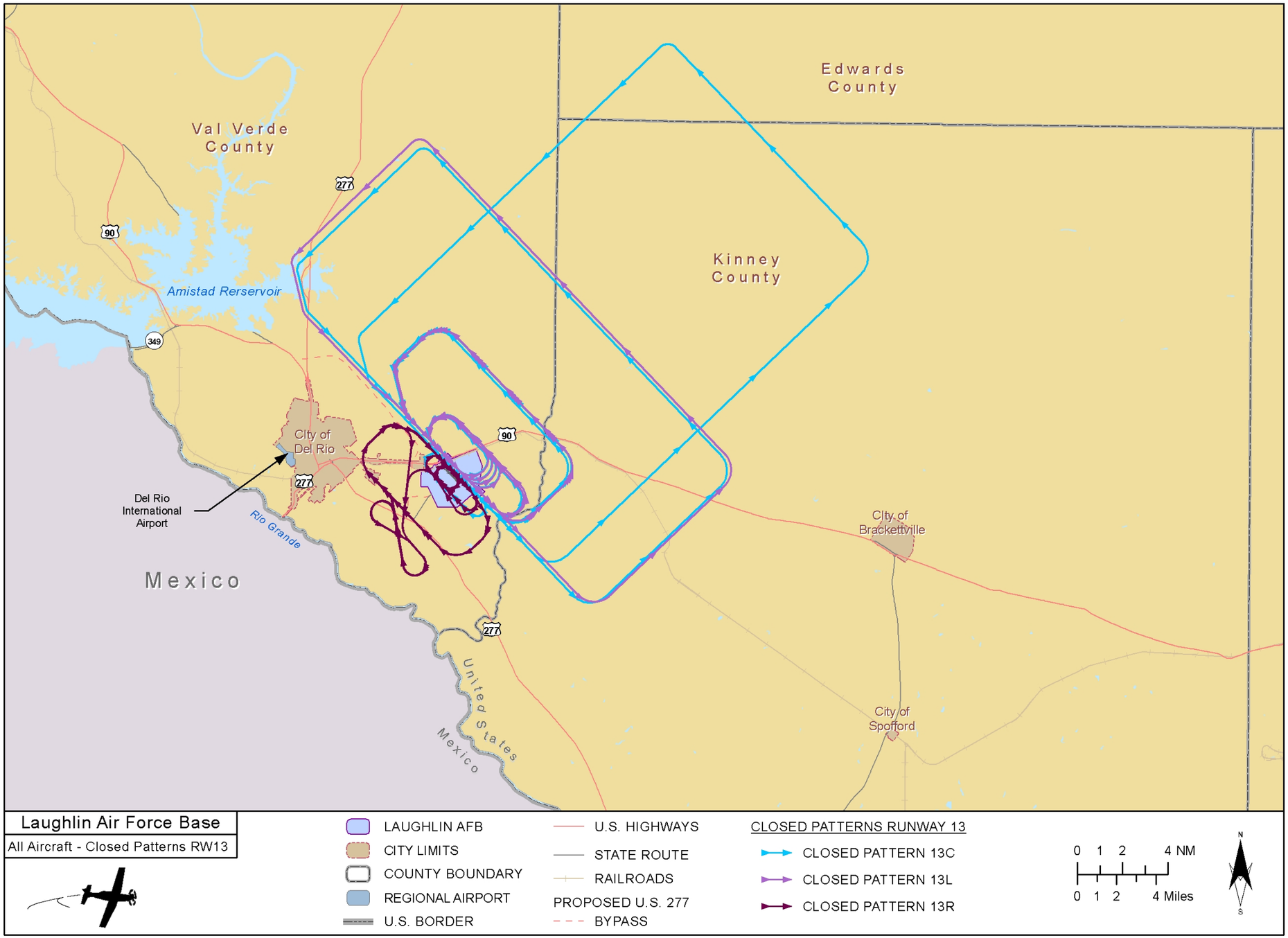

Figure 2-9. All Aircraft Closed Patterns Runways 13L/13C/13R.

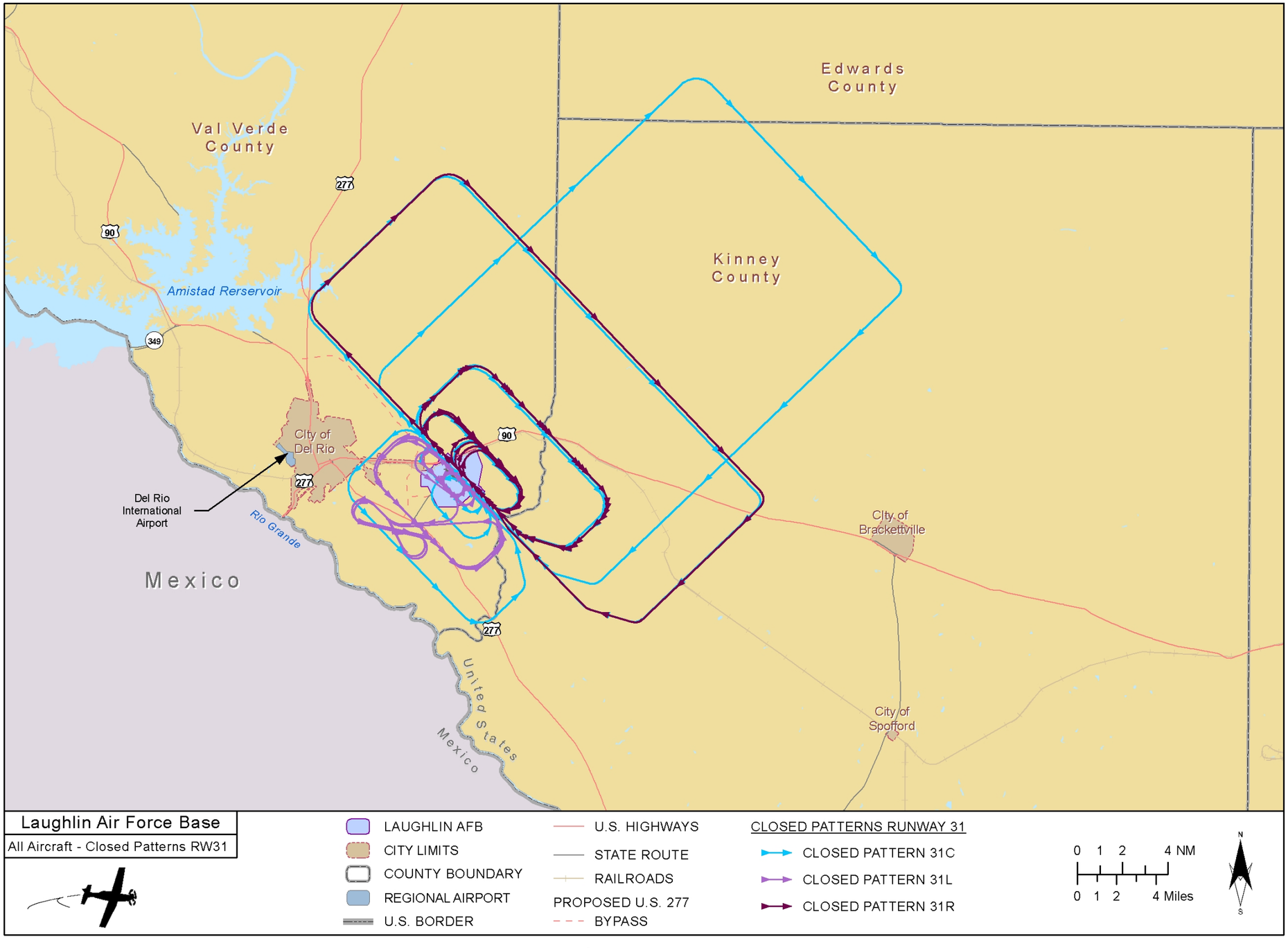

Figure 2-10. All Aircraft Closed Patterns Runways 31R/31C/31L.

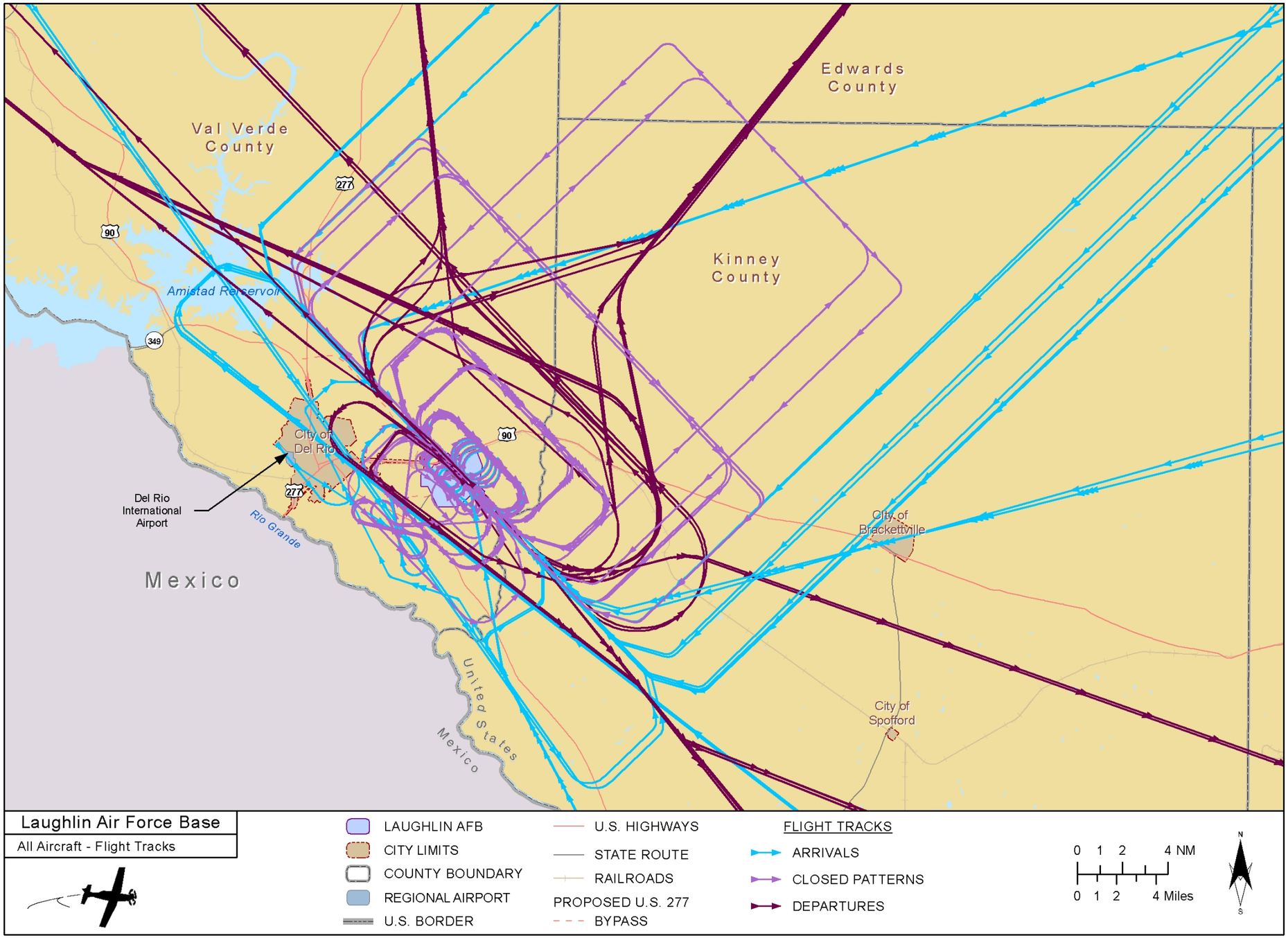

Figure 2-11. All Aircraft Flight Tracks.

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3.0 LAND USE COMPATIBILITY GUIDELINES

3.1 Introduction

The DoD developed the AICUZ Program to protect aircraft operational capabilities at its military airfields and to assist local government officials in protecting and promoting the public health, safety, and quality of life. The goal of the program is to promote compatible land use development around military airfields by providing information on aircraft noise levels and accident potential.

AICUZ reports describe three basic types of constraints that affect or result from flight operations. The first constraint involves areas identified by the FAA and DoD where height limitations on structures exist to prevent obstructions to air navigation. Airspace Control Surface Plans, which are based on Federal Aviation Regulations, designate height standards that determine whether an object constitutes an obstruction to air navigation.

The second constraint regarding flight operations involves the potential effects arising from noise exposure resulting from aircraft overflight and ground engine runs. Detailed sociological studies conducted by federal agencies over the past few decades have shown a correlation between certain noise exposure levels and increased levels of human annoyance. One of the purposes of the DoD AICUZ Program is a comparison of the land uses in the vicinity of its airfields to noise zones. Using the NOISEMAP computer program, which is similar to the FAA's Integrated Noise Model (INM), the DoD produces noise contours showing the DNL that would be generated by current levels of aircraft operations. These contours (lines connecting points of equal noise exposure) are expressed in terms of the DNL. Essentially, the DNL metric is the average noise level over a 24-hour period with a 10 dB penalty added to aircraft flights that occur between 10 PM and 7 AM to account for their increased annoyance. This AICUZ report contains noise contours plotted in increments of 5 dB, ranging from a DNL of 65 dB to 80 plus dB. Additional information on the methodology used for analyses in this report is contained in Appendix C of Volume II.

The third constraint involves APZs based on statistical analyses of past DoD aircraft accidents. DoD analyses have determined that the areas immediately beyond the ends of runways and along the approach and departure flight paths have significant potential for aircraft accidents. Based on these analyses, DoD developed three zones that have high relative potential for accidents. The CZ, or area closest to the runway's end, is the most hazardous area. The overall risk of an accident is so high that DoD generally acquires the land through purchase or easement to prevent development. APZ I is an area beyond the CZ that possesses a significant potential for accidents. APZ II is an area beyond APZ I having lesser, but still significant potential for accidents. While the aircraft accident potential in APZs I and II does not warrant land acquisition by the Air Force, land use planning and controls are strongly encouraged in these areas for the protection of the public. The CZ for the runways at Laughlin AFB (13L/31R, 13C/31C, 13R/31L) is 3,000 feet wide by 3,000 feet long. APZ I for these runways is 3,000 feet wide by 5,000 feet long, and APZ II is 3,000 feet wide by 7,000 feet long. Additional information on the methodology associated with accident potential is contained in Appendix B of this report's Volume II.

3.2 Airspace Control Surfaces

Airspace Control Surfaces or "Imaginary Surfaces" are graphic representations resulting from the application of criteria for height and obstruction clearance found in the Code of Federal Regulations (CFR), Title 14, Part 77 (FAR Part 77) and in Air Force design standards for its airfields. The design standards for Laughlin AFB are found in the DoD's Unified Facility Criteria (UFC) 3-260-01 *Airfield and Heliport Planning and Design* (Figure 3-1). Under the standards of the UFC, Laughlin AFB has a Class B runway. For a more complete description of obstruction evaluation/airport airspace analysis (OE/AAA), see FAR Part 77 and the UFC. Additional information on this topic is provided in Volume II, Appendix D.

The purpose of these airspace control surfaces is to prevent construction of structures whose height would tend to compromise the ability of airplanes to land in adverse weather and, in the case of military airfields, to designate airspace required to safely conduct military training maneuvers. During periods of adverse weather conditions, course guidance is provided to pilots and minimum flight altitudes are observed to prevent collisions with terrain and man-made structures. If tall structures are built near airfields, the minimum in-flight altitude must also be increased.

The utility of an airfield is diminished when its minimum obstacle avoidance altitudes are increased, because the likelihood of having to divert to other airfields during adverse weather increases. A weather divert to another airfield consumes additional fuel and to allow for that possibility, training time is diminished. At Laughlin AFB, increases to minimums in flight altitudes would severely limit the viability of pilot training conducted by the 47 FTW squadrons.

3.2.1 Land Uses Hazardous to Air Navigation

Controls discouraging land uses that are inherently hazardous to aircraft or flight crews should be developed. The following uses should be restricted or prohibited in the vicinity of an airfield:

- Uses which release into the air any substance which would impair visibility or otherwise interfere with the operation of aircraft (i.e., steam, dust, or smoke from industrial operations);
- Uses which produce light emissions, either direct or indirect (reflective), which would interfere with pilot vision;
- Uses which produce electrical emissions which would interfere with aircraft communications systems or navigational equipment;
- Uses which would attract birds or waterfowl, including but not limited to, operation of sanitary landfills, maintenance of feeding stations, sand and gravel dredging operations, storm water retention ponds, created wetland areas, or the growing of certain vegetation; and
- Uses that provide for structures within ten feet of aircraft approach-departure and/or transitional surfaces outlined above.

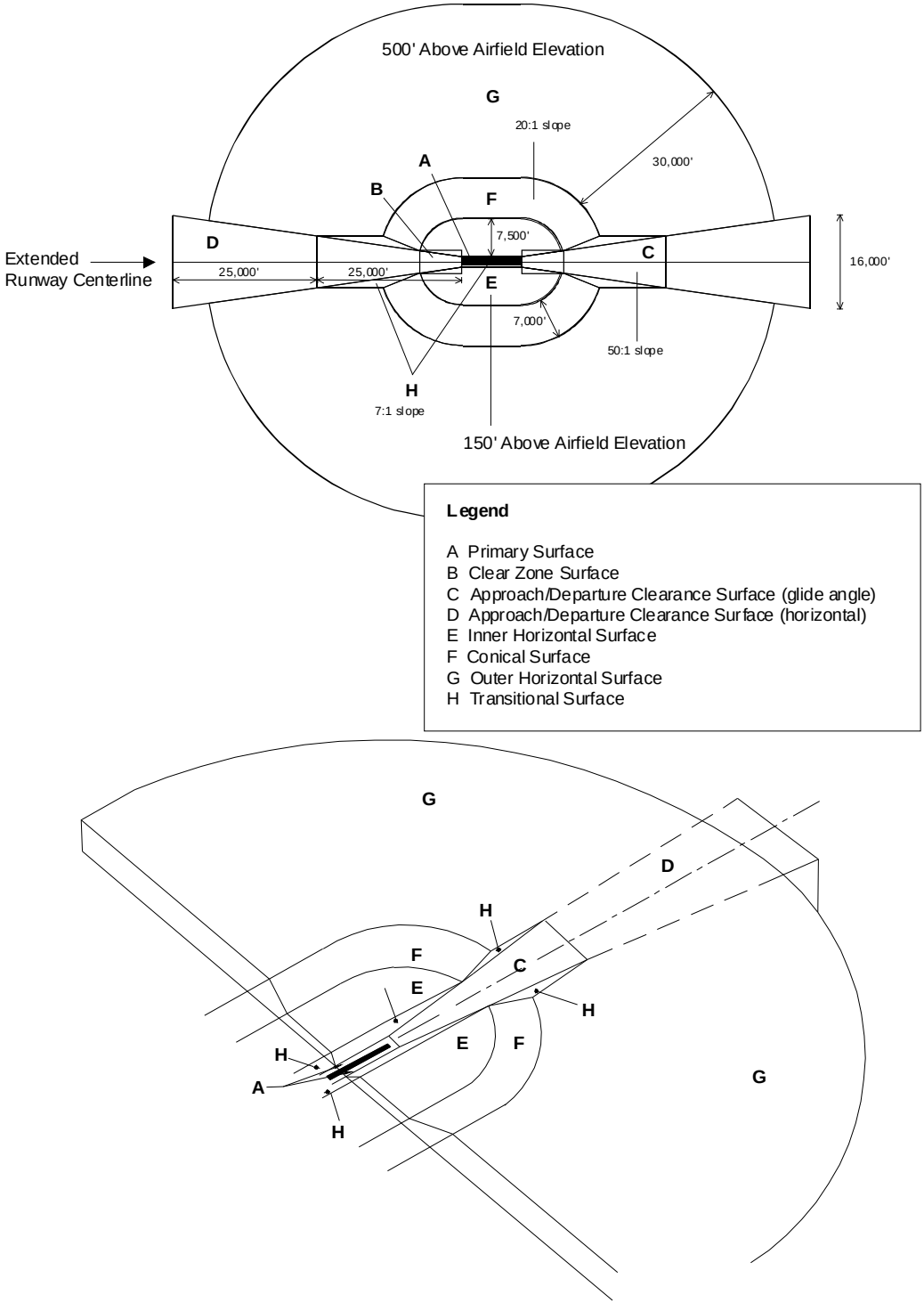

Figure 3-1. Plan View of FAR Part 77 Imaginary Surfaces.

3.3 Noise Due to Aircraft Operations

Using the NOISEMAP computer program, which is similar to FAA's INM, the Air Force produces DNL noise contours showing the areas with significant exposure to aircraft noise. The DNL noise metric averages aircraft sound levels over a complete 24-hour period with a 10 dB penalty added to those noise events taking place between 10 PM and 7 AM. This adjustment is made because most people are sleeping during these hours and generally winds diminish during this period, enabling the same sound energy to carry further than it would otherwise during the day. This AICUZ study contains noise contours plotted in increments of 5 dB, ranging from 65 DNL to 80+ DNL.

Based on the aircraft operations data presented in Section 2.5, NOISEMAP (Version 7.0) was used to calculate and plot the average busy-day contours for DNL 65 dB through DNL 80+ dB for the anticipated aircraft operations. At the current operational tempo of 2,145 daily operations (504,766 annual operations) along the mix of flight tracks depicted in Chapter 2, the primary DNL 65 dB contour extends northwest from the center of the runway approximately 4.1 miles. A second, isolated DNL 65 dB contour extends 6.0 miles from the center point of runway complex. To the southeast, also along the axis of the runway centerline, the same primary DNL 65 dB contour extends to 5.9 miles from the center of the runway complex. The primary DNL 65 dB contour extends to the sides of the runway complex, 1.5 miles to the northeast and 1.0 miles to the southwest. Lateral extensions of up to 3 miles project from the runway centerlines in a generally perpendicular fashion. East of the airfield, another isolated, secondary DNL 65 dB contour extends about 3.5 miles from the extended runway centerline (Figure 3-2).

Using year 2000 population data from the U.S. Census Bureau (USCB) combined with aerial photography, it is possible to estimate the number of persons occupying land that falls within a noise contour (Figure 3-3). The population and dwelling data were obtained from the USCB 2000 census. The total area in each contour outside the base boundary and the number of residents within each contour were calculated for comparison purposes. The estimated total number of persons exposed to a DNL of greater than 65 dB is 759; of that, all reside off base. The total land area underlying an area of noise exposure greater than 65 dB DNL is 10,644 acres, with 8,427 of those acres located off-base (Tables 3-1 and 3-2).

A contour is a line connecting points of equal noise exposure; however, the line is not intended to be viewed as boundary. Aircraft noise does not stop at the edge of a noise contour. A 3 dB change is the point at which the human ear can begin to distinguish between noise levels. It is also important to note that predicted noise exposure contours fluctuate over time and that the contours shown are a snapshot of activity found on an average busy day in 2006-2007. For that reason, it is useful to show previous contours and to project future levels of activity. Although no change in aircraft mix is projected for the next five years, it is foreseeable that flying hour budgets and sorties generated by the 47 FTW may increase. Projecting a reasonably anticipated potential increase in flying activity based on forecasts prepared in 2006/2007, it becomes possible to depict a hypothetical contour. A comparison of the contour plots from the 2007 data, the previous 2000 AICUZ and a 2012 hypothetical case indicates that during this 12-year timeframe, the land area exposed to noise greater than 65 dB DNL can and would fluctuate (Figure 3-4). This is largely due to variations in the number of flight operations and changes to the mix of aircraft stationed at Laughlin AFB. Between 2000 and 2007, the flight tracks have not changed significantly, although some minor changes in procedures have occurred.

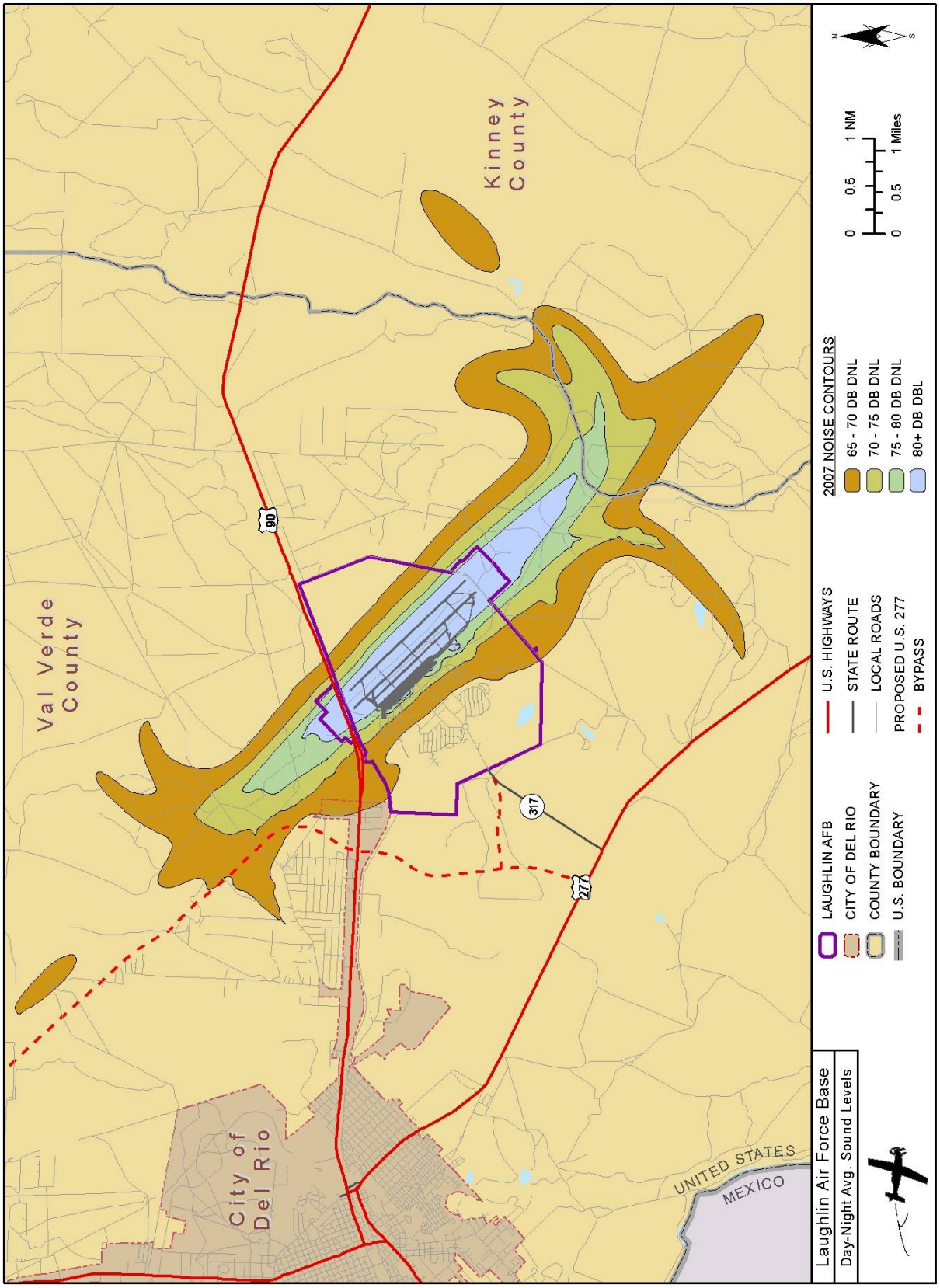

Figure 3-2. Day-Night Average Sound Levels.

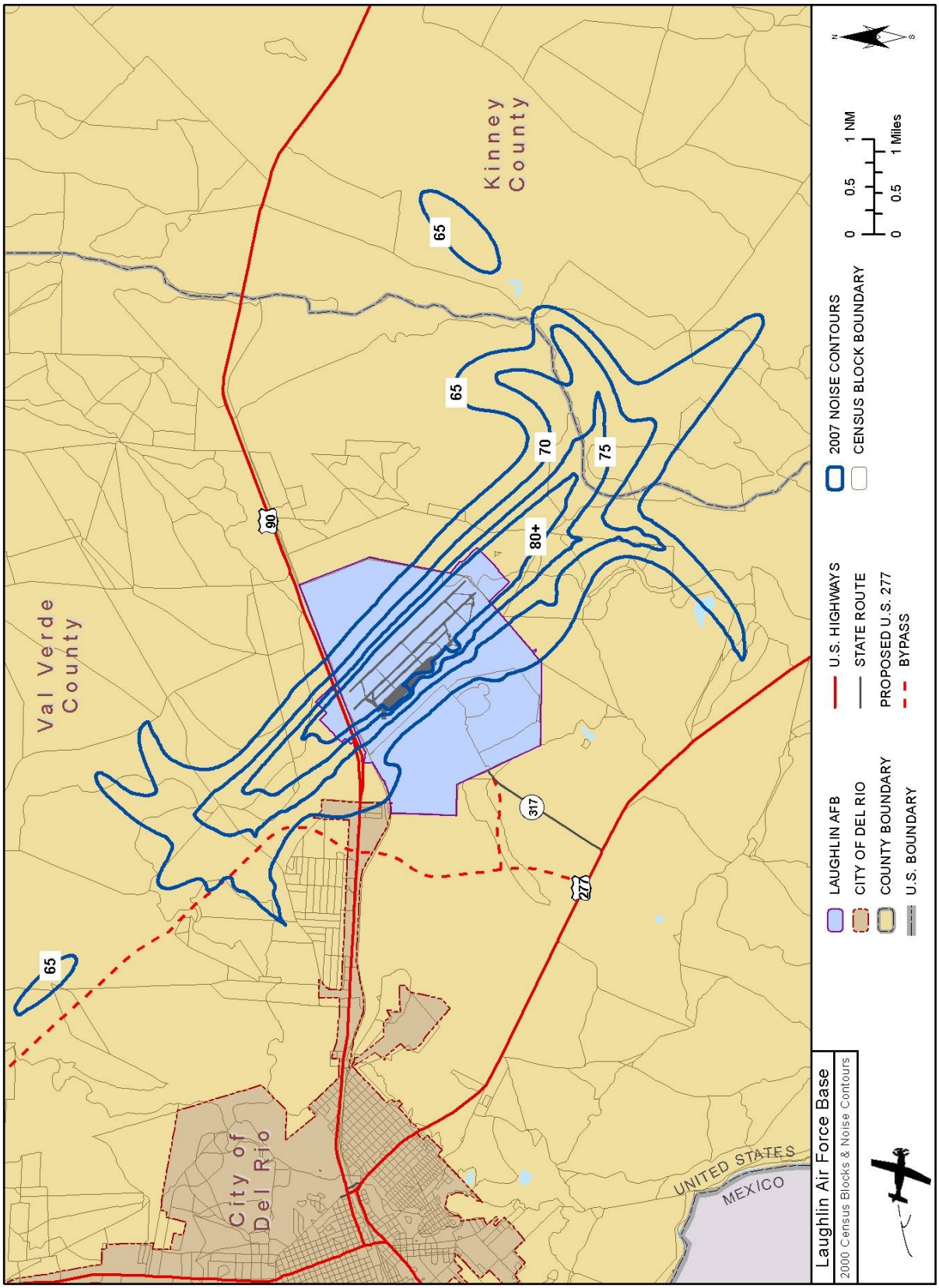

Figure 3-3. 2000 Census Blocks and Noise Contours.

Table 3-1. Total Areas and Estimated Population (2000 Census) Residing within the 65 to 80+ dB Contours.

DNL Noise Zone	Acres	Population
65–69	5,720	630
70–74	2,380	59
75–79	1,178	34
80+	1,366	36
Total	10,644	759

Source: U.S. Census Bureau (USCB) 2000 SF1 (Block Level); 108th CD Census 2000 TIGER/Line

Table 3-2. Off-Base Areas and the Estimated Number of Individuals (2000 Census) Residing within the 65 to 80+ dB Noise Contours.

DNL Noise Zone	Acres	Population
65–69	5,002	630
70–74	2,032	59
75–79	928	34
80+	465	36
Total	8,427	759

Source: U.S. Census Bureau (USCB) 2000 SF1 (Block Level); 108th CD Census 2000 TIGER/Line

3.4 CZs and APZs

This section describes the accident potential criteria that are used to define the CZs and APZs and apply them to Laughlin AFB. Section 3.4.1 presents the standards for defining CZs and APZs and Section 3.4.2 indicates how those standards apply to Laughlin AFB.

3.4.1 Standards for CZs and APZs

Areas around military airfields are exposed to the possibility of aircraft accidents. While the maintenance of aircraft and the training of aircrews are rigorous, it should be understood that military flights at Laughlin AFB are primarily for the purpose of training. Despite stringent maintenance requirements and countless hours of training, history shows that accidents occur. Accidents of military aircraft differ from accidents of commercial air carriers and general aviation due to the variety of aircraft flown, the type of missions, and the number of training flights.

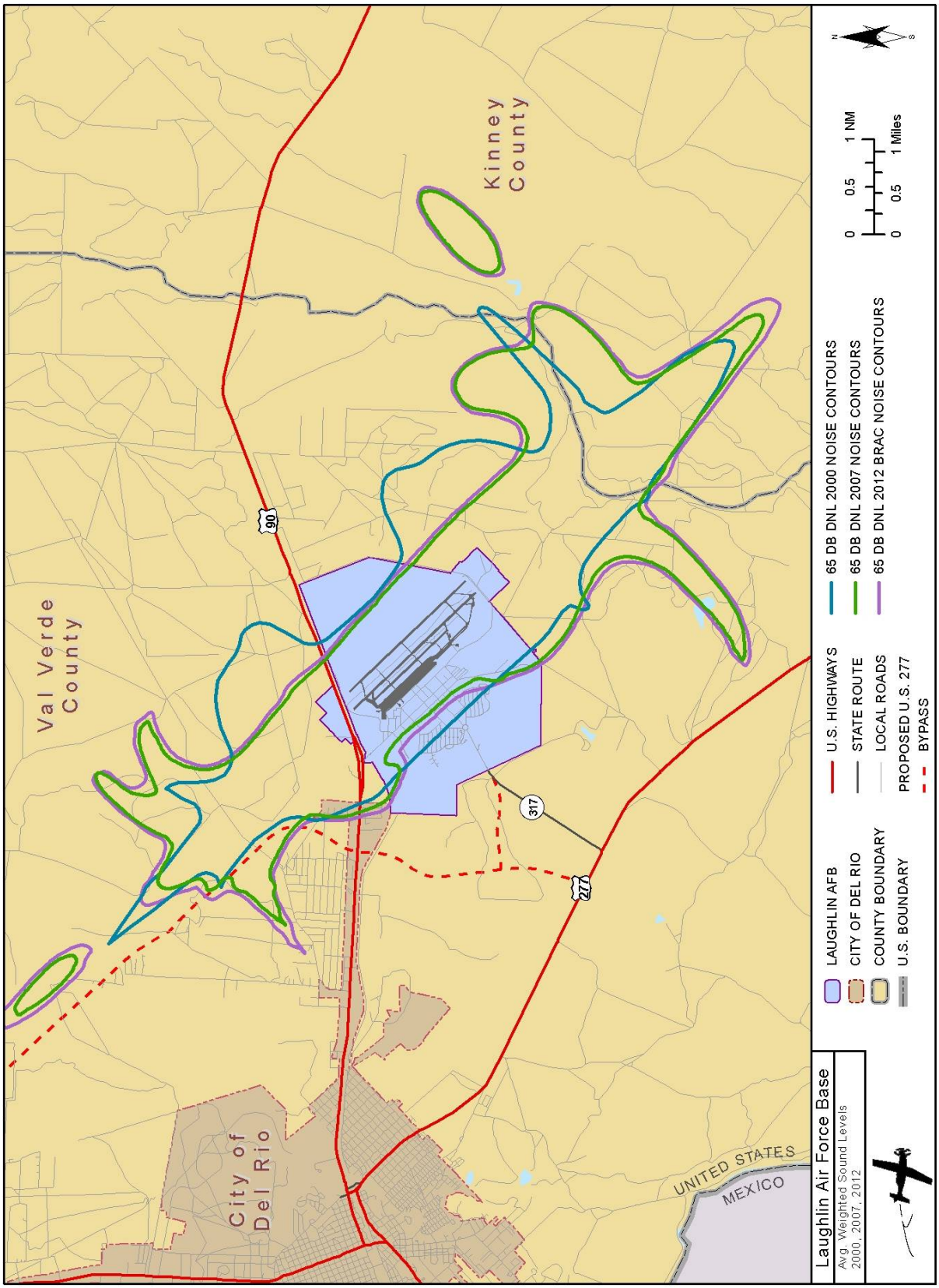

Figure 3-4. *A*-Weighted Sound Levels.

Although the risk to people on the ground being killed or injured by aircraft accidents is small, an aircraft accident is a high-consequence event. When a crash occurs, the result is often catastrophic. As a result, the Air Force does not attempt to base its safety standards on accident probabilities, but instead approaches this safety issue from a land-use planning perspective. Designation of safety zones around airfields and restrictions of incompatible land uses can reduce the public's exposure to aircraft safety hazards.

Based on analysis of 834 Air Force accidents at Air Force bases from 1968 through 1995 that occurred within 10 miles of the associated base, three planning zones were established; the CZ, APZ I, and APZ II. Each end of a runway has a CZ that starts at the runway threshold and extends outward 3,000 feet with a width of 3,000 feet. Of the three safety zones, the CZ has the highest potential for accidents with 27 percent of the total accidents studied having occurred in this zone. The Air Force has adopted a policy of acquiring property rights through purchase or easement to areas designated as CZs.

APZ I extends outward from the CZ an additional 5,000 feet. This area has a significant though reduced accident potential. Ten percent of the accidents studied occurred in this area. APZ I is 3,000 feet wide and 5,000 feet long beginning 3,000 feet from the runway endpoint along and centered on the extended runway centerline.

APZ II extends from the outer end of APZ I an additional 7,000 feet. This is an area having lesser, but still significant potential for accidents. Five percent of the accidents studied occurred in this area. APZ II is 3,000 feet wide and 7,000 feet long beginning 8,000 feet from the runway endpoint along and centered on the extended runway centerline.

While the aircraft accident potential in APZs I and II does not warrant land acquisition by the Air Force, land use planning and controls are strongly encouraged in these areas for the protection of the public. Of the Air Force accidents studied, 15 percent occurred in APZs I and II. The area extending 1,000 feet out from each side of the runway centerline for the length of the runway accounted for 25 percent of the accidents analyzed. The remaining 33 percent occurred outside APZ II but were dispersed within 10 miles of the associated airfield.

3.4.2 CZs and APZs at Laughlin AFB

The Laughlin AFB CZs and APZs are based on the configuration of the runway (Figures 3-5, 3-6, and 3-7). Just as population estimates and areas were derived within noise contours, population (based on 2000 census data) and areas associated with CZs and APZs can be estimated (Figure 3-8). It is estimated that 2 persons reside within the CZs for Runways 13L/31R, 13C/31C, and 13R/31L; it is estimated that 41 persons reside within the APZs associated with these runways (Table 3-3). A review of aerial photography and census data indicates that none of the estimated CZs or APZs I or II population resides on the base.

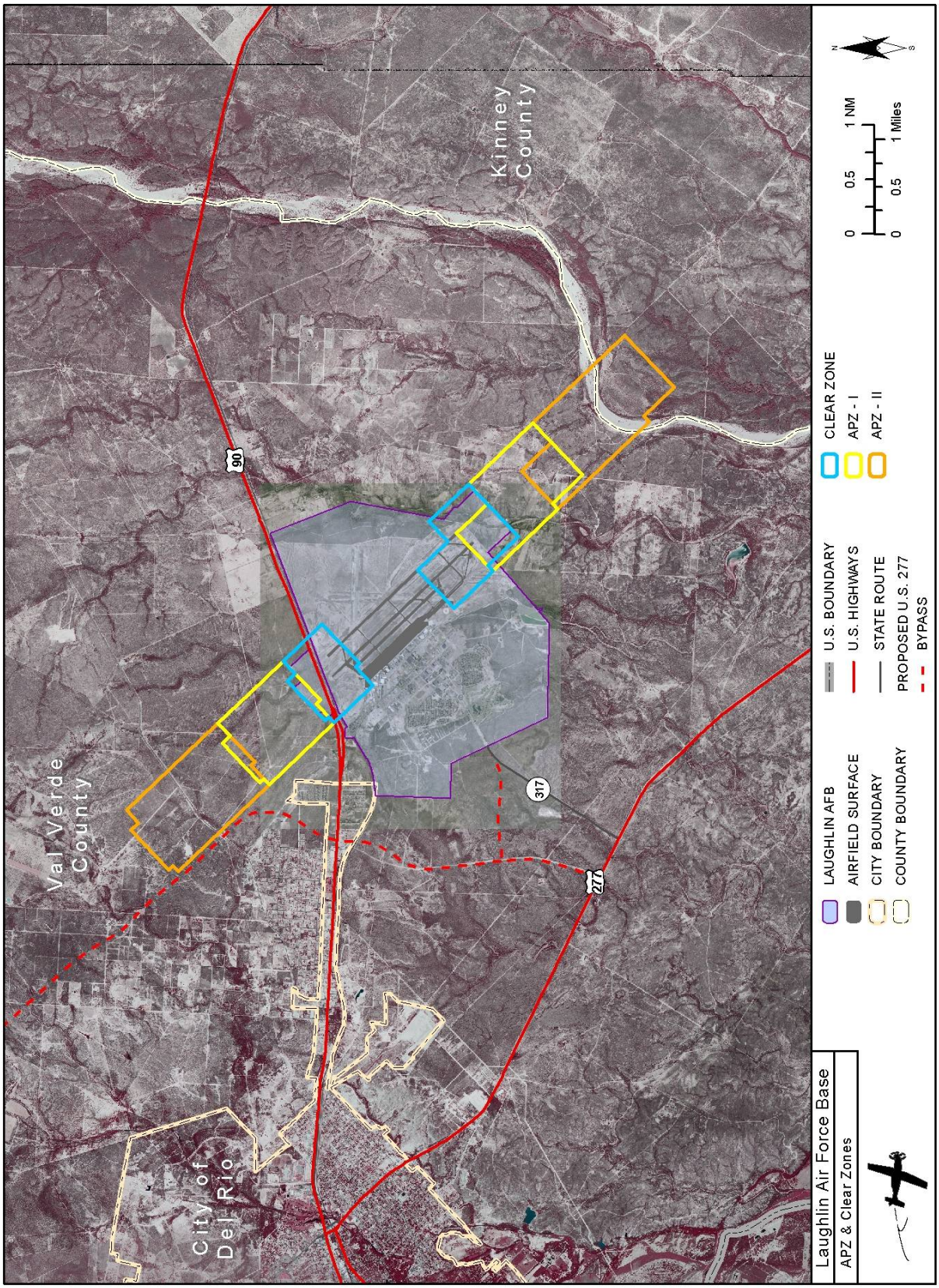

Figure 3-5. APZ and CZs.

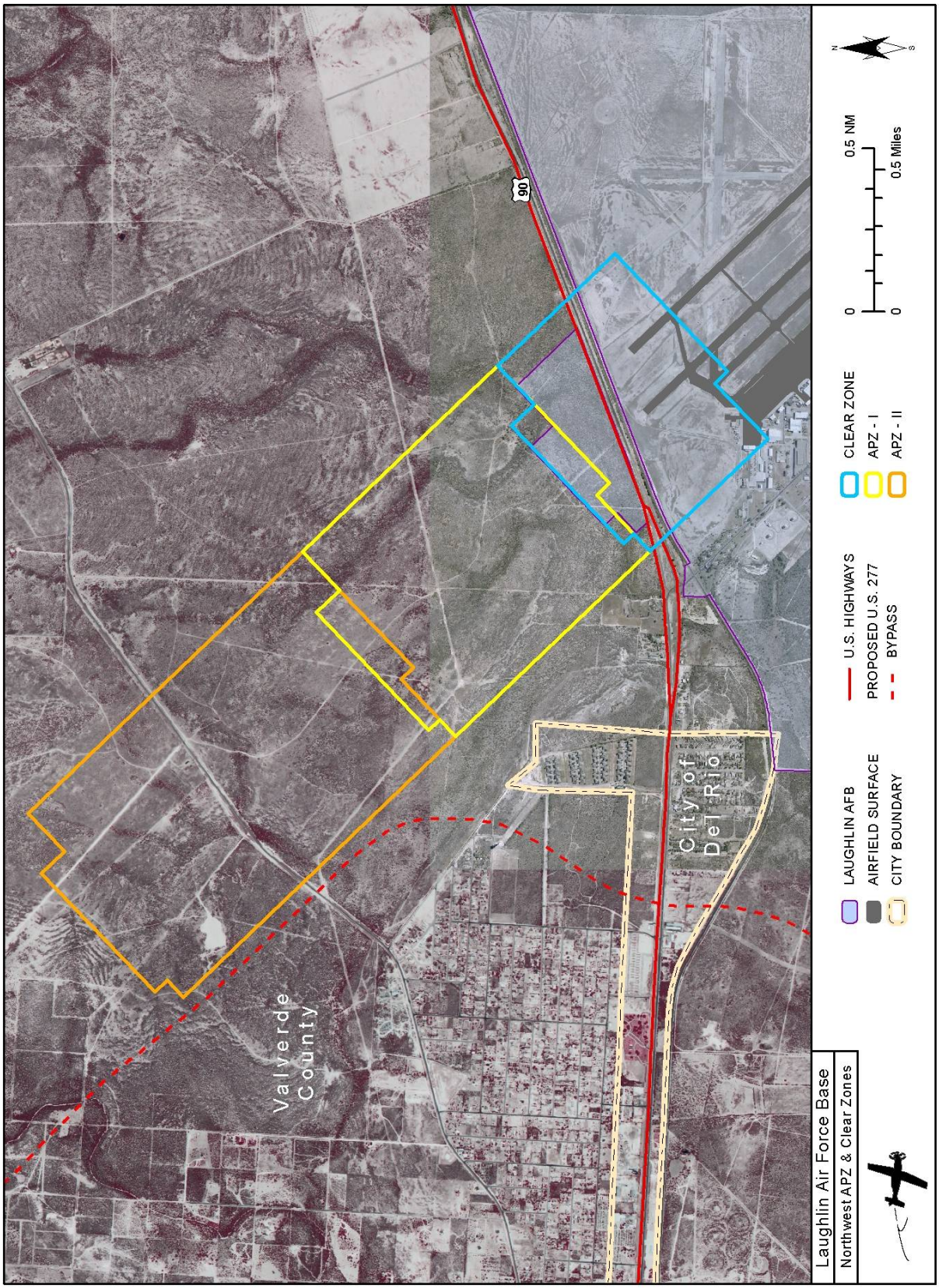

Figure 3-6. North APZ and CZs.

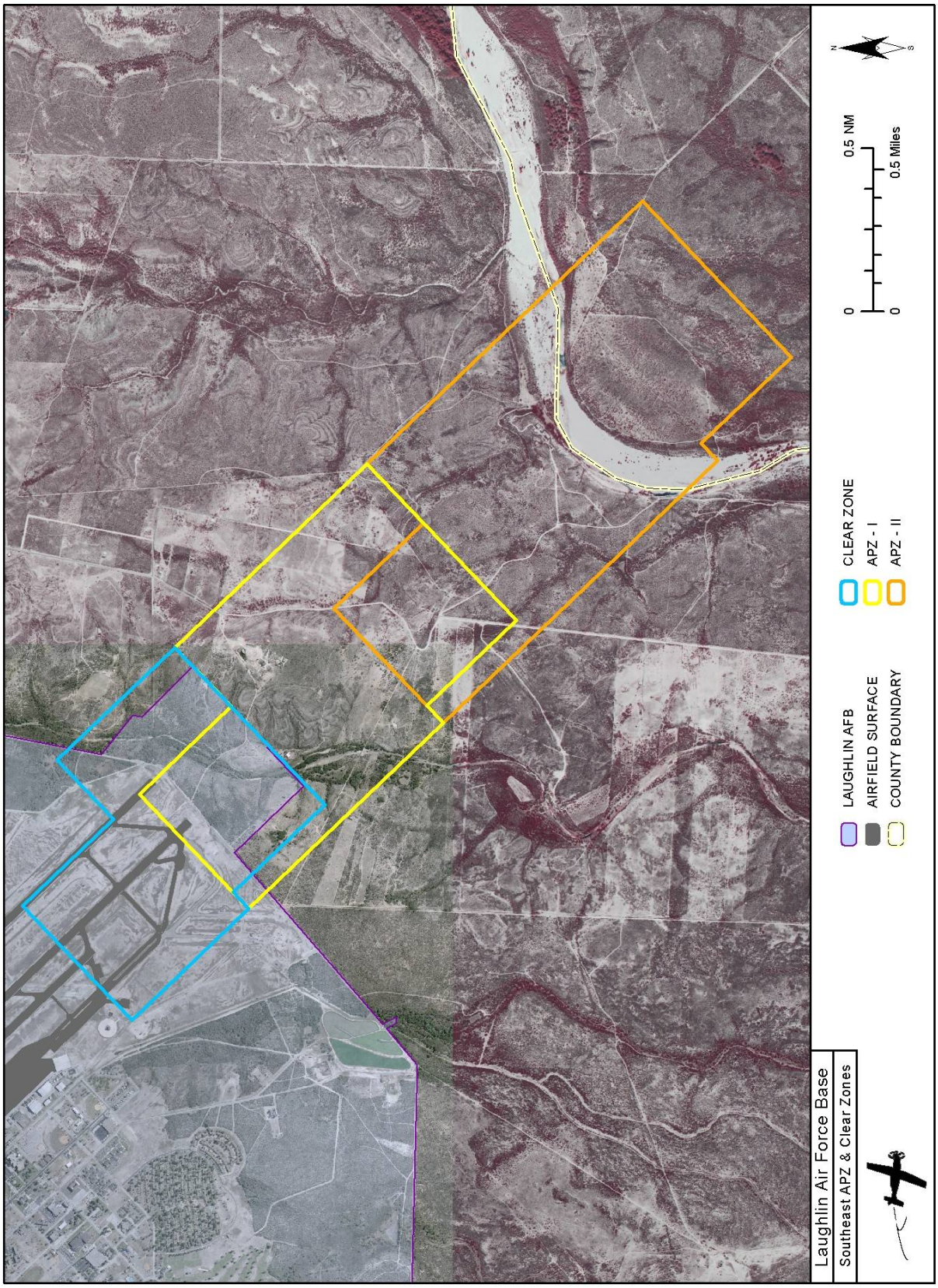

Figure 3-7. South APZ and CZs.

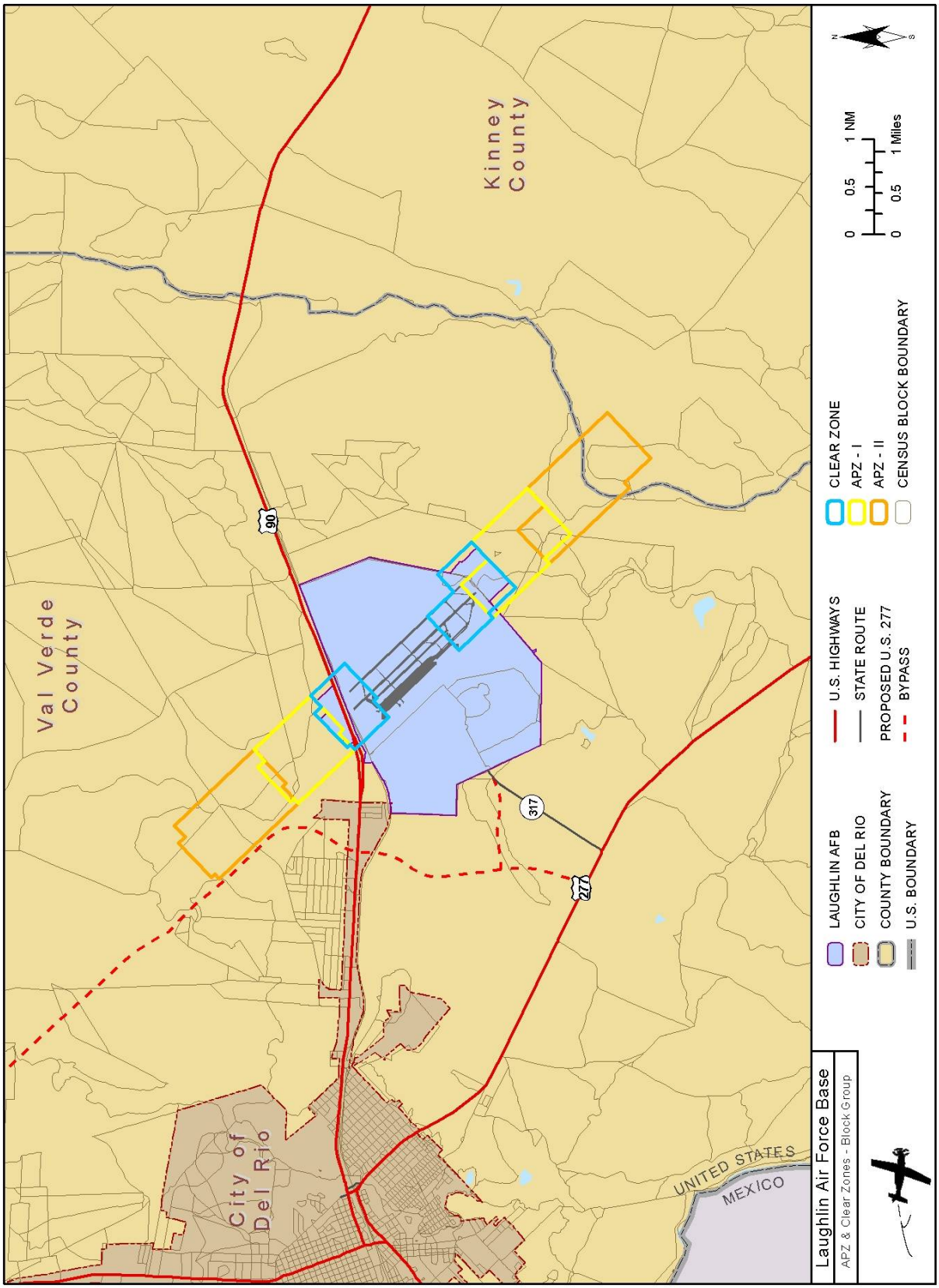

Figure 3-8. APZ and CZs—Census Block.

Table 3-3. Total Acres and Population (2000 Census) Residing within the Laughlin AFB Runway 13L/31R, 13C/31C, and 13R/31L APZs.

APZ	Acres	Off-Base Acres	Population
CZ	992	111	2
APZ I	1186	1042	33
APZ II	1607	1607	6
Total	3775	2760	41

Source: U.S. Census Bureau 2000 SF1 (Block Level); 108th CD Census 2000 TIGER/Line

3.5 Land Use Compatibility

Each AICUZ report contains land use guidelines. Combinations of noise exposure and accident potential at Laughlin AFB have been considered in relation to land uses, with an ultimate determination of their compatibility (Table 3-4). Noise guidelines are essentially the same as those published by the Federal Interagency Committee on Urban Noise in the June 1980 publication, *Guidelines for Considering Noise in Land Use Planning and Control.* The DoT publication, *Standard Land Use Coding Manual (SLUCM),* has been used for identifying and coding land use activities.

3.6 Participation in the Planning Process

As local communities prepare their land use plans, the Air Force must be ready to provide data and information. The Base Civil Engineer has been designated as the official liaison with the local community on all planning matters. This officer is prepared to participate in the continuing discussion of zoning and other land use matters as they may affect, or may be affected by, Laughlin AFB.

Table 3-4. Land Use Compatibility, Noise Exposure, and Accident Potential.

LAND USE		ACCIDENT POTENTIAL ZONES			NOISE ZONES			
SLUCM NO.	NAME	CLEAR ZONE	APZ I	APZ II	65-69 dB	70-74 dB	75-79 dB	80+ dB
10	Residential							
11	Household units							
11.11	Single units; detached	N	N	Y[1]	A[11]	B[11]	N	N
11.12	Single units; semidetached	N	N	N	A[11]	B[11]	N	N
11.13	Single units; attached row	N	N	N	A[11]	B[11]	N	N
11.21	Two units; side-by-side	N	N	N	A[11]	B[11]	N	N
11.22	Two units; one above the other	N	N	N	A[11]	B[11]	N	N
11.31	Apartments; walk up	N	N	N	A[11]	B[11]	N	N
11.32	Apartments; elevator	N	N	N	A[11]	B[11]	N	N
12	Group quarters	N	N	N	A[11]	B[11]	N	N
13	Residential hotels	N	N	N	A[11]	B[11]		N
14	Mobile home parks or courts	N	N	N	N	N	N	N
15	Transient lodgings	N	N	N	A[11]	B[11]	C[11]	N
16	Other residential	N	N	N[1]	A[11]	B[11]	N	N
20	Manufacturing							
21	Food & kindred products; manufacturing	N	N[2]	Y	Y	Y[12]	Y[13]	Y[14]
22	Textile mill products; manufacturing	N	N[2]	Y	Y	Y[12]	Y[13]	Y[14]
23	Apparel and other finished products made from fabrics, leather, and similar materials; manufacturing	N	N	N[2]	Y	Y[12]	Y[13]	Y[14]
24	Lumber and wood products (except furniture); manufacturing	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
25	Furniture and fixtures; manufacturing	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
26	Paper & allied products; manufacturing	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
27	Printing, publishing, and allied industries	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
28	Chemicals and allied products; manufacturing	N	N	N[2]	Y	Y[12]	Y[13]	Y[14]
29	Petroleum refining and related industries	N	N	N	Y	Y[12]	Y[13]	Y[14]
30	Manufacturing							
31	Rubber and misc. plastic products, manufacturing	N	N[2]	N[2]	Y	Y[12]	Y[13]	Y[14]
32	Stone, clay and glass products manufacturing	N	N[2]	Y	Y	Y[12]	Y[13]	Y[14]
33	Primary metal industries	N	N2	Y	Y	Y12	Y13	Y14

Table 3-4. Land Use Compatibility, Noise Exposure, and Accident Potential (cont'd).

LAND USE		ACCIDENT POTENTIAL ZONES			NOISE ZONES			
SLUCM NO.	**NAME**	**CLEAR ZONE**	**APZ I**	**APZ II**	**65-69 dB**	**70-74 dB**	**75-79 dB**	**80+ dB**
34	Fabricated metal products; manufacturing	N	N[2]	Y	Y	Y[12]	Y[13]	Y[14]
35	Professional, scientific, and controlling instruments; photographic and optical goods; watches and clocks manufacturing	N	N	N[2]	Y	A	B	N
39	Miscellaneous manufacturing	N	Y[2]	Y[2]	Y	Y[12]	Y[13]	Y[14]
40	Transportation, communications and utilities							
41	Railroad, rapid rail transit and street railroad transportation	N[3]	Y[4]	Y	Y	Y[12]	Y[13]	Y[14]
42	Motor vehicle transportation	N[3]	Y	Y	Y	Y[12]	Y[13]	Y[14]
43	Aircraft transportation	N[3]	Y[4]	Y	Y	Y[12]	Y[13]	Y[14]
44	Marine craft transportation	N[3]	Y[4]	Y	Y	Y[12]	Y[13]	Y[14]
45	Highway & street right-of-way	N[3]	Y	Y	Y	Y[12]	Y[13]	Y[14]
46	Automobile parking	N[3]	Y[4]	Y	Y	Y[12]	Y[13]	Y[14]
47	Communications	N[3]	Y[4]	Y	Y	A[15]	B[15]	N
48	Utilities	N[3]	Y[4]	Y	Y	Y	Y[12]	Y[13]
49	Other transportation communications and utilities	N[3]	Y[4]	Y	Y	A[15]	B[15]	N
50	Trade							
51	Wholesale trade	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
52	Retail trade-building materials, hardware and farm equipment	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
53	Retail trade-general merchandise	N[2]	N[2]	Y[2]	Y	A	B	N
54	Retail trade-food	N[2]	N[2]	Y[2]	Y	A	B	N
55	Retail trade-automotive, marine craft, aircraft and accessories	N[2]	N[2]	Y[2]	Y	A	B	N
56	Retail trade-apparel and accessories	N[2]	N[2]	Y[2]	Y	A	B	N
57	Retail trade-furniture, home furnishings and equipment	N[2]	N[2]	Y[2]	Y	A	B	N
58	Retail trade-eating and drinking establishments	N	N	N2	Y	A	B	N
59	Other retail trade	N	N[2]	Y[2]	Y	A	B	N
60	Services							
61	Finance, insurance and real estate services	N	N	Y[6]	Y	A	B	N
62	Personal services	N	N	Y[6]	Y	A	B	N

Table 3-4. Land Use Compatibility, Noise Exposure, and Accident Potential (cont'd).

LAND USE		ACCIDENT POTENTIAL ZONES			NOISE ZONES			
SLUCM NO.	**NAME**	**CLEAR ZONE**	**APZ I**	**APZ II**	**65-69 dB**	**70-74 dB**	**75-79 dB**	**80+ dB**
62.4	Cemeteries	N	Y[7]	Y[7]	Y	Y[12]	Y[13]	Y[14, 2, 1]
63	Business services	N	Y[8]	Y[8]	Y	A	B	N
64	Repair services	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
65	Professional services	N	N	Y[6]	Y	A	B	N
65.1	Hospitals, nursing homes	N	N	N	A*	B*	N	N
65.1	Other medical facilities	N	N	N	Y	A	B	N
66	Contract construction services	N	Y[6]	Y	Y	A	B	N
67	Governmental services	N[6]	N	Y[6]	Y*	A*	B*	N
68	Educational services	N	N	N	A*	B*	N	N
69	Miscellaneous services	N	N[2]	Y[2]	Y	A	B	N
70	Cultural, entertainment and recreational							
71	Cultural activities (including churches)	N	N	N[2]	A*	B*	N	N
71.2	Nature exhibits	N	Y[2]	Y	Y*	N	N	N
72	Public assembly	N	N	N	Y	N	N	N
72.1	Auditoriums, concert halls	N	N	N	A	B	N	N
72.11	Outdoor music shell, amphitheaters	N	N	N	N	N	N	N
72.2	Outdoor sports arenas, spectator sports	N	N	N	Y[17]	Y[17]	N	N
73	Amusements	N	N	Y[8]	Y	Y	N	N
74	Recreational activities (including golf courses, riding stables, water recreation)	N Y	Y[8, 9, 10]	Y	Y*	A*	B*	N
75	Resorts and group camps	N	N	N	Y*	Y*	N	N
76	Parks	N	Y[8]	Y[8]	Y*	Y*	N	N
79	Other cultural, entertainment and recreation	N[9]	Y[9]	Y[9]	Y*	Y*	N	N
80	Resources production and extraction							
81	Agriculture (except livestock)	Y[16]	Y	Y	Y[18]	Y[19]	Y[20]	Y[20, 21]
81.5 to 81.7	Livestock farming and animal breeding	N	Y	Y	Y[18]	Y[19]	Y[20]	Y[20, 21]
82	Agricultural related activities	N	Y[5]	Y	Y[18]	Y[19]	N	N
83	Forestry activities and related services	N[5]	Y	Y	Y[18]	Y[19]	Y[20]	Y[20, 21]
84	Fishing activities and related services	N[5]	Y[5]	Y	Y	Y	Y	Y

Table 3-4. Land Use Compatibility, Noise Exposure, and Accident Potential (cont'd).

LAND USE		ACCIDENT POTENTIAL ZONES			NOISE ZONES			
SLUCM NO.	**NAME**	**CLEAR ZONE**	**APZ I**	**APZ II**	**65-69 dB**	**70-74 dB**	**75-79 dB**	**80+ dB**
85	Mining activities and related services	N	Y[5]	Y	Y	Y	Y	Y
89	Other resources production and extraction	N	Y[5]	Y	Y	Y	Y	Y

LEGEND SLUCM - Standard Land Use Coding Manual, U.S. Department of Transportation.
Y = (Yes); Land use and related structures are compatible without restriction.
N = (No); Land use and related structures are not compatible and should be prohibited.
Y^{x} = (Yes with restrictions); Land use and related structures are generally compatible; see note indicated by the superscript.
N^{x} = (No with exceptions); See note indicated by the superscript.
NLR = (Noise Level Reduction; NLR) (outdoor to indoor); To be achieved through incorporation of noise attenuation measures into the design and construction of the structures.
A, B, or C = Land use and related structures generally compatible; measures to achieve NLR of A (25 dB), B (30 dB), or C (35 dB) should be incorporated into the design and construction of structures.
A*, B*, and C* = Land use generally compatible with NLR. However, measures to achieve an overall noise level reduction do not necessarily solve noise difficulties and additional evaluation is warranted. See appropriate footnotes.
* = The designation of these uses as "compatible" in this zone reflects individual federal agency and program consideration of general cost and feasibility factors, as well as past community experiences and program objectives. Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider.

NOTES
[1]Suggested maximum density of 1-2 dwelling units per acre possibly increased under a Planned Unit Development (PUD) where maximum lot coverage is less than 20 percent.
[2]Within each land use category, uses exist where further definition may be needed due to the variation of densities in people and structures. Shopping malls and shopping centers are considered incompatible in any APZ.
[3]The placing of structures, buildings, or above ground utility lines in the clear zone is subject to severe restrictions. In a majority of the clear zones, these items are prohibited. See AFI 32-7063 and AFI 32-1026 for specific guidance.
[4]No passenger terminals and no major above ground transmission lines in APZ I.
[5]Factors to be considered: labor intensity, structural coverage, explosive characteristics, and air pollution.
[6]Low-intensity office uses only. Meeting places, auditoriums, etc., are not recommended.
[7]Excludes chapels.
[8]Facilities must be low intensity.
[9]Clubhouse not recommended.
[10]Areas for gatherings of people are not recommended.
[11a]Although local conditions may require residential use, it is discouraged in DNL 65-69 dB and strongly discouraged in DNL 70-74 dB. An evaluation should be conducted prior to approvals, indicating that a demonstrated community need for residential use would not be met if development were prohibited in these zones, and that there are no viable alternative locations.
[11b]Where the community determines the residential uses must be allowed, measures to achieve outdoor to indoor NLR for DNL 65-69 dB and DNL 70-74 dB should be incorporated into building codes and considered in individual approvals.
[11c]NLR criteria will not eliminate outdoor noise problems. However, building location and site planning, and design and use of berms and barriers can help mitigate outdoor exposure, particularly from near ground level sources. Measures that reduce outdoor noise should be used whenever practical in preference to measures which only protect interior spaces.
[12]Measures to achieve the same NLR as required for facilities in the DNL 65-69 dB range must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
[13]Measures to achieve the same NLR as required for facilities in the DNL 70-74 dB range must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
[14]Measures to achieve the same NLR as required for facilities in the DNL 75-79 dB range must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
[15]If noise sensitive, use indicated NLR; if not, the use is compatible.
[16]No buildings.
[17]Land use is compatible provided special sound reinforcement systems are installed.
[18]Residential buildings require the same NLR required for facilities in the DNL 65-69 dB range.
[19]Residential buildings require the same NLR required for facilities in the DNL 70-74 dB range.
[20]Residential buildings are not permitted.
[21]Land use is not recommended. If the community decides the use is necessary, hearing protection devices should be worn by personnel.

4.0 LAND USE AND ANALYSIS

4.1 Introduction

Land use planning and control is a dynamic rather than a static process. The specific characteristics of land use determinants will always reflect, to some degree, the changing conditions of the economic, social, and physical environment of a community, as well as changing public concerns. The planning process accommodates this fluidity in that decisions are normally not based on boundary lines but rather on more generalized area designations. Computer technology has enabled Laughlin AFB to more precisely display its flight tracks, airspace control surfaces, noise contours, and accident potential areas for land use planning purposes.

For the purposes of this study, existing land uses have been classified into one of the following six general categories:

(1) Residential—includes all types of residential activity, such as single and multi-family residences and mobile homes, at a density of greater than one dwelling unit per acre.
(2) Commercial—encompasses offices, retail, restaurants, and other types of commercial establishments.
(3) Industrial—includes manufacturing, warehousing, and other similar uses.
(4) Public/Quasi-Public—is comprised of publicly owned lands and/or lands to which the public has access, including military reservations and training grounds, public buildings, schools, churches, cemeteries, and hospitals.
(5) Recreation—embodies land areas designated for recreational activity, including parks, wilderness areas and reservations, conservation areas, and areas designated for trails, hiking, and camping.
(6) Open/Agriculture/Low Density—includes undeveloped land areas, agricultural areas, grazing lands, and areas with residential activity at densities less than or equal to one dwelling unit per acre.

4.2 Existing Land Use

This section presents the municipalities that have tax or land-use jurisdiction in the vicinity of Laughlin AFB, including descriptions of existing land uses. In Texas, land use planning and zoning is exercised only by cities or incorporated municipalities. Laughlin AFB lies immediately east, but outside of the City of Del Rio. The city itself lies in the southeastern portion of Val Verde County. A portion of the noise contours associated with Laughlin extend southeastward into Kinney County.

As noted in Chapter 2, the population of the State of Texas has been growing rapidly. Val Verde County and Del Rio are experiencing a more moderate growth rate (Table 4-1). Since the 2000 AICUZ study, very little land use change has occurred in Val Verde County or Del Rio. What growth has been occurring appears to be primarily from conversion of open space and agricultural land uses to residential uses to accommodate population growth.

Table 4-1. U.S. Census Population.

AREA	1990 Census	2000 Census	1990-2000 Rate of Change %
State of Texas	16,986,510	20,851,820	22.76
Val Verde County	38,721	44,856	15.84
City of Del Rio	30,705	33,867	10.29

Source: U.S. Census Bureau (USCB) 1990, 2000

Using geo-spatial analysis and ortho-photography of the region surrounding Laughlin AFB, land use classifications were derived. This was augmented and spot-checked with discussions with installation personnel and city officials. The following sections examine existing land use, zoning, and future land use plans in detail (Figures 4-1 through 4-3; Tables 4-2 through 4-6).

4.2.1 Del Rio and Val Verde County

As noted above, Laughlin AFB lies east and outside of the city limits of Del Rio, Texas. As a smaller city along the Rio Grande River, south of the Hill Country of Texas, it has a variety of land uses. Since the base is along the eastern side of the city, the majority of the development around the base lies west of the base. Immediately to the west of the base is open space. Northwest of the base are low to medium-density residential and commercial uses fronting along US 90. North, east and south of the base is open space with very low density residential uses interspersed among the ranches and range land (Figure 4-1).

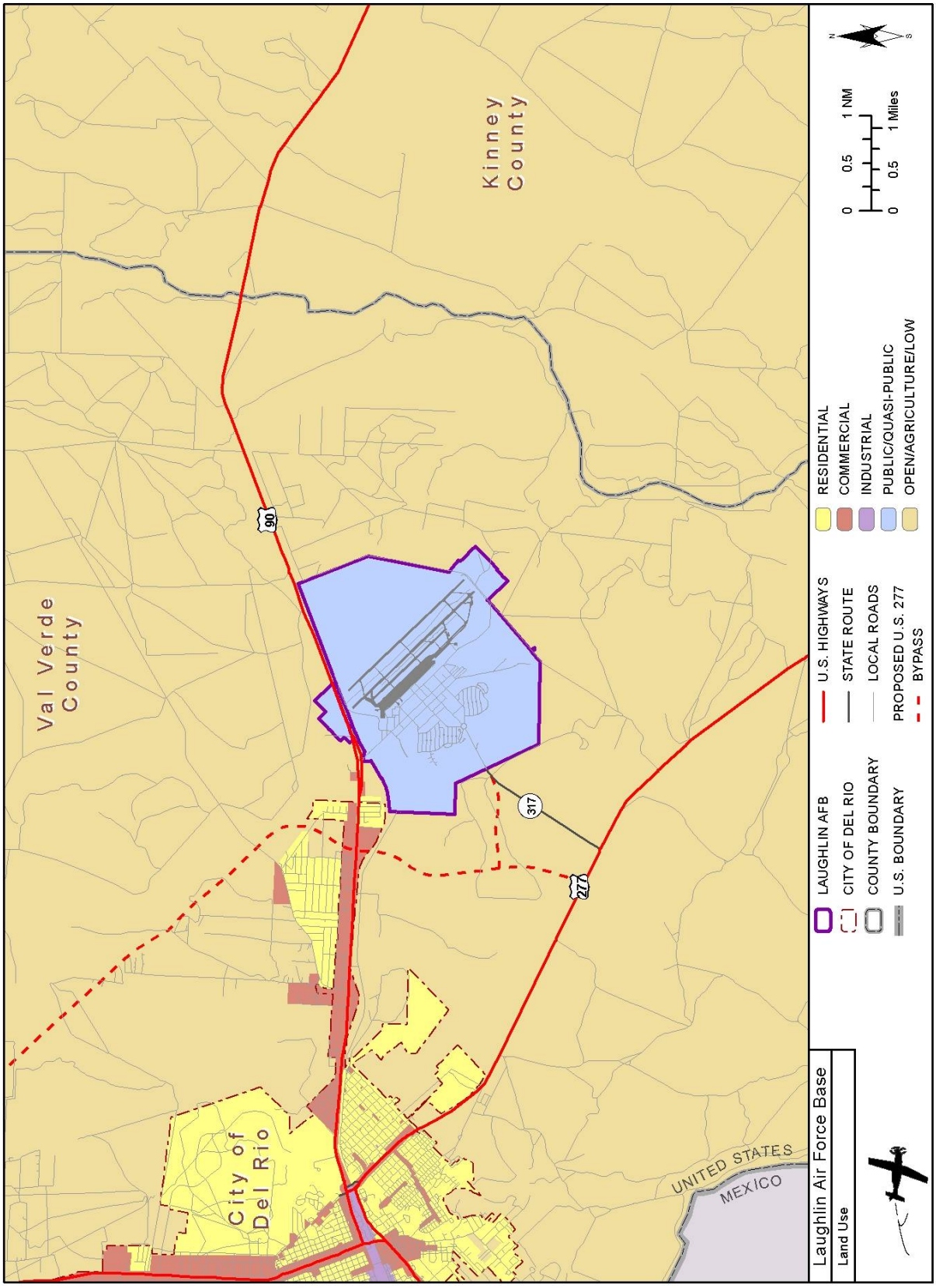

Figure 4-1. Exiting Land Use in the Region.

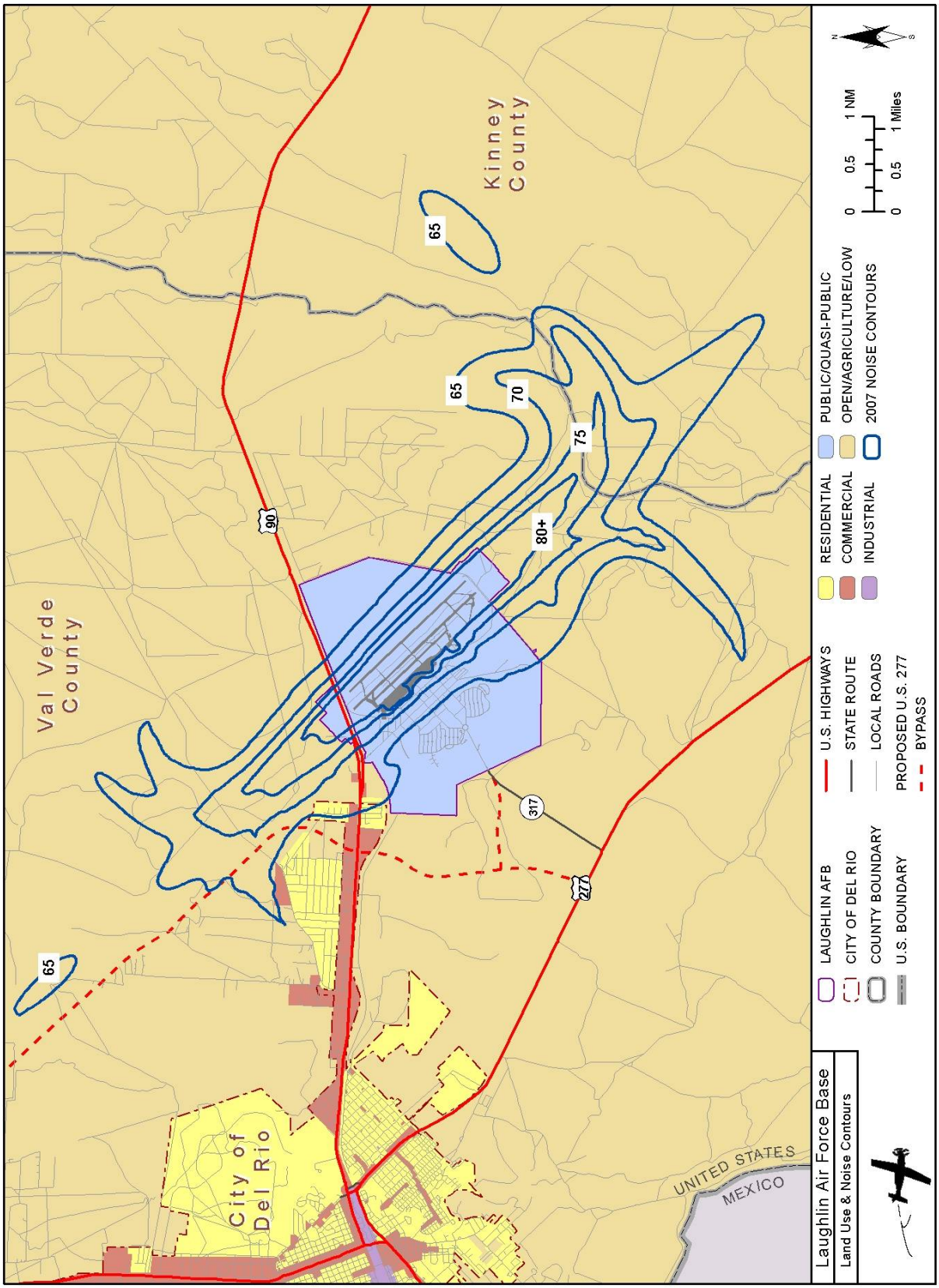

Figure 4-2. Existing Land Use and Noise Contours.

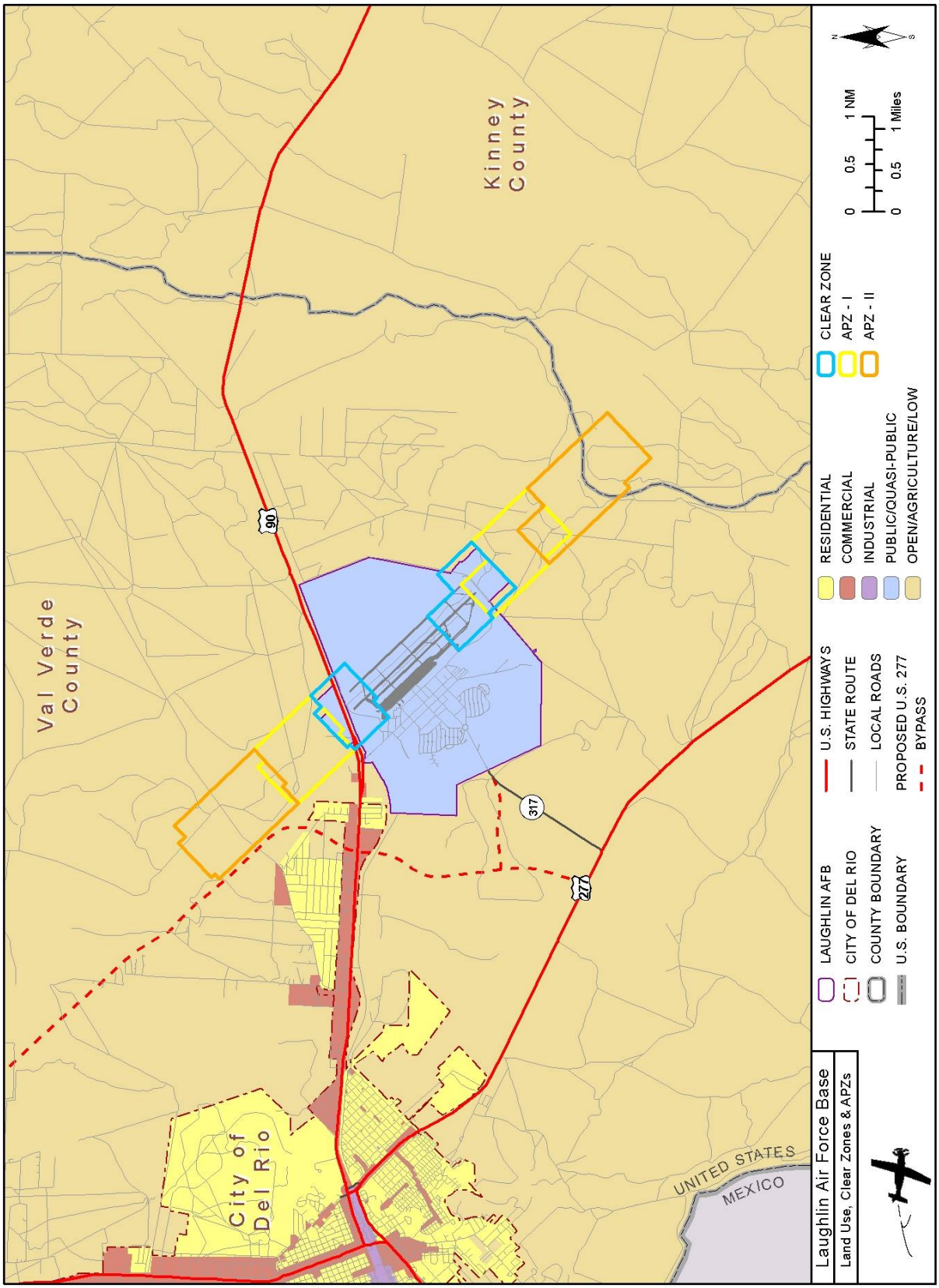

Figure 4-3. Existing Land Use and CZs and APZs.

Table 4-2. Total Acreage and Population within 65-80+ dB.

Total		
DNL noise zone	Acreage	Population
65-69	5,720	630
70-74	2,380	59
75-79	1,178	34
80+	1,366	36
Total	10,644	759
Off Base		
65-69	5,002	630
70-74	2,032	59
75-79	928	34
80+	465	36
Total	8,427	759

Table 4-3. Total Acres and Populations within CZ and APZs.

Zone	Total Acres	Off Base Acres	Total Population
Clear Zone	982	111	2
APZ I	1,186	1,042	33
APZ II	1,607	1,607	6
Total	3,775	2,760	41

Source: U.S. Census Bureau 2000 SF1 (Block Level); 108th CD Census 2000 TIGER/Line
Note: There is no on-base population within the CZs and no part of APZs lie within base boundaries

Table 4-4. Off Base Land Use within 65dB+ Noise Contour.

Category	Acreage
Residential	67
Commercial	22
Industrial	0
Public/Quasi-Public	0
Recreation	0
Open/Agriculture	8,238
Total	8,327

Table 4-5. Off Base Compatibility within Noise Contours.

	DNL Noise Zone				
Category	**65-69**	**70-74**	**75-79**	**80+**	**Total**
Residential	67	0	0	0	67
Compatible	45	0	0	0	45
Incompatible	22	0	0	0	22
Commercial	25	0	0	0	25
Compatible	25	0	0	0	25
Incompatible	0	0	0	0	0
Industrial	0	0	0	0	0
Compatible	0	0	0	0	0
Incompatible	0	0	0	0	0
Public/Quasi-Public	0	0	0	0	0
Compatible	0	0	0	0	0
Incompatible	0	0	0	0	0
Recreation	0	0	0	0	0
Compatible	0	0	0	0	0
Incompatible	0	0	0	0	0
Open/Agriculture	4,910	2032	928	465	8,335
Compatible	4,910	2032	928	465	8,335
Incompatible	0	0	0	0	0
Unclassified (includes water and rights-of-way)	0	0	0	0	0
Compatible	0	0	0	0	0
Incompatible	0	0	0	0	0
TOTAL	**5,002**	**2,032**	**928**	**465**	**8,427**

Table 4-6. Off Base Land Use Acreage for CZs and APZs.

Category	Clear Zone	APZ I	APZ II	Total
Residential	0	0	0	0
Compatible	0	0	0	0
Incompatible	0	0	0	0
Commercial	0	0	0	0
Compatible	0	0	0	0
Incompatible	0	0	0	0
Industrial	0	0	0	0
Compatible	0	0	0	0
Incompatible	0	0	0	0
Public/Quasi-Public	0	0	0	0
Compatible	0	0	0	0
Incompatible	0	0	0	0
Recreation	0	0	0	0
Compatible	0	0	0	0
Incompatible	0	0	0	0
Open/Agriculture	**111**	**1,042**	**1,607**	**2,760**
Compatible	0	1,042	1,607	2,760
Incompatible	111	0	0	111
Unclassified (includes water)	0	0	0	0
Compatible	0	0	0	0
Incompatible	0	0	0	0
TOTAL	**1111**	**1,042**	**1,607**	**2,760**

4.2.1.1 Noise Zones

In general terms, the noise contours extend along the axes of the runways (see Figure 4-2). The noise exposure area from aircraft operations is generally focused to the southeast of the runway, on the opposite side of the base from the city of Del Rio's population center. This reflects the fact that the majority of operations occur to the southeast and departures typically are louder than arrivals, particularly for the T-38C which uses afterburners on takeoff. To the northwest, a narrower noise exposure area exists, again generally along the axes of the runways.

The 80+ DNL contour extends beyond the base boundary; however, the contour is confined to Val Verde County, not extending far enough to touch Kinney County to the southeast nor the City of Del Rio to the west. The 75-80 DNL contour similarly affects no real estate within the city limits; however a very small portion of the contour does cross into Kinney County. Both north and south of the base this contour covers real estate with an open space and low density residential land uses. The 70-75 DNL contour overlies a similar mixture of open space (agricultural) and low-density residential uses to the northwest and southeast of the base.

Within the 65-70 DNL contour, a greater variety of land uses are present. Northwest of the base, a wider area bulges out in the vicinity of the Union Pacific railroad and US 90. This portion underlies the T-6A closed pattern turn away from the runway (31L) on takeoff. Underneath this area is a mixture of open space, low-density residential, medium density residential, and commercial uses. The higher density uses residential and commercial uses extend along US 90. Further northwest, an angular shaped extension of the contour underlies where the T-6A turns toward final approach when landing (Runway 13R). Immediately south of this extension is a medium-density (multi-family) residential use. Apart from these uses, the balance of the 65-70 DNL contour consists of open-space and very low-density residential uses. Similar in manner in which the contours extend outward from the runway on the west side of the base under T-6A turns on takeoff and landings, extensions of the contours occur on the east side of the base. North of US 90, an eastward extension underlies where the T-38C generally turns after takeoff. Southeast of the base, contour extensions also occur.

4.2.1.2 Clear Zone/Accident Potential Zones I and II

Most of the real estate underlying the CZ or APZs falls either on the base itself or within Val Verde County. No portion of the city lies within a CZ or APZ. The primary land uses are open space (see Figure 4-3).

4.2.2 Kinney County

A tributary of the Rio Grande River forms the boundary between Val Verde and Kinney counties. The county itself has a very low population, 3,379 as of the 2000 Census, and this portion of the county is very sparsely settled.

4.2.2.1 Noise Zones

All of the Kinney County lands in the study area are rural, including agricultural or open space uses, with scattered rural residential uses intermixed. As noted above, the 80+ DNL contour extends along the runway to the southeast but does not quite cross into Kinney County. The 75-80+ DNL, 70-75 DNL, and 65-70 DNL contours cover open space land uses.

4.2.2.2 Clear Zone/Accident Potential Zones I and II

The Laughlin CZ and APZ I do not extend into Kinney County. A little less than half of APZ II crosses into the county. As with the areas within the noise zone, the land use is open space with very isolated residential uses.

4.3 Current Zoning

This section examines the existing zoning classification. As with land use, the classifications are grouped together within the six major categories. Like any real estate owned by the Federal government, Laughlin AFB itself is not subject to the jurisdiction of either the city or county and land use control or regulation by the city or county does not apply to real estate within the base boundary.

4.3.1 Del Rio and Val Verde County

The city of Del Rio has a comprehensive zoning ordinance; however, it does not extend beyond the city limits. The eastern portion of the city that extends along US 90 lies within either a residential or commercial zoning district.

Under Texas law, counties do not exercise land use control. Recognizing that airports and airfields often lie outside of municipalities, the state of Texas does authorize a special purpose jurisdiction, a Joint Airport Zoning Board that does have the authority to regulate land uses for the purposes of airport compatibility. This zoning is contained in the Laughlin Air Force Base Compatible Land Use and Hazard Zoning Ordinance, adopted by the Del Rio-Val Verde County Joint Airport Zoning Board. This ordinance was prepared in accordance with the State of Texas Airport Zoning Act to address the area of influence derived from a previous 1994 AICUZ Study. The ordinance establishes a controlled area that extends five miles from the ends of the runway paved surfaces (along the extended runway centerline) and one and one-half miles outward from the centerline of each runway. Within this area, development is regulated to ensure its compatibility with the accident potential and noise generated by aircraft operations at Laughlin AFB. Land uses within the controlled area are regulated by type and density, and noise level reduction requirements are established for future development within noise zones.

4.3.2 Kinney County

Kinney County does not exercise land use control.

4.4 Future Land Use

In 2007, the City of Del Rio adopted a comprehensive master planning document, *Del Rio Plan*. Among the goals and policies articulated therein was recognition of the important role Laughlin AFB serves in the greater community. Specifically, Chapter 3 (Land Use) of the document has the "long term sustenance and protection of Laughlin AFB" as one of its primary objectives. The plan makes reference to many, if not all of the objectives in this report in guiding the growth of the city. Specific call-outs to noise, aircraft safety, airspace, and electromagnetic spectrum are made. Detailed recommendations that comply with the objectives of this study are also made.

In addition to developing the *Del Rio Plan*, the city of Del Rio, Val Verde County, Kinney County, and the Department of Defense have begun a Joint Land Use Study (JLUS). The study area encompasses a 15-mile radius around the installation. Within this area, specific strategies that the participating jurisdictions may employ to promote compatible development around Laughlin will be recommended.

No similar planning document to the *Del Rio Plan* exists to guide the development of land within Val Verde or Kinney counties. Counties in Texas do not exercise land use control through zoning ordinances or master land use planning documents.

4.5 Obstructions to Air Navigation (FAR Part 77 Analysis)

The Air Force seeks to protect its airfields from encroachment from construction of uses that are incompatible. In addition to the recommendations the Air Force is also concerned about development that has the potential to compromise the utility of the airfield if their height or other characteristics (e.g., light emissions, smoke, dust, or steam) are not regulated.

Although the topography of the immediate area is generally flat, the community should be alert for locations where the terrain elevations are significantly higher than those found at base. The elevation above sea level of the outer horizontal surface is 1,582 feet, based on the established airfield elevation of 1,082 MSL. Obstructions erected in this area have the potential to adversely affect the current and future mission capability of Laughlin by impeding the use of precision instrument approach corridors. These obstacles could cause the aircraft to maintain an altitude that is too high to permit a descent below adverse weather causing a divert to another airfield. As noted in Chapter 3, a weather/fuel divert increases risk to aviators and those on the ground, incurs additional expense in ferrying the aircraft and aircrew when weather improves and consumes additional fuel. It should be noted however that the Federal government cannot and does not exercise land use control over real estate it does not own. Kinney County, Val Verde County, the city of Del Rio, and the state of Texas should continue to implement land use controls to minimize encroachment from construction of structures whose height and location compromise the utility of the airfield.

To protect aviators and persons on the ground, the FAA evaluates proposals for construction of objects greater than 199 feet above ground level (AGL) or within 20,000 feet of an airport and the object to be constructed would exceed a slope of 100:1 horizontally, (i.e., 100 feet horizontally for each foot vertically) from the nearest point of the nearest runway. Where proposed structures are found to penetrate the Airspace Control Surface Plan (Section 3.2), the FAA and Laughlin AFB would strongly recommend disapproval of the project to protect Laughlin AFB's pilots during times of adverse weather (low ceilings, poor visibility). Such obstructions can lead to raised minimum altitude for an instrument procedure can mean the difference between a successful instrument approach to the airfield and a diversion to another base. See Volume II, Appendix D for additional details on how these maximum height recommendations are calculated.

The review of FAA obstruction data indicates no obstructions currently penetrate the imaginary surfaces (Figures 4-4 and 4-5). The Air Force recognizes that maximum recommended height for proposed structures in the vicinity of an airfield varies depending upon the distance the proposed site would be from the airfield. Base personnel can assist during the planning phases of proposed projects to help proponents of such uses ensure that they do not penetrate recommended height limits.

Apart from incompatibilities due to height, the Air Force is concerned that structures not interfere with Air Force communications, navigation, surveillance (CNS), or weather radar facilities. Tall structures, especially when aggregated, may interfere with terrestrial based CNS and weather equipment due to frequency interference, scattering of radar beams, or attenuation of radar returns. In addition, therefore, to the traditional obstruction height analysis performed by the FAA, local communities may wish to require proponents to demonstrate that proposed structures would not compromise the utility of an airfield and the taxpayer's long-standing investment in Laughlin AFB.

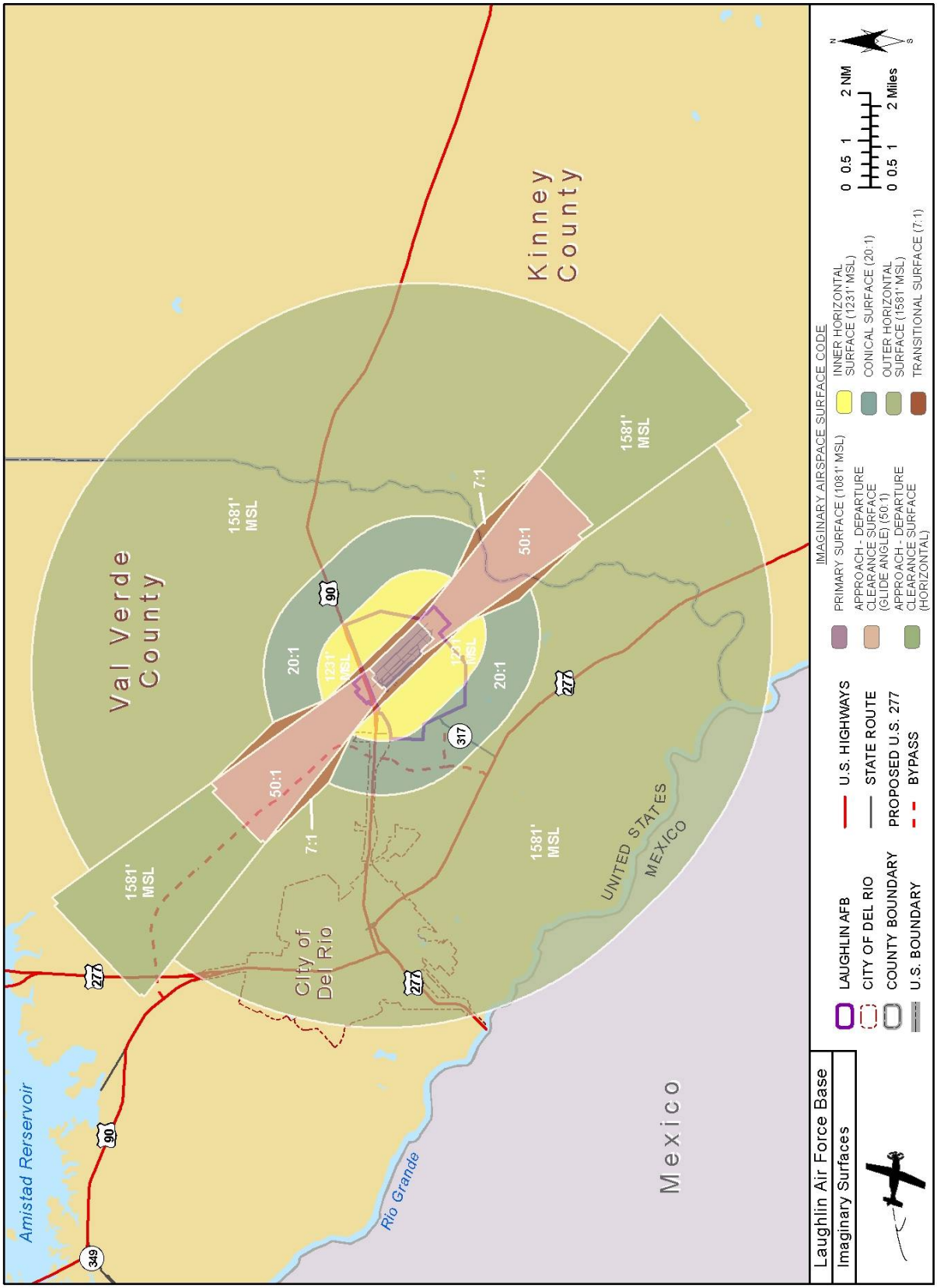

Figure 4-4. Imaginary Surfaces.

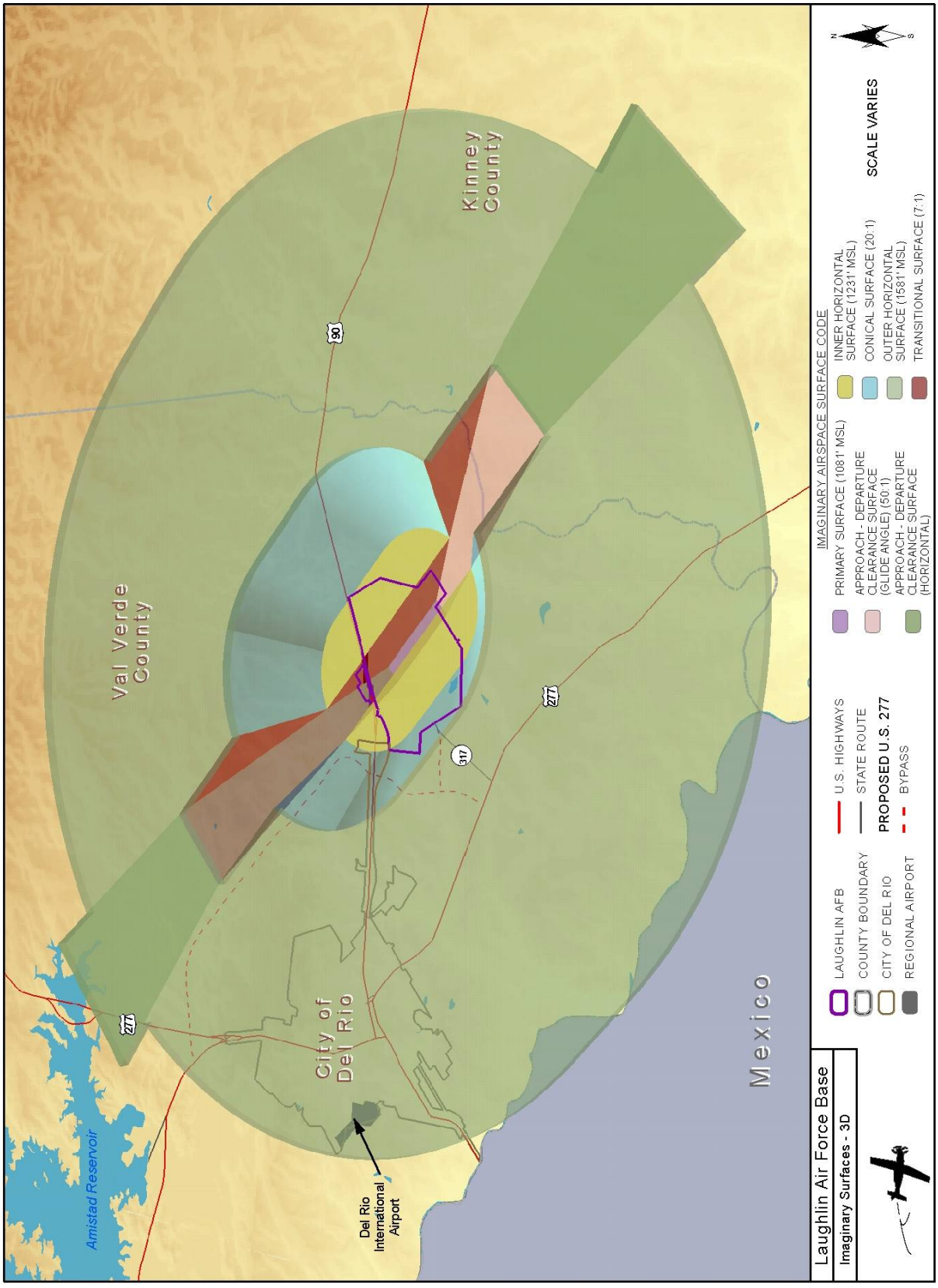

Figure 4-5. Imaginary Surfaces 3-D.

4.6 AICUZ Environs

The area of influence for an AICUZ study for which specific land use planning should be undertaken extends beyond the base's immediate neighbors (Figure 4-6).

AICUZ boundaries and noise contours describe the noise exposure of the current operational environment and as such will change over time as operational changes are made. If the local communities that make up the Laughlin AFB environs attempt to use noise contours alone as boundary lines for zoning districts, it is conceivable that problems will result. Should a new mission be established at Laughlin AFB adding a larger number of airplanes, or additional model types, the noise contours would change.

Additionally, the Air Force is recommending that AICUZ data be utilized with all other planning data. Therefore, specific land use control decisions should not be based solely on AICUZ boundaries. With these thoughts in mind, Laughlin AFB has revised the 2000 study and provides flight track and noise contour maps in this report that reflect the most current and accurate picture of aircraft activities.

The local communities engage in a continuous process of maintaining their comprehensive land use plans, the accompanying implementing ordinances (zoning, subdivision control), and their capital improvement plans for infrastructure and public facility investments. During this process, the communities should continue to use sound planning principles. In particular, the Air Force would continue to recommend that planning documents, zoning changes, and similar activities be evaluated against the recommendations contained in Table 3-4 of this document for land use compatibility recommendations.

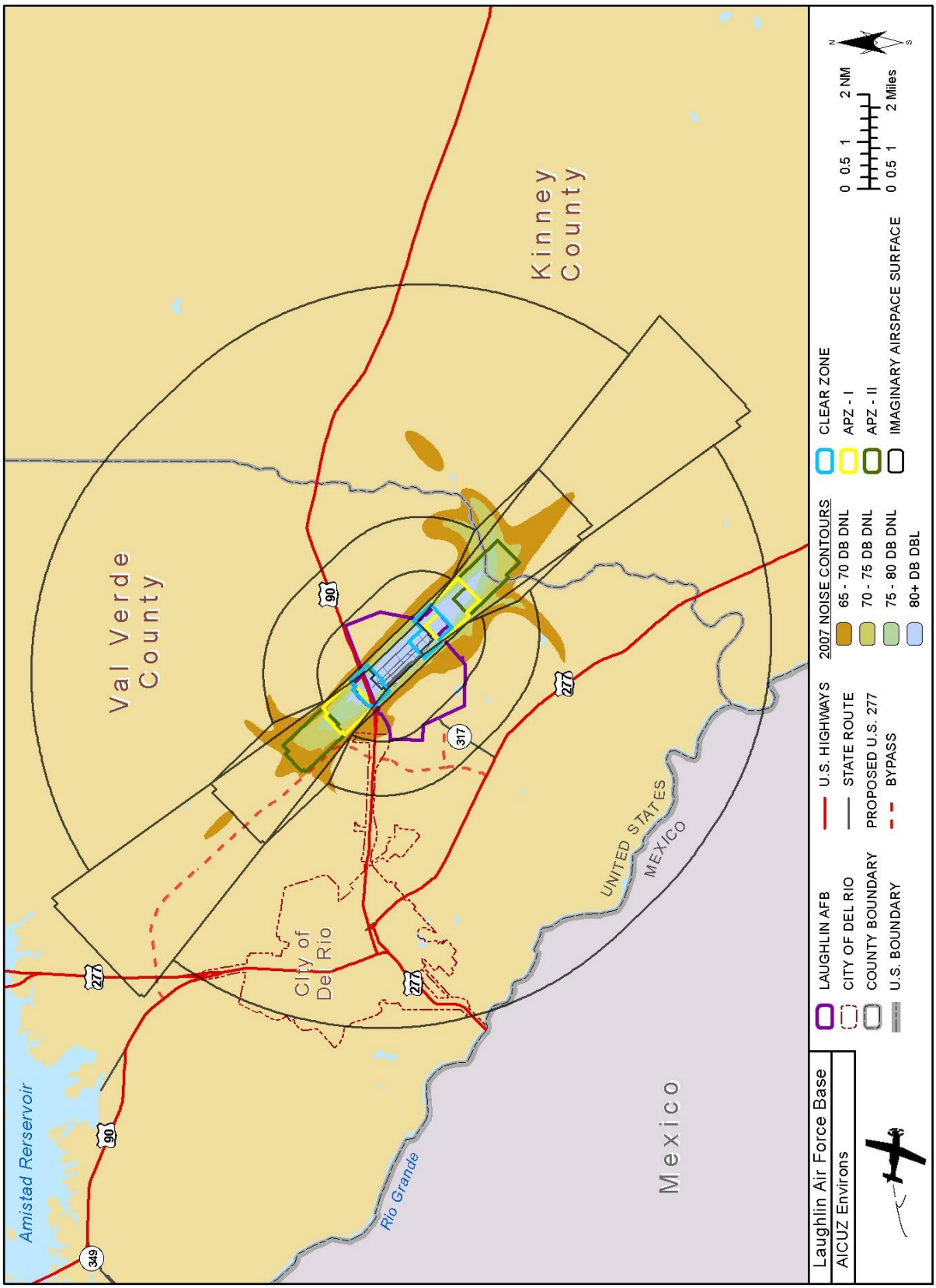

Figure 4-6. AICUZ Environs.

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5.0 IMPLEMENTATION

The implementation of the AICUZ study must be a joint effort between the Air Force, the City of Del Rio, the Counties of Val Verde and Kinney, and the state of Texas. The Air Force's role is to minimize the impact on the local communities caused by Laughlin AFB operations. The role of the communities is to ensure that development in the base environs is compatible with accepted planning and development principles and practices.

5.1 AICUZ Environs

To better assist the community in identifying whether real estate is potentially affected by, or has the potential to affect Air Force flight operations, it is important that all elements of AICUZ, accident potential, noise exposure, and obstruction evaluation and airfield airspace analysis be considered by local authorities when considering potential development. It is hoped that the base leadership working in concert with local community leaders and municipal planners would use the information contained within this report as a starting point for inquiry and analysis.

5.2 Air Force Responsibilities

In general, the Air Force perceives its AICUZ responsibilities as encompassing the areas of flying safety, noise abatement, and participation in the land use planning process.

Well-maintained aircraft and well-trained aircrews do much to assure that aircraft accidents are avoided. However, despite the best training of aircrews and maintenance of aircraft, history makes it clear that accidents do occur. It is imperative that flights be routed over sparsely populated areas as much as possible to reduce the exposure of lives and property to a potential accident.

According to Air Force regulations, commanders are required to periodically review existing traffic patterns, instrument approaches, weather minimums, as well as operating practices and evaluate these factors in relationship to populated areas and other local situations. This requirement is a direct result and expression of Air Force policy that all AICUZ plans must include an analysis of flying and flying-related activities that are designed to reduce and control the effects of such operations on surrounding land areas.

The preparation and presentation of this Laughlin AFB AICUZ Study is one phase of the continuing Air Force participation in the planning process of local municipalities. As local communities update land use plans, the Air Force must be ready to provide additional inputs.

The AICUZ program represents an ongoing, dynamic process that occurs even after compatible community development plans are adopted and implemented. Base personnel are prepared to participate in the continuing discussion of zoning and other land use matters as they may affect or may be affected by Laughlin AFB. Base personnel will also be available to provide information, criteria, and guidelines to state, county and local planning bodies, civic associations, and similar groups.

In a spirit of mutual respect and in consideration of our neighbors residing in adjacent communities, the Air Force continuously seeks ways to minimize impacts from flying operations. Some examples would include:

- Evaluating flight procedures to minimize impacts to adjacent communities, such as adjusting flight tracks to avoid congested areas or adjusting power settings and climb rates to minimize noise.
- Using a hush house and test cell buildings to suppress noise from high power maintenance engine runs.
- Consistent with the requirements of the base's mission of producing Air Force pilots, minimizing flight and maintenance operations during nighttime periods.

These and other noise reduction initiatives, while not depicted or represented in the noise model used to develop the contours, do represent ways that the Air Force seeks to minimize noise impacts on its neighbors.

Another initiative that the Air Force may undertake would be a comprehensive study of existing avigation easements on nearby private property lying in a CZ. Such a study could recommend whether further easements are warranted.

The Air Force should participate in working groups with other federal agencies to proactively prevent encroachment. One technique may include exploring the feasibility of entering into public-private partnerships to conserve land in other high accident potential areas, such as APZs.

5.3 Local Community Responsibilities

The residents of the Laughlin AFB environs and the personnel at the base have a long history of working together for mutual benefit. The adoption of the following recommendations will strengthen this relationship, increase the health and safety of the public, and help protect the integrity of the base's flying mission:

- Incorporate AICUZ policies and guidelines into the comprehensive plans for Del Rio, Val Verde and Kinney counties. Use overlay maps of the AICUZ noise contours and Air Force Land Use Compatibility Guidelines to evaluate existing and future land use proposals.
- Modify existing zoning ordinances and subdivision regulations to support compatible land uses outlined in this AICUZ study.
    - Make specific recommendations against future development in CZs to the extent that the Air Force does not own the real estate lying within them;
    - Recommend against public assembly or high intensity uses in APZ I or II;
    - Recommend against residential use in APZ I or II, or in high-noise areas;
    - Require a site specific review process for noise-sensitive uses (e.g., schools, hospitals, housing) to assess proposed noise level reduction techniques;
    - Discourage noise sensitive development clustered adjacent to but not within a noise zone since contours shift over time and noise does not stop at a noise zone boundary;
    - Provide for specific review recommendation on tall structures in the airfield vicinity; and
    - Provide specific recommendations on development along the US 277 Bypass corridor that are consistent with the land use compatibility recommendation of the AICUZ program.

- Ensure that height and obstruction ordinances reflect current Air Force and FAA FAR Part 77 requirements, and require project proponents demonstrate that their actions will not compromise the utility of the Laughlin AFB airfield.
- Implement procedures that require project proponents to notify Laughlin AFB of temporary construction activity which could require the use of cranes within the vicinity of the airfield, in order to allow the installation to analyze impacts on flight operations.
- Modify building codes to ensure that new construction within the AICUZ area adheres to the recommended noise level reductions incorporated into the design and construction.
- Continue to inform Laughlin AFB of planning and zoning actions that have the potential to affect base operations.

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LAUGHLIN AIR FORCE BASE
TEXAS

V O L U M E I I

AIR INSTALLATION COMPATIBLE USE ZONE

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APPENDIX A THE AICUZ CONCEPT, PROGRAM, METHODOLOGY, AND POLICIES

A.1 Concept

Federal legislation, national sentiment, and other external forces that directly affect the Air Force mission have served to greatly increase the Air Force's role in environmental and planning issues. Problems with airfield encroachment from incompatible land uses surrounding installations, as well as air and water pollution and socioeconomic impacts, require continued and intensified Air Force involvement. The nature of these problems dictates direct Air Force participation in comprehensive community and land use planning. Effective, coordinated planning, that bridges the gap between the Federal Government and the community, requires the establishment of good working relationships with local citizens, local planning officials, and state and federal officials. These relationships depend on an atmosphere of mutual trust and helpfulness. The Air Installation Compatible Use Zone (AICUZ) Program has been developed in an effort to:

- Assist local, regional, state, and federal officials in protecting and promoting public health, safety, and welfare by encouraging compatible development within the AICUZ area of influence.
- Protect Air Force operational capability from the effects of land use that are incompatible with aircraft operations.

The land use guidelines developed herein are a composite of a number of other land use compatibility studies that have been refined to fit the Laughlin AFB aviation environment.

A.2 Program

Geo-Marine, Inc. performed this AICUZ Study for Laughlin AFB and Headquarters, Air Education and Training Command. Primary data collection occurred in June 2006 at Laughlin AFB in conjunction with a separate environmental analysis. In November 2007, a re-validation of the data occurred, with additional noise modeling and land use analysis occurring in subsequent months.

Installation commanders establish and maintain active programs to achieve the maximum feasible land use compatibility between air installations and neighboring communities. The program requires that all appropriate government agencies and citizens be fully informed whenever AICUZ or other planning matters affecting the installation are under consideration. This includes positive and continuous programs designed to:

- Provide information, criteria, and guidelines to federal, state, regional, and local planning bodies, civic associations, and similar groups.
- Inform such groups of the requirements of the flying activity, noise exposure, aircraft accident potential, and AICUZ plans.
- Describe the noise reduction measures being used.
- Ensure reasonable, economical, and practical measures are taken to reduce or control the impact of noise-producing activities. These measures include such considerations

as proper location of engine test facilities, provision of sound suppressors where necessary, and adjustment of flight patterns and/or techniques to minimize the noise impact on populated areas. This must be done without jeopardizing safety or operational effectiveness.

A.3 Methodology

The AICUZ area of influence consists of land areas upon which certain land uses may obstruct the airspace or otherwise be hazardous to aircraft operations, as well as the land areas that are exposed to the health, safety, or welfare hazards of aircraft operations. The AICUZ concept includes:

- Accident potential zones (APZs) and clear zones (CZs) based on past Air Force aircraft accidents and installation operational data (Appendix B).
- Noise zones (NZs) produced by the computerized Day-Night Average A-Weighted Sound Level (DNL) metric (Appendix C).
- The area designated by the Federal Aviation Administration (FAA) and the Air Force for purposes of height limitations in the approach and departure zones of the base (Appendix D).

The APZs, CZs, and NZs are the basic building blocks for land use planning with AICUZ data. Compatible land uses are specified for these zones, and recommendations on building materials and standards to reduce interior noise levels inside structures are provided in Appendix E.

As part of the AICUZ Program, the only real property acquisition for which the Air Force has requested and received congressional authorization, and for which the base and major commands request appropriations, are the areas designated as the CZs. Laughlin AFB has not acquired real property interests for the entire CZ areas. Laughlin AFB owns aviation easements restricting the height of structures within the approach and departure zones, including the CZs. Compatible land use controls for the remaining airfield area of influence have been attained through the Laughlin Air Force Base Compatible Land Use and Hazard Zoning Ordinance, prepared by the City of Del Rio-Val Verde County Joint Airport Zoning Board in accordance with the Texas Airport Zoning Act.

A.4 AICUZ Land Use Development Policies

The basis for any effective land use control system is the development of, and subsequent adherence to, policies that serve as the standard by which all land use planning and control actions are evaluated. Laughlin AFB recommends the following policies be considered for incorporation into the comprehensive plans of agencies in the vicinity of the base:

A.4.1 Policy 1. In order to promote the public health, safety, peace, comfort, convenience, and general welfare of the inhabitants of airfield area of influence, it is necessary to:

- Guide, control, and regulate future growth and development.
- Promote orderly and appropriate land use.

- Protect the character and stability of existing land uses.
- Prevent the destruction or impairment of the airfield and the public investment therein.
- Enhance the quality of living in the affected areas.
- Protect the general economic welfare by restricting incompatible land use.

A.4.2 Policy 2. In furtherance of Policy 1, it is appropriate to:

- Establish land use compatibility guidelines.
- Restrict or prohibit incompatible land use.
- Prevent establishment of any land use that would unreasonably endanger aircraft operations and the continued use of the airfield.
- Incorporate the AICUZ concept into community land use plans, modifying them when necessary.
- Adopt appropriate ordinances to implement airfield area of influence land use plans.

A.4.3 Policy 3. Within the boundaries of the AICUZ, certain land uses are inherently incompatible. The following land uses are not in the public interest and must be restricted or prohibited:

- Uses that release into the air any substance, such as steam, dust, or smoke, which would impair visibility or otherwise interfere with the operation of aircraft.
- Uses that produce light emissions, either direct or indirect (reflective), that would interfere with pilot vision.
- Uses that produce electrical emissions that would interfere with aircraft communication systems or navigation equipment.
- Uses that attract birds or waterfowl, such as operation of sanitary landfills, maintenance or feeding stations, or growth of certain vegetation.
- Uses that involve structures within 10 feet of aircraft approach-departure and/or transitional surfaces.

A.4.4 Policy 4. Certain noise levels of varying duration and frequency create hazards to both physical and mental health. A limited, though definite, danger to life exists in certain areas adjacent to airfields. Where these conditions are sufficiently severe, it is not consistent with public health, safety, and welfare to allow the following land uses:

- Residential
- Retail business
- Office buildings
- Public buildings (schools, churches, etc.)
- Recreation buildings and structures

A.4.5 Policy 5. Land areas below takeoff and final approach flight paths are exposed to significant danger of aircraft accidents. The density of development and intensity of use must be limited in such areas.

A.4.6 Policy 6. Different land uses have different sensitivities to noise. Standards of land use acceptability should be adopted, based on these noise sensitivities. In addition, a system of Noise Level Reduction guidelines (Appendix E) for new construction should be implemented to permit certain uses where they would otherwise be prohibited.

A.4.7 Policy 7. Land use planning and zoning in the airfield area of influence cannot be based solely on aircraft-generated effects. Allocation of land used within the AICUZ should be further refined by consideration of:

- Physiographic factors
- Climate and hydrology
- Vegetation
- Surface geology
- Soil characteristics
- Intrinsic land use capabilities and constraints
- Existing land use
- Land ownership patterns and values
- Economic and social demands
- Cost and availability of public utilities, transportation, and community facilities
- Other noise sources

Each runway end at Laughlin AFB has a 3,000 foot by 3,000 foot CZ and two APZs (Appendix B). Accident potential on or adjacent to the runway or within the CZ is so high that the necessary land use restrictions would prohibit reasonable economic use of land. As stated previously, it is Air Force policy to request that Congress authorize and appropriate funds for the necessary real property interests in this area to prevent incompatible land uses. At Laughlin, the vast majority of the real estate underlying each CZ is under government ownership or otherwise controlled through an avigation easement. Although certain CZ areas extend off-base, land use control over these areas is through the *Laughlin Air Force Base Compatible Land Use and Hazard Zoning Ordinance*.

Accident potential zone I is less critical than the CZ, but still possesses a significant risk factor. This 3,000 foot by 5,000 foot area has land use compatibility guidelines that are sufficiently flexible to allow reasonable economic use of the land, such as industrial/manufacturing, transportation, communication/utilities, wholesale trade, open space, recreation, and agriculture. However, uses that concentrate people in small areas are not acceptable.

Accident potential zone II is less critical than APZ I, but still possesses potential for accidents. Accident potential zone II, also 3,000 feet wide, is 7,000 feet long extending to 15,000 feet from

the runway threshold. Acceptable uses include those of APZ I, as well as low density single family residential and those personal and business services and commercial/retail trade uses of low intensity or scale of operation. High-density functions such as multistory buildings, places of assembly (theaters, churches, schools, restaurants, etc.), and high-density office uses are not considered appropriate.

High people densities should be limited to the maximum extent possible. The optimum density recommended for residential usage (where it does not conflict with noise criteria) in APZ II is one dwelling per acre. For most nonresidential usage, buildings should be limited to one story and the lot coverage should not exceed 20%.

A.5 Basic Land Use Compatibility

Research on aircraft accident potential, noise, and land use compatibility is ongoing at a number of federal and other agencies. One such effort is the Concentrations of Persons per Acre Standard developed by the Sacramento Area Council of Governments for incorporation into the land use planning process. These and all other compatibility guidelines must not be considered inflexible standards. They are the framework within which land use compatibility questions can be addressed and resolved. In each case, full consideration must be given to local conditions such as:

- Previous community experience with aircraft accidents and noise;
- Local building construction and development practices;
- Existing noise environment due to other urban or transportation noise sources;
- Time period of aircraft operations and land use activities;
- Specific site analysis; and
- Noise buffers, including topography.

These basic guidelines cannot resolve all land use compatibility questions. However, they do offer a reasonable framework within which to work.

A.6 Accident Potential

Land use guidelines for the two APZs are based on a hazard index system that compares the relationship of accident occurrence for five areas:

- On or adjacent to the runway
- Within the CZ
- In APZ I
- In APZ II
- In all other areas within a 10 nautical mile radius of the runway

Accident potential on or adjacent to the runway or within the CZ is so high that few uses are acceptable. The risk outside APZ I and APZ II, but within the 10 nautical mile radius area, is

significant but acceptable, if sound engineering and planning practices are followed.

Land use guidelines for APZs I and II have been developed. The main objective has been to restrict all people-intensive uses because there is greater risk in these areas. The basic guidelines aim at prevention of uses that:

- Have high residential density characteristics;
- Have high labor intensity;
- Involve above-ground explosive, fire, toxic, corrosive, or other hazardous characteristics;
- Promote population concentrations;
- Involve utilities and services required for area-wide population, where disruption would have an adverse impact (telephone, gas, etc.);
- Concentrate people who are unable to respond to emergency situations, such as children, elderly, handicapped, etc.; and
- Pose hazards to aircraft operations.

There is no question that these guidelines are relative. Ideally, there should be no people-intensive uses in either APZ. The free market and private property systems prevent this where there is land development demand. To go beyond these guidelines, however, substantially increases risk by placing more people in areas where there may ultimately be an aircraft accident.

A.7 Noise

Nearly all studies analyzing aircraft noise and residential compatibility recommend no residential uses in noise zones above DNL 75 dB. Usually, no restrictions are recommended below noise zone DNL 65 dB. Between DNL 65-74 dB there is currently no consensus. These areas may not qualify for federal mortgage insurance in residential categories according to the Department of Housing and Urban Development (HUD) Regulation 24 CFR 51B. In many cases, HUD approval requires noise attenuation measures, the Regional Administrator's concurrence, and an environmental impact statement. The Department of Veterans Affairs also has airfield noise and accident restrictions that apply to their home loan guarantee program. Whenever possible, residential land use should be located below DNL 65 dB according to Air Force land use recommendations. Residential buildings within the DNL 65-70 dB noise contours shall utilize noise level reduction measures in accordance with the Air Force land use compatibility guidelines in the AICUZ Study, Table 4-2.

Most industrial/manufacturing uses are compatible in the airfield area of influence. Exceptions are uses such as research or scientific activities that require lower noise levels. Noise attenuation measures are recommended for portions of buildings devoted to office use, receiving the public, or where the normal background noise level is low.

The transportation, communications, and utilities categories have a high noise level compatibility because they generally are not people-intensive. When people use land for these purposes, the use

is generally very short in duration. Where buildings are required for these uses, additional evaluation is warranted.

The commercial/retail trade and personal and business services categories are compatible without restriction up to DNL 70 dB; however, they are generally incompatible above DNL 80 dB. Between DNL 70-80 dB, noise level reduction measures should be included in the design and construction of buildings.

The nature of most uses in the public and quasi-public services category requires a quieter environment, and attempts should be made to locate these uses below DNL 65 dB (an Air Force land use recommendation), or else provide adequate noise level reduction.

Although recreational use has often been recommended as compatible with high noise levels, recent research has resulted in a more conservative view. Above DNL 75 dB, noise becomes a factor that limits the ability to enjoy such uses. Where the requirement to hear is a function of the use (i.e., music shell, etc.), compatibility is limited. Buildings associated with golf courses and similar uses should be noise attenuated.

With the exception of forestry activities and livestock farming, uses in the resources production, extraction, and open space category are compatible almost without restrictions.

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APPENDIX B CLEAR ZONES AND ACCIDENT POTENTIAL ZONES

B.1 Guidelines for Accident Potential

Urban areas around airports are exposed to the possibility of aircraft accidents even with well-maintained aircraft and highly trained aircraft crews. Despite stringent maintenance requirements and countless hours of training, past history shows accidents do happen.

When the AICUZ Program began, there were no current comprehensive studies on accident potential. To support the program, the Air Force completed a study of Air Force aircraft accidents that occurred between 1968 and 1972 within 10 nautical miles (NMs) of airfields. The study of 369 accidents revealed that 75 percent of aircraft accidents occurred on or adjacent to the runway (1,000 feet to each side of the runway centerline) and in a corridor 3,000 feet (1,500 feet either side of the runway centerline) wide, extending from the runway threshold along the extended runway centerline for a distance of 15,000 feet.

Three zones were established based on crash patterns: the CZ, APZ I, and APZ II. The CZ starts at the end of the runway and extends outward 3,000 feet. It has the highest accident potential of the three zones. The Air Force has adopted a policy of acquiring property rights to areas designated as CZs because of the high accident potential. APZ I extends from the CZ an additional 5,000 feet. It includes an area of reduced accident potential. APZ II extends from APZ I an additional 7,000 feet in an area of further reduced accident potential.

The Air Force's research work in accident potential was the first significant effort in this subject area since 1952 when the President's Airport Commission published "The Airport and Its Neighbors," better known as the "Doolittle Report." The recommendations of this earlier report were influential in the formulation of the APZ concept.

The risk to people on the ground of being killed or injured by aircraft accidents is small. However, an aircraft accident is a high consequence event and when a crash does occur, the result is often catastrophic. Because of this, the Air Force does not attempt to base its safety standards on accident probabilities. Instead, the Air Force approaches this safety issue from a land use planning perspective.

B.2 Accident Potential Analysis

Military aircraft accidents differ from commercial air carrier and general aviation accidents because of the variety of aircraft used, the type of missions, and the number of training flights. The 1973 study reviewed 369 major Air Force accidents during 1968-1972, and found that 61 percent of the accidents were related to landing operations and 39 percent were takeoff related. It also found that 70 percent occurred in daylight, and that fighter and training aircraft accounted for 80 percent of the accidents.

Because the purpose of the study was to identify accident hazards, the study plotted each of the 369 accidents in relation to the airfield. This plotting found that the accidents clustered along the runway and its extended centerline. To further refine this clustering, a tabulation was prepared that described the cumulative frequency of accidents as a function of distance from the runway

centerline along the extended centerline. This analysis was done for widths of 2,000, 3,000, and 4,000 total feet. Table B-1 reflects the location analysis.

Table B-1. Location Analysis.

	Width of Runway Extension (Feet)		
Length From Both Ends of Runway (feet)	2,000	3,000	4,000
Percent of Accidents			
On or Adjacent to Runway (1,000 feet to each side of runway centerline)	23	23	23
0 to 3,000	35	39	39
3,000 to 8,000	8	8	8
8,000 to 15,000	5	5	7
Cumulative Percent of Accidents			
On or Adjacent to Runway (1,000 feet to each side of runway centerline)	23	23	23
0 to 3,000	58	62	62
3,000 to 8,000	66	70	70
8,000 to 15,000	71	75	77

Figure B-1 indicates the cumulative number of accidents rises rapidly from the end of the runway to 3,000 feet, rises more gradually to 8,000 feet, then continues at about the same rate of increase to 15,000 feet, where it levels off rapidly. The location analysis also indicates 3,000 feet as the optimum runway extension width and the width that would include the maximum percentage of accidents in the smallest area.

Using the optimum runway extension width, 3,000 feet, and the cumulative distribution of accidents from the end of the runway, zones were established that minimized the land area included and maximized the percentage of accidents included. The zone dimensions and accident statistics for the 1968-1972 study are shown in Figure B-2.

Figure B-1.
Distribution of Air Force Aircraft Accidents
(369 Accidents - 1968-1972).

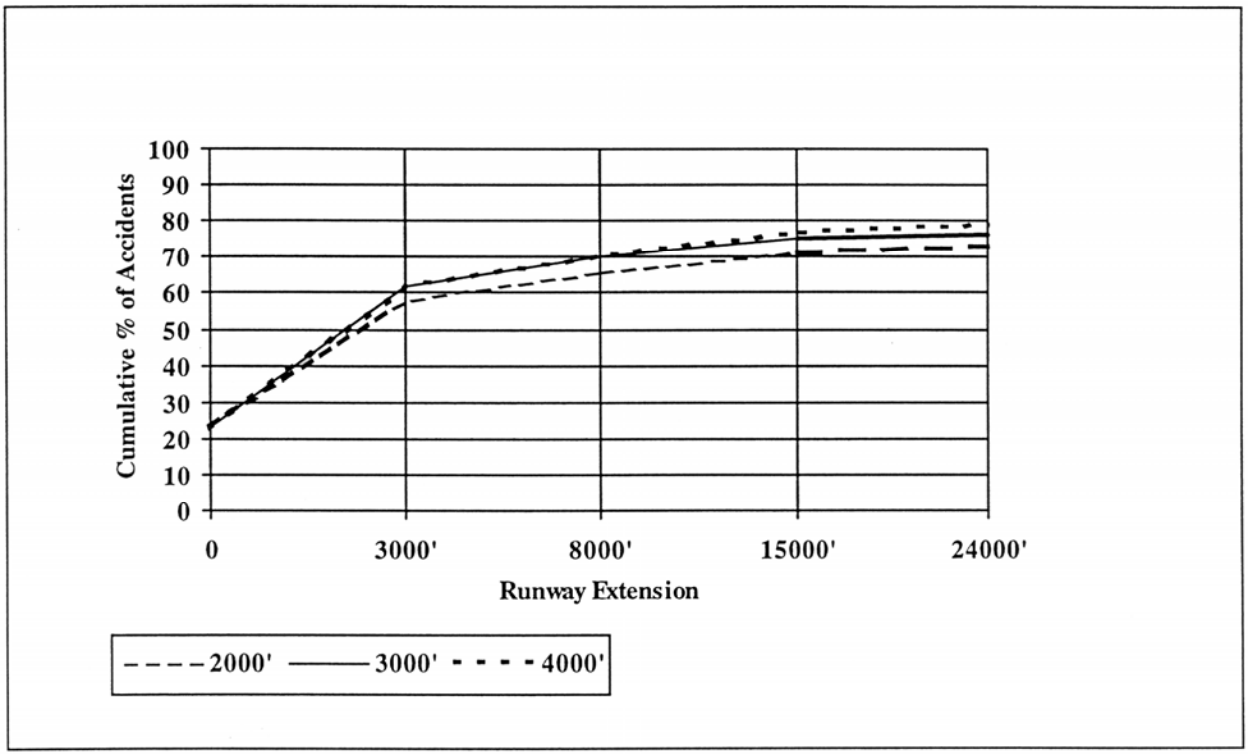
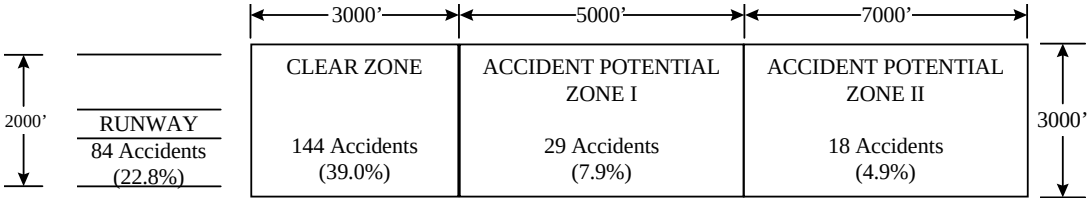


Figure B-2.
Air Force Aircraft Accident Data
(369 Accidents - 1968-1972).



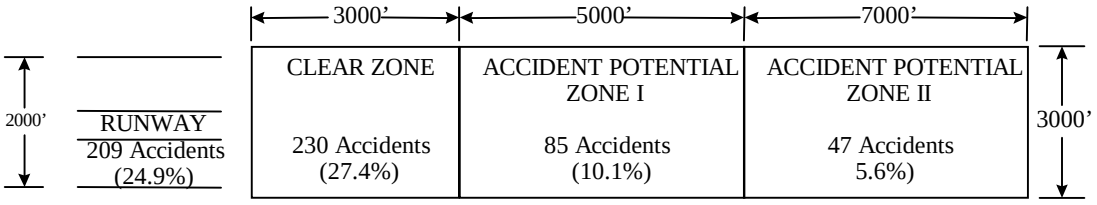
Other Accidents Within 10 NMs:
94 Accidents, 25.4%

Additional accident data for 1986 through 1995 has been analyzed. Table B-2 compares the accident distribution data for 1968-1985 with that for 1968-1995, and Figure B-3 depicts the results for a total of 838 accidents. Analysis shows the cumulative changes evident in accident location through 1995 reconfirm the dimensions of the CZ and APZs.

Table B-2.
Additional Accident Data
(838 Accidents - 1968-1995).

ZONE	1968-1985	1968-1995
On-Runway	197-27.1%	209-25.1%
CZ	210-28.8%	226-27.1%
APZ I	57-7.8%	85-10.2%
APZ II	36-5.0%	47-5.6%
Other (Within 10 NMs)	228-31.3%	267-32.0%

Figure B-3.
Air Force Aircraft Accident Data
(838 Accidents - 1968-1995).



Other Accidents Within 10 NMs:
267 Accidents, 32.0%

B.3 Definable Debris Impact Areas

The Air Force also determined which accidents had definable debris impact areas, and in what phase of flight the accident occurred. Overall, 75 percent of the accidents had definable debris impact areas, although they varied in size by type of accident.

The Air Force used weighted averages of impact areas, for accidents occurring only in the approach and departure phase, to determine the following average impact areas:

- Overall Average Impact Area 5.06 acres
- Fighter, Trainer, and Misc. Aircraft 2.73 acres
- Heavy Bomber and Tanker Aircraft 8.73 acres

B.4 Findings

Designation of safety zones around the airfield and restriction of incompatible land uses can reduce the public's exposure to safety hazards.

Air Force accident studies have found that aircraft accidents near Air Force installations occurred in the following patterns:

- 61% were related to landing operations;
- 39% were related to takeoff operations;
- 70% occurred in daylight;
- 80% were related to fighter and training aircraft operations;
- 25% occurred on the runway or within an area extending 1,000 feet out from each side of the runway;
- 27% occurred in an area extending from the end of the runway to 3,000 feet along the extended centerline and 3,000 feet wide, centered on the extended centerline; and
- 16% occurred in an area between 3,000 and 15,000 feet along the extended runway centerline and 3,000 feet wide, centered on the extended centerline.

US Air Force aircraft accident statistics found that 75% of aircraft accidents resulted in definable impact areas. The average size of the impact areas were:

- 5.1 acres overall
- 2.7 acres for fighters and trainers
- 8.7 acres for heavy bombers and tankers

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APPENDIX C DESCRIPTION OF THE NOISE ENVIRONMENT

C.1 Noise Contours

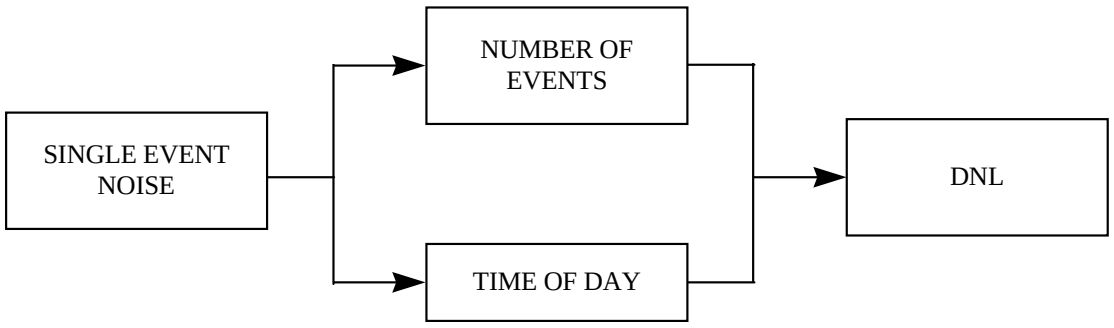
The following paragraphs describe the methodologies used to produce the noise contours contained in this AICUZ Study.

C.2 Noise Environment Descriptor

The noise contour methodology used is the Day-Night Average A-Weighted Sound Level (DNL) metric for describing the noise environment. Efforts to provide a national uniform standard for noise assessment have resulted in adoption by the Environmental Protection Agency of DNL as the standard noise prediction metric for this procedure. The Air Force uses the DNL descriptor as the method to assess the amount of exposure to aircraft noise and predict community response to the various levels of exposure. The DNL values used for planning purposes are 65, 70, 75, and 80+ dB. Land use guidelines are based on the compatibility of various land uses with these noise exposure levels. DNL is a measurable quantity that can be measured directly.

It is generally recognized that a noise environment descriptor should consider, in addition to the annoyance of a single event, the effect of repetition of such events and the time of day in which these events occur. DNL begins with a single event descriptor and adds corrections for the number of events and the time of day. Since the primary development concern is residential, nighttime events are considered more annoying than daytime events and are weighted accordingly. DNL values are computed from the single event noise descriptor, plus corrections for number of flights and time of day (see Figure C-1).

Figure C-1. Day-Night Average A-Weighted Sound Level (DNL).

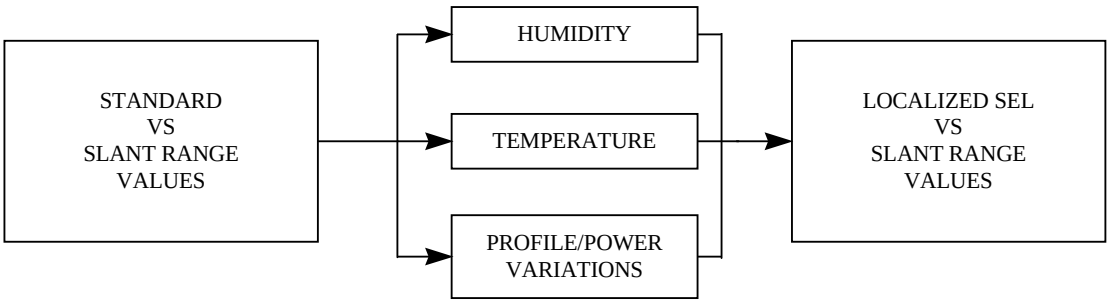


As part of the extensive data collection process, detailed information is gathered on the type of aircraft and number and time of day of flying operations for each aircraft flight track during a typical day. This information is used in conjunction with the single event noise descriptor to produce DNL values. These values are combined on an energy summation basis to provide single DNL values for the mix of aircraft operations at the base. Equal value points are connected to form the contour lines.

C.3 Noise Event Descriptor

The single event noise descriptor used in the DNL system is the sound exposure level (SEL). The SEL measure is an integration of an "A" weighted noise level over the period of a single event, such as an aircraft overflight, in dB. Frequency, magnitude, and duration vary according to aircraft type, engine type, and power setting. Therefore, individual aircraft noise data are collected for various types of aircraft/engines at different power settings and phases of flight. Figure C-2 shows the relationship of the single event noise descriptor (SEL) to the source sound energy.

Figure C-2. Sound Exposure Level (SEL).



SEL vs. slant range values are derived from noise measurements made according to a source noise data acquisition plan developed by Bolt, Beranek, and Newman, Inc., in conjunction with the Air Force's Armstrong Laboratory (AL), and carried out by AL. These standard day, sea level values form the basis for the individual event noise descriptors at any location and are adjusted to the location by applying appropriate corrections for temperature, humidity, and variations from standard profiles and power settings.

Ground-to-ground sound propagation characteristics are used for altitudes up to 500 feet absolute with linear transition between 500 and 700 feet and air-to-ground propagation characteristics above 700 feet.

In addition to the assessment of aircraft flight operations, the DNL system also incorporates noise resulting from engine/aircraft maintenance checks on the ground. Data concerning the orientation of the noise source, type of aircraft or engine, number of test runs on a typical day, power settings used and their duration, and use of suppression devices are collected for each ground run up or test position. This information is processed and the noise contribution added (on an energy summation

basis) to the noise generated by flying operations to produce noise contours reflecting the overall noise environment with respect to aircraft air and ground operations.

C.4 Noise Contour Production

Data describing flight track distances and turns, altitudes, airspeeds, power settings, flight track operational utilization, maintenance locations, ground runup engine power settings, and number and duration of runs by type of aircraft/engine was assembled by Laughlin AFB. HQ AETC/A7C screened the data and trained personnel processed the data for input into a central computer. Flight track maps were generated for verification and approval by Laughlin AFB and HQ AETC/A7C. After any required changes were incorporated, DNL contours were generated by the computer using the supplied data and standard source noise data corrected to local weather conditions. A set of these contours is provided in the body of the AICUZ Study.

Additional technical information on the DNL procedures is available in the following publications:

- *Community Noise Exposure Resulting from Aircraft Operations: Applications Guide for Predictive Procedure*, AMRL-TR-73-105, November 1974, from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22151.
- *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with* Adequate *Margin of Safety*, EPA Report 550/9-74-004, March 1974, from Superintendent of Documents, US Government Printing Office, Washington, DC 20402.

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APPENDIX D HEIGHT AND OBSTRUCTIONS CRITERIA

D.1 Height and Obstructions Criteria

D.1.1 General

This appendix establishes criteria for determining whether an object or structure is an obstruction to air navigation. Obstructions to air navigation are considered to be:

- Natural objects or man-made structures that protrude above the planes or surfaces as defined in the following paragraphs and/or
- Man-made objects that extend more than 500 feet above the ground at the site of the structure.

D.1.2 Explanation of Terms

The following will apply:

- Controlling Elevation. Whenever surfaces or planes within the obstructions criteria overlap, the controlling (or governing) elevation becomes that of the lowest surface or plane.
- Runway Length. Laughlin AFB has three runways; Table D-1 details Laughlin AFB runway coordinates and elevations. Runway 13L/31R has 8,311 feet of pavement designed and built for sustained aircraft landings and take offs. Runway 13C/31C has 8,857 feet of pavement designed and built for this purpose and Runway 13R/31L has 6,246 feet of pavement designed and built for this purpose.
- Established Airfield Elevation. The established Laughlin AFB elevation in feet above mean sea level (MSL) is 1,082 feet.
- Dimensions. All dimensions are measured horizontally unless otherwise noted.

D.1.3 Planes and Surfaces.

Definitions are as follows (Figure D-1):

- Primary Surface. This surface defines the limits of the obstruction clearance requirements in the immediate vicinity of the landing area. The primary surface comprises surfaces of the runway, runway shoulders, and lateral safety zones and extends 200 feet beyond the runway end. The width of the primary surface for a class "B" runway, the class for the Laughlin runways, is 2,000 feet, or 1,000 feet on each side of the runway centerline. Ideally, there should be no obstructions, fixed or mobile, within the primary surface area.
- Clear Zone Surface. This surface defines the limits of the obstruction clearance requirements in the vicinity contiguous to the end of the primary surface. The CZ surface length and width (for a single runway) is 3,000 feet by 3,000 feet.

Table D-1. Laughlin AFB Coordinates and Elevations.

Airport Elevation:		1,082 feet (MSL)
Coordinates:		
	Runway 13L/31R	Lat: 29° 22' 5.55" N Long: 100° 47' 3.71" W
		Lat: 29° 21' 6.90" N Long: 100° 45' 57.73" W
	Runway 13C/31C	Lat: 29° 22' 2.82" N Long: 100° 47' 16.51" W
		Lat: 29° 21' 0.32" N Long: 100° 46' 6.21" W
	Runway 13R/31L	Lat: 29° 21' 56.92" N Long: 100° 47' 17.80" W
		Lat: 29° 21' 12.85" N Long: 100° 46' 28.22" W

- Approach-Departure Clearance Surface. This surface is symmetrical about the extended runway centerline, begins as an inclined plane (glide angle) at each end of the primary surface of the centerline elevation of the runway end, and extends for 50,000 feet. The slope of the approach-departure clearance surface is 50:1 along the extended runway (glide angle) centerline until it reaches an elevation of 500 feet above the established airfield elevation. It then continues horizontally at this elevation to a point 50,000 feet from the start of the glide angle. The width of this surface at the runway end is 2,000 feet; it flares uniformly, and the width at 50,000 feet is 16,000 feet.
- Inner Horizontal Surface. This surface is a plane, oval in shape at a height of 150 feet above the established airfield elevation. It is constructed by scribing an arc with a radius of 7,500 feet above the centerline at the end of the runway and interconnecting these arcs with tangents.
- Conical Surface. This is an inclined surface extending outward and upward from the outer periphery of the inner horizontal surface for a horizontal distance of 7,000 feet to a height of 500 feet above the established airfield elevation. The slope of the conical surface is 20:1.
- Outer Horizontal Surface. This surface is a plane located 500 feet above the established airfield elevation. It extends for a horizontal distance of 30,000 feet from the outer periphery of the conical surface.

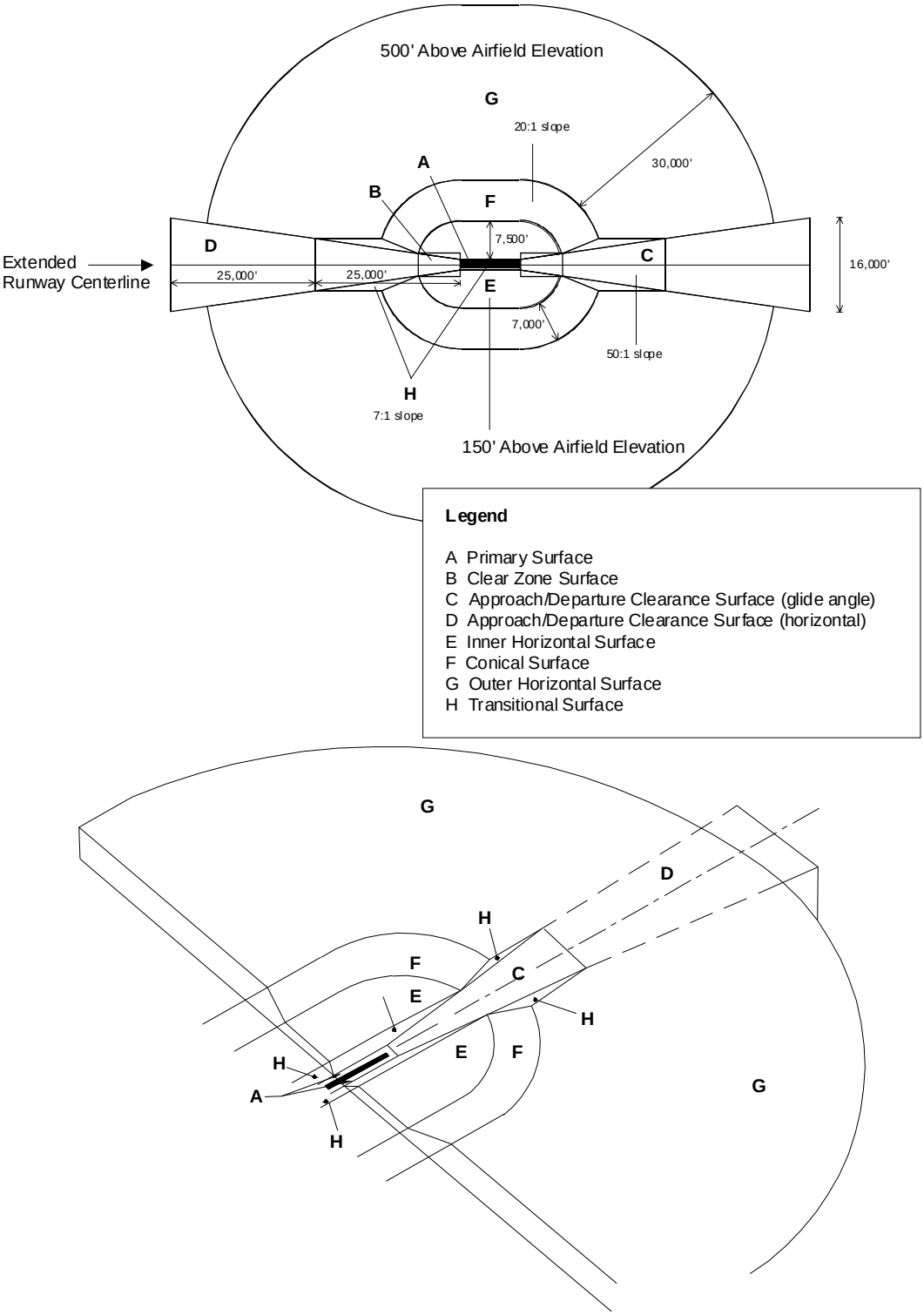

Figure D-1 Airspace Control Surface Plan.

(For a more complete description of airspace control surfaces, refer to FAR Part 77, Subpart C, or Air Force Manual 32-1123, Airfield and Heliport Planning and Design.)

- Transitional Surfaces. These surfaces connect the primary surfaces, CZ surfaces, and approach-departure clearance surfaces to the outer horizontal surface, conical surface, other horizontal surface, or other transitional surfaces. The slope of the transitional surface is 7:1 outward and upward at right angles to the runway centerline. To determine the elevation for the beginning of the transitional surface slope at any point along the lateral boundary of the primary surface, including the clear zone, draw a line from this point to the runway centerline. This line will be at right angles to the runway axis. The elevation at the runway centerline is the elevation for the beginning of the 7:1 slope.

The land areas outlined by these criteria should be regulated to prevent uses that might otherwise be hazardous to aircraft operations. The following uses should be restricted and/or prohibited.

- Uses that release into the air any substance that would impair visibility or otherwise interfere with the operation of aircraft (i.e., steam, dust, or smoke).
- Uses that produce light emissions, either direct or indirect (reflective), that would interfere with pilot vision.
- Uses that produce electrical emissions that would interfere with aircraft communications systems or navigational equipment.
- Uses that would attract birds or waterfowl, including but not limited to, operation of sanitary landfills, maintenance of feeding stations, or the growing of certain vegetation.
- Uses that include structures within ten feet of aircraft approach-departure and/or transitional surfaces.

D.2 Height Restrictions

City/County/Township agencies involved with approvals of permits for construction should require developers to submit calculations that show projects meet the height restriction criteria of FAR Part 77, *Objects Affecting Navigable Airspace*, Subpart C (Obstruction Standards), as described in part by the information contained in this Appendix.

APPENDIX E NOISE LEVEL REDUCTION GUIDELINES

A study providing in-depth, state-of-the-art noise level reduction guidelines was completed for the Naval Facilities Engineering Command and the Federal Aviation Administration by Wyle Laboratories in April 2005. The study title is *Guidelines for the Sound Insulation of Residences Exposed to Aircraft Operations*. Copies of this study are available for review, upon request, from the Civil Engineer office at Laughlin AFB.

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