

LANGLEY AIR FORCE BASE



Final
Report



July
2007



AICUZ Update

Air Installation Compatible Use Zone



**Langley Air Force Base – AICUZ Update
Air Installation Compatible Use Zone**



**Prepared For:
United States Air Force
Air Combat Command
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ACRONYMS and ABBREVIATIONS

ACC	Air Combat Command
AFB	Air Force Base
AFH	Air Force Handbook
AGL	above ground level
AICUZ	Air Installation Compatible Use Zone
ALF	Airlift Flight
ANG	Air National Guard
APZ	accident potential zone
ATC	air traffic control
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
EIA	Economic Impact Analysis
EIR	economic impact region
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FS	Fighter Squadron
FW	Fighter Wing
GPC	government charge card purchases
HRPDC	Hampton Roads Planning District Commission
HUD	Housing and Urban Development
IFR	instrument flight rules
INM	Integrated Noise Model
MOA	military operations area
MSA	Metropolitan Statistical Area
MSL	mean sea level
NAS	National Airspace System
NASA LaRC	National Aeronautics and Space Administration Langley Research Facility
OE/AAA	obstruction evaluation/airport airspace analysis
PA	Public Affairs Office
SV	Services Squadron
TAC	Tactical Air Command
TRACON	terminal radar approach control
VFR	visual flight rules
UFC	Unified Facility Criteria
USCB	U.S. Census Bureau



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LANGLEY AIR FORCE BASE
VIRGINIA

**CHAPTER 1 • PURPOSE
AND NEED**

AIR INSTALLATION COMPATIBLE USE ZONE



1.0 PURPOSE AND NEED

1.1 Introduction



Langley Air Force Base, whose host wing is the 1st Fighter Wing, is home to the multi-role, all-weather F-15C Eagle and F-22A Raptor and provides worldwide deployable aircraft and personnel capable of executing combat missions in support of the Air and Space Expeditionary Force.

The F-15C Eagle is an air superiority fighter designed to perform air-to-air combat missions. An array of avionics and electronics systems gives the F-15C Eagle the capability to fight at low altitude, day or night, and in all weather.

The F-22 Raptor is the Air Force's newest fighter and is a dual-role fighter designed to perform air-to-air and air-to-ground missions. An array of stealth, avionics, and supercruise speed makes the F-22 Raptor able to deal with any threat.

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 Hampton, the City of Poquoson, the City of Newport News and York County, with the goal of preventing incompatibilities that might compromise Langley 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 guidelines for Air Force AICUZ outlined in Air Force Handbook (AFH) 32-7084 *AICUZ Program Manager's Guide* reflect preferred land use recommendations 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 zones are delineated by connecting points of equal noise exposure (contours). Land use recommendations 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 axis of the runway. 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 inhabitants of the Langley AFB environs (Figure 1-1) and to the citizens of the United States to point out ways to protect the people in adjacent areas as well as 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 Langley AFB's anticipated flying operations was performed, including types of aircraft, flight patterns, variations in altitude, power settings, number of 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 Langley AFB.

1.2 Process and Procedure

This study is an update of the previous 1997 Langley AFB AICUZ study. The update presents and documents all changes to the AICUZ for the period of 1997 to 2007 that result from changes to the mix of aircraft using Langley AFB (both transient and based), as well as 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 F-22 *Raptor* from Langley AFB. Additionally, the Air Force is integrating the Air National Guard (ANG) into its active duty program, resulting in more frequent operations on weekends. This AICUZ study reaffirms Air Force policy of promoting public health, safety, and general welfare in areas surrounding Langley AFB. In 2001, the Air Force released anticipated noise exposure (contours) prior to the beddown of the F-22 *Raptor*. Now that the F-22 *Raptor* is operational, contours reflecting actual operational experience are warranted.

This update to Langley AFB's AICUZ study is part of the continuing Air Force participation in the local planning process. It is recognized that the Air Force has the responsibility of providing information on its activities that potentially affect the community. As local communities prepare land use plans and zoning

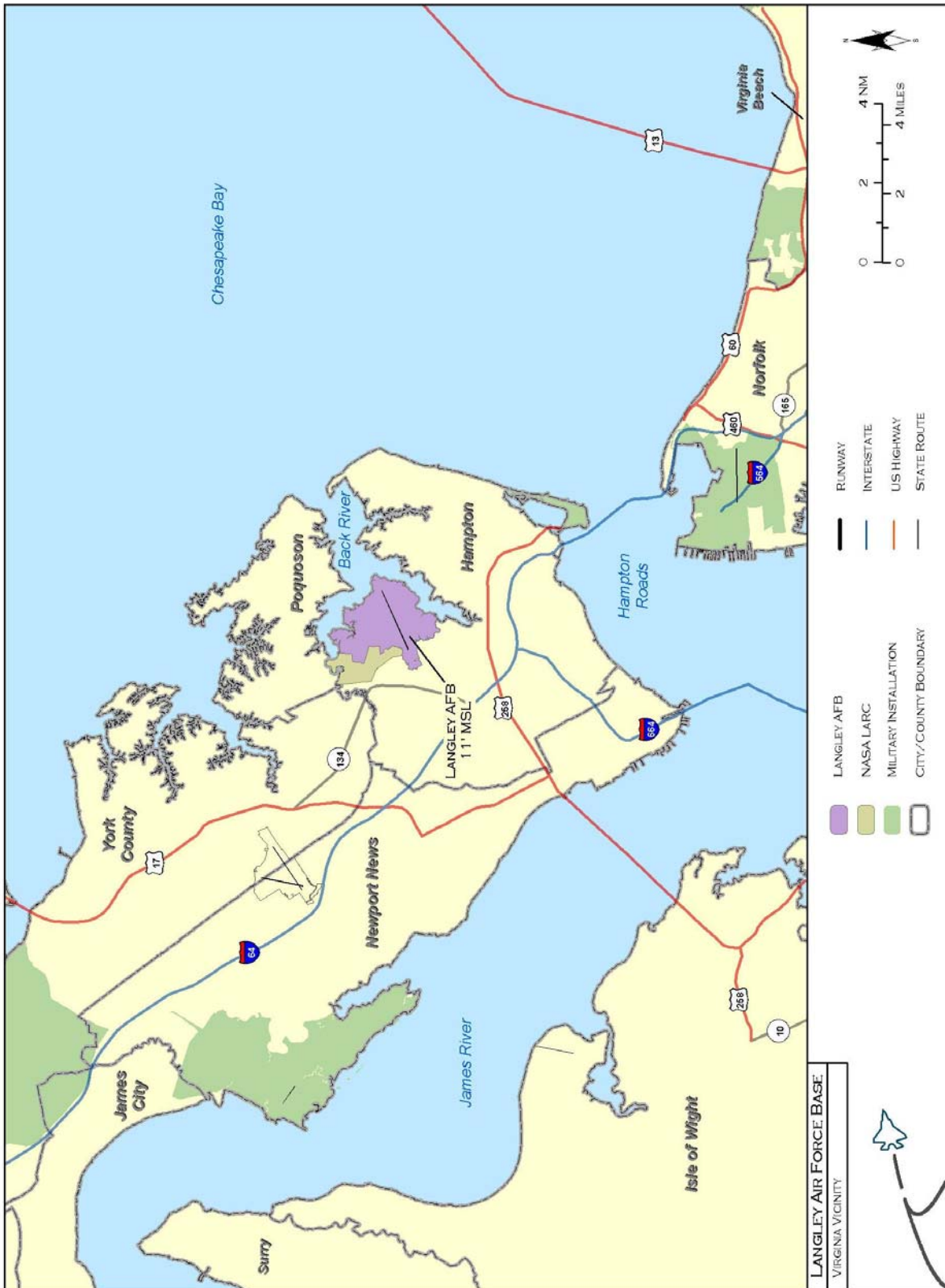


Figure 1-1. Langley AFB Virginia Vicinity.



ordinances, Langley AFB presents this study in the spirit of mutual cooperation and respect with the intent of assisting in the local land use planning process.

Aircraft operations data were collected at Langley AFB in November 2005, with additional data collected during the spring of 2006. 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 noise contours were calculated; the results are expressed in terms of DNL. Contours were 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 are depicted. These imaginary surfaces are designated to promote and maintain clear 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.



LANGLEY AIR FORCE BASE
VIRGINIA

**CHAPTER 2 • INSTALLATION
DESCRIPTION**

AIR INSTALLATION COMPATIBLE USE ZONE



2.0 INSTALLATION DESCRIPTION

2.1 Location, Geography, and Airspace

The term “National Airspace System” (NAS) refers to a complex network of air navigation facilities, air traffic control facilities, airports, technology, and appropriate rules and regulations. Aircraft operate within the NAS (and become subject to Federal Aviation Regulations) once they begin taxiing from their parking space with the intent to takeoff.

Langley AFB is located in the Hampton Roads region of southeastern Virginia. The base itself is situated between two branches of the Back River. The City of Poquoson lies north of the base, across the Back River (Northwest Branch). To the northwest of Hampton (and the base) is York County; the City of Newport News abuts the western boundary of Hampton. Across the Southwest branch of the Back River lies the balance of the City of Hampton and further to the east is the Chesapeake Bay (Figure 2-1).

Langley AFB has three major parcels of real estate: the main base in Hampton, the Bethel Manor housing area in York County, and the Big Bethel Reservoir, which forms a boundary between York County and the cities of Hampton and Newport News. Langley AFB main base is located on a peninsula between two tidal tributaries of the Chesapeake Bay (the York River and the James River); the topography of the area is characterized as a coastal plain with very little variation in terrain. Major transportation corridors extend along the length of this peninsula, including I-64 and a main line of the CSX railroad. The Norfolk International Terminal port complex includes facilities in Newport News for servicing oceangoing vessels; commercial air carrier service to the region is provided at airports in Newport News and Norfolk.

The population of both the Commonwealth of Virginia and the Hampton Roads region have been growing rapidly since the end of World War II and this growth is expected to continue for the foreseeable future. Current projections indicate that the population residing in jurisdictions near Langley AFB will increase between 2007 and 2020 in a range between 29.2 % (York County) to 3.2% (Poquoson). In Hampton and Newport News, the projected percentage increases are expected to be 5.2% and 4.9%, respectively. This compares to a statewide project rate of population growth of 12.5% between 2007 and 2020. The heavy concentration of military bases and shipyards in the Hampton Roads region, along with the presence of numerous employers in the governmental, educational, and service sectors have contributed to the growth in the region (Table 2-1).

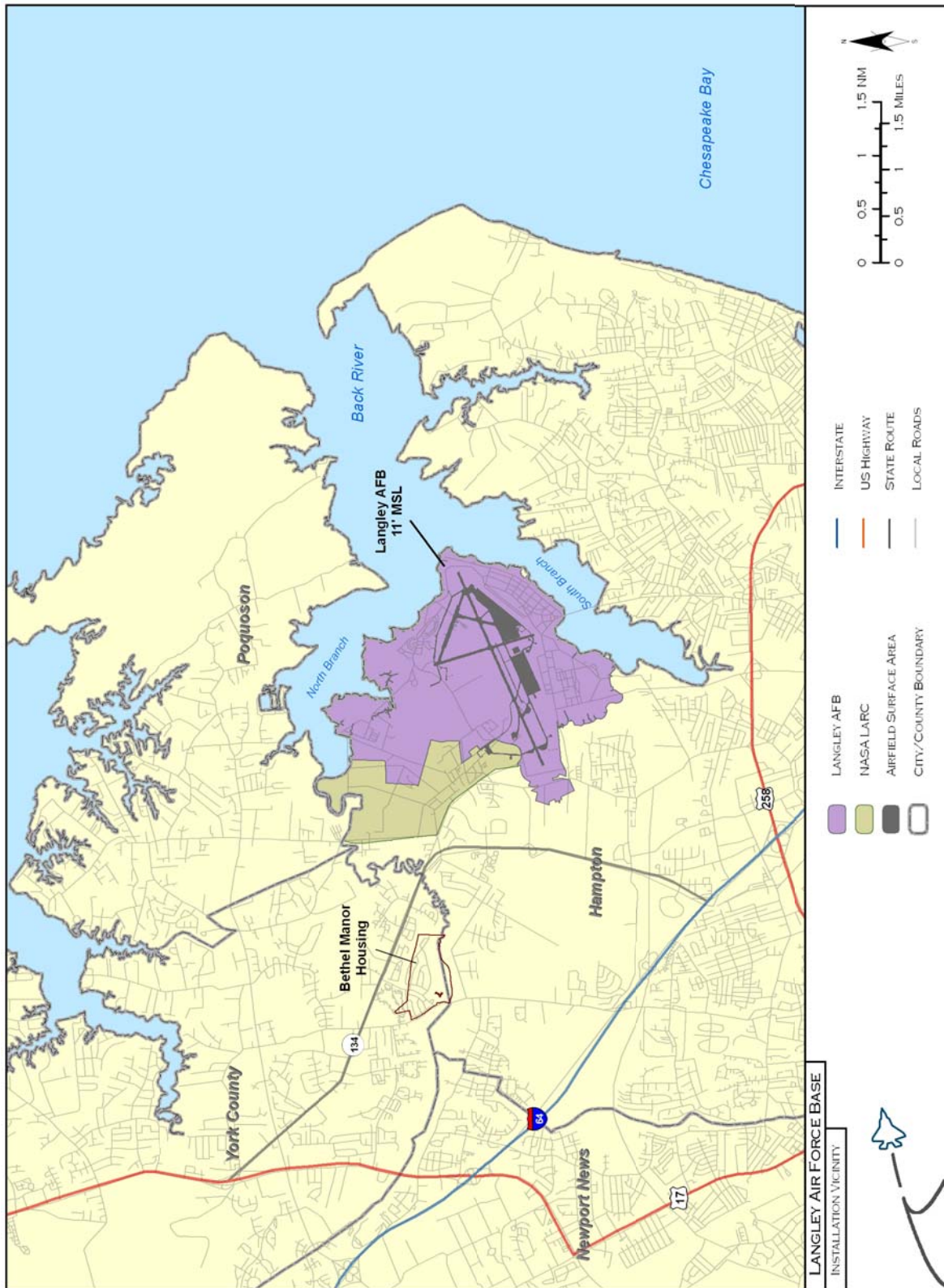


Figure 2-1. Installation Vicinity.

**Table 2-1. Population and Projections.**

Jurisdiction	1990	2000	2006 (estimated)	2020 (estimated)	Percentage of Growth (estimated)
Commonwealth of Virginia	6,187,358	7,078,515	7,642,884	8,601,896	12.5
City of Hampton	133,793	146,437	145,017	152,598	5.2
City of Poquoson	11,005	11,566	11,918	12,299	3.2
City of Newport News	170,045	180,150	178,281	187,100	4.9
York County	42,422	56,297	61,879	80,002	29.2

Source: US Census Bureau (1990, 2000 and 2006 data); Virginia Employment Commission (2020 Population Projection).

The FAA classifies airspace based on whether it provides ATC. Separation services are provided to aircraft operating under Instrument Flight Rules. Controlled Airspace (further subdivided into Class A, B, C, D or E) is airspace within which ATC separation service is provided; Class G is uncontrolled airspace; no ATC separation is provided. The airspace around Langley AFB is a mix of Class D, E, and G airspace. Of these, Class D is the most restrictive, requiring all aircraft to establish communications prior to entry.

The main base occupies approximately 2,883 acres, with a runway complex consisting of a single runway (08/26). Runway 08/26 is 10,000 feet long by 150 feet wide oriented along an east-west axis, with intersecting taxiways and ramp space to the south for taxiing and parking of 1 Fighter Wing (FW) aircraft. Additional ramp space for aircraft parking north of the runway, at the west and east ends, is used by the National Aeronautics and Space Administration Langley Research Center (NASA LaRC) and an Aero Club, respectively (Figure 2-2). North of the runway and east of the NASA LaRC hangar is an Alert Hangar for the ANG. The north portion of a former crosswind runway is now used as a taxiway and, occasionally, for aircraft parking.

Aircraft maintenance and static engine runs occur either in the parking areas, at the ends of the runways, at a trim pad (near NASA LaRC hangar), or in test cells or hush houses. The parking areas are located on both the south side (1 FW) and the north side (NASA LaRC, Aero Club) of the runway and the hush houses are on the east side of the base, also north of the runway (Figure 2-2). The airfield elevation is 11 feet above mean sea level (MSL).

The airfield at Langley AFB lies within controlled airspace. The term controlled airspace refers to airspace within which aircraft separation (i.e., air traffic control [ATC]) is provided by the FAA or Air Force air traffic controllers. Separation of aircraft is achieved through a combination of a terminal radar approach control (TRACON) facility in Norfolk operated by the FAA and a

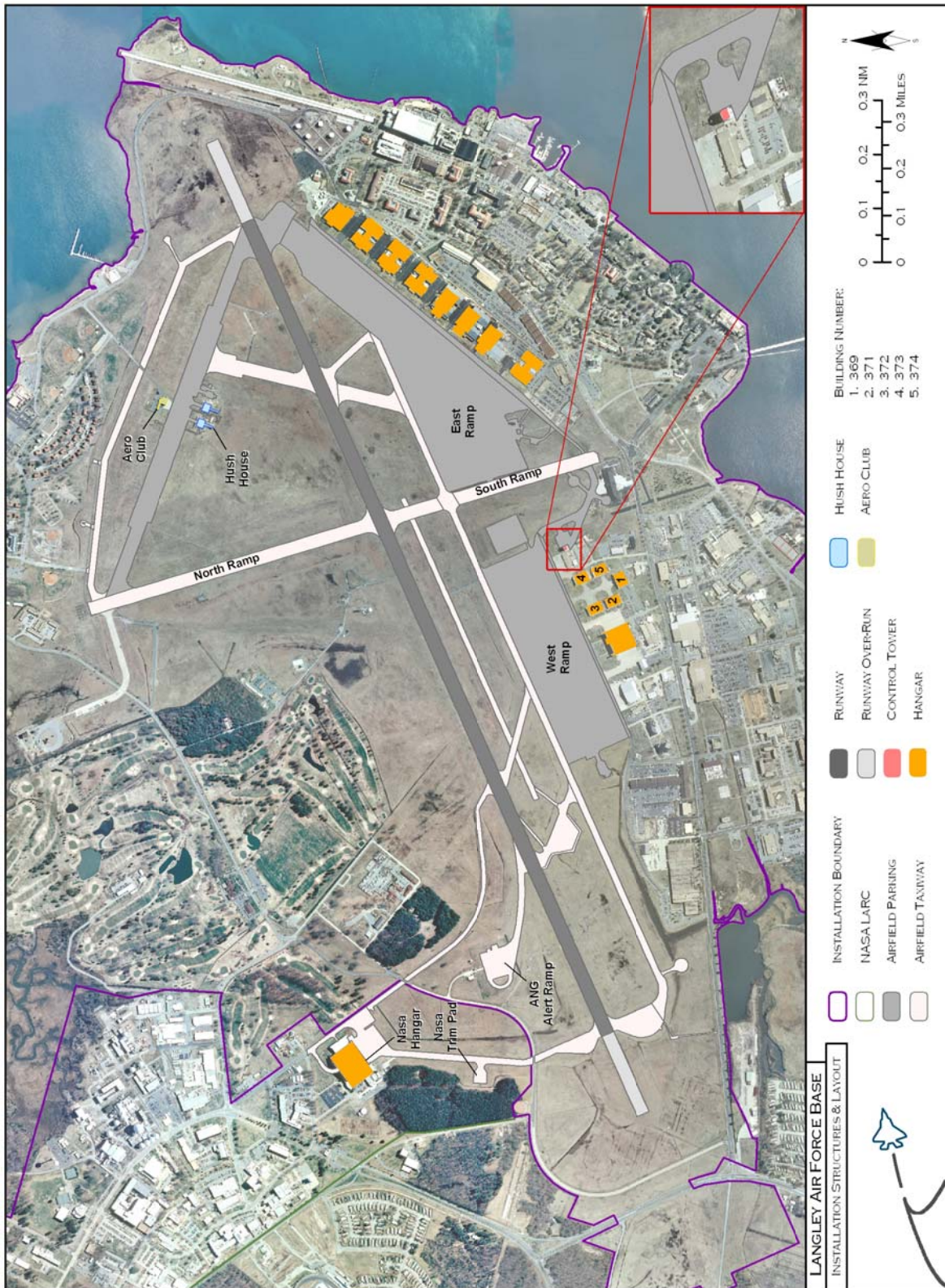


Figure 2-2. Installation Structures and Layout.



In March of 1981, the USAF announced the Enhanced Tactical Fighter program to procure a replacement for the F-111 'Aardvark'. The concept envisioned an aircraft capable of launching deep interdiction missions without requiring additional support in the form of fighter escort or jamming support. General Dynamics submitted the F-16XL, while McDonnell Douglas submitted a variant of the F-15 Eagle.

Air Combat Command is an Air Force major command that was created June 1, 1992 by combining its predecessors Strategic Air Command and Tactical Air Command. ACC is the primary provider of air combat forces to America's warfighting commanders. It is the Air Force component of the Department of Defense's Joint Forces Command, headquartered in Norfolk, VA.

control tower at Langley AFB operated by Air Force air traffic controllers. The closest to Langley AFB is a Class D airspace area. This airspace requires two-way communication prior to entry. The communication requirement allows ATCs to provide separation service to participating aircraft operating under visual flight rules (VFR) and instrument flight rules (IFR), permitting operations to occur during periods of less favorable weather. The Class D airspace extends outward from the airfield for approximately 5 miles and upward to 2,500 feet MSL.

2.2 History of Langley Air Force Base

The history of Langley AFB parallels the history of military aviation in this country, first as an element of the Army and then as a separate military department. The base was named for aviation pioneer Samuel Pierpont Langley who was the head of the Smithsonian Institute and a competitor with the Wright brothers in the development of the first powered aircraft. In December 1916, the land that became Langley Field was the first property ever purchased by the United States for aviation purposes. The War Department bought the site for the Army's young air "arm" to build an Aeronautical Experimental Station and Proving Ground, an airfield for aeronautical research, experiments, and flight tests. An air base for national defense purposes was not yet conceived in the early years of aviation. After construction was underway at the new experimental station, the Army set aside a section of Langley Field for the National Advisory Committee for Aeronautics (NACA), an independent agency established in 1915 to advance American aeronautics. The NACA began construction of its first aeronautical laboratory at Langley Field in 1917. It was the federal government's first and only civilian aeronautical laboratory in the 1920s and 1930s, the "Golden Age" of aviation between the world wars, characterized by rapid advances in technology. This organization was the forerunner of today's National Aeronautics and Space Administration.

The advent of World War I altered the Army's plans for Langley Field and it became an air station with coastal defense responsibilities. After the war, experimentation continued including a famous demonstration by Brigadier General Billy Mitchell off the coast of Virginia during the summer of 1921 when it was shown that Naval vessels could be sunk by aerial bombardment. The base was also the first site of a school for the training of airmen in the doctrine for aerial combat; ultimately this



school was moved in 1931 to Maxwell AFB, known as the home of the Air University.

Langley AFB has historically functioned as a headquarters, first for the Army and later for the Air Force major command responsible for fighter aircraft. In 1935, the General Headquarters, Air Force was established at Langley AFB, in recognition that an “air force” was a combat force in its own right, rather than just a supporting organization to Army units. Just prior to the creation of the DoD in 1947, and with that a separation of the Air Force from the Army, Langley AFB became home to Tactical Air Command (TAC). During this period the Air Force realigned its roles with fighter and pursuit aircraft falling under TAC’s command, and with long-range strategic bombers falling under Strategic Air Command. In 1992 the Air Force again realigned, merging these two organizations into Air Combat Command.

Over its history, units stationed at Langley AFB have fought in virtually all of our nation’s military engagements. The aircraft types assigned to the base have paralleled the history of military aviation and have included a wide variety of lighter-than-air aircraft (airships) as well as the more traditional heavier-than-air aircraft.

2.3 Mission

The primary mission performed at Langley AFB is that of the base’s host command, the 1 FW (Table 2-2). The 1 FW has three fighter squadrons (FS) assigned to Langley AFB, two of which have the F-22A *Raptor* fighters assigned to them and one squadron that has the F-15C *Eagle* assigned to it. The 192 FW (an ANG unit) augments the 1 FW by integrating its flight crews with the 27 FS and 94 FS. Active components and ANG fly side by side in 1 FW aircraft.

The mission of the 1 FW is to train, organize and equip airmen in an expeditionary Air Force in order that they may deploy, fight and win engagements, thereby providing dominance of the airspace over the battlefield.

The F-22A *Raptor* is the Air Force’s newest fighter aircraft. Its combination of stealth, supercruise, maneuverability, and integrated avionics, coupled with improved supportability, represents an exponential leap in warfighting capabilities. The



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

Unit Designation	Aircraft Type	Number of Aircraft
71 st FS	F-15C	21
94 th FS	F-22A	20
27 th FS	F-22A	20
158 th FW, Det. 1 (ANG)	F-16A	4

Note: NASA LaRC has approximately 6 aircraft of various types and the Aero Club has approximately 6 single-engine and 1 twin-engine piston aircraft.

Raptor performs both air-to-air and air-to-ground missions. The F-22A, is designed to project air dominance, rapidly and at great distances. The combination of sleek aerodynamic design and increased thrust allows the F-22A to cruise at supersonic airspeeds (greater than 1.0 Mach) without using afterburner—a characteristic known as supercruise. This feature greatly expands the F-22A's operating envelope in both speed and range over current fighters, which must use fuel-consuming afterburner to operate at supersonic speeds. The sophisticated F-22A design, advanced flight controls, thrust vectoring, and high thrust-to-weight ratio provide the F-22A with the capability to outmaneuver all current and projected aircraft.

The F-15C *Eagle* is an all-weather, extremely maneuverable, tactical fighter designed to permit the Air Force to gain and maintain air supremacy over the battlefield. First developed in the 1970s, it has been modified extensively over the years to improve its target acquisition and navigational capabilities.

In addition to the host unit, the ANG has a detachment stationed at the base performing air defense and surveillance of the airspace between Virginia and Texas. Aircraft are kept in an “alert hangar” at the west end of the base, north of the runway and are prepared to “scramble” on very short notice should the need arise.

The National Aeronautics and Space Administration has a small fleet of aircraft at its NASA LaRC hangar, also located on the west end of the base. NASA operates the following aircraft: BE-200 King Air; Cessna 206; Cirrus SR-22; Lancair Columbia 300; OV-10A *Bronco*; and a UH-1H helicopter. These aircraft are used for aeronautical research.



The Services Squadron (1st SVS) operates a morale, welfare and recreation non-appropriated fund activity for flight instruction and aircraft rental. Commonly known as an Aero Club, its aircraft and facilities are available to its members. The Aero Club fleet consists of reciprocating, single- and twin-engine propeller driven aircraft. Membership is limited to patrons having ties to DoD, either as service members, retirees, or civilian employees.

2.4 Economic Impact

Langley AFB is located within the City of Hampton, Virginia. The base's economic region of influence is generally thought to extend approximately 50 miles. The general economic health of the region is good and is characterized by a well-diversified economy with manufacturing (including shipbuilding), retailing, public administration (local, state and federal government, including military) and education as the primary industries in the region (Table 2-3). These sectors in aggregate provide 58 percent of the total jobs in the region. The US Census Bureau estimates that the median household income as of 1999 ranged from \$36,597 in Newport News to \$60,920 in Poquoson. For the City of Hampton and York County during this same period, the median household income was \$39,532 and \$57,956 respectively. This compares to a statewide median household income of \$46,677 and a nationwide median household income of \$41,994 in 1999 dollars.

Apart from physical proximity, numerous factors link Langley AFB with the surrounding communities. The relationship historically has been one of cooperation, mutual respect, and support. Strong ties between the local governments, the business community, and the military have existed for decades.

Langley AFB hosts an annual air show and open house. Base personnel are actively involved in local affairs, frequently attending city meetings to discuss any Langley AFB issues that could potentially affect the city.

The economic impact of Langley AFB on this region of Virginia is significant, especially within the 50-mile radius of the economic impact region (EIR) generally associated with military installations. In 2004, Langley AFB employed over 8,905 military personnel, 1,632 civil service personnel and 738 non-appropriated fund employees or employees of private businesses located on the base. A little over 25 percent of the military personnel stationed at Langley AFB reside on base, with the remainder living in the local area. The annual total payroll is approximately \$726 million.

**Table 2-3. Total Employment by Industry.**

Sector	2002 estimate (# of persons)	2012 Projection (# of persons)
Total, All Industries	221,565	263,758
Agriculture, Forestry, Fishing and Hunting	65	53
Utilities	517	314
Construction	10,937	11,643
Manufacturing	30,628	29,629
Wholesale Trade	3,926	5,380
Retail Trade	28,006	32,066
Transportation and Warehousing	3,674	4,354
Information	4,755	7,112
Finance and Insurance	3,553	3,651
Real Estate and Rental and Leasing	4,439	5,442
Professional and Technical Services	13,409	22,632
Management of Companies and Enterprises	1,518	1,961
Administrative and Waste Services	12,427	17,264
Educational Services	20,789	24,468
Health Care and Social Assistance	19,525	25,805
Arts, Entertainment, and Recreation	6,901	8,140
Accommodation and Food Services	22,842	25,156
Other Services, Ex. Public Admin	6,022	7,372
Public Administration	27,632	31,316

Note: Data are for the counties of Gloucester, James City, York, and the cities of Hampton, Newport News, Poquoson, and Williamsburg.

Source: Virginia Employment Commission, Industry and Occupational Projections, 2002-2012

Through commodity, service, and construction contracts, an additional \$886 million entered the local economy in 2005.



The population directly associated with Langley AFB in FY04 totaled 23,855 persons; including 8,787 permanent military personnel, 12,655 dependents, and 2,413 civilians (Tables 2-4 and 2-5).

Table 2-4. Personnel by Classification and Housing Location.

Classification	Living on-base	Living off-base	Total
APPROPRIATED FUND MILITARY			
Active Duty	1,859	6,928	8,787
Air Force Reserve/Air National Guard	0	0	0
Non-Extended Active Duty Reserve/ANG	0	0	0
Trainees/Cadets	0	0	0
TOTAL	1,859	6,928	8,787
ACTIVE DUTY MILITARY DEPENDENTS			
	2,525	10,130	12,655
APPROPRIATED FUND CIVILIANS			
General Schedule			1,424
Federal Wage Board			113
Other (Senior Executive, Senior Level and General Manager)			95
		TOTAL	1,632
NON-APPROPRIATED FUND CONTRACT CIVILIANS AND PRIVATE BUSINESS			
Civilian NAF			479
Civilian BX			234
Contract Civilians (not elsewhere included)			46
Private Businesses on Base, By Type			22
Branch Banks/Credit Union		22	
Other Civilians (not elsewhere included)		0	
		TOTAL	781
	TOTAL PERSONNEL		23,855

Source: Langley AFB EIA 2005



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

Procurements	Expenditure (\$)
CONSTRUCTION	
Military Construction Program	23,700,000
Non-Appropriated Fund	5,905,307
Military Family Housing	3,708,900
Operations and Maintenance	31,719,600
Other	234,700
Total	65,268,507
SERVICES	
Services Contracts*	260,158,325
Other Services (not elsewhere included)	0
Total	260,158,325
MATERIALS, EQUIPMENT, AND SUPPLIES PROCUREMENT	
Commissary	403,725
Base Exchange (BX)	1,555,484
Health (TRICARE, Government cost only)	11,663,245
Education (Impact Aid and Tuition Assistance)	10,321,168
Temporary Duty	2,263,338
Other Materials, Equipment and Supplies (not elsewhere included)	352,086,185
Total	378,293,145
TOTAL ANNUAL EXPENDITURES	703,719,977

*Includes only contracts in the local economic area or contracts requiring the use of locally supplied goods and services.

Source: Langley AFB EIA 2005

The Fiscal Year 2005 total direct economic impact of Langley AFB on the local economy was \$1.61 billion dollars (Table 2-6).



Table 2-6. Estimated Economic Impact.

ANNUAL PAYROLL		\$726,398,126
Military	\$582,202,188	
DoD Civilian	\$131,166,725	
Other Civilian	\$13,029,213	
ANNUAL EXPENDITURES		\$703,719,977
ESTIMATED ANNUAL DOLLAR VALUE OF JOBS CREATED		\$182,287,222
Estimated Indirect Jobs Created	5,914	
Average Annual Pay	\$30,823	
	GRAND TOTAL	\$1,612,405,325

Source: Langley AFB EIA 2004

2.5 Flying Activity

Prior to the data collection that occurred in November 2005, the most recent AICUZ study for Langley AFB was accomplished in 1997 with an interim noise study occurring in 2001 in conjunction with an environmental impact statement for the beddown of F-22A *Raptor*. Since the previous AICUZ study, the aircraft types based at Langley AFB have changed, notably with the F-22A replacing the F-15C in two of the three squadrons (27 FS, 94 FS). Additionally, when the 12 Airlift Flight (ALF) was stationed at Langley AFB, it operated the military equivalent of a *Learjet*, the C-21 executive transport aircraft. Since the previous study, the 12 ALF was drawn down and is no longer at Langley AFB. The mix of transient aircraft can and 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 Langley 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. However, it should be noted that C-12 *Huron* aircraft stationed at Fort Belvoir (Davison Army Airfield)



or Oceana Naval Air Station perform operational support airlift missions to and from Langley AFB nearly every weekday.

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 (F-22A, F-15C and F-16), transient aircraft from other military installations often land and take off at Langley AFB.

A sortie is a single military flight from initial takeoff to its terminating landing. A sortie consists of at least two operations (a takeoff and a landing) and often additional circuits in the traffic pattern, called closed pattern operations. Closed patterns are counted as two operations because they include a departure and an arrival.

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 and 2-7a). 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 1 FW is flying (i.e., less frequently on holidays and weekends).

The typical F-22A or F-15C sortie consists of a departure from Langley AFB on a heading toward the training airspace followed with air work in the Military Operations Area (MOA), or offshore warning area, an arrival back at Langley AFB followed by radar and visual closed pattern work.



Table 2-7. Average Busy-Day Aircraft Operations at Langley AFB during FY06.

Aircraft Type	Average Daily Operations	Average Annual Operations
F-15C	26.6	6,916
F-22A	59.4	15,444
F-16	5.6	1,956
NASA	1.07	278
Transient	12.92	3,928
Aero Club	20.88	7,621
TOTAL	126.5	35,643

*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). Additionally, calculations are based on a 260 day per year flying schedule for F-15C, F-16A, and F-22A (Average Busy Day) and on a 365 day per year flying schedule for NASA, transient and Aero Club aircraft.

Table 2-7a. Based Fighter Aircraft Operational Splits

	Departures		Arrivals		Closed Patterns		Totals	
	Day	Night*	Day	Night	Day	Night	Day	Night
F-15C	11.70	0.40	11.70	0.40	1.20	0.00	25.80	0.80
F-22A	22.40	0.20	22.40	0.20	7.10	0.00	59.00	0.40
F-16	2.40	0.00	2.40	0.00	0.40	0.00	5.60	0.00

*Note: Night operations are those flown 10 PM to 7 AM.

The Federal Aviation Regulations governing aircraft flight operations describe two basic sets of flight rules under which aircraft may be operated: VFR, which requires certain minimum in-flight visibility and cloud ceilings, and IFR, which do not.

For all operations, if sufficient visibility exists, the pilot in command remains responsible for collision avoidance and aircraft separation, this is usually referred to as “see and avoid.” There are times, however, when this technique is impractical and reliance upon it would be inadvisable. Examples would be flying through a cloud; flying at high speeds and high altitude; or flying in a very congested airspace.

Over the years, IFR has evolved to keep it effective as a separation method. Therefore, the FAA designates ‘controlled airspace’ within which it will provide ATC separation, specifies minimum equipment requirements to facility communications and radar surveillance of aircraft, and requires the filing of IFR flight plans and prior receipt of clearances before undertaking an IFR flight and the adherence to ATC instructions during such flight.



Military fighter aircraft use an overhead arrival pattern in which the aircraft flies over the arrival end of the runway at pattern altitude (normally 1,500 feet above ground level (AGL), then banks sharply to the left or right, turning to a heading opposite that of the runway in use. This sharp turn is also called a “pitch” or a “break.” Using the turn to slow down while holding pattern altitude, the aircraft is then flown parallel to the runway (downwind), configures its flaps and landing gear, and when beyond the threshold of the runway begins a descending turn toward final approach such that the plane rolls out wings-level at the proper airspeed on about a 1 mile final and about 300 feet AGL. This technique minimizes vulnerability to enemy fire and provides additional altitude in the event of aircraft malfunctions.

Civil aircraft ordinarily approach the runway, descending on a more gradual glidepath and seldom overflying the threshold at pattern altitude. The tight turns at high rates of speed that are required in order to stay within the vicinity of the airfield generate G forces beyond the design capabilities of most civil aircraft and would also result in an unpleasant ride for passengers not expecting such a vigorous maneuver.

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 Runway 08 or Runway 26) 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, Langley AFB has a main runway (08/26) oriented east/west. Traffic patterns for departures from and arrivals to the main runway generally correspond to the training airspace in use by the sortie. The closed pattern traffic is generally kept to the north side of the runway to fly over the NASA LaRC and to avoid overflying base housing areas and off-base residents to the south.

Generally, Runway 08 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 Langley 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 Langley AFB use the following basic flight patterns:

- Turning departure (departing Runway 26 and turning north and then east toward the offshore training areas);
- Straight out departure off Runway 08/26
- Straight in approach (typically used by transient aircraft); and
- Overhead landing pattern.

Static engine run-ups are performed at Langley 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 F15C, F-16A and F-22A for high power static engine runs.

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 2-3, 2-4, and 2-5) are the result of such planning.

Runway 08/26 departure tracks reflect the varied missions of the aircraft stationed at Langley AFB. For example, the F-15C and F-22A tracks generally are the result of a requirement to get to the training areas expeditiously. The F-16A flight tracks are designed to facilitate the air defense mission assigned to that unit. The flight tracks used by NASA and Aero Club traffic are designed to deconflict with the fighter aircraft and in the case of the Aero Club

In order to enhance safety, aircraft flying in the traffic pattern fly at a specified pattern altitude. Usually for light aircraft, this altitude is 1,000 AGL; for heavy aircraft and fighters it is 1,500 AGL. The use of a common altitude makes it easier to spot aircraft along the horizon. Aircraft normally descend from pattern altitude when turning from downwind to a base or final approach segment.

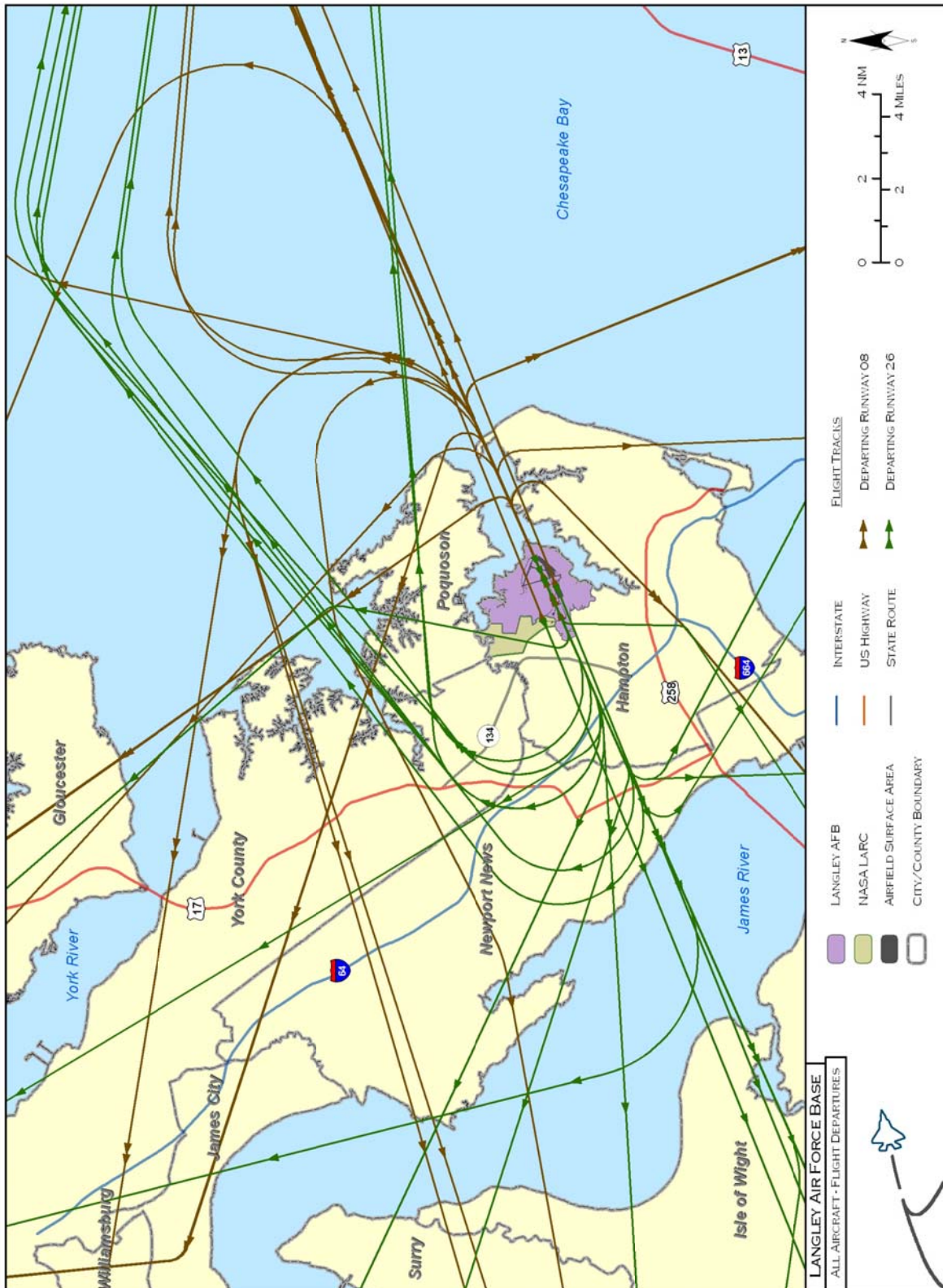


Figure 2-3. All Aircraft—Flight Departures.

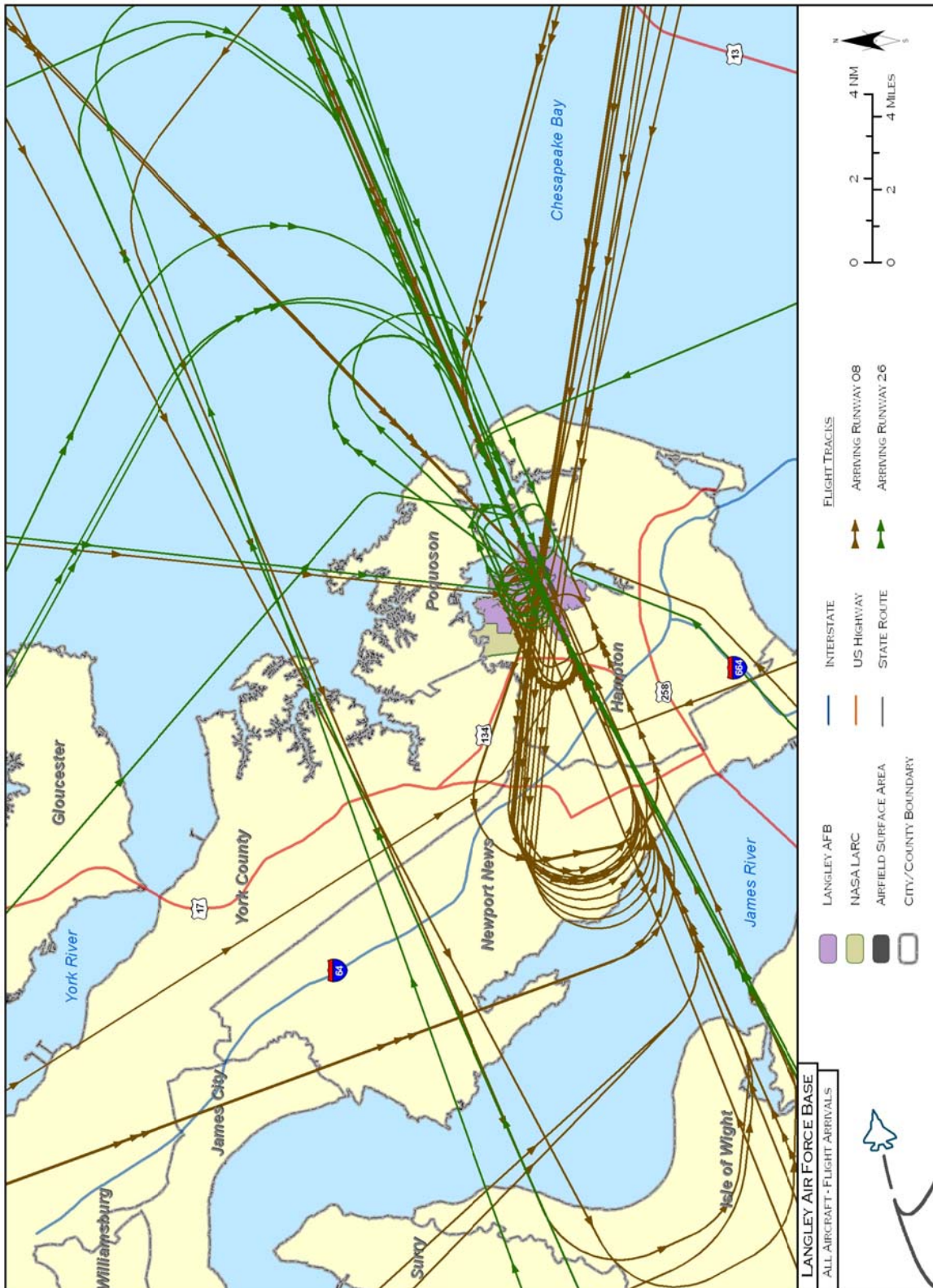


Figure 2-4. All Aircraft—Flight Arrivals.

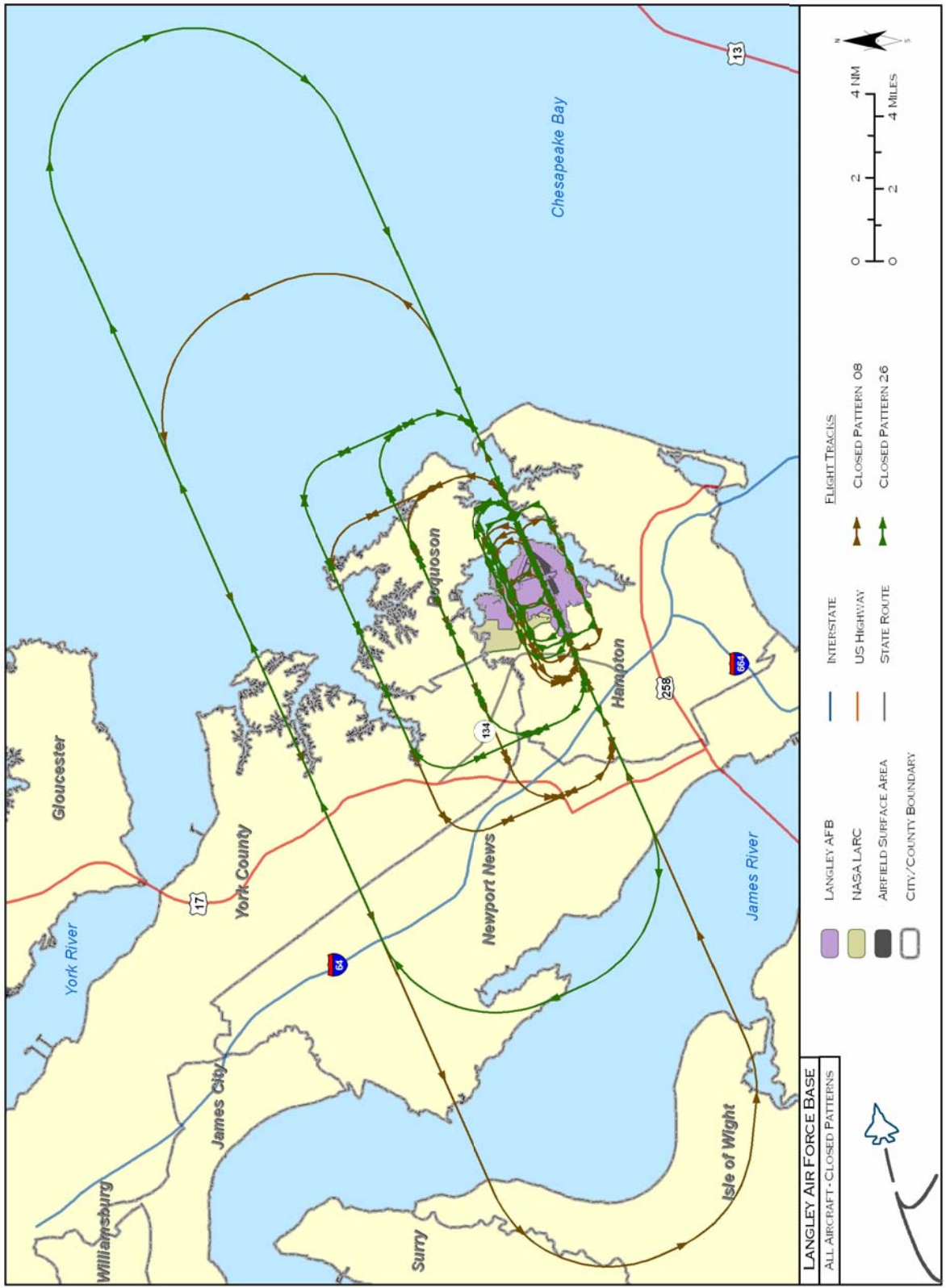


Figure 2-5. All Aircraft—Closed Patterns.



to take the aircraft toward their training areas. Transient departures typically turn toward their destination after a straight-out course of several miles. Normally, departure rolls begin from the runway ends; however, the location of the parking ramps and aircraft performance characteristics may warrant a takeoff roll beginning at the intersection of a taxiway elsewhere. In particular, F-16, transient executive transport and Aero Club aircraft often do not taxi to the runway ends prior to departure.

Arrivals to Langley AFB include both visual straight-in and overhead approaches to Runways 08/26; 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 on the north side of the runway. When recovering to Runway 08 from the offshore training areas, the F-15C and F-22A will often fly westward directly over the base toward the James River and then perform a teardrop shaped course reversal along the extended runway centerline.

The closed patterns on Runway 08/26 are normally flown at 1,500 feet AGL by the fighters and 1,000 feet AGL by the Aero Club traffic. Depending on the purpose of the maneuver, other altitudes are also 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

There are many occasions when an aircraft will have its engines running but not be moving; this is called an engine ground run. Aircraft with engines running while waiting to taxi or waiting to take the runway for takeoff are everyday occurrences, as are aircraft that are undergoing maintenance.

Engine ground runs associated with maintenance up to a moderate power setting are normally performed in the squadron ramp space; higher power runs to maximum power levels normally occur in a building specifically designed to attenuate noise (a hush house). Occasionally, a specific area called a trim pad that has blast deflectors and reinforced tie-downs may be used for moderate power runs.



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 Langley AFB aircraft flight profiles were obtained by interviewing pilots assigned to units based at Langley 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. Langley AFB's climate is temperate, characterized by long hot summers and shorter, usually mild winters. As a coastal climate, it has fairly narrow daily temperature swings compared to other parts of the country due to a high relative humidity.



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LANGLEY AIR FORCE BASE
VIRGINIA

**CHAPTER 3 • LAND USE
COMPATIBILITY GUIDELINES**

AIR INSTALLATION COMPATIBLE USE ZONE



3.0 LAND USE COMPATIBILITY GUIDELINES

3.1 Introduction

The DoD has studied land-use compatibility in the vicinity of its airfields since the end of World War II. One of the first efforts was in 1952 when the President's Airport Commission published "The Airport and Its Neighbors", better known as the "Doolittle Report". The recommendations of this study were influential in the formulation of the APZ concept.

The AICUZ Program was developed in response to increased urban encroachment around military airfields. Most Air Force installations were built in the late 1940's and early 1950's in locations 10 to 15 miles away from urban population centers during an era of propeller aircraft. Since then, the nature of aircraft has changed, notably with the development of the jet engine. Urban growth has gradually moved closer towards the boundaries of many Air Force installations. Incompatible land use often results in public complaints about the effects of aircraft operations (e.g., noise and low overflights). Frequent complaints can cause operational changes, which in many cases adversely affect the flying mission. As an example, encroachment around Lowry, Chanute and Laredo AFBs contributed to the decision to cease aircraft operations at those installations.

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 runway at Langley AFB (08/26) is 3,000 feet wide by 3,000 feet long. APZ I for this runway 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.

CZs and APZs are normally rectangular in shape, extending from the runway along the axis of its centerline but in certain circumstances a CZ and APZ can be curved.

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 Langley 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, Langley 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.

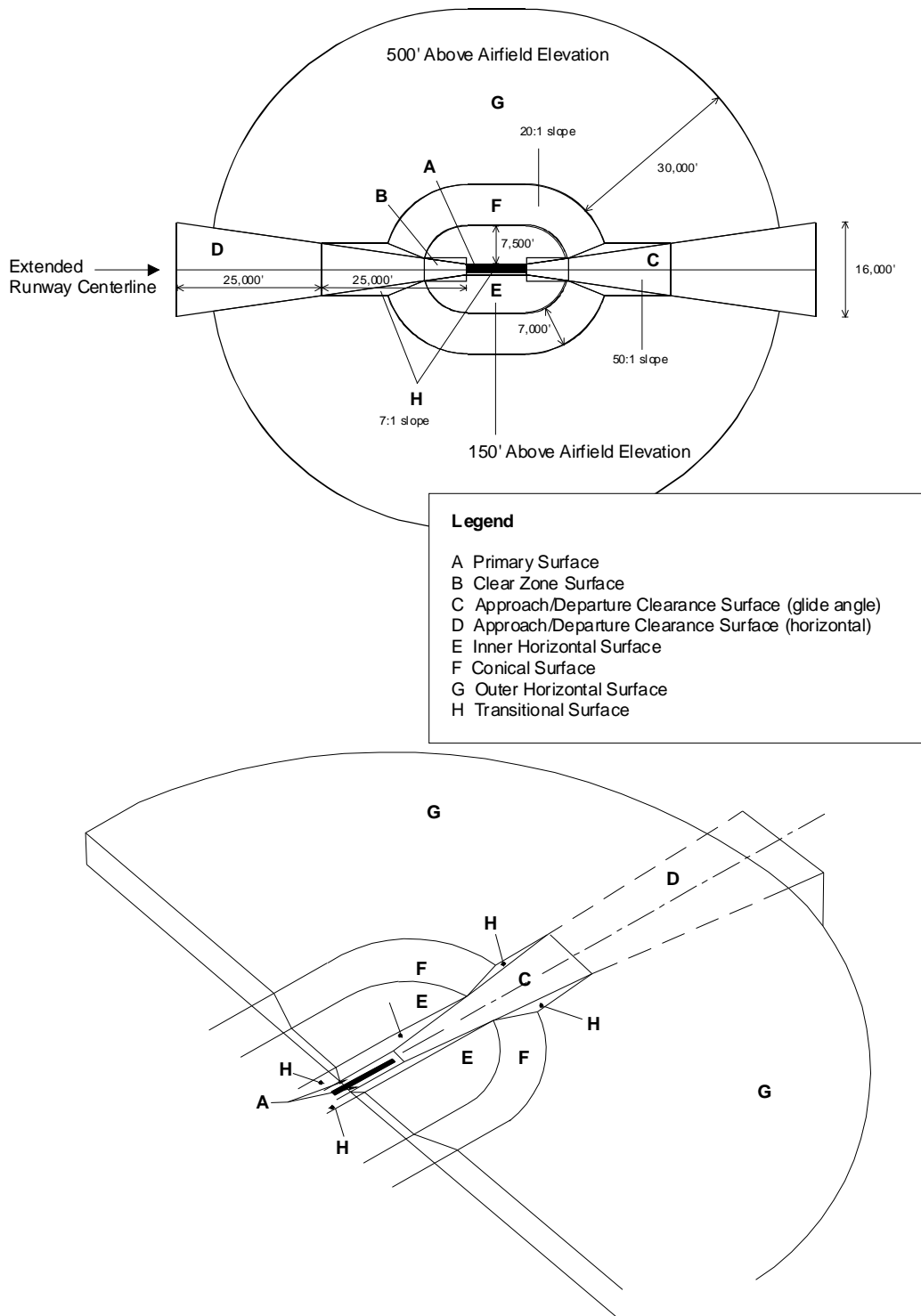


Figure 3-1. Plan View of FAR Part 77 Imaginary Surfaces.



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 Langley AFB, increases to minimums in flight altitudes would severely limit the viability of fighter training conducted by the 1 FW 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.

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.

In a FAR Part 77 analysis, the heights of natural or man-made objects are examined to determine whether such objects would be hazardous to air navigation; this analysis is named after the section of the Federal Aviation Regulations (FAR Part 77) that set forth the applicable standards.

Another term often used in this line of inquiry is "imaginary surfaces." Imaginary surfaces project outward from an airfield, either parallel to the runway or inclined at an angle.

While FAR Part 77 Obstruction Evaluation/Airfield Airspace Analysis (OE/AAA) and Accident Potential use similar terminology, their methods and purposes are distinct. Accident Potential Areas are two-dimensional rectangles (CZ, APZ I, and APZ II) within which land use is assessed and severely restricted (for Clear Zones). Within a Clear Zone, only items necessary for airfield operations (e.g., approach lights and navigation transmitters) are permitted but are designed to be frangible. With OE/AAA, the surfaces can be three-dimensional, and land use compatibility is not assessed. Instead, the height of the structure is examined to see if it interferes with arrivals and departures, particularly under instrument meteorological flight conditions.



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 126.5 daily operations (35,643 annual operations) along the mix of flight tracks depicted in Chapter 2, the DNL 65 dB contour extends west from the center of the runway approximately 5.5 miles; to the east the contour extends 7.5 miles from the center of the runway; this reflects the usage pattern favoring Runway 08. To the sides of the runway, the 65 dB contour extends southward approximately 1.5 miles; to the north, the 65 dB contour extends somewhat more, around 1.9 miles (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 23,721; of that, 14,536 reside off base. The total land area underlying an area of noise exposure greater than 65 dB DNL is 16,655 acres, with 13,288 of those acres located off-base (Tables 3-1 and 3-2).

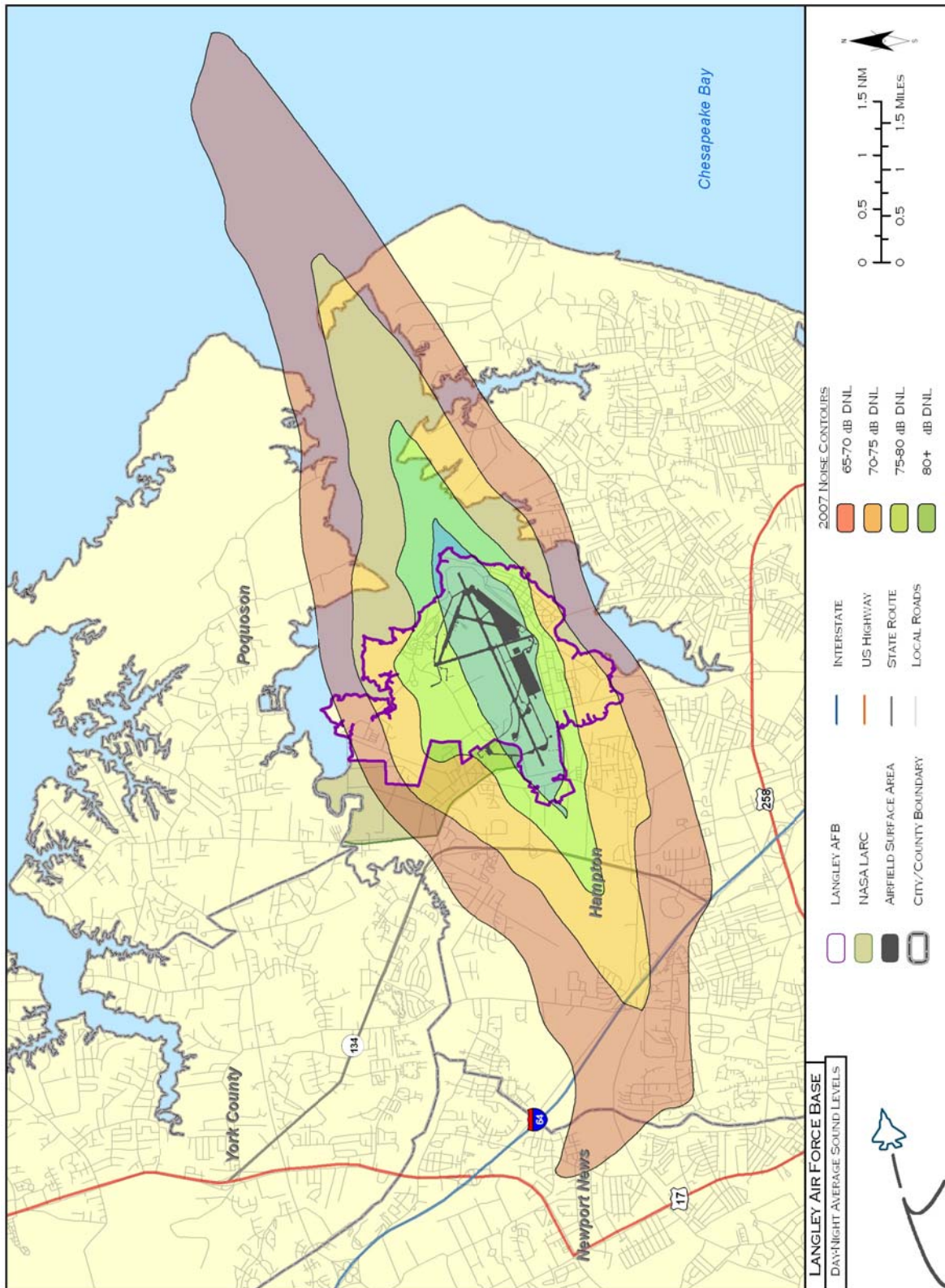


Figure 3-2. Day-Night Average Sound Levels.

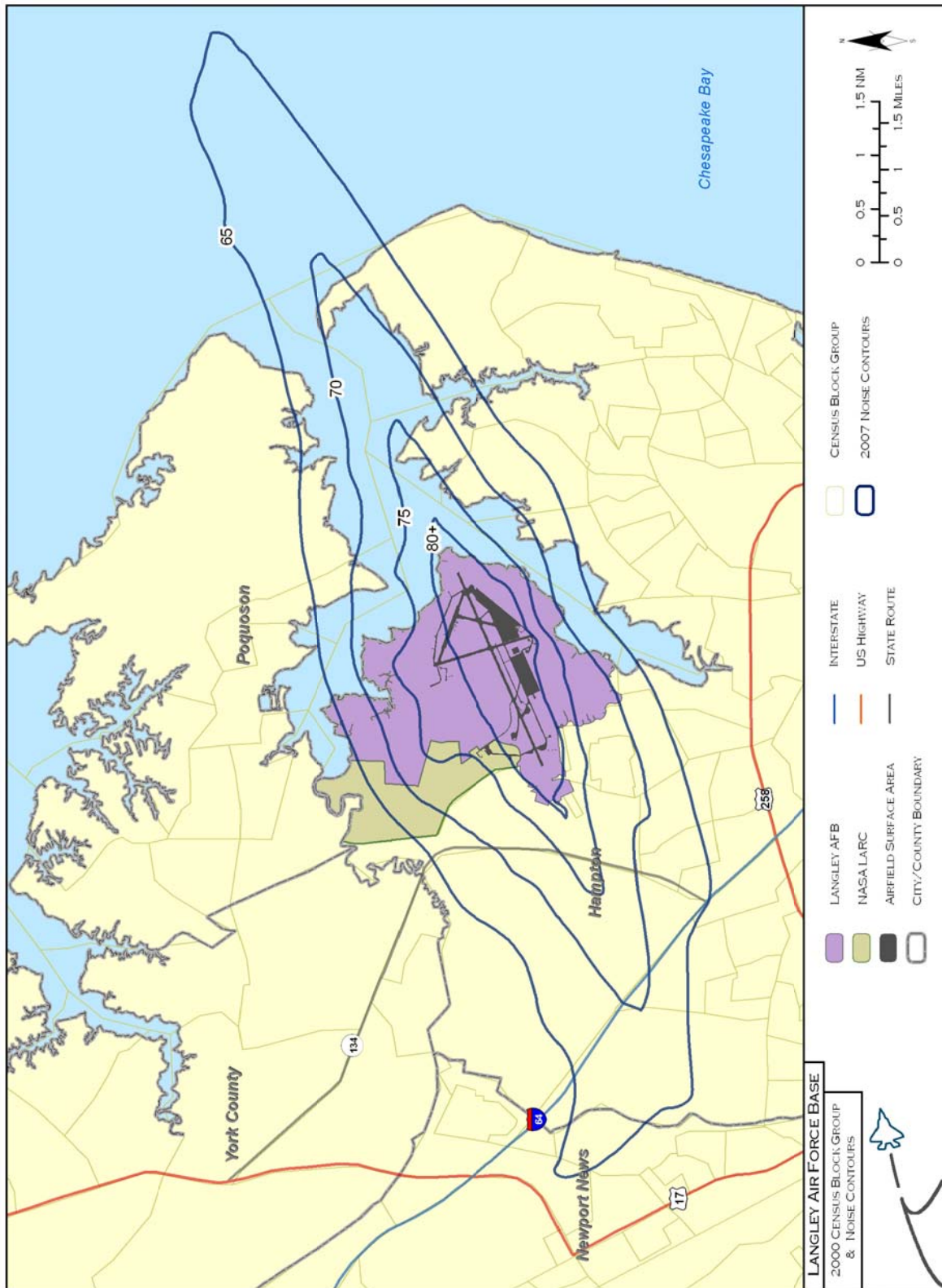


Figure 3-3. 2000 Census Blocks and Noise Contours.



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	8,685	10,211
70–74	4,690	9,262
75–79	2,042	3,948
80+	1,238	300
TOTAL	16,655	23,721

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

Table 3-2. Off-Base Areas and Populations within the 65 to 80+ dB Noise Contours.

DNL Noise Zone	Acres	Population
65–69	8,257	10,211
70–74	3,850	3,137
75–79	1,078	1,188
80+	91	0
TOTAL	13,276	14,536

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



The comparison of the contour plots from the 2007 data, the previous 2001 noise study performed prior to the F-22A beddown, and the 1997 AICUZ study indicates that during the 10 year timeframe, the land area exposed to noise greater than 65 dB DNL has fluctuated (Figure 3-4). This is largely due to variations in the number of flight operations and changes to the mix of aircraft stationed at Langley AFB. The flight tracks have not changed significantly during this time, although some minor changes in procedures have occurred.

3.4 Clear Zones (CZs) and Accident Potential Zones (APZs)

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

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

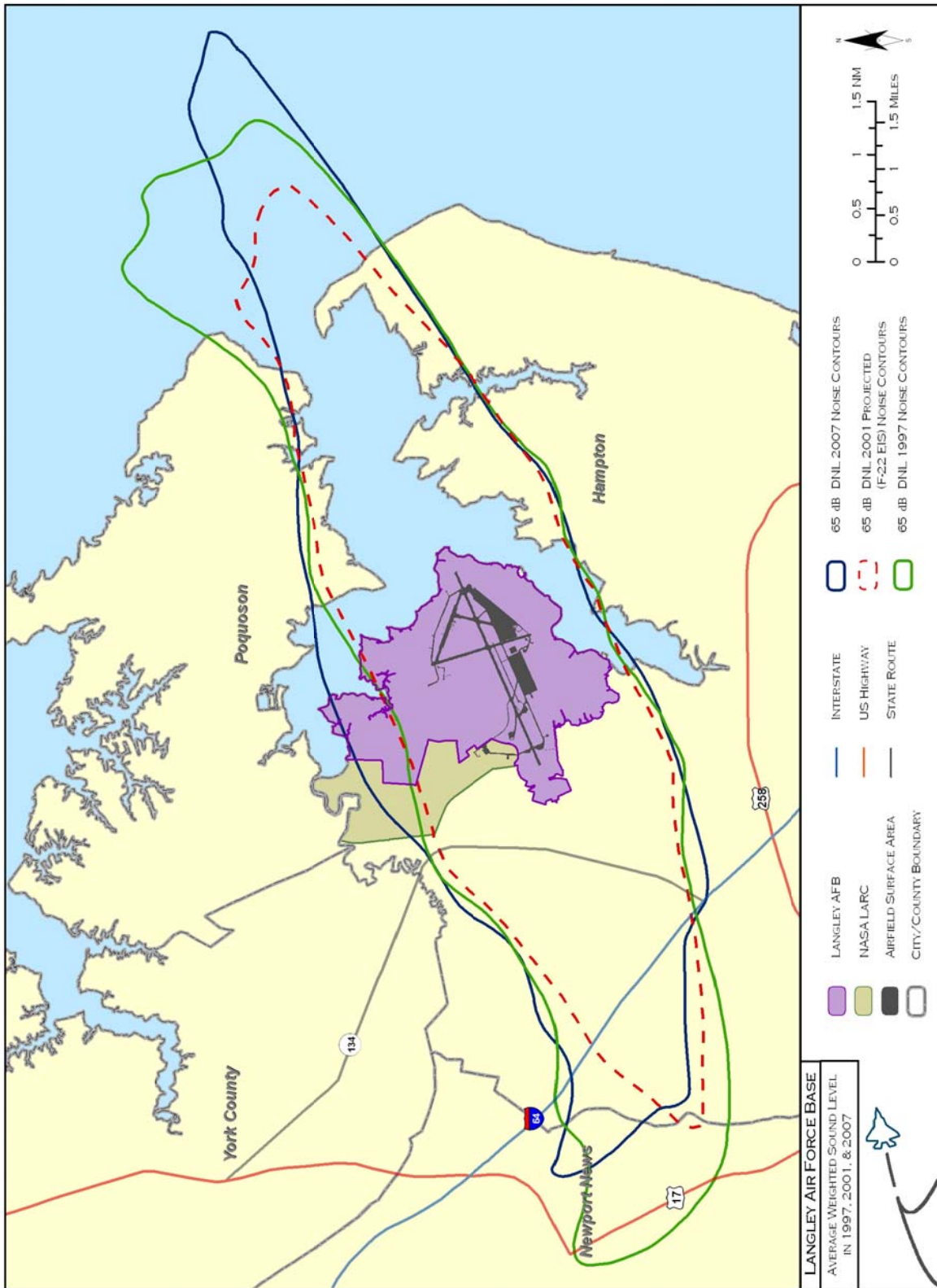


Figure 3-4. Day-Night Average Sound Level in 1997, 2001, and 2007.



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 Langley AFB

The Langley AFB CZs and APZs are based on the configuration of the runway (Figures 3-5, 3-5a, 3-5b). 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 3-6). It is estimated that 182 persons reside within the CZs for Runway 08/26; it is estimated that 396 persons reside within the APZs associated with this runway (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.

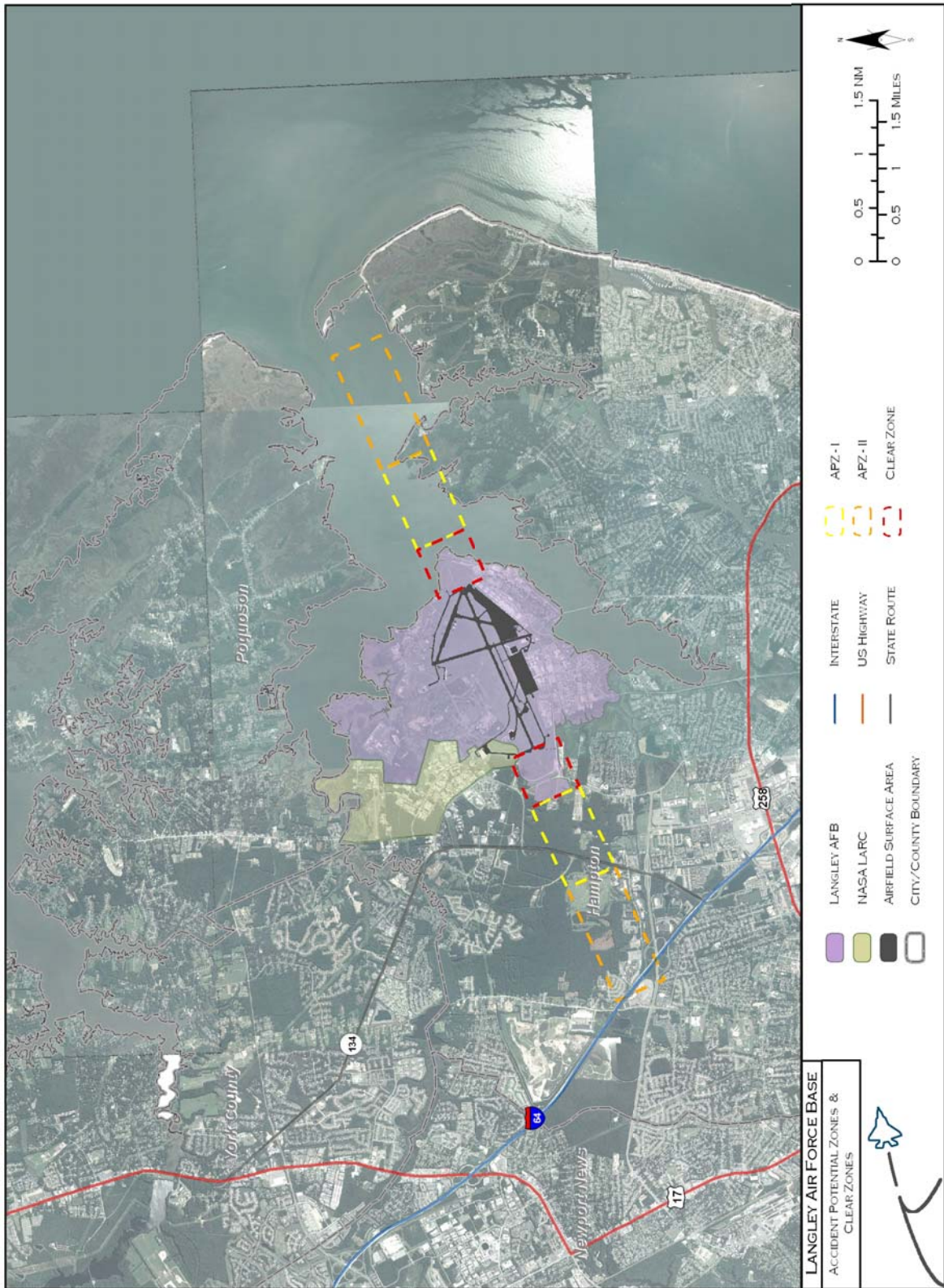


Figure 3-5. CZs and APZs.

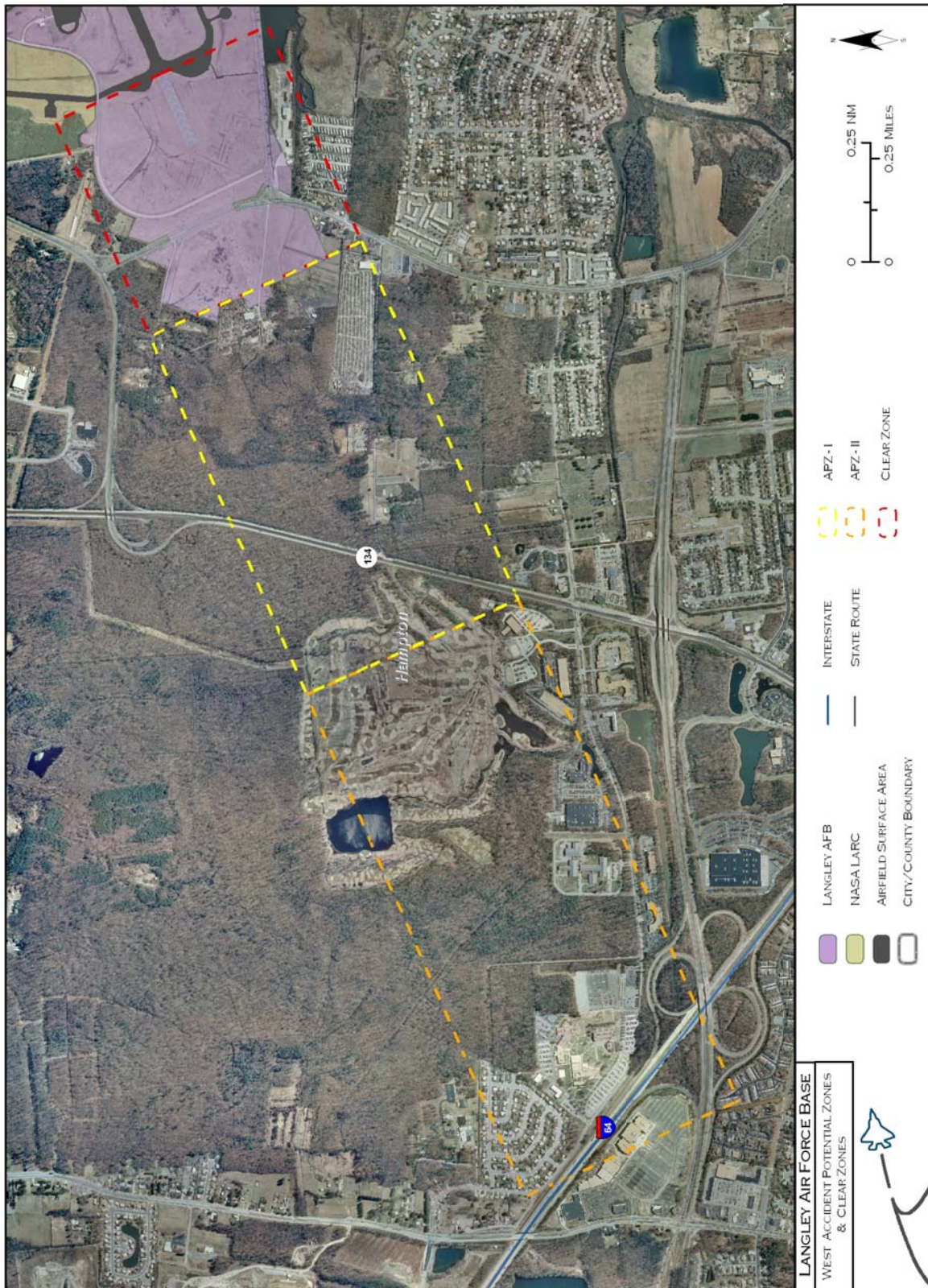


Figure 3-5a. West APZs and CZs.

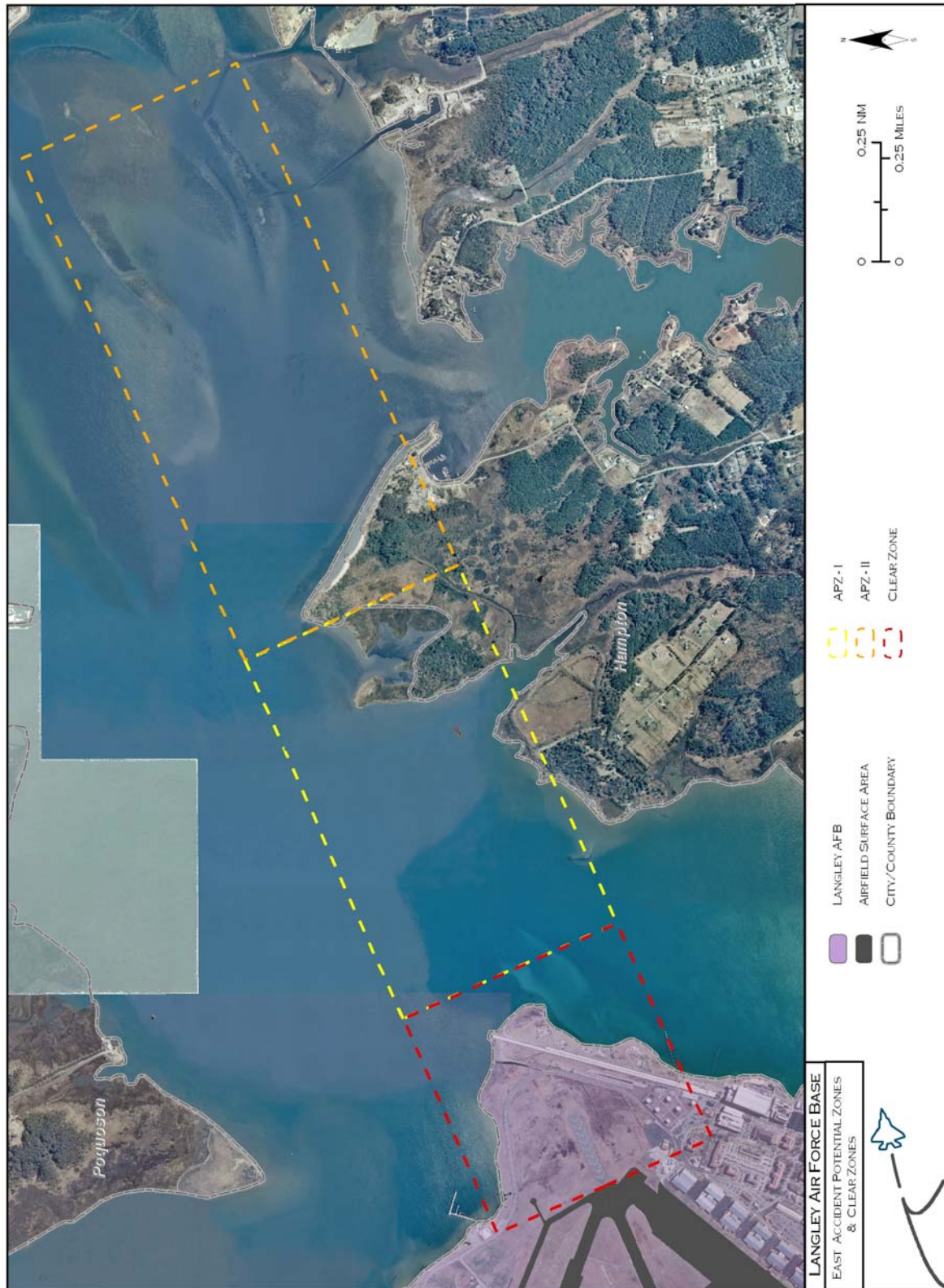


Figure 3-5b. East APZs and CZs.

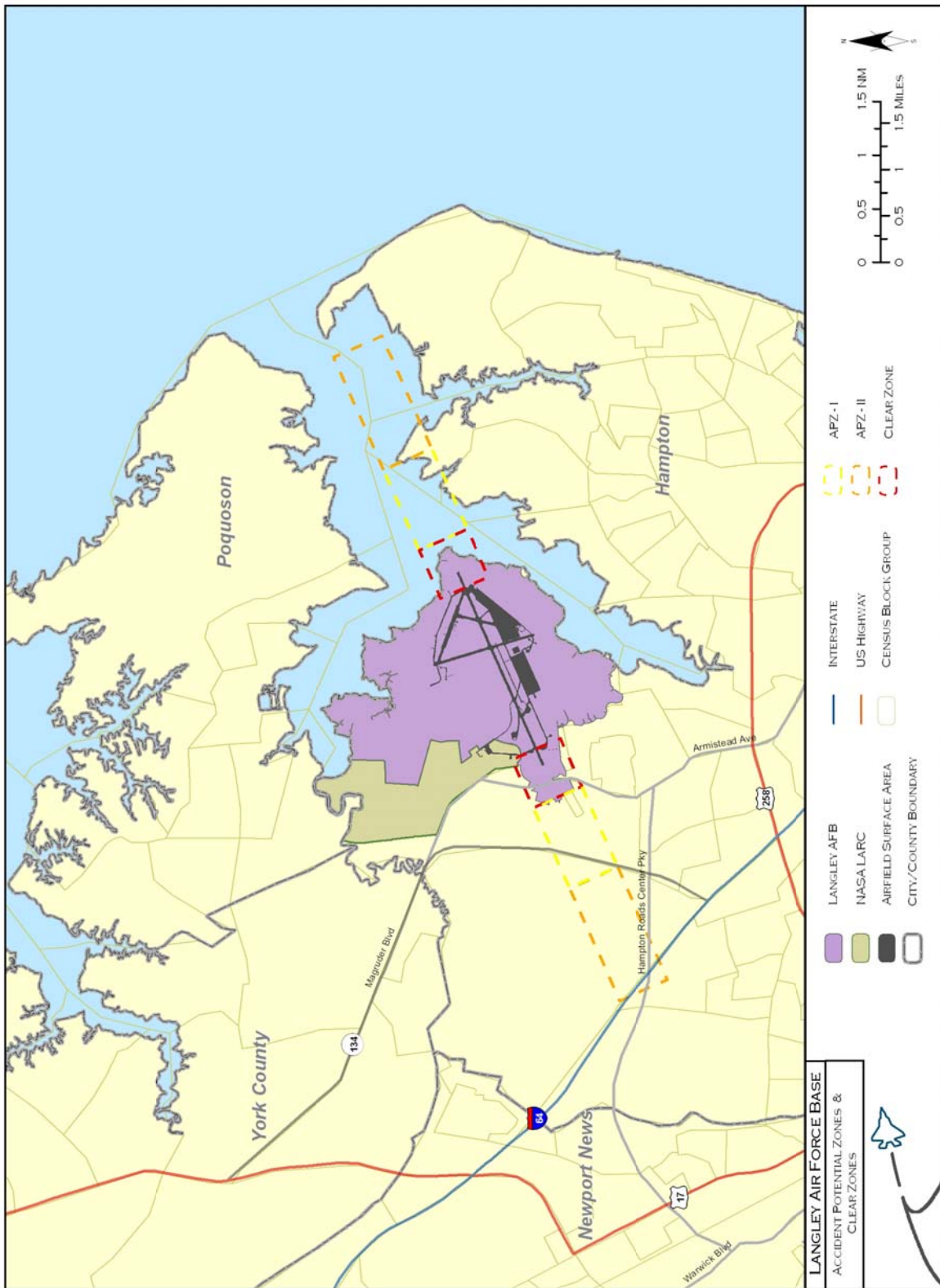


Figure 3-6. Langley AFB Census Blocks and APZs.



Table 3-3. Total Acreage and Population within the Langley AFB Runway 08/26 CZ and APZs.

Zone	Acres	Off-Base Acres	Population
Clear Zone	413	146	182
Zone I	689	686	30
Zone II	965	964	366
Total	2,067	1,796	578

3.5 Land Use Compatibility

Each AICUZ report contains land use guidelines. Combinations of noise exposure and accident potential at Langley 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, Langley AFB.

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

SLUCM NO.	LAND USE NAME	ACCIDENT POTENTIAL ZONES			NOISE ZONES			
		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).

SLUCM NO.	LAND USE NAME	ACCIDENT POTENTIAL ZONES			NOISE ZONES			
		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	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	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 ^b	Y	Y	Y	Y	Y
89	Other resources production and extraction	N	Y ^b	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

¹Suggested 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.

²Within 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.

³The 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.

⁴No passenger terminals and no major above ground transmission lines in APZ I.

⁵Factors to be considered: labor intensity, structural coverage, explosive characteristics, and air pollution.

⁶Low-intensity office uses only. Meeting places, auditoriums, etc., are not recommended.

⁷Excludes chapels.

⁸Facilities must be low intensity.

⁹Clubhouse not recommended.

¹⁰Areas 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.

¹²Measures 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.

¹³Measures 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.

¹⁴Measures 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.

¹⁵If noise sensitive, use indicated NLR; if not, the use is compatible.

¹⁶No buildings.

¹⁷Land use is compatible provided special sound reinforcement systems are installed.

¹⁸Residential buildings require the same NLR required for facilities in the DNL 65-69 dB range.

¹⁹Residential buildings require the same NLR required for facilities in the DNL 70-74 dB range.

²⁰Residential buildings are not permitted.

²¹Land use is not recommended. If the community decides the use is necessary, hearing protection devices should be worn by personnel.



LANGLEY AIR FORCE BASE
VIRGINIA

**CHAPTER 4 • LAND USE
AND ANALYSIS**

AIR INSTALLATION COMPATIBLE USE ZONE



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 Langley 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 Current Land Use

This section presents the municipalities that have tax or land-use jurisdiction in the vicinity of Langley AFB, including descriptions of existing and future land uses. In Virginia, land use planning and zoning is exercised by cities, incorporated towns, as well as by counties. Additionally, in Virginia, cities and counties are distinct and real estate is never in both jurisdictions concurrently. Although cities and counties may enter into agreements to share certain functions (e.g., school boards, library systems and court systems), generally each jurisdiction performs all of its own municipal functions. The City of Hampton exercises land-use control for the area immediately west and south of Langley AFB, as well as the land that is across the Back River (Southwest Branch). The City of Poquoson lies to the north of the base, across the Back River (Northwest Branch); the river forms the northern boundary of the base. Although not immediately adjacent to the base, York County and the City of Newport News lie west and northwest, respectively, and both jurisdictions also have land use controls in place for real estate.

Each of the four jurisdictions in the vicinity of Langley AFB (the cities of Hampton, Poquoson, Newport News, and York County), has adopted Land Use Plans, Zoning Ordinance, and subdivision controls. Localities only have the power to regulate land use in Virginia to the extent that the legislature has granted it specifically. Additionally, in this region of Virginia, Land Use Plans and zoning/subdivision ordinances are used to implement provisions of the Chesapeake Bay Act through limitations on impervious cover and by provision of required buffers (setbacks) from tidal waters and wetlands. A uniform statewide building code adopted by the Commonwealth governs construction standards in Virginia; however, it is implemented at the local level by the city or county code officials. Additionally, the Code of Virginia (§55-517) requires a Military Air Installation Disclosure addendum to all real estate contracts involving the transfer of residential property in Hampton, Newport News, Poquoson, and York County. Failure of a seller to provide a disclosure prior to contract ratification gives buyers the right to terminate contracts unless the property in question is located outside of a 65+ dB noise zone. A similar disclosure requirement applies to residential lease contracts.

The population of Commonwealth of Virginia in general and the Hampton Roads region is growing rapidly. York County is one the fastest growing counties in Virginia (Table 4-1).

**Table 4-1. US Census Population.**

Jurisdiction	1990	2000	Population Change
Commonwealth of Virginia	6,187,358	7,078,515	891,157 (14.4%)
City of Hampton	133,793	146,437	12,644 (9.4%)
City of Poquoson	11,005	11,566	561 (5.1%)
City of Newport News	170,045	180,150	10,105 (5.9%)
York County	42,422	56,297	13,875 (32.7%)

Source: US Census Bureau (1990, 2000)

When the land on which Langley AFB site was purchased by the government in 1916, the area was low-lying marshland and upland agricultural lands. Originally considered somewhat distant and removed from downtown Hampton and Newport News, the suburban growth experienced by the region has resulted over time in population growth and land use changes in the vicinity of the base. As development pressure continues with the population growth occurring in the region, the primary constraints appear to be environmental due to the considerable amount of waterways, creeks, streams and similar features. The presence of the Back River and the NASA LaRC effectively forms a barrier to close-in encroachment from incompatible uses on the east side and north sides of the base. However, northeast of the base in Poquoson, northwest, west, southwest and southeast of the base in Hampton, Newport News and York County, are areas of vacant land that by their proximity and lack of natural barriers are areas of potential incompatible development.

Since the 1997 AICUZ study, suburban growth has continued to radiate outward from downtown Hampton and Newport News. Southwest of the base, considerable development has occurred with the completion of Hampton Roads Center Parkway, an east-west connector road that runs between Armistead Avenue in Hampton and Jefferson Avenue in Newport News. A hospital, medical office complex and ancillary uses have all been developed at the junction of Coliseum Drive and Hampton Roads Center Parkway as the City of Hampton implements its long range plans for mixed use development in the Coliseum Central district. Further west, office park development has occurred along Butler Farm Road between Magruder Boulevard and Bethel Road. The



following sections examine existing land use, zoning and future land use plans in detail (Figures 4-1, 4-2, 4-3, Tables 4-2a, b; Tables 4-3a, b, c). For purpose of this analysis, the NASA LaRC is considered part of the base.

4.2.1 City of Hampton

Langley AFB (main base) lies entirely within the city limits of the City of Hampton, Virginia. This section of Hampton is suburban in character with development patterns influenced by the automobile. Although the base is surrounded by tidal waterways around half of its boundary, the landward side has seen considerable development over the years. Much of the development predates the AICUZ program and the city is an active partner with Langley AFB to enact land use controls in the AICUZ area of influence (the CZ/APZs and noise zones). The CZ/APZs do not extend beyond the Hampton city limits.

4.2.1.1 Noise Zones

In general terms, the noise contours extend along the axis of the runway (Figure 4-2). The 80+ contour does extend beyond the base boundary to an automobile salvage yard. Also included in this contour is the northernmost portion of a mobile home park near Armistead Avenue. The mobile home park is an incompatible use, and to the extent that retailing occurs at the automobile salvage yard, that is also not compatible.

The 75-80 noise zone generally includes vacant/open space land uses. To the west side of the base, noteworthy uses include single-family residential (low density), a golf course, the previously mentioned mobile home park, and an automobile salvage yard. The residential uses are not compatible, and while recreational uses would be compatible with noise level reduction, these methods are not always practical for outdoor uses. However, uses such as a golf course are highly preferable to other more noise sensitive uses such as housing. Extending along the runway axis to the east, the predominant land use is open space with some low-density residential housing. As noted, residential uses in this noise zone is incompatible.

The 70-75 noise zone generally includes a mix of nearly all six major land use types. At the western most extent of the contour there is a shopping center, a residential neighborhood, a community college, office/warehouse facilities, and a golf course.

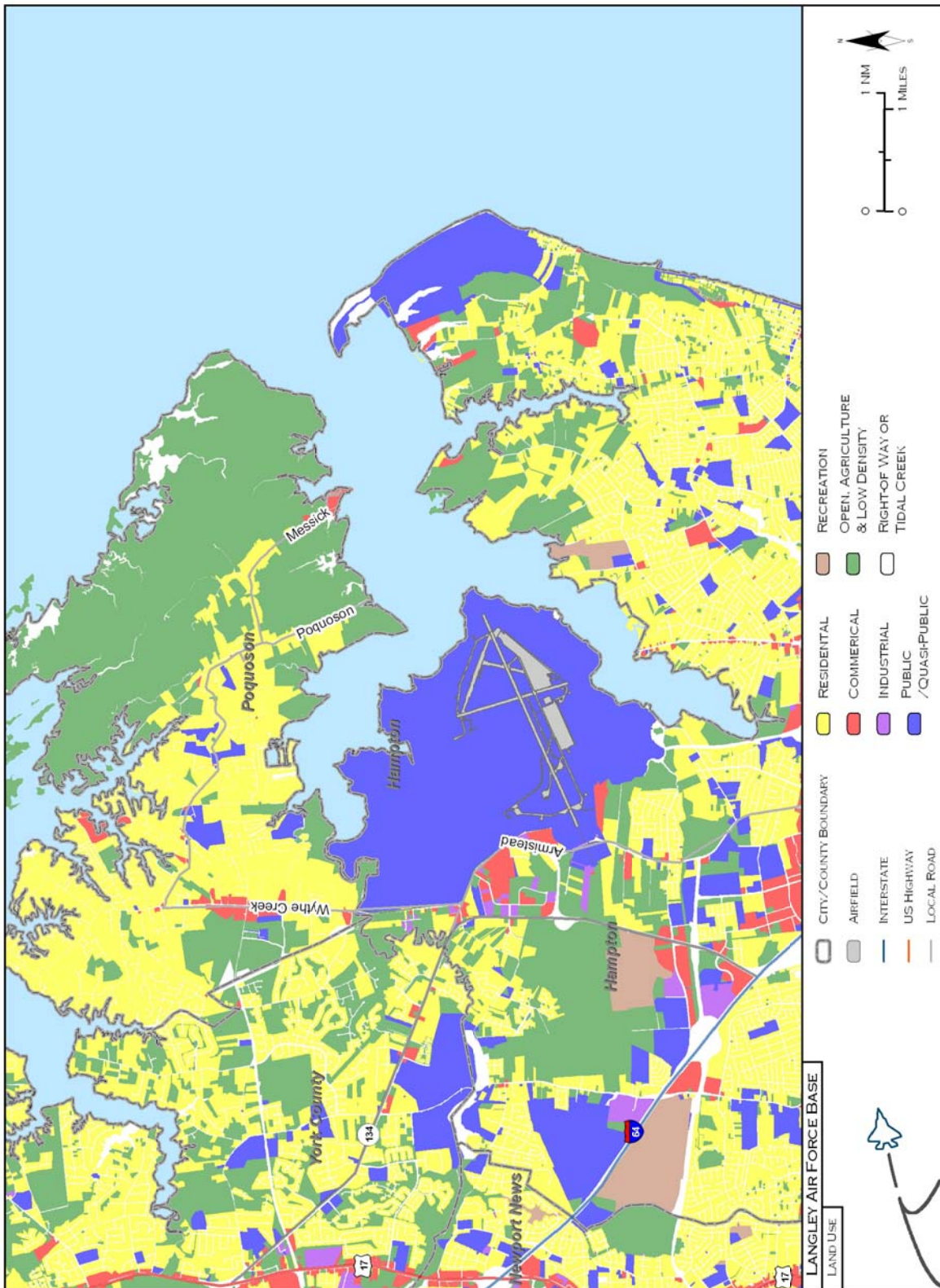


Figure 4-1. Existing Land Uses in the Region.

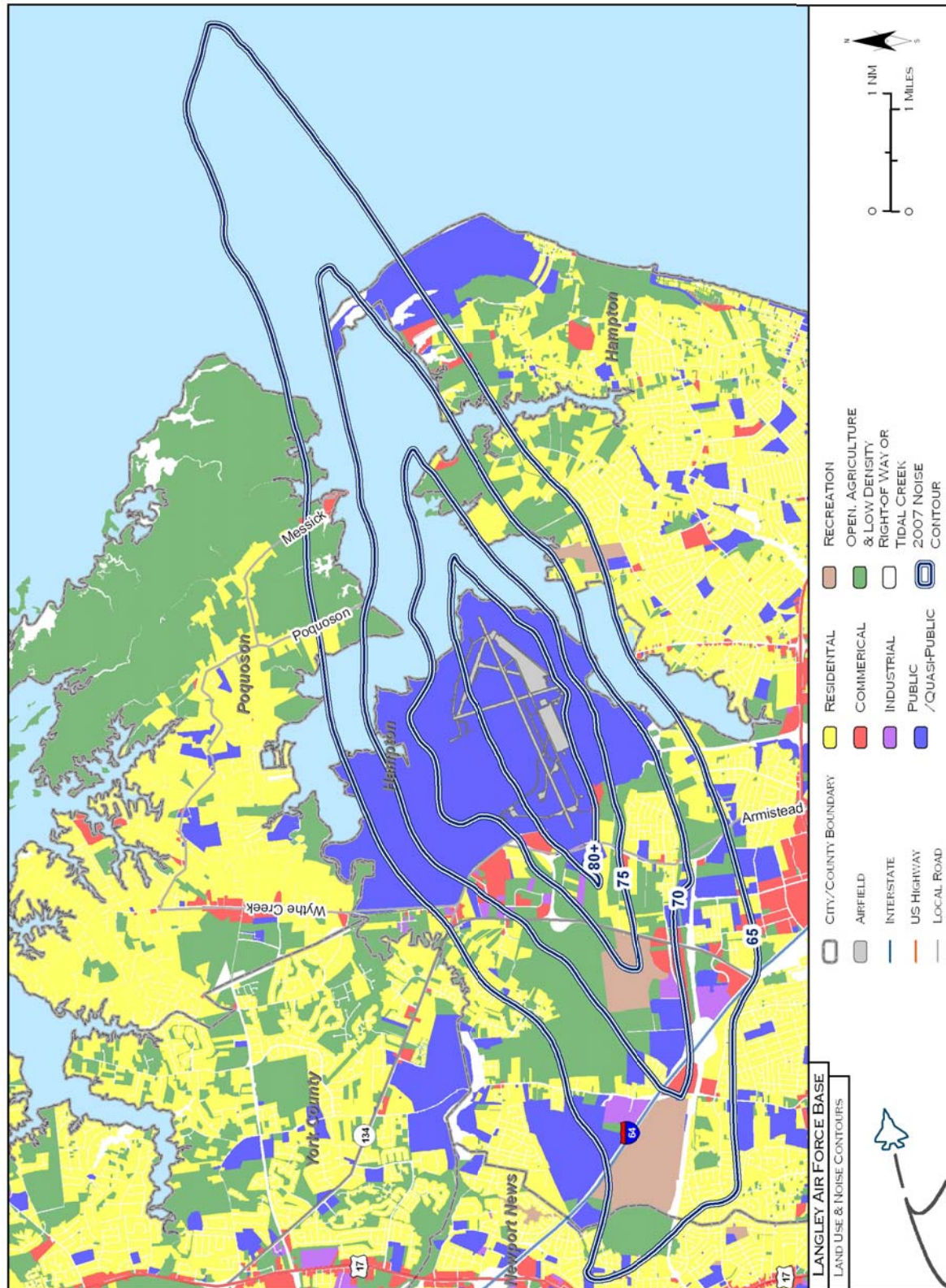


Figure 4-2. Existing Land Uses and 2007 Noise Contours.

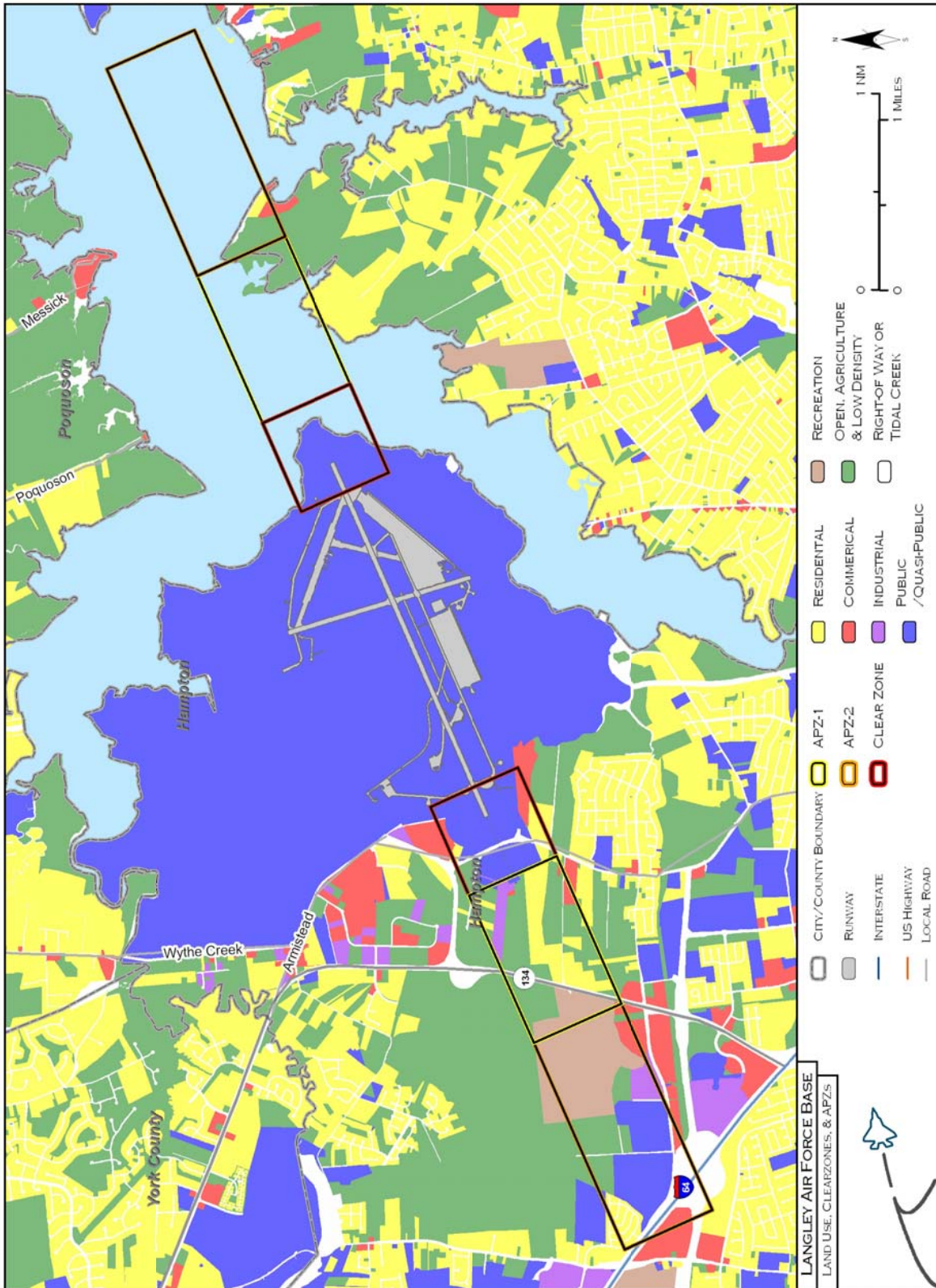


Figure 4-3. Existing Land Uses and CZs and APZs.



Table 4-2a. Total Acreage and Populations within 65-80+ dB Noise Contours.

Total		
DNL noise zone	Acreage	Population
65-69	8,685	10,211
70-74	4,690	9,262
75-79	2,042	3,948
80+	1,238	300
Total	16,655	23,721

Off Base		
DNL noise zone	Acreage	Population
65-69	8,257	10,211
70-74	3,850	3,137
75-79	1,078	1,188
80+	91	0
Total	13,276	14,536

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

Table 4-2b. Total Acreage and Populations within CZ and APZs.

Zone	Total Acres	Off Base Acres	Total Population
Clear Zone	413	146	182
APZ I	689	686	30
APZ II	965	964	366
Total	2,067	1,796	578

Note: There is no on-base population within the CZs.

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

Table 4-3a. Off Base Land Use within 65 dB+ Noise Contour.

Category	Acreage
Residential	1,707
Commercial	467
Industrial	199
Public/Quasi-Public	692
Recreation	653
Open/Agriculture	2,944
Unclassified	6,613
Total	13,275

Source: City of Newport News, City of Hampton, Hampton Roads Planning District Commission (HRPDC)

**Table 4-3b. Off Base Compatibility within Noise Contours.**

Category	65-69	70-74	75-79	80+	Total
Residential	1,197	393	116	1	1,707
Compatible	1,197	393	0	0	1,590
Incompatible	0	0	116	1	117
Commercial	219	190	49	9	467
Compatible	219	190	49	0	458
Incompatible	0	0	0	9	9
Industrial	132	46	19	2	199
Compatible	132	46	19	2	199
Incompatible	0	0	0	0	0
Public/Quasi-Public	496	196	0	0	692
Compatible	496	0	0	0	496
Incompatible	0	196	0	0	196
Recreation	433	173	47	0	653
Compatible	433	173	0	0	606
Incompatible	0	0	47	0	47
Open/Agriculture	1,854	832	255	3	2,944
Compatible	1,854	832	255	3	2,944
Incompatible	0	0	0	0	0
Unclassified (includes water)	3,927	2,019	593	75	6,614
Compatible	3,927	2,019	593	75	6,614
Incompatible	8,258	3,849	1,079	90	13,276

Source: City of Newport News, City of Hampton, HRPDC

Table 4-3c. Off Base Land Use Acreage for CZs and APZs.

Category	CZ	APZ I	APZ II	TOTAL
Residential	18	91	28	137
Compatible				
Incompatible	18	91	28	137
Commercial	15	7	32	54
Compatible	0	0	32	32
Incompatible	15	7	0	22
Industrial	0	20	18	38
Compatible	0	20	18	38
Incompatible	0	0	0	0
Public/Quasi-Public	0	42	123	165
Compatible	0	0	0	0
Incompatible	0	42	123	165
Recreation	0	0	151	151
Compatible	0	0	151	151
Incompatible	0	0	0	0
Open/Agriculture	11	216	108	335
Compatible	11	216	108	335
Incompatible	0	0	0	0
Unclassified (includes water)	102	310	504	916
Compatible	102	310	504	916
Incompatible	0	0	0	0
TOTAL	146	686	964	1,796

Source: City of Newport News, City of Hampton, HRPDC



The land use recommendations within this noise zone generally depend upon noise level reductions of 30 dB being incorporated into the construction design. While residential uses are discouraged in this zone, they are generally compatible with noise level reduction. They are incompatible and strongly discouraged absent implementation of noise level reduction in building construction. However, the shopping center, office/warehouse and recreational uses are generally compatible. The community college, a state institution not subject to municipal land use control, is compatible with respect to noise. Although compatible from a noise perspective, it is not compatible with respect to accident potential. It should be noted that a significant economic development initiative, the Hampton Roads Center North Campus Plan, lies partially in this noise contour and partially within the 65-70 noise zone. Absent a rigorous site-specific review process for this development, the plan appears to sanction uses that would be incompatible with the land use recommendations contained in Table 3-4. Further east, between Magruder Boulevard and the Back River (Southwest Branch) are single-family residential areas, a few shopping centers and retail establishments, and an elementary school. Again, these uses are not normally compatible absent the use of noise level reductions incorporated in the construction design. Northwest of the base within this contour is generally less intensely developed with housing; significant land uses include an automobile racetrack (Langley Speedway), a mobile home park adjacent to the racetrack, and office/warehouse uses. The mobile home park is not compatible; the other uses generally are compatible. To the east and southeast of the base, across the Back River (Southwest Branch) open space and residential uses predominate. A 105-acre city park (Gosnolds Hope Park) and a marina are other noteworthy uses in this noise zone. The residential uses are not compatible without noise level reduction. Noise level reduction is not practical for outdoor recreation uses such as the park and marina; however, these types of uses are still preferable to more noise sensitive uses such as housing.

All of the six major land use categories are represented in the 65-70 noise zone. The land use recommendations for this noise zone generally depend upon noise level reductions of 25 dB being incorporated into the construction design. At its westernmost extent, the zone includes a 465-acre city park (Sandy Bottom) and residential neighborhoods. Residential uses are normally incompatible absent implementation of noise level reduction



techniques in the building construction and are discouraged; the park is generally compatible. At the intersection of Bethel Road and Hampton Roads Center Parkway are two shopping centers and other retail uses. These uses are compatible. Further north and east, a regional landfill and significant wholesaling activities are present. The area between Bethel Road and Magruder Boulevard underlying this contour generally is a mix of open space and residential uses with the former being more focused toward Semple Farm Road near its junction with Magruder Boulevard and Armistead Avenue. The residential use is discouraged; the other uses are compatible. As noted above in the discussion for the 70-75 noise zone, the Hampton Roads Center North Campus Plan may introduce incompatible uses. Southeast of the base, across the Back River (Southwest Branch), the mix of uses includes residential neighborhoods, marinas, and a portion of the city owned and managed 475-acre Grandview Nature Preserve.

4.2.1.2 Clear Zone/Accident Potential Zones I & II

The CZ and APZs to the east of Runway 08/26 mostly overlie water (Figure 4-3). No privately owned real estate lies in the CZ east of Runway 08/26. Further east and all within the City of Hampton, along the south bank of the Back River prior to its division into branches, land uses are predominately open space and low-density residential. The residential uses are in both APZ I and II. A marina is located in the APZ II. At development densities below 1-2 dwelling units per acre, single-family dwelling residential use is compatible in APZ II; it is not compatible in APZ I. The marina use is compatible.

By comparison, the area to the west of Runway 08/26 contains substantially more intense land uses. The CZ and APZs are contained within the city limits of Hampton. The previously mentioned mobile home park near the west gate along Armistead Avenue, low-density residential uses across Armistead Avenue, and automobile salvage yards lie within the CZ. None of these uses are compatible (other than agricultural and airfield uses, no land use is compatible in a CZ). A mix of residential uses, industrial (warehouse), recreation uses, (golf course, fitness center) and open space lie within APZ I between Armistead Avenue and Magruder Boulevard, north of Butler Farm Road. Many of the low-intensity industrial type uses, as well as the golf course itself, are compatible; however, the dwellings, the golf course club house, and the fitness center are not compatible. Furthermore, the previously mentioned Hampton Roads Center North Campus Plan



lies partially in APZ I. Absent a rigorous site-specific review process for this development, the plan appears to sanction uses that would be incompatible with the land use recommendations contained in Table 3-4.

Further to the west, in APZ II between Magruder Boulevard and Bethel Road, are a recreational use (golf course), a public/quasi public use (community college), low-to medium density residential uses, and warehouses. The golf course itself, and many of the warehouse type uses are compatible uses. The community college, a state institution not subject to municipal land use control, is not compatible. Residential use in APZ II is generally not compatible. Low-density (less than 2 dwelling units per acre) single family residential use is compatible. The residential uses adjacent to (northwest of) the community college and on the northeast side of I-64 are not compatible due to their density being higher than recommended. At the northeast corner of Hampton Roads Center Parkway, a shopping center and 24-screen movie theater are also located within APZ II. Shopping centers and places of assembly (e.g., movie theaters) are not compatible in an APZ.

4.2.2 City of Poquoson

Originally a portion of York County, the town of Poquoson was incorporated in 1952 and became an independent city in 1975. The southernmost portion of the town with its frontage along the Back River underlies two noise zones. The 70-75 noise zone embraces a point of land that marks the confluence of the Back River (Northwest Branch) with the Southwest Branch of the same river. This area is open space and undeveloped. Underlying the 65-70 noise zone are residences along Poquoson Avenue south of its intersection with Messick Road, commercial and marina uses further east near the terminus of Messick Road, in addition to the predominately low-density residential and open space uses located along the Back River frontage. The residential use is not recommended; however the commercial and marina uses are compatible in this noise zone.

4.2.3 City of Newport News

Only a small portion of the 65-70 noise zone extends into Newport News. South of Hampton Roads Center Parkway is a residential neighborhood whose northeast corner lies within the contour. North of Hampton Roads Center Parkway, the uses are single-family residential, public/quasi public (a parochial high school), and an apartment complex (under construction). The residential



uses are discouraged in this noise zone and while educational uses may be compatible with noise level reductions, such reductions are not always feasible.

4.2.4 York County

The noise exposure contours for Langley AFB do not extend into York County; however, the 65-70 noise zone comes within 0.3 miles of the Hampton/York County boundary in the vicinity of Hampton Highway/Magruder Boulevard (Rt. 134) and its intersection with Armistead Avenue and Semple Farm Road. Land uses within a mile of the noise zone include military housing (Bethel Manor), single- and multi-family residential, and some open space. Additionally, a mobile home park is situated on the south side of Hampton Highway.

4.3 Current Zoning

This section examines the existing generalized zoning classifications as adopted by the jurisdictions in the region. Abbreviations are taken from the zoning ordinances and maps for each jurisdiction (Figures 4-4a, b, and 4-5).

4.3.1 City of Hampton

The City of Hampton has customized zoning for the area most directly affected by aircraft operations. The city has designated two zoning districts (M-4 – Langley Flight Approach and M-5 – Langley Flight Approach) that combined have six sub-districts each permitting uses generally in compliance with Table 3-4 of this document and previously released noise contours. Additionally, the city uses overlay zoning districts, notably the SPI-AA – Special Public Interest –Aircraft Approach district, to further regulate land uses lying in the CZ/APZs. The zoning ordinance incorporates provisions for additional scrutiny of uses that may pose a hazard to aviators due to their emission of light, dust or potential to create a bird-aircraft strike hazard (BASH). Despite this customization, the zoning districts permit the development or continuation of incompatible uses. For example, the residential uses permitted in the M5C district in APZ II, the office uses permitted in APZ I, or any uses that entail congregating large numbers of persons (i.e., restaurants, theaters, clubhouses, fitness centers), would result in incompatible development. However, it is recommended that specific development proposals be evaluated in light of the land use recommendations in this document. For example, the residential uses permitted in the M5C district allow a density of



greater than the two dwelling units per acre recommended within an APZ.

The city has zoned the base itself (including the NASA LaRC) residential; this allows the city significant control over its redevelopment should Langley AFB ever be returned to private ownership. For the purpose of this study, Langley AFB and NASA LaRC are considered public/quasi-public and remain displayed as such.

4.3.2 City of Poquoson

The City of Poquoson has a comprehensive zoning ordinance that regulates development of land in the area across the Back River from Langley AFB. Unlike in the City of Hampton, the CZ/APZs do not extend into Poquoson. Accordingly, no customization of the zoning ordinance to reflect the presence of Langley AFB to the southwest appears in the ordinance. This area along the Back River underlying the 65-70 noise zone and the 70-75 noise zone is classified as either C-1 Conservation, R-1 Residential, R-2 Residential, or B-2 Business. The Business district does not permit dwelling uses. The maximum density for residential users in the C-1, R-1, or R-2 districts varies between 2.18 and 2.4 dwelling units per acre if a public water and sewage system is available and 2 dwelling units per acre if not. The residential zoning creates the potential for future land use conflicts, particularly if noise level reduction measures are not required.

4.3.3 City of Newport News

The City of Newport News has adopted zoning regulations in the area underlying the 65-70 noise zone that permit residential development (R-4 Single Family, R-7 Medium Density Multi-Family). The R-4 district permits 6.6 dwelling units per acre; the R-7 district allows 10.9 dwelling units per acre. Absent a requirement for noise level reductions in building construction, these zoning classifications would permit incompatible uses to be developed.

4.3.4 York County

No real estate in York County underlies a noise contour. It is useful however, to assess the zoning classification of the real estate closest to the 65-70 noise zone since noise contours fluctuate over time and aircraft noise does not stop at the edge of a contour.

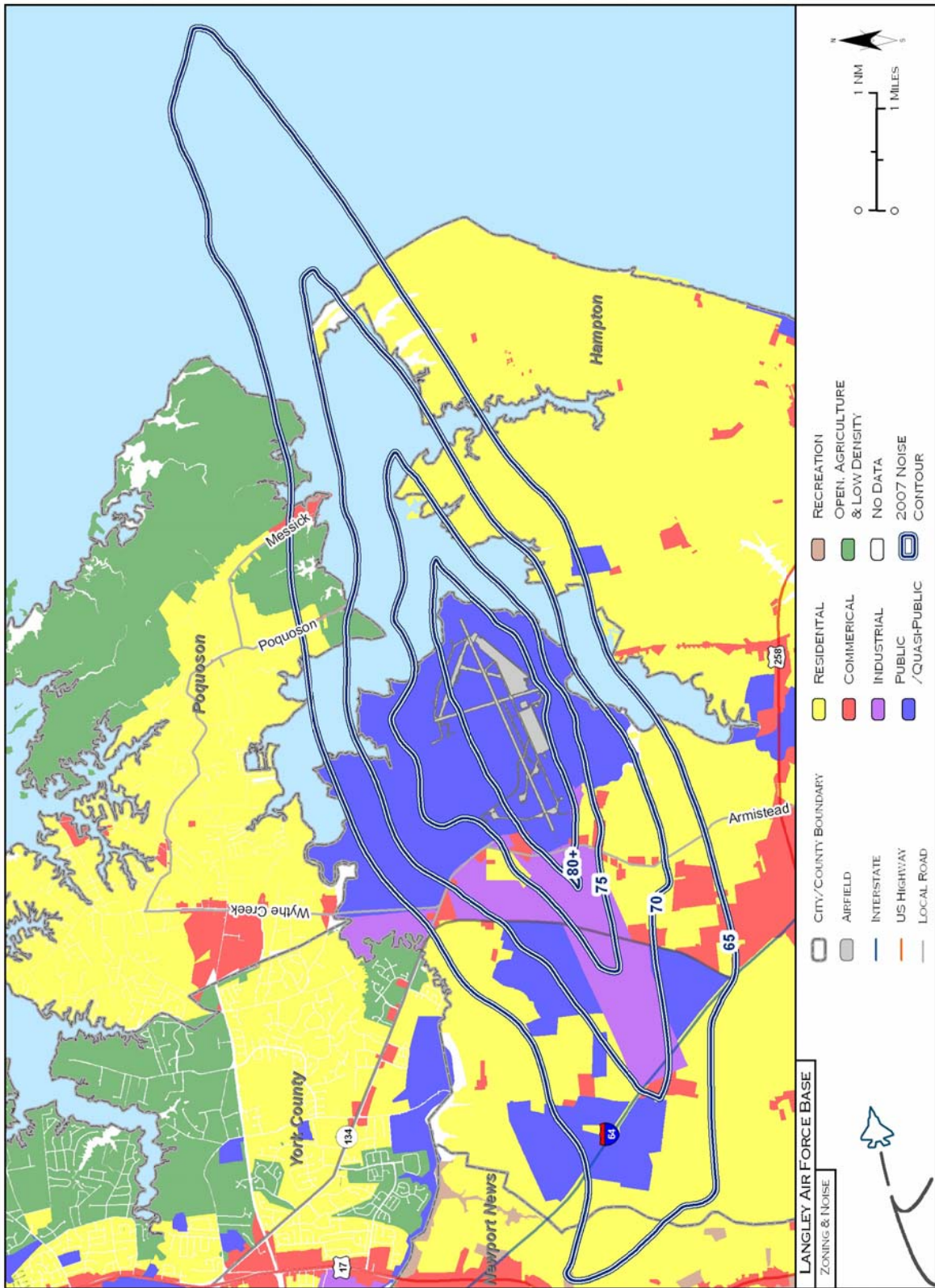


Figure 4-4a. Generalized Zoning and Noise Contours.

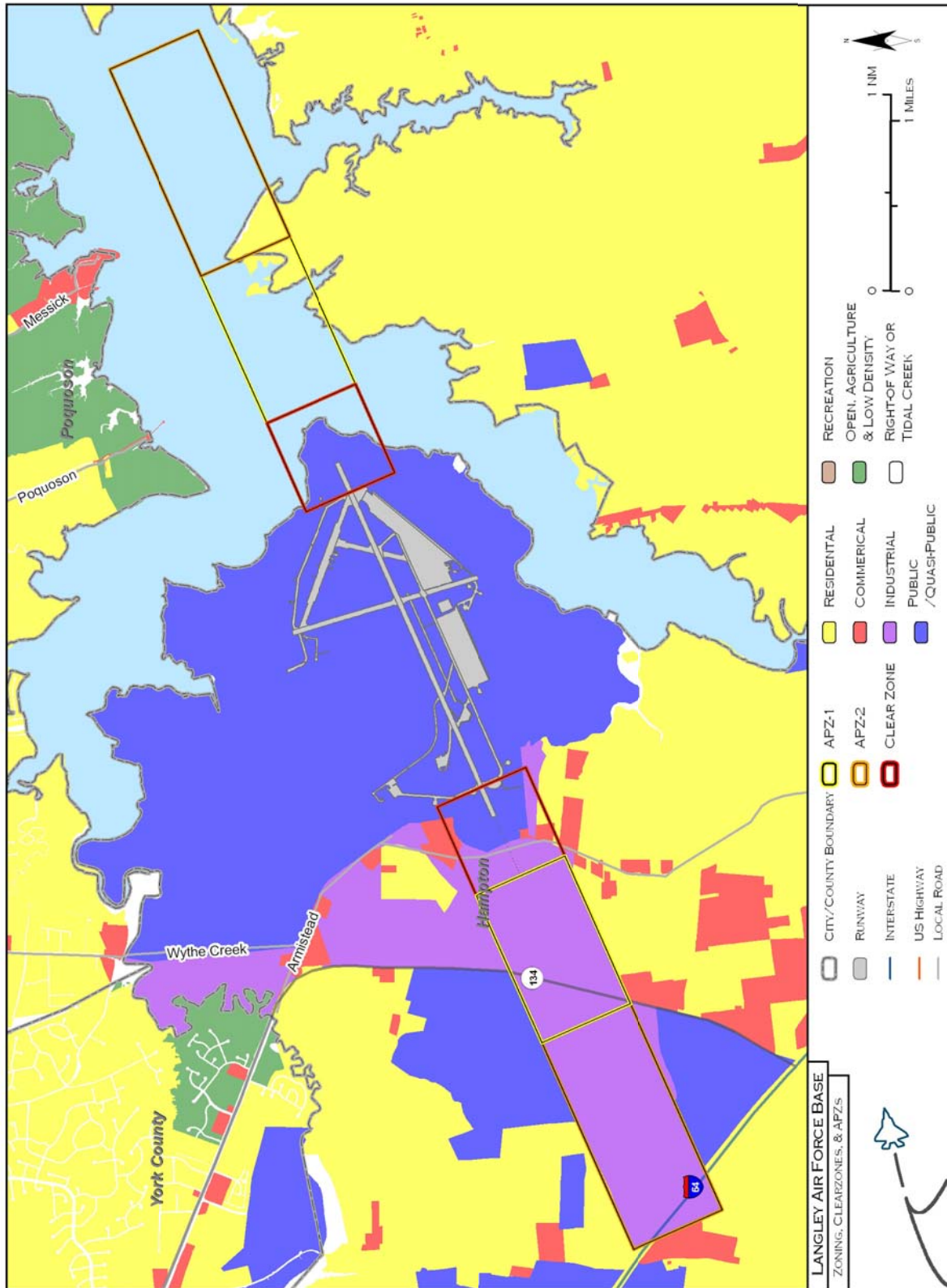


Figure 4-4b. Generalized Zoning and CZs and APZs.

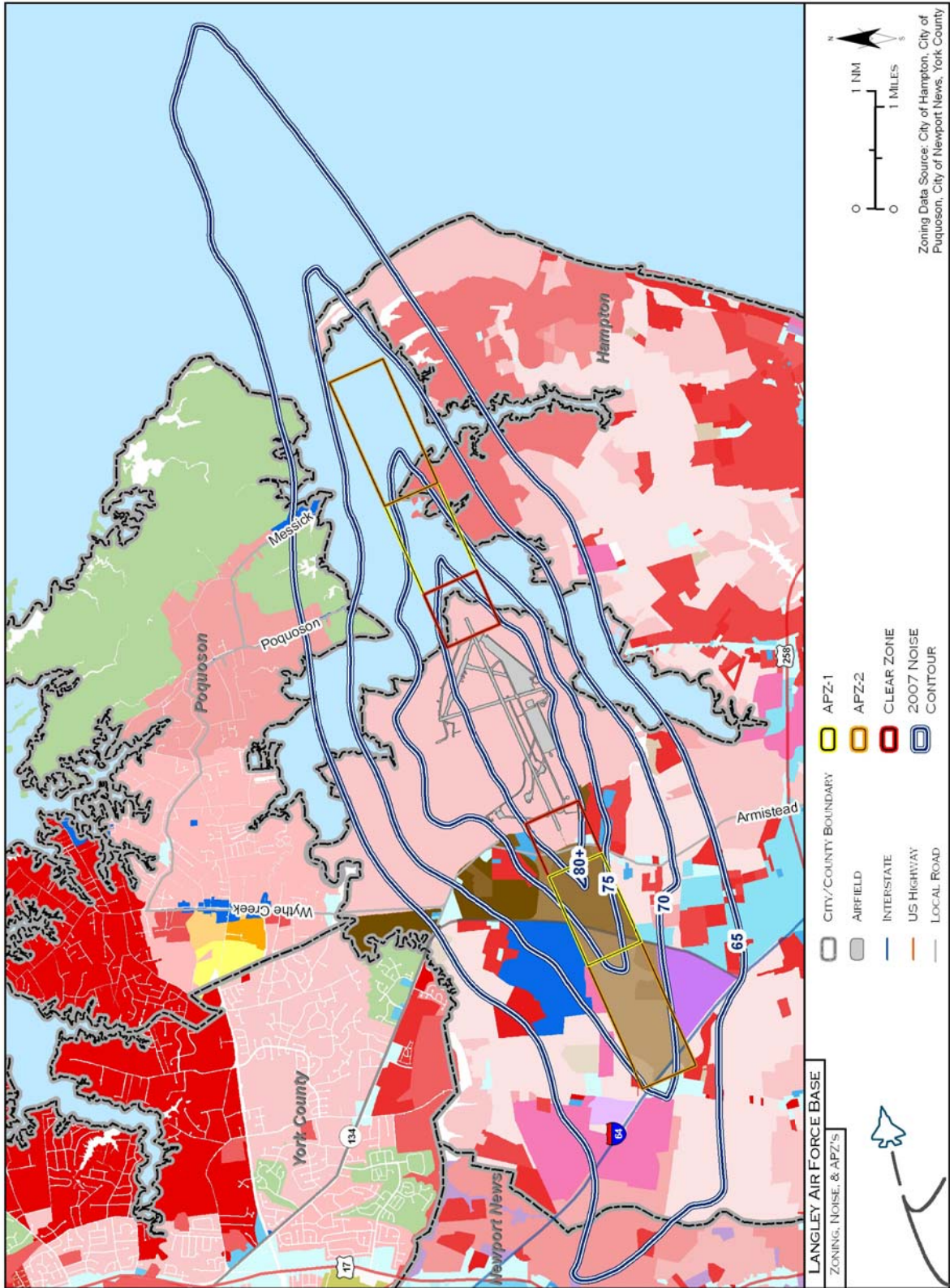


Figure 4-5. Current Zoning, APZs, and Noise Contours.

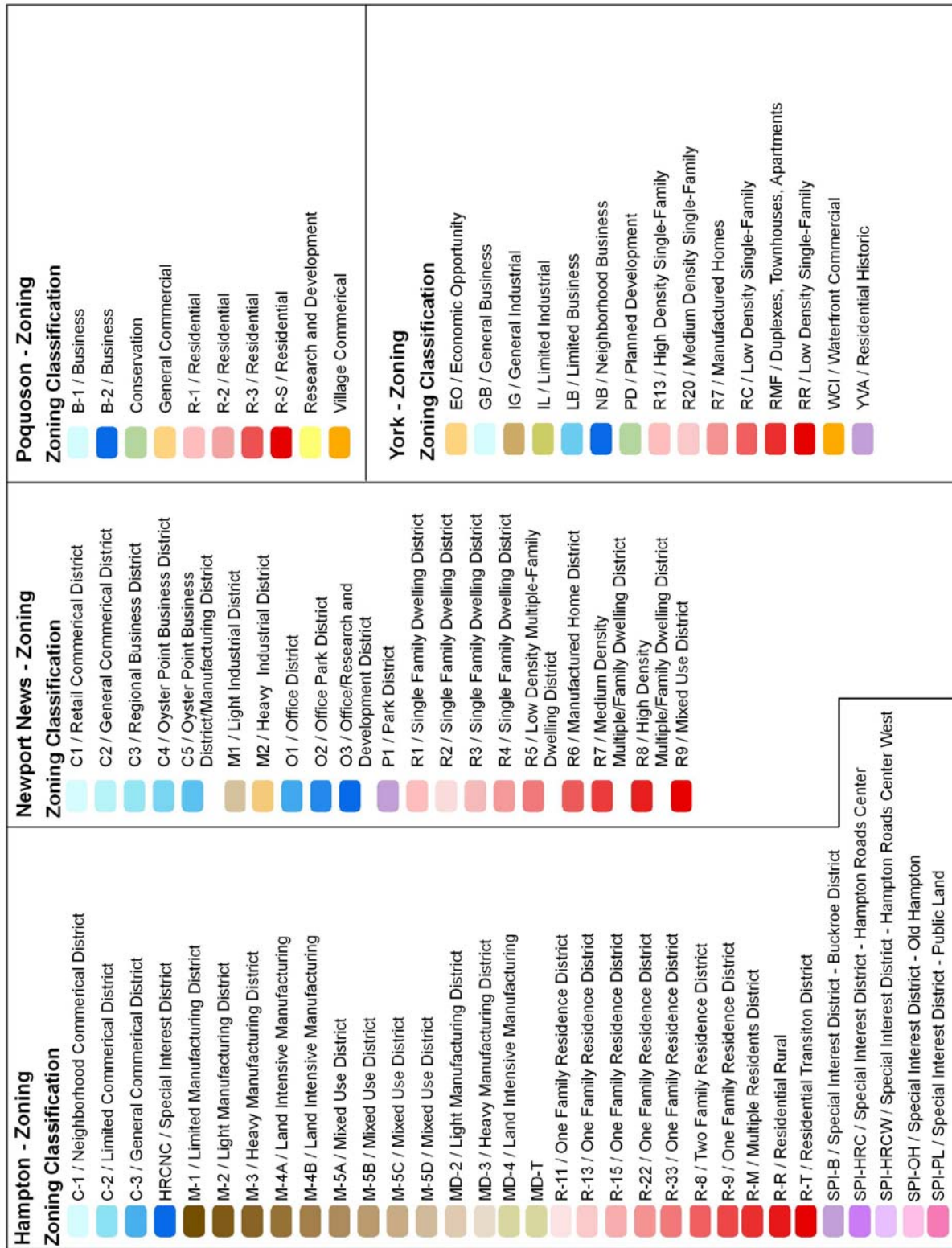


Figure 4-5. Current Zoning, APZs, and Noise Contours (cont'd).



The southeastern tip of York County along Hampton Highway (Va. Route 134), includes real estate with several zoning classifications. On the north side of Hampton Highway, the properties are zoned PD—Planned Development, LB—Limited Business, and R-20—Medium Density Single-Family. On the south side of Hampton Highway, the properties are zoned RR—Low Density Single-Family, R-7—Manufactured Homes and RMF—Multi-Family Residential.

Should the noise contours ever extend into York County, the residential zoning districts would allow for land use conflict arising from incompatible development. Of particular concern would be the R-7 Manufactured Homes zoning classification.

4.4 Future Land Use

This section examines the comprehensive land use plans (Figure 4-6) adopted by the local jurisdictions and assesses the extent to which the recommend changes to land use patterns could generate potential conflicts with the Air Force mission at Langley AFB.

4.4.1 City of Hampton

In February 2006, the Hampton City Council adopted its most recent comprehensive plan. Among the goals and policies articulated therein (Section VII – Environmental Stewardship) was an objective that the city should “Promote compatible land uses within high accident potential areas and high noise areas in the vicinity of Langley AFB.” Accordingly, in its Land Use recommendations, it continues to recommend Mixed Use, Business/Industrial, and Public/Semi-Public uses west of the base. To the east, the plan recommends Rural Residential and Open Space uses along the south bank of the Back River.

One of its implementing strategies encourages the city to continue to work closely with the base to study the impact associated with the beddown of the F-22A *Raptor* aircraft. The land use component of that plan calls for industrial uses in the APZs that lie to the west of the base, and for low-density residential uses or agricultural/open space uses within the areas of predicted noise exposure. To the extent that these recommendations are implemented through zoning, capital improvements and subdivision controls, this may generally yield compatible land uses. However, the comprehensive plan could be strengthened to support Langley AFB if it:

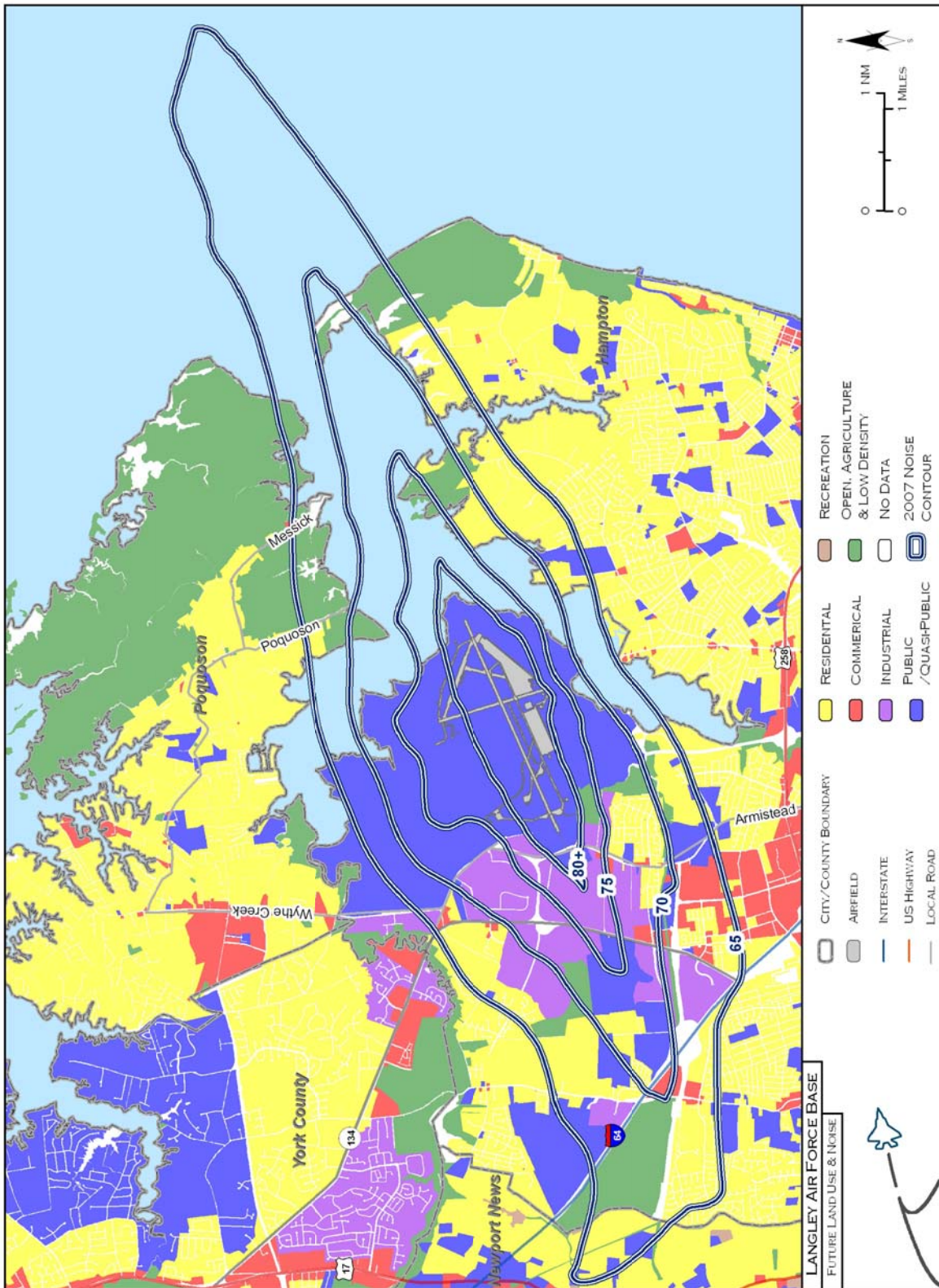


Figure 4-6. Generalized Future Land Use Plan Recommendations.



- made specific recommendations against future development in the CZ west of Runway 08/26;
- recommended against public assembly or high intensity uses in APZ I or II;
- recommended against residential use in APZ I or II, or in high-noise areas;
- required a site-specific review process for noise-sensitive uses (e.g., schools, hospitals, housing) to assess proposed noise level reduction techniques;
- discouraged 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; and
- provided for a site-specific review on tall structures in the airfield vicinity.

4.4.2 City of Poquoson

The City of Poquoson is currently revising its comprehensive plan and supporting document. The August 2006 draft plan continues previous recommendations for conservation districts (open space) generally along the frontage of the Back River in the area underlying the 65-70 noise zone and the 70-75 noise zone. At the end of Messick Road, a small commercial land use is recommended and at the end of Poquoson Boulevard, a “Waterfront Commercial” land use is recommended. These recommendations, if followed, should generally result in the development of compatible land uses. However, as with the City of Hampton, it is recommended that the comprehensive plan proactively address issues of concern to the Air Force by incorporating criteria for evaluating proposed zoning changes and site development that address residential density, public assembly spaces, noise sensitive uses, uses near a noise zone boundary, and obstruction evaluation of tall structures in the airfield vicinity.

4.4.3 City of Newport News

The *Framework for the Future* is the City of Newport News’ comprehensive plan. It was adopted in June 2001. The area underlying the 65-70 noise zone is fairly well developed, especially in light of the apartment construction currently underway on the north side of Hampton Roads Center Parkway east of Harpersville Road. The single and multi-family residential uses are envisioned to continue in this document. Although the document requests a FAA Part 150 Noise Study for Newport News/Williamsburg International airport and an AICUZ study for Felker Army Airfield at Fort Eustis, no specific recommendations



concerning noise from aircraft operations at Langley AFB are noted. As with the Hampton and Poquoson comprehensive plans, it is recommended that the Newport News comprehensive plan specifically address those issues of concern to the Air Force noted above in order to provide decision makers (e.g., the Planning Commission and City Council) criteria for evaluating proposed zoning changes and site development initiatives.

4.4.4 York County

The comprehensive plan for York County, “*Charting the Course to 2025*” recommends “*Military*”, “*Multi-Family Residential*”, and “*Medium Density Residential*” for the southeastern portion of the county reflecting the presence of the Bethel Manor housing area. It is recommended that future planning efforts by the county recognize the potential noise effects from flight operations.

4.5 Obstructions to Air Navigation (FAR Part 77 Analysis)

The Air Force seeks to protect its airfields from encroachment from construction of facilities whose uses are incompatible with its mission. In addition to the recommendations in Chapter 3 (Table 3-4), the Air Force is also concerned about development that has the potential to compromise the utility of the airfield if its height or other characteristics (e.g., light emissions, smoke, dust, or steam) is not regulated.

Unlike bases in mountainous areas, terrain elevations around the base are similar to the airfield elevation (Figure 4-7). The elevation above sea level of the outer horizontal surface is 511 feet MSL, based on the established airfield elevation of 11 feet MSL. Obstructions erected in this area have the potential to adversely affect the current and future mission capability of Langley AFB by impeding the use of 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.

The nearby jurisdictions (cities of Hampton, Poquoson, Newport News, and York County) as well as the Commonwealth of Virginia 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

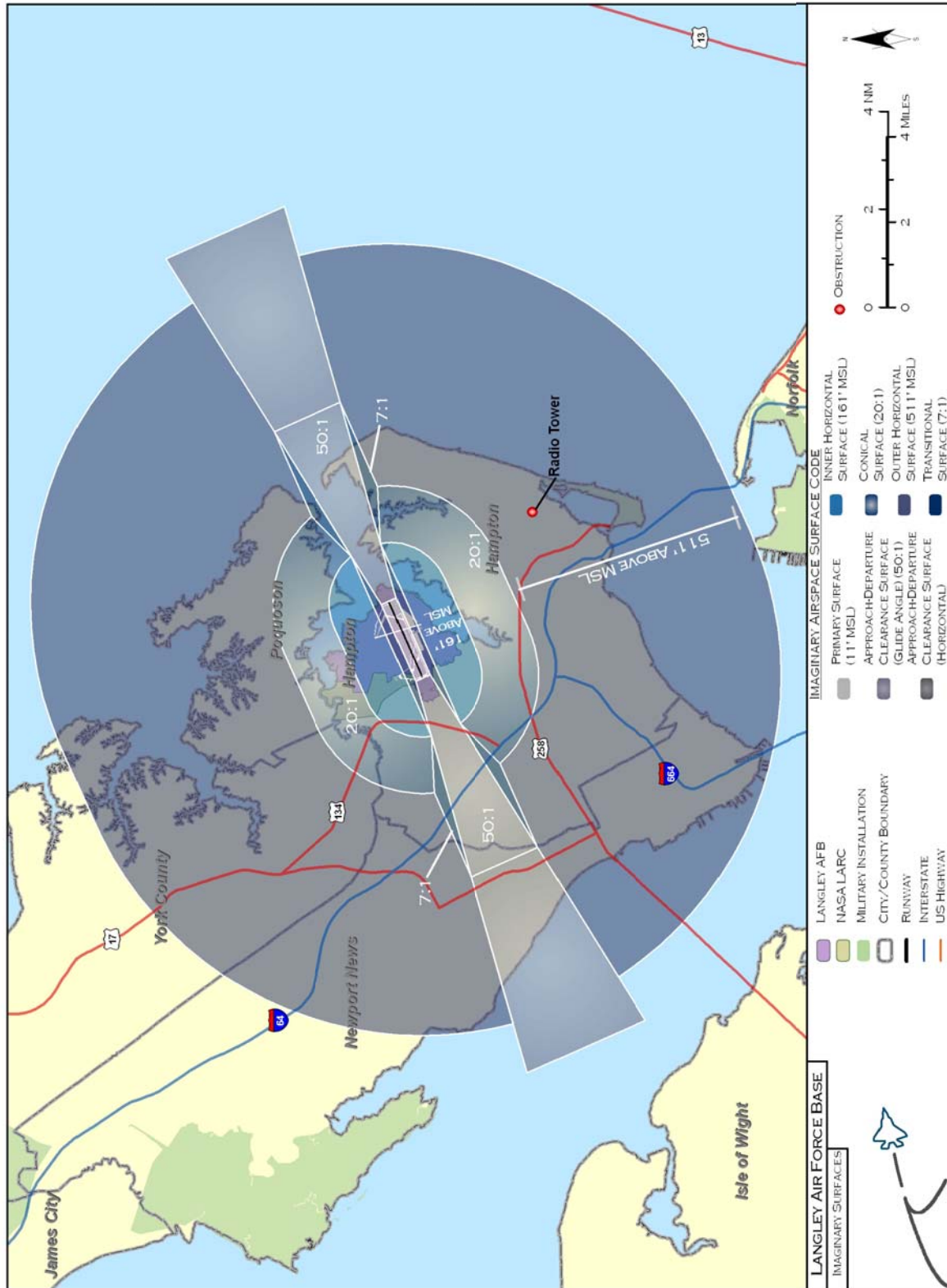


Figure 4-7. Imaginary Surfaces.



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 Langley AFB would strongly recommend disapproval of the project to protect Langley AFB's pilots during times of adverse weather (low ceilings, poor visibility). Such obstructions can lead to raised minimum altitude for an instrument procedure which 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.

It is also important that the local communities be cognizant of temporary construction activities that might require obstructions, such as tall cranes. These can also affect airfield operations and Langley AFB would request that the surrounding communities contact the installation to determine whether such would have an effect on airfield operations.

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.

The review of FAA obstruction data indicates a group obstruction (radio transmitter towers) in the vicinity of the Buckroe Beach area of Hampton extends above the 511-foot MSL elevation for the outer horizontal surface.

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 Langley AFB. In particular, the landfill to the west off Bethel Road in Hampton is an incompatible use because it presents a Bird Aircraft Strike Hazard potential (Appendix D).



4.6 AICUZ Environs

The area of influence for an AICUZ study for which specific land use planning should be undertaken extend beyond the base's immediate neighbors (Figure 4-8).

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 Langley 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 Langley 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, Langley AFB has revised the 1997 Study and provides flight track and noise contour maps in this report that reflect the most current and accurate picture of aircraft activities.

As 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, 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.

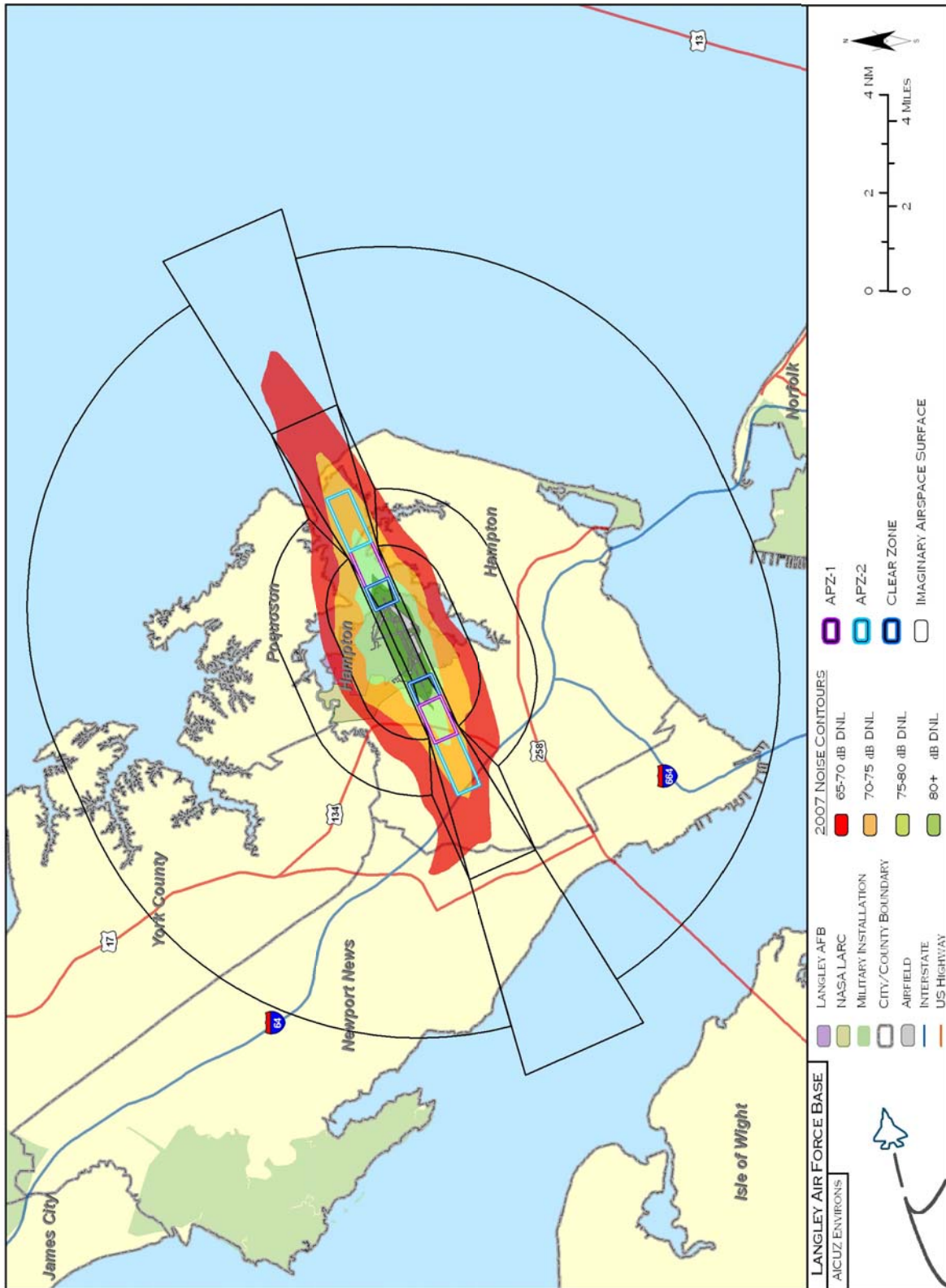


Figure 4-8. AICUZ Environs Map.



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LANGLEY AIR FORCE BASE
VIRGINIA

**CHAPTER 5 •
IMPLEMENTATION**

AIR INSTALLATION COMPATIBLE USE ZONE



5.0 IMPLEMENTATION

The implementation of the AICUZ study must be a joint effort between the Air Force, the cities of Hampton, Poquoson, Newport News, and York County, Virginia. The Air Force's role is to minimize the impact on the local communities caused by Langley 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 Langley 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 Langley 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:

- Revising standard operating procedures to allow for more departures over the Back River, thereby reducing noise exposure to populated areas;
- Working in concert with the FAA revising departures that take off to the west on Runway 26 to allow a more expeditious rate of climb, again minimizing noise exposure. FAA coordination is required to deconflict with civilian air carrier traffic in the vicinity of Newport News/Williamsburg International Airport and traffic approaching Norfolk International Airport from the north.

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 aviation 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 Langley 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 of the Cities of Hampton, Poquoson, Newport News, and York County. 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 the CZ west of Runway 08/26;
 - 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; and
 - provide for specific review recommendation on tall structures in the airfield vicinity.
- 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 Langley AFB airfield.
- 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 Langley AFB of planning and zoning actions that have the potential to affect base operations.



- Implement procedures that require project proponents to notify Langley 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.



LANGLEY AIR FORCE BASE
VIRGINIA

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 impact, 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 Langley AFB aviation environment.

A.2 Program

Geo-Marine, Inc., performed this AICUZ Study for Headquarters Air Combat Command (ACC) and Langley Air Force Base. Data collection occurred in November 2005 at Langley AFB and data validation, noise modeling, and land use analysis occurred in the 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; and



- Ensure all 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); and
- 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 a matter of policy, which is based on previous expressions of legislative intent, the Air Force will only seek to control (either by fee-simple ownership or by easement) land uses on that real estate which lies in a CZ. Beyond this area (i.e., noise exposure zones or APZs), compatible land use controls should be achieved through the municipal land use planning process.

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. Langley 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; and
- 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; and
- 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; and
- Uses that involve structures constructed to a height that would be within 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.); and
- 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; and
- Other noise sources.



Each runway end at Langley AFB has a 3,000-foot by 3,000-foot CZ and two APZs. 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 Langley AFB, most of the real estate underlying each CZ is under government ownership or controlled by an aviation easement. Records indicated that approximately 53 acres of real estate in the West Clear Zone adjacent to the departure end of Runway 08 are privately owned. The Air Force, as a matter of policy, would wish to purchase such land or limit its development potential by easement. As a result, incompatible land uses are minimized, although not entirely eliminated. Langley AFB wishes to complete a study of existing aviation easements that will also make recommendations for obtaining new easements if needed in order to prevent incompatible development in the West Clear Zone. The AF also wishes to explore public-private partnerships that would conserve land in other high-accident potential areas, such as the APZs.

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. For Runway 08/26, APZ 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; and
- 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 would be considered 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 that serve a wide area population, the disruption of which 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 rights prevent this when land is in high 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 its home loan guarantee program. Whenever possible, residential land use should be located below DNL 65 dB according to Air Force land use recommendations.

Most industrial/manufacturing uses are compatible in the airfield area of influence. Exceptions are uses such as research or scientific activities which 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. When buildings are required for these uses, additional evaluation would be 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, 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 in 1973 of Air Force aircraft accidents that occurred between 1968 and 1972 within 10 nautical miles of airfields. The study of 369 accidents indicated 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 these 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 along the extended runway centerline. 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. Analysis of Location of Air Force Airfield Accidents.

Length From Both Ends of Runway (feet)	Width of Runway Extension (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, which includes the maximum percentage of accidents in the smallest area.

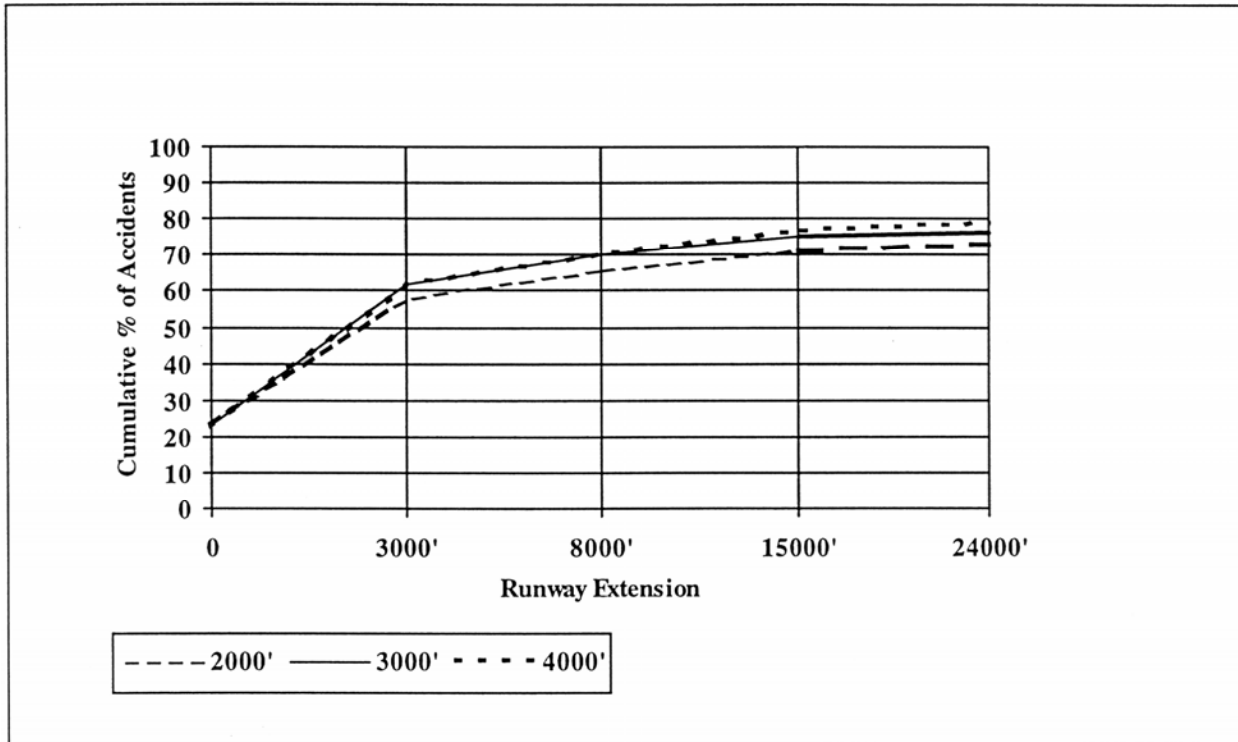
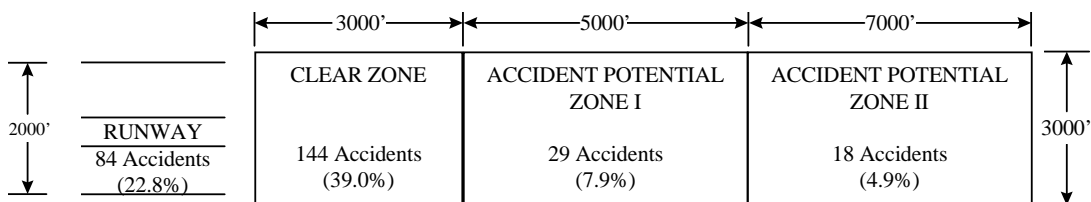


Figure B-1. Distribution of Air Force Aircraft Accidents (369 Accidents—1968-1972).

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.



Other Accidents within 10 Nautical Miles: 94 Accidents, 25.4%

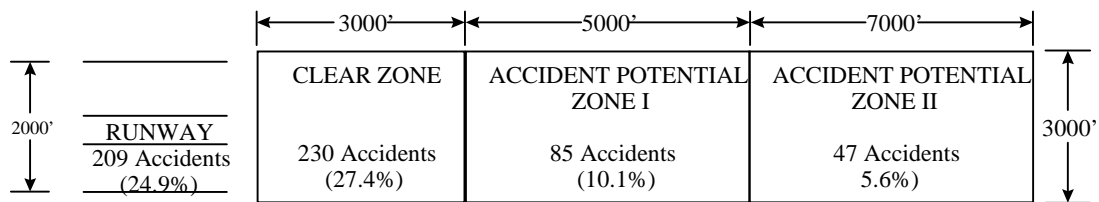
Figure B-2. Air Force Aircraft Accident Data (369 Accidents—1968-1972).



Additional accident data for 1986 through 1995 have 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 Ten NM)	228-31.3 %	267-32.0 %



Other Accidents within 10 Nautical Miles: 267 Accidents, 32.0%

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

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.

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

- 5.1 acres overall average;
- 2.7 acres for fighters and trainers; and
- 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 (Figure C-1).

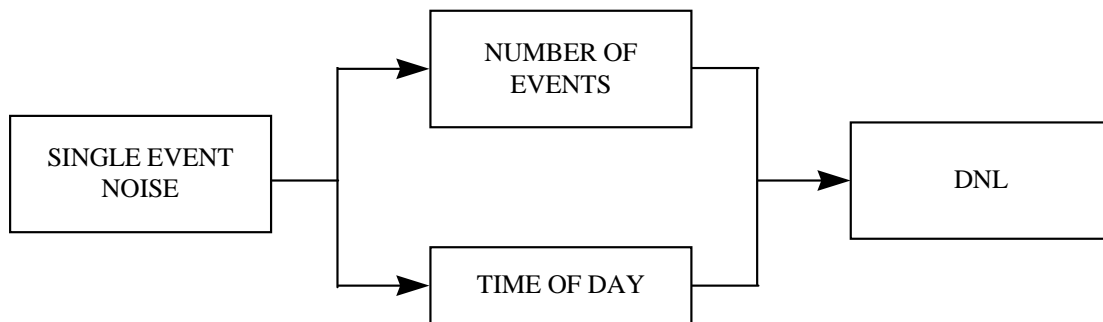


Figure C-1. Day-Night Average A-Weighted Sound Level (DNL).



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.

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 (Figure C-2).

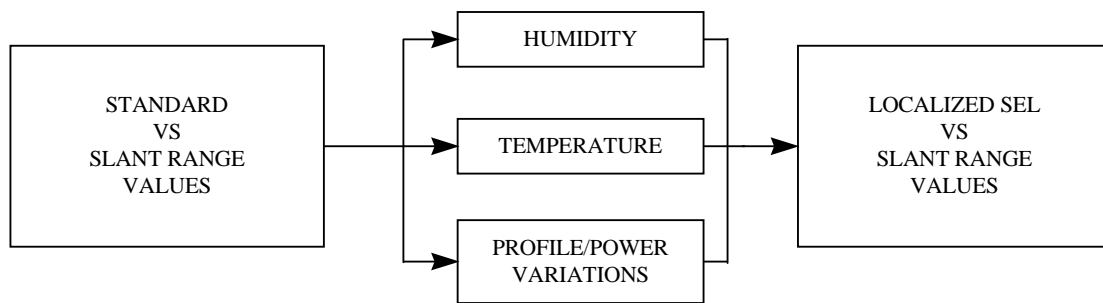


Figure C-2. Sound Exposure Level (SEL).

Ground-to-ground sound propagation characteristics are used for altitudes up to 500 feet above ground level, with linear transition from ground-to-ground sound propagation characteristics occurring between 500 and 700 feet, and air-to-ground propagation characteristics are employed 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 for Langley AFB. Flight track maps were generated for verification and approval by Langley AFB and HQ ACC/A7PP. As part of this process, data from the flight simulators used to maintain pilot proficiency was collected to verify profile (power, airspeed, altitude, aircraft configuration) data elements. 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, Virginia, 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, D.C., 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 (Figures D-1, D-2, D-3):

- Controlling Elevation. When surfaces or planes within the obstructions criteria overlap, the controlling (or governing) elevation becomes that of the lowest surface or plane.
- Runway Length. Langley AFB has one runway designed and built for sustained aircraft landings and take offs. Runway 08/26 is 10,000 feet long and 150 feet wide.
- Established Airfield Elevation. The established field elevation for Langley is 11 MSL.
- Dimensions. All dimensions are measured horizontally unless otherwise noted.

D.1.3 Planes and Surfaces.

The *Unified Facilities Criteria 3-260-01, Airfield and Heliport Planning and Design*, the DoD implementing instruction for FAR Part 77 obstruction evaluation/airport airspace analysis (OE/AAA) outlines the dimensions the different types of imaginary surfaces associated with a Class B runway.

Definitions are as follows:

- 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 ends. The width of the primary surface for a single class “B” runway, the class for Langley AFB’s primary runway (08/26), 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.
 - **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.
 - **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.

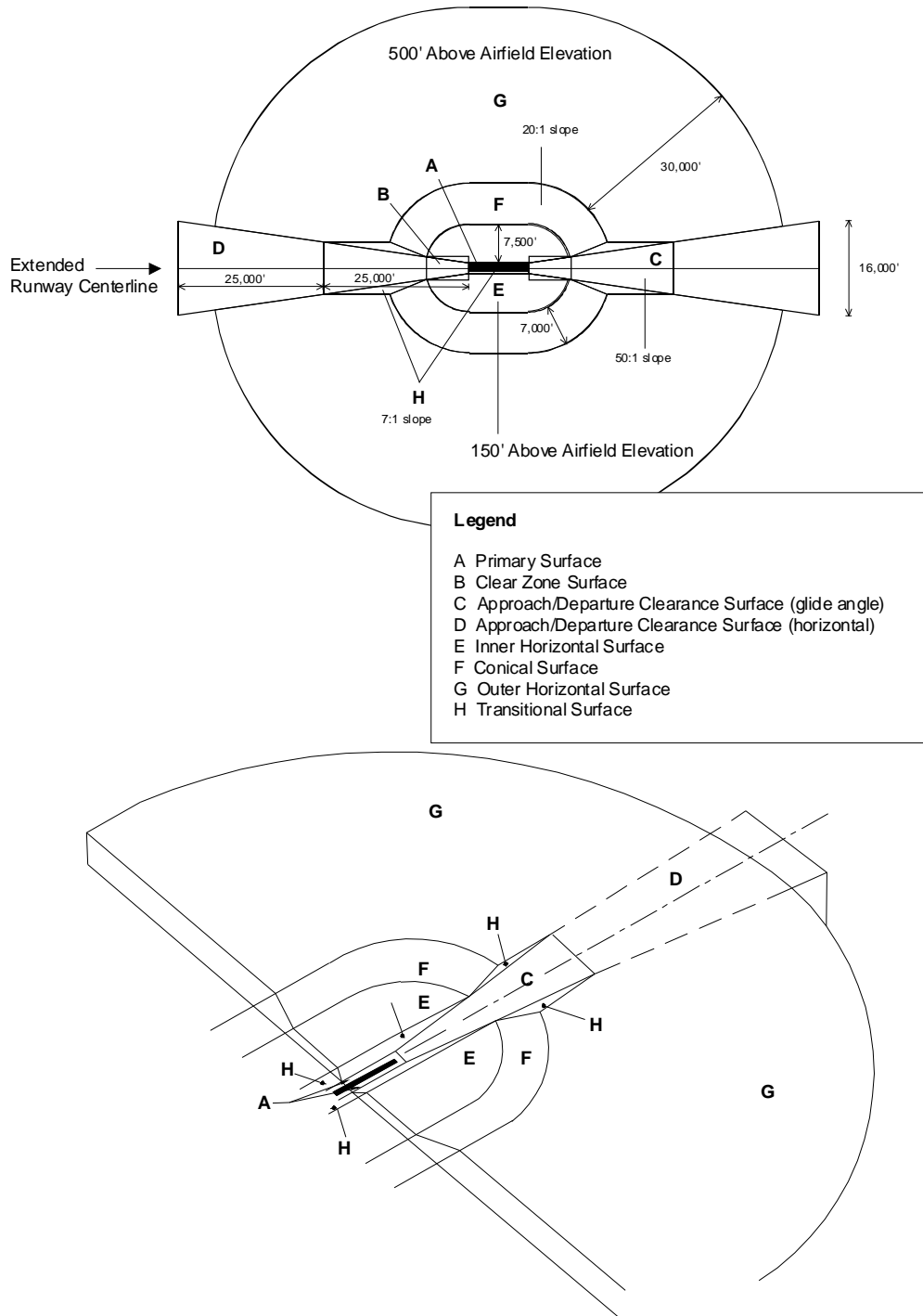
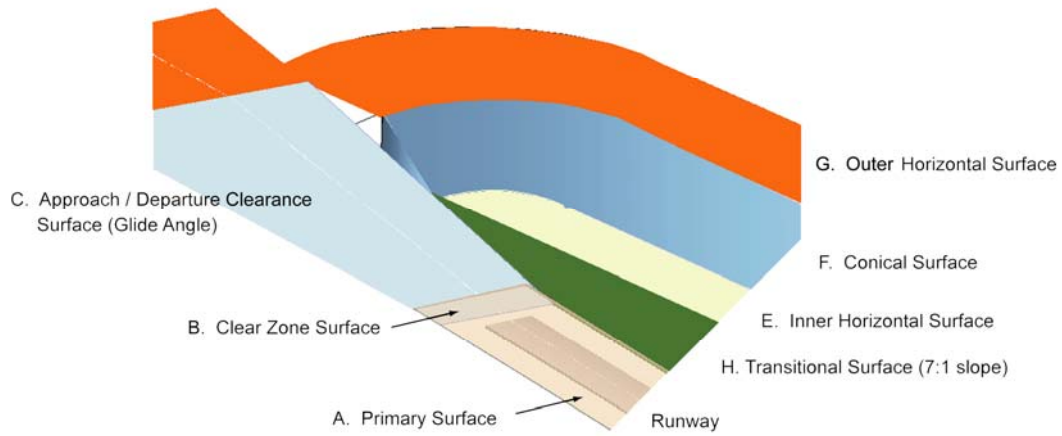


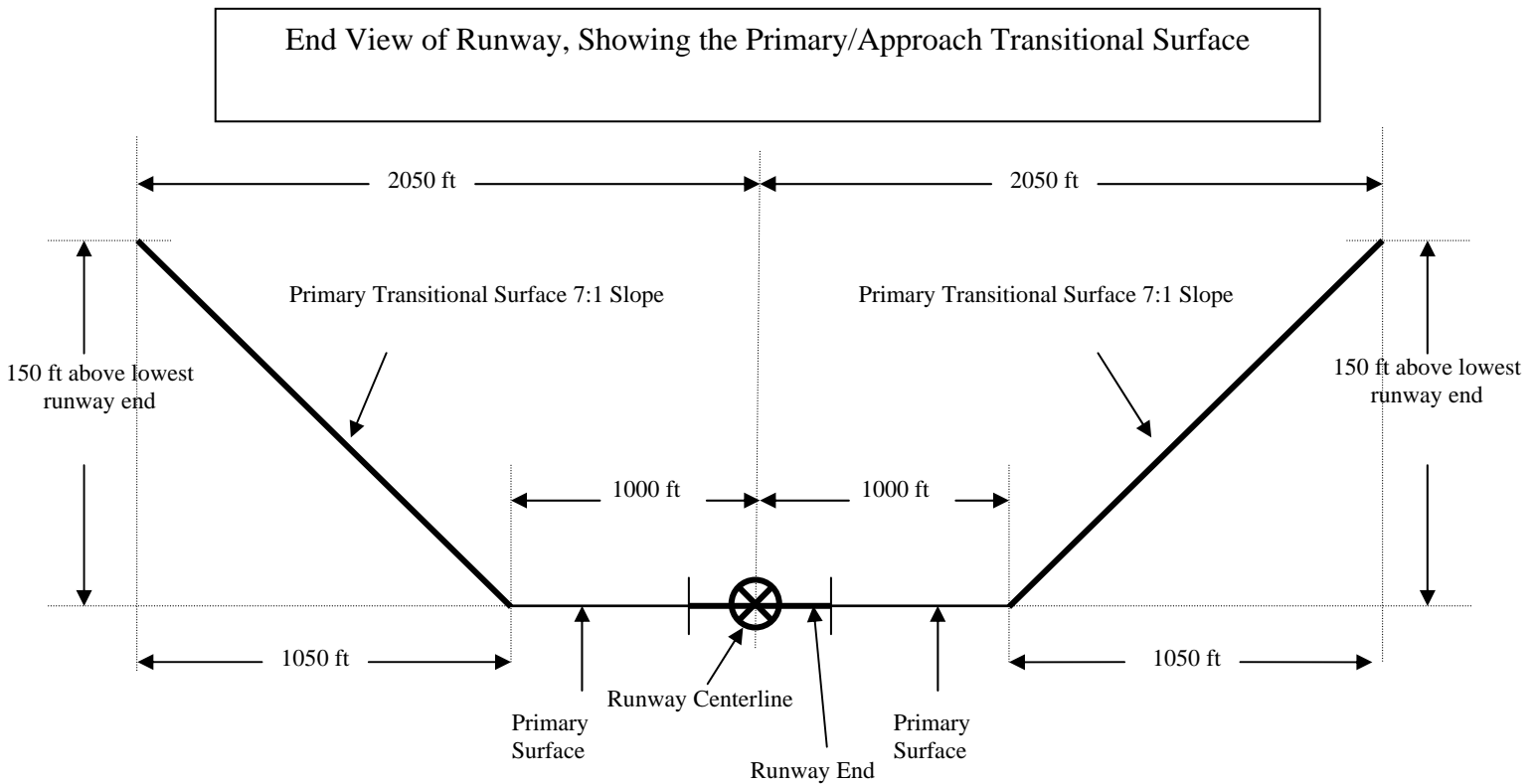
Figure D-1. Airspace Control Surface Plan¹.

¹ For a more complete description of airspace control surfaces, refer to FAR Part 77, Subpart C, or Unified Facilities Criteria (UFC) 3-260-01, *Airfield and Heliport Planning and Design*.



Not to Scale

Figure D-2. Three-Dimensional View of FAR Part 77 and UFC Imaginary Surfaces.



Source: Natural Geospatial-Intelligence Agency, Airfield Initiative Document, 24 April 2001

Figure D-3. Cross-Section View of FAR Part 77 Imaginary Surfaces.



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 also 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 and county 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.

Table D-1. Langley AFB Coordinates and Elevations.

Airport Elevation:		11 feet (MSL)
Coordinates:	Runway 08	Lat. 37° 4' 39.36" N Long. 76° 22' 35.04" W
	Runway 26	Lat. 37° 5' 17.16" N Long. 76° 20' 40.92" W

Under the provisions of FAR Part 77, obstructions to air navigation are considered to be natural objects or man-made structures that penetrate the surfaces originating at the airfield or any man-made objects that extend more than 500 feet above the ground at the site of the object.



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LANGLEY AFB

AIGUZ

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 Langley AFB.



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