

JOINT BASE ANDREWS MARYLAND

AIR INSTALLATIONS COMPATIBLE USE ZONES STUDY

FINAL



U.S. AIR FORCE

2017



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 11TH WING (AFDW)
JOINT BASE ANDREWS, MARYLAND 20762



NOV 09 2017

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Prince George's County Officials and Citizens

This Air Installations Compatible Use Zones (AICUZ) Study is an update of the 2007 Joint Base Andrews (JBA) AICUZ Study. This updated study presents and documents changes to flight operations, noise exposure areas, accident potential zones, and land use compatibility conditions since the previous AICUZ Study.

The basic objective of the AICUZ program is to achieve compatible uses of public and private lands in the vicinity of military airfields. This can be accomplished by controlling incompatible development through local regulatory actions. The AICUZ Study provides the information necessary to maximize beneficial use of the land surrounding JBA, while minimizing the potential for degradation of the health and safety of the affected public.

The AICUZ Study includes a description of the area of influence around the base and outlines the location of noise contours and runway clear zones and accident potential zones. The Study also provides land use recommendations to ensure compatible development in the vicinity of the base. It is our hope this information will be incorporated into your community comprehensive plans, ordinances, regulations, building codes, and related planning initiatives.

We greatly value the positive relationship JBA has experienced with its neighbors over the years. As a partner in the process, we have attempted to minimize disturbances generated by our aircraft operations in the area. We solicit your cooperation in implementing the recommendations and guidelines presented in this study.

Sincerely

ERNEST J. TEICHERT III, Colonel, USAF
Commander

JOINT BASE ANDREWS, MARYLAND

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FINAL

2017

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ACRONYMS

1 AS	1st Airlift Squadron
1 HS	1st Helicopter Squadron
11 WG	11th Wing
113 WG	113th Wing
121 FS	121st Fighter Squadron
201 AS	201st Airlift Squadron
457 AS	457th Airlift Squadron
459 ARW	459th Air Refueling Wing
844 CG	844th Communications Group
89 AW	89th Airlift Wing
99 AS	99th Airlift Squadron
AFB	Air Force Base
AFDW	Air Force District of Washington
AFCEC	Air Force Civil Engineer Center
AFI	Air Force Instruction
AGL	above ground level
AICUZ	Air Installations Compatible Use Zones
Air Force	United States Air Force
APZ	Accident Potential Zones
ATC	Air Traffic Control
BASH	Bird/Wildlife Aircraft Strike Hazard
CAP	Civil Air Patrol
CFR	Code of Federal Regulations
CZ	Clear Zone
dB	decibel
dBA	A-weighted decibel
DC ANG	District of Columbia Air National Guard
DIA	Defense Intelligence Agency
DNL	day-night average sound level
DoD	Department of Defense
DoDI	Department of Defense Instruction
DOE	Department of Energy
EMI	Electromagnetic Interference
FAA	Federal Aviation Administration
FAR	floor area ratio
FBI	Federal Bureau of Investigation
GCA	Ground Control Approach
HAFZ	Hazards to Aircraft Flight Zone

Hz	hertz
IFR	Instrument Flight Rules
ILS	Instrument Landing System
JBA	Joint Base Andrews
LED	Light Emitting Diode
MD	Maryland Route
MIOZ	Military Installation Overlay Zone
M-NCPPC	Maryland-National Capital Park and Planning Commission
mph	miles per hour
NCR	National Capital Region
NVG	Night Vision Goggles
MSL	mean sea level
PAG	Presidential Airlift Group
PM	Project Manager
RCS	radar cross-section
REPI	Readiness and Environmental Protection Integration
SEL	Sound Exposure Levels
TACAN	Tactical Air Navigation
UFC	Unified Facilities Criteria
USAPAT	United States Army Priority Air Transportation
USMC	United States Marine Corps
VFR	visual flight rule
VMR	Transport Squadron Detachment

1 INTRODUCTION

This study is an update of the 2007 Joint Base Andrews (JBA) Air Installations Compatible Use Zones (AICUZ) Study. This AICUZ Study reaffirms the United States Air Force policy of assisting local, regional, state, and federal officials in the areas surrounding JBA by promoting compatible development within the AICUZ area of influence, and protecting Air Force operational capability from the effects of land use that are incompatible with aircraft operations. The information provided in this AICUZ Study is intended to assist local communities with future planning.

The study presents the updated aircraft operations at JBA, which are based on optimized 2016 flight operations and documents changes to flight operations, noise exposure areas, accident potential, and land use compatibility conditions since the previous AICUZ Study.

1.1 AICUZ PROGRAM

Military airfields attract development—people who work on base want to live close to the base, while others want to provide services to base employees and residents. When incompatible development occurs near an installation or training area, affected parties within the community may seek relief through political channels that could restrict, degrade, or eliminate capabilities necessary to perform the defense mission. In the early 1970s, the Department of Defense (DoD) established the AICUZ Program. The goal of the program is to protect the health, safety, and welfare of those living and working in the vicinity of a military installation while sustaining the Air Force’s operational mission. The Air Force accomplishes this goal by promoting proactive, collaborative planning for compatible development to sustain mission and community objectives.

The AICUZ Program recommends that noise levels, Clear Zones (CZs), Accident Potential Zones (APZs), and flight clearance requirements associated with military airfield operations be incorporated into local community planning programs in order to maintain the airfield’s operational requirements while minimizing the impact to residents in the surrounding community. Mutual cooperation in the public planning process between military airfield planners and community-based counterparts serves to increase public awareness of the importance of air installations and the need to address mission requirements and associated noise and risk factors. As the communities that surround airfields grow and develop, the Air Force has the responsibility to communicate and collaborate with local government on land use planning, zoning, and similar matters that could affect the installations’ operations or missions. Likewise, the Air Force has the responsibility to communicate and understand the potential impacts that new and changing missions may have on the local community.

1.2 SCOPE AND AUTHORITY

1.2.1 SCOPE

This study is based on optimized current flight operations to present updated noise contours. CZs and APZs associated with JBA's runways are provided with recommendations for compatible land use in the vicinity of the base for state and local governments to incorporate into comprehensive plans, zoning ordinances, subdivision regulations, building codes, and other related documents.

1.2.2 AUTHORITY

Department of Defense Instruction (DoDI) 4165.57, "*Air Installations Compatible Use Zones*," (DoD 2015), establishes policy and assigns responsibility for educating air installation personnel and engaging local communities on issues related to noise, safety, and compatible land use in and around air installations as well as prescribes procedures for plotting noise contours for land use compatibility analysis.

Air Force Instruction (AFI) 32-7063, "*Air Installations Compatible Use Zones Program*," (Air Force 2015a) implements DoDI 4165.57 and applies to all Air Force installations with active runways located in the United States and its territories. This instruction provides guidance to installation AICUZ Program Managers (PMs).

Air Force Handbook 32-7084, *AICUZ Program Manager's Guide* (Air Force 2017) provides installation AICUZ PMs specific guidance concerning the organizational tasks and procedures necessary to implement the AICUZ Program. It is written in a "how to" format and aligns with AFI 32-7063.

1.3 PREVIOUS AICUZ EFFORTS AND RELATED STUDIES

Previous AICUZ studies and other relevant studies include:

- 1998 AICUZ Study for Andrews Air Force Base (AFB)
- December 2007 AICUZ Study for Andrews AFB
- December 2009 Joint Land Use Study

1.4 CHANGES THAT REQUIRE AN AICUZ STUDY UPDATE

AICUZ studies should be updated when an installation has a significant change in aircraft operations (i.e., the number of takeoffs and landings), a change in the type of aircraft stationed and operating at the installation, or changes in flight paths or procedures. This AICUZ Study has been prepared to reflect current optimized flight tracks, noise contours, APZs, and flight operations for full mission requirements.

As the DoD aircraft fleet mix and training requirements change over time, the resulting flight operations, which drive the noise contours, change as well. Additionally, non-operational changes may also require the need for an AICUZ Study update. The primary changes at JBA since the previous AICUZ Study include:

- A decrease of projected operations
- Substantial reduction of large transient jet operations
- Changes in runway utilization and flight tracks
- Elimination of older aircraft (such as EA-6B “Prowler”) that generate greater noise

1.4.1 UPDATE OF AIR FORCE INSTRUCTIONS

The 2017 JBA AICUZ Study uses the most recent AFI, which uses “annual average day” (Air Force 2015a). The primary reason for the change to average annual day is to be consistent with the land use recommendations guidelines.

1.4.2 UPDATE OF LAND USE ENVIRONMENT

The land use compatibility analysis of the AICUZ Study should be updated to reflect the current land use environment. New development has occurred around JBA since the previous AICUZ Study, and this AICUZ Study includes newly identified areas of compatibility concern.

2 INSTALLATION PROFILE

2.1 LOCATION

JBA is located in Prince George's County, Maryland, approximately five miles southeast of Washington D.C. (Figure 2-1). The installation is bordered by Allentown Road to the west, Marlboro Pike to the east, Old Alexandria Ferry Road to the south, and Suitland Parkway to the north. Communities surrounding JBA include Morningside, Forestville, Westphalia, Woodyard, Clinton, and Camp Springs.

The base operates two outlying communication sites. The Brandywine Receiver Site is located 10 miles south of the base in Prince George's County, and the Davidsonville Transmitter Station is located 20 miles northeast of the base in Anne Arundel County. Both sites have helicopter landing zones and support training operations for the base (JBA 2016a).

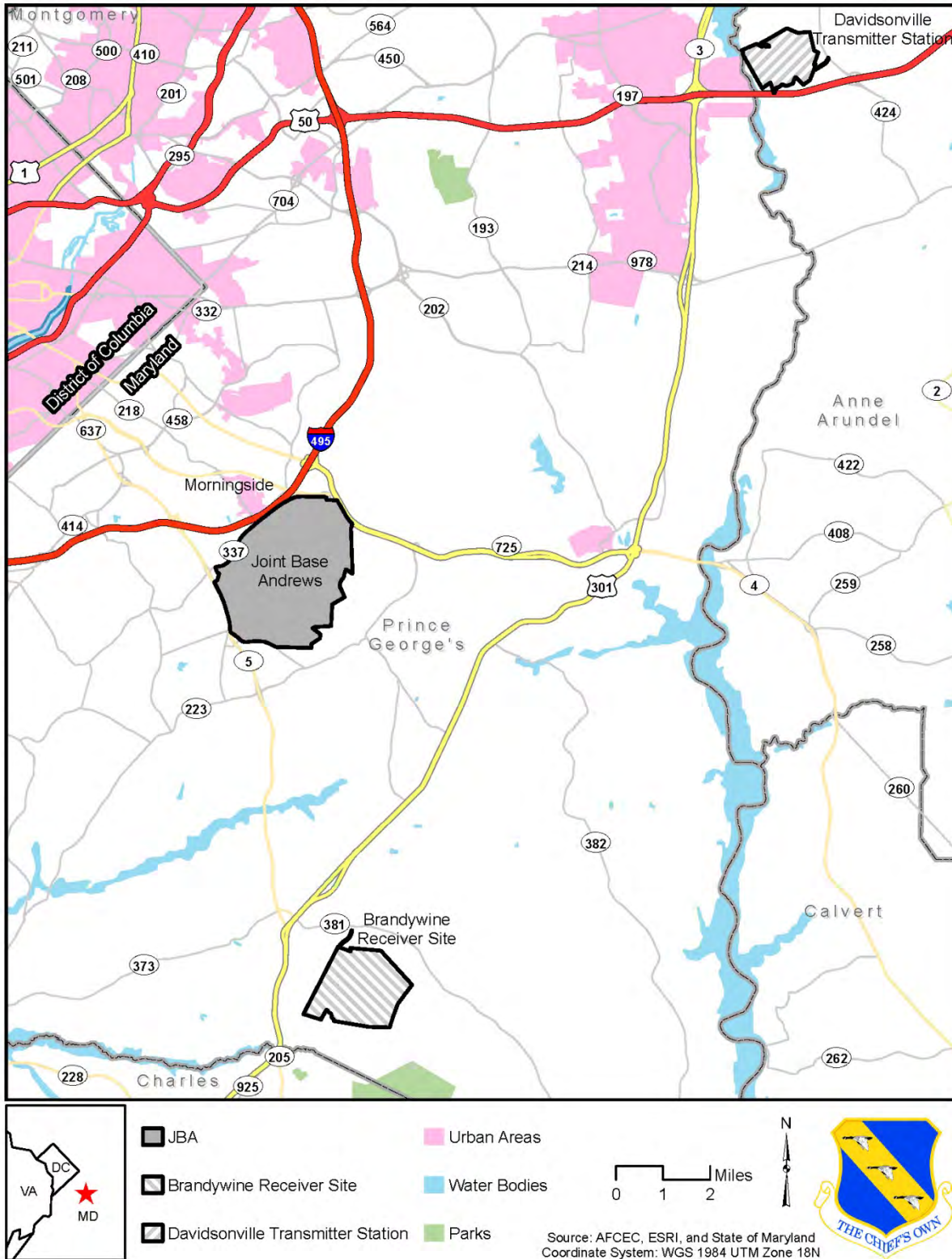
2.2 HISTORY

The military history of JBA began during the Civil War when Union troops occupied a small church near Camp Springs, Maryland, for a local headquarters. Today the church is known as Chapel Two and is still used for services by the JBA community. During World War II, the Secretary of War acquired the site as an army airfield to train fighter pilots for overseas combat. The airfield became operational on May 2, 1943, and was named Camp Springs Army Air Field. The Army renamed the airfield in 1945 as the Andrews Army Air Field in honor of Lieutenant General Frank M. Andrews who was the Commander of European operations for all Army Air Forces (JBA 2012).

In 1947, the Air Force was recognized as a separate military service from the Army, and Andrews Army Air Field was named Andrews AFB. After World War II, Andrews AFB served as headquarters for Continental Air Command, Strategic Air Command and the Military Air Transport Service. The base was used to train pilots during the Korean War in the early 1950s, and was headquarters to the Air Research and Development Command from 1950 through 1992 (JBA 2012). Andrews AFB officially became the home airbase for the presidential aircraft in 1962 when President Kennedy's official C-118 aircraft was transferred from Washington National Airport.

In 2009, Andrews AFB and the Naval Air Facility Washington became Joint Base Andrews Naval Air Facility Washington, or JBA. The 11th Wing (11 WG) became JBA's host wing in October 2010.

Figure 2-1: Regional Location



2.3 MISSION

JBA is the secure aerial reception point for the President of the United States, Vice President, executive and legislative branch leaders, DoD leaders, and foreign dignitaries. Critical “No-Fail” missions include Aerospace Control Alert, Single Integrated Operational Plan Alert, presidential and vice presidential airlift, air sovereignty, and worldwide special air mission airlift.

2.4 HOST AND TENANT ORGANIZATIONS

2.4.1 11TH WING

The 11 WG is the host wing at JBA that provides security, personnel, contracting, and financial and infrastructural support to five wings, two headquarters, over 80 tenant organizations, 6,500 Airmen in the Pentagon, and 60,000 Airmen and families worldwide. The 11 WG provides instantaneous airlift response for the nation’s capital and security for the world’s chief flight operations. The 11 WG also provides ceremonial support for the Air Force Band, Honor Guard, and Air Force Arlington Chaplaincy (JBA 2016b). The 1st Helicopter Squadron (1 HS) is part of the 11 WG and provides local rotary airlift to the Executive Department.



2.4.2 MAJOR TENANTS

2.4.2.1 AIR FORCE DISTRICT OF WASHINGTON

The Air Force District of Washington (AFDW) is a direct reporting unit to the Headquarters Air Force, and is the “designated single Air Force voice for planning and implementing Air Force and joint solutions concerning the National Capital Region (NCR)” (JBA 2016a). The AFDW is composed of the 11 WG and the 844th Communication Group at JBA and the 11 WG at Bolling AFB. AFDW provides air, space, and cyberspace capabilities to protect the nation’s capital and supports local personnel and those serving worldwide (AFDW 2012).



2.4.2.2 844TH COMMUNICATIONS GROUP

The 844th Communications Group (844 CG) “provides communication and information support to the Air Force National Capitol Region warfighters” (Air Force 2012).



2.4.2.3 89TH AIRLIFT WING

The 89th Airlift Wing (89 AW) provides “worldwide special air mission airlift, logistics and communications support for the president, vice president, cabinet members, combatant commanders and other senior military and elected leaders” (JBA 2016b). The Presidential Airlift Group (PAG) is responsible for transporting the President of the United States. The 1st Airlift Squadron (1 AS) and the 99th Airlift Squadron (99 AS) are part of 89 AW.



2.4.2.4 1ST HELICOPTER SQUADRON

The 1 HS is the first Air Force rotary-wing squadron in the NCR and the largest operational helicopter squadron in the Air Force. The unit conducts high-priority airlift missions and provides contingency response in the NCR. Additionally, 1 HS provides defense support to civilian authorities in the event of a disaster (JBA 2017).



2.4.2.5 NAVAL AIR FACILITY, WASHINGTON D.C.

The Naval Air Facility, Washington D.C. provides training and readiness support for more than 6,000 Navy Reservists including four Navy squadrons, two aviation detachments, and 133 reserve units (JBA 2016b). Tenant commands include VR-1, VR-53, and a United States Marine Corps (USMC) Transport Squadron Detachment (VMR).



2.4.2.6 459TH AIR REFUELING WING (AIR FORCE RESERVE COMMAND)

The 459th Air Refueling Wing (459 ARW) recruits, trains, and equips personnel to operate and maintain the KC-135 Stratotanker missions. The 459 ARW provides refueling and cargo transport support for exercises and contingencies globally (Air Force 2012).



2.4.2.7 113TH WING

The 113th Wing (113 WG) District of Columbia Air National Guard (DC ANG) “provides air sovereignty forces to defend the nation's capital, and also provides fighter, airlift and support forces capable of local, national and global employment” (JBA 2016b). The Wing consists of the 201st Airlift Squadron (201 AS) and the 121st Fighter Squadron (121 FS). The 201 AS provides global transportation for government officials and foreign dignitaries, and the 121 FS, known as the “Capital Guardians,” provides air control forces in defense of the nation’s capital, as well as fighter, airlift, and backup forces for local and global deployments.



2.4.2.8 457TH AIRLIFT SQUADRON

The 457th Airlift Squadron (457 AS) is stationed at JBA and is part of the 375th Air Mobility Wing at Scott AFB. The 457 AS mission is to transport military and civilian leaders for national security issues (Air Force 2010).



2.4.2.9 UNITED STATES ARMY PRIORITY AIR TRANSPORTATION

The United States Army Priority Air Transportation (USAPAT) transports Army senior leadership, selected DoD officials, and Combatant Commanders regionally and globally (JBA 2016b).



2.4.2.10 DEPARTMENT OF ENERGY

The Department of Energy’s (DOE) mission is to provide the NCR support for the nation’s energy, environment, and nuclear challenges with first-class scientific and technological resolutions (Air Force 2012).



2.4.2.11 DEFENSE INTELLIGENCE AGENCY

The Defense Intelligence Agency (DIA) is a member of the United States Intelligence Community that manages foreign military intelligence provided to warfighters, defense policymakers, and force planners within the DoD and the Intelligence Community (Air Force 2012).



2.4.2.12 MARYLAND STATE POLICE AVIATION COMMAND

The mission of the Maryland State Police Aviation Command is to ensure public safety through airborne law enforcement, medical transportation, search and rescue, homeland security, and disaster response services to citizens of the State of Maryland (Maryland State Police 2016).



2.4.2.13 CIVIL AIR PATROL

The Civil Air Patrol (CAP) began as a group of civilian aviators that volunteered their services during World War II. Today this voluntary organization is an auxiliary of the Air Force that supports aerospace education, cadet programs, and emergency services.



2.5 OPERATIONAL AREAS

JBA encompasses approximately 4,436 acres and has two active Class B parallel runways that align north/south. Class B runways are primarily used by large, heavy, and high-performance aircraft, and JBA is the only military airfield in the NCR that can support heavy aircraft. Runway 01R/19L (east runway) measures 9,755 feet long and 150 feet wide, and Runway 01L/19R (west runway) is 9,318 feet long (not including overruns/displaced thresholds) and 200 feet wide. The overruns at the ends of each runway are 1,000 feet long. The airfield elevation is 280 feet above mean sea level (MSL). All runways have a high-intensity approach lighting system with centerline sequenced flashers and precision approach path indicators. The airfield is equipped with Category III Instrument Landing System (ILS) capabilities, and “CAT III” ILS approaches are conducted on Runway 01L/19R. Airfield operations occur 365 days a year, 24 hours a day. JBA can accommodate 16 helicopters, 54 small aircraft, 53 medium aircraft, and 24 heavy aircraft (JBA 2016a). Figure 2-2 illustrates the airfield at JBA.

2.6 LOCAL ECONOMIC IMPACTS

The military provides direct, indirect, and induced economic benefit to local communities through jobs and wages. Benefits include employment opportunities and increases in local business revenue, property sales, and tax revenue. In Fiscal Year 2012, Maryland’s military installations contributed \$57.4 billion to the local economy, which is approximately 17 percent of the state’s total economic output. Additionally, installation visitors generated \$211.6 million in tourism spending (Maryland Department of Business and Economic Development 2015).

The economic impact of a military installation is based on annual payroll (jobs and salaries), annual expenditures, and the estimated annual dollar value of jobs created. The military further contributes to the economic development of communities through increased demand for local goods and services, and increased household spending by military and civilian employees.

Based on the 2016 JBA Economic Impact Report, the installation directly employs approximately 16,033 military and civilian personnel. JBA’s spending generated \$283 million in local expenditures, and contributed an additional 6,706 jobs in the local communities. In total,

JBA has an estimated total economic impact of \$1.7 billion on the local economy (JBA 2016c). A summary of personnel for JBA is provided in Table 2-1, and a summary of the economic impact of the base is provided in Table 2-2.

Table 2-1: Personnel by Classification at JBA

Classification	Total
Active Duty Military	4,767
Reserve and Guard	5,269
Non- Extended Reserves	1,340
Government Civilian	3,262
Non- Appropriated Civilian	868
Contractors	527
Grand Total	16,033

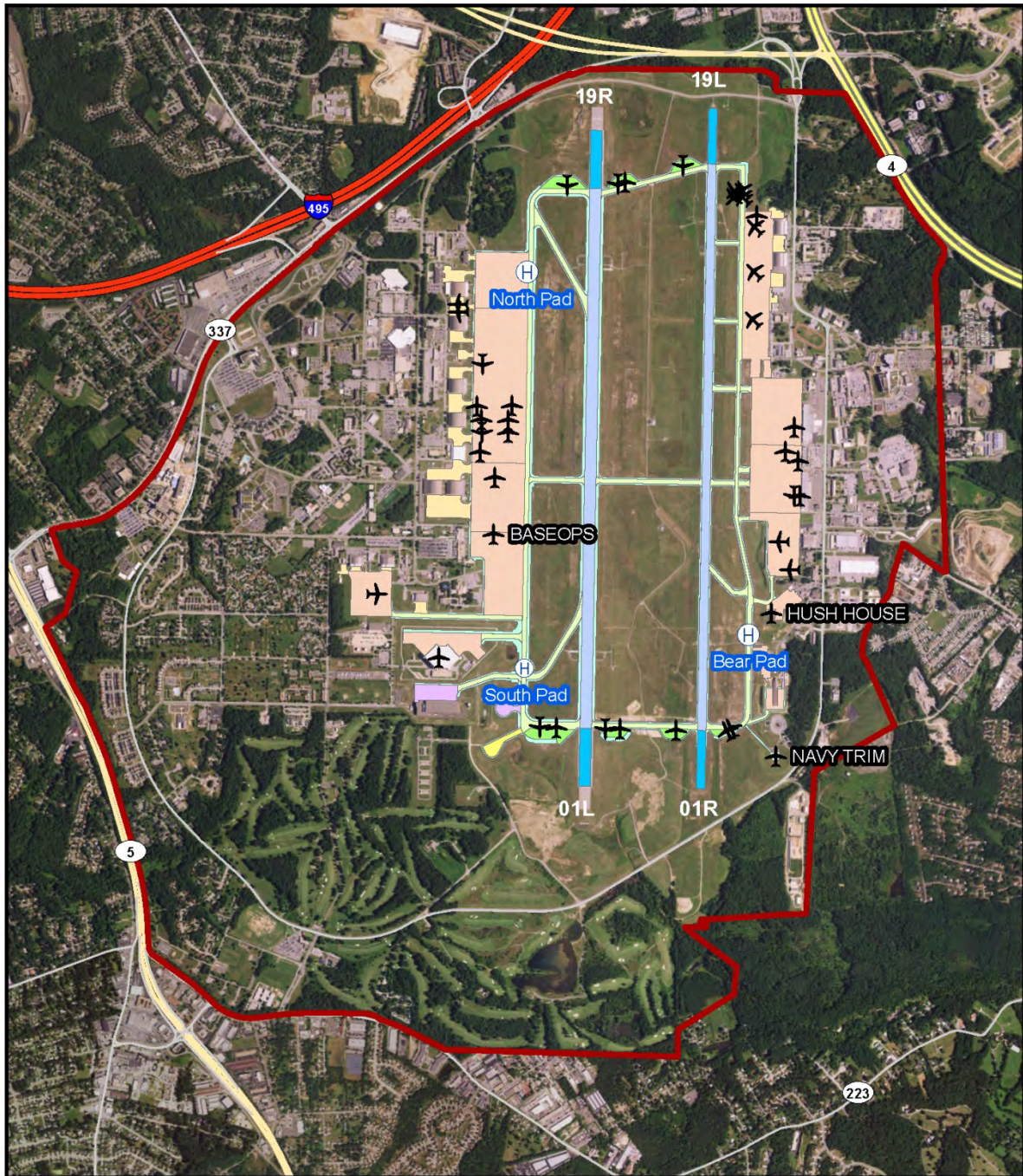
Source: JBA 2016c

Table 2-2: Annual Economic Impact of JBA

Payroll	(\$M)
Military	702.20
Federal Civilian	311.30
Other Civilian	30.42
Total	1,043.91
Expenditures	(\$M)
Annual Expenditures	282.98
Estimated Annual Dollar Value of Jobs Created	366.35
Annual Payroll	1,043.91
Total Economic Impact	1,693.24

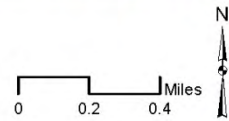
Source: JBA 2016c

Figure 2-2: Joint Base Andrews



- JBA
- H Helipads
- ✈ Maintenance Locations

- Airfield Surface**
- Runway
 - Overrun
 - Ramp
 - Access Ramp
 - Taxiway
 - Warmup Holding Pad
 - Apron
 - Hot Cargo Pad
 - Shoulder



Source: AFCEC, ESRI, and State of Maryland
 Coordinate System: WGS 1984 UTM Zone 18N

3 AIRCRAFT OPERATIONS

Flying activities, including where aircraft fly, how high they fly, how many times they fly over a given area, and the time of day they operate, must be fully evaluated to understand the relationship of flight operations and land use. This chapter discusses aircraft based at or transient to JBA, the types and numbers of operations conducted at the airfield, and the runways and flight tracks used to conduct the operations.

3.1 AIRCRAFT TYPES

3.1.1 BASED AIRCRAFT

Both fixed- and rotary-wing aircraft operations are conducted at JBA. Table 3-1 presents based aircraft at JBA and the associated flying units.

Table 3-1: Based Aircraft and Helicopters at Joint Base Andrews

Squadron/Unit	Aircraft Type	Description
DC ANG/113 WG	F-16	Single-engine fighter jet
89 AW/99 AS	C-20	Twin-engine jet
457 AS	C-21	Twin-engine jet
PAG	VC-25	Four-engine presidential aircraft
89 AW/1 AS	C-32	Mid-size, narrow body twin-engine jet
89 AW/99 AS; USN VR-1; USAPAT	C-37	Twin-engine business jet
USN VR-53	C-130	Four-engine transport aircraft
459 ARW	KC-135	Four-engine aerial refueling tanker
DOE; DIA; USMC VMR	C-12	Twin-engine turboprop
USAPAT; USMC VMR	UC-35	Twin-engine medium business jet
89 AW/1 AS; DC ANG/201 AS	C-40	Twin-engine jet
CAP	Cessna 182	Four-seat, single-engine light airplane
1 HS	UH-1N	Twin-engine light-lift utility military helicopter
MD State Police Aviation Command	AW 139	15-seat twin-engine medium size helicopter
DOE	Bell 412	Twin-engine light-lift utility helicopter

Note: The C-20 aircraft was retired September 2017 and is no longer part of JBA operations.

3.1.1.1 F-16 "FIGHTING FALCON"

The F-16 Fighting Falcon is single-engine multirole fighter jet with a high-performance weapon system used for air-to-air combat and air-to-surface attack operations. The aircraft's length is approximately 49.5 feet with a height of 16 feet and a wingspan of over 32 feet. The aircraft has a maximum speed of 1,500 mile per hour (mph) and a maximum range of more than 2,002 miles (Air Force 2015b).



3.1.1.2 C-12 "HURON"

The C-12 Huron is a twin-engine turboprop aircraft used for passengers and cargo transport. The aircraft has a maximum speed of 334 mph, a service range of 1,974 nautical miles, and a maximum operational ceiling of 35,000 feet (U.S. Navy 2009).



3.1.1.3 C-20

The C-20 is a twin-engine turbofan jet that provides airlift for government and DoD officials. The primary function of the aircraft is worldwide special air and operational support airlift missions. The aircraft's length is approximately 83 feet with a height of 24.5 feet and a wingspan of over 77 feet. The aircraft has a maximum speed of 576 mph and an operational range of 3,698 nautical miles (Air Force 2003a).

Note: The C-20 aircraft was retired September 2017 and is no longer part of JBA operations.



3.1.1.4 C-21

The C-21 is a twin-engine turbofan jet used for cargo and passenger airlift. The C-21 is also used to transport patients during aeromedical evacuations. The aircraft's length is approximately 49 feet with a height of 12 feet and a wingspan of 39.5 feet. The aircraft has a maximum speed of 530 mph and an operational ceiling of 45,000 feet (Air Force 2003c).



3.1.1.5 VC-25

The mission of the VC-25 is to transport the President of the United States. The presidential fleet consists of two modified Boeing 747-200Bs commercial airliner, and when the president is aboard either aircraft, the call sign is “Air Force One.” The VC-25 is a four-engine jet that can carry 71 passengers and 30 crew members. The aircraft’s length is approximately 232 feet with a height of 63 feet and a wingspan of over 195 feet. The aircraft has a maximum speed of 630 mph and an operational range of 6,800 nautical miles (Air Force 2003e).



3.1.1.6 C-32

The primary mission of the C-32 is to transport national leaders including the vice president, first lady, and members of the Cabinet and Congress. The C-32 is a mid-size twin-engine jet, modification of the Boeing 757-200 commercial intercontinental airliner, with a wingspan of over 124 feet and a cargo capacity of 45 passengers. The aircraft has a maximum speed of 530 mph and an operational range of 5,500 nautical miles (Air Force 2015c).



3.1.1.7 UC-35

The UC-35 is a twin-engine business jet used to transport passengers and cargo. The aircraft’s length is approximately 49 feet with a height of 15 feet and a wingspan of 52 feet. The aircraft has a maximum speed of 498 mph and an operational range of 1,800 miles (Naval Air Systems Command 2012).



3.1.1.8 C-37

The C-37 is a twin-engine turboprop business jet that supports worldwide special air missions for high-ranking government and DoD officials. The aircraft’s length is approximately 96 feet with a height of 26 feet and a wingspan of 93.5 feet. The aircraft has a maximum speed of 600 mph, an operational ceiling of 51,000 feet, and an operational range of 5,500 nautical miles (Air Force 2003d).



3.1.1.9 C-40

The C-40 is a twin-engine business jet, modification of the Boeing 737-700, used to transport national leaders and senior military leaders worldwide. The aircraft has a wingspan of 117 feet, cruising speed of 530 mph, and a maximum operational range of 4,500 to 5,000 nautical miles (based on payload) (Air Force 2003f).



3.1.1.10 C-130 "HERCULES"

The C-130 Hercules is a four-engine turboprop military transport aircraft. The C-130 Hercules was originally designed for global tactical airlift and troop transport, but the aircraft is also used for a variety of special missions such as a gunship, airborne assault, search and rescue, scientific research support, weather reconnaissance, aerial refueling, maritime patrol, and aerial firefighting. The aircraft's length is approximately 98 feet with a height of 39 feet and a wingspan of over 132 feet. The aircraft has a maximum speed of 366 mph and a maximum allowable payload of 42,000 pounds (Air Force 2003b).



3.1.1.11 KC-135 "STRATOTANKER"

The KC-135 Stratotanker is a four-engine military aerial refueling tanker aircraft. The KC-135 can carry up to 83,000 pounds of cargo and is also used for airlift support during aeromedical evacuations. The aircraft's length is approximately 136 feet with a height of 42 feet and a wingspan of 131 feet. The aircraft has a maximum speed of 530 mph and an operational range of 1,500 miles with 150,000 pounds of transfer fuel (Air Force 2004).



3.1.1.12 UH-1N "HUEY"

The UH-1N "Huey" is a two-engine light-lift utility helicopter that supports various missions. At JBA, 1 HS flies the UH-1N Huey to provide airlift in the NCR for the Executive Branch, high-ranking military leaders, and distinguished visitors. The squadron is also tasked to support key government officials and search and rescue missions. The diameter of the main rotor is 48 feet and the diameter of the tail rotor is 8.5 feet. The helicopter has a cruising speed of 115 mph, a service ceiling of 15,000 feet, and range of more than 300 miles (Air Force 2015d).



3.1.1.13 AW-139

The AW-139 is a twin-engine medium-size helicopter used by the Maryland State Police Aviation Command for medical transportation, search and rescue, homeland security, and disaster response. The AW-139 has a cruising speed of 191 mph, service ceiling of 20,000 feet, and service range of 675 nautical miles.



3.1.1.14 CESSNA 182

The Cessna-182 is a single-engine aircraft used by the CAP for inland and coastal search and rescue, homeland security support, and airborne communications repeater service. The aircraft has a wingspan of 36 feet, cruising speed of 167 mph, service ceiling of 18,000 feet, and a serving range of 930 nautical miles.



3.1.1.15 BELL-412

The Bell 412 is a twin-engine light-lift utility helicopter used by the DOE at JBA for specialized radiation and contamination surveys. The helicopter has a cruising speed of 140 mph and service ceiling of 20,000 feet.



3.1.2 TRANSIENT AIRCRAFT

Non-assigned aircraft at an airfield are considered transient. Aircraft typically land at other airfields to refuel or to conduct airfield training that cannot otherwise be accomplished at their home airfield. Table 3-2 lists the transient aircraft types at JBA.

Table 3-2: Transient Aircraft

Aircraft Type	Description
F-16	Single-engine fighter jet
T-38	Twin-engine supersonic trainer
C-5	Four-engine military transport aircraft
C-9	Twin-engine transport aircraft
KC-135	Four-engine aerial refueling tanker
C-130	Four-engine transport aircraft
C-17	Four-engine large transport aircraft
C-21	Twin-engine jet
C-23	Small military transport aircraft
KC-10	Four-engine refueling tanker
UC-35	Twin-engine medium business jet
E-4	Four-engine commander aircraft
G-4	Twin-engine business aircraft
C-12	Twin-engine turboprop
Cessna-441	Twin-engine light turboprop
P-3	Four-engine turboprop anti-submarine and maritime surveillance aircraft
B-727	Four-engine commercial jet
B-747	Four-engine commercial jet
B-757-200	Four-engine commercial jet
H-60	Twin-engine medium-lift helicopter

3.2 PRE-FLIGHT AND MAINTENANCE RUN-UP OPERATIONS

Pre-flight engine runs and maintenance runs are conducted prior to takeoff to test engines at various power settings and durations to check for malfunctions. Run-up locations are designated areas along the flight line where pilots or mechanics can conduct last-minute engine checks without obstructing ground traffic. To the maximum extent possible, engine run-up locations are established in areas that minimize noise impacts on base and in the surrounding communities. Additionally, engine testing occurs in a “test cell” or “hush house”, which are buildings specifically designed to muffle noise during engine testing. A hush house is a large enclosed, noise-suppressed facility that can accommodate an entire aircraft, and a test cell is used for out of frame engine testing. A total of 33 maintenance run-up locations, including one hush house used for F-16 engine testing, are located at JBA. Engine run-up locations are depicted in Figure 2-2.

Engine runs are generally conducted during daytime hours; however, depending on mission necessity, particularly for nighttime departures, pre-flight maintenance run-ups could occur during nighttime hours (10:00 p.m. to 7:00 a.m.). The noise associated with pre-flight and engine maintenance runs was included in the noise analysis and modeling associated with the noise contours.

3.3 FLIGHT OPERATIONS

An aircraft operation is defined as one takeoff or one landing. A complete closed pattern or circuit is counted as two operations because the aircraft crosses over a runway threshold twice, once on arrival and once on departure. Typical flight operations conducted at JBA include:

- **Departure.** An aircraft takes off to a training area or as part of a training maneuver.
- **Approaches and Arrivals.**
 - **Straight-In/Full-Stop Arrival.** An aircraft lines up on the runway extended centerline, descends gradually, lands, comes to a full stop, and then taxis off the runway.
 - **Overhead Arrival.** An expeditious arrival using visual flight rules (VFR). The aircraft arrives over the airfield at pattern altitude and then breaks (turns), performing a 180-degree turn to enter the landing pattern. Once established in the pattern, the aircraft lowers landing gear and flaps and performs a 180-degree descending turn to land on the runway.
 - **Low Approach.** Runway approach where the pilot descends near the runway, typically lower than 500 feet, then increases altitude without making contact with the runway.
 - **Radar Approach.** An instrument approach is provided with active assistance from Air Traffic Control (ATC). ATC personnel direct the aircraft to align with the runway centerline and glideslope to the runway, continuing until the pilot gains visual contact with the runway environment.
- **Patterns.** Patterns refer to operations where the pilot trains in a circuit at the airfield. Patterns are designed with either left- or right-hand turns depending on variables that include airport design/layout and urban development/noise restrictions.

A pilot can operate an aircraft by VFR or instrument flight rules (IFR). VFR is a standard set of rules that govern the procedures for conducting flight under visual conditions (i.e., pilots remain clear of clouds, avoid other aircraft, and usually fly unassisted by ATC). IFR is a standard set of rules governing the procedures for conducting flights whereby ATC provides for separation between aircraft and is the standard flight rule used outside of the local traffic pattern. Pilots flying IFR do so with the assistance of ATC and aircraft instruments.

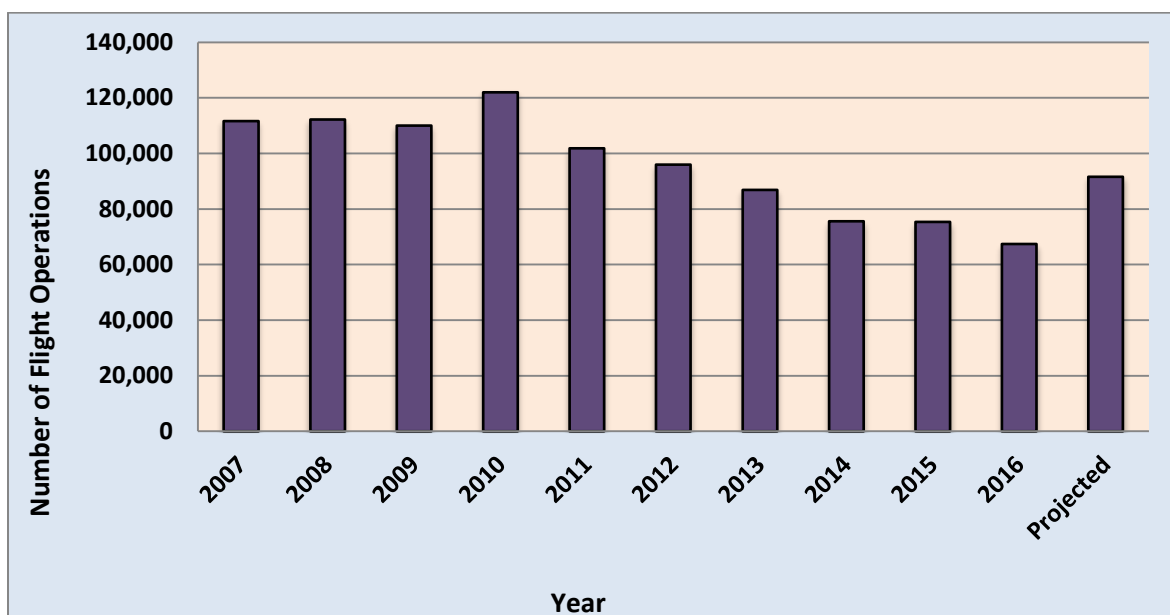
- **Tactical Air Navigation (TACAN) System Arrival.** TACAN is a navigation system used by military aircraft during approach that provides the pilot with bearing and distance to a runway information from a ground unit.

- **Touch and Go.** A touch-and-go landing pattern is a maneuver that involves landing on a runway and taking off again without coming to a full stop. Usually the pilot then circles the airport in a defined pattern known as a circuit and repeats the maneuver.
- **Ground Control Approach (GCA).** A radar or “talk down” approach directed from the ground by ATC. ATC personnel provide pilots with verbal course and glide slope information, allowing pilots to make an instrument approach during inclement weather. A box-shaped pattern is normally flown to practice GCA approaches.
- **Simulated Flameout Pattern Approach.** A practice approach at idle thrust to a runway to simulate a run-down of a jet engine flameout. The approach may start over a runway at a high altitude and continue on a relatively high and wide downwind leg with a continuous turn to a final landing or low approach.

3.4 ANNUAL OPERATIONS

Figure 3-1 summarizes flight operations (based on Federal Aviation Administration [FAA] published control tower records), which occurred at JBA over a 10-year period, including based and transient aircraft operations. Total annual operations account for each departure and arrival, including those conducted as part of a pattern operation.

Figure 3-1: Summary of Flight Operations



3.4.1 PROJECTED FLIGHT OPERATIONS

A total of 91,616 annual flight operations are projected at JBA for the 2017 AICUZ Study, which reflects an approximate 20 percent increase in flight operations since 2014. The number of

projected flight operations would be similar to the number of operations in 2012, which was the highest total of flight operations over the past five years. The projected operations are based on ideal flying schedules and sortie¹ rates and are not indicative of changes to the mission or introduction of new training requirements at JBA.

Table 3-3 summarizes the projected annual flight operations for JBA from all flying units, including transient operations. Consistent with Air Force policy, aircraft operations are modeled on an annual average day basis that is based on 365 flying days per year. Average annual day is used to define the average number of daily airfield operations that would occur during a 24-hour period.

Table 3-3: Projected Annual Flight Operations at JBA

Unit	Aircraft	Departures	Arrivals	Closed Patterns	Total
Assigned Aircraft					
1 AS	C-32	304	304	60	668
	C-40	204	204	40	448
1 HS	UH-1N	6,448	6,448	29,200	42,096
99 AS	C-20	500	500	1,500	2,500
	C-37	500	500	1,500	2,500
457 AS	C-21	550	550	928	2,028
459 ARW	KC-135	500	500	3,200	4,200
CAP	Cessna 182	49	49	-	98
DC ANG/113 WG	F-16	3,155	3,155	6,310	12,620
DC ANG/201 AS	C-40	1,281	1,281	2,280	4,842
DIA	C-12	207	207	414	828
DOE	C-12	230	230	480	940
	Bell 412	110	110	2,776	2,996
MD State Police	AW 139	711	711	576	1,998
PAG	VC-25	186	186	24	396
USAPAT	C-37	730	730	220	1,680
	UC-35	730	730	220	1,680
USMC VMR	C-12	698	698	422	1,818
	UC-35	834	834	474	2,142
USN VR-1	C-37	624	624	400	1,648
USN VR-53	C-130	84	84	144	312
Total Assigned Aircraft Operations					88,438

1 A sortie is an "aircraft flight consisting of one departure, one approach, and any number of closed patterns. One sortie is made up of more than one operation" (Air Force 2017).

Unit	Aircraft	Departures	Arrivals	Closed Patterns	Total
Transient Aircraft					
	B-727	8	8	-	16
	B-747	7	7	-	14
	B-757-200	160	160	-	320
	C-12	184	184	-	368
	C-130	126	126	-	252
	KC-135	83	83	-	166
	C-17	492	492	-	984
	C-21	82	82	-	164
	C-23	31	31	-	62
	C-5	14	14	-	28
	C-9	13	13	-	26
	Cessna-441	118	118	-	236
	E-4	22	22	-	44
	F-16	3	3	-	6
	G-4	99	99	-	198
	H-60	29	29	-	58
	KC-10	3	3	-	6
	P-8A	13	13	-	26
	T-38	2	2	-	4
	UC-35	100	100	-	200
Total Transient Aircraft Operations					3,178
TOTAL					91,616

Note: Closed patterns count as two operations each.

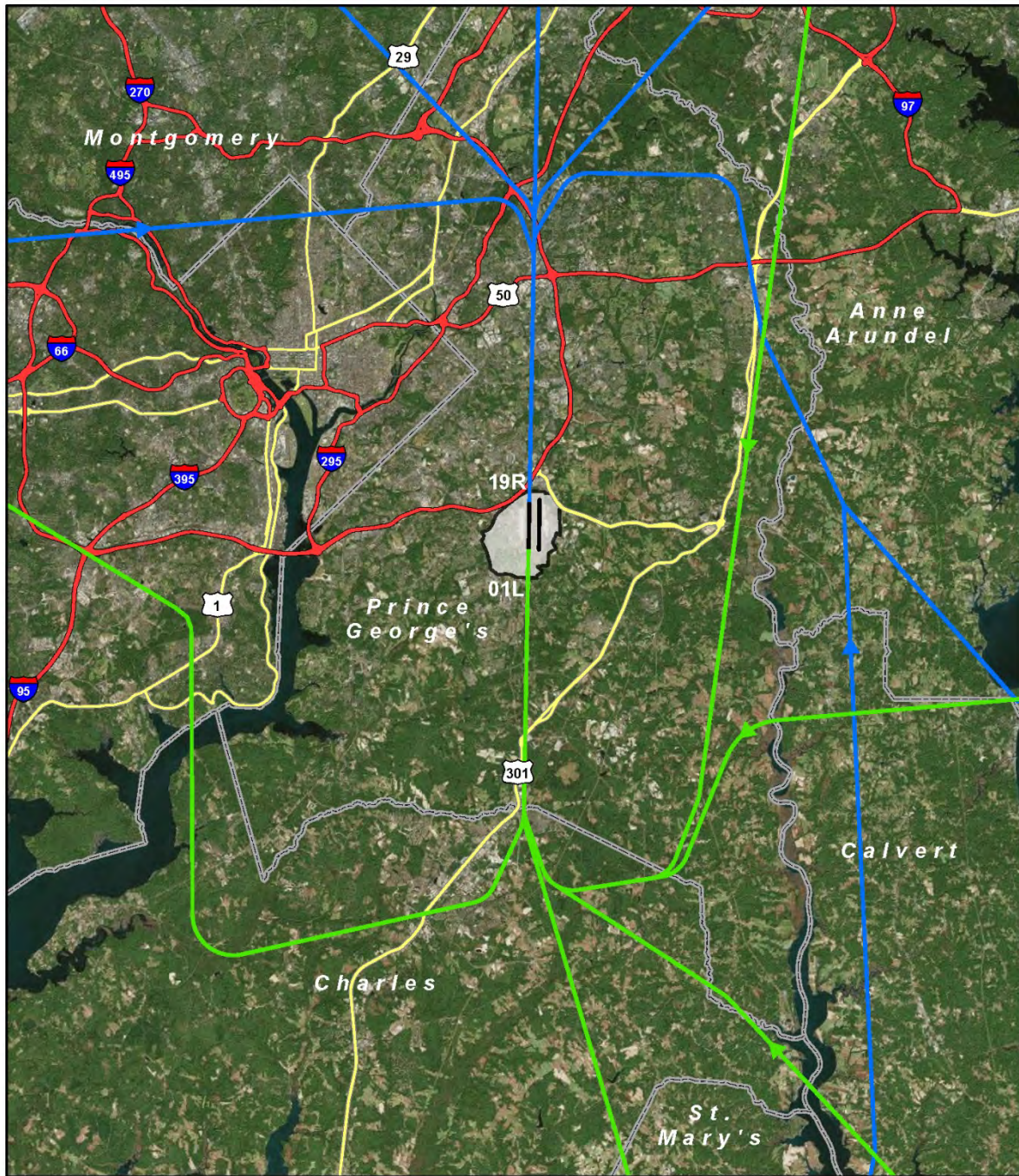
Note: The C-20 aircraft was retired September 2017 and is no longer part of JBA operations.

3.5 FLIGHT TRACKS AND RUNWAY UTILIZATION

Each runway has designated flight tracks that provide for the safety, consistency, and control of an airfield. A flight track is a route an aircraft follows while conducting an operation at the airfield, between airfields, or to/from training areas. Flight tracks typically include departures, arrivals, and local area patterns to depict where the aircraft fly in relation to the airfield.

While flight tracks are graphically represented as single lines in this study, the actual flight track over the ground is much broader due to aircraft performance, pilot technique, and weather conditions. Flights are idealized representations based on pilot and ATC input. Figures 3-2 through 3-8 illustrate the arrival, departure, and pattern flight tracks for JBA, respectively.

Figure 3-2: Arrival Flight Tracks on Runway 01L/19R



- JBA
- Runways
- Arrival Flight Tracks (Runway 01L)
- Arrival Flight Tracks (Runway 19R)

0 2.5 5 Miles



Source: AFCEC and ESRI
Coordinate System: WGS 1984 UTM Zone 18N

Figure 3-3: Arrival Flight Tracks on Runway 01R/19L

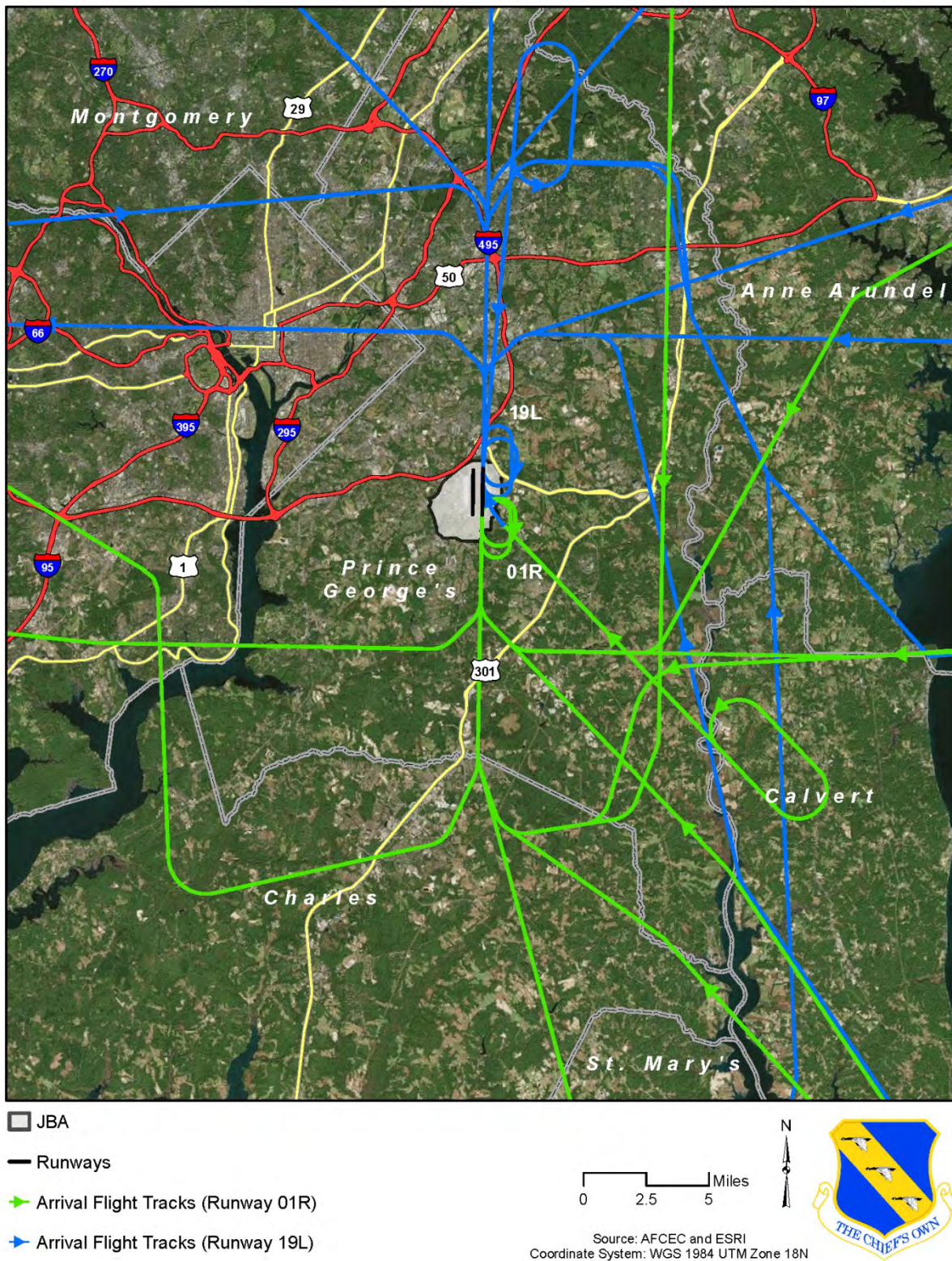
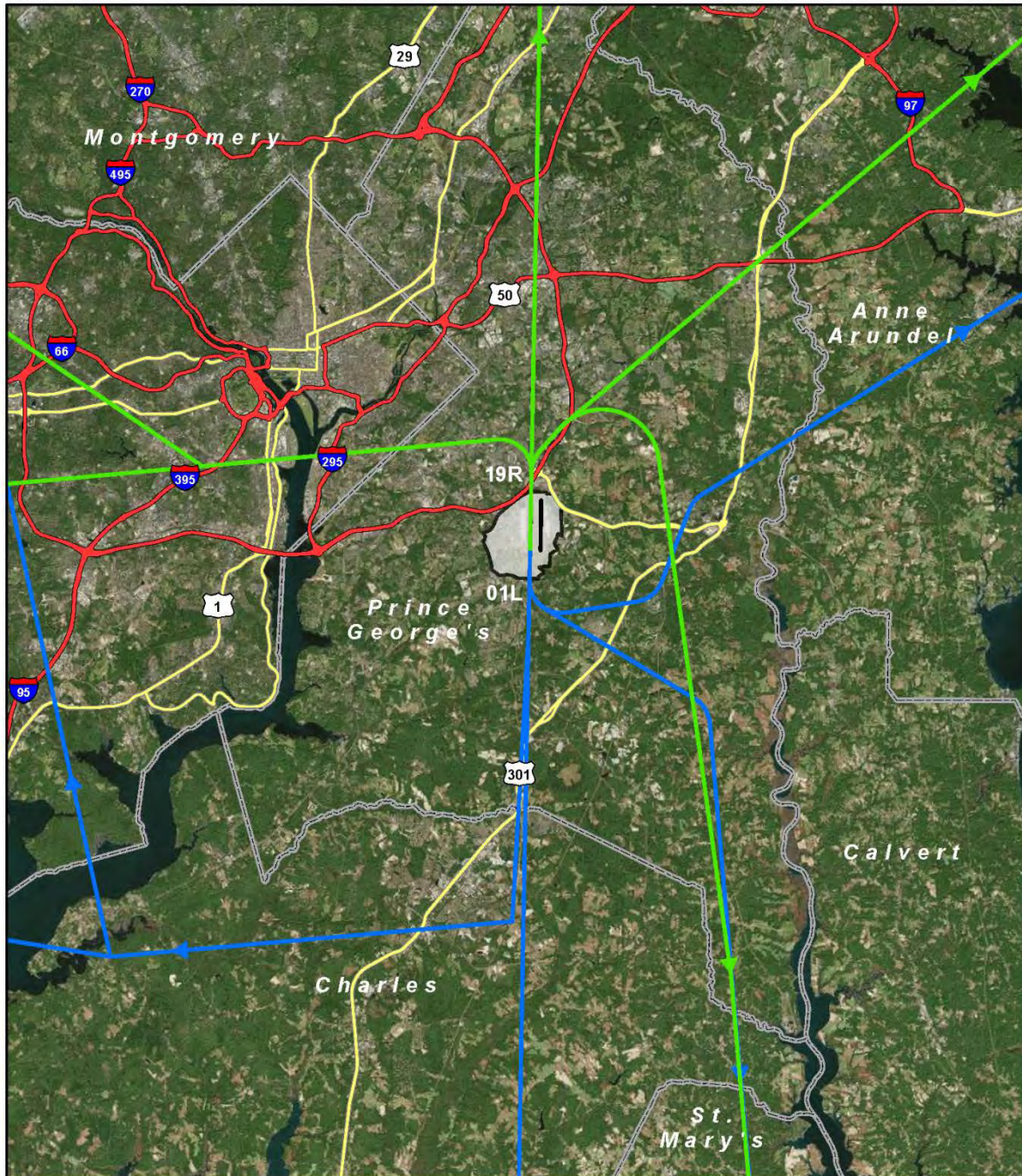


Figure 3-4: Departure Flight Tracks on Runway 01L/19R



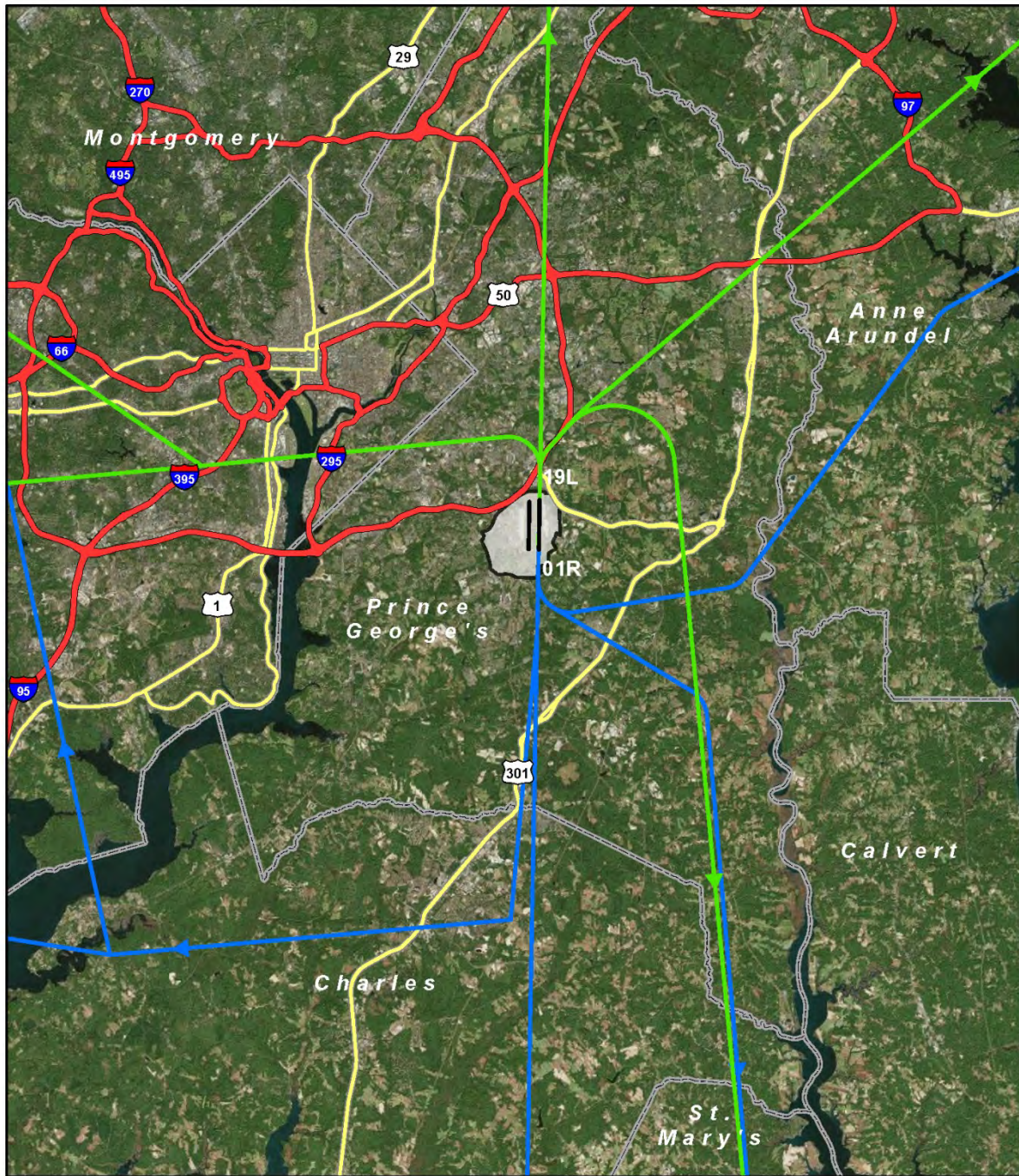
- JBA
- Runways
- Departure Flight Tracks (Runway 01L)
- Departure Flight Tracks (Runway 19R)

0 2.5 5 Miles



Source: AFCEC and ESRI
Coordinate System: WGS 1984 UTM Zone 18N

Figure 3-5: Departure Flight Tracks on Runway 01R/19L



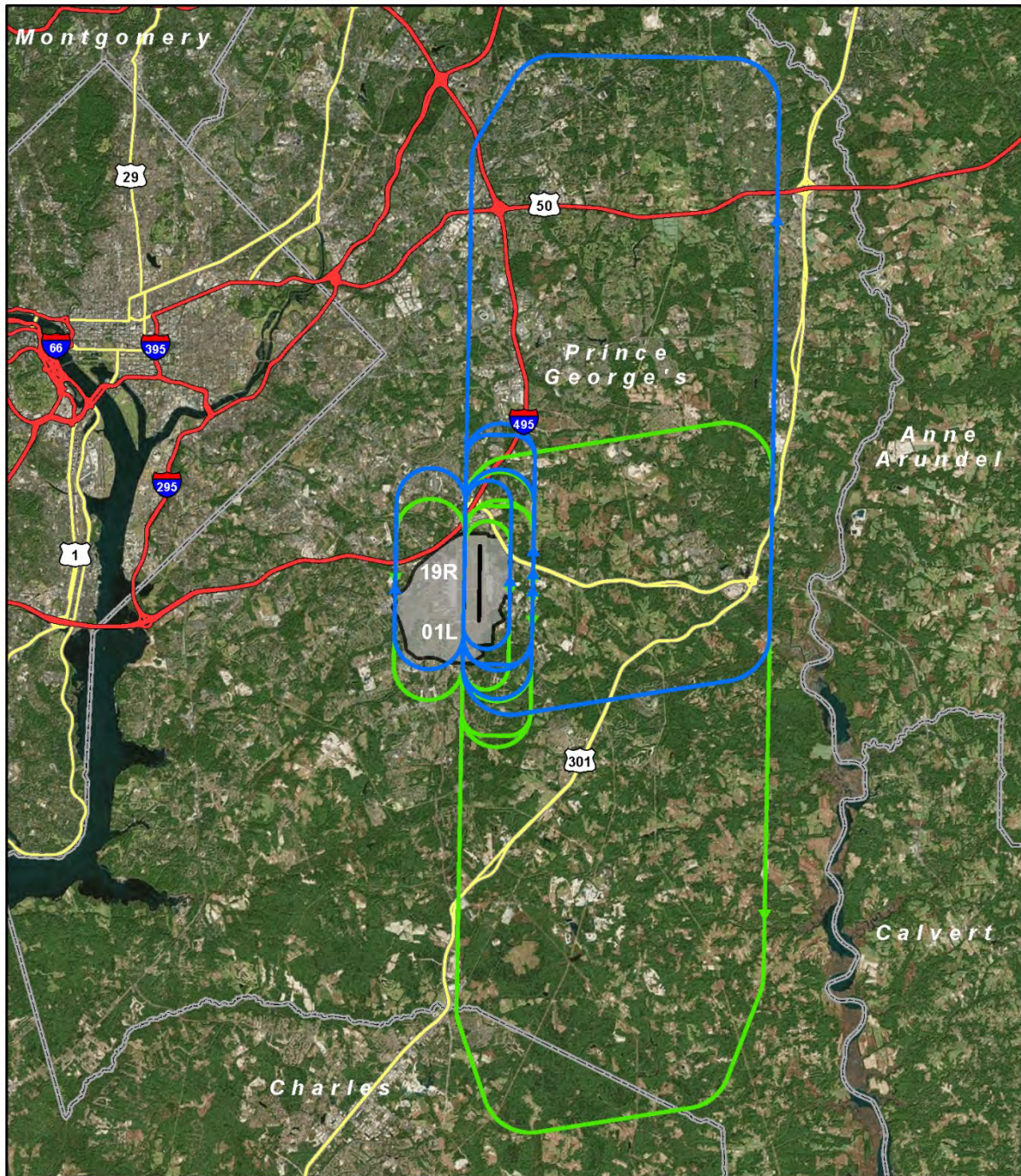
- JBA
- Runways
- Departure Flight Tracks (Runway 01R)
- Departure Flight Tracks (Runway 19L)

0 2.5 5 Miles



Source: AFCEC and ESRI
Coordinate System: WGS 1984 UTM Zone 18N

Figure 3-6: Closed Pattern Flight Tracks on Runway 01L/19R

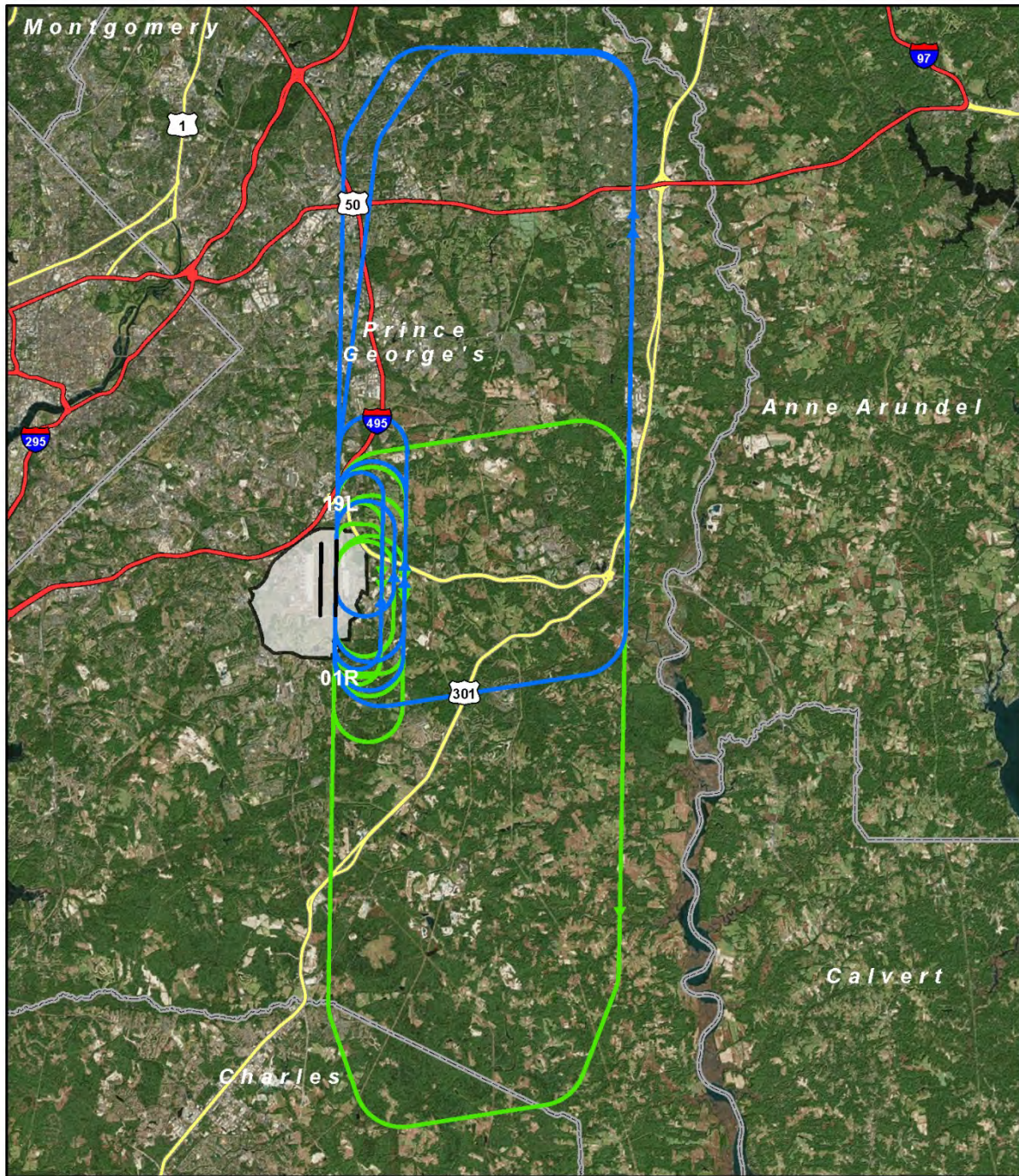


- JBA
- Runways
- Closed Pattern Tracks (Runway 01L)
- Closed Pattern Tracks (Runway 19R)

0 2 4 Miles

Source: AFCEC and ESRI
Coordinate System: WGS 1984 UTM Zone 18N

Figure 3-7: Closed Pattern Flight Tracks on Runway 01R/19L

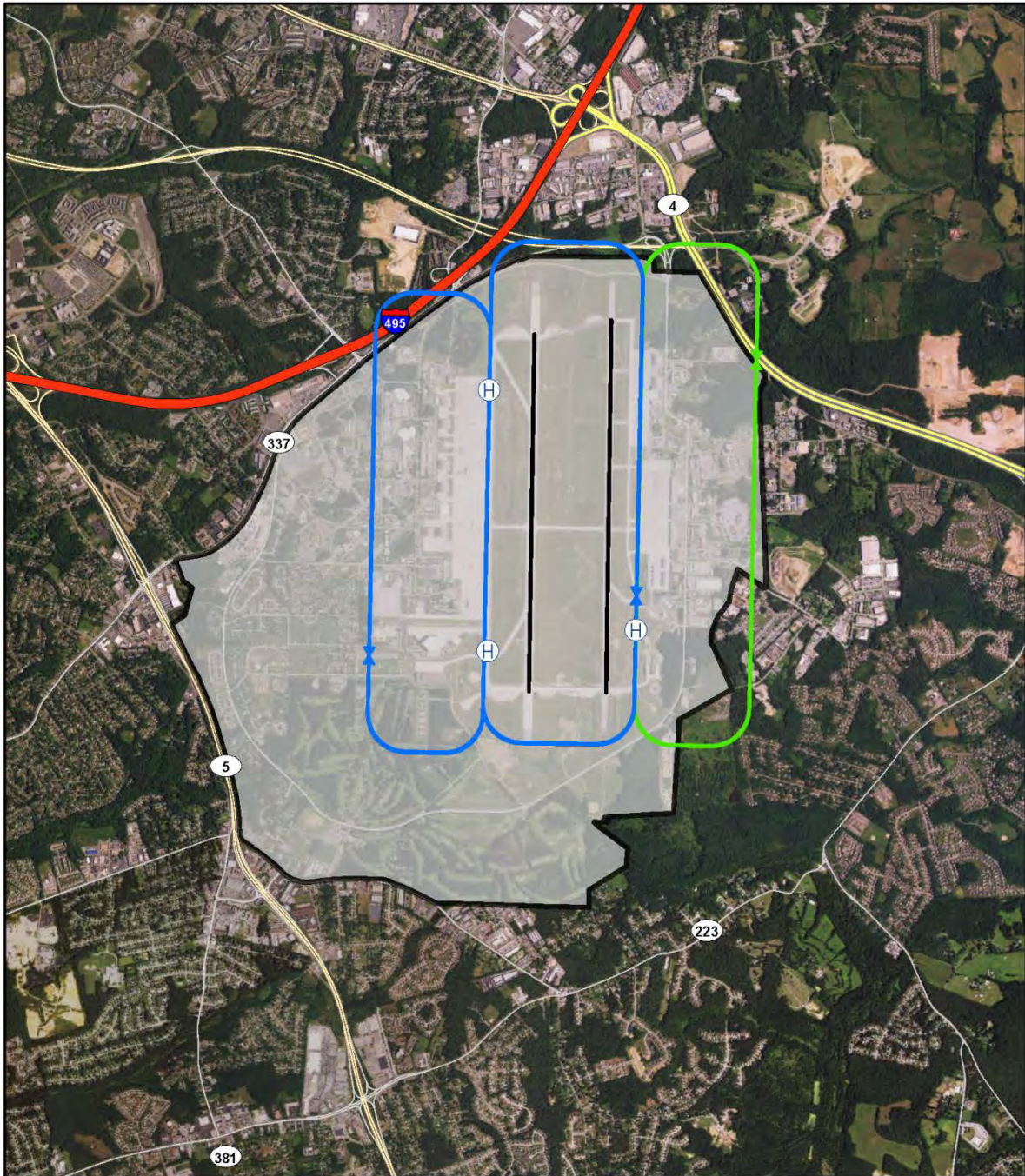


- JBA
- Runways
- Closed Pattern Tracks (Runway 01R)
- Closed Pattern Tracks (Runway 19L)

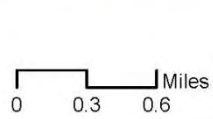
0 2 4 Miles

Source: AFCEC and ESRI
Coordinate System: WGS 1984 UTM Zone 18N

Figure 3-8: Closed Pattern Flight Tracks - Helicopters



- JBA
- Runways
- H Helipads
- Closed Pattern Tracks (Bear Pad)
- Closed Pattern Tracks (North Pad)



Source: AFCEC and ESRI
 Coordinate System: WGS 1984 UTM Zone 18N

Overall runway usage at JBA is evenly distributed between Runway 01R/19L (east runway) and Runway 01L/19R (west runway). Because Runway 01R/19L is 455 feet longer than Runway 01L/19R, F-16 and most large transport aircraft use this runway. Transient flight runway usage is split between Runways 01L (50 percent) and 19R (50 percent). Runway usage is summarized in Table 3-4.

Table 3-4: Runway Usage by Aircraft Type and Operation Type at JBA

Runway	Aircraft Using Runway	Departure	Arrival	Closed Pattern
01L	C-40, B-747, C-32, C-12, C-20, C-21, Cessna 182, C-37, UC-35, Transients	33%	33%	26%
19R	C-40, B-747, C-32, C-12, C-20, C-21, Cessna 182, C-37, UC-35, Transients	20%	20%	13%
01R	C-40, C-12, C-130, C-20, C-21, F-16, Cessna 182, C-37, KC-135, UC-35	29%	29%	36%
19L	C-40, C-12, C-130, C-20, C-21, F-16, Cessna 182, C-37, KC-135, UC-35	18%	18%	25%
North Pad	UH-1N	100%	100%	59%
South Pad	UH-1N	0%	0%	41%
Bear Pad	AW139	100%	100%	0%

Note: The C-20 aircraft was retired September 2017 and is no longer part of JBA operations.

3.6 NOISE ABATEMENT PROCEDURES

The Air Force strives to be a good neighbor and actively pursues operational measures to minimize aircraft noise. Noise abatement procedures apply to flight operations, as well as engine run-up and maintenance operations conducted on station. To the greatest extent possible, flights are routed over sparsely populated areas to reduce the exposure to noise. Through Air Force regulations, commanders are required to periodically review existing traffic patterns, instrument approaches, weather constrictions, and operating practices in relation to populated areas and other local situations.

Inflight Guides provide detailed noise abatement procedures for departures, patterns, and arrivals, including:

- After takeoff, aircraft will climb as rapidly as possible to 1,500 feet above MSL.
- Multiple approaches and touch-and-go operations are not authorized during quiet hours (10:00 p.m. to 7:00 a.m.).
- Helicopters are not permitted to operate below 800 feet above ground level (AGL) between Runway 01L/19R and the western perimeter of the base during quiet hours (10:00 p.m. to 7:00 a.m.).
- Helicopters avoid overflying base housing and Malcolm Grow Medical Center.
- Aircraft will maintain traffic pattern altitude as long as practical before landing.
- North IFR departure aircraft executing a left turn will begin a standard rate turn within 1.5 nautical miles of the departure end of the runway.
- Aircraft making an east turnout from either Runway 01L or Runway 01R will not turn right until reaching Suitland Parkway at an altitude at or above 400 feet AGL.

3.7 NOISE COMPLAINTS

All noise complaints are evaluated to ensure future operations, where possible, do not generate unacceptable noise, and that the results from noise investigations are provided back to the complainant as soon as practical. The Public Affairs Officer will inform local officials about upcoming events and post notifications on the base website. Concerned citizens are encouraged to contact JBA Public Affairs Office with any noise complaints. Citizens can call the main number at the Public Affairs Office for complaints at 240-612-4428. Complaint forms are also available online at <http://www.jba.af.mil/> and can be submitted via email.

4 AIRCRAFT NOISE

How an installation manages aircraft noise can play a key role in shaping an installation's relationship with the adjacent communities. Aircraft noise management is also a key factor in local land use planning. Because noise from aircraft operations may significantly affect areas surrounding the installation, JBA has defined noise zones using the guidance provided in the AICUZ Instruction. The AICUZ noise contours are based on aircraft type, type of flight operations (i.e., arrivals, departures, and patterns), and time of day that aircraft are flown.

4.1 WHAT IS SOUND/NOISE?

Sound is vibrations in the air, which can be generated by a multitude of sources to include roadway traffic, a barking dog, a radio—or aircraft operations. The vibrations are known as compression waves. Just like a pebble dropped into a pond creates ripples, the compression waves—formed of air molecules pressed together—radiate out, decreasing with distance. If these vibrations reach our eardrum, at a certain rate and intensity, we perceive it as sound. When the sound is unwanted, we refer to it as noise. Generally, sound becomes noise to a listener when it interferes with normal activities. Sound has three components: intensity, frequency, and duration.

- Intensity or loudness is related to sound pressure change. As the vibrations oscillate back and forth, they create a change in pressure on the eardrum. The greater the sound pressure change, the louder it seems.
- Frequency determines how the pitch of the sound is perceived. Low-frequency sounds are characterized as rumbles or roars, while high-frequency sounds are typified by sirens or screeches. Sound frequency is measured in terms of cycles per second or hertz (Hz). While the range of human hearing goes from 20 to 20,000 Hz, we hear best in the range of 1,000 to 4,000 Hz. For environmental noise, we use A-weighting, which focuses on this range, to best represent human hearing. While A-weighted decibels may be written as “dBA,” if it is the only weighting being discussed, the “A” is generally dropped.
- Duration is the length of time the sound can be detected.

4.2 HOW IS SOUND PERCEIVED

The loudest sounds that can be comfortably heard by the human ear have intensities a trillion times higher than those of sounds barely heard. Because such large numbers become awkward to use, we measure noise in decibels (dB), which uses a logarithmic scale that doubles the noise energy every three decibels.

Figure 4-1 is a chart of A-weighted sound levels from common sources. A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above 120 dB begin to be felt inside the human ear as discomfort, while sound levels between 130 and 140 dB are felt as pain.

Figure 4-1: Sound Levels of Typical Sources and Environments

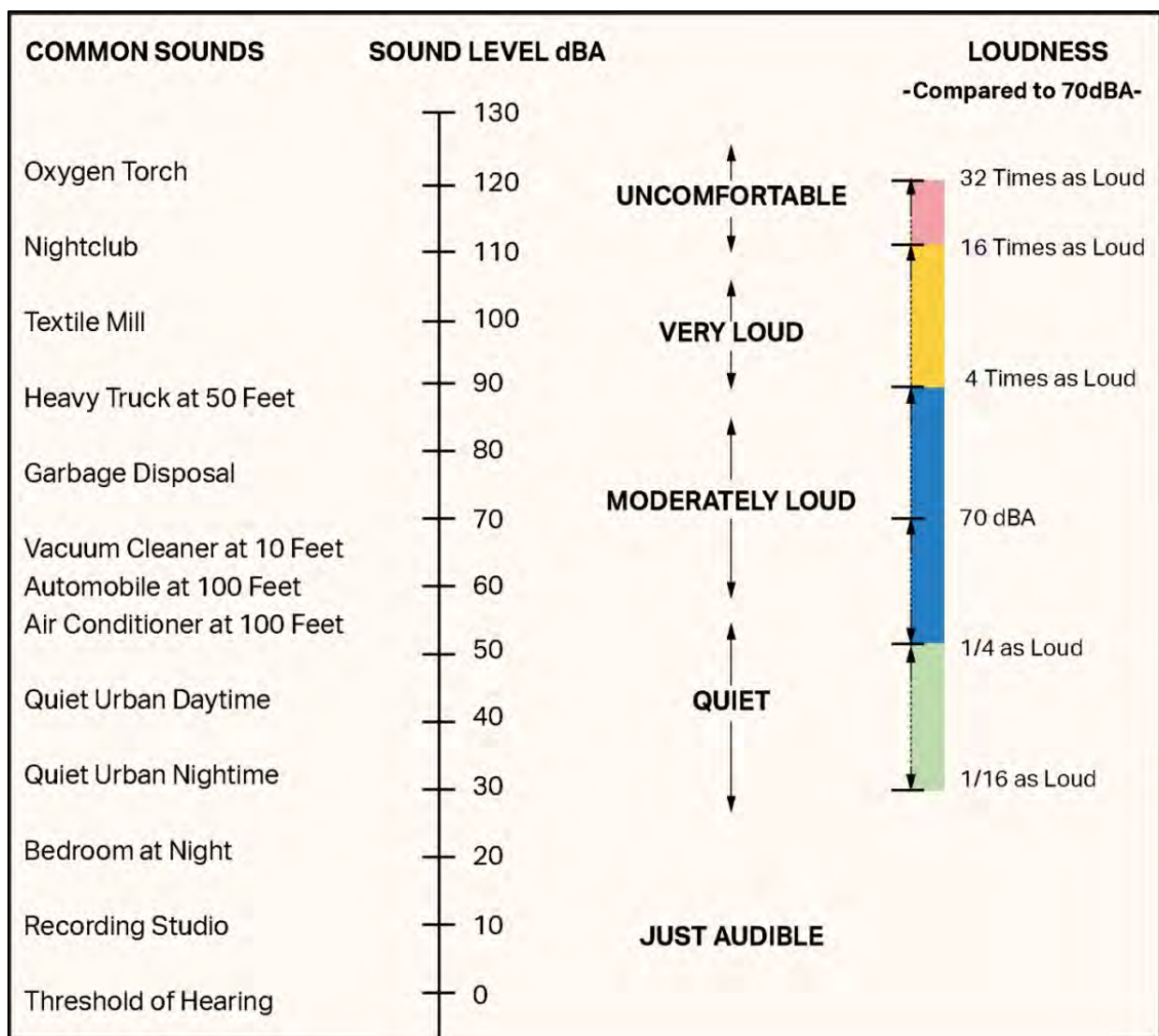


Table 4-1 tabulates the subjective responses with change in (single-event) sound level. While noise energy doubles or halves with every 3-dB change, we do not perceive all that noise energy. It takes a 10 dB increase or decrease for our ear to perceive a doubling or halving of loudness.

Table 4-1: Subjective Responses to Changes in A-Weighted Decibels (dBA)

Change	Change in Perceived Loudness
1 dB	Requires close attention to notice
3 dB	Barely perceptible
5 dB	Quite noticeable
10 dB	Dramatic, perceived as twice or half as loud
20 dB	Striking, fourfold change

4.3 THE DAY-NIGHT AVERAGE SOUND LEVEL

When we hear an aircraft fly overhead, the question may be asked, “How loud was that?” While we may often find ourselves concerned over the loudness of a sound, there are other dimensions to the sound event that draw our interest. For instance, does one overflight draw the same interest as two separate overflights – or as 20 overflights? Also, does the 30-second run-up of engines prior to takeoff draw the same interest as a 30-minute maintenance run? Additionally, is an overflight more noticeable at 2 p.m. or at 2 a.m., when the ambient noise is low and people are trying to sleep?

The length and number of events – the total noise energy – and the time of day play key roles in our perception of noise. To reflect these concerns, the Air Force uses the day-night average sound level (DNL) metric to describe the cumulative noise exposure that results from all aircraft operations. DNL is a standard noise metric created by the United States Environmental Protection Agency to describe the effects of noise on humans, and is used throughout the United States.

DNL, when used as a metric for aircraft noise, represents the accumulation of noise energy from all individual aircraft noise events in a 24-hour period. Because aircraft operations at military airfields fluctuate from day to day, the DNL value is typically based on an entire year of operations and thus represents the annual average day of aircraft events. Additionally, for all operations between 10:00 p.m. and 7:00 a.m., 10 decibels are added to each event to account for the intrusiveness of nighttime operations.

DNL is not a level of noise heard at any given time, but represents long-term noise exposure. Scientific studies of community response to numerous types of environmental noise have found strong correlation between the level of annoyance and the level of average noise exposure measured in DNL.

DNL is depicted visually as a noise contour that connects points of equal value. The noise contours in this document are depicted in 5-dB increments (60, 65, 70, 75, 80, and 85 dB DNL).

The area between two noise contours is the noise exposure area. Calculated noise contours do not represent exact measurements. Noise levels inside a contour may be similar to those outside a contour line. When the contour lines are close, the change in noise level is greater. When the contour lines are far apart, the change in noise level is gradual.

4.4 AICUZ NOISE CONTOURS

Noise contours provide the installation, local community planning organizations, and the general public with maps of the modeled noise-related impacts of aircraft operations. Noise contours, when overlaid with local land uses, can help identify areas of incompatible land uses and help plan for future development around an air station.

4.4.1 JBA 2017 AICUZ NOISE CONTOURS

The AICUZ noise contours align with the runways and follow the dominate flight tracks for arrivals, departures, and patterns at each airfield; noise propagates outward from those paths. As expected, the highest noise levels are concentrated over the airfield and along the runways. Touch-and-go patterns and departures have the greatest effect on the shape of the noise contours. Departures and the ascending portion of pattern operations require a greater power setting, which generates greater noise and influences the shape of the contours. Fighter jets and large cargo aircraft generate greater noise and can also influence the shape of the noise contours. Figure 4-2 presents the 2017 AICUZ noise contours (based on optimized 2016 operations at JBA). Figure 4-3 shows a comparison of the 2017 AICUZ noise contours and the 2007 AICUZ noise contours.

The 2017 AICUZ noise contours extend approximately one mile off base to the north and 0.5 mile off base to the south. The majority of pattern operations are conducted on Runway 01R/19L resulting in more contours extending towards the east of the airfield. The F-16 and several of the heavier transport aircraft conduct flight operations exclusively on Runway 01R/19L (east runway), resulting in higher noise levels in comparison to contours on Runways 01L/19R (west runway). The larger transport aircraft are heavier and require more power during takeoff, which generates more noise. The F-16 is a fighter jet that generates more noise than other aircraft based at JBA. The curved contours on the east side of the airfield near the runway end of 19L are formed from the departure portion of the F-16 patterns on Runway 01R. The smaller concentrated circular contours to the west of Runway 01L/19R (west runway) are generated from helicopter operations at the north helo pads and VC-25 engine maintenance and run-ups at the ramp near Hangar 19.

Table 4-2 presents the off-base land acreage and estimated population within the JBA AICUZ 2017 noise contours; the population estimates are based on 2010 Census block-level data (United States Census Bureau 2010). A geometric proportion method was used to determine the estimated population within the contour bands. This method assigns population based on the portion of a census block that falls within the contour. The population across census blocks is assumed to be evenly distributed.

Table 4-2: Off-Base Land Area and Estimated Population in the 2017 AICUZ Noise Contours at JBA

Noise Zone	Acres	Population
65 to 69 dB DNL	761	1,164
70 to 74 dB DNL	161	149
75+ dB DNL	12	6
TOTAL	934	1,319

Flight operations have reduced at JBA in comparison to the 2007 AICUZ operations, and the overall off-base noise exposure area (65 dB DNL and greater) is approximately 7,356 acres less than the 2007 AICUZ noise exposure area.

As shown in Figure 4-3, differences in noise exposure areas occur:

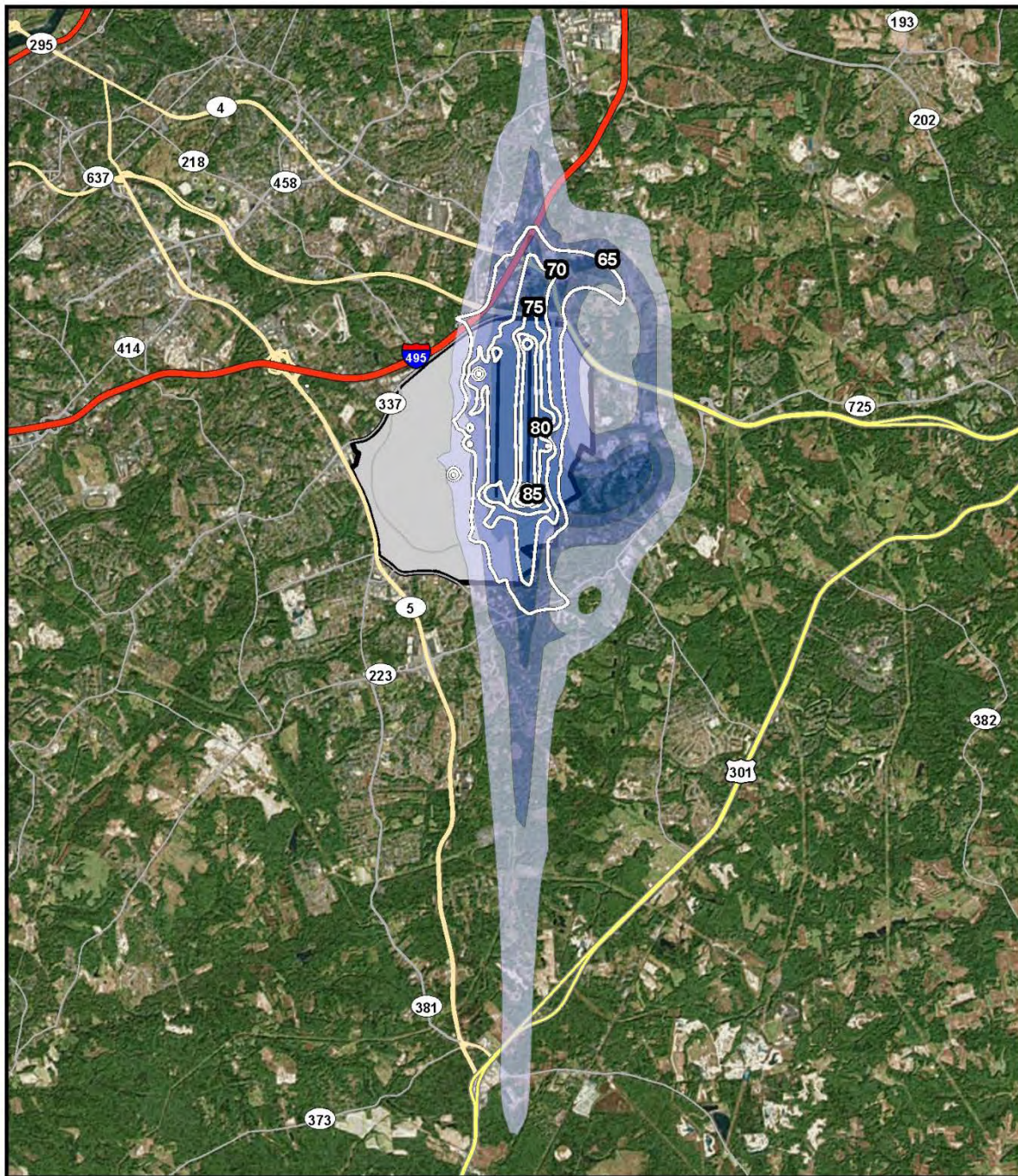
- To the south of the runways, where the 2007 AICUZ noise contours extend approximately six miles farther south than the 2017 AICUZ noise contours.
- To the north of the runways, where the 2007 AICUZ noise contours extend approximately two miles farther north than the 2017 AICUZ noise contours.
- To the east of the airfield, where the 2017 AICUZ noise contours are substantially shallow and smaller than the 2007 AICUZ noise contours due to the elimination of some dominant pattern flights tracks.

Generally, flight patterns have not changed significantly at JBA since the 2007 AICUZ Study. The difference in the geographic extent of the noise contours is attributed to a reduction in annual operations (35 percent decrease), elimination of some greater noise-generating aircraft based at JBA, reduction of transient fighter jet and large transport aircraft operations, and improvements of operational parameters such as new aircraft models equipped with quieter engines.

Figure 4-2: 2017 AICUZ Noise Contours with Gradient, JBA



Figure 4-3: Comparison of the 2007 and 2017 AICUZ Noise Contours, JBA



JBA	2007 AICUZ DNL Contours (dB)	 Source: ESRI and AECOM Coordinate System: WGS 1984 UTM Zone 18N	
Runways	80+		
2017 AICUZ DNL Contours (dB)	75-80		
	70-75		
	65-70		

5 COMMUNITY AND AIRCRAFT SAFETY

As development increases near an airfield, more people may be exposed to the potential risks from nearby aircraft operations. Airfield safety is a shared responsibility between the Air Force and the surrounding communities, each playing a vital role in its success. Cooperation between the Air Force and the community results in strategic and effective land use planning and development around military airfields. Accordingly, the Air Force has established a flight safety program and has designated areas of accident potential around its air installations to assist in preserving the health, safety, and welfare of the people living near the airfield. This AICUZ Study provides the information needed, in part, to reach the shared safety goal.

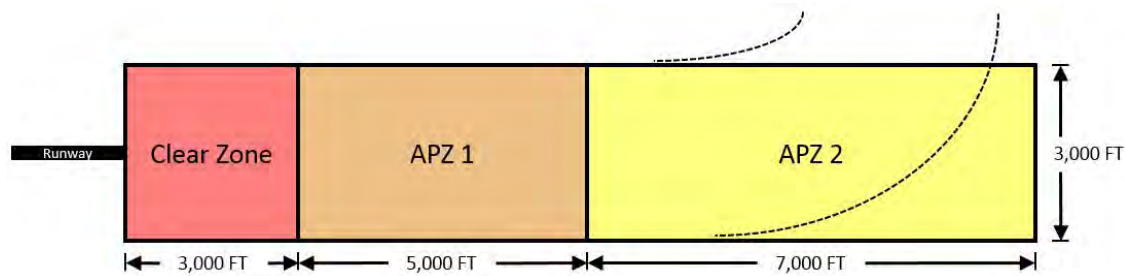
Identifying safety hazards and areas of accident potential can help communities with land use compatibility planning for airfield operations. As part of the AICUZ Program, the Air Force defines areas of accident potential, imaginary surfaces, and hazards to aircraft flight.

5.1 CLEAR ZONES AND ACCIDENT POTENTIAL ZONES

In the 1970s and 1980s, the DoD conducted studies of historical accident and operations data throughout the military to identify patterns of accident occurrence. The studies showed that most aircraft accidents occur on or near the runway, diminishing in likelihood with distance from the runway. Based on these studies, the DoD identified Clear Zones (CZs) and Accident Potential Zones (APZs) as areas where an aircraft accident is most likely to occur if an accident were to take place; however, these zones are not a prediction of accidents. The studies identified three areas—the CZ, APZ I, and APZ II—that, because of accident potential, should be considered for density and land use restrictions. These zones are illustrated in Figure 5-1 and described below:

- **Clear Zone.** The CZ is the square area beyond the end of the runway and centered on the runway centerline, extending outward 3,000 feet. The CZ is 3,000 feet in width and 3,000 feet in length. A CZ is required for all active runways and should remain undeveloped.
- **APZ I.** APZ I is the rectangular area beyond the CZ. APZ I is 3,000 feet in width and 5,000 feet in length along the extended runway centerline.
- **APZ II.** APZ II is the rectangular area beyond APZ I. APZ II is 3,000 feet in width and 7,000 feet in length along the extended runway centerline.

Figure 5-1: Accident Potential Zones for Class B Runways



Most land uses in the CZ are considered incompatible with military aircraft operations. For this reason, the Air Force's policy, where possible, is to acquire real property interests on land in the CZs to ensure incompatible development does not occur. Within APZ I and APZ II, a variety of land uses are compatible; however, higher-density uses (e.g., schools, apartments, or churches) should be restricted because of the greater risk in these areas. Existing land uses in the CZs and APZs at each airfield and recommendations for addressing incompatibility issues are discussed in Chapter 6: *Land Use Compatibility Analysis*.

Figure 5-2 depicts the CZs and APZs for Runways 01L/19R and 01R/19L at JBA. Table 5-1 tabulates the off-base land acreage and estimated population within the CZs and APZs.

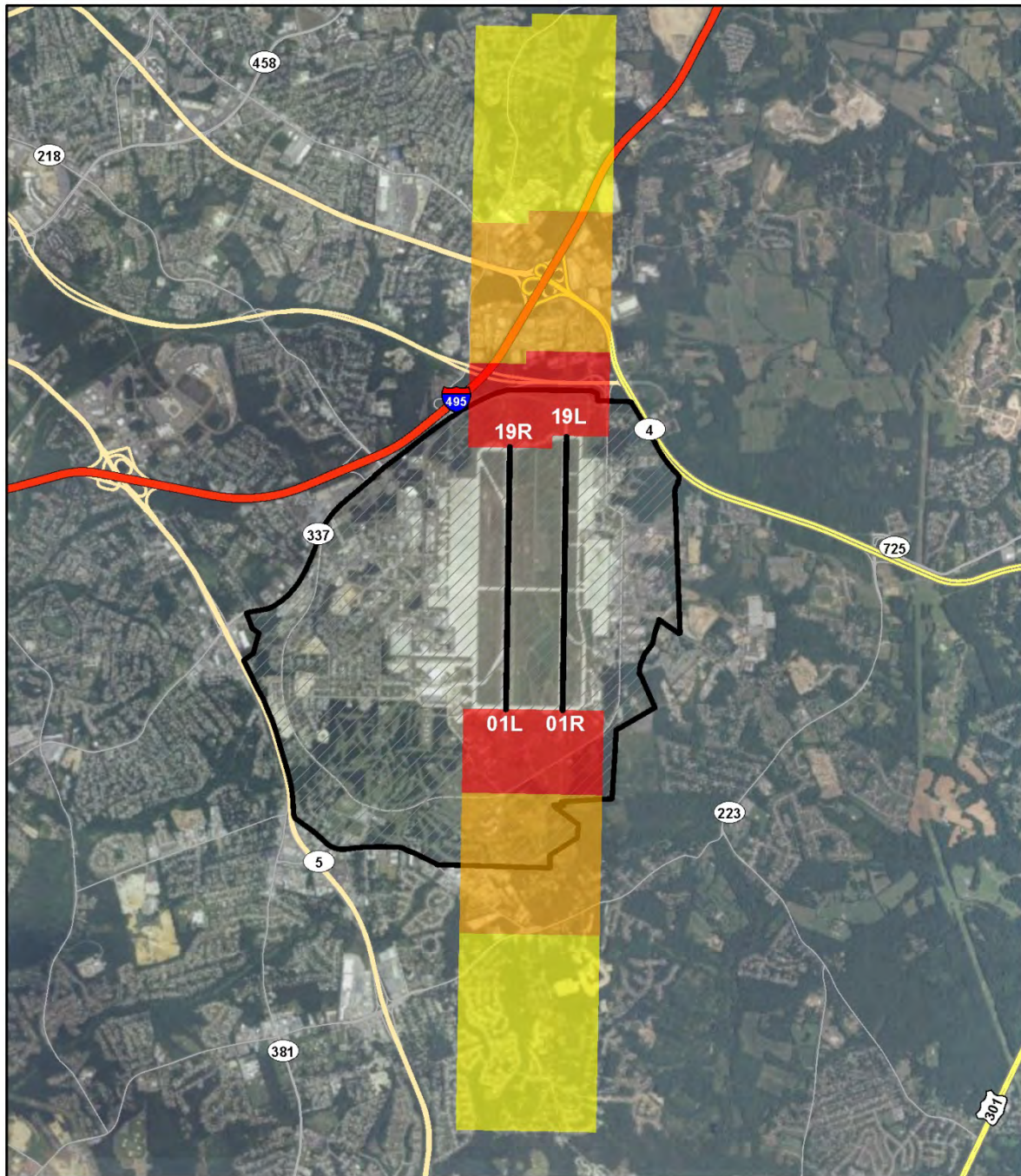
Table 5-1: Off-Base Land Acreage and Estimated Population within the APZs and CZs

Zone	Land Acreage	Population
CZ	150.0	199
APZ I	923.2	1,981
APZ II	1,607.9	4,512
TOTAL	2,681.1	6,692

All CZs at JBA measure 3,000 feet long and 3,000 feet wide (1,500 feet to either side of runway centerline) in compliance with the AFI 32-7063 and Unified Facilities Criteria (UFC) 3-260-01 (DoD 2008). All runways at JBA have one set of APZs. APZ I measures 5,000 feet in length from the CZ and is 3,000 feet in width. APZ II measures 7,000 feet in length from APZ I and is 3,000 feet in width.

The northern CZ of Runway 01R/19L (east runway) currently extends beyond the base property. JBA is considering realigning the north threshold of the Runway 01R/19L with Runway 01L/19R (west runway) and moving Runway 01R/19L 800 feet to the west. The realignment would push the northern CZ farther south, and reduce the amount of incompatible development in that CZ. Although the realignment would move the southern CZ of Runway 01R/19L farther south, the CZ will still be within the base property. An industrial park is currently located in the northern CZ of Runway 01R/19L, and with the realignment, this property would no longer be in the CZ. Areas of incompatible developments are further discussed in Chapter 6: *Land Use Compatibility Analysis*.

Figure 5-2: 2017 AICUZ Clear Zones and Accident Potential Zones for JBA



- JBA
- Runways
- 2017 AICUZ APZs**
- Clear Zone
- Accident Potential Zone I
- Accident Potential Zone II

0 0.5 1 Miles



Source: ESRI and AFCEC
Coordinate System: WGS 1984 UTM Zone 18N

5.2 IMAGINARY SURFACES

The DoD and FAA identify a complex series of imaginary planes and transition surfaces that define the airspace that needs to remain free of obstructions around an airfield. Obstruction-free imaginary surfaces help ensure safe flight approaches, departures, and pattern operations. Obstructions include natural terrain and man-made features such as buildings, towers, poles, wind turbines, cell towers, and other vertical obstructions to airspace navigation.

Fixed-wing runways and rotary-wing runways/helipads have different imaginary surfaces. Imaginary surfaces for fixed-wing runways are described in Table 5-2 and illustrated in Figure 5-3. Figure 5-4 depicts the airspace imaginary surfaces specific to each runway at JBA as well as the combined imaginary surfaces of both runways.

In general, no above-ground structures are permitted in the primary surface of clear zones, and height restrictions apply to transitional surfaces and approach and departure surfaces. Height restrictions are more stringent as one approaches the runway and flight path.

Figure 5-3: Imaginary Surfaces for Air Force Class B Fixed Wing Runways

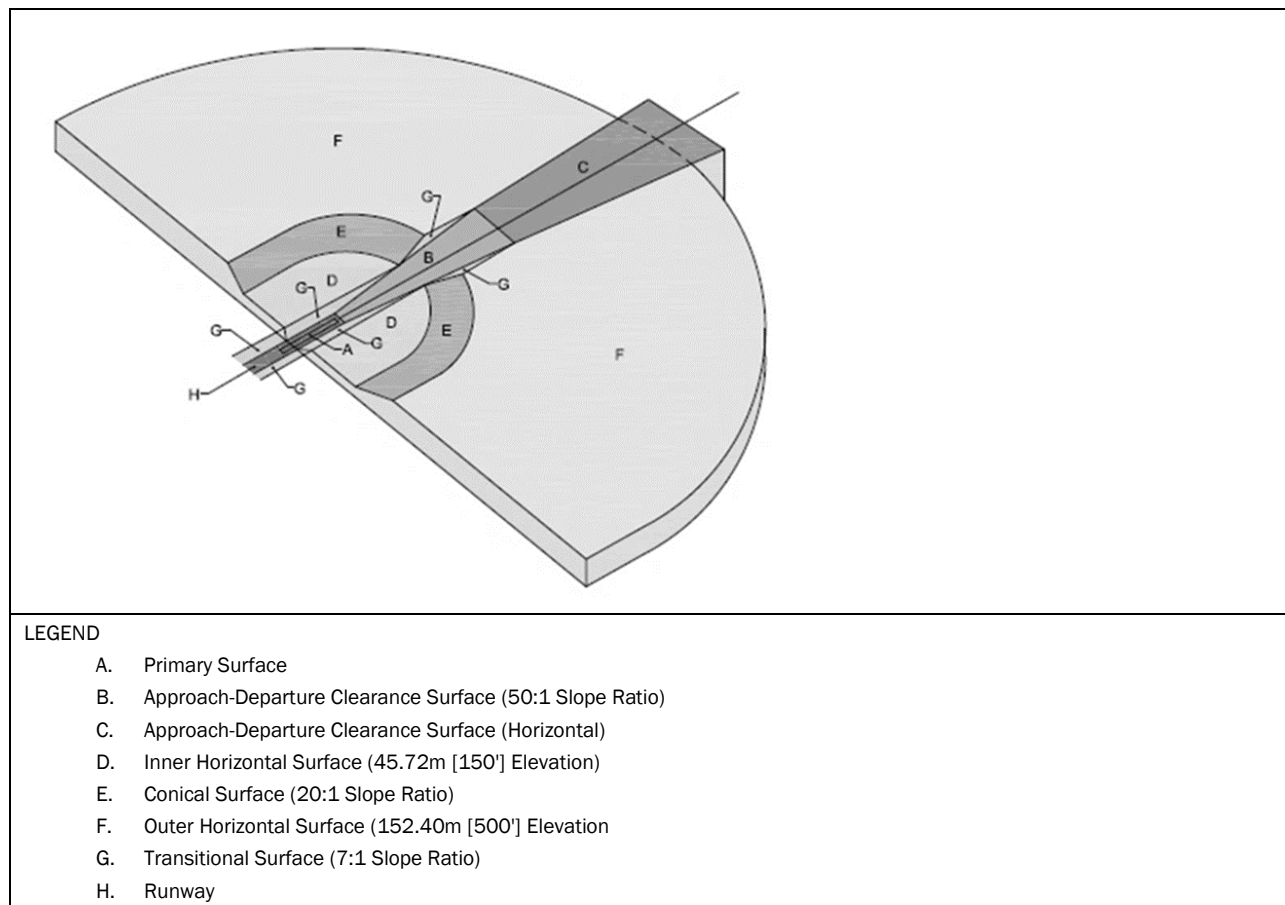
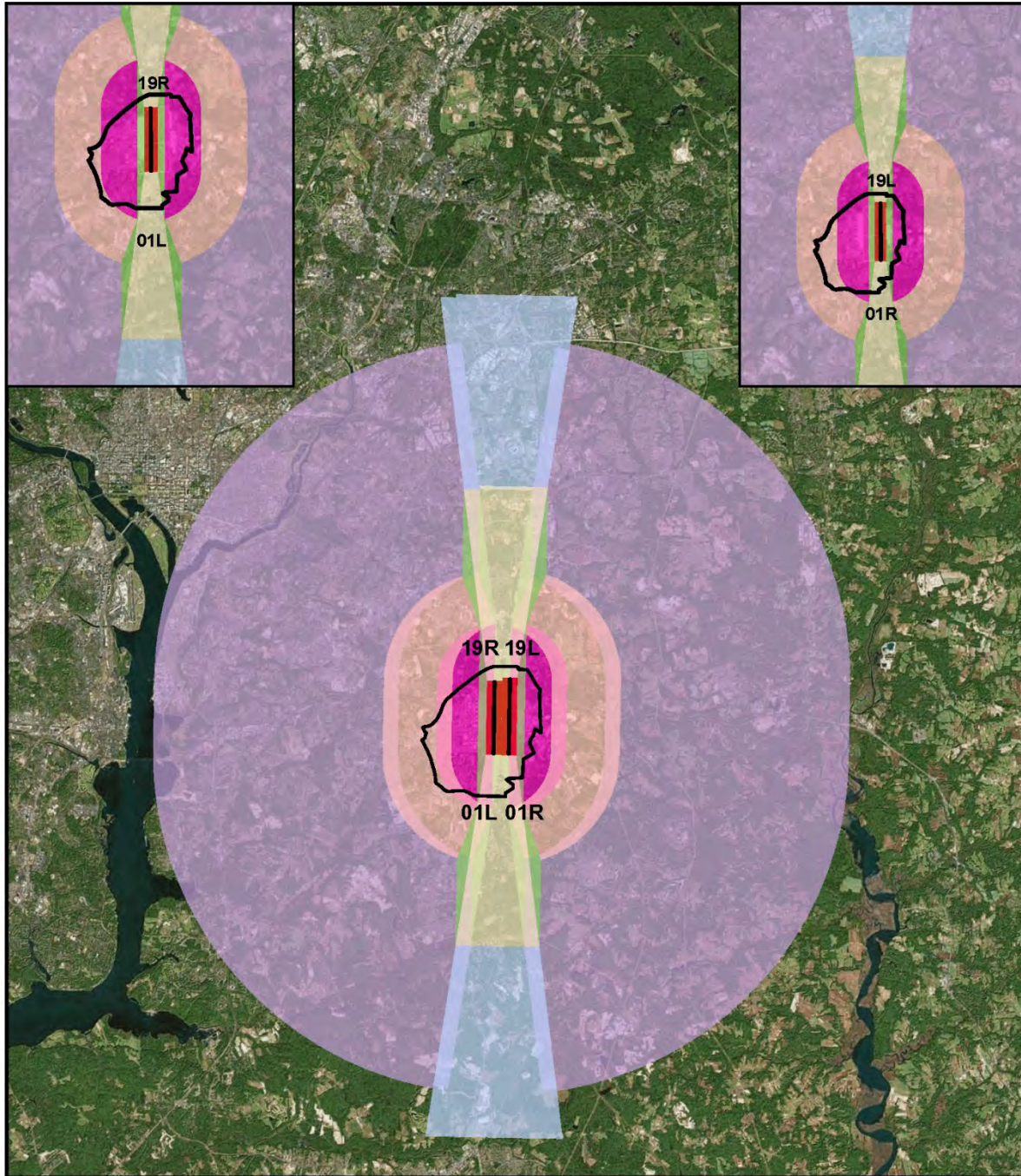


Table 5-2: Description of Imaginary Surfaces

Planes and Surface	Geographical Dimensions
Primary Surface	An imaginary surface symmetrically centered on the runway, extending 200 feet beyond each runway end, that defines the limits of the obstruction clearance requirements in the vicinity of the landing area. The width of the primary surface is 2,000 feet, or 1,000 feet on each side of the runway centerline.
Approach-Departure Clearance Surface	This imaginary surface is symmetrically centered on the extended runway centerline, beginning as an inclined plane (glide angle) at the end of the primary surface (200 feet beyond each end of the runway), and extending for 50,000 feet. The slope of the approach-departure clearance surface is 50:1 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 starting point. The width of this surface at the runway end is 2,000 feet, flaring uniformly to a width of 16,000 feet at the end point.
Inner Horizontal Surface	This imaginary surface is an oval plane at a height of 150 feet above the established airfield elevation. The inner boundary intersects with the approach-departure clearance surface and the transitional surface. The outer boundary is formed by scribing arcs with a radius of 7,500 feet from the centerline of each runway end and interconnecting these arcs with tangents.
Conical Surface	This is an inclined imaginary 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. The conical surface connects the inner and outer horizontal surfaces.
Outer Horizontal Surface	This imaginary surface is located 500 feet above the established airfield elevation and extends outward from the outer periphery of the conical surface for a horizontal distance of 30,000 feet.
Transitional Surface	This imaginary surface extends outward and upward at right angles to the runway centerline and extended runway centerline at a slope of 7:1. The transitional surface connects the primary and the approach-departure clearance surfaces to the inner horizontal, the conical, and the outer horizontal surfaces.

Source: DoD 2008

Figure 5-4: Imaginary Surfaces and Transition Planes for JBA



- JBA
 - Runways
- Imaginary Surface**
- Primary Surface
 - Approach-Departure Clearance Surface (34:1)
 - Approach-Departure Clearance Surface (Horizontal)
 - Inner Horizontal Surface
 - Conical Surface (20:1)
 - Outer Horizontal Surface
 - Transitional Surface



Source: ESRI and AFCEC
 Coordinate System: WGS 1984 UTM Zone 18N

5.3 HAZARDS TO FLIGHT ZONE

Certain land uses and activities around an airfield can pose potential hazards that can obstruct or interfere with aircraft arrivals and departures, pilot vision, communications, or aircraft electronics. Evaluating and addressing the causes of flight hazards before mishaps occur can help eliminate these sources and prevent future mishaps. The Air Force has defined a “Hazards to Aircraft Flight Zone” (HAFZ) that includes the area within the imaginary surfaces. Unlike noise and safety zones, the AICUZ guidelines do not provide specific land use compatibility recommendations for the HAFZ; instead, the HAFZ is used as a “consultation zone.” Developers and local planning bodies are encouraged to consult with the Air Force to evaluate proposed projects in the HAFZ to ensure compatibility with military operations. Potential hazards to flight operations are discussed in the following sections.

5.3.1 HEIGHT OBSTRUCTIONS

Tall objects can pose significant hazards to flight operations or interfere with navigational equipment (including radar). Aircraft operations can be constrained by the surrounding natural terrain and manmade features such as buildings, towers, poles, and other potential vertical obstructions to navigation. Federal Aviation Regulations, Title 14 of the Code of Federal Regulations (CFR), Part 77, *Objects Affecting Navigable Airspace*, outline a notification procedure for proposed construction or alteration of objects near airports that could affect navigable airspace. City and county agencies responsible for approving construction permits should require developers to submit accurate measurements and calculations for any project in the vicinity of a military airfield to verify that the proposed project meets the height restriction criteria of 14 CFR Part 77.17. City and county agencies may also consider requiring a “Determination of No Hazard” issued by the FAA for any tall objects within this zone. Height obstructions are a current compatibility issue and are further discussed in Section 6.4 *Compatibility Concerns*.

5.3.2 VISUAL INTERFERENCE

Industrial or agricultural sources of smoke, dust, or steam in the airfield vicinity can obstruct the pilot’s vision during takeoff, landing, or other periods of low-altitude flight. These concerns can often be mitigated with close coordination between the base and the landowner. For example, irrigating before plowing can greatly reduce dust concerns.

5.3.3 LIGHTING

Bright lights, either direct or reflected, in the airfield vicinity can impair a pilot’s vision, especially at night. A sudden flash from a bright light causes a spot or “halo” to remain at the center of the visual field for a few seconds or more, rendering a person virtually blind to all other visual input. This is particularly dangerous at night when the flash can diminish the eye’s adaptation to darkness. Partial recovery of this adaptation is usually achieved in minutes, but full adaptation typically requires 40 to 45 minutes.

Specific examples of light emissions that can interfere with the safety of nearby aviation operations include the following:

- Lasers that emit in the visible spectrum can be potentially harmful to a pilot's vision during the day and night.
- The increasing use of energy-efficient Light Emitting Diode (LED) lights also poses potential conflicts in areas where pilots use Night Vision Goggles (NVGs). NVGs can exaggerate the brightness of these lights, interfering with pilot vision.
- The use of red LED lights to mark obstructions can produce an unintended safety consequence because red LED lights are not visible on most NVG models, rendering them invisible to NVG users in the area.

5.3.4 BIRD/WILDLIFE AIRCRAFT STRIKE HAZARD

Wildlife represents a significant hazard to flight operations. Wildlife, birds in particular, are drawn to different habitat types found in the airfield environment, including hedges, grass, brush, forest, water, and even the warm pavement of the runways. Although most bird/wildlife aircraft strike hazard (BASH) occurrences do not result in a total loss of aircraft, they can cause structural and mechanical damage to aircraft, as well as loss of flight time. Most collisions with wildlife occur when the aircraft is at an elevation of less than 3,000 feet; due to the speed of the aircraft, these collisions can happen with considerable force.

To reduce the potential of a BASH occurrence, the Air Force recommends locating land uses that attract birds farther away from the airfield's most active movement areas. These land uses include transfer stations, landfills, golf courses, wetlands, stormwater ponds, and dredge disposal sites. Wildlife in search of resources, such as food, water, and shelter, will flock the aforementioned areas, increasing the probability of BASH occurrences. Design modifications also can be used to reduce the attractiveness of these types of land uses to birds and other wildlife. BASH occurrences are a current issue at JBA and are further discussed in the following section.

5.3.4.1 BIRD/ANIMAL AIRCRAFT STRIKE HAZARD OCCURRENCES AT JBA

JBA is located within the Atlantic Migratory Flyway with several wildlife refuge areas in the surrounding area. Small birds typically account for the majority of the bird strikes near JBA; however, large waterfowl and predatory birds are also a significant risk to flight operations. Chesapeake Bay, which is located approximately 20 miles east of the base, provides habitat, water, and food sources for migratory waterfowl. The number of birds as well as the size of waterfowl during migration season is a BASH concern. Waterfowl hunting is a profitable source of income for farmers in the surrounding area. Farmers prepare their land to attract waterfowl, which increases BASH conditions.

Wetlands and open water areas on base and near the airfield provide food and water sources for birds and waterfowl. Wetlands are protected under Section 404 of the Clean Water Act, and Executive Order 11990, *Protection of Wetlands*, directs federal agencies to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and

beneficial values of wetlands on federal lands. Wetlands mitigation requirements can be costly. Phragmites is an invasive plant species found in wetlands on the installation, and it provides habitat near the airfield for birds. These plants can grow as tall as 12 feet and are difficult to remove. Other water areas near the airfield that attract birds include the lake at the golf course and Piscataway Creek. The spillway between the runways on the south end of the airfield also attracts birds.

Trees on base create roosting opportunities for large birds such as eagles and hawks. Several bird species and deer are found in the wooded area surrounding the Belle Chance historic mansion on base.

Additionally, the fence line on the northwest side of the installation collapsed from a sink hole, and wildlife can access the airfield through these collapsed areas. Areas of the collapsed fence are large enough that a human could pass through the fence line and access the airfield, which raises security concerns.

5.3.4.2 BIRD/ANIMAL AIRCRAFT STRIKE HAZARD MANAGEMENT

JBA employs a BASH Officer from the U.S. Department of Agriculture to develop management strategies and determine actions to reduce bird densities. BASH management strategies focus on reducing favorable habitat and initiating bird avoidance behavior from specified areas. The base implements several non-lethal hazing and dispersal-harassing measures such as cannons, noise makers, and pyrotechnics to control the bird population. The BASH Officer will also capture, band, and relocate birds away from the base. Ideally, the adult birds need to be relocated at least 100 miles away from an airfield/airport; however, given the number of airports in the area, it is difficult and costly to relocate them. The best area for relocation is currently across the Bay Bridge that is only 45 miles away from the airfield. Bird strikes have significantly decreased under the BASH Officer management program and implementation of control methods.

5.3.5 ELECTROMAGNETIC INTERFERENCE

Electromagnetic Interference (EMI) is defined by the American National Standards Institute as any electromagnetic disturbance that interrupts, obstructs, or otherwise degrades or limits the effective performance of electronics/electrical equipment. EMI may be caused by atmospheric phenomena, such as lightning or precipitation static, and by non-telecommunications equipment, such as vehicles and industrial machinery.

New generations of military aircraft are highly dependent on complex electronic systems for navigation and critical flight- and mission-related functions. Consequently, care should be taken in siting any activities that create EMI. Electronic devices, such as cell phones, FM radios, television reception, and garage door openers, can also generate EMI. Many of these sources are low-level emitters of EMI; however, when multiple sources are combined, they have an additive quality. In some cases, the source of interference occurs when consumer electronics use frequencies set aside for military use.

5.3.6 WIND FARMS

Wind turbines may restrict training operations, reduce the quality of training, and compromise pilot safety if sited near military airfields and in the direct course of low-level training routes. Wind turbines located in or near training areas may encroach upon low-level flight aviation training and testing. Wind turbines sited in conflict with military training routes and designated special use airspace can reduce training quality and compromise pilot safety. Obstructions may ultimately lead to costly changes in training and flight paths. As wind energy development increases, future training may be significantly restricted or ineffective.

Wind turbines may significantly affect the effectiveness of military air defense radar systems, navigation systems, weather radar systems, and ATC radar systems, while compromising security, aviation safety, and military readiness. Factors contributing to radar interference include the radar cross-section of a wind turbine, the number of turbines and their configuration, and Doppler-shift.

- **Radar Cross-Section (RCS).** The RCS of a wind turbine blade is significantly larger than many target aircraft. The RCS of rotating wind turbines blocks the radar signal and creates a “shadow” behind the wind farm where target objects may not be detected. RCS effects include false weather depiction, actual weather masking, and target masking (DoD 2006).
- **Turbine Configuration.** The magnitude of the potential impact of wind turbines on radar depends upon the placement and number of turbines within the radar line-of-sight. The obstruction from multiple turbines and the intermittent rotation of the blades causes diffraction. When turbines are closely aligned, radar waves reflect/diffract from multiple rotating blades, distorting the target aircraft signals and increasing the shadow effect (DoD 2006). Increased shadowing impacts the ability to detect low-flying aircraft and target aircraft at a long range.
- **Doppler Shift.** When rotating turbines are within or close to the radar line-of-sight, the radar signal may be reflected from the rotating blades, causing a Doppler shift or clutter effect. Clutter refers to unwanted reflected signals sent to the radar receiver that interfere with target tracking abilities. The Doppler shift impacts the ability of radar to discriminate the wind turbine from an aircraft. The effects of Doppler shift include false target generation, scintillation, and spontaneous appearance or disappearance of aircraft targets (DoD 2006).

Loss of communication from radar interference raises safety concerns for aircraft control and command, and continual interference may limit the development of training activities and future capabilities. Continual communication and radar interference may compromise training standards.

As mentioned in Section 5.3.1, 14 CFR Part 77 identifies the maximum allowable height of a structure in the vicinity of an airport and requires FAA notification prior to any construction or alteration of objects near an airport. However, airspace restrictions are not always enforced, and the FAA cannot monitor all construction activities that may obstruct air navigation.

Although the FAA may issue a Notice of Presumed Hazard, they do not have regulatory authority to prohibit development. Height obstructions, such as wind turbines, are monitored by the FAA through the Obstruction Evaluation/Airport Airspace Analysis notification process; however, the process is focused on communication and not enforcement. The military can only advise against proposed incompatible development and does not have the authority to restrict development.

6 LAND USE COMPATIBILITY ANALYSIS

The AICUZ area of influence or the “AICUZ footprint” of an airfield is the combination of noise contours, CZs, APZs, and the HAFZ, and is used as the basis for the land use compatibility analysis. The AICUZ footprint defines the minimum acceptable area in which land use control measures are recommended to protect the public’s health, safety, and welfare and to preserve the flying mission of the base. The AICUZ footprint, combined with the guidance and recommendations set forth in the AICUZ Study, are the fundamental tools necessary for the planning process. To guide compatible development near JBA, local municipalities should incorporate the 2017 AICUZ footprint into land use studies, regulations, and planning initiatives (Figure 6-1).

6.1 LAND USE COMPATIBILITY GUIDELINES AND CLASSIFICATIONS

To establish long-term land use compatibility for lands in the vicinity of military air installations, the DoD has developed guidelines, based on the Federal Highway Administration’s Standard Land Use Coding Manual, for compatible development and land use within an airfield’s AICUZ APZs and noise zones. These guidelines are used by DoD personnel for on-base planning and for engaging with the local community to foster compatible land use development. Suggested land use compatibility guidelines within noise zones, CZs, and APZs are shown in Table A-1 and Table A-2 of Appendix A.

Table 6-1 provides common land use classifications and their compatibility recommendations within AICUZ noise zones and APZs. Land use classifications in this table are generalized and do not represent the local communities’ land use designations. Land use compatibility conditions are categorized as the following: Compatible, Compatible with Restrictions, Not Compatible, and Not Compatible with Exceptions. Land uses deemed “compatible with restrictions” or “not compatible with exceptions” may require noise attenuation measures in the design and construction of structures or density limitations for land in CZs and APZs to be considered “compatible.”

Figure 6-1: 2017 Composite AICUZ Map

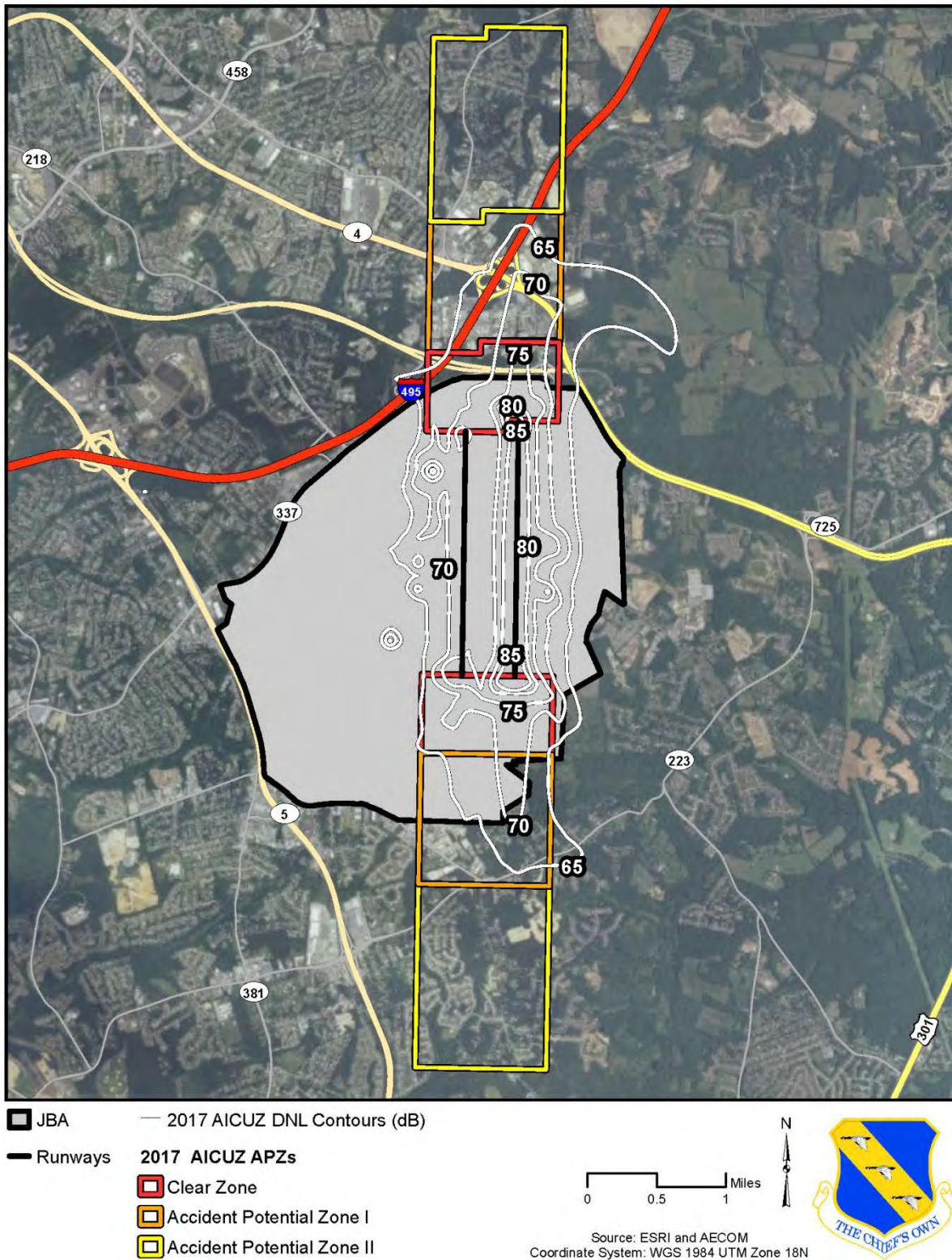


Table 6-1: Land Use Classification and Compatibility Guidelines

Land Use	Noise Zones (dB DNL)						CZ	APZ I	APZ II
	<65	65-69	70-74	75-79	80-84	85+			
Residential	Yes	No ¹	No ¹	No	No	No	No	No	No ¹
Commercial	Yes	Yes	Yes ²	Yes ²	No	No	No	Yes ²	Yes ²
Industrial	Yes	Yes	Yes	Yes	Yes ²	No	No	Yes ²	Yes ²
Public Assembly/Public Use	Yes	Yes ²	Yes ²	Yes ²	No	No	No	No	Yes ²
Outdoor Parks and Recreation Areas	Yes	Yes ²	Yes ²	Yes ²	No	No	No	Yes ²	Yes ²
Agriculture, Open Area, Low Density Development	Yes	Yes ²	Yes ²	Yes ²	Yes ²	Yes ²	No	Yes ²	Yes ²
Undesignated	Yes	No	No	No	No	No	No	No	No

Source: Adapted from AFI 32-7063 (Air Force 2015a)

Note: This generalized land use table provides an overview of recommended land use. Specific land use compatibility guidelines are provided in Appendix A.

¹ Incompatible with exceptions

² Compatible with restrictions

6.2 PLANNING AUTHORITIES

6.2.1 MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION

The Maryland-National Capital Park and Planning Commission (M-NCPPC) is responsible for directing the regional park system and managing regional planning and growth for both Montgomery County and Prince George's County. The governing body of the M-NCPPC consists of 10 members appointed by both counties. Members of the commission also serve on their respective county planning boards.

6.2.2 PRINCE GEORGE'S COUNTY COUNCIL AND PLANNING BOARD

County-level land use and planning authority is separated from the M-NCPPC and granted to the Planning Board and District Council under the Maryland-Washington Regional District Act. The County Council serves as the District Council, and is responsible for zoning and rezoning. The Prince George's County Planning Board, which is appointed by the County Executive, reviews and approves site plans and provides recommendations to the County Council. The County Council has appellate authority over the Planning Board.

6.2.3 GENERAL PLANS

The Prince George's County General Plan provides guidelines and long-range policies for future development, redevelopment, and community enhancement through the County. The General Plan divides the County into three policy areas—developed, developing, and rural tiers—based on the intensity of residential and employment development. JBA and the surrounding area are within the “Developing Tier,” which is characterized by patterns of low- to moderate-density suburban residential communities, compact mixed-use commercial centers, and planned employment areas.

The County is further divided into seven subregions, and each subregion has their own sector plan. The General Plan provides the comprehensive policy framework, while the sector plans provide a detailed planning framework and land use policies. JBA is located within Subregion 6. Sector plans for the subregions surrounding JBA provide recommendations to address areas of potential compatibility concern near the base.

6.2.4 ZONING AND LAND USE REGULATIONS

Local and regional governments manage land use activities and future growth through comprehensive planning, policies, and zoning regulations. These planning tools define standards to restrict or permit land uses, density, and development. Zoning is the legal tool to implement a municipality's land use plan. Through zoning regulations, cities are authorized to create zoning districts that permit or prohibit property use, construction standards, and development density. Municipalities can also establish overlay zones to protect resource areas and ensure land use compatibility for special uses or areas of unusual conditions related to noise and safety issues. Overlay zoning may apply greater restrictions for land uses and/or additional development standards and design guidelines for a designated area. Overlay zones may also allow for less restrictive standards.

6.2.5 LOCAL ORDINANCES

Military Installation Overlay Zone

Section 27-548.50 of the Prince George's County Municipal Code defines and establishes a Military Installation Overlay Zone (MIOZ) to regulate development and land uses that may impact operations at JBA and to protect the public safety and welfare. The MIOZ boundaries generally reflect the boundaries of the AICUZ APZs, the 2007 AICUZ noise contours, and the airfield imaginary surfaces. The MIOZ identifies areas surrounding JBA where activities and development are subject to design standards, height restrictions, and density restrictions. MIOZ regulations apply to new construction; therefore, projects approved prior to the MIOZ implementation have been grandfathered and allowed to continue development. Sound attenuation is required for new construction within the high-noise impact zones. Land uses that encourage a high concentration of people, and activities that generate smoke or dust, are prohibited in the overlay district. The MIOZ does not include density restrictions for single-family residential use in APZs; however, multi-family residential use is prohibited in the overlay district. While lighting restrictions are not specified in the MIOZ, any uses that may produce light/glare concerns are directed to the base for review.

Woodland and Wildlife Habitat Conservation Ordinance

In 2010, Prince George's County adopted the Woodland and Wildlife Habitat Conservation Ordinance. The ordinance requires tree conservation plans and grading permits for development of sites that are 40,000 square feet or greater in area and contain a total of 10,000 square feet or more of woodlands. Conservation plans must be developed in accordance with the "Prince George's County Conservation and Tree Preservation Policy Document."

6.2.6 JOINT LAND USE STUDY

Through the Office of Economic Adjustment, the DoD developed the Joint Land Use Study Program to enhance coordination between military installations and their surrounding communities and to address existing and future compatibility issues. The Joint Land Use Study Program is a collaborative land use planning effort between the military, cities, counties, and local interest groups and organizations. In 2009, community and Air Force leaders completed a Joint Land Use Study for JBA. Participating members included officials from representatives from the M-NCPPC, Prince George's County government agencies, and JBA. The Joint Land Use Study provides recommendations for long-term compatible development policies and implementation actions; however, the recommended actions are not mandatory. The MIOZ is an example of a recommendation from the Joint Land Use Study.

6.3 LAND USE AND PROPOSED DEVELOPMENT

The land use compatibility analysis identifies existing and future land uses near JBA to determine compatibility conditions. Existing land use is assessed to determine current land use activity, while future land plans are used to project development and potential growth areas. Existing land use and parcel data provided by local communities was evaluated to ensure an actual account of land use activity regardless of conformity to zoning classification or designated planning or permitted use. Additionally, local management plans, policies, ordinances, and zoning regulations were evaluated to determine the type and extent of land use allowed in specific areas.

6.3.1 EXISTING LAND USES AND ZONING

Land use in the vicinity of JBA is generally characterized by a mix of commercial, residential, industrial, and undeveloped land. The areas west and north of the installation are heavily developed, and the areas to the south and east are generally rural and lower-density suburban development.

Land directly north of the installation is primarily industrial development with medium- to high-density residential development to the northwest. The Westphalia sector is located northeast of the installation and is mostly undeveloped; however, this area is planned for a large-scale community that will include a mix of residential development, commercial and office centers, and retail. Land to the west of the installation consists mostly of medium-density residential development with commercial development along major thoroughfares. Land directly south of the installation is mostly low- and medium-density residential development with large commercial and retail centers along Maryland Route (MD) 5 (Branch Avenue). Land farther

south and to the east of the installation consists of residential development, agricultural, and larger areas of forest land.

Suitland Parkway, which is part of the National Capital Parks system, is located north of JBA. The parkway is maintained by the National Park Service and included in the National Register of Historic Places. Other recreational areas include the Piscataway Creek Stream Valley Park located south of JBA and the Rosaryville State Park located approximately two to three miles southeast of JBA.

Zoning in the vicinity of the base is generally consistent with existing land use (Figures 6-2 and 6-3). The County's zoning allows for industrial development to the east and north sides of the base, and commercial and single-family development on the west and south sides. Westphalia to the northeast of the installation is zoned as mixed use and comprehensive design. A small pocket of land on the east side of the installation is zoned for mobile homes.

Existing land uses within the JBA 2017 AICUZ APZs and noise contours are illustrated Figures 6-4 and 6-5, respectively. Predominant land uses within the JBA 2017 AICUZ APZs are residential, industrial, and forest; predominant land uses within the JBA 2017 noise contours are industrial and forest. Table 6-2 summarizes the total acreage of land uses within the 2017 AICUZ APZs and noise zones. Areas of specific land use compatibility concerns within the AICUZ APZs and noise contours are further evaluated in Section 6.4. *Compatibility Concerns*.

Table 6-2: Existing Off-Base Land Uses within the JBA AICUZ Footprint

Land Use	Noise Zones (acres)				APZs (acres)		
	65-70dB	70-75dB	75-80dB	80-85dB	CZ	APZ I	APZ II
Low-Density Residential	53.3	8.9	0	0	0	87.1	191.6
Medium-Density Residential	45.9	0	0	0	0	92.7	833.3
High-Density Residential	1.9	0	0	0	0	0	22.3
Commercial	8.9	0	0	0	1.4	35.0	48.6
Industrial	211.3	106.5	0.4	0	40.6	356.1	114.8
Institutional	4.7	1.8	0.8	0	6.7	25.1	16.4
Transportation	57.7	9.8	0	0	5.3	64.0	10.3
Other Developed Lands	35.8	1.9	0	0	8.1	27.1	8.31
Agricultural	52.0	6.6	4.8	0	10.9	4.5	0
Forest	275.3	25.5	5.9	0	76.7	230.5	339.8
Barren Land	13.3	0	0	0	0	0	22.4

Figure 6-2: Existing Zoning within the JBA 2017 AICUZ APZs

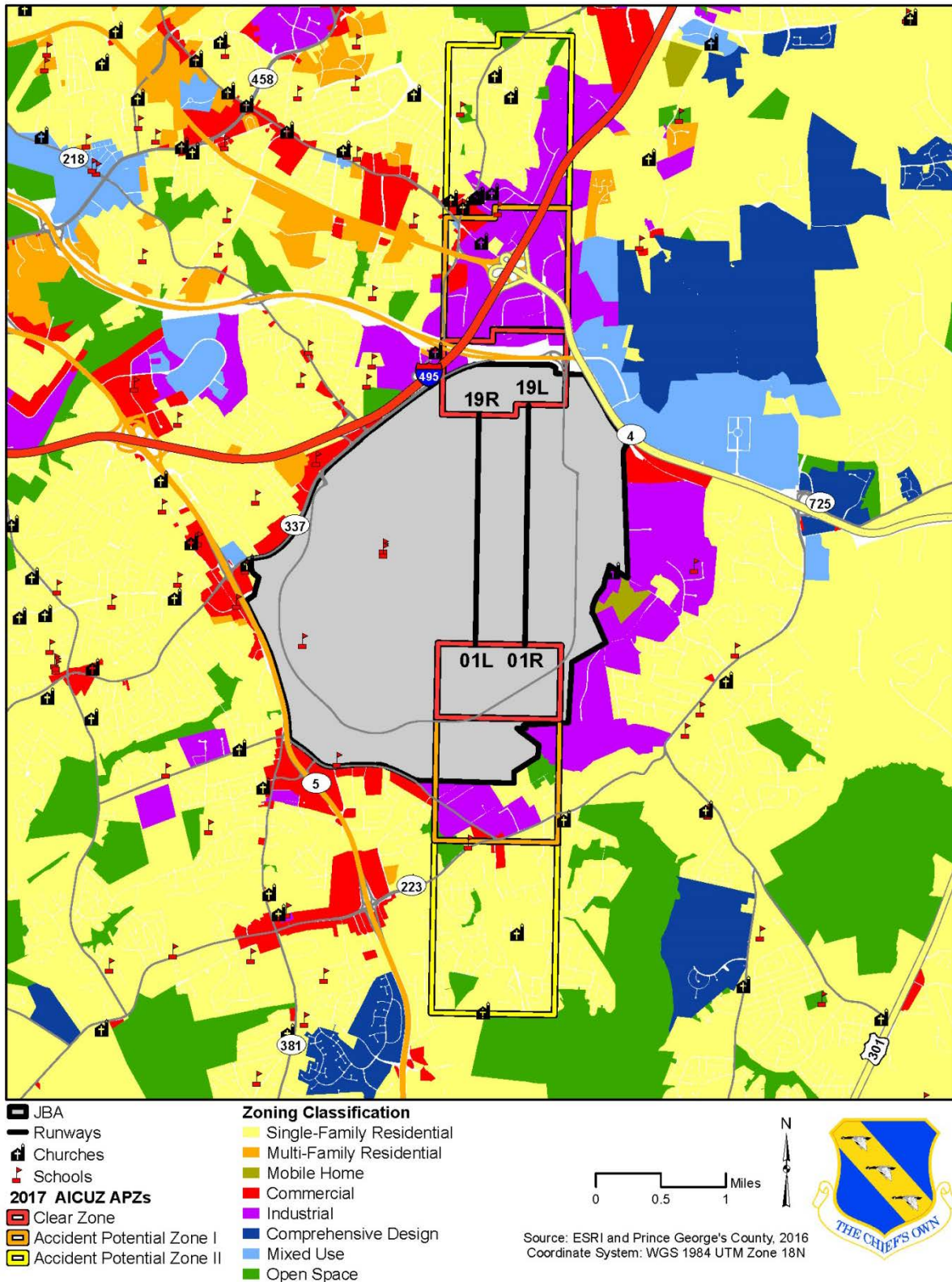


Figure 6-3: Existing Zoning within the JBA 2017 AICUZ Noise Contours

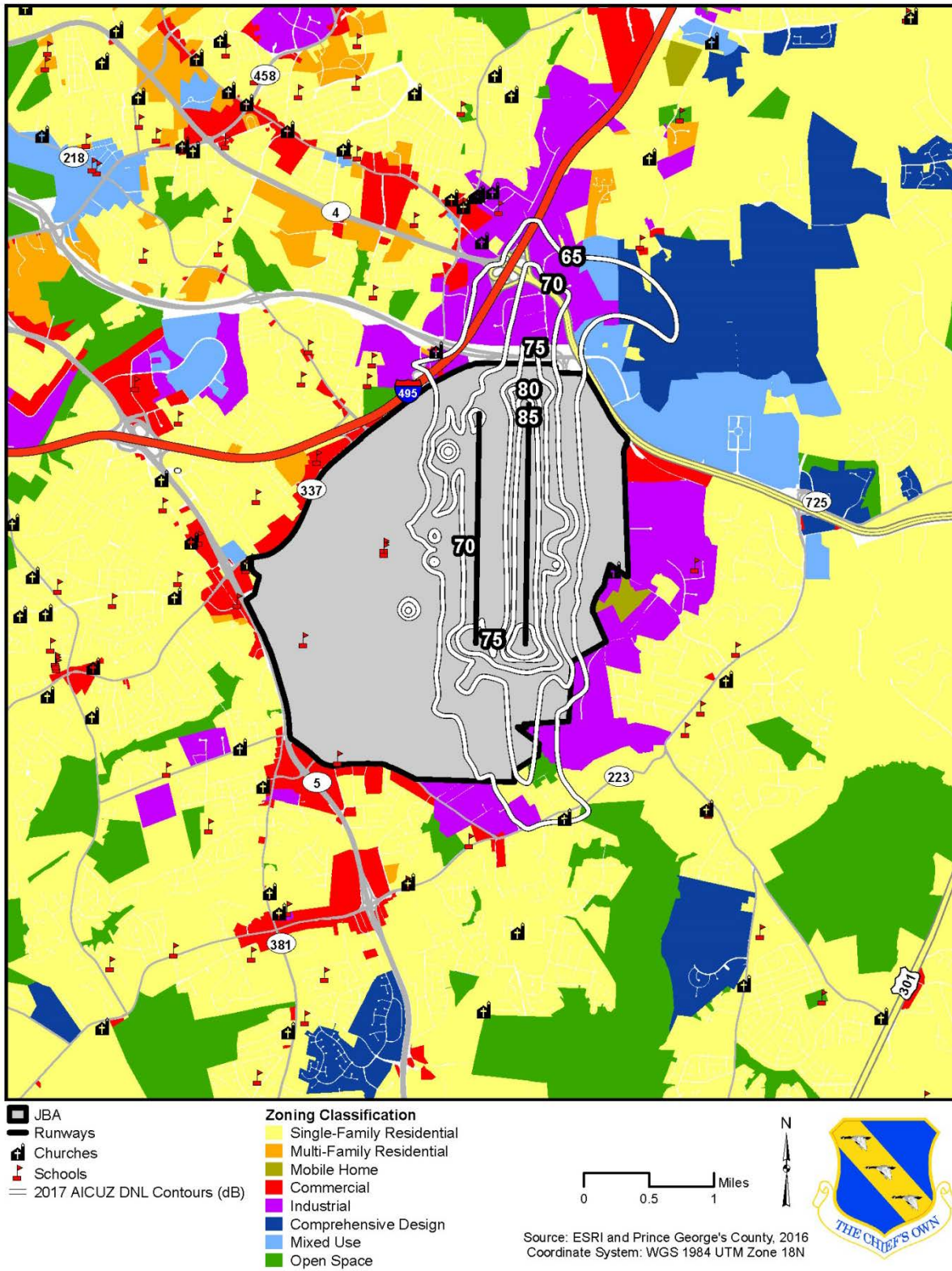
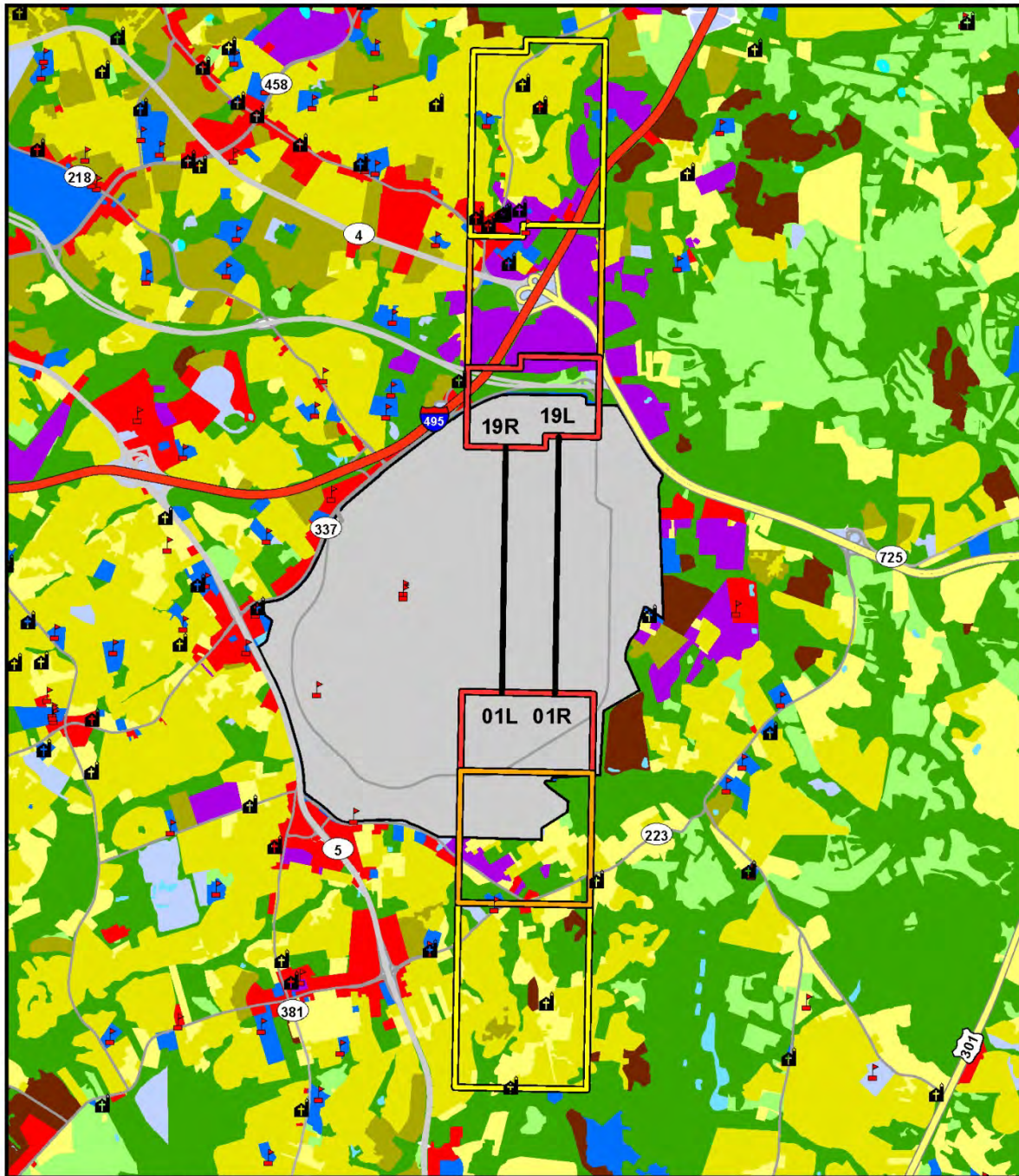


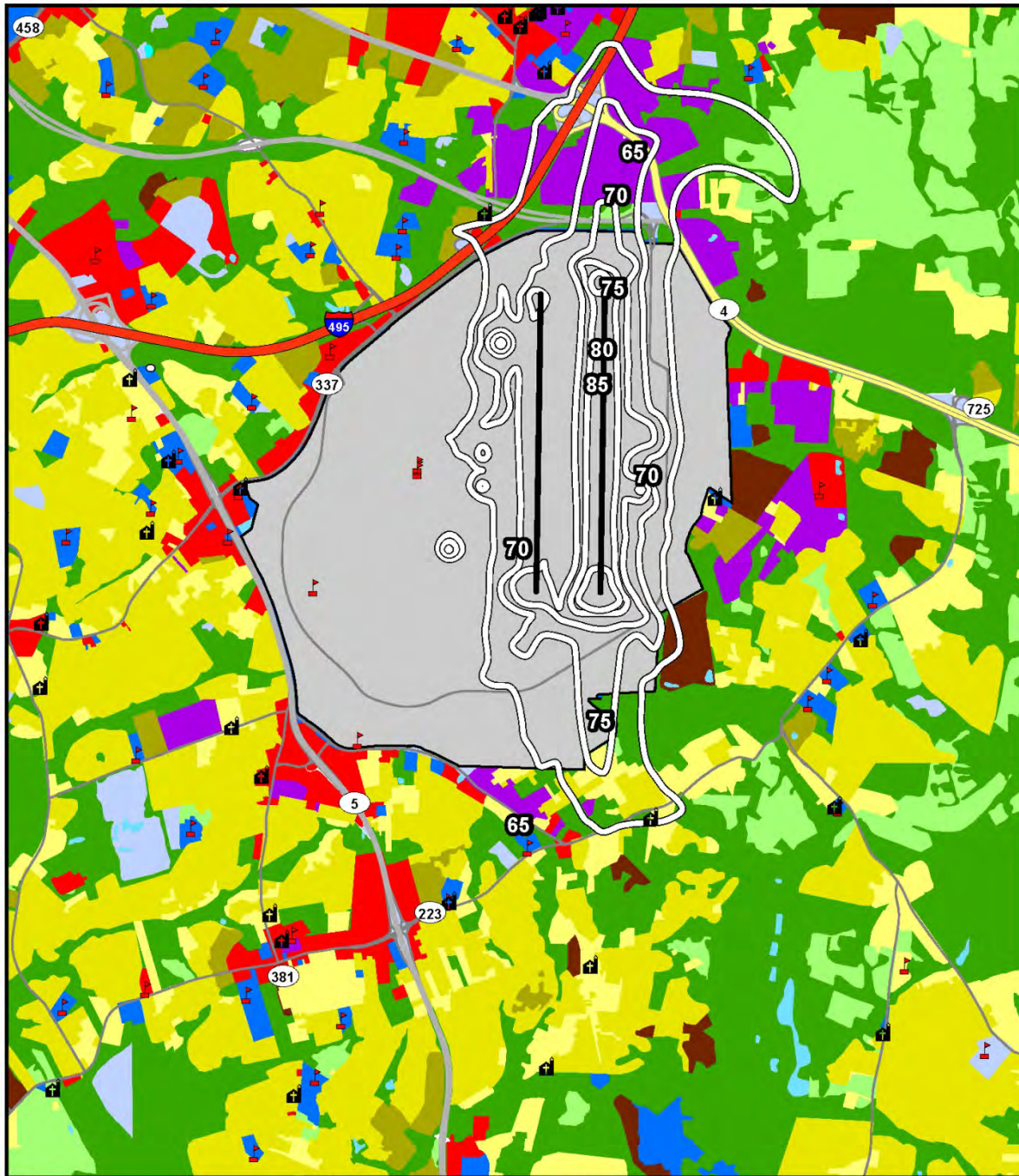
Figure 6-4: Existing Land Uses within the JBA AICUZ 2017 APZs



JBA	2017 AICUZ APZs	2010 Land Use	Agriculture	
Runways	Clear Zone	Low Density Residential	Forest	
Churches	Accident Potential Zone I	Medium Density Residential	Institutional	
Schools	Accident Potential Zone II	High Density Residential	Barren Land	
		Commercial	Water & Wetlands	
		Industrial	Other Developed Lands	

Source: ESRI and Prince George's County, 2016
 Coordinate System: WGS 1984 UTM Zone 18N

Figure 6-5: Existing Land Uses within the JBA AICUZ 2017 Noise Contours



<ul style="list-style-type: none"> JBA Churches Schools Runways 2017 AICUZ DNL Contours (dB) 	<p>2010 Land Use</p> <ul style="list-style-type: none"> Low Density Residential Medium Density Residential High Density Residential Commercial Industrial 	<ul style="list-style-type: none"> Agriculture Forest Institutional Other Developed Lands Barren Land Water & Wetlands
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Source: ESRI and Prince George's County, 2016
 Coordinate System: WGS 1984 UTM Zone 18N

N

6.3.2 FUTURE LAND USE SURROUNDING JBA

Land west and northwest of the installation is largely built out, and growth in this area would most likely consist of infill development. Future growth is projected to occur in the rural areas to the east and south of the installation. The County's future land use plan designates employment development areas along the eastern and southern boundary of the installation.

Large-scale developments in the vicinity of JBA will affect future land use patterns. Westphalia is a 6,000-acre master-planned community located northeast of JBA that will include a town center with a mix of high-density residential, commercial and office centers, parks and trails, and public facilities. Development has started, and the community will be constructed in several phases. National Harbor is a waterfront development and master-planned community located farther west of the installation on the Potomac River in Oxon Hill. This area includes a mix of retail, restaurants, hotels, residential units, office space, and a marina. The Woodmore Towne Centre at Glenarden is a new master-planned community located north of the installation. This developing community is a mixed-use development that includes retail, office space, a hotel and conference center, single-family homes, townhomes, and condominiums.

The Maryland State Highway Administration completed a planning corridor study for Highway 223, between MD 4 and Steed Road, to identify short- and long-term actions to improve mobility and transportation network connectivity (Maryland State Highway Administration 2015). Proposed improvements on Highway 223 could encourage future development to the south of the base. To the west of the base, a high-capacity transit route is proposed on MD 5 from White Plains in Charles County to the Branch Avenue Metro Rail Station in Prince George's County. A new transit station is planned at the interchange of Branch Avenue and MD 223. The Westphalia Sector Plan includes a transit station and supports extending the Metro Green Line to Westphalia.

The Federal Bureau of Investigation (FBI) is relocating their headquarters office, and Prince George's County is one of the locations under consideration. A location has not been selected. Relocation of FBI headquarters would bring an estimated 11,000 jobs to the area and would likely attract new development and induce growth in the surrounding area of the selected location.

6.4 COMPATIBILITY CONCERNS

Land use compatibility conditions determined in the analysis are derived from the Air Force land use recommendation for both AICUZ noise zones and APZs (Appendix A). To assess whether existing land use is compatible with flight operations at JBA, the 2017 AICUZ noise contours and the 2017 AICUZ APZs were overlaid on zoning data, land use data, and/or aerial photographs. The land use compatibility analysis of these areas includes an assessment of developed properties, as well as the identification of properties that are currently vacant or have development potential. Generally, vacant property is compatible with the land use compatibility guidance; however, if vacant properties are developed, they may not remain compatible. Vacant properties with obstructions, such as trees, that penetrate the imaginary surfaces are compatibility concerns. Areas of compatibility concern are illustrated in Figure 6-6.

6.4.1 JBA COMPATIBILITY CONCERNS

Clear Zones

Approximately 150 acres of off-base property are located within the northern CZs at JBA. The southern CZs are entirely within the base perimeter. The Air Force should, whenever practicable, acquire real property interest on all land within the CZs either in fee or through appropriate restrictive easements to prevent incompatible development or to prohibit uses that would generate increased incompatibility (Air Force 2015a). Any structure or obstruction within the CZ, whether permanent or temporary, is a safety threat. Prince George's County received a grant from the Office of Economic Adjustments in 2014 for a CZ study. The County is considering options to purchase land or obtain rights to property.

Incompatible land uses, including an industrial park, commercial businesses, and institutional facilities, were identified within the northern CZ of Runway 01R/19L. Suitland Parkway, which is part of the National Capital Parks system, runs through the northern CZs. The parkway is maintained by the National Park Service and included in the National Register of Historic Places. Trees north of the base along Highway 337 (Allentown Road) are an obstruction for approach and departure flights. Most land uses in the CZs are considered incompatible with military aircraft operations, and the CZs should remain free of any potential obstructions. Acreages of existing land uses in the CZs are provided in Table 6-2.

JBA is considering realigning the north threshold of Runway 01R/19L (east runway) with Runway 01L/19R (west runway) and moving Runway 01R/19L 800 feet to the west, which would move the northern CZ of Runway 01R/19L farther south and reduce areas of incompatibility. The industrial park currently in the northern CZ of Runway 01R/19L would no longer be in the CZ after the realignment. Although the realignment would move the southern CZ of Runway 01R/19L farther south, the CZ will still be within the base property.

Northern APZs and Noise Contour Areas

The majority of the land in the northern APZ I and the northern 65- to 69-dB DNL and the 70- to 74-dB DNL noise contours is low-density industrial development. Some commercial development is in the northwest corner of APZ I. Rose's Department Store and shopping center is in APZ II and the parking is in APZ I; the shopping center is not within the 2017 AICUZ noise contour area. Industrial use is compatible in the 65- to 69-dB DNL and the 70- to 74-dB DNL noise contours. Compatibility of commercial and industrial uses within APZ I and APZ II is dependent on densities and intensity of uses.

A small area of medium-density residential development is northwest of the MD 4 (Pennsylvania Avenue) and Interstate 495 interchange in APZ I. The majority of land use in APZ II is medium-density residential development with some areas of low-density residential development. No residential land use is within the northern noise contours. Residential land use is incompatible within APZ I, and the maximum-density for single-family housing in APZ II is one to two dwelling units per acre. Some residential development in APZ II may exceed the density limits.

Several churches were identified during field visits in the northern APZ I and APZ II and the northern 65- to 69-dB DNL and the 70- to 74-dB DNL noise contours. Schools were identified in APZ II; no schools are within the northern APZ I or noise contours. Churches and schools are not compatible in APZs I and II. These land uses can be considered compatible within the 65- to 69-dB DNL and 70- to 74-dB DNL noise zones with proper noise attenuation measures. Additionally, land uses that encourage a high concentration of people are prohibited in the County's MIOZ. Many representatives of the churches do not support the MIOZ and claim that under the Religious Land Use Protection Act, the overlay would be reducing the size of their land and is considered a taking.

Undeveloped areas in the northern APZ I and APZ II and noise contour area are forest and agriculture lands. Undeveloped land may be vulnerable to development pressures and future incompatibility concerns.

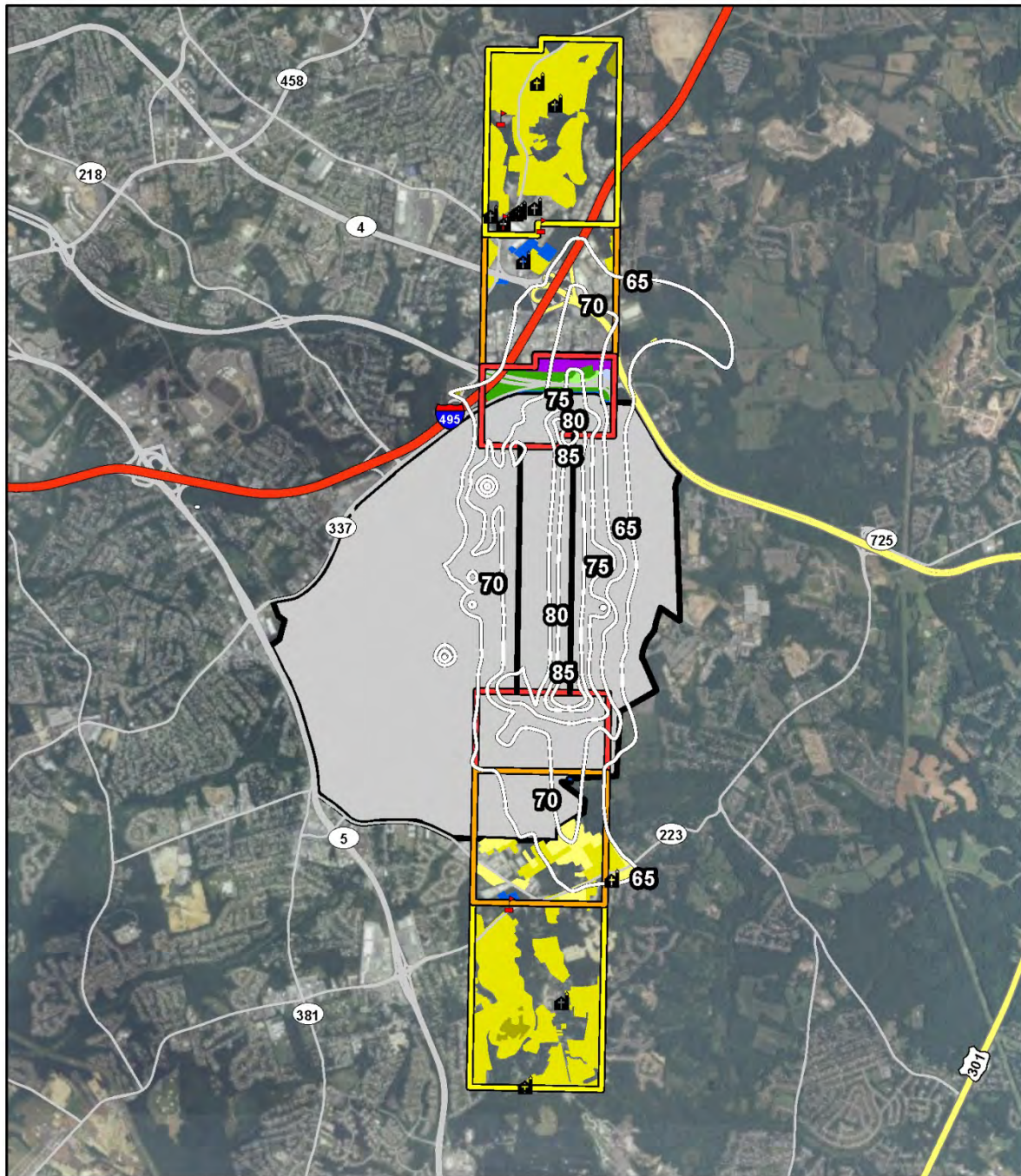
Southern APZs and Noise Contour Areas

The 65- to 69-dB DNL and 70- to 74-dB DNL noise contours extend slightly off base to the south and to the east. Land within the 70- to 74-dB DNL noise zone is low-density residential development or forest land, and land within the 65- to 69-dB DNL noise zone includes low- and medium-density residential development, forest land, and one pocket of industrial development. One church was identified in the 65- to 69-dB DNL noise zone. Land use in the southern APZ I includes forest, residential, commercial, and industrial development. APZ II mostly consists of low- and medium-density residential development and some forest land. Two churches are in the APZ II, and one school, the Tanglewood Special Education Center, is situated between APZs I and II.

Residential land use is incompatible within APZ I, discouraged within the 65- to 69-dB DNL noise zone, and strongly discouraged within the 70- to 74-dB DNL noise zone. Some residential development in APZ II may exceed the density limits of one to two dwelling units per acre. Public assembly land uses such as churches and school are not compatible in APZ I and APZ II; these land uses can be considered compatible within the 65- to 69-dB DNL noise zone with proper noise attenuation measures. Industrial use is compatible in the 65- to 69-dB DNL noise zone. Compatibility of commercial and industrial uses within APZ I and APZ II is dependent on densities and intensity of uses. The Clean Earth LLC Soil and Concrete Recycling Facility, which is located southeast of the base, is a height obstruction for airfield operations.

The area south of the airfield is Prince George's County Subregion 5. Future land use plans project existing forested areas in the southern APZs and noise zones as low-density residential or industrial development. The Subregion 5 Master Plan encourages compatible industrial use in this area; however, residential development would be incompatible and future development in proximity to aircraft operations may lead to noise complaints. The proposed transit station at the interchange of Branch Avenue and MD 223 would be outside of the 2017 AICUZ footprint; however, improvements to the transportation network would likely induce future growth and/or redevelopment in the surrounding area. Future changes in land use patterns may not be compatible with operations at JBA.

Figure 6-6: Areas of Compatibility Concerns



- JBA
- Runways
- Churches
- Schools
- 2017 AICUZ DNL Contours (dB)
- 2017 AICUZ APZs**
- Clear Zone
- Accident Potential Zone I
- Accident Potential Zone II

- 2010 Land Use**
- Low Density Residential
- Medium Density Residential
- High Density Residential
- Commercial
- Industrial
- Agriculture
- Forest
- Institutional
- Other Developed Lands



Source: ESRI and Prince George's County, 2016
 Coordinate System: WGS 1984 UTM Zone 18N

7 IMPLEMENTATION

Implementation of the AICUZ Study must be a joint effort between JBA and surrounding communities. This AICUZ Study provides the best source of information to ensure land use planning decisions made by the local municipalities are compatible with a future installation presence. This chapter discusses the roles of all the partners in the collaborative planning.

7.1 AIR FORCE ROLE

The goal of the Air Force AICUZ Program is to minimize the noise and safety concerns on the surrounding communities and to advise these communities on potential effects from base operations on the safety, welfare, and quality of life of their citizens.

JBA perceives its AICUZ responsibilities as encompassing the areas of flying safety, noise abatement, and participation in the land use planning process. Recommended actions for JBA include:

- Maintain aircraft and train aircrews to help ensure that the chances of an accident are remote; however, accidents do occur despite the best aircrew training and aircraft maintenance.
- The Air Force should ensure that, wherever possible, flights be routed over sparsely populated areas to reduce the exposure of lives and property to a potential accident.
- The Air Force should periodically review existing traffic patterns, instrument approaches, weather conditions, and operating practices and evaluate these factors in relationship to populated areas and other local situations. This is done to limit, reduce, and control the impact of flying operations noise on surrounding communities.
- JBA should establish a community forum between the installation and surrounding stakeholders to discuss land use and other issues of concern; these meetings should be held on a quarterly basis.

Preparation and presentation of this AICUZ Study is one phase of continuing Air Force participation in the local planning process. As the local communities update their land use plans, the Air Force must be ready to provide additional input when needed.

Implementation of the AICUZ Program objectives is a continuous process that requires ongoing participation and action even after initial compatibility policies are adopted. JBA should provide the AICUZ Study to the local communities for reference as the communities update their land use plans. JBA personnel are prepared to engage with the surrounding communities to discuss proposed development plans and land use policies as they may affect, or may be affected by, the base. They also are available to provide information, criteria, and guidelines to state, regional, and local planning bodies, civic associations, and similar groups to assist them in

planning efforts and to ensure Air Force input is offered in the early stages of any long-range planning initiatives.

Encroachment Partnering

Title 10 United States Code §2684a authorizes the Secretary of Defense or the Secretary of a military department to enter into agreements with an eligible entity or entities to address the use or development of real property in the vicinity of, or ecologically related to, a military airfield or military airspace, to limit encroachment or use of the property that would be incompatible with the mission of the airfield, or place other constraints on military training, testing, and operations. Eligible entities include a state, a political subdivision of a state, and a private entity that has as its principal organizational purpose or goal the conservation, restoration, or preservation of land and natural resources, or a similar purpose or goal.

Encroachment partnering agreements provide for an eligible entity to acquire fee title, or a lesser interest, in land for the purpose of limiting encroachment on the mission of a military airfield and/or to preserve habitat off the airfield to relieve current or anticipated environmental restrictions that might interfere with military operations or training at the airfield. The DoD can share the real estate acquisition costs for projects that support the purchase of fee simple, conservation, or other restrictive easements for such property. The eligible entity negotiates and acquires the real estate interest for encroachment partnering projects with a voluntary seller. The eligible entity must transfer the agreed-upon restrictive easement interest to the United States of America upon the request of the Secretary of Defense.

Under the Readiness and Environmental Protection Integration (REPI) Program, the DoD provides funding to military services in support of partnerships that promote compatible land use and ensure the future use of military training areas. By forming partnerships, the Air Force can be eligible for funding to share the costs of land acquisition and conservation easement efforts through the REPI Program. REPI funds cannot be used to acquire property rights in the CZs.

In 2010, JBA repaired the west runway, under the Rebuilding America's Airfields initiative, and impacted approximately 13 acres of wetlands on the airfield. With the assistance of the Army Corps of Engineers Baltimore District, the Air Force identified a wetlands mitigation banking site and has partnered with the Green Trust Alliance and the Walton Foundation to restore 63 acres of wetlands on Walton Farm (U.S. Army Corps of Engineers 2016).

7.2 STATE/REGIONAL ROLES

The Air Force can work with the Maryland Military Installation Council to propose statewide regulations that prohibit development that may interfere or compromise flight operations and training. The Maryland Military Installation Council consists of appointed and ex officio members that assess potential compatibility concern between local communities and military installations throughout the state. The Council evaluates State of Maryland policies to support

the operational capabilities of military installations while ensuring economic benefits to local communities.

Regional planning agencies can help control incompatible growth by aiding and influencing local governments in the development of policies, plans, and regulations necessary for the physical and economic expansion of the region.

7.3 LOCAL GOVERNMENT ROLES

The development and use of lands outside of military installations is beyond the control of the Air Force. Local governments have the authority to implement regulations and policies to control development and direct growth to ensure land use activity is compatible within the AICUZ footprint. Local governments should recognize their responsibility in providing land use control in those areas encumbered by the AICUZ footprint by incorporating AICUZ information into their planning policies and regulations.

Adoption of the following recommendations during the revision of relevant land use planning or zoning regulations will strengthen this relationship, increase the health and safety of the public, and help protect the integrity of the installation's flying mission:

- Consider AICUZ policies and guidelines when developing or revising comprehensive plans and use AICUZ overlay maps and Air Force Land Use Compatibility Guidelines (see Appendix A) to evaluate existing and future land use proposals.
- Adopt or modify zoning ordinances to reflect the compatible land uses outlined in the AICUZ Study.
- Establish protocols to consult with the base on land use matters within overlapping extra-territorial jurisdictions near JBA.
- Review capital improvement plan, infrastructure investments, and development policies to ensure they do not encourage incompatible land use patterns near JBA, with particular emphasis on utility extension and transportation planning.
- Implement height and obstruction ordinances that reflect current Air Force and 14 CFR Part 77 requirements.
- Enforce fair disclosure ordinances to require disclosure to the public for those AICUZ items that directly relate to aircraft operations at JBA.
- Adopt or modify building codes to ensure that any new construction in the vicinity of JBA has the recommended noise-level reduction measures incorporated into the design and construction of structures.
- Monitor proposals for tall structures such as wind turbines and communication towers to ensure that new construction does not pose a hazard to navigable airspace around JBA.
- Recommend AICUZ land use recommendations for development density in APZs are reflected in local government plans and ordinances.

- Consult with JBA on planning and zoning actions that have the potential to affect base operations.
- Invite the Air Force leadership to participate as an ex officio member on boards, commissions, and regional councils addressing long-range development and other planning policy.
- Continue to inform JBA of planning and zoning actions that have the potential to affect base operations. Develop a working group representing city planners, county planners, and base planners to meet at least quarterly to discuss AICUZ concerns and major development proposals that could affect airfield operations.

7.4 COMMUNITY ROLES

Neighboring residents and base personnel have a long-established history of working together for the mutual benefit of the JBA mission and local community. Adoption of the following recommendations will strengthen this relationship, ensure the health and safety of the public, and help protect the integrity of the installation's flying mission:

Real Estate Professionals

- Be informed of where the noise zones and CZs/APZs encumber land near the base.
- Invite base representatives to local real estate and broker association chapter meetings to discuss the AICUZ Program goal and objectives.
- Disclose to prospective buyers when property is located within CZs/APZs or noise zone greater than 65 dB DNL.
- Require Realtor Multiple Listing Services to disclose noise zones and CZs/APZs on all listings.

Developers

- Be informed of where the noise zones and CZs/APZs encumber land near the base. Consult with JBA on proposed developments within the AICUZ area of influence.
- Ensure that new construction within the AICUZ area of influence has the recommended noise level reductions incorporated into design and construction codes.

Local Citizens

- Participate in local forums with the base to learn more about the base's missions.
- Become informed about the AICUZ Program and learn about the program's goals, objectives, and value in protecting the public's health, safety, and welfare.
- Ask local real estate professionals, city planners, and base representatives about noise and accident potential when considering to purchase or lease properties near JBA.

Whereas the base and community are physically separated by a fence, Air Force activities can affect the community and, conversely, community activities can affect the Air Force mission. Collaborative planning, forging partnerships, open communications, and close relationships help the Air Force and its neighbors achieve their mutual goals.

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APPENDICES

Appendix A Land Use Compatibility Tables

Appendix B Key Terms

APPENDIX A LAND USE COMPATIBILITY TABLES

Land use compatibility recommendations in Tables A-1 and A-2 are from AFI 32-7063 (Air Force 2015a) and reflect the Air Force's minimum compatibility requirements; however, individual circumstances at each base may require more stringent guidelines as prudent.

Table A-1: Land Use Compatibility Recommendations in APZs and CZs

SLUCM NO.	LAND USE	SUGGESTED LAND USE COMPATIBILITY			
		CLEAR ZONE Recommendation ¹	APZ-I Recommendation ¹	APZ-II Recommendation ¹	DENSITY Recommendation ¹
10	Residential				
11	Household Units				
11.11	Single units: detached	N	N	Y ²	Maximum density of two dwelling units/acre
11.12	Single units: semi-detached	N	N	N	
11.13	Single units: attached row	N	N	N	
11.21	Two units: side-by-side	N	N	N	
11.22	Two units: one above the other	N	N	N	
11.31	Apartments: walk-up	N	N	N	
11.32	Apartment: elevator	N	N	N	
12	Group quarters	N	N	N	
13	Residential hotels	N	N	N	
14	Mobile home parks or courts	N	N	N	
15	Transient lodgings	N	N	N	
16	Other residential	N	N	N	
20	Manufacturing³				
21	Food and kindred products; manufacturing	N	N	Y	Maximum FAR 0.56 in APZ II
22	Textile mill products; manufacturing	N	N	Y	Maximum FAR 0.56 in APZ II
23	Apparel and other finished products; products made from fabrics, leather and similar materials; manufacturing	N	N	N	
24	Lumber and wood products (except furniture); manufacturing	N	Y	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II
25	Furniture and fixtures; manufacturing	N	Y	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II

SLUCM NO.	LAND USE	SUGGESTED LAND USE COMPATIBILITY			
		CLEAR ZONE Recommendation ¹	APZ-I Recommendation ¹	APZ-II Recommendation ¹	DENSITY Recommendation ¹
26	Paper and allied products; manufacturing	N	Y	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II
27	Printing, publishing, and allied industries	N	Y	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II
28	Chemicals and allied products; manufacturing	N	N	N	
29	Petroleum refining and related industries	N	N	N	
30	Manufacturing³ (continued)				
31	Rubber and miscellaneous plastic products; manufacturing	N	N	N	
32	Stone, clay, and glass products; manufacturing	N	N	Y	Maximum FAR of 0.56 in APZ II
33	Primary metal products; manufacturing	N	N	Y	Maximum FAR of 0.56 in APZ II
34	Fabricated metal products; manufacturing	N	N	Y	Maximum FAR of 0.56 in APZ II
35	Professional, scientific, and controlling instruments; photographic and optical goods; watches and clocks	N	N	N	
39	Miscellaneous manufacturing	N	Y	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II
40	Transportation, communication, and utilities^{3, 4}				
41	Railroad, rapid rail transit, and street railway transportation	N	Y ⁶	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II
42	Motor vehicle transportation	N	Y ⁶	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II
43	Aircraft transportation	N	Y ⁶	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II
44	Marine craft transportation	N	Y ⁶	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II
45	Highway and street right-of-way	Y ⁵	Y ⁶	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II
46	Automobile parking	N	Y ⁶	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II

SLUCM NO.	LAND USE	SUGGESTED LAND USE COMPATIBILITY			
		CLEAR ZONE Recommendation ¹	APZ-I Recommendation ¹	APZ-II Recommendation ¹	DENSITY Recommendation ¹
47	Communication	N	Y ⁶	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II
48	Utilities ⁷	N	Y ⁶	Y ⁶	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II
48.5	Solid waste disposal (landfills, incinerators, etc.)	N	N	N	
49	Other transportation, communication, and utilities	N	Y ⁶	Y	See Note 6 below
50	Trade				
51	Wholesale trade	N	Y	Y	Maximum FAR of 0.28 in APZ I and 0.56 in APZ II
52	Retail trade – building materials, hardware and farm equipment	N	Y	Y	See Note 8 below
53	Retail trade – including, discount clubs, home improvement stores, electronics superstores, etc.	N	N	Y	Maximum FAR of 0.16 in APZ II
53	Shopping centers – Neighborhood, Community, Regional, Super-regional ⁹	N	N	N	
54	Retail trade – food	N	N	Y	Maximum FAR of 0.24 in APZ II
55	Retail trade – automotive, marine craft, aircraft, and accessories	N	Y	Y	Maximum FAR of 0.14 in APZ I and 0.28 in APZ II
56	Retail trade – apparel and accessories	N	N	Y	Maximum FAR of 0.28 in APZ II
57	Retail trade – furniture, home, furnishings and equipment	N	N	Y	Maximum FAR of 0.28 in APZ II
58	Retail trade – eating and drinking establishments	N	N	N	
59	Other retail trade	N	N	Y	Maximum FAR of 0.16 in APZ II
60	Services¹⁰				
61	Finance, insurance and real estate services	N	N	Y	Maximum FAR of 0.22 in APZ II
62	Personal services	N	N	Y	Office uses only. Maximum FAR of 0.22 in APZ II.
62.4	Cemeteries	N	Y ¹¹	Y ¹¹	
63	Business services (credit reporting; mail, stenographic, reproduction; advertising)	N	N	Y	Maximum FAR of 0.22 in APZ II

SLUCM NO.	LAND USE	SUGGESTED LAND USE COMPATIBILITY			
		CLEAR ZONE Recommendation ¹	APZ-I Recommendation ¹	APZ-II Recommendation ¹	DENSITY Recommendation ¹
63.7	Warehousing and storage services ¹²	N	Y	Y	Maximum FAR of 1.0 in APZ I; 2.0 in APZ II
64	Repair Services	N	Y	Y	Maximum FAR of 0.11 APZ I; 0.22 in APZ II
65	Professional services	N	N	Y	Maximum FAR of 0.22 in APZ II
65.1	Hospitals, nursing homes	N	N	N	
65.1	Other medical facilities	N	N	N	
66	Contract construction services	N	Y	Y	Maximum FAR of 0.11 APZ I; 0.22 in APZ II
67	Government services	N	N	Y	Maximum FAR of 0.24 in APZ II
68	Educational services	N	N	N	
68.1	Child care services, child development centers, and nurseries	N	N	N	
69	Miscellaneous services	N	N	Y	Maximum FAR of 0.22 in APZ II
69.1	Religious activities (including places of worship)	N	N	N	
70	Cultural, entertainment and recreational				
71	Cultural activities	N	N	N	
71.2	Nature exhibits	N	Y ¹³	Y ¹³	
72	Public assembly	N	N	N	
72.1	Auditoriums, concert halls	N	N	N	
72.11	Outdoor music shells, amphitheaters	N	N	N	
72.2	Outdoor sports arenas, spectator sports	N	N	N	
73	Amusements – fairgrounds, miniature golf, driving ranges; amusement parks, etc.	N	N	Y ²⁰	
74	Recreational activities (including golf courses, riding stables, water recreation)	N	Y ¹³	Y ¹³	Maximum FAR of 0.11 in APZ I; 0.22 in APZ II
75	Resorts and group camps	N	N	N	
76	Parks	N	Y ¹³	Y ¹³	Maximum FAR of 0.11 in APZ I; 0.22 in APZ II
79	Other cultural, entertainment and recreation	N	Y ¹¹	Y ¹¹	Maximum FAR of 0.11 in APZ I; 0.22 in APZ II

SLUCM NO.	LAND USE	SUGGESTED LAND USE COMPATIBILITY			
		CLEAR ZONE Recommendation ¹	APZ-I Recommendation ¹	APZ-II Recommendation ¹	DENSITY Recommendation ¹
80	Resource production and extraction				
81	Agriculture (except livestock)	Y ⁴	Y ¹⁴	Y ¹⁴	
81.5-81.7	Agriculture – Livestock farming, including grazing and feedlots	N	Y ¹⁴	Y ¹⁴	
82	Agriculture-related activities	N	Y ¹⁵	Y ¹⁵	Maximum FAR of 0.28 in APZ I; 0.56 in APZ II; no activity that produces smoke or glare, or involves explosives
83	Forestry activities ¹⁶	N	Y	Y	Maximum FAR of 0.28 in APZ I; 0.56 in APZ II; no activity that produces smoke or glare, or involves explosives
84	Fishing activities ¹⁷	N ¹⁷	Y	Y	Maximum FAR of 0.28 in APZ I; 0.56 in APZ II; no activity that produces smoke or glare, or involves explosives
85	Mining activities ¹⁸	N	Y ¹⁸	Y ¹⁸	Maximum FAR of 0.28 in APZ I; 0.56 in APZ II; no activity that produces smoke or glare, or involves explosives
89	Other resource production or extraction	N	Y	Y	Maximum FAR of 0.28 in APZ I; 0.56 in APZ II; no activity that produces smoke or glare, or involves explosives
90	Other				
91	Undeveloped land	Y	Y	Y	
93	Water areas ¹⁹	N ¹⁹	N ¹⁹	N ¹⁹	

Key:

Y (Yes) – Land use and related structures compatible without restrictions.

N (No) – Land use and related structures are not compatible and should be prohibited.

Y^x – Yes with restrictions. The land use and related structures generally are compatible. However, see note(s) indicated by the superscript.

N^x – No with exceptions. The land use and related structures are generally incompatible. However, see note(s) indicated by the superscript.

Notes:

- 1 "Yes" or a "No" designation for compatible land use is to be used only for general comparison. Within each, uses exist where further evaluation may be needed in each category as to whether it is clearly compatible, normally compatible, or not compatible due to the variation of densities of people and structures. To assist air installations and local governments, general suggestions as to FARs are provided as a guide to density in some categories. In general, land use restrictions that limit occupants, including employees, of commercial, service, or industrial buildings or structures to 25 per acre in APZ I and 50 per acre in APZ II are considered low density. Outside events should normally be limited to assemblies of not more than 25 people per acre in APZ I, and maximum assemblies of 50 people per acre in APZ II. Recommended FARs are calculated using standard parking generation rates for various land uses, vehicle occupancy rates, and desired density in APZs I and II. For APZ I, the formula is FAR = 25 people per acre / (Average Vehicle Occupancy × Average Parking Rate × (43,560/1,000)). The formula for APZ II is FAR = 50 / (Average Vehicle Occupancy × Average Parking Rate × (43,560/1,000)).
- 2 The suggested maximum density for detached single-family housing is two dwelling units per acre. In a PUD of single-family detached units, where clustered housing development results in large open areas, this density could possibly be increased slightly provided the amount of surface area covered by structures does not exceed 20 percent of the PUD total area. PUD encourages clustered development that leaves large open areas.
- 3 Other factors to be considered: Labor intensity, structural coverage, explosive characteristics, air-pollution, electronic interference with aircraft, height of structures, and potential glare to pilots.
- 4 No structures (except airfield lighting and navigational aids necessary for the safe operation of the airfield when there are no other siting options), buildings, or above-ground utility and communications lines should normally be located in Clear Zone areas on or off the air installation. The Clear Zone is subject to the most severe restrictions.
- 5 Roads in the graded portion of the Clear Zone are prohibited. All roads within the Clear Zone are discouraged, but if required, they should not be wider than two lanes and the rights-of-way should be fenced (frangible) and not include sidewalks or bicycle trails. Nothing associated with these roads should violate obstacle clearance criteria.
- 6 No aboveground passenger terminals and no aboveground power transmission or distribution lines. Prohibited power lines include high-voltage transmission lines and distribution lines that provide power to cities, towns, or regional power for unincorporated areas.
- 7 Development of renewable energy resources, including solar and geothermal facilities and wind turbines, may affect military operations through hazards to flight or electromagnetic interference. Each new development should be analyzed for compatibility issues on a case-by-case basis that considers both the proposal and potentially affected mission.
- 8 Within SLUCM Code 52, maximum FARs for lumberyards (SLUCM Code 521) are 0.20 in APZ-I and 0.40 in APZ-II; the maximum FARs for hardware, paint, and farm equipment stores, (SLUCM Code 525), are 0.12 in APZ I and 0.24 in APZ II.
- 9 A shopping center is an integrated group of commercial establishments that is planned, developed, owned, or managed as a unit. Shopping center types include strip, neighborhood, community, regional, and super-regional facilities anchored by small businesses, a supermarket or drug store, discount retailer, department store, or several department stores, respectively.
- 10 Ancillary uses such as meeting places and auditoriums are not recommended.
- 11 No chapels or houses of worship are allowed within APZ I or APZ II.
- 12 Big box home improvement stores are not included as part of this category.
- 13 Facilities must be low intensity, and provide no playgrounds, etc. Facilities such as club houses, meeting places, auditoriums, and large classes are not recommended.
- 14 Activities that attract concentrations of birds, creating a hazard to aircraft operations, should be excluded.
- 15 Factors to be considered: labor intensity, structural coverage, explosive characteristics, and air pollution.
- 16 Lumber and timber products removed due to establishment, expansion, or maintenance of Clear Zone lands owned in fee will be disposed of in accordance with applicable DoD guidance.
- 17 Controlled hunting and fishing may be permitted for the purpose of wildlife management.
- 18 Surface mining operations that could create retention ponds that may attract waterfowl and present BASH, or operations that produce dust or light emissions that could affect pilot vision are not compatible.
- 19 Naturally occurring water features (e.g., rivers, lakes, streams, or wetlands) are pre-existing, nonconforming land uses. Naturally occurring water features that attract waterfowl present a potential BASH. Actions to expand naturally occurring water features or construction of new water features should not be encouraged. If construction of new features is necessary for storm water retention, such features should be designed so that they do not attract waterfowl.
- 20 Amusement centers, family entertainment centers, or amusement parks designed or operated at a scale that could attract or result in concentrations of people, including employees and visitors, greater than 50 people per acre at any given time are incompatible in APZ II.

APZ	Accident Potential Zone
BASH	bird/wildlife aircraft strike hazards
DoD	Department of Defense
FAR	floor to area ratio
PUD	planned unit development
SLUCM	Standard Land Use Coding Manual, United States Department of Transportation

Table A-2: Recommended Land Use Compatibility for Noise Zones

SLUCM NO.	LAND USE	SUGGESTED LAND USE COMPATIBILITY				
		DNL or CNEL 65-69	DNL or CNEL 70-74	DNL or CNEL 75-79	DNL or CNEL 80-84	DNL or CNEL 85+
10	Residential					
11	Household units	N ¹	N ¹	N	N	N
11.11	Single units: detached	N ¹	N ¹	N	N	N
11.12	Single units: semidetached	N ¹	N ¹	N	N	N
11.13	Single units: attached row	N ¹	N ¹	N	N	N
11.21	Two units: side-by-side	N ¹	N ¹	N	N	N
11.22	Two units: one above the other	N ¹	N ¹	N	N	N
11.31	Apartments: walk-up	N ¹	N ¹	N	N	N
11.32	Apartment: elevator	N ¹	N ¹	N	N	N
12	Group quarters	N ¹	N ¹	N	N	N
13	Residential hotels	N ¹	N ¹	N	N	N
14	Mobile home parks or courts	N	N	N	N	N
15	Transient lodgings	N ¹	N ¹	N ¹	N	N
16	Other residential	N ¹	N ¹	N	N	N
20	Manufacturing					
21	Food and kindred products; manufacturing	Y	Y ²	Y ³	Y ⁴	N
22	Textile mill products; manufacturing	Y	Y ²	Y ³	Y ⁴	N
23	Apparel and other finished products; products made from fabrics, leather, and similar materials; manufacturing	Y	Y ²	Y ³	Y ⁴	N
24	Lumber and wood products (except furniture); manufacturing	Y	Y ²	Y ³	Y ⁴	N
25	Furniture and fixtures; manufacturing	Y	Y ²	Y ³	Y ⁴	N
26	Paper and allied products; manufacturing	Y	Y ²	Y ³	Y ⁴	N
27	Printing, publishing, and allied industries	Y	Y ²	Y ³	Y ⁴	N
28	Chemicals and allied products; manufacturing	Y	Y ²	Y ³	Y ⁴	N
29	Petroleum refining and related industries	Y	Y ²	Y ³	Y ⁴	N
30	Manufacturing (continued)					
31	Rubber and misc. plastic products; manufacturing	Y	Y ²	Y ³	Y ⁴	N

SLUCM NO.	LAND USE	SUGGESTED LAND USE COMPATIBILITY				
		DNL or CNEL 65-69	DNL or CNEL 70-74	DNL or CNEL 75-79	DNL or CNEL 80-84	DNL or CNEL 85+
32	Stone, clay and glass products; manufacturing	Y	Y ²	Y ³	Y ⁴	N
33	Primary metal products; manufacturing	Y	Y ²	Y ³	Y ⁴	N
34	Fabricated metal products; manufacturing	Y	Y ²	Y ³	Y ⁴	N
35	Professional scientific, and controlling instruments; photographic and optical goods; watches and clocks	Y	25	30	N	N
39	Miscellaneous manufacturing	Y	Y ²	Y ³	Y ⁴	N
40	Transportation, communication and utilities					
41	Railroad, rapid rail transit, and street railway transportation	Y	Y ²	Y ³	Y ⁴	N
42	Motor vehicle transportation	Y	Y ²	Y ³	Y ⁴	N
43	Aircraft transportation	Y	Y ²	Y ³	Y ⁴	N
44	Marine craft transportation	Y	Y ²	Y ³	Y ⁴	N
45	Highway and street right-of-way	Y	Y	Y	Y	N
46	Automobile parking	Y	Y	Y	Y	N
47	Communication	Y	Y ⁶	Y	N	N
48	Utilities	Y	Y ²	Y ³	Y ⁴	N
49	Other transportation, communication and utilities	Y	255	305	N	N
50	Trade					
51	Wholesale trade	Y	Y ²	Y ³	Y ⁴	N
52	Retail trade - building materials, hardware and farm equipment	Y	25	30	Y ⁴	N
53	Retail trade - including shopping centers, discount clubs, home improvement stores, electronics superstores, etc.	Y	25	30	N	N
54	Retail trade - food	Y	25	30	N	N
55	Retail trade - automotive, marine craft, aircraft and accessories	Y	25	30	N	N
56	Retail trade - apparel and accessories	Y	25	30	N	N

SLUCM NO.	LAND USE	SUGGESTED LAND USE COMPATIBILITY				
		DNL or CNEL 65-69	DNL or CNEL 70-74	DNL or CNEL 75-79	DNL or CNEL 80-84	DNL or CNEL 85+
57	Retail trade - furniture, home, furnishings and equipment	Y	25	30	N	N
58	Retail trade - eating and drinking establishments	Y	25	30	N	N
59	Other retail trade	Y	25	30	N	N
60	Services					
61	Finance, insurance and real estate services	Y	25	30	N	N
62	Personal services	Y	25	30	N	N
62.4	Cemeteries	Y	Y ²	Y ³	Y ^{4,11}	Y ^{6,11}
63	Business services	Y	25	30	N	N
63.7	Warehousing and storage	Y	Y ²	Y ³	Y ⁴	N
64	Repair services	Y	Y ²	Y ³	Y ⁴	N
65	Professional services	Y	25	30	N	N
65.1	Hospitals, other medical facilities	25	30	N	N	N
65.16	Nursing homes	N ¹	N ¹	N	N	N
66	Contract construction services	Y	25	30	N	N
67	Government services	Y ¹	25	30	N	N
68	Educational services	25	30	N	N	N
68.1	Child care services, child development centers, and nurseries	25	30	N	N	N
69	Miscellaneous services	Y	25	30	N	N
69.1	Religious activities (including places of worship)	Y	25	30	N	N
70	Cultural, entertainment and recreational					
71	Cultural activities	25	30	N	N	N
71.2	Nature exhibits	Y ¹	N	N	N	N
72	Public assembly	Y	N	N	N	N
72.1	Auditoriums, concert halls	25	30	N	N	N
72.11	Outdoor music shells, amphitheaters	N	N	N	N	N
72.2	Outdoor sports arenas, spectator sports	Y ⁷	Y ⁷	N	N	N
73	Amusements	Y	Y	N	N	N
74	Recreational activities (including golf courses, riding stables, water recreation)	Y	25	30	N	N

SLUCM NO.	LAND USE	SUGGESTED LAND USE COMPATIBILITY				
		DNL or CNEL 65-69	DNL or CNEL 70-74	DNL or CNEL 75-79	DNL or CNEL 80-84	DNL or CNEL 85+
75	Resorts and group camps	Y	25	N	N	N
76	Parks	Y	25	N	N	N
79	Other cultural, entertainment and recreation	Y	25	N	N	N
80	Resource production and extraction					
81	Agriculture (except live-stock)	Y ⁸	Y ⁹	Y ¹⁰	Y ^{10,11}	Y ^{10,11}
81.5-81.7	Agriculture – Livestock farming including grazing and feedlots	Y ⁸	Y ⁹	N	N	N
82	Agriculture-related activities	Y ⁸	Y ⁹	Y ¹⁰	Y ^{10,11}	Y ^{10,11}
83	Forestry activities	Y ⁸	Y ⁹	Y ¹⁰	Y ^{10,11}	Y ^{10,11}
84	Fishing activities	Y	Y	Y	Y	Y
85	Mining activities	Y	Y	Y	Y	Y
89	Other resource production or extraction	Y	Y	Y	Y	Y

Key:

Y (Yes) – Land use and related structures compatible without restrictions.

N (No) – Land use and related structures are not compatible and should be prohibited.

Y^x – Yes with restrictions. The land use and related structures generally are compatible. However, see note(s) indicated by the superscript.

N^x – No with exceptions. The land use and related structures are generally incompatible. However, see note(s) indicated by the superscript.

25, 30, or 35 – The numbers refer to noise level reduction (NLR) levels. NLR (outdoor to indoor) is achieved through the incorporation of noise attenuation into the design and construction of a structure. Land use and related structures are generally compatible; however, measures to achieve NLR of 25, 30, or 35 must be incorporated into design and construction of structures. However, measures to achieve an overall noise reduction do not necessarily solve noise difficulties outside the structure and additional evaluation is warranted. Also, see notes indicated by superscripts where they appear with one of these numbers.

Notes:

- 1 General
 - a Although local conditions regarding the need for housing may require residential use in these zones, residential use is discouraged in DNL 65-69 and strongly discouraged in DNL 70-74. The absence of viable alternative development options should be determined and an evaluation should be conducted locally prior to local approvals indicating that a demonstrated community need for the residential use would not be met if development were prohibited in these zones. Existing residential development is considered as pre-existing, nonconforming land uses.
 - b Where the community determines that these uses must be allowed, measures to achieve outdoor to indoor NLR of at least 25 decibels (dB) in DNL 65-69 and 30 dB in DNL 70-74 should be incorporated into building codes and be considered in individual approvals; for transient housing, an NLR of at least 35 dB should be incorporated in DNL 75-79.
 - c Normal permanent construction can be expected to provide an NLR of 20 dB; thus, the reduction requirements are often stated as 5, 10, or 15 dB over standard construction and normally assume mechanical ventilation, upgraded sound transmission class ratings in windows and doors, and closed windows year-round. Additional consideration should be given to modifying NLR levels based on peak noise levels or vibrations.
 - d NLR criteria will not eliminate outdoor noise problems. However, building location, site planning, design, and use of berms and barriers can help mitigate outdoor noise exposure particularly from ground level sources. Measures that reduce noise at a site should be used wherever practical in preference to measures that only protect interior spaces.
- 2 Measures to achieve NLR of 25 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.
- 3 Measures to achieve NLR of 30 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.
- 4 Measures to achieve NLR of 35 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.
- 5 If project or proposed development is noise-sensitive, use indicated NLR; if not, land use is compatible without NLR.
- 6 Buildings are not permitted.
- 7 Land use is compatible provided special sound reinforcement systems are installed.
- 8 Residential buildings require an NLR of 25
- 9 Residential buildings require an NLR of 30.
- 10 Residential buildings are not permitted.
- 11 Land use that involves outdoor activities is not recommended, but if the community allows such activities, hearing protection devices should be worn when noise sources are present. Long-term exposure (multiple hours per day over many years) to high noise levels can cause hearing loss in some unprotected individuals.

dB decibel

DNL day-night average sound level

CNEL Community Noise Equivalent Level (normally within a very small decibel difference of DNL)

NLR noise level reduction

SLUCM Standard Land Use Coding Manual, United States Department of Transportation

APPENDIX B KEY TERMS

- **Day-Night Average Sound Level (DNL)** – DNL is a composite noise metric accounting for the sound energy of all noise events in a 24-hour period. To account for increased human sensitivity to noise at night, a 10-dB penalty is applied to events occurring during the acoustical nighttime period (10:00 p.m. through 7:00 a.m.). Noise metrics are discussed in Chapter 4: *Aircraft Noise*.
- **Decibel** – Decibel (abbreviated as dB) is the unit used to measure the intensity of a sound.
- **Flight Profiles** – Flight profiles consist of aircraft conditions (i.e., altitude, speed, power setting, etc.) defined at various locations along each assigned flight track.
- **Flight Track** – A flight track is the route an aircraft follows while conducting an operation at the airfield, between airfields, or to/from training areas. The flight track locations represent the various types of arrivals, departures, and closed patterns accomplished at JBA. Flight tracks are graphically represented as single lines, but actual flight patterns may vary due to aircraft performance, pilot technique, and weather conditions.
- **Operation** – An aircraft operation is defined as one takeoff or one landing. A complete closed pattern or circuit is counted as two operations because the aircraft crosses over the runway threshold twice, once on arrival and once on departure. A sortie is a single military aircraft flight from the initial takeoff through the termination landing. The minimum number of aircraft operations for one sortie is two operations, one takeoff (departure) and one landing (approach).