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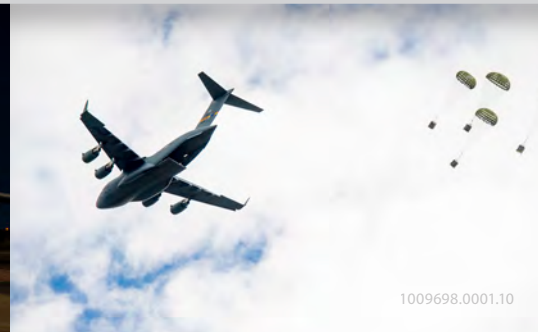
JOINT BASE CHARLESTON AND NORTH AUXILIARY AIRFIELD

Air Installations Compatible Use Zones (AICUZ) Study

March 2019



U.S. AIR FORCE



MEMORANDUM FOR AREA GOVERNMENTS

FROM: 628th Air Base Wing
102 E Hill Blvd
Joint Base Charleston SC 29404

SUBJECT: Air Installations Compatible Use Zones (AICUZ) Study

Reference: (a) Joint Base Charleston and North Auxiliary Airfield AICUZ Study.

1. The 2019 AICUZ Study for Joint Base (JB) Charleston (CHS) and North Auxiliary Airfield (NAAF) is an update of the AICUZ Study dated 2004. The Air Force initiated this update because of changes since the last AICUZ including the Base Realignment and Closure (BRAC) for Charleston Air Force Base (AFB) and Naval Weapons Station (NWS) Charleston, as well as updated flight track changes, operational changes, and mission changes for JB CHS, specifically JB CHS-Air Base (AB) and the NAAF. It is a reevaluation of aircraft noise and accident potential related to United States Air Force (Air Force) flying operations. The Air Force provides the AICUZ to aid in the development of local planning mechanisms that will protect the public safety and health, as well as preserve the operational capabilities of JB CHS and NAAF.

2. The AICUZ Study contains a description of the affected area around the installation. It outlines the location of runway Clear Zones (CZs), Accident Potential Zones (APZs), and noise contours, and provides recommendations for development that is compatible with military flight operations. It is our recommendation that local governments incorporate these recommendations into community plans, zoning ordinances, subdivision regulations, building codes, and other related documents.

3. This update provides noise contours based upon the Day-night Average Sound Level (DNL) metric and utilizes current year (2019) flight operations. Chapter 4 of the study describes the metric in detail and Chapter 5 discusses safety, while Chapter 6 covers land use compatibility. Chapter 7 discusses roles of the Air Force and its neighbors in land use collaboration.

4. We greatly value the positive relationship JB CHS has experienced with its neighbors over the years. As a partner in the process, we have attempted to minimize noise disturbances through such actions as minimizing night flying and avoiding flights over heavily populated areas. We solicit your cooperation in implementing the recommendations and guidelines presented in this AICUZ Study update.



TERRENCE A. ADAMS, Colonel, USAF
Commander, 628th Air Base Wing

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Abbreviations and Acronyms

AB	Air Base
ABW	Air Base Wing
AFB	Air Force Base
AFCEC	Air Force Civil Engineer Center
AFH	Air Force Handbook
AFI	Air Force Instruction
AGL	Above Ground Level
AICUZ	Air Installations Compatible Use Zones
Air Force	United States Air Force
APZ	Accident Potential Zone
ATC	Air Traffic Control
BASH	Bird/Wildlife Aircraft Strike Hazard
BCDCOG	Berkeley-Charleston-Dorchester Council of Governments
BRAC	Base Realignment and Closure
CCAA	Charleston County Aviation Authority
CFR	Code of Federal Regulations
CNEL	Community Noise Equivalent Level [California only]
CZ	Clear Zone
dB	Decibel
dBA	A-weighted Decibel
DNL	Day-night Average Sound Level
DoD	Department of Defense
DoDI	Department of Defense Instruction
Du/Ac	Dwelling unit/Acre
EMI	Electromagnetic Interference
EPA	United States Environmental Protection Agency
FAA	Federal Aviation Administration
FAR	Floor Area Ratio (also Federal Aviation Regulation)
GCA	Ground Control Approach
GIS	Geographic Information System
HAFZ	Hazards to Aircraft Flight Zone
Hz	Hertz
I-	Interstate
IFR	Instrument Flight Rules
JB CHS	Joint Base Charleston
JLUS	Joint Land Use Study
LZ	Landing Zone
NAAF	North Auxiliary Airfield
NLR	Noise Level Reduction
NRHP	National Register of Historic Places
NVG	Night Vision Goggles
NWS	Naval Weapons Station
PA	Public Affairs

PUD	Planned Unit Development
REPI	Readiness and Environmental Protection Integration
SLUCM	Standard Land Use Coding Manual
T&G	Touch-and-Go
TACAN	Tactical Area Navigation
TDR	Transfer of Development Rights
UFC	United Facilities Criteria
VFR	Visual Flight Rules
WS	Weapons Station

1.0 Introduction

This study is a combined update of both the 2004 Charleston Air Force Base (AFB) and the 2004 North Auxiliary Airfield (NAAF) Air Installations Compatible Use Zones (AICUZ) studies. The update presents and documents changes to the AICUZ since the release of the previous studies in 2004. It reaffirms the United States Air Force’s policy of promoting public health, safety, and general welfare in areas surrounding an air installation while seeking development that is compatible with the defense flying mission. This study presents changes in flight operations since the previous studies and provides current year noise contours and recommendations for achieving development that is compatible with the defense flying mission. This 2019 Joint Base Charleston (JB CHS) and NAAF AICUZ Study focuses on the flying mission of JB CHS, specifically JB CHS’s Air Base (JB CHS-AB) and the NAAF.

1.1 AICUZ Program

Military airfields attract development—people who work on the installation want to live nearby, while others want to provide services to installation 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 near air installations 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 zones, 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. Cooperation 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 in the public planning process. As the communities that surround airfields grow and develop, the Air Force has the responsibility to communicate and collaborate with local governments on land use planning, zoning, and similar matters that could affect the installation’s operations or missions. Likewise, the Air Force has a responsibility to understand and communicate potential impacts that new and changing missions may have on the local community.

1.2 Scope, and Authority

1.2.1 Scope

This AICUZ Study uses current year air operations. The Air Force provides JB CHS and NAAF's CZs, APZs, and noise zones associated with the airfield's runways to the local communities, along with recommendations for compatible land use near the installation for incorporation into comprehensive plans, zoning ordinances, subdivision regulations, building codes, and other related documents.

1.2.2 Authority

Authority for the Air Force AICUZ Program lies in two documents:

- Air Force Instruction (AFI) 32-7063, *Air Installations Compatible Use Zones Program*, implements Department of Defense Instruction (DoDI) 4165.57, *Air Installations Compatible Use Zones*, 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.
- Air Force Handbook (AFH) 32-7084, *AICUZ Program Manager's Guide*, provides installation AICUZ Program Managers with 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 AFPD 32-70, *Environmental Quality*.

1.3 Previous AICUZ Efforts and Related Studies

Previous studies relevant to this AICUZ Study include:

- Charleston AFB AICUZ Study, 2004;
- NAAF Charleston AFB AICUZ Study, 2004; and
- Charleston Air Force Base Naval Weapons Station Joint Land Use Study, 2008.

1.4 Changes that Require an AICUZ Study Update

This 2019 JB Charleston and NAAF AICUZ Study updates the 2004 Charleston AFB and the 2004 NAAF AICUZ studies. This combined update provides the installation's current flight tracks, CZs, APZs, and noise zone information and also presents the most accurate representation of the installation's current aircraft activities. As such, the AICUZ Program allows surrounding communities to consider current activities when making land use decisions.

As the DoD aircraft fleet mix and training requirements change over time, the resulting flight operations change as well. These changes can affect noise contours and necessitate an AICUZ Study update. Additionally, non-operational changes, such as noise modeling methods and a local community's land use, may also require the need for an update. Per AFI 32-7063 and AFH 32-7084, the primary changes since the previous AICUZ Study that necessitate this update include:

- Updates to the base since JB CHS was created as a result of the merging of Charleston AFB and Naval Weapons Station (NWS) Charleston in 2010 in accordance with the 2005 Base Realignment and Closure (BRAC) Commission;
- Flight track changes;
- Operational changes, and mission changes for JB CHS and the NAAF;
- Decrease in air operations at both JB CHS and NAAF; and
- Changes in off-installation land use.

More information on these changes can be found in Section 3.4.1 of this study.

2.0 Joint Base Charleston, South Carolina

2.1 Location

JB CHS is located in Charleston, Berkeley, and Orangeburg counties, and borders Dorchester County, South Carolina (Figure 2-1). JB CHS is comprised of several land holdings, including:

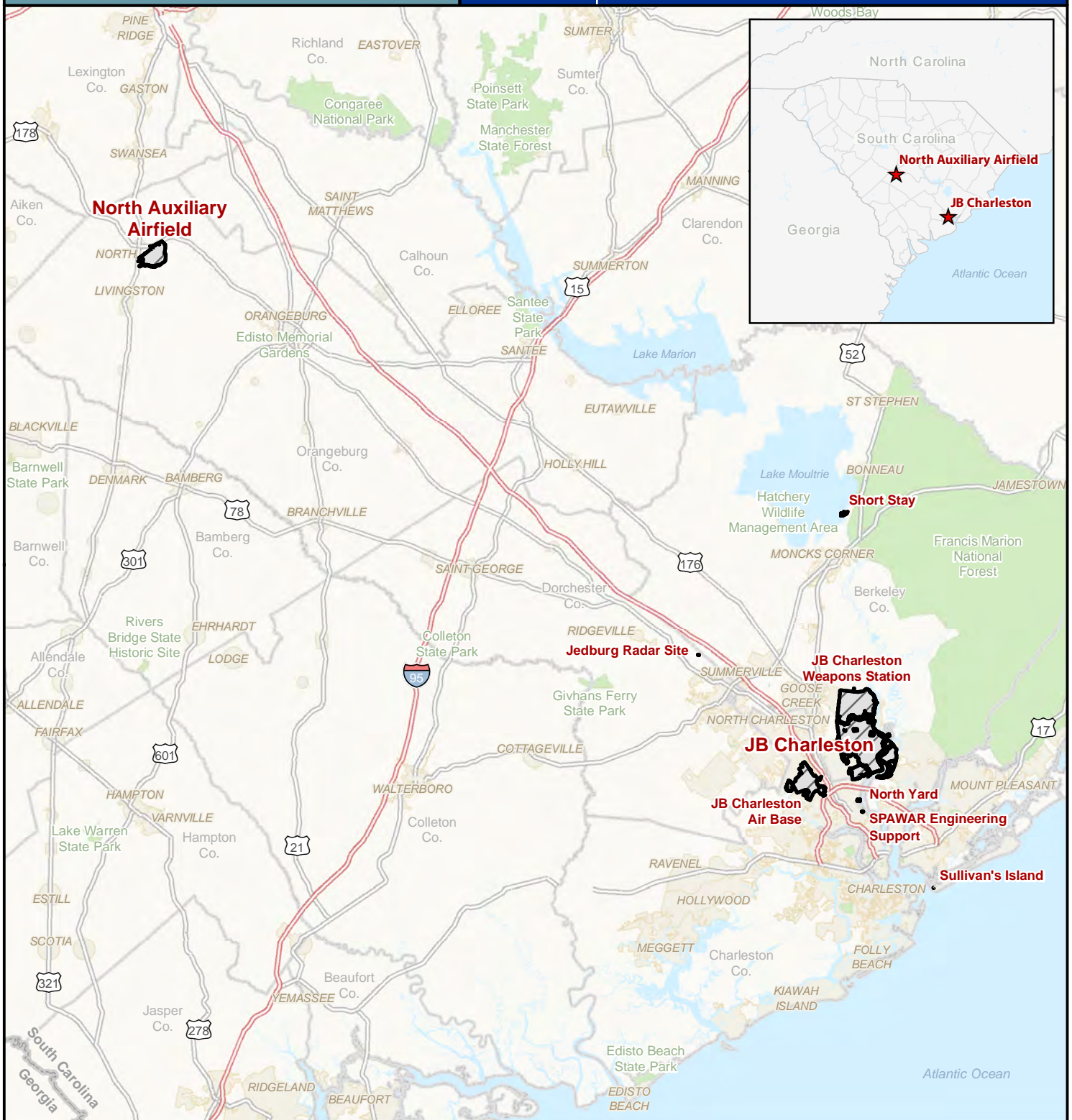
- The **Air Base (JB CHS-AB)**: As a joint civil-military airport, JB CHS owns and shares runways with the Charleston International Airport at JB CHS-AB. JB CHS-AB is located within the city of North Charleston within Charleston County, South Carolina;
- The **Weapons Station (JB CHS-WS)**: JB CHS-WS is located approximately 5 miles northeast of JB CHS-AB in Berkeley and Charleston counties; and
- The **North Auxiliary Airfield (NAAF)**: The NAAF is located approximately 85 miles northwest of JB CHS-AB and near the town of North, in Orangeburg County, South Carolina.

2.2 History

JB CHS was created as a result of the merging of Charleston AFB and NWS Charleston in 2010 in accordance with the 2005 BRAC Commission. Under the leadership of the 628th Air Base Wing (ABW), JB CHS began providing support to 60 DoD and federal agencies with personnel stationed at two geographically separated installations: JB CHS-AB and JB CHS-WS (JB CHS 2017).

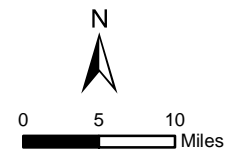
Prior to their merging in 2010, Charleston AFB and NWS Charleston had a long history in Charleston, dating back to the early 1900s. In 1941, NWS Charleston was commissioned as a U.S. Naval Ammunition Depot and served as a munitions collection and distribution point during World War II. After the war, the site then handled guided missiles and arming submarines (Von Nessen 2017).

The original Charleston Municipal Airport was a privately owned local airfield that opened in 1929 (Charleston International Airport 2018). The City of Charleston started leasing the Charleston Municipal Airport to the War Department in 1942, which later became the Charleston Army Airfield. The field's initial mission was training air depot groups. Following the war, the newly formed Air Force returned the base to the City of Charleston. Later, in 1952, the City of Charleston signed a Joint Use Lease with the Air Force that initiated construction of the base opposite the local airfield. By 1953, the Air Force started occupying the new base named Charleston Air Force Base.



Legend:

- State Boundary
- County Boundary
- Interstate
- U.S. Highway
- City
- Waterbody
- Park/Recreation Area
- Installation



Source: AFCEC 2017, 2018; Digital Globe 2016; ESRI 2017; FHWA 2017. © Ecology and Environment, Inc. 2018

Today the Air Force owns the runways at JB CHS, which are shared with the Charleston International Airport in one of the longest running civilian/military joint-use agreements with the DoD (Charleston International Airport 2018).

2.3 Mission

JB CHS is one of 12 DoD Joint Bases and is host to over 60 DoD and federal agencies. The 628th ABW is the host unit and delivers installation support to over 90,000 Airmen, Sailors, Soldiers, Marines, Coast Guardsmen, civilians, dependents, and retirees across the installation, including the JB CHS-AB and JB CHS-WS, working together in the pursuit of national security objectives (JB CHS 2015). JB CHS also offers unique installation support missions, including the harbor security patrol, the transportation isolation system, and the Cooper River dredging. The mission consists of six different focus areas: installation support, airlift and airdrop operations, training Naval nuclear operators, deployable logistics, multi-mission warfighter support, and inter-agency cooperation. The 628th ABW's mission is to "deliver installation support to all Joint Base Charleston Mission Partners and mission ready forces to Combatant Commanders" (JB CHS 2018). This AICUZ Study focuses specifically on the flying mission at JB CHS.

2.4 Host and Tenant Organizations

JB CHS hosts various tenants between the JB CHS-AB and the JB CHS-WS. JB CHS-AB hosts the 628th ABW, 437th Airlift Wing, and the 315th Airlift Wing. In addition, the Naval Support Activity, Nuclear Power Training Unit, Naval Nuclear Power Training Command, Naval Health Clinic Charleston, Space and Naval Warfare Systems, Naval Consolidated Brig Charleston, Naval Munition Command Atlantic Unit Charleston, 841st Transportation Battalion, and Army Strategic Logistics Activity are stationed at JB CHS-WS. This AICUZ Study focuses on the tenants stationed at JB CHS-AB, as described in the sections below.

2.4.1 628th Air Base Wing



The 628th ABW serves as the host unit of JB CHS and is comprised of a wing staff directorate and two operational groups (JB CHS 2015). The 628th ABW is comprised of two groups: the 628th Mission Support Group and the 628th Medical Group. The 628th Mission Support Group provides programs, policies, services, and facilities to support personnel in the 628th ABW and both the 437th and 315th Airlift Wings. The wing supports JB CHS's joint-use airfield with Charleston International Airport.

2.4.2 437th Airlift Wing



The 437th Airlift Wing is headquartered at Joint Base Charleston and commands the base's active-duty flying wing (JB CHS 2013). The 437th Airlift Wing provides a large share of Air Mobility Command's Global Reach airlift capability. The wing commands the assigned airlift and supporting units to maintain the assigned C-17 Globemaster III aircraft and load and unload passengers, out-sized equipment, bulk cargo, and

aeromedical evacuation. The 437th Airlift Wing delivers passengers, equipment, and supplies as required via airdrop missions. The 437th Airlift Wing trains and executes the only C-17 Globemaster III special operations capability in the Air Force (JB CHS 2013).

In addition to the airdrop missions and humanitarian support, the 437th Airlift Wing's missions range from supporting U.S. embassies to supplying humanitarian airlift relief to victims of disasters, to special operations, to airdropping forces or vital supplies into the heart of contingency operations in hostile areas. The wing also supports the Denton Amendment program, which provides free space available transportation to non-profit organizations providing humanitarian cargo to other countries (JB CHS 2013).

The 437th Airlift Wing is comprised of two groups: the 437th Operations Group and the 437th Maintenance Group. The 437th Operations Group is charged with the projection of America's global reach through direct delivery, airdrop, and air refueling. The 437th Maintenance Group performs organizational and intermediate-level maintenance on all assigned C-17 aircraft in addition to providing loading and unloading expertise for all cargo and personnel (JB CHS 2013).

2.4.3 315th Airlift Wing



The 315th Airlift Wing, an Air Force Reserve Command, provides a large part of Air Mobility Command's Global Reach airlift capability in conjunction with the 437th active duty Airlift Wing.

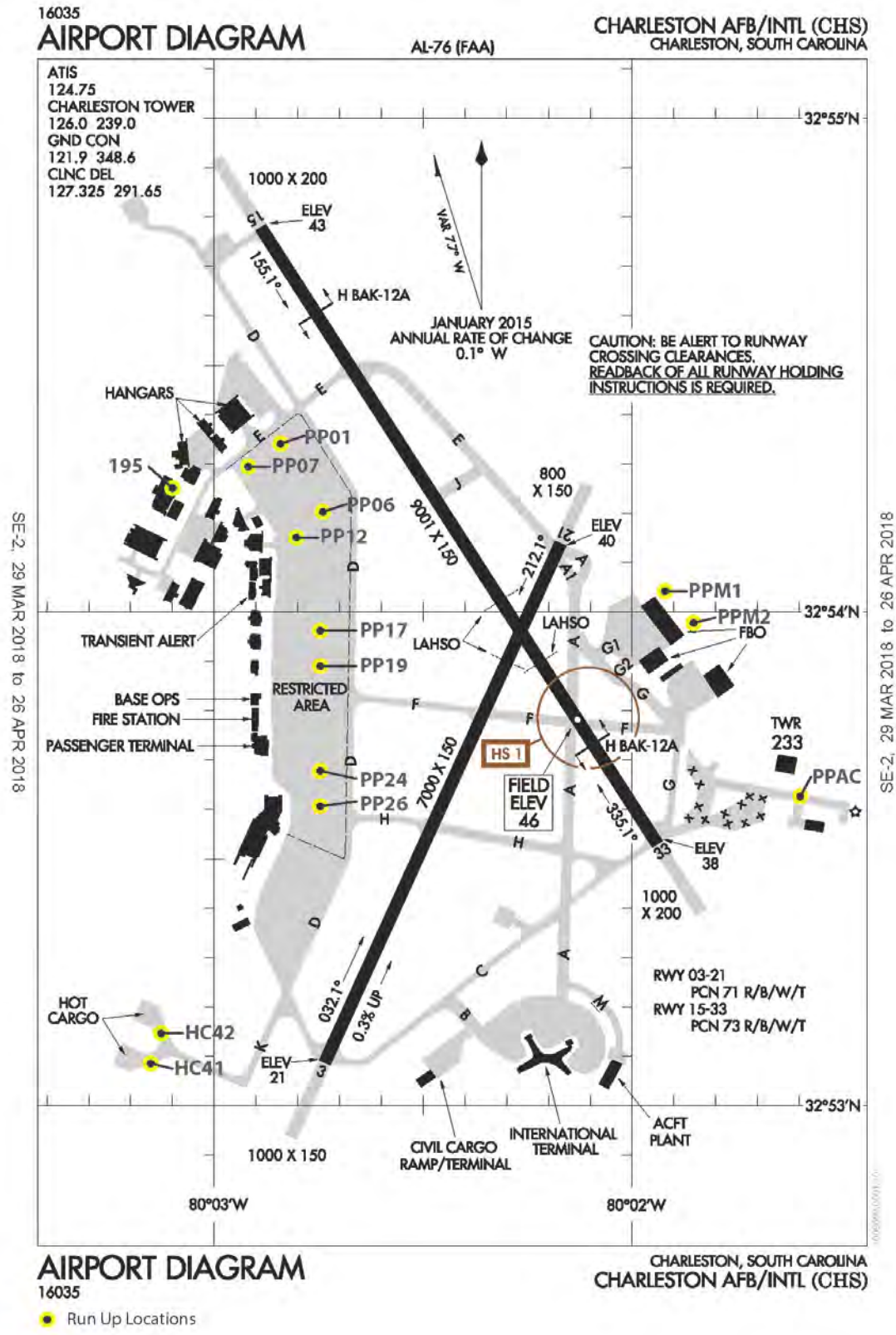
The 315th Airlift Wing provides trained personnel for the active forces in any emergency expansion of the Air Force's strategic and aeromedical airlift capability. The 315th Airlift Wing also conducts peacetime missions and collaborates with the 437th Airlift Wing and the 628th ABW in their normal Air Mobility Command operations and logistics missions (JB CHS 2015).

2.5 Airfield Environment

2.5.1 Joint Base Charleston Air Base

JB CHS's airfield is located at JB CHS-AB (Figure 2-2). JB CHS-AB shares two intersecting runways with Charleston International Airport. The installation owns, operates, and maintains the two runways and most of the taxiways as well as security and crash rescue response for all flights. The primary runway at JB CHS-AB, designated as Runway 15/33, is 9,001 feet long and 150 feet wide. It intersects with the secondary runway, Runway 03/21, which is 7,000 feet long and 150 feet wide.

Figure 2-2. JB CHS-AB Airfield Diagram



Source: Airmav 2018

Through a long-standing joint use agreement with the Charleston County Aviation Authority (CCAA), the 628 ABW provides support for the JB CHS-AB joint-use airfield and shares two intersecting runways with Charleston International Airport, which covers approximately 1,400 acres of Air Force land. The runways at Charleston International Airport are owned by the Air Force and JB CHS and are shared through what is the longest-running civilian/military joint-use agreement of its kind. The agreement defines the rights and responsibilities for maintenance and utilization of the airfield areas.

A runway is typically used in both directions and counted as two separate runways, depending on the direction of the departure. Each direction is labeled as a separate runway and numbered based on its magnetic heading, divided by 10 and rounded to a whole number. Parallel runways have the same heading and are distinguished by the suffix "L" for 'left' and "R" for 'right.'

2.5.2 North Auxiliary Airfield

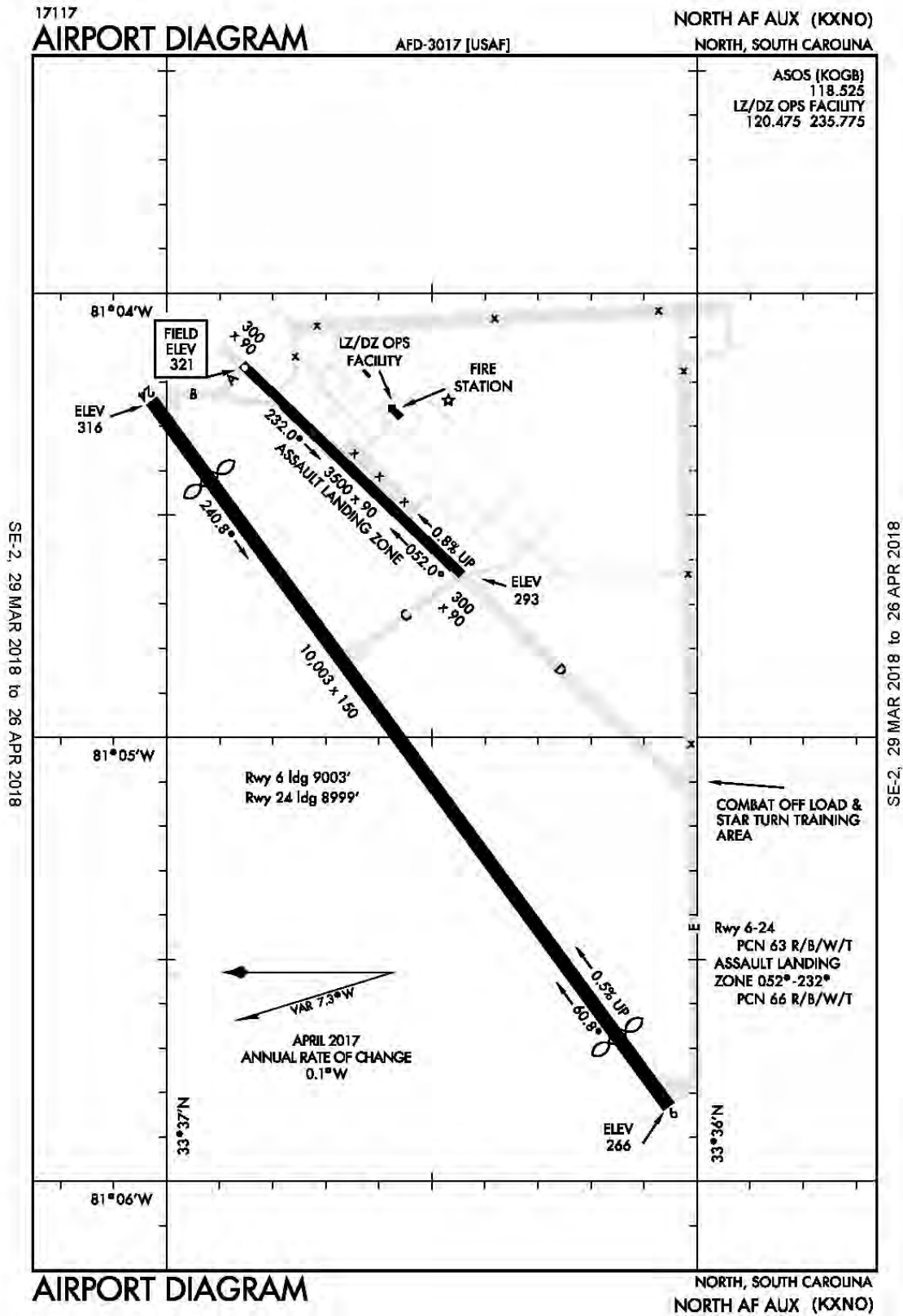
The NAAF is used by aircrews from JB CHS and other military installations to practice takeoffs, landings, and airdrop operations at drop zones on the airfield. The NAAF is located one mile southeast of the town of North, in Orangeburg County, South Carolina. NAAF is comprised of approximately 2,392 acres and has two active runways (Figure 2-3). The main runway is designated as Runway 06/24. Runway 06/24 is 10,003 feet long and 150 feet wide. The secondary runway is designated as Runway 05/23 and is classified by the Air Force as a Landing Zone. Landing Zone 05/23 is 3,500 feet long and 90 feet wide.

2.6 Local Economic Impacts

The military provides direct, indirect, and induced economic benefits to local communities through jobs and wages. Benefits include employment opportunities and increases in local business revenue, property sales, and tax revenue. The annual economic impact of South Carolina's military community on the state is \$24.1 billion. The military's annual economic impact to the Charleston region is \$10.6 billion, supporting approximately 67,108 jobs. This impact includes JB CHS, as well as other military related classifications including the U.S. Coast Guard, the U.S. Army Corps of Engineers, DoD contractors, military retirees and veterans, portions of the South Carolina National Guard, and the U.S. Army Reserve (Von Nessen 2017).

The economic impact of a military installation is based on annual payroll (jobs and salaries), annual expenditures, and the estimated annual dollar value of the 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.

Figure 2-3. NAAF Airfield Diagram



Source: SkyVector 2018

Based on the 2017 Economic Impact of South Carolina’s Military Community, JB CHS, through the 628th ABW, provides installation support to more than 60 DoD and federal agencies serving over 90,000 Airmen, Sailors, Marines, Soldiers, Coast Guardsmen, civilians, dependents, and retirees. It also provides expeditionary Airmen to combatant commanders in support of joint and combined operations. JB CHS’s economic impact extends throughout the state of South Carolina as well as the surrounding Charleston region, specifically.

The total economic impact of JB CHS, specifically on the state of South Carolina, includes all operations, in-state procurement, and military and civilian payroll employment and totals \$8.7 billion in economic activity annually (Von Nessen 2017) (Table 2-1). The 2017 Economic Impact of South Carolina’s Military Community Study also identifies the 10 industrial sectors in South Carolina that are impacted the most by JB CHS (Table 2-2).

Of the \$8.7 billion economic impact that JB CHS has on South Carolina each year, most of the impact is focused within the Charleston region (comprised of Berkeley, Charleston, and Dorchester counties, per the 2017 Economic Impact of South Carolina’s Community Study). The economic impact that Joint Base Charleston has on the Charleston region totals \$6.6 billion and is described in Table 2-3. The 10 industrial sectors in the Charleston region that are impacted the most by JB CHS are highlighted in Table 2-4, along with the annual economic activity with respect to each.

Table 2-1. Economic Impact of Joint Base Charleston on South Carolina

	Employment	Labor Income	Economic Output
Direct Effect	20,653	\$2.1 billion	\$4.5 billion
Multiplier Effect	29,650	\$1.5 billion	\$4.2 billion
Total	50,303	\$3.6 billion	\$8.7 billion

Source: Von Nessen 2017

Table 2-2. Economic Impact of Joint Base Charleston on South Carolina by Industrial Sector

Industrial Sector	Total (in Millions of Dollars)
Computer related services	\$ 629.73
Architectural, engineering, and related services	\$ 459.99
All other professional, scientific, and technical services	\$ 254.98
Imputed rental activity for owner-occupied dwellings	\$ 194.92
Maintenance and repair construction	\$ 182.49
Real estate establishments	\$ 166.75
Insurance carriers	\$ 121.77
Wholesale trade	\$ 113.85
Medical and diagnostic labs and outpatient and other ambulatory care services	\$ 99.77
Hospitals	\$ 89.23

Source: Von Nessen 2017

Table 2-3. Economic Impact of Joint Base Charleston on the Charleston Region

	Employment	Labor Income	Economic Output
Direct Effect	20,653	\$ 2.1 billion	\$ 4.3 billion
Multiplier Effect	26,691	\$ 1.3 billion	\$ 2.3 billion
Total	47,344	\$ 3.4 billion	\$ 6.6 billion

Source: Von Nessen 2017

Table 2-4. Economic Impact of Joint Base Charleston on South Carolina by Industrial Sector

Industrial Sector	Total (in Millions of Dollars)
Computer related services	\$ 477.73
Architectural, engineering, and related services	\$ 348.96
All other professional, scientific, and technical services	\$ 193.43
Imputed rental activity for owner-occupied dwellings	\$ 147.87
Maintenance and repair construction	\$ 138.44
Real estate establishments	\$ 126.50
Insurance carriers	\$ 92.38
Wholesale trade	\$ 86.37
Medical and diagnostic labs and outpatient and other ambulatory care services	\$ 75.69
Hospitals	\$ 67.69

Source: Von Nessen 2017

3.0 Aircraft Operations

Aircraft operations are the primary source of noise associated with a military air installation. The level of noise exposure relates to a number of variables, including the aircraft type, engine power setting, altitude flown, direction of the aircraft, flight track, temperature, relative humidity, frequency, and time of operation (day/night). This chapter discusses the aircraft based at or transient to JB CHS-AB and NAAF, the types and number of operations conducted at the airfields, and the runways and flight tracks used to conduct the operations.

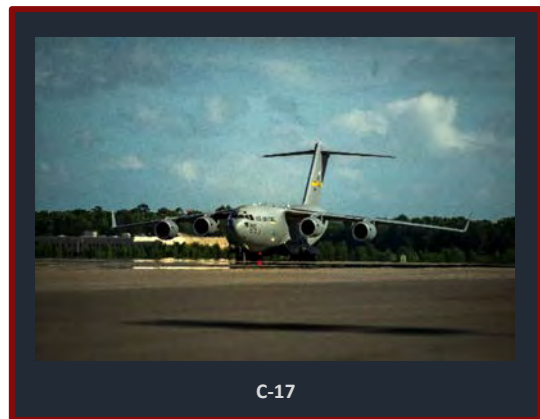
3.1 Aircraft Types

There are two primary types of aircraft operating at JB CHS-AB and NAAF: fixed-wing (propeller-driven and jets) and rotary-wing (helicopters). However, there are only fixed-wing aircraft permanently based at JB CHS-AB, and these are the most common aircraft conducting flight operations at the installation. Aircraft are not permanently based at NAAF; however, based aircraft from JB CHS-AB conduct operations at NAAF on a regular basis.

Aircraft that are not permanently assigned to the installation, but conduct operations from the installation on an occasional basis, are referred to as “transient” aircraft. Both fixed-wing and rotary-wing transient aircraft conduct flight operations at JB CHS-AB and NAAF. Other aircraft at JB CHS-AB also include aircraft that operate from Charleston International Airport. Brief descriptions of assigned aircraft, the most common transient aircraft, and other aircraft at JB CHS-AB and NAAF are provided below.

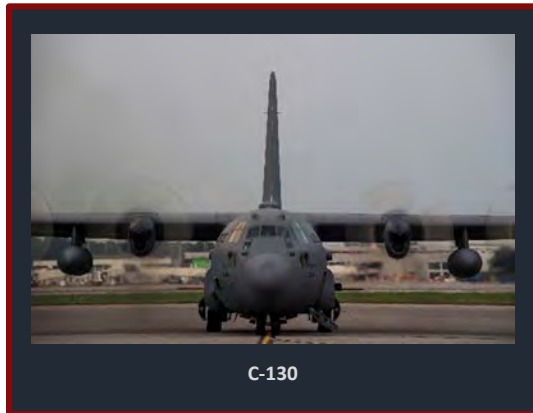
3.1.1 Assigned Aircraft

The C-17 Globemaster III is a cargo aircraft capable of rapid, strategic delivery of troops and all types of cargo to main operating bases or directly to forward bases in the deployment area. The maximum payload capacity of the C-17 is 170,900 pounds, and it has an approximate cruise speed of 450 knots. The C-17 measures 174 feet long with a wingspan of 169 feet, 10 inches. The aircraft is operated by a crew of three: a pilot, co-pilot, and loadmaster (JB CHS 2013).



C-17

3.1.2 Transient Aircraft

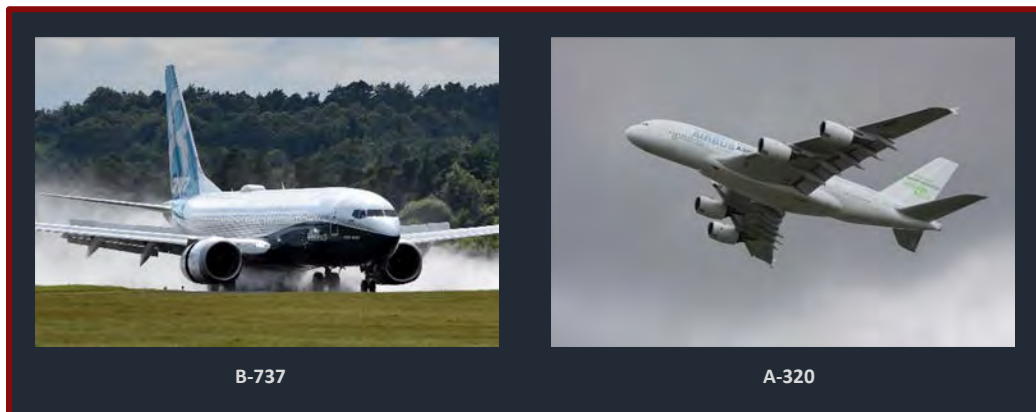


The C-130 Hercules is a four-engine, turboprop, military transport aircraft capable of operating from dirt strips, and it is the prime transport for airdropping troops and equipment into hostile areas. Using its aft loading ramp and door, the C-130 can accommodate a wide variety of oversized cargo, from utility helicopters and six-wheeled armored vehicles, to standard palletized cargo and military personnel. Originally designed for troop transport, it has filled many roles, such as a gunship, airborne assault, search and rescue, scientific research support, weather reconnaissance, aerial refueling, maritime patrol, and aerial firefighting.

3.1.3 Other Aircraft

The Boeing 737 (B-737) is a short- to medium-range twin-engined jet that was developed and manufactured by Boeing Commercial Airplanes in the United States. The B-737 is a common commercial jetliner used worldwide. There have been several series of the B-737, including the original, classic, next generation, business jet, and most recently, the MAX.

Airbus Commercial Aircraft (A-300/A-310/A-320) offers a suite of passenger aircraft commonly used worldwide. The A-300 was the world's first twin-aisle, twin-engine aircraft. The A-310 is a shorter re-winged variant of the A-300. The A-320 is the longest-range single-aisle aircraft and is the most recent addition to this line of aircraft. These aircraft variants are common at Charleston International Airport.



3.2 Maintenance Operations

Maintenance is an integral part of any flying operation and requires a dedicated team of professionals to ensure that units can meet their flying requirements. Two key tasks in maintaining aircraft are low- and high-powered engine maintenance runs.

Aircraft maintainers may conduct engine maintenance runs at power settings ranging from idle to maximum power. Maintainers typically conduct low- to mid-range-powered engine maintenance runs on aircraft parking ramps or just outside of maintenance hangars. High-powered engine maintenance runs are typically conducted in test cells (for out-of-frame engine testing) and in acoustical enclosures, commonly referred to as “hush houses” (i.e., buildings specifically designed to muffle engine noise during in-frame testing). C-17’s don’t use hush houses. They conduct engine run ups at the designated locations within the runway area. Noise associated with these operations is included in the noise analysis for the JB CHS-AB noise contours.

Engine runs are typically conducted during daytime hours; however, due to mission necessity, maintenance engine runs also occur during nighttime hours, between 10:00 p.m. and 7:00 a.m. Maintenance operations are not conducted at NAAF.

3.3 Flight Operations

Flight 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 typical flight operations for aircraft based at or visiting at JB CHS-AB and NAAF.

Each time an aircraft crosses over a runway threshold (the beginning or ending of a runway’s useable surface) to either takeoff, practice an approach, or land, it is counted as a single flight operation. For example, a departure counts as a single operation as does an arrival. As another example, when an aircraft conducts a pattern (a departure followed by an immediate return) it counts as two operations because the aircraft crosses both the approach and departure ends of the runway during the pattern.

This AICUZ Study considers operations from JB CHS-AB and the NAAF. For JB CHS-AB, operations include both based and transient military aircraft, as well as non-based Air Force aircraft and general commercial and civilian aircraft associated with Charleston International Airport. For NAAF, operations reflect aircraft landings, air drops, and air drop recoveries associated with military aircraft primarily aircraft based at JB CHS-AB.

The following list highlights typical operations utilized during normal or increased flight operations. Each flight track utilized is designed to maximize flight operations and, when possible, minimize the effects of noise.

- **Takeoff:** When an aircraft is positioned on the runway, the engine power is set to facilitate movement and eventual flight.

- **Departure:** For the purpose of air traffic sequencing, separation, noise abatement, compliance with avoidance areas, and overall safety of flight, aircraft follow specific ground tracks and altitude restrictions as they depart the airfield's immediate airspace.
- **Straight-In Arrival:** An aircraft performing a straight-in arrival aligns with the runway extended centerline and begins a gradual descent for landing. This type of approach enables an aircraft to maintain a smooth, stable, and steady approach and requires no additional maneuvering.
- **Overhead Break Arrival:** An expeditious arrival using visual flight rules (VFR). The aircraft arrives over the airfield on the runway centerline at a specified point and altitude and then performs a 180-degree "break turn" away from the runway to enter the landing pattern. Once established, the pilot lowers the landing gear and flaps and then performs a second 180-degree descending turn toward the runway centerline to land.
- **Pattern Work:** Pattern work refers to traffic pattern training where the pilot performs takeoffs and landings in quick succession by taking off, flying the pattern, and then landing. A closed pattern consists of two portions, a takeoff/departure and an approach/landing; a complete closed pattern is counted as two operations because the aircraft crosses over a runway threshold twice, once on departure and once on arrival. Traffic pattern training is demanding and utilizes all of the basic flying maneuvers a pilot learns—takeoffs, climbs, turns, climbing turns, descents, descending turns, and straight and level landings.
 - **Low Approach:** A low approach is an approach to a runway that does not result in a landing, but rather a descent towards the runway (usually below 500 feet above ground level [AGL]) followed by a climb-out away from the airfield. Pilots perform low approaches for a number of reasons, including practicing to avoid potential ground obstructions (e.g., vehicles, debris, stray animals).
 - **Touch-and-Go (T&G):** A T&G landing pattern is a training maneuver that involves landing on a runway and taking off again without coming to a full stop. Usually, the pilot then circles the airfield in a defined pattern, known as a circuit, and repeats the maneuver.
 - **Ground Control Approach (GCA):** GCA is a radar or "talk down" approach directed from the ground by an air traffic controller (ATC). ATC personnel provide pilots with verbal course and glide slope information, allowing them to make an instrument approach during inclement weather. The GCA generally utilizes a "box-shaped" flight pattern with four 90-degree turns performed at a set altitude and is used to practice a variety of approach procedures at an airfield."

- **Radar Approach:** Radar approaches are instrument approaches performed with active assistance from ATC during poor weather conditions. ATC personnel direct the aircraft toward the runway centerline. Once established on the centerline, pilots use aircraft instruments to maintain runway alignment and adherence to altitude restrictions until the pilot is able to acquire visual sight with the runway environment. Pilots often practice this type of approach to maintain proficiency.

3.4 Annual Aircraft Operations

3.4.1 Joint Base Charleston Air Base

Table 3-1 provides the number of aircraft operations presented in the 2004 AICUZ Study for JB CHS-AB, including based and transient aircraft. Total annual operations account for each departure and arrival, including those conducted as part of a pattern operation. A total of 121,114 annual flight operations were projected in the 2004 AICUZ Study.

Table 3-2 provides the current annual number of aircraft operations for JB CHS-AB, including based, transient, and other aircraft. Total annual operations account for each departure and arrival, including those conducted as part of a pattern operation. Current annual operations for this 2019 AICUZ Study are 106,137 annual flight operations. Of those annual operations, approximately 28% are military aircraft (based and transient) and 72% are affiliated with commercial aircraft operating at Charleston International Airport.

Current year operations have decreased by 14,977 annual flight operations compared to operations presented in the 2004 AICUZ Study. The reduction in annual operations is attributed to a reduction in based C-17 aircraft operations and an overall reduction in transient aircraft operations. Other aircraft operations affiliated with commercial aircraft and Charleston International Airport operations were similar in both studies.

Table 3-1. 2004 AICUZ Study Annual Aircraft Flight Operations, JB CHS-AB

Aircraft	Departures/Arrivals			Closed Patterns			Totals		
	Day 7AM-10PM	Night 10PM-7AM	Total	Day 7AM-10PM	Night 10PM-7AM	Total	Day 7AM-10PM	Night 10PM-7AM	Total
Based Aircraft									
C-17	8,696	1,186	9,881	18,550	2,530	21,080	27,246	3,715	30,961
Aero Club	1,461	199	1,660	0	0	0	1,461	199	1,660
Transient									
AV-8	320	44	364	3,800	518	4,318	4,120	562	4,681
A-10	104	14	118	0	0	0	104	14	118
C-5	213	29	242	0	0	0	213	29	242
C-9	86	12	98	0	0	0	86	12	98
C-17	163	22	185	0	0	0	163	22	185
C-130	839	114	953	0	0	0	839	114	953
KC-135	332	45	377	0	0	0	332	45	377
C-141	415	57	472	0	0	0	415	57	472
F-16	670	91	761	3,800	518	4,318	4,469	609	5,079
H-60	210	29	239	0	0	0	210	29	239
T-1	347	47	394	335	46	381	682	93	775
T-6	290	40	330	279	38	317	569	78	647
T-37	252	34	286	243	33	276	495	67	562
T-38	199	27	226	190	26	216	388	53	441
Other Aircraft									
Regional Jet	20,266	2,764	23,030	0	0	0	20,266	2,764	23,030
B-737	2,964	404	3,368	0	0	0	2,964	404	3,368
B-757	1,778	242	2,021	0	0	0	1,778	242	2,021
MD-80	1,778	242	2,021	0	0	0	1,778	242	2,021
Dornier 38	4,742	647	5,389	0	0	0	4,742	647	5,389
A-319/320	1,186	162	1,347	0	0	0	1,186	162	1,347
Beech 1900	1,440	196	1,637	0	0	0	1,440	196	1,637
Single Engine	5,400	736	6,136	8,862	1,208	10,070	14,262	1,945	16,206

Table 3-1. 2004 AICUZ Study Annual Aircraft Flight Operations, JB CHS-AB

Aircraft	Departures/Arrivals			Closed Patterns			Totals		
	Day 7AM-10PM	Night 10PM-7AM	Total	Day 7AM-10PM	Night 10PM-7AM	Total	Day 7AM-10PM	Night 10PM-7AM	Total
Twin Engine	3,628	495	4,122	5,957	812	6,770	9,585	1,307	10,892
Turboprop	5,032	686	5,719	0	0	0	5,032	686	5,719
Jet	1,755	239	1,994	0	0	0	1,755	239	1,994
Grand Total	64,566	8,804	73,370	42,014	5,729	47,744	106,580	14,534	121,114

Source:

2004 AICUZ Study, translated to Average Annual Day based on the annual aircraft operations estimate provided in the AICUZ Study, Section 3.2.

Notes:

Annual operations are estimates based on average busy day operations provided in 2004 AICUZ Study and discrepancies in totals are a result of rounding. Arrivals/Departures not broken out in 2004 AICUZ Study data.

Table 3-2. Current Annual Aircraft Flight Operations for AICUZ Noise Contours, JB CHS-AB

Aircraft	Departures			Arrivals			Closed Patterns			Totals		
	Day 7AM- 10PM	Night 10PM-7AM	Total	Day 7AM-10PM	Night 10PM-7AM	Total	Day 7AM-10PM	Night 10PM-7AM	Total	Day 7AM-10PM	Night 10PM-7AM	Total
Based Aircraft												
C-17	3,721	1,018	4,739	3,318	1,421	4,739	10,280	3,428	13,708	17,319	5,867	23,186
Transient Aircraft												
C-130	227	6	233	227	6	233	0	0	0	454	12	466
C-17	2,707	71	2,778	2,707	71	2,778	0	0	0	5,414	142	5,556
C-5	22	1	23	22	1	23	0	0	0	44	2	46
KC-10	35	1	36	35	1	36	0	0	0	70	2	72
KC-135	55	1	56	55	1	56	0	0	0	110	2	112
Misc	28	1	29	28	1	29	0	0	0	56	2	58
Other Aircraft												
A300, A310, A320	6,463	763	7,226	6,463	763	7,226	0	0	0	12,926	1,526	14,452
B737, E135, E190	7,916	1,557	9,473	7,916	1,557	9,473	0	0	0	15,832	3,114	18,946
B747, B757, B787	433	402	835	433	402	835	0	0	0	866	804	1,670
MD-81, MD-90	3,247	670	3,917	3,247	670	3,917	0	0	0	6,494	1,340	7,834
BE40, C56X, LJ45	4,773	340	5,113	4,773	340	5,113	0	0	0	9,546	680	10,226
AC90, B350, E110	433	21	454	433	21	454	0	0	0	866	42	908
Single Engine	3,445	220	3,665	3,445	220	3,665	6,891	439	7,330	13,781	879	14,660
Twin Engine	1,740	167	1,907	1,740	167	1,907	3,481	334	3,815	6,961	668	7,629
Helo	158	0	158	158	0	158	0	0	0	316	0	316
Grand Total	35,403	5,239	40,642	35,000	5,642	40,642	20,652	4,201	24,853	91,055	15,082	106,137

Source: AFCEC- Noble 2018.

Notes:

Departure = Standard/MIL

Arrivals = IFR/Straight in and Formation Approach

Closed Pattern = VFR, IFR and TACAN

3.4.2 North Auxiliary Airfield

Table 3-3 provides the number of aircraft operations presented in the 2004 AICUZ Study for NAAF, including based and transient aircraft. Total annual operations account for each departure and arrival, including those conducted as part of a pattern operation. A total of 86,227 annual flight operations were projected in the 2004 AICUZ Study.

Table 3-4 presents the current annual aircraft operations for NAAF, including based and transient aircraft. Total annual operations account for each departure and arrival, including those conducted as part of a pattern operation. Current annual operations for this 2019 AICUZ Study are 52,540 annual flight operations.

Current year operations have decreased by 33,687 annual flight operations compared to operations presented in the 2004 AICUZ Study. The reduction in annual operations is attributed to a reduction in JB CHS-AB based C-17 aircraft operations and an overall reduction in transient aircraft operations.

Table 3-3. 2004 AICUZ Study Annual Aircraft Flight Operations, NAAF

Aircraft	Departures/Arrivals			Closed Patterns			Totals		
	Day 7AM-10PM	Night 10PM-7AM	Total	Day 7AM-10PM	Night 10PM-7AM	Total	Day 7AM-10PM	Night 10PM-7AM	Total
Based Aircraft (JB CHS-AB)									
C-17	8,383	9,841	18,224	25,634	30,092	55,727	34,017	39,933	73,951
Transient									
C-5	45	52	97	244	286	529	288	338	626
C-17	1,224	1,437	2,661	2,203	2,586	4,789	3,427	4,023	7,449
C-130	132	155	287	1,523	1,788	3,311	1,655	1,943	3,598
CH-53	22	26	48	255	299	554	277	325	602
Grand Total	9,806	11,511	21,317	29,858	35,051	64,910	39,664	46,562	86,227

Source:

2004 AICUZ Study, translated to Average Annual Day based on the annual aircraft operations estimate provided in the AICUZ Study, Section 3.2.

Notes:

Annual operations are estimates based on average busy day operations provided in 2004 AICUZ Study and discrepancies in totals are a result of rounding. Arrivals/Departures not broken out in 2004 AICUZ Study data.

Table 3-4. Current Annual Aircraft Flight Operations for AICUZ Noise Contours, NAAF

Aircraft	Departures			Arrivals			Closed Patterns			Totals		
	Day 7AM-10PM	Night 10PM-7AM	Total	Day 7AM-10PM	Night 10PM-7AM	Total	Day 7AM-10PM	Night 10PM-7AM	Total	Day 7AM-10PM	Night 10PM-7AM	Total
Based Aircraft (JB CHS-AB)												
C-17	828	972	1,800	828	972	1,800	13,248	15,552	28,800	14,904	17,496	32,400
Transient Aircraft												
C-17	354	416	770	354	416	770	4,250	4,990	9,240	4,959	5,821	10,780
Helicopters	101	119	220	101	119	220	2,024	2,376	4,400	2,226	2,614	4,840
C-130	101	119	220	101	119	220	1,619	1,901	3,520	1,822	2,138	3,960
C-5	18	22	40	18	22	40	221	259	480	258	302	560
Grand Total	1,403	1,647	3,050	1,403	1,647	3,050	21,362	25,078	46,440	24,168	28,372	52,540

Source: AFCEC – Noble 2018.

Discrepancies in total are a result of rounding from calculations for the day/night split.

3.5 Runway Utilization and Flight Tracks

3.5.1 Runway Utilization

The frequency with which aircraft utilize a runway involves a variety of factors including, but not limited to:

- Airfield environment (layout, lights, runway length);
- Direction of prevailing winds;
- Location of natural terrain features (rivers, lakes, mountains, and other features);
- Wildlife activity;
- Number of aircraft in the pattern; and/or
- Preference of a runway for the purpose of safety and noise abatement.

Installation Operations, ATC personnel, and the Supervisor of Flying establish the runway in use. Aviation planners adjust the pattern procedures accordingly to maximize air traffic flow efficiency. Table 3-5 lists how frequently each runway at JB CHS-AB is used, and Table 3-6 lists runway usage for NAAF.

Table 3-5. Runway Usage and Departure Routing, JB CHS-AB

Runway Direction	Arrival (percent)	Departure (percent)	Closed Pattern
RWY 03	24	24	14
RWY 15	26	26	37
RWY 21	25	25	14
RWY 33	25	25	35

Sources:

Noble 2018.

Operations Data for JB CHS-AB spreadsheet.

Table 3-6. Runway Usage and Departure Routing, NAAF

Runway Direction	Arrival (percent)	Departure (percent)	Closed Pattern
RWY 24	40	73	19
RWY 06	20	19	9
RWY 05	4	0	10
RWY 23	28	0	57
Drop Zone	8	8	5

Sources:

Noble2018.

Operations Data for JB CHS-AB spreadsheet.

3.5.2 Flight Tracks

Each runway has designated flight tracks that provide for the safety, consistency, and control of an airfield. Flight tracks depict where aircraft fly in relation to an airfield. They are designed for departures, arrivals, and for pattern work procedures, and are designated for each runway to facilitate operational safety, noise abatement, air crew consistency, and the efficient flow of air traffic within the tower's controlled airspace. Aircraft flight tracks are not set "highways in the sky." While we show flight tracks as lines on the map, they are actually bands. Aircraft de-confliction, configuration, pilot technique, takeoff weight, and wind all affect the actual path taken on any given flight.

Figures 3-1, 3-2, and 3-3 present the departure, arrival, and closed pattern flight tracks for JB CHS-AB. Figures 3-4, 3-5, and 3-6 present the flight tracks for NAAF.

3.6 Noise Abatement

The Air Force recognizes that noise from military operations may cause concern for people living near military installations.

For this reason, the Air Force has established a Noise Program aimed at reducing and controlling the emission of noise and vibrations associated with the use of military aircraft, weapon systems, and munitions while maintaining operational requirements. The result is the implementation of various strategies, techniques and procedures, documented under the JB CHS-AB and NAAF Noise Abatement Program that are aimed at protecting persons and structures from the harmful effects of noise and vibrations.

JB CHS-AB noise abatement procedures include the following:

- Restrictions on approaches over the city of Charleston because there are a number of properties listed on the National Register of Historic Places (NRHP). For example, Drayton Hall, a colonial plantation near the base, is not overflown due to potential noise impacts;
- Establishing a 2,000-foot minimum pattern altitude;
- Prohibiting, when possible, all overflights of identified historic sites and hospitals;
- Limiting maximum-power takeoffs;
- Prohibiting the practice of circling approaches (600 feet AGL) between 11:00 p.m. and 7:00 a.m.;
- When possible, approach and departure practice operations are conducted during the day when noise disruptions are less evident than they would be during the evening or nighttime hours; and

-
- Flight pattern altitudes and runway approach angles have been adjusted over the years in an effort to reduce noise impacts while maintaining safe operations. (437th Airlift Wing, n.d.)

NAAF noise abatement procedures include the following:

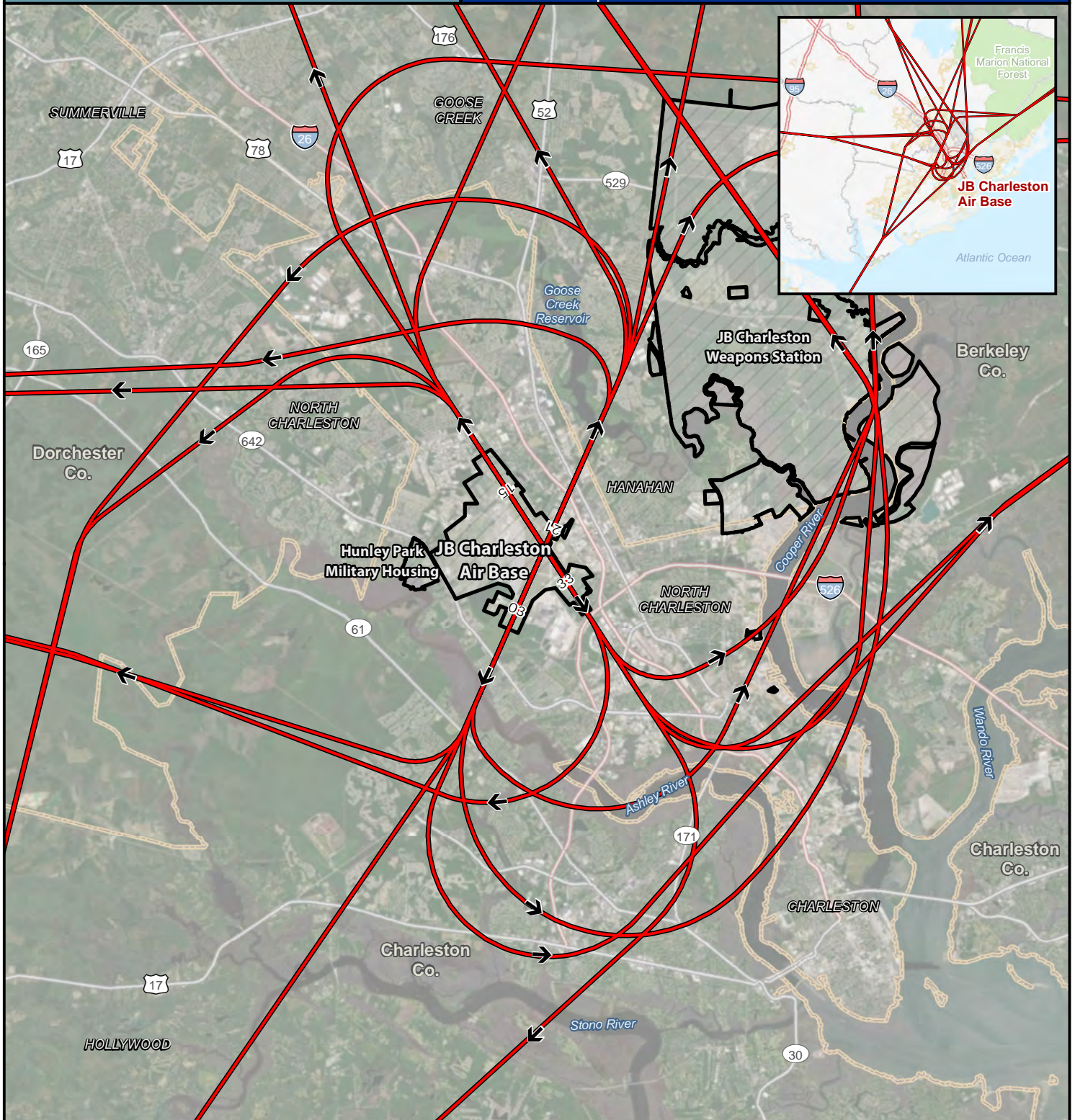
- Prohibiting flying over the town of North below 2,000 feet AGL.

Installation leadership periodically reviews flight operations and their potential impact on surrounding communities. This requirement facilitates the planning, designation, and establishment of flight tracks over sparsely populated areas and/or waterways as often as practicable to balance operational safety and reduce noise exposure levels in surrounding communities.

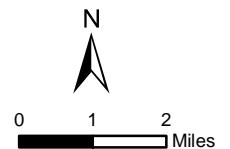
3.7 Noise Complaints

At times, military operations may generate noise complaints. The Air Force evaluates all noise complaints to ensure future operations, when possible, do not generate unacceptable noise. Concerned citizens are encouraged to contact the JB CHS Public Affairs (PA) Office with any noise complaints. You can reach the PA Office at (843) 963-5608 or the PA Community Engagement section at (843) 963-5535. Noise complaints can also be sent to the base via email at 628.abw.pa@us.af.mil.

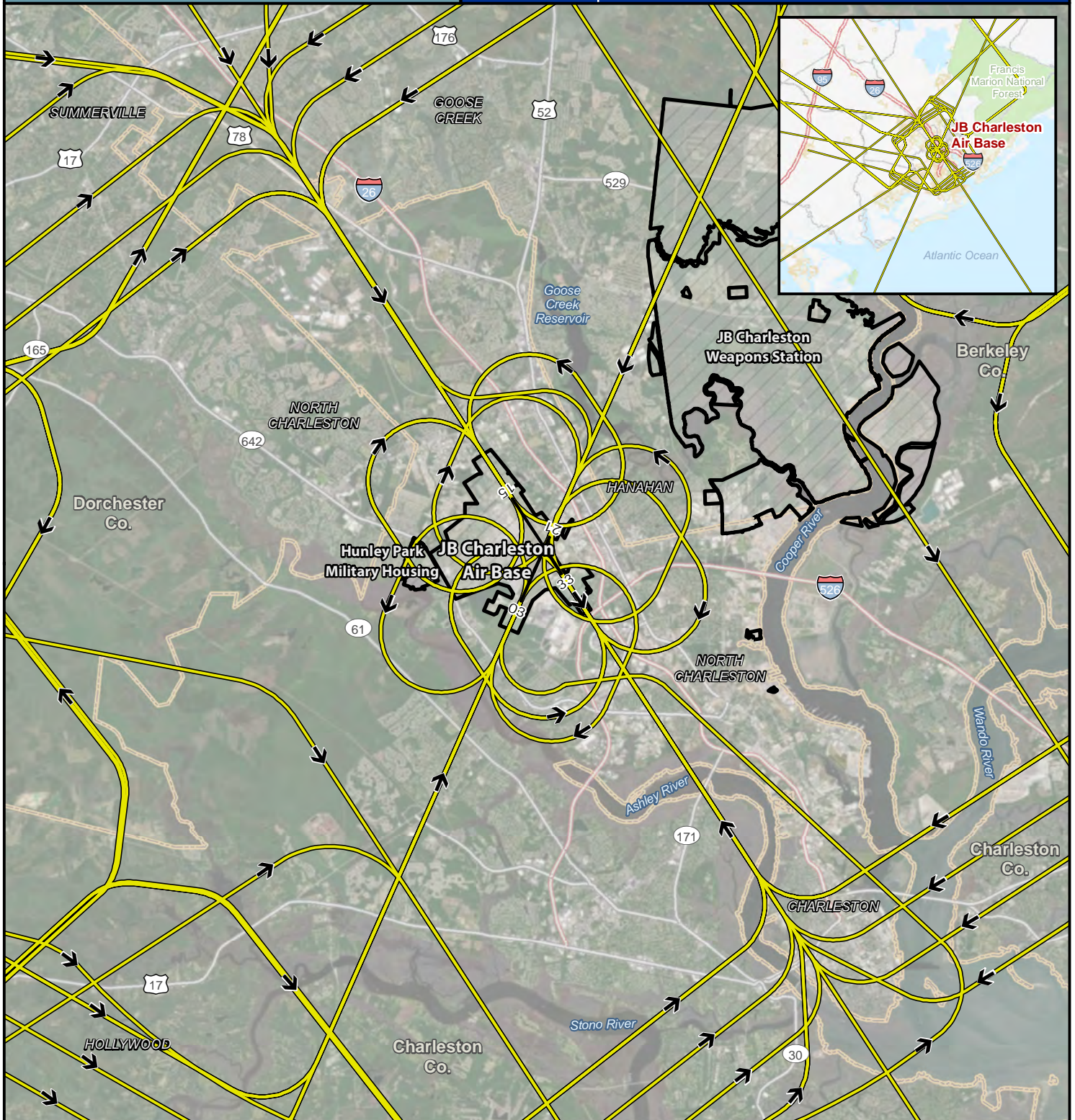
When noise complaints are filed with the base, a Noise Complaint Worksheet is filled out for review and noise tracking purposes. This worksheet includes the caller's information, a description of the event and the aircraft involved, along with comments from on-base reviewers and the ultimate resolution received. JB CHS does not typically receive a high volume of noise complaints.









- Legend:**
- County Boundary
 - Interstate
 - U.S./State Highway
 - Runway
 - Departure Flight Track
 - Installation

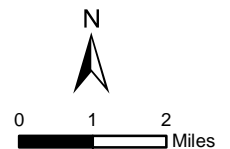


Source: AFCEC 2017, 2018; Digital Globe 2016; ESRI 2017; FHWA 2017. © Ecology and Environment, Inc. 2019

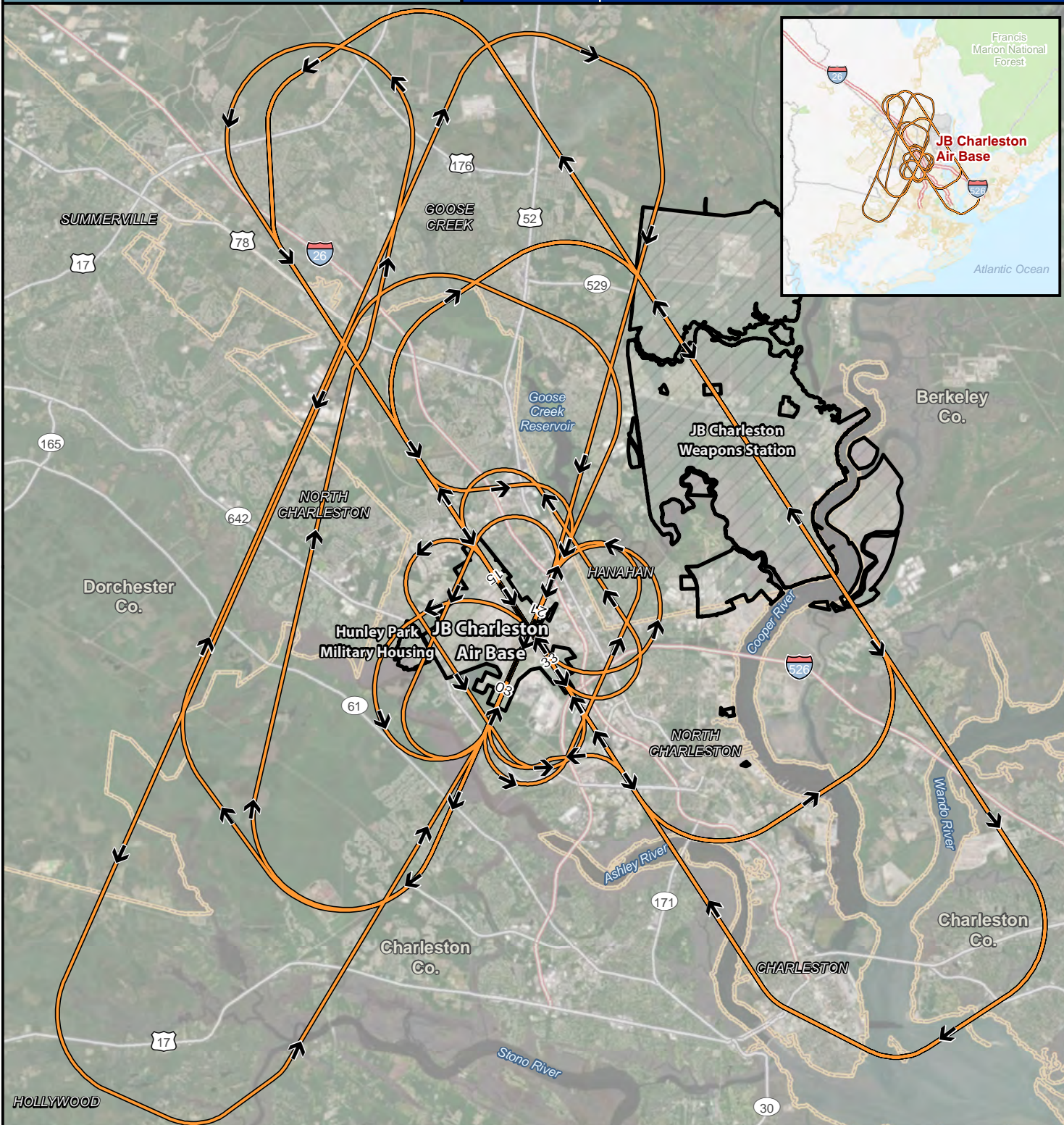


Legend:

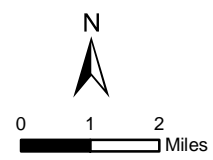
-  County Boundary
-  Interstate
-  U.S./State Highway
-  Runway
-  Arrival Flight Track
-  Installation



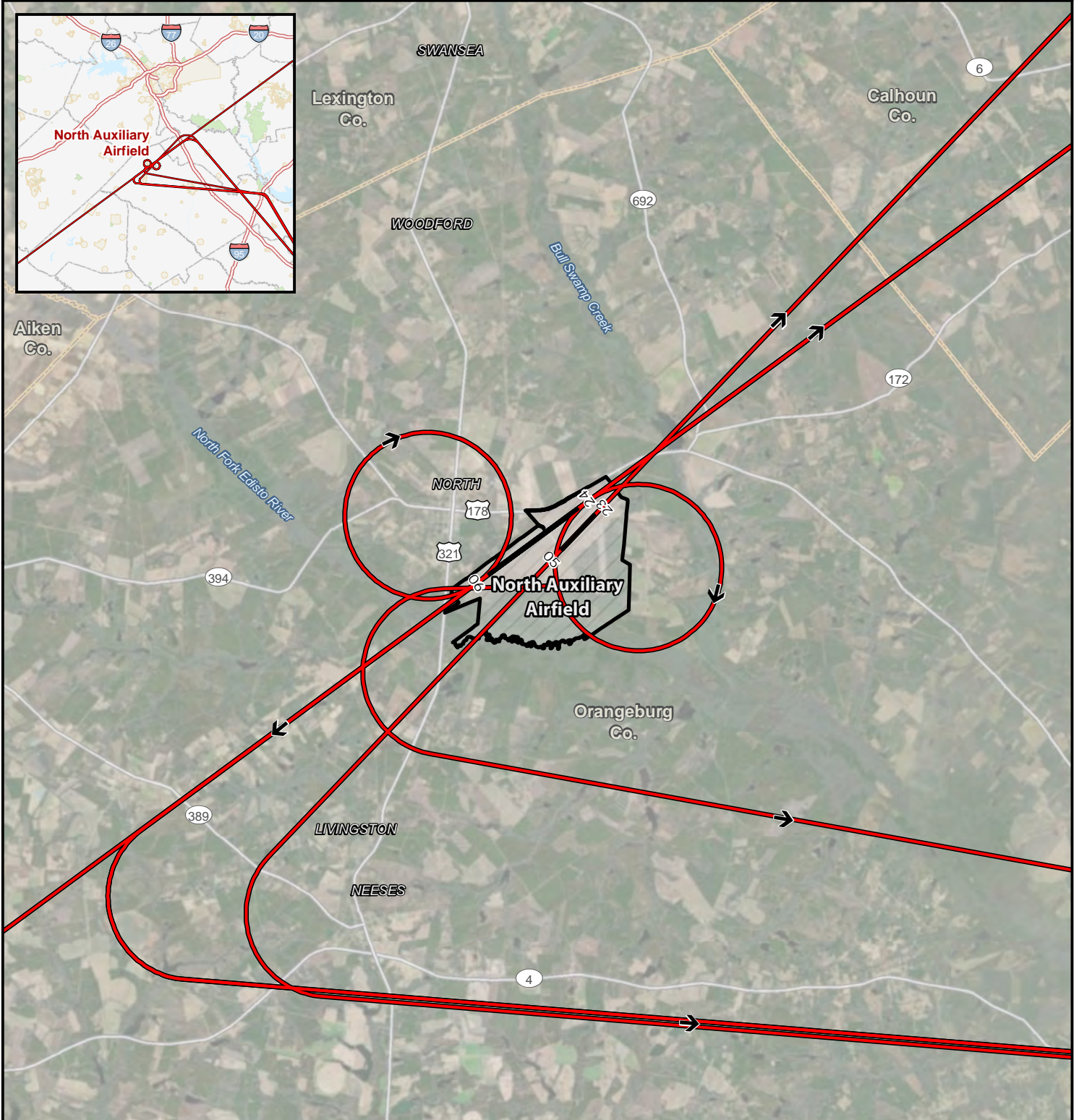
Source: AFCEC 2017, 2018; Digital Globe 2016; ESRI 2017; FHWA 2017. © Ecology and Environment, Inc. 2019








- Legend:**
- County Boundary
 - Interstate
 - U.S./State Highway
 - Runway
 - Closed Pattern Flight Track
 - Installation

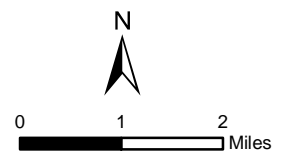


Source: AFCEC 2017, 2018; Digital Globe 2016; ESRI 2017; FHWA 2017. © Ecology and Environment, Inc. 2019

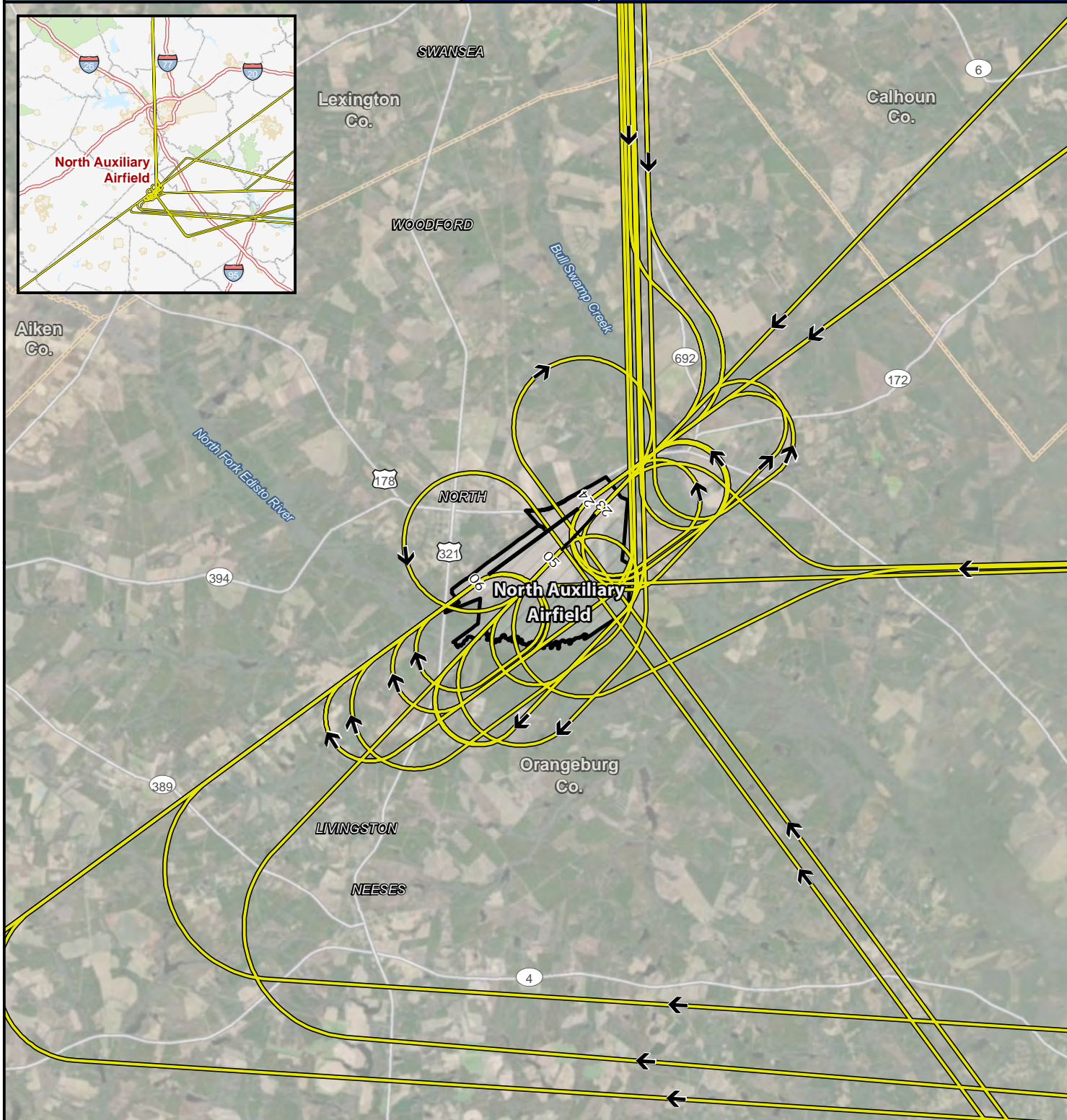


Legend:



-  County Boundary
-  U.S./State Highway
-  Runway
-  Departure Flight Track
-  Installation

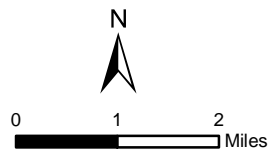


Source: AFCEC 2017, 2018; Digital Globe 2017; ESRI 2017.
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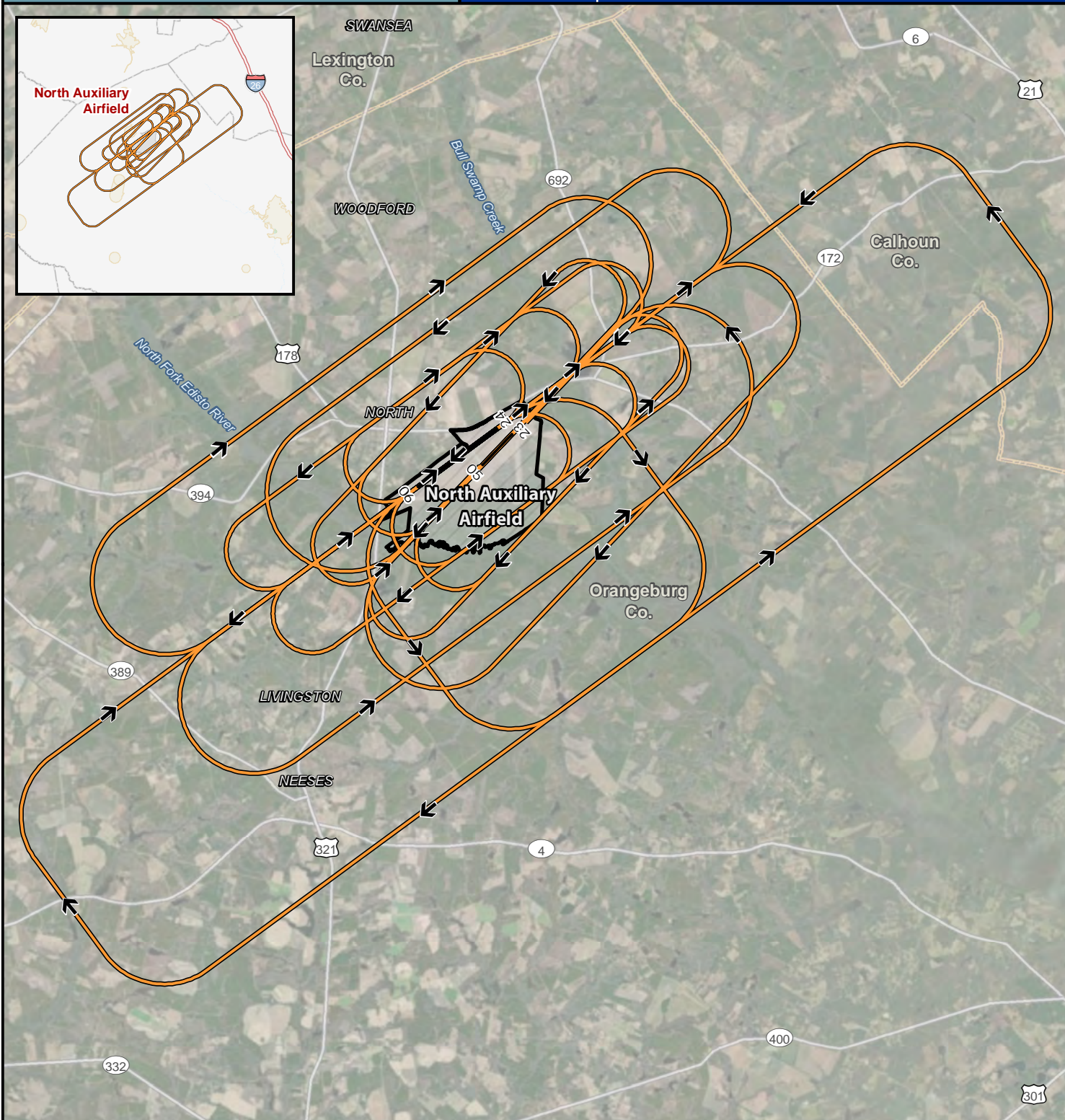


Legend:



-  County Boundary
-  U.S./State Highway
-  Runway
-  Arrival Flight Track
-  Installation

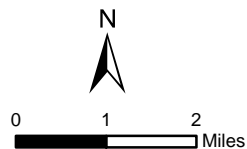


Source: AFCEC 2017, 2018; Digital Globe 2017; ESRI 2017.
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Legend:

-  County Boundary
-  U.S./State Highway
-  Runway
-  Closed Pattern Flight Track
-  Installation



Source: AFCEC 2017, 2018; Digital Globe 2017; ESRI 2017.
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4.0 Aircraft Noise

Terrain features, weather phenomena, man-made structures, and daily life activity contribute to noise exposure.

How an installation manages aircraft noise can play a key role in shaping its relationship with neighboring communities. Ideally, aircraft noise and its management should be key factors in local land use planning. Because noise from aircraft may affect areas around the installation, the Air Force has defined noise zones using the guidance provided in the AICUZ Instruction (AFI 32-7063).

While the level of noise produced by aircraft may have a direct effect on communities in proximity to military air installations, other factors also influence the noise impact. An airfield's layout (its buildings, parking ramps, and runways), type of aircraft, natural terrain features, weather phenomena, and daily activities all influence the levels of noise that the community experiences.

4.1 What is Sound/Noise?

Sound consists of vibrations in the air. A multitude of sources can generate these vibrations, including roadway traffic, barking dogs, radios—or aircraft operations. We call these vibrations 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 your eardrum at a certain rate and intensity, you 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.

Sound becomes noise when it interferes with normal activities.

- **Intensity** or loudness relates 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 we perceive the pitch of the sound. 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 we may refer to A-weighted decibels as “dBA”, if it is the only weighting being discussed, the “A” is generally dropped.
- **Duration** is the length of time one can detect the sound.

4.2 How Sound is Perceived

The loudest sounds that the human ear can comfortably hear are a trillion times higher in intensity than those of sounds we barely hear. Because such large numbers become awkward to use, we measure noise in decibels (dB), which uses a logarithmic scale.

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 can cause discomfort inside the ear, while sound levels between 130 and 140 dB are felt as pain.

Figure 4-1. Typical A-weighted Sound Levels of Common Sounds

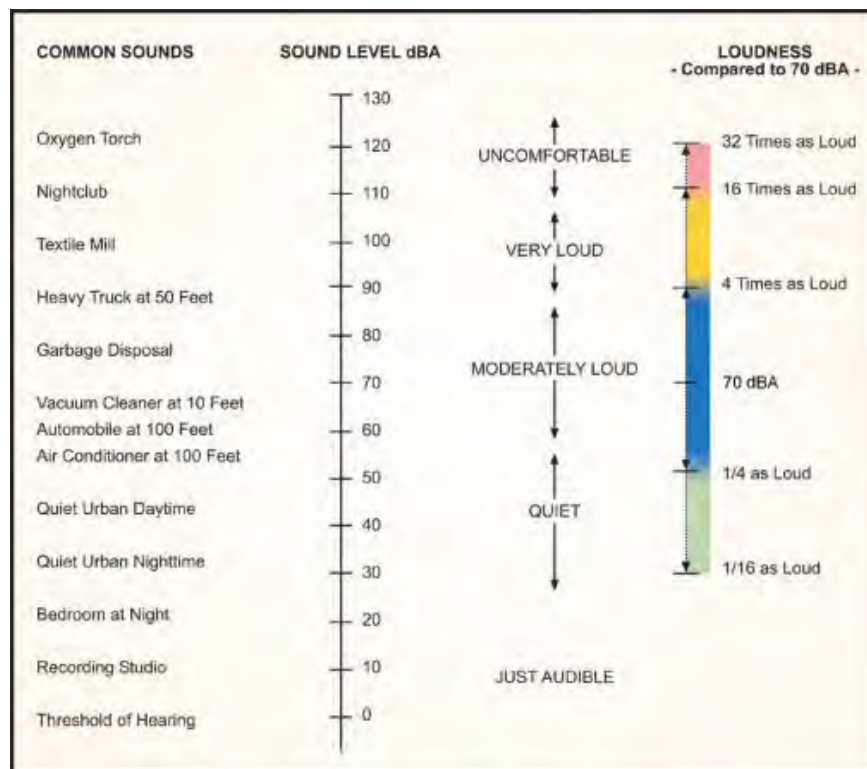


Table 4-1 shows the subjective responses with change in (single-event) sound level. While noise energy doubles or halves with every 3-dB change, we do not perceive all this noise energy. It takes a 10 dB increase or decrease for our ears to perceive a doubling or halving of loudness.

Table 4-1. Subjective Response to Changes in Sound Level

Change in Sound Level	Change in Loudness
20 dB	Striking 4-fold Change
10 dB	Dramatic 2-fold or Half as Loud
5 dB	Quite Noticeable
3 dB	Barely Perceptible
1 dB	Requires Close Attention to Notice

4.3 The Day-Night Average Sound Level

When people 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 20? 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 2:00 p.m. or at 2:00 a.m., when the ambient noise is low and most people are sleeping?

The length and number of events—the total noise energy—and the time of day that a noise event takes place play key roles in our perception of noise. To reflect these concerns, the Air Force uses a metric called the “Day-night Average Sound Level” (DNL). DNL was created by the United States Environmental Protection Agency (EPA) and is used throughout the United States.

DNL, when used as a metric for aircraft noise, represents the accumulation of noise energy from all aircraft noise events in a 24-hour period. Additionally, for all operations between 10:00 p.m. and 7:00 a.m., DNL adds a 10-dB penalty to each event to account for the intrusiveness of nighttime operations. As is implied in its name, the DNL represents the noise energy present in a daily period. However, because aircraft operations at military airfields fluctuate from day to day, the Air Force typically bases DNL on a year’s worth of operations and represents the annual average daily aircraft events.

DNL is not a level heard at any given time, but represents long-term exposure. Scientific studies have found good correlation between the percentages of groups of people highly annoyed by sounds and the level of average noise exposure measured in DNL.

4.4 Noise Contours

The Air Force develops noise contours, as needed, to assess the compatibility of aircraft operations with surrounding land uses. Noise contours connect points of equal value, just as contours on topographic maps connect points of equal elevation. This AICUZ Study presents the historical and current year noise contours. The Air Force utilizes NOISEMAP, the DoD standard model for assessing noise exposure from military aircraft operations at air installations. Noise contours, when overlaid on local land use maps, can help to

identify areas of incompatible land use and assist communities in planning for future development around an air installation.

4.4.1 Current Year Contours

This AICUZ Study provides current year noise contours. Planning by local land use authorities involves strategies that influence present and future uses of land. Due to the nature of this planning, the Air Force provides contours for local land use authorities to consider in their planning practices.

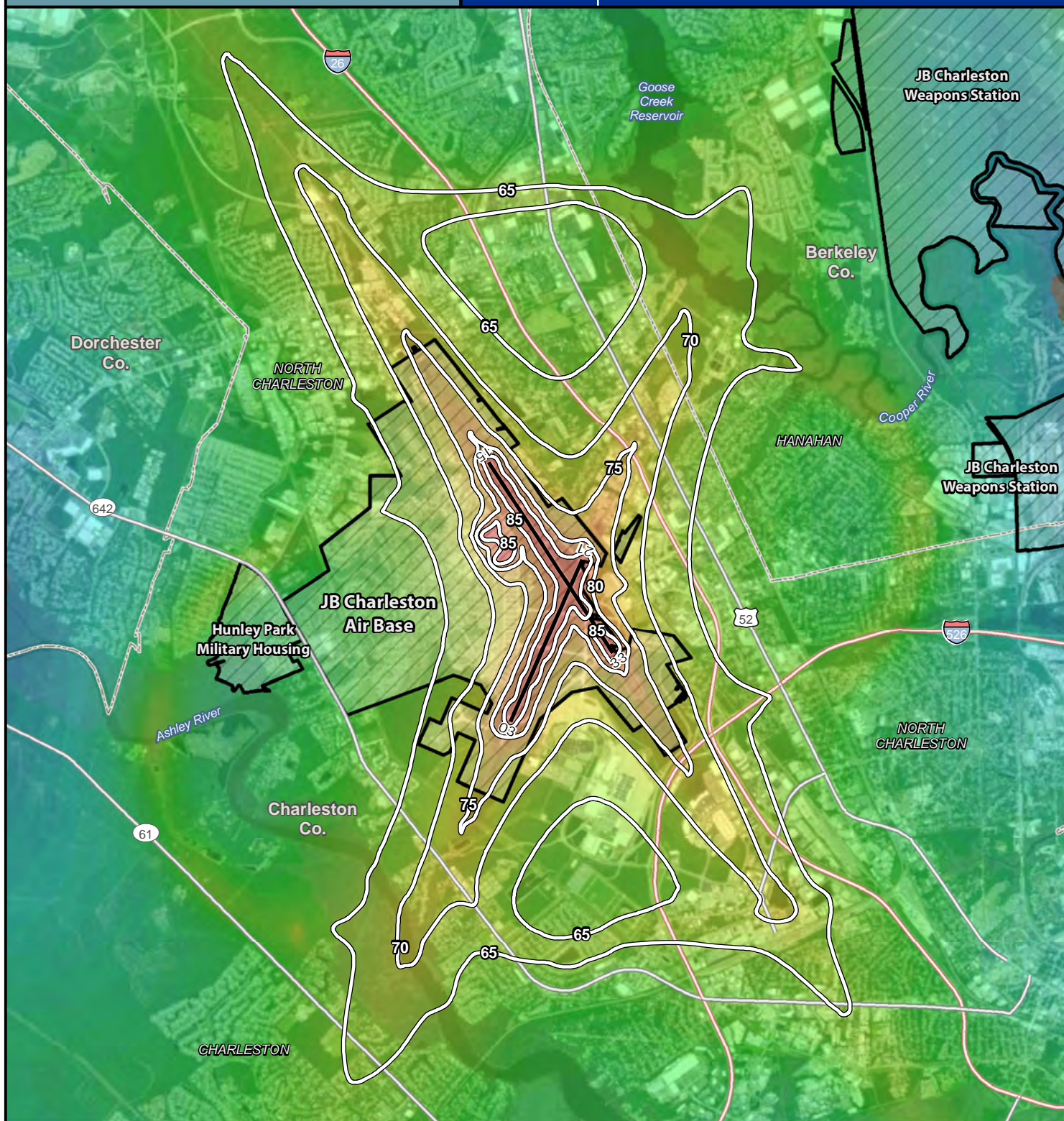
4.4.2 JB CHS-AB Noise Contours

The 2019 AICUZ noise contours for JB CHS-AB (Figure 4-2) are based on current year operations (Table 3-2). The C-17 is the main military aircraft that contributes to the 2019 AICUZ contours. The current noise contours are largely influenced by commercial aircraft operations from Charleston International Airport.

The 65 dB DNL noise contour extends beyond the northern boundary of the installation approximately 2.5 miles to the northeast into Berkeley County and 2.6 miles to the northwest within Charleston County. It also stretches out to the southwest approximately 2.4 miles and southeast 2.4 miles within Charleston County.

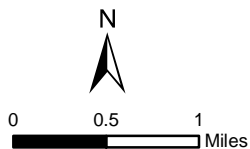
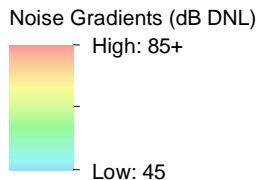
The 75 dB DNL noise contour extends beyond the installation boundary 0.5 miles to the northeast, 0.1 miles to the northwest, 0.3 miles to the southwest, and 0.2 miles to the southeast.

Figure 4-3 shows a comparison of the 2019 and the 2004 AICUZ noise contours for JB CHS-AB. In general, the noise contours are similar in size and shape, with the 2019 AICUZ contours being only slightly smaller. This is due, in part, to a decrease of 14,977 operations. In addition, the noise contours that were shown in a curve off Runway 33 and Runway 15 are no longer present in the 2019 AICUZ contours due to changes in flight tracks.

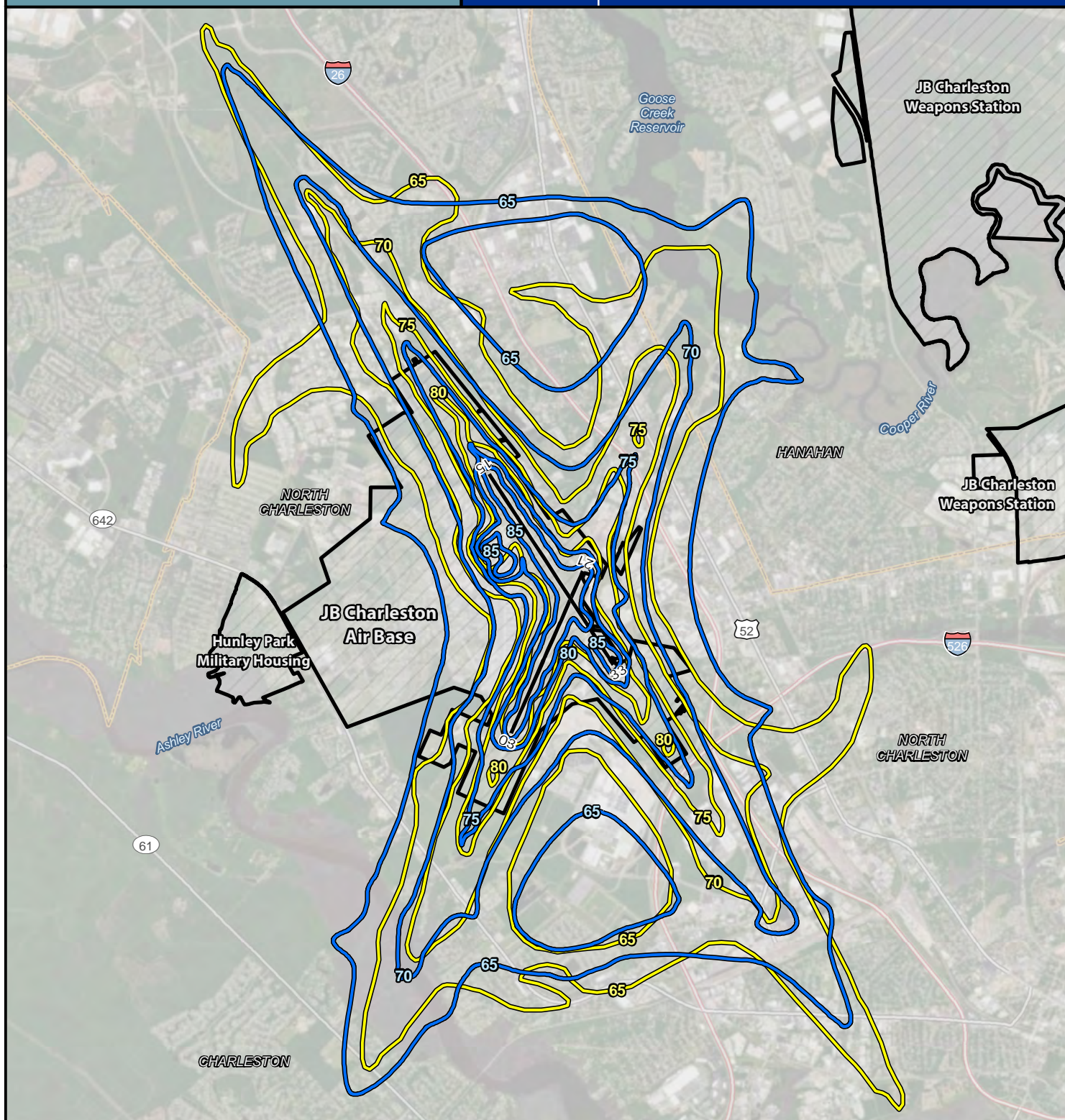


Legend:

- County Boundary
- Interstate
- U.S./State Highway
- Runway
- Installation
- 2019 AICUZ Noise Contour (dB DNL)

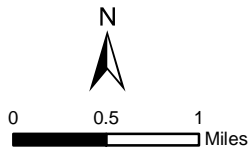


Source: AFCEC 2017, 2018; Digital Globe 2016; ESRI 2017; FHWA 2017. © Ecology and Environment, Inc. 2018



Legend:

- County Boundary
- Interstate
- U.S./State Highway
- Runway
- Installation
- 2019 AICUZ Noise Contour (dB DNL)
- 2004 AICUZ Noise Contour (dB DNL)



Source: AFCEC 2017, 2018; Digital Globe 2016; ESRI 2017; FHWA 2017. © Ecology and Environment, Inc. 2019

Table 4-2 presents the off-installation land acreage and estimated population within the 2019 AICUZ contours for JB CHS-AB. The Air Force generates population estimates on 2016 Census block-level data, using a geometric proportion method 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-installation Land Area and Estimated Population within Noise Zones for the 2019 AICUZ Noise Contours, JB CHS-AB

Noise Zone (dB DNL)	Acres	Estimated Population
65-69	5,094	12,746
70-74	1,789	4,229
75-79	194	373
80-84	21	8
85+	3	1
Total (65+)	7,101	17,357

Source: United States Census Bureau 2016

Note:

¹ Population is estimated using a geometric proportion method 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 shows that the 65-59 dB DNL noise zone encompasses the most area outside of the installation boundary (5,094 acres) and largest population (12,746 people), when compared to the other noise zones. The 70-74 dB DNL noise zone covers the second largest off-installation area (1,789 acres) and population (4,229 people). There are 194 acres and an estimated 373 people in the 75-79 dB DNL noise zone. Approximately 24 acres and nine people are exposed to DNLs greater than or equal to 80 dB.

4.4.3 NAAF Noise Contours

The 2019 AICUZ noise contours for NAAF (Figure 4-4) are based on current year operations (Table 3-4). The C-17 is a main contributor to the 2019 AICUZ contours.

The 65 dB DNL noise contours fall within Orangeburg County and extend beyond the northern boundary of the installation approximately 2.9 miles to the northeast and 2.3 miles to the southwest. It also stretches out to the south approximately 0.7 miles and to the north 0.2 miles.

The 75 dB DNL noise contour is within the installation boundary, except to the northeast where it extends beyond the installation boundary 1.2 miles and borders the installation boundary to the north.

Figure 4-5 shows a comparison of the 2019 and the 2004 AICUZ noise contours for NAAF. In general, the noise contours have decreased in overall size. This is due, in part, to a decrease of 33,687 operations. The most notable change is the elimination of the noise contours associated with the GCA closed pattern operation on Runway 06/24 and an associated reduction in closed pattern operations since the 2004 AICUZ Study.

Table 4-3 presents the off-installation land acreage and estimated population within the 2019 contours for NAAF. The Air Force generates population estimates on 2016 Census block-level data, using a geometric proportion method 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 4-3. Off-installation Land Area and Estimated Population within Noise Zones for the 2019 AICUZ Noise Contours, NAAF

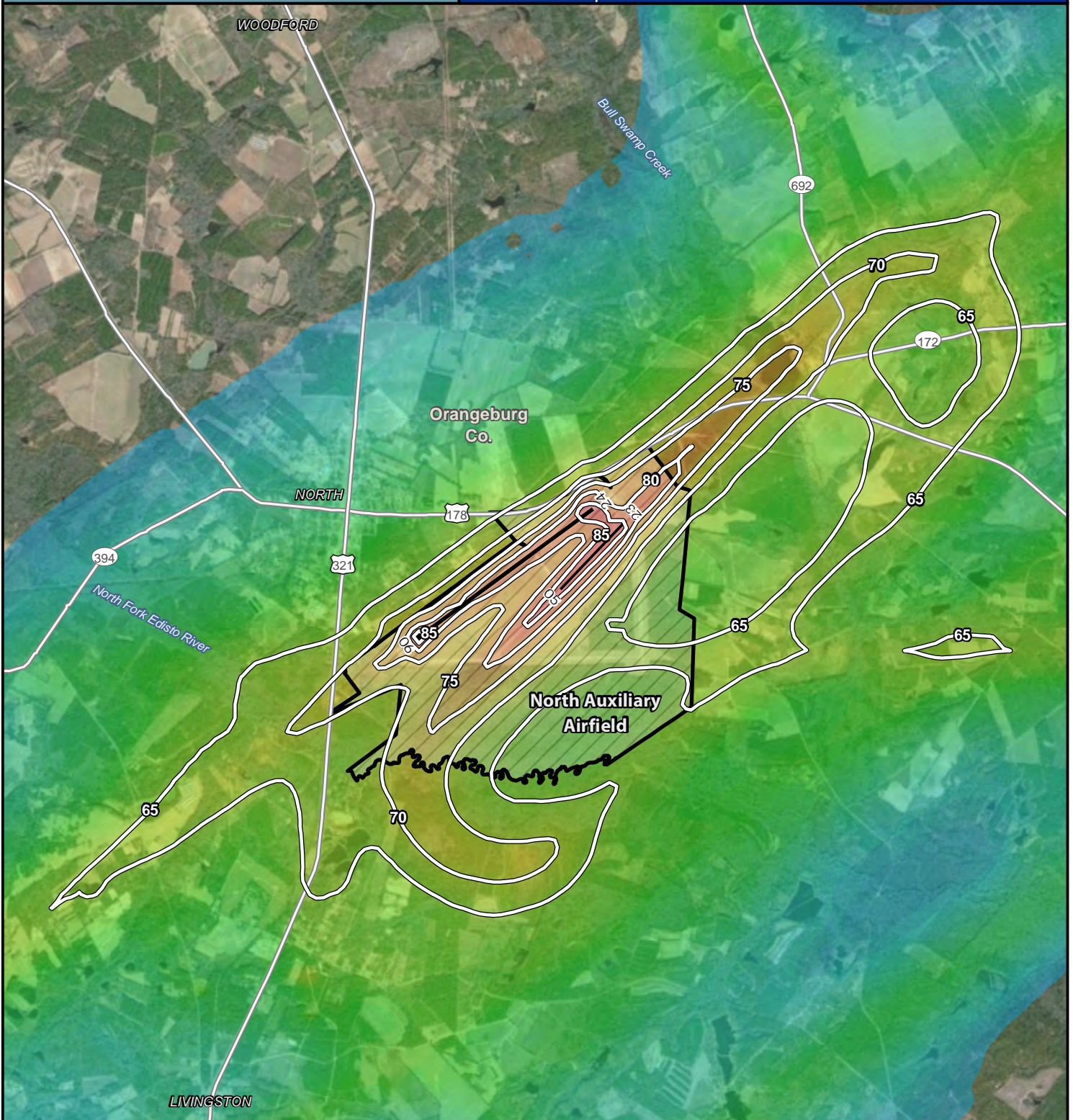
Noise Zone (dB DNL)	Acres	Estimated Population ¹
65-69	4,083	290
70-74	905	64
75-79	150	10
80-84	6	1
85+	0	0
Total (65+)	5,144	365

Source: United States Census Bureau 2016






Note:

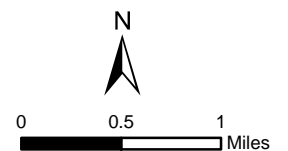
¹Population is estimated using a geometric proportion method within the contour bands. This method assigns population based on the portion of a census block that falls within the contour. The population across census blocks is assumed to be evenly distributed.

Table 4-2 shows the NAAF 2019 65-69 dB DNL noise zone encompass 4,083 acres and a population of 290 people. The second largest area and number of people exposed is within the 70-74 dB DNL noise zone (905 acres and 64 people). The table also shows 150 acres and an estimated 10 people in the 75-79 dB DNL noise zone. Approximately 6 acres and 1 person are exposed to the 80-84 dB DNL noise zone.

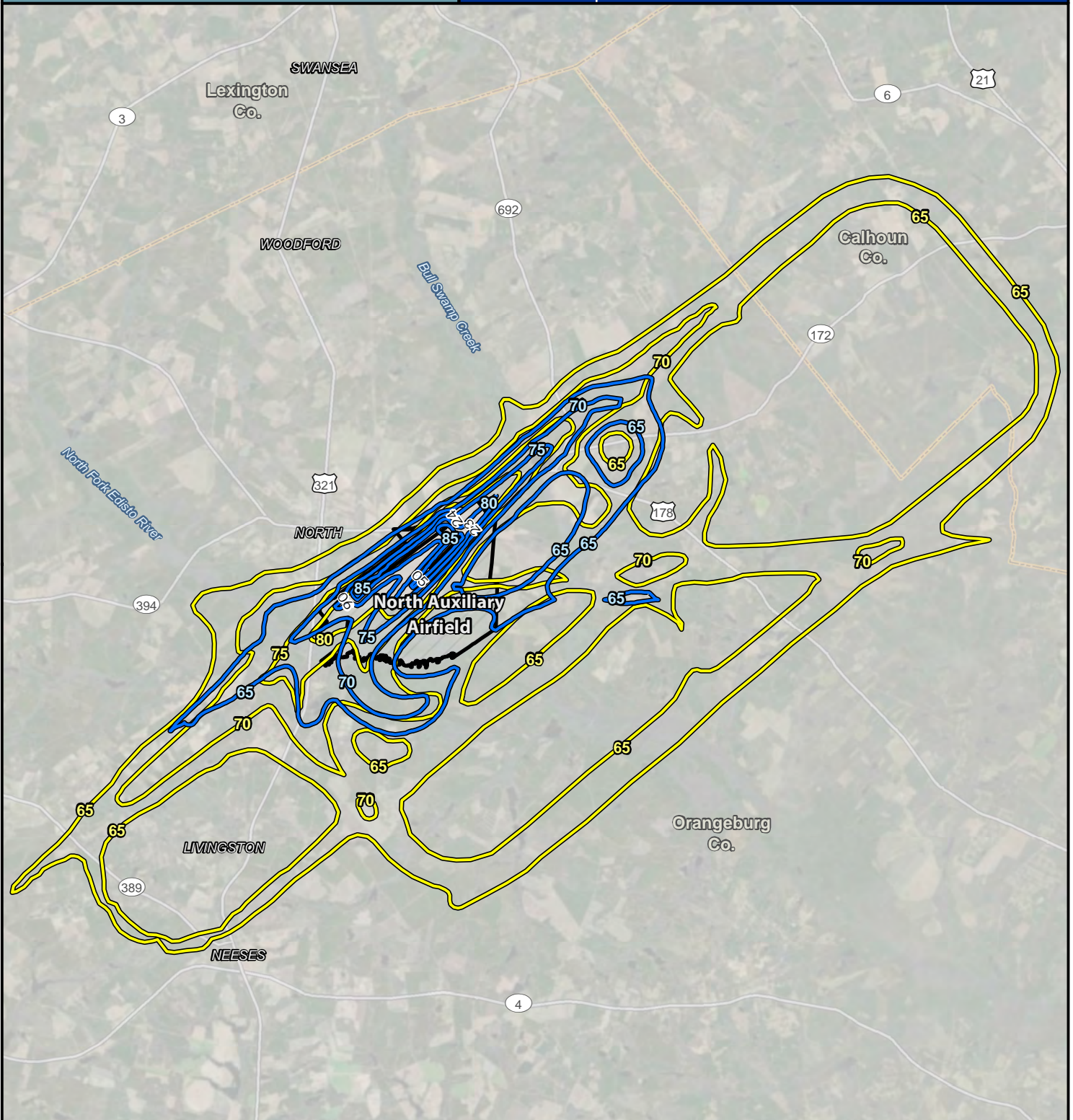


Legend:







-  U.S./State Highway
 -  Runway
 -  Installation
 -  2019 AICUZ Noise Contour (dB DNL)
- Noise Gradients (dB DNL)
-  High: 85+
 - Low: 45

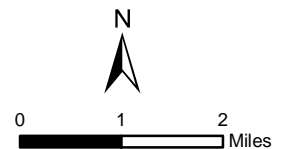


Source: AFCEC 2017, 2018; Digital Globe 2017; ESRI 2017.
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Legend:

-  County Boundary
-  U.S./State Highway
-  Runway
-  Installation
-  2019 AICUZ Noise Contour (dB DNL)
-  2004 AICUZ Noise Contour (dB DNL)



Source: AFCEC 2017, 2018; Digital Globe 2017; ESRI 2017.
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5.0 Community and Aircraft Safety

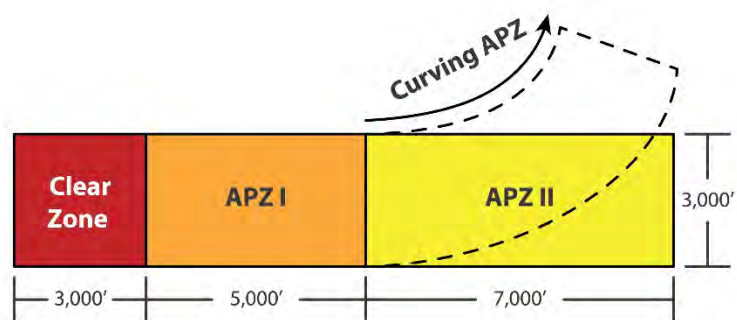
Community and aircraft safety is paramount to the Air Force, and this safety is a shared responsibility between the Air Force and the surrounding communities, with each playing a vital role in its success. Cooperation between the Air Force and the community results in strategic and effective land use planning and development. As such, 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 residents living near its airfield. This AICUZ Study provides the information needed, in part, to reach this shared safety goal.

Identifying safety issues assists the community in developing land uses compatible with 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 military conducted studies of historical accident and operations data throughout the military. The studies showed that most aircraft mishaps occur on or near the runway, diminishing in likelihood with distance from the runway. Based on these studies, the DoD identified CZs and APZs as areas where an aircraft accident is most likely to occur if an accident were to take place; however, it should be noted that CZs and APZs are not predictors of accidents. The studies identified three areas that, because of accident potential, planners should consider for density and land use restrictions: the CZ, APZ I, and APZ II. The CZs and APZs are shown on Figure 5-1 and described in the bullets below.

Figure 5-1. Runway Clear Zones and Accident Potential Zones



- **Clear Zone:** At the end of all active Air Force runways is an area known as the “Clear Zone.” The CZ is an area 3,000 feet square centered on the end of the runway. A CZ is required for all active runways and should remain undeveloped.

- **APZ I:** Beyond the CZ is APZ I. 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 by 7,000 feet in length along the extended runway centerline.

While the APZs extend outward from the ends of the runway along the extended runway centerline, the installation may add a curved APZ when over 80-percent of the operations follow a curved departure. There are no curved APZs for JB CHS-AB or NAAF.

The secondary Runway 05/23 at NAAF, categorized by the Air Force as a Landing Zone (LZ), has CZs and APZs with different dimensions. The dimensions of the CZ and APZs associated with the LZ at NAAF are presented in Section 5.2, Imaginary Surfaces.

Within the CZ, most uses are incompatible with military aircraft operations. For this reason, it is the Air Force’s policy, where possible, to acquire real property interests in land within the CZ 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, churches) should be restricted because of the greater safety risk in these areas.

Table 5-1 and Table 5-2 present the off-installation land acreage and estimated population within the CZs and APZs for JB CHS-AB and NAAF, respectively. Table 5-2 also includes NAAF’s Landing Zone (LZ), which falls within the CZ and APZ for Runway 06/24. This is described further in Figure 5-3. Chapter 6 discusses land use and recommendations for addressing incompatibility issues within CZs and APZs for each airfield.

Table 5-1. Off-installation Land Area and Estimated Population within the Clear Zones and Accident Potential Zones for JB CHS-AB

Zone	Acres	Estimated Population ¹
CZ	224	552
APZ I	1,223	3,258
APZ II	1,928	4,245
Total	3,375	8,055

Source: United States Census Bureau 2016

Note:

¹ Population is estimated using a geometric proportion method within the safety zones. 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 5-2. Off-installation Land Area and Estimated Population within the Clear Zones and Accident Potential Zones for NAAF

Zone	Acres	Estimated Population ¹
CZ	123 ²	8
APZ I	683	48
APZ II	964	69
Total	1,770	125

Source: United States Census Bureau 2016

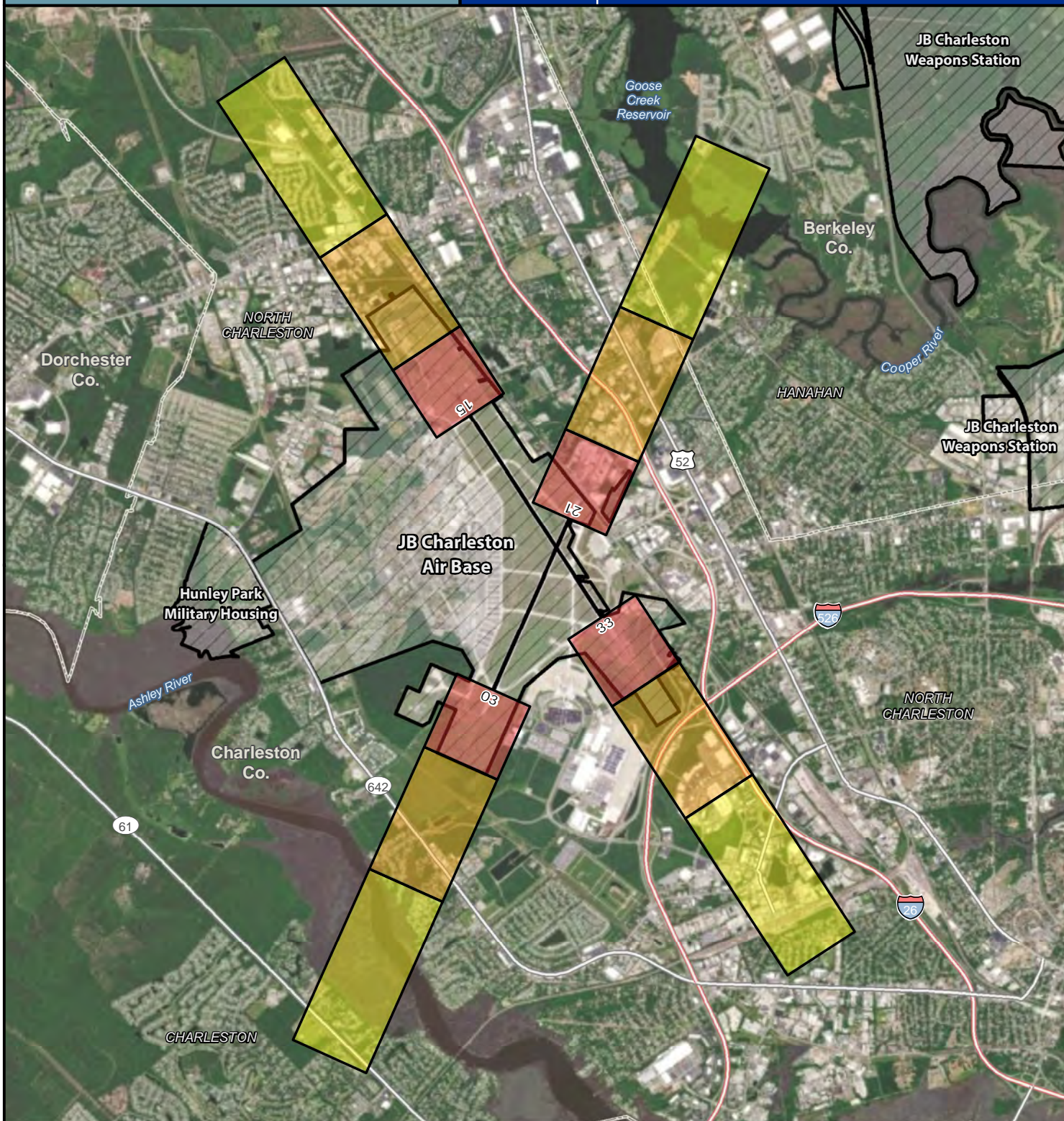
Note:

¹ Population is estimated using a geometric proportion method within the safety zones. 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.

² Includes acreage from the LZ APZ that extends off the installation.

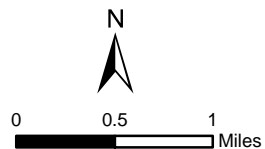
Figure 5-2 depicts the CZs and APZs for Runway 03/21 and 15/33 for JB CHS-AB. There are no changes in the CZs or APZs from the 2004 AICUZ. Most of the CZ area is contained within the installation; however, some portions of the CZ from each runway extend off-installation, totaling approximately 224 acres. All of APZ I and APZ II on both directions of Runway 03/21 extend off-installation. Portions of APZ I and all of APZ II from both directions of Runway 15/33 extend off-installation. The APZs for JB CHS-AB do not curve.

Figure 5-3 depicts the CZs and APZs for Runway 06/24 and LZ 05/23 for NAAF. There are no changes in the CZs or APZs from the 2004 AICUZ. Most of the CZ area is contained within the installation; however, some portions of the CZ from Runway 06/24 extend off-installation, totaling approximately 123 acres. Most of APZ I and all of APZ II from both directions of Runway 06/24 extend off-installation. A small portion of the LZ APZ extends off-installation and underlies the CZ from Runway 06/24. The APZs for NAAF do not curve.

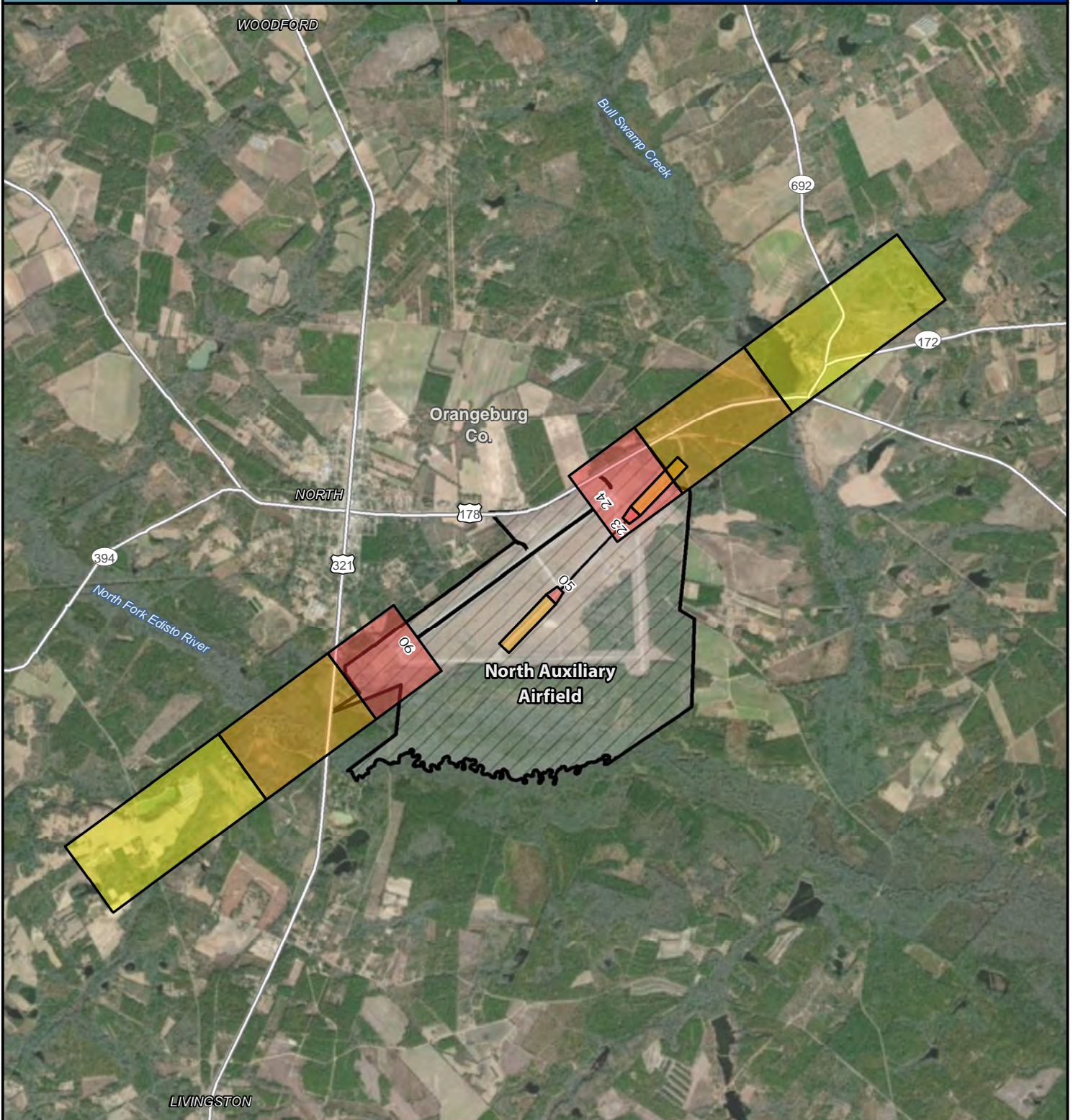


Legend:







- | | |
|----------------------|---------------------------------|
| --- County Boundary | 2019 AICUZ Clear Zones and APZs |
| — Interstate | Clear Zone |
| — U.S./State Highway | Accident Potential Zone I |
| — Runway | Accident Potential Zone II |
| Installation | |

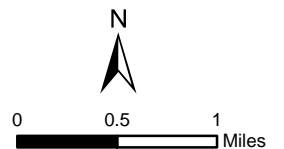


Source: AFCEC 2017, 2018; Digital Globe 2016;
ESRI 2017; FHWA 2017.
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Legend:

- | | |
|---|--|
|  U.S./State Highway | 2019 AICUZ Clear Zones and APZs |
|  Runway |  Clear Zone |
|  Installation |  Accident Potential Zone I |
| |  Accident Potential Zone II |



Source: AFCEC 2017, 2018; Digital Globe 2017; ESRI 2017.
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5.2 Imaginary Surfaces

The DoD and Federal Aviation Administration (FAA) identify a complex series of imaginary planes and transition surfaces that define the airspace needed to remain free of obstructions around an airfield. Obstruction-free imaginary surfaces 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, rotary-wing runways/helipads, and LZs each have different imaginary surfaces. An illustration of the imaginary surfaces for fixed-wing runways is depicted on Figure 5-4, and Table 5-3 provides brief descriptions for each.

Figure 5-4. Imaginary Surfaces and Transition Planes for Fixed-Wing Runways

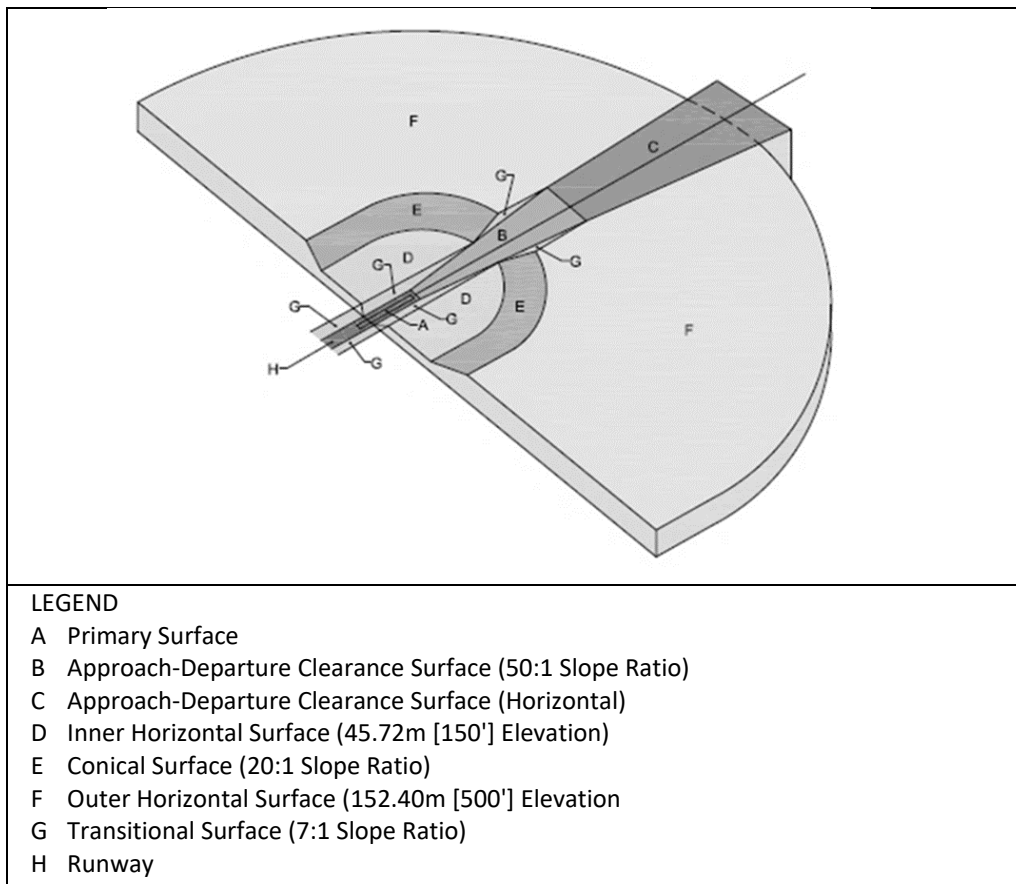


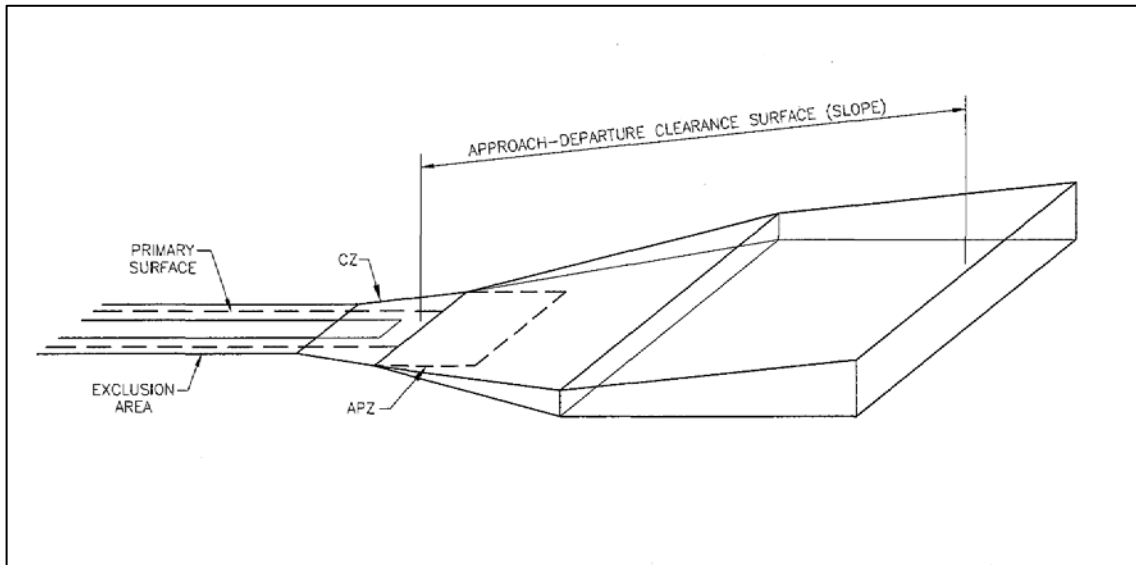
Table 5-3. Descriptions of Imaginary Surfaces for Military Airfields

<p>Primary Surface</p>	<p>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.</p>
<p>Approach-Departure Clearance Surface</p>	<p>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.</p>
<p>Inner Horizontal Surface</p>	<p>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 7,500 feet from the centerline of each runway end and interconnecting these arcs with tangents.</p>
<p>Conical Surface</p>	<p>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.</p>
<p>Outer Horizontal Surface</p>	<p>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.</p>
<p>Transitional Surface</p>	<p>This 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.</p>

The secondary runway at NAAF is designated as Runway 05/23 and is classified by the Air Force as an LZ. The Unified Facilities Criteria (UFC) 3-260-01 provides descriptions for airspace imaginary surfaces, CZs, and APZs for Air Force LZs. The dimensions for some surfaces differ for C-17 and C-130 aircraft. C-17 criteria are used in this AICUZ Study, although C-130s also operate at the NAAF LZ. An illustration of the imaginary surfaces for Air Force LZs is depicted in Figure 5-5, and Table 5-4 provides brief descriptions for each.

Figures 5-6 and 5-7 depict the runway airspace imaginary surfaces specific to JB CHS-AB and NAAF, respectively. In general, the Air Force does not permit above-ground structures in the primary surface, and height restrictions apply to transitional surfaces and approach and departure surfaces. Height restrictions are more stringent for areas closer to the runway and flight paths.

Figure 5-5. Landing Zone Runway Imaginary Surfaces

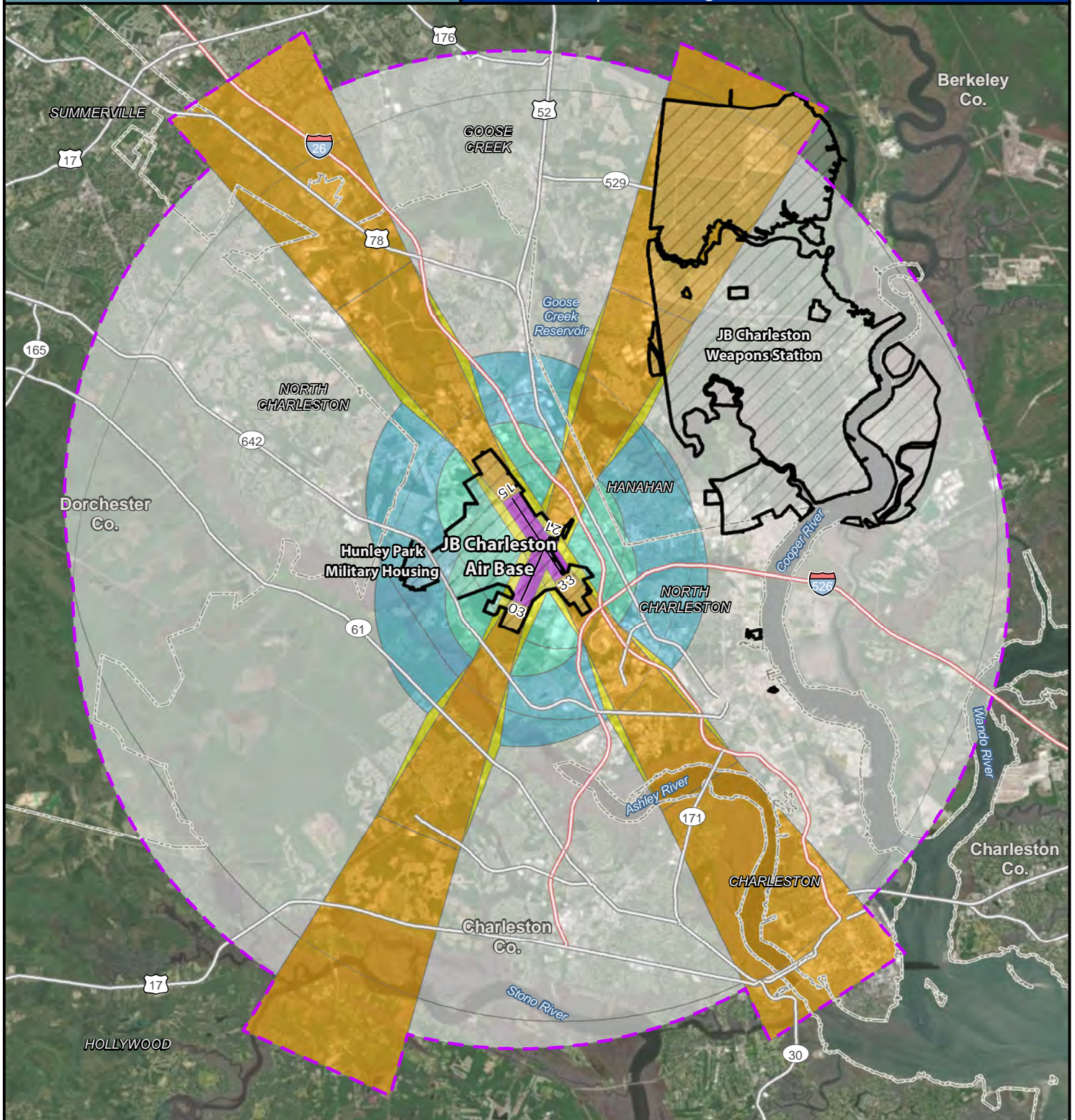


Source: United States Air Force 2004

Table 5-4. Descriptions of Imaginary Surfaces for Air Force Landing Zones

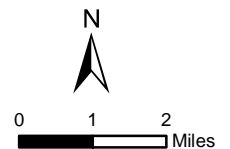
<p>Primary Surface</p>	<p>An imaginary surface symmetrically centered on the runway, extending 1,000 feet beyond each paved runway end. The width of the primary surface is 180 feet for C-17s and 150 feet for C-130s, or 90 feet on each side of the runway centerline for C-17s and 75 feet for C-130s.</p>
<p>Approach-Departure Clearance Surface</p>	<p>This imaginary surface is symmetrically centered on the extended runway centerline, beginning as an inclined plane (glide angle) 500 feet beyond each end of the primary surface, and extending for a minimum 10,500 feet. The desired slope length is 32,000 feet. The slope of the approach-departure clearance surface is 20:1 for C-17s and 35:1 for C-130s throughout the entire length. The width of this surface at the inner end (CZ end) is 500 feet, flaring uniformly to a width of 2,500 feet at the 10,500-foot point. The width is a constant 2,500 feet from the 10,500-foot point to the 32,000-foot point.</p>
<p>Exclusion Surface Area</p>	<p>The 1,000-foot exclusion area is centered on the longitudinal axis of the runway (500 feet to each side of the runway centerline) for LZs in built-up and occupied areas. The exclusion area extends the length of the LZ plus the CZ on each end. The width of the exclusion area in unoccupied areas is 700 feet (350 feet to each side of the runway centerline).</p>
<p>Clear Zone Surface</p>	<p>The CZ extends outward 500 feet from the end of the runway, is centered on the end of the runway, and is 320 feet wide at the end of the runway for C-17s and 270 feet wide for C-130s, flaring to 500 feet in width at the outer end.</p>
<p>Accident Potential Zone Surface</p>	<p>The APZ begins at the outer end of the CZ, extends outward 2,500 feet, and is 500 feet wide in unoccupied and built-up areas (1,000 feet in unoccupied areas).</p>

Source: DoD 2008

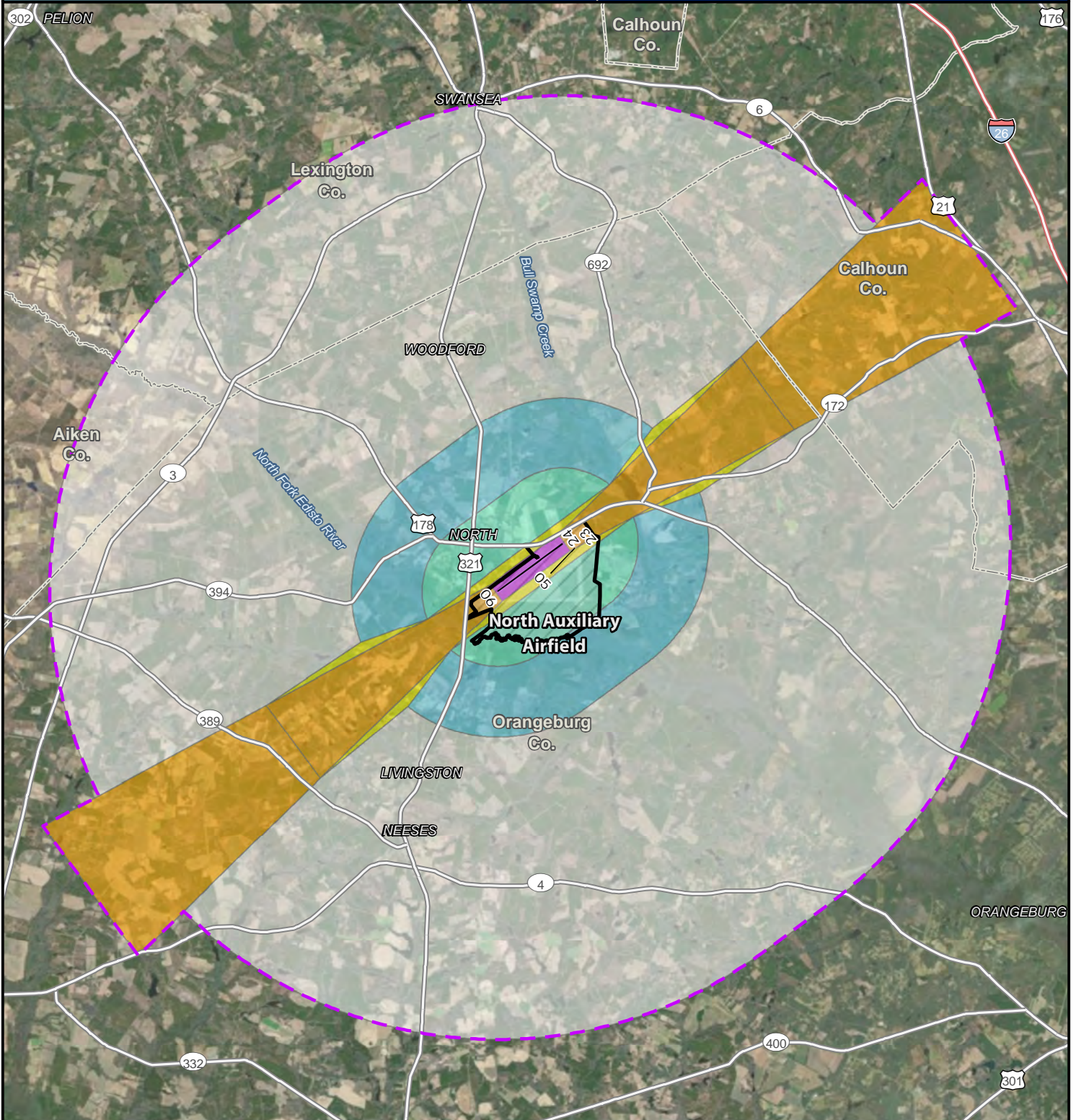


Legend:

- | | | |
|------------------------|-----------------------------|--------------------------|
| County Boundary | Airfield Imaginary Surfaces | Outer Horizontal Surface |
| Interstate | Approach/Departure Surface | Primary Surface |
| U.S./State Highway | Conical Surface | Transitional Surface |
| Runway | Inner Horizontal Surface | |
| Installation | | |
| HAFZ Consultation Zone | | |

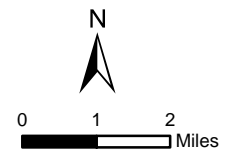


Source: AFCEC 2017, 2018; Digital Globe 2016; ESRI 2017; FHWA 2017. © Ecology and Environment, Inc. 2018



Legend:

- | | | |
|------------------------|----------------------------|--------------------------|
| County Boundary | Approach/Departure Surface | Outer Horizontal Surface |
| Interstate | Conical Surface | Primary Surface |
| U.S./State Highway | Inner Horizontal Surface | Transitional Surface |
| Runway | | |
| Installation | | |
| HAFZ Consultation Zone | | |



Source: AFCEC 2017, 2018; Digital Globe 2017; ESRI 2017.
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5.3 Hazards to Aircraft Flight Zone

Certain land uses and activities pose potential hazards to flight. To ensure land uses and activities are examined for compatibility, the Air Force has identified a Hazards to Aircraft Flight Zone (HAFZ). The HAFZ is defined as the area within the imaginary surfaces that are shown on Figure 5-4. Unlike noise zones and safety zones, the HAFZ does not have recommended land use compatibility tables. Instead, it is a consultation zone recommending that project applicants and local planning bodies consult with the Air Force to ensure the project is compatible with Air Force operations. These land use and activity compatibility considerations include:

- **Height:** Tall objects can pose significant hazards to flight operations or interfere with navigational equipment (including radar). City/county agencies involved with approvals of permits for construction should require developers to submit calculations showing that projects meet the height restriction criteria of 14 Code of Federal Regulations (CFR) 77.17 for the specific airfield described in the AICUZ Study. City and county agencies may also consider requiring a “Determination of No Hazard” issued by the FAA for any tall objects within this zone.
- **Visual Interference:** Industrial or agricultural sources of smoke, dust, and steam in the airfield vicinity can obstruct a pilot’s vision during takeoff, landing, or other periods of low-altitude flight. Close coordination between the installation and landowners can often mitigate these concerns. For example, irrigating before plowing can greatly reduce dust concerns.
- **Light Emissions:** 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 for pilots at night when the flash can diminish the eye’s adaptation to darkness. The eyes partially recover from this adaptation in a matter of 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:
 - Lasers that emit in the visible spectrum, which can be potentially harmful to a pilot’s vision during both day and night.
 - The increasing use of energy-efficient LED lighting, which 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, which 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.

- **Bird/Wildlife Aircraft Strike Hazard (BASH):** Wildlife represents a significant hazard to flight operations. 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. Due to the speed of the aircraft, collisions with wildlife can happen with considerable force. Although most bird and animal strikes do not result in crashes, they cause structural and mechanical damage to aircraft as well as loss of flight time.

Most collisions occur when the aircraft is at an elevation of less than 1,000 feet. To reduce the potential of a BASH, the Air Force recommends that land uses that attract birds not be located near installations with an active air operations mission. These land uses include:

- Waste disposal operations;
- Wastewater treatment facilities;
- Transfer stations;
- Landfills;
- Golf courses;
- Wetlands;
- Storm water ponds; and
- Dredge disposal sites.

Birds and raptors in search of food or rodents will flock to landfills, increasing the probability of BASH occurrences near these facilities. One can also use design modifications to reduce the attractiveness of these types of land uses to birds and other wildlife.

- **Radio Frequency/Electromagnetic Interference:** The American National Standards Institute defines electromagnetic interference (EMI) as any electromagnetic disturbance that interrupts, obstructs, or otherwise degrades or limits the effective performance of electronics/electrical equipment.

EMI can be induced intentionally, as in forms of electronic warfare, or unintentionally, as a result of spurious emissions and responses, such as high-tension line leakage and industrial machinery. In addition, EMI may be caused by atmospheric phenomena, such as lightning or precipitation static.

New generations of military aircraft are highly dependent on complex electronic systems for navigation and critical flight and mission-related functions. Consequently, communities should use care when siting any activities that create EMI. Many of these sources are low-level emitters of EMI. However, when combined, they have an additive quality.

EMI also affects consumer devices, such as cell phones, FM radios, television reception, and garage door openers. In some cases, the source of interference occurs when consumer electronics use frequencies set aside for military use.

6.0 Land Use Compatibility Analysis

CZs, APZs, noise zones, and the HAFZ make up the AICUZ footprint for an air installation. The AICUZ footprint defines the minimum recommended area within which land use controls are needed to enhance the health, safety, and welfare of those living or working near a military airfield and to preserve the flying mission. The AICUZ footprint, combined with the guidance and recommendations set forth in the AICUZ Study, are the fundamental tools necessary for the planning process. The Air Force recommends that local and regional governments adopt the AICUZ noise zones, CZs, APZs, and HAFZ into planning studies, regulations, and processes to best guide compatible development around installations. This AICUZ Study uses the AICUZ noise zones, CZs, and APZs (Figures 6-1, 6-3, 6-4, and 6-5) for JB CHS-AB and NAAF as the basis for the land use compatibility analysis.

6.1 Land Use Compatibility Guidelines and Classifications

In an effort to establish long-term compatibility for lands within the vicinity of military air installations, the DoD has created land use compatibility recommendations based on the Federal Highway Administration's Standard Land Use Coding Manual (SLUCM). These guidelines are used by DoD personnel for on-installation planning and for engaging with the local community to foster compatible land use development. Table A-1 of Appendix A shows the suggested land use compatibility guidelines within the CZs and APZs. Table A-2 of Appendix A provides land use compatibility recommendations within noise zones.

6.2 Planning Authorities

This section presents information for each governing body that has land use jurisdictions near JB CHS-AB and NAAF, including descriptions of existing and future land uses. As noted in Section 2.1 Location, JB CHS is located in Charleston, Berkeley, and Orangeburg counties, and borders Dorchester County, South Carolina. JB CHS-AB is located within the city of North Charleston in Charleston County. NAAF is located near the town of North, in Orangeburg County.

6.2.1 *South Carolina Local Government Comprehensive Planning Enabling Act of 1994*

Under the South Carolina Local Government Comprehensive Planning Enabling Act of 1994, all counties and municipalities with land use regulations had to have comprehensive plans in place by May 4, 1999. The purpose of comprehensive plans is to manage future growth and preserve community identity. Comprehensive plans must include nine planning elements: population, economic development, natural resources, cultural resources, community facilities, housing, land use, transportation, and priority investments. The local planning commission must review the comprehensive plan, or elements of it, at least once every 5 years, to determine whether amendments to the plan are needed. The comprehensive plan, including all elements of it, must be updated at

least every 10 years (South Carolina Legislature 2018). The South Carolina Local Government Comprehensive Planning Enabling Act specifies how local governments must organize their planning commissions and boards of zoning appeals, process applications, and enforce ordinances. In addition, it requires each planning commission to develop comprehensive plans with public participation and make recommendations to the local governing bodies (Charleston County 2018).

6.2.2 Berkeley-Charleston-Dorchester Council of Governments (BCDCOG)

The Berkeley-Charleston-Dorchester Council of Governments (BCDCOG) is one of South Carolina's ten regional planning councils. Together, the ten regional planning agencies/councils make up the South Carolina Association of Regional Councils. The BCDCOG's main purpose is to assist local governments with developing local and regional plans by providing planning and technical support within the tri-county region (BCDCOG 2018). The BCDCOG and its board of directors provide the surrounding communities with a forum to find and align common planning goals and identify regional opportunities, avoid redundancy, and make collective decisions. The BCDCOG assists in comprehensive planning, particularly for Berkeley County and the City of Hanahan, as well as maintains Geographic Information System (GIS) data services (zoning and parcel mapping) for some surrounding communities.

In 2008, the BCDCOG was the sponsoring agency for the 2008 Charleston AFB and NWS Charleston Joint Land Use Study (JLUS). The 2008 JLUS considered surrounding community and regional plans. The surrounding local governments continue to have individual land development regulations and zoning ordinances. The JLUS introduced recommendations for compatible land uses surrounding the installation. The AICUZ Study discusses these recommendations further in Chapter 7.

6.2.3 Berkeley County

Land use management is led by Berkeley County's Planning and Zoning Department. Their mission is to provide technical advice and guidance regarding growth management plans and zoning ordinances, standards, and policies. The County's 2010 Comprehensive Plan, *Planning the Future While Preserving the Past*, was adopted by the City Council. Their 5-year review is currently ongoing.

City of Hanahan

The City of Hanahan's Building and Codes Department manages planning and zoning services for the city by providing guidance for long-term growth and technical zoning assistance. Through the assistance of the BCDCOG and Berkeley County, the Building and Codes Department also creates and maintains a comprehensive plan. Other services include maintaining GIS mapping and zoning ordinance information and updates. The City maintains zoning maps showing residential, commercial, and industrial zoning districts. The Zoning Ordinance determines which land uses are permitted in each zone (City of Hanahan 2018). The City's Planning Commission is a seven-member, citizen-appointed

commission. The Planning Commission's responsibilities include review of planning applications, zoning requests, and the comprehensive plan, among other duties. Recommendations from the Planning Commission are considered by City Council for final approval or rejection.

6.2.4 Charleston County

Charleston County's Zoning and Planning Department administers zoning and land development as well as the county's comprehensive plan. Charleston County adopted their comprehensive plan in November 2008. A 5-year review was then adopted in October 2013 and implemented by January 2015. The Charleston County Planning Commission has begun updating the plan, which is estimated to be complete by November 2018 (Charleston County 2018). The Zoning and Planning Department supports the County Planning Commission, which is an advisory board to the County Council on planning and zoning matters.

City of Charleston

Planning and zoning are managed through the Planning, Preservation, and Sustainability Department in the City of Charleston. The city's comprehensive plan is called the Century V Plan, and was adopted in 2011 by the City Council. The department also has a Planning Commission, which is an advisory group of Charleston citizens appointed by the Mayor and City Council. The Planning Commission is comprised of nine people who review plans and zoning ordinances and pass on recommendations to the City Council who hold final approval (City of Charleston 2018).

City of North Charleston

Planning and land management is managed by North Charleston's Planning and Zoning Department. The department reviews demographic trends and capacity for growth and creates and updates neighborhood plans, including the comprehensive plan. The City of North Charleston City Council adopted the review of the 2008 Comprehensive Development Plan on July 28, 2016. The City of North Charleston also has a Planning Commission, which is an advisory body made up of eight appointed citizens of the city who meet to hear and review rezoning requests, subdivision variance requests, and subdivision plats (North Charleston 2018).

6.2.5 Orangeburg County

The Orangeburg County Community Development Division is responsible for planning, zoning, and building permitting and inspection, among other areas. The Planning Commission's purpose is to manage growth in by maintaining a comprehensive planning program, coordinating the provision of public services, and enhancing the quality of life for residents (Orangeburg County 2018). Orangeburg County is in the process of finalizing their 2018 Comprehensive Land Use Plan. The previous plan was the April 2002 Comprehensive Land Use Plan with 2007 Land Use Update.

6.3 Land Use and Proposed Development

The land use compatibility analysis identifies existing and future land uses near JB CHS-AB and NAAF to determine compatibility conditions. Existing land use and zoning is assessed to determine current land use activity, while future land use plans are used to project development and potential growth areas.

To compare land use consistently across jurisdictions, this analysis uses generalized land use classifications illustrating land use compatibility across common land use types. These generalized land use categories are not exact representations of the local community's land use designations, but combine similar land uses into one of several categories:

- **Business/Retail Commercial:** Commercial and retail business uses. This includes large-scale (big box) stores, malls, strip commercial centers, restaurants, hotels, and highway commercial uses.
- **Conservation/Agriculture/Open Space:** Natural, preserved, agricultural, or undeveloped land areas, but may include some passive recreation features, such as trails and boardwalks. Also includes wetlands, floodplains, forests, and stream buffers.
- **Heavy Industrial:** Heavy manufacturing, seaport, utilities, and other higher-impact industrial uses. Can allow for petroleum storage.
- **Institutional:** Land that the public has access to, including schools, colleges, churches, hospitals, museums, and libraries. Government uses include government offices and fire stations.
- **Light Industrial:** Low-impact or high-tech manufacturing, distribution, or warehousing uses.
- **Low Density Residential:** Rural in character with single-family residential detached housing. It can also include a continuation of agricultural uses, open space, equestrian, civic and recreation, and mixed-uses, where appropriate.
- **Mixed Use:** A blend of residential, commercial, cultural, institutional, or even industrial uses may be proposed.
- **Mobile Home:** Areas developed for single-family mobile homes, mobile home parks, or manufactured housing.
- **Multi-family Residential:** Includes apartments, townhouses, duplexes, condominiums, senior housing, and other attached housing.
- **Office:** Professional offices that include business offices, usually grouped in office parks or medium-rise office buildings.
- **Parks and Recreation:** Active or passive park space or recreation facilities.

- **Planned Unit Development:** Area of planned development or growth, which can include various mixed uses.
- **Single-family Residential:** Single-family, detached housing ranging from one to four dwelling units per acre.
- **Transportation/Utility:** Utility service distribution and freight handling and movement.

See Section 6.4.1, Land Use Analysis, for further details on the generalized codes. Appendix B, Generalized Land Use Codes, provides further description on how land use categories were generalized along with notes on general allowable uses for JB CHS and NAAF's surrounding jurisdictions.

6.3.1 Existing Land Uses for JB CHS-AB

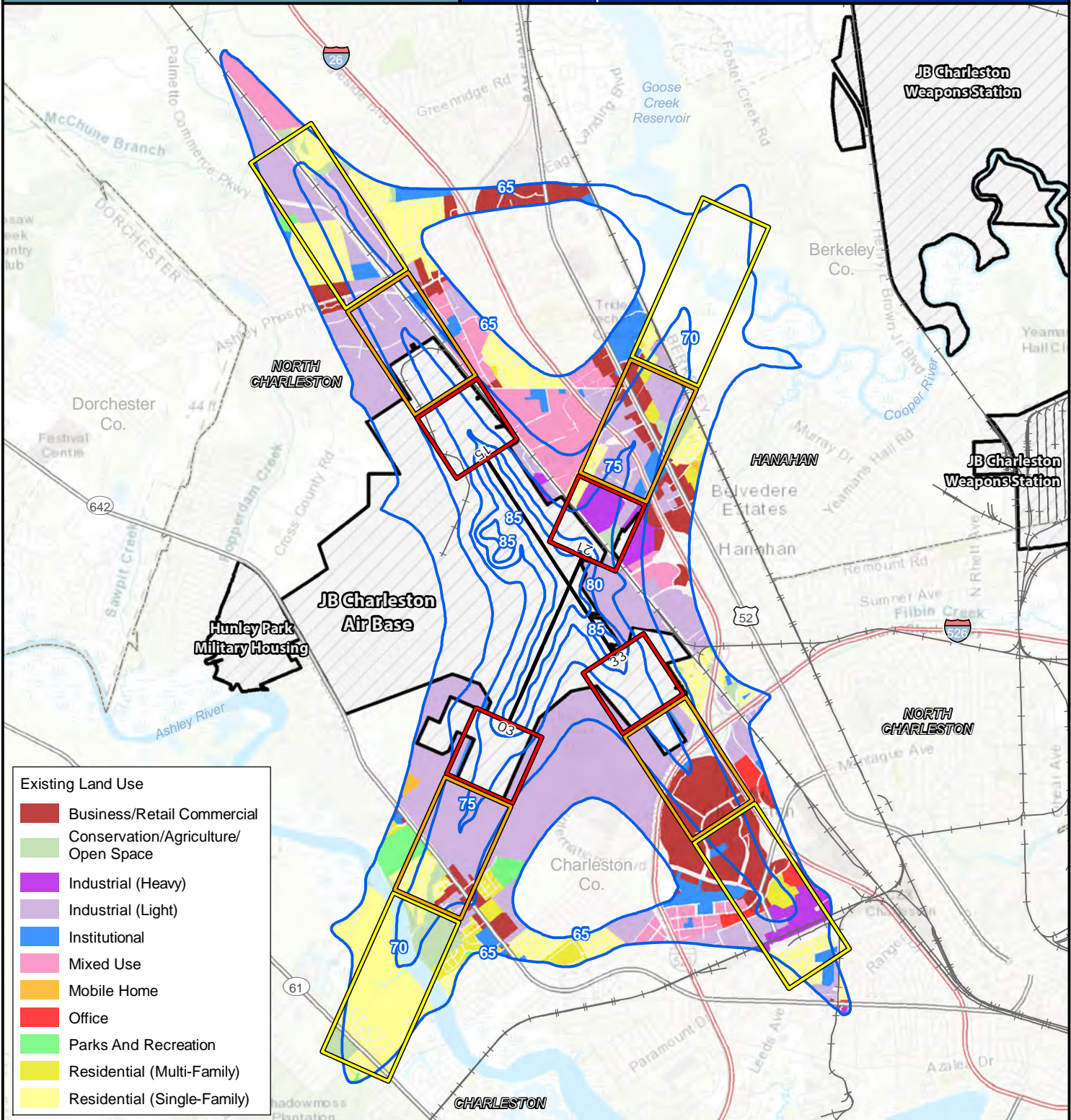
JB CHS-AB is in a developed area in the City of North Charleston and Charleston County. The airfield's associated noise zones, CZs, and APZs also span across developed areas of Charleston and Berkeley counties, as well as the cities of Hanahan, North Charleston, and Charleston.

Immediately southwest of JB CHS-AB, there is light industrial use. Further south of Highway 642, there is single-family residential land use with smaller areas of parks and recreation, business/retail commercial, conservation/agriculture/open space, and institutional land uses.

Southeast of JB CHS-AB, there are areas of light industrial and smaller areas of single-family residential and conservation/agriculture/open space uses. South of Interstate (I-) 526 to the southeast of the base, are areas of business/retail commercial and office areas in addition to mixed uses, heavy industrial, and multi- and single-family residential land uses.

To the northeast of JB CHS-AB, there several different land uses, including heavy industrial, mixed use, and single-family residential. Areas of business/retail commercial follow along U.S. Route 52 and I-26. West of I-26 and northwest of JB CHS-AB, there are areas of mixed use, light industrial, and single-family residential, with smaller areas of parks and recreation and institutional land uses. Berkeley County does not maintain current land use and, therefore, the data were unavailable for this AICUZ analysis.

Existing land use within the 2019 AICUZ CZs, APZs, and noise contours for JB CHS-AB are illustrated on Figure 6-1. Several transportation corridors surround JB CHS, including railroads, I-526 and I-26, and smaller U.S. and state highways. Land use data were not available within major transportation corridors. Areas of specific land use compatibility concerns within the JB CHS-AB noise contours, CZs, and APZs are further evaluated in Section 6.4, Compatibility Concerns.



Existing Land Use

- Business/Retail Commercial
- Conservation/Agriculture/Open Space
- Industrial (Heavy)
- Industrial (Light)
- Institutional
- Mixed Use
- Mobile Home
- Office
- Parks And Recreation
- Residential (Multi-Family)
- Residential (Single-Family)

Legend:

 County Boundary	 Installation	 2019 AICUZ Clear Zones and APZs
 Interstate	 Waterbody	 Clear Zone
 U.S./State Highway	 2019 AICUZ Noise Contour (dB DNL)	 Accident Potential Zone I
 Railroad		 Accident Potential Zone II
 Runway		

N
0 0.5 1 Miles

Note: No Existing Land Use data available for Berkeley County. Land use data is not available within major transportation corridors.

Source: AFCEC 2017, 2018; BCDCOG 2018; ESRI 2017; FHWA 2017; U.S. Census Bureau 2017. © Ecology and Environment, Inc. 2018

6.3.2 Current Zoning for JB CHS-AB

Zoning immediately southwest of the base includes light industrial and planned unit development (PUD). Along Highway 642, there are areas zoned for mixed use, business/retail commercial, and multi-family and single-family residential. Other areas southwest of Highway 642 are zoned as PUD, business/retail commercial, multi-family and single-family residential, and mobile home.

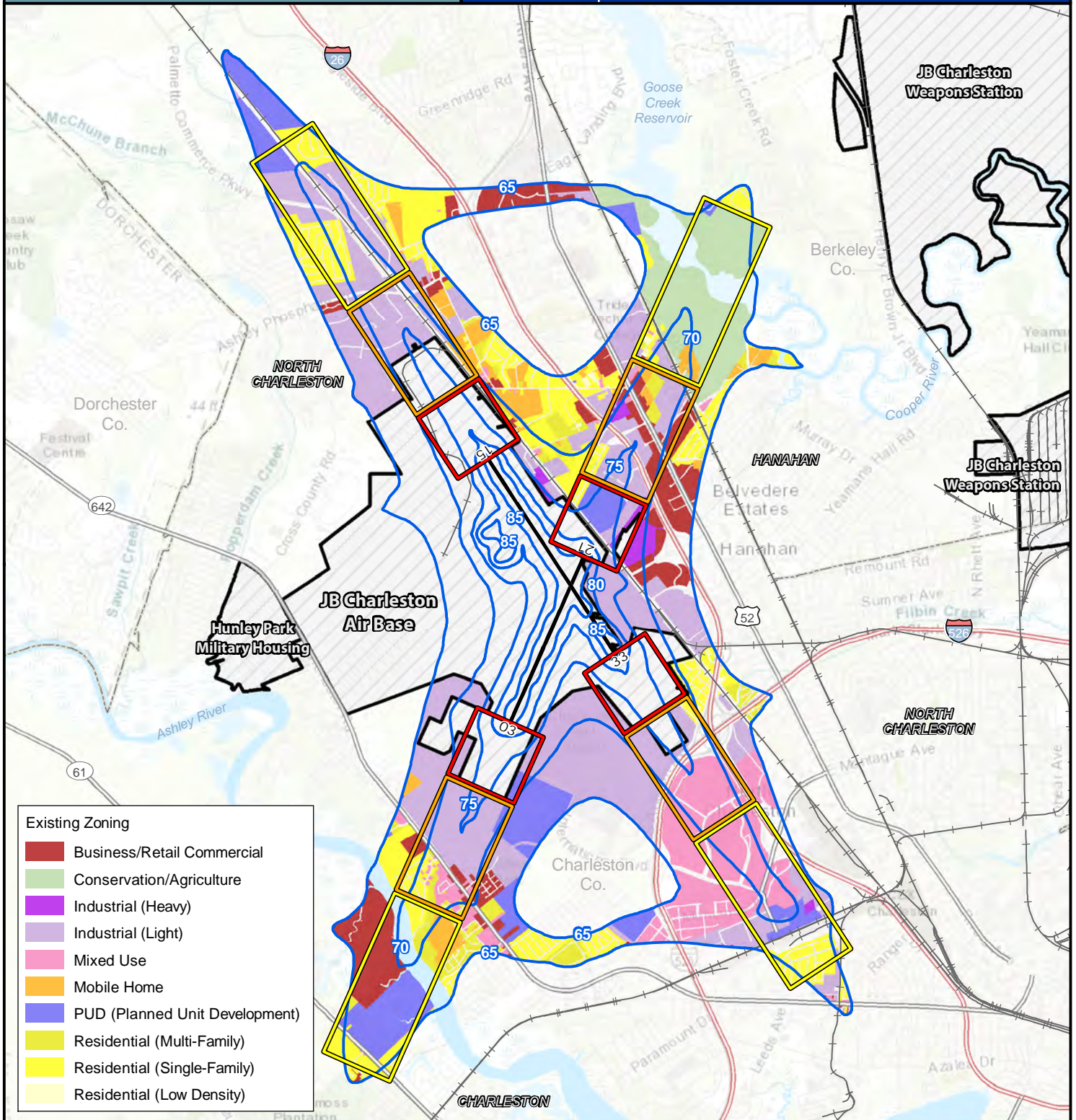
Areas immediately southeast of the base are zoned light industrial as well as multi-family and single-family residential. Further southeast, beyond I-526, there is a larger area zoned for mixed use as well as PUD and additional single-family and multi-family residential uses, with very small areas of business/retail commercial.

Northeast of the base, there are several zoning classifications. Immediately surrounding the base, the areas are zoned light and heavy industrial, PUD, business/retail commercial, single-family, low density, and multi-family residential, and mobile home. East of I-26, there are additional areas of business/retail commercial, light industrial, mobile home, and conservation/agriculture/open space. West of I-26, the area is mostly zoned single-family and multi-family residential as well as light industrial, with areas of business/retail commercial, PUD, mobile home, and some mixed use. Current zoning within the 2019 AICUZ CZs, APZs, and noise contours for JB CHS-AB are illustrated on Figure 6-2.

6.3.3 Future Land Use for JB CHS-AB

The areas south of the base have future land use classifications of mostly light industrial and transportation/utility. Farther southwest, along Highway 642, there are future land uses of single-family and multi-family residential, parks and recreation, and business/retail commercial. Beyond Highway 642, the area's future land use is mostly classified as single-family residential with smaller areas of conservation/agriculture/open space, mobile home, and institutional. Areas immediately southeast of the base include single-family residential, institutional, and conservation/agriculture/open space. South of I-526 is largely comprised of business/retail commercial and office future land use classifications with additional future land uses of single-family and multi-family residential, institutional, light and heavy industrial, mixed use, and transportation/utility uses.

Future land use classifications for areas immediately northeast of the base include light and heavy industrial, mixed use, and institutional use. Along Route 52, there are areas with future land use classified as business/retail commercial, institutional, conservation/agriculture/open space, and single-family and multi-family residential. The area northeast of Route 52 includes additional light industrial uses as well as low density residential future land use, which is specifically located northeast of the base in Berkeley County. Northwest of the base and west of I-26, the land has mostly future land use classifications of light industrial, single-family and multi-family residential, and mixed use. There are also areas of institutional, business/retail commercial, conservation/agriculture/open space, and parks and recreation.

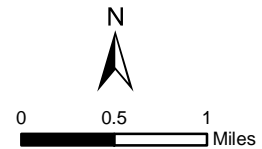


Existing Zoning

- Business/Retail Commercial
- Conservation/Agriculture
- Industrial (Heavy)
- Industrial (Light)
- Mixed Use
- Mobile Home
- PUD (Planned Unit Development)
- Residential (Multi-Family)
- Residential (Single-Family)
- Residential (Low Density)

Legend:

 County Boundary	 Installation	 2019 AICUZ Clear Zones and APZs
 Interstate	 Waterbody	 Clear Zone
 U.S./State Highway	 2019 AICUZ Noise Contour (dB DNL)	 Accident Potential Zone I
 Railroad		 Accident Potential Zone II
 Runway		



Note: Zoning data is not available within major transportation corridors.

Source: AFCEC 2017, 2018; Berkeley County 2018; BCDCOG 2018; Charleston County 2018; City of Charleston 2018; City of North Charleston 2018; ESRI 2017; FHWA 2017; U.S. Census Bureau 2017. © Ecology and Environment, Inc. 2018

Future land use within the 2019 AICUZ CZs, APZs, and noise contours for JB CHS-AB are illustrated on Figure 6-3. Areas of specific land use compatibility concerns within the JB CHS-AB noise contours, CZs, and APZs are further evaluated in Section 6.4, Compatibility Concerns.

6.3.4 Existing Land Uses and Current Zoning for NAAF

NAAF is located in the rural area of Orangeburg County, directly southeast of the town of North. The predominant existing land use surrounding NAAF is conservation/agriculture. Southwest of the base, there is an area with existing land use classified as low density residential.

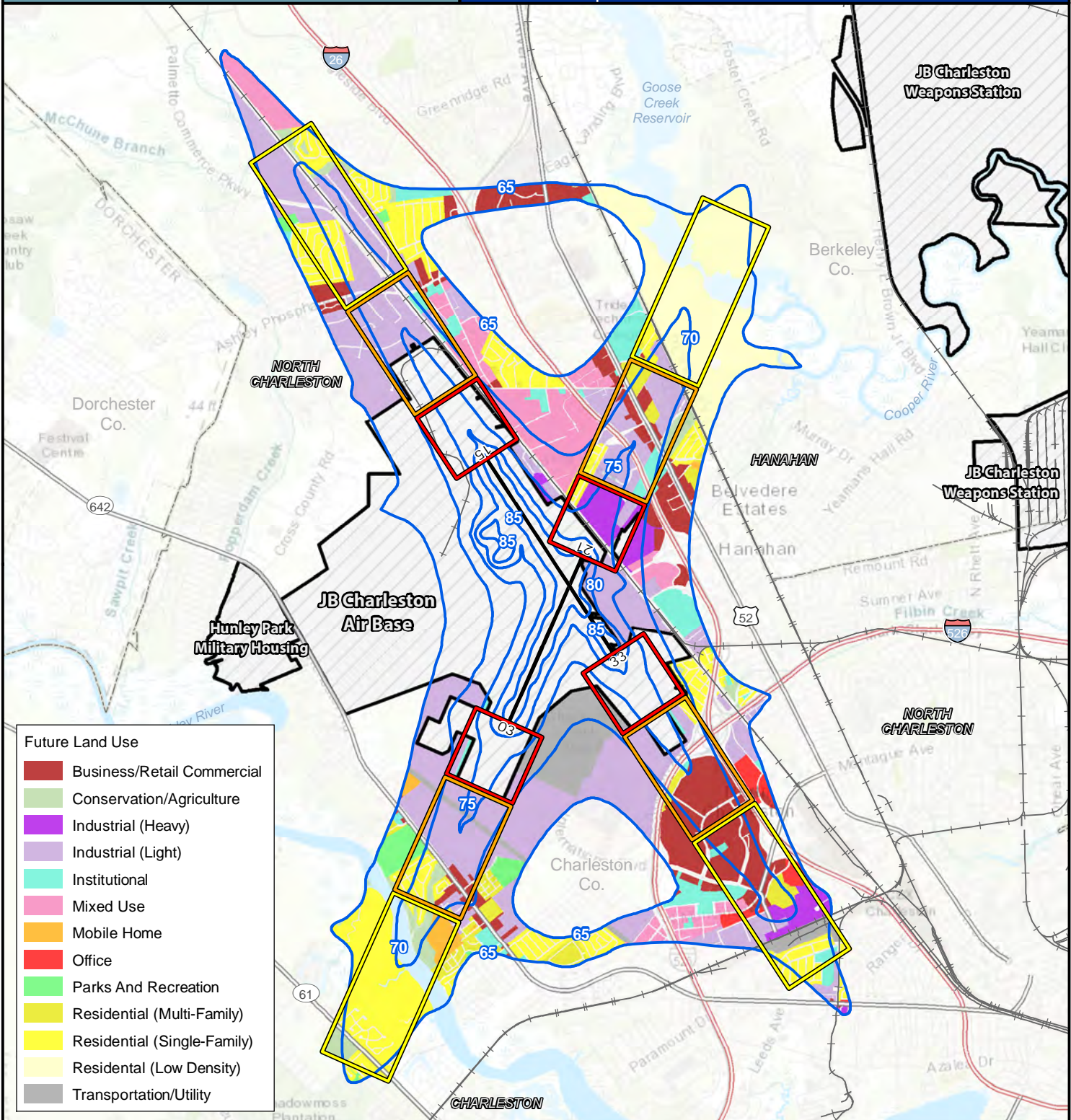
Existing land use within the 2019 AICUZ noise contours, CZs, and APZs are illustrated on Figure 6-4. Section 6.4, Compatibility Concerns, further evaluates areas of specific land use compatibility concerns within NAAF's noise contours, CZs, and APZs.

Orangeburg County's zoning data and classifications are currently the same as the existing land use. Therefore, the existing land use matches the zoning (see Figure 6-4).

6.3.5 Future Land Use for NAAF

The predominant future land use classification surrounding NAAF is conservation/agriculture. The area immediately along the northwest boundary is designated as mixed use. South of the airfield, there is some area with a future land use designated as low density residential.

Future land use within the 2019 AICUZ noise contours, CZs, and APZs for NAAF is illustrated on Figure 6-5. Section 6.4, Compatibility Concerns, further evaluates areas of specific land use compatibility concerns within NAAF's noise contours, CZs, and APZs.

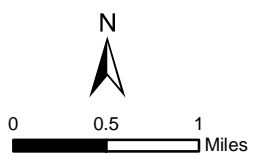


Future Land Use

- Business/Retail Commercial
- Conservation/Agriculture
- Industrial (Heavy)
- Industrial (Light)
- Institutional
- Mixed Use
- Mobile Home
- Office
- Parks And Recreation
- Residential (Multi-Family)
- Residential (Single-Family)
- Residential (Low Density)
- Transportation/Utility

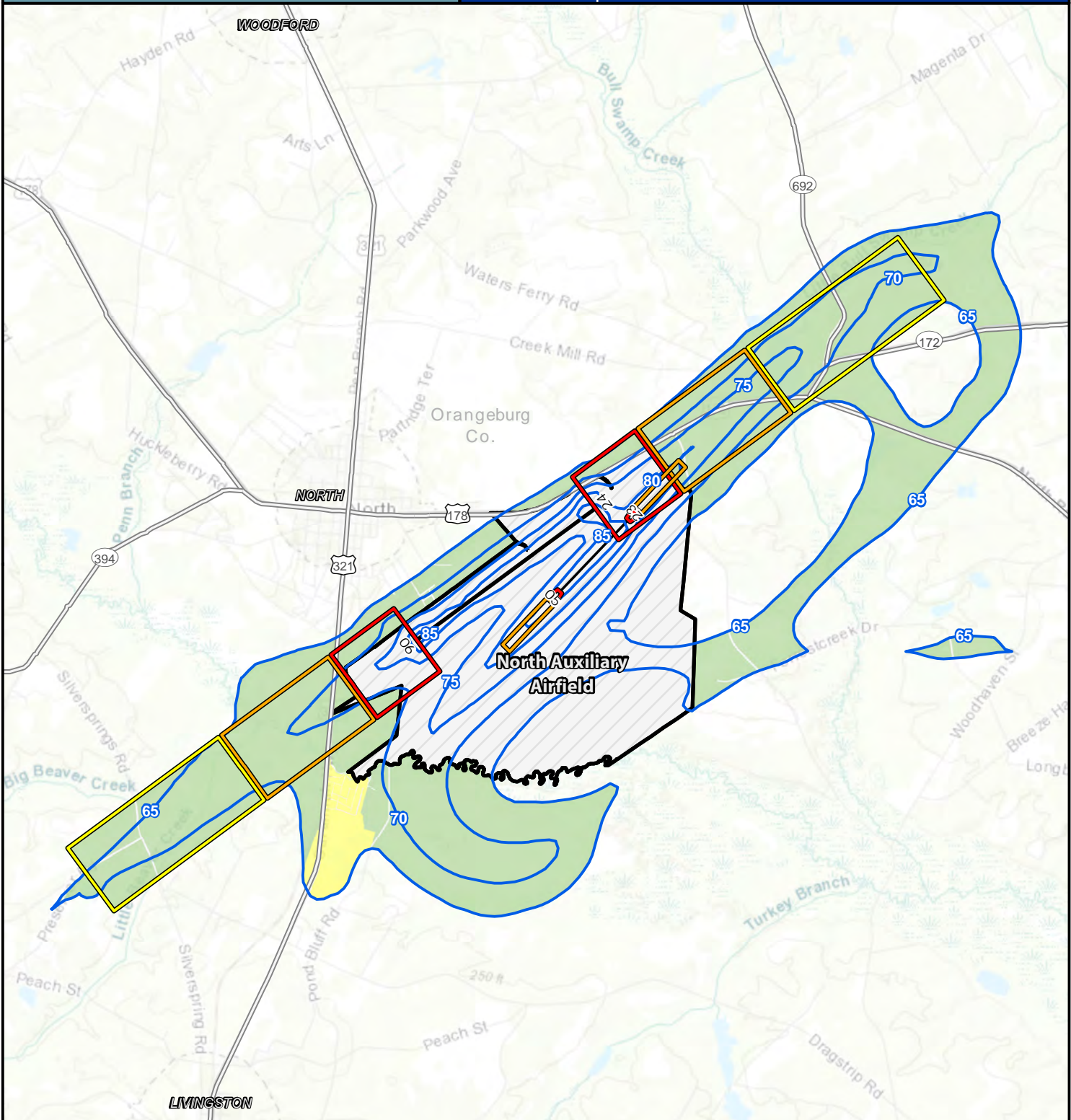
Legend:

- County Boundary
- Interstate
- U.S./State Highway
- Railroad
- Runway
- Installation
- Waterbody
- 2019 AICUZ Noise Contour (dB DNL)
- Clear Zone
- Accident Potential Zone I
- Accident Potential Zone II



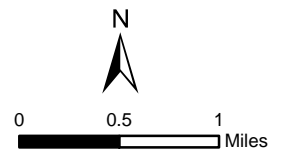
Note: Future land use data is not available within major transportation corridors.

Source: AFCEC 2017, 2018; BCDCOG 2018; ESRI 2017; FHWA 2017; U.S. Census Bureau 2017. © Ecology and Environment, Inc. 2018

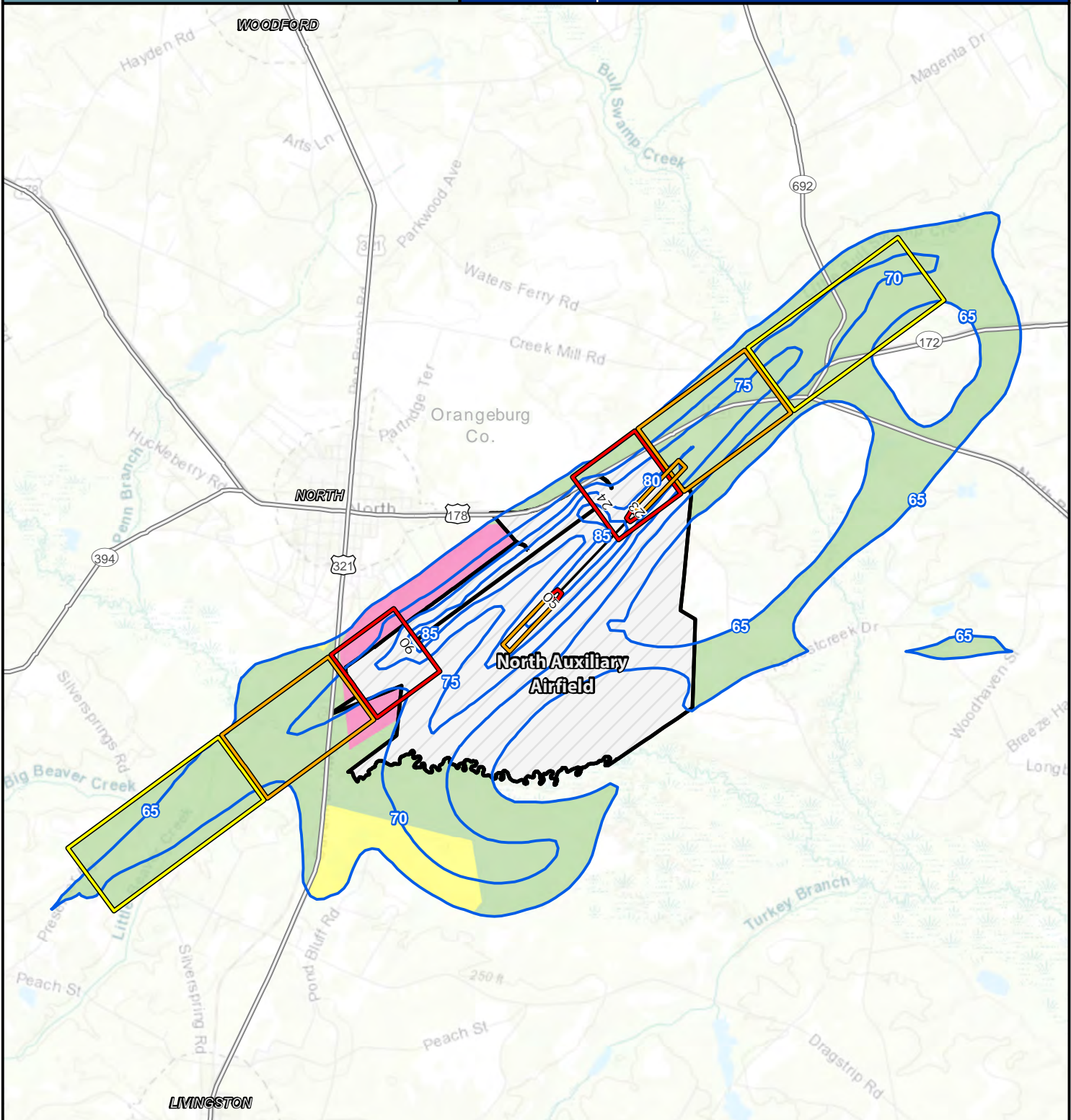


Legend:

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|-----------------------------------|---------------------------------|---------------------------|
| U.S./State Highway | 2019 AICUZ Clear Zones and APZs | Existing Land Use |
| Runway | Clear Zone | Conservation/Agriculture |
| Installation | Accident Potential Zone I | Residential (Low Density) |
| Waterbody | Accident Potential Zone II | |
| 2019 AICUZ Noise Contour (dB DNL) | | |

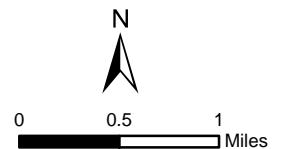


Source: AFCEC 2017, 2018;
ESRI 2017; Orangeburg County 2018.
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Legend:

- | | | |
|-----------------------------------|---------------------------------|---------------------------|
| U.S./State Highway | 2019 AICUZ Clear Zones and APZs | Future Land Use |
| Runway | Clear Zone | Conservation/Agriculture |
| Installation | Accident Potential Zone I | Mixed Use |
| Waterbody | Accident Potential Zone II | Residential (Low Density) |
| 2019 AICUZ Noise Contour (dB DNL) | | |



Source: AFCEC 2017, 2018;
ESRI 2017; Orangeburg County 2018.
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6.4 Compatibility Concerns

6.4.1 Land Use Analysis

Land use describes how land is developed and managed, and is characterized by the dominant function occurring within an area. Local management plans, zoning regulations, and GIS provided by the jurisdictions and BCDCOG were evaluated to determine the type and extent of land use recommended in specific areas. There are multiple jurisdictions surrounding JB CHS-AB and NAAF, each with different land use and zoning data classifications. In order to synthesize the data and conduct a meaningful land use analysis, land use codes for the multiple jurisdictions were assigned a generalized category, see Appendix B for more details.

For purposes of this analysis, the compatibility of the generalized land uses used Air Force guidance and the DoD AICUZ compatibility guidelines (Tables A-1 and A-2 of Appendix A). Land use compatibility falls into one of three categories: (1) Compatible; (2) Compatible with Conditions (which includes compatible with restrictions and incompatible with exceptions); and (3) Incompatible.

The compatible with conditions land use (i.e., category 2) may require incorporation of noise attenuation measures into the design and construction of structures and further evaluation should be considered. Although local conditions regarding the need for housing may require residential use in these zones, residential use is discouraged in 65-69 dB DNL and strongly discouraged in 70-74 dB DNL. 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. Where the community determines that these uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB in 65-69 dB DNL and 30 dB in 70-74 dB DNL 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 75-79 dB DNL. The compatible with conditions land use may also require density limitations for land in APZs. For example, the suggested maximum density for detached single-family housing is two Dwelling unit/ Acre (Du/Ac).

This study analyzes existing and future land use compatibility with both noise contours and with CZs and APZs throughout Chapter 6. In order to determine the compatibility of a specific area, the user must consider both the noise contours and the CZ and APZs that apply to that specific area. In addition, the Air Force recommends coordination between the land use jurisdiction and JB CHS for land areas within the AICUZ footprint and adjacent properties.

6.4.2 Existing Land Use Compatibility Concerns for JB CHS-AB

The existing land use surrounding the JB CHS-AB is mostly compatible or compatible with conditions. However, there are some areas of incompatibility. Within the 2019 AICUZ Noise Contours, there are approximately 2,170 acres of compatible existing land use, 3,068 acres of conditionally compatible existing land use, and 16 acres of incompatible existing land use. Within the 2019 AICUZ CZ and APZs over existing land use, there are approximately 188 acres that are compatible, 1,818 acres that are compatible with conditions, and 390 acres that are incompatible. These acreages do not reflect the overall compatibility totals for the AICUZ footprint as a whole, as the noise contours and CZ and APZs have overlap. Existing land use compatibility with noise contours and compatibility with CZs and APZs are illustrated separately in Figure 6-6 and Figure 6-7, respectively (presented at the end of this section). Table 6-1 and 6-2 (presented at the end of this section) summarize the total acreage of land uses within the 2019 noise zones, CZs, and APZs for JB CHS-AB, respectively. The following analysis describes the compatibility in more detail.

- The land southwest of JB CHS-AB off of Runway 03 and within the CZ is categorized as light industrial and classified as incompatible. Areas of incompatibility within APZ I are multi-family and single-family residential. A small portion of land within APZ II, categorized as multi-family residential, is also incompatible, as it allows for residential uses that exceed two dwelling units per acre. The land within APZ I and APZ II is predominantly light industrial, with some business/retail commercial, which were classified as compatible with conditions. Small areas categorized as mobile home within the 65-69 dB DNL noise zone are incompatible, per the AICUZ Instruction. Other land southwest of the base within the 65-69 dB DNL noise zones is a mixture of compatible with conditions and compatible. Compatible areas in this zone include conservation/agriculture/open space, parks and recreation, and light industrial. The areas within 70-74 dB DNL are compatible with conditions and include uses such as light industrial, conservation/agriculture/open space, and business/retail commercial. It is important to note that this area also allows single-family residential uses, however, residential uses within 70-74 dB DNL are incompatible with exceptions and strongly discouraged. Areas within the 75-79 dB DNL noise zone are over areas categorized as light industrial, which is classified as compatible with conditions.
- The area southeast of the base includes incompatible areas. Light industrial uses in the CZ as well as institutional and single-family residential in APZ I and multi-family residential and institutional uses within APZ II all drive the incompatibility classification. Areas in yellow are compatible with conditions, including industrial uses and business/retail commercial uses in APZ I and II and mixed use and single-family residential use within APZ II. Within the 65-69 dB DNL noise zone, the compatible with condition classification includes existing land use, such as single-family residential, multi-family residential,

institutional, and mixed use. Compatible uses within this area include light and heavy industrial, office, and business/retail commercial. The compatible with conditions classification within noise zones to the southeast of the base is mostly within the 70-74 dB DNL noise zone. The uses within this area under this classification include light industrial, multi-family residential, institutional, and business/retail commercial, although residential use within the 70-74 dB DNL noise zones are incompatible with exceptions and strongly discouraged.

- Northeast of the base, all uses within the CZ off of Runway 21 are incompatible, except a small area categorized as conservation/agriculture/open space, which is compatible. The institutional and multi-family residential uses are incompatible within APZ I and APZ II. Single-family residential uses are categorized as incompatible in APZ I. Within noise zones, areas that are incompatible include a small area categorized as mobile home within the 65-69 dB DNL noise zone and an area of light industrial within the 85+ dB DNL noise zone near Runway 21. Northeast of the base, the 70-74 dB DNL noise contour includes light industrial and conservation/agriculture/open space land uses, which are compatible with conditions. Within the 70-74 dB DNL noise zone, most uses are compatible with conditions, except for heavy industrial which is compatible. Uses classified as compatible with conditions within 65-69 dB DNL noise zone include institutional, multi-family and single-family residential, and mixed use. Residential use within 65-69 dB DNL is incompatible with exceptions and is discouraged.
- Northwest of the base, institutional use is classified as incompatible within APZ I and APZ II. Institutional is incompatible in this location because this land use allows for schools, colleges, churches, hospitals, museums, and libraries, which are all considered to be incompatible in these areas. A small area off base located within the CZ does not have a land use designation because it is surrounding the railroad, and land use data were not available within major transportation corridors. The area designated as compatible with conditions in APZ I is categorized as light industrial. In APZ II, conditionally compatible areas are comprised of light industrial, single-family residential, and business/retail commercial. Compatible areas are conservation/agricultural/open space. The compatible with conditions classification within noise zones to the northwest of the base within the 70-74 dB DNL noise zone include light industrial, institutional, single-family residential uses, and a small amount of mixed use. The northwest area of the base within 65-69 dB DNL noise zones are both compatible with conditions and compatible. Areas that are compatible with conditions include uses such as mixed use, institutional, and single-family residential.
- As noted in previous sections, major transportation corridors surrounding the base, such as roads and railroads that pass through the CZs, APZs, and noise

zones for JB CHS-AB, did not have a classified existing land use. However, these uses are not compatible within the CZ and are compatible with conditions in APZ I, indicating that no passenger facilities or power lines should be present.

6.4.3 Future Land Use Compatibility Concerns for JB CHS-AB

The existing land uses discussed in Section 6.4.2 are very similar to the future land use classifications for the land surrounding JB CHS-AB; therefore, many of the compatibility classifications are similar to the previous existing land use analysis. Berkeley County had future land use data available; consequently, it is included in this analysis and on Figures 6-8 and 6-9 (presented at the end of this section). Differences in compatibility from existing to future are highlighted below.

- Southwest of the base, the future land use of mobile home is present within APZ II and the 65-69 dB DNL noise zone, which is not compatible.
- Southeast of the base, there are single-family residential areas along I-526 within APZ I that are incompatible per the AICUZ Instruction. On the eastern boundary of the base near Runway 33, future land use of institutional is present within the 65-69 dB DNL noise zone and is classified as compatible with conditions.
- Northeast of the base, residential and industrial uses fall within the CZ and are incompatible. Low density residential is also present within APZ II and classified as compatible with conditions. Low density residential areas within the 65-69 dB DNL noise zones in Berkeley County are shown as compatible with conditions, however residential development in this area is incompatible with exceptions and discouraged. The compatible areas within Berkeley County are water.
- Roads and railroads that pass through noise zones, CZs, and APZs for JB CHS-AB did not have a classified future land use. However, these uses are not compatible within the CZ. They are compatible with conditions in APZ I, indicating that no passenger facilities or power lines should be present.

6.4.4 Existing Land Use Compatibility Concerns for NAAF

Most of the existing land use surrounding NAAF is classified as compatible with conditions. Off-installation land within the CZs, categorized as conservation/agriculture, is classified as compatible with conditions. It is important to note that, although the land use within the CZ is classified compatible with conditions, the land use of conservation/agriculture has allowable uses within the CZ, including single-family and manufactured dwellings, which are incompatible. Structures currently appear to be within the CZs at NAAF and are incompatible. Some of the compatible with conditions area to the southwest of NAAF is low density residential land use present within the 65-69 dB DNL noise zone. The remaining land use is categorized as conservation/agriculture

and is classified as compatible with conditions, as the uses allow for residential uses, agriculture, undeveloped land, and forestry.

Roads that pass through the CZs, APZs and noise zones for NAAF did not have a classified existing land use. These uses are not compatible within the CZ and are compatible with conditions in APZ I indicating that no passenger facilities or power lines should be present. Existing land use compatibility is illustrated on Figures 6-10 and 6-11. Table 6-3 and 6-4 summarize the total acreage of land uses within the 2019 noise zones, CZs, and APZs for NAAF.

6.4.5 Future Land Use Compatibility Concerns for NAAF

Most of the future land use surrounding NAAF is classified as compatible with conditions. The mixed use future land use within the CZ is incompatible, as it allows for low intensity residential and institutional uses. The future land use of low density residential within the 65-69 and 70-74 dB DNL noise zones is classified under the category of compatible with conditions. It is important to note that residential uses within these noise zones are discouraged within the 65-69 dB DNL and strongly discouraged within the 70-74 dB DNL. Measures to achieve outdoor to indoor NLR of at least 25 dB in DNL 65-69 and 30 dB in DNL 70-74 should be incorporated into building codes and be considered in individual approvals. In addition, the land use category of low density residential permits uses such as educational services, which can be incompatible per the AICUZ Instruction.

Roads that pass through the noise zones, CZs, and APZs for NAAF did not have a classified future land use category and, therefore, compatibility concerns for roads were not shown on Figure 6-9. However, these uses are not compatible within CZs and are compatible with conditions in APZ I, indicating that no passenger facilities or power lines should be present. Future land use compatibility is illustrated on Figures 6-12 and 6-13.

Table 6-1. Off-Installation Existing Land Use Acreage within AICUZ Noise Zones for JB CHS-AB

Generalized Land Use Category	Noise Zone (dB DNL)														
	65-69			70-74			75-79			80-84			85+		
	Compatible	Compatible with Conditions*	Incompatible	Compatible	Compatible with Conditions*	Incompatible	Compatible	Compatible with Conditions*	Incompatible	Compatible	Compatible with Conditions*	Incompatible	Compatible	Compatible with Conditions*	Incompatible
Business/Retail Commercial	427.59				251.63			1.11							
Conservation/Agriculture/Open Space	131.24				52.24			7.05							
Heavy Industrial	79.09			61.13			47.47								
Institutional		207.47			61.53			8.20				1.63			0.41
Light Industrial	1,273.67				793.02			109.40			19.34				2.88
Low Density Residential															
Mixed Use		388.74			85.23										
Mobile Home			11.52												
Multi-family Residential		108.82			33.80										
Office	58.45				1.26										
Parks and Recreation	91.22				0.67										
Planned Unit Development															
Single-family Residential		828.53			110.01										
Subtotals	2,061.26	1,533.56	11.52	61.13	1,389.40	0.00	47.47	125.76	0.00	0.00	19.34	1.63	0.00	0.00	3.29
Total	3,606.34			1,450.53			173.23			20.97			3.29		

Notes:

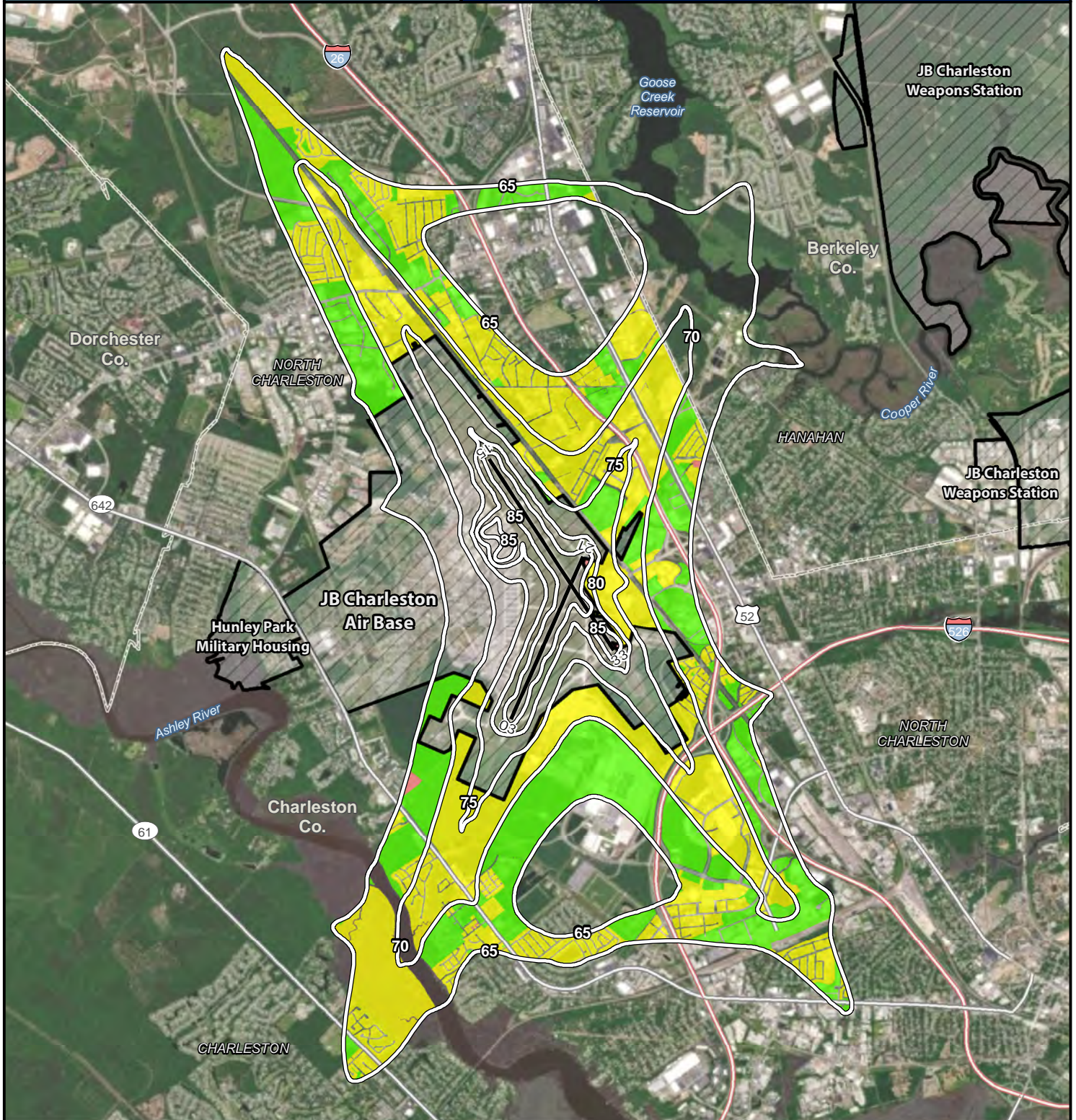
- * Compatible with Conditions to include Incompatible with Exceptions and Compatible with Restrictions
- All contour areas on-installation are excluded from the counts.
- Refer to Appendix B for more details on Generalized Land Use Designations.
- Discrepancies in total are a result of rounding from calculations.

Table 6-2. Off-installation Existing Land Use Acreage within Clear Zones/Accident Potential Zones for JB CHS-AB

	CZ			APZ I			APZ II		
	Compatible	Compatible with Conditions*	Incompatible	Compatible	Compatible with Conditions*	Incompatible	Compatible	Compatible with Conditions*	Incompatible
Business/Retail Commercial			1.79		210.25			153.33	
Conservation/Agriculture/Open Space	12.56			37.61			116.94		
Heavy Industrial			63.98		1.38			69.15	
Institutional			11.60			53.64			44.22
Light Industrial			85.14		592.94			287.76	
Low Density Residential									
Mixed Use			3.82		13.92			5.50	
Mobile Home									
Multi-family Residential						20.19			30.29
Office							20.58		
Parks and Recreation					11.57			4.60	
Planned Unit Development									
Single-family Residential			10.10			65.15		467.90	
Subtotals	12.56	0.00	176.44	37.61	830.06	138.99	137.52	988.25	74.51
Total	189.00			1,006.66			1,200.28		

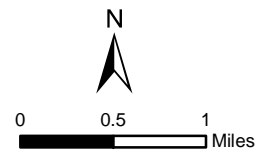
Notes:

- * Compatible with Conditions to include Incompatible with Exceptions and Compatible with Restrictions
- All contour areas on-installation are excluded from the counts.
- Refer to Appendix B for more details on Generalized Land Use Designations.
- The suggested maximum density for detached single-family housing is two Du/Ac.
- Discrepancies in total are a result of rounding from calculations.



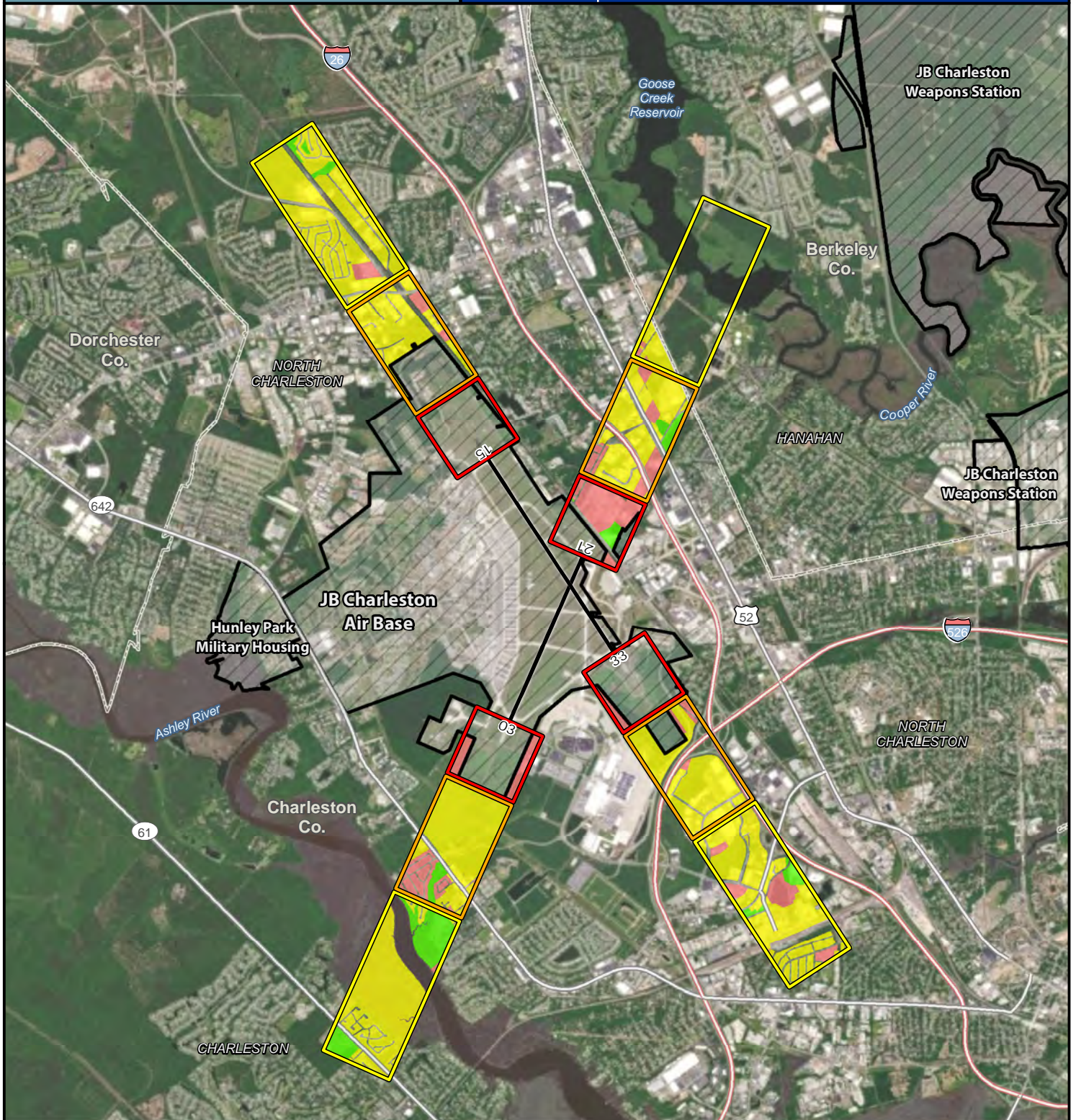
Legend:

- | | |
|-----------------------|--|
| --- County Boundary | ==== 2019 AICUZ Noise Contour (dB DNL) |
| == Interstate | Compatibility |
| == U.S./State Highway | Compatible |
| == Runway | Compatible with Conditions |
| ▭ Installation | Incompatible |



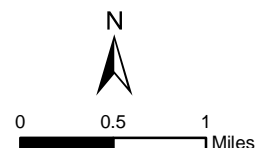
Notes: No Existing Land Use data available for Berkeley County.
Land use data is not available within major transportation corridors.

Source: AFCEC 2017, 2018; BCDCOG 2018; Digital Globe 2016; ESRI 2017; FHWA 2017. © Ecology and Environment, Inc. 2018



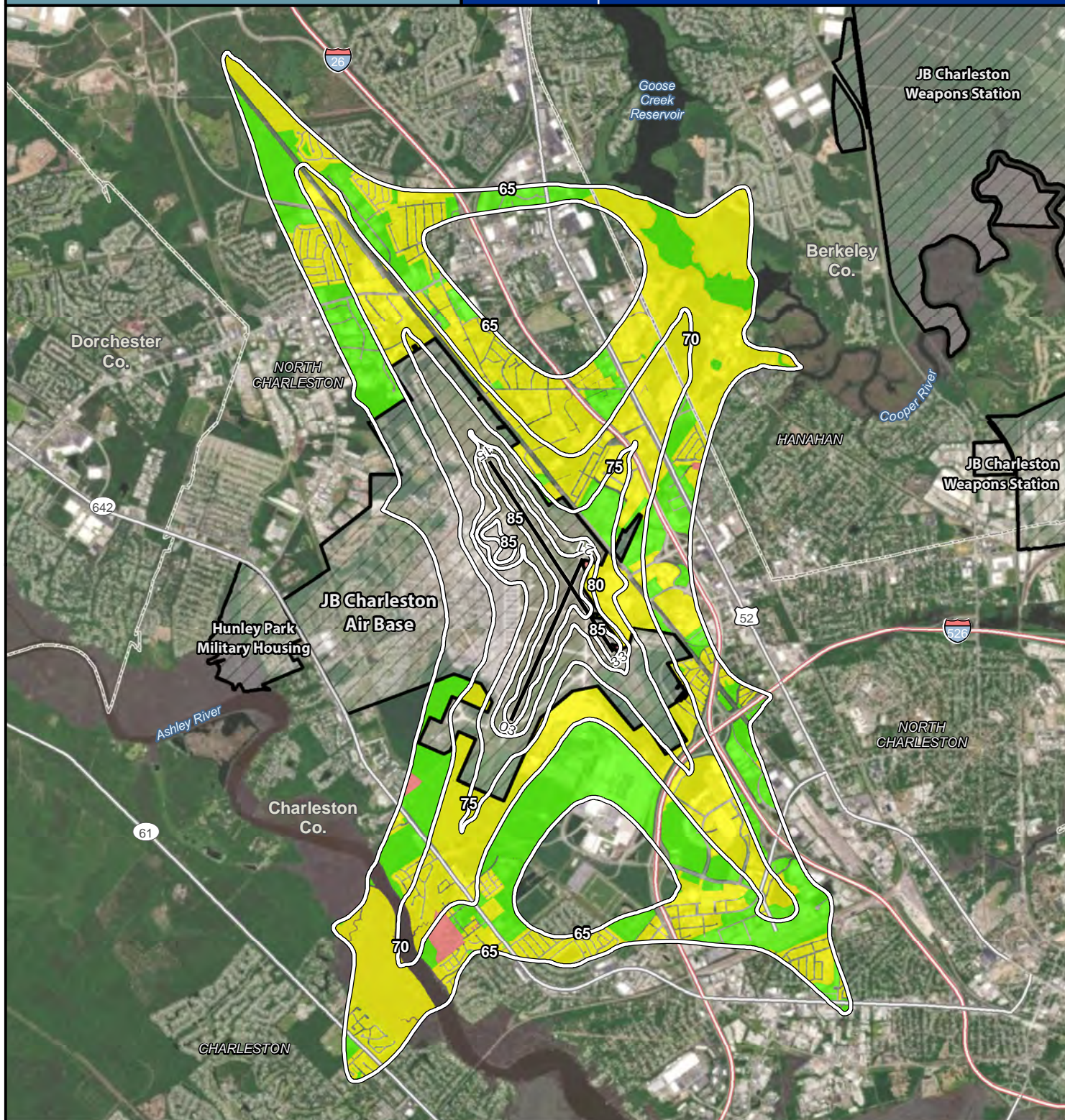
Legend:

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|--|---|--|
| --- County Boundary | 2019 AICUZ Clear Zones and APZs | Compatibility |
| == Interstate | Clear Zone | Compatible |
| == U.S./State Highway | Accident Potential Zone I | Compatible with Conditions |
| == Runway | Accident Potential Zone II | Incompatible |
| Installation | | |



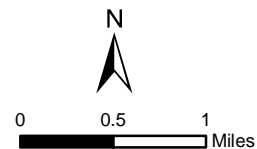
Notes: No Existing Land Use data available for Berkeley County.
Land use data is not available within major transportation corridors.

Source: AFCEC 2017, 2018; BCDCOG 2018;
Digital Globe 2016; ESRI 2017; FHWA 2017.
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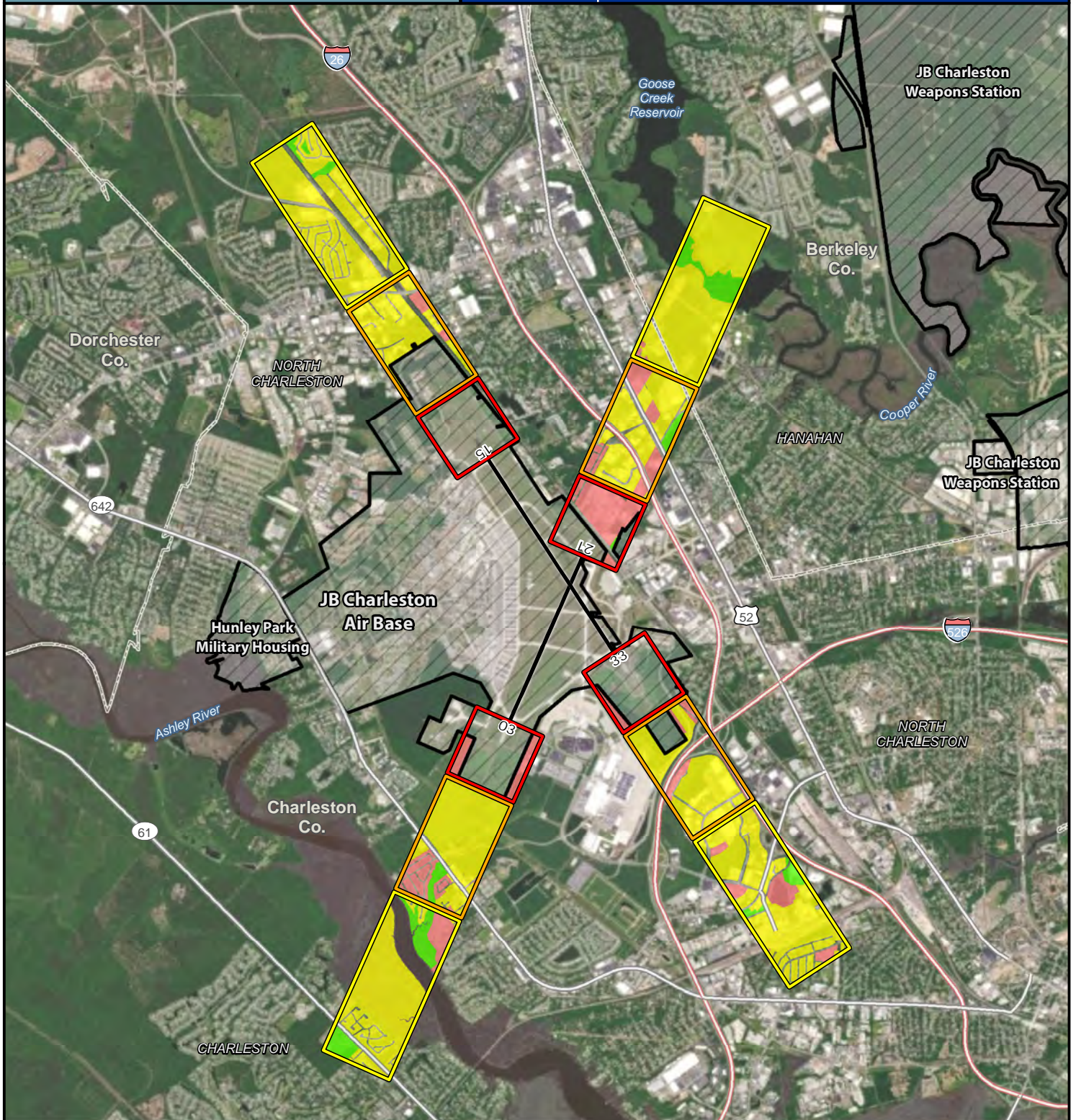
Legend:

- | | |
|-----------------------|--|
| --- County Boundary | ==== 2019 AICUZ Noise Contour (dB DNL) |
| == Interstate | |
| == U.S./State Highway | Compatibility |
| == Runway | Compatible |
| ▭ Installation | Compatible with Conditions |
| | Incompatible |



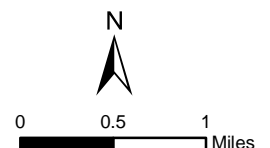
Note: Future land use data is not available within major transportation corridors.

Source: AFCEC 2017, 2018; BCDCOG 2018; Digital Globe 2016; ESRI 2017; FHWA 2017. © Ecology and Environment, Inc. 2018



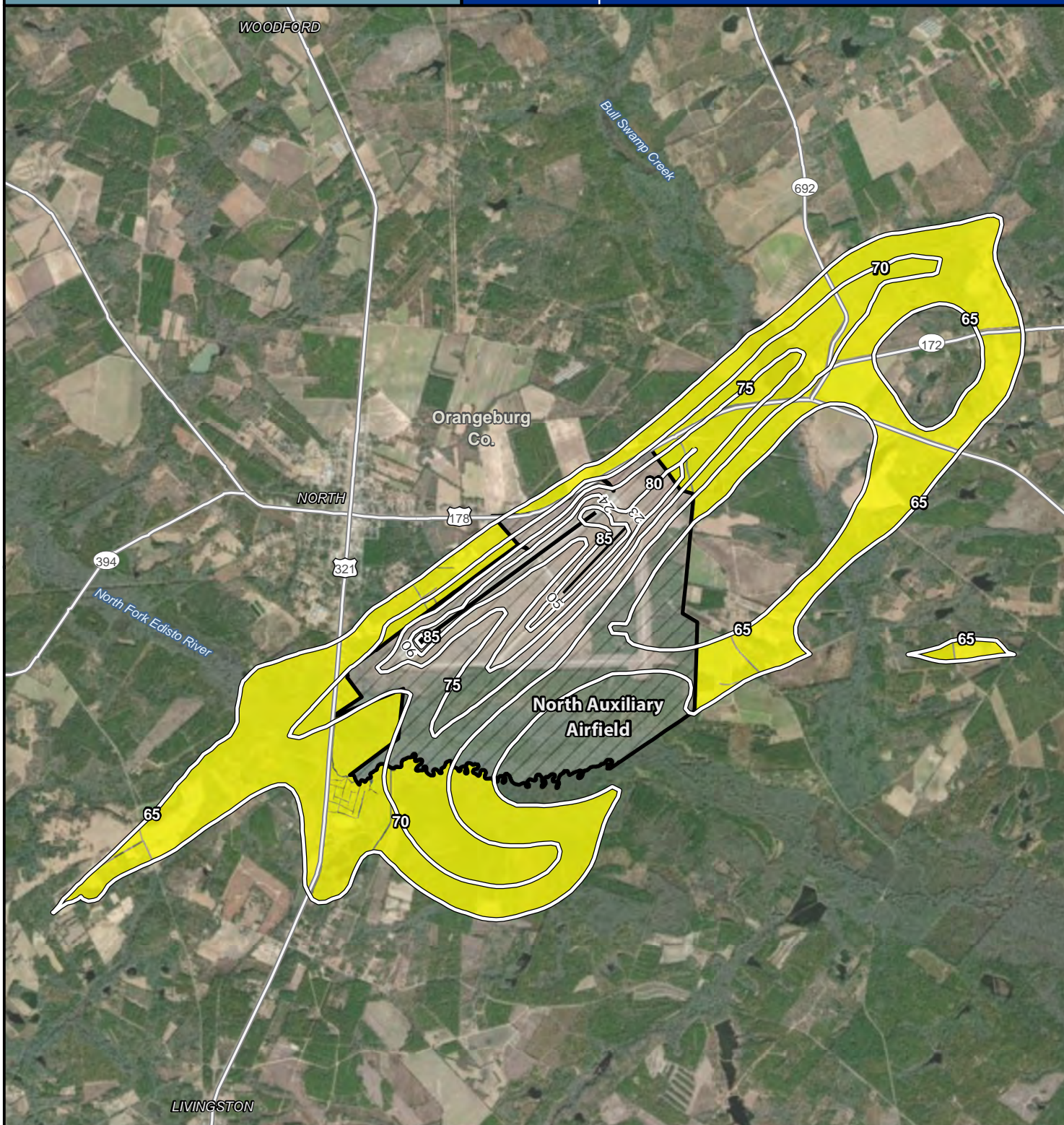
Legend:

- | | | |
|--|---|--|
| --- County Boundary | 2019 AICUZ Clear Zones and APZs | Compatibility |
| — Interstate | Clear Zone | Compatible |
| — U.S./State Highway | Accident Potential Zone I | Compatible with Conditions |
| — Runway | Accident Potential Zone II | Incompatible |
| Installation | | |



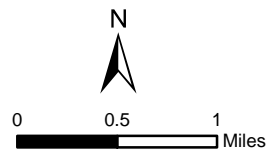
Note: Future land use data is not available within major transportation corridors.

Source: AFCEC 2017, 2018; BCDCOG 2018; Digital Globe 2016; ESRI 2017; FHWA 2017. © Ecology and Environment, Inc. 2018



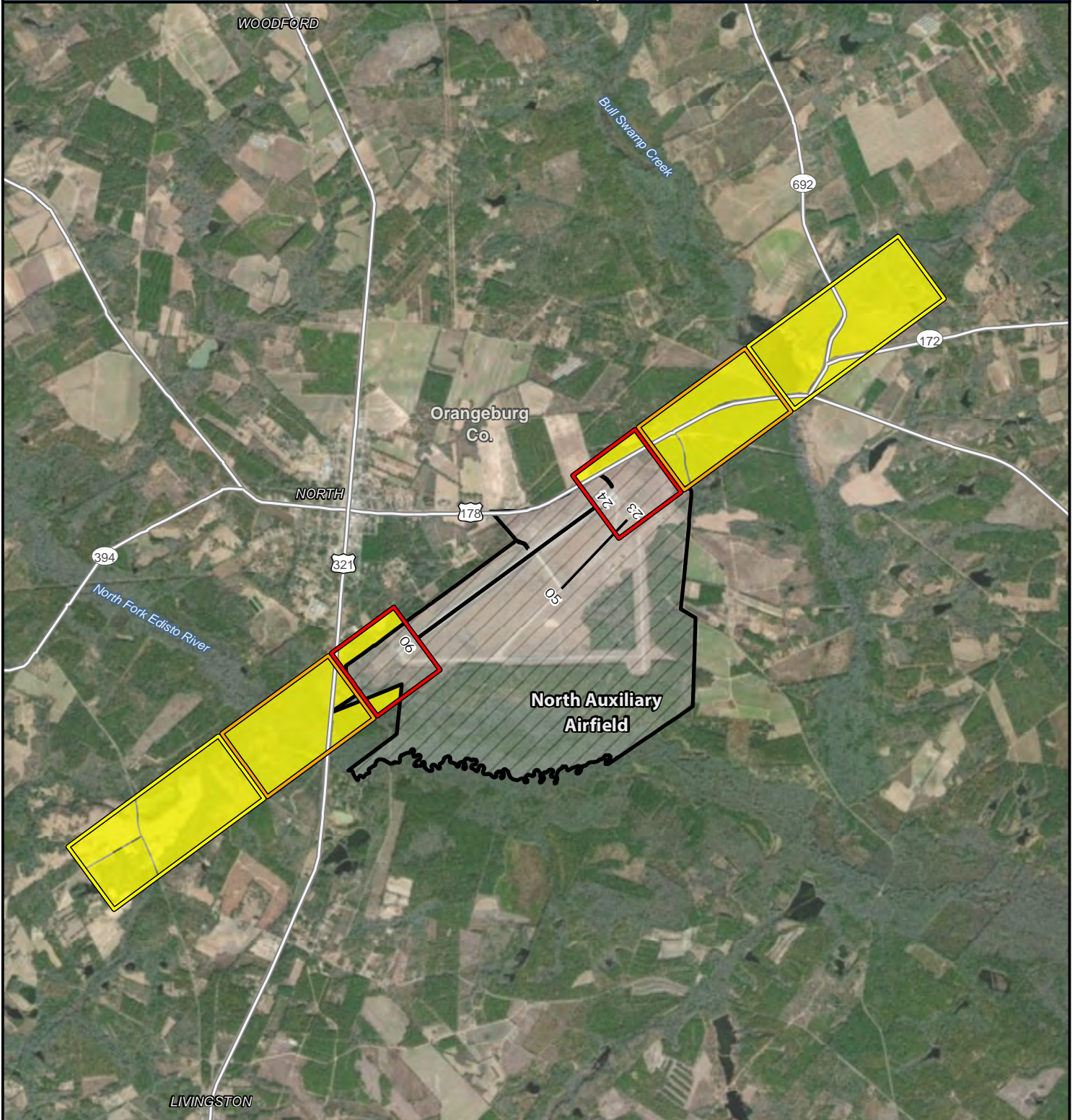
Legend:

- U.S./State Highway
- Runway
- ▭ Installation
- 2019 AICUZ Noise Contour (dB DNL)
- Compatibility
- Compatible with Conditions



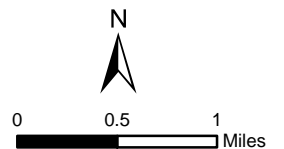
Note: Land use data is not available within major transportation corridors.

Source: AFCEC 2017, 2018; Digital Globe 2017; ESRI 2017; Orangeburg County 2018. © Ecology and Environment, Inc. 2018



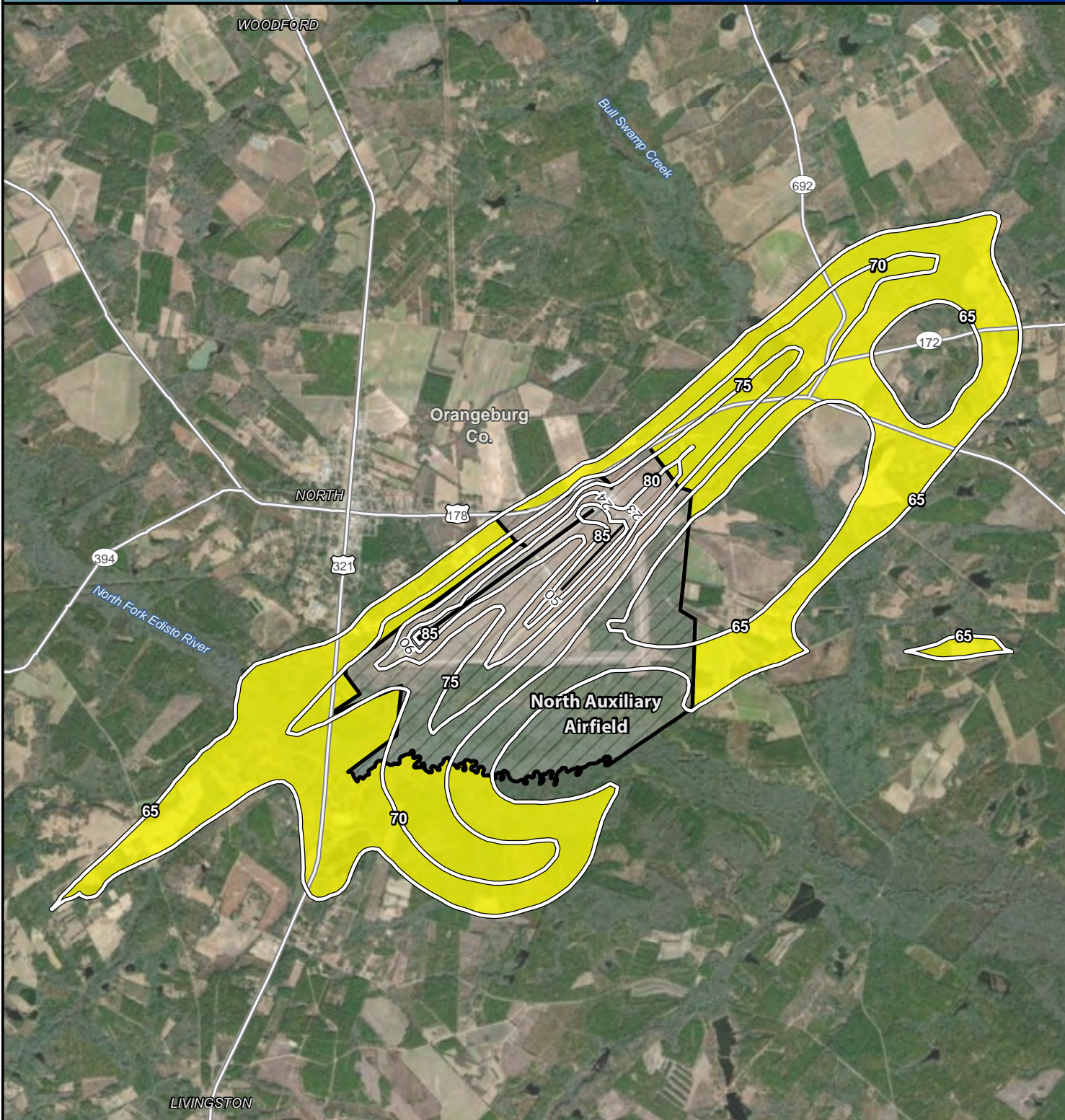
Legend:

- | | | |
|--------------------|---------------------------------|----------------------------|
| U.S./State Highway | 2019 AICUZ Clear Zones and APZs | Compatibility |
| Runway | Clear Zone | Compatible with Conditions |
| Installation | Accident Potential Zone I | |
| | Accident Potential Zone II | |



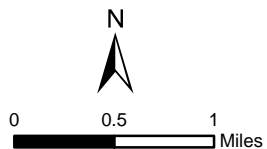
Note: Land use data is not available within major transportation corridors.

Source: AFCEC 2017, 2018; Digital Globe 2017; ESRI 2017; Orangeburg County 2018. © Ecology and Environment, Inc. 2018



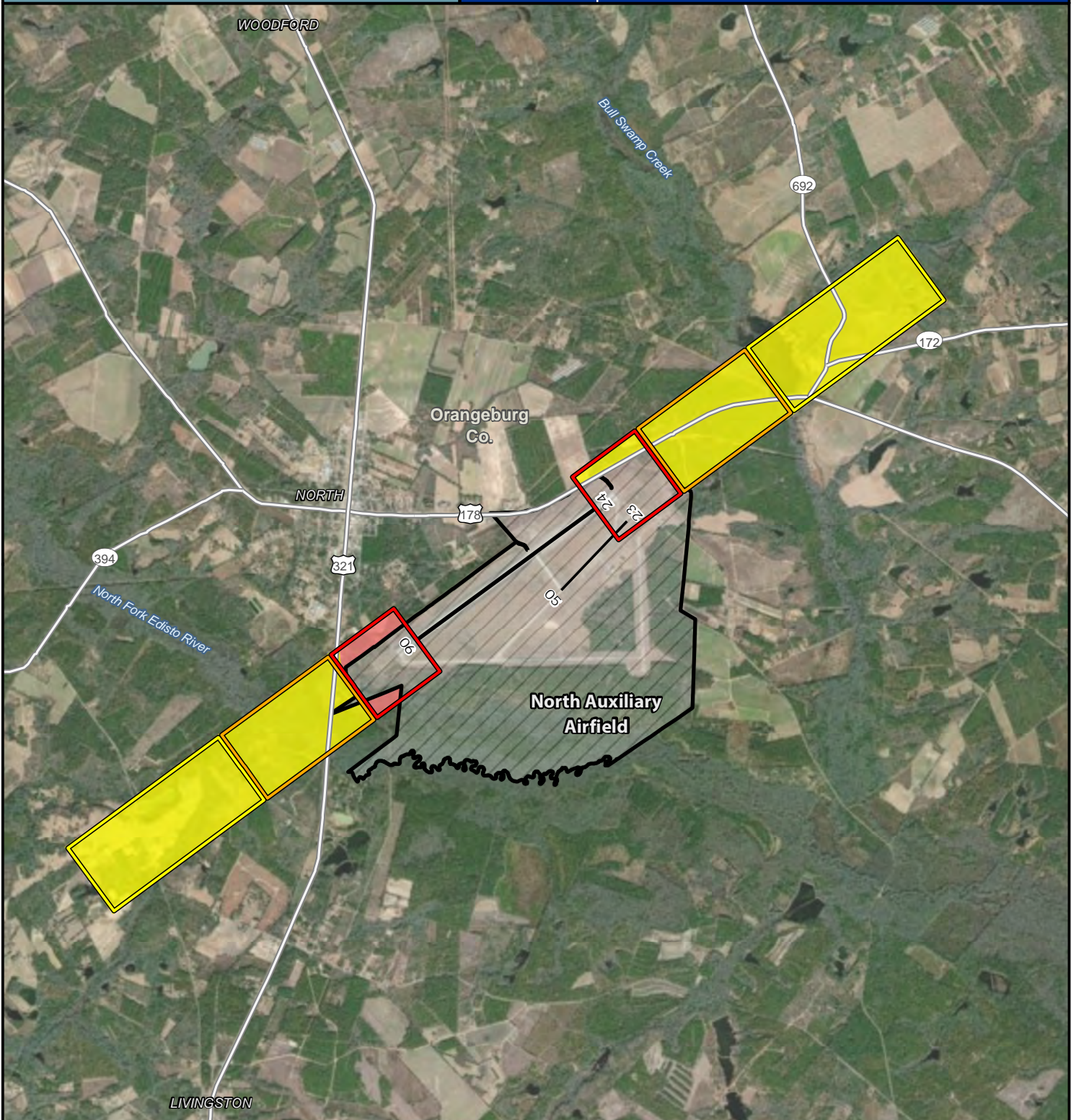
Legend:

- U.S./State Highway
- Runway
- Installation
- 2019 AICUZ Noise Contour (dB DNL)
- Compatibility
- Compatible with Conditions



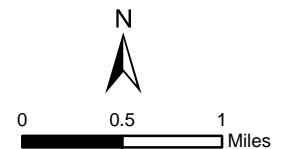
Note: Future land use data is not available within major transportation corridors.

Source: AFCEC 2017, 2018; Digital Globe 2017; ESRI 2017; Orangeburg County 2018. © Ecology and Environment, Inc. 2018



Legend:

- | | | |
|--------------------|---------------------------------|----------------------------|
| U.S./State Highway | 2019 AICUZ Clear Zones and APZs | Compatibility |
| Runway | Clear Zone | Compatible with Conditions |
| Installation | Accident Potential Zone I | Incompatible |
| | Accident Potential Zone II | |



Note: Future land use data is not available within major transportation corridors.

Source: AFCEC 2017, 2018; Digital Globe 2017; ESRI 2017; Orangeburg County 2018. © Ecology and Environment, Inc. 2018

Table 6-3. Off-Installation Existing Land Use Acreage within AICUZ Noise Zones for NAAF

Generalized Land Use Category	Noise Zone (dB DNL)														
	65-69			70-74			75-79			80-84			85+		
	Compatible	Compatible with Conditions*	Incompatible	Compatible	Compatible with Conditions*	Incompatible	Compatible	Compatible with Conditions*	Incompatible	Compatible	Compatible with Conditions*	Incompatible	Compatible	Compatible with Conditions*	Incompatible
Business/Retail Commercial															
Conservation/Agriculture/Open Space		2,946.70			729.62			139.00			5.66				
Heavy Industrial															
Institutional															
Light Industrial															
Low Density Residential		156.08													
Mixed Use															
Mobile Home															
Multi-family Residential															
Office															
Parks and Recreation															
Planned Unit Development															
Single-family Residential															
Subtotals	0.00	3,102.78	0.00	0.00	729.62	0.00	0.00	139.00	0.00	0.00	5.66	0.00	0.00	0.00	0.00
Total		3,102.78			729.62			139.00			5.66			0.00	

Notes:

- * Compatible with Conditions to include Incompatible with Exceptions and Compatible with Restrictions
- All contour areas on-installation are excluded from the counts.
- Refer to Appendix B for more details on Generalized Land Use Designations.
- Discrepancies in total are a result of rounding from calculations.

Table 6-4. Off-installation Existing Land Use Acreage within Clear Zones/Accident Potential Zones for NAAF

Generalized Land Use Category	CZ			APZ I			APZ II		
	Compatible	Compatible with Conditions*	Incompatible	Compatible	Compatible with Conditions*	Incompatible	Compatible	Compatible with Conditions*	Incompatible
Business/Retail Commercial									
Conservation/Agriculture/Open Space		116.83			664.24			943.62	
Heavy Industrial									
Institutional									
Light Industrial									
Low Density Residential									
Mixed Use									
Mobile Home									
Multi-family Residential									
Office									
Parks and Recreation									
Planned Unit Development									
Single-family Residential									
Subtotals	0.00	116.83	0.00	0.00	664.24	0.00	0.00	943.62	0.00
Total		116.83			664.24			943.62	

Notes:

- * Compatible with Conditions to include Incompatible with Exceptions and Compatible with Restrictions
- All contour areas on-installation are excluded from the counts.
- Refer to Appendix B for more details on Generalized Land Use Designations.
- The suggested maximum density for detached single-family housing is two Du/Ac.
- Discrepancies in total are a result of rounding from calculations.

7.0 Implementation

Implementation of the AICUZ Study must be a joint effort between JB CHS and the 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 partners in the collaborative planning process.

7.1 Air Force Role

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

JB CHS's AICUZ responsibilities encompass the areas of flight safety, noise abatement, and participation in the land use planning process.

Air Force policy and guidance requires that installation leadership periodically review existing practices for flight operations and evaluate these factors in relationship to populated areas and other local situations.

- JB CHS will ensure that, wherever possible, air operations planners route flights over sparsely populated areas to reduce the exposure of lives and property to a potential accident.
- JB CHS will periodically review existing traffic patterns, instrument approaches, weather conditions, and operating practices and evaluate these factors in relationship to populated areas and other local conditions. The purpose of this review is to limit, reduce, and control the impact of noise from flying operations on surrounding communities.
- JB CHS will consider the establishment of a community forum between the installation and surrounding stakeholders to discuss land use and other issues of concern; the installation would hold these meetings on a quarterly basis.
- JB CHS will schedule land use planning meetings to provide a forum for agencies to meet and discuss future development and to address issues that may surface because of new proposals.
- JB CHS will provide copies of the AICUZ Study to local, county, tribal, and regional planning departments and zoning administrators to aid in the planning process and provide copies of the AICUZ Study to appropriate state and federal agencies.

Preparation and presentation of this JB CHS and NAAF AICUZ Study is one phase in continuing Air Force participation in the local planning process. The Air Force recognizes

that, as the local community updates its land use plans, JB CHS must be ready to provide additional input, as needed.

7.2 State/Regional Roles

As noted in Section 6.2.1, growth management is guided by the South Carolina Local Government Comprehensive Planning Enabling Act of 1994. The periodic reviews and updates to the surrounding jurisdiction local plans is an opportunity to revise the AICUZ-specific information within them and implement targeted zoning and land use controls to prevent future incompatibility.

In addition to planning legislature, there are military-related organizations and councils, the CCAA, as well as a JLUS, which help to promote community development that is compatible with JB CHS's mission.

The 2008 Charleston AFB and NWS Charleston JLUS introduced recommendations for compatible land uses surrounding the installation. Recommendations from the JLUS included:

- Real estate disclosures should be implemented for properties located within the AICUZ footprint in the Charleston region.
- Surrounding communities should amend their comprehensive land use plans to address opportunities for implementing an AICUZ Overlay District.
- A Transfer of Development Rights (TDR) Program should be considered by the City of North Charleston and Charleston County to effectively redirect land development away from AICUZ surrounding the JB CHS-AB.
- The installation should pursue funding sources through existing federal government programs, such as DoD's Readiness and Environmental Protection Integration (REPI), for acquisition of private property within the CZ and APZs.

While much has changed over the past decade, some of the recommendations introduced that were not implemented or did not initially seem viable should be reconsidered. One example of this includes revisiting the idea of TDR, and reinforcing the recommendations and messaging around that effort. In addition, the BCDCOG is planning to conduct an updated JLUS in the next few years to include NAAF as well as major updates to the JB CHS mission and surrounding areas. The BCDCOG also plans to hire someone into a 2-year term position to serve as a coordinator between the surrounding communities and JB CHS to facilitate recommendations from the 2008 JLUS and any new developments that emerge from the updated JLUS.

Military councils and task forces work toward strengthening the relationship between the community and the base. An example of these entities includes the Charleston Metro Chamber of Commerce's Military Policy Council. The council was formed in 2001 in

preparation for BRAC and continues to operate today focusing on the retention and expansion of military and federal facilities and operations within the Charleston region. The JB CHS Advisory Council is an additional entity that serves to promote compatibility between the community and the military. The Council's mission is to advise current Honorary Commanders as well as support the U.S. military, JB CHS, the base's mission, and its people. The Honorary Commander Program partners professionals from various areas of the community with commanders to strengthen the relationship between the base and local community.

These regional community/military entities often align with the mission of the South Carolina Military Task Force. The state task force's mission is to enhance the value of the state's military installations and facilities, in addition to the quality of life for service members and their families.

The CCAA is governed by an 11-member board made up of local mayors, state and county elected officials, and business leaders from the region, each serving a 4-year term. The CCAA owns and operates three public airports in the area: Charleston International, Charleston Executive Airport on Johns Island, and the Mount Pleasant Regional Airport. The runways at Charleston International Airport are owned by the Air Force at JB CHS and are shared through what is the longest-running civilian/military joint-use agreement of its kind within the DoD. The CCAA works closely with the installation and community to ensure operations are sustained and enhanced.

7.3 Local Government Role

The role of the local government is to enact planning, zoning, and development principles and practices that are compatible with the installation and protect the installation's mission. The residents of the surrounding community have a long history of working with personnel from JB CHS. 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 protect the integrity of the installation's flying mission:

- Local government planners consider AICUZ policies and guidelines when developing or revising city 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.
- Ensure that new development applications or "changed use of property" are submitted to JB CHS to afford the opportunity to assess those applications for potential impacts on defense missions. The JB CHS PA Office can provide a land use planning point of contact.
- Zoning ordinances be adopted or modified to reflect the compatible land uses outlined in the AICUZ Study, including the creation of military airport overlay zones.

- Local governments review capital improvement plans, infrastructure investments, and development policies to ensure they do not encourage incompatible land use patterns near JB CHS-AB and NAAF, with particular emphasis on utility extension and transportation planning.
- Recommend local governments implement height and obstruction ordinances that reflect current Air Force and 14 CFR 77 requirements, presented in this study as HAFZs.
- Fair disclosure ordinances be enacted to require disclosure to the public for AICUZ items that directly relate to aircraft operations at JB CHS-AB and NAAF.
- Where allowed, local governments require real estate disclosure for individuals purchasing or leasing property within noise zones or CZs/APZs.
- Enact or modify building/residential codes to ensure that any new construction near JB CHS-AB and NAAF has the recommended noise level reduction measures incorporated into the design and construction of structures.
- Government planning bodies 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 JB CHS-AB and NAAF. Where appropriate, coordinate with the FAA on the height of structures.
- Local government land use plans and ordinances reflect AICUZ recommendations for development in CZs/APZs and noise zones.
- Local governments consult with JB CHS on planning and zoning actions that have the potential to affect installation operations.
- Invite the Air Force leadership to be ex officio members on boards, commissions, and regional councils addressing long-range development and other planning policies.
- Continue the development of a working group of city, county, and JB CHS representatives to discuss land use concerns and major development proposals that could affect aircraft operations.

7.4 Community Roles

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

- **Real Estate Professionals and Brokers:**

- Know where noise zones and CZs/APZs encumber land near the air installation and invite installation representatives to brokers' meetings to discuss the AICUZ Program with real estate professionals.
- Disclose noise impacts to all prospective buyers of properties within areas greater than 65 dB DNL or within the CZs/APZs.
- Require the Multiple Listing Service to disclose noise zones and CZs/APZs for all listings.

- **Developers:**

- Know where the noise zones and CZs/APZs encumber land near the air installation. Consult with JB CHS on proposed developments within the AICUZ footprint.
- Participate in local discussions regarding existing zoning ordinances and subdivision regulations to support the compatible land uses outlined in this AICUZ Study through implementation of a zoning overlay district based on noise contours and CZs/APZs.

- **Local Citizens:**

- Participate in local forums with the installation to learn more about the installation'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.
- When considering property purchases, ask local real estate professionals, city planners, and installation representatives about noise and accident potential.

While the installation and community are separated by a fence, Air Force activities and operations affect the community and, conversely, community activities and decisions 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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Appendix A. Land Use Compatibility Tables

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

SLUCM NO.	LAND USE NAME	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 2 Du/Ac
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 & 0.56 in APZ II
25	Furniture and fixtures; manufacturing	N	Y	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
26	Paper and allied products; manufacturing	N	Y	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
27	Printing, publishing, and allied industries	N	Y	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
28	Chemicals and allied products; manufacturing	N	N	N	

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

SLUCM NO.	LAND USE NAME	CLEAR ZONE Recommendation ¹	APZ-I Recommendation ¹	APZ-II Recommendation ¹	DENSITY Recommendation ¹
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 0.56 in APZ II
33	Primary metal products; manufacturing	N	N	Y	Maximum FAR 0.56 in APZ II
34	Fabricated metal products; manufacturing	N	N	Y	Maximum FAR 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 & 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 & 0.56 in APZ II
42	Motor vehicle transportation	N	Y ⁶	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
43	Aircraft transportation	N	Y ⁶	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
44	Marine craft transportation	N	Y ⁶	Y	Maximum FAR of 0.28 in APZ I & 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 & 0.56 in APZ II
46	Automobile parking	N	Y ⁶	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
47	Communication	N	Y ⁶	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
48	Utilities ⁷	N	Y ⁶	Y ⁶	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II

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

SLUCM NO.	LAND USE NAME	CLEAR ZONE Recommendation ¹	APZ-I Recommendation ¹	APZ-II Recommendation ¹	DENSITY Recommendation ¹
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 & .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 & 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	

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

SLUCM NO.	LAND USE NAME	CLEAR ZONE Recommendation ¹	APZ-I Recommendation ¹	APZ-II Recommendation ¹	DENSITY Recommendation ¹
63	Business services (credit reporting; mail, stenographic, reproduction; advertising)	N	N	Y	Maximum FAR of 0.22 in APZ II
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

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

SLUCM NO.	LAND USE NAME	CLEAR ZONE Recommendation ¹	APZ-I Recommendation ¹	APZ-II Recommendation ¹	DENSITY Recommendation ¹
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
80	Resource production and extraction				
81	Agriculture (except live- stock)	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 which produces smoke, 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 which produces smoke, 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 which produces smoke, 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 which produces smoke, 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 which produces smoke, glare, or involves explosives
90	Other				
91	Undeveloped land	Y	Y	Y	
93	Water areas ¹⁹	N ¹⁹	N ¹⁹	N ¹⁹	

FOOTNOTES - Land Use Compatibility Recommendations in APZs and CZs

1. A “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. In order 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 an acre in APZ I and 50 an acre in APZ II are considered to be low density. Outside events should normally be limited to assemblies of not more than 25 people an acre in APZ I, and maximum assemblies of 50 people an acre in APZ II. Recommended FARs are calculated using standard parking generation rates for various land uses, vehicle occupancy rates, and desired density in APZ I and II. For APZ I, the formula is $FAR = 25 \text{ people an acre} / (\text{Average Vehicle Occupancy} \times \text{Average Parking Rate} \times (43560/1000))$. The formula for APZ II is $FAR = 50 / (\text{Average Vehicle Occupancy} \times \text{Average Parking Rate} \times (43560/1000))$.
2. The suggested maximum density for detached single-family housing is two Du/Ac. In a planned unit development (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 within 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 above ground passenger terminals and no above ground 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 impact 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-11; 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, auditoriums, etc. are not recommended.
11. Chapels, houses of worship, and other land uses of public gatherings are incompatible 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, large classes, etc., 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 bird/wildlife aircraft strike hazards (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, 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.

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

LAND USE		SUGGESTED LAND USE COMPATIBILITY				
SLUCM NO.	LAND USE NAME	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
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

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

LAND USE		SUGGESTED LAND USE COMPATIBILITY				
SLUCM NO.	LAND USE NAME	DNL or CNEL 65-69	DNL or CNEL 70-74	DNL or CNEL 75-79	DNL or CNEL 80-84	DNL or CNEL 85+
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	25 ⁵	30 ⁵	N	N
48	Utilities	Y	Y ²	Y ³	Y ⁴	N
49	Other transportation, communication and utilities	Y	25 ⁵	30 ⁵	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
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

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

LAND USE		SUGGESTED LAND USE COMPATIBILITY				
SLUCM NO.	LAND USE NAME	DNL or CNEL 65-69	DNL or CNEL 70-74	DNL or CNEL 75-79	DNL or CNEL 80-84	DNL or CNEL 85+
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
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

FOOTNOTES - Recommended Land Use Compatibility for Noise Zones

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, non-conforming 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.

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- 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.

Appendix B. Generalized Land Use Codes

Land Use Type	Source Data	Notes as Applicable	Generalized Land Use Code
Existing and Future Land Use JB CHS			
Conservation	City of North Charleston FLU (from BCDCOG)	Areas preserved in their natural state without development but may include some passive recreation features such as trails and boardwalks. Includes: wetlands, floodplains, forests, and stream buffers.	Conservation/ Agriculture/ Open Space
Constrained Residential Growth	Berkeley County FLU (from BCDCOG)	Rural in character and develop at densities lower than typically found in the Low Density Suburban areas - forestry and agriculture, rural residential/detached single-family residences, supporting and complementary uses, including open space and recreation, equestrian uses, schools, places of worship, and other public uses.	Low Density Residential
Heavy Industrial	City of North Charleston FLU (from BCDCOG)	Heavy manufacturing, seaport, utilities, and other higher-impact industrial uses.	Heavy Industrial
Highway Oriented Use (B-3)	City of North Charleston FLU (from BCDCOG)	Highway oriented business, as are typically found in the B-3 zoning category.	Mixed Use
Institutional	City of North Charleston FLU (from BCDCOG)	Schools, colleges, churches, hospitals, museums, and libraries. Government uses include government offices and fire stations.	Institutional
Light Industrial	City of North Charleston FLU (from BCDCOG)	Low-impact or high-tech manufacturing, distribution or warehousing uses.	Light Industrial
Low Density Suburban	Berkeley County FLU (from BCDCOG)	Single-family residential detached housing, continuation of agricultural uses, open space, civic and recreation, and mixed-uses where appropriate.	Low Density Residential
Major Business/Retail	City of North Charleston FLU (from BCDCOG)	Commercial and retail business uses. This includes large-scale (big box) stores, malls, strip commercial centers, hotels, and highway commercial uses.	Business/Retail Commercial

Land Use Type	Source Data	Notes as Applicable	Generalized Land Use Code
Mixed Use Centers	City of North Charleston (from BCDCOG)	Blend of residential, commercial, cultural, institutional, or even industrial uses may be proposed.	Mixed Use
Mobile Home	City of North Charleston FLU (from BCDCOG)	Mobile Home	Mobile Home
Multi-Family Residential	City of North Charleston FLU (from BCDCOG)	Includes apartments, townhouses, duplexes, condominiums, senior housing and other attached housing.	Multi-Family Residential
Neighborhood Business	City of North Charleston FLU (from BCDCOG)	Community or pedestrian scale retail and office uses – such as corner grocers, lawyers’ offices, restaurants	Business/Retail Commercial
Office/Professional	City of North Charleston (from BCDCOG)	Professional office includes business offices, usually grouped in office parks or medium-rise office buildings.	Office
Park	City of Charleston ELU (from BCDCOG)	Any publicly or privately owned lands that are open to the general population for a variety of recreational purposes, active or passive.	Parks and Recreation
Parks And Recreation	City of North Charleston FLU (from BCDCOG)	Passive park space or recreation facilities.	Parks and Recreation
Protected	City of Charleston ELU (from BCDCOG)	Lands that have been preserved via public ownership (although not necessarily routinely open to the general population) or private ownership with preservation or conservation easements that significantly restrict development.	Conservation/ Agriculture/Open Space
Redevelopment Priority	City of North Charleston FLU (from BCDCOG)	Areas where current land uses do not fit well with the long-term goals of the city. Emphasis should be placed on housing interests but, where properly scaled, commercial activities would enhance the local community such developments may also be permissible.	Mixed Use
Single-Family, Suburban	City of North Charleston FLU (from BCDCOG)	Includes single-family, detached housing.	Single-family Residential
Suburban Edge	City of Charleston ELU (from BCDCOG)	Lowest densities found inside the urban growth boundary, ranging from one to four dwelling units per acre (1 du/a to 4 du/a). Uses are almost exclusively residential.	Single-family Residential

Land Use Type	Source Data	Notes as Applicable	Generalized Land Use Code
Transportation/Utilities	City of North Charleston FLU (from BCDCOG)	Utility service distribution and freight handling and movement	Transportation/Utility
Zoning JB CHS			
B-1 - Limited Business District	City of North Charleston Zoning (from City of North Charleston)	All uses permitted in the office district (OD) and the single-family residential zoning district (R-1). Allows elementary school, daycare, worship, etc.	Mixed Use
B-2 - General Business District	City of North Charleston Zoning (from City of North Charleston)	Permitted uses: all for R-1, OD and B-1 zoning districts.	Business/ Retail Commercial
B-3 - Commercial Recreation, Highway Oriented Usage	City of North Charleston Zoning (from City of North Charleston)	Uses permitted in the B-1 and B-2 zoning districts, except for residential uses.	Business/ Retail Commercial
C (Commercial)	City of Charleston Zoning (from City of Charleston)		Business/ Retail Commercial
CC (Community Commercial District)	Charleston County Zoning (from Charleston County)	Allows residential from m-12 (which is residential density 12 units per acre).	Mixed Use
CP (Conservation/ Preservation)	City of Hanahan Zoning (from BCDCOG)		Conservation/ Agriculture/Open Space
CRD - Commercial Redevelopment District	City of North Charleston Zoning (from City of North Charleston)	Permitted uses (medium density business): airport, golf course, commercial, residential, galleries, etc.	Mixed Use
CT (Commercial Transition)	Charleston County Zoning (from Charleston County)	Permits commercial uses and residential allowed in r-4.	Mixed Use
DR-9	City of Charleston Zoning (from City of Charleston)	The DR districts allow multi-family residential (3 or more) dwellings and one-family attached dwellings as well as single- and two-family dwellings.	Multi- Family Residential
I (Industrial)	Charleston County Zoning (from Charleston County)	Distribution facilities, flex space, industrial support activities, ports and transportation related facilities.	Light Industrial
M-1 - Light Industrial District	City of North Charleston Zoning (from City of North Charleston)	Commercial, warehousing, transportation, and certain light manufacturing activities	Light Industrial
M-2 - Heavy Industrial District	City of North Charleston Zoning (from City of North Charleston)	Same as light industrial but also allows for petroleum storage and dance clubs.	Heavy Industrial

Land Use Type	Source Data	Notes as Applicable	Generalized Land Use Code
M-12 Mixed Style Residential district	Charleston County Zoning (from Charleston County)	Mixed Style Residential district implements the Mixed Style Residential/ Residential Moderate Density (Urban/Suburban Area). Maximum Density 12 dwelling units per acre.	Mixed Use
MHP (manufactured Housing)	Charleston County Zoning (from Charleston County)		Mobile Home
OD_DRC (Dorchester Road Corridor Overlay zoning district)	Charleston County Zoning (from Charleston County)	"Dorchester Road Corridor Overlay zoning district, straddles Dorchester Road, one of the major thoroughfares in the North Area. This road carries a large number of vehicles each day. Much of the property within the DRC-O district is located within the jurisdictional limits of the City of North Charleston, while some property remains within unincorporated Charleston County."	Business/ Retail Commercial
ON - Office Neighborhood District	City of North Charleston Zoning (from City of North Charleston)	Business and professional offices such as lawyers, accountants, engineers, architects, advertising agencies, real estate agents, physicians, dentists and hair stylists. All uses permitted in R-1 zoning districts.	Mixed Use
OR - Residential Office District	Charleston County Zoning (from Charleston County)		Mixed Use
PD	Charleston County Zoning (from Charleston County)		PUD (Planned Unit Development)
PD	City of Hanahan Zoning (from BCDCOG)		PUD (Planned Unit Development)
PDD - Planned Development District	City of North Charleston Zoning (from City of North Charleston)	PUD (Planned Unit Development)	PUD (Planned Unit Development)
PUD (Planned Unit Development)	City of Charleston Zoning (from City of Charleston)		PUD (Planned Unit Development)
PUD (Planned Unit Development)	City of Hanahan Zoning (from BCDCOG)		PUD (Planned Unit Development)

Land Use Type	Source Data	Notes as Applicable	Generalized Land Use Code
R-1 - Single Family Residential	City of North Charleston Zoning (from City of North Charleston)	Permitted use: Single-family dwellings excluding mobile homes.	Single Family Residential
R-1A - Low To Medium Density Residential District	City of North Charleston Zoning (from City of North Charleston)	Permitted use: All uses allowed in the R-1, Single-family district. Mobile homes, excluding mobile home parks.	Single Family Residential
R-2 - Multi-Family Residential District	City of North Charleston Zoning (from City of North Charleston)		Multi- Family Residential
R-3 - Mobile Home Residential District	City of North Charleston Zoning (from City of North Charleston)		Mobile Home
R-4 (single Family Residential)	Charleston County Zoning (from Charleston County)		Single Family Residential
RM (Multi-Family Residential District)	City of Hanahan Zoning (from BCDCOG)		Multi-Family Residential
RO (Residential/Office District)	City of Charleston Zoning (from City of Charleston)	Intended to allow limited office uses within converted residential structures along major roadways.	Mixed Use
RS (Single Family Residential)			Single Family Residential
RSL (Single Family Residential- Low Density)	City of Hanahan Zoning (from BCDCOG)		Low Density Residential
RT (Residential Manufactured Housing)	City of Hanahan Zoning (from BCDCOG)		Mobile Home
SR-1 (Single Family Residential)	City of Charleston Zoning (from City of Charleston)		Single Family Residential
Existing Land Use and Zoning NAAF			
FA-Forest and Agriculture	Orangeburg County Zoning (from Orangeburg County)		Conservation/ Agriculture
RC-Rural Community	Orangeburg County Zoning (from Orangeburg County)	Agricultural, forestry (#11),Single-family dwellings, Manufactured dwellings, Retail (limited #44-45),Information (# 51) Finance and Insurance (#52), Real estate (#53) Educational services (# 61), Health Care and social assistance (# 62), Arts, Entertainment and Recreation (#71), Accommodation and Food Service (#72) Public administration.	Low Density Residential

Land Use Type	Source Data	Notes as Applicable	Generalized Land Use Code
Future Land Use NAAF			
Airport_Areas	Orangeburg County FLU (from Orangeburg County)	Low density residential, Low intensity institutional, commercial warehousing and industrial uses, Low-rise buildings and structures.	Mixed Use
Existing_Residential	Orangeburg County FLU (from Orangeburg County)	Existing residential uses; educational, recreational and religious uses.	Low Density Residential
Farming_and_Forest	Orangeburg County FLU (from Orangeburg County)	Agricultural, forestry (#11); Mining (#21); Construction (#23); Administrative support and Waste management services (# 56); Single-family dwellings and Manufactured dwellings.	Conservation/ Agriculture
Rural_Community	Orangeburg County FLU (from Orangeburg County)	Agricultural, forestry (#11), Single-family dwellings, Manufactured dwellings, Retail (limited #44-45), Information (# 51) Finance and Insurance (#52), Real estate (#53) Educational services (# 61), Health Care and social assistance (# 62), Arts, Entertainment and Recreation (#71), Accommodation and Food Service (#72) Public administration.	Low Density Residential

REFERENCES

Existing and Future Land Use:

Charleston County:

(<http://www.online.encodeplus.com/regs/charlestoncounty-sc/doc-viewer.aspx#secid-391>)

County of Charleston Zoning and Land Development Regulations

(https://www.charlestoncounty.org/departments/zoning-planning/zldr/CHAPTER4_All.pdf)

City of Charleston:

<http://www.charleston-sc.gov/DocumentCenter/View/513>

City of North Charleston:

<http://www.northcharleston.org/files/northcharleston/07/07272745-c2a4-4604-8c90-cf9509662c73.pdf>

Orangeburg County:

Orangeburg: <https://www.orangeburgcounty.org/depts/commDev/planning/planningDownloads/planningOrdinances/planningLandUsePlan2002with2007LandUseUpdate.pdf>

NAICS codes: <https://www.census.gov/eos/www/naics/>

Zoning:

Charleston County:

<http://www.online.encodeplus.com/regs/charlestoncounty-sc/doc-viewer.aspx#secid-192>; Comp Plan:

<https://www.charlestoncounty.org/departments/zoning-planning/comp-plan.php>

City of Charleston:

<http://gis.charleston-sc.gov/interactive/zoning/>

City of Hanahan:

<https://cityofhanahan.com/government/building-and-codes/zoning-planning/>

City of North Charleston:

[https://library.municode.com/sc/north_charleston/codes/code_of_ordinances?nodeId=COOR_APXAZO
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O#TOPTITLE)

Appendix C. Key Terms

Community Noise Equivalent Level (CNEL) – CNEL is a composite noise metric accounting for the sound energy of all noise events in a 24-hour period. In order to account for increased human sensitivity to noise in the evening and at night, a 5 dB penalty is applied to events that occur between 7 p.m. and 10 p.m. and a 10 dB penalty is applied to events occurring during the acoustical nighttime period (10 p.m. through 7 a.m.). **[CALIFORNIA ONLY]**

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. In order to account for increased human sensitivity to noise at night, DNL includes a 10 dB penalty to events occurring during the acoustical nighttime period (10 p.m. through 7 a.m.). See section 4.3 for additional information.

Decibel (dB) – Decibel 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 – The flight track locations represent the various types of arrivals, departures, and closed patterns accomplished at air installations. The location for each track is representative for the specific track and may vary due to air traffic control, weather, and other reasons (e.g. one pilot may fly the on one side of the depicted track, while another pilot may fly slightly to the other side of the track).

Operation – An aircraft operation is defined as one takeoff or one landing. A complete closed pattern or circuit is counted as two operations because it has a takeoff component and a landing component. 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).