

4 Affected Environment

This chapter describes the human, physical, and natural environmental conditions that could be affected by the Proposed Action. Specifically, this Environmental Assessment (EA) considers effects on the environmental resource categories identified in Appendix A of Federal Aviation Administration (FAA) Order 1050.1E, Chg. 1, *Environmental Impacts: Policies and Procedures* (FAA Order 1050.1E). The potential environmental impacts of the Proposed Action and No Action Alternatives are discussed in Chapter 5, *Environmental Consequences*.

The technical terms and concepts discussed in this chapter are explained in Chapter 1, *Background*.

4.1 General Study Area

To describe Existing Conditions in the Charlotte Metroplex, the FAA developed a General Study Area. The General Study Area is used to evaluate the potential for environmental impacts under the Proposed Action. Two overall objectives guided the development of the General Study Area:

1. The General Study Area captures all flight paths identified for the No Action Alternative using 2011 radar data (the latest year of complete data available when this project started) and the flight paths designed for the Proposed Action, up to the point at which 95 percent of departing aircraft are at or above 10,000 feet above ground level (AGL) and 95 percent of arriving aircraft are at or above 7,000 feet AGL. As stated in FAA Order 1050.1E, Appendix A, Paragraph 14.5e, the FAA requires consideration of noise impacts of airspace actions from the surface to 10,000 feet AGL if the study area is larger than the immediate area around an airport or involves more than one airport. Furthermore, policy guidance issued by the FAA Program Director for Air Traffic Airspace Management states that, for air traffic project environmental analyses, noise impacts should be evaluated for proposed changes in arrival procedures between 3,000 and 7,000 feet AGL and departure procedures between 3,000 and 10,000 feet AGL for large civil jet aircraft weighing over 75,000 pounds.²⁰
2. The lateral boundary of the General Study Area is based on where aircraft cross U.S. Census tract boundaries at the 10,000/7,000 feet AGL thresholds. This extent is concisely defined to focus on areas of air traffic flow.

Exhibit 4-1 presents the General Study Area developed for this EA. **Table 4-1** identifies the states and counties that fall within or are intersected by the GSA boundary. In total, portions of 39 counties in North Carolina, 15 counties in South Carolina and three counties and two independent cities in Virginia fall within the General Study Area.

²⁰ Department of Transportation, Federal Aviation Administration, *Memorandum Regarding Altitude Cut-Off for National Airspace Redesign (NAR) Environmental Analyses*, September 15, 2003.

Table 4-1 States and Counties in the Study Area

North Carolina				
Alamance County	Caswell County	Henderson County	Rockingham County	Wilkes County
Alexander County	Catawba County	Iredell County	Rowan County	Yadkin County
Anson County	Cleveland County	Lincoln County	Rutherford County	Yancey County
Avery County	Davidson County	McDowell County	Stanly County	
Buncombe County	Davie County	Mecklenburg County	Stokes County	
Burke County	Forsyth County	Mitchell County	Surry County	
Cabarrus County	Gaston County	Montgomery County	Transylvania County	
Caldwell County	Guilford County	Polk County	Union County	
South Carolina				
Abbeville County	Chester County	Greenville County	Laurens County	Spartanburg County
Anderson County	Chesterfield County	Greenwood County	Pickens County	Union County
Cherokee County	Fairfield County	Lancaster County	Richland County	York County
Virginia				
Pittsylvania County	Patrick County	Henry County	Danville City	Martinsville City

Source: National Atlas of the United States of America: U.S. County Boundaries, 2005; ATAC Corporation, August 2014.

Prepared by: ATAC Corporation, August 2014.

4.2 Resource Categories or Sub-Categories Not Affected

This section discusses the environmental resource categories or sub-categories that would remain unaffected by the Proposed Action. These resource categories would remain unaffected, either because the resource does not exist within the General Study Area or the types of activities associated with the Proposed Action would not affect them. The resource categories or sub-categories are as follows:

- **Coastal Resources:** The Proposed Action does not involve land acquisition or ground disturbing activities that would affect coastal resources.
- **Construction Impacts:** The Proposed Action does not involve any construction or ground disturbing activities.
- **Farmlands:** The Proposed Action would not involve any land acquisition or ground disturbance that would have the potential to convert existing farmland to a non-agricultural use.
- **Fish, Wildlife and Plants (*Fish and Plants sub-categories only*):** The Proposed Action is generally situated in areas above 3,000 feet AGL and would not involve ground disturbance or other activities that would affect plant or terrestrial animal species.
- **Floodplains:** The Proposed Action would not be located in areas that include floodplains.

- **Hazardous Materials, Pollution Prevention, and Solid Waste:** The Proposed Action would not generate, disturb, transport, or treat hazardous materials or solid waste.
- **Historic, Architectural, Archeological, and Cultural Resources (*Archeological and Architectural sub-categories only*):** The Proposed Action would not involve land acquisition or ground disturbing activities that would affect archaeological or architectural resources.
- **Light Emissions and Visual Impacts:** The Proposed Action would not involve construction of any structures that would introduce new sources of lighting or result in visual impacts to surrounding areas. The changes to air traffic associated with the Proposed Action would generally occur at altitudes at or above 3,000 feet AGL and in the same general areas in which aircraft currently operate. Accordingly, the distances between aircraft and viewers on the ground would be sufficient to avoid intrusions and new aircraft operations would not be introduced to the viewshed that would constitute an adverse impact.
- **Natural Resources and Energy Supply (*Natural Resources sub-category only*):** The Proposed Action would not require use of unusual natural resources or other materials, or those in short supply.
- **Secondary (Induced) Impacts:** The Proposed Action would not cause changes in patterns of population movement or growth, public service demands, or business and economic activity. In addition, implementation of the Proposed Action would not result in an increase in the number of aircraft operations at the Study Airports. Furthermore, the Proposed Action does not involve construction of airport facilities that would result in or induce an increase in operational capacity or other ground disturbing activities that would involve the relocation of people or businesses.
- **Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks**
 - ***Socioeconomic Impacts sub-category:*** The Proposed Action would not involve acquisition of real estate, relocation of residents or community businesses, disruption of local traffic patterns, loss in community tax base, or changes to the fabric of the community.
 - ***Children's Environmental Health and Safety Risks sub-categories:*** The Proposed Action would not involve products or substances with which a child is likely to be exposed, come into contact, ingest, or use. Furthermore, the Proposed Action would not result in a local increase in emissions that would have the potential to affect children's health. Accordingly, there would be no increase in environmental health and safety risks that could disproportionately affect children.
- **Water Quality:** The Proposed Action does not involve any ground disturbing activities that would result in an increase in impervious surfaces or affect water quality or ground water.
- **Wetlands:** The Proposed Action does not involve land acquisition or ground disturbing activities that would affect wetlands.

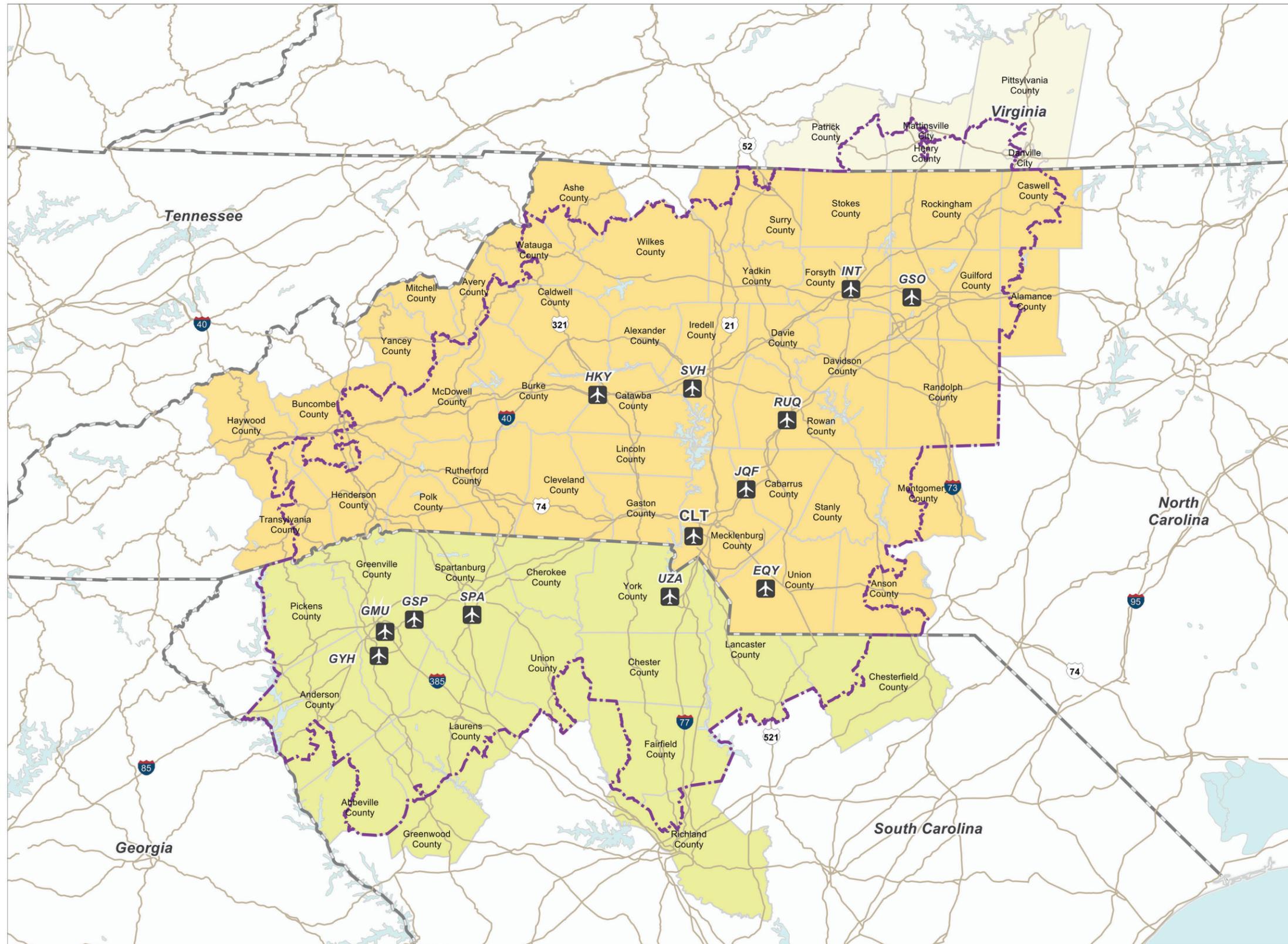
- **Wild and Scenic Rivers:** Two designated rivers, the New River and Wilson Creek, are located within the General Study Area. However, the Proposed Action would not involve ground disturbance or any other activity that would result in any diminishment of the scenic, recreational, or biological value of the rivers.

4.3 Potentially Affected Resource Categories or Sub-Categories

This section provides information on the current conditions within the General Study Area for those environmental resource categories or components that the Proposed Action could potentially affect. These environmental resource categories or sub-categories include:

- **Noise** (Section 4.3.1)
- **Compatible Land Use** (Section 4.3.2)
- **Department of Transportation Act: Section 4(f) Resources** (Section 4.3.3)
- **Historic, Architectural, Archeological, and Cultural Resources – *Historic and Cultural Resources sub-categories only*** (Section 4.3.4)
- **Fish, Wildlife, and Plants – *Wildlife sub-category only*** (Section 4.3.5)
- **Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks – *Environmental Justice sub-category only*** (Section 4.3.6)
- **Natural Resources and Energy Supply- *Energy Supply sub-category only (aircraft fuel only)*** (Section 4.3.7)
- **Air Quality** (Section 4.3.8)
- **Climate** (Section 4.3.9)

The following sections discuss each of the above listed environmental resource categories in detail.



LEGEND

-  General Study Area Boundary
-  Study Airport
-  North Carolina County in Study Area
-  South Carolina County in Study Area
-  Virginia County in Study Area
-  State Boundary
-  U.S. and Interstate Highways
-  Water

Notes:

- CLT** Charlotte Douglas International Airport
- EQY** Charlotte-Monroe Executive Airport
- GMU** Greenville Downtown Airport
- GSO** Piedmont Triad International Airport
- GSP** Greenville Spartanburg International Airport
- GYH** Donaldson Center Airport
- HKY** Hickory Regional Airport
- INT** Smith Reynolds Airport
- JQF** Concord Regional Airport
- RUQ** Rowan County Airport
- SPA** Spartanburg Downtown Memorial Airport
- SVH** Statesville Regional Airport
- UZA** Rock Hill/York County/Bryant Field Airport

Projection: Lambert Conformal Conic
Scale: 1,750,000



Sources: National Atlas of the United States of America: U.S. County Boundaries, 2005; U.S. State Boundaries, 2005; and Water Bodies, 2005; Bureau of Transportation Statistics: National Transportation Atlas Database National Highway Planning Network, 2012; FAA: NFDC Airport database, 2012; ATAC Corporation: Study Area Boundary, 2013.
Prepared by: ATAC Corporation, November 2014.

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4.3.1 Noise

Aircraft noise is often the most noticeable environmental effect associated with any aviation project. This section discusses FAA guidance on conducting noise analyses, noise model input development, and existing aircraft noise conditions. **Appendix E** provides background information on the physics of sound, the effects of noise on people, and noise metrics. Detailed information on the noise analysis is provided in the *CLT OAPM Aircraft Noise Technical Report*, available on the OAPM Project website (<http://www.oapmenvironmental.com>).

4.3.1.1 Noise Modeling Methodology

The FAA has issued guidance on the assessment of aircraft noise in FAA Order 1050.1E. This guidance requires that aircraft noise analysis use the yearly Day-Night Average Sound Level (DNL) metric. The DNL metric is a single value representing the aircraft sound level over a 24-hour period and includes all of the sound energy generated within that period. The DNL metric includes a 10 decibel (dB) weighting for noise events occurring between 10:00 P.M. and 6:59 A.M. (i.e., nighttime). This weighting helps account for the greater level of annoyance caused by nighttime noise events when ambient noise levels are lower. Accordingly, the metric essentially equates one nighttime flight to 10 daytime flights. The DNL metric is further discussed in **Appendix E**.

In addition to requiring the use of the DNL metric, FAA Order 1050.1E also requires that aircraft noise be evaluated using one of three noise models: (1) the Integrated Noise Model (INM), (2) the Heliport Noise Model (HNM), or (3) the Noise Integrated Routing System (NIRS). NIRS is typically used for flight track changes over large areas and at altitudes over 3,000 feet AGL. For this EA, the FAA uses NIRS, Version 7.0b to analyze noise associated with the Proposed Action and No Action Alternative.

To evaluate Existing Conditions, the FAA conducted a detailed analysis of aircraft operating under instrument flight rules (IFR) conditions in 2011. Although the noise environment around major airports comes almost entirely from jet aircraft operations, the DNL calculations reflect noise from many types of jet and propeller aircraft operations on IFR flight plans that could be affected by the Proposed Action. Most aircraft around major airports that operate under IFR conditions obtain direction from air traffic control (ATC) related to separation from surrounding aircraft in these busy areas.

When operating outside certain categories of controlled airspace, aircraft operating under visual flight rules (VFR) conditions are not required to be in contact with ATC. Because these aircraft operate at the discretion of the pilot and are often not required to file flight plans, the FAA has very limited information for these operations. Subsequently, there is no known source for comprehensive route, altitude, aircraft type, and frequency information for VFR operations in the General Study Area. However, even if complete information were available for VFR operations, the Proposed Action evaluated in the EA would not require any changes to routing or altitudes to accommodate these operations. If they could be modeled, they would use the same flight routes and altitudes under the Proposed Action and No Action Alternative scenarios. Their operations would not be affected by the forecast conditions in 2015 (i.e., the first year of implementation) and 2020 (i.e., five years after implementation) for either the Proposed Action or the No Action Alternative. Therefore, VFR aircraft were not included in the analysis.

NIRS requires a variety of inputs, including local environmental data (e.g., temperature and humidity), runway layout, number and type of aircraft operations, runway use, and flight tracks. Accordingly, detailed information on aircraft operations for the Study Airports was assembled for input into NIRS. This includes specific aircraft fleet mix information, including aircraft type, arrival and departure times, and origin/destination airport.

A total of 743,312 IFR-filed flights to/from the Study Airports were identified through an examination of radar data obtained from the FAA's Performance Data Analysis and Reporting System (PDARS). The PDARS database was queried for the 2011 calendar year for all IFR-filed flights that operated at the Study Airports within the General Study Area. During this 365-day period, 15 days of data were unusable due to radar equipment anomalies, operational outages, or extreme weather events that made the data unreliable. The 350 days of usable data span all seasons and runway usage configurations for the Study Airports in the General Study Area. This data was used to develop the average annual day (AAD) fleet mix, time of day (day and night), and runway use input for NIRS. More detailed information related to the NIRS inputs for Existing Conditions is provided in the *CLT OAPM Aircraft Noise Technical Report*, available on the OAPM Project website (<http://www.oapmenvironmental.com>).

The PDARS data provided tracks for each flight that occurred within the 350 day period of 2011. The data was used both to define the AAD track locations and to represent a typical flow of traffic, including the typical climb and descent patterns that occur along each flow. Patterns also include top-of-climb and top-of-descent locations for fuel burn modeling purposes. The tracks were analyzed using proprietary software in order to visualize and analyze the radar data. All the trajectories were "bundled" into a set of tracks, representing a flow. The flows comprise all typical flight routings within the General Study Area for an annual average day. NIRS tracks are then developed based on the group of radar tracks representing each flow.

The NIRS model was used to calculate noise levels for the following specific locations on the ground:

- **Census Block Centroids:** The NIRS model can calculate DNL at the geographic centers (i.e., centroids) of census blocks to estimate the population exposed to varying levels of aircraft noise exposure. For this EA, population within the General Study Area was analyzed using 2010 U.S. Census block geometries.²¹ A census block is the smallest geographical unit used by the United States Census to collect data. The census block centroid DNL represents the DNL for the total maximum potential population within that census block. Because noise levels are analyzed only at the centroid point and applied to the entire census block area population, and because the area represented by each centroid varies depending on the density of population, the actual noise exposure level for individuals will vary from the reported level based on their proximity to the geographic centroid.
- **Grid Points:** The NIRS model can also be used to calculate noise exposure at evenly spaced grid points. For this EA, the General Study Area was covered with a grid with points spaced evenly at intervals of 0.5 nautical miles (nm). This grid was used to calculate noise at regular intervals throughout the General Study Area, as

²¹ U.S. Census Bureau, *2010 Tracts and American Community Survey Selected Economic Characteristics*, 2010.

well as within properties requiring evaluation under Section 4(f) of the *U.S. Department of Transportation (DOT) Act of 1966* (i.e., Section 4(f) Resources). These resources are discussed further in Sections 4.3.3.

- **Unique Points:** Noise levels at sites of interest that are too small to be captured in the 0.5 nm grid can also be analyzed using the NIRS model. Such sites include individual Section 4(f) resources that are less than one square nm in area (such as significant public parks or trails), and specific historic sites (such as individual buildings). See Section 4.3.3 for a discussion of what constitutes a Section 4(f) resource and Section 4.3.4 for a discussion of historic properties in the General Study Area.

In total, noise exposure levels were calculated at 115,841 census block centroids (centroids in the General Study Area that represent areas with population), 201,156 grid points, and 17,431 unique points throughout the General Study Area.

4.3.1.2 Existing Aircraft Noise Exposure

Table 4-2 identifies the total population exposed to aircraft noise between DNL 45 dB and 60 dB, DNL 60 dB and 65 dB, and DNL 65 dB and higher. This data is provided to establish a baseline for existing aircraft noise exposure. **Exhibit 4-2** provides a graphical representation of 2011 Existing Conditions noise exposure within the General Study Area by DNL 5 dB bands. As shown on **Exhibit 4-2**, areas exposed to higher DNL are generally aligned with Study Airport runways and areas with existing aircraft traffic.

Table 4-2 Maximum Population Exposed to Aircraft Noise (DNL) within the Study Area (2011)

DNL Range (dB)	Population
DNL 45 dB to DNL 60 dB	402,794
DNL 60 dB to less than DNL 65 dB	5,939
DNL 65 dB and higher	262
Total Above DNL 45 dB	408,995

Sources: U.S. Department of Transportation, Federal Aviation Administration, *NIRS Version 7.0b3*; U.S. Census Bureau, *2010 Tracts and American Community Survey Selected Economic Characteristics*, 2010.

Prepared by: ATAC Corporation, July 2014.

4.3.2 Compatible Land Use

Existing land use in the General Study Area is characterized by using generalized land coverage data obtained from the U.S. Geological Survey (USGS) *2006 National Land Cover Database (NLCD 2006)*. As shown on **Exhibit 4-3**, land use in the General Study Area is typified by dense urban development around the Charlotte, Greensboro, and Greenville areas. Areas of mixed forest interspersed with grassland dominate the remainder of the General Study Area. The General Study Area includes numerous large parks, recreational areas, wilderness areas, forests, and other types of resources managed by federal and state agencies. Section 4.3.3 further discusses these resources.

4.3.3 Department of Transportation Act, Section 4(f) Resources

Section 4(f) of the *U.S. Department of Transportation Act of 1966* (49 U.S.C. § 303(c)), states that, subject to exceptions for *de minimis* impacts:

... [The] Secretary [of Transportation] may approve a transportation program or project (other than any project for a park road or parkway under section 204 [1] of title 23) requiring the use of publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, State, or local significance, or land of an historic site of national, State, or local significance (as determined by the Federal, State, or local officials having jurisdiction over the park, area, refuge, or site) only if...there is no prudent and feasible alternative to using that land; and... the program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use.

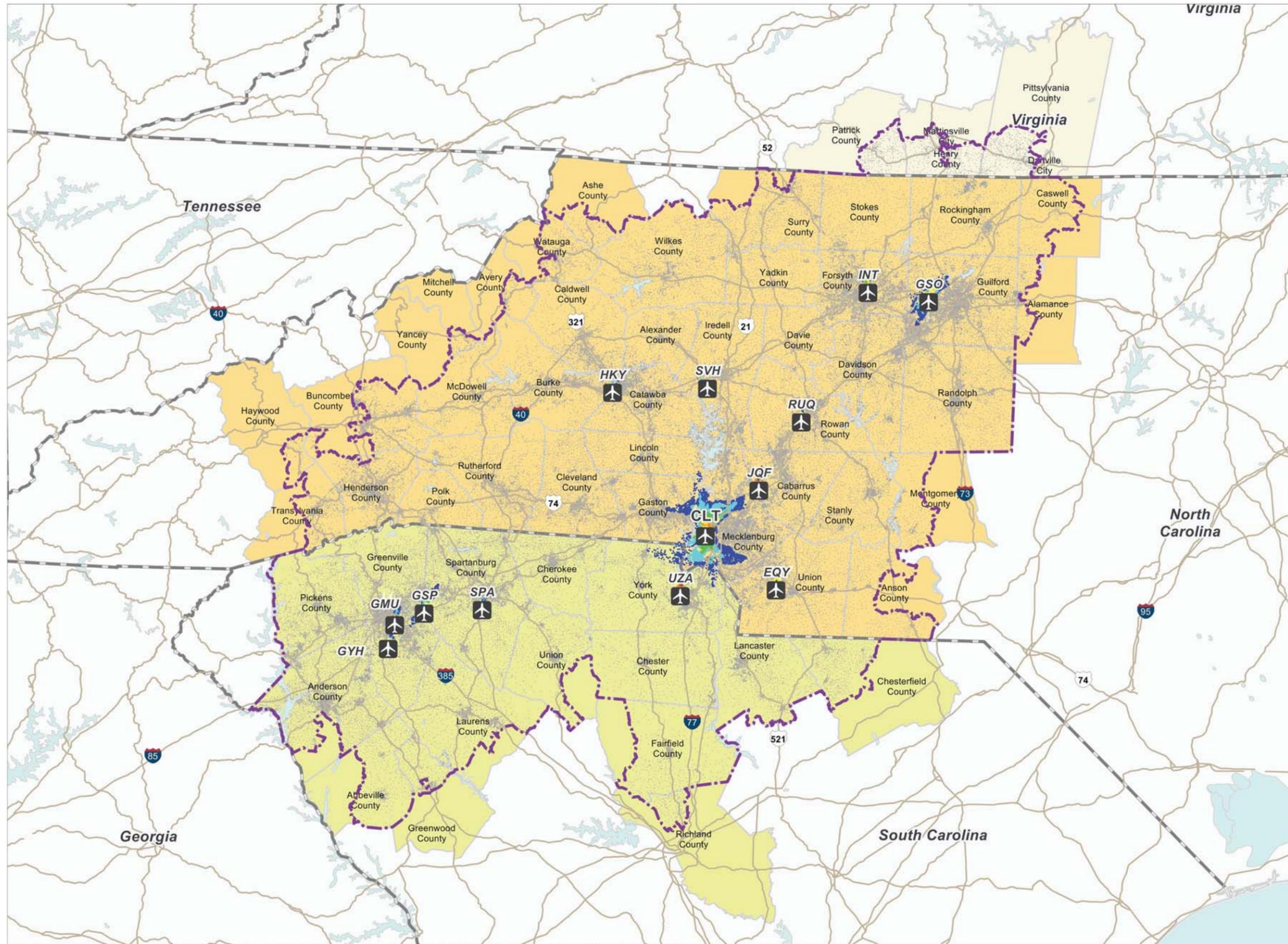
The term “use” includes both direct (i.e., physical) and indirect (i.e., constructive) impacts to Section 4(f) properties. Direct use is the physical occupation or alteration of a Section 4(f) property or any portion of a Section 4(f) property. A constructive use does not require direct physical impacts or occupation of a Section 4(f) resource, but would occur when an action would result in substantial impairment of a resource to the degree that the activities, features, or attributes of the resource that contribute to its significance or enjoyment are substantially diminished.

Parks and natural areas where a quiet setting is a generally recognized purpose and attribute receive special consideration. In these areas, the FAA official “must consult all appropriate Federal, State, and local officials having jurisdiction over the affected Section 4(f) resources when determining whether project-related noise impacts would substantially impair the resource.” Privately owned parks, recreation areas, and wildlife refuges are not subject to the Section 4(f) provisions.

Some Section 4(f) properties received funding through Section 6(f) of the *Land and Water Conservation Fund (LWCF) Act of 1965* (16 U.S.C. § 460l-4 *et seq.*) Section 6(f) states that no public outdoor recreation areas acquired or developed with LWCF assistance can be converted to non-recreation uses without the approval of the Secretary of the Interior. The Secretary of the Interior may only approve conversions if they are in accordance with the comprehensive statewide outdoor recreation plan, and if other recreation lands of reasonably equivalent usefulness and location will replace the converted areas.

4.3.3.1 Section 4(f) Resources in the General Study Area

Data collected from both federal and state sources was used to identify Section 4(f) resources within the General Study Area. A total of 3,008 Section 4(f) resources were identified within the General Study Area. **Exhibit 4-4** depicts the locations of these resources. The locations of historic and cultural resources, also considered Section 4(f) resources, are discussed in Section 4.4 and depicted on **Exhibit 4-5**.



LEGEND

- General Study Area
- Study Airport
- North Carolina County in Study Area
- South Carolina County in Study Area
- State Boundary
- U.S. and Interstate Highways
- Water

Noise Levels (2011)

- <45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- 65 - 70
- 70 - 75

Notes:

- AVL Asheville Regional Airport
- CAE Columbia Metropolitan Airport
- CHS Charleston AFB/International Airport
- CLT Charlotte Douglas International Airport
- EQY Charlotte-Monroe Executive Airport
- GMU Greenville Downtown Airport
- GSO Piedmont Triad International Airport
- GSP Greenville Spartanburg International Airport
- GYH Donaldson Center Airport
- INT Smith Reynolds Airport
- JQF Concord Regional Airport
- JZI Charleston Executive Airport
- RDU Raleigh-Durham International Airport
- RUQ Rowan County Airport
- SPA Spartanburg Downtown Memorial Airport
- SVH Statesville Regional Airport
- UZA Rock Hill/York County/Bryant Field Airport

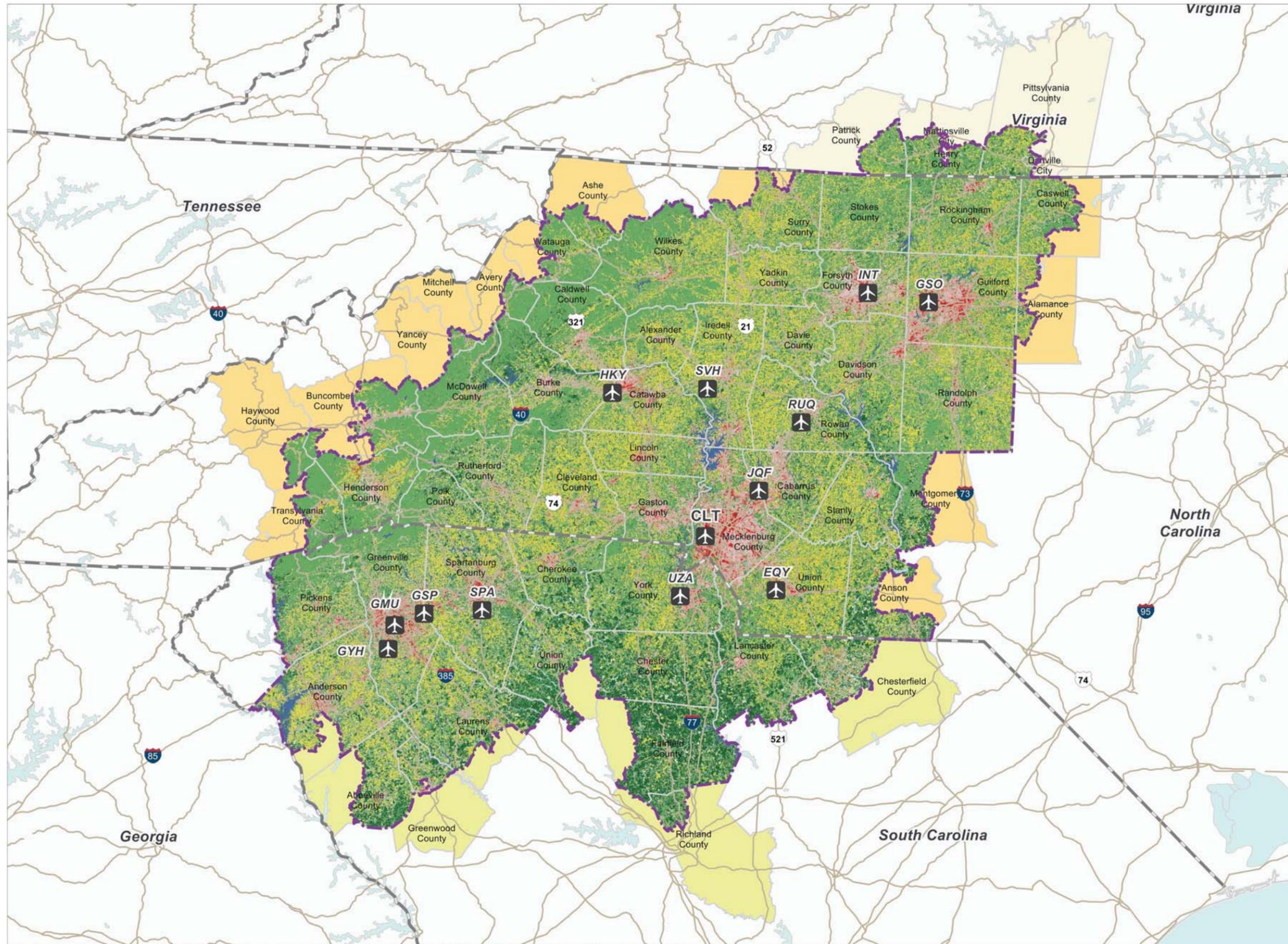
Projection: Lambert Conformal Conic
Scale: 2,500,000

0 40 nm



Sources: National Atlas of the United States of America: U.S. County Boundaries, 2005; U.S. State Boundaries, 2005; and Water Bodies, 2005; Bureau of Transportation Statistics: National Transportation Atlas Database National Highway Planning Network, 2012; FAA: NFDC Airport database, 2012; ATAC Corporation: Study Area Boundary, 2012, and Noise Levels, 2013.
Prepared by: ATAC Corporation, December 2014.

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LEGEND

- General Study Area Boundary
 - Study Airport
 - North Carolina County in Study Area
 - South Carolina County in Study Area
 - State Boundary
 - U.S. and Interstate Highways
 - Water
-
- National Land Cover Data**
- Open Water
 - Perennial ice/snow
 - Developed, open space
 - Developed, low intensity
 - Developed, medium intensity
 - Developed, high intensity
 - Barren land
 - Deciduous forest
 - Evergreen forest
 - Mixed forest
 - Shrub/scrub
 - Grassland/herbaceous
 - Hay/pasture
 - Cultivated crops
 - Woody wetlands
 - Herbaceous wetlands

- Notes:**
- AVL Asheville Regional Airport
 - CAE Columbia Metropolitan Airport
 - CHS Charleston AFB/International Airport
 - CLT Charlotte Douglas International Airport
 - EQY Charlotte-Monroe Executive Airport
 - GMU Greenville Downtown Airport
 - GSO Piedmont Triad International Airport
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Sources: National Atlas of the United States of America: U.S. County Boundaries, 2005; U.S. State Boundaries, 2005; and Water Bodies, 2005; Bureau of Transportation Statistics: National Transportation Atlas Database National Highway Planning Network, 2012; FAA: NFDC Airport database, 2012; ATAC Corporation: Study Area Boundary, 2013; Multi-Resolution Land Characteristics (MRLC) Consortium: 2006 National Land Cover Database

Prepared by: ATAC Corporation, December 2014.

Exhibit 4-3

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4.3.4 Historic, Architectural, Archeological, and Cultural Resources – Historic and Cultural Resources Sub-Categories

The *National Historic Preservation Act (NHPA) of 1966* (16 U.S.C. § 470, as amended) requires federal agencies to consider the effects of their undertakings on properties listed or eligible for listing in the National Register of Historic Properties (i.e., National Register). Compliance requires consultation with the Advisory Council on Historic Preservation (ACHP), State Historic Preservation Officers (SHPO), and/or the Tribal Historic Preservation Officers (THPO).

It is possible that changes in aircraft flight routes associated with the Proposed Action could introduce or increase aircraft routing over historic resources and result in potential adverse aircraft noise impacts. For purposes of this EA, historic properties are defined as resources that are listed or eligible for listing in the National Register or relevant SHPO listings, or that have been identified through tribal consultation for values other than their archaeological qualities. As noted in Section 4.2, the Proposed Action does not involve ground disturbance that could potentially impact archaeological or architectural resources. Thus, these resources are not further discussed in this EA.

4.3.4.1 Historic and Cultural Resources in the General Study Area

Exhibit 4-5 shows the location of historic and cultural resources identified in the General Study Area. A total of 1,246 National Register listed properties and one tribal property were identified in the General Study Area. Historic properties are representative of every period in the history of this region and include some of the nation's most important historic and cultural resources from the colonial, antebellum, and post-Civil War periods.

4.3.5 Fish, Wildlife, and Plants – Wildlife Sub-Category

This section discusses the existing wildlife resources within the General Study Area. The Proposed Action involves redesign of standard instrument arrival and departure procedures (generally above 3,000 feet AGL) and the supporting airspace management structure serving the Study Airports. Accordingly, discussion is focused on avian and bat species that may be present within the General Study Area.

4.3.5.1 Threatened and Endangered Species and Migratory Birds

The *Endangered Species Act (ESA) of 1973* (16 U.S.C. § 1531 *et seq.*), requires the evaluation of all federal actions to determine whether a Proposed Action is likely to jeopardize any proposed, threatened, or endangered species or proposed or designated critical habitat. A federal action is one that is conducted, funded, or permitted by a federal agency. Section 7 of the ESA requires the lead federal agency – in this case the FAA – to consult with the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration (NOAA) to determine whether the proposed federal action would jeopardize the continued existence of any species listed or proposed for listing as threatened or endangered, or would result in the destruction or adverse modification of designated or proposed critical habitat. Critical habitat includes areas that will contribute to the recovery or survival of a listed species. Federal agencies are responsible for determining if an action “may affect” listed species. If so, the federal agency is required to prepare a Biological Assessment (BA) to determine if the action is “likely to adversely affect

the species.” The presence of federal and state listed avian and bat species was assessed based on agency lists and reports. Data from the USFWS were used to identify potential federally-listed species.

4.3.5.2 Migratory Birds

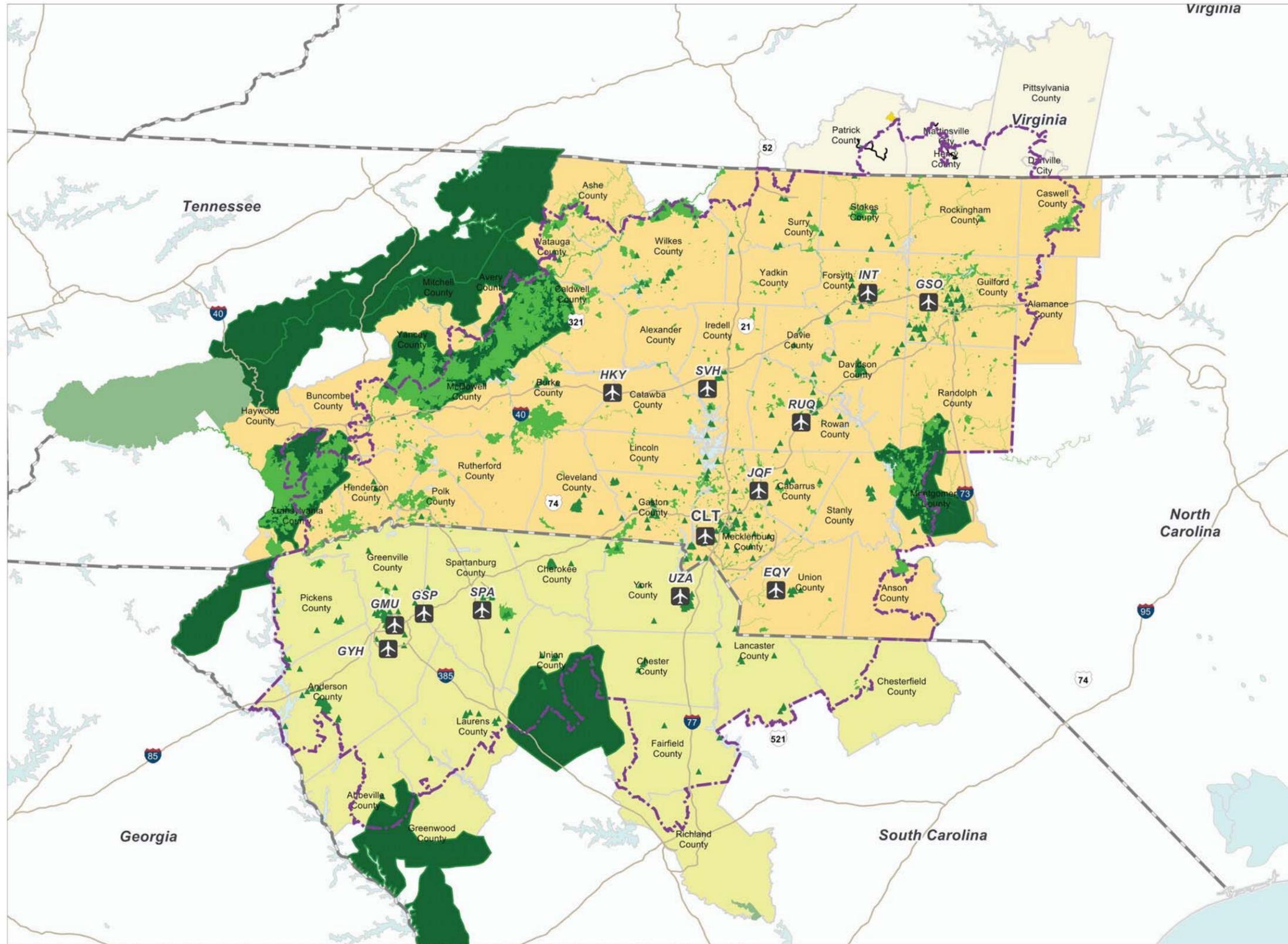
The *Migratory Bird Treaty Act (MBTA) of 1918* (16 U.S.C. §§ 703-712) prohibits the taking of any migratory bird and any part, nest, or egg of any such bird, without a permit issued by the USFWS. “Take” under the MBTA is defined as the action or attempt to “pursue, hunt, shoot, capture, collect, or kill.” Migratory birds listed under the ESA are managed by the agency staff members who handle compliance with Section 7 of the ESA; management of all other migratory birds is overseen by the Migratory Bird Division of the ESA. Several migratory bird species occur in, or migrate through, the General Study Area.

Birds migrate along four main routes or flyways in North America loosely delineated by geographic region: (1) Atlantic, (2) Central, (3) Mississippi, and (4) Pacific. The General Study Area for the CLT OAPM Project is located within the Atlantic Flyway. These flyways are not specific lines the birds follow but broad areas through which the birds migrate.

Migration routes may be defined as the various lanes birds travel from their breeding ground to their winter quarters. The actual routes followed by a given bird species differ by distance traveled, starting time, flight speed, geographic position and latitude of the breeding, and wintering grounds. The Atlantic Flyway includes multiple primary migration routes throughout these areas and connects to other primary flyway routes.

The most frequently traveled migration routes conform very closely to major topographical features that lie in the general north-south movement of migratory bird flyways. Therefore, the lanes of heavier concentration in the General Study Area follow principal valleys and mountain ranges.

Table 4-3 lists the eight federally listed threatened and endangered bird or bat species of concern that are found within the General Study Area.



LEGEND

- General Study Area Boundary
 - Study Airport
 - North Carolina County in Study Area
 - South Carolina County in Study Area
 - State Boundary
 - U.S. and Interstate Highways
 - Water
-
- Potential DOT 4(f) Resources**
- National Forest
 - National Park
 - National Recreation Area
 - National Wildlife Refuge
 - National Wilderness Area
 - Park/Trail
 - State/Regional Park

Notes:

- AVL Asheville Regional Airport
- CAE Columbia Metropolitan Airport
- CHS Charleston AFB/International Airport
- CLT Charlotte Douglas International Airport
- EQY Charlotte-Monroe Executive Airport
- GMU Greenville Downtown Airport
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Projection: Lambert Conformal Conic
Scale: 2,500,000

0 40 nm

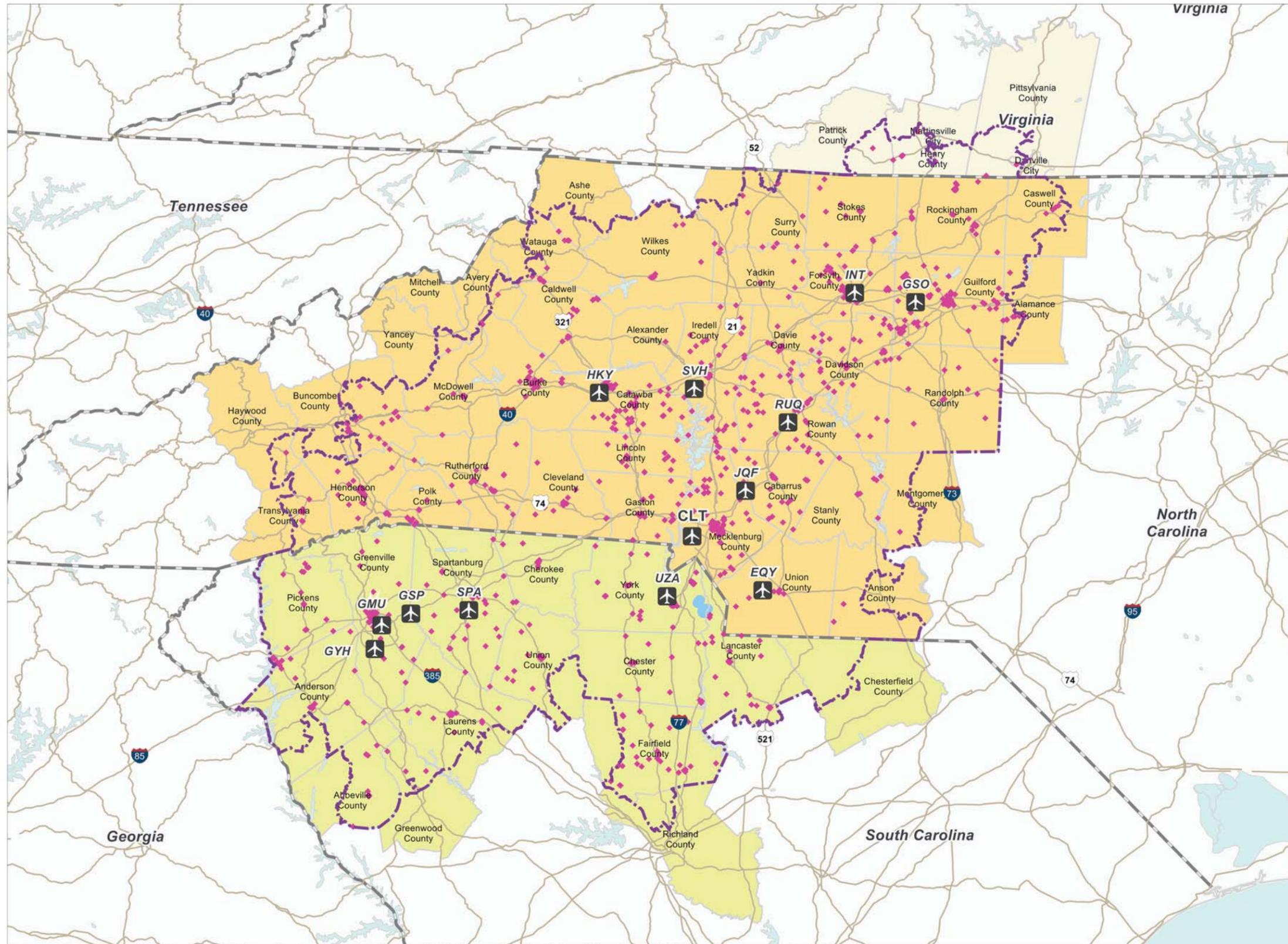


Sources: National Atlas of the United States of America: U.S. County Boundaries, 2005; U.S. State Boundaries, 2005; Water Bodies, 2005; and Federal Lands, 2005; Bureau of Transportation Statistics: National Transportation Atlas Database National Highway Planning Network, 2012; FAA: NFDC Airport database, 2012; National Park Service: Register of Historic Places, 2012; ATAC Corporation: Study Area Boundary, 2013.

Prepared by: ATAC Corporation, December 2014.

**Section 4(f) Resources
in the General Study Area**

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LEGEND

- General Study Area Boundary
- Study Airport
- North Carolina County in Study Area
- South Carolina County in Study Area
- Virginia County in Study Area
- State Boundary
- U.S. and Interstate Highways
- Water
- Historic Resources
- Tribal Lands

- Notes:
- AVL Asheville Regional Airport
 - CAE Columbia Metropolitan Airport
 - CHS Charleston AFB/International Airport
 - CLT Charlotte Douglas International Airport
 - EQY Charlotte-Monroe Executive Airport
 - GMU Greenville Downtown Airport
 - GSO Piedmont Triad International Airport
 - GSP Greenville Spartanburg International Airport
 - GYH Donaldson Center Airport
 - INT Smith Reynolds Airport
 - JQF Concord Regional Airport
 - JZI Charleston Executive Airport
 - RDU Raleigh-Durham International Airport
 - RUQ Rowan County Airport
 - SPA Spartanburg Downtown Memorial Airport
 - SVH Statesville Regional Airport
 - UZA Rock Hill/York County/Bryant Field Airport

Projection: Lambert Conformal Conic
Scale: 2,500,000

0 40 nm



Sources: National Atlas of the United States of America: U.S. County Boundaries, 2005; U.S. State Boundaries, 2005; and Water Bodies, 2005; Bureau of Transportation Statistics: National Transportation Atlas Database National Highway Planning Network, 2012; FAA: NFDC Airport database, 2012; National Park Service: Register of Historic Places, 2012; ATAC Corporation: Study Area Boundary, 2013.

Prepared by: ATAC Corporation, December 2014.

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Table 4-3 Threatened or Endangered Avian and Bat Species Potentially in the Study Area

Status	Species	Type	North Carolina	State South Carolina	Virginia
Endangered	Bat, gray Entire (<i>Myotis grisescens</i>)	Bat	X		
Endangered	Bat, Indiana Entire (<i>Myotis sodalis</i>)	Bat	X		X
Endangered	Bat, Virginia big-eared Entire (<i>Corynorhinus (=Plecotus) townsendii</i> <i>virginianus</i>)	Bat	X		X
Threatened	Plover, piping except Great Lakes watershed (<i>Charadrius melodus</i>)	Bird	X	X	
Endangered	Stork, wood AL, FL, GA, SC (<i>Mycteria americana</i>)			X	
Endangered	Tern, roseate northeast U.S. nesting pop. (<i>Sterna dougallii dougallii</i>)	Bird	X		X
Endangered	Warbler (=wood), Bachman's Entire (<i>Vermivora bachmanii</i>)	Bird		X	
Endangered	Woodpecker, red-cockaded Entire (<i>Picoides borealis</i>)	Bird	X	X	X

Sources: US Fish and Wildlife Service, <http://www.fws.gov/endangered/> Accessed March 2013; August 2014.

Prepared by: ATAC Corporation, August 2014.

4.3.5.3 Existing Wildlife Strikes

The aviation community has long recognized that the threat of aircraft collision with wildlife is real and increasing. Globally, wildlife strikes have killed more than 229 people and destroyed over 210 aircraft since 1988.²² Contributing factors to this threat include an increase in large bird populations as well as an increase in air traffic operations by quieter, turbofan-powered aircraft. According to the FAA National Wildlife Strike Database, since 1990 the majority (92 percent) of aircraft collisions with wildlife have occurred below 3,000 feet AGL.

Wildlife strike reports from 2011 were collected from the FAA *National Wildlife Strike Database* for each Study Airport. According to the wildlife strike reports, Study Airports accounted for 3.3 percent of the 2011 national wildlife strike total and three percent of the 2011 national avian/bat strike total. **Table 4-4** depicts study airports that had wildlife and avian/bat strikes for 2011. Of the 133 avian/bat strikes reported for 2011, 117 included information on the altitude at which the strike took place. A total of 20 of the 133 bird strikes reported occurred at altitudes above 3,000 feet.

²² U.S. Department of Transportation, Federal Aviation Administration, *Wildlife Strikes to Civil Aircraft in the United States, 1990-2010*, Serial Report Number 17, 2011.

Table 4-4 2011 Study Airports Wildlife and Avian/Bat Strike Summary

Airport	Avian/Bat	Strikes		Total
			Other Wildlife	
CLT	114	3		117
EQY	0	0		0
GMU	1	0		1
GSO	7	0		7
GSP	8	0		8
GYH	0	0		0
HKY	1	0		1
INT	1	0		1
JQF	0	0		0
RUQ	0	0		0
SPA	0	0		0
SVH	0	0		0
UZA	1	0		1
Total	133	2		136

Source: U.S. Department of Transportation, Federal Aviation Administration, *Wildlife Strike Database* (<http://wildlife-mitigation.tc.faa.gov/wildlife/database.aspx>; accessed December 2014).

Prepared by: ATAC Corporation, December 2014.

4.3.6 Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks – Environmental Justice Sub-Category

This section is limited to a discussion of Environmental Justice as it pertains to potential aircraft noise impacts in the General Study Area. An environmental justice analysis considers the potential of the proposed project alternatives to cause disproportionate and adverse effects on low-income or minority populations. In the event that adverse effects are determined, applicable mitigation ensures that no minority or low-income populations bear a disproportionate burden of those effects.

As discussed in FAA Order 1050.1E, both Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, and the accompanying Presidential Memorandum, as well as Order DOT 5610.2, *Environmental Justice*, require the FAA to provide for meaningful public involvement by minority and low-income populations. These documents encourage consideration of environmental justice impacts in EAs to determine whether a disproportionately high and adverse impact may occur.

The socioeconomic and racial characteristics of the population within the General Study Area are based on data from the 2010 U.S. Census. Minority and low-income populations for each census tract within the General Study Area were identified using Geographic Information Systems (GIS). This analysis defines and identifies minority population census tracts and low-income population census tracts as follows:

- A **Minority Population census tract** is defined as a tract having a minority population percentage greater than the average minority population percentage of the General Study Area. Based on the 2010 census data, the average percentage of minority population residing in the General Study Area was 41 percent.

Therefore, every census tract with a percentage of minority population greater than 41 percent was identified as a census tract of environmental justice concern. A minority population is defined as as “any readily identifiable groups of minority persons who live in geographic proximity, and if circumstances warrant, geographically dispersed/transient persons (such as migrant workers or Native Americans) who will be similarly affected by a proposed DOT program, policy or activity.”²³ Minority means a person who is Black, Hispanic or Latino, Asian American, American Indian and Alaskan Native, or Native Hawaiian and Other Pacific Islander.²⁴

- A **Low-Income Population census tract** is defined as a tract having a greater percentage of low-income population than the average percentage of low-income population residing in the General Study Area. Based on the 2010 Poverty Guidelines identified by the Department of Health and Human Services (HHS), the poverty threshold for a household of three persons was set at \$18,310 for the 48 contiguous states, and therefore is applicable to the General Study Area. For the purposes of identifying low-income population census tracts, the HHS threshold of \$18,310 was used. Based on the 2010 data, the average percentage of low-income population residing in the General Study Area was 12.6 percent. Therefore, every census tract with a percentage of low-income population greater than 12.6 percent was identified as a census tract of environmental justice concern.

Exhibit 4-6 depicts areas of environmental justice concern in the General Study Area. **Table 4-5** shows the total population, minority population, and low-income population for each state in the General Study Area as reported by the 2010 Census.

Table 4-5 Selected Populations in the General Study Area

State	Population	General Study Area Population			
		Minority	% of Total	Low Income	% of Total
North Carolina	4,589,721	1,164,167	25%	537,055	12%
South Carolina	1,796,186	447,432	25%	227,537	13%
Virginia	107,368	28,456	27%	13,654	13%

Source: U.S. Census Bureau, *2010 Tracts and American Community Survey Selected Economic Characteristics*, 2010.

Prepared by: ATAC Corporation, October 2014.

4.3.7 Energy Supply (Aircraft Fuel)

This section describes fuel consumption by IFR aircraft arriving at and departing from the Study Airports. Using the NIRS model, aircraft fuel burn was calculated to estimate aircraft fuel consumption associated with air traffic flows under 2011 Existing Conditions. NIRS calculates fuel burn using the same input used for calculating noise. (See Section 4.3.1.1 for a discussion of NIRS model inputs.) Based on the NIRS calculation, IFR aircraft arriving at and departing from the Study Airports burn approximately 1,394,001 kg of fuel on an AAD basis.

²³ Order DOT 5610.2, *Environmental Justice*, May 2, 2012.

²⁴ Id.

4.3.8 Air Quality

This section describes air quality conditions within the General Study Area. In the United States, air quality is generally monitored and managed at the county or regional level. The U.S. Environmental Protection Agency (EPA), pursuant to mandates of the federal *Clean Air Act*, (42 U.S.C. § 7401 *et seq.*), has established the National Ambient Air Quality Standards (NAAQS) to protect public health, the environment, and quality of life from the detrimental effects of air pollution. Standards have been established for the following criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO₂), ozone (O₃), particulate matter (PM), and sulfur dioxide (SO₂). PM standards have been established for inhalable coarse particles ranging in diameter from 2.5 to 10 micrometers (µm) [referred to as PM₁₀] and fine particles less than 2.5 µm [PM_{2.5}] in diameter.

In accordance with the *Clean Air Act* (), 42 U.S.C. 7401 *et. seq.* the EPA uses air monitoring data it compiles as well as data collected by local air quality agencies to classify counties and some sub-county geographical areas by their compliance with the NAAQS. An area with air quality at or below the NAAQS is designated as an attainment area. An area with air quality that exceeds the NAAQS is designated as a nonattainment area. Nonattainment areas are further classified as extreme, severe, serious, moderate, and marginal by the extent the NAAQS are exceeded. Areas that have been reclassified from nonattainment to attainment are identified as maintenance areas. An area may be designated as unclassifiable when there is a temporary lack of data on which to base its attainment status. **Table 4-6** identifies those areas within the General Study Area that are in nonattainment or maintenance for one or more criteria pollutants.

The FAA has determined that aircraft operations at or above the average mixing height of 3,000 feet AGL have a very small effect on pollutant concentrations at ground level.²⁵ The mixing height represents the height of the completely mixed portion of the atmosphere that begins at the earth's surface and extends to a few thousand feet overhead where the atmosphere becomes fairly stable.²⁶

Table 4-6 NAAQS Attainment Areas in the General Study Area

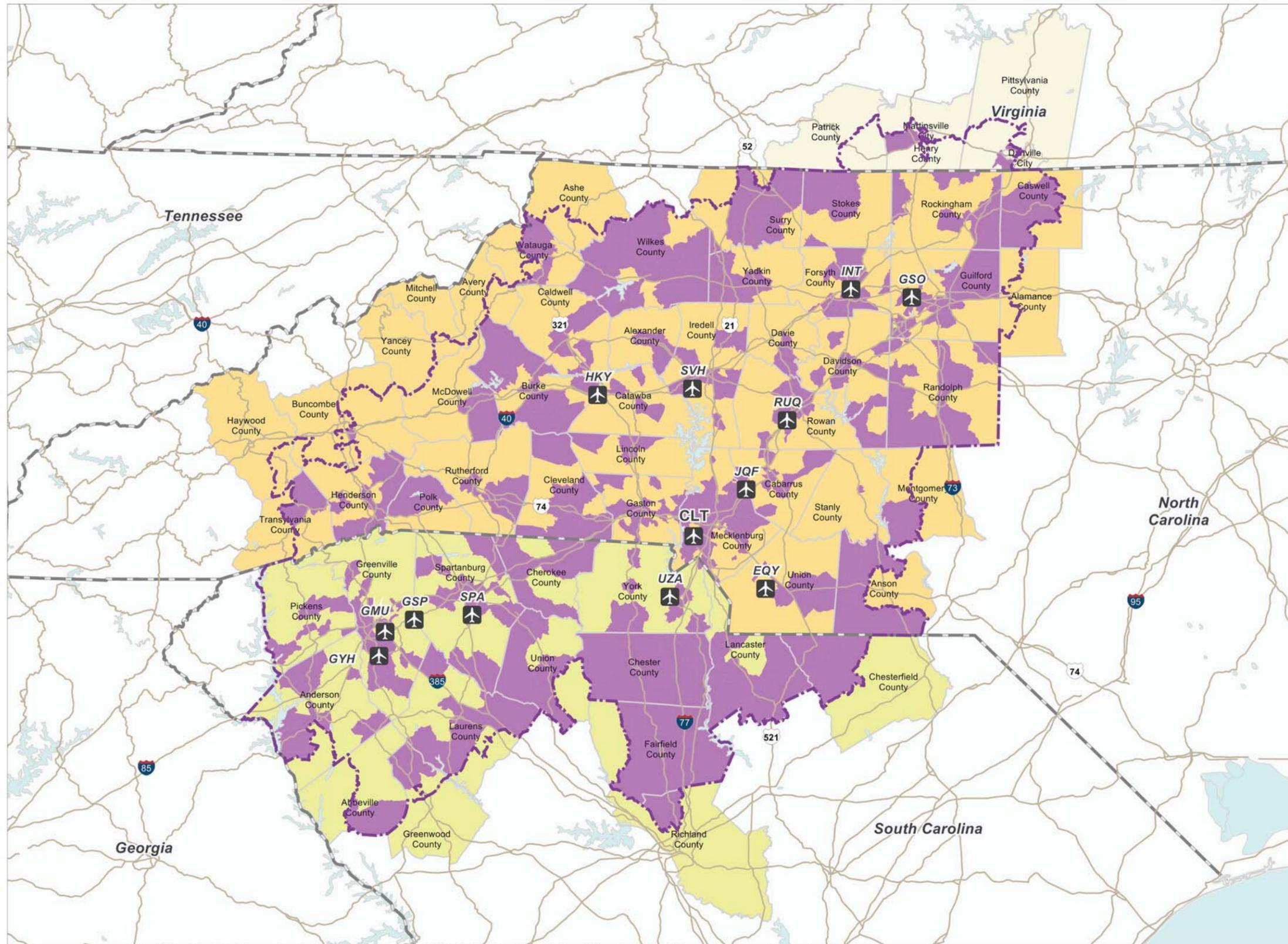
Criteria Pollutant	Status	State	County
Ozone (8-Hour)	Marginal	NC	Lincoln County, Union County, Mecklenburg County, Cabarrus County, Rowan County
		SC	York County
Carbon Monoxide	Moderate	NC	Mecklenburg County, Durham County, Wake County, Forsyth County

Sources: US Environmental Protection Agency Green Book [<http://www.epa.gov/oaqps001/greenbk/>]. Accessed March 2013.

Prepared by: ATAC Corporation, March 2013.

²⁵ Wayson, Roger, and Fleming, Gregg, "Consideration of Air Quality Impacts by Airplane Operations at or Above 3000 feet AGL," Volpe National Transportations Systems Center and FAA Office of Environment & Energy, FAA-AEE-00-01-DTS-34, September 2000 (http://www.faa.gov/regulations_policies/policy_guidance/envir_policy/).

²⁶ U.S. Department of Transportation, Federal Aviation Administration, *Air Quality Procedures For Civilian Airports & Air Force Bases*, April 1997 (http://www.faa.gov/regulations_policies/policy_guidance/envir_policy/airquality_handbook/media/Handbook.PDF).



LEGEND

- General Study Area Boundary
- Study Airport
- North Carolina County in Study Area
- South Carolina County in Study Area
- State Boundary
- U.S. and Interstate Highways
- Water
- Environmental Justice Community

- Notes:
- CLT Charlotte Douglas International Airport
 - EQY Charlotte-Monroe Executive Airport
 - GMU Greenville Downtown Airport
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 - GSP Greenville Spartanburg International Airport
 - GYH Donaldson Center Airport
 - HKY Hickory Regional Airport
 - INT Smith Reynolds Airport
 - JQF Concord Regional Airport
 - RUQ Rowan County Airport
 - SPA Spartanburg Downtown Memorial Airport
 - SVH Statesville Regional Airport
 - UZA Rock Hill/York County/Bryant Field Airport

Projection: Lambert Conformal Conic
Scale: 1,750,000



Sources: National Atlas of the United States of America: U.S. County Boundaries, 2005; U.S. State Boundaries, 2005; and Water Bodies, 2005; Bureau of Transportation Statistics: National Transportation Atlas Database National Highway Planning Network, 2012; FAA: NFDC Airport database, 2012; U.S. Census Bureau: 2010 Tracts, Profile of General Population and Housing Characteristics, and American Community Survey Selected Economic Characteristics; ATAC Corporation: Study Area Boundary, 2013.

Prepared by: ATAC Corporation, December 2014.

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4.3.9 Climate

Greenhouse gases (GHGs) are naturally occurring and man-made gases that trap heat in the earth's atmosphere. These gases include CO₂, methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆). According to the EPA, in 2009 the General Accounting Office (GAO) reported that domestic aviation contributed approximately three percent of national CO₂ emissions.²⁷ Similarly, the International Civil Aviation Organization (ICAO) estimated that aviation accounted for approximately three percent of all man-made global CO₂ emissions.²⁸ The FAA considers CO₂ emissions from aircraft to be the primary GHG of concern.

In June 2012, the CEQ updated the *Federal GHG Accounting and Reporting Guidance* establishing requirements for federal agencies to calculate and report GHG emissions associated with their operations. The federal guidance establishes a single metric for reporting all GHGs in metric tons (MT) of CO₂ equivalent (CO₂e) or MTCO₂e.

For purposes of this EA, the amount of fuel burned by IFR aircraft arriving and departing from the Study Airports in the General Study Area as estimated by the NIRS model is used to calculate total MTCO₂e. Fuel burn calculations are discussed in Section 4.3.7, *Energy Supply*. The calculated fuel burn was used to estimate the total MT of CO₂, reported here as MTCO₂e. **Table 4-7** presents the total estimated MTCO₂e along with estimates of all national and global emissions of MTCO₂e.

Table 4-7 CLT OAPM CO₂e Estimates (2011)

CLT OAPM	National	Global
0.00044 MMT	148 MMT	50,100 MMT ¹

Notes:
¹ 2010 estimate.
 MMT=Million Metric Tons

Source: U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2011* (EPA 430-R-13-001), April 12, 2013; United Nations Environment Programme, *The Emissions Gap Report 2012*, November 2012; ATAC Corporation, July 2014.

Prepared by: ATAC Corporation, August 2014.

²⁷United States Congress, U.S. Government Accountability Office, *Aviation and Climate Change. GAO Report to Congressional Committees*, (2009). (<http://www.gao.gov/new.items/d09554.pdf>).

²⁸ Alan Melrose, "European ATM and Climate Adaptation: A Scoping Study," in *ICAO Environmental Report*. (2010).

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