

4 Affected Environment

This chapter of the environmental assessment (EA) describes the human, physical, and natural environmental conditions that could be affected by the Proposed Action. Specifically, the 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 DC 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 was designed to capture all flight paths identified for the No Action Alternative using 2011 radar data (the latest year of complete data available) and the flight paths designed as part of the Proposed Action up to the point at which 95 percent of departing aircraft are above 10,000 feet AGL and 95 percent of arriving aircraft are above 7,000 feet above ground level (AGL). Paragraph 14.5e of Appendix A to FAA Order 1050.1E, requires consideration of 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.⁴²
2. The lateral extent of the General Study Area was concisely defined to focus on areas of air traffic flow.

The following sections describe the data acquired and methodology used to develop the General Study Area.

4.1.1 Data Acquisition to Develop the General Study Area

The General Study Area is based on aircraft arrivals and departures at the Study Airports. **Table 4-1** lists operations by Study Airport and the type of operation. An operation is defined as a takeoff or landing by an aircraft operating under Instrument Flight Rules (IFR).

⁴² Department of Transportation, Federal Aviation Administration, *Memorandum Regarding Altitude Cut-Off for National Airspace Redesign (NAR) Environmental Analyses*, September 15, 2003.

Table 4-1 2011 Study Airport Operations by Airport and Category

ID	Airport Name	City	State	2011 Operations		
				Arrivals	Departures	Total
ADW	Joint Base Andrews (U.S. Air Force)	Camp Springs	MD	12,820	12,821	25,641
BWI	Thurgood Marshall International	Baltimore	MD	136,454	136,454	272,908
DCA	Ronald Reagan Washington National	Washington	DC	141,309	141,309	282,618
ESN	Easton/Newnam Field	Easton	MD	2,608	2,609	5,217
FDK	Frederick Muni	Frederick	MD	3,352	3,218	6,570
GAI	Montgomery County Airpark	Gaithersburg	MD	4,767	4,991	9,758
HEF	Manassas Regional/Harry P. Davis Field	Manassas	VA	10,036	10,036	20,072
IAD	Washington Dulles Intl	Washington	DC	179,804	179,804	359,608
JYO	Leesburg Executive	Leesburg	VA	5,757	5,848	11,605
MRB	Eastern WV Regional/Shepherd Field	Martinsburg	WV	1,752	1,864	3,616
MTN	Martin State	Baltimore	MD	5,683	5,683	11,366
OKV	Winchester Regional	Winchester	VA	1,616	1,537	3,153
RIC	Richmond International	Richmond	VA	43,217	43,218	86,435
RMN	Stafford Regional	Stafford	VA	1,537	1,356	2,893
Total				550,712	550,748	1,101,460

Source: US Department of Transportation, Federal Aviation Administration, Air Traffic Activity System (ATADS), Traffic Flow Management System Counts (TFMSC), August 2012.

Prepared by: ATAC Corporation, June 2013.

Aircraft flight altitudes were identified for both the Proposed Action and No Action Alternative using radar data for 2011, the latest full year of data available at the time the analysis was conducted. However, only 282 days of data was used for 2011. The remaining 83 days of data for 2011 was either unavailable due to radar equipment anomalies, operational outages, or extreme weather events that made the data unreliable. The radar data was used to understand existing arrival and departure flight paths for aircraft operating under IFR conditions in the DC Metroplex. An initial study area was identified based on a detailed analysis of the radar data and the topography in the DC Metroplex area. Given the varied terrain west of the Washington, D.C. area, United States Geological Survey (USGS) data were acquired to define ground elevations throughout the General Study Area.

The radar data analysis included an assessment of existing and proposed flight tracks and profiles (altitudes).⁴³ The radar data obtained to determine the General Study Area and existing noise conditions is further discussed in Section 4.3.1.

4.1.2 Methodology Used to Determine the General Study Area

As discussed in Section 4.1, the parameters for defining the General Study Area are based on the requirements of FAA Order 1050.1E (Appendix A, Paragraph 14.5e) and policy guidance issued by the Program Director for Air Traffic Airspace Management for air traffic project environmental analyses. Accordingly, the General Study Area is a three-dimensional block of airspace designed to capture aircraft operations to and from the Study Airports as they operate at or below 10,000 feet AGL. The lateral dimensions of the General Study Area are defined using 2011 radar data to determine the point at which departing aircraft penetrate the 10,000 feet AGL altitude and arriving aircraft penetrate the

⁴³ Proposed Action tracks were based on the Terminal Area Route Generations, Evaluation, and Traffic Simulation (TARGETS) design package (June 6, 2012) provided by the FAA Design and Implementation Team.

7,000 feet AGL altitude. Applying these criteria, the General Study Area captures the maximum range of flight tracks where 95 percent of aircraft pass through 10,000 feet AGL ceiling. The outer boundaries of the General Study Area are largely shaped by the 7,000 feet AGL point data for arrivals because the aircraft are travelling at this altitude further away from the Study Airports compared to departures which reach higher altitudes closer in. However, the General Study Area boundary was also shaped by the 10,000 feet AGL points in areas over which departure operations predominate.

Because the General Study Area represents an area between the ground surface up to 10,000 feet AGL, it was necessary to identify ground elevations throughout the DC Metroplex area. This was particularly important as the terrain in this area generally consists of rolling hills with varying surface elevation. Data from the USGS was used to ensure the best representation of terrain conditions below the aircraft flight paths. Areas with high concentrations of air traffic flows were used to focus the General Study Area boundaries and to eliminate areas from the General Study Area with minimal or no aircraft overflights. Similarly, because the surface elevations vary throughout the General Study Area, the top elevation of the General Study Area was established at 10,000 feet AGL above the highest point of elevation on the ground for areas predominately overflowed by departures.

Exhibit 4-1 depicts the General Study Area developed for this EA. **Table 4-2** identifies the states and counties that fall within or are intersected by the General Study Area boundary. In total, the District of Columbia and portions of 83 counties in four states fall within the General Study Area.

Table 4-2 States and Counties in the Study Area (1 of 2)

District of Columbia				
There are no counties in the District of Columbia				
Maryland				
Anne Arundel County	Caroline County ¹	Dorchester County ¹	Kent County ¹	Saint Mary's County ¹
Baltimore City	Carroll County	Frederick County ¹	Montgomery County	Talbot County
Baltimore County	Charles County	Harford County	Prince George's County	Washington County ¹
Calvert County	Cecil County ¹	Howard County	Queen Anne's County ¹	

Table 4-2 States and Counties in the Study Area (2 of 2)

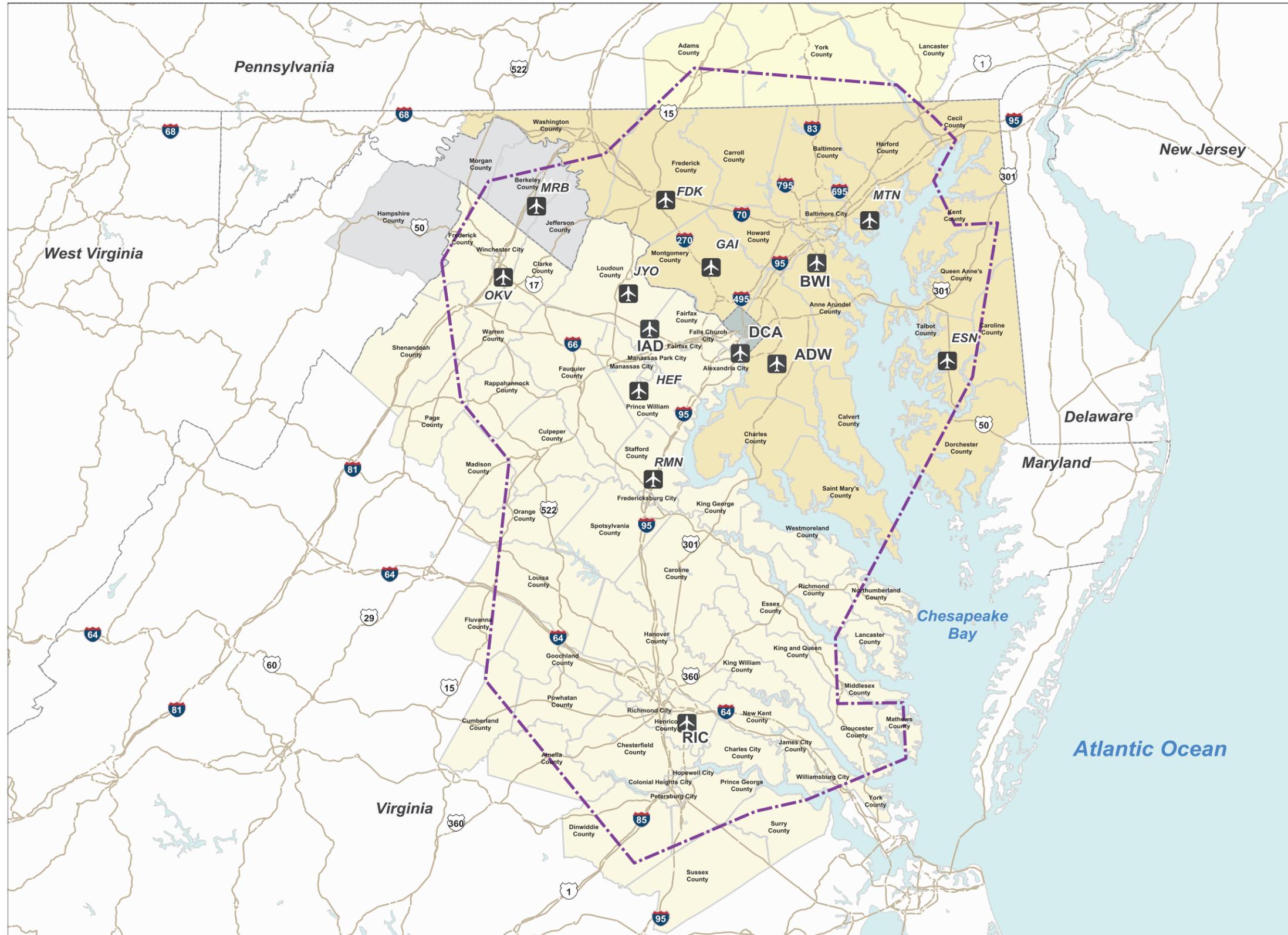
Pennsylvania				
Adams County ¹	Lancaster County ¹	York County ¹		
West Virginia				
Berkeley County	Hampshire County ¹	Jefferson County	Morgan County ¹	
Virginia				
Alexandria City	Fairfax City	James City County	New Kent County	Spotsylvania County
Amelia County ¹	Fairfax County	King and Queen County	Northumberland County ¹	Stafford County
Arlington County	Falls Church City	King George County	Orange County	Surry County ¹
Caroline County	Fauquier County	King William County	Page County ¹	Sussex County ¹
Charles City County	Fluvanna County ¹	Lancaster County ¹	Petersburg City	Warren County
Chesterfield County	Frederick County	Loudoun County	Powhatan County	Westmoreland County
Clarke County	Fredericksburg City	Louisa County	Prince George County	Williamsburg City
Colonial Heights City	Gloucester County	Madison County ¹	Prince William County	Winchester City
Culpeper County	Goochland County	Manassas City	Rappahannock County	York County ¹
Cumberland County ¹	Hanover County	Manassas Park City	Richmond City	
Dinwiddie County ¹	Henrico County	Mathews County ¹	Richmond County	
Essex County	Hopewell City	Middlesex County ¹	Shenandoah County ¹	

Notes:

1) Only a portion of the county falls within the General Study Area

Source: National Atlas of the United States of America: U.S. County Boundaries, 2005; ATAC Corporation, August 2012.

Prepared by: ATAC Corporation, August 2012.



LEGEND

- General Study Area Boundary
- Study Airport
- District of Columbia
- Maryland County in Study Area
- Pennsylvania County in Study Area
- Virginia County in Study Area
- West Virginia County in Study Area
- State Boundary
- U.S. and Interstate Highways
- Water

Notes:

- DCA** Ronald Reagan Washington National Airport
- IAD** Washington Dulles International Airport
- BWI** Baltimore Washington International Airport
- ADW** Andrews Air Force Base
- RIC** Richmond International Airport
- MTN** Martin State Airport
- ESN** Easton/Newnam Field
- FDK** Frederick Municipal Airport
- GAI** Montgomery County Airpark
- RMN** Stafford Regional Airport
- JYO** Leesburg Executive Airport
- HEF** Manassas Regional Airport
- OKV** Winchester Regional Airport
- MRB** Eastern West Virginia Regional 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: NFDCA Airport database, 2012; ATAC Corporation: Study Area Boundary, 2012.
Prepared by: ATAC Corporation, June 2013.

Exhibit 4-1

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4.2 Resource Categories or Sub-Categories Not Affected

This section discusses the environmental resource categories or sub-categories included in Appendix A of FAA Order 1050.1E that would remain unaffected by the Proposed Action. These resource categories would remain unaffected because the resource either 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:

- **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 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 situated in areas that include floodplains.
- **Hazardous Materials, Pollution Prevention, and Solid Waste:** The Proposed Action would not generate, disturb, transport, or treat hazardous materials.
- **Historic, Architectural, Archeological, and Cultural Resources – Archeological and Architectural sub-category 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 – Light Emissions sub-category only:** The Proposed Action does not involve construction of any structures that would introduce new sources of lighting.
- **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, the Proposed Action does not involve construction or other ground disturbing activities that would involve the relocation of people or businesses. Furthermore, the proposed project does not include the construction of airport facilities that would result in or induce an increase in operational capacity.
- **Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks –**

- Socioeconomic Impacts: 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: There are no designated Wild and Scenic Rivers located within the General Study Area.

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)
- Natural Resources and Energy Supply- Energy Supply sub-category only (aircraft fuel only) (Section 4.3.5)
- Greenhouse Gases and Climate Change (Section 4.3.6)
- Fish, Wildlife, and Plants – Wildlife sub-category only (Section 4.3.7)
- Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks – Environmental Justice sub-category only (Section 4.3.8)
- Air Quality (Section 4.3.9)
- Light Emissions and Visual Impacts – Visual Impacts sub-category only (Section 4.3.10)

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

4.3.1 Noise

Aircraft noise is often the most noticeable environmental effect associated with any aviation project. This section discusses guidance and regulations established by the FAA for noise analyses, noise model input development, and existing aircraft noise conditions. Existing conditions are based on year 2011 operations, the most recent full calendar year at the time of this analysis. **Appendix E** provides background information on the physics of sound, the effects of noise on people, and noise metrics. More detailed information related to the noise model input is available upon request (Please see **Appendix C** for contact information).

4.3.1.1 Noise Modeling Methodology

To comply with NEPA requirements, the FAA has developed specific guidance and requirements for the assessment of aircraft noise. This guidance, specified in FAA Order 1050.1E, requires that aircraft noise be analyzed in terms of the yearly Day-Night Average Sound Level (DNL) metric. In practice, this requirement means that DNL is computed for an average annual day (AAD) of operations for the year of interest.

The DNL metric is a single value representing the aircraft sound level over a 24-hour period. DNL includes all of the time-varying sound energy within the period. To represent the greater annoyance caused by a noise event at night, the DNL metric includes a 10-decibel (dB) weighting for noise events occurring between 10:00 P.M. and 6:59 A.M. (nighttime). The nighttime event weighting helps to account for annoyance that would potentially be caused by noise during night time periods when ambient noise levels are lower. The weighting used equates one night flight to 10 day flights. In this EA, for ease of reference, the format DNL 45 is used to represent a noise exposure level of DNL 45 dB. Additional details relating to the emergence of DNL as the metric of choice by FAA are available in **Appendix E**.

In addition to requiring the use of the DNL metric, FAA also requires that aircraft noise be evaluated using one of several authorized computer noise models. FAA Order 1050.1E specifies that one of three noise models should be used for an Environmental Assessment: (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 AGL. Specifically, for the Proposed Action, FAA specifies use of NIRS, Version 7.0b.

For this EA, the FAA conducted a detailed analysis of aircraft operating under 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 operate under IFR to obtain direction on separation from surrounding aircraft from air traffic control (ATC) in these busy areas. Those aircraft operating under Visual Flight Rules (VFR) are unaffected by the Proposed Action.

When operating outside certain categories of controlled airspace, the aircraft operating under VFR described above 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 these 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. Therefore, VFR aircraft were not included in the analysis. Their operations would not be affected by the forecast conditions in 2013 (the first year of implementation) and 2018 (five years after implementation) for both the No Action Alternative and Proposed Action.

NIRS requires a variety of inputs, including local environmental data (e.g., temperature and humidity), runway layout, 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 such as aircraft type, arrival and departure times, and origin/destination airport.

AAD NIRS Operations: A total of 1,438,745 IFR-filed flights from/to 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. As described in Section 4.1.1, during this 365 day period, 84 days of data were unusable. The 281 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 AAD fleet mix, time of day (day and night) and runway use input for NIRS. More detailed information related to the NIRS input for Existing Conditions is available upon request (Please see **Appendix C** for contact information).

AAD NIRS Flight Tracks and Climb/Descent Patterns: The PDARS data provided tracks for each flight that occurred within the 281 days of 2011. The data was not only used to define the AAD track locations and use representing a typical flow of traffic, but also 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 the typical flight routings within the General Study Area for an average annual 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 be used to calculate DNL at the geographic centers (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.⁴⁴ 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

⁴⁴ US Census Bureau, *2010 Tracts and American Community Survey Selected Economic Characteristics*, 2010.

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 0.5 nm by 0.5 nm grid for use in identifying DNL within potential Department of Transportation (DOT) Act Section 4(f) resources. These resources are discussed further in Section 4.3.3.

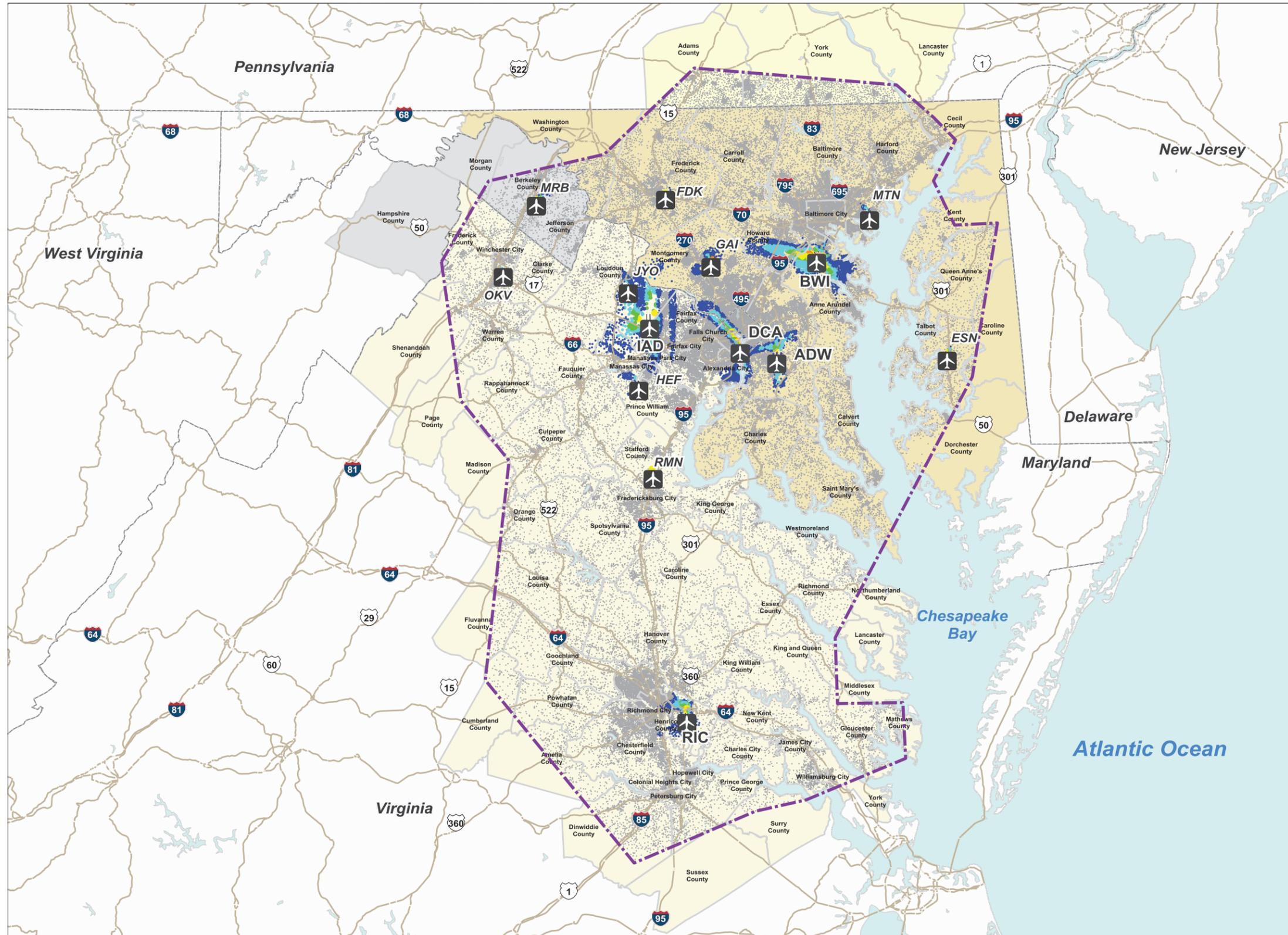
Unique Points: Noise levels at sites of interest too small to be captured in the 0.5 nm grid can also be analyzed using the NIRS model. Such sites include individual Section 4(f) resources that are less than one square nautical mile in area (such as significant public parks), and historic sites (such 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 126,316 census block centroids (centroids in the General Study Area that represent areas with population), 3,752 grid points, and 6,697 unique points throughout the General Study Area.

4.3.1.2 Existing Aircraft Noise Exposure

Table 4-3 describes the population exposed to AAD DNL in ranges 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 represented by the DNL metric. The information provided refers to DNL only within the General Study Area. **Exhibit 4-2** provides a graphical representation of the 2011 existing condition DNL within the General Study Area. **Exhibit 4-3** provides a closer look at 2011 existing conditions DNL in areas around IAD, FDK, HEF, JYO, MRB, OKV, and RMN. Similarly, **Exhibit 4-4** provides a closer look at 2011 existing conditions DNL in areas around ADW, BWI, DCA, ESN, GAI, and MTN. Finally, **Exhibit 4-5** provides a closer look at 2011 existing conditions DNL at areas around RIC.

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LEGEND

- General Study Area
- Study Airport
- District of Columbia
- Maryland County in Study Area
- Virginia County in Study Area
- State Boundary
- U.S. and Interstate Highways
- Secondary Roads
- Water

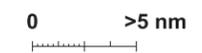
Noise Levels (2011)

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

Notes:

- DCA Ronald Reagan Washington National Airport
- IAD Washington Dulles International Airport
- BWI Baltimore Washington International Airport
- ADW Andrews Air Force Base
- RIC Richmond International Airport
- MTN Martin State Airport
- ESN Easton/Newnam Field
- FDK Frederick Municipal Airport
- GAI Montgomery County Airpark
- RMN Stafford Regional Airport
- JYO Leesburg Executive Airport
- HEF Manassas Regional Airport
- OKV Winchester Regional Airport
- MRB Eastern West Virginia Regional Airport

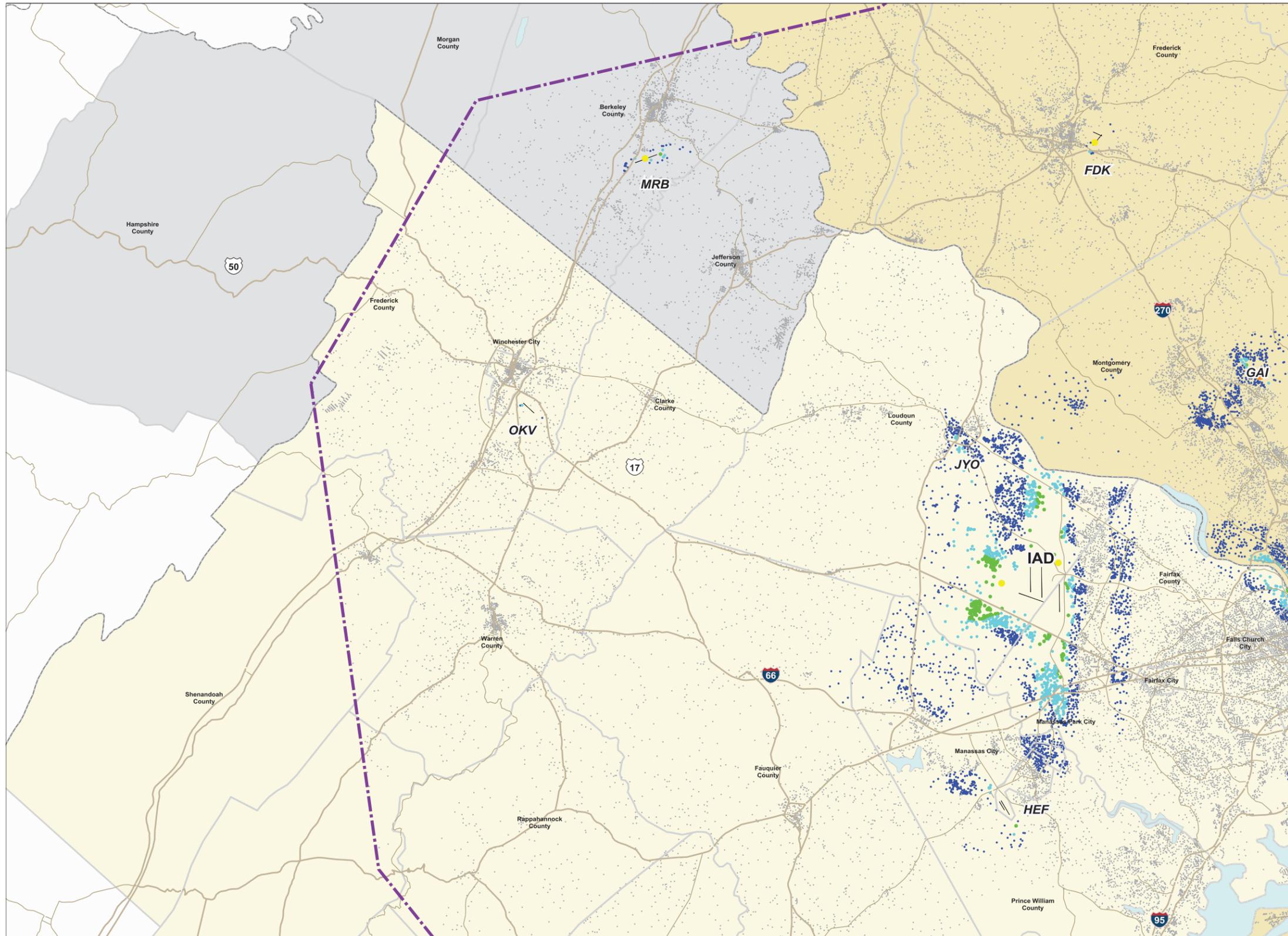
Projection: Lambert Conformal Conic
Scale: 1,750,000



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: NFDCA Airport database, 2012; ATAC Corporation: Study Area Boundary, 2012, and Noise Levels, 2013.
Prepared by: ATAC Corporation, June 2013.

Exhibit 4-2

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LEGEND

- General Study Area
- Runway
- District of Columbia
- Maryland County in Study Area
- Virginia County in Study Area
- West Virginia County in Study Area
- State Boundary
- U.S. and Interstate Highways
- Secondary Roads
- Water

- Noise Levels (2011)
- <45
 - 45 - 50
 - 50 - 55
 - 55 - 60
 - 60 - 65
 - 65 - 70
 - 70 - 75

Notes:

- IAD** Washington Dulles International Airport
- FDK** Frederick Municipal Airport
- RMN** Stafford Regional Airport
- JYO** Leesburg Executive Airport
- HEF** Manassas Regional Airport
- OKV** Winchester Regional Airport
- MRB** Eastern West Virginia Regional Airport

Projection: Lambert Conformal Conic
Scale: 500,000

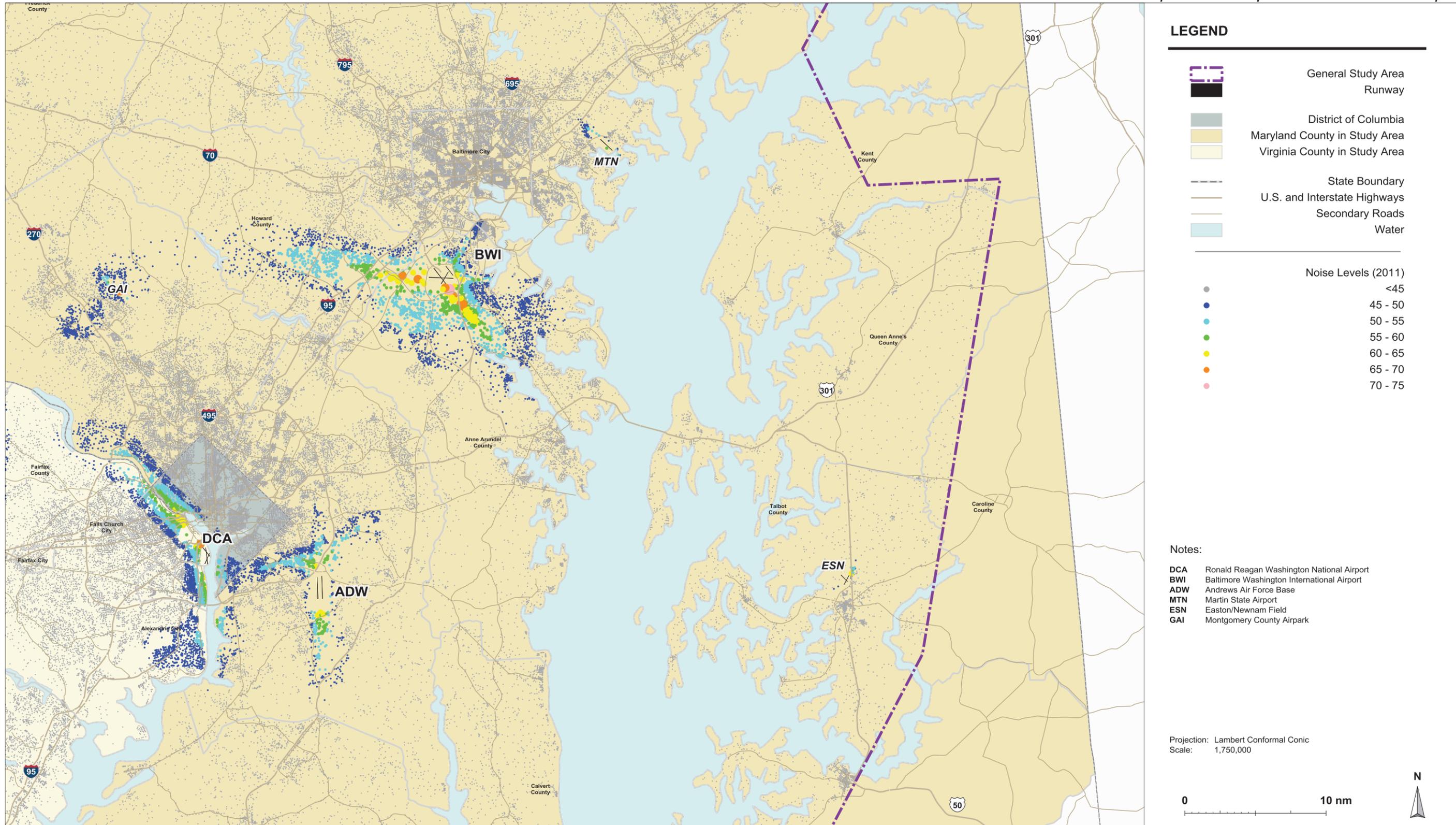


Sources: National Atlas of the United States of America: U.S. County Boundaries, 2005; U.S. State Boundaries, 2005; and Water Bodies, 2005; Bureau of Transportation Statistics: National Transportation Atlas Database National Highway Planning Network, 2012; FAA: NFDC Airport database, 2012; ATAC Corporation: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

Exhibit 4-3

2011 Baseline DNL - Noise Exposure Levels - IAD, FDK, HEF JYO, MRB, OKV, RMN and Environs

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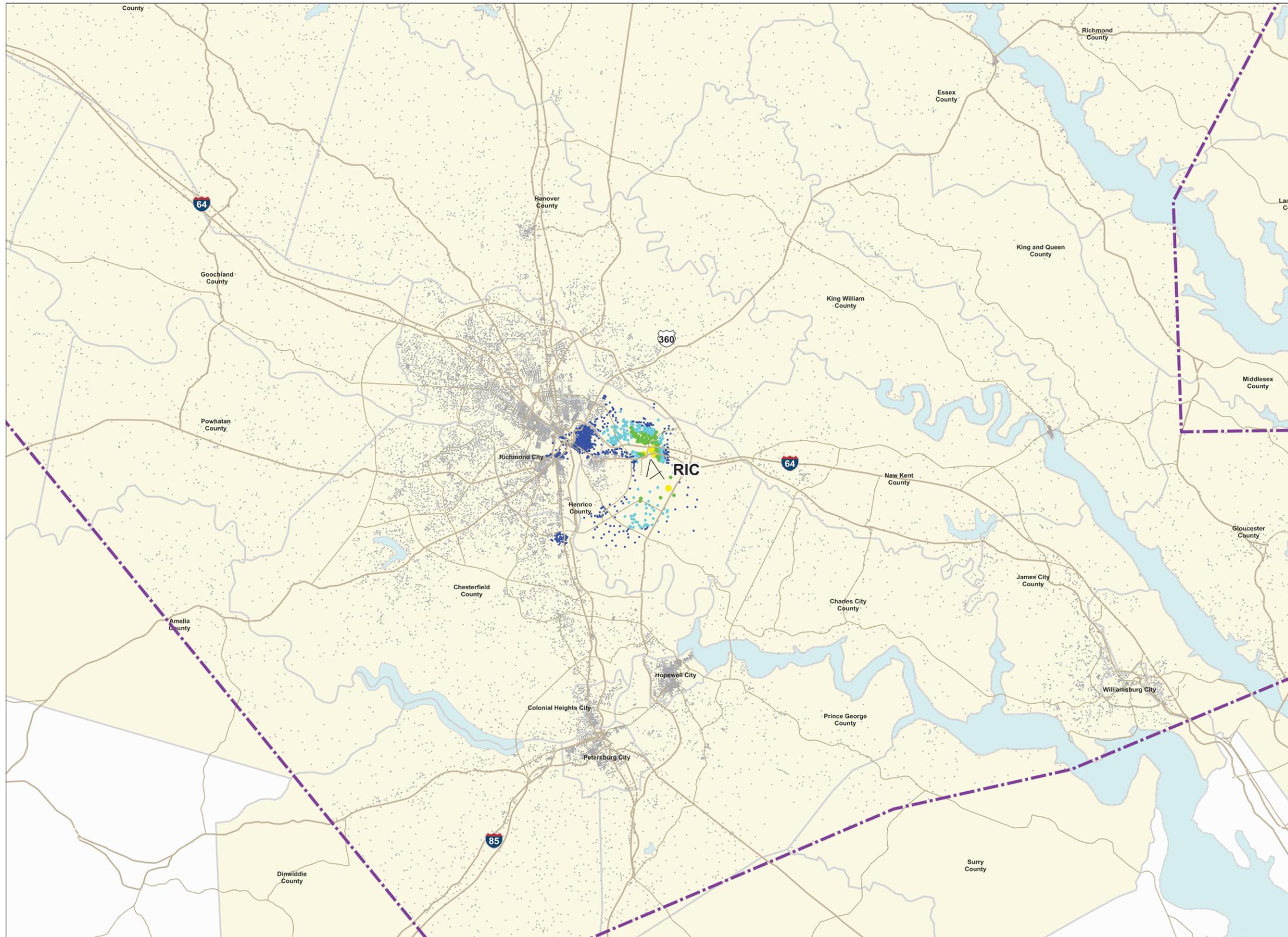


Sources: National Atlas of the United States of America: U.S. County Boundaries, 2005; U.S. State Boundaries, 2005; and Water Bodies, 2005; Bureau of Transportation Statistics: National Transportation Atlas Database National Highway Planning Network, 2012; FAA: NFDC Airport database, 2012; ATAC Corporation: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

Exhibit 4-4

2011 Baseline DNL -
Noise Exposure Levels - ADW, BWI,
DCA, ESN, GAI, MTN and Environs

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LEGEND

-  General Study Area
-  Runway
-  Virginia County in Study Area
-  State Boundary
-  U.S. and Interstate Highways
-  Secondary Roads
-  Water

- Noise Levels (2011)
-  <45
 -  45 - 50
 -  50 - 55
 -  55 - 60
 -  60 - 65
 -  65 - 70
 -  70 - 75

Notes:

RIC Richmond International Airport

Projection: Lambert Conformal Conic
Scale: 1:500,000



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, 2012, and Noise Levels, 2013.
Prepared by: ATAC Corporation, June 2013.

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Table 4-3 Maximum Population Exposed to Aircraft Noise within the Study Area (2011)

DNL Range (dB)	Population
DNL 45 dB to DNL 60 dB	1,530,673
DNL 60 dB to less than DNL 65 dB	21,417
DNL 65 dB and higher	1,003
Total Above DNL 45 dB	1,533,093

Sources: NIRS Version 7.0b3; US Census Bureau, 2010 Tracts and American Community Survey Selected Economic Characteristics, 2010.

Prepared by: ATAC Corporation, August 2012.

As shown on **Exhibit 4-2**, the higher DNL are generally aligned with study airport primary runways and areas of existing aircraft traffic.

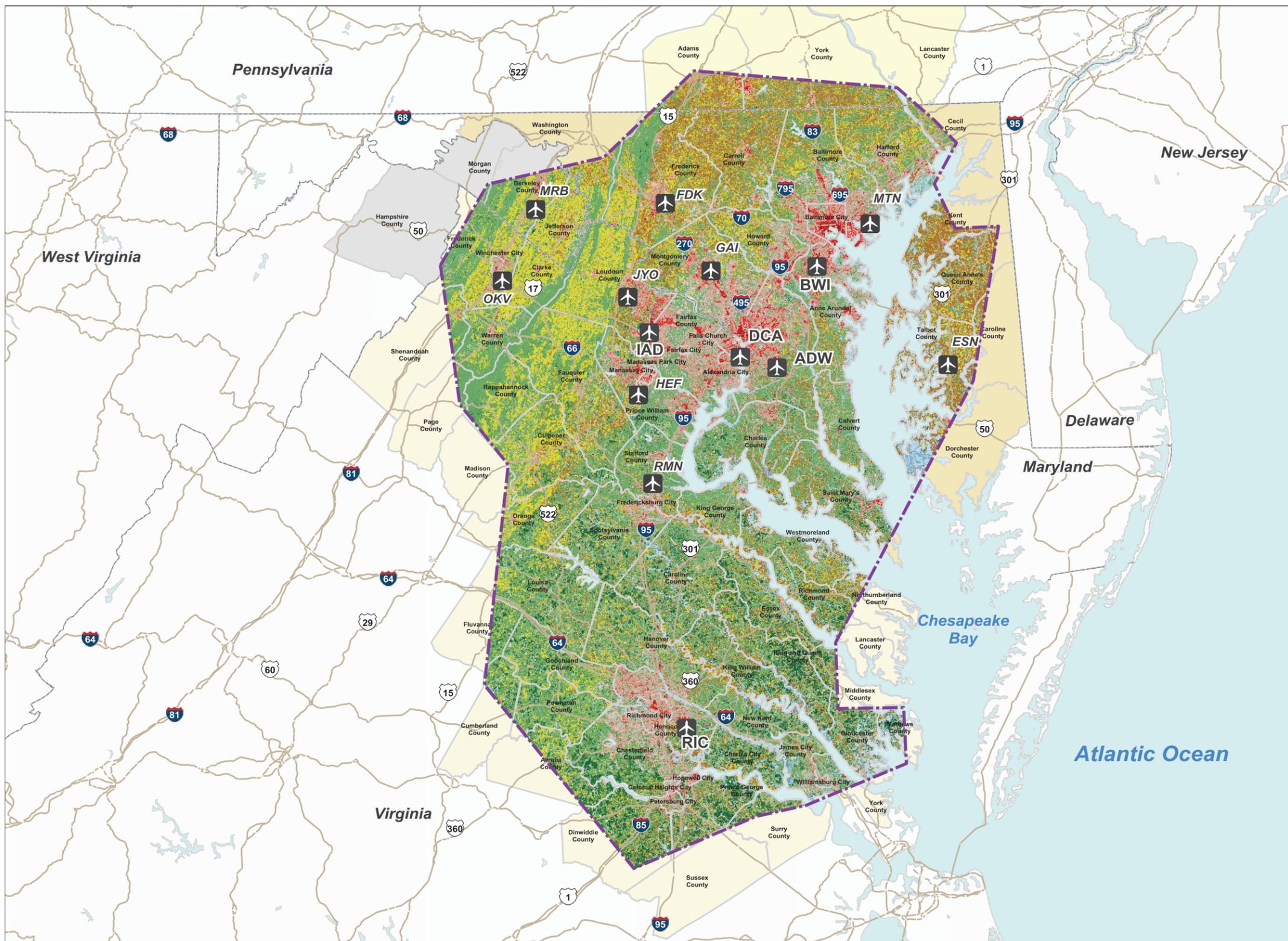
4.3.2 Compatible Land Use

Land coverage data was obtained from the USGS National Land Cover Database 2006 (NLCD 2006). Land coverage classifications located within the General Study Area include:

- **Open Water**—areas of open water, generally with less than 25 percent cover of vegetation or soil.
- **Developed, Open Space**—areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20 percent of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.
- **Developed, Low Intensity**— areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20 percent to 49 percent of total cover. These areas most commonly include single-family housing units.
- **Developed, Medium Intensity**— areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50 percent to 79 percent of the total cover. These areas most commonly include single-family housing units.
- **Developed, High Intensity**— highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80 percent to 100 percent of the total cover.
- **Barren Land**— areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15 percent of total cover.
- **Deciduous Forest**—areas dominated by trees generally greater than five meters tall, and greater than 20 percent of total vegetation cover. More than 75 percent of the tree species shed foliage simultaneously in response to seasonal change.
- **Evergreen Forest**—areas dominated by trees generally greater than five meters tall, and greater than 20 percent of total vegetation cover. More than 75 percent

- of the tree species maintain their leaves all year. The canopy is never without green foliage.
- **Mixed Forest**— areas dominated by trees generally greater than five meters tall, and greater than 20 percent of total vegetation cover. Neither deciduous nor evergreen species are greater than 75 percent of total tree cover.
 - **Shrub/Scrub**— areas dominated by shrubs; less than five meters tall with shrub canopy typically greater than 20 percent of total vegetation. This class includes true shrubs, young trees in an early successional stage, or trees stunted from environmental conditions.
 - **Grasslands/Herbaceous**— areas dominated by graminoid or herbaceous vegetation, generally greater than 80 percent of total vegetation. These areas are not subject to intensive management such as tilling, but can be used for grazing.
 - **Hay/Pasture**— areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20 percent of total vegetation.
 - **Cultivated Crops**— areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20 percent of total vegetation. This class also includes all land being actively tilled.
 - **Woody Wetlands**— areas where forest or shrub land vegetation accounts for greater than 20 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.
 - **Emergent Herbaceous Wetlands**—Areas where perennial herbaceous vegetation accounts for greater than 80 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

Exhibit 4-6 shows the distribution of land coverage types within 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. These resources are further discussed in Section 4.3.3.



LEGEND

- General Study Area Boundary
- Study Airport
- District of Columbia
- Maryland County in Study Area
- Pennsylvania County in Study Area
- Virginia County in Study Area
- West Virginia County in Study Area
- State Boundary
- U.S. and Interstate Highways
- Water

National Land Cover Data

- Open Water
- 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:
- DCA Ronald Reagan Washington National Airport
 - IAD Washington Dulles International Airport
 - BWI Baltimore Washington International Airport
 - ADW Andrews Air Force Base
 - RIC Richmond International Airport
 - MTN Martin State Airport
 - ESN Easton/Newnam Field
 - FDK Frederick Municipal Airport
 - GAI Montgomery County Airpark
 - RMN Stafford Regional Airport
 - JYO Leesburg Executive Airport
 - HEF Manassas Regional Airport
 - OKV Winchester Regional Airport
 - MRB Eastern West Virginia Regional Airport

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

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; Multi-Resolution Land Characteristics (MRLC) Consortium: 2006 National Land Cover Database

Prepared by: ATAC Corporation, June 2013.

Exhibit 4-6

Land Coverage in the General Study Area

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

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

...[the] Secretary of Transportation will not approve any program or project that requires the use of any publicly owned land from a public park; recreation area; or wildlife and waterfowl refuge of national, state, or local significance as determined by the officials having jurisdiction thereof, unless there is no feasible and prudent alternative to the use of such land...and [unless] the project includes all possible planning to minimize harm resulting from the use.

The term “use” includes both physical and indirect or “constructive” impacts to Section 4(f) properties. Direct use is the physical occupation or alteration (direct use) 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. A constructive use 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. The determination of use must consider the entire property and not simply the portion of the property being used for a proposed project.

Special consideration is given to parks and natural areas where a quiet setting is a generally recognized purpose and attribute. 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.”

Since there is the potential for the Proposed Action to constructively “use” Section 4(f) properties due to noise effects, this section describes the 4(f) resources located within the General Study Area. **Table 4-4** identifies the categories of Section 4(f) properties considered in identifying these resources within the General Study Area, as well as the agencies responsible for managing them. Privately-owned parks, recreation areas, and wildlife refuges are not subject to the Section 4(f) provisions.

Table 4-4 Types of Section 4(f) Resources Considered in the General Study Area (1 of 2)

Section 4(f) Property Type	Responsible Agency/Agencies
Historic Sites (Only those listed on the National Register of Historic Places)	National Park Service, State and Local Agencies
National Forests and Grasslands	U.S. Forest Service
National Historical Park, National Historic Site, and International Historic Site	National Park Service
National Lakeshore	National Park Service
National Memorial	National Park Service
National Military Park, National Battlefield Park, National Battlefield Site, and National Battlefield	National Park Service

Table 4-4 Types of Section 4(f) Resources Considered in the General Study Area (2 of 2)

Section 4(f) Property Type	Responsible Agency/Agencies
National Monument	National Park Service, Bureau of Land Management, U.S. Forest Service, U.S. Fish and Wildlife Service
National Park	National Park Service
National Parkway	National Park Service
National Preserve and National Reserve	National Park Service
National Recreation Area	National Park Service, Bureau of Land Management, U.S. Forest Service
National River and National Wild and Scenic River and Riverway	National Park Service, Bureau of Land Management
National Scenic Trail	National Park Service, Bureau of Land Management
National Seashore	National Park Service
National Wilderness Areas	Bureau of Land Management
Nationally-Recognized Trails	National Park Service
Other Designations (White House, National Mall, etc.)	National Park Service
Significant Regional Parks and Trails	State Agencies
State Parks and Forests	State Agencies
State Wilderness Areas	State Agencies
Local Parks and Recreational Facilities	Local Agencies

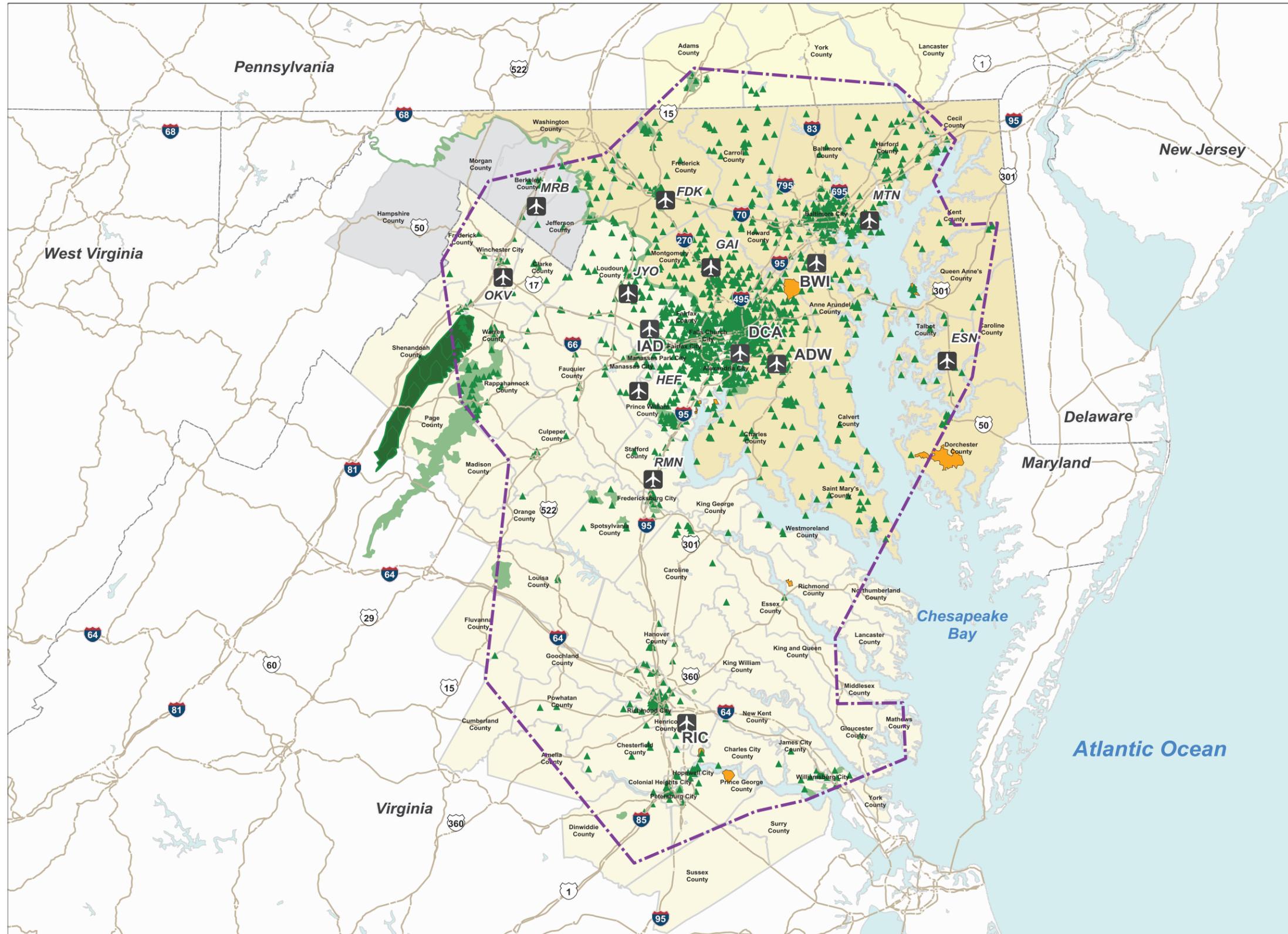
Sources: National Park Service, 2013 National Park System Inventory, March 28, 2013; Bureau of Land Management, National Conservation Lands (http://www.blm.gov/wo/st/en/prog/blm_special_areas/NLCS.html); U.S. Fish and Wildlife Service, Marine National Monuments (<http://www.fws.gov/marinationalmonuments/>); U.S. Forest Service, Recreational Resources (<http://www.fs.fed.us/recreation/>).

Prepared by: ATAC Corporation, April 2013.

Many Section 4(f) properties are also subject to the Section 6(f) of the Land and Water Conservation Fund Act of 1965 (LWCF) (16 U.S.C. § 460I–4 *et seq.*).. Section 6(f) states that no public outdoor recreation areas acquired or developed with any 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 the converted areas will be replaced with other recreation lands of reasonably equivalent usefulness and location.

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 located within the General Study Area. A total of 5,173 Section 4(f) resources were identified within the General Study Area. **Exhibit 4-7** depicts the locations of all potential Section 4(f) resources within the General Study Area, excluding historic and cultural resources. The locations of historic and cultural resources, discussed in Section 4.4, are depicted on **Exhibit 4-8**. **Appendix F** includes a list of the Section 4(f) resources identified in the General Study Area, the type of resource (i.e., federal, state, or local), the state and county in which they are located, site acreage, and DNL under existing conditions.



LEGEND

- General Study Area Boundary
- Study Airport
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- State Boundary
- U.S. and Interstate Highways
- Water

Potential DOT 4(f) Resources

- National Forest
- National Park
- National Recreation Area
- National Wildlife Refuge
- State Parks
- State Forests
- Regional/Local parks
- State Wildlife Refuge/Management Area
- Significant Park/Trail

- Notes:
- DCA Ronald Reagan Washington National Airport
 - IAD Washington Dulles International Airport
 - BWI Baltimore Washington International Airport
 - ADW Andrews Air Force Base
 - RIC Richmond International Airport
 - MTN Martin State Airport
 - ESN Easton/Newnam Field
 - FDK Frederick Municipal Airport
 - GAI Montgomery County Airpark
 - RMN Stafford Regional Airport
 - JYO Leesburg Executive Airport
 - HEF Manassas Regional Airport
 - OKV Winchester Regional Airport
 - MRB Eastern West Virginia Regional 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; 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; U.S. Geological Survey: Geographic Names Information System (state and local parks/trails), 2013; ATAC Corporation: Study Area Boundary, 2012; West Virginia State GIS Technical Center: State Parks, Forests, and Wildlife Management Areas, 2013; Virginia Department of Conservation & Recreation: Public Lands, 2013; Maryland Department of Natural Resources: Protected Lands and Dept. of Natural Resource Lands, 2011; Delaware Geospatial Data Exchange: State Forests, 2006; Pennsylvania Spatial Data Access: State Parks, Forests, Wildlife and Natural Areas, Trails, and Recreation Areas, 2012; National Capital Planning Commission: Parks, Zoos, and Gardens, 1999;

Prepared by: ATAC Corporation, June 2013.

Exhibit 4-7

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

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4.3.4 Historic, Architectural, Archeological, and Cultural Resources – Historic, Archeological 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 Places (NRHP). Compliance requires consultation with the Advisory Council on Historic Preservation, State Historic Preservation Officers (SHPO), and/or the Tribal Historic Preservation Officers (THPO).

It is possible that changes in aircraft flight routes could introduce or increase aircraft routing over historic resources. This could result in potential adverse aircraft noise or visual impacts. Therefore, historic properties in the General Study Area have been identified for this EA. For the purpose of this EA, historic properties are defined as resources that are listed or eligible for listing in the NRHP 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 resources. Thus, archaeological resources are not further discussed in this EA.

4.3.4.1 Historic and Cultural Resources in the General Study Area

Exhibit 4-8 shows the location of historic and cultural resources identified in the General Study Area. A total of 2,566 NRHP listed properties were identified, including 423 properties in the District of Columbia, 1,045 properties in Maryland, 43 properties in Pennsylvania, 975 properties in Virginia, and 142 properties in West Virginia. These properties are representative of every period in American history and include some of the nation's most important historic and cultural resources. **Appendix G** includes a list of the historic and cultural resources identified in the General Study Area, the state and county in which they are located, and DNL under existing conditions.

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 the airspace (specifically the standard instrument arrival and departure procedures primarily above 3,000 feet AGL and the supporting airspace management structure) serving the Study Airports. Accordingly, the discussion is limited to 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.* (1973)), 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 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) Fisheries 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 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 potential for 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 of 1918 (MBTA) (16 U.S.C. §§ 703-712) prohibits, without a permit issued by the USFWS, the taking of any migratory bird and any part, nest, or egg of any such bird. 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 ESA; management of all other migratory birds is overseen by the Migratory Bird Division of ESA. Numerous migratory birds occur in, or migrate through the General Study Area.

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 migratory bird species differ by variables such as distance traveled, time of starting, flight speed, geographic position and latitude of the breeding, and wintering grounds.

Birds migrate along four main routes or flyways in North America: the Atlantic, the Central, the Mississippi, and the Pacific flyways, which are loosely delineated in these geographic regions. These flyways are not specific lines the birds follow but broad areas through which the birds migrate. 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 river valleys and mountain ranges.

As shown on **Exhibit 4-9**, the General Study Area is located within the Atlantic Flyway. The Atlantic Flyway stretches along the East Coast from Puerto Rico and the U.S. Virgin Islands to Canada. The Atlantic Flyway includes multiple primary migration routes throughout these areas and connects to other primary flyway routes. **Table 4-5** lists the avian and bat species of concern that are found within the General Study Area.

Table 4-5 Threatened or Endangered Avian and Bat Species Potentially in the General Study Area (1 of 2)

Status	Species	Type	VA	MD	PA	WV
E	Bat, gray (<i>Myotis grisescens</i>)	Bat	X			X
E	Bat, Indiana (<i>Myotis sodalis</i>)	Bat	X	X	X	X
E	Bat, Virginia big-eared (<i>Corynorhinus (=Plecotus) townsendii virginianus</i>)	Bat	X			X
T	Plover, piping except Great Lakes watershed (<i>Charadrius melodus</i>)	Avian	X	X		

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Table 4-5 Threatened or Endangered Avian and Bat Species Potentially in the General Study Area (2 of 2)

Status	Species	Type	VA	MD	PA	WV
E	Plover, piping Great Lakes watershed (<i>Charadrius melodus</i>)	Avian			X	
E	Tern, roseate northeast U.S. nesting pop. (<i>Sterna dougallii dougallii</i>)	Avian	X			
E	Woodpecker, red-cockaded (<i>Picoides borealis</i>)	Avian	X			

Notes:
VA = Virginia;
MD = Maryland,
PA = Pennsylvania,
WV = West Virginia

Sources: US Fish and Wildlife Service, (<http://www.fws.gov/endangered/>, Accessed August 2012.)
Prepared by: ATAC Corporation, August 2012.

4.3.5.3 Existing Wildlife Strikes

Media attention to wildlife strikes with aircraft has increased over time. For example, there was substantial media coverage of the emergency forced landing of US Airways Flight 1549 in the Hudson River on January 15, 2009. This emergency landing was due to Canada geese being ingested into both of the aircraft’s engines and demonstrates to the public that wildlife strikes are a serious but manageable aviation safety issue. The civil and military aviation communities have long recognized that the threat of aircraft collisions with wildlife is real and increasing. Globally, wildlife strikes have killed more than 229 people and destroyed over 210 aircraft since 1988.⁴⁵ Factors that contribute to this threat are an increase in the populations of large birds as well as an increase in air traffic operations by quieter, turbofan-powered aircraft.

Table 4-6 provides a summary of wildlife and avian/bat strikes nationwide between 1990 and 2010. The number of strikes reported annually has increased more than five-fold from the 1,793 strikes in 1990 to 9,622 in 2010 (109,107 for 1990-2010).⁴⁶ Prior to the emergency landing of US Airways Flight 1549, there was an average of 20 reported wildlife strikes per day between 2004 and 2008.⁴⁷ This increased to an average of 26 reported strikes per day in 2009; a 25-percent increase from 2008. This trend continued through 2010. Birds were involved in 97.2 percent of the strikes, terrestrial mammals in 2.3 percent, bats in 0.4 percent, and reptiles in 0.1 percent.⁴⁸ Although the number of reported strikes has steadily increased, the number of reported damaging strikes has actually declined from 765 in 2000 to 573 in 2010.

⁴⁵ US Department of Transportation, Federal Aviation Administration, *Wildlife Strikes to Civil Aircraft in the United States, 1990-2010*, Serial Report Number 17, 2011.

⁴⁶ Id.

⁴⁷ Id.

⁴⁸ Id.

Table 4-6 1990-2010 National Wildlife and Avian/Bat Strike Summary

Year	Strikes		Total
	Avian/Bat	Other Wildlife	
1990	1,741	52	1,793
1991	2,255	54	2,309
1992	2,353	74	2,427
1993	2,409	67	2,476
1994	2,468	83	2,551
1995	2,679	92	2,771
1996	2,848	94	2,942
1997	3,351	109	3,460
1998	3,656	118	3,774
2000	5,879	127	6,006
2001	5,644	146	5,790
2002	6,065	134	6,199
2003	5,869	132	6,001
2004	6,428	134	6,562
2005	7,103	139	7,242
2006	7,085	153	7,238
1999	5,007	97	5,104
2007	7,569	183	7,752
2008	7,416	189	7,605
2009	9,239	244	9,483
2010	9,363	259	9,622
Total	106,427	2,680	109,107

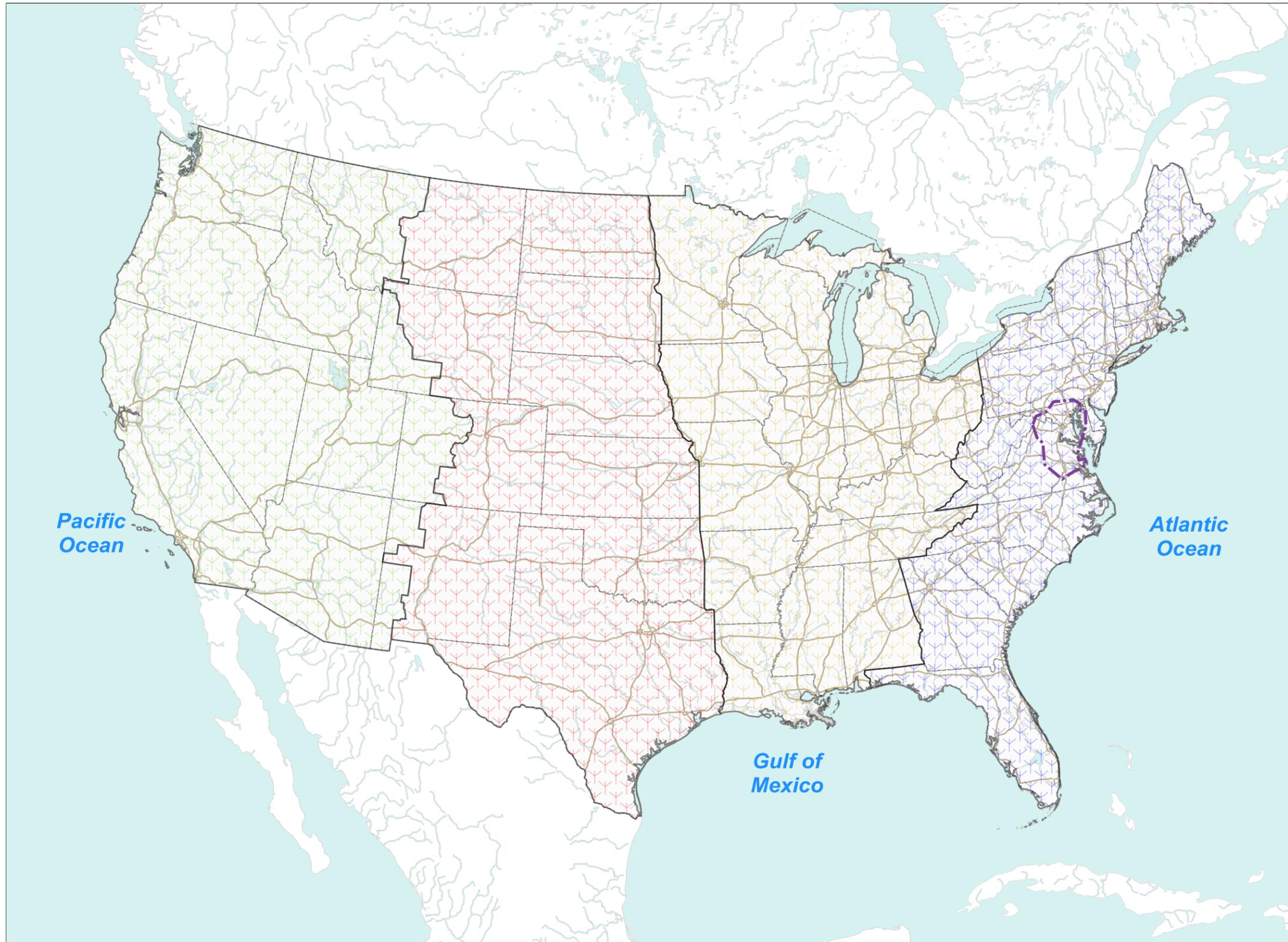
Sources: Wildlife Strikes to Civil Aircraft in the United States, 1990–2010, Serial Report Number 17, US Department of Transportation, Federal Aviation Administration, 2011

Prepared by: ATAC Corporation, August 2012.

The FAA National Wildlife Strike Database states that for commercial and GA aircraft, 72 and 76 percent of bird strikes, respectively, occurred at or below 500 feet AGL.⁴⁹ Above 500 feet AGL, the number of strikes declined by 33 percent for each 1,000-foot gain in height for commercial aircraft, and by 41 percent for GA aircraft.⁵⁰

⁴⁹ Id.

⁵⁰ Id.



LEGEND

-  General Study Area Boundary
-  State Boundary
-  Interstate Highway
-  Water
- Migratory Bird Flyways**
 -  Atlantic
 -  Central
 -  Mississippi
 -  Pacific

Projection: Lambert Conformal Conic
Scale: 17,500,000

0 400 nm



Sources: National Atlas of the United States of America: U.S. County Boundaries, 2005; U.S. State Boundaries, 2005; and Continent Boundaries, 2005; Bureau of Transportation Statistics: National Transportation Atlas Database National Highway Planning Network, 2012; and Hydrology. Manifold Software Ltd: Lakes, Rivers, and Inland Waters, 2007; ATAC Corporation: Study Area Boundary, 2012.
Prepared by: ATAC Corporation, June 2013.

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The FAA National Wildlife Strike Database was accessed for the 2011 calendar year to obtain wildlife strike reports for each Study Airport. The Study Airports account for 31.3 percent of the 2011 national wildlife strike total and 31 percent of the avian/bat 2011 national strike total. **Table 4-7** provides a summary of wildlife and avian/bat strikes at each of the study airports as of 2011. Of the 301 avian/bat strikes reported for 2011, 132 included information on the altitude at which the strike took place. Nineteen of the 132 bird strikes reported occurred at altitudes above 3,000 feet.

Table 4-7 2011 Study Airports Wildlife and Avian/Bat Strike Summary

Airport	Avian/Bat	Strikes		Total
			Other Wildlife	
ADW	4	0		4
BWI	105	2		107
DCA	50	1		51
ESN	1	0		1
FDK	0	1		1
HEF	11	0		11
IAD	90	6		96
JYO	3	0		3
MTN	1	0		1
OKV	1	0		1
RIC	25	0		25
GAI	0	0		0
RMN	0	0		0
MRB	0	0		0
Total	291	10		301

Source: US Department of Transportation, Federal Aviation Administration, *Wildlife Strike Database*
<http://wildlife-mitigation.tc.faa.gov/wildlife/database.aspx>, Accessed August, 2012

Prepared by: ATAC Corporation, August 2012.

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

FAA Order 1050.1E, Appendix A, paragraph 16.2b states, “Environmental health risks and safety risks include risks to health or to safety that are attributable to products or substances that a child is likely to come in contact with or ingest, such as air, food, drinking water, recreational waters, soil, or products they might use or be exposed to.” Paragraph 16.2c states, “The principal social impacts to be considered are those associated with relocation or other community disruption, transportation, planned development, and employment.” As indicated in Section 4.2, the Proposed Action does not include land acquisition or ground disturbing activities. In addition, the Proposed Action would not result in an increase in operations that would result in greater emissions that could potentially exacerbate health issues such as asthma in children. Therefore, this section does not address Socioeconomic Impacts or Children’s Environmental, Health, and Safety Risks. This section is limited to a discussion of Environmental Justice as it would pertain to potential aircraft over flight and resultant noise impacts within the airspace of the General Study Area.

Environmental justice analysis considers the potential of the proposed project alternatives to cause disproportionate and adverse effects on low-income or minority populations. The analysis of environmental justice impacts and associated mitigation ensures that no low income or minority population bears a disproportionate burden of effects resulting from the implementation of the preferred alternative.

To help describe environmental justice, this EA relies on the following definition from the U.S. EPA Office of Environmental Justice:

The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies. Meaningful involvement means that:

- (1) people have an opportunity to participate in decisions about activities that may affect their environment and/or health;
- (2) the public's contribution can influence the regulatory agency's decision;
- (3) their concerns will be considered in the decision making process; and,
- (4) the decision makers seek out and facilitate the involvement of those potentially affected.⁵¹

The socioeconomic and racial characteristics of the population within the General Study Area are based on data from the 2010 U.S. Census. This data was provided for geographical units called census tracts which include over 500 types of demographic information including number of households, number of inhabitants, and percentage of households below the federal poverty level. Census tracts with no populations were not included in the analysis. Because some census tracts were only partially located within the General Study Area, only a portion of the population based on the amount of area within the General Study Area was included. This methodology was used because census tracts are composed of census blocks, which are used by the NIRS noise model to calculate noise impact at the centroid, or geometric center of the block.

Minority and low-income populations were identified using GIS based on information for each census tract within the General Study Area. For the purposes of this environmental justice analysis, minority population census tracts and low-income population census tracts were defined and identified as follows:

- A minority 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 43 percent. Therefore, every census tract with a percentage of minority population greater than 43 percent was identified as a

⁵¹ U.S. Environmental Protection Agency, *Environmental Justice: Basic Information*, (<http://www.epa.gov/compliance/environmentaljustice/index.html>, accessed August 2012.)

census tract of environmental justice concern. **Exhibit 4-10** depicts those areas exceeding the average minority population percentage within the General Study Area. As depicted, census tracts with high concentrations of minority population are located in the urbanized metropolitan cities of Washington, DC, Baltimore, and Richmond.

- 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 6.7 percent. Therefore, every census tract with a percentage of low-income population greater than 6.7 percent was identified as a census tract of environmental justice concern. **Exhibit 4-11** depicts the census tracts with above average populations of low-income households within the General Study Area. As depicted, census tracts with populations of above average percentages of low-income households are located throughout the General Study Area with no discerned geographic relationship.

Census tracts of environmental justice concern are defined as those tracts in which the percentage of minority population and/or the percentage of low-income population are higher than their respective averages of the General Study Area. The combined low income households and minority population data is represented in **Exhibit 4-12** as areas of environmental justice concern. **Exhibit 4-13** provides a closer look at areas of environmental justice concern in locations around IAD, FDK, HEF, JYO, MRB, OKV, and RMN. Similarly, **Exhibit 4-14** provides a closer look at areas of environmental justice concern in locations around ADW, BWI, DCA, ESN, GAI, and MTN. Finally, **Exhibit 4-15** provides a closer look at areas of environmental justice concern in locations around RIC. **Table 4-8** shows the 2010 census data for total population, minority population, and low income population for the General Study Area.

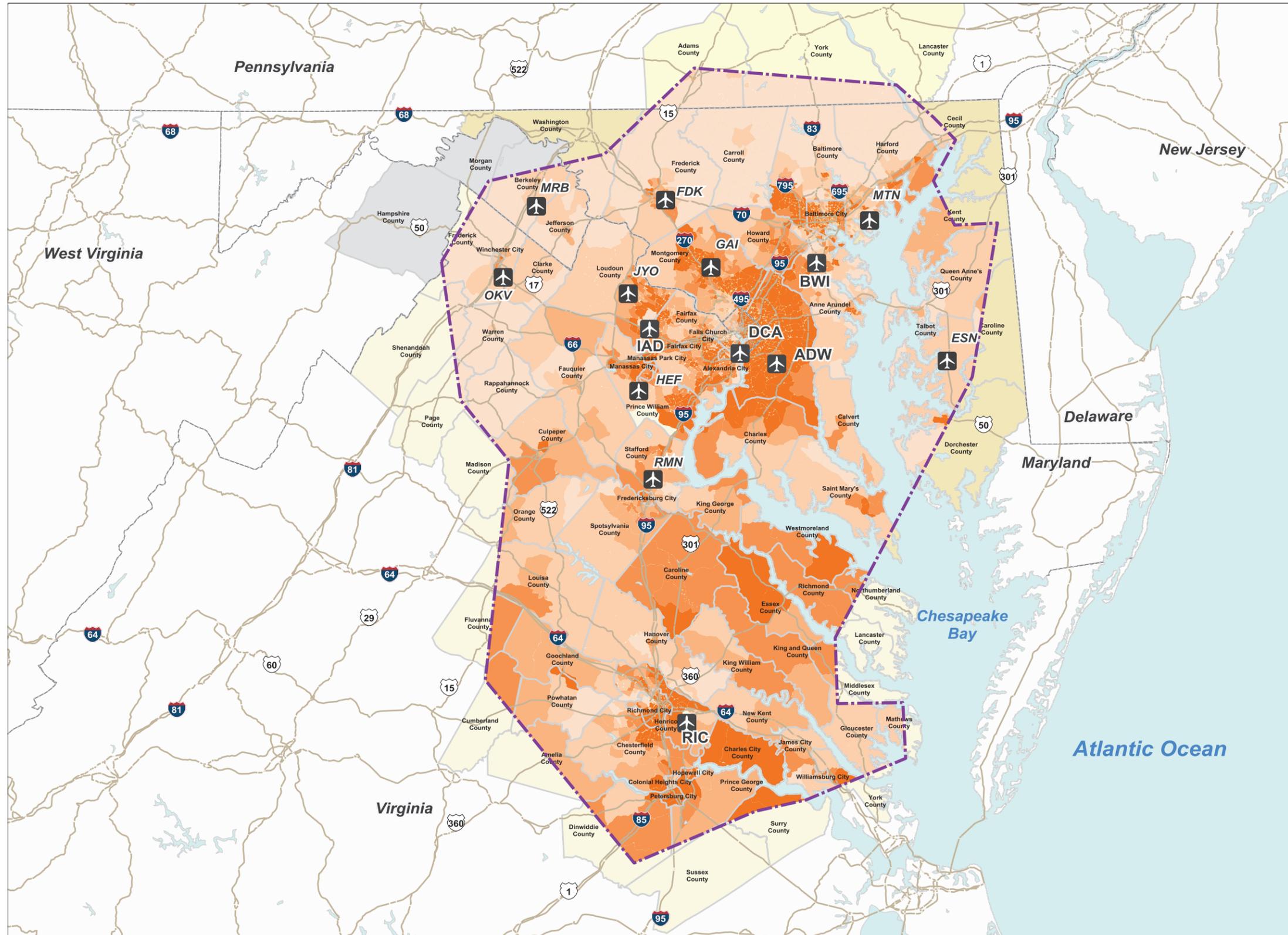
Table 4-8 Selected Populations in the Study Area

State	Study Area Population				
	Total	Minority	% of Total	Low Income	% of Total
District of Columbia	601,723	370,263	61.5%	81,104	13.5%
Maryland	5,229,358	2,311,074	44.2%	309,287	5.9%
Pennsylvania	140,095	7,860	5.6%	6,911	4.9%
Virginia	4,255,267	1,451,325	34.1%	230,850	5.4%
West Virginia	128,293	16,844	13.1%	8,061	6.3%

Source: US Census Bureau, 2010 Tracts and American Community Survey Selected Economic Characteristics, 2010

Prepared by: ATAC Corporation, August 2012.

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LEGEND

- General Study Area Boundary
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- Water

Concentrations of Minority Populations (Percent)

- < 10
- 10 - 20
- 20 - 30
- 30 - 43
- > 43

Notes:

- DCA** Ronald Reagan Washington National Airport
- IAD** Washington Dulles International Airport
- BWI** Baltimore Washington International Airport
- ADW** Andrews Air Force Base
- RIC** Richmond International Airport
- MTN** Martin State Airport
- ESN** Easton/Newnam Field
- FDK** Frederick Municipal Airport
- GAI** Montgomery County Airpark
- RMN** Stafford Regional Airport
- JYO** Leesburg Executive Airport
- HEF** Manassas Regional Airport
- OKV** Winchester Regional Airport
- MRB** Eastern West Virginia Regional Airport

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

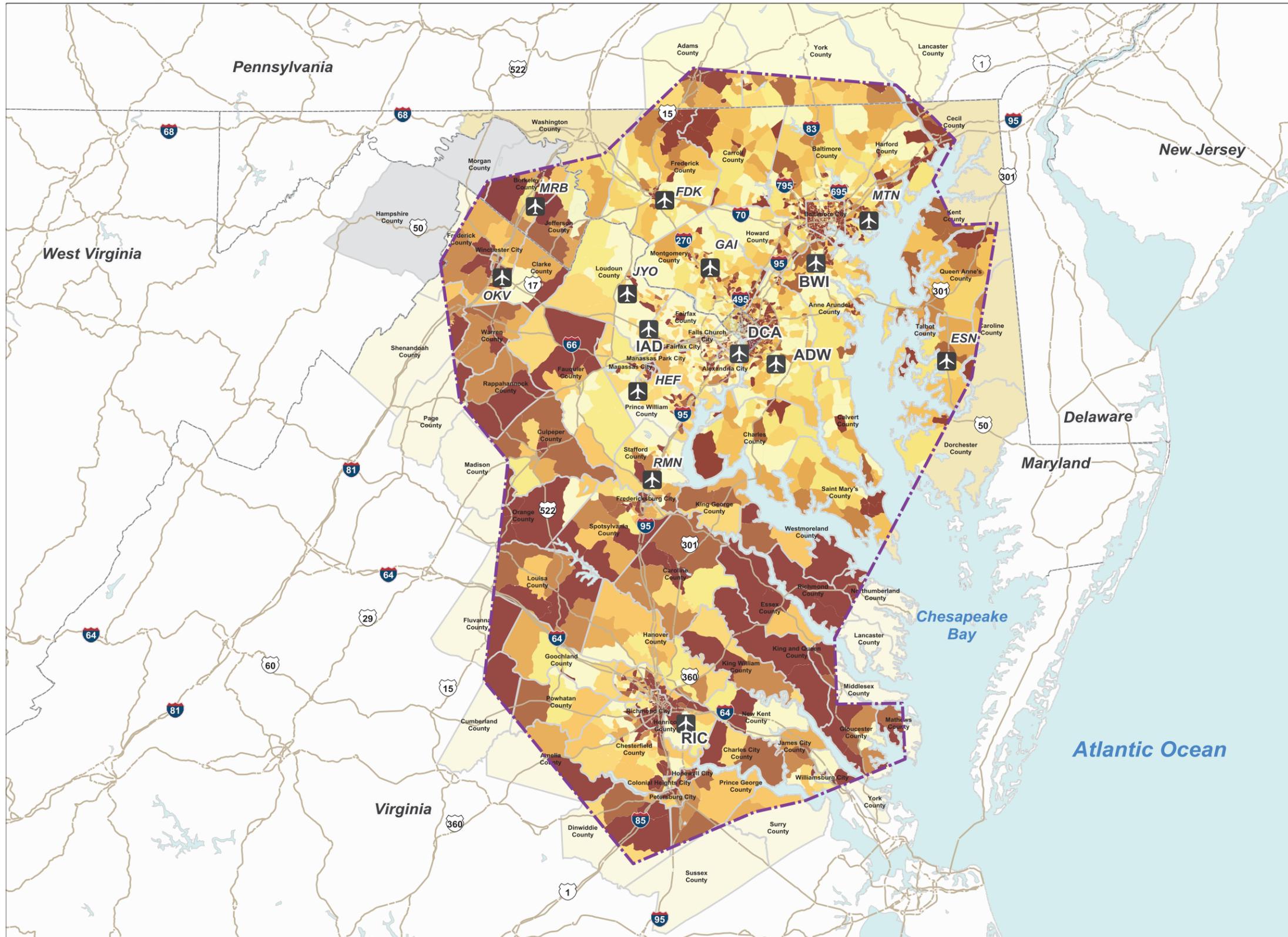


Sources: National Atlas of the United States of America: U.S. County Boundaries, 2005; U.S. State Boundaries, 2005; and Water Bodies, 2005; Bureau of Transportation Statistics: National Transportation Atlas Database National Highway Planning Network, 2012; FAA: NFDCA Airport database, 2012; U.S. Census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

Exhibit 4-10

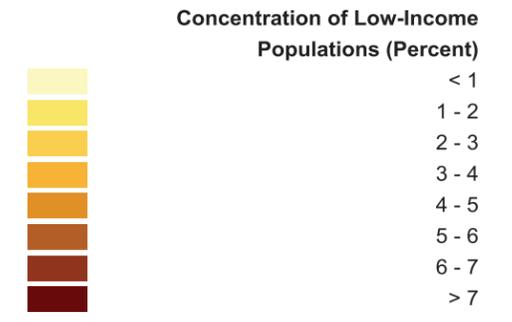
**Minority Populations
in the General Study Area**

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LEGEND

- General Study Area Boundary
- Study Airport
- District of Columbia
- Maryland County in Study Area
- Pennsylvania County in Study Area
- Virginia County in Study Area
- West Virginia County in Study Area
- State Boundary
- U.S. and Interstate Highways
- Water



- Notes:
- DCA Ronald Reagan Washington National Airport
 - IAD Washington Dulles International Airport
 - BWI Baltimore Washington International Airport
 - ADW Andrews Air Force Base
 - RIC Richmond International Airport
 - MTN Martin State Airport
 - ESN Easton/Newnam Field
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 - OKV Winchester Regional Airport
 - MRB Eastern West Virginia Regional Airport

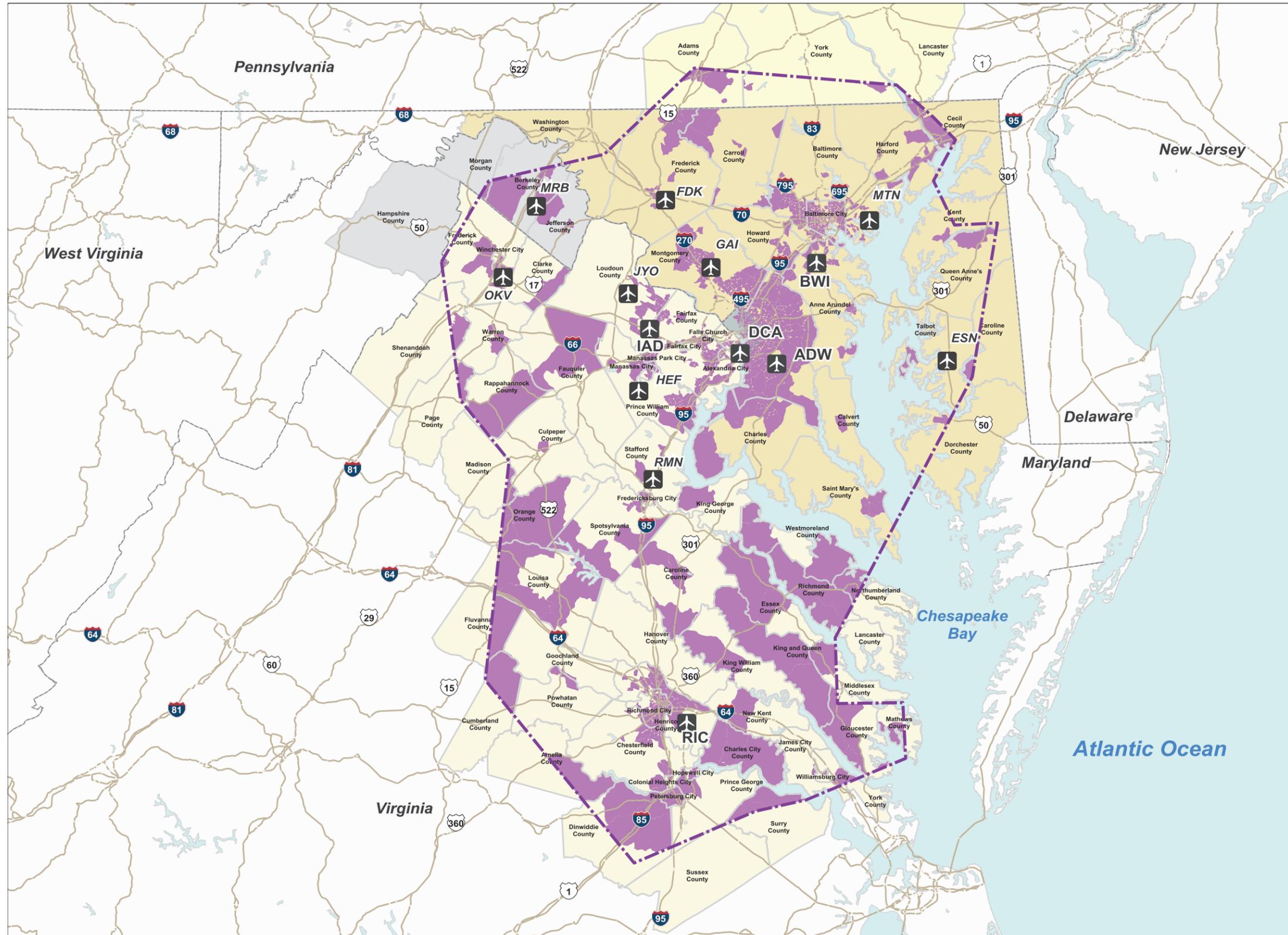
Projection: Lambert Conformal Conic
 Scale: 1,750,000

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: NFDCA Airport database, 2012; U.S. Census Bureau: 2010 Tracts and American Community Survey Selected Economic Characteristics; ATAC Corporation: Study Area Boundary, 2012.
 Prepared by: ATAC Corporation, June 2013.

Exhibit 4-11

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LEGEND

- General Study Area Boundary
- Study Airport
- District of Columbia
- Maryland County in Study Area
- Pennsylvania County in Study Area
- Virginia County in Study Area
- West Virginia County in Study Area
- State Boundary
- U.S. and Interstate Highways
- Water
- Environmental Justice Community

Notes:

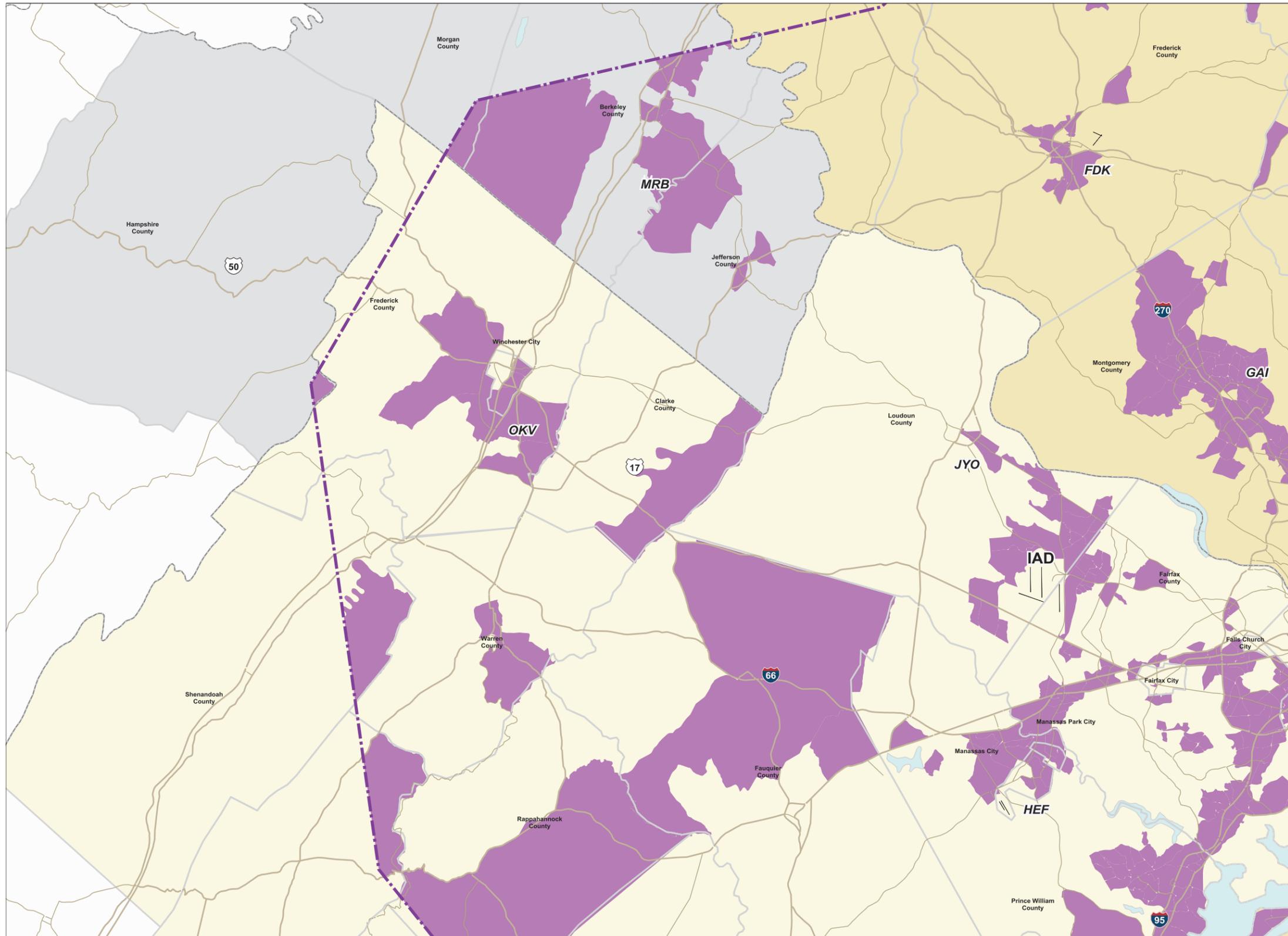
- DCA Ronald Reagan Washington National Airport
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Projection: Lambert Conformal Conic
Scale: 1,750,000



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: NFDCA 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, 2012.
Prepared by: ATAC Corporation, June 2013.

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LEGEND

-  General Study Area
-  Runway
-  District of Columbia
-  Maryland County in Study Area
-  Virginia County in Study Area
-  West Virginia County in Study Area
-  State Boundary
-  U.S. and Interstate Highways
-  Secondary Roads
-  Water
-  Environmental Justice Community

Notes:

- IAD** Washington Dulles International Airport
- FDK** Frederick Municipal Airport
- RMN** Stafford Regional Airport
- JYO** Leesburg Executive Airport
- HEF** Manassas Regional Airport
- OKV** Winchester Regional Airport
- MRB** Eastern West Virginia Regional Airport

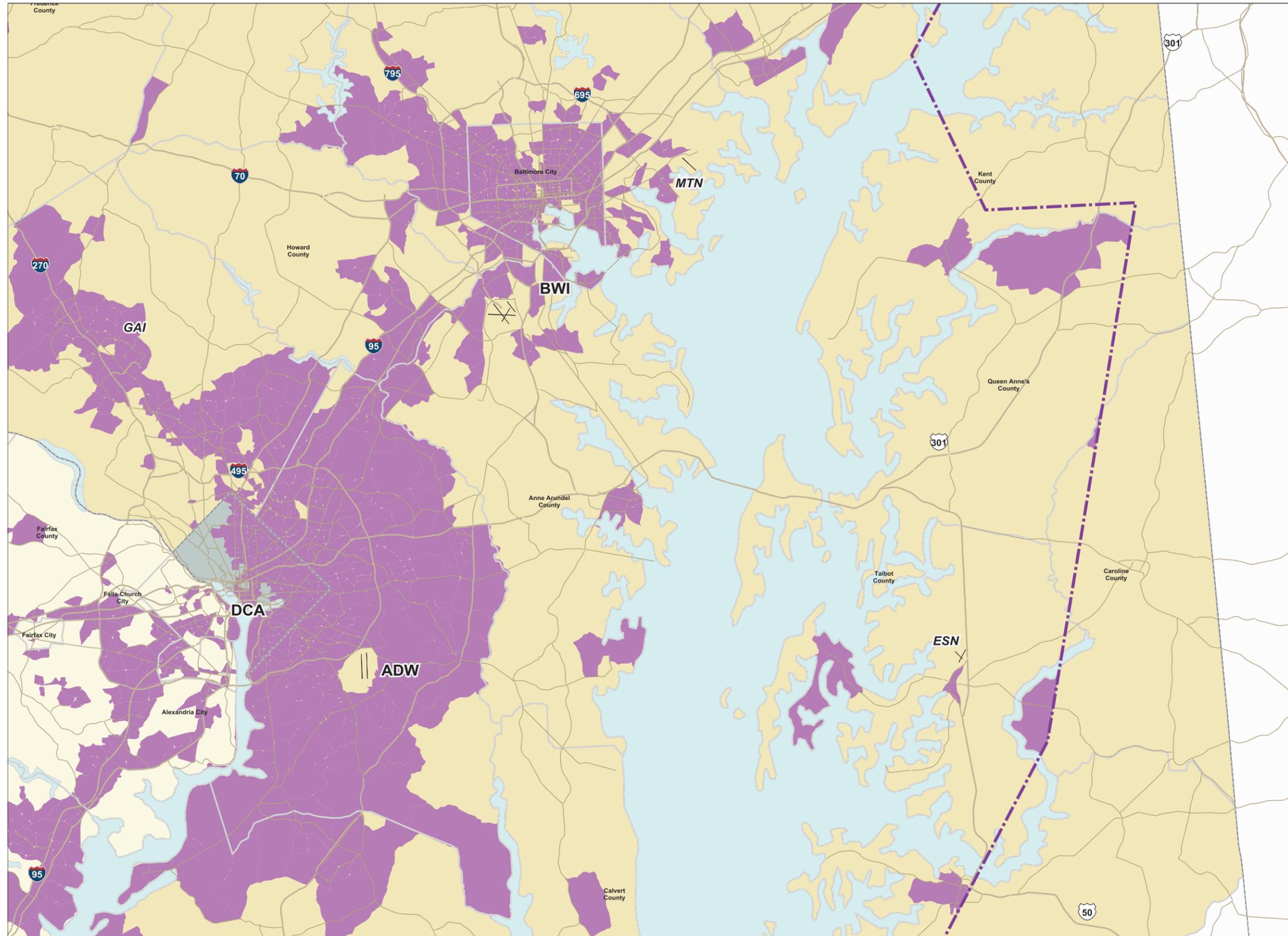
Projection: Lambert Conformal Conic
Scale: 1,750,000



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: NFDCA 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, 2012.
Prepared by: ATAC Corporation, June 2013.

Exhibit 4-13
Environmental Justice
Communities - IAD, FDK, HEF,
JYO, MRB, OKV, RMN and Environs

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LEGEND

- General Study Area
- Runway
- District of Columbia
- Maryland County in Study Area
- Virginia County in Study Area
- West Virginia County in Study Area
- State Boundary
- U.S. and Interstate Highways
- Secondary Roads
- Water
- Environmental Justice Community

- Notes:
- DCA** Ronald Reagan Washington National Airport
 - BWI** Baltimore Washington International Airport
 - ADW** Andrews Air Force Base
 - MTN** Martin State Airport
 - ESN** Easton/Newnam Field
 - GAI** Montgomery County Airpark

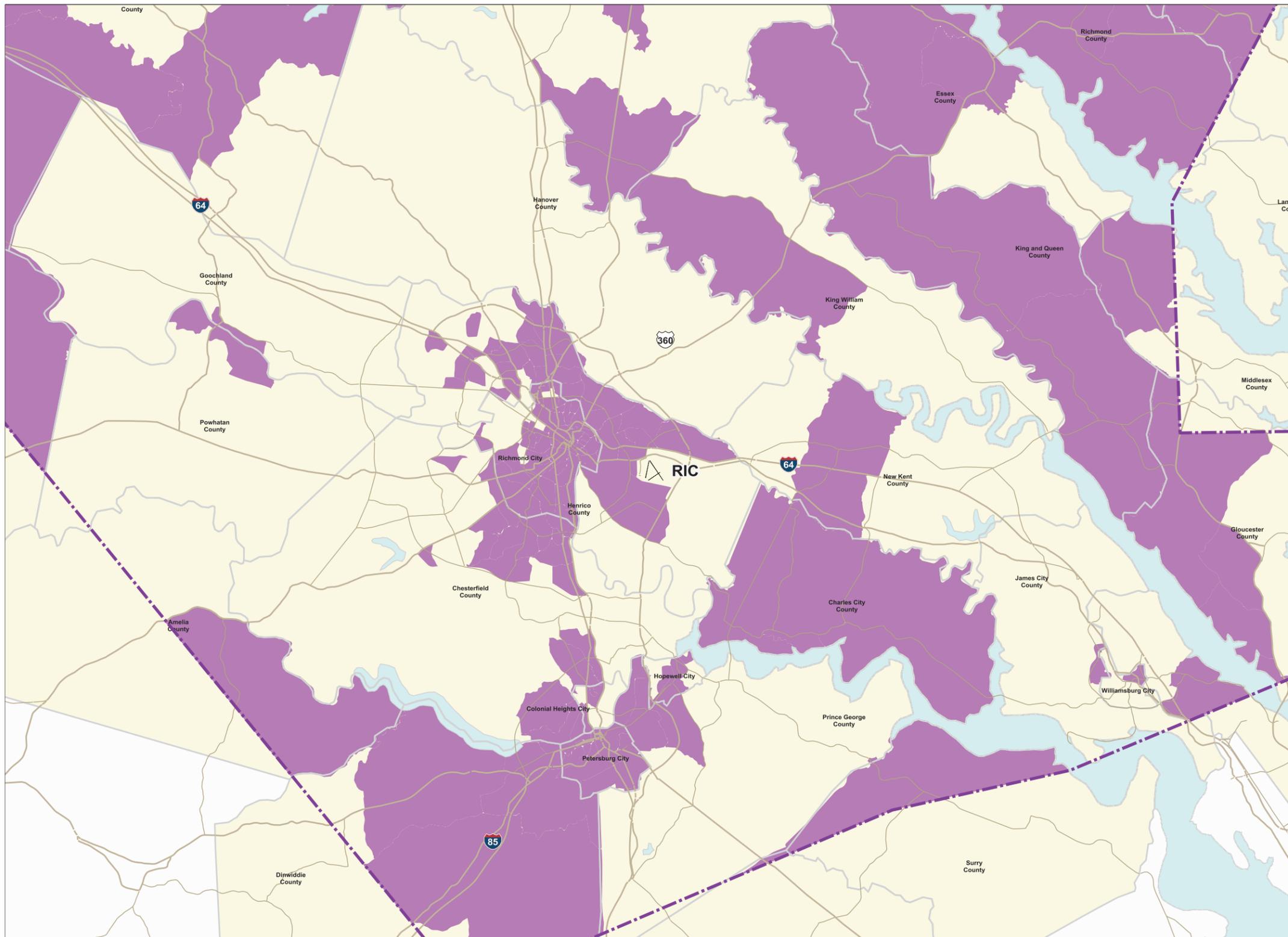
Projection: Lambert Conformal Conic
Scale: 1,750,000



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, 2012.

Prepared by: ATAC Corporation, June 2013.

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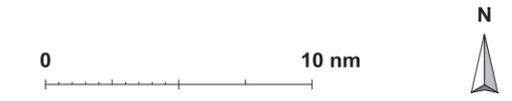


LEGEND

-  General Study Area
-  Runway
-  Virginia County in Study Area
-  State Boundary
-  U.S. and Interstate Highways
-  Secondary Roads
-  Water
-  Environmental Justice Community

- Notes:
- DCA** Ronald Reagan Washington National Airport
 - BWI** Baltimore Washington International Airport
 - ADW** Andrews Air Force Base
 - MTN** Martin State Airport
 - ESN** Easton/Newnam Field
 - GAI** Montgomery County Airpark

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, 2012.
Prepared by: ATAC Corporation, June 2013.

Exhibit 4-15

**Environmental Justice
Communities -RIC and Environs**

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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, on an annual average day basis, approximately 698,958 gallons of fuel were burned by IFR aircraft arriving at and departing from the study airports.

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. EPA, pursuant to mandates of the federal Clean Air Act, (42 U.S.C. § 7401 *et seq.* (1970)), 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) (PM₁₀) and fine particles less than 2.5 µm (PM_{2.5}) in diameter.

In accordance with the Clean Air Act Amendments (CAAA) of 1997, (91 Stat. 685, P.L. 95-95), counties and some sub-county geographical areas are classified by the U.S. EPA with regards to their compliance with the NAAQS based on air monitoring data compiled by U.S. EPA and local air quality agencies. 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 4-9** identifies those areas within the General Study Area that are in nonattainment or maintenance for one or more criteria pollutants.

Table 4-9 NAAQS Attainment Areas in the General Study Area (1 of 2)

Pollutant	Status	State	County
Ozone (O ₃)	Nonattainment	DC	District of Columbia
		MD	Anne Arundel County
		MD	Baltimore City
		MD	Baltimore County
		MD	Calvert County
		MD	Carroll County
		MD	Cecil County

Table 4-9 NAAQS Attainment Areas in the General Study Area (2 of 2)

Pollutant	Status	State	County
		MD	Charles County
		MD	Frederick County
		MD	Harford County
		MD	Howard County
		MD	Montgomery County
		MD	Prince George's County
		PA	Lancaster County
		VA	Alexandria City
		VA	Arlington County
		VA	Fairfax City
		VA	Fairfax County
		VA	Falls Church City
		VA	Loudoun County
		VA	Manassas City
		VA	Manassas Park City
PM2.5	Nonattainment	PA	Lancaster County
		PA	York County
Carbon Monoxide (CO)	Maintenance	DC	District of Columbia
		MD	Montgomery County
		MD	Prince George's County
		VA	Alexandria City
		VA	Arlington County
		VA	Prince William County

Sources: US Environmental Protection Agency *Green Book* [<http://www.epa.gov/oaqps001/greenbk/>]. Accessed August, 2012.
 Prepared by: ATAC Corporation, August 2012.

As noted above, portions of the General Study Area have been designated as being in nonattainment of standards for ozone and PM_{2.5}. **Exhibit 4-16** shows those portions of the General Study Area in non-attainment for ozone. **Exhibit 4-17** shows those areas in the General Study Area in non-attainment for PM_{2.5}. Finally, **Exhibit 4-18** shows those portions of the General Study Area that have been designated in maintenance for CO. A general description of these three criteria pollutants follows:

Ozone (O₃): Ozone is found in two regions of the Earth's atmosphere – at ground level and in the upper regions of the atmosphere. Both types of ozone have the same chemical composition (O₃). While upper atmospheric ozone protects the earth from the sun's harmful rays, ground level ozone is the main component of smog. Tropospheric, or ground level ozone, is not emitted directly into the air, but is created by chemical reactions between ozone precursors, including oxides of nitrogen (NO_x) and volatile organic compounds (VOCs). Ozone is likely to reach unhealthy levels on hot sunny days in urban environments. Ozone can also be transported long distances by wind. For this reason, even rural areas can experience high ozone levels.

PM_{2.5}: PM is a complex mixture of extremely small particles and liquid droplets. Particle pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles. "Fine particles," such as those found in smoke and haze, are 2.5 micrometers in diameter and smaller. These

particles can be directly emitted from sources such as forest fires, or they can form when gases emitted from power plants, industry, automobiles, and aircraft react in the air.

CO: is a colorless, odorless gas emitted from combustion processes. Nationally and, particularly in urban areas, the majority of CO emissions to ambient air come from mobile sources, and to a significantly lesser degree, from stationary fuel combustion, solvents, fires, and industrial processes.

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.⁵² 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.⁵³

4.3.9 Greenhouse Gases and Climate Change

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). In 2009, based on data provided by the EPA, the General Accounting Office (GAO) reported that domestic aviation contributed approximately three percent of total national carbon dioxide emissions.⁵⁴ Similarly, in its 2010 Environmental Report, the International Civil Aviation Organization (ICAO) estimated that aviation accounted for approximately three percent of all global CO₂ emissions resulting from human activity.⁵⁵ CO₂ emissions from aircraft are considered to be the primary GHG of concern by the FAA.

In October 2010, the CEQ issued the *Federal GHG Accounting and Reporting Guidance* (Guidance) establishing requirements for federal agencies to calculate and report GHG emissions associated with agency operations. The federal guidance also established a single metric for reporting all GHGs in metric tons (MT) of CO₂ equivalent (CO₂e) or MTCO₂e.

For purposes of this EA, total MTCO₂e were calculated using 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. 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 4-10** presents the total estimated MTCO₂e along with estimates of all national and global emissions of MTCO₂e.

⁵² Wayson, Roger, and Fleming, Gregg, "Consideration of Air Quality Impacts by Airplane Operations at or Above 3000 feet AGL," Volpe National Transportation 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/)

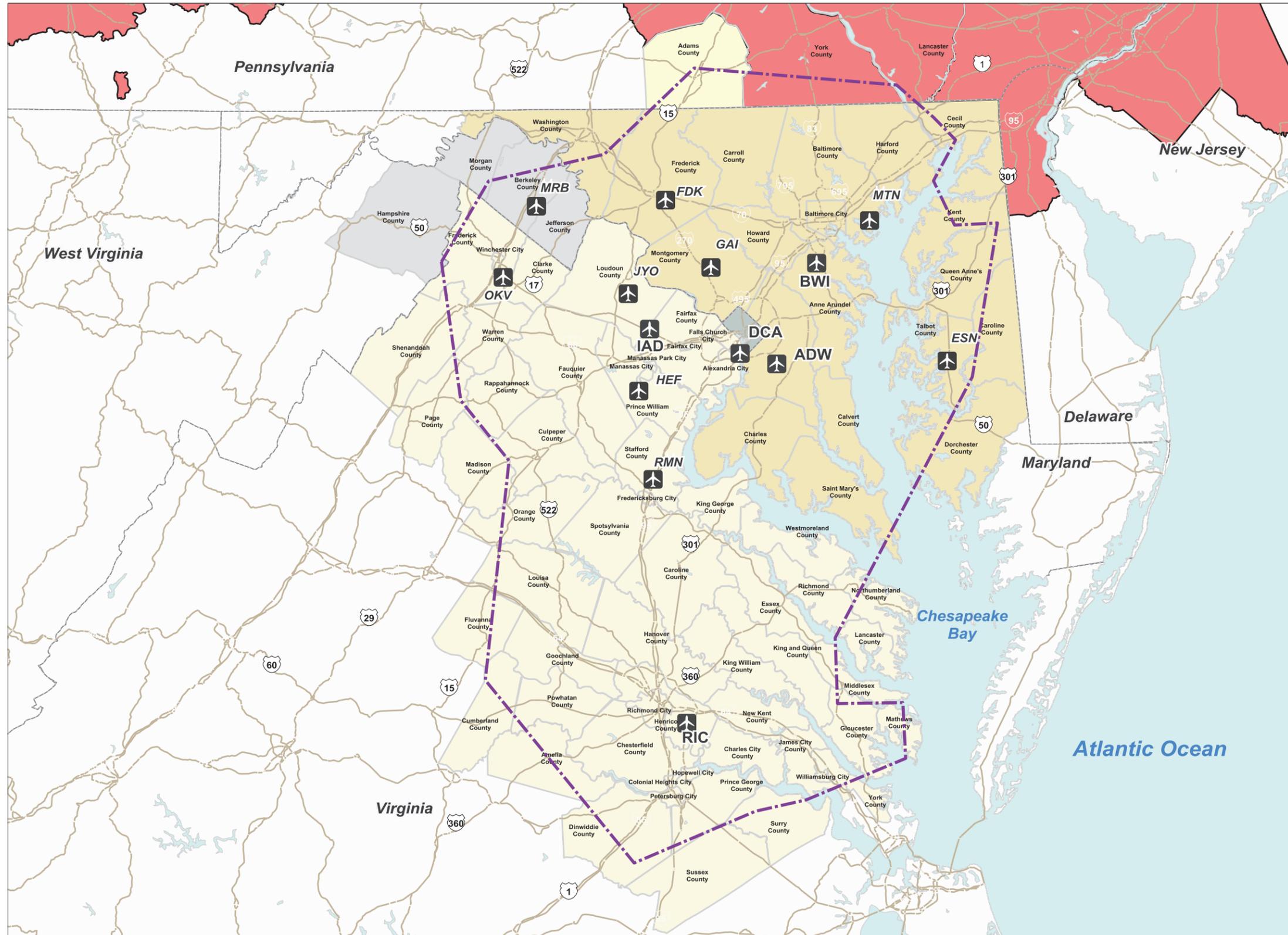
⁵³ Department of Transportation, Federal Aviation Administration, *Air Quality Procedures For Civilian Airports & Air Force Bases*, April 1997. (http://www.faa.gov/regulations_policies/policy_guidance/envir_policy/airquality_handbook/media/Handbook.PDF)

⁵⁴ United 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>).

⁵⁵ Alan Melrose, "European ATM and Climate Adaptation: A Scoping Study," in *ICAO Environmental Report*. (2010).

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LEGEND

- General Study Area Boundary
- Study Airport
- District of Columbia
- Maryland County in Study Area
- Pennsylvania County in Study Area
- Virginia County in Study Area
- West Virginia County in Study Area
- State Boundary
- U.S. and Interstate Highways
- Water
- PM 2.5 Nonattainment Area

Notes:

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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. Environmental Protection Agency: The Green Book Nonattainment Areas for Criteria Pollutants; ATAC Corporation: Study Area Boundary, 2012.
Prepared by: ATAC Corporation, June 2013.

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Table 4-10 DC OAPM CO₂e Estimates (2011)

DC OAPM	National	Global
0.0068 MMT	148 MMT	50,100 MMT ¹

Notes:
1\ 2010 estimate.
MMT=Million Metric Tons

Source: ATAC Corporation, March 2013; U.S. EPA, 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.
Prepared by: ATAC Corporation, April 2013.

4.3.10 Light Emissions and Visual Impact – Visual impact Sub-Category

The General Study Area includes approximately 19,348 square statute miles of developed and undeveloped areas consisting of portions of four states and the District of Columbia, including major urbanized regions. A large number of aircraft operate within the General Study Area and numerous aircraft are regularly visible within General Study Area airspace flying at various altitudes. Aircraft operations include arrivals, departures, and overflights. According to Federal Aviation Regulation (FAR), Section 91.209, all aircraft are required to operate with position lights during the period between sunset and sunrise. These position lights are intended for the safe movement of aircraft and do not produce significant light emissions; however, these lights are often visible from the ground.

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