



Review of Proposed Flight Procedure Changes at BWI Marshall

Presented by MDOT MAA and HMMH

April 13, 2021

Outline

- Purpose of presentation
- Flight track analysis of Roundtable Technical Committee proposed procedure changes



Purpose of Tonight's Presentation

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- Provide overview of proposed changes to BWI Marshall flight procedures
- Review proposed procedure changes developed and supported by the Roundtable Technical Committee, MDOT MAA, and Industry
 - Presented at the November 2019 Roundtable meeting

Abbreviated Timeline of Procedure Change/Roundtable Technical Committee Process

- **March 2015:** FAA completed implementation of DC Metroplex at BWI Marshall, communities voice concerns regarding flight path changes
- **February 2016:** FAA further modifies departure procedure (TERPZ) for Runways 28 and 15R
- **March 2017:** DC Metroplex BWI Community Roundtable formed to address community concerns regarding flight path changes
- **August 2017 – April 2018:** FAA convenes PBN Working Group to evaluate modifying BWI Marshall procedures. FAA presents proposed flight procedures (mainly departures) from PBN Working Group to Roundtable
- **December 2018 – January 2019:** MDOT MAA presents noise analysis of FAA proposed procedure changes from April 2018. Roundtable sends FAA letter assessing proposed procedure changes
- **February 2019 – September 2019:** Roundtable Technical Committee meets with MDOT MAA and industry to explore and finalize additional flight procedure changes (arrivals)
- **October 2019:** Roundtable Technical Committee presents “first look” at proposed flight procedure changes to full Roundtable
- **December 2019:** Roundtable submits proposed flight procedure changes package to FAA
- **October 2020:** Discussion with FAA PBN Working Group, MDOT MAA, and Roundtable Technical Committee

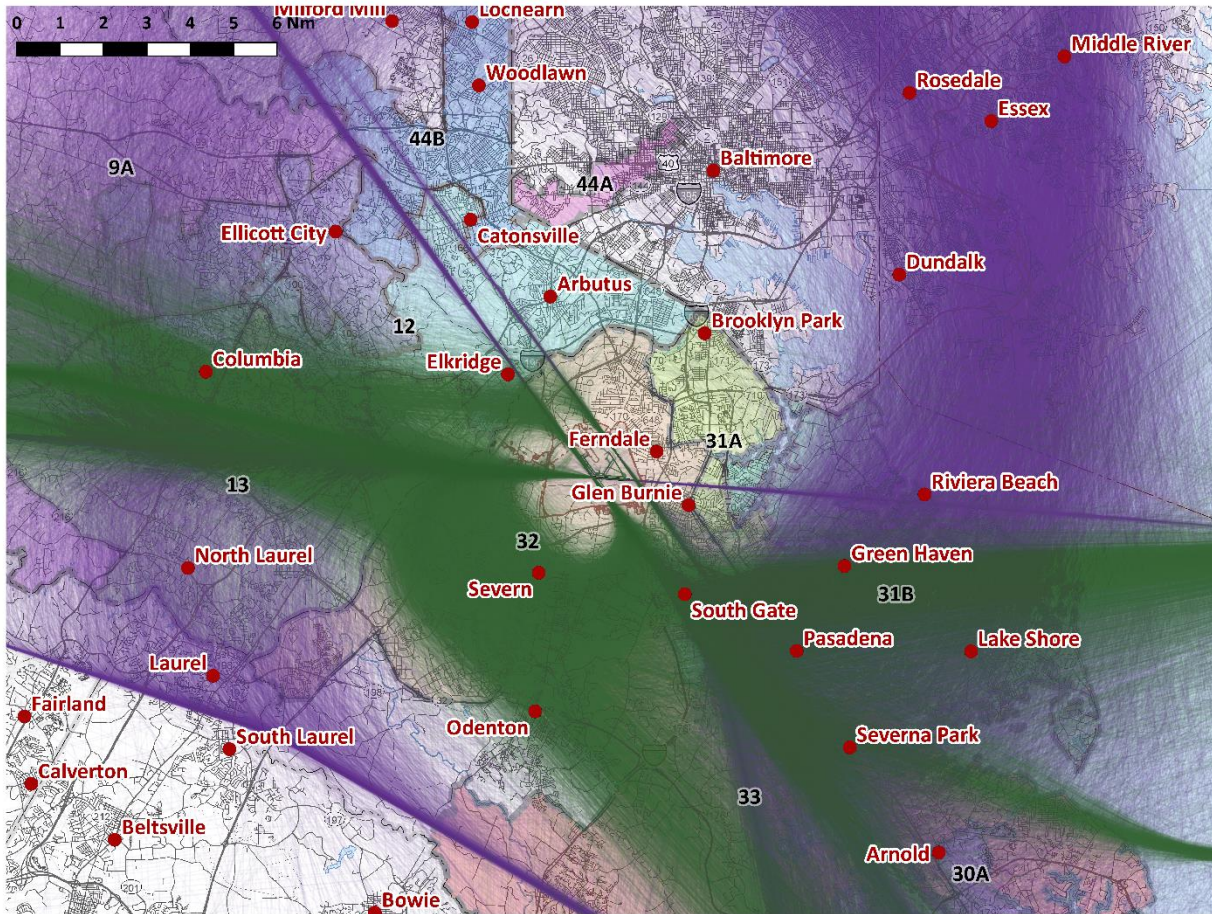


Flight Track Analysis of Roundtable Technical Committee Proposed Procedure Changes

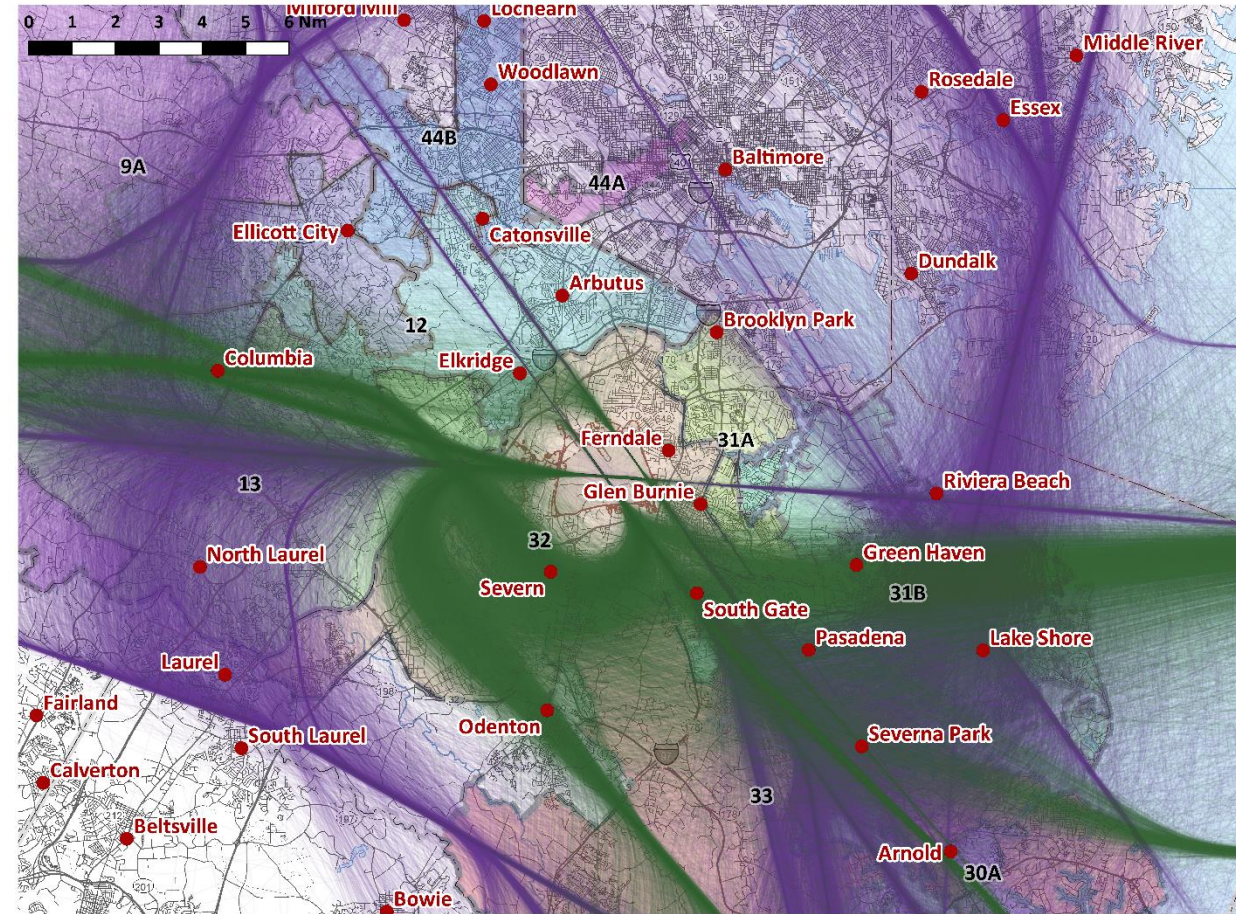
Historical/Existing BWI Marshall Flight Tracks

- The following slides present historical and existing Jet flight tracks from the MDOT MAA Airport Noise Monitoring and Management System (ANOMS) for context regarding the following time periods:
 - **Pre-Metroplex:** January, June, July, and December 2012 (123 days)
 - **Post-Metroplex/Existing:** November 2018, and February, May, and August 2019 (120 days)
 - The same flight tracks and aircraft operations were also used in the forthcoming technical analysis
 - Time periods selected to account for seasonal variability in aircraft operations, performance, and avoid runway closures
- Arrival flight tracks are depicted in Purple
- Departure flight tracks are depicted in Green
- Darker shades of color represent areas with greater concentrations of flight tracks, lighter shades represent areas of lesser concentrations

BWI Marshall Arrival and Departure Jet Flight Tracks – All Flows



2012 Pre-Metroplex arrival and departure flight tracks

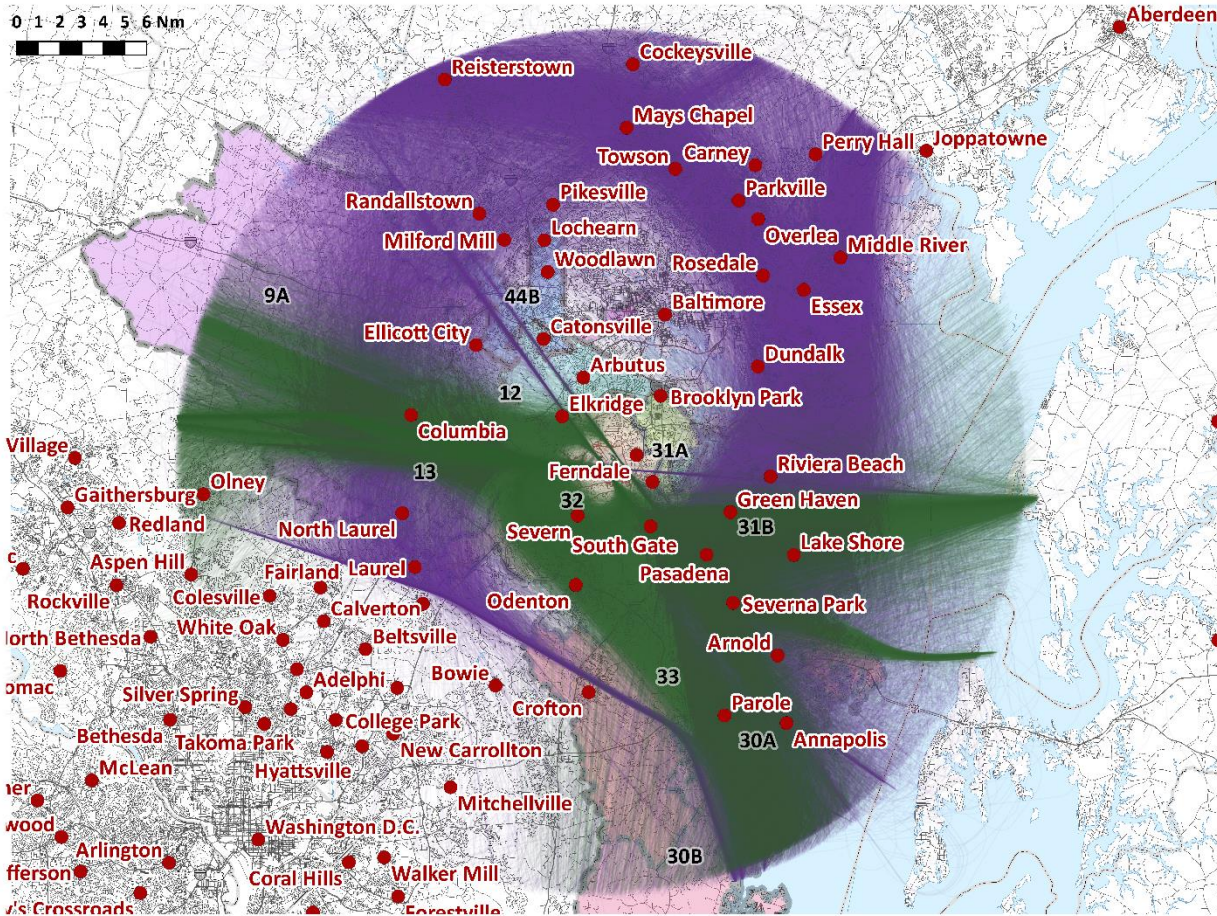


2018-2019 Existing arrival and departure flight tracks

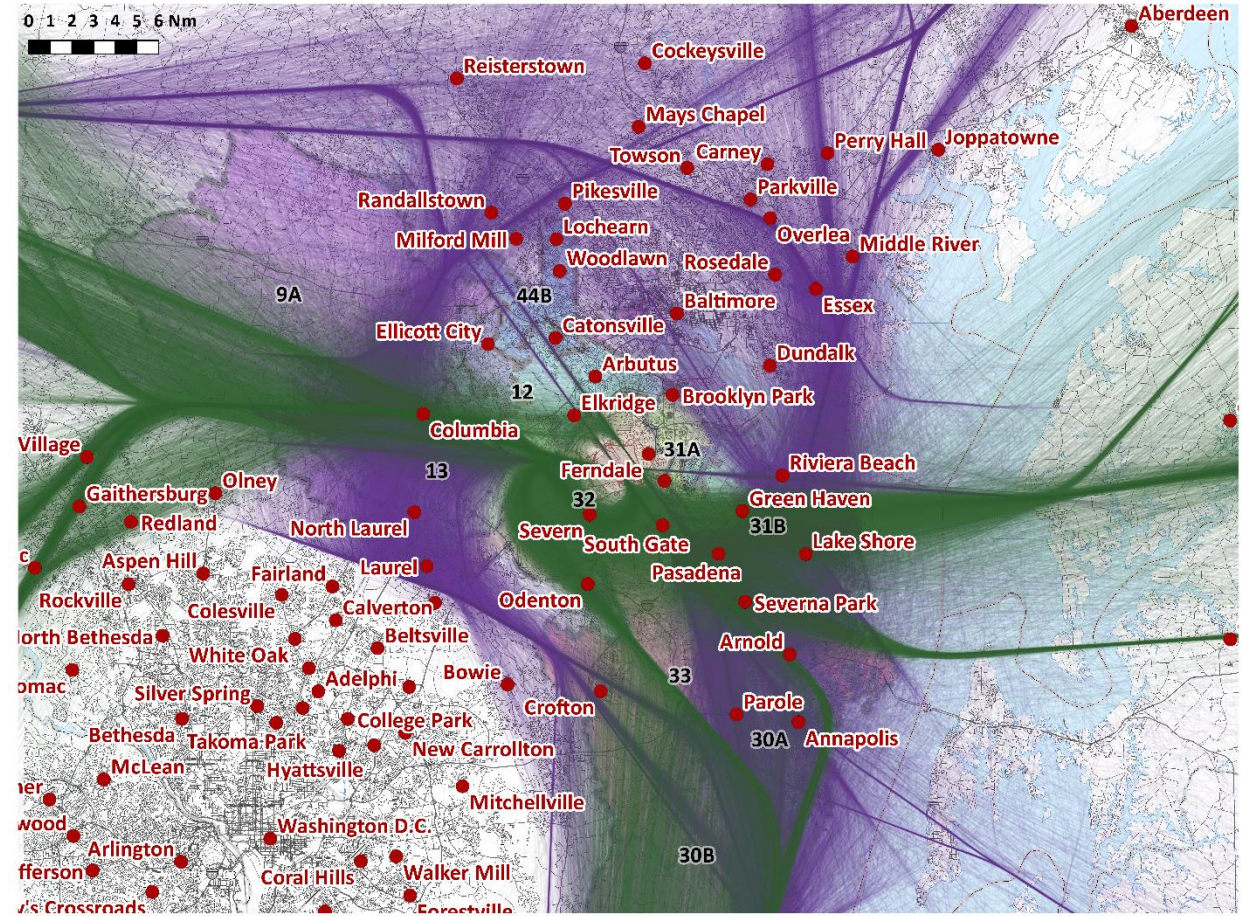
Legend

- Departure Flight Tracks
- Arrival Flight Tracks

BWI Marshall Arrival and Departure Jet Flight Tracks – All Flows



2012 Pre-Metroplex arrival and departure flight tracks



2018-2019 Existing arrival and departure flight tracks

Legend

- Departure Flight Tracks
- Arrival Flight Tracks

Goals of the Technical Committee in Developing Procedure Changes

- To develop solutions that address the following issues that resulted from implementation of NextGen related Performance Based Navigation (PBN) procedures at BWI Marshall:
 - Concentrated flight paths associated with existing FAA published and proposed NEXTGEN arrival and departure procedures
 - Extended periods of level flight by arrival aircraft at low altitudes and low altitude approaches
 - Changes to lateral flight paths of arrival and departures to relocate flight parts to historical locations or locations with the potential to reduce community noise exposure
- To develop and submit to FAA procedures that can be supported by the Roundtable, MDOT MAA, and Industry
- The following slides briefly review the proposed approach and arrival procedure changes developed by the Roundtable Technical Committee as presented at the October 15, 2019 Roundtable meeting

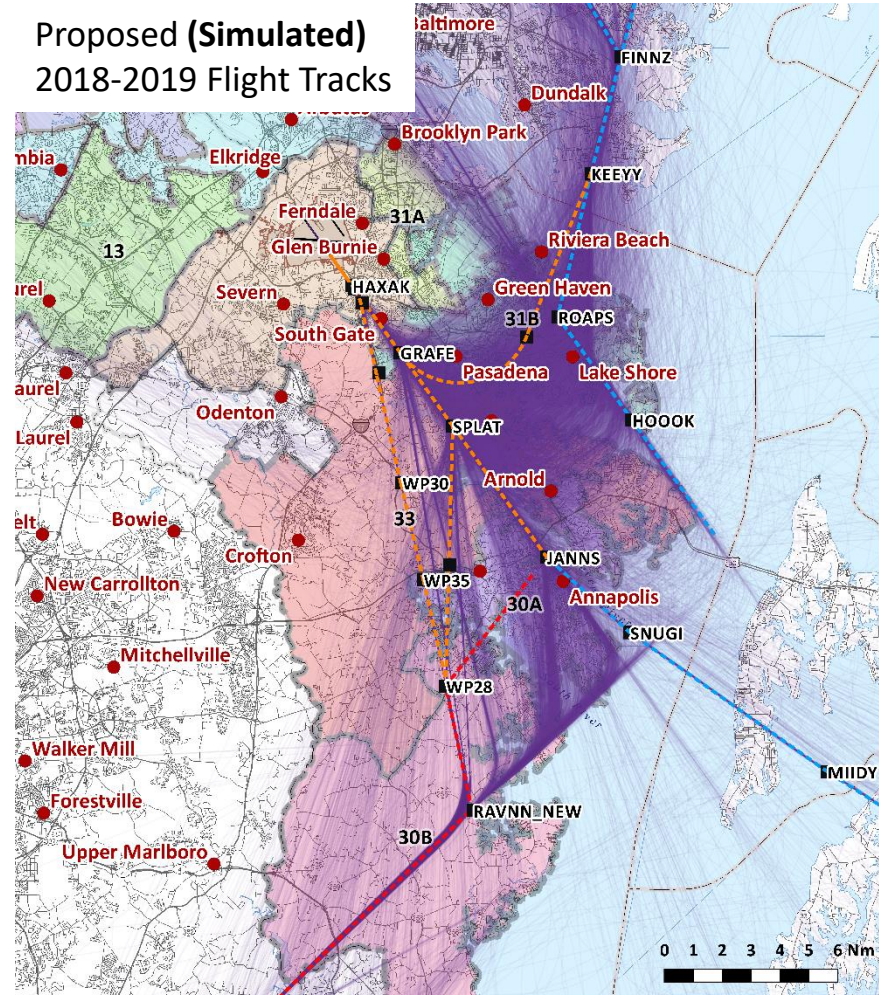
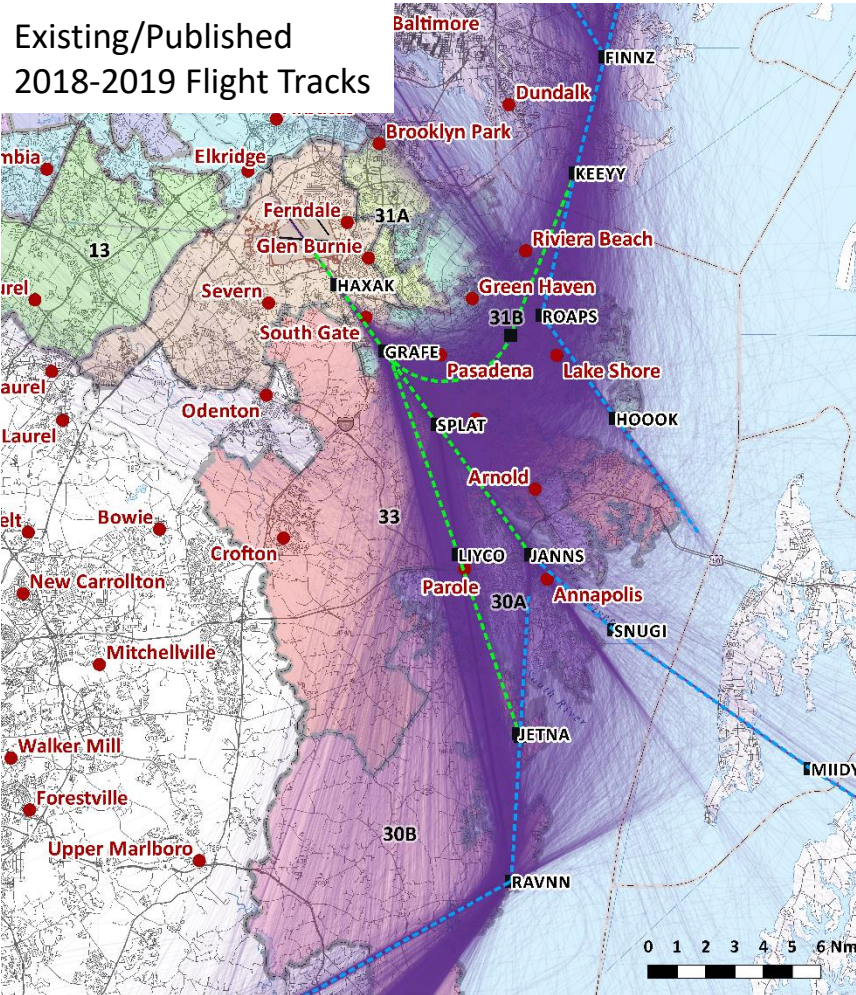
Anticipated Benefits of Proposed Technical Committee Procedure Changes

- Increased/higher aircraft altitudes on arrival where possible
- Increased/higher aircraft altitudes on approach during good and bad weather conditions leveraging Continuous Descent Approaches (CDAs)
 - Fewer instances of aircraft flying large distances from the airport at lower altitudes in level flight
 - Reduced/near-idle engine power settings due to continuous descent
 - Published procedures along existing approach corridors used during good weather (visual approaches) that allow for vertical guidance
- Better distribution of approach operations
- Relocation of flight paths to locations with the potential to reduce cumulative community noise exposure



Runway 33L—RAVNN Arrivals and Approaches

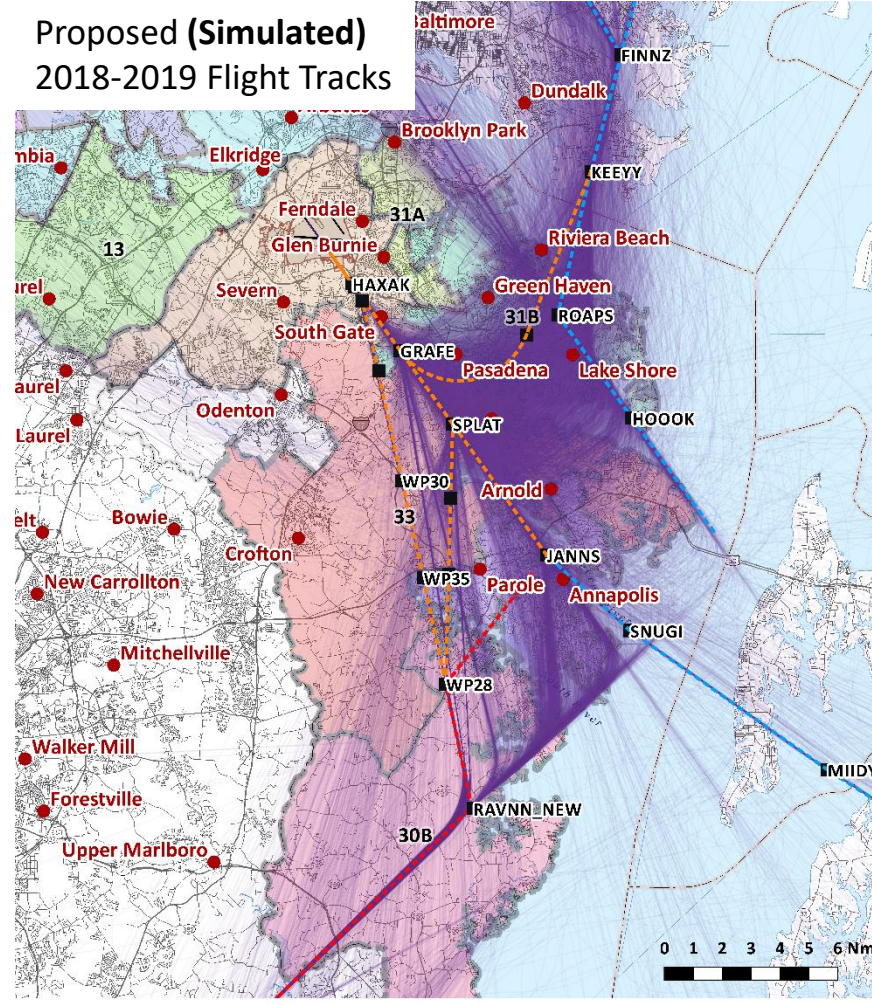
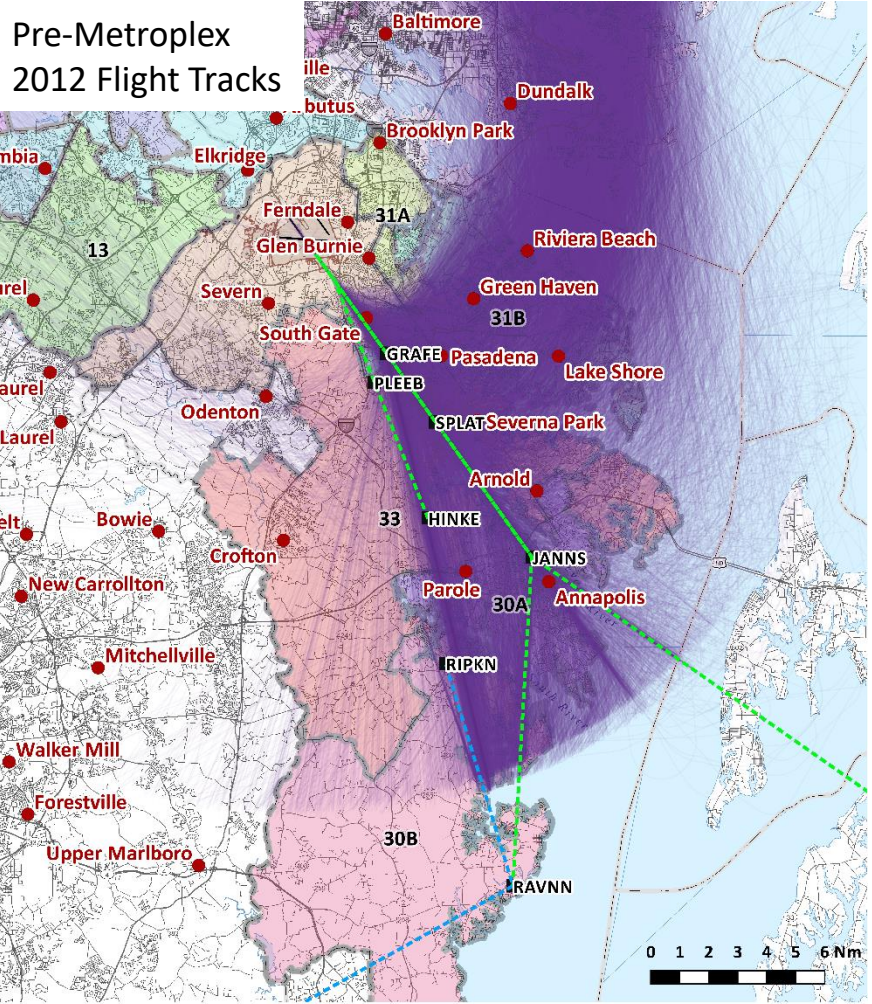
Runway 33L Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)



Legend

- Navigational Points
 - Proposed Arrival Procedure Changes
 - Existing Published Arrival Procedures
 - Proposed Approach Procedure Changes
 - Existing Published Approach Procedures
 - Arrival Flight Tracks
- Pre-Decisional: For informational purposes only

Runway 33L Jet Arrivals – 2012 compared to 2018-2019 Proposed (Simulated)



Legend

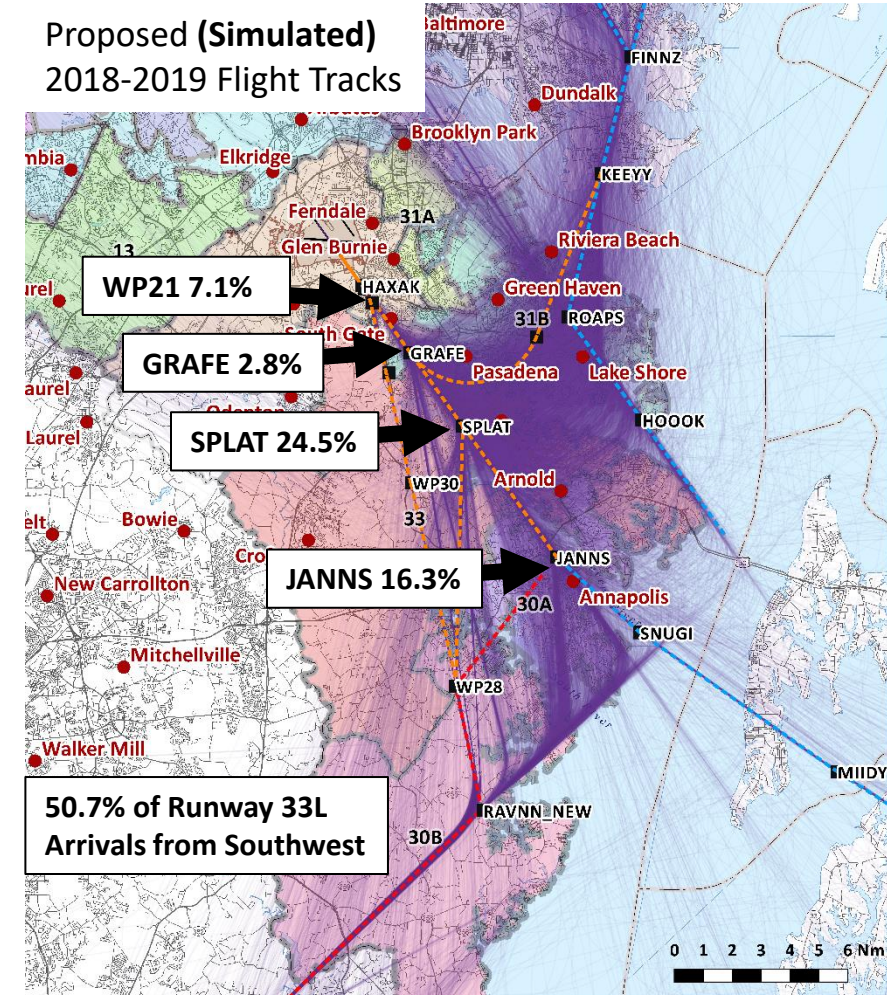
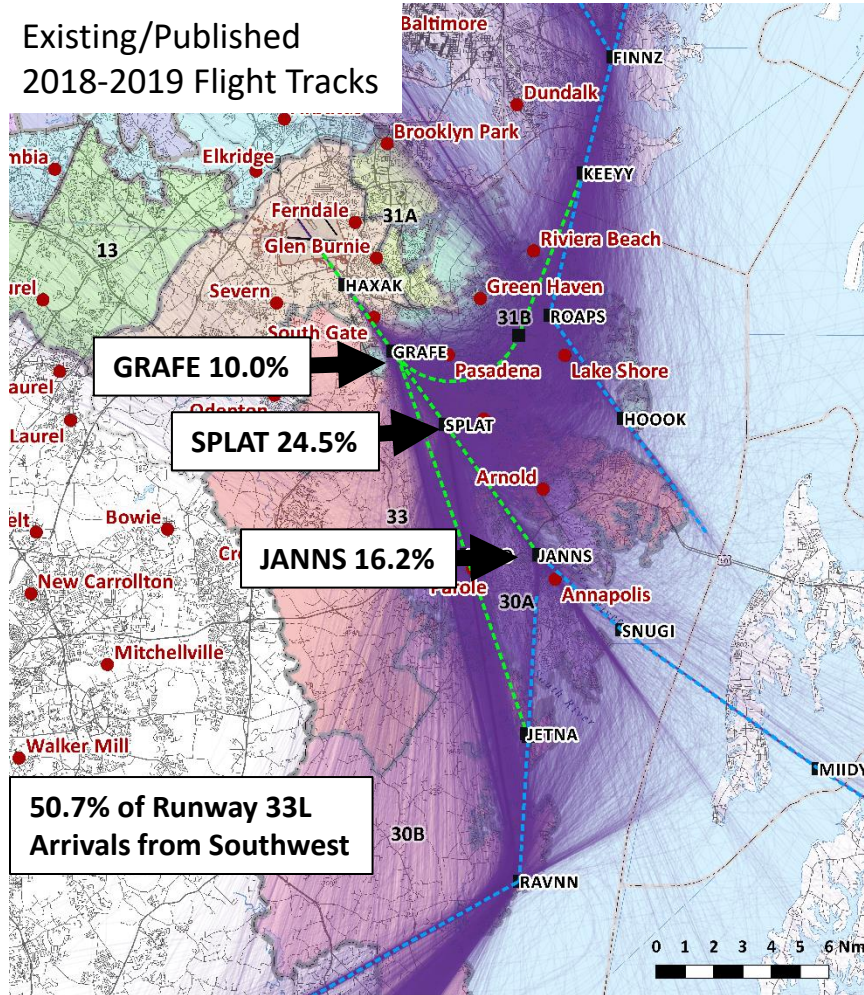
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Runway 33L Jet Arrivals – Flight Track Analysis Summary

- Runway 33L Roundtable Technical Committee procedure changes may:
 - Shift RAVNN arrival aircraft northwest of current corridor over less densely populated areas
 - Establish RNP approach with a **continuous descent** from the RAVNN to WP21 navigational points along corridor commonly used for visual approaches while also shifting this corridor to the west over less densely populated areas
 - Establish RNAV approach transition with a **continuous descent** from the RAVNN to SPLAT navigational points along corridor commonly used for visual approaches
 - Better distribute approach operations along the final approach course by adding a third approach corridor from RAVNN to WP21 that will alleviate some traffic from flying to the GRAFE navigational point
- Overall, aircraft flight paths may shift but will largely remain heavily concentrated due to **RNAV** and **RNP (continuous descent)** procedure designs

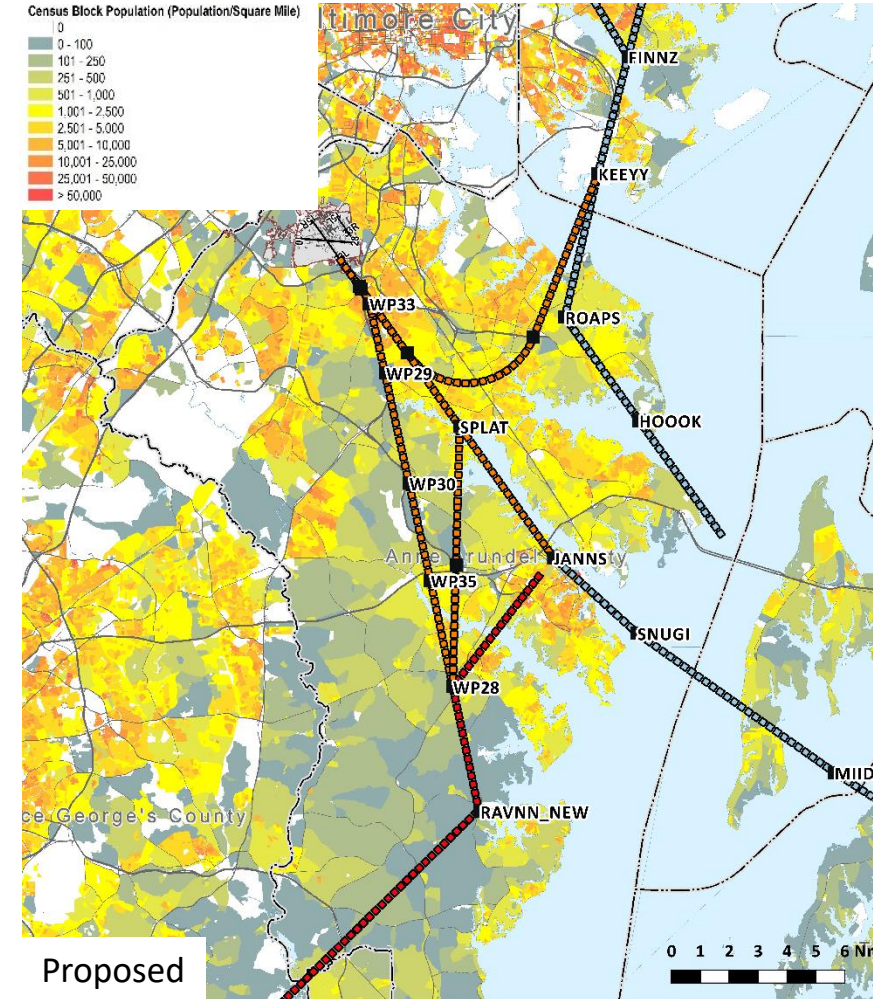
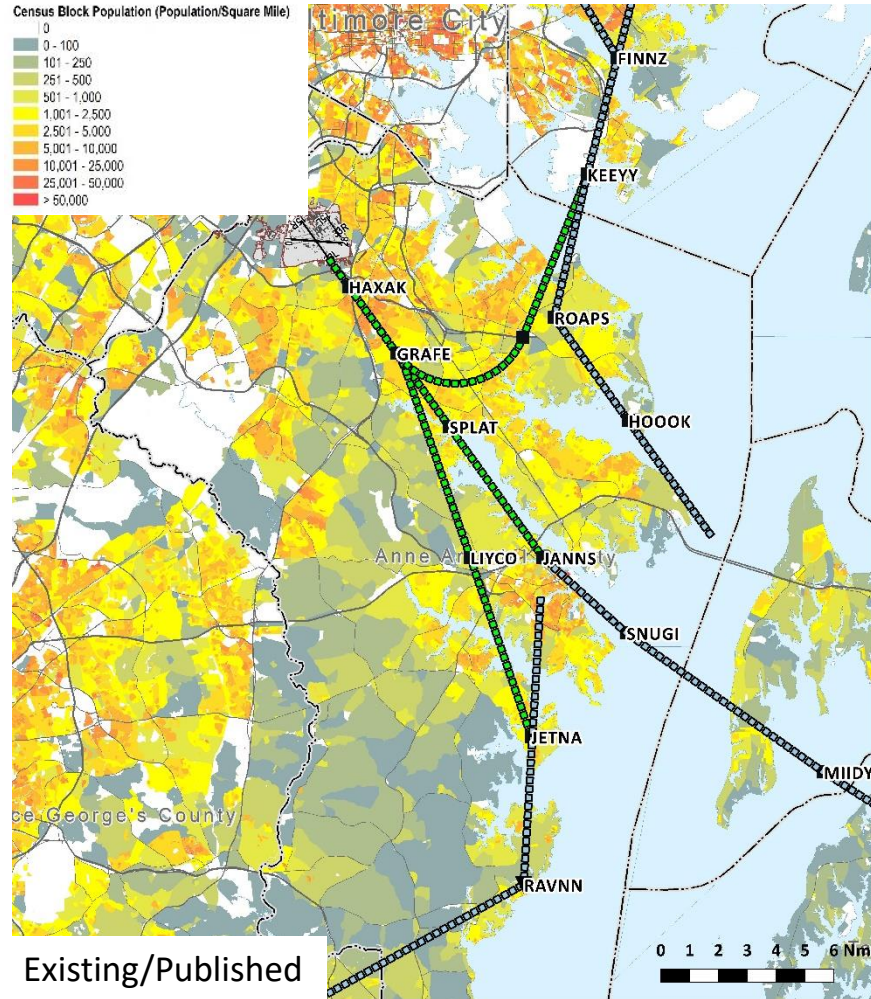
Runway 33L Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)



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Runway 33L Arrivals/Approaches – Population 2019 Published compared to Proposed



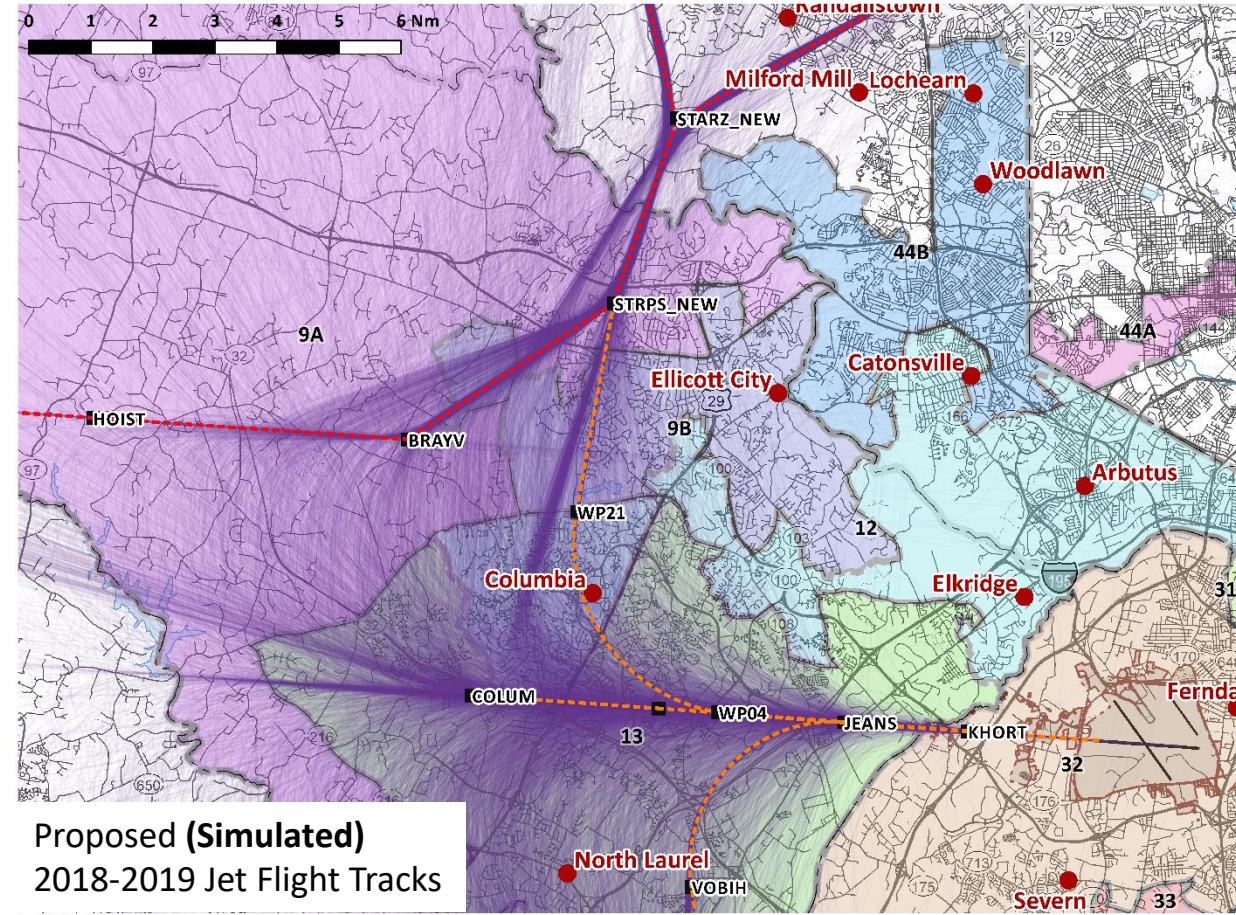
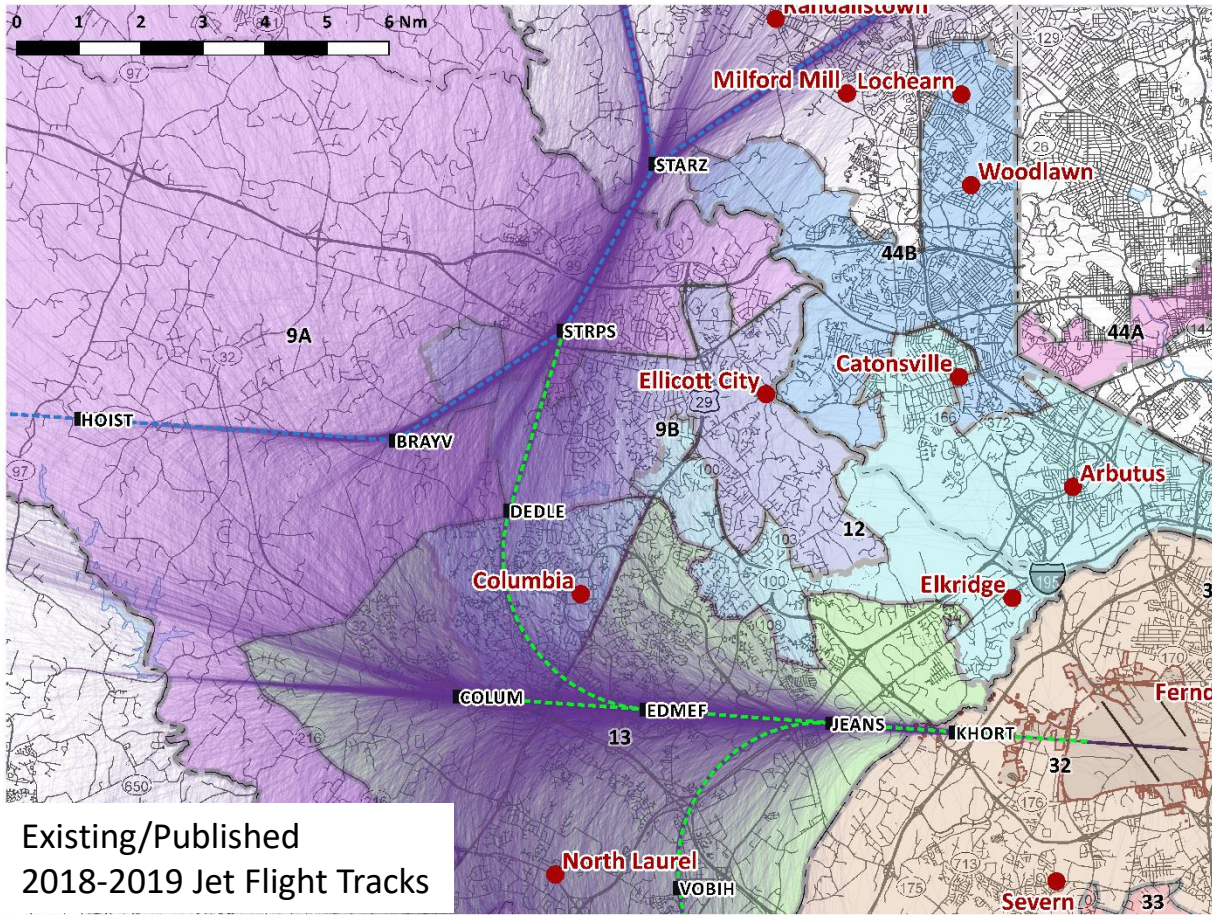
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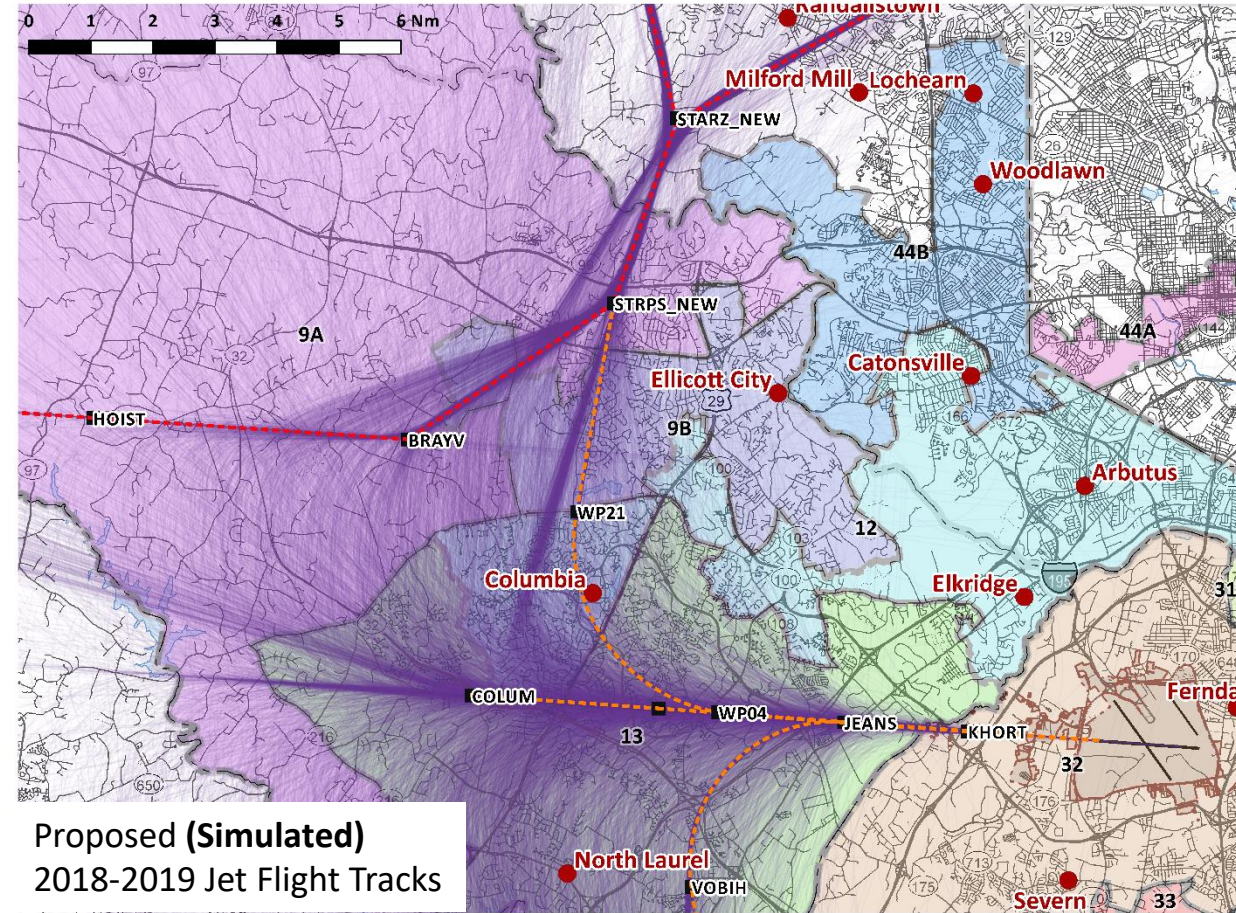
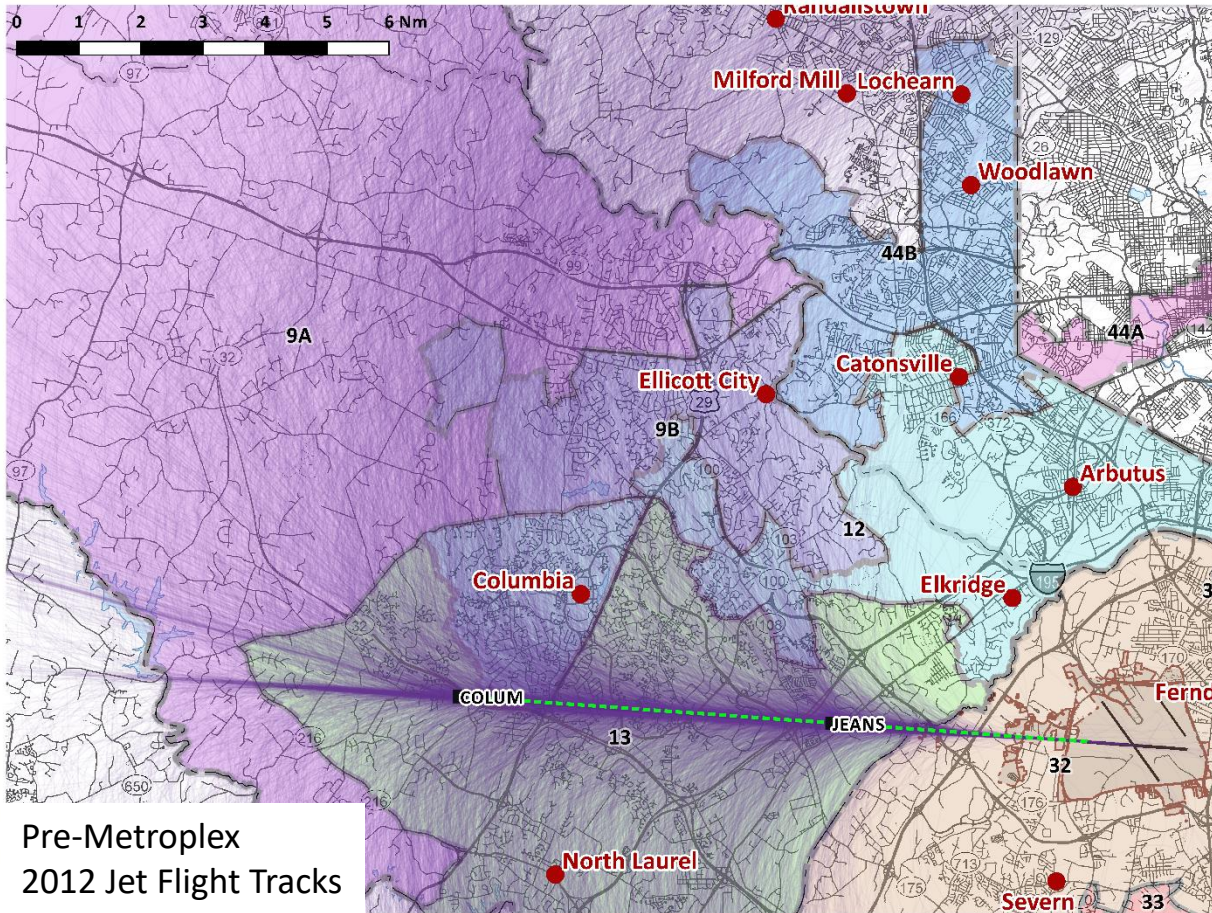
Runway 10—ANTHM and TRISH Arrivals and Approaches

Runway 10 Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)



- Legend**
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Runway 10 Jet Arrivals – 2012 compared to 2018-2019 Proposed (Simulated)



Legend

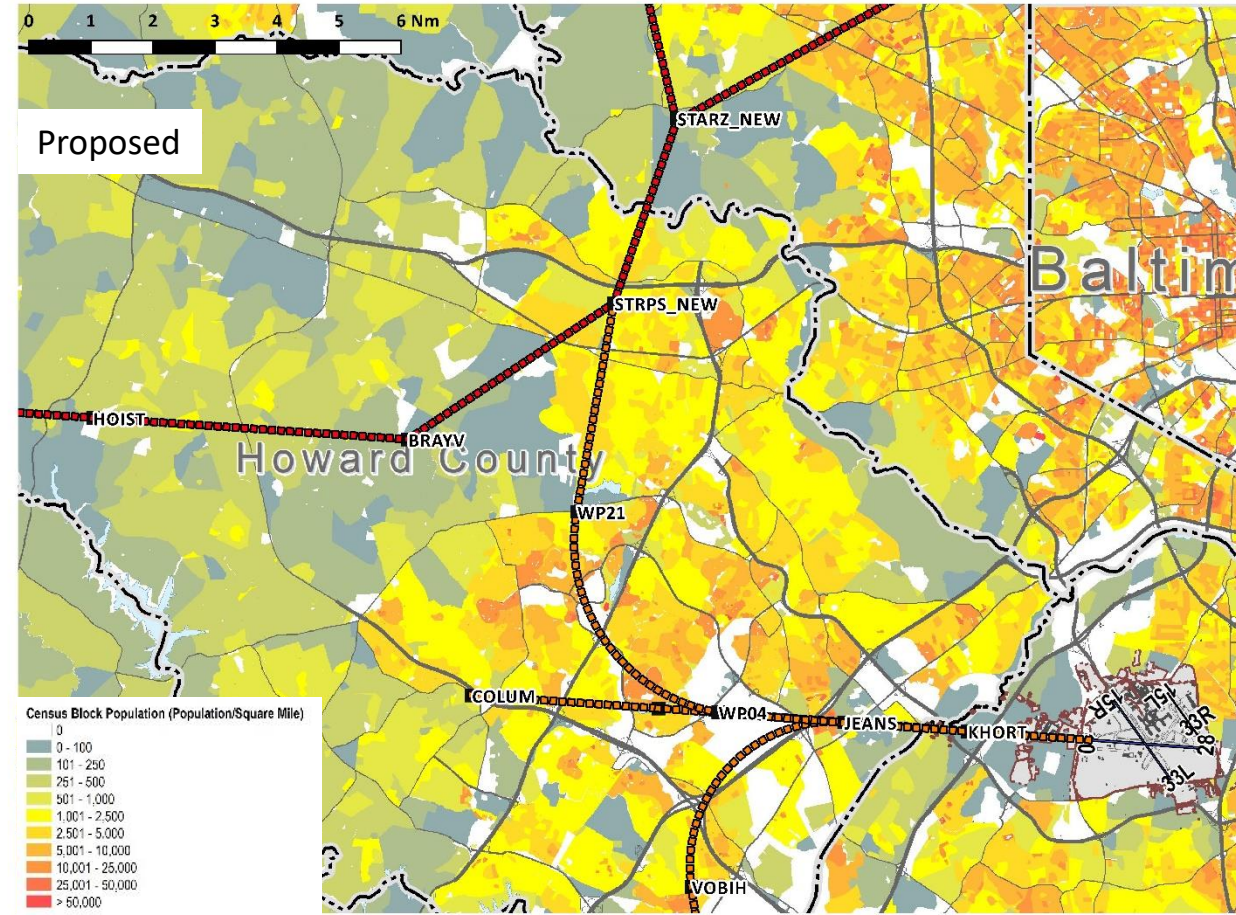
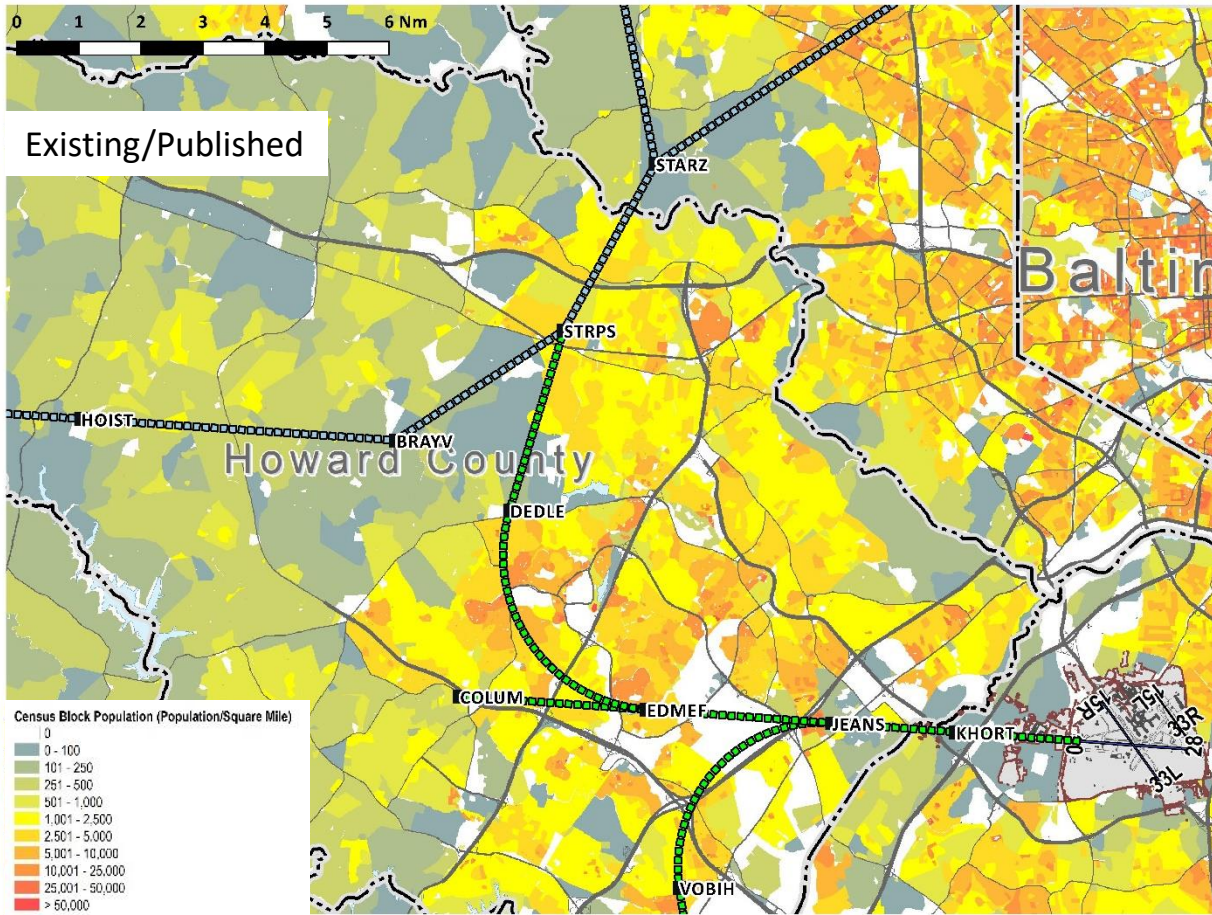
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- Existing Published Approach Procedures
- Proposed Arrival Procedure Changes
- Proposed Approach Procedure Changes
- Arrival Flight Tracks

Pre-Decisional: For informational purposes only

Runway 10 Jet Arrivals – Flight Track Analysis Summary

- Runway 10 Roundtable Technical Committee proposed arrival procedure changes may:
 - Shift flight paths closer to the airport away from western portions of Columbia affected by departures under all BWI Marshall operating configurations utilizing a RNP approach with a **continuous descent**
 - Increase aircraft altitudes slightly north of Columbia and east of Ellicott City as they fly to the west on the downwind for sequencing by air traffic control
- Overall, aircraft flight paths may shift but will remain heavily concentrated due to RNAV and RNP procedure design

Runway 10 Arrivals/Approaches – Population 2019 Published compared to Proposed



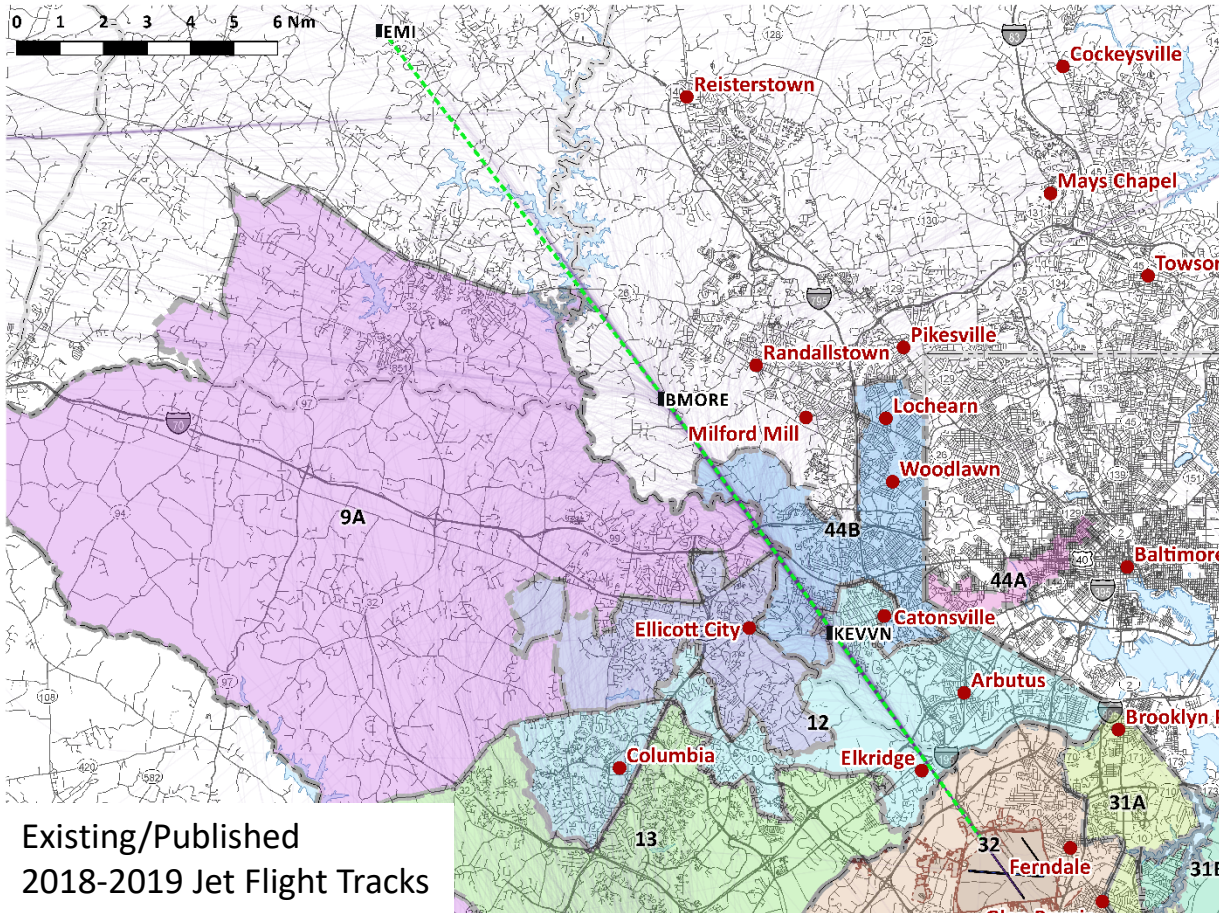
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- Existing Published Approach Procedures
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- Arrival Flight Tracks

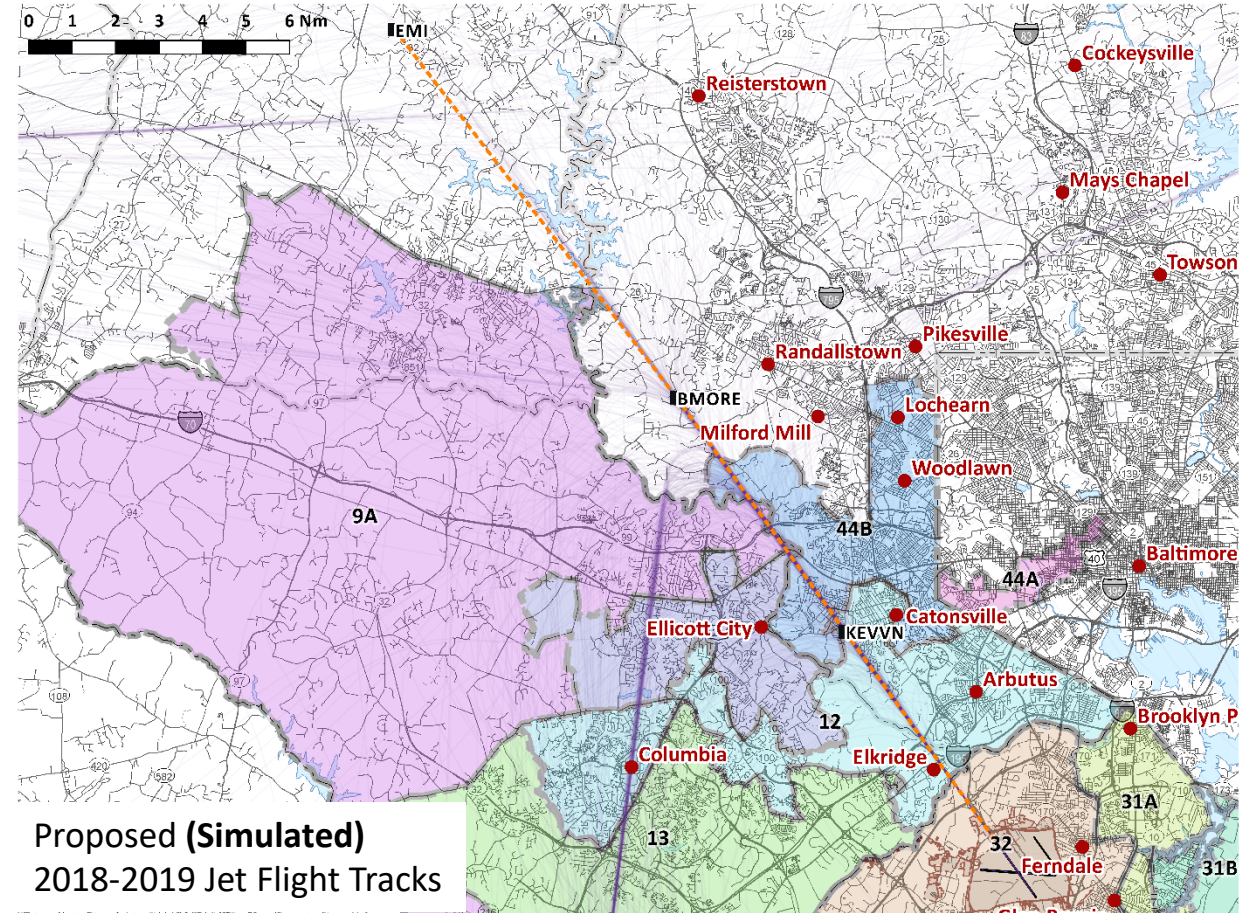
Pre-Decisional: For informational purposes only

Runway 15—RNP Arrivals and Approaches

Runway 15R Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)



Existing/Published
2018-2019 Jet Flight Tracks



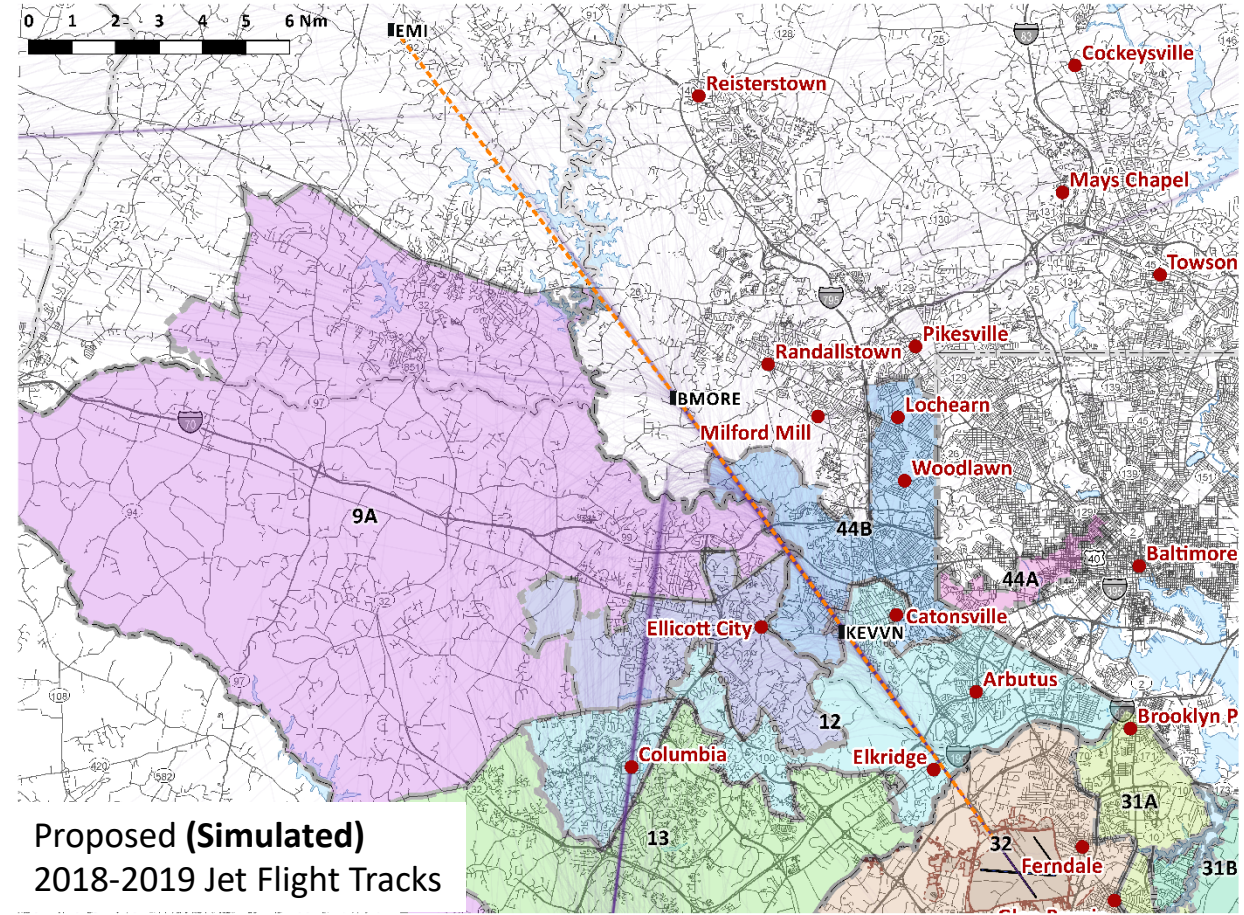
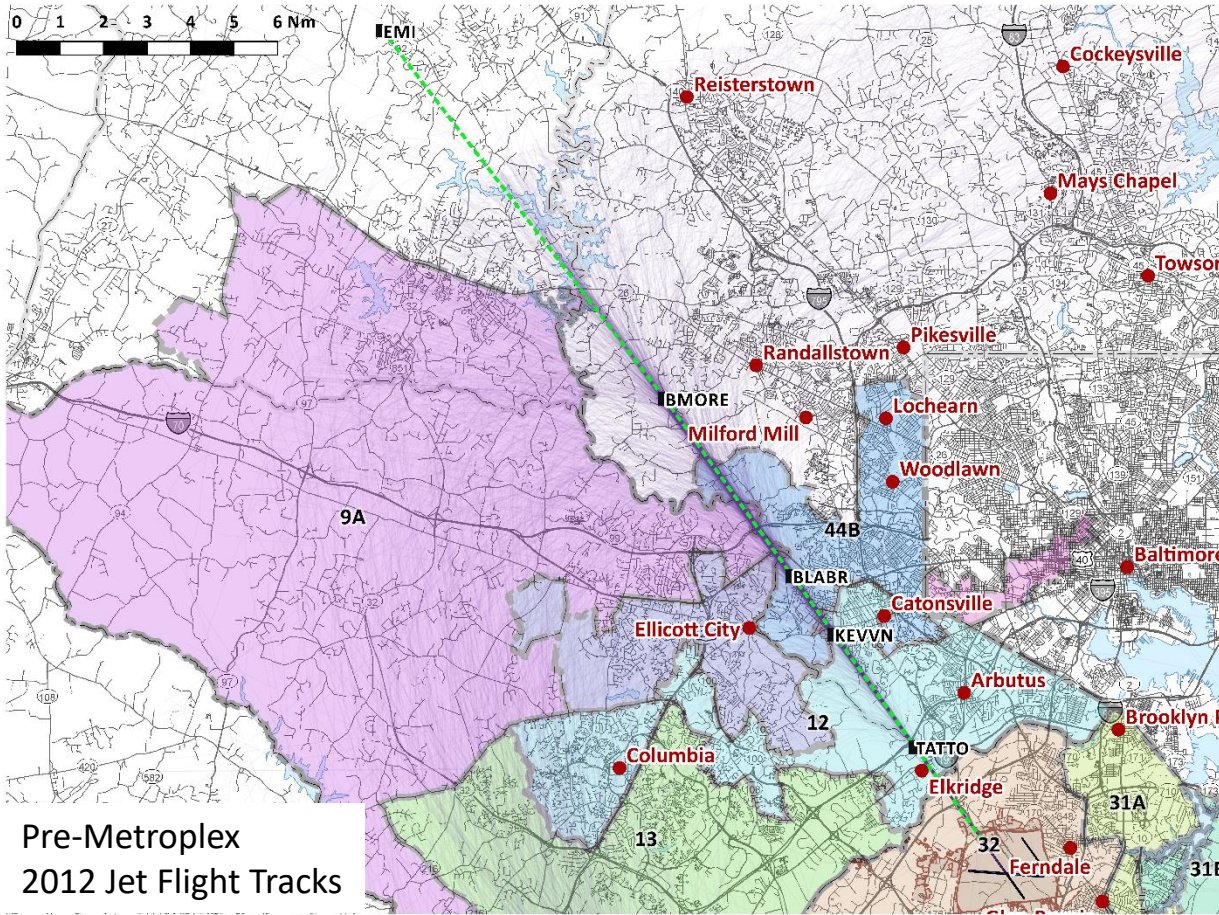
Proposed (Simulated)
2018-2019 Jet Flight Tracks

Legend

- Navigational Points
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- Existing Published Arrival Procedures
- Proposed Approach Procedure Changes
- Existing Published Approach Procedures
- Arrival Flight Tracks

Pre-Decisional: For informational purposes only

Runway 15R Jet Arrivals – 2012 compared to 2018-2019 Proposed (Simulated)



- Legend**
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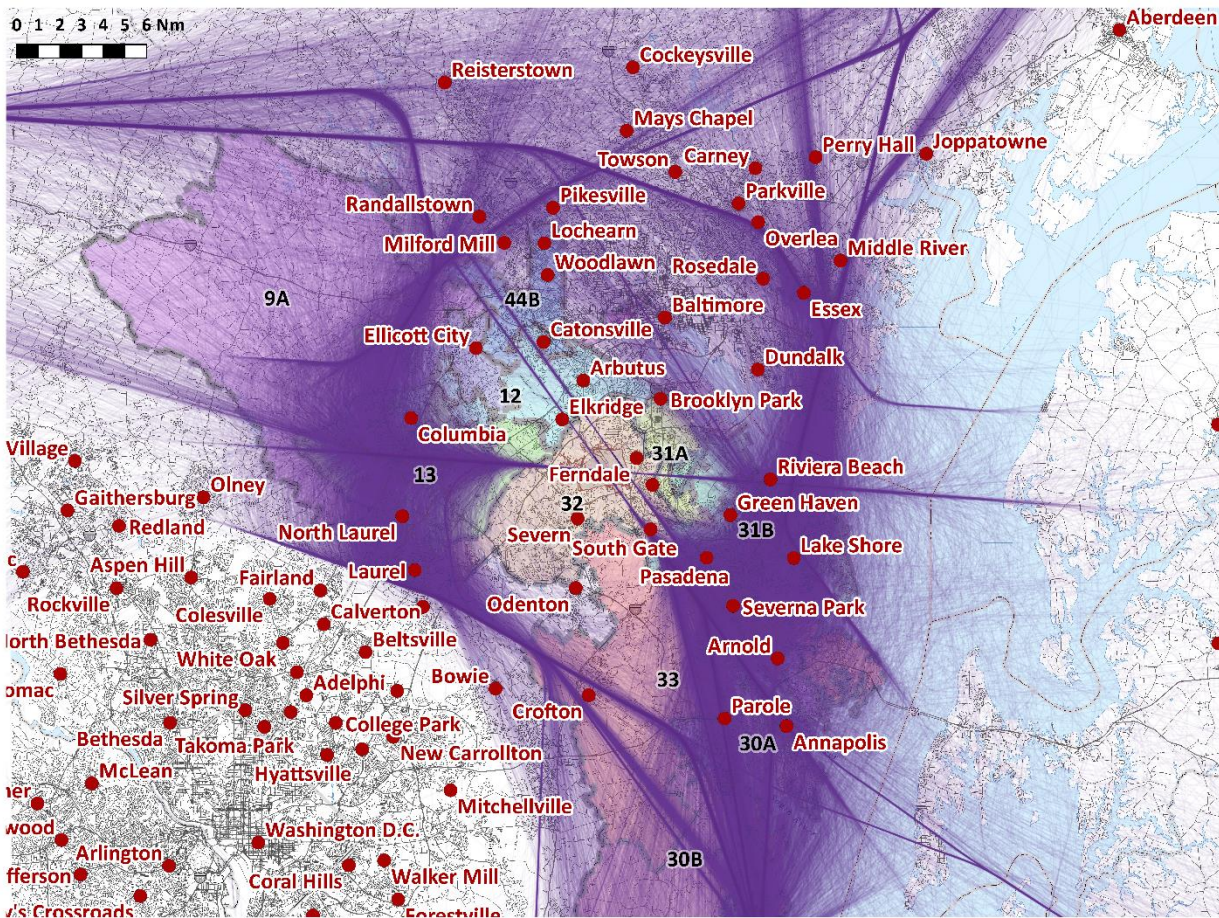
Runway 15R Jet Arrivals – Flight Track Analysis Summary

- Runway 15R Roundtable Technical Committee proposed procedure changes may:
 - Increase aircraft altitudes along the Runway 15R final approach course west of Milford Hill utilizing a RNP approach with a **continuous descent**
 - Lateral flight paths are not anticipated to change, although our analysis assumed aircraft would fly a single corridor before making an approach due to the uncertainty of vectoring/sequencing by air traffic control

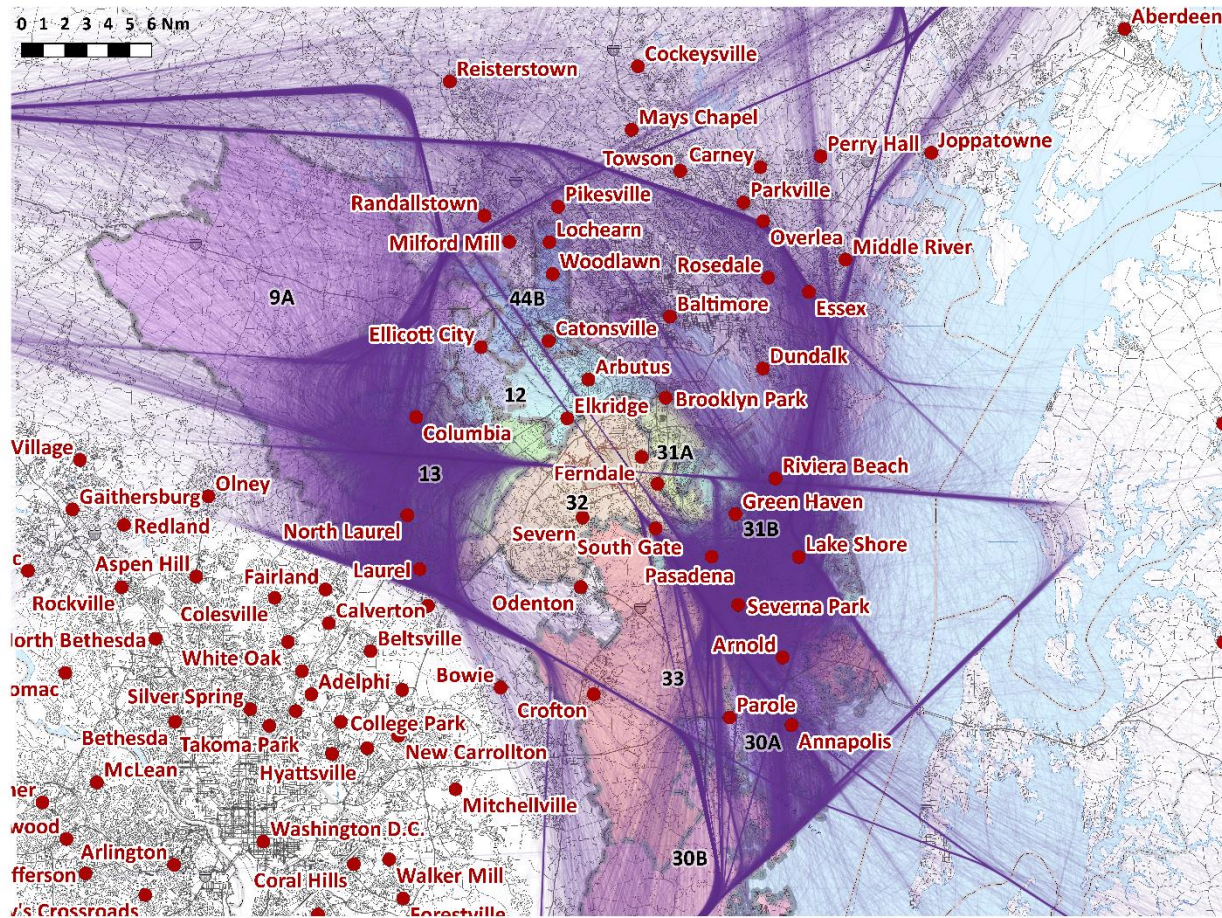


All Jet Arrivals and Approaches

All Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)



2018-2019 Existing arrival flight tracks

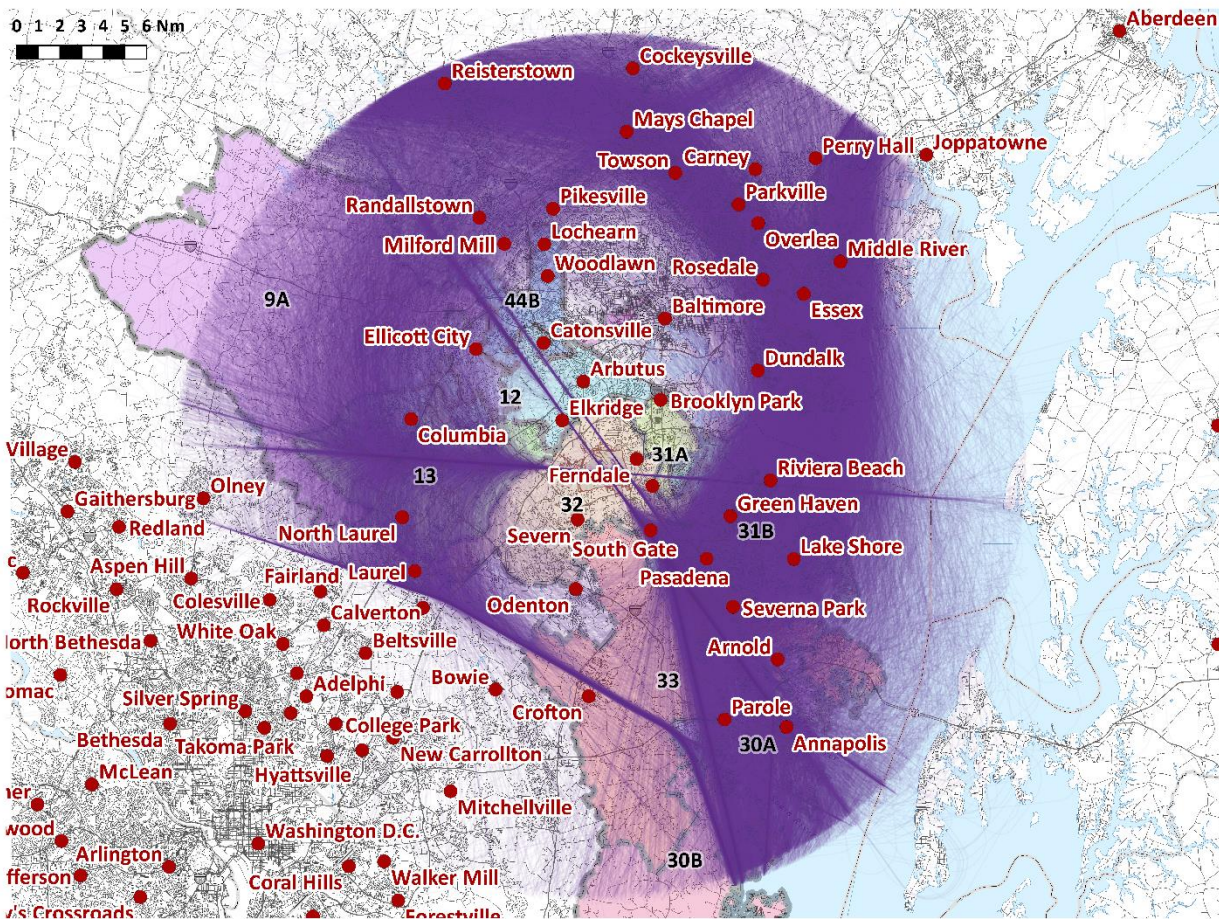


2018-2019 Proposed (Simulated) arrival flight tracks

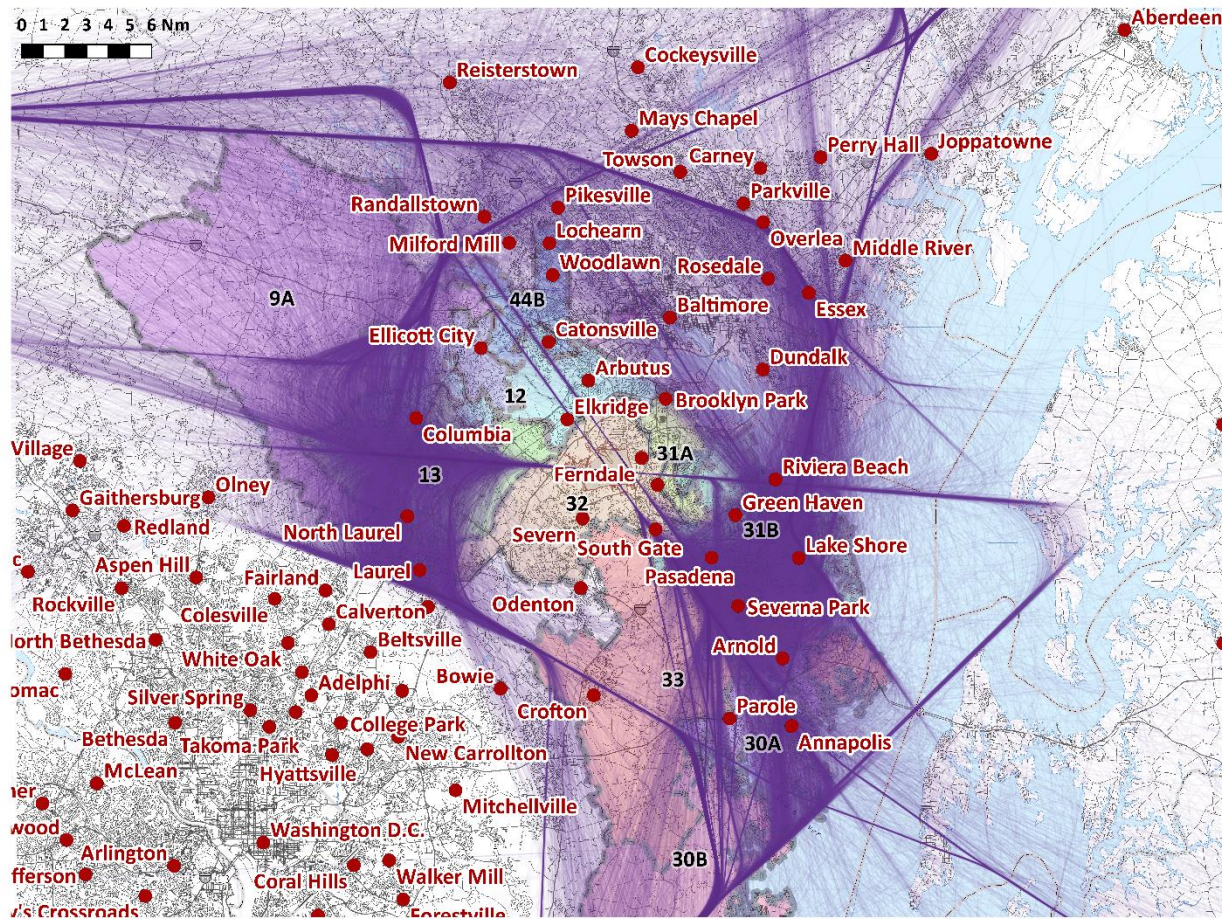
Legend

— Arrival Flight Tracks

All Jet Arrivals – 2012 compared to 2018-2019 Proposed (Simulated)



2012 Pre-Metroplex arrival flight tracks



2018-2019 Proposed (Simulated) arrival flight tracks

Legend

— Arrival Flight Tracks

All Jet Arrivals – Flight Track Analysis Summary

- Proposed Roundtable Technical Committee arrival and approach procedure changes may:
 - Shift some arrivals to Runway 33L over less densely populated areas along corridors currently used for visual approaches, better distribute operations, and facilitate **continuous aircraft descents** at higher altitudes with reduced power settings
 - Facilitate **continuous aircraft descents** for some aircraft within the existing Runway 33L arrival corridor west of Annapolis between the South and Severn Rivers that allow for descents at higher altitudes and reduced power settings
 - Shift some arrivals to Runway 10 to the east closer to the airport away from western portions of Columbia and increase aircraft altitudes on arrival and on approach that facilitate **continuous aircraft descents**
 - Increase the altitudes of some arrivals to Runway 15R and **facilitate continuous aircraft descents**

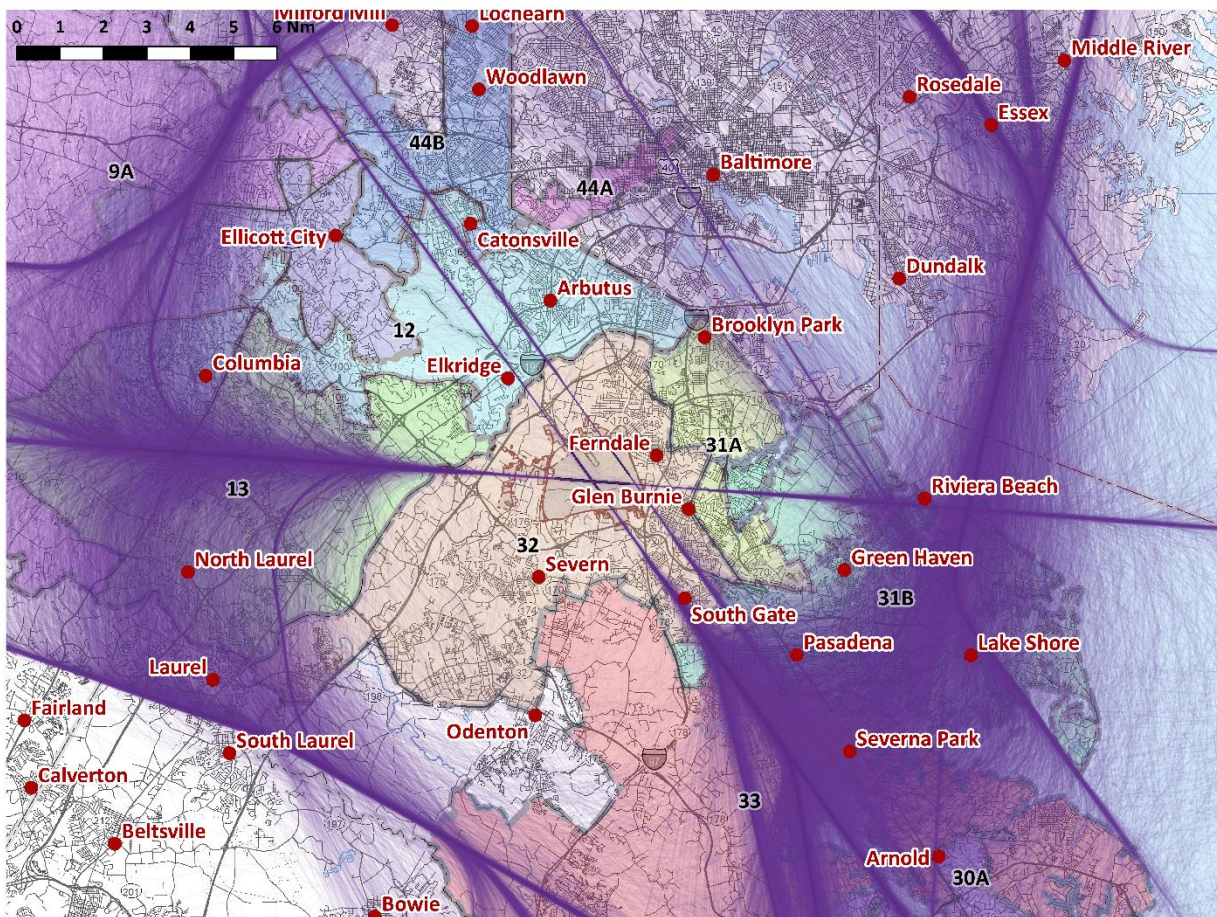


Additional Slides

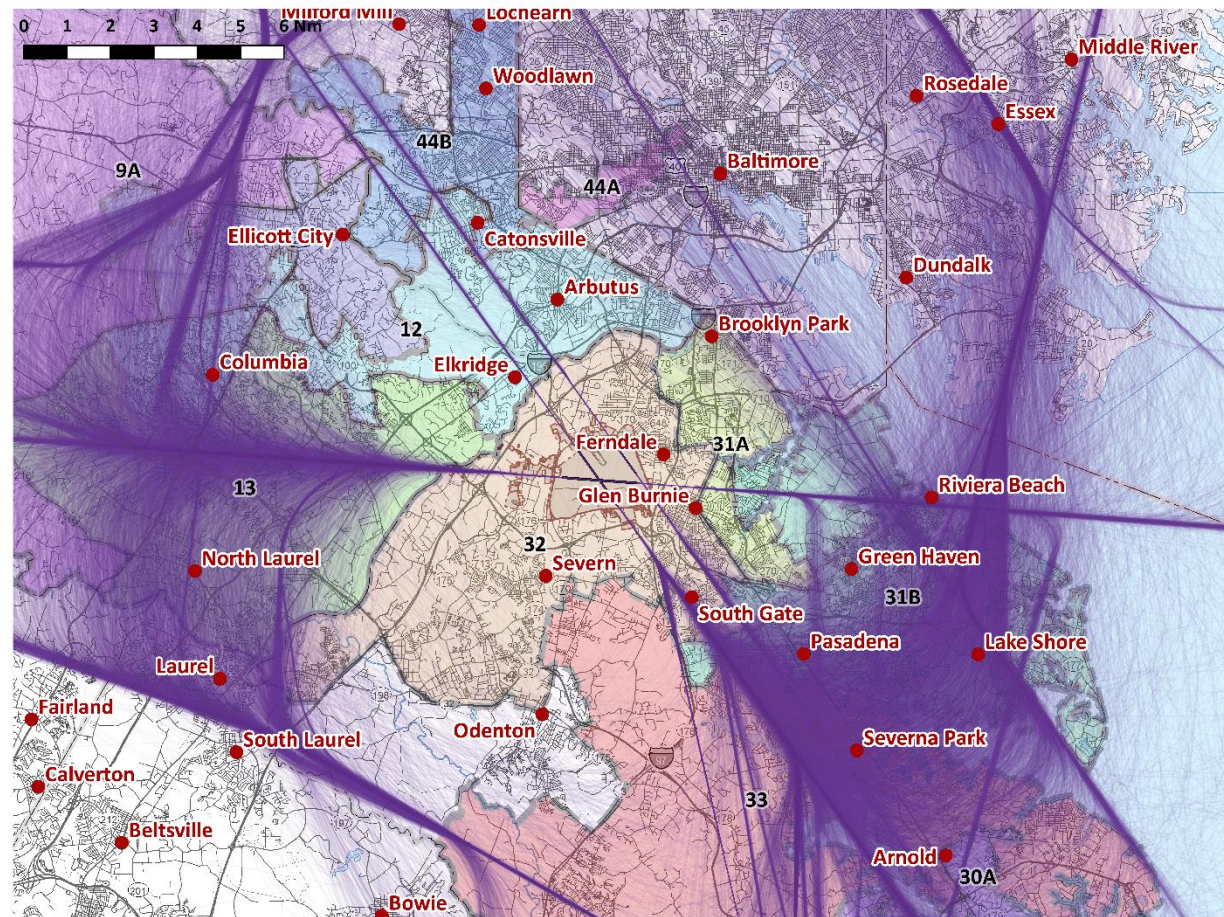
Flight Track Analysis – Overview

- 2018-2019 proposed departure and arrival procedure data sample simulation assumptions:
 - Only Jet aircraft would utilize the proposed procedures
 - Turbine and Piston Propeller aircraft would fly procedures as published today
 - A majority of Jet aircraft would fly the arrival procedures as published and would not be “short cut” by air traffic controllers. **However, some Jet aircraft that today are not flying on a published arrival procedure are assumed not to change**
 - Proposed Required Navigation Performance (RNP) and Area Navigation (RNAV) approach procedures would be limited to only those aircraft found in the 2018-2019 data sample to be capable of flying RNP or RNAV approach procedures
 - Some approach aircraft will continue to intercept each Runway’s final approach course in the same locations as they do today based on the need for sequencing/vectoring from air traffic controllers. **Not all aircraft will fly the new proposed RNP or RNAV approach procedures**
 - Runway 15R and 28 approach aircraft fly a concentrated path to each runway when arriving from the southwest (RAVNN arrival procedure). However, these aircraft may be sequenced/vectored by air traffic control which may better disperse these operations
- **Simulated flight tracks represent our interpretation of how aircraft may fly the FAA’s proposed procedures and aircraft may fly the procedures differently once implemented**

All Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)



2018-2019 Existing arrival flight tracks

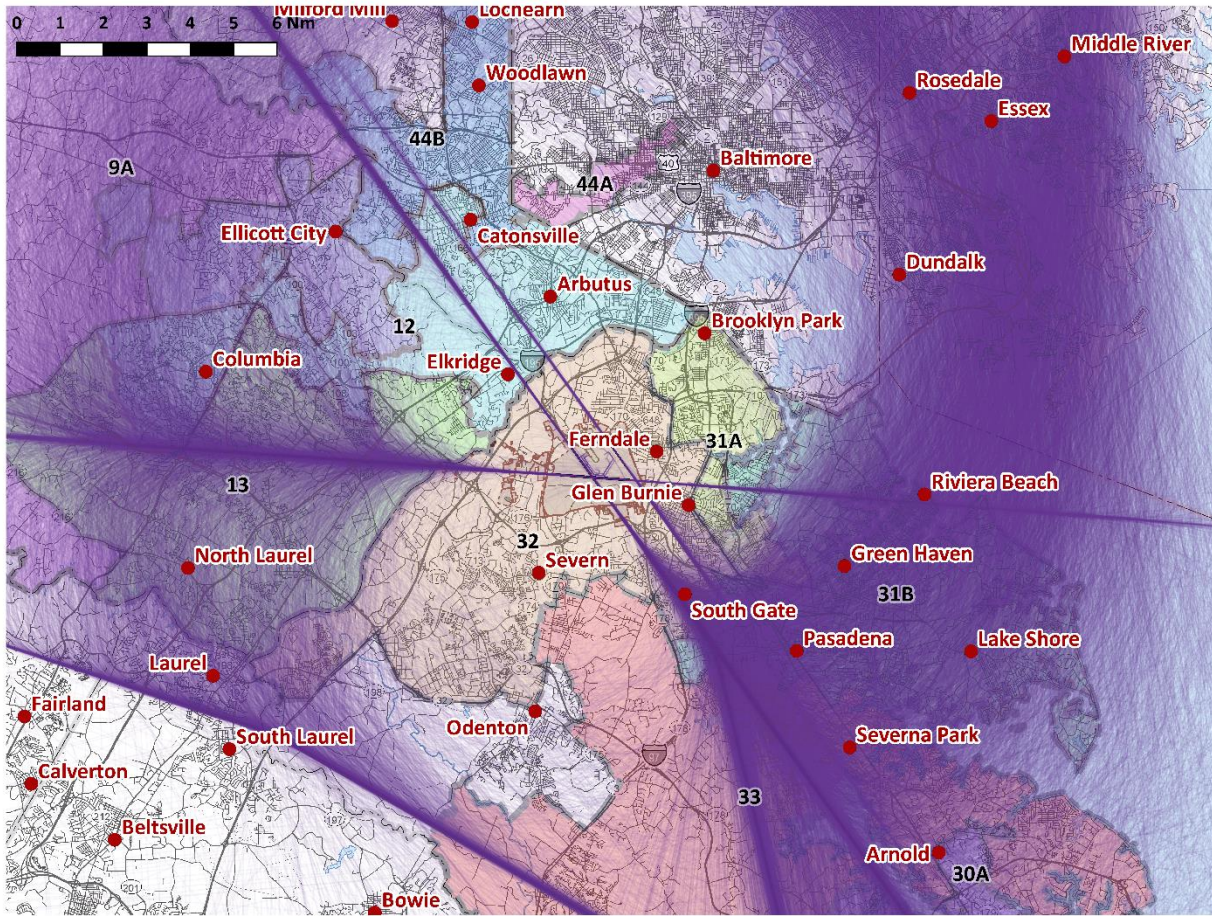


2018-2019 Proposed (Simulated) arrival flight tracks

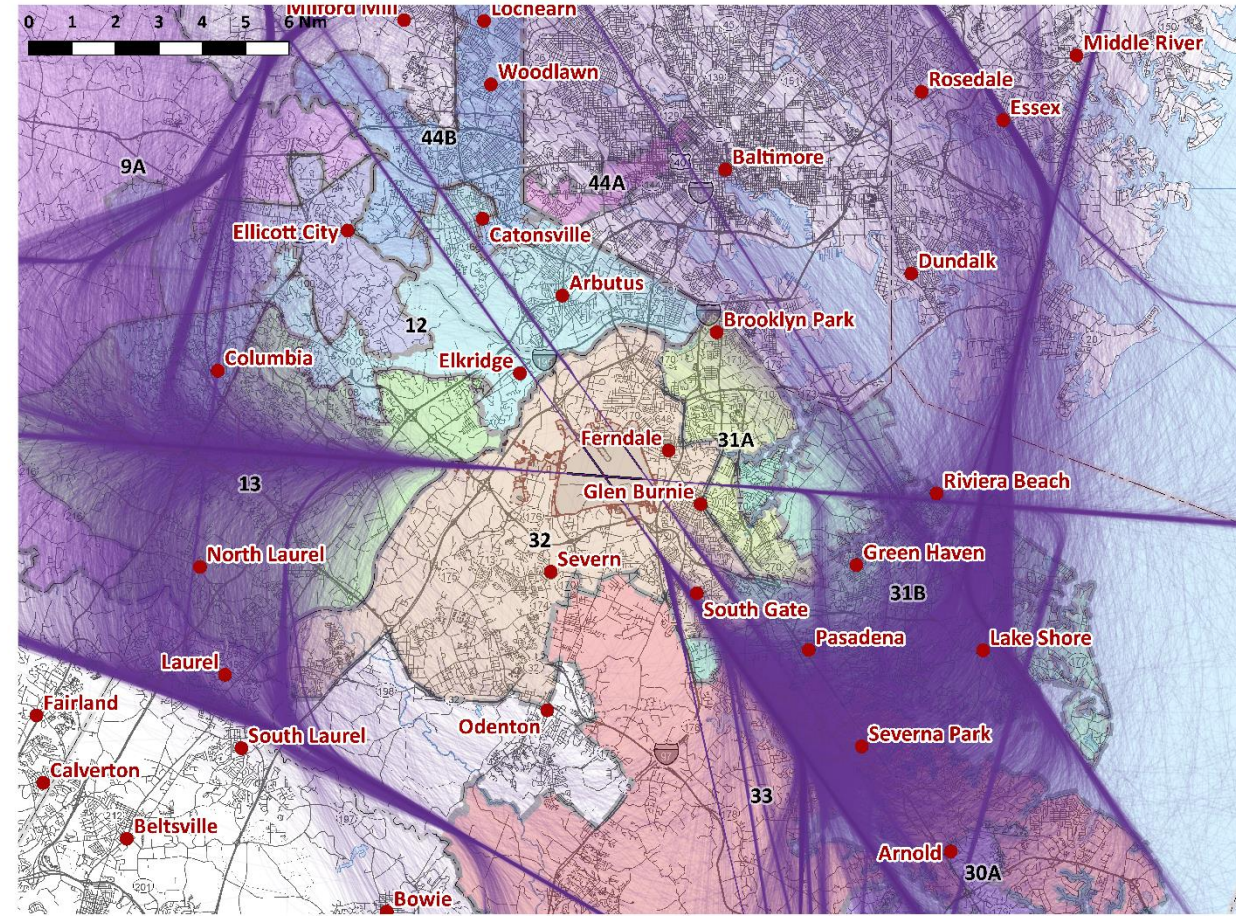
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— Arrival Flight Tracks

All Jet Arrivals – 2012 compared to 2018-2019 Proposed (Simulated)



2012 Pre-Metroplex arrival flight tracks

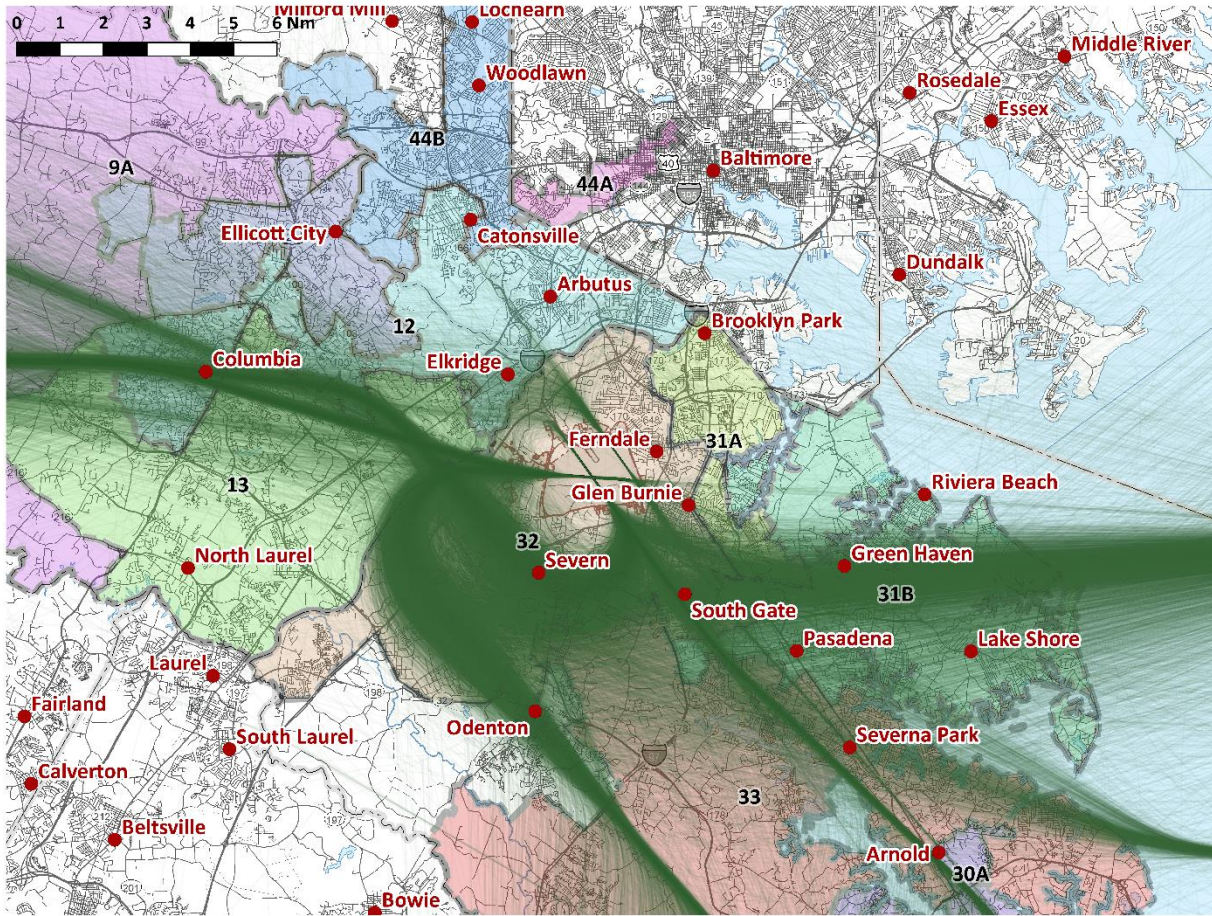


2018-2019 Proposed (Simulated) arrival flight tracks

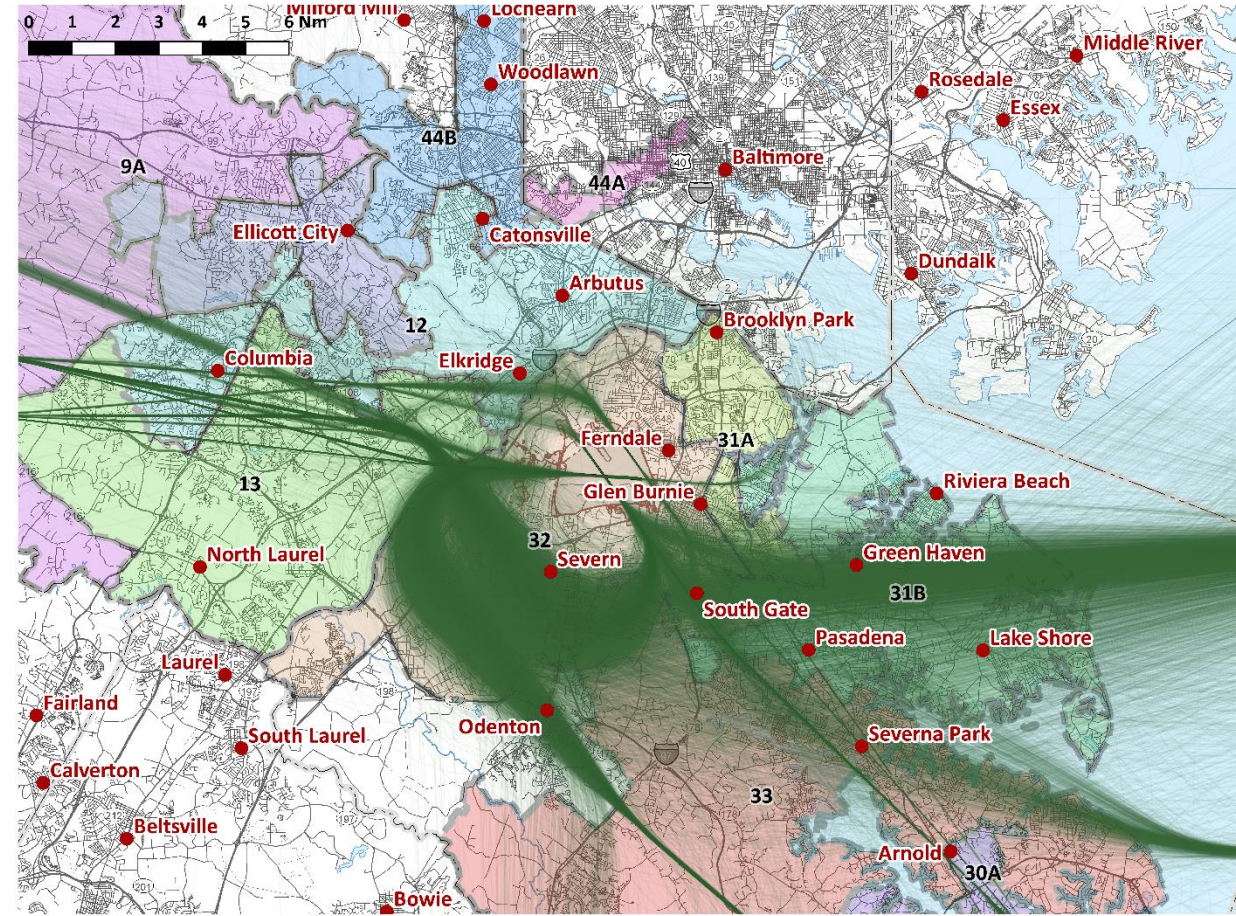
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— Arrival Flight Tracks

All Jet Departures – 2018-2019 compared to 2018-2019 Proposed (Simulated)



2018-2019 Existing departure flight tracks

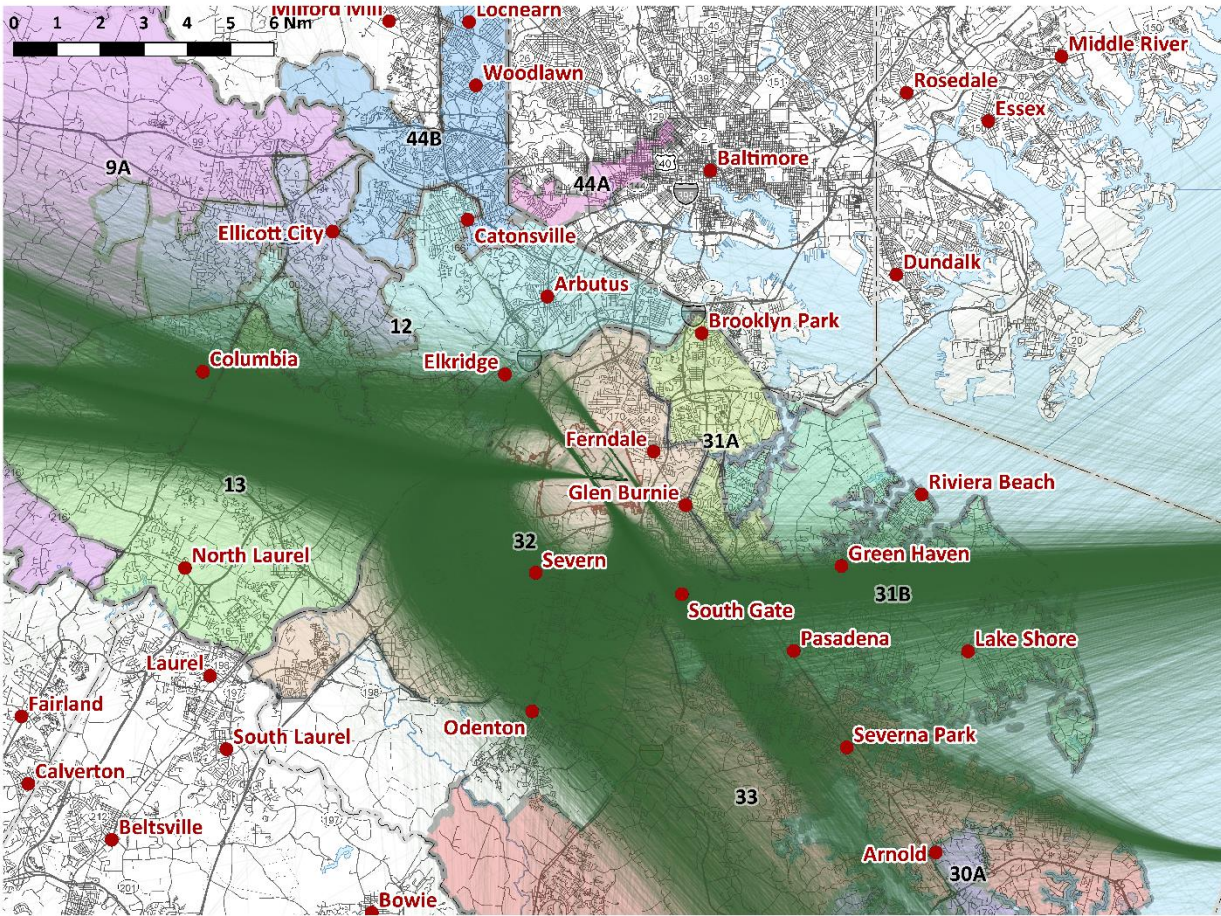


2018-2019 Proposed (Simulated) departure flight tracks

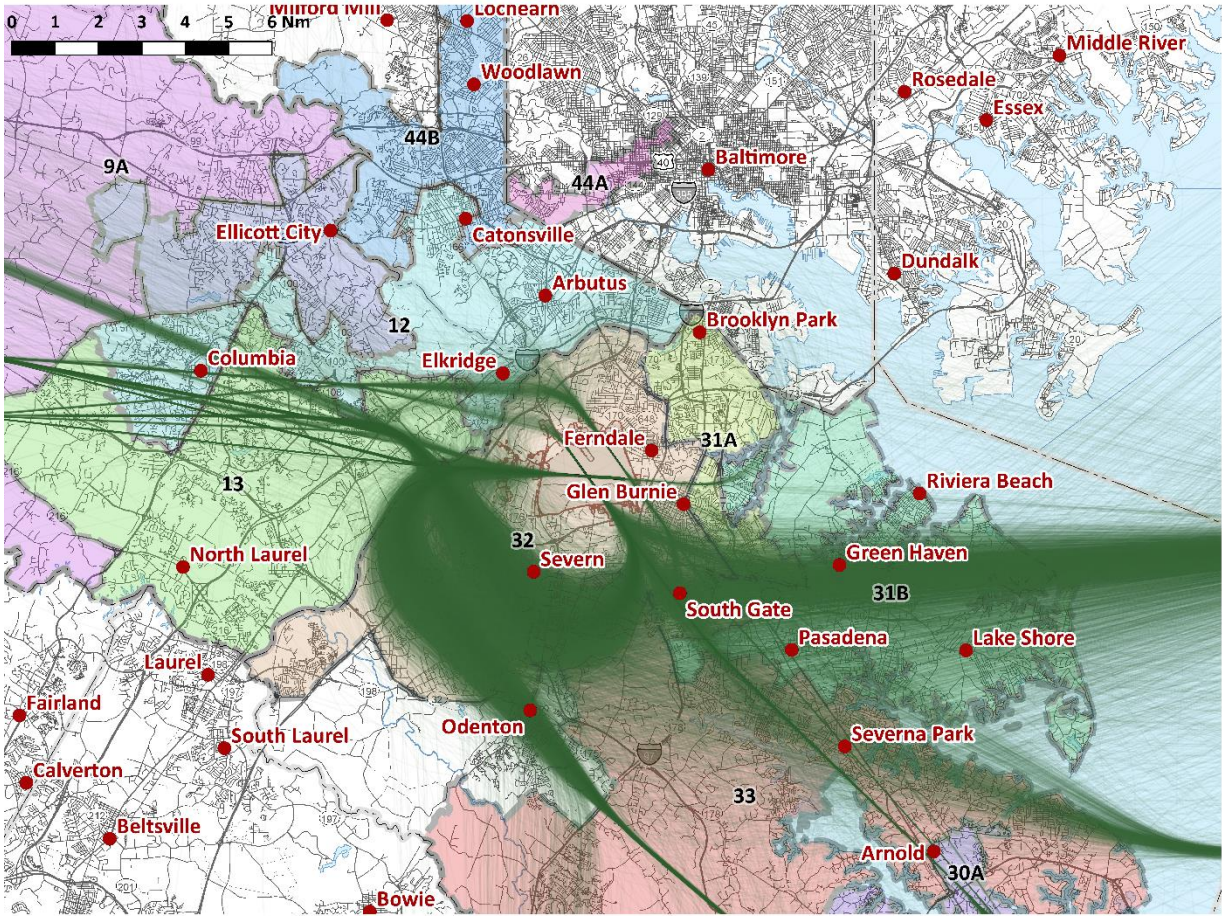
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— Departure Flight Tracks

All Jet Departures – 2012 compared to 2018-2019 Proposed (Simulated)



2012 Pre-Metroplex departure flight tracks



2018-2019 Proposed (Simulated) departure flight tracks

Legend

— Departure Flight Tracks

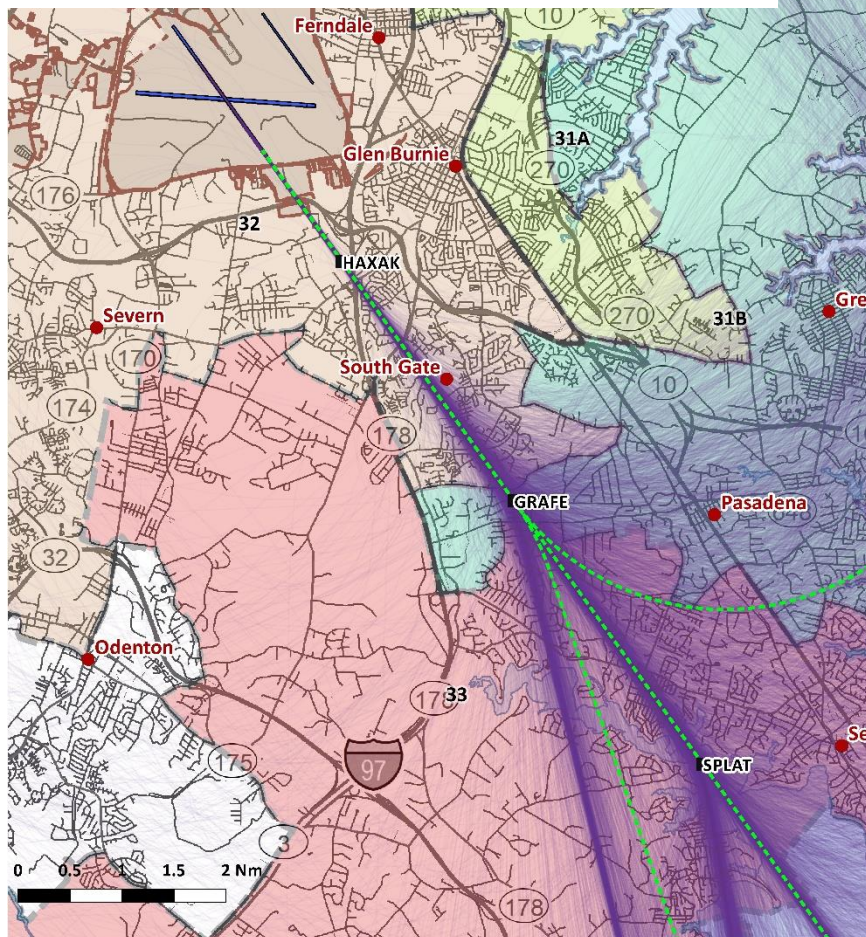




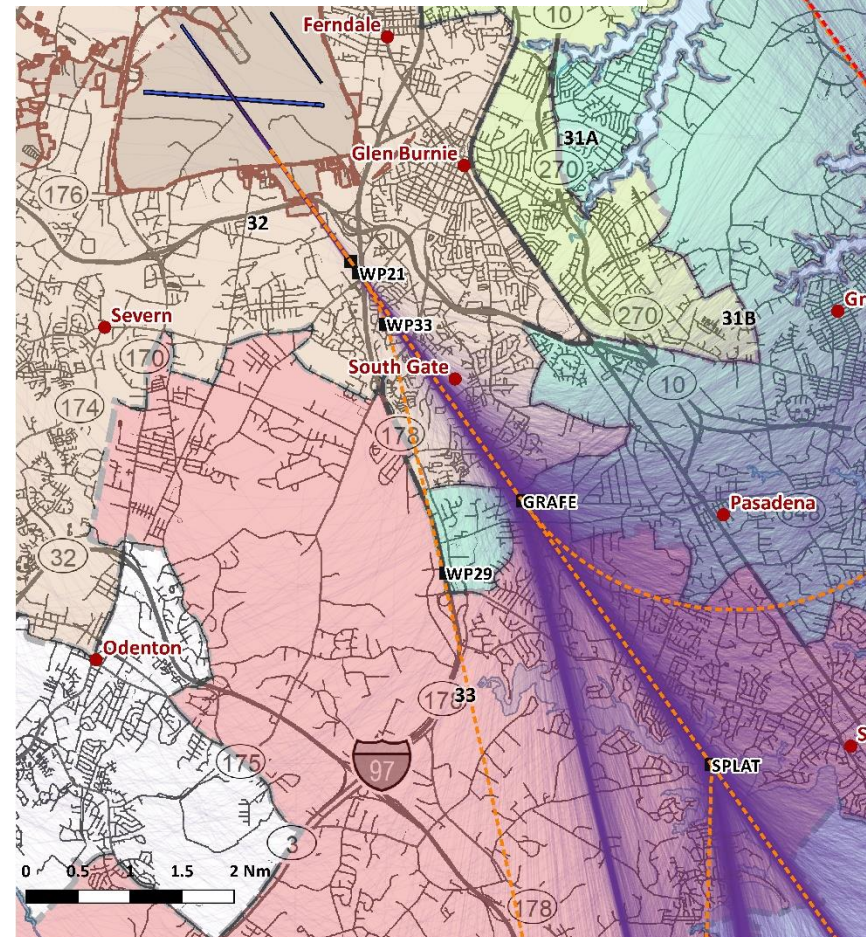
Runway 33L Arrivals—Additional Slides

RAVNN Runway 33L Arrivals and Runway 33L Approaches

Existing/Published – 2018-2019 Jet Flight Tracks



Proposed – 2018-2019 Jet Flight Tracks



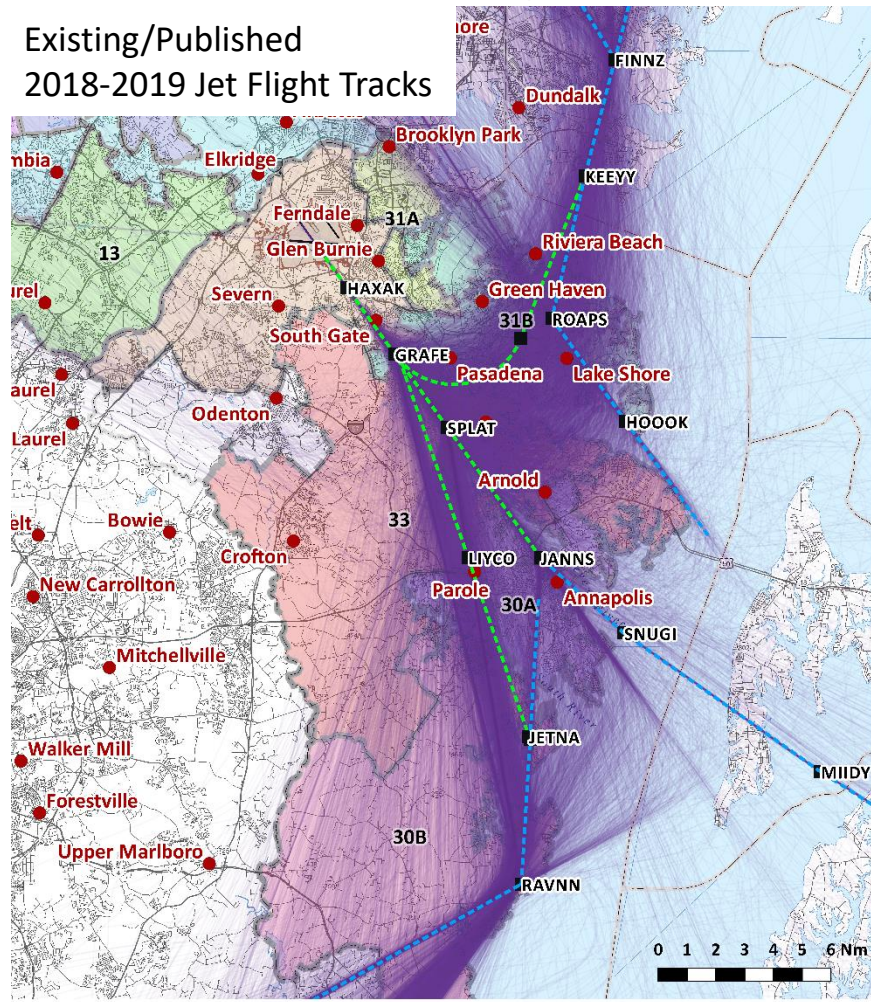
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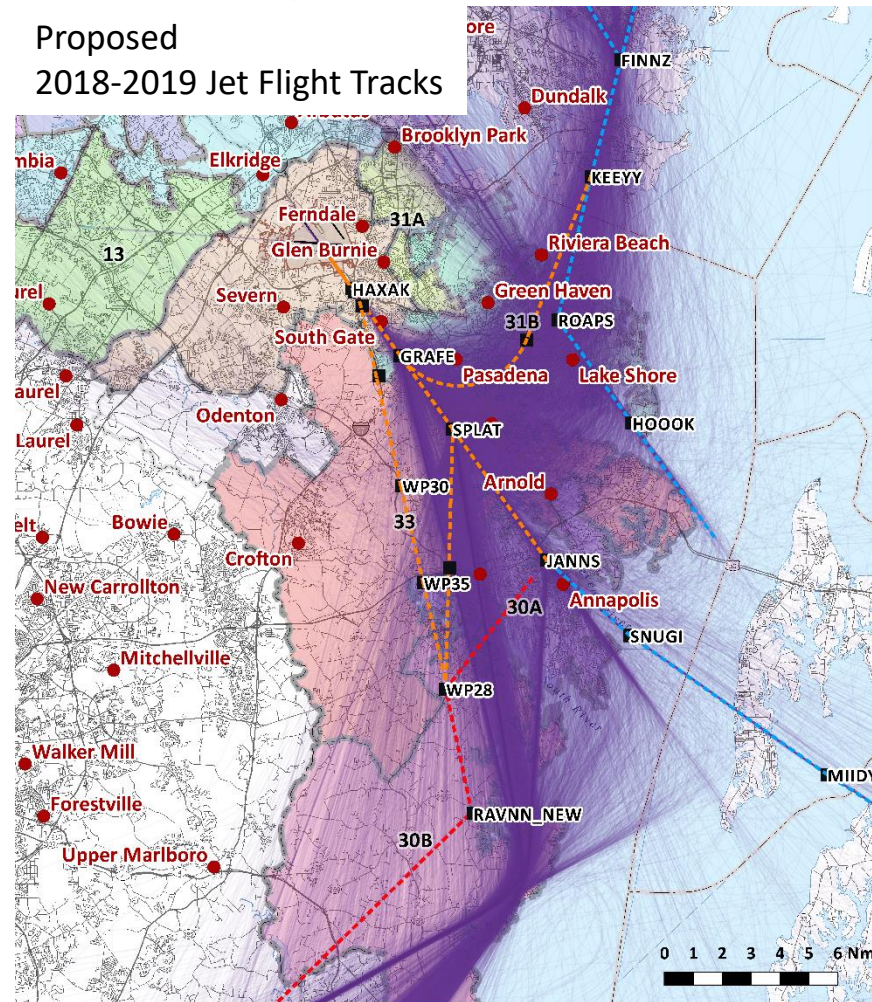
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RAVNN Runway 33L Arrivals and Runway 33L Approaches

Existing/Published
2018-2019 Jet Flight Tracks



Proposed
2018-2019 Jet Flight Tracks



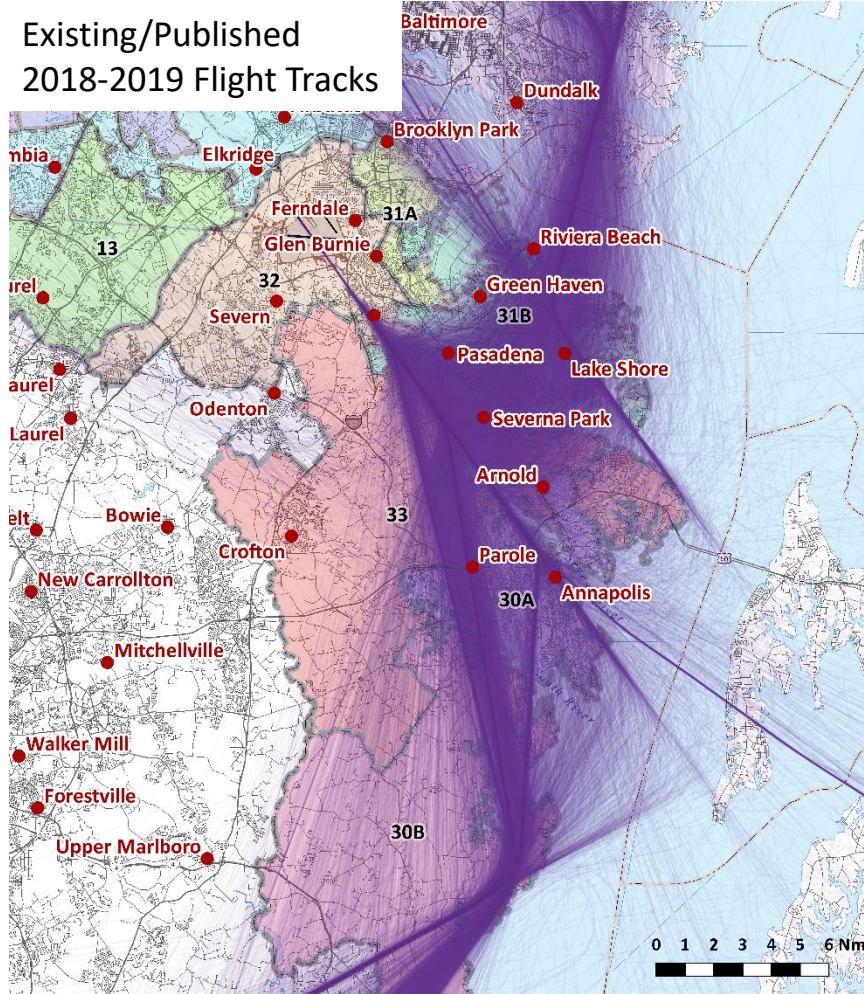
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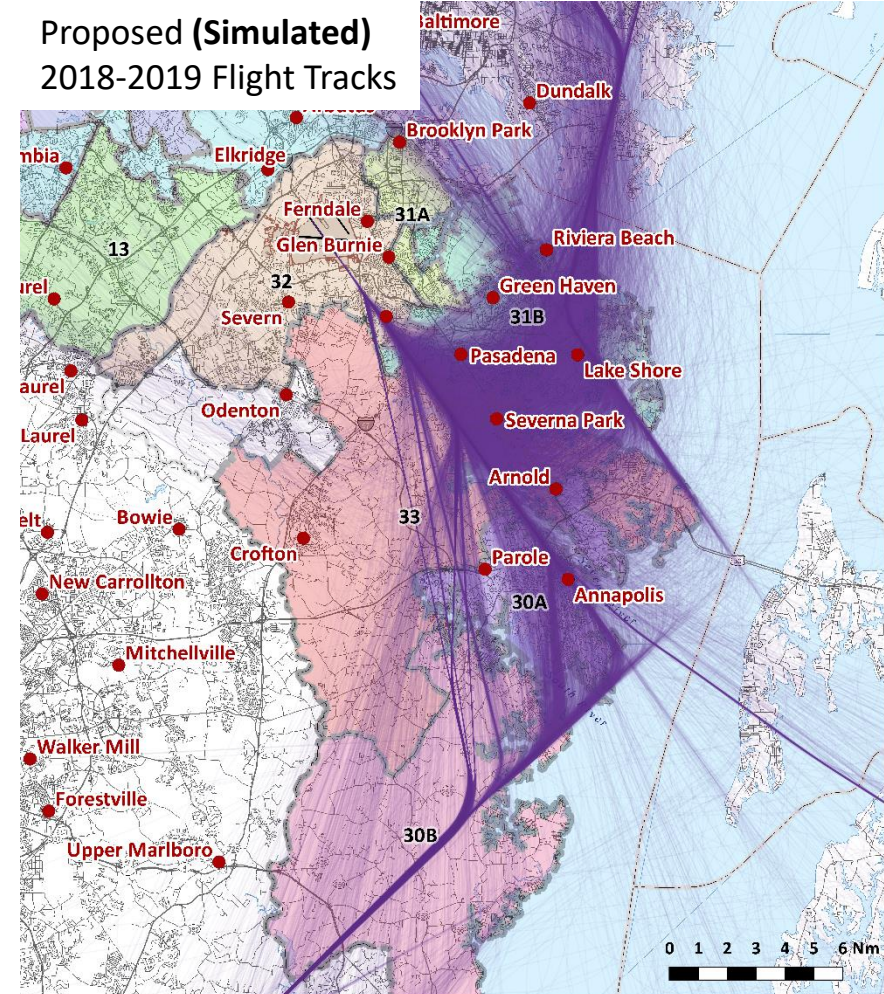
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Runway 33L Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)

Existing/Published
2018-2019 Flight Tracks



Proposed (Simulated)
2018-2019 Flight Tracks

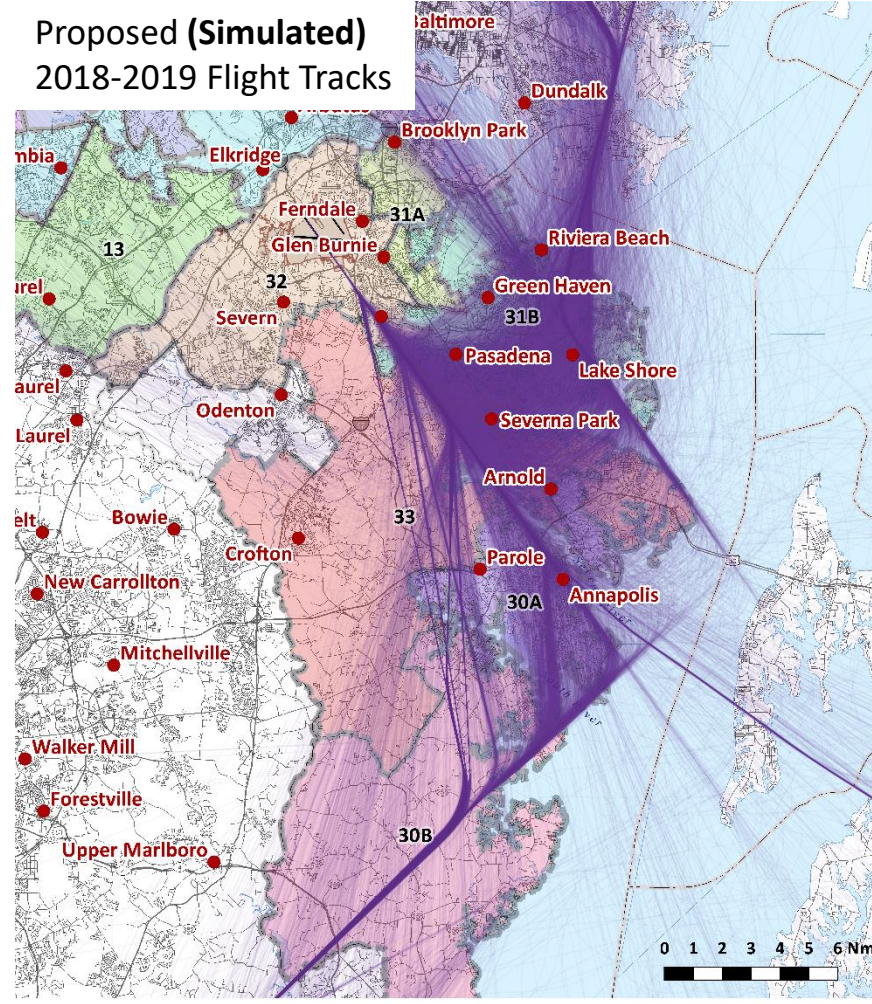
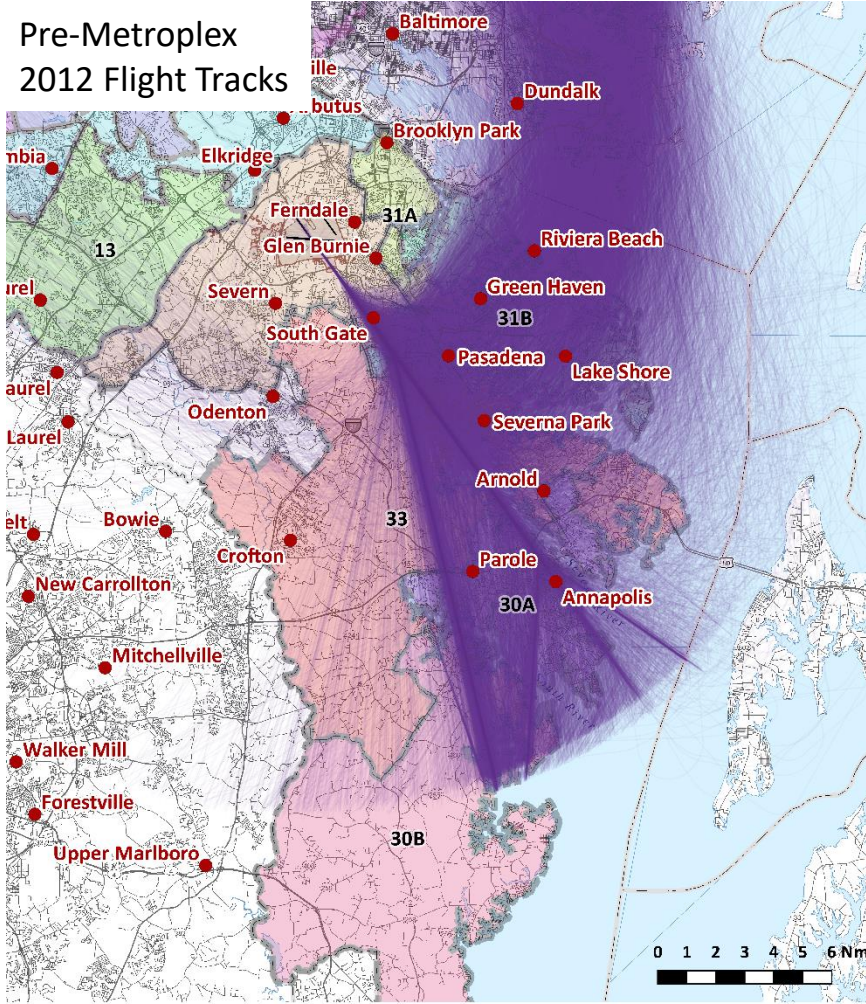


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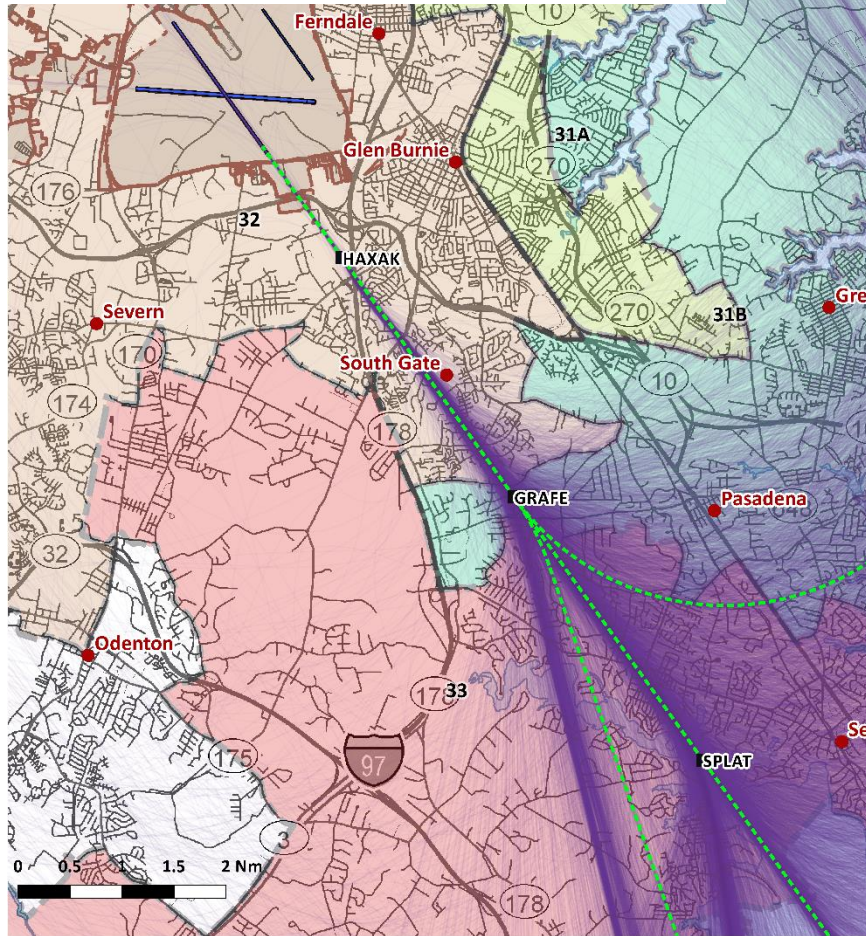
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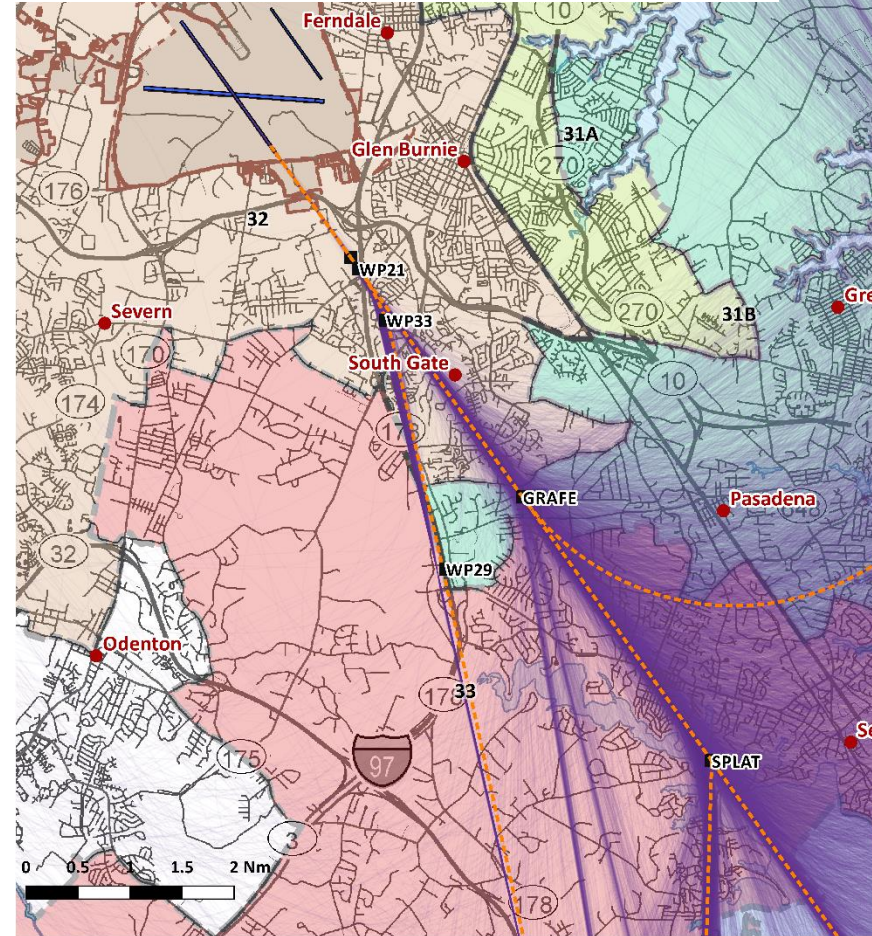


Runway 33L Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)

Existing/Published – 2018-2019 Flight Tracks



Proposed (Simulated) – 2018-2019 Flight Tracks



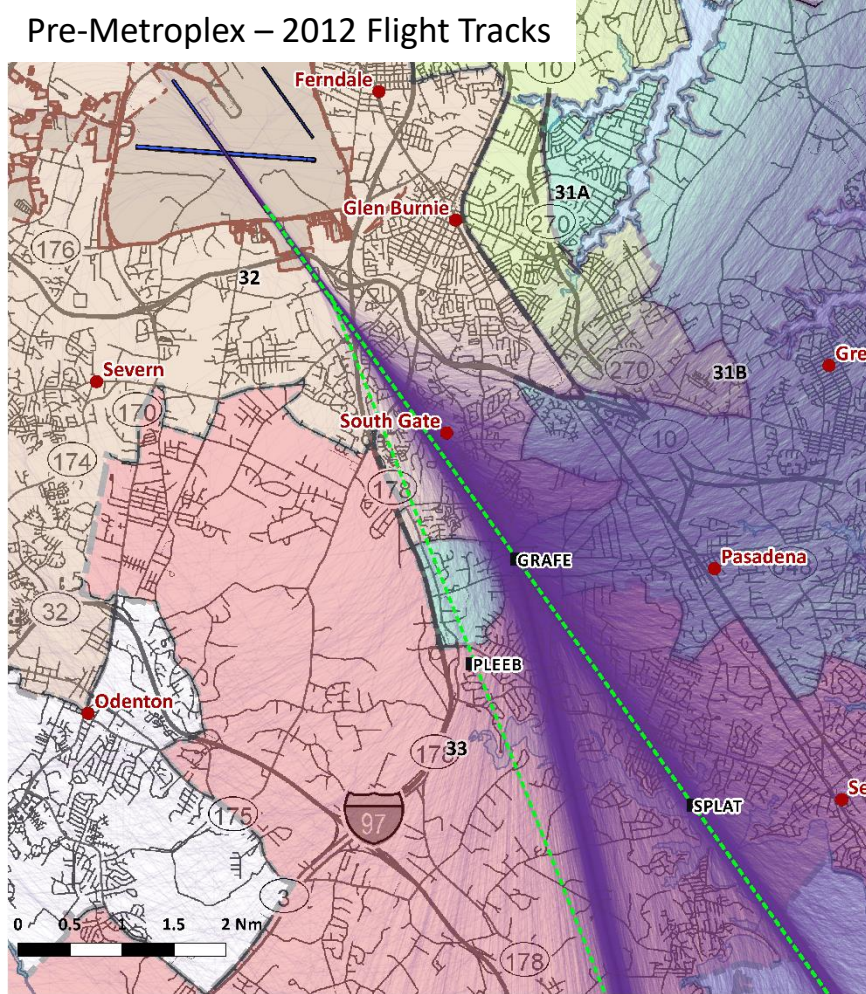
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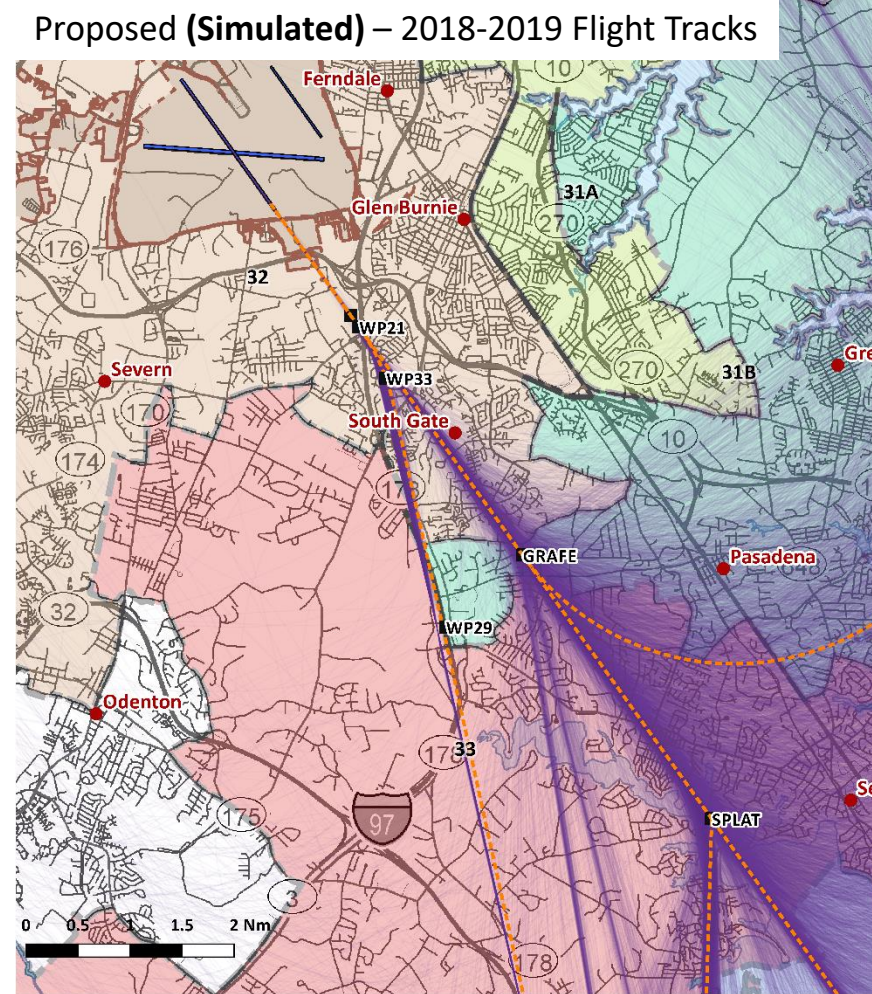
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Runway 33L Jet Arrivals – 2012 compared to 2018-2019 Proposed (Simulated)

Pre-Metroplex – 2012 Flight Tracks



Proposed (Simulated) – 2018-2019 Flight Tracks



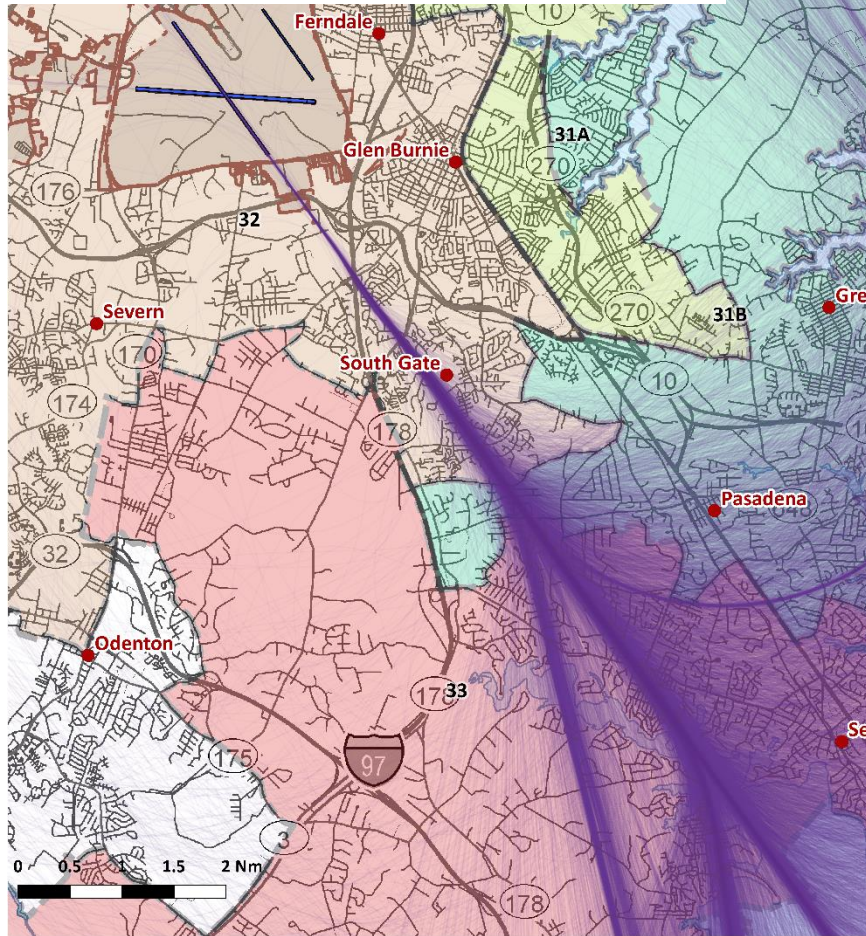
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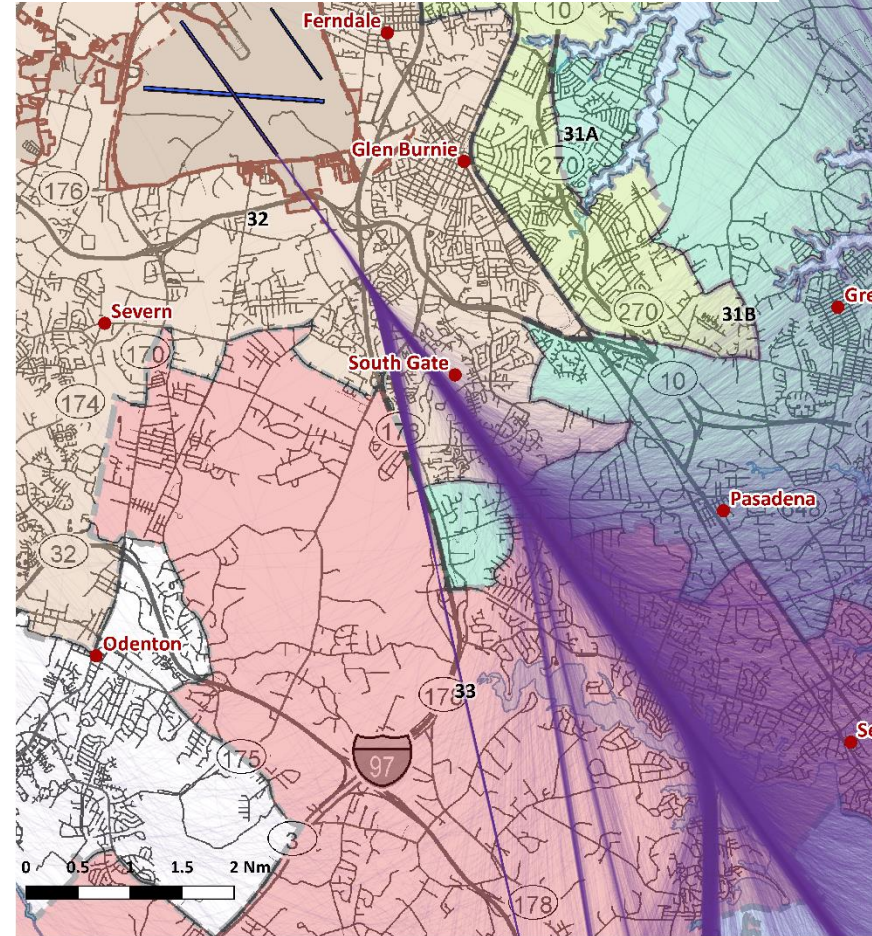
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Existing/Published – 2018-2019 Flight Tracks



Proposed (Simulated) – 2018-2019 Flight Tracks



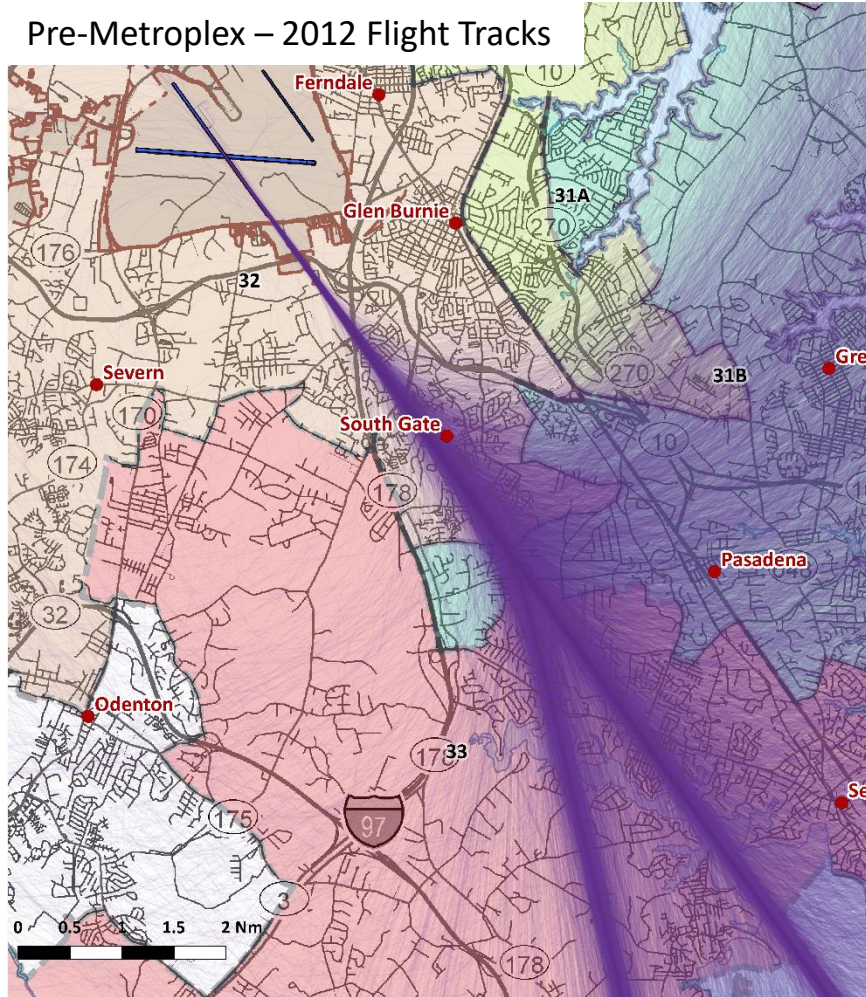
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- Arrival Flight Tracks

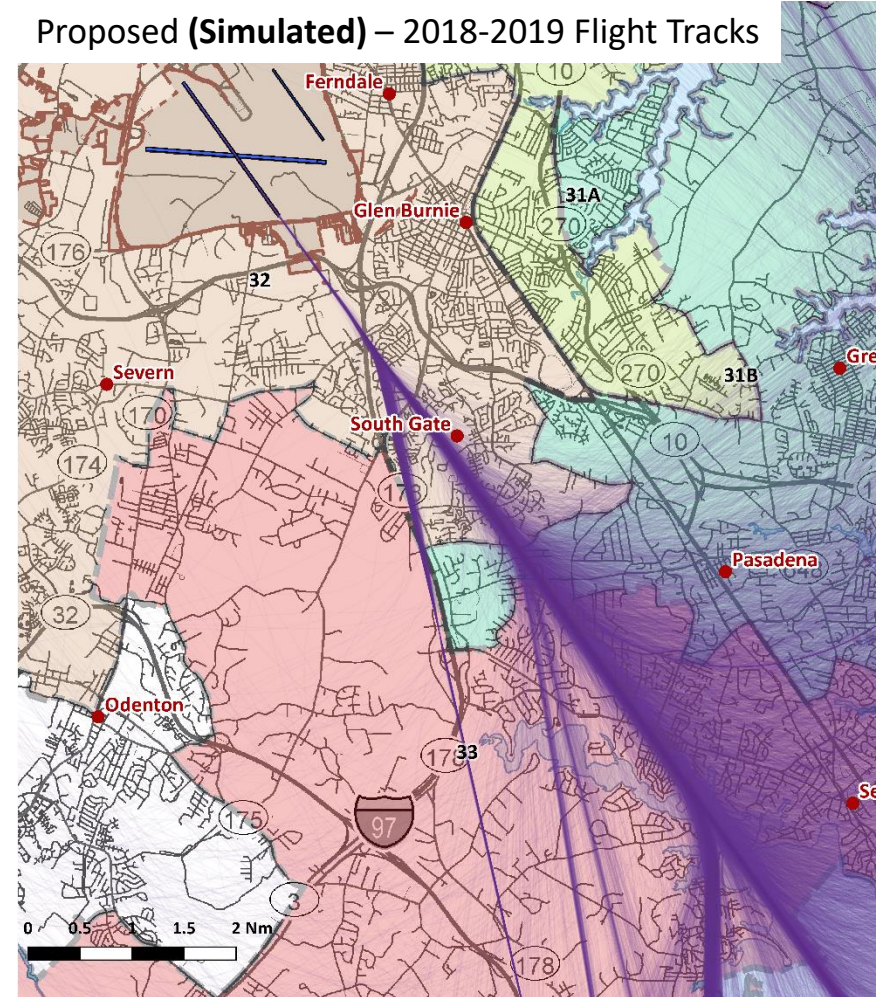
Pre-Decisional: For informational purposes only

Runway 33L Jet Arrivals – 2012 compared to 2018-2019 Proposed (Simulated)

Pre-Metroplex – 2012 Flight Tracks



Proposed (Simulated) – 2018-2019 Flight Tracks

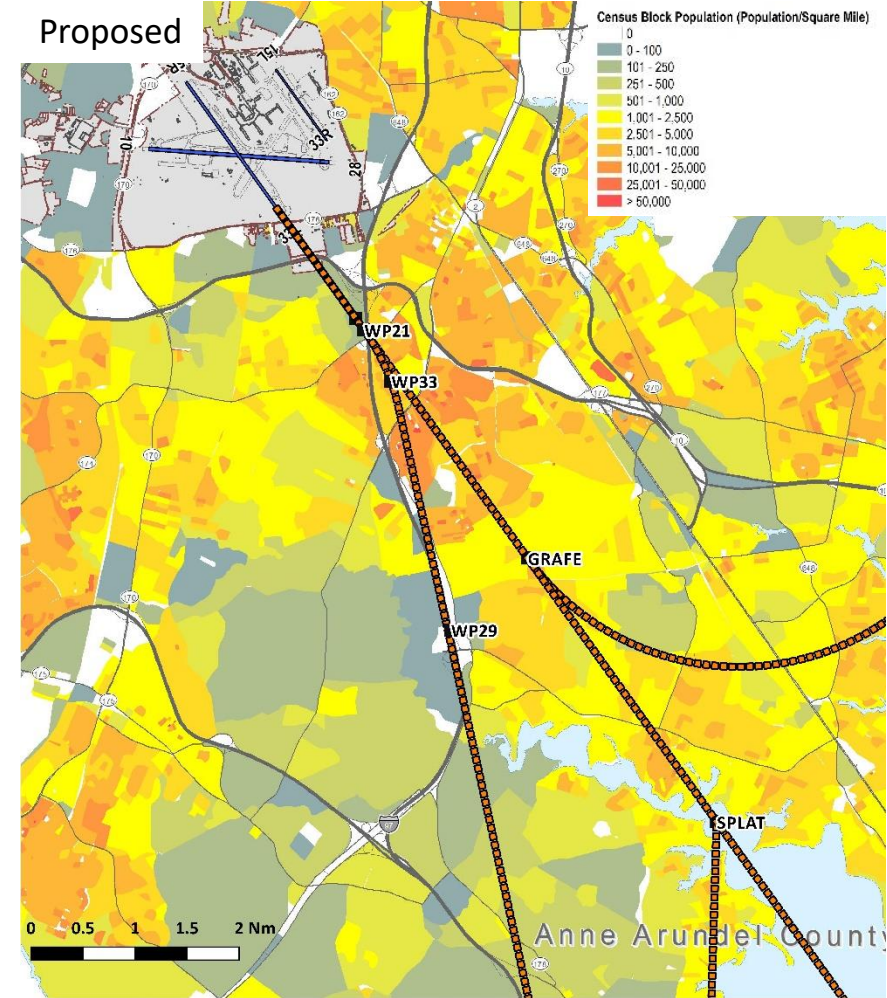
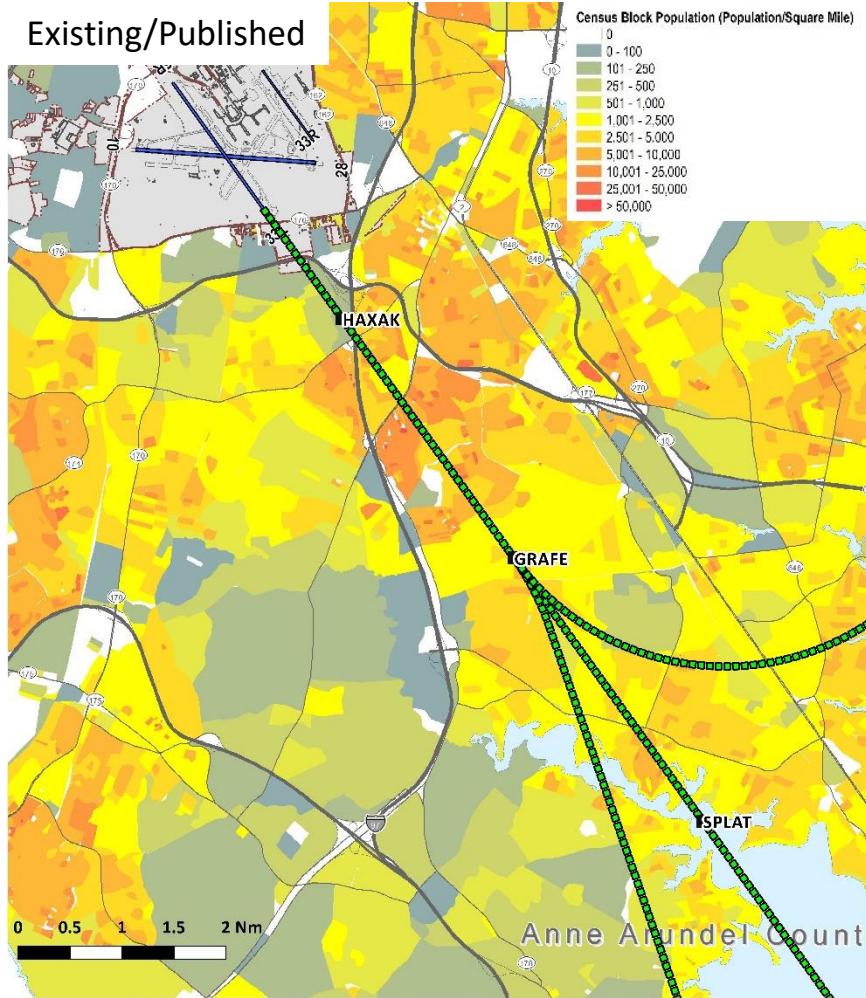


Legend

- Navigational Points
- Proposed Arrival Procedure Changes
- Proposed Approach Procedure Changes
- Existing Published Arrival Procedures
- Existing Published Approach Procedures
- Arrival Flight Tracks

Pre-Decisional: For informational purposes only

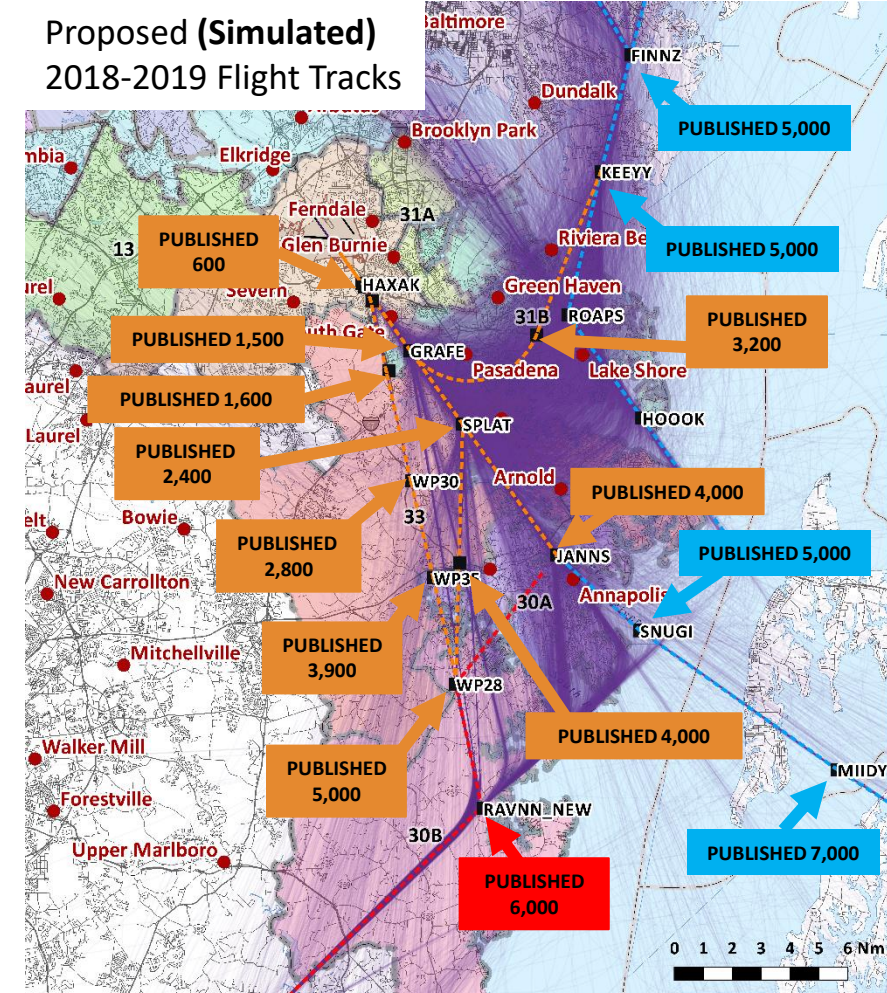
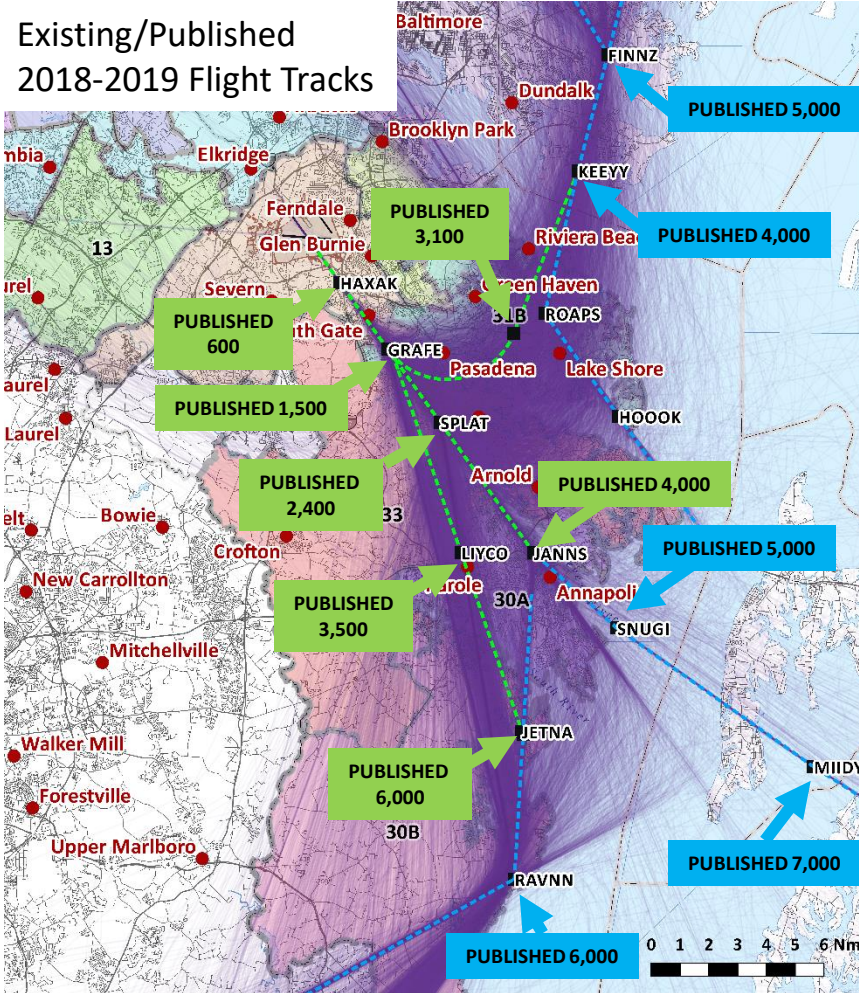
Runway 33L Arrivals/Approaches – Population 2019 compared to Proposed



Legend

- Navigational Points
 - Proposed Arrival Procedure Changes
 - Existing Published Arrival Procedures
 - Proposed Approach Procedure Changes
 - Existing Published Approach Procedures
 - Arrival Flight Tracks
- Pre-Decisional: For informational purposes only

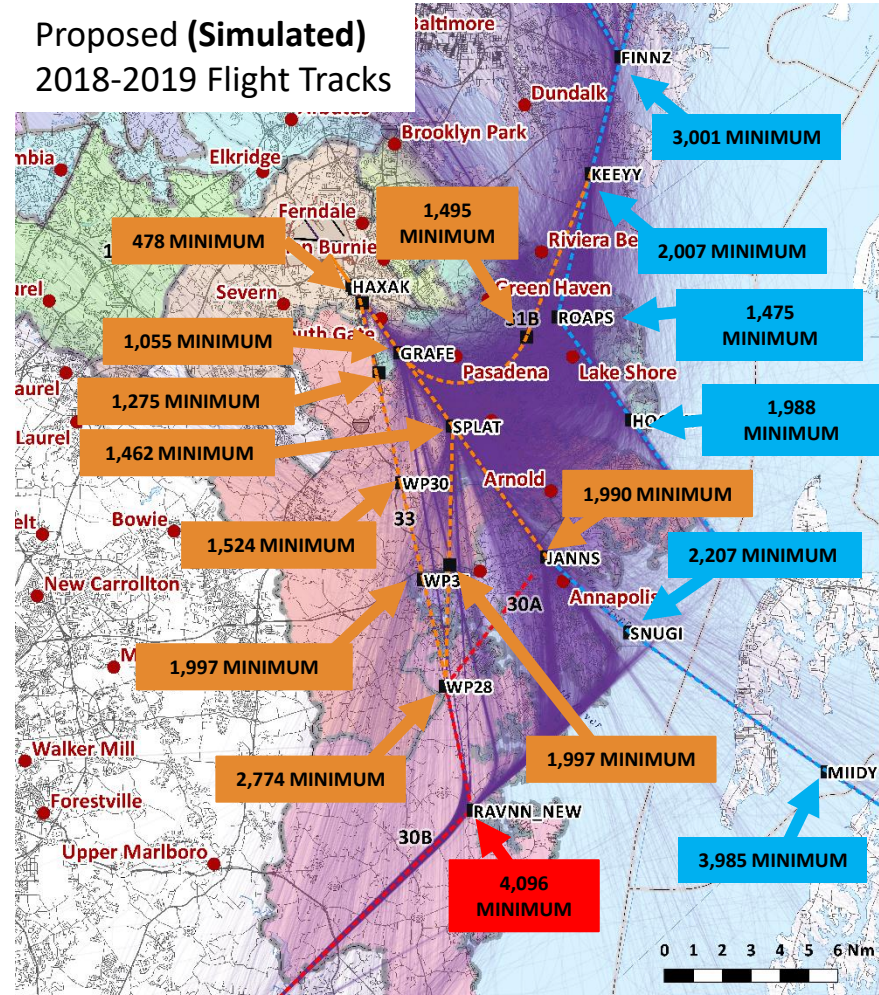
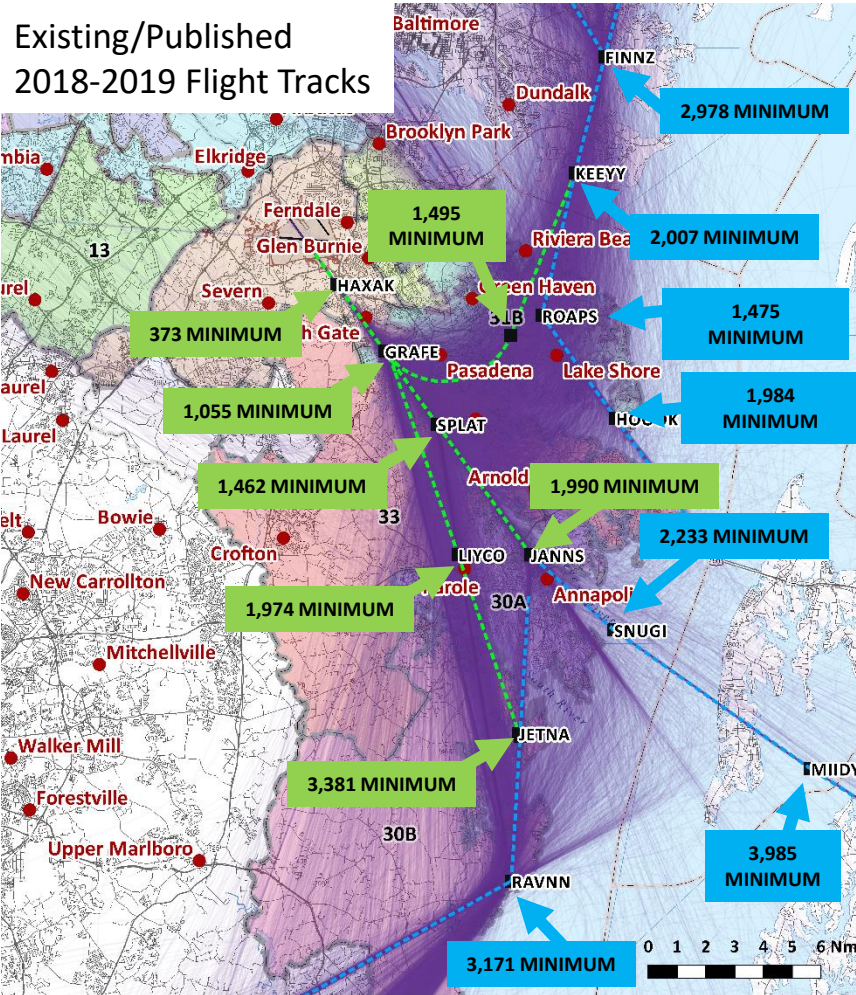
Runway 33L Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)



Legend

- Navigational Points
 - Proposed Arrival Procedure Changes
 - Existing Published Arrival Procedures
 - Existing Published Approach Procedures
 - Proposed Approach Procedure Changes
 - Arrival Flight Tracks
- Pre-Decisional: For informational purposes only

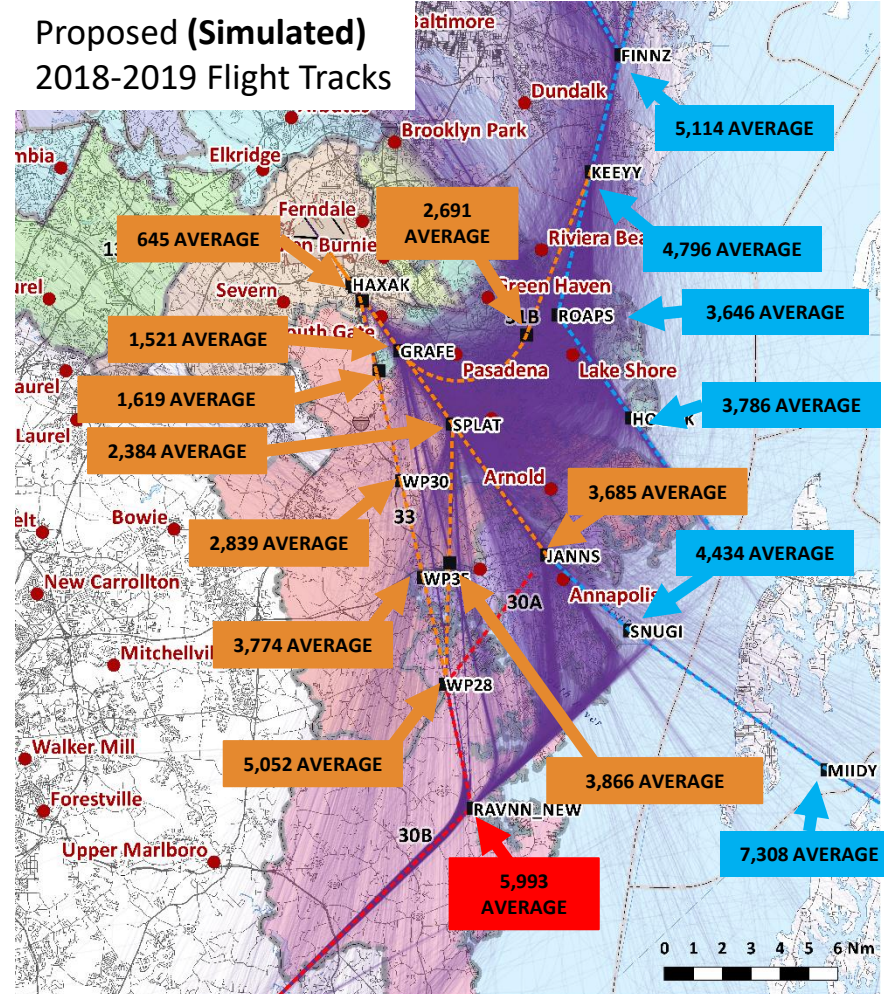
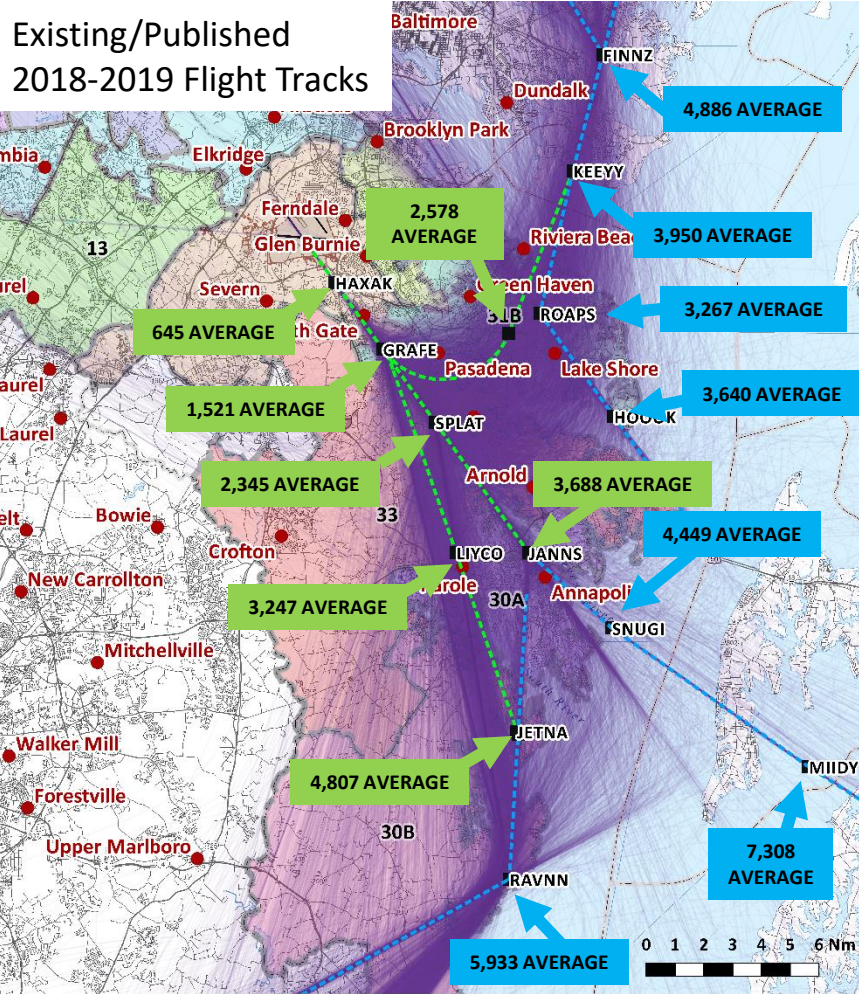
Runway 33L Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)



Legend

- Navigational Points
 - Proposed Arrival Procedure Changes
 - Existing Published Arrival Procedures
 - Existing Published Approach Procedures
 - Proposed Approach Procedure Changes
 - Arrival Flight Tracks
- Pre-Decisional: For informational purposes only

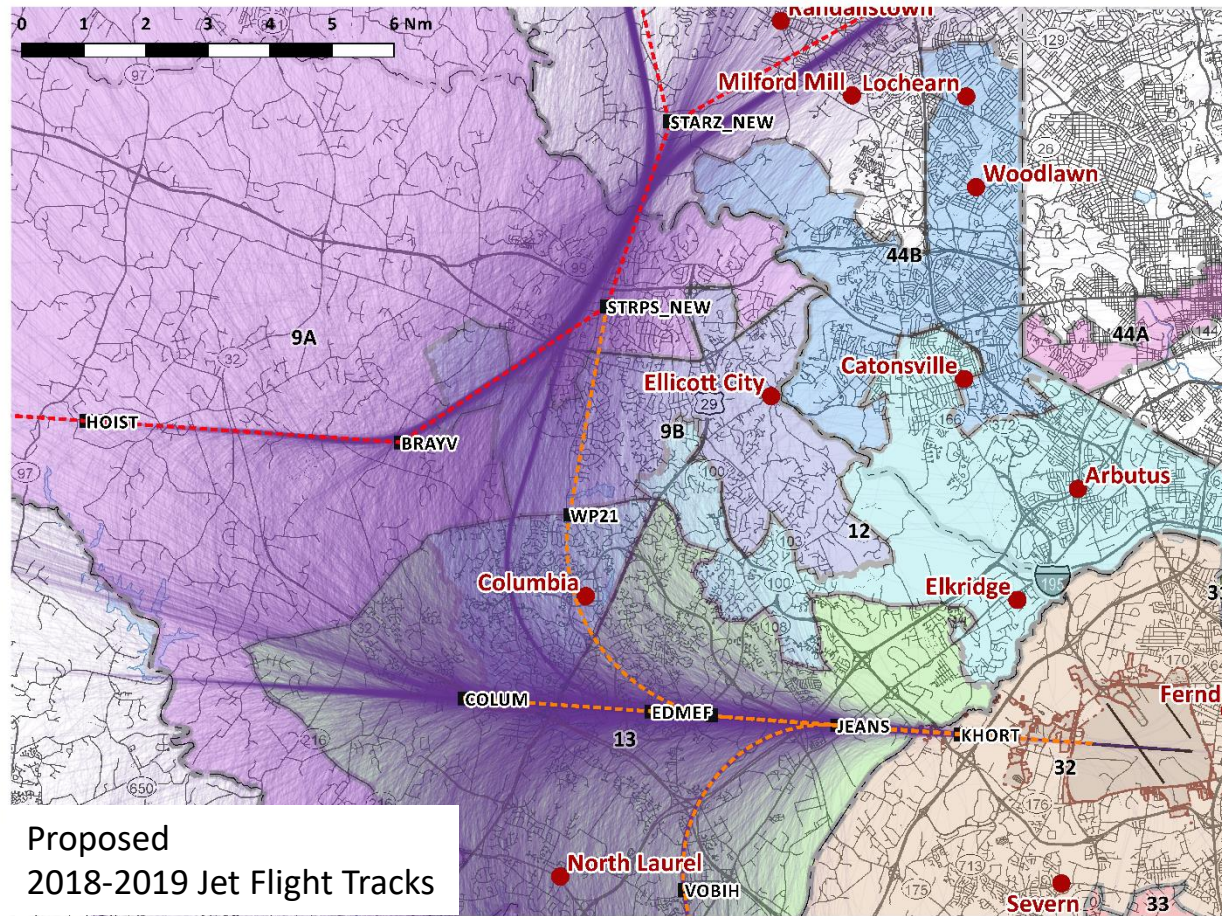
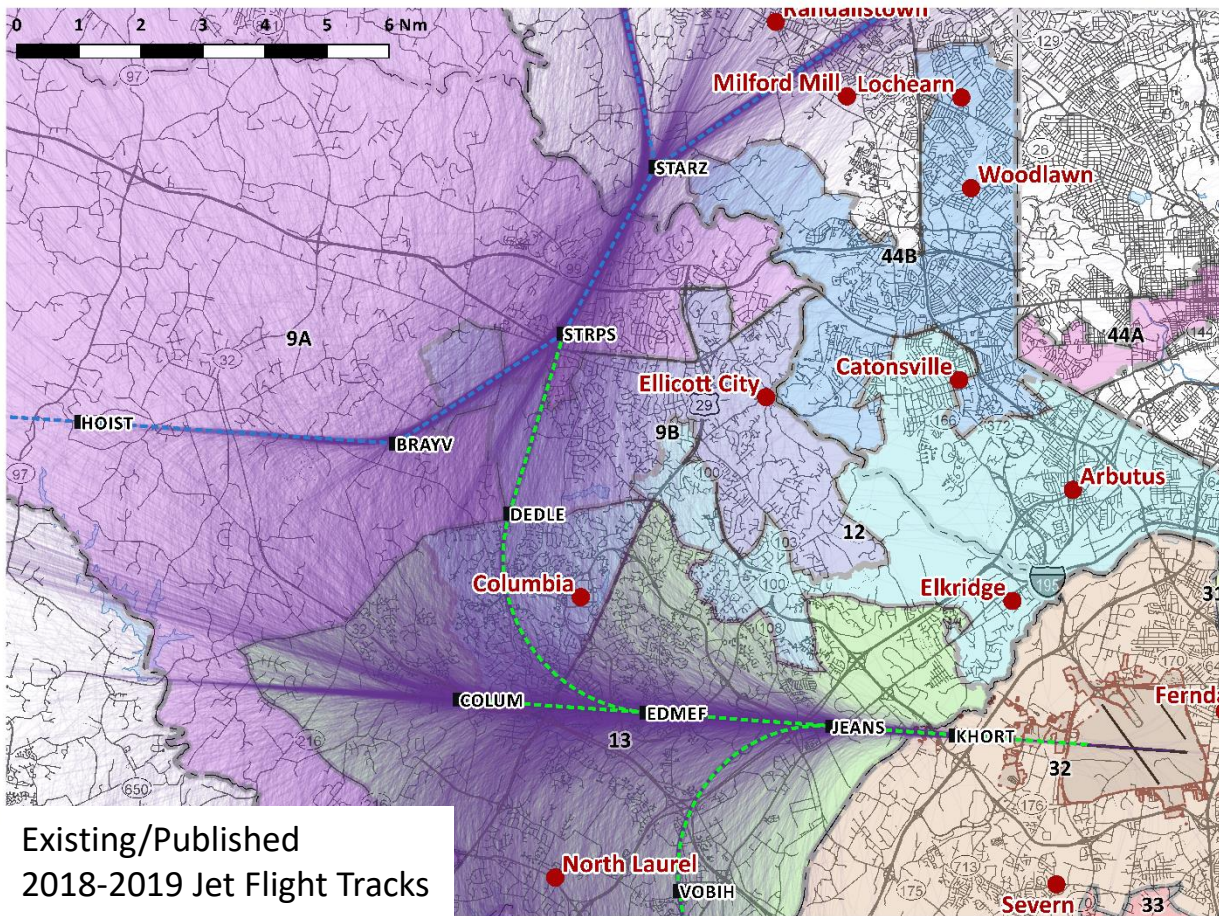
Runway 33L Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)



- Legend**
- Navigational Points
 - Proposed Arrival Procedure Changes
 - Existing Published Arrival Procedures
 - Existing Published Approach Procedures
 - Proposed Approach Procedure Changes
 - Arrival Flight Tracks
- Pre-Decisional: For informational purposes only

Runway 10 Arrivals—Additional Slides

ANTHM and TRISH Runway 10 Arrivals and Runway 10 Approaches

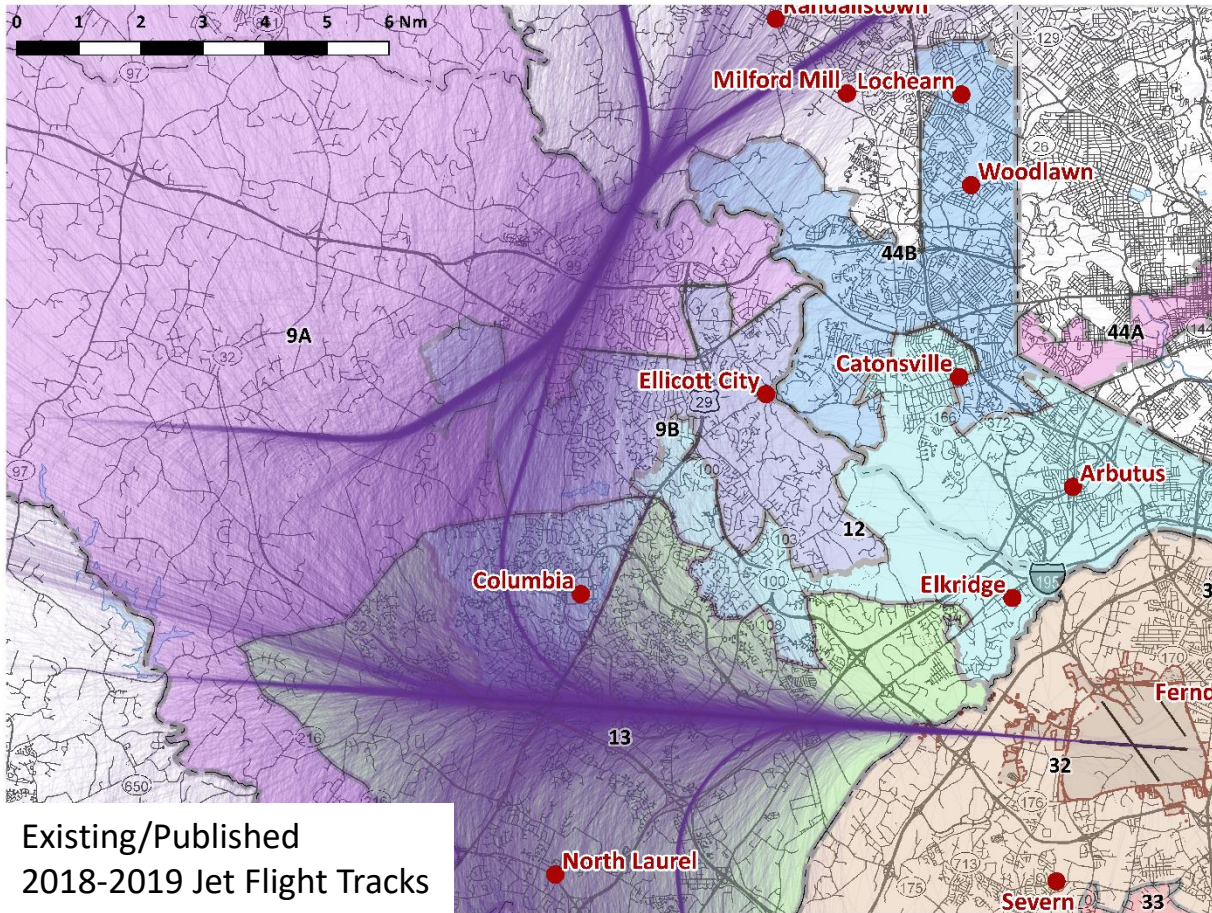


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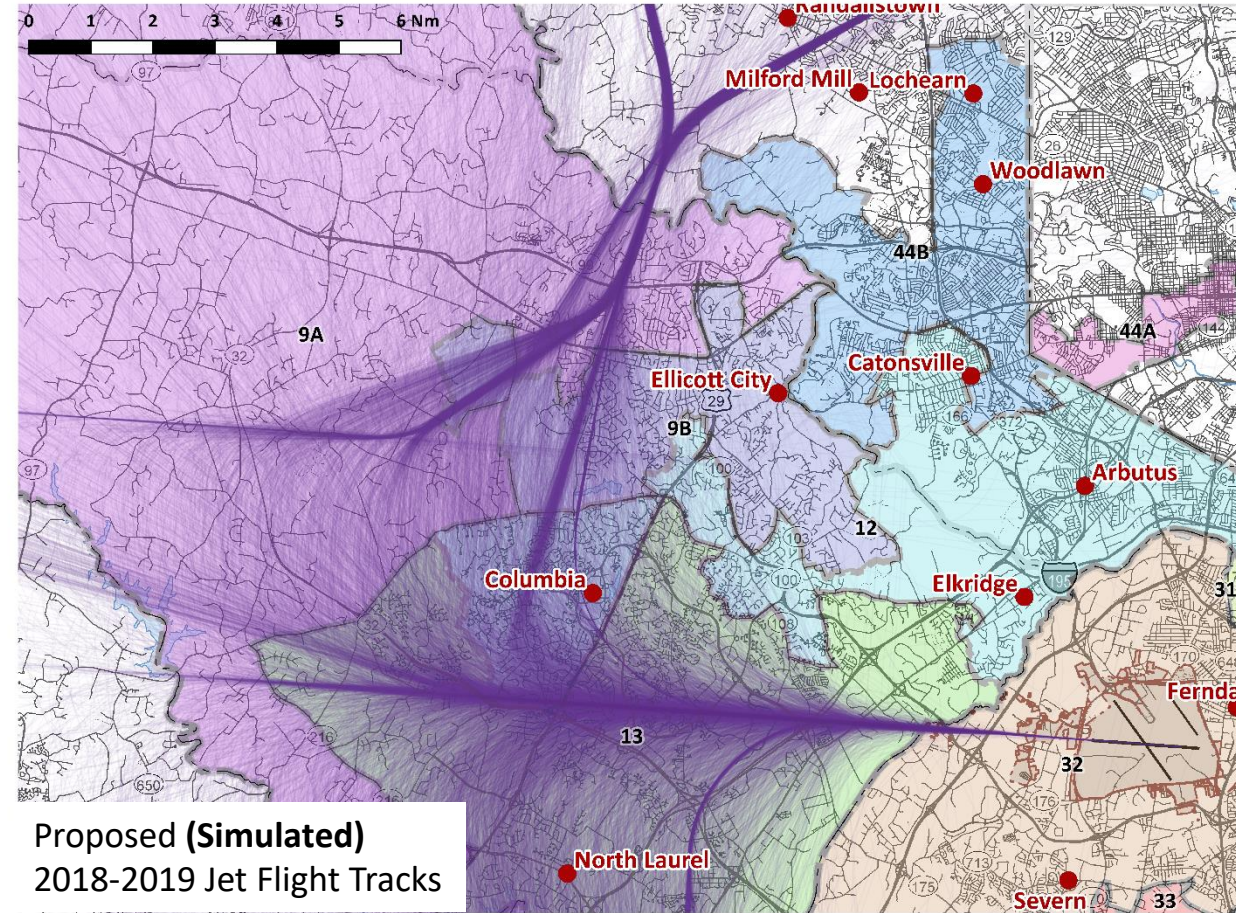
- Navigational Points
- Proposed Arrival Procedure Changes
- Existing Published Arrival Procedures
- Proposed Approach Procedure Changes
- Existing Published Approach Procedures
- Arrival Flight Tracks

Pre-Decisional: For informational purposes only

Runway 10 Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)



Existing/Published
2018-2019 Jet Flight Tracks



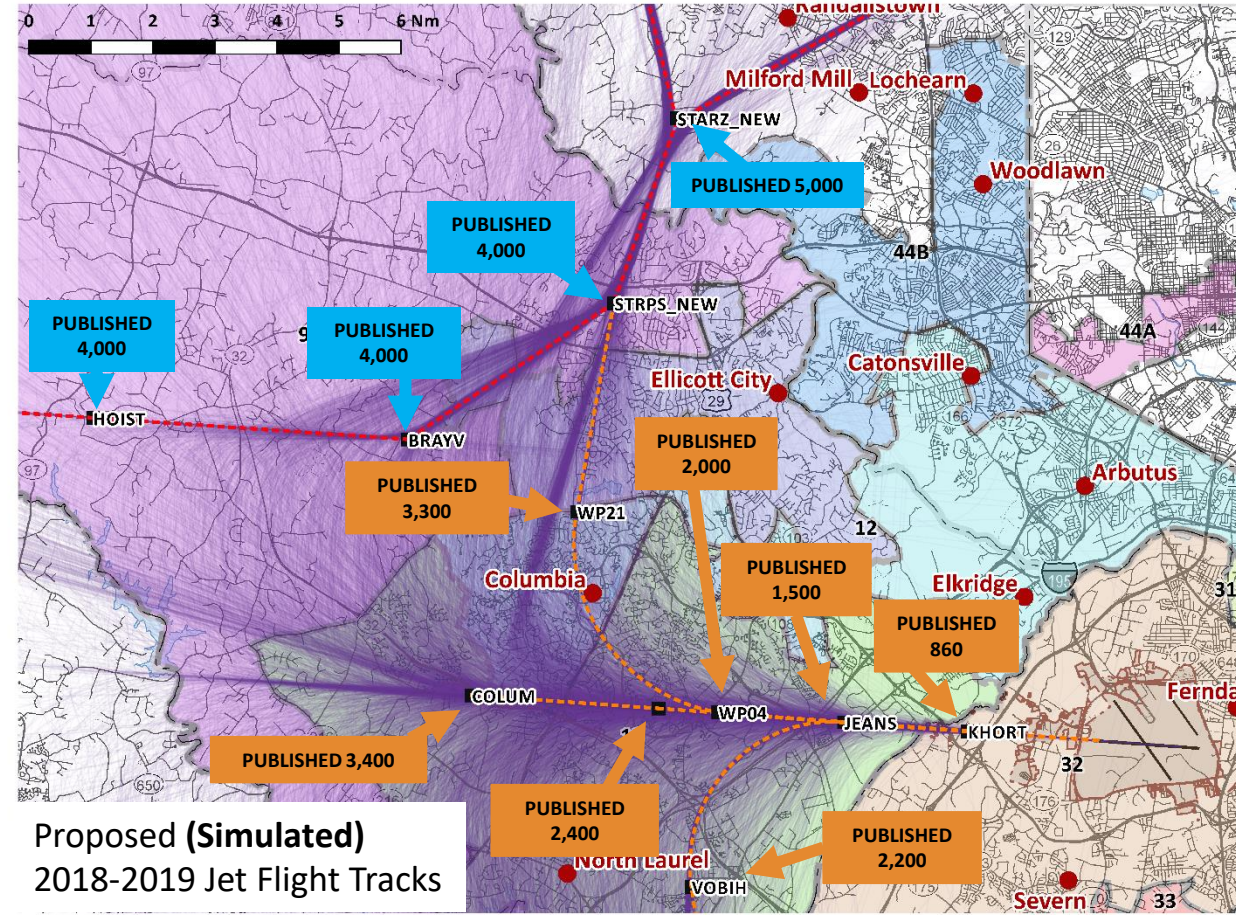
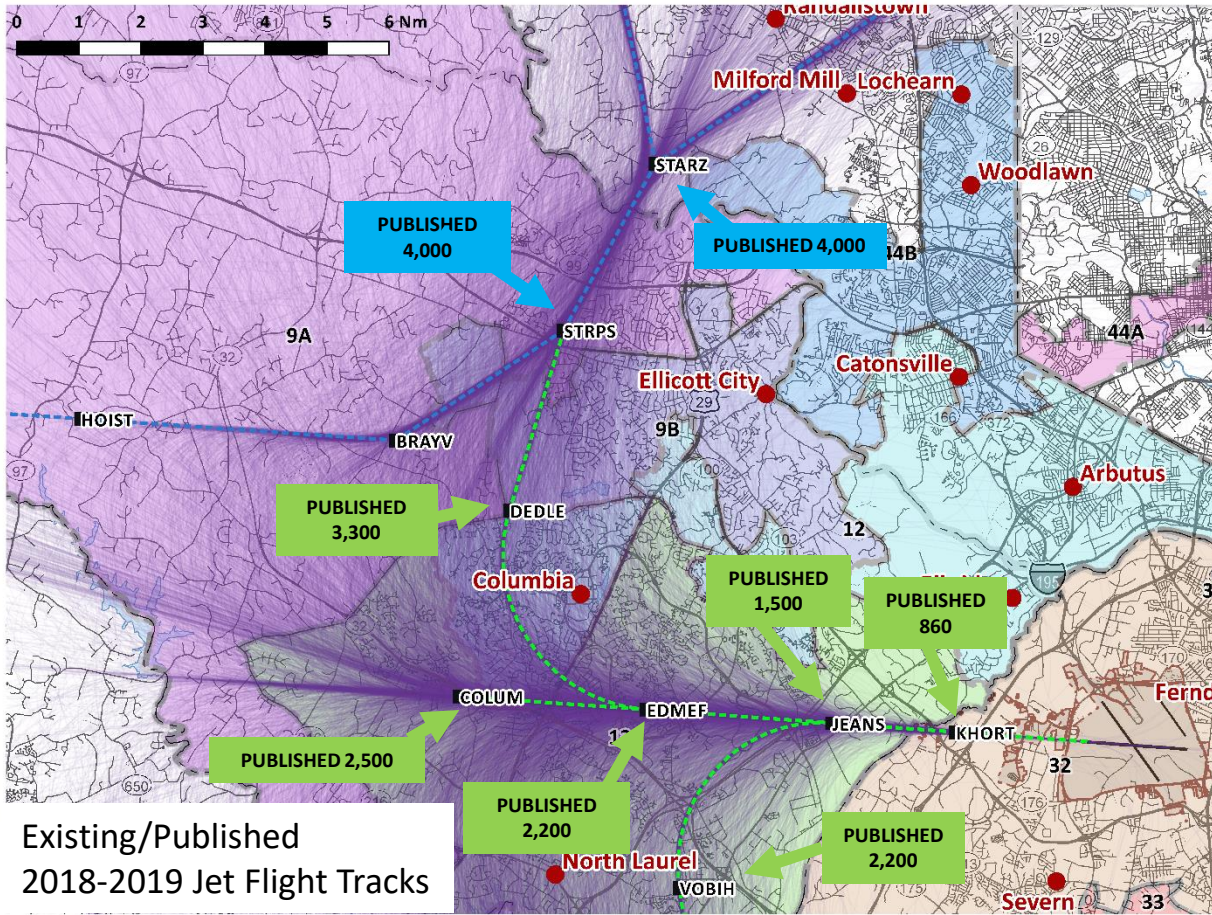
Proposed (Simulated)
2018-2019 Jet Flight Tracks

Legend

- Navigational Points
- Proposed Arrival Procedure Changes
- Existing Published Arrival Procedures
- Proposed Approach Procedure Changes
- Existing Published Approach Procedures
- Arrival Flight Tracks

Pre-Decisional: For informational purposes only

Runway 10 Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)

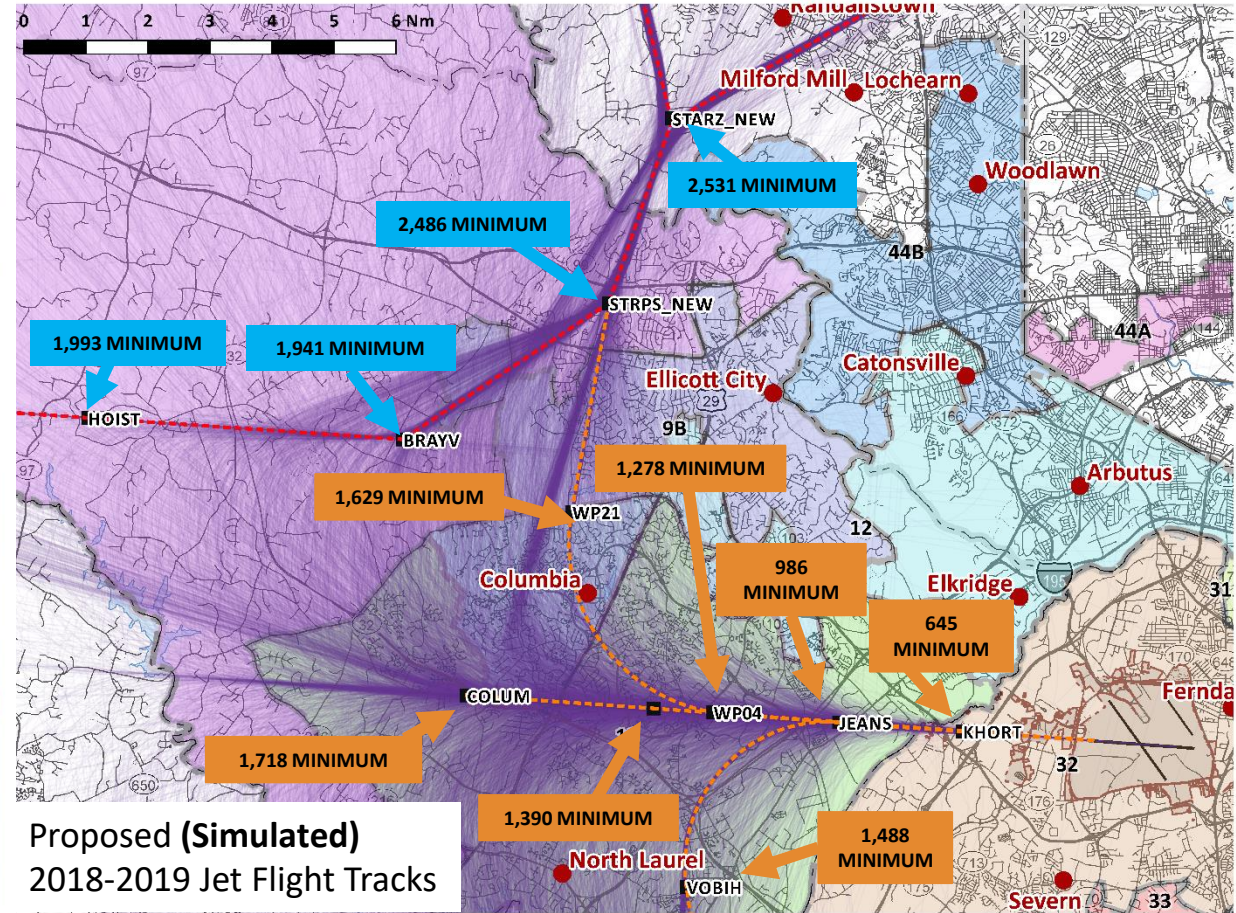
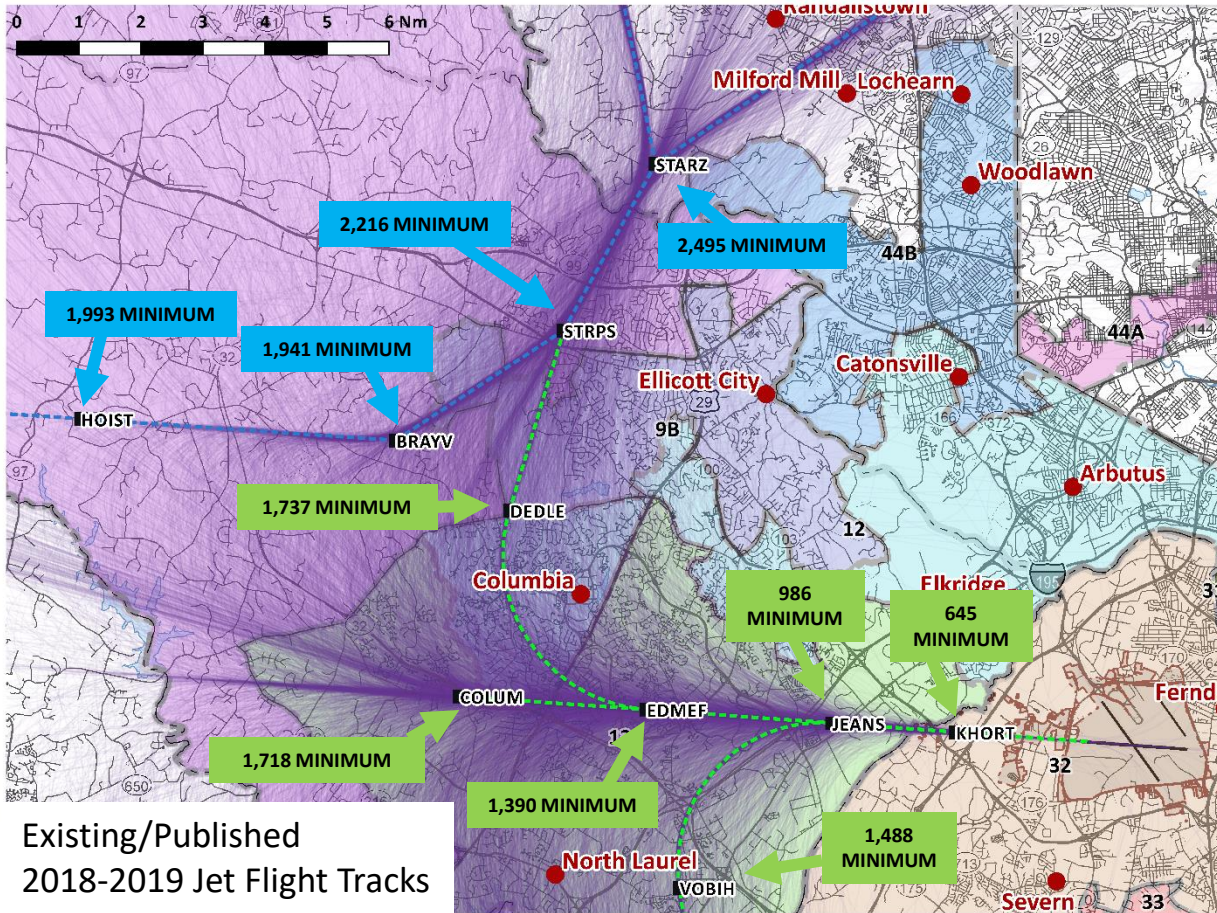


Legend

- Navigational Points
- Proposed Arrival Procedure Changes
- Existing Published Arrival Procedures
- Existing Published Approach Procedures
- Proposed Approach Procedure Changes
- Arrival Flight Tracks

Pre-Decisional: For informational purposes only

Runway 10 Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)

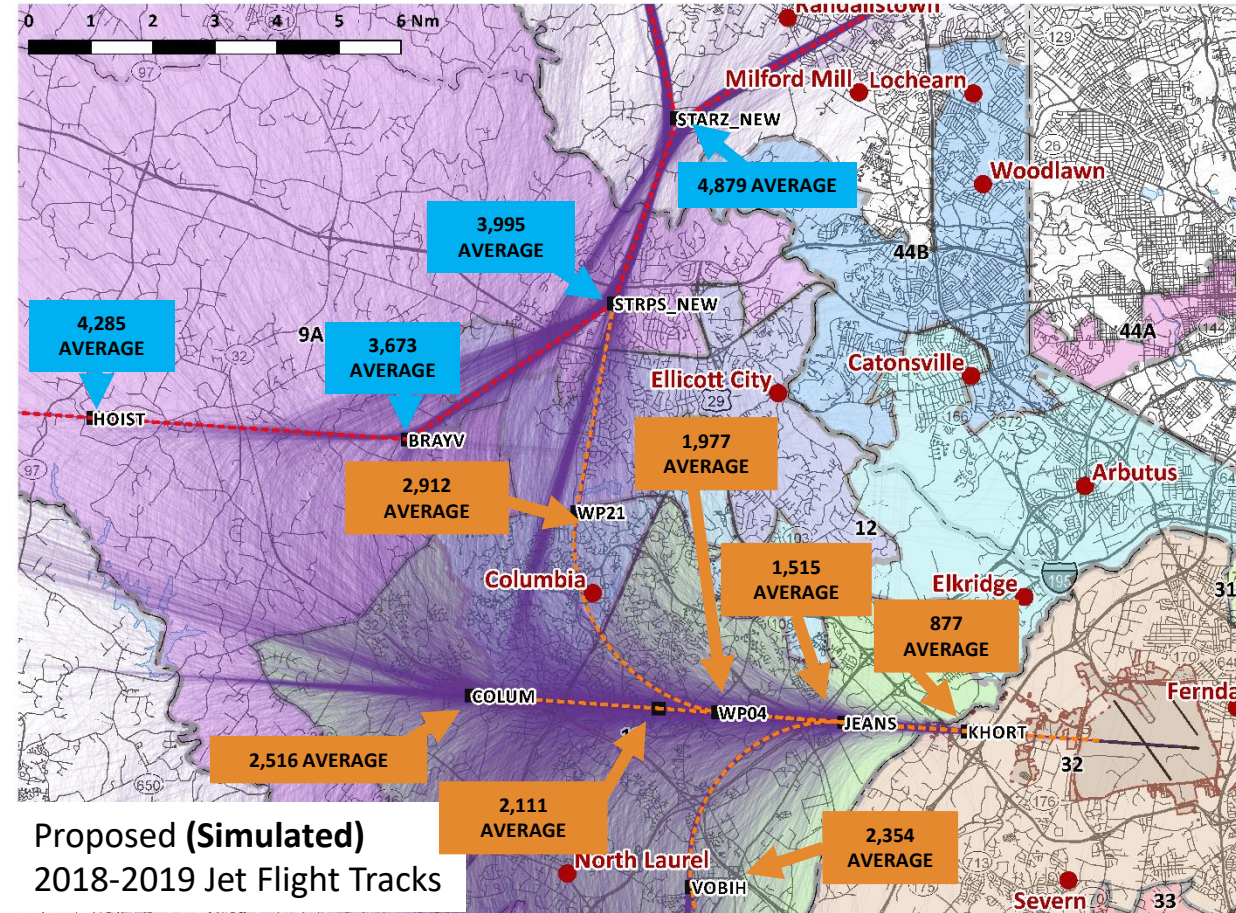
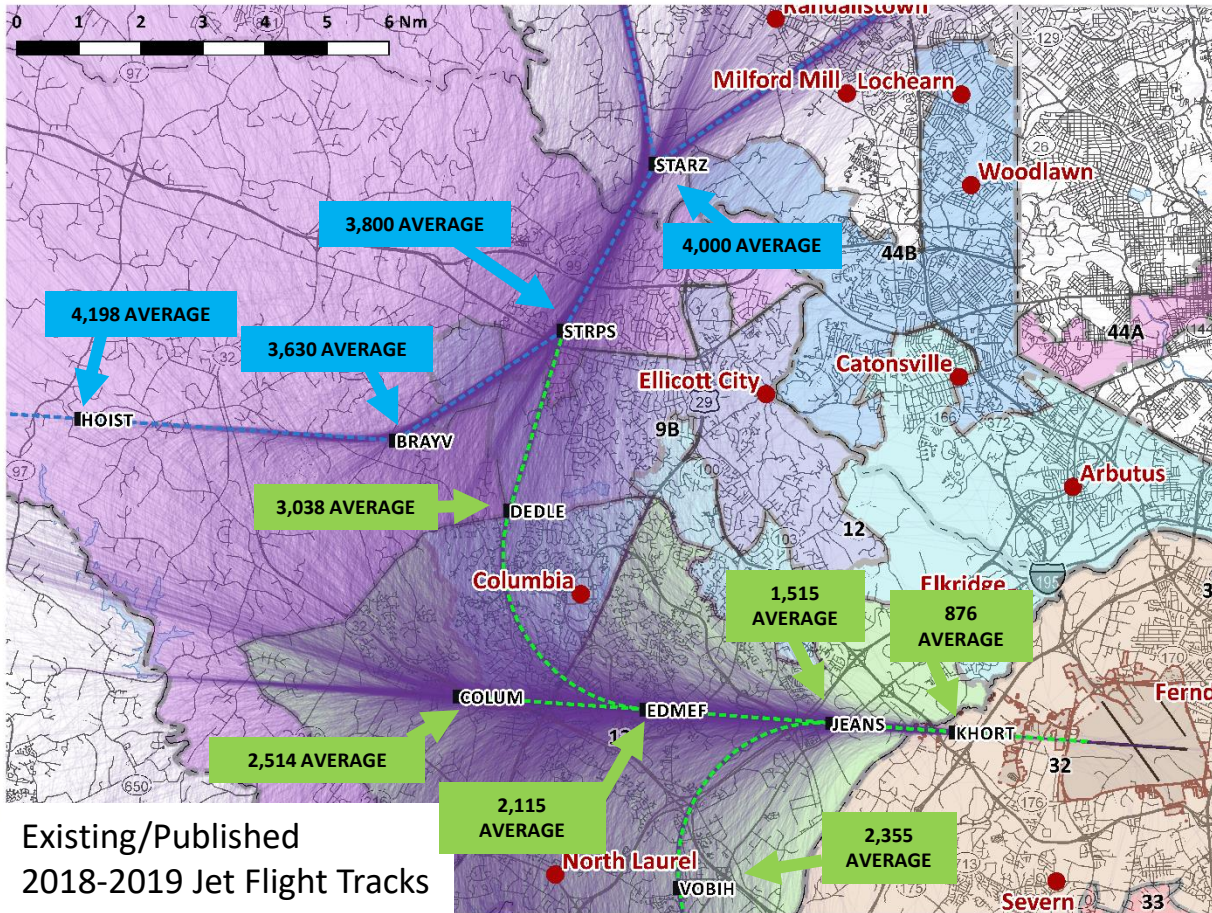


Legend

- Navigational Points
- Proposed Arrival Procedure Changes
- Existing Published Arrival Procedures
- Existing Published Approach Procedures
- Proposed Approach Procedure Changes
- Arrival Flight Tracks

Pre-Decisional: For informational purposes only

Runway 10 Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)

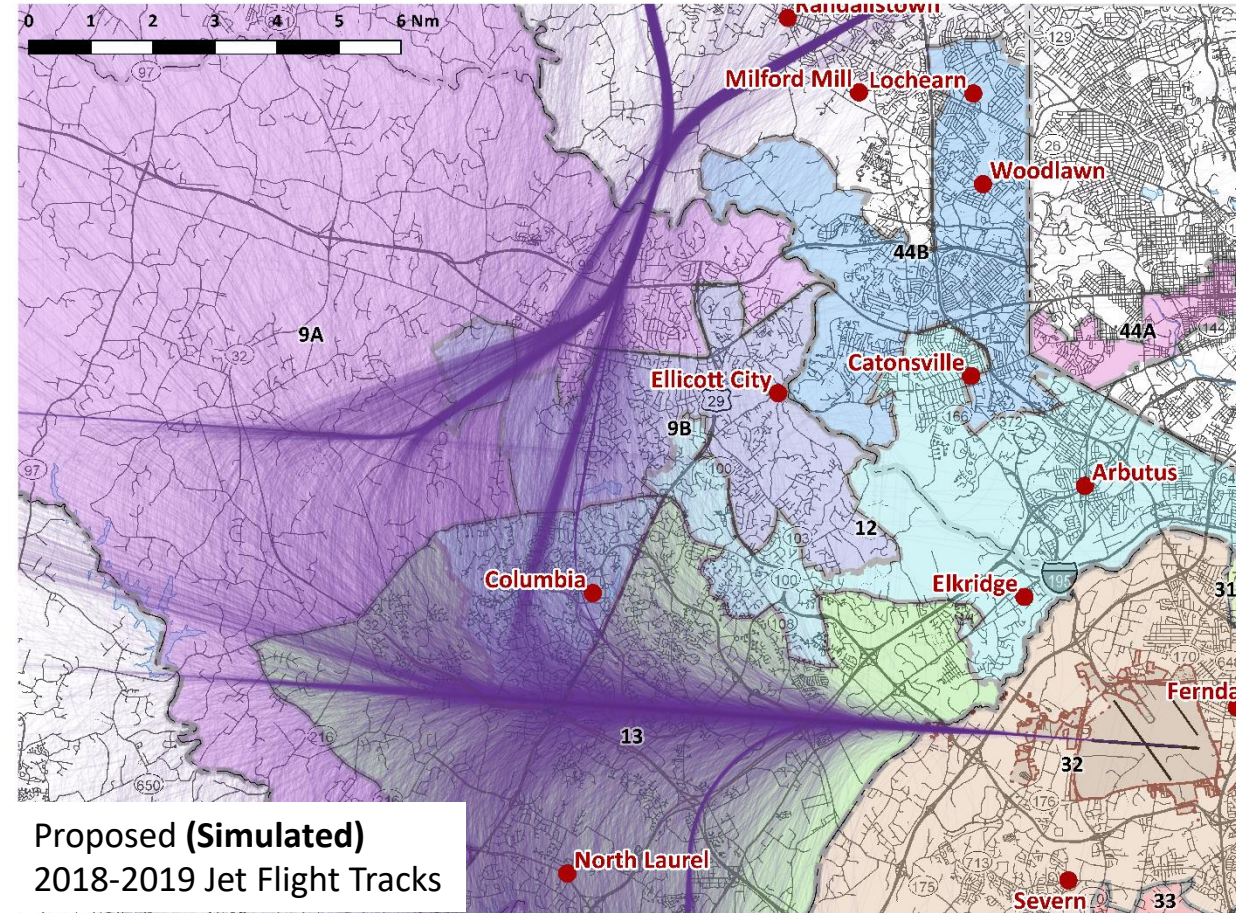
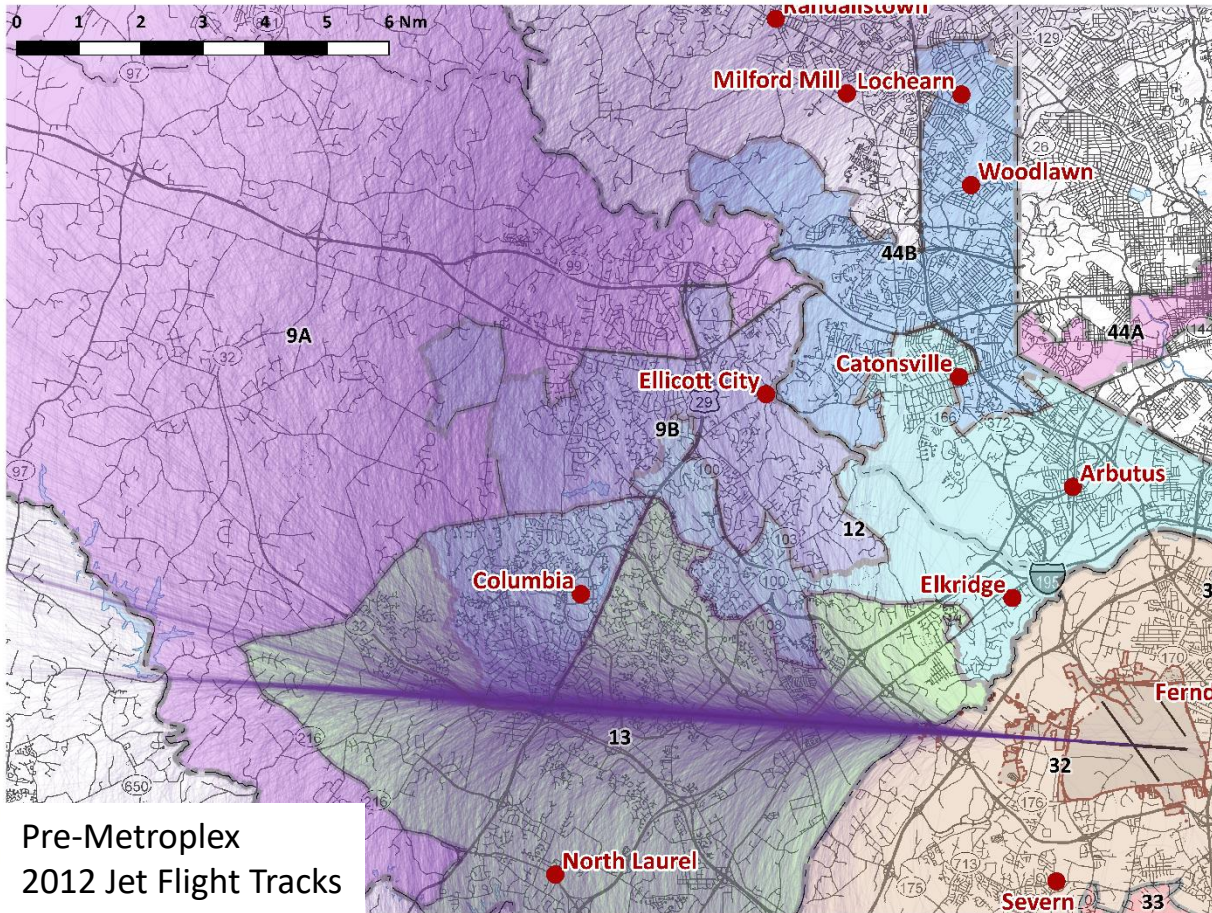


Legend

- Navigational Points
- Proposed Arrival Procedure Changes
- Existing Published Arrival Procedures
- Existing Published Approach Procedures
- Proposed Approach Procedure Changes
- Arrival Flight Tracks

Pre-Decisional: For informational purposes only

Runway 10 Jet Arrivals – 2012 compared to 2018-2019 Proposed/Simulated



Legend

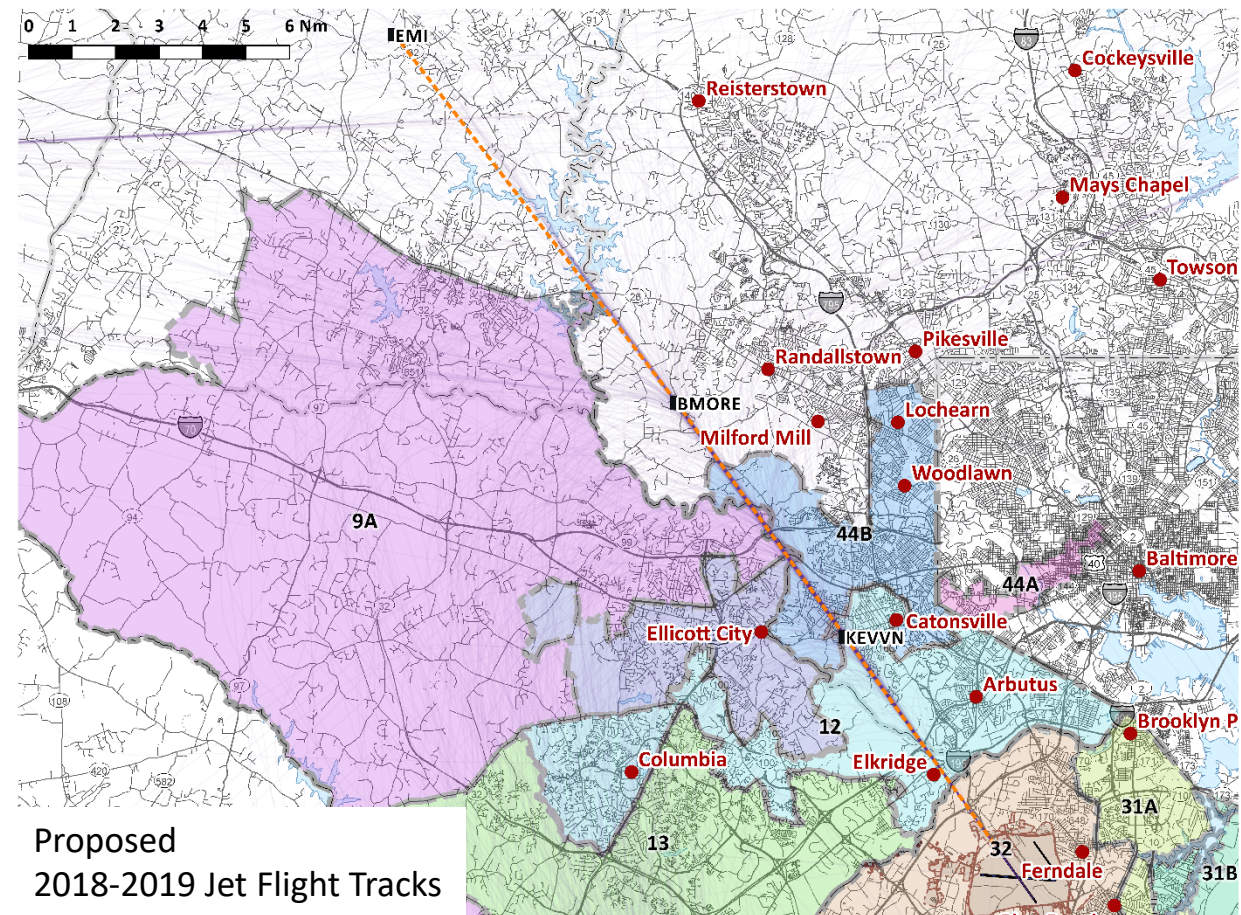
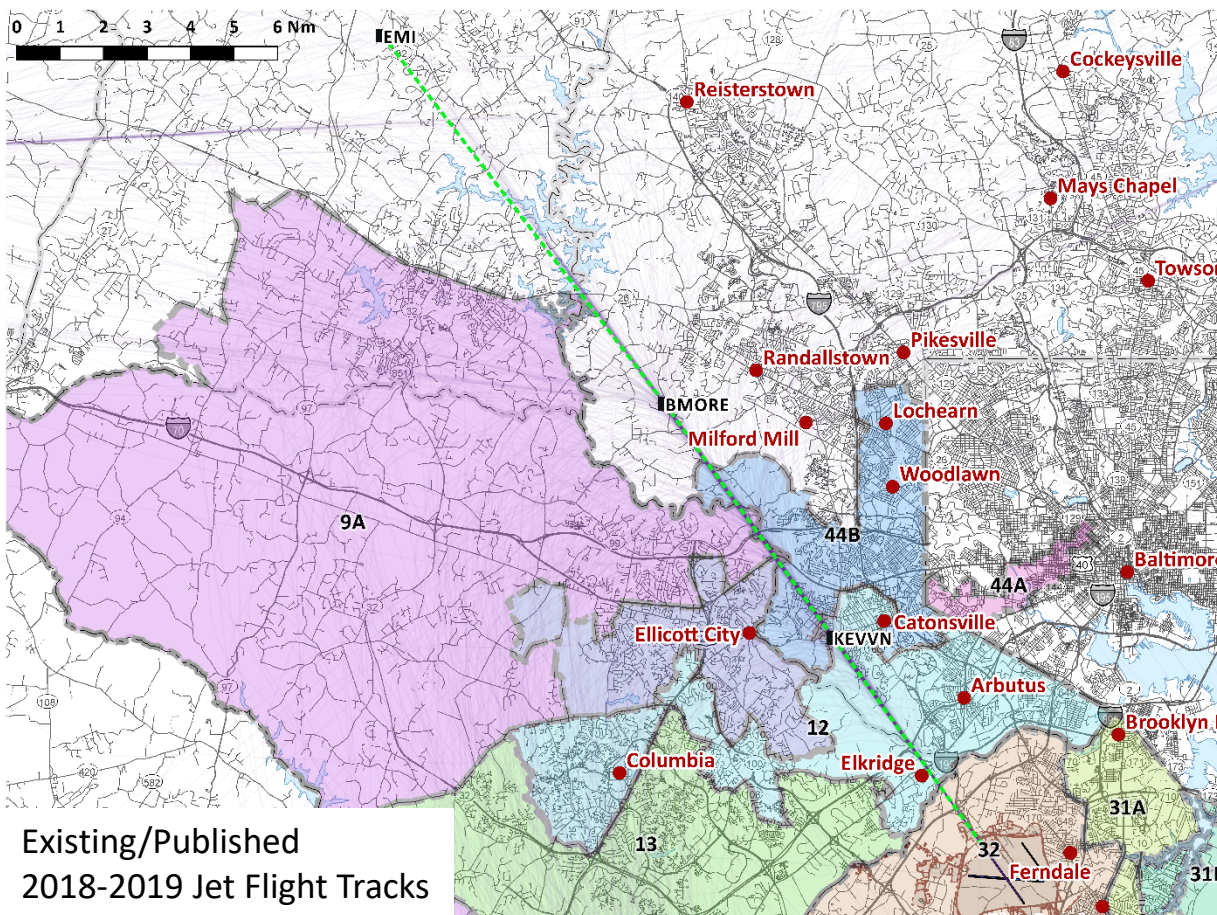
- Navigational Points
- Proposed Arrival Procedure Changes
- Proposed Approach Procedure Changes
- Existing Published Arrival Procedures
- Existing Published Approach Procedures
- Arrival Flight Tracks

Pre-Decisional: For informational purposes only



Runway 15R Arrivals—Additional Slides

Proposed Runway 15R RNP Approach

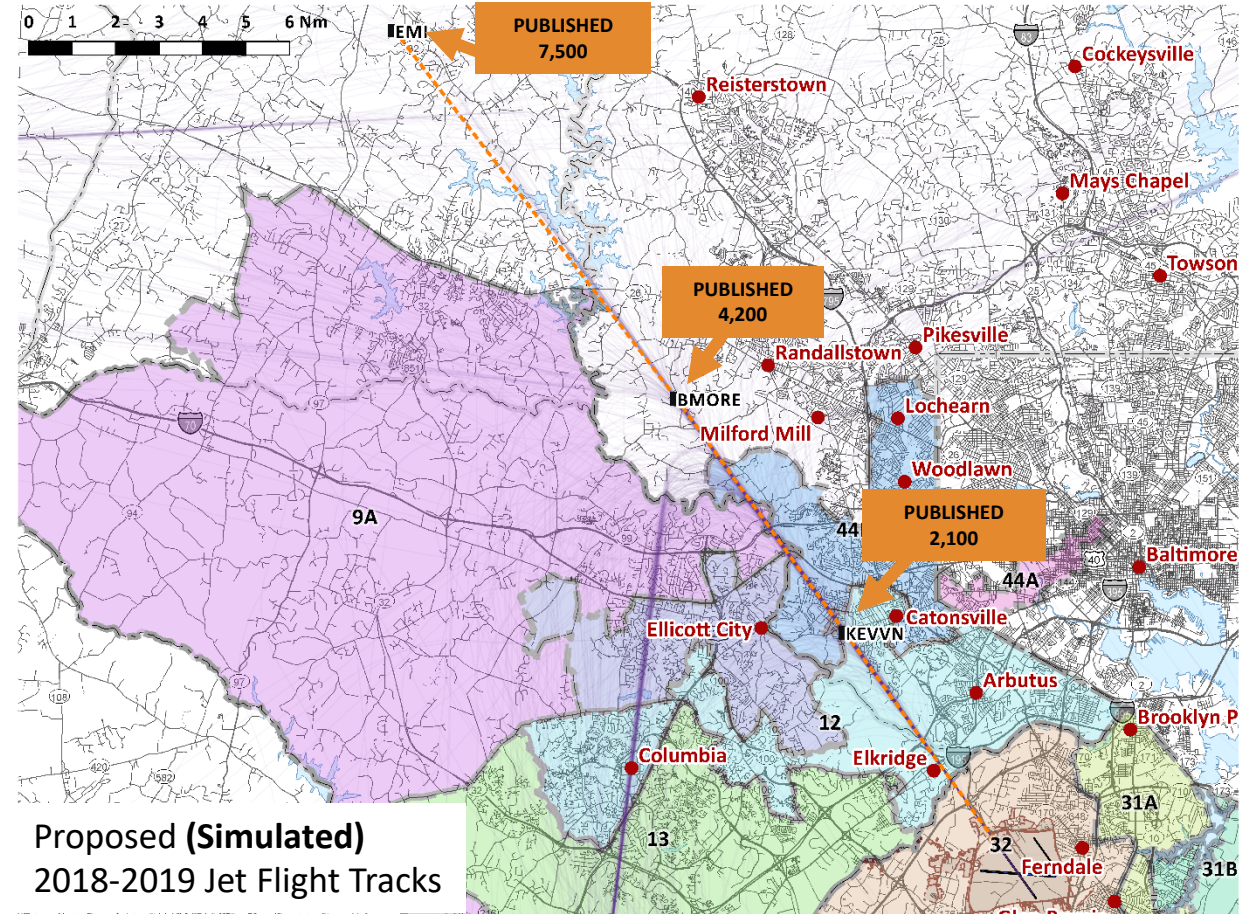
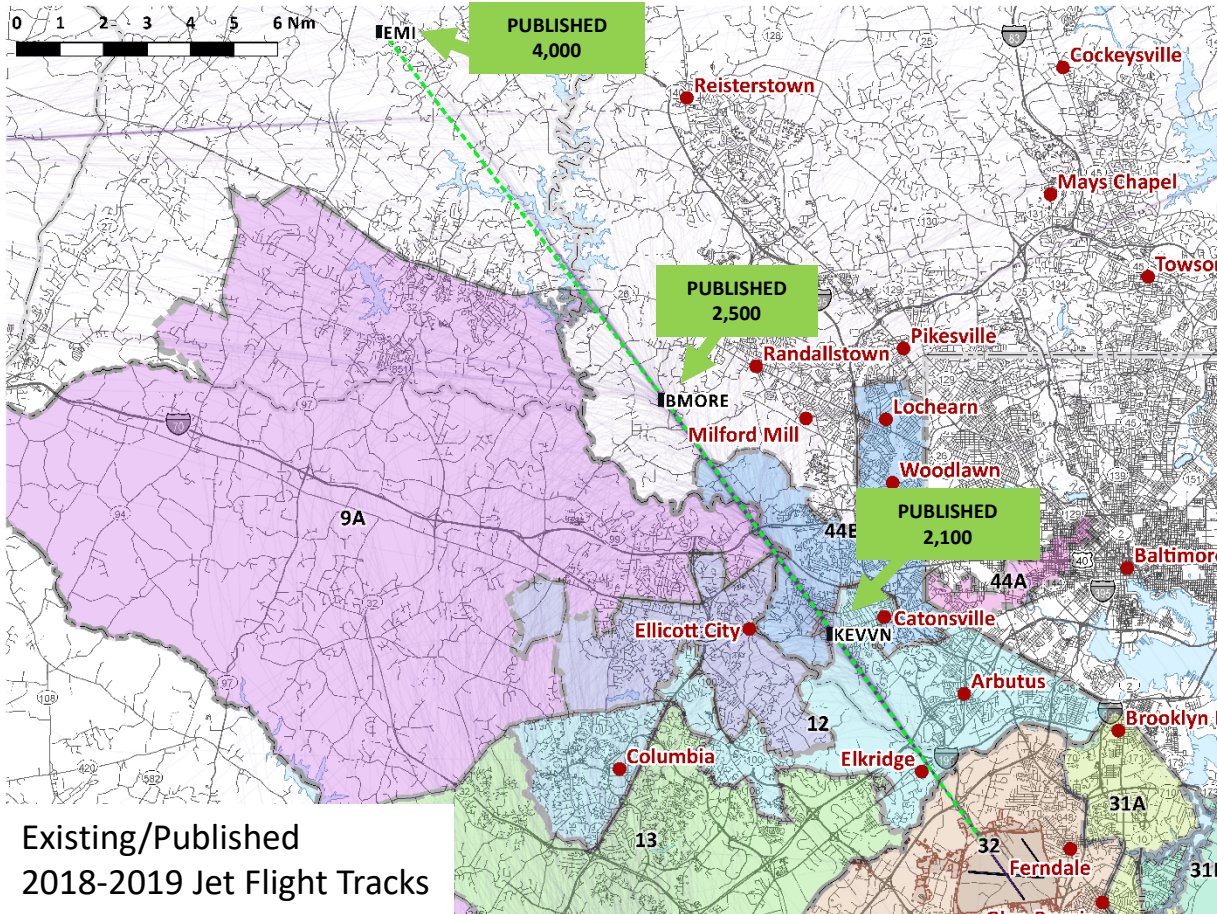


Legend

- Navigational Points
 - Proposed Arrival Procedure Changes
 - Existing Published Arrival Procedures
 - Proposed Approach Procedure Changes
 - Existing Published Approach Procedures
 - Arrival Flight Tracks
- Pre-Decisional: For informational purposes only



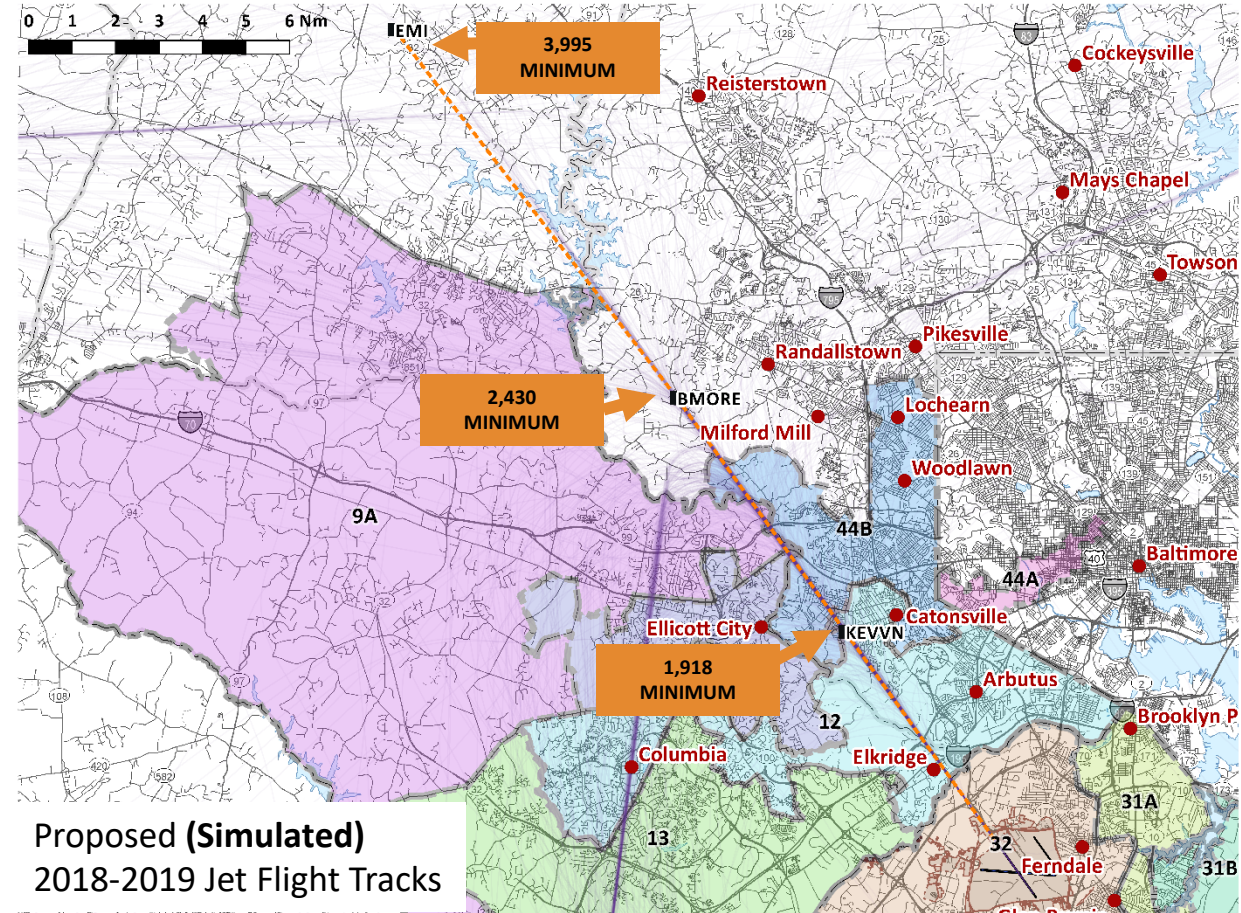
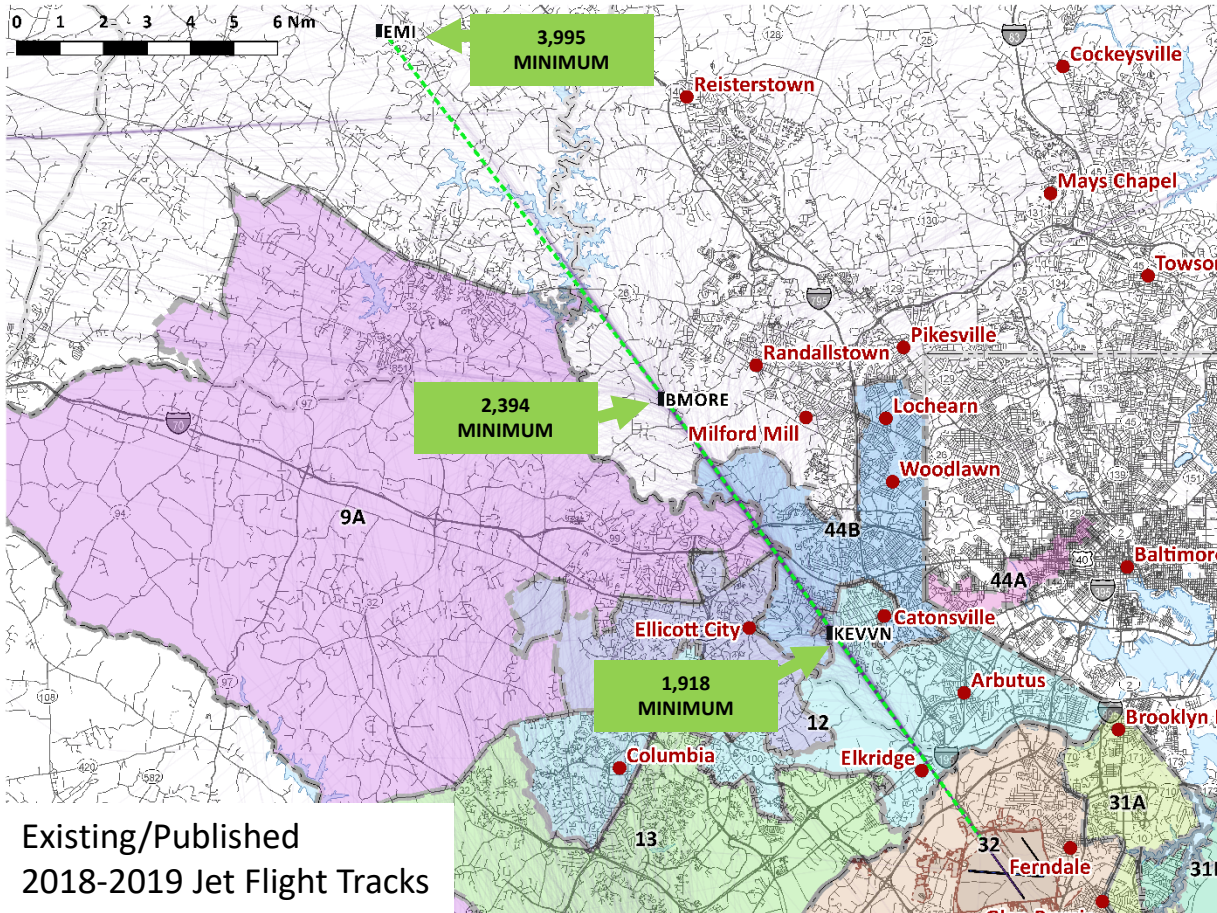
Runway 15R Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)



Legend

- Navigational Points
 - Proposed Arrival Procedure Changes
 - Existing Published Arrival Procedures
 - Proposed Approach Procedure Changes
 - Existing Published Approach Procedures
 - Arrival Flight Tracks
- Pre-Decisional: For informational purposes only

Runway 15R Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)

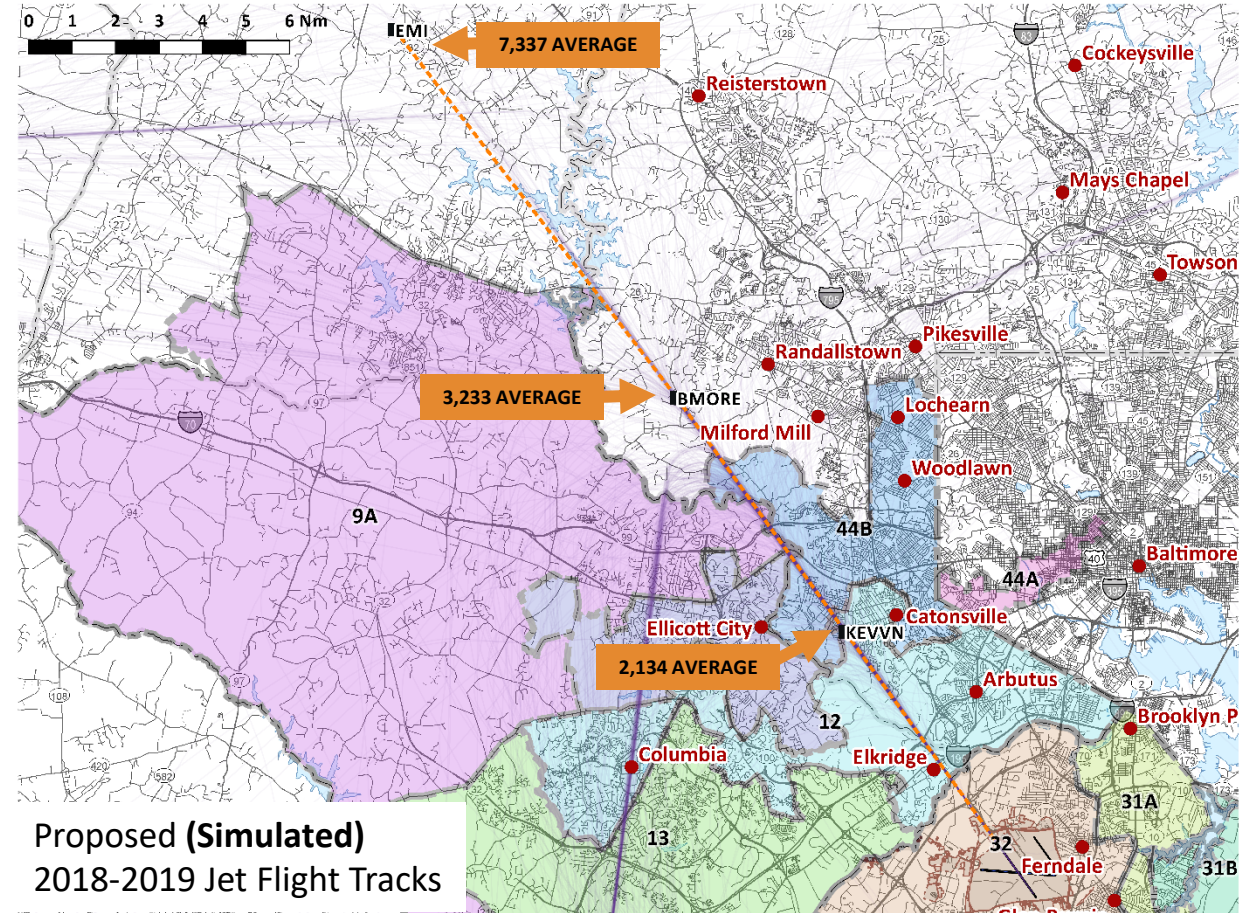
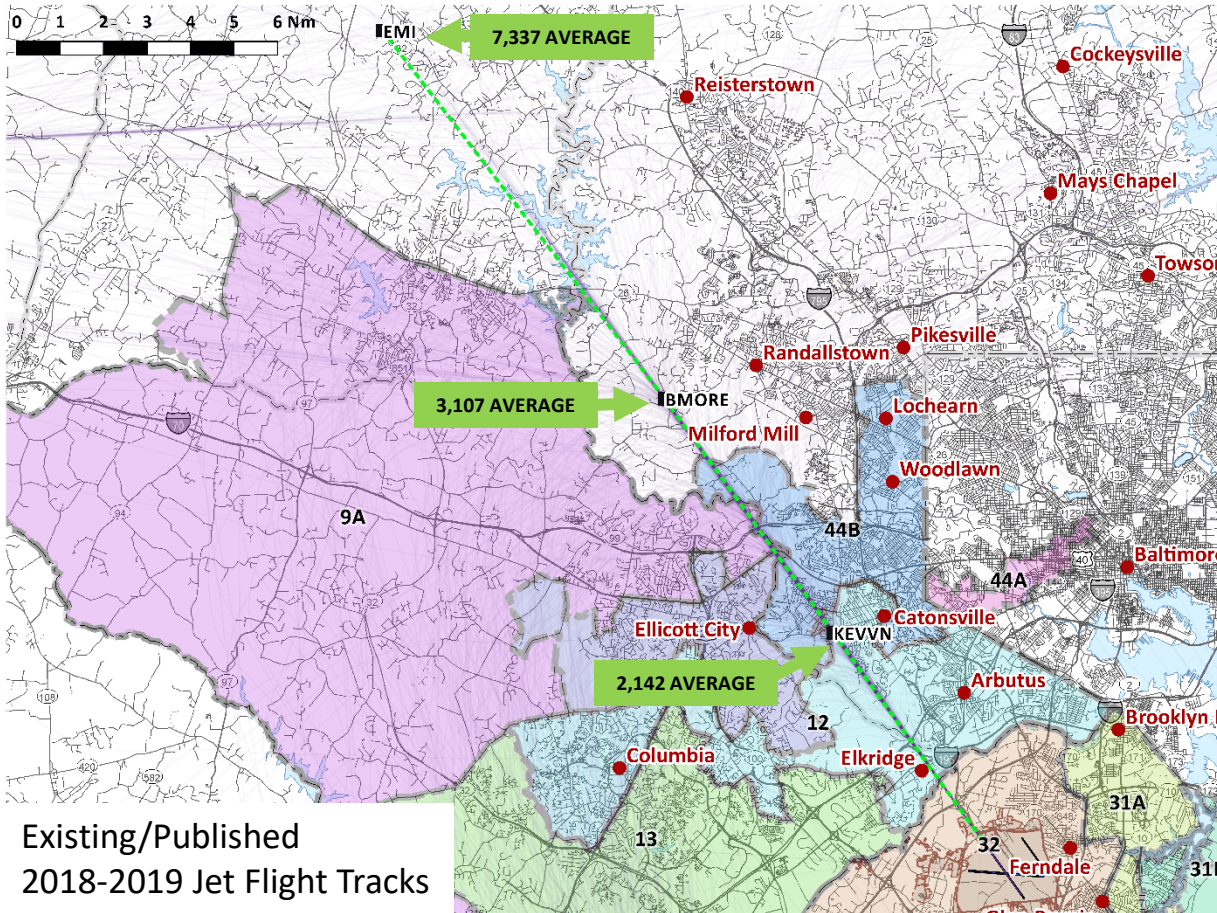


Legend

- Navigational Points
- Proposed Arrival Procedure Changes
- Existing Published Arrival Procedures
- Proposed Approach Procedure Changes
- Existing Published Approach Procedures
- Arrival Flight Tracks

Pre-Decisional: For informational purposes only

Runway 15R Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)

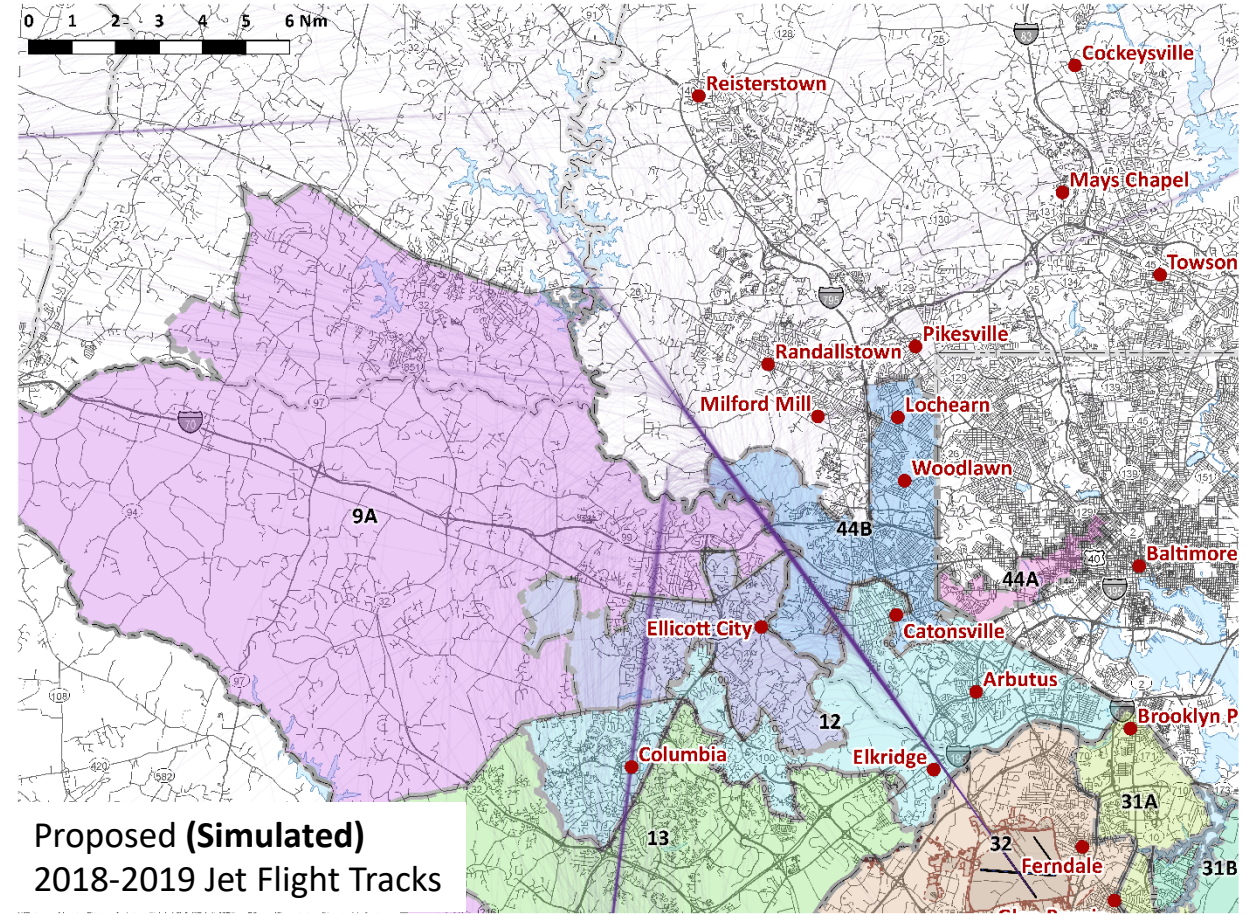
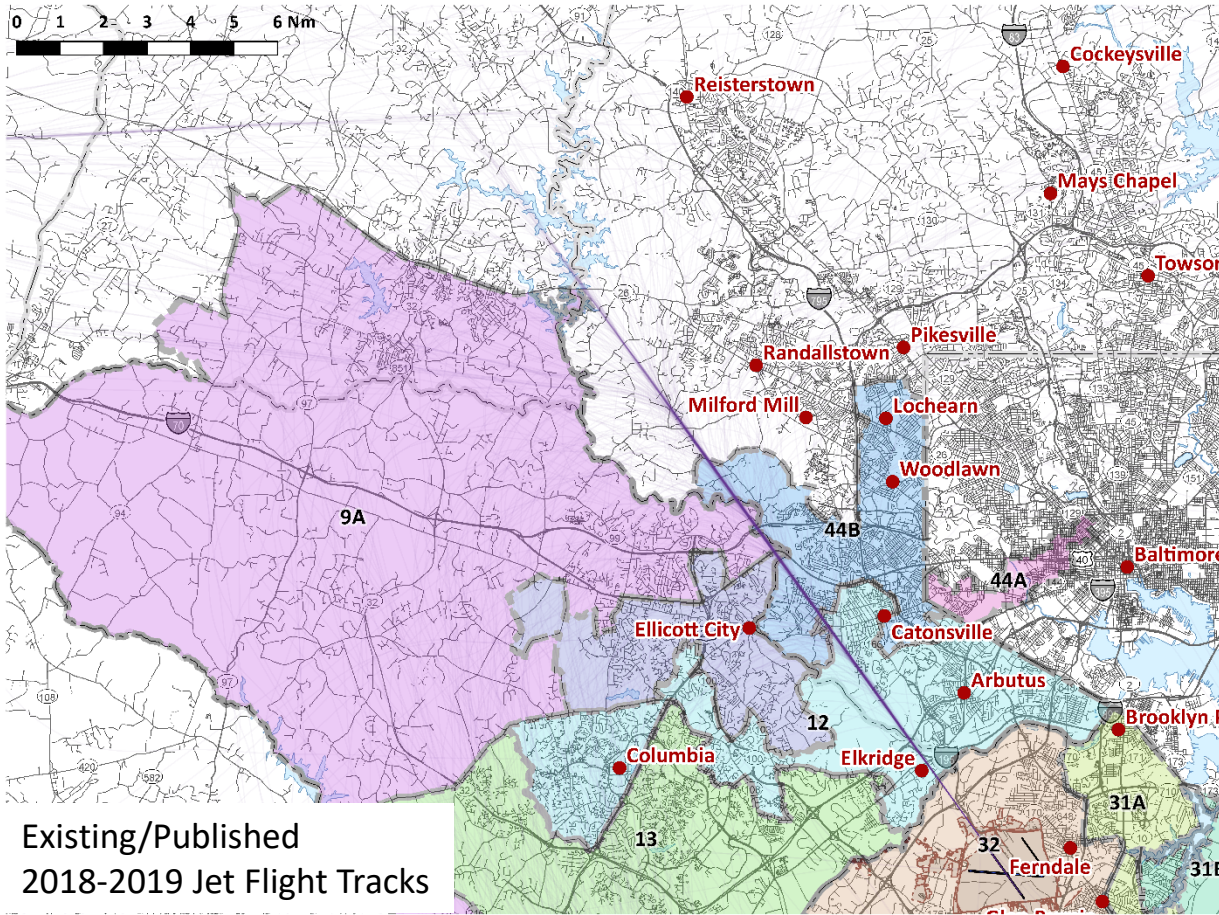


Legend

- Navigational Points
- Proposed Arrival Procedure Changes
- Existing Published Arrival Procedures
- Proposed Approach Procedure Changes
- Existing Published Approach Procedures
- Arrival Flight Tracks

Pre-Decisional: For informational purposes only

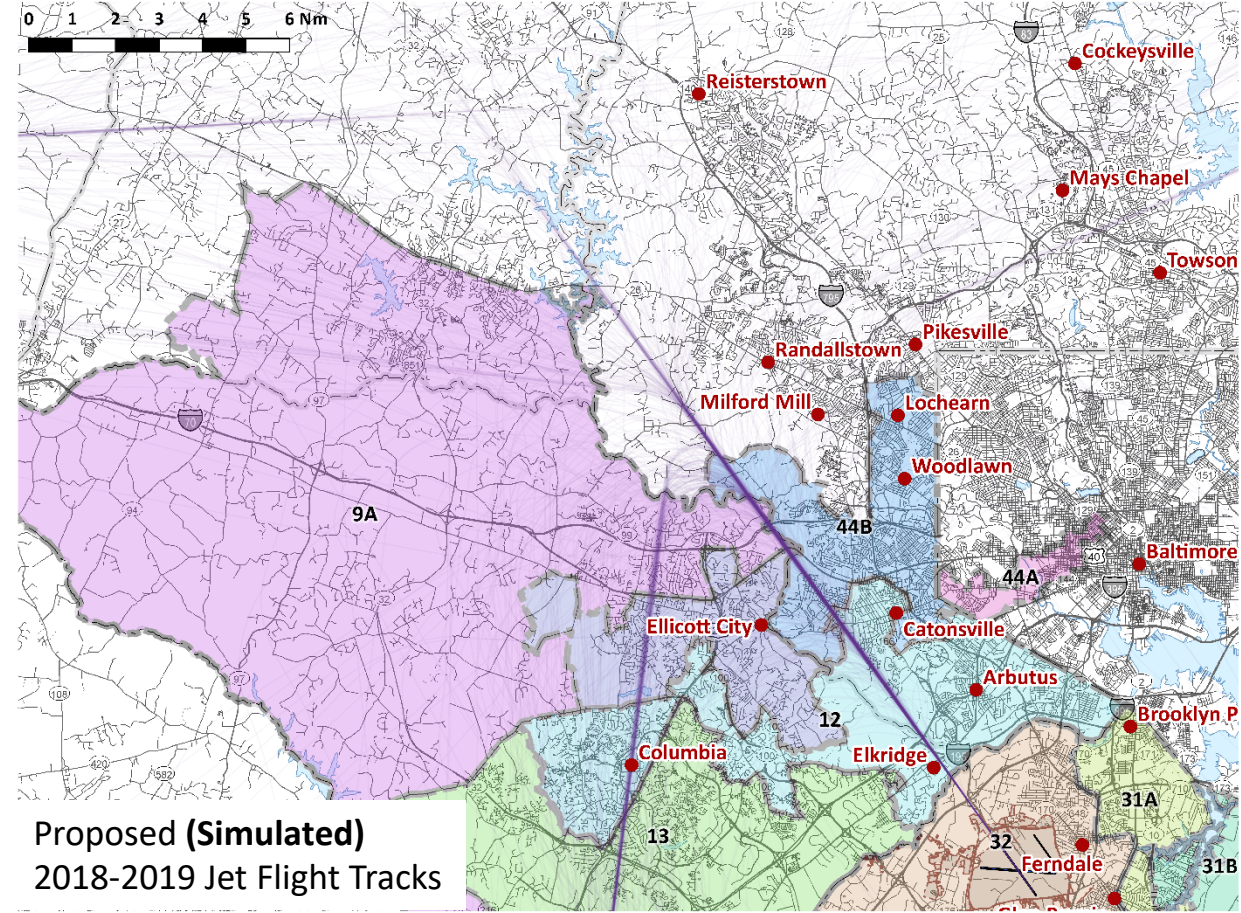
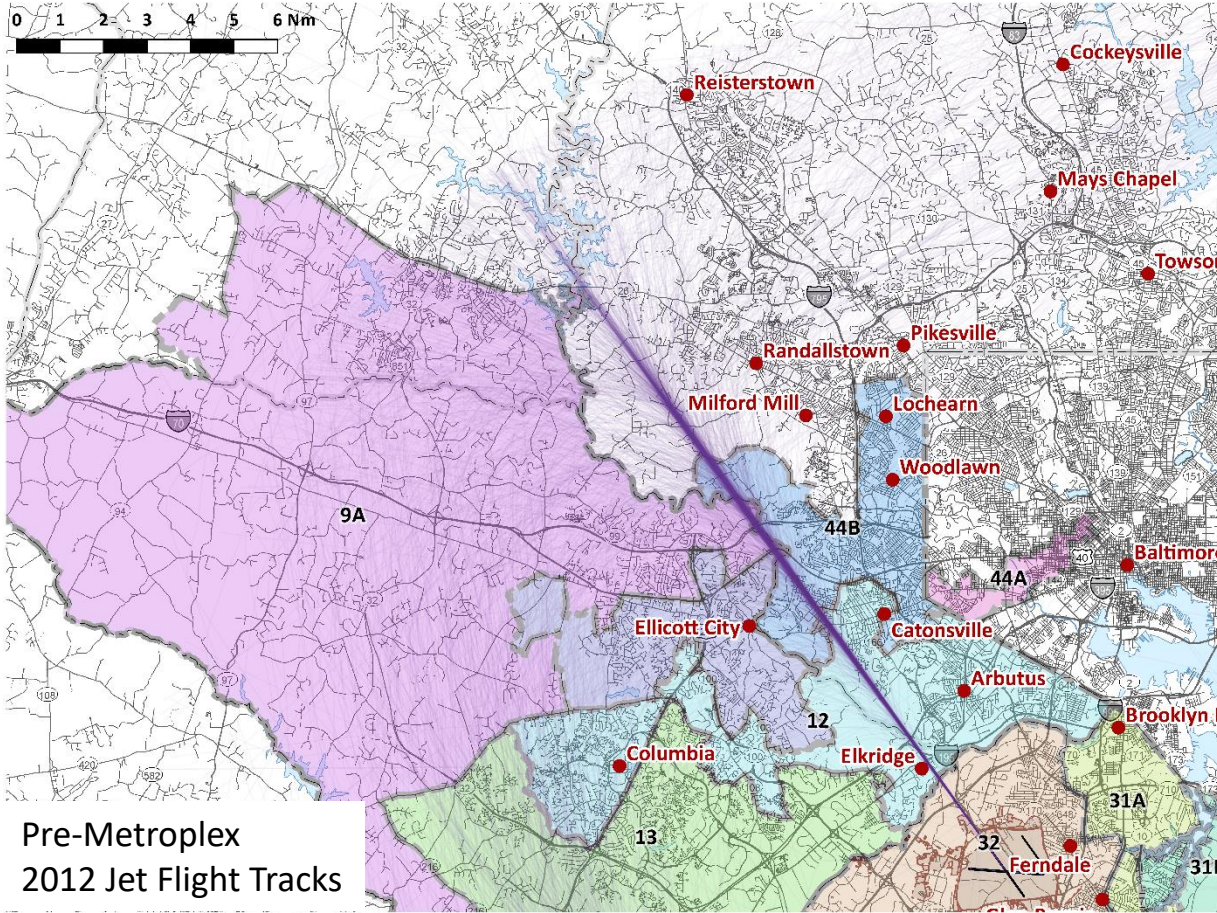
Runway 15R Jet Arrivals – 2018-2019 compared to 2018-2019 Proposed (Simulated)



Legend

- Navigational Points
 - Proposed Arrival Procedure Changes
 - Existing Published Arrival Procedures
 - Existing Published Approach Procedures
 - Proposed Approach Procedure Changes
 - Arrival Flight Tracks
- Pre-Decisional: For informational purposes only

Runway 15R Jet Arrivals – 2012 compared to 2018-2019 Proposed (Simulated)



Legend

- Navigational Points
 - Proposed Arrival Procedure Changes
 - Proposed Approach Procedure Changes
 - Existing Published Arrival Procedures
 - Existing Published Approach Procedures
 - Arrival Flight Tracks
- Pre-Decisional: For informational purposes only