



Analysis of April 24, 2018 FAA Proposed Procedure Changes at Baltimore/Washington International Thurgood Marshall Airport (BWI Marshall)

Presented by
Maryland Department of Transportation (MDOT)
Maryland Aviation Administration (MAA)

December 4, 2018



Agenda

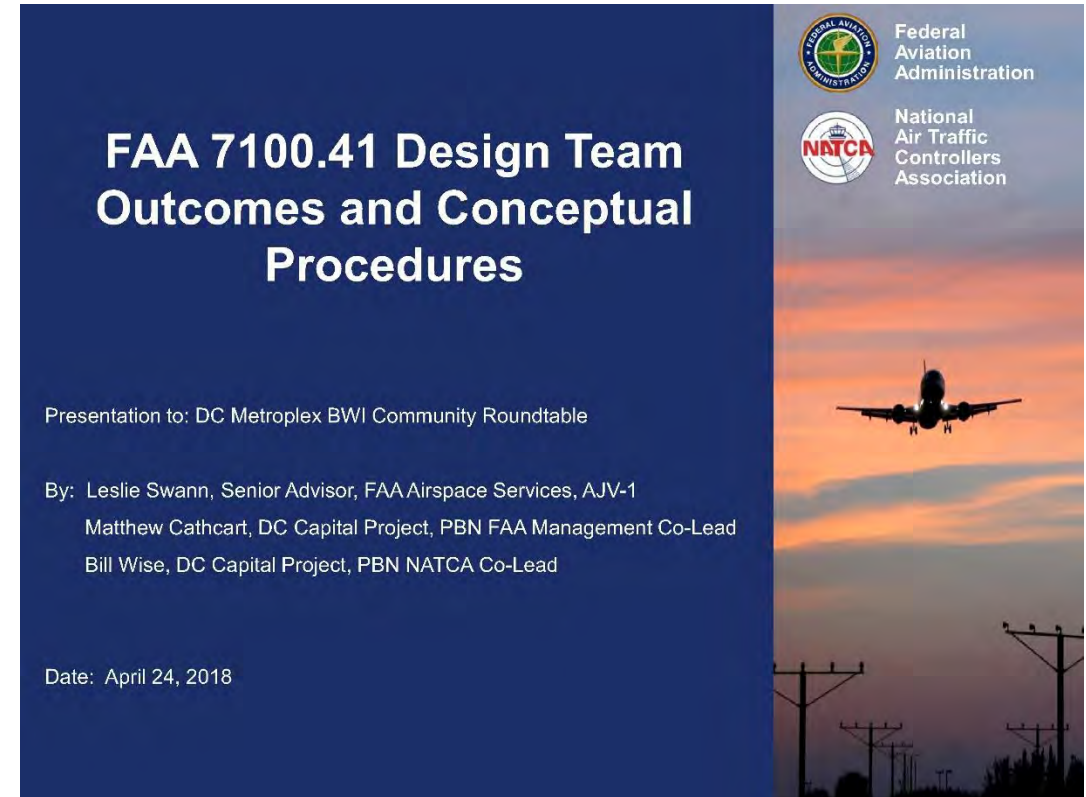
- FAA proposed procedure summary and Roundtable request
- Flight track analysis
- Discussion
- Noise analysis
- Discussion



FAA Proposed Procedure Summary and Roundtable Request

FAA Proposed Procedure Summary - Overview

- FAA presented proposed procedure changes at BWI Marshall at April 24, 2018 DC Metroplex BWI Community Roundtable meeting
- Intended to address:
 - Concerns of Roundtable regarding departure flight path changes implemented as part of DC Metroplex
 - Issues with flyability of arrival and departure procedures
 - Aircraft level-offs on departure (“Climb Via”)



FAA 7100.41 Design Team Outcomes and Conceptual Procedures

Federal Aviation Administration
National Air Traffic Controllers Association

Presentation to: DC Metroplex BWI Community Roundtable

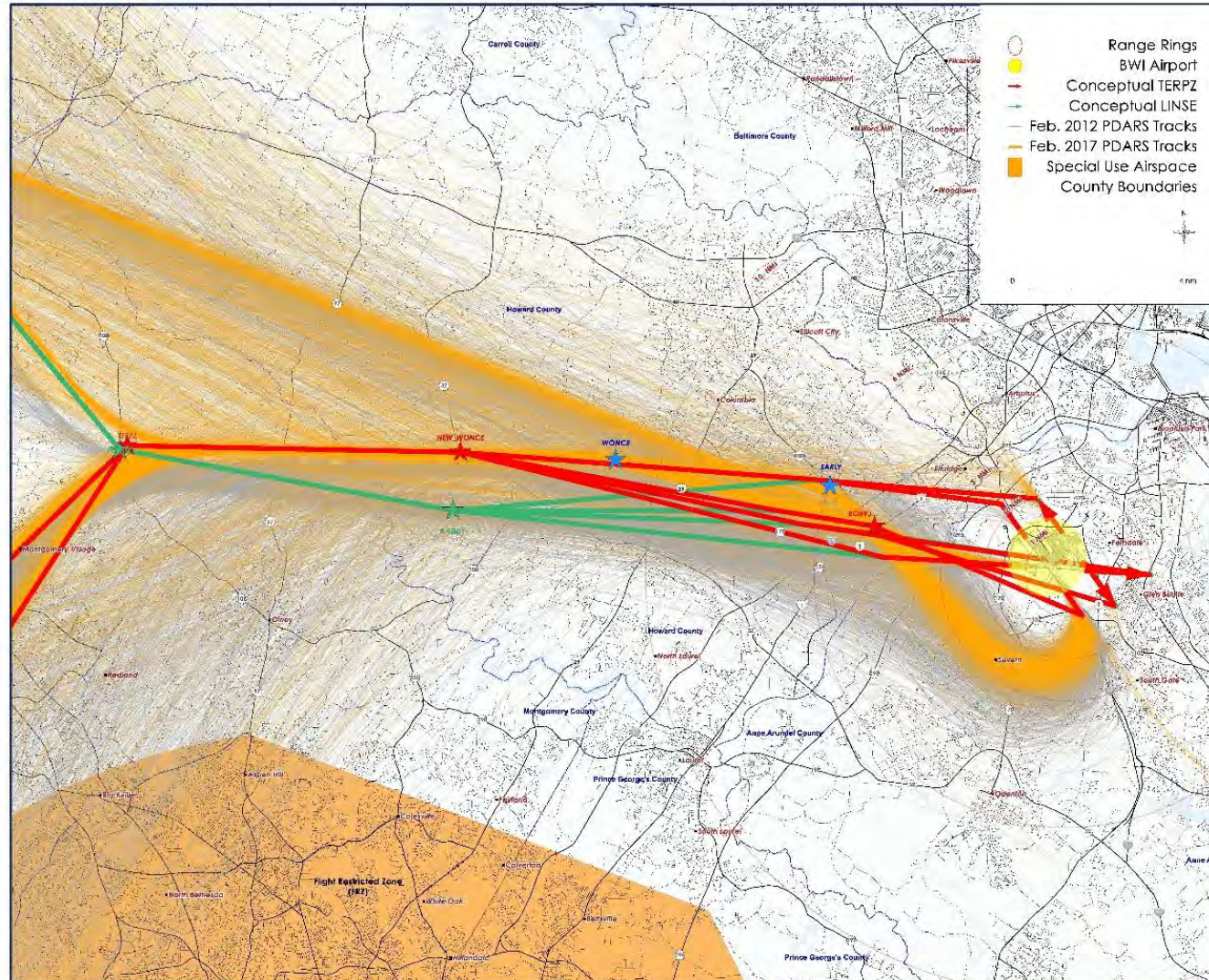
By: Leslie Swann, Senior Advisor, FAA Airspace Services, AJV-1
Matthew Cathcart, DC Capital Project, PBN FAA Management Co-Lead
Bill Wise, DC Capital Project, PBN NATCA Co-Lead

Date: April 24, 2018

FAA Proposed Procedure Summary - Departures

- Departure Changes
 - Modification of TERPZ procedure (westbound departures) to return aircraft flight paths closer to pre-Metroplex historical locations
 - Creation of new LINSE procedure (westbound departures) to better distribute departures over pre-Metroplex historical locations
 - Adjustments to CONLE and FIXET procedures (southbound departures) to meet FAA design criteria
 - Shifting of low altitude overflights (T Routes) to de-conflict from departures
 - “Climb Via” capability added to all procedures

FAA Proposed Procedure Summary - Departures

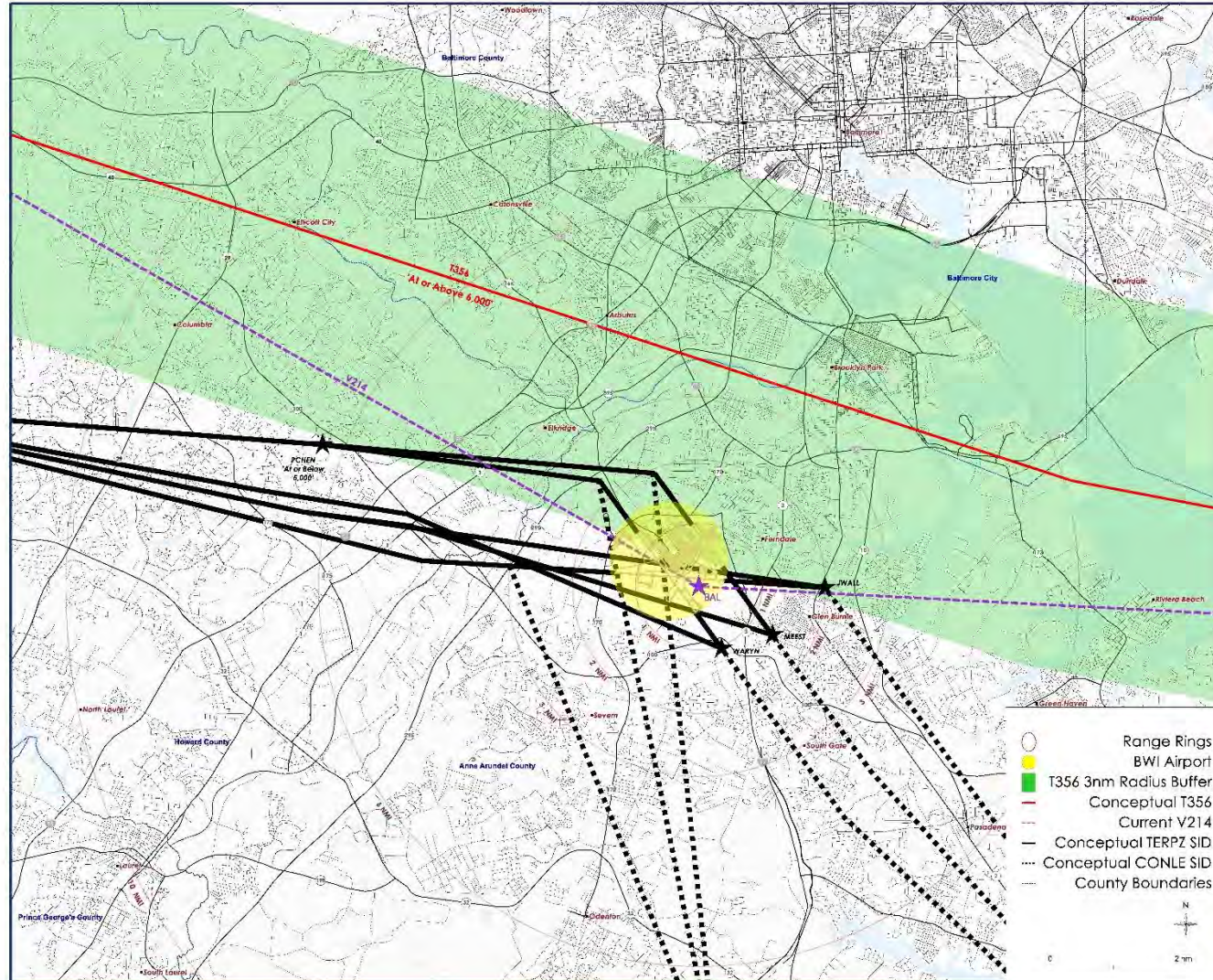


BWI TERPZ/LINSE RNAV SIDs (Departures)

- **Conceptual TERPZ**
Serves jet departures to the west and southwest
Anticipated usage = 74%
- **Conceptual LINSE**
Serves jet departures to the northwest
Anticipated usage = 26%
- TERPZ/LINSE – All Runway Transitions

Runway	Percent Usage	Operation Counts
10	0.5%	606
33L/R	7.1%	9,043
15L/R	29.1%	37,171
28	63.4%	81,023

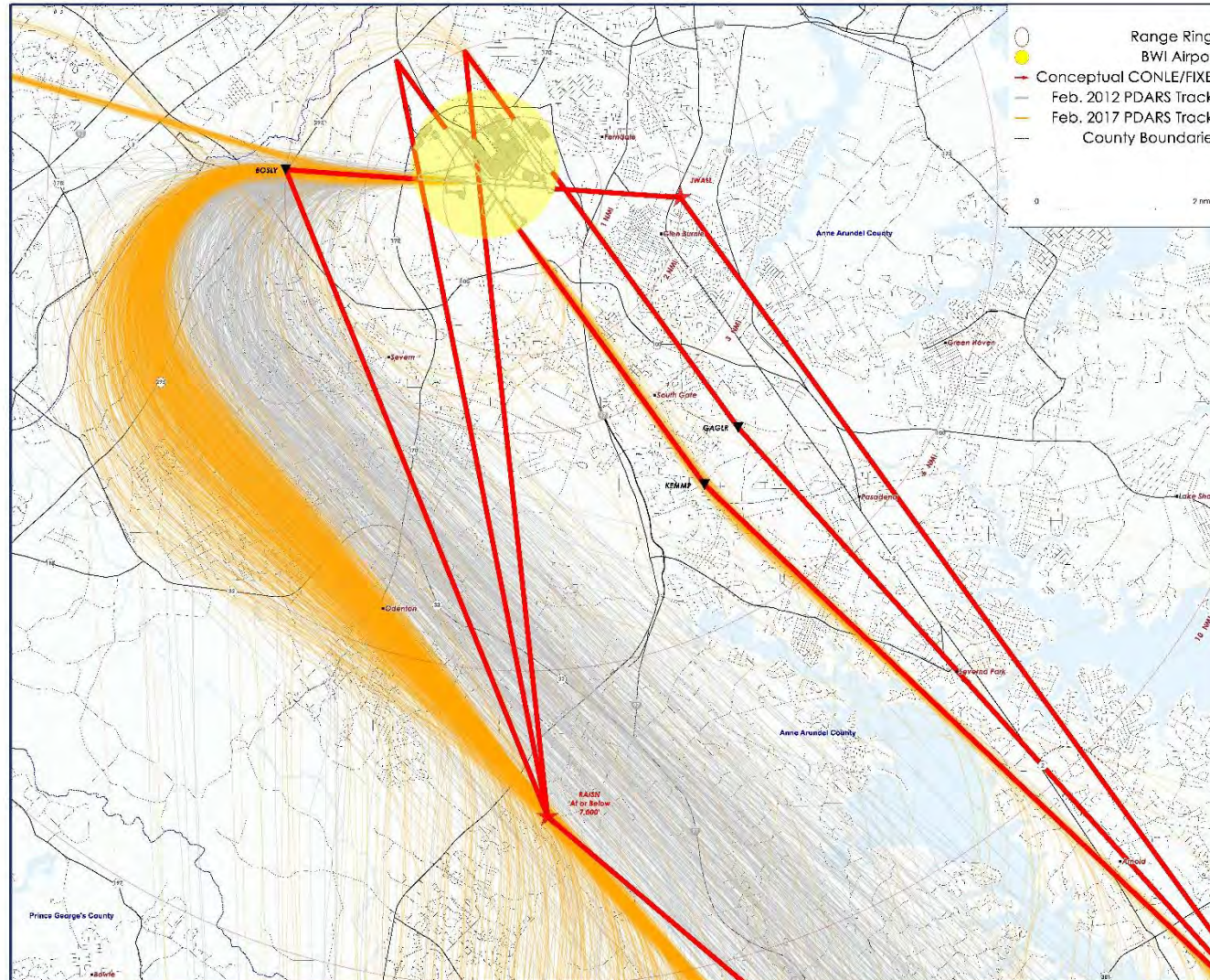
FAA Proposed Procedure Summary - Departures



T-Route 356

- T356 will allow BWI Tower to issue a Climb Via clearance
- Climb Via clearance allows for a pre-determined, repeatable, and efficient climb
- Currently, Runway 33L/R departures climb to 4,000 ft and level off
- Conceptual procedure will allow for a Climb Via clearance to 14,000 ft

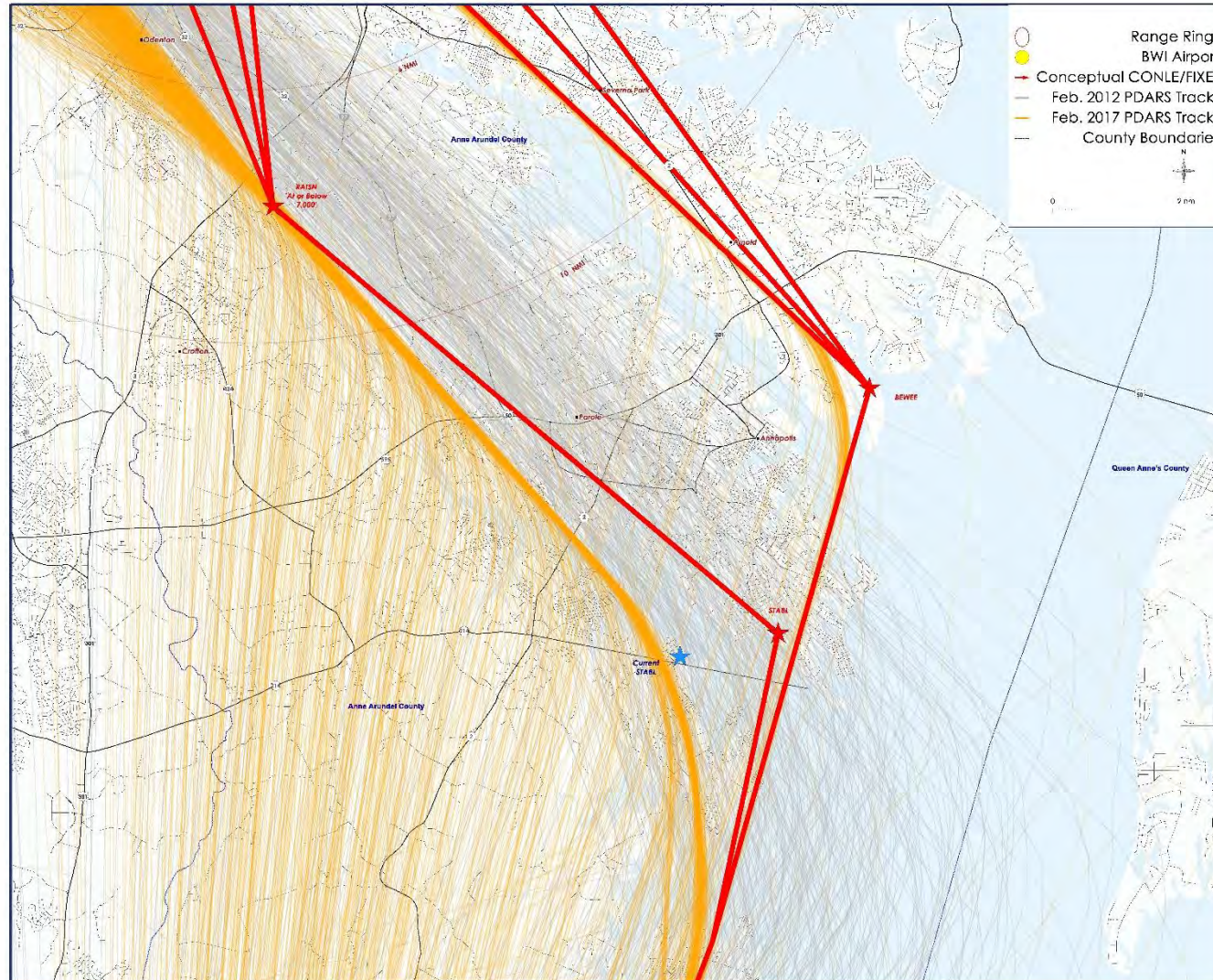
FAA Proposed Procedure Summary - Departures



BWI CONLE/FIXET RNAV SIDs (Departures)

- No changes to departures off RWY 15L/R
- RWY 28 & 33L/R Changes:
 - Altitude restriction 'At or Below 7,000' ft added at RAJN for climb via clearance
- Runway 10 Changes:
 - JWALL added 1 nm from end of RWY 10 for conformance with voluntary noise abatement plan and to utilize climb via

FAA Proposed Procedure Summary - Departures



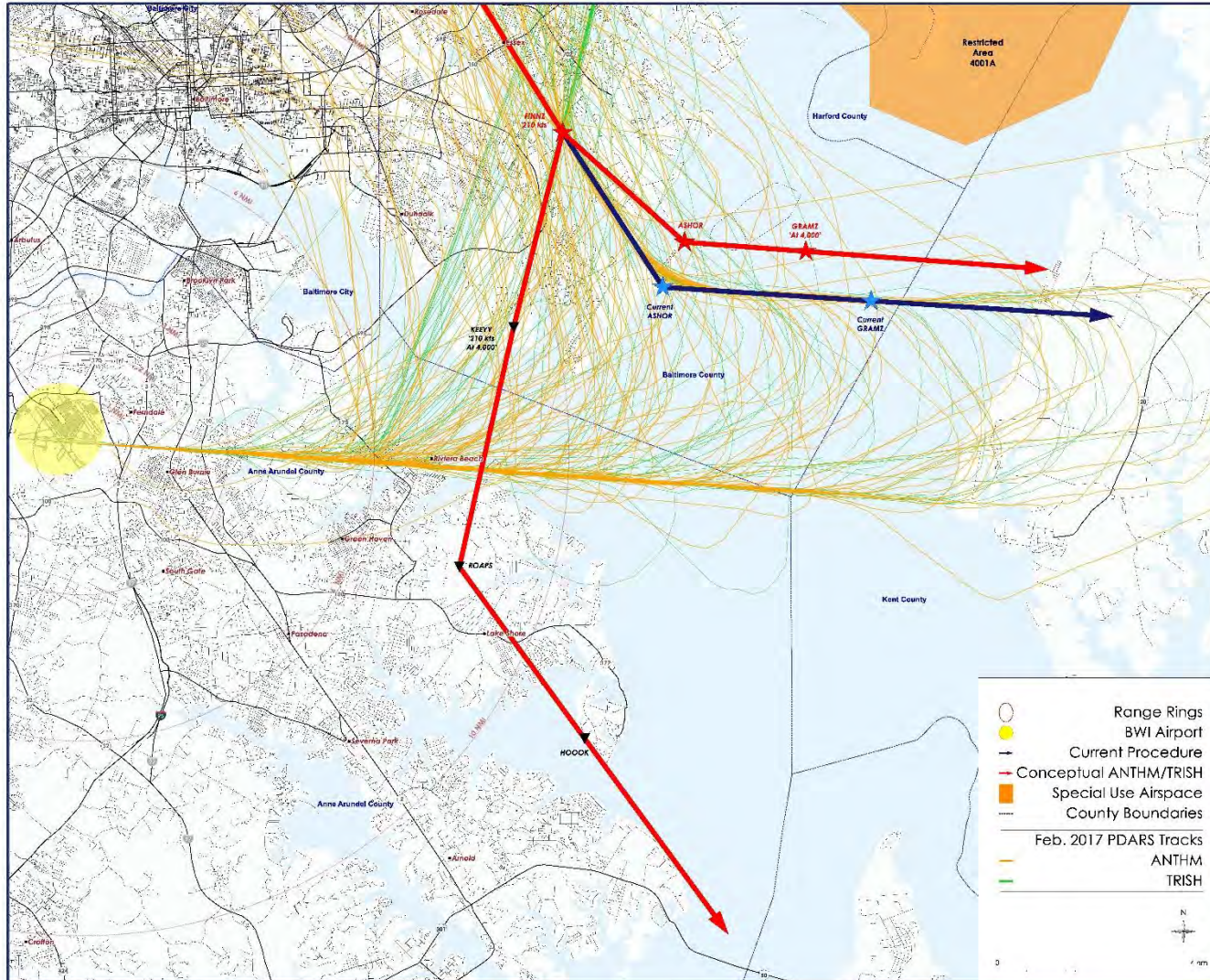
BWI CONLE/FIXET RNAV SIDs (Departures)

- RWY 28 & 33L/R Changes:
 - Altitude restriction 'At or Below 7,000' ft added at RAIN for climb via clearance
 - STABL moved 1.59 nm east for criteria
- Runway 10 Changes:
 - After JWALL procedure goes direct BEWEE, direct OHSSS

FAA Proposed Procedure Summary - Arrivals

- Arrival Changes
 - Modification of ANTHM and TRISH procedures (arrivals from west and north) to adjust downwind leg for Runway 28 and address design criteria issues
 - Modification of MIIDY procedure (arrivals from southeast) to adjust base leg for Runway 28 and address design criteria issues

FAA Proposed Procedure Summary - Arrivals



BWI ANTHM/TRISH RNAV STARs RWY 28 Arrivals

- **ANTHM**
Serves jet arrivals from the west
- **TRISH**
Serves jet arrivals from the north
- Runway 28 Usage:
 - 4.8% (6,223 flights/year)
- Runway 28 Changes:
 - Added 210 kts speed restriction at FINNZ for criteria
 - Moved ASHOR and GRAMZ 0.9 nm north to provide a 4-mile downwind to RWY 28
 - Moved 4,000 ft altitude restriction from ASHOR to GRAMZ for criteria



FAA Proposed Procedure Summary - Arrivals

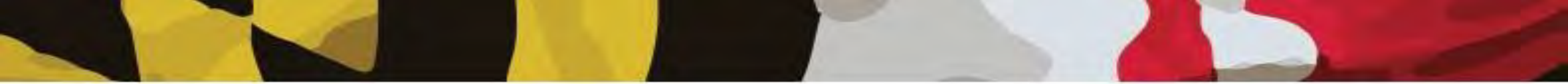
BWI MIIDY RNAV STAR (Arrival)



- Serves jet arrivals from the southeast
- Runway 28 Usage:
 - ✓ 4.8% (6,223 flights/year)
- Added 11,000 ft and 250 kts speed restriction at CHOPS to match existing agreements between Washington Air Route Center (ZDC) and Potomac TRACON (PCT)
- Removed 250 kts speed restrictions from BILIT and TRUTH to avoid redundancy
- Runway 28 Changes:
 - ✓ Removed HURTZ
 - ✓ Moved TROTZ 1 nm southeast to help with RWY28 sequencing

Roundtable Request

- MAA provide technical support to the Roundtable to evaluate FAA proposed procedure designs presented at the April 24, 2018 Roundtable meeting
- Analysis to be relative to current (post-Metroplex) operations and pre-Metroplex operations
- Analysis to include
 - DNL Contours in a format similar to the BWI Marshall Airport Noise Zone (ANZ)
 - Population counts of noise exposure



Flight Track Analysis

Flight Track Analysis - Overview

- Obtained flight track data from BWI Marshall Noise and Operations Monitoring System (NOMS) for the following selected sample periods:

Year	Start Date	End Date	Duration	Arrival Flight Tracks	Departure Flight Tracks	Total Flight Tracks	Notes
2012	9 Feb. 2012	2 May 2012	84 days	30,956	30,928	61,884	Pre-Metroplex
2017	2 Feb. 2017	26 April 2017	84 days	27,800	27,867	55,667	Post-Metroplex

- Modified 2017 data sample to reflect simulate aircraft usage of April 24, 2018 FAA procedure changes based on data provided by the FAA

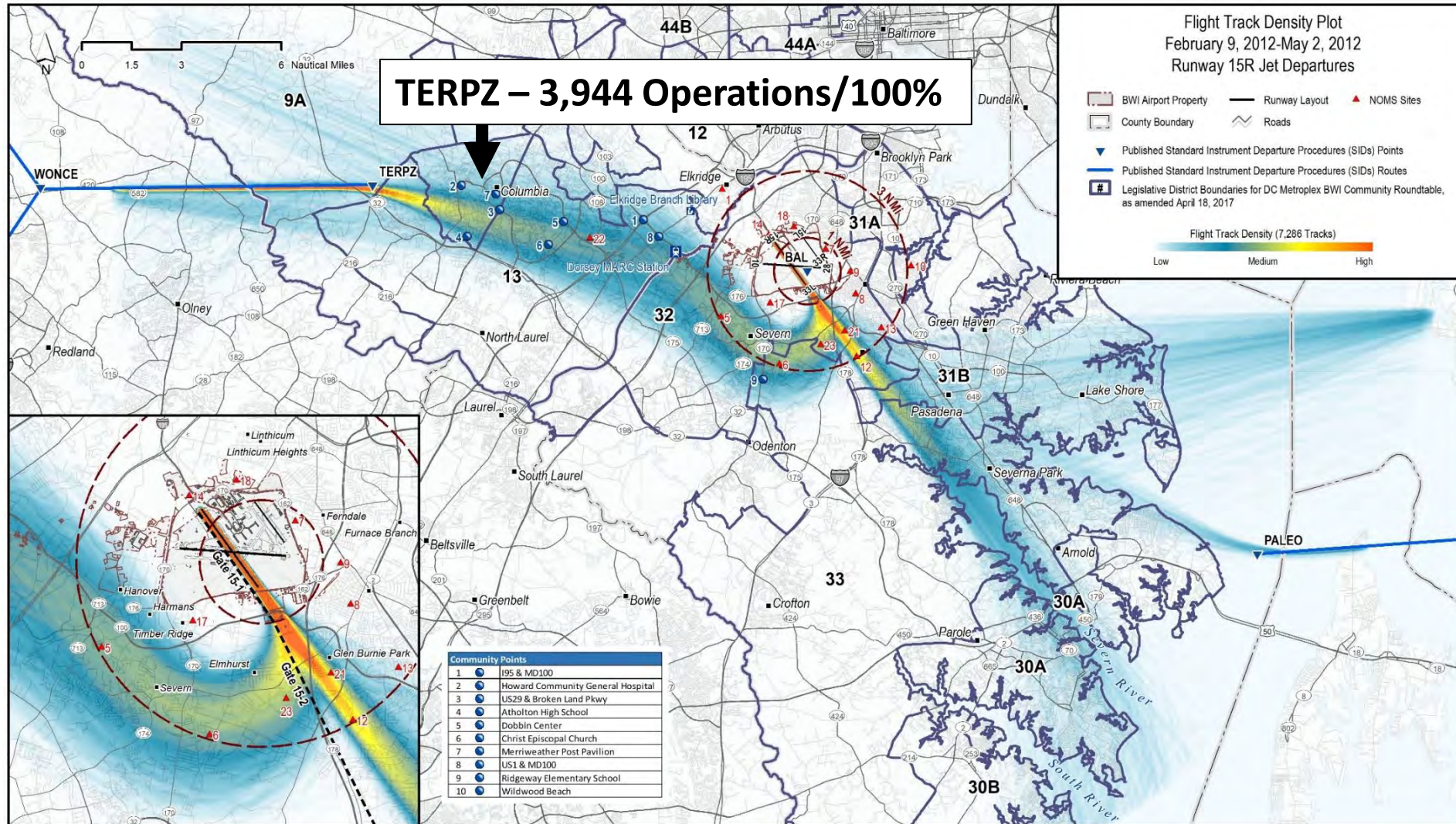
Flight Track Analysis - Overview

- 2017 FAA proposed procedure data sample simulation assumptions:
 - Jet aircraft would utilize the proposed procedures
 - Turbine and Piston Propeller aircraft would fly procedures as published today
 - Most Jet aircraft would fly the procedures as published and would not be “short cut” by air traffic controllers
- Based on assumptions, generated flight track density plots of Jet operations for 2012, 2017, and 2017 operations modified to simulate use of FAA proposed procedures
- 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

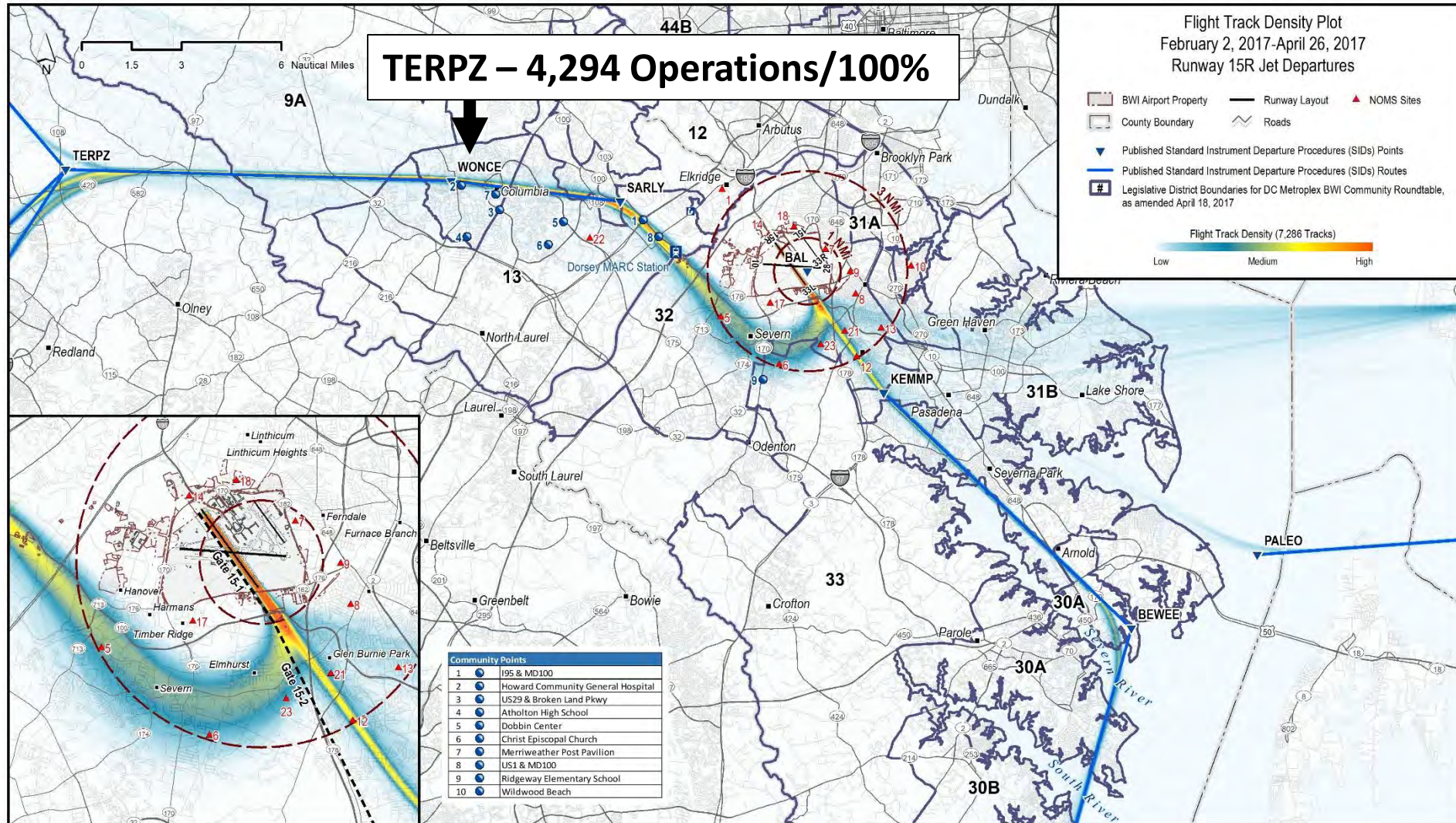
Flight Track Analysis - Overview

- High/Low track density relative to size of each track sample
 - Red (“warmer”) colors indicate areas of:
 - More tracks
 - Higher density/less dispersion
 - Blue (“cooler”) colors indicate areas of:
 - Less tracks
 - Lower density/more dispersion
- Include selected community locations and NOMS sites
- Focus on Runway 15R and 28 departure procedure changes, but all Jet arrivals and departures evaluated in flight track analysis

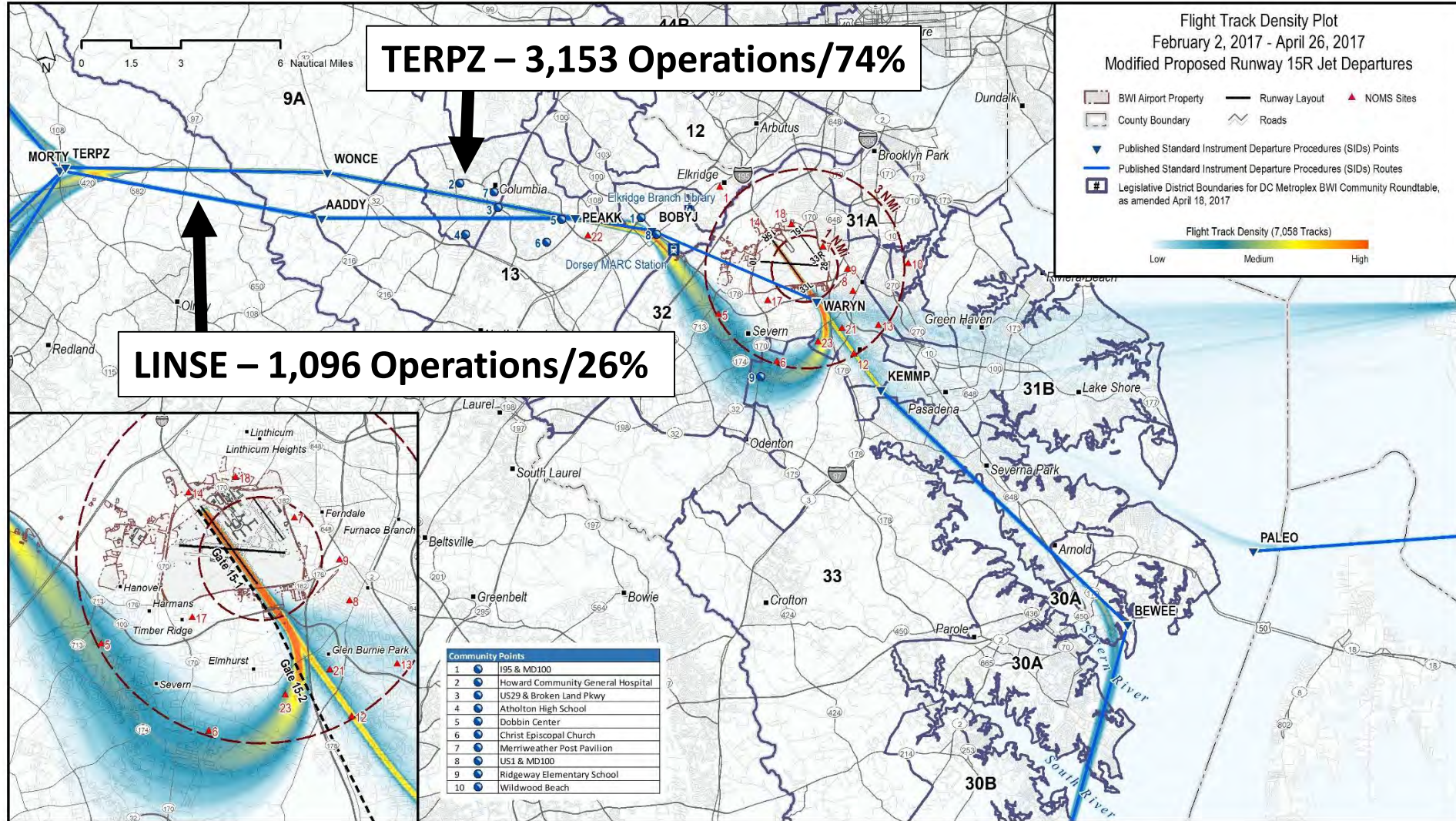
Runway 15R Jet Departures – 2012



Runway 15R Jet Departures – 2017

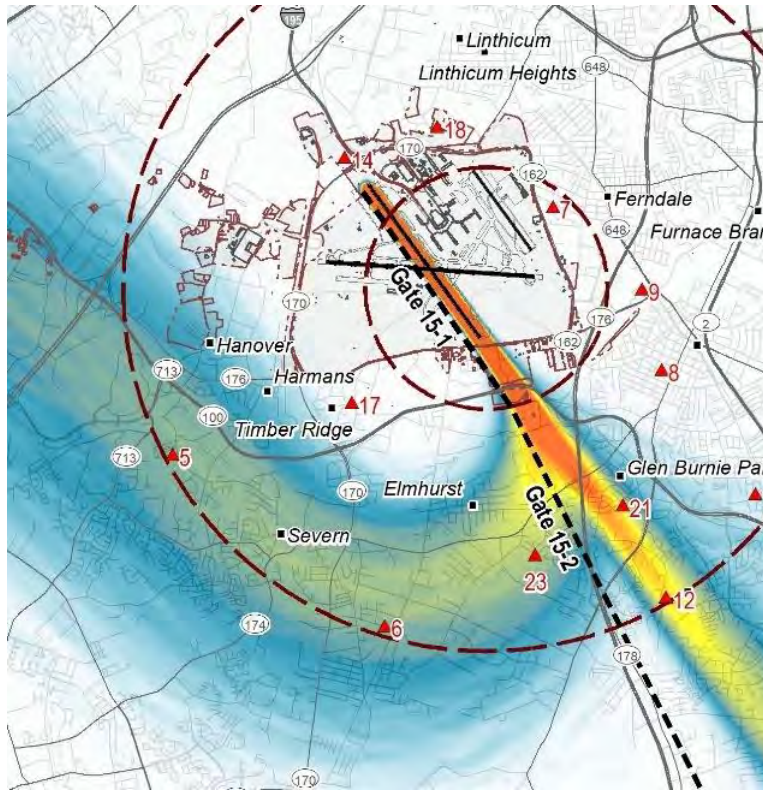


Runway 15R Jet Departures – 2017 Proposed (Simulated)



Runway 15R Jet Departures – Comparison

2012 Pre-Metroplex



2017 Post-Metroplex



2017 Proposed (Simulated)



Flight Track Density

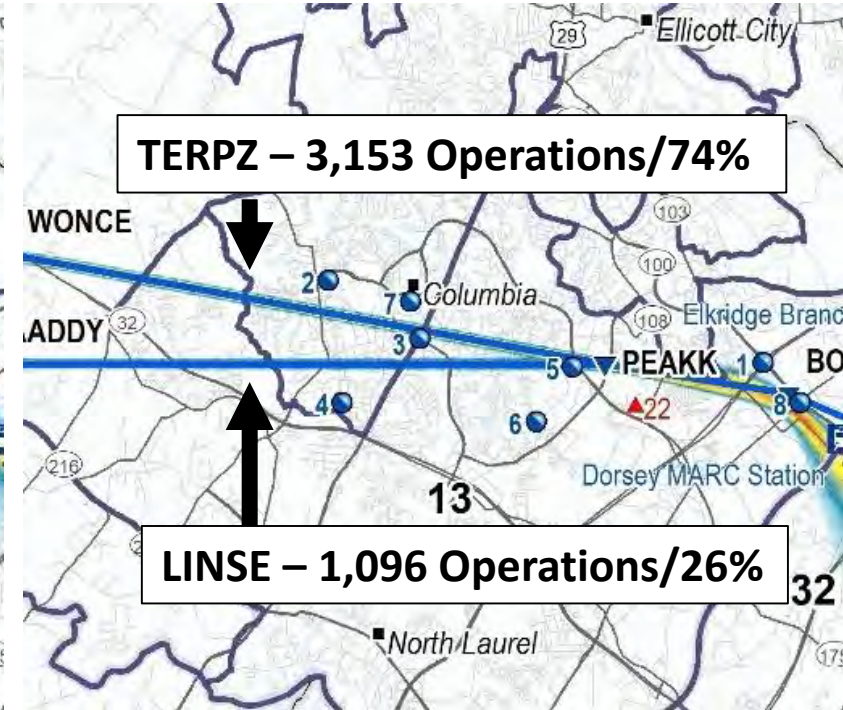
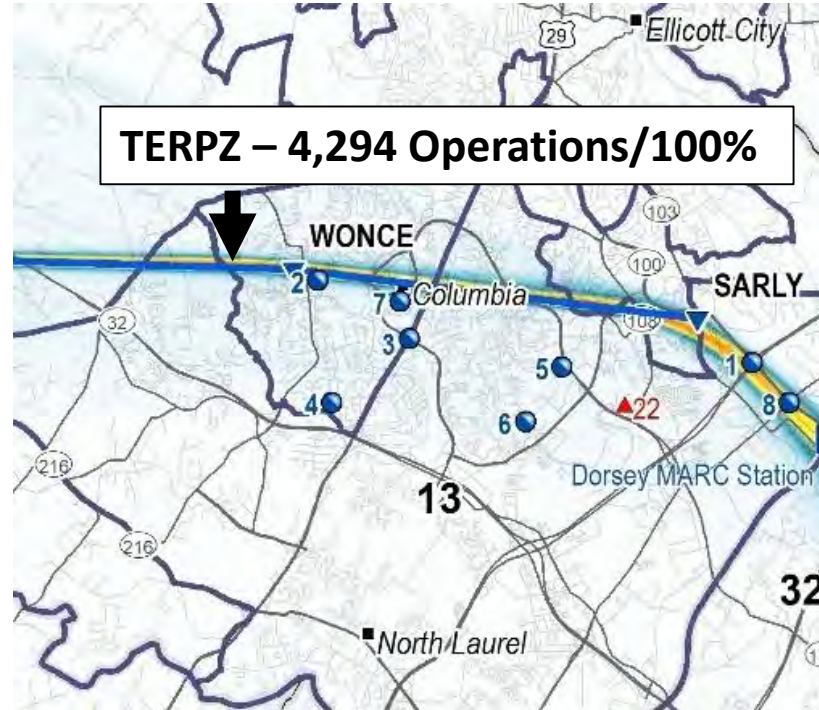
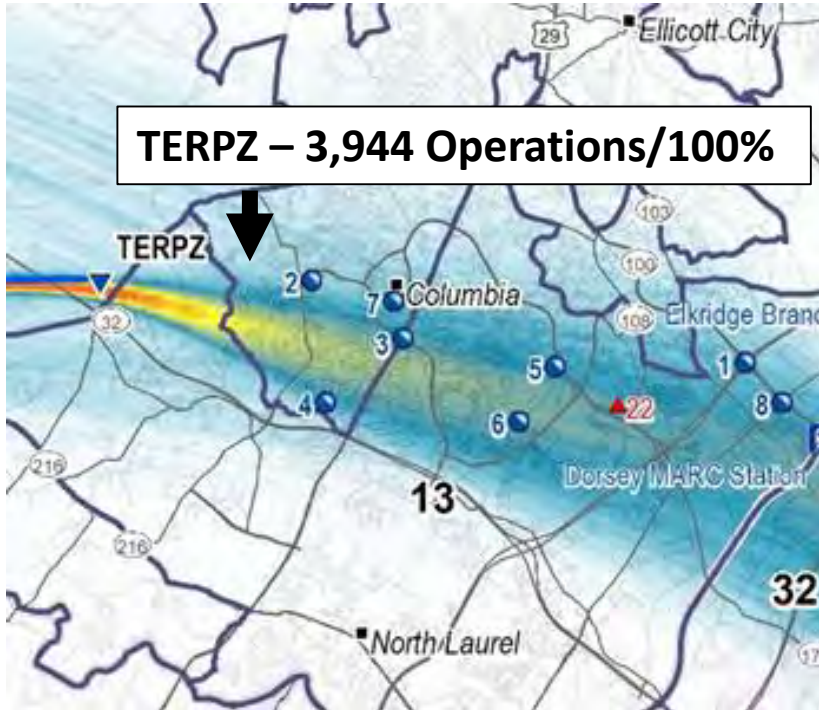


Runway 15R Jet Departures – Comparison

2012 Pre-Metroplex

2017 Post-Metroplex

2017 Proposed (Simulated)



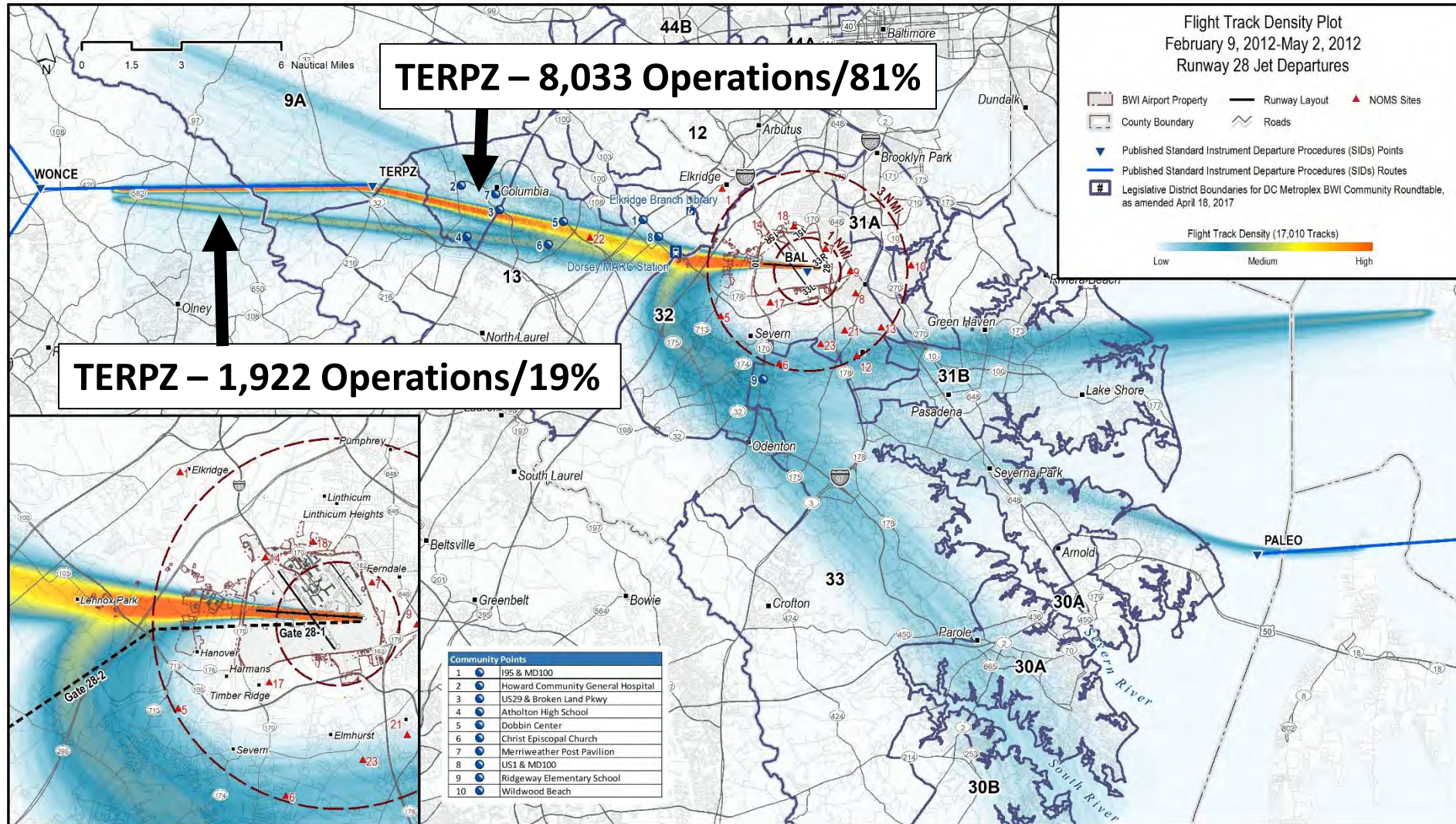
Community Points	
1	I95 & MD100
2	Howard Community General Hospital
3	US29 & Broken Land Pkwy
4	Atholton High School
5	Dobbin Center
6	Christ Episcopal Church
7	Merriweather Post Pavilion
8	US1 & MD100
9	Ridgeway Elementary School
10	Wildwood Beach



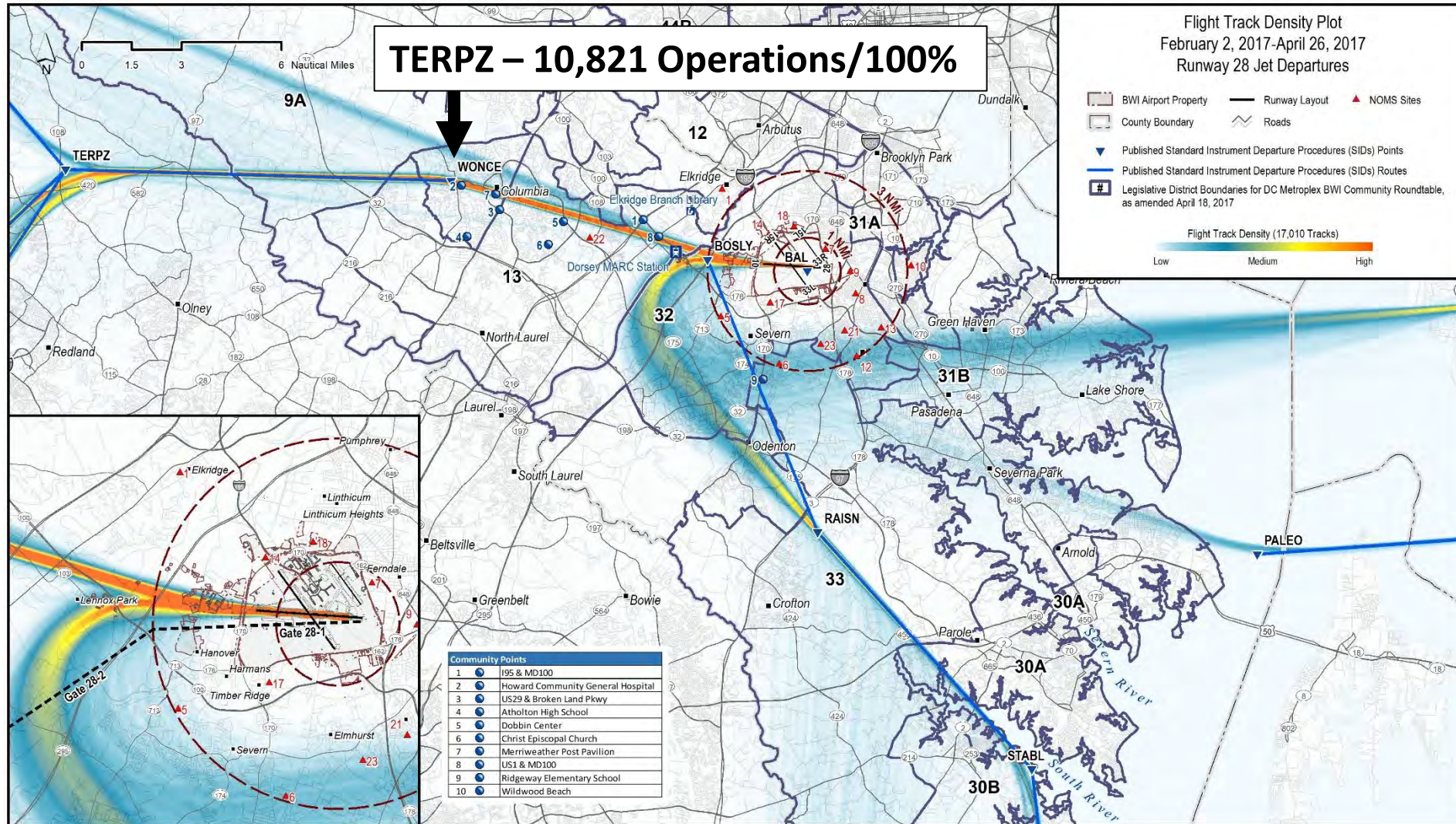
Runway 15R Jet Departures – Flight Track Analysis Summary

- Runway 15R FAA proposed departure procedure changes may:
 - Shift initial Jet departure turns southeast of 2012 and 2017 turn locations
 - Increase dispersion of initial Jet departure turns relative to 2017, but will not return dispersion to 2012 levels
 - Shift flight paths closer to 2012 historical locations to the west and south of Elkridge and Columbia
 - Better distribute operations over a larger area by splitting the TERPZ departure procedure into the modified TERPZ and LINSE procedures
- Overall, aircraft flight paths may shift but will remain heavily concentrated due to Area Navigation (RNAV) design

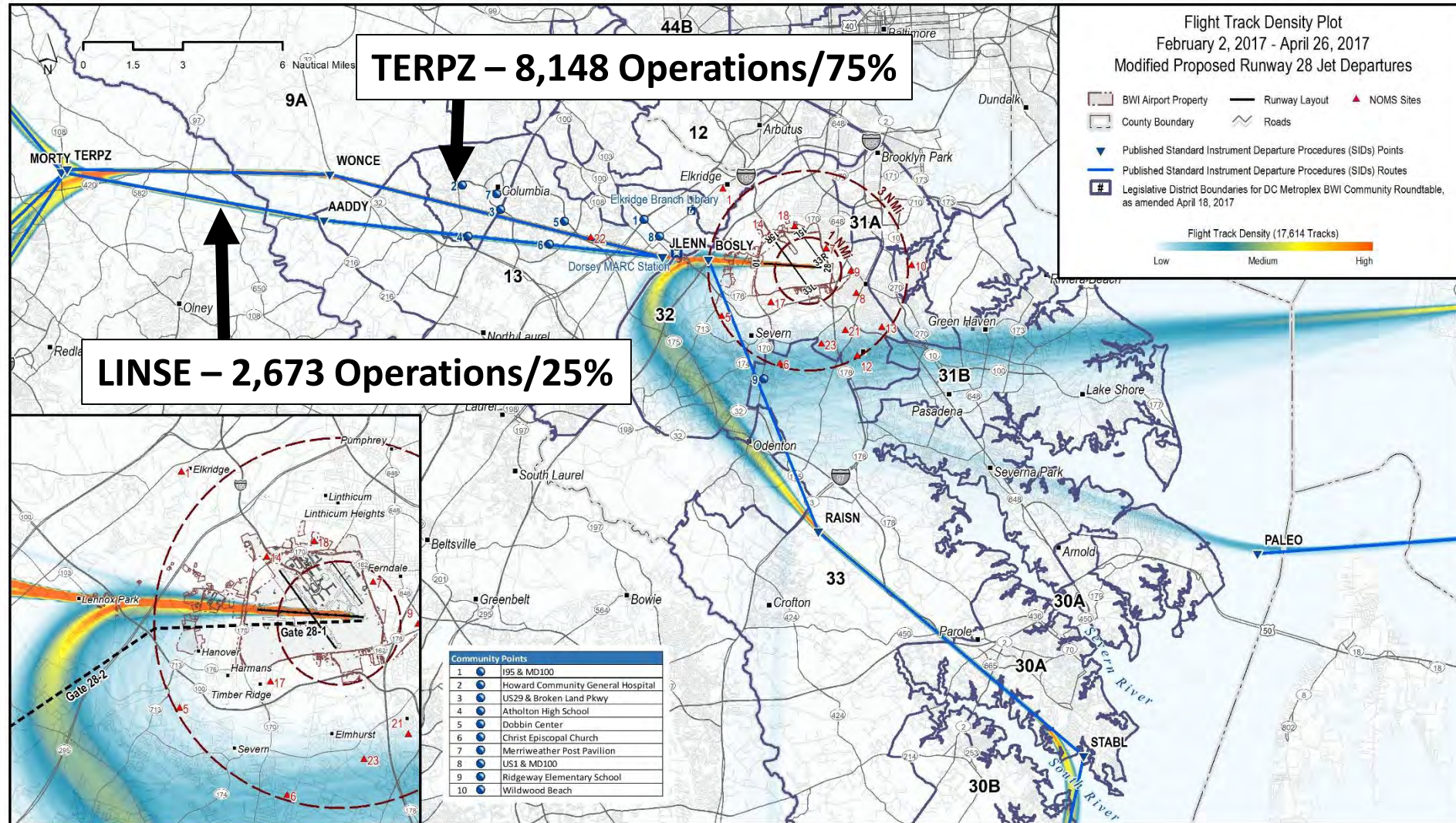
Runway 28 Jet Departures – 2012



Runway 28 Jet Departures – 2017

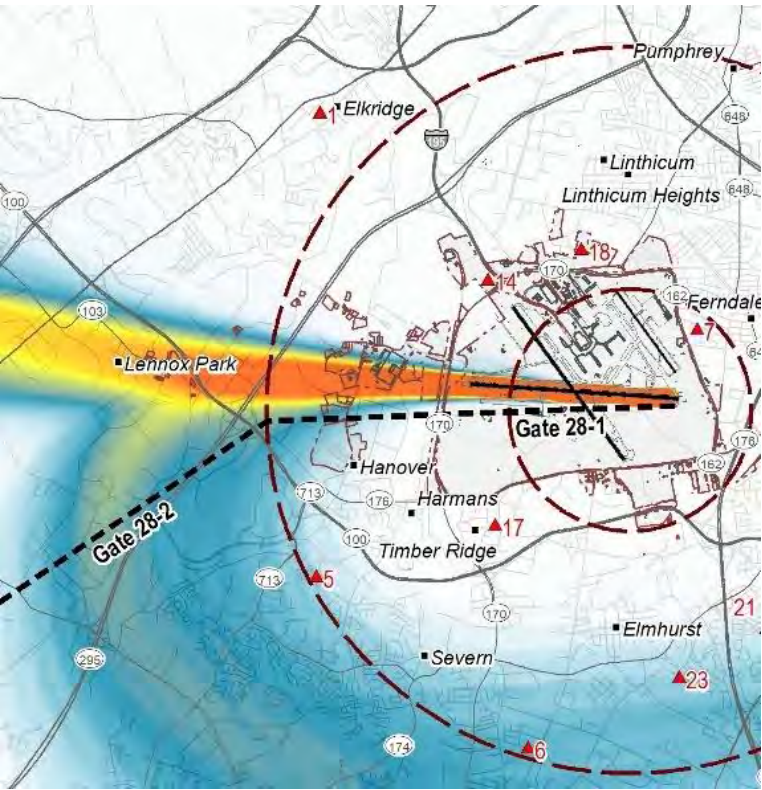


Runway 28 Jet Departures – 2017 Proposed (Simulated)

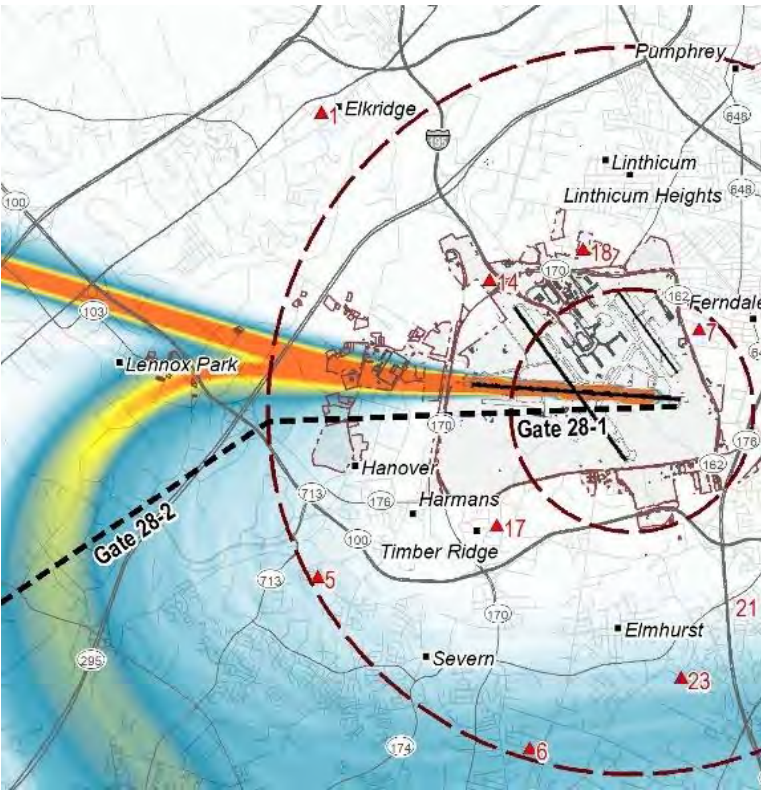


Runway 28 Jet Departures – Comparison

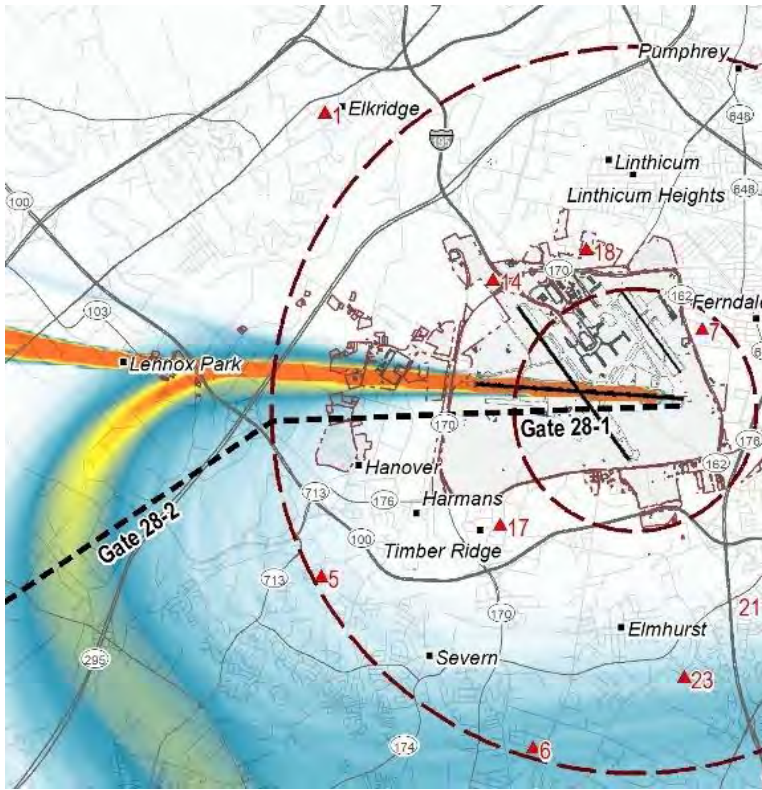
2012 Pre-Metroplex



2017 Post-Metroplex



2017 Proposed (Simulated)

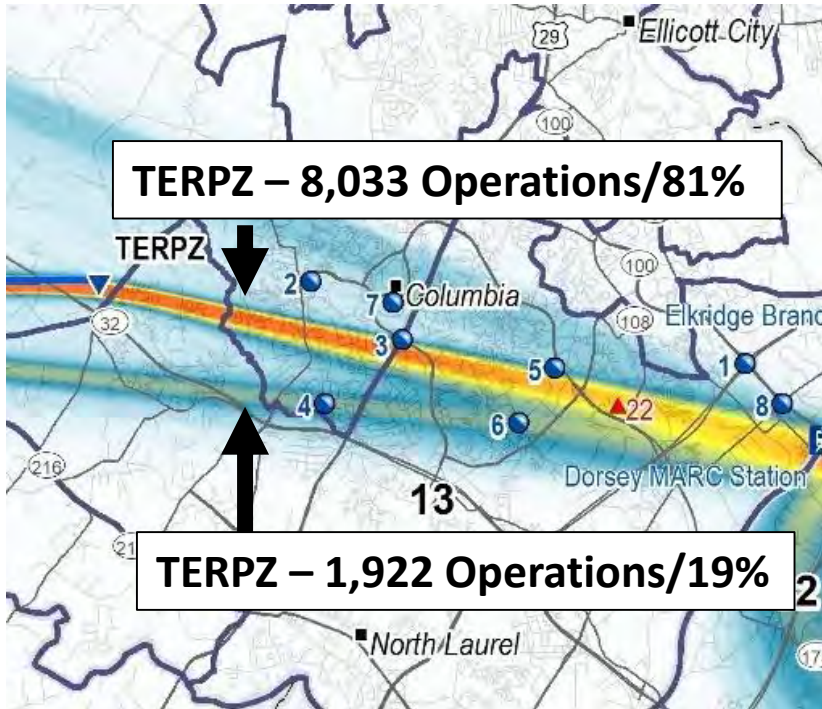


Flight Track Density

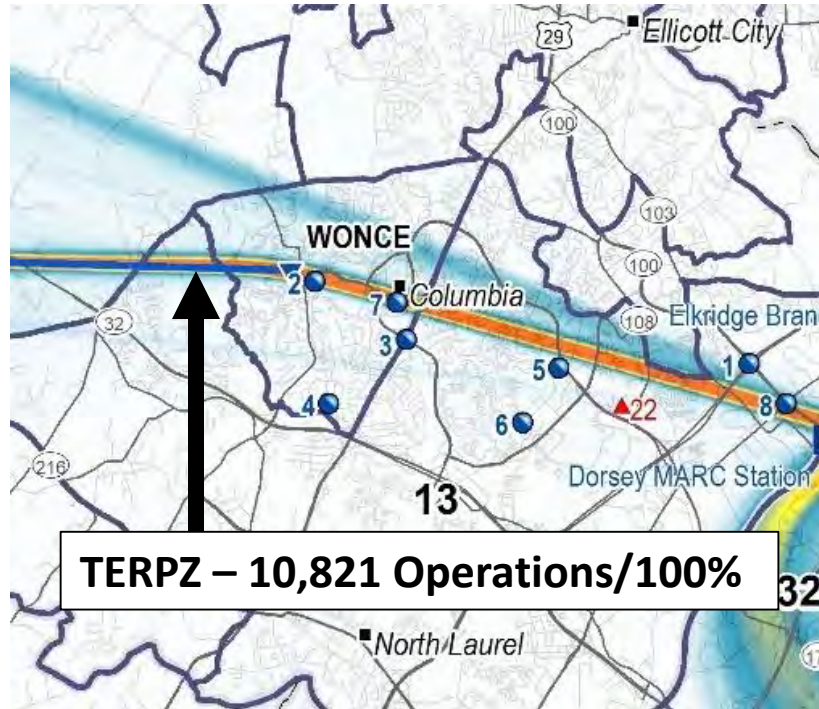


Runway 28 Jet Departures – Comparison

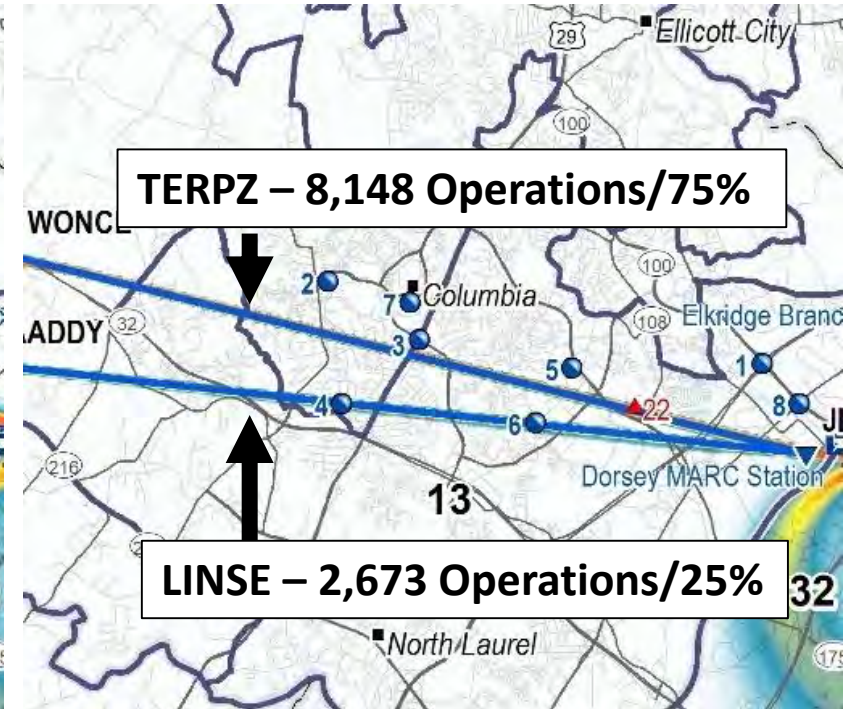
2012 Pre-Metroplex



2017 Post-Metroplex



2017 Proposed (Simulated)



Community Points	
1	I95 & MD100
2	Howard Community General Hospital
3	US29 & Broken Land Pkwy
4	Atholton High School
5	Dobbin Center
6	Christ Episcopal Church
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8	US1 & MD100
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10	Wildwood Beach



Runway 28 Jet Departures – Comparison

2012 Pre-Metroplex



2017 Post-Metroplex



2017 Proposed (Simulated)



Flight Track Density

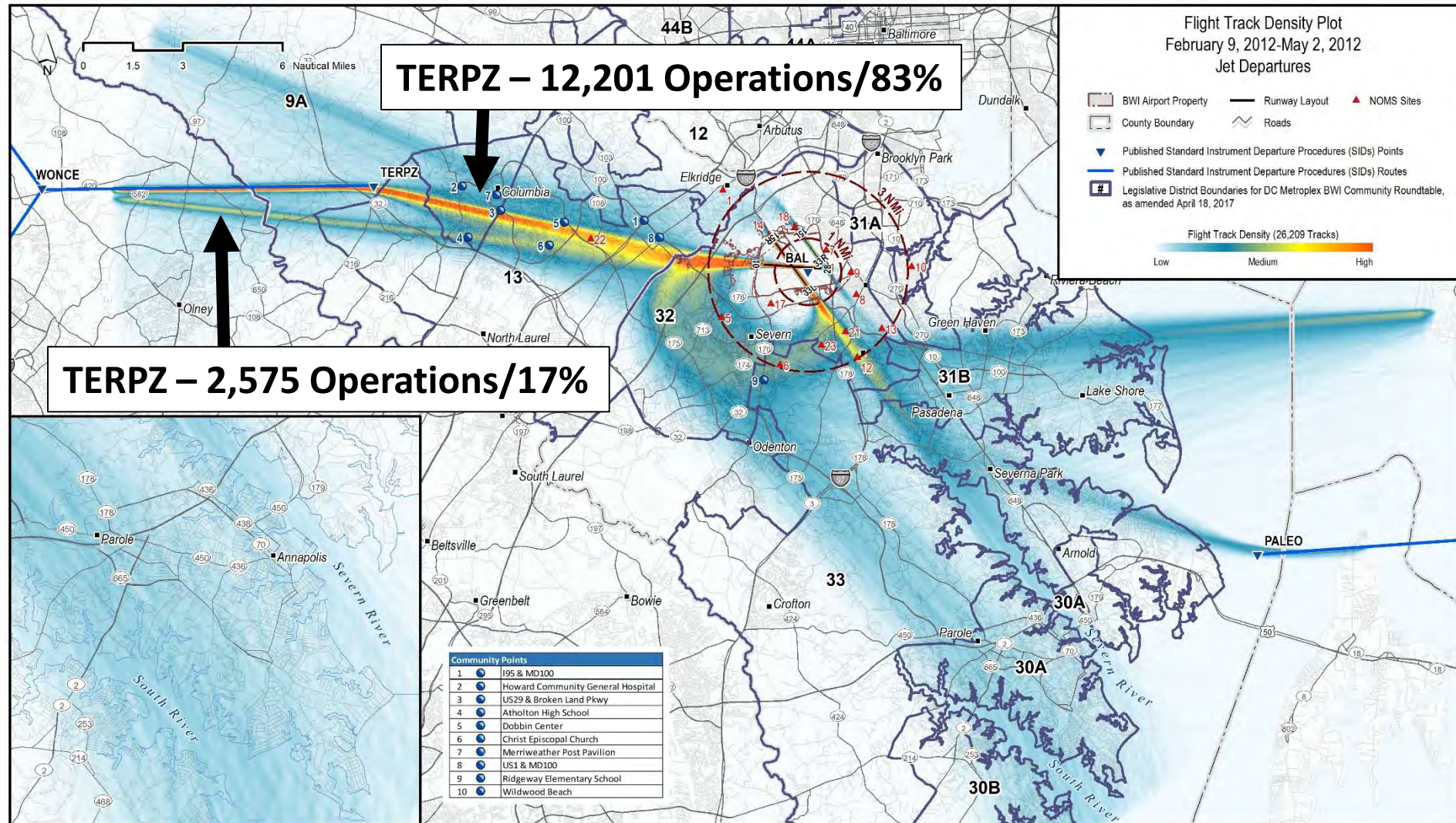
Low Medium High

- BWI Airport Property
- County Boundary
- Published Standard Instrument Departure Procedures (SIDs) Points
- Published Standard Instrument Departure Procedures (SIDs) Routes
- Legislative District Boundaries for DC Metroplex BWI Community Roundtable, as amended April 18, 2017
- Runway Layout
- Roads
- NOMS Sites

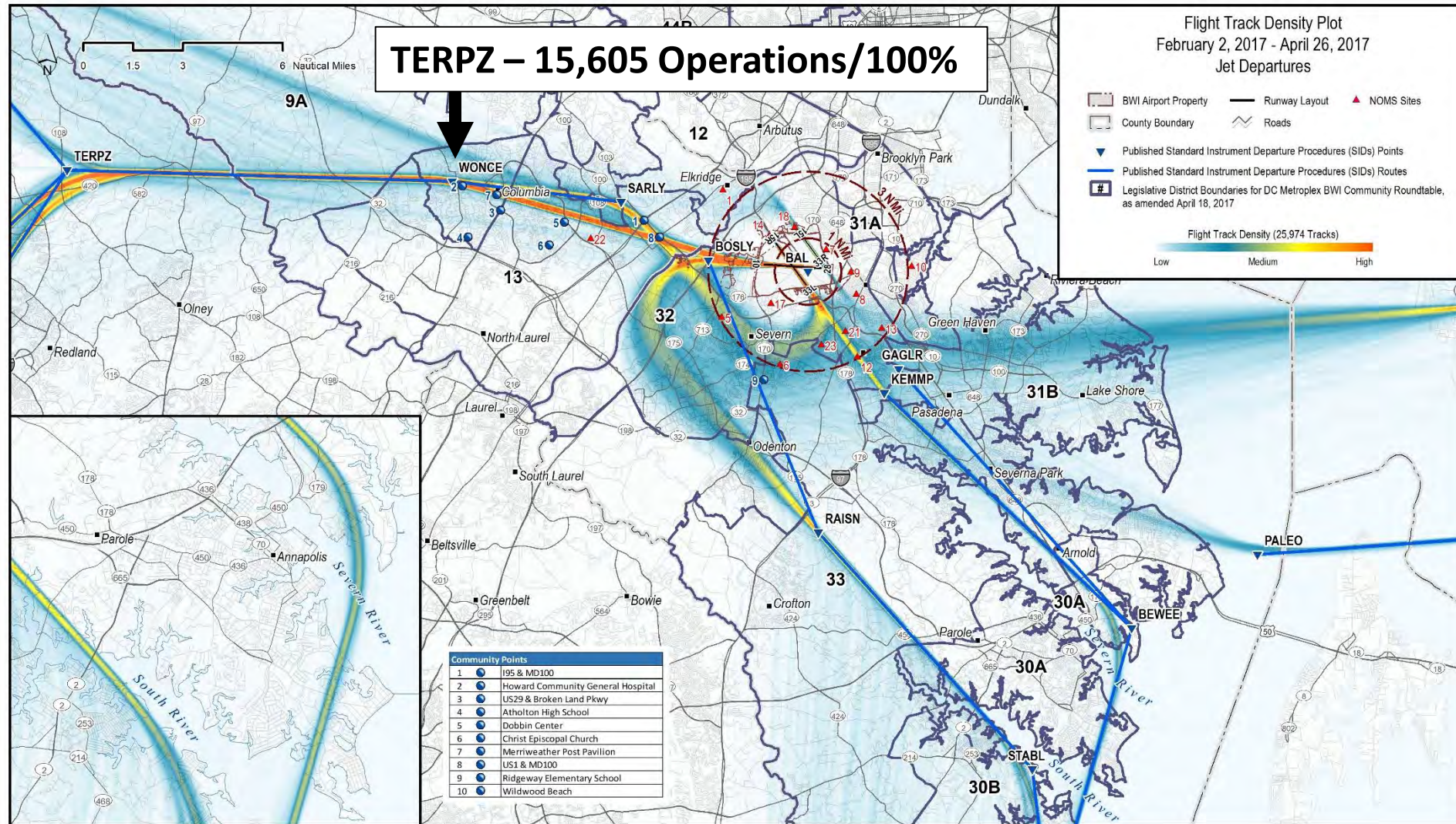
Runway 28 Jet Departures – Flight Track Analysis Summary

- Runway 28 FAA proposed departure procedure changes may:
 - Shift flight paths closer to 2012 historical locations to the west and south of Elkridge and Columbia
 - Better distribute operations over a larger area by splitting the TERPZ departure procedure into the modified TERPZ and LINSE procedures
 - Shift CONLE departures over the Annapolis peninsula at altitudes of 8,000 – 9,000 feet above Mean Sea Level (MSL)
- Overall, aircraft flight paths may shift but will remain heavily concentrated due to Area Navigation (RNAV) design

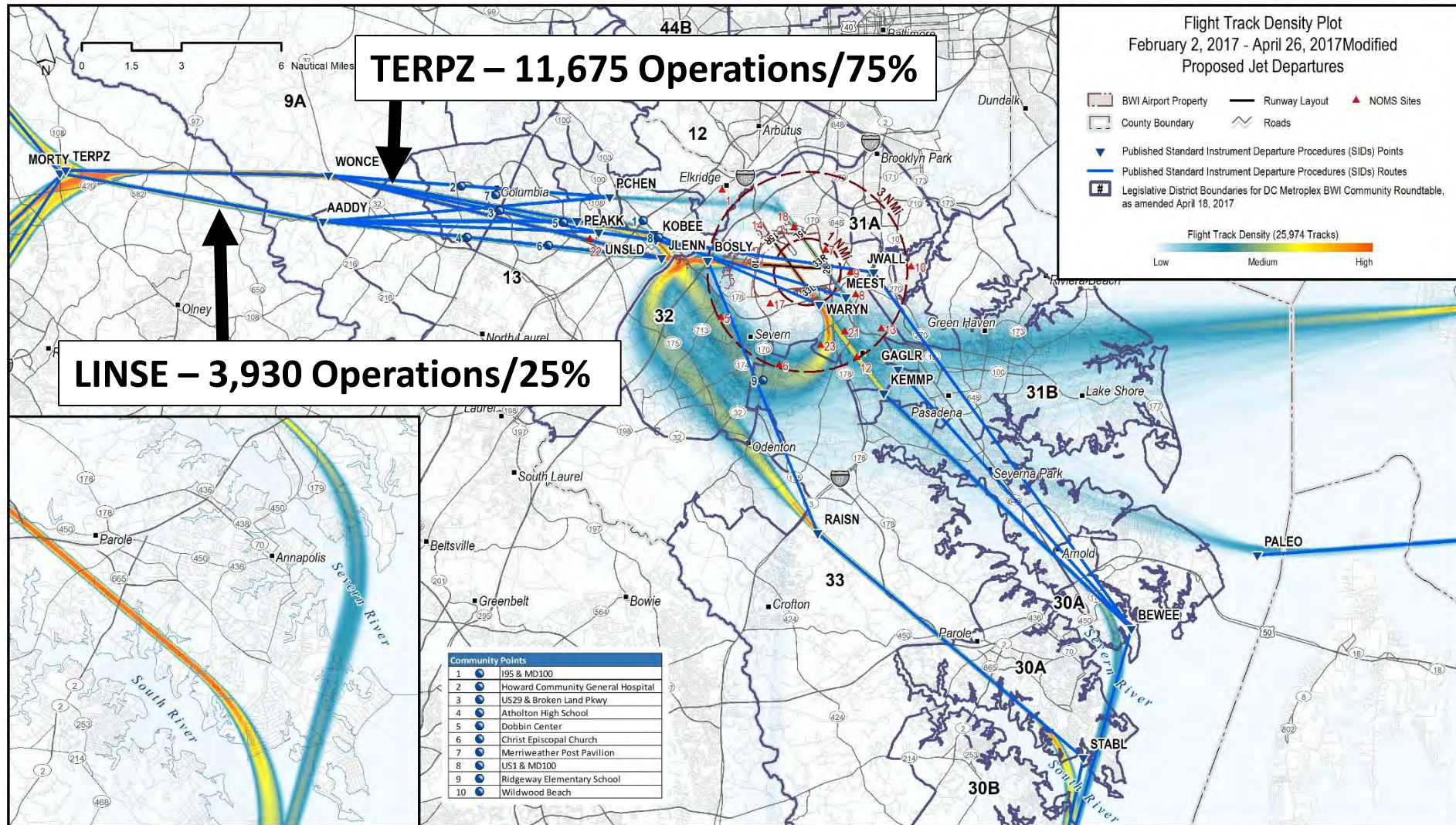
All Jet Departures – 2012



All Jet Departures – 2017



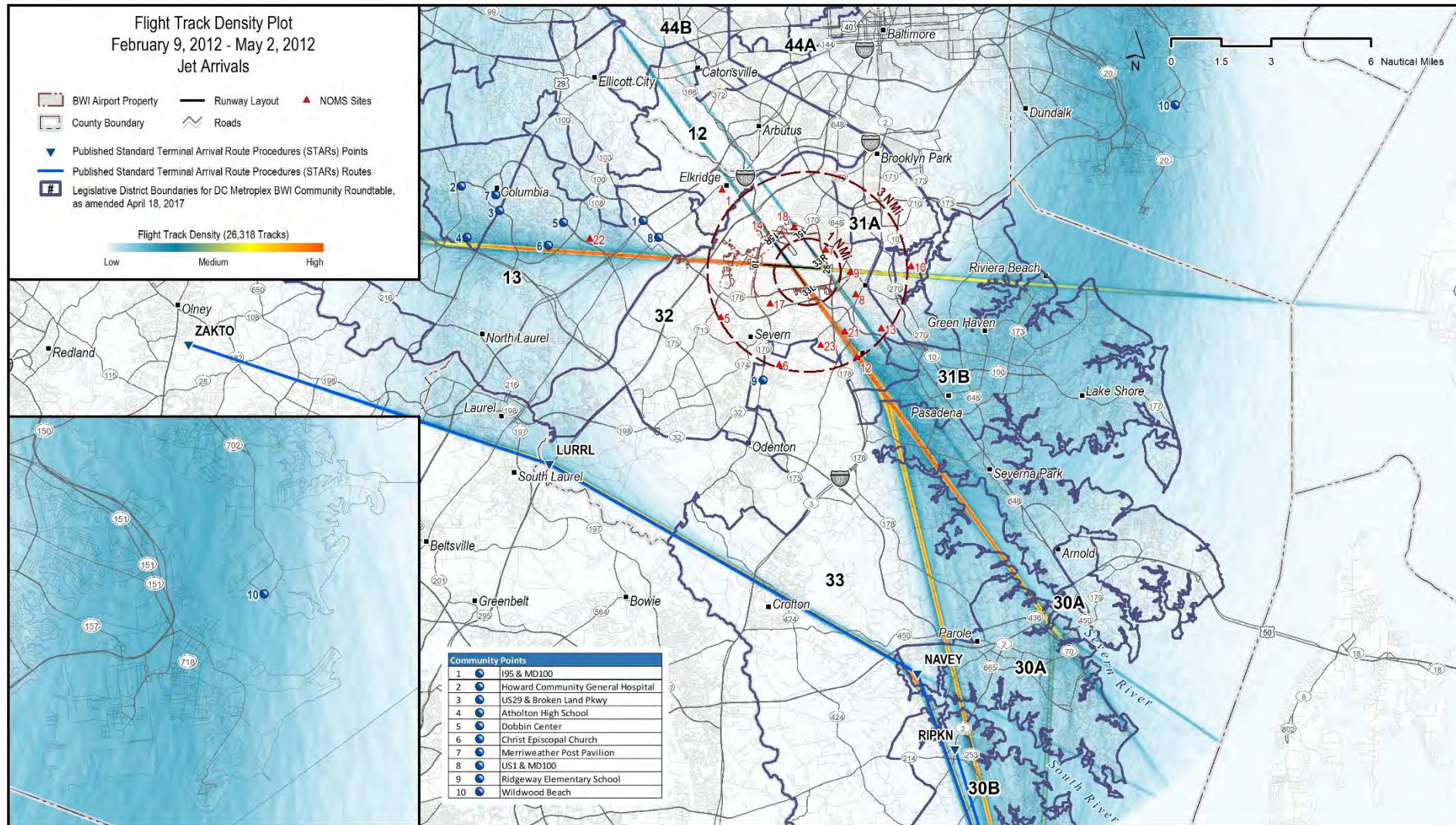
All Jet Departures – 2017 Proposed (Simulated)



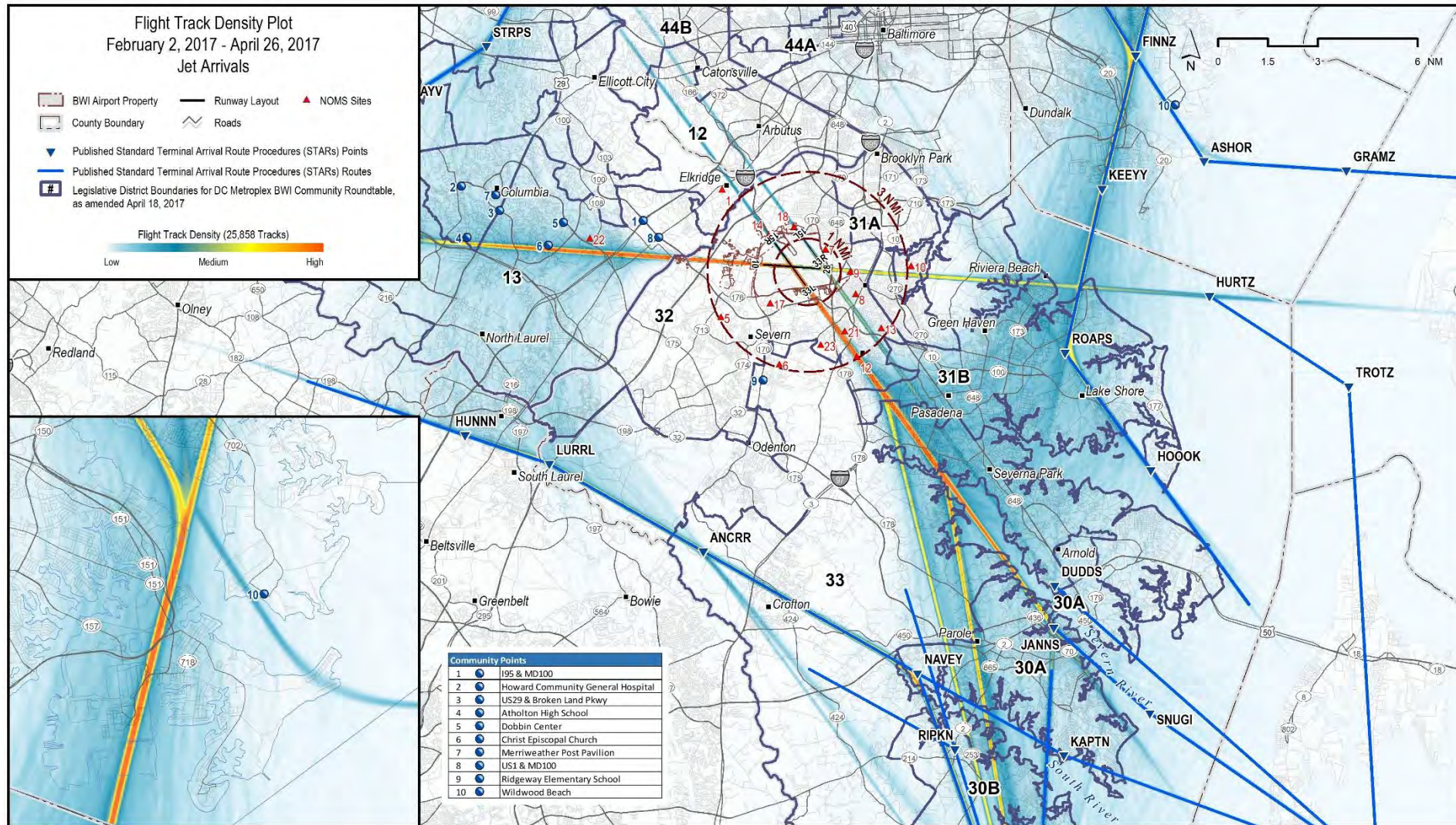
All Jet Departures – Flight Track Analysis Summary

- Proposed FAA procedures for Runways 15R and 28 may:
 - Shift Runway 15R initial Jet departure turns southeast of 2012 and 2017 turn locations
 - Increase dispersion of Runway 15R initial Jet departure turns relative to 2017, but will not return dispersion to 2012 levels
 - Shift flight paths for both runways closer to 2012 historical locations to the west and south of Elkridge and Columbia
 - Shift Runway 28 CONLE departures over the Annapolis peninsula at altitudes of 8,000 – 9,000 feet MSL
- Minor changes to aircraft altitude profiles
- Proposed FAA procedures for other Runways may:
 - Marginally increase the concentration of Runway 33R Jet departures

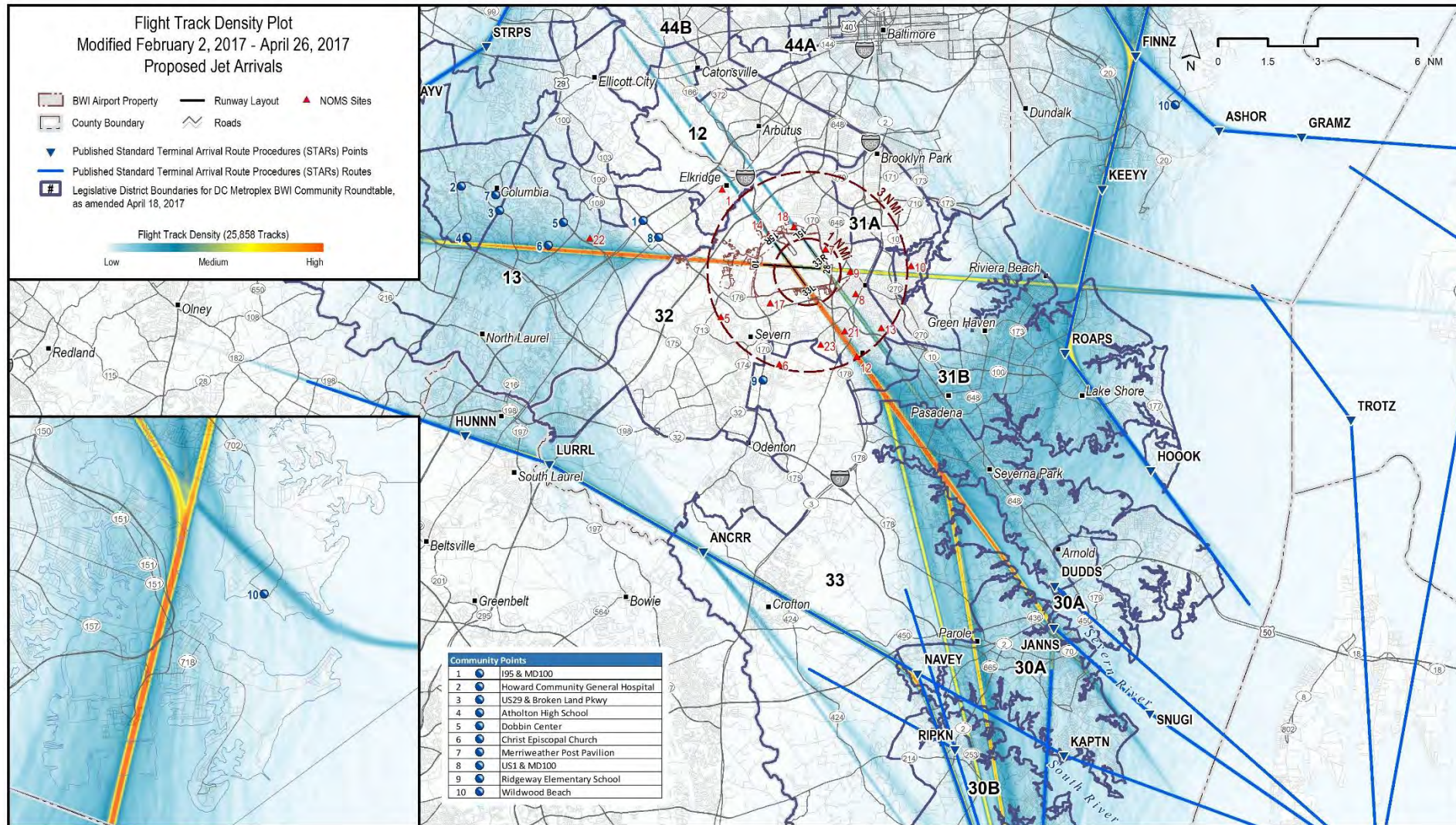
All Jet Arrivals – 2012



All Jet Arrivals – 2017



All Jet Arrivals – 2017 Proposed (Simulated)



All Jet Arrivals – Flight Track Analysis Summary

- Proposed FAA procedures for Runway 28 may shift the flight paths of arrivals to the north as aircraft turn to the downwind leg near Wildwood Beach
- No other anticipated notable flight path or altitude changes



Discussion



Noise Analysis

Noise Analysis - Overview

- Developed noise modeling inputs from radar flight track data samples used in flight track analysis for 2012, 2017, and 2017 operations modified to simulate use of proposed FAA procedures
- Fed inputs into Aviation Environmental Design Tool (AEDT) Version 2d
- Generated noise results
 - Day-Night Average Sound Level (DNL)
 - Contours, uniform grid, and US Census block centroids
 - Selected community locations and NOMS sites
 - Population counts from 2010 US Census and 2016 American Community Survey (ACS) 5-Year Estimates

Noise Analysis – Operation Inputs

- Reviewed operations during 2012 and 2017 sample periods recorded by BWI Marshall NOMS and compared to FAA recorded operations at BWI Marshall from Air Traffic Activity Data System (ATADS)
- Adjusted operations to ensure arrival and departure operations are equal, and then scaled to match FAA recorded operations from ATADS based on Tower Category
 - Modeled 2012 (84 days) operations: 61,974
 - Modeled 2017/2017 (84 days) modified proposed simulated operations: 55,995
- 2017 operations simulated to fly FAA proposed procedures utilized same inputs as baseline 2017 data sample with the exception of changes to aircraft flight tracks

Modeled DNL Contours - 2012

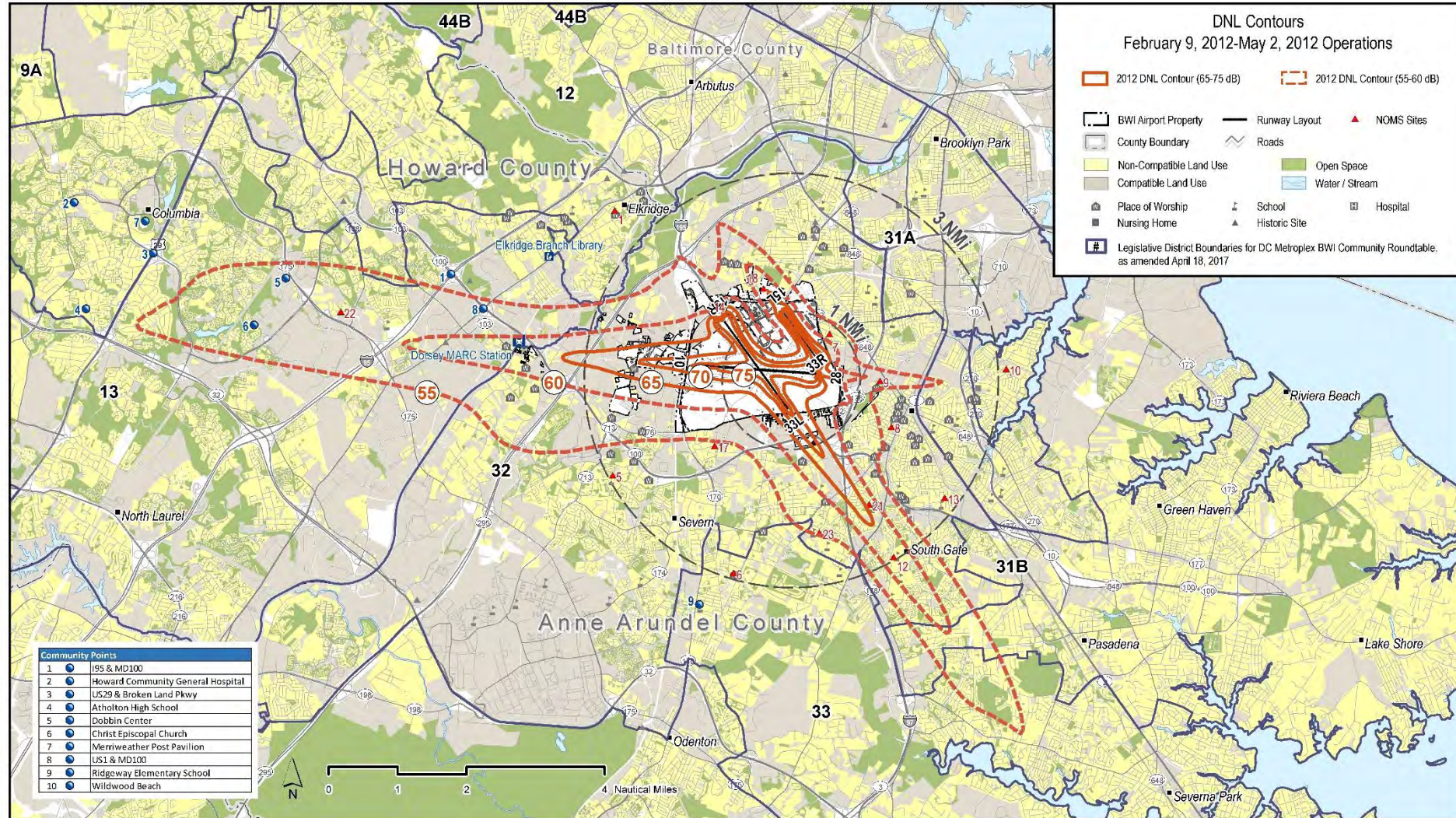
2010 US Census

Contour Range	Population	Households
55-60 dB	48,189	19,200
60-65 dB	8,143	3,282
65-70 dB	611	246
70-75 dB	12	5
75+ dB	0	0
Total	56,955	22,733

2016 ACS

5-Year Estimates

Contour Range	Population	Households
55-60 dB	54,466	21,558
60-65 dB	8,955	3,838
65-70 dB	1,527	561
70-75 dB	122	47
75+ dB	3	1
Total	65,073	26,005



Note: For informational purposes only

Modeled DNL Contours - 2017

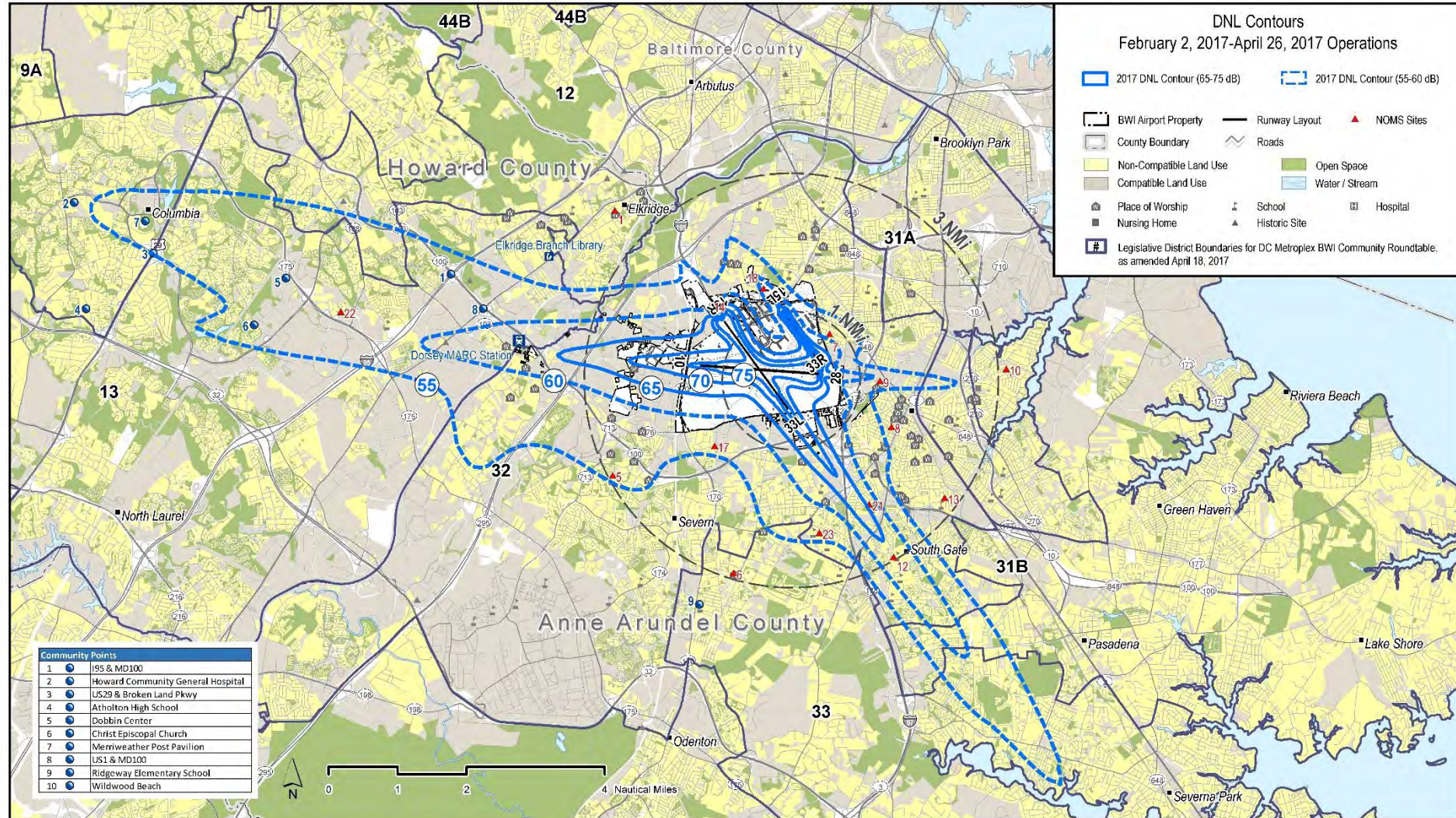
2010 US Census

Contour Range	Population	Households
55-60 dB	75,460	30,589
60-65 dB	10,472	4,239
65-70 dB	1,051	420
70-75 dB	35	14
75+ dB	0	0
Total	87,018	35,262

2016 ACS

5-Year Estimates

Contour Range	Population	Households
55-60 dB	83,249	33,160
60-65 dB	11,163	4,726
65-70 dB	2,091	806
70-75 dB	232	90
75+ dB	10	4
Total	96,745	38,786



Note: For informational purposes only

Modeled DNL Contours – 2017 Proposed (Simulated)

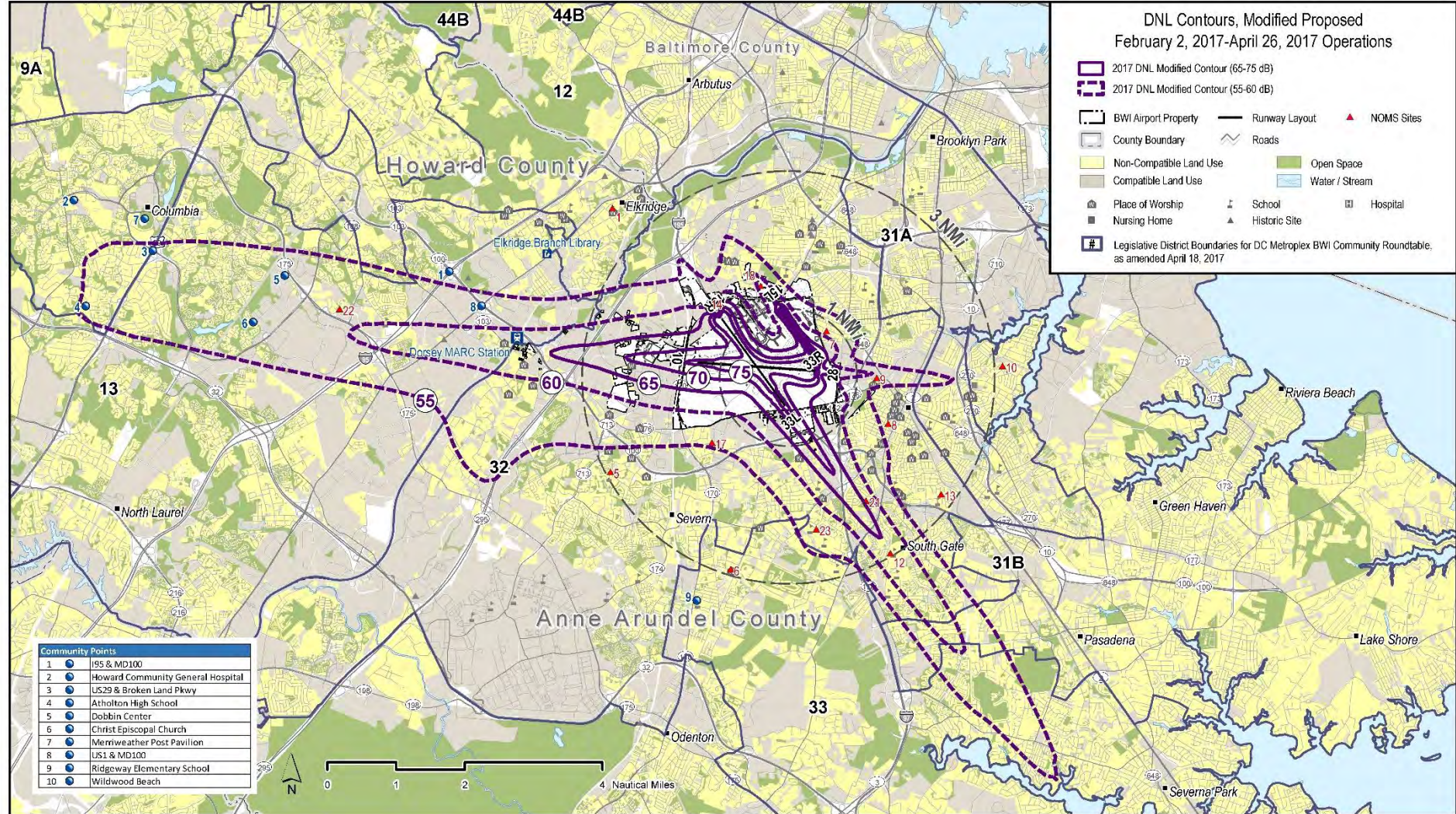
2010 US Census

Contour Range	Population	Households
55-60 dB	59,792	23,411
60-65 dB	13,353	5,380
65-70 dB	1,120	454
70-75 dB	37	15
75+ dB	0	0
Total	74,302	29,260

2016 ACS

5-Year Estimates

Contour Range	Population	Households
55-60 dB	67,154	26,350
60-65 dB	13,356	5,590
65-70 dB	2,163	836
70-75 dB	246	95
75+ dB	10	4
Total	82,929	32,875



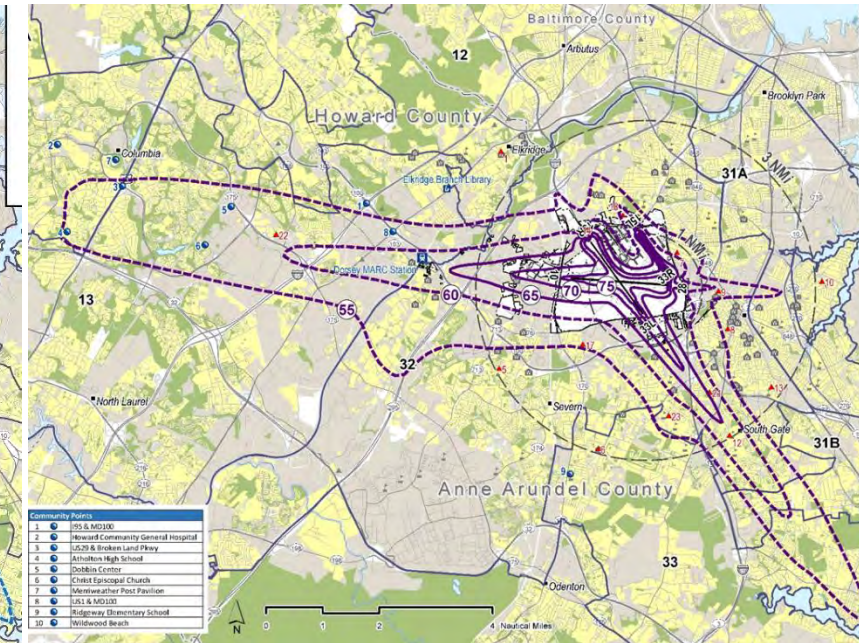
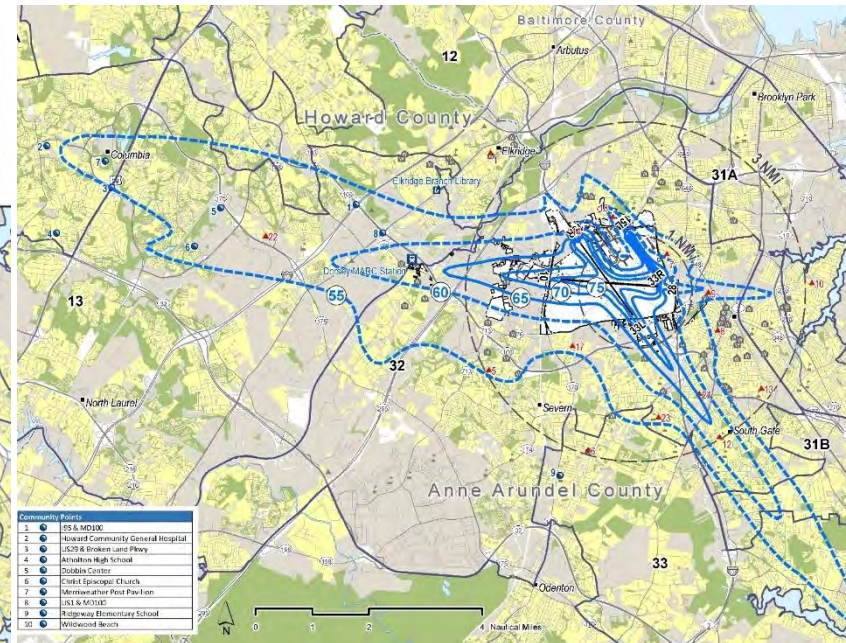
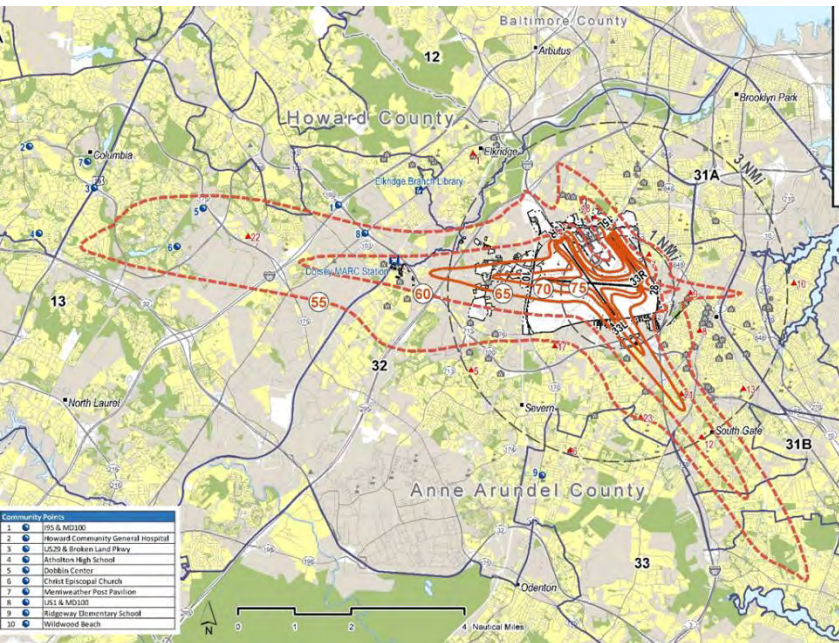
Note: For informational purposes only

Modeled DNL Contours – Comparison

2012 Pre-Metroplex

2017 Post-Metroplex

2017 Proposed (Simulated)



2012 DNL Contour (65-75 dB)
 2012 DNL Contour (55-60 dB)

2017 DNL Contour (65-75 dB)
 2017 DNL Contour (55-60 dB)

2017 DNL Modified Contour (65-75 dB)
 2017 DNL Modified Contour (55-60 dB)

- BWJ Airport Property
- Runway Layout
- NOMS Sites
- County Boundary
- Roads
- Non-Compatible Land Use
- Open Space
- Compatible Land Use
- Water / Stream
- Place of Worship
- School
- Hospital
- Nursing Home
- Historic Site
- Legislative District Boundaries for DC Metroplex BWI Community Roundtable, as amended April 18, 2017

Modeled DNL Contours – 2017 Proposed (Simulated) Compared to 2017

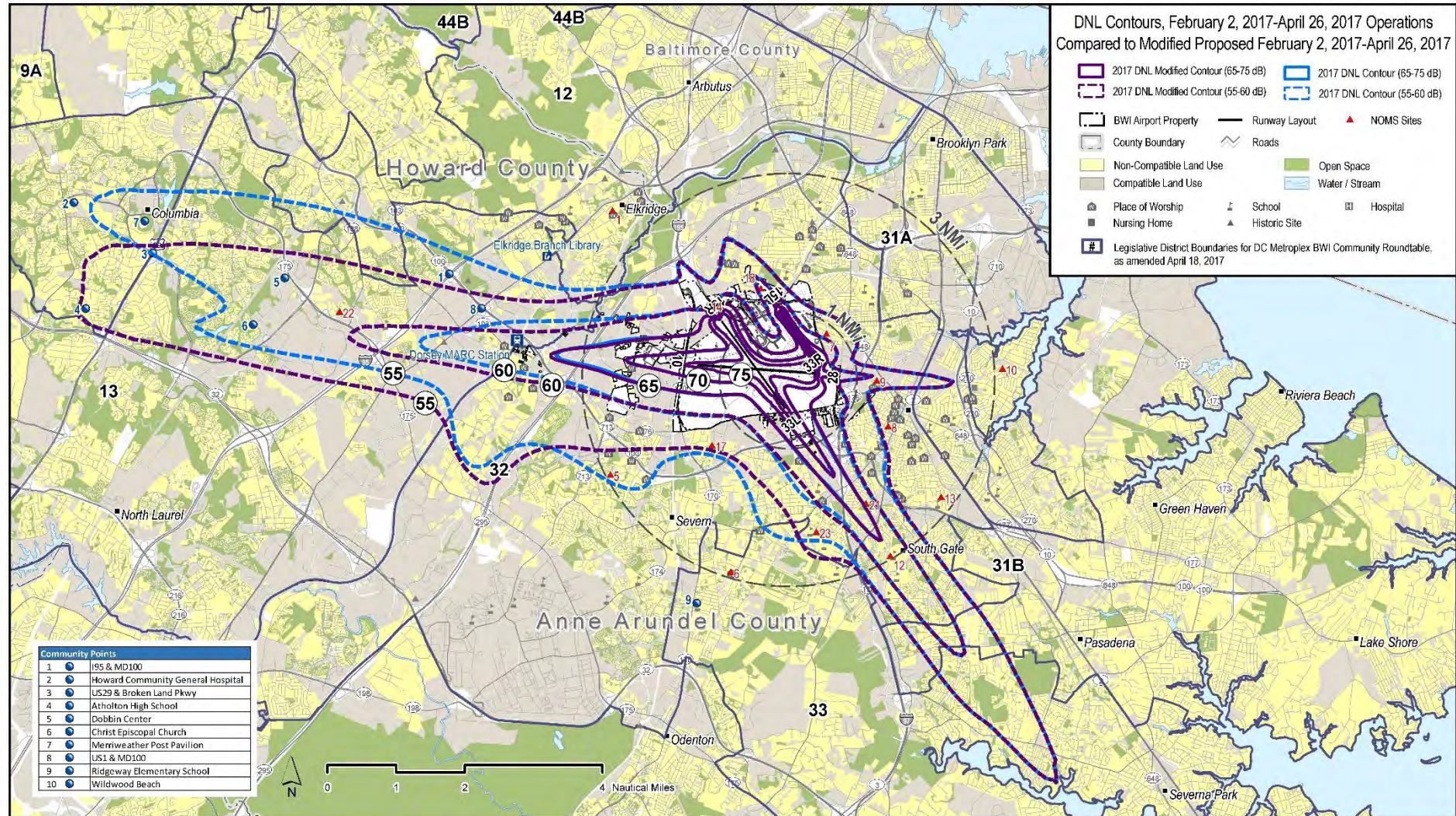
2010 US Census

Contour Range	Population Difference	Households Difference
55-60 dB	-15,668	-7,178
60-65 dB	2,881	1,141
65-70 dB	69	34
70-75 dB	2	1
75+ dB	0	0
Total	-12,716	-6,002

2016 ACS

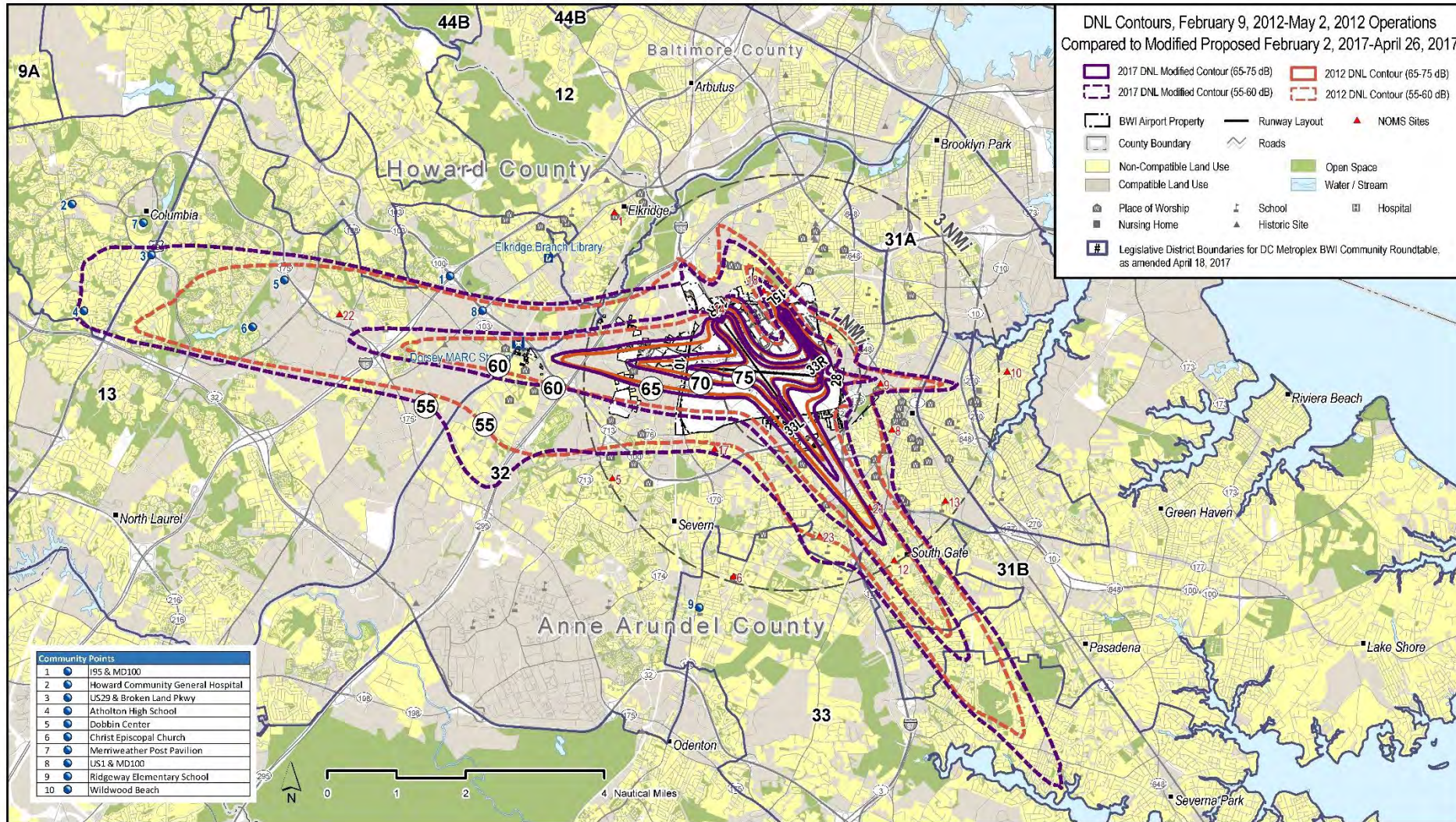
5-Year Estimates

Contour Range	Population Difference	Households Difference
55-60 dB	-16,095	-6,810
60-65 dB	2,193	864
65-70 dB	72	30
70-75 dB	14	5
75+ dB	0	0
Total	-13,816	-5,911



Note: For informational purposes only

Modeled DNL Contours – 2017 Proposed (Simulated) Compared to 2012

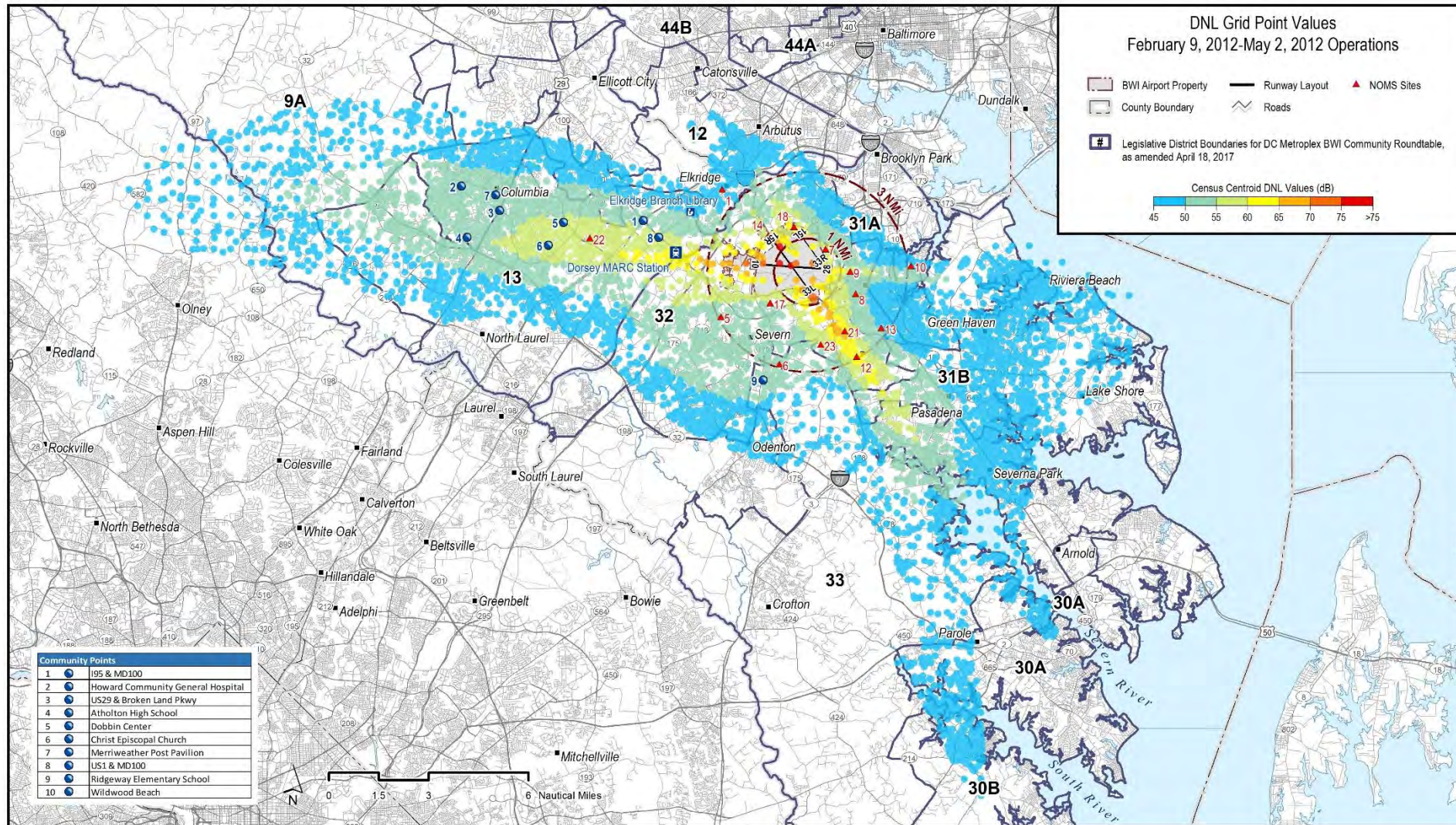


Note: For informational purposes only

Noise Analysis – Modeled DNL Contour Summary

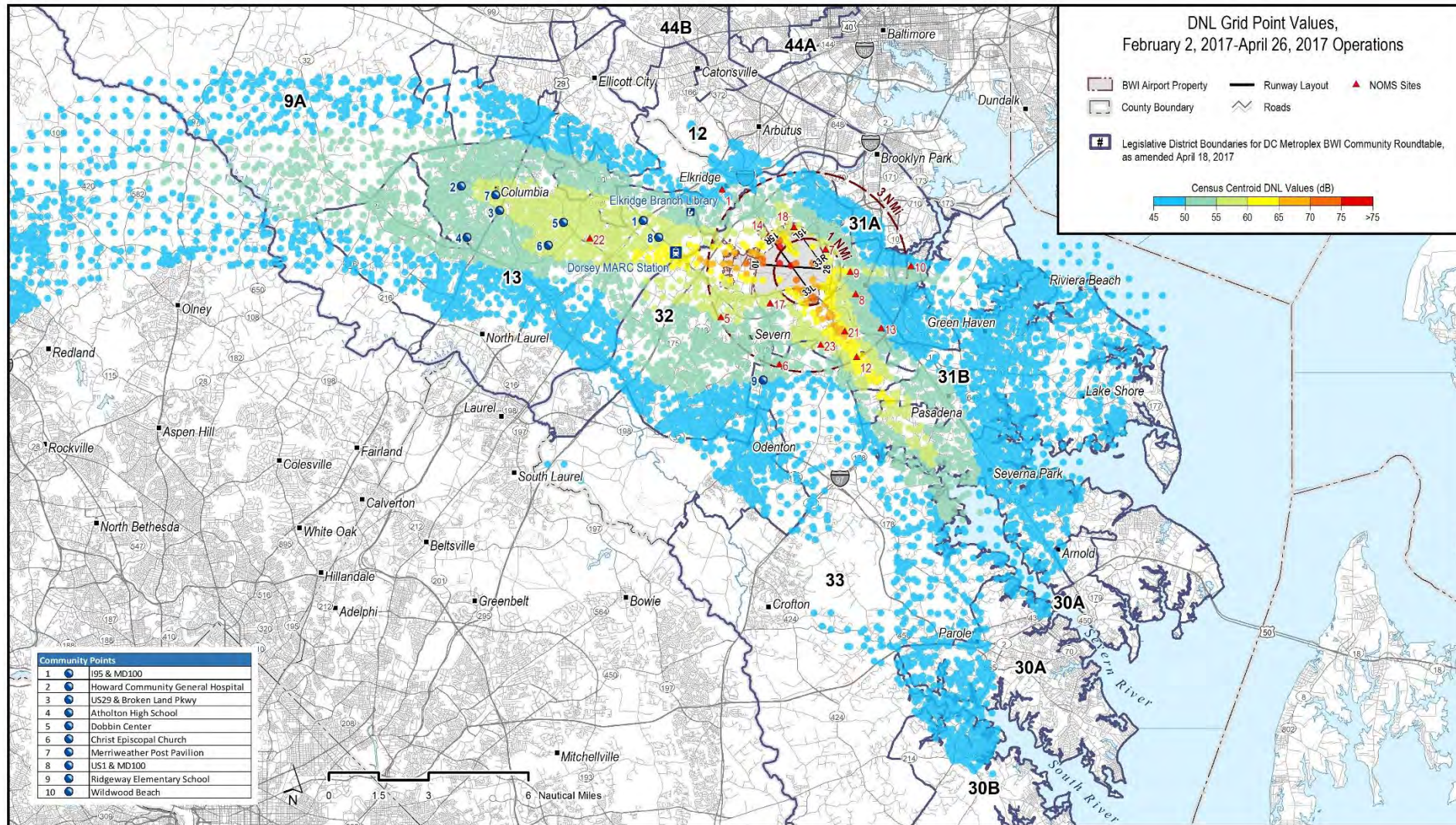
- Proposed FAA procedures may:
 - Slightly change the 65 dB DNL and greater contours
 - Shift the 55 and 60 dB DNL contours west of the airport associated with Runway 28 departures further to the south closer to the historical location of 55 and 60 dB DNL contours in 2012
 - Shift the 55 and 60 dB DNL contours south of the airport associated with Runway 15R departures further to the south

Modeled DNL Grid Points - 2012



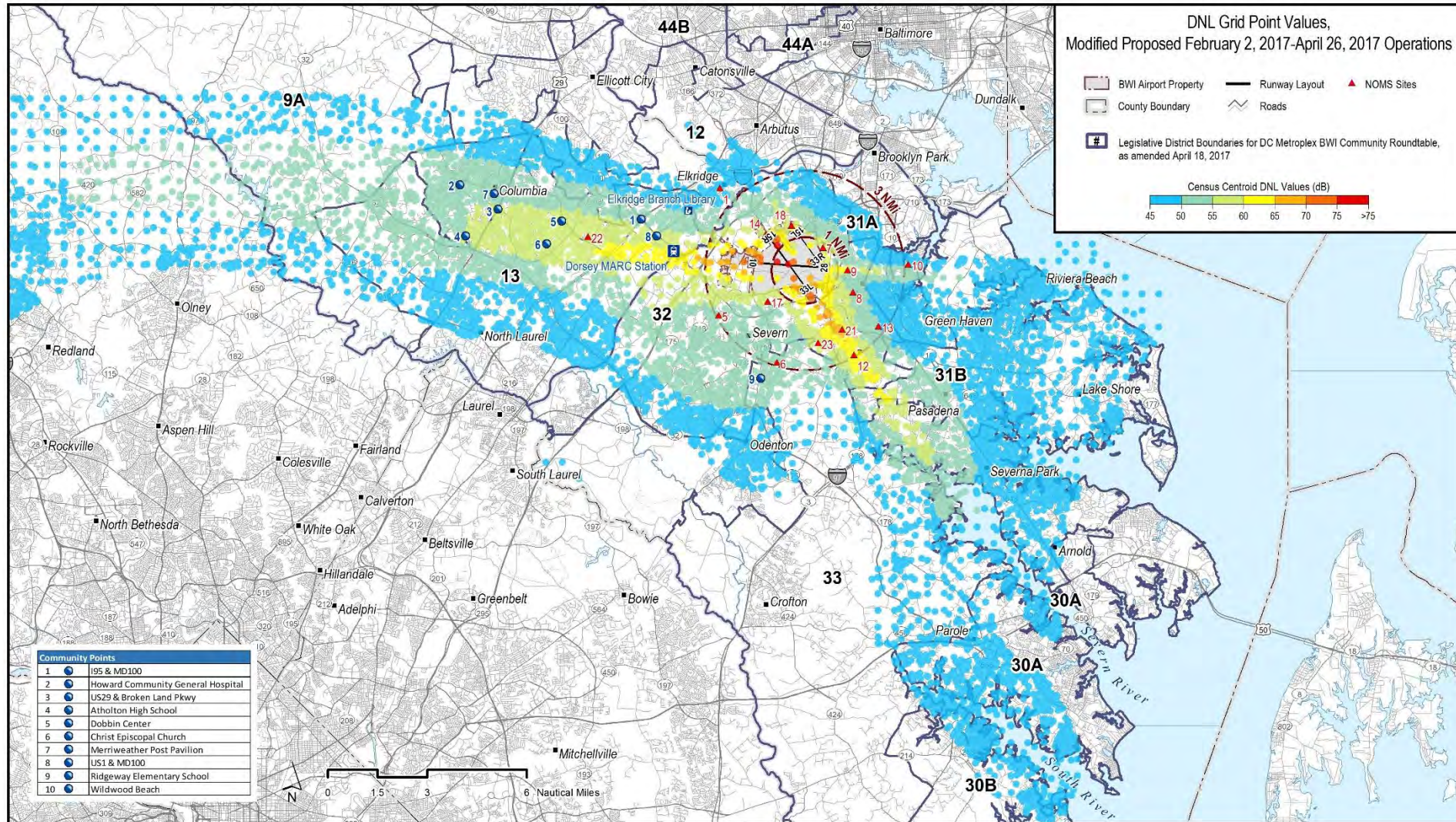
Note: For informational purposes only

Modeled DNL Grid Points - 2017



Note: For informational purposes only

Modeled DNL Grid Points – 2017 Proposed (Simulated)



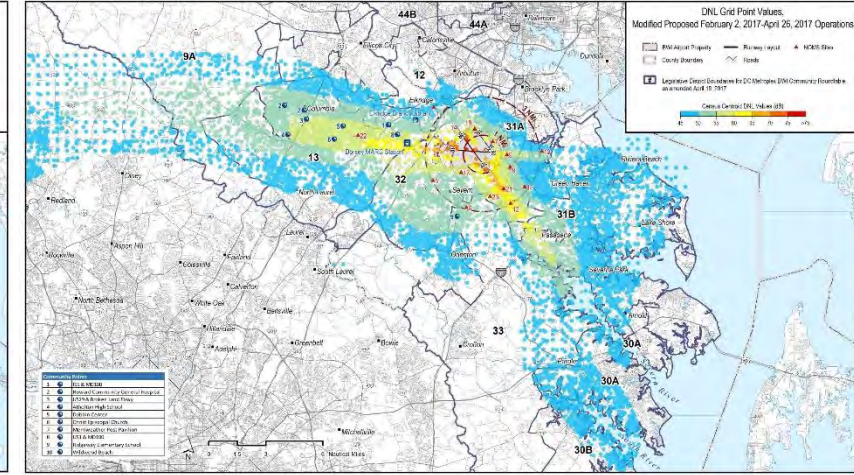
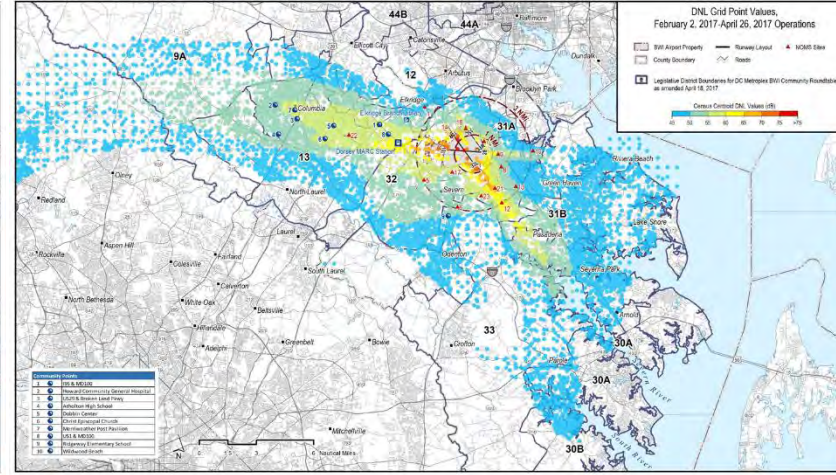
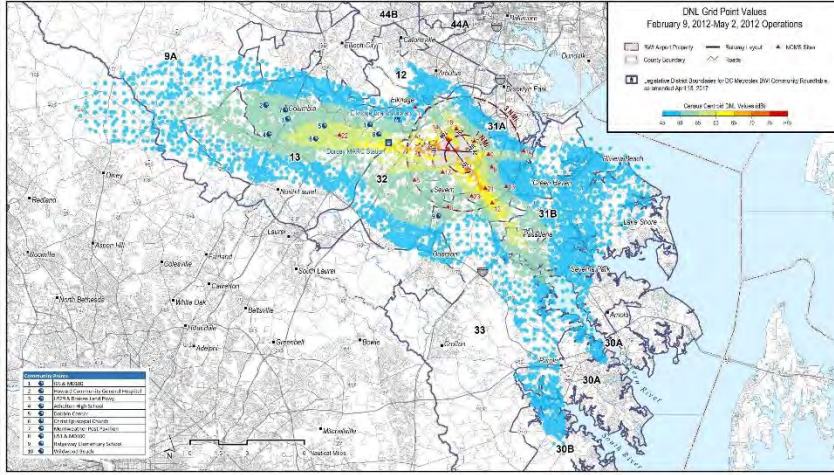
Note: For informational purposes only

Modeled DNL Grid Points – Comparison

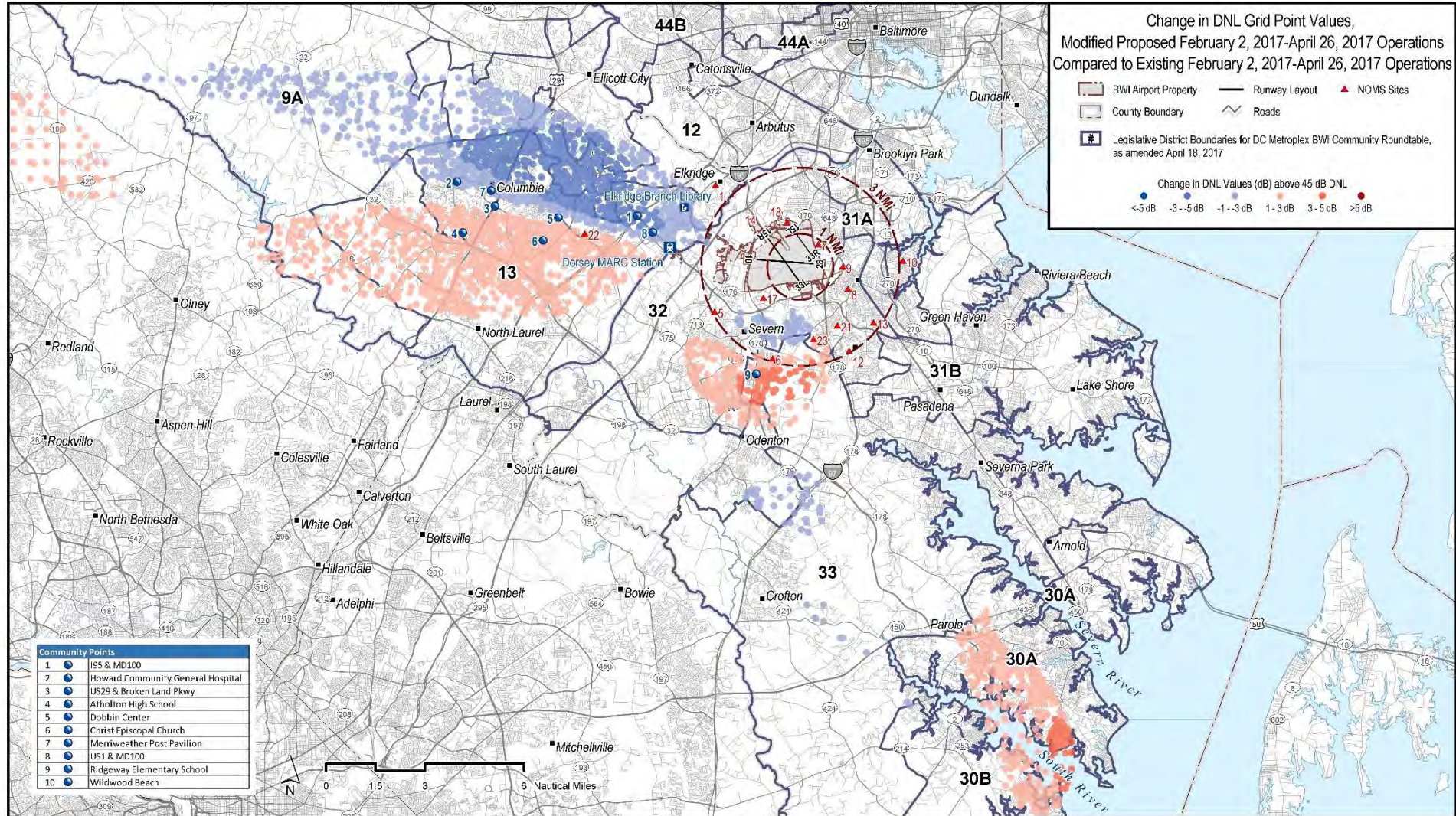
2012 Pre-Metroplex

2017 Post-Metroplex

2017 Proposed (Simulated)



Modeled DNL Grid Points – 2017 Proposed (Simulated) Compared to 2017



Note: For informational purposes only

Noise Analysis – Summary

- None of the observed noise increases or decreases meet the FAA criteria for reportable changes defined under FAA Order 1050.1F, “Environmental Impacts: Policies and Procedures”
 - (+/-) 1.5 dB change within 65 dB DNL
 - (+/-) 3 dB change within 60 dB DNL
 - (+/-) 5 dB change within 45 dB DNL
- Proposed FAA procedures may:
 - Slightly decrease noise over and north of Columbia, and increase noise south of Columbia over Guilford due to shifting south of Runway 15R and 28 departures
 - Slightly decrease noise over northern areas of Severn and Elmhurst, and increase noise in the southern areas of Severn approaching Odenton
 - Slightly increase noise over the Annapolis peninsula



Discussion