BNA MASTER PLAN
NASHVILLE INTERNATIONAL AIRPORT

Nashville International Airport

Noise Exposure Map (NEM) Update
Noise Study Advisory Committee
Noise Modeling Meeting

June 11, 2019

BNA Nashville International Airport

AECOM

Agenda

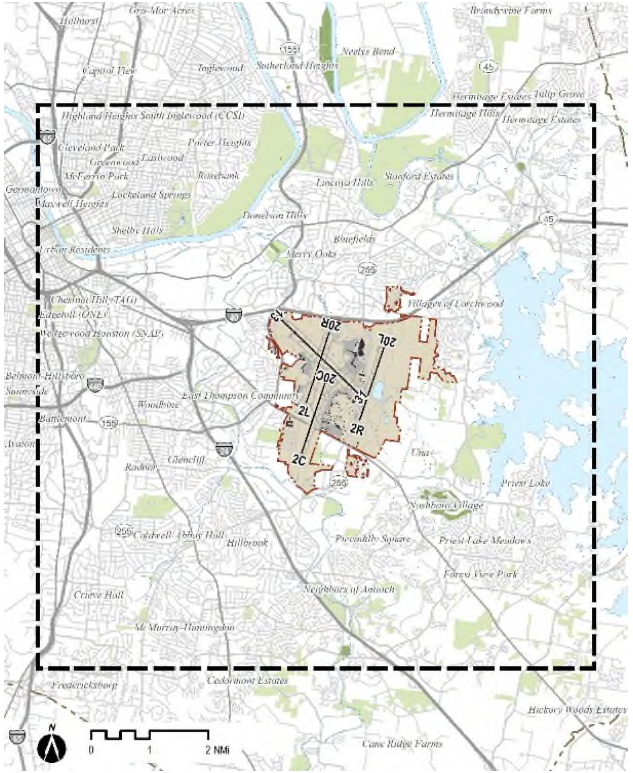
- Welcome and Introductions
- Noise Modeling Inputs
  - Airport Layout
  - Aircraft Operations (2019 & 2024)
  - Run-up Operations
  - Runway Use
  - Flight Track Geometry & Utilization
  - Meteorological Data
  - Terrain
- Draft 2019 and 2024 DNL Noise Contour Results
- Next Steps



Noise Modeling Inputs

Noise Modeling Inputs – Study Area

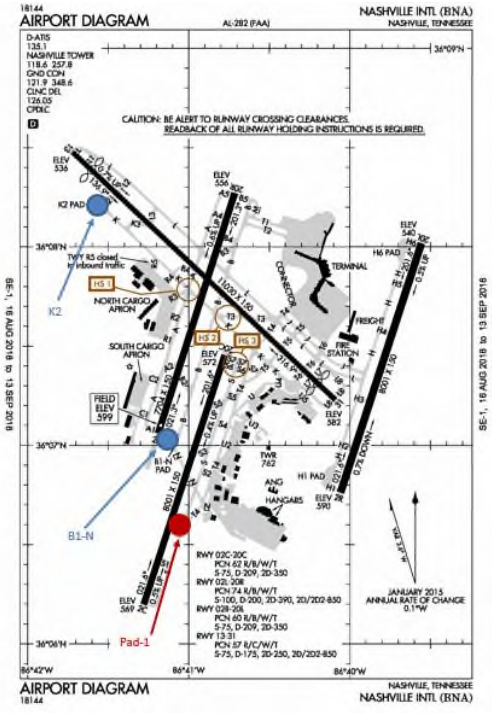
- Study Area
  - Study Area
  - Dashed rectangle defined by a region 4.8 nmi from airport center
  - Identifies the area of data collection, analyses, outreach, or other investigations



Noise Modeling Inputs – Airport Layout

- Runway, Helipad, and Run-up Area Coordinates
  - Blue = run-up locations
  - Red = helipad location at Taxiway S and T4

Runway	Latitude (degrees)	Longitude (degrees)	Elevation (feet, MSL)	Displaced Landing Threshold (feet)	Glide Slope (degrees)	Threshold Crossing Height (feet)	Magnetic Orientation (degrees)
2C	36.103331	-86.687961	569	None	3	60	18
2L	36.117679	-86.686474	598	None	3	55	18
2R	36.112713	-86.667642	590	None	3	59	18
13	36.141276	-86.695355	536	801	3	55	133
20C	36.124233	-86.679597	572	None	3	77	198
20L	36.133614	-86.659277	540	None	3	47	198
20R	36.137841	-86.678566	555	None	3	60	198
31	36.120496	-86.668178	582	741	3	52	313
PAD_1	36.110385	-86.683677	577				



Noise Modeling Inputs – Operations

- Operational inputs based on BNA 2017-2018 data and Aviation Activity Forecast
- FAA approved NEM forecast

2017 Actual Operations and BNA 2019 and 2024 Forecasts								
Year	Air Carrier			General Aviation			Military	Total Operations
	Passenger Aircraft	All Cargo Aircraft	Total	Air Taxi	Other GA	Total		
2017	132,473	2,662	135,135	30,540	36,577	67,117	3,550	205,802
2019	169,137	2,896	172,033	31,127	37,006	68,133	3,550	243,716
2024	183,385	3,194	186,579	33,783	39,431	73,214	3,550	263,343

Noise Modeling Inputs - Operations

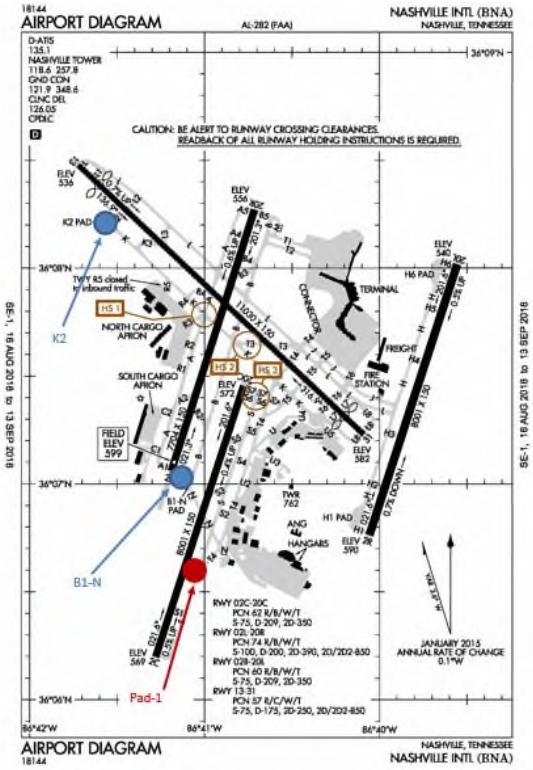
Existing Year 2019 BNA Operations								
Aircraft Category	Arrivals		Departures		Total Operations			% Total Operations
	Day	Night	Day	Night	Day	Night	Total	
Air Carrier	73,484	11,085	73,411	11,157	146,895	22,242	169,137	69.40%
Cargo	330	1,118	353	1,095	683	2,213	2,896	1.19%
General Aviation - Jet	17,724	1,695	16,982	2,437	34,706	4,132	38,838	15.94%
General Aviation - Turbo prop	7,729	467	7,420	776	15,149	1,243	16,392	6.73%
General Aviation - Piston	5,942	510	3,100	3,351	9,042	3,861	12,903	5.29%
Military	1,765	10	1,768	7	3,533	17	3,550	1.46%
Total	106,974	14,885	103,034	18,823	210,008	33,708	243,716	100.00%

Forecast Year 2024 BNA Operations								
Aircraft Category	Arrivals		Departures		Total Operations			% Total Operations
	Day	Night	Day	Night	Day	Night	Total	
Air Carrier	79,673	12,019	79,591	12,102	159,264	24,121	183,385	69.64%
Cargo	363	1,234	395	1,202	758	2,436	3,194	1.21%
General Aviation - Jet	19,045	1,822	18,248	2,619	37,293	4,441	41,734	15.85%
General Aviation - Turbo prop	8,306	502	7,974	834	16,280	1,336	17,616	6.69%
General Aviation - Piston	6,384	548	3,331	3,601	9,715	4,149	13,864	5.26%
Military	1,765	10	1,768	7	3,533	17	3,550	1.35%
Total	115,536	16,135	111,307	20,365	226,843	36,500	263,343	100.00%

Noise Modeling Inputs – Run-up Operations

- Run-up activity reported by six airport operators
- Run-up activities reported on K2 and B1-N
  - K2: modeled at a heading of 310° magnetic
  - B1-N: modeled at a heading of 200° magnetic.
- Noise Modeling Memorandum includes detailed tabular summaries

BNA 2019 and 2024 Run-up Activity by Location		
Run-up Location	2019	2024
K2	62.30%	63.19%
B1-N	37.70%	36.81%
Total	**100.00%**	**100.00%**



Noise Modeling Inputs – Runway Utilization

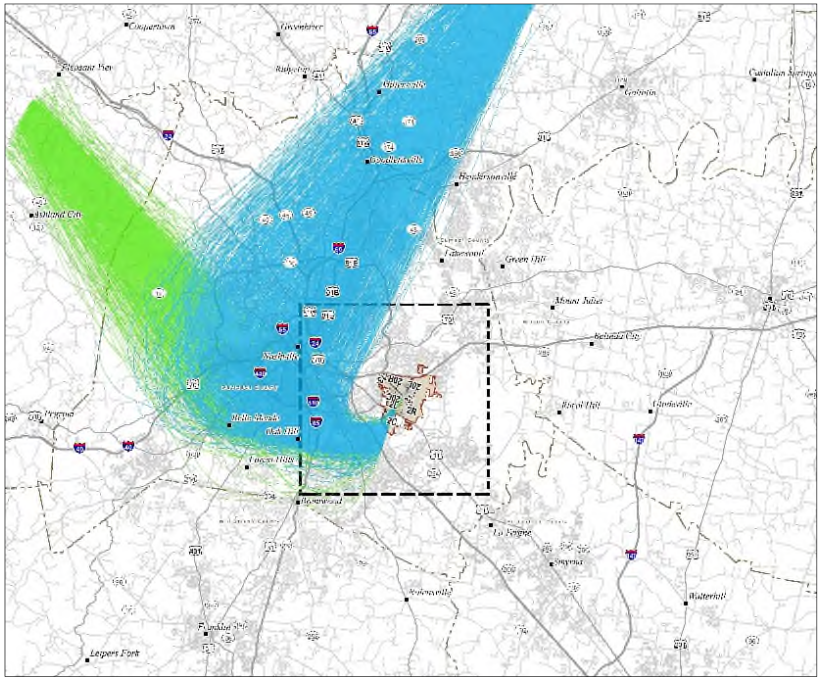
- Derived from 2017 - 2018 radar data obtained from BNA's Flight Track Monitoring System (FTMS) database
- Developed for each aircraft category
  - Wide-body
  - Narrow-body
  - Regional/Business Jet
  - Turboprop
  - Piston

BNA 2019 and 2024 General Runway Utilization				
	Arrivals		Departures	
Runway	Day	Night	Day	Night
02C	20.7%	17.9%	5.5%	2.2%
02L	9.2%	13.3%	18.4%	15.7%
02R	18.5%	12.8%	13.9%	9.2%
13	0.0%	0.5%	0.1%	0.1%
20C	5.2%	3.1%	41.1%	33.0%
20L	27.9%	23.6%	1.0%	5.7%
20R	17.3%	21.2%	9.5%	10.2%
31	1.2%	7.6%	10.5%	24.0%
Total	100.0%	100.0%	100.0%	100.0%

Noise Modeling Inputs – Flight Track Geometry and Utilization Rates

- Backbone tracks
  - Represent median flight path for specific procedure
- Subtracks
  - Represent observed dispersion for specific procedure
  - Equal number of subtracks on either side of backbone tracks
- Bundled by similar flight track geometry

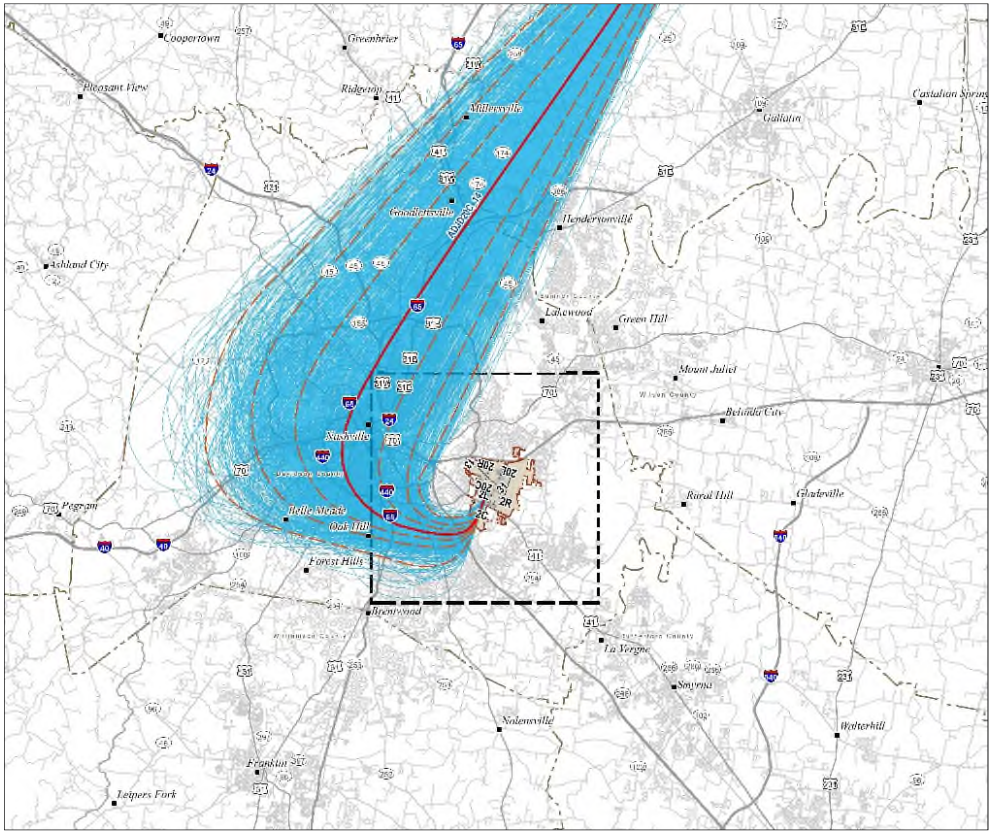
BNA 2019 and 2024 Number of Flight Tracks				
Aircraft Category	Arrival Tracks		Departures Tracks	
	Day	Night	Day	Night
Jet	163	191	247	283
Non-Jet	86	36	132	10
Total	476		672	



South Flow Daytime Jet Departure Tracks from Runway 20C

HGGRD SID KRSTA SID

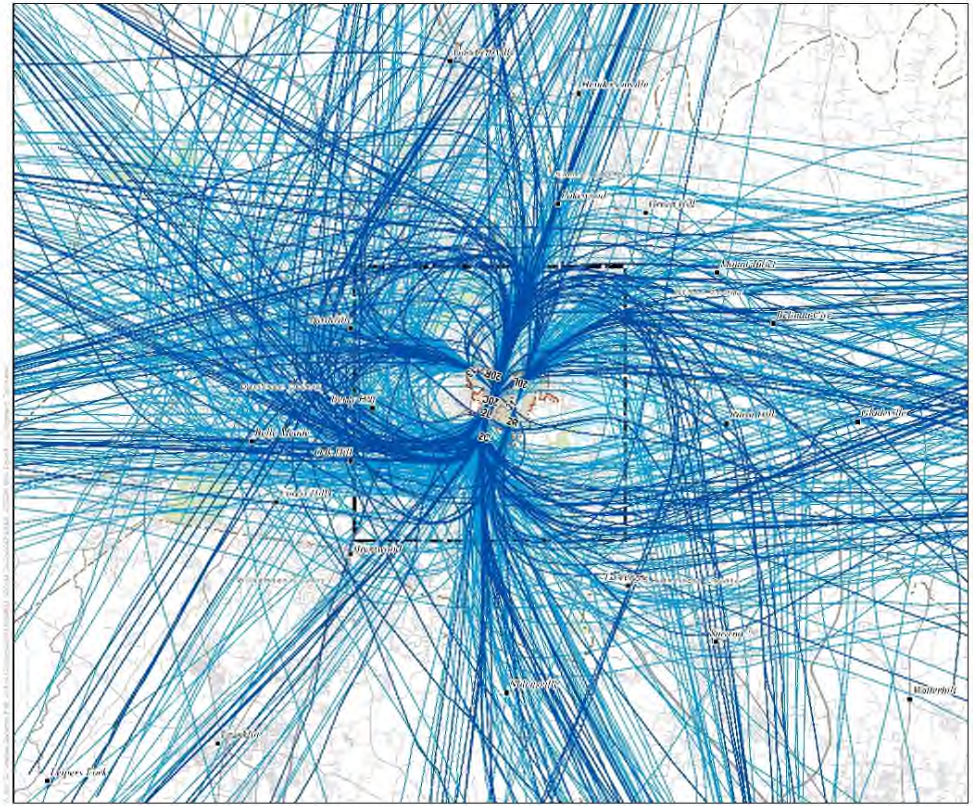
Noise Modeling Inputs – Departure Flight Track Geometry



Daytime Jet Departure Tracks from Runway 20C with Model Track

- **KRSTA SID (NE route)**
- **Model Track Backbone**
- **Model Track Subtrack**

Noise Modeling Inputs – All Departure Flight Tracks

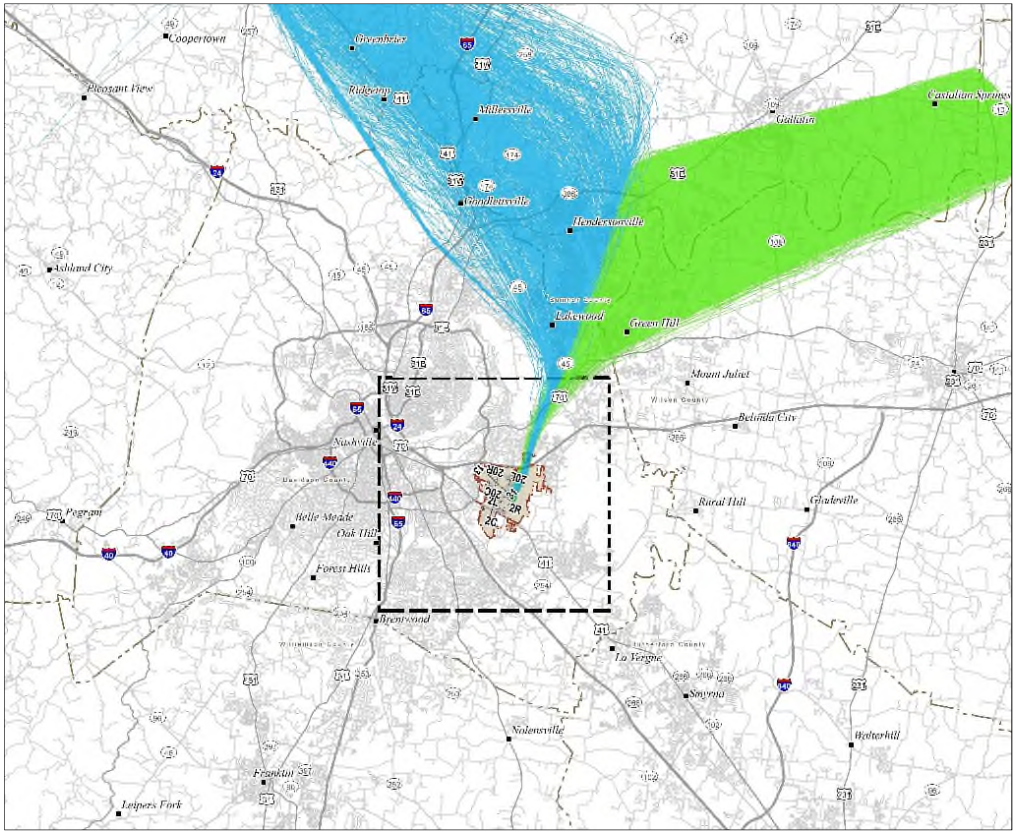


All Departure Tracks

Model Track Backbone

Model Track Subtrack

Noise Modeling Inputs – Arrival Flight Track Geometry

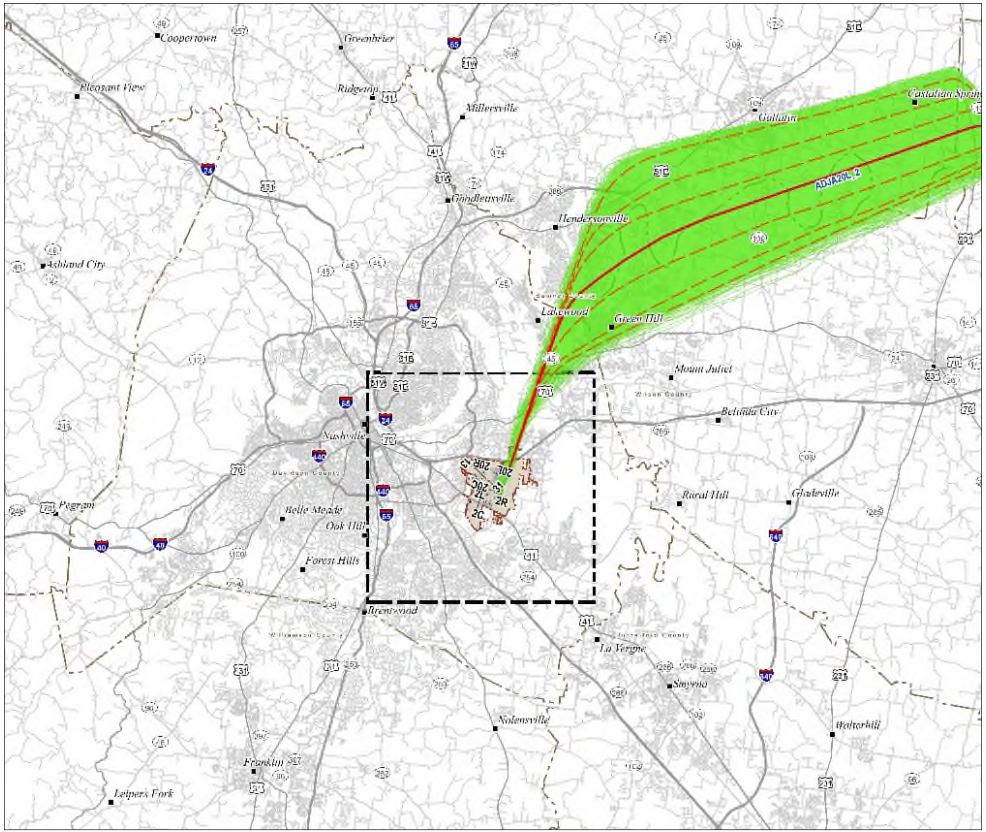


South Flow Daytime Jet Arrival Tracks to Runway 20L

PASLY STAR (NE corner)

RYYMN STAR (NW corner)

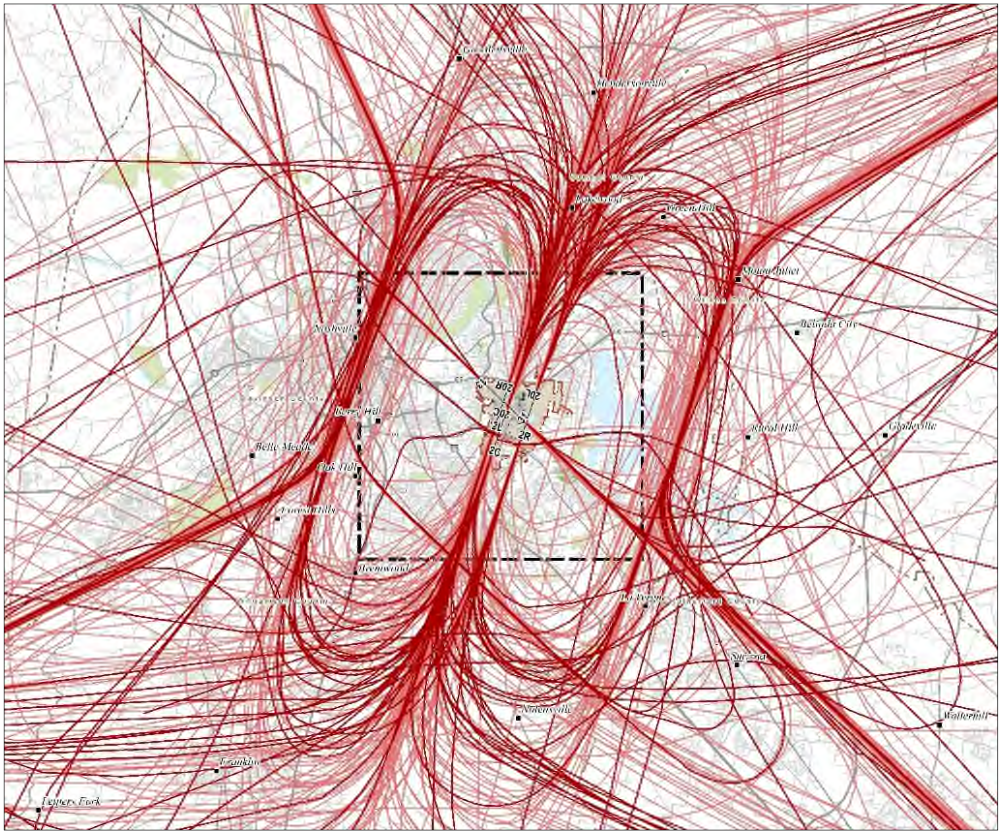
Noise Modeling Inputs – Arrival Flight Track Geometry



Daytime Jet Arrival Tracks to Runway 20L with Model Track

- **PASLY STAR (NE corner)**
- **Model Track Backbone**
- **Model Track Subtrack**

Noise Modeling Inputs – All Arrival Flight Tracks



All Arrival Tracks

Model Track Backbone

Model Track Subtrack

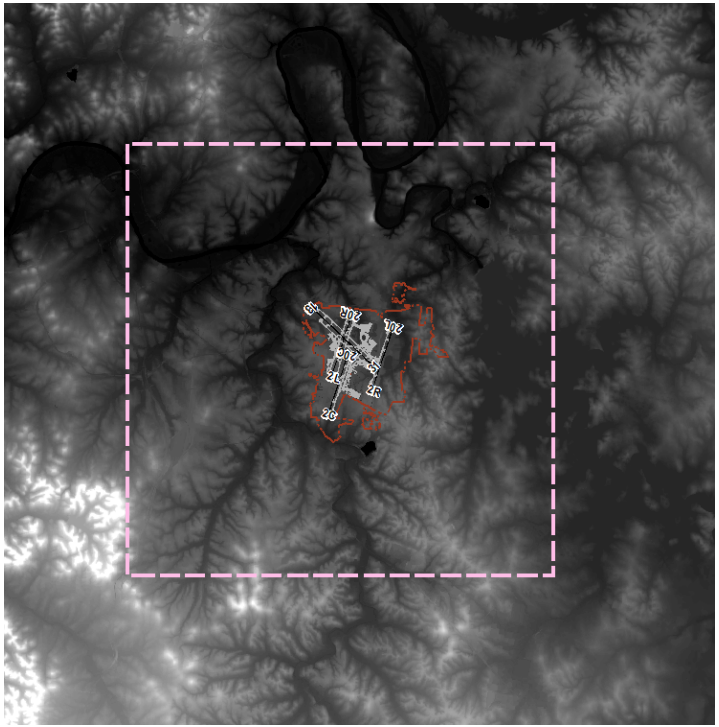
Noise Modeling Inputs – Meteorological Data

- Meteorological data effects
  - Aircraft noise performance
  - Sound propagation
- AEDT Default weather
  - 30-year average

BNA 30-year Weather	
Temperature	59.9 (°F)
Station Pressure	995.81 mbar
Sea Level Pressure	1017.96 mbar
Dew Point	48.73(°F)
Relative Humidity	67.88%
Wind Speed	6.11 knots

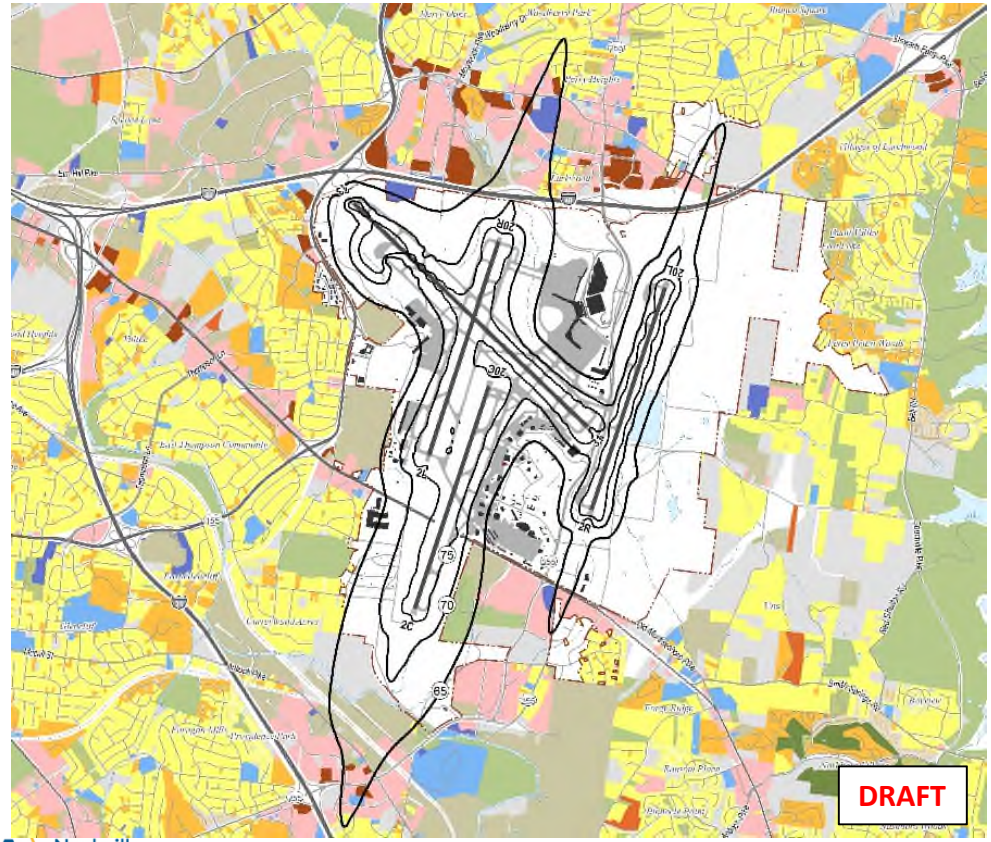
Noise Modeling Inputs – Terrain

- Obtained from United States Geological Survey (USGS)
- 1/3 arc second (approximately 33 ft.) resolution
- AEDT adjusts aircraft-to-ground path length using terrain



Draft Noise Modeling Results

Draft 2019 Existing Noise Exposure Map (NEM)

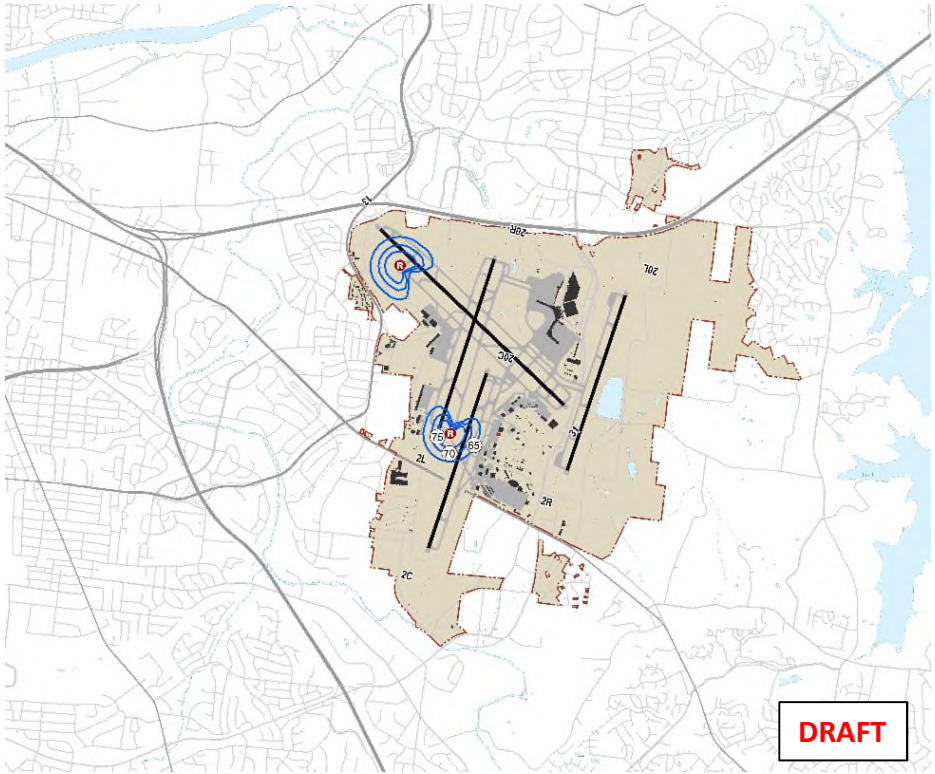


2019 Existing NEM Contour (65-75 dB)
BNA Airport Boundary (Approximate)
Runway
State Boundary
Municipal Boundary
Highway
Minor Roads
Major Roads
Railroad

Land Use

Residential
Multi-Family Residential
Mobile Home Park
Transient Lodging
Public Use (Non-Compatible)
Public Use (Compatible)
Recreational / Open Space / Golf
Commercial Use
Manufacturing and Production
Vacant / Undefined
Water / Stream

Draft 2019 Existing DNL Contour Run-ups



Existing Condition 2019 Draft DNL Runup Contours (65-75 dB)

BNA Airport Boundary (Approximate)

Runway R Runup Area

BNA Study Area

State Boundary

County Boundary

Open Space/Golf

Water/Stream

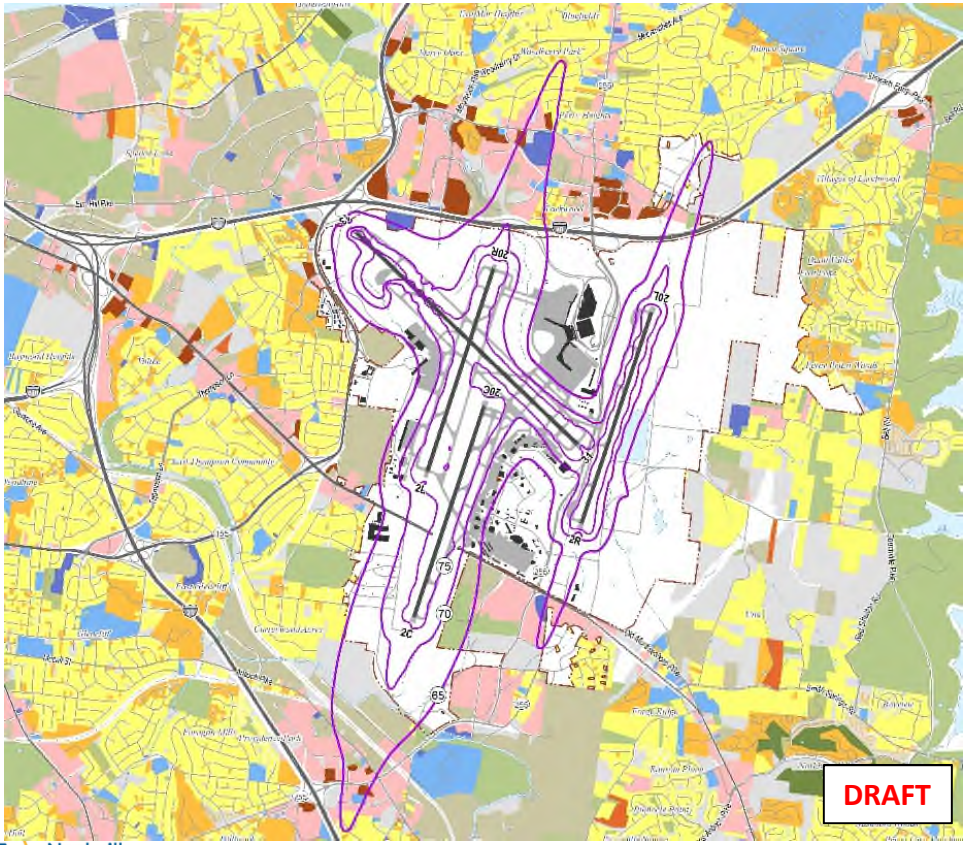
Highway

Minor Roads

Major Roads

Railroad

Draft 2024 Future Noise Exposure Map (NEM)



2024 Future NEM Contour (65-75 dB)

BNA Airport Boundary (Approximate)

Runway

State Boundary

Municipal Boundary

Highway

Minor Roads

Major Roads

Railroad

Land Use

Residential

Multi-Family Residential

Mobile Home Park

Transient Lodging

Public Use (Non-Compatible)

Public Use (Compatible)

Recreational / Open Space / Golf

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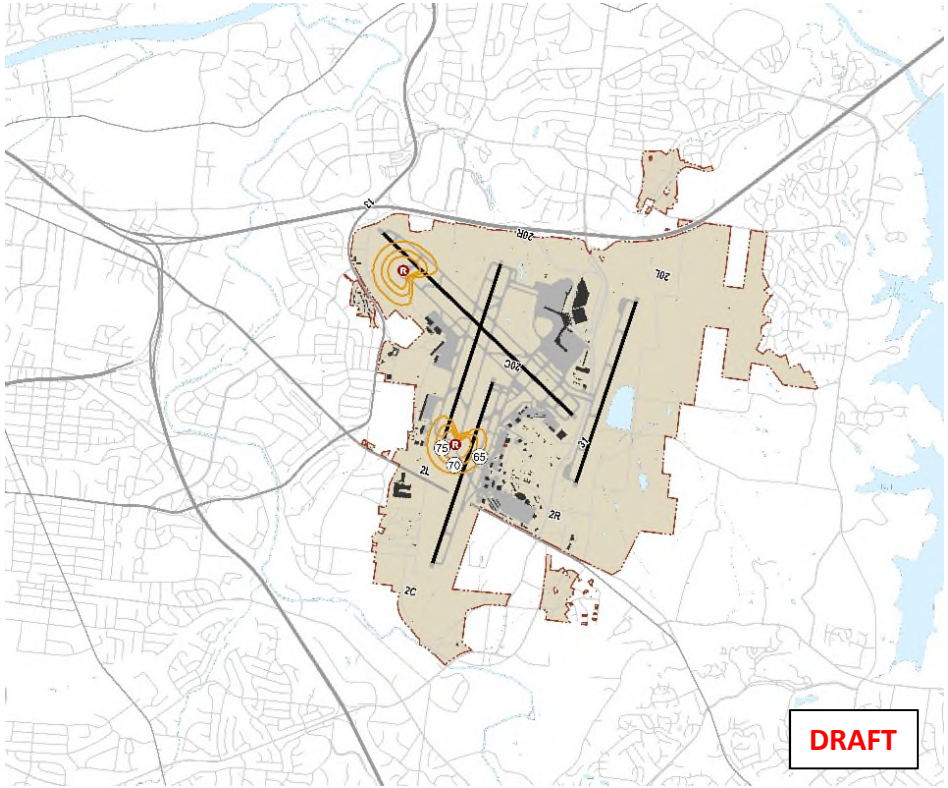
Draft 2024 Future DNL Contour Run-ups



Future Condition 2024 Draft DNL Runup Contours (65-75 dB)

BNA Airport Boundary (Approximate)

Runway R Runup Area

BNA Study Area

State Boundary

County Boundary

Open Space/Golf

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Major Roads

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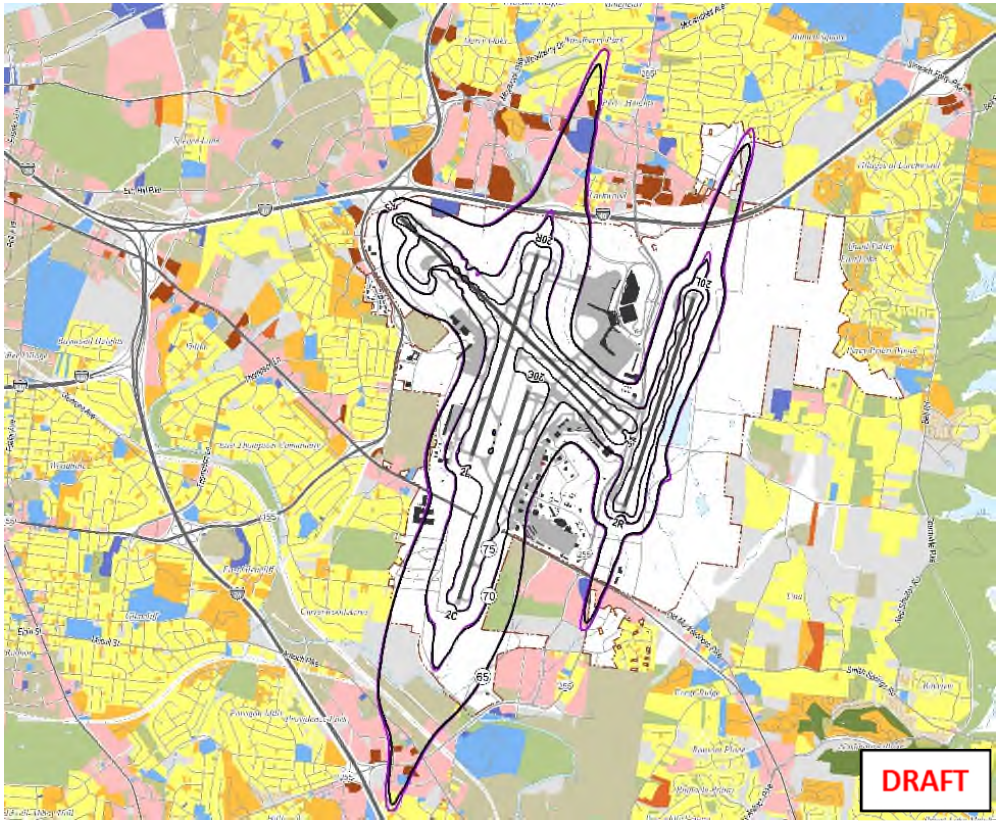
Draft 2019 & 2024 NEM DNL Contour Comparison



2019 Existing NEM Contour (65-75 dB)
2024 Future NEM Contour (65-75 dB)

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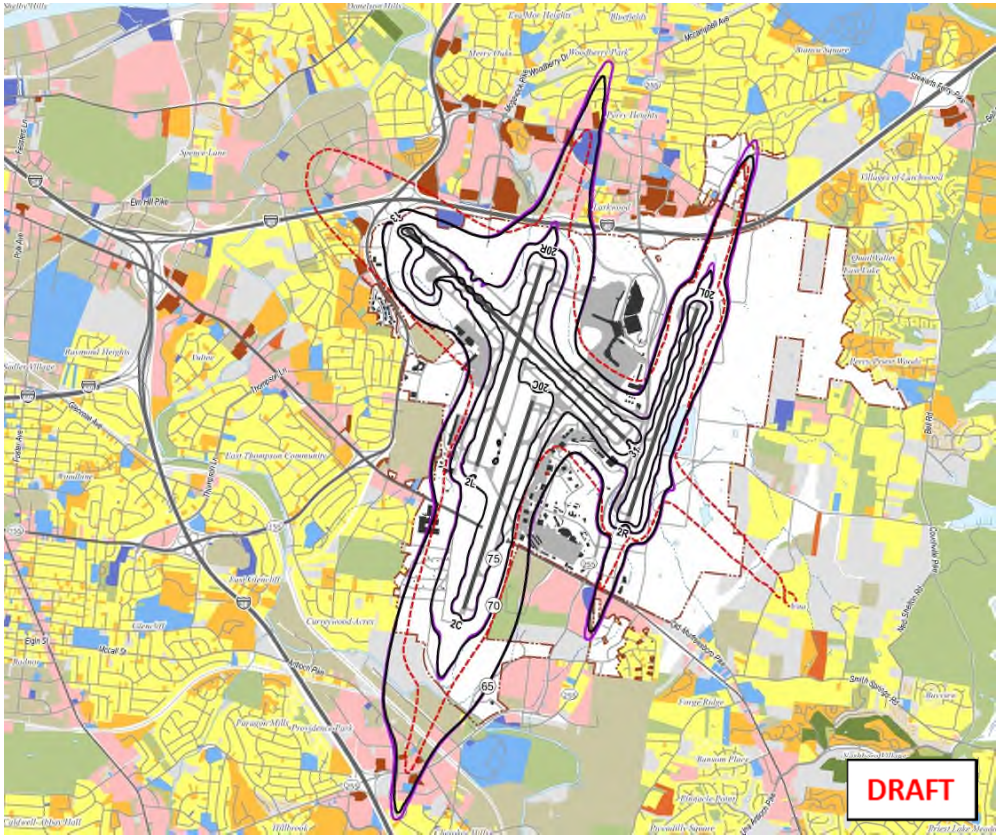
2012 NEM, Draft 2019, & 2024 NEM Contour Comparison



2012 NEM Contour (65 dB)
2019 Existing NEM Contour (65-75 dB)
2024 Future NEM Contour (65-75 dB)

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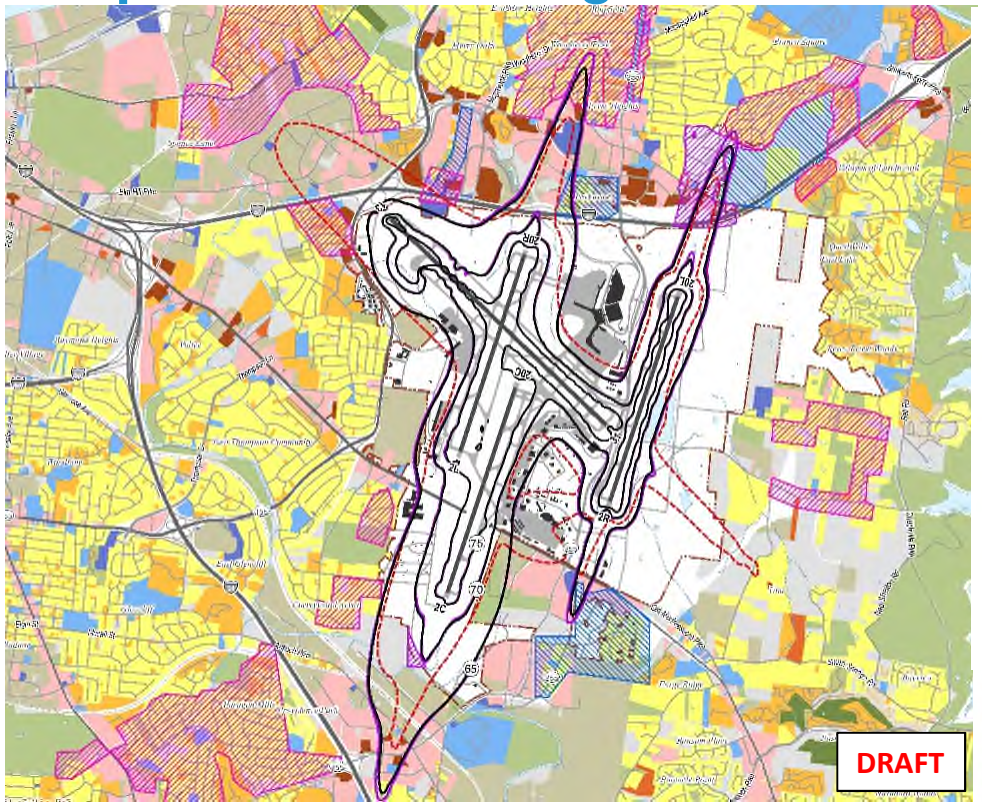
2012 NEM, Draft 2019, & 2024 NEM DNL Contour Comparison with Mitigation Areas



2012 NEM Contour (65 dB)
2019 Existing NEM Contour (65-75 dB)
2024 Future NEM Contour (65-75 dB)

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Previously Approved Mitigation Areas

Transition Area
Sound Insulation/Residential Property Sales Assistance Program
Acquisition of Residential Use in Approach Areas

Draft DNL Contour Summary

- 65 DNL contour expansion to the north and south
  - Approx. 70,823 more operations forecast in 2019 compared to 2012
  - Approx. 90,450 more operations forecast in 2024 compared to 2012
  - Increased runway use on the parallel runways
- 65 DNL contour reduction in the east and west
  - Significant decrease in nighttime jet arrivals and departures on Runway 31
  - Newer quieter and efficient aircraft in fleet mix
- Contour Areas
  - 2012 DNL 65: 12,317,020 sq. meters
  - 2019 DNL 65: 11,913,002 sq. meters
  - 2024 DNL 65: 12,363,045 sq. meters

Draft Population/Housing Summary

- Overall decrease of 164 persons and 59 housing units in 2019 as compared to 2012 exposed to 65 DNL or higher
  - However, 2012 had 2 noncompatible housing units (the remaining 116 were mitigated)
  - 2019 has 6 noncompatible housing units (the remaining 53 have been mitigated)
- Overall decrease of 60 persons and 15 housing units in 2024 as compared to 2012 exposed to 65 DNL or higher
  - 2024 has 13 noncompatible housing units (the remaining 90 have been mitigated)
- Even with the shift in the area of the 65 DNL contour to the north and south of the airport the area of noncompatible land use is still very small at BNA

2012 Contour Population & Housing		
Contour Intervals	Population Census 2010	Housing Units
65-70 DNL	294	118
70-75 DNL	0	0
>75 DNL	0	0
Total >= 65	**294**	**118**

Draft 2019 Contour Population & Housing		
Contour Intervals	Population Census 2010	Housing Units
65-70 DNL	130	59
70-75 DNL	0	0
>75 DNL	0	0
Total >= 65	**130**	**59**

Draft 2024 Contour Population & Housing		
Contour Intervals	Population Census 2010	Housing Units
65-70 DNL	234	103
70-75 DNL	0	0
>75 DNL	0	0
Total >= 65	**234**	**103**

Thank You for Your Participation!

Next meeting – Fall 2019

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