Nashville International Airport

Title 14 Code of Federal Regulations (CFR) Part 150
Noise Exposure Map Update

January 2020



Prepared for:

Metropolitan Nashville Airport Authority
One Terminal Drive | Suite 501 | Nashville, TN 37214

By

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And

AECOM

Nashville International Airport
14 C.F.R. Part 150
Noise Exposure Map Update

HMMH Report No. 309620

January 2020

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BNA Nashville International Airport

SPONSOR'S CERTIFICATION

This is to certify the following:

(1) The 2020 and 2025 Noise Exposure Maps for Nashville International Airport, and associated documentation for Nashville International Airport submitted in this volume to the Federal Aviation Administration under Federal Aviation Regulations 14 C.F.R. Part 150, Subpart B, Section 150.21, are true and complete under penalty of 18 U.S.C. Part 1001; and

(2) Pursuant to Part 150, Subpart B, Section 150.21(b), all interested parties have been afforded adequate opportunity to submit their views, data, and comments concerning the correctness and adequacy of the draft noise exposure map, and of the descriptions of forecast aircraft operations.

By: _____

Title: President and CEO

Date: 1-17-2020

Airport Name: *Nashville International Airport*

Airport Owner/Operator: Metropolitan Nashville Airport Authority, Tennessee

Address: Metropolitan Nashville Airport Authority
One Terminal Drive, Suite 501
Nashville, Tennessee 37214

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TABLE OF CONTENTS

SPONSOR'S CERTIFICATION ..... **III**

TABLE OF CONTENTS ..... **V**

LIST OF FIGURES **VII**

LIST OF TABLES **VIII**

GLOSSARY OF TERMS ..... **IX**

1 INTRODUCTION **1**

1.1 Purpose of this Submission 1

1.2 Organization of this Submission 2

1.3 Physical, Operational, and Historical Setting 3

1.4 Prior Land Use Compatibility Studies at Nashville International Airport 9

1.5 14 C.F.R. Part 150 Overview 10

1.5.1 Noise Exposure Maps 11

1.5.2 Noise Compatibility Program 12

1.6 Project Roles and Responsibilities 13

1.6.1 Metropolitan Nashville Airport Authority 13

1.6.2 Federal Aviation Administration 13

1.6.3 Consulting Team 14

1.6.4 Stakeholder Consultation 14

1.7 FAA Noise Exposure Maps Checklist 14

2 LAND USE COMPATIBILITY GUIDELINES AND STANDARDS **21**

2.1 Part 150 Land Use Compatibility Guidelines 21

3 EXISTING NOISE COMPATIBILITY PROGRAM **25**

3.1 Aircraft Operational / Noise Abatement Measures 25

3.1.1 Operational Strategy 1 25

3.1.2 Operational Strategy 2 25

3.1.3 Operational Strategy 3 26

3.1.4 Operational Strategy 4 27

3.2 Land Use Measures 28

3.2.1 Remedial Action 1 28

3.2.2 Remedial Action 2 28

3.2.3 Remedial Action 3 29

3.2.4 Remedial Action 4 29

3.2.5 Preventive Action: Undeveloped Areas 29

3.3 Program Management Measures 30

3.3.1 Management Technique 1 30

3.3.2 Management Technique 2 30

3.3.3 Management Technique 3 30

3.3.4 Management Technique 4 31

3.3.5 Management Technique 5 31
4 EXISTING AND FORECAST NOISE EXPOSURE MAPS 33
4.1 Introduction 33
4.2 Noise Exposure Map Figures 33
4.3 Noncompatible Land Uses within the Noise Contours 41
4.3.1 Discrete Sensitive Land Use 41
4.3.2 Residential Land Use 41
4.3.3 Historic Properties 42
4.4 Effects of Forecast Changes on Future Land Use Compatibility 42
5 DEVELOPMENT OF NOISE CONTOURS 43
5.1 Airport Physical Parameters 43
5.2 Meteorological Data 45
5.3 Terrain Data 45
5.4 Airport Flight Operations 46
5.5 Aircraft Maintenance Runup Activity 51
5.6 Aircraft Noise and Performance Characteristics 54
5.7 Runway Utilization Rates 54
5.8 Flight Track Geometry and Utilization 57
5.8.1 2020 and 2025 Flight Tracks and Use 57
5.8.2 2020 and 2025 Flight Track Utilization Rates 57
6 PUBLIC CONSULTATION 72
6.1 Consultation with FAA to Obtain Required Noise-Modeling Approvals 72
6.2 Noise Study Advisory Committee 72
6.2.1 Formation of the NSAC 73
6.2.2 Membership 73
6.2.3 Summary of NSAC Meetings 73
6.3 NEMs Notice, Review, and Comment Opportunities 73
6.4 Public Presentation 74
6.5 Documentation of Comments and Follow-Up 74
APPENDIX A NOISE TERMINOLOGY A-1
A.1 Decibel, dB A-3
A.2 A-Weighted Decibel, dBA A-4
A.3 Maximum A-Weighted Sound Level, Lmax A-6
A.4 Sound Exposure Level, SEL A-6
A.5 Equivalent A-Weighted Sound Level, Leq A-7
A.6 Day-Night Average Sound Level, DNL or Ldn A-8
APPENDIX B FAA ACCEPTANCE OF PREVIOUS NOISE EXPOSURE MAPS B-1
APPENDIX C MAY 23, 1989 FAA RECORD OF APPROVAL FOR 1989 NOISE COMPATIBLITY PROGRAM SUBMISSION C-1

APPENDIX D 2020 AND 2025 NOISE EXPOSURE MAP FORECAST DOCUMENTATION AND FAA APPROVAL D-1
D.1 BNA Noise Exposure Map Forecast D-3
D.2 FAA Forecast Approval D-27
APPENDIX E NOISE STUDY ADVISORY COMMITTEE E-1
E.1 NSAC October 2018 Meeting Sign-in Sheets E-3
E.2 NSAC October 2018 Meeting Presentation E-13
E.3 NSAC June 2019 Meeting Sign-in Sheet E-24
E.4 NSAC June 2019 Meeting Presentation E-26
E.5 NSAC October 2019 Meeting E-40
E.6 NSAC October 2019 Meeting Presentation E-42
APPENDIX F DOCUMENTATION RELATED DRAFT NOISE EXPOSURE MAP NOTICE, REVIEW, AND COMMENT OPPORTUNITIES F-1
F.1 MNAA Website Information F-3
F.2 Airport Tenants and Regular Aeronautical Users Receiving Notice F-4
APPENDIX G DOCUMENTATION RELATED TO FALL 2019 PUBLIC INFORMATION OPEN HOUSE WORKSHOP G-1
G.1 Public Workshop Notice- Press Release G-3
G.2 Public Workshop Advertisements G-4
G.3 Public Workshop Attendee List G-11
G.4 NEM-Related Workshop Boards G-15
APPENDIX H WRITTEN COMMENTS RECEIVED DURING CONSULTATION H-1

LIST OF FIGURES

Figure 1 Nashville International Airport Regional Location 5
Figure 2 Nashville International Airport and Existing Land Use 7
Figure 3 Existing Conditions (2020) Noise Exposure Map 35
Figure 4 Forecast Conditions (2025) Noise Exposure Map 37
Figure 5 Comparison of Existing (2020) and Forecast (2025) Noise Exposure Maps 39
Figure 6 Existing BNA Airport Layout 44
Figure 7 Jet Departure Radar Tracks from Runway 20C with Northwest or Northeast Destinations 59
Figure 8 Jet Departure Radar Tracks and AEDT Model Track Set from Runway 20C with Northeast Destinations 61
Figure 9 North Flow Arrival and Departure Flight Tracks 63
Figure 10 South Flow Arrival and Departure Flight Tracks 65
Figure A-1 Frequency-Response Characteristics of Various Weighting Networks A-5
Figure A-1 Representative A-Weighted Sound Levels A-5

Figure A-2 Variation in the A-Weighted Sound Level over Time A-6
Figure A-3 Graphical Depiction of Sound Exposure Level A-7
Figure A-4 Graphical Depiction of Sound Exposure Level for Two Noise Events with Different Maximums and Durations A-7
Figure A-5 Example of a One-Minute Equivalent Sound Level A-8
Figure A-6 Example of a Day-Night Average Sound Level Calculation A-9
Figure A-7 Examples of Measured Day-Night Average Sound Levels A-10

LIST OF TABLES

Table 1 Part 150 Noise Exposure Maps Checklist 15
Table 2 Part 150 Land Use Compatibility 22
Table 3 Comparison of Nighttime Runway Distribution of Aircraft Operations, July 1, 2017 through June 30, 2018 26
Table 4 Runway Details 45
Table 5 Modeled Average Daily Aircraft Operations for 2020 47
Table 6 Modeled Average Daily Aircraft Operations for 2025 49
Table 7 Designated Runup Locations and Use Guidance 51
Table 8 Modeled Average Daily Runup Operations for 2020 52
Table 9 Modeled Average Daily Runup Operations for 2025 53
Table 10 Modeled Average Daily Runway Use for 2020 and 2025 55
Table 11 Modeled Track Utilization for 2020 and 2025 67
Table A-1 Guidelines for Interpreting Changes in Cumulative Exposure A-10

GLOSSARY OF TERMS

ADO	-	Airports District Office
AEE	-	FAA Office of Environment and Energy
AEDT	-	Aviation Environmental Design Tool
AIP	-	Airport Improvement Program
ANAC	-	Airport Noise Advisory Committee
APP	-	FAA Office of Airport Planning and Programming
ASNA	-	Aviation Safety and Noise Abatement Act
ATADS	-	Air Traffic Activity Data System
ATC	-	Air Traffic Control
ATCT	-	Air Traffic Control Tower
BNA	-	Nashville International Airport
C.F.R.	-	Code of Federal Regulations
dB	-	Decibel
dBA	-	A-Weighted Decibel
DME	-	Distance Measuring Equipment
DNL	-	Day-Night Average Sound Level
DP	-	Departure Procedure
FAA	-	Federal Aviation Administration
FAR	-	Federal Aviation Regulation
FTMS	-	Flight Track Monitoring System
FY	-	Fiscal Year
GA	-	General Aviation
GIS	-	Geographic Information System
GPS	-	Global Positioning System
HMMH	-	Harris Miller Miller & Hanson Inc.
HUD	-	Department of Housing and Urban Development
IAP	-	Instrument Approach Procedure
ILS	-	Instrument Landing System
Ldn	-	Day-Night Average Sound Level

MNAA	-	Metropolitan Nashville Airport Authority
MPC	-	Metropolitan Planning Commission
MSL	-	Mean Sea Level
NCDC	-	National Climatic Data Center
NCP	-	Noise Compatibility Program
NED	-	National Elevation Dataset
NEPA	-	National Environmental Policy Act
NEM	-	Noise Exposure Map
NextGen	-	Next Generation Air Transportation System
NLR	-	Noise Level Reduction
PBN	-	Performance-Based Navigation
RNAV	-	Area Navigation
RNP	-	Required Navigational Performance
ROA	-	Record of Approval
RPSAP	-	Residential Property Sales Assistance Program
SID	-	Standard Instrument Departure
STAR	-	Standard Terminal Arrival Route
TAF	-	Terminal Area Forecast
TANG	-	Tennessee Air National Guard
USGS	-	United States Geological Survey

1 INTRODUCTION

The federal "Aviation Safety and Noise Abatement Act of 1979" (ASNA), as amended, defines procedures under which the federal government, through the Federal Aviation Administration (FAA), will "provide assistance to airport operators to prepare and carry out noise compatibility programs." The FAA assistance includes both regulatory guidance and financial support.

FAA implemented the ASNA noise-related regulatory requirements in 14 C.F.R. (Code of Federal Regulations) Part 150, "Airport Noise Compatibility Planning." The regulation, most commonly referred to simply as "Part 150," defines standards for airport operators to use in documenting noise exposure in the airport environs and establishing programs to minimize noise-related land use incompatibilities. While involvement is strictly voluntary, over 270 airports have participated in the program, which assists in standardizing noise analysis at a national level. FAA provides funding support under the federal Airport Improvement Program (AIP). The agency has provided over $100 million in AIP grants for Part 150 studies, and for over $5 billion in grants for implementation of noise compatibility measures.

A formal submission to the FAA under Part 150 includes two principal elements: (1) the Noise Exposure Map (NEM) submission and (2) the Noise Compatibility Program (NCP) submission. In simple terms, the NEM submission identifies existing and potential future noise / land use compatibility issues within the 65 decibel (dB) Day-Night Average Sound Level (DNL) noise contour, Federal guidelines and standards adopted by the MNAA and local land use jurisdictions identify the 65 dB DNL contour as the outer limit of the area within which any category of land use may be classified noncompatible with aircraft noise.[1] The NCP submission recommends actions that may be taken – by a wide range of entities – to reduce or eliminate noncompatible areas.

1.1 Purpose of this Submission

The Metropolitan Nashville Airport Authority (MNAA, or the Authority), in its role as owner and operator of Nashville International Airport (BNA), completed its first full Part 150 study for the airport in 1989, including both the NEM and NCP elements. In that first study, the MNAA established a goal of addressing all noncompatible land use through a combination of noise abatement and compatible land use measures. It also committed to preparing NEM updates approximately every five years, to monitor progress toward that goal. ***Consistent with that commitment, the MNAA is updating only the NEM currently. The year of submission for this update is 2020. Therefore, following FAA's Part 150 regulatory standards and guidelines (as summarized in Section 1.5), the existing conditions noise contours are for 2020 and the five-year forecast case contours are for 2025.***

This document represents the fifth NEM submission, following updates in 1996, 2004, and 2012. The prior NEM updates have shown that the MNAA has made steady progress toward its goal of full land use compatibility. A Congressionally mandated phaseout of older, noisier "Stage 2" aircraft[2]

[1] Appendix A provides an introduction to decibels and other noise terminology used in this document.

[2] The FAA has established aircraft noise criteria in 14 C.F.R. Part 36, "Noise Standards: Aircraft Type and Airworthiness Certification." For transport category "large" aircraft (with maximum takeoff weights of 12,500 pounds or more) and all turbojet-powered aircraft, Part 36 identifies five aircraft noisiness "stages." Stage 1

over 75,000 pounds maximum gross takeoff weight led to a nationwide ban on all civil operations in these aircraft (with very limited exceptions for emergencies and similarly extraordinary situations). This phaseout, combined with the demise of the American Airlines hub at the airport in the mid-1990s, has led to a significant reduction in aircraft-related noise exposure that complements the local noise abatement and compatible land use measures.

1.2 Organization of this Submission

The balance of this chapter provides further introductory information.

- Section 1.3 summarizes the BNA physical, operational, and historical setting.
- Section 1.4 presents an overview of prior Part 150 and other noise compatibility studies that the MNAA has undertaken at BNA.
- Section 1.5 provides an expanded introduction to Part 150.
- Section 1.6 identifies major roles and responsibilities of primary parties responsible for the development of this submission.
- Section 1.7 presents a completed copy of the FAA's NEM review checklist, which the agency requests airports provide with each submission to assist reviewers in identifying the location of required information in the document.

The balance of this document presents all information required by the Part 150 regulation and FAA guidance (in the checklist and relevant advisory publications). The material is organized and formatted following generally accepted professional practice.

- Section 2 presents land use compatibility guidelines that MNAA has adopted for use in its previous Part 150 process, and that MNAA is applying in an unchanged fashion in this current effort.
- Section 3 summarizes the noise abatement, land use control, and management measures that the MNAA proposed in its latest NCP submission, identifies the FAA response to each proposal (i.e., approval or disapproval), and reviews the implementation status of approved measures.
- Section 4 presents the existing and forecast NEMs, including identification of noncompatible land uses within the noise contours.
- Section 5 describes the development of the noise contours included in the NEM figures, including an overview of the overall noise modeling process, identification of data sources, description of data refinement steps, and detailed documentation of specific modeling inputs.

aircraft have never been shown to meet any noise standards, either because they have never been tested or because they have been tested and failed. Stage 2 aircraft meet original noise limits, set in 1969; more stringent limits were established in 1977 (Stage 3), 2005 (Stage 4) and 2017 (Stage 5). No Stage 2 operations for aircraft above 75,000 lbs. have been allowed in the U.S. since December 1999. The most recent standards (Stage 5) must be met by new aircraft designs starting December 31, 2017 for larger aircraft (55,000 kg MTOW) and December 31, 2020 for smaller aircraft.
https://www.federalregister.gov/documents/2017/10/04/2017-21092/stage-5-airplane-noise-standards

- Section 6 summarizes the public consultation undertaken in association with this NEM update.
- The appendices present required documentation that is too lengthy to incorporate in the body of the submission, or that is generally supplementary or informational in nature, and go beyond Part 150 requirements.

1.3 Physical, Operational, and Historical Setting

As shown in Figure 1, BNA is located in Davidson County, approximately six miles southeast of downtown Nashville. The airport is surrounded by commercial, industrial, and residential land uses, as shown in Figure 2.

The airport opened in 1937 with a single 4,000-foot runway on approximately 340 acres. It has evolved over the past 82 years to its current configuration of three parallel runways and one cross-wind runway on over 4,460 acres. Section 5.1 presents more detail on the airport's physical characteristics and layout that are relevant to noise modeling.

The airport primarily provides aviation services to residents of Tennessee, southern Kentucky, and northern Alabama. Currently, 14 airlines provide commercial passenger service at the airport. In fiscal year (FY) 2017, these airlines conducted nearly 132,000 operations, and enplaned over seven million passengers, with an average of 180 daily departures to approximately 65 non-stop destinations. Scheduled all-cargo carrier air cargo service is primarily provided at the airport by FedEx (and feeder carriers operating on their behalf), and DHL (Airborne Express).

Military operations accounted for approximately 3,500 operations, or approximately two percent of total activity at the airport in FY 2017. The airport is home to the Tennessee Army National Guard 1/230th Air Cavalry Squadron (ACS), with sixteen based UH-60 Blackhawk helicopters and 4 UH-72 Lakota helicopters. Transient military aircraft also use BNA for training or refueling.

A total of approximately 67,000 general aviation (GA) operations were conducted at the airport in FY 2017, representing approximately one-quarter of total BNA operations. GA activity includes all segments of the aviation industry except commercial air carriers/regional/commuter service, scheduled cargo, and military operations. A total of 87 GA aircraft are based at BNA, including single and multi-engine piston and turbo-shaft propeller-driven aircraft, helicopters, and jet models.

BNA is owned and operated by the MNAA, which was established in 1970. The Authority operates separately from local government without the benefit of local tax dollars. Its primary functions are to plan, construct, operate, and manage a system of airports formerly owned by the Metropolitan Government of Nashville and Davidson County and to assure the promotion and development of commerce and industry through air transportation.

The MNAA is run by a Board of Commissioners, nine of whom are appointed by the mayor and subject to confirmation by the Nashville Metropolitan Council. The Board is made up of three business and finance representatives, two pilot representatives, two neighborhood representatives, one engineering representative, one legal representative, and the mayor of Nashville. In accordance with the enabling legislation, commissioners must each represent one of the following professional and managerial disciplines: engineering, aviation, law, commerce, finance, and industry.

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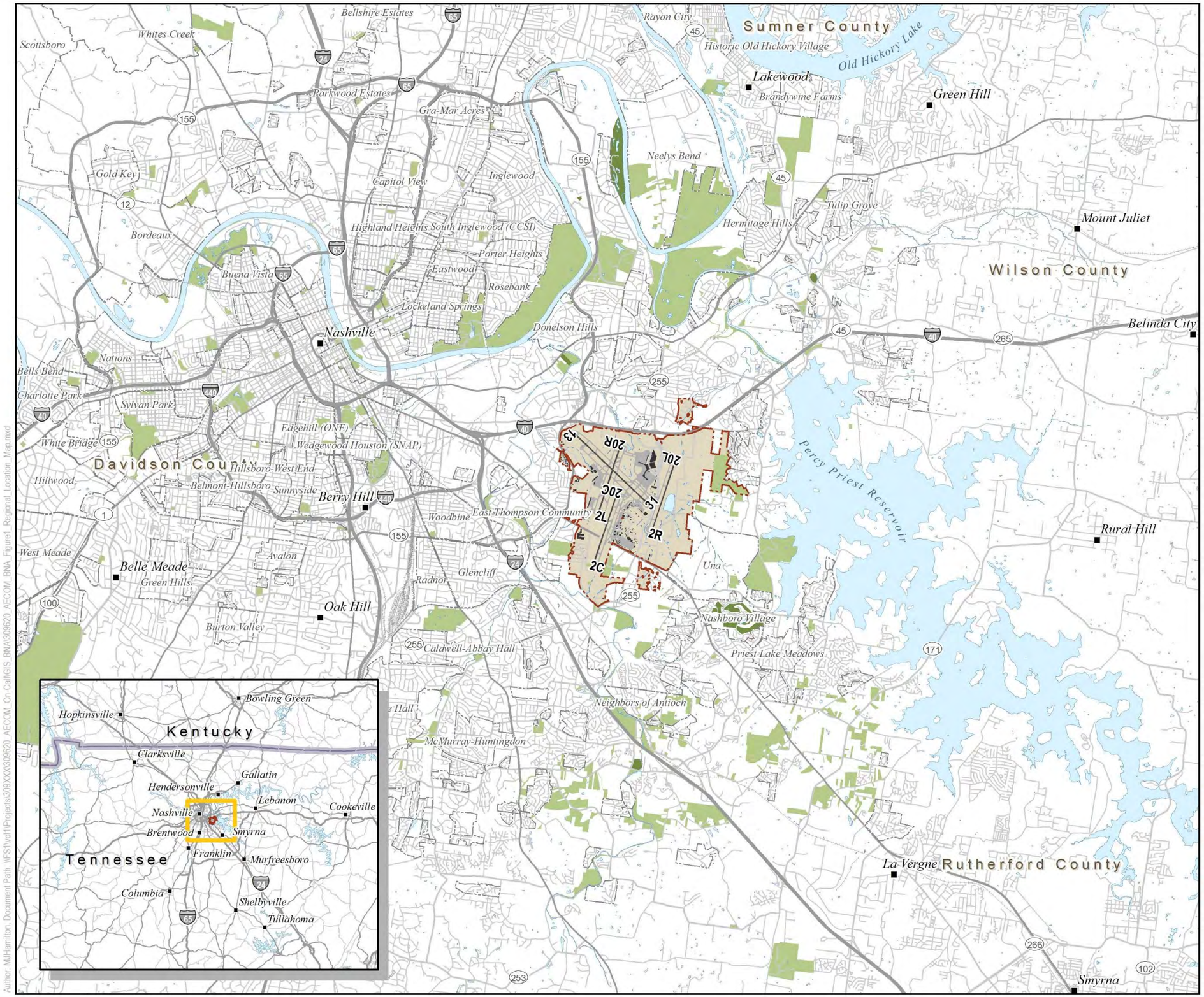

BNA Nashville International Airport

Airport Noise Compatibility - Part 150 Study
2020 and 2025 Noise Exposure Maps

Figure: 1

Nashville International Airport Regional Location

BNA Airport Boundary (Approximate)

Runway

State Boundary

Municipal Boundary

Highway

Minor Roads

Major Roads

Railroad

Recreational / Open Space / Golf

Water / Stream

0 10,000 20,000 Feet

N

hmmh

Author: MJHamilton, Document Path: \\FS1\vol1\Projects\309XXX\309620_AECOM_On-Call\GIS_BNA\309620_AECOM_BNA_Figure1_Regional_Location_Map.mxd

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BNA Nashville International Airport

Airport Noise Compatibility - Part 150 Study
2020 and 2025 Noise Exposure Maps

Figure: 2

Existing Land Use

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

0 4,000 8,000 Feet

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1.4 Prior Land Use Compatibility Studies at Nashville International Airport

The MNAA has undertaken several prior Part 150 and other noise compatibility studies at BNA, including the following major efforts:

- **BNA Noise Control Study, 1985-6**: The MNAA conducted this study of aircraft noise exposure on the area surrounding the airport outside of the Part 150 process. The study recommended strategies for reducing noise exposure, with a primary focus on actions to be implemented in the near term. Public information meetings were held and the study results were provided to area residents.

- **BNA Part 150 Study, 1988-9:** The MNAA completed the first full Part 150 study for BNA in 1989. The MNAA submitted the NEM documentation for calendar year 1988 and 1993 operations in 1988. The FAA accepted the NEMs on November 14, 1988.[3] The MNAA submitted the NCP documentation in 1989. The FAA issued a Record of Approval (ROA) for the NCP in September 1989.[4] Section 3 of this document summarizes the NCP recommendations, the related FAA response, and the implementation status of each.

- **BNA NCP Recommended Land Use Program Changes, 1992:** The MNAA conducted this study to review the status of the land use elements of the NCP and recommend changes to reflect current conditions. It was not an official Part 150 study or submission; rather, it adjusted the existing, FAA-approved elements.[5]

- **BNA Part 150 Noise Exposure Map Update Study, 1996:** In 1996, the MNAA submitted updated NEM documentation to the FAA for calendar years 1996 and 2001. The FAA accepted the NEMs on December 4, 1997. The study did not address any revisions to the NCP, nor include updated NCP documentation.[6]

- **BNA Noise Exposure Map Update, 2004:** In 2004, the MNAA submitted its second set of updated NEM documentation to the FAA for calendar years 2004 and 2009. The FAA accepted the NEMs on April 12, 2005. The study did not address any revisions to the NCP, nor include updated NCP documentation.[7]

[3] "Nashville International Airport, Airport Noise Compatibility Study, Volume I: Noise Exposure Maps," prepared for the Metropolitan Nashville Airport Authority, by Aviation Planning Associates, Inc., September 20, 1988.

[4] "Nashville International Airport, Airport Noise Compatibility Study, Volume II: Noise Compatibility Program," prepared for the Metropolitan Nashville Airport Authority, by Aviation Planning Associates, Inc., January 24, 1989.

[5] "Nashville International Airport, Airport Noise Compatibility Program, Recommended Land Use Program Changes," prepared by the Metropolitan Nashville Airport Authority, June 1992.

[6] "Final Noise Exposure Maps Submittal Documents, 1996 and 2001, for Nashville International Airport," prepared for the Metropolitan Nashville Airport Authority, by Landrum & Brown, Incorporated, December 1997.

[7] "Nashville International Airport, Noise Exposure Map Update, Final," prepared for the Metropolitan Nashville Airport Authority, by Landrum & Brown, Incorporated, December 2004.

- **BNA Noise Exposure Map Update, 2012:** In 2012, the MNAA submitted its third set of updated NEM documentation to the FAA for calendar years 2012 and 2017. The FAA accepted the NEMs on February 4, 2013. The study did not address any revisions to the NCP, nor include updated NCP documentation.[8] Appendix B presents a copy of the Federal Register notice announcing the FAA determination that the 2012 submission was in compliance with applicable regulations; i.e., "accepting" the NEMs.

1.5 14 C.F.R. Part 150 Overview

In addition to its financial assistance elements, the previously introduced ASNA required the FAA to "(1) establish a single system of measuring noise …, (2) establish a single system for determining the exposure of individuals to noise resulting from airport operations …, and (3) identify land uses normally compatible with various exposures of individuals to noise."[9]

The FAA addressed these requirements in Part 150. For the measurement system, the FAA selected the A-weighted sound level (dBA), which describes noise exposure in the manner most consistent with human hearing.[10] For evaluating exposure of individuals to noise from airport operations, FAA selected the Day-Night Average Sound Level (DNL or Ldn). To address the third requirement, Part 150 includes a table of land use compatibility as a function of yearly DNL.[11] It should be noted that the table represents *guidelines* and does not present federally mandated standards; the federal government defers to local land use jurisdictions for determination of the level of noise exposure that is acceptable for given land uses. Part 150 expressly acknowledges that deference by stating:

> The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise compatible land uses.[12]

Section 2 discusses MNAA's locally adopted land use compatibility guidelines, which are the same as those utilized in all the previous FAA-accepted NEMs, including this 2020 submission with NEMs for calendar years 2020 and 2025 operations.

ASNA further provided for any airport operator to prepare and submit "a noise exposure map showing the noncompatible uses in each area of the map on the date the map is submitted, a description of estimated aircraft operations during a forecast period that is at least 5 years in the future and how those operations will affect the map."[13] ASNA also provided for airport operators to provide revised maps if "a change in the operation of the airport would establish a substantial new noncompatible use, or would significantly reduce noise over existing noncompatible uses, that

[8] "Nashville International Airport, 14 C.F.R. Part 150, Noise Exposure Map Update," prepared for the Metropolitan Nashville Airport Authority, by HMMH, December 2012.

[9] ASNA as codified under 49 U.S.C. § 47502: "Noise measurement and exposure systems and identifying land use compatible with noise exposure."

[10] 14 C.F.R. Part 150, Appendix A, Part B, § A150.3(a).

[11] Ibid., Appendix A, Part B, Table 1.

[12] Ibid., Appendix A, Part B, introductory paragraph of "Notes for Table 1."

[13] 49 U.S.C. § 47503: Noise exposure maps (ASNA as amended), § (a)

is not reflected in either the existing conditions map or forecast map currently on file with the [FAA]."[14]

In summary, Part 150 sets forth a process for airport proprietors to follow in developing and obtaining FAA approval of programs to reduce or eliminate incompatibilities between aircraft noise and surrounding land uses. Part 150 prescribes specific standards and systems for:

- Measuring noise
- Estimating and describing cumulative noise exposure
- Coordinating NCP development with local land use officials and other interested parties
- Documenting the analytical process and development of the compatibility program
- Submitting documentation to the FAA
- FAA and public review processes
- FAA approval or disapproval of the submission

A full Part 150 submission to the FAA includes two elements: (1) the NEMs and (2) the NCP. As discussed in Section 1.1, this document presents only an update to previously accepted NEMs.

1.5.1 Noise Exposure Maps

The NEMs describe the airport layout and operation, aircraft-related noise exposure, land uses in the airport environs, and the resulting noise/land use compatibility situation. The NEMs must address two time frames: (1) data representing the year of submission (the "existing conditions") and (2) the fifth calendar year or later following the year of submission (the "forecast conditions"). The NEMs also address how the forecast operations will affect the compatibility of the land uses depicted.

The year of submission for this update is 2020. Therefore, the existing conditions noise contours are for 2020 and the five-year forecast case contours are for 2025.

The primary objective is to describe the current and forecast conditions at the airport and the noise effects of the aircraft activity on the surrounding communities. While this description is normally processed into individual NEMs, Part 150 requires more than a simple "map" to provide all the necessary information. The development of the NEM graphics includes such tasks as:

- Collecting historical aviation activity data such as aircraft fleet mix, number and type of operations, aircraft departure weights, and runway utilization
- Developing a forecast of aircraft activity for a period at least five years in the future from the year representing the existing conditions
- Determining aircraft flight tracks and usage based on radar data, if available, or other sources of data

[14] Ibid., § (b).

- Creating the necessary inputs to the FAA Aviation Environmental Design Tool (AEDT) using the average annual input conditions to include airport configuration, meteorological data, operations, etc.
- Obtaining FAA approval for user-specified aircraft noise modeling profiles and non-standard aircraft type modeling substitutes
- Collecting data from local jurisdictions to establish detailed land use data in the airport environs
- Estimating population data within the local area

Therefore, in addition to the graphical elements, the NEMs submission must document, through tabulated information and text discussions, the full range of data collection and analyses undertaken to depict existing and future noise exposure resulting from aircraft operations, and the encompassed land uses in the airport environs. The NEMs development must also include public consultation meeting Part 150 requirements, as discussed in Section 6. After considering and addressing all input received during that consultation, the airport operator submits the NEMs documentation to the FAA. Subsequent to a thorough review, the FAA "accepts" submissions it finds in conformance with Part 150.

1.5.2 Noise Compatibility Program

The NCP is essentially a list of the actions that the airport proprietor proposes to undertake to minimize existing and future noncompatible land uses. The NCP documentation must recount the development of the program, including a description of all measures considered, reasons individual measures were accepted or rejected, how and when the measures will be implemented, costs and funding sources, parties responsible for implementation and their agreement to fulfill their role(s), the predicted effectiveness of individual measures and the overall program, and compliance with consultation requirements, including all government agencies with land use control jurisdiction within the 65 dB DNL contours, airport users, the FAA, the general public, and other relevant stakeholders.

Overall acceptance of the Part 150 submission and approval of NCP elements does not eliminate requirements for formal environmental assessment of any proposed actions under the requirements of the National Environmental Policy Act of 1969 (NEPA).[15] However, acceptance of the submission and approval of individual measures is a prerequisite to application to the FAA by the airport proprietor for federal funding assistance under AIP.

NCP alternatives generally fall under three major categories:

1) Noise abatement actions to reduce the size of the noise contours or change their shape, to minimize coverage of potentially noncompatible land uses; e.g., changes to the physical layout of the airport, changes to airport and airspace use, or changes to aircraft operations.

2) Compatible land use actions to address noncompatible land uses that remain after application of noise abatement measures; including *corrective* measures, such as sound insulation or outright acquisition and elimination of noncompatible uses, *compensatory* measures, such as purchase of avigation easements, and *preventive* measures, such as compatible zoning,

[15] 42 U.S.C. §§ 4321- 4347.

subdivision controls to require avigation easements, or changes in building codes to require sound insulation.

3) Program management measures, to support the ongoing publicity, implementation, monitoring, review, and enforcement of noise abatement and compatible land use measures.

Part 150 requires airport proprietors to consider the following alternatives:

- Acquisition of land which includes overflight, easement, and development rights to ensure property use is compatible with airport operations
- Construction of noise barriers or shielding through sound insulating buildings
- Implementation of a preferential runway use program
- Utilization of flight procedures to reduce noise from the source (aircraft) through actions such as flight track changes or aircraft performance profile adjustments
- Restriction of use of the airport by specific aircraft types, nighttime operations, etc.

Upon completion of the analyses and coordination, the NCP is submitted to the FAA for review and approval. The FAA approves or disapproves each measure on its merits and adherence to the national aviation policy. Upon approval, the airport will begin its implementation schedule based on the availability of federal funding and local resources.

Once again, as discussed in Section 1.1, this document presents only an update to previously accepted NEMs. Section 3 reviews the NCP status, but does not propose any revisions.

1.6 Project Roles and Responsibilities

Several groups were involved in the development of the NEM Update, including the MNAA, the FAA, and the consulting team.

1.6.1 Metropolitan Nashville Airport Authority

As the "airport operator," the MNAA has authority over the NEM Update study elements and submission to the FAA. The MNAA retained a team of consultants to conduct the technical work required to fulfill the NEM analysis and documentation requirements, and to assist in public outreach and consultation. Section 1.6.3 describes the composition of the consulting team and the general assignment of responsibilities among its members.

1.6.2 Federal Aviation Administration

For the NEM Update, the FAA responsibility includes a review of the submission to determine that the technical work, consultation, and documentation comply with 14 C.F.R. Part 150 requirements. The FAA must also approve the non-standard modeling requests, if any are proposed. The final role of the FAA is to accept or not accept the NEM Update. FAA involvement includes participation by staff from at least two levels in the agency:

The ***Memphis Airports District Office (ADO)*** and/or ***Airports-Southern Region*** evaluates and accepts (or does not accept) the NEM and supporting documentation.

FAA headquarters, in particular the ***Airport Planning and Environmental Division of the FAA Office of Planning and Programming (APP-400) and the Office of Environment and Energy Noise Division (AEE-100)*** reviews and approves (or disapproves) of non-standard data inputs to the AEDT.

1.6.3 Consulting Team

The MNAA contracted with the ***AECOM*** team to update the Master Plan and NEM. As part of the ***AECOM*** team, the consulting firm of ***Harris Miller Miller & Hanson Inc. (HMMH)*** is responsible to complete the technical work required for the NEM Update. HMMH has overall project management responsibility for the NEM Update and has responsibility for all noise-related technical elements, including analysis of airspace procedures and assistance with the land-use, airport plan and public outreach elements. As part of the Master Plan Update forecasting effort, ***AECOM*** gathered all data and information necessary to prepare detailed aviation activity forecasts for the 2020 base year and the 2025 forecast year for the NEM Update.

1.6.4 Stakeholder Consultation

The MNAA is conducting the NEM Update in a transparent fashion, including engaging a variety of stakeholders in a manner that exceeds Part 150 consultation requirements, as discussed below.

The process employed by the MNAA provides opportunities for all interested parties to both follow the study's progress and be involved when key decisions are taken. Specific engagement strategies of the NEM, which exceed Part 150 requirements, were designed to ensure that all interested parties are given ample opportunity to review and comment on all aspects of the NEM Update.

These include:

- Establishing a Noise Study Advisory Committee (NSAC) which held three meetings over the course of the development of the NEM Update, at which the Study Team presented briefings on the study and committee members were encouraged to provide feedback
- Affording opportunities for public review and comment during the NEM Update development
- Making project-specific materials available on the MNAA's website
- Hosting a public workshop about the results of the NEM Update

Chapter 6 and Appendices E, F, G document the public consultation process required under Part 150 in greater detail.

1.7 FAA Noise Exposure Maps Checklist

The FAA provides advice to airports and other interested parties to consider in conducting Part 150 studies, in Advisory Circular (AC) 150/5020, "Airport Noise and Land Use Compatibility Planning." The AC includes a checklist for FAA's use in reviewing NEMs submissions. The FAA prefers that Part 150 documentation include a copy of the current version of the checklist, with appropriate page number or other references, and other notes or comments to assist in the document's review, as presented in Table 1.

Table 1 Part 150 Noise Exposure Maps Checklist

Source: http://www.faa.gov/airports/environmental/airport_noise/part_150/checklists/, FAA 2019

14 C.F.R. PART 150 NOISE EXPOSURE MAPS CHECKLIST-PART I		
PROGRAM REQUIREMENT	**Yes/No**	**Supporting section, page, or other reference and comments**
I. Submitting and Identifying the NEMs:		
A. Submission properly identified:		
1. 14 C.F.R. Part 150 NEMs?	Yes	Cover letter, cover, and Section 1.
2. NEMs and NCP together?	No	NEMs update only.
3. Revision to NEMs FAA previously determined to be in compliance with Part 150?	Yes	Cover letter and Section 1.5.1.
B. Airport and Airport Operator's name are identified?	Yes	Cover letter and Certification (page iii).
C. NCP is transmitted by operator's dated cover letter, describing it as a Part 150 submittal and requesting appropriate FAA determination?		Not applicable.
II. Consultation: [150.21(b), A150.105(a)]		
A. Is there a narrative description of the consultation accomplished, including opportunities for public review and comment during map development?	Yes	Section 6.
B. Identification of consulted parties:		
1. Are the consulted parties identified?	Yes	Sections 6.1 and 6.2.
2. Do they include all those required by 150.21(b) and A150.105 (a)?	Yes	Section 6.2.
3. Agencies in 2., above, correspond to those indicated on the NEM?	Yes	Section 6.2.
C. Does the documentation include the airport operator's certification, and evidence to support it, that interested persons have been afforded adequate opportunity to submit their views, data, and comments during map development and in accordance with 150.21(b)?	Yes	Certification (page iii) and Section 6.
D. Does the document indicate whether written comments were received during consultation and, if there were comments that they are on file with the FAA regional airports division manager?	Yes	Section 6.5 lists the parties submitting comments. Appendix H provides copies of the comments, which by submission of this document are on file with the FAA's Regional Airports Division Manager.
III. General Requirements: [150.21]		
A. Are there two maps, each clearly labeled on the face with year (existing condition year and one that is at least 5 years into the future)?	Yes	"2020 Existing Condition Noise Exposure Map" (Figure 3) and "2025 Five-Year Forecast Condition Noise Exposure Map" (Figure 4)
B. Map currency:		
1. Does the year on the face of the existing condition map graphic match the year on the airport operator's NEM submittal letter?	Yes	"2020 Existing Condition Noise Exposure Map" (Figure 3)
2. Is the forecast year map based on reasonable forecasts and other planning assumptions and is it for at least the fifth calendar year after the year of submission?	Yes	Section 5.4 discusses the 2020 and 2025 forecasts.
3. If the answer to 1 and 2 above is no, the airport operator must verify in writing that data in the documentation are representative of existing condition and at least 5 years' forecast conditions as of the date of submission?	N.A.	Not applicable.

14 C.F.R. PART 150 NOISE EXPOSURE MAPS CHECKLIST-PART I		
PROGRAM REQUIREMENT	**Yes/No**	**Supporting section, page, or other reference and comments**
C. If the NEMs and NCP are submitted together:		
1. Has the airport operator indicated whether the forecast year map is based on either forecast conditions without the program or forecast conditions if the program is implemented?	N.A.	Not applicable. Note: The "2020 Existing Condition Noise Exposure Map" (Figure 3) and "2025 Five-Year Forecast Condition Noise Exposure Map" (Figure 4) reflect objective data analysis reflecting the current implementation of the existing, FAA-approved NCP elements summarized in Section 3.
2. If the forecast year map is based on program implementation:	N.A.	
a. Are the specific program measures that are reflected on the map identified?	N.A.	
b. Does the documentation specifically describe how these measures affect land use compatibilities depicted on the map?	N.A.	
3. If the forecast year NEM does not model program implementation, the airport operator must either submit a revised forecast NEM showing program implementation conditions [B150.3 (b), 150.35 (f)] or the sponsor must demonstrate the adopted forecast year NEM with approved NCP measures would not change by plus/minus 1.5 DNL? [150.21(d)]	N.A.	
IV. MAP SCALE, GRAPHICS, AND DATA REQUIREMENTS: [A150.101, A150.103, A150.105, 150.21(a)]		
A. Are the maps of sufficient scale to be clear and readable (they must be not be less than 1" to 2,000'), and is the scale indicated on the maps? *(Note (1) if the submittal uses separate graphics to depict flight tracks and/or noise monitoring sites, these must be of the same scale, because they are part of the documentation required for NEMs.)* *(Note (2) supplemental graphics that are not required by the regulation do not need to be at the 1" to 2,000' scale)*	Yes	The "2020 Existing Condition Noise Exposure Map" (Figure 3) and "2025 Five-Year Forecast Condition Noise Exposure Map" (Figure 4) are presented at 1" to 3,000'. Unbound NEM and flight track figures are provided at the scale of 1" to 2,000' in pockets at the rear of this document and included as an attachment to the electronic version, as permitted by FAA.
B. Is the quality of the graphics such that required information is clear and readable? (Refer to C. through G., below, for specific graphic depictions that must be clear and readable)	Yes	
C. Depiction of the airport and its environs.		
1. Is the following graphically depicted to scale on both the existing condition and forecast year maps:	Yes	See Section 5.1, Figure 3, and Figure 4
a. Airport boundaries	Yes	
b. Runway configurations with runway end numbers	Yes	
2. Does the depiction of the off-airport data include?		
a. A land use base map depicting streets and other identifiable geographic features	Yes	Land uses on the NEMs, streets and other features are shown over the entire mapped area. Land use coverage is shown in Figure 2 for informational purposes.
b. The area within the DNL 65 dB (or beyond, at local discretion)	Yes	
c. Clear delineation of geographic boundaries and the names of all jurisdictions with planning and land use control authority within the DNL 65 dB (or beyond, at local discretion)	Yes	As noted directly on the map portion of the NEM figures (which extends in both cases well beyond 65 dB DNL contour), the entire mapped area is within the jurisdictional boundaries of the Metropolitan Government of Nashville and Davidson County.

14 C.F.R. PART 150 NOISE EXPOSURE MAPS CHECKLIST-PART I		
PROGRAM REQUIREMENT	**Yes/No**	**Supporting section, page, or other reference and comments**
D. 1. Continuous contours for at least DNL 65, 70, and 75 dB?	Yes	
2. Has the local land use jurisdiction(s) adopted a lower local standard and, if so, has the sponsor depicted this on the NEMs?	No	Part 150 Appendix A Table 1 guidelines are used locally, as discussed in Section 2
3. Based on current airport and operational data for the existing condition year NEM, and forecast data representative of the selected year for the forecast NEM?	Yes	See the Section 5 discussion of the 2020 and 2025 noise modeling data.
E. Flight tracks for the existing condition and forecast year timeframes (these may be on supplemental graphics which must use the same land use base map and scale as the existing condition and forecast year NEM), which are numbered to correspond to accompanying narrative?	Yes	See the Section 5.8 discussion, and related figures and tables.
F. Locations of any noise monitoring sites (these may be on supplemental graphics which must use the same land use base map and scale as the official NEMs)	N.A.	Not applicable; no noise monitoring was used in the development of the NEMs.
G. Noncompatible land use identification:	Yes	
1. Are noncompatible land uses within at least the DNL 65 dB noise contour depicted on the map graphics?	Yes	Noncompatible uses within 65 dB DNL are depicted, as required
2. Are noise sensitive public buildings and historic properties identified? *(Note: If none are within the depicted NEM noise contours, this should be stated in the accompanying narrative text.)*	Yes	As discussed in Section 4.3, the NEM contours encompass one house of worship, but there are no other noise sensitive public buildings or historic properties within the contours.
3. Are the noncompatible uses and noise sensitive public buildings readily identifiable and explained on the map legend?	Yes	Legends identify noncompatible land uses.
4. Are compatible land uses, which would normally be considered noncompatible, explained in the accompanying narrative?	Yes	As discussed in Section 4.3, the noise contours encompass land uses that would normally be considered noncompatible, but are now compatible by virtue of their inclusion in completed MNAA noise mitigation program elements.
V. NARRATIVE SUPPORT OF MAP DATA: [150.21(a), A150.1, A150.101, A150.103]		
A. 1. Are the technical data and data sources on which the NEMs are based adequately described in the narrative?	Yes	Section 5
2. Are the underlying technical data and planning assumptions reasonable?	Yes	Section 5
B. Calculation of Noise Contours:		
1. Is the methodology indicated?	Yes	As discussed in Section 5, The DNL contours contained in these NEMs were prepared using the most recent release of the FAA's AEDT available at the time the NEMs were prepared; i.e., "Version 2d."
a. Is it FAA approved?	Yes	
b. Was the same model used for both maps? *(Note: The same model also must be used for NCP submittals associated with NEM determinations already issued by FAA where the NCP is submitted later, unless the airport sponsor submits a combined NEMs/NCP submittal as a replacement, in which case the model used must be the most recent version at the time the update was started.)*	Yes	
c. Has AEE approval been obtained for use of a model other than those that have previous blanket FAA approval?	N.A.	Not applicable.

14 C.F.R. PART 150 NOISE EXPOSURE MAPS CHECKLIST-PART I		
PROGRAM REQUIREMENT	**Yes/No**	**Supporting section, page, or other reference and comments**
2. Correct use of noise models:	Yes	No nonstandard data was used in the AEDT.
a. Does the documentation indicate, or is there evidence, the airport operator (or its consultant) has adjusted or calibrated FAA-approved noise models or substituted one aircraft type for another that was not included on the FAA's pre-approved list of aircraft substitutions?	No	
b. If so, does this have written approval from AEE, and is that written approval included in the submitted document?	No	
3. If noise monitoring was used, does the narrative indicate that Part 150 guidelines were followed?	N.A.	Not applicable; no noise monitoring was used.
4. For noise contours below DNL 65 dB, does the supporting documentation include an explanation of local reasons? *(Note: A narrative explanation, including evidence the local jurisdiction(s) have adopted a noise level less than DNL 65 dB as sensitive for the local community(ies), and including a table or other depiction of the differences from the Federal table, is highly desirable but not specifically required by the rule. However, if the airport sponsor submits NCP measures within the locally significant noise contour, an explanation must be included if it wants the FAA to consider the measure(s) for approval for purposes of eligibility for Federal aid.)*	N.A.	Not applicable, since no contours below DNL 65 dB provided.
C. Noncompatible Land Use Information:		
1. Does the narrative (or map graphics) give estimates of the number of people residing in each of the contours (DNL 65, 70 and 75, at a minimum) for both the existing condition and forecast year maps?	Yes	See Section 4.3.2.
2. Does the documentation indicate whether the airport operator used Table 1 of Part 150?	Yes	
a. If a local variation to table 1 was used:	N.A.	Not applicable; no local variation was used.
(1) Does the narrative clearly indicate which adjustments were made and the local reasons for doing so?	N.A.	
(2) Does the narrative include the airport operator's complete substitution for table 1?	N.A.	
3. Does the narrative include information on self-generated or ambient noise where compatible or noncompatible land use identifications consider non-airport and non-aircraft noise sources?	No	
4. Where normally noncompatible land uses are not depicted as such on the NEMs, does the narrative satisfactorily explain why, with reference to the specific geographic areas?	Yes	As discussed in Section 4.3, land uses that would normally be considered noncompatible within the 65 dB DNL contours, are now compatible by virtue of their inclusion in completed MNAA noise mitigation program elements.
5. Does the narrative describe how forecast aircraft operations, forecast airport layout changes, and forecast land use changes will affect land use compatibility in the future?	Yes	See Section 4.3.3.

14 C.F.R. PART 150 NOISE EXPOSURE MAPS CHECKLIST-PART I		
PROGRAM REQUIREMENT	**Yes/No**	**Supporting section, page, or other reference and comments**
VI. MAP CERTIFICATIONS: [150.21(b), 150.21(e)]		
A. Has the operator certified in writing that interested persons have been afforded adequate opportunity to submit views, data, and comments concerning the correctness and adequacy of the draft maps and forecasts?	Yes	See certification (on page iii) and Section 6.
B. Has the operator certified in writing that each map and description of consultation and opportunity for public comment are true and complete under penalty of 18 U.S.C. Section 1001?	Yes	

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2 LAND USE COMPATIBILITY GUIDELINES AND STANDARDS

In a Part 150 study, cumulative noise exposure estimates have two principal uses:

- To provide a quantitative basis for assessing land use compatibility with aircraft noise exposure.
- To provide a means for determining the significance of changes in noise exposure that might result from changes in airport layout, operations, or activity levels.

Both these functions require application of objective criteria. Government agencies dealing with environmental noise have devoted significant attention to this issue, and have developed noise / land use compatibility guidelines to help federal, state, and local officials with this evaluation process.

2.1 Part 150 Land Use Compatibility Guidelines

Part 150 Appendix A sets forth FAA-recommended guidelines for noise / land-use compatibility based on DNL. Table 2 reproduces these guidelines.

The Part 150 guidelines represent a compilation of the results of scientific research into noise-related activity interference and attitudinal response. The guidelines indicate that all uses normally are compatible with aircraft noise at exposure levels below 65 dB DNL.

This submission continues the FAA-accepted approach that the MNAA has used in all previous NEM submissions for BNA and utilizes the Part 150 land-use compatibility guidelines without revision.

Table 2 Part 150 Land Use Compatibility
Source: 14 C.F.R. Part 150, Appendix A, Table 1

Land Use	Yearly Day-Night Average Sound Level, Ldn, [or Day-Night Average Sound Level, DNL], in Decibels (Key and notes on following page)					
	<65	65–70	70–75	75–80	80–85	>85
Residential Use						
Residential other than mobile homes and transient lodgings	Y	N(1)	N(1)	N	N	N
Mobile home park	Y	N	N	N	N	N
Transient lodgings	Y	N(1)	N(1)	N(1)	N	N
Public Use						
Schools	Y	N(1)	N(1)	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Governmental services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
Commercial Use						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail, bldg. mtls., hardware, and farm equip.	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail trade–general	Y	Y	25	30	N	N
Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Communication	Y	Y	25	30	N	N
Manufacturing and Production						
Manufacturing general	Y	Y	Y(2)	Y(3)	Y(4)	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock farming and breeding	Y	Y(6)	Y(7)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
Recreational						
Outdoor sports arenas and spectator sports	Y	Y(5)	Y(5)	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts and camps	Y	Y	Y	Y	Y	Y
Golf courses, riding stables, water recreation	Y	Y	25	30	N	N

Key Table 2	
Y(Yes)	Land use and related structures compatible without restrictions.
N(No)	Land use and related structures are not compatible and should be prohibited.
NLR	Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
25, 30, or 35	Land use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structure.

Notes for Table 2

The designations contained in this table do not constitute a Federal determination that any use of land covered by the program is acceptable or unacceptable under Federal, State, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise compatible land uses.

(1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide a NLR of 20 dB, thus, the reduction requirements are often stated as 5, 10, or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. However, the use of NLR criteria will not eliminate outdoor noise problems.

(2) Measures to achieve NLR of 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.

(3) Measures to achieve NLR of 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.

(4) Measures to achieve NLR of 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.

(5) Land use compatible provided special sound reinforcement systems are installed.

(6) Residential buildings require an NLR of 25.

(7) Residential buildings require an NLR of 30.

(8) Residential buildings not permitted.

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3 EXISTING NOISE COMPATIBILITY PROGRAM

This section reviews the status of measures that the MNAA proposed in its 1989 NCP submission, based on the approval or disapproval status set forth by the FAA in its May 23, 1989 ROA, which is reproduced in Appendix C of this document. The NCP organized the measures into noise abatement, land use control, and management categories. *The following discussion reproduces the descriptions of the measures as presented in the FAA's ROA.*

3.1 Aircraft Operational / Noise Abatement Measures

The MNAA's NCP includes four operational strategies designed to reduce noise exposure on the communities near BNA.

3.1.1 Operational Strategy 1

Modification of the daytime runway use to balance airfield operations resulting in a 50/50 north/south runway split. Adoption of this procedure will direct more departures to the east, south, or southwest resulting in a reduced population noise exposure.

FAA Action: Approved

Implementation Status: Implemented

Review of Implementation: Following the FAA ROA for the NCP, the MNAA worked with the BNA Air Traffic Control Tower (ATCT) to develop a "Tower Order" to establish noise abatement procedures to implement the approved noise abatement elements. The ROA has evolved over time to reflect current operating conditions, FAA criteria, airport layout modifications, etc. The current Tower Order[16] lists this strategy as one of the goals of the informal runway use program. The current implementation status of this measure was developed from operations data for July 2017 through June 2018. The data were collected from the MNAA's Flight Track Monitoring System (FTMS) that is discussed in Section 3.3.3. The north / south flow split was determined to be 50.7% / 49.3%, reflecting essentially perfect implementation.

3.1.2 Operational Strategy 2

Use of Runway 13/31 for over 96 percent of operations between 10:00 pm and 7:00 am with an emphasis on departing to the east and arriving from the southeast whenever conditions allow (i.e., low traffic periods, wind and weather conditions, etc.). The night uses of this crossing runway will remove the large population center north of the airport from aircraft noise.

FAA Action: Approved

Implementation Status: Implemented

Review of Implementation: Increased airport activity since 1989 led the MNAA and ATCT to agree to relax this measure during the "shoulder" hours of 10:00 pm - Midnight and 5:30 am - 7:00 am, in order to maintain safe and timely operations.

[16] "Informal Runway Use Program – Nashville International Airport," BNA ATCT 7323.38N, August 1, 2014.

To review the implementation of this measure, operations data were obtained from the FTMS for July 1, 2017 through June 30, 2018. Table 3 displays the nighttime arrival and departure runway use rates during that period.

Table 3 Comparison of Nighttime Runway Distribution of Aircraft Operations, July 1, 2017 through June 30, 2018
Source: Flight Data, HMMH

Runway	Departures	Arrivals	Total Operations	% of Total Operations
10:00 pm – 12:00 pm (Note: The definition of the shoulder hours times has changed since the previous NEM Update)				
13	24	59	83	0.8%
31	351	222	573	5.4%
02/20	2,972	6,995	9,967	93.8%
Totals	**3,347**	**7,276**	**10,623**	**100%**
12:00 pm – 5:30 am				
13	17	52	69	1.5%
31	521	477	998	21.3%
02/20	1,318	2,308	3,626	77.3%
Totals	**1,856**	**2,837**	**4,693**	**100%**
5:30 am – 7:00 am				
13	20	3	23	0.2%
31	2,260	292	2,552	23.1%
02/20	5,787	2,663	8,450	76.6%
Totals	**8,067**	**2,958**	**11,025**	**100%**
10:00 pm – 7:00 am				
13	61	114	175	0.7%
31	3,132	991	4,123	15.7%
02/20	10,077	11,966	22,043	83.7%
Totals	**13,270**	**13,071**	**26,341**	**100%**

As shown in the table, overall use of Runway 13/31 during the full 10:00 pm – 7:00 am nighttime period is approximately 16 percent with almost 23 percent use between midnight and 5:30am. Most use of the diagonal runway is in the northwesterly direction; i.e., departures to the northwest and arrivals from the southeast. This use places most operations on this runway over the mitigated and otherwise compatible uses to the northwest. As discussed in Section 4.3, even though usage of Runway 13/31 has reduced at night, the significant reduction in the noise level of aircraft operating at the airport, has resulted in a situation where there is only a small amount of noncompatible land use.

3.1.3 Operational Strategy 3

Changes in the following nighttime (10:00 pm to 7:00 am) flight corridors:

- Runway 13 departures turn to a heading of 090 degrees until reaching 3,600 feet above mean sea level (MSL)

- Runway 31 departures turn to a heading of 280 degrees until reaching 3,600 feet MSL. Turn to be initiated at 2 DME[17]
- Runway 20R departures turn to a heading of 180 degrees until reaching an altitude of 3,600 feet MSL.

Flight corridor changes are recommended for the purpose of reducing highly developed residential areas from unnecessary aircraft noise.

FAA Action: Approved

Implementation Status: Implemented

Review of Implementation: Since the implementation of this strategy, initial headings for nighttime departures have been modified slightly for operational reasons, as follow:

- Runway 13 departures turn left to heading 095
- Runway 31 departures turn left to heading 280
- Runway 20R departures turn right to heading 260.

All departures remain on the assigned headings until leaving 3,600 feet MSL or 3 miles from the end of the runway.

The FTMS-based data for July 1, 2017 through June 30, 2018 revealed high compliance with this procedure for Runway 31, Runway 13 is rarely used for departures at night resulting in lower compliance with the measure, and compliance for Runway 20R is less due to the RNAV procedures in place which direct aircraft to turn to other headings due to their destinations:

- For Runway 13, approximately 46 percent of the departures conformed.
- For Runway 31, approximately 89 percent of the departures conformed.
- For Runway 20R, approximately 61 percent of the departures conformed.

3.1.4 Operational Strategy 4

Changes in the following daytime flight corridors: 1) Runway 31 departures follow runway heading then turn to 50 degrees or 280 degrees at 2 DME 2) Runway 20R eastbound departures turn to the southeast (140 or 180 degrees) 3) New Runway 20L westbound departures turn to the southwest (220 degrees). Adoption of this strategy will reduce the number of people exposed to aircraft noise.

FAA Action: Approved

Implementation Status: Implemented

Review of Implementation: These procedures also have been modified slightly for operational reasons, as follow:

[17] DME stands for Distance Measuring Equipment, and 2 DME refers to a distance of 2 nautical miles from the DME location on the airport.

- For Runway 31, departures maintain runway heading until 2 DME and then turn left to heading 280 or right to heading 050.
- Runway 20R departures turn right to headings between 220 and 260 or turn left to headings between 140 and 180.
- Runway 20L departures maintain runway heading or turn right to heading 220.

The FTMS-based data for July1, 2017 through June 30, 2018 revealed high compliance with these procedures on Runways 31 and 20R.

- For Runway 31, approximately 94 percent of the departures conformed.
- For Runway 20R, approximately 90 percent of the departures conformed.
- For Runway 20L, approximately 84 percent of the departures conformed.

3.2 Land Use Measures

The MNAA's NCP for BNA includes four remedial measures and one preventive measure.

Review of Overall Implementation: The MNAA implemented the first three remedial measures, which were designed to correct existing noncompatible land uses in the areas denoted on the NEM graphics. (The NEM graphics in this document are found in Section 4.2 as Figure 3 and Figure 4, for 2020 and 2025, respectively). The implementation of these measures was a major factor contributing to the current situation, in which there is negligible noncompatible land use remaining within the existing or forecast case NEM contours, as discussed in Section 4.3.

Furthermore, as shown in the NEM figures, the remedial land use program implementation areas are largely outside the current 65 dB DNL contours, due to shrinkage in the overall contour size. This situation provides a buffer against introduction of future noncompatible land use, should activity levels increase the size of the contours in the future.

The fourth remedial measure and the preventive measure also will assist in preventing future introduction of noncompatible uses.

3.2.1 Remedial Action 1

Acquisition of Residential Areas in the Extended Approach Areas. Two residential areas around the airport would be acquired on a voluntary basis. One area is north of Runway 2R-20L and Interstate 40. A second area is located south of Runway 2L-20R and east of Airport Estates. This community became eligible because it would be left fragmented due to the Airport Estates acquisition. The requirements of the Federal Uniform Relocation Assistance and Real Property Acquisition Policy Act will be followed.

FAA Action: Approved

Implementation Status: Implemented

3.2.2 Remedial Action 2

The NCP recommends that single family, owner-occupied houses in the 65 to 75 DNL noise contours be insulated for noise reduction. Intensive insulation would be installed in the 70 to 75 DNL area,

and less intensive insulation in the 65 to 70 DNL. MNAA will provide funding for the insulation program but would limit the cost for the 65 to 70 DNL areas to a maximum of $4,000.

FAA Action: Approved

Implementation Status: Implemented

3.2.3 Remedial Action 3

Residential Property Sales Assistance Program (RPSAP). The MNAA will guarantee property owners living in viable residential areas inside the DNL 65 dB contour fair market value if they wish to sell their homes. Sale would be voluntary and the homeowners would not receive relocation assistance. To participate, homeowners would be required to provide the MNAA with easements at the time of sale. If home owners previously participated in the sound insulation option, they will be asked to wait one year after completion of sound insulation before becoming eligible for this RPSAP option.

FAA Action: Approved

Implementation Status: Implemented

3.2.4 Remedial Action 4

To preclude future residential development and to transition existing noncompatible land uses to nonresidential uses, the MNAA will work with the Metropolitan Planning Commission (MPC) to identify and effect zoning policy changes for several areas. The MPC agreed to recommend that the residential areas be changed to nonresidential zoning. To promote the transition the MPC agreed to recommend that these areas be given priority designation within Metropolitan Nashville's capital improvement budget process. MNAA also agreed to reevaluate the status of two transition areas one year after approval of the NCP.

FAA Action: Approved

Implementation Status: Largely addressed through Remedial Actions 1 through 3.

As required by the NCP ROA, these areas were reviewed one year after the ROA to assess whether or not the transition from residential to commercial was occurring. The review showed that commercial development was not occurring and that the residents of the Transition Areas elected to participate in acquisition, sales assistance, or sound insulation (depending upon their location.) The Subarea Plan administered by the MPC was changed to indicate that the best use of these areas was airport-compatible development such as commercial or office space. [18]

3.2.5 Preventive Action: Undeveloped Areas

The MNAA and the MPC will discourage residential development in undeveloped areas within the DNL 65 dB contour and will recommend that Nashville's building code be revised *to identify an aircraft noise impact area* with more stringent requirements for noise reduction.

FAA Action: Approved

Implementation Status: Implemented

[18] "Nashville International Airport, Noise Exposure Map Update, Final," prepared for the Metropolitan Nashville Airport Authority, by Landrum & Brown, Incorporated, December 2004, p. 34.

3.3 Program Management Measures

The MNAA's NCP for BNA contains three measures to assist in the implementation and management of the noise abatement and land use control measures.

3.3.1 Management Technique 1

Fan markers should be installed on Runways 31 and 20L to guide aircraft turns in conjunction with preferred flight corridors.

FAA Action: Disapproved

The ROA noted the following:

The FAA Air Traffic Control has determined that varying sensitivities/settings of aircraft receivers tend to impact precision and make the use of these markers ineffective.

3.3.2 Management Technique 2

Documentation for the preferred runway use program should be updated as needed to reflect aircraft noise abatement turning procedures and runway utilization goals.

FAA Action: Approved

Implementation Status: Implemented

As discussed in Section 3.1.1, the informal runway use program was implemented through a Tower Order. The most recent publication date of that Tower Order is August 1, 2014.

3.3.3 Management Technique 3

An Automated Radar Terminal Service (ARTS) Data Acquisition System, such as the one installed …on a temporary basis, should be retained in service. Adoption of this system will help MNAA track operations so MNAA can work with FAA to direct more departures to the east, south, or southwest resulting in a reduced population noise exposure.

FAA Action: Approved

Implementation Status: Implemented

The MNAA acquired an FTMS that uses data from a third-party vendor which passively monitors the FAA's radar system. The MNAA acquired an initial FTMS in 1989 and updated it in 2008. The current FTMS uses HMMH-provided software to process the data, develop a database, and permit the MNAA to retrieve and analyze the data for a broad range of purposes. The updated system allows the MNAA Noise Office to better view the tracks, perform spatial analysis, and view individual flight information. On a day-to-day basis, the most common MNAA use of the FTMS is to investigate noise complaints and follow up with the complainant and the aircraft operator, as appropriate.

The FTMS provided a valuable source of operational data for use in developing noise modeling inputs, including – but not limited to – operations detail for AECOM to use as baseline inputs in the development of the 2020 and 2025 forecasts (including specific aircraft types, the day-night split of activity, and departure stage lengths). FTMS data also informed the development of flight track geometry and utilization rates, vertical flight profiles, and runway use rates for this study.

3.3.4 Management Technique 4

A Standard Instrument Departure Procedure (SID) or other published procedures should be developed for Runway 2R to align aircraft turns over the highway.

FAA Action: Disapproved

The ROA noted the following:

The FAA objected to the proposed SIDs for noise abatement purposes at this airport. The proposed SID would extend tracks well past required distances/altitudes, be insensitive to aircraft route of flight, be labor intensive to both pilots and controllers during critical periods of flight and create high potential for confusion/conflict between written procedure and ATC requirements. Development of the proposed SID is incongruous with an existing SID which considers these factors. However, other published procedures may be appropriate, and will be considered by the FAA upon submittal of more detailed information in order to make an informed analysis.

Despite this objection, the FAA subsequently published the TITAN ONE SID that included the recommended noise abatement procedure for Runway 2R.[19] Because the navigational aid that provides part of the guidance for that SID has been unreliable, the FAA currently implements the procedure through the Informal Runway Use Tower Order that calls for giving pilots an instruction to "turn right heading 055 degrees." This procedure has been incorporated into the current RNAV[20] SIDs and the instruction is highly effective in keeping traffic over the highway as intended by the NCP.

In 2015, RNAV SIDs were added to all runways at BNA; these were developed by FAA in cooperation with MNAA to follow the existing noise abatement procedures as much as possible.

3.3.5 Management Technique 5

The Airport Noise Advisory Committee (ANAC) or some comparable group should be used to review the MNAA's land use program implementation efforts.

FAA Action: Approved

Implementation Status: Implemented

The ROA noted the following:

This committee has already been established and its purpose set forth in the NCP and subsequent correspondence from the MNAA dated February 7, 1989. The intent of the committee is to aid the airport in implementing the land use strategies presented in the NCP and approved in this Record of Approval. This management technique has been determined to be consistent with Part 150 program standards. The committee was disbanded when its purpose was complete.

[19] TITAN ONE DEPARTURE (Obstacle) , SE-1, 16 Dec 2010 to 13 JAN 2011

[20] RNAV stands for "Area Navigation", a set of navigation specifications which guide the operation of aircraft on a desired flight path

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4 EXISTING AND FORECAST NOISE EXPOSURE MAPS

4.1 Introduction

As discussed in Section 1.5.1, the most fundamental elements of the NEMs submission are cumulative exposure noise contours for annual operations at the airport for: (1) data representing the year of submission and (2) data representing a forecast year at least five years from the year of submission.[21]

The year of submission for this NEMs update is 2020. Therefore, the existing conditions noise contours are for 2020 and the five-year forecast case contours are for 2025.

- Section 4.2 presents the NEM figures.
- Section 4.3 documents the noncompatible land uses within the noise contours.
- Section 4.3.3 discusses effects on future land use compatibility of forecast changes in operations from 2020 to 2025.
- Chapter 5 describes the development of the noise contours, summarizes the noise modeling assumptions, and identifies data sources.

4.2 Noise Exposure Map Figures

Figure 3 and Figure 4 present the NEMs for existing (2020) and five-year forecast conditions (2025), respectively***. These are the official Noise Exposure Maps that the MNAA is submitting under Part 150 for appropriate FAA review and determination of compliance, pursuant to §150.21.***

The copies of the figures bound into this volume on the following pages are at a scale of 1" to 3,000', which is smaller than the minimum scale permitted under §A150.103(b)(1); i.e., 1" to 2,000'. Copies of the figures at the required 1" to 2,000' scale are provided in a pocket at the rear of this document and as an attachment to the electronic version of this document.

The two figures identify the following items, as required in Part 150 (in the sections cited):[22]

- Runway layout as required in §A150.103(b)(1). Section 5.1 provides more detailed information on Part 150 requirements related to runway layout and other airfield geometry data, including a more detailed airport layout diagram (Figure 6) at the required 1" to 2,000' scale.

[21] See §III.A and §III.B of the FAA's "Part 150 Noise Exposure Maps Checklist" presented in Table 1 starting on page 12 of this document.

[22] §A150.103(b)(1) also requires depiction of flight tracks out to 30,000' from each runway end. As noted in the FAA's "Part 150 Noise Exposure Maps Checklist" presented in Table 1 (starting on page 12 of this document), FAA permits separate flight track figures, to accommodate the high level of detail and large size required for this purpose. Section 5.8 presents flight track figures out to the required distance at a scale of 1" to 7,500'; these same figures are provided at the required 1" to 2,000' scale in a pocket at the rear of this document.

- Calendar year 2020 and 2025 noise contours (for 65, 70, and 75 dB DNL) resulting from aircraft operations, as required in §A150.101(e)(3).
- Outline of the airport boundaries, as required in §A150.101(e)(4) and §A150.103(b)(1).
- Noncompatible land uses within the contours, as required in §A150.101(e)(5), including Part 150 land use categories and discrete sensitive land uses. As noted on the figures, the noncompatible land uses within the 65 dB DNL contours include: residential dwelling units to the north of the airport under the approach to Runway 20L and 20R; and south of the airport under the approach path to Runway 20R.
- Locations of noise sensitive public buildings, as required in §A150.101(e)(6).
- A note that there are no properties within the contours that are on or eligible for inclusion in the National Register of Historic Places, as required in §A150.101(e)(6).
- A note that the entire area depicted on the map (the boundaries of which extend well beyond the 65 dB DNL contours), is within the jurisdictional boundaries of the Metro Government of Nashville and Davidson County, as required in §A150.105.

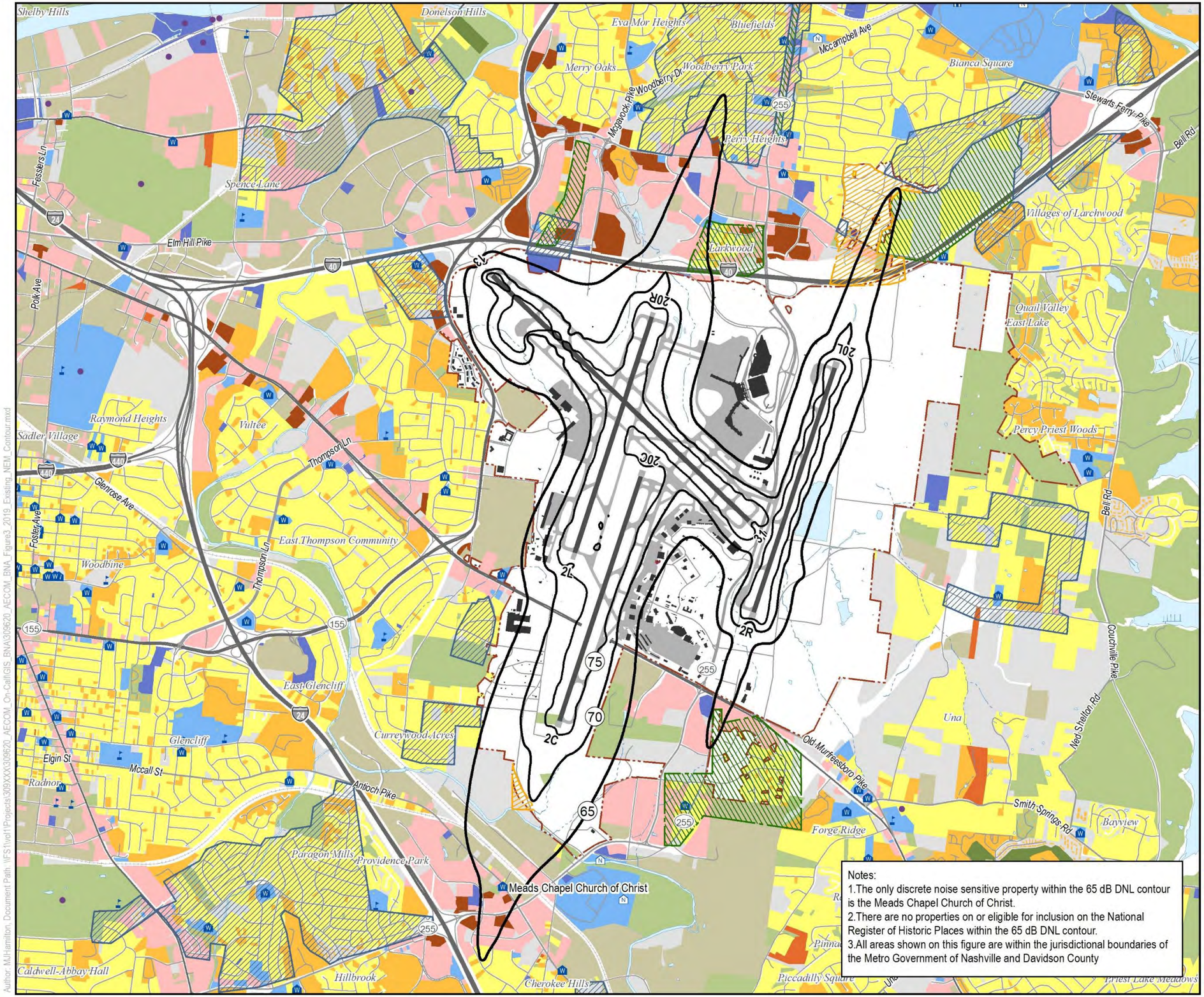
Figure 5 presents a comparison of the 2020 and 2025 contours, in the same format as the official NEM figures. However, since that figure is not an official NEM, it is not provided at a 1" to 2,000' scale version at the rear of this document.

BNA Nashville International Airport

Airport Noise Compatibility - Part 150 Study
2020 and 2025 Noise Exposure Maps

Figure: 3

Existing Conditions (2020) Noise Exposure Map



Notes:
1.The only discrete noise sensitive property within the 65 dB DNL contour is the Meads Chapel Church of Christ.
2.There are no properties on or eligible for inclusion on the National Register of Historic Places within the 65 dB DNL contour.
3.All areas shown on this figure are within the jurisdictional boundaries of the Metro Government of Nashville and Davidson County

- 2020 Existing NEM Contour (65-75 dB DNL)
- 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
- School
- Place of Worship
- Library
- Hospital
- Nursing Home
- National Register of Historic Places
- Transitional Area
- Sound Insulation/Residential Property Sales Assistance Program
- Acquisition of Residential Uses in Approach Areas

0 3,000 6,000 Feet

N

hmmh

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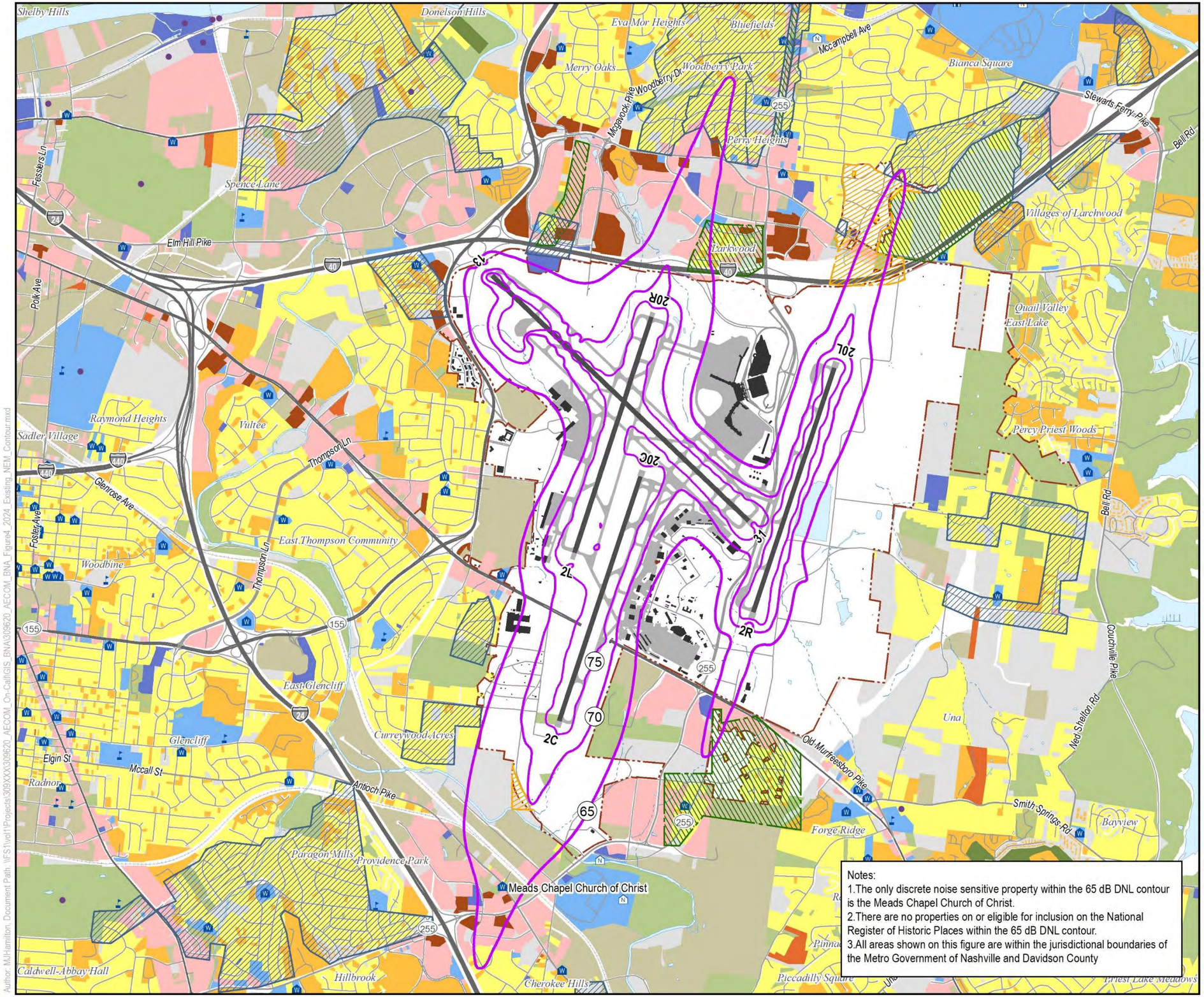
BNA Nashville International Airport

Airport Noise Compatibility - Part 150 Study
2020 and 2025 Noise Exposure Maps

Figure: 4

Forecast Conditions (2025) Noise Exposure Map



2025 Future NEM Contour (65-75 dB DNL)

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

School

Place of Worship

Library

Hospital

Nursing Home

National Register of Historic Places

Transitional Area

Sound Insulation/Residential Property Sales Assistance Program

Acquisition of Residential Uses in Approach Areas

0 3,000 6,000 Feet

N

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Author: MJHamilton, Document Path: \\FS1\vol1\Projects\309XXX\309620_AECOM_On-Call\GIS_BNA\309620_AECOM_BNA_Figure4_2024_Existing_NEM_Contour.mxd

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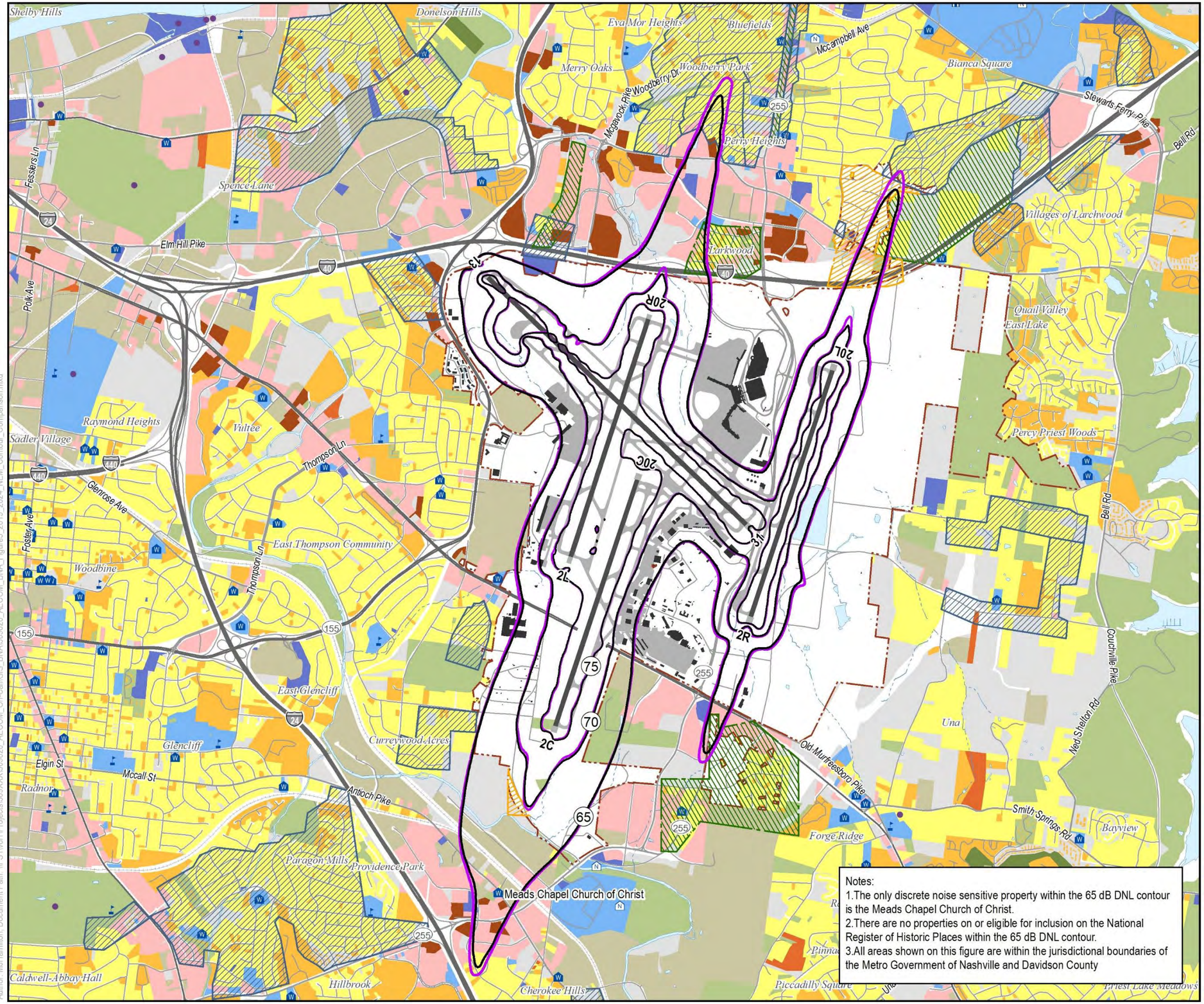
BNA Nashville International Airport

Airport Noise Compatibility - Part 150 Study
2020 and 2025 Noise Exposure Maps

Figure: 5

Comparison of Existing (2020) and Forecast (2025) Noise Exposure Maps



2020 Existing NEM Contour (65-75 dB DNL)
2025 Future NEM Contour (65-75 dB DNL)

BNA Airport Boundary (Approximate)
Runway
State Boundary
Highway
Major Roads
Municipal Boundary
Minor 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
School
Library
Nursing Home
Place of Worship
Hospital
National Register of Historic Places
Transitional Area
Sound Insulation/Residential Property Sales Assistance Program
Acquisition of Residential Uses in Approach Areas

N

0 3,000 6,000 Feet

Author: MJHamilton Document Path: \\FS1\vol1\Projects\309XXX\309620_AECOM_On-Call\GIS_BNA\309620_AECOM_BNA_Figure5_2019_2024_NEM_Contour_Comparison.mxd

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4.3 Noncompatible Land Uses within the Noise Contours

As noted on the figures, there are only two types of noncompatible land use within the 65 dB DNL contours, based on the land use compatibility criteria discussed in Section 2: (1) a single discrete sensitive land use and (2) two areas of residential land use. These two categories are discussed in order below.

4.3.1 Discrete Sensitive Land Use

As shown on the NEM figures, the Meades Chapel Church of Christ place of worship is located under the approach to Runway 2C, within the 65-70 dB DNL contour interval for both 2020 and 2025. In accordance with the land use compatibility criteria discussed in Section 2, this single discrete sensitive land use is *noncompatible* with noise exposure within that contour interval, unless the structure's design and construction provides an NLR of 25 dB.

Neither the 2020 nor the 2025 NEM contours encompassed any other types of noise sensitive public buildings (such as schools, hospitals, and health care facilities).

4.3.2 Residential Land Use

As shown on the NEM figures, there are two areas of residential land use under the extended approaches to Runways 2C and 20R within both the 2020 and 2025 65 dB DNL contour and an additional area north of Runway 20L in the 2025 65 dB DNL contour. The areas north of Runway 20R and Runway 20L are within MNAA's previously approved noise mitigation program (under Remedial Action 2, "Residential Sound Insulation," and Remedial Action 3 "Residential Property Sales Assistance," as discussed in Sections 3.2.2 and 3.2.3 of this document, respectively.) *Therefore, all dwelling units in that area are compatible under Part 150 regulatory standards and guidelines.* The third area of residential land use, under the arrival path to Runway 2C, is within both the 2020 and 2025 65 dB DNL contours. This area is outside any of the MNAA's previously approved noise mitigation areas. Careful review of the contours and aerial photography indicate the following:

- The 2020 65-70 dB DNL contour interval encompasses 59 dwelling units. Of these 59 dwelling units, 53 have been mitigated and six are considered noncompatible.
- The 2025 65-70 dB DNL contour interval encompasses 103 dwelling units. Of these 103 dwelling units, 90 have been mitigated and 13 are considered noncompatible.
- Review of past aerial photography on Google Earth shows all but two of the noncompatible dwellings existed on February 21, 1999, so it is likely they were constructed prior to the FAA's October 1, 1998 cutoff date for eligibility for inclusion in AIP-funding noise mitigation programs (i.e., only dwelling units built prior to that date are eligible). Therefore, it is likely that these dwelling units are noncompatible under Part 150 regulatory standards and guidelines, as applied at BNA.

Based on 2010 census data, 2.27 residents live in each dwelling unit in the census tracts encompassing the 103 units, on average. ***Therefore, an estimated 130 residents live within the 2020 NEM contour and an estimated 234 residents live within the 2025 NEM contour.***

South of the airport, under the approach to Runway 2L, there is a currently undeveloped residentially zoned area. That area includes portions of two parcels of land that are in the process

of being rezoned to a compatible "industrial, warehousing, and distribution" category. Since there is no residential use on either parcel, any future residential development of the land would not meet the previously discussed October 1, 1998 cutoff date for eligibility for inclusion in AIP-funding noise mitigation programs. In addition, the anticipated rezoning will permit only compatible land development. *Therefore, this area is (and will continue to be) compatible under Part 150 regulatory standards and guidelines.*[23]

4.3.3 Historic Properties

Neither the 2020 nor the 2025 NEM contours encompass any properties that are on or eligible for inclusion in the National Register of Historic Places.

4.4 Effects of Forecast Changes on Future Land Use Compatibility

The existing and forecast (2020 and 2025) noise modeling assumptions differ only in the level and mix of aircraft activity in the two years (as discussed in Section 5.4). There are no known reasons for assuming changes in any other modeling inputs; therefore, all other variables remained constant.

Figure 5, "Comparison of Existing (2020) and Forecast (2025) Noise Exposure Maps," shows that the forecast growth in aircraft activity slightly increases the *area* encompassed by the 65 dB DNL contour to the north and south of the airport in 2025; this change is the major factor contributing to the additional dwelling units encompassed by the 65 dB DNL contour off the approach ends of Runway 2C, Runway 20R and Runway 20L.

[23] As shown on the NEM figures, a portion of the undeveloped residential land area falls within the previously approved mitigation program to acquire residential land in extended approach areas (Remedial Action 1, "Acquisition of Residential Areas in the Extended Approach Areas," as discussed in Section 3.2.1 of this document). The MNAA purchased the land that fell within that program area that is within the airport property boundary shown on the figures. The MNAA did not purchase the program area outside of the airport property boundary; that program area is in part of the currently undeveloped property that is in the process of being rezoned to a compatible use category.

5 DEVELOPMENT OF NOISE CONTOURS

The DNL contours contained in these NEMs were prepared using the most recent release of the FAA's Aviation Environmental Design Tool (AEDT) available at the time the contours were prepared; i.e., "Version 2d." The AEDT requires inputs in the following categories:

- Physical airport layout parameters
- Meteorological data
- Terrain data
- Number and mix of aircraft flight operations
- Aircraft maintenance runup activity
- Aircraft noise and performance characteristics
- Runway utilization rates
- Prototypical flight track descriptions and accompanying utilization rates

Sections 5.1 through 5.8 present this information (in the order listed above) for the noise contours presented in the preceding figures.

5.1 Airport Physical Parameters

Figure 6 depicts the BNA airfield layout. As shown in the figure, it includes four 150-foot wide runways, three of which are parallel oriented in a north-northeast to south-southwest direction, and one "crosswind" runway that is roughly perpendicular to the parallel runways.

Each runway end is designated by a number that, with the addition of a trailing "0," reflects the magnetic heading of the runway to the nearest 10°, as seen by the pilot. Thus, "Runway 13-31" has the designation "13" at the west end of the pavement looking eastward, indicating that it is aligned on a magnetic heading of approximately 130°, while the opposite end of the same piece of pavement has the designation "31" indicating its orientation on an approximate heading of 310°. Runway 13-31 is 11,030 feet long. The three parallel runways, 2L-20R, 2C-20C and 2R-20L, are oriented on approximate magnetic headings of 20° and 200° and are 7,704 feet, 8,001 feet and 8,001 feet long, respectively. The parallel runways are distinguished from each other with letter endings "L", meaning left, "C", meaning center, and "R", meaning right, as seen by the pilot.

The parallel runways provide BNA with the greatest capacity to accommodate high numbers of aircraft operations. The crosswind runway is used for late night operations and occasionally at other times during strong crosswinds.

Runway length, runway width, instrumentation, and declared distances do not directly affect noise calculations. However, these parameters may affect which aircraft might use a particular runway and under what conditions, and therefore how often a runway would be used relative to the other runways at the airport.

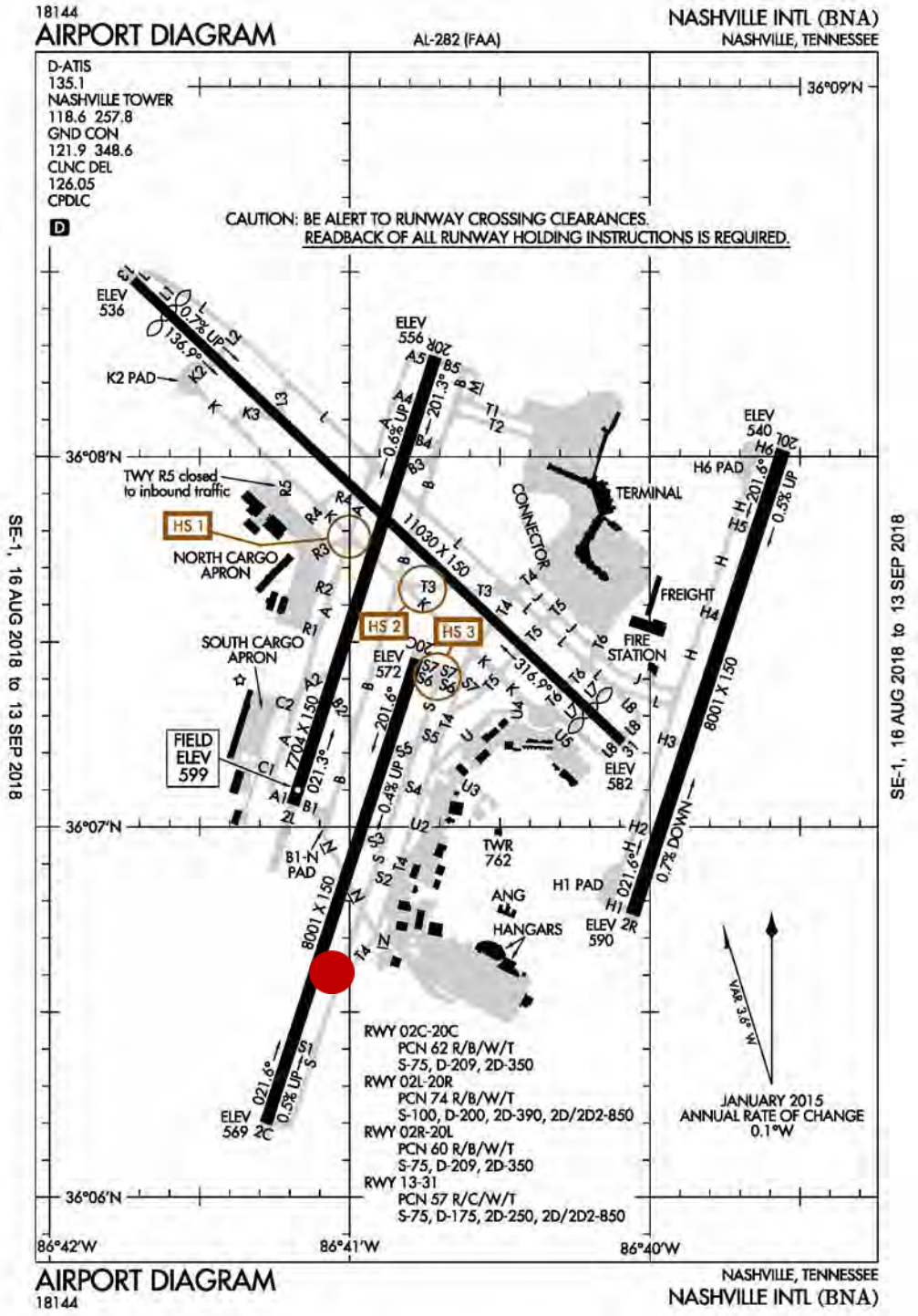

Figure 6 Existing BNA Airport Layout

Sources: FAA, MNAA

Note: Modeled Helipad location indicated by red dot

Table 4 provides the detailed parameters for each runway end. Note that each end of Runway 13/31 has a displaced landing threshold; the arrival thresholds are at the physical end of all other runways. All departures are assumed to start at the physical runway end on all runways.

Table 4 Runway Details
Source: FAA Form 5010, Current September 13, 2018

Runway	Latitude (dd-mm-ss)	Longitude (dd-mm-ss)	Latitude (degrees)	Longitude (degrees)	Elevation (feet, MSL)	Displaced Landing Threshold (feet)	Glide Slope (degrees)	Threshold Crossing Height (feet)	Magnetic Orientation (degrees)
2C	36-06-11.9 N	86-41-16.6 W	36.103331	-86.687961	569	None	3	60	18
2L	36-07-03.6 N	86-41-11.3 W	36.117679	-86.686474	598	None	3	55	18
2R	36-06-45.7 N	86-40-03.5 W	36.112713	-86.667642	590	None	3	59	18
13	36-08-28.6 N	86-41-43.2 W	36.141276	-86.695355	536	801	3	55	133
20C	36-07-27.2 N	86-40-46.5 W	36.124233	-86.679597	572	None	3	77	198
20L	36-08-16.2 N	86-40-42.8 W	36.133614	-86.659277	540	None	3	47	198
20R	36-08-01.0 N	86-39-33.4 W	36.137841	-86.678566	555	None	3	60	198
31	36-07-13.7 N	86-40-05.4 W	36.120496	-86.668178	582	741	3	52	313
PAD_1	36-06-37.3 N	86-41-1.2 W	36.110385	-86.683677	577	Note: This is a helipad used to model helicopter operations at the intersection of Taxiways S and T4			

5.2 Meteorological Data

The AEDT has several settings that affect aircraft performance profiles and sound propagation based on meteorological data. Meteorological settings include average annual temperature, barometric pressure, relative humidity at the airport, and average headwind speed. The AEDT contains standard reference climatological data for airports throughout the US.

The noise modeling utilized the following average data for BNA from the AEDT database:

- Temperature: 59.9° F
- Station Pressure: 995.81 mbar
- Sea Level Pressure: 1017.96 mbar
- Dew point: 48.73° F
- Relative humidity: 67.88%

The headwind speed was set to the AEDT default of 6.11 knots.

5.3 Terrain Data

Terrain data describes the elevation of the ground surrounding the airport, and on airport property. The AEDT uses terrain data to adjust the ground level under the flight paths. The terrain data does not affect the aircraft's performance or noise levels but does affect the vertical distance between the aircraft and a "receiver" on the ground. This in turn affects assumptions about how noise propagates over ground. The National Elevation Dataset (NED) 1/3 arc second terrain data were

obtained from the United States Geological Survey (USGS).[24] The NED data set has a resolution of 10 meters or 33 feet.

5.4 Airport Flight Operations

As discussed in Section 1.1, since the year of submission for this update is 2020, the existing conditions noise contours are for 2020 and the five-year forecast case contours are for 2025.

Appendix D presents a copy of the detailed documentation that the MNAA submitted to the FAA describing the forecast development process (including data sources, assumptions, etc.) and results. This documentation was in the form of a report from AECOM, the consulting team member responsible for the preparation of the forecasts, as discussed in Section 1.6.3. That documentation presents forecasts for calendar years 2019 and 2024 and the associated FAA approval letter.

Since this report is being submitted in January 2020, the MNAA evaluated how the FAA approved forecast for 2019 compared to the actual operations for 2019 in order to justify that 2020 and 2025 are still representative. The evaluation showed that the FAA approved 2019 forecast operations are approximately 3.4 percent higher than the actual 2019 operations[25] and therefore submitting these NEMs as 2020 and 2025 is representative of conditions evaluated in this report.

Table 5 presents the detailed forecast of 2020 average daily operations for BNA by aircraft type (including the detailed AEDT model type) for arrivals and departures, broken down into the day and night time periods used in the calculation of DNL (7:00 a.m. to 10:00 p.m. for daytime and 10:00 p.m. to 7:00 a.m. for nighttime, as discussed in Appendix A.6).

Table 6 presents the same information for 2025 average daily operations.

[24] Data downloaded from https://viewer.nationalmap.gov/basic/?howTo=true on 03/07/2018 in 1/3 Arc second GridFloat format.

[25] FAA OPSNET data pulled Jan 2020 – Dec 2019 was not available at this time, so the Nov 2019 operations were used to make a 12 month set.

Table 5 Modeled Average Daily Aircraft Operations for 2020
Source: HMMH

Track Group	Aircraft Type	AEDT Type	Departures		Arrivals	
			Day	Night	Day	Night
Passenger Carrier						
Jet	Airbus A319	A319-131	9.19	1.62	8.22	2.59
Jet	Airbus A320	A320-211	8.19	0.60	8.07	0.72
Jet	Airbus A321	A321-232	3.13	0.03	3.12	0.04
Jet	Boeing 737 MAX 8	7378MAX	1.42	0.18	1.46	0.14
Jet	Boeing 717	717200	3.44	0.07	3.46	0.04
Jet	Boeing 737-300	737300	3.25	0.34	3.15	0.44
Jet	Boeing 737-700	737700	67.16	9.71	66.35	10.53
Jet	Boeing 737-800	737800	27.45	7.34	28.55	6.24
Jet	Boeing 737-900	737800	1.27	0.09	1.17	0.19
Jet	Boeing 757-200	757PW	0.19	0.04	0.20	0.02
Jet	Boeing 757-300	757300	0.07	0.01	0.07	<0.01
Jet	Boeing 787-8	7878R	0.65	0.00	0.65	0.00
Jet	Canadair Regional Jet 100	CL600	0.71	0.33	0.86	0.19
Jet	Canadair Regional Jet 200	CL600	6.31	1.76	7.35	0.72
Jet	Canadair Regional Jet 700	CRJ9-ER	13.02	1.19	11.42	2.79
Jet	Canadair Regional Jet 900	CRJ9-ER	10.99	3.27	12.62	1.65
Non-Jet	DHC-8-400 Dash 8Q	DHC830	0.94	0.00	0.94	0.00
Jet	Embraer RJ135	EMB175	0.83	0.16	0.77	0.22
Jet	Embraer RJ145	EMB14L	6.36	0.42	6.57	0.20
Jet	Embraer 170	EMB170	2.97	0.06	3.01	0.02
Jet	Embraer 190	EMB190	1.72	0.17	1.79	0.10
Jet	Embraer 145XR	EMB145	0.66	0.02	0.66	0.02
Jet	Embraer 175 (long wing)	EMB175	13.58	1.52	13.36	1.73
Jet	Embraer 175 (short wing)	EMB175	6.94	0.23	6.73	0.45
Jet	McDonnell Douglas MD-83	MD83	2.36	0.02	2.37	0.01
Jet	McDonnell Douglas MD-88	MD83	6.83	1.18	6.94	1.07
Jet	McDonnell Douglas MD-90	MD9025	1.48	0.22	1.46	0.24
Subtotal			**201.13**	**30.57**	**201.33**	**30.37**
Cargo						
Jet	Airbus A300-600	A300-622R	0.07	0.24	0.09	0.23
Non-Jet	Beechcraft 1900	1900D	<0.01	0.01	0.01	0.01
Jet	Boeing 757-200	757PW	0.74	2.06	0.50	2.31
Jet	Boeing 767-200	767CF6	0.02	0.22	0.13	0.10
Jet	Boeing 767-300	767300	0.07	0.43	0.11	0.39
Non-Jet	Cessna 208 Caravan	CNA208	0.01	0.01	0.02	<0.01
Jet	McDonnell Douglas MD-11	MD11PW	0.04	0.01	0.03	0.01
Non-Jet	SWEARINGEN Merlin 4	DHC6	0.01	0.01	0.01	0.01

Track Group	Aircraft Type	AEDT Type	Departures		Arrivals	
			Day	Night	Day	Night
Subtotal			**0.97**	**3.00**	**0.90**	**3.06**
General Aviation						
Jet	Beech Jet	MU3001	3.70	0.53	3.86	0.37
Jet	Cessna 525 Citation Jet	CNA525C	4.53	0.65	4.73	0.45
Jet	Cessna 525B Citation Jet III	CNA525C	2.50	0.36	2.61	0.25
Jet	Cessna 550 Citation II	CNA55B	4.03	0.58	4.21	0.40
Jet	Citation Excel	CNA560U	3.93	0.56	4.10	0.39
Jet	Citation II	CNA500	0.38	0.05	0.39	0.04
Jet	CJ1	CNA500	0.18	0.02	0.18	0.02
Jet	CJ2	CNA500	1.84	0.26	1.92	0.18
Jet	CJ4	CNA500	2.53	0.36	2.64	0.25
Jet	Embraer 145XR	EMB145	0.25	0.04	0.27	0.02
Jet	Embraer 170	EMB170	0.20	0.03	0.21	0.02
Jet	Embraer Phenom 100	CNA510	1.69	0.24	1.77	0.17
Jet	Embraer Phenom 300	CNA55B	2.08	0.30	2.18	0.21
Jet	Falcon 50	CNA750	4.45	0.64	4.64	0.44
Jet	Falcon 7	CNA750	0.43	0.06	0.45	0.04
Jet	Falcon 9	CNA750	6.17	0.88	6.44	0.62
Jet	Global Express	BD-700-1A10	0.81	0.12	0.84	0.08
Jet	Gulfstream 400/450	GIV	4.30	0.62	4.49	0.43
Jet	Gulfstream 500	GV	2.21	0.32	2.30	0.22
Jet	Learjet 35	LEAR35	0.30	0.04	0.31	0.03
Jet	Mitsubishi MU-300	MU3001	0.03	<0.01	0.03	<0.01
Non-Jet	Beech 200 Super King Air	DHC6	7.11	0.74	7.40	0.45
Non-Jet	Beech 350 Super King Air	DHC6	5.48	0.57	5.71	0.35
Non-Jet	Beech 90 King Air	DHC6	3.79	0.40	3.95	0.24
Non-Jet	Cessna 208 Grand Caravan	CNA208	0.40	0.04	0.42	0.02
Non-Jet	Pilatus PC-12 Eagle	CNA208	3.55	0.37	3.70	0.22
Non-Jet	Beech 58 Baron	BEC58P	2.52	1.66	3.14	1.04
Non-Jet	Beech Bonanza	GASEPV	0.17	0.21	0.37	0.01
Non-Jet	Cessna 172 Skyhawk	CNA172	3.85	4.85	8.47	0.23
Non-Jet	Cirrus SR-22	COMSEP	1.28	1.61	2.81	0.08
Non-Jet	Piper Cherokee	PA28	0.68	0.86	1.50	0.04
Subtotal			**75.35**	**17.98**	**86.01**	**7.32**
Military						
Helo	Blackhawk Helicopter	S70	3.09	0.00	3.09	0.00
Jet	F18H - F/A 18 Hornet	F-18	0.41	0.00	0.41	<0.01
Jet	Boeing 737-700	737700	0.11	0.01	0.11	0.01
Jet	Boeing 747 All Series	747400	0.01	0.00	0.01	0.00
Jet	Boeing KC-135 Stratotanker	KC135R	0.03	0.00	0.03	0.00
Non-Jet	Lockheed 130 Hercules	C130	0.23	0.01	0.22	0.01

Track Group	Aircraft Type	AEDT Type	Departures		Arrivals	
			Day	Night	Day	Night
Jet	Bombardier Learjet 35/36	LEAR35	0.43	0.01	0.43	<0.01
Non-Jet	Raytheon Texan 2	GASEPV	0.28	0.00	0.28	0.00
Non-Jet	Beech 200 Super King	CNA441	0.26	0.00	0.25	<0.01
Subtotal			**4.84**	**0.02**	**4.84**	**0.03**
Grand Totals			**282.28**	**51.57**	**293.08**	**40.78**
			333.85		**333.86**	
Notes: Totals and sub-totals may not match exactly due to rounding. Operations are carried to out to 8 decimal places but are only presented to 2 decimals (1/100th). 1/100th of an average annual day operation is less than 4 flights per year.						

Table 6 Modeled Average Daily Aircraft Operations for 2025
Source: HMMH

Track Group	Aircraft Type	AEDT Type	Departures		Arrivals	
			Day	Night	Day	Night
Passenger Carrier						
Jet	Airbus A319	A319-131	9.96	1.75	8.91	2.81
Jet	Airbus A320	A320-211	8.88	0.65	8.75	0.79
Jet	Airbus A321	A321-232	5.30	0.29	5.28	0.32
Jet	Boeing 737 MAX 8	7378MAX	1.53	0.20	1.58	0.15
Jet	Boeing 717	717200	3.72	0.07	3.75	0.05
Jet	Boeing 737-700	737700	82.55	11.81	81.73	12.63
Jet	Boeing 737-800	737800	33.29	8.33	34.37	7.25
Jet	Boeing 737-900	737800	1.33	0.10	1.28	0.15
Jet	Boeing 757-200	757PW	0.19	0.04	0.20	0.02
Jet	Boeing 757-300	757300	0.07	0.01	0.07	<0.01
Jet	Boeing 787-8	7878R	0.71	0.00	0.71	0.00
Jet	Canadair Regional Jet 100	CL600	0.77	0.36	0.93	0.20
Jet	Canadair Regional Jet 200	CL600	6.84	1.92	7.98	0.78
Jet	Canadair Regional Jet 700	CRJ9-ER	14.12	1.29	12.38	3.03
Jet	Canadair Regional Jet 900	CRJ9-ER	11.92	3.55	13.68	1.79
Jet	DHC-8-400 Dash 8Q	DHC830	1.02	0.00	1.02	0.00
Jet	Embraer RJ135	EMB175	0.90	0.17	0.83	0.24
Jet	Embraer RJ145	EMB14L	6.90	0.45	7.13	0.22
Jet	Embraer 170	EMB170	3.22	0.06	3.26	0.03
Jet	Embraer 190	EMB190	1.87	0.18	1.94	0.11
Jet	Embraer 145XR	EMB145	0.72	0.02	0.71	0.02
Jet	Embraer 175 (long wing)	EMB175	14.72	1.65	14.48	1.88
Jet	Embraer 175 (short wing)	EMB175	7.53	0.25	7.30	0.48
Subtotal			**218.06**	**33.16**	**218.28**	**32.93**
Cargo						
Jet	Airbus A300-600	A300-622R	0.08	0.27	0.10	0.25
Jet	Beechcraft 1900	1900D	0.01	0.02	0.01	0.01
Jet	Boeing 757-200	757PW	0.82	2.27	0.55	2.54

Track Group	Aircraft Type	AEDT Type	Departures		Arrivals	
			Day	Night	Day	Night
Jet	Boeing 767-200	767CF6	0.05	0.24	0.16	0.13
Jet	Boeing 767-300	767300	0.09	0.47	0.12	0.44
Non-Jet	Cessna 208 Caravan	CNA208	0.01	0.02	0.03	<0.01
Jet	McDonnell Douglas MD-11	MD11PW	0.02	0.00	0.02	0.00
Non-Jet	SWEARINGEN Merlin 4	DHC6	0.01	0.02	0.01	0.01
Subtotal			**1.08**	**3.29**	**0.99**	**3.38**
General Aviation						
Jet	Beech Jet	MU3001	3.97	0.57	4.15	0.40
Jet	Cessna 525 Citation Jet	CNA525C	4.87	0.70	5.08	0.48
Jet	Cessna 525B Citation Jet III	CNA525C	2.69	0.39	2.81	0.27
Jet	Cessna 550 Citation II	CNA55B	4.33	0.62	4.52	0.43
Jet	Citation Excel	CNA560U	4.22	0.61	4.40	0.42
Jet	Cessna 500 Citation II	CNA500	0.41	0.06	0.42	0.04
Jet	CJ1	CNA500	0.19	0.03	0.20	0.02
Jet	CJ2	CNA500	1.98	0.28	2.07	0.20
Jet	CJ4	CNA500	2.72	0.39	2.84	0.27
Jet	Embraer 145XR	EMB145	0.27	0.04	0.29	0.03
Jet	Embraer 170	EMB170	0.22	0.03	0.23	0.02
Jet	Embraer Phenom 100	CNA510	1.82	0.26	1.90	0.18
Jet	Embraer Phenom 300	CNA55B	2.24	0.32	2.34	0.22
Jet	Falcon 50	CNA750	4.78	0.68	4.99	0.48
Jet	Falcon 7	CNA750	0.46	0.07	0.48	0.05
Jet	Falcon 9	CNA750	6.63	0.95	6.92	0.66
Jet	Global Express	BD-700-1A10	0.87	0.12	0.90	0.09
Jet	Gulfstream 400/450	GIV	4.62	0.66	4.82	0.46
Jet	Gulfstream 500	GV	2.37	0.34	2.47	0.24
Jet	Learjet 35	LEAR35	0.32	0.05	0.33	0.03
Jet	Mitsubishi MU-300	MU3001	0.03	0.01	0.03	<0.01
Non-Jet	Beech 200 Super King Air	DHC6	7.64	0.80	7.96	0.48
Non-Jet	Beech 350 Super King Air	DHC6	5.90	0.62	6.14	0.37
Non-Jet	Beech 90 King Air	DHC6	4.07	0.42	4.24	0.26
Non-Jet	Cessna 208 Grand Caravan	CNA208	0.43	0.04	0.45	0.03
Non-Jet	Pilatus PC-12 Eagle	CNA208	3.81	0.40	3.97	0.24
Non-Jet	Beech 58 Baron	BEC58P	2.70	1.78	3.37	1.12
Non-Jet	Beech Bonanza	GASEPV	0.02	0.23	0.40	0.01
Non-Jet	Cessna 172 Skyhawk	CNA172	4.14	5.21	9.10	0.25
Non-Jet	Cirrus SR-22	COMSEP	1.37	1.73	3.02	0.08
Non-Jet	Piper Cherokee	PA28	0.73	0.92	1.61	0.04
Subtotal			**80.97**	**19.33**	**92.42**	**7.87**
Military						
Helo	Blackhawk Helicopter	S70	3.09	0.00	3.09	0.00

Track Group	Aircraft Type	AEDT Type	Departures		Arrivals	
			Day	Night	Day	Night
Jet	F18H - F/A 18 Hornet	F-18	0.41	0.00	0.41	<0.01
Jet	Boeing 737-700	737700	0.11	0.01	0.11	0.01
Jet	Boeing 747 All Series	747400	0.01	0.00	0.01	0.00
Jet	Boeing KC-135 Stratotanker	KC135R	0.03	0.00	0.03	0.00
Non-Jet	Lockheed 130 Hercules	C130	0.23	0.01	0.22	0.01
Jet	Bombardier Learjet 35/36	LEAR35	0.43	0.01	0.43	<0.01
Non-Jet	Raytheon Texan 2	GASEPV	0.28	0.00	0.28	0.00
Non-Jet	Beech 200 Super King	CNA441	0.26	0.00	0.25	<0.01
Subtotal			**4.84**	**0.02**	**4.84**	**0.03**
Grand Totals			**304.95**	**55.79**	**316.54**	**44.21**
			360.75		**360.74**	

Notes: Totals and sub-totals may not match exactly due to rounding. Operations are carried to out to 8 decimal places but are only presented to 2 decimals (1/100th). 1/100th of an average annual day operation is less than 4 flights per year.

5.5 Aircraft Maintenance Runup Activity

The NEM contours include the effect of maintenance activity conducted at designated on-airfield runup locations, shown on Figure 6.

BNA reviewed the areas designated for engine maintenance run-up activity in 2011.[26] Noise levels were modeled for each current and proposed area for typical aircraft that use the run-up locations. Different aircraft orientations also were modeled at each site since the location of the maximum noise levels depends on the heading of the stationary aircraft while its engines are running. Based on the analysis of the four primary areas designated as aircraft run-up areas the MNAA established guidance for their use as shown in Table 7.

Table 7 Designated Runup Locations and Use Guidance
Source: MNAA, HMMH

Area	Southeast Heading			Southwest Heading			Northeast Heading			Northwest Heading		
	King Air	C-130	E-175	King Air	C-130	E-175	King Air	C-130	E-175	King Air	C-130	E-175
H1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
H6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
K2	Limit[2]	Limit[2]	Limit[2]	Yes	Limit[2]	Yes	No[1]	No[1]	No[1]	Limit[2]	Limit[2]	Yes
B1-N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes:
1. No runups at any time due to location of airfield fence.
2. No nighttime runups to prevent potential increased noise exposure in neighboring residential areas.

[26] HMMH, "Nashville International Airport - Analysis/Evaluation of Airport Run-up Locations," March 1, 2011. The King Air was evaluated in the noise study to represent a typical civil general aviation propeller-driven aircraft. The C-130 was selected to represent a four-engine military propeller transport aircraft, and the E-175 was selected to represent a civil jet transport.

MNAA recently surveyed aircraft operators and determined that primarily only K2 and the B1-N pad are being used. Therefore, all maintenance runup activity was modeled at those two locations.

Table 8 presents details regarding the maintenance runups modeled in the 2020 contours. Table 9 presents the same information for the 2025 contours.

Table 8 Modeled Average Daily Runup Operations for 2020
Source: HMMH

Aircraft	Runup Location	Heading (Deg. Mag.)	Percent Power	Duration (Seconds)	Runups Per Day	
					7 am – 10 pm	10 pm – 7 am
DHC6	K2	310	80	600	0.016	0.000
DHC6	B1-N	200	80	600	0.016	0.000
GASEPV	K2	310	80	600	0.016	0.000
GASEPV	B1-N	200	80	600	0.016	0.000
MU3001	K2	310	100	180	0.032	0.000
MU3001	K2	310	75	600	0.032	0.000
BEC58P	K2	310	80	600	0.016	0.000
BEC58P	B1-N	200	80	600	0.016	0.000
CNA500	K2	310	100	180	0.032	0.000
CNA500	K2	310	75	600	0.032	0.000
CNA525C	K2	310	100	180	0.032	0.000
CNA525C	K2	310	75	600	0.032	0.000
CNA500	K2	310	100	180	0.032	0.000
CNA500	K2	310	75	600	0.032	0.000
CNA500	K2	310	100	180	0.032	0.000
CNA500	K2	310	75	600	0.032	0.000
CNA500	K2	310	100	180	0.032	0.000
CNA500	K2	310	75	600	0.032	0.000
CNA55B	K2	310	100	180	0.032	0.000
CNA55B	K2	310	75	600	0.032	0.000
CNA560U	K2	310	100	180	0.032	0.000
CNA560U	K2	310	75	600	0.032	0.000
GASEPV	K2	310	80	600	0.016	0.000
GASEPV	B1-N	200	80	600	0.016	0.000
LEAR35	K2	310	100	180	0.032	0.000
LEAR35	K2	310	75	600	0.032	0.000
CNA750	K2	310	100	120	0.005	0.000
CNA750	K2	310	100	120	0.005	0.000
CNA750	K2	310	100	120	0.005	0.000
GIV	B1-N	200	50	180	0.066	0.000
A319-131	K2	310	100	180	0.000	0.006
A319-131	B1-N	200	100	180	0.000	0.032
A320-211	K2	310	100	180	0.000	0.006
A320-211	B1-N	200	100	180	0.000	0.005
717200	K2	310	100	180	0.000	0.004
717200	B1-N	200	100	180	0.000	0.005
737700	K2	310	100	180	0.000	0.004
737700	B1-N	200	100	180	0.000	0.006
757PW	K2	310	100	180	0.000	0.012

Aircraft	Runup Location	Heading (Deg. Mag.)	Percent Power	Duration (Seconds)	Runups Per Day	
					7 am – 10 pm	10 pm – 7 am
757PW	B1-N	200	100	180	0.000	0.006
MD83	K2	310	100	180	0.000	0.032
MD83	B1-N	200	100	180	0.000	0.004
MD9025	K2	310	100	180	0.000	0.006
MD9025	B1-N	200	100	180	0.000	0.004
EMB14L	K2	310	85	180	0.000	0.099
EMB170	K2	310	85	180	0.000	0.395
CRJ9-ER	B1-N	200	90	300	0.000	0.374
CRJ9-ER	K2	310	90	300	0.000	0.374
CRJ9-ER	B1-N	200	90	300	0.000	0.125
CRJ9-ER	K2	310	90	300	0.000	0.125
EMB175	B1-N	200	90	300	0.000	0.872
EMB175	K2	310	90	300	0.000	0.872

Table 9 Modeled Average Daily Runup Operations for 2025
Source: HMMH

Aircraft	Runup Location	Heading (Deg. Mag.)	Percent Power	Duration (Seconds)	Runups Per Day	
					7 am – 10 pm	10 pm – 7 am
DHC6	K2	310	80	600	0.020	0.000
DHC6	B1-N	200	80	600	0.020	0.000
GASEPV	K2	310	80	600	0.020	0.000
GASEPV	B1-N	200	80	600	0.020	0.000
MU3001	K2	310	100	180	0.040	0.000
MU3001	K2	310	75	600	0.040	0.000
BEC58P	K2	310	80	600	0.020	0.000
BEC58P	B1-N	200	80	600	0.020	0.000
CNA500	K2	310	100	180	0.040	0.000
CNA500	K2	310	75	600	0.040	0.000
CNA55B	K2	310	100	180	0.040	0.000
CNA55B	K2	310	75	600	0.040	0.000
CNA560U	K2	310	100	180	0.040	0.000
CNA560U	K2	310	75	600	0.040	0.000
CNA500	K2	310	100	180	0.040	0.000
CNA500	K2	310	75	600	0.040	0.000
CNA500	K2	310	100	180	0.040	0.000
CNA500	K2	310	75	600	0.040	0.000
CNA525C	K2	310	100	180	0.040	0.000
CNA525C	K2	310	75	600	0.040	0.000
CNA500	K2	310	100	180	0.040	0.000
CNA500	K2	310	75	600	0.040	0.000
GASEPV	K2	310	80	600	0.020	0.000
GASEPV	B1-N	200	80	600	0.020	0.000
LEAR35	K2	310	100	180	0.040	0.000
LEAR35	K2	310	75	600	0.040	0.000
CNA750	K2	310	100	120	0.008	0.000
CNA750	K2	310	100	120	0.008	0.000
GIV	B1-N	200	50	180	0.066	0.000
A319-131	K2	310	100	180	0.000	0.006

Aircraft	Runup Location	Heading (Deg. Mag.)	Percent Power	Duration (Seconds)	Runups Per Day	
					7 am – 10 pm	10 pm – 7 am
A319-131	B1-N	200	100	180	0.000	0.020
A320-211	K2	310	100	180	0.000	0.006
A320-211	B1-N	200	100	180	0.000	0.040
717200	K2	310	100	180	0.000	0.004
717200	B1-N	200	100	180	0.000	0.008
737700	K2	310	100	180	0.000	0.004
737700	B1-N	200	100	180	0.000	0.006
757PW	K2	310	100	180	0.000	0.012
757PW	B1-N	200	100	180	0.000	0.006
737700	K2	310	100	180	0.000	0.032
737700	B1-N	200	100	180	0.000	0.004
A321-232	K2	310	100	180	0.000	0.006
A321-232	B1-N	200	100	180	0.000	0.004
EMB14L	K2	310	85	180	0.000	0.099
EMB170	K2	310	85	180	0.000	0.395
CRJ9-ER	B1-N	200	90	300	0.000	0.374
CRJ9-ER	K2	310	90	300	0.000	0.374
CRJ9-ER	B1-N	200	90	300	0.000	0.125
CRJ9-ER	K2	310	90	300	0.000	0.125
EMB175	B1-N	200	90	300	0.000	0.872
EMB175	K2	310	90	300	0.000	0.872

5.6 Aircraft Noise and Performance Characteristics

Specific noise and performance data must be entered into the AEDT for each aircraft type operating at the airport. Noise data are included in the form of sound exposure level (SEL, as discussed in Appendix A.4) at a range of distances (from 200 feet to 25,000 feet) from a particular aircraft with engines at a specific thrust level. Performance data include thrust, speed, and altitude profiles for takeoff and landing operations. The AEDT database contains standard noise and performance data for over one hundred different fixed-wing aircraft types, most of which are civilian aircraft. The AEDT automatically accesses the noise and performance data for takeoff and landing operations by those aircraft.

The noise contours presented in this document followed the FAA guidance.

5.7 Runway Utilization Rates

Weather, particularly wind direction and wind speed, is the primary factor affecting runway use at airports. Additional factors that may affect runway use include the position of a facility (such as a passenger terminal) relative to the runways and temporary runway closures, generally for airfield maintenance and construction.

2020 and 2025 runway usage tables, by aircraft category and time of day, were developed from actual operations data for calendar years 2017 and 2018, obtained using the MNAA's FTMS, as discussed in Section 3.3.3. There was no reason to anticipate any significant difference in runway use from those years to 2020 or 2025.

Table 10 provides runway use percentages for departures and arrivals for the day and nighttime periods used in the calculation of DNL. The runway use rates are presented for major aircraft groups with common runway use characteristics.

Table 10 Modeled Average Daily Runway Use for 2020 and 2025
Source: HMMH

Runway	Wide-Body Jet			
	Departure		Arrival	
	Daytime	Nighttime	Daytime	Nighttime
02L	17.0%	39.2%	20.0%	15.4%
02C	2.8%	--	10.0%	7.7%
02R	6.6%	--	7.9%	3.8%
13	2.8%	3.6%	0.7%	--
20L	--	--	21.4%	19.2%
20C	23.6%	17.9%	1.4%	3.8%
20R	27.4%	17.9%	31.5%	23.1%
31	19.8%	21.4%	7.1%	27.0%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Runway	**Narrow-Body Jet**			
	Departure		**Arrival**	
	Daytime	**Nighttime**	**Daytime**	**Nighttime**
02L	19.4%	14.5%	9.0%	12.4%
02C	3.8%	1.7%	19.4%	17.3%
02R	15.0%	10.5%	20.1%	14.8%
13	0.1%	0.1%	0.1%	0.6%
20L	1.1%	6.6%	29.5%	26.3%
20C	40.8%	32.7%	3.2%	2.1%
20R	9.2%	8.3%	17.6%	20.1%
31	10.6%	25.6%	1.1%	6.4%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Runway	**Cargo**			
	Departure		**Arrival**	
	Daytime	**Nighttime**	**Daytime**	**Nighttime**
02L	33.6%	36.7%	30.1%	25.3%
02C	3.7%	0.6%	11.4%	5.7%
02R	4.5%	0.2%	8.1%	0.4%
13	--	0.1%	--	--
20L	0.7%	0.2%	10.2%	5.0%
20C	30.6%	15.6%	2.5%	2.4%
20R	20.9%	34.1%	36.0%	42.0%
31	6.0%	12.5%	1.7%	19.2%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Runway	General Aviation - Jet			
	Departure		Arrival	
	Daytime	Nighttime	Daytime	Nighttime
02L	7.7%	4.4%	4.1%	3.6%
02C	21.9%	12.5%	32.3%	31.4%
02R	7.6%	5.0%	11.7%	6.6%
13	0.1%	--	--	--
20L	1.1%	1.9%	21.7%	19.7%
20C	50.0%	43.7%	20.1%	19.0%
20R	2.6%	1.3%	9.1%	10.2%
31	9.0%	31.2%	1.0%	9.5%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Runway	**Piston**			
	Departure		**Arrival**	
	Daytime	**Nighttime**	**Daytime**	**Nighttime**
02L	5.9%	-	2.0%	3.8%
02C	20.6%	6.1%	34.1%	61.9%
02R	8.0%	2.9%	12.2%	-
13	-	-	-	-
20L	0.9%	-	19.6%	6.1%
20C	51.9%	77.4%	24.1%	17.2%
20R	3.7%	2.5%	5.2%	1.1%
31	9.0%	11.1%	2.8%	9.9%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Runway	**Turboprop**			
	Departure		**Arrival**	
	Daytime	**Nighttime**	**Daytime**	**Nighttime**
02L	14.3%	-	16.0%	17.5%
02C	15.1%	19.8%	25.3%	32.9%
02R	5.0%	3.6%	6.4%	-
13	-	-	0.1%	-
20L	0.6%	-	15.9%	9.5%
20C	38.6%	58.9%	14.2%	20.4%
20R	16.8%	3.0%	21.8%	13.9%
31	9.6%	14.7%	0.3%	5.8%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Note: Individual entries may not add exactly to 100% due to rounding.

5.8 Flight Track Geometry and Utilization

In addition to runway usage, radar data from the MNAA's FTMS provided an ideal source of information for identifying where aircraft fly and how often they use different flight corridors in the vicinity of the airport. From the radar data, prototypical flight tracks were developed for noise modeling. Known as "backbones," these tracks follow the central tendency of more dispersed paths flown by aircraft along each major flight corridor. Additional tracks are created to either side of the backbones to account for the dispersion within each corridor, and traffic is distributed normally onto each track to reflect the spreading of noise along the corridor.

Aircraft are assigned to specific modeling tracks based on historical averages determined through analysis of the radar data. Knowledge of destinations for departures from the airport or points of origin for arrivals to the airport are also considered. The standard procedure for model track development entails separating tracks by operation type, (e.g., arrival or departure) and runway end. Next, the destination direction (e.g. northeast, south, west, etc.) defines flight track groups. HMMH analyzed flight tracks with the same operation type, runway end, and destination direction for similar geometry and this resulted in the final flight track bundles used to create model tracks, as shown in Figure 7 and Figure 8. Figure 7 displays jet radar tracks from Runway 20C to the northwest and northeast destinations in different colors and Figure 8 displays just the northeast set of Runway 20C jet departures with the AEDT model backbone and subtracks. Model flight tracks are labeled with a number following the designations distinguish tracks that take different routes from the same runway end. For example, flight track DJD20C_14 identifies the time of day (D for day, as opposed to N for night), the primary aircraft type, (J for jet, as opposed to N for non-jet), a departure flight track (D, as opposed to A if it were an arrival) from Runway 20C (20C). The number at the end of the track name differentiates it from others in its group.

All fixed-wing aircraft flight tracks start or end at runway ends (or at displaced landing thresholds for arrivals to both ends of Runway 13-31). Helicopter tracks generally start and end at a defined helipad and thus are modeled as flights to and from the midfield area (the "helipad" identified in Table 4 and marked on Figure 6).

5.8.1 2020 and 2025 Flight Tracks and Use

Figure 9 and Figure 10 present existing conditions flight track geometry, for north- and south-flow operations, respectively. These tracks were developed using calendar year 2017 and 2018 data from the MNAA's FTMS, as discussed in Section 3.3.3. The set of flight tracks reflects existing operations following RNAV departures and some Required Navigational Performance (RNP) arrival procedures, which are a subset of the more advanced Performance Based Navigation (PBN) procedures that the FAA is in the process of implementing across the U.S.

5.8.2 2020 and 2025 Flight Track Utilization Rates

Table 11 presents the 2020 and 2025 flight track use rates by runway end and aircraft type category, for arrivals and departures. The 2020 and 2025 use rates were also developed using the same sample of radar data that formed the basis of the runway use and flight track geometry.

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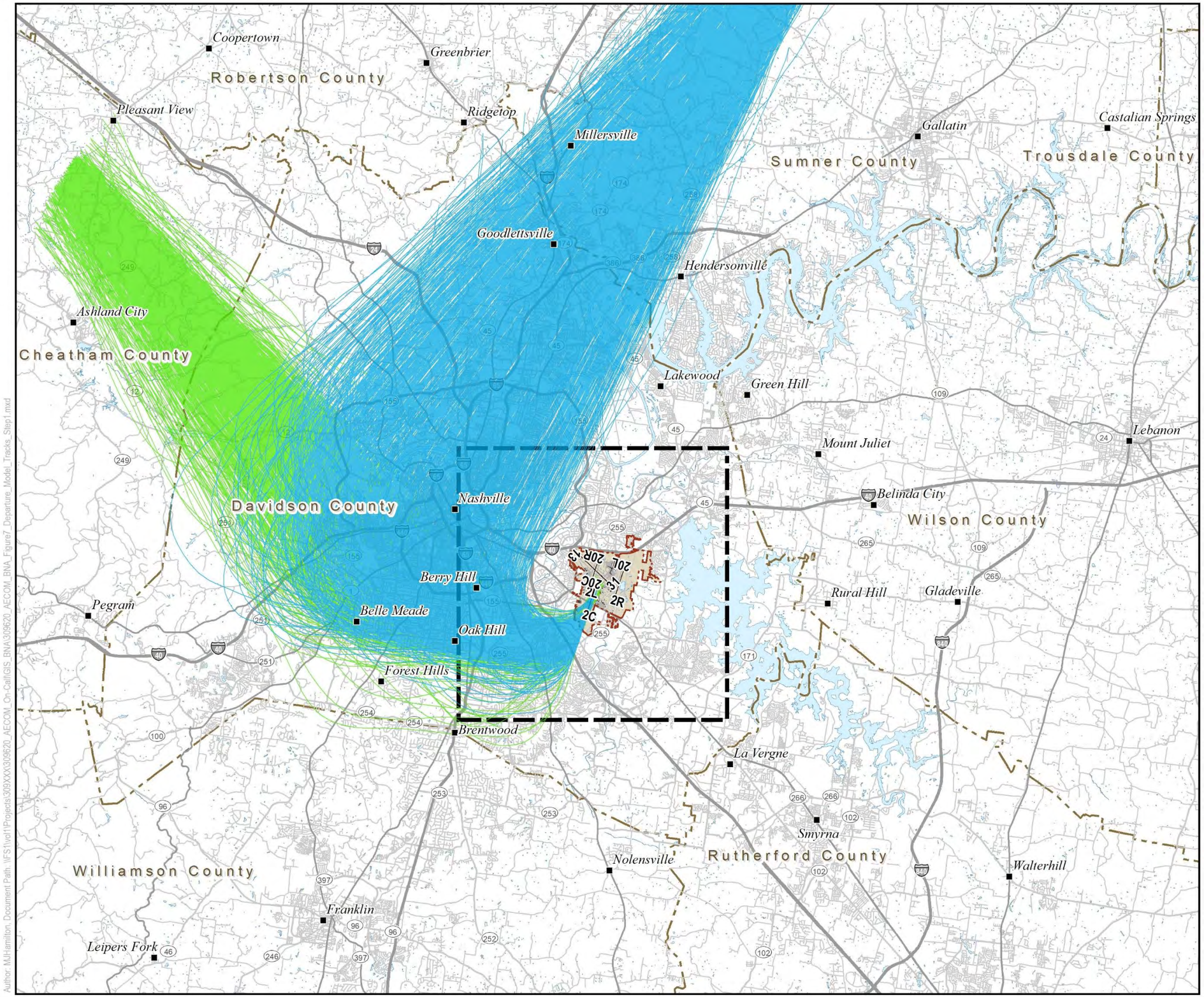

BNA Nashville International Airport

Airport Noise Compatibility - Part 150 Study
2020 and 2025 Noise Exposure Maps

Figure: 7

Jet Departure Radar Tracks from Runway 20C with Northwest or Northeast Destinations

Radar Tracks Northeast (Departure)
Radar Tracks Northwest (Departure)

BNA Airport Boundary (Approximate)
Runway
BNA Study Area
State Boundary
County Boundary
Water / Stream
Highway
Minor Roads
Major Roads

0 3 6 NMi

N

hmmh

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BNA Nashville International Airport

Airport Noise Compatibility - Part 150 Study
2020 and 2025 Noise Exposure Maps

Figure: 8

Jet Departure Radar Tracks and AEDT Model Track Set from Runway 20C with Northeast Destinations

- Model Backbone Track (Departure)
- Model Track Backbone (Departure)
- Radar Tracks Northeast (Departure)
- BNA Airport Boundary (Approximate)
- Runway
- BNA Study Area
- State Boundary
- County Boundary
- Water / Stream
- Highway
- Minor Roads
- Major Roads

0 3 6 NMi

N

hmmh

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BNA Nashville International Airport

Airport Noise Compatibility - Part 150 Study
2020 and 2025 Noise Exposure Maps

Figure: 9

North Flow Arrival and Departure Flight Tracks

- Model Backbone Track (Arrival)
- Model Backbone Track (Departure)
- Model Track (Arrival)
- Model Track (Departure)
- BNA Airport Boundary (Approximate)
- Runway
- State Boundary
- Municipal Boundary
- Highway
- Minor Roads
- Major Roads
- Railroad
- Recreational / Open Space / Golf
- Water / Stream

0 10,000 20,000 Feet

N

hmmh

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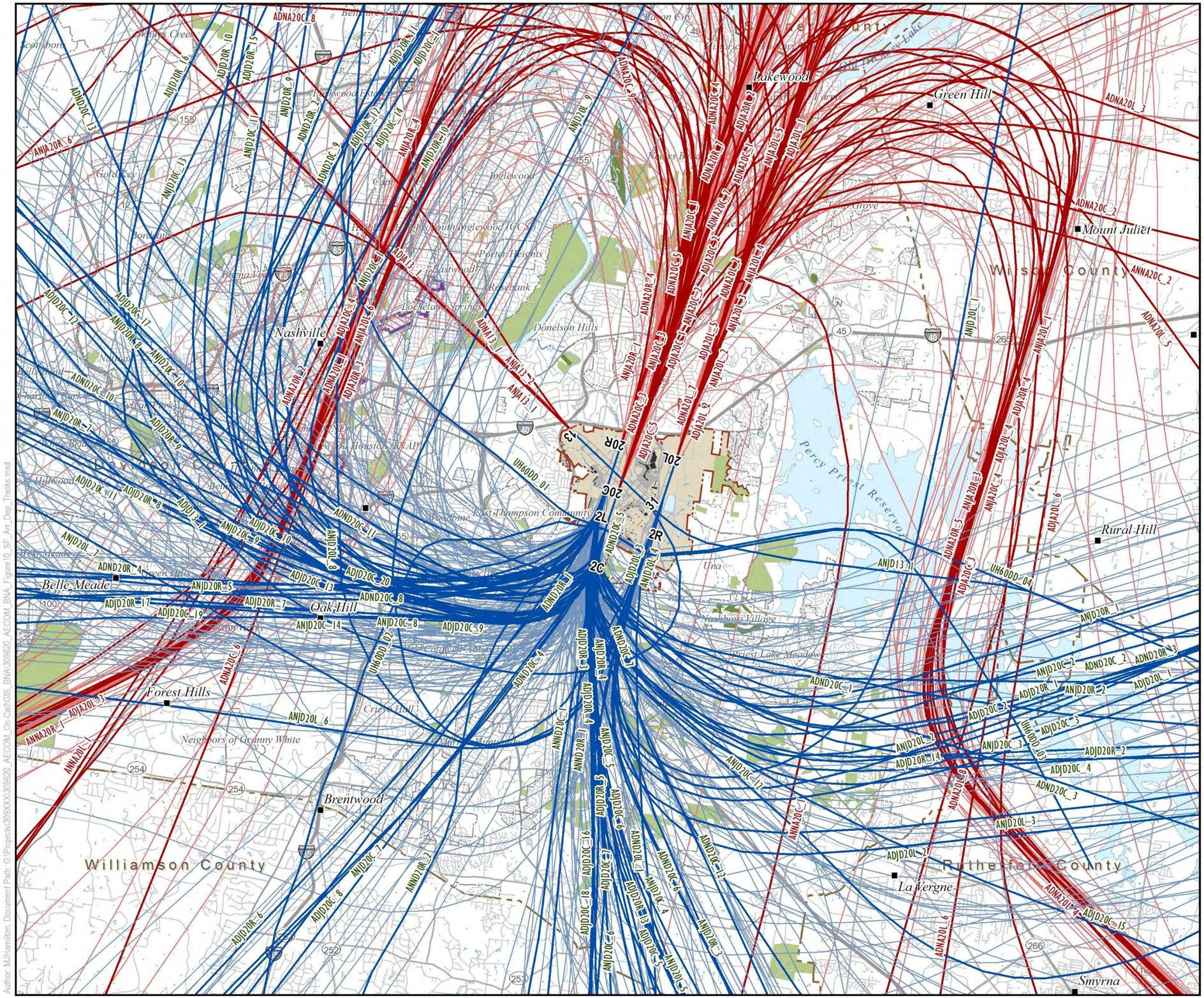

BNA Nashville International Airport

Airport Noise Compatibility - Part 150 Study
2020 and 2025 Noise Exposure Maps

Figure: 10

South Flow Arrival and Departure Flight Tracks

- Model Backbone Track (Arrival)
- Model Backbone Track (Departure)
- Model Track (Arrival)
- Model Track (Departure)
- BNA Airport Boundary (Approximate)
- Runway
- State Boundary
- Municipal Boundary
- Highway
- Minor Roads
- Major Roads
- Railroad
- Recreational / Open Space / Golf
- Water / Stream

0 10,000 20,000 Feet

N

hmmh

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Table 11 Modeled Track Utilization for 2020 and 2025
Source: HMMH

Jet						
Runway	Departures			Arrivals		
	Track ID	Percent Use		Track ID	Percent Use	
		Day	Night		Day	Night
2C	DJD02C_1 (1)	3.42%	-	DJA02C_1 (7)	39.18%	-
	DJD02C_2 (1)	5.75%	-	DJA02C_2 (7)	15.60%	-
	DJD02C_3 (3)	11.51%	-	DJA02C_3 (7)	32.71%	-
	DJD02C_4 (3)	8.89%	-	DJA02C_4 (7)	11.04%	-
	DJD02C_5 (1)	3.06%	-	DJA02C_5 (3)	1.28%	-
	DJD02C_6 (3)	6.63%	-	DJA02C_6 (1)	0.19%	-
	DJD02C_7 (1)	2.11%	-	NJA02C_1 (5)	-	36.64%
	DJD02C_8 (3)	6.92%	-	NJA02C_2 (5)	-	26.48%
	DJD02C_9 (3)	12.89%	-	NJA02C_3 (5)	-	9.93%
	DJD02C_10 (3)	17.48%	-	NJA02C_4 (5)	-	17.73%
	DJD02C_12 (1)	3.57%	-	NJA02C_5 (5)	-	9.22%
	DJD02C_13 (1)	1.46%	-	NJA02C_1 (5)	-	36.64%
	DJD02C_14 (1)	3.57%	-			
	DJD02C_15 (1)	3.35%	-			
	DJD02C_16 (1)	2.04%	-			
	DJD02C_17 (1)	5.68%	-			
	DJD02C_18 (1)	1.68%	-			
	NJD02C_1 (5)	-	29.23%			
	NJD02C_2 (5)	-	16.92%			
	NJD02C_3 (5)	-	13.08%			
	NJD02C_4 (3)	-	16.15%			
	NJD02C_5 (3)	-	14.62%			
	NJD02C_6 (3)	-	10.00%			
	Total	**100.0%**	**100.0%**	**Total**	**100.0%**	**100.0%**
2L	DJD02L_1 (3)	7.70%	-	DJA02L_1 (7)	28.10%	-
	DJD02L_2 (7)	24.77%	-	DJA02L_2 (5)	18.64%	-
	DJD02L_3 (3)	2.68%	-	DJA02L_3 (7)	27.86%	-
	DJD02L_4 (3)	3.80%	-	DJA02L_4 (1)	0.56%	-
	DJD02L_5 (3)	4.07%	-	DJA02L_5 (7)	23.19%	-
	DJD02L_6 (7)	19.73%	-	DJA02L_6 (1)	1.22%	-
	DJD02L_7 (7)	23.80%	-	DJA02L_7 (1)	0.43%	-
	DJD02L_8 (3)	7.92%	-	NJA02L_1 (7)	-	21.47%
	DJD02L_9 (1)	0.65%	-	NJA02L_2 (7)	-	15.57%
	DJD02L_10 (1)	0.35%	-	NJA02L_3 (5)	-	33.08%
	DJD02L_11 (1)	0.50%	-	NJA02L_4 (5)	-	1.67%
	DJD02L_12 (1)	1.32%	-	NJA02L_5 (5)	-	1.81%
	DJD02L_13 (1)	0.57%	-	NJA02L_6 (7)	-	26.41%
	DJD02L_15 (1)	0.82%	-			
	DJD02L_16 (1)	0.44%	-			
	DJD02L_17 (1)	0.49%	-			
	DJD02L_18 (1)	0.39%	-			
	NJD02L_1 (5)	-	10.06%			
	NJD02L_2 (3)	-	35.25%			
	NJD02L_3 (5)	-	4.00%			
	NJD02L_4 (5)	-	5.88%			
	NJD02L_5 (5)	-	20.69%			
	NJD02L_6 (5)	-	15.56%			
	NJD02L_7 (5)	-	5.63%			
	NJD02L_8 (5)	-	2.94%			
	Total	**100.0%**	**100.0%**	**Total**	**100.0%**	**100.0%**
2R	ADJD02R_1 (1)	0.37%	-	ADJA02R_1 (3)	2.77%	-
	ADJD02R_2 (3)	2.38%	-	ADJA02R_2 (7)	45.08%	-
	ADJD02R_3 (7)	35.31%	-	ADJA02R_3 (3)	1.40%	-
	ADJD02R_4 (3)	2.26%	-	ADJA02R_4 (7)	49.64%	-
	ADJD02R_5 (7)	17.96%	-	ADJA02R_5 (1)	1.12%	-
	ADJD02R_6 (7)	31.51%	-	ANJA02R_1 (5)	-	10.60%
	ADJD02R_7 (3)	4.54%	-	ANJA02R_2 (5)	-	34.25%

Jet						
Runway	Departures			Arrivals		
	Track ID	Percent Use		Track ID	Percent Use	
		Day	Night		Day	Night
	ADJD02R_8 (3)	1.94%	-	ANJA02R_3 (5)	-	42.96%
	ADJD02R_9 (1)	1.10%	-	ANJA02R_4 (5)	-	12.19%
	ADJD02R_10 (1)	0.99%	-			
	ADJD02R_11 (1)	0.92%	-			
	ADJD02R_12 (1)	0.38%	-			
	ADJD02R_13 (1)	0.34%	-			
	ANJD02R_1 (3)	-	3.16%			
	ANJD02R_2 (5)	-	7.23%			
	ANJD02R_3 (7)	-	38.08%			
	ANJD02R_4 (5)	-	3.62%			
	ANJD02R_5 (5)	-	13.33%			
	ANJD02R_6 (5)	-	32.77%			
	ANJD02R_7 (5)	-	1.81%			
	Total	**100.0%**	**100.0%**	**Total**	**100.0%**	**100.0%**
13	ADJD31_1 (1)	6.69%	-	ADJA31_1 (1)	21.65%	-
	ADJD31_2 (1)	10.55%	-	ADJA31_2 (1)	10.31%	-
	ADJD31_3 (1)	5.48%	-	ADJA31_3 (1)	20.62%	-
	ADJD31_5 (1)	4.87%	-	ADJA31_5 (1)	47.42%	-
	ADJD31_6 (1)	19.68%	-	ANJA31_1 (5)	-	5.95%
	ADJD31_7 (3)	23.12%	-	ANJA31_2 (5)	-	38.70%
	ADJD31_8 (1)	14.00%	-	ANJA31_3 (5)	-	45.71%
	ADJD31_9 (1)	3.65%	-	ANJA31_5 (5)	-	9.63%
	ADJD31_10 (1)	11.97%	-			
	ANJD31_1 (5)	-	8.82%			
	ANJD31_2 (3)	-	1.33%			
	ANJD31_3 (3)	-	16.35%			
	ANJD31_4 (3)	-	1.73%			
	ANJD31_5 (3)	-	17.48%			
	ANJD31_6 (3)	-	17.36%			
	ANJD31_7 (5)	-	5.03%			
	ANJD31_8 (3)	-	14.78%			
	ANJD31_9 (5)	-	1.09%			
	ANJD31_10 (5)	-	1.09%			
	ANJD31_11 (5)	-	5.03%			
	ANJD31_12 (5)	-	7.45%			
	ANJD31_13 (5)	-	2.46%			
	Total	**100.0%**	**100.0%**	**Total**	**100.0%**	**100.0%**
20C	ADJD20C_1 (7)	14.34%	-	ADJA20C_1 (3)	19.06%	-
	ADJD20C_2 (7)	11.88%	-	ADJA20C_2 (5)	24.86%	-
	ADJD20C_3 (3)	2.87%	-	ADJA20C_3 (5)	26.92%	-
	ADJD20C_4 (7)	7.45%	-	ADJA20C_4 (5)	27.42%	-
	ADJD20C_5 (7)	9.87%	-	ADJA20C_5 (1)	1.73%	-
	ADJD20C_6 (3)	2.28%	-	ANJA20C_1 (5)	-	25.13%
	ADJD20C_7 (3)	3.26%	-	ANJA20C_2 (5)	-	31.94%
	ADJD20C_8 (5)	3.97%	-	ANJA20C_3 (5)	-	14.66%
	ADJD20C_9 (7)	10.70%	-	ANJA20C_4 (5)	-	28.27%
	ADJD20C_10 (3)	0.98%	-			
	ADJD20C_11 (7)	13.16%	-			
	ADJD20C_12 (7)	7.51%	-			
	ADJD20C_13 (1)	0.57%	-			
	ADJD20C_14 (7)	9.16%	-			
	ADJD20C_15 (1)	0.55%	-			
	ADJD20C_16 (1)	0.38%	-			
	ADJD20C_17 (1)	0.41%	-			
	ADJD20C_18 (1)	0.25%	-			
	ADJD20C_19 (1)	0.16%	-			
	ADJD20C_20 (1)	0.23%	-			
	ANJD20C_1 (3)	-	15.26%			
	ANJD20C_2 (7)	-	21.26%			

Jet						
Runway	Departures			Arrivals		
	Track ID	Percent Use		Track ID	Percent Use	
		Day	Night		Day	Night
	ANJD20C_3 (3)	-	8.82%			
	ANJD20C_4 (5)	-	13.69%			
	ANJD20C_5 (5)	-	2.50%			
	ANJD20C_6 (3)	-	1.12%			
	ANJD20C_7 (5)	-	1.80%			
	ANJD20C_8 (5)	-	10.13%			
	ANJD20C_9 (5)	-	12.47%			
	ANJD20C_10 (7)	-	3.11%			
	ANJD20C_11 (7)	-	6.60%			
	ANJD20C_12 (3)	-	0.48%			
	ANJD20C_13 (3)	-	1.60%			
	ANJD20C_14 (5)	-	1.15%			
	Total	**100.0%**	**100.0%**	**Total**	**100.0%**	**100.0%**
20L	ADJD20L_1 (3)	52.38%	-	ADJA20L_1 (7)	8.69%	-
	ADJD20L_2 (1)	21.09%	-	ADJA20L_2 (7)	39.88%	-
	ADJD20L_3 (1)	26.53%	-	ADJA20L_3 (7)	7.08%	-
	ANJD20L_1 (3)	-	5.74%	ADJA20L_4 (7)	41.64%	-
	ANJD20L_2 (5)	-	17.05%	ADJA20L_5 (3)	2.48%	-
	ANJD20L_3 (5)	-	11.48%	ADJA20L_6 (1)	0.22%	-
	ANJD20L_4 (3)	-	9.84%	ANJA20L_1 (5)	-	29.73%
	ANJD20L_5 (5)	-	14.75%	ANJA20L_2 (5)	-	12.73%
	ANJD20L_6 (5)	-	13.44%	ANJA20L_3 (5)	-	16.06%
	ANJD20L_7 (3)	-	17.05%	ANJA20L_4 (5)	-	19.93%
	ANJD20L_8 (5)	-	3.61%	ANJA20L_5 (5)	-	10.86%
	ANJD20L_9 (3)	-	7.05%	ANJA20L_6 (5)	-	10.69%
	Total	**100.0%**	**100.0%**	**Total**	**100.0%**	**100.0%**
20R	ADJD20R_1 (3)	13.37%	-	ADJA20R_1 (7)	36.98%	-
	ADJD20R_2 (1)	1.91%	-	ADJA20R_2 (5)	9.69%	-
	ADJD20R_3 (5)	15.88%	-	ADJA20R_3 (7)	47.08%	-
	ADJD20R_4 (3)	3.55%	-	ADJA20R_4 (5)	5.91%	-
	ADJD20R_5 (1)	2.31%	-	ADJA20R_5 (1)	0.35%	-
	ADJD20R_6 (1)	1.33%	-	ANJA20R_1 (7)	-	22.70%
	ADJD20R_7 (3)	10.11%	-	ANJA20R_2 (5)	-	31.49%
	ADJD20R_8 (3)	13.66%	-	ANJA20R_3 (5)	-	11.35%
	ADJD20R_9 (3)	11.64%	-	ANJA20R_4 (5)	-	27.69%
	ADJD20R_10 (3)	6.58%	-	ANJA20R_5 (5)	-	4.86%
	ADJD20R_11 (5)	13.77%	-	ANJA20R_6 (5)	-	1.90%
	ADJD20R_12 (1)	2.22%	-			
	ADJD20R_13 (1)	0.84%	-			
	ADJD20R_14 (1)	0.78%	-			
	ADJD20R_15 (1)	0.92%	-			
	ADJD20R_16 (1)	0.43%	-			
	ADJD20R_17 (1)	0.69%	-			
	ANJD20R_1 (5)	-	20.74%			
	ANJD20R_2 (3)	-	4.36%			
	ANJD20R_3 (3)	-	7.27%			
	ANJD20R_4 (3)	-	4.55%			
	ANJD20R_5 (3)	-	15.70%			
	ANJD20R_7 (3)	-	3.20%			
	ANJD20R_8 (5)	-	8.04%			
	ANJD20R_9 (5)	-	9.30%			
	ANJD20R_10 (5)	-	26.84%			
	Total	**100.0%**	**100.0%**	**Total**	**100.0%**	**100.0%**
31	ADJD13_1 (1)	100.00%	-	ADJA13_1 (1)	100.00%	-
	ANJD13_1 (1)	-	100.00%	ANJA13_1 (5)	-	64.29%
				ANJA13_2 (3)	-	35.71%
	Total	**100.0%**	**100.0%**	**Total**	**100.0%**	**100.0%**

Non-Jet						
Runway	Departure			Arrival		
	Track ID	Percent Use		Track ID	Percent Use	
		Day	Night		Day	Night
2C	ADND02C_1 (3)	10.98%	-	ADNA02C_1 (7)	22.22%	-
	ADND02C_2 (1)	3.33%	-	ADNA02C_2 (3)	18.54%	-
	ADND02C_3 (3)	20.98%	-	ADNA02C_3 (3)	11.05%	-
	ADND02C_4 (1)	17.25%	-	ADNA02C_6 (3)	9.96%	-
	ADND02C_5 (3)	23.53%	-	ADNA02C_7 (3)	17.63%	-
	ADND02C_6 (1)	4.51%	-	ADNA02C_9 (1)	1.51%	-
	ADND02C_7 (1)	8.04%	-	ADNA02C_10 (3)	10.02%	-
	ADND02C_8 (1)	4.51%	-	ADNA02C_11 (1)	5.74%	-
	ADND02C_9 (1)	6.86%	-	ADNA02C_13 (1)	1.81%	-
	ANND02R_1 (1)	-	100.00%	ADNA02C_14 (1)	1.51%	-
				ADNA02C_1 (7)	22.22%	-
				ADNA02C_2 (3)	18.54%	-
				ADNA02C_3 (3)	11.05%	-
				ADNA02C_6 (3)	9.96%	-
				ANNA02C_1 (3)	-	54.13%
				ANNA02C_2 (5)	-	16.12%
				ANNA02C_3 (5)	-	18.18%
				ANNA02C_4 (5)	-	11.57%
	Total	**100.0%**	**100.0%**	**Total**	**100.0%**	**100.0%**
2L	ADND02L_1 (3)	27.47%	-	ADNA02L_1 (5)	76.10%	-
	ADND02L_2 (1)	6.04%	-	ADNA02L_2 (1)	9.17%	-
	ADND02L_3 (3)	55.77%	-	ADNA02L_3 (1)	5.78%	-
	ADND02L_4 (1)	10.71%	-	ADNA02L_4 (1)	6.00%	-
	ANND02C_2 (5)	-	100.00%	ADNA02L_5 (1)	2.94%	-
	Total	**100.0%**	**100.0%**	**Total**	**100.0%**	**0.0%**
2R	ADND02R_1 (3)	39.43%	-	ADNA02R_1 (3)	58.09%	-
	ADND02R_2 (1)	32.11%	-	ADNA02R_2 (3)	18.98%	-
	ADND02R_4 (5)	28.46%	-	ADNA02R_3 (1)	11.55%	-
				ADNA02R_4 (1)	3.63%	-
				ADNA02R_5 (1)	7.76%	-
	Total	**100.0%**	**0.0%**	**Total**	**100.0%**	**0.0%**
13	ADND31_1 (5)	61.11%	-	ADNA31_1 (1)	100.00%	-
	ADND31_2 (5)	38.89%	-	ANNA31_1 (5)	-	100.00%
	ANND31_1 (1)	-	100.00%			
	Total	**100.0%**	**100.0%**	**Total**	**100.0%**	**100.0%**
20C	ADND20C_1 (5)	18.30%	-	ADNA20C_1 (1)	8.53%	-
	ADND20C_2 (5)	14.22%	-	ADNA20C_2 (3)	34.46%	-
	ADND20C_3 (5)	4.43%	-	ADNA20C_3 (1)	6.76%	-
	ADND20C_4 (5)	11.22%	-	ADNA20C_4 (3)	24.64%	-
	ADND20C_5 (5)	7.08%	-	ADNA20C_5 (1)	9.02%	-
	ADND20C_6 (5)	9.44%	-	ADNA20C_6 (1)	3.86%	-
	ADND20C_7 (5)	2.07%	-	ADNA20C_7 (1)	5.48%	-
	ADND20C_8 (5)	10.08%	-	ADNA20C_8 (1)	3.86%	-
	ADND20C_9 (5)	9.72%	-	ADNA20C_9 (1)	3.38%	-
	ADND20C_10 (5)	8.43%	-	ANNA20C_1 (5)	-	55.38%
	ADND20C_11 (5)	1.43%	-	ANNA20C_2 (1)	-	44.62%
	ADND20C_12 (5)	2.07%	-			
	ADND20C_13 (5)	1.50%	-			
	ANND20C_1 (1)	-	100.00%			
	Total	**100.0%**	**100.0%**	**Total**	**100.0%**	**100.0%**
20L	ADND20L_1 (5)	100.00%	-	ADNA20L_1 (3)	12.16%	-
				ADNA20L_2 (3)	28.66%	-
				ADNA20L_3 (1)	8.44%	-
				ADNA20L_4 (3)	27.54%	-
				ADNA20L_5 (1)	6.58%	-
				ADNA20L_6 (1)	5.96%	-
				ADNA20L_7 (1)	4.71%	-
				ADNA20L_8 (1)	5.96%	-
				ANNA20L_1 (1)	-	100.00%

Non-Jet						
Runway	Departure			Arrival		
	Track ID	Percent Use		Track ID	Percent Use	
		Day	Night		Day	Night
	Total	**100.0%**	**0.0%**	**Total**	**100.0%**	**100.0%**
20R	ADND20R_1 (5)	76.99%	-	ADNA20R_1 (1)	4.65%	-
	ADND20R_2 (5)	15.04%	-	ADNA20R_2 (5)	68.44%	-
	ADND20R_3 (5)	4.53%	-	ADNA20R_3 (3)	11.76%	-
	ADND20R_4 (5)	3.44%	-	ADNA20R_4 (1)	7.28%	-
	ANND20R_1 (1)	-	75.00%	ADNA20R_5 (1)	1.69%	-
	ANND20R_2 (1)	-	25.00%	ADNA20R_6 (1)	3.47%	-
				ADNA20R_7 (1)	2.71%	-
				ANNA20R_1 (1)	-	100.00%
	Total	**100.0%**	**100.0%**	**Total**	**100.0%**	**100.0%**
31				ADNA13_1 (1)	100.00%	-
	Total	**0.0%**	**0.0%**	**Total**	**100.0%**	**0.0%**

Runway	Helicopter					
	Departures			Arrivals		
	Track ID	Percent Use		Track ID	Percent Use	
		Day	Night		Day	Night
PAD_1				UH60DA_01 (1)	69.56%	-
				UH60DA_02 (1)	4.35%	-
				UH60DA_03 (1)	8.70%	-
				UH60DA_04 (3)	17.39%	-
	Total	**0.00%**	**0.00%**	**Total**	**100.00%**	**0.00%**
PAD_1	UH60DD_01 (1)	10.59%	-			
	UH60DD_03 (1)	17.65%	-			
	UH60DD_02 (3)	70.00%	-			
	UH60DD_04 (1)	1.76%	-			
	Total	**100.00%**	**0.00%**	**Total**	**0.00%**	**0.00%**
Note: All helicopter operations occur in daytime hours (between 7:00 am and 10:00 pm)						

6 PUBLIC CONSULTATION

Part 150 sets the following consultation-related requirements for airports to follow when preparing NEMs:

> Each map, and related documentation submitted under this section must be developed and prepared in accordance with appendix A of this part, or an FAA approved equivalent, and in consultation with states, and public agencies and planning agencies whose area, or any portion of whose area, of jurisdiction is within the [DNL] 65 dB contour depicted on the map, FAA regional officials, and other Federal officials having local responsibility for land uses depicted on the map. This consultation must include regular aeronautical users of the airport. The airport operator shall certify that it has afforded interested persons adequate opportunity to submit their views, data, and comments concerning the correctness and adequacy of the draft noise exposure map and descriptions of forecast aircraft operations. Each map and revised map must be accompanied by documentation describing the consultation accomplished under this paragraph and the opportunities afforded the public to review and comment during the development of the map. One copy of all written comments received during consultation shall also be filed with the Regional Airports Division Manager.[27]

The balance of this section summarizes steps that the MNAA has undertaken, or will undertake, that exceed these requirements.

6.1 Consultation with FAA to Obtain Required Noise-Modeling Approvals

Sections 5.4 and Appendix D describe consultation undertaken with FAA to obtain all required approvals of the forecast and any non-standard noise modeling substitutions.

6.2 Noise Study Advisory Committee

The NEM Update study process benefits from the creation and participation of a Noise Study Advisory Committee (NSAC). The NSAC serves several important functions, such as:

- Representing a broad range of stakeholder groups
- Receiving information about the Study and sharing it with their constituencies
- Reviewing information and providing timely input to the Study
- In some cases, providing technical advice to the Study Team

In order for the NSAC to be effective and to be representative of all of the key positions involved in aircraft noise issues, the MNAA composed a diverse group of key stakeholders including, but not limited to: MNAA staff, FAA, aircraft operators/airlines, airport tenants, affected jurisdictions, and land use planners. While representation needed to be broad, the NSAC needed to remain a reasonable size so that deliberations are efficient. The MNAA identified and invited members to serve on the NSAC for the BNA NEM Update study.

[27] The draft was provided during the NEMs development process when sufficient information was available to "[afford] interested persons adequate opportunity to submit their views, data, and comments concerning the correctness and adequacy of the draft noise exposure map and descriptions of forecast aircraft operations." Op cit., § 150.21 (b).

6.2.1 Formation of the NSAC

An initial invitation was distributed for the NSAC to a key set of stakeholders. These were identified as agencies requiring consultation based on the regulations governing the Part 150 process at 14 CFR 150.21 (b) and 14 CFR 150.105(a).53. Not all member organizations invited to the NSAC chose to send a representative.

6.2.2 Membership

The NSAC meetings were open to the public and were advertised on the MNAA website. Each meeting concluded with a question and answer session. It is important to note that the NSAC is only advisory to the Study. That is, the NSAC can offer opinions, advice and guidance to the Study, but the MNAA has the sole discretion to accept or reject the NSAC recommendations in accordance with 14 CFR Part 150. As the sponsor of the Part 150 Study and as the operator of BNA, the MNAA is a member of the NSAC. The FAA, as the primary funding agency for the study and as the accepting authority, is a key advisor of the NSAC.

6.2.3 Summary of NSAC Meetings

Three NSAC meetings were held at BNA at the MNAA Consolidated Services Facility throughout the course of the study. The date and topics for each of these meetings are listed below.

- October 18, 2018 – Part 150 basics, aviation forecast, and NCP review
- June 11, 2019 – Noise modeling inputs and draft noise contour results
- October 7, 2019 – Aircraft noise terminology and NEM report review

The Study Team handled all aspects of meeting logistics, prepared meeting agendas and presentations. Copies of meeting sign in sheets and presentations for the three NSAC meetings are provided in Appendix E. Each meeting presentation was posted on the MNAA website for public review.

6.3 NEMs Notice, Review, and Comment Opportunities

The MNAA has undertaken the following public notice, review, and comment process based on the agreements reached in coordination with the FAA Memphis ADO. The ADO representatives agreed that the process would meet FAA requirements:

- The MNAA provided a copy of the preliminary draft NEM for submission to the FAA's Memphis ADO and FAA Southern Region Division for review prior to public distribution.
- The MNAA, with consulting team assistance, addressed FAA feedback in a final draft NEM.
- The MNAA placed the final draft on the MNAA website for public review. Appendix F.1 presents a copy of the relevant website page.
- The MNAA sent email notices to the airport tenants and regular aeronautical users of the airport that the Draft NEM was available on the website. Appendix F.2 presents the list of the airport tenants and regular aeronautical users to whom it was sent.
- HMMH made final revisions as requested by MNAA and delivered printed and electronic copies of the Final NEMs document to MNAA for submission to the FAA.

6.4 Public Presentation

While not a Part 150 requirement, the MNAA included the NEM update in a public information open house workshop held in coordination with the concurrent Airport Master Plan Update. Appendix G provides copies of the public notice and advertisements distributed for the workshop. Appendix G.3 presents a list of workshop attendees.

The NEM-related boards at the November 21, 2019 public workshop included large-scale versions of the official 2020 and 2025 NEM contours (like Figure 5 of this document), and the comparison to the existing 2012 NEM figure from the preceding Part 150 study (as discussed in Section 1.4). These public workshop boards are provided in Appendix G.4. The workshop boards were also posted on the MNAA website.

6.5 Documentation of Comments and Follow-Up

The MNAA requested comments at the end of each NSAC meeting and during the Public Workshop. The study received two comments as part of this process, and they are provided in Appendix H along with the MNAA response. MNAA has provided these comments to FAA by listing the comments in this report.

Name	Email	Comment	Response
Michael W. Johnson	mwjohnson1939@gmail.com	No remedy to noise from airplane. No contingency plan to abate noise. Address 1449 Woodfield Drive, Nashville, TN 37211 This meeting does not properly answer residents concerns. Feel free to make contact.	Your home is several miles to the south of the airport located under the final approach to Runway 2C. Aircraft on approach to Runway 2C need to line up with the runway in order to establish a safe descent and overflights of your home are an operational necessity based on FAA flight procedures. All flight procedures were modeled as part of this study and your residence is located outside of the 65 DNL contour.
Mary Johnson	mary.johnson0902@gmail.com	I reside in Bradford Hills Subdivison. The planes upon final descent are over my home. The noise is UNBEARABLE!!! Beginning the process of legal action	Your home is several miles to the south of the airport located under the final approach to Runway 2C. Aircraft on approach to Runway 2C need to line up with the runway in order to establish a safe descent and overflights of your home are an operational necessity based on FAA flight procedures. All flight procedures were modeled as part of this study and your residence is located outside of the 65 DNL contour.

APPENDIX A NOISE TERMINOLOGY

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Introduction

Noise is a very complex physical quantity. The properties, measurement, and presentation of noise involve specialized terminology that is often difficult to understand. To assist reviewers in interpreting the complex noise metrics used in evaluating airport noise, this appendix introduces six acoustical descriptors of noise, roughly in increasing degree of complexity:

- Decibel, dB
- A-Weighted Decibel, dBA
- Maximum A-Weighted Sound Level, Lmax
- Sound Exposure Level, SEL
- Equivalent A-Weighted Sound Level, Leq
- Day-Night Average Sound Level, DNL

These noise metrics form the basis for the majority of noise analyses conducted at U.S. airports.

A.1 Decibel, dB

All sounds come from a sound source -- a musical instrument, a voice speaking, an airplane passing overhead. It takes energy to produce sound. The sound energy produced by any sound source is transmitted through the air in sound waves -- tiny, quick oscillations of pressure just above and just below atmospheric pressure. The ear detects these oscillating pressures interpreting it as "sound."

Our ears are sensitive to a wide range of sound pressures. Although the loudest sounds that we hear without pain have about one million times more energy than the quietest sounds we hear, our ears are incapable of detecting small differences in these pressures. Thus, to better match how we hear this sound energy, we compress the total range of sound pressures to a more meaningful range by introducing the concept of sound pressure level.

Sound pressure level (SPL) is measured in decibels (dB). Decibels are logarithms of a ratio, the numerator being the pressure of the sound source of interest, and the denominator being the reference pressure (equivalent to the quietest sound that an average healthy young adult can hear):

$$\textit{Sound Pressure Level (SPL)} = 20 * Log\left(\frac{P_{source}}{P_{reference}}\right) dB$$

The logarithmic conversion of sound pressure to sound pressure level means that the quietest sound that we can hear (the reference pressure) has a sound pressure level of about 0 dB, while the loudest sounds that we hear without pain have sound pressure levels of about 120 dB. Most sounds in our day-to-day environment have sound pressure levels on the order of 30 to 100 dB.

Because decibels are logarithmic, combining decibels is unlike common arithmetic. For example, if two sound sources each produce 100 dB and they are then operated together, they produce 103 dB -- not the 200 decibels we might expect. Four equal sources operating simultaneously produce another three decibels of noise, resulting in a total sound pressure level of 106 dB. For every doubling of the number of equal sources, the sound pressure level goes up another three decibels.

A tenfold increase in the number of sources makes the sound pressure level go up 10 dB. A hundredfold increase makes the level go up 20 dB, and it takes a thousand equal sources to increase the level 30 dB.

If one noise source is much louder than another, the two sources together will produce virtually the same sound pressure level (and sound to our ears) as the louder source alone. For example, a 100 dB source plus an 80 dB source produce approximately 100 dB when operating together (actually, 100.04 dB). The louder source "masks" the quieter one. But if the quieter source gets louder, it will have an increasing effect on the total sound pressure level such that, when the two sources are equal, as described above, they produce a level three decibels above the sound of either one by itself.

Conveniently, people also hear or interpret sound pressure in a logarithmic fashion. Two useful rules of thumb to remember when comparing sound pressure levels are: (1) a 6 to 10 dB increase is generally perceived to be about a doubling of loudness, and (2) changes in sound pressure level of less than about three decibels are not readily detectable outside of a laboratory environment.

A.2 A-Weighted Decibel, dBA

An important characteristic of sound is its frequency, or "pitch." This is the per-second rate of repetition of the sound pressure oscillations as they reach our ear, expressed in units known as Hertz (Hz), formerly called cycles per second.

When analyzing the total noise of any source, acousticians often break the noise into frequency bands to determine how much is low-frequency noise, how much is middle-frequency noise, and how much is high-frequency noise. This breakdown is important for two reasons:

- Our ear is better equipped to hear mid and high frequencies and is less sensitive to lower frequencies. Thus, we find mid- and high-frequency noise more annoying.
- Engineering solutions to a noise problem are different for different frequency ranges. Low-frequency noise is generally harder to control.

The normal frequency range of hearing for most people extends from a low of about 20 Hz to a high of about 10,000 to 15,000 Hz. People respond to sound most readily when the predominant frequency is in the range of normal conversation, typically around 1,000 to 2,000 Hz. The acoustical community has defined several “filters,” which approximate this sensitivity of our ear and thus, help us to judge the relative loudness of various sounds made up of many different frequencies.

The "A" filter (or “A-weighting”) does this best for most environmental noise sources. A-weighted sound levels are measured in decibels, just like unweighted. To avoid ambiguity, A-weighted sound levels should be identified as such (e.g. "an A-weighted sound level of 85 dB") or in an abbreviated form (e.g. "a sound level of 85 dBA") where the "A" indicates the sound level has been A-weighted.

Government agencies in the U.S. (and most governments worldwide) recommend or require the use of A-weighted sound levels for measuring, modeling, describing, and assessing aircraft sound levels (and sound levels from most other transportation and environmental sources).

Figure A-1 depicts A-weighting adjustments to sound from approximately 20 Hz to 10,000 Hz.

Source: HMMH, 2011

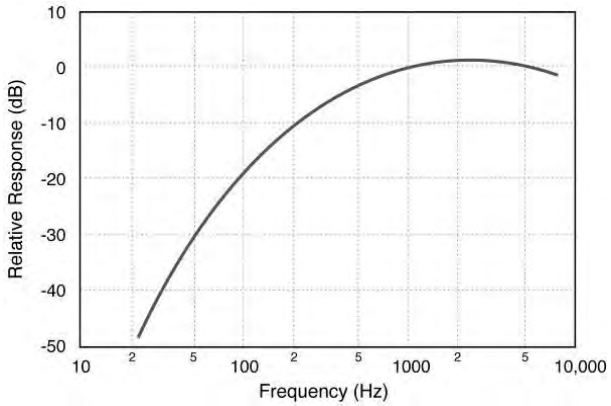

Figure A-1 Frequency-Response Characteristics of Various Weighting Networks

The A-weighted filter significantly de-emphasizes those parts of the total noise at lower and higher frequencies (below about 500 Hz and above about 10,000 Hz) where we do not hear as well. The filter has very little effect, or is nearly "flat," in the middle range of frequencies between 500 and 10,000 Hz where we hear quite easily. Because this filter generally matches our ears' sensitivity, sounds having higher A-weighted sound levels are usually judged to be louder than those with lower A-weighted sound levels, a relationship which otherwise might not be true. It is for this reason that acousticians normally use A-weighted sound levels to evaluate environmental noise sources.

Figure A-1 depicts representative A-weighted sound levels for a variety of common sounds.

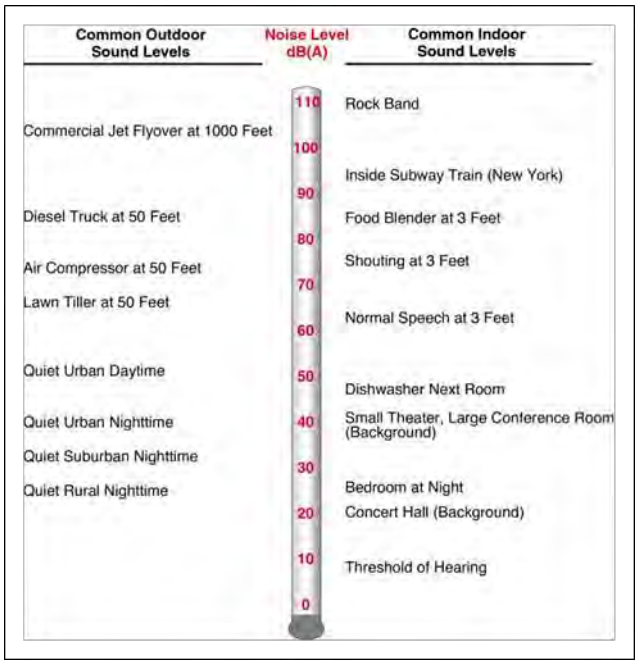

Figure A-1 Representative A-Weighted Sound Levels
Source: HMMH, 2011

A.3 Maximum A-Weighted Sound Level, Lmax

An additional dimension to environmental noise is that A-weighted levels vary with time. For example, the sound level increases as an aircraft approaches, then falls and blends into the background as the aircraft recedes into the distance (though even the background varies as birds chirp, the wind blows, or a vehicle passes by). This is illustrated in Figure A-2.

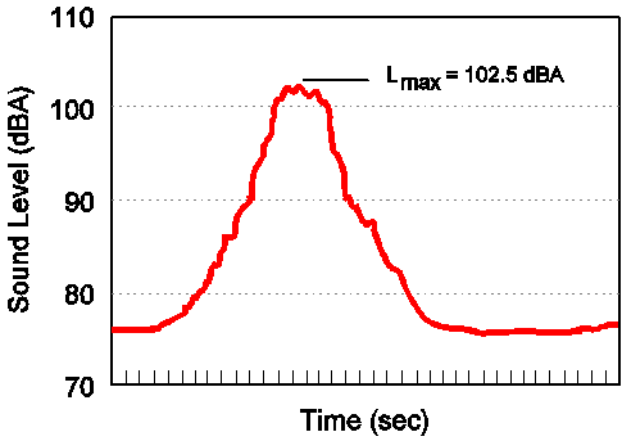

Figure A-2 Variation in the A-Weighted Sound Level over Time
Source: HMMH, 2011

Because of this variation, it is often convenient to describe a particular noise "event" by its maximum sound level, abbreviated as Lmax (or LAmax, if the decibel abbreviation dB is used). In Figure A-2 the Lmax is approximately 102.5 dBA.

While the maximum level is easy to understand, it suffers from a serious drawback when used to describe the relative “noisiness” of an event such as an aircraft flyover; i.e., it describes only one dimension of the event and provides no information on the event’s overall, or cumulative, noise exposure. In fact, two events with identical maximum levels may produce very different total exposures. One may be of very short duration, while the other may continue for an extended period and be judged much more annoying. The next sections introduce two closely related measures that account for this concept of a noise "dose," or the cumulative exposure associated with an individual “noise event” such as an aircraft flyover.

A.4 Sound Exposure Level, SEL

The most commonly used measure of cumulative noise exposure for an individual noise event, such as an aircraft flyover, is the Sound Exposure Level, or SEL. SEL is a summation of the A-weighted sound energy over the entire duration of a noise event. SEL expresses the accumulated energy in terms of the one-second-long steady-state sound level that would contain the same amount of energy as the actual time-varying level.

In simple terms, SEL “compresses” the energy into a single second. Figure A-3 depicts this compression:

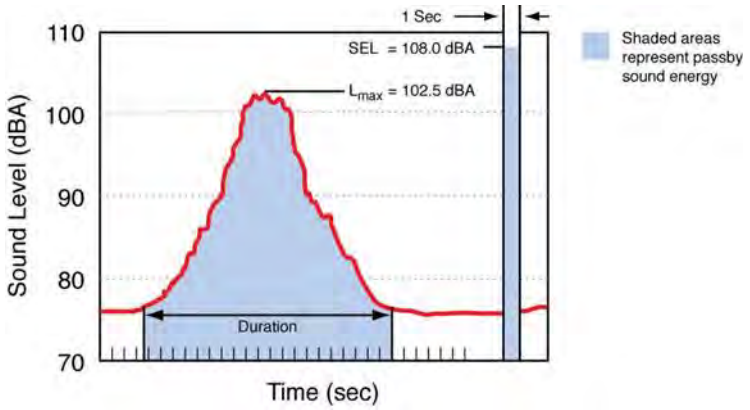

Figure A-3 Graphical Depiction of Sound Exposure Level
Source: HMMH, 2011

Note that because SEL is normalized to one second, it almost always will be higher than the event's Lmax. In fact, for most aircraft flyovers, SEL is on the order of five to 12 dB higher than Lmax.

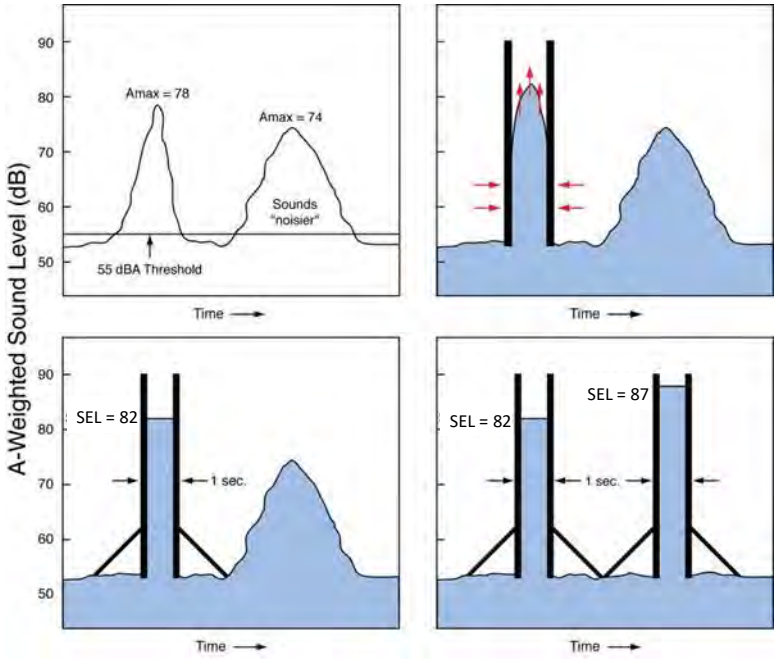

Figure A-4 Graphical Depiction of Sound Exposure Level for Two Noise Events with Different Maximums and Durations
Source: HMMH, 2011

SEL provides a basis for comparing noise events that generally match our impression of their overall "noisiness," including the effects of both duration and level; the higher the SEL, the more annoying a noise event is likely to be.

A.5 Equivalent A-Weighted Sound Level, Leq

The Equivalent Sound Level, abbreviated Leq, is a measure of the exposure resulting from the accumulation of sound levels over a particular period of interest; e.g., an hour, an eight-hour school

day, nighttime, or a full 24-hour day. The applicable period should always be identified or clearly understood when discussing the metric.

Leq may be thought of as a constant sound level over the period of interest that contains as much sound energy as the actual varying level. It is a way of assigning a single number to a time-varying sound level. This is illustrated in Figure A-5.

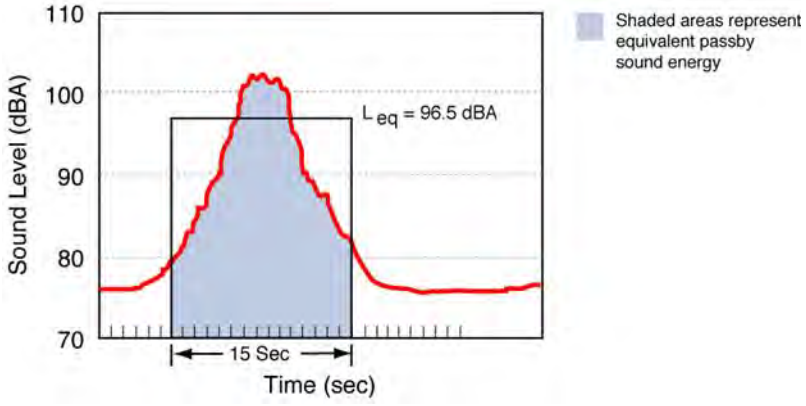

Figure A-5 Example of a One-Minute Equivalent Sound Level
Source: HMMH, 2011

In airport noise applications, Leq is often presented for consecutive one-hour periods to illustrate how the hourly noise dose rises and falls throughout a 24-hour period as well as how certain hours are significantly affected by a few loud aircraft.

A.6 Day-Night Average Sound Level, DNL or Ldn

The previous sections address noise measures that account for short term fluctuations in A-weighted levels as sound sources come and go affecting the overall noise environment. The Day-Night Average Sound Level (DNL or Ldn) represents a 24-hour A-weighted noise dose. DNL is essentially equal to the 24-hour A-weighted Leq, with one important adjustment: noise occurring at night – from 10 pm through 7 am – is "factored up." The factoring up can be made in one of two ways:

- Weighting, by counting each nighttime noise contribution 10 times; e.g., if DNL is calculated by summing the SEL of aircraft operations over a 24-hour period, each nighttime operation is represented by 10 identical daytime operations.
- Penalizing, by adding 10 dB to all nighttime noise contributions; e.g., if DNL is calculated from the SEL of aircraft operations occurring over a 24-hour period, 10 dB are added to the SEL values for nighttime operations.

The 10 dB adjustment accounts for our greater sensitivity to nighttime noise and the fact lower ambient levels at night tend to make noise events, such as aircraft flyovers, more intrusive.

Figure A-6 depicts this adjustment graphically.

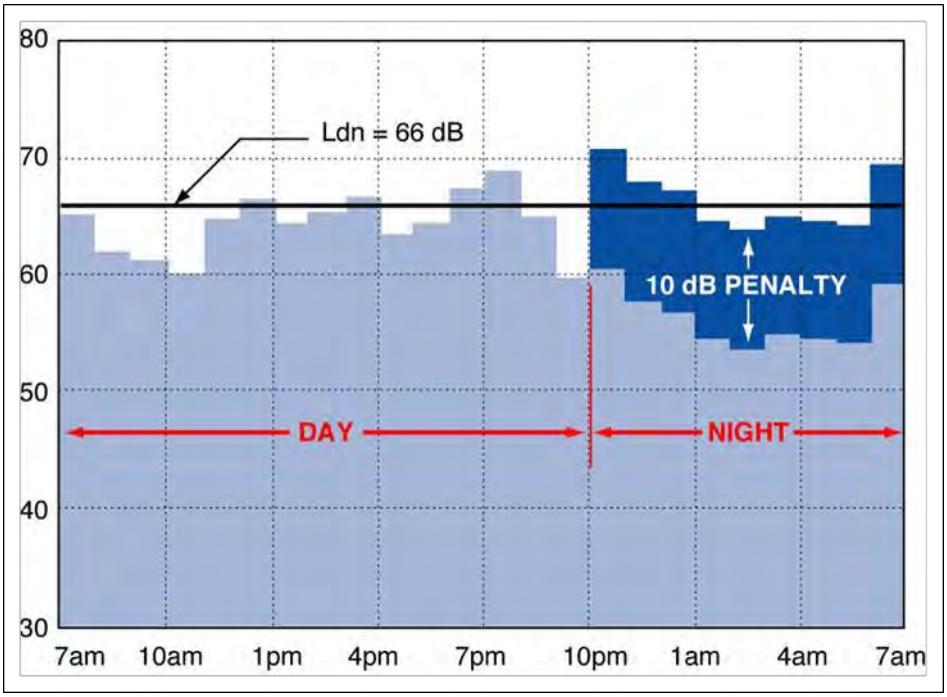

Figure A-6 Example of a Day-Night Average Sound Level Calculation
Source: HMMH, 2011

Most aircraft noise studies utilize computer-generated estimates of DNL, determined by adding up the energy from the SELs from each event, with the 10 dB penalty / weighting applied to night operations. Computed values of DNL are often depicted as noise contours reflecting lines of equal exposure around an airport (much as topographic maps indicate contours of equal elevation). The contours usually reflect long-term (annual average) operating conditions, taking into account the average flights per day, how often each runway is used throughout the year, and where over the surrounding communities the aircraft normally fly. Alternative time frames may also be helpful in understanding shorter term aspects of a noise environment.

Why is DNL used to describe noise around airports? The U.S. Environmental Protection Agency identified DNL as the most appropriate measure of evaluating airport noise based on the following considerations:

- It is applicable to the evaluation of pervasive long-term noise in various defined areas and under various conditions over long periods of time.
- It correlates well with known effects of noise on individuals and the public.
- It is simple, practical, and accurate. In principal, it is useful for planning as well as for enforcement or monitoring purposes.
- The required measurement equipment, with standard characteristics is commercially available.
- It was closely related to existing methods currently in use.

Representative values of DNL in our environment range from a low of 40 to 45 dB in extremely quiet, isolated locations, to highs of 80 or 85 decibels immediately adjacent to a busy truck route.

DNL would typically be in the range of 50 to 55 dB in a quiet residential community and 60 to 65 decibels in an urban residential neighborhood. Figure A-7 presents representative outdoor DNL values measured at various U.S. locations.

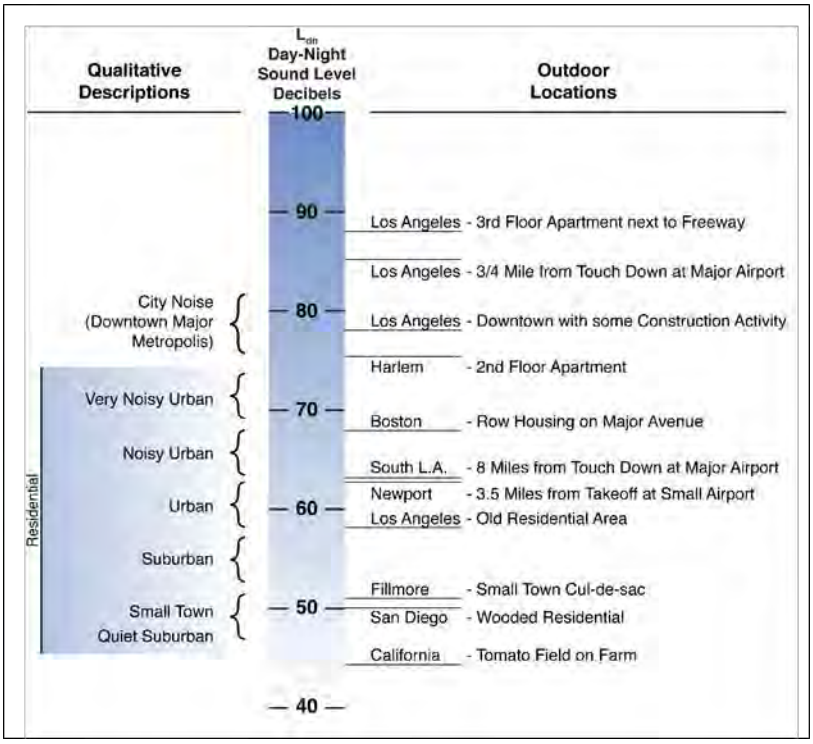

Figure A-7 Examples of Measured Day-Night Average Sound Levels
Source: HMMH, 2011

When preparing environmental noise analyses, the FAA considers a change of 1.5 dB within the DNL 65 dB contour to be "significant." If a change of 1.5 dB is observed, analysts should look between the 60 and 65 dB contours to see if there are areas of change of 3 dB or more; this is considered a "reportable impact."

Section A.1 provided rules of thumb for interpreting moment-to-moment changes in sound level; the following table presents guidelines for interpreting changes in cumulative exposure:

Table A-1 Guidelines for Interpreting Changes in Cumulative Exposure
Source: HMMH, 2011

DNL Change	Community Response	Mitigation
0 – 2 dB	May be noticeable	Abatement may be beneficial
2 – 5 dB	Generally noticeable	Abatement should be beneficial
Over 5 dB	A change in community reaction is likely	Abatement definitely beneficial

Most public agencies dealing with noise exposure, including the Federal Aviation Administration (FAA), Department of Defense, and Department of Housing and Urban Development (HUD), have adopted DNL in their guidelines and regulations.

APPENDIX B FAA ACCEPTANCE OF PREVIOUS NOISE EXPOSURE MAPS

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U.S. Department
of Transportation
Federal Aviation
Administration

Memphis Airports District Office
2862 Business Park Dr, Bldg G
Memphis, Tennessee 38118-1555
Phone: 901-322-8181

February 4, 2013

Mr. Rob Wigington, IAP
Executive Vice President and
Chief Operating Officer
Metropolitan Nashville Airport Authority
One Terminal Drive
Suite 501
Nashville, TN 37214-4114

Noise Exposure Map Compliance Determination
2012 Noise Exposure Map Update (NEM)
Nashville International Airport (BNA)

Dear Mr. Wigington:

This is to notify you that the Federal Aviation Administration (FAA) has evaluated and accepted the Noise Exposure Maps and supporting documentation transmitted by a letter from your office dated December 19, 2012 for the Nashville International Airport, in accordance with Section 103(a) (1) of the Aviation Safety and Noise Abatement Act of 1979 (ASNA), and has determined that they are in compliance with applicable requirements of 14 CFR Part 150. Further, we have determined that the "Existing Conditions (2012) Noise Exposure Map" and "Forecast Condition (2017) Noise Exposure Map" fulfill the requirements for the current and the future year noise exposure maps.

FAA's determination that your Noise Exposure Maps are in compliance is limited to a finding that the maps were developed in accordance with the procedures contained in Appendix A of 14 CFR Part 150. Such determination does not constitute approval of your data, information or plans.

Should questions arise concerning the precise relationship of specific properties to noise exposure contours depicted on the Noise Exposure Maps, you should note that the FAA will not be involved in any way in the determination of relative locations of specific properties with regard to the depicted noise contours, or in interpreting the maps to resolve questions concerning, for example, which properties should be covered by the provisions of Section 107 of the Act. These functions are inseparable from the ultimate land use control and planning responsibilities of local government. These local responsibilities are not changed in any way under Part 150 or through FAA's determination relative to your Noise Exposure Maps. Therefore, the responsibility for the detailed overlaying of noise contours onto the maps depicting properties on the surface rests exclusively with you the airport operator, or those public agencies and planning agencies with which consultation is required under Section 103 of the Act. The FAA relies on the certification by you under 150.21 of 14 CFR Part 150, that the statutorily required consultation has been accomplished.

The FAA will publish a notice in the Federal Register announcing the acceptance of the Noise Exposure Maps for Nashville International Airport. Your notice of this determination and the availability of the Noise Exposure Maps, when published at least three times in a newspaper of general circulation in the county or counties where the affected properties are located, will satisfy the requirements of Section 107 of the ASNA Act.

Your attention is called to the requirements of Section 150.21(d) of 14 CFR Part 150, involving the prompt preparation and submission of revisions to these maps of any actual or proposed change in the operation of Nashville International Airport might create any substantial, new, noncompatible land use in any areas depicted on the Noise Exposure Maps, or significant reduction in noise over existing noncompatible land uses that is not reflected in either map now on file with the FAA.

Should you have any questions, please feel free to contact me at (901) 322-8181.

Sincerely,

Phillip J. Braden, Manager
Memphis Airports District Office

cc: APP-400
ASO-610
ASO-7

APPENDIX C MAY 23, 1989 FAA RECORD OF APPROVAL FOR 1989 NOISE COMPATIBLITY PROGRAM SUBMISSION

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U.S. Department of Transportation
Federal Aviation Administration

Memorandum

AIRPORTS DISTRICT OFFICE
3973 Knight Arnold Rd, Suite 105
Memphis, TN 38118-3004

Subject: ACTION: Recommendation for Approval of Nashville International Airport Noise Compatibility Program (NCP)

Date: MAY 2 3 1989

From: Manager, MEM-ADO

Reply to Attn. of:

FTS: 222-3495

To: ARP-1, ATTN: APP-600
~~THROUGH: ASO-620~~ mia 6/1/89

On November 14, 1988, the Nashville International Airport (BNA) was notified of FAA's determination of compliance of the Noise Exposure Map under Section 103.(c) of the Aviation Safety and Noise Abatement Act of 1979 ("the Act"). On March 2, 1989, we began the formal 180-day review period for BNA's proposed Noise Compatibility Program (NCP) under the provisions of Section 104(a) of the Act. Notice was transmitted to AGC-10 on March 2, 1989, for publication in the Federal Register.

The Southern Region has reviewed and evaluated the proposed NCP and has concluded that it is consistent with the intent of the Act and that it meets the standards set forth in FAR Part 150 for such programs. The standard Part 150 noise compatibility program checklist was reviewed to ensure that all required items were included in the proposed program. The checklist is attached. The NCP document has been transmitted previously.

The proposed program has been reviewed by the Memphis Airports District Office; Flight Standards, Airway Facilities, Air Traffic and Airports Divisions; and Regional Counsel. Comments were received from the Air Transport Association (ATA). Their comments related to the benefits of eliminating a flight corridor for night operations. One track was eliminated in order to reduce noise impacts to a populated area. ATA also offered comments on Hush houses and proposed rules yet to be established regarding Stage III aircraft and the possible moving of Air Cargo operations to Smyrna Airport. The Authority's NCP does not include these items; however, they will be considered in 1993 only after ATA and the Nashville International Airport implementation committee consider all ramifications of this measure. Each proposed action in the Noise Compatibility Program was then reviewed and evaluated on the basis of effectiveness and potential conflict with Federal policy and prerogatives. These include safe and efficient use of the nation's airspace, undue burden on interstate commerce, unjust discrimination and interference with a Federal regulatory compliance schedule (i.e., FAR Part 91, Subpart E).

Our recommendation on each of these proposed actions is described in the attached Record of Approval. Each approved action is described in detail in the BNA NCP.

Page 2

John M. Dempsey

Attachments:
NCP's Previously Transmitted
NEM Acceptance Letter, NCP
Transmittal of NEM Federal Register Notice
Record of Approval
NCP Checklist Previously Transmitted

Concur ☑ Joan W. Bauerlein (planning) — Associate Administrator for Policy and International Aviation, API-1 — 8/18/89 Date
Nonconcur ☐ (for)

Concur ☑ Gregory S. Walden — Chief Counsel, AGC-1 — Aug. 24, 1989 Date
Nonconcur ☐

Approve ☒ Robert K. Lamkin — Associate Administrator for Airport System Development, ARP-1 — Aug 25, 1989 Date
Disapprove ☐

cc: ASO-620 W/Attachments

Record of Approval
Nashville International Airport
Nashville, Tennessee

The approvals listed herein include approvals of actions that the airport recommends be taken by the Federal Aviation Administration. It should be noted that these approvals indicate only that the actions would, if implemented, be consistent with the purposes of Part 150. These approvals do not constitute decisions to implement the actions. Later decisions concerning possible implementation of these actions may be subject to applicable environmental or other procedures or requirements.

The recommendations below summarize as closely as possible the airport operator's recommendations in the noise compatibility program and are cross-referenced to the program. The statements contained within the summarized recommendations and before the indicated FAA approval, disapproval, or other determination do not represent the opinions or decisions of the FAA.

Recommended Noise Mitigation Option

The Noise Compatibility Program recommends the following changes to existing and proposed operational strategies as the primary mechanism for controlling noise impacts:

Operational Strategy 1.

Modification of the daytime runway use to balance airfield operations resulting in a 50/50 north/south runway split. (NCP Study, p 3)

Adoption of this procedure will direct more departures to the east, south, or southwest resulting in a reduced population impact.

FAA Action: Approved

Operational Strategy 2.

Use of Runway 13/31 for over 96 percent of operations between 10:00pm and 7:00am with an emphasis on departing to the east and arriving from the southeast whenever conditions allow (i.e., low traffic periods, wind and weather conditions, etc.). (NCP Study, pp 3-4)

The night uses of this crossing runway will remove the large population center north of the airport from aircraft noise.

FAA Action: Approved

Operational Strategy 3.

Changes in the following nighttime (10pm to 7am) flight corridors: (NCP Study, p 4)

1. Runway 13 departures turn to a heading of 090 degrees until reaching 3,600 feet above sea level.
2. Runway 31 departures turn to a heading of 280 degrees until reaching 3,600 feet above sea level. Turn to be initiated at 2DME.

3. Runway 20R departures turn to a heading of 180 degrees until reaching an altitude of 3,600 feet MSL.

(The flight corridors in Operational Strategies 3 and 4 are shown on the recommended 1993 Program Flight Corridors map in the pocket following page 5, NCP).

Flight corridor changes are recommended for the purpose of reducing highly developed residential areas from unnecessary aircraft noise.

FAA Action: Approved

Operational Strategy 4.

Changes in the following daytime flight corridors: (NCP Study, p 4)

1. Runway 31 departues follow runway heading then turn to 50 degrees or 280 degrees at 2DME.
2. Runway 20R eastbound departures turn to the southeast (140 or 180 degrees).
3. New Runway 20L westbound departures turn to the southwest (220 degrees).

Adoption of this strategy will reduce the number of people impacted by aircraft noise. By adopting the above four strategies the population affected by aircraft noise in the 65-70 Ldn will be reduced from 14,302 down to 12,095 and within the 70-75 Ldn drom 1740 to 1474. There are no people residing within the 75 Ldn. Also the total residential land area impacted by aircraft noise will be reduced form 2717 acres to 2049 acres.

FAA Action: Approved

Recommended Land Use Control Option

The Noise Capatibility Program for Nashville International Airport recommends remedial land use control for promoting compatibility in already developed areas, and preventive measures for the undeveloped areas.

Remedial Action 1. Acquisition of Residential Areas in the Extended Approach Areas. (NCP Study, p 18)

Two residential areas around the airport would be acquired on a voluntary basis.

One area is north of the new runway. (Shown on Exhibits 2 and 3, NCP and marked with an A). Most of the area is included in the 65 Ldn. A second area is located south of the existing runway 2L and east of Airport Estates which is being acquired presently. (Shown on Exhibits 5 and 6). This community is within the 70 Ldn and would be left fragmented due to the Airport Estates acquisition. The requirements of the Federal Uniform Relocation Assistance and Real Property Acquisition Policy Act will be followed.

FAA Action: Approved

Remedial Action 2. Sound Insulation

The NCP recommends that single family, owner-occupied houses in the 65 to 75 Ldn noise contours be insulated for noise reduction. (NCP Study, pp 18-19 and Exhibits 1-6).

Intensive insulation would be installed in the 70 to 75 Ldn area (shown on Exhibit 2 and marked with an S), and less intensive insulation in the 65 to 70 Ldn (shown on Exhibits 1-6 and marked with an R). MNAA will provide funding for the insulation program but would limit the cost for the 65 to 70 Ldn areas to a maximum of $4,000.

FAA Action: Approved

Remedial Action 3. Residential Property Sales Assistance Program (RPSAP) (NCP Study, p 19 and Exhibits 1-6).

The MNAA will guarantee property owners living in viable residential areas inside the 65 Ldn fair market value if they wish to sell their homes. Sale would be voluntary and the homeowners would not receive relocation assistance. To participate.., homeowners would be required to provide the MNAA with easements at the time of sale. If a home owner has previously participated in the sound insulation option, they will be asked to wait 1 year after completion of sound insulation before becoming eligible for this RPSAP option. The residential property sales assistance program area is shown on Exhibits 1-6 and designated with an R. (NCP Study, p 19 and Exhibits 1-6).

FAA Action: Approved

Remedial Action 4. Transition Area

To preclude future residential development and to transition existing incompatible land uses to nonresidential uses the MNAA worked with the MPC to identify and effect zoning policy changes for several areas. (NCP Study pp 19-20, Exhibits 1-5, and Appendix E).

The Metropolitan Planning Commission has agreed to recommend that the residential areas shown on Exhibits 1-5 and marked with an U be changed to nonresidential zoning. To promote the transition the MPC agreed to recommend that these areas be given priority designation within Metropolitan Nashville's capital improvement budget process. MNAA also agreed to reevaluate the status of two transition areas one year after approval of the NCP.

FAA Action: Approved

Preventive Action. Undeveloped Area (Noise Study, pp 21-22)

The MNAA and the MPC will discourage residential development in undeveloped areas within the 65Ldn, and will recommend that Nashville's building code be revised to identify an aircraft noise impact area with more stringent requirements for noise reduction.

FAA Action: Approved

Management Technique 1.

Fan markers should be installed on Runways 31 and 20L to guide aircraft turns in conjunction with preferred flight corridors. (page 5 NCP and Appendix D)

FAA Action. Disapproved. The FAA Air Traffic Control has determined that varying sensitivities/setings of aircraft receivers tend to impact precision and make the use of these markers ineffective.

Management Technique 2.

Documentation for the preferred runway use program should be updated as needed to reflect aircraft noise abatement turning procedures and runway utilization goals. (page 5 NCP)

FAA Action: Approved.

Management Technique 3.

An Automated Radar Terminal Service (ARTS) Data Acquisition System, such as the one installed ... on a temporary basis should be retained in service. (page 5 NCP, Appendix D)

FAA Action: Approved. This system has been operating on a temporary basis by agreement with FAA and the MNAA. Continuation of this Data Acquisition System is an acceptable management technique and is recommended as long as space is available and the installation does not intefere with ATC carrying out its responsibilities.

Management Technique 4.

A Standard Instrument Departure Procedure (SID) or other published procedures should be developed for Runway 2R to align aircraft turns over the highway. (page 5 NCP and Appendix D)

FAA Action: Disapproved. The FAA objected to the proposed SID's for noise abatement purposes at this airport. The proposed SID would extend tracks well past required distances/altitudes, insensitive to aircraft route of flight, labor intensive to both pilots and controllers during critical periods of flight, and create high potential for confusion/conflict between written procedure and ATC requirements. Development of the proposed SID is incongruous with an existing SID which considers these factors. Other published procedures may; however, be appropriate, and will be considered by the FAA upon submittal of more detailed information in order to make an informed analysis.

Management Technique 5.

The Airport Noise Advisory Committee (ANAC) or some comparable group should be used to review the MNAA's land use program implementation efforts. (page 5 NCP, MNAA letter dated 02/07/89)

FAA Action: Approved. This committee has already been established and its purpose set forth in the NCP and subsequent correspondence from the MNAA dated February 7, 1989. The intent of the committee is to aid the airport in implementing the land use strategies presented in the NCP and approved in this Record of Approval. This management technique has been determined to be consistent with Part 150 program standards.

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APPENDIX D 2020 AND 2025 NOISE EXPOSURE MAP FORECAST DOCUMENTATION AND FAA APPROVAL

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D.1 BNA Noise Exposure Map Forecast

The Aviation Demand Forecast prepared for the Noise Exposure Map Update (included in this appendix) was completed by AECOM in December 2018. At that time, it was anticipated that the NEM Update would be filed during calendar year 2019, and so the forecast years used were 2019 and 2024.

Since this report is being submitted in January 2020, the MNAA evaluated how the FAA approved forecast for 2019 compared to the actual operations for 2019 in order to justify that 2020 and 2025 are still representative. The evaluation showed that the FAA approved 2019 forecast operations are approximately 3.4 percent higher than the actual 2019 operations[1] and therefore submitting these NEMs as 2020 and 2025 is representative of conditions evaluated in this report.

[1] FAA OPSNET data pulled Jan 2020 – Dec 2019 was not available at this time, so the Nov 2019 operations were used to make a 12-month set.

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BNA
MASTER PLAN
NASHVILLE INTERNATIONAL AIRPORT

Appendix A

Noise Exposure Map (NEM) Update Forecast 2019 and 2024

Nashville International Airport (BNA)

Master Plan Update

December 28, 2018

AECOM

BNA Nashville International Airport

Final Report

Appendix A NEM Update Forecast 2019 and 2024

For the purpose of developing the Noise Exposure Map (NEM) update for MNAA, the annual aircraft operations forecast for 2019 and 2024 are given in **Table A-1** below. The annual aircraft operations forecast follows the approach and methodology given in the Aviation Demand Forecasts Report for the BNA Master Plan Update.

Table A-1. Annual Aircraft Operations Forecast for 2019 and 2024

Year	Baseline Scenario							FAA TAF (2017 Model, issued Jan 2018)	% Difference between Baseline and FAA TAF
	Passenger Aircraft	All-Cargo Aircraft	Air Carrier	Air Taxi	General Aviation	Military	Total Operations		
	Actual							Forecast	
2017	132,473	2,662	135,135	30,540	36,577	3,550	**205,802**	**204,731**	**0.5%**
	Forecast							Forecast	
2018*	160,034	2,785	162,819	30,832	36,791	3,550	**233,992**	214,692	9.0%
2019	169,137	2,896	172,033	31,127	37,006	3,550	**243,716**	**219,570**	**11.0%**
2020*	174,500	2,984	177,484	31,425	37,222	3,550	**249,680**	223,821	11.6%
2021*	177,826	3,047	180,873	31,726	37,439	3,550	**253,588**	227,673	11.4%
2022*	180,263	3,099	183,362	32,029	37,658	3,550	**256,599**	231,516	10.8%
2023*	181,816	3,146	184,962	32,894	38,534	3,550	**259,940**	235,476	10.4%
2024	183,385	3,194	186,579	33,783	39,431	3,550	**263,343**	**239,592**	**9.9%**

Source: AECOM analysis.

*Note: * Operation forecasts at 2018, 2020, 2021, 2022, and 2023 are included as reference only. The NEM Update is based on the operation forecasts for 2019 and 2024. Numbers may not add up due to rounding.*

In accordance with Federal Aviation Regulations (FAR) Part 150 guidance, operations are shown by arrivals and departures, time-of-day, and stage length. Time-of-day indicates, as the name implies, whether the operation takes place in the day or night, while stage length is used to assess typical aircraft takeoff weights and resulting takeoff performance. Standard noise modeling methodology assumes that aircraft takeoff weights and resulting aircraft performance can be approximated based upon stage (or trip) length, a factor much more readily obtainable from airline schedules. Longer distance (high stage length) flights are assumed to require more fuel and thus to have higher takeoff weights. This increases takeoff distance and lowers the aircraft's climb rate, as compared to lighter (short trip) flights. Accordingly, information on aircraft stage lengths is incorporated into the Part 150 forecast. The following presents the parameters that define the time-of-day and stage length metrics:

Day/Night Operations	Time-of-Day
Day Operations	7:00 am to 10:00 pm
Night Operations	10:00 pm to 7:00 am

Abbreviations for Stage Lengths (SL)	Trip Length (Nautical Miles)
SL1	0 – 500
SL2	500 – 1,000
SL3	1,000 – 1,500
SL4	1,500 – 2,500
SL5	2,500 – 3,500
SL6	3,500 – 4,500

Operations forecasts for all activity types (Passenger, Cargo, GA, and Military) are presented with this level of detail to facilitate the NEM modeling process.

Passenger carrier operations are presented in Tables TS-1 for the 2017 baseline operations data, while Tables TS-2 and TS-3 present the 2019 and 2024 operations forecast, respectively.

In line with announced fleet changes, the American and Delta MD80 series fleets have been eliminated from the fleet after 2020. These operations have been replaced by B737 operations by both carriers consistent with their announced fleet replacement strategies.

Table TS-1. 2017 Passenger Carrier Operations

Aircraft Code	Model	Arrivals			Departures												Total Departures	Total Operations
					Day						Night							
		Day	Night	Total Arrivals	SL1	SL2	SL3	SL4	SL6	Total	SL1	SL2	SL3	SL4	SL6	Total		
A319	Airbus A319	2,349	740	3,089	916	623	374	714	0	2,627	239	156	30	37	0	462	3,089	6,178
A320	Airbus A320	2,307	207	2,514	484	1,381	164	313	0	2,342	43	116	6	7	0	172	2,514	5,028
A321	Airbus A321	108	11	119	55	31	8	16	0	110	3	4	1	1	0	9	119	238
B38M	Boeing 737 MAX 8	230	37	267	51	111	18	35	0	215	15	21	7	9	0	52	267	534
B712	Boeing 717	990	12	1,002	661	316	2	4	0	983	13	5	0	1	0	19	1,002	2,004
B733	Boeing 737-300	900	127	1,027	513	410	2	4	0	929	8	86	2	2	0	98	1,027	2,054
B737	Boeing 737-700	19,128	3,025	22,153	9,337	8,280	598	1,144	0	19,359	968	1,526	134	166	0	2,794	22,153	44,306
B738	Boeing 737-800	8,163	1,784	9,947	1,653	4,125	711	1,359	0	7,848	259	1,232	272	336	0	2,099	9,947	19,894
B739	Boeing 737-900	337	38	375	66	45	82	157	0	350	2	16	3	4	0	25	375	750
B752	Boeing 757-200	74	8	82	25	25	7	12	0	69	6	5	1	1	0	13	82	164
B753	Boeing 757-300	26	1	27	15	8	1	1	0	25	1	0	0	1	0	2	27	54
CRJ1	Canadair Regional Jet 100	246	53	299	0	204	0	0	0	204	0	95	0	0	0	95	299	598
CRJ2	Canadair Regional Jet 200	2,103	205	2,308	871	932	0	0	0	1,803	207	298	0	0	0	505	2,308	4,616
CRJ7	Canadair Regional Jet 700	3,264	798	4,062	2,875	838	3	7	0	3,723	330	7	1	1	0	339	4,062	8,124
CRJ9	Canadair Regional Jet 900	3,608	471	4,079	984	2,135	8	16	0	3,143	557	375	2	2	0	936	4,079	8,158
DH8D	DHC-8-400 Dash 8Q	270	0	270	1	269	0	0	0	270	0	0	0	0	0	0	270	540
E135	Embraer RJ135	220	62	282	15	218	1	2	0	236	1	45	0	0	0	46	282	564
E145	Embraer RJ145	1,879	58	1,937	896	915	2	5	0	1,818	13	105	0	1	0	119	1,937	3,874
E170	Embraer 170	860	7	867	91	754	2	3	0	850	9	8	0	0	0	17	867	1,734
E190	Embraer 190	512	29	541	102	388	1	1	0	492	1	48	0	0	0	49	541	1,082
E45X	Embraer 145XR	188	6	194	79	110	0	0	0	189	0	5	0	0	0	5	194	388
E75L	Embraer 175 (long wing)	3,819	496	4,315	1,335	2,503	15	28	0	3,881	312	117	2	3	0	434	4,315	8,630
E75S	Embraer 175 (short wing)	1,923	128	2,051	632	1,327	9	17	0	1,985	31	31	2	2	0	66	2,051	4,102
MD82	McDonnell Douglas MD-82	187	3	190	2	187	0	1	0	190	0	0	0	0	0	0	190	380
MD83	McDonnell Douglas MD-83	678	3	681	26	649	0	0	0	675	1	5	0	0	0	6	681	1,362
MD88	McDonnell Douglas MD-88	2,767	306	3,073	2,645	80	4	7	0	2,736	327	8	1	1	0	337	3,073	6,146
MD90	McDonnell Douglas MD-90	418	67	485	378	41	2	3	0	424	58	3	0	1	0	62	486	971
Total		57,554	8,682	66,236	24,708	26,905	2,014	3,849	0	57,476	3,404	4,317	464	576	0	8,761	66,237	132,473

Source: Nashville InFLIGHT Flight Tracking System (FTS), FAA OPSNET, TransSolutions, August 21, 2018.

Table TS-2. 2019 Passenger Carrier Operations

Aircraft Code	Model	Arrivals			Departures												Total Departures	Total Operations
					Day						Night							
		Day	Night	Total Arrivals	SL1	SL2	SL3	SL4	SL6	Total	SL1	SL2	SL3	SL4	SL6	Total		
A319	Airbus A319	2,999	945	3,944	1,170	795	477	912	0	3,354	305	199	39	47	0	590	3,944	7,888
A320	Airbus A320	2,946	264	3,210	618	1,763	209	400	0	2,990	55	148	8	9	0	220	3,210	6,420
A321	Airbus A321	1,139	14	1,153	1,070	40	11	20	0	1,141	4	5	1	2	0	12	1,153	2,306
B38M	Boeing 737 MAX 8	533	51	584	68	381	24	45	0	518	19	27	9	11	0	66	584	1,168
B712	Boeing 717	1,264	15	1,279	844	403	3	5	0	1,255	17	6	0	1	0	24	1,279	2,558
B733	Boeing 737-300	1,149	162	1,311	655	523	3	5	0	1,186	10	110	2	3	0	125	1,311	2,622
B737	Boeing 737-700	24,217	3,842	28,059	11,862	10,505	729	1,417	0	24,513	1,230	1,938	169	208	0	3,545	28,058	56,117
B738	Boeing 737-800	10,422	2,278	12,700	2,110	5,267	907	1,736	0	10,020	331	1,573	348	428	0	2,680	12,700	25,400
B739	Boeing 737-900	426	71	497	84	57	111	212	0	464	4	20	4	5	0	33	497	994
B752	Boeing 757-200	74	8	82	25	25	7	12	0	69	6	5	1	1	0	13	82	164
B753	Boeing 757-300	26	1	27	15	8	1	1	0	25	1	0	0	1	0	2	27	54
B788	Boeing 787-8	238	0	238	0	0	0	0	238	238	0	0	0	0	0	0	238	476
CRJ1	Canadair Regional Jet 100	313	68	381	0	260	0	0	0	260	0	121	0	0	0	121	381	762
CRJ2	Canadair Regional Jet 200	2,684	262	2,946	1,112	1,190	0	0	0	2,302	264	380	0	0	0	644	2,946	5,892
CRJ7	Canadair Regional Jet 700	4,168	1,019	5,187	3,671	1,070	4	9	0	4,754	421	9	1	2	0	433	5,187	10,374
CRJ9	Canadair Regional Jet 900	4,607	601	5,208	1,256	2,726	11	20	0	4,013	711	479	2	3	0	1,195	5,208	10,416
DH8D	DHC-8-400 Dash 8Q	344	0	344	1	343	0	0	0	344	0	0	0	0	0	0	344	688
E135	Embraer RJ135	281	79	360	20	278	1	3	0	302	1	57	0	0	0	58	360	720
E145	Embraer RJ145	2,399	74	2,473	1,144	1,168	3	6	0	2,321	17	134	0	1	0	152	2,473	4,946
E170	Embraer 170	1,097	9	1,106	116	963	2	4	0	1,085	11	10	0	0	0	21	1,106	2,212
E190	Embraer 190	654	37	691	131	495	1	2	0	629	1	61	0	0	0	62	691	1,382
E45X	Embraer 145XR	240	8	248	102	140	0	0	0	242	0	6	0	0	0	6	248	496
E75L	Embraer 175 (long wing)	4,876	633	5,509	1,705	3,196	19	36	0	4,956	398	149	3	3	0	553	5,509	11,018
E75S	Embraer 175 (short wing)	2,455	163	2,618	806	1,694	11	22	0	2,533	40	40	2	3	0	85	2,618	5,236
MD83	McDonnell Douglas MD-83	866	4	870	34	829	0	0	0	863	1	6	0	0	0	7	870	1,740
MD88	McDonnell Douglas MD-88	2,533	391	2,924	2,377	102	5	9	0	2,493	418	10	1	2	0	431	2,924	5,848
MD90	McDonnell Douglas MD-90	534	86	620	483	52	2	4	0	541	74	4	0	1	0	79	620	1,240
Total		73,484	11,085	84,569	31,479	34,273	2,541	4,880	238	73,411	4,339	5,497	590	731	0	11,157	84,568	169,137

Source: Nashville InFLIGHT Flight Tracking System (FTS), FAA OPSNET, TransSolutions, August 21, 2018.

Table TS-3. 2024 Passenger Carrier Operations

Aircraft Code	Model	Arrivals			Departures													Total Operations
					Day						Night							
		Day	Night	Total Arrivals	SL1	SL2	SL3	SL4	SL6	Total	SL1	SL2	SL3	SL4	SL6	Total	Total Departures	
A319	Airbus A319	3,252	1,024	4,276	1,268	862	517	989	0	3,636	331	216	42	51	0	640	4,276	8,552
A320	Airbus A320	3,194	287	3,481	670	1,912	227	433	0	3,242	60	161	8	10	0	239	3,481	6,962
A321	Airbus A321	1,926	116	2,042	1,070	825	14	27	0	1,936	85	17	2	2	0	106	2,042	4,084
B38M	Boeing 737 MAX 8	576	55	631	73	411	26	49	0	559	21	29	10	12	0	72	631	1,262
B712	Boeing 717	1,368	17	1,385	914	437	3	5	0	1,359	18	7	0	1	0	26	1,385	2,770
B737	Boeing 737-700	29,832	4,610	34,442	16,524	11,247	810	1,550	0	30,131	1,786	2,113	185	228	0	4,312	34,443	68,885
B738	Boeing 737-800	12,546	2,646	15,192	2,998	6,278	987	1,887	0	12,150	370	1,824	380	468	0	3,042	15,192	30,384
B739	Boeing 737-900	467	53	520	92	62	114	217	0	485	3	22	4	6	0	35	520	1,040
B752	Boeing 757-200	74	8	82	25	25	7	12	0	69	6	5	1	1	0	13	82	164
B753	Boeing 757-300	26	1	27	15	8	1	1	0	25	1	0	0	1	0	2	27	54
B788	Boeing 787-8	260	0	260	0	0	0	0	260	260	0	0	0	0	0	0	260	520
CRJ1	Canadair Regional Jet 100	341	73	414	0	282	0	0	0	282	0	132	0	0	0	132	414	828
CRJ2	Canadair Regional Jet 200	2,911	284	3,195	1,205	1,290	0	0	0	2,495	287	413	0	0	0	700	3,195	6,390
CRJ7	Canadair Regional Jet 700	4,518	1,105	5,623	3,979	1,160	5	9	0	5,153	457	10	1	2	0	470	5,623	11,246
CRJ9	Canadair Regional Jet 900	4,995	652	5,647	1,362	2,956	11	22	0	4,351	771	519	3	3	0	1,296	5,647	11,294
DH8D	DHC-8-400 Dash 8Q	374	0	374	1	373	0	0	0	374	0	0	0	0	0	0	374	748
E135	Embraer RJ135	304	86	390	21	302	1	3	0	327	1	62	0	0	0	63	390	780
E145	Embraer RJ145	2,601	80	2,681	1,240	1,267	3	7	0	2,517	18	145	0	1	0	164	2,681	5,362
E170	Embraer 170	1,190	10	1,200	126	1,044	2	5	0	1,177	12	11	0	0	0	23	1,200	2,400
E190	Embraer 190	708	40	748	141	537	1	2	0	681	1	66	0	0	0	67	748	1,496
E45X	Embraer 145XR	260	8	268	109	152	0	0	0	261	0	7	0	0	0	7	268	536
E75L	Embraer 175 (long wing)	5,287	687	5,974	1,848	3,465	21	39	0	5,373	432	162	3	4	0	601	5,974	11,948
E75S	Embraer 175 (short wing)	2,663	177	2,840	875	1,837	12	24	0	2,748	43	43	3	3	0	92	2,840	5,680
Total		79,673	12,019	91,692	34,556	36,732	2,762	5,281	260	79,591	4,703	5,964	642	793	0	12,102	91,693	183,385

Source: Nashville InFLIGHT Flight Tracking System (FTS), FAA OPSNET, TransSolutions, August 21, 2018.

Table TS-4 presents the 2017 baseline cargo operations data, while Table TS-5 and Table TS-6 present the 2019 and 2024 forecasted operations respectively.

Table TS-4. 2017 All-Cargo Aircraft Operations

Aircraft Code	Model	Arrivals			Departures													Total Operations
					Day						Night							
		Day	Night	Total Arrivals	SL1	SL2	SL3	SL4	SL6	Total	SL1	SL2	SL3	SL4	SL6	Total	Total Departures	
A306	Airbus A300-600	30	77	107	23	2	0	0	0	25	81	1	0	0	0	82	107	214
B190	Beechcraft 1900	3	3	6	1	0	0	0	0	1	4	1	0	0	0	5	6	12
B744	Boeing 747-400	4	3	7	2	2	0	0	0	4	1	1	1	0	0	3	7	14
B752	Boeing 757-200	161	767	928	229	12	1	0	0	242	523	163	0	0	0	686	928	1,856
B762	Boeing 767-200	45	35	80	4	1	2	0	0	7	71	2	0	0	0	73	80	160
B763	Boeing 767-300	31	128	159	14	4	1	0	0	19	137	3	0	0	0	140	159	318
B77L	Boeing 777-200LR / 777F	2	3	5	1	0	2	0	0	3	0	0	2	0	0	2	5	10
C208	Cessna 208 Caravan	8	1	9	4	0	0	0	0	4	4	1	0	0	0	5	9	18
DC10	Douglas DC-10	5	4	9	4	3	0	0	0	7	2	0	0	0	0	2	9	18
MD11	McDonnell Douglas MD-11	10	4	14	7	3	2	0	0	12	1	0	1	0	0	2	14	28
SW4	SWEARINGEN Merlin 4	4	3	7	2	0	0	0	0	2	4	1	0	0	0	5	7	14
Total		303	1,028	1,331	291	27	8	0	0	326	828	173	4	0	0	1,005	1,331	2,662

Source: Nashville InFLIGHT Flight Tracking System (FTS), FAA OPSNET, TransSolutions, August 17, 2018.

Table TS-5. 2019 All-Cargo Aircraft Operations

Aircraft Code	Model	Arrivals			Departures													Total Operations
					Day						Night							
		Day	Night	Total Arrivals	SL1	SL2	SL3	SL4	SL6	Total	SL1	SL2	SL3	SL4	SL6	Total	Total Departures	
A306	Airbus A300-600	33	83	116	25	2	0	0	0	27	88	1	0	0	0	89	116	232
B190	Beechcraft 1900	3	3	6	1	0	0	0	0	1	4	1	0	0	0	5	6	12
B752	Boeing 757-200	182	842	1,024	253	15	3	0	0	271	571	179	3	0	0	753	1,024	2,048
B762	Boeing 767-200	49	38	87	4	1	2	0	0	7	78	2	0	0	0	80	87	174
B763	Boeing 767-300	39	144	183	19	7	1	0	0	27	153	3	0	0	0	156	183	366
C208	Cessna 208 Caravan	9	1	10	5	0	0	0	0	5	4	1	0	0	0	5	10	20
MD11	McDonnell Douglas MD-11	11	4	15	8	3	2	0	0	13	1	0	1	0	0	2	15	30
SW4	SWEARINGEN Merlin 4	4	3	7	2	0	0	0	0	2	4	1	0	0	0	5	7	14
Total		330	1,118	1,448	317	28	8	0	0	353	903	188	4	0	0	1,095	1,448	2,896

Source: Nashville InFLIGHT Flight Tracking System (FTS), FAA OPSNET, TransSolutions, August 17, 2018.

Table TS-6. 2024 All-Cargo Aircraft Operations

Aircraft Code	Model	Arrivals			Departures													
					Day						Night							
		Day	Night	Total Arrivals	SL1	SL2	SL3	SL4	SL6	Total	SL1	SL2	SL3	SL4	SL6	Total	Total Departures	Total Operations
A306	Airbus A300-600	36	92	128	28	2	0	0	0	30	97	1	0	0	0	98	128	256
B190	Beechcraft 1900	4	4	8	2	0	0	0	0	2	5	1	0	0	0	6	8	16
B752	Boeing 757-200	199	927	1,126	280	16	3	0	0	299	627	197	3	0	0	827	1,126	2,252
B762	Boeing 767-200	60	47	107	11	5	2	0	0	18	87	2	0	0	0	89	107	214
B763	Boeing 767-300	43	159	202	20	9	3	0	0	32	165	4	1	0	0	170	202	404
C208	Cessna 208 Caravan	10	1	11	5	0	0	0	0	5	5	1	0	0	0	6	11	22
MD11	McDonnell Douglas MD-11	6	0	6	6	0	0	0		6	0	0	0	0	0	0	6	12
SW4	SWEARINGEN Merlin 4	5	4	9	3	0	0	0	0	3	5	1	0	0	0	6	9	18
Total		363	1,234	1,597	355	32	8	0	0	395	991	207	4	0	0	1,202	1,597	3,194

Source: Nashville InFLIGHT Flight Tracking System (FTS), FAA OPSNET, TransSolutions, August 17, 2018.

Table TS-7 presents the 2017 general aviation operations data, while Table TS-8 and Table TS-9 present the 2019 and 2024 forecasted operations respectively.

Table TS-7. 2017 General Aviation Operations

Aircraft Type	Arrivals			Departures													
				Day						Night							
	Day	Night	Total Arrivals	SL1	SL2	SL3	SL4	SL6	Total	SL1	SL2	SL3	SL4	SL6	Total	Total Departures	Total Operations
Business Jet	17,459	1,670	19,129	9,828	5,763	545	563	30	16,729	1,694	615	47	44	0	2,400	19,129	38,258
Turbo Prop	7,614	460	8,074	6,691	606	6	6	0	7,309	670	94	1	0	0	765	8,074	16,148
Multi Piston	1,128	373	1,501	805	95	2	2	0	904	558	38	1	0	0	597	1,501	3,002
Single Piston	4,725	129	4,854	1,936	186	13	14	1	2,150	2,238	456	6	5	0	2,705	4,855	9,709
Total	30,926	2,632	33,558	19,260	6,650	566	585	31	27,092	5,160	1,203	55	49	0	6,467	33,559	67,117

Source: Nashville InFLIGHT Flight Tracking System (FTS), FAA OPSNET, TransSolutions, August 17, 2018.

Table TS-8. 2019 General Aviation Operations

Aircraft Type	Arrivals			Departures												Total Operations
	Day	Night	Total Arrivals	Day						Night						Total Departures	
				SL1	SL2	SL3	SL4	SL6	Total	SL1	SL2	SL3	SL4	SL6	Total		
Business Jet	17,724	1,695	19,419	9,977	5,850	553	571	31	16,982	1,721	624	47	45	0	2,437	19,419	38,838
Turbo Prop	7,729	467	8,196	6,793	615	6	6	0	7,420	680	95	1	0	0	776	8,196	16,392
Multi Piston	1,145	379	1,524	818	96	2	2	0	918	565	39	1	0	0	605	1,523	3,047
Single Piston	4,797	131	4,928	1,965	189	13	14	1	2,182	2,272	463	6	5	0	2,746	4,928	9,856
Total	31,395	2,672	34,067	19,553	6,750	574	593	32	27,502	5,238	1,221	55	50	0	6,564	34,066	68,133

Source: Nashville InFLIGHT Flight Tracking System (FTS), FAA OPSNET, TransSolutions, August 17, 2018.

Table TS-9. 2024 General Aviation Operations

Aircraft Type	Arrivals			Departures												Total Operations
	Day	Night	Total Arrivals	Day						Night						Total Departures	
				SL1	SL2	SL3	SL4	SL6	Total	SL1	SL2	SL3	SL4	SL6	Total		
Business Jet	19,045	1,822	20,867	10,721	6,287	593	614	33	18,248	1,849	671	51	48	0	2,619	20,867	41,734
Turbo Prop	8,306	502	8,808	7,299	661	7	7	0	7,974	730	103	1	0	0	834	8,808	17,616
Multi Piston	1,230	407	1,637	878	104	2	2	0	986	609	41	1	0	0	651	1,637	3,274
Single Piston	5,154	141	5,295	2,111	203	15	15	1	2,345	2,441	497	6	6	0	2,950	5,295	10,590
Total	33,735	2,872	36,607	21,009	7,255	617	638	34	29,553	5,629	1,312	59	54	0	7,054	36,607	73,214

Source: Nashville InFLIGHT Flight Tracking System (FTS), FAA OPSNET, TransSolutions, August 17, 2018.

To address the military flights, the 3,550 annual operations from OPSNET were distributed among military aircraft types known to be operating at BNA. Approximately half of the operations were assigned to the TAANG Blackhawk helicopters based at BNA and the remainder assigned to the military fleet aircraft types available for BNA from July 2017 to June 2018 through the FAA Traffic Flow Management System Counts (TFMSC). Tables TS-10 presents the Military operations that will be used for the NEM update.

Table TS-10. 2017, 2019, and 2024 Military Operations

Aircraft Code	Model	Arrivals			Departures											Total Operations
					Day					Night						
		Day	Night	Total Arrivals	SL1	SL2	SL3	SL4	Total	SL1	SL2	SL3	SL4	Total	Total Departures	
A10	Fairchild A10	3	0	3	3	0	0	0	3	0	0	0	0	0	3	6
B350	Beech Super King Air 350	14	1	15	8	5	1	1	15	0	0	0	0	0	15	30
B737	Boeing 737-700	10	0	10	9	1	0	0	10	0	0	0	0	0	10	20
B747	Boeing 747 All Series	5	0	5	5	0	0	0	5	0	0	0	0	0	5	10
BE20	Beech 200 Super King	16	0	16	10	6	0	0	16	0	0	0	0	0	16	32
BE40	Raytheon/Beech Beechjet 400/T-1	47	0	47	40	7	0	0	47	0	0	0	0	0	47	94
BE9L	Beech King Air 90	8	0	8	5	3	0	0	8	0	0	0	0	0	8	16
C130	Lockheed 130 Hercules	50	3	53	32	16	1	2	51	2	0	0	0	2	53	106
C17	Boeing Globemaster 3	30	2	32	19	1	2	7	29	2	0	0	1	3	32	64
C30J	C-130J Hercules ; Lockheed	27	1	28	18	7	1	2	28	0	0	0	0	0	28	56
C560	Cessna Citation V/Ultra/Encore	21	1	22	17	4	0	0	21	1	0	0	0	1	22	44
C750	Cessna Citation X	15	0	15	12	1	1	0	14	0	1	0	0	1	15	30
CN35	CASA CN-235	7	0	7	7	0	0	0	7	0	0	0	0	0	7	14
D328	Dornier 328 Series	41	0	41	39	2	0	0	41	0	0	0	0	0	41	82
DA42	Diamond Twin Star	3	0	3	1	2	0	0	3	0	0	0	0	0	3	6
DHC6	DeHavilland Twin Otter	3	1	4	2	2	0	0	4	0	0	0	0	0	4	8
EC45	Eurocopter EC-145	30	0	30	30	0	0	0	30	0	0	0	0	0	30	60
F15	Boeing F-15 Eagle	6	0	6	6	0	0	0	6	0	0	0	0	0	6	12
F16	Lockheed F-16 Fighting Falcon	9	0	9	7	2	0	0	9	0	0	0	0	0	9	18
F18	Boeing FA-18 Hornet	11	0	11	11	0	0	0	11	0	0	0	0	0	11	22
F18H	F/A 18 Hornet	36	0	36	14	22	0	0	36	0	0	0	0	0	36	72
F18S	F18 Hornet	33	1	34	6	28	0	0	34	0	0	0	0	0	34	68
F22	Boeing Raptor F22	10	0	10	9	1	0	0	10	0	0	0	0	0	10	20
F5	Northrop F-5 Freedom Fighter	3	0	3	3	0	0	0	3	0	0	0	0	0	3	6

Aircraft Code	Model	Arrivals			Departures											Total Operations
		Day	Night	Total Arrivals	Day					Night					Total Departures	
					SL1	SL2	SL3	SL4	Total	SL1	SL2	SL3	SL4	Total		
FA18	F18 Hornet	16	0	16	16	0	0	0	16	0	0	0	0	0	16	32
GLF5	Gulfstream V/G500	8	0	8	7	1	0	0	8	0	0	0	0	0	8	16
H60	Sikorsky SH-60 Seahawk	46	0	46	46	0	0	0	46	0	0	0	0	0	46	92
HAR	Boeing AV-8 Harrier	7	0	7	6	1	0	0	7	0	0	0	0	0	7	14
HAWK	BAe Systems Hawk	15	0	15	15	0	0	0	15	0	0	0	0	0	15	30
K35R	Boeing KC-135 Stratotanker	10	0	10	5	4	1	0	10	0	0	0	0	0	10	20
LJ35	Bombardier Learjet 35/36	9	0	9	5	4	0	0	9	0	0	0	0	0	9	18
M28	PZL M-28 Skytruck	4	0	4	3	1	0	0	4	0	0	0	0	0	4	8
P28A	Piper Cherokee	11	0	11	11	0	0	0	11	0	0	0	0	0	11	22
P8	Boeing P-8 Poseidon	4	0	4	3	1	0	0	4	0	0	0	0	0	4	8
PC12	Pilatus PC-12	13	0	13	13	0	0	0	13	0	0	0	0	0	13	26
SW4	Swearingen Merlin 4/4A Metro2	13	0	13	11	2	0	0	13	0	0	0	0	0	13	26
T38	Northrop T-38 Talon	16	0	16	9	7	0	0	16	0	0	0	0	0	16	32
TEX2	Raytheon Texan 2	103	0	103	98	5	0	0	103	0	0	0	0	0	103	206
UH60	Blackhawk Helicopter	1,052	0	1,052	1,052	0	0	0	1,052	0	0	0	0	0	1,052	2,104
Total		1,765	10	1,775	1,613	136	7	12	1,768	5	1	0	1	7	1,775	3,550

Source: Nashville InFLIGHT Flight Tracking System (FTS), FAA OPSNET, TransSolutions, August 17, 2018.

Appendix B Summary of Scheduled Departures in 2017 and 2018

The average seats per departure and fleet mix for 2017 and 2018 are based on the flight schedules as summarized in **Table B-1** below.

Table B-1. Summary of Scheduled Departures and Departure Seats in 2017 and 2018

Carrier	Destination	Aircraft	Departures 1/1/2018 - 12/31/2018	Departure Seats 1/1/2018 - 12/31/2018	Carrier	Destination	Aircraft	Departures 1/1/2017 - 12/31/2017	Departure Seats 1/1/2017 - 12/31/2017
4B			1,052	7,454	4B			952	6,664
	GLH		626	4,442		GLH		625	4,375
		PL2	626	4,442			PL2	625	4,375
	MSL		426	3,012		MSL		327	2,289
		PL2	426	3,012			PL2	327	2,289
9X			401	4,317	9X			724	7,878
	MEM		401	4,317		MEM		724	7,878
		CNC	401	4,317			CNC	724	7,878
AA			16,038	1,535,710	AA			16,064	1,436,057
	CLT		2,673	315,171		CLT		2,789	296,514
		319	988	126,464			319	1,401	177,156
		320	426	63,900			320	193	28,950
		321	80	14,960					
		738	79	11,692					
		73H	155	24,800					
		CR2	31	1,550			CR2	9	450
							CR7	1	65
		CR9	310	23,422			CR9	403	30,628
		E75	468	34,919			E75	753	56,394
		E90	136	13,464			E90	29	2,871
	CUN		41	5,376		CUN		41	5,180
		319	37	4,736			319	41	5,180
		73H	4	640					
	DCA		1,667	101,593		DCA		1,728	103,179
		319	2	256					
		CR2	407	20,350			CR2	723	36,144
		CR7	374	24,117			CR7	548	35,620
							CR9	63	4,788
		CRJ	140	7,000					
		E75	542	39,770			E75	277	20,777
		ER4	202	10,100			ER4	117	5,850
	DFW		2,774	404,097		DFW		2,706	390,989
		319	1	128			319	82	10,268
		738	917	135,716					
		73H	859	138,613			73H	1,557	235,795
							CR9	16	1,216
		E75	131	9,956			E75	20	1,520
		ER4	2	100			ER4	1	50
		M80	176	24,640					
		M82	688	94,944			M82	1,030	142,140
	JFK		716	36,256		JFK		724	44,081
		E75	80	6,094			E75	319	23,831
		ER4	363	18,150			ER4	405	20,250
		ERD	273	12,012			ERD		
	LAX		757	115,950		LAX		671	94,592
		319	47	6,016			319	278	34,756
		32B	27	4,293					

Carrier	Destination	Aircraft	Departures 1/1/2018 - 12/31/2018	Departure Seats 1/1/2018 - 12/31/2018
		738	330	48,840
		73H	353	56,801
	LGA		1,642	99,842
		321	1	187
		CR2	79	3,950
		E75	874	64,899
		ER4	89	4,450
		ERD	599	26,356
	MIA		1,084	97,311
		319	84	10,752
		73H	144	23,340
		E75	856	63,219
	ORD		2,928	201,901
		738	131	19,388
		73H	51	8,160
		CR7	2,050	137,577
		E75	76	5,776
		ER4	620	31,000
	PHL		1,756	158,213
		319	386	49,408
		320	19	2,850
		321	1	187
		E75	504	37,400
		E90	532	52,668
		ER4	314	15,700
AC			1,031	51,550
	YYZ		1,031	51,550
		CRJ	1,031	51,550
AS			681	111,908
	SEA		434	75,236
		320	1	148
		739	147	25,284
		73H	80	12,560
		73J	206	37,244
	SFO		247	36,672
		319	3	357
		320	209	30,932
		32A	28	4,088
		32B	7	1,295
B6			1,067	158,800
	BOS		703	104,200
		320	678	101,700
		E90	25	2,500
	FLL		364	54,600
		320	364	54,600
BA			164	35,097
	LHR		164	35,097
		788	163	34,882
		789	1	215
DL			12,436	1,412,598
	ATL		3,538	554,480
		319	9	1,188

Carrier	Destination	Aircraft	Departures 1/1/2017 - 12/31/2017	Departure Seats 1/1/2017 - 12/31/2017
		73H	393	59,836
	LGA		1,644	104,187
		CR2	246	12,300
		E75	884	66,187
		ER4	514	25,700
		ERD		
	MIA		1,092	91,190
		319		
		73H	131	20,139
		E75	923	69,151
		ER4	38	1,900
	ORD		2,967	184,740
		73H		
		CR2	182	9,100
		CR7	2,250	148,890
		E75		
		ER4	535	26,750
	PHL		1,702	121,405
		319		
		CR2	235	11,750
		CR9	5	380
		E75	1,343	100,336
		E90	61	6,039
		ER4	58	2,900
AC			1,038	51,900
	YYZ		1,038	51,900
		CRJ	1,038	51,900
AS			366	62,205
	SEA		366	62,205
		739	65	11,180
		73H	144	22,608
		73J	157	28,417
B6			1,086	162,150
	BOS		721	107,400
		320	706	105,900
		E90	15	1,500
	FLL		365	54,750
		320	365	54,750
DL			11,345	1,235,456
	ATL		3,508	508,062
		319	124	15,828

Carrier	Destination	Aircraft	Departures 1/1/2018 - 12/31/2018	Departure Seats 1/1/2018 - 12/31/2018
		320	2	296
		321	1	170
		717	58	6,380
		738	4	600
		739	61	10,980
		73W	1	124
		757	556	110,644
		M88	2,842	423,458
		M90	4	640
	BOS		765	58,274
		321	1	170
		757	5	995
		CR7	1	69
		CR9	467	35,492
		E70	16	1,088
		E75	46	3,514
		E7W	229	16,946
	CUN		34	5,438
		739	12	2,160
		M88	22	3,278
	CVG		229	17,404
		CR9	229	17,404
	DTW		1,867	225,167
		319	66	8,712
		320	64	9,472
		321	17	2,890
		717	844	92,840
		739	27	4,860
		CR7	5	346
		CR9	305	23,180
		E75	2	146
		E7W	1	74
		M88	283	42,167
		M90	253	40,480
	JFK		786	59,160
		CR9	498	37,848
		E7W	288	21,312
	LAS		2	300
		738	2	300
	LAX		546	77,724
		319	232	30,624
		738	314	47,100
	LGA		1,817	134,314
		CR7	99	6,902
		CR9	505	38,380
		E70	145	9,906
		E75	81	6,088
		E7W	987	73,038

Carrier	Destination	Aircraft	Departures 1/1/2017 - 12/31/2017	Departure Seats 1/1/2017 - 12/31/2017
		320	117	17,316
		717	381	41,910
		738	11	1,650
		739	1	180
		73H	1	150
		73W	35	4,340
		757	1	184
		CR7	1	70
		CR9	5	380
		M88	2,446	364,454
		M90	385	61,600
	BOS		365	27,011
		CR9	266	20,216
		E70	89	6,045
		E75	10	750
		E7W		
	CUN		36	5,364
		320		
		M88	36	5,364
	CVG		376	25,456
		CR9	256	19,456
		CRJ	120	6,000
	DTW		1,849	205,156
		319	144	18,366
		320	185	27,380
		717	537	59,070
		739	4	720
		73H	1	150
		757	1	184
		CR7	67	4,620
		CR9	490	37,240
		CRJ	53	2,650
		E70	1	68
		E75	6	452
		M88	304	45,296
		M90	56	8,960
	JFK		487	37,012
		CR9	487	37,012
	LAS			
		738		
	LAX		524	70,854
		319	356	45,654
		738	168	25,200
	LGA		1,759	130,129
		CR7	162	11,322
		CR9	1,197	90,972
		E70	311	21,213
		E75	89	6,622
		E7W		

Carrier	Destination	Aircraft	Departures 1/1/2018 - 12/31/2018	Departure Seats 1/1/2018 - 12/31/2018
	MCO		24	1,800
		CR9	12	912
		E7W	12	888
	MSN		2	220
		717	2	220
	MSP		1,558	134,802
		319	13	1,716
		717	418	45,980
		CR7	166	11,545
		CR9	853	64,828
		E7W	76	5,624
		M88	1	149
		M90	31	4,960
	RDU		581	43,705
		CR7	46	3,175
		CR9	530	40,280
		CRJ	5	250
	SEA		328	46,068
		319	174	22,968
		738	154	23,100
	SLC		359	53,742
		319	6	792
		738	353	52,950
F9			1,097	177,501
	DEN		305	45,900
		319	178	24,564
		320	127	21,336
	LAS		191	32,088
		320	191	32,088
	MCO		232	39,201
		320	217	36,456
		321	15	2,745
	PHL		152	25,536
		320	152	25,536
	RSW		83	12,264
		319	56	7,728
		320	27	4,536
	TPA		20	3,360
		320	20	3,360
	TTN		114	19,152
		320	114	19,152
G4			343	59,388
	MYR		42	7,434
		320	42	7,434
	PGD		68	12,036
		320	68	12,036

Carrier	Destination	Aircraft	Departures 1/1/2017 - 12/31/2017	Departure Seats 1/1/2017 - 12/31/2017
	MCO		39	2,998
		717	1	110
		CR9	38	2,888
		E7W		
	MSP		1,535	126,853
		319	18	2,328
		717	230	25,300
		CR7	46	3,192
		CR9	1,214	92,264
		E70	6	420
		M88	1	149
		M90	20	3,200
	RDU		306	23,243
		CR7	2	139
		CR9	304	23,104
	SEA		198	25,728
		319	198	25,728
		738		
	SLC		363	47,590
		319	281	35,844
		320	43	6,364
		738	33	4,950
		CR7	4	280
		CR9	2	152
F9			914	140,610
	DEN		332	50,739
		319	194	26,772
		320	85	14,280
		321	53	9,687
	LAS		169	28,392
		320	169	28,392
	MCO		237	36,951
		319	96	13,248
		320	140	23,520
		321	1	183
	PHL		71	9,798
		319	71	9,798
		320		
	PHX		48	6,624
		319	48	6,624
	RSW		50	6,930
		319	49	6,762
		320	1	168
	TPA		7	1,176
		320	7	1,176

Carrier	Destination	Aircraft	Departures 1/1/2018 - 12/31/2018	Departure Seats 1/1/2018 - 12/31/2018
	PIE		48	8,055
		319	21	3,276
		320	27	4,779
	RIC		48	8,496
		320	48	8,496
	SAV		50	8,787
		319	3	468
		320	47	8,319
	SYR		26	4,224
		319	18	2,808
		320	8	1,416
	VPS		61	10,356
		319	21	3,276
		320	40	7,080
LF			1,547	28,187
	TUP		1,547	28,187
		J31	1,511	27,503
		J32	36	684
SY			104	16,848
	MCO		17	2,754
		738	17	2,754
	MIA		17	2,754
		738	17	2,754
	MSP		17	2,754
		738	17	2,754
	MSY		18	2,916
		738	18	2,916
	RSW		18	2,916
		738	18	2,916
	TPA		17	2,754
		738	17	2,754
UA			8,748	774,151
	DEN		1,072	83,536
		319	59	7,080
		320	1	138
		738	21	3,192
		CR7	93	6,510
		E70	1	70
		E7W	894	66,396
		ER4	3	150
	EWR		1,685	165,441
		319	164	19,680
		320	104	14,352
		738	387	58,824
		739	6	1,002
		73G	145	17,110
		E70	171	11,682
		E7W	289	21,841
		ERJ	419	20,950
	IAD		1,089	82,057
		319	112	13,440
		320	3	414

Carrier	Destination	Aircraft	Departures 1/1/2017 - 12/31/2017	Departure Seats 1/1/2017 - 12/31/2017
J1			246	1,682
	PIT		246	1,682
		BE4	246	1,682
LF			1,551	28,162
	TUP		1,551	28,162
		J31	1,551	28,162
UA			7,442	634,876
	DEN		706	57,412
		319	39	4,680
		320	23	3,174
		738	39	5,928
		739	1	167
		CR7	269	18,830
		E70	62	4,184
		E7W	271	20,349
		ER4	2	100
	EWR		1,396	137,683
		319	21	2,520
		320	169	23,322
		738	263	39,976
		739	27	4,509
		73G	213	25,134
		E70	189	12,910
		E7W	142	10,712
		ERJ	372	18,600
	IAD		1,064	74,766
		319		
		320	2	276

Carrier	Destination	Aircraft	Departures 1/1/2018 - 12/31/2018	Departure Seats 1/1/2018 - 12/31/2018
		73G	1	118
		CR2	58	2,900
		CR7	413	28,910
		CRJ	22	1,100
		E7W	444	33,375
		ER4	12	600
		ERJ	24	1,200
	IAH		1,862	167,255
		319	179	21,480
		320	231	31,878
		738	29	4,408
		739	92	15,364
		73G	91	10,738
		CR7	547	38,290
		E70	120	8,216
		E7W	325	24,481
		ERJ	248	12,400
	ORD		2,396	194,600
		319	313	37,560
		320	174	24,012
		738	13	1,976
		739	11	1,837
		73G	146	17,228
		CR2	365	18,250
		CR7	75	5,250
		CRJ	200	10,000
		E70	18	1,230
		E7W	946	70,507
		ER4	50	2,500
		ERJ	85	4,250
	SFO		644	81,262
		319	528	63,360
		320	30	4,140
		738	40	6,080
		739	46	7,682
VX			114	16,224
	SFO		114	16,224
		319	15	1,770
		320	99	14,454
WN			35,649	5,355,302
	ATL		613	89,515
		73H	58	10,150
		73W	555	79,365
	AUS		858	130,822
		73H	254	44,450
		73W	604	86,372
	BOS		959	149,457
		73H	376	65,800
		73W	574	82,082
		7M8	9	1,575
	BWI		2,091	311,813

Carrier	Destination	Aircraft	Departures 1/1/2017 - 12/31/2017	Departure Seats 1/1/2017 - 12/31/2017
		73G	3	354
		CR2		
		CR7	630	44,100
		E7W	333	25,236
		ER4	96	4,800
	IAH		1,717	133,233
		319	150	18,000
		320	48	6,624
		738	30	4,560
		739	4	668
		73G	118	13,924
		CR7	529	37,030
		E70	17	1,160
		E7W	395	29,967
		ERJ	426	21,300
	ORD		2,088	169,005
		319	73	8,760
		320	156	21,528
		738	34	5,168
		739	43	7,181
		73G	87	10,266
		753	1	213
		CR2	30	1,500
		CR7	156	10,920
		E70	99	6,752
		E7W	1,051	78,817
		ER4	182	9,100
		ERJ	176	8,800
	SFO		471	62,777
		319	275	33,000
		320	60	8,280
		738	81	12,312
		739	55	9,185
VX			118	15,184
	SFO		118	15,184
		319	73	8,614
		320	45	6,570
WN			32,796	4,872,023
	ATL			
		73H		
		73W		
	AUS		850	125,940
		73C	180	25,740
		73H	136	23,838
		73W	534	76,362
	BOS		930	136,775
		73C	291	41,613
		73H	117	20,516
		73W	522	74,646
	BWI		2,061	305,795
		738	6	1,050
		733	51	7,293
		73C	478	68,354

Carrier	Destination	Aircraft	Departures 1/1/2018 - 12/31/2018	Departure Seats 1/1/2018 - 12/31/2018
		73H	364	63,700
		73W	1,691	241,813
		7M8	36	6,300
	CHS		449	65,551
		73H	42	7,350
		73W	407	58,201
	CLE		906	135,734
		73H	192	33,600
		73W	713	101,959
		7M8	1	175
	CLT		496	72,176
		73H	39	6,825
		73W	457	65,351
	CMH		701	103,251
		73H	82	14,350
		73W	607	86,801
		7M8	12	2,100
	CUN		39	5,577
		73W	39	5,577
	DAL		1,467	219,833
		738	4	640
		73H	305	53,375
		73W	1,151	164,593
		7M8	7	1,225
	DCA		1,124	160,764
		73H	1	175
		73W	1,123	160,589
	DEN		1,646	255,902
		738	12	1,920
		73H	626	109,550
		73W	999	142,857
		7M8	9	1,575
	DTW		681	101,543
		73H	130	22,750
		73W	551	78,793
	ECP		805	116,011
		73H	20	3,500
		73W	777	111,111
		7M8	8	1,400
	FLL		1,243	190,713
		738	36	5,760
		73H	347	60,725
		73W	821	117,403

Carrier	Destination	Aircraft	Departures 1/1/2017 - 12/31/2017	Departure Seats 1/1/2017 - 12/31/2017
		73H	338	59,214
		73W	1,188	169,884
	CHS		403	60,194
		733	11	1,573
		73C	88	12,584
		73H	79	13,862
		73W	225	32,175
	CLE		886	128,524
		73C	49	7,007
		73H	57	9,977
		73W	780	111,540
	CLT		365	52,356
		73C	80	11,440
		73H	5	876
		73W	280	40,040
	CMH		692	101,102
		73C	216	30,888
		73H	67	11,727
		73W	409	58,487
	CUN		8	1,144
		73W	8	1,144
	DAL		1,369	209,551
		738	9	1,575
		733	15	2,145
		73C	239	34,177
		73H	418	73,270
		73W	688	98,384
	DCA		1,083	154,901
		73H	1	175
		73W	1,082	154,726
	DEN		1,596	247,295
		733	29	4,147
		73C	184	26,312
		73H	592	103,723
		73W	791	113,113
	DTW		675	100,803
		73C	91	13,013
		73H	133	23,297
		73W	451	64,493
	ECP		720	106,402
		73C	51	7,293
		73H	107	18,743
		73W	562	80,366
	FLL		1,219	179,383
		733	11	1,573
		73C	204	29,172
		73H	158	27,660
		73W	846	120,978

Carrier	Destination	Aircraft	Departures 1/1/2018 - 12/31/2018	Departure Seats 1/1/2018 - 12/31/2018	Carrier	Destination	Aircraft	Departures 1/1/2017 - 12/31/2017	Departure Seats 1/1/2017 - 12/31/2017
		7M8	39	6,825					
	HOU		1,385	209,287		HOU		1,377	209,312
							738	10	1,750
							733	40	5,720
							73C	253	36,179
		73H	314	54,950			73H	377	65,992
		73W	1,034	147,862			73W	697	99,671
		7M8	37	6,475					
	JAX		980	142,636		JAX		957	140,960
							738	28	4,900
							73C	388	55,484
		73H	74	12,950			73H	100	17,513
		73W	902	128,986			73W	441	63,063
		7M8	4	700					
	LAS		1,143	189,721		LAS		1,116	174,351
		73H	734	128,450			73H	458	80,257
		73W	322	46,046			73W	658	94,094
		7M8	87	15,225					
	LAX		1,016	155,336		LAX		1,007	149,064
							738	9	1,575
		73H	281	49,175			73H	149	26,082
		73W	702	100,386			73W	849	121,407
		7M8	33	5,775					
	LGA		1,070	157,266		LGA		1,123	160,845
		73H	133	23,275			73H	8	1,400
		73W	937	133,991			73W	1,115	159,445
	MCI		1,245	181,715		MCI		1,213	176,480
							733	9	1,287
		73H	115	20,125			73C	401	57,343
		73W	1,130	161,590			73H	94	16,463
							73W	709	101,387
	MCO		1,638	246,520		MCO		1,533	228,107
							733	14	2,002
		738	30	4,800					
							73C	325	46,475
		73H	317	55,475			73H	276	48,356
		73W	1,240	177,320			73W	918	131,274
		7M8	51	8,925					
	MDW		2,311	340,894		MDW		2,309	345,285
		738	5	800			738	36	6,300
		73H	306	53,550			73H	433	75,865
		73W	1,983	283,569			73W	1,840	263,120
		7M8	17	2,975					
	MKE		699	106,293		MKE		113	17,055
		73H	198	34,650			73H	28	4,900
		73W	501	71,643			73W	85	12,155
	MSP		365	52,739		MSP		211	32,268
							73C	11	1,573
		73H	17	2,975			73H	65	11,390
		73W	348	49,764			73W	135	19,305
	MSY		1,222	178,010		MSY		1,168	168,697
							733	5	715
							73C	175	25,025
		73H	102	17,850			73H	52	9,109
		73W	1,120	160,160			73W	936	133,848
	OAK		365	56,707		OAK		365	56,526

Carrier	Destination	Aircraft	Departures 1/1/2018 - 12/31/2018	Departure Seats 1/1/2018 - 12/31/2018	Carrier	Destination	Aircraft	Departures 1/1/2017 - 12/31/2017	Departure Seats 1/1/2017 - 12/31/2017
		73H	139	24,325			73H	135	23,636
		73W	224	32,032			73W	230	32,890
		7M8	2	350					
	OKC		22	3,146					
		73W	22	3,146					
	PHL		854	129,002		PHL		711	106,935
							733	9	1,287
							73C	133	19,019
		73H	214	37,450			73H	164	28,714
		73W	639	91,377			73W	405	57,915
		7M8	1	175					
	PHX		1,041	165,711		PHX		962	148,583
		738	16	2,560					
		73H	430	75,250			73H	343	60,066
		73W	507	72,501			73W	619	88,517
		7M8	88	15,400					
	PIT		529	79,839		PIT		390	59,232
							733	10	1,430
							73C	137	19,591
		73H	131	22,925			73H	108	18,906
		73W	398	56,914			73W	135	19,305
	PNS		725	103,675		PNS		717	106,595
							73C	118	16,874
							73H	125	21,939
		73W	725	103,675			73W	474	67,782
	RDU		1,120	162,592		RDU		1,071	155,141
							733	10	1,430
							73C	436	62,348
		73H	76	13,300			73H	62	10,854
		73W	1,044	149,292			73W	563	80,509
	RSW		84	12,652		RSW		133	19,019
							73C	41	5,863
		73H	20	3,500					
		73W	64	9,152			73W	92	13,156
	SAN		607	97,041		SAN		462	69,853
		73H	316	55,300			73H	118	20,661
		73W	287	41,041			73W	344	49,192
		7M8	4	700					
	SAT		692	106,700		SAT		740	106,972
							73C	151	21,593
		73H	242	42,350			73H	36	6,300
		73W	450	64,350			73W	553	79,079
	SEA		118	19,242		SEA		113	19,308
		73H	65	11,375			73H	97	17,020
		73W	44	6,292			73W	16	2,288
		7M8	9	1,575					
	STL		964	141,660		STL		828	120,454
							738	5	875
							733	3	429
							73C	283	40,469
		73H	119	20,825			73H	59	10,327
		73W	845	120,835			73W	478	68,354
	TPA		1,376	208,256		TPA		1,320	190,816
							73C	387	55,341
		73H	358	62,650			73H	64	11,208
		73W	1,017	145,431			73W	869	124,267

Carrier	Destination	Aircraft	Departures 1/1/2018 - 12/31/2018	Departure Seats 1/1/2018 - 12/31/2018	Carrier	Destination	Aircraft	Departures 1/1/2017 - 12/31/2017	Departure Seats 1/1/2017 - 12/31/2017
		7M8	1	175					
WS			471	48,510	WS			396	33,992
	YYC		131	18,270		YYC		50	7,100
		736	4	452					
		73H	62	9,368			73H	40	5,800
		73W	65	8,450			73W	10	1,300
	YYZ		340	30,240		YYZ		346	26,892
		736	1	113					
		73H	24	3,624					
		73W	32	4,160					
		DH4	283	22,343			DH4	346	26,892
Total			80,943	9,793,545	Total			75,038	8,688,839
Sub-Total					Sub-Total				
Mainline			25,124	1,522,011	Mainline			26,379	1,589,012
Regional			55,819	8,271,534	Regional			48,659	7,099,827

Source: Flight schedule from Innovata via Aviation Dataminer. AECOM analysis.

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U.S. Department
of Transportation
**Federal Aviation
Administration**

Memphis Airports District Office
2600 Thousand Oaks Blvd, Suite 2250
Memphis, Tennessee 38118

Phone: 901-322-8180

May 31, 2019

Mr. Jeff Roach, A.A.E.
AVP, Strategic Planning
Metropolitan Nashville Airport Authority
One Terminal Drive, Suite 501
Nashville, TN 37214

Master Plan/Aviation Demand Forecast
Nashville International Airport (BNA)

Dear Mr. Roach:

We have reviewed the Aviation Demand Forecasts for BNA dated December 28, 2018. As a result of our review, we find it consistent with the 2018 Federal Aviation Administration (FAA) Terminal Area Forecast (TAF). Based on this finding, the master plan baseline forecast is approved for use. Should you have any questions, please feel free to contact me at 901-322-8185.

Sincerely,

Jamal Stovall, Community Planner
Memphis Airports District Office

APPENDIX E NOISE STUDY ADVISORY COMMITTEE

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BNA MASTER PLAN

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Nashville International Airport

Noise Exposure Map (NEM) Update
Noise Study Advisory Committee Kick-off Meeting

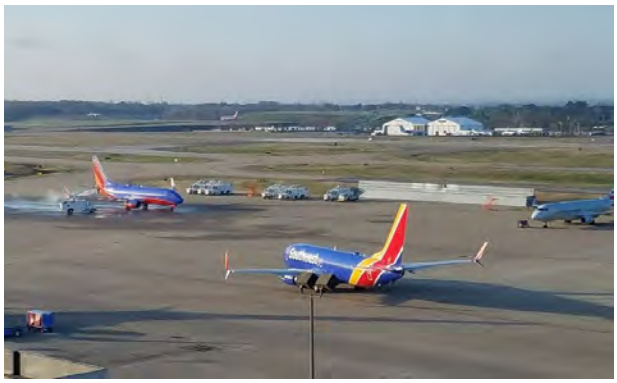
October 18, 2018

Metropolitan Nashville Airport Authority

1

Agenda

- Welcome and Introductions
- NSAC Roles and Responsibilities
- Part 150 Basics
- Aviation Demand Forecast
- Noise Compatibility Program Review
- Next Steps
- Project Schedule



Metropolitan Nashville Airport Authority

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2

Noise Study Advisory Committee

- Membership covers full range of "stakeholders"
- Committee members are responsible for
  - Reviewing materials in advance of meetings
  - Assisting in obtaining data of value such as a run-up survey
  - Providing feedback on technical work
  - Representing the interests of their organizations
  - Communicating progress with their constituents
  - Sharing their constituents' concerns and feedback

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3

3

Part 150

- *Voluntary* Federal Aviation Administration (FAA) process
  - 250+ airports have participated
- *Why do airports participate?* Primary reasons include:
  - Provides access to FAA funding of some approved measures
  - Well-established, understood, accepted, and comprehensive *process*
- Two primary elements
  - Noise Exposure Map (NEM)
  - Noise Compatibility Program (NCP)
  - Detailed FAA guidance at www.faa.gov/airports/environmental/airport_noise/
- Consultation required with
  - All local, state, and federal entities with control over land use within DNL 65+ dB
  - FAA regional officials, regular aeronautical users of the airport
  - All parties interested in review of and comment on the draft

MNAA submitted the first NEM in 1988 and three updates since in 1996, 2004, and 2012.

MNAA submitted an NCP in 1989 with a Land Use update in 1992.

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4

4

Part 150 Noise Exposure Map

- NEM must include detailed description of
  - Airport layout, aircraft operations, and other inputs to noise model
  - Aircraft noise exposure in terms of Day-Night Average Sound Level (DNL)
  - Land uses within DNL 65+ decibel (dB) contours
  - Noise / land use compatibility statistics within DNL 65+ dB contours
- NEM must address two calendar years
  - Year of submission
  - Forecast year (at least five years from year of submission)
  - FAA reviews forecasts for consistency with Terminal Area Forecast (TAF)
- FAA "accepts" NEM as compliant with Part 150 standards

For this NEM:
Year of submission - 2019
Forecast year - 2024

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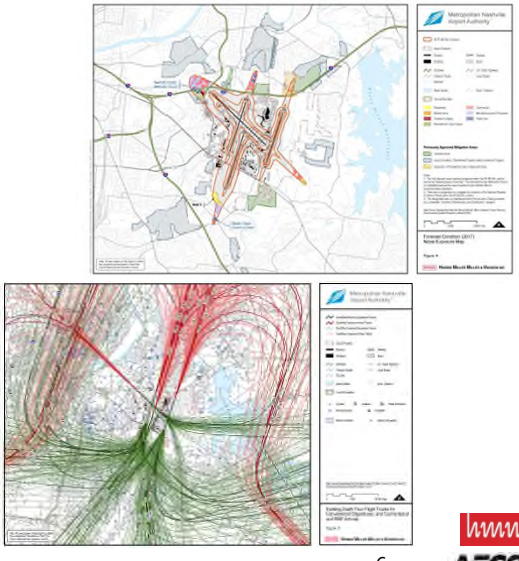
5

5

Part 150 Noise Exposure Map

- DNL 65, 70 and 75 dB contours
- Within 65 dB DNL contour
  - Generalized land use categories
  - Noise sensitive sites
  - Identification of all non-compatible land uses
  - Jurisdiction(s) responsible for land use controls
- Modeled Flight tracks

  (typically on supplemental figures)



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6

6

Part 150 Noise Exposure Map Process

BNA MASTER PLAN

We are here

Review Current NCP
- Operational measures
- Land Use Measures
- Program Measures

Noise Study Database
- Review Previous NEM and Studies
- GIS and land use data
- Flight track data
- Noise complaint data
- Operational forecasts
- Setup AEDT model

Develop NEMs
- Prepare aviation forecast
- Develop noise contours for existing and forecast conditions
- Noise impact evaluation for > DNL 65 dB
- Prepare maps in accordance with 14 CFR Part 150

NEM Report
- Document input data
- Document Land Use, Flight Tracks and DNL contours
- Provide population and housing counts
- Draft Report
- Final report submittal to FAA

Public Process
- Draft report available for review
- Workshops
- Response to comments received in Final report

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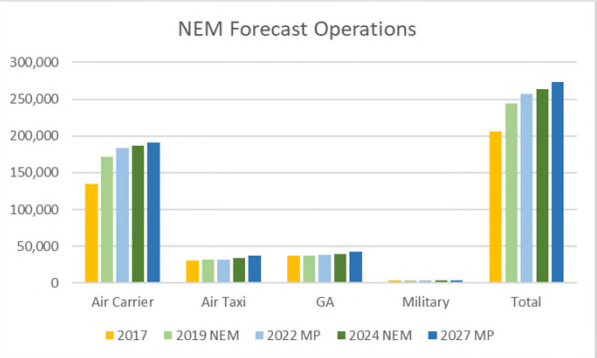
NEM Forecast

BNA MASTER PLAN

- Aviation demand forecast developed from the Master Plan forecast



Annual Operations					
	Year	Air Carrier	Air Taxi	GA	Total
Baseline	2017	135,135	30,540	36,577	205,802
NEM	2019	172,033	31,127	37,006	243,716
Master Plan	2022	183,362	32,029	37,658	256,599
NEM	2024	186,579	33,783	39,431	263,343
Master Plan	2027	191,530	36,595	42,249	273,924

Notes: The Air Carrier category includes both passenger and cargo operations.
The totals include 3,550 military operations for each year.

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Review of Existing Noise Compatibility Program

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Existing Noise Compatibility Program

- 1989 Record of Approval from the FAA
- The NCP has dramatically reduced non-compatible land uses
- There are three types of measures in an NCP
  - Aircraft Operational / Noise Abatement Measures
  - Land Use Measures
  - Program Management Measures

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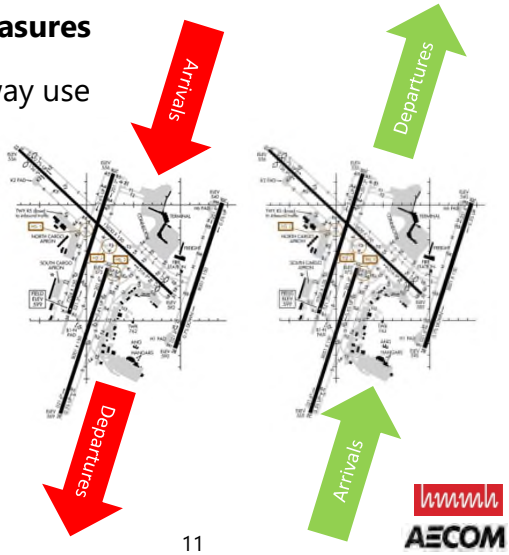
NCP Noise Abatement Measures

- **Aircraft Operational / Noise Abatement Measures**
- *Operational Strategy 1* – Balance daytime runway use
  - Expected (50% South flow / 50 % North flow) split
  - Actual (50.7% South flow / 49.3% North flow) split

July 2017 – June 2018		
Runway	Arrivals	Departures
02C	10%	4%
02L	5%	8%
02R	9%	7%
31	1%	6%
North Flow	24%	25%
20C	3%	20%
20L	13%	1%
20R	8%	5%
13	0%	0%
South Flow	25%	26%



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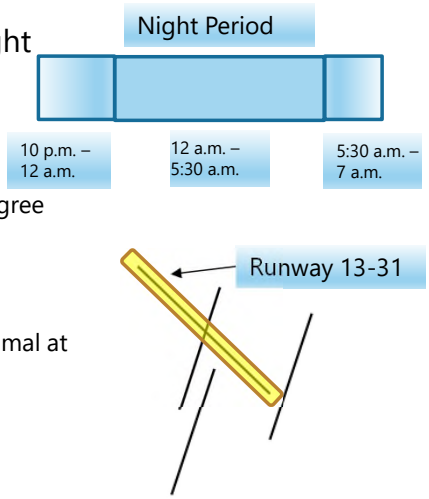
11

11

NCP Noise Abatement Measures - *continued*

- *Operational Strategy 2* – Use of Runway 13-31 at night whenever conditions will allow
  - Goal 96% during nighttime hours 10 p.m. – 7 a.m.
  - Increased airport activity since 1989 led MNAA and ATCT to agree to relax this measure during the beginning and end of the nighttime interval (10 p.m. – 12 a.m. and 5:30 a.m. – 7 a.m.)
  - Usage of Runway 13-31 over the full nighttime interval is minimal at 16% (down from 50% in 2009)
  - Usage of Runway 13-31 is 23% between 12 a.m. and 5:30 a.m.



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12

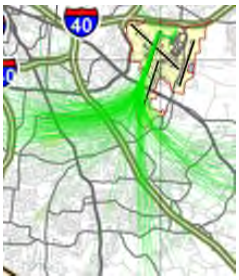
12

NCP Noise Abatement Measures - *continued*

- *Operational Strategy 3* – Nighttime (10 p.m. to 7 a.m.) flight procedures
  - Runway 13 departures turn to 090 degrees until 3,600 ft. (MSL)
    - Procedure has since been changed to 095 degrees
    - Not shown; departure numbers from Runway 13 are negligible
  - Runway 31 departures turn at 2 DME to 280 degrees until 3,600 ft. (MSL)
  - Runway 20R departures turn to 180 degrees until 3,600 ft. (MSL)
    - Procedure has since been changed to 260 degrees
  - These were recommended for the purpose of reducing highly developed residential areas from unnecessary aircraft noise



Runway 31 Nighttime Departures



Runway 20R Nighttime Departures

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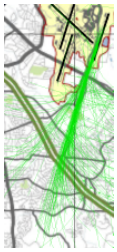
13

NCP Noise Abatement Measures - *continued*

- *Operational Strategy 4* – Daytime (7a.m. to 10p.m.) flight procedures
  - Runway 31 departures turn to 050 degrees or 280 degrees at 2 DME
  - Runway 20R eastbound departures turn to 140 or 180 degrees
    - Procedure has since been changed to turn right 220 or 260 degrees or turn left to 140 or 180 degrees
  - Runway 20L westbound departures turn to 220 degrees
    - Procedure has since been changed to maintain runway heading or turn right to 220 degrees
  - These were recommended for the purpose of reducing highly developed residential areas from unnecessary aircraft noise.



Runway 31 Daytime Departures


Runway 20L Daytime Departures



Runway 20R Daytime Departures

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14

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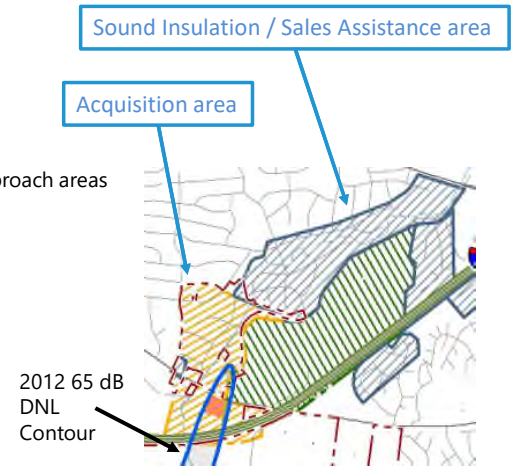
14

NCP Land Use Measures

- Corrective Action 1 – Land Acquisition
  - Designed to eliminate non-compatible land uses
  - Implemented and complete
    - MNAA acquired one residential area in the extended approach areas
- Corrective Action 2 – Sound Insulation
  - Designed to mitigate eligible properties
  - Implemented and complete
    - MNAA sound insulated eligible residential properties



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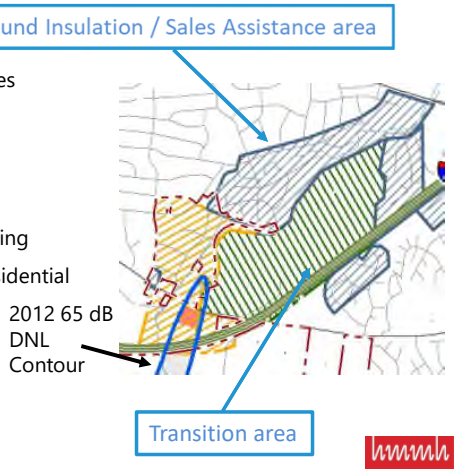
15

NCP Land Use Measures - *continued*

- Corrective Action 3 – Residential Sales Assistance Program
  - Implemented and complete
    - MNAA provided sales assistance to eligible residential properties
- Corrective Action 4 – Transition Area Zoning
  - Implemented and complete
    - MNAA worked with the Metropolitan Nashville-Davidson Planning Department (Metro Planning) to convert these areas to non-residential zoning



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16

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16

NCP Land Use Measures - *continued*

- Preventive Action 1 – Undeveloped Areas
  - Implemented and complete
    - MNAA works with the Metro Planning to discourage residential development in undeveloped areas within the DNL 65 dB contour.
    - *Area 1:* 19 parcels in this area have not been acquired
    - *Area 2:* This area has been rezoned to compatible use.



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17

17

NCP Program Management Measures

- Management 1 – Install fan markers
  - Disapproved by the FAA
    - FAA stated ATC has determined due to various settings on aircraft these markers are generally ineffective
- Management 2 – Informal runway use program
  - Implemented and complete
    - MNAA worked with ATCT and implemented an informal runway use program


U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
Nashville Air Traffic Control Tower

ORDER
BNA ATCT
7232.38N

Effective Date:
August 1, 2014

SUBJ: Informal Runway Use Program – Nashville International Airport

1. **Purpose of this Order.** This Order sets forth noise abatement procedures which are designed to meet the goals of the Metropolitan Nashville Airport Authority (MNAA) Noise Control Plan.

2. **Audience.** This Order applies to air traffic personnel at the Nashville Air Traffic Control Tower.

3. **Where Can I Find This Order?** This Order is available in the main office library and on the national repository.

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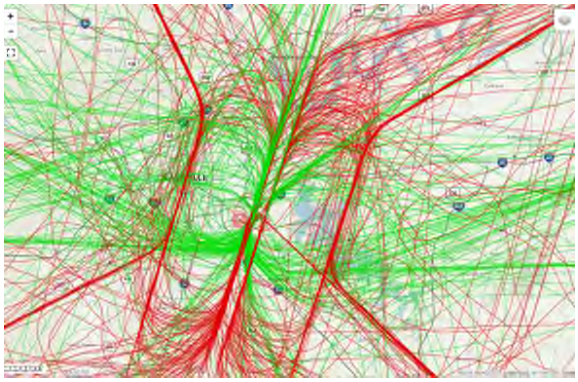
18

18

NCP Program Management Measures - continued

- Management 3 – Flight Tracking System
  - Implemented and complete
    - MNAA acquired and continues to operate a flight track monitoring system
    - The InFLIGHT system provides FAA radar data on a daily basis
    - The InFLIGHT system allows MNAA staff to review runway use, operations, flight procedures and investigate noise complaints

InFLIGHT™



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19

NCP Program Management Measures - continued

- Management 4 – Runway 2R Standard Instrument Departure Procedure (SID)
  - Disapproved by the FAA
    - The FAA objected to the proposed SIDs for noise abatement purposes. The SID as proposed would extend tracks well past required distances and may cause confusion or conflicts.
    - However, despite this objection, the FAA subsequently published the TITAN ONE SID that included the recommended noise abatement procedure for Runway 2R.
- Management 5 – Airport Noise Advisory Committee
  - Implemented and complete
    - MNAA established the committee to aid the airport with implementing the land use strategies.
    - The committee was disbanded when the land use strategies were complete.

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20

Next Steps

- Complete development of noise study database
- Finalize noise model inputs
- Develop draft Day-Night Average Sound Level (DNL) noise contours
- Develop draft Noise Exposure Maps (NEM)
- Complete land use analysis
- Develop draft Noise Exposure Map (NEM) document

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21

21

Thank You for Your Participation!

Next meeting – March 2019

Follow the Noise Exposure Map (NEM) Update on
https://www.flynashville.com/about/Pages/Noise-information.aspx

Comments or Questions
https://www.flynashville.com/contact/Pages/commentsandquestions.aspx



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22

22

Noise Study Advisory Committe Attendees
June 11th, 2009

Name	Email	Signature
Nathanial Smith	nathanial.a.smith.mil@mail.mil	Tennessee Army National Guard
Anna Grider	Anna.Grider@nashville.gov	Metro Planning
Travis Romelhardt	Travis.Romelhardt@atlanticaviation.com	Atlantic Aviation

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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

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1

Agenda

BNA MASTER PLAN

- 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



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2

Noise Modeling Inputs

3

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

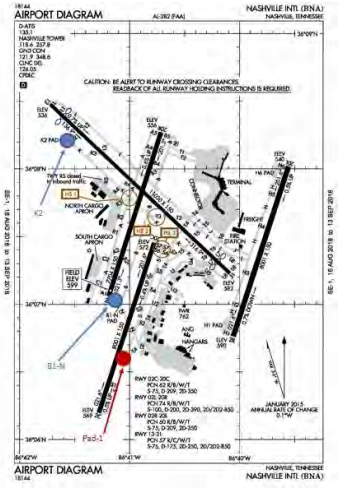


4

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				



5

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

6

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%

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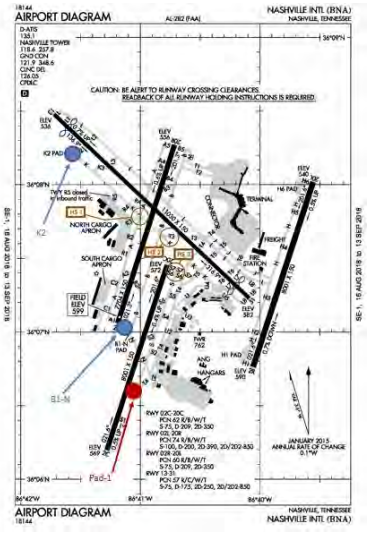
7

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%



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8

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

Runway	Arrivals		Departures	
	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%

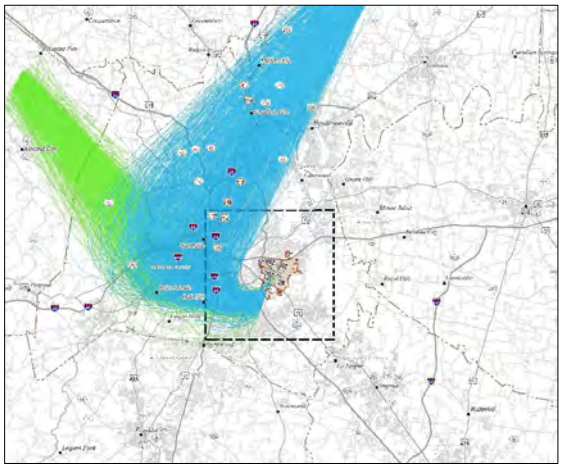
9

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	

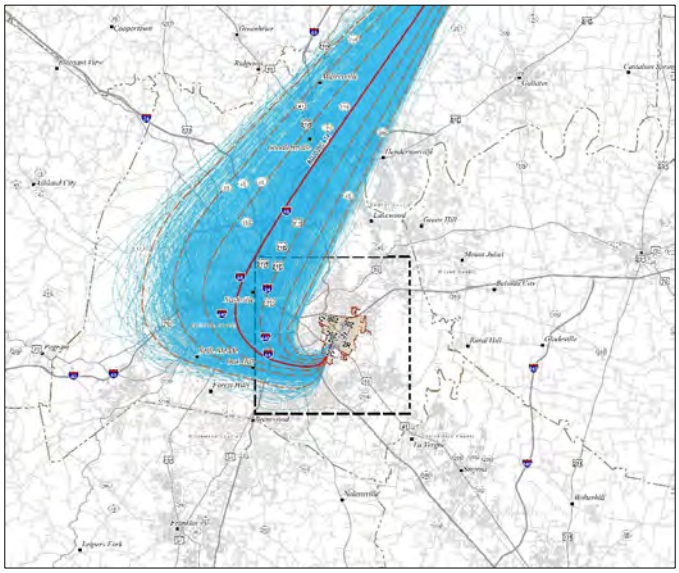


South Flow Daytime Jet Departure Tracks from Runway 20C

HGGRD SID KRSTA SID

10

Noise Modeling Inputs – Departure Flight Track Geometry

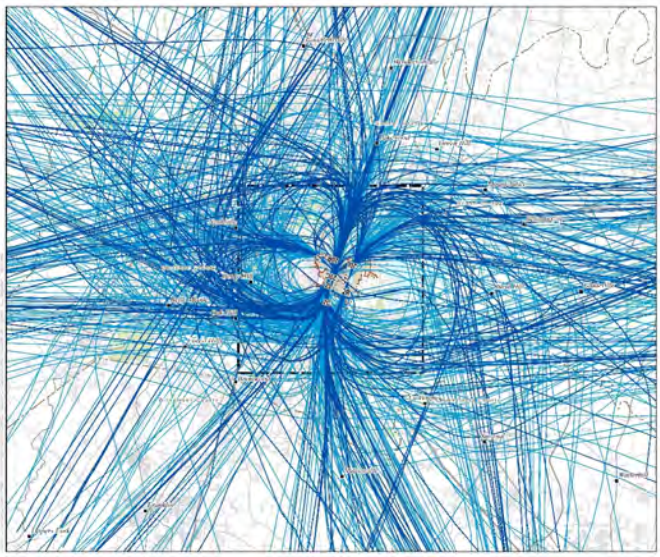


Daytime Jet Departure Tracks from Runway 20C with Model Track

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

11

Noise Modeling Inputs – All Departure Flight Tracks

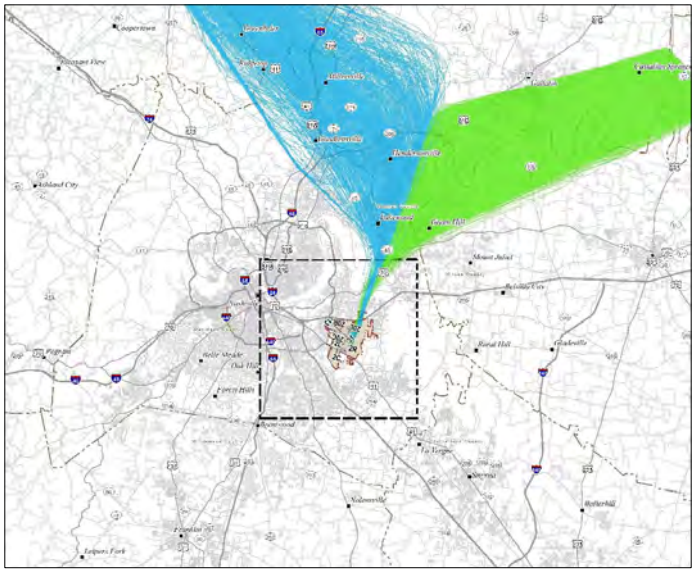


All Departure Tracks

- Model Track Backbone
- Model Track Subtrack

12

Noise Modeling Inputs – Arrival Flight Track Geometry



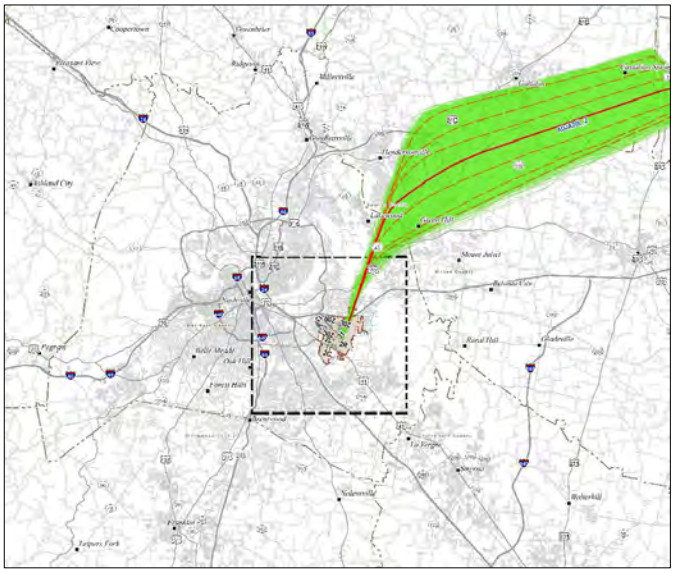
South Flow Daytime Jet Arrival Tracks to Runway 20L

PASLY STAR (NE corner)

RYYMN STAR (NW corner)

13

Noise Modeling Inputs – Arrival Flight Track Geometry



Daytime Jet Arrival Tracks to Runway 20L with Model Track

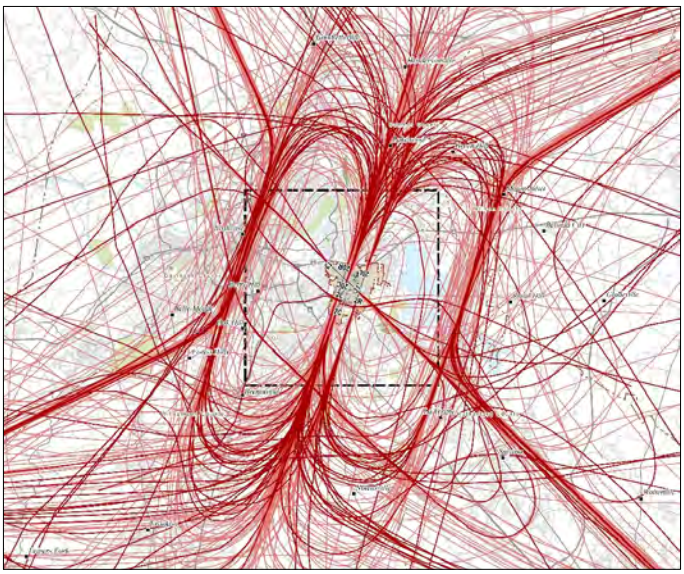
PASLY STAR (NE corner)

Model Track Backbone

Model Track Subtrack

14

Noise Modeling Inputs – All Arrival Flight Tracks



All Arrival Tracks

Model Track Backbone

Model Track Subtrack

15

Noise Modeling Inputs – Meteorological Data

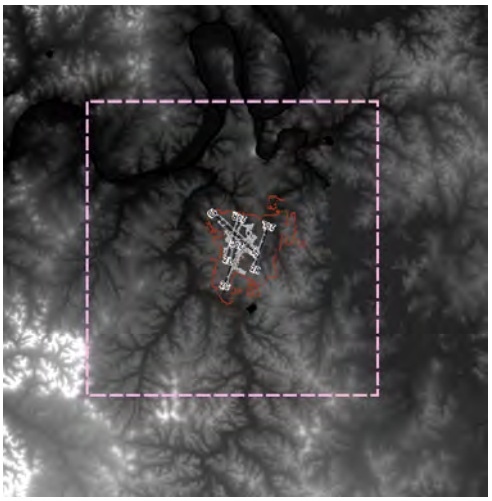
- Meteorological data effects
  - Aircraft noise performance
  - Sound propagation
- AEDT Default weather
  - 30-year average

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

16

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



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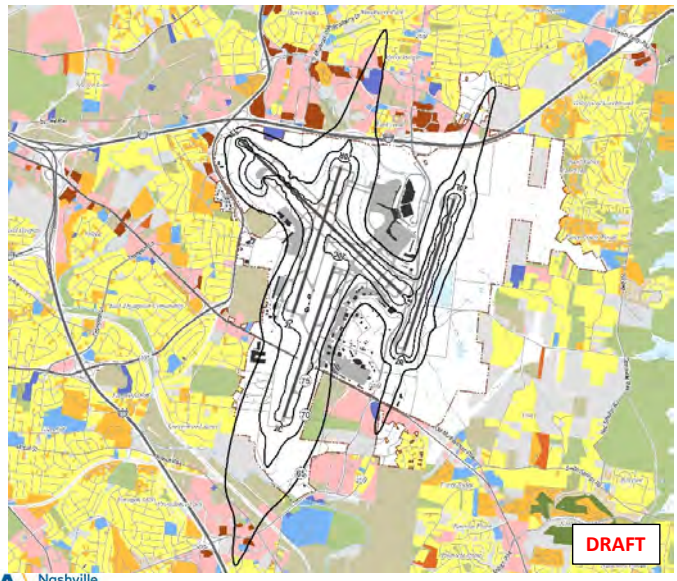
Draft Noise Modeling Results

18

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

BNA Nashville International Airport
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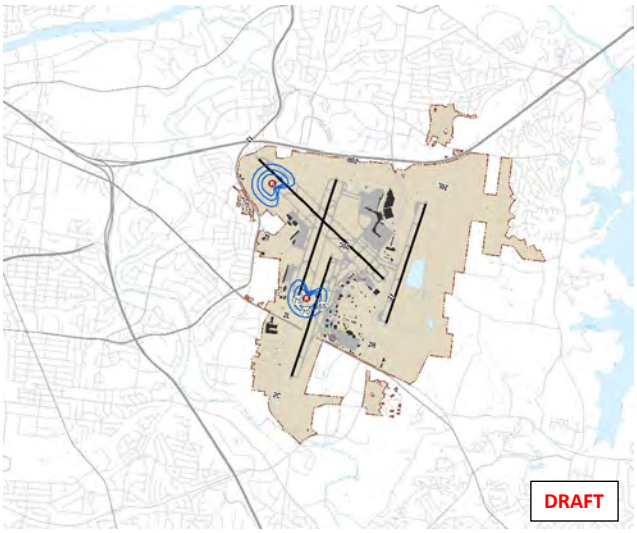
Draft 2019 Existing DNL Contour Run-ups



Existing Condition 2019 Draft DNL Runup Contours (65-75 dB)
BNA Airport Boundary (Approximate)
Runway
Runup Area
BNA Study Area
State Boundary
County Boundary
Open Space/Golf
Water/Stream
Highway
Minor Roads
Major Roads
Railroad

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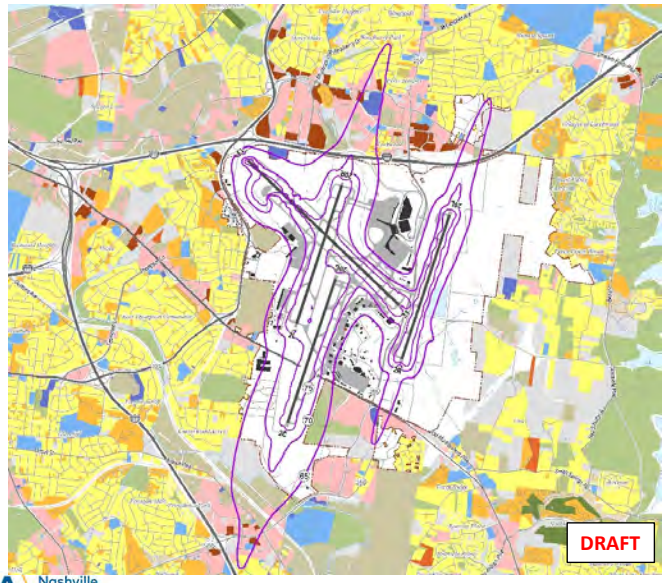
20

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
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Multi-Family Residential
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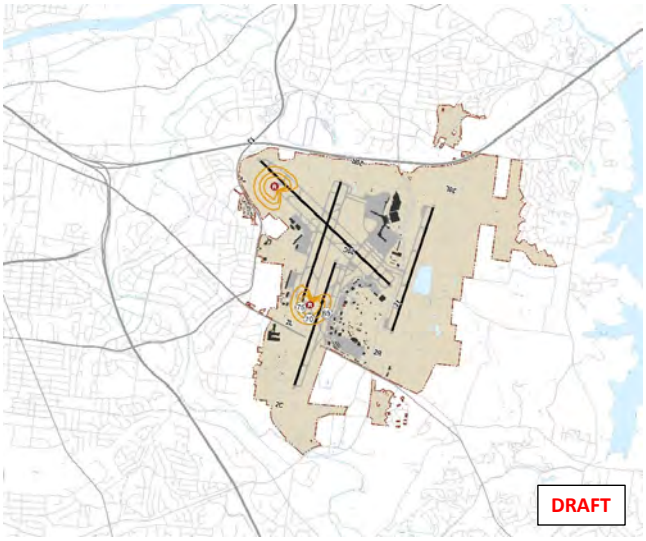
Draft 2024 Future DNL Contour Run-ups



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
Water/Stream
Highway
Minor Roads
Major Roads
Railroad

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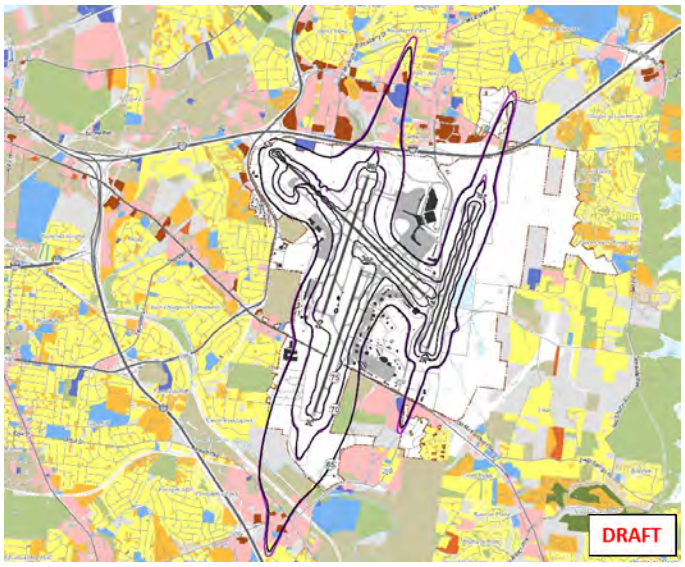
22

Draft 2019 & 2024 NEM DNL Contour Comparison



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

BNA Airport Boundary (Approximate)
Runway
State Boundary
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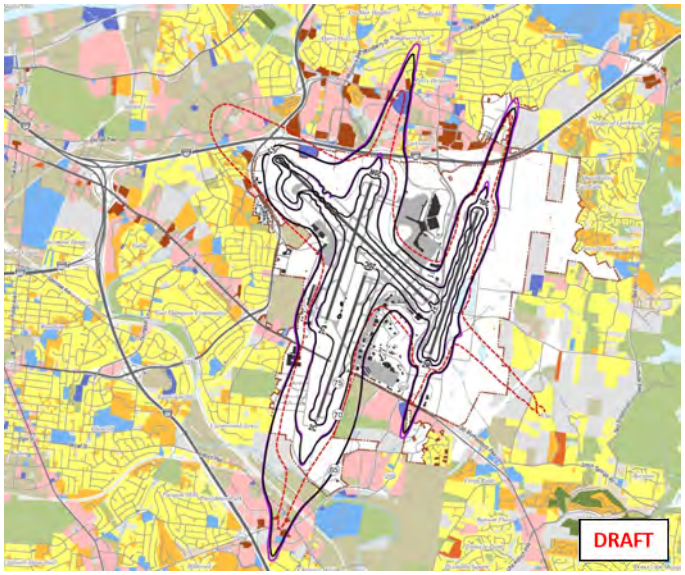
23

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)

BNA Airport Boundary (Approximate)
Runway
State Boundary
Municipal Boundary
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Minor Roads
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Land Use
Residential
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Recreational / Open Space / Golf
Commercial Use
Manufacturing and Production
Vacant / Undefined
Water / Stream

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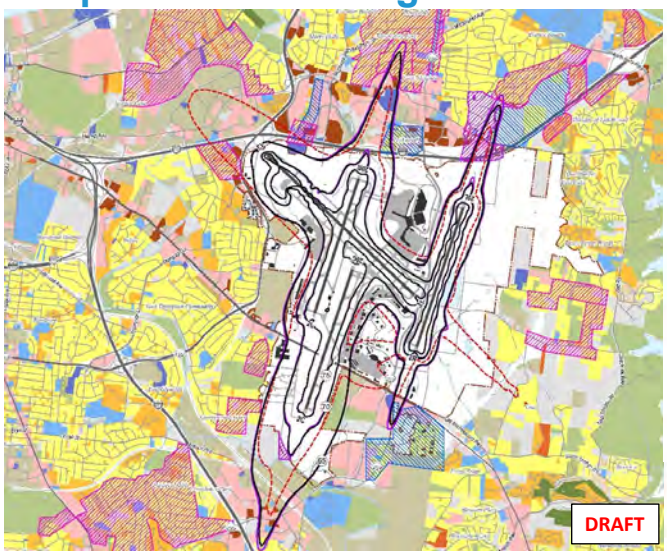
24

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)
BNA Airport Boundary (Approximate)
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State Boundary
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Public Use (Non-Compatible)
Public Use (Compatible)
Recreational / Open Space / Golf
Commercial Use
Manufacturing and Production
Vacant / Undefined
Water / Stream
Previously Approved Mitigation Areas
Transition Area
Sound Insulation/Residential Property Sales Assistance Program
Acquisition of Residential Use in Approach Areas

25

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

26

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**

27

Thank You for Your Participation!

Next meeting – Fall 2019

Follow the NEM Update on
https://www.flynashville.com/about/Pages/noise-information.aspx

Comments or Questions
https://www.flynashville.com/contact/Pages/commentsandquestions.aspx



28

Noise Study Advisory Committee Meeting Sign-In
10/07/19

Name	Email	Initials	Organization Being Represented:
Aaron Evans	Aaron.Evans@flynashville.com		
Anna Grider	Anna.Grider@nashville.gov		
Butch Gelband	Butch.Gelband@flynashville.com		MNAA
Chad Joines	Chad.Joines@faa.gov		
Jeff Roach	Jeff.Roach@flynashville.com		
Jeff Root	jkroot@yahoo.com		
Michael Rhodes	michael.rhodes@fireflyemail.com		
Robert Ramsey	Robert.Ramsey@flynashville.com		
Tom Bibb	Tom.Bibb@flynashville.com		
Travis Romelhardt	Travis.Romelhardt@atlanticaviation.com	TR	Atlantic Aviation
Kimberly Howard	On File	KH	MNAA - SP
DAVID GRISWOLD	davidgriswold@flynashville.com		MNAA-OPS
Edward McDonald	Edward.McDonald@fly...	EMB	BNA RISK MGMT

Noise Study Advisory Committee Meeting Sign-In
10/07/19

Name	Email	Initials	Organization Being Represented:
Aaron Evans	Aaron.Evans@flynashville.com		
Anna Grider	Anna.Grider@nashville.gov	AG	Metro Planning
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Chad Joines	Chad.Joines@faa.gov		
Jeff Roach	Jeff.Roach@flynashville.com		
Jeff Root	jkroot@yahoo.com		
Michael Rhodes	michael.rhodes@fireflyemail.com		
Robert Ramsey	Robert.Ramsey@flynashville.com	RLR	BNA
Tom Bibb	Tom.Bibb@flynashville.com		
Travis Romelhardt	Travis.Romelhardt@atlanticaviation.com		
Wayne Schuster	Wayne.Schuster@aecom.com	WBS	

BNA MASTER PLAN
NASHVILLE INTERNATIONAL AIRPORT

Nashville International Airport

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

October 7, 2019

BNA Nashville International Airport

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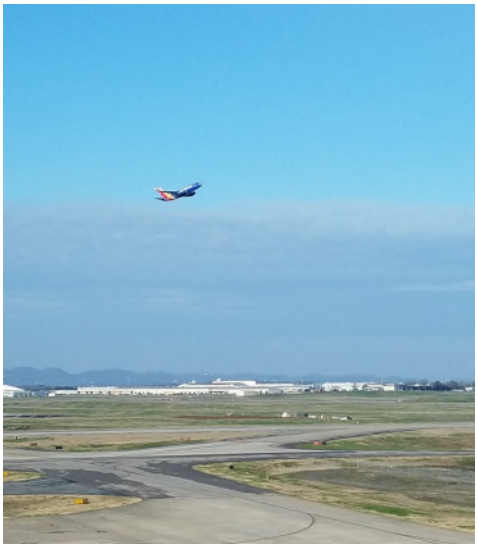
1

Agenda

BNA MASTER PLAN

- Welcome and Introductions
- Noise Exposure Map Update Status
- Aircraft Noise Terminology
- Draft 2019 and 2024 DNL Noise Contour Maps
- Draft Noise Exposure Map Report
- Public Comment Period
- Next Steps



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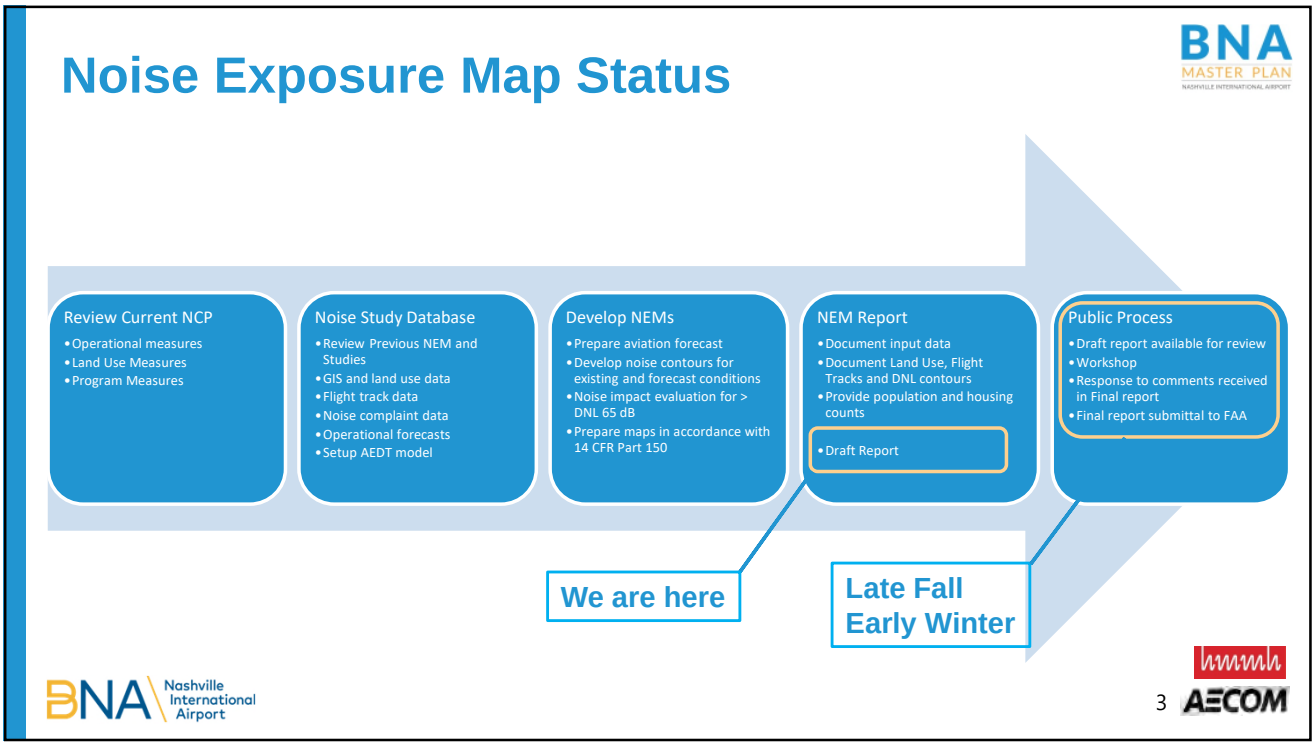
Noise Exposure Map Status
BNA MASTER PLAN
Review Current NCP
• Operational measures
• Land Use Measures
• Program Measures
Noise Study Database
• Review Previous NEM and Studies
• GIS and land use data
• Flight track data
• Noise complaint data
• Operational forecasts
• Setup AEDT model
Develop NEMs
• Prepare aviation forecast
• Develop noise contours for existing and forecast conditions
• Noise impact evaluation for > DNL 65 dB
• Prepare maps in accordance with 14 CFR Part 150
NEM Report
• Document input data
• Document Land Use, Flight Tracks and DNL contours
• Provide population and housing counts
• Draft Report
Public Process
• Draft report available for review
• Workshop
• Response to comments received in Final report
• Final report submittal to FAA
We are here
Late Fall
Early Winter
BNA Nashville International Airport
3
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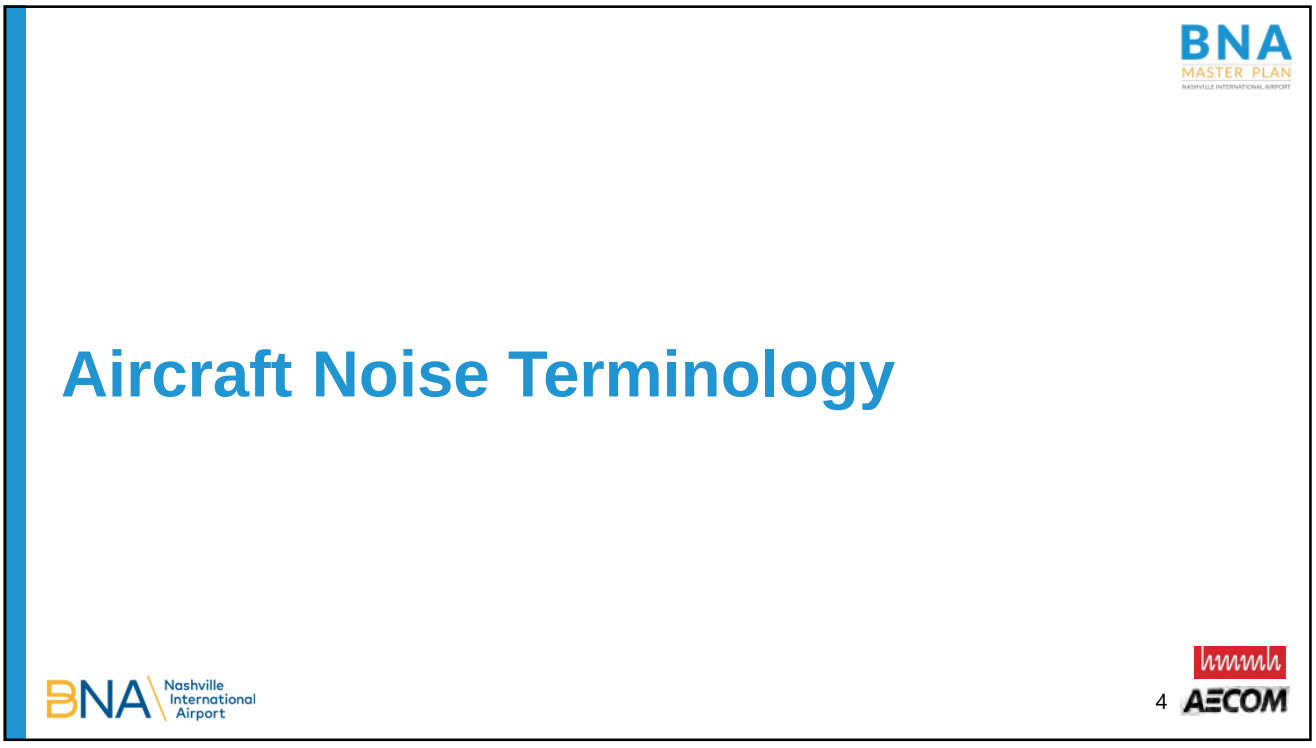
BNA MASTER PLAN
Aircraft Noise Terminology
BNA Nashville International Airport
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4

Aircraft Noise Terminology

Primer to prepare for the NEM Update Report and Maps review

- The decibel scale (dB)
- The A-weighted decibel
- Single event noise metrics
  - Maximum sound level (L_{max})
  - Sound Exposure Level (SEL)
- Cumulative noise exposure metric
  - Day-Night Average Sound Level (DNL)



5

5

The Decibel Scale

- We use a logarithmic scale – decibels (dB) to express sound levels and noise levels
- Why?
  - We hear sound pressures over a HUGE range
  - Decibels compress this range to match the way we interpret sound pressures
  - 0 to 140 dB
  - 0.000000003 to 0.003 lbs. per sq. inch (psi)
  - We "hear" in decibels

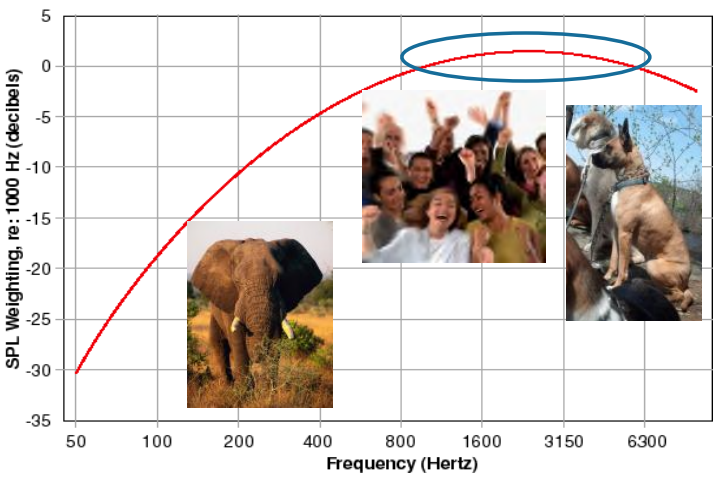
"Energy"	dB	Common sounds
100,000,000,000,000	140	Near a jet engine at start of takeoff
10,000,000,000,000	130	Threshold of pain
1,000,000,000,000	120	On stage at a loud rock concert
100,000,000,000	110	
10,000,000,000	100	Jack hammer at 6 feet
1,000,000,000	90	
100,000,000	80	Vacuum cleaner at user's ear
10,000,000	70	Vacuum cleaner at 10 feet
1,000,000	60	Normal speech
100,000	50	
10,000	40	Quiet residential area
1,000	30	
100	20	Whisper
10	10	
1	0	Threshold of hearing
0.1	-10	

6

6

The Decibel Scale

- Our ear is not equally sensitive to all frequencies
- A-weighted decibels (dB) measure sound the way we "hear" it
- Part 150 specifies A-weighted noise metrics to describe
  - Single events
  - Cumulative exposure
- Consistent with worldwide practice



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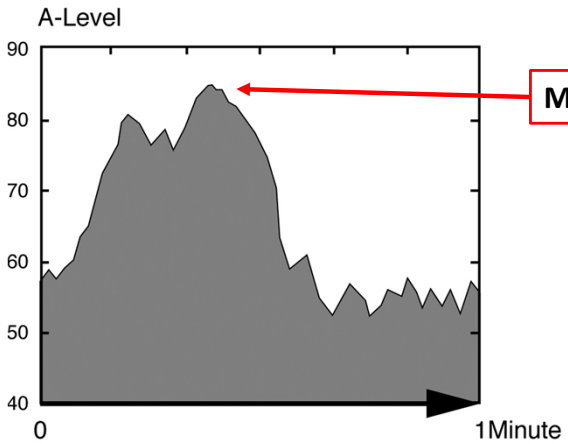
Maximum Sound Level (L_{max})

- The simplest way to describe a discrete noise "event" is its maximum sound level (Lmax)



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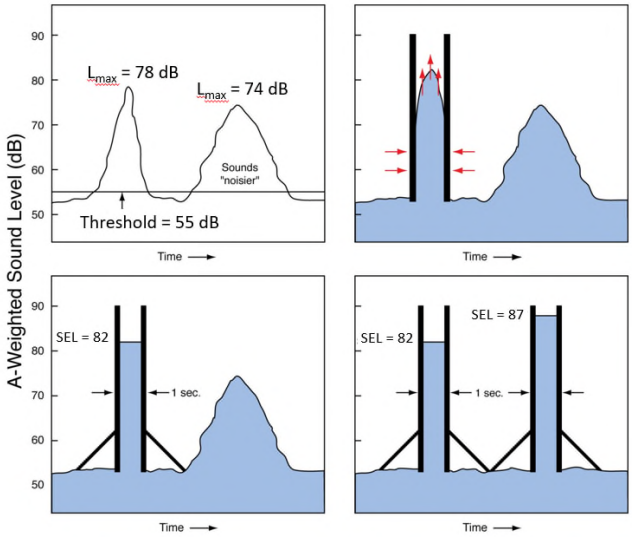
Sound Exposure Level (SEL)

- Duration matters: A longer event may seem "noisier," even if it has a lower or equal maximum level
- SEL measures the total "noisiness" of an event by taking duration into account
- The FAA's noise model (AEDT) uses SEL as the basis for calculating the required noise metric Day-Night Average Sound Level



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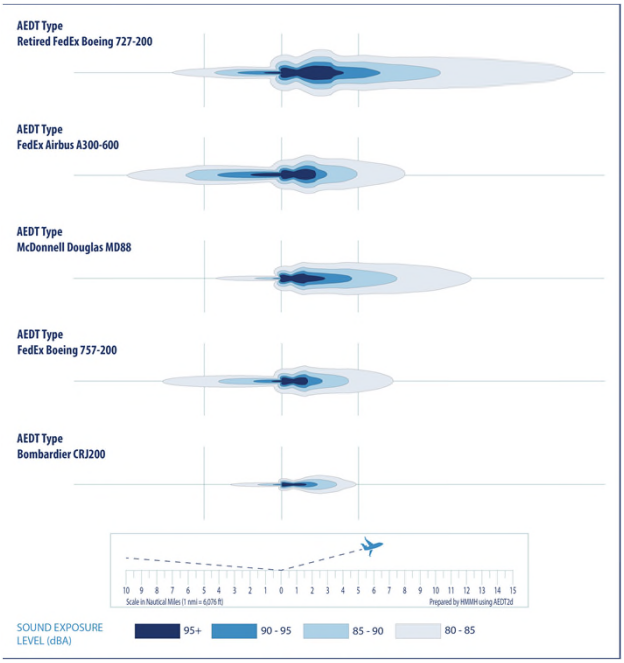
Comparative SELs

- The sound exposure levels created by an aircraft overflight depend on its
  - Engine type
  - Thrust setting profile
  - Altitude profile
  - Airspeed profile
- These graphics compare a typical landing (from left) and takeoff (to right) of different aircraft types



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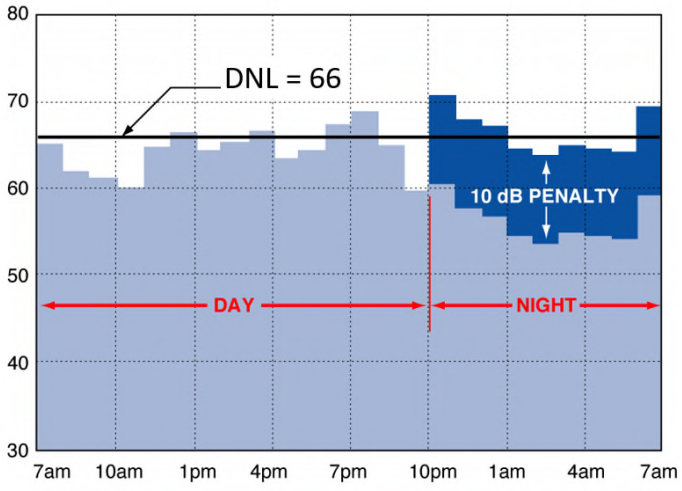
Cumulative Exposure: Day-Night Average Sound Level

- Describes 24-hour exposure
- Noise from 10 pm to 7 am is factored up by 10 dB
  - "Penalty" is equal to counting each night aircraft 10 times
- DNL is the only metric that Part 150 requires for land use compatibility



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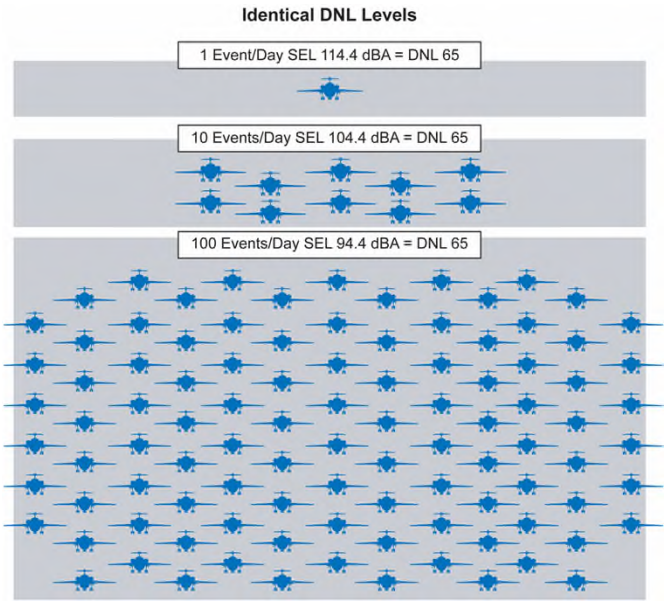
SEL versus DNL

- A given cumulative exposure level (DNL) can come from many different combinations of single noise events
- Since today's aircraft are quieter it takes many more operations to generate a similar size contour
- Hypothetical jet aircraft shown



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Draft 2019 and 2024 DNL Noise Contour Maps

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13

Draft 2019 and 2024 Noise Exposure Maps

- *As a refresher*, Part 150 requires depiction of:
  - DNL 65, 70, and 75 dB contours
  - Existing conditions (year of submission; 2019 in this case)
  - Forecast conditions (at least five years in the future; 2024 in this case)
  - Land use information within contours
    - Noise sensitive public buildings, such as schools, places of worship, health care facilities, and properties on or eligible for inclusion in the National Register of Historic Places
    - Identification of all noncompatible land uses
    - Jurisdiction(s) responsible for land use controls
    - Generalized land uses and street map
  - Other information
    - Runway layout and airport boundary
    - Flight tracks (may be on supplemental graphics, as in this case)

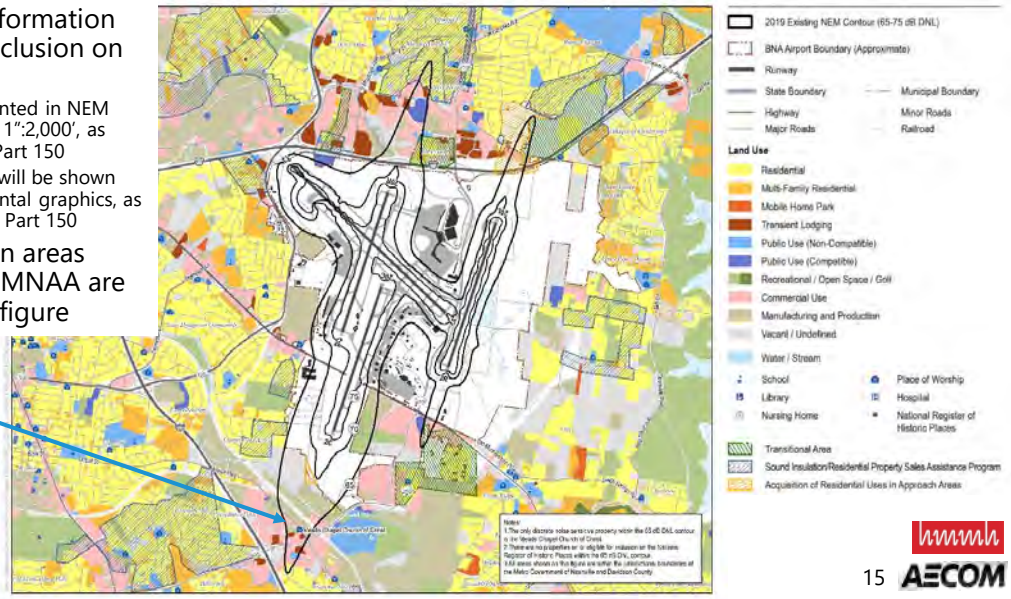
14

14

Draft 2019 Noise Exposure Map

- Contains all information required for inclusion on NEM figure
  - Will be presented in NEM document at 1":2,000', as required by Part 150
  - Flight tracks will be shown on supplemental graphics, as permitted by Part 150
- Prior mitigation areas completed by MNAA are shown on the figure

One Noise Sensitive Site



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Draft 2024 Noise Exposure Map

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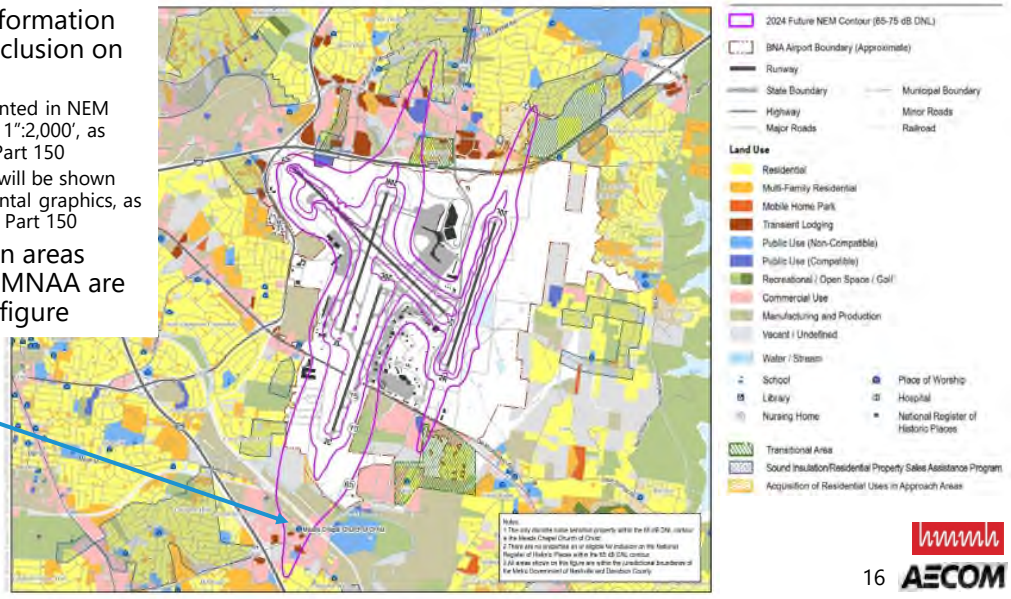

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16

Draft 2019 & 2024 Noise Exposure Maps

BNA MASTER PLAN



Completed Sound Insulation/Residential Property Sales Assistance Program Area

Completed Residential Property Acquisition Area

Transitional Land Use Area

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

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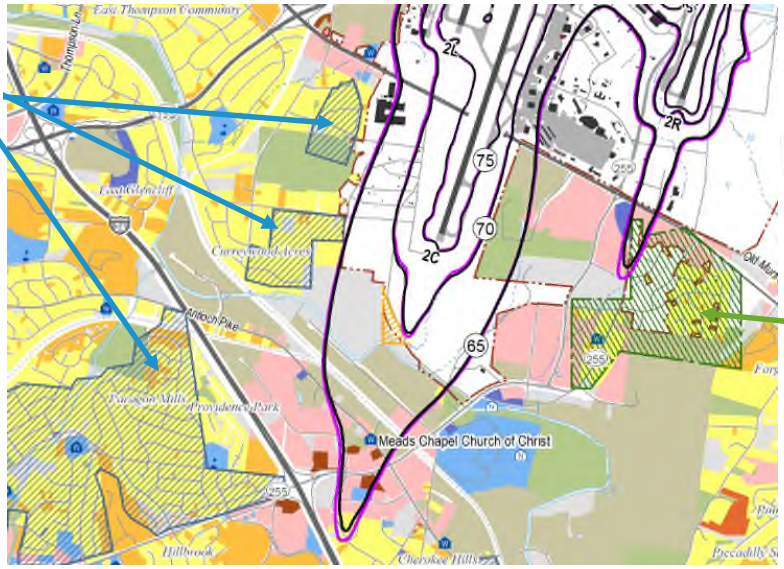
17

Draft 2019 & 2024 Noise Exposure Maps

BNA MASTER PLAN

Completed Sound Insulation/Residential Property Sales Assistance Program Area



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

Transitional Land Use Area

BNA Nashville International Airport

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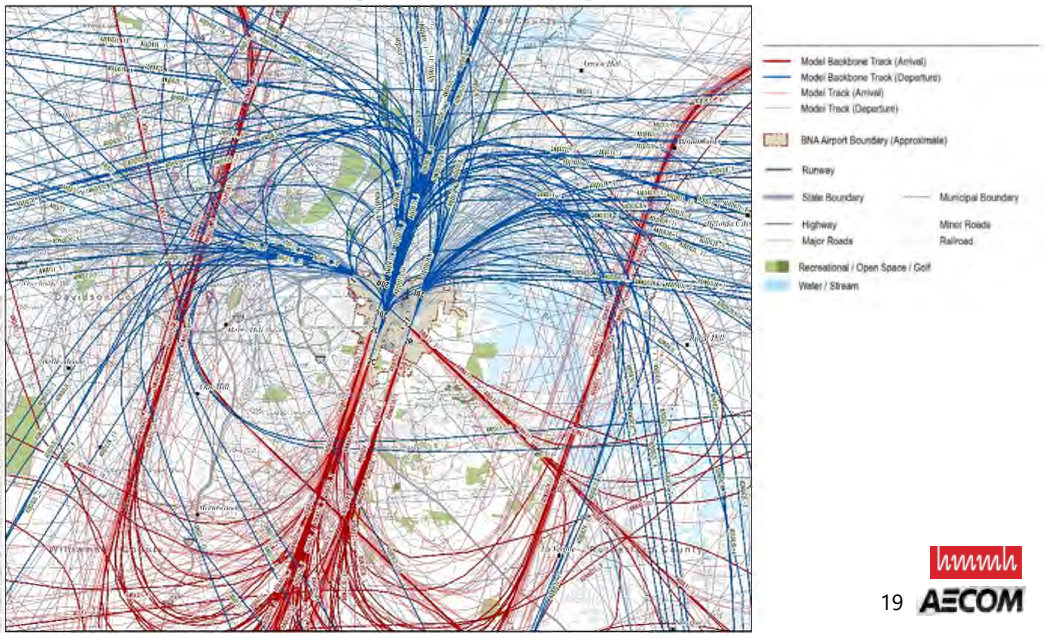
18

North Flow Arrival and Departure Flight Tracks



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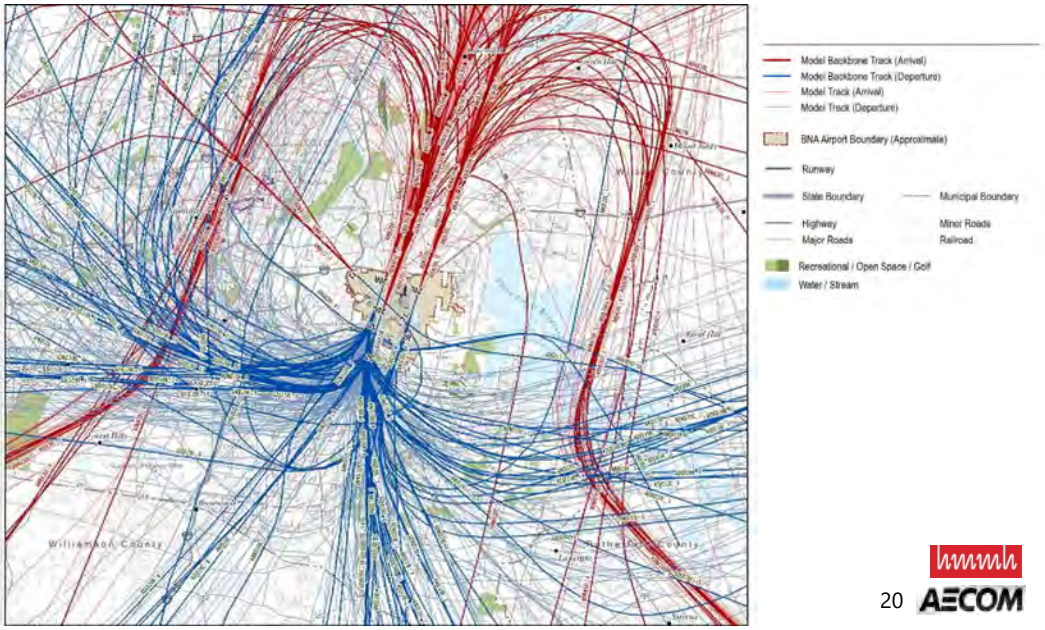
South Flow Arrival and Departure Flight Tracks



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20

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

21

21

Draft Noise Exposure Map Report

22

22

Organization of Draft Noise Exposure Map Report

Main Body

Sponsor's Certification (Executed in final submission)

Glossary

1. Introduction
   FAA Checklist
2. Land Use Compatibility Guidelines and Standards
3. Existing Noise Compatibility Program
4. Existing and Forecast Noise Exposure Maps
5. Development of Noise Contours
6. Public Consultation

Appendix Volume

A. Noise Terminology
B. FAA Acceptance of Previous Noise Exposure Maps
C. Record of Approval for 1989 NCP Submission
D. 2019 and 2024 Noise Exposure Map Forecast Documentation and FAA Approval
E. Noise Study Advisory Committee
F. Documentation Related Draft Noise Exposure Map Notice, Review, And Comment Opportunities
G. Public Workshop
H. Written Comments

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23

Draft NEM Report Availability and Comment Period

- The Draft NEM report will be available for public review for a period of 30 days this Fall
- The Draft NEM report will be available
  - On the MNAA website, at: https://www.flynashville.com/about/Pages/noise-information.aspx
  - At seven physical locations:
    - MNAA Offices
    - Six Local Libraries

MNAA Administrative Offices (during business hours)
Nashville International Airport
One Terminal Drive, Suite 501
Fourth Floor Reception Area
Nashville, TN 3706
(615) 275-1600

Nashville Public Library Branches

Main Library
615 Church Street
Nashville, TN 37219
(615) 862-5800

Hermitage Branch
2315 Lebanon Road
Nashville, TN 37214
(615) 862-5859

Edmonson Pike Branch
5501 Edmondson Pike
Nashville, TN 37211
(615) 880-3957

Donelson Branch
2315 Lebanon Road
Nashville, TN 37214
(615) 862-5859

Southeast Branch
2325 Hickory Highlands Drive
Antioch, TN 37013
(615) 862.5871

Thompson Lane Branch
380 Thompson Lane
Nashville, TN 37211
(615) 862-5873

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24

Draft NEM Report Availability and Comment Period

- The Draft NEM report availability and comment period will be advertised through:
  - Legal advertisements in The Tennessean newspaper
  - Emailed notices to Metropolitan Council representatives
  - Emailed notices to airport tenants and regular aeronautical users
  - NSAC meeting
- While not a Part 150 requirement, the MNAA will include the NEM update in a public workshop held in coordination with the concurrent Airport Master Plan Update
- Written comments may be submitted by:
  - A form on the MNAA website
  - Mailed to MNAA
  - Emailed to MNAA (email address will be provided with public comment notice)

25

25

Draft NEM Report Availability and Comment Period

- MNAA will collect and review all comments provided:
  - MNAA will provide these comments to the FAA
- Part 150 does not require MNAA to provide a response to each comment for a Noise Exposure Map Update



26

26

Next Steps

- Preliminary Draft NEM Report is under review by FAA
- MNAA will address FAA comments and develop the Draft NEM Report for public review
- MNAA will schedule 30 day public review period and send out notices
- Draft NEM Report will be available during the 30 day comment period
- MNAA will update the NEM Report after the public comment period and then submit the Final NEM Report to FAA for review and acceptance
- FAA will review and provide a Record of Acceptance
- 2019 or 2024 NEM contours will then be the approved contours for any ongoing or upcoming projects

27

27

Thank You for Your Participation!

Follow the NEM Update on
https://www.flynashville.com/about/Pages/noise-information.aspx

Comments or Questions
https://www.flynashville.com/contact/Pages/commentsandquestions.aspx



28

28

APPENDIX F DOCUMENTATION RELATED DRAFT NOISE EXPOSURE MAP NOTICE, REVIEW, AND COMMENT OPPORTUNITIES

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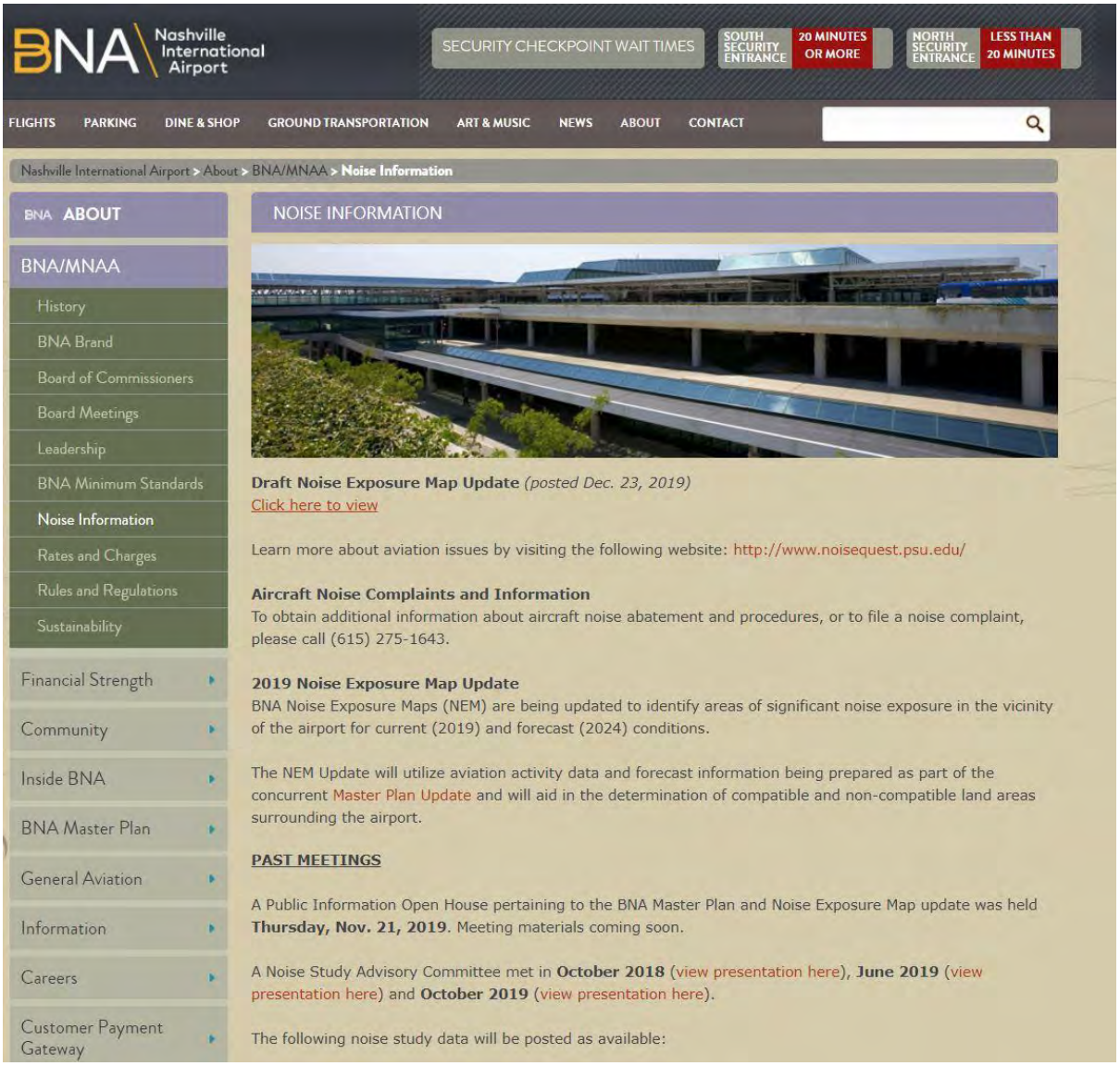
F.1 MNAA Website Information

MNAA Website Page[29] Providing Public Notice of Availability of Draft Document



[29] https://flynashville.com/about/Pages/noise-information.aspx, website screen capture Dec.31, 2019

F.2 Airport Tenants and Regular Aeronautical Users Receiving Notice

Advantage Rent A Car
Air Canada
Aircraft Services International
Alaska Airlines
Alamo
Allegiant
American Airlines
Atlantic Aviation
Averitt Express
Avis/Budget
BAX Global
BF Companies
British Airways
Boingo
Cape Air
CBR Airport Retail
Central Parking
Contour Airlines
Customs and Border Protection
Delaware North
Delta Airlines
Dollar/Thrifty
Embraer
Enterprise Rent A Car
E-Z Rent A Car
FAA Air Traffic Control Tower
FAA Airways Facilities
FAA Flight Standards District Office
FedEx
Frontier Airlines
Gaylord Hotels
Gray Cliff
Hertz
HMS Host
Hudson Group
Interspace/Smart Cart
JetBlue
Jetwiz
Marison International
National
Payless
Radio Road/Fly Babies
Service by Air
Signature Flight Support
Skywest
Southwest Airlines
Sun County Airlines
Super Shuttle
Spirit Airlines
Swissport
Tech Experience
Tennessee Aeronautics Division
Tennessee Air National Guard
Thrifty
Trans Fare, Inc.
United Airlines
UPS
Vacation Express
Vanguard
WestJet
Wright Travel

APPENDIX G DOCUMENTATION RELATED TO FALL 2019 PUBLIC INFORMATION OPEN HOUSE WORKSHOP

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G.1 Public Workshop Notice- Press Release

FOR IMMEDIATE RELEASE
Nov. 7, 2019

Contact: **Jared Porter**
(615) 275-4577
jared.porter@flynashville.com

Nashville International Airport Planning for the Future, Invites Public to Open House on Nov. 21

NASHVILLE – Nashville International Airport (BNA) will host an open house on Thursday, Nov. 21, 2019, to discuss preliminary findings and recommendations from its Master Plan Update and Noise Exposure Map Update.

WHO: BNA officials and members of the public interested in future plans for BNA

WHAT: BNA Master Plan/Noise Exposure Map Update - Public Information Open House

WHEN: Thursday, Nov. 21, 2019
5 p.m. to 8 p.m.

WHERE: One Century Place Conference Center
26 Century Blvd.
Nashville, TN 37214

The public is welcome to come by at any time. The meeting will be held in an open house format where attendees can review materials, ask questions and leave comments. The Master Plan Update identifies facilities needed to support future aviation activity at BNA in a safe, secure and environmentally responsible and sustainable manner. More information about the Master Plan Update is available at https://www.flynashville.com/about/Pages/MasterPlan.aspx.

BNA's Noise Exposure Maps are being updated to depict aircraft noise exposure levels graphically in the vicinity of BNA for current (2019) and forecast (2024) conditions. More information about the Noise Exposure Map (NEM) Update is available at: https://www.flynashville.com/about/Pages/noise-information.aspx

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With more than 17 million passengers visiting each year, Nashville International Airport (BNA) is one of the fastest growing airports in North America. BNA serves 540 daily flights to 75 nonstop destinations. According to a recent study, in 2018 alone, BNA generated more than $7.1 billion in total economic impact, supported more than 67,000 jobs in the region, and produced more than $392 million in state, local and federal taxes. BNA receives no local tax dollars. For more information, visit flynashville.com. Follow us on Facebook: @NashvilleInternationalAirport, Twitter: @Fly_Nashville and Instagram: @FlyNashville. Learn more about *BNA Vision*, our growth and expansion plan for the airport, at BNAVision.com.

G.2 Public Workshop Advertisements

Newspaper ads for the Public Information Open House are reproduced below and ran as follows:

- The Tennessean – Print- Tuesday 11/19/19, Online- Monday 11/18/19- Thursday 11/21/19
- Nashville Post – Monday-Wednesday 11/18/19 -11/20/19 morning and evening newsletters
- Tennessee Tribune- Print Tuesday 11/19/19, Online Monday- Thursday 11/18-11/21
- Donelson Hermitage – Online via website and in their newsletter 11/18-11/21

BNA Nashville International Airport

AIRPORT MASTER PLAN & NOISE EXPOSURE MAPS (NEM) UPDATE

PUBLIC INFORMATION OPEN HOUSE

NOVEMBER 21, 2019
5:00 p.m. – 8:00 p.m.

One Century Place Conference Center 26 Century Blvd
Nashville, TN 37214

The Nashville International Airport (BNA) is undertaking a Master Plan Update to map out and plan for sustainable airport development at BNA over the next 20 years.

This is an opportunity to view the BNA Master Plan and NEM Updates, both nearing completion, and to share your comments and questions. More information about the Master Plan Update and process is available at: https://www.flynashville.com/about/Pages/MasterPlan.aspx. More information on the NEM Update is available at https://www.flynashville.com/about/Pages/noise-information.aspx

The meeting will be held in an open house format where attendees can review materials, ask questions, and leave comments. The public is welcome to come by at any time.

BNA Nashville International Airport

AIRPORT MASTER PLAN & NOISE EXPOSURE MAP (NEM) UPDATE

PUBLIC INFORMATION OPEN HOUSE

November 21, 2019 • 5:00 p.m. – 8:00 p.m.

One Century Place Conference Center
26 Century Blvd Nashville, TN 37214

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BNA Nashville International Airport

PUBLIC INFORMATION OPEN HOUSE

One Century Place Conference Center
26 Century Blvd, Nashville, TN 37214
November 21, 2019
5 pm - 8 pm



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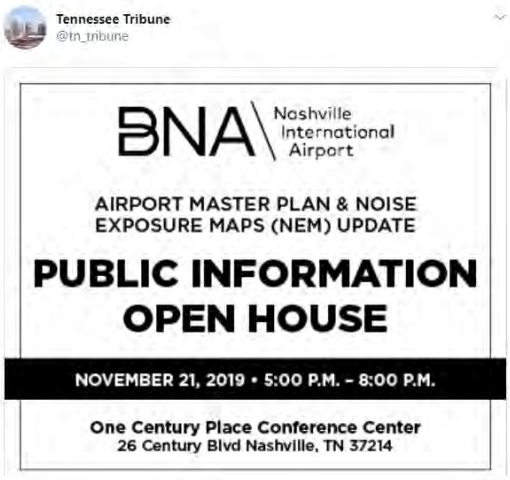
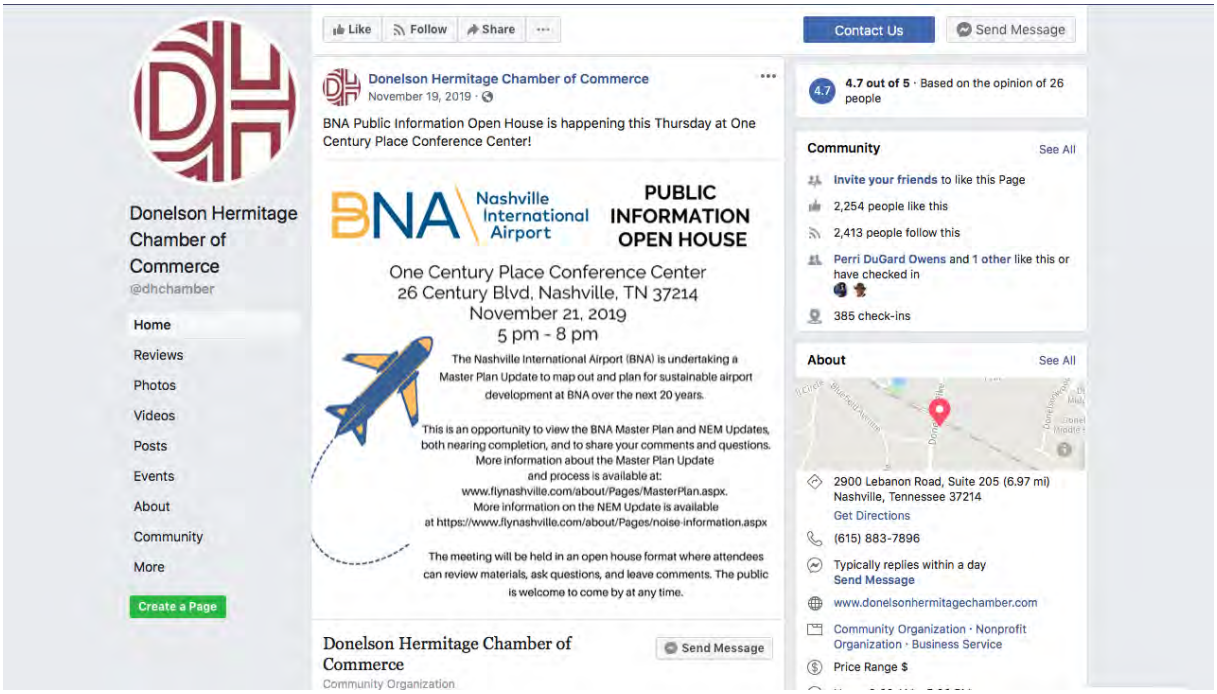
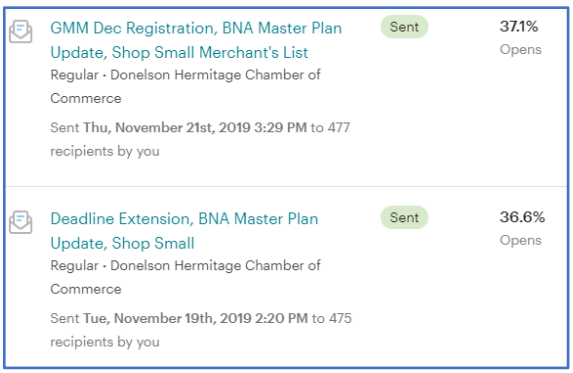
Tennessee Tribune Facebook posting



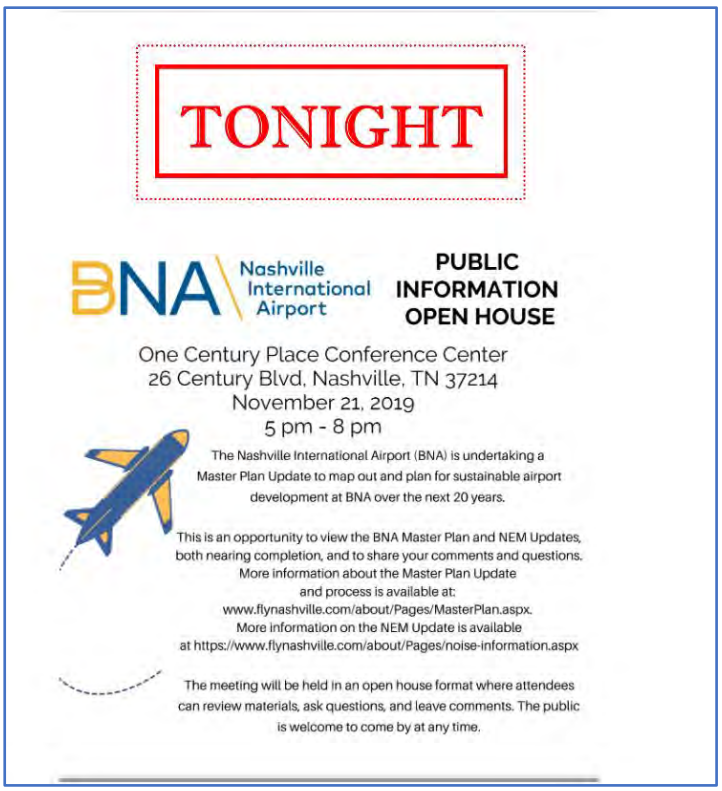
Tennessee Tribune Twitter Posting



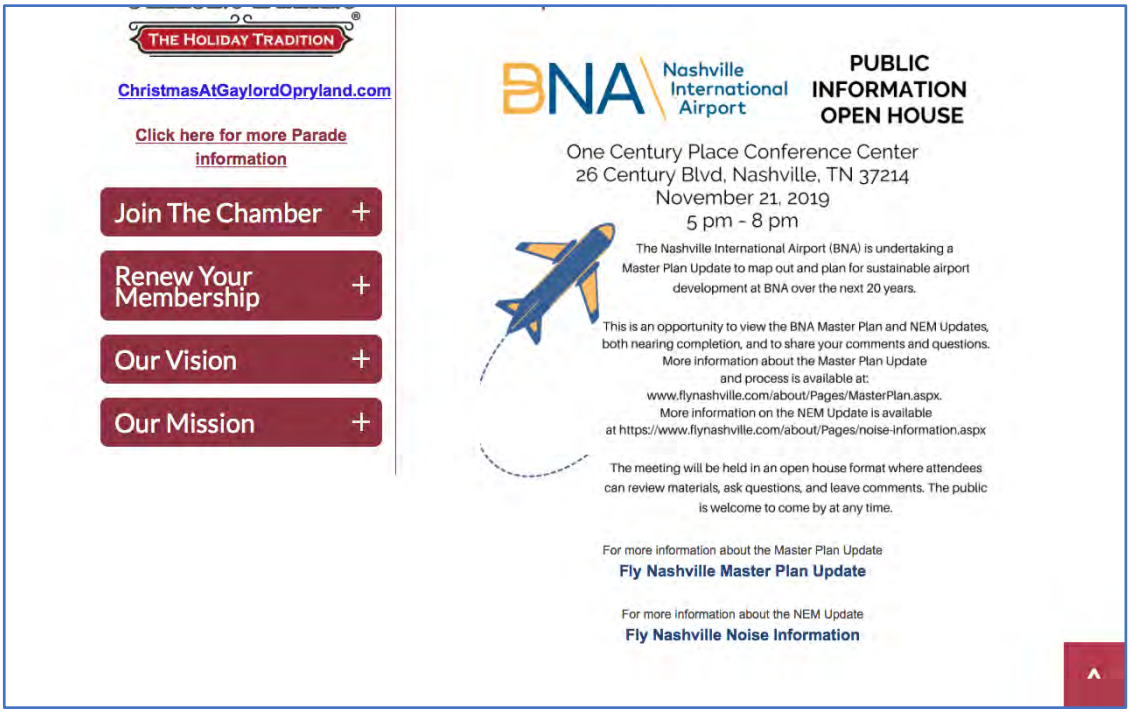
Donelson Hermitage Chamber of Commerce Facebook Page



Donelson Hermitage email report



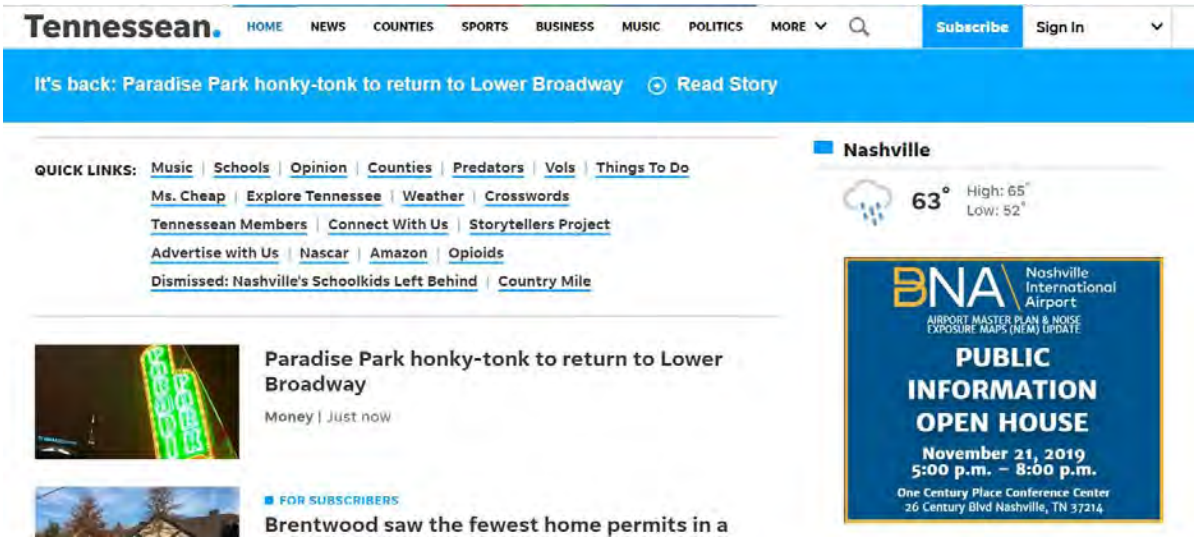
Donelson Hermitage website ad on Nov.21, 2019



Donelson Hermitage Chamber Website



Nashville Post page showing Open House advertisement



Tennessean Website

4A ‖ TUESDAY, NOVEMBER 19, 2019 ‖ THE TENNESSEAN

Swift can perform old songs at AMAs

Artist, label, production company reach a deal

Matthew Leimkuehler
Nashville Tennessean
USA TODAY NETWORK – TENNESSEE

Pop megastar Taylor Swift has shaken off the latest dispute with her former label.

Nashville-based Big Machine Label Group, which Swift parted ways with in 2018, and American Music Awards curator Dick Clark Productions gave Swift the green light to perform her old material Sunday at the ceremony.

A joint statement from Big Machine and Dick Clark Productions, which doesn't name Swift directly, allows "artists' performances to stream post show and for re-broadcast on mutually approved platforms."

The decision comes following a public back-and-forth last week between Swift and the label. Launched by Nashville music executive Scott Borchetta in 2005, music mogul Scooter Braun purchased Big Machine earlier this year for a reported $300 million — a business move that Swift, who recorded her first six albums with Big Machine, publicly criticized.

The American Music Awards will honor Swift as Artist of the Decade during Sunday night's broadcast on ABC.

The full statement from Big Machine and Dick Clark Productions:

"The Big Machine Label Group and Dick Clark Productions announce that they have come to terms on a licensing agreement that approves their artists' performances to stream post show and for re-broadcast on mutually approved platforms. This includes the upcoming American Music Awards performances. It should be noted that recording artists do not need label approval for live performances on television or any other live media. Record label approval is only needed for contracted artists' audio and visual recordings and in determining how those works are distributed."

Chris Young, Gavin DeGraw team up for 'CMT Crossroads'

Dave Paulson and Cindy Watts
Nashville Tennessean
USA TODAY NETWORK – TENNESSEE

Country star Chris Young and hit-making singer-songwriter Gavin DeGraw are the latest duo teaming up for an episode of "CMT Crossroads" — and fans have the chance to see the TV taping in person.

Young and DeGraw will share the stage at Liberty Hall at the Factory in Franklin, 230 Franklin Rd., Franklin, on Nov. 26.

"He's just ... a great guy and a phenomonal vocalist," Young said of DeGraw. "He's had so many hits, and he's just someone I wanted to collaborate with. This is just the perfect time for us to get together and kind of riff on each others songs and have a good time with it."

The respect is mutual.

"We all love country music, and the best thing about country is the feeling of community around it," DeGraw said. "Chris embodies that sense of community, not only in his music, but in real life as well. That's why I'm excited to be part of 'Crossroads' with him."

The show is free and open to the public, but an RSVP is required.

Fans can RSVP for tickets at CMT.com. Doors open at 7 p.m. and will close at 8 p.m. Fans are urged to "arrive early as once seating capacity is reached, admission will close. RSVP does not guarantee entry."

The taping is estimated to end at 9:30 p.m.



The "Today" show co-hosts, including, from left, Al Roker, Sheinelle Jones and Craig Melvin, are seen on Oct. 15. NATHAN CONGLETON/NBC

NBC'S 'Today' show coming to Nashville for live broadcast

Dave Paulson Nashville Tennessean
USA TODAY NETWORK – TENNESSEE

Al Roker and several of his "Today" show co-hosts will come to Nashville this Friday for a special Music City edition of "The 3rd Hour of Today."

The show will air from Pinewood Social, where Roker will be joined by Sheinelle Jones, Craig Melvin and former fourth hour of "Today" host and Franklin resident Kathie Lee Gifford.

The Nashville edition is set to spotlight the city's "thriving local scene" via restaurants, bars, shops and music spots, along with a pre-taped tour of 12 South and East Nashville.

Other special guests include country star Jimmie Allen, the volunteers of local nonprofit Second Spoon and "several of the city's finest chefs."

The hosts announced the news on Monday's edition of "3rd Hour."

"We keep saying we want to take this show on the road," said Jones.

"And we thought, 'What a great place to start.'"

The show will air at 9 a.m. CT this Friday on NBC.

BNA Nashville International Airport

AIRPORT MASTER PLAN & NOISE EXPOSURE MAPS (NEM) UPDATE

PUBLIC INFORMATION OPEN HOUSE

November 21, 2019
5:00 p.m. – 8:00 p.m.

One Century Place Conference Center
26 Century Blvd Nashville, TN 37214

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Alabama reschedules Bridgestone Arena concert

Cindy Watts
Nashville Tennessean
USA TODAY NETWORK – TENNESSEE

Play me some mountain music, indeed.

Country Music Hall of Fame group Alabama rescheduled the Nashville show on its 50th Anniversary Tour and added a second date. The postponed concert is set for July 17 at Bridgestone Arena with the added second show at Bridgestone Arena for July 18.

Charlie Daniels Band will join Alabama at both concerts.

Tickets for the second Alabama concert go on sale at 10 a.m. Friday through Ticketmaster at ticketmaster.com, by calling 800 745 3000 at all Ticketmaster locations and at the Bridgestone Arena box office.

Alabama, known for hit songs including "Mountain Music" and "Song of the South," will announce all rescheduled "50th Anniversary Tour" 2020 concert dates in the coming weeks.



Tennessean.
PART OF THE USA TODAY NETWORK

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‖ Saturday: 7:00 a.m. – 11:00 a.m. for technical support only
‖ Sunday & holidays: 7:00 a.m. – 11:00 a.m.

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Vice President & Editor ..... Michael A. Anastasi | 615-259-8022
Advertising ..... Ryan Kedzielski | 615-259-8032
Obituaries 615-259-8808

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Tennessean print page Nov.19, 2019



10B Thursday, November 21 - 27, 2019 www.TnTribune.com The Tennessee Tribune

CONTINUED FROM PAGE B9

2019. Letters of Authority in respect to the estate of GUINESTER K CALLOWAY who died on 09/04/2019 were issued to the undersigned by the Circuit Court of Davidson County, Tennessee Probate Division. All persons, resident and non-resident, having claims, matured or unmatured, against the estate are required to file same with the clerk of the above name court on or before the earlier of the dates prescribed in (1) or (2), otherwise their claims will be forever barred: (1) (A) Four (4) months from the date of the first publication (or posting) as do-scribed in (1) (A) or Twelve (12) months from the decedents date of death the 9th day of SEPTEMBER, 2019 PAUL B. CALLOWAY JR., 200 LEXINGTON WAY, HERITAGE TN 37076 Attorney for Personal Representative(s) GRIFFIN, ROBERT, 4121 CLARKSVILLE PIKE, STE 8, NASHVILLE, TN 37218 Publish dates November 7 and November 28, 2019

INVITATION TO BIDDERS FOR JANITORIAL CONSUMABLE SUPPLIES

Bids for Janitorial Consumable Supplies shall be received by the Metropolitan Nashville Airport Authority, no later than 2:00 p.m. (central), on Monday, December 30, 2019.

Copies of the Contract Documents (ITB, Proposal Schedule, Attachments, etc.) will be available on Wednesday, November 20, 2019, and may be obtained electronically from www.secure2.saars.com, an online bidding service. Free registration with Aexacor is available at https://www.flynashville.com/business-opportunities/Pages/default.aspx

The Small Minority Women-Owned Business Enterprise (SMWBE) participation level established for this project is TEN POINT FOUR-EIGHT PERCENT (10.48%) MBE and/or WBE. For information on eligible SMWBE firms, bidders should contact the Business Diversity Development, (615) 275-2710, or visit http://www.flynashville.com/business-opportunities/pages/default.aspx

Further detail concerning this bid may be obtained from the MNAA web site: http://www.flynashville.com/business-opportunities/opportunities/Pages/default.aspx

Publish November 21, 2019

PUBLIC NOTICE

Notice of Public Meetings are: Public Comment Opportunities related to the Greater Nashville Regional Council (GNRC) and its Standing Committees

Public Meetings

Notice is hereby given that the following public bodies will meet during regular sessions for the purposes of considering and transacting business on behalf of the GNRC and its membership.

• Transportation Coordinating Committee (TCC) – Will meet at 2 Victory Avenue, Suite 300, Nashville, TN 37213 on Dec. 4 at 10:00 a.m. for the purpose of considering recommendations to be considered by the Transportation Policy Board.

• Finance and Personnel Committee (F&P) – Will meet at 220 Athens Way, Suite 200, Nashville, TN 37228 on Dec. 9 at 10:00 a.m. for the purposes of developing recommendations to be considered by the Executive Board.

• Transportation Policy Board (TPB)– Will meet at the Tennessee Bankers Association at 211 Athens Way, Nashville, TN 37228 on Dec. 11 at 10:15 a.m. to conduct business related to regional transportation policy and plans of the Nashville Area Metropolitan Planning Organization.

• Executive Board (XBD)– Will meet at the Tennessee Bankers Association at 211 Athens Way Nashville, TN 37228 on Dec. 11 at 11:00 a.m. to conduct business on behalf of GNRC membership.

Further notice is given that all public meetings are posted online at GNRC.org. please check the website or call 615-862-8838 for the most information and meetings and other jurisdictions.

Documents for Public Review

GNRC is seeking public review and comment on the following item(s).

• Amendments to the 2040 Regional Transportation Plan are FY 2020 of the Transportation Improvement Program – The Regional Transportation Plan (RTP) is a long-range, 25-year multimodal strategy and fiscally-constrained capital improvement program developed to guide the investment of public funds to manage congestion, improve roadway safety, and keep transportation facilities in a state of good repair. The Transportation Improvement Program (TIP) is a short-range program of short-term projects which advances the implementation of projects from the RTP. The amendments consist of the addition of projects. A public hearing is scheduled in conjunction with the TPB meeting on Dec. 11, 2019. Amendments will be available for review online at https://www.nrcog2040.com/Notices no later than Dec. 1, 2019.

About the GNRC

GNRC is established by the TN General Assembly as an association of local governments empowered to convene local and state leaders for the purposes of planning and programming state and federal investments into a range of social services and public infrastructure. GNRC serves as the region's federally-recognized Metropolitan Planning Organization (MPO), Area Agency on Aging and Disability (AAAD), and Economic Development District (EDD).

GNRC does not discriminate on the basis of race, color, national origin, limited English proficiency, gender, gender identity, sexual orientation, age, religion, creed or disability in admission to, access to, or operations of its programs, services, or activities. Comments or requests for accommodation should be directed to Leyten Smith, Non-Discrimination Coordinator, 220 Athens Way, Suite 200, Nashville, TN 37228, phone number 615-862-8803. Publish November 21, 2019

NOTICE OF PUBLIC SALE

Storaway Self Storage

According to provision of THE TENNESSEE SELF SERVICE STORAGE FACILITIES ACT (Tennessee chapter 31-66-31-101) ths 66-31-107) will conduct a public sale of the contents of the (Storage Spaces), unless so by with the contents being sold to the highest bidder. Owner reserves the right to bid. The sale is being held at safety a landlord's lien and will be held at 7:4 Charlotte Pike, Nashville, TN 37209 on 11/26/19 at 10 am. THE PUBLIC IS INVITED TO ATTEND.

Unit 027 Melanie Krupp 100 Sowing Ave 46 Nashville, TN 37209 Boxes

Unit 228 Melanie Krupp 100 Sowing Ave 46 Nashville, TN 37209 Boxes

Unit 211 Melanie Krupp 100 Sowing Ave 46 Nashville, TN 37209 Boxes

Unit 27 William Thrower 5077 Moss Rd Nashville, TN 37221 Furniture and Household

Unit 328 Kiel Lackey 66 Twin St. Nashville, TN 37209 Totes and misc. items

Unit +43 Anita Thrower 2304 Alameda St. Nashville, TN 37208 Boxes and misc. items

Unit 648 Donna Hersey 818 Percy Warner Blvd. Nashville, TN 37205 Bags and totes

Unit 678 Katherine Worel 8378 Sawyer Brown Rd. Nashville, TN 37221 Furniture and boxes. Publish: November 21, 2019

CLASSIFIEDS

Auctions

Live Public Auction – Sunday, November 24th @12:30 pm. Selling items that was accepted at Richard Wagner Estate sale at Porter Wagoner. Also will be selling Porter Wagoner memorabilia. www.DustyBottomAuction.com 615-383-7030 (TnScan)

Firearms, Gold Coins, Vehicles, Motorcycles, ATVs. HIGH VALUE MONEY! Jess Wenger, Construction and Industrial Equipment, Contractor Grade Tools & Lots for PUBLIC AUCT ON, Nov. 27th, 28th and beyond. Guns & Gunsmithing Conducted and Auction or how. 50811 Over 1000 lots will be available for Live Online bidding to the Public at www.SnoonConnaise.com. Real Estate Auction Dec. 10th. Consignments always accepted for our Monthly Auctions as well as Real Estate sales and Auctions. Visit www.SnoonConnaise.com for more details or to register. 800-729-6466. Connaise Auctions & Real Estate Firm #5639 (TnScan)

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DISH Network $39.99 For 190 Channels! Add High Speed Internet for ONLY $19.99/month. Call Today for $100 Gift Card! Best Value & Technology. FREE Installation. Call 1-844-274-8074 (some restrictions apply) (TnScan)

Spectrum Triple Play: TV, Internet & Voice for $99.97/mo. Fastest Internet, 100 MB per second speed. Free Primetime on Demand. Unlimited Voice. NO CONTRACTS. Call 1-855-417-8520 (TnScan)

Get NFL Sunday Ticket FREE w/ DIRECTV Choice All-Included Package. $59.99/month for 12 months. 185 Channels PLUS Thousands of Shows/Movies On Demand. FREE Genie HD DVR Upgrade. Call 1-844-230-4803 or satellitedeals.how.com/TN (TnScan)

Farm Equipment

GOT LAND? Our Hunters w/ Pay Top $$$ To hunt your land. Call for a FREE info packet & Quote. 1-866-339-1567 www.BaseCampLeasing.com (TnScan)

Health / Beauty

Full Spectrum CBD Rich Hemp Oil. Known to help reduce stress & anxiety, improve sleep, manage chronic pain. Lab Tested. USA Grown not Overseas. 100% Money Back Guarantee. Save Over 33%. CALL NOW 1-844-241-8152 (TnScan)

DENTAL INSURANCE. Call Physicians Mutual Insurance Company for details. NOT just a discount plan. REAL coverage for 350 procedures. 844-278-6288 or http://www.dentalbyphysicians.com/tnpress AAT 6118 (TnScan)

Attention Viagra users: Generic 100 mg Blue pills or Generic 20 mg Yellow pills. Get 40 pills + Free 999 = $99. Guaranteed, no prescription necessary. Call Today 1-888-445-8212 (TnScan)

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NEW STARTING BASE PAY - 80 gm w/ option to make 90 gpm for Class A CDL Flatbed Drivers. Excellent Benefits. Home Weekends. Call 800-948-8915 or www.bogdancorp.com (TnScan)

Home Improvement

Eliminate gutter cleaning forever! Leaf Filter, the most advanced seamless gutter protection. Schedule a FREE Leaf Filter estimate today. 10% off and 0% financing for those who qualify. PLUS Senior & Military Discounts. Call 1-855-989-5064 (TnScan)

Home Service

Looking for self storage units? We have them! Self Storage offers clean and affordable storage to fit any need. Reserve today! 1-855-897-3423 (TnScan)

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Frontier Communications internet. Bundles. Simply Speed! Satellite. Value! Broadband Max - $79.99/mo. or Broadband Ultra - $89.99/mo. Both include FREE Wi-Fi Router. CALL For Details! - 1-877-886-9644 (TnScan)

HughesNet Satellite Internet - 25 mbps starting at $49.99/mo! Get More Data FREE Online Plans Data. FAST download speeds. WiFi built in. FREE Standard installation for lease customers! Limited Time. Call 1-844-231-4950 (TnScan)

Earthlink High Speed Internet As Low As $14.95/month (for the first 3 months) Reliable High Speed Fiber Optic Technology. Stream Videos, Music and Much More! Call Earthlink Today 1-888-337-9611 (TnScan)

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A PLACE FOR MOM has helped over a million families find senior living. Our trusted, local advisors will find solutions to your unique needs at no cost to you. 1-855-894-4575 (TnScan)

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YOUR LOW COST ADVERTISING Solution! One call & your 25 word ad will appear in 88 Tennessee newspapers for $275/wk or 44 Middle TN newspapers for $150/wk. Call this newspaper's classified advertising dept. or go to www.tnadvertising.biz. (TnScan)

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for Seniors only
The Tennessee Tribune's monthly magazine for seniors!
Our magazine engages older adults and offers useful information on health, wellness learning, lifestyle activities and more!
Our magazine is inserted the last week of each month in the Tribune!
TO ADVERTISE IN OUR MONTHLY MAGAZINE:
Please contact us at 615-321-3268 or email sales1501@aol.com

HENSEL PHELPS
Plan. Build. Manage.
The Nashville Airport BNA Vision
Terminal Lobby & IAF Project
CGMP4 - Below Grade Foundation Scopes Pre Solicitation Event
All firms Invited to Learn and Network
Tuesday, December 10, 2019
1:00pm – 3:00pm
Meharry Medical College Campus
Cal Turner Family Center Auditorium
1011 21st Avenue North
Nashville, TN 37208
RSVP/Inquire with James Harper at
jharper@henselphelps.com
Bids Due February 19, 2020
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BNA Nashville International Airport

AIRPORT MASTER PLAN & NOISE EXPOSURE MAP (NEM) UPDATE

PUBLIC INFORMATION OPEN HOUSE

November 21, 2019 • 5:00 p.m. – 8:00 p.m.

One Century Place Conference Center
26 Century Blvd Nashville, TN 37214

The Nashville International Airport (BNA) is undertaking a Master Plan Update to map out and plan for sustainable airport development at BNA over the next 20 years.

This is an opportunity to view the BNA Master Plan and NEM Updates, both nearing completion, and to share your comments and questions. More information about the Master Plan Update and process is available at: https://www.flynashville.com/about/Pages/MasterPlan.aspx. More information on the NEM Update is available at https://www.flynashville.com/about/Pages/noise-information.aspx

The meeting will be held in an open house format where attendees can review materials, ask questions, and leave comments. The public is welcome to come by at any time.

Tennessee Tribune print page

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BNA MASTER PLAN

BNA Master Plan Public Information Open House 11/21/2019 Attendees

Name	Email	Organization	Telephone
Chauncey Davis	biocad2@gmail.com		615-506-4389
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Kym Gerlock		BNA	
Kyle Ogden	kyle.ogden@aecom.com	AECOM	
Tony Tenpenny	tonytenpenny@yahoo.com	Lee House	615-506-2016
Bob Whitley	whitleyb0018@att.net		615-255-5412
James Morinec	jmordm@att.net		615-478-2113
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Scott Hinote	djscotthinote@gmail.com		615-566-1197
Michelle Smith	whambette@gmail.com		615-476-5505
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Stefan Bobot	sbobot@smeinc.com	S&ME	615-385-4144
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Ed Colacuori	ecol@bellsouth.net		615-243-0678

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Josh Mann	josh.mann@foth.com	Foth	515-322-0069
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Jeff Anderson	janderson@supsriorse.com		615-917-7233
Nathan Hyde	nhyde@bellsouth.net	Cumberland Trust	615-554-2456
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Rosemary Blackwell			
Jesse Smith			
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Robert Ramsey	robert.ramsey@flynashville.com	MNAA	
Mary Johnson	mary.johnson0902@gmail.com	Bradford Hills Community	615-330-3832

Name	Email	Organization	Telephone
Michael Johnson	mwjohnson1939@gmail.com	Bradford Hills Community	615-294-6815
Christa Simpson	csimpson@gmail.com	TSC (Resident)	615-594-0064
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Adam Jernigan	aj_jernigan@hotmail.com		270-217-3542
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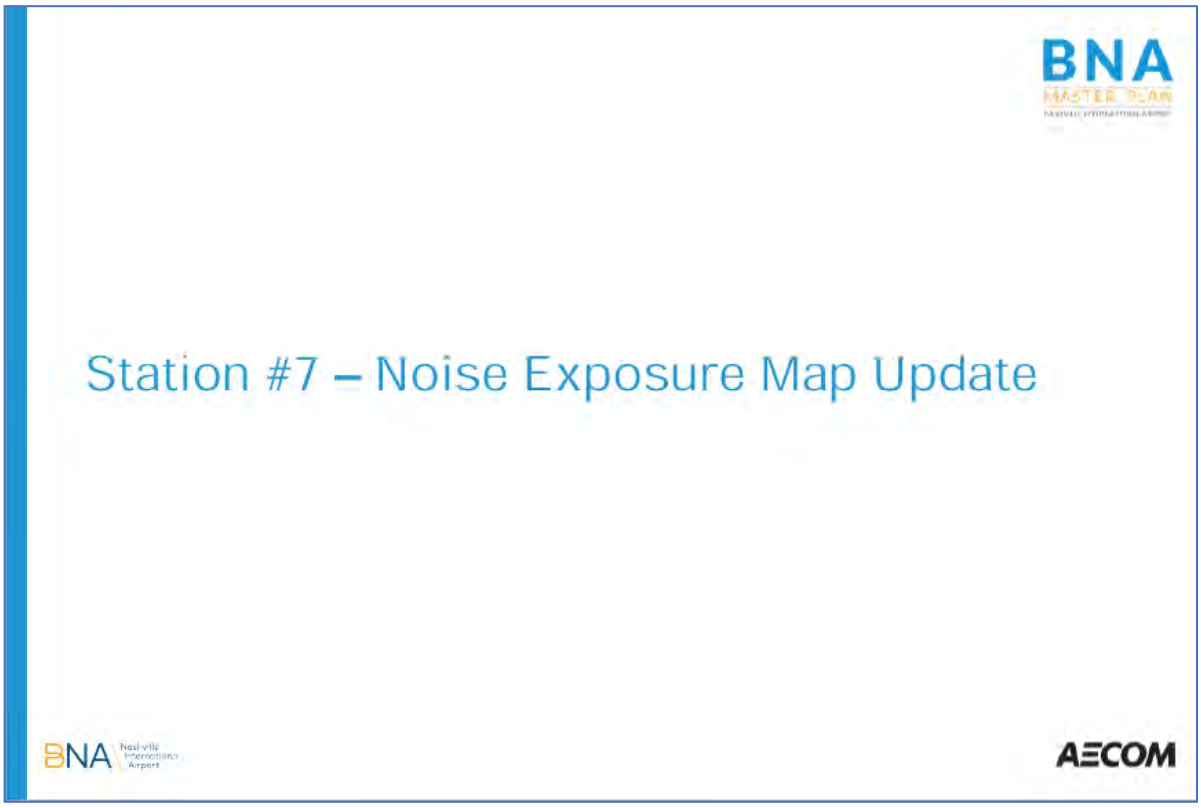
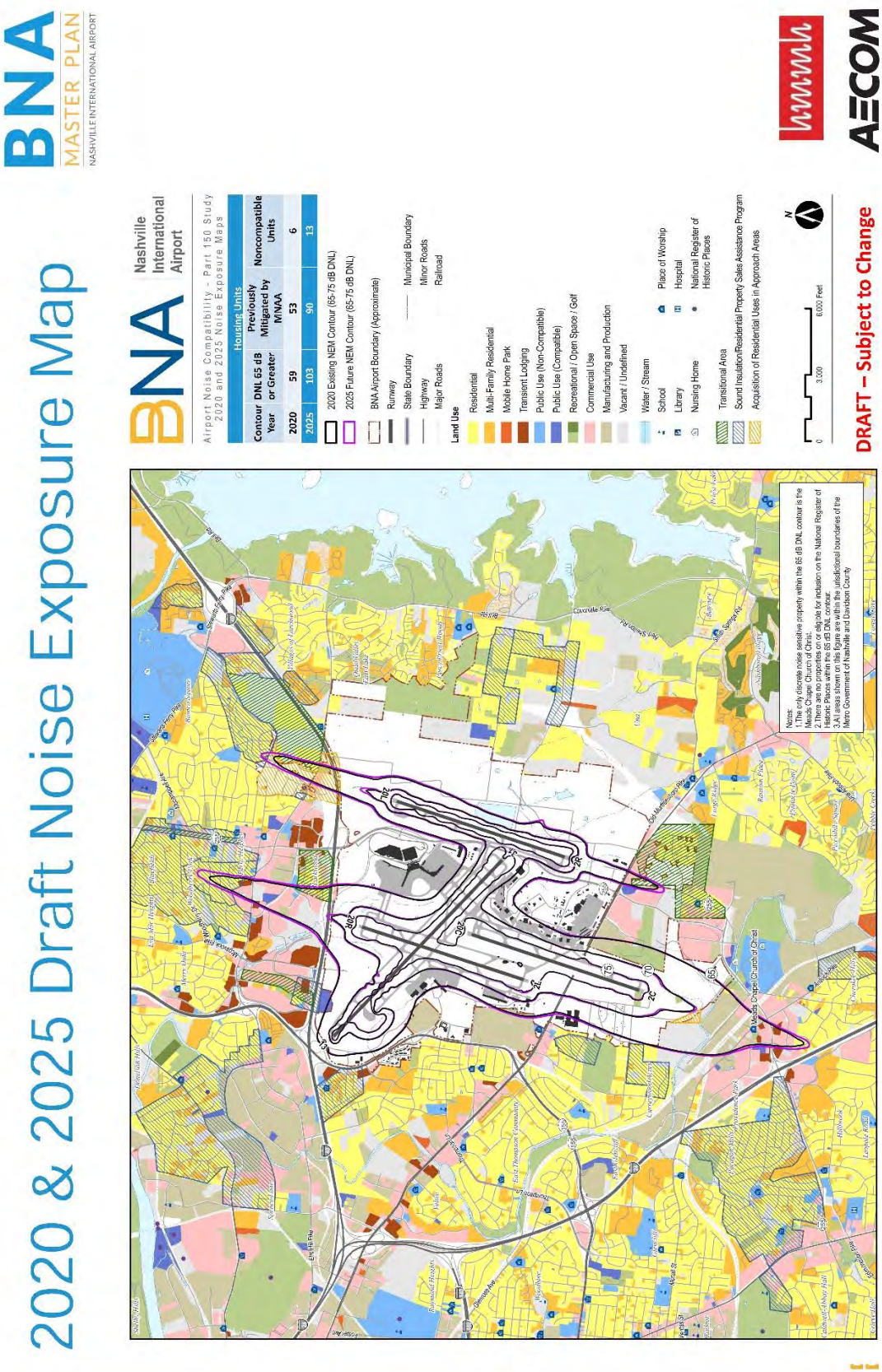
Chuck Quvett	charlesquvett@yahoo.com	TWARWG	615-367-5544
Kyle Sanderson	KJ.sanderson@gmx.com	TWARWG	615-367-5544
Rebecca Brown	rebecca-brown@live.com	Community Member	615-429-6248
John Stern	jstern@comcast.net		615-889-3100
Dan Chally	dan@pilgrimconsulting.com	Pilgrim Consulting	312-286-4499
Robert Brown	lmsgreenjeans@aol.com		615-305-6619
Louan Brown	lmsgreenjeans@aol.com		615-305-6619
Alex Fort	lmsgreenjeans@aol.com		615-305-6619

Name	Email	Organization	Telephone
Mike Morgan	michael.c.morgan@vumc.com		615-429-2167
Barry Lee	barryleestuff@gmail.com		615-678-9195

G.4 NEM-Related Workshop Boards

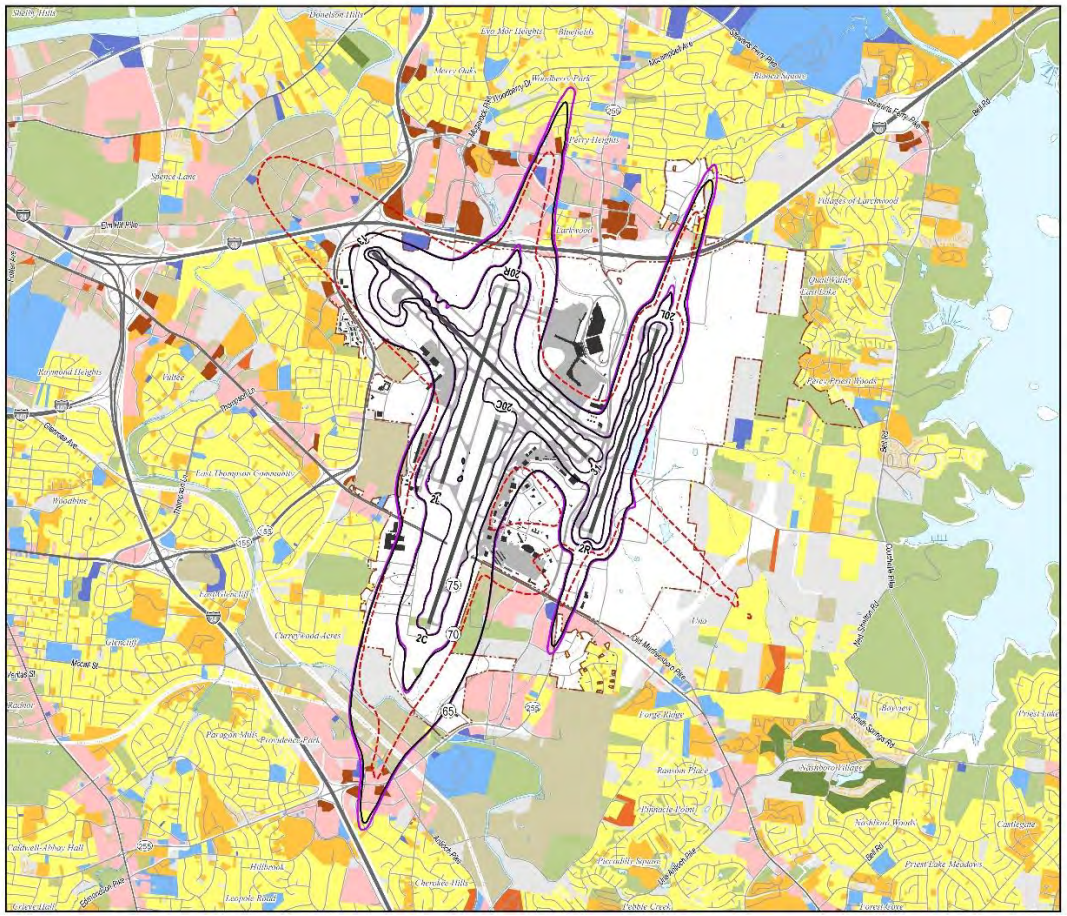
The NEM-related boards at the fall 2019 public workshop, held on November 21, included large-scale version of the official 2020 and 2025 NEM contours (similar to Figure 5 of this document) and the comparison to the prior existing condition (2012) NEM figure from the preceding study, as reproduced below:




BNA
MASTER PLAN
NASHVILLE INTERNATIONAL AIRPORT
2020 & 2025 Draft Noise Exposure Map
BNA
Nashville International Airport
Airport Noise Compatibility - Part 150 Study
2020 and 2025 Noise Exposure Maps
Housing Units
Contour Year
DNL 65 dB or Greater
Previously Mitigated by NMAA
Noncompatible Units
2020
59
53
6
2025
103
90
13
2020 Existing NEM Contour (65-75 dB DNL)
2025 Future NEM Contour (65-75 dB DNL)
BNA Airport Boundary (Approximate)
Runway
State Boundary
Highway
Major Roads
Municipal Boundary
Minor 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
School
Library
Nursing Home
Place of Worship
Hospital
National Register of Historic Places
Transitional Area
Sound Insulation/Residential Property Sales Assistance Program
Acquisition of Residential Uses in Approach Areas
N
0
3,000
6,000 Feet
DRAFT – Subject to Change
AECOM
Notes:
1.The only discrete noise sensitive property within the 65 dB DNL contour is the Meade Chapel Church of Christ.
2.There are no properties on or eligible for inclusion on the National Register of Historic Places within the 65 dB DNL contour.
3.All lanes shown on this figure are within the jurisdictional boundaries of the Metro Government of Nashville and Davidson County

2012 DNL Contours Compared to the 2020 & 2025 DNL Contours

BNA MASTER PLAN
NASHVILLE INTERNATIONAL AIRPORT



BNA Nashville International Airport

Airport Noise Compatibility - Part 150 Study
2020 and 2025 Noise Exposure Maps

Housing Units			
Contour Year	DNL 65 dB or Greater	Previously Mitigated by MNAA	Noncompatible Units
2012	118	116	2
2020	59	53	6
2025	103	90	13

- 2012 NEM Contour (65 dB)
- 2020 Existing NEM Contour (65-75 dB DNL)
- 2025 Future NEM Contour (65-75 dB DNL)
- 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

0 3,000 6,000 Feet

N

DRAFT – Subject to Change

hmmh

AECOM

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APPENDIX H WRITTEN COMMENTS RECEIVED DURING CONSULTATION

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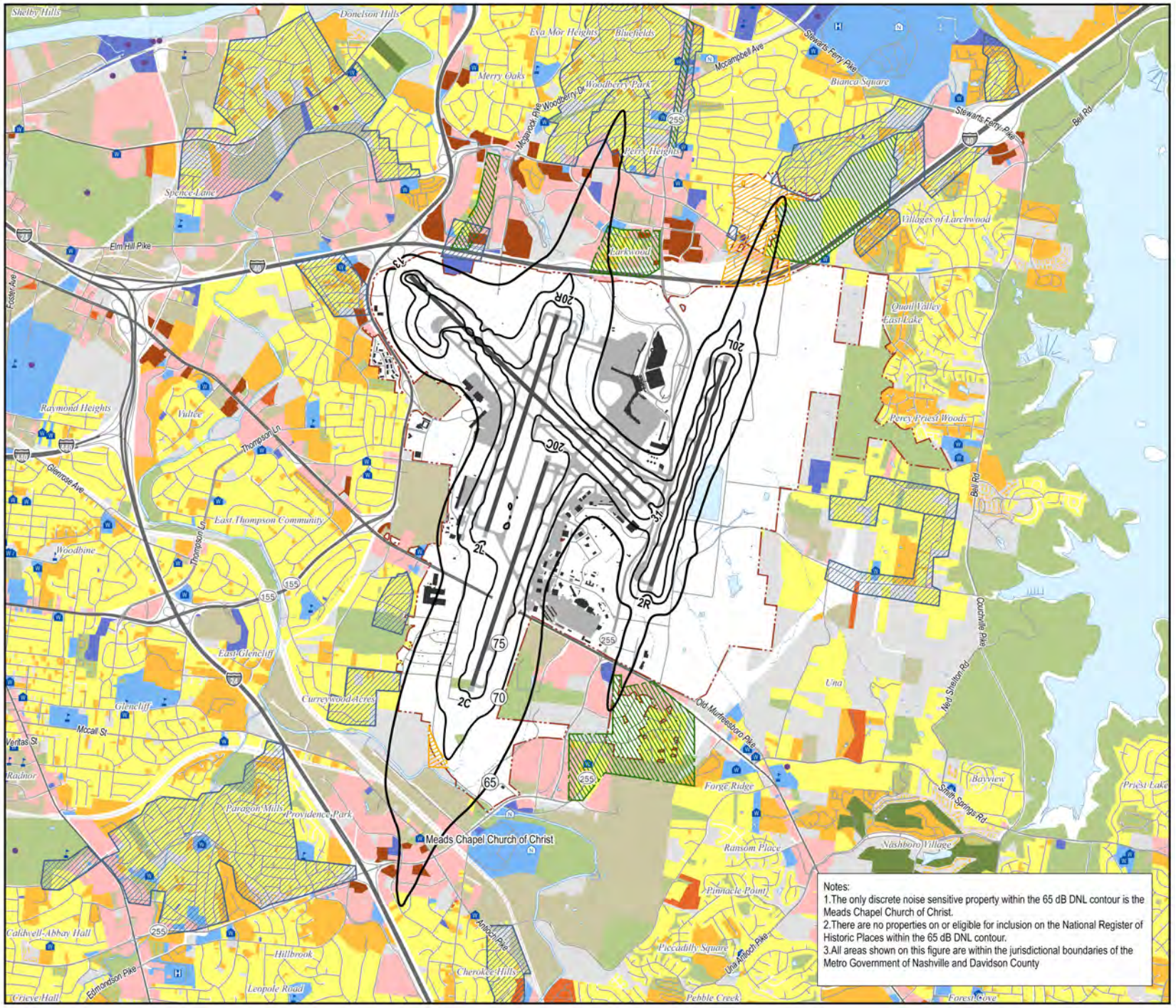
The MNAA requested comments at the end of each NSAC meeting and during the Public Workshop. The study received two comments as part of this process, and they are provided below along with the MNAA response. MNAA has provided these comments to FAA by listing the comments in this report.

Name	Email	Comment	Response
Michael W. Johnson	mwjohnson1939@gmail.com	No remedy to noise from airplane. No contingency plan to abate noise. Address 1449 Woodfield Drive, Nashville, TN 37211 This meeting does not properly answer residents concerns. Feel free to make contact.	Your home is several miles to the south of the airport located under the final approach to Runway 2C. Aircraft on approach to Runway 2C need to line up with the runway in order to establish a safe descent and overflights of your home are an operational necessity based on FAA flight procedures. All flight procedures were modeled as part of this study and your residence is located outside of the 65 DNL contour.
Mary Johnson	mary.johnson0902@gmail.com	I reside in Bradford Hills Subdivison. The planes upon final descent are over my home. The noise is UNBEARABLE!!! Beginning the process of legal action	Your home is several miles to the south of the airport located under the final approach to Runway 2C. Aircraft on approach to Runway 2C need to line up with the runway in order to establish a safe descent and overflights of your home are an operational necessity based on FAA flight procedures. All flight procedures were modeled as part of this study and your residence is located outside of the 65 DNL contour.



BNA Nashville International Airport

Airport Noise Compatibility - Part 150 Study
2020 and 2025 Noise Exposure Maps

Figure: 3

Existing Conditions (2020) Noise Exposure Map

- 2020 Existing NEM Contour (65-75 dB DNL)
- BNA Airport Boundary (Approximate)
- Runway
- State Boundary
- Municipal Boundary
- Highway
- Minor Roads
- Major Roads
- Railroad

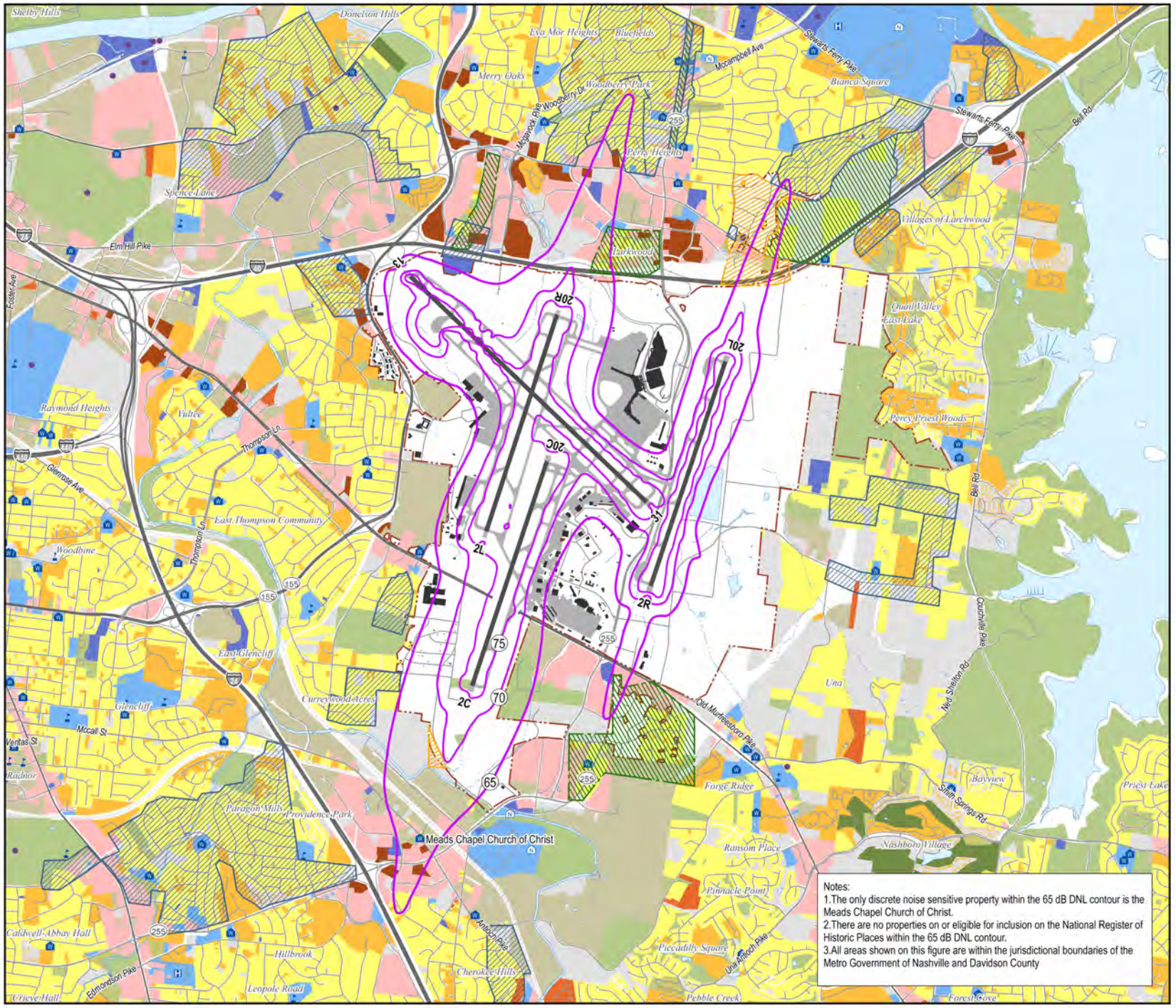
Land Use

- 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
- School
- Place of Worship
- Library
- Hospital
- Nursing Home
- National Register of Historic Places
- Transitional Area
- Sound Insulation/Residential Property Sales Assistance Program
- Acquisition of Residential Uses in Approach Areas

0 3,000 6,000 Feet

N

hmmh



Notes:
1.The only discrete noise sensitive property within the 65 dB DNL contour is the Meads Chapel Church of Christ.
2.There are no properties on or eligible for inclusion on the National Register of Historic Places within the 65 dB DNL contour.
3.All areas shown on this figure are within the jurisdictional boundaries of the Metro Government of Nashville and Davidson County

BNA Nashville International Airport

Airport Noise Compatibility - Part 150 Study
2020 and 2025 Noise Exposure Maps

Figure: 4

Forecast Conditions (2025) Noise Exposure Map

- 2025 Future NEM Contour (65-75 dB DNL)
- BNA Airport Boundary (Approximate)
- Runway
- State Boundary
- Municipal Boundary
- Highway
- Minor Roads
- Major Roads
- Railroad

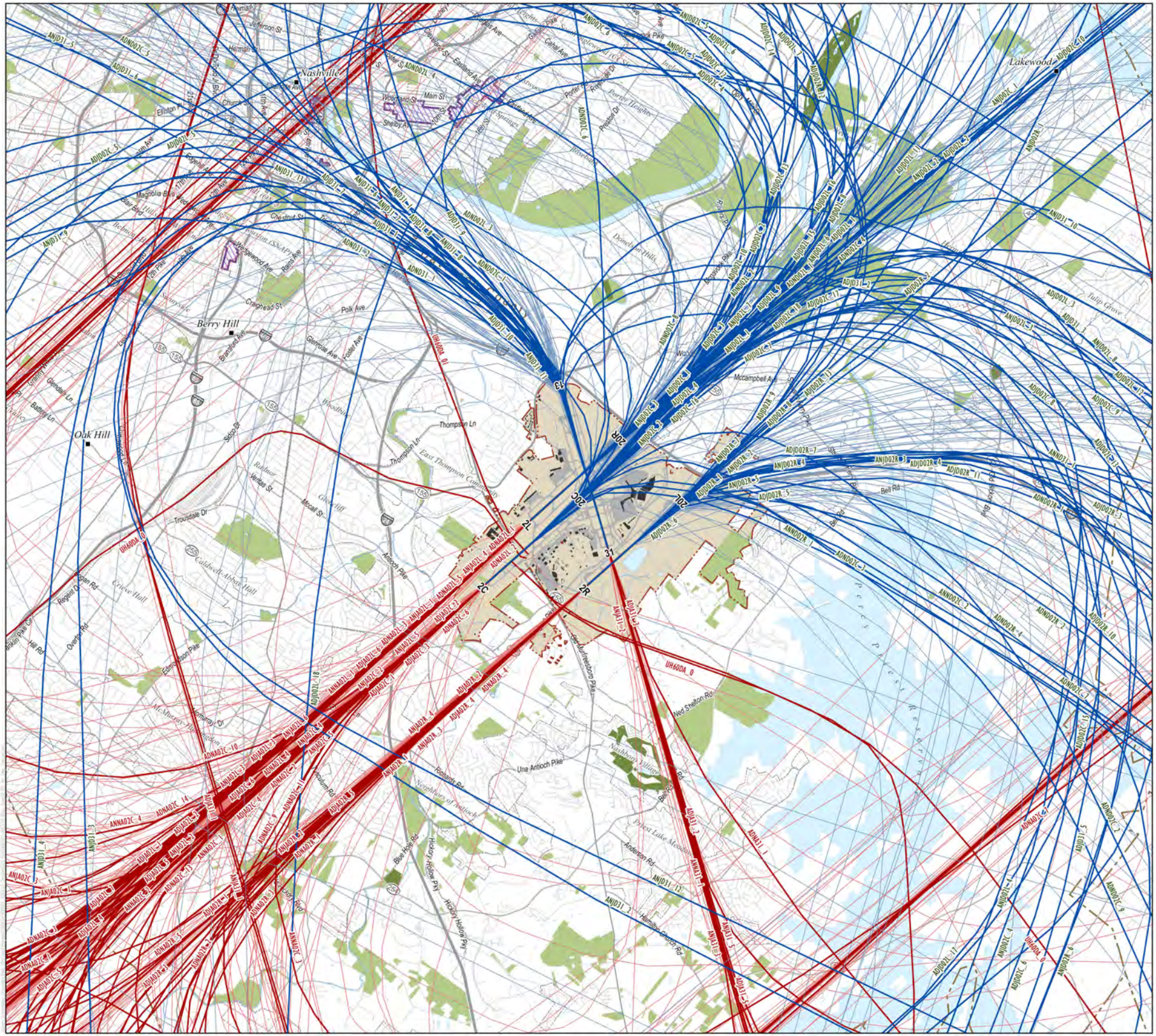
Land Use

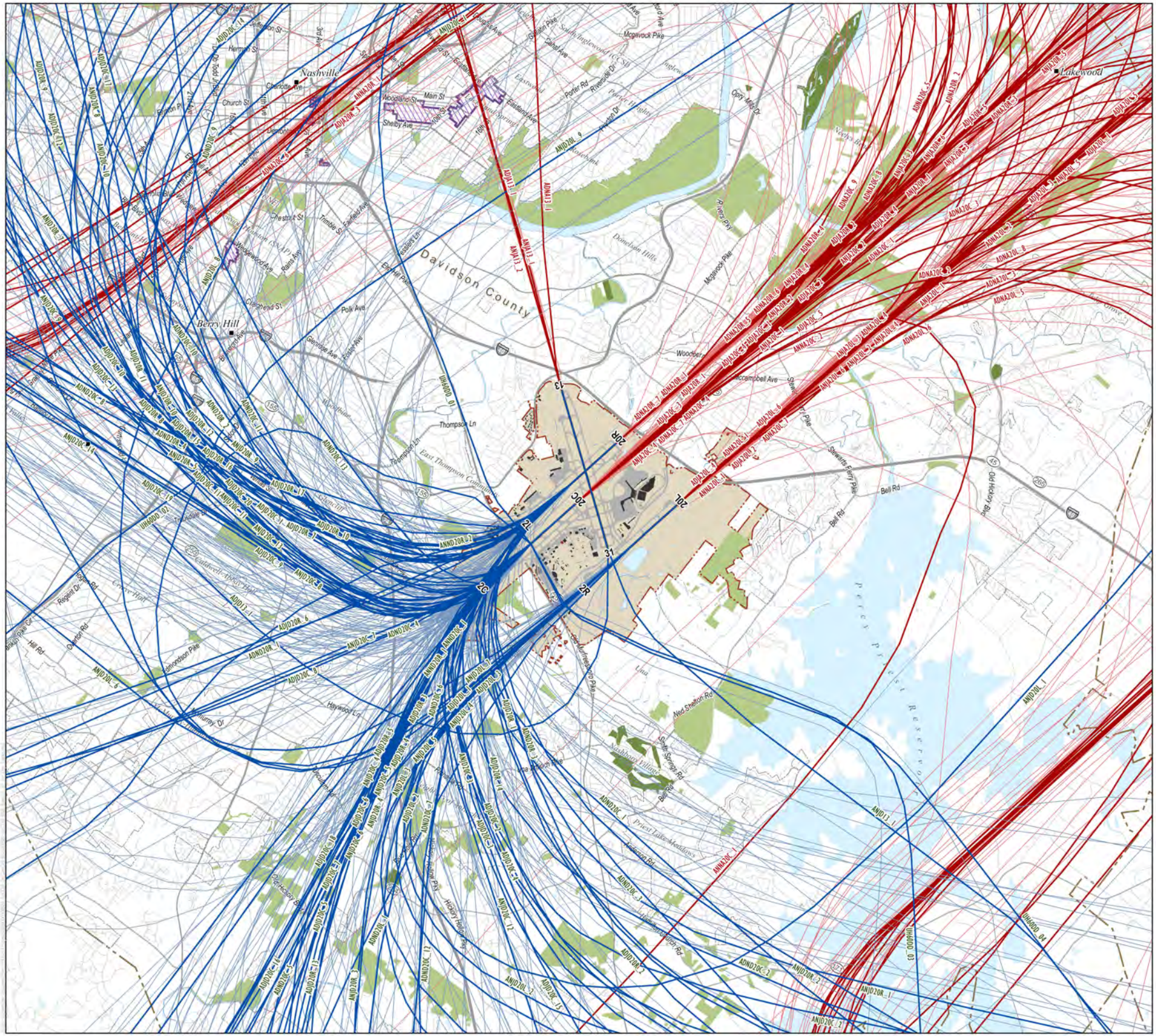
- Residential
- Multi-Family Residential
- Mobile Home Park
- Transient Lodging
- Public Use (Non-Compatible)
- Public Use (Compatible)
- Recreational / Open Space / Golf
- Commercial Use
- Manufacturing and Production
- Vacant / Undefined
- Water / Stream
- School
- Place of Worship
- Library
- Hospital
- Nursing Home
- National Register of Historic Places
- Transitional Area
- Sound Insulation/Residential Property Sales Assistance Program
- Acquisition of Residential Uses in Approach Areas

0 3,000 6,000 Feet

N

hmmh


Nashville
Berry Hill
Oak Hill
Lakewood
Thompson Ln
Trousdale Dr
Craighead St
Polk Ave
Chestnut St
Main St
Woodland St
Antioch Pike
Una Antioch Pike
Hobson Pike
Old Hickory Blvd
Bell Rd
Hed Shelton Rd
Edmondson Pike
Murfreesboro Pike
Nolensville Pike
Harding Place
Donelson Hills
Percy Priest Lake
Priest Lake Meadows
Neighbors of Antioch
Nashboro Village
Crieve Hall
Caldwell-Athens Hall
East Thompson Community
Porter Heights
Lakeside Park
Tulip Grove
Belmont
Hillsboro
Vanderbilt
Fisk
Meharry
Watkins
Ridley
Hickory Hollow Pky
Blue Hole Rd
Anderson Rd
Hamilton Church Rd
Rosebank
Woodbine
Glendale
Glenrose Ave
Foster Ave
Branstetter Ave
Ramsey Ave
Woodmont Ave
Belmont Ave
Acklen Ave
Elliston Pl
Church St
Broadway
Gallatin Pike
Dickerson Pike
Jefferson St
Clarksville Pike
Shelby Ave
Eastland Ave
Porter Rd
Preston Dr
Friendship Dr
Magnolia Blvd
Bear Creek Pike
Old Hickory Blvd
Mcampbell Ave
Mccall St
Ridgetop Dr
Ridgetop Ln
Stacy Dr
Glenhurst Ln
Battery Ln
Regent Dr
Overton Rd
Hall Rd
Memorial Dr
Mcmurray Dr
Woodlawn Dr
Mcdurm Rd
Ashland City Hwy
Cockrill Bend Blvd
Cumberland River
Old Hickory Lake
Bell Rd
Hobson


Nashville
Lakewood
Berry Hill
Davidson County
Percy Priest Reservoir
Nashboro Village
Old Hickory Blvd
Bell Rd
Mcgavock Pike
Dickerson Pike
Murfreesboro Pike
Thompson Ln
Woodland St
Main St
Shelby Ave
Eastland Ave
Porter Rd
Riverside Dr
Opry Mills Dr
Donelson Hills
Stewarts Ferry Pike
Neal Shelton Rd
Smith Springs Rd
Hickory Hollow Pkwy
Old Hickory Blvd
Pennington Bend Rd
Andrew Jackson Pkwy
Percy Priest Lake
Cumberland River
Stones River
Mill Creek
Una
Woodbine
Edgehill
Belmont-Hillsboro
Chestnut Hill
Vine Hill
Fairfield
Lockeland Springs
East Nashville
Germantown
Salemtown
Capitol Hill
Wedgewood-Houston
Gulch
Music Row
Sylvan Park
Hillsboro Village
Green Hills
Oak Hill
Forest Hills
Belle Meade
Radnor
Crieve Hall
Brookmeade
Glendale
Whites Creek
Jefferson St
Charlotte Ave
Church St
Broadway
Demonbreun St
Hermitage Ave
Trinity Ln
Clarksville Pike
Dickerson Rd
Gallatin Pike
Meridian St
Ellamore Ave
Foster Ave
Glenrose Ave
Polk Ave
Clarkwood Ave
Rains Ave
Trimble St
Fessler's Ln
Chestnut St
Clephead St
Edgehill Ave
Belmont Ave
Wedgewood Ave
Hillsboro Pike
Franklin Pike Cir
Hall Rd
Overton Rd
Regent Dr
Murphy Dr
Heywood Ln
Thompson Ln
Pennington Bend Rd
Old Hickory Blvd
Andrew Jackson Pkwy
Hickory Hollow Pkwy
Smith Springs Rd
Neal Shelton Rd
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Murfreesboro Pike
Bell Rd
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Riverside Dr
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Woodland St
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