APPENDICES

Noise Exposure Map Update and Noise Compatibility Program Amendments

Piedmont Triad International Airport

HMMH Report No. 310081
November 2020

Prepared for:

PIEDMONT TRIAD AIRPORT AUTHORITY

Piedmont Triad Airport Authority
1000A Ted Johnson Parkway
Greensboro, NC 27409

Draft – Subject to Change

APPENDICES

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Pursuant to Title 14 of the Code of Federal Regulations Part 150

Piedmont Triad International Airport

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Prepared for:

Piedmont Triad Airport Authority
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Greensboro, NC 27409

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Contents

Appendix A Fundamentals of Characterizing Sound, Noise Effects, and Metrics

A.1 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.2 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):

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

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.3 A-Weighted Decibel, sometimes denoted 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.

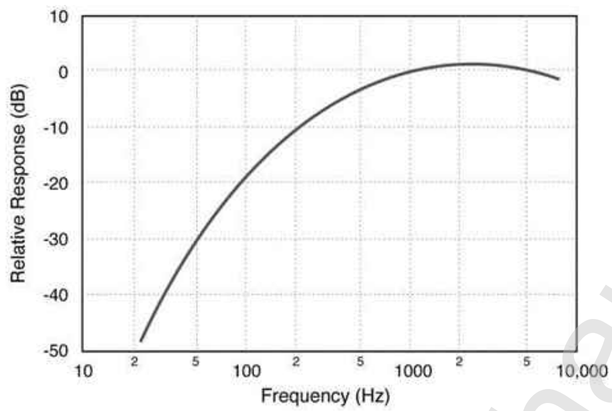


Figure A-1: Frequency-Response Characteristics of Various Weighting Networks
Source: HMMH, 2011

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-2 depicts representative A-weighted sound levels for a variety of common sounds.

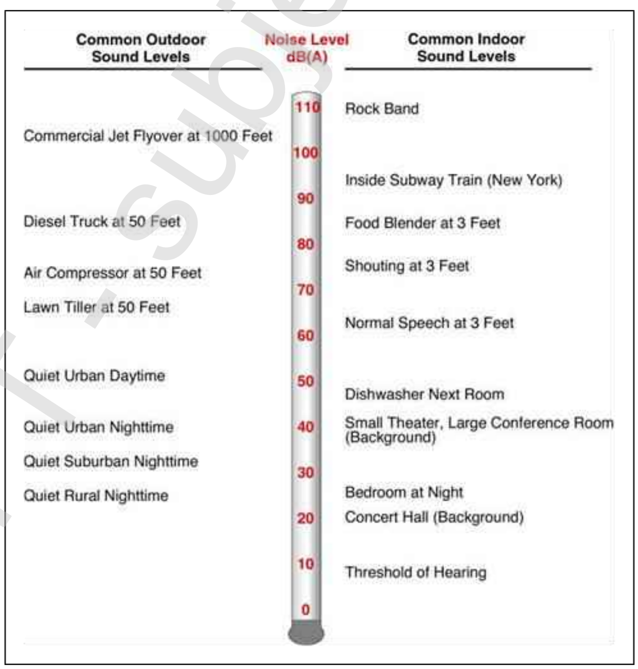


Figure A-2: Representative A-Weighted Sound Levels
Source: HMMH, 2011

A.4 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-3.

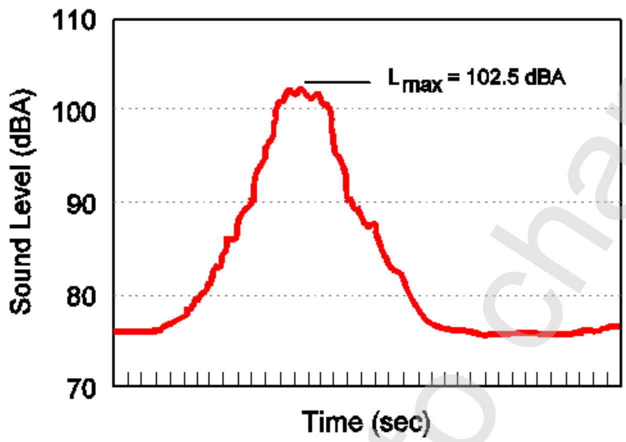


Figure A-3: Variation in the A-Weighted Sound Level over Time
Source: HMMH, 2011

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-3 the Lmax is approximately 102.5 dB.

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.5 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-4 depicts this compression:

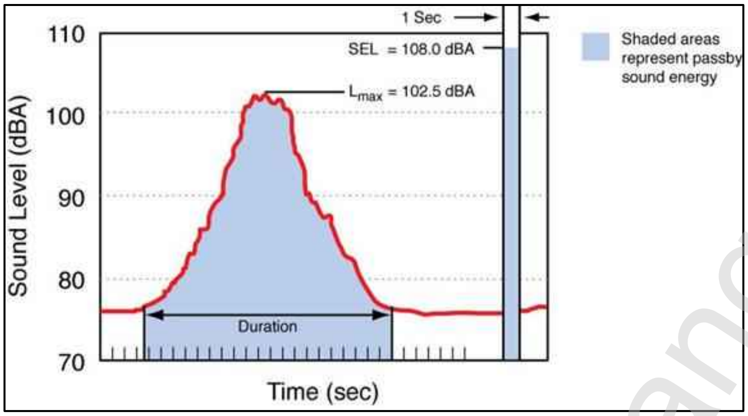


Figure A-4: Graphical Depiction of Sound Exposure Level
Source: HMMH, 2011

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. 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. Figure A-5 shows a comparison of two different noise events: the first has a shorter duration but a greater maximum level. More noise energy is contained in the second event, which has a higher SEL value.

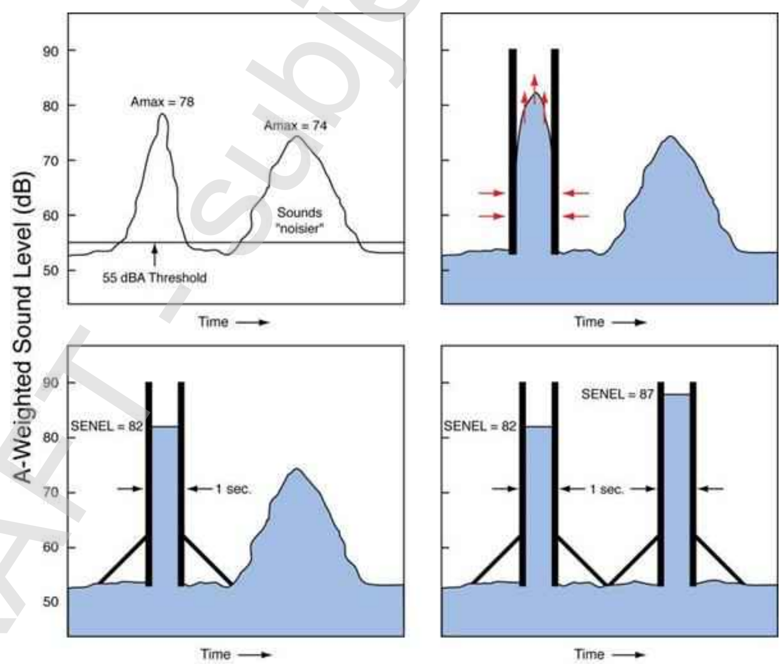


Figure A-5: Graphical Comparison of SEL for Two Noise Events with Different Maximums and Durations
Source: HMMH, 2011

A.6 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-6.

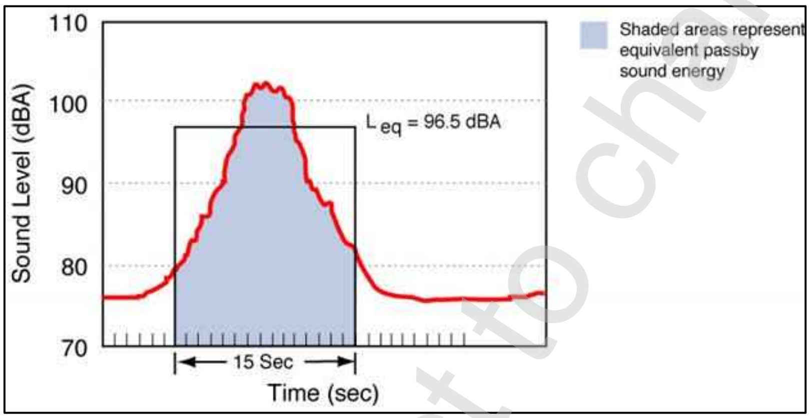


Figure A-6 Example of a One-Minute Equivalent Sound Level
Source: HMMH, 2011

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.7 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-7 depicts this adjustment graphically.

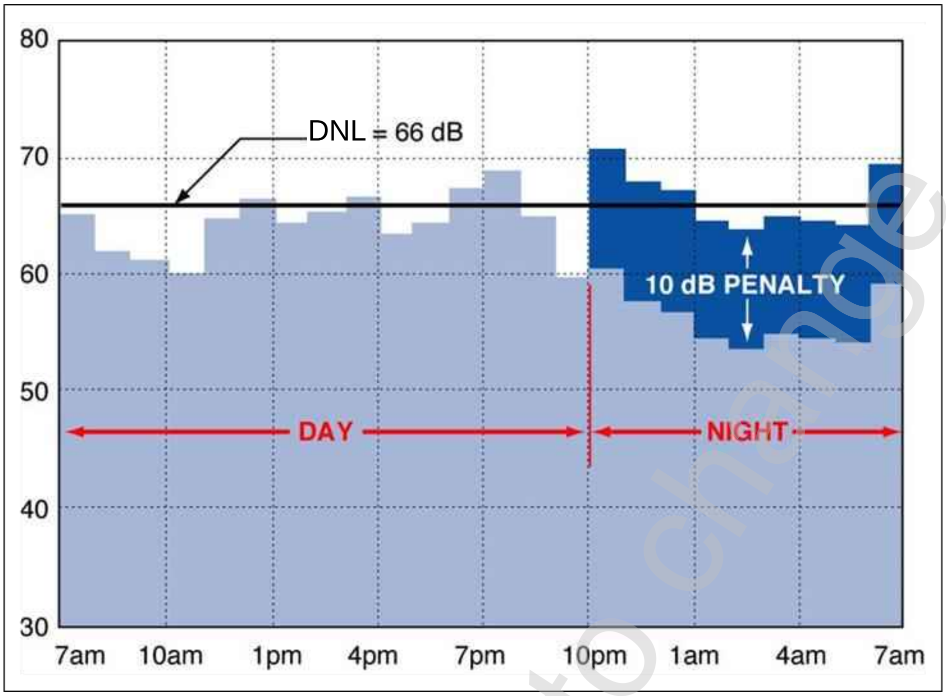


Figure A-7 Example of a Day-Night Average Sound Level Calculation
Source: HMMH, 2011

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-8 presents representative outdoor DNL values measured at various U.S. locations.

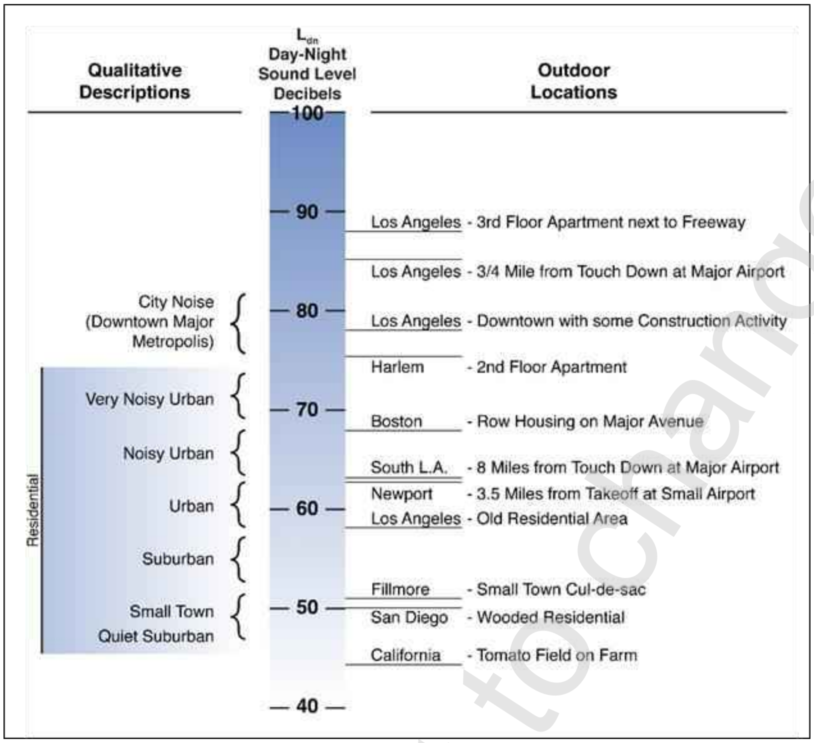


Figure A-8 Examples of Measured Day-Night Average Sound Levels
Source: HMMH, 2011

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-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 and FAA Record of Approval for 2007 Noise Compatibility Program

Section B.1 presents the Federal Register notice published on June 19, 2008, regarding the acceptance of PTAA's Noise Exposure Maps from the original Part 150 Study. Section B.2 is a copy of the FAA's Record of Approval for the NCP contained in the original Part 150 Study.

B.1 FAA Acceptance of Previous Noise Exposure Maps

The FAA determined that the maps submitted by PTAA on May 7, 2008 for PTI follow applicable requirements. This determination was effective on June 10, 2008. FAA's determination on PTAA's Noise Exposure Maps is limited to a finding that the maps were developed in accordance with the procedures contained in Appendix A of FAR Part 150. Such determination does not constitute approval of PTAA's data, information or plans, or a commitment to approve a Noise Compatibility Program or to fund the implementation of that Program.

The same notice provided that the FAA formally received the Noise Compatibility Program for PTI, also effective on June 10, 2008. Preliminary review of the submitted material by the FAA indicated that the report conforms to the requirements for the submittal of Noise Compatibility Programs, but that further review will be necessary prior to approval or disapproval of the program. The formal review period, limited by law to a maximum of 180 days, would be completed on or before December 7, 2008.

34976 Federal Register / Vol. 73, No. 119 / Thursday, June 19, 2008 / Notices

[redacted]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Noise Exposure Map Notice; Receipt of Noise Compatibility Program and Request for Review; Piedmont Triad International Airport, Greensboro, NC

AGENCY: Federal Aviation Administration, DOT.

SUMMARY: The Federal Aviation Administration (FAA) announces its determination that the Noise Exposure Maps submitted by the Piedmont Triad Airport Authority for Piedmont Triad International Airport under the provisions of 49 U.S.C. 47501 *et seq.* (Aviation Safety and Noise Abatement Act) and 14 CFR 150 are in compliance with applicable requirements. The FAA also announces that it is reviewing a proposed Noise Compatibility Program that was submitted for Piedmont Triad International Airport under Part 150 in conjunction with the Noise Exposure Map, and that this program will be approved or disapproved on or before December 7, 2008.

EFFECTIVE DATE: The effective date of the FM's determination on the Noise Exposure Maps and of the start of its review of the associated Noise Compatibility Program is June 10, 2008. The public comment period ends August 9, 2008.

FOR FURTHER INFORMATION CONTACT: Dana Perkins, Federal Aviation Administration, Atlanta ADO, FAA Southern Region Airports District Office, 1701 Columbia Avenue, College Park, Georgia 30337–2747, (404) 305–7152. Comments on the proposed Noise Compatibility Program should also be submitted to the above office.

SUPPLEMENTARY INFORMATION: This Notice announces that the FAA finds that the Noise Exposure Maps submitted for Piedmont Triad International Airport are in compliance with applicable requirements of Part 150, effective June 10, 2008. Further, FAA is reviewing a proposed Noise Compatibility Program for that Airport which will be approved or disapproved on or before December 7, 2008. This notice also announces the availability of this Program for public review and comment.

Under 49 U.S.C., Section 47503 (the Aviation Safety and Noise Abatement Act (the Act)), an airport operator may submit to the FAA Noise Exposure Maps which meet applicable regulations and which depict non-compatible land uses as of the date of submission of such maps, a description of projected aircraft operations, and the ways in which such operations will affect such maps. The Act requires such maps to be developed in consultation with interested and affected parties in the local community, government agencies, and persons using the airport.

An airport operator who has submitted Noise Exposure Maps that are found by FAA to be in compliance with the requirements of Part 150, promulgated pursuant to the Act, may submit a Noise Compatibility Program for FAA approval which sets forth the measures the operator has taken or proposes to take to reduce existing non-compatible uses and prevent the introduction of additional non-compatible uses.

Piedmont Triad Airport Authority submitted to the FAA on May 7, 2008 Noise Exposure Maps, descriptions and other documentation that were produced during the Piedmont Triad International Airport FAR Part 150 Study conducted between March, 2003 and April 30, 2008. It was requested that the FAA review this material as the Noise Exposure Maps, as described in Section 47503 of the Act, and that the noise mitigation measures, to be implemented jointly by the airport and surrounding communities, be approved as a Noise Compatibility Program under Section 47504 of the Act.

The FAA has completed its review of the Noise Exposure Maps and related descriptions submitted by Piedmont Triad Airport Authority. The specific documentation determined to constitute the Noise Exposure Maps includes: Figure 5, DNL Contours Base Case NEM 2006, p. 19; Table 10, Incompatible Land Uses (2006) Piedmont Triad International Airport Based on Updated Operations Forecast, p. 20; Table 16, Incompatible Land Uses (2014) with NCP Based on Operational Alternative 2C Piedmont Triad International Airport Based on Updated Operations Forecast, p. 63; Figure 15, DNL Contour 2014 NEM with NCP Measures (Final 2014 Forecast A Alternative 2C), p. 65; Table A–3, Existing Condition (2006) Yearly Average Daily Aircraft Operations by User Group Piedmont Triad International Airport Updated Operations Forecast, p. 98; Table A–4 Existing Condition (2006) Yearly Average Daily Aircraft Operations by INM Aircraft Type Piedmont Triad International Airport Updated Operations Forecast, p. 99; Table A–5, Runway Use 2006 Piedmont Triad International Airport, p. 101; Figure A–2, Departure Flight Tracks 2006 Base Case p. 102; Figure A–3, Arrival Flight Tracks 2006 Base Case, p. 103; Table A–6, Flight Track Use-2006 Piedmont Triad International Airport, p. 104; Figure A–4, Departure Flight Tracks 2014 Base Case, p. 110; Figure A–5, Arrival Flight Tracks 2014 Base Case, p. 111; Table A 12, Future Condition (2014) Yearly Average Daily Aircraft Operations by INM Aircraft Type Piedmont Triad International Airport Updated Operations, pp 114–115; Table A 13, Runway Use 2014 NEM with NCP (Alternative 2C) Piedmont Triad International Airport, p. 116; Figure A–6 FedEx Departure Flight Tracks NEM with NCP (Alternative 2C), p.118; Table A–14, Flight Track Use-2014 NEM with NCP (Alternative 2C) Piedmont Triad International Airport, p. 119; Table A–16, Runway Use 2014 Alternatives 2A, 2B, 2C, and 2D Piedmont Triad Airport, p122; Figure A–9, FedEx Departure Flight Tracks Alternatives 2C, 3C, and 2D, p. 128; Table A–20 Flight Track Use-2014 Alternative 2C Piedmont Triad International Airport, p.131. The FAA has determined that these maps for Piedmont Triad International Airport are in compliance with applicable requirements. This determination is effective on June 10, 2008. FAA's determination on the airport operator's Noise Exposure Maps is limited to a finding that the maps were developed in accordance with the procedures contained in Appendix A of FAR Part 150. Such determination does not constitute approval of the airport operator's data, information or plans, or a commitment to approve a Noise Compatibility Program or to fund the implementation of that Program.

If questions arise concerning the precise relationship of specific properties to noise exposure contours depicted on a Noise Exposure Map submitted under Section 47503 of the Act, it should be noted that the FAA is not involved in any way in determining the relative locations of specific properties with regard to the depicted noise exposure contours, or in interpreting the Noise Exposure Maps to resolve questions concerning, for example, which properties should be covered by the provisions of Section 47506 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 review of Noise Exposure Maps. Therefore, the responsibility for the detailed overlaying of noise exposure contours onto the map depicting properties on the surface rests exclusively with the airport operator that submitted those maps, or with those public agencies and planning agencies with which consultation is required under Section 47503 of the Act. The FAA has relied on the certification by the airport operator, under Section 150.21 of Part 150, that the statutorily required consultation has been accomplished.

The FAA has formally received the Noise Compatibility Program for Piedmont Triad International Airport, also effective on June 10, 2008. Preliminary review of the submitted material indicates that it conforms to the requirements for the submittal of Noise Compatibility Programs, but that further review will be necessary prior to approval or disapproval of the program. The formal review period, limited by law to a maximum of 180 days, will be completed on or before December 7, 2008.

The FAA's detailed evaluation will be conducted under the provisions of Part 150, Section 150.33. The primary considerations in the evaluation process are whether the proposed measures may reduce the level of aviation safety, create an undue burden on interstate or foreign commerce, or be reasonably consistent with obtaining the goal of reducing existing non-compatible land uses and preventing the introduction of additional non-compatible land uses.

Interested persons are invited to comment on the proposed program with specific reference to these factors. All comments, other than those properly addressed to local land use authorities, will be considered by the FAA to the extent practicable. Copies of the Noise Exposure Maps, the FAA's evaluation of the maps, and the proposed Noise Compatibility Program are available for examination at the following locations: Federal Aviation Administration, Atlanta ADO, FAA Southern Region, 701 Columbia Avenue, Campus Bldg., Suite 2–260, College Park, GA 30337–2747.

Questions may be directed to the individual named above under the heading, **FOR FURTHER INFORMATION CONTACT.**

Issued in College Park, Georgia, June 10, 2008.

Scott L. Seritt,

Manager, Atlanta Airports District Office.

[FR Doc. E8–13540 Filed 6–18–08; 8:45 am]

BILLING CODE 4910–13–M

B.2 FAA Record of Approval for 2007 Noise Compatibility Program

On November 7, 2008, FAA announced its findings on the Noise Compatibility Program submitted by the PTAA under the provisions of 49 U.S.C. (the Aviation Safety and Noise Abatement Act) and 14 CFR Part 150. The FAA approved fully or in part all 20 recommendations of the PTI NCP.

FEDERAL AVIATION ADMINISTRATION

RECORD OF APPROVAL
FAR PART 150
NOISE COMPATIBILITY PROGRAM

Piedmont Triad International Airport (GSO)
Greensboro, North Carolina

Acting Regional Counsel, ASO-7

✓ CONCUR   NONCONCUR

06 NOV 08
Date

Robert B. Chapman
Airports Division Manager
Southern Region

✓ APPROVED   DISAPPROVED

07 Nov 08
Date

RECORD OF APPROVAL
PIEDMONT TRIAD INTERNATIONAL AIRPORT
GREENSBORO, NORTH CAROLINA

The approvals listed herein include approvals of actions that the airport recommends be taken by the Federal Aviation Administration (FAA). It should be noted that these approvals indicate only that the actions would, if implemented, be consistent with the purposes of Federal Air Regulation (FAR) Part 150. The FAA has provided technical advice and assistance to the airport to ensure that the operational elements are feasible (see 14 CFR 150.23(c)). These approvals do not constitute decisions to implement the actions. Later decisions concerning possible implementation of measures in this ROA will be subject to applicable environmental or other procedures or requirements, including Section 106 of the National Historic Preservation Act (NHPA).

The operational, land use control, and program management measures below summarize as closely as possible the airport operator's recommendations in the Noise Compatibility Program (NCP) and are cross-referenced to the program. The statements contained within the summarized measures and before the indicated FAA approval, disapproval, or other determination do not represent the opinions or decisions of the FAA.

OPERATIONAL MEASURES

1. NA-1: Evaluate Noise Barriers at Sites of Future Airport Facilities.

Under this measure, the Piedmont Triad Airport Authority (PTAA) would adopt a policy to evaluate potential benefits of noise barriers to control off-airport noise levels from future airport facilities. The policy would commit the PTAA to work with tenants to have the tenant install noise barriers if the PTAA considers the use of a barrier appropriate. (NCP, pp. 29-30; Tables 13 and 17)

FAA Action: **Approved for study only.** At such time as the study is complete, the FAA will review to determine if benefits are demonstrated.

2. NA-2: Preferred Night Runway Use.

When new runway 5L/23R is available for use during nighttime hub operations, designate runways 23L and 23R as the preferred departure runways and runways 5L and 5R as the preferred arrival runways. This head-to-head pattern of runway use will be used when permitted by weather and runway conditions. To the extent feasible, equal numbers of aircraft shall use the left and right runways for arrivals. Runway use assignments for departures shall be as established by Proposed Measure NA-3. (NCP, pp. 30-49; Tables 13; 14, and 17; and Figure 9)

FAA Action: **Approved as a voluntary measure**. This measure is approved as a voluntary measure, subject to traffic, weather, and airspace safety and efficiency. This measure may be implemented totally or in part by FAA Air Traffic based on the safe and efficient movement of air traffic. Times and levels of compliance will be determined by FAA Air Traffic as specific traffic management situations exist, understanding that ultimately the pilot in command of an aircraft is directly responsible for, and is the final authority as to the operation of that aircraft.

3. NA-3: Night Runway Use Assignments.

When new runway 5L/23R is available for use during the nighttime hub operations, designate the following pattern of runway use:

1. When departures are using runways 23L and 23R, designate runway 23R as the departure runway for Retrofitted Stage 3 aircraft
2. When departures are using runways 23L and 23R, the runways to be used by New Stage 3 aircraft are as follows:
    a. For all New Stage 3 aircraft departing to southern destinations, designate runway 23L as the departure runway
    b. For all New Stage 3 aircraft departing to south-western destinations, designate runway 23R as the departure runway
    c. For New Stage 3 aircraft departing to northern destinations, either runway 23L or runway 23R may be used as the departure runway.
    d. To the extent feasible, assign usage of runways 23L and 23R by New Stage 3 aircraft to northern destinations so that equal numbers of aircraft use runways 23L and 23R for night departures
3. When departures are using runways 5L and 5R, designate runway 5R as the departure runway for Retrofitted Stage 3 aircraft
4. When departures are using runways 5L and 5R, assign usage of departure runways by New Stage 3 aircraft so that approximately equal numbers of aircraft use runways 5L and 5R for departures to the extent feasible.
5. Aircraft departing on runway 23R and needing to make a transition to a more southerly heading should delay the transition until they have reached an altitude of 4,000 MSL.
6. It is anticipated that carriers operating during the nighttime will request runway assignments that are consistent with this measure.

(NCP, pp. 30-50; Tables 13; 14, and 17; and Figure 9)

FAA Action: **Approved as a voluntary measure for Piedmont Triad Airport Authority (PTAA) implementation through coordination and agreement with air carriers**. This measure is approved as a voluntary measure, subject to traffic, weather, and airspace safety and efficiency. This measure may be implemented totally or in part by FAA Air Traffic based on the safe and efficient movement of air traffic. Times and levels of compliance will be determined by FAA Air Traffic as specific traffic management situations exist, understanding that ultimately the pilot in command of an aircraft is directly responsible for, and is the final authority as to the operation of that aircraft. The PTAA will work with Greensboro Air Traffic Control to determine appropriate distance measuring equipment (DME) to replace altitudes.

4. NA-4: Night Southbound Departure Corridor from Runway 23L.

Promptly after FAA approval of this measure, establish a new nighttime departure procedure for aircraft departing runway 23L for southern destinations so that the initial flightpath is in a southerly direction, east of and parallel to NC Highway 68. Departing aircraft shall initiate the left departure turn onto this flight path as soon as practicable. Aircraft may make a transition to another heading after reaching 4,000 feet MSL. (NCP, pp. 30-50; Tables 13; 14, and 17; and Figure 9)

FAA Action: **Approved as a voluntary measure.** This measure is approved as a voluntary measure, subject to traffic, weather, and airspace safety and efficiency. This measure may be implemented totally or in part by FAA Air Traffic based on the safe and efficient movement of air traffic. Times and levels of compliance will be determined by FAA Air Traffic as specific traffic management situations exist, understanding that ultimately the pilot in command of an aircraft is directly responsible for, and is the final authority as to the operation of that aircraft. The PTAA will work with Greensboro Air Traffic Control to determine appropriate distance measuring equipment (DME) to replace altitudes.

5. NA-5: Night Departure Procedures from Runway 23R.

Aircraft departing runway 23R at night and turning right shall initiate the right departure turn as soon as practicable. (NCP, pp. 30-50; Tables 13; 14, and 17; and Figure 9)

FAA Action: **Approved as a voluntary measure.** This measure is approved as a voluntary measure, subject to traffic, weather, and airspace safety and efficiency. This measure may be implemented totally or in part by FAA Air Traffic based on the safe and efficient movement of air traffic. Times and levels of compliance will be determined by FAA Air Traffic as specific traffic management situations exist, understanding that ultimately the pilot in command of an aircraft is directly responsible for, and is the final authority as to the operation of that aircraft.

6. NA-6: Night Northbound Departure Corridor from Runway 23L.

Promptly after FAA approval of this measure, establish a new nighttime departure procedure for aircraft departing from runway 23L to northern destinations to initiate a left departure turn to a northeasterly heading as soon as practicable. (NCP, pp. 30-50; Tables 13; 14, and 17; and Figure 9)

FAA Action: **Approved as a voluntary measure.** This measure is approved as a voluntary measure, subject to traffic, weather, and airspace safety and efficiency. This measure may be implemented totally or in part by FAA Air Traffic based on the safe and efficient movement of air traffic. Times and levels of compliance will be determined by FAA Air Traffic as specific traffic management situations exist, understanding that ultimately the pilot in command of an aircraft is directly responsible for, and is the final authority as to the operation of that aircraft.

7. NA-8: Departures from Runway 5L.

When runway 5L/23R is available for use, establish a procedure to delay initial turns from runway heading by aircraft departing on runway 5L until such aircraft reach an altitude of 4,000 MSL. (NCP, pp. 30-50; Tables 13; 14, and 17; and Figure 9)

FAA Action: **Approved as a voluntary measure**. This measure is approved as a voluntary measure, subject to traffic, weather, and airspace safety and efficiency. This measure may be implemented totally or in part by FAA Air Traffic based on the safe and efficient movement of air traffic. Times and levels of compliance will be determined by FAA Air Traffic as specific traffic management situations exist, understanding that ultimately the pilot in command of an aircraft is directly responsible for, and is the final authority as to the operation of that aircraft. The PTAA will work with Greensboro Air Traffic Control to determine appropriate distance measuring equipment (DME) to replace altitudes.

8. NA-9: Departures from Runway 5R.

Revise the existing procedure to delay initial left turns from runway heading by aircraft using runway 5R until such aircraft reach an altitude of 4,000 MSL. (NCP, pp. 30-50; Tables 13; 14, and 17; and Figure 9)

FAA Action: **Approved as a voluntary measure**. This measure is approved as a voluntary measure, subject to traffic, weather, and airspace safety and efficiency. This measure may be implemented totally or in part by FAA Air Traffic based on the safe and efficient movement of air traffic. Times and levels of compliance will be determined by FAA Air Traffic as specific traffic management situations exist, understanding that ultimately the pilot in command of an aircraft is directly responsible for, and is the final authority as to the operation of that aircraft. The PTAA will work with Greensboro Air Traffic Control to determine appropriate distance measuring equipment (DME) to replace altitudes.

9. NA-10: Restrictions on Use of APUs.

Under this measure, the Piedmont Triad Airport Authority (PTAA) will adopt a policy for future airport facilities, and for new tenants after FAA approval of this measure, that would require that auxiliary power units, either on-board units or ground units, except for units in use for engine starts, not produce night-time noise levels in off-airport residential neighborhoods that exceed the ambient noise level at those locations. (NCP, p. 51; Tables 13 and 17)

FAA Action: **Approved**. Although implementation of this measure would not reduce the footprint of the NEM contours and the exact benefits are difficult to assess, it may reduce the amount of sleep disturbance and noise annoyance perceived by residents of nearby neighborhoods during nighttime hours.

10. NA-11: Noise Abatement Departure Profiles.

Under this measure, the Piedmont Triad Airport Authority (PTAA) designates the Close-in Noise Abatement Departure Profile (NADP) for jet departures on runways 5L and 5R beginning with the opening for use of new runway 5L/23R. (NCP, pp. 51-52; and Tables 13 and 17)

FAA Action: Approved as a voluntary measure. This measure is approved as a voluntary measure, subject to traffic, weather, and airspace safety and efficiency. This measure may be implemented totally or in part by FAA Air Traffic based on the safe and efficient movement of air traffic. Times and levels of compliance will be determined by FAA Air Traffic as specific traffic management situations exist, understanding that ultimately the pilot in command of an aircraft is directly responsible for, and is the final authority as to the operation of that aircraft.

11. NA-12: Noise Abatement Approach Procedure.

Under this measure, the PTAA requests that FAA Air Traffic Control Tower personnel direct all jet aircraft arriving at the airport, whether on an IFR or a visual approach, to intercept the final approach at least 5.5 nautical miles from the intended landing runway and to stay at or above the glideslope throughout the remainder of their approach. The PTAA requests that FAA Air Traffic Control Tower personnel direct all jet aircraft arriving at the airport and on the final approach within 12.5 nautical miles from the intended landing runway, whether on an IFR or a visual approach, to stay at or above the glideslope throughout the remainder of their approach. (NCP, pp. 52-54; Tables 13 and 17)

FAA Action: Approved as a voluntary measure. This measure is approved as a voluntary measure, subject to traffic, weather, and airspace safety and efficiency. This measure may be implemented totally or in part by FAA Air Traffic based on the safe and efficient movement of air traffic. Times and levels of compliance will be determined by FAA Air Traffic as specific traffic management situations exist, understanding that ultimately the pilot in command of an aircraft is directly responsible for, and is the final authority as to the operation of that aircraft.

12. NA-13: Altitude for Downwind Legs.

Under this measure, the PTAA requests that FAA Air Traffic Control Tower personnel direct IFR aircraft on the downwind leg for arrival on runways 5L, 5R, 23L or 23R to remain at or above 4,000' MSL until crossing the extended centerline of runway14/32 at the airport. When implementing this measure and there are simultaneous approaches to runways 5L and 5R, the PTAA requests that FAA Air Traffic Control Tower personnel direct IFR aircraft on the downwind leg for runway 5R to remain at or above 5,000' MSL and aircraft on the downwind leg for runway 5L to remain at or above 4,000' MSL. (NCP, pp. 52-54; and Tables 13 and 17)

FAA Action: **Approved as a voluntary measure**. This measure is approved as a voluntary measure, subject to traffic, weather, and airspace safety and efficiency. This measure may be implemented totally or in part by FAA Air Traffic based on the safe and efficient movement of air traffic. Times and levels of compliance will be determined by FAA Air Traffic as specific traffic management situations exist, understanding that ultimately the pilot in command of an aircraft is directly responsible for, and is the final authority as to the operation of that aircraft.

LAND USE MEASURES

FAA consideration of recommended land use measures utilizing the 2014 Noise Exposure Maps (NEMs) and forecast operational data as opposed to the current Operations NEM is appropriate due to FedEx's documented commitment and imminent timeline for establishing their Overnight Express Air Cargo Sorting and Distribution Facility at Piedmont Triad International Airport.

1. **LU-1**: Acquire Noise-Sensitive Properties where DNL Exceeds 70 dB.

The PTAA will offer to acquire properties with houses or other noise-sensitive land uses where DNL with the 2014 NCP exceeds 70 dB. (NCP, pp. 55-56; Figures 14 and 15, and Table14 and 16)

FAA Action: **Approved.** The specific identification of properties recommended for inclusion in the program and specific definition of the scope of the program will be required prior to approval for Federal funding. Further, applicable real property acquisitions must conform to the provisions of the Uniform Relocation Assistance and Real Property Acquisitions Act and 14 CFR Part 24 to be eligible for Federal funding. Homes built after October 1, 1998 are not eligible for acquisition programs. All noise land acquisitions must comply with Grant Assurance 31 which requires sponsors to develop re-use plans and dispose of noise land as soon as practicable.

2. LU-2: Sound Insulation of Noise-Sensitive Structures where DNL Exceeds 65 dB.

The PTAA will offer to sound insulate eligible residences and other noise-sensitive structures intended for public use or assembly (i.e., schools, houses of worship and hospitals) where DNL with the 2014 NCP exceeds 65 dB. The PTAA will require property owners participating in the program to grant an avigation easement to the PTAA upon completion of the treatment. (NCP, pp. 55-57; Figures 14 and 15, and Table14 and 16)

FAA Action: **Approved for eligible properties where the DNL is between 65 and 70 dB in accordance with the Record of Decision (ROD), rendered on 12/31/01 based on the Environmental Impact Statement for Proposed Runway 5L/23R, Proposed New Overnight Express Air Cargo Sorting and Distribution Facility, and Associated Developments.** The specific identification of structures recommended for inclusion in the program and specific definition of the scope of the program will be required prior to approval for Federal funding.

3. LU-3: Optional Acquisition of Avigation Easements for Noise-Sensitive Structures where DNL Exceeds 65 dB.

The PTAA may at its option offer to acquire noise easements for selected residences where the DNL with the 2014 NCP exceeds 65 dB. (NCP, pp 55-58; (NCP, pp. 55-57; Figures 14 and 15, and Table14 and 16)

FAA Action: Approved for eligible properties where the DNL is between 65 and 70 dB that choose not to participate in LU-2. The specific identification of structures recommended for inclusion in the program and specific definition of the scope of the program will be required prior to approval for Federal funding.

4. LU-4: Other Assistance for Owners of Residential Property where DNL Exceeds 65 dB.

The PTAA may at its option offer assistance in the form of Sales Assistance or in the form of Purchase Assurance to owners of selected residential property where the DNL with the 2014 NCP exceeds 65 dB. Homeowners participating in the Sales Assistance Program would grant an avigation easement to the PTAA upon the closing of the sale. (NCP, pp. 57-59; Figures 14 and 15, and Table14 and 16)

FAA Action: Approved for further study and analysis for eligible properties where the DNL is between 65 and 70 dB. Upon identification of interested eligible properties and before FAA approval for implementation, the sponsor must submit an updated NCP identifying the details of the proposed measure for FAA deliberation. The specific identification of structures recommended for inclusion in the program and specific definition of the scope of the program will be required prior to approval for Federal funding. This will require submission of an updated NCP for FAA deliberation.

5. LU-5: Pursue Compatible Use Zoning where DNL Exceeds 65 dB.

The PTAA will work with land use authorities of jurisdictions in the vicinity of the airport to adopt compatible use zoning. (NCP, p. 59)

FAA Action: Approved.

PROGRAM MANAGEMENT MEASURES

1. NM-1: Establish a Noise Monitoring Function at PTIA.

The PTAA will establish a noise monitoring function within the PTAA with responsibilities that include: to monitor aircraft noise; to provide a point of contact within the PTAA for issues related to aircraft noise; to serve as a liaison with the community for such issues; and to keep air carriers and the public informed about compliance with measures in the NCP. (NCP, p. 60)

FAA Action: Approved.

2. NM-2: Publish DNL Contours for DNL 60 and Above.

When the PTAA publishes aircraft noise contours, it will publish contours at 5-dB intervals for values of DNL of 60 dB and above. The most recent contours will be published on the PTAA web site. The contours will be updated as required by FAR Part 150. (NCP, pp. 60-61)

FAA Action: Approved.

3. NM-3: Install and Operate an Aircraft Noise and Operations Monitoring System.

The PTAA will install and operate an aircraft noise and operations monitoring system to monitor aircraft noise and aircraft operations in the vicinity of the airport. The system will reflect state-of-the-art technology. It is expected that the system will have six or more permanent monitoring microphones and one or two portable monitoring microphones. To the extent feasible, the permanent microphones will be at locations used during the Part 150 study. Summaries of the monitoring results will be reported regularly on the PTAA web site. (NCP, pp. 61-62; and Figure 15)

FAA Action: Approved. For reasons of aviation safety, this approval does not extend to the use of monitoring equipment for enforcement purposes by in-situ measurement of any preset noise thresholds and shall not be used for mandatory enforcement of any voluntary measure. Eligibility for Federal funding for a fixed permanent monitoring system will be limited to sponsors who can clearly show that portable monitors would be inadequate for their situation. A determination of eligibility will be made at the time of application for funding.

Appendix C Noise Monitoring Program

Section C.1 presents noise measurement results from each individual site. Section C.2 contains copies of the handwritten site notes and logs.

C.1 Individual Measurement Site Results, November 11 – 17, 2019

The individual measurement site results are presented in the following pages. Each site's information consists of seven 24-hour bar graphs (one for each of the seven days). The noise energy associated with identified aircraft events was summed for each hour of the day and the resulting values are presented in the form of decibel averages, or LEQ. The blue portion of each bar represents the aircraft noise that occurred at that site during that hour; the orange portion of the bar represents the community (non-aircraft) noise that comprised the rest of the sound energy detected by the monitor during that hour. The series of hourly bar graphs for each site are followed by a map and table, respectively, depicting and tallying the aircraft noise events that registered on the site's monitor over the course of the week that could be correlated with aircraft flight operations data. When comparing the daily graphs, it is useful to remember that on Monday, November 11 and Thursday, November 14 the airport was operating in south flow; on each of the remaining days, the airport was operating in north flow. The airport operating direction is provided by Figure 5-2 in Chapter 5.

For some sites, the noise environment is dependent on which runways are in use at any given time. For example, aircraft noise at site 2 is mainly from Runway 23L departures which turn to a southerly heading, as shown by the map (Figure C-16). The difference between north flow and south flow in terms of noise at that site can be seen by comparing the daily graphs (Figures C-9 through C-15). Site 2 was selected to measure noise from aircraft departing the parallel runways and heading south along Route 68, which only occurs during south flow. In another example, site 6 experienced noise events from both arrival and departure operations, as shown in Figure C-48 and summarized in Table C-7. At site 6, the arrival operations occurred during south flow operations periods, and the departures occurred during north flow operations times.

Table C-1 identifies the specific aircraft types in each of the aircraft categories that are noted in Tables C-2 through C-9, where the aircraft noise events at each site are sorted into six distinct aircraft categories and tallied by type of operation (arrival, departure or other). The most common specific type of large jet aircraft noise event was the MD88 and the most common small jet aircraft noise event was the Honda Jet; these were tallied separately.

Table C-1 Aircraft Categories Used in Tallying Aircraft Noise Events

Source: HMMH

Large Jets	Regional Jets	Small Jets		Non Jets	
MD88	CRJ2	**Honda Jet**		AC95	P28A
Other Large Jets	CRJ7	Other Small Jets		AT43	P28B
A21N	CRJ9	BE40	CL30	B350	P28R
A319	E135	C25A	CL35	BE20	P46T
A320	E145	C25B	CL60	BE35	PA24
B733	E170	C25C	E45X	BE36	PA28
B734	E75L	C25M	E545	BE55	PA32
B738	E75S	C500	EA50	BE58	PA34
B739		C510	G280	BE60	PA44
DC87		C525	GLF5	C172	PA46
A306		C550	H25B	C182	PAY2
A310		C560	LJ45	COL4	PC12
B722		C56X	LJ75	DH8B	PC24
B752		C680	PRM1	LNC2	RV7
B763		C68A		M20P	S22T
DC10				M20T	SF50
J328				MO20	SR22

At site 1, 4532 Walpole Rd, High Point, the predominant aircraft activity during the measurement week were arrivals to Runway 5R when the airport was operating in north flow and departures from Runway 23L when in south flow.

Notes: On Monday, the airport was in south flow, resulting in departures from Runway 23L turning to the southwest along Route 68 and away from site 1, which in turn resulted in no aircraft events above the threshold. There are hours where no aircraft events are triggered but that does not mean there were zero aircraft that flew near the site (e.g. the rain during Tuesday morning raised the ambient level resulting in difficulty identifying aircraft noise events above the noise level of the rain at the microphone).

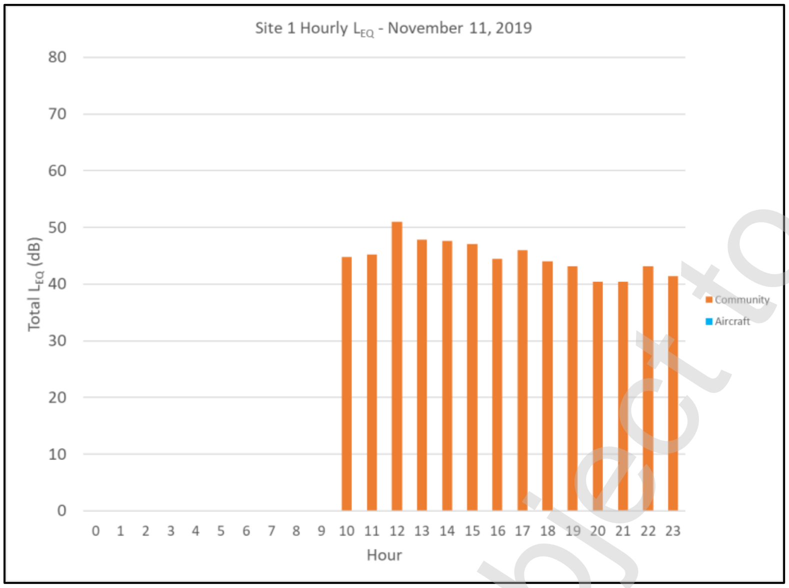


Figure C-1. Site 1 Monday, November 11, 2019 Hourly LEQ

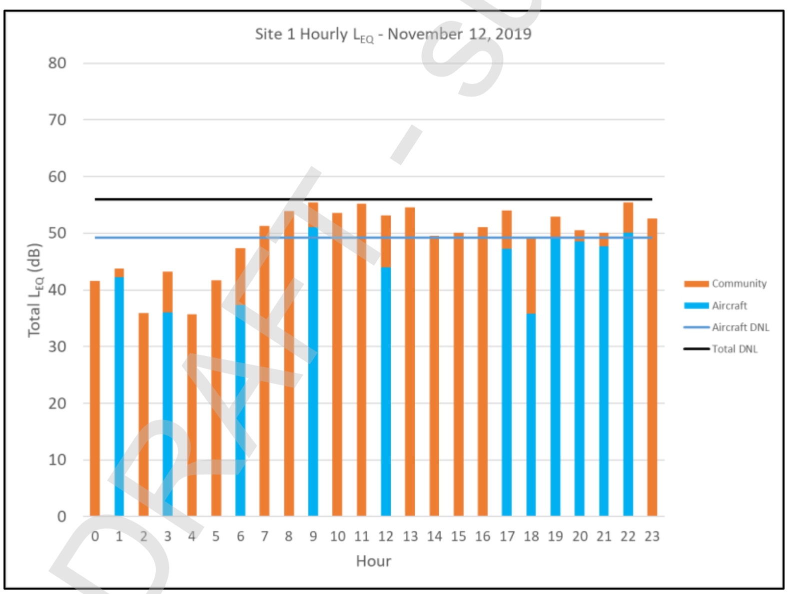


Figure C-2. Site 1 Tuesday, November 12, 2019 Hourly LEQ

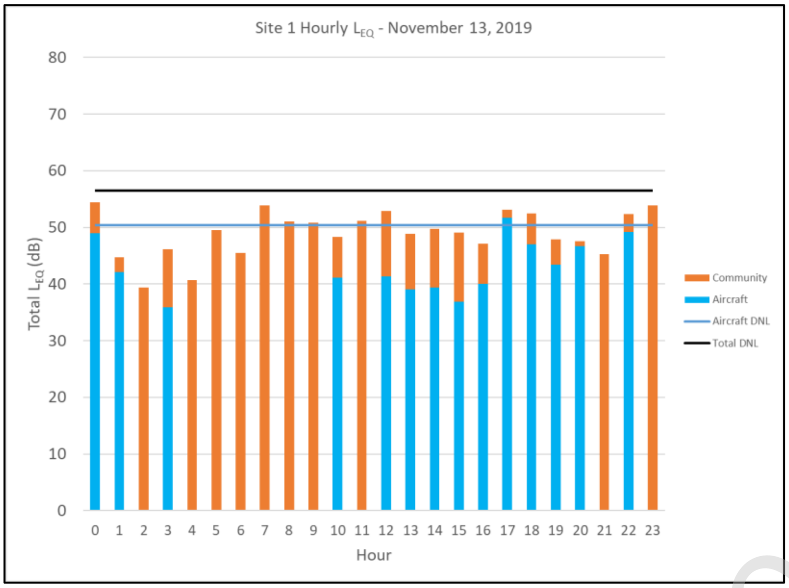


Figure C-3. Site 1 Wednesday, November 13, 2019 Hourly LEQ

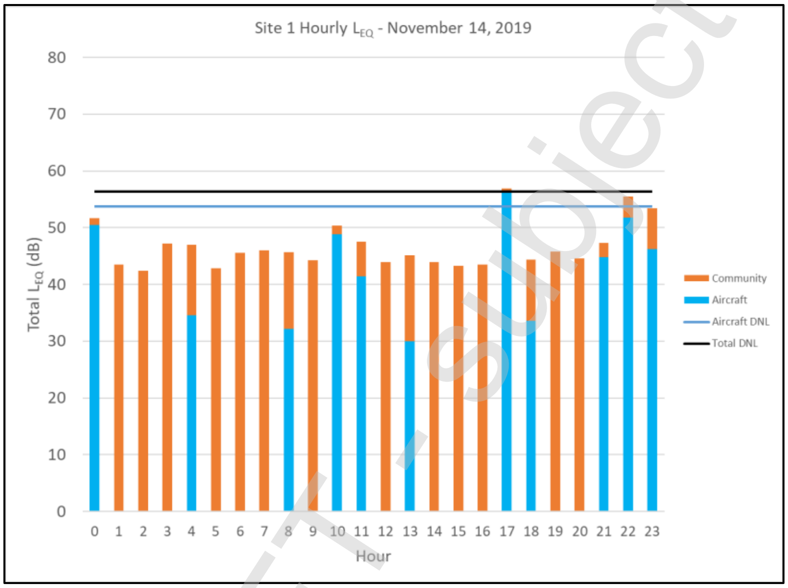


Figure C-4. Site 1 Thursday, November 14, 2019 Hourly LEQ

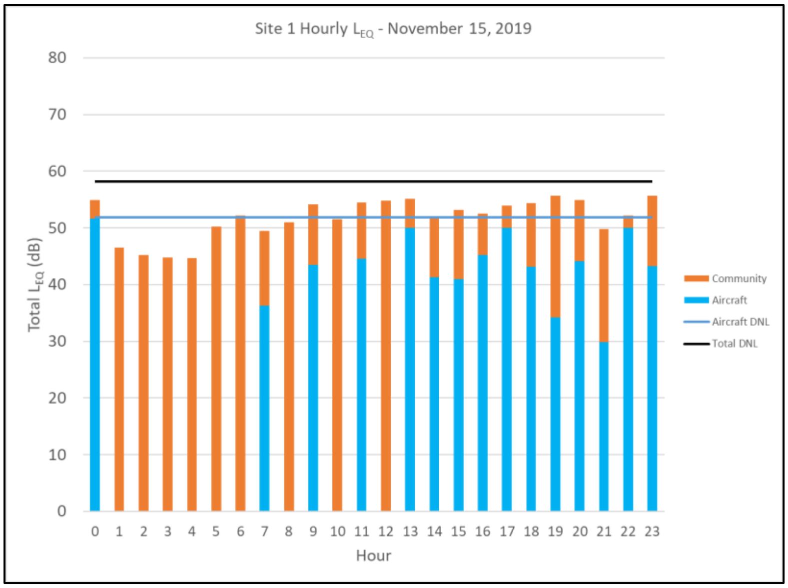


Figure C-5. Site 1 Friday, November 15, 2019 Hourly LEQ

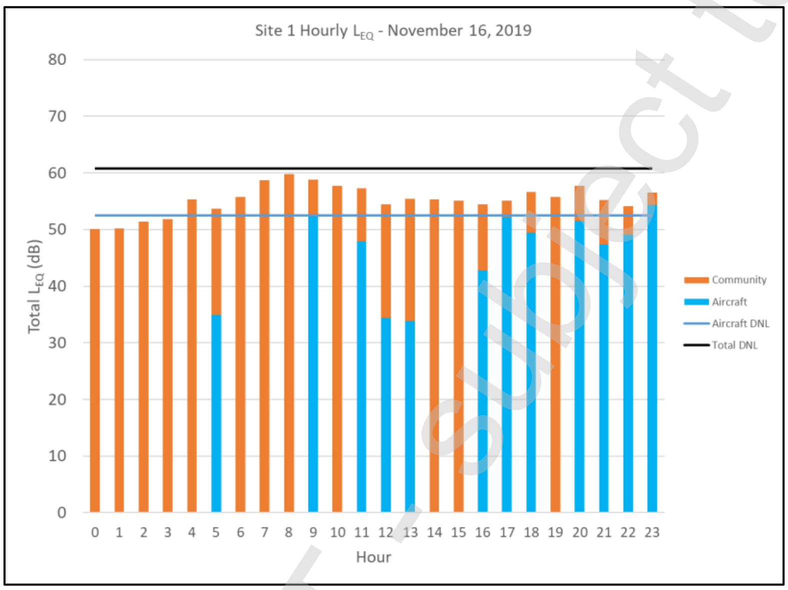


Figure C-6. Site 1 Saturday, November 16, 2019 Hourly LEQ

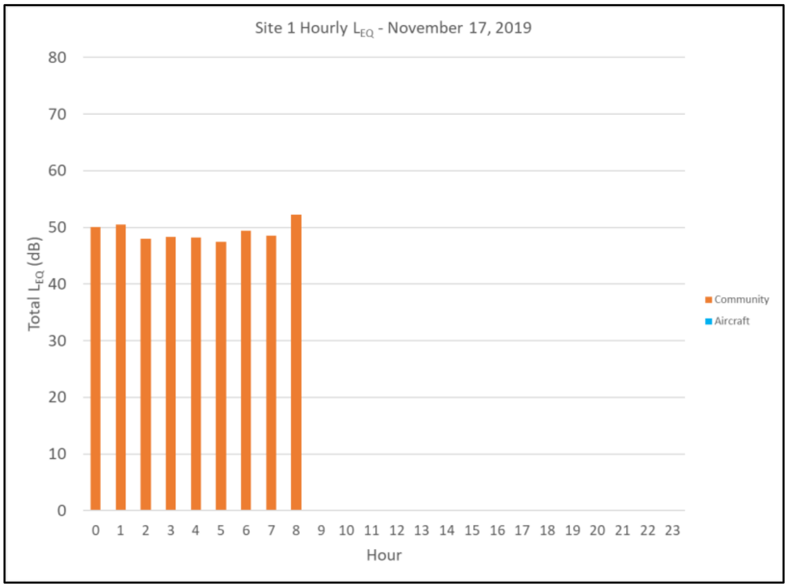


Figure C-7. Site 1 Sunday, November 17, 2019 Hourly LEQ

For site 1, 4532 Walpole Rd, High Point, 157 aircraft noise events were identified by correlating the noise monitor data to the NOIARS data. Table C-2 summarizes these events by aircraft category, and Figure C-8 depicts the individual flight tracks. The 12 departure tracks are shown in green and the 137 arrival tracks are shown in red. The loudest event at this site was an MD88 departure, followed closely by jet arrivals to Runway 5R.

Table C-2. Site 1 Aircraft Noise Events

Aircraft Category	Operation	Count of Events	Max SEL	Min SEL	Median SEL
MD88	Arrival	11	89.4	70.4	84.2
	Departure	2	91.8	84.4	88.1
Other Large Jet	Arrival	18	84.3	68.3	80.7
	Departure	1	81.3	81.3	81.3
Regional Jet	Arrival	57	87.9	63.2	76.3
	Departure	2	72.9	72.9	72.9
Honda Jet	Arrival	21	78.4	65.4	69.2
	Departure	1	70.8	70.8	70.8
	Other	1	67.7	67.7	67.7
Other Small Jet	Arrival	11	79.5	65.4	74.4
	Departure	1	67.7	67.7	67.7
	Other	1	70.9	70.9	70.9
Non-jet	Arrival	19	82.3	66.6	74.9
	Departure	5	72.6	65.5	71.5
	Other	6	79.5	66.0	69.6
Total	Arrival	137	89.4	63.2	75.6
	Departure	12	91.8	65.5	72.1
	Other	8	79.5	66.0	69.55
Total		**157**			

Note: Operations that are counted as “Other” are classified by the NOIARS as overflights or circuits.

Source: GSO NOIARS November 11 - 17, 2019

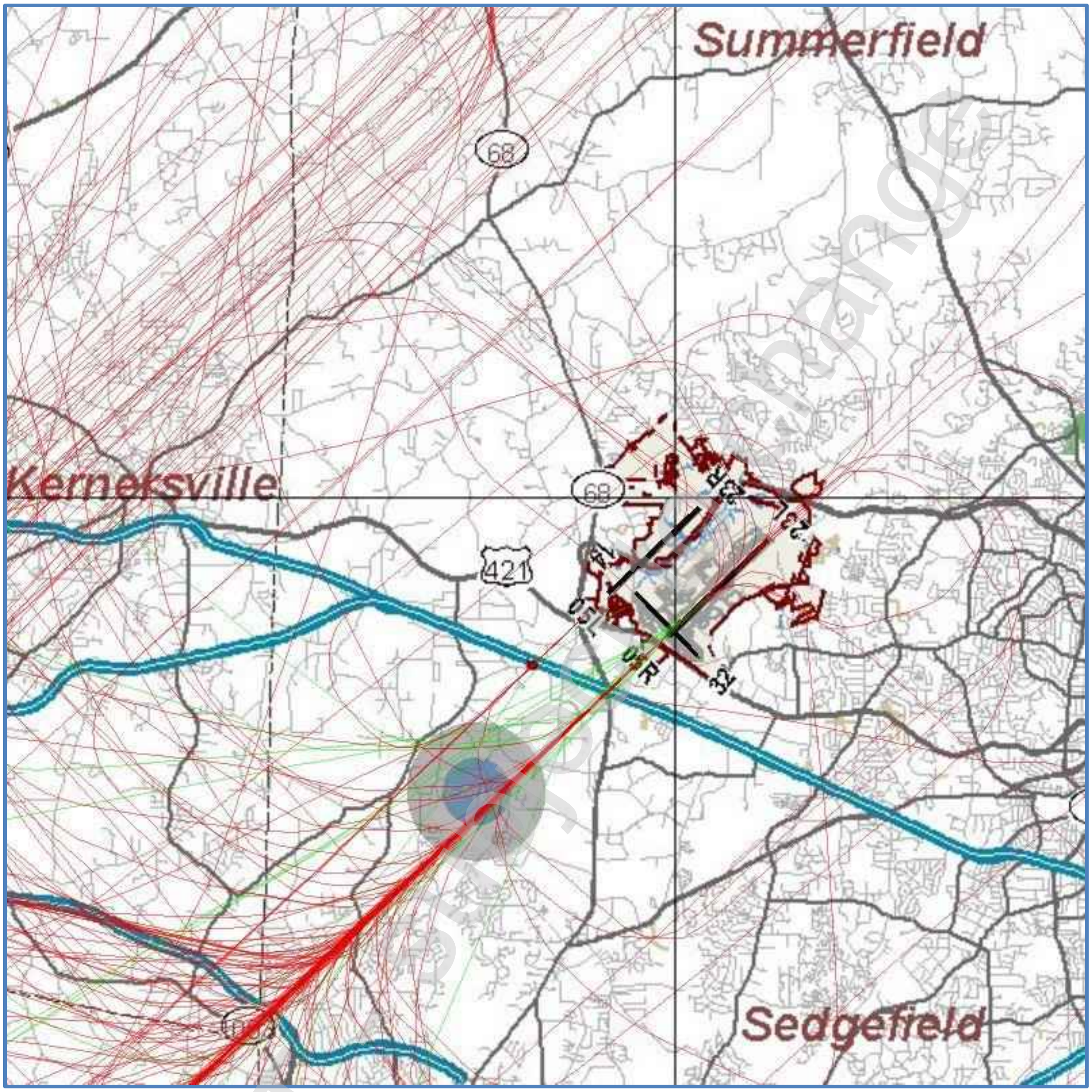


Figure C-8. Site 1 Aircraft Noise Events

Source: GSO NOIARS November 11 - 17, 2019

At site 2, 1701 River Knoll Court, Greensboro, the predominant aircraft activity during the measurement week were departures from Runway 23L when the airport was operating in south flow (on Monday, Thursday, a few hours before sunrise on Tuesday, as well as Tuesday through Friday mornings in the 3am hour during the FedEx sort departure bank). Because this site is not under the arrival flight path to Runway 5R, it experiences few aircraft noise events when the airport is operating in north flow.

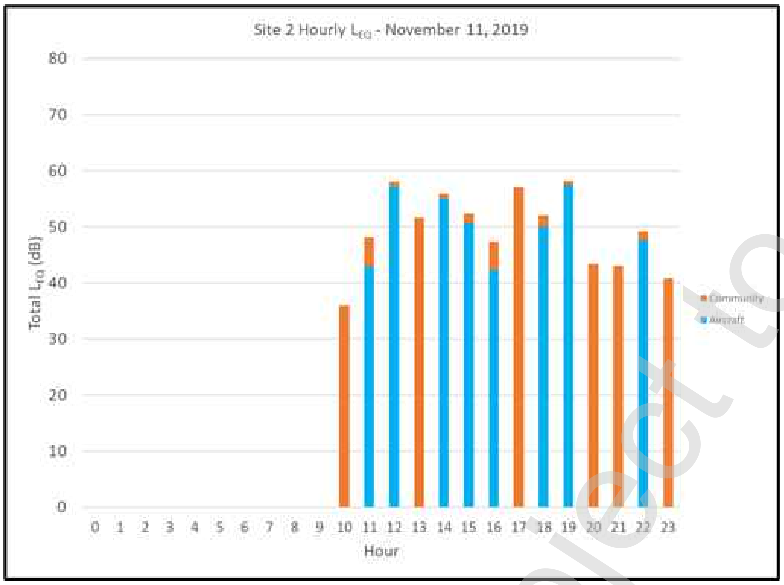


Figure C-9. Site 2 Monday, November 11, 2019 Hourly LEQ

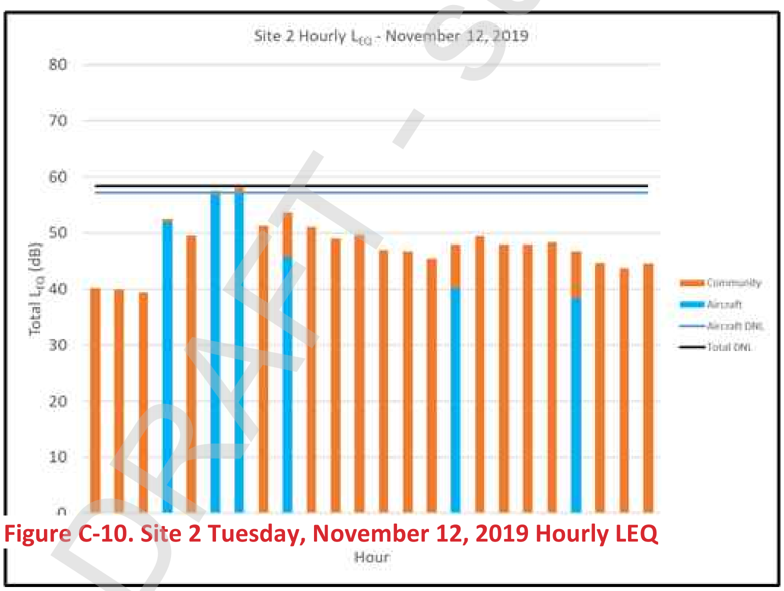


Figure C-10. Site 2 Tuesday, November 12, 2019 Hourly LEQ

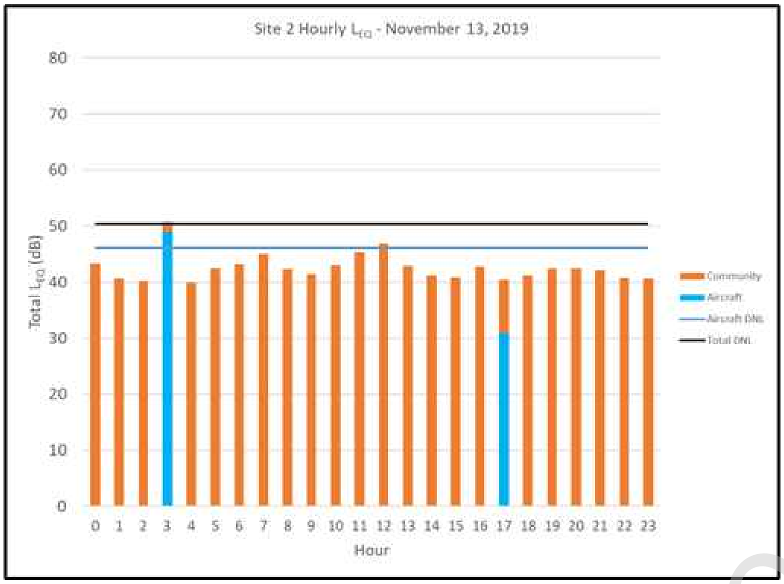


Figure C-11. Site 2 Wednesday, November 13, 2019 Hourly LEQ

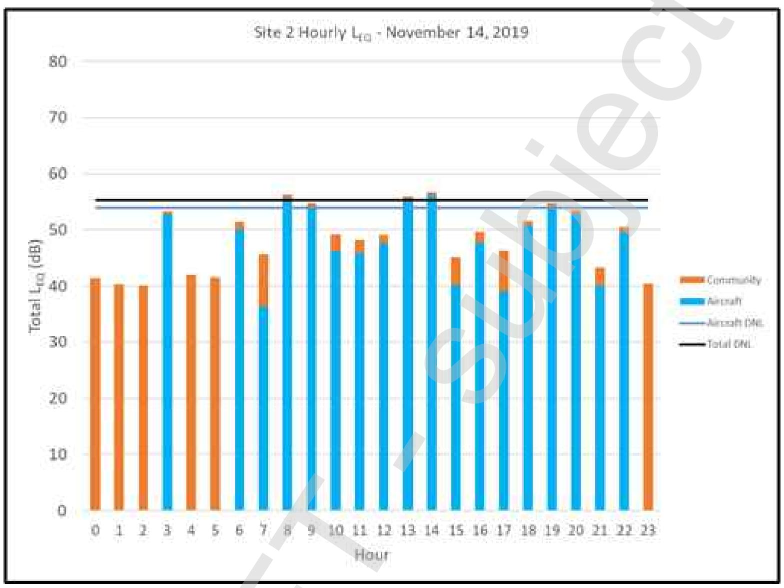


Figure C-12. Site 2 Thursday, November 14, 2019 Hourly LEQ

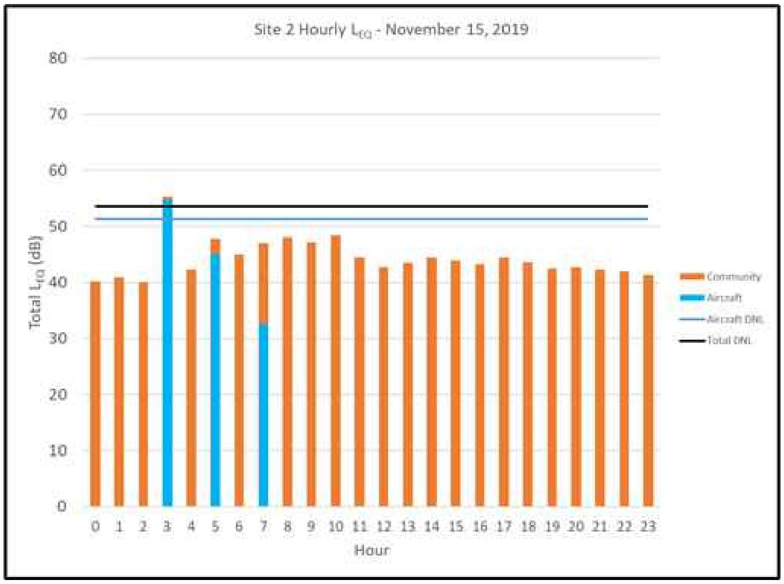


Figure C-13. Site 2 Friday, November 15, 2019 Hourly LEQ

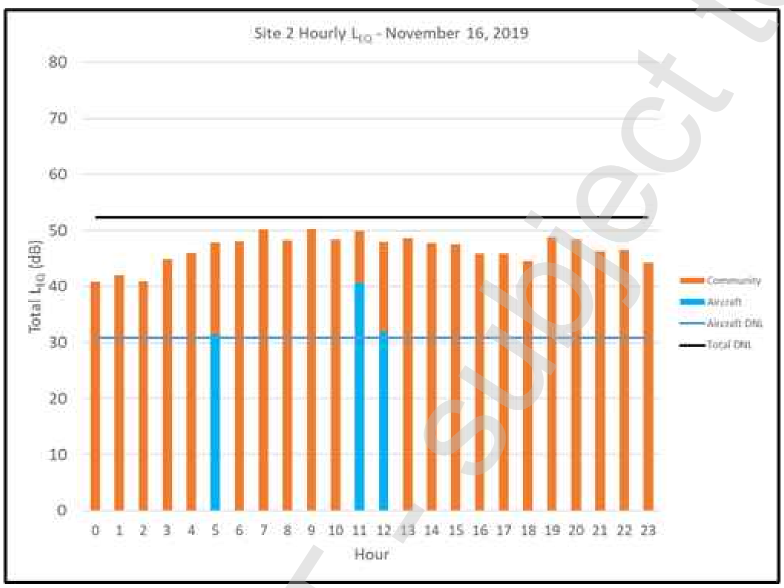


Figure C-14. Site 2 Saturday, November 16, 2019 Hourly LEQ

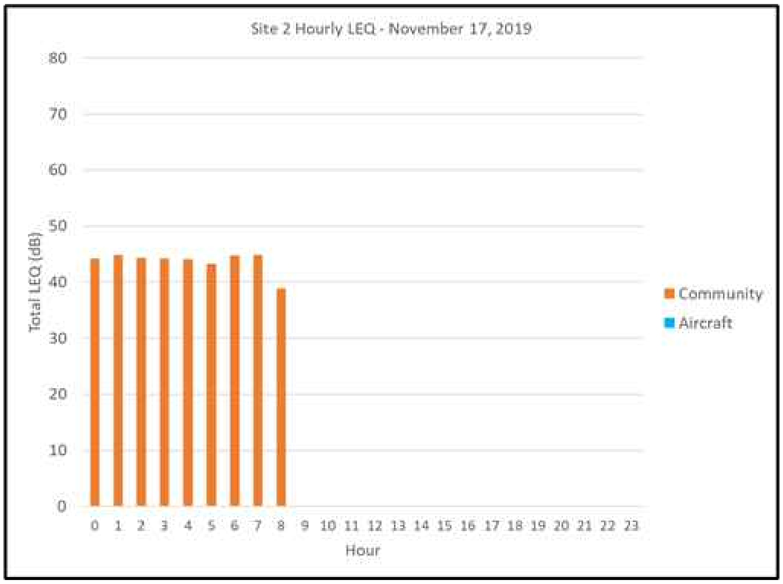


Figure C-15. Site 2 Sunday, November 17, 2019 Hourly LEQ

At site 2, 1701 River Knoll Court, Greensboro, 109 aircraft noise events were identified over the course of the week-long measurement program. Table C-3 summarizes these events by aircraft category, and Figure A-16 depicts the individual flight tracks. The 96 departure tracks are shown in green and the 8 arrival tracks are shown in red. The loudest events at this site were jet departures, particularly MD88 departures.

Table C-3. Site 2 Aircraft Noise Events

Aircraft Category	Operation	Count of Events	Max SEL	Min SEL	Median SEL
MD88	Departure	14	92.3	80.7	90.1
Other Large Jet	Arrival	1	66.1	66.1	66.1
	Departure	28	86.2	73.9	82.1
Regional Jet	Departure	32	81.4	67.1	76.2
Honda Jet	Departure	1	74.0	74.0	74.0
Other Small Jet	Departure	14	79.3	67.4	74.9
Non-jet	Arrival	7	75.7	66.4	71.0
	Departure	7	75.3	66.4	68.8
	Other	5	68.2	66.5	67.5
Total	Arrival	8	75.7	66.1	69.9
	Departure	96	92.3	66.4	78.45
	Other	5	68.2	66.5	67.5
Total		**109**			

Note: Operations that are counted as "Other" are classified by the NOIARS as overflights or circuits.

Source: GSO NOIARS November 11 - 17, 2019

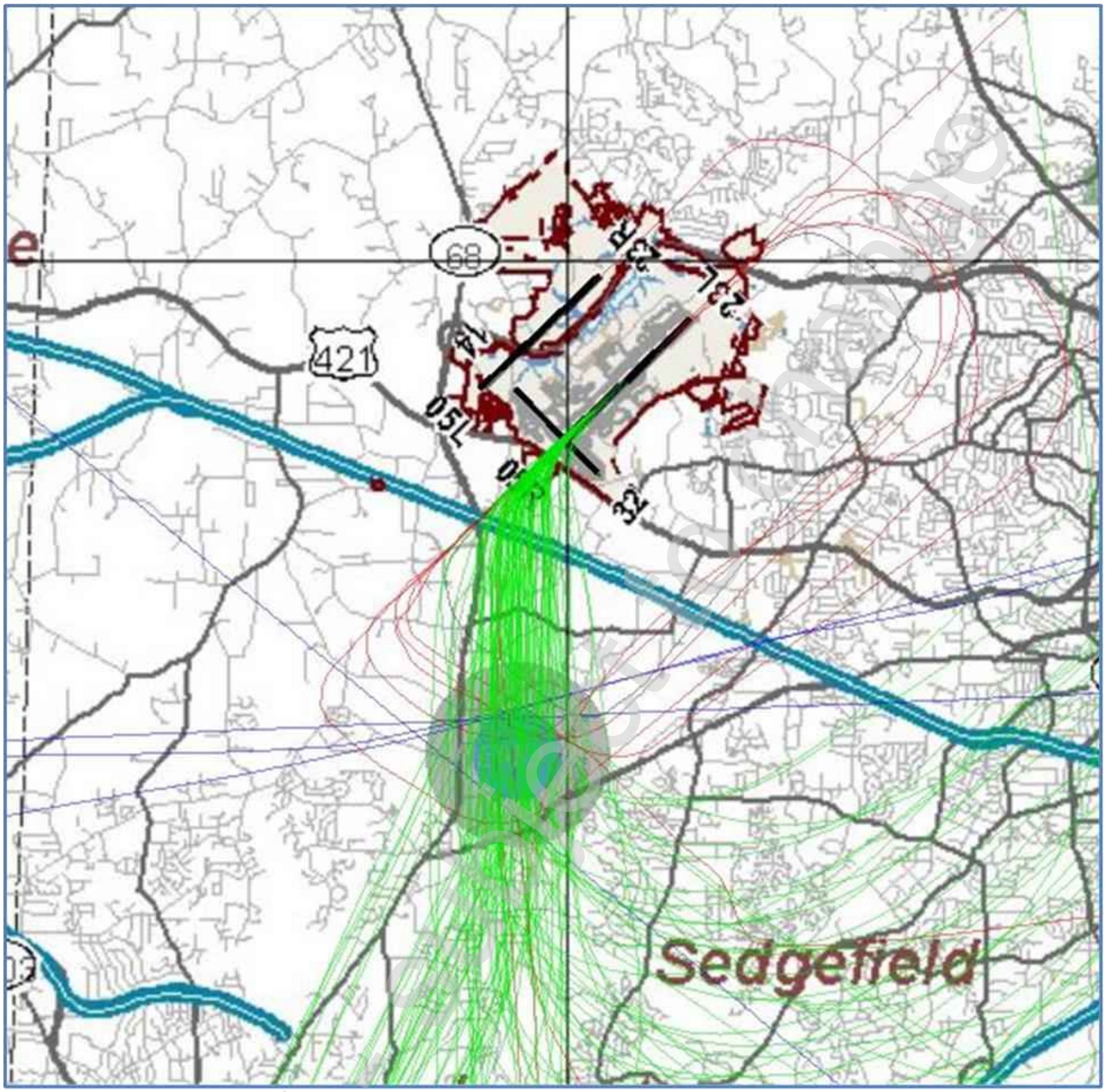


Figure C-16. Site 2 Aircraft Noise Events

Source: GSO NOIARS November 11 - 17, 2019

At site 3, 3625 Dairy Point Dr, High Point, the predominant aircraft activity during the measurement week were departures from Runway 23L when the airport was operating in south flow (mainly Monday and Thursday). The site is aligned with Runway 5L and experiences direct overflights of arrivals to that runway when in north flow, but the other parallel runway is used far more frequently. Many Runway 5R arrivals are audible from this site, but are not direct overflights.

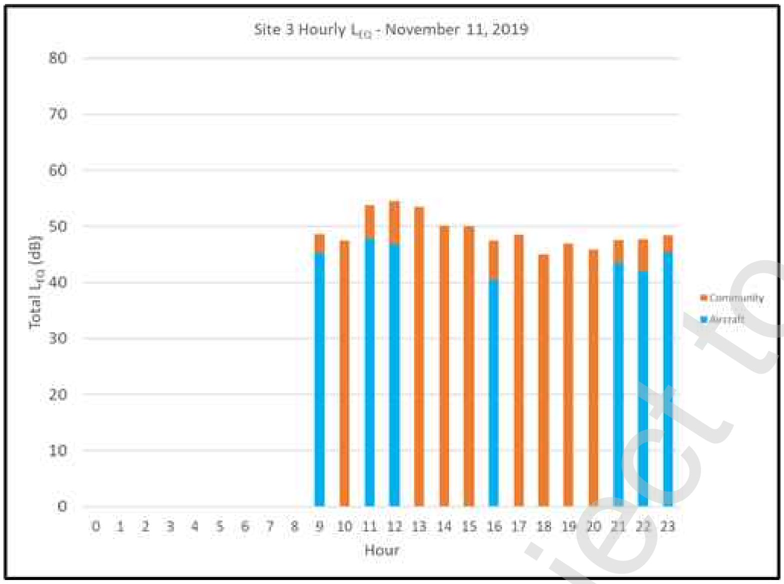


Figure C-17. Site 3 Monday, November 11, 2019 Hourly LEQ

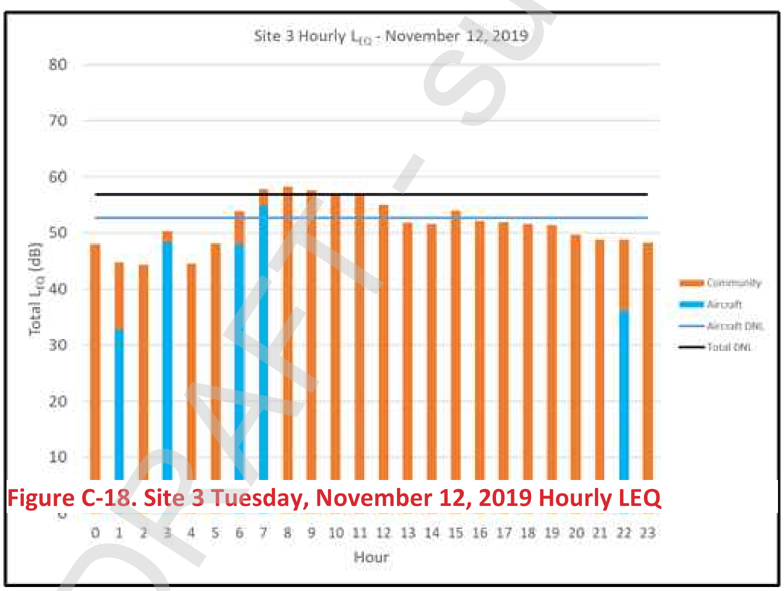


Figure C-18. Site 3 Tuesday, November 12, 2019 Hourly LEQ

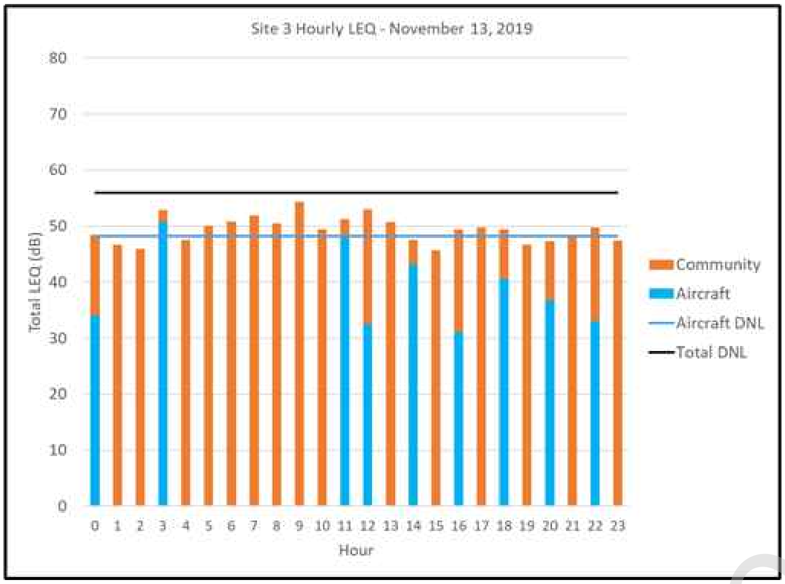


Figure C-19. Site 3 Wednesday, November 13, 2019 Hourly LEQ

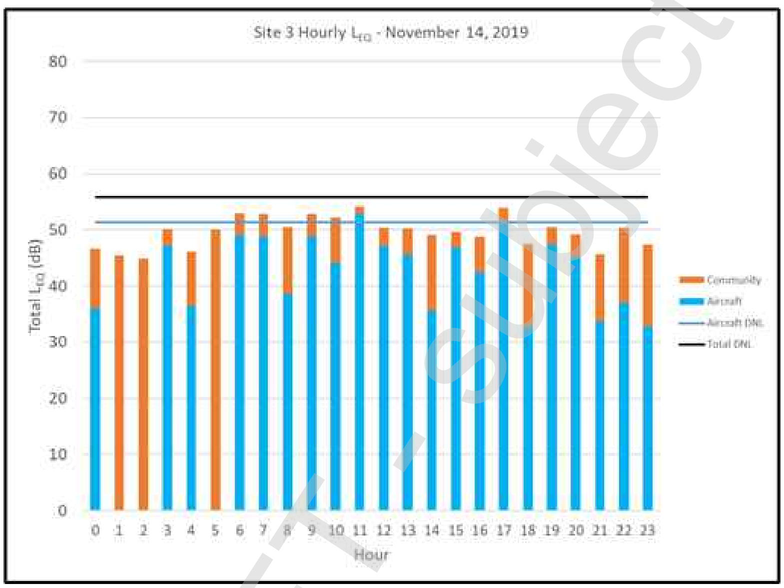


Figure C-20. Site 3 Thursday, November 14, 2019 Hourly LEQ

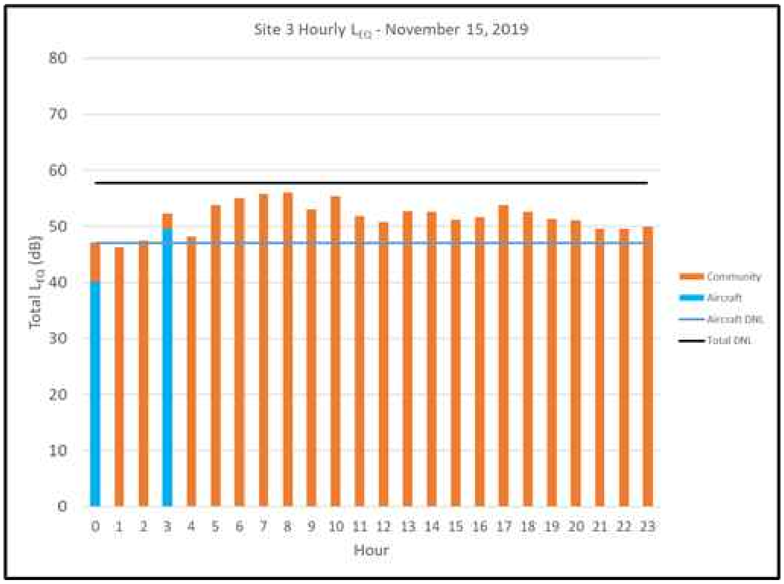


Figure C-21. Site 3 Friday, November 15, 2019 Hourly LEQ

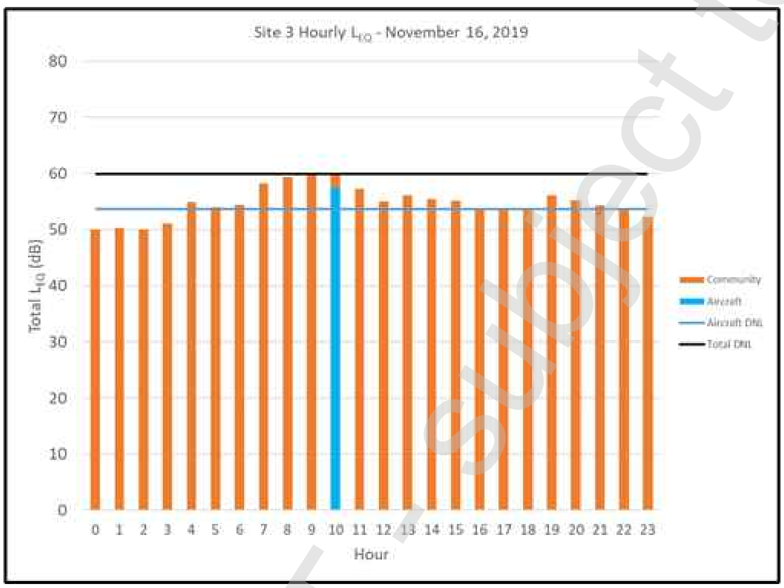


Figure C-22. Site 3 Saturday, November 16, 2019 Hourly LEQ

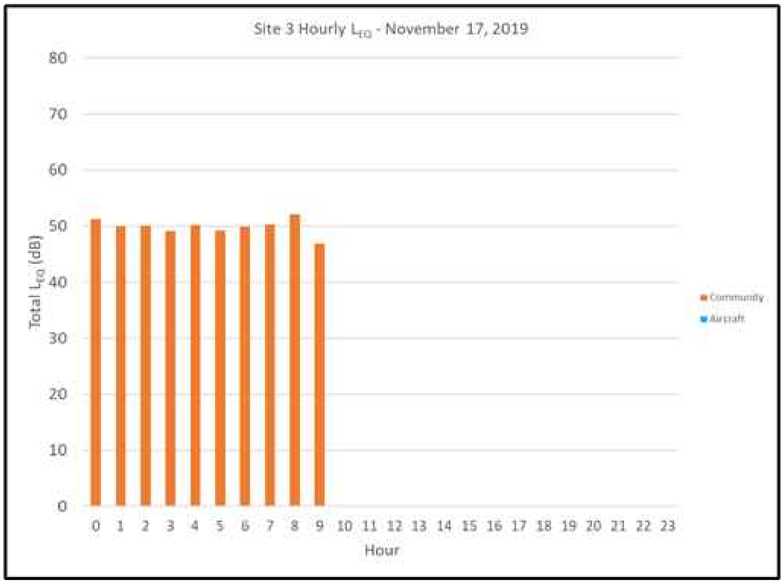


Figure C-23. Site 3 Sunday, November 17, 2019 Hourly LEQ

At site 3, 3625 Dairy Point Dr, High Point, 93 aircraft noise events were identified over the course of the week-long measurement program. Table C-4 summarizes these events by aircraft category, and Figure C-24 depicts the individual flight tracks. The 57 departure tracks are shown in green and the 25 arrival tracks are shown in red. Some practice pattern operations (oval-shaped flight tracks) are depicted in black. The loudest event at this site was a nonjet arrival to Runway 05L, followed by jet departures from Runway 23L.

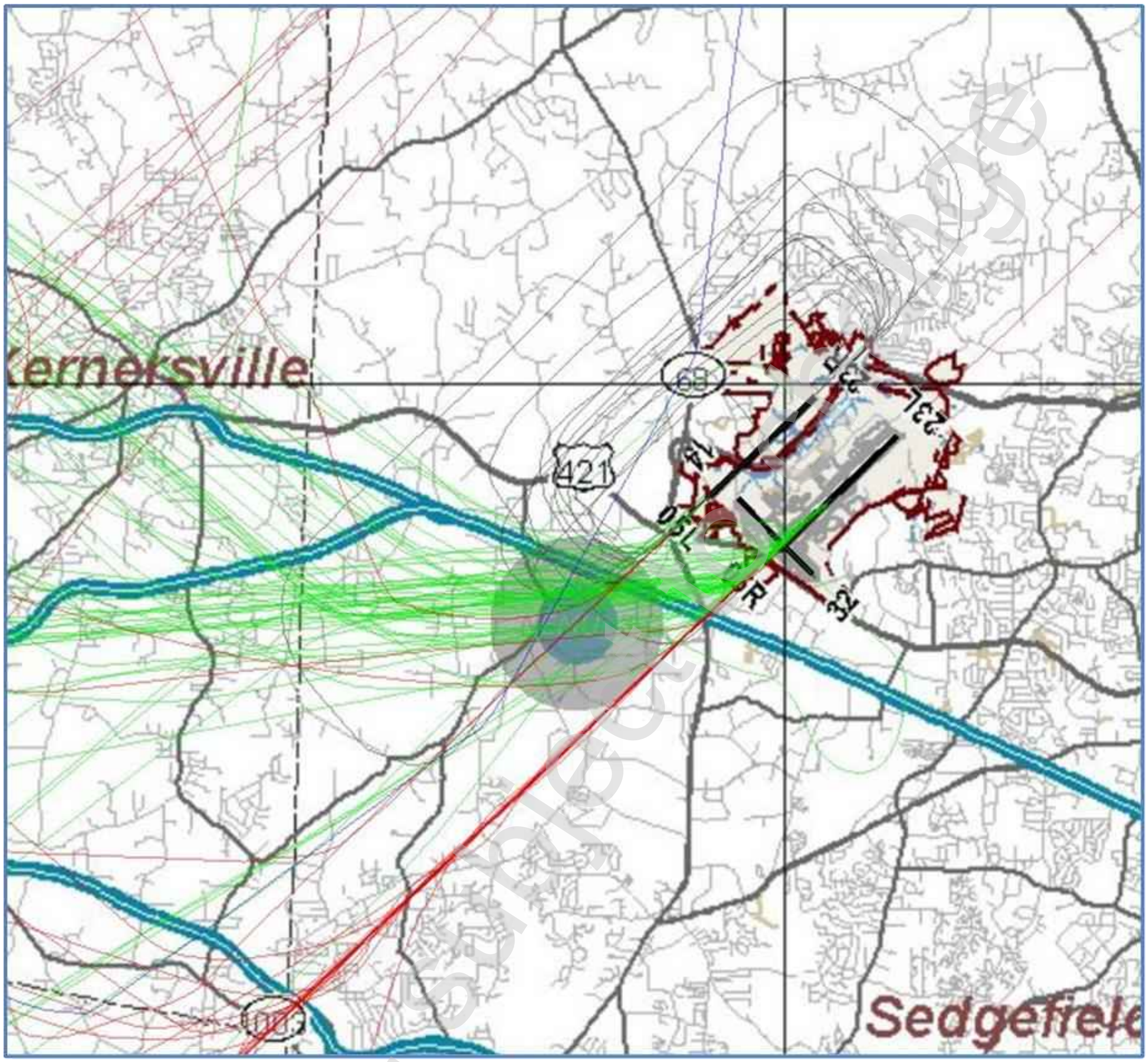
Table C-4. Site 3 Aircraft Noise Events

Aircraft Category	Operation	Count of Events	Max SEL	Min SEL	Median SEL
MD88	Arrival	3	76.1	67.7	68.6
Other Large Jet	Arrival	8	71.9	68.3	68.9
	Departure	13	84.4	75.6	81.0
Regional Jet	Arrival	6	79.9	66.8	69.3
	Departure	24	90.3	70.9	78.8
Honda Jet	Arrival	1	73.0	73.0	73.0
	Departure	3	76.5	73.0	73.4
Other Small Jet	Arrival	1	68.1	68.1	68.1
	Departure	5	83.6	70.6	74.2
	Other	1	66.5	66.5	66.5
Non-jet	Arrival	6	93.1	66.7	69.4
	Departure	12	81.1	67.3	72.1
	Other	10	81.2	66.9	70.7
Total	Arrival	25	93.1	66.7	68.9
	Departure	57	90.3	67.3	77.1
	Other	11	81.2	66.5	70.4
Total		**93**			

Note: Operations that are counted as "Other" are classified by the NOIARS as overflights or circuits.

Source: GSO NOIARS November 11 - 17, 2019

Figure C-24. Site 3 Aircraft Noise Events



Source: GSO NOIARS November 11 - 17, 2019

At site 4, 6502 Lytham Court, Greensboro, the predominant aircraft activity during the measurement week were non-jet operations, including practice pattern flights using Runway 23R. Jet arrivals and departures using the more distant parallel runway can be heard from this site, but do not directly overfly this location. Some hours of data on November 14 were lost at this site due to a data collection error.

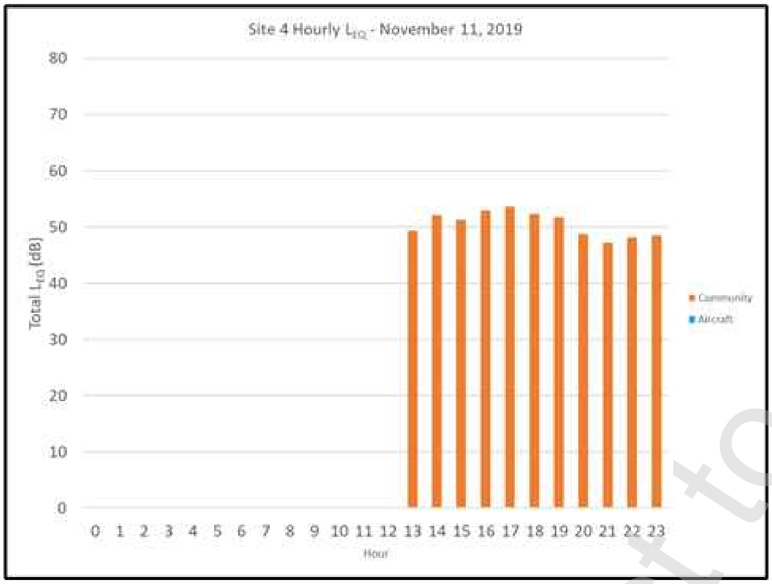


Figure C-25. Site 4 Monday, November 11, 2019 Hourly LEQ

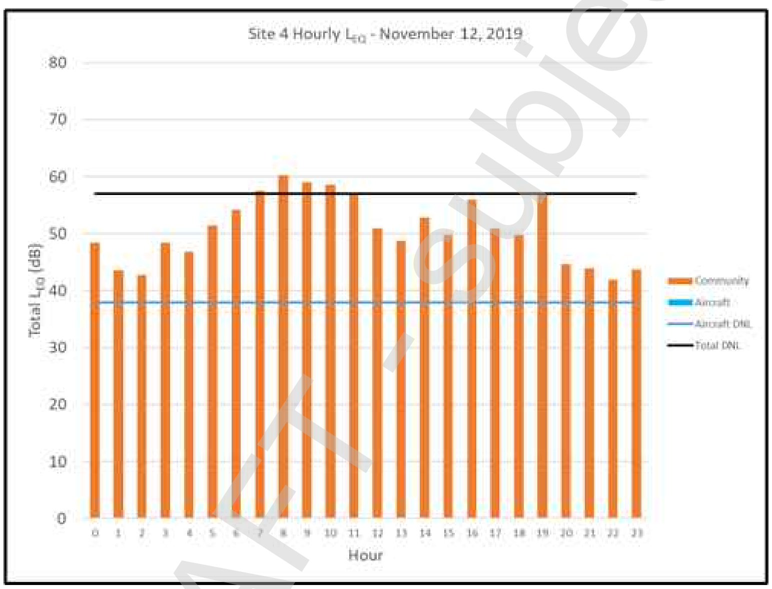


Figure C-26. Site 4 Tuesday, November 12, 2019 Hourly LEQ

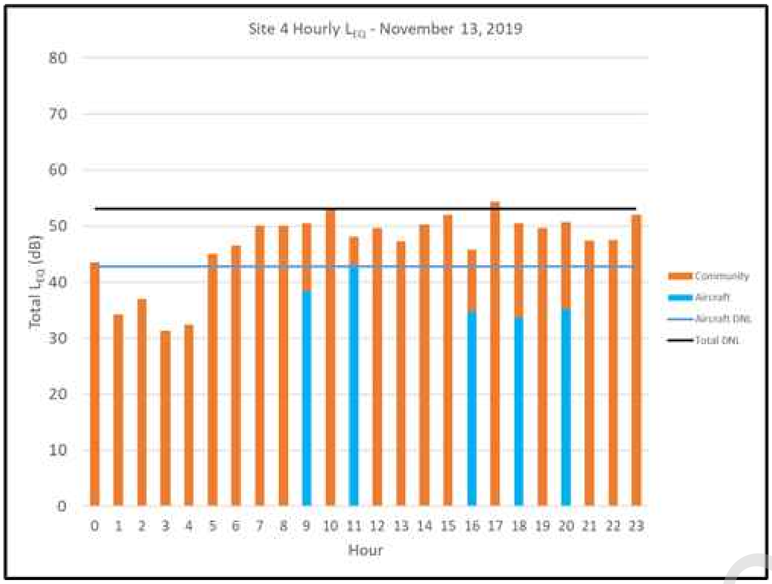


Figure C-27. Site 4 Wednesday, November 13, 2019 Hourly LEQ

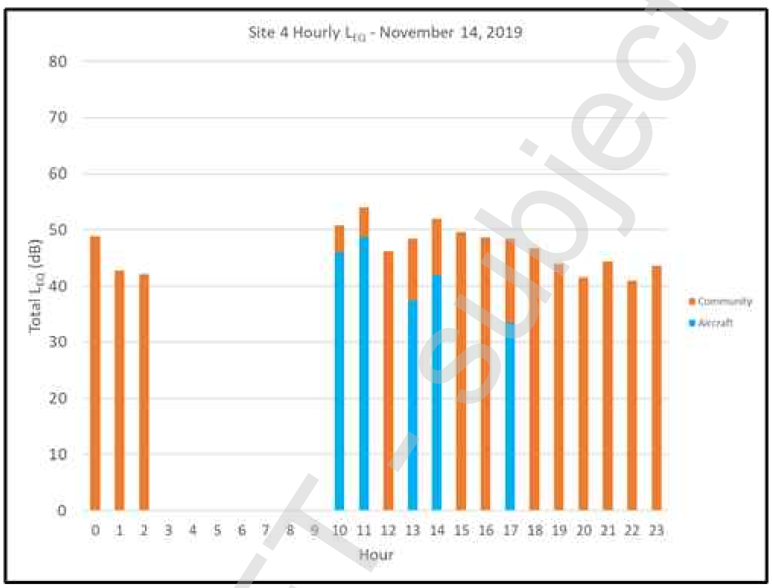


Figure C-28. Site 4 Thursday, November 14, 2019 Hourly LEQ

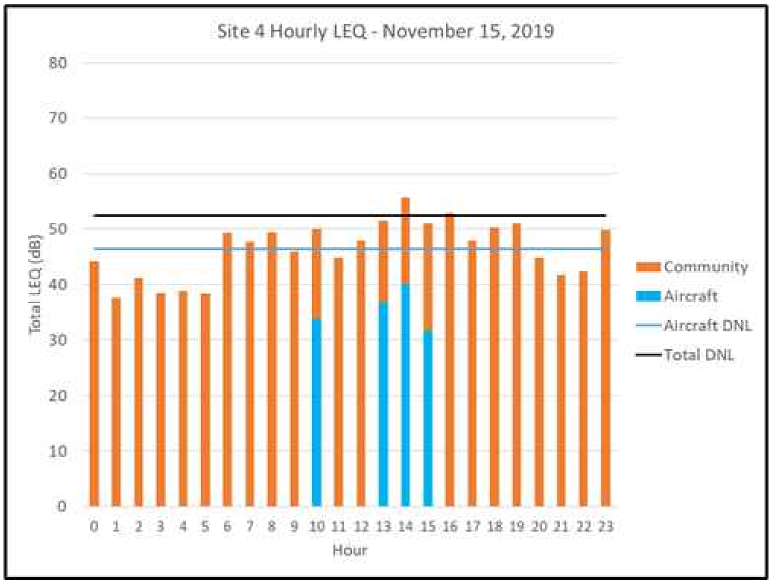


Figure C-29. Site 4 Friday, November 15, 2019 Hourly LEQ

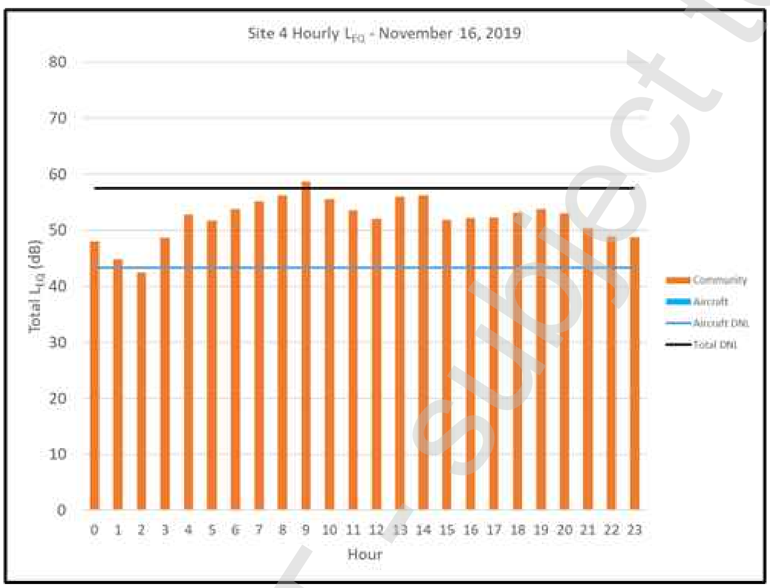


Figure C-30. Site 4 Saturday, November 16, 2019 Hourly LEQ

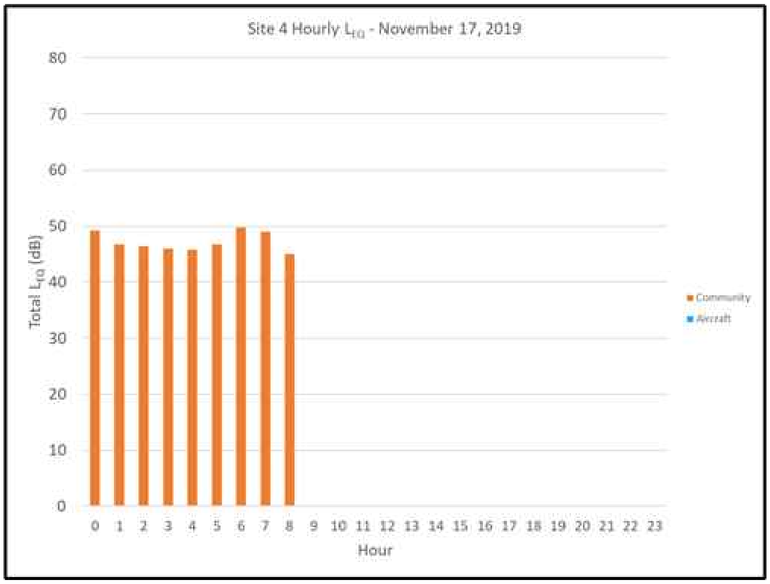


Figure C-31. Site 4 Sunday, November 17, 2019 Hourly LEQ

At site 4, 6502 Lytham Court, Greensboro, only 30 aircraft noise events were identified by the correlation algorithm for the course of the week-long measurement program. Table C-5 summarizes these events by aircraft category, and Figure C-32 depicts the individual flight tracks. All but one of the events were non-jet aircraft. The four departure tracks are shown in green and the three arrival tracks are shown in red. The 23 "other" operations are the practice pattern flights (oval-shaped flight tracks) depicted in black. The loudest aircraft operations at this site during the measurement period were the practice pattern operations which were using Runway 05L-23R.

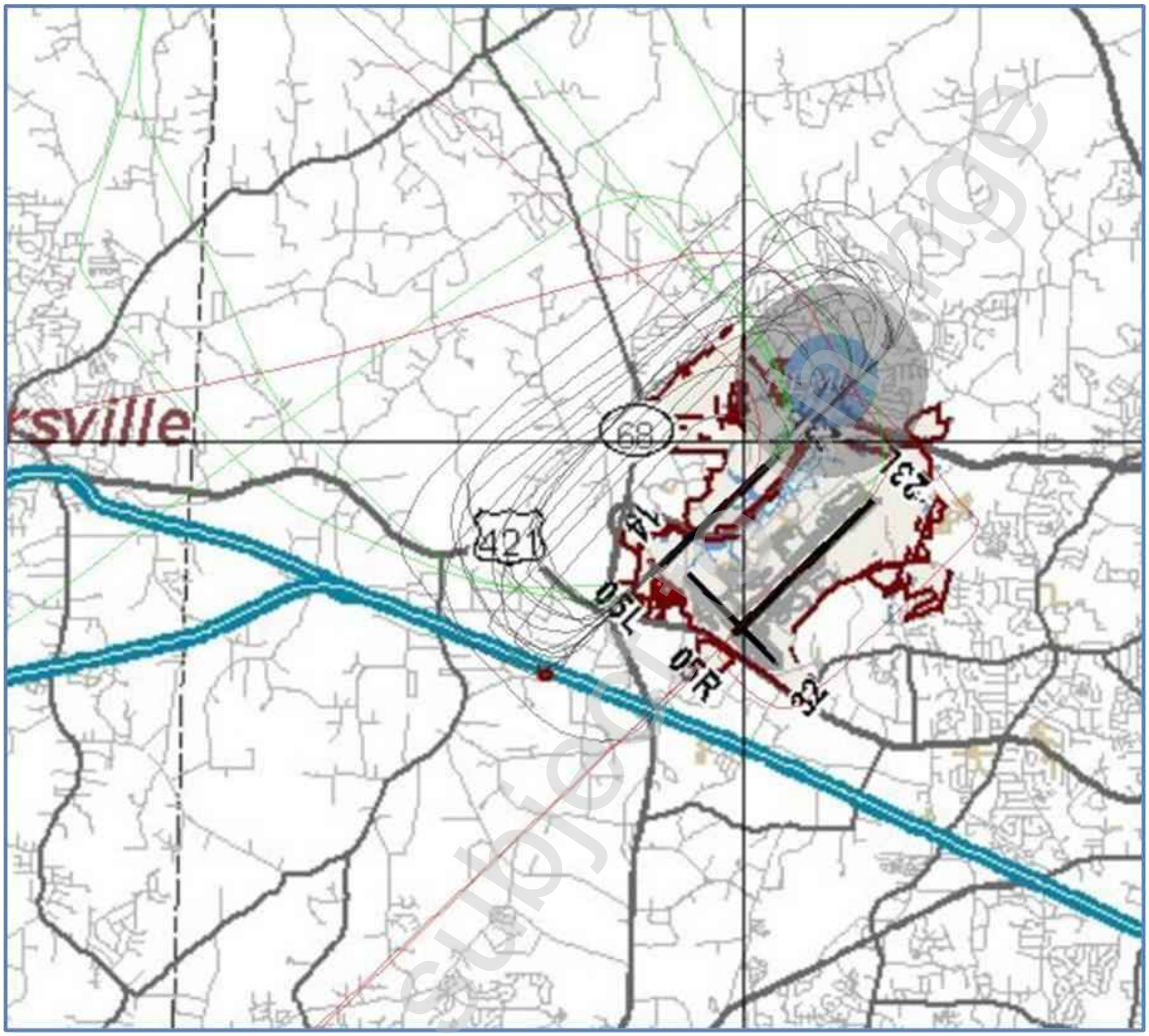
Table C-5. Site 4 Aircraft Noise Events

Aircraft Category	Operation	Count of Events	Max SEL	Min SEL	Median SEL
Other Small Jet	Other	1	69.0	69.0	69.0
Non-jet	Arrival	3	74.0	67.2	69.3
	Departure	4	75.7	69.4	70.5
	Other	22	82.1	65.2	69.3
Total	Arrival	3	74.0	67.2	69.3
	Departure	4	75.7	69.4	70.5
	Other	23	82.1	65.2	69.0
Total		**30**			

Note: Operations that are counted as "Other" are classified by the NOIARS as overflights or circuits.

Source: GSO NOIARS November 11 - 17, 2019

Figure C-32. Site 4 Aircraft Noise Events



Source: GSO NOIARS November 11 - 17, 2019

At site 5, 4703 Clarkson Rd, Greensboro, the predominant aircraft activity during the measurement week were departures from Runway 5R when the airport was operating in north flow and arrivals to Runway 23L when in south flow.

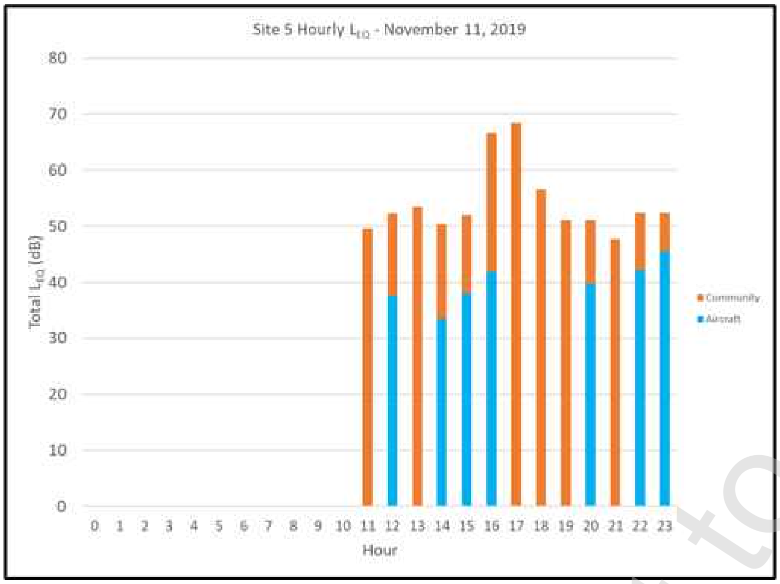


Figure C-33. Site 5 Monday, November 11, 2019 Hourly LEQ

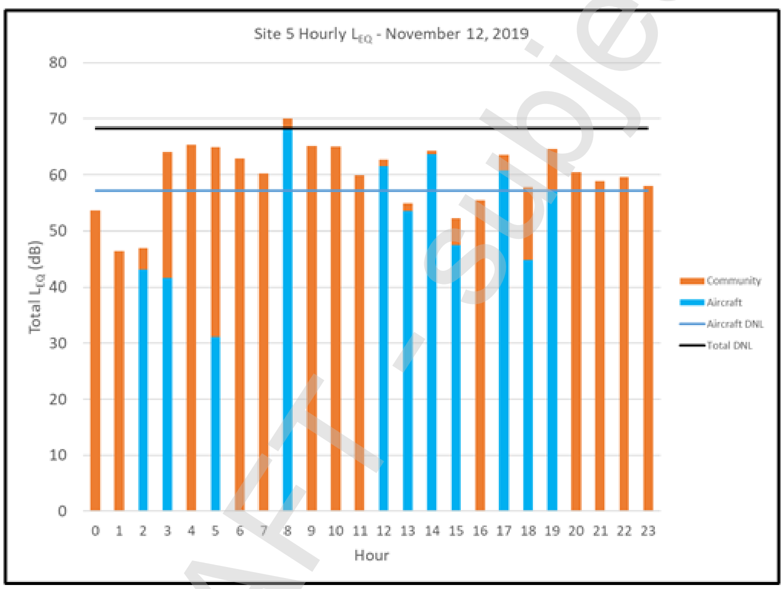


Figure C-34. Site 5 Tuesday, November 12, 2019 Hourly LEQ

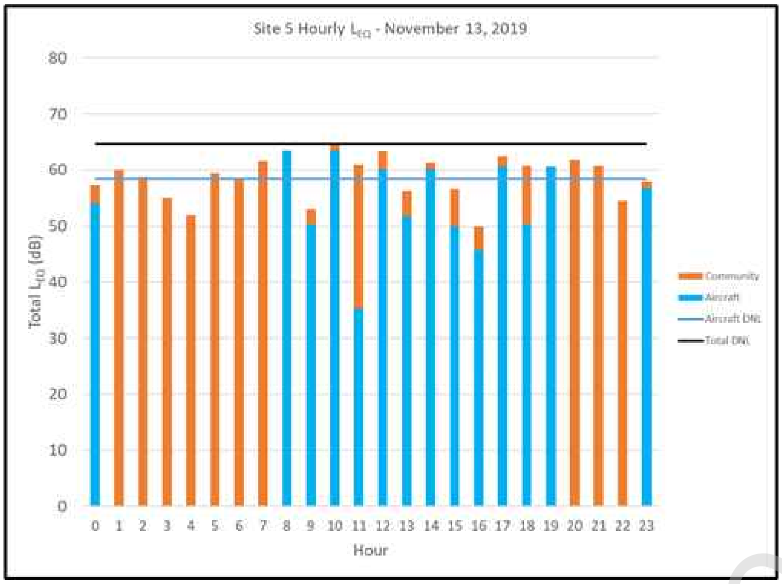


Figure C-35. Site 5 Wednesday, November 13, 2019 Hourly LEQ

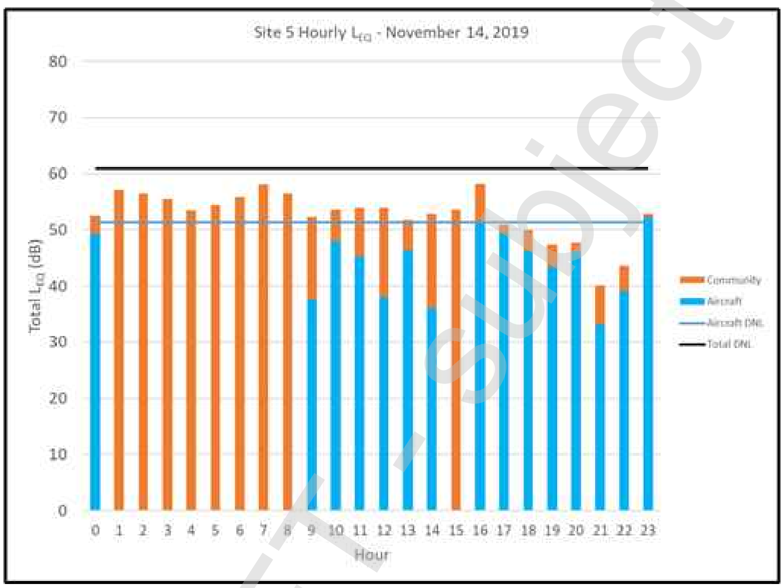


Figure C-36. Site 5 Thursday, November 14, 2019 Hourly LEQ

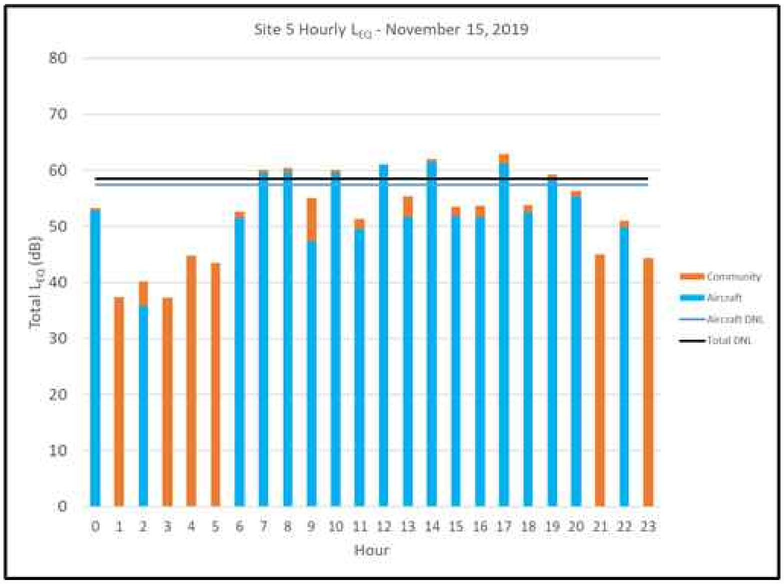


Figure C-37. Site 5 Friday, November 15, 2019 Hourly LEQ

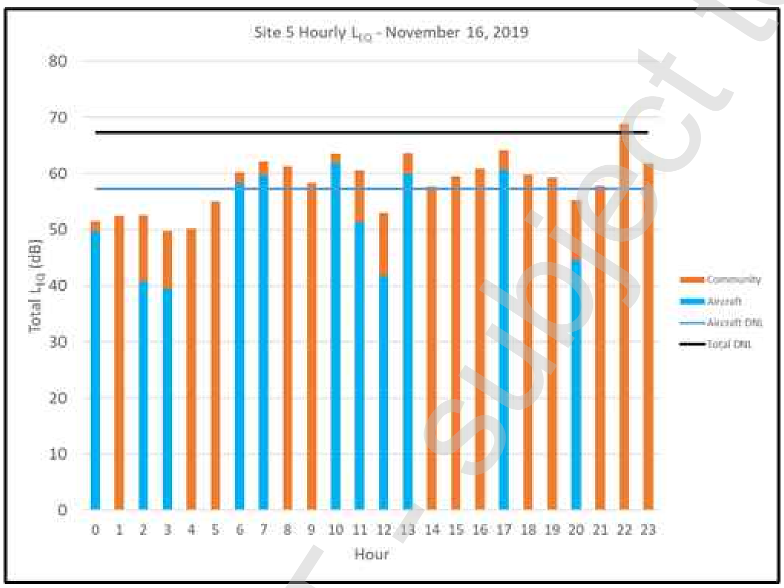


Figure C-38. Site 5 Saturday, November 16, 2019 Hourly LEQ

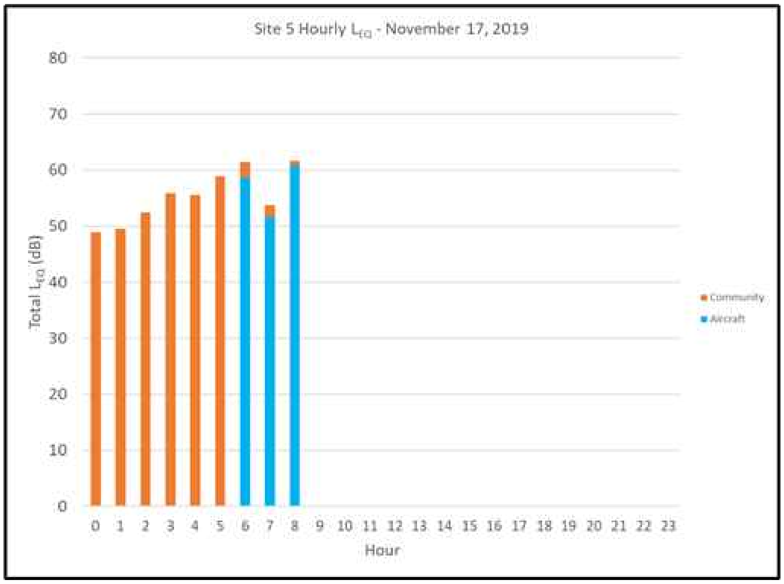


Figure C-39. Site 5 Sunday, November 17, 2019 Hourly LEQ

At site 5, 4703 Clarkson Rd, Greensboro, 229 aircraft noise events were identified over the course of the week-long measurement program. Table C-6 summarizes these events by aircraft category, and Figure C-40 depicts the individual flight tracks. The 172 departure tracks are shown in green and the 49 arrival tracks are shown in red. The loudest events at this site were jet departures, specifically MD88 departures.

Table C-6. Site 5 Aircraft Noise Events

Aircraft Category	Operation	Count of Events	Max SEL	Min SEL	Median SEL
MD88	Arrival	3	80.5	78.0	80.1
	Departure	26	103.7	90.5	95.9
Other Large Jet	Arrival	7	82.4	66.7	76.9
	Departure	22	91.8	80.0	84.7
Regional Jet	Arrival	16	86.9	68.5	75.1
	Departure	60	86.1	71.0	79.5
Honda Jet	Arrival	6	73.6	68.2	69.4
	Departure	12	80.0	72.2	76.0
Other Small Jet	Arrival	7	75.2	67.3	69.8
	Departure	29	81.9	69	75.4
Non-jet	Arrival	10	80.4	67.5	70.5
	Departure	23	95.9	68.2	74.3
	Other	8	82.5	66.1	73.3
Total	Arrival	49	86.9	66.7	72.3
	Departure	172	103.7	68.2	79.5
	Other	8	82.5	66.1	73.25
Total		**229**			

Note: Operations that are counted as “Other” are classified by the NOIARS as overflights or circuits.

Source: GSO NOIARS November 11 - 17, 2019

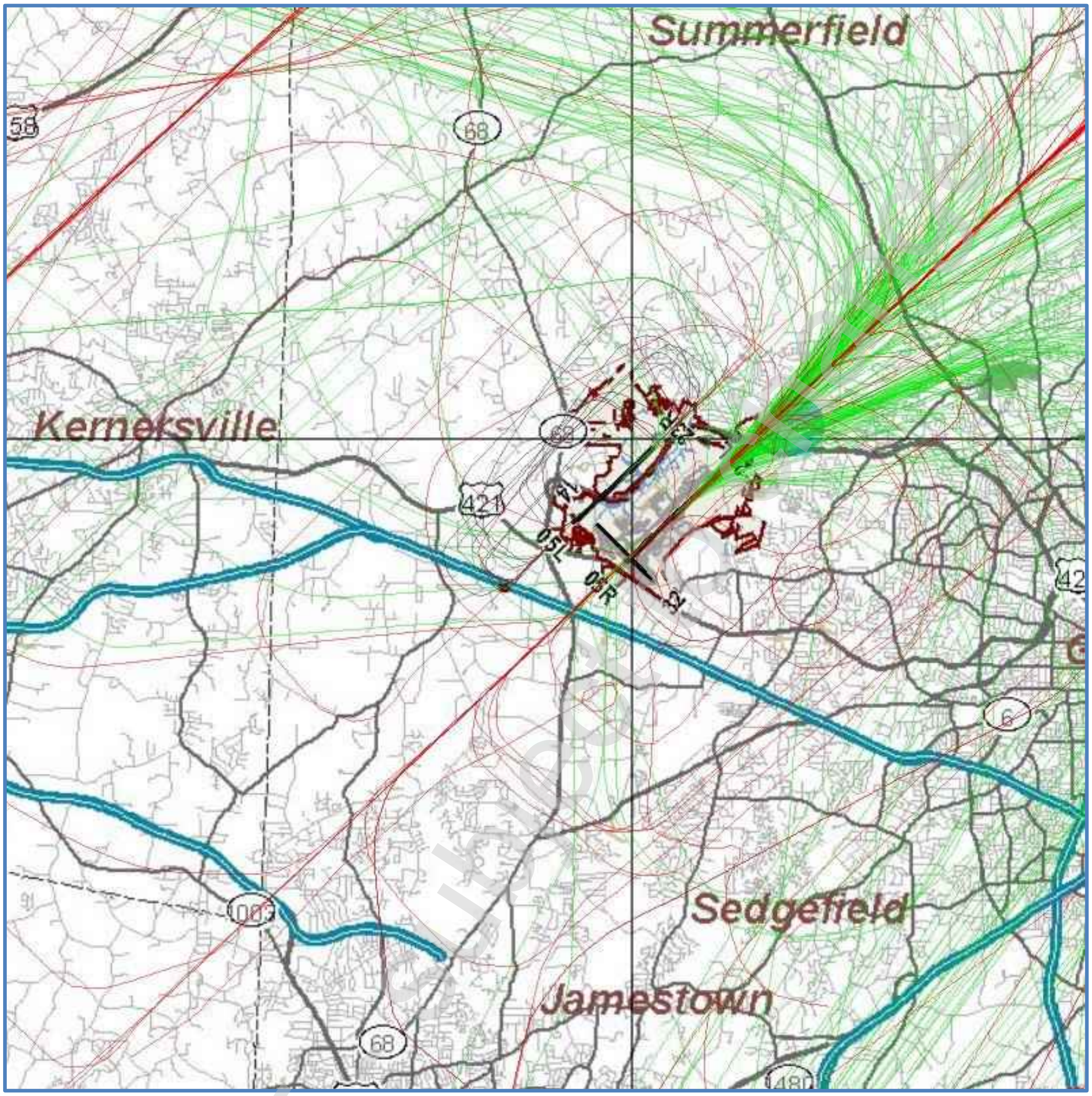


Figure C-40. Site 5 Aircraft Noise Events

Source: GSO NOIARS November 11 - 17, 2019

At site 6, 3600 Lewiston Rd, Greensboro, the predominant aircraft activity during the measurement week were departures from Runway 5R when the airport was operating in north flow and arrivals to Runway 23L when in south flow.

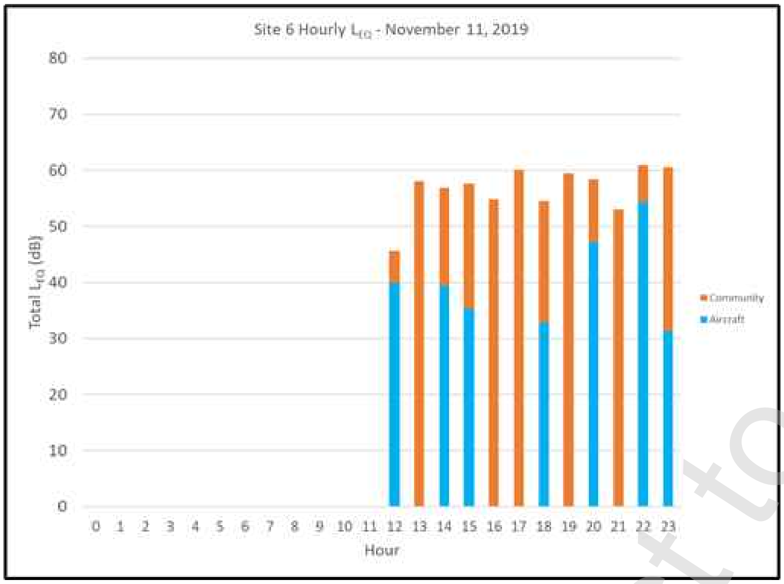


Figure C-41. Site 6 Monday, November 11, 2019 Hourly LEQ

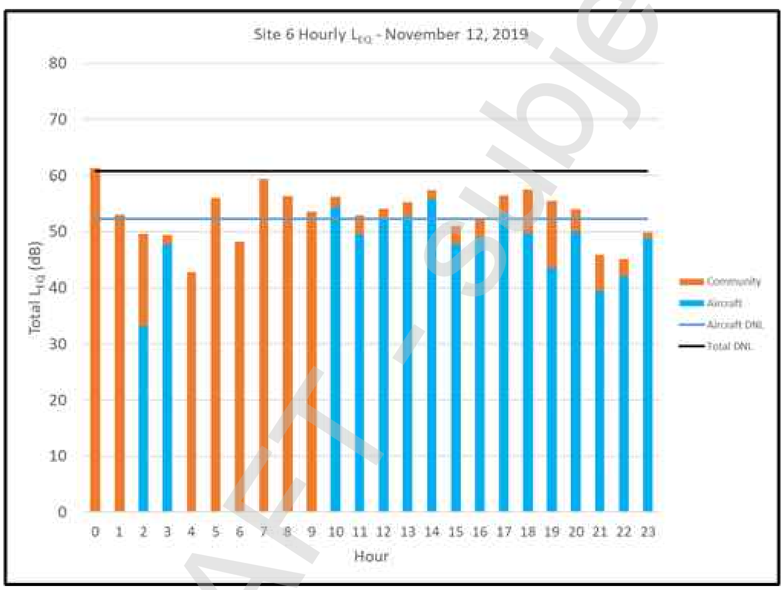


Figure C-42. Site 6 Tuesday, November 12, 2019 Hourly LEQ

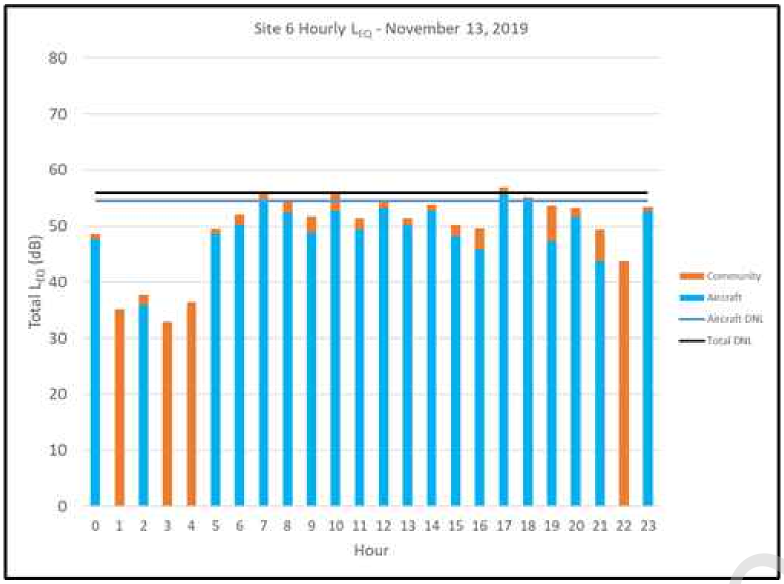


Figure C-43. Site 6 Wednesday, November 13, 2019 Hourly LEQ

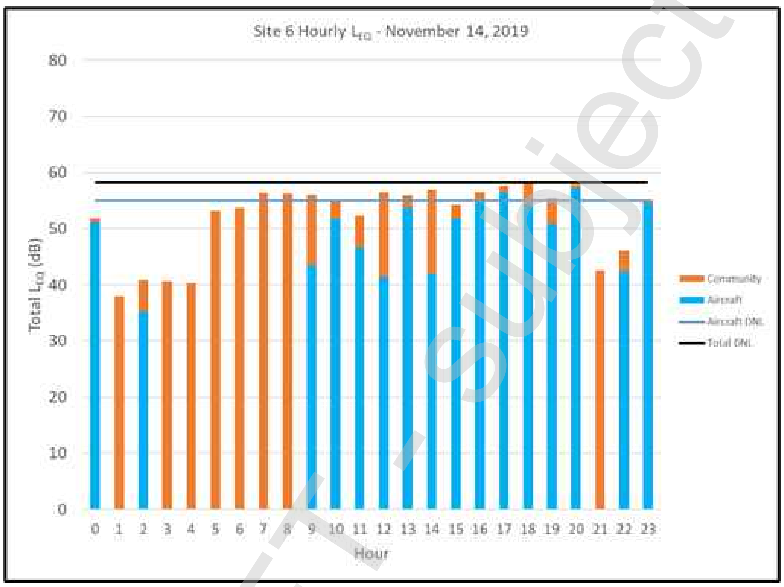


Figure C-44. Site 6 Thursday, November 14, 2019 Hourly LEQ

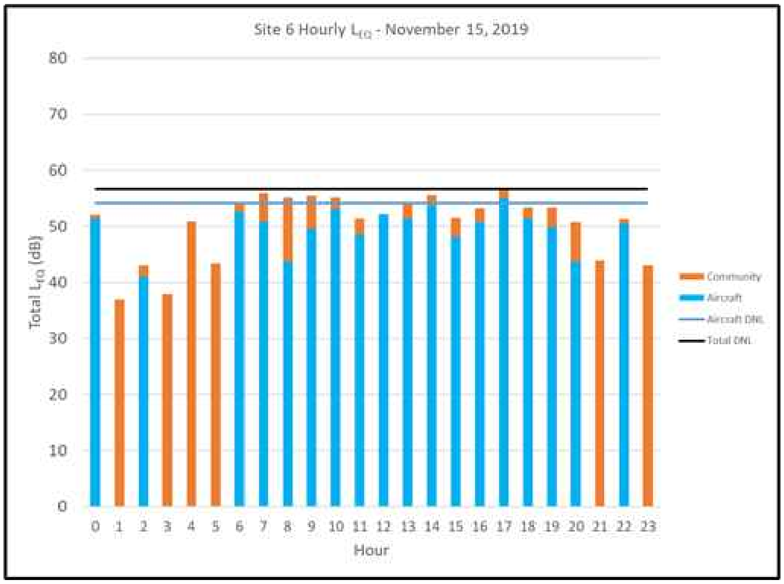


Figure C-45. Site 6 Friday, November 15, 2019 Hourly LEQ

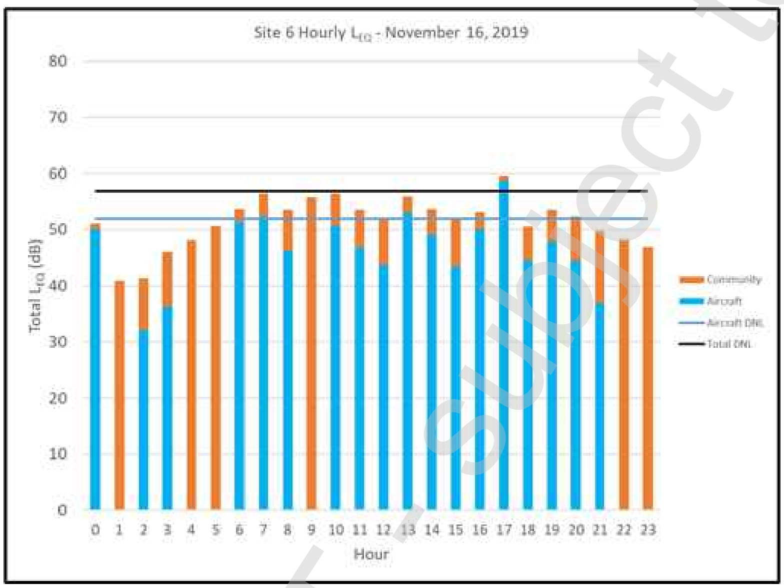


Figure C-46. Site 6 Saturday, November 16, 2019 Hourly LEQ

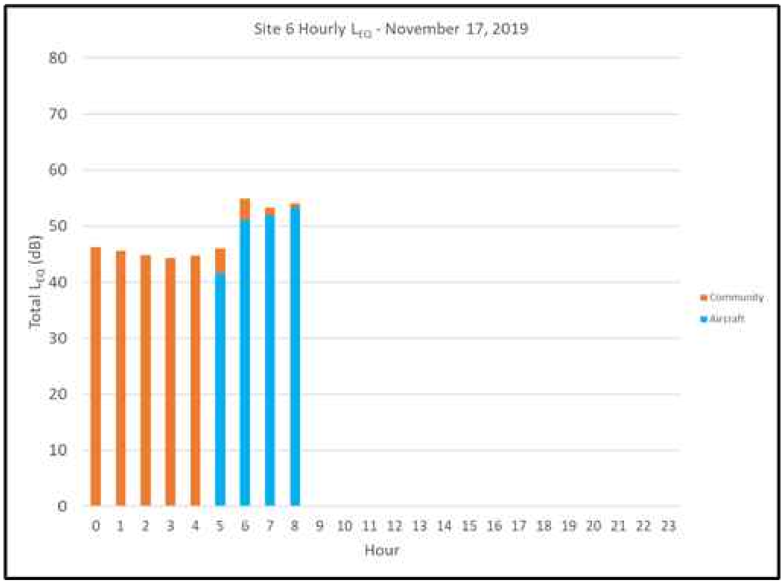


Figure C-47. Site 6 Sunday, November 17, 2019 Hourly LEQ

At site 6, 3600 Lewiston Rd, Greensboro, 329 aircraft noise events were identified over the course of the week-long measurement program. Table C-7 summarizes these events by aircraft category, and Figure C-48 depicts the individual flight tracks. The 257 departure tracks are shown in green and the 64 arrival tracks are shown in red. At this site, the loudest events were MD88 operations, both departures and arrivals, followed by other large jet departure and arrival operations.

Table C-7. Site 6 Aircraft Noise Events

Aircraft Category	Operation	Count of Events	Max SEL	Min SEL	Median SEL
MD88	Arrival	6	92.3	68.5	86.7
	Departure	25	93.6	83.2	86.4
Other Large Jet	Arrival	7	89.6	78.3	84.8
	Departure	31	90.2	75.1	83.2
Regional Jet	Arrival	22	83.9	66.9	81.6
	Departure	124	84.1	69.5	78.3
Honda Jet	Arrival	7	77.5	69.8	72.8
	Departure	18	78.9	68.1	75.5
	Other	1	73.2	73.2	73.2
Other Small Jet	Arrival	11	80.8	66.6	74.7
	Departure	43	82.3	69.2	77.2
Non-jet	Arrival	11	81.9	66.0	71.6
	Departure	16	85.3	67.5	72.3
	Other	7	86.4	64.7	72.1
Total	Arrival	64	92.3	66.0	77.5
	Departure	257	93.6	67.5	78.3
	Other	8	86.4	64.7	72.6
Total		**329**			

Note: Operations that are counted as “Other” are classified by the NOIARS as overflights or circuits.

Source: GSO NOIARS November 11 - 17, 2019

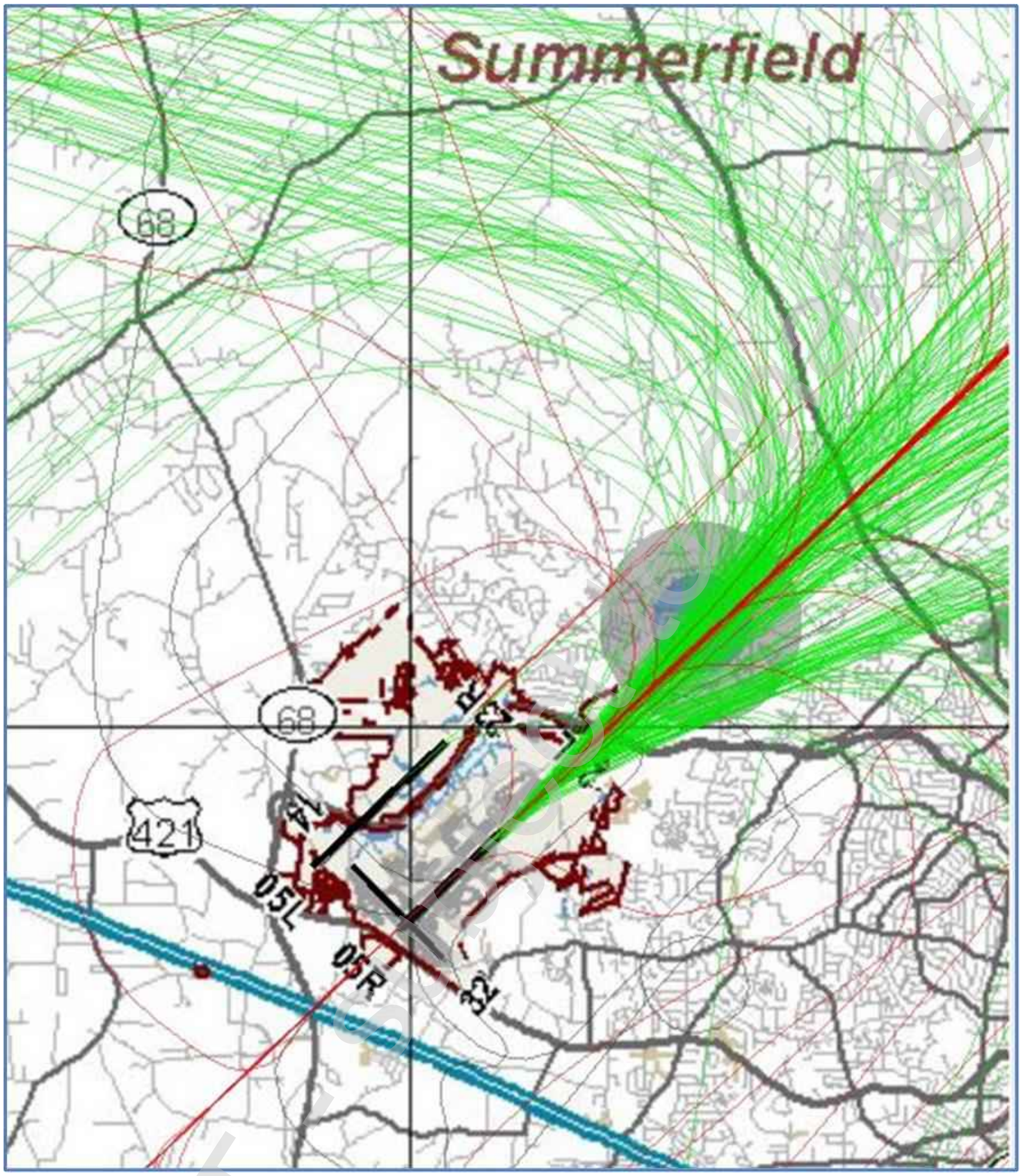


Figure C-48. Site 6 Aircraft Noise Events
Source: GSO NOIARS November 11 - 17, 2019

At permanent monitor Site A, the predominant aircraft activity during the measurement week were arrivals to Runway 5L when the airport was operating in north flow, and departures from Runway 23R when in south flow. Since those operations occur far less frequently than operations on the other parallel runway, the more distant operations on the other runway make a contribution to the overall aircraft noise environment at site A.

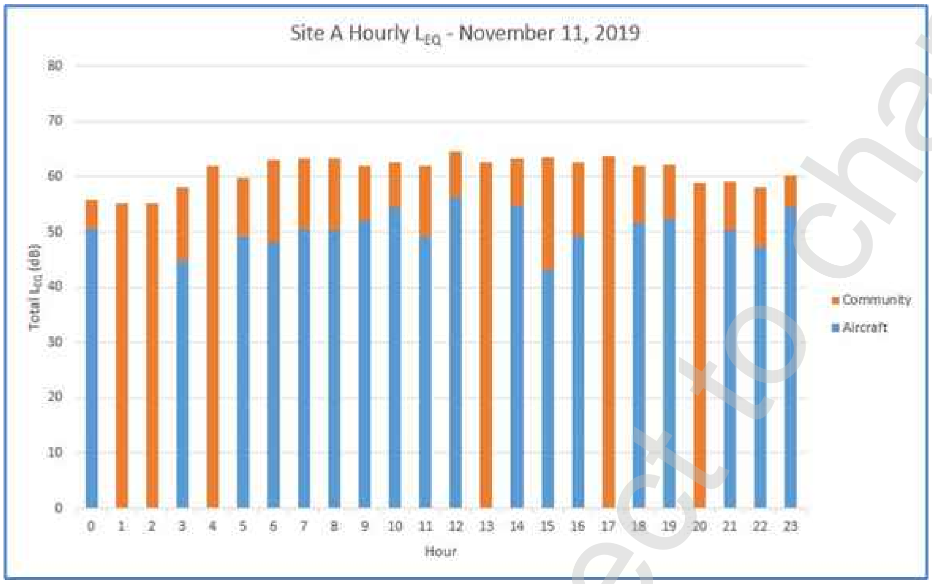


Figure C-49. Site A Monday, November 11, 2019 Hourly LEQ

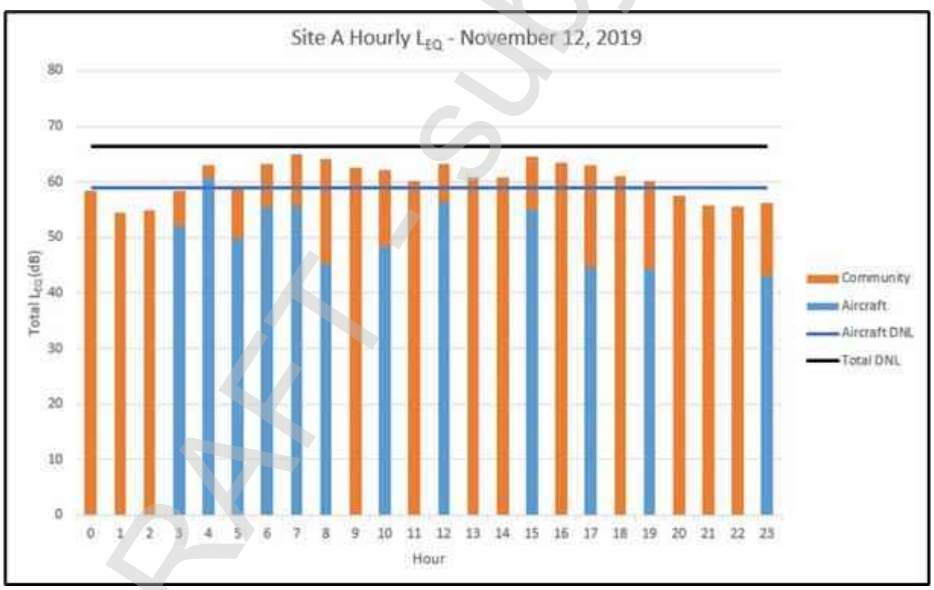


Figure C-50. Site A Tuesday, November 12, 2019 Hourly LEQ

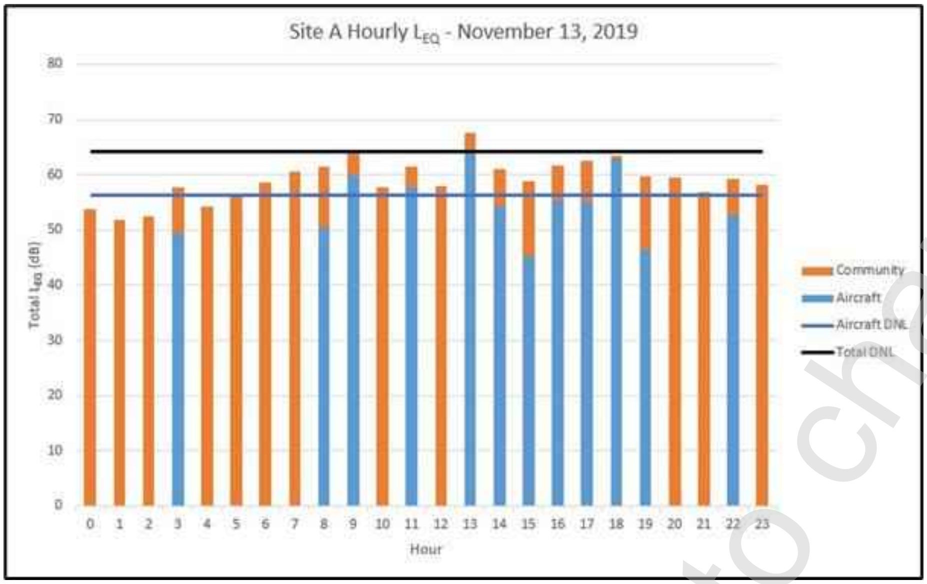


Figure C-51. Site A Wednesday, November 13, 2019 Hourly LEQ

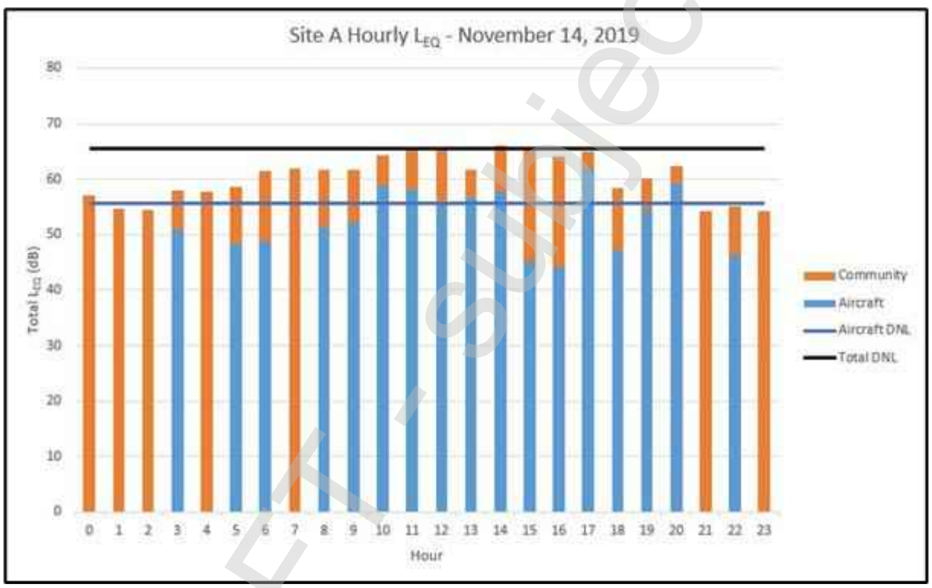


Figure C-52. Site A Thursday, November 14, 2019 Hourly LEQ

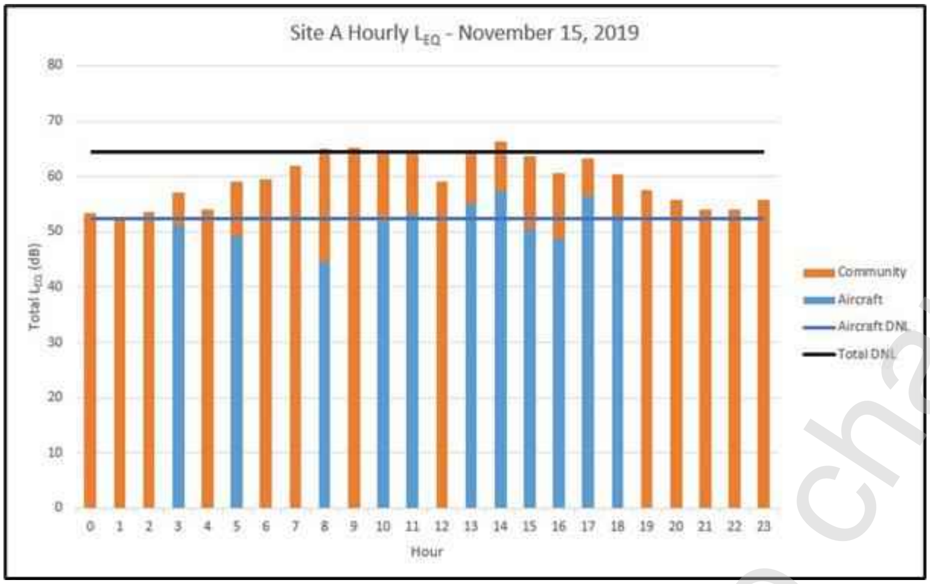


Figure C-53. Site A Friday, November 15, 2019 Hourly LEQ

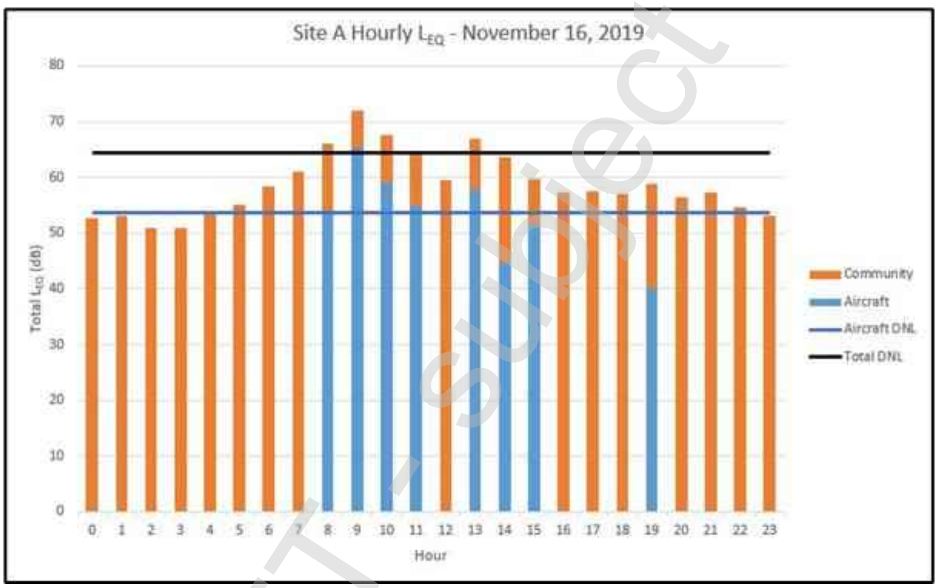


Figure C-54. Site A Saturday, November 16, 2019 Hourly LEQ

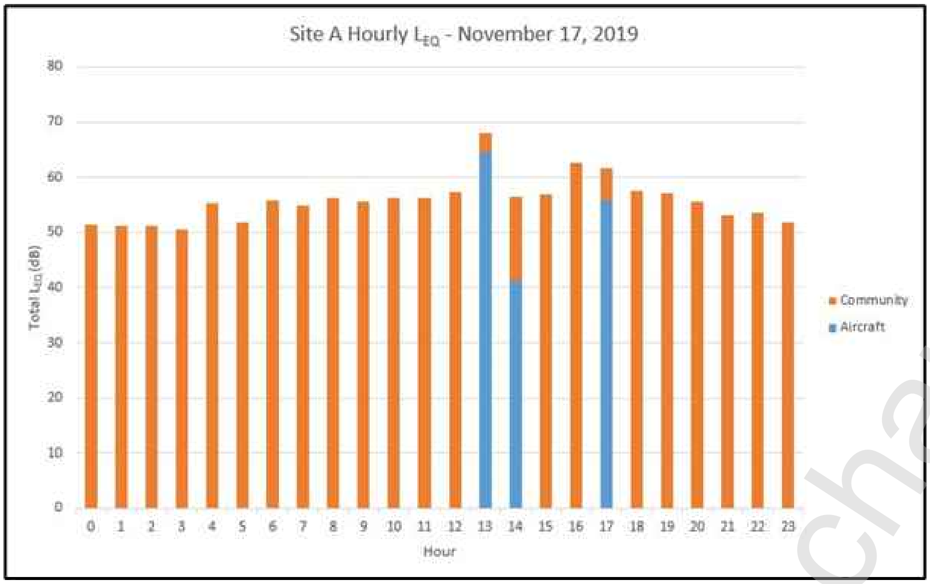


Figure C-55. Site A Sunday, November 17, 2019 Hourly LEQ

At permanent monitor site A, 255 aircraft noise events were identified over the course of the week-long measurement program. Table C-8 summarizes these events by aircraft category, and Figure C-56 depicts the individual flight tracks. The tracks corresponding to the 119 departure events are shown in green and those for the 83 arrival events are shown in red. "Other" operations, generally practice pattern flights, are plotted in black. The loudest events at this site are from aircraft operations using Runway 5L-23R because they are the closest, but many departures from Runway 23L or arrivals to Runway 5R also register as noise events at this site.

Table C-8. Site A Aircraft Noise Events

Aircraft Category	Operation	Count of Events	Max SEL	Min SEL	Median SEL
MD88	Arrival	7	98.9	79	83.2
	Departure	24	87.5	81.7	83.9
Other Large Jet	Arrival	2	86.6	78.8	82.7
	Departure	36	92.7	76.3	81.3
Regional Jet	Arrival	16	91.9	76.9	82.4
	Departure	23	92.4	78.1	80.9
Honda Jet	Arrival	10	84.1	77.8	81.4
	Departure	7	83.8	77.2	81.0
Other Small Jet	Arrival	5	92.0	79.6	84.5
	Departure	9	88.9	76.7	80.9
	Other	1	80.0	80.0	80.0
Non-jet	Arrival	43	100.0	75.8	83.3
	Departure	20	90.8	75.6	80.1
	Other	52	98.5	76.1	81.4
Total	Arrival	83	100.0	75.8	82.7
	Departure	119	92.7	75.6	81.6
	Other	53	98.5	76.1	81.2
Total		**255**			

Note: Operations that are counted as "Other" are classified by the NOIARS as overflights or circuits.

Source: GSO NOIARS November 11 - 17, 2019

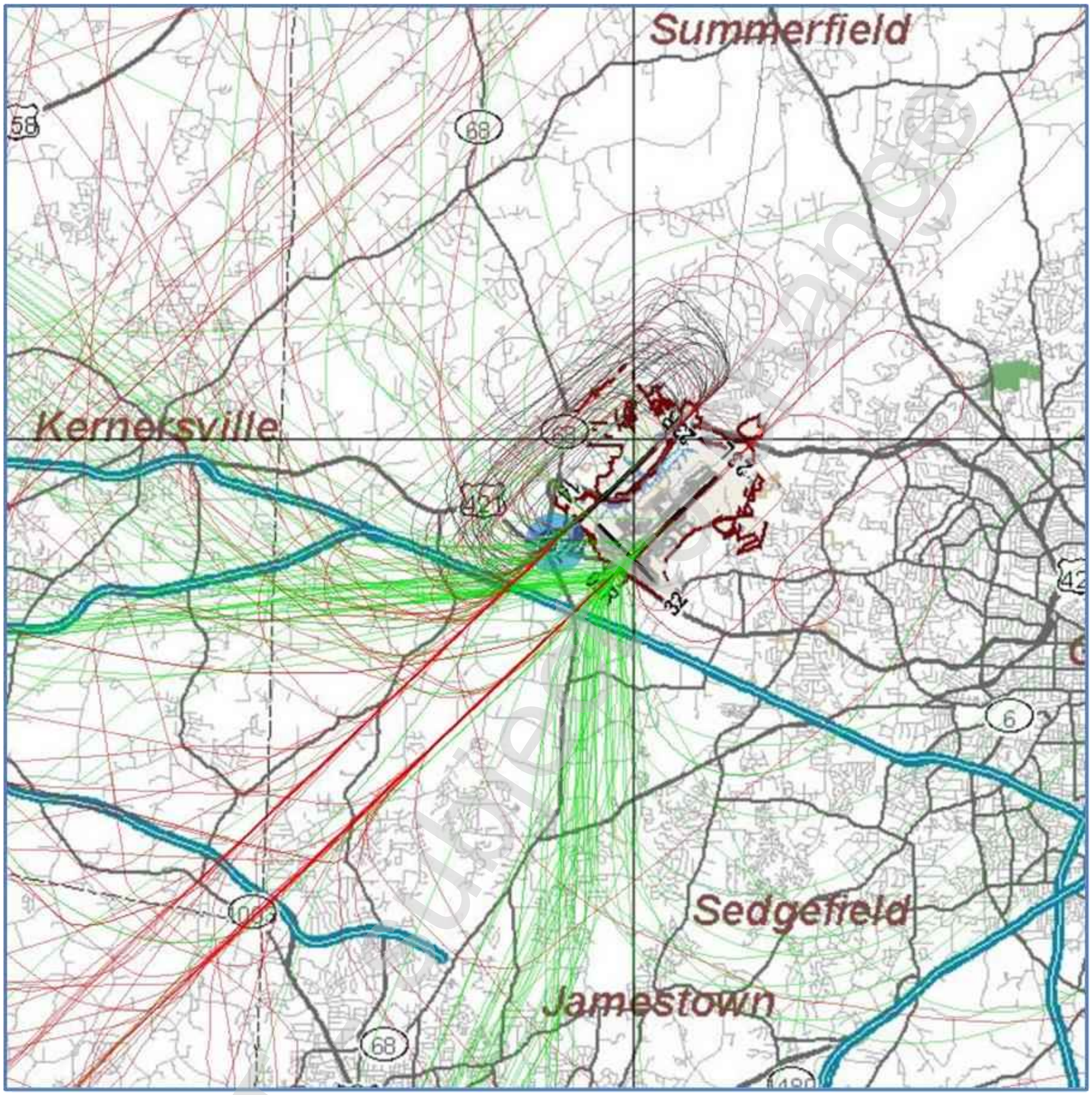


Figure C-56. Site A Aircraft Noise Events
Source: GSO NOIARS November 11 - 17, 2019

At permanent monitor Site C, the predominant aircraft activity during the measurement week were arrivals to Runway 5R when the airport was operating in north flow and departures from Runway 23L when in south flow. Because the monitor is so close to the runway end, ground noise from aircraft operating in the opposite direction (start of takeoff-roll for departures from Runway 5R and braking noise for arrivals on Runway 23L) also contribute to the noise environment in this location. Airport ground noise such as taxiing and runups would be classified by the NOIARS as non-aircraft (community) noise. The majority of the noise energy detected by the monitor at this location is attributable to aircraft flight operations, as evidenced by the closeness of the aircraft-only DNL level to the total DNL level..

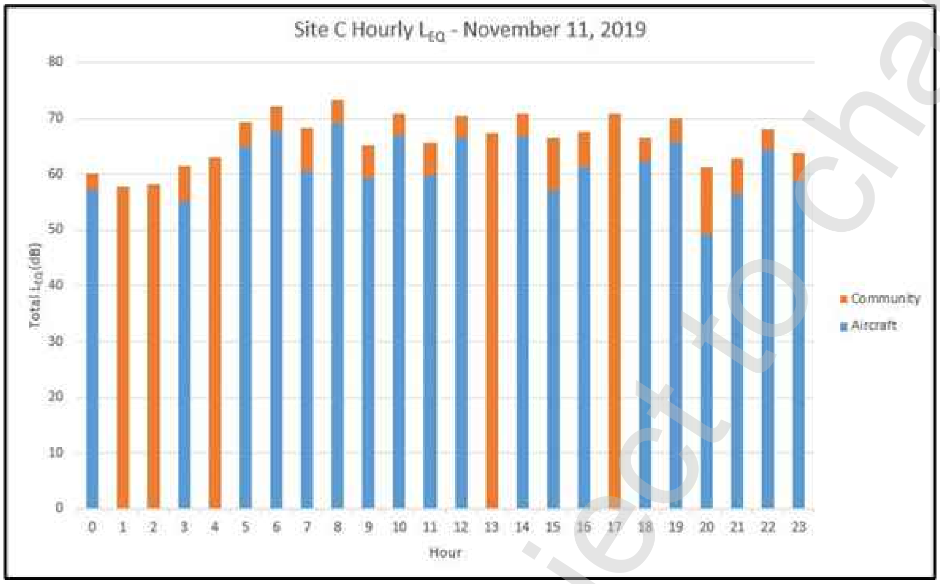


Figure C-57. Site C Monday, November 11, 2019 Hourly LEQ

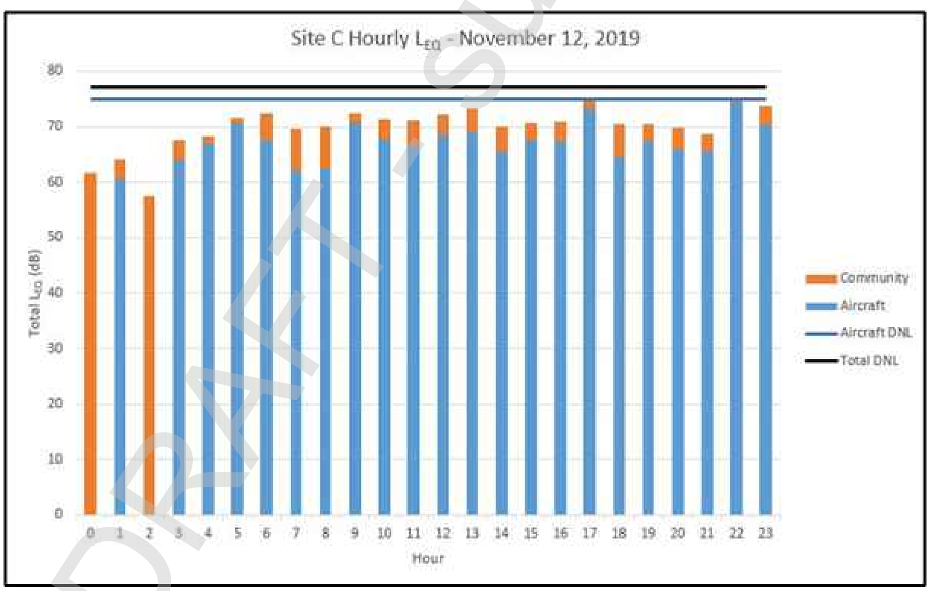


Figure C-58. Site C Tuesday, November 12, 2019 Hourly LEQ

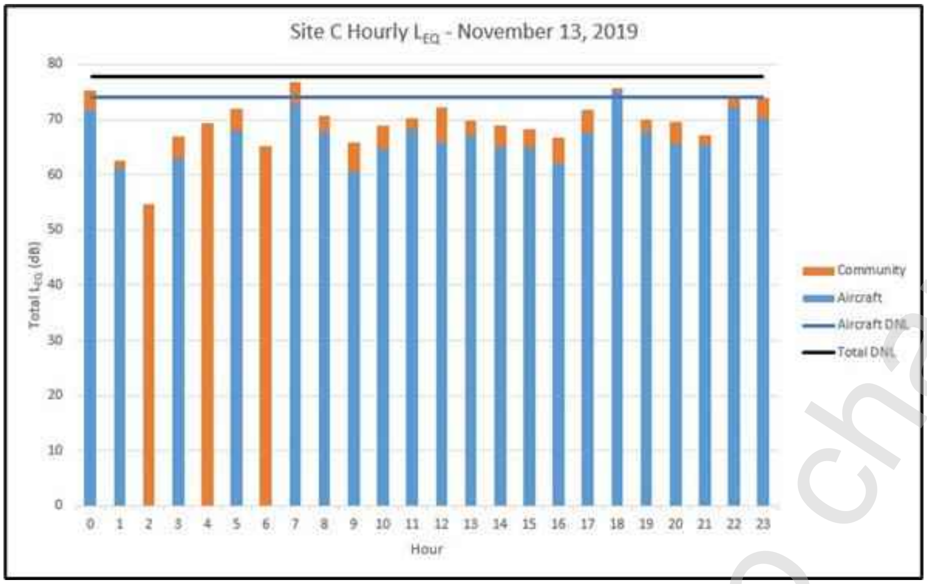


Figure C-59. Site C Wednesday, November 13, 2019 Hourly LEQ

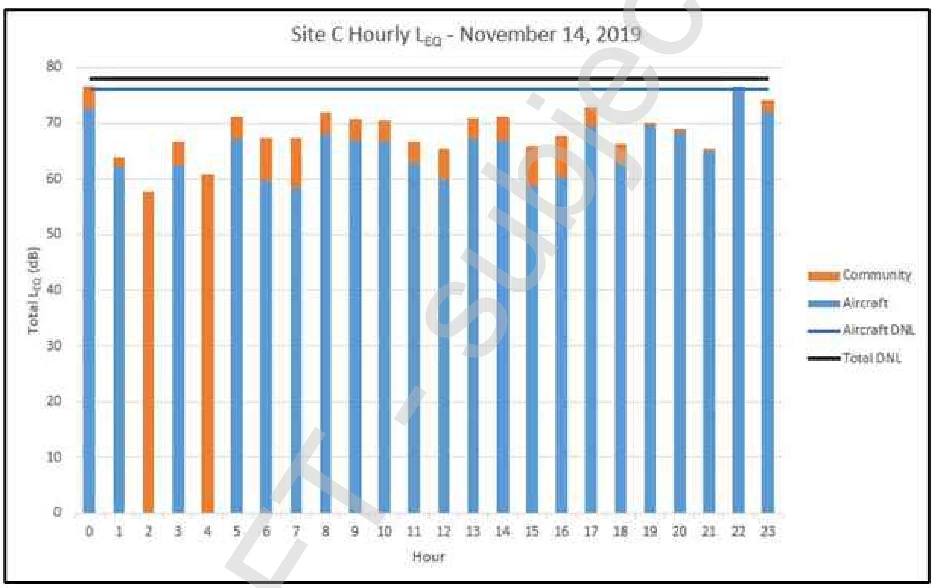


Figure C-60. Site C Thursday, November 14, 2019 Hourly LEQ

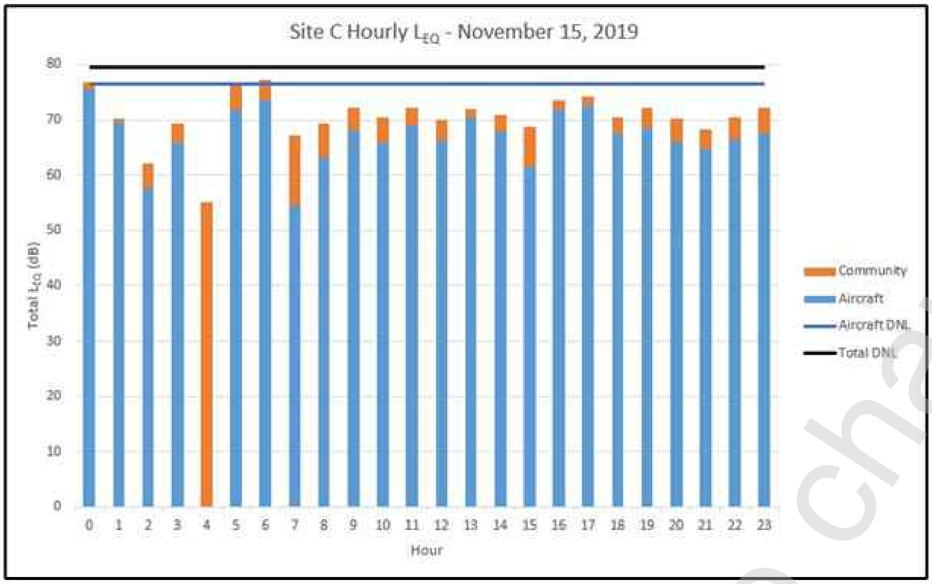


Figure C-61. Site C Friday, November 15, 2019 Hourly LEQ

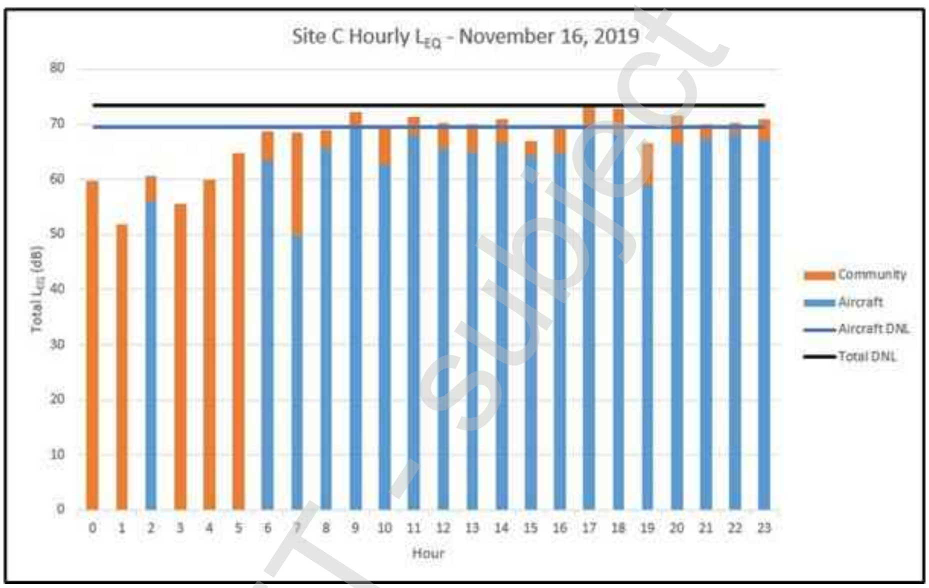


Figure C-62. Site C Saturday, November 16, 2019 Hourly LEQ

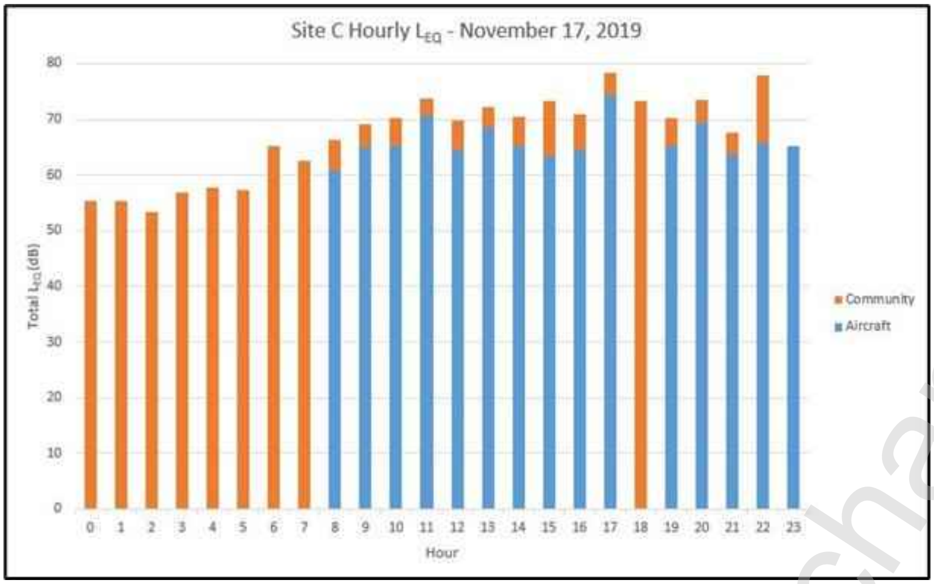


Figure C-63. Site C Sunday, November 17, 2019 Hourly LEQ

At permanent monitor site C, 901 aircraft noise events were identified over the course of the week-long measurement program. Table C-9 summarizes these events by aircraft category, and Figure C-64 depicts the individual flight tracks. The tracks corresponding to the 249 departure events are shown in green and those for the 630 arrival events are shown in red. The loudest events at this site were large jet arrivals to Runway 5R and departures from Runway 23L, including MD88 operations. Because this site is so close to the runway end, some operations register as more than one event. For example, an arriving jet creates a noise event as it passes overhead, about to land, and then a few seconds later creates another event as it applies reverse thrust braking to come to a stop on the runway.

Table C-9. Site C Aircraft Noise Events

Aircraft Category	Operation	Count of Events	Max SEL	Min SEL	Median SEL
MD88	Arrival	66	103.8	83.2	98.0
	Departure	30	104.6	80.6	101.5
Other Large Jet	Arrival	97	107.4	81.1	98.7
	Departure	59	103.8	86.4	90.6
Regional Jet	Arrival	245	104.4	80.5	93.5
	Departure	97	98.9	82.1	87.6
Honda Jet	Arrival	58	95.0	81.8	87.5
	Departure	8	85.6	81.4	84.9
Other Small Jet	Arrival	87	96.2	81.8	91.5
	Departure	35	100.1	80.3	87.0
	Other	1	82.2	82.2	82.2
Non-jet	Arrival	77	97.8	81.2	90.5
	Departure	20	95.1	81.0	84.6
	Other	21	101.8	84.9	90.0
Total	Arrival	630	107.4	80.5	93.1
	Departure	249	104.6	80.3	88.8
	Other	22	101.8	82.2	89.8
Total		**901**			

Note: Operations that are counted as “Other” are classified by the NOIARS as overflights or circuits.

Source: GSO NOIARS November 11 - 17, 2019

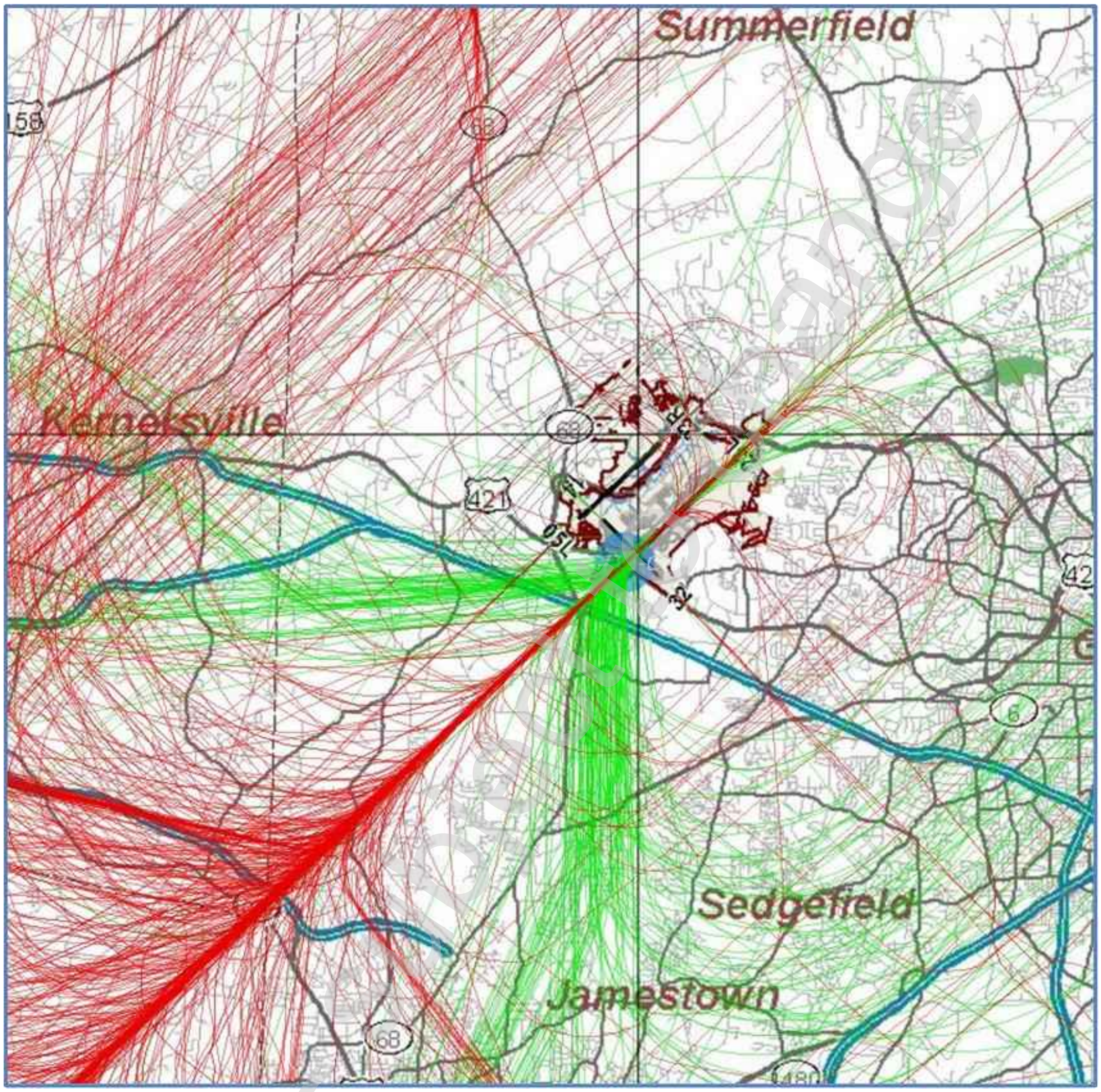


Figure C-64. Site C Aircraft Noise Events
Source: GSO NOIARS November 11 - 17, 2019

At permanent monitor Site D, the predominant aircraft activity during the measurement week were departures from Runway 5R when the airport was operating in north flow and arrivals to Runway 23L when in south flow. Because the monitor is so close to the runway end, ground noise from aircraft operating in the opposite direction (start of takeoff-roll for departures from Runway 23L and braking noise for arrivals on Runway 5R) also contribute to the noise environment in this location. Airport ground noise such as taxiing and runups would be classified by the NOIARS as non-aircraft (community) noise. The majority of the noise energy detected by the monitor at this location is attributable to aircraft operations, as evidenced by the closeness of the aircraft-only DNL level to the total DNL level.

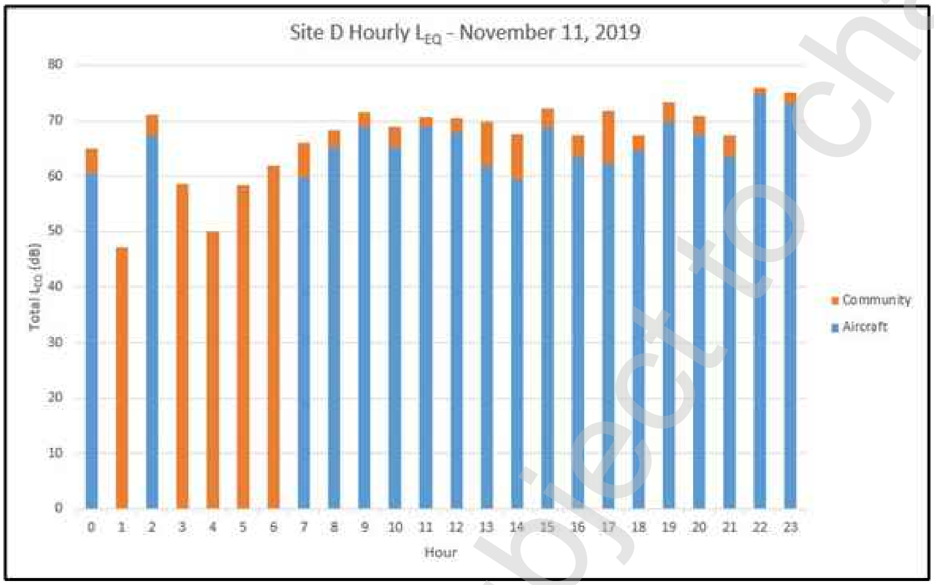


Figure C-65. Site D Monday, November 11, 2019 Hourly LEQ

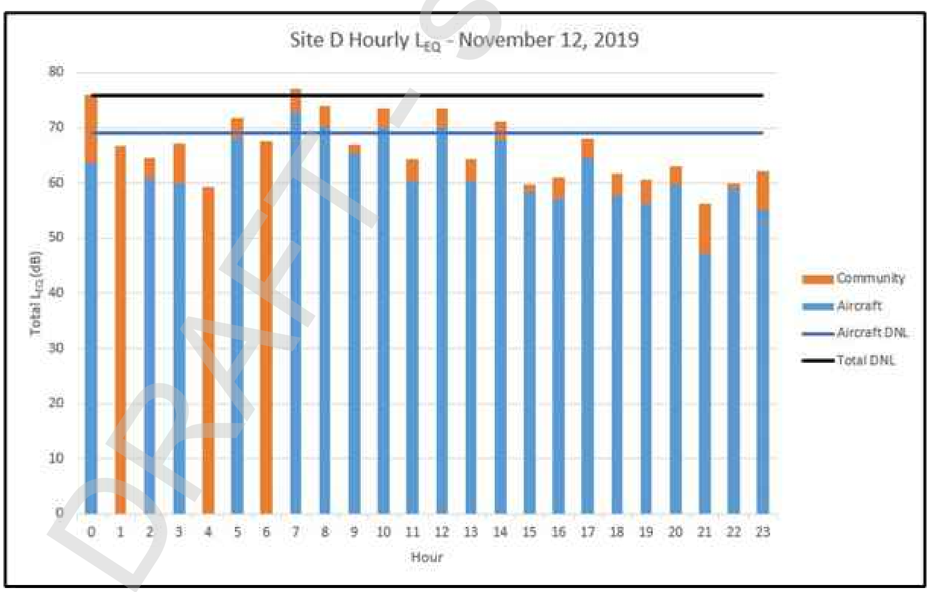


Figure C-66. Site D Tuesday, November 12, 2019 Hourly LEQ

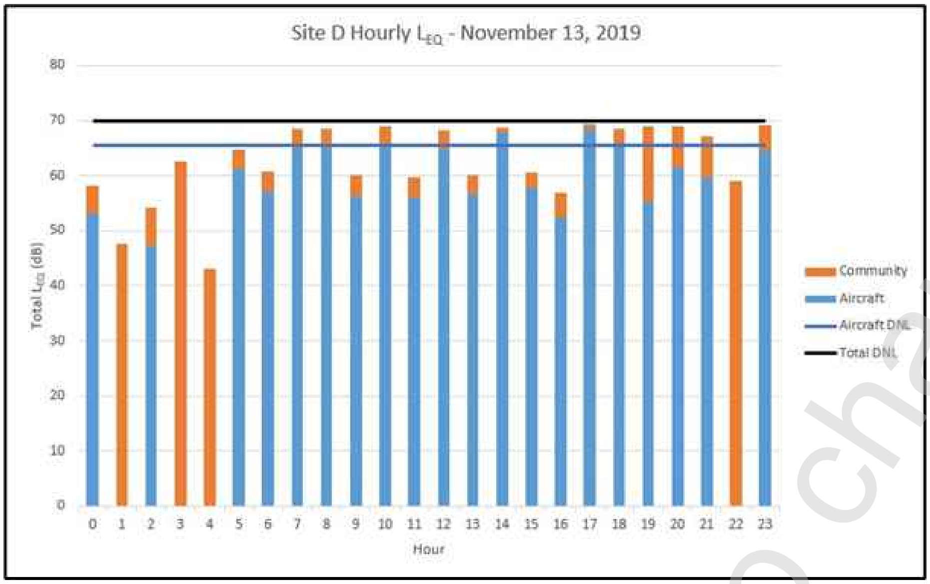


Figure C-67. Site D Wednesday, November 13, 2019 Hourly LEQ

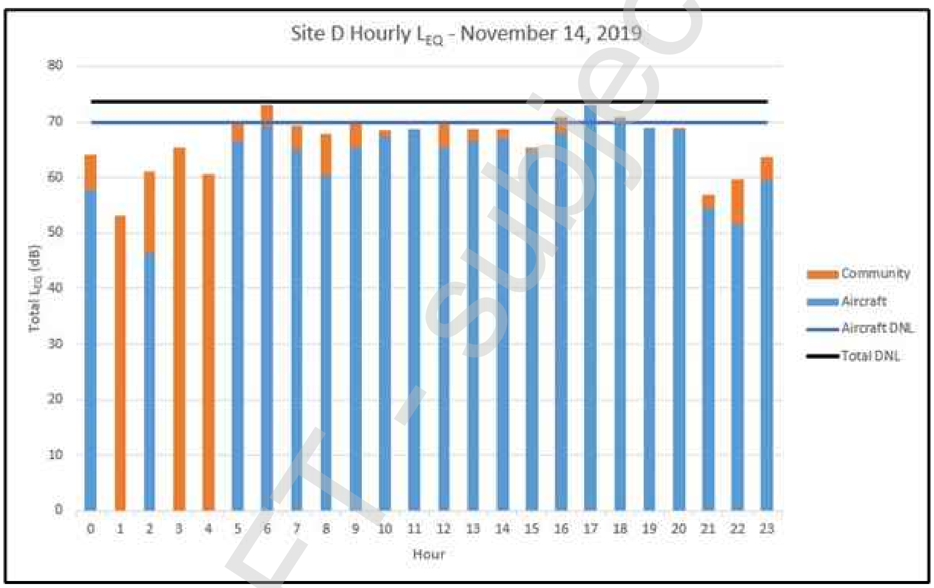


Figure C-68. Site D Thursday, November 14, 2019 Hourly LEQ

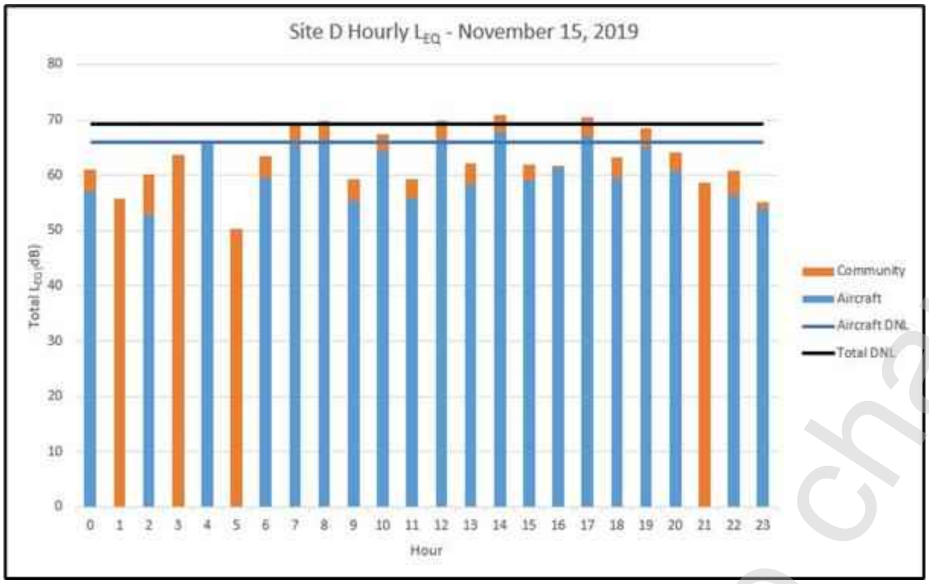


Figure C-69. Site D Friday, November 15, 2019 Hourly LEQ

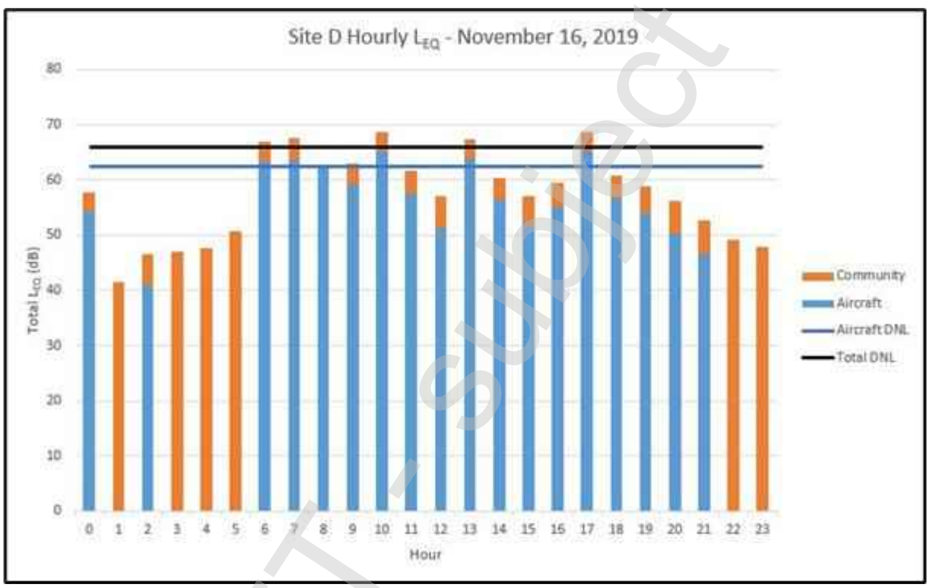


Figure C-70. Site D Saturday, November 16, 2019 Hourly LEQ

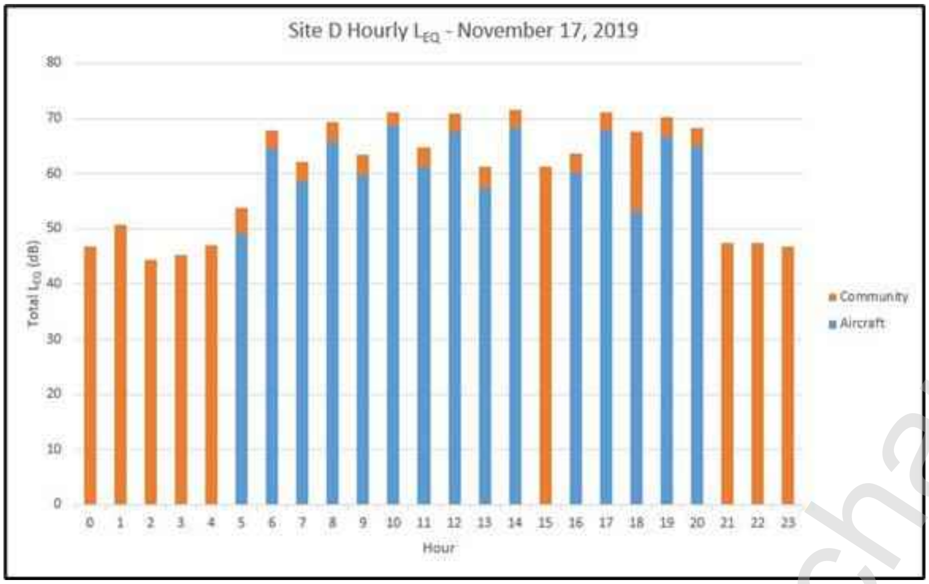


Figure C-71. Site D Sunday, November 17, 2019 Hourly LEQ

At permanent monitor site D, 755 aircraft noise events were identified over the course of the week-long measurement program. Table C-10 summarizes these events by aircraft category, and Figure C-72 depicts the individual flight tracks. The tracks corresponding to the 430 departure events are shown in green and those for the 302 arrival events are shown in red. The loudest events at this site were large jet departures from Runway 5R and arrivals to Runway 23L, including MD88 operations. Because this site is so close to the runway end, some operations register as more than one event. For example, an arriving jet creates a noise event as it passes overhead, about to land, and then a few seconds later creates another event as it applies reverse thrust braking to come to a stop on the runway.

Table C-10. Site D Aircraft Noise Events

Aircraft Category	Operation	Count of Events	Max SEL	Min SEL	Median SEL
MD88	Arrival	28	103.8	77.1	98.5
	Departure	37	105.7	86.3	100.0
Other Large Jet	Arrival	52	106.3	75.9	96.0
	Departure	45	99.4	86.0	90.1
Regional Jet	Arrival	92	96.8	76.9	92.7
	Departure	178	92.7	78.7	85.9
Honda Jet	Arrival	27	96.3	80.0	83.5
	Departure	27	88.7	79.4	83.0
Other Small Jet	Arrival	48	100.4	75.0	89.1
	Departure	72	92.7	76.4	84.2
	Other	1	85.2	85.2	85.2
Non-jet	Arrival	55	100.1	75.5	85.9
	Departure	71	93.3	75.0	81.1
	Other	22	100.7	76.1	89.7
Total	Arrival	302	106.3	75.0	92.0
	Departure	430	105.7	75.0	85.7
	Other	23	100.7	76.1	89.5
Total		**755**			

Note: Operations that are counted as “Other” are classified by the NOIARS as overflights or circuits.

Source: GSO NOIARS November 11 - 17, 2019

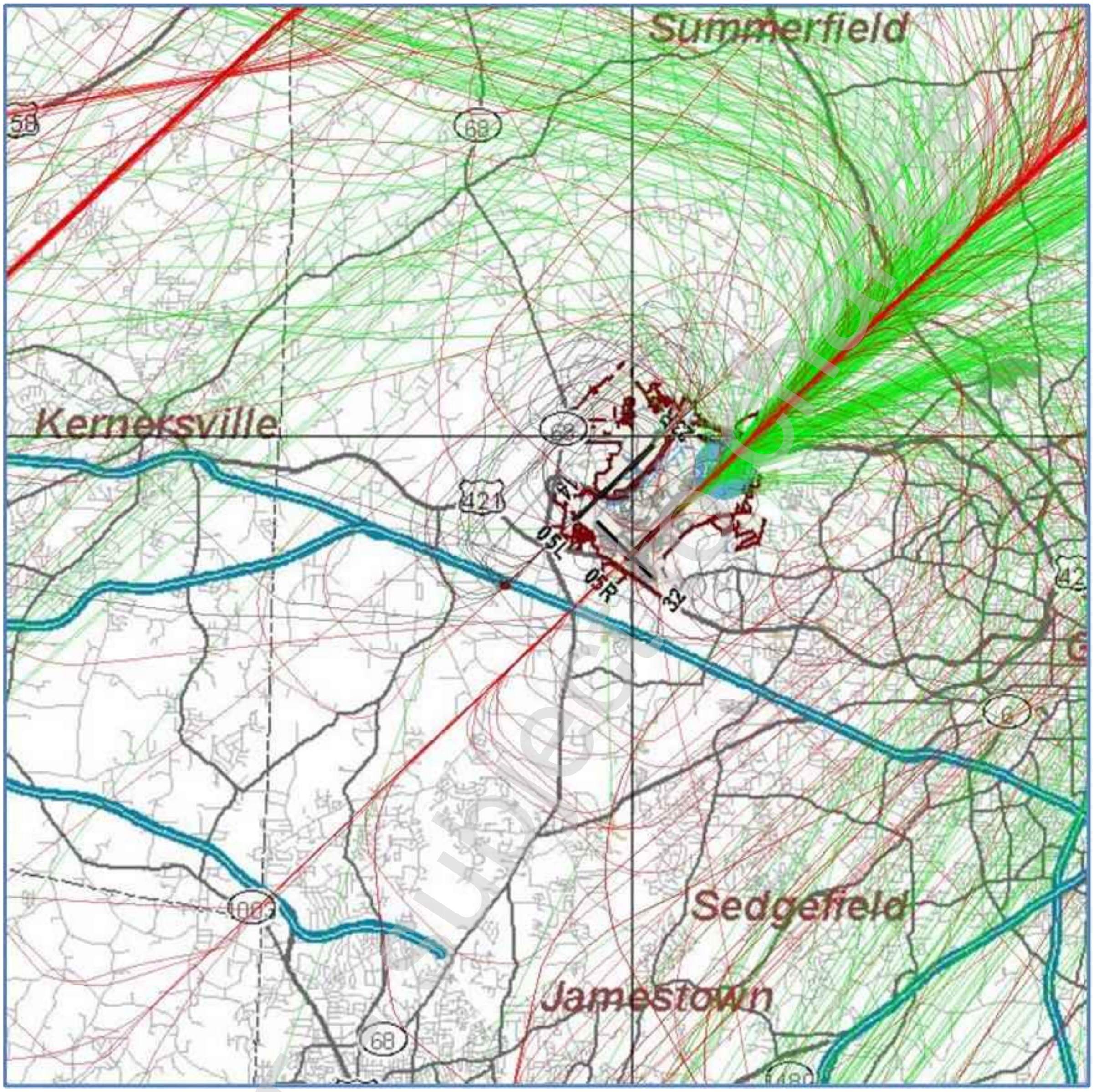


Figure C-72. Site D Aircraft Noise Events
Source: GSO NOIARS November 11 - 17, 2019

C.2 Noise Monitor Logs, November 11 – 17, 2019

Logs were taken of each site when measurement staff were present. The logs include current conditions, identification of aircraft overflights and other noise sources. The logs are provided on the next 19 pages.

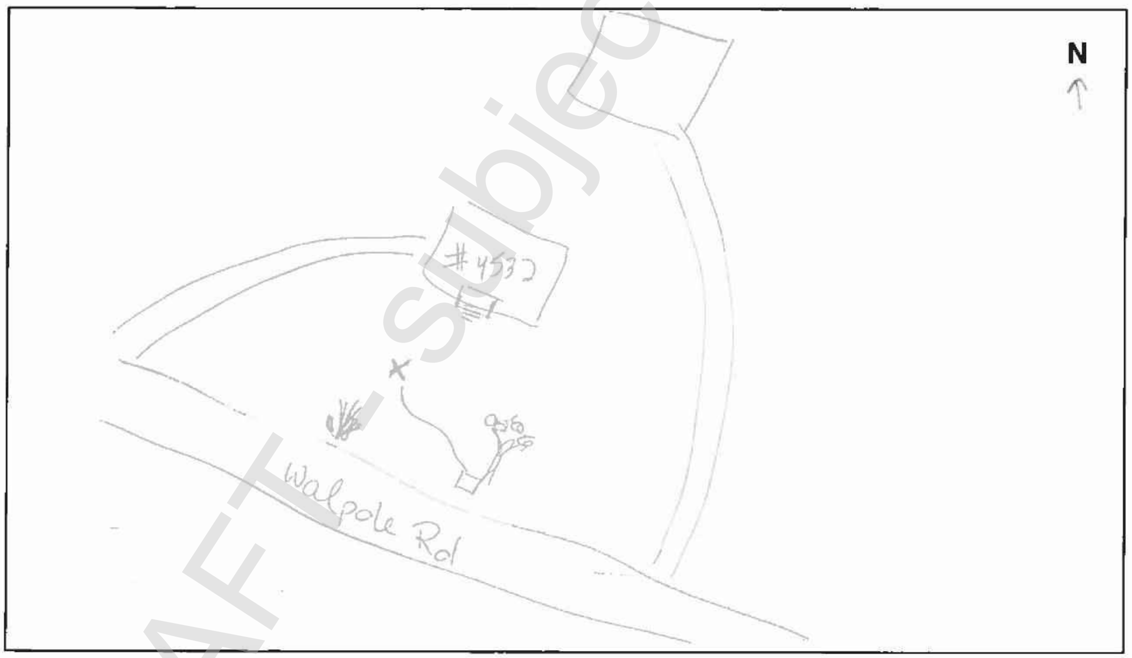
HARRIS MILLER MILLER & HANSON INC.

Long Term Noise Monitoring Site Log

Project: GSO Part 150 Update
Proj. #: 310081
Personnel: KMSL/DMS

Site #: 01
Address: 4532 Walpole Rd, High Point
Owner/Description: Gulnar Begum 336-833-0748
Noise Sources: Approaches to 5R (close to centerline)
distant vehicle traffic, dog across street, birds, hammering at house in back
Noise Monitor: BK2 S/N:
Microphone: S/N:
Calibrator: calib in kit bad: used BK-1 S/N:
Start Date: 11/11/19 End Date:
Start Time: 10:00am End Time:
Metrics Stored: Sync w/ Hrs?
Exceedance Threshold: Duration:
Calibration: PRE: POST: Coordinates:

Site Sketch:



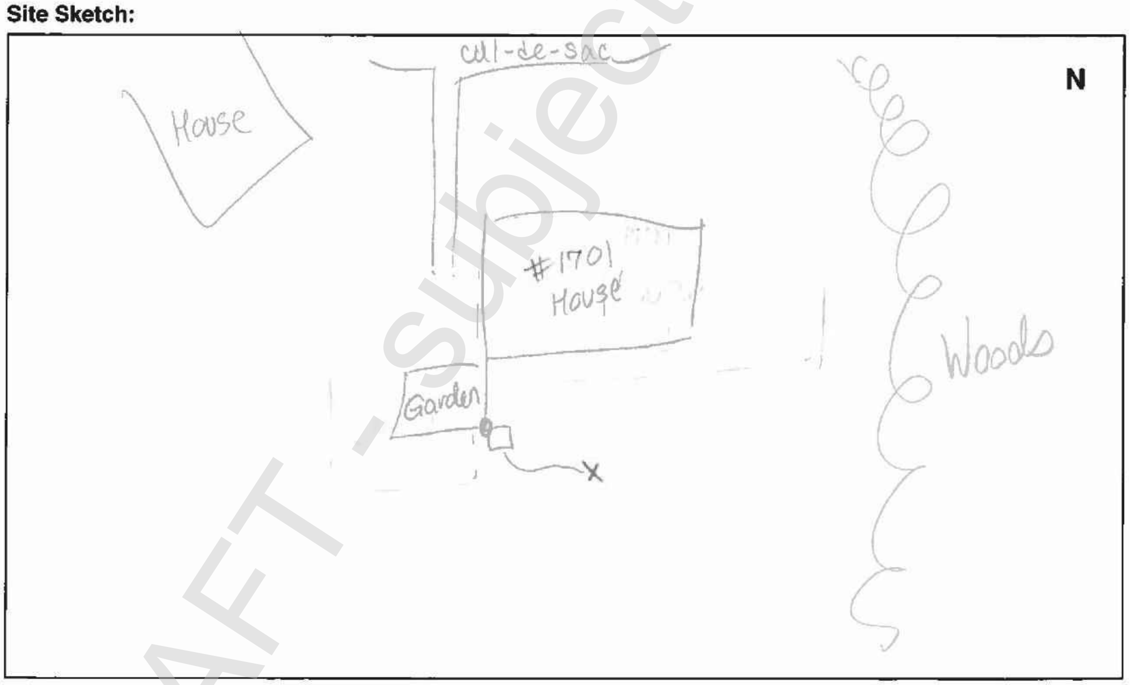
Avg. Temperature: 59° °F Weather Conditions: 2 mph wind 45° dewpoint

HARRIS MILLER MILLER & HANSON INC.

Project: GSO Part150 Update
Proj. #: 310081
Personnel: DMS/KMSL

Long Term Noise Monitoring Site Log

Site #: 02
Address: 1701 River Knoll Ct, Greensboro
Owner/Description: Kevin Dockery
Noise Sources: 23L departures, distant highway noise (Rt.68)
gardening activity
Noise Monitor: BK-5 S/N:
Microphone: S/N:
Calibrator: S/N:
Start Date: 11/11/2019 End Date:
Start Time: 11:00 End Time:
Metrics Stored: Sync w/ Hrs?
Exceedance Threshold: Duration:
Calibration: PRE: POST: Coordinates:
Site Sketch:



Avg. Temperature: 64 °F Weather Conditions: 1 mph, 44° dewpoint

HARRIS MILLER MILLER & HANSON INC.

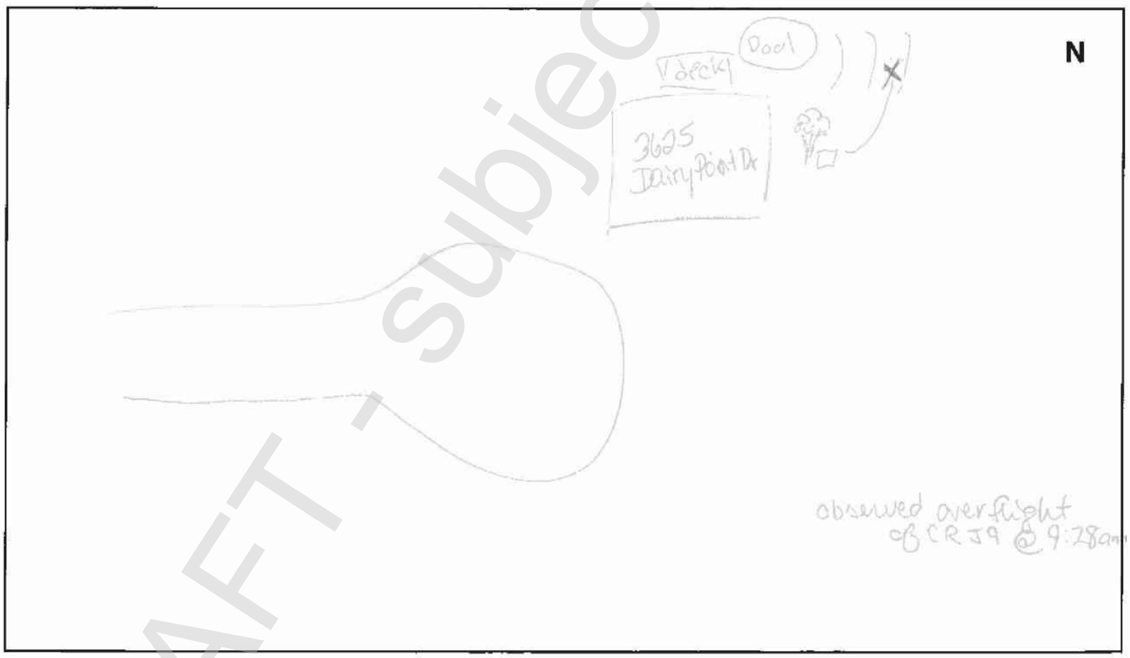
Project: CSO P150
Proj. #: 310081.003
Personnel: KMSL + DMS

Long Term Noise Monitoring Site Log

Site #: 03
Address: 3625 Dairy Point Dr, High Point NC
Owner/Description: Renee Greene 336-978-4117
Noise Sources: Departures from 23R (or 23L that turn)
Arrivals to 05L, Construction, [illegible].

Noise Monitor: BK-4 S/N:
Microphone: S/N:
Calibrator: S/N:
Start Date: 11/11/19 End Date:
Start Time: 9:20 End Time:
Metrics Stored: Sync w/ Hrs?
Exceedance Threshold: Duration:
Calibration: PRE: POST: Coordinates:

Site Sketch:



Avg. Temperature: ~55° °F at setup time Weather Conditions: Calm wind dewpoint 43°F

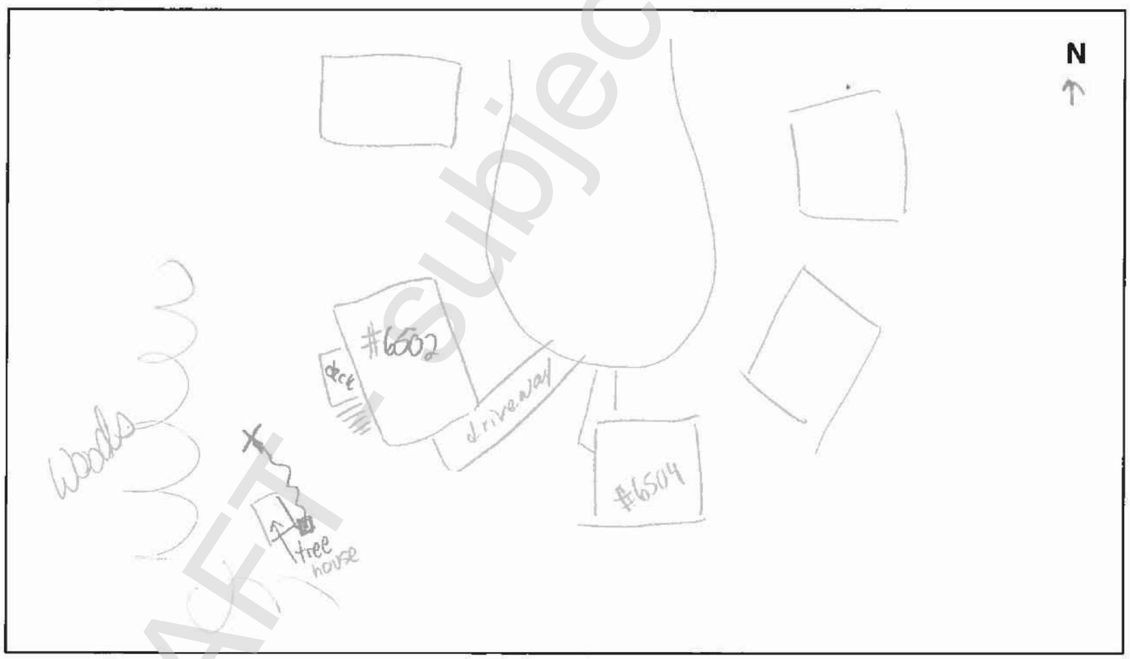
HARRIS MILLER MILLER & HANSON INC.

Project: GSO Part 150 Update
Proj. #: 310081
Personnel: DMS, KMSL

Long Term Noise Monitoring Site Log

Site #: 04
Address: 6502 Lytham Ct., Greensboro
Owner/Description: Sharon Lambros 336-971-8321
Noise Sources: power tools (house next door), 3 dogs, Rwy 23R approaches/05L deps
start of t.roll 23L/R deps, distant highway
Noise Monitor: BK-6 S/N:
Microphone: S/N:
Calibrator: S/N:
Start Date: 11/11/2019 End Date:
Start Time: 1:15pm End Time:
Metrics Stored: Sync w/ Hrs?
Exceedance Threshold: Duration:
Calibration: PRE: POST: Coordinates:

Site Sketch:



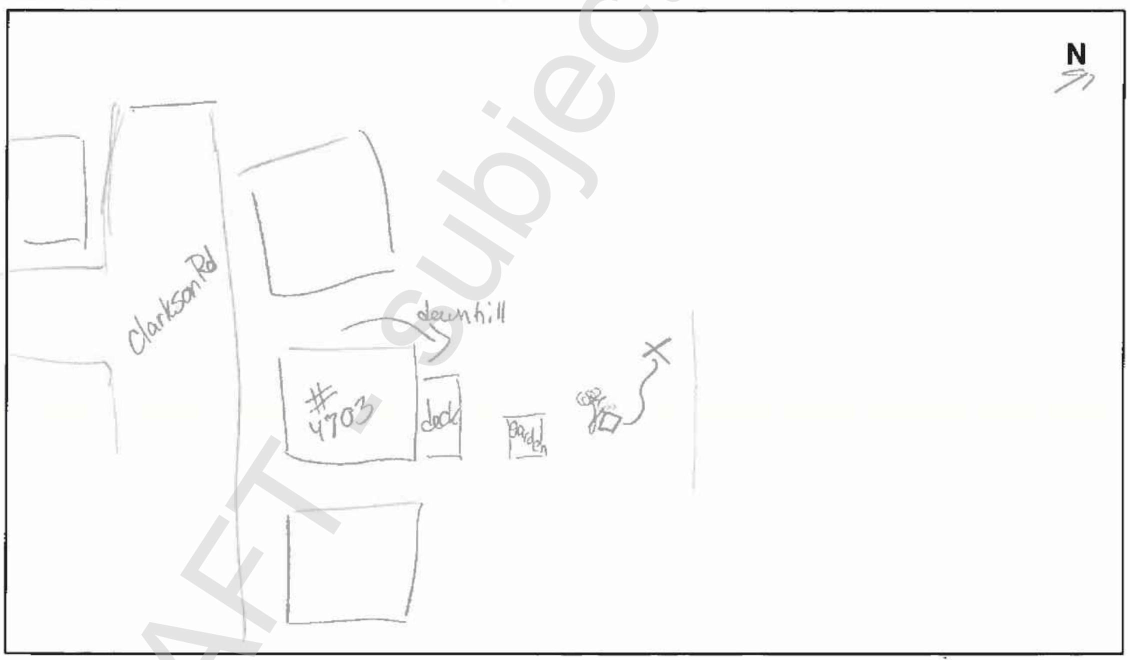
Avg. Temperature: 70 °F Weather Conditions: 4mph winds, 42° dewpoint

HARRIS MILLER MILLER & HANSON INC.

Project: GSO Part150 Update
Proj. #: 310081
Personnel: DMS, KMSL

Long Term Noise Monitoring Site Log

Site #: 05
Address: 4703 Clarkson Rd, Greensboro
Owner/Description: Bessie Macaulay 336-944-3431
Noise Sources: Rwy 23L arrivals + reverse thrust / 05R departures
probably 23L dep start of t-roll, dog on deck
Noise Monitor: BK-1 S/N:
Microphone: S/N:
Calibrator: S/N:
Start Date: 11/11/2019 End Date:
Start Time: 11:40 am End Time:
Metrics Stored: Sync w/ Hrs?
Exceedance Threshold: Duration:
Calibration: PRE: POST: Coordinates:
Site Sketch:



Avg. Temperature: 70 °F Weather Conditions: dewpoint 47°, wind

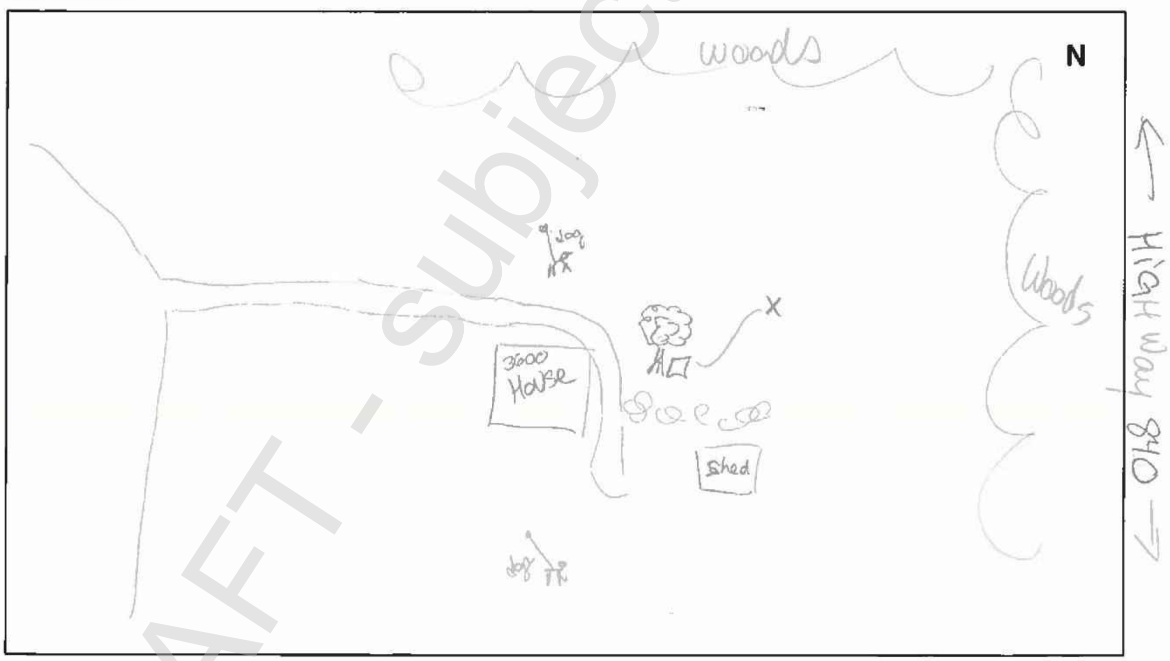
HARRIS MILLER MILLER & HANSON INC.

Project: GSG Part 150 Update
Proj. #: 310018
Personnel: KMSL, DMS

Long Term Noise Monitoring Site Log

Site #: 06
Address: 3600 Lewiston Rd, Greensboro
Owner/Description: Melissa Jessup
Noise Sources: approaches to 23L, Highway Noise, potential 05R departures
dogs in yard (2 or 3)
Noise Monitor: BK-3 S/N: ______
Microphone: ______ S/N: ______
Calibrator: ______ S/N: ______
Start Date: 11/11/2019 End Date: ______
Start Time: 12:55pm End Time: ______
Metrics Stored: ______ Sync w/ Hrs? ______
Exceedance Threshold: ______ Duration: ______
Calibration: PRE: ______ POST: ______ Coordinates: ______

Site Sketch:



Avg. Temperature: 72 °F Weather Conditions: 46° dewpoint, winds 2mph

HARRIS MILLER MILLER & HANSON INC.

Project: GSO P150
Proj. #: 310081

MEASUREMENT SITE EVENT LOG

Date: 11-16-19 Page: 1	Personnel: DMS
Site: 01 Waldo Road	Monitor: BK-2
Weather: T-47°F Td=37°F W 20G32	

Event	Description / Comments	Event Time (HH:MM:SS)		
		Start	POCA	Stop
1	Occassional Dogs barking	11:00:00		—
2	Strong Winds	11:00:00		—
3	Distant leaf blower	11:21:00		11:23:00
4	GSO Arrival; small biz jet	11:26:05		11:26:45
5	Car drive by	11:31:30		11:31:35
6	GSO Arrival; small biz jet	11:38:30		11:40:05
7	GSO Arrival: E135	11:43:25		11:43:50
8	GSO Arrival; A319	11:45:30		11:46:00
9	GSO Arrival: small biz jet	11:47:40		11:48:10

Weather: ______________________

Sketch on Back →

HARRIS MILLER MILLER & HANSON INC.

Project: GSOP150
Proj. #: 310081

MEASUREMENT SITE EVENT LOG

Date: 11-13-19	Page: 1	Personnel: DMS	
Site: 01 Walpole Rd		Monitor: BK-2	
Weather: 39°F Td=11°F W 2mph			

Event	Description / Comments	Event Time (HH:MM:SS) Start	POCA	Stop
1	Car door shut	3:18:00		3:18:00
2	Continuous birds	3:15:00		—
3	Distant train horn	3:23:00		3:23:05
4	GSO Overflight: SEP	3:23:50		3:24:10
5	Car engine revving	3:29:40		3:30:05
6	Car engine start	3:31:25		3:31:35
7	Car engine revving	3:31:30		3:31:40
8	Dogs barking	3:32:20		3:33:30
9	Truck drive by	3:33:00		3:33:05
10	Occasional distant loudspeaker	3:30:00		—
11	Truck drive by	3:36:10		3:36:15
12	GSO Arrival: E145	3:39:50		3:40:15
13	Dogs barking	3:42:45		3:43:00
14	Truck drive by	3:43:15		3:43:20
15	GSO arrival: MD88	3:51:10		3:51:50

Weather: ______________________

Sketch on Back →

HARRIS MILLER MILLER & HANSON INC.

Project: ____________

Proj. #: ____________

MEASUREMENT SITE EVENT LOG

Date: 11-14-19	Page: 1	Personnel: DMS	
Site: 01 Walpole Road		Monitor: BK-2	
Weather: 40°F, Td=20°F, W calm			

Event	Description / Comments	Event Time (HH:MM:SS) Start	POCA	Stop
1	Dogs barking	3:10:00		3:12:00
2	Dogs barking	3:15:35		3:17:00
3	GSO Overflight: SEP	3:24:05		3:24:50
4	GSO Overflight jet. Not direct	3:32:35		3:33:10
5	GSO Overflight jet. Not direct	3:36:50		3:36:15
6	GSO Overflight jet. Not direct	3:43:15		3:43:35
7	Amazon van Backup beeping	3:53:20		3:53:40

Weather: ____________ Sketch on Back →

HARRIS MILLER MILLER & HANSON INC.

Project: GSO P150
Proj. #: 312081

MEASUREMENT SITE EVENT LOG

Date: 11-16-19 Page: 1	Personnel: DMS
Site: 02 River Knoll Ct.	Monitor: BK-5
Weather: T= 47°F, Td= 27°F, W20G32	

Event	Description / Comments	Event Time (HH:MM:SS)		
		Start	POCA	Stop
1	Strong Winds	12:00:00		—

Weather: ______________________

Sketch on Back →

HARRIS MILLER MILLER & HANSON INC.

Project: ______________

Proj. #: ______________

MEASUREMENT SITE EVENT LOG

Date: 11-14-19 Page: 1	Personnel: DMS
Site: 02 River Knoll Court	Monitor: BK-5
Weather: 39°F, Td=19°F, W calm	

Event	Description / Comments	Event Time (HH:MM:SS) Start	POCA	Stop
1	Occasional birds	2:00:00		—
2	Continuous [illegible]	2:00:00		—
3	Occasional distant construction	2:25:00		—
4	GSO [illegible] : MD88	2:32:15		2:33:05
5	GSO [illegible] : [illegible]	2:33:50		2:34:15
6	GSO Departure : 319	2:40:35		2:41:00
7	GSO Departure : E145	2:54:45		

Weather: ______________________________

Sketch on Back →

HARRIS MILLER MILLER & HANSON INC.

Project: 310081GSOP150
Proj. #:

MEASUREMENT SITE EVENT LOG

Date: 11-16-19 Page: 1	Personnel: DMS
Site: 03 Dairy Point Dr.	Monitor: BK4
Weather: 43°F, Td=27°F, W 20G32	

Event	Description / Comments	Event Time (HH:MM:SS) Start	POCA	Stop
1	Continuous distant construction	10:00:00		—
2	Strong winds	10:00:00		—
3	GSO Overflight: MEP	10:36:15		10:36:50

Weather: ______

Sketch on Back →

HARRIS MILLER MILLER & HANSON INC.

Project: ____________
Proj. #: ____________

MEASUREMENT SITE EVENT LOG

Date: 11-14-19 Page: 1	Personnel: DMS
Site: 03 Dairy Point Drive	Monitor: BK-4
Weather: 29°F, Td=19°F, W Calm	

Event	Description / Comments	Event Time (HH:MM:SS)		
		Start	POCA	Stop
1	GSO Departure: A319	1:16:55		1:17:35
2	Continuous distant construction	1:00:00		—
3	GSO ground noise → not direct overflight	1:27:05		1:28:10
4	GSO Overflight: SEP	1:28:55		1:29:25
5	GSO Overflight: SEP	1:39:55		1:40:15
6	GSO ground noise → not overflight	1:41:20		1:41:45

Weather: ____________

Sketch on Back →

HARRIS MILLER MILLER & HANSON INC.

Project: GSO P150
Proj. #: 310081

MEASUREMENT SITE EVENT LOG

Date: 11-13-19 **Page:** 1	**Personnel:** DMS
Site: 04 Lytham CT	**Monitor:** BK-6
Weather: 36°F, Td=11°F, W2G7	

Event	Description / Comments	Event Time (HH:MM:SS) Start	POCA	Stop
1	Continuous → dogs barking distant	1:15:00		—
2	Continuous → distant lawnmower	1:15:00		1:33:25
3	Continuous → birds chirping	1:15:00		—
4	GSO Departure: E135 distant	1:17:30		1:18:00
5	Car leaving house	1:20:10		1:20:20
6	Occasional local vehicle traffic	1:15:00		—
7	Continuous distant leaf blower	1:34:00		—
8	Distant lawnmower start again	1:35:00		1:35:45
9	GSO Overflight: small [illegible]	1:37:40		1:38:10
10	GSO Departure: CL30	1:47:20		1:47:55

Weather: ____________________

Sketch on Back →

HARRIS MILLER MILLER & HANSON INC.

Project: GSO Part 150 Update
Proj. #: 310081

MEASUREMENT SITE EVENT LOG

Date: 11/16/2019 **Page:** 2	**Personnel:** KMSL
Site: #04, 6502 Lytham Ct.	**Monitor:** BK-6
Weather: temp 54°, dewpoint 30°	

Event	Description / Comments	Event Time (HH:MM:SS) Start	POCA	Stop
		12:03		
1	Fed Ex truck, delivery, left engine running	12:04		12:06:02
2	propellor aircraft overflight	12:13:40		12:14:30
3	departure from 5R maybe?	12:16:11		12:17:05

Weather: __________ Sketch on Back →

HARRIS MILLER MILLER & HANSON INC.

Project: GSO P150
Proj. #: 310081

MEASUREMENT SITE EVENT LOG

Date: 11-13-19	Page: 1	Personnel: DMS	
Site: 05 Clarkson Rd.		Monitor:	
Weather: 36°F, Td 11°F, W calm			

Event	Description / Comments	Event Time (HH:MM:SS)		
		Start	POCA	Stop
1	GSO Overflight: SEP	2:04:00		2:05:30
2	GSO Overflight: MIL HELO	2:08:10		2:09:10
3	Truck startup	2:14:45		2:14:50
4	GSO Departure: MD88	2:19:30		2:20:05
5	GSO Departure: Small biz jet	2:21:25		
6	Distant dogs barking	2:28:00		2:29:00
7	GSO Overflight: SEP	2:29:30		2:30:15
8	GSO Departure: CRJ700	2:31:45		2:32:20
9	GSO Departure: CRJ200	2:34:00		2:34:30
10	GSO Departure: Small biz jet	2:44:00		2:44:30
11	GSO Overflight: MEP	2:53:05		2:53:40
12	GSO Departure: CRJ	2:54:25		2:54:50

Weather: ______

Sketch on Back →

HARRIS MILLER MILLER & HANSON INC.

Project: GSO Part 150 Update
Proj. #: 310081

MEASUREMENT SITE EVENT LOG

Date: Nov. 16, 2019 Page: 2	Personnel: KMSL
Site: 05 (Clarkson Rd)	Monitor: BK-1
Weather: temp 49°, dewpoint 29.3°, gusty winds	

Event	Description / Comments	Event Time (HH:MM:SS) Start	POCA	Stop
		10:10 am		
1	CRJ2 (AWI 3938 to IAD)	10:24:10		10:24:42
2	small Jet	10:26:20		10:27:05
3	CRJ7 (GJS 3397 to STL)	10:30:01		10:30:55
4	CRJ2 (JIA 5242 to DCA)	10:33:21		10:34:01
5	E145 (PDT 4929 to PHL)	10:50:50		10:51:16
6	MD88 (DAL 514 to ATL)	10:55:24		10:56:18
7	Small Jet	10:56:50		10:57:07
8	Small Jet (CL30 (XOJ 548) to MDW)	10:58:07		10:58:50

Weather: ______

Sketch on Back →

HARRIS MILLER MILLER & HANSON INC.

Project: GSO Part 150 Update
Proj. #: 310081

MEASUREMENT SITE EVENT LOG

Date: 11/14/2019 **Page:** 1	**Personnel:** KMSL
Site: #6, 3600 Lewiston Rd	**Monitor:** BK-3
Weather: overcast, 38°F	

Begin observations 1:00pm / @ intersection of Lewiston + Oneida to avoid dogs in yard; end at 1:50pm

Event	Description / Comments	Event Time (HH:MM:SS) Start	POCA	Stop
1	MD88 (DAL 1749) Arr 23L	1:13		
2	" reverse thrust audible	1:14		
3	distant train / horn intermittently audible	1:21		1:30
4	CRJ2 (AWI 3838) Arr 23L	1:33		
5	small jet Arr 23L	1:36		
6	A319 (NKS 1152 Spirit Air from MCO) Arr 23L	1:45		

Weather: calm winds

Sketch on Back →

HARRIS MILLER MILLER & HANSON INC.

Project: GSO Part 150 Update
Proj. #: 310081

MEASUREMENT SITE EVENT LOG

Date: 11/16/2019 **Page:** 2	**Personnel:** KmSL
Site: #6, 3600 Lewiston Rd	**Monitor:** Bk-3
Weather: temperature 53°, dewpoint 32°	Observations from same location as noted on p.1

Event	Description / Comments	Event Time (HH:MM:SS) Start	POCA	Stop
	main noise source is local roads traffic	11:05am		
1	small jet (barely audible over local road traffic)	11:16:20		11:16:25
2	E145 Dep 05R (ASQ4043 to EWR)	11:18:09		11:19:02
3	small jet (barely audible)	11:22:40		11:22:50
4	E135 Dep 05R (ENY3805 to CLT)	11:24:52		11:25:20
5	HDJT (HON31, local)	11:26:40		11:27:25
6	small jet	11:29:10		11:29:35
7	small jet	11:35:29		11:35:41
8	small jet	11:41:27		11:41:46
9	small jet	11:48:12		11:48:20
	Scheduled:			
11:01	E135 to CLT ✓			
11:05	E145 to EWR ✓			
11:25	HDJT to GSO (local) ✓			
11:30	HDJT to CBF			

Weather: ______

Sketch on Back →

Appendix D Documentation of the Noise Modeling Process

Section D.1 presents the documentation of the Aviation Activity Forecast prepared for this Part 150 Update. Section D.2 is a copy of the FAA forecast approval letter. Section D.3 presents the detailed flight track information included in the noise model inputs.

D.1 Part 150 Forecast

The next 78 pages contain a copy of the forecast document that was submitted to FAA in February 2020.

Piedmont Triad International Airport FAR Part 150 Update

Aviation Activity Forecast

submitted February, 2020

Prepared by:

CHA Consulting, Inc

Chantilly, VA

In association with:

Harris Miller Miller & Hanson Inc

Burlington, MA

Prepared for:

Piedmont Triad Airport Authority

Greensboro, NC

PTI
PIEDMONT TRIAD AIRPORT AUTHORITY

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 FORECASTS OF AVIATION ACTIVITY

1.1 INTRODUCTION

This report projects aviation demand for Piedmont Triad International Airport (GSO or "The Airport") and will serve as an addition to the Part 150 Noise Exposure Map (NEM) Update, as recommended by the Piedmont Triad Airport Authority (PTAA or "The Airport Authority"). The Authority's initial Part 150 Study was approved by the FAA in 2008. Existing conditions, together with the forecasts herein, are used to define the current and future levels of noise exposure around the Airport. The forecasts presented represent projected activity levels over a five-year planning horizon (through 2025, by calendar year), consistent with Title 14 Code of Federal Regulations (CFR) Part 150, *Airport Noise Compatibility Planning*[1].

The projected activity levels are derived from methodologies in accordance with the requirements provided in Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*. To develop these forecasts, an understanding of current and historical Airport operations, industry trends, and economic conditions within GSO's market is necessary. These variables must be detailed and factored into individual forecast scenarios that will comprise the commercial passenger and operations forecasts. It is important to note that, unlike Airport Master Plan Studies (which primarily are driven by forecasted enplanements), Part 150 Studies are heavily driven by forecasted operations.

The assumptions, methodologies, and data used to create the various projections are presented and analyzed in the following sections. The specific activity elements for which forecasts were prepared include:

- Commercial Aviation
  - Passenger Enplanements
  - Operations and Fleet Mix
- Air Taxi
  - Operations and Fleet Mix
- Air Cargo
  - Operations and Fleet Mix
- General Aviation
  - Based Aircraft (By Type)
  - Operations and Fleet Mix
- Military
  - Operations and Fleet Mix

1.2 FORECAST RATIONALE

A critical component of a Part 150 Study and the development of a Part 150 NEM is the preparation of detailed operations forecasts required for noise modeling purposes. Traditional forecasting efforts, as previously stated, are based on requirements set forth in AC 150/5070-6B, *Airport Master Plans*. The process of developing the recommended activity forecasts consists of

[1] Per Title 14 CFR Part 150.21(d), forecasts are developed "for a period of at least five years after the date of submission."

identifying aviation activity measures, reviewing previous Airport forecasts, gathering data, selecting forecast methods, applying forecast methods and comparing forecast results with the FAA's Terminal Area Forecast (TAF). The general requirement for FAA approval of forecasts is that the forecasts are supported by an acceptable forecasting analysis and are consistent with the TAF. To meet FAA criteria, the enplanements, activity, and based aircraft forecasts for small-hub airports, such as GSO, must differ from the TAF by less than 10 percent in the 5-year forecast (and by 15 percent in 10-year period, if applicable).

1.2.1 Factors Affecting Forecasts

Several factors should be considered when preparing activity forecasts or when updating existing forecasts. When developing the forecasts herein, socioeconomic data (demographics, disposable income, etc.) and geographic attributes (catchment and core areas) were considered to evaluate their impacts on passenger and operational activity at the Airport. Nearby airports, as well as routes and fares, were also evaluated. When preparing to make travel reservations, potential passengers typically compare the routes offered and associated fares at airports within their region. When a nearby airport offers similar routes at a lower cost, passenger leakage can occur, affecting the airport's level of enplanements and commercial operations.

Commercial Activity Region and Destinations

As of May 2019, according to its published schedule, GSO had service to 16 non-stop destinations, shown in **Table 1-1** and **Figure 1-1**, via five air carriers: Allegiant Air, American Airlines, Delta Air Lines, Spirit Airlines, and United Airlines. Spirit Airlines began operating at the Airport in September 2018.

Table 1-1 – GSO Non-Stop Routes[2]

Airline	Destination
Allegiant	PIE, SFB
American	CLT, DCA, DFW, LGA, MIA, ORD, PHL
Delta	ATL, DTW, LGA
Spirit	FLL, MCO, TPA
United	EWR, IAD, ORD

Source: CHA, 2019.

[2] Charlotte Douglas International Airport (CLT), Chicago O'Hare International Airport (ORD), Dallas-Fort Worth International Airport (DFW), Detroit Metropolitan Wayne County Airport (DTW), Fort Lauderdale-Hollywood International Airport (FLL), Hartsfield-Jackson Atlanta International Airport (ATL), LaGuardia Airport (LGA), Miami International Airport (MIA), Newark Liberty International Airport (EWR), Orlando International Airport (MCO), Orlando Sanford International Airport (SFB), Philadelphia International Airport (PHL), Ronald Reagan Washington International Airport (DCA), St. Petersburg-Clearwater International Airport (PIE), Tampa International Airport (TPA), Washington-Dulles International Airport (IAD)

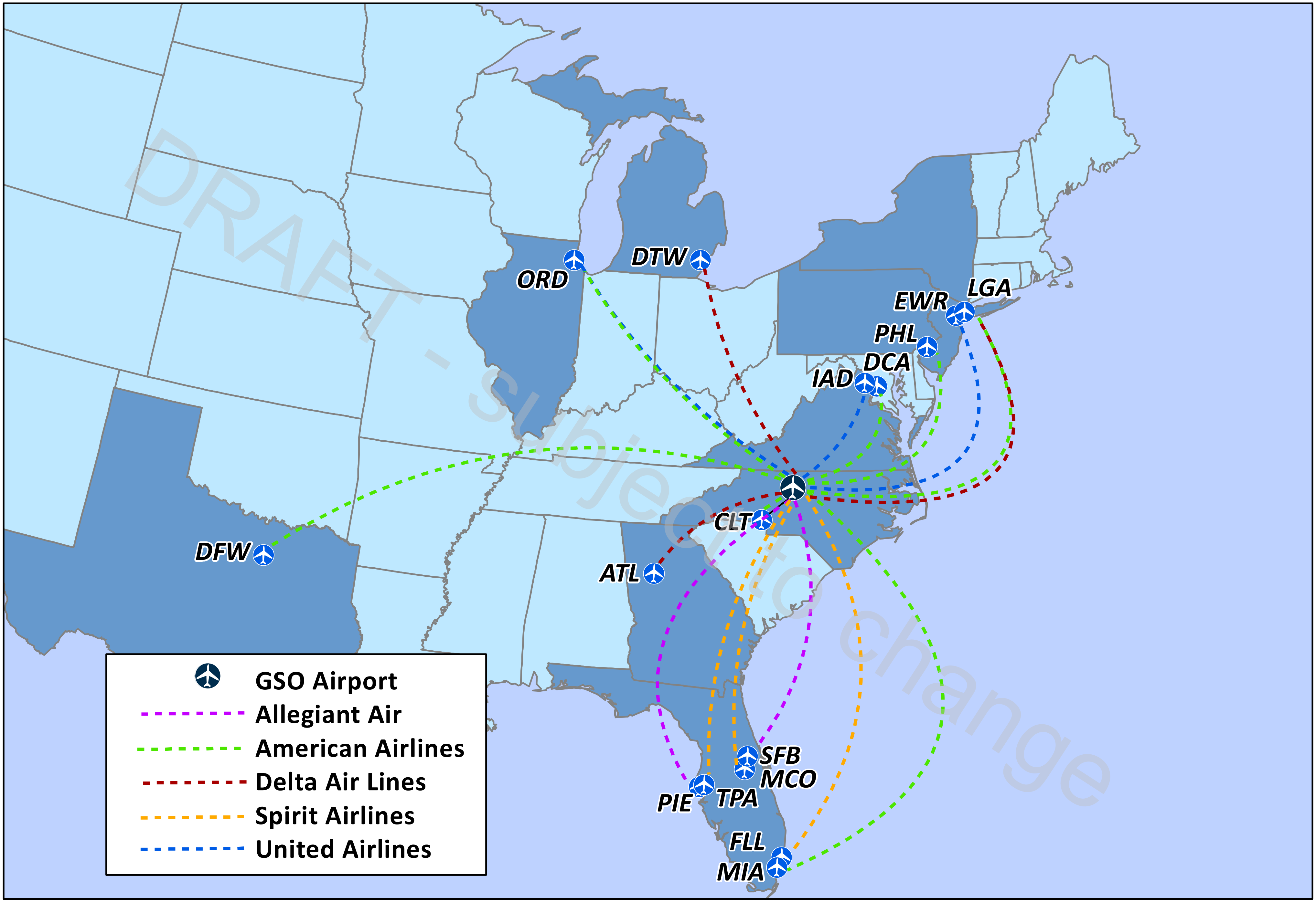


Figure 1-1
GSO Non-Stop Route Map

Nearby Airports

GSO's route availability compared to the distances (by nautical miles and drive-time for passengers), routes, and type of hub of competing airports are shown in **Table 1-2.** The competing airports include Roanoke Regional Airport (ROA), Charlotte Douglas International Airport (CLT), Concord-Padgett Regional Airport (JQF), and Raleigh-Durham International Airport (RDU).

Table 1-2 – Comparison of Competing Airports to GSO

Airports	Airport Information			From GSO		
	Non-Stop Routes	Avg. Daily Commercial Passenger Flights	Hub-Type	Distance (nm)	Direction	Drive-Time (minutes)
GSO	16	65	Small-Hub	-	-	-
ROA	9	40	Non-Hub	73.5	north	114
CLT	175	1,400	Large-Hub	72.5	southwest	95
JQF	6	25	Non-Hub	56.8	southwest	80
RDU	66	400	Medium-Hub	57.6	east-southeast	75

Source: Airport Websites (GSO, ROA, CLT, JQF, RDU), PTAA, CHA, 2019.

GSO Catchment and Core Areas

An airport's catchment area, or market, is defined as the area in which an airport captures the majority of its airport users. To determine the catchment area, an evaluation using socioeconomic factors was conducted to identify which airports the local area population is most likely to use, based on the proximity with respect to other airports in the region, drive-time and demographics. For the purposes of this forecast, the catchment area for GSO primarily includes the following North Carolina counties: Alamance, Caswell, Chatham, Davidson, Davie, Forsyth, Guilford, Randolph, Rockingham, Stokes, and Surry.

Based on its location relative to major airports in North Carolina and drive times associated with the surrounding roadway network, GSO depends on a core region within its catchment area for a large portion of its passenger activity. The core region consists of areas located within a 30-minute drive-time. This region includes Guilford County, as well as portions of Davidson, Forsyth, Randolph, and Rockingham Counties. **Figure 1-2** shows the catchment area and the MSA.

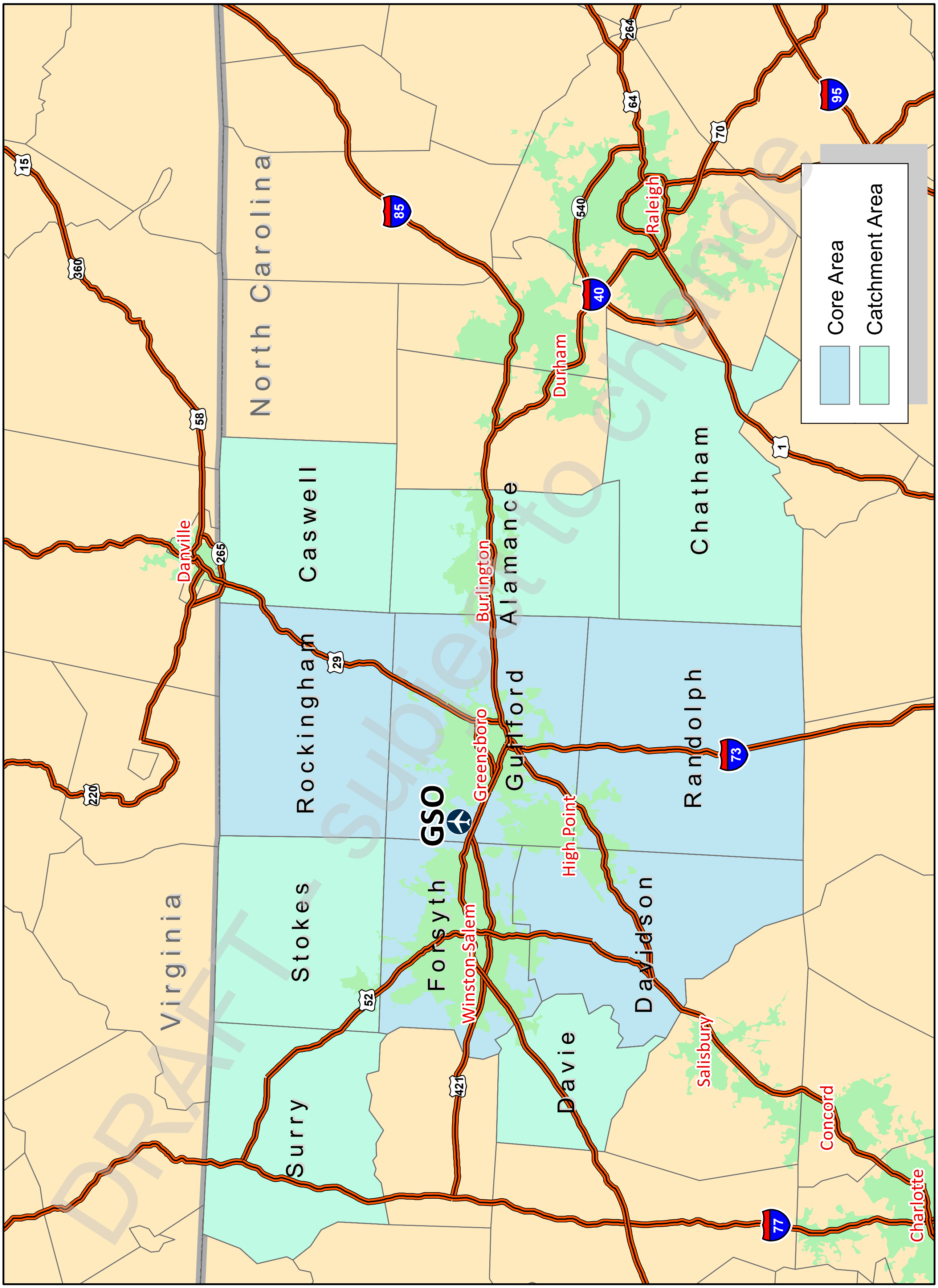


Figure 1-2
GSO Catchment and Core Areas

1.2.2 Forecast Data Sources

Information factored into the forecasting effort include commercial air carrier industry trends, airframe orders and retirement programs, GA operational trends, and anticipated changes in the aircraft fleet mix operating at GSO. The data and assumptions used to define baseline conditions and future activity trends were derived from the following data sources:

- Airport Authority – Airport Authority representatives typically provide the most accurate historical data and future assumptions at the Airport. This includes passenger and operational activity, fleet mix transition, and anticipated service growth.
- Airline Management – Airline representatives provide insight on planned and future airline routes and airframe changes, which are directly factored into the assumptions and methodologies of the demand projections.
- Airport Tenants/Stakeholders/Users – Tenants/Stakeholders/Users include Fixed Base Operator (FBO), Non-Profit Commuter, Corporate Jet Manufacturer, Flight Academy, Cargo Integrator, and Maintenance, Repair & Overhaul (MRO) representatives. GSO currently has two FBOs (Koury Aviation and Signature Flight Support), one non-profit on-demand charter organization (Samaritan's Purse), one corporate jet manufacturer (Honda Jet), one on-Airport flight academy (Triad Aviation Academy), three cargo integrators (FedEx, UPS, and DHL), and two MROs (HAECO and Textron Aviation) that provide services at the Airport. Representatives from these operators provide insight regarding historical and projected operational activity, as well as future fleet mix transitions.
- FAA Terminal TAF[3] – TAF activity estimates are derived by the FAA from national estimates of aviation activity. These estimates are then assigned to individual airports based upon multiple market and forecast factors. The FAA looks at local and national economic conditions, as well as trends within the aviation industry, to develop each forecast.
- FAA Operations Network (OPSNET) – This data source is the official source of National Air Space (NAS) air traffic operations and delay data. This source was used when determining air taxi operations at airports in the vicinity of GSO.
- FAA Aerospace Forecast Fiscal Years 2019-2039 – This forecast provides an overview of aviation industry trends and expected growth for the commercial passenger air carrier activity segments. National growth rates in enplanements and operations, as well as growth and mix for commercial fleets, are provided over a 20-year forecast horizon. For the purposes of this forecast, the FAA Aerospace Forecasts were used as comparisons for the basis of determining the growth of the GSO general aviation and commercial fleet, as well as for air taxi operations. This forecast also provides insight into future air cargo growth trends on a national and international level.

[3] Note, the 'FAA 2019 TAF', which was accessed in January 2020, represents the TAF containing all data from 2019.

- The Boeing Commercial Market Outlook 2018-2037 – This market outlook provides information detailing future fleet mix transitions, such as new aircraft entering the market and future equipment retirements, for commercial and air cargo carriers.
- Airbus Global Market Forecast 2018-2037 & Boeing World Air Cargo Forecast 2018-2037 – These forecasts provide insight into future commercial cargo fleet growth and anticipated fleet mix of both domestic and foreign airlines. These insights were used to assist in developing and confirming the validity of future GSO cargo carrier fleet mix assumptions.
- Woods & Poole Economics, Inc. – Woods & Poole Economics, Inc. is an independent firm that specializes in developing long-term economic and demographic projections. Their database includes every state, Metropolitan Statistical Area (MSA), and county in the United States (U.S.) and contains historical data and projections from 1970 through 2050, utilizing more than 900 economic and demographic variables.
- Bureau of Transportation Statistics (BTS) – Part of the Department of Transportation (DOT), BTS is a well-known source of statistics, including those related to commercial aviation, and is governed primarily by statistical policy directives of the Office of Management and Budget and Title 49 of the United States Code.
- FAA Traffic Flow Management System Counts (TFMSC) – The TFMSC provides information on traffic counts by airport or by city pair for various data groupings (aircraft type, operating hour, etc.). Source data is created when pilots file flight plans and/or when flights are detected by the National Airspace System (NAS), usually via RADAR. Data accessed via TFMSC was used during the development of the detailed operations/derivative forecasts.

1.3 SOCIOECONOMIC FORECASTS

The factors that have the greatest impact on the growth prospects of an airport are the socioeconomic characteristics (i.e., population, income, and employment) present within the Airport's catchment, or market, area. In addition to the common demographic factors, gross regional product (GRP) was also evaluated. GRP represents all final goods and services produced within an area over a specified period of time.

Several factors can affect a local economy, such as industry sectors (which can significantly impact the economy in terms of employment and GRP) and the housing market (which can influence the population). *Comprehensive Plan Conditions and Trends*[4], a study released in March 2018 by the City of Greensboro, discusses current economic conditions, as well as global trends likely to affect Greensboro in the future. According to the Study, Greensboro's economy is adversely affected "by the steep decline in the manufacturing sector, with jobs in this sector

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4 City of Greensboro. (2018, March). *Comprehensive Plan Conditions and Trends*. [PDF file]. Retrieved from https://www.greensboro-nc.gov/home/showdocument?id=37474

decreasing annually." The Study also indicated that median home values in Greensboro vary; however, over fifty percent of householders in the area rent rather than own their homes. The area has seen a sustained lack of investment, as well as lower than average property values.

1.3.1 Population

In 2018, according to Woods and Poole Economics, Inc., the Greensboro-High Point MSA, consisting of Guilford, Randolph, and Rockingham Counties, had a population of approximately 770,000, while the GSO catchment area had a population of approximately 1,750,000. The Average Annual Growth Rate (AAGR) for the GSO catchment area was 0.7 percent, which was equal to the AAGR of both the United States and MSA; however, the GSO catchment area AAGR was below the State of North Carolina AAGR of 1.0 percent, despite having a steady increase in population from 2009 through 2018.

The GSO catchment area is projected to grow throughout the five-year forecast horizon, with an AAGR of 1.0 percent, a quicker annual rate than the United States (0.9 percent) or MSA (0.8 percent); however, the AAGR for the GSO catchment area is lower than the projected AAGR for the State of North Carolina (1.3 percent). See **Table 1-3** and **Figure 1-3.**

The lesser growth rate indicates that the Airport's passenger growth is supported by more than resident travelers, as some passengers that reside in proximity to other nearby airports in the Piedmont Triad and surrounding area also choose to support GSO. Passenger leakage occurs when travelers choose to utilize airports outside their core area when flying. Passenger leakage (as of 2015) relating to GSO's primary catchment area is shown in **Appendix A**.

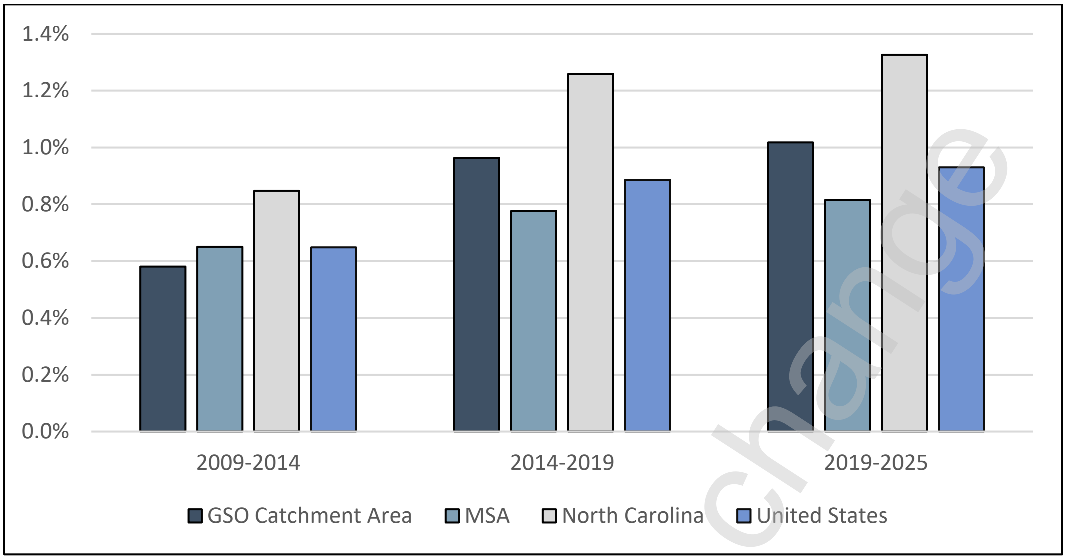
Table 1-3 – Population (Historical and Projected)

Year	GSO Catchment Area (000)	AAGR	MSA (000)	AAGR	State of North Carolina (000)	AAGR	United States (000)	AAGR
2009	1,628.2	-	718.9	-	9,449.6	-	306,771.5	-
2014	1,685.7	0.6%	747.4	0.6%	9,940.4	0.8%	318,906.9	0.6%
2018	1,750.5	0.8%	770.5	0.6%	10,442.4	1.0%	330,206.7	0.7%
AAGR 2009-2018	**0.7%**	**-**	**0.7%**	**-**	**1.0%**	**-**	**0.7%**	**-**
2019	1,768.5	1.0%	776.9	0.8%	10,581.7	1.3%	333,280.0	0.9%
2020	1,786.6	1.0%	783.3	0.8%	10,722.6	1.3%	336,382.5	0.9%
2021	1,804.9	1.0%	789.7	0.8%	10,865.3	1.3%	339,514.8	0.9%
2022	1,823.3	1.0%	796.2	0.8%	11,009.7	1.3%	342,676.7	0.9%
2023	1,841.8	1.0%	802.6	0.8%	11,155.7	1.3%	345,864.6	0.9%
2024	1,860.5	1.0%	809.1	0.8%	11,303.3	1.3%	349,080.8	0.9%
2025	1,879.2	1.0%	815.6	0.8%	11,452.4	1.3%	352,314.6	0.9%
AAGR 2019-2025	**1.0%**	**-**	**0.8%**	**-**	**1.3%**	**-**	**0.9%**	**-**

Source: Woods &Poole Economics, Inc., CHA, 2019.

Note: Woods & Poole Economics, Inc. data from 2016 to 2025 is estimated. More historical data available in **Appendix B**.

Figure 1-3 – Population Growth (AAGR: Historical and Projected)



Source: Woods &Poole Economics, Inc., CHA, 2019.
Note: Woods & Poole Economics, Inc. data from 2016 to 2025 is estimated.

1.3.2 Employment

In 2018, according to Woods and Poole Economics, Inc., the Greensboro-High Point MSA had an employment level of approximately 487,000, while the GSO catchment area had an employment level of approximately 1,023,000. The GSO catchment area had an employment AAGR of 1.0 percent, which was lower than the AAGRs for the Greensboro-High Point MSA, State of North Carolina, and the United States which had growth rates of 1.1 percent, 1.4 percent, and 1.3 percent, respectively.

As mentioned previously, the Piedmont Triad is heavily impacted by the manufacturing sector, with manufacturing jobs making up approximately 10.7 percent of jobs in the GSO catchment area and approximately 12.2 percent of jobs in the Greensboro-High Point MSA over the last 10 years. In comparison, manufacturing comprises about 8.5 percent and 6.9 percent of jobs in North Carolina and the United States, respectively.

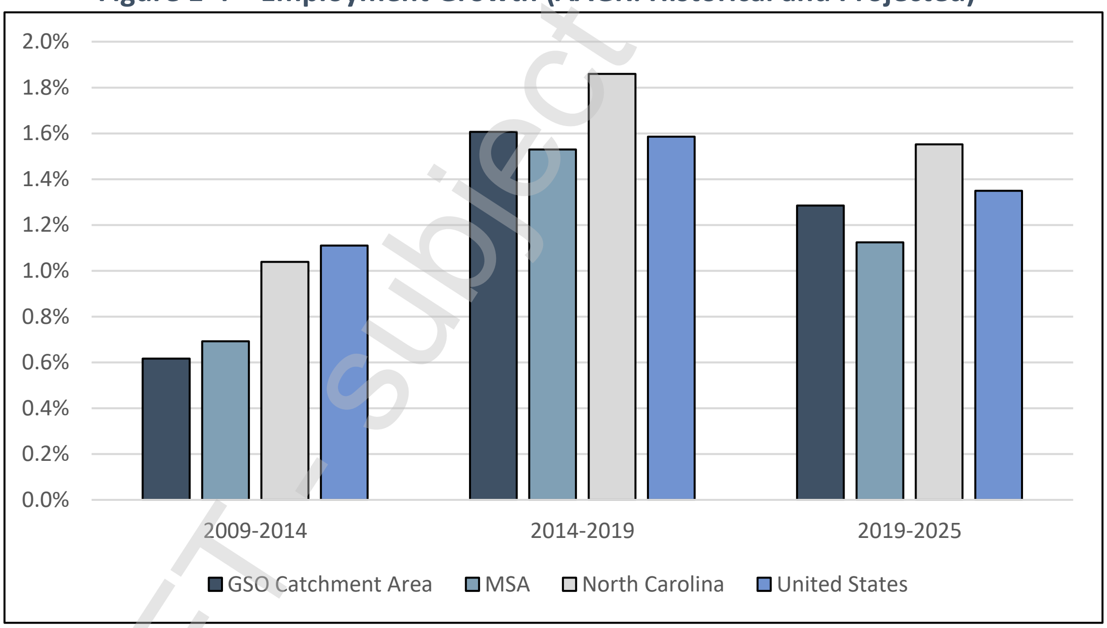
Employment in the GSO catchment area is expected grow at an annual rate of 1.3 percent throughout the forecast horizon, equal to that of the United States and higher than the Greensboro-High Point MSA (1.1 percent); however, the State of North Carolina is expected to have a slightly high AAGR of 1.6 percent over the same period. See **Table 1-4** and **Figure 1-4**.

Table 1-4 – Employment (Historical and Projected)

Year	GSO Catchment Area (000)	AAGR	MSA (000)	AAGR	State of North Carolina (000)	AAGR	United States (000)	AAGR
2009	923.1	-	438.8	-	5,232.5	-	174,233.7	-
2014	957.8	0.6%	457.4	0.7%	5,567.2	1.0%	186,168.1	1.1%
2018	1,023.1	1.3%	487.4	1.3%	6,007.0	1.5%	198,635.3	1.3%
AAGR 2009-2018	**1.0%**	**-**	**1.1%**	**-**	**1.4%**	**-**	**1.3%**	**-**
2019	1,037.2	1.4%	493.4	1.2%	6,104.3	1.6%	201,404.2	1.4%
2020	1,051.1	1.3%	499.3	1.2%	6,201.7	1.6%	204,186.6	1.4%
2021	1,065.0	1.3%	505.1	1.2%	6,299.5	1.6%	206,984.1	1.4%
2022	1,078.8	1.3%	510.8	1.1%	6,398.2	1.6%	209,800.4	1.4%
2023	1,092.6	1.3%	516.5	1.1%	6,497.3	1.5%	212,627.0	1.3%
2024	1,106.3	1.3%	522.1	1.1%	6,596.2	1.5%	215,449.5	1.3%
2025	1,119.8	1.2%	527.7	1.1%	6,695.1	1.5%	218,270.0	1.3%
AAGR 2019-2025	**1.3%**	**-**	**1.1%**	**-**	**1.6%**	**-**	**1.3%**	**-**

Source: Woods &Poole Economics, Inc., CHA, 2019.
Note: Woods & Poole Economics, Inc. data from 2016 to 2025 is estimated.

Figure 1-4 – Employment Growth (AAGR: Historical and Projected)



Source: Woods &Poole Economics, Inc., CHA, 2019.
Note: Woods & Poole Economics, Inc. data from 2016 to 2025 is estimated.

1.3.3 Per Capita Income

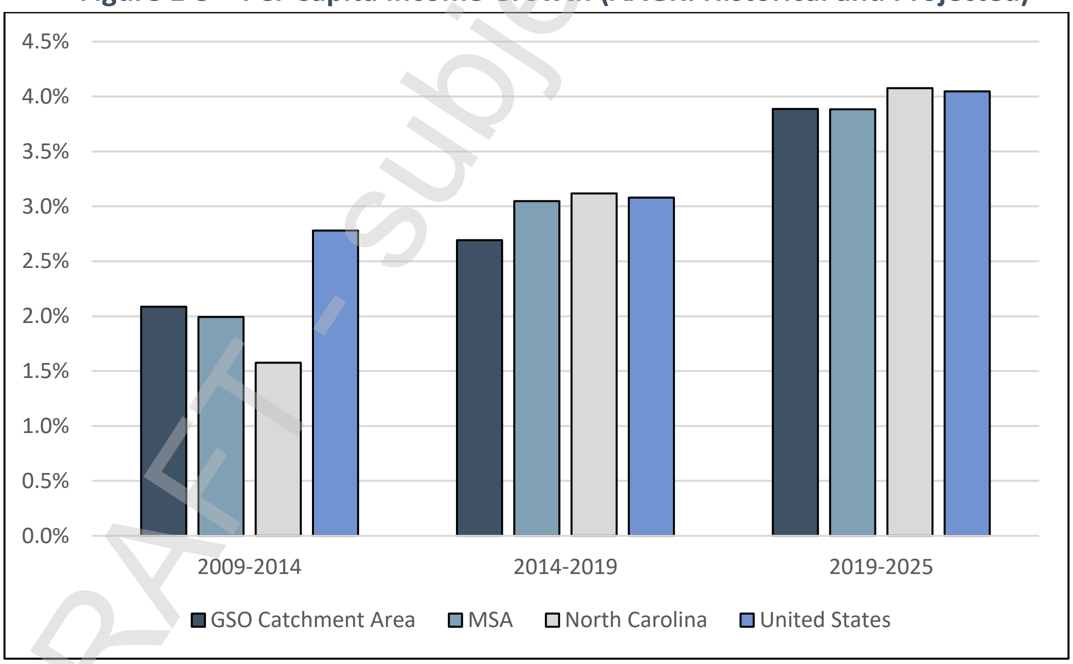
In 2018, according to Woods and Poole Economics, Inc., the Greensboro-High Point MSA had a per capita income of approximately $43,000, while the GSO catchment area had an average per capita income of approximately $41,000. The AAGR of per capita income in the GSO catchment area was slightly higher than the growth rate of the State of North Carolina, with an AAGR of approximately 2.3 percent and 2.2 percent, respectively. The Greensboro-High Point MSA grew by an annual rate of 2.4 percent and the United States grew by 2.9 percent annually. Both the Greensboro-High Point MSA and GSO catchment area are projected grow at an average annual rate of 3.9 percent over the forecast horizon. The State of North Carolina and the United States are expected to grow at a quicker annual rate of 4.1 percent and 4.0 percent, respectively. See **Table 1-5** and **Figure 1-5**.

Table 1-5 – Per Capita Income (Historical and Projected)

Year	GSO Catchment Area ($)	AAGR	MSA ($)	AAGR	State of North Carolina ($)	AAGR	United States ($)	AAGR
2009	32,454	-	33,714	-	35,840	-	39,376	-
2014	36,733	2.1%	37,952	2.0%	39,365	1.6%	46,414	2.8%
2018	40,686	2.0%	42,774	2.4%	44,444	2.5%	52,321	2.4%
AAGR 2009-2018	**2.3%**	**-**	**2.4%**	**-**	**2.2%**	**-**	**2.9%**	**-**
2019	41,952	3.1%	44,096	3.1%	45,895	3.3%	54,012	3.2%
2020	43,366	3.4%	45,573	3.3%	47,517	3.5%	55,902	3.5%
2021	44,914	3.6%	47,195	3.6%	49,298	3.7%	57,982	3.7%
2022	46,634	3.8%	49,000	3.8%	51,276	4.0%	60,290	4.0%
2023	48,508	4.0%	50,976	4.0%	53,436	4.2%	62,813	4.2%
2024	50,532	4.2%	53,107	4.2%	55,774	4.4%	65,549	4.4%
2025	52,739	4.4%	55,425	4.4%	58,324	4.6%	68,528	4.5%
AAGR 2019-2025	**3.9%**	**-**	**3.9%**	**-**	**4.1%**	**-**	**4.0%**	**-**

Source: Woods &Poole Economics, Inc., CHA, 2019.
Note: Woods & Poole Economics, Inc. data from 2016 to 2025 is estimated.

Figure 1-5 – Per Capita Income Growth (AAGR: Historical and Projected)



Source: Woods &Poole Economics, Inc., CHA, 2019.
Note: Woods & Poole Economics, Inc. data from 2016 to 2025 is estimated.

1.3.4 Gross Regional Product

As previously mentioned, GRP represents all final goods and services produced within an area over a specified period of time and is important when evaluating the size of an economy. GRP is considered as a factor affecting aviation activity, as areas with higher economic output (or a growing economy) tend to have a greater need for aviation travel.

In 2018, according to Woods and Poole Economics, Inc., the Greensboro-High Point MSA's output was approximately $38,000,000, while the output of the GSO catchment area was approximately $76,000,000. Between 2009 and 2018 the AAGR of the GRP of the GSO catchment area was 1.8 percent, compared to the MSA and State of North Carolina, which both had an AAGR of 1.9 percent. The United States had a historical AAGR of 2.1 percent over the same time period.

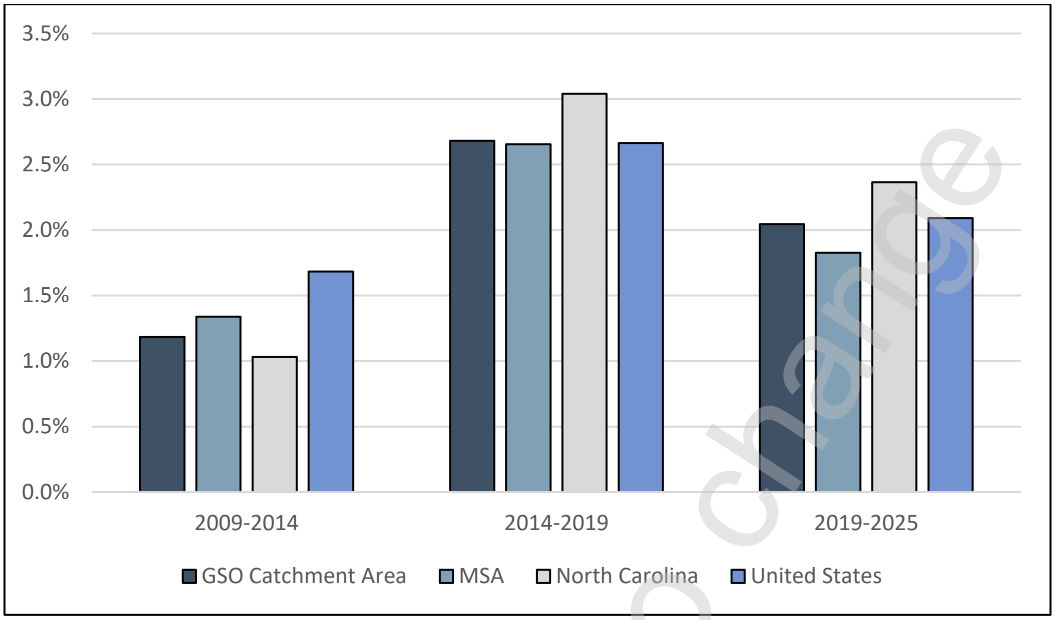
Over the forecast horizon, the GSO catchment area is projected to grow at a slightly slower annual rate than the United States with an AAGR of approximately 2.0 percent compared to the United States' AAGR of approximately 2.1 percent. The Greensboro-High Point MSA is expected to grow by approximately 1.8 percent per year, while the State of North Carolina is expected to grow by an annual rate of 2.4 percent. See **Table 1-6** and **Figure 1-6**.

Table 1-6 – Gross Regional Product (Historical and Projected)

Year	GSO Catchment Area (in millions of $)	AAGR	MSA (in millions of $)	AAGR	State of North Carolina (in millions of $)	AAGR	United States (in millions of $)	AAGR
2009	63,177.9	-	31,275.5	-	407,846.0	-	14,320,115.0	-
2014	67,810.2	1.2%	33,873.5	1.3%	433,780.1	1.0%	15,829,180.0	1.7%
2018	75,775.7	2.2%	37,879.6	2.3%	491,780.7	2.5%	17,673,837.1	2.2%
AAGR 2009-2018	**1.8%**	**-**	**1.9%**	**-**	**1.9%**	**-**	**2.1%**	**-**
2019	77,405.5	2.2%	38,615.8	1.9%	503,845.7	2.5%	18,052,251.8	2.1%
2020	79,037.3	2.1%	39,347.9	1.9%	516,044.5	2.4%	18,436,030.4	2.1%
2021	80,680.5	2.1%	40,081.7	1.9%	528,420.9	2.4%	18,825,583.1	2.1%
2022	82,344.5	2.1%	40,823.3	1.9%	541,014.6	2.4%	19,221,366.9	2.1%
2023	84,029.2	2.1%	41,572.8	1.8%	553,794.1	2.4%	19,622,540.1	2.1%
2024	85,710.2	2.0%	42,313.9	1.8%	566,684.4	2.3%	20,027,670.6	2.1%
2025	87,392.7	2.0%	43,049.4	1.7%	579,703.2	2.3%	20,436,994.2	2.0%
AAGR 2019-2025	**2.0%**	**-**	**1.8%**	**-**	**2.4%**	**-**	**2.1%**	**-**

Source: Woods &Poole Economics, Inc., CHA, 2019.
Note: Woods & Poole Economics, Inc. data from 2016 to 2025 is estimated.

Figure 1-6 – Gross Regional Product Growth (AAGR: Historical and Projected)



Source: Woods &Poole Economics, Inc., CHA, 2019.
Note: Woods & Poole Economics, Inc. data from 2016 to 2025 is estimated.

1.3.5 Summary of Socioeconomic Forecasts

Population, employment, per capita income, GRP, and the local economy can greatly impact the Airport's growth prospects; therefore, evaluating and understanding the socioeconomic and demographic activity within the Airport's catchment area is important.

According to Woods and Poole Economics, Inc., the historical (2009 – 2018) and projected (2019 – 2025) AAGRs by socioeconomic and demographic variable are as follows:

- Population
  - Historical: 0.7%
  - Projected: 1.0%
- Employment
  - Historical: 1.0%
  - Projected: 1.3%
- Per Capita Income
  - Historical: 2.3%
  - Projected: 3.9%
- GRP
  - Historical: 1.8%
  - Projected: 2.0%

As shown, population, employment, per capita income, and GRP are expected to continue growing throughout the forecast period, with AAGRs higher than experienced from 2009 through 2018.

1.4 COMMERCIAL AVIATION

This section provides a brief overview of recent commercial aviation trends at GSO, identifies the methodologies that were evaluated for developing the commercial passenger forecast and makes the final recommendation for commercial passengers and operations through 2025 that will be used in the noise analysis.

> Note: Data for 2018 or earlier represents historical data. The base year for the forecasts herein is 2018, with 2023 representing the 5-year forecasts; however, the forecast period has been extended through 2025. *The definition of base year and existing year within this Chapter are exclusive to the forecasts herein and should not be applied to other Chapters in this Study

1.4.1 Passenger Enplanements

For the purposes of this study, an enplanement forecast was developed as a derivative to identifying projected passenger carrying commercial operations necessary to accommodate the demand at the Airport. An enplanement, defined as a revenue-paying passenger boarding an aircraft at a given airport, is the primary measure of a commercial service airport's passenger activity. In addition to being an important trend-tracking tool for airport management, the reported annual enplanements are also used by the FAA to calculate Airport Improvement Program (AIP) passenger entitlement funding through its apportionment formula.

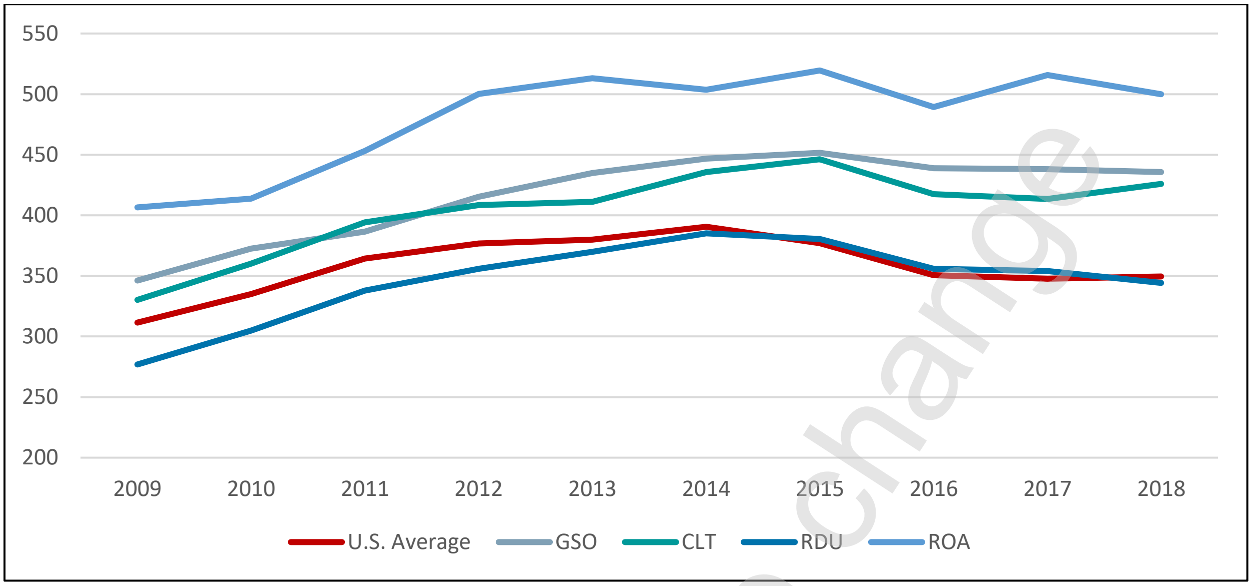
Although enplanement forecasts are not used for determining noise in the Part 150 Study, it is important to evaluate the enplanement levels at the Airport throughout the forecast period. Enplanements and load factors influence fleet mix and frequency of operations at the Airport, which are included in the Study.

Average Historical Airfare

As previously discussed in **Section 1.2.1**, the Airport's catchment and core areas are where an airport captures most of the airport passengers. In addition to evaluating socioeconomic factors in the area (**Section 1.3**), the air fares of surrounding airports were also evaluated and considered when developing the commercial enplanements forecast, as air fare can draw people away from other airports or can drive people to fly via an alternative airport (leakage).

Figure 1-7 depicts the average air fares per year since 2009 for GSO, ROA, CLT, RDU, and the United States. It should be noted that the average air fare per year for JQF was not available prior to 2017; however, the average air fares for JQF in 2017 and 2018 were $114 and $128, respectively.

Figure 1-7 – Historical Air Fare Comparisons



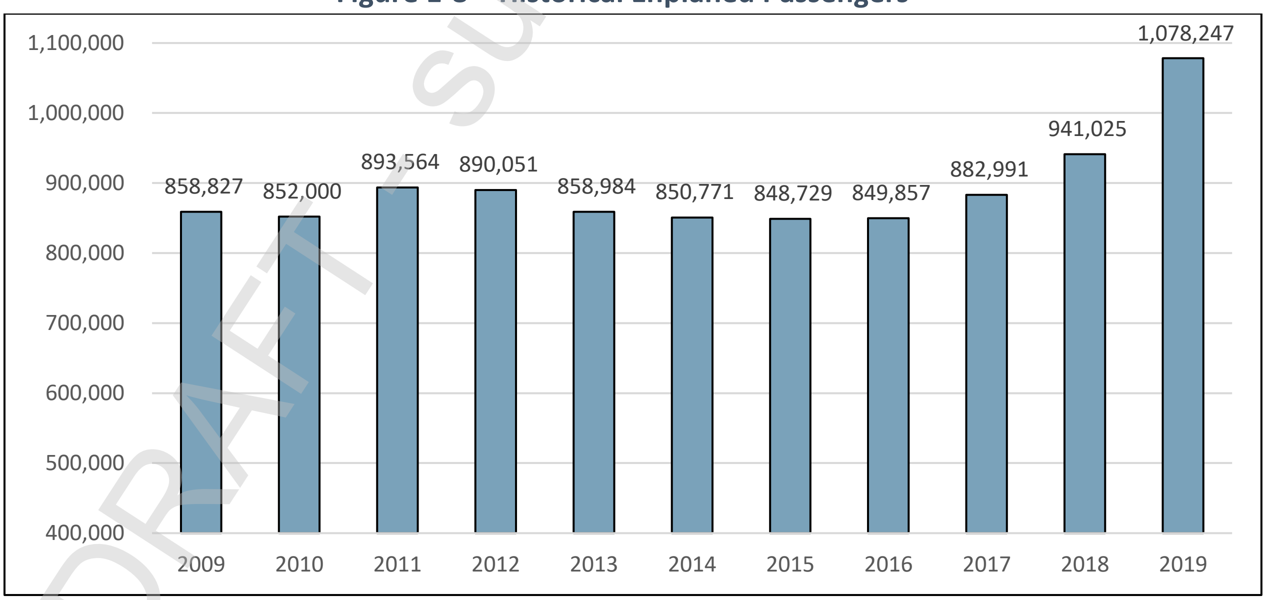
Source: BTS, CHA, 2019.

Note: Historical Air Fares were acquired via the Bureau of Transportation Statistics. According to BTS, average fares are based on domestic itinerary fares, which consist of round-trip fares unless the customer does not purchase a return fare. In that case, the one-way is included.

Historical Annual Enplaned Passengers

Like most small hub commercial service airports, GSO's enplanement levels have fluctuated between periods of decline and growth since 2009. Despite the fluctuating nature of past enplanements, GSO had its highest number of enplanements in the last 11 years in 2019 with approximately 1,078,247 enplanements, as shown in **Figure 1-8**.

Figure 1-8 – Historical Enplaned Passengers



Source: BTS Office of Airline Information (T-100 Data), CHA, 2019.

Forecasts

Four different methodologies were considered and analyzed in the development of the recommended GSO enplanement forecast. Each of the methodologies are described briefly below. Further detail on each method and the analyses with a full break down of year by year projections is provided in **Appendix C**.

Methodologies

- TAF Variable Growth Analysis – Uses the FAA's projected annual growth of enplanements and applies that variable to the T-100 data (via the Bureau of Transportation Statistics)[5], projecting enplanements throughout the forecast period. It is important to note that the 2018 enplanement counts differ because the airport-reported data was updated after the development of the FAA TAF.
- Trend Analysis – A method to predict the future based on past results. The 5- and 10-year annual growth rates were calculated and used to estimate growth at GSO.
- Market Share Analysis – A "top-down" method where projected growth rates of larger aggregates (e.g., the nation, the state, and/or the region) are used to derive forecasts for smaller areas (e.g., airports). In other words, a market share forecast essentially applies national, state, and/or regional forecast growth rates to airport-specific market areas. For this analysis, future GSO enplanements were estimated by applying the future share trend and the FAA's National TAF enplanement numbers. As detailed in **Appendix C**, eight different market share analyses were performed and compared.
- Regression Analysis – An examination of aviation and passenger activity through the scope of current and historical activity levels, seeking to find a relationship between the activity levels and the socioeconomic conditions prevalent during that period. Causal relationships between population, employment, and income are examined to determine if there is a statistically valid correlation that may assist in projecting future activity. Demographic projections for the catchment area, provided by Woods & Poole Economics, Inc., were used to estimate growth at GSO. A total of 13 regression relationships were considered, but none resulted in strong correlation.

Table 1-7 below provides a summary of projected enplanements given the various methodologies described. Note, additional market share and regression scenarios were performed and can be found in **Appendix D**, along with comparisons to the FAA TAF. It is important to note that the TAF projections are annualized by the FAA Fiscal Year (October-

[5] The T-100 data bank (also known as the Air Carrier Statistics database) contains domestic and international airline market and segment data. The data is collected by the Bureau of Transportation Statistics via Form T-100 and includes the following information: carrier name, origin and destination, aircraft type and service class for transported passengers, freight and mail, available capacity, scheduled departures, departures performed, aircraft hours, and load factor.

September), and for the purposes of the Part 150 Study, all Airport projections have been developed and completed in Calendar Year.

Table 1-7 – Summary of Projected Enplanements Scenarios

Year	TAF Growth Analysis	Historical Time Trend		Market Share Scenarios			Regression Scenarios		
		5-Year Time Series	10-Year Time Series	Average National	Average State	Average Regional	Population Based	Employment Based	Income Based
2018	941,025	941,025	941,025	941,025	941,025	941,025	941,025	941,025	941,025
2019	945,172	960,194	949,666	1,058,671	1,050,104	1,040,213	900,006	896,362	896,103
2020	949,338	979,753	958,386	1,086,030	1,077,507	1,067,533	905,852	900,599	901,908
2021	953,522	999,710	967,186	1,111,437	1,102,638	1,092,636	911,742	904,816	908,267
2022	957,724	1,020,075	976,066	1,135,903	1,126,255	1,116,240	917,680	909,023	915,329
2023	961,945	1,040,854	985,029	1,159,612	1,149,420	1,139,401	923,656	913,222	923,026
2024	966,184	1,062,056	994,073	1,181,612	1,171,537	1,161,533	929,674	917,381	931,337
2025	970,442	1,083,690	1,003,201	1,203,273	1,193,597	1,183,603	935,716	921,506	940,402
AAGR 2019-2025	**0.4%**	**2.0%**	**0.9%**	**2.2%**	**2.2%**	**2.2%**	**0.7%**	**0.5%**	**0.8%**
Growth 2019-2025	**2.7%**	**12.9%**	**5.6%**	**13.7%**	**13.7%**	**13.8%**	**4.0%**	**2.8%**	**4.9%**

Source: FAA 2018 TAF, Woods & Poole Economics, Inc., PTAA, CHA, 2019.

Recommended Enplanements Forecast

After comparing the results of the various methodologies, the Average Regional Market Share forecast was chosen as the recommended enplanements forecast. The Average Regional Market Share methodology uses the aggregate, regional-level forecast of commercial activity projections from the FAA's TAF for the individual commercial service airports in the region (GSO, CLT, RDU, ROA, & JQF) to derive a forecast for the Airport based on its regional market share.

One determining factor in choosing the Average Regional Market Share analysis as the recommended commercial enplanements forecast is that enplanements resulting from recently added service and destinations are accounted for within the analysis. It is important to note that the enplanements forecast includes all scheduled airline passengers (e.g. Air Carrier and Commuter). Historically, the Airport has maintained a relatively stable regional market share, ranging from 3.00 percent to 3.77 percent in the past 10 years; therefore, the average (3.31 percent) was assumed to be a realistic growth factor in the future.

Table 1-8 – Historical Percent Market Share

Year	National	State	Regional
2009	0.12%	3.62%	3.77%
2010	0.12%	3.47%	3.62%
2011	0.12%	3.45%	3.60%
2012	0.12%	3.36%	3.50%
2013	0.12%	3.10%	3.22%
2014	0.11%	3.00%	3.11%
2015	0.11%	2.95%	3.05%
2016	0.10%	2.90%	3.00%
2017	0.10%	2.97%	3.09%
2018	0.11%	3.03%	3.15%

Source: FAA TAF, BTS Office of Airline Information (T-100 Data), CHA, 2019.

Appendix C details the market share analyses evaluated during this forecasting effort. Historical percent market shares are shown in **Table 1-8**. **Table 1-9** provides the comparison between the recommended enplanements forecast and the TAF enplanements forecast.

Table 1-9 – Recommended Commercial Enplanements Forecast vs. FAA TAF

Year	FAA TAF	Recommended Forecast	Recommended Forecast vs. FAA TAF
2018	915,482	941,025	2.8%
2019	1,048,146	1,040,213	-0.8%
2020	1,085,064	1,067,533	-1.6%
2021	1,090,671	1,092,636	0.2%
2022	1,095,877	1,116,240	1.9%
2023	1,100,769	1,139,401	3.5%
2024	1,105,440	1,161,533	5.1%
2025	1,110,311	1,183,603	6.6%
AAGR 2019-2025	1.0%	**2.2%**	-
Growth 2019-2025	5.9%	**13.8%**	-

Source: FAA TAF, BTS Office of Airline Information (T-100 Data), CHA, 2020.
Note: FAA TAF presented as Federal Fiscal Year, and Recommended Forecast presented as Calendar Year.

1.4.2 Commercial Operations

According to the FAA, the "Air Carrier" category of FAA-reported operations data includes aircraft with seating capacity of more than 60 seats or a maximum payload capacity of more than 18,000 pounds, carrying passengers or cargo for hire or compensation, including US and foreign-flagged carriers; however, the "Air Taxi & Commuter" category of FAA-reported operations data includes both scheduled air carrier operations with 60-seats or less (i.e., this will include all 50-seat regional jet operations) and Part 135 business and charter operations. As such, the Air Taxi & Commuter category of the FAA TAF includes scheduled airlines and non-airline passenger operations, as well as some cargo operations.

The following describes the difference between air carrier and air taxi & commuter operations, as defined by the FAA.

- Air Carrier – Operations with aircraft designed to have a seating capacity of more than 60 seats or a maximum payload capacity of more than 18,000 pounds carrying passengers or cargo for hire or compensation. This includes US and foreign flagged carriers.
- Air Taxi & Commuter – Operations with aircraft designed to have a maximum seating capacity of 60 seats or less or a maximum payload capacity of 18,000 pounds or less carrying passengers or cargo for hire or compensation.

For the purpose of this forecast, scheduled air carriers (i.e. scheduled passenger airline operators) and their regional partners, as well as commuters (i.e., scheduled operations on aircraft with less than 60 seats), are included within the commercial operations forecast.

Historical Data

Operations

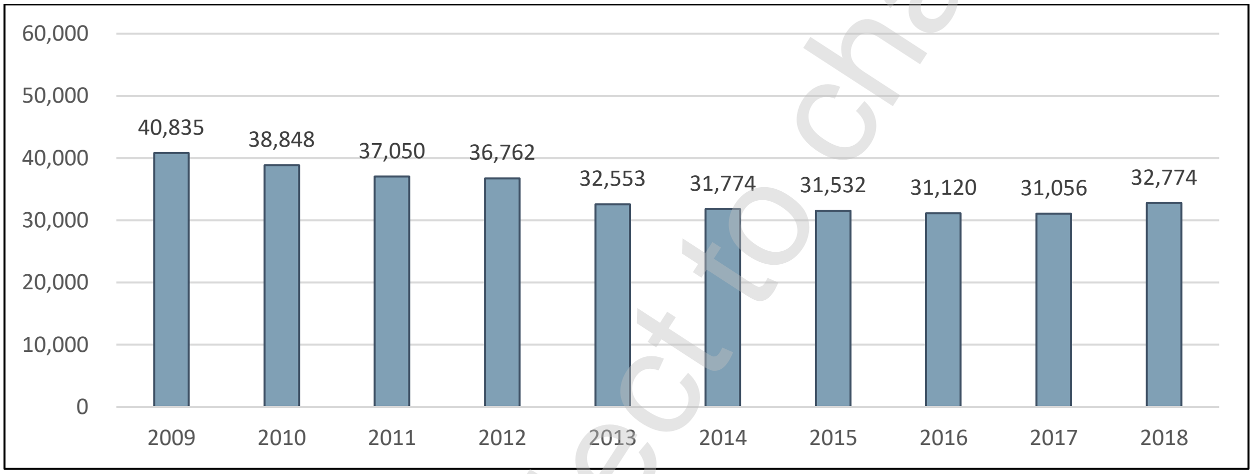
Commercial operations at GSO have seen, overall, a decline since 2009, as shown in **Figure 1-9**. The decline can be attributed to a number of factors, including airline bankruptcies and consolidation, higher fuel prices, the economic recession, and airlines transitioning their fleets from smaller 50-seat regional jets to larger 60- and 90-seat regional jets and narrow-body aircraft. However, operations in 2018 have begun to increase with the recent addition of a new air carrier and additional service on incumbent carriers.

Commercial Seats and Average Aircraft Size

GSO's approximate 2.4 million scheduled seats[6] in 2018 was the high point in the last ten years, as shown in **Figure 1-10**.

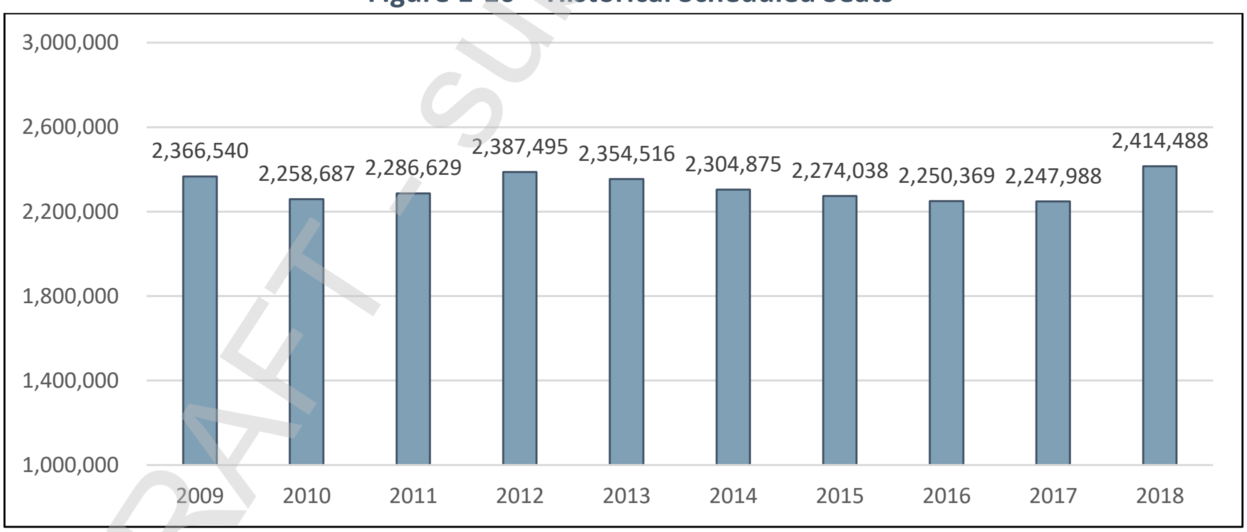
Figure 1-11 shows the average seats per departure, which following a sharp increase in 2013, has remained fairly constant through 2018.

Figure 1-9 – Historical Commercial Operations



Source: BTS Office of Airline Information (T-100 Data), CHA, 2019.
Note: Includes commercial arrivals and departures.

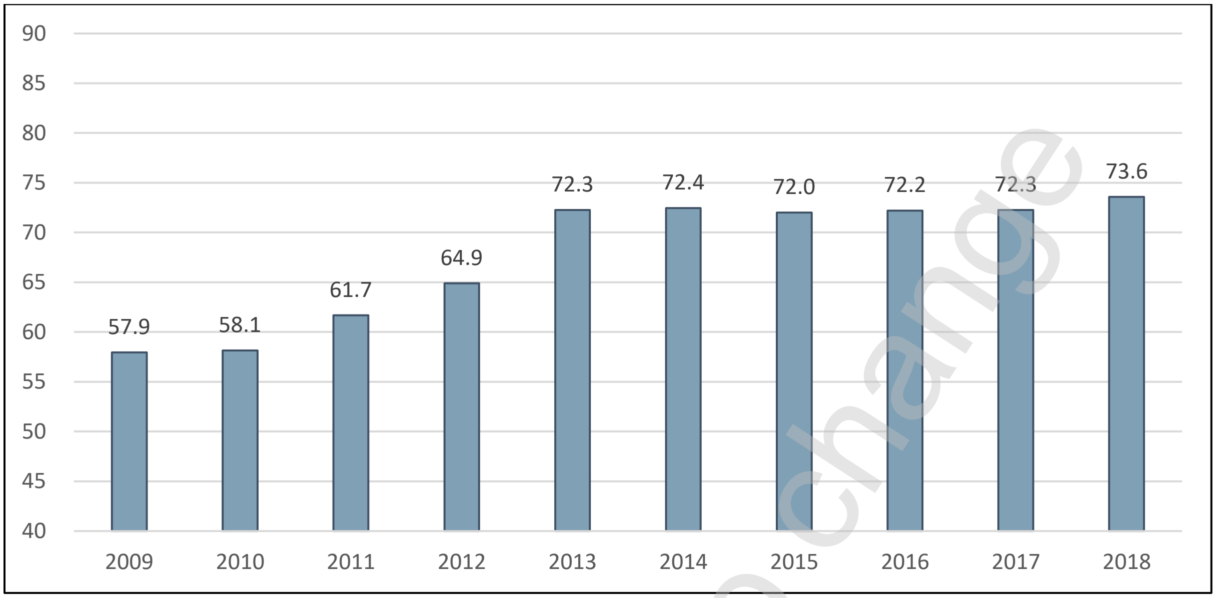
Figure 1-10 – Historical Scheduled Seats



Source: BTS Office of Airline Information (T-100 Data), CHA, 2019.
Note: Includes commercial arrival and departure seats.

[6] Scheduled seats include the total number of seats available for passenger use on aircraft flying scheduled routes.

Figure 1-11 – Historical Average Seats per Departure

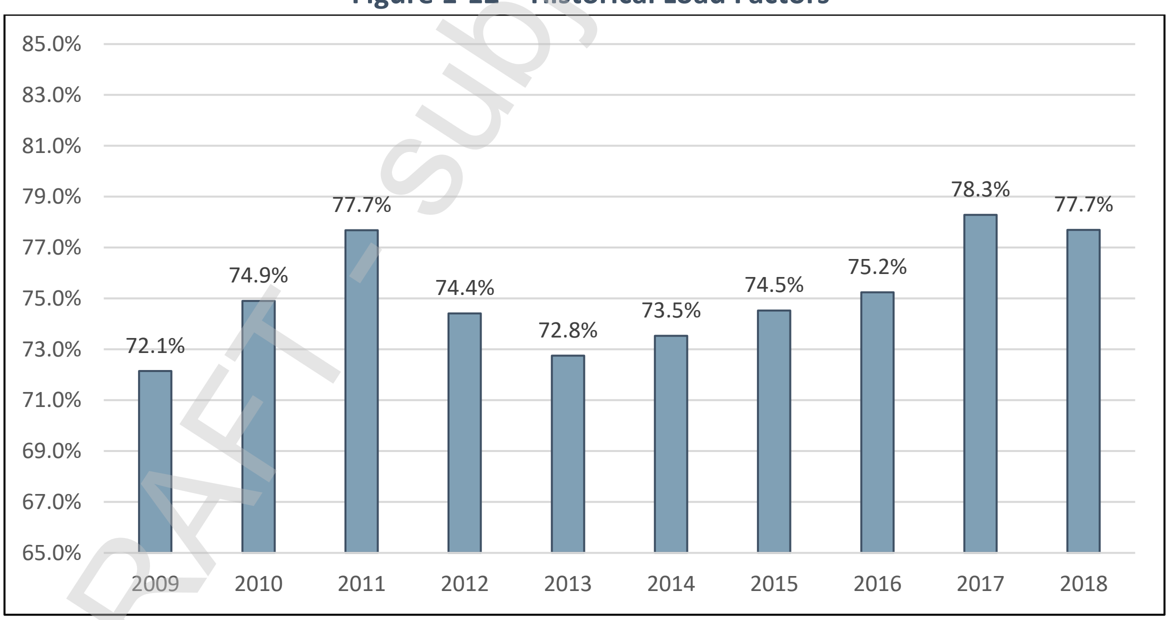


Source: BTS Office of Airline Information (T-100 Data), FAA GSO Control Tower Statistics[7], CHA, 2019.

Load Factors

Load factor (LF) measures capacity utilization and is used to quantify efficiency in filling air carrier seats and in generating revenue. LF is calculated by dividing the total number of revenue passengers by total available seats. **Figure 1-12** shows a general trend of increasing LF at GSO over the past ten years, consistent with national trends and airline strategy.

Figure 1-12 – Historical Load Factors



Source: BTS Office of Airline Information (T-100 Data), CHA, 2019.

[7] See **Appendix E** for FAA GSO Control Tower Statistics.

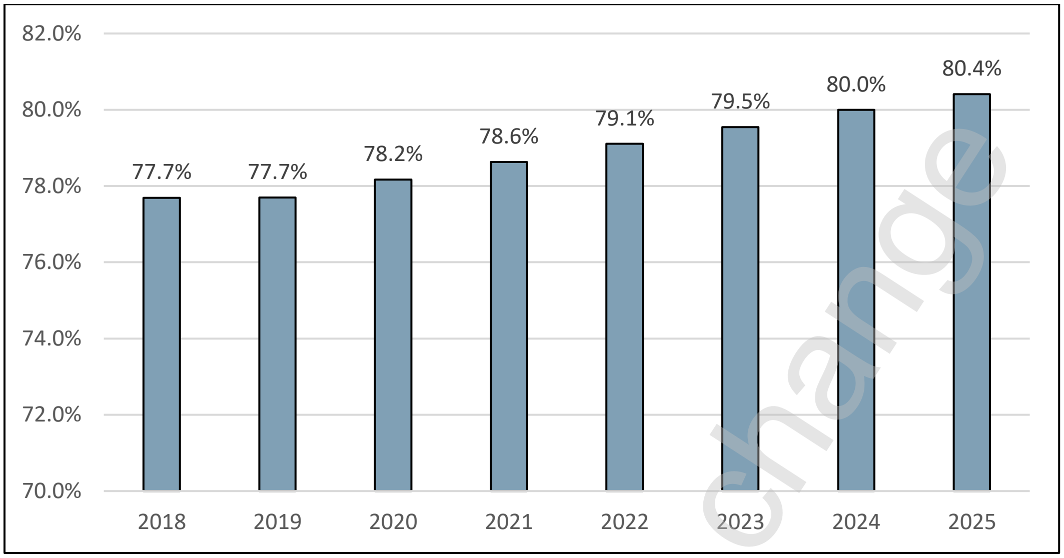
Forecasts

The commercial operations forecast (i.e. scheduled passenger airlines) was derived using the recommended enplanement forecast methodology, growth trends in percentage of seats filled, and average seats per departure, as described below. Aircraft size, as well as routes served, were considered during the development of this forecast. It is important to note that for the purposes of this forecast, all scheduled commercial passenger carrying service operations were included in the commercial operations forecast. This includes the scheduled passenger operations included in the Air Carrier and Air Taxi & Commuter FAA TAF categories. For the purposes of comparison to FAA operations, Commuter operations (passenger operations in aircraft with less than 60-seats; see **Section 1.5** for definitions of Air Carrier and Air Taxi and Commuter), included in the commercial operations forecast will be re-categorized in subsequent sections. The commercial operations forecast was determined using the following calculations:

- Commercial Load Factors
    - For each non-stop destination, divide the number of passengers in 2018 by the total available seats in 2018 to determine the percentage of seats filled for each destination.
    - Increase the percentage of seats filled by 0.6 percent per year (assumption based on industry averages discussed in The FAA Aerospace Forecast) for each destination until the percentage reaches 85.0 percent. When the percentage of seats filled reaches 85.0 percent, it is capped[8] for the remaining years.
    - For each year, determine the average of the percentage of seats filled for all destinations. This results in the Airport's annual percentage of seats filled (load factor) per forecasted year. See **Figure 1-13**.
- Departure Seats
    - Determine annual departure seats by dividing the forecasted enplaned passengers per year by the annual load factor per forecasted year.
- Seats both Ways
    - Multiply the number of departure seats per year by two to determine the total number of seats each way, as departure seats contribute to half of the total seats.
- Operations
    - Divide the total seats per year by the average number of seats per departure to determine the total commercial operations for each forecasted year. See **Figure 1-14**.

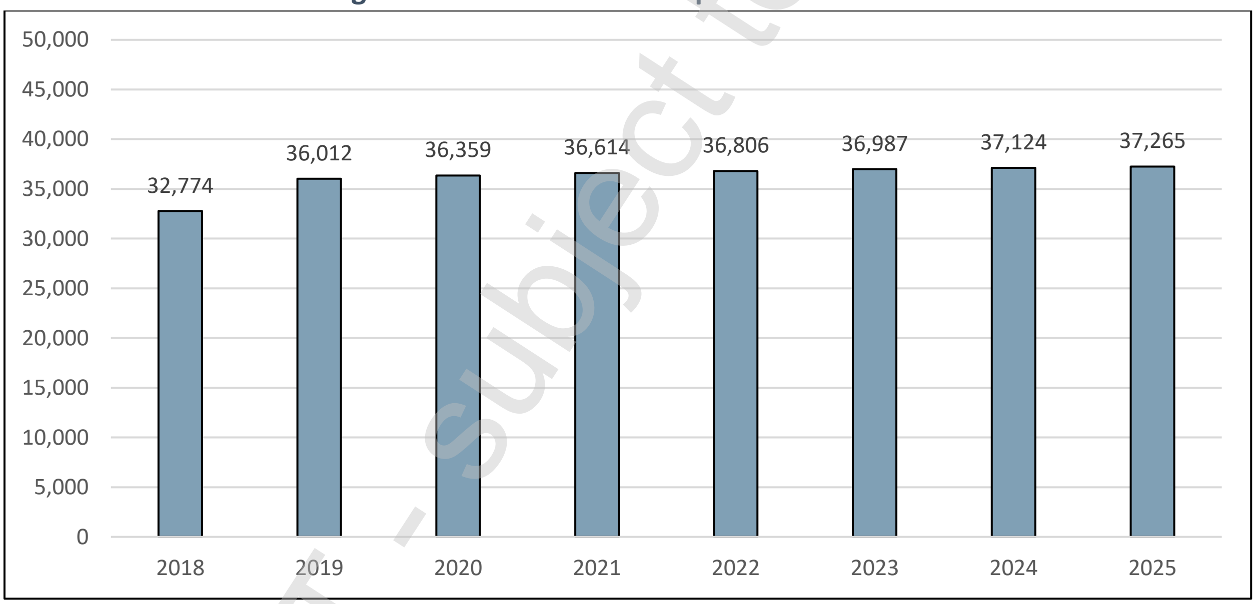
[8] The 85 percent is a proxy, or benchmark, as airlines approach an 85 (or higher) percent load factor, they typically evaluate the cost and benefits of either increasing frequency of that route or upgrading to larger aircraft for the high-load factor routes. As such, for the purposes of this forecast, it was assumed that airlines would up-gauge aircraft.

Figure 1-13 – Forecasted Load Factors



Source: BTS Office of Airline Information (T-100 Data), CHA, 2019.

Figure 1-14 – Commercial Operations Forecast



Source: BTS Office of Airline Information (T-100 Data), CHA, 2019.

<u>Commercial Fleet Mix Forecast</u>

The recommended commercial operations forecast accounts for some fleet mix transitions from smaller regional jet aircraft to larger jet and narrow-body aircraft, while also assuming smaller regional jets will remain a substantial part of GSO's fleet mix through 2025.

Historical (2018) and projected (2020 and 2025) commercial carrier fleet mixes are presented within the Derivative Forecast (**Section 1.10**).

1.4.3 Summary of Recommended Commercial Aviation Forecasts

Table 1-10 shows a summary of the recommended commercial enplanements and operations forecast, with average seats per departure and percent of seats filled (load factor) detailed.

Table 1-10 – Recommended Commercial Forecast

Year	Enplanements	Load Factor	Avg. Seats Per Departure	Operations
2018	941,025	77.7%	73.7	32,774
2019	1,040,213	77.7%	74.4	36,012
2020	1,067,533	78.2%	75.3	36,359
2021	1,092,636	78.6%	76.1	36,614
2022	1,116,240	79.1%	76.4	36,806
2023	1,139,401	79.5%	76.6	36,987
2024	1,161,533	80.0%	76.9	37,124
2025	1,183,603	80.4%	77.1	37,265
AAGR 2019-2025	**2.2%**	**-**	**1.0%**	**0.6%**
Growth 2019-2025	**13.8%**	**-**	**6.3%**	**3.5%**

Source: BTS Office of Airline Information (T-100 Data), CHA, 2019.

1.5 AIR TAXI

For purposes of this forecast, "Air Taxi" represents non-airline passenger operations, and excludes scheduled passenger airline and cargo operations. The airport-reported air traffic control data was adjusted to separate passenger airline and cargo operations, as follows:

Table 1-11 – Calculating Air Taxi Operations

(Tower Reported Air Carrier + Tower Reported Air Taxi) – (T-100 Air Carrier + Airport Reported Cargo) = **Actual Air Taxi**
(21,912 + 27,354) – (32,774 + 6,458) = 10,034

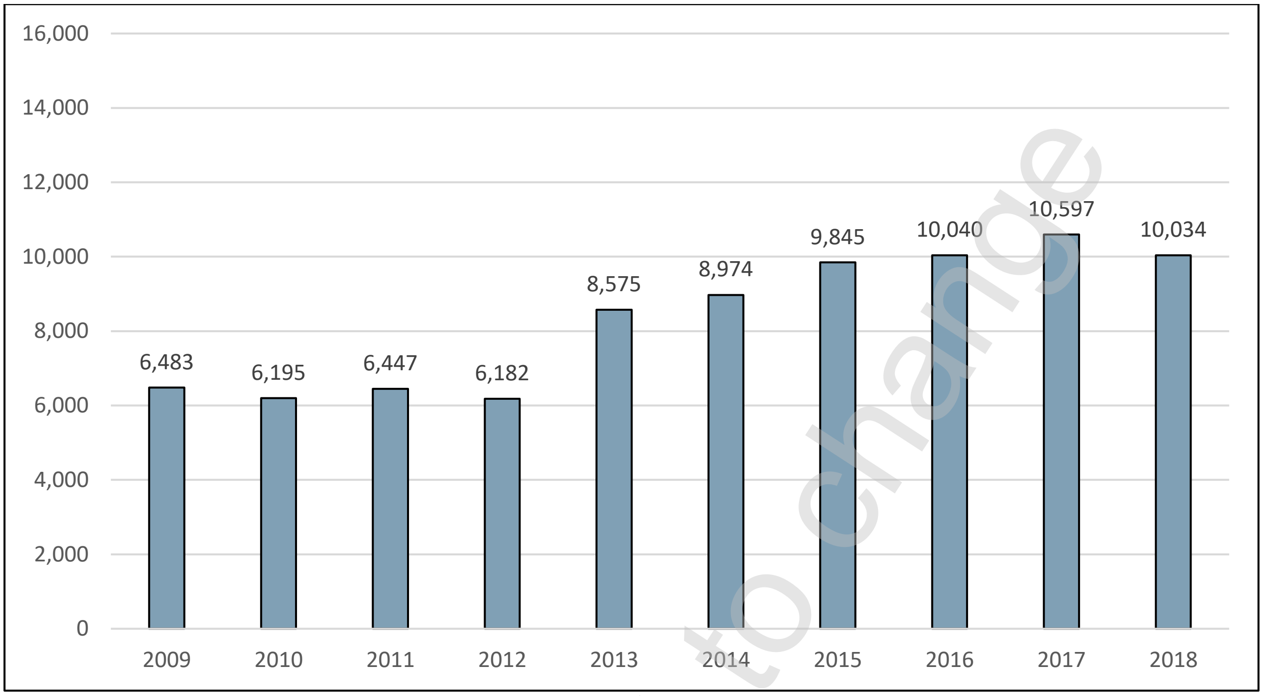
Source: BTS Office of Airline Information (T-100 Data), PTAA, CHA, 2019.

Note: Actual air carrier operations were derived from T-100 data provided by BTS Office of Airline Information.

1.5.1 Historical Data

The previously described calculations were applied to data from 2009 through 2018 to accurately determine air taxi operations at GSO, as shown in **Figure 1-15**.

Figure 1-15 – Historical Air Taxi Operations



Source: BTS Office of Airline Information (T-100 Data), FAA GSO Control Tower Statistics, CHA, 2019.

1.5.2 Forecasts

Six methodologies were considered and analyzed in the development of the recommended GSO air taxi forecast, and the Market Share Analysis was selected as the most reasonable and representative. Each of the methodologies, along with accompanying air taxi forecasts, are shown below and then compared to each other (**Table 1-14**).

Methodologies

- FAA Aerospace Forecast Analysis – A forecasting approach that analyzes data provided in the FAA Aerospace Forecasts (FY 2019-2039). *Table 32* from the FAA Aerospace Forecast (attached in **Appendix F**) depicts projected trends of total combined aircraft operations at airports with FAA and contract tower service. The table further breaks down the operations according to the type of operator (air carrier, air taxi & commuter, GA, and military). The analysis of the data was performed using two variations. In one variation, future growth in air taxi operations at GSO was calculated by taking the AAGR for air taxi & commuter provided by the FAA Aerospace forecast for the entire forecast period and applies the AAGR to each forecast year. The second variation takes the year-over-year growth (variable growth) and applies the percent growths to the GSO forecasted operations from year to year. The growth rates used are presented in **Table 1-12**, showing a decline in projected air taxi & commuter operational activity. Based on activity and trends within the region, air taxi activity at GSO is not expected to decrease over the forecast horizon; therefore, the results of this analysis are not believed to accurately depict future air taxi activity.

Table 1-12 – FAA Aerospace Growth Rates

Year	AAGR
2018-2019	1.0%
2019-2039	-2.2%
Year	**Variable Growth**
2018-2019	1.0%
2019-2020	-7.7%
2020-2021	-2.8%
2021-2022	-5.8%
2022-2023	-8.3%
2023-2024	-1.6%
2024-2025	0.9%

Source: FAA Aerospace Forecast (FY 2019-2039), CHA, 2019.

- TAF Growth Analysis – Uses the FAA's projected annual growth of air taxi & commuter operations and applies that variable to the actual air taxi operations, projecting air taxi operations throughout the forecast period. It is important to note that the actual air taxi operations differ from the FAA TAF because the airport reported and BTS data were updated after the development of the FAA TAF. In addition, the FAA TAF does not include the previously described separation of air taxi & commuter, air carrier, and cargo operations (explained in **Table 1-11**); therefore, this analysis was not chosen as the recommended forecast.

- Itinerant GA Based Growth Analysis – Assumes air taxi operations will grow in conjunction with forecasted itinerant GA operations. Oftentimes when developing operations forecasts, air taxi is not forecast separately from all other operations and is included in the itinerant GA operations forecast, as the operations occur outside of a 20-mile radius of the tower (itinerant) via aircraft with a capacity of 60 seats or less; therefore, this analysis projects air taxi operations to grow at the same rate (0.3 percent) as itinerant GA operations, which is discussed in **Section 1.7.2**. After further evaluation, this analysis was not chosen to represent the recommended air taxi operations at GSO because growth of itinerant GA operations is impacted by based aircraft activity, as well as by the flight school, which are not drivers of air taxi operations.

- Trend Analysis – A method used to predict the future based on past results. The 5- and 10-year annual growth rates were calculated and used to estimate growth in air taxi operations at the Airport. Over the last five years, GSO has seen a 1.1 percent growth in air taxi operations; however, over the last 10 years, the Airport has experienced a 3.2 percent decrease in air taxi activity. Air taxi activity at GSO is not expected to decrease over the forecast horizon; therefore, the 10-year growth rate is not reasonable for this forecast. Although the analysis based on growth rates from the previous five years is not unreasonable, it does not take regional activity and its effect on air taxi operations at GSO into consideration. It is important to consider activity within the region as it relates to air taxi operations, as air taxi operations are partially driven by business travelers.

- Market Share Analysis – A "top-down" method where projected growth rates of larger aggregates (in this case, the region) are used to derive forecasts for smaller areas (e.g., airports). Similar to the commercial enplanements analysis, this market share forecast essentially applies national, state, and/or regional forecast growth rates to airport-specific market areas. For this analysis, future air taxi operations at GSO were estimated based on their average historical market share of the region (CLT, RDU, ROA, JQF, and GSO). When determining the percent market share GSO has held within the region, it was important to determine the actual air taxi operations for each of the previously mentioned airports by applying a split calculation[9]. Data for the airports in the region was provided via the FAA Operations Network (OPSNET) and the BTS. As shown in **Table 1-13**, regional air taxi operations grew an average of 0.1 percent over the last 10 years. For this analysis, it was assumed, based on recent trends within the region, that air taxi operations at GSO will grow statically at the average historical regional growth rate (0.1 percent). This analysis accounts for socioeconomic development and activity within the region, including GSO's core region and catchment area; therefore, this methodology will serve as the recommended air taxi operations forecast.

Table 1-13 – Average Historical Regional Air Taxi Operations

Year	Regional % Change
2009	-
2010	2.3%
2011	-1.8%
2012	-8.3%
2013	-9.8%
2014	10.7%
2015	-0.7%
2016	0.9%
2017	4.9%
2018	2.5%
Average (2009-2018)	**0.1%**

Source: FAA OPSNET, BTS, CHA, 2019.

[9] The formula in **Table 1-11** that was used for determining air taxi operations at GSO utilized data provided by the air traffic control tower and via BTS T-100 data. Since Tower data was not provided for the airports in the region, OPSNET data was utilized (as well as BTS T-100 data) thus resulting in use of the following formula when determining air taxi at the airports in the region: (OPSNET Reported Air Carrier + OPSNET Reported Air Taxi) – (T-100 Air Carrier) = Actual Air Taxi.

Table 1-14 – Air Taxi Operations Forecast Comparisons

Year	FAA Aerospace	FAA Aerospace Variable Growth	FAA TAF Based	Itinerant GA Based Growth	Historical Time Trend		Avg. Historical Regional Mkt. Share
					5-Year Time Series	10-Year Time Series	
2018	10,034	10,034	10,034	10,034	10,034	10,034	10,034
2019	10,135	10,135	9,090	10,067	10,140	9,716	10,043
2020	9,910	9,356	8,235	10,100	10,248	9,407	10,053
2021	9,690	9,090	7,461	10,133	10,356	9,109	10,062
2022	9,476	8,559	6,759	10,167	10,466	8,820	10,071
2023	9,266	7,850	6,124	10,200	10,576	8,540	10,080
2024	9,060	7,722	5,548	10,234	10,688	8,269	10,090
2025	8,860	7,794	5,026	10,268	10,802	8,006	10,099
AAGR 2019-2025	**-2.2%**	**-4.3%**	**-9.4%**	**0.3%**	**1.1%**	**-3.2%**	**0.1%**
Growth 2019-2025	**-12.6%**	**-23.1%**	**-44.7%**	**2.0%**	**6.5%**	**-17.6%**	**0.6%**

Source: FAA 2018 TAF, OPSNET, FAA Aerospace Forecast (FY 2019-2039), BTS Office of Airline Information (T-100 Data), FAA GSO Control Tower Statistics, CHA, 2019.

1.5.3 Recommended Air Taxi Operations Forecast

The results of the market share analysis were chosen to represent the recommended air taxi operations forecast through 2025 for GSO. This analysis was chosen because it considers activity and trends within the region that affect GSO. The recommended air taxi operations forecast is presented in **Table 1-15**.

Table 1-15 – Recommended Air Taxi Operations Forecast

Year	Recommended Forecast
2018	10,034
2019	10,043
2020	10,053
2021	10,062
2022	10,071
2023	10,080
2024	10,090
2025	10,099
AAGR 2019-2025	**0.1%**
Growth 2019-2025	**0.6%**

Source: FAA OPSNET, BTS, CHA, 2019.

1.6 AIR CARGO

Air cargo traffic is comprised of freight, express, and airmail. Air cargo is typically transported via three different methods: commercial air carrier ("belly cargo"), dedicated commercial cargo carriers (integrators, e.g. FedEx, UPS, and others[10]), or all-cargo charter services. Air cargo activity and demand fluctuates based on national and global economic trends. Factors that affect air

[10] Others include cargo carriers such as ABX Air, DHL, etc.

cargo growth are fuel price volatility, movement of real yields[11], and globalization. This section analyzes historical trends in air cargo aircraft operations and develops forecasts of commercial cargo (integrator) traffic and all-cargo aircraft operations by type, based on projected economic trends. For the purposes of this forecast, only domestic air cargo analyses were evaluated, as GSO does not currently have, nor are they anticipating initiating international air cargo services within the forecast period.

1.6.1 Historical Data

In 2018, GSO had 6,458 all-cargo operations, 82.1 percent of which were integrator flights, as shown in **Table 1-16**. From 2009 to 2018, integrator operations increased by 31.3 percent, while other all-cargo operators decreased by 2.0 percent over the same period.

Table 1-16 – Historical Cargo Operations

Year	Integrators	% Change	Other All-Cargo	% Change	Total Cargo Operations	% Total Integrators
2009	4,036	-	1,182	-	5,218	77.3%
2010	4,416	9.4%	1,026	-13.2%	5,442	81.1%
2011	4,396	-0.5%	1,032	0.6%	5,428	81.0%
2012	4,332	-1.5%	1,024	-0.8%	5,356	80.9%
2013	4,388	1.3%	980	-4.3%	5,368	81.7%
2014	3,902	-11.1%	958	-2.2%	4,860	80.3%
2015	4,024	3.1%	968	1.0%	4,992	80.6%
2016	4,046	0.5%	748	-22.7%	4,794	84.4%
2017	5,086	25.7%	1,194	59.6%	6,280	81.0%
2018	5,300	4.2%	1,158	-3.0%	6,458	82.1%
AAGR 2009-2018	**2.8%**	**-**	**-0.2%**	**-**	**2.2%**	**-**
Growth 2009-2018	**31.3%**	**-**	**-2.0%**	**-**	**23.8%**	**-**

Source: PTAA All-Cargo Data Reports, CHA, 2019.

Additionally, beginning in September 2018, FedEx expanded its hub operation at GSO. Specifically, FedEx increased hub operations by eight flights (16 operations) serviced largely by B757 aircraft, and re-scheduled two turboprop feeder flights (4 operations) to the nighttime sort.

1.6.2 Forecasts

The future growth of cargo activity at GSO will primarily depend on growth in the demand for integrator cargo services currently provided by FedEx, UPS, and others, as well as further expansion of the cargo hub operations. Most of the traffic is next-day and second-day delivery traffic, which is affected by local consumer and business demand for both inbound and outbound services, specifically the continued expansion of e-commerce-based traffic. As mentioned, GSO does not have scheduled international all-cargo service at this time.

[11] Real yield is the product of supply and demand that takes inflation into consideration.

Integrated Cargo Trends

The industry forecasts of Revenue Ton Miles (RTMs) presented in this section were developed by world cargo experts[12] and are based on models that link cargo activity to gross domestic product (GDP). These forecasts of domestic cargo RTMs were developed with real U.S. GDP as the primary driver. The distribution of RTMs between passenger and all-cargo carriers are forecast based on an analysis of historical trends in shares, changes in industry structure, and market assumptions. The U.S. economic recovery from the recession of 2008 is projected to continue, influencing the forecast for domestic cargo in the U.S. In 2019, according to the FAA Aerospace Forecast, domestic air cargo RTMs in the U.S. are forecast to grow 4.5 percent, which is slower than the growth of 7.7 percent experienced from 2017 to 2018.

In addition to UPS and FedEx, Amazon has recently begun operations within the air cargo industry and flying their own aircraft as Prime Air. According to industry experts, Prime Air is expected to become a primary competitor to UPS and FedEx in the future; although, it is unknown to what extent Prime Air will serve the air cargo industry. It is not anticipated that Prime Air will serve GSO within the forecast period.

FedEx Expansion at GSO

FedEx currently has 13 air express hubs, with one of its regional hubs being located at GSO. As previously mentioned, FedEx expanded its hub operations at the Airport in September 2018[13].

FedEx added a net total of eight new flights, primarily serviced by narrow-body and widebody aircraft (B757, B767, A300s, and MD-10s), and two turboprop feeder aircraft which were re-scheduled to the nighttime sort. The ten aircraft arrive at GSO at night (between 10:30 pm and 1:00 am) and then depart between 3:00 am and 4:00 am, four nights per week.

Methodologies

Due to the varying nature of the cargo business and its poor correlation with historical socioeconomic factors, the cargo forecasts were based on research and findings by industry experts, such as those found in the FAA Aerospace Forecast (FY 2019-2039), Boeing World Air Cargo Forecast (2018-2037), and the Airbus Global Market Forecast (2018-2037). The forecasts of cargo operations were established independently of one another; however, the same methodology was used when developing the projections.

As previously mentioned, GDP is the main driver in air cargo activity and is used as the basis for the FAA, Boeing, and Airbus forecasts. The AAGRs pertaining to the future cargo activity provided in each forecast were used to develop three separate forecasts for three separate scenarios for cargo operations at GSO. The average annual growth rates provided by each forecast are shown in **Table 1-17**.

[12] FAA Aerospace Forecast (FY 2019-2039), Boeing World Air Cargo Forecast (2018-2037), Airbus Global Market Forecast (2018-2037)

[13] The press release containing information about the FedEx expansion can be found in **Appendix G**.

Table 1-17 – Industry Growth Forecasts

Source	Forecast Period	AAGR
National FAA Aerospace (FY 2019 –2039)	2019-2039	1.9%
National Boeing (2018 – 2037)	2018-2037	2.3%
National Airbus (2018 – 2037)	2017-2027	1.5%
	2027-2037	1.6%

Source: FAA Aerospace Forecast (FY 2019-2039), Boeing World Air Cargo Forecast (2018-2037), Airbus Global Market Forecast (2018-2037), CHA, 2019.

The predicted cargo operations using the growth rates provided in the National FAA Aerospace, Boeing, and Airbus traffic forecasts are shown in **Table 1-18** and are compared to each other in **Figure 1-16** and **Figure 1-17**. It is important to note, for the purposes of this forecast, the FedEx hub operations beginning after 2018 are not accounted for in the cargo projections that service the GSO market.

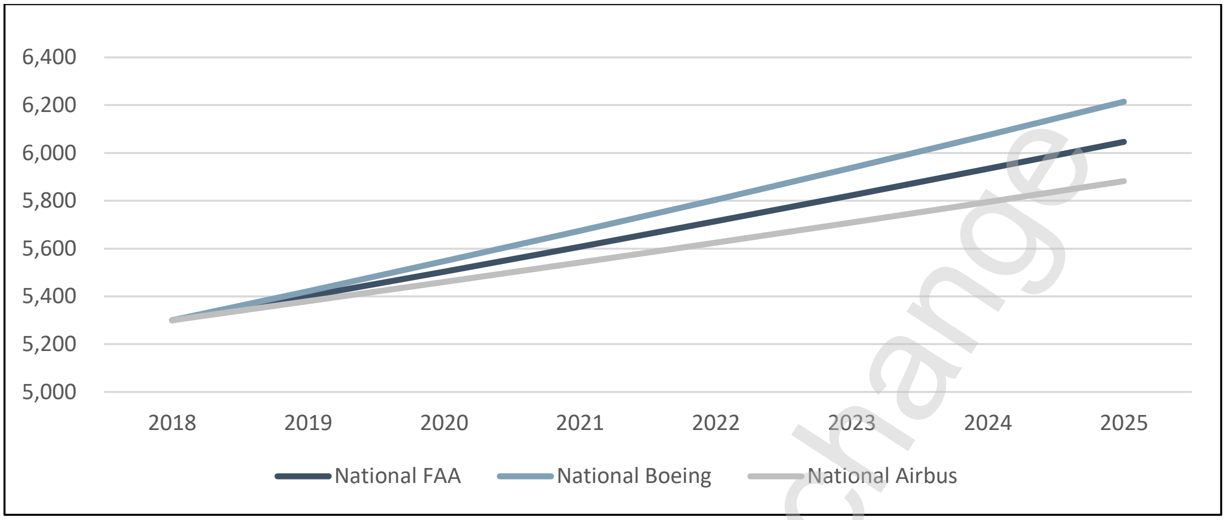
Table 1-18 – Air Cargo Operations Forecast Comparisons[14]

Year	Integrators			Other All-Cargo		
	National FAA	National Boeing	National Airbus	National FAA	National Boeing	National Airbus
2018	5,300	5,300	5,300	1,158	1,158	1,158
2019	5,401	5,422	5,380	1,180	1,185	1,175
2020	5,503	5,547	5,460	1,202	1,212	1,193
2021	5,608	5,674	5,542	1,225	1,240	1,211
2022	5,714	5,805	5,625	1,249	1,268	1,229
2023	5,823	5,938	5,710	1,272	1,297	1,247
2024	5,934	6,075	5,795	1,296	1,327	1,266
2025	6,046	6,214	5,882	1,321	1,358	1,285
AAGR 2019-2025	**1.9%**	**2.3%**	**1.5%**	**1.9%**	**2.3%**	**1.5%**
Growth 2019-2025	**12.0%**	**14.6%**	**9.3%**	**12.0%**	**14.6%**	**9.3%**

Source: FAA Aerospace Forecast (FY 2019-2039), Boeing World Air Cargo Forecast (2018-2037), Airbus Global Market Forecast (2018-2037), PTAA All-Cargo Data Reports, CHA, 2019.

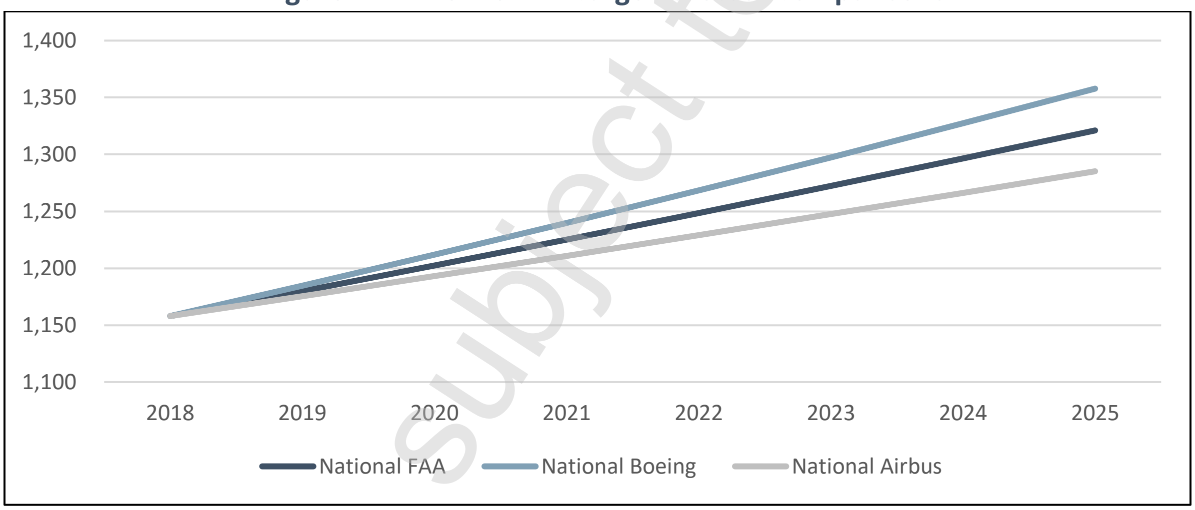
[14] This table represents organic growth at the Airport; therefore, additional operations due to the FedEx expansion is not included.

Figure 1-16 – Integrator Cargo Forecast Comparisons



Source: FAA Aerospace Forecast (FY 2019-2039), Boeing World Air Cargo Forecast (2018-2037), Airbus Global Market Forecast (2018-2037), PTAA All-Cargo Data Reports, CHA, 2019.

Figure 1-17 – Other All-Cargo Forecast Comparisons



Source: FAA Aerospace Forecast (FY 2019-2039), Boeing World Air Cargo Forecast (2018-2037), Airbus Global Market Forecast (2018-2037), PTAA All-Cargo Data Reports, CHA, 2019.

1.6.3 Recommended Air Cargo Operations Forecast

The recommended air cargo operations forecast is based on the average of the FAA, Boeing, and Airbus forecasts and an assumed growth rate for integrators. The resulting AAGR for integrators and other all-cargo is approximately 1.9 percent.

Table 1-19 presents the estimated number of operations by GSO's integrated and all-cargo carriers based on annual operations.

Table 1-19 – Recommended Air Cargo Operations Forecast

Year	Integrators	Other All-Cargo	Total
2018	5,300	1,158	6,458
2019	6,576	1,180	7,756
2020	7,001	1,202	8,204
2021	7,427	1,225	8,653
2022	7,854	1,249	9,102
2023	8,281	1,272	9,553
2024	8,708	1,296	10,004
2025	9,135	1,321	10,456
AAGR 2019-2025	**5.6%**	**1.9%**	**5.1%**
Growth 2019-2025	**38.9%**	**12.0%**	**34.8%**

Source: FAA Aerospace Forecast (FY 2019-2039), Boeing World Air Cargo Forecast (2018-2037), Airbus Global Market Forecast (2018-2037), PTAA All-Cargo Data Reports, FedEx, CHA, 2019.

Cargo Fleet Mix Forecast

The future fleet mix for integrator cargo is expected to remain relatively unchanged due to the consistency of the fleet mix over the historical analysis period. For the integrators, the stability of GSO's role in their networks, the long operating life for freighter aircraft, and the ability to add converted passenger aircraft to replace aging freighter models contributes to this assumption. It is likely that the split between narrow body and widebody jets will be maintained, although it is probable that there will be some shift between wide body jet aircraft types as determined by the likely future composition of cargo carrier fleets.

Air cargo fleet mix directly correlates to growth of air cargo traffic; therefore, as an air cargo business experiences growth, its fleet expands to meet the projected needs. The freighter aircraft fleet is categorized as standard-body, medium-widebody, and large-widebody freighters. Categorization is determined by carrying capacity as follows:

- Standard-body: less than 45 tonnes
- Medium-widebody: 40 to 80 tonnes
- Large freighters: 80 tonnes or more

Projected cargo aircraft deliveries by category, as determined by Boeing, are depicted in **Figure 1-18**.

Figure 1-18 – Boeing World Air Cargo Forecasted Fleet Mix

According to the FAA Aerospace Forecast, the United States' cargo carrier large jet aircraft fleet is forecast to increase from 858 aircraft in 2018 to 1,587 aircraft by 2039, driven by the growth in freight RTMs. The narrow-body cargo jet fleet is projected to increase by seven aircraft a year as Boeing 757s and 737-800s are converted from passenger use to cargo service. The wide-body cargo fleet is forecast to have a net increase of 28 aircraft per year as new B747-800, B777-200, and new or converted B767-300 aircraft are added, replacing older MD11, A300/310, and B767-200 freighters.

In early 2018, UPS announced a purchase agreement with Boeing of 14 additional B747-8 freighters, as well as four B767 freighters. In 2017, FedEx announced a purchase agreement with ATR of 30 ATR 72-600 aircraft, with the option of purchasing up to 20 additional aircraft. FedEx is scheduled to begin receiving the ATRs in 2020 and will continue to receive them over a five-year period until all purchased aircraft are received. In June 2018, FedEx also announced a new order for 12 B767 Freighters (to be delivered between 2020 and 2022) and 12 B777 Freighters (to be delivered between 2021 and 2025).

It is assumed that the fleet mix for other all-cargo operations at GSO will be relatively constant throughout the forecast period. In 2018, operations of other all-cargo aircraft by non-integrated all-cargo carriers were conducted via B767s, MD-11s, ATR42s, and ATR72s. Historical (2018) and projected (2020 & 2025) cargo fleet mixes are presented within the Derivative Forecasts (**Section 1.10**).

1.7 GENERAL AVIATION

GA includes all segments of the aviation industry except commercial air carriers/regional service, scheduled cargo, and military operations. GA represents the largest percentage of civil aircraft in the U.S. and collectively accounts for most operations handled by towered and non-towered airports. Its activities include flight training, sightseeing, recreational flights, aerial photography, law enforcement, and medical flights, as well as business, corporate, and personal travel via air taxi charter/commuter/charter operations. GA aircraft encompass a broad range of types, from single-engine piston aircraft to large corporate jets, as well as helicopters, gliders, and amateur-built aircraft.

GA operations are further categorized as either itinerant or local operations. Local operations are those performed by aircraft that remain in the local traffic pattern or within a 20-mile radius of the air traffic control tower. Local operations are commonly associated with training activity and flight instruction and include touch and go operations. Itinerant operations are arrivals or departures performed by either based or transient aircraft that do not remain in the airport traffic pattern or within a 20-nautical mile radius (i.e., operations not included in local operations counts). It is important to note that, as shown in **Table 1-20**, the FAA's TAF indicates very little change in GA operations at GSO from 2019 through 2025, with an approximate AAGR of 0.5 percent for local (civil) operations and 0.1 percent for itinerant operations, resulting in an overall growth of approximately 1.1 percent operations. For GA operations, the FAA TAF uses trend models to project growth in the future.

Table 1-20 – FAA TAF (GA Operations and Based Aircraft)

Year	Operations			Based Aircraft
	Itinerant	Civil	Total	
2018	24,978	6,906	31,884	86
2019	23,887	7,273	31,160	88
2020	23,911	7,306	31,217	90
2021	23,935	7,339	31,274	91
2022	23,959	7,372	31,331	91
2023	23,983	7,405	31,388	92
2024	24,007	7,438	31,445	93
2025	24,031	7,472	31,503	94
AAGR 2019-2025	**0.1%**	**0.5%**	**0.2%**	**1.1%**
Growth 2019-2025	**0.6%**	**2.7%**	**1.1%**	**6.8%**

Source: FAA 2018 TAF, CHA, 2019.

Note: The table does not represent the entire FAA 2018 TAF; Only activity pertaining to GA operations (itinerant and civil) and based aircraft are included.

1.7.1 Based Aircraft

Historical Data

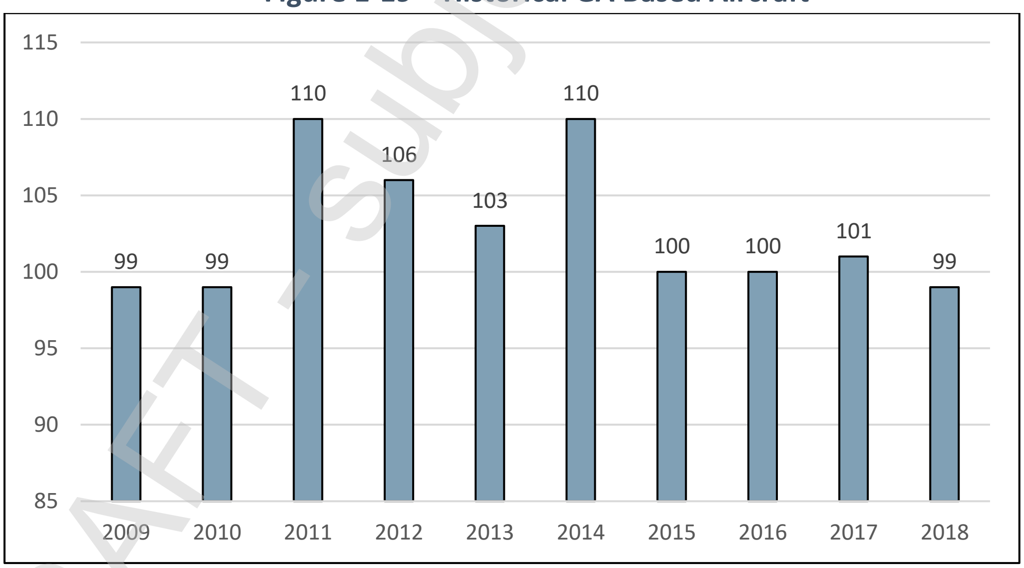
At GSO, two FBOs (Koury Aviation and Signature Flight Support), and one flight school (Triad Aviation Academy[15]), have based aircraft at GSO. It should be noted that an FBO at GSO operated under the name of Landmark Aviation prior to being acquired by Signature Flight Support in 2016. Based aircraft prior to the acquisition have been included in the count of historical based aircraft,

Table 1-21 – Historical GA Based Aircraft

Year	Piston		Turbo-Prop	Jet	Helicopter	Total
	Single-Engine	Multi-Engine				
2009	67	11	5	16	0	99
2010	67	11	5	16	0	99
2011	79	9	5	17	0	110
2012	75	9	5	17	0	106
2013	71	10	5	16	1	103
2014	76	10	5	18	1	110
2015	70	10	5	15	0	100
2016	69	11	5	15	0	100
2017	68	11	6	16	0	101
2018	65	10	7	16	1	99

Source: Koury Aviation, Signature Flight Support, Triad Aviation Academy (website), CHA, 2019.

Figure 1-19 – Historical GA Based Aircraft



[15] Based aircraft counts for Triad Aviation Academy were determined from information regarding aircraft rentals accessed from the company's website on May 29, 2019. During the compilation of this document, contact was attempted without response from Triad Aviation Academy; therefore, it was assumed that the four aircraft listed were the only based aircraft the flight school had at GSO at the time the forecasts were developed. The webpage is : https://flytaa.com/rates/

Source: Koury Aviation, Signature Flight Support, Triad Aviation Academy (website), CHA, 2019.

Forecasts

Like with commercial forecasts, the FAA provides guidance on multiple acceptable methodologies to be used to project GA based aircraft. To determine the most reasonable scenario for GSO, it was necessary to compare and eliminate forecasts that do not support the key factors and variables that comprise the specific direction of the Airport and its market. This section identifies and describes the methodologies included for the development of the recommended forecast of GA based aircraft at GSO. The methodologies, and results therein, are described below and their results are shown in **Table 1-23**.

Methodologies

- FAA Aerospace Forecast Analysis – A forecasting approach that analyzes data provided in the FAA Aerospace Forecasts (FY 2019-2039), such as annual based aircraft projections by category, and then projects growth for based aircraft at the Airport using these growth rates. This analysis assumes that the Airport's GA based aircraft count will grow at the FAA projected national rates while maintaining their respective share of fleet throughout the forecast period. As shown in **Table 1-22**, the growth is aggressive compared to the TAF (**Table 1-20**); however, detailed evaluation of the Aerospace methodology (**Table 1-22**) identified the single-engine market at GSO decreasing (65 single-engine aircraft in 2018 to 61 by 2025) and the multi-engine, turbo-prop, and rotorcraft markets remaining static (10 multi-engine aircraft, seven turbo-prop, and one rotorcraft), while the Jet market shows growth (3 additional Jet aircraft by 2025). This analysis was chosen as the recommended forecast of based aircraft at GSO through 2025.

Table 1-22 – FAA Aerospace Forecast Break-down of Based Aircraft

Year	Single-Engine Piston	Multi-Engine Piston	Turbo-Prop	Jet	Rotorcraft	Total
2018	65	10	7	16	1	99
2019	65	10	7	16	1	99
2020	64	10	7	17	1	99
2021	63	10	7	17	1	99
2022	63	10	7	18	1	98
2023	62	10	7	18	1	98
2024	61	10	7	19	1	98
2025	61	10	7	19	1	98
AAGR 2019-2025	**-1.0%**	**-0.3%**	**0.8%**	**2.5%**	**1.7%**	**-0.2%**
Growth 2019-2025	**-6.1%**	**-2.0%**	**5.0%**	**15.8%**	**10.4%**	**-1.1%**

Source: FAA Aerospace Forecast (FY 2019-2039), Koury Aviation, Signature Flight Support, Triad Aviation Academy (website), CHA, 2019.
Note: Numbers have been rounded.

- TAF Growth Analysis – Takes the FAA's projected based aircraft annual growth for 2018 to 2025 and applies that rate to actual based aircraft at the Airport[16]. In other words, the TAF growth is applied to an actual 2018 based aircraft count and projected throughout the forecast period. For example, the TAF has an estimated 2018 based aircraft count of 86; however, according to data provided by the FBOs and data collected from the flight school's website, the actual number of based aircraft was 99 as of December 2018. The year-to-year TAF growth rate was then applied to the actual 99 based aircraft and projected from 2019 through 2025. The result of this methodology was 107 based aircraft in 2025, approximately 13.7 percent above the 94 reported in the TAF. This analysis was not chosen to represent the recommended based aircraft forecast, as it was believed to be too aggressive and not accurately representing trends in the area.
- Market Share Analysis (Average) – Similar to previous forecasts presented in this chapter, a Market Share forecast is a "top-down" method where projected growth rates of larger aggregates (e.g., the nation) are used to derive forecasts for smaller areas (e.g., airports). Future GSO based aircraft were estimated by multiplying the future share trend and the Federal Aviation Administration's (FAA) Terminal Area Forecast (TAF) for National, Eastern Region, and State based aircraft numbers. Future share trends were determined by averaging the historical shares for each aggregate. (Historical market shares can be found in **Appendix B**). As shown in **Table 1-23**, the national, state, and Eastern Region projections for GSO based aircraft range from 104 to 112 by 2025. This analysis was not chosen to represent the recommended based aircraft forecast, as they were believed to be too aggressive.

Table 1-23 – GA Based Aircraft Forecast Comparisons

Year	FAA Aerospace	TAF Based	Market Share		
			Average National	Average State	Average Regional
2018	99	99	99	99	99
2019	99	100	104	102	106
2020	99	101	105	103	107
2021	99	102	106	103	108
2022	98	103	107	103	109
2023	98	105	108	104	110
2024	98	106	109	104	111
2025	98	107	110	104	112
AAGR 2019-2025	**-0.2%**	**1.1%**	**0.8%**	**0.4%**	**0.9%**
Growth 2019-2025	**-1.1%**	**6.8%**	**5.1%**	**2.1%**	**5.3%**

Source: FAA 2018 TAF, FAA Aerospace Forecast (FY 2019-2039), Koury Aviation, Signature Flight Support, Triad Aviation Academy (website), CHA, 2019.

[16] Note: Actual based aircraft data (provided by the FBOs and the flight academy's website) contains the most recent information, which has been updated since the development of the FAA TAF.

Recommended Based Aircraft Forecast

As previously mentioned, the results produced by the FAA Aerospace Forecast analysis will serve as the recommended GA based aircraft forecast at the Airport. When developing its Aerospace Forecast, the FAA uses estimates of fleet size, hours flown, and utilization rates from the General Aviation and Part 135 Activity Survey (GA Survey) as baseline figures to forecast GA fleet and activity. Those assumptions and evaluation also include retirement of aircraft and their replacements. Although the results of the FAA Aerospace Forecast depict a decrease of approximately 1.1 percent in based aircraft, it was still chosen as the recommended as it accounts for the retirement of a few older single- and multi-engine aircraft, which are expected to be replaced by jets, thus reducing the overall number of based aircraft. As a result of retiring the older smaller aircraft, the Airport is expected to experience an approximate 6.1 percent and 2.0 percent decrease in single- and multi-engine aircraft, respectively; however, the retirement of the smaller aircraft and replacement with jet aircraft will boost the amount of based jets by approximately 15.8 percent by 2025. These expectations serve as the justification of choosing these results for the recommended based aircraft forecast (**Table 1-24**). (See **Table 1-22** for a breakdown by aircraft type.)

Table 1-24 – Recommended GA Based Aircraft Forecast

Year	Recommended Forecast
2018	99
2019	99
2020	99
2021	99
2022	98
2023	98
2024	98
2025	98
AAGR 2019-2025	**-0.2%**
Growth 2019-2025	**-1.1%**

Source: FAA Aerospace Forecast (FY 2019-2039), Koury Aviation, Signature Flight Support, Triad Aviation Academy (website), CHA, 2019.

1.7.2 GA Operations

As previously mentioned, GA activity, further categorized as either itinerant or local, includes all segments of the aviation industry except commercial air carriers/regional/commuter service, scheduled cargo, and military operations. It is important to note that GA operations at GSO are primarily performed by aircraft based at the Airport.

Historical Data

National trends in general aviation activity have shown a decrease in itinerant and local operations. The Great Recession (occurring from 2007-2009) impacted GA activity trends. During this time, the aviation industry saw an increase in the cost of aviation fuel. According to the U.S.

Energy Information Administration (EIA), the cost of aviation fuel[17] increased by 39.9 percent from 2007 to 2014. From 2007 to 2018, aviation fuel suppliers[18] experienced an 18.9 percent decrease in sales and deliveries. The recession also resulted in individuals having less disposable income. As fuel prices increase and less disposable income is available, recreational GA users become less likely to travel long distance, hence resulting in a decrease of itinerant GA activity at airports throughout the country, including at GSO.

GSO has experienced intermittent periods of decreased itinerant and local GA activity at the Airport over the historical 10-year period; however, GSO has seen an increase in itinerant and local operations in recent years (since 2015), with activity levels increasing by 4.0 percent and 37.3 percent, respectively. Overall GA operations at the Airport have increased by 4.0 percent since 2009 and 9.1 percent since 2015.

The increase in GA activity can be partially attributed to factors associated with based aircraft. Since GA operations at GSO are dominated by the based aircraft at the Airport, the amount of local GA operations increases at a quicker rate than itinerant operations. Increases in itinerant operations can be partially attributed to flight training activity.

Table 1-25 – Historical GA Operations

Year	Itinerant Operations	Local Operations	Total GA Operations
2009	26,986	2,269	29,255
2010	28,898	9,062	37,960
2011	30,921	8,778	39,699
2012	27,786	9,518	37,304
2013	25,134	7,931	33,065
2014	24,084	6,254	30,338
2015	23,652	4,235	27,887
2016	24,035	6,694	30,729
2017	24,891	7,135	32,026
2018	24,596	5,816	30,412
AAGR 2009-2018	**-0.9%**	**9.9%**	**0.4%**
Growth 2009-218	**-8.9%**	**156.3%**	**4.0%**

Source: FAA GSO Control Tower, CHA, 2019.

Forecasts

Like commercial operations forecasts and GA based aircraft forecasts, several methodologies exist that could be used to forecast GA operations. To determine the most reasonable scenario for GSO, it is necessary to compare and eliminate forecasts that do not support the specific operational direction of the Airport. This section identifies the methodology that was chosen, as well as methodologies that were considered but not chosen, for the development of the GA

[17] U.S. Energy Information Administration (EIA), Independent Statistics & Analysis (2019). Petroleum & Other Liquids. Retrieved from https://www.eia.gov/dnav/pet/PET_SUM_MKT_DCU_NUS_A.htm

[18] U.S. Energy Information Administration (EIA), Independent Statistics & Analysis (2019). Petroleum & Other Liquids. Retrieved from https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=c400000001&f=a

forecasts at GSO. Each of the methodologies, along with accompanying GA operations forecasts, are described below and then compared to each other.

Methodologies

- Trend Analysis – A growth analysis that uses the airport's historical activity as a means to provide future growth projections. Typically, this analysis develops 5- and 10-year historical trends and then extrapolates these growth rates over the forecast horizon (through 2025). Over the last decade, GSO has experienced a net increase (4.0 percent) in GA activity, from 29,255 total itinerant and local operations in 2009 to 30,412 total operations in 2018. Over the last five years (2014 to 2025), the Airport experienced a 0.2 percent increase in total GA activity. Neither the 5-year or 10-year trend analysis were chosen as the recommended GA operations forecast.

- Market Share Analysis (Average)[19] – Compares local GA activity levels with aggregate level trends. This methodology assumes that the activity of any one airport is regular and predictable in accordance with the average of airports within the market. An evaluation of local, regional, State, and national FAA GA projections was performed and is detailed in **Table 1-26**. (See Appendix B for the historical market share percentages used in this methodology). The results of the Average Regional Market Share scenario will serve as the recommended GA operations forecast for GSO.

Table 1-26 – General Aviation Operations Forecast Comparisons

Year	Historical Time Trend		Market Share Scenarios		
	5-Year	10-Year	Average National	Average State	Average Regional
2018	30,412	30,412	30,412	30,412	30,412
2019	30,486	31,615	32,729	33,284	33,513
2020	30,561	32,865	32,840	33,302	33,620
2021	30,635	34,165	32,955	33,320	33,729
2022	30,710	35,516	33,070	33,339	33,840
2023	30,785	36,921	33,186	33,358	33,952
2024	30,860	38,381	33,303	33,376	34,065
2025	30,935	39,899	33,422	33,395	34,180
AAGR 2019-2025	**0.2%**	**4.0%**	**0.3%**	**0.1%**	**0.3%**
Growth 2019-2025	**1.5%**	**26.2%**	**2.1%**	**0.3%**	**2.0%**

Source: FAA 2018 TAF, FAA GSO Control Tower Statistics, CHA, 2019.

Recommended GA Operations Forecast

The Average Regional Market Share scenario has been chosen to represent the recommended GA operations forecast for GSO, as the Airport's GA activity has maintained a relatively stable

[19] GSO's GA Operations Average Percent Market Shares from 2009 through 2018: National (0.05 percent), State (1.96 percent), Regional (0.21 percent)

market share over the last 10 years, fluctuating between 0.18 and 0.26 percent for an average market share of 0.21 percent.

To determine the breakdown of GA operations by itinerant versus local, an average five-year split was applied to each forecast year. On average over the past five years, GA activity has consisted of approximately 80.2 percent itinerant and 19.8 percent local operations. This split was applied throughout the forecast. The recommended GA operations forecast, with the applied split between itinerant and local operations, is depicted in **Table 1-27**.

Table 1-27 – Recommended GA Operations Forecast

Year	Itinerant	Local	Total
2018	24,596	5,816	30,412
2019	26,878	6,635	33,513
2020	26,964	6,656	33,620
2021	27,052	6,677	33,729
2022	27,140	6,699	33,840
2023	27,230	6,722	33,952
2024	27,321	6,744	34,065
2025	27,413	6,767	34,180
AAGR 2019-2025	**0.3%**	**0.3%**	**0.3%**
Growth 2019-2025	**2.0%**	**2.0%**	**2.0%**

Source: FAA 2018 TAF, FAA GSO Control Tower Statistics, CHA, 2019.

1.7.3 Summary of Recommended GA Forecasts

The following table presents a summary of the recommended GA activity forecasts for based aircraft and operations, as detailed in the previous sections. The results of the FAA Aerospace Forecast analysis have been chosen as the recommended based aircraft forecast, while the results of the Average Regional Market Share analysis has been chosen to represent the forecast of recommended GA operations. **Table 1-28** presents the complete summary of the preferred GA forecast for based aircraft and operations by type.

Table 1-28 – Recommended GA Forecast

Year	Based Aircraft	Operations		
		Itinerant	Local	Total
2018	99	24,596	5,816	30,412
2019	99	26,878	6,635	33,513
2020	99	26,964	6,656	33,620
2021	99	27,052	6,677	33,729
2022	98	27,140	6,699	33,840
2023	98	27,230	6,722	33,952
2024	98	27,321	6,744	34,065
2025	98	27,413	6,767	34,180
AAGR 2019-2025	**-0.2%**	**0.3%**	**0.3%**	**0.3%**
Growth 2019-2025	**-1.1%**	**2.0%**	**2.0%**	**2.0%**

Source: FAA 2018 TAF, FAA Aerospace Forecast (FY 2019-2039), Koury Aviation, Signature Flight Support, Triad Aviation Academy (website), FAA GSO Control Tower Statistics, CHA, 2019.

1.8 MILITARY

Military activity is often included in the general aviation operations projections at an airport but are not forecast in the same manner as general aviation activity since their number, location, and activity levels are not a function of anticipated market and economic conditions, but are rather a function of military decisions, national security priorities, and budget pressures that cannot be predicted over the course of the forecast period; therefore, military operations are considered separately from the GA operations forecast. Typically, for forecasting purposes, military operations are assumed to remain static at baseline year levels throughout the forecast period.

1.8.1 Historical Data

Military activity at GSO has drastically increased over the last 10 years, as shown in **Table 1-29**. Like GA operations, military operations are categorized as either itinerant or local. From 2009 to 2018, the AAGRs for itinerant and local military operations were 8.1 percent and 16.0 percent, respectively, resulting in an overall growth in total operations of approximately 143.5 percent.

Table 1-29 – Historical Military Operations

Year	Itinerant	Local	Total
2009	667	87	754
2010	1,170	406	1,576
2011	919	304	1,223
2012	2,107	446	2,553
2013	2,173	653	2,826
2014	1,558	518	2,076
2015	1,491	468	1,959
2016	1,482	458	1,940
2017	1,929	823	2,752
2018	1,453	383	1,836

Source: FAA GSO Control Tower Operations, CHA, 2019.

1.8.2 Forecast

As previously mentioned, military operations are not forecast using the same methodologies as the operations presented earlier in this chapter. Due to the inability to predict military activity and decisions, it was assumed that the military operations at GSO will remain static over the forecast period; therefore, military operations are assumed to remain static throughout the forecast period, with 1,453 itinerant operations and 383 local operations (a total of 1,836 annual military operations).

1.9 RECOMMENDED FORECAST SUMMARY

Several methodologies, as they related to each forecasting effort, were utilized during the evaluation process of developing the recommended forecast for the Airport. The following table presents a summary of the recommended aviation activity forecasts for air carrier activity (operations and enplanements), air taxi activity, air cargo, GA activity (based aircraft and operations), and military activity as detailed in the previous sections. The recommended forecasts are the projections on which operational noise model inputs will be based. **Table 1-30** presents the complete summary of the preferred forecast for based aircraft, enplanements, and operations by type.

Table 1-30 – Recommended Forecast

Year	Based Aircraft	Enplanements	Itinerant Operations						Local Operations			Total Airport Operations
			Air Carrier	Air Taxi	Cargo	GA	Military	Total Itinerant	Civil	Military	Total Local	
2018	99	941,025	32,774	10,034	6,458	24,596	1,453	75,315	5,816	383	6,199	81,514
2019	99	1,040,213	36,012	10,043	7,756	26,878	1,453	82,143	6,635	383	7,018	89,160
2020	99	1,067,533	36,359	10,053	8,204	26,964	1,453	83,033	6,656	383	7,039	90,072
2021	99	1,092,636	36,614	10,062	8,653	27,052	1,453	83,833	6,677	383	7,060	90,894
2022	98	1,116,240	36,806	10,071	9,102	27,140	1,453	84,573	6,699	383	7,082	91,656
2023	98	1,139,401	36,987	10,080	9,553	27,230	1,453	85,304	6,722	383	7,105	92,408
2024	98	1,161,533	37,124	10,090	10,004	27,321	1,453	85,992	6,744	383	7,127	93,119
2025	98	1,183,603	37,265	10,099	10,456	27,413	1,453	86,686	6,767	383	7,150	93,836
AAGR 2019-2025	**-0.2%**	**2.2%**	**0.6%**	**0.1%**	**5.1%**	**0.3%**	**0.0%**	**0.9%**	**0.3%**	**0.0%**	**0.3%**	**0.9%**
Growth 2019-2025	**-1.1%**	**13.8%**	**3.5%**	**0.6%**	**34.8%**	**2.0%**	**0.0%**	**5.5%**	**2.0%**	**0.0%**	**1.9%**	**5.2%**

Source: FAA 2018 TAF, FAA OPSNET, BTS, FAA Aerospace Forecast (FY 2019-2039), Boeing World Air Cargo Forecast (2018-2037), Airbus Global Market Forecast (2018-2037), FedEx, Koury Aviation, Signature Flight Support, Triad Aviation Academy (website), GSO Control Tower Statistics, PTAA, CHA, 2019.

1.9.1 Recommended Forecasts vs. FAA 2019 TAF

Direct comparisons to the FAA's 2019 TAF for GSO are provided for evaluation purposes. **Table 1-31** details the recommended forecast of enplanements and total airport operations (all activity types) in comparison to the FAA TAF forecast. Forecasts should be within 10 percent of the TAF in the first five years and 15 percent in 10 years, as set forth by the FAA in AC 150/5070-6B*, Airport Master Plans,* for approval of Master Plan forecasts. For the purposes of the Part 150 Study, the forecasts should be within 10 percent of the TAF at the five-year mark; per FAA requirements, the base year + 5 comparison year falls on 2023, although the forecast period ends in 2025.

At the end of the planning period, the recommended forecast predicts a level of enplanements approximately 6.6 percent above the GSO 2019 TAF, and total Airport operations approximately 9.5 percent above what is contained in the 2019 TAF for 2025. The Airport operations forecast is within the FAA's recommended range (+/- 10 percent of the TAF) and the forecast is considered reasonable due to recent growth in operations at the Airport. From 2015 through 2018, GSO experienced approximately 7.0 percent growth in total operations. The recommended forecast consists of a modest 0.9 percent average annual growth rate in total operations, whereas the FAA TAF assumes operations will increase in the near term and then decrease over the forecast period. Due to recent trends at the Airport, including announcements by airline and cargo operators, it is reasonable to forecast that GSO will continue to slowly grow as it has in recent years.

Table 1-31 – Recommended Forecast vs. 2019 TAF

Year	Enplanements			Operations		
	GSO TAF	Recommended Forecast	Recommended Forecast vs. TAF	GSO TAF	Recommended Forecast	Recommended Forecast vs. TAF
2018	915,482	941,025	2.8%	82,593	81,514	-1.3%
2019	1,048,146	1,040,213	-0.8%	89,294	89,160	-0.2%
2020	1,085,064	1,067,533	-1.6%	93,170	90,072	-3.3%
2021	1,090,671	1,092,636	0.2%	91,805	90,894	-1.0%
2022	1,095,877	1,116,240	1.9%	89,270	91,656	2.7%
2023	1,100,769	1,139,401	3.5%	85,896	92,408	7.6%
2024	1,105,440	1,161,533	5.1%	85,285	93,119	9.2%
2025	1,110,311	1,183,603	6.6%	85,679	93,836	9.5%
AAGR 2019-2025	1.0%	**2.2%**	-	-0.7%	**0.9%**	-
Growth 2019-2025	5.9%	**13.8%**	-	-4.0%	**5.2%**	-

Source: FAA 2019 TAF, FAA OPSNET, BTS Office of Airline Information (T-100 Data), FAA Aerospace Forecast (FY 2019-2039), Boeing World Air Cargo Forecast (2018-2037), Airbus Global Market Forecast (2018-2037), FedEx, Koury Aviation, Signature Flight Support, Triad Aviation Academy (website), PTAA, CHA, 2020.
Note: FAA TAF presented as Federal Fiscal Year, and Recommended Forecast presented as Calendar Year.

Per FAA recommendations, an appendix (**Appendix H**) has been included that provides a condensed look at the various forecast levels and growth rates, as well as operational factors at GSO, as presented in this Chapter.

1.10 DETAILED OPERATIONS FORECASTS

In accordance with Part 150 guidance, operations are shown by arrivals and departures, time-of-day, and stage length. Time-of-day only indicates whether the operation occurs during 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 (higher stage length) flights require more fuel; therefore, these flights have higher takeoff weights. Higher takeoff weights, in turn, increase takeoff distance and lower the aircraft's climb rate, as compared to lighter (shorter trip) flights. 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:

- Time-of-day:
  - Day Operations: 7:00 am to 10:00 pm
  - Night Operations: 10:00 pm to 7:00 am
- Stage Length:
  - Stage Length 1 (SL1): 0-500 Nautical Miles
  - Stage Length 2 (SL2): 500-1,000 Nautical Miles
  - Stage Length 3 (SL3): 1000-1,500 Nautical Miles
  - Stage Length 4 (SL4): 1,500-2,500 Nautical Miles

Operations forecasts for all activity types (e.g., commercial, cargo, military, and air taxi & GA) will be presented with this level of detail in order to facilitate the Noise Exposure Map modeling process. **Table 1-32** through **Table 1-42** present the derivative forecasts for 2018, 2020 and 2025 by type of operation.

Table 1-32 – Commercial Air Carrier Operations Derivative Forecast (2018)

Aircraft Type	Arrivals			Departures									Total Operations
	Day Ops	Night Ops	Total Arrivals	Day Ops				Night Ops				Total Departures	
				SL1	SL2	SL3	Total	SL1	SL2	SL3	Total		
B757-200	1	0	**1**	1	0	0	1	0	0	0	0	**1**	**2**
A220-300	0	0	**0**	0	0	0	0	0	0	0	0	**0**	**0**
A319	168	30	**198**	131	41	0	172	20	6	0	26	**198**	**396**
A320-100/200	209	38	**247**	101	114	0	214	15	17	0	33	**247**	**494**
A320-200N	16	3	**19**	8	9	0	16	1	1	0	3	**19**	**38**
A321	7	1	**8**	7	0	0	7	1	0	0	1	**8**	**16**
B717-200	779	142	**921**	799	0	0	799	122	0	0	122	**921**	**1,842**
B737-700/LR	4	1	**5**	4	0	0	4	1	0	0	1	**5**	**9**
B737-800	6	1	**7**	6	0	0	6	1	0	0	1	**7**	**13**
B737-900	0	0	**0**	0	0	0	0	0	0	0	0	**0**	**0**
CRJ900	1,965	357	**2,322**	2,014	0	0	2,014	308	0	0	308	**2,322**	**4,644**
E170	3	1	**4**	3	0	0	3	0	0	0	0	**4**	**7**
E175	1,311	238	**1,550**	619	725	0	1,344	95	111	0	205	**1,550**	**3,099**
MD-80/1/2/3/8	1,500	272	**1,772**	1,535	3	0	1,537	234	0	0	235	**1,772**	**3,544**
MD-90	5	1	**6**	5	0	0	5	1	0	0	1	**6**	**12**
CRJ200ER/440	2,693	489	**3,182**	1,942	818	0	2,760	297	125	0	421	**3,182**	**6,363**
CRJ700	763	139	**902**	781	2	0	783	119	0	0	119	**902**	**1,804**
ERJ140	1,425	259	**1,684**	1,460	1	0	1,461	223	0	0	223	**1,684**	**3,368**
ERJ145	2,984	542	**3,527**	2,016	1,043	0	3,059	308	159	0	467	**3,527**	**7,053**
DHC-8-2	5	1	**6**	5	0	0	5	1	0	0	1	**6**	**12**
DHC-8-3	25	4	**29**	25	0	0	25	4	0	0	4	**29**	**58**
Total	**13,868**	**2,519**	**16,387**	**11,462**	**2,755**	**0**	**14,217**	**1,750**	**421**	**0**	**2,170**	**16,387**	**32,774**

Source: BTS Office of Airline Information (T-100 Data), CHA, 2019.

Table 1-33 – Commercial Air Carrier Operations Derivative Forecast (2020)[20]

Aircraft Type	Arrivals			Departures										Total Operations
	Day Ops	Night Ops	Total Arrivals	Day Ops				Night Ops				Total Departures		
				SL1	SL2	SL3	Total	SL1	SL2	SL3	Total			
B757-200	0	0	**0**	0	0	0	0	0	0	0	0	**0**		**0**
A220-300	0	0	**0**	0	0	0	0	0	0	0	0	**0**		**0**
A319	186	34	**220**	145	46	0	191	22	7	0	29	**220**		**439**
A320-100/200	648	118	**765**	312	352	0	664	48	54	0	101	**765**		**1,531**
A320-200N	18	3	**21**	9	10	0	18	1	1	0	3	**21**		**42**
A321	8	2	**10**	9	0	0	9	1	0	0	1	**10**		**20**
B717-200	865	157	**1,022**	886	0	0	886	135	0	0	135	**1,022**		**2,043**
B737-700/LR	4	1	**5**	4	0	0	4	1	0	0	1	**5**		**10**
B737-800	422	77	**499**	433	0	0	433	66	0	0	66	**499**		**997**
B737-900	4	1	**5**	4	0	0	4	1	0	0	1	**5**		**10**
CRJ900	2,180	396	**2,576**	2,235	0	0	2,235	341	0	0	341	**2,576**		**5,152**
E170	0	0	**0**	0	0	0	0	0	0	0	0	**0**		**0**
E175	1,533	278	**1,811**	724	847	0	1,571	110	129	0	240	**1,811**		**3,622**
MD-80/1/2/3/8	832	151	**983**	851	1	0	853	130	0	0	130	**983**		**1,966**
MD-90	1	0	**2**	1	0	0	1	0	0	0	0	**2**		**3**
CRJ200ER/440	2,838	515	**3,353**	2,047	862	0	2,909	313	132	0	444	**3,353**		**6,706**
CRJ700	1,112	202	**1,314**	1,138	3	0	1,140	174	0	0	174	**1,314**		**2,628**
ERJ140	1,587	288	**1,875**	1,626	1	0	1,627	248	0	0	248	**1,875**		**3,750**
ERJ145	3,147	572	**3,719**	2,126	1,100	0	3,226	325	168	0	493	**3,719**		**7,438**
DHC-8-2	0	0	**0**	0	0	0	0	0	0	0	0	**0**		**0**
DHC-8-3	0	0	**0**	0	0	0	0	0	0	0	0	**0**		**0**
Total	**15,385**	**2,794**	**18,179**	**12,550**	**3,222**	**0**	**15,772**	**1,916**	**492**	**0**	**2,408**	**18,179**		**36,359**

Source: BTS Office of Airline Information (T-100 Data), CHA, 2019.

[20] Commercial Operations Derivative Forecasts for 2020 and 2025 are based on individual air carrier's historical (2018) and projected fleet. Transitions in fleet mix were considered when developing these forecasts.

Table 1-34 – Commercial Air Carrier Operations Derivative Forecast (2025)

Aircraft Type	Arrivals			Departures									Total Operations
	Day Ops	Night Ops	Total Arrivals	Day Ops				Night Ops				Total Departures	
				SL1	SL2	SL3	Total	SL1	SL2	SL3	Total		
B757-200	0	0	**0**	0	0	0	0	0	0	0	0	**0**	**0**
A220-300	426	77	**504**	437	0	0	437	67	0	0	67	**504**	**1,007**
A319	191	35	**225**	148	47	0	195	23	7	0	30	**225**	**450**
A320-100/200	877	159	**1,036**	422	477	0	899	64	73	0	137	**1,036**	**2,073**
A320-200N	18	3	**22**	9	10	0	19	1	2	0	3	**22**	**43**
A321	9	2	**10**	9	0	0	9	1	0	0	1	**10**	**20**
B717-200	886	161	**1,047**	908	0	0	908	139	0	0	139	**1,047**	**2,094**
B737-700/LR	4	1	**5**	4	0	0	4	1	0	0	1	**5**	**10**
B737-800	646	117	**763**	662	0	0	662	101	0	0	101	**763**	**1,526**
B737-900	6	1	**7**	6	0	0	6	1	0	0	1	**7**	**14**
CRJ900	2,234	406	**2,640**	2,290	0	0	2,290	350	0	0	350	**2,640**	**5,280**
E170	0	0	**0**	0	0	0	0	0	0	0	0	**0**	**0**
E175	1,900	345	**2,245**	897	1,050	0	1,948	137	160	0	297	**2,245**	**4,490**
MD-80/1/2/3/8	0	0	**0**	0	0	0	0	0	0	0	0	**0**	**0**
MD-90	0	0	**0**	0	0	0	0	0	0	0	0	**0**	**0**
CRJ200ER/440	2,250	409	**2,659**	1,623	683	0	2,307	248	104	0	352	**2,659**	**5,318**
CRJ700	1,852	336	**2,189**	1,895	4	0	1,899	289	1	0	290	**2,189**	**4,378**
ERJ140	1,626	295	**1,922**	1,666	1	0	1,667	254	0	0	255	**1,922**	**3,843**
ERJ145	2,842	516	**3,358**	1,920	993	0	2,914	293	152	0	445	**3,358**	**6,717**
DHC-8-2	0	0	**0**	0	0	0	0	0	0	0	0	**0**	**0**
DHC-8-3	0	0	**0**	0	0	0	0	0	0	0	0	**0**	**0**
Total	**15,769**	**2,864**	**18,632**	**12,898**	**3,267**	**0**	**16,164**	**1,969**	**499**	**0**	**2,468**	**18,632**	**37,265**

Source: BTS Office of Airline Information (T-100 Data), CHA, 2019.

Table 1-35 – Cargo Operations Derivative Forecast (2018)

Aircraft Type	Arrivals			Departures										Total Operations
	Day Ops	Night Ops	Total Arrivals	Day Ops				Night Ops				Total Departures		
				SL1	SL2	SL3	Total	SL1	SL2	SL3	Total			
A300	138	767	**905**	140	0	0	140	400	382	0	783	**923**		**1,828**
A310	0	1	**1**	0	0	0	0	1	0	0	1	**1**		**2**
ATR42	77	382	**459**	77	0	0	77	382	0	0	382	**459**		**918**
ATR72	1	5	**6**	1	0	0	1	5	0	0	5	**6**		**12**
B737-300	3	12	**15**	3	0	0	3	12	0	0	12	**15**		**30**
B757	111	555	**667**	111	0	0	111	399	157	0	556	**667**		**1,334**
B767	169	418	**587**	168	0	0	168	415	0	0	415	**583**		**1,170**
Cessna 208	65	325	**390**	65	0	0	65	325	0	0	325	**390**		**780**
MD10-10/30	32	160	**192**	32	0	0	32	160	0	0	160	**192**		**384**
DC10	0	0	**0**	0	0	0	0	0	0	0	0	**0**		**0**
Total	**596**	**2,626**	**3,222**	**597**	**0**	**0**	**597**	**2,100**	**539**	**0**	**2,639**	**3,236**		**6,458**

Source: FAA Aerospace Forecast (FY 2019-2039), Boeing World Air Cargo Forecast (2018-2037), Airbus Global Market Forecast (2018-2037), PTAA All-Cargo Data Reports, CHA, 2019.

Table 1-36 – Cargo Operations Derivative Forecast (2020)

Aircraft Type	Arrivals			Departures										Total Operations
	Day Ops	Night Ops	Total Arrivals	Day Ops				Night Ops				Total Departures		
				SL1	SL2	SL3	Total	SL1	SL2	SL3	Total			
A300	91	598	**689**	93	0	0	93	389	225	0	614	**707**		**1,396**
A310	0	0	**0**	0	0	0	0	0	0	0	0	**0**		**0**
ATR42	55	396	**451**	55	0	0	55	396	0	0	396	**451**		**901**
ATR72	0	0	**0**	0	0	0	0	0	0	0	0	**0**		**0**
B737-300	0	0	**0**	0	0	0	0	0	0	0	0	**0**		**0**
B757	192	1,393	**1,585**	192	0	0	192	943	451	0	1,394	**1,586**		**3,171**
B767	176	434	**610**	174	0	0	174	431	0	0	431	**605**		**1,215**
Cessna 208	0	0	**0**	0	0	0	0	0	0	0	0	**0**		**0**
MD10-10/30	0	0	**0**	0	0	0	0	0	0	0	0	**0**		**0**
DC10	92	668	**760**	92	0	0	92	668	0	0	668	**760**		**1,521**
Total	**605**	**3,490**	**4,095**	**606**	**0**	**0**	**606**	**2,827**	**676**	**0**	**3,503**	**4,109**		**8,204**

Source: FAA Aerospace Forecast (FY 2019-2039), Boeing World Air Cargo Forecast (2018-2037), Airbus Global Market Forecast (2018-2037), PTAA All-Cargo Data Reports, CHA, 2019.

Table 1-37 – Cargo Operations Derivative Forecast (2025)

Aircraft Type	Arrivals			Departures									Total Operations
	Day Ops	Night Ops	Total Arrivals	Day Ops				Night Ops				Total Departures	
				SL1	SL2	SL3	Total	SL1	SL2	SL3	Total		
A300	98	723	**821**	100	0	0	100	429	312	0	741	**841**	**1,662**
A310	0	0	**0**	0	0	0	0	0	0	0	0	**0**	**0**
ATR42	56	568	**624**	56	0	0	56	568	0	0	568	**624**	**1,248**
ATR72	0	0	**0**	0	0	0	0	0	0	0	0	**0**	**0**
B737-300	0	0	**0**	0	0	0	0	0	0	0	0	**0**	**0**
B757	281	2,824	**3,105**	282	0	0	282	2,044	780	0	2,824	**3,106**	**6,211**
B767	193	477	**670**	192	0	0	192	474	0	0	474	**665**	**1,335**
Cessna 208	0	0	**0**	0	0	0	0	0	0	0	0	**0**	**0**
MD10-10/30	0	0	**0**	0	0	0	0	0	0	0	0	**0**	**0**
DC10	0	0	**0**	0	0	0	0	0	0	0	0	**0**	**0**
Total	**629**	**4,592**	**5,220**	**630**	**0**	**0**	**630**	**3,514**	**1,092**	**0**	**4,606**	**5,236**	**10,456**

Source: FAA Aerospace Forecast (FY 2019-2039), Boeing World Air Cargo Forecast (2018-2037), Airbus Global Market Forecast (2018-2037), PTAA All-Cargo Data Reports, CHA, 2019.

Table 1-38 – Military Operations Derivative Forecast (2018-2025)

Aircraft Type	Arrivals			Departures									Total Operations
	Day Ops	Night Ops	Total Arrivals	Day Ops				Night Ops				Total Departures	
				SL1	SL2	SL3	Total	SL1	SL2	SL3	Total		
Single-Engine Piston	10	1	**11**	10	0	0	10	1	0	0	1	**11**	**22**
Multi-Engine Piston	0	0	**0**	0	0	0	0	0	0	0	0	**0**	**0**
Single-Engine Turbo-Prop	41	2	**43**	41	0	0	41	2	0	0	2	**43**	**87**
Multi-Engine Turbo-Prop	206	11	**217**	206	0	0	206	11	0	0	11	**217**	**433**
Military Jet	481	25	**506**	481	0	0	481	25	0	0	25	**506**	**1,013**
Rotorcraft	134	7	**141**	134	0	0	134	7	0	0	7	**141**	**282**
Total	**872**	**46**	**918**	**872**	**0**	**0**	**872**	**46**	**0**	**0**	**46**	**918**	**1,836**

Source: FAA GSO Control Tower, CHA, 2019.

Table 1-39 – Air Taxi & GA Operations Derivative Forecast (2018)

Aircraft Type	Arrivals Day Ops	Arrivals Night Ops	Total Arrivals	Departures Day Ops SL1	SL2	SL3	SL4	Total	Departures Night Ops SL1	SL2	SL3	SL4	Total	Total Departures	Total Operations
Single-Engine Piston	2,938	326	**3,264**	2,935	3	0	0	2,938	326	0	0	0	326	**3,264**	**6,528**
Multi-Engine Piston	2,121	236	**2,357**	2,121	0	0	0	2,121	236	0	0	0	236	**2,357**	**4,714**
Single-Engine Turbo-Prop	1,369	152	**1,521**	1,367	2	0	0	1,369	152	0	0	0	152	**1,521**	**3,042**
Multi-Engine Turbo-Prop	1,591	177	**1,768**	1,590	1	0	0	1,591	177	0	0	0	177	**1,768**	**3,536**
Business Jet	10,161	1,129	**11,290**	10,105	37	9	10	10,161	1,127	0	1	1	1,129	**11,290**	**22,579**
Rotorcraft	21	2	**23**	21	0	0	0	21	2	0	0	0	2	**23**	**46**
Total	**18,201**	**2,022**	**20,223**	**18,139**	**43**	**9**	**10**	**18,201**	**2,020**	**0**	**1**	**1**	**2,022**	**20,223**	**40,446**

Source: FAA 2018 TAF, FAA GSO Control Tower Statistics, CHA, 2019.

Table 1-40 – Air Taxi & GA Operations Derivative Forecast (2020)

Aircraft Type	Arrivals Day Ops	Arrivals Night Ops	Total Arrivals	Departures Day Ops SL1	SL2	SL3	SL4	Total	Departures Night Ops SL1	SL2	SL3	SL4	Total	Total Departures	Total Operations
Single-Engine Piston	3,172	352	**3,525**	3,169	3	0	0	3,172	352	0	0	0	352	**3,525**	**7,049**
Multi-Engine Piston	2,291	255	**2,545**	2,291	0	0	0	2,291	255	0	0	0	255	**2,545**	**5,090**
Single-Engine Turbo-Prop	1,478	164	**1,642**	1,476	2	0	0	1,478	164	0	0	0	164	**1,642**	**3,285**
Multi-Engine Turbo-Prop	1,718	191	**1,909**	1,717	1	0	0	1,718	191	0	0	0	191	**1,909**	**3,818**
Business Jet	10,971	1,219	**12,190**	10,908	34	1	3	10,971	1,216	0	0	0	1,219	**12,190**	**24,381**
Rotorcraft	22	2	**25**	22	0	0	0	22	2	0	0	0	2	**25**	**50**
Total	**19,653**	**2,184**	**21,836**	**19,583**	**40**	**1**	**3**	**19,653**	**2,181**	**0**	**0**	**0**	**2,184**	**21,836**	**43,673**

Source: FAA 2018 TAF, FAA GSO Control Tower Statistics, CHA, 2019.

Table 1-41 – Air Taxi & GA Operations Derivative Forecast (2025)

Aircraft Type	Arrivals			Departures											Total Operations
	Day Ops	Night Ops	Total Arrivals	Day Ops					Night Ops					Total Departures	
				SL1	SL2	SL3	SL4	Total	SL1	SL2	SL3	SL4	Total		
Single-Engine Piston	3,216	357	**3,573**	3,213	3	0	0	3,216	357	0	0	0	357	**3,573**	**7,147**
Multi-Engine Piston	2,322	258	**2,581**	2,322	0	0	0	2,322	258	0	0	0	258	**2,581**	**5,161**
Single-Engine Turbo-Prop	1,499	167	**1,665**	1,497	2	0	0	1,499	167	0	0	0	167	**1,665**	**3,331**
Multi-Engine Turbo-Prop	1,742	194	**1,935**	1,741	1	0	0	1,742	194	0	0	0	194	**1,935**	**3,871**
Business Jet	11,124	1,236	**12,360**	11,060	34	1	3	11,124	1,233	0	0	0	1,236	**12,360**	**24,719**
Rotorcraft	23	3	**25**	23	0	0	0	23	3	0	0	0	3	**25**	**51**
Total	**19,926**	**2,214**	**22,140**	**19,856**	**40**	**1**	**3**	**19,926**	**2,211**	**0**	**0**	**0**	**2,214**	**22,140**	**44,279**

Source: FAA 2018 TAF, FAA GSO Control Tower Statistics, CHA, 2019.

Table 1-42 – Touch and Go Operations

Aircraft Type	2018	2020	2025
Single-Engine Piston	2,550	3,012	3,070
Multi-Engine Piston	1,243	1,526	1,553
Single-Engine Turbo-Prop	1,150	1,245	1,271
Multi-Engine Turbo-Prop	64	64	64
Business Jet	908	908	908
Rotorcraft	284	284	284
Total	**6,199**	**7,039**	**7,150**

Source: FAA 2018 TAF, FAA GSO Control Tower Statistics, HAECO, CHA, 2019.

Note: Operations performed by HAECO, Honda Aircraft Company, and Cessna Citation Service Center are incorporated.

APPENDIX A – LEAKAGE STUDY

Top 15 GSO Domestic Markets: Primary Catchment Area

Market	O&D Passengers Using GSO (YE Q3 2015)	Leakage to/from CLT, RDU or ROA[1] (YE Q3 2015)	Total Market Size (YE Q3 2015)	PDEW (YE Q3 2015)	% Leakage (YE Q3 2015)
New York (EWR,JFK,LGA)	176,695	106,989	283,684	389	37.7%
S Florida (FLL,MIA,PBI)	79,138	54,305	133,442	183	40.7%
Chicago (MDW,ORD)	70,437	51,489	121,926	167	42.2%
Orlando (MCO,SFB)	66,027	54,708	120,735	165	45.3%
Boston (BOS,MHT,PVD)	35,277	63,504	98,781	135	64.3%
Atlanta (ATL)	75,261	17,563	92,824	127	18.9%
Dallas (DAL,DFW)	54,779	38,031	92,809	127	41.0%
Washington/Baltimore (BWI,DCA,IAD)	56,497	34,113	90,610	124	37.6%
LA Basin (BUR,LAX,LGB,ONT,SNA)	43,237	46,104	89,342	122	51.6%
Tampa (PIE,TPA)	56,891	20,190	77,081	106	26.2%
Philadelphia (PHL)	61,967	13,239	75,206	103	17.6%
Denver (DEN)	56,361	16,184	72,544	99	22.3%
Bay Area (OAK,SJC,SFO)	25,801	38,518	64,319	88	59.9%
Las Vegas (LAS)	26,851	36,031	62,882	86	57.3%
Houston (HOU,IAH)	19,184	29,473	48,657	67	60.6%
Others	561,596	459,528	1,021,125	1,399	45.0%
Total	1,465,997	1,079,968	2,545,965	3,488	42.4%

1/ Includes passengers originating in the GSO service area and an estimate of passengers originating from the markets listed.

Source: Adjusted ARC, YE Q3 2015.

Campbell-Hill Aviation Group, LLC

APPENDIX B – HISTORICAL DATA SETS

Table B-1 – Socioeconomic Factors: GSO Catchment Area

Year	Population (000)	Employment (000)	Per Capita Income ($)	GRP (000)
2009	1,628.2	923.1	32,453.9	63,177.9
2010	1,640.8	911.9	32,754.8	65,494.2
2011	1,651.9	924.4	33,696.5	64,722.5
2012	1,661.8	931.8	35,151.2	63,456.7
2013	1,672.4	943.1	35,086.5	65,977.0
2014	1,685.7	957.8	36,733.4	67,810.2
2015	1,698.8	977.3	37,897.7	70,482.4
2016	1,715.0	993.2	38,482.8	72,424.9
2017	1,732.7	1,008.6	39,539.8	74,124.0
2018	1,750.5	1,023.1	40,686.2	75,775.7

Source: Woods &Poole Economics, Inc., CHA, 2019.

Table B-2 – Operational Activity

Year	Itinerant Operations							Local Operations			Total Operations
	Commercial	Air Taxi	Cargo		GA	Military	Total	Civil	Military	Total	
			Integrators	Other All-Cargo							
2009	40,835	6,483	2,606	2,612	26,986	667	80,189	2,269	87	2,356	82,545
2010	38,848	6,195	2,992	2,450	28,898	1,170	80,553	9,062	406	9,468	90,021
2011	37,050	6,447	2,968	2,460	30,921	919	80,765	8,778	304	9,082	89,847
2012	36,762	6,182	2,918	2,438	27,786	2,107	78,193	9,518	446	9,964	88,157
2013	32,553	8,575	2,992	2,376	25,134	2,173	73,803	7,931	653	8,584	82,387
2014	31,774	8,974	2,506	2,354	24,084	1,558	71,250	6,254	518	6,772	78,022
2015	31,532	9,845	2,606	2,386	23,652	1,491	71,512	4,235	468	4,703	76,215
2016	31,120	10,040	2,606	2,188	24,035	1,482	71,471	6,694	458	7,152	78,623
2017	31,056	10,597	2,976	3,304	24,891	1,929	74,753	7,135	823	7,958	82,711
2018	32,774	10,034	3,590	2,868	24,596	1,453	75,315	5,816	383	6,199	81,514

Source: BTS Office of Airline Information, PTAA, CHA, 2019.

Table B-3 – GSO's Percent Market Share: Enplanements

Year	% of National	% of State	% of Regional
2009	0.1%	3.6%	3.8%
2010	0.1%	3.5%	3.6%
2011	0.1%	3.5%	3.6%
2012	0.1%	3.4%	3.5%
2013	0.1%	3.1%	3.2%
2014	0.1%	3.0%	3.1%
2015	0.1%	2.9%	3.1%
2016	0.1%	2.9%	3.0%
2017	0.1%	3.0%	3.1%
2018	0.1%	3.0%	3.1%

Source: FAA 2018 TAF, BTX Office of Airline Information (T-100 Data), CHA, 2019.

Table B-4 – GSO's Percent Market Share: GA Based Aircraft

Year	% of National	% of State	% of Regional
2009	0.06%	2.75%	0.30%
2010	0.06%	2.93%	0.32%
2011	0.07%	3.23%	0.38%
2012	0.06%	3.04%	0.35%
2013	0.06%	2.94%	0.33%
2014	0.06%	3.05%	0.34%
2015	0.06%	2.95%	0.32%
2016	0.06%	2.84%	0.30%
2017	0.06%	2.94%	0.32%
2018	0.06%	2.87%	0.31%

Source: FAA 2018 TAF, Koury Aviation, Signature Flight Support, Triad Aviation Academy (website), CHA, 2019.

Table B-5 – GSO's Percent Market Share: GA Operations

Year	% of National	% of State	% of Regional
2009	0.04%	1.76%	0.18%
2010	0.05%	2.27%	0.25%
2011	0.06%	2.25%	0.26%
2012	0.05%	2.25%	0.24%
2013	0.05%	2.00%	0.21%
2014	0.04%	1.86%	0.20%
2015	0.04%	1.66%	0.18%
2016	0.05%	1.87%	0.20%
2017	0.05%	1.90%	0.21%
2018	0.04%	1.79%	0.19%

Source: FAA 2018 TAF, Koury Aviation, Signature Flight Support, Triad Aviation Academy (website), CHA, 2019.

APPENDIX C – ENPLANEMENTS FORECAST METHODOLOGIES

TAF Variable Growth Analysis

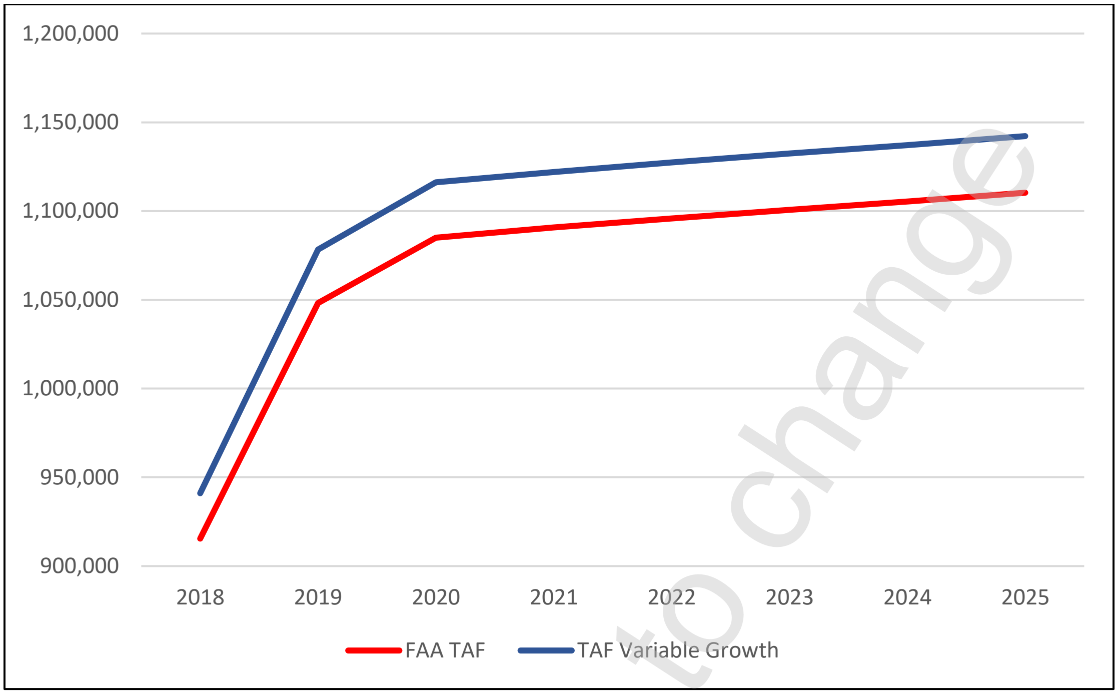
The TAF variable growth analysis takes the FAA's year-over-year growth rate (variable growth) and applies that variable to actual enplanement data provided by the PTAA. In other words, the TAF's growth rate from 2019 to 2020 is applied to an actual 2019 enplanement count to determine the enplanements for 2020. For example, the FAA TAF has an estimated 2019 enplanement number of 1,048,146. From 2019 to 2020, the FAA TAF predicts that enplanements will grow to 1,085,064, which is approximately a 3.5 percent growth. According to PTAA records, the actual enplanement number was 1,078,247. The 3.5 percent growth rate was applied to the actual 1,078,247 enplanements to determine the projected enplanements (1,116,225) for 2020. The process is repeated for each forecasted year. The result of this methodology was 1,142,197 enplanements in 2025, approximately 2.9 percent above the 1,110,311 reported in the TAF. It is important to note that the TAF does not reflect regional service growth trends or potential introduction of new service in the Greensboro, NC region; therefore, this scenario was not considered for the recommended forecast for GSO. See **Table C-1** and **Figure C-1**.

Table C-1 – TAF Growth Forecast Comparisons

Year	FAA TAF	TAF Variable Growth	% Change
2018	915,482	941,025	-
2019	1,048,146	1,078,247	-
2020	1,085,064	1,116,225	3.5%
2021	1,090,671	1,121,993	0.5%
2022	1,095,877	1,127,349	0.5%
2023	1,100,769	1,132,381	0.4%
2024	1,105,440	1,137,186	0.4%
2025	1,110,311	1,142,197	0.4%
AAGR 2019-2025	1.0%	**1.0%**	**-**
Growth 2019-2025	5.9%	**5.9%**	**-**

Source: FAA 2019 TAF, PTAA, CHA, 2020.

Figure C-1 – TAF Growth Forecast Comparisons



Source: FAA TAF, BTS Office of Airline Information (T-100 Data), CHA, 2020.

Trend Analysis

A historical trend forecast is a simple time-series model that relies on extrapolating historical enplanements into the future. Examining the historical growth rates and projecting them forward provides a picture of growth, assuming the market area and the state of the commercial passenger airline industry reflect past trends through the forecast period. For the historical trend scenario, the historical enplanement data was projected forward through the forecast horizon.

As previously mentioned, GSO's historical trend of passenger enplanements have fluctuated over the historical period (since 2009). In 2019, GSO reached its highest level of enplanements (1,078,247) over the past 10 years, with the second highest enplanement count (941,025) in that time frame occurring in 2018 and the third highest (893,564) occurring in 2011. For the purposes of the Historical Trend Analysis, two scenarios were identified in the evaluation (5-year and 10-year) of the time series model, as shown in **Table C-2**.

As shown in **Figure C-2**, the historical time trend analysis results in varying degrees of growth rates. The fluctuating nature of passenger growth of the previous 10-year period at GSO reveals an initial decline in enplanements, followed by steady growth, between the 5- and 10-year period. The following details the AAGR within the various time periods included in this evaluation:

- 5-Year Historical Trend – resulted in a 2.0 percent AAGR FY 2014 to 2018
- 10-Year Historical Trend – resulted in a 0.9 percent AAGR 2009 to 2018

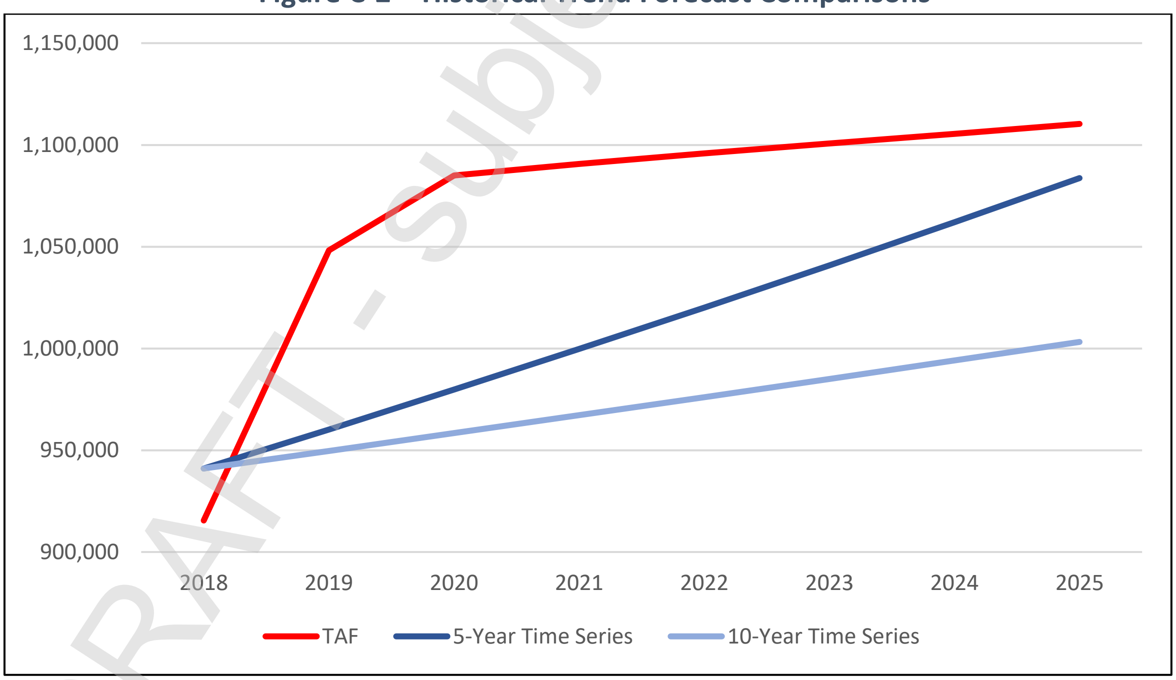
Table C-2 – Historical Trend Forecast Comparisons

Year	TAF	5-Year Time Series	10-Year Time Series
2018	915,482	941,025	941,025
2019	1,048,146	960,194	949,666
2020	1,085,064	979,753	958,386
2021	1,090,671	999,710	967,186
2022	1,095,877	1,020,075	976,066
2023	1,100,769	1,040,854	985,029
2024	1,105,440	1,062,056	994,073
2025	1,110,311	1,083,690	1,003,201
AAGR 2019-2025	1.0%	**2.0%**	**0.9%**
Growth 2019-2025	5.9%	**12.9%**	**5.6%**

Source: FAA 2019 TAF, BTS Office of Airline Information (T-100), CHA, 2020.

The 5-year time trend scenario represents a projection that is 2.4 percent lower than the TAF, while the 10-year time trend scenarios represents a projection significantly lower than the TAF (9.6 percent). It is important to note that within the last 5 years, a new ultra-low-cost carrier was introduced to the Airport, resulting in a higher than normal increase in enplanements, which may not be sustainable over the forecast period. These scenarios are not considered to be reliable projections at the Airport because they do not account for future growth resulting from the new ultra-low-cost carrier, who is expected to see a sharp increase in enplanements during the forecast period.

Figure C-2 – Historical Trend Forecast Comparisons



Source: FAA TAF, BTS Office of Airline Information (T-100), CHA, 2019.

Market Share Analysis

In a market share forecast, the dependent variables of the item being forecast (i.e., airport specific operations or enplanements) are compared to independent variables of a larger aggregate (i.e., region, state, or national operations or enplanements). In this case, enplanements represent the independent variable. GSO has an identified enplanement level within each fiscal year. When this level is compared to a total of a larger whole (i.e., national enplanements), a percentage (i.e., market share) can be determined. This analysis has shown that growth in an airport's market can be correlated to aviation activity on a larger scale. Through a direct comparison of various levels of enplanement projections versus GSO market area growth rates, the forecasts can be adjusted to reflect differing larger scale markets to local growth trends. Below are market share analyses evaluated during this forecasting effort. Historical percent market shares are shown in **Table C-3**, while the results of each of the scenarios are presented and compared in **Table C-4**. (See **Appendix B** for historical market share.)

- Average Market Share (National, State, & Regional) – This methodology uses the aggregate (national, state, or regional) level forecast of commercial enplanements identified in the FAA's TAF to derive forecasts for the Airport based on market share. This forecast methodology assumes that GSO will maintain a level market share, based on its 10-year average market share of commercial enplanements relative to activity projections of the larger aggregate throughout the planning period.

- Static Market Share (National, State, & Regional) – While similar to the Average Market Share methodology, this forecast uses activity projections derived from the FAA TAF and airport-reported enplanement levels as the basis for determining market share. This forecast assumes that GSO will maintain its 2018 (most recent annual enplanements) level of commercial enplanements relative to market activity projections of the larger aggregate (national, state, or regional) throughout the planning period. The Static Market Share forecast is considered a relatively conservative range of potential commercial activity based on market conditions within the larger aggregate.

- Variable Growth Market Share (State) – In this methodology, the year-over-year percent growth of the larger aggregate (state) is applied to GSO's yearly enplanements and is carried out throughout the forecast horizon to project future enplanements. In other words, the year-over-year enplanements at GSO will grow rate at the same year-over-year aggregate (state).

- Adjusted Static Regional Market Share – The Adjusted Static Regional Market Share methodology uses the aggregate, regional-level forecast of commercial activity projections from the FAA's TAF for the individual commercial service airports in the region (GSO, CLT, RDU, ROA, & JQF) to derive a forecast for the Airport based on its regional market share. This forecast assumes that GSO will maintain its 2018 (most recent annual enplanements) level, or static market share, of commercial enplanements relative to regional activity projections throughout the planning period.

Table C-3 – Historical Percent Market Share

Year	National	State	Regional
2009	0.12%	3.62%	3.77%
2010	0.12%	3.47%	3.62%
2011	0.12%	3.45%	3.60%
2012	0.12%	3.36%	3.50%
2013	0.12%	3.10%	3.22%
2014	0.11%	3.00%	3.11%
2015	0.11%	2.95%	3.05%
2016	0.10%	2.90%	3.00%
2017	0.10%	2.97%	3.09%
2018	0.11%	3.03%	3.15%

Source: FAA 2018 TAF, BTS Office of Airline Information (T-100 Data), CHA, 2019.

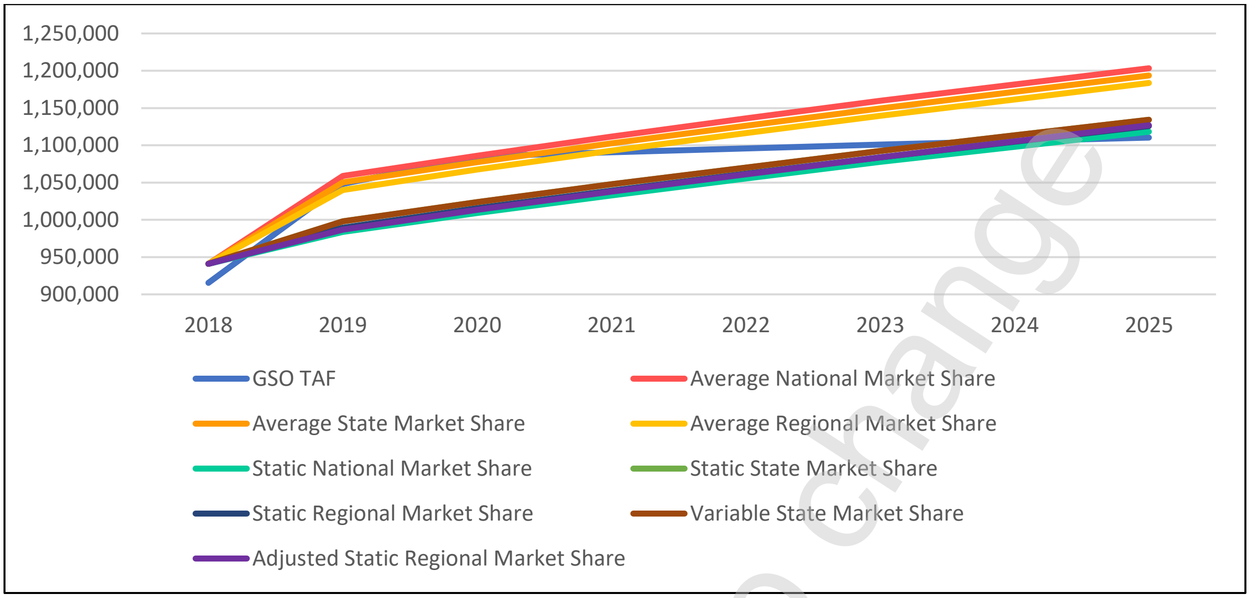
Table C-4 – Market Share Forecast Comparisons

Year	Average Market Share			Static Market Share			Variable Growth Market Share	Adjusted Static Regional Market Share
	National	State	Regional	National	State	Regional	State	
2018	941,025	941,025	941,025	941,025	941,025	941,025	941,025	941,025
2019	1,058,671	1,050,104	1,040,213	983,829	997,834	989,375	997,834	986,921
2020	1,086,030	1,077,507	1,067,533	1,009,254	1,023,874	1,015,360	1,023,874	1,013,553
2021	1,111,437	1,102,638	1,092,636	1,032,865	1,047,753	1,039,236	1,047,753	1,038,036
2022	1,135,903	1,126,255	1,116,240	1,055,602	1,070,194	1,061,686	1,070,194	1,061,064
2023	1,159,612	1,149,420	1,139,401	1,077,634	1,092,206	1,083,715	1,092,206	1,083,666
2024	1,181,612	1,171,537	1,161,533	1,098,079	1,113,223	1,104,766	1,113,223	1,105,268
2025	1,203,273	1,193,597	1,183,603	1,118,209	1,134,184	1,125,758	1,134,184	1,126,812
AAGR 2019-2025	**2.2%**	**2.2%**	**2.2%**	**2.2%**	**2.2%**	**2.2%**	**2.2%**	**2.2%**
Growth 2019-2025	**13.7%**	**13.7%**	**13.8%**	**13.7%**	**13.7%**	**13.8%**	**13.7%**	**14.2%**

Source: FAA 2018 TAF, BTS Office of Airline Information (T-100 Data), CHA, 2019.

The Average Regional Market Share forecast was chosen as the recommended enplanements forecast, as enplanements resulting from recently added service and destinations are accounted for within this analysis.

Figure C-3 – Market Share Forecast Comparisons



Source: FAA TAF, BTS Office of Airline Information (T-100 Data), CHA, 2019.

Regression Analysis

As mentioned previously, regression-based forecasts examine aviation and passenger activity to determine if there is a causal relationship between the activity levels and the socioeconomic conditions prevalent during that period. Several different economic-, income-, and population-based regression analyses were initially performed. The first step was to conduct a regression analysis to determine if there is a relationship between any of the socioeconomic factors (i.e., population, income, and employment) addressed earlier in the chapter and the historical level of enplanements. The key output of a regression analysis is called the ‘coefficient of determination’, denoted as R^2, which ranges from 0 to 1.0. If the R^2 of an analysis falls between 0.85 and 1.0, there is a strong statistical correlation; if it falls below 0.85, there is not a strong statistical correlation. In other words, the higher the R^2 value, the stronger the correlation is between the variables. The following regression analyses were conducted, with the resulting R^2 value shown for each:

- Population-Based Regression: R^2-value = 0.19
- Employment Based Regression: R^2-value = 0.16
- Income-Based Regression: R^2-value = 0.16
- Population-Income Regression: R^2-value = 0.28
- Employment-Income Based Regression: R^2-value = 0.16
- Population-Income-Employment Regression: R^2-value = 0.29

Though the socioeconomic indicators have grown at rates that are consistent with those at the state and national levels, the 10-year historical GSO enplanements have fluctuated over the 10-year historical period: declining from 2009 to 2010, increasing from 2010 to 2011, decreasing from 2011 to 2015, and increasing from 2015 to 2018. As discussed in **Section 1.4.1**, the overall economic changes at GSO within the 10-year historical period can be attributed to regional and national economic impacts. For example, the national recession and high fare prices contributed to decreasing enplanement activity at GSO. Based on these parameters and fluctuations in Airport activity, it is evident that there is poor correlation between the 10-year relatively stable socioeconomic history in the study area and the Airport.

Recently, with the introduction of an ultra-low-cost carrier, as well as the new service routes associated with that carrier, GSO enplanement figures have begun to rebound and trend towards historical highs. As such, the 10-year historical socioeconomic regression analyses do not show a strong correlation to enplanements to serve as the preferred forecast scenario. The results of these analyses are presented in **Table C-5**.

Table C-5 – Regression Forecast Comparisons

Year	TAF	Population Based	Employment Based	Income Based	Population-Income Based	Employment-Income Based	Population-Employment-Income Based
2018	915,482	941,025	941,025	941,025	941,025	941,025	941,025
2019	1,048,146	900,006	896,362	896,103	906,518	896,463	907,132
2020	1,085,064	905,852	900,599	901,908	909,228	901,092	911,356
2021	1,090,671	911,742	904,816	908,267	909,056	905,833	913,005
2022	1,095,877	917,680	909,023	915,329	905,169	910,729	911,307
2023	1,100,769	923,656	913,222	923,026	897,898	915,766	906,552
2024	1,105,440	929,674	917,381	931,337	887,384	920,914	898,912
2025	1,110,311	935,716	921,506	940,402	872,713	926,211	887,518
AAGR 2019-2025	**1.0%**	**0.7%**	**0.5%**	**0.8%**	**-0.6%**	**0.5%**	**-0.4%**
Growth 2019-2025	**5.9%**	**4.0%**	**2.8%**	**4.9%**	**-3.7%**	**3.3%**	**-2.2%**
R2	**-**	**0.19**	**0.16**	**0.16**	**0.28**	**0.16**	**0.29**

Source: FAA 2019 TAF, Woods & Poole Economics, Inc. CHA, 2019.

(See **Appendix D** for comparisons of all enplanement forecast methodologies.)

Additionally, more in-depth, regression analyses (including GRP) also resulted in poor correlations and were not considered realistic for representation of enplanements at GSO.

Table C-6 – Socioeconomic Regression Outputs

Regression Output	Population Based	Employment Based	Income Based	Population-Income Based	Employment-Income Based	Population-Employment-Income Based
R2	0.19	0.16	0.16	0.28	0.16	0.29
Intercept	329,526.39	580,613.46	723,820.46	-1,605,048.45	611,770.98	-1,692,241.81
X-Variable 1	322.58	304.42	4.11	1,975.41	236.03	2,200.09
X-Variable 2	-	-	-	-23.41	0.95	-374.29
X-Variable 3	-	-	-	-	-	-21.53

Source: FAA 2018 TAF, Woods & Poole Economics, Inc. CHA, 2019.

Table C-7 – Socioeconomic & GRP: Regression Outputs

Regression Output	GRP Based	Pop.-GRP Based	Emp.-GRP Based	Inc.-GRP Based	Pop.-Inc.-GRP Based	Emp.-Inc.-GRP Based	Pop.-Emp.-Inc.-GRP Based
R2	0.13	0.25	0.18	0.16	0.42	0.18	0.44
Intercept	713,356.20	-352,911.07	448,450.01	737,317.89	-3,704,972.37	447,674.04	-4,200,348.69
X-Variable 1	2.33	967.66	676.56	5.56	3,872.41	678.30	3,972.43
X-Variable 2	-	-5.91	-3.29	-0.97	-35.12	-0.02	891.41
X-Variable 3	-	-	-	-	-9.80	-3.29	-43.50

Source: FAA 2018 TAF, Woods & Poole Economics, Inc. CHA, 2019.

Table C-8 – Socioeconomic & GRP: Regression Result

Year	GRP Based	Population-GRP Based	Employment-GRP Based	Income-GRP Based	Population-Income-GRP Based	Employment-Income-GRP Based	Population-Employment-Income-GRP Based
2018	941,025	941,025	941,025	941,025	941,025	941,025	941,025
2019	893,803	901,124	895,498	895,619	911,632	895,495	911,882
2020	**897,607**	909,021	899,545	901,900	916,175	899,534	913,434
2021	**901,437**	916,984	903,512	908,919	916,408	903,488	909,463
2022	**905,316**	924,965	907,386	916,869	910,997	907,347	898,330
2023	**909,244**	932,940	911,175	925,660	900,415	911,116	880,649
2024	**913,162**	941,064	914,886	935,287	885,121	914,804	856,908
2025	**917,085**	949,248	918,519	945,932	863,643	918,410	825,349
AAGR 2019-2025	**0.4%**	**0.9%**	**0.4%**	**0.9%**	**-0.9%**	**0.4%**	**-1.6%**
Growth 2019-2025	**2.6%**	**5.3%**	**2.6%**	**5.6%**	**-5.3%**	**2.6%**	**-9.5%**

Source: FAA 2018 TAF, Woods & Poole Economics, Inc. CHA, 2019.

APPENDIX D – NATIONAL TAF AND PROJECTED ENPLANEMENTS

Table D-1 – National TAF and Projected Enplanements

Year	National TAF	GSO TAF	TAF Growth Analysis	Historical Time Trend		Market Share Scenarios								Regression Scenarios					
				5-Year	10-Year	Average National	Static National	Average State	Static State	Variable State	Static Regional	Average Regional	Adjusted Static Regional	Population Based	Employment Based	Income Based	Population-Income Based	Employment-Income Based	Population-Employment-Income Based
2018	888,360,299	915,482	941,025	941,025	941,025	941,025	941,025	941,025	941,025	941,025	941,025	941,025	941,025	941,025	941,025	941,025	941,025	941,025	941,025
2019	922,624,258	1,048,146	945,172	960,194	949,666	1,058,671	983,829	1,050,104	997,834	997,834	989,375	1,040,213	986,921	900,006	896,362	896,103	906,518	896,463	907,132
2020	967,184,383	1,085,064	949,338	979,753	958,386	1,086,030	1,009,254	1,077,507	1,023,874	1,023,874	1,015,360	1,067,533	1,013,553	905,852	900,599	901,908	909,228	901,092	911,356
2021	989,370,387	1,090,671	953,522	999,710	967,186	1,111,437	1,032,865	1,102,638	1,047,753	1,047,753	1,039,236	1,092,636	1,038,036	911,742	904,816	908,267	909,056	905,833	913,005
2022	1,011,104,771	1,095,877	957,724	1,020,075	976,066	1,135,903	1,055,602	1,126,255	1,070,194	1,070,194	1,061,686	1,116,240	1,061,064	917,680	909,023	915,329	905,169	910,729	911,307
2023	1,032,303,857	1,100,769	961,945	1,040,854	985,029	1,159,612	1,077,634	1,149,420	1,092,206	1,092,206	1,083,715	1,139,401	1,083,666	923,656	913,222	923,026	897,898	915,766	906,552
2024	1,052,961,396	1,105,440	966,184	1,062,056	994,073	1,181,612	1,098,079	1,171,537	1,113,223	1,113,223	1,104,766	1,161,533	1,105,268	929,674	917,381	931,337	887,384	920,914	898,912
2025	1,073,920,401	1,110,311	970,442	1,083,690	1,003,201	1,203,273	1,118,209	1,193,597	1,134,184	1,134,184	1,125,758	1,183,603	1,126,812	935,716	921,506	940,402	872,713	926,211	887,518
AAGR 2019-2025	**2.2%**	**1.0%**	**0.4%**	**2.0%**	**0.9%**	**2.2%**	**2.2%**	**2.2%**	**2.2%**	**2.2%**	**2.2%**	**2.2%**	**2.2%**	**0.7%**	**0.5%**	**0.8%**	**-0.6%**	**0.5%**	**-0.4%**
Growth 2019-2025	**13.7%**	**5.9%**	**2.7%**	**12.9%**	**5.6%**	**13.7%**	**13.7%**	**13.7%**	**13.7%**	**13.7%**	**13.8%**	**13.8%**	**14.2%**	**4.0%**	**2.8%**	**4.9%**	**-3.7%**	**3.3%**	**-2.2%**
% Dif. From TAF (in 2023)			**-12.6%**	**-5.4%**	**-10.5%**	**5.3%**	**-2.1%**	**4.4%**	**-0.8%**	**-0.8%**	**-1.5%**	**3.5%**	**-1.6%**	**-16.1%**	**-17.0%**	**-16.1%**	**-18.4%**	**-16.8%**	**-17.6%**
% Dif. From TAF (in 2025)			**-12.6%**	**-2.4%**	**-9.6%**	**8.4%**	**0.7%**	**7.5%**	**2.2%**	**2.2%**	**1.4%**	**6.6%**	**1.5%**	**-15.7%**	**-17.0%**	**-15.3%**	**-21.4%**	**-16.6%**	**-20.1%**

Source: FAA 2019 TAF, Woods & Poole Economics, Inc., PTAA, CHA, 2019.

APPENDIX E – AIRPORT PROVIDED DATA

Table E-1 – Control Tower Statistics (2009-2018)

Year	User	January	February	March	April	May	June	July	August	September	October	November	December	Total
2009	Commercial Air Carriers	1,092	1,081	1,331	1,350	1,282	1,319	1,244	1,248	1,123	1,312	1,206	1,185	14,773
2009	Air Taxi	3,281	3,046	3,325	3,228	3,254	3,112	3,373	3,290	3,003	3,069	2,838	2,944	37,763
2009	General Aviation-Itinerant	1,865	1,810	2,225	2,530	2,349	2,291	2,322	2,347	2,351	2,573	2,314	2,009	26,986
2009	General Aviation-Local	107	137	147	162	104	203	286	168	100	235	282	338	2,269
2009	Military-Itinerant	34	54	49	65	38	49	49	81	61	92	57	38	667
2009	Military-Local	2	27	6	0	0	0	0	37	0	15	0	0	87
2010	Commercial Air Carriers	1,050	936	1,047	1,281	1,184	1,249	1,342	1,424	1,339	1,304	1,141	1,176	14,473
2010	Air Taxi	2,884	2,659	3,139	2,887	3,010	3,124	3,059	3,048	2,952	3,251	3,037	2,962	36,012
2010	General Aviation-Itinerant	1,960	1,728	2,614	3,066	2,304	2,379	2,295	2,443	2,524	2,980	2,441	2,164	28,898
2010	General Aviation-Local	190	442	842	844	683	611	811	1,355	989	1,101	759	435	9,062
2010	Military-Itinerant	44	32	95	58	72	118	153	220	136	111	67	64	1,170
2010	Military-Local	0	4	59	28	38	30	41	80	31	27	24	44	406
2011	Commercial Air Carriers	1,077	1,028	1,203	1,263	1,251	1,280	1,106	1,227	1,305	1,393	1,379	1,257	14,769
2011	Air Taxi	2,791	2,696	3,013	2,868	2,816	2,925	2,923	2,980	2,784	2,890	2,637	2,833	34,156
2011	General Aviation-Itinerant	2,171	2,249	2,948	2,899	2,609	2,763	2,490	2,691	2,463	3,049	2,355	2,234	30,921
2011	General Aviation-Local	448	389	695	859	641	1,008	933	1,137	615	719	739	595	8,778
2011	Military-Itinerant	27	66	81	53	74	67	95	78	98	142	83	55	919
2011	Military-Local	0	20	21	22	2	36	55	12	6	80	24	26	304
2012	Commercial Air Carriers	1,333	1,326	1,264	1,200	1,344	1,332	1,398	1,444	1,510	1,538	1,565	1,558	16,812
2012	Air Taxi	2,545	2,561	2,987	2,830	2,829	2,797	2,652	2,822	2,339	2,538	2,408	2,180	31,488
2012	General Aviation-Itinerant	2,122	2,189	2,466	2,886	1,654	2,557	2,235	2,616	2,312	2,668	2,353	1,728	27,786
2012	General Aviation-Local	627	530	840	903	965	845	1,050	500	814	1,003	781	660	9,518
2012	Military-Itinerant	148	102	161	79	940	94	137	117	102	73	72	82	2,107
2012	Military-Local	59	4	85	2	82	14	79	40	12	25	0	44	446
2013	Commercial Air Carriers	1,558	1,457	1,725	1,786	1,854	1,773	1,790	1,725	1,674	1,999	1,730	1,699	20,770
2013	Air Taxi	2,180	2,041	2,244	2,204	2,186	2,096	2,082	2,300	2,088	2,156	2,139	2,010	25,726
2013	General Aviation-Itinerant	1,728	1,801	2,116	2,618	2,192	2,011	1,935	2,241	2,214	2,549	2,050	1,679	25,134
2013	General Aviation-Local	660	716	807	689	525	583	134	918	825	982	600	492	7,931
2013	Military-Itinerant	82	26	134	180	112	92	817	128	194	167	137	104	2,173
2013	Military-Local	44	108	12	88	37	40	28	107	60	99	28	2	653
2014	Commercial Air Carriers	1,578	953	1,595	1,646	1,694	1,854	1,816	1,732	1,734	1,888	1,622	1,545	19,657
2014	Air Taxi	1,966	1,186	2,090	2,517	2,356	2,038	2,308	2,298	2,280	2,457	2,206	2,249	25,951
2014	General Aviation-Itinerant	1,712	1,204	1,965	2,395	2,208	2,133	2,209	2,066	2,043	2,520	2,018	1,611	24,084
2014	General Aviation-Local	520	555	350	330	477	564	524	261	563	702	638	770	6,254
2014	Military-Itinerant	187	69	128	126	193	170	135	110	100	179	104	57	1,558
2014	Military-Local	40	26	44	25	95	36	114	16	35	51	29	7	518
2015	Commercial Air Carriers	1,512	1,329	1,711	1,655	1,718	1,779	1,906	1,913	1,834	2,046	1,786	1,571	20,760
2015	Air Taxi	2,176	2,021	2,320	2,496	2,203	2,131	2,083	2,040	1,949	2,106	2,041	2,043	25,609
2015	General Aviation-Itinerant	1,662	1,540	2,010	2,228	2,113	2,157	2,081	2,178	1,920	2,395	1,845	1,523	23,652
2015	General Aviation-Local	344	352	254	133	530	478	489	346	324	330	317	338	4,235
2015	Military-Itinerant	156	60	200	83	160	99	101	206	83	162	108	73	1,491
2015	Military-Local	26	8	76	4	70	34	37	59	18	84	32	20	468
2016	Commercial Air Carriers	1,515	1,480	1,855	1,681	1,830	1,867	1,707	1,802	1,816	1,997	1,740	1,631	20,921
2016	Air Taxi	1,852	1,758	2,124	2,315	2,158	2,025	2,051	2,255	2,085	2,282	2,176	1,952	25,033
2016	General Aviation-Itinerant	1,659	1,679	2,006	2,195	1,902	2,140	2,010	2,203	1,791	2,577	1,980	1,893	24,035
2016	General Aviation-Local	475	599	509	473	638	926	781	477	565	379	411	461	6,694
2016	Military-Itinerant	106	137	118	136	109	90	163	195	94	101	131	102	1,482
2016	Military-Local	15	74	54	51	27	16	71	60	24	0	26	40	458
2017	Commercial Air Carriers	1,596	1,639	1,877	1,811	1,757	1,678	1,680	1,795	1,836	1,854	1,669	1,708	20,900
2017	Air Taxi	1,884	1,842	1,933	2,087	2,367	2,250	2,200	2,554	2,377	2,630	2,585	2,324	27,033
2017	General Aviation-Itinerant	1,539	1,953	1,887	2,246	2,062	2,166	2,177	2,130	2,205	2,594	2,008	1,924	24,891
2017	General Aviation-Local	458	545	459	303	437	389	738	1,007	656	908	597	638	7,135
2017	Military-Itinerant	120	125	106	123	161	280	267	230	120	194	110	93	1,929
2017	Military-Local	38	20	48	48	40	160	209	95	44	56	35	30	823
2018	Commercial Air Carriers	1,649	1,557	1,654	1,752	1,734	1,720	1,618	1,696	1,941	2,323	2,239	2,029	21,912
2018	Air Taxi	2,104	2,032	2,411	2,385	2,510	2,301	2,329	2,567	2,138	2,366	2,167	2,044	27,354
2018	General Aviation-Itinerant	1,801	1,643	1,905	2,403	2,084	2,446	2,098	2,396	1,676	2,568	1,866	1,710	24,596
2018	General Aviation-Local	474	684	566	456	506	678	482	484	433	516	267	270	5,816
2018	Military-Itinerant	80	162	118	139	154	93	128	94	83	137	131	134	1,453
2018	Military-Local	40	46	47	35	42	12	41	0	9	49	6	56	383

Source: FAA GSO Tower Statistics, CHA, 2019.

APPENDIX F – FAA AEROSPACE FORECAST (FY 2019-2039): [TABLE 32]

TABLE 32

TOTAL COMBINED AIRCRAFT OPERATIONS AT AIRPORTS WITH FAA AND CONTRACT TRAFFIC CONTROL SERVICE

(In Thousands)

			GENERAL AVIATION			MILITARY				NUMBER OF TOWERS	
FISCAL YEAR	AIR CARRIER	AIR TAXI/ COMMUTER	ITINERANT	LOCAL	TOTAL	ITINERANT	LOCAL	TOTAL	TOTAL	FAA	CONTRACT
Historical											
2010	12,658	9,410	14,864	11,716	26,580	1,309	1,298	2,607	51,255	264	244
2015	13,755	7,895	13,887	11,691	25,578	1,292	1,203	2,495	49,722	264	252
2016	14,417	7,580	13,904	11,632	25,536	1,317	1,145	2,462	49,995	264	252
2017	15,047	7,179	13,838	11,732	25,570	1,326	1,200	2,526	50,322	264	253
2018E	15,686	7,126	14,130	12,354	26,485	1,319	1,155	2,474	51,770	264	254
Forecast											
2019	16,301	7,197	14,223	12,672	26,896	1,319	1,155	2,474	52,868	264	254
2024	19,093	5,484	14,412	12,870	27,282	1,319	1,155	2,474	54,332	264	254
2029	20,772	5,752	14,606	13,081	27,687	1,319	1,155	2,474	56,685	264	254
2034	22,653	6,047	14,806	13,300	28,106	1,319	1,155	2,474	59,281	264	254
2039	24,663	6,361	15,012	13,526	28,538	1,319	1,155	2,474	62,037	264	254
Avg Annual Growth											
2010-18	2.7%	-3.4%	-0.6%	0.7%	0.0%	0.1%	-1.5%	-0.7%	0.1%		
2018-19	3.9%	1.0%	0.7%	2.6%	1.6%	0.0%	0.0%	0.0%	2.1%		
2019-29	2.5%	-2.2%	0.3%	0.3%	0.3%	0.0%	0.0%	0.0%	0.7%		
2019-39	2.1%	-0.6%	0.3%	0.3%	0.3%	0.0%	0.0%	0.0%	0.8%		

Source: FAA Air Traffic Activity.

APPENDIX G – PRESS RELEASES

PTI PIEDMONT TRIAD INTERNATIONAL AIRPORT *fly easy.*

FACTS ABOUT THE FEDEX EXPANSION AT PIEDMONT TRIAD INTERNATIONAL AIRPORT

For Immediate Release: August 22, 2018

Piedmont Triad – FedEx will expand its activity at PTI beginning on or about September 4, 2018 and will be adding as many as 400 new jobs. The expansion will also add a net total of eight new FedEx flights at the airport, nearly doubling existing operations. These flights will primarily consist of B757 aircraft. With few exceptions, the hub operations will be limited to four nights per week (Monday – Thursday).

All of these new flights, plus two small turboprop feeder aircraft (that replace two similar feeders that currently operate earlier in the day), will arrive late at night and depart early morning.

Specifically, these ten flights will arrive between 10:30 p.m. and 1:00 a.m. and will then depart between 3:00 a.m. and 4:00 a.m. In its environmental approval for the FedEx hub, the FAA directed that these flights would operate in a "head-to-head" fashion – that is, when winds allow, aircraft will arrive from the southwest, and after the sort is completed and the planes are reloaded, the aircraft will depart in the reverse direction, back to the southwest. Wind analysis predicts that this pattern will be applicable approximately 90-95% of the time.

It is also expected that Runway 5R/23L will be the primary runway for these operations, when it is in service, but any runway may be used at the discretion of Air Traffic Control. Runway 5R/23L is currently closed for reconstruction; but the Authority has taken extra measures to accelerate the project.

The environmental analyses done for the FedEx Hub operations, and the Authority's Part 150 Noise Compatibility Program contemplated as many as 63 flights per night operating in the head-to-head pattern. The currently planned number of ten is significantly fewer.

Finally, many of the 63 flights in earlier planning were to be operated with B727 aircraft, one of the noisiest aircraft flying at that time. FedEx has since retired all of its B727 fleet. The new flights will be operated with more modern and quieter aircraft.

For additional information regarding this exciting growth and the operations that it includes, please follow links on the Authority's website (flyfrompti.com) for the "FedEx Expansion".

# # #

Contact: Kimberly Hodges, 336-665-5669, hodgesk@gsoair.org

APPENDIX H – FAA AIRPORT PLANNING APPENDICES

FAA Appendix B: Summarizing and Documenting Airport Planning Forecasts

A. Forecast Levels and Growth Rates

Table H-1 – Forecast Levels and Growth Rates

Specified Base Year: 2018	Forecast Levels								Average Annual Compound Growth Rates						
	2018	Base Year + 1	Base Year + 2	Base Year + 3	Base Year + 4	Base Year + 5	Base Year + 6	Base Year + 7	Base Year + 1	Base Year + 2	Base Year + 3	Base Year + 4	Base Year + 5	Base Year + 6	Base Year + 7
Passenger Enplanements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Air Carrier	620,573	694,290	727,236	758,555	786,198	813,390	839,759	865,986	11.9%	8.3%	6.9%	6.1%	5.6%	5.2%	4.9%
Commuter	320,452	345,923	340,297	334,081	330,042	326,011	321,773	317,617	7.9%	3.0%	1.4%	0.7%	0.3%	0.1%	-0.1%
TOTAL ENPLANEMENTS	**941,025**	**1,040,213**	**1,067,533**	**1,092,636**	**1,116,240**	**1,139,401**	**1,161,533**	**1,183,603**	**10.5%**	**6.5%**	**5.1%**	**4.4%**	**3.9%**	**3.6%**	**3.3%**
Operations															
Itinerant	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Air Carrier	20,668	24,054	25,768	26,805	27,794	28,759	29,684	30,594	16.4%	11.7%	9.1%	7.7%	6.8%	6.2%	5.8%
Air Taxi and Commuter	28,598	29,758	28,848	28,524	28,186	27,861	27,534	27,225	4.1%	0.4%	-0.1%	-0.4%	-0.5%	-0.6%	-0.7%
Total Commercial Operations*	**49,266**	**53,812**	**54,615**	**55,329**	**55,980**	**56,620**	**57,218**	**57,820**	**9.2%**	**5.3%**	**3.9%**	**3.2%**	**2.8%**	**2.5%**	**2.3%**
General Aviation	24,596	26,878	26,964	27,052	27,140	27,230	27,321	27,413	9.3%	4.7%	3.2%	2.5%	2.1%	1.8%	1.6%
Military	1,453	1,453	1,453	1,453	1,453	1,453	1,453	1,453	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Local	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
General Aviation	5,816	6,635	6,656	6,677	6,699	6,722	6,744	6,767	14.1%	7.0%	4.7%	3.6%	2.9%	2.5%	2.2%
Military	383	383	383	383	383	383	383	383	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
TOTAL OPERATIONS	**81,514**	**89,160**	**90,072**	**90,894**	**91,656**	**92,408**	**93,119**	**93,836**	**9.4%**	**5.1%**	**3.7%**	**3.0%**	**2.5%**	**2.2%**	**2.0%**
Based Aircraft															
Single Engine (Nonjet)	65	65	64	63	63	62	61	61	-0.5%	-0.8%	-0.9%	-0.9%	-0.9%	-1.0%	-1.0%
Multi Engine (Nonjet)	10	10	10	10	10	10	10	10	-0.2%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%	-0.3%
Turbo-Prop	7	7	7	7	7	7	7	7	0.0%	0.4%	0.5%	0.6%	0.7%	0.7%	0.7%
Jet Engine	16	16	17	17	18	18	19	19	2.6%	2.6%	2.5%	2.5%	2.5%	2.5%	2.5%
Helicopter	1	1	1	1	1	1	1	1	1.8%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%
TOTAL	**99**	**99**	**99**	**99**	**98**	**98**	**98**	**98**	**0.1%**	**-0.1%**	**-0.1%**	**-0.1%**	**-0.1%**	**-0.1%**	**-0.1%**

Source: FAA 2018 TAF, FAA OPSNET, BTS, FAA Aerospace Forecast (FY 2019-2039), Boeing World Air Cargo Forecast (2018-2037), Airbus Global Market Forecast (2018-2037), FedEx, Koury Aviation, Signature Flight Support, Triad Aviation Academy (website), GSO Control Tower Statistics, PTAA, CHA, 2019.

Note*: Cargo operations are included within the air carrier and the air taxi and commuter categories, as well as in the total commercial operations.

B. Operational Factors

Table H-2 – Operational Factors

Specified Base Year: 2018	2018	Base Year + 1	Base Year + 2	Base Year + 3	Base Year + 4	Base Year + 5	Base Year + 6	Base Year + 7
Average Aircraft Size (Seats) - Air Carrier	73.6	74.4	75.1	75.9	76.7	77.5	78.2	79.0
Average enplaning load factor - Air Carrier	77.7%	77.7%	78.2%	78.6%	79.1%	79.5%	80.0%	80.4%
GA operations per based aircraft	307.2	338.1	340.0	341.8	343.6	345.4	347.1	348.8

Source: BTS, FAA Aerospace Forecast (FY 2019-2039), Koury Aviation, Signature Flight Support, Triad Aviation Academy (website), CHA, 2019.

FAA Appendix C: Comparing Airport Planning and TAF Forecasts

Table H-3 – Comparing Airport Planning and TAF Forecasts

Specified Base Year: 2018	Year	Airport Forecast	TAF	Airport Forecast/TAF (% Difference)
Passenger Enplanements				
Base Year Level	2018	941,025	915,482	2.8%
Base Year + 1	2019	1,040,213	1,048,146	-0.8%
Base Year + 2	2020	1,067,533	1,085,064	-1.6%
Base Year + 3	2021	1,092,636	1,090,671	0.2%
Base Year + 4	2022	1,116,240	1,095,877	1.9%
Base Year + 5	2023	1,139,401	1,100,769	3.5%
Base Year + 6	2024	1,161,533	1,105,440	5.1%
Base Year + 7	2025	1,183,603	1,110,311	6.6%
Commercial Operations				
Base Year Level	2018	49,266	48,868	0.8%
Base Year + 1	2019	53,812	53,167	1.2%
Base Year + 2	2020	54,615	55,548	-1.7%
Base Year + 3	2021	55,329	54,138	2.2%
Base Year + 4	2022	55,980	51,558	8.6%
Base Year + 5	2023	56,620	48,139	17.6%
Base Year + 6	2024	57,218	47,483	20.5%
Base Year + 7	2025	57,820	47,832	20.9%
Total Operations				
Base Year Level	2018	81,514	82,593	-1.3%
Base Year + 1	2019	89,160	89,294	-0.2%
Base Year + 2	2020	90,072	93,170	-3.3%
Base Year + 3	2021	90,894	91,805	-1.0%
Base Year + 4	2022	91,656	89,270	2.7%
Base Year + 5	2023	92,408	85,896	7.6%
Base Year + 6	2024	93,119	85,285	9.2%
Base Year + 7	2025	93,836	85,679	9.5%

Source: FAA 2019 TAF, FAA OPSNET, BTS, FAA Aerospace Forecast (FY 2019-2039), Boeing World Air Cargo Forecast (2018-2037), Airbus Global Market Forecast (2018-2037), FedEx, Koury Aviation, Signature Flight Support, Triad Aviation Academy (website), GSO Control Tower Statistics, PTAA, CHA, 2019.

Note: Commercial operations are comprised of air carrier, air taxi and commuter, and air cargo operations.

D.2 FAA Approval for Part 150 Forecast

U.S. Department
of Transportation
Federal Aviation Administration

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

Phone: 901-322-8180

March 12, 2020

Mr. J. Alex Rosser, P.E.
Deputy Executive Director, Piedmont Triad
International Airport
Piedmont Triad Airport Authority
1000A Ted Johnson Parkway
Greensboro, NC 27409

Part 150 Update – Aviation Activity Forecast
Part 150 Update
Piedmont Triad Airport Authority (GSO)

Dear Mr. Rosser:

We have reviewed the revised draft copy of the February 2020 FAR Part 150 Update, Aviation Activity Forecast, transmitted to us on February 20, 2020. The forecast meets the FAA requirements for the five-year period forecast for operations and enplanements.

The Airport Master Plan Update Forecast is expected to provide a forecast (based on the Part 150 Update Forecast) of passenger enplanements, air cargo tonnage, aircraft operations, based aircraft, aircraft fleet mix (based and operational), and peaking characteristics (average day peak month and peak hour). We have no other comments in reference to this submittal. We, therefore, find the subject forecast for operations and enplanements, approved for use.

Should you have any questions, please contact me at (901) 322-8187 or by email at Leonard.Green@faa.gov.

Sincerely,

L. Bernard Green, CM, AICP
Airport Planner, Memphis Airports District Office

D.3 AEDT Flight Track Geometry and Utilization Rates

Flight track geometry and utilization rates were developed using flight track and aircraft identification data from January 2017 through March 2019. The flight track data were first sorted into four groups: jet arrivals, jet departures, non-jet arrivals, and non-jet departures. Cargo-only aircraft tracks were compared to the "jet" track sets and no additional tracks are needed (i.e. the jet tracks sufficiently cover the cargo-only operations). Each group of flight tracks was then separated into "bundles" by general direction and waypoints. Statistical analysis of each bundle produced a "backbone" track with an equal number of dispersion tracks to either side. This process led to the development of a large number of modeling tracks (218 bundles, each consisting of 3 or 5 model tracks, for a total of 942 tracks overall), as summarized by aircraft type and arrival/departure groups in Table D-1. The table indicates which figure (in the pages at the end of this memo) presents the map showing the bundles for that group.

For clarity, the presentation of flight tracks separates each of the four aircraft operation categories by runway, creating 24 groups. Each group in Table D-1 is mapped in its own figure (Figures D-1 through D-24) on which the radar tracks are overlaid by the model tracks. The backbone track for each bundle is portrayed by a bold line, the associated dispersion tracks by dashed lines. The name of the bundle is marked on each backbone track. A table in the legend area of each figure lists the percentage of operations assigned to each bundle and the number of model tracks within the bundle. The number of radar tracks is also indicated in the legend.

Part 150 guidelines specify that the documentation show the model flight tracks out to at least 30,000 from the runway ends. The circular shape outlined in dashed line on each figure indicates that distance; the model tracks were developed well past that minimum.

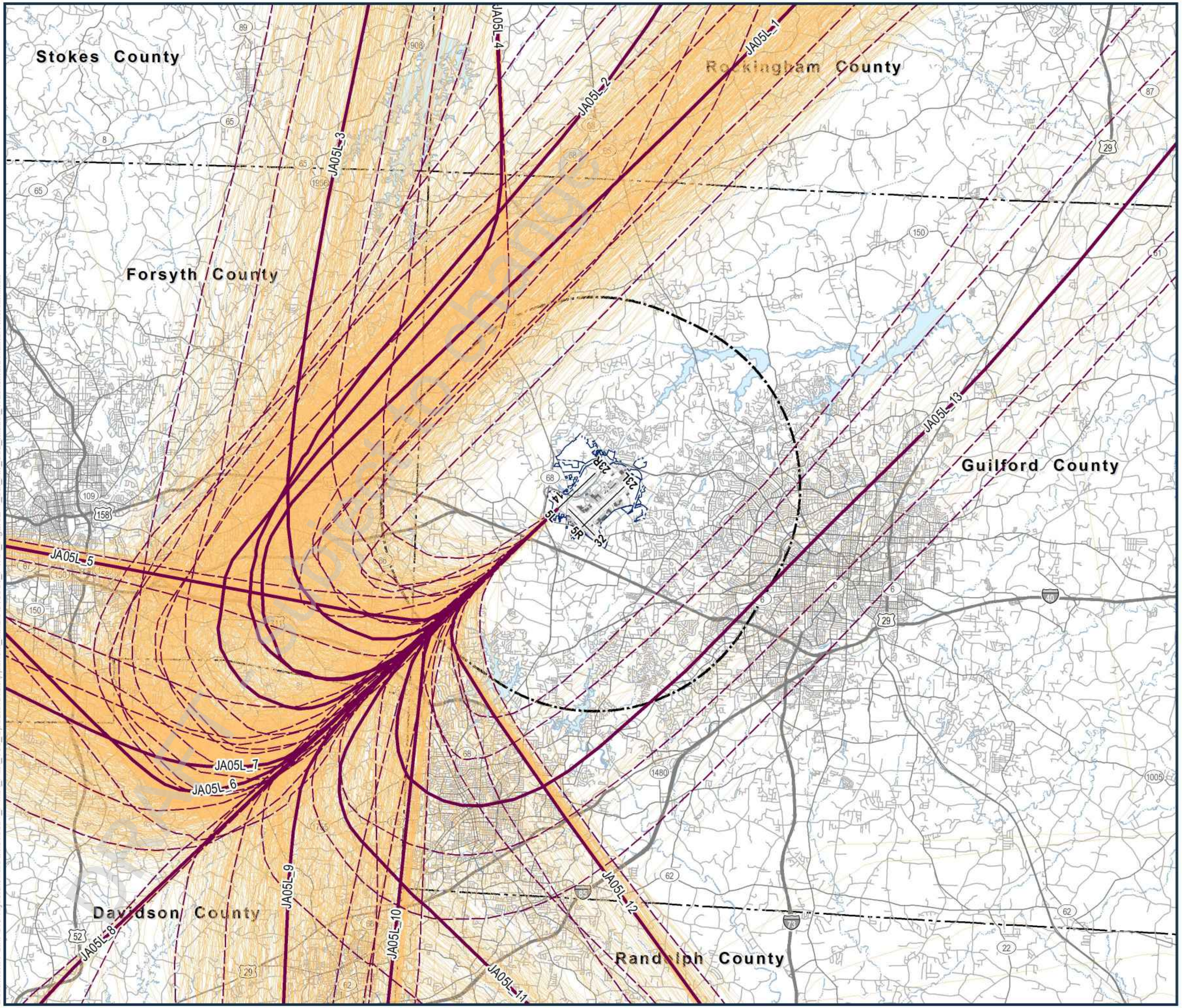
Table D-1 Numbers of Model Arrival/Departure Flight Tracks by Aircraft Operation Category

Source: HMMH, 2018

Aircraft Category	Arrival Track Bundles			Departure Track Bundles		
	Runway	Flight Track Map	# of bundles	Runway	Flight Track Map	# of bundles
Jet	05L	Figure D-1	13	05L	Figure D-7	7
	05R	Figure D-2	14	05R	Figure D-8	10
	14	Figure D-3	4	14	Figure D-9	2
	23L	Figure D-4	12	23L	Figure D-10	7
	23R	Figure D-5	10	23R	Figure D-11	7
	32	Figure D-6	8	32	Figure D-12	6
Non-Jet	05L	Figure D-13	7	05L	Figure D-19	11
	05R	Figure D-14	13	05R	Figure D-20	10
	14	Figure D-15	4	14	Figure D-21	7
	23L	Figure D-16	12	23L	Figure D-22	15
	23R	Figure D-17	9	23R	Figure D-23	11
	32	Figure D-18	10	32	Figure D-24	9
Totals			**116**			**102**

The flight tracks for helicopters that could be identified in the flight track and aircraft identification data were analyzed separately from the fixed-wing aircraft. **Figures D-25 and D-26** present the helicopter arrivals and departures, respectively, with the radar tracks overlaid by the proposed model tracks. All helicopter operations will be modeled as arriving to or departing from the location identified as a "helipad" in Figure 6.1 of the main document. For modeling purposes, the set of identified helicopter operations in the flight track and aircraft identification data were divided into six arrival bundles and six departure bundles, in a process similar to the fixed-wing flight track analysis. Each bundle is represented by three model flight tracks; a backbone track with a dispersion track on either side. The tables in the legend area of Figures D-25 and D-26 list the percentage of operations assigned to each bundle.

Local circuit pattern tracks were developed from the flight track and aircraft identification data as well. **Figures D-27 through D-32** present the circuit tracks for each runway, with track usage percent tables in the legend area of each figure.



PIEDMONT TRIAD AIRPORT AUTHORITY

Part 150 Update

Figure: D-1

Jet Arrivals to Runway 05L

Arrival Backbone Model Track
Arrival Model Subtrack
Arrival Radar Tracks (3,715)
Airport Boundary
Airport Buildings
Runway
Taxiway / Apron
30,000 ft. Extent from Runway End
County Boundary
Highways
Major Roads
Local Roads
Railroad
Water / Stream / Creek

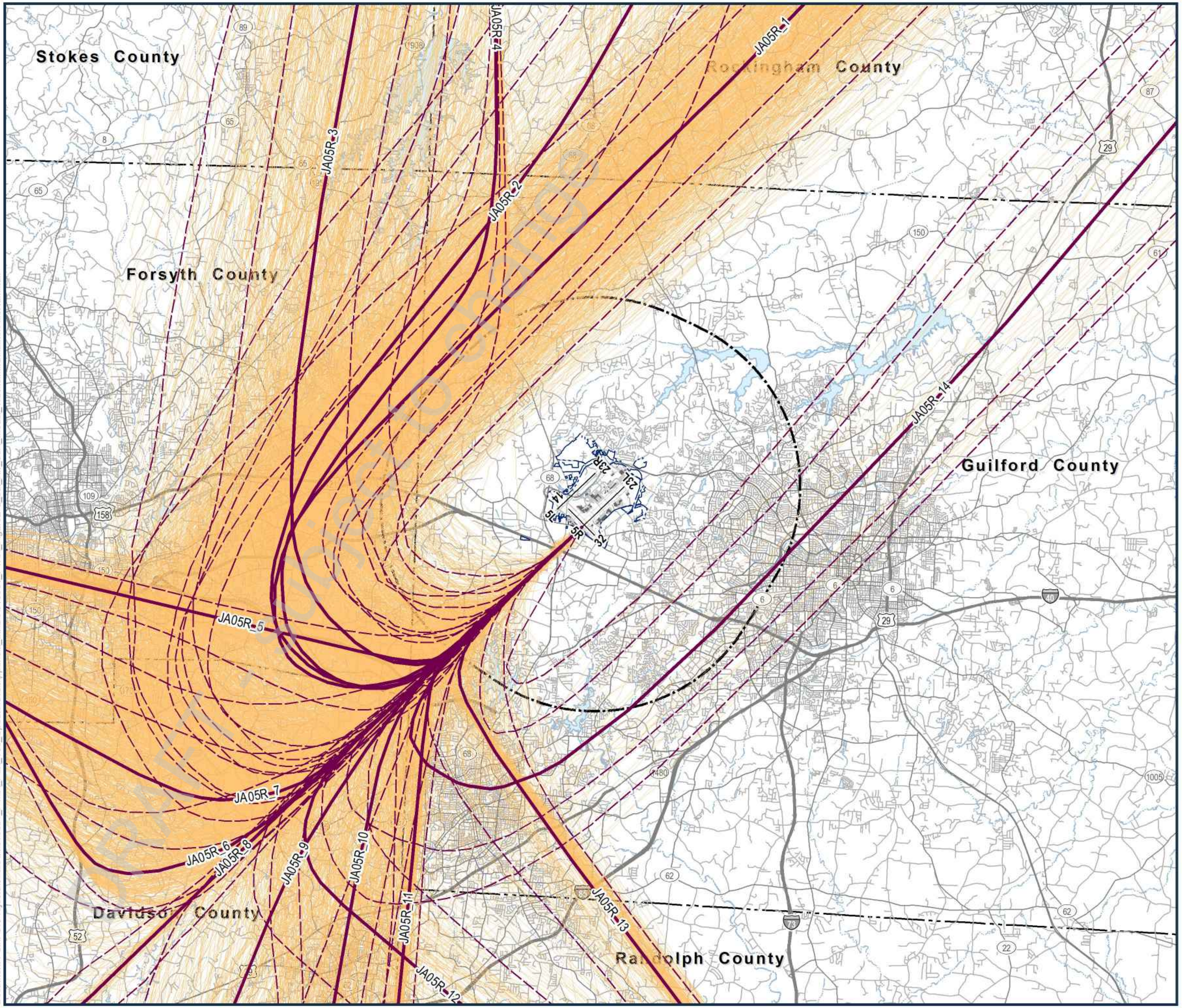
Track Bundle	# of tracks	Day Usage	Night Usage	Cargo Day	Cargo Night
JA05L_1	5	19.0%	30.4%	3.0%	19.7%
JA05L_2	5	2.6%	2.0%	1.5%	1.8%
JA05L_3	5	7.7%	4.9%	1.5%	9.1%
JA05L_4	3	12.2%	3.7%	1.5%	6.1%
JA05L_5	3	8.9%	13.5%	22.4%	5.2%
JA05L_6	3	10.7%	6.5%	29.9%	11.8%
JA05L_7	5	16.3%	17.6%	38.8%	21.2%
JA05L_8	3	0.5%	3.3%	0.0%	0.0%
JA05L_9	5	11.1%	10.4%	0.0%	0.0%
JA05L_10	3	3.3%	1.8%	0.0%	0.0%
JA05L_11	3	4.8%	2.9%	1.5%	10.3%
JA05L_12	3	2.6%	1.4%	0.0%	10.6%
JA05L_13	5	0.4%	1.6%	0.0%	4.2%
Total	**51**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

0 4 8 NMi

hmmh



PIEDMONT TRIAD AIRPORT AUTHORITY
Part 150 Update

Figure: D-2

Jet Arrivals to Runway 05R

Arrival Backbone Model Track
Arrival Model Subtrack
Arrival Radar Tracks (5,372)
Airport Boundary
Airport Buildings
Runway
Taxiway / Apron
30,000 ft. Extent from Runway End
County Boundary
Highways
Major Roads
Local Roads
Railroad
Water / Stream / Creek

Track Bundle	# of tracks	Day Usage	Night Usage	Cargo Day	Cargo Night
JA05R_1	5	21.1%	18.6%	1.7%	18.7%
JA05R_2	5	3.4%	2.5%	0.9%	1.8%
JA05R_3	5	8.3%	4.9%	0.0%	11.1%
JA05R_4	5	14.8%	4.3%	0.0%	6.6%
JA05R_5	3	13.8%	23.7%	35.0%	18.7%
JA05R_6	3	3.7%	2.0%	4.3%	2.1%
JA05R_7	5	15.8%	15.1%	55.6%	17.2%
JA05R_8	3	0.4%	2.9%	0.0%	0.6%
JA05R_9	3	3.6%	8.8%	0.0%	0.6%
JA05R_10	5	5.3%	3.5%	0.0%	0.3%
JA05R_11	3	3.8%	2.0%	0.0%	0.0%
JA05R_12	3	2.6%	2.9%	1.7%	4.8%
JA05R_13	3	3.1%	7.7%	0.9%	12.3%
JA05R_14	5	0.2%	1.1%	0.0%	5.1%
Total	**56**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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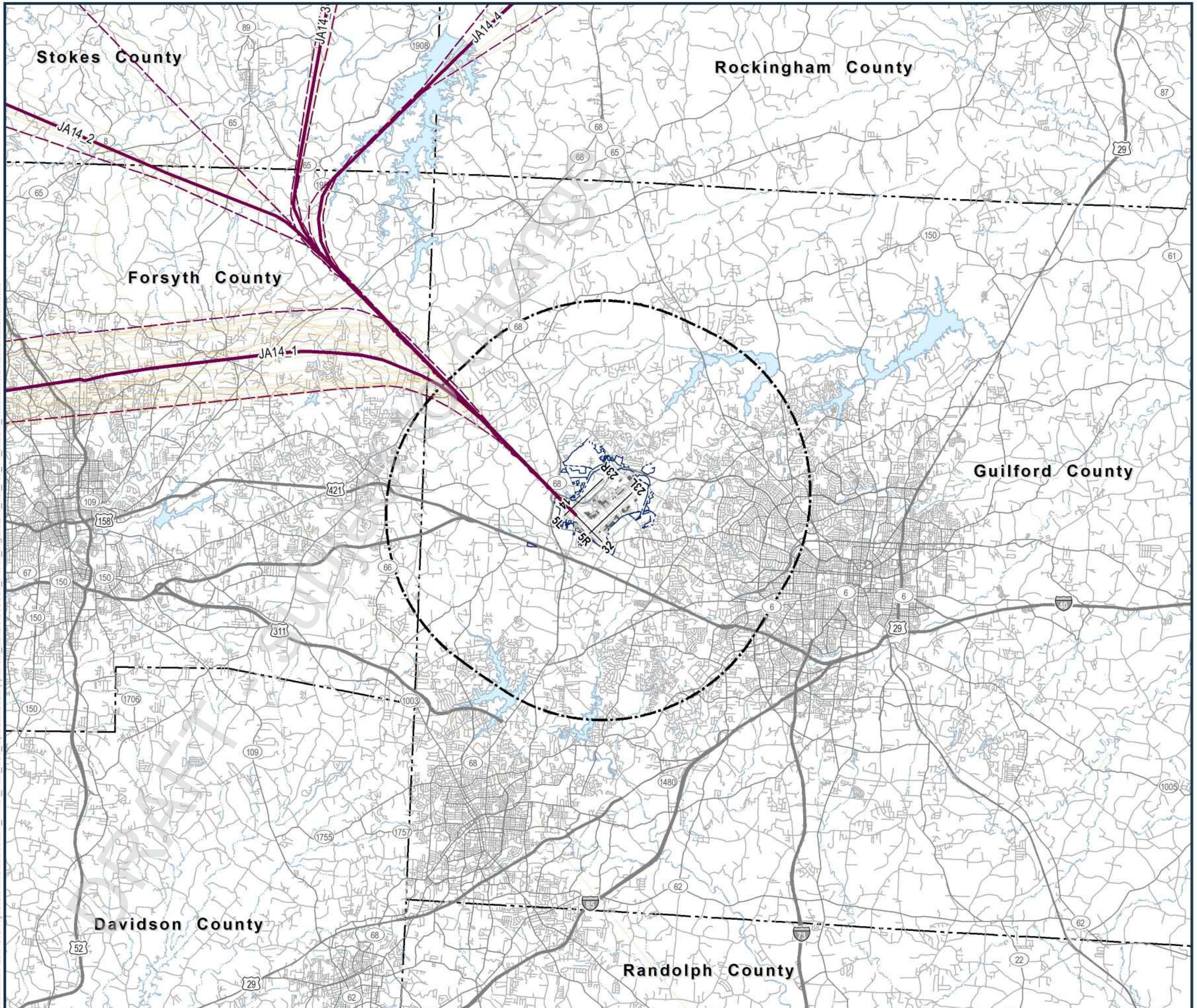
hmmh



PIEDMONT TRIAD AIRPORT AUTHORITY

Part 150 Update

Figure: D-3

Jet Arrivals to Runway 14

Arrival Backbone Model Track
Arrival Model Subtrack
Arrival Radar Tracks (53)
Airport Boundary
Airport Buildings
Runway
Taxiway / Apron
30,000 ft. Extent from Runway End
County Boundary
Highways
Major Roads
Local Roads
Railroad
Water / Stream / Creek

Track Bundle	# of tracks	Day Usage	Night Usage
JA14_1	3	57.1%	25.0%
JA14_2	3	12.2%	75.0%
JA14_3	3	16.3%	0.0%
JA14_4	3	14.3%	0.0%
Total	**12**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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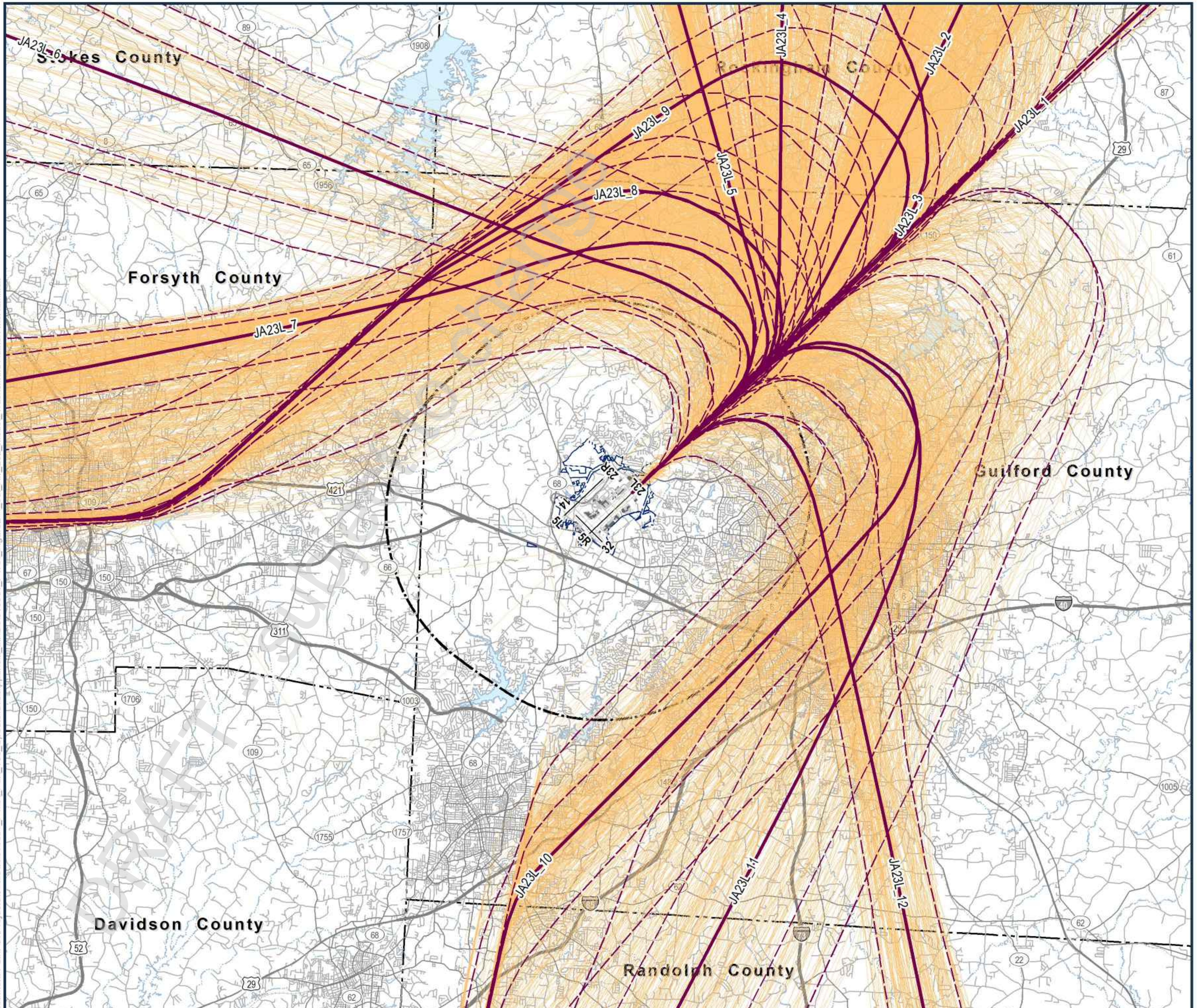


PIEDMONT TRIAD AIRPORT AUTHORITY

Part 150 Update

Figure: D-4

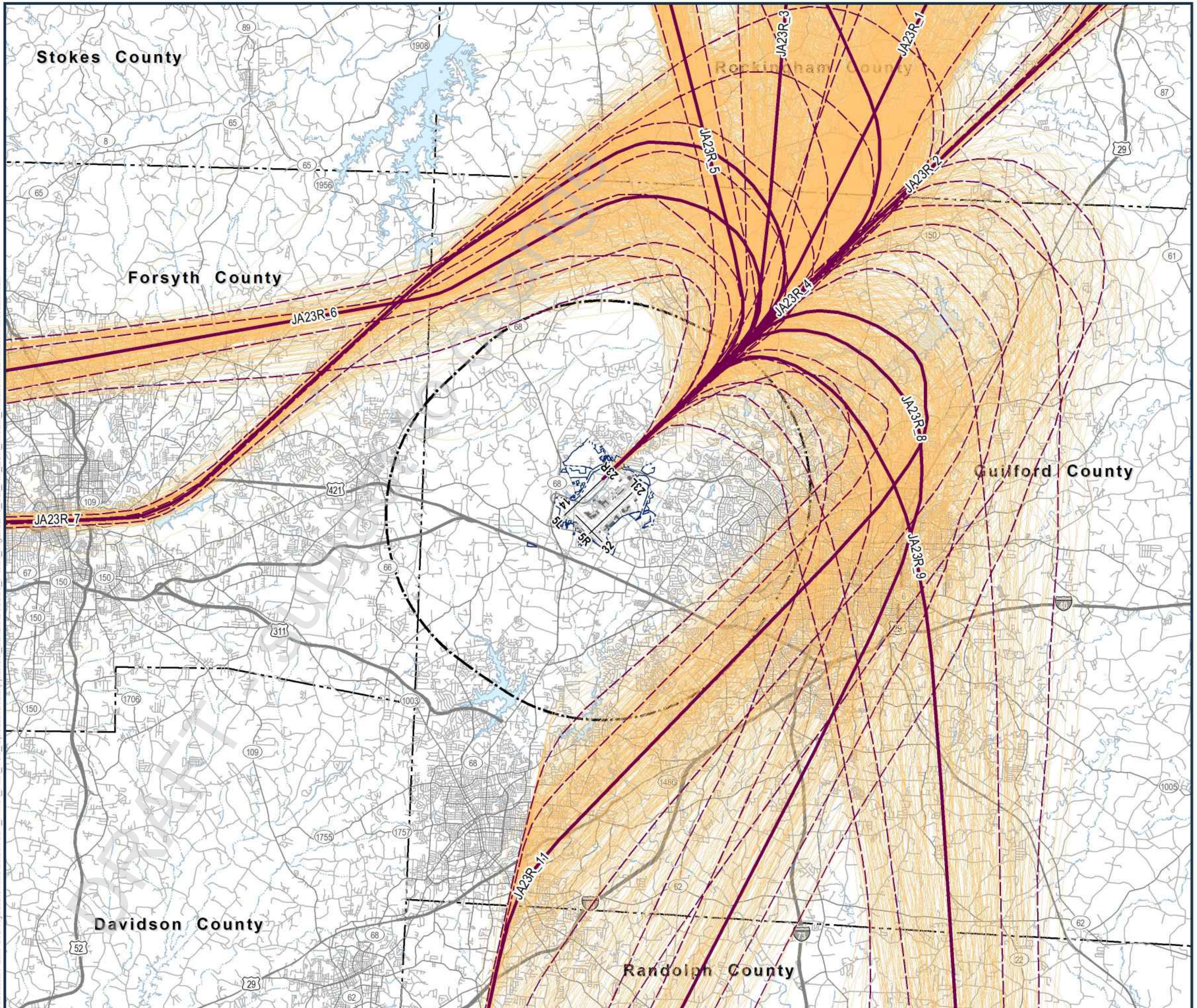
Jet Arrivals to Runway 23L

Track Bundle	# of tracks	Day Usage	Night Usage	Cargo Day	Cargo Night
JA23L_1	3	1.0%	2.8%	0.0%	7.2%
JA23L_2	5	24.2%	20.6%	0.0%	8.4%
JA23L_3	3	4.1%	1.9%	1.6%	2.3%
JA23L_4	3	7.0%	3.0%	0.0%	0.8%
JA23L_5	3	9.2%	8.9%	0.0%	12.2%
JA23L_6	5	0.3%	1.1%	1.6%	36.5%
JA23L_7	5	8.4%	16.0%	19.5%	11.0%
JA23L_8	5	22.0%	19.1%	60.9%	14.4%
JA23L_9	5	4.0%	4.0%	16.4%	6.8%
JA23L_10	5	11.7%	9.4%	0.0%	0.0%
JA23L_11	5	5.1%	4.3%	0.0%	0.0%
JA23L_12	3	3.0%	8.9%	0.0%	0.4%
Total	**50**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

hmmh



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Part 150 Update

Figure: D-5

Jet Arrivals to Runway 23R

- Arrival Backbone Model Track
- Arrival Model Subtrack
- Arrival Radar Tracks (4,212)
- Airport Boundary
- Airport Buildings
- Runway
- Taxiway / Apron
- 30,000 ft. Extent from Runway End
- County Boundary
- Highways
- Major Roads
- Local Roads
- Railroad
- Water / Stream / Creek

Track Bundle	# of tracks	Day Usage	Night Usage	Cargo Day	Cargo Night
JA23R_1	3	20.1%	36.7%	2.2%	9.8%
JA23R_2	5	4.8%	8.1%	1.1%	16.8%
JA23R_3	3	6.1%	5.7%	0.0%	2.3%
JA23R_4	3	5.8%	4.3%	2.2%	6.9%
JA23R_5	3	9.6%	5.7%	1.1%	17.9%
JA23R_6	5	6.6%	7.4%	23.9%	6.9%
JA23R_7	5	23.0%	19.0%	68.5%	30.6%
JA23R_8	5	3.5%	2.1%	0.0%	0.0%
JA23R_9	5	6.1%	5.2%	1.1%	8.7%
JA23R_11	5	14.3%	5.7%	0.0%	0.0%
Total	**42**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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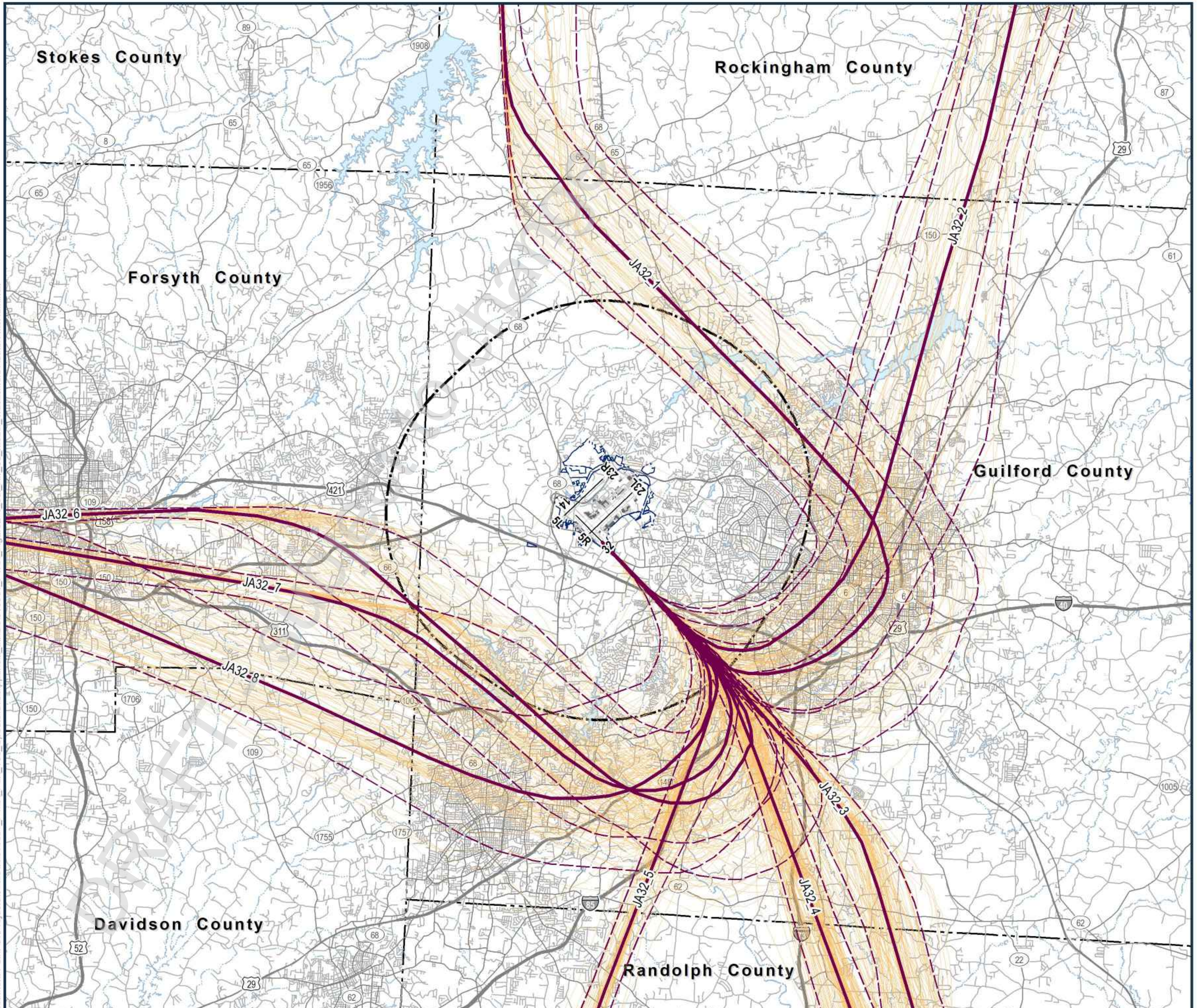

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Figure: D-6

Jet Arrivals to Runway 32

- Arrival Backbone Model Track
- Arrival Model Subtrack
- Arrival Radar Tracks (659)
- Airport Boundary
- Airport Buildings
- Runway
- Taxiway / Apron
- 30,000 ft. Extent from Runway End
- County Boundary
- Highways
- Major Roads
- Local Roads
- Railroad
- Water / Stream / Creek

Track Bundle	# of tracks	Day Usage	Night Usage	Cargo Day	Cargo Night
JA32_1	5	14.2%	9.4%	0.0%	0.0%
JA32_2	5	8.2%	15.6%	0.0%	0.0%
JA32_3	3	15.8%	25.0%	0.0%	100.0%
JA32_4	3	19.7%	28.1%	0.0%	0.0%
JA32_5	3	8.4%	9.4%	0.0%	0.0%
JA32_6	3	11.1%	0.0%	50.0%	0.0%
JA32_7	3	11.3%	9.4%	0.0%	0.0%
JA32_8	3	11.3%	3.1%	50.0%	0.0%
Total	28	100.0%	100.0%	100.0%	100.0%

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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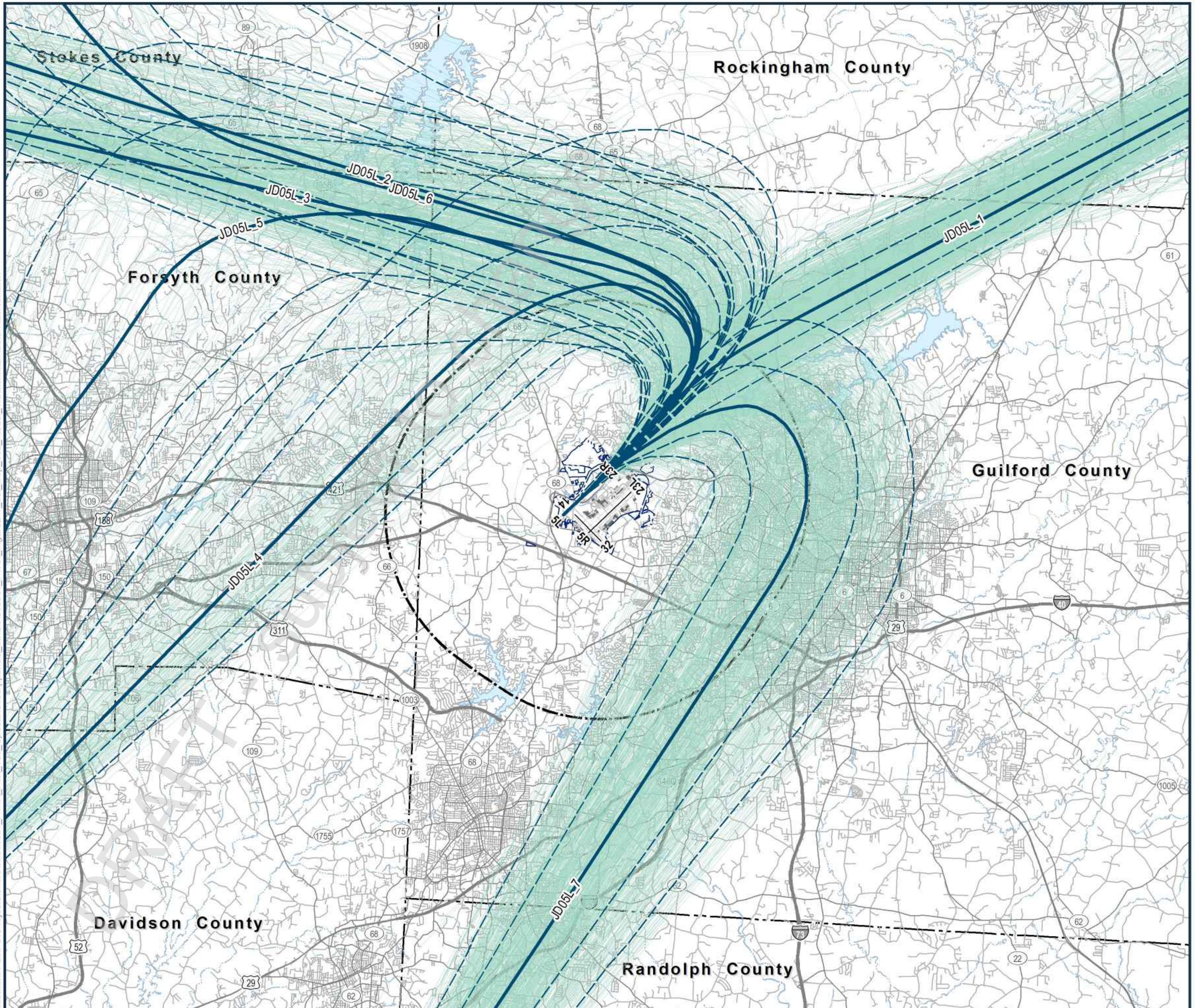

PIEDMONT TRIAD AIRPORT AUTHORITY
Part 150 Update

Figure: D-7

Jet Departures from Runway 05L

- Departure Backbone Model Track
- Departure Model Subtrack
- Departure Radar Tracks (3,063)
- Airport Boundary
- Airport Buildings
- Runway
- Taxiway / Apron
- 30,000 ft. Extent from Runway End
- County Boundary
- Highways
- Major Roads
- Local Roads
- Railroad
- Water / Stream / Creek

Track Bundle	# of tracks	Day Usage	Night Usage	Cargo Day	Cargo Night
JD05L_1	5	44.5%	61.4%	48.5%	12.1%
JD05L_2	5	4.5%	2.7%	4.4%	10.3%
JD05L_3	5	12.4%	9.2%	17.6%	41.1%
JD05L_4	5	7.6%	7.0%	0.0%	0.9%
JD05L_5	5	2.7%	4.3%	0.0%	0.0%
JD05L_6	5	3.4%	1.4%	0.0%	8.4%
JD05L_7	5	24.9%	14.1%	29.4%	27.1%
Total	**35**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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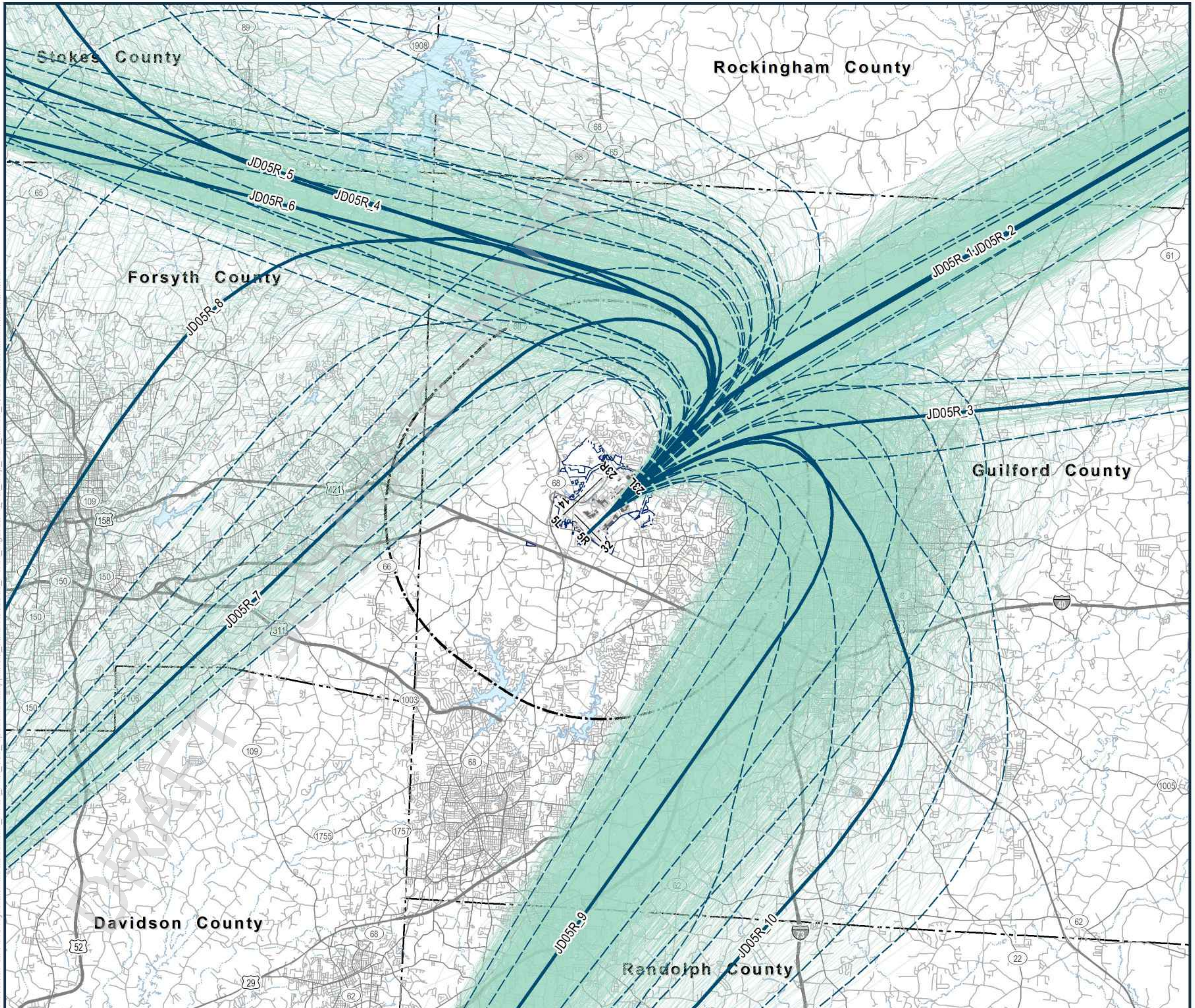

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Part 150 Update

Figure: D-8

Jet Departures from Runway 05R

- Departure Backbone Model Track
- Departure Model Subtrack
- Departure Radar Tracks (6,248)
- Airport Boundary
- Airport Buildings
- Runway
- Taxiway / Apron
- 30,000 ft. Extent from Runway End
- County Boundary
- Highways
- Major Roads
- Local Roads
- Railroad
- Water / Stream / Creek

Track Bundle	# of tracks	Day Usage	Night Usage	Cargo Day	Cargo Night
JD05R_1	5	46.4%	53.0%	35.6%	17.2%
JD05R_2	3	1.8%	0.8%	5.5%	0.0%
JD05R_3	3	1.1%	0.3%	0.0%	0.0%
JD05R_4	5	4.8%	3.9%	3.7%	6.6%
JD05R_5	5	2.0%	1.0%	6.7%	9.8%
JD05R_6	5	5.8%	3.6%	11.0%	29.5%
JD05R_7	5	4.0%	5.5%	0.0%	0.0%
JD05R_8	5	3.3%	4.8%	0.0%	0.0%
JD05R_9	5	28.9%	26.6%	36.2%	36.9%
JD05R_10	5	1.9%	0.6%	1.2%	0.0%
Total	**46**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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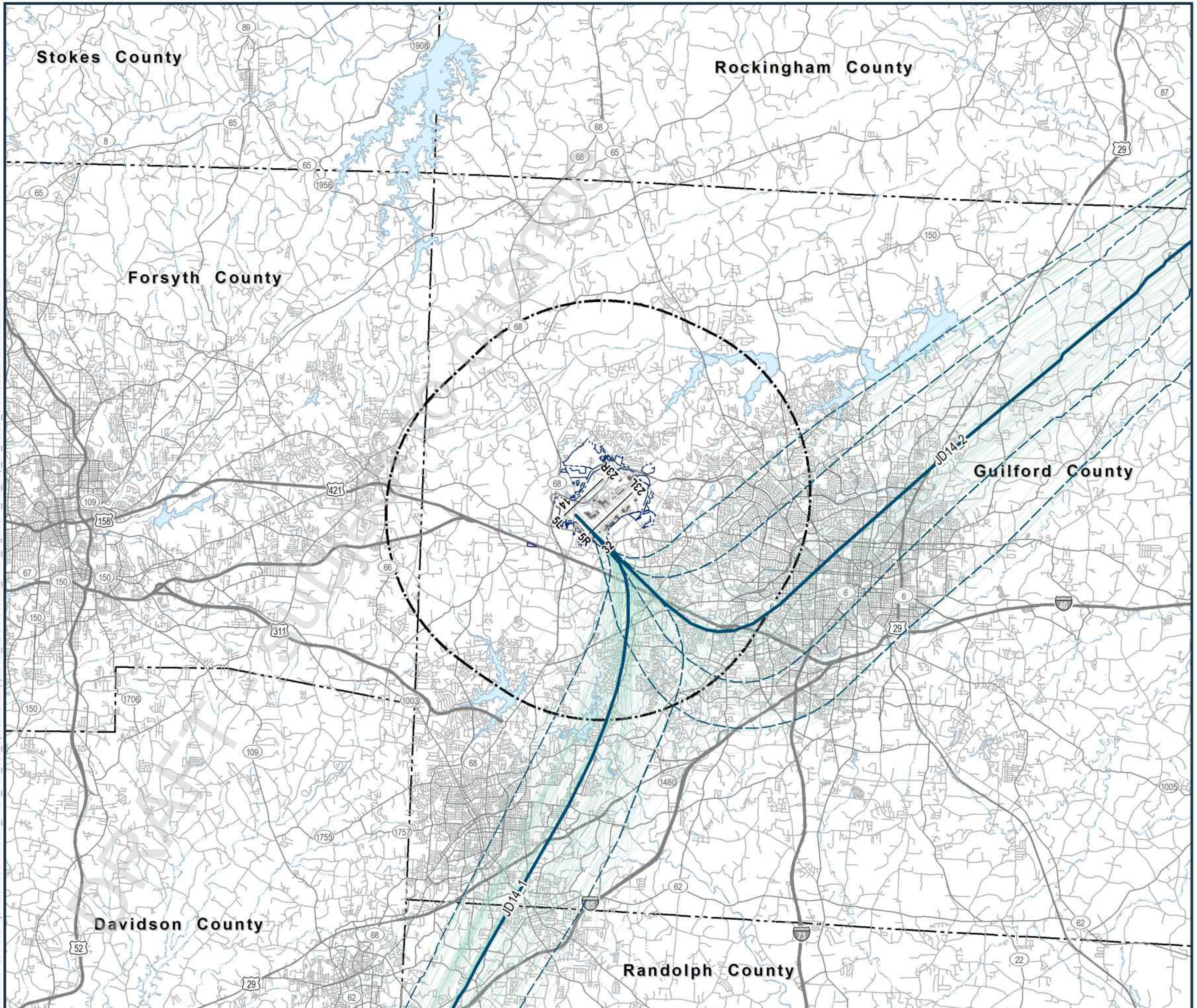
Document Path: G:\Projects\310XXX\310081_PTAA_Part_150_Update\GIS\Appendix_MXDs\310081_PTAA_FigureD-8_Jet_Dep_05R_Model_Tracks.mxd Author: MJHamilton



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Part 150 Update

Figure: D-9

Jet Departures from Runway 14

- Departure Backbone Model Track
- Departure Model Subtrack
- Departure Radar Tracks (157)
- Airport Boundary
- Airport Buildings
- Runway
- Taxiway / Apron
- 30,000 ft. Extent from Runway End
- County Boundary
- Highways
- Major Roads
- Local Roads
- Railroad
- Water / Stream / Creek

Track Bundle	# of tracks	Day Usage	Night Usage
JD14_1	3	54.9%	40.0%
JD14_2	5	45.1%	60.0%
Total	**8**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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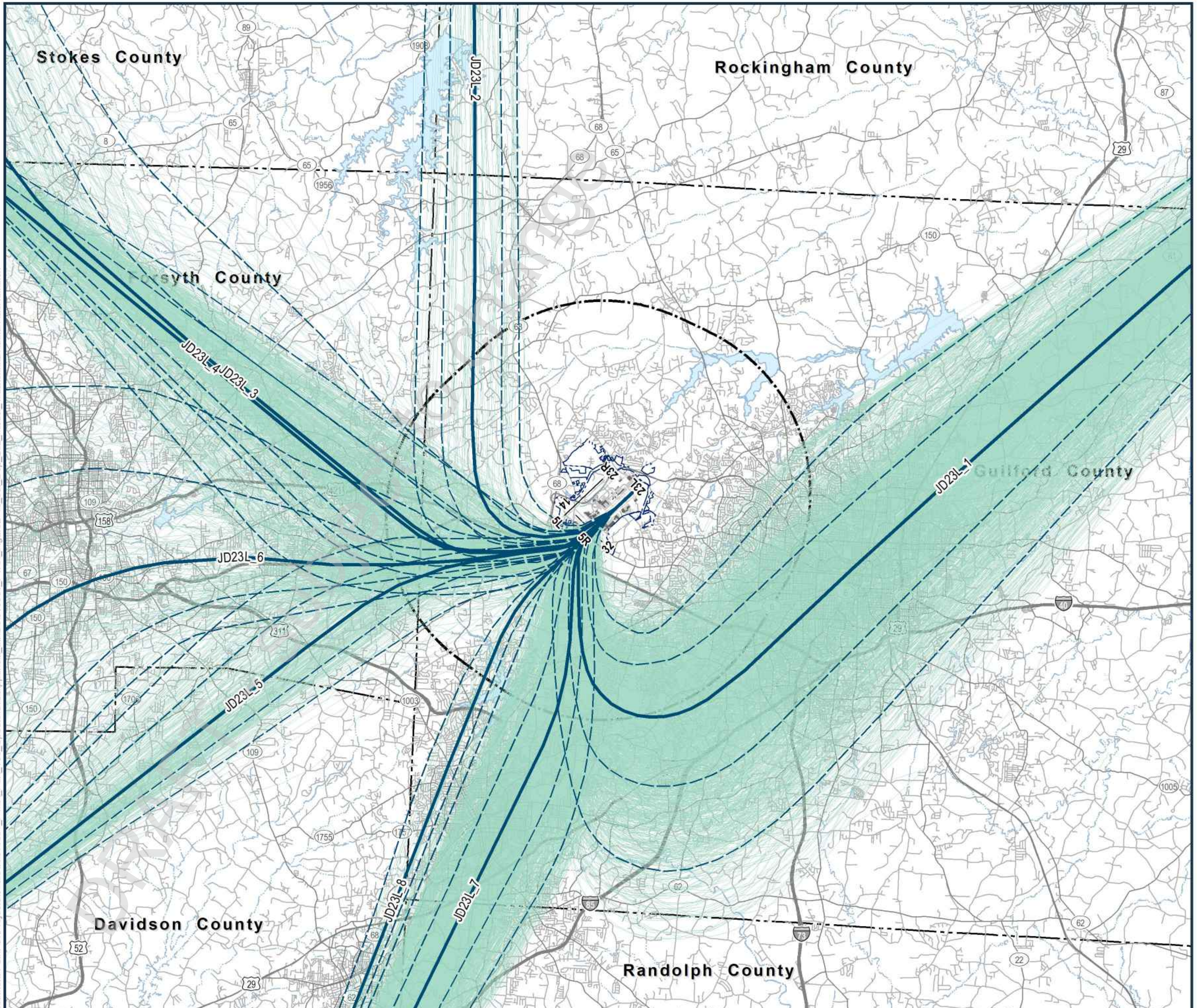

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Part 150 Update

Figure: D-10

Jet Departures from Runway 23L

- Departure Backbone Model Track
- Departure Model Subtrack
- Departure Radar Tracks (5,503)
- Airport Boundary
- Airport Buildings
- Runway
- Taxiway / Apron
- 30,000 ft. Extent from Runway End
- County Boundary
- Highways
- Major Roads
- Local Roads
- Railroad
- Water / Stream / Creek

Track Bundle	# of tracks	Day Usage	Night Usage	Cargo Day	Cargo Night
JD23L_1	5	36.5%	62.8%	13.0%	9.4%
JD23L_2	5	0.1%	0.0%	2.2%	8.9%
JD23L_3	5	3.7%	2.3%	1.2%	3.4%
JD23L_4	5	13.9%	5.5%	29.2%	24.7%
JD23L_5	5	8.7%	6.9%	0.0%	0.0%
JD23L_6	5	1.5%	0.3%	2.2%	0.5%
JD23L_7	5	30.5%	17.8%	41.3%	42.9%
JD23L_8	5	5.1%	4.4%	10.9%	10.2%
Total	**35**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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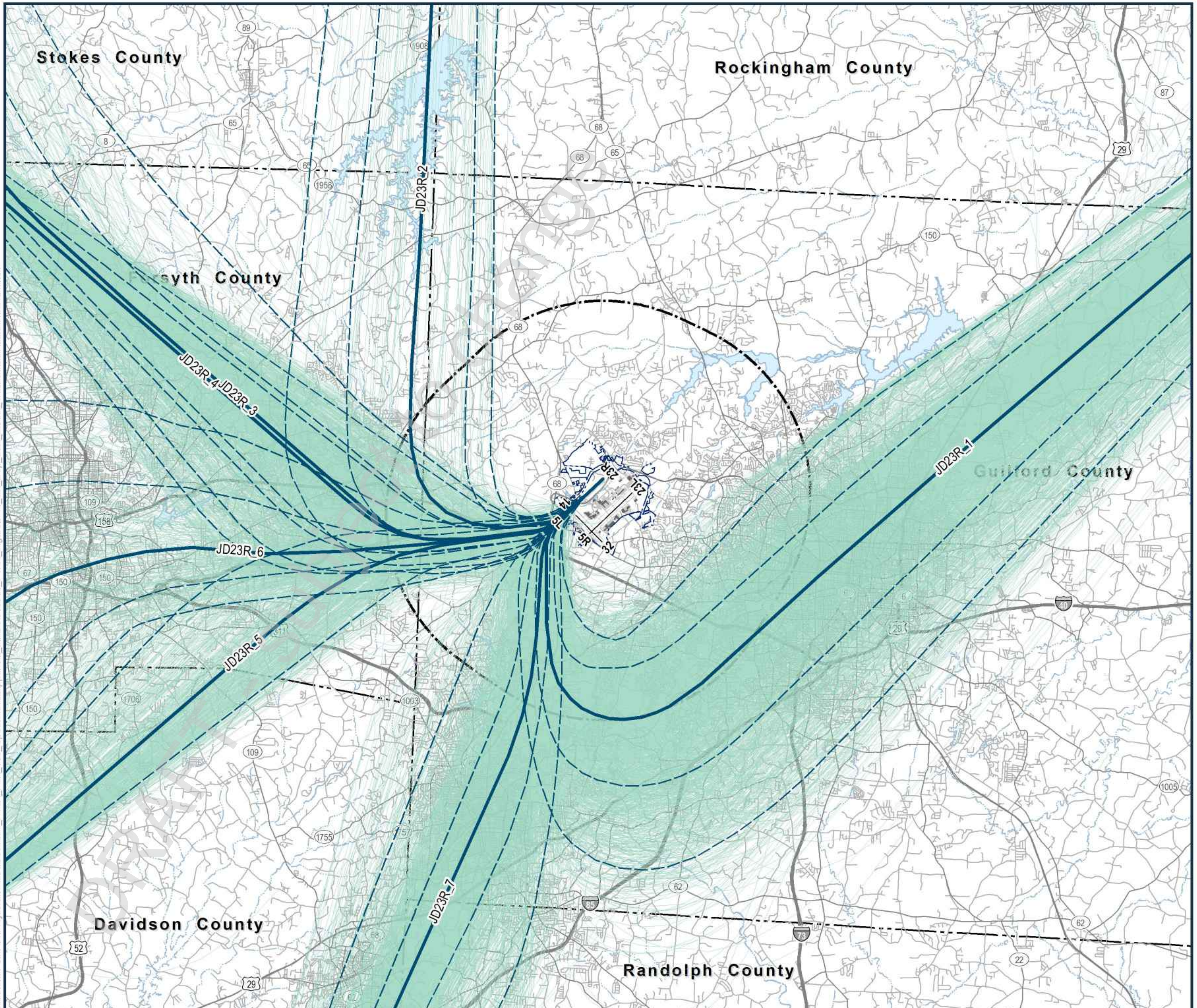

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Part 150 Update

Figure: D-11

Jet Departures from Runway 23R

- Departure Backbone Model Track
- Departure Model Subtrack
- Departure Radar Tracks (6,924)
- Airport Boundary
- Airport Buildings
- Runway
- Taxiway / Apron
- 30,000 ft. Extent from Runway End
- County Boundary
- Highways
- Major Roads
- Local Roads
- Railroad
- Water / Stream / Creek

Track Bundle	# of tracks	Day Usage	Night Usage	Cargo Day	Cargo Night
JD23R_1	5	31.8%	50.7%	33.0%	8.8%
JD23R_2	5	0.1%	0.0%	4.3%	13.2%
JD23R_3	5	4.1%	2.4%	2.1%	10.4%
JD23R_4	5	21.3%	14.0%	26.1%	31.2%
JD23R_5	3	10.0%	9.6%	0.5%	0.0%
JD23R_6	5	4.4%	5.3%	0.0%	0.0%
JD23R_7	5	28.4%	18.0%	34.0%	36.4%
Total	**33**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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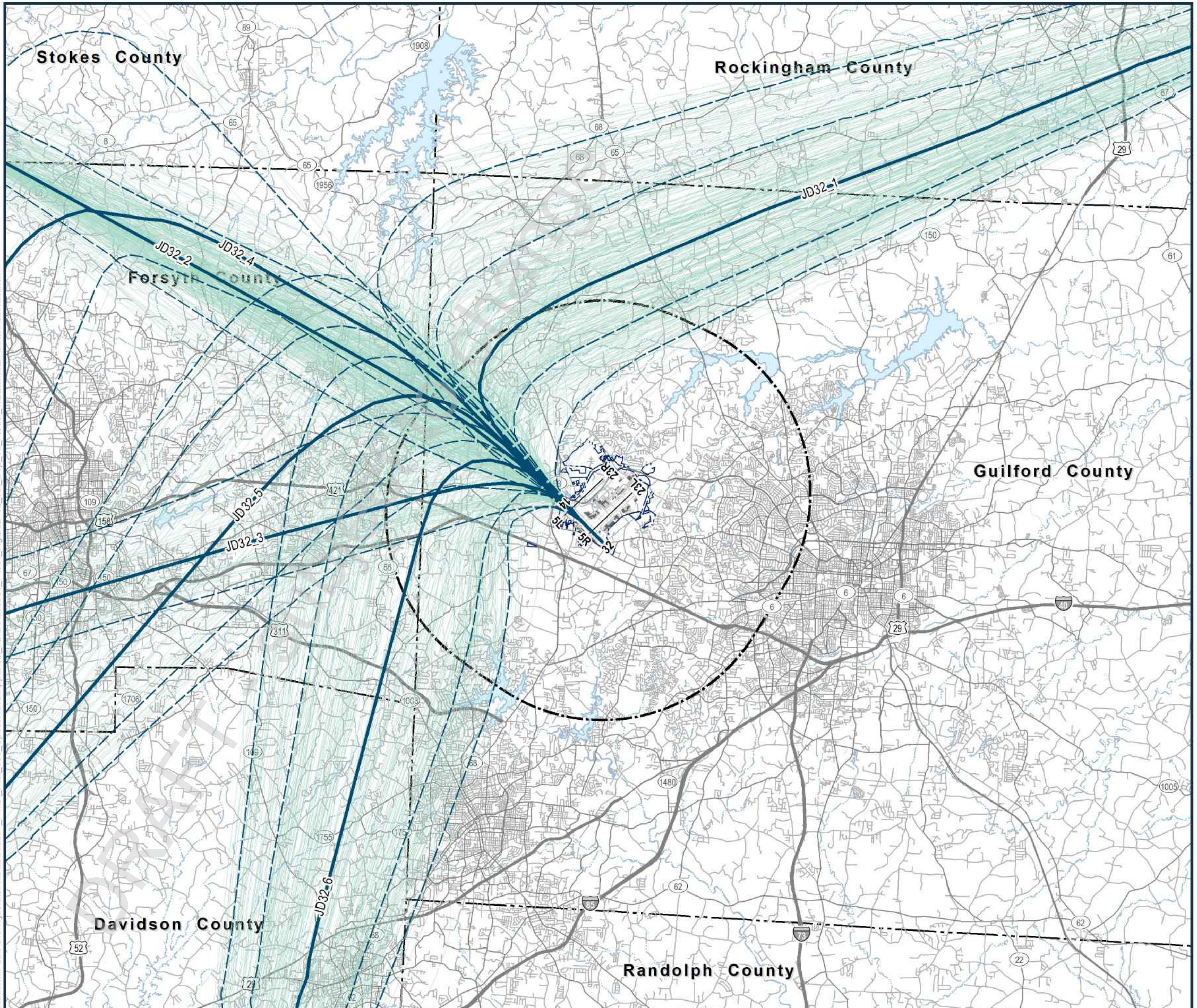

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Part 150 Update

Figure: D-12

Jet Departures from Runway 32

Departure Backbone Model Track
Departure Model Subtrack
Departure Radar Tracks (966)
Airport Boundary
Airport Buildings
Runway
Taxiway / Apron
30,000 ft. Extent from Runway End
County Boundary
Highways
Major Roads
Local Roads
Railroad
Water / Stream / Creek

Track Bundle	# of tracks	Day Usage	Night Usage	Cargo Day	Cargo Night
JD32_1	5	32.0%	21.4%	0.0%	0.0%
JD32_2	3	33.4%	23.8%	80.0%	100.0%
JD32_3	3	3.6%	21.4%	0.0%	0.0%
JD32_4	3	1.9%	0.0%	0.0%	0.0%
JD32_5	5	7.0%	4.8%	0.0%	0.0%
JD32_6	5	22.1%	28.6%	20.0%	0.0%
Total	**24**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

0 4 8 NMi

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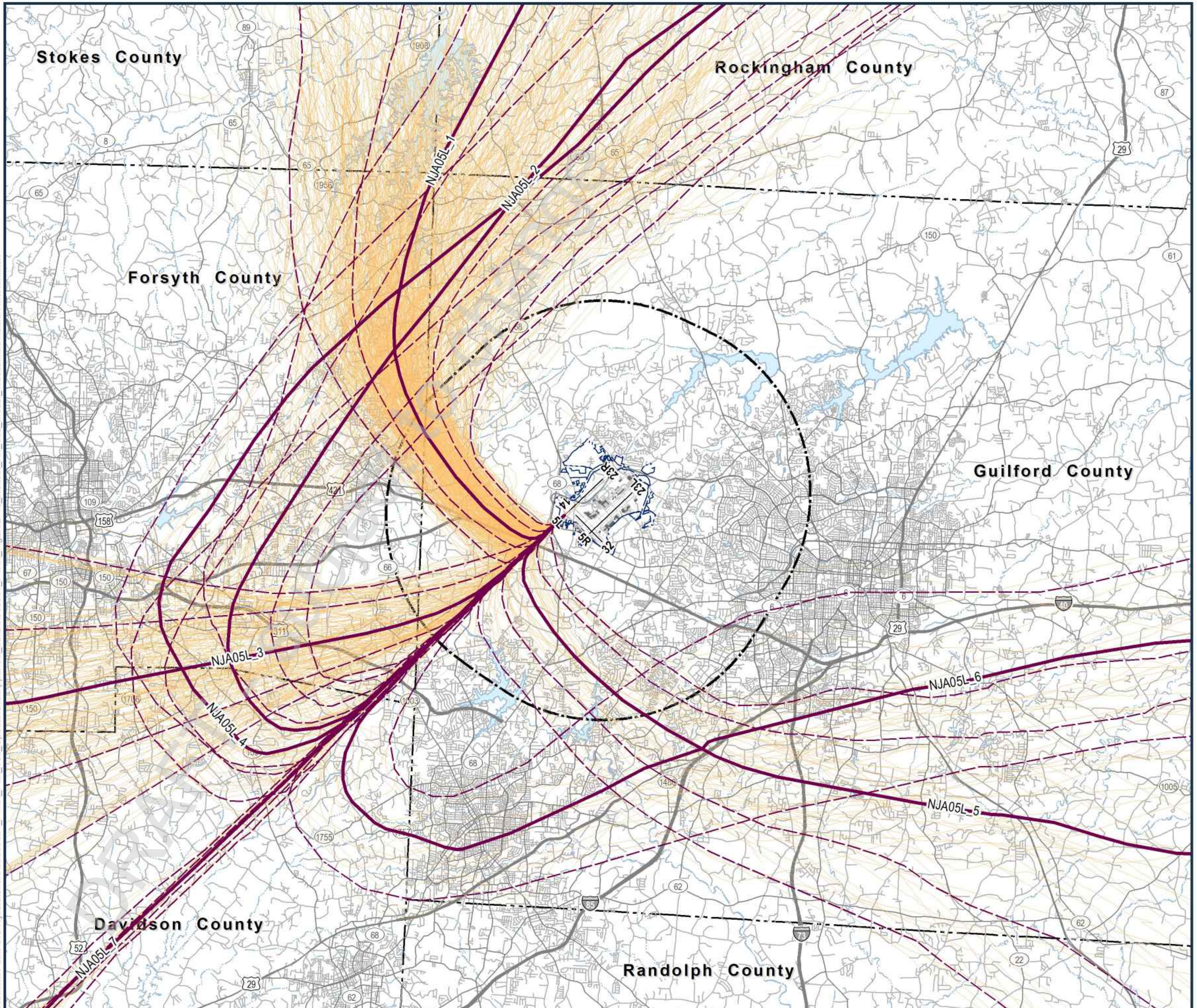

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Part 150 Update

Figure: D-13

Non-Jet Arrivals to Runway 05L

Arrival Backbone Model Track
Arrival Model Subtrack
Arrival Radar Tracks (902)
Airport Boundary
Airport Buildings
Runway
Taxiway / Apron
30,000 ft. Extent from Runway End
County Boundary
Highways
Major Roads
Local Roads
Railroad
Water / Stream / Creek

Track Bundle	# of tracks	Day Usage	Night Usage
NJA05L_1	5	65.8%	4.2%
NJA05L_2	5	7.8%	1.4%
NJA05L_3	5	14.4%	84.5%
NJA05L_4	3	1.6%	0.0%
NJA05L_5	5	5.5%	7.0%
NJA05L_6	3	1.9%	1.4%
NJA05L_7	5	3.0%	1.4%
Total	**31**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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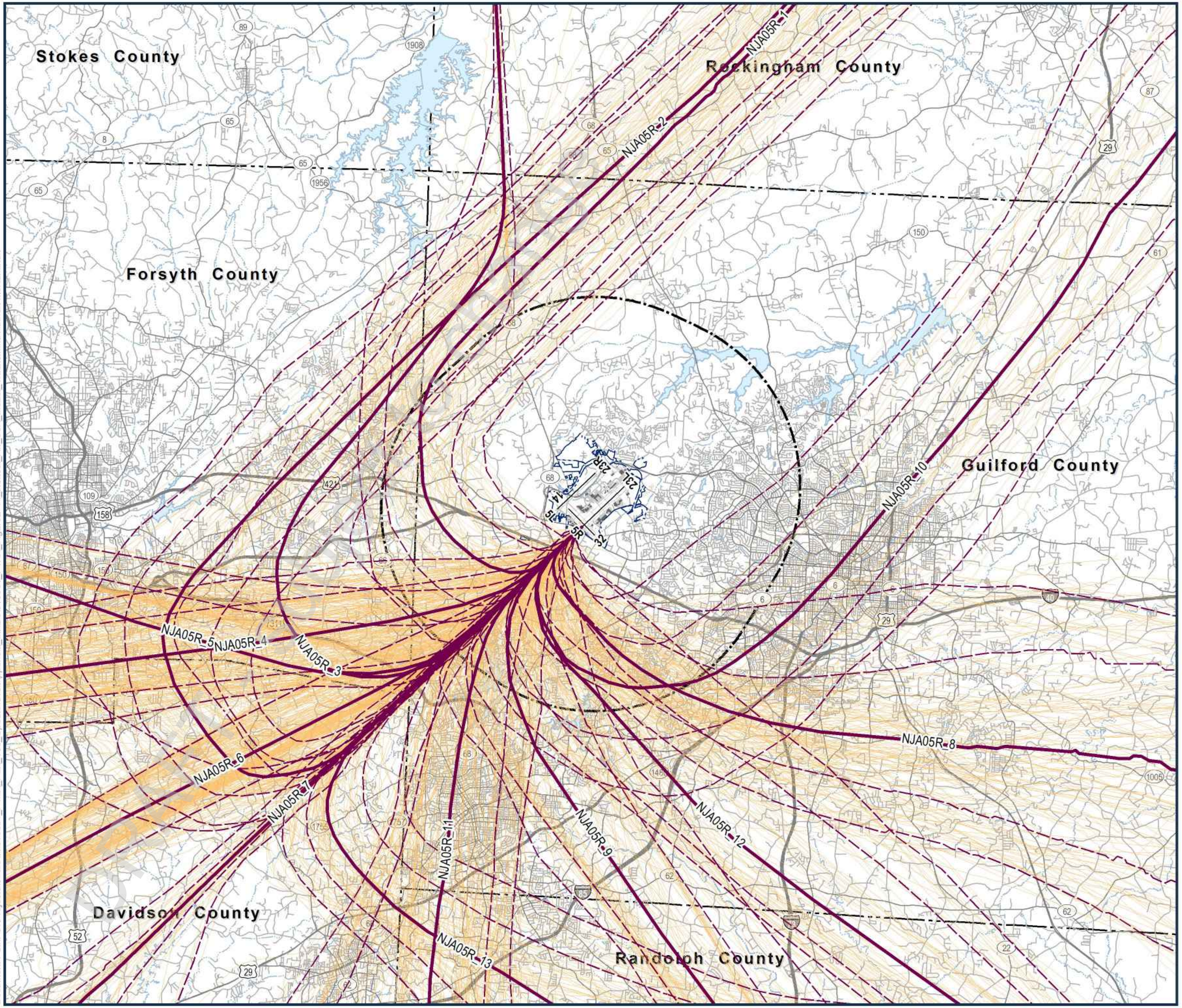
Part 150 Update

Figure: D-14

Non-Jet Arrivals to Runway 05R



Arrival Backbone Model Track
Arrival Model Subtrack
Arrival Radar Tracks (1,411)
Airport Boundary
Airport Buildings
Runway
Taxiway / Apron
30,000 ft. Extent from Runway End
County Boundary
Highways
Major Roads
Local Roads
Railroad
Water / Stream / Creek

Track Bundle	# of tracks	Day Usage	Night Usage
NJA05R_1	5	7.9%	0.4%
NJA05R_2	5	5.8%	0.8%
NJA05R_3	3	3.0%	0.0%
NJA05R_4	5	6.1%	35.8%
NJA05R_5	5	12.2%	1.3%
NJA05R_6	3	0.5%	46.4%
NJA05R_7	5	4.8%	3.3%
NJA05R_8	5	15.8%	1.9%
NJA05R_9	5	7.8%	4.4%
NJA05R_10	5	5.4%	0.2%
NJA05R_11	5	13.2%	4.4%
NJA05R_12	5	7.6%	0.4%
NJA05R_13	5	9.7%	0.6%
Total	**61**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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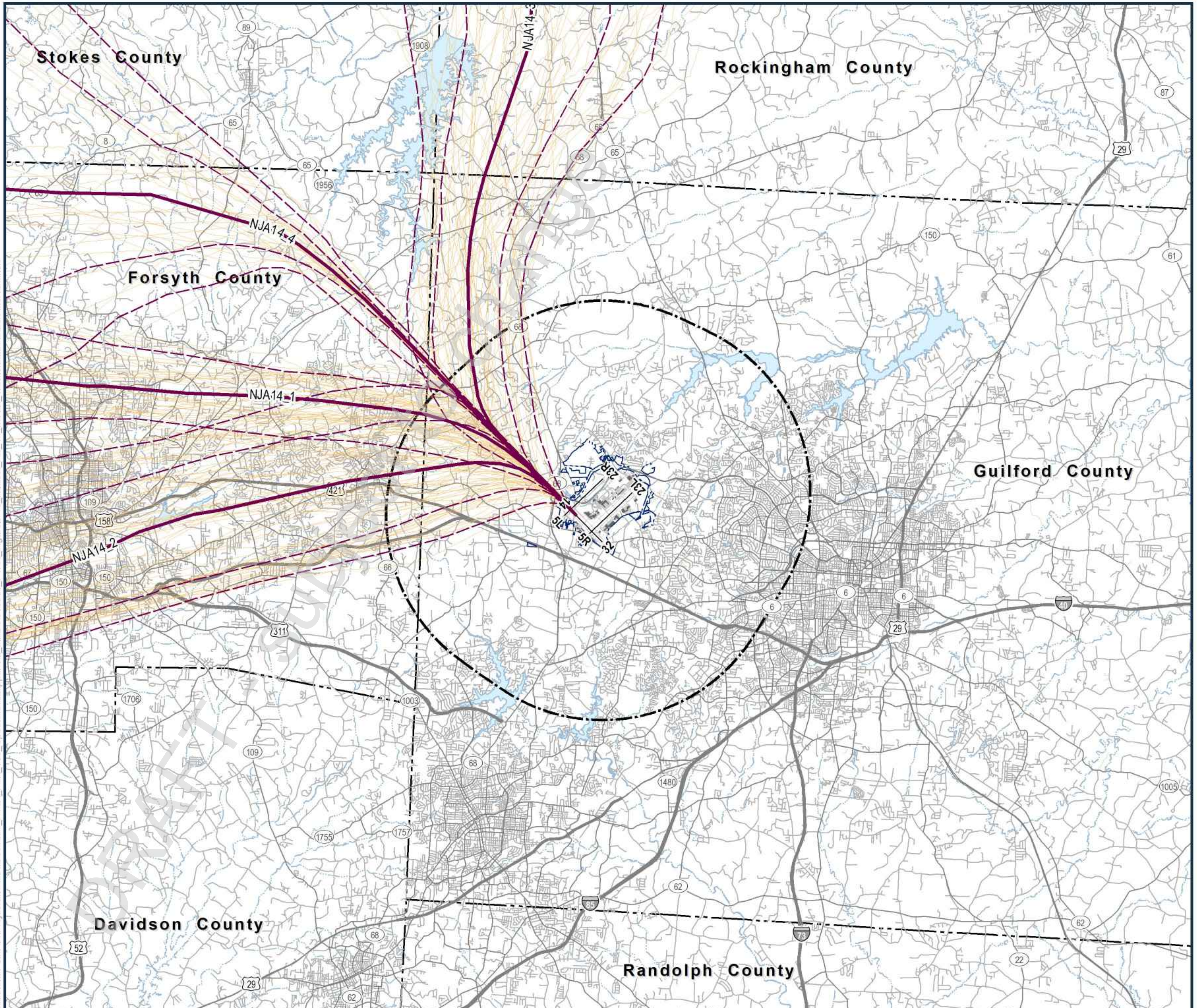

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Part 150 Update

Figure: D-15

Non-Jet Arrivals to Runway 14

- Arrival Backbone Model Track
- Arrival Model Subtrack
- Arrival Radar Tracks (212)
- Airport Boundary
- Airport Buildings
- Runway
- Taxiway / Apron
- 30,000 ft. Extent from Runway End
- County Boundary
- Highways
- Major Roads
- Local Roads
- Railroad
- Water / Stream / Creek

Track Bundle	# of tracks	Day Usage	Night Usage
NJA14_1	3	23.6%	2.2%
NJA14_2	5	20.0%	97.8%
NJA14_3	5	36.4%	0.0%
NJA14_4	5	20.0%	0.0%
Total	**18**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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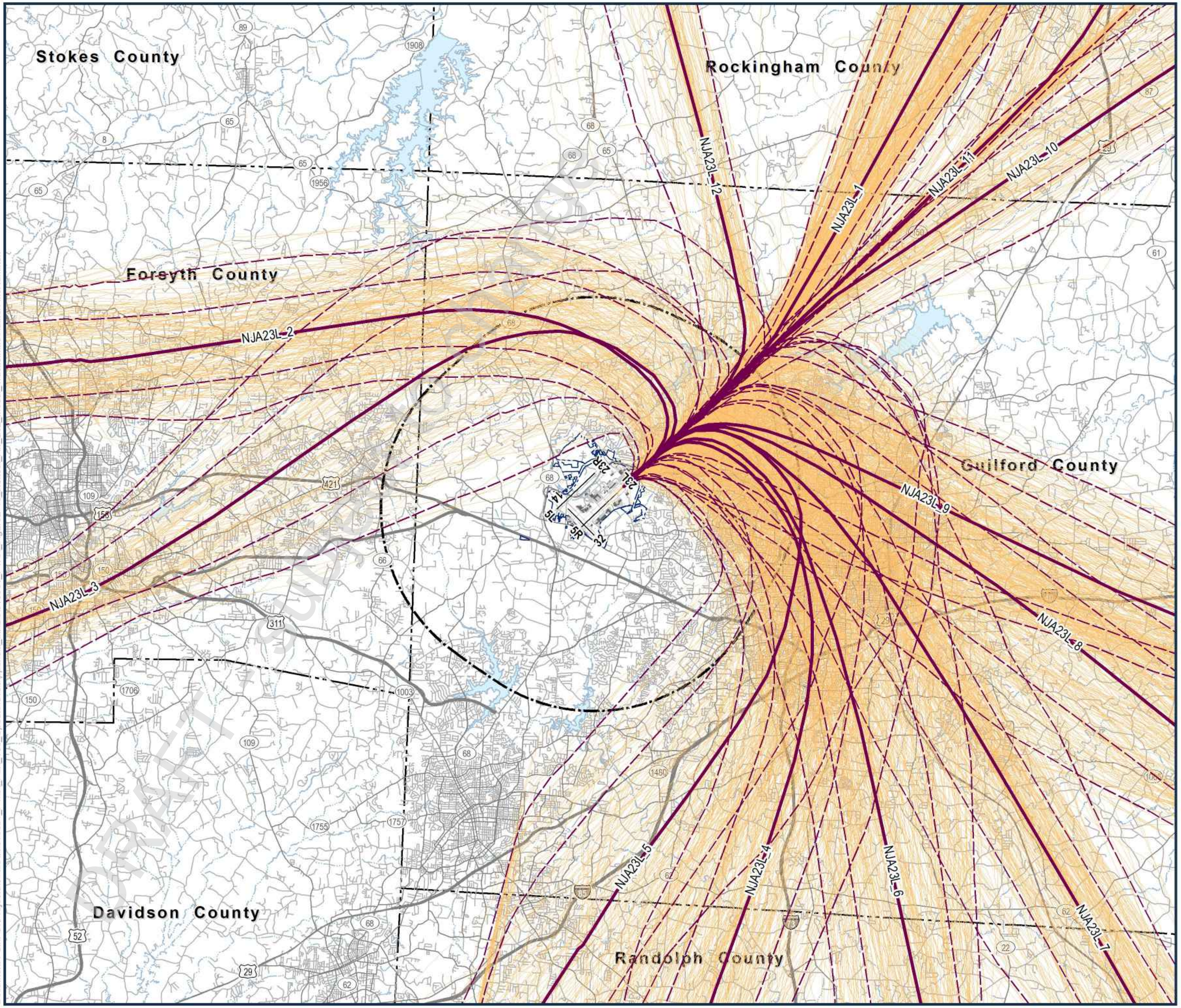

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Figure: D-16

Non-Jet Arrivals to Runway 23L

Arrival Backbone Model Track
Arrival Model Subtrack
Arrival Radar Tracks (2,517)
Airport Boundary
Airport Buildings
Runway
Taxiway / Apron
30,000 ft. Extent from Runway End
County Boundary
Highways
Major Roads
Local Roads
Railroad
Water / Stream / Creek

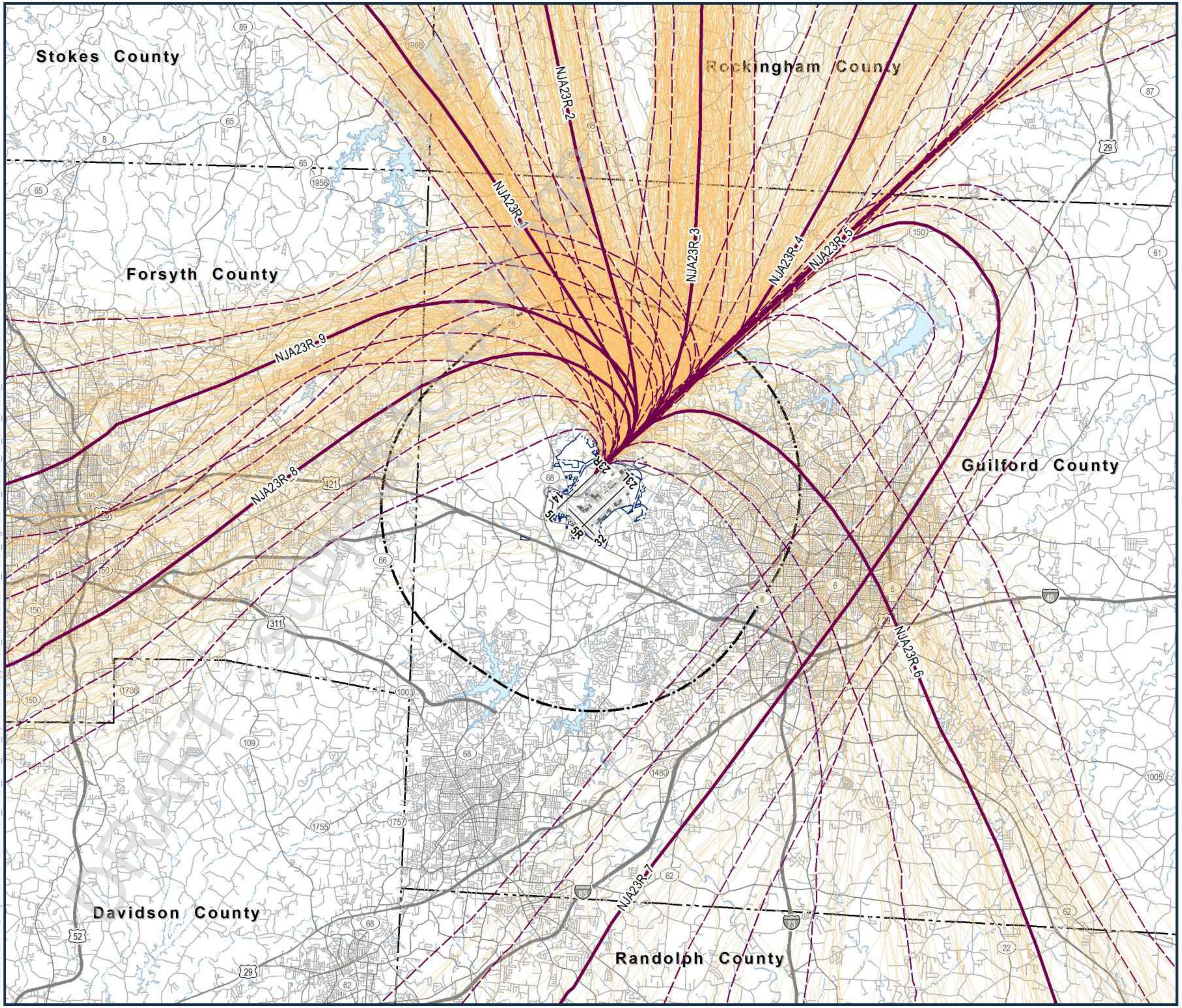
Track Bundle	# of tracks	Day Usage	Night Usage
NJA23L_1	5	11.7%	49.0%
NJA23L_2	5	8.2%	1.6%
NJA23L_3	5	3.6%	16.0%
NJA23L_4	5	9.6%	0.4%
NJA23L_5	5	8.1%	2.7%
NJA23L_6	5	8.7%	2.3%
NJA23L_7	5	11.3%	0.4%
NJA23L_8	5	12.6%	0.8%
NJA23L_9	5	9.3%	5.8%
NJA23L_10	5	5.7%	3.1%
NJA23L_11	5	7.4%	16.7%
NJA23L_12	3	3.8%	1.2%
Total	**58**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

0 4 8 NMi

hmmh



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Part 150 Update

Figure: D-17

Non-Jet Arrivals to Runway 23R

- Arrival Backbone Model Track
- Arrival Model Subtrack
- Arrival Radar Tracks (1,921)
- Airport Boundary
- Airport Buildings
- Runway
- Taxiway / Apron
- 30,000 ft. Extent from Runway End
- County Boundary
- Highways
- Major Roads
- Local Roads
- Railroad
- Water / Stream / Creek

Track Bundle	# of tracks	Day Usage	Night Usage
NJA23R_1	5	21.0%	0.0%
NJA23R_2	5	10.9%	10.2%
NJA23R_3	5	20.8%	10.2%
NJA23R_4	5	13.3%	4.1%
NJA23R_5	5	6.3%	10.2%
NJA23R_6	5	7.2%	14.3%
NJA23R_7	5	2.1%	8.2%
NJA23R_8	5	8.3%	30.6%
NJA23R_9	5	10.1%	12.2%
Total	**45**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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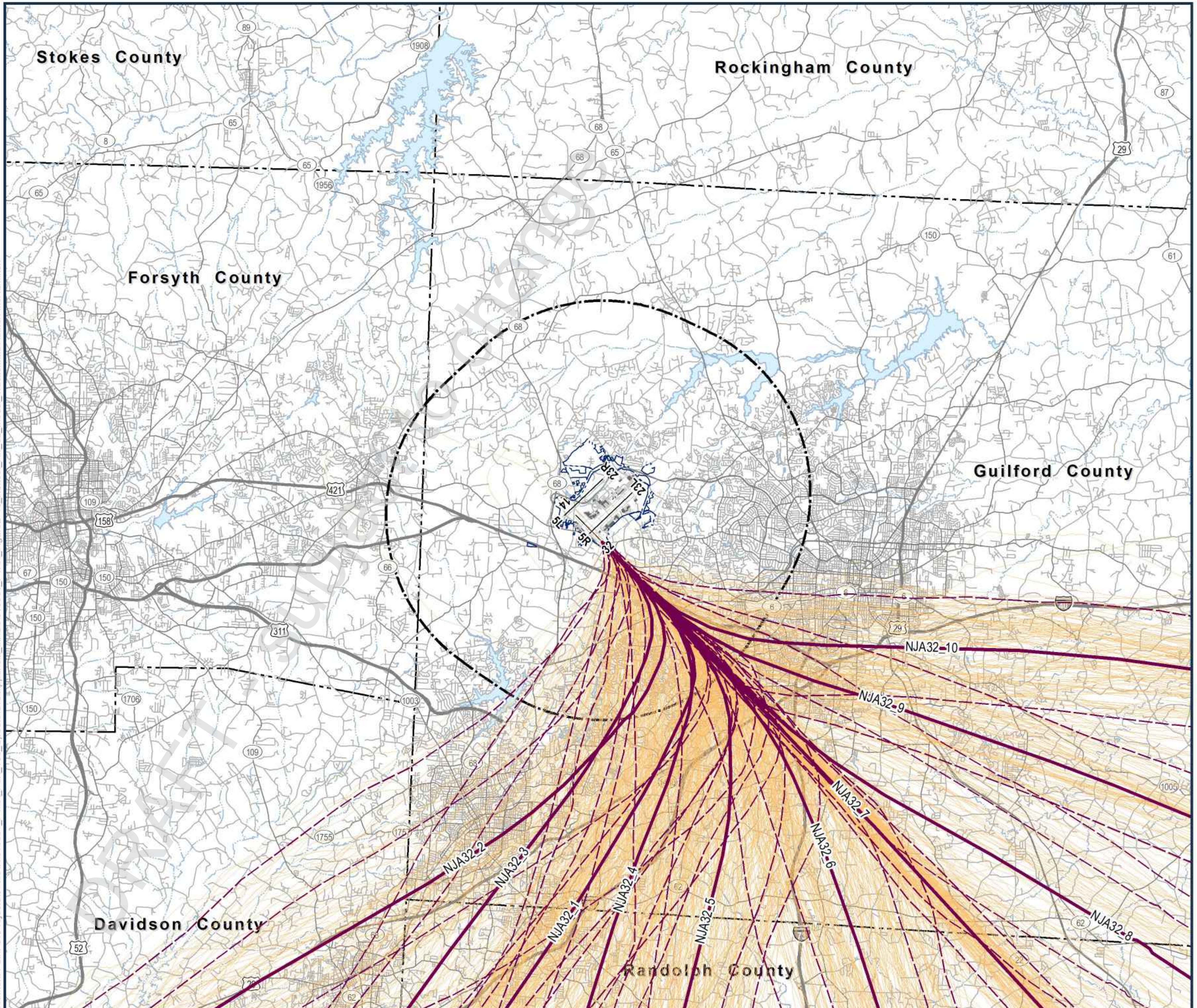

PIEDMONT TRIAD AIRPORT AUTHORITY

Part 150 Update

Figure: D-18

Non-Jet Arrivals to Runway 32

Arrival Backbone Model Track — Arrival Model Subtrack

Arrival Radar Tracks (1,396)

Airport Boundary — Airport Buildings

Runway — Taxiway / Apron

30,000 ft. Extent from Runway End

County Boundary

Highways — Major Roads — Local Roads

Railroad — Water / Stream / Creek

Track Bundle	# of tracks	Day Usage	Night Usage
NJA32_1	5	6.4%	56.2%
NJA32_2	5	8.3%	1.9%
NJA32_3	5	4.2%	16.2%
NJA32_4	5	7.5%	4.3%
NJA32_5	5	16.9%	8.1%
NJA32_6	5	17.5%	1.4%
NJA32_7	3	16.0%	1.4%
NJA32_8	5	6.2%	3.8%
NJA32_9	3	6.9%	1.4%
NJA32_10	3	9.9%	5.2%
Total	**44**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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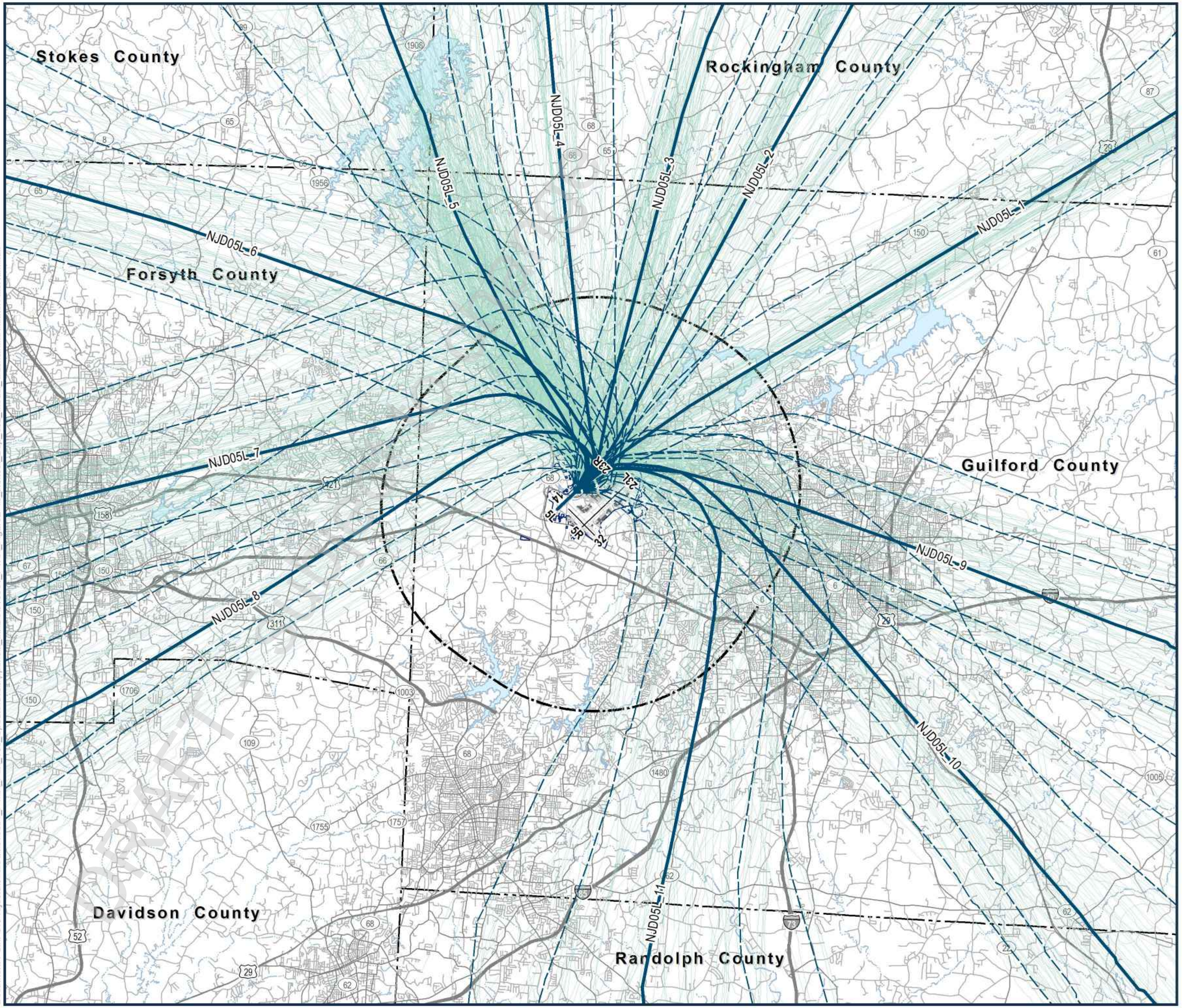

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Part 150 Update

Figure: D-19

Non-Jet Departures from Runway 05L

Departure Backbone Model Track
Departure Model Subtrack
Departure Radar Tracks (1,178)
Airport Boundary
Airport Buildings
Runway
Taxiway / Apron
30,000 ft. Extent from Runway End
County Boundary
Highways
Major Roads
Local Roads
Railroad
Water / Stream / Creek

Track Bundle	# of tracks	Day Usage	Night Usage
NJD05L_1	3	5.7%	15.8%
NJD05L_2	5	5.1%	32.1%
NJD05L_3	3	9.8%	1.2%
NJD05L_4	3	4.6%	1.8%
NJD05L_5	5	31.1%	0.6%
NJD05L_6	5	7.0%	4.2%
NJD05L_7	5	12.2%	4.2%
NJD05L_8	5	5.1%	20.6%
NJD05L_9	5	5.5%	10.9%
NJD05L_10	5	7.6%	5.5%
NJD05L_11	5	6.3%	3.0%
Total	**49**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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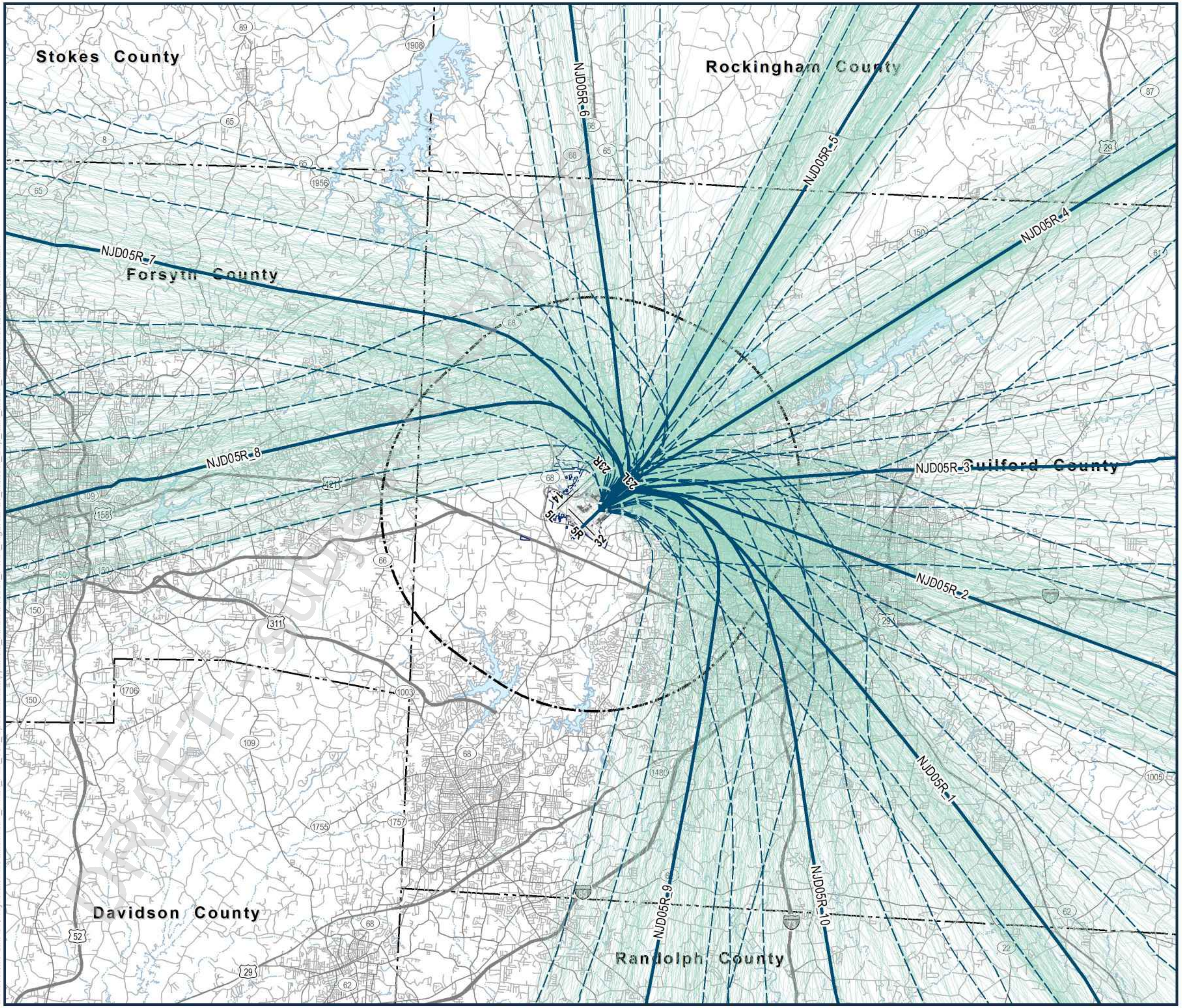

Document Path: G:\Projects\310XXX\310081_PTAA_Part_150_Update\GIS\Appendix_MXDs\310081_PTAA_FigureD-20_NonJet_Dep_05R_Model_Tracks.mxd Author: MJHamilton

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Part 150 Update

Figure: D-20

Non-Jet Departures from Runway 05R

Departure Backbone Model Track
Departure Model Subtrack
Departure Radar Tracks (2,269)
Airport Boundary
Airport Buildings
Runway
Taxiway / Apron
30,000 ft. Extent from Runway End
County Boundary
Highways
Major Roads
Local Roads
Railroad
Water / Stream / Creek

Track Bundle	# of tracks	Day Usage	Night Usage
NJD05R_1	5	12.5%	9.5%
NJD05R_2	5	12.3%	13.9%
NJD05R_3	5	4.3%	0.8%
NJD05R_4	5	14.1%	13.5%
NJD05R_5	5	7.2%	49.5%
NJD05R_6	5	4.2%	2.4%
NJD05R_7	5	11.4%	1.4%
NJD05R_8	5	12.2%	4.8%
NJD05R_9	5	11.8%	3.0%
NJD05R_10	5	10.1%	1.2%
Total	**50**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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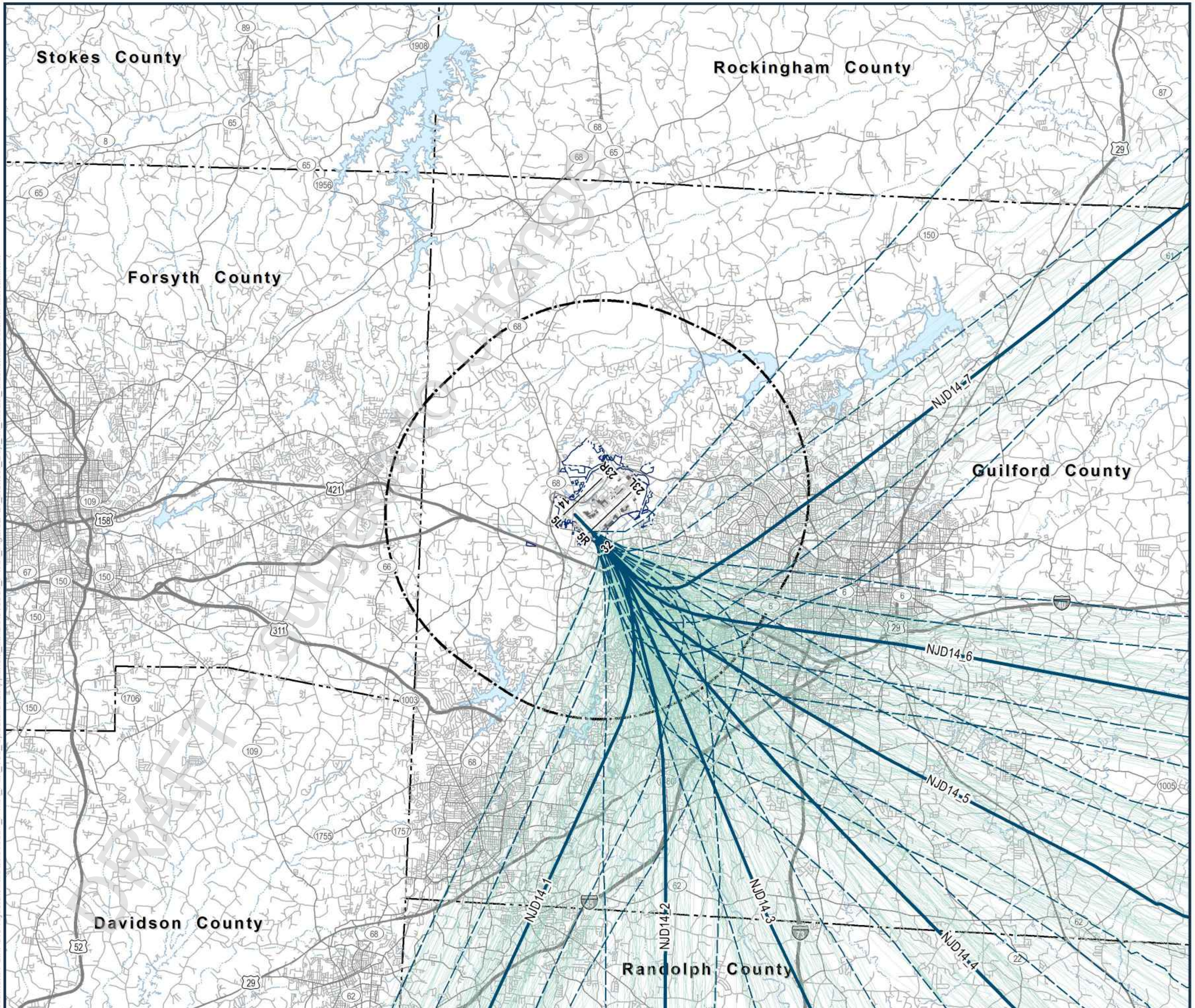

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Part 150 Update

Figure: D-21

Non-Jet Departures from Runway 14

Departure Backbone Model Track
Departure Model Subtrack
Departure Radar Tracks (638)
Airport Boundary
Airport Buildings
Runway
Taxiway / Apron
30,000 ft. Extent from Runway End
County Boundary
Highways
Major Roads
Local Roads
Railroad
Water / Stream / Creek

Track Bundle	# of tracks	Day Usage	Night Usage
NJD14_1	5	26.6%	10.3%
NJD14_2	3	10.9%	3.4%
NJD14_3	3	11.7%	3.4%
NJD14_4	3	12.0%	13.8%
NJD14_5	5	16.8%	3.4%
NJD14_6	5	14.8%	24.1%
NJD14_7	5	7.3%	41.4%
Total	**29**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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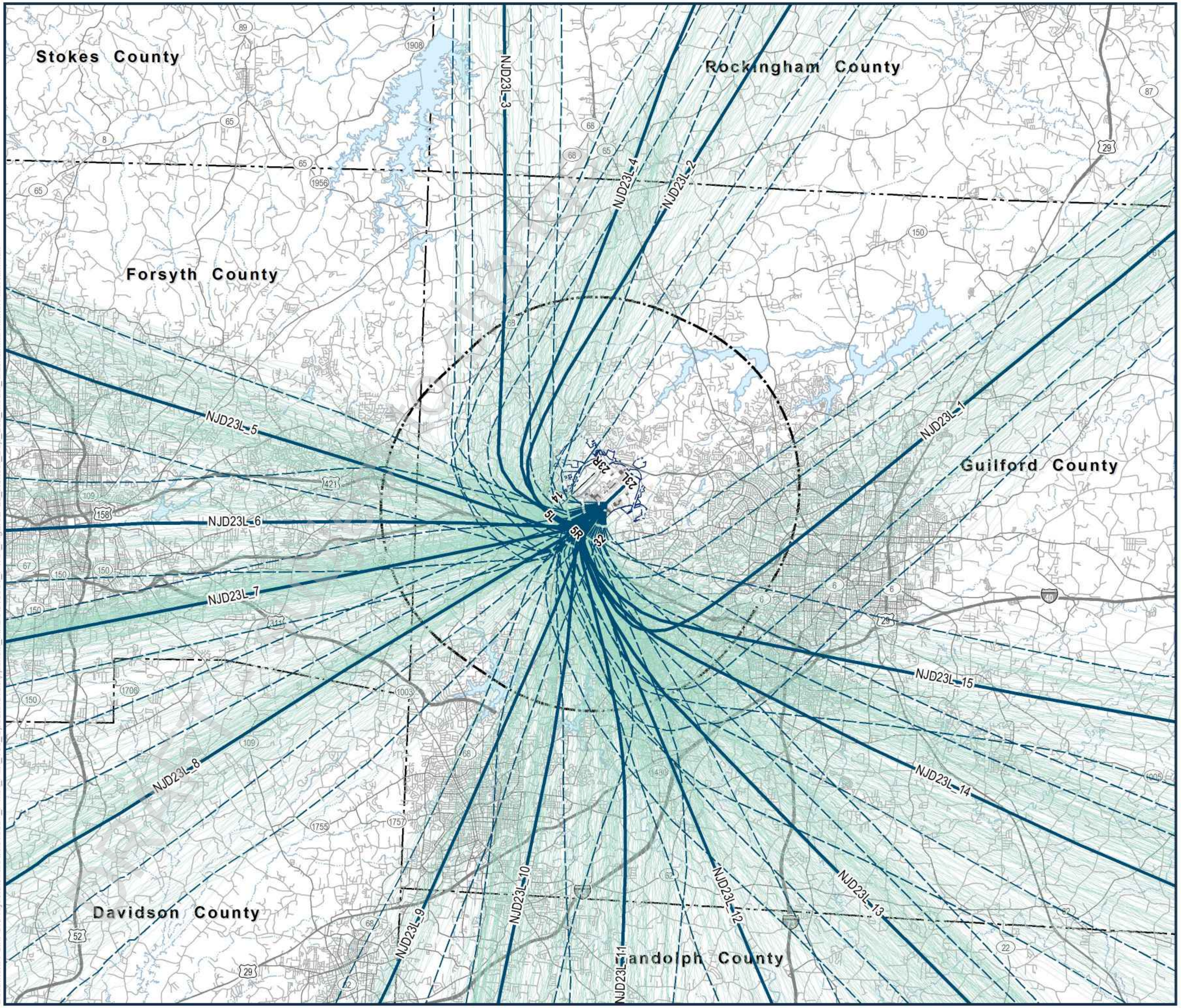

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Part 150 Update

Figure: D-22

Non-Jet Departures from Runway 23L

Departure Backbone Model Track
Departure Model Subtrack
Departure Radar Tracks (1,932)
Airport Boundary
Airport Buildings
Runway
Taxiway / Apron
30,000 ft. Extent from Runway End
County Boundary
Highways
Major Roads
Local Roads
Railroad
Water / Stream / Creek

Track Bundle	# of tracks	Day Usage	Night Usage
NJD23L_1	5	10.0%	4.7%
NJD23L_2	5	5.1%	7.2%
NJD23L_3	5	2.6%	0.9%
NJD23L_4	3	5.5%	0.0%
NJD23L_5	3	9.9%	1.6%
NJD23L_6	3	4.3%	0.6%
NJD23L_7	3	8.7%	9.7%
NJD23L_8	5	5.3%	24.3%
NJD23L_9	3	3.2%	2.8%
NJD23L_10	3	7.8%	6.2%
NJD23L_11	3	8.8%	2.8%
NJD23L_12	3	4.4%	0.3%
NJD23L_13	5	10.3%	19.6%
NJD23L_14	5	9.6%	17.1%
NJD23L_15	3	4.5%	2.2%
Total	**57**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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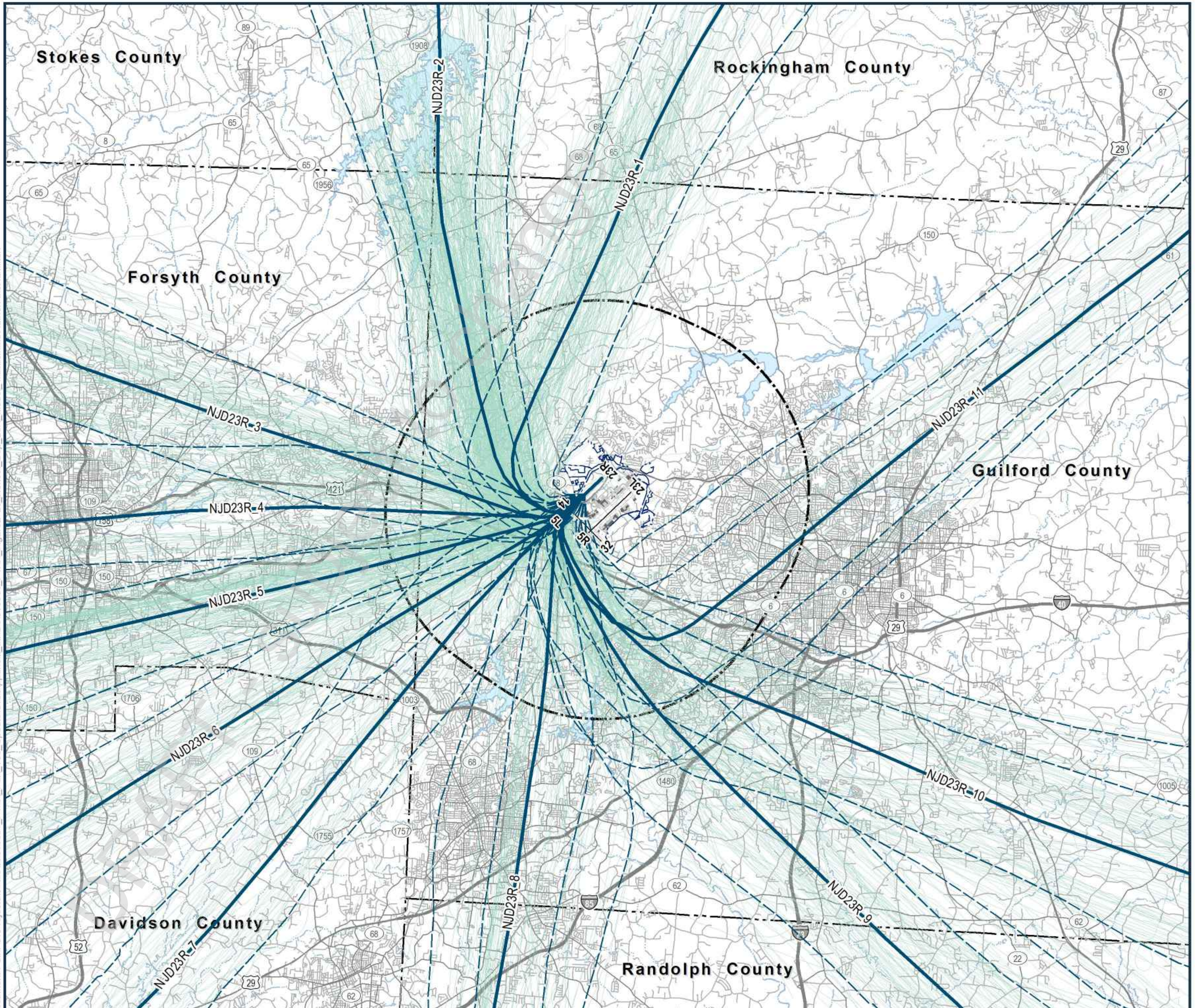
PIEDMONT TRIAD AIRPORT AUTHORITY

Part 150 Update

Figure: D-23

Non-Jet Departures from Runway 23R



Departure Backbone Model Track
Departure Model Subtrack
Departure Radar Tracks (1,329)
Airport Boundary
Airport Buildings
Runway
Taxiway / Apron
30,000 ft. Extent from Runway End
County Boundary
Highways
Major Roads
Local Roads
Railroad
Water / Stream / Creek

Track Bundle	# of tracks	Day Usage	Night Usage
NJD23R_1	3	14.5%	3.6%
NJD23R_2	5	29.2%	2.9%
NJD23R_3	3	9.0%	5.8%
NJD23R_4	3	5.2%	0.7%
NJD23R_5	3	12.2%	16.5%
NJD23R_6	3	3.4%	22.3%
NJD23R_7	3	3.8%	2.9%
NJD23R_8	5	4.8%	13.7%
NJD23R_9	3	6.5%	16.5%
NJD23R_10	5	6.9%	12.9%
NJD23R_11	5	4.5%	2.2%
Total	**41**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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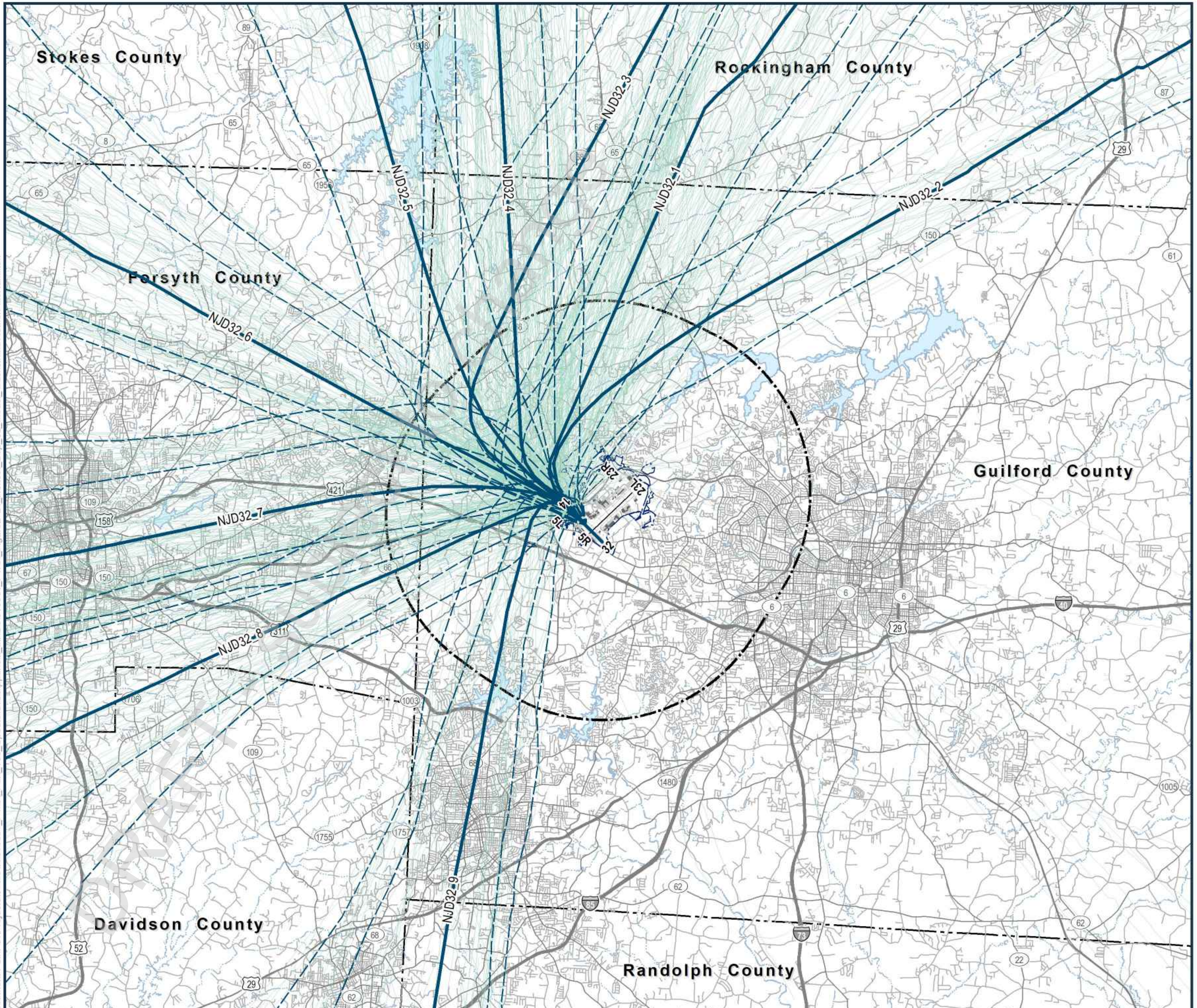

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Part 150 Update

Figure: D-24

Non-Jet Departures from Runway 32

- Departure Backbone Model Track
- Departure Model Subtrack
- Departure Radar Tracks (777)
- Airport Boundary
- Airport Buildings
- Runway
- Taxiway / Apron
- 30,000 ft. Extent from Runway End
- County Boundary
- Highways
- Major Roads
- Local Roads
- Railroad
- Water / Stream / Creek

Track Bundle	# of tracks	Day Usage	Night Usage
NJD32_1	5	20.2%	46.3%
NJD32_2	3	3.7%	9.3%
NJD32_3	3	6.2%	3.7%
NJD32_4	5	19.5%	0.0%
NJD32_5	3	5.5%	7.4%
NJD32_6	5	13.9%	5.6%
NJD32_7	5	17.3%	9.3%
NJD32_8	5	8.0%	18.5%
NJD32_9	5	5.8%	0.0%
Total	**39**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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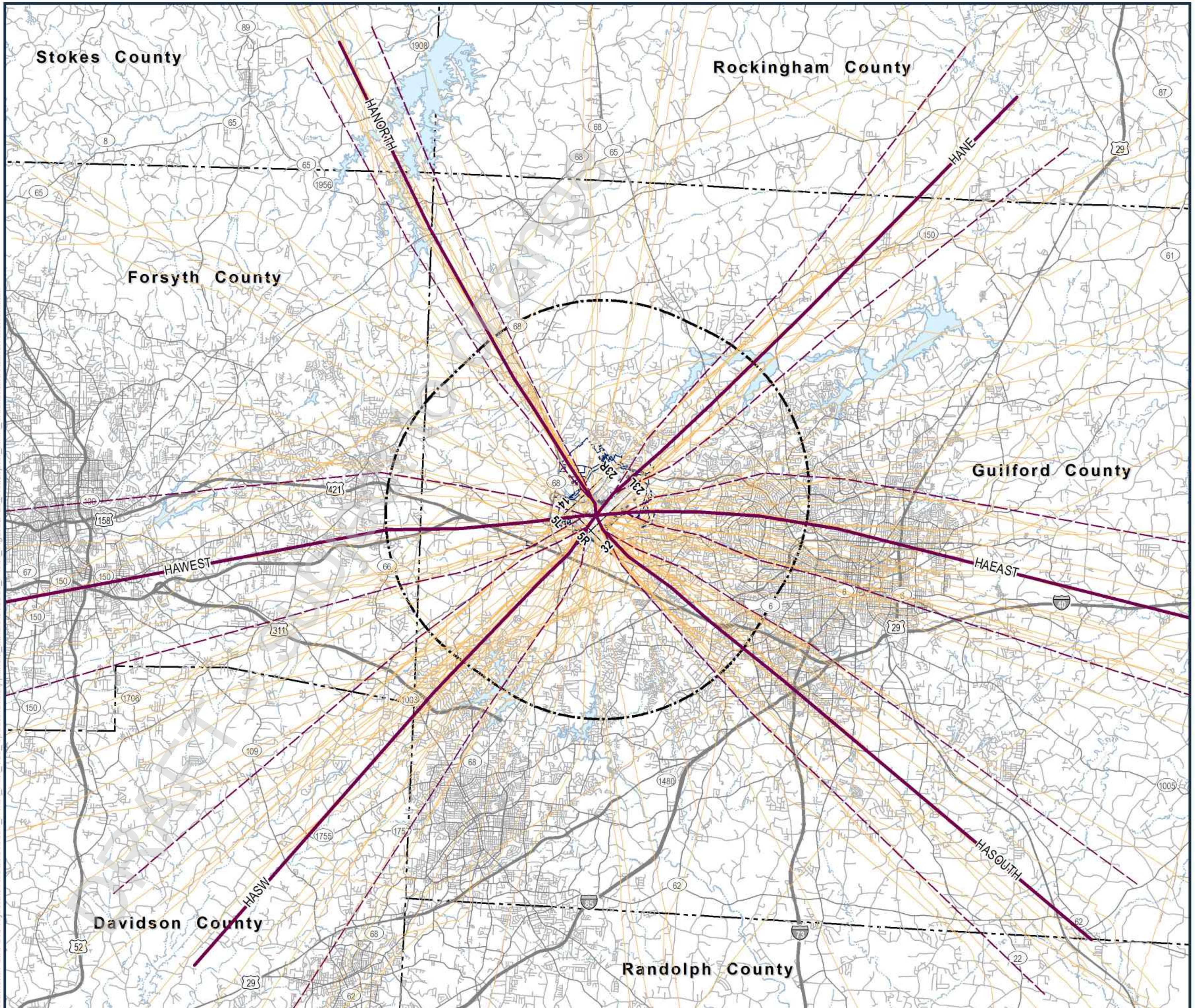
Part 150 Update

Figure: D-25

Helicopter Arrivals



- Arrival Backbone Model Track
- Arrival Model Subtrack
- Arrival Radar Tracks (157)
- Airport Boundary
- Airport Buildings
- Runway
- Taxiway / Apron
- 30,000 ft. Extent from Runway End
- County Boundary
- Highways
- Major Roads
- Local Roads
- Railroad
- Water / Stream / Creek

Track Bundle	# of tracks	Usage
HANORTH	3	15.3%
HASOUTH	3	11.5%
HAWEST	3	15.3%
HAEAST	3	19.1%
HASW	3	24.2%
HANE	3	14.6%
Total	**18**	**100%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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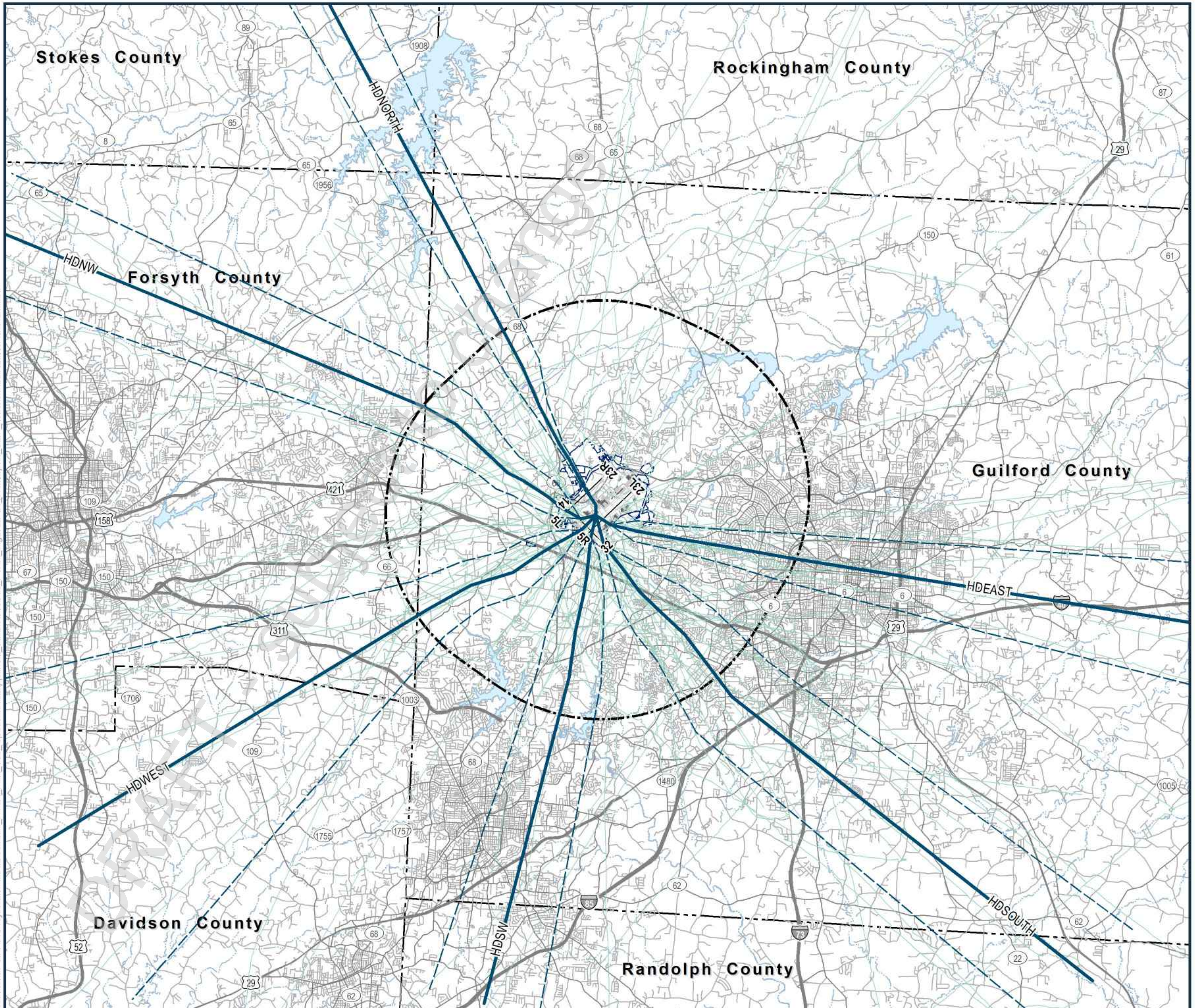

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Part 150 Update

Figure: D-26

Helicopter Departures

- Departure Backbone Model Track
- Departure Model Subtrack
- Departure Radar Tracks (113)
- Airport Boundary
- Airport Buildings
- Runway
- Taxiway / Apron
- 30,000 ft. Extent from Runway End
- County Boundary
- Highways
- Major Roads
- Local Roads
- Railroad
- Water / Stream / Creek

Track Bundle	# of tracks	Usage
HDNORTH	3	15.0%
HDSOUTH	3	25.7%
HDWEST	3	15.0%
HDEAST	3	12.4%
HDSW	3	19.5%
HDNW	3	12.4%
Total	**18**	**100%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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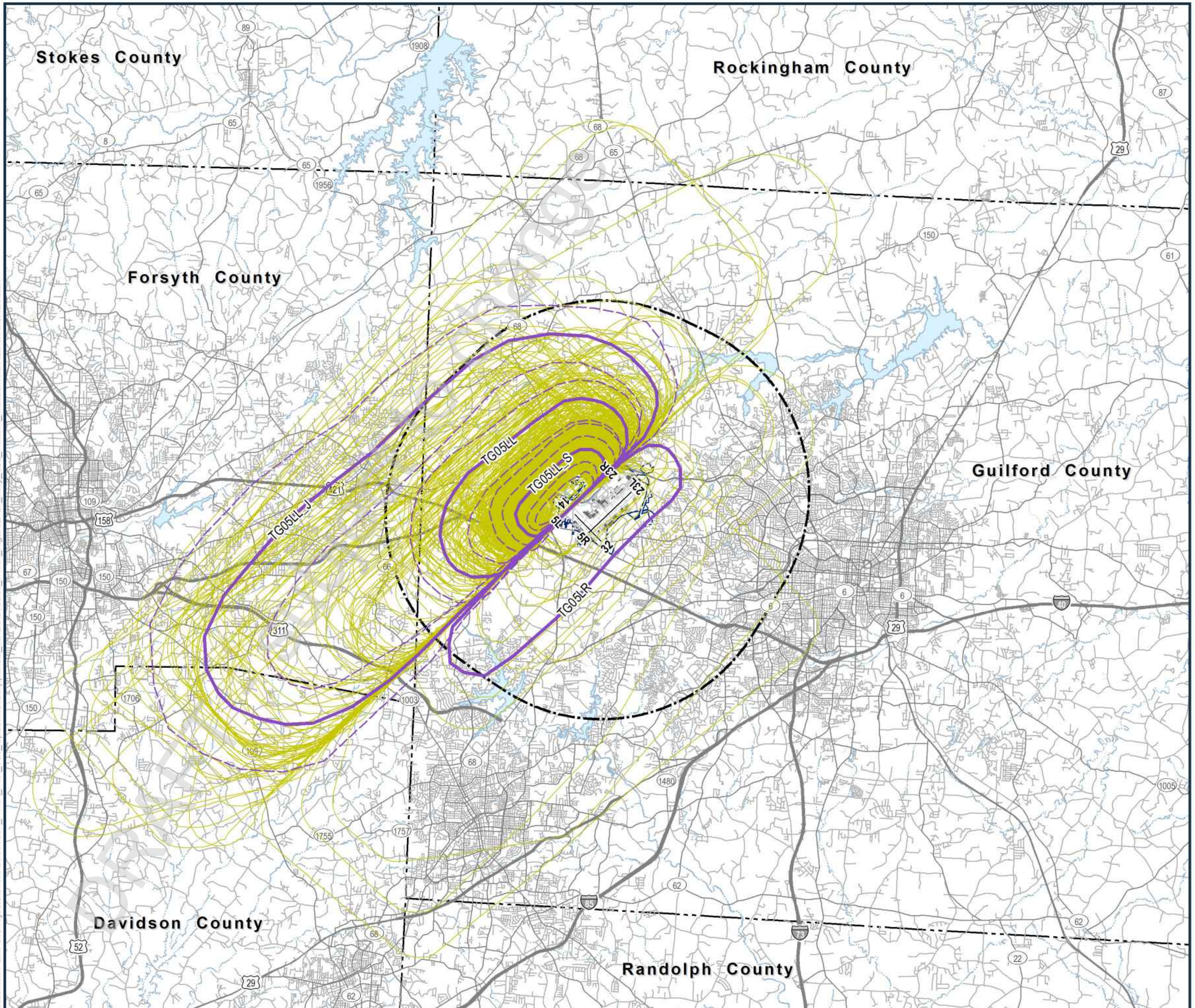

PIEDMONT TRIAD AIRPORT AUTHORITY
Part 150 Update

Figure: D-27

Runway 05L Local Pattern Operations

Pattern Backbone Model Track
Pattern Model Subtrack
Runway 05L Pattern Tracks (1,638)
Airport Boundary
Airport Buildings
Runway
Taxiway / Apron
30,000 ft. Extent from Runway End
County Boundary
Highways
Major Roads
Local Roads
Railroad
Water / Stream / Creek

Track Bundle	# of tracks	GA Jet Usage	Mil Jet Usage	NonJet Usage
TG05LR	1	10.7%	0.0%	0.8%
TG05LL_S	5	0.0%	0.0%	91.6%
TG05LL	3	64.3%	0.0%	5.4%
TG05LL_J	3	25.0%	100.0%	2.2%
Total	**12**	**100.0%**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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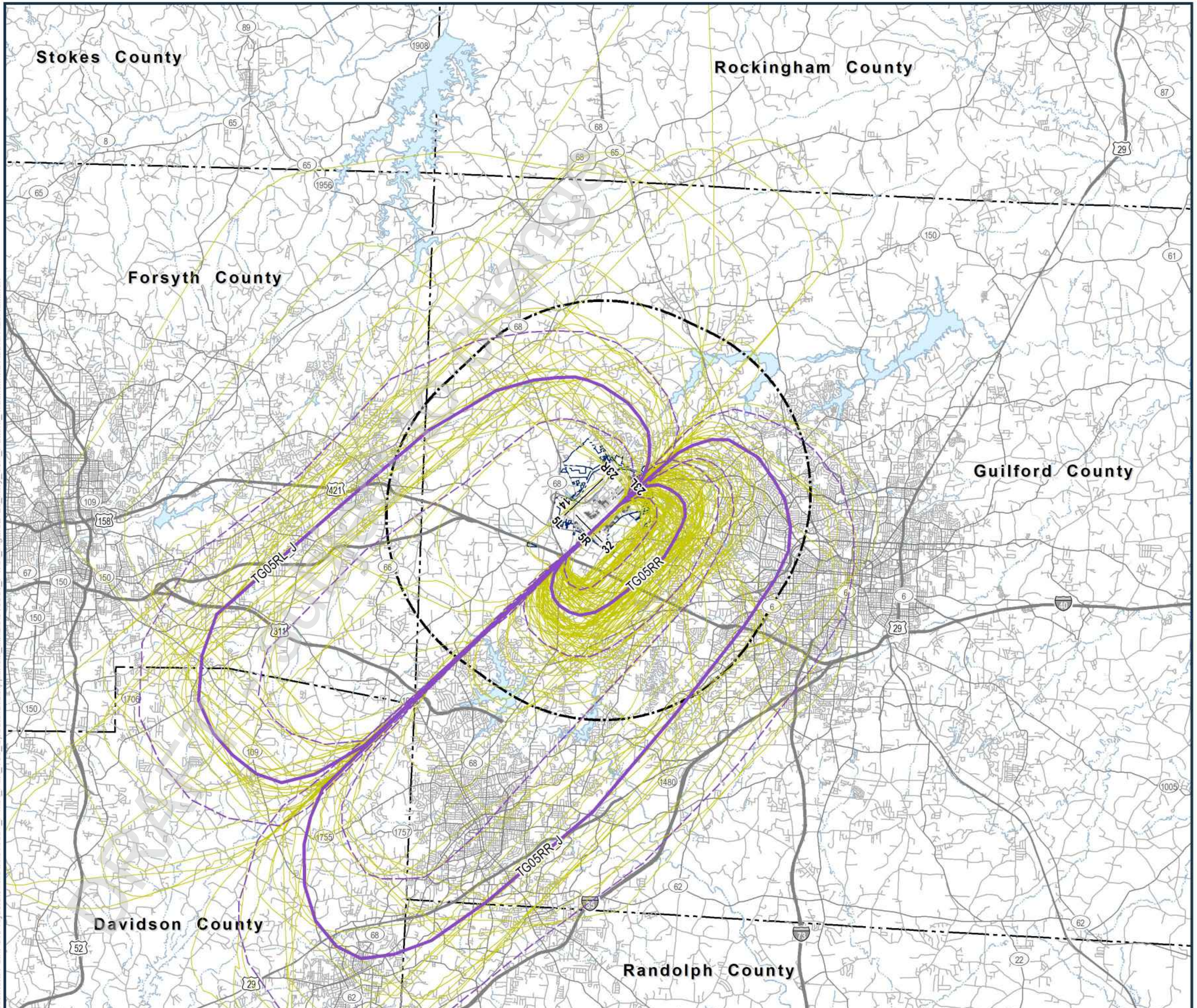

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Part 150 Update

Figure: D-28

Runway 05R Local Pattern Operations

- Pattern Backbone Model Track
- Pattern Model Subtrack
- Runway 05R Pattern Tracks (149)
- Airport Boundary
- Airport Buildings
- Runway
- Taxiway / Apron
- 30,000 ft. Extent from Runway End
- County Boundary
- Highways
- Major Roads
- Local Roads
- Railroad
- Water / Stream / Creek

Track Bundle	# of tracks	GA Jet Usage	Mil Jet Usage	NonJet Usage
TG05RR	3	75.0%	0.0%	85.2%
TG05RR_J	3	10.6%	40.0%	5.7%
TG05RL_J	3	14.4%	60.0%	9.0%
Total	**9**	**100.0%**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

0 4 8 NMi

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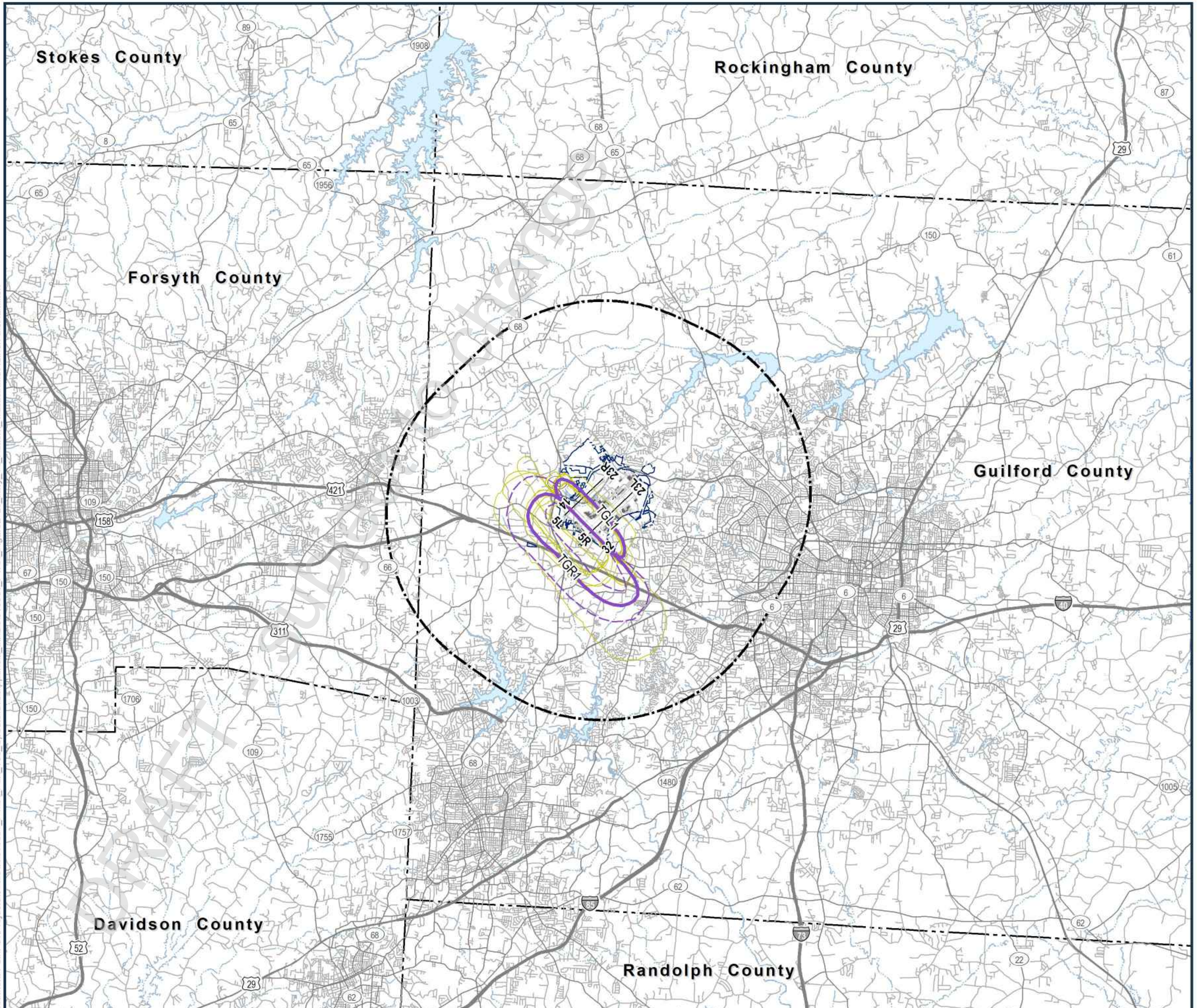

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Part 150 Update

Figure: D-29

Runway 14 Local Pattern Operations

- Pattern Backbone Model Track
- Pattern Model Subtrack
- Runway 14 Pattern Tracks (16)
- Airport Boundary
- Airport Buildings
- Runway
- Taxiway / Apron
- 30,000 ft. Extent from Runway End
- County Boundary
- Highways
- Major Roads
- Local Roads
- Railroad
- Water / Stream / Creek

Track Bundle	# of tracks	GA Jet Usage	Mil Jet Usage	NonJet Usage
TGR1	3	0.0%	0.0%	61.1%
TGL1	1	0.0%	0.0%	38.9%
Total	**4**	**0.0%**	**0.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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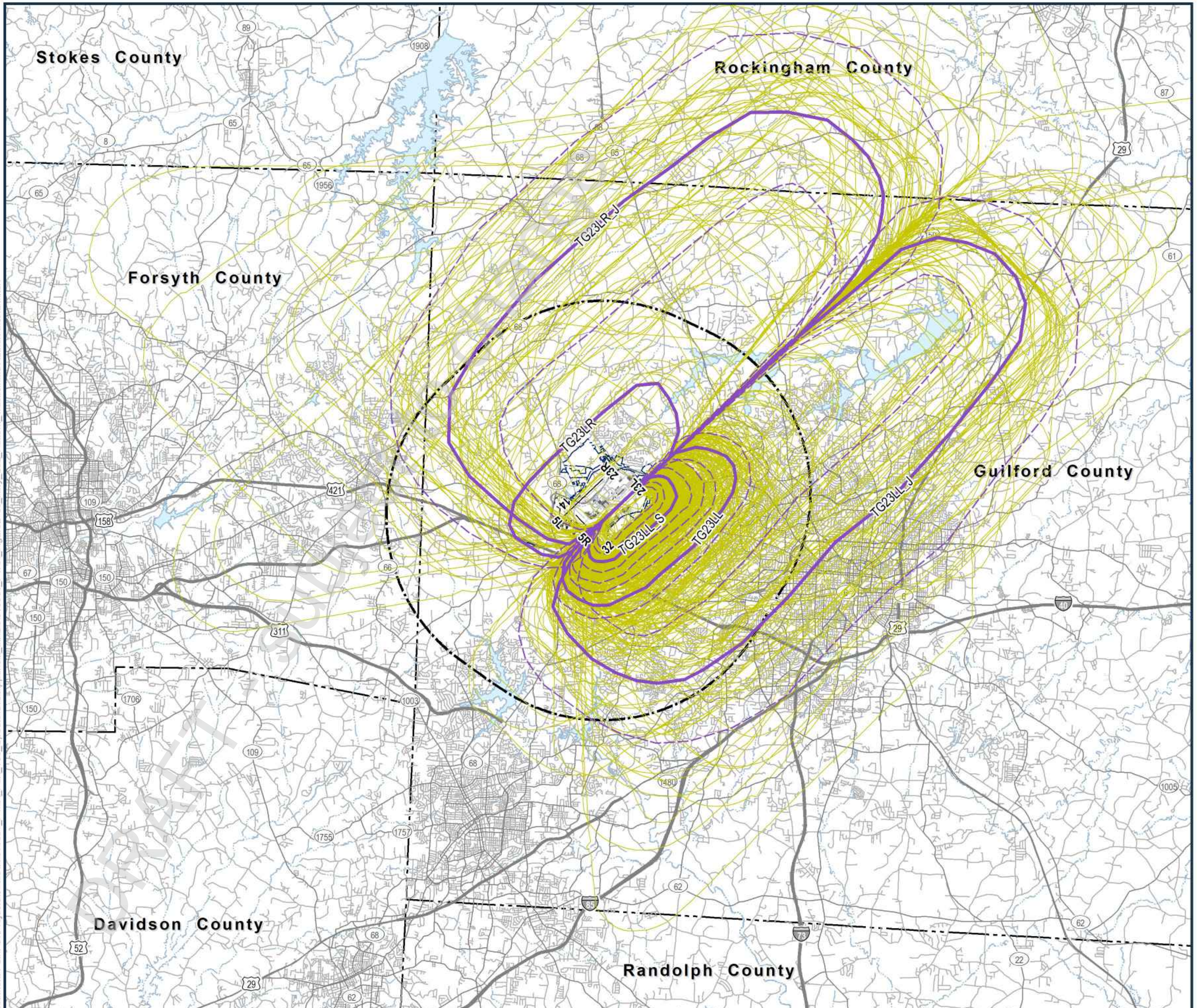

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Part 150 Update

Figure: D-30

Runway 23L Local Pattern Operations

Pattern Backbone Model Track
Pattern Model Subtrack
Runway 23L Pattern Tracks (553)
Airport Boundary
Airport Buildings
Runway
Taxiway / Apron
30,000 ft. Extent from Runway End
County Boundary
Highways
Major Roads
Local Roads
Railroad
Water / Stream / Creek

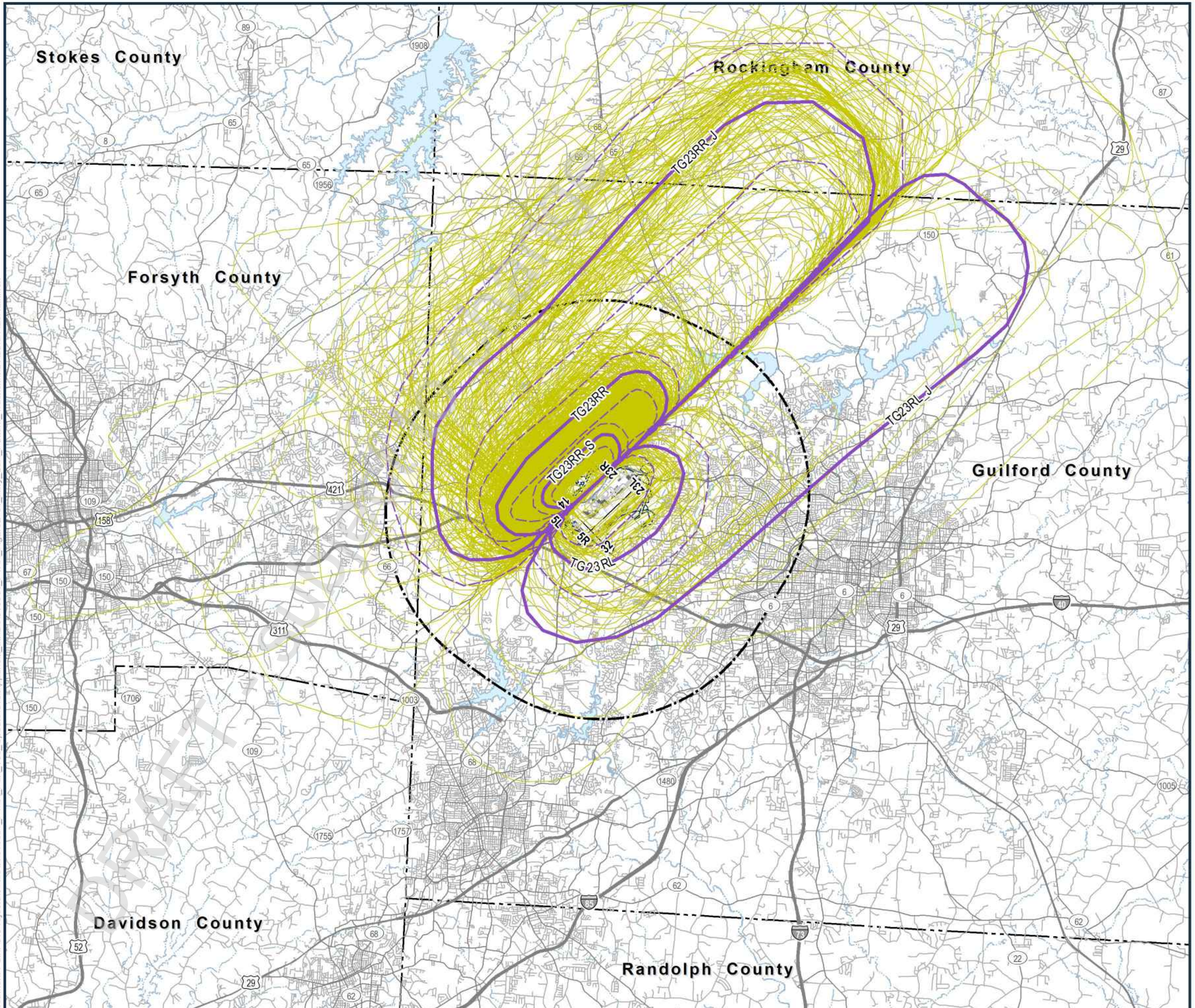
Track Bundle	# of tracks	GA Jet Usage	Mil Jet Usage	NonJet Usage
TG23LR	1	8.8%	0.0%	1.9%
TG23LR_J	3	12.4%	50.0%	4.8%
TG23LL_S	5	0.0%	0.0%	65.6%
TG23LL	3	66.2%	0.0%	22.9%
TG23LL_J	3	12.6%	50.0%	4.8%
Total	**15**	**100.0%**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

0 4 8 NMi

hmmh



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Part 150 Update

Figure: D-31

Runway 23R Local Pattern Operations

Pattern Backbone Model Track
Pattern Model Subtrack
Runway 23R Pattern Tracks (3,592)
Airport Boundary
Airport Buildings
Runway
Taxiway / Apron
30,000 ft. Extent from Runway End
County Boundary
Highways
Major Roads
Local Roads
Railroad
Water / Stream / Creek

Track Bundle	# of tracks	GA Jet Usage	Mil Jet Usage	NonJet Usage
TG23RR_S	3	0.0%	0.0%	44.4%
TG23RR	3	59.6%	0.0%	50.6%
TG23RR_J	3	22.2%	90.0%	3.8%
TG23RL	3	15.4%	0.0%	1.0%
TG23RL_J	1	2.8%	10.0%	0.2%
Total	**13**	**100.0%**	**100.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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Part 150 Update

Figure: D-32

Runway 32 Local Pattern Operations

- Pattern Backbone Model Track
- Pattern Model Subtrack
- Runway 32 Pattern Tracks (142)
- Airport Boundary
- Airport Buildings
- Runway
- Taxiway / Apron
- 30,000 ft. Extent from Runway End
- County Boundary
- Highways
- Major Roads
- Local Roads
- Railroad
- Water / Stream / Creek

Track Bundle	# of tracks	GA Jet Usage	Mil Jet Usage	NonJet Usage
TG32R	3	0.0%	0.0%	19.7%
TG32R_J	1	11.1%	0.0%	5.3%
TG32L	3	0.0%	0.0%	63.6%
TG32L_M	1	75.0%	0.0%	9.1%
TG32L_J	1	13.9%	0.0%	2.3%
Total	**9**	**100.0%**	**0.0%**	**100.0%**

Preliminary Draft - Subject to Change

Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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Appendix E Advisory Committees

E.1 Technical Advisory Committee

The TAC serves several important functions:

- Represents a broad range of stakeholder groups;
- Receives information about the Study and shares it with their constituencies;
- Reviews information and provides timely input to the Study;
- In some cases, provides technical advice to the Study Team.

In order for the TAC to be effective and to be representative of all of the key positions involved in aircraft noise issues, PTAA composed a diverse group of key stakeholders including, but not limited to, community representatives, aircraft operators/airlines, affected jurisdictions, land use planners, and FAA Air Traffic Control. While representation needed to be broad, the Technical Advisory Committee (TAC) needed to remain a reasonable size so that deliberations would be efficient. The PTAA identified and invited members to serve on the TAC for the PTI Part 150 Study.

E.1.1 Technical Advisory Committee Members

Table E-1 lists the regular members of the TAC during the study process.

Table E-1 Member Organizations Represented on the Technical Advisory Committee
Source: PTAA

Name	Affiliation	Name	Affiliation	Name	Affiliation
Aaron Braswell/ Lisa Cooke	FAA, ADO	Jim Messura	FedEx	Steve Galanti	Greensboro
Felicia Reeves	FAA, Southern Region	Michael Robertson	DHL (Quantem)	Lee Burnette	High Point
Charlie Dale	FAA, TCT/TRACON - FAA	David Daubenmire	UPS (Quantem)	Matthew Johnson	Jamestown
Ryan Hampton	FAA, ATCT/TRACON -	Brian Hofheins	HAECO Americas	Rochelle Joseph	Kernersville
John Parker	FAA, FSDO	Israel Stolze	Cessna/Textron	Chris York	Summerfield
Jose Rullan/ Kelly Scudder	American Airlines	Nathan Wilsford	GTCC	Sean Taylor	Oak Ridge
Bryan Street	Delta Airlines	Bernie Dalere	US Customs and Border Protection	Ted Kaplan	Forsyth County
Erica Simmons	Spirit Airlines	Jason Dean	Honda Aircraft Company	Joe Saldarini	CAC Chair
Donald Brookshire	Signature Flight Support	Rachel Wall	Samaritan's Purse	Janet Mazzurco	CAC Co-Chair/Chair
Scott Stuart	Koury Aviation	Kaye Graybeal	Guilford County		

E.1.2 Technical Advisory Committee Presentations

The same presentations were made to both the TAC and CAC on the dates listed in Table E-2. There was also an extra meeting, only held for the CAC, regarding the NCP review; therefore only the CAC presentations are provided in this appendix. The TAC presentations can be accessed on the project website at https://ptipart150update.com/public-outreach/.

Table E-2 TAC Meeting Dates and Locations
Source: PTAA

Meeting	Date	Location
TAC Meeting #1	June 26, 2019	PTAA Conference Room
TAC Meeting #2	October 2, 2019	PTAA Conference Room
TAC Meeting #3	May 20, 2020	Virtual via Zoom
TAC Meeting #4	tbd	tbd

E.1.3 Technical Advisory Committee Summaries

The summaries of each of the TAC meetings, as posted on the Study website, are reproduced on the next several pages, in order by meeting date.

PIEDMONT TRIAD AIRPORT AUTHORITY

PTI Part 150 Study Update

Meeting Summary: First Meeting of the PTI Technical Advisory Committee

June 27, 2019

The first meeting of the PTI Part 150 Update Technical Advisory Committee was held in the Airport Authority Board Room 2 p.m. Thursday, June 27th.

The Committee heard a presentation by HMMH on the PTI Part 150 Study Update. You can find a copy of the presentation here.

There were no substantive questions asked during the presentation.

After the presentation:

Steve Galanti from the City of Greensboro Planning Department asked for a list of compatible land uses. Suzanne Akkoush agreed to email him the list.

Lee Burnette, the City of High Point's Planning Director, asked that he and his staff be given ample time to review the land use map once it is prepared.

Lee Burnette also asked for additional data, which Suzanne Akkoush agreed to email to him.

PIEDMONT TRIAD AIRPORT AUTHORITY

PTI Part 150 Study Update

Meeting Summary: Second Meeting of the Technical Advisory Committee

October 2, 2019

The group heard a presentation from the HMMH team regarding draft forecast data, land use data, noise model inputs, and planned noise measurements. The presentation may be found here.

The group had the following questions:

Is there a particular cargo carrier responsible for the increase in cargo operations during the 2020 to 2025 study period?

Bob Mentzer answered that the study considers growth among all of the cargo carriers.

Are the 757 jets that will make up the majority of cargo operations during the study period quieter than heavier aircraft, which currently make up a larger proportion of the cargo fleet at the airport?

Bob Mentzer answered yes.

Has HMMH checked the total operations projected in the 2025 forecast against the 2014 operations projected in the 2008 Part 150 study to see how close the forecast was to actual operations?

Gene Reindel answered that HMMH hasn't done that comparison, but could provide those numbers.

What will the rental car area be used for once it is moved to its new location?

Alex Rosser answered that the former rental car space will be used for aviation-related purposes.

Will the day-night average sound level (DNL) 60 decibel contour be included in the new noise contour maps?

Gene Reindel answered that HMMH intends to include the DNL 60 contour, though the FAA has become less favorable about airports including the DNL 60 contour. HMMH and the Airport intend to include the DNL 60 and mark it as "for informational purposes," Gene said.

When will the land use be finalized?

Airport staff and HMMH are working with planning staff from the nearby jurisdictions to update the maps to make them as accurate as possible. The plan is for land use maps to be ready before the noise contours are created. Land uses within the DNL 65 will then be verified with a visual inspection. The timeline for the contours depends on how long it takes the FAA to approve the forecast. We hope to have that approval by the end of the year.

PIEDMONT TRIAD AIRPORT AUTHORITY

PTI Part 150 Study Update

Meeting Summary: Third Meeting of the PTI Technical Advisory Committee

May 20, 2020

The third meeting of the PTI Part 150 Update Technical Advisory Committee (TAC) was held by Zoom teleconference at 1 p.m. Wednesday, May 20, 2020. The meeting was held by teleconference because the Governor's order restricting public gatherings was still in place in North Carolina due to the COVID-19 pandemic.

There were 13 committee members on the Zoom call, with some additional members of the community listening in. HMMH presented to the CAC on the current status of the PTI Part 150 Study Update. You can find a copy of the presentation here.

The HMMH presentation reviewed noise model input and noise metrics, presented preliminary aircraft noise exposure contours for 2020 and 2025, and provided an extensive overview of noise measurements that were completed around the Airport during November 2019. A brief summary of the current Noise Compatibility Program was also presented.

Committee members had the following questions regarding the presentation:

Has there been any communication with the City of Greensboro because the City is currently working on an amendment to the City's Comprehensive Plan?

Airport officials have been in close contact with City planning staff regarding the new contours and the City's planning documents.

E.2 Citizens Advisory Committee

The Part 150 Study process benefited from the creation and participation of a Citizens Advisory Committee (CAC). The CAC serves several important functions:

- Represents a broad range of community groups;
- Receives information about the Study and shares it with the members' constituencies;
- Reviews information and provides timely input to the Study.

In order for the CAC to be effective and to be representative of all of the key positions involved in PTI aircraft noise issues, PTAA created a diverse group of key community representatives. To achieve this goal, the Airport Authority asked the governing bodies of each of the surrounding jurisdictions to appoint members to the Part 150 Study Update Citizens Advisory Committee. The number of members from each jurisdiction was determined by a district system intended to ensure that all neighborhoods surrounding the airport were equally represented, with special emphasis given to neighborhoods frequently reporting issues with airport noise. Greensboro and High Point, therefore, were more heavily represented with five members each than were other jurisdictions, which generally had one representative each. These jurisdictions included several small towns located on all sides of the airport. The airport assisted int he recruitment of committee members by sending out a press release publicizing the formation of the committee to newspapers in Greensboro, High Point, Winston-Salem and the surrounding area. The press release is provided below in Figure E-1. Individual jurisdictions also publicized the need for committee members to their constituents, again emphasizing the most affected neighborhoods. The committee structure was similar to the committee structure created in the PTAA's original Part 150 Study, which was approved by the FAA in 2008.

E.2.1 Citizens Advisory Committee Members

Error! Reference source not found. lists the regular members of the TAC during the study process.

Table E-3 Member Organizations Represented on the Citizens Advisory Committee
Source: PTAA

Name	Affiliation	Name	Affiliation
Joe Saldarini, Chair 5/2019-8/2020	Greensboro	Ed Levick	High Point
Janet Mazzurco, Co-Chair/Chair	Greensboro	Thad Juszczak	High Point
Stan Tennant (Co-Chair 8/2020)	Greensboro	Keith Brown	High Point
Steve Johnson	Greensboro	Erin Randall	High Point
Alyson Best	Greensboro	Bill Nagy	High Point
Sebastian King	Guilford County	Michael Lopez	Summerfield
Sharon Kasica	Guilford County	Lawrence Straughn	Jamestown
Toneq McCullough	Winston-Salem	George McClellan	Oak Ridge
Clarence Lambe	Forsyth County	Bob Prescott	Kernersville
Scott McInnis	Greensboro		

PTI PIEDMONT TRIAD INTERNATIONAL AIRPORT *fly easy.* MENU

AIRPORT TO BEGIN PART 150 NOISE STUDY UPDATE

Greensboro, N.C. – The Piedmont Triad Airport Authority is preparing to update the Noise Compatibility Planning Study for the Piedmont Triad International Airport that was approved by the Federal Aviation Administration (FAA) in November 2008 per Title 14 of the Code of Federal Regulations Part 150 (or simply "Part 150"). HMMH, an airport noise consulting firm, has been hired to assist the Authority with the study update.

Two committees will be formed to advise and provide input to the Authority during the study update: a Citizens Advisory Committee and a Technical Advisory Committee. These committees will provide input on current noise conditions around the airport, will review existing measures that are in place to reduce aircraft noise exposure on neighborhoods, will advise the Authority if any adjustments may be needed to those measures and will comment on study results. Each committee will meet four times over the course of the approximately one-year study update. The meetings will be facilitated by the HMMH team.

The Authority has requested the mayors of Greensboro and High Point, the chairman of the Guilford County Board of Commissioners, the chairman of the Forsyth County Board of Commissioners and the mayors of other area jurisdictions to assist by selecting members for the Citizens Advisory Committee. The Citizens Advisory Committee is expected to include about 20 members.

The Citizens Advisory Committee will be chosen from six districts around the airport, with three members being chosen from each district by local officials in Greensboro, High Point, Guilford County, Jamestown, Kernersville, Summerfield, and Oak Ridge. Winston-Salem and Forsyth County will also be asked to appoint one member each.

The Technical Advisory Committee will include airline representatives, FAA Airport Traffic Control Tower personnel, airport tenants, representatives from local planning jurisdictions and others with expertise in some aspect of airport operations or land use planning.

To allow for broader public participation, the Authority and the HMMH team will hold two public workshops, using an open house format, to explain the study, present information and to solicit public comments. These workshops will be publicized.

The study will recommend updated Noise Exposure Maps and possible changes to noise mitigation measures for consideration by the Authority's governing board. The FAA has final authority to accept the Noise Exposure Maps and approve any changes to the Noise Compatibility Program if recommended by the Authority.

Figure 1 Press Release for the Noise Study Update and Formation of Committees

E.2.2 Citizens Advisory Committee Presentations

The CAC met on the dates listed in Table E-4. Four of these dates coincided with the TAC meeting dates, when the two committees saw essentially the same presentations. The CAC also participated in an additional meeting: the NCP Review Workshop. The full presentations for each of the CAC meetings, including the NCP Review Workshop, are reproduced on the next 100+ pages, in order by meeting date.

Table E-4 CAC Meeting Dates and Locations
Source: PTAA

Meeting	Date	Location
CAC Meeting #1	June 26, 2019	PTAA Conference Room
CAC Meeting #2	October 2, 2019	PTAA Conference Room
CAC Meeting #3	May 20, 2020	Virtual via Zoom
NCP Review Workshop	August 13, 2020	Virtual via Zoom
CAC Meeting #4	tbd	tbd

The access information to the CAC NCP Review Workshop, as posted on the Part 150 Update website, is provided as Figure 2.

Figure 2 CAC NCP Review Workshop Notice

Welcome!

Noise Compatibility Study (Part 150) Update
Piedmont Triad International Airport

Citizens Advisory Committee Meeting #1
June 26, 2019

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1

Meeting Agenda

- Welcome and introductions
  - Piedmont Triad Airport Authority
  - Part 150 Consulting Team
  - Citizens Advisory Committee
  - Aircraft noise terminology "Noise 101"
  - Part 150 – aircraft noise and land use compatibility
  - Noise model and modeling
- Schedule
- CAC member discussion
- Adjournment

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2

Piedmont Triad Airport Authority

- **Kevin Baker**, Executive Director
  - Part 150 Airport Sponsor
- **Alex Rosser**, Deputy Executive Director
  - Part 150 Program Manager
- **Suzanne Akkoush**, Project Manager – Noise Program
  - Part 150 Project Manager

Part 150 Consultant Team

- **Harris Miller Miller & Hanson Inc. (HMMH)**
  - Noise, airspace, and airport planning consulting at over 200 airports worldwide
  - Part 150 studies and/or implementation at 80 airports
  - Noise effects research and consulting
- **CHA Consulting, Inc. (CHA)**
  - Airport planning and design consultant at over 200 airports worldwide
  - Airport planning studies that included aviation forecasting at over 75 airports
  - Specialists in all phases of airport development (planning, design, & construction)
- **Ron Miller & Associates Inc. (RMA)**
  - Public outreach support for the original 2008 Part 150 Study
  - Public outreach support for the 2010 Airport Master Plan Update
  - Communications support for industry and government since 2004

Part 150 Consulting Team Responsibilities

- ***HMMH Responsibilities***
  - Overall project management, documentation and outreach
  - Aircraft noise analysis and abatement planning
  - Noise compatibility analysis and planning
- ***CHA Responsibilities***
  - Aviation forecasting
- ***RMA Responsibilities***
  - Public outreach and engagement

- ***HMMH Key Personnel***
  - Gene Reindel – Principal Lead
  - Bob Mentzer – Project Manager
  - Kate Larson – Assistant Project Manager
- ***CHA Key Personnel***
  - Paul Puckli – Aviation Forecaster
- ***RMA Personnel***
  - Ron Miller – Principal

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5

CAC Members

Name	Jurisdiction	Name	Jurisdiction
Janet Mazzurco	Greensboro	Ed Levick	High Point
Dr. Stan Tennant	Greensboro	Thad Juszczak	High Point
Steve Johnson	Greensboro	Keith Brown	High Point
Alyson Best	Greensboro	Erin Randall	High Point
Joe Saldarini	Greensboro	Bill Nagy	High Point
Sebastian King	Guilford County	Michael Lopez	Summerfield
Sharon Kasica	Guilford County	Lawrence Straughn	Jamestown
Toneq McCullough	Winston-Salem	George McClellan	Oak Ridge
Clarence Lambe	Forsyth County	Bob Prescott	Kernersville

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6

CAC Roles and Responsibilities

- The CAC is advisory to the Authority solely for purposes of the Part 150 Study including:
  - Review of study inputs, assumptions, analyses, documentation, etc.
  - Input, advice, and guidance related to NEM and NCP updates
- CAC members are expected to provide two-way communication between the CAC and their represented communities
- The Authority shall respect and consider CAC input, but must retain overall responsibility for the Part 150 Study including all recommendations
- The CAC and Authority recognize FAA is responsible for accepting NEM and NCP submissions and for approving recommended measures

Piedmont Triad International Airport Noise Compatibility Study Update | CAC Meeting #1

7

CAC Meeting Facilitator

- CAC meetings will be moderated by a professional facilitator
- The facilitator is responsible for ensuring CAC meetings
  - Run efficiently, respectfully, and effectively
  - Focus on the published agenda
  - Provide appropriate opportunities for all members to participate
  - Result in consensus conclusions to the maximum extent feasible
  - Are documented through preparation of accurate meeting notes
- The facilitator may extend or cut off discussion to meet these objectives
- CAC members are expected to respect the facilitator's role and authority

Piedmont Triad International Airport Noise Compatibility Study Update | CAC Meeting #1

8

CAC Charter

- Charter was sent with CAC invitations
- Charter describes CAC's role, member responsibilities, meeting conduct and logistics, etc.
- 4 meetings anticipated - approximately once per quarter
  - Agendas, and background material will be provided in advance of each meeting
  - Dates and times will be sought that are convenient to a majority of members; e.g., weekdays during evening hours
  - Meetings are expected to be two hours or less in length
- CAC meetings will be open to public observers

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9

Projected CAC Meetings & Public Workshops

Meeting	Date	Topic
CAC Meeting #1	***June 26, 2019 (Today)***	***Introduction to the Part 150 process***
Public Information Workshop #1	June 27, 2019 (Tomorrow)	Introduction to the Part 150 study
CAC Meeting #2	September 2019	Noise modeling inputs
CAC Meeting #3	November 2019	Noise modeling results and review of NCP measures
CAC Meeting #4	February 2020	Presentation of the Part 150 Report
Public Information Workshop #2	February 2020	Presentation of the study results

- Please consider attending the public information workshop tomorrow evening at the Airport Marriott from 5 to 7 pm

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10

Aircraft Noise Terminology

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

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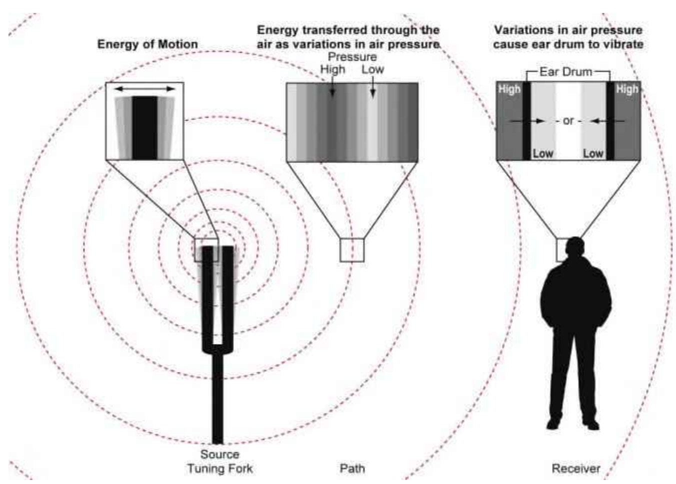
11

What is "Noise"?

- Sound is pressure variation our ears can detect
  - o An objective quantity
- Noise is "unwanted sound"
  - o A subjective quantity
- We relate sound and noise by considering effects
  - o Annoyance
  - o Speech interference
  - o Sleep disruption



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12

The Decibel Scale

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

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13

Real-Time Decibel Change "Rules of Thumb"

- In a laboratory test, a 1 dB change is generally detectible
- In a normal environment, a 3 dB change is generally the threshold of detectability for a careful listener
  - o Why? Distinct A:B comparisons are rare
- A 6 dB change is clear in most day-to-day situations
- In general, a 10 dB change seems twice as loud
- Different rules of thumb apply to cumulative exposure
  - o More on that in a few slides

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14

Caution: Decibel Addition Isn't ordinary math!

- Decibels are a logarithmic quantity, so…
- Two equal sources:
  - 60 + 60 dB = **63 dB**
- Four equal sources:
  - 60 + 60 + 60 + 60 dB = **66 dB**
- Ten equal sources:
  - 60 + 60 + 60 + 60 + 60 + 60 + 60 + 60 + 60 + 60 dB = **70 dB**
- We are *more* sensitive to small changes and *less* sensitive to large changes

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15

Other factors to consider...

- Sound *quality* matters
  - Sources with the same overall dB level may "sound" different

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16

Other factors to consider...

- Duration matters
  - o Longer durations increase exposure, even for sources with the same dB level

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17

Other factors to consider...

- *Time of day* matters

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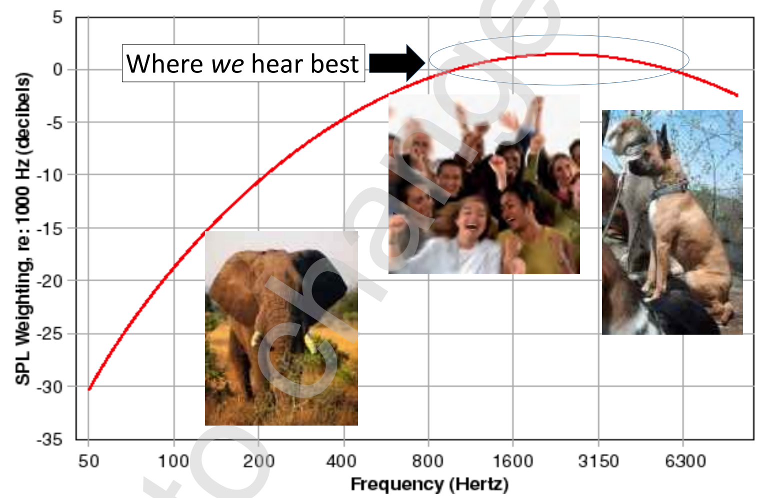
18

FAA requires use of the A-Weighted Sound Level

- 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
  - o Single events
  - o Cumulative exposure
- Consistent with worldwide practice



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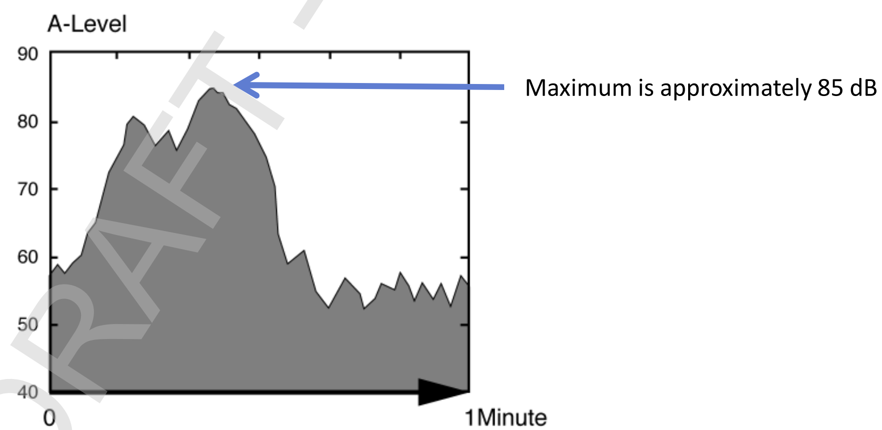
19

Single Event Noise Metrics: Maximum Sound Level (L_{max})

The simplest way to describe a discrete noise "event" is its maximum sound level (L_{max})



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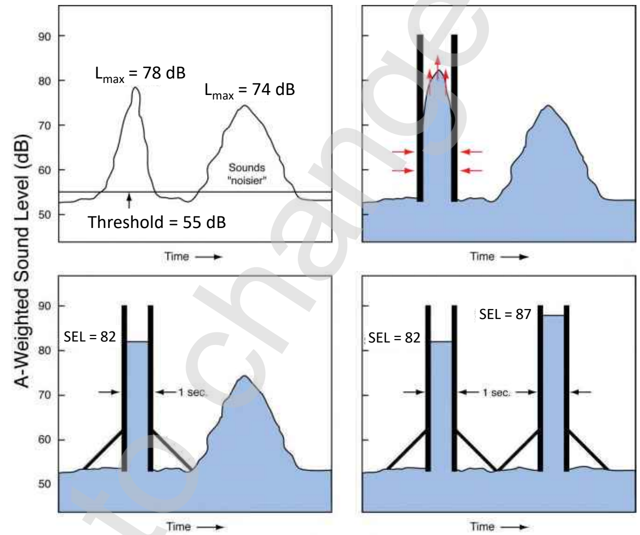
20

Single Event Noise Metrics: 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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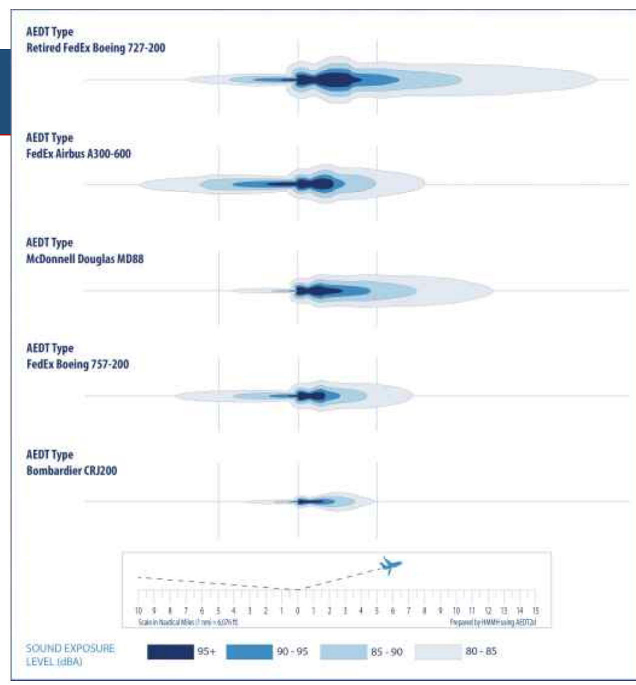
21

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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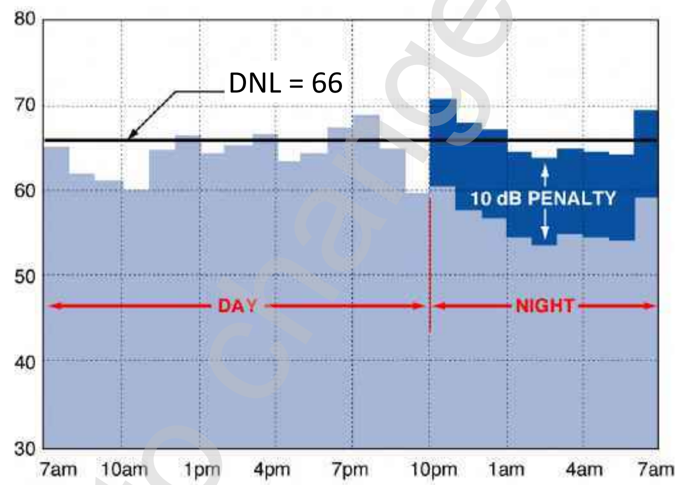
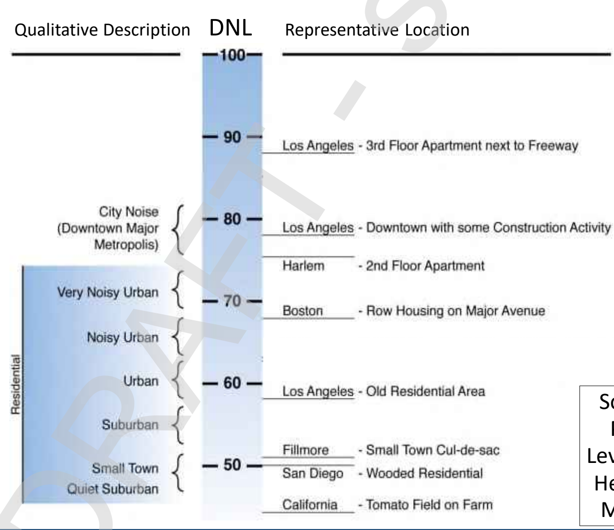
22

Cumulative Exposure: Day-Night Average Level (DNL)

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



Typical Community DNL Examples



Source: United States Environmental Protection Agency, Information on Levels Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, March 1974, p. 14.

Interpreting Changes in DNL

- 1 - 2 dB change in level
  - May be noticeable
- 2 - 5 dB change in level
  - Generally noticeable
- Over 5 dB change in level
  - Community reaction is likely

- These differ from the previously cited "rules of thumb" for perceiving "real-time" change:
  - 1 dB threshold of detectability in a laboratory test
  - 3 dB threshold of detectability for a careful listener in a normal environment
  - 6 dB in most day-to-day situations

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25

Aircraft Noise Metric Summary

- The decibel is a complex logarithmic quantity based on sound pressure
- A-weighted decibels correlate well with how we hear
- Noise levels can be expressed many ways, including but not limited to:
  - Instantaneous maximum (L_{max})
  - Single event dose (SEL)
  - Long-duration exposure (DNL)
- Best metric to use depends on purpose
- FAA requires use of DNL in a Part 150 study
- Part 150 guidelines consider all land uses compatible below 65 dB DNL

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26

Part 150 Overview

- Federal Aviation Administration (FAA) developed the Part 150 Program in response to the federal Aviation Safety and Noise Abatement Act of 1979 ("ASNA")
- Codified under Title 14 of the Code of Federal Regulations (CFR) Part 150
  - Formal *citation* is "14 CFR Part 150," informal is "Part 150"
  - Formal *title* is "Airport Noise Compatibility Planning"
- *Voluntary* FAA-defined process for airport noise studies
  - 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

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27

Part 150 Overview

- In response to ASNA, Part 150 prescribes standards and systems for:
  - measuring noise
  - estimating cumulative noise exposure using computer modeling
  - describing noise exposure
  - coordinating with local land use agencies
  - documenting the analytical process
  - submitting the documentation to FAA
  - FAA and public review processes
  - FAA approval or disapproval process

Piedmont Triad International Airport Noise Compatibility Study Update | CAC Meeting #1

28

Part 150 Overview

- 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 reviewing and commenting on the draft reports

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29

Part 150 Overview: Noise Exposure Map

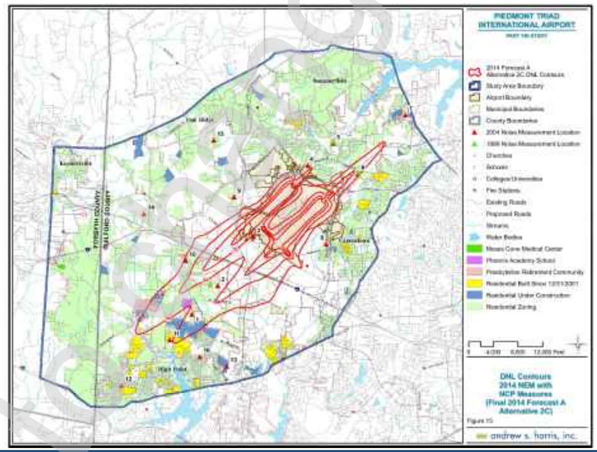
- FAA "accepts" NEM as compliant with Part 150 standards
- NEM must include detailed description of
  - Airport layout, aircraft operations, and other inputs to noise model
  - Aircraft noise exposure in terms of Day-Night Average Sound Level (DNL)
  - Land uses within DNL 65+ decibel (dB) contours
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

Piedmont Triad International Airport Noise Compatibility Study Update | CAC Meeting #1

30

PTI Noise Exposure Map

- PTAA completed original Part 150 process in 2008
  - o 2006 (Existing Condition) and 2014 (Forecast Condition) NEMs
- Major graphical components include:
  - o DNL 65, 70, and 75 dB contours
  - o Within 65 dB DNL contour
    - Generalized land use categories
    - Historic properties, schools, places of worship, health care facilities, other “discrete” sensitive uses
    - Jurisdiction(s) responsible for land use controls
  - o Flight tracks (on supplemental figures)



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31

Part 150 Overview: Noise Compatibility Program

- NCP must include three major categories of proposed actions to address noncompatible land uses within the DNL 65 dB contour
  - o Noise abatement measures
  - o Compatible land use measures
  - o Program implementation
- FAA *accepts* NCP as compliant with Part 150 standards
- FAA reviews and *approves* or *disapproves* proposals on an element-by-element basis

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32

Part 150 Overview: Noise Compatibility Program

- Noise abatement measures
  - Shrink noise contours or move them away from noncompatible uses
  - Aircraft operational, airport layout, flight track and runway use, etc.
  - *Note: Study will build on PTAA's well-established abatement program*
- Compatible land use measures
  - To address existing noncompatible uses
  - To prevent introduction of new noncompatible uses
- Program implementation
  - Required actions, responsible parties, costs
  - NEM and NCP review and update processes

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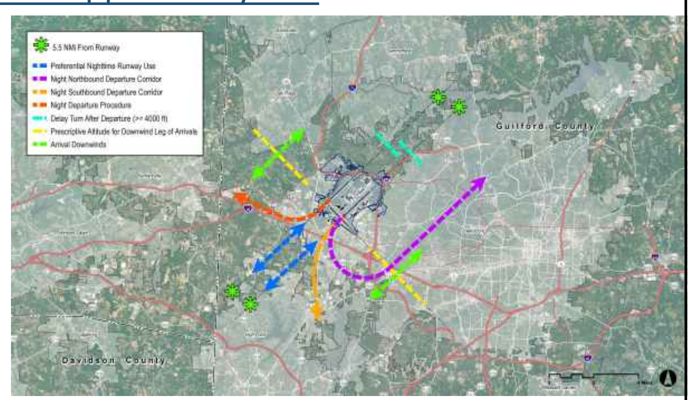
33

PTI Noise Compatibility Program

Existing NCP measures as approved by FAA

- Noise abatement measures:
  - ✓Evaluate Noise Barriers
  - ✓Preferential Nighttime Runway Use
  - ✓Nighttime Departure Corridors
  - ✓Nighttime Departure Procedures
  - ✓Delay Turns After Departure
  - ✓Restriction on Aircraft APU Use
  - ✓Noise Abatement Departure Procedure
  - ✓Noise Abatement Arrival Procedure
  - ✓Prescriptive Altitude for Downwind Leg of Arrivals



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34

PTI Noise Compatibility Program

Existing NCP measures as approved by FAA

- Land use measures:
  - ✓Land Acquisition*
  - ✓Sound Insulation*
  - ✓Easement Acquisition*
  - ✓Sales/Purchase Assistance*
  - ✓Land Use Zoning

* Applicable within the FAA-accepted 65 DNL contour

- Program measures:
  - ✓Monitor Aircraft Noise
  - ✓Publish Noise Contours
  - ✓Install a Noise and Operations Monitoring System

Piedmont Triad International Airport Noise Compatibility Study Update | CAC Meeting #1

35

Noise Compatibility Roles and Responsibilities

Defined by "FAA Noise Abatement Policy Statement" (November 1976)

- Federal government - source emissions, air traffic control, funding, and safety oversight
- State and local government - compatible land use planning and control
- Aircraft operators - noise-sensitive schedules, cockpit procedures, and fleet improvements
- Air travelers and shippers - bear the costs
- Current and potential residents – seek to act in an informed manner
- Airport operators - plan and implement noise compatibility measures

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36

Application of FAA Policy to Part 150 Process

- **PTAA**
  - Directs study - it is the PTAA's project
  - Submits NEM and NCP documentation to FAA
- **FAA**
  - Provides input to, reviews and assists with analysis of noise abatement flight procedures
  - "Accepts" documentation and "approves" NCP measures
  - Responsible for implementation of noise abatement flight procedures
  - Assists in funding eligible measures in all three categories
- **Local governments**
  - Provide input to recommended land use measures
  - Implement and enforce land use measures to maintain and improve noise compatibility
- **All stakeholders, including aviation interests, residents, and other interested parties**
  - Monitor study process, provide input, assist with implementation

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37

Noise Model and Modeling

- We must use FAA-approved model
  - FAA's Aviation Environmental Design Tool (AEDT)
- Required noise modeling inputs
  - Airport layout
  - Annual average meteorological data
  - Terrain
  - Aircraft operations by day/night for 2020 and forecast 2025
  - Runway utilization rates by aircraft categories
  - Flight track geometry and use by aircraft categories

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38

Noise Modeling: Airport Layout

- Existing Airport Facilities:
  - 3,770 acres
  - 3 runways
  - 1 terminal
  - 25 passenger gates

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39

Noise Modeling: Major Data Sources

- Best available source(s) will be used for each specific category
  - *Airport layout* - FAA airport diagram, GSO Airport Layout Plan (ALP)
  - *Meteorological* - NOAA National Climatic Data Center
  - *Terrain* - U.S. Geological Survey
  - *Baseline operations* - NOIARS monitoring system
  - *Forecast operations* – Discussion with GSO users and the FAA's Terminal Area Forecast (TAF)
  - *Flight tracks, profiles, and runway use* – 2017-2019 data from NOIARS monitoring system
- Data will be compared to formal and informal procedures
  - FAA Standard Instrument Departure (SID) and approach procedures (APs), etc.
  - PTAA and industry noise abatement procedures
- Modelling assumptions and data will be presented in detail to the TAC and CAC.
  - The presentations will be posted on the website
  - **CAC members - *Please offer feedback on sources or assumptions prior to September 2019***

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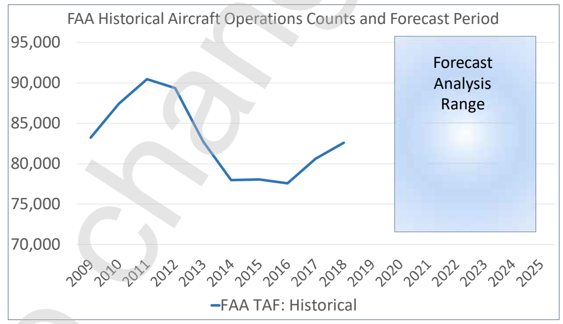
40

Noise Modeling: Aviation Forecast

- Aviation forecasts will represent annual-average day of aircraft operations by aircraft type and time of day including:
  - o Commercial (passenger) operations
  - o Air taxi (passenger) operations
  - o Air cargo (freight) operations
  - o General aviation (private) operations
  - o Military operations
- Forecast development will include:
  - o Complex analysis of socioeconomics, demographics, and recent airport trends
  - o Projections using statistical econometric models
- FAA approves the aviation forecasts



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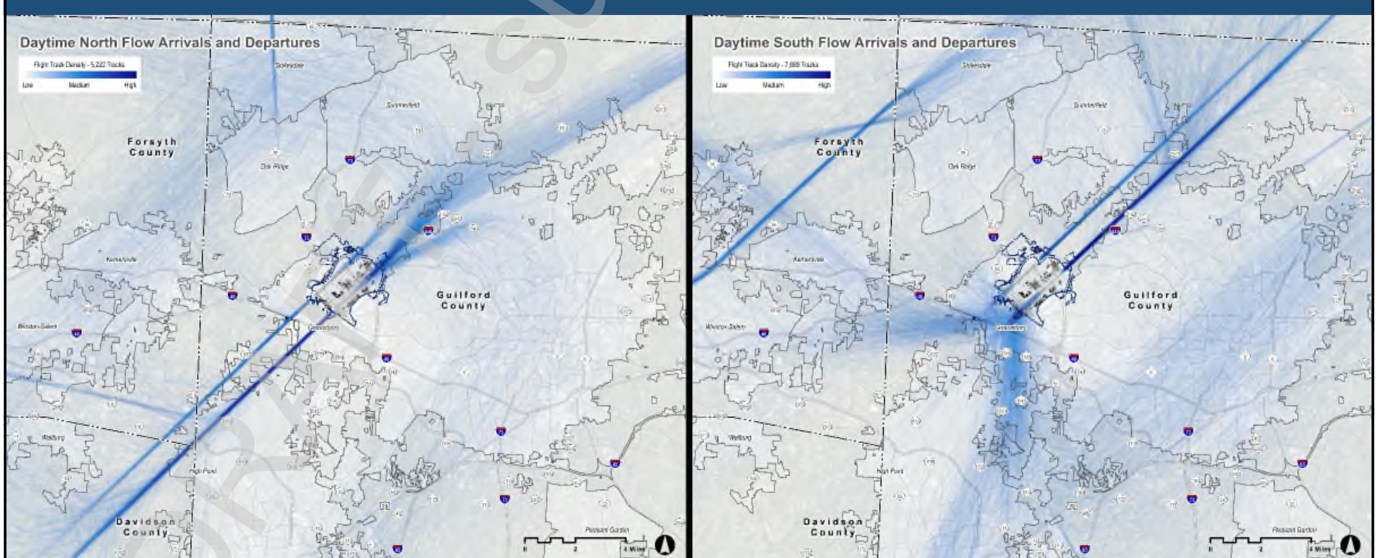
41

Noise Modeling Input: Daytime Flight Tracks (7am – 10pm)



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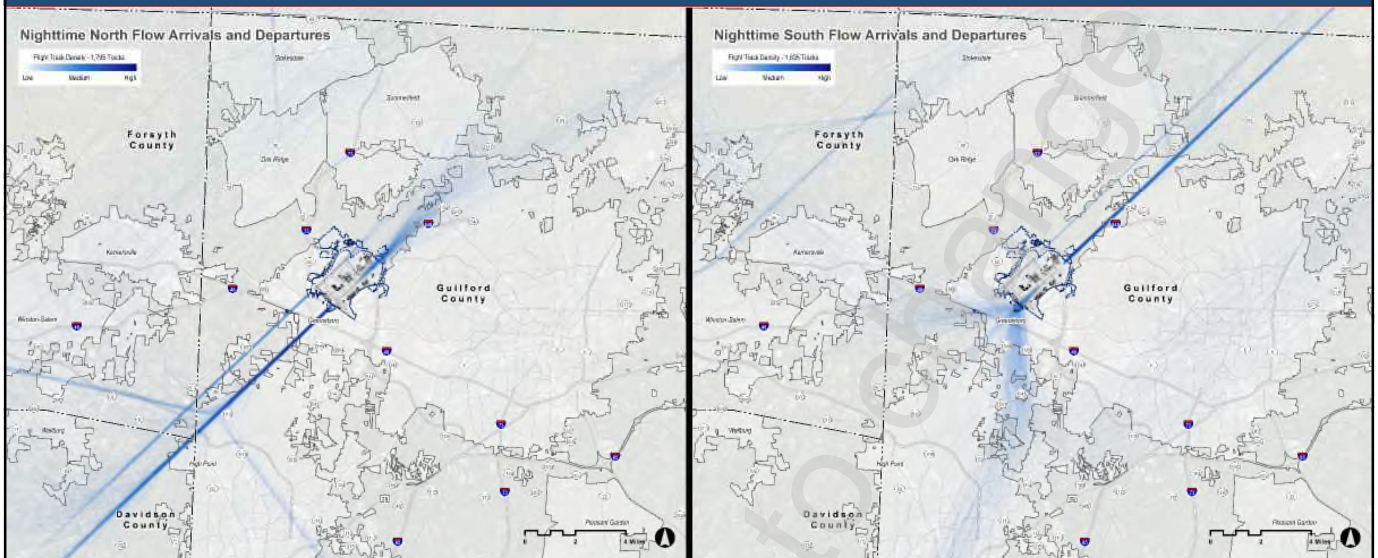
42

Noise Modeling Input: Nighttime Flight Tracks (10pm – 7am)



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43

Projected CAC Meetings & Public Workshops

Meeting	Date	Topic
CAC Meeting #1	June 26, 2019 (Today)	Introduction to the Part 150 process
Public Information Workshop #1	June 27, 2019 (Tomorrow)	Introduction to the Part 150 study
CAC Meeting #2	***September 2019***	***Noise modeling inputs***
CAC Meeting #3	November 2019	Noise modeling results and review of NCP measures
CAC Meeting #4	February 2020	Presentation of the Part 150 Report
Public Information Workshop #2	February 2020	Presentation of the study results

- Please consider attending the public information workshop tomorrow evening at the Airport Marriott from 5 to 7 pm

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44

CAC Member Discussion

Appoint Committee Chair / Co-chair / representatives to TAC

CAC Members

Name	Jurisdiction	Name	Jurisdiction
Janet Mazzurco	Greensboro	Ed Levick	High Point
Dr. Stan Tennant	Greensboro	Thad Juszczak	High Point
Steve Johnson	Greensboro	Keith Brown	High Point
Alyson Best	Greensboro	Erin Randall	High Point
Joe Saldarini	Greensboro	Bill Nagy	High Point
Sebastian King	Guilford County	Michael Lopez	Summerfield
Sharon Kasica	Guilford County	Lawrence Straughn	Jamestown
Toneq McCullough	Winston-Salem	George McClellan	Oak Ridge
Clarence Lambe	Forsyth County	Bob Prescott	Kernersville

Adjournment

- Next CAC meeting September 2019 (exact date and time to be determined)
- Project contacts and websites
  - Suzanne Akkoush, Project Manager – Part 150 Study
  - Address emails to Part150@gsoair.org
  - Part 150 Website (PTIPart150Update.com) provides most relevant information
    - Will be updated regularly for public outreach purposes
    - TAC will receive direct notices
  - PTAA noise information website provides broader information
    - https://flyfrompti.com/noise-information/

Thanks for participating and attending!

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47

Welcome!

Noise Compatibility Study (Part 150) Update
Piedmont Triad International Airport

Citizens Advisory Committee Meeting #2
October 2, 2019

Piedmont Triad International Airport Noise Compatibility Study Update | CAC Meeting #2

PIEDMONT TRIAD AIRPORT AUTHORITY

1

Meeting Agenda

- Welcome and introductions
- Aircraft operations forecast
- Land use
- Noise model inputs
- Noise measurement program
- CAC member discussion
- Adjournment

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PIEDMONT TRIAD AIRPORT AUTHORITY

2

Piedmont Triad Airport Authority

- **Kevin Baker**, Executive Director
  - Part 150 Airport Sponsor
- **Alex Rosser**, Deputy Executive Director
  - Part 150 Program Manager
- **Suzanne Akkoush**, Project Manager – Noise Program
  - Part 150 Project Manager

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3

Part 150 Consultant Team

- **Gene Reindel**, HMMH Vice President
  - Part 150 Principal
- **Bob Mentzer**, HMMH Principal Consultant
  - Part 150 Project Manager
- **Kate Larson**, HMMH Senior Consultant
  - Part 150 Assistant Project Manager
- **Ron Miller**, Ron Miller & Associates
  - Part 150 Public Outreach

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4

CAC Members

Name	Jurisdiction	Name	Jurisdiction
Joe Saldarini, Chair	Greensboro	Ed Levick	High Point
Janet Mazzurco, Co-Chair	Greensboro	Thad Juszczak	High Point
Stan Tennant	Greensboro	Keith Brown	High Point
Steve Johnson	Greensboro	Erin Randall	High Point
Alyson Best	Greensboro	Bill Nagy	High Point
Sebastian King	Guilford County	Michael Lopez	Summerfield
Sharon Kasica	Guilford County	Lawrence Straughn	Jamestown
Toneq McCullough	Winston-Salem	George McClellan	Oak Ridge
Clarence Lambe	Forsyth County	Bob Prescott	Kernersville

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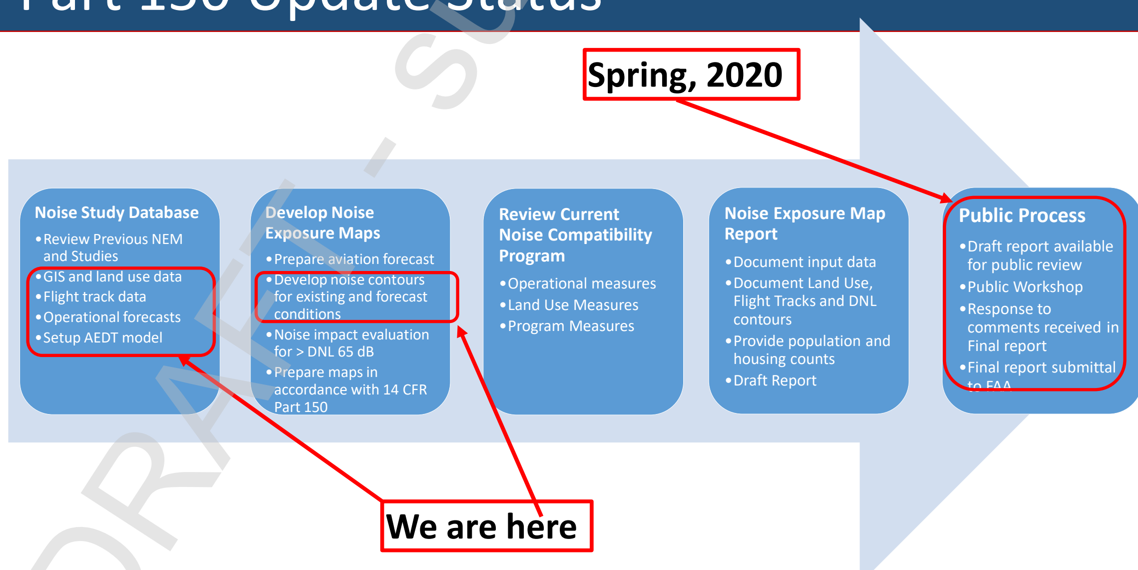
5

Part 150 Update Status



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6

Part 150 Update Public Process

- First Round of TAC/CAC meetings held in June 2019 at the airport
- Presentations for both meetings available at https://ptipart150update.com/public-outreach/

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7

Part 150 Update Public Process

- First Public Workshop held in June 2019 at the Airport Marriott
- About 140 people participated
- The Workshop Boards are available at https://ptipart150update.com/public-outreach/
- Public Comments were collected and helped to develop the website FAQs page https://ptipart150update.com/faqs/

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8

Aircraft Operations Forecast

- Forecast Data collection:
  - Over a year of operational data collected by the PTAA NOIARS
  - PTAA and Study Team met with airport tenants over a two-day period on-site
  - PTAA provided historical passenger and cargo data
  - FAA OPSNET data (Tower Operations)
  - FAA Terminal Area Forecast (TAF)
  - Various other historical and forecast data sets and documents
- The FAA approves all aviation forecasts for use in any planning study.
  - FAA's 2018 Terminal Area Forecast (TAF), published Feb 2019, is the primary reference
  - 2020 is the forecast year for the existing condition Noise Exposure Map
  - 2025 is the forecast year for the five-year forecast condition Noise Exposure Map

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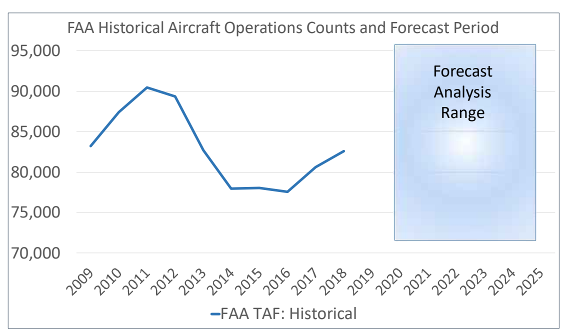
9

Aircraft Operations Forecast

- Aviation forecasts for Part 150 represent average annual day of aircraft operations by aircraft type and time of day including:
  - Commercial (passenger)
  - Air taxi (passenger)
  - Air cargo (freight)
  - General aviation (private)
  - Military
- Forecast development includes:
  - Analysis of socioeconomics, demographics, and recent airport trends
  - Projections using statistical econometric models



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10

Passenger Flight Market Analysis

Figure 1-2
GSO Catchment and Core Areas

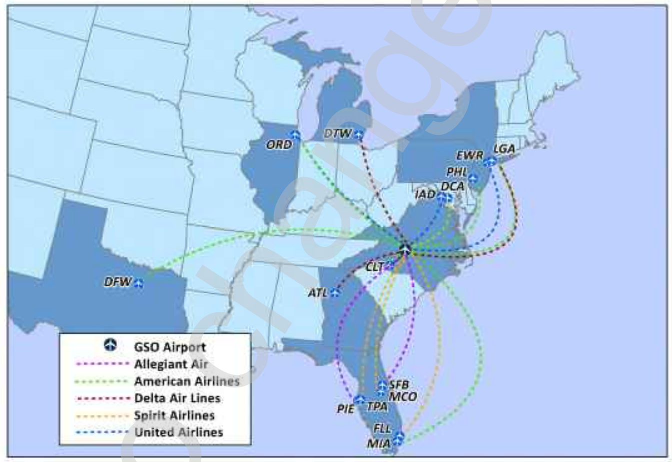
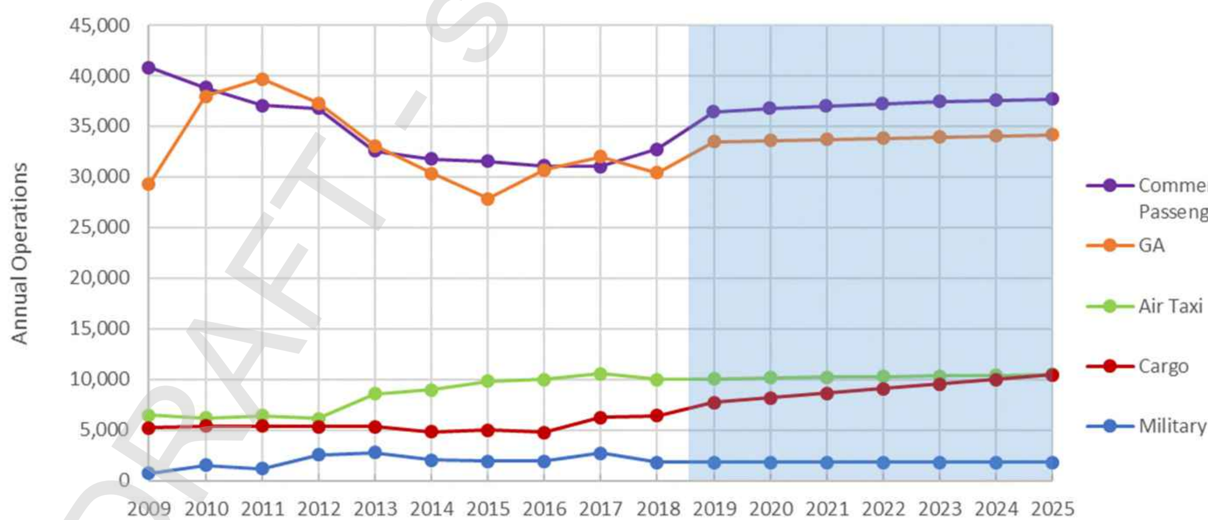


Figure 1-1
GSO Non-Stop Route Map

11

Aircraft Operations, Historical and Draft Forecast



12

Draft Aircraft Operations Forecast

Year	Based Aircraft	Enplanements	Itinerant Operations: Air Carrier	Itinerant Operations: Air Taxi	Itinerant Operations: Cargo	Itinerant Operations: GA	Itinerant Operations: Military	Itinerant Operations: Total Itinerant	Local Operations: Civil	Local Operations: Military	Local Operations: Total Local	Total Airport Operations
2018	99	941,025	32,774	10,034	6,458	24,596	1,453	75,315	5,816	383	6,199	81,514
2019	99	1,040,213	36,012	10,043	7,756	26,878	1,453	82,143	6,635	383	7,018	89,160
2020	99	1,067,533	36,359	10,053	8,204	26,964	1,453	83,033	6,656	383	7,039	90,072
2021	99	1,092,636	36,614	10,062	8,653	27,052	1,453	83,833	6,677	383	7,060	90,894
2022	98	1,116,240	36,806	10,071	9,102	27,140	1,453	84,573	6,699	383	7,082	91,656
2023	98	1,139,401	36,987	10,080	9,553	27,230	1,453	85,304	6,722	383	7,105	92,408
2024	98	1,161,533	37,124	10,090	10,004	27,321	1,453	85,992	6,744	383	7,127	93,119
2025	98	1,183,603	37,265	10,099	10,456	27,413	1,453	86,686	6,767	383	7,150	93,836
AAGR 2019-2025	-0.2%	2.2%	0.6%	0.1%	5.1%	0.3%	0.0%	0.9%	0.3%	0.0%	0.3%	0.9%
Growth 2019-2025	-1.1%	13.8%	3.5%	0.6%	34.8%	2.0%	0.0%	5.5%	2.0%	0.0%	1.9%	5.2%

Source: FAA TAF, FAA OPSNET, BTS, FAA Aerospace Forecast (FY 2019-2039), Boeing World Air Cargo Forecast (2018-2037), Airbus Global Market Forecast (2018-2037), FedEx, Koury Aviation, Signature Flight Support, Triad Aviation Academy (website), GSO Control Tower Statistics, PTAA, CHA, 2019.

NOTE: the forecast is currently pending FAA review and approval

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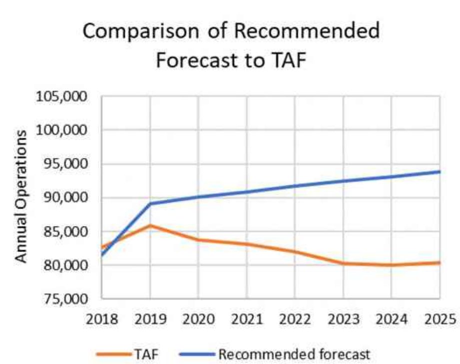
13

Comparing Draft Forecast to FAA's TAF (Terminal Area Forecast)

Year	Enplanements: GSO TAF	Enplanements: Recommended Forecast	Enplanements: Recommended Forecast vs. TAF	Operations: GSO TAF	Operations: Recommended Forecast	Operations: Recommended Forecast vs. TAF
2018	919,089	941,025	2.4%	82,593	81,514	-1.3%
2019	1,064,858	1,040,213	-2.3%	85,895	89,160	3.8%
2020	1,070,938	1,067,533	-0.3%	83,804	90,072	7.5%
2021	1,076,167	1,092,636	1.5%	83,160	90,894	9.3%
2022	1,080,834	1,116,240	3.3%	81,967	91,656	11.8%
2023	1,085,249	1,139,401	5.0%	80,251	92,408	15.1%
2024	1,089,329	1,161,533	6.6%	79,982	93,119	16.4%
2025	1,093,328	1,183,603	8.3%	80,368	93,836	16.8%
AAGR 2019-2025	0.4%	2.2%	-	-1.1%	0.9%	-
Growth 2019-2025	2.7%	13.8%	-	-6.4%	5.2%	-

Source: FAA TAF, FAA OPSNET, BTS Office of Airline Information (T-100 Data), FAA Aerospace Forecast (FY 2019-2039), Boeing World Air Cargo Forecast (2018-2037), Airbus Global Market Forecast (2018-2037), FedEx, Koury Aviation, Signature Flight Support, Triad Aviation Academy (website), PTAA, CHA, 2019.
Note: FAA TAF presented as Federal Fiscal Year, and Recommended Forecast presented as Calendar Year.



NOTE: the forecast is currently pending FAA review and approval

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14

Forecast Operations for Noise Modeling - Draft

Annual Operations

Year	Commercial				General Aviation			Military			Total Operations
	Passenger	Air Taxi	Cargo	Total	Itinerant	Local (T&G)	Total	Itinerant	Local (T&G)	Total	
2018	32,775	10,034	6,458	**49,267**	24,596	5,816	**30,412**	1,453	383	**1,836**	**81,515**
2020	36,359	10,053	8,204	**54,616**	26,964	6,656	**33,620**	1,453	383	**1,836**	**90,072**
2025	37,266	10,099	10,456	**57,821**	27,413	6,767	**34,180**	1,453	383	**1,836**	**93,837**

Average Annual Daily Operations

Average Day in	Commercial				General Aviation			Military			Total Operations
	Passenger	Air Taxi	Cargo	Total	Itinerant	Local (T&G)	Total	Itinerant	Local (T&G)	Total	
2018	89.8	27.5	17.7	**135.0**	67.4	15.9	**83.3**	4.0	1.0	**5.0**	**223.3**
2020	99.6	27.5	22.5	**149.6**	73.9	18.2	**92.1**	4.0	1.0	**5.0**	**246.8**
2025	102.1	27.7	28.6	**158.4**	75.1	18.5	**93.6**	4.0	1.0	**5.0**	**257.1**

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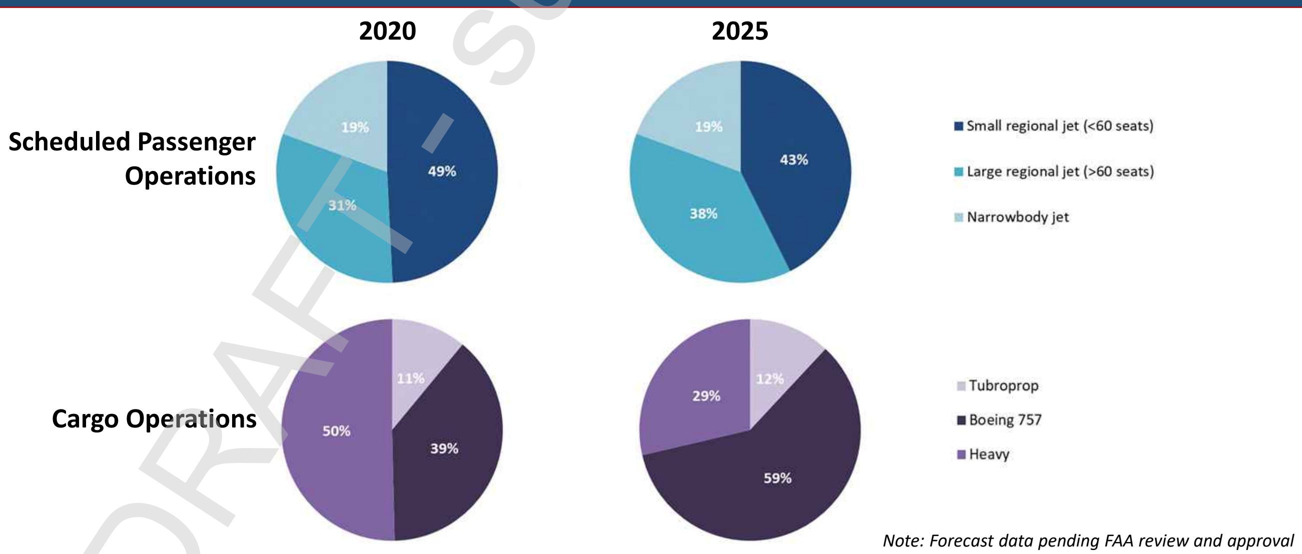
15

Fleet Mix Summary, Passenger and Cargo



Note: Forecast data pending FAA review and approval

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16

Forecast Day/Night Split - Draft

- Slight increase in the proportion of nighttime cargo flights
- All other aircraft categories assumed to remain at the same proportions between day and night

Aircraft Category	2020 Day	2020 Night	2025 Day	2025 Night
Scheduled Passenger	85.7%	14.3%	85.7%	14.3%
Cargo	14.8%	85.2%	12.0%	88.0%
Cargo Jets	15.1%	84.9%	12.4%	87.6%
Cargo Turboprops	12.1%	87.9%	9.1%	90.9%
Air Taxi & General Aviation	90.0%	10.0%	90.0%	10.0%
Military	95.0%	5.0%	95.0%	5.0%
Overall	81.5%	18.5%	79.7%	20.3%

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17

Land Use Mapping

- Primary data collection steps include:
  - Assemble and review land use, zoning, and population data
  - Identify any local land use policies that address airport operations
  - Create existing land use maps
- Locations of noise sensitive sites (churches and schools) are noted
- Local jurisdictions will review the maps
- Once the draft DNL contours are created, the study team will survey and confirm land use within the 65 DNL contours

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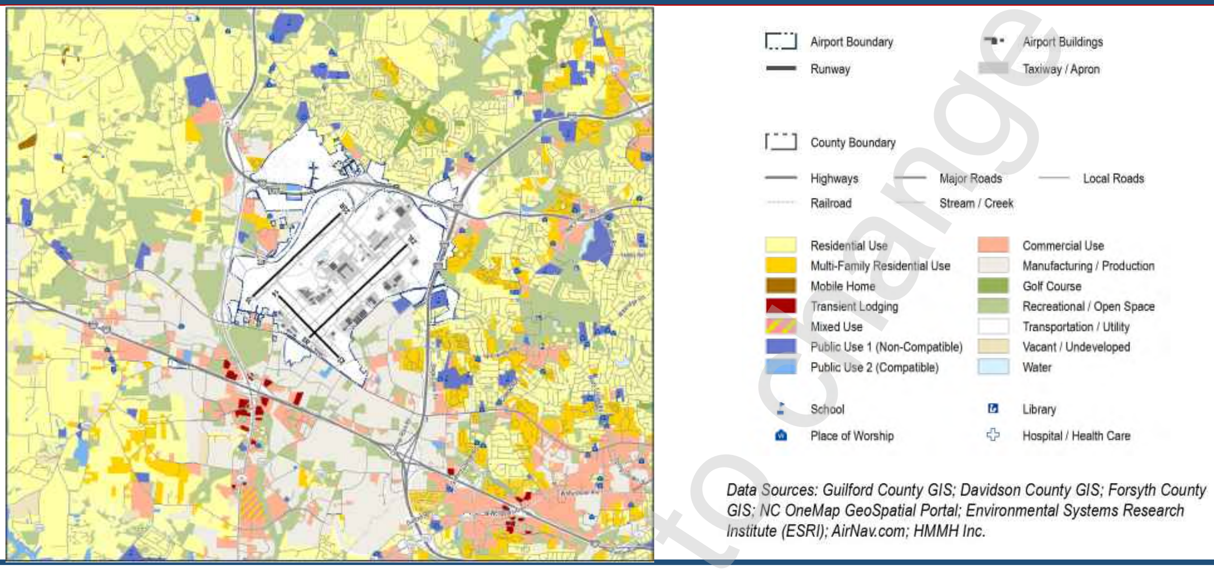
18

Land Use Close to the Airport – Draft



Data Sources: Guilford County GIS; Davidson County GIS; Forsyth County GIS; NC OneMap GeoSpatial Portal; Environmental Systems Research Institute (ESRI); AirNav.com; HMMH Inc.

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19

Noise Model Inputs

- We must use FAA-approved model
  - FAA's Aviation Environmental Design Tool (AEDT)
- Required noise modeling inputs
  - Airport layout
  - Aircraft operations by day/night for existing year 2020 and forecast 2025
    - Arrivals, departures, runups, touch & go operations
  - Runway utilization rates by aircraft categories
  - Flight track geometry and use by aircraft categories
  - Annual average meteorological data
  - Terrain

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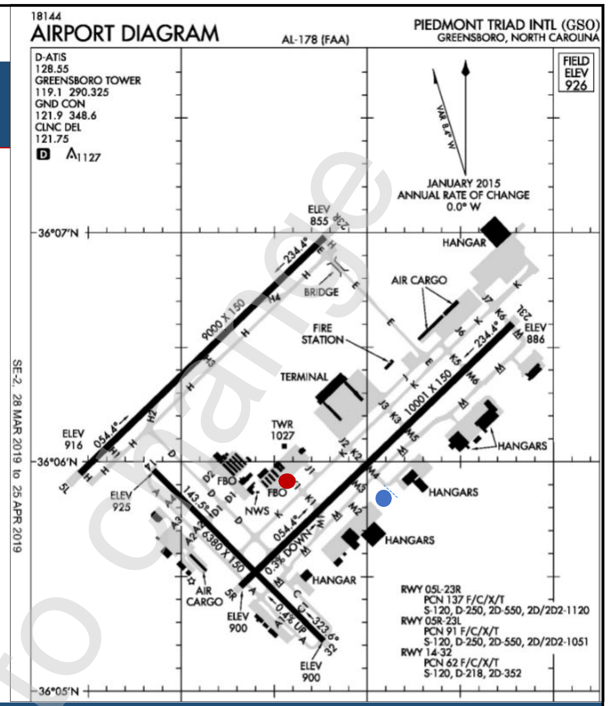
20

Airport Layout Inputs

- Runway End data
  - o 6 Runway Ends: 5L-23R, 5R-23L, and 14-32
  - o Latitude/longitude coordinates
  - o Elevation
  - o Approach glide slope
  - o Any displaced thresholds (list if there are any at GSO)
- "Helipad" at apron in front of Signature Aviation (red dot on diagram)
- Engine Run-up location by blast fence (blue dot on diagram)



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21

Aircraft Operations

- Arrivals
  - o 3-degree approach profile
- Departures
  - o Stage length based on city-pairs
    - 0-500 nmi = Stage length 1 (ex: GSO-ATL = 266 nmi)
    - 500-1000 nmi = Stage length 2 (ex: GSO-DFW = 868 nmi)
  - o Corresponds to fuel load, and therefore to aircraft weight
  - o AEDT noise and performance database has departure profiles by stage length
- Touch & go patterns
- Engine Run-ups
  - o Location, duration, power setting, heading, time of day

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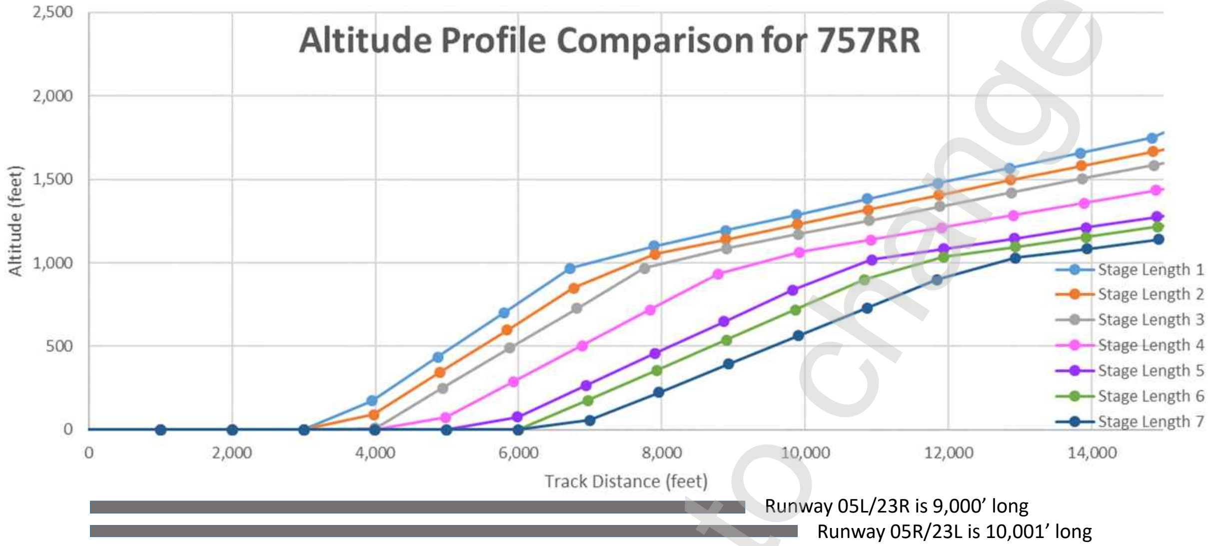
22

Sample Departure Profile Data – Cargo Jet



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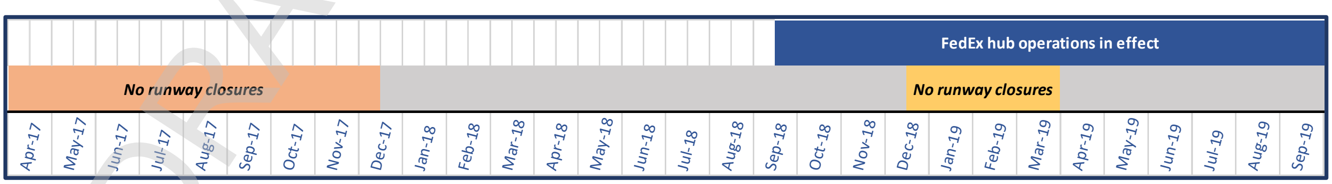
23

Runway Use

- Daytime runway use is calculated from radar data, using 12 months (two periods) without runway closures
- Nighttime runway use is based on a full year of radar data since the FedEx hub operation commenced, providing information on nighttime flow direction
- A 3.5-month sample without runway closures provided proportional information on nighttime left/right splits in each direction



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24

Runway Use to be modeled for 2020 & 2025

- Daytime Runway Use for each category calculated from 12-month sample of data without runway closures (April 1, 2017 – December 14, 2017 and December 15, 2018 – March 31, 2019)
- Nighttime directional use calculated from full year of operations after hub operations commenced (September 15, 2018 – September 14, 2019), with Left/Right split calculated from 3.5-month period without runway closures (December 15, 2018 – March 31, 2019)

	Daytime					
	Jets		NonJets		FedEx	
Runway	Arrival	Departure	Arrival	Departure	Arrival	Departure
5L	2.7%	3.4%	9.5%	4.5%	0.6%	2.5%
5R	30.9%	30.0%	18.0%	21.6%	33.7%	26.0%
14	0.2%	0.7%	1.7%	3.9%	0.0%	0.0%
23L	57.6%	55.3%	40.4%	51.1%	61.9%	67.2%
23R	5.6%	7.9%	20.4%	13.6%	2.9%	4.2%
32	2.9%	2.7%	10.0%	5.4%	0.9%	0.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

	Nighttime					
	Jets		NonJets		FedEx	
Runway	Arrival	Departure	Arrival	Departure	Arrival	Departure
5L	6.1%	3.2%	6.1%	1.9%	6.1%	1.3%
5R	48.4%	19.7%	42.5%	23.3%	55.1%	10.8%
14	0.0%	0.5%	5.3%	3.6%	0.0%	0.0%
23L	41.9%	71.0%	24.8%	57.5%	36.6%	86.1%
23R	2.5%	4.6%	3.5%	6.6%	2.1%	1.8%
32	1.2%	1.0%	17.8%	7.1%	0.2%	0.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

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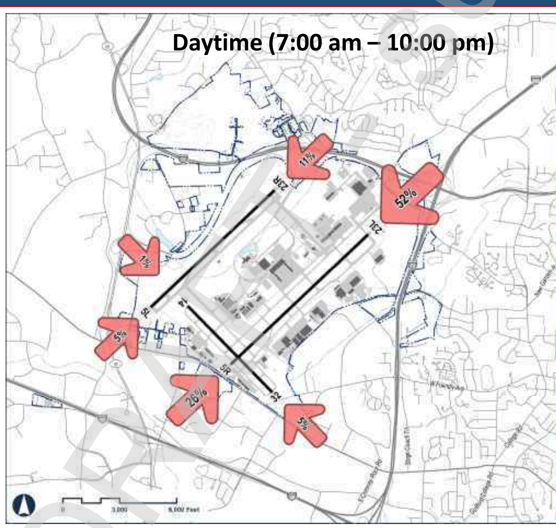
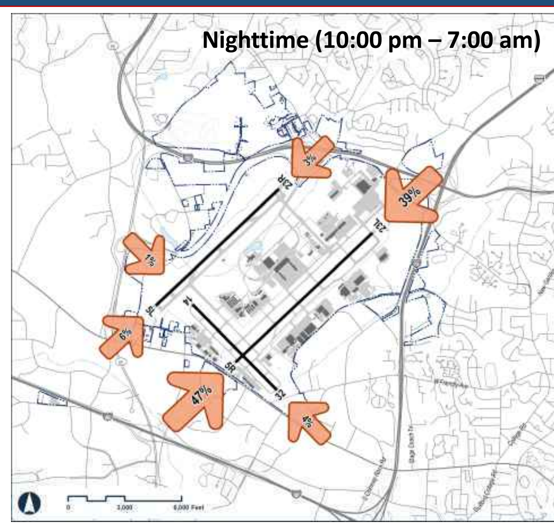
25

Runway Use: All Arrivals, Day and Night



Calculated from radar data taken from 12 months without runway closures



Directional use calculated from 12 months of radar data after FedEx hub operations commenced with left/right splits as observed during the 3.5 months with all runways open

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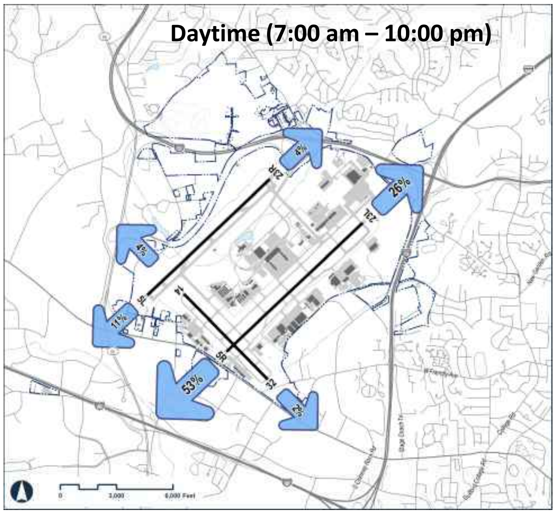
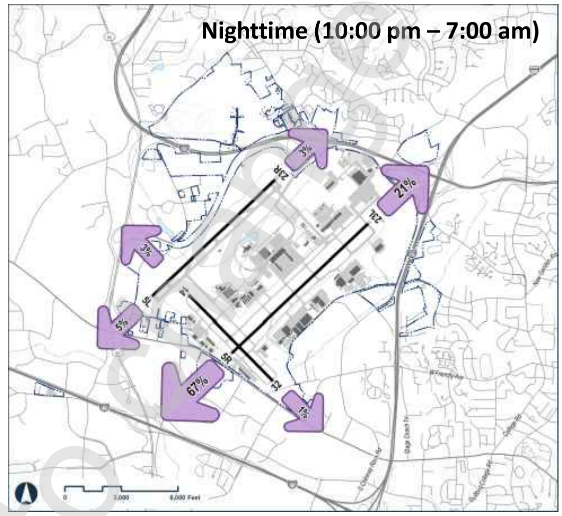
26

Runway Use: All Departures, Day and Night



Calculated from radar data taken from 12 months without runway closures



Directional use calculated from 12 months of radar data after FedEx hub operations commenced with left/right splits as observed during the 3.5 months with all runways open

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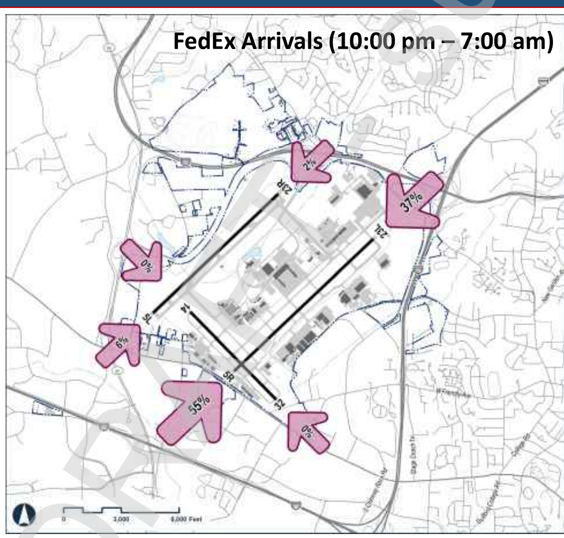
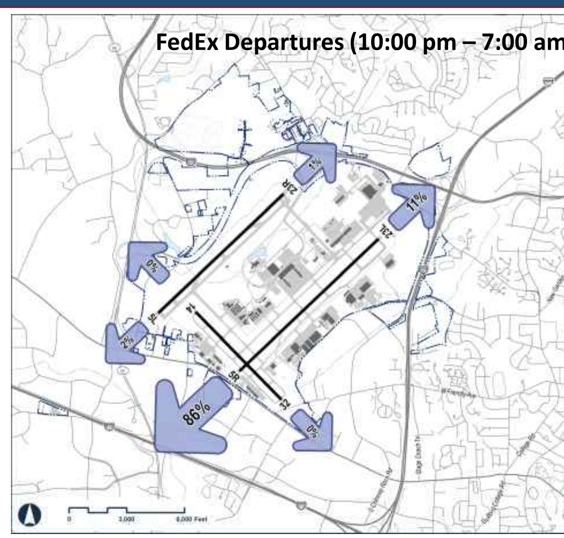
27

Nighttime FedEx Runway Use





Calculated from radar data taken from 12 months since hub operations commenced, with left/right split using data from the 3.5 months without runway closures

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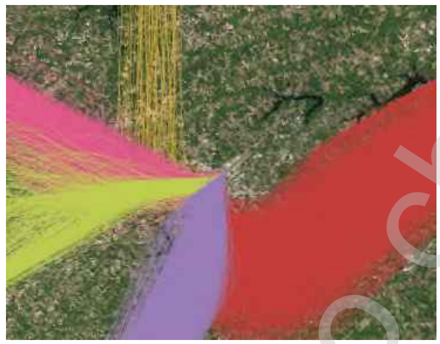
28

Model Flight Tracks Development

Radar Data for 12 months or more are sorted by aircraft type, operation type, runway, and then by corridor.

Statistical analysis determines position and percent usage of model flight tracks.

Runway 23L Jet Departures in radar sample



Runway 23L Jet Departure "bundles"

One bundle with associated model flight tracks

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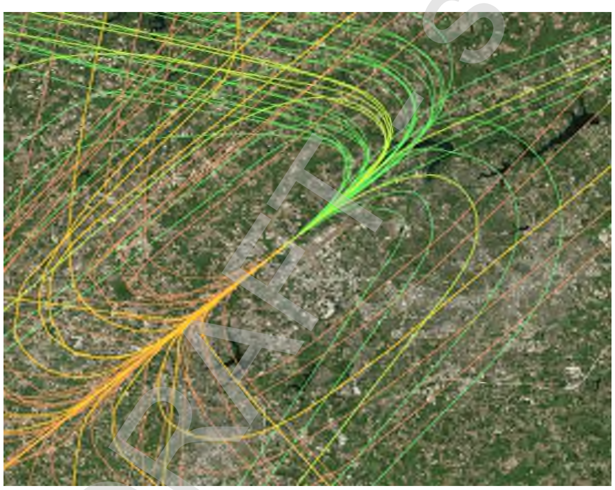
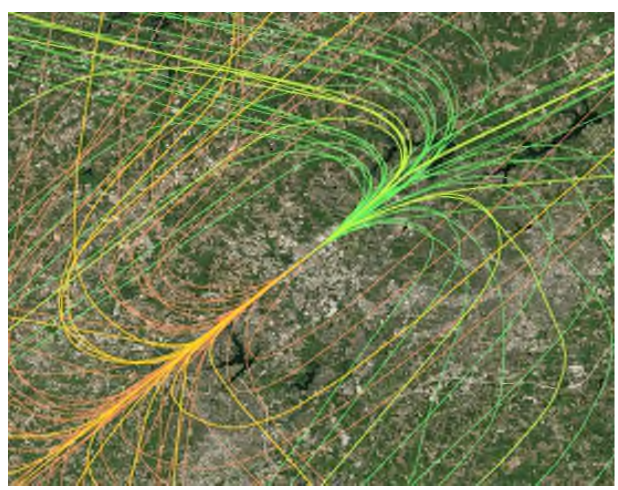
29

Model Flight Tracks: Jets, Runways 5L and 5R



Jet Model Tracks, Runway 5L



Jet Model Tracks, Runway 5R

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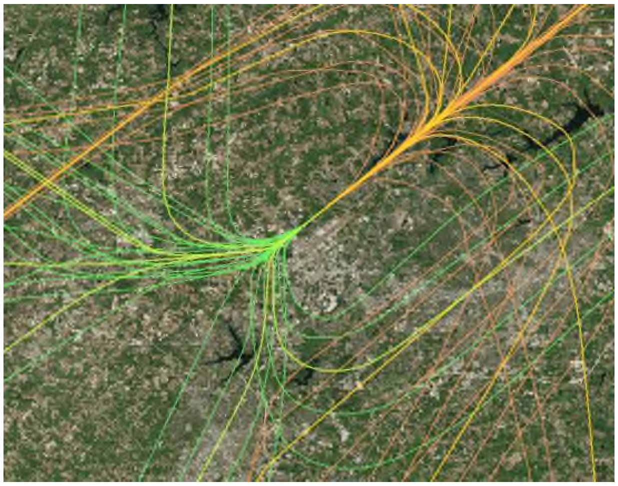
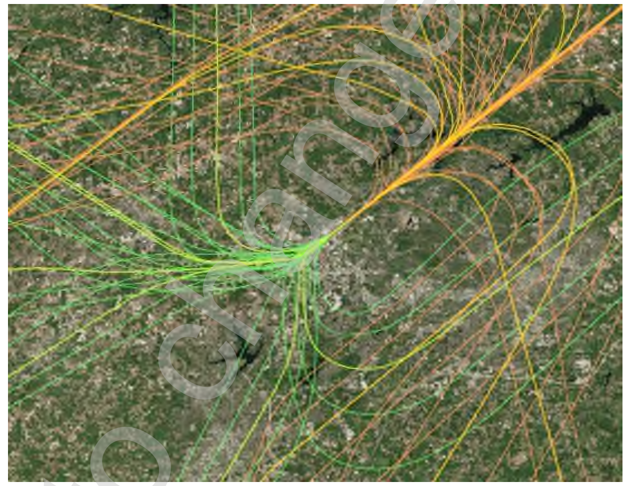
30

Model Flight Tracks: Jets, Runways 23L and 23R



Jet Model Tracks, Runway 23R



Jet Model Tracks, Runway 23L

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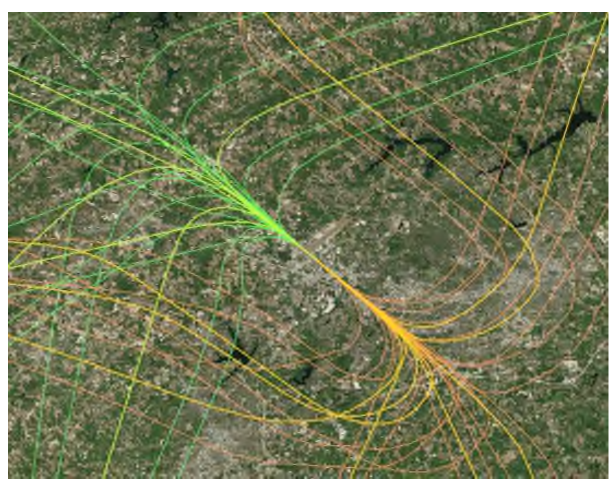
31

Model Flight Tracks: Jets, Runways 14 and 32

Jet Model Tracks, Runway 14



Jet Model Tracks, Runway 32

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32

Weather and Terrain data

- Temperature: 58° F
- Station Pressure: 985.75 mbar
- Sea Level Pressure: 1018.04 mbar
- Dew point: 46.99° F
- Relative humidity: 67.35%
- Wind speed 6.15 knots

Source: AEDT 30-year weather database

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33

Noise Measurements

- November 10 through November 16, 2019
- Using 6 portable monitors; one at each of 6 sites
- Measurements of individual aircraft noise events; will be correlated with radar data
- Hourly noise levels (Leq) and daily (DNL) values will be measured at each of the locations
- Two HMMH staff will spend time at each location, observing and logging aircraft noise events

Note: Measured noise levels are NOT used to generate or calibrate contours

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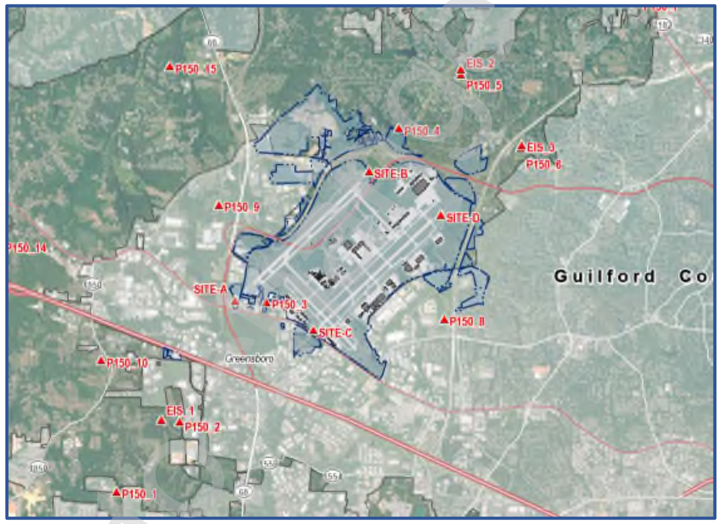
34

Noise Measurement Locations

Sites 2, 4, 5 & 6 replicate locations from previous Part 150 study (measurements conducted in August 2004)

Site 1 - recommend be placed under Route 68 departure corridor

Site 3 - recommend be placed in a residential area under the Runway 05L approach corridor



35

Proposed Noise Measurement Locations

Sites 1, 2 and 3: south of airport

Sites 4, 5 and 6: north of airport

36

Projected CAC Meetings & Public Workshops

Meeting	Date	Topic
CAC Meeting #1	June 26, 2019	Introduction to the Part 150 process
Public Information Workshop #1	June 27, 2019	Introduction to the Part 150 study
CAC Meeting #2	***October 2, 2019 (today)***	***Noise modeling inputs***
CAC Meeting #3	Early 2020	Noise modeling results and review of NCP measures
CAC Meeting #4	Spring 2020	Presentation of the Part 150 Report
Public Information Workshop #2	Spring 2020	Presentation of the study results

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37

Next Steps

- Confirm land use adjacent to the airport
- Finalize noise model inputs after FAA forecast approval
- Generate noise contours with AEDT
- Assess land use and population within contours
- Conduct noise measurements and analyze data
- Review NCP measures

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38

CAC Member Discussion

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39

Adjournment

- Next CAC meeting early 2020 (exact date and time to be determined)
- Project contacts and websites
  - Suzanne Akkoush, Project Manager – Part 150 Study
  - Address emails to Part150@gsoair.org
  - Part 150 Website (PTIPart150Update.com) provides most relevant information
    - Will be updated regularly for public outreach purposes
    - TAC will receive direct notices
  - PTAA noise information website provides broader information
    - https://flyfrompti.com/noise-information/

Thanks for participating and attending!

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40

Welcome!

Noise Compatibility Study (Part 150) Update
Piedmont Triad International Airport

Citizens Advisory Committee Meeting #3
May 20, 2020

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1

Meeting Agenda

- Welcome and introductions
- Project status
- Noise model input
- Preliminary noise model results
- Noise measurement program results
- Overview of Noise Compatibility Program
- Next steps
- CAC member discussion

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Piedmont Triad Airport Authority

- **Kevin Baker**, Executive Director
  - Part 150 Airport Sponsor
- **Alex Rosser**, Chief Operating Officer
  - Part 150 Program Manager
- **Suzanne Akkoush**, Project Manager – Noise Program
  - Part 150 Project Manager

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3

Part 150 Consultant Team

- **Gene Reindel**, HMMH Vice President
  - Part 150 Principal
- **Bob Mentzer**, HMMH Principal Consultant
  - Part 150 Project Manager
- **Kate Larson**, HMMH Senior Consultant
  - Part 150 Assistant Project Manager
- **Ron Miller**, Ron Miller & Associates
  - Part 150 Public Outreach

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4

CAC Members

Name	Jurisdiction	Name	Jurisdiction
Joe Saldarini, Chair	Greensboro	Ed Levick	High Point
Janet Mazzurco, Co-Chair	Greensboro	Thad Juszczak	High Point
Stan Tennant	Greensboro	Keith Brown	High Point
Steve Johnson	Greensboro	Erin Randall	High Point
Alyson Best	Greensboro	Bill Nagy	High Point
Sebastian King	Guilford County	Michael Lopez	Summerfield
Sharon Kasica	Guilford County	Lawrence Straughn	Jamestown
Toneq McCullough	Winston-Salem	George McClellan	Oak Ridge
Clarence Lambe	Forsyth County	Bob Prescott	Kernersville

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Project Status

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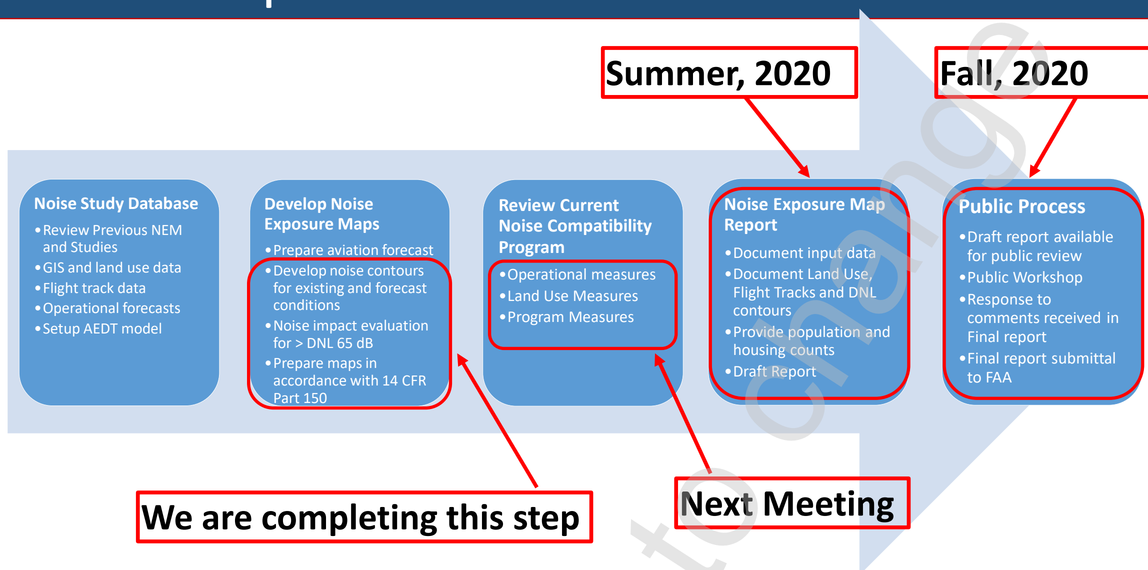
6

Part 150 Update Status



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7

Part 150 Update Public Process

- This is the third of four TAC/CAC meetings
  - o First held in June 2019
  - o Second held in October 2019
- Two Public workshops
  - o First was held June 27, 2019
  - o Second will present Study results in fall 2020
- Presentations for all prior meetings available at
  https://ptipart150update.com/public-outreach/

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8

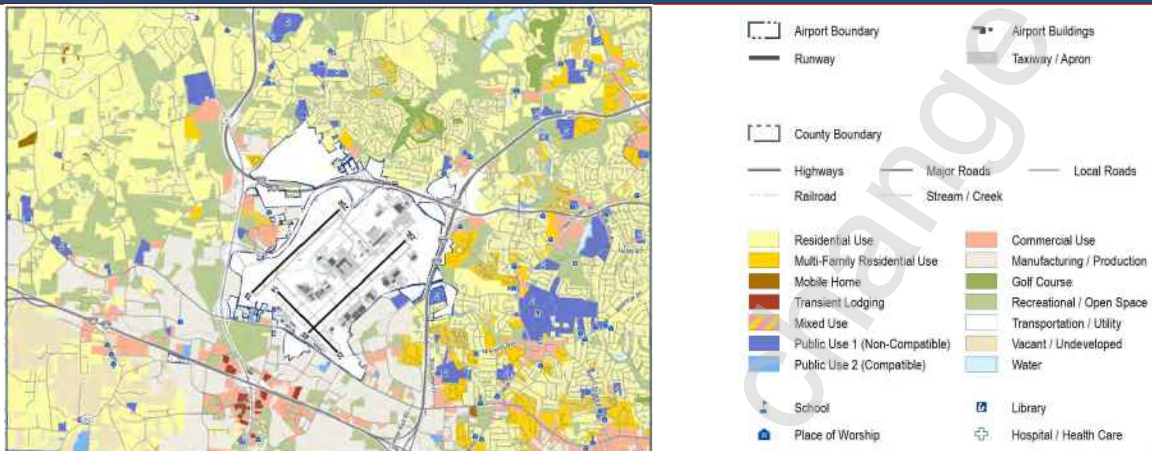
Noise Model Input

Noise Model Input

Categories of noise model input:

1. Study Area and physical description of the Airport Layout
2. Aircraft noise and performance characteristics
3. Aircraft operations
   - Flight operations (arrival/departure/touch-and-gos)
   - Runup operations (aircraft maintenance)
4. Runway utilization rates
5. Flight track geometry and utilization rates
6. Meteorological and terrain data

Study Area with Updated Land Use



Map has been updated based on input submitted by: PTAA, City of Greensboro, City of High Point, Guilford County, and windshield surveys conducted by HMMH in November, 2019

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Thank you to committee member Sharon Kasica for information on locations of area schools – we added in those that were missing.

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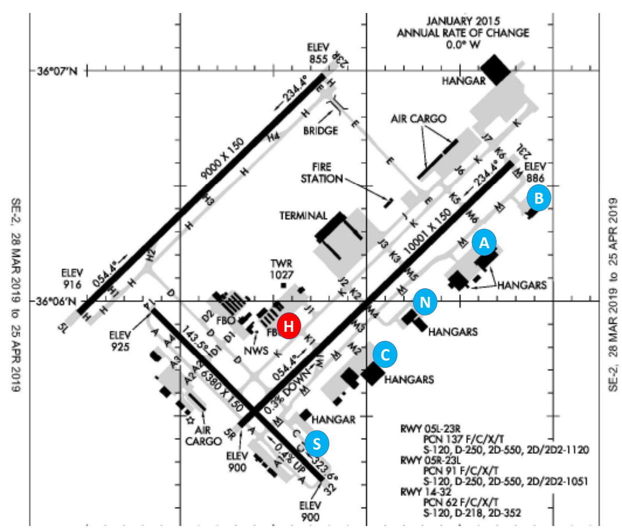
11

Airport Layout

- Modeled helipad location (H)
- Modeled Engine Runup locations
  - o DC10s, A300s, 767s (C)
  - o A319s, A320s, A321s, 737s (C) (N)
  - o small jets and turboprops (S)
  - o Honda jets (A) (B)



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12

Modeled Aircraft Operations: Annual Forecasts

FAA-approved PTAA Aviation Forecast

Year	Commercial				General Aviation			Military			Total Operations
	Passenger Aircraft	Air Taxi	Cargo Aircraft	Total	Itinerant	Local	Total	Itinerant	Local	Total	
2018	32,774	10,034	6,458	49,267	24,596	5,816	30,412	1,453	383	1,836	81,514
2020	36,359	10,053	8,204	54,616	26,964	6,656	33,620	1,453	383	1,836	90,072
2025	37,265	10,099	10,456	57,821	27,413	6,767	34,180	1,453	383	1,836	93,836
Average Annual Day	Commercial				General Aviation			Military			Total Operations
	Passenger Aircraft	Air Taxi	Cargo Aircraft	Total	Itinerant	Local	Total	Itinerant	Local	Total	
2018	89.8	27.5	17.7	135.0	67.4	15.9	83.3	4.0	1.0	5.0	223.3
2020	99.6	27.5	22.5	149.6	73.9	18.2	92.1	4.0	1.0	5.0	246.8
2025	102.1	27.7	28.6	158.4	75.1	18.5	93.6	4.0	1.0	5.0	257.1

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13

Modeled Aircraft Operations: Aircraft Types

Commercial Passenger

Aircraft Type	AEDT Type	2020 Total Operations	2025 Total Operations	Change from 2020
A220-300 or 737-700/LR	737700	10	1,019	1,009
A319	A319-131	439	450	11
A320-100/200	A320-232	1,531	2,073	542
A320-200N	A320-271N	42	43	1
A321	A321-232	20	20	0
B717-200	717200	2,043	2,094	51
B737-800 or B737-900	737800	1,007	1,540	533
MD-80/1/2/3/8	MD83	1,966	0	-1,966
MD-90	MD9025	3	0	-3
CRJ900 or CRJ700	CRJ9-ER	7,780	9,658	1,878
E175	EMB175	3,622	4,490	868
CRJ200ER/440	CL600	6,706	5,318	-1,388
ERJ140	EMB145	3,750	3,843	93
ERJ145	EMB14L	7,438	6,717	-721
Commercial Passenger totals		**36,359**	**37,265**	**906**

Cargo

Aircraft Type	AEDT Type	2020 Total Operations	2025 Total Operations	Change from 2020
A300	A300B4-203	1,396	1,662	266
B767(200)	767CF6	948	1,041	93
B767(300)	767300	267	294	27
DC10	DC1030	1,521	0	-1,521
B757(PW)	757PW	1,332	2,609	1,277
B757(RR)	757RR	1,839	3,603	1,764
ATR42	DHC8	901	1,248	347
Cargo totals		**8,204**	**10,456**	**2,252**

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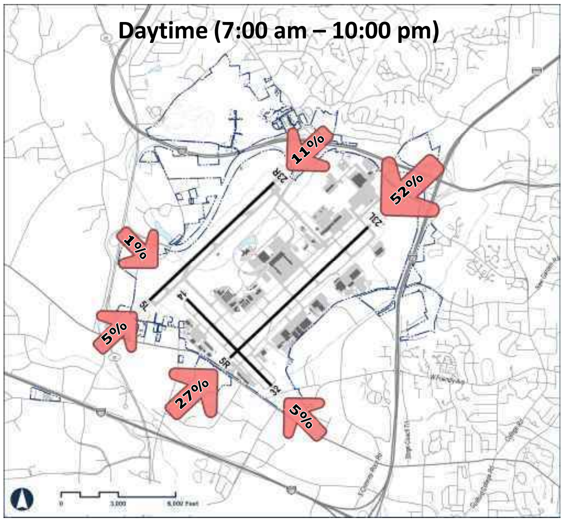
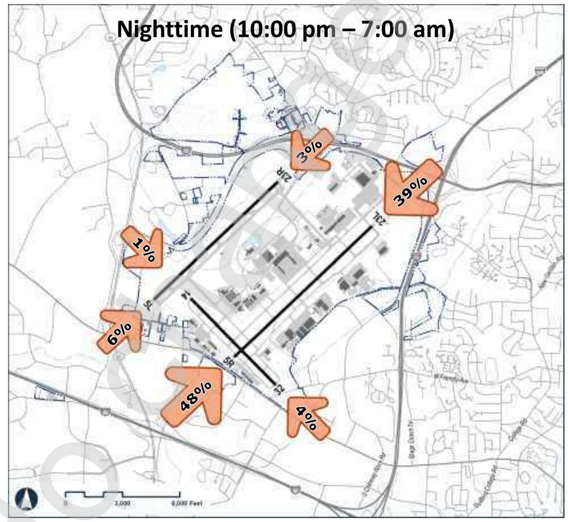
14

Modeled Runway Use: Arrivals





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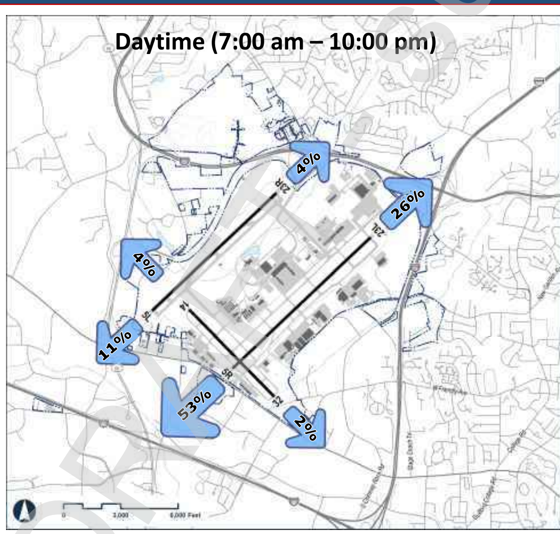
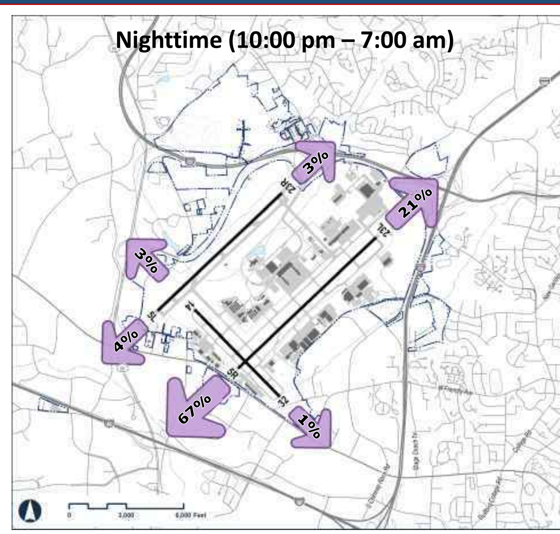
15

Modeled Runway Use: Departures





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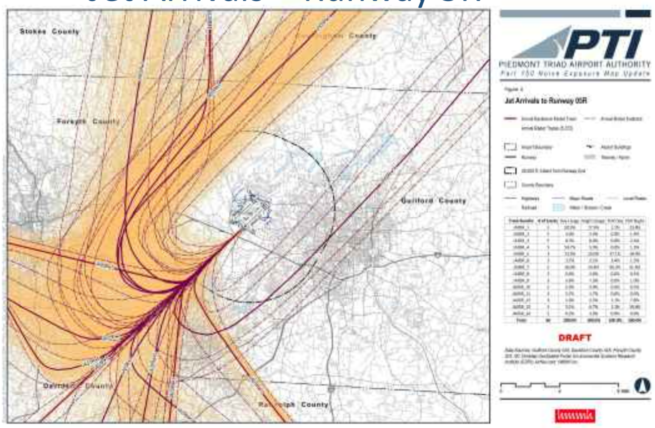
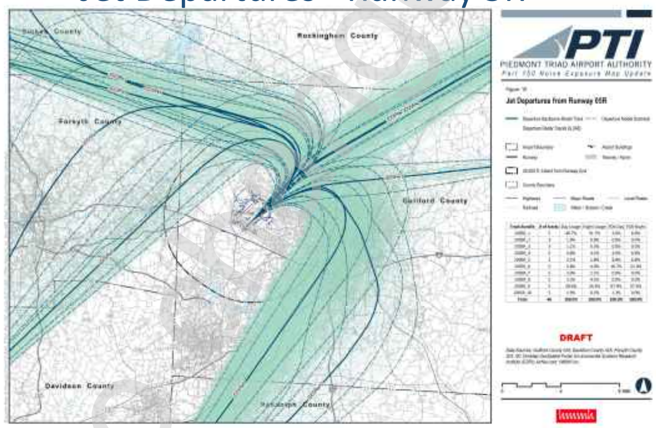
16

Modeled Flight Tracks: Runway 5R

Jet Arrivals – Runway 5R



Jet Departures - Runway 5R



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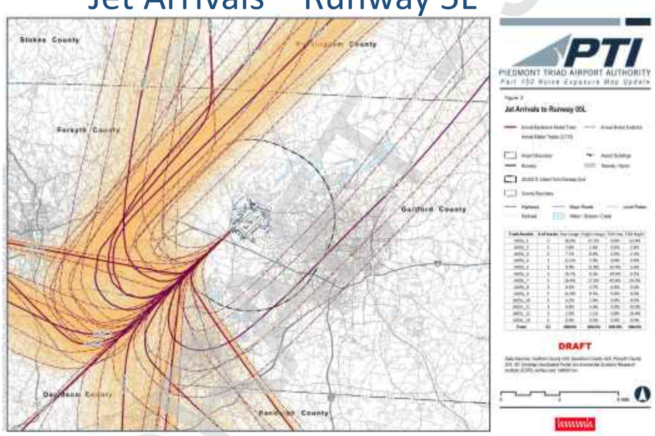
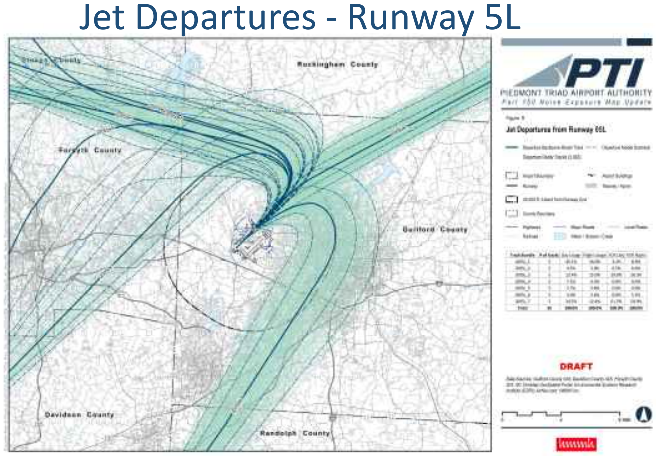
17

Modeled Flight Tracks: Runway 5L

Jet Arrivals – Runway 5L



Jet Departures - Runway 5L



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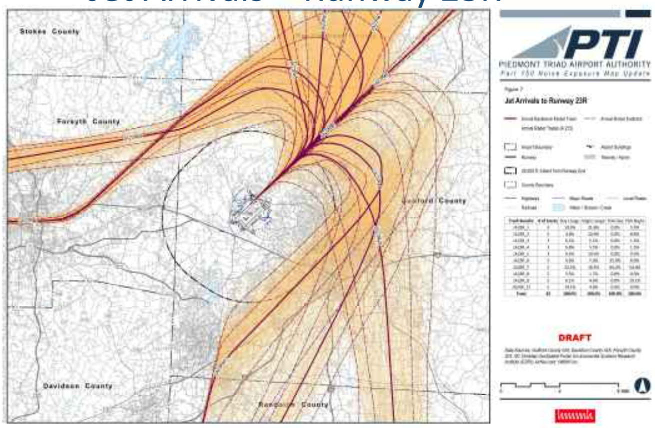
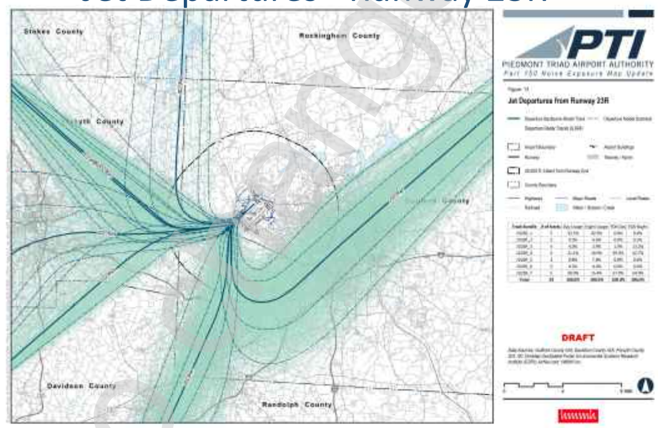
18

Modeled Flight Tracks: Runway 23R

Jet Arrivals – Runway 23R



Jet Departures - Runway 23R



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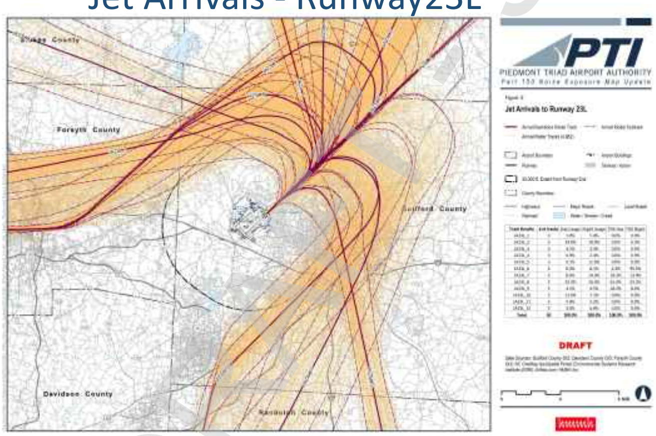
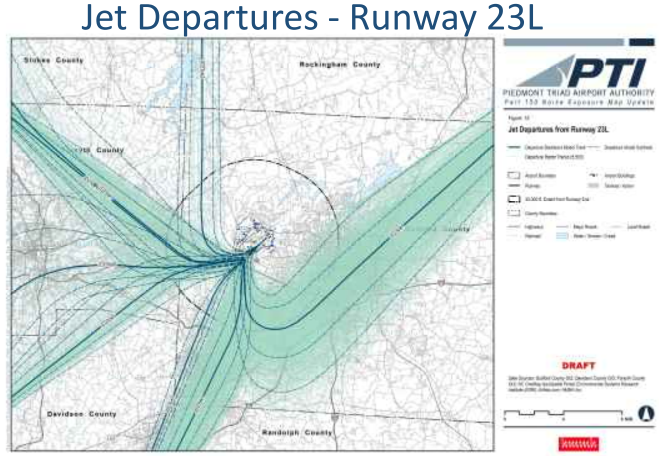
19

Modeled Flight Tracks: Runway 23L

Jet Arrivals - Runway23L



Jet Departures - Runway 23L



Thank you to committee member Ed Levick for careful review of flight track inputs; an additional model track was added to fill a gap.

20

Modeled Weather and Terrain Data

- The FAA requires the use of the provided AEDT 30-year average weather information. These data for PTI are:
  - Temperature: 58° F
  - Station Pressure: 985.75 mbar
  - Sea Level Pressure: 1018.04 mbar
  - Dew point: 46.99° F
  - Relative humidity: 67.35%
  - Wind speed 6.15 knots
- Terrain data were obtained from the United States Geological Survey National Elevation Dataset with 1/3 arc second (approximately 33 ft.) resolution covering the Study Area

Thank you to committee member Thad Juszczak for the question about weather inputs – the FAA requires the 30-year average data

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21

Preliminary Noise Model Results

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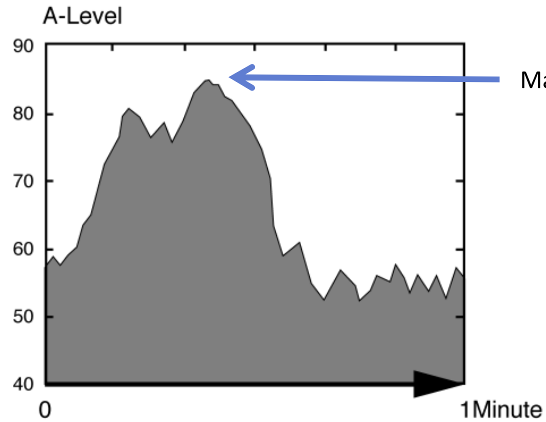
22

Single Event Noise Metrics: Maximum Sound Level (L_{max})

The simplest way to describe a discrete noise "event" is its maximum sound level (L_{max})



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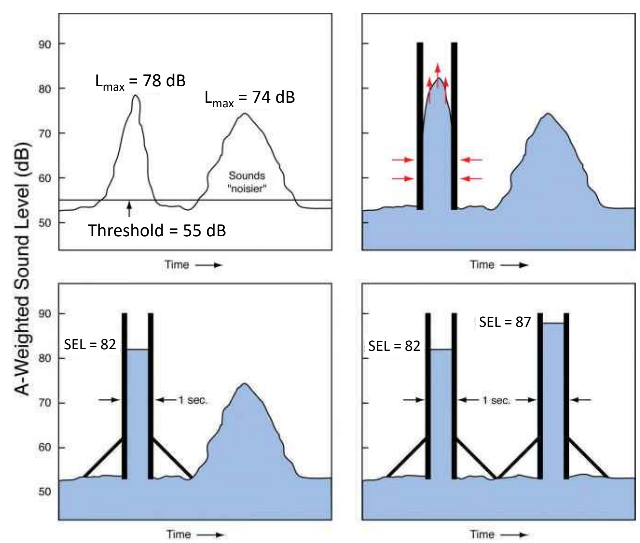
23

Single Event Noise Metrics: 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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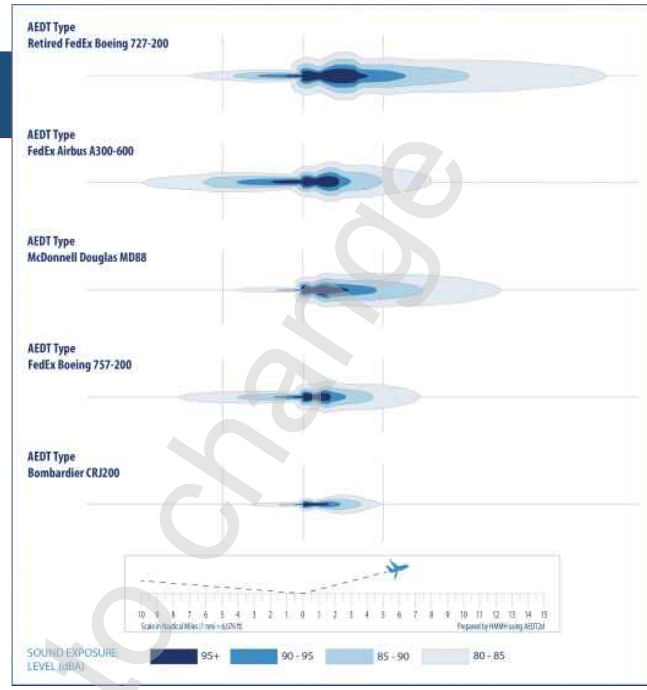
24

Comparative SELs

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



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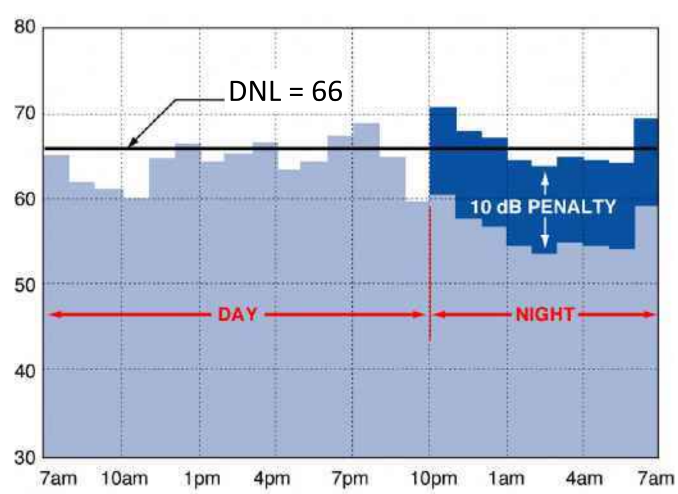
Cumulative Exposure: Day-Night Average Level (DNL)

- Describes 24-hour exposure
- Noise from 10 pm to 7 am is factored up by 10 dB
  - o "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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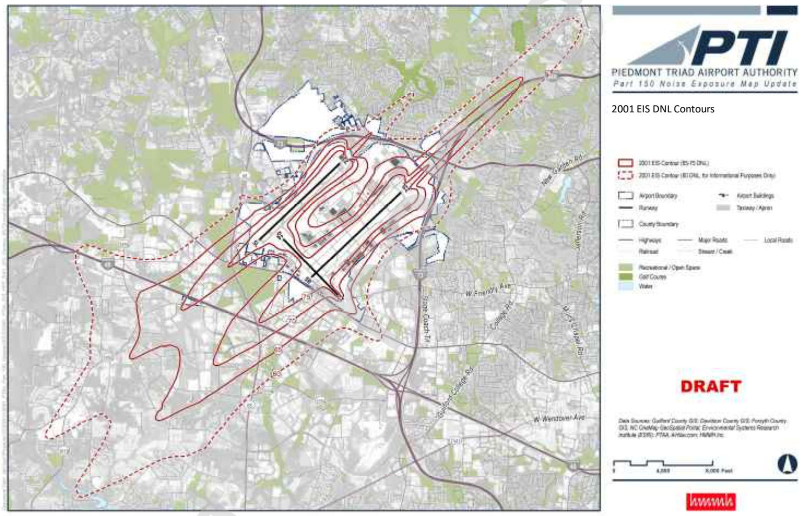
26

Previous Study Noise Contours: 2001 EIS



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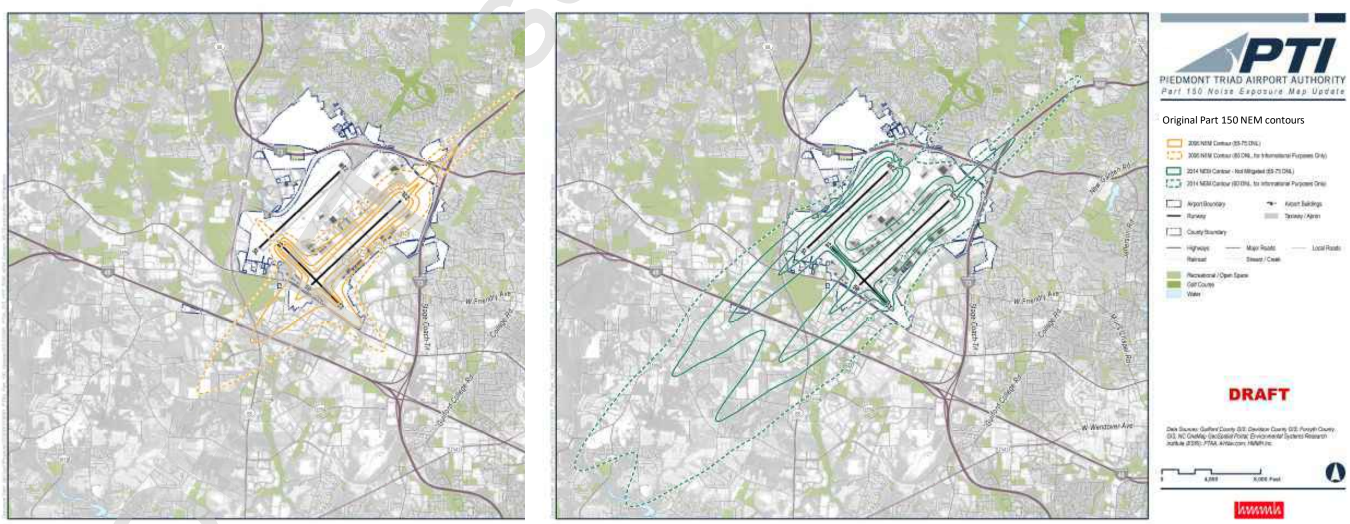
27

Previous Study Noise Contours: Original Part 150 NEMs



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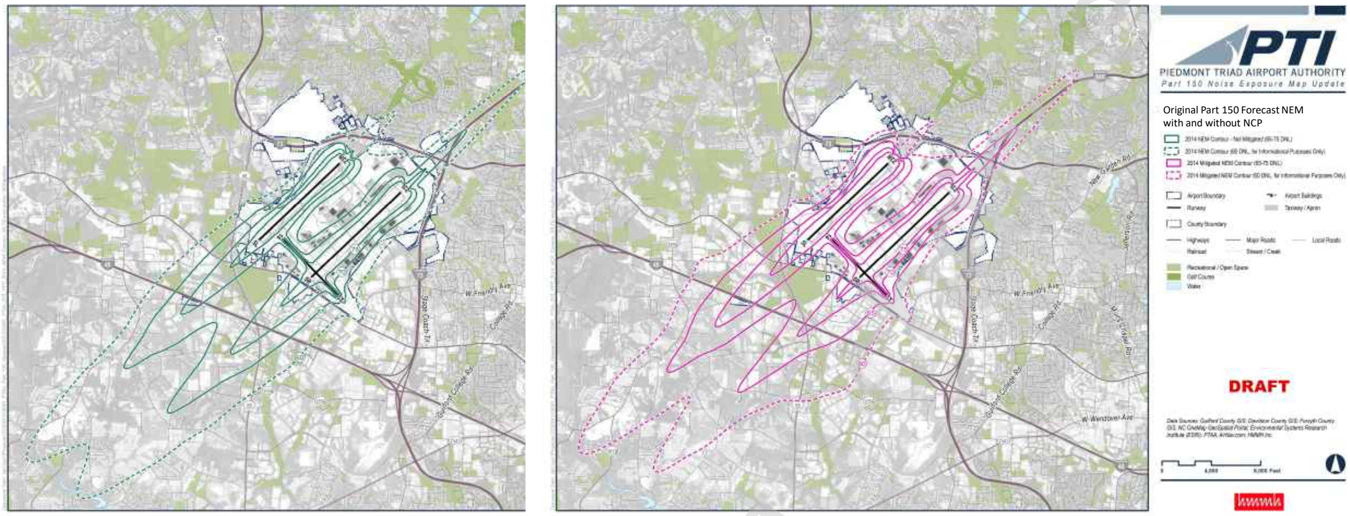
28

Previous Study Noise Contours: Original Part 150 forecast



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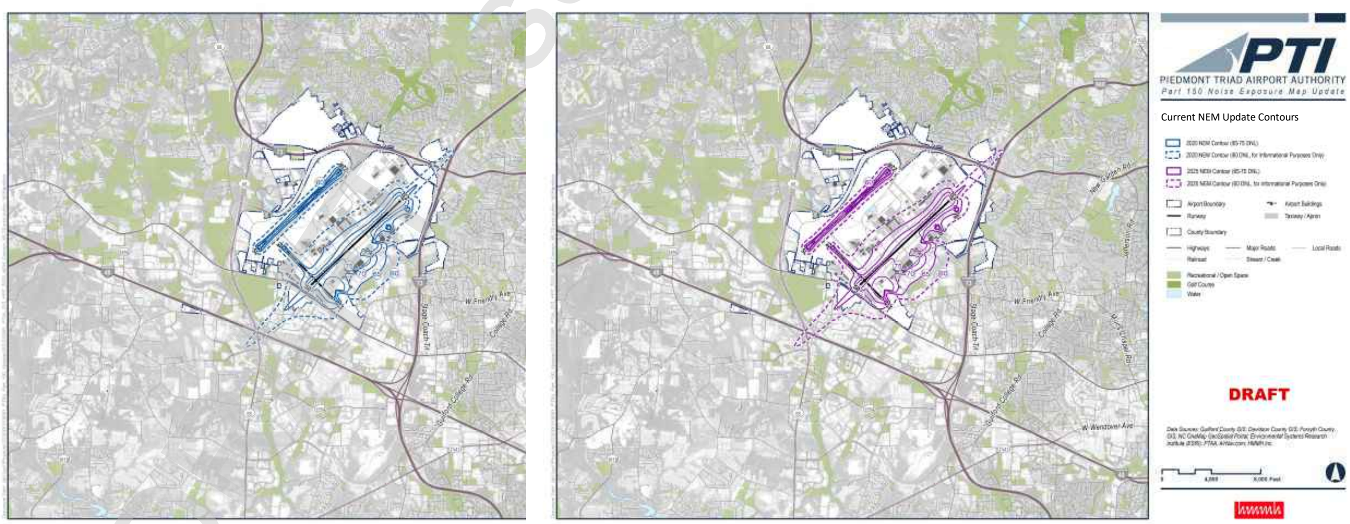
29

Current Study Noise Contours: Part 150 Update



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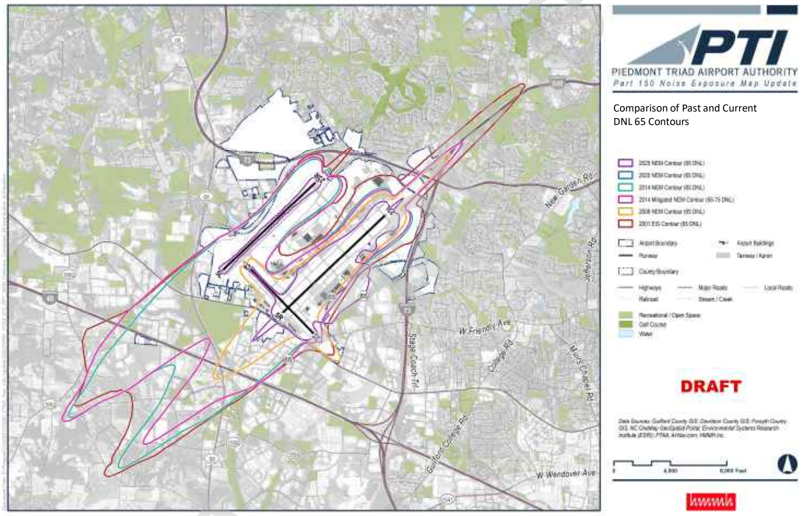
30

Comparison of 65 DNL contours

- EIS:
  - nearly 600 daily operations
  - 30 daily B-727 or DC-8/9 (Stage 2)
- 2014 Part 150 NEM:
  - nearly 500 daily operations
  - 10 daily B-727 or DC-8/9 (Stage 2)
- 2020 NEM Update:
  - about 250 daily operations
  - no B-727 or DC8/9 (Stage 2)
- 2025 forecast NEM:
  - about 250 daily operations
  - no Stage 2/no MD80s (Stage 3)

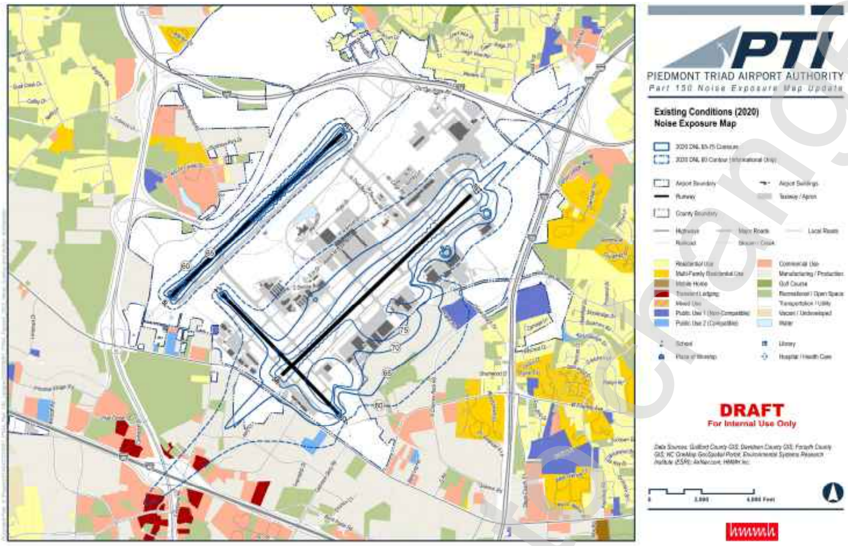


Note: EIS and Original Part 150 assumed full FedEx hub in operation by 2014. NEM update contours include current level of hub operations with small increase for 2025.

Comparison of Modeled Airport Operations

Average Annual Day	Commercial			General Aviation	Military	Total Operations
	Passenger	Air Taxi	Cargo			
2001 EIS	242.0	18.0	138.8	174.0	3.0	**575.8**
2006 NEM	46.0	132.2	17.3	135.6	2.8	**333.8**
2014 NEM	43.2	179.5	101.2	148.9	5.2	**478.0**
2020 NEM	99.6	27.5	22.5	92.1	5.0	**246.8**
2025 NEM	102.1	27.7	28.6	93.6	5.0	**257.1**

Preliminary Noise Model Results – 2020



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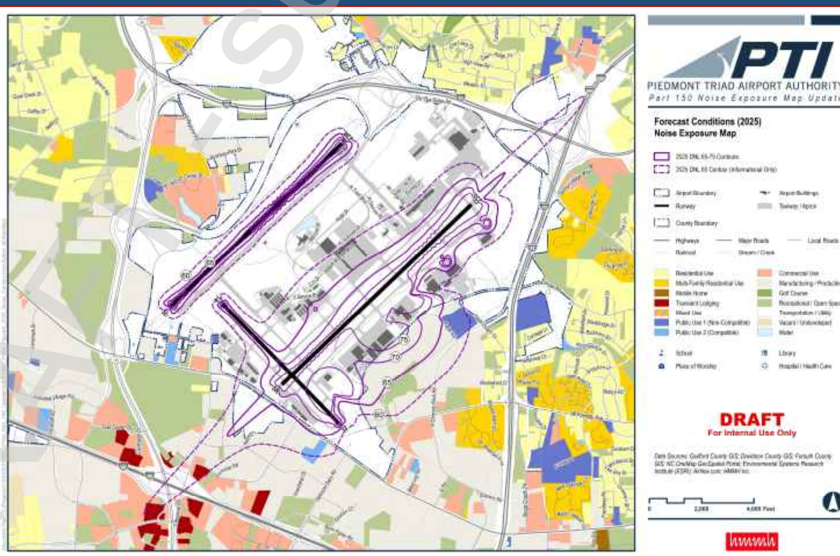
33

Preliminary Noise Model Results – 2025



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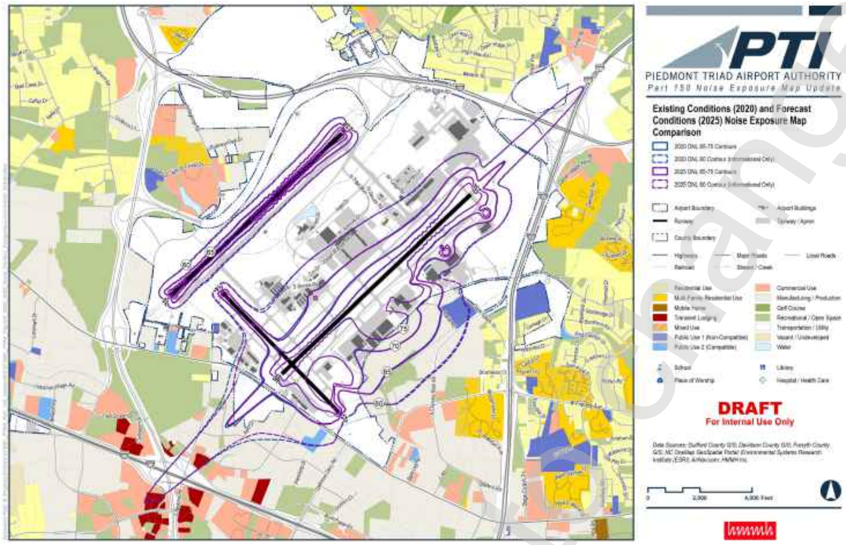
34

Preliminary Noise Model Results – 2020/2025



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35

Preliminary Noise Model Results – Land Use

Noise Level, DNL	Existing Contours - 2020		Forecast Contours – 2025	
	Estimated Population	Estimated Number of Housing Units	Estimated Population	Estimated Number of Housing Units
65-70 dB	0	0	0	0
70-75 dB	0	0	0	0
75+ dB	0	0	0	0
Total	**0**	**0**	**0**	**0**

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36

Noise Measurement Program Results

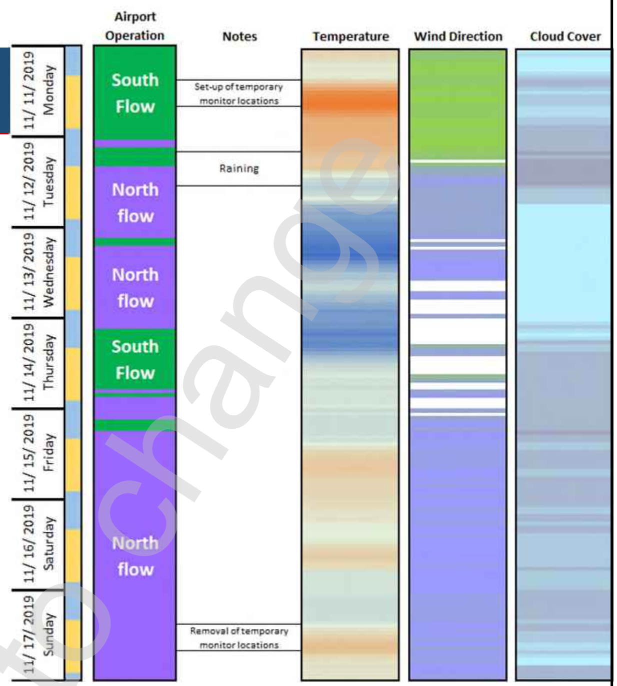
Noise Measurement Program

- Six temporary (portable) noise monitors collected data from November 11 through November 17, 2019
  - Measurements of individual aircraft noise events
  - Measurements of hourly and daily (DNL) noise levels
- Two HMMH staff spent time at each temporary location, observing and logging aircraft noise events

Note: Measured noise levels are NOT used to generate or modify contours

Noise Measurement Program

- Weather data for the week correlate with the airport operational direction



Legend:

daytime - 7:00am to 10:00pm
nighttime - 10:00pm to 7:00am

Temperature *in degrees F*: 21, 27, 33, 39, 45, 51, 57, 63, 69
Wind Direction: SW, SE or NW, NE, calm/variable
Cloud Cover: Fair, Partly to Mostly Cloudy, Cloudy, Raining

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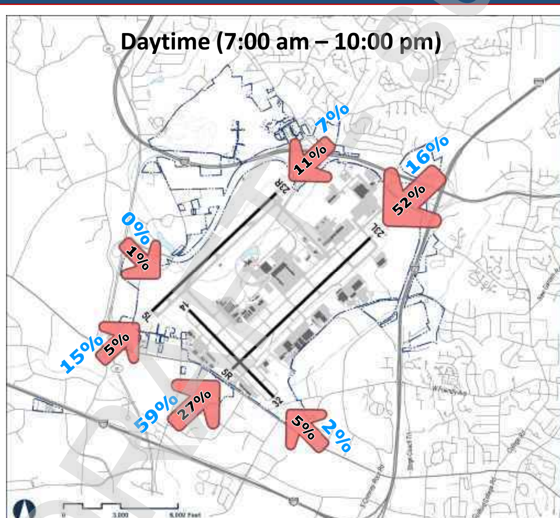
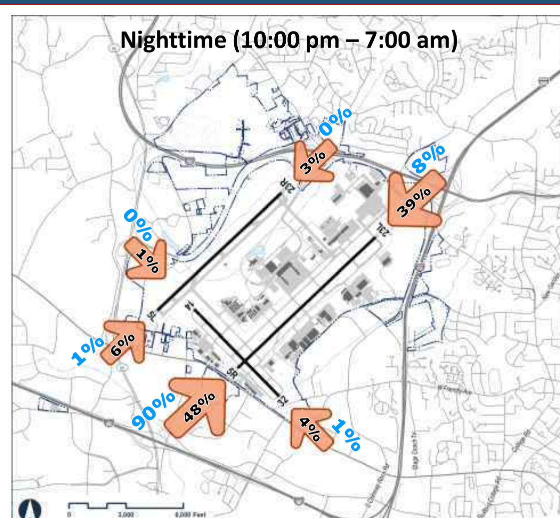
39

Runway Use during Measurement Program: Arrivals

Daytime (7:00 am – 10:00 pm)



Nighttime (10:00 pm – 7:00 am)



Annual average modeled runway use shown within the arrows; actual use from Nov. 12-16, 2019 indicated beside each

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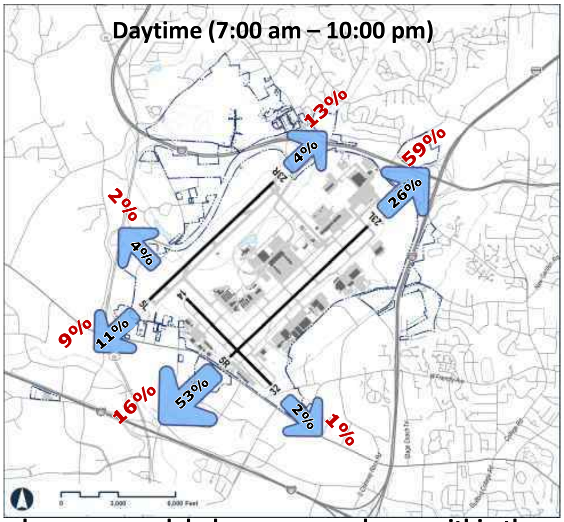
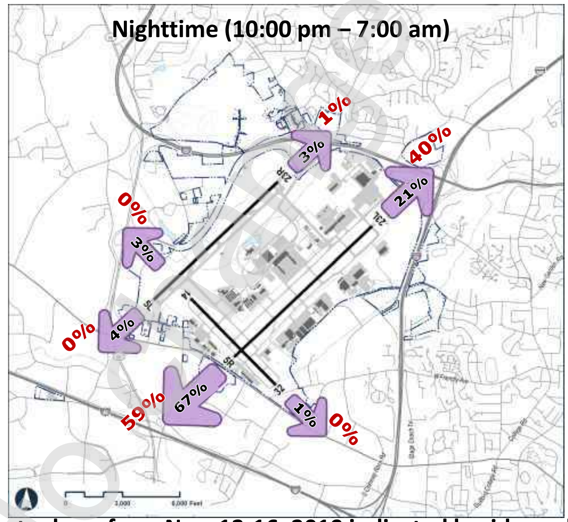
40

Runway Use during Measurement Program: Departures





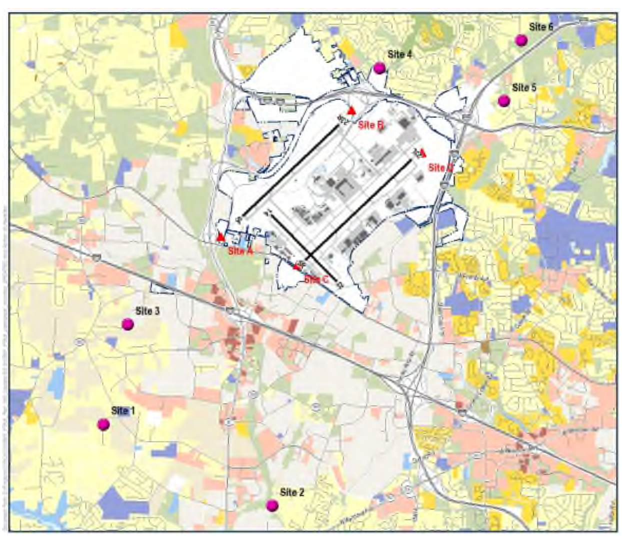
Annual average modeled runway use shown within the arrows; actual use from Nov. 12-16, 2019 indicated beside each

41

Noise Monitor Locations

Label	Location
Site 1	4532 Walpole Rd, High Point, NC 27265
Site 2	1701 River Knoll Ct, Greensboro, NC 27409
Site 3	3625 Dairy Point Dr, High Point, NC 27265
Site 4	6502 Lytham Ct, Greensboro, NC 27409
Site 5	4703 Clarkson Rd, Greensboro, NC 27409
Site 6	3600 Lewiston Rd, Greensboro, NC 27409
Site A	Approach end of Runway 5L
Site B	Approach end of Runway 23R
Site C	Approach end of Runway 23L
Site D	Approach end of Runway 5R

Note: Site B was not operational during the measurement program



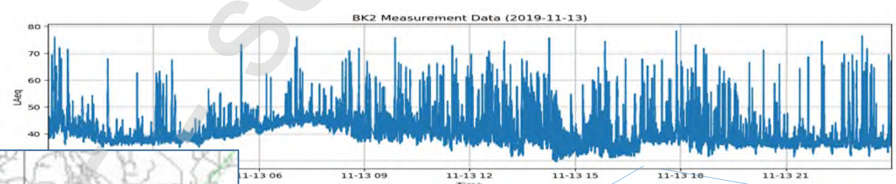
42

Identification of Aircraft Noise Events

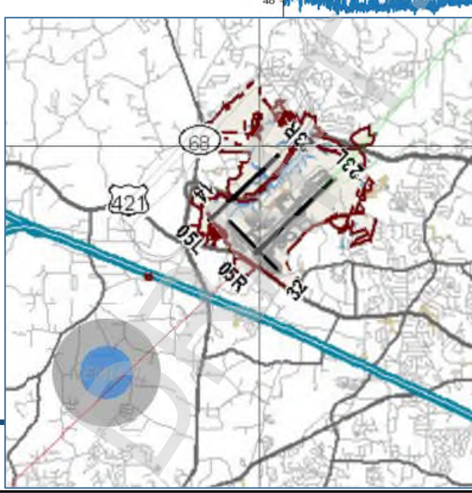
- The portable noise monitors measure all noise once per second, while the permanent monitors measure all noise in half-second intervals
- Noise events are determined based on a set threshold and minimum duration
- Noise events are correlated to aircraft operations in the vicinity of the noise measurement site by time
- Noise energy from the noise events correlated to aircraft operations is combined to determine the daily noise exposure levels from aircraft operations

Identification of Aircraft Noise Events

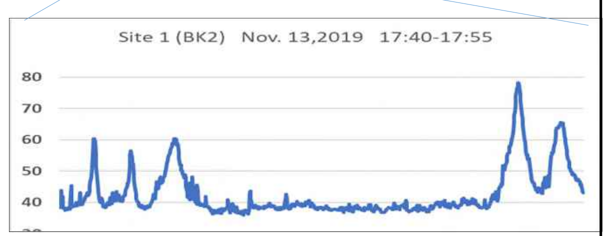
A monitor samples the noise environment every second



This graph shows the time history for a full day



If an aircraft operation is within 5,000 feet of the site at the time of the event, the event is attributed to that operation



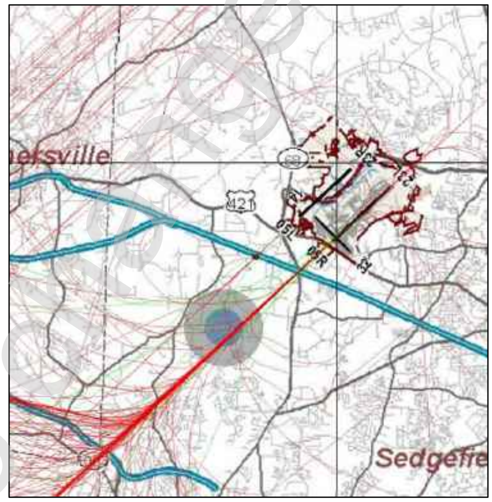
Noise events are visible in this 15-minute excerpt; sound level rises above 50 dB threshold for at least 10 seconds

STARTTIME	Aircraft	Operation	Runway	DURATION	LMAX	SEL
17:43:03	E135	A	05R	26	60.4	71.5
17:52:41	MD88	A	05R	12	78.4	86.1
17:54:02	CRJ9	A	05R	26	65.6	76.8

Measured Noise Levels – Single Aircraft Events

Aircraft Category	Operation	Number Events	Max SEL	Min SEL	Median SEL
MD88	Arrival	12	89.4	71.5	84.1
	Departure	2	91.8	84.4	88.1
Other Large Jet	Arrival	19	84.3	72.7	80.7
	Departure	1	81.3	81.3	81.3
Regional Jet	Arrival	52	85.4	69.2	77.6
	Departure	2	72.9	72.7	72.8
Honda Jet	Arrival	18	80	68.5	73.3
	Departure	0	0	0	0
Other Small Jet	Arrival	12	79.5	73.2	75.9
	Departure	0	0	0	0
	Other	1	69.6	69.6	69.6
Non-jet	Arrival	19	80.4	69	75.0
	Departure	4	75.8	71.2	72.1
	Other	4	84.2	69.6	76.4
Total	**Arrival**	**132**	**89.4**	**68.5**	**77.6**
	Departure	**9**	**91.8**	**71.2**	**72.9**
	Other	**5**	**84.2**	**69.6**	**73.2**
Total		**146**			

Site 1
(as an example)



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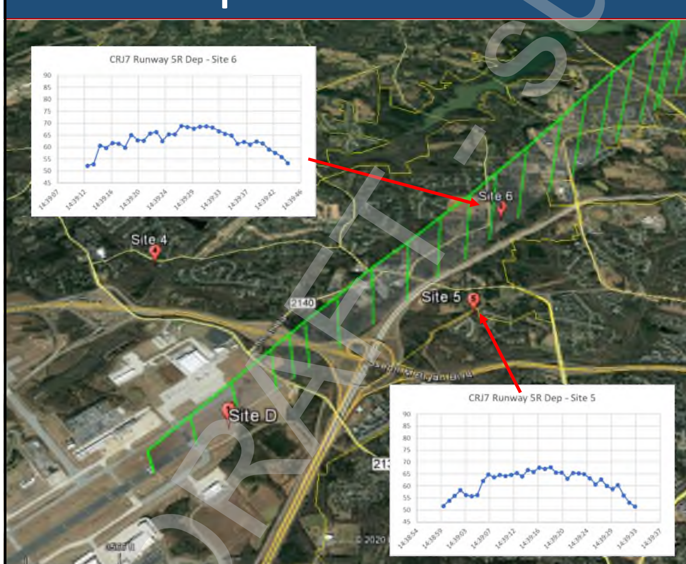
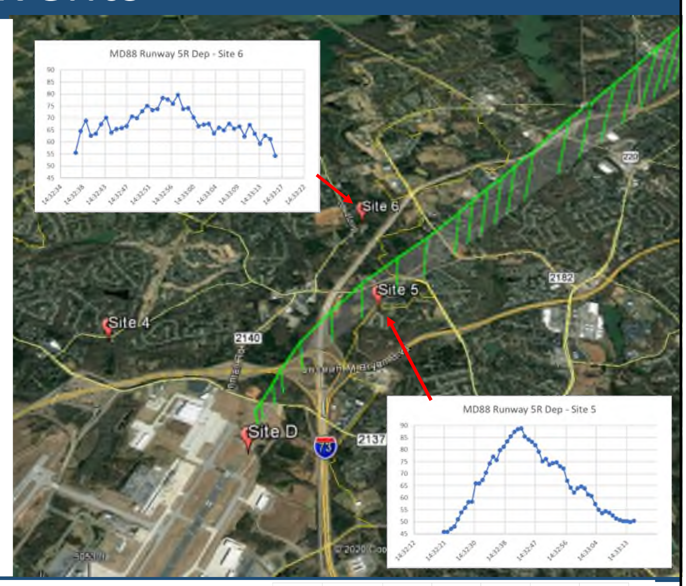
45

Sample Aircraft Noise Events





CRJ7

SITECODE	Event Start	LMAX	LEQ	SEL	ALT (AGL)	Range (ft)
Site_D	14:38:00	78.4	74.8	86.5	997	243
NEMU_5	14:38:58	67.73	64.5	78.7	2004	1621
NEMU_6	14:39:12	68.96	64.4	80.8	2274	295

MD88

SITECODE	Event Start	LMAX	LEQ	SEL	ALT (AGL)	Range (ft)
Site_D	14:32:21	97.3	93.5	102.3	800	40
NEMU_5	14:32:25	88.89	85.1	95.9	1692	118
NEMU_6	14:32:28	79.76	75.1	86.6	1736	3379

46

Measured Noise Levels – DNL

- All measured aircraft DNL are well below 65 dB, except those on Airport property aligned with Runway 5R/23L

Note: Site B was not operational during the measurement program

Site	DNL	Tuesday, 12-Nov	Wednesday, 13-Nov	Thursday, 14-Nov	Friday, 15-Nov	Saturday, 16-Nov	5-day* Average Measured DNL
1	Aircraft	49	50	54	52	52	**52**
	Total	56	57	56	58	61	58
2	Aircraft	57	46	54	51	31	**53**
	Total	58	50	55	54	52	55
3	Aircraft	53	48	51	47	54	**51**
	Total	57	56	56	58	60	58
4	Aircraft	38	43	N/A	46	43	**44**
	Total	57	53	N/A	52	57	56
5	Aircraft	57	58	51	57	57	**57**
	Total	68	65	61	58	67	65
6	Aircraft	52	55	55	54	52	**54**
	Total	61	56	58	57	57	58
A	Aircraft	59	56	56	52	54	**56**
	Total	66	64	65	64	64	65
C	Aircraft	75	74	76	76	69	**75**
	Total	77	78	78	79	74	78
D	Aircraft	69	65	70	66	62	**67**
	Total	76	70	74	69	66	72

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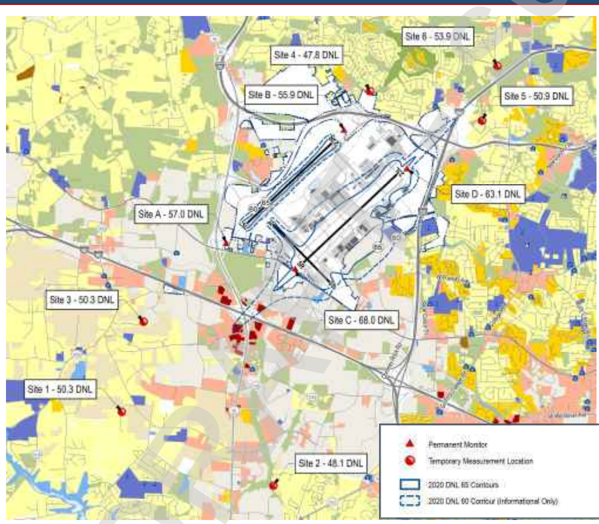
47

Measured vs Modeled Noise Levels – DNL



AEDT calculated DNL contours and DNL values at monitor locations for 2020 Existing case

Comparison of the 5-day average measured Aircraft-only DNL to AEDT calculated DNL

Site	Average Measured DNL	AEDT-Calculated DNL	Difference (Measured – AEDT)
1	52	50 (56)	2 (-4)
2	53	48 (52)	5 (1)
3	51	50 (49)	1 (2)
4	44	48 (49)	-4 (-5)
5	57	51 (58)	6 (-1)
6	54	54 (57)	0 (-3)
A	56	57 (52)	-1 (4)
B	N/A	56 (52)	N/A
C	75	68 (68)	7 (7)
D	67	63 (67)	4 (0)

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48

Measured vs Modeled

- 5-day measured average DNL generally higher than modeled for 2020
  - Sites A and 4 measured lower than modeled
    - Both of these sites are close to the extended centerline of Runway 5L-23R
    - Less jet use of Runway 5L-23R during the measurements than the modeled annual average
  - Sites C, D, 5 and 2 measured 4 to 7 dB higher than modeled
    - Sites C, D and 5 all near the extended centerline of Runway 5R-23L
    - Site 2 is south of the airport under the departure path that follows Route 68
    - Less use of Runway 23L and more use of Runway 5R during the measurements than the modeled annual average
    - Also much more use of MD88 aircraft during the measurements than modeled for 2020
      - In 2018 there were less than 10 average daily MD88 operations
      - 2020 forecast assumed retirement of some MD88s; reduced to around 5 daily
      - During the measurements, there were an average of 15 MD88 daily operations
- We believe runway use and higher use of MD88 aircraft resulted in the differences

49

Noise Compatibility Program Review

50

Review of Noise Compatibility Program (NCP)

The FAA approved, in whole or in part, all 20 PTAA-recommended NCP measures in the previous Part 150 Study.

Noise Abatement Measures

1. Evaluate Noise Barriers *
2. Preferred Night Runway Use **
3. Night Runway Use Assignments **
4. Night Southbound Departure Corridor from Runway 23L **
5. Night Departure Procedures from Runway 23R **
6. Night Northbound Departure Corridor from Runway 23L **
8. Departures from Runway 05L **
9. Departures from Runway 05R **
10. Restrictions on Use of APUs
11. Noise Abatement Departure Profiles **
12. Noise Abatement Approach Procedure **
13. Altitude for Downwind Legs **

Land Use Measures

1. Acquire Noise-Sensitive Properties where DNL Exceeds 70 dB
2. Sound Insulation of Noise-Sensitive Structures where DNL Exceeds 65 dB
3. Optional Acquisition of Avigation Easements for Noise-Sensitive Structures where DNL Exceeds 65 dB
4. Other Assistance for Owners of Residential Property where DNL Exceeds 65 dB *
5. Pursue Compatible Use Zoning where DNL Exceeds 65 dB

Programmatic Measures

1. Establish a Noise Monitoring Function at PTI
2. Publish DNL Contours at 60 dB and Above
3. Install and Operate an Aircraft Noise and Operations Monitoring System

Note: There is no Noise Abatement Measure number 7 since it was included in Noise Abatement Measure number 5 during the course of the original study.
** - Approved for further study.*
*** - Approved as voluntary measures subject to traffic, weather, and airspace safety and efficiency.*

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51

Next Steps

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52

Schedule of TAC Meetings & Public Workshops

Meeting	Date	Topic
CAC Meeting #1	June 27, 2019	Introduction to the Part 150 process
Public Information Workshop #1	June 27, 2019	Introduction to the Part 150 study
CAC Meeting #2	October 2, 2019	Noise modeling inputs
CAC Meeting #3	***May 20, 2020 (today)***	***Noise modeling results and review of NCP measures***
NCP Review Meeting	Early summer 2020	Review of Existing NCP
CAC Meeting #4	Fall 2020	Presentation of the Part 150 Report
Public Information Workshop #2	Fall 2020	Presentation of the study results

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53

Next Steps

- Determine whether to amend the NCP
  - If amending NCP, then prepare the proposed amendments for the documentation
  - Note: PTAA is not updating the NCP, but only amending with this project
- Preparation of draft Part 150 Update documentation
- Schedule NCP Review Meeting
- Schedule final TAC/CAC meetings and Public Workshop to present the draft document

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54


CAC Member Discussion

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55

Adjournment

- NCP Review Meeting early summer 2020 (exact date and time to be determined)
- Next CAC meeting fall 2020 (exact date and time to be determined)
- Project contacts and websites
  - Suzanne Akkoush, Project Manager – Part 150 Study
  - Address emails to Part150@gsoair.org
  - Part 150 Website (PTIPart150Update.com) provides most relevant information
    - Will be updated regularly for public outreach purposes
    - TAC will receive direct notices
  - PTAA noise information website provides broader information
    - https://flyfrompti.com/noise-information/

Thanks for participating and attending!

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56

Welcome!

Noise Compatibility Study (Part 150) Update
Piedmont Triad International Airport

Citizens Advisory Committee
Noise Compatibility Program Review Workshop
August 13, 2020

Piedmont Triad International Airport Noise Compatibility Study Update | NCP Review Workshop

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1

Meeting Agenda

- Welcome and introductions
- Election of CAC Chair and Vice Chair
- Noise Compatibility Program Review
- Next steps
- CAC member discussion

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2

Piedmont Triad Airport Authority

- **Kevin Baker**, Executive Director
  - Part 150 Airport Sponsor
- **Alex Rosser**, Deputy Executive Director
  - Part 150 Program Manager
- **Suzanne Akkoush**, Project Manager – Noise Program
  - Part 150 Project Manager

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3

Part 150 Consultant Team

- **Gene Reindel**, HMMH Vice President
  - Part 150 Principal
- **Bob Mentzer**, HMMH Principal Consultant
  - Part 150 Project Manager
- **Ron Miller**, Ron Miller & Associates
  - Part 150 Public Outreach

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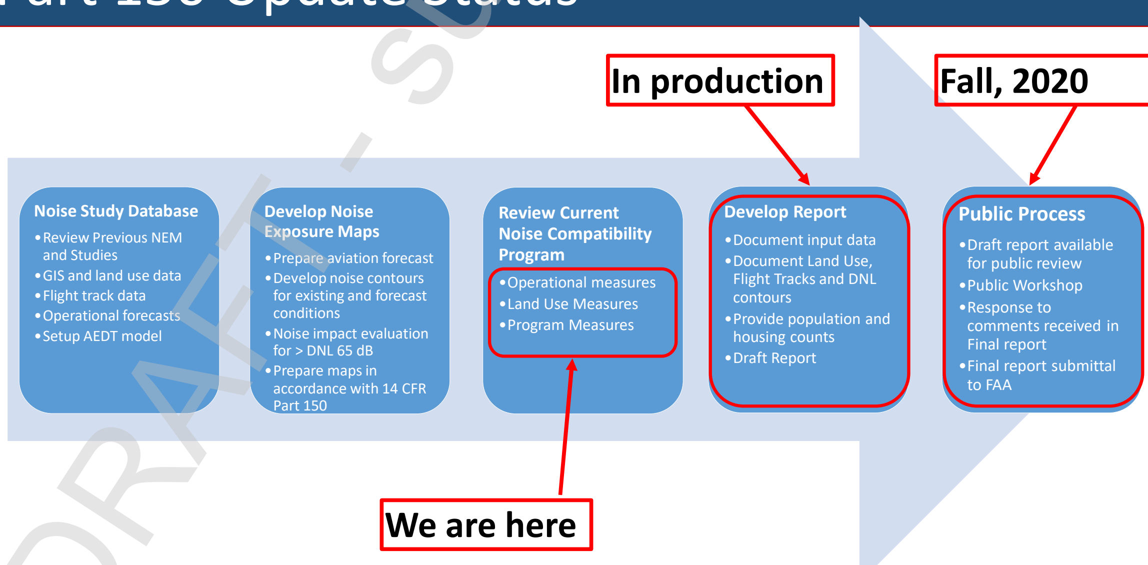
4

CAC Members

Name	Jurisdiction	Name	Jurisdiction
Janet Mazzurco, Co-Chair	Greensboro	Ed Levick	High Point
Stan Tennant	Greensboro	Thad Juszczak	High Point
Scott McInnis	Greensboro	Keith Brown	High Point
Steve Johnson	Greensboro	Erin Randall	High Point
Alyson Best	Greensboro	Bill Nagy	High Point
Sebastian King	Guilford County	Michael Lopez	Summerfield
Sharon Kasica	Guilford County	Lawrence Straughn	Jamestown
Toneq McCullough	Winston-Salem	George McClellan	Oak Ridge
Clarence Lambe	Forsyth County	Bob Prescott	Kernersville

5

Part 150 Update Status



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6

Part 150 Update Public Process

- Three TAC/CAC meetings have been held up to this point
  - First held in June 2019
  - Second held in October 2019
  - Third held virtually in May 2020
- First Public Workshop was June 27, 2019
- Second Public Workshop will present Study results in fall 2020
- Presentations for all prior meetings available at https://ptipart150update.com/public-outreach/

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7

Noise Compatibility Program Overview

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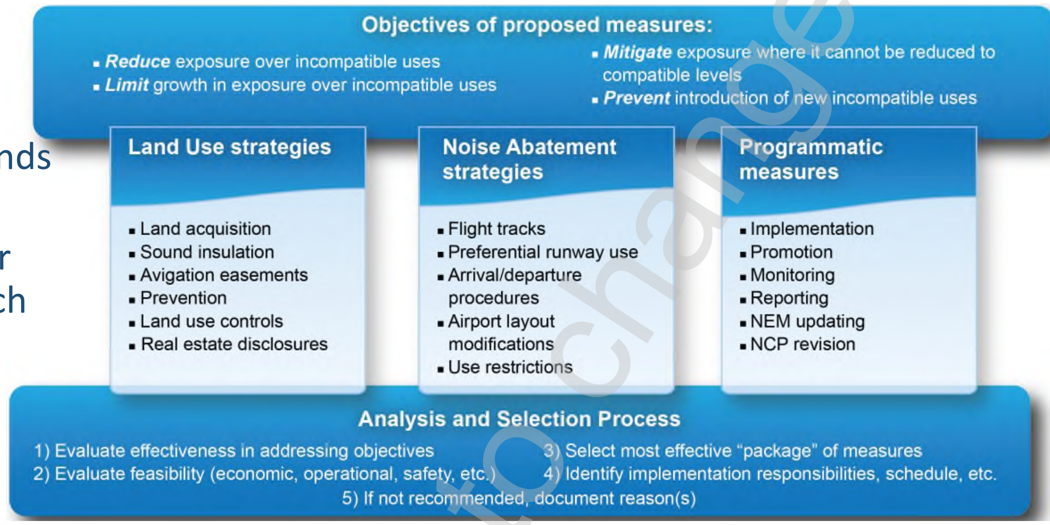
8

Noise Compatibility Program (NCP) overview

- PTAA recommends NCP measures
- FAA approves or disapproves each recommended measure



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9

PTI Noise Compatibility Program (NCP)

The FAA approved, in whole or in part, all 20 PTAA-recommended NCP measures in the previous Part 150 Study.

Noise Abatement Measures	Land Use Measures	Programmatic Measures
1. Evaluate Noise Barriers * 2. Preferred Night Runway Use ** 3. Night Runway Use Assignments ** 4. Night Southbound Departure Corridor from Runway 23L ** 5. Night Departure Procedures from Runway 23R ** 6. Night Northbound Departure Corridor from Runway 23L ** 8. Departures from Runway 05L ** 9. Departures from Runway 05R ** 10. Restrictions on Use of APUs 11. Noise Abatement Departure Profiles ** 12. Noise Abatement Approach Procedure ** 13. Altitude for Downwind Legs **	1. Acquire Noise-Sensitive Properties where DNL Exceeds 70 dB 2. Sound Insulation of Noise-Sensitive Structures where DNL Exceeds 65 dB 3. Optional Acquisition of Avigation Easements for Noise-Sensitive Structures where DNL Exceeds 65 dB 4. Other Assistance for Owners of Residential Property where DNL Exceeds 65 dB * 5. Pursue Compatible Use Zoning where DNL Exceeds 65 dB	1. Establish a Noise Monitoring Function at PTI 2. Publish DNL Contours at 60 dB and Above 3. Install and Operate an Aircraft Noise and Operations Monitoring System

Note: There is no Noise Abatement Measure number 7 since it was included in Noise Abatement Measure number 5 during the course of the original study.
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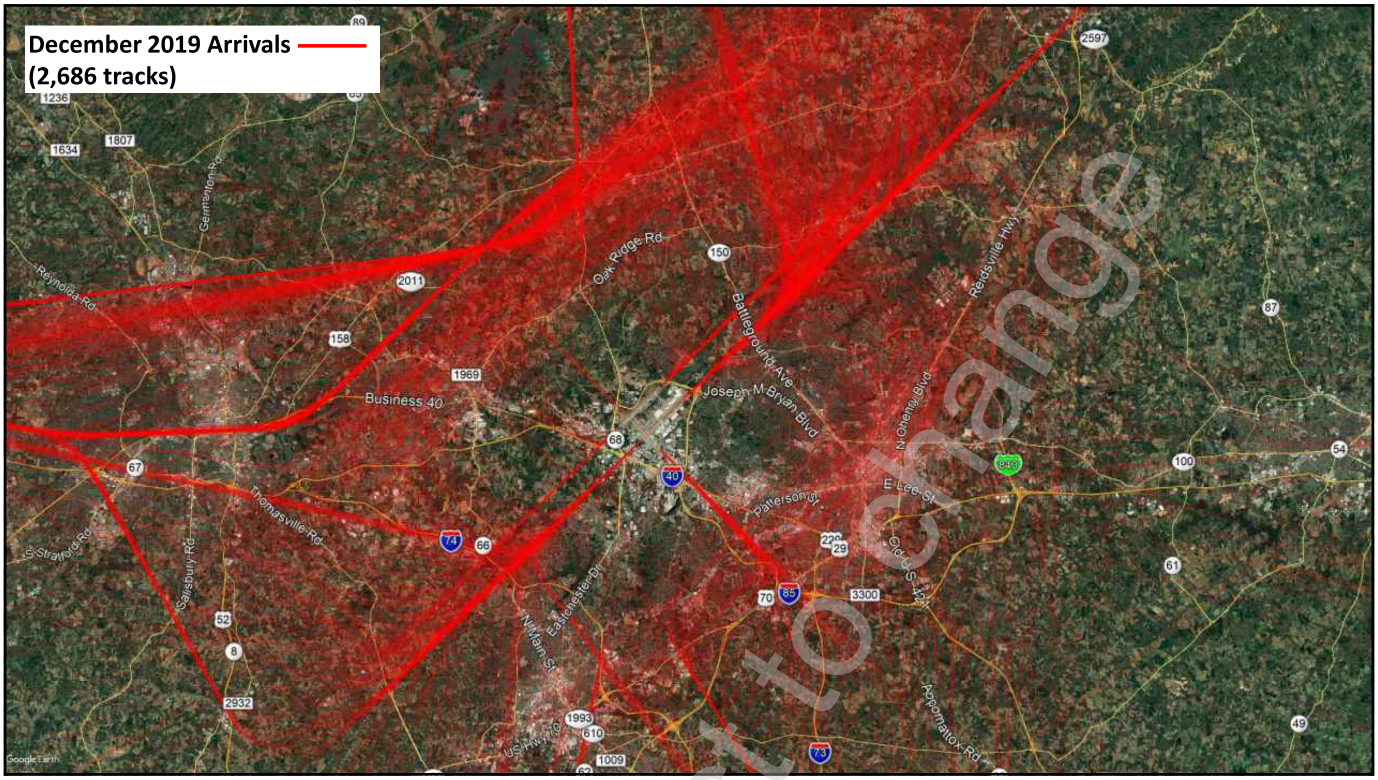
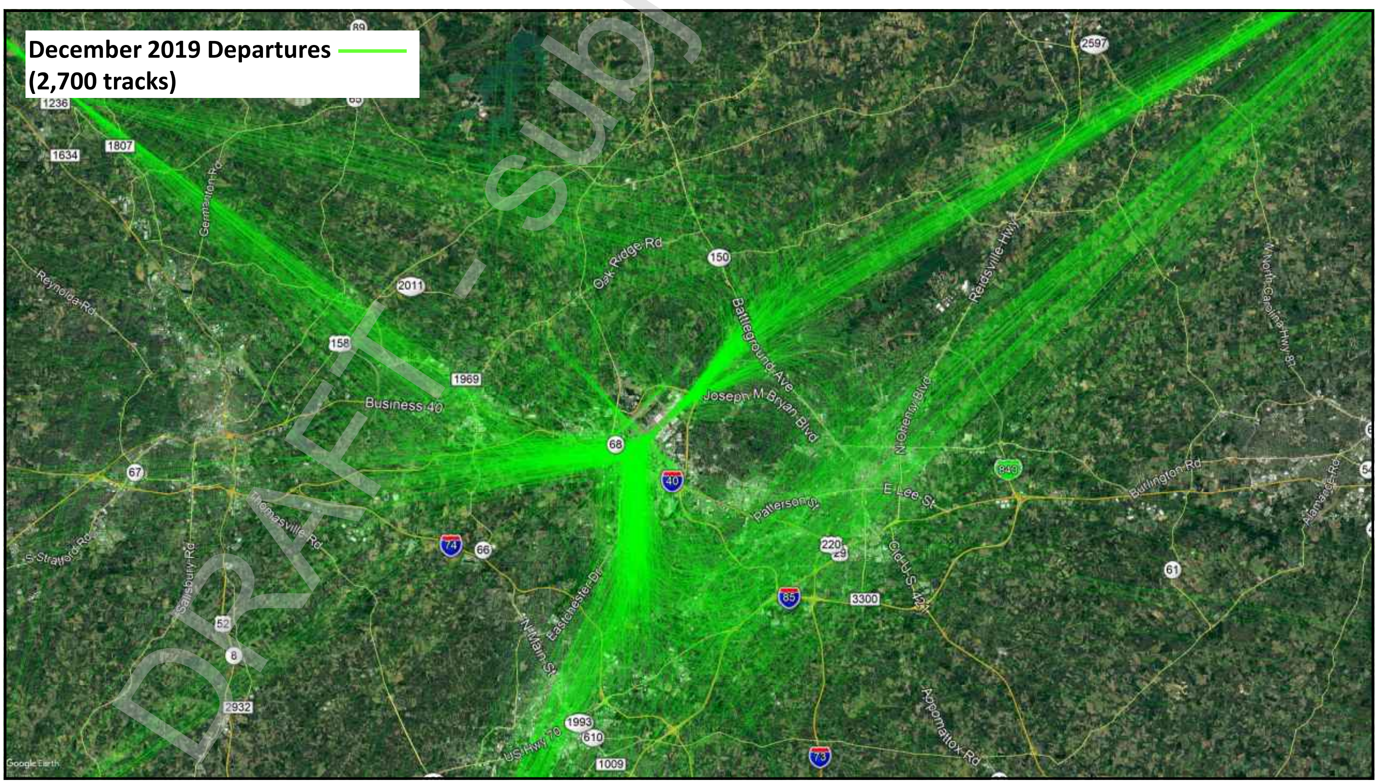
10


December 2019 Arrivals
(2,686 tracks)
Oak Ridge Rd
Battleground Ave
Joseph M Bryan Blvd
Business 40
Thomasville Rd
Reidsville Hwy
E Lee St
Patterson St
Appomattox Rd
Google Earth

11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Reidsville Hwy
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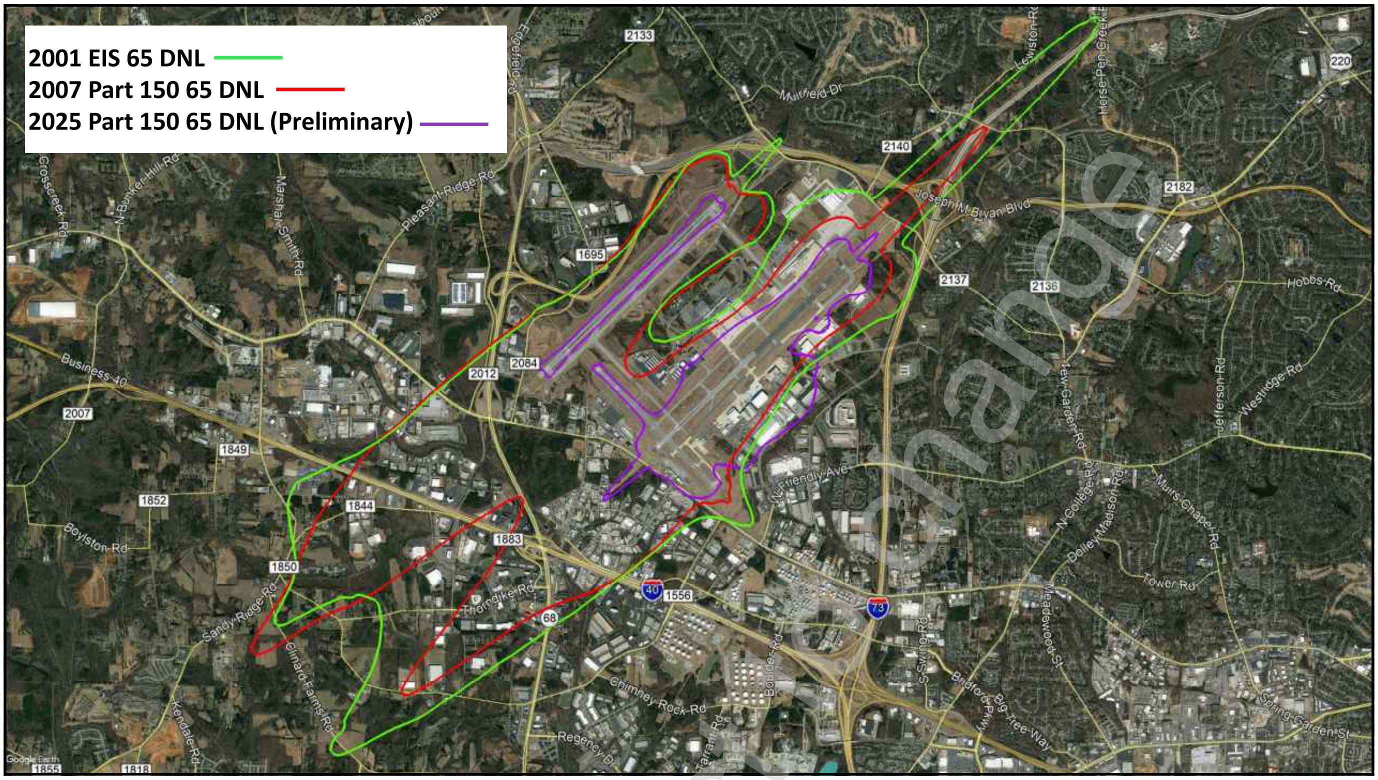
Burlington Rd
Appomattox Rd
Google Earth

12



13

Preliminary Noise Model Results – Land Use

- Preliminary 65 DNL contours have no non-compatible land uses
- No DNL justification for additional NCP measures

Noise Level, DNL	Existing Contours - 2020		Forecast Contours – 2025	
	Estimated Population	Estimated Number of Housing Units	Estimated Population	Estimated Number of Housing Units
65-70 dB	0	0	0	0
70-75 dB	0	0	0	0
75+ dB	0	0	0	0
Total	**0**	**0**	**0**	**0**

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14

Existing Noise Compatibility Program Review

Noise Abatement (NA) Measures – 12 FAA-approved measures

NA-1: Evaluate Noise Barriers

*"Under this measure, the Piedmont Triad Airport Authority (PTAA) would adopt a policy to **evaluate potential benefits of noise barriers** to control off-airport noise levels from future airport facilities. The policy would commit the PTAA to work with tenants to have the tenant install noise barriers if the PTAA considers the use of a barrier appropriate."*

- **Implementation status:** not implemented; engine run-up policy prohibits engine run-ups between 11pm and 5am
- **Compliance**: not applicable

NA-2: Preferred Night Runway Use

*"When new runway 5L/23R is available for use during nighttime hub operations, **designate runways 23L and 23R as the preferred departure runways and runways 5L and 5R as the preferred arrival runways**. This head-to-head pattern of runway use will be used when permitted by weather and runway conditions. To the extent feasible, equal numbers of aircraft shall use the left and right runways for arrivals. Runway use assignments for departures shall be as established by Proposed Measure NA-3."*

- **Implementation status:** implemented head-to-head operations; current hub activity levels do not require simultaneous use of the parallel runways, so equal runway use for arrivals not implemented
- **Compliance**: 75% hub arrivals and 92% hub departures comply

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17

NA-2: Preferred Night Runway Use

- Current hub arrival operations generally occur between 11:00 pm and 1:00 am and hub departure operations between 3:00 am and 4:30 am.
- Only FedEx flights occurring on hub nights within an hour or two of these time windows were counted as "Sort" operations.

Runway	Number of Departures	Departure Percentage	Number of Arrivals	Arrival Percentage
5L or 5R	38	8%	353	**75%**
23L or 23R	463	**92%**	114	24%
14 or 32	0	0%	2	0%
Total	501	100%	469	100%

Source: GSO NOMS December 15, 2018 – March 31, 2019

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18

NA-3: Night Runway Use Assignments

“When new runway 5L/23R is available for use during the nighttime hub operations, designate the following pattern of runway use…”

- **Note:** the measure included six parts to differentiate runway use between retrofitted Stage 3 aircraft and the rest of the fleet. Retrofitted Stage 3 commercial aircraft no longer operate in the U.S.
- **Implementation status:**
  - Parts 1, 3 and 6 apply to retrofitted Stage 3 aircraft – not applicable
  - Parts 2 and 4 apply to simultaneous use of the parallel runways – not applicable
  - Part 5 applies to aircraft departing Runway 23R – addressed with NA-5
- **Compliance**: not applicable

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19

NA-4: Night Southbound Departure Corridor from Runway 23L

“Promptly after FAA approval of this measure, establish a new nighttime departure procedure for aircraft departing runway 23L for southern destinations so that the ***initial flightpath is in a southerly direction, east of and parallel to NC Highway 68****. Departing aircraft shall initiate the left departure turn onto this flight path as soon as practicable. Aircraft may make a transition to another heading after reaching 4,000 feet MSL.”*

- **Implementation status:** implemented
- **Compliance**: 79% of all Runway 23L nighttime southbound departures turn left to be east of and parallel to NC Highway 68; 93% of these reach 4,000 feet MSL before transitioning to another heading

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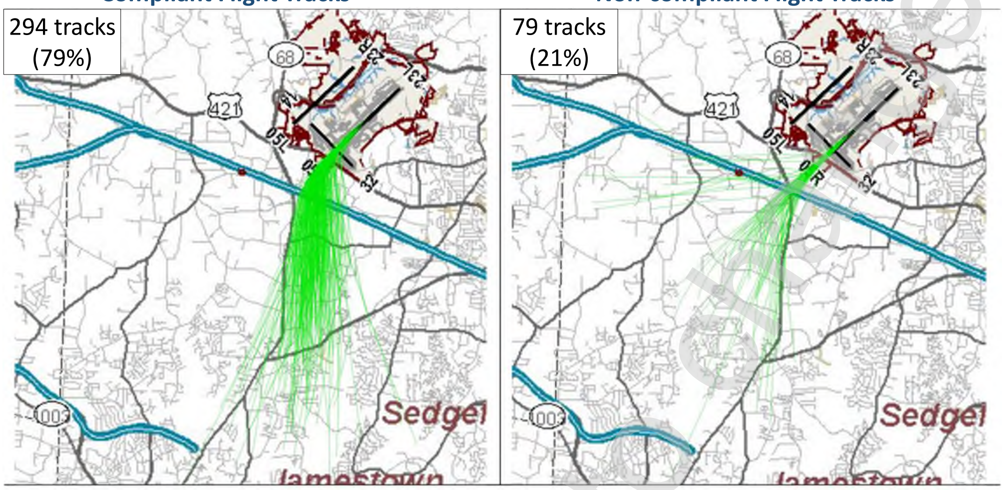
20

NA-4: Night Southbound Departure Corridor from Runway 23L

Compliant Flight Tracks | **Non-compliant Flight Tracks**



Source: GSO NOMS December 15, 2018 – March 31, 2019

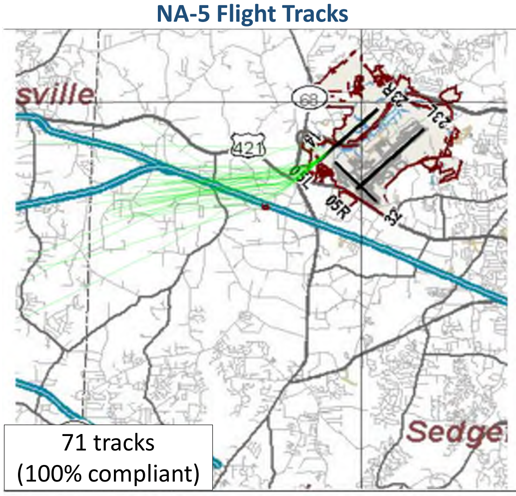
NA-3 Part 5 and NA-5: Night Departure Procedures from Runway 23R

NA-5:
"Aircraft departing runway 23R at night and turning right shall initiate the right departure turn as soon as practicable."
NA-3, Part 5:
"*Aircraft departing on runway 23R and needing to make a transition to a more southerly heading should delay the transition until they have reached an altitude of 4,000 MSL"*

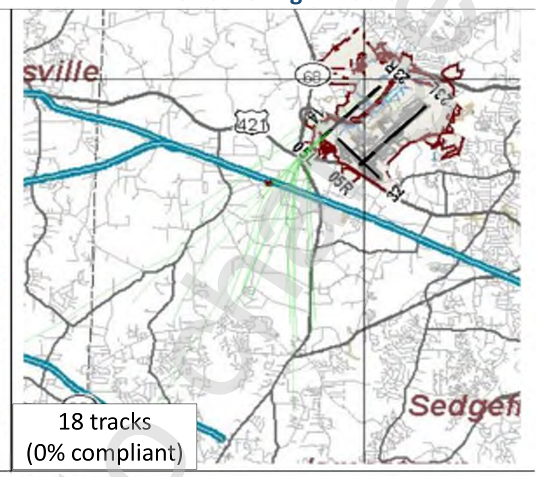
- **Implementation status:** implemented (NA-5); not implemented (NA-3, Part 5)
- **Compliance**: 100% (NA-5); 0% (NA-3, Part 5)

NA-3 Part 5 and NA-5: Night Departure Procedures from Runway 23R

NA-5 Flight Tracks



NA-3 Part 5 Flight Tracks



Source: GSO NOMS December 15, 2018 – March 31, 2019

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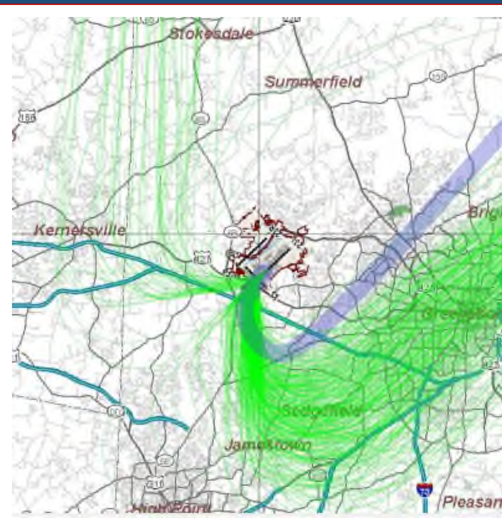
23

NA-6: Night Departure Procedures from Runway 23L

"Promptly after FAA approval of this measure, establish a new nighttime departure procedure for ***aircraft departing from runway 23L to northern destinations to initiate a left departure turn to a northeasterly heading*** *as soon as practicable."*

- **Implementation status:** not implemented
- **Compliance**: not applicable
- Of the operations that turned left the majority appear to follow the initial flight path parallel to and east of NC Highway 68, as prescribed in NA-4, as opposed to executing an immediate turn to a northeasterly heading.



Source: GSO NOMS December 15, 2018 – March 31, 2019

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24

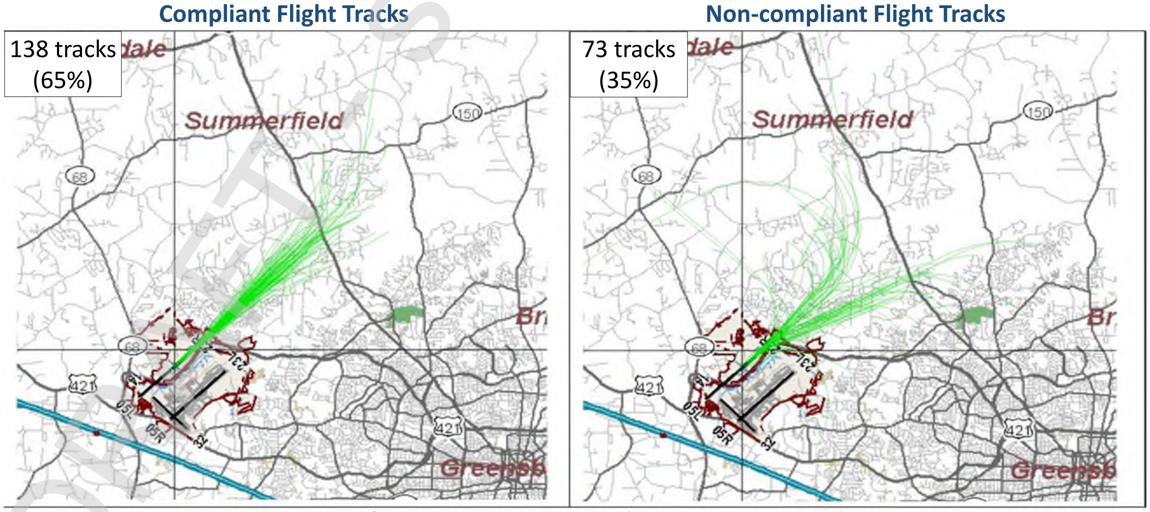
NA-8: Departures from Runway 5L

*"When runway 5L/23R is available for use, establish a procedure to **delay initial turns from runway heading** by aircraft departing on runway 5L until such aircraft reach an altitude of 4,000 feet MSL."*

- **Implementation status:** partially implemented
- **Compliance**: 65% of jets currently delay initial turn until reaching 4,000 feet MSL

NA-8: Departures from Runway 5L

Compliant Flight Tracks | **Non-compliant Flight Tracks**



Source: Runway 5L jet departures from GSO NOMS December 15, 2018 – March 31, 2019

NA-9: Departures from Runway 5R

*"Revise the existing procedure to **delay initial left turns from runway heading** by aircraft using runway 5R until such aircraft reach an altitude of 4,000 MSL."*

- **Implementation status:** partially implemented
- **Compliance**: 78% of jets currently delay initial turn until reaching 4,000 feet MSL

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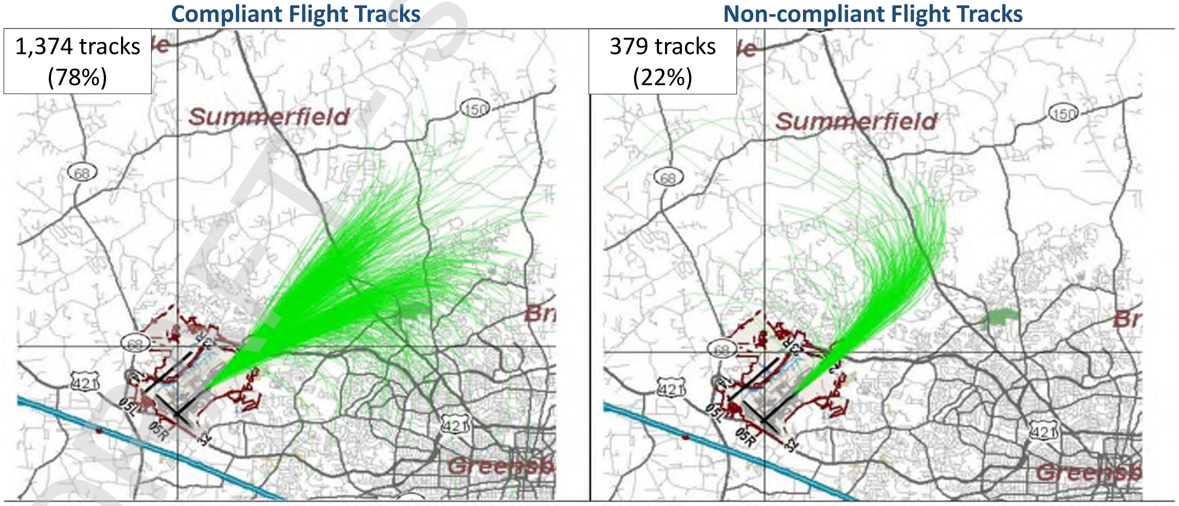
27

NA-9: Departures from Runway 5R

Compliant Flight Tracks | **Non-compliant Flight Tracks**



Source: Runway 5R jet departures from GSO NOMS December 15, 2018 – March 31, 2019

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28

NA-10: Restrictions on Use of Auxiliary Power Units

"Under this measure, the Piedmont Triad Airport Authority (PTAA) will adopt a policy for future airport facilities, and for new tenants after FAA approval of this measure, that would require that auxiliary power units, either on-board units or ground units, except for units in use for engine starts, not produce night-time noise levels in off-airport residential neighborhoods that exceed the ambient noise level at those locations."

- **Implementation status:** partially implemented – formal policy not adopted
- **Compliance**: 16 of 20 jet bridges will have ground power units (GPU) by the end of 2020, allowing aircraft to shut down their APUs at the gate

Ground Power Unit (GPU) at Gate 43

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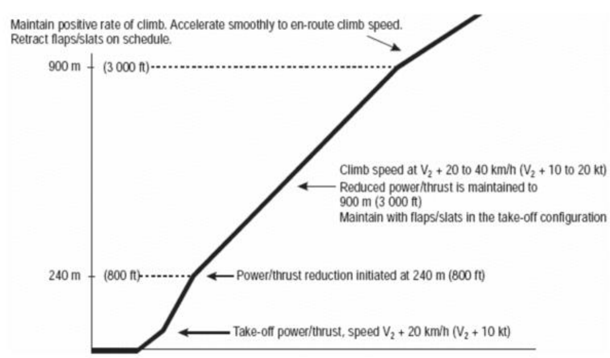
29

NA-11: Noise Abatement Departure Profiles

"Under this measure, the Piedmont Triad Airport Authority (PTAA) designates the Close-in Noise Abatement Departure Profile (NADP) for jet departures on runways 5L and 5R beginning with the opening for use of new runway 5L/23R."

- **Implementation status:** not implemented; likely not as effective with the newer generation aircraft
- **Compliance**: not applicable

Noise Abatement Departure Profile (NADP-1)



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30

NA-12: Noise Abatement Approach Procedure

"Under this measure, the PTAA requests that FAA Air Traffic Control Tower personnel direct all jet aircraft arriving at the airport, whether on an IFR or a visual approach, to ***intercept the final approach at least 5.5 nautical miles*** *from the intended landing runway and to stay at or above the glideslope throughout the remainder of their approach. The PTAA requests that FAA Air Traffic Control Tower personnel direct all jet aircraft arriving at the airport and on the final approach within 12.5 nautical miles from the intended landing runway, whether on an IFR or a visual approach, to* ***stay at or above the glideslope*** *throughout the remainder of their approach."*

- **Implementation status:** partially implemented
- **Compliance**: 82% intercept final approach at or beyond 5.5 nautical miles; 80% at or above glideslope at 5.5NM; 6% above at 12NM

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31

Example Final Approach Profile: Runway 23L

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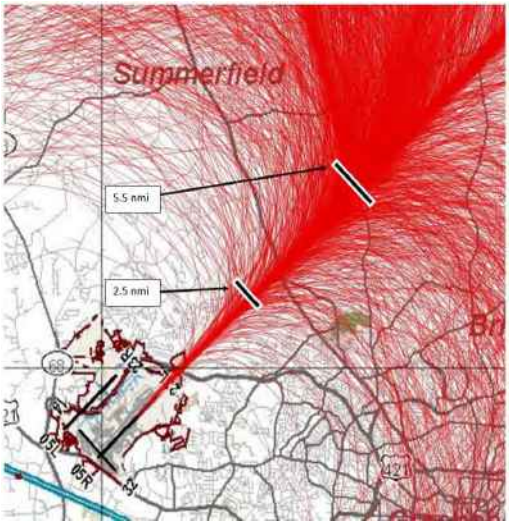
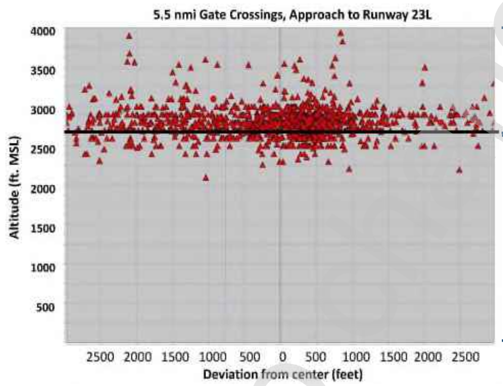
32

NA-12: Noise Abatement Approach Procedure



Example analysis of Runway 23L approaches



ABOVE glideslope at 5.5NM (84% of 23L arrivals)

BELOW glideslope at 5.5NM (16% of 23L arrivals)

Source: GSO NOMS December 15, 2018 – March 31, 2019

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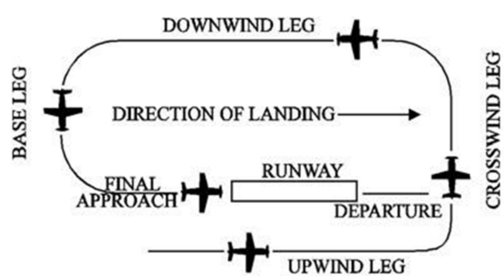
33

NA-13: Altitude for Downwind Legs

"Under this measure, the PTAA requests that FAA Air Traffic Control Tower personnel direct IFR aircraft on the downwind leg for arrival on runways 5L, 5R, 23L or 23R to ***remain at or above 4,000' MSL until crossing the extended centerline of runway 14/32*** *at the airport. When implementing this measure and there are simultaneous approaches to runways 5L and 5R, the PTAA requests that FAA Air Traffic Control Tower personnel direct IFR aircraft on the downwind leg for runway 5R to remain at or above 5,000' MSL and aircraft on the downwind leg for runway 5L to remain at or above 4,000' MSL."*

- **Implementation status:** implemented
- **Compliance**: 94% Runway 5L; ≥90% Runway 5R; ≥89% Runway 23L; and ≥85% Runway 23R

Traffic Pattern Segments



Source: https://www.faa.gov/air_traffic/publications/atpubs/aim_html/chap4_section_3.html

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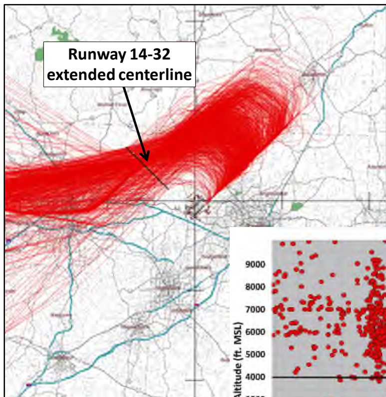
34

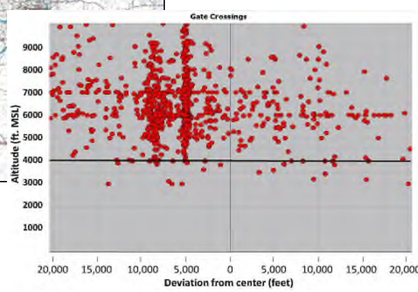
NA-13: Altitude for Downwind Legs

Runway 23L Arrivals: West Downwind



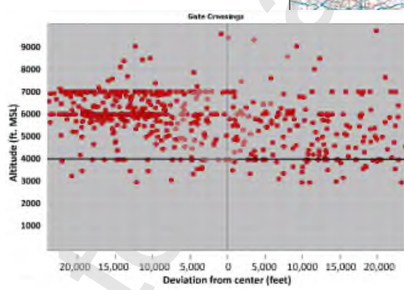
1,045 of 1,076 arrival tracks (97%) above 4,000 ft MSL crossing Runway 14-32 extended centerline

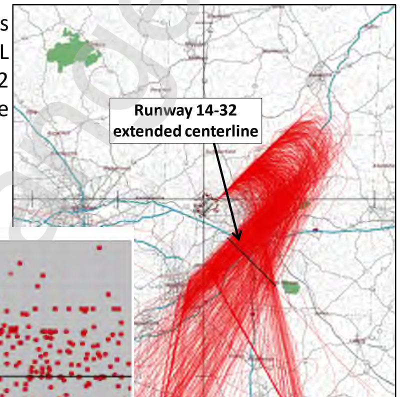
Source: GSO NOMS December 15, 2018 – March 31, 2019



Runway 23L Arrivals: East Downwind

536 of 603 arrival tracks (89%) above 4,000 ft MSL crossing Runway 14-32 extended centerline





Source: GSO NOMS December 15, 2018 – March 31, 2019

Source: GSO NOMS December 15, 2018 – March 31, 2019

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35

Existing Noise Compatibility Program Review

Land Use (LU) Measures – 5 FAA-approved measures

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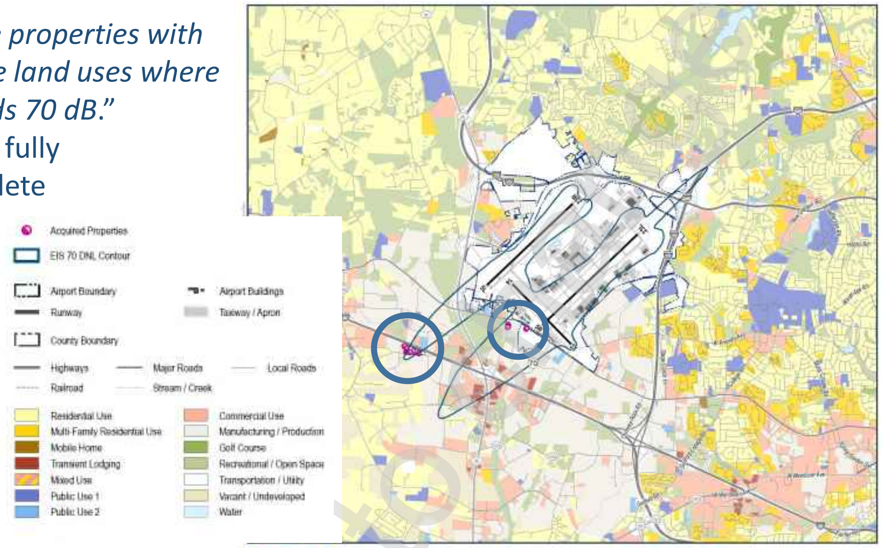
36

LU-1: Acquire Noise-Sensitive Properties Where DNL Exceeds 70 dB

"The PTAA will offer to acquire properties with houses or other noise-sensitive land uses where DNL with the 2014 NCP exceeds 70 dB."

- **Implementation status:** fully implemented and complete



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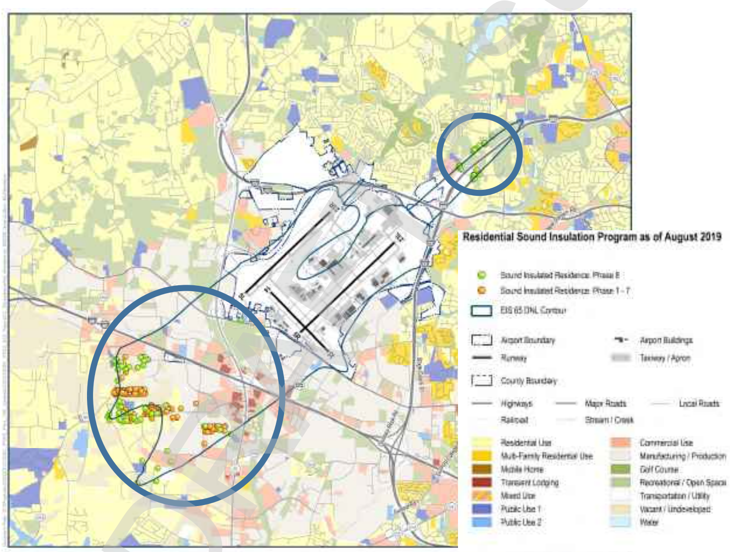
37

LU-2: Sound Insulation of Noise-Sensitive Structures where DNL Exceeds 65 dB



"The PTAA will offer to sound insulate eligible residences and other noise-sensitive structures intended for public use or assembly where DNL with the 2014 NCP exceeds 65 dB. The PTAA will require property owners participating in the program grant an avigation easement to the PTAA upon completion of the treatment."

- **Implementation status:** fully implemented and nearly complete

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38

Land Use Measures LU-3 through LU-5

- **LU-3: Optional Acquisition of Avigation Easements for Noise-Sensitive Structures where DNL Exceeds 65 dB**
  - **Implementation status:** not implemented
- **LU-4: Other Assistance for Owners of Residential Property where DNL Exceeds 65 dB**
  - **Implementation status:** not implemented
- **LU-5:** ***Pursue Compatible Use Zoning where DNL Exceeds 65 dB***
  - **Implementation status:** implemented by the cities of High Point and Greensboro and Guilford County

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39

Existing Noise Compatibility Program Review

Program Management (PM) Measures – 3 FAA-approved measures

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40

PM-1: Establish a Noise Monitoring Function at PTIA

"The PTAA will establish a noise monitoring function within the PTAA with responsibilities that include: to monitor aircraft noise; to provide a point of contact within the PTAA for issues related to aircraft noise; to serve as a liaison with the community for such issues; and to keep air carriers and the public informed about compliance with measures in the NCP."

- **Implementation status:** implemented; Suzanne Akkoush currently fills this role

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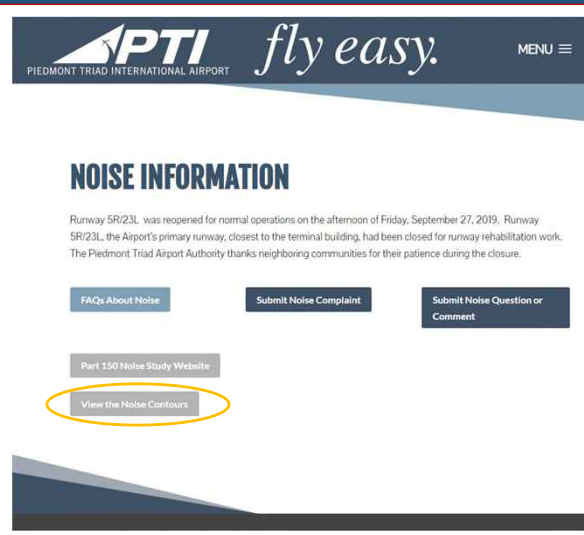
41

PM-2: Publish DNL Contours for DNL 60 and Above

"When the PTAA publishes aircraft noise contours, it will publish contours at 5-dB intervals for values of DNL of 60 dB and above. The most recent contours will be published on the PTAA web site. The contours will be updated as required by FAR Part 150."

- **Implementation status:** implemented



Source: https://flyfrompti.com/noise-information/

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42

PM-3: Install and Operate an Aircraft Noise and Operations Monitoring System

"The PTAA will install and operate an aircraft noise and operations monitoring system to monitor aircraft noise and aircraft operations in the vicinity of the airport. The system will reflect state-of-the-art technology. It is expected that the system will have six or more permanent monitoring microphones and one or two portable monitoring microphones. To the extent feasible, the permanent microphones will be at locations used during the Part 150 study. Summaries of the monitoring results will be reported regularly on the PTAA web site."

- **Implementation status:** implemented; see next slide

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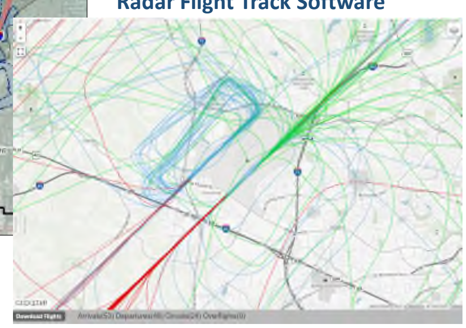
43

PM-3: Install and Operate an Aircraft Noise and Operations Monitoring System

- Four permanent noise monitors
- Three portable noise monitors available for temporary monitoring in other locations
- Accesses radar flight track data and ability to correlate radar data with measured noise events

Permanent Monitor Locations

Radar Flight Track Software



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44

Next Steps

Next Steps

- Determine whether to amend the NCP
  - If amending NCP, then prepare and document the proposed amendments
    Note: PTAA is not updating the NCP, but may amend the NCP with this project
- Preparation of draft Part 150 Update documentation
- Schedule final TAC/CAC meetings, Public Comment period and Public Workshop to present the draft document

Schedule of CAC Meetings & Public Workshops

Meeting	Date	Topic
CAC Meeting #1	June 27, 2019	Introduction to the Part 150 process
Public Information Workshop #1	June 27, 2019	Introduction to the Part 150 study
CAC Meeting #2	October 2, 2019	Noise modeling inputs
CAC Meeting #3	May 20, 2020	Noise modeling and noise measurement results
NCP Review Meeting	***August 13, 2020 (today)***	***Review of NCP measures***
CAC Meeting #4	Fall 2020	Presentation of the Part 150 Report
Public Information Workshop #2	Fall 2020	Presentation of the study results

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47

CAC Member Discussion

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48

Adjournment

- Next CAC meeting fall 2020 (exact date and time to be determined)
- Project contacts and websites
  - Suzanne Akkoush, Project Manager – Part 150 Study
  - Address emails to Part150@gsoair.org
  - Part 150 Website (PTIPart150Update.com) provides most relevant information
    - Will be updated regularly for public outreach purposes
    - TAC will receive direct notices
  - PTAA noise information website provides broader information
    - https://flyfrompti.com/noise-information/

Thanks for participating and attending!

E.2.3 Citizens Advisory Committee Summaries

The summaries of each of the CAC meetings, as posted on the Study website, are reproduced on the next several pages, in order by meeting date

PTI
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PTI Part 150 Study Update

Meeting Summary: First Meeting of the PTI Citizens Advisory Committee

June 26, 2019

The first meeting of the PTI Part 150 Update Committee was held in the Airport Authority Board Room 6 p.m. Wednesday, June 26th.

There were 14 of 18 members attending.

The Committee heard a presentation by HMMH on the PTI Part 150 Study Update. You can find a copy of the presentation **here**. The following description of the discussion occurred during the course of the presentation, which lasted over two hours.

Committee members introduced themselves. They described where they live in relation to the airport.

Committee members discussed the meeting schedule. They wanted to set a date for the next meeting. After discussion, committee members agreed to send any conflicts in September and early October to Suzanne Akkoush, project manager. Suzanne will select a date and send it back out to committee members for confirmation.

Committee member Janet Mazzurco asked if members are representing their neighborhoods or districts. Gene Reindel made it clear that committee members do represent the areas where they live, beyond neighborhood boundaries. A district system was used to create a geographically balanced committee.

Some Committee members asked for a full map of the 2014 Noise Exposure Map (NEM) so that they could better see the contours. Committee members were directed to the Part 150 website where they can zoom in on the 2014 NEM.

There was a discussion of the approved noise compatibility program (NCP). Gene Reindel explained the program to the committee as part of the presentation referenced above.

Sharon Kasica said she had read that there has been a concentration of flight tracks. Gene Reindel confirmed that concentrating flight paths is part of the FAAs NextGen program. He agreed that aircraft flying the same route can result in an increase in frequency of overflights and, in some cases, increased noise.

Sharon Kasica asked if NextGen is something the committee could address. Gene Reindel said that NextGen procedures could be considered in the NCP.

There was a discussion of whether modeling aircraft noise will take weather into account. Joe Saldarini asked about cloud cover impacts on noise. Gene Reindel said typically temperature inversions (not cloud cover) can cause noticeable changes in noise. Long term weather averages will be taken into account in the modeling.

The committee heard from Paul Puckli of CHA Consulting Inc. (CHA) regarding the development of aviation activity forecasts to be used in the Part 150 Study Update. CHA is developing forecasts of aircraft operations for 2020 and 2025 to be used in the development of updated NEMs. These forecasts will account for all types of operations at the airport (passenger, cargo, military, etc.) and distinguish between daytime and nighttime operations.

There was a discussion of the use of noise monitors versus modeling to create the noise contours. The FAA requires modeling because it is the only way to calculate noise at hundreds of thousands of points around the airport which are the basis for the contour lines. Also, only modeling can develop the future noise contours. A noise measurement program will be conducted as part of this study, and those results will be compared to the results of the noise modeling.

The committee selected Joe Saldarini and Janet Mazzurco as co-chairs. The committee selected Stan Tennant and Sebastian King as alternates.

During a general discussion of committee members concerns, the following concerns were raised:

Alyson Best lives in the Guilford College area. She is concerned about ground noise.

Thad Juszczak is concerned that using a 30 year average for weather data in the model ignores the effects of global warming.

Sharon Kasica is concerned about the concentration of approaches over her house. She lives near Bur Mil, outside the noise cone. She described her experience as "one flight after another, a constant hammering of noise, five minutes apart."

Ed Levick asked how the airport can be sure that NCP measures are enforced and complied with following completion of the study. He says planes fly very low over his house in North High Point, almost like they are in slow motion.

Janet Mazzurco believes the airport needs to do more ongoing outreach to the community. She recommends a standing citizens committee.

Gene Reindel said that an ongoing committee could be a recommended programmatic measure under the Part 150 program.

Stan Tennant says that the runway closure has moved air traffic away from his house and made his summer more enjoyable, however is sensitive to others receiving all of the flights during the closure. He calls for a balanced approach in terms of runway use. He also commented on the age of the contours on which the Greensboro Airport Overlay District is based on.

Joe Saldarini made it clear that he represents an area that doesn't want flights over their houses. A balanced approach to runway use would not work for his neighbors.

Joe Saldarini says he started the Nextdoor online community in the Cardinal neighborhood. He has 1,700 Cardinal emails and 8,000 area email addresses.

All members agreed that they want to see PTI be a successful airport and continue to support the region.

The committee adjourned after 8 p.m.

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PTI Part 150 Study Update

Meeting Summary: Second Meeting of the PTI Citizens Advisory Committee

October 2, 2019

Attending the meeting were 14 of 18 committee members. One committee member attended remotely.

The group heard a presentation from HMMH team regarding draft forecast data, land use data, noise model inputs, and planned noise measurements. That presentation is available here.

Citizens Advisory Committee members asked the following questions.

What is the purpose of tonight's session?

Gene Reindel answered that the purpose of the current meeting is to walk committee members through the draft forecast and noise model inputs, which will provide the basis for the development of the noise contours. It is important that the committee members understand that data because they will receive a Noise Model Input memorandum in November that they will be asked to review before the noise modeling is performed.

Are you confident in the forecast of cargo operations for the FedEx hub, given that previous studies assumed 62 aircraft arriving and departing on a sort night?

Bob Mentzer told committee members that the forecast of nighttime cargo sort flights were developed using assumptions based on site visits and interviews with FedEx and other carriers. This is the best information currently available.

If not for the growth in cargo, would there be any growth at all in the number of operations at the airport over the five-year study period, from 2020 to 2025?

Gene Reindel answered that there is projected to be an increase in total operations at the airport, but not as large an increase as predicted for cargo on its own. Passenger enplanements at the airport are projected to increase at a faster rate than scheduled passenger operations, reflecting the changing industry trends in average seats per flight, and percent of seats filled. Therefore, the increase in passengers is exceeding the increase in operations because more passengers are flying on fewer aircraft.

But the overall number of scheduled passenger carrier operations is still showing a modest upward trend.

After a discussion of the FAA Terminal Area Forecast (TAF) versus the draft Part 150 Update operations forecast, a committee member asked if the contour, if based on the FAA TAF would be larger than a contour generated from the Part 150 Update forecast?

Gene Reindel explained that any contour based on the FAA forecast would be smaller than a contour based on the draft Part 150 Update forecast. The FAA forecast shows negative growth in operations, while the draft Part 150 Update forecast shows modest but steady positive growth.

Kevin Baker explained to the group that the draft Part 150 Update forecast is based on more recent data and local considerations, and should be more accurate than the FAA forecast, which did not take into account a number of changes in operations at the airport that have occurred over the past year.

- Spirit Airlines has started service to Florida from PTI, which the FAA did not take into account.
- Passenger enplanements have increased 18 percent year to date over the past year, which the FAA did not take into account.
- FedEx hub operations have increased significantly, which the FAA did not take into account.

For these reasons, the airport believes that the draft Part 150 Update forecast is more accurate.

A committee member asks why the airport cannot direct cargo carriers to fly during the daytime rather than at night.

Gene Reindel answered that the airport cannot control the schedules of the cargo carriers. All air carriers control their own schedules and the Airport is prevented by federal law from limiting the hours of the day or night when aircraft are allowed to operate.

A committee member further observed that overnight delivery demands that cargo carriers fly at night.

A committee member asks: Hasn't the demand for overnight air freight been reduced by the current custom of sending documents electronically? Documents, which had previously been delivered as paper documents by overnight carriers, are now sent electronically, thus reducing demand for overnight cargo. Correct?

Kevin Baker answered that the effect of electronic transfer of documents has already been felt, which is one reason that FedEx was slow to ramp up its operations at the airport. However, overnight delivery of goods ordered online has now caused an increase in the air cargo business, which is what we are witnessing with FedEx currently.

If Amazon does not use FedEx, will that affect the number of operations here?

The HMMH team answered that the projected operations are based on demand that the cargo carriers believe will occur over the next five years, taking all variables into account. Amazon packages will still need to be transported, whether by FedEx or some other carrier.

A committee member asks: Does the land use map inform or change the noise contours?

The HMMH team answered that the noise contours will be overlaid over the land use map being developed. Local jurisdictions may choose to make changes in land use or zoning based on the results of the noise contours, but the contours themselves are not influenced by the land use.

A committee member asks a question about jets coming low into the airport, sparking a discussion about aircraft approaches to the airport.

Kevin Baker explained to the group that it is unusual for jets to come in low. If they do, the pilots could face consequences from air traffic control or their airline. It is unsafe for pilots to approach the airport at a low altitude.

HMMH staff explained that larger aircraft look lower because of their size.

A committee member asks who monitors how low the aircraft are?

Committee members who are pilots answered that the plane's equipment keeps the aircraft on the glide slope. The pilots in the group explain that pilots want to be higher, not lower, because flying low is unsafe. Air traffic controllers monitor the altitude of approaching aircraft. The pilots also explained that there are a lot of variables, which can affect the altitude of an aircraft.

PIEDMONT TRIAD AIRPORT AUTHORITY

PTI Part 150 Study Update

Summary: Third Meeting of the PTI Citizens Advisory Committee

May 20, 2020

The third meeting of the PTI Part 150 Update Citizens Advisory Committee (CAC) was held by Zoom teleconference at 6 p.m., Wednesday, May 20, 2020. The meeting was held by teleconference because the Governor's order restricting public gatherings was still in place in North Carolina due to the COVID-19 pandemic.

There were 12 committee members on the Zoom call, with some additional members of the community listening in. HMMH presented to the CAC on the current status of the PTI Part 150 Study Update. You can find a copy of the presentation here.

The HMMH presentation reviewed noise model input and noise metrics, presented preliminary aircraft noise exposure contours for 2020 and 2025, and provided an extensive overview of noise measurements that were completed around the airport during November 2019. A brief summary of the current PTI Noise Compatibility Program was presented as an introduction to a fifth meeting, which consultants plan to add to the study schedule.

The Part 150 Team proposed an additional CAC meeting to cover the review of the Noise Compatibility Program. The preference is to hold this meeting in person if at all possible. Consultants will monitor North Carolina orders regarding public gatherings, and set the next meeting date accordingly. If groups of more than 10 are discouraged through the summer, consultants will propose another Zoom meeting for the Noise Compatibility Program Workshop.

Committee members had the following questions regarding the presentation:

Was noise from the future tenant(s) of the Airport's development site on the former Bel Aire Golf Course included in the current noise modeling?

No, this was not accounted for in the noise modeling because it is not possible at this time to forecast the aircraft operations that might result from the development of new aeronautical sites around Runway 5L/23R, including the site that has been cleared north of I-73. The FAA is clear that only known and well-defined and FAA-approved future plans be included in the five-year forecast. While the Authority does not expect, at this time, that the planned use of these sites would involve a major increase in aircraft flights, if any new flights would cause a significant change in noise exposure on non-compatible land use in the five-year forecast noise exposure map (NEM), as defined by FAA criteria, the Authority would develop new NEMs to reflect the change.

Do the new noise contours reflect more flights, lower or higher flights, flights in different directions, more use of one runway over another?

The contours reflect actual historical data (i.e., runway use, flight tracks) of what has been occurring at the airport in the recent past and what is expected to occur if current trends and operations continue.

Why are the contours preliminary?

The 2020 and 2025 noise exposure contours presented to the committee are preliminary at this time. Once the contours have been included in a draft document for public review, they will be considered draft noise exposure contours. They will not be official Noise Exposure Maps for the Airport until the FAA accepts the maps as being completed per federal regulations at the end of the Part 150 Study Update. PTAA expects to submit the Noise Exposure Maps for FAA review and acceptance by the end of calendar year 2020.

PIEDMONT TRIAD AIRPORT AUTHORITY

PTI Part 150 Study Update

Meeting Summary: Special Meeting of the PTI Citizens Advisory Committee: Noise Compatibility Program Review

August 13, 2020

A special (fourth) meeting of the PTI Part 150 Update Citizens Advisory Committee (CAC) was held by Zoom teleconference at 6 p.m. Thursday, August 13, 2020. The meeting was held by teleconference because the Governor's order restricting public gatherings was still in place in North Carolina due to the COVID-19 pandemic.

There were nine committee members on the Zoom call, with some additional members of the community listening in. The Committee heard a presentation by HMMH on the PTI Part 150 Study Update. You can find a copy of the presentation here.

The presentation summarized HMMH's review of the Airport's existing Noise Compatibility Program (NCP) measures. The implementation status and compliance of each measure was conveyed, as well as HMMH's recommendation for whether to keep, eliminate, or make minor modifications to the measures as part of an NCP amendment.

HMMH reviewed the 65 DNL preliminary draft noise contour compared with the prior Part 150 and Environmental Impact Statement contours. Stan Tennant asked which contour to use for land use decisions. Gene Reindel answered that it is a decision to be made by local jurisdictions with input from the Airport Authority.

HMMH reminded the group that because there are no incompatible land uses within the updated contours, there is no DNL justification for a full NCP update or for additional NCP measures. Instead, this Part 150 Update will include an NCP amendment, focusing on eliminating measures that are no longer applicable and making small modifications to clarify certain measures.

HMMH recommended the following NCP amendments:

NA-1: Evaluate Noise Barriers at Sites of Future Airport Facilities

HMMH recommended retaining this measure. The Airport Authority has restrictions on engine run-ups between 11pm and 5am. Janet Mazzurco asked if this policy included weekends. the Airport Authority answered affirmatively, applies 7 days a week.

NA-2: Preferred Night Runway Use

HMMH recommended to clarify the equal runway use clause in the statement of the measure and to drop the last two sentences.

Keith Brown noted that all aircraft are directed over High Point. Gene responded that is correct, head-to-head operations are in effect for the FedEx flights, meaning arrivals from the southwest and departures to the southwest, weather permitting. Bob Mentzer noted that the head-to-head operation pertains only to FedEx hub flights, not to other nightly operations.

NA-3: Night Runway Use Assignments

HMMH recommended deleting this measure since retrofitted Stage 3 aircraft have largely been retired.

NA-4: Night Southbound Departure Corridor from Runway 23L

HMMH recommended keeping this measure with modifications to include northeast departures and to pursue an RNAV procedure to standardize and concentrate the flight path of these departures.

Stan Tennant asked if it would it be better to spread noise out rather than sending all planes down the 68 corridor. Gene and Suzanne Akkoush responded that it is better to concentrate noise over the highway and industrial/commercial areas than to spread it out over residential areas.

NA-5: Night Departure Procedures from Runway 23R

HMMH recommended keeping this measure and adding a clause from the original statement of NA-3 for departures transitioning to a southerly direction.

NA-6: Night Northbound Departure Corridor from Runway 23L

HMMH recommended consolidating this measure with NA-4 to reflect the preferred routing for northbound departures being used by the tower today.

In the discussion of this measure, it was noted that it is better to do what the tower is currently doing than to adhere to the original measure, which instructs the tower to have aircraft make tight turns to the north east from runway 23L. Currently, the tower has air traffic following the 68 corridor until aircraft reach 4,000 feet, then allowing turns to the northeast.

NA-8: Departures from Runway 5L and NA-9: Departures from Runway 5R

HMMH recommended no change.

NA-10: Restriction on Use of APUs

HMMH recommended no change.

NA-11: Noise Abatement Departure Profiles

HMMH recommend eliminating this measure, as it is likely not as effective with newer generation aircraft.

NA-12: Noise Abatement Approach Procedure

HMMH recommended keeping this measure.

Michael Lopez asked if we can tell if the aircraft in the data set are on a visual or instrument approach. Gene said this is not apparent in the data and cannot be determined, but could be a factor.

Stan Tennant noted that one out of six aircraft are below the glideslope on approach at 5.5NM and even more on the approach to Runway 23R. Stan said this seems correctable. Michael Lopez, who is a pilot, agreed with Stan. Bob Mentzer replied that it could be an issue of fidelity of the radar data on the approach to Runway 23R and will investigate using an error margin.

Stan asked how compliance with glideslope altitude could be improved. Gene answered that the Airport Authority could work with the tower to investigate possible reasons that aircraft are not at or above the standard glideslope and potentially improve compliance through training.

Stan asked if the Airport could implement stricter enforcement of procedures like John Wayne Orange County Airport's departure procedures. Gene replied that the John Wayne procedures are unique, and Airports cannot implement such procedures today, given legislation from 1990. However, the Airport Authority can work with FAA to improve compliance.

Janet asked if low flying aircraft result in areas of noise complaints. Suzanne replied that complaints do frequently come from the final approach paths of the runways, and are typically evenly distributed around the Airport depending on the day-to-day runway use and operations. Janet said she believes low flying aircraft are the biggest issue she hears from neighbors.

Land Use Measures

HMMH recommended eliminating LU-1 (Acquire Noise-Sensitive Properties Where DNL Exceeds 70 dB) and LU-2 (Sound Insulation of Noise-Sensitive Structures Where DNL Exceeds 65 dB) as they have been fully implemented and are complete or nearly complete.

HMMH recommended eliminating LU-3 (Optional Acquisition of Avigation Easements for Noise-Sensitive Structures where DNL Exceeds 65 dB) and LU-4 (Other Assistance for Owners of Residential Property where DNL Exceeds 65 dB) as they are no longer needed.

HMMH recommended keeping LU-5 (Pursue Compatible Use Zoning where DNL Exceeds 65 dB) as is.

Program Management Measures

HMMH recommended keeping all Program Management measures as is.

Keith asked about keeping an active citizens committee after the Part 150 is over. Alex Rosser and Gene replied that Suzanne is doing a good job keeping the public informed and will plan to go forward keeping Suzanne as the point of contact with Airport neighbors.

Appendix F Public Outreach

This appendix presents copies of PTAA's publicity materials related to the project as a whole as well as to the public workshops and public hearing.

F.1 Newsletters

Two newsletters were sent out to the community: one sent at the start of the project advertising the initial Public Workshop, and the second sent out before the start of the Public Comment Period and Public Workshop for the Part 150 Update.

Noise Compatibility Study Update (Part 150)

Piedmont Triad International Airport

Newsletter #1 | June 2019

In 2004, the Piedmont Triad Airport Authority (PTAA) began participation in the federal Airport Noise Compatibility Planning process under Title 14 of the Code of Federal Regulations Part 150 (14 CFR Part 150 or simply "Part 150") for the Piedmont Triad International Airport (PTI). This process culminated in a report submitted to the Federal Aviation Administration (FAA) in 2007. The FAA accepted the Noise Exposure Maps contained in the report and issued a Record of Approval (ROA) in 2008 addressing PTAA-recommended measures for a Noise Compatibility Program (NCP). The FAA approved, in whole or in part, all of the 20 PTAA recommended NCP measures. The following table lists the NCP measures.

Noise Abatement Measures	Land Use Measures	Programmatic Measures
1. Evaluate Noise Barriers * 2. Preferred Night Runway Use ** 3. Night Runway Use Assignments ** 4. Night Southbound Departure Corridor from Runway 23L ** 5. Night Departure Procedures from Runway 23R ** 6. Night Northbound Departure Corridor from Runway 23L ** 8. Departures from Runway 05L ** 9. Departures from Runway 05R ** 10. Restrictions on Use of APUs 11. Noise Abatement Departure Profiles ** 12. Noise Abatement Approach Procedure ** 13. Altitude for Downwind Legs **	1. Acquire Noise-Sensitive Properties where DNL Exceeds 70 dB 2. Sound Insulation of Noise-Sensitive Structures where DNL Exceeds 65 dB 3. Optional Acquisition of Avigation Easements for Noise-Sensitive Structures where DNL Exceeds 65 dB 4. Other Assistance for Owners of Residential Property where DNL Exceeds 65 dB * 5. Pursue Compatible Use Zoning where DNL Exceeds 65 dB	1. Establish a Noise Monitoring Function at PTI 2. Publish DNL Contours at 60 dB and Above 3. Install and Operate an Aircraft Noise and Operations Monitoring System

Note: There is no Noise Abatement Measure number 7 since it was included in Noise Abatement Measure number 5 during the course of the original study.
** - Approved for further study.*
*** - Approved as voluntary measures subject to traffic, weather, and airspace safety and efficiency.*

Part 150 Update

The PTAA has begun the process to update the Part 150 Study. The update will develop new Noise Exposure Maps for current (2020) and projected future (2025) aircraft operations. The study update will also consider whether changes are needed to the NCP that was adopted in the previous study to address any noncompatible land uses that exist.

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Greensboro, NC 27409
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Greensboro, NC 27409

Study Team

The PTAA has contracted with a team of experienced noise consultants (HMMH) to conduct the Part 150 Study Update. A Technical Advisory Committee (TAC) will include representatives from aircraft operators, FAA Air Traffic Control, airport tenants, and local planning jurisdictions. A Citizens Advisory Committee (CAC) will include representatives of the surrounding communities. The TAC and CAC will provide input to the PTAA on the study update.

Study Schedule

The PTI Part 150 update began in early 2019 and is scheduled to be submitted to the FAA for final review in early 2020. Four TAC and CAC meetings will be held at key points in the study process to review assumptions, baseline data, forecasts and draft results, and to provide feedback and suggestions. Two open house style public workshops will be held during the course of the study.

Stay Connected

For more information or to submit comments and feedback, the PTAA has several ways you can participate and stay informed:

1. The project website (http://PTIPart150Update.com) is updated regularly with project documents, meeting announcements, and other general information about the study. Register on this site to join the mailing list and receive project updates.
2. To make comments and give feedback, please email us at Part150@gsoair.org
3. PTAA noise information website provides broader information: https://flyfrompti.com/noise-information/

Project News

The PTI Part 150 update is in the inventory phase, which includes data collection, meeting with users of the airport, development of the aviation forecast, and setting up the noise model, which by federal regulation is the FAA's Aviation Environmental Design Tool (AEDT). During this phase of the Part 150 update the PTAA has set up the TAC and CAC, and is planning the first public open house to introduce the project.

Public Open House

To learn more, please attend the Part 150 Public Workshop on **Thursday, June 27, 2019 from 5 p.m. to 7 p.m.** at the Greensboro-High Point Marriott Airport, 1 Marriott Drive, Greensboro, NC 27409. The purpose of this first open house is to provide background information on Part 150 regulations, an introduction to aircraft noise, and an overview of the project schedule. Please come anytime between 5 p.m. and 7 p.m. to browse project information and discuss the study with PTAA Staff and members of the Study Team.

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Second newsletter will be inserted here

F.2 Project website

The study provided a Project website (https://ptipart150update.com/) which provided study updates, FAQs about aircraft noise, meeting notices, the Draft Part 150 Update document and copies of all materials

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Part 150 Study Update

Welcome

The "Part 150" Airport Noise Study Update for the Piedmont Triad International Airport (PTI) is underway. We strongly encourage all interested parties to participate. As the study progresses, you will find updates here, so check back often.

The Piedmont Triad Airport Authority (PTAA) is committed to being a good neighbor and a responsible operator of the Piedmont Triad International Airport (PTI). The most comprehensive way an airport addresses noise is through the Airport Noise Compatibility Planning program under Title 14 of the Code of Federal Regulations Part 150 ("Part 150"). A Part 150 Study is a voluntary, federally funded and supervised program that helps airports find ways to reduce noncompatible land uses by analyzing current and future airport use. Committees of citizens, airport users and other stakeholders are formed to advise a noise consultant team as they analyze aircraft traffic patterns and review current noise mitigation measures in accordance with Federal Aviation Administration (FAA) guidance.

Before the airport's newest runway opened in 2010, the Airport Authority undertook its first Part 150 Study. During development of the airport's original Part 150 Study, the PTAA partnered with residents, airport users, local government agencies, elected officials and the FAA to develop its Noise Compatibility Program. The airport's current Noise Compatibility Program was approved by the FAA in November 2008 in a Record of Approval **(ROA)**. Since that time, the airport has implemented the measures outlined in that program, including a Sound Insulation Program for neighborhoods within the airport's 65 DNL noise contour.

Over the past 10 years, aircraft operations, aircraft types and land uses surrounding the airport have changed. That's why the PTAA is updating its current Part 150 program - to ensure that current measures are effective and to determine whether new measures are warranted. The Airport Authority has contracted with noise consultants from Harris Miller Miller & Hanson Inc. (HMMH) of Burlington, Massachusetts, to work with airport staff and members of the community to fine tune PTI's noise program.

This website is designed to provide information about the Part 150 Update and to keep the community apprised of the program's progress. Below is a brief guide to the website. Please take a moment to explore the website sections and feel free to email the PTI Part 150 team with questions and comments.

Basics: This page describes the overall Part 150 study process.

Documents: You will find background documentation, including maps and the 2008 report linked on this page.

Public Outreach: This section presents an overview of the public outreach program, upcoming meetings, and summaries of completed meetings.

FAQs: Please look here to find answers to frequently asked questions about the Part 150 Update Study.

Contact: Please use this link to submit input, request information, and sign up for email updates.

PTI Part 150 Newsroom

Airport to begin Part 150 Noise Study Update
May 15, 2019

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Part 150 Study Update

Public Outreach

The Piedmont Triad Airport Authority encourages the public to participate in the Part 150 Update study. The study provides a range of opportunities outlined below for interested parties to learn about the study and to comment. Please use the Contact page to sign up to receive emailed notices of those opportunities and to be added to the newsletter distribution list.

Citizens Advisory Committee

The public will have an opportunity to participate directly in the study in two ways. A Citizens Advisory Committee, which will be made up of local residents from neighborhoods and jurisdictions around the airport, will meet quarterly with study consultants from HMMH to provide the public perspective on the development of noise mitigation measures. There will also be a Technical Advisory Committee made up of airline professionals, airport tenants, tower personnel and others, to provide a technical perspective.

Public Workshops

Members of the public may also attend two public workshops to be held during the course of the study. These workshops will be well publicized on this website and in general circulation publications. Members of the public may ask questions at each of the workshop stations, and they may leave written comments at tables that will be available at both workshops. If the existing Noise Compatibility Program is to be updated or amended, then a court reporter will be on hand at the second public workshop to record spoken comments from the public.

Website and Newsletters

Study consultants will publish two newsletters during the course of the Part 150 update, which will be circulated at the beginning of the study and just before the second public workshop. You may request to be added to the newsletter mailing list by emailing the study team at Part150@gsoair.org. Summaries of committee meetings will be posted on this website (ptipart150update.com), as will notices of meetings and public workshops.

Make Comment or Ask a Question

Members of the public may also comment or ask questions at any time during the study by writing to this email address: Part150@gsoair.org or by submitting the form located on the Contact page of this website.

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FREQUENTLY ASKED QUESTIONS

The Piedmont Triad Airport Authority answers basic questions about the Part 150 Study Update below. We will add questions and answers to this list as the study progresses.

- WHAT IS A PART 150 STUDY?
- WHAT IS THE PURPOSE OF THE CURRENT PART 150 UPDATE?
- WHO CONDUCTS THE UPDATE?
- IS THE PROCESS PUBLIC?
- HOW LONG WILL THE STUDY TAKE?
- WHAT IS THE END PRODUCT OF THE PART 150 UPDATE?
- WHAT IS A NOISE EXPOSURE MAP (NEM)?
- WHAT IS THE NOISE COMPATIBILITY PROGRAM (NCP)?

F.3 Public Workshops

Two public workshops were held during the Part 150 Update. Below is the notice for the first Public Workshop. The workshops were also advertised in newspapers and on social media.

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PTI TO HOLD PUBLIC WORKSHOP FOR AIRPORT NOISE STUDY UPDATE

Greensboro, N.C. -The Piedmont Triad Airport Authority (PTAA) has begun an update of the Airport Noise Compatibility Planning study for Piedmont Triad International Airport. The original study was approved by the Federal Aviation Administration in November 2008 per Title 14 of the Code of Federal Regulations Part 150 (or simply "Part 150").PTAA will hold an open house style Public Workshop on Thursday, June 27, 2019 from 5 p.m. to 7 p.m.at the Greensboro-High Point Marriott Airport (1 Marriott Drive, Greensboro, NC, 27409). The workshop displays will provide background information on Part 150 regulations, an introduction to aircraft noise, and an overview of the project schedule. Interested residents can attend anytime between 5 p.m. and 7 p.m. to browse project information and discuss the study update with PTAA staff and members of the Study Team. Meeting materials will be posted on the project website (www.PTIPart150Update.com) following the workshop. PTAAencourages all interested parties to attend the workshop and monitor the project website for the latest study information and announcements.

F.3.1 Newspaper Public Notice Advertisements

Newspaper Meeting announcement

RHINO TIMES

Airport To Hold June 27 Noise Mitigation Workshop

Posted by Scott D. Yost | Jun 19, 2019 | News

Earlier this year, Piedmont Triad International Airport (PTIA) announced that it would be conducting a noise study in 2019 – and, on Wednesday, June 19, the airport announced the time and place of the first public workshop to allow citizens who may be affected by the noise a chance to voice their concerns and hear information about airport plans.

The hope is that the citizen input and the public dialogue will help the airport mitigate negative effects that noise may have on communities near the airport.

On Thursday, June 27 PTIA will hold the "open house style" meeting from 5 p.m. to 7 p.m. at the Greensboro-High Point Marriott Airport, at 1 Marriott Dr. in Greensboro.

According to information from airport officials, at that meeting, displays will offer background information on aircraft noise levels and noise regulations, and also provide an overview of the airport's project schedule.

Those who want to attend the meeting can show up at any time between 5 p.m. and 7 p.m. to browse the information and discuss the new study update with staff and with members of the team conducting the study.

For those who can't attend, meeting materials will be posted on the project's website (www.PTIPart150Update.com) after the workshop. The study is called a "Part 150 Update" because it's part of the federal "Airport Noise Compatibility Planning Program" established under Title 14 of the Code of Federal Regulations Part 150.

According to a statement from the Piedmont Triad Airport Authority – the airport's governing body – the authority "is committed to being a good neighbor and a responsible operator of the Piedmont Triad International Airport."

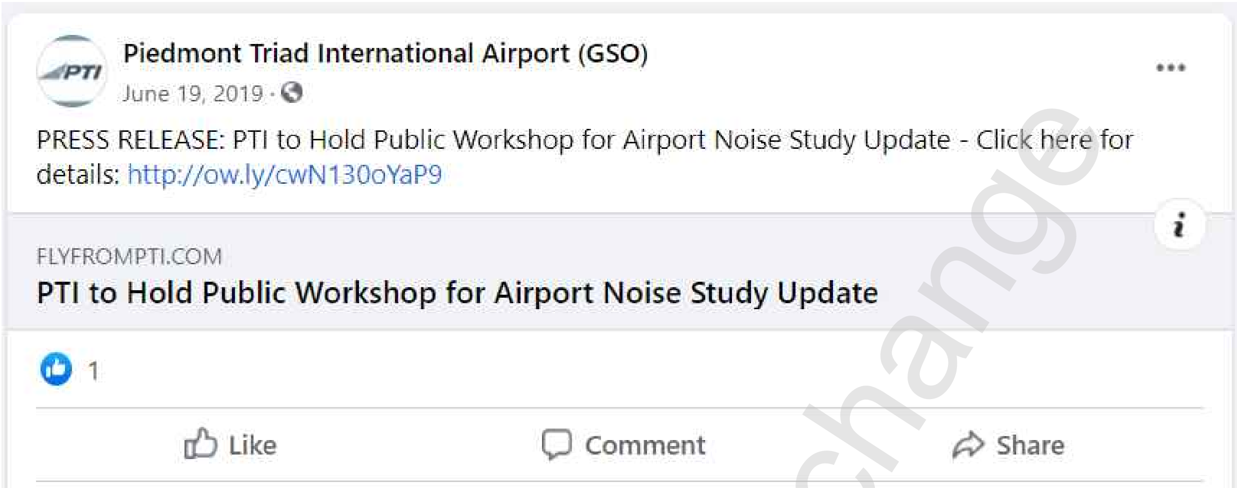
The statement continues: "The most comprehensive way an airport addresses noise is through the Airport Noise Compatibility Planning program. A Part 150 Study is a voluntary, federally funded and supervised program that helps airports find ways to reduce noncompatible land uses by analyzing current and future airport use. Committees of citizens, airport users and other stakeholders are formed to advise a noise consultant team as they analyze aircraft traffic patterns and review current noise mitigation measures in accordance with Federal Aviation Administration (FAA) guidance."

The Airport Authority conducted the first Part 150 study in 2008 before the airport opened its newest runway in 2010. Since then, as a result of that study, the airport has taken steps to mitigate noise – including changes in approach routes and a sound insulation program in some neighborhoods.

According to the statement from PTIA, there have been a lot of changes over the past decade. Aircraft operations, the types of aircraft flying to and from the airport and land uses surrounding the airport have all changed. That's why the airport is updating its current Part 150 program: "to ensure that current measures are effective and to determine whether new measures are warranted."

The Airport Authority has contracted with noise consultants from Harris Miller Miller & Hanson Inc. (HMMH) of Burlington, Massachusetts, to work with airport staff and with members of the community to "fine-tune" PTIA's current noise mitigation program.

PTI Facebook Posting:



F.3.2 Workshop Presentation Materials

The presentation materials displayed at the public workshops are presented on the next several pages.

Welcome!

Noise Compatibility Study (Part 150) Update
Piedmont Triad International Airport

Public Information Workshop

Piedmont Triad International Airport Noise Compatibility Study Update | Public Information Workshop

1

Part 150 Overview

- Federal Aviation Administration (FAA) developed the voluntary Part 150 program for airports to assess and address land use compatibility
  - Codified under Title 14 of the Code of Federal Regulations (CFR) Part 150
    - Informally called "Part 150"
    - Formal *citation* is "14 CFR Part 150"
    - Formal *title* is "Airport Noise Compatibility Planning"
  - Over 250 airports have participated
  - Sets national standards for noise analysis
  - Provides access to federal funds for mitigation
- PTI has begun an update of the Part 150 study approved by FAA in 2008

Detailed FAA guidance at www.faa.gov/airports/environmental/airport_noise/

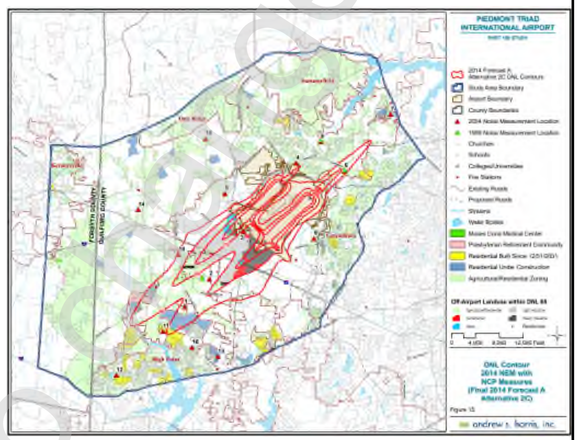
Piedmont Triad International Airport Noise Compatibility Study Update | Public Information Workshop

2

Part 150 Overview: Noise Exposure Map

- FAA "accepts" NEM as compliant with Part 150 standards
  - FAA accepted PTI NEM in 2008
- NEM includes 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+ dB contours
  - Noise / land use compatibility statistics within DNL 65+ dB contours
- NEM includes two calendar years

Conditions/Years	Original PTI Part 150	Current PTI Part 150 Update
Existing Conditions (year of submittal)	**2006**	**2020**
Forecast Conditions (at least 5 years beyond year of submittal)	**2014**	**2025**



Piedmont Triad International Airport forecast (2014) NEM with recommended noise abatement measures

Part 150 Overview: Noise Compatibility Program

- FAA "accepts" NCP as compliant with Part 150 standards
  - FAA accepted current PTI NCP in 2008
- FAA reviews and "approves" or "disapproves" recommended measures as compliant with Part 150 standards on an element-by-element basis
  - FAA provided Record of Approval for the current PTI NCP in 2008

- NCP must address three major categories of proposed actions
  - Noise abatement measures
    - PTI NCP currently includes 12 noise abatement measures approved by the FAA
  - Compatible land use measures
    - PTI NCP currently includes 5 land use measures approved by the FAA
  - Program implementation
    - PTI NCP currently includes 3 program measures approved by the FAA

Part 150 Overview: Noise Compatibility Program

Existing PTI NCP measures as approved by FAA

- Noise abatement measures:
  - ✓Evaluate Noise Barriers
  - ✓Preferential Nighttime Runway Use
  - ✓Nighttime Departure Corridors
  - ✓Nighttime Departure Procedures
  - ✓Delay Turns After Departure
  - ✓Restriction on Aircraft APU Use
  - ✓Noise Abatement Departure Procedure
  - ✓Noise Abatement Arrival Procedure
  - ✓Prescriptive Altitude for Downwind Leg of Arrivals
- Land use measures:
  - ✓Land Acquisition*
  - ✓Sound Insulation*
  - ✓Easement Acquisition*
  - ✓Sales/Purchase Assistance*
  - ✓Land Use Zoning
- Program measures:
  - ✓Monitor Aircraft Noise
  - ✓Publish Noise Contours
  - ✓Install a Noise and Operations Monitoring System

* Applicable within the FAA-accepted 65 DNL contour

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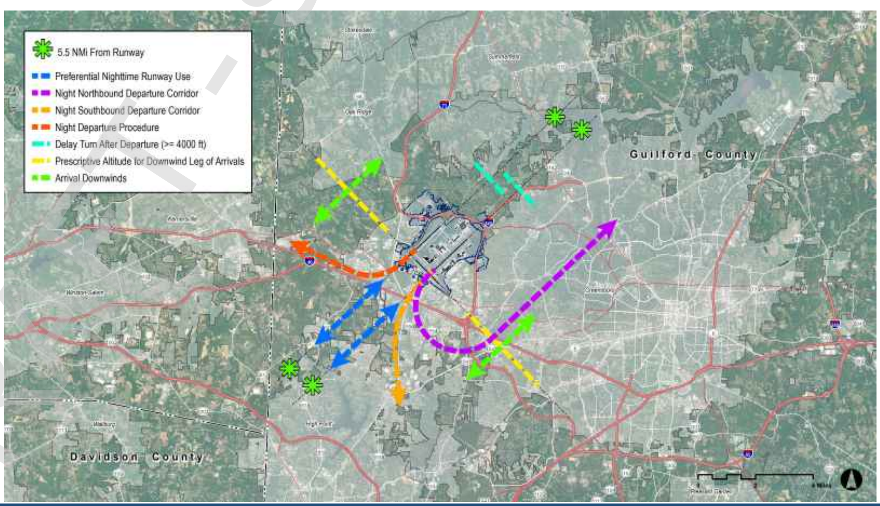
5

Part 150 Overview: Noise Compatibility Program

Existing PTI noise abatement measures as approved by FAA



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6

Part 150 Update Schedule

Milestone	Anticipated Date
Project Kickoff Meeting with the FAA	March 2019
Data Collection, Forecast Development and Noise Model Input	March 2019 thru September 2019
Public Information Workshop – Introduce Project	***June 27, 2019 (today)***
FAA Approvals (forecasts, non-standard modeling if required)	September 2019
Preliminary draft aircraft noise exposure contours for evaluations	December 2019
Draft Part 150 Documentation and Maps (Report)	January 2020
Public Information Workshop – Present Results	***February 2020***
Submit Part 150 Documentation and Maps to FAA	March 2020

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7

Noise Modeling: Required Model Inputs

- We must use FAA-approved model
  - FAA's Aviation Environmental Design Tool (AEDT)
- Required noise modeling inputs
  - Airport layout
  - Annual average meteorological data
  - Terrain
  - Aircraft operations by day/night for 2020 and forecast for 2025
  - Runway utilization rates by aircraft categories
  - Flight track geometry and use by aircraft categories

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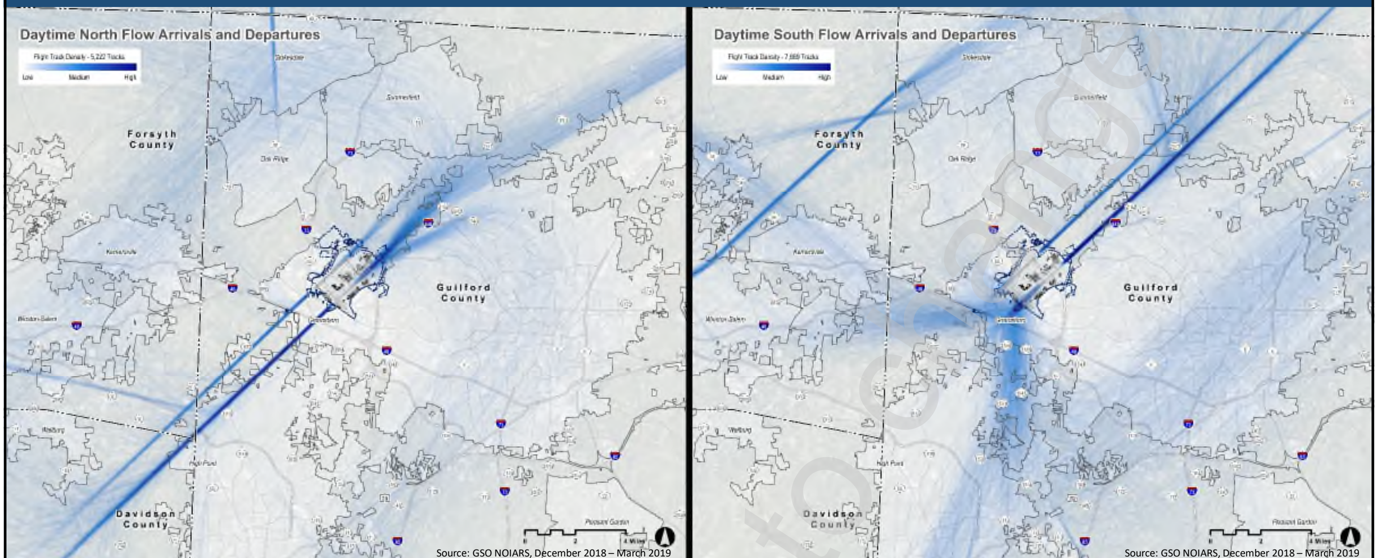
Noise Modeling Input: Daytime Flight Tracks (7am – 10pm)



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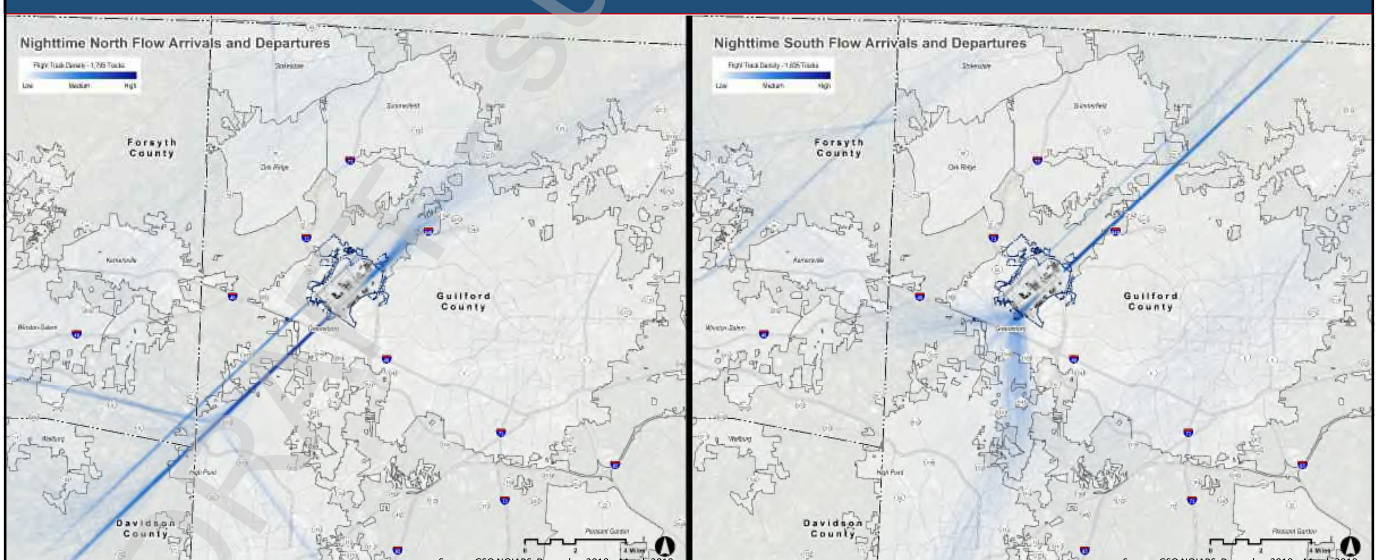
9

Noise Modeling Input: Nighttime Flight Tracks (10pm – 7am)



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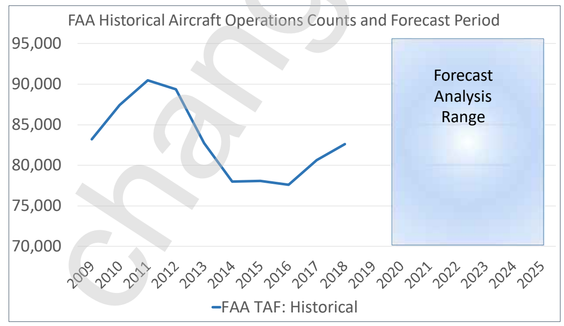
10

Forecast of Aircraft Operations – 2020 and 2025

- Aviation forecasts will represent annual-average day of aircraft operations by aircraft type and time of day including:
  - Commercial (passenger)
  - Air taxi (passenger)
  - Air cargo (freight)
  - General aviation (private)
  - Military
- Forecast development will include:
  - Analysis of socioeconomics, demographics, and recent airport trends
  - Projections using statistical econometric models
- FAA to approve aviation forecasts



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11

Project Contacts and Websites

- Suzanne Akkoush, Project Manager – Part 150 Study
- Address emails to Part150@gsoair.org
- Part 150 Website provides most relevant information
  - Will be updated regularly for public outreach purposes
  - http://PTIPart150Update.com
- PTI noise information website provides broader information
  - https://flyfrompti.com/noise-information/

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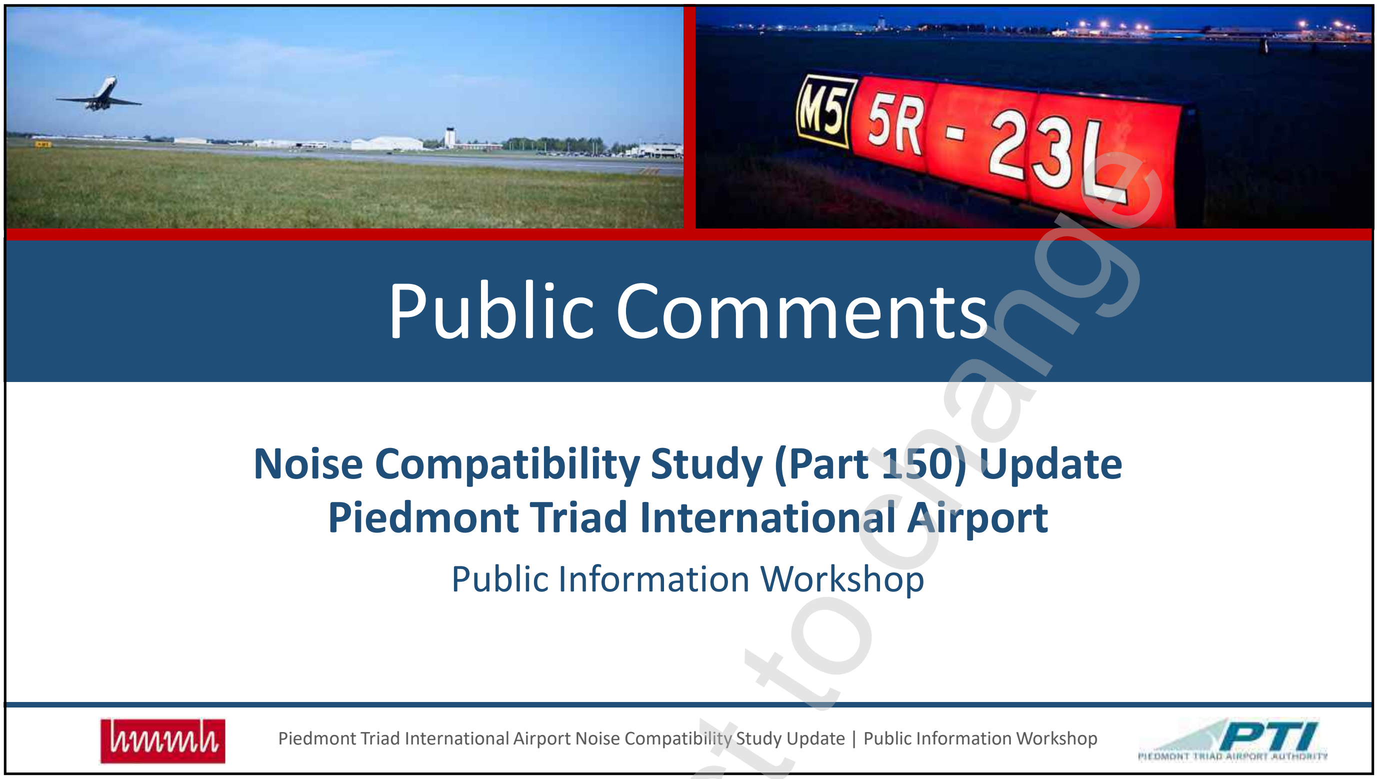
12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Public Comments
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Public Information Workshop
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13

F.4 Public Hearing

To be added in the Final Report

F.4.1 Newspaper Public Notice Advertisements

To be added in the Final Report

F.4.2 Public Hearing Presentation Materials

To be added in the Final Report

Appendix G Public Comments

G.1 Summary of Comments

To be added in the Final Report

G.2 Comment Forms

Comment form from the First Public Workshop

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Noise Compatibility Study (Part 150)

Piedmont Triad International Airport

We welcome your comments! This card may be:

- filled out and left at the comment table today,
- mailed to: *Piedmont Triad International Airport, 1000A Ted Johnson Parkway, Greensboro, NC 27409 (attn.: Suzanne Akkoush),*
- or emailed to: *Part150@gsoair.org*

Commenter's Name: ______________________________ date of comment __________

email: ____________________________ phone: ________________________

mailing address: ____

Comments:

You can keep informed through the project website: ***https://PTIpart150update.com***

Additional items to be added in the Final Report