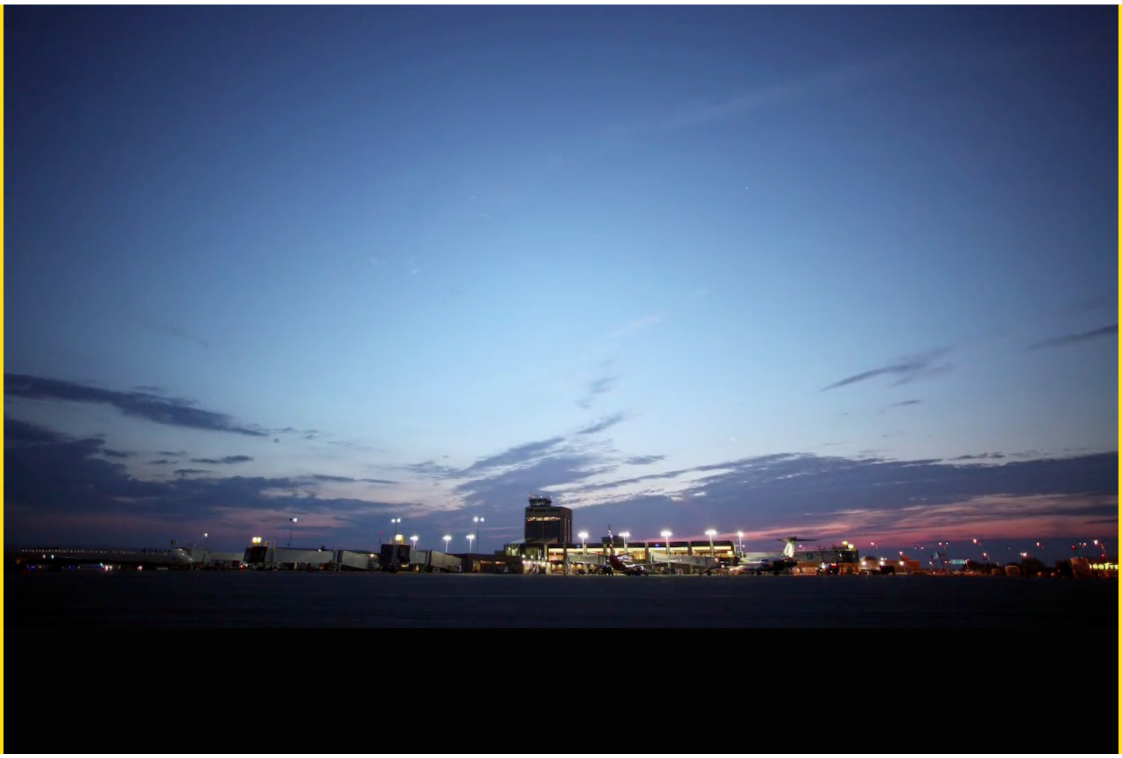
Akron-Canton Airport
Part 150 Update
Project Introduction and Inventory Report

Draft - September 2013



Prepared for:

Akron-Canton Airport Authority

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Engage Public Affairs, LLC

Akron-Canton Airport

Part 150 Update

PROJECT INTRODUCTION
and
INVENTORY REPORT

HMMH Report No. 305231.001.001

Working Draft Subject to Airport, Advisory Committee, FAA, Public Agency, and Other Public Review and Revision

September 2013

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LIST OF ACRONYMS USED IN THIS REPORT

Acronym	Full Definition	First Reference or Definition in Document
AC	[Federal Aviation Administration] Advisory Circular	Section 1.4
ATCT	[Federal Aviation Administration] Airport Traffic Control Tower	Section 1.2.2
ADO	[Federal Aviation Administration] Airports District Office	Section 1.2.2
ANSI	American National Standards Institute	Section 2.2.2
CAK	Akron-Canton Airport	Section 1
CFR	Code of Federal Regulations	Section 1
CHA	CHA Consulting, Inc. (formerly RW Armstrong, Inc.)	Section 1
dBA	Decibel	Section 2.1
dBA	A-Weighted Decibel	Section 2.1
DNL	Day Night Average Sound Level (also L_{dn}, as noted below)	Section 2.1
FAA	Federal Aviation Administration	Section 1
FAR	Federal Aviation Regulation	Section 1
FICAN	Federal Interagency Committee on Aircraft Noise	Section 2.2.2
FICON	Federal Interagency Committee on Noise	Section 2.2.3
HMMH	Harris Miller Miller & Hanson Inc.	Section 1
L_{eq}	Equivalent Sound Level	Section 2.1
L_{dn}	Day Night Average Sound Level (also DNL, as noted above)	Section 2.1
L_{max}	Maximum A-Weighted Sound Level	Section 2.1
MSL	Mean Sea Level	Section 4.4
NCP	(Part 150) Noise Compatibility Program	Section 1
NEM	(Part 150) Noise Exposure Map	Section 1
OANG	Ohio Army National Guard	Section 1.2.2
PAPI	Precision Approach Path Indicator (lights)	Section 4.4
Part 150	14 CFR (FAR) Part 150, “Airport Noise Compatibility Planning”	Section 1.1
PASSUR	Passur Aerospace (source of flight track and operations data)	Section 3.2.1
ROA	Record of Approval (for a Part 160 Noise Compatibility Program)	Section 1
RWA	RW Armstrong, Inc. (now CHA Consulting, Inc.)	Section 1
SEL	Sound Exposure Level	Section 2.1

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1 INTRODUCTION

Part 150 of the Federal Aviation Regulations (FAR[1]) "Airport Noise Compatibility Planning"[2] sets standards for airport operators to use in documenting noise exposure in the airport environs and establishing programs to minimize noise-related land use incompatibilities. A formal submission to the Federal Aviation Administration (FAA) under Part 150 includes documentation for two principal elements: (1) the Noise Exposure Map (NEM) and (2) the Noise Compatibility Program (NCP).

The Akron-Canton Airport (CAK) is situated in North Canton, OH, approximately midway between Akron and Canton, at the border between Summit and Stark Counties, as shown in Figure 1. The airport is operated by the Akron-Canton Airport Authority, which has conducted two previous Part 150 study efforts for CAK:

- 1988 Noise Exposure Map and Noise Compatibility Program submissions
- 1997 Noise Exposure Map and Noise Compatibility Program submissions[3]

Appendix A presents a copy of the FAA's Record of Approval (ROA) for the 1988 Noise Compatibility Program Submission. Appendix B presents the ROA for the 1997 submission.

These prior efforts reflect the Authority's commitment to continuous monitoring, evaluation, and refinement of its noise-related efforts, to ensure they appropriately reflect and address current and anticipated conditions and needs. Consistent with this commitment, in 2012 the Authority retained Harris Miller Miller & Hanson Inc. (HMMH), in association with the CHA Consulting, Inc. (CHA), and Engage Public Affairs, LLC, to prepare an update to the Part 150 Study. The update is being conducting in parallel with a Master Plan Update Study, on which CHA is the lead consultant.[4]

The Part 150 Update Study is addressing 2014 existing conditions and 2019 five-year forecast conditions. This document presents background information for distribution to the study's advisory committee, local residents, aviation interests, and any other interested parties in advance of the first public workshop, consistent with the public outreach program discussed in Section 1.3.

The background information is in two areas: (1) project introduction and (2) database inventory.

The *introductory* information covers:

- Part 150 overview
- Primary project participants, and their roles and responsibilities
- Public consultation elements
- FAA checklists addressing detailed requirements for NEM and NCP submissions
- Noise terminology and evaluation

[1] All abbreviations and acronyms used in this document are listed in the "Table of Acronyms" on page xii.

[2] Codified as Title 14 Code of Federal Regulations (CFR) Part 150.

[3] Harris Miller Miller & Hanson, Inc. in association with The Airport Technology and Planning Group, Inc., "Akron-Canton Regional Airport FAR Part 150 Update Noise Exposure Map" and "Akron-Canton Regional Airport FAR Part 150 Update Noise Compatibility Program," 1997.

[4] CHA is the overall prime contractor to the Authority for the two studies.

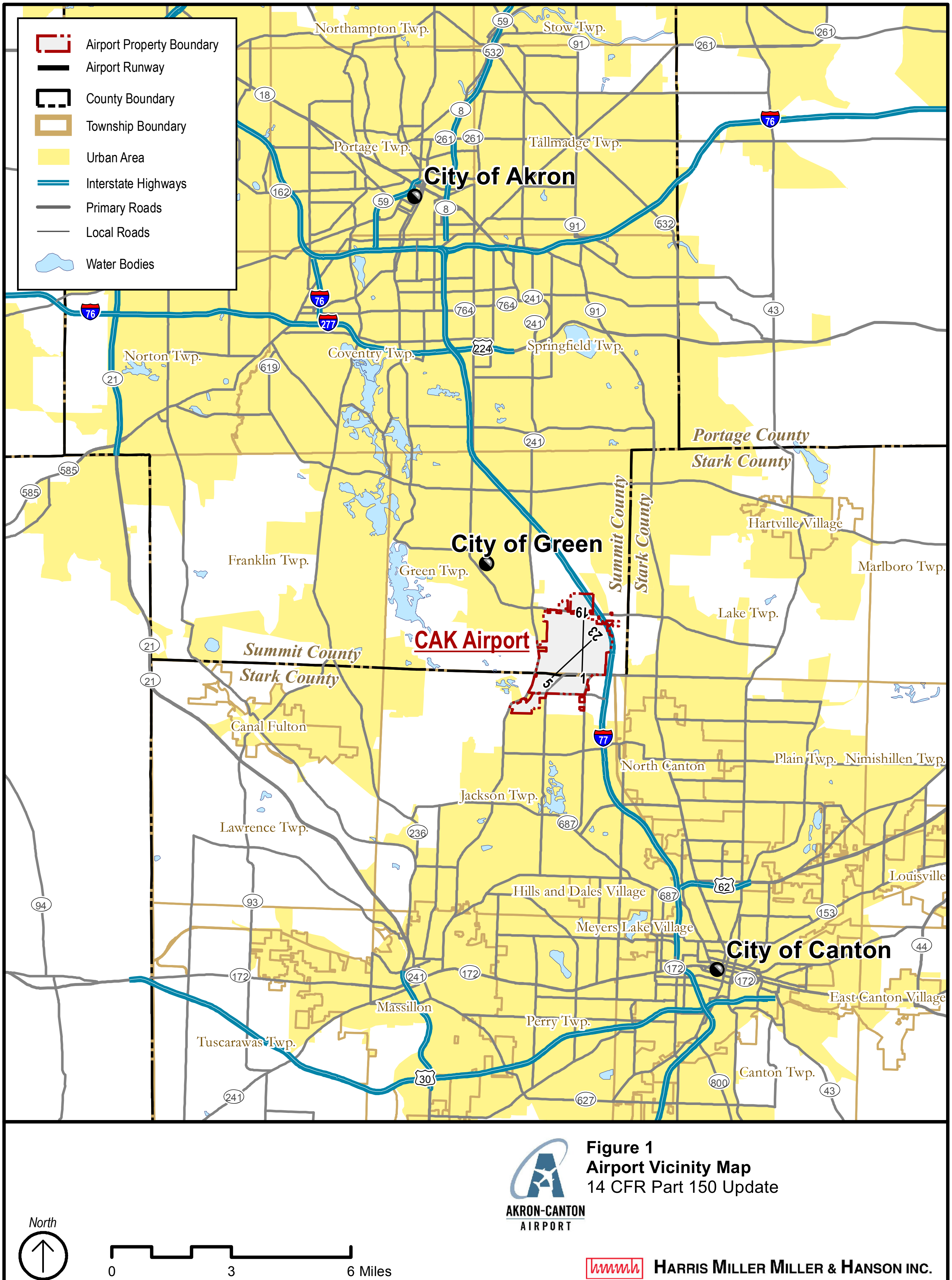

Figure 1
Airport Vicinity Map
14 CFR Part 150 Update

AKRON-CANTON AIRPORT

HARRIS MILLER MILLER & HANSON INC.

Path: G:\Projects\305XXX\305231_CAK_Part_150_Update\GIS\305231_CAK_Figure_1_Vicinity_Map.mxd

The *inventory* information includes:

- Results of a noise measurement program conducted in June 2013
- Overview of noise modeling data collection requirements and processes
- Draft noise modeling inputs in all required categories, including:
  - Number and mix of aircraft operations
  - Aircraft noise and performance characteristics
  - Physical description of the airport layout
  - Runway utilization rates
  - Prototypical flight track descriptions and accompanying utilization rates

The consulting team will seek input on these draft inputs from the Advisory Committee, the general public, and other interested stakeholders, through a presentation at a committee meeting, posting of the material on the Part 150 update page on the CAK website, and presentation at the first workshop. All interested parties will be encouraged to provide feedback in person at the meetings, via the comments section of the website, or through written (hand delivered, posted mail, or emailed) comments.

1.1 Part 150 Overview

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

- Measuring noise
- Estimating cumulative noise exposure
- Describing noise exposure (including instantaneous, single event, and cumulative levels)
- Coordinating with local land use officials and other interested parties
- Documenting the analytical process and development of the compatibility program
- Submitting documentation to the FAA
- FAA and public review processes
- FAA approval or disapproval of the submission

1.1.1 Noise Exposure Map(s)

Noise Exposure Map documentation describes the airport layout and operation, aircraft-related noise exposure, land uses in the airport environs and the resulting noise/land use compatibility situation. The Noise Exposure Map documentation must address two time frames: (1) data representing the year of submission (the “existing conditions”) and (2) a forecast year that is at least five years following the year of submission (the “forecast conditions”). Part 150 requires more than simple “maps” to provide all the necessary information in a Noise Exposure Map. In addition to the graphics, requirements include extensive tabulated information and text discussion. The Noise Exposure Map documentation must describe the data collection and analysis undertaken in its development.

The anticipated year of submission for this update is 2014, with an existing conditions map for that year, and a five-year forecast case map for 2019. Chapter 4 presents draft inventory data required for development of updated existing and forecast case Noise Exposure Maps for those years.

1.1.2 Noise Compatibility Program

The Noise Compatibility Program is essentially a list of the actions the airport proprietor proposes to undertake to minimize existing and future noise/land use incompatibilities. The Noise Compatibility Program documentation must describe the development of the program, each measure that the proprietor considered, the reasons the proprietor elected to include or exclude individual measures, the entities responsible for implementing each measure, implementation and funding mechanisms, and the predicted effectiveness of both individual measures and of the overall program.

Official FAA acceptance of the Part 150 submission and approval of the Noise Compatibility Program does not eliminate requirements for formal environmental assessment of any proposed actions pursuant to requirements of the National Environmental Policy Act (NEPA). However, FAA acceptance of the submission and approval of individual measures are prerequisites to application for funding of implementation actions.

1.2 Project Roles and Responsibilities

Several groups are involved in the Part 150 update; primary groups included the Authority and its staff, the Part 150 Update Study Advisory Committee, the FAA, and the consulting team.

1.2.1 Akron-Canton Airport Authority

As the airport operator (or "proprietor"), the Authority has overall responsibility for all Part 150 related actions at CAK, including ultimate responsibility for determining what elements will be included in the revised Noise Compatibility Program when it is submitted to the FAA for review. The Authority is responsible for pursuing implementation of adopted measures.

CAK retained a team of consultants to conduct the technical work required to fulfill Part 150 analysis and documentation requirements, and to assist in public outreach and consultation.

1.2.2 Part 150 Update Study Advisory Committee

CAK has established a Part 150 Update Study Advisory Committee to ensure that all appropriate outside entities and groups have official representation in the study process. The committee is the central focus of a comprehensive public consultation program, as described in Section 1.3.

The committee members cover all relevant "stakeholder" groups, including:

- Local land use control jurisdiction officials, from surrounding counties and municipalities
- Citizen representatives
- Airline, general aviation, Ohio Army National Guard (OANG), and other major aircraft operators
- Local business interests, including airport tenants and local chambers of commerce
- FAA representatives, including planning staff from the Detroit Airports District Office (ADO) and the CAK airport traffic control tower (ATCT), as discussed in Section 1.2.3
- CAK staff representatives
- Consulting team representatives, as discussed in Section 1.2.4

The Advisory Committee members are responsible for representing their constituents throughout the study process, including commenting on the adequacy and accuracy of collected data, simplifying assumptions, and technical analyses. The Advisory Committee also serves as a forum for the varied interest groups to discuss complex issues and share their perspectives on aircraft noise issues.

1.2.3 Federal Aviation Administration

The FAA has ultimate review authority over the Noise Compatibility Program submitted under Part 150. Their review encompasses the details of technical documentation as well as broader issues of safety and constitutionality of recommended noise abatement alternatives.

FAA involvement includes participation by staff from several agency offices.

The CAK **Airport Traffic Control Tower (ATCT)** provides significant input in several areas, including operational data from their files, judgment regarding safety and capacity effects of noise abatement measures, and input on implementation requirements.

On a regional level, either the FAA's **Detroit Airports District Office (ADO)** or **Great Lakes Regional Office** (in Des Plaines, IL) will review the Noise Exposure Map and Noise Compatibility Program submissions for compliance with Part 150. They will notify the Authority of their determinations, evaluate Noise Compatibility Program proposals, prepare a formal Record of Approval for the Noise Compatibility Program, publish related notices in the Federal Register, and provide opportunity for public comment.[5]

The Regional Office may solicit review and input on more complex technical, regulatory, legal, or other matters from FAA's **Washington headquarters**.

1.2.4 Consulting Team

As noted previously, three consulting firms are collaborating to assist CAK with the Part 150 Update Study, in parallel with Master Plan Update Study.

CHA Consulting, Inc. (CHA) is prime contractor on the two studies and is managing the Master Plan Update Study. For the Part 150 Update Study, CHA is responsible for the 2014 and 2019 activity forecasts and noise modeling fleet mixes (see Section 4.2), land-use data collection, identification, and analysis of compatible land use alternatives for the Noise Compatibility Program, coordination of the Part 150 and Master Plan Update Studies, and documentation and public-outreach assistance related to these tasks.

Harris Miller Miller & Hanson Inc. (HMMH) has overall responsibility for the Part 150 Update Study, including project management, consistency with Part 150 requirements, noise measurement (Section 3), noise modeling (Section 4), development of all modeling inputs other than the activity forecasts and fleet mixes, identification and analysis of noise abatement alternatives, and lead responsibility for public outreach and study documentation.

Engage Public Affairs, LLC is providing public outreach administration and documentation assistance.

1.3 Public Consultation

The Authority is committed to conducting the Part 150 Update Study in a highly "transparent" fashion. As discussed in this section, the study includes a broad range of public outreach elements to provide opportunities for all interested parties to both follow the study and be directly involved.

The Part 150 regulation sets forth the following minimum "consultation" requirements:

[5] The division of responsibility depends on the extent of delegation by the Regional Office to the District Office,

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

§ 150.23 (c) [for Noise Compatibility Programs]: Each noise compatibility program must be developed and prepared … in consultation with FAA regional officials, the officials of the state and of any public agencies and planning agencies whose area, or any portion or whose area, of jurisdiction within the Ldn 65 dB noise contours is depicted on the noise exposure map, and other Federal officials having local responsibility of land uses depicted on the map. Consultation with FAA regional officials shall include, to the extent practicable, informal agreement from FAA on proposed new or modified flight procedures. For air carrier airports, consultation must include any air carriers and, to the extent practicable, other aircraft operators using the airport.

The Part 150 Update Study will include the following primary public consultation elements that significantly exceed those minimum Part 150 requirements:

- Advisory Committee meetings and Authority briefings
- Material posted on the CAK website
- Three workshops open to the general public
- Informational newsletters distributed prior to each workshop
- A final public hearing (held as part of the third workshop)

1.4 FAA Noise Exposure Map and Noise Compatibility Program Checklists

The FAA Advisory Circular (AC) 150/5020, “Airport Noise and Land Use Compatibility Planning” provides guidance to airports and other interested parties to consider in preparing a Part 150 study. The Advisory Circular includes checklists for FAA’s internal use in reviewing Noise Exposure Map and Noise Compatibility Program submissions. The FAA prefers that Part 150 documentation include completed copies of the checklists. Table 1 presents a copy of the Noise Exposure Map checklist. The Noise Compatibility Program update documentation volume will include the comparable checklist. Table 2 presents the Noise Compatibility Program checklist.

The final Noise Exposure Map and Noise Compatibility Program submissions that CAK makes to the FAA will include completed copies of these checklists. The uncompleted versions presented here to provide all study participants and interested parties with a sense of the scope and detail of the formal documentation and processing requirements.

Table 1 Part 150 Noise Exposure Map Checklist
Source: FAA

[Note: Formal submission to FAA will include completed table.]

FAR PART 150 NOISE EXPOSURE MAP CHECKLIST-PART I			
Airport Name: Akron-Canton Airport	Reviewer:		
	Yes/No/ NA	Page/Other Reference	Notes/ Comments
I. IDENTIFICATION AND SUBMISSION OF MAP DOCUMENT			
A. Is this submittal appropriately identified as one of the following, submitted under Part 150:			
1. a Noise Exposure Map only			
2. a Noise Exposure Map and Noise Compatibility Program			
3. a revision to Noise Exposure Maps that have previously been determined by FAA to be in compliance with Part 150?			
B. Is the airport name and the qualified airport operator identified?			
C. Is there a dated cover letter from the airport operator which indicates the documents are submitted under Part 150 for appropriate FAA determinations?			
II. CONSULTATION: [150.21(B), A150.105(A)]			
A. Is there a narrative description of the consultation accomplished, including opportunities for public review and comment during map development?			
B. Identification:			
1. Are the consulted parties identified?			
2. Do they include all those required by 150.21(b) and 150.105(a)?			
C. Does the documentation include the airport operator's certification, and evidence to support it, that interested persons have been afforded adequate opportunity to submit their views data, and comments during map development and in accordance with 150.21(b)?			
D. Does the document indicate whether written comments were received during consultation and, if there were comments, that they are on file with the FAA region?			
III. GENERAL REQUIREMENTS: (150.21)			
A. Are there two maps, each clearly labeled on the face with year (existing condition year and 5-year)?			
B. Map currency:			
1. Does the existing condition map year match the year on the airport operator's submittal letter?			
2. Is the 5-year map based on reasonable forecasts and other planning assumptions and is it for the fifth calendar year after the year of submission?			
3. If the answer to 1 and 2 above is no, has the airport operator verified in writing that data in the documentation are representative of existing conditions and 5-year forecast conditions as of the date of submission?			
C. If the Noise Exposure Map and Noise Compatibility Program are submitted together:			
1. Has the airport operator indicated whether the 5-year map is based on 5-year contours without the program vs. contours if the program is implemented?			

FAR PART 150 NOISE EXPOSURE MAP CHECKLIST-PART I			
Airport Name: Akron-Canton Airport	Reviewer:		
	Yes/No/ NA	Page/Other Reference	Notes/ Comments
2. If the five year map is based on program implementation:			
a. are the specific program measures which are reflected on the map identified?			
b. does the documentation specifically describe how these measures affect land use compatibilities depicted on the map?			
3. If the 5-year Noise Exposure Map does not incorporate program implementation, has the airport operator included an additional Noise Exposure Map for FAA determination after the program is approved which shows program implementation conditions and which is intended to replace the 5-year Noise Exposure Map as the new official 5-year map?			
IV. MAP SCALE, GRAPHICS, AND DATA REQUIREMENTS: [A150.101, A150.103, A150.105, 150.21(A)]			
A. Are the maps of sufficient scale to be clear and readable (they must be not be less than 1" to 2,000'), and is the scale indicated on the maps?			
B. Is the quality of the graphics such that required information is clear and readable?			
C. Depiction of the airport and its environs.			
1. Is the following graphically depicted to scale on both the existing condition and 5-year maps:			
a. airport boundaries			
b. runway configurations with runway and numbers			
2. Does the depiction of the off-airport data include:			
a. a land use base map depicting streets and other identifiable geographic features			
b. area within 65 DNL (or beyond, at local discretion.)			
c. clear delineation of geographic boundaries and the names of all jurisdictions with planning and land use control authority within the 65 DNL (or beyond, at local discretion).			
D. 1. Continuous contours for at least DNL 65, 70, and 75?			
2. Based on current airport and operational data for the existing condition year Noise Exposure Map, and forecast data for the 5-year Noise Exposure Map?			
E. Flight tracks for the existing condition and 5-year forecast time frames (these may be on supplemental graphics which must use the same land use base map as the existing condition and 5-year Noise Exposure Map), which are numbered to correspond to accompanying narrative?			
F. Locations of any noise monitoring sites (these may be on supplemental graphics which must use the same land use base map as the official Noise Exposure Maps)			
G. Noncompatible land use identification:			
1. Are noncompatible land uses within at least the 65 DNL depicted on the maps?			
2. Are noise sensitive public buildings identified?			

FAR PART 150 NOISE EXPOSURE MAP CHECKLIST-PART I			
Airport Name: Akron-Canton Airport	Reviewer:		
	Yes/No/ NA	Page/Other Reference	Notes/ Comments
3. Are the noncompatible uses and noise sensitive public buildings readily identifiable and explained on the map legend?			
4. Are compatible land uses, which would normally be considered noncompatible, explained in the accompanying narrative?			
V. NARRATIVE SUPPORT OF MAP DATA: [150.21(A), A150.1, A150.101, A150.103]			
A. 1. Are the technical data, including data sources, on which the Noise Exposure Maps are based, adequately described in the narrative?			
2. Are the underlying technical data and planning assumptions reasonable?			
B. Calculation of Noise Contours:			
1. Is the methodology indicated?			
a. is it FAA approved?			
b. was the same model used for both maps?			
c. has AEE approval been obtained for use of a model other than those with previous blanket FAA approval?			
2. Correct use of noise models:			
a. does the documentation indicate the airport operator has adjusted or calibrated FAA-approved noise models or substituted one aircraft type for another?			
b. if so, does this have written approval from AEE?			
3. If noise monitoring was used, does the narrative indicate that Part 150 guidelines were followed?			
4. For noise contours below 65 DNL, does the supporting documentation include explanation of local reasons? (Narrative explanation is desirable but not required.)			
C. Noncompatible Land Use Information:			
1. Does the narrative give estimates of the number of people residing in each of the contours (DNL 65, 70 and 75, at a minimum) for both the existing condition and 5-year maps?			
2. Does the documentation indicate whether Table 1 of Part 150 was used by the airport operator?			
a. If a local variation to Table 1 was used:			
(1) does the narrative clearly indicated which adjustments were made and the local reasons for doing so?			
(2) does the narrative include the airport operator's complete substitution for Table 1?			
3. Does the narrative include information on self-generated or ambient noise where compatible/noncompatible land use identifications consider non-airport/aircraft sources?			
4. Where normally noncompatible land uses are not depicted as such on the Noise Exposure Maps, does the narrative satisfactorily explain why, with reference to the specific geographic areas?			

FAR PART 150 NOISE EXPOSURE MAP CHECKLIST-PART I			
Airport Name: Akron-Canton Airport	Reviewer:		
	Yes/No/ NA	Page/Other Reference	Notes/ Comments
5. Does the narrative describe how forecasts will affect land use compatibility?			
VI. MAP CERTIFICATIONS: [150.21(B), 150.21(E)]			
A. Has the operator certified in writing that interested persons have been afforded adequate opportunity to submit views, data, and comments concerning the correctness and adequacy of the draft maps and forecasts?			
B. Has the operator certified in writing that each map and description of consultation and opportunity for public comment are true and complete?			

Table 2 Part 150 Noise Compatibility Program Map Checklist
Source: FAA

[Note: Formal submission to FAA will include completed table.]

FAR PART 150 NOISE COMPATIBILITY PROGRAM CHECKLIST--PART I			
Airport Name: Akron-Canton Airport	REVIEWER:		
	Yes/No/ NA	Page/Other Reference	Notes/ Comments
I. IDENTIFICATION AND SUBMISSION OF PROGRAM:			
A. Submission is properly identified:			
1. FAR 150 NCP?			
2. NEM and NCP together?			
3. Program Revision?			
B. Airport and Airport Operator's name identified?			
C. NCP transmitted by airport operator's cover letter?			
II. CONSULTATION: [150.23]			
A. Documentation includes narrative of public participation and consultation process?			
B. Identification of consulted parties:			
1. all parties in 150.23(c) consulted?			
2. public and planning agencies identified?			
3. agencies in 2., above, correspond to those indicated on the NEM?			
C. Satisfies 150.23(d) requirements:			
1. documentation shows active and direct participation of parties in B., above?			
2. active and direct participation of general public?			
3. participation was prior to and during development of NCP and prior to submittal to FAA?			
4. indicates adequate opportunity afforded to submit views, data, etc.?			
D. Evidence included of notice and opportunity for a public hearing on NCP?			
E. Documentation of comments:			
1. includes summary of public hearing comments, if hearing was held?			
2. includes copy of all written material submitted to operator?			
3. includes operator's response/disposition of written and verbal comments?			
F. Informal agreement received from FAA on flight procedures?			
III. NOISE EXPOSURE MAPS: [150.23, B150.3; 150.35(f)] (This section of the checklist is not a substitute for the Noise Exposure Map checklist. It deals with maps in the context of the Noise Compatibility Program submission.)			
A. Inclusion of NEMs and supporting documentation:			
1. Map documentation either included or incorporated by reference?			
2. Maps previously found in compliance by FAA?			
3. Compliance determination still valid?			
4. Does 180-day period have to wait for map compliance finding?			
B. Revised NEMs submitted with program: (Review using NEM			

FAR PART 150 NOISE COMPATIBILITY PROGRAM CHECKLIST--PART I			
Airport Name: Akron-Canton Airport	REVIEWER:		
	Yes/No/ NA	Page/Other Reference	Notes/ Comments
checklist if map revisions included in NCP submittal)			
1. Revised NEMs included with program?			
2. Has airport operator requested FAA to make a determination on the NEM(s) when NCP approval is made?			
C. If program analysis uses noise modeling:			
1. INM, HNM or FAA-approved equivalent?			
2. Monitoring in accordance with A150.5?			
D. Existing condition and 5-year maps clearly identified as the official NEMs?			
IV. CONSIDERATION of ALTERNATIVES: [B150.7, 150.23(e)]			
A. At a minimum, are the alternatives below considered?			
1. land acquisition and interests therein, including air rights, easements, and development rights?			
2. barriers, acoustical shielding, public building soundproofing			
3. preferential runway system			
4. flight procedures			
5. restrictions on type/class of aircraft (at least one restriction below must be checked): a. deny use based on Federal standards b. capacity limits based on noisiness c. noise abatement takeoff/approach procedures d. landing fees based on noise or time of day e. nighttime restrictions			
6. Responsible implementing authority identified for each considered alternative?			
7. Other FAA recommendations			
B. Responsible implementing authority identified for each considered alternative?			
C. Analysis of alternative measures:			
1. measures clearly described?			
2. measures adequately analyzed?			
3. adequate reasoning for rejecting alternatives?			
D. Other actions recommended by the FAA?			
V. ALTERNATIVES RECOMMENDED for IMPLEMENTATION: [150.23(e), B150.7(c); 150.35(b), B150.5]			
A. Document clearly indicates:			
1. alternatives recommended for implementation?			
2. final recommendations are airport operator's, not those of consultant or third party?			
B. Do all program recommendations:			
1. relate directly or indirectly to reduction of noise and noncompatible land uses?			
2. contain description of contribution to overall effectiveness of program?			
3. noise/land use benefits quantified to extent possible?			
4. include actual/anticipated effect on reducing noise exposure within noncompatible areas shown on NEM?			

FAR PART 150 NOISE COMPATIBILITY PROGRAM CHECKLIST--PART I			
Airport Name: Akron-Canton Airport	REVIEWER:		
	Yes/No/ NA	Page/Other Reference	Notes/ Comments
5. effects based on relevant and reasonable expressed assumptions?			
6. have adequate supporting data to support its contribution to the noise/land use compatibility?			
C. Analysis appears to support program standards set forth in 150.35(b) and B150.5?			
D When use restrictions are recommended:			
1. Are alternatives with potentially significant noise/compatible land use benefits thoroughly analyzed so that appropriate comparisons and conclusions can be made?			
2. use restrictions coordinated with APP-600 prior to making determination on start of 180-days?			
E Do the following also meet Part 150 analytical standards?:			
1. formal recommendations which continue existing practices?			
2. new recommendations or changes proposed at end of Part 150 process?			
F Documentation indicates how recommendations may change previously adopted plans?			
G. Documentation also:			
1. identifies agencies which are responsible for implementing each recommendation?			
2. indicates whether those agencies have agreed to implement?			
3. indicates essential government actions necessary to implement recommendations?			
H. Time frame:			
1. includes agreed-upon schedule to implement alternatives?			
2. indicates period covered by the program?			
I. Funding/Costs:			
1. includes costs to implement alternatives?			
2. includes anticipated funding sources?			
VI. PROGRAM REVISION: [150.23(e)(9)] Supporting documentation includes provision for revision?			

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2 INTRODUCTION TO NOISE TERMINOLOGY AND EVALUATION

Noise is a complex physical quantity. The properties, measurement, and presentation of noise involve specialized terminology that can be difficult to understand. Throughout the Part 150 update, we will use graphics and everyday comparisons to communicate noise-related quantities and effects in reasonably simple terms.

To provide a basic reference on these technical issues, this chapter introduces fundamentals of noise terminology (Section 2.1), the effects of noise on human activity (Section 2.2), weather and distance effects (Section 2.3), and Part 150 noise-land use compatibility guidelines (Section 2.4).

2.1 Introduction to Noise Terminology

Part 150 relies largely on a measure of cumulative noise exposure over an entire calendar year, in terms of a metric called the Day-Night Average Sound Level (DNL). However, DNL does not provide an adequate description of noise for many purposes. A variety of other measures is available to address essentially any issue of concern, including:

- Sound Pressure Level, SPL, and the Decibel, dB
- A-Weighted Decibel, dBA
- Maximum A-Weighted Sound Level, L_{max}
- Sound Exposure Level, SEL
- Equivalent A-Weighted Sound Level, L_{eq}
- Day-Night Average Sound Level, DNL

2.1.1 Sound Pressure Level, SPL, and the 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 travels through the air in sound waves – tiny, quick oscillations of pressure just above and just below atmospheric pressure. The ear senses these pressure variations and – with much processing in our brain – translates them into “sound.”

Our ears are sensitive to a wide range of sound pressures. The loudest sounds that we can hear without pain contain about one million times more energy than the quietest sounds we can detect. To allow us to perceive sound over this very wide range, our ear/brain “auditory system” compresses our response in a complex manner, represented by a term called sound pressure level (SPL), which we express in units called decibels (dB).

Mathematically, SPL is a logarithmic quantity based on the ratio of two sound pressures, the numerator being the pressure of the sound source of interest (P_{source}), and the denominator being a reference pressure ($P_{reference}$)[6]

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

[6] The reference pressure is approximately the quietest sound that a healthy young adult can hear.

The logarithmic conversion of sound pressure to SPL 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 from about 40 to 100 dB.[7]

Because decibels are logarithmic quantities, we cannot use common arithmetic to combine them. For example, if two sound sources each produce 100 dB operating individually, when they operate simultaneously they produce 103 dB -- not the 200 dB we might expect. Increasing to four equal sources operating simultaneously will add another three decibels of noise, resulting in a total SPL of 106 dB. *For every doubling of the number of equal sources, the SPL goes up another three decibels.*

If one noise source is much louder than another is, the louder source "masks" the quieter one and the two sources together produce virtually the same SPL as the louder source alone. For example, a 100 dB and 80 dB sources produce approximately 100 dB of noise when operating together.

Two useful “rules of thumb” related to SPL are worth noting: (1) humans generally perceive a six to 10 dB increase in SPL to be about a doubling of loudness,[8] and (2) changes in SPL of less than about three decibels are not readily detectable outside of a laboratory environment.

2.1.2 A-Weighted Decibel

An important characteristic of sound is its frequency, or "pitch.” This is the per-second oscillation rate of the sound pressure variation at our ear, expressed in units known as Hertz (Hz).

When analyzing the total noise of any source, acousticians often break the noise into frequency components (or bands) to consider the “low,” “medium,” and “high” frequency components. This breakdown is important for two reasons:

- Our ear is better equipped to hear mid and high frequencies and is least sensitive to lower frequencies. Thus, we find mid- and high-frequency noise more annoying.
- Engineering solutions to noise problems differ with frequency content. 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. Most 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 so-called "A" filter (“A weighting”) generally does the best job of matching human response to most environmental noise sources, including natural sounds and sound from common transportation sources. “A-weighted decibels” are abbreviated “dBA.” Because of the correlation with our hearing, the U. S. Environmental Protection Agency (EPA) and by nearly every other federal and state agency have adopted A-weighted decibels as the metric for use in describing environmental and transportation noise.

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

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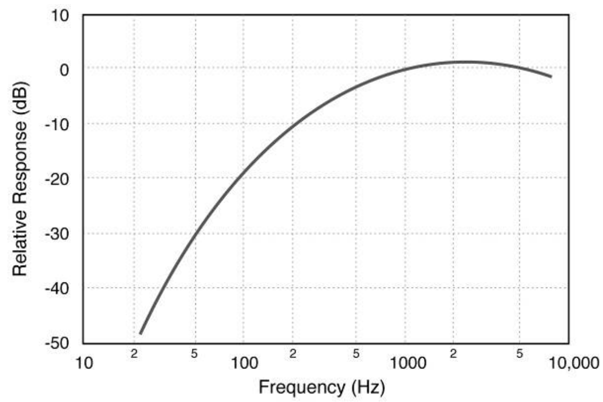
[7] The logarithmic ratio used in its calculation means that SPL changes relatively quickly at low sound pressures and more slowly at high pressures. This relationship matches human detection of changes in pressure. We are much more sensitive to changes in level when the SPL is low (for example, hearing a baby crying in a distant bedroom), than we are to changes in level when the SPL is high (for example, when listening to highly amplified music).

[8] A “10 dB per doubling” rule of thumb is the most often used approximation.

Figure 1 A-Weighting Frequency Response

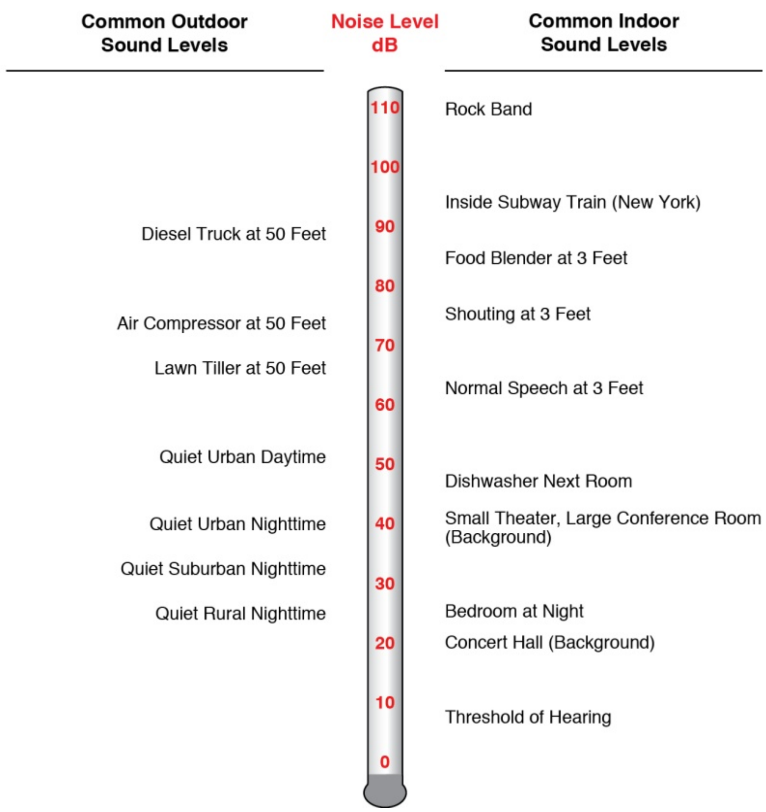
Source: Extract from Harris, Cyril M., Editor, "Handbook of Acoustical Measurements and Control," McGraw-Hill, Inc., 1991, pg. 5.13; HMMH



As the figure shows, A-weighting significantly de-emphasizes noise content at lower and higher frequencies where we do not hear as well, and has little effect, or is nearly "flat," in for mid-range frequencies between 1,000 and 5,000 Hz.

<u>All sound pressure levels presented in this document are A-weighted unless otherwise specified.</u>

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

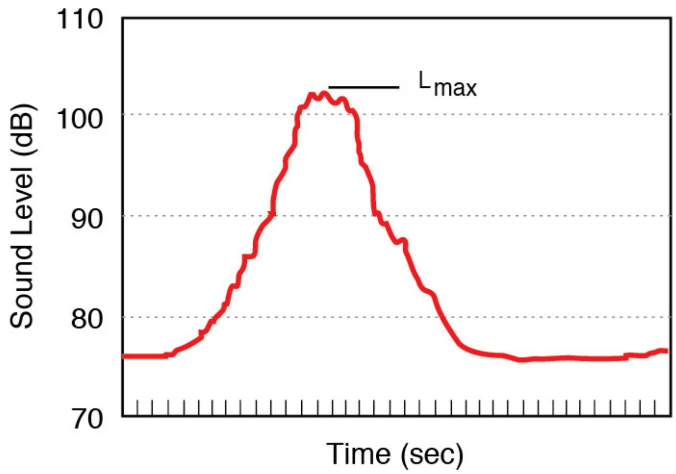


2.1.3 Maximum A-Weighted Sound Level, L_{max}

An additional dimension to environmental noise is that A-weighted levels vary with time. For example, the sound level increases as a car or aircraft approaches, then falls and blends into the background as the aircraft recedes into the distance. The background or "ambient" level continues to vary in the absence of a distinctive source, for example due to birds chirping, insects buzzing, leaves rustling, etc. It is often convenient to describe a particular noise "event" (such as a vehicle passing by, a dog barking, etc.) by its maximum sound level, abbreviated as L_{max}.

Figure 2 depicts this general concept, for a hypothetical noise event with an L_{max} of approximately 102 dB.

Figure 2 Variation in A-Weighted Sound Level over Time and Maximum Noise Level
Source: HMMH



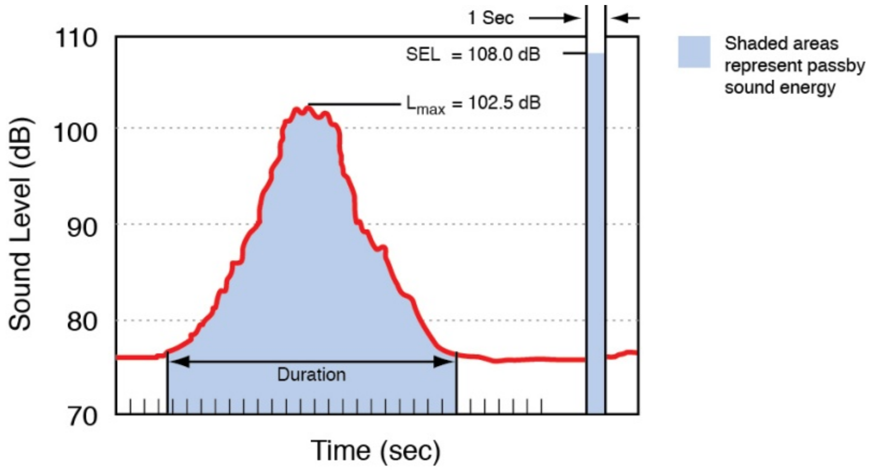
While the maximum level is easy to understand, it suffers from a serious drawback when used to describe the relative "noisiness" of an event such as an aircraft flyover; i.e., it describes only one dimension of the event and provides no information on the event's overall, or cumulative, noise exposure. 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 section introduces a measure that accounts for this concept of a noise "dose," or the cumulative exposure associated with an individual "noise event" such as an aircraft flyover.

2.1.4 Sound Exposure Level, SEL

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

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. In simple terms, SEL "compresses" the energy for the noise event into a single second. Figure 3 depicts this compression, for the same hypothetical event shown in Figure 2. Note that the SEL is higher than the L_{max}.

Figure 3 Graphical Depiction of Sound Exposure Level
Source: HMMH



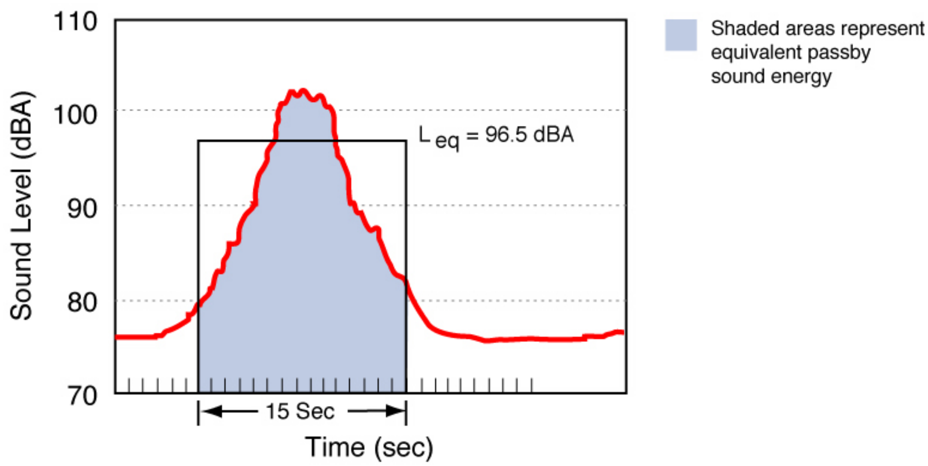
The "compression " of energy into one second means that a given noise event's SEL will almost always will be a higher value than its L_{max}. For most aircraft flyovers, SEL is roughly five to 12 dB higher than L_{max}. Adjustment for duration means that relatively slow and quiet propeller aircraft can have the same or higher SEL than faster, louder jets, which produce shorter duration events.

2.1.5 Equivalent A-Weighted Sound Level, L_{eq}

The Equivalent Sound Level, abbreviated L_{eq}, is a measure of the exposure resulting from the accumulation of sound levels over a particular period of interest; e.g., one hour, an eight-hour school day, nighttime, or a full 24-hour day. L_{eq} plots for consecutive hours can help illustrate how the noise dose rises and falls over a day or how a few loud aircraft significantly affect some hours.

L_{eq} may be thought of as the constant sound level over the period of interest that would contain as much sound energy as the actual varying level. It is a way of assigning a single number to a time-varying sound level. Figure 4 illustrates this concept for the same hypothetical event shown in Figure 2 and Figure 3. Note that the L_{eq} is lower than either the L_{max} or SEL.

Figure 4 Example of a 15-Second Equivalent Sound Level
Source: HMMH



2.1.6 Day-Night Average Sound Level, DNL or Ldn

Part 150 requires that airports use a measure of noise exposure that is slightly more complicated than L_{eq} to describe cumulative noise exposure – the Day-Night Average Sound Level, DNL.

The U.S. Environmental Protection Agency identified DNL as the most appropriate means of evaluating airport noise based on the following considerations.[9]

- The measure should be applicable to the evaluation of pervasive long-term noise in various defined areas and under various conditions over long periods.
- The measure should correlate well with known effects of the noise environment and on individuals and the public.
- The measure should be simple, practical, and accurate. In principal, it should be useful for planning as well as for enforcement or monitoring purposes.
- The required measurement equipment, with standard characteristics, should be commercially available.
- The measure should be closely related to existing methods currently in use.
- The single measure of noise at a given location should be predictable, within an acceptable tolerance, from knowledge of the physical events producing the noise.
- The measure should lend itself to small, simple monitors, which can be left unattended in public areas for long periods.

Most federal agencies dealing with noise have formally adopted DNL. The Federal Interagency Committee on Noise (FICON) reaffirmed the appropriateness of DNL in 1992. The FICON summary report stated; “There are no new descriptors or metrics of sufficient scientific standing to substitute for the present DNL cumulative noise exposure metric.”

In simple terms, DNL is the 24-hour L_{eq} with one adjustment; all noises occurring at night (defined as 10 p.m. through 7 a.m.) are increased by 10 dB, to reflect the added intrusiveness of nighttime noise events when background noise levels decrease. In calculating aircraft exposure, this 10 dB “penalty” is mathematically identical to counting each nighttime aircraft noise event ten times.

DNL can be measured or estimated. Measurements are practical only for obtaining DNL values for limited numbers of points, and, in the absence of a permanently installed monitoring system, only for relatively short periods. Most airport noise studies use computer-generated DNL estimates depicted as equal-exposure noise contours (much as topographic maps have contours of equal elevation). Part 150 *requires* that airports use computer-generated contours, as discussed in Section 4.1.

More specifically, Part 150 requires that Noise Exposure Maps depict the 65, 70, and 75 dB DNL contours for total annual operations for the existing and forecast conditions cases (2014 and 2019 in this study). The annual DNL is mathematically identical to the DNL for the average annual day; i.e., a day on which the number of operations is equal to the annual total divided by 365 (366 in a leap year).

Figure 5 graphically depicts the manner in which the nighttime adjustment applies in calculating DNL. Figure 6 presents representative outdoor DNL values measured at various U.S. locations.

[9] "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety," U. S. EPA Report No. 550/9-74-004, March 1974.

Figure 5 Example of a Day-Night Average Sound Level Calculation
Source: HMMH

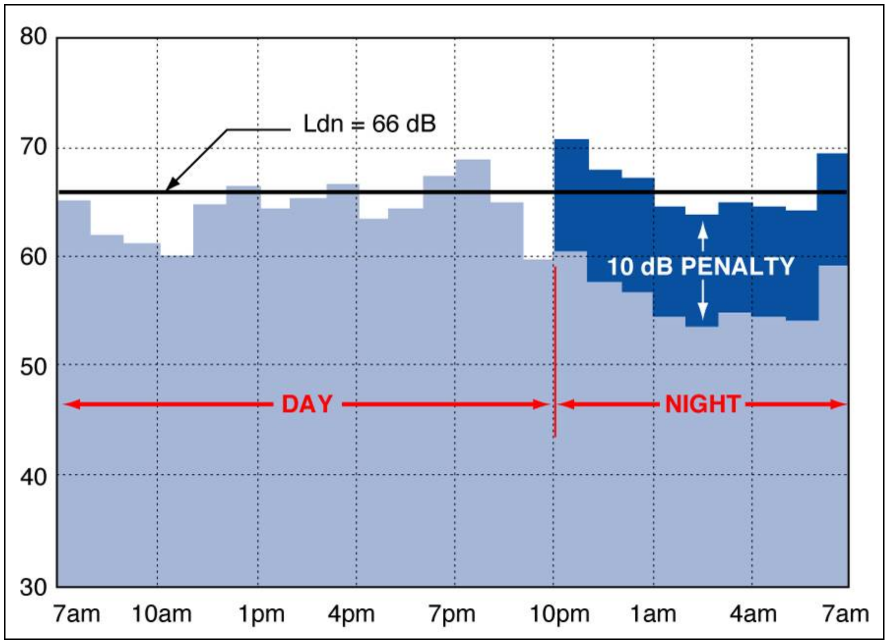
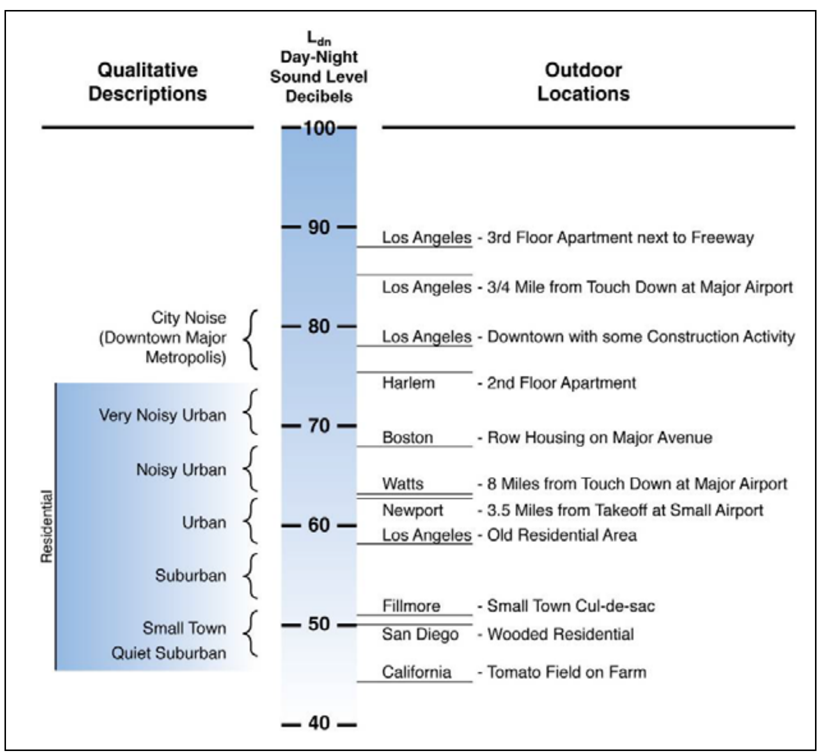


Figure 6 Examples of Measured Day-Night Average Sound Levels, DNL
Source: U.S. Environmental Protection Agency, "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety," March 1974, p.14.



2.2 Aircraft Noise Effects on Human Activity

Aircraft noise can be an annoyance and a nuisance. It can interfere with conversation and listening to television, disrupt classroom activities in schools, and disrupt sleep. Relating these effects to specific noise metrics helps in the understanding of how and why people react to their environment.

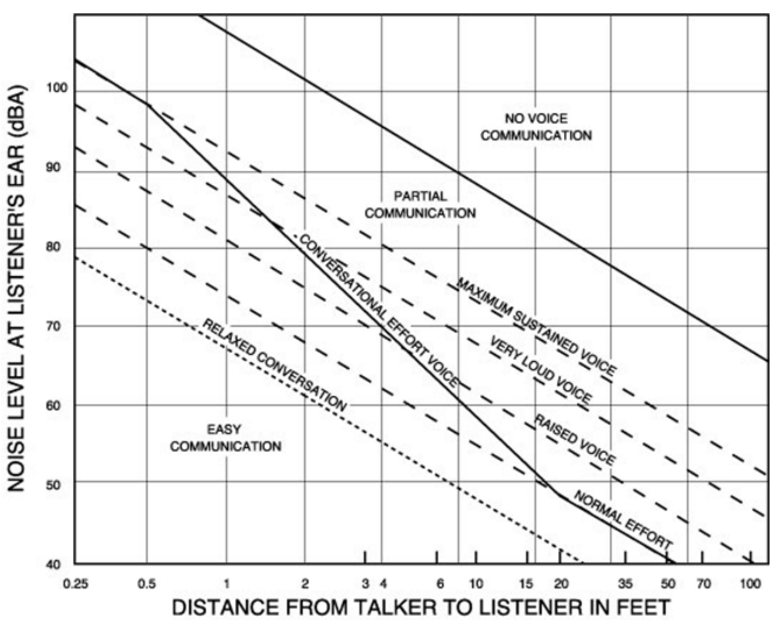
2.2.1 Speech Interference

One potential effect of aircraft noise is its tendency to "mask" speech, making it difficult to carry on a normal conversation. The sound level of speech decreases as the distance between a talker and listener increases. As the background sound level increases, it becomes harder to hear speech.

Figure 7 presents typical distances between talker and listener for satisfactory outdoor conversations, in the presence of different steady A-weighted background noise levels for raised, normal, and relaxed voice effort. As the background level increases, the talker must raise his/her voice, or the individuals must get closer together to continue talking.

Figure 7 Outdoor Speech Intelligibility

Source: U.S. Environmental Protection Agency, “Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety,” March 1974, p.D-5.



Satisfactory conversation does not always require hearing every word; 95% intelligibility is acceptable for many conversations. In relaxed conversation, however, we have higher expectations of hearing speech and generally require closer to 100% intelligibility. Any combination of talker-listener distances and background noise that falls below the bottom line in the figure (which roughly represents the upper boundary of 100% intelligibility) represents an ideal environment for outdoor speech communication. Indoor communication is generally acceptable in this region as well.

One implication of the relationships in Figure 7 is that for typical communication distances of three or four feet, acceptable outdoor conversations can be carried on in a normal voice as long as the background noise outdoors is less than about 65 dB. If the noise exceeds this level, as might occur when an aircraft passes overhead, intelligibility would be lost unless vocal effort were increased or communication distance were decreased.

Indoors, typical distances, voice levels, and intelligibility expectations generally require a background level less than 45 dB. With windows partly open, housing generally provides about 10 to 15 dB of interior-to-exterior noise level reduction. Thus, if the outdoor sound level is 60 dB or less, there a reasonable chance that the resulting indoor sound level will afford acceptable interior conversation. With windows closed, 24 dB of attenuation is typical.

2.2.2 Sleep Interference

Research on sleep disruption from noise has led to widely varying observations. In part, this is because (1) sleep can be disturbed without awakening, (2) the deeper the sleep the more noise it takes to cause arousal, (3) the tendency to awaken increases with age, and other factors. Figure 9 shows a recent summary of findings on the topic.

Figure 8 Sleep Interference

Source: Federal Interagency Committee on Aircraft Noise (FICAN), "Effects of Aviation Noise on Awakenings from Sleep," June 1997, pg. 6

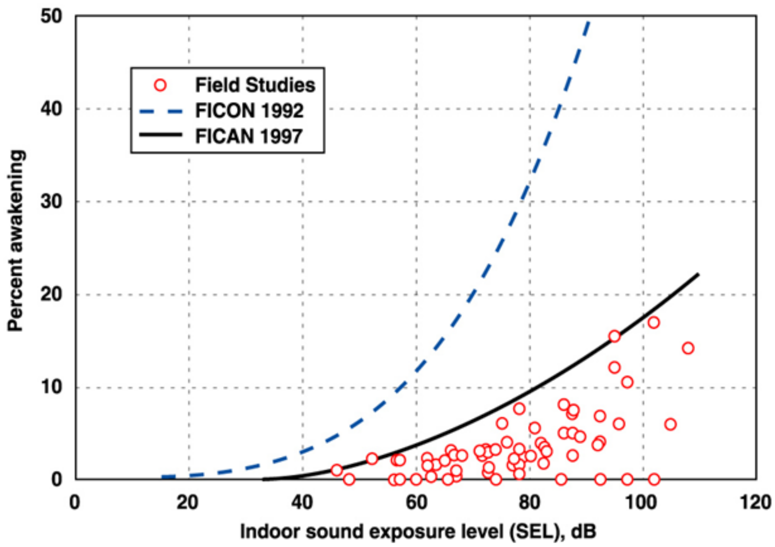


Figure 9 uses indoor SEL as the measure of noise exposure; current research supports the use of this metric in assessing sleep disruption. An indoor SEL of 80 dBA results in a maximum of 10% awakening. Assuming the typical windows-open interior-to-exterior noise level reduction of approximately 12 dBA and a typical L_{max} value for an aircraft flyover 12 dBA lower than the SEL value, an interior SEL of 80 dBA roughly translates into an exterior L_{max} of the same value.[10]

2.2.3 Community Annoyance

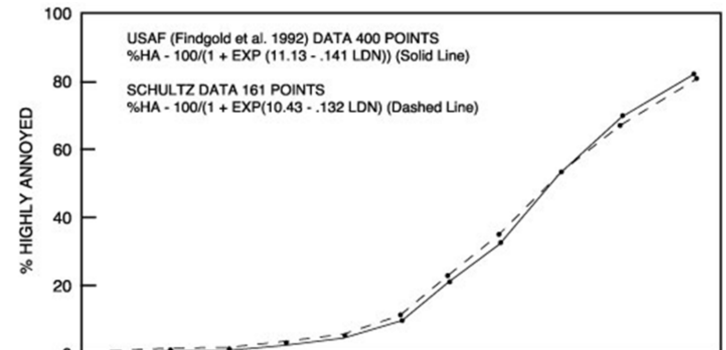
Numerous psychoacoustic surveys provide substantial evidence that individual reactions to noise vary widely with noise exposure level. Since the early 1970s, researchers have determined (and subsequently confirmed) that aggregate community response is generally predictable and relates

[10] The awakening data presented in Figure 9 apply only to individual noise events. The American National Standards Institute (ANSI) has published a standard that provides a method for estimating the number of people awakened at least once from a full night of noise events: ANSI/ASA S12.9-2008 / Part 6, "Quantities and Procedures for Description and Measurement of Environmental Sound – Part 6: Methods for Estimation of Awakenings Associated with Outdoor Noise Events Heard in Homes." This method can use the information on single events computed by a program such as the FAA's Integrated Noise Model, to compute awakenings.

reasonably well to cumulative noise exposure such as DNL. Figure 9 depicts the widely recognized relationship between environmental noise and the percentage of people "highly annoyed," with annoyance being the key indicator of community response usually cited in this body of research.

Figure 9 Percentage of People Highly Annoyed

Source: FICON, "Federal Agency Review of Selected Airport Noise Analysis Issues," September 1992

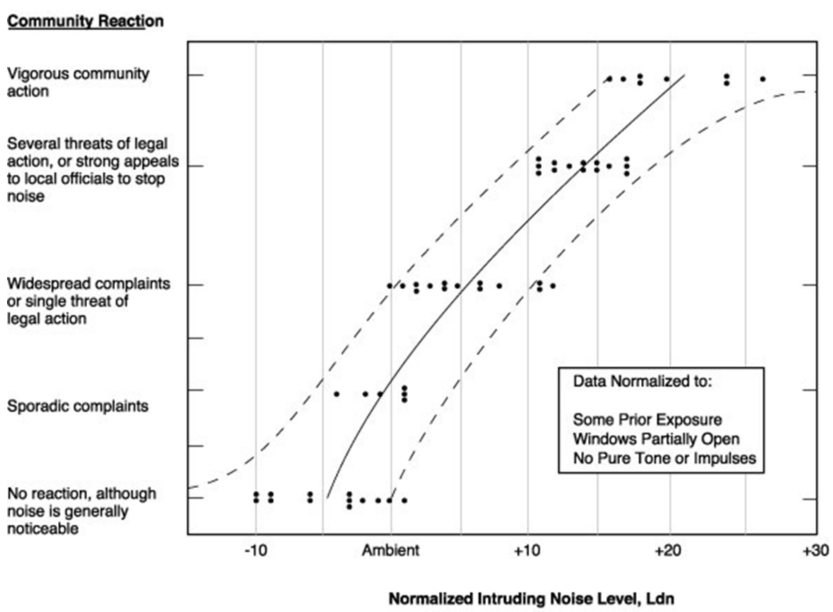


Day - Night Average Sound Level in dB		40	45	50	55	60	65	70	75	80	85	100
Calculated %HA Points	USAF	0.41	0.831	1.66	3.31	6.48	12.29	22.1	36.47	53.74	70.16	82.64
	SCHULTZ	0.576	1.11	2.12	4.03	7.52	13.59	23.32	37.05	53.25	68.78	81

Separate work by the EPA has shown that overall community reaction to a noise environment is also dependent on DNL. Figure 9 depicts this relationship.

Figure 10 Community Reaction as a Function of Outdoor DNL

Source: Wyle Laboratories, Community Noise, prepared for the U.S. Environmental Protection Agency, Office of Noise Abatement and Control, Washington, D.C., December 1971, pg. 63



Data summarized in the figure suggest that little reaction would be expected for intrusive noise levels five decibels below the ambient, while widespread complaints can be expected as intruding noise exceeds background levels by about five decibels. Vigorous action is likely when levels exceed the background by 20 dB.

2.3 Effects of Weather and Distance

Participants in airport noise studies often express interest in two sound-propagation issues: (1) weather and (2) source-to-listener distance.

2.3.1 Weather-Related Effects

Weather (or atmospheric) conditions that can influence the propagation of sound include humidity, precipitation, temperature, wind, and turbulence (or gustiness). The effect of wind – turbulence in particular – is generally more important than the effects of other factors. Under calm-wind conditions, the importance of temperature (in particular vertical "gradients") can increase, sometimes to very significant levels. Humidity generally has little significance relative to the other effects.

Influence of Humidity and Precipitation

Humidity and precipitation rarely effect sound propagation in a significant manner. Humidity can reduce propagation of high-frequency noise under calm-wind conditions. In very cold conditions, listeners often observe that aircraft sound "tinny," because the dry air increases the propagation of high-frequency sound. Rain, snow, and fog also have little, if any noticeable effect on sound propagation. A substantial body of empirical data supports these conclusions.[11]

Influence of Temperature

The velocity of sound in the atmosphere is dependent on the air temperature.[12] As a result, if the temperature varies at different heights above the ground, sound will travel in curved paths rather than straight lines. During the day, temperature normally decreases with increasing height. Under such "temperature lapse" conditions, the atmosphere refracts ("bends") sound waves upwards and an acoustical shadow zone may exist at some distance from the noise source.

Under some weather conditions, an upper level of warmer air may trap a lower layer of cool air. Such a "temperature inversion" is most common in the evening, at night, and early in the morning when heat absorbed by the ground during the day radiates into the atmosphere.[13] The effect of an inversion is just the opposite of lapse conditions. It causes sound propagating through the atmosphere to refract downward.

The downward refraction caused by temperature inversions often allows sound rays with originally upward-sloping paths to bypass obstructions and ground effects, increasing noise levels at greater distances. This type of effect is most prevalent at night, when temperature inversions are most common and when wind levels often are very low, limiting any confounding factors.[14] Under extreme conditions, one study found that noise from ground-borne aircraft might be amplified 15 to 20 dB by a temperature inversion. In a similar study, noise caused by an aircraft on the ground

[11] Ingard, Uno. "A Review of the Influence of Meteorological Conditions on Sound Propagation," *Journal of the Acoustical Society of America*, Vol. 25, No. 3, May 1953, p. 407.

[12] In dry air, the approximate velocity of sound can be obtained from the relationship:

$c = 331 + 0.6T_c$ (c in meters per second, T_c in degrees Celsius). Pierce, Allan D., *Acoustics: An Introduction to its Physical Principles and Applications.* McGraw-Hill. 1981. p. 29.

[13] Embleton, T.F.W., G.J. Thiessen, and J.E. Piercy, "Propagation in an inversion and reflections at the ground," *Journal of the Acoustical Society of America*, Vol. 59, No. 2, February 1976, p. 278.

[14] Ingard, p. 407.

registered a higher level at an observer location 1.8 miles away than at a second observer location only 0.2 miles from the aircraft[15].

Influence of Wind

Wind has a strong directional component that can lead to significant variation in propagation. In general, receivers that are downwind of a source will experience higher sound levels, and those that are upwind will experience lower sound levels. Wind perpendicular to the source-to-receiver path has no significant effect.

The refraction caused by wind direction and temperature gradients is additive.[16] One study suggests that for frequencies greater than 500 Hz, the combined effects of these two factors tends towards two extreme values: approximately 0 dB in conditions of downward refraction (temperature inversion or downwind propagation) and -20 dB in upward refraction conditions (temperature lapse or upwind propagation). At lower frequencies, the effects of refraction due to wind and temperature gradients are less pronounced[17].

Wind turbulence (or "gustiness") can also affect sound propagation. Sound levels heard at remote receiver locations will fluctuate with gustiness. In addition, gustiness can cause considerable attenuation of sound due to effects of eddies traveling with the wind. Attenuation due to eddies is essentially the same in all directions, with or against the flow of the wind, and can mask the refractive effects discussed above.[18]

2.3.2 Distance-Related Effects

People often ask how distance from an aircraft to a listener affects sound levels. Changes in distance may be associated with varying terrain, offsets to the side of a flight path, or aircraft altitude. The answer is a bit complex, because distance affects the propagation of sound in several ways.

The principal effect results from the fact that any emitted sound expands in a spherical fashion – like a balloon – as the distance from the source increases, resulting in the sound energy being spread out over a larger volume. With each doubling of distance, spherical spreading reduces instantaneous or maximum level by approximately six decibels, and SEL by approximately three decibels.

"Atmospheric absorption" is a secondary effect. As an overall example, increasing the aircraft-to-listener distance from 2,000' to 3,000' could produce reductions of about four to five decibels for instantaneous or maximum levels, and of about two to four decibels for SEL, under average annual weather conditions around CAK. This absorption effect drops off relatively rapidly with distance. The INM takes these reductions into account.

2.4 Noise / Land Use Compatibility Guidelines

DNL estimates have two principal uses in a Part 150 study:

1. Provide a basis for comparing existing noise conditions to the effects of noise abatement procedures and/or forecast changes in airport activity.

[15]Dickinson, P.J., "Temperature Inversion Effects on Aircraft Noise Propagation," (Letters to the Editor) *Journal of Sound and Vibration.* Vol. 47, No. 3, 1976, p. 442.

[16]Piercy and Embleton, p. 1412. Note, in addition, that as a result of the scalar nature of temperature and the vector nature of wind, the following is true: under lapse conditions, the refractive effects of wind and temperature add in the upwind direction and cancel each other in the downwind direction. Under inversion conditions, the opposite is true.

[17]Piercy and Embleton, p. 1413.

[18]Ingard, pp. 409-410.

2. Provide a quantitative basis for identifying potential noise impacts.

Both of these functions require the application of objective criteria for evaluating noise impacts. Part 150 Appendix A presents land use compatibility guidelines as a function of DNL values. Table 3 reproduces those guidelines.

The Akron-Canton Airport Authority and surrounding land-use control jurisdictions adopted the FAA guidelines in both preceding CAK Part 150 studies. Consistent with FAA policy, this study will continue to use those guidelines for determination of land use compatibility in this study.

Table 3 Part 150 Airport Noise / Land Use Compatibility Guidelines
Source: Part 150, Appendix A, Table 1

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

Key to Table 3

SLCUM: Standard Land Use Coding Manual.

Y(Yes): Land use and related structures compatible without restrictions.

N(No): Land use and related structures are not compatible and should be prohibited.

NLR: Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.

25, 30, or 35: Land use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dBA must be incorporated into design and construction of structure.

Notes for Table 3

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

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

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

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

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

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

(6) Residential buildings require an NLR of 25.

(7) Residential buildings require an NLR of 30

(8) Residential buildings not permitted.

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3 NOISE MEASUREMENTS

This chapter summarizes the portable noise measurement program conducted in the Noise Exposure Map phase of this Part 150 update study. Section 3.1 summarizes measurement program objectives. Section 3.2 summarizes measurement program design and execution. Section 3.3 presents a summary of the DNL measurements. Section 3.4 presents site-by-site single event and cumulative exposure results.

3.1 Measurement Program Objectives

Part 150 does not require airport operators to measure noise levels. Moreover, the FAA does not permit airports to use noise measurements to "adjust" or "calibrate" the noise modeling process.[19] However, most airports operators and other noise stakeholders find that measurements are valuable for a number of informational and assessment purposes, which the FAA supports considering.

CAK, the Advisory Committee, and the consulting team identified the following primary measurement objectives:

- assessing the reasonableness of modeled estimates
- illustrating the effect of existing operations
- comparing aircraft and non-aircraft noise levels
- sampling cumulative exposure over several days at a few key locations
- documenting noise exposure patterns over a sample of days

3.2 Measurement Program Design and Execution

To accomplish the measurement objectives, HMMH staff conducted noise measurements over the week of June 3 – 10, 2013, at the six locations shown on Figure 11.

3.2.1 Measurement Site Selection

CAK and the consulting team selected measurement locations in consultation with the Advisory Committee, including discussions at committee meetings prior to the measurements and input provided by committee members in follow-up communications. Actual flight operations data ("radar data") that CAK and the consulting team obtained for the months of January, April, July, and October of 2012 provided factual input on actual flight paths for consideration in the site selection process.[20] Section 4.6 discusses these radar data, which the consulting team also used for the development of a variety of noise modeling inputs.

Major site-selection criteria included:

- Sites were in residential areas, to focus on the most sensitive land use.
- Sites were near major flight corridors, to maximize the number of operations monitored.

[19] Draft FAA Advisory Circular 150/5020-1, "Airport Noise and Land Use Compatibility Planning," paragraph 6.10, "Using Short-Term Monitoring Data," page 56, January 13, 2009.

[20] The operations data were purchased from PASSUR Aerospace. See: http://www.passur.com/.

- Sites were at a variety of distances from the airport, to assist in assessing variation associated with aircraft altitude.
- In each identified general measurement area, pragmatic reasons determined specific sites, such as: (1) reasonable isolation from unusual non-aircraft levels, (2) equipment security, (3) measurement staff access, and (4) line-of-sight views from the microphone to the most common flight paths, to avoid acoustic shielding and to permit the measurement staff to observe and log the activity.

The overall objective was to select sites that provided representative data on a broad range of representative aircraft operations and geographic areas around the airport.

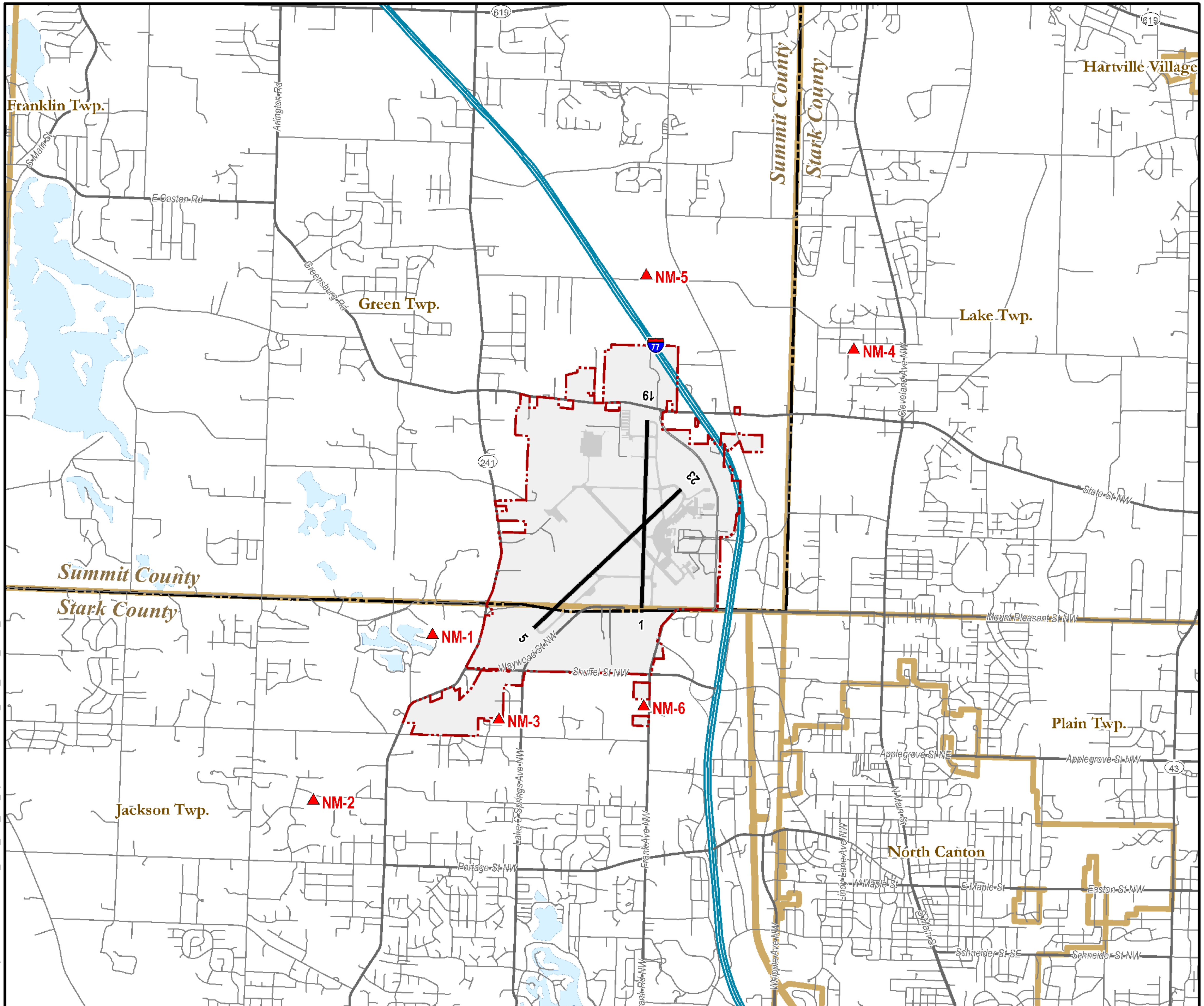
3.2.2 Measurement Procedures and Equipment

Measurements were conducted in accordance with requirements of Part 150 Section A150.5 “Noise measurement procedures and equipment,” using HMMH-owned Larson-Davis Model 870 (“LD 870”) monitors. These instruments are portable devices capable of long-term unattended operation. The monitors meet American National Standards Institute (ANSI) S1.4-1983 standards for Type I “precision” sound level meters, which exceed Part 150 accuracy requirements. HMMH staff calibrated every monitor in the field before and after each of the measurement sessions. The calibrations are traceable to the United States National Institute of Standards and Technology ("NIST").

The monitors measure cumulative exposure levels, such as hourly equivalent sound level (L_{eq}) and the 24-hour day-night average sound level (DNL), and noise levels associated with individual aircraft events, including maximum sound level (L_{max}) and sound exposure level (SEL). Section 2.1 introduces these metrics. All measurements were A-weighted, as discussed in Section 2.1.2, and as required in Part 150 Section A150.5.

The units operated on a 24-hour basis during the eight-day measurement session, with breaks for relocation, battery changes, calibrations, and other maintenance requirements. Three HMMH staff conducted the measurements. To the extent feasible during daylight hours, the staff spent time at the monitoring locations, on a rotating basis, to observe and log aircraft and non-aircraft noise-producing events, weather data, and other relevant information. The clocks on each of the noise monitors were time-synchronized to facilitate the correlation of aircraft noise events measured at multiple sites and of aircraft noise events with flight events.

Table 4 lists the monitoring locations, the dates and times of measurements, and the number of hours of monitoring and observations at each site. Overall, the monitoring program encompassed approximately 493 hours of measurements and 59 hours of observations at the six locations.



AKRON-CANTON AIRPORT

Figure 11
Portable Noise Monitoring Sites
June 3 – 10, 2013
14 CFR Part 150 Update

Airport Property Boundary
Airport Runway
NM-# Portable Noise Monitoring Sites

County Boundary
Township Boundary

Interstate Highways
Primary Roads
Local Roads

Water Bodies

North

0 4,000 8,000 Feet

HARRIS MILLER MILLER & HANSON INC.

Path: G:\Projects\305XXX\305231_CAK_Part_150_Update\GIS\305231_CAK_Noise_Meas_Sites.mxd

Table 4 Summary of Noise Measurement Site Visits, June 3 – 10, 2013
Source: HMMH, June 2013

Site #	Address	Start		End		Approximate Hours	
		Date	Time	Date	Time	Monitored	Observed
1	95 Spruce Dr. NW	6/3/2013	7:02 p.m.	6/10/2013	9:38 a.m.	159	20
2	7601 Pine Ridge St. NW	6/7/2013	5:03 p.m.	6/10/2013	10:03 a.m.	66	6
3	6167 Redford Rd. NW	6/4/2013	2:34 p.m.	6/10/2013	10:26 a.m.	141	20
4	3527 Northgate St. NW	6/4/2013	3:46 p.m.	6/7/2013	4:17 p.m.	74	4
5	2475 Wise Rd. NW	6/3/2013	12:44 p.m.	6/4/2013	1:40 p.m.	26	5
6	7979 Frank Ave. NW	6/3/2013	1:40 p.m.	6/4/2013	3:04 p.m.	27	4

3.3 Day-Night Average Sound Level Results

Table 5 summarizes the Day-Night Average Sound Level (DNL) measurement results at the six measurement locations.

Table 5 Summary of Day-Night Average Sound Level (DNL) Measurements
Source: HMMH, June 2013

Site #	Daily DNL (dBA)								Overall DNL (dBA)[2]
	Monday June 3	Tuesday June 4	Wednes. June 5	Thursday June 6	Friday June 7	Saturday June 8	Sunday June 9	Monday June 10	
1	49[1]	54	52	64	51	52	50	58[1]	57
2	-	-	-	-	51[1]	53	50	52[1]	52
3	-	55[1]	54	56	51	56	52	55[1]	54
4	-	51[1]	55	54	54[1]	-	-	-	54
5	63[1]	64[1]	-	-	-	-	-	-	64
6	60[1]	59[1]	-	-	-	-	-	-	59

[1] DNL for partial day calculated using proper weighting of day and night contributions.
[2] Overall DNL values calculated using proper weighting of day and night contributions.

3.4 Site-by-Site Results

This section provides site-by-site discussions of the measurement results. The summaries present the maximum A-weighted sound level (L_{max}) and hourly equivalent sound level (L_{eq}) results in graphical form, as described below.

3.4.1 Presentation of L_{max} Measurements

L_{max} measurements provide a basis for comparing noise produced by aircraft and non-aircraft sources at a site, and for comparing single event levels among sites. For each measurement location, a figure presents L_{max} data in a “thermometer” form. Representative sound levels from illustrative non-aircraft sources are on the left of the thermometer. The ranges of L_{max} values for observed aircraft operations (and for any events caused by non-aircraft sources that were measured at the site) are on the right. These figures provide a visual basis for comparing levels caused by different types of aircraft and operations, and for comparing sound levels at different sites. The figures group the aircraft data by major aircraft type and operation categories. (Only a subset of these categories applies at any given site.)

The aircraft type categories include:

- "Air Carrier Jet" – commercial jet aircraft with greater than 90 passenger seats[21]
- "Regional Jet" – commercial jet aircraft with less than 90 passenger seats
- "Corporate Jet" – corporate jet aircraft
- "Unknown Jet" – jet-powered aircraft of unknown size
- "Twin Engine Turbo Prop" – twin engine, turbine-powered, propeller-driven aircraft
- "Twin Engine Piston Prop" – twin engine, piston-powered, propeller-driven aircraft
- "Single Engine Turbo Prop" – single engine, turbine-powered, propeller-driven aircraft
- "Single Engine Piston Prop" – single engine, piston-powered, propeller-driven aircraft
- "Unknown Prop" – propeller-driven aircraft, type and number of engines unknown
- "Other" – includes noise events from non-aircraft sources

The monitors automatically identified a "noise event" – regardless of source – when the measured level exceeded 65 decibels for at least five seconds. Consistent with accepted practice, these decibel and time thresholds are as non-restrictive as feasible, to maximize the number of noise events captured; i.e., set as low as possible without being so low that background noise would cause events to merge together. The thresholds have no effect on the cumulative noise exposure measurements; i.e., L_{eq} or DNL. During periods when an observer was at a site, the observer read the maximum level directly from the monitor display regardless of duration; i.e., for events which never exceeded 65 dBA. In some cases, the observers could not identify the type of aircraft visually, but could identify the powerplant (jet vs. prop) audibly, leading to the "Unknown Jet" and "Unknown Prop" categories.

3.4.2 Presentation of Hourly L_{eq} Results

Each site discussion also includes figures that graphically present hourly L_{eq} results in two formats: (1) for the full period of measurement and (2) for each calendar day. The calendar day figures identify the DNL value. For any days with fewer than 24 hours of data, the DNL calculations take into account the proper weighting of day and night hours. The hours indicated on the figures represent the starting time of the measurement interval; e.g., hour 10 is the hour starting at 10 a.m. The figures use a 24-hour clock ("military time"), where the hour starting at 1 p.m. is hour 13; 2 p.m. is hour 14, through the hour starting at 11 p.m., which is hour 23.

[21] "Reverse Thrust" – At some sites, the noise from thrust reversers used to slow aircraft on arrival were measured and reported.

3.4.3 Site 1: 95 Spruce Dr. NW

Site 1 is located approximately 2,500 feet northwest of the extended centerline of Runway 5/23, approximately 4,000 feet southwest of the Runway 5 approach end (Runway 23 departure end). The monitor was in the rear yard of a single-family residence, between the house and a lake that abuts the property (at a lower elevation). It was in a small community with little vehicular traffic, so traffic noise was not an issue.

As shown in Figure 13, arrivals and departures on and off both ends of Runway 5/23 were the principal aircraft operations affecting the site during the measurements. Other monitored operations include start-of-takeoff roll thrust from jet departures on Runway 5, a few Runway 1 departures (largely start-of-takeoff roll thrust as well), and reverse thrust from jet arrivals on Runways 5 and 23. During the measurement period, arrivals and departures of jet aircraft made up almost 80% of the observed operations. Tree cover at the site often made it difficult to see aircraft clearly (or at all), so many of the measured jet operations are classified as "Unknown Jets." The identified jet operations are split between corporate jets and air carrier jets.

Runway 23 departures generally produced the highest L_{max} values during the measurement period. A single-engine piston-propeller aircraft produced an L_{max} of 74 dBA. One session of Lakota helicopter pattern work by the Ohio Army National Guard produced four events, for which the highest L_{max} was also 74 dBA. A jet departure on Runway 23 produced a similarly high L_{max} of 73 dBA. The highest measured L_{max} for Runway 5 start-of-takeoff-roll operations was 68 dBA.

Of the approximately 159 hours of measurements at Site 1, 157 were full hours. As shown in Figure 14, the hourly L_{eq} ranged approximately from 30 to 63 dBA. The long measurement duration at the site requires a small scale in that figure. For easier detailed review, Figure 15 presents the hourly data for each calendar day.

The measured hourly levels follow a typical daily pattern, falling during late-night hours, increasing in the morning, usually starting around 7 a.m. (0700 hour), and remaining high until the early evening, through the hour starting at 7 p.m. (1900). This type of pattern is very common at locations affected by human activity – whether related to aircraft operations, surface traffic, or other community sources, and occurred at the other measurement locations.

The highest hourly L_{eq} was for the hour starting at 5 a.m. (0500) on the morning of June 6, with similarly high levels from 3 a.m. (0300) to 6 a.m. (0600). Non-aircraft sources almost certainly produced these relatively high levels. Investigation into noise events occurring during this hour revealed that they were above the 65-dBA threshold for several minutes, whereas an aircraft event would only last about 30 seconds or less. In addition, the events had maximum levels that were only slightly above the threshold and the level held relatively steady in the 60 to 65 dBA range over the duration of each event. All of these characteristics suggest that the most likely source was insects or – somewhat less likely – a bird chirping near the microphone.

It rained most of the day on June 6th, resulting in artificially elevated noise levels associated with water hitting the microphone, in addition to the normal increase in noise associated with the rain hitting leaves and other surrounding surfaces.

Including the effects of rain on the 6th, the overall measured DNL at Site 1 was 57 dBA, seven decibels below Site 5 (the site with the highest overall DNL), and five decibels above Site 2 (the site with the lowest overall DNL).

Figure 12 Site 1 Measured Maximum A-Weighted Levels
Source: HMMH June 2013

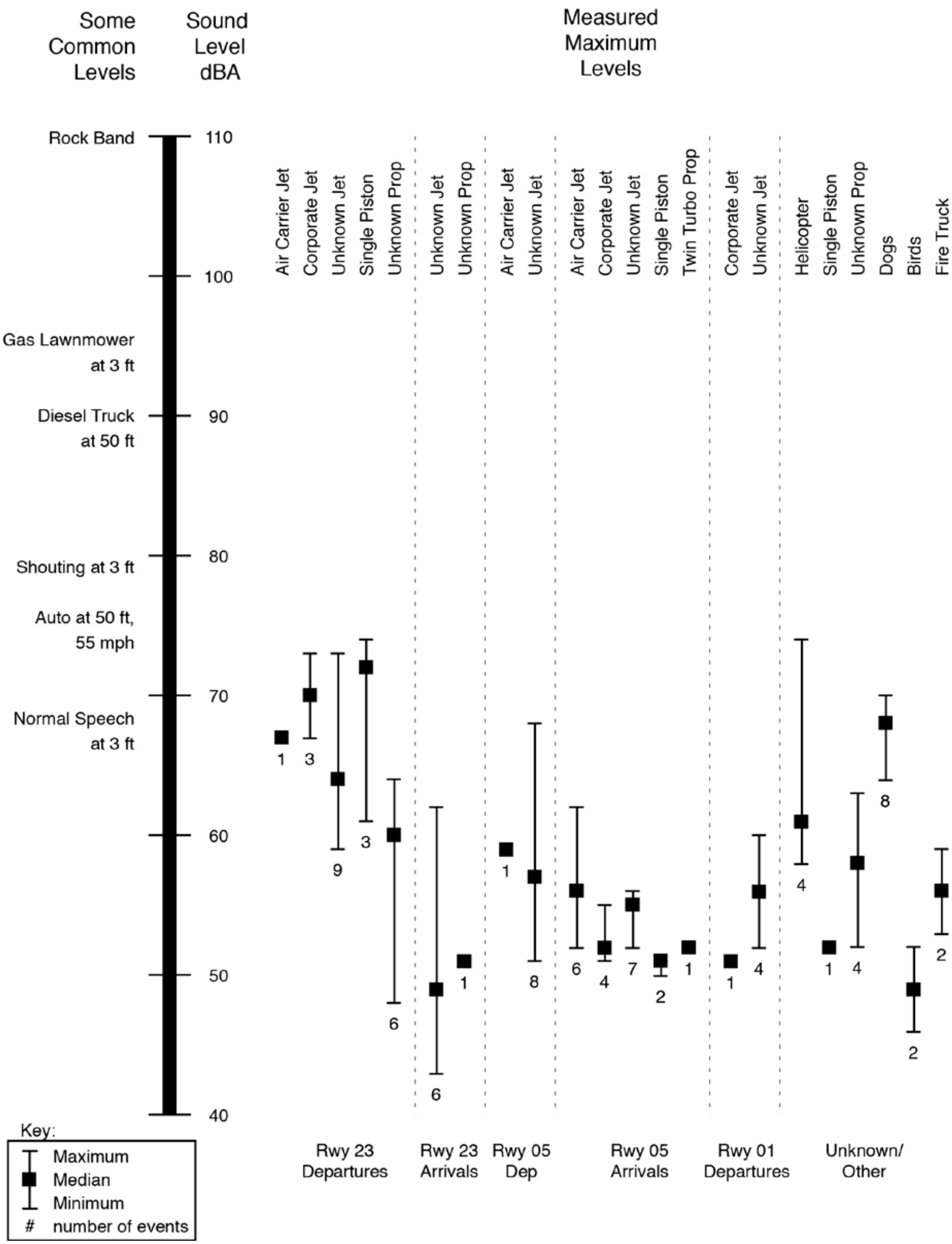


Figure 13 Site 1 Measured Hourly Noise Levels (L_{eq}), Full Duration
Source: HMMH June 2013

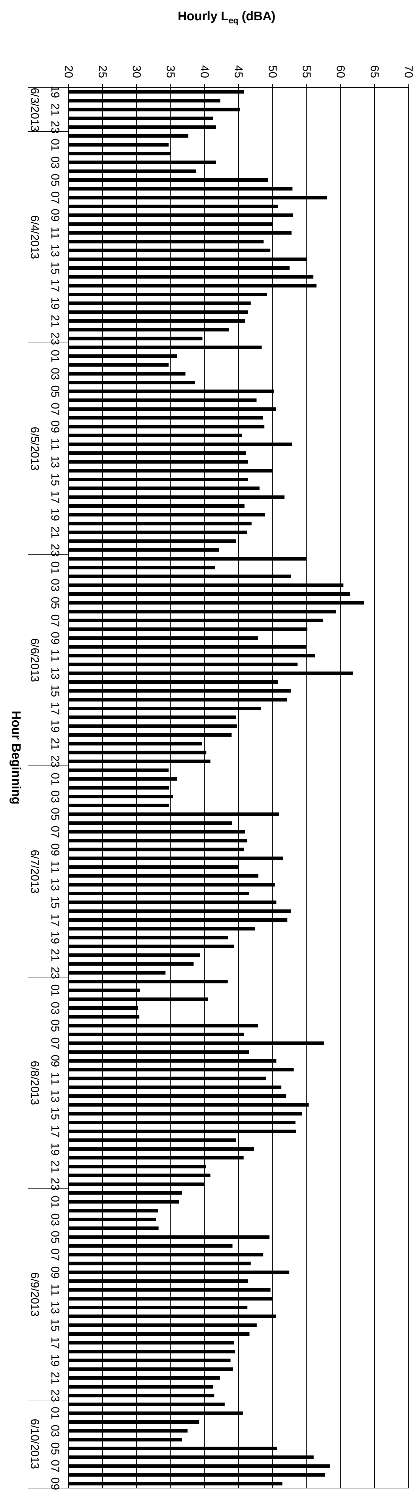
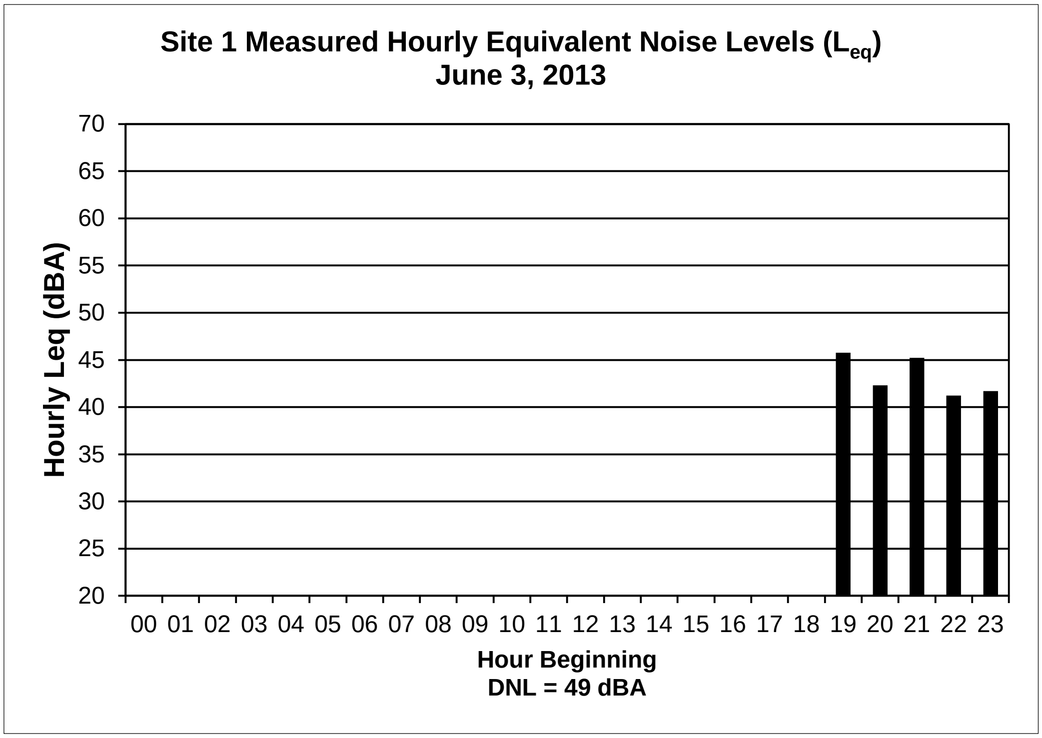
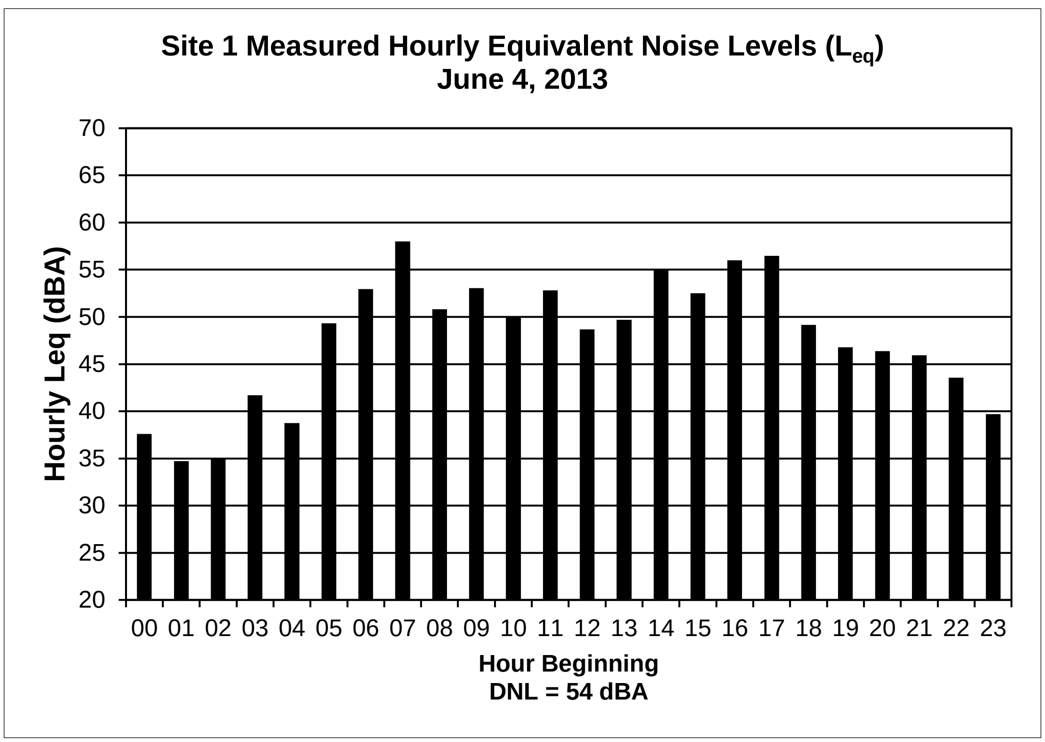
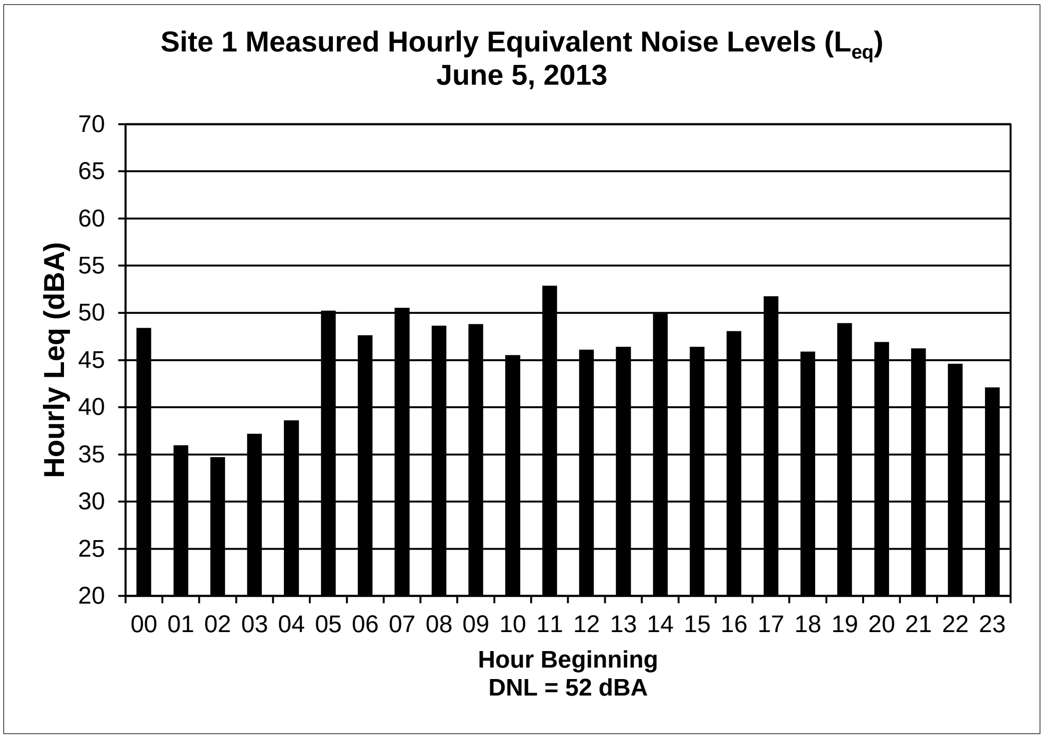
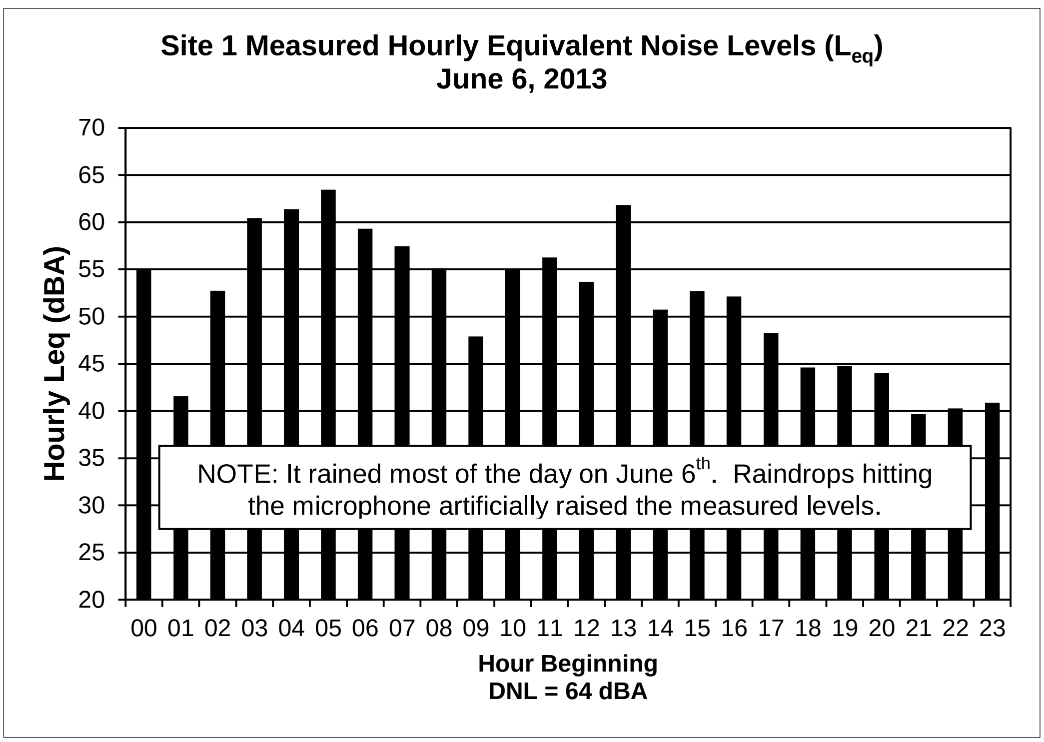


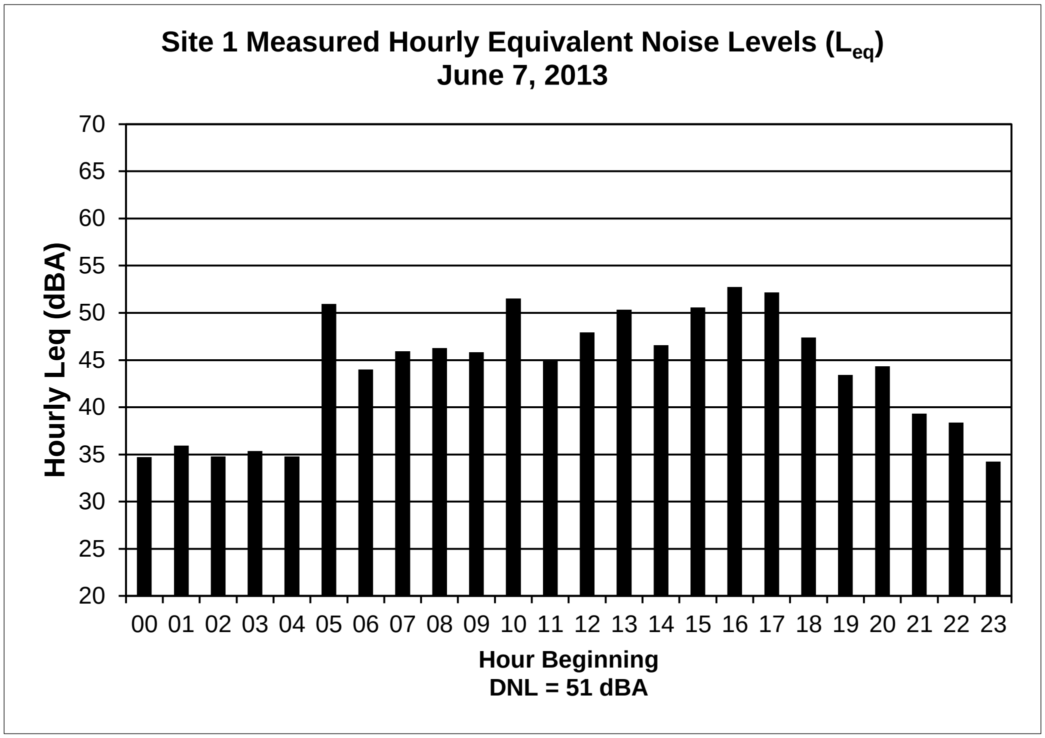
Figure 14 Site 1 Measured Hourly Noise Levels (L_{eq}), Calendar Days
Source: HMMH June 2013

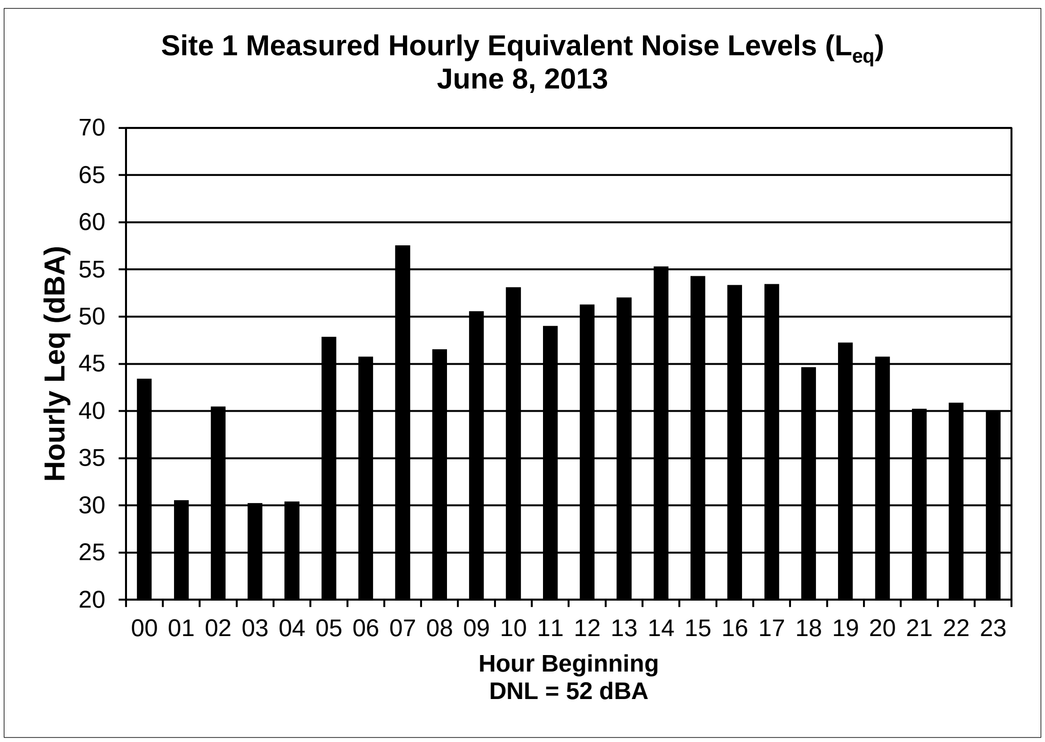


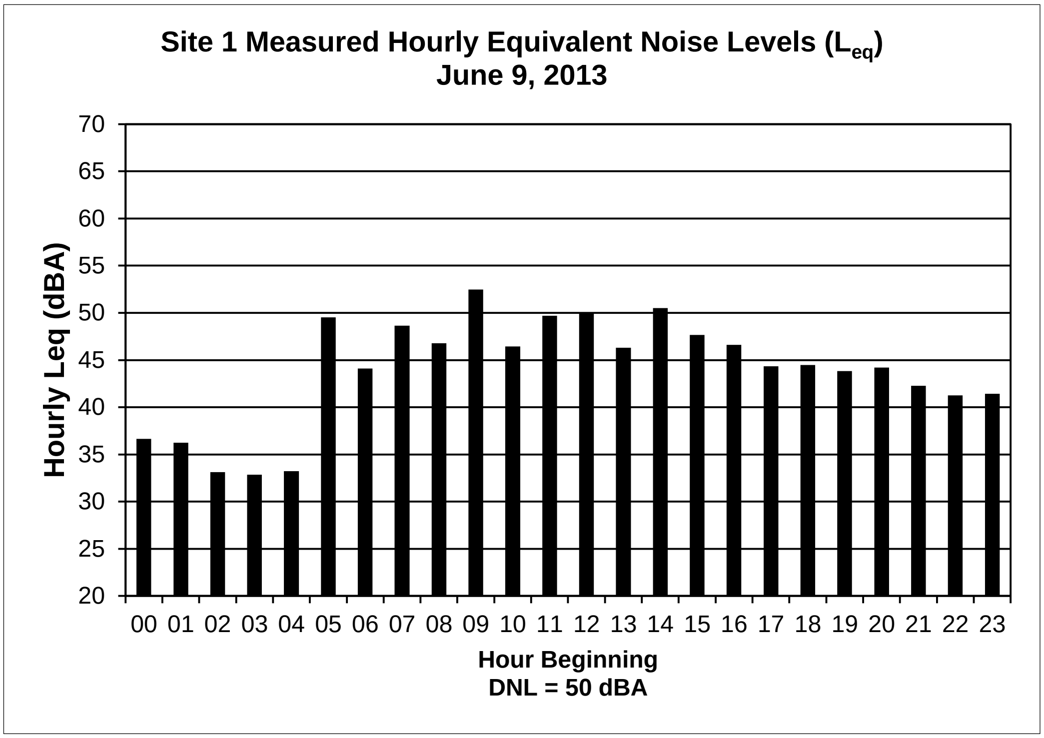


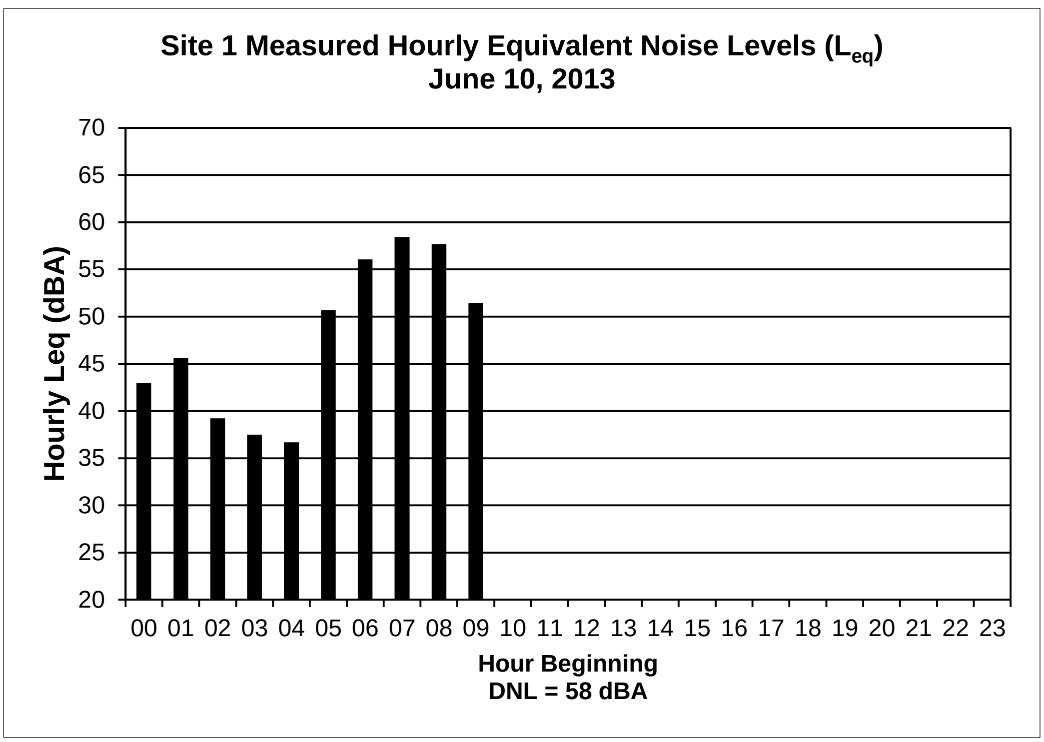

Site 1 Measured Hourly Equivalent Noise Levels (L_{eq})
June 5, 2013
Hourly Leq (dBA)
20
25
30
35
40
45
50
55
60
65
70
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hour Beginning
DNL = 52 dBA


Site 1 Measured Hourly Equivalent Noise Levels (L_{eq})
June 6, 2013
Hourly Leq (dBA)
20
25
30
35
40
45
50
55
60
65
70
NOTE: It rained most of the day on June 6th. Raindrops hitting the microphone artificially raised the measured levels.
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hour Beginning
DNL = 64 dBA


Site 1 Measured Hourly Equivalent Noise Levels (L_{eq})
June 7, 2013
Hourly Leq (dBA)
70
65
60
55
50
45
40
35
30
25
20
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hour Beginning
DNL = 51 dBA


Site 1 Measured Hourly Equivalent Noise Levels (L_{eq})
June 8, 2013
Hourly Leq (dBA)
70
65
60
55
50
45
40
35
30
25
20
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hour Beginning
DNL = 52 dBA


Site 1 Measured Hourly Equivalent Noise Levels (L_{eq})
June 9, 2013
Hourly Leq (dBA)
70
65
60
55
50
45
40
35
30
25
20
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hour Beginning
DNL = 50 dBA


Site 1 Measured Hourly Equivalent Noise Levels (L_{eq})
June 10, 2013
Hourly Leq (dBA)
70
65
60
55
50
45
40
35
30
25
20
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hour Beginning
DNL = 58 dBA

3.4.4 Site 2: 7601 Pine Ridge St. NW

Site 2 is located approximately 900 feet northwest of the extended centerline of Runway 5/23, approximately two miles southwest of the Runway 5 approach end (Runway 23 departure end). The monitor was in the rear yard of a single-family residence, approximately 200 feet from the house and 200 feet from a local road.

Runway 23 was the primary runway in use during the measurements at this site. Runway 23 departures in regional jets and propeller aircraft were the only identified aircraft operations affecting the site during the measurements. A relatively small number of operations were measured because of the distance from the airport and because most Runway 23 departures turn away from runway centerline before reaching Site 2.

As shown in Figure 16, a jet departure produced the highest L_{max} of 73 dBA. A variety of propeller aircraft produced measurable levels. In some cases, the observer could not determine the runway used and type of operation because of the distance from the site to the runway and the fact that the observer could hear but not see the aircraft. The L_{max} for one single-piston operation was 69 dBA

Of the approximately 66 hours of measurements at Site 2, 64 were full hours. As shown in Figure 17, the hourly L_{eq} ranged approximately from 30 to 59 dBA. As at other sites, the hourly levels followed a typical daily pattern, with the lowest levels during the late night and early morning hours.

The highest hourly L_{eq} was for the hour starting at 7 a.m. (0700) on the morning of June 8^{th}. While no observer was present, that hour may reflect the effect of relatively high aircraft overflight activity. Six events in the hour exceeded 65 dBA for at least five seconds. This is consistent with the early morning "push" of departures at CAK. The hour starting at 5 a.m. on that day also shows a spike in exposure. A monitor operating at Site 3 (see following discussion) was exposed to the same departures (but much closer to the airport). That monitor measured a similar pair of spikes for these hours, reinforcing the conclusion that aircraft operations were the primary source.

Site 2 had the lowest overall DNL, of 52 dBA, two decibels lower than Sites 3 and 4, the next quietest sites, and 11 dB lower than Site 5, the site with the highest overall DNL.

Figure 15 Site 2 Measured Maximum A-Weighted Levels
Source: HMMH June 2013

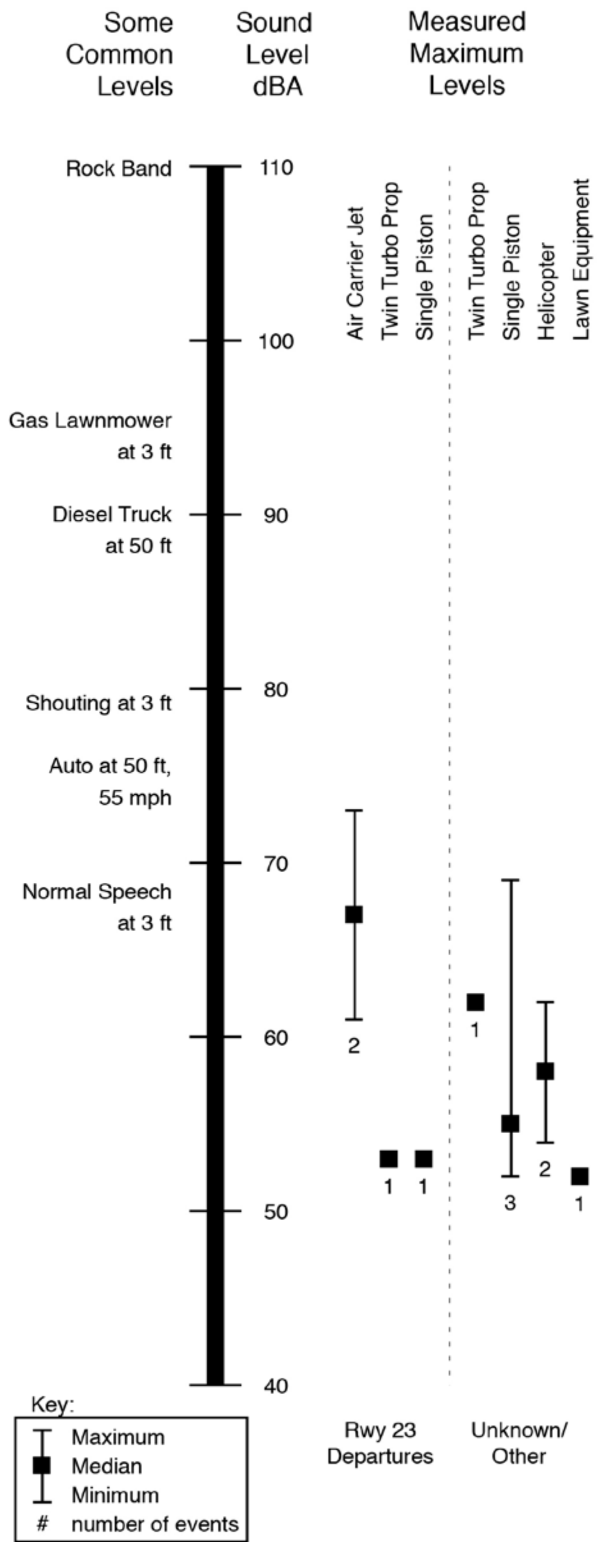


Figure 16 Site 2 Measured Hourly Noise Levels (L_{eq}), Full Duration
Source: HMMH June 2013

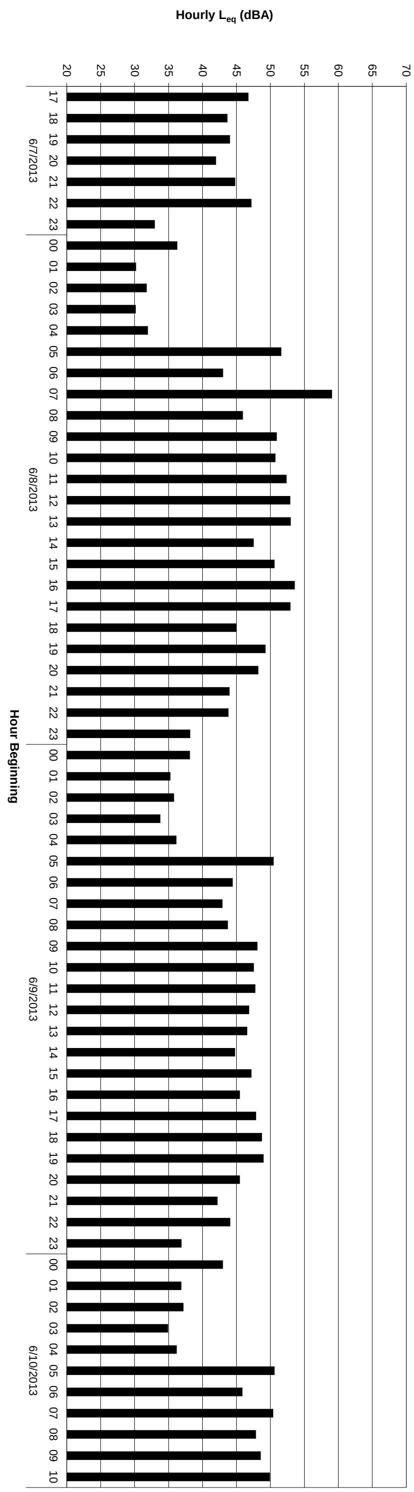
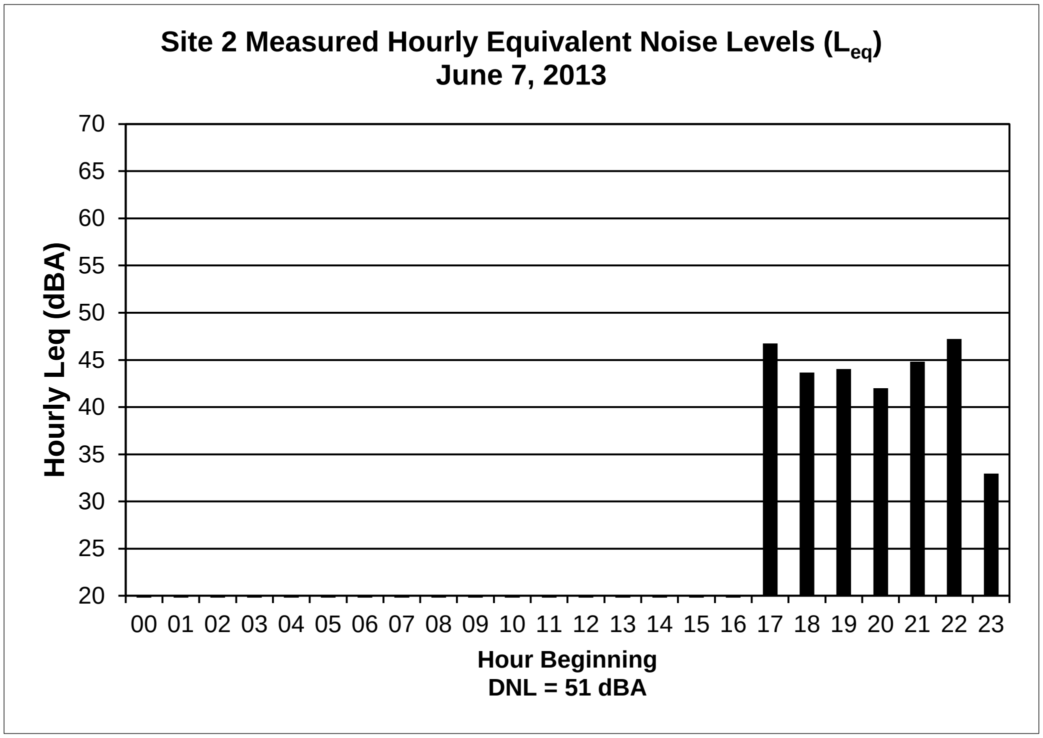
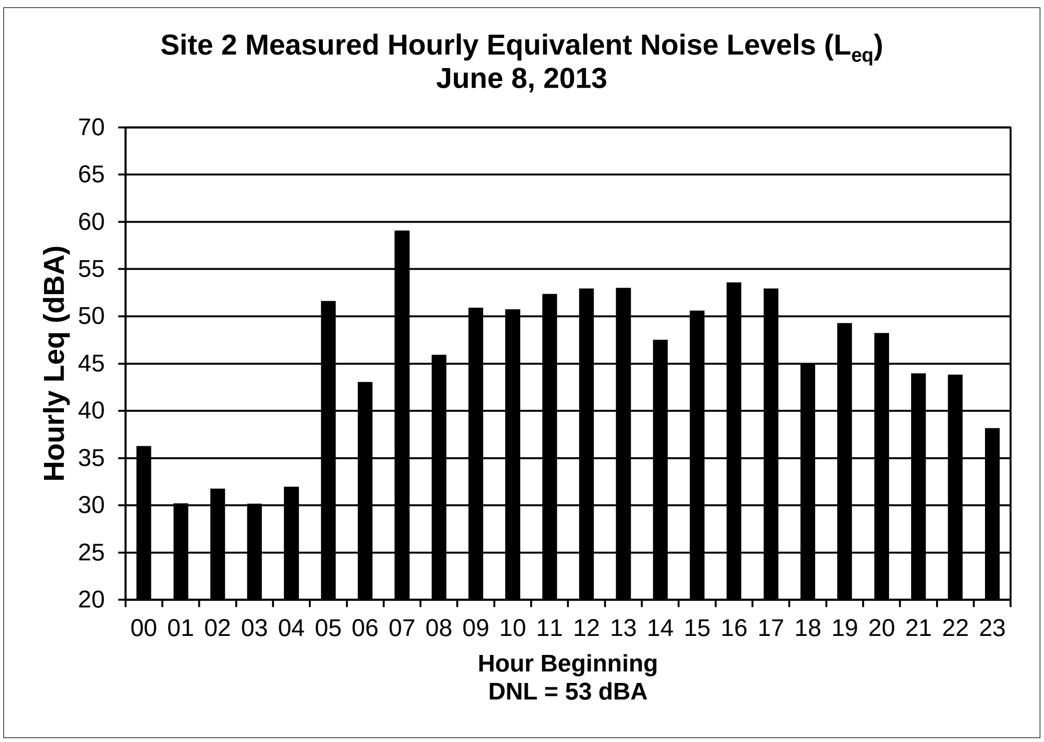
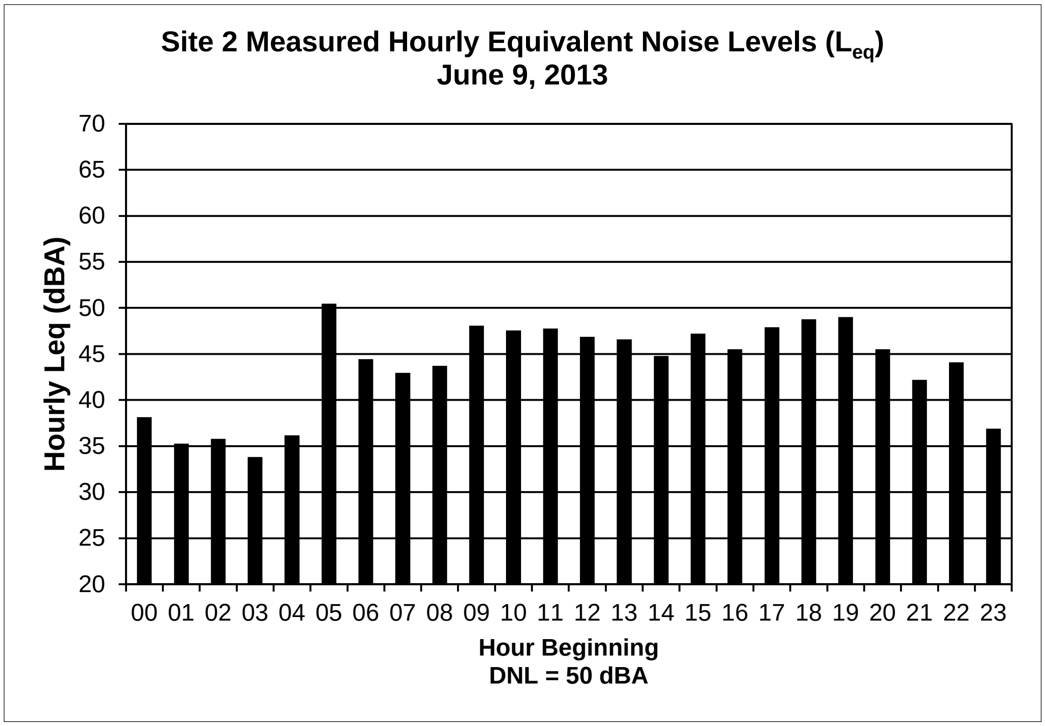
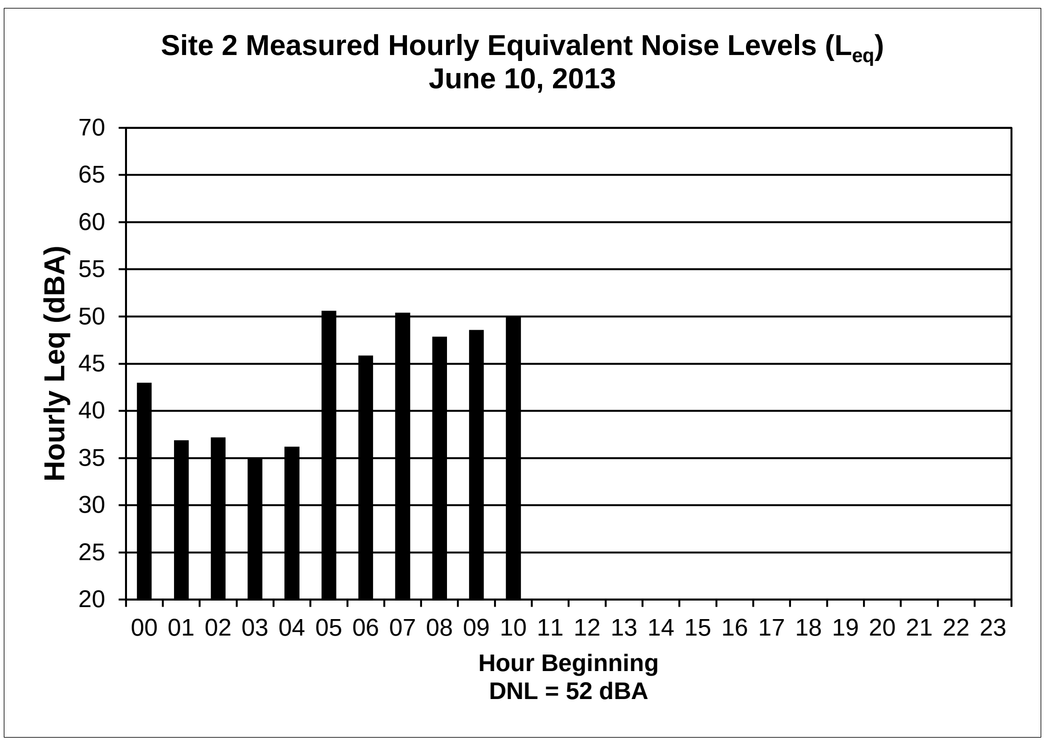


Figure 17 Site 2 Measured Hourly Noise Levels (L_{eq}), Calendar Days
Source: HMMH June 2013






Site 2 Measured Hourly Equivalent Noise Levels (L_{eq})
June 9, 2013
Hourly Leq (dBA)
70
65
60
55
50
45
40
35
30
25
20
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hour Beginning
DNL = 50 dBA


Site 2 Measured Hourly Equivalent Noise Levels (L_{eq})
June 10, 2013
Hourly Leq (dBA)
70
65
60
55
50
45
40
35
30
25
20
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hour Beginning
DNL = 52 dBA

3.4.5 Site 3: 6167 Redford Rd. NW

Site 3 is approximately 1,700 feet southeast of the extended centerline of Runway 5/23, roughly three-quarters of a mile south-southwest of the arrival end of Runway 5 (Runway 23 departure end). The monitor was in the rear yard of a single-family residence, with the house shielding it from local traffic noise. The north side of the property – to which the monitor was directly exposed – borders undeveloped airport property.

Runway 5/23 was the primary runway in use during the measurements at this site. As shown in Figure 19, the principal aircraft operations affecting the site were Runway 5 arrivals and departures from both ends of Runway 5/23. A small number of Runway 1 operations also caused noise events. Runway 23 departures were the loudest. A twin-engine piston-propeller aircraft produced the highest L_{max} of 80 dBA. The highest L_{max} values for air carrier and regional jet were 78 dBA and 77 dBA, respectively.

Of the approximately 141 hours of monitoring at Site 3, 139 were full hours. As shown in Figure 20, the hourly L_{eq} ranged from approximately 28 to 64 dBA. As at other sites, the levels followed a normal daily pattern, with the lowest levels during the late night and early morning hours.

The hour starting at 7 a.m. (0700) on the mornings of both June 8th and 10th had the highest hourly L_{eq} values, of approximately 64 and 59 dBA respectively. On the 8th, there was a secondary spike for the hour starting at 5 a.m. (0500). As noted in the preceding section, a monitor operating at Site 2 measured the same departures (but much further from the airport). It reported similar spikes for those two hours on the 8th, reinforcing the conclusion that CAK's early morning departure push was the primary source.

As at Site 1, it rained most of the day on June 6th, resulting in artificially elevated noise levels associated with water hitting the microphone, in addition to the normal increase in noise associated with the rain hitting leaves and other surrounding surfaces.

Including the effects of rain on the 6th, the overall measured DNL for Site 3 was 54 dBA, equal to the overall DNL at Site 4, two decibels higher than Site 2 (the site with the lowest overall DNL), and 10 dB lower than Site 5 (the site with the highest overall DNL).

Figure 18 Site 3 Measured Maximum A-Weighted Sound Levels
Source: HMMH June 2013

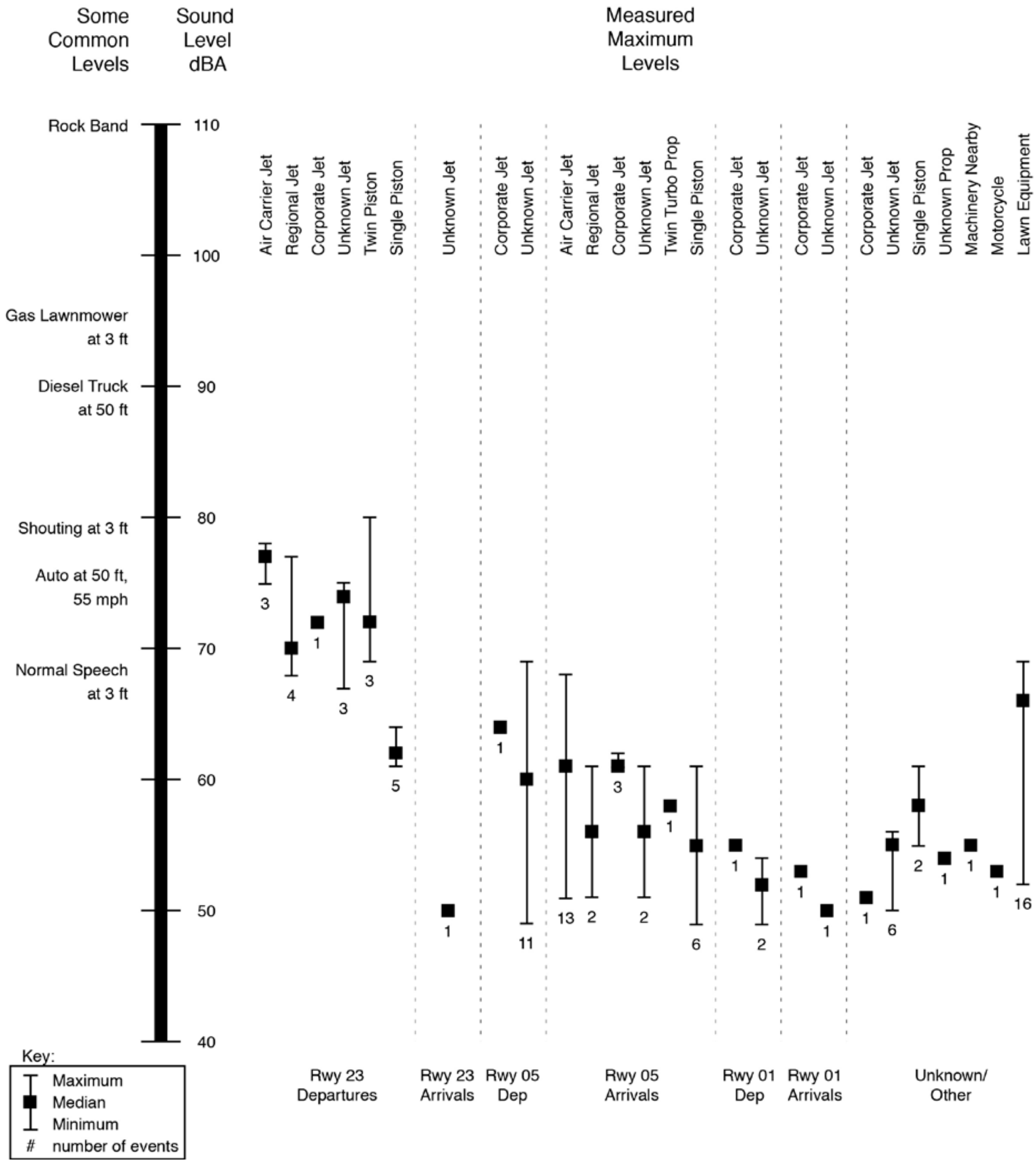


Figure 19 Site 3 Measured Hourly Noise Levels (L_{eq}), Full Duration
Source: HMMH June 2013

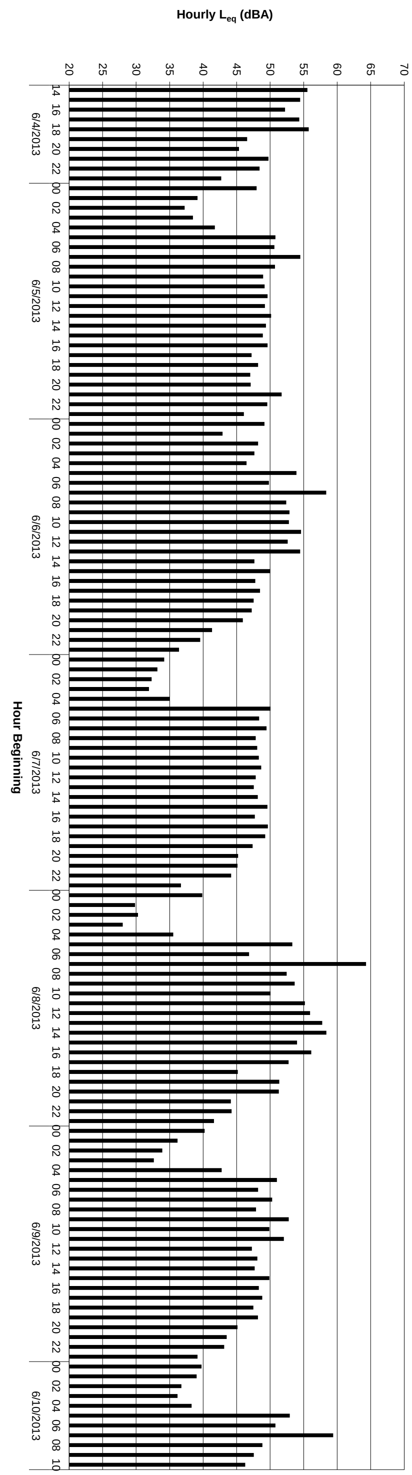
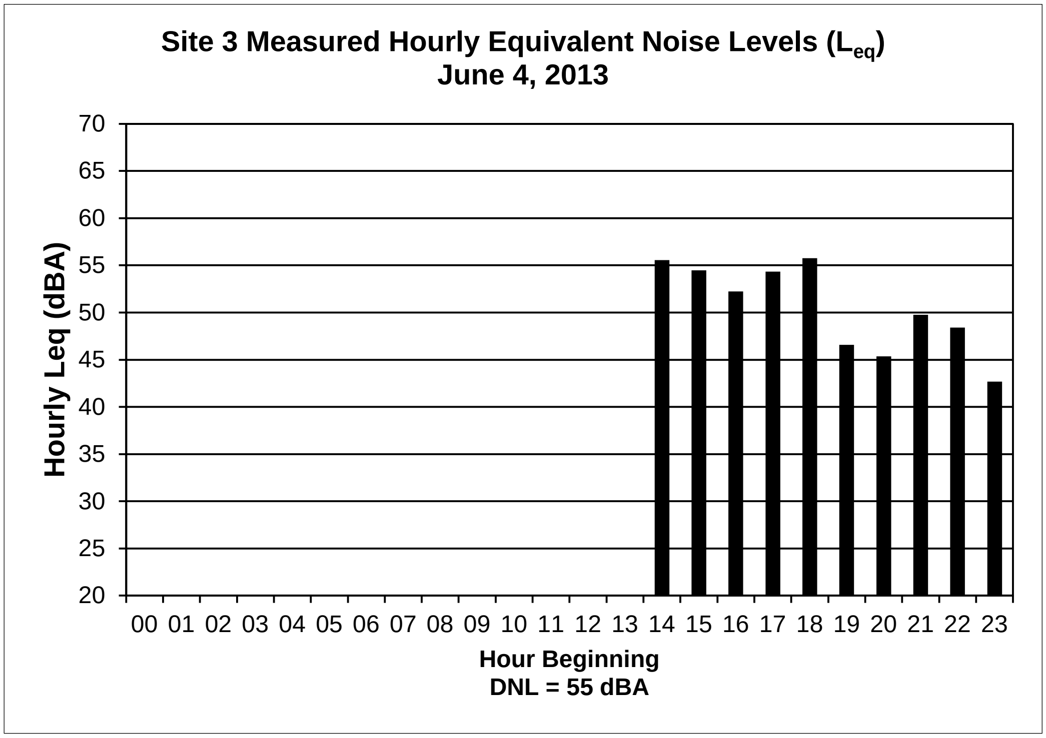
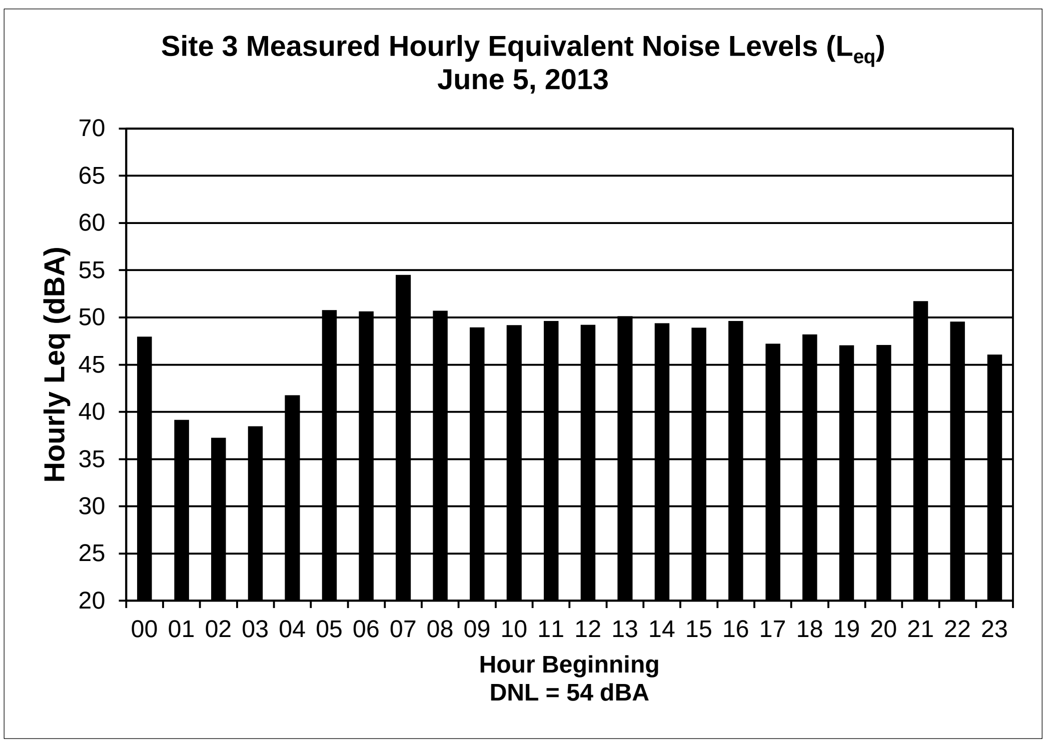
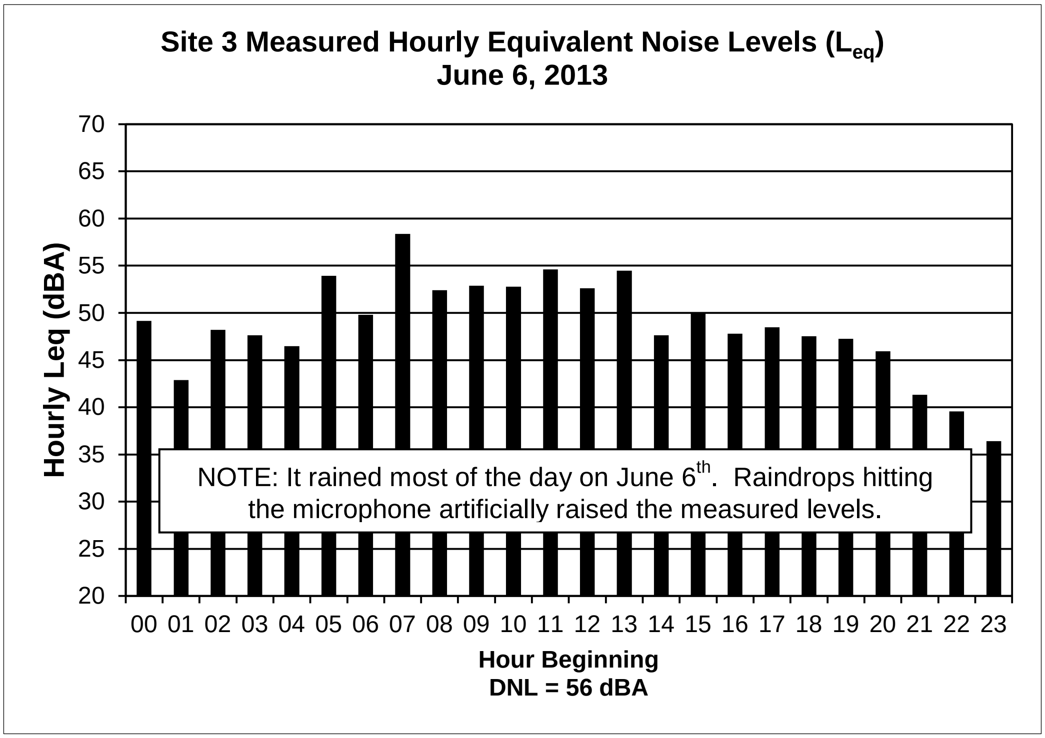
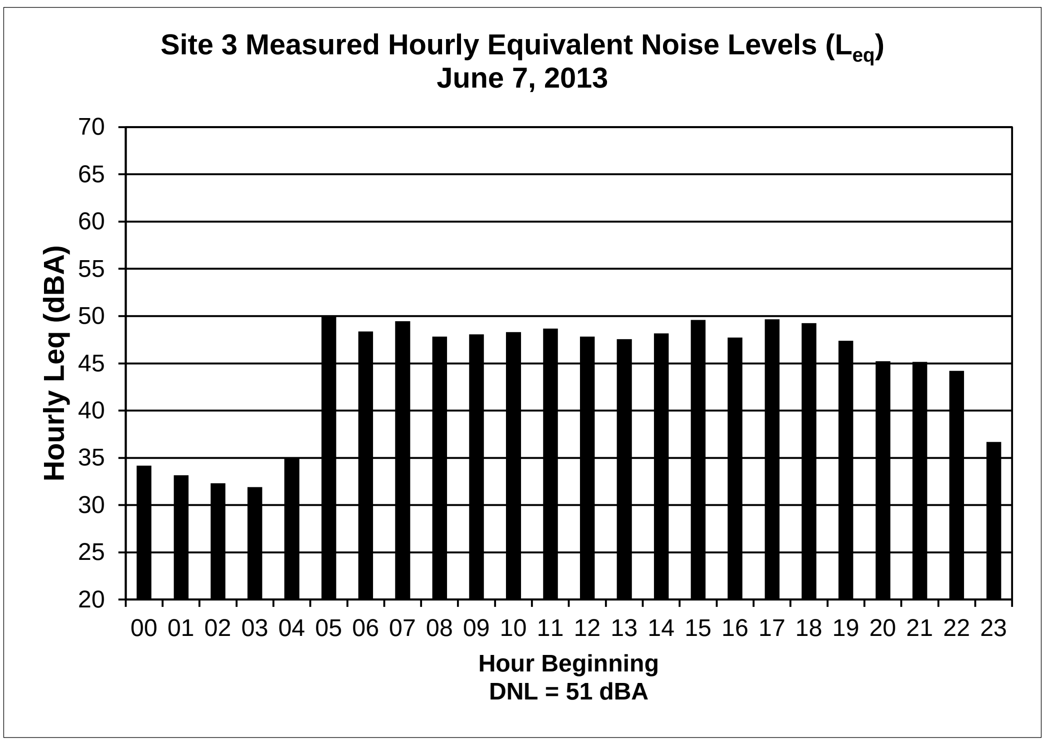


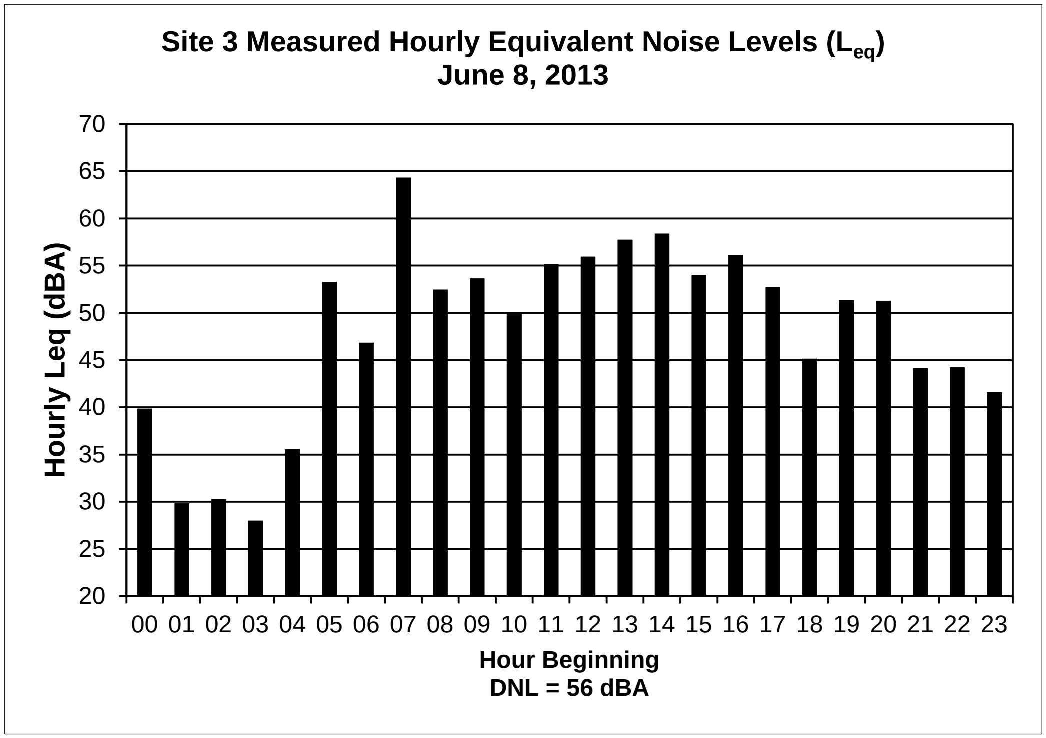
Figure 20 Site 3 Measured Hourly Noise Levels (Leq), Calendar Days
Source: HMMH June 2013

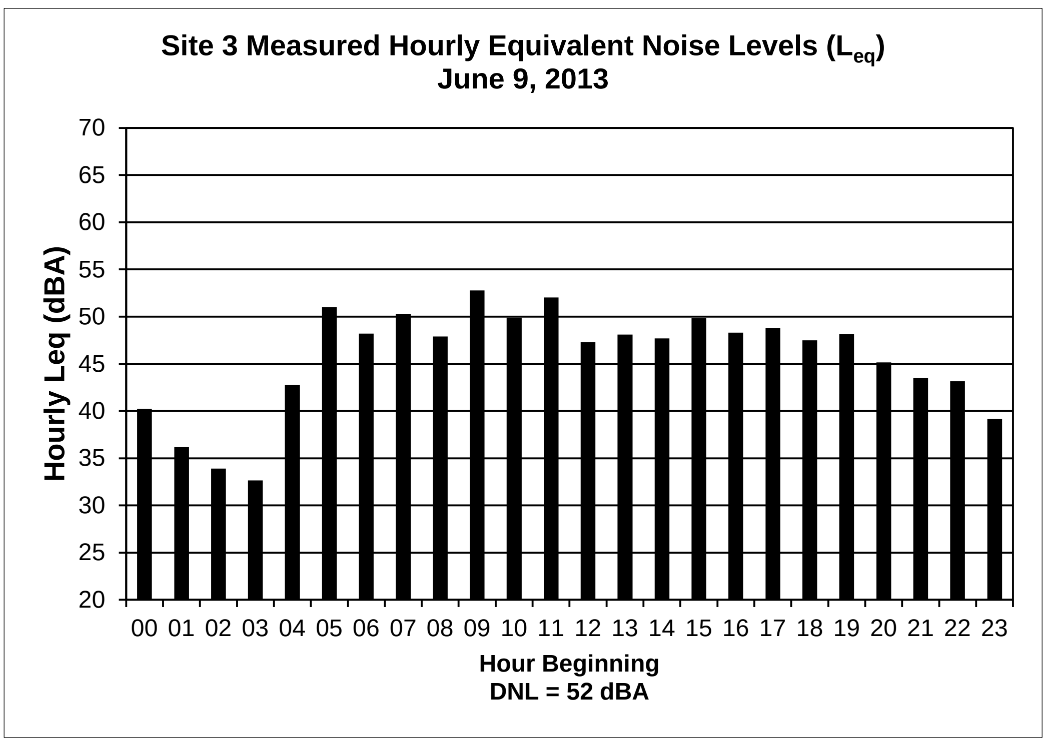


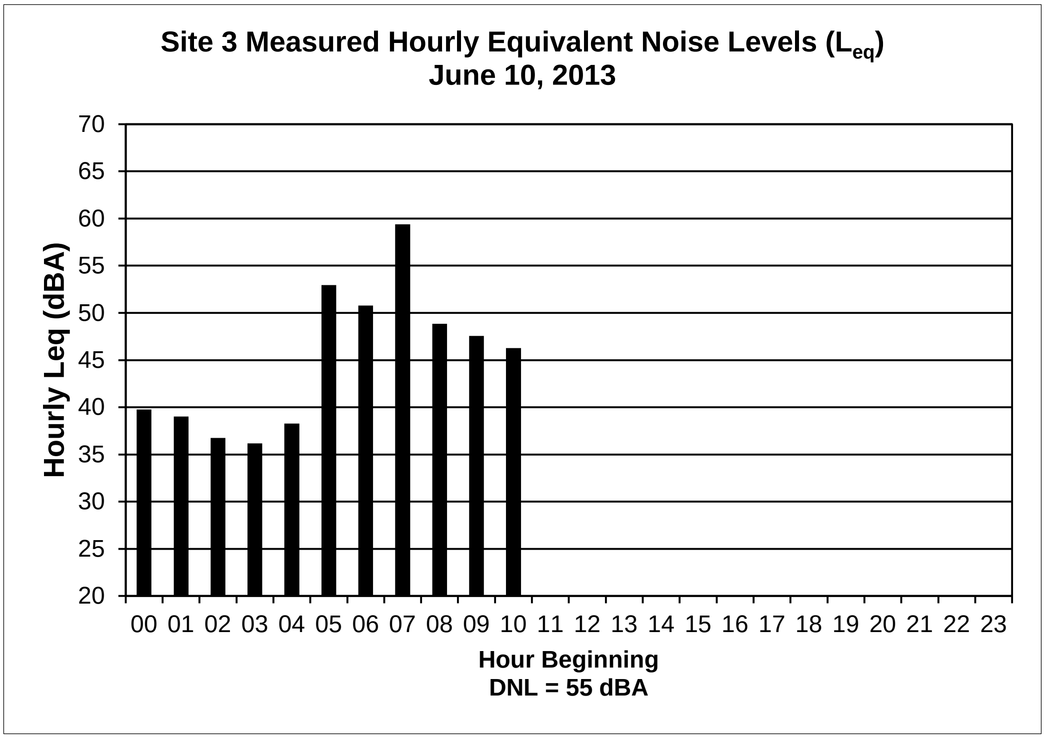



Site 3 Measured Hourly Equivalent Noise Levels (L_{eq})
June 6, 2013
Hourly Leq (dBA)
70
65
60
55
50
45
40
35
30
25
20
NOTE: It rained most of the day on June 6th. Raindrops hitting the microphone artificially raised the measured levels.
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hour Beginning
DNL = 56 dBA


Site 3 Measured Hourly Equivalent Noise Levels (L_{eq})
June 7, 2013
Hourly Leq (dBA)
70
65
60
55
50
45
40
35
30
25
20
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hour Beginning
DNL = 51 dBA


Site 3 Measured Hourly Equivalent Noise Levels (L_{eq})
June 8, 2013
Hourly Leq (dBA)
70
65
60
55
50
45
40
35
30
25
20
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hour Beginning
DNL = 56 dBA


Site 3 Measured Hourly Equivalent Noise Levels (L_{eq})
June 9, 2013
Hourly Leq (dBA)
70
65
60
55
50
45
40
35
30
25
20
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hour Beginning
DNL = 52 dBA


Site 3 Measured Hourly Equivalent Noise Levels (L_{eq})
June 10, 2013
Hourly Leq (dBA)
70
65
60
55
50
45
40
35
30
25
20
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hour Beginning
DNL = 55 dBA

3.4.6 Site 4: 3527 Northgate St. NW

Site 4 is located approximately 500 feet southeast of the extended centerline of Runway 5/23, approximately 9,000 feet (1.5 to 2 miles) northeast of the Runway 5 departure end (Runway 23 arrival end). The monitor was in the rear yard of a single-family residence in a location largely shielded from street traffic noise.

Runway 5 departures and Runway 23 arrivals were the principal aircraft operations affecting the site during the measurements. Jet aircraft were the sole source of measured aircraft noise events, with a maximum L_{max} value of 78 dBA for Runway 5 departures and 72 dBA for Runway 23 arrivals.

Of the approximately 74 hours of monitoring at Site 3, 72 were full hours. As shown in Figure 23, the hourly L_{eq} approximately ranged from 31 to 58 dBA. The levels followed a normal daily pattern, with the lowest levels during the late night and early morning hours.

As at Sites 1 and 3, it rained most of the day on June 6th, resulting in artificially elevated noise levels associated with water hitting the microphone, in addition to the normal increase in noise associated with the rain hitting leaves and other surrounding surfaces.

Including the effects of rain on the 6th, the overall measured DNL for Site 4 was 54 dBA, equal to the overall DNL at Site 3, two decibels higher than Site 2 (the site with the lowest overall DNL), and 10 dB lower than Site 5 (the site with the highest overall DNL).

Figure 21 Site 4 Measured Maximum A-Weighted Levels
Source: HMMH, June 2013

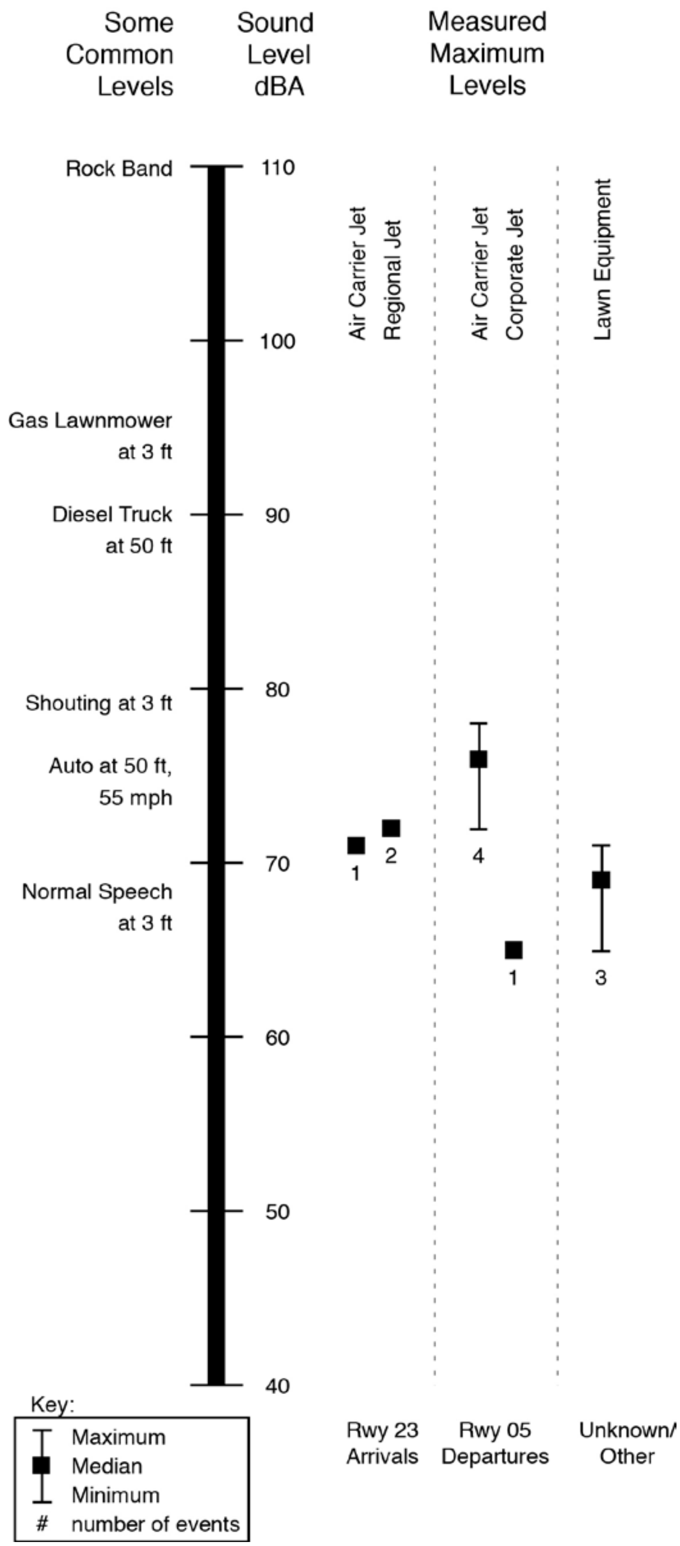


Figure 22 Site 4 Measured Hourly Noise Levels (L_{eq}), Full Duration
Source: HMMH June 2013

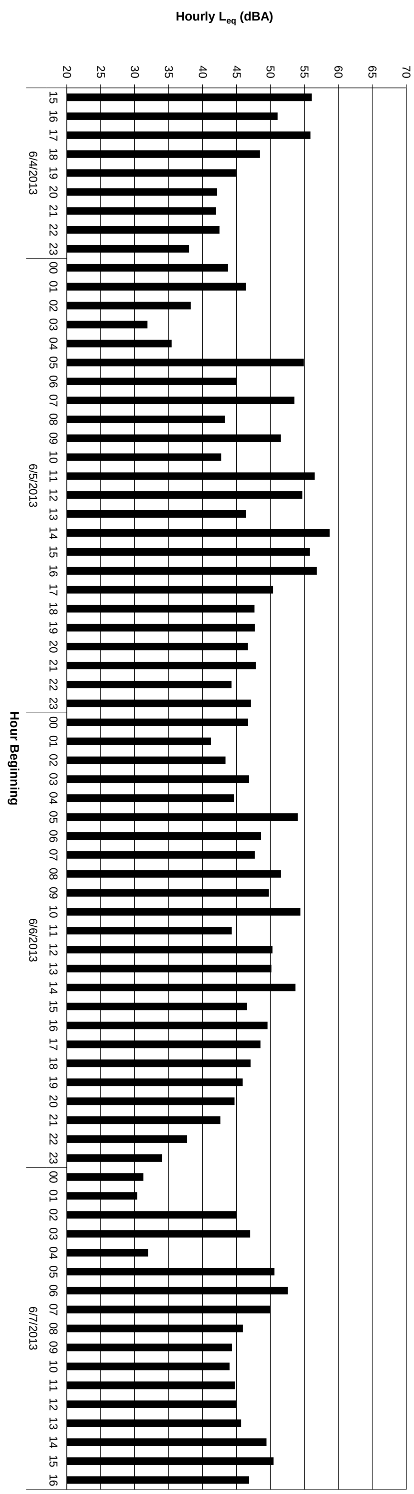
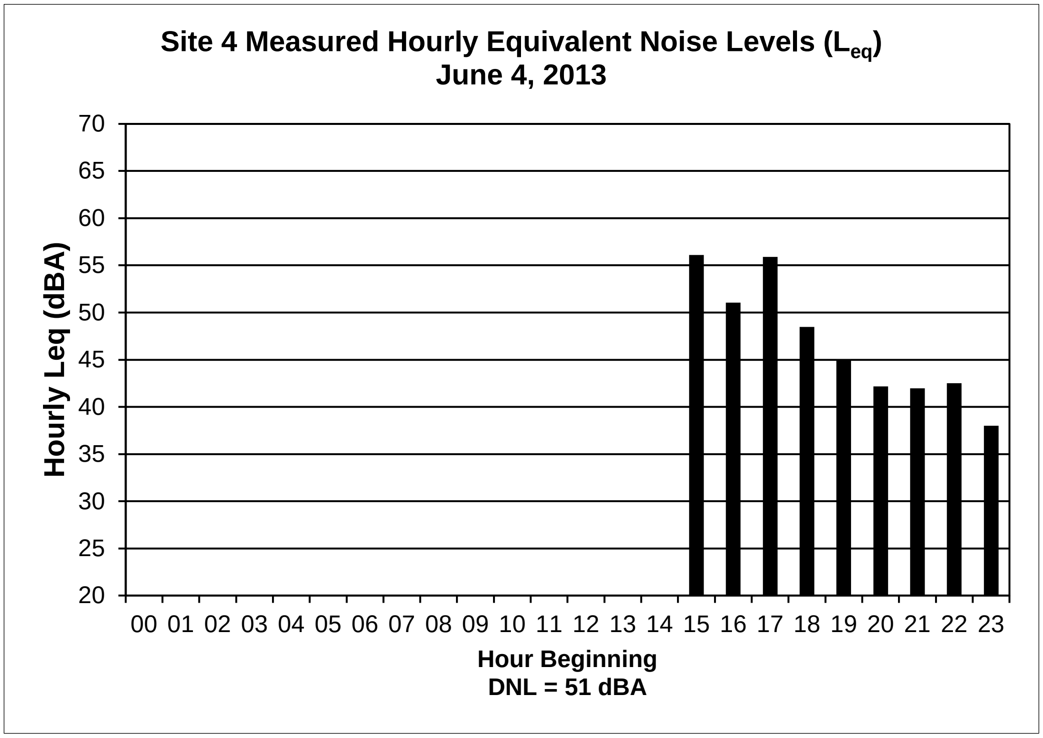
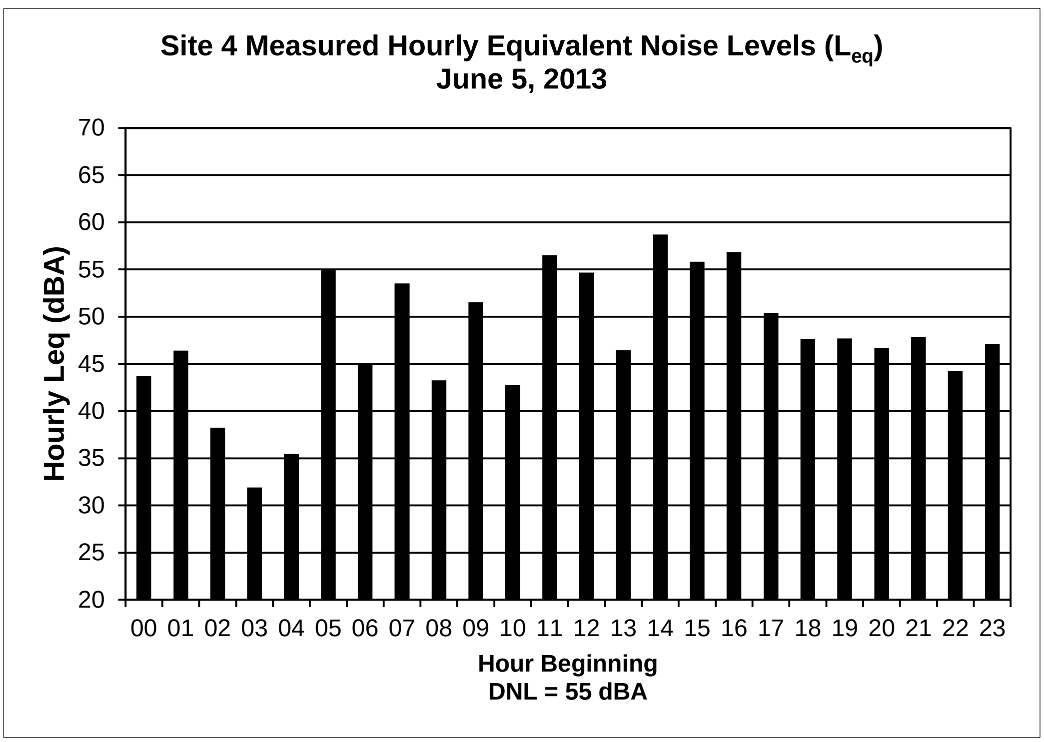
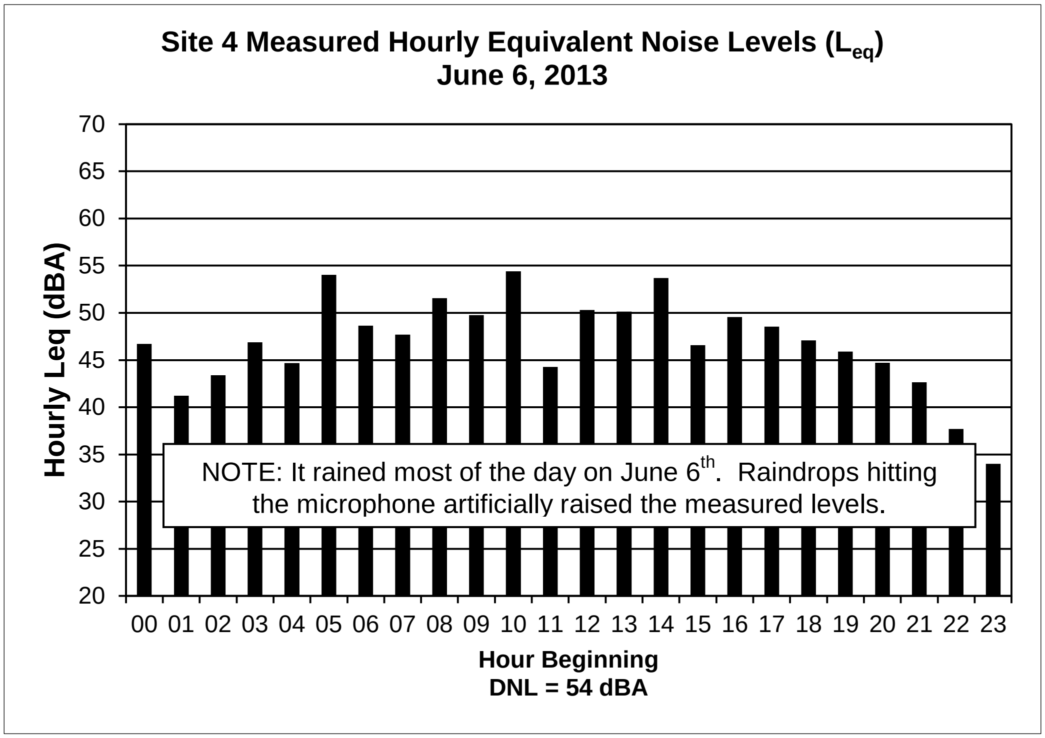
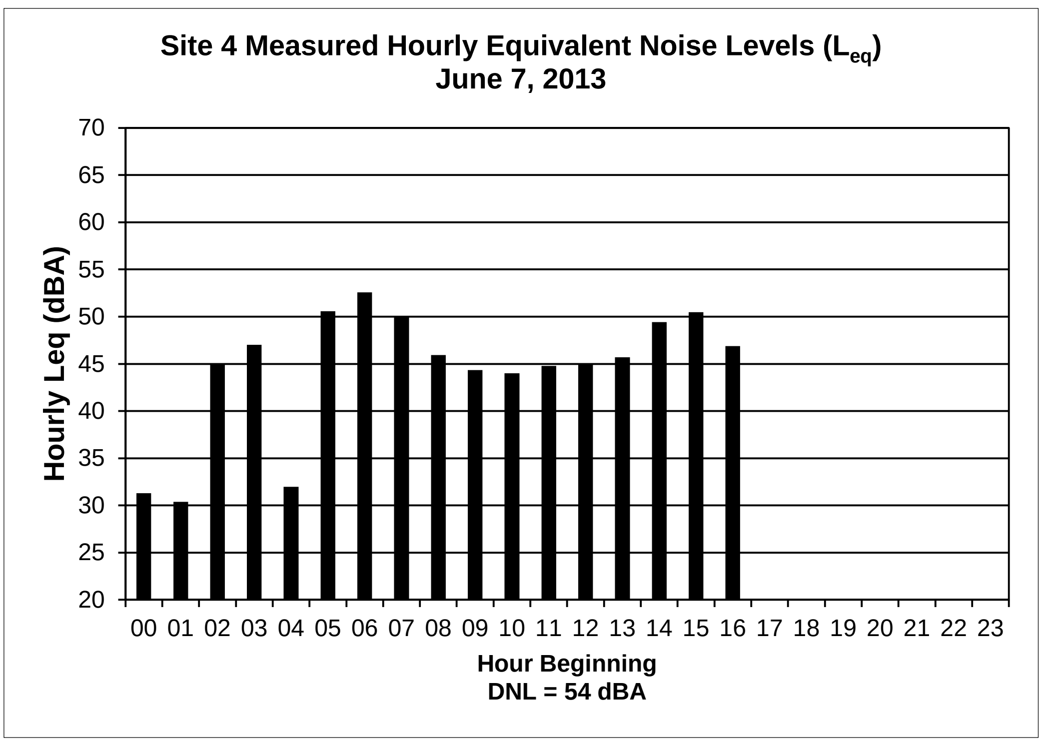


Figure 23 Site 4 Measured Hourly Noise Levels (Leq), Calendar Days
Source: HMMH June 2013






Site 4 Measured Hourly Equivalent Noise Levels (L_{eq})
June 6, 2013
70
65
60
55
50
45
40
35
30
25
20
Hourly Leq (dBA)
NOTE: It rained most of the day on June 6th. Raindrops hitting the microphone artificially raised the measured levels.
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hour Beginning
DNL = 54 dBA


Site 4 Measured Hourly Equivalent Noise Levels (L_{eq})
June 7, 2013
70
65
60
55
50
45
40
35
30
25
20
Hourly Leq (dBA)
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Hour Beginning
DNL = 54 dBA

3.4.7 Site 5: 2475 Wise Rd. NW

Site 5 is located approximately 200 feet west of the extended centerline of Runway 1/19, almost due north of the runway, approximately 6,000 feet (1.2 miles) from the northern runway end. The monitor was in the rear yard of a single-family residence, shielded from local street traffic. The rear yard bordered a golf course, with a cart path adjacent to the property. During the observed measurements, no golf course activity produced any noise events.

As shown in Figure 25, Runway 1 departures were the principal operations affecting the site during the measurements. Air carrier jets were responsible for nearly 60% of the identified noise events. Overall, air carrier departures at Site 5 caused the highest L_{max} values recorded at any site during the measurement period. One air carrier jet departure produced the highest overall maximum L_{max} measured at any site, of 96 dBA. Regional jets and corporate jets departing from Runway 1 also caused relatively high L_{max} values of 81 dBA and 83 dBA, respectively.

Approximately 26 hours of monitoring were conducted at Site 5, including 24 consecutive full hours starting at 1 p.m. (hour 13) on June 3rd. As shown in Figure 26, the hourly L_{eq} values ranged from 49 to 70 dBA. The general variation in hourly L_{eq} is consistent with activity at the airport and normal patterns of non-aircraft activities in a residential setting. An MD-88 departure on Runway 1, with an SEL of 105 dBA (the same event with the Lmax of 96 dBA), caused the abnormally high L_{eq} value on June 3rd for the hour starting at 5 p.m. (hour 17).

The overall measured DNL for Site 5 was 64 dBA, the highest overall DNL measured, 12 dB higher than Site 2 (the site with the lowest overall DNL).

Figure 24 Site 5 Measured Maximum A-Weighted Levels
Source: HMMH, June 2013

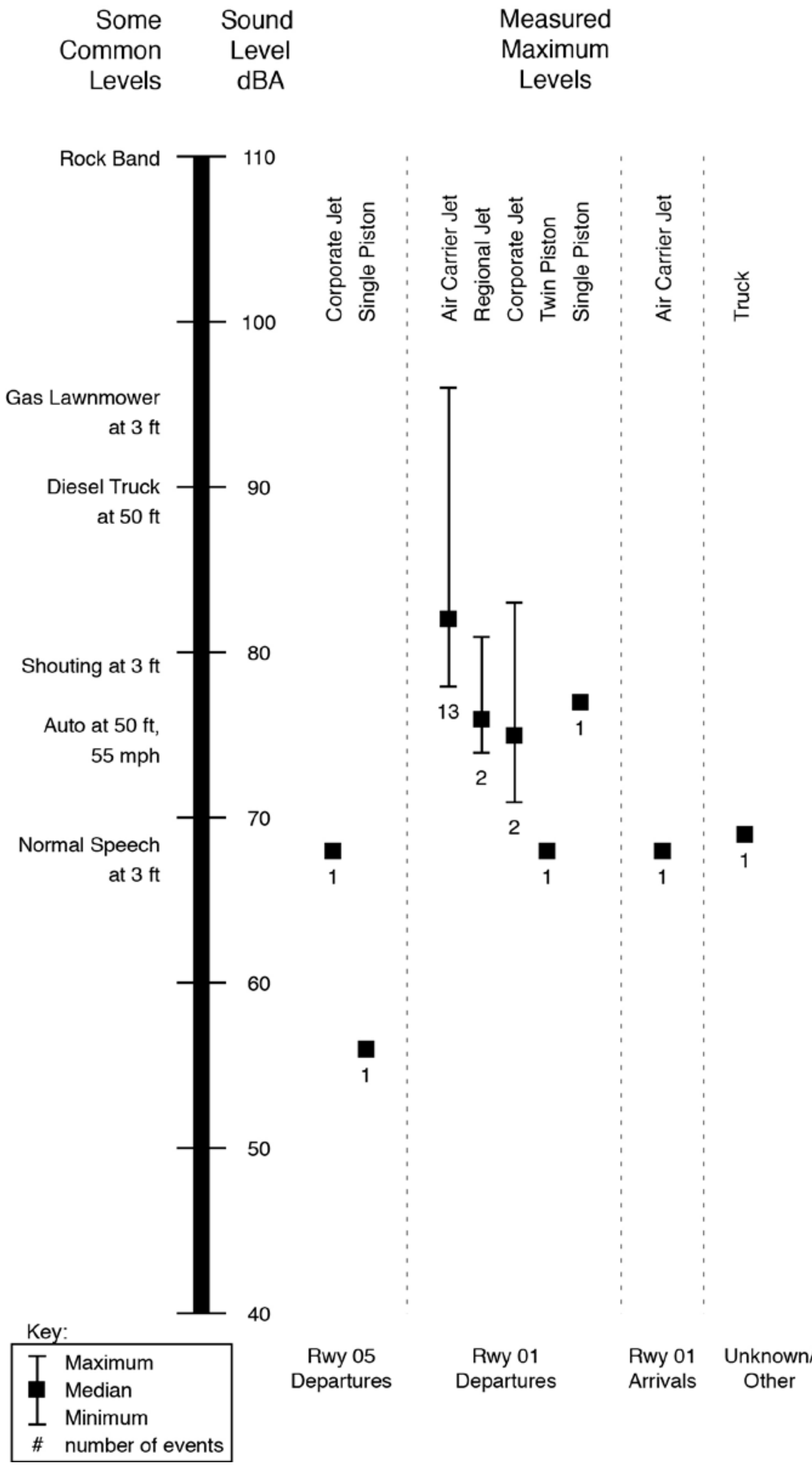


Figure 25 Site 5 Measured Hourly Noise Levels (L_{eq}), Full Duration
Source: HMMH, June 2013

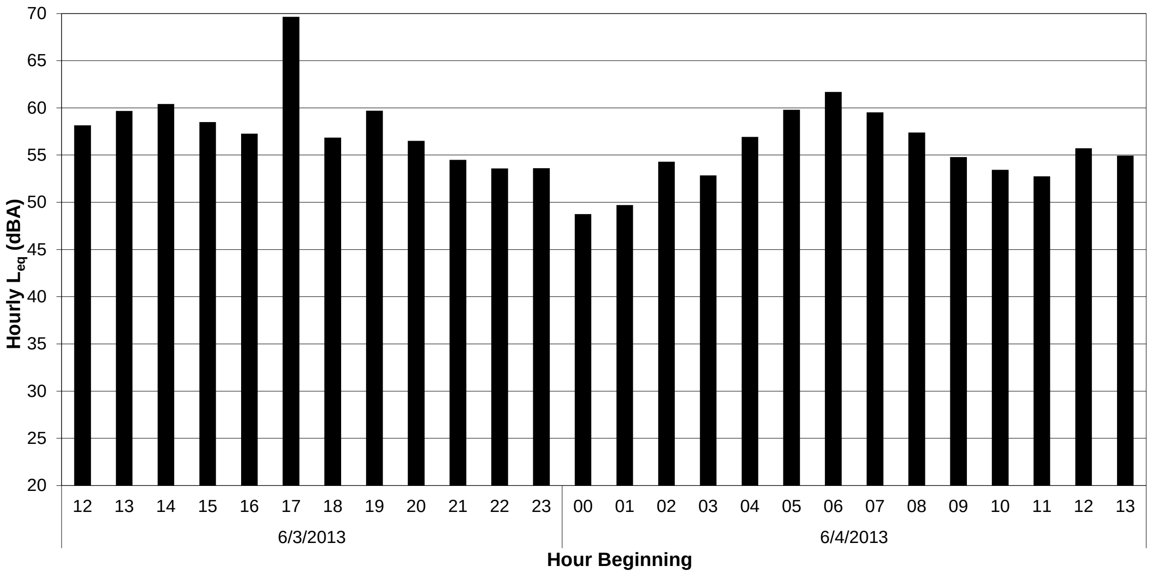
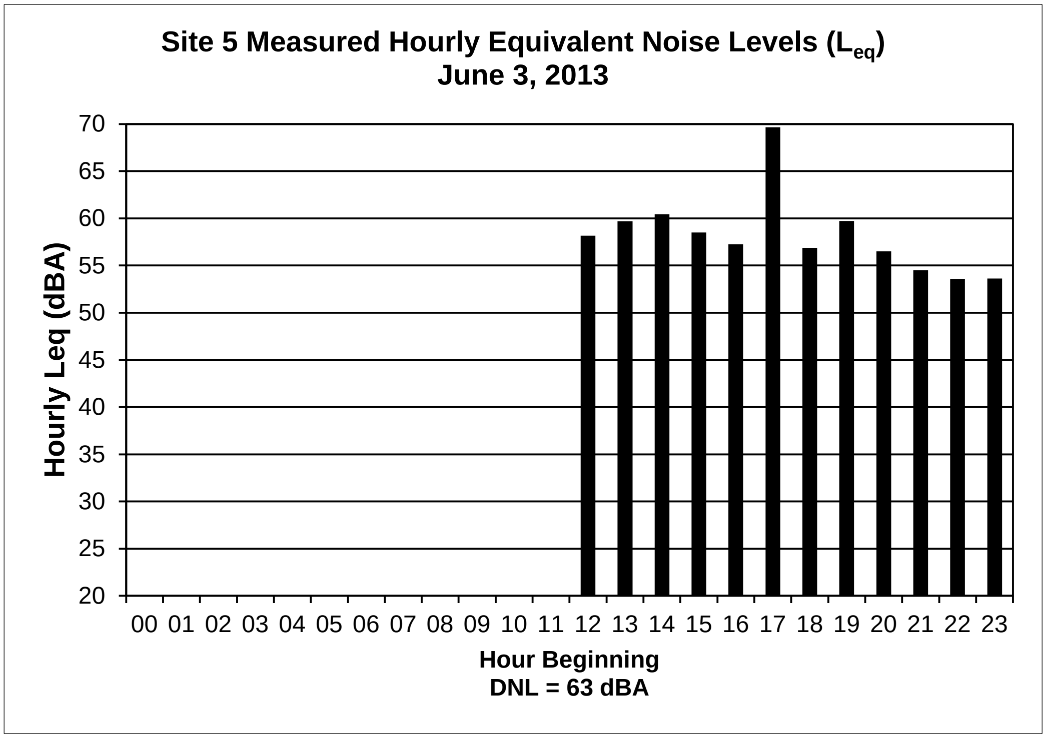
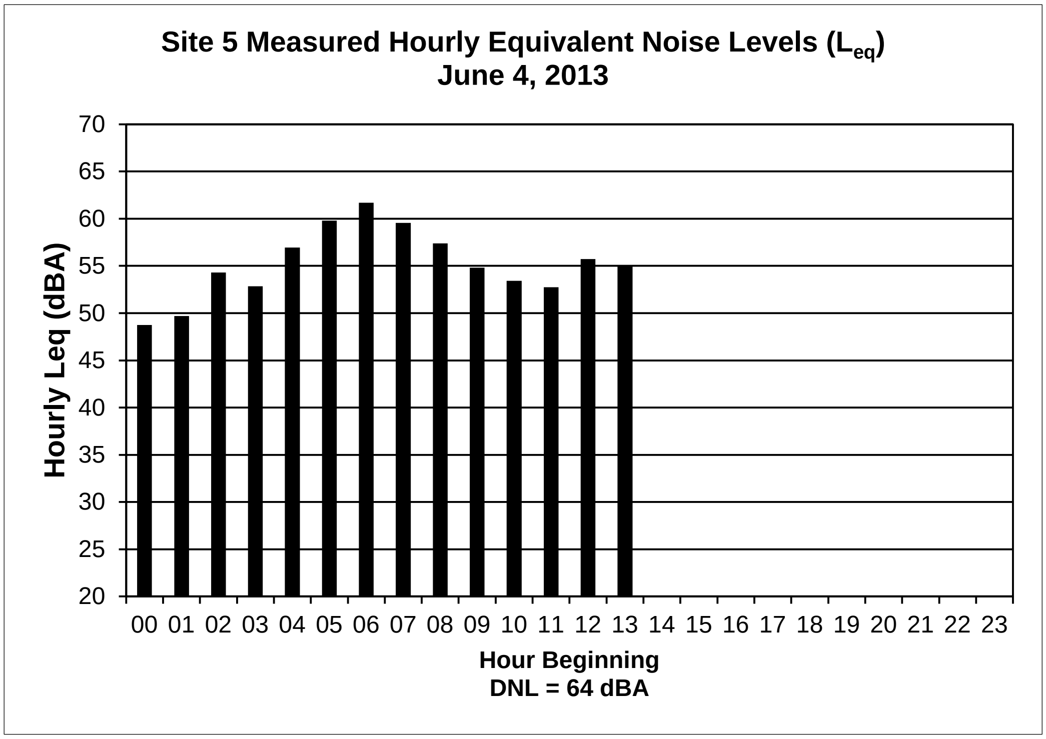


Figure 26 Site 5 Measured Hourly Noise Levels (L_{eq}), Calendar Days
Source: HMMH, June 2013





3.4.8 Site 6: 7979 Frank Ave. NW

Site 6 is located approximately 200 feet east of the extended centerline of Runway 1/19, approximately three-quarters of a mile south of the departure end of Runway 19, almost directly in line with the runway. The monitor was located in the rear yard of a single-family residence, shielded from any significant local traffic noise

Runway 1 arrivals were the principal aircraft operations affecting the site during the measurements. Air carrier jet, regional jet, and corporate jet operations caused nearly all of the observed noise events. As shown in Figure 28, an air carrier jet arrival produced the highest L_{max} of 89 dBA. This aircraft type category had an overall median L_{max} of 84 dBA. Reverse thrust from jet aircraft arrivals on Runway 1 was sometimes audible, but did not trigger noise events.

Site 6 measurements covered 27 hours. As shown in Figure 29, the hourly L_{eq} approximately ranged from 46 to 61 dBA. The highest hourly L_{eq} was for the hour starting at 5 p.m. (hour 17) on the afternoon of June 3rd. A relatively high number of jet aircraft arriving on Runway 01 were the cause of the somewhat elevated exposure in that hour. The monitor operating at Site 5 during this same hour also measured a high exposure level during this hour.

The overall measured DNL for Site 6 was 59 dBA, 5 dB lower than Site 5 (the site with the highest overall DNL) and 7 dB higher than Site 2 (the site with the lowest overall DNL).

Figure 27 Site 6 Measured Maximum A-Weighted Levels
Source: HMMH, June 2013

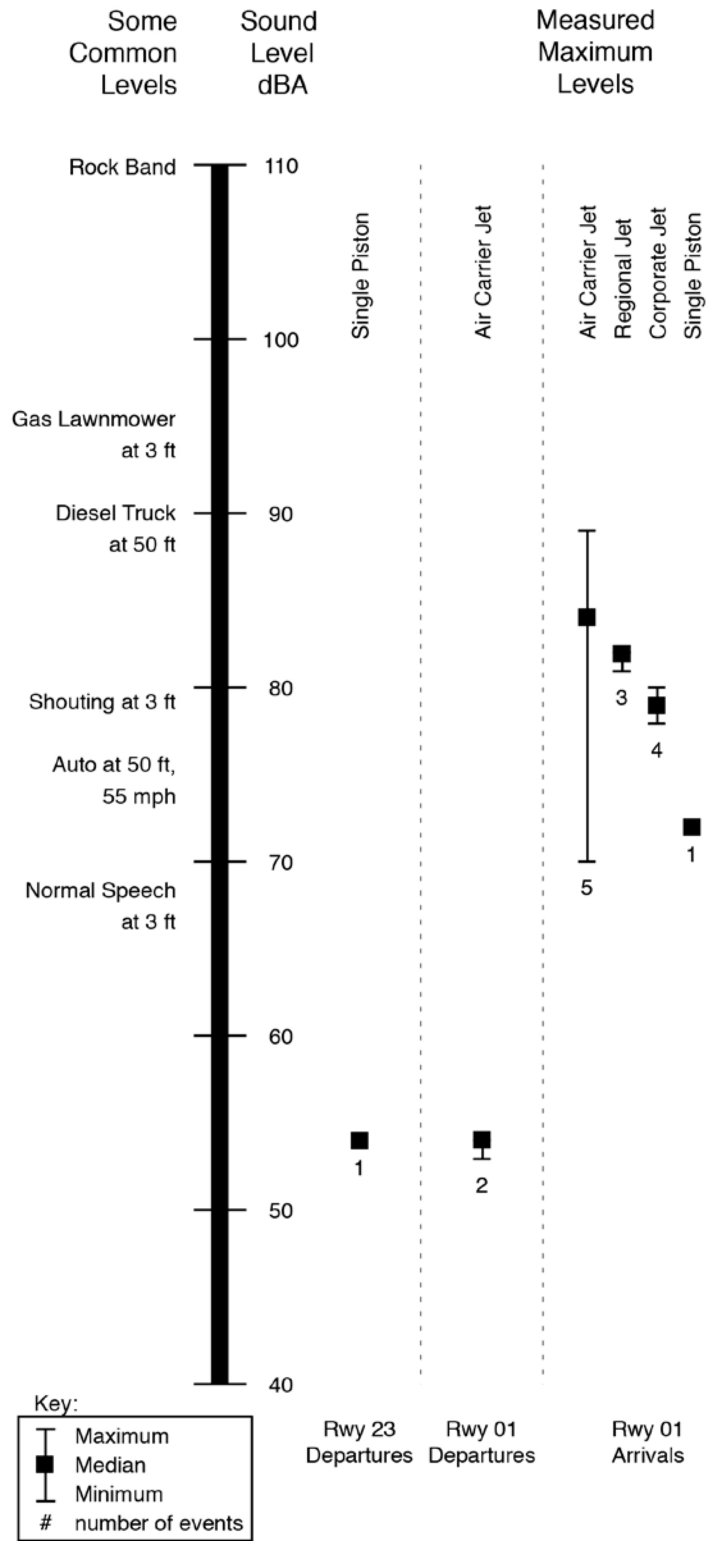


Figure 28 Site 6 Measured Hourly Noise Levels (L_{eq}), Full Duration
Source: HMMH, June 2013

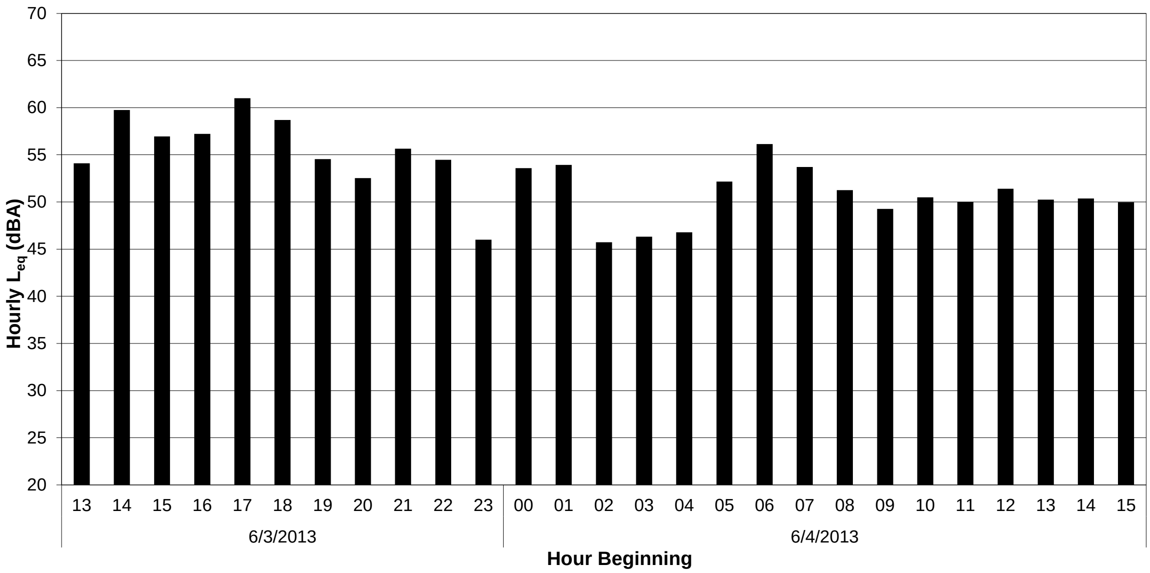
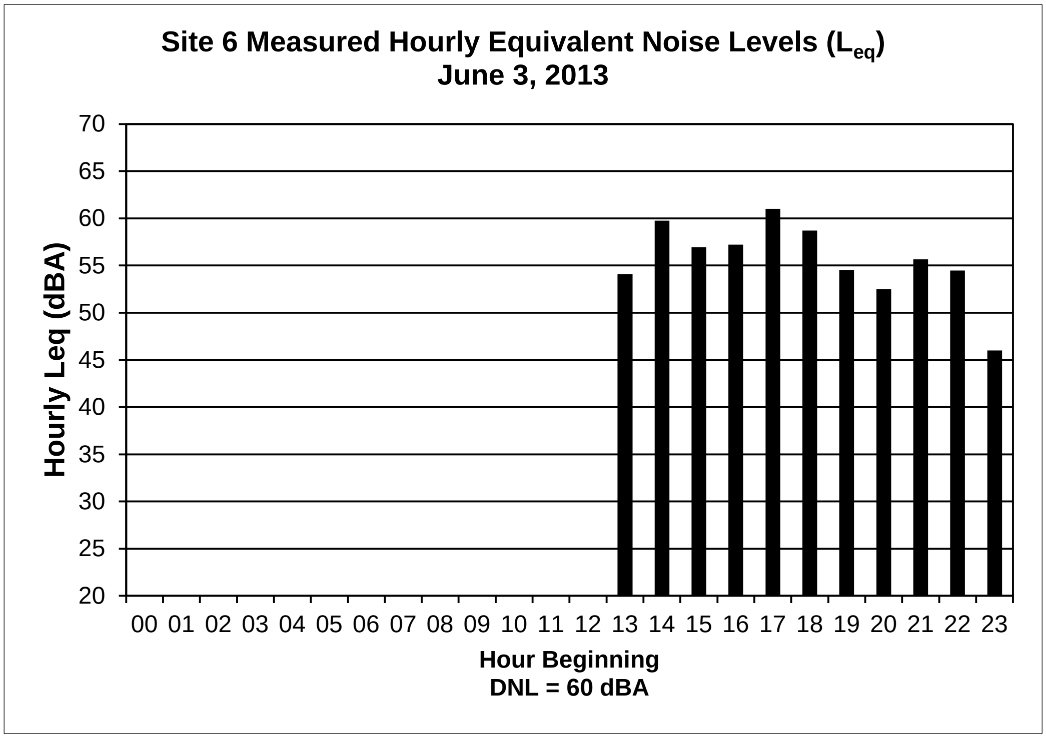
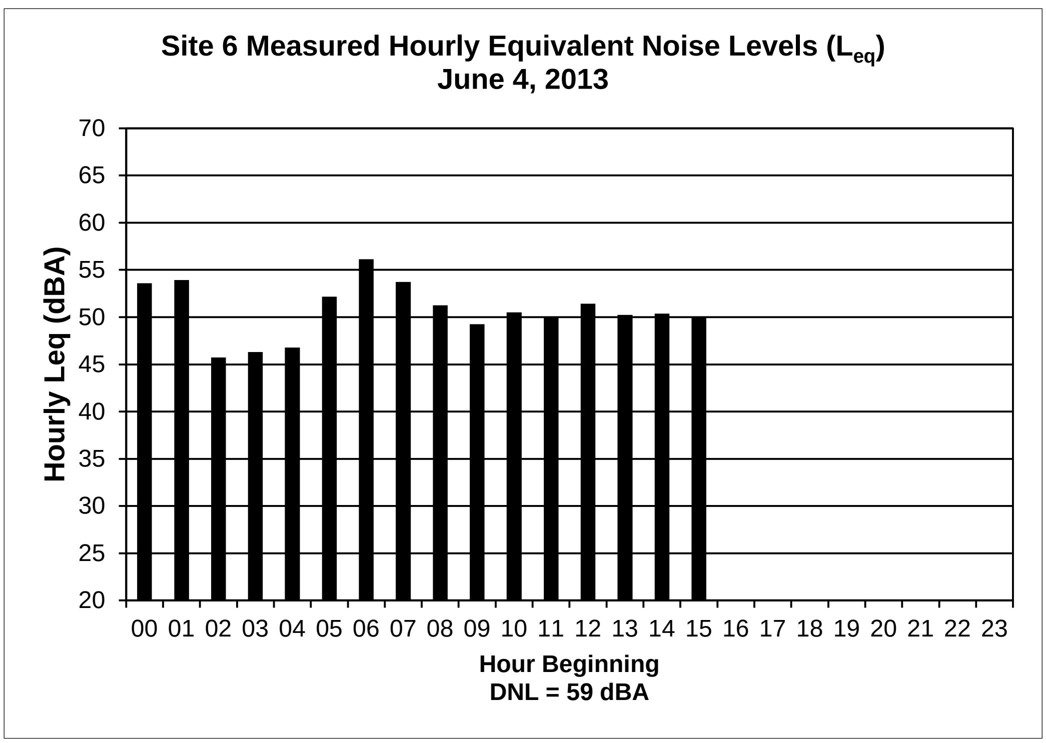


Figure 29 Site 6 Measured Hourly Noise Levels (L_{eq}), Calendar Days
Source: HMMH, June 2013





4 DEVELOPMENT OF UPDATED EXISTING AND FORECAST CONDITIONS NOISE EXPOSURE MAPS

The fundamental noise elements of a Noise Exposure Map are DNL contours for existing and forecast conditions (2014 and 2019 in this update) presented over base maps depicting the airport layout, local land use control jurisdictions, major land use categories, discrete noise-sensitive "receptors," and other information required by Part 150.

4.1 Development of Noise Contours

Consistent with Part 150 requirements, the consulting team will prepare the DNL contours for this study using the most recent release of the FAA's Integrated Noise Model (INM) that was available at outset of the study, "Version 7.0c." Also consistent with FAA requirements, the model application will not include any unauthorized "calibration" or "adjustment."

The INM requires inputs in the following categories:

- Number and mix of aircraft operations
- Aircraft noise and performance characteristics
- Physical description of the airport layout
- Runway utilization rates
- Noise modeling flight track descriptions and utilization rates

Sections 4.2 through 4.6 present this information in order.

4.2 Aircraft Operations

Appendix C presents a detailed report prepared by CHA that documents the preparation of draft activity and fleet mix forecasts for 2014 and 2019. The draft is subject to FAA review and approval.

Appendix C addresses and summarizes the forecasts by operator category (i.e., scheduled passenger, military, and general aviation), and according to specific aircraft types. Under Part 150 requirements, FAA must review and approve these forecasts. Appendix D will provide a copy of the FAA review and approval letter when it is available.

The following two tables present the detailed aircraft modeling fleet mixes for the two years.

- Table 6 Forecast 2014 Average Annual Day Operations
- Table 7 Forecast 2019 Average Annual Day Operations

The tables present fleet mix detail broken down into categories that the INM requires:

- INM database aircraft types (See Section 4.3)
- Type of operation; i.e., departures, arrivals, and "circuits"[22]
- DNL "day" and "night" time periods (as discussed in Section 2.1.6)
- Departure "stage length;" i.e., distance flown, since fuel load generally is the primary factor affecting departure weight and climb performance

[22] Circuits are closed loops that operators generally conduct for training purposes, including fixed-wing "touch-and-go" loops shown on Figure 34 and Ohio Army National Guard (OANG) "pattern work" loops shown on Figure 35. These are the two types of circuits conducted in sufficient numbers to merit modeling at CAK.

Table 6 Forecast 2014 Average Annual Day Operations
Source: CHA and HMMH, 2013 (Subject to FAA Approval)

INM Aircraft Type	Departures (by Stage Length in Nautical Miles)						Arrivals		Circuits (See Notes)		Total (See Notes)		
	Day (7 a.m. – 10 p.m.)			Night (10 p.m. – 7 a.m.)									
	0-500	500-1,000 n.m.	1,000-1,500 n.m.	0-500 n.m.	500-1,000 n.m.	1,000-1,500 n.m.	Day	Night	Day	Night	Day	Night	Total
Scheduled Passenger Operations													
A320-211	1.0	0.7	-	0.4	-	-	1.6	0.5	-	-	3.3	1.0	4.3
717200	4.8	0.7	-	1.4	-	-	5.2	1.6	-	-	10.7	3.1	13.7
7373B2	0.4	0.1	0.4	0.2	-	-	0.9	0.3	-	-	1.9	0.5	2.4
737700	1.3	0.4	1.5	0.8	-	-	3.0	0.9	-	-	6.2	1.8	7.9
737800	0.1	0.0	0.1	0.1	-	-	0.2	0.1	-	-	0.5	0.1	0.6
MD88	0.4	0.0	-	0.1	-	-	0.4	0.1	-	-	0.8	0.2	1.0
DC95HW	0.2	-	-	0.1	-	-	0.2	0.1	-	-	0.4	0.1	0.5
EMB145	2.9	-	-	0.8	-	-	2.8	0.9	-	-	5.7	1.6	7.4
CLREGJ	9.7	-	0.3	2.6	-	-	9.6	3.0	-	-	19.6	5.6	25.2
CRJ701	5.2	1.0	0.7	1.8	-	-	6.7	2.1	-	-	13.6	3.9	17.5
CRJ900	1.5	0.2	0.3	0.5	-	-	2.0	0.6	-	-	4.0	1.1	5.1
Subtotal	27.4	3.2	3.3	8.9	-	-	32.7	10.2	-	-	66.7	19.1	85.8
Military Operations													
B429	0.4	-	-	0.2	-	-	0.4	0.2	0.4	-	1.6	0.3	1.9
CH47D	0.9	-	-	0.4	-	-	0.9	0.4	0.9	-	3.7	0.7	4.4
S70	0.4	-	-	-	-	-	0.4	-	-	-	0.7	-	0.7
C-130E	0.0	-	-	-	-	-	0.0	-	-	-	0.1	-	0.1
F16GE	0.0	-	-	-	-	-	0.0	-	-	-	0.1	-	0.1
Subtotal	1.7	-	-	0.5	-	-	1.7	0.5	1.3	-	6.1	1.1	7.2
General Aviation Operations													
M20L	1.6	-	-	0.1	-	-	1.6	0.1	0.4	-	2.4	0.2	4.2
BEC50	1.1	-	-	0.1	-	-	1.1	0.1	0.3	-	1.7	0.1	3.0
BEC33	0.3	-	-	0.0	-	-	0.3	0.0	0.1	-	0.4	0.0	0.7
BEC45	0.0	-	-	0.0	-	-	0.0	0.0	0.0	-	0.1	0.0	0.1
LA42	0.0	-	-	0.0	-	-	0.0	0.0	0.0	-	0.1	0.0	0.1
CNA172	0.9	-	-	0.1	-	-	0.9	0.1	0.2	-	1.4	0.1	2.4
CNA177	0.0	-	-	0.0	-	-	0.0	0.0	0.0	-	0.1	0.0	0.1
CNA182	1.0	-	-	0.1	-	-	1.0	0.1	0.2	-	1.5	0.1	2.6
CNA206	0.3	-	-	0.0	-	-	0.3	0.0	0.1	-	0.4	0.0	0.7
CNA210	0.6	-	-	0.0	-	-	0.6	0.0	0.2	-	0.9	0.1	1.6
SR22	1.4	-	-	0.1	-	-	1.4	0.1	0.3	-	2.0	0.1	3.5
PA32C6	4.3	-	-	0.2	-	-	4.3	0.2	1.1	-	6.5	0.5	11.3
PA60	1.6	-	-	0.8	-	-	1.6	0.8	-	-	3.2	1.6	4.8
BEC55	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.1
BEC58	0.4	-	-	0.2	-	-	0.4	0.2	-	-	0.7	0.4	1.1
CNA310	0.1	-	-	0.1	-	-	0.1	0.1	-	-	0.2	0.1	0.3
CNA340	0.2	-	-	0.1	-	-	0.2	0.1	-	-	0.3	0.2	0.5
CNA402	0.2	-	-	0.1	-	-	0.2	0.1	-	-	0.4	0.2	0.6
CNA414	0.3	-	-	0.1	-	-	0.3	0.1	-	-	0.6	0.3	0.9

INM Aircraft Type	Departures (by Stage Length in Nautical Miles)						Arrivals		Circuits (See Notes)		Total (See Notes)		
	Day (7 a.m. – 10 p.m.)			Night (10 p.m. – 7 a.m.)									
	0-500	500-1,000 n.m.	1,000-1,500 n.m.	0-500 n.m.	500-1,000 n.m.	1,000-1,500 n.m.	Day	Night	Day	Night	Day	Night	Total
CNA421	0.3	-	-	0.1	-	-	0.3	0.1	-	-	0.5	0.3	0.8
CNA425	0.1	-	-	0.0	-	-	0.1	0.0	-	-	0.2	0.1	0.3
DA42	0.1	-	-	0.1	-	-	0.1	0.1	-	-	0.3	0.1	0.4
BEC190	0.1	-	-	0.0	-	-	0.1	0.0	-	-	0.1	0.0	0.2
BEC95	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0
BEC99	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0
BD100	1.1	-	-	0.3	-	-	1.1	0.3	-	-	2.2	0.7	2.9
CNA441	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.1
CNA208	4.7	-	-	1.5	-	-	4.7	1.5	-	-	9.4	3.0	12.4
AC50	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0
AC95	0.2	-	-	0.1	-	-	0.2	0.1	-	-	0.4	0.1	0.5
RWCM12	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0
DHC8	0.1	-	-	0.0	-	-	0.1	0.0	-	-	0.2	0.1	0.2
DHC830	0.1	-	-	0.0	-	-	0.1	0.0	-	-	0.1	0.0	0.2
DHC6	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0
PC12	0.4	-	-	0.1	-	-	0.4	0.1	-	-	0.9	0.3	1.1
EMB110	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0
EMB120	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0
BEC90	0.3	-	-	0.1	-	-	0.3	0.1	-	-	0.7	0.2	0.9
BEC100	0.1	-	-	0.0	-	-	0.1	0.0	-	-	0.1	0.0	0.2
BAEJ41	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0
MU2	0.1	-	-	0.0	-	-	0.1	0.0	-	-	0.1	0.0	0.2
MU300	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0
P180	0.6	-	-	0.2	-	-	0.6	0.2	-	-	1.2	0.4	1.6
SD330	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.1	0.0	0.1
SD360	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0
BEC200	0.8	-	-	0.3	-	-	0.8	0.3	-	-	1.6	0.5	2.2
BEC300	1.3	-	-	0.4	-	-	1.3	0.4	-	-	2.5	0.8	3.3
SAMER3	0.4	-	-	0.1	-	-	0.4	0.1	-	-	0.8	0.3	1.1
STBM7	0.2	-	-	0.1	-	-	0.2	0.1	-	-	0.4	0.1	0.5
IA1124	0.2	-	-	0.0	-	-	0.2	0.0	-	-	0.4	0.0	0.4
IA1125	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.1	0.0	0.1
G200	0.3	-	-	0.0	-	-	0.3	0.0	-	-	0.7	0.0	0.7
BEC400	1.9	-	-	0.1	-	-	1.9	0.1	-	-	3.8	0.3	4.0
CL600	2.1	-	-	0.2	-	-	2.1	0.2	-	-	4.2	0.3	4.5
CNA500	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0
CNA501	0.3	-	-	0.0	-	-	0.3	0.0	-	-	0.5	0.0	0.6
CNA510	0.4	-	-	0.0	-	-	0.4	0.0	-	-	0.7	0.1	0.8
CNA525C	3.3	-	-	0.3	-	-	3.3	0.3	-	-	6.7	0.5	7.2
CNA550	1.9	-	-	0.1	-	-	1.9	0.1	-	-	3.7	0.3	4.0
CNA560	4.8	-	-	0.3	-	-	4.8	0.3	-	-	9.7	0.7	10.4

INM Aircraft Type	Departures (by Stage Length in Nautical Miles)						Arrivals		Circuits (See Notes)		Total (See Notes)		
	Day (7 a.m. – 10 p.m.)			Night (10 p.m. – 7 a.m.)									
	0-500	500-1,000 n.m.	1,000-1,500 n.m.	0-500 n.m.	500-1,000 n.m.	1,000-1,500 n.m.	Day	Night	Day	Night	Day	Night	Total
CNA650	0.6	-	-	0.0	-	-	0.6	0.0	-	-	1.2	0.1	1.3
CNA680	3.1	-	-	0.2	-	-	3.1	0.2	-	-	6.2	0.4	6.6
CNA750	0.6	-	-	0.0	-	-	0.6	0.0	-	-	1.3	0.1	1.4
D328J	0.7	-	-	0.0	-	-	0.7	0.0	-	-	1.3	0.1	1.4
FAL10	0.2	-	-	0.0	-	-	0.2	0.0	-	-	0.3	0.0	0.3
FAL20	0.2	-	-	0.0	-	-	0.2	0.0	-	-	0.4	0.0	0.5
FAL50	0.2	-	-	0.0	-	-	0.2	0.0	-	-	0.4	0.0	0.5
FAL900	0.1	-	-	0.0	-	-	0.1	0.0	-	-	0.2	0.0	0.3
FAL20A	1.0	-	-	0.1	-	-	1.0	0.1	-	-	1.9	0.1	2.1
GIIB	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.1	0.0	0.1
GIV	0.6	-	-	0.0	-	-	0.6	0.0	-	-	1.1	0.1	1.2
GV	0.2	-	-	0.0	-	-	0.2	0.0	-	-	0.4	0.0	0.4
G150	0.2	-	-	0.0	-	-	0.2	0.0	-	-	0.4	0.0	0.4
R390	0.5	-	-	0.0	-	-	0.5	0.0	-	-	1.0	0.1	1.1
HK4000	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0
LEAR25	0.3	-	-	0.0	-	-	0.3	0.0	-	-	0.6	0.0	0.7
LEAR35	6.3	-	-	0.5	-	-	6.3	0.5	-	-	12.5	0.9	13.4
SABR60	0.1	-	-	0.0	-	-	0.1	0.0	-	-	0.2	0.0	0.2
Subtotal	55.4	-	-	7.8	-	-	55.4	7.8	2.9	-	105.1	15.7	132.3
Operations by All Operator Categories													
Total	84.6	3.2	3.3	17.3	-	-	89.8	18.6	4.2	-	177.9	35.9	225.3

Notes:

1. Totals and subtotals may not match the sum of individual entries exactly due to rounding.
2. Circuits include fixed-wing touch-and-go patterns and Ohio Army National Guard (OANG) helicopter “pattern work” activity.
3. Each circuit includes two operations. Therefore, the day, night, and overall totals in the far-right-hand columns are equal to the sum of arrivals and departures plus two times the number of relevant touch-and-go-circuits

Table 7 Forecast 2019 Average Annual Day Operations
Source: CHA and HMMH, 2013 (Subject to FAA Approval)

INM Aircraft Type	Departures (by Stage Length in Nautical Miles)						Arrivals		Circuits (See Notes)		Total (See Notes)		
	Day (7 a.m. – 10 p.m.)			Night (10 p.m. – 7 a.m.)									
	0-500	500-1,000 n.m.	1,000-1,500 n.m.	0-500 n.m.	500-1,000 n.m.	1,000-1,500 n.m.	Day	Night	Day	Night	Day	Night	Total
Scheduled Passenger Operations													
A320-211	1.1	0.8	-	0.5	-	-	1.8	0.6	-	-	3.6	1.0	4.7
717200	5.2	0.7	-	1.6	-	-	5.7	1.8	-	-	11.6	3.3	14.9
7373B2	0.8	0.1	0.5	0.4	-	-	1.4	0.4	-	-	2.8	0.8	3.6
737700	2.6	0.5	1.6	1.2	-	-	4.5	1.4	-	-	9.1	2.6	11.8
737800	0.2	0.0	0.1	0.1	-	-	0.4	0.1	-	-	0.7	0.2	0.9
MD88	-	-	-	-	-	-	-	-	-	-	-	-	-
DC95HW	-	-	-	-	-	-	-	-	-	-	-	-	-
EMB145	2.7	-	-	0.7	-	-	2.6	0.8	-	-	5.2	1.5	6.7
CLREGJ	3.0	-	-	0.8	-	-	2.8	0.9	-	-	5.8	1.7	7.5
CRJ701	8.4	1.1	0.7	2.7	-	-	9.9	3.1	-	-	20.2	5.8	26.0
CRJ900	6.0	0.2	0.7	1.8	-	-	6.6	2.1	-	-	13.5	3.9	17.4
Subtotal	29.9	3.5	3.6	9.7	-	-	35.6	11.1	-	-	72.6	20.8	93.4
Military Operations													
B429	0.4	-	-	0.2	-	-	0.4	0.2	0.4	-	1.6	0.3	1.9
CH47D	0.9	-	-	0.4	-	-	0.9	0.4	0.9	-	3.7	0.7	4.4
S70	0.4	-	-	-	-	-	0.4	-	-	-	0.7	-	0.7
C-130E	0.0	-	-	-	-	-	0.0	-	-	-	0.1	-	0.1
F16GE	0.0	-	-	-	-	-	0.0	-	-	-	0.1	-	0.1
Subtotal	1.7	-	-	0.5	-	-	1.7	0.5	1.3	-	6.1	1.1	7.2
General Aviation Operations													
M20L	1.6	-	-	0.1	-	-	1.6	0.1	0.4	-	4.1	0.2	4.3
BEC50	1.2	-	-	0.1	-	-	1.2	0.1	0.3	-	2.9	0.1	3.0
BEC33	0.3	-	-	0.0	-	-	0.3	0.0	0.1	-	0.7	0.0	0.7
BEC45	0.0	-	-	0.0	-	-	0.0	0.0	0.0	-	0.1	0.0	0.1
LA42	0.0	-	-	0.0	-	-	0.0	0.0	0.0	-	0.1	0.0	0.1
CNA172	0.9	-	-	0.1	-	-	0.9	0.1	0.2	-	2.3	0.1	2.4
CNA177	0.0	-	-	0.0	-	-	0.0	0.0	0.0	-	0.1	0.0	0.1
CNA182	1.0	-	-	0.1	-	-	1.0	0.1	0.2	-	2.5	0.1	2.7
CNA206	0.3	-	-	0.0	-	-	0.3	0.0	0.1	-	0.7	0.0	0.7
CNA210	0.6	-	-	0.0	-	-	0.6	0.0	0.2	-	1.6	0.1	1.6
SR22	1.4	-	-	0.1	-	-	1.4	0.1	0.3	-	3.4	0.2	3.6
PA32C6	4.4	-	-	0.2	-	-	4.4	0.2	1.1	-	11.0	0.5	11.5
PA60	1.6	-	-	0.8	-	-	1.6	0.8	-	-	3.2	1.6	4.8
BEC55	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.1
BEC58	0.4	-	-	0.2	-	-	0.4	0.2	-	-	0.7	0.4	1.1
CNA310	0.1	-	-	0.1	-	-	0.1	0.1	-	-	0.2	0.1	0.3
CNA340	0.2	-	-	0.1	-	-	0.2	0.1	-	-	0.3	0.2	0.5
CNA402	0.2	-	-	0.1	-	-	0.2	0.1	-	-	0.4	0.2	0.6
CNA414	0.3	-	-	0.1	-	-	0.3	0.1	-	-	0.6	0.3	0.9

INM Aircraft Type	Departures (by Stage Length in Nautical Miles)						Arrivals		Circuits (See Notes)		Total (See Notes)		
	Day (7 a.m. – 10 p.m.)			Night (10 p.m. – 7 a.m.)									
	0-500	500-1,000 n.m.	1,000-1,500 n.m.	0-500 n.m.	500-1,000 n.m.	1,000-1,500 n.m.	Day	Night	Day	Night	Day	Night	Total
CNA421	0.3	-	-	0.1	-	-	0.3	0.1	-	-	0.5	0.3	0.8
CNA425	0.1	-	-	0.0	-	-	0.1	0.0	-	-	0.2	0.1	0.3
DA42	0.1	-	-	0.1	-	-	0.1	0.1	-	-	0.3	0.1	0.4
BEC190	0.1	-	-	0.0	-	-	0.1	0.0	-	-	0.1	0.0	0.2
BEC95	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0
BEC99	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0
BD100	1.1	-	-	0.4	-	-	1.1	0.4	-	-	2.2	0.7	3.0
CNA441	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.1
CNA208	4.8	-	-	1.5	-	-	4.8	1.5	-	-	9.7	3.1	12.8
AC50	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0
AC95	0.2	-	-	0.1	-	-	0.2	0.1	-	-	0.4	0.1	0.5
RWCM12	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0
DHC8	0.1	-	-	0.0	-	-	0.1	0.0	-	-	0.2	0.1	0.2
DHC830	0.1	-	-	0.0	-	-	0.1	0.0	-	-	0.1	0.0	0.2
DHC6	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0
PC12	0.4	-	-	0.1	-	-	0.4	0.1	-	-	0.9	0.3	1.2
EMB110	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0
EMB120	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0
BEC90	0.3	-	-	0.1	-	-	0.3	0.1	-	-	0.7	0.2	0.9
BEC100	0.1	-	-	0.0	-	-	0.1	0.0	-	-	0.1	0.0	0.2
BAEJ41	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0
MU2	0.1	-	-	0.0	-	-	0.1	0.0	-	-	0.1	0.0	0.2
MU300	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0
P180	0.6	-	-	0.2	-	-	0.6	0.2	-	-	1.2	0.4	1.6
SD330	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.1	0.0	0.1
SD360	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0
BEC200	0.8	-	-	0.3	-	-	0.8	0.3	-	-	1.7	0.5	2.2
BEC300	1.3	-	-	0.4	-	-	1.3	0.4	-	-	2.6	0.8	3.4
SAMER3	0.4	-	-	0.1	-	-	0.4	0.1	-	-	0.8	0.3	1.1
STBM7	0.2	-	-	0.1	-	-	0.2	0.1	-	-	0.4	0.1	0.5
IA1124	0.2	-	-	0.0	-	-	0.2	0.0	-	-	0.4	0.0	0.4
IA1125	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.1	0.0	0.1
G200	0.3	-	-	0.0	-	-	0.3	0.0	-	-	0.7	0.0	0.7
BEC400	1.9	-	-	0.1	-	-	1.9	0.1	-	-	3.9	0.3	4.1
CL600	2.2	-	-	0.2	-	-	2.2	0.2	-	-	4.3	0.3	4.6
CNA500	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0
CNA501	0.3	-	-	0.0	-	-	0.3	0.0	-	-	0.5	0.0	0.6
CNA510	0.4	-	-	0.0	-	-	0.4	0.0	-	-	0.7	0.1	0.8
CNA525C	3.4	-	-	0.3	-	-	3.4	0.3	-	-	6.9	0.6	7.4
CNA550	1.9	-	-	0.1	-	-	1.9	0.1	-	-	3.8	0.3	4.1
CNA560	5.0	-	-	0.4	-	-	5.0	0.4	-	-	9.9	0.7	10.7

INM Aircraft Type	Departures (by Stage Length in Nautical Miles)						Arrivals		Circuits (See Notes)		Total (See Notes)		
	Day (7 a.m. – 10 p.m.)			Night (10 p.m. – 7 a.m.)									
	0-500	500-1,000 n.m.	1,000-1,500 n.m.	0-500 n.m.	500-1,000 n.m.	1,000-1,500 n.m.	Day	Night	Day	Night	Day	Night	Total
CNA650	0.6	-	-	0.0	-	-	0.6	0.0	-	-	1.2	0.1	1.3
CNA680	3.2	-	-	0.2	-	-	3.2	0.2	-	-	6.3	0.5	6.8
CNA750	0.7	-	-	0.0	-	-	0.7	0.0	-	-	1.3	0.1	1.4
D328J	0.7	-	-	0.0	-	-	0.7	0.0	-	-	1.4	0.1	1.5
FAL10	0.2	-	-	0.0	-	-	0.2	0.0	-	-	0.3	0.0	0.3
FAL20	0.2	-	-	0.0	-	-	0.2	0.0	-	-	0.4	0.0	0.5
FAL50	0.2	-	-	0.0	-	-	0.2	0.0	-	-	0.4	0.0	0.5
FAL900	0.1	-	-	0.0	-	-	0.1	0.0	-	-	0.3	0.0	0.3
FAL20A	1.0	-	-	0.1	-	-	1.0	0.1	-	-	2.0	0.1	2.1
GIIB	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.1	0.0	0.1
GIV	0.6	-	-	0.0	-	-	0.6	0.0	-	-	1.2	0.1	1.2
GV	0.2	-	-	0.0	-	-	0.2	0.0	-	-	0.4	0.0	0.4
G150	0.2	-	-	0.0	-	-	0.2	0.0	-	-	0.4	0.0	0.4
R390	0.5	-	-	0.0	-	-	0.5	0.0	-	-	1.0	0.1	1.1
HK4000	0.0	-	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0
LEAR25	0.3	-	-	0.0	-	-	0.3	0.0	-	-	0.7	0.0	0.7
LEAR35	6.4	-	-	0.5	-	-	6.4	0.5	-	-	12.8	0.9	13.8
SABR60	0.1	-	-	0.0	-	-	0.1	0.0	-	-	0.2	0.0	0.2
Subtotal	56.7	-	-	8.0	-	-	56.7	8.0	2.9	-	119.3	16.0	135.3
Operations by All Operator Categories													
Total	88.4	3.5	3.6	18.2	-	-	94.1	19.7	4.2	-	198.0	37.9	235.9

Notes:

1. Totals and subtotals may not match the sum of individual entries exactly due to rounding.
2. Circuits include fixed-wing touch-and-go patterns and Ohio Army National Guard (OANG) helicopter “pattern work” activity.
3. Each circuit includes two operations. Therefore, the day, night, and overall totals in the far-right-hand columns are equal to the sum of arrivals and departures plus two times the number of relevant touch-and-go-circuits

4.3 Aircraft Noise and Performance Characteristics

The INM database contains noise and performance data for over one hundred different aircraft types. The program automatically accesses the applicable noise and performance data for operations by those aircraft. Noise data are in the form of SEL (see Section 2.1.4) at a range of distances (from 200 feet to 25,000 feet) from a particular aircraft with engines at a specific thrust level. Performance data includes thrust, speed, and altitude profiles for takeoff and landing operations.

The aircraft types listed in the tables in Section 4.2 identify operations according to INM aircraft types. Many of these types represent multiple aircraft models with comparable noise and performance characteristics. For some aircraft models for which the database does not include type-specific data, the FAA has identified "standard" substitutes; i.e., pre-approved surrogates to use from among the types in the database. For models not included in the database and for which there is not standard substitute, the FAA works with the INM user to identify appropriate "non-standard substitutes." Appendix E reproduces correspondence with the FAA for this purpose, including a request for a single determination and the FAA letter identifying the approved substitute; i.e., to use the Bell B429 helicopter as the surrogate for the Ohio Army National Guard UH-72 "Lakota."

4.4 Airport Physical Parameters

CAK has two operational paved runways: Runway 1/19 and Runway 5/23.

The INM requires detailed inputs on the runway layout, including runway ends, runway end elevations, start-of-takeoff roll points, landing thresholds, threshold crossing heights, and approach angles. These inputs define starting and ending points of modeled operations in three dimensions.

The INM includes an internal database of airport layout inputs. The consulting team compared the INM data to the most current, official published sources, including:

- "AirNav.com" web page entry for CAK[23]
- FAA "airport diagram" for CAK[24]
- FAA Form 5010-1 "Airport Master Record" for CAK[25]

The consulting team also verified the data with CAK staff.

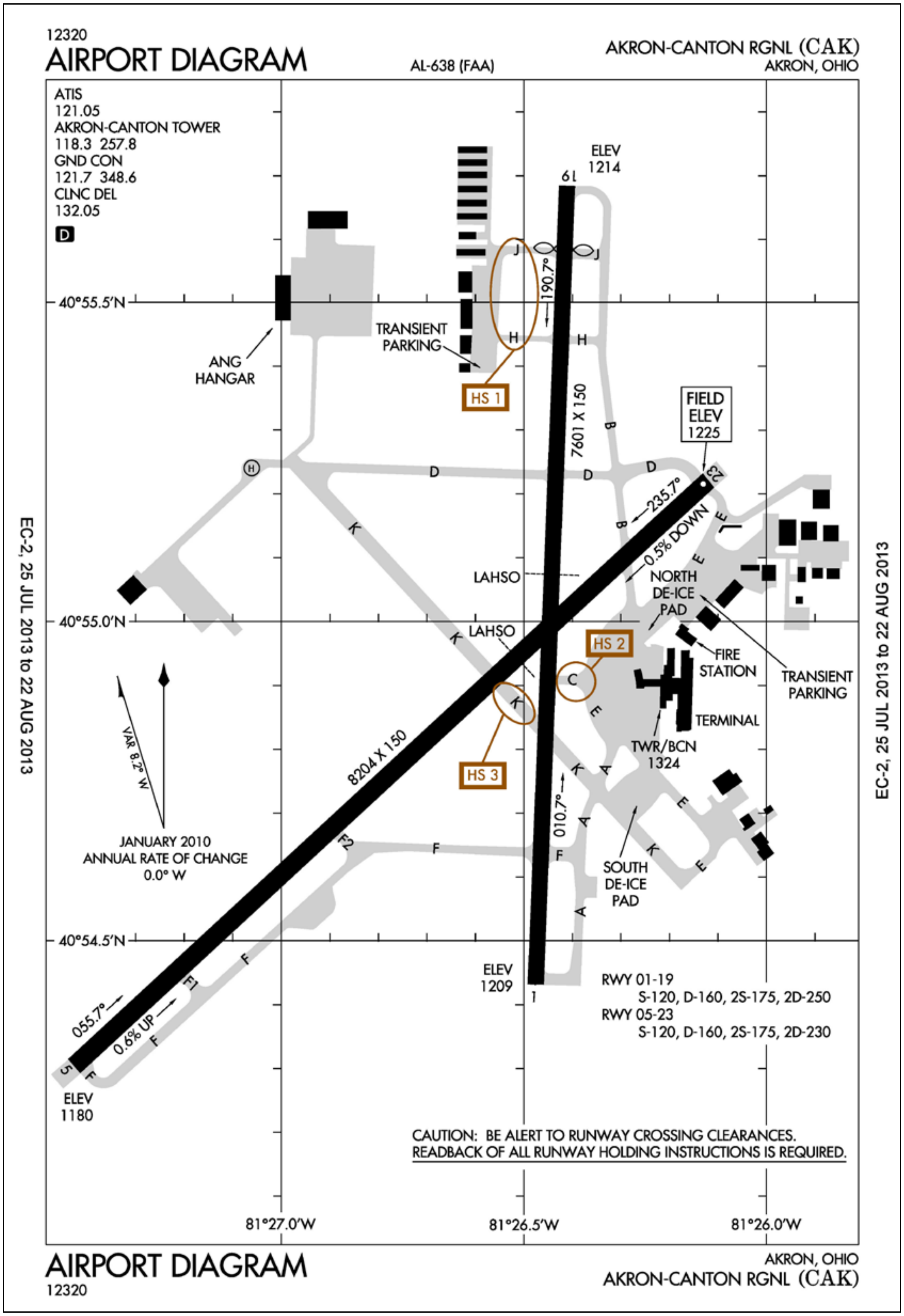
Figure 31 presents the FAA Airport Diagram for CAK, which displays relevant layout data in a graphic format.

[23] AirNav is a private company that is considered a reliable source of airport information, regularly used by pilots to obtain information about an airport prior to operating at it. AirNav obtains the information that it posts on its website from FAA sources. See: www.AirNav.com.

[24] The FAA publishes (electronically and in hard copy) "U.S. Terminal Procedure Publications" that provide charts of "instrument approach procedures," "departure procedures," "standard terminal arrival procedures," "charted visual flight procedures" and "airport diagrams." The airport diagrams are an official source of airport physical dimensions. See: http://www.naco.faa.gov/index.asp?xml=naco/online/d_tpp.

[25] The FAA Form 5010-1, "Airport Master Record," presents comprehensive data on airports. It is maintained for all public use airports by the FAA's National Flight Data Center. It is updated annually for Akron-Canton Airport. See: http://www.faa.gov/airports_airtraffic/airports/airport_safety/airportdata_5010/.

Figure 30 FAA Airport Diagram for Akron-Canton Airport
Source: FAA, 2013



4.5 Runway Utilization

At the outset of the inventory phase of the Part 150 Update Study, the consulting team conferred with CAK staff, FAA Airport Traffic Control Tower (ATCT) staff, and FAA Airports District Office (ADO) staff to determine the appropriate source of information on which to base runway use and flight track modeling assumptions. The ADO staff included the personnel who will have primary responsibility for reviewing the Noise Exposure Map submission for compliance with FAA requirements.

The result of those discussions was agreement that it would be appropriate to obtain flight operations ("radar") data from four months in 2012 providing reasonable representation of seasonal variation in activity and operating conditions. The participants in those discussions selected the months of January, April, July, and October 2012 to reflect the four seasons, with consideration given to sampling months without unusual airport operating conditions, such as extended runway closures, that could affect operations significantly.[26]

The source of the data was a commercial operations monitoring installation that Passur Aerospace operates at Cleveland-Hopkins International Airport and that covered the CAK airspace.

The four-month data sample included flight tracks for 11,464 fixed-wing operations – a very significant sample size. Table 8 summarizes the runway use rates from the data. The CAK staff and FAA ATCT staff reviewed and approved these rates for reasonableness.

Helicopter arrival and departure operations, and helicopter pattern activity all operate to and from the point marked "Ⓗ" on the Figure 31 airport diagram (to the southwest of the Ohio Army National Guard hangar (labeled "ANG" on the figure). The flight track figures and utilization tables presented in Section 4.6 provide information on the percentage use of these tracks by direction.

[26] CHA also used the Passur data sample for development of the activity and fleet mix forecasts presented in Appendix C, as summarized Table 6 and Table 7 in Section 4.2 of the body of this report.

Table 8 Fixed-Wing Runway Use by Major Aircraft Type Category
Source: HMMH, based on four-month Passur data sample from 2012

Air Carrier Jets (≥ 90 seats) and All Military Fixed-Wing	Arrival			Departure			Touch-and-Go			Total		
	Day	Night	Total	Day	Night	Total	Day	Night	Total	Day	Night	Total
Runway 1	11%	15%	12%	24%	23%	24%	Not applicable			18%	19%	19%
Runway 5	15%	32%	19%	4%	2%	3%				9%	18%	10%
Runway 19	26%	21%	25%	11%	9%	10%				17%	15%	17%
Runway 23	48%	32%	44%	62%	66%	63%				56%	48%	54%
Total	100%	100%	100%	100%	100%	100%				100%	100%	100%

Regional Jets (< 90 seats)	Arrival			Departure			Touch-and-Go			Total		
	Day	Night	Total	Day	Night	Total	Day	Night	Total	Day	Night	Total
Runway 1	16%	24%	17%	25%	25%	25%	Not applicable			21%	25%	22%
Runway 5	12%	23%	14%	3%	1%	3%				7%	9%	7%
Runway 19	29%	17%	27%	13%	11%	12%				20%	13%	18%
Runway 23	42%	36%	41%	59%	64%	60%				52%	54%	53%
Total	100%	100%	100%	100%	100%	100%				100%	100%	100%

General Aviation Jets	Arrival			Departure			Touch-and-Go			Total		
	Day	Night	Total	Day	Night	Total	Day	Night	Total	Day	Night	Total
Runway 1	14%	14%	14%	25%	25%	0%	Not applicable			21%	22%	6%
Runway 5	16%	17%	16%	1%	0%	2%				7%	5%	8%
Runway 19	26%	28%	26%	17%	11%	22%				20%	16%	24%
Runway 23	45%	41%	44%	57%	63%	77%				52%	57%	62%
Total	100%	100%	100%	100%	100%	100%				100%	100%	100%

Turbo-Propeller Aircraft	Arrival			Departure			Touch-and-Go			Total		
	Day	Night	Total	Day	Night	Total	Day	Night	Total	Day	Night	Total
Runway 1	11%	4%	8%	19%	16%	19%	Not applicable			16%	6%	14%
Runway 5	14%	2%	8%	4%	3%	4%				7%	3%	6%
Runway 19	28%	22%	25%	19%	13%	19%				22%	20%	21%
Runway 23	47%	72%	59%	58%	68%	59%				55%	72%	59%
Total	100%	100%	100%	100%	100%	100%				100%	100%	100%

Piston-Propeller Aircraft	Arrival			Departure			Touch-and-Go			Total		
	Day	Night	Total	Day	Night	Total	Day	Night	Total	Day	Night	Total
Runway 1	7%	8%	7%	23%	4%	20%	0%	0%	0%	16%	5%	14%
Runway 5	15%	38%	18%	5%	4%	5%	0%	0%	0%	10%	14%	10%
Runway 19	49%	29%	47%	20%	21%	20%	75%	0%	75%	33%	24%	32%
Runway 23	29%	25%	28%	52%	71%	55%	25%	0%	25%	42%	57%	44%
Total	100%	100%	100%	100%	100%	100%	100%	0%	100%	100%	100%	100%

4.6 Flight Track Geometry and Utilization

The Passur data discussed in the preceding section also provided the primary basis for development of fixed-wing modeling flight tracks. Since the sample included very few tracks for Ohio Army National Guard (OANG) helicopter operations, HMMH interviewed OANG representatives to develop those tracks.

4.6.1 Flight Track Geometry

The following four figures present the modeling flight tracks developed for the following combinations of aircraft type and operations type:

- Figure 32 Fixed-Wing Departure Modeling Flight Tracks
- Figure 33 Fixed-Wing Arrival Modeling Flight Tracks
- Figure 34 Fixed-Wing Touch-and-Go Modeling Flight Tracks
- Figure 35 Helicopter Modeling Flight Tracks

For clarity, these figures cover the Advisory Committee defined study area, at the scale of 1” to 8,000’. The flight track figures depict “backbone” modeling tracks with bold lines. There are two “dispersion” tracks on either side of each backbone, depicted using shaded lines.

Part 150 requires formal Noise Exposure Map submissions to depict tracks out to at least 30,000 feet at a scale of at least 1” to 2,000’. FAA guidelines permit airports to present the flight tracks covering this scope and scale on a separate, unbound figure at this scale accompanying the Noise Exposure Map document. Based on discussion with the FAA Airports District Office (ADO) staff, the NEM submission will include that figure folded up and inserted into a sleeve in the rear of that volume.

4.6.2 Flight Track Utilization

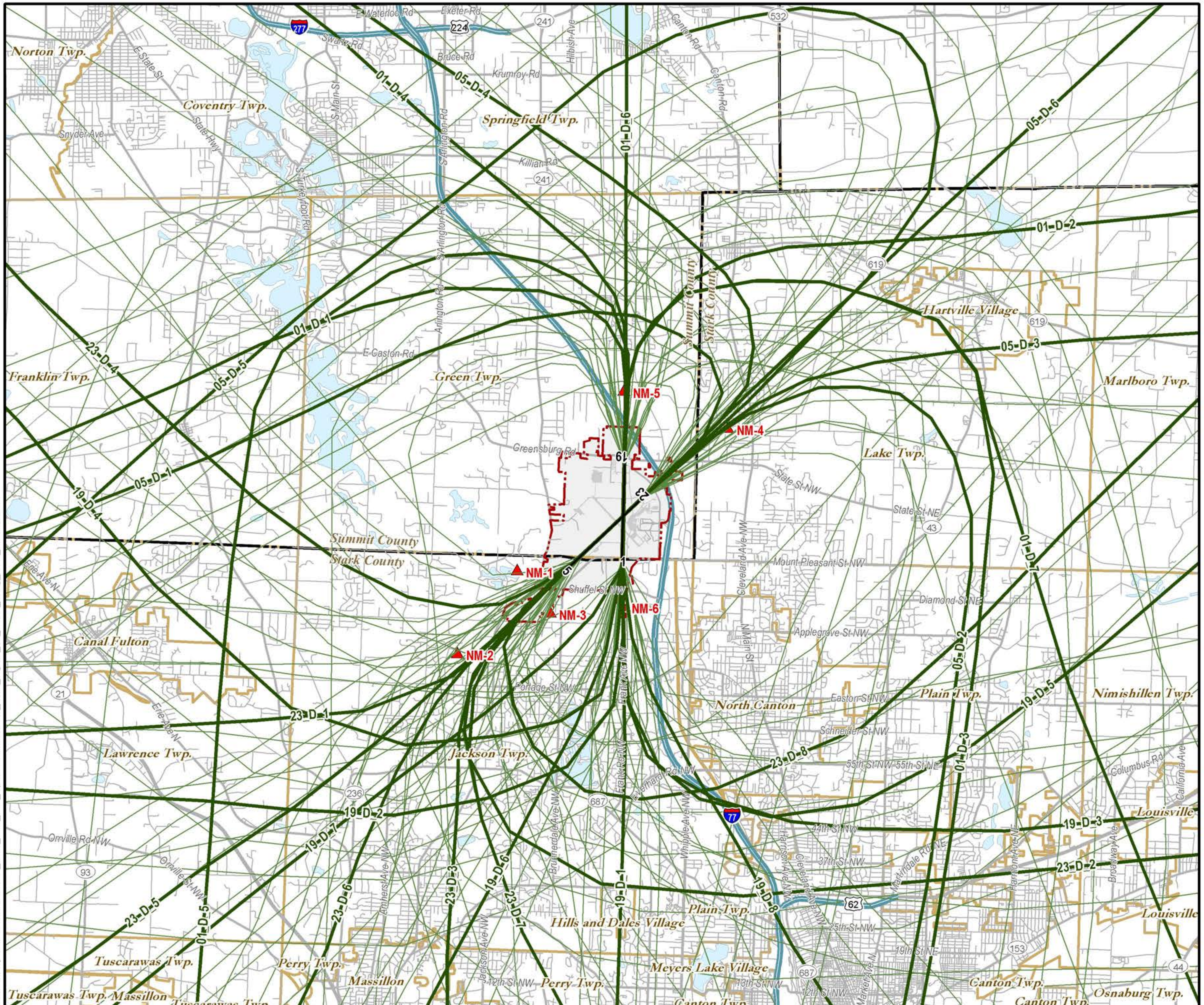
Four tables following the flight track figures present the following modeling assumptions:

- Table 9 Fixed-Wing Backbone Departure Flight Track Utilization Rates
- Table 10 Fixed-Wing Backbone Arrival Flight Track Utilization Rates
- Table 11 Civil Fixed-Wing Touch-and-Go Flight Track Utilization Rates
- Table 12 Ohio Army National Guard Helicopter Flight Track Utilization Rates

The INM uses “backbone” tracks with two associated “dispersion” tracks on either side of the backbone. The arrival and departure utilization rates presented in the tables are for the operations assigned to each backbone track and its associated dispersion tracks. The INM distributes operations among these five tracks using a “normal” distribution (e.g., a “bell-shaped” curve) as follows:

- Outer-left dispersion track: 6.3%
- Inner-left dispersion track: 24.4%
- Backbone track: 38.6%
- Inner-right dispersion track: 24.4%
- Outer-right dispersion track: 6.3%

There is one fixed-wing touch-and-go track for each of the four runway ends; 100% of the touch-and-go operations on each runway are on the associated circuit. There are no dispersion tracks for these circuits. There are two OANG helicopter circuit tracks to the northwest of the airport and one to the southwest. The OANG helicopters use the northwest tracks on a 50%/50% basis when Runway 5/23 is in use and the southwest track when Runways 01/19 is in use. There are no dispersion tracks for these circuits either.



AKRON-CANTON AIRPORT

Figure 32
Fixed-Wing Departure Modeling Flight Tracks
14 CFR Part 150 Update

Airport Property Boundary
Airport Runway
Backbone Model Track
Dispersed Track
NM-# Portable Noise Monitoring Sites
County Boundary
Township Boundary
Interstate Highways
Primary Roads
Local Roads
Water Bodies

North

0 4,000 8,000 Feet

HARRIS MILLER MILLER & HANSON INC.

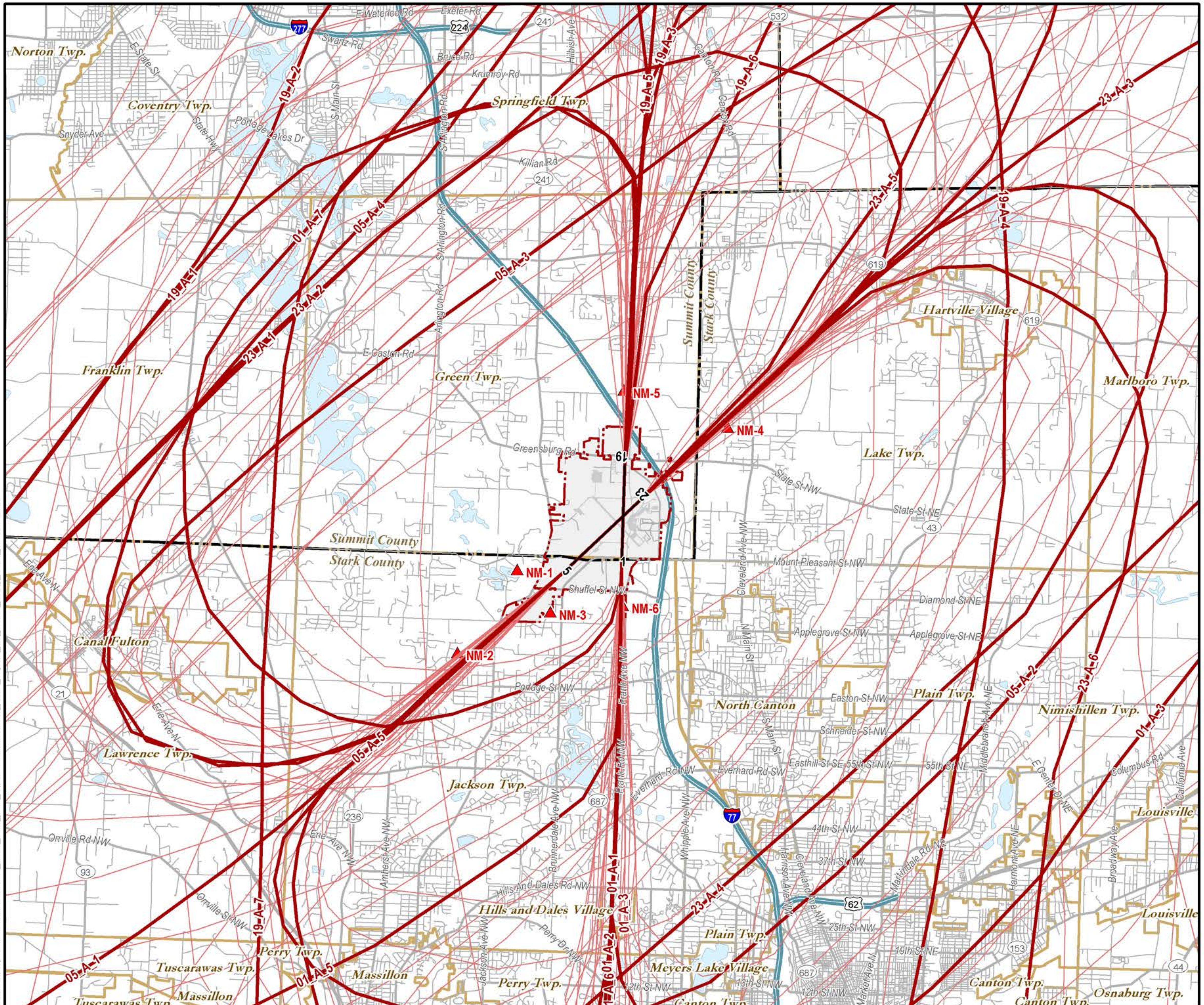
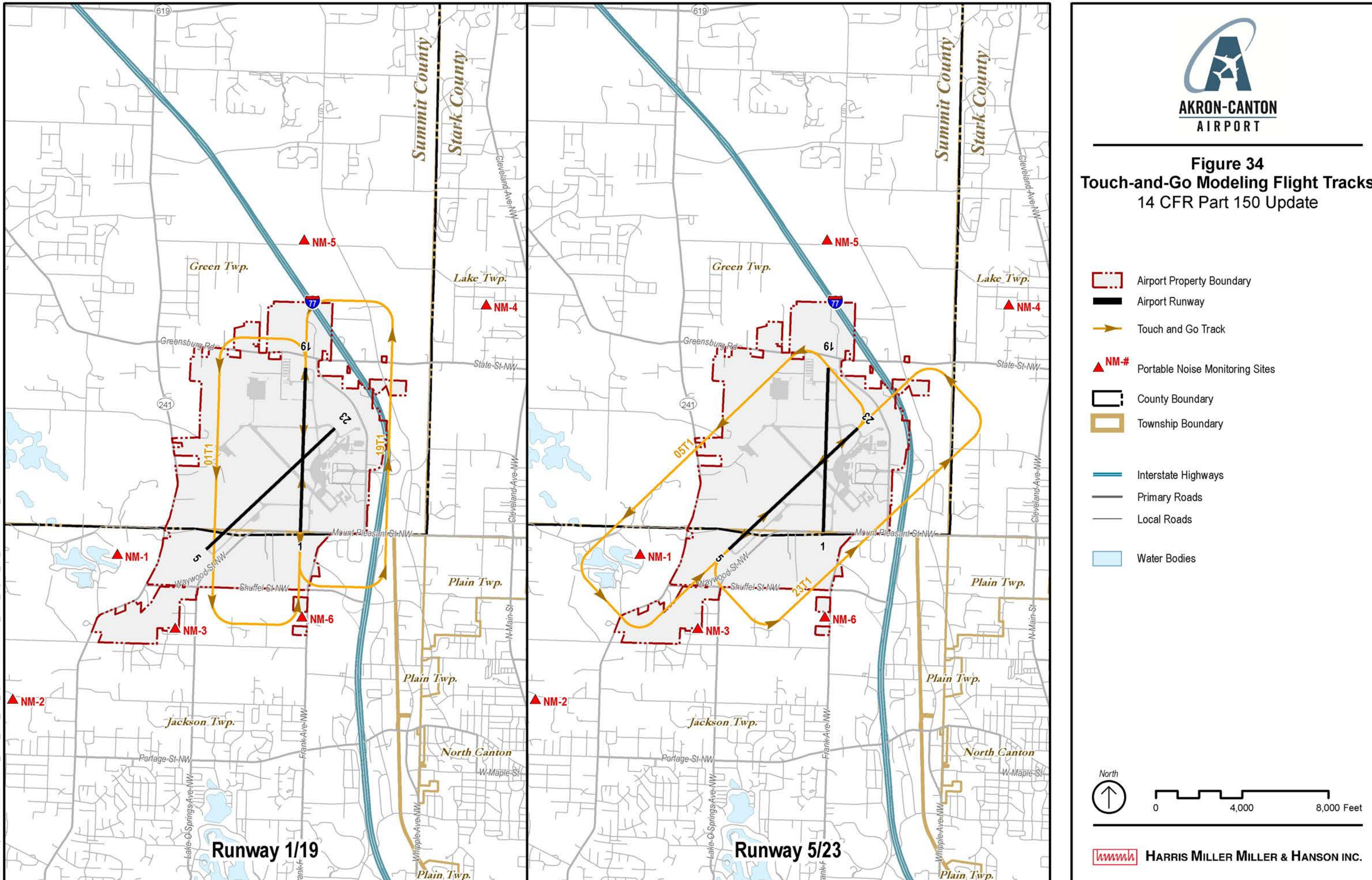


Figure 33
Fixed-Wing Arrival Modeling Flight Tracks
14 CFR Part 150 Update

AKRON-CANTON AIRPORT

Airport Property Boundary
Airport Runway
Backbone Model Track
Dispersed Track
NM-# Portable Noise Monitoring Sites
County Boundary
Township Boundary
Interstate Highways
Primary Roads
Local Roads
Water Bodies

HARRIS MILLER MILLER & HANSON INC.



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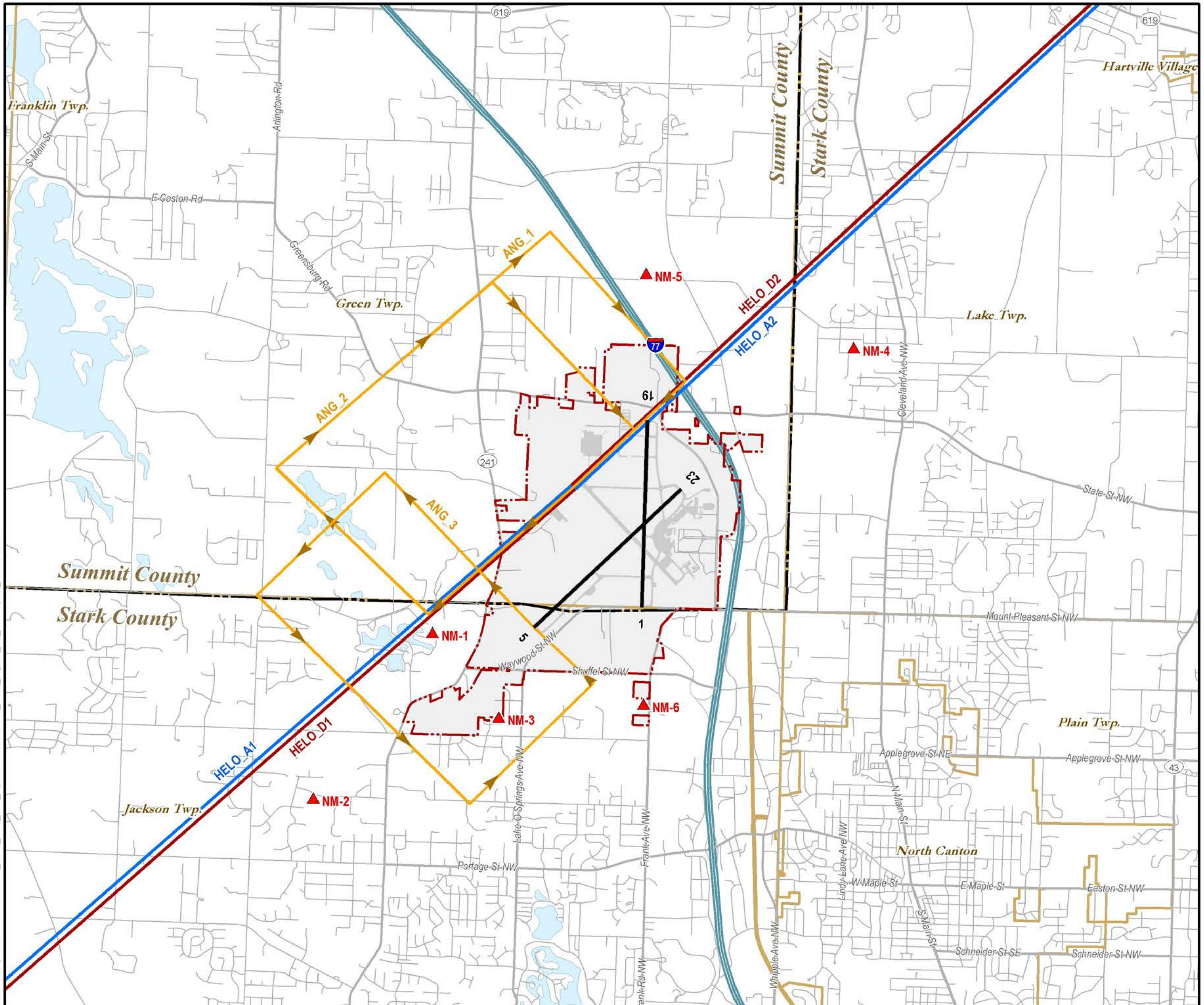

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AKRON-CANTON
AIRPORT

Figure 35
Helicopter Modeling Flight Tracks
14 CFR Part 150 Update

Airport Property Boundary
Airport Runway
Helicopter Arrival Track
Helicopter Departure Track
OANG Pattern Work
NM-# Portable Noise Monitoring Sites
County Boundary
Township Boundary
Interstate Highways
Primary Roads
Local Roads
Water Bodies

North
0 4,000 8,000 Feet

HARRIS MILLER MILLER & HANSON INC.

Table 9 Fixed-Wing Backbone Departure Flight Track Utilization Rates, by Runway End
Source: HMMH, 2013

Runway	Track Name	Air Carrier Jets and Fixed-Wing Military		Regional Jets		General Aviation Jets		Non-Jet Civil Aircraft	
		Day	Night	Day	Night	Day	Night	Day	Night
1	01_D_1	24%	24%	20%	20%	31%	31%	25%	25%
1	01_D_2	23%	23%	16%	16%	22%	22%	25%	25%
1	01_D_3	51%	51%	38%	38%	33%	33%	18%	18%
1	01_D_4	-	-	18%	18%	10%	10%	11%	11%
1	01_D_5	2%	2%	4%	4%	4%	4%	9%	9%
1	01_D_6	-	-	-	-	-	-	13%	13%
1	01_D_7	-	-	4%	4%	-	-	-	-
5	05_D_1	23%	23%	23%	23%	-	-	52%	52%
5	05_D_2	50%	50%	46%	46%	-	-	19%	19%
5	05_D_3	27%	27%	15%	15%	29%	29%	-	-
5	05_D_4	-	-	15%	15%	-	-	-	-
5	05_D_5	-	-	-	-	71%	71%	-	-
5	05_D_6	-	-	-	-	-	-	29%	29%
19	19_D_1	48%	48%	39%	39%	21%	21%	21%	21%
19	19_D_2	21%	21%	5%	5%	27%	27%	21%	21%
19	19_D_3	25%	25%	9%	9%	11%	11%	12%	12%
19	19_D_4	-	-	12%	12%	9%	9%	-	-
19	19_D_5	-	-	7%	7%	12%	12%	7%	7%
19	19_D_6	3%	3%	8%	8%	12%	12%	14%	14%
19	19_D_7	3%	3%	16%	16%	-	-	15%	15%
19	19_D_8	-	-	5%	5%	9%	9%	9%	9%
23	23_D_1	24%	24%	19%	19%	22%	22%	31%	31%
23	23_D_2	23%	23%	12%	12%	14%	14%	6%	6%
23	23_D_3	51%	51%	35%	35%	15%	15%	7%	7%
23	23_D_4	1%	1%	17%	17%	8%	8%	16%	16%
23	23_D_5	-	-	7%	7%	10%	10%	15%	15%
23	23_D_6	1%	1%	2%	2%	11%	11%	6%	6%
23	23_D_7	-	-	6%	6%	9%	9%	9%	9%
23	23_D_8	1%	1%	1%	1%	9%	9%	8%	8%

Table 10 Fixed-Wing Backbone Arrival Flight Track Utilization Rates, by Runway End
Source: HMMH, 2013

Runway	Track Name	Air Carrier Jets and Fixed-Wing Military		Regional Jets		General Aviation Jets		Non-Jet Civil Aircraft	
		Day	Night	Day	Night	Day	Night	Day	Night
1	01_A_1	39%	39%	12%	12%	31%	31%	24%	24%
1	01_A_2	37%	37%	58%	58%	27%	27%	38%	38%
1	01_A_3	14%	14%	7%	7%	9%	9%	10%	10%
1	01_A_5	10%	10%	7%	7%	13%	13%	19%	19%
1	01_A_6	-	-	10%	10%	19%	19%	10%	10%
1	01_A_7	-	-	5%	5%	-	-	-	-
5	05_A_1	91%	91%	79%	79%	90%	90%	84%	84%
5	05_A_2	6%	6%	3%	3%	10%	10%	-	-
5	05_A_3	3%	3%	-	-	-	-	-	-
5	05_A_4	-	-	10%	10%	-	-	16%	16%
5	05_A_5	-	-	8%	8%	-	-	-	-
19	19_A_1	41%	41%	26%	26%	45%	45%	35%	35%
19	19_A_2	32%	32%	14%	14%	19%	19%	20%	20%
19	19_A_3	12%	12%	10%	10%	13%	13%	10%	10%
19	19_A_4	6%	6%	13%	13%	10%	10%	6%	6%
19	19_A_5	-	-	24%	24%	13%	13%	29%	29%
19	19_A_6	-	-	12%	12%	-	-	-	-
19	19_A_7	9%	9%	-	-	-	-	-	-
23	23_A_1	31%	31%	15%	15%	36%	36%	45%	45%
23	23_A_2	36%	36%	18%	18%	17%	17%	14%	14%
23	23_A_3	28%	28%	24%	24%	30%	30%	27%	27%
23	23_A_4	5%	5%	2%	2%	-	-	-	-
23	23_A_5	-	-	34%	34%	8%	8%	14%	14%
23	23_A_6	-	-	8%	8%	9%	9%	-	-

Table 11 Civil Fixed-Wing Touch-and-Go Flight Track Utilization Rates, by Runway End
Source: HMMH, 2013

Runway	Track Name	Circuits	
		Day	Night
1	01T1	100%	100%
19	19T1	100%	100%
5	05T1	100%	100%
23	23T1	100%	100%

Table 12 Ohio Army National Guard Helicopter Flight Track Utilization Rates
Source: HMMH, 2013

Track Name	Departures		Arrivals		Pattern Work Circuits	
	Day	Night	Day	Night	Day	Night
Helo_D1	21%	-	-	-	Not Applicable	
Helo_D2	79%	100%	-	-		
Helo_A1	-	-	21%	-		
Helo_A2	-	-	79%	100%		
ANG_1	Not Applicable				30%	30%
ANG_2					30%	30%
ANG_3					41%	41%

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APPENDIX A FAA RECORD OF APPROVAL ON 1988 PART 150 NOISE COMPATIBILITY PROGRAM UPDATE

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U.S. Department of Transportation
Federal Aviation Administration

Memorandum

Subject: ACTION: Approval of Noise Compatibility Program for Akron-Canton Regional Airport, North Canton, Ohio

Date: SEP 7 1989

From: Assistant Manager, Airports Division, Great Lakes Region, AGL-601

Reply to Attn. of: Snyder:X7538

To: Associate Administrator for Airport System Development, ARP-1
ATTN: APP-600

On April 24, 1989, the FAA determined that the Noise Exposure Maps (NEM's) for Akron-Canton Regional Airport in North Canton, Ohio, are in compliance with applicable requirements of Section 103 (c) of the Aviation Safety and Noise Abatement Act of 1979 ("The Act"). On July 21, 1989, FAA determined that the Noise Compatibility Program conforms to the requirements of FAR Part 150 and is acceptable for detailed review. Therefore, July 21, 1989 marked the start of the formal 180-day review period for Akron-Canton Regional Airport's proposed Noise Compatibility Program (NCP) under Section 104(a) of the Act. According to the Act, the NCP must be approved or disapproved by FAA within 180 days or it shall be deemed approved. The last date for such approval or disapproval is January 17, 1989.

The proposed NCP has been reviewed and evaluated by the Detroit Airports District Office; Flight Standards, Airway Facilities, Air Traffic, and Airports Divisions; the Regional Planning Specialist; and Assistant Chief Counsel. Their comments were consolidated with those of APP-600 and AEE-100 and sent to the airport sponsor. The sponsor addressed these comments, and produced errata sheets for Part I and Part II of the Akron-Canton Regional Airport Part 150 Study submittal. The sponsor's response also contained certification of public participation in the Part 150 process and documentation of the sponsor's certification for both the NEM and NCP. Copies of all of these are being submitted with this memorandum to APP-600 to be consolidated with previous submittals of the NEM and NCP, and the NEM checklist.

We have concluded that the NCP is consistent with the intent of the Act and that it meets the standards set forth in FAR Part 150 for such programs. The standard Part 150 noise compatibility program checklist was reviewed to ensure that all required items were included in the proposed program. That checklist is attached.

As part of the formal 180-day review, each proposed action in the NCP has undergone further review and evaluation on the basis of effectiveness and potential conflict with Federal policy and prerogatives. These include safe and efficient use of the nation's airspace, undue burden on interstate commerce, unjust discrimination, and interference with a Federal regulatory compliance schedule (i.e., FAR Part 91, Subpart E).

On July 21, 1989, in accepting the NCP for formal review, FAA indicated informally to the airport sponsor that a portion of Land Use Management Measure 9 in the NCP lacked sufficient justification for recommending purchase of three homes and approximately six acres of undeveloped land north of the airport on the south side of Greensburg Road. These properties, for the most part, lie outside the Ldn 65 contour generated by the Integrated Noise Model. In a letter dated August 8, 1989, the airport sponsor, through its consultant, submitted an Addendum dated August 8, 1989, entitled, "Taxiway and Helicopter Ramp Noise Analysis-Impact on Greensburg Road Homes". This document provided further analysis of the noise impact on these homes, to be used by FAA in evaluation of the measure. This analysis was reviewed by Tom Connor, AEE-120, and was found to have some minor deficiencies. An errata sheet addressing these deficiencies was submitted by the sponsor's consultant in a letter dated August 24, 1989. The sponsor, in a letter dated September 6, 1989, submitted additional documentation for Land Use Management Measure 9, and urged further consideration at the Washington level. We feel further consideration is merited, but we have no current guidance that would allow us to recommend approval.

Our recommendation on each of the proposed actions is described in the attached Record of Approval. Each measure is described in detail in the Akron-Canton Regional Airport NCP.

Robert Billingsley

W. Robert Billingsley, Assistant Manager
Airports Division
FAA Great Lakes Region

Attachments

Addendum: Taxiway and Helicopter Ramp Noise Analysis-Impact on Greensburg Road Homes, August 8, 1989 (Revised August 24, 1989)
Letter from Sponsor dated September 6, 1989, requesting reconsideration of recommendation on Land Use Management Measure 9
NCP and NEM, Including Sponsor's Response to FAA Comments
NEM Acceptance Letter
Federal Register Notice, Copy of Original Submittal
Record of Approval
NCP and NEM Checklists

3

RECORD OF APPROVAL
AKRON-CANTON REGIONAL AIRPORT
NOISE COMPATIBILITY PROGRAM

Concur	✓	Joan W. Bauerlein for Associate Administrator for Policy and International Aviation, API-1	9/21/89 (date)
Non concur	____		
Concur	✓	Gregory S. Walden Chief Counsel, AGC-1	Sept. 21, 1989 (date)
Non concur	____		
Approve	✓	Quentin S. Taylor Associate Administrator for Airport System Development, ARP-1	9/21/89 (date)
Disapprove	____		

RECORD OF APPROVAL
AKRON-CANTON REGIONAL AIRPORT
NOISE COMPATIBILITY PROGRAM

The Noise Compatibility Program (NCP) for Akron-Canton Regional Airport, North Canton, Ohio, describes the current and future non-compatible land uses based upon the parameters as established in FAR Part 150, Airport Noise Compatibility Planning. The Akron-Canton Regional Airport Authority recommended seventeen (17) measures in their NCP to remedy existing noise problems and prevent future non-compatible land uses. These measures are grouped into three categories: Noise Abatement Measures (4 measures), Land Use Management Measures (10 measures) and Continuing Program Measures (3 measures).

Each measure is identified below by plan category, and includes a summary of the airport operator's recommendations and a cross reference to page numbers in the NCP where each measure can be found. Summaries of these measures are found in Table 6A, Noise Abatement Recommendations and Table 6C, Land Use Management Alternative Evaluation Matrix. Also, Table 6G, contains information on who is responsible for implementation, an implementation schedule, and associated implementation costs for each measure. These pages and recommendations are supplemented by an Addendum dated August 8, 1989, entitled, "Taxiway and Helicopter Ramp Noise Analysis-Impact on Greensburg Road Homes" (Revised August 24, 1989). This document provided additional justification for recommendations made in Land Use Management Measure 9.

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

The recommendations in the Record of Approval summarize as closely as possible the airport operator's recommendations in the Noise Compatibility Program, and are cross-referenced. The statements contained within the summarized recommendations and before the indicated FAA approval, disapproval, or other determination do not represent the opinions or decisions of the FAA.

NOISE ABATEMENT MEASURES.

1. **Establish Runway 23 Departure Procedures (NCP pages 5-4, 5-5, Exhibit 5A (following page 5-6), 6-2 (including errata dated July 21, 1989), 6-3, 6-5, 6-21, 6-23, 6-24, 6-29, and Appendix D, page D-2).** The Airport Authority recommends maintaining a recently implemented departure procedure for Runway 23 which

calls for all jet aircraft to hold runway heading on Runway 23 departures until 4 nautical miles from the ASR Antenna. The straight out departure procedure is intended to apply only to jet aircraft. For purposes of promoting safety and the efficient use of local airspace, it is important to allow the separation of high performance aircraft from slower aircraft. By restricting the straight-out procedure to jets, slower turboprop and piston-engine aircraft can be turned to the right or left to keep them separated from the flow of jet aircraft. FAA's Akron-Canton Air Traffic Control Tower would continue to implement this procedure subject to the authority of the pilot in command to request an amended departure clearance pursuant to FAR 91.75. The Airport Authority plans to notify all carriers utilizing the airport of the procedure. Also, the Authority plans to reinforce the procedure through a written letter of agreement between the airport management and the FAA Air Traffic Control Tower and by having the procedure included in the Air Traffic Control Tower Orders.

Approved.

2. **Establish Itinerant Helicopter Departure Procedures (NCP pages 5-6, 6-3 (including errata dated July 21, 1989), 6-5, 6-21, 6-23, 6-24 (including errata dated July 21, 1989), and 6-29).** The Airport Authority recommends maintaining a departure procedure for itinerant helicopters implemented July 25, 1988. This procedure calls for itinerant helicopters to be cleared to 2,500 feet MSL immediately after takeoff when conflicts are not present. This procedure could impose some delays on helicopters when conflicting traffic is in the area. However, the procedure would reduce noise impacts by increasing the altitude of those departures that were formerly allowed to take off and fly lower. FAA's Akron-Canton Air Traffic Control Tower would continue to implement this procedure subject to the authority of the pilot in command to request an amended departure clearance pursuant to FAR 91.75.

Approved.

3. **Establish Minimum Approach Altitude For Helicopters On Runway 32 (NCP pages 5-7, 6-3 (including errata dated July 21, 1989 and August 8, 1989), 6-5, 6-21, 6-23, 6-24, 6-29, and Appendix D, page D-3).** The Airport Authority recommends establishing an approach procedure to Runway 32. The procedure would call for helicopters approaching Runway 32 to maintain an altitude of at least 2,500 feet MSL until reaching a distance of 5 nautical miles from the ASR antenna (4 nautical miles from the runway end). At that point, the helicopters could begin their descent at a rate of 300 feet per mile, maintaining that rate of descent until landing. Although this procedure will not result in any change in Ldn noise contours, it should reduce some of the potentially disturbing occasional

single event noise from helicopter arrivals over North Canton. This procedure would be implemented by FAA's Akron-Canton Air Traffic Control Tower, subject to the authority of the pilot in command to request an amended approach clearance pursuant to FAR 91.75. The Airport Authority plans to reinforce this procedure through a written letter of agreement between the airport management, the FAA Air Traffic Control Tower and the Army National Guard.

Approved.

4. **Establish Noise Abatement Turn For Eastbound Departures On Runway 19 (NCP pages 5-5, 5-6, Exhibit 5B (preceding page 5-7), 6-4 (including errata dated July 21, 1989), 6-5, 6-21, 6-23, 6-24, 6-29, and Appendix D, page D-4).** The Airport Authority recommends establishing a noise abatement turn for eastbound departures by all aircraft on Runway 19. The procedure would call for eastbound aircraft departing on Runway 19 to be assigned a heading of 160 degrees at 2 nautical miles from the ASR antenna that heading would be maintained until reaching 4 nautical miles from the ASR antenna, at which point the aircraft would be assigned a destination heading. FAA's Akron-Canton Air Traffic Control Tower would implement this procedure subject to the authority of the pilot in command to request an amended approach clearance pursuant to FAR 91.75. The Authority plans to reinforce the procedure through a written letter of agreement between the airport management and the FAA Air Traffic Control Tower and by having the procedure included in the Air Traffic Control Tower Orders.

Approved.

LAND USE MANAGEMENT MEASURES

1. **Adopt Office/Research Or Planned Light Industrial Zoning In Jackson Township (NCP pages 5-32, Exhibit 5K (following page 5-32), 5-34, 5-35, 6-9 through 6-11, Exhibit 6D (following page 6-12), 6-21, 6-23, 6-24, and 6-29).** The Airport Authority will encourage Jackson Township to consider the adoption of new zoning provisions creating an "office/research" or "planned light industrial" zoning district. This zoning provision would then be recommended to be applied to property south of Portage Road and north of Stark Technical College/Kent State University.

Approved.

2. **Adopt Industrial/Commercial Rezoning in Lake Township (NCP pages 5-32, Exhibit 5K following page 5-32, 5-33, 6-9, 6-11, Exhibit 6D following page 6-12, 6-21, 6-24, and 6-29).** The Airport Authority will encourage Lake Township to consider rezoning a tract of land in Lake Township on the north side of Greensburg Road and near the extended centerline of Runway 5-23 to either Light or General Industrial. Abutting land to the south and west is currently zoned General Industrial or Light Industrial. Commercial zoning would be equally acceptable from a noise compatibility standpoint.

   Approved.

3. **Adopt Zoning Amendments For Planned Unit Development in Green Township (NCP pages 5-32, Exhibit 5K (following page 5-32), 5-34, 5-35, 6-9, 6-11, 6-12, Exhibit 6D (following page 6-12), 6-21, 6-23, 6-24, and 6-29).** The Airport Authority will encourage Green Township to consider amending its zoning resolution to permit the Township Trustees to zone four areas in Green Township, indicated on Exhibit 6D, to PD-1, independently of the property owner, or consider establishing a new PD-2 District to apply to these properties.

   Approved.

4. **Adopt Noise Overly Zoning (NCP pages 5-35, 5-36, 6-9, 6-12, Exhibit 6E (preceding page 6-13), 6-13, Table 6D (pages 6-14 through 6-18), 6-21, 6-23, 6-24, 6-29, and Appendix D, pages D-5 and D-6).** The Airport Authority will encourage the adoption of noise overlay zoning by Green, Jackson, and Lake Townships. The noise overlay boundaries are shown in Exhibit 6E titled, "Recommended Noise Overlay Zone Boundaries," preceding page 6-13. The boundary generally follows the 60 Ldn contour, except for the area south of the airport, where it more closely follows the 65 Ldn. A proposed model noise overlay zoning ordinance is included in Appendix D, pages D-5 and D-6. Several important provisions of this model ordinance follow. First, the proposed ordinance recommends the standards found in Table 6D, pages 6-14 through 6-18, which among other things prohibit mobile homes, private schools, hospitals, nursing homes, amphitheaters, and resorts and group camps in the noise overlay zone. These standards exceed the Part 150 guidelines which would prohibit these uses effective inside the Ldn 75 contour. As there appears to be little demand for these kinds of uses in the near future, the Authority feels that this is a practical way of protecting the public welfare without creating hardships for existing property owners or unreasonably constraining the choice of future building locations by an of those uses. The public schools, however, are exempt from these proposed regulations by state law. The proposed ordinance also requires that avigation easements for noise and non-suit covenants be secured from all new residential development and new churches inside the noise overlay

zone. Finally, the proposed ordinance includes a requirement of notifying the airport management of any land use development proposals within the overlay zone which require discretionary review or approval by the Board of Zoning Appeals, the Zoning Commission, or the Township Board of Trustees to enable them an opportunity to review and comment on applications for variance, conditional use, rezoning, and subdivision plat approval. This special notification requirement is not intended to apply to simple applications for zoning certificates.

Approved.

5. **Adopt Subdivision Regulation Amendments (NCP pages 5-38, 5-39, 6-9, 6-17, 6-21, 6-23, 6-24, 6-29, and Appendix D, pages D-7 through D-9).** The Airport Authority will request Stark and Summit Counties to amend their subdivision regulations by adopting measures requiring the dedication of avigation easements for noise for any subdivisions within a noise overlay zone and a notice of potentially high aircraft noise levels should be recorded with the plat. It is also proposed that the ordinance require that the airport management be notified of any proposed subdivisions within the noise overlay zone to give them an opportunity to review and comment on the proposals.

   Approved.

6. **Adopt/Endorse Part 150 Study As A Comprehensive Plan Element Or Planning Guideline (NCP pages 5-41, 6-9, 6-17, 6-21, 6-23, 6-25, and 6-29).** The Airport Authority will recommend to Stark County that it adopt the Part 150 Study, or the relevant parts to the study,as the airport compatibility element of its comprehensive plan. The Airport Authority will also recommend to Summit County and Green, Jackson and Lake Townships that they endorse or adopt the Part 150 Study as a planning guideline, of if they ever develop a comprehensive plan or land use plan, they would adopt this study as an element of that plan.

   Approved.

7. **Development Of Parks South Of Runway 1-19 (NCP pages 6-9, Exhibit 6D (following page 6-12), 6-17, 6-18, 6-21, 6-23, 6-27, 6-28, and 6-29).** The Airport Authority plans to seek the cooperation of Jackson Township and Stark County in considering the use of land south of Runway 1-19 for parks. Two possible locations for these parks are shown on Exhibit 6D, Recommended Land Use Management Measures (following page 6-12). They include an area on the west side of Frank Avenue south of Portage Road and an area immediately north of Stark Technical College/Kent State University, east of Frank Avenue. The former location includes some land covered in Land Use Management Measure

10, while the latter location is included in land covered by Land Use Management Measure 1. If Jackson Township is willing to consider outright purchase of the land for parks, the Airport Authority plans to encourage the Township to include as much of the undeveloped land along the Runway 1-19 centerline, including these two park sites.

Approved.

8. **Establish Guidelines For Discretionary Review Of Development Projects (NCP pages 5-42, 6-9, Exhibit 6E (preceding page 6-13), 6-18, 6-19, 6-23, 6-25, 6-27, and 6-29).** The Airport Authority will recommend to Green, Jackson and Lake Townships and Stark and Summit Counties, that they adopt informal guidelines for planning commissions, zoning commissions, boards of zoning appeals and planning departments encouraging the consideration of the impact of airport noise on community development proposals and applications for rezoning, variances and conditional uses. Suggested guidelines to be considered are included on pages 6-18 and 6-19.

Approved.

9. **Acquire Land And Homes North Of Airport On Greensburg Road (NCP Exhibit 5K (following page 5-32); NCP pages 5-42, 5-43 (including additional analysis dated August 8, 1989, revised by errata sheet August 24, 1989), 6-6, Table 6B page 6-7, 6-9, Exhibit 6D (following page 6-12), 6-19 (including errata dated July 21, 1989 and additional analysis dated August 8, 1989, revised by errata sheet August 24, 1989), 6-27 (including errata dated July 21, 1989), 6-28 and 6-29; and Addendum titled "Taxiway and Helicopter Ramp Noise Analysis-Impact on Greensburg Road Homes", dated August 8, 1989, revised by errata sheet August 24, 1989), September 6, 1989, letter from Akron-Canton Regional Airport.** The Airport Authority plans to acquire five homes, two on the north side of Greensburg Road and three on the south side. The acquisition boundaries have been adjusted to accommodate the purchase of complete land parcels. These properties are shown on Exhibit 6D, Recommended Land Use Management Measures (following page 6-12) and the Location Map included in the August 8, 1989 Addendum. The two homes on the north side of Greensburg Road are impacted by noise exceeding 65 Ldn, as shown on the 1993 Noise Exposure Map. The other three homes south of Greensburg Road are within the 60 Ldn contour, which is based on overflight noise only, and does not consider the effects of ground noise such as taxiing aircraft, and ground based aircraft (helicopter) noise from a helicopter base. These houses are within 1000 feet from the Ohio National Guard helicopter base and within 2000 feet of the taxiway for Runway 19.

Additional noise analysis was provided in the Addendum titled, "Taxiway and Helicopter Ramp Noise Analysis-Impact on Greensburg Road Homes", revised August 24, 1989. Calculations using values within the tolerance parameters of the predictive noise models indicate than the Ldn level for the sites due to fixed-wing aircraft and helicopter overflight/taxi operations are between 61.6 and 62.7 Ldn at the sites. The INM Standard Grid Analysis Report also indicates that the sites are subject to Sound Exposure Levels of about 90.9 daily. Time Above analysis indicates that the sites experience a total of between 40 and 41.1 minutes a day of noise levels in excess of 65 dB.

Approved.

10. **Acquire Land And Homes South of Runway 1-19 (NCP Exhibit 5K (following page 5-32), and pages 5-42, 5-43, 6-9, Exhibit 6D (following page 6-12), 6-19, 6-20 (including errata dated July 21, 1989), 6-22, 6-23, 6-27 (including errata dated July 21, 1989), 6-28, and 6-29 (including errata dated July 21, 1989).** The Airport Authority plans to acquire most of the residences and all the residentially zoned land within the Ldn 65 contour as shown on the 1993 Noise Exposure Map and on Exhibit 6D, Recommended Land Use Management Measures (following page 6-12). The latter area consists of approximately 212 acres which is undeveloped and zoned residential. The acquisition boundaries have been adjusted to accommodate the purchase of complete land parcels. Fifty-seven acres of this is currently surfaced mined, which is compatible, but ultimate use can be for residential use. Less than fee simple interest may be acquired for this acreage. The overall area to be acquired also includes eleven homes and one duplex immediately south of the airport. Not included are homes at the extreme southern end of the Ldn 65 contour and three homes on the south side of Mt. Pleasant Street owned by the Timken Company. The latter homes, located between the Timken Plant and the airport, are currently zoned industrial.

Approved.

CONTINUING PROGRAM MEASURES

1. **Noise Monitoring And Noise Contour Updating (NCP pages 6-26 and 6-29).** The Airport Authority plans on monitoring compliance with the recommended noise abatement plan. However this will be done without continuous noise monitoring or employment of a full time noise abatement specialist. If deviations are observed, the airport management will promptly investigate the reasons for any deviations and relay its concerns to the appropriate officials. The airport management will seek periodic feedback from the air carriers, the Army National Guard and the air traffic control tower regarding compliance with the plan. The

Airport Authority plans to update the Ldn noise contour maps approximately every five years, or more often if equivalent operations levels change significantly.

Approved.

2. **Noise Complaint Response (NCP pages 6-26, 6-29, and Appendix D, page D-10).** The Airport Authority plans to maintain its current noise complaint response function. This includes compilation of a noise complaint file, initial response to those complaining, follow-up actions/evaluation of individual complaints where possible, and recurrent reports. A noise complaint form is included in Appendix D to assist in this effort. If the pattern of complaints indicates that some of the recommended noise abatement procedures are not being followed, the airport management will promptly investigate the matter and seek corrective action.

   Approved.

3. **Plan Review and Evaluation (NCP pages 6-26, 6-27 and 6-29).** The Airport Authority plans to establish a process for the continuing review and evaluation for making refinements to the NCP, and updating the complete plan every five to eight years.

   Approved.

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APPENDIX B FAA RECORD OF APPROVAL ON 1997 PART 150 NOISE COMPATIBILITY PROGRAM UPDATE

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Part 150: Records of Approval

Akron-Canton Regional Airport, Ohio

Approved on 4/9/98

The Noise Compatibility Program (NCP) for Akron-Canton Regional Airport (CAK) describes the current and future noncompatible land uses based upon the parameters established in FAR Part 150, Airport Noise Compatibility Planning. The Akron-Canton Regional Airport Authority recommended twenty four (24) measures in its NCP to remedy existing noise problems and to prevent future noncompatible land uses. These measures are grouped into three categories: noise abatement (8), land use management (9), and program management (7).

Each measure of the recommended NCP is identified below by plan category, includes a summary of the airport operator's recommendations and a cross-reference to page numbers in the NCP where each measure may be found. The current Noise Exposure Map (NEM) (1994, recertified as current 1997) is found as Figure 8.2 on pages 105 and 106 of the Noise Exposure Map document. The revised forecast Noise Exposure Map (2002) which implements the revised Noise Compatibility Program is found as updated Figure 4.1, submitted as a revision at the time the NCP was submitted for FAA action. FAA will take action on this revised 5-year NEM at the time its decision on the NCP is announced in the Federal Register. The updated noise exposure map is being reviewed concurrently with the updated Noise Compatibility Program. Chapter 3 of the updated NCP contains noise abatement alternatives, land use alternatives, and program management alternatives. Table 3.5, page 36, Table 3.6, page 37, and Table 3.7, page 37, depict the recommended program, estimate of program costs, and recommended implementation schedule.

Mr. Frederick J. Krum's letter dated September 22, 1997, officially transmitted the Akron-Canton Regional Airport Authority's updated NEM and NCP.

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

The recommendations in the Record of Approval summarize as closely as possible the airport operator's recommendations in the Noise Compatibility Program. The statements contained within the summarized recommendations and before the indicated FAA approval, disapproval, or other determination do not represent the opinions or decisions of the FAA.

Noise Abatement Measures

NA-1 Pilots of all turbojet aircraft may voluntarily use recommended noise abatement departure procedures. (NCP Table 3.2, Page 20; Section 3.2.1, Page 21; Table 3.5, Page 36; Section 5.7.2, Pages 52, 55; Figure 5.1, Pages 53-54; Table 5.5, Page 55; FAA Advisory Circular 91-53A, "Noise Abatement Departure Profiles", Appendix D; NBAA Noise Abatement Departure Procedure, Appendix E).

The Akron-Canton Regional Airport Authority recommends that pilots of all turbojet aircraft voluntarily use the noise abatement departure procedures described in FAA Advisory Circular 91-53A "Noise Abatement Departure Profiles", and National Business Aircraft Association publication entitled "Noise Abatement Procedures for Turbojet Business Aircraft". The noise abatement departure procedures would be considered for all turbojet departures on Runways 1-19 and 5-23.

The NCP recommends that the "standard" NBAA procedure be used at the airport, since it is designed for airports where most jet departures are on runways where the first residences are at least 10,000 feet from the brake release point. This is the case at Akron-Canton Regional Airport.

For civil turbojet aircraft over 75,000 pounds, noise abatement departure procedures are referred to as NADP's and are defined by FAA Advisory Circular 91-53A. AC 91-53A defines 2 NADP's: a "close-in" NADP to provide noise reduction for noise sensitive land uses in close proximity to the departure end of an airport runway, and a "distant" NADP to provide noise reduction for all other noise-sensitive areas. Since most residential areas around the airport are located within one or two miles of the runway ends, the NCP recommends the use of the "close-in" procedure.

The intent of the above procedures is to reduce the single event noise levels from turbojet departures. This is a new measure.

<u>APPROVED as voluntary</u>. Before the procedures are implemented, an environmental assessment may be required.

NA-2 Establish maximum climb departures for helicopters. (NCP Table 3.2, Page 20; Section 3.2.2, Pages 21-22; Table 3.5, Page 36; Section 5.7.3, Pages 55-56).

The Akron-Canton Regional Airport Authority recommends that helicopters from the Ohio Army Air National Guard Base be cleared to 4,000 feet MSL (2,800 feet AGL) or the requested altitude, whichever is lower (usually 2,500 feet MSL or 1,300 feet AGL) immediately after takeoff.

The original Part 150 NCP recommended that helicopters be cleared to 2,500 feet MSL (1,300 feet AGL) immediately after takeoff. The FAA approved this measure. The local air traffic control tower implemented the measure by clearing helicopters to 4,000 feet MSL, or the requested altitude, whichever is lower, immediately after takeoff. Since the implementation of this measure, single event noise levels from helicopter overflights have been reduced.

The Akron-Canton Regional Airport Authority requests that this measure be reapproved for implementation on a voluntary, cooperative, departure-by-departure basis. This measure benefits residents by reducing single event noise levels on local residents.

<u>APPROVED as voluntary</u>. The procedures described in this measure are a continuation of the procedures approved under the Record of Approval dated September 21, 1989.

NA-3 Pilots of all turbojet aircraft may voluntarily restrict the use of reverse thrust activity at night (10:00 p.m. - 7:00 a.m.). (NCP Table 3.2, Page 20; Section 3.2.3, Page 22; Table 3.5, Page 36; Section 5.7.6, Pages 57-58).

The Akron-Canton Regional Airport Authority recommends that pilots of all turbojet aircraft voluntarily restrict the use of reverse thrust activity at night (between the hours of

10:00 p.m. and 7:00 a.m.). The procedure would only apply to dry runway conditions. With wet or snow covered runways, full use of reverse thrust would be encouraged at all times.

The intent of this procedure is to minimize the use of reverse thrust at night. Several residents in close proximity to the airport have expressed concern regarding the noise associated with the use of reverse thrust from turbojet aircraft at night. Any policy that would reduce the use of reverse thrust could have a significant noise benefit. Use of reverse thrust is dependent upon aircraft type, aircraft weight, runway length, and runway surface condition.

This voluntary procedure may be communicated to pilots through the use of informational handouts or signs in the local FBO offices for local pilots. Itinerant pilots may be notified through the use of a Letter to Airmen.

This measure would benefit residents by reducing single event noise levels on local residents during nighttime periods. This is a new measure.

APPROVED as voluntary.

NA-4 All eastbound turbojet aircraft departing on Runway 23 maintain runway heading until 3 nautical miles from the radar, or until the aircraft is at 2,500 feet MSL (1,300 feet AGL). (NCP Table 3.2, Page 20; Section 3.2.4, Pages 22-23; Table 3.5, Page 36; Section 5.8.1, Page 59).

The Akron-Canton Regional Airport Authority recommends that all eastbound turbojet aircraft departing on Runway 23 maintain runway heading until 3 nautical miles from the radar, or until the aircraft is at 2,500 feet MSL (1,300 feet AGL).

The original NCP called for the implementation of a noise abatement procedure for turbojet aircraft departing on Runway 23. The measure was implemented in a modified form following the approval of the original NCP. The procedure as originally proposed, requires all turbojet aircraft departing on Runway 23 to maintain runway heading until 4 nautical miles from the radar. As implemented, the procedure requires all eastbound turbojet aircraft departing on Runway 23 to maintain runway heading until 3 nautical miles from the radar, or until the aircraft is at 2,500 feet MSL (1,300 feet AGL).

This straight-out procedure for eastbound turbojet aircraft would avoid overflights of the residential area that straddles Strausser Street, just south of the extended centerline of Runway 23. Continued implementation would reduce noise levels from single event overflights on this residential area.

APPROVED as voluntary.

NA-5 All eastbound and southbound turbojet aircraft departing on Runway 19 initiate a turn to a heading of 160 degrees at 1 nautical mile from the radar and maintain that heading until 4 nautical miles. (NCP Table 3.2, Page 20; Section 3.2.5, Page 23; Table 3.5, Page 36; Section 5.8.2, Pages 59,63).

The Akron-Canton Regional Airport Authority recommends that the departure procedure developed for Runway 19 in the original Part 150 study be implemented in full to minimize overflights on residential areas south. Although this has been implemented in some fashion by FAA for several years, having a formal procedure in place will help minimize the impact of the runway extension. In addition, it is recommended that the turn to 160 degrees be initiated at 1 nautical mile instead of the 2 nautical miles recommended in the original Part 150 study.

The original NCP called for the implementation of a noise abatement turn for turbojet aircraft departing on Runway 19 to a heading of 160 degrees at 2 nautical miles from the radar and maintain until 4 nautical miles. In the original Part 150, this procedure assumed that Runway 1-19 would be extended to the south and that operations would increase considerably on that runway. That extension is now planned within the next 10 years. The procedure has not been implemented although departures are routinely turned to avoid the residential areas to the south.

One home is within the 5-year 65 DNL contour (area C). Approval of this revised procedure does not eliminate this home from the contour. However, it would eliminate residentially zoned vacant land and would reduce noise from overflights of the residential area south of the airport and west of Frank Avenue.

<u>DISAPPROVED.</u> The FAA will continue the current voluntary procedure to turn at 2 nautical miles. One nautical mile from the radar site is approximately over the departure end of the runway. Flights will be very low to the ground and at relatively slow airspeed. Crews should not be required or requested to initiate turns at this critical phase of the flight.

NA-6 Designate the location and orientation of engine runups. (NCP Table 3.2, Page 20; Section 3.2.6, Pages 23-24; Table 3.5, Page 36; Section 5.9.9, Pages 70-71; Section 5.10.2, Pages 76,79; Figure 5.4, Pages 77,78; Airport Memo on Engine Runup Operations - Appendix F).

The Akron-Canton Regional Airport Authority recommends that the location and orientation of engine runups be designated. Several residents in close proximity to the airport have expressed concern regarding the noise associated with the engine runups that result from the maintenance operators at the airport. This measure designates a maintenance runup area to limit the noise impacts from runups. Given the amount of residential development to the south of the airport and the lack of residential development to the southeast of the airport, a designated area at the threshold to Runway 32 would be a suitable location for all engine maintenance runups above flight idle power. Flight idle power maintenance runups would continue to be allowed on the ramp areas. Maintenance runups above flight idle power should be prohibited from all areas of the airfield, except the designated engine runup area at the threshold to Runway 32 at the runway heading of 320 degrees if at all possible. Maintenance runups at flight idle power should also be limited to certain directions. On the Chautauqua ramp on the west side of the airport, flight idle runs should be limited to a heading of 360 degrees if possible, while on the PSA ramp on the east side of the airport flight idle runups should be limited to headings of 360 degrees or 050 degrees if possible.

The intent of this measure is to minimize the single event noise levels from aircraft engine runups at night. This is a new measure.

<u>APPROVED</u>.

NA-7 Designate the location for an engine runup enclosure. (NCP Table 3.2, Page 20; Section 3.2.7, Pages 24-25; Table 3.5, Page 36; Section 5.10.6, Pages 80-81; Figure 5.5, Pages 83-84).

The Akron-Canton Regional Airport Authority recommends that a location be designated for the construction of an engine runup enclosure, should the number and type of runups increase substantially in the near future. Noise runup enclosures are structures that help mitigate noise from aircraft ground runups. These structures are typically used in areas where the runups are in close proximity to noise sensitive receivers and where maintenance runup restrictions or the designation of a maintenance runup area is insufficient to control noise from the runups in the surrounding areas.

A ground runup enclosure (GRE) may be appropriate at Akron-Canton Regional Airport. The GRE is generally closed on all 4 sides but open over the roof area. Aircraft are towed into the GRE and the front doors are closed with the aircraft inside. The rear of the GRE incorporates a blast deflector, while the rear, side, and front walls are treated with sound absorbing material.

At the present time, the runup noise at the airport is the result of a relatively low number of propeller runup operations. Noise levels from these runup operations, although disturbing to some people, are much less than the runup noise created by turbojet aircraft. If the activity level of runup operations increases in the next several years, or if the type of aircraft changes, the airport should consider a ground runup enclosure to mitigate the noise from the runup operations. Given the relatively low noise levels from engine runups (propeller aircraft only), and the low number of runup operations, a GRE is not recommended at this time. However, the airport should consider the location of such a structure.

This is a new measure.

APPROVED. Consideration of an appropriate location for a GRE is approved, and a location should be designated on the next update of the airport layout plan.

NA-8 Improve engine runup and taxiing procedures. (NCP Table 3.2, Page 20; Section 3.2.8, Page 25; Table 3.5, Page 36; Section 5.11.1, Pages 85-86.

The Akron-Canton Regional Airport Authority recommends that engine runup and taxiing procedures be improved. Aircraft that undertake these procedures are recommended to perform them at specific designated areas on the airport so as to minimize the impact on residential areas to the north and northeast of the airport. Pre-flight engine checks should be undertaken either near the passenger terminal area or on Taxiway "C" with an aircraft orientation of 360 degrees.

The intent of these measures is to provide a reduction in the single event noise levels over residential areas around the airport. This is a new measure.

APPROVED.

Land Use Management Measures

LU-1 Acquire in fee simple 2 existing residential properties within the 65 DNL noise contour. (NCP Table 3.3, Page 26; Section 3.3.1, Pages 26-27; Table 3.6, Page 37; Section 3.6.1, Pages 96,97,101; Figure 6.2, Pages 99, 100).

The Akron-Canton Regional Airport Authority plans to acquire 2 residential properties in fee simple which lie within the 65 DNL noise contour. One parcel is located north of the airport in the city of Green, and the other parcel is located south of the airport in Jackson Township. The purchase of the parcel in Jackson Township was approved under the original NCP but was never purchased. Acquisition of the 2 parcels will eliminate all incompatible use of residential development within the 65 DNL noise contour. A voluntary acquisition program is proposed.

APPROVED. LU-2 will be implemented in conjunction with LU-3, below, if the homeowners do not wish their residences to be acquired. The acquisitions must comply with the Uniform Relocation Assistance and Real Property Acquisitions Act to be eligible for Federal financial assistance.

LU-2 Develop a sound insulation program. (NCP Table 3.3, Page 26; Section 3.3.2, Page 27; Table 3.6, Page 37; Section 6.3.5, Pages 104-106).

The Akron-Canton Regional Airport Authority plans to institute a sound insulation program for the 2 homeowners described in Measure LU-1 above if they do not desire to be acquired. The sound insulation of the structures on the 2 parcels would result in compatible development for the 2 parcels. This is a new measure.

APPROVED.

LU-3 Develop an avigation easement acquisition program. (NCP Table 3.3, Page 26; Section 3.3.3, Page 27; Table 3.6, Page 37; Section 6.3.4, Pages 103-104).

The Akron-Canton Regional Airport Authority plans to develop an avigation easement program to be used in conjunction with sound insulation for the 2 homes within the DNL 65dB noise contour described above if the owners elect to have their residences sound insulated. The avigation easements are meant to protect the airport's interest in the property in terms of right of overflight and right to remove obstructions in return for the offer of sound insulation to the owners.

This is a new measure. In conjunction with the sound insulation program, all incompatible existing residential development within the DNL 65dB noise contour would be eliminated.

APPROVED.

LU-4 Pursue overlay zoning for one vacant parcel in the city of Green. (NCP Table 3.3, Page 26; Section 3.3.4, Pages 27,28; Table 3.6, Page 37; Section 6.4.2, Pages 111-112).

The Akron-Canton Regional Airport Authority plans to create an overlay zoning area for one vacant parcel in the city of Green. Overlay zoning is used to manage development in areas impacted by aircraft noise. It creates a special zoning district that supplements, or overlays, the other existing zoning districts. This zoning could involve the prohibition of some or all of the noise-sensitive uses in the noise impact area. It may also be used to require additional insulation and to dedicate avigation easements.

The area described in this measure is currently designated for residential use, and is part of several larger parcels that include 2 residences which are outside of the 65 DNL noise contour. The Airport Authority recommends that the overlay zoning be used to prevent additional noise-sensitive uses from using these parcels. These zoning changes would prevent further incompatible land uses from developing. This is a new measure.

APPROVED.

LU-5 Acquire vacant residentially-zoned property in the city of Green and Jackson Township. (NCP Table 3.3, Page 26; Section 3.3.5, Page 28; Table 3.6, Page 37; Section 6.4.4, Page 113).

Should the city of Green or Jackson Township decide not to overlay rezone the existing residentially-zoned areas, the Airport Authority plans to acquire the remaining existing residentially zoned properties within the 65 DNL noise contour. A voluntary acquisition program is proposed.

This is a new measure, and should be considered only if compatible use zoning or overlay zoning cannot be implemented.

APPROVED. Action to carry out this measure is subject to a determination at the time of implementation that the purchase is necessary to prevent new noncompatible development because noncompatible development on the vacant land is highly likely and local land use controls will not prevent such development. If zoning is changed to provide for compatible development, acquisition of that land will not be required. The acquisitions must comply with the Uniform Relocation Assistance and Real Property Acquisition Act to be eligible for Federal financial assistance.

LU-6 Develop subdivision regulations. (NCP Table 3.3, Page 26; Section 3.3.6, Page 28; Table 3.6, Page 37; Section 6.4.6, Pages 114-115).

The Akron-Canton Regional Airport Authority staff plans to consult with city and county planning, building, zoning, and legal personnel to explore the feasibility of enacting site plan and building code measures to minimize the potential for noise impacts.

Subdivision regulations associated with platting and site planning can be effective, inexpensive tools for enhancing compatibility, even where the designated land use and zoning are compatible with the projected noise level. In some jurisdictions, a note is placed on the plat referencing the Noise Exposure Map, the location within a noise exposure zone, the proximity of the airport, or any special height limitations. Such notes should reference an adopted zoning regulation or other legal document. Site planning techniques, especially the placement and orientation of structures on the property, can help enhance compatibility even when the proposed use is nonresidential.

In the case of Akron-Canton Regional Airport, the Part 150 Noise Exposure Maps could be used as the basis for an overlay zone within which the regulations apply. These regulations would be more effective if the zone created by the subdivision ordinance extended beyond the 65 DNL contour to the 60 DNL contour, and if the regulations were adopted by all the local governments with jurisdiction over development in the vicinity. The majority of undeveloped land around the airport is within the city of Green.

Building code provisions requiring additional sound insulation for structures in noise impact zones are closely related to subdivision regulations. Since such measures can render construction more costly, efforts to modify building codes to incorporate noise attenuation requirements tend to encounter some opposition. If the city of Green were to adopt such measures, future compatibility could be enhanced, since most of the undeveloped areas are within the city's limits.

This may be a potential way to control new development proposed within the impact area of the 60 DNL contour. Changes in subdivision regulations for Stark and Summit Counties were recommended in the original Part 150 NCP. Implementation of the regulations was never undertaken.

This is a continuation of an existing measure.

APPROVED.

LU-7 Develop fair disclosure regulations. (NCP Table 3.3, Page 26; Section 3.3.7, Page 28; Table 3.6, Page 37; Section 6.4.7, Pages 115-116).

Fair disclosure is used to inform potential residents of existing or potential noise levels before they make the decision to move into the area. The impact area is often defined by the 65 DNL noise contour, but could be defined as the area within the 60 DNL.

The Akron-Canton Regional Airport Authority plans to disseminate informational packages, conduct orientation sessions, and prepare ongoing updates for realtors, planning, and building officials for real estate sales within the 60 LDN contour.

Publication of the Noise Exposure Maps (NEMs) is the primary vehicle recommended for fair disclosure. Dissemination and explanation of the Airport Master Plan and NEMs to Realtors and local government staff are recommended to ensure potential residents are aware of the airport and its operations.

This is a continuation of an existing measure.

APPROVED.

LU-8 Comprehensive Planning. (NCP Table 3.3, Page 26; Section 3.38, Pages 28-29; Table 3.6, Page 37; Section 6.4.8, Page 116).

A comprehensive plan for a community establishes policies for its future development and growth. These plans usually take into account existing development and coordinate future developments, assuring compatibility between areas. With regard to an airport, a comprehensive plan must support the operation of the airport, discourage noise-sensitive and incompatible land uses around the airport, and encourage development that is compatible with the use of the airport and surrounding area.

The Akron-Canton Regional Airport Authority will pursue comprehensive planning with local counties, municipalities, and realtors. The comprehensive plans of the 5 noise impacted communities of Summit County, Stark County, Lake Township, Jackson Township, and the city of Green will be updated for the development and growth of the various communities. All plans should discourage incompatible growth within the 60 LDN noise contour surrounding the airport.

Adoption of the original Part 150 study was only undertaken by Stark County. The Airport Authority will encourage the remaining communities to review and adopt the recommendations of the updated Part 150 study which urge that each planning jurisdiction consider the impacts of aircraft noise in any revisions to its development plans.

This is a continuation of an existing measure.

APPROVED.

LU-9 Capital Improvement Planning. (NCP Table 3.3, Page 26; Section 3.3.9, Page 29; Table 3.6, Page 37; Section 6.4.9, Pages 116, 117).

Similar to the option to control future subdivision or neighborhood development based on noise exposure, development can be stimulated for industrial/commercial uses or discouraged for noise-sensitive uses through the control and planning of the infrastructure network. This network includes roads and utilities such as power, gas, water, and sewer. Other services such as police and fire and community facilities such as schools and libraries tend to promote development. Capital improvements should be programmed to allow infrastructure, facilities, and services that tend to support industrial and commercial uses in areas where they would be compatible. Capital improvement planning can be used in areas with large vacant tracts of land that hold a potential for development. It can be used to discourage growth in areas that are incompatible with airport noise and to encourage growth in compatible areas.

The Akron-Canton Regional Airport Authority plans to pursue capital improvement planning with local counties and municipalities. The airport staff will consult with city and county planning, building, zoning, and legal staffs to explore the feasibility of planning for capital improvements that encourage industrial/commercial uses and discourage residential use within the 60 DNL noise contour surrounding the airport. This would not effect existing development, but only vacant tracts of land with the potential for noise-sensitive development.

This is the continuation of an existing measure.

APPROVED.

Program Management Measures

PM-1 Update Noise Complaint Receipt and Response Procedures. (NCP Table 3.4, Page 30; Section 3.4.1, Pages 29-30; Table 3.7, Page 38; Section 7.4.1, Pages 124-125; Appendix H - "Noise Complaint Receipt and Response Procedures").

The Akron-Canton Regional Airport Authority plans to update noise complaint receipt and response procedures. Although noise complaints are received and responded to by airport staff, there are not presently any formal procedures for the receipt and response to noise complaints. It is suggested that the airport set up a formal process to receive and log noise complaints within the community. This measure will outline specific procedures and provide a standard noise complaint form that can be used by airport personnel to log noise complaints. These forms will be used to effectively track all noise complaints at the airport.

This proposal will modify an existing procedure.

APPROVED.

PM-2 Establish Noise Monitoring System. (NCP Table 3.4, Page 30; Section 3.4.2, Pages 30-31; Table 3.7, Page 38; Section 7.4.2, Pages 125-126).

The Akron-Canton Regional Airport Authority plans to establish an airport noise monitoring system. Noise monitoring is a useful noise abatement tool due to its capability to collect and analyze noise data from aircraft operations. In addition, a noise monitoring system can be an effective public relations tool for the community. A portable noise monitor would allow the airport to measure noise and to respond to noise complaints without the complexity and cost of a permanent system.

Although noise monitoring was recommended and approved as part of the original Part 150 Study, it was never implemented.

APPROVED.

PM-3 Public Information Program/Informational Pilot Handouts. (NCP Table 3.4, Page 30; Section 3.4.3, Page 31; Table 3.7, Page 38; Section 7.4.3, Pages 126-127).

The airport staff plans to undertake a continuing public information program to inform the public about aircraft noise, impacts, and compatible land use. The airport staff will give verbal and written briefings to the Akron-Canton Regional Airport Authority, give briefings at city meetings, and make presentations to outside organizations such as pilot groups, real estate organizations, and homeowner organizations.

To further enhance the distribution of information to pilots operating at the airport, the airport staff should arrange for the printing of a full-color informational insert on the airport in a format that is compatible with the Jeppesen Sanderson manual. This insert would be an effective means of educating pilots on the details of noise abatement procedures.

This proposal is a new measure.

APPROVED.

PM-4 Designate a Noise Abatement Contact. (NCP Table 3.4, Page 30; Section 3.4.4, Page 31; Table 3.7, Page 38; Section 7.4.4, Page 127).

The Akron-Canton Regional Airport Authority plans to designate a noise abatement contact person at the airport. The person would be responsible for operation of the portable noise monitoring system, community liaison regarding noise issues, collection of and response to noise complaints, implementation of the noise compatibility program, and ongoing noise compatibility planning efforts.

This proposal is a new measure.

APPROVED.

PM-5 ATIS/ATCT Advisories (NCP Table 3.4, Page 30; Section 3.4.5, Pages 31-32; Table 3.7, Page 38; Section 7.4.5, Pages 127-128).

The FAA can play an instrumental role in helping to make pilots aware of some noise abatement measures, even those of a voluntary measure. This could be accomplished both through the use of the Automatic Terminal Information Service (ATIS) or direct FAA air traffic control tower (ATCT) transmissions to pilots, reminding or advising them to follow certain noise abatement instructions.

The ATIS is a continuous recording relaying non-control information in areas of high activity. ATIS procedures do not specifically identify noise abatement messages as allowable content. It is recommended that ATIS transmissions pertaining to noise abatement measures be encouraged, at least on a minimal advisory level. The goal is to achieve greater adherence to noise abatement procedures. Although the proposed operational measures are limited to departure procedures and runup issues, reminders of the approved measures should be included in ATIS advisories to the extent feasible.

This is a new measure.

APPROVED in part; DISAPPROVED in part. The FAA permits the use of the ATIS for short messages such as "noise abatement procedures in effect" when time and space permit; use on a voluntary, space available basis is approved.

The tower controller's role to maintain safe, efficient use of the navigable airspace does not include educating pilots in regard to specific noise abatement procedures; this portion of the measure is disapproved. We note that approved measure PM-3, above, will be used by the airport operator to inform pilots through publications and public information programs.

PM-6 Purchase and Install Airside Signs to Advertise NCP Measures. (NCP Table 3.4, Page 30; Section 3.4.6, Page 32; Figure 3.1, Page 33; Table 3.7, Page 38; Section 7.4.6, Pages 128-129).

The Akron-Canton Regional Airport Authority plans to purchase and install 7 signs on the airport that inform departing pilots of the key noise abatement procedures. The signs are to be located where aircraft hold prior to takeoff, where aircraft conduct pre-takeoff runups, and where pilots conduct regular engine runups. The original NCP did not include a recommendation for these signs. However, they prove to be an effective means of alerting pilots to noise abatement procedures.

This is a new measure.

APPROVED. Approval of informational signs can improve community relations and reduce overflights of noise sensitive areas; however, such signs must not be construed as mandatory air traffic procedures. The airport sponsor should work with local Air Traffic personnel to establish mutually acceptable signage. The content and location of airfield signs are subject to specific approval by appropriate FAA officials outside of the Part 150 process and are not approved in advance by this action, including airspace approval.

PM-7 NEM/NCP Review and Revision. (NCP Table 3.4, Page 30; Section 3.4.7, Pages 32,34; Table 3.7, Page 38).

The Akron-Canton Regional Airport Authority plans to update the noise exposure maps (NEMs) every 5 years, or as required by changed conditions, in accordance with FAA guidelines. If the revised NEMs indicate that changed conditions have diminished the effectiveness or efficiency of the NCP, the Airport Authority will also evaluate the NCP and update as required. The Airport Authority will also provide continuing review and evaluation of proposed changes to the NCP between overall updates.

APPROVED.

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APPENDIX C PART 150 ACTIVITY FORECAST, 2014-2019

Draft subject to FAA review and approval.

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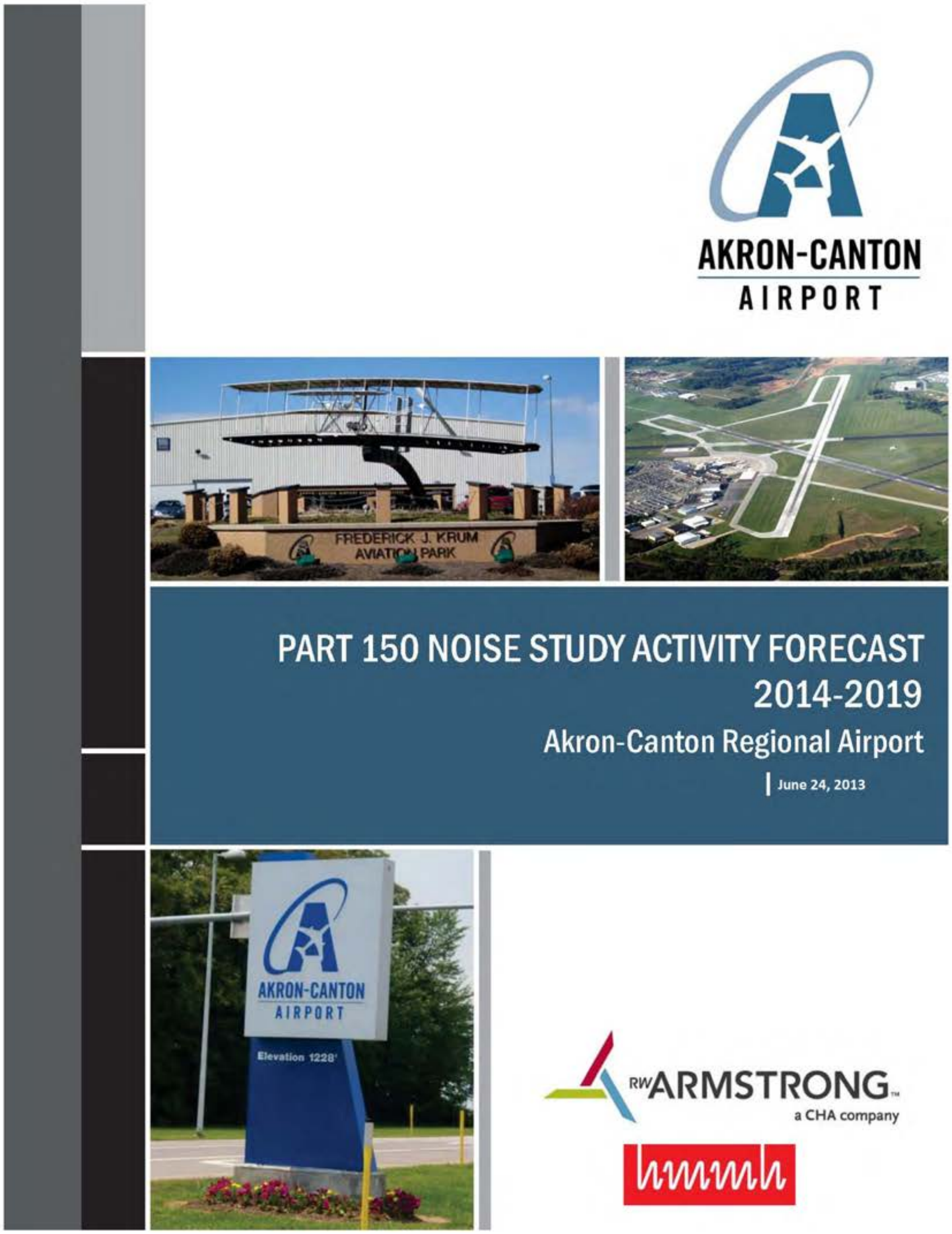
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AIRPORT
FREDERICK J. KRUM
AVIATION PARK
PART 150 NOISE STUDY ACTIVITY FORECAST
2014-2019
Akron-Canton Regional Airport
June 24, 2013
AKRON-CANTON
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Elevation 1228'
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Appendices

1 Forecast Overview

The Akron-Canton Regional Airport Authority is performing an update to its Title 14 Code of Federal Regulations (CFR) Part 150 Noise Exposure Maps and Noise Compatibility Program. In support of this update, detailed aircraft activity forecasts were necessary to model and evaluate the current and projected levels of noise exposure generated from flying operations at the Akron-Canton Airport (CAK).

The forecasts presented in this document are founded on the activity forecasts developed for the Authority's concurrent Airport Master Plan Update Study. Those forecasts were approved by the FAA in February 2013. Much of the methodology and assumptions used in developing those forecasts is reiterated in this document. To meet the needs of the Part 150 noise exposure modeling effort, the approved Master Plan forecasts have been broken down into greater detail per FAA guidance to include the following:

- Five year forecast horizon covering 2014-2019 (i.e. five years from date of program submission)
- Identification of annual average daily operations (i.e., Arrivals and Departures) by:
  - Activity type (i.e., Passenger Carrier, General Aviation, and Military)
  - Aircraft type
  - Time of day, (i.e., Day and Night); daytime is defined as 7:00 a.m. to 10:00 p.m. while nighttime is defined as 10:00 p.m. to 7:00 a.m.

2 Data Sources

Information factored into both the Master Plan and Part 150 forecasting efforts include commercial carrier industry trends, aircraft order and retirement programs, FAA General Aviation (GA) fleet trends, anticipated changes in the aircraft fleet mix operating at CAK, and local and regional socioeconomic trends. The data and assumptions used to define baseline conditions and future activity trends were derived from several data sources. The following provides a brief description of these data sources:

- FAA Terminal Area Forecast (TAF) - 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 Air Traffic Activity System (ATADS) – The Air Traffic Activity Data System contains the official air traffic operations data available for public release.
- CAK Air Traffic Control Tower (ATCT) – ATCT data is tabulated and recorded by the Tower operators and is available through request. This data includes all operations at airport in a monthly summarized format.
- Akron-Canton Airport Authority – The Airport Authority provides as much available data pertaining to the Airport as possible. Most data includes Commercial and Non-Commercial operations, GA, and military along with official passenger activity counts.
- Official Airline Guide (OAG) – OAG is a business that provides aviation information and services based on airline schedules, flight statuses, fleet, etc. OAG data is used for its airline schedules database which shows immediate future and historical flight details for commercial airlines.
- PASSUR Aerospace, Inc. (PASSUR) – PASSUR data was provided from a flight monitoring system located at Cleveland Hopkins International Airport (CLE) that includes flight tracking and surface management tools to track operations to and from the Airport.
- Ohio Army National Guard (OANG) – OANG data is provided by the military based personnel operating at CAK.
- Woods & Poole Economics, Inc. – Woods & Poole 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 U.S. and contains historic data and projections through 2040 utilizing more than 900 economic and demographic variables.

3 Baseline Forecast Data

To derive the annual average daily forecasts of aircraft operations by aircraft type required for the Part 150 study, it is first necessary to identify the baseline level of annual operations on which future activity levels will be based. Operations data for 2007 through 2019 (historic and projected) were pulled from the FAA TAF. The TAF is prepared by the FAA and includes historical and forecast data for passenger enplanements, airport operations, TRACON operations, and based aircraft, and as such serves as the benchmark against which the FAA compares all airport activity forecasts. It is important to note that at the time the Master Plan forecasts were prepared, the 2010 TAF was the most current FAA forecast available. The 2010 TAF covers the years 2010-2032 and projects activity for the following four major users of the air traffic system:

- *Air Carrier*: Operations include scheduled service on aircraft with more than 60 seats operated by carriers certified under Federal Aviation Regulations FAR Part 119 (Certification: Air Carriers and Commercial Operators), whose operations are governed under FAR Part 121 (Operating Requirement: Domestic, Flag and Supplemental Operations).
- *Air Taxi and Commuter*: Carriers that operate aircraft with 60 or fewer seats or a cargo payload capacity of less than 18,000 lbs., and carries passengers on an on-demand basis only (charter service) and/or carries cargo or mail on either a scheduled or charter basis. Commuter operators provide scheduled passenger service (five or more round trips per week on at least one route according to published flight schedules) while utilizing aircraft of 60 or fewer seats. Air taxi and commuter carriers are governed under FAR Part 135 (Commuter and On Demand Operations).
- *General Aviation*: All other operations not including air carrier, air taxi and commuter, and military. These operations are conducted under FAR Part 91 (General Operating and Flight Rules).
- *Military*: Operations conducted by the nation's military forces.

As shown in **Table 3-1**, the FAA TAF recorded a decrease of -7.7% for total airport operations, both itinerant and local, over the 2007-2011 period. For forecasting purposes, the historic decreases will not be used for future trend line analysis. The projected TAF operations from 2012 through 2019 show an incremental increase through the end of the planning period, though the average annual growth rate for total airport operations is only 0.5%.

For Part 150 forecasting purposes, aircraft operations must further be identified by individual aircraft type, with aircraft-specific operations data pulled from multiple sources. Using the TAF as a starting point, OAG data is used to categorize the operations by activity type, as well as by specific aircraft type which will be identified later in the detailed fleet mix forecasts. The following is a summary of the data sources and assumptions used to arrive at the 2011 forecast baseline operation totals for each activity type which are presented in **Table 3-2** and **Figure 3-1**:

- *Passenger Carrier*: 2011 OAG data.
- *Cargo Carrier*: With the limited number of all cargo carrier operations at CAK and the aircraft performing these operations (e.g., Cessna 208 Caravan), cargo operations at CAK are included as a function of GA operations.
- *General Aviation*: 2010 TAF. Within the TAF, the "Air Taxi & Commuter" category includes scheduled air carrier regional jet and turbo prop operations, as well as unscheduled GA charter operations. In order to accurately gauge GA operations utilizing the TAF data, it becomes necessary to split GA air taxi operations from the commercial carrier

operations which are presented together in the single "Air Taxi & Commuter" category. This is accomplished by calculating the scheduled commercial carrier regional jet and turbo prop operations based on OAG and other FAA data.

- *Military*: 2011 operations data provided by the Akron-Canton Airport Authority.

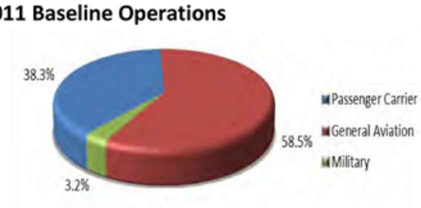
Table 3-1 – 2010 TAF Aircraft Operations by Type, CY 2007-2019

	Itinerant Operations					Local Operations			
Year	Air Carrier	Air Taxi & Commuter	GA	Military	Total	GA	Military	Total	Total Ops.
2007	21,597	10,996	45,592	1,710	79,895	23,281	801	24,082	103,977
2008	23,084	7,810	47,157	2,206	80,257	24,109	776	24,885	105,142
2009	21,981	3,770	34,215	1,800	61,766	18,251	556	18,807	80,573
2010	22,363	6,718	35,635	2,056	66,772	15,608	501	16,109	82,881
2011*	12,464	16,727	22,386	1,661	53,238	15,314	1,058	16,372	69,610
AAGR 2007-2011	-10.4%	8.8%	-13.3%	-0.6%	-7.8%	-8.0%	5.7%	-7.4%	-7.7%
2012	19,858	11,017	19,107	1,661	51,643	14,634	1,058	15,692	67,335
2013	19,145	10,602	19,108	1,661	50,516	14,701	1,058	15,759	66,275
2014	18,965	10,466	19,109	1,661	50,201	14,769	1,058	15,827	66,028
2015	19,280	10,587	19,110	1,661	50,638	14,837	1,058	15,895	66,533
2016	19,695	10,757	19,111	1,661	51,224	14,905	1,058	15,963	67,187
2017	20,214	10,978	19,112	1,661	51,965	14,974	1,058	16,032	67,997
2018	20,748	11,204	19,113	1,661	52,726	15,043	1,058	16,101	68,827
2019	21,295	11,435	19,114	1,661	53,505	15,112	1,058	16,170	69,675
AAGR 2012-2019	1.0%	0.5%	0.0%	0.0%	0.5%	0.5%	0.0%	0.4%	0.5%

Source: 2010 FAA Terminal Area Forecast
*Note 2011 data is shown as historic, but is actually the TAF projection for this year.

Table 3-2 and Figure 3-1 – 2011 Baseline Operations

Aircraft Category	Operations	Percent of Total
Passenger Carrier*	31,146	38.3%
General Aviation**	47,641	58.5%
Military	2,618	3.2%
Total	**81,405**	**100%**



Source: Akron-Canton Airport Authority, 2012.
*Note: Includes Commercial service "belly cargo" operations (Section 3.5 Cargo Carrier Operations Forecast)
**Note: Includes charter cargo service and GA air taxi (<50 seat) operations

4 Forecast Factors

With the 2011 baseline operations numbers established, this section will describe the socioeconomic and industry forecast factors, or trends, that are expected to influence airport usage over the planning horizon.

4.1.1 Socioeconomic Trends Affecting Aviation

Commercial service airports are typically influenced by national and regional trends in population, per capita income, and employment, as well as airport prominence, and flights offered. The population growth, or decline, could have a direct influence on the level of demand for aviation services. Per capita income is usually a strong indicator of a community's discretionary income and ability to afford flying, either commercially or recreationally. For these reasons, a clear understanding of local demographic and economic forces and trends is important for developing an accurate aviation activity forecast.

To this end, historic and projected data of population and per capita income in the United States, State of Ohio, and the Akron Canton MSA were obtained from Woods & Poole Economics, Inc. The socioeconomic data shows the Akron Canton catchment area to have a steady incremental growth market over the forecast period. The two key indicators of future Airport use, population growth and per capita income, indicate the Airport's catchment area growing at the same pace as the U.S. and the state of Ohio.

The following describes these trends, which were used in the approved Master Plan forecasts, to verify and modify, as necessary, the FAA forecast growth factors to more accurately reflect local market and socioeconomic conditions in the CAK catchment areas.

4.1.1.1 Akron Canton MSA Population Trends

The historic and projected populations and corresponding average annual growth rates (AAGR) for the CAK catchment area, the CAK MSA, the State of Ohio, and the United States for years 2001 through 2011 (historic) and 2012 through 2032 (projected) are shown in **Table 4-1**. These trends show that the historic CAK catchment area population growth is equivalent to that reported for the State of Ohio, and below that of the United States.

For years 2012 through 2032, the projected population growth of the CAK MSA and CAK catchment area is anticipated to be below that projected for the State of Ohio and the National population growth. However, incremental population growth in the CAK market (i.e. the CAK catchment area), should be considered a significant indicator of continued airport demand.

Figure 4-1 illustrates the historic and projected growth rates of the respective population groups.

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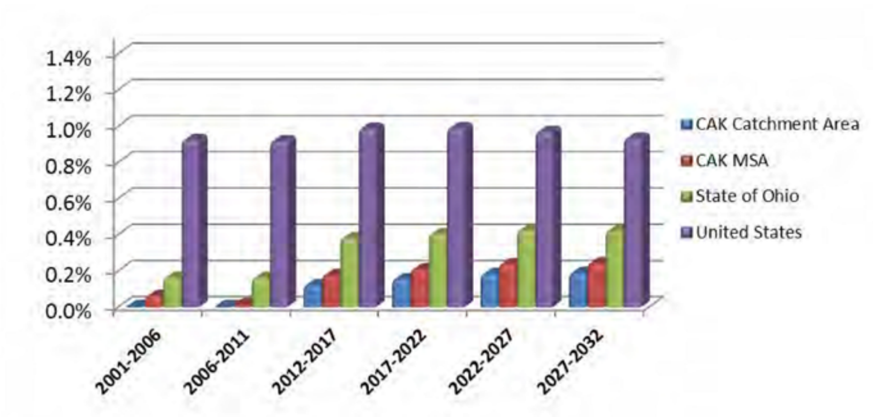
Table 4-1 – Population Growth (Historic and Projected)

Year	CAK MSA (000)	AAGR	CAK Catchment Area (000)	AAGR	State of Ohio (000)	AAGR	United States (000)	AAGR
2001	1,104	-	4,286	-	11,387	-	284,969	-
2006	1,108	0.1%	4,235	-0.2%	11,481	0.2%	298,379	0.9%
2011	1,109	0.0%	4,197	-0.25	11,574	0.2%	312,308	0.9%
2001-2011 AAGR		**0.0%**		**-0.2%**		**0.2%**		**0.9%**
2012	1,111	0.2%	4,202	0.1%	11,618	0.4%	315,387	1.0%
2017	1,122	0.2%	4,235	0.2%	11,854	0.4%	331,274	1.0%
2022	1,136	0.2%	4,273	0.2%	12,107	0.4%	347,639	1.0%
2027	1,149	0.2%	4,314	0.2%	12,365	0.4%	364,127	0.9%
2032	1,163	0.2%	4,352	0.2%	12,616	0.4%	380,413	0.9%
2012-2032 AAGR		**0.2%**		**0.2%**		**0.4%**		**0.9%**

Source: Woods & Pool Economics, Inc., RW Armstrong 2012.
*Note: 2011 Woods & Poole Economics data is an estimated value.
CAK catchment area is both primary and secondary catchment areas.
AAGR – average annual growth rate.

Figure 4-1 – Historic and Projected Population Growth Rates



Source: Woods & Pool Economics, Inc., RW Armstrong 2012.

4.1.1.2 Akron Canton MSA Per Capita Income Trends

The historic and projected per capita income for the CAK catchment area, the CAK MSA, the State of Ohio, and the United States are shown in **Table 4-2**. As shown, historic per capita income growth rates for the CAK MSA and the CAK catchment area are equal to or below the State of Ohio and the United States, indicating that, historically, the MSA and catchment areas have been lagging in growth comparatively. However, for the years 2012-2032, the projected per capita income growth for the CAK MSA, CAK catchment area, the State of Ohio, and the United States are shown to increase at an AAGR of 4.9 percent, 5.1 percent, 5.0 percent, and 4.9 percent, respectively. This growth rates indicates that the CAK MSA and catchment area will begin to grow equally with the State of Ohio and the United States during the 20-year forecast period. These projections suggest that the CAK MSA and the CAK catchment area are anticipated to maintain a strong national financial presence throughout the planning period.

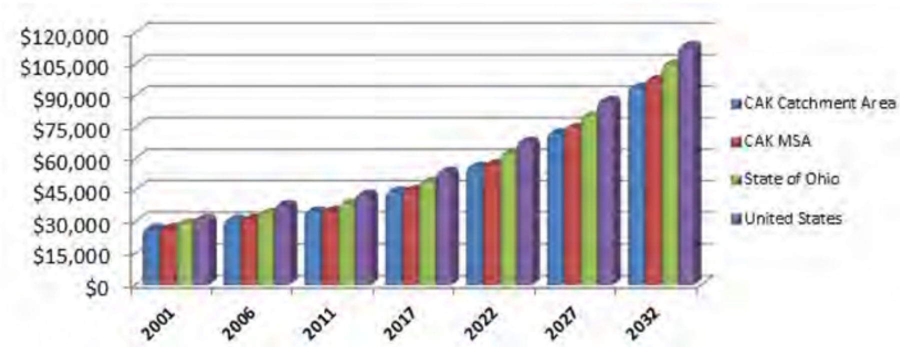
Table 4-2 – Per Capita Income Trend (Historic and Projected)

Year	CAK MSA ($)	AAGR	CAK Catchment Area ($)	AAGR	State of Ohio ($)	AAGR	United States ($)	AAGR
2001	29,702	-	26,978	-	29,275	-	31,157	-
2006	30,823	2.9%	31,249	3.0%	34,008	3.0%	37,726	3.9%
2011	34,966	2.6%	35,166	2.4%	38,293	2.4%	42,702	2.5%
2001-2011 AAGR		**2.7%**		**2.7%**		**2.7%**		**3.2%**
2012	36,091	3.2%	36,383	3.5%	39,507	3.2%	43,881	2.8%
2017	44,258	4.2%	44,988	4.3%	48,725	4.3%	53,634	4.1%
2022	55,994	4.8%	57,398	5.0%	62,022	4.9%	67,854	4.8%
2027	72,078	5.2%	74,490	5.4%	80,294	5.3%	87,412	5.2%
2032	93,560	5.4%	97,469	5.5%	104,766	5.5%	113,590	5.4%
2012-2032 AAGR		**4.9%**		**5.1%**		**5.0%**		**4.9%**

Source: Woods & Pool Economics, Inc., RW Armstrong 2012.
*Note: 2011 Woods & Poole Economics data is an estimated value.
CAK catchment area is both primary and secondary catchment areas.
AAGR – average annual growth rate.

Figure 4-2 illustrates the historic and projected per capita income for each study area.

Figure 4-2 – Historic and Projected Per Capita Income



Source: Woods & Pool Economics, Inc., RW Armstrong 2012.

4.1.2 Aviation Industry Trends

Multiple industry data sources in addition to those described in **Section 2** were used to identify aviation trends that are anticipated to influence activity at CAK over the planning horizon. The following describes these sources, and how the identified trends were applied to the aviation activity forecasts:

- The FAA National Aviation Forecast is a cumulative total of all U.S. airports and provides the anticipated national growth in enplanements, operations, and GA aircraft. The national growth rates and forecasts will differ from the Airport-specific CAK TAF forecast since the CAK TAF is, as is each individual airport's TAF, based on assumptions of local growth and market demand.
- The *FAA Aerospace Forecast, Fiscal Years (FY) 2012-2032* provides an overview of aviation industry trends and expected growth for the commercial passenger carrier, cargo carrier, and GA activity segments. National growth rates in enplanements, operations, fleet growth and fleet mix for commercial fleets and the GA fleet are provided over a 20-year forecast horizon. For the purposes of this forecast, the FAA Aerospace Forecasts were as the basis for determining the growth of the CAK based GA fleet and its composition by aircraft type (i.e., GA fleet mix).
- The *Boeing Current Market Outlook 2011-2030* provides insight into future commercial carrier 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 CAK commercial carrier fleet mix assumptions.

- The biennial *Boeing World Air Cargo Forecast 2010-2011* provides anticipated growth factors in the domestic air cargo market, as well as growth factors for international trade lanes (e.g., U.S.-Asia Pacific traffic). These factors were used to gauge potential air cargo growth at the Airport.

5 Passenger Carrier Operations Forecast

This section presents the development and results of the activity forecast and fleet mix for passenger air carrier operations, including discussions of overall trends, airline and market factors, and trends in the use of specific aircraft types.

5.1.1 Forecast Factors

CAK TAF growth factors for commercial operations are adjusted upward to account for anticipated economic and overall activity demand growth for the Airport's market area during the forecast period. The adjustments were made based on Woods & Poole demographic data showing above average population growth and strong per capita income in the CAK catchment area, historic market share growth, and recent airline activity trends including the Southwest-AirTran merger. The Passenger Carrier forecast anticipates an increasing local passenger market share, thus increasing the average size of aircraft and number of operations needed to accommodate activity demand.

The data in **Table 5-1** presents the approved Passenger Enplanement and Operations forecast for the years 2011-2019. The entirety of the commercial forecast is provided in **Appendix A**. Commercial operations growth at CAK is directly associated with the growth in passenger activity and commercial aircraft fleet mix fluctuations. The approved commercial forecast incorporated specific factors directly associated with CAK:

- Gains in passenger activity as a result of the Southwest-AirTran merger
- Increasing the Airport's share of national enplanements
- A shift from regional jets to larger narrowbody jets

According to both Southwest Airlines and Delta Air Lines, Southwest will lease the newly acquired Boeing 717s, received in the merger with AirTran, to Delta Air Lines. The delivery of the aircraft is anticipated to occur over a two-year period beginning in the second half of 2013. Delta Air Lines will use the Boeing 717s to replace a portion of its 50-seat regional jets, as well as some of their dated jets including the DC-9. With Delta assumed to be operating larger narrowbody aircraft in place of regional jets by 2014, and a growth in commercial service demand at CAK, an additional increase in the average number of passengers per departure can be anticipated.

According to the approved commercial forecast, the level of average passengers per departures at CAK is expected to increase along with the average numbers of seats per departure. This translates to more passengers per flight on larger aircraft than what currently serves CAK. With the shift to larger narrowbody aircraft, it is assumed that the number of operations to accommodate the growing number of passenger enplanements will not grow at a similar rate to that of the enplanements. Additional information will be analyzed later on in this report. Based on these assumptions, the growth in commercial carrier operations will be more moderate than that of the passenger enplanement growth.

Table 5-1 – Approved Commercial Air Carrier Forecast

Year	Annual Enplanements	Annual Operations
2011	834,454	31,146
2012	942,343	31,190
2013	1,018,000	31,250
2014	1,051,400	31,323
2015	1,086,500	32,154
2016	1,118,900	32,224
2017	1,144,900	32,839
2018	1,171,600	33,467
2019	1,199,000	34,104
2012-2032 Growth	**43.7%**	**9.5%**
2012-2032 AAGR	**1.8%**	**0.5%**

Source: Akron-Canton Airport Authority, RW Armstrong 2012.

5.1.2 Fleet Mix Assumptions

The passenger carrier operations forecast reflect the overall growth and economic conditions anticipated for the Airport's market area during the forecast period. The operations scenario captures the incremental air service growth resulting from the Southwest-AirTran Merger, and directly quantifies the growth's impact in terms of projected passenger enplanements and aircraft operations.

The commercial aircraft fleet mix projections are a function of the scheduled commercial passenger carriers that operate (or are expected to operate) at the Airport during the forecast period. Each carrier's anticipated future fleet mix (i.e., aircraft acquisitions and retirements) and forecast enplanement levels influence a carrier's aircraft type and level of operations. This data is then coupled with the forecast commercial air carrier operations to determine the number of annual departures by aircraft type.

The first step in determining CAK's future commercial carrier fleet mix was identifying the overall market trends that will drive future airline fleets, as well as aircraft fleet mix decisions specific to each airline operating at the Airport. It is important to note, however, that overall passenger enplanements have increased and are forecast to maintain a positive growth throughout the planning period. With the increase in the number of short to medium haul, low-cost air carriers, and the replacement of older larger aircraft, such as early versions of the Boeing B737 and Airbus A320, the demand for smaller single-aisle aircraft has grown within the past decade trending the industry toward aircraft with fewer seats.[1] In general, this transition has translated to higher passenger load factor per flight.

However, according to the *2011 Boeing Current Market Outlook*, domestic air carriers have begun trending away from regional jet aircraft and retiring smaller 50-seat aircraft at an accelerated rate. These 50-seat aircraft are being replaced with larger 70- and 90-plus seat regional jets as well as larger narrowbody aircraft; however, replacements will not keep pace with retirements. Boeing predicts that the 2030 fleet of regional jets will consist of 760 aircraft, down from 1,780 in 2010. Single-aisle mainline aircraft will continue to comprise the majority of the domestic fleet and will increase market share from 56 percent of the fleet in 2009 to 73 percent in 2030.

As with the predicted national fleet shift toward newer, larger, and more efficient aircraft, CAK specific fleet mix characteristics and trends were identified and applied directly to the preferred passenger carrier forecasts through 2032. In order to provide a detailed picture of future CAK operations, the following assumptions are based upon airline-specific fleet plans and aircraft orders, as well as overall industry trends:

- Southwest Airlines Boeing B737-300 aircraft will be gradually phased out of service and replaced with Boeing B737-700 and B737-800 aircraft. For forecasting purposes, it was assumed that this transition will occur at a rate of 10 percent of the B737-300 fleet per year.[2]
- Delta Air Lines McDonnell-Douglas DC9 aircraft, acquired in the Northwest merger, will be gradually phased out of service and replaced with Canadair CRJ700 and CRJ900 aircraft, as

[1] Boeing, *Long-Term Market Outlook 2012-2031.*
[2] Boeing, *Boeing to Lead Southwest Airlines 737 Flight Deck Modernization*, December 22, 2008; Boeing.com, *Orders through September 2010.*

well as the newly acquired B717s.[3] For forecasting purposes, it was assumed that this transition will occur at a rate of 15 percent of the DC9 fleet per year.

- Regional jet aircraft with a passenger capacity of 50 seats or under (Canadair CRJ100/200 and Embraer ERJ 135/140/145) will be gradually phased out of service and replaced with larger 70-seat plus regional jet aircraft (Canadair CRJ700/900 and Embraer ERJ170/175/190).[4]
- As a result of the Southwest Airlines and AirTran Airways merger, Southwest will be transitioning all Boeing 717 operations to Boeing 737 operations.
- Southwest Airlines will be leasing the 88 newly acquired Boeing 717s to Delta Air Lines. This process is expected to begin in mid-2013 at a rate of three aircraft per month. It is expected that the move will be completed within three years[5].
- It is anticipated that Delta Air Lines will gradually phase out 50-seat regional jet aircraft (CRJ 100/200) and replace operations with larger regional jets (CRJ 700/900) as well as the newly leased Boeing 717s.
- It is anticipated that Canadair CRJ900 aircraft will begin operation within the 5-year planning period.
- A “cascading” effect will occur with 70-seat regional jets. As 50-seat regional jet operations transition to 70-seat aircraft, likewise a percentage of 70-seat regional jet operations will transition to larger 80-plus seat and 99-seat regional jets, and smaller narrowbody aircraft.

Consistent with what the Boeing Market Outlook is projecting, Delta Air Lines has begun to phase out smaller 50-seat RJs and replacing those operations with larger RJs and narrowbody aircraft. According to OAG data, Delta only operated the McDonnell Douglas MD-88 series during peak periods for the airline. With the transition to larger aircraft, and the tentative lease agreement with Southwest Airlines to acquire B717s, it is assumed that there will no longer be a need for the larger MD-88, thus replacing those operations with the B717s.

With the Southwest/AirTran merger it is important to note that all operations that were B717 operations are now being transitioned to larger B737 series aircraft. As the larger aircraft begins to dominate AirTran operations, it is anticipated that the number of operations needed to accommodate passengers will be lower to become more efficient, and remain at a higher

[3] Delta Museum.Org, *Douglas DC-9 Factsheet;* World Airline News, *Delta Retires the last DC9-30 from Scheduled Service*, September 9, 2010; Airbus.com, *Summary of Orders and Deliveries.*
[4] Boeing, *2010 Boeing Market Outlook.*

level of average passengers per departure. It is assumed that this will create a slower growth in commercial operations over the course of the forecast horizon.

5.1.3 Forecast Presentation

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

Time-of-day:

- Day Operations: 7:00am to 10:00pm
- Night Operations: 10:00pm to 7:00am

Stage Length:

- Stage Length 1 (SL1): 0-500 Nautical Miles
- Stage Length 2 (SL2): 500-1000 Nautical Miles
- Stage Length 3 (SL3): 1000+ Nautical Miles

Operations forecasts for all activity types (e.g., passenger, cargo, GA, and military) will be presented with this level of detail in order to facilitate the Noise Exposure Map modeling process. **Table 5-1** presents the 2011 baseline passenger carrier operations data, while **Table 5-2** and **Table 5-3** present the 2014 and 2019 operations, respectively.

Table 5-2 – 2011 Passenger Carrier Operations

Aircraft Code	Model	Arrivals			Departures								Total Departures	Total Operations
					Day				Night					
		Day	Night	Total	SL1	SL2	SL3	Total	SL1	SL2	SL3	Total		
A320	Airbus Industrie A320	622	195	**817**	367	280	0	**647**	169	0	0	**169**	**817**	**1,633**
B717-200	Boeing 717	3,764	1,179	**4,942**	3,011	183	722	**3,917**	1,026	0	0	**1,026**	**4,942**	**9,885**
B737	Boeing 737-700	389	122	**510**	365	39	0	**404**	106	0	0	**106**	**510**	**1,020**
MD80	McDonnell Douglas Md80	284	89	**373**	276	20	0	**296**	78	0	0	**78**	**373**	**747**
DC9	McDonnell Douglas DC-9	71	22	**94**	74	0	0	**74**	19	0	0	**19**	**94**	**187**
ERJ4	Embraer ERJ 145	908	284	**1,193**	673	273	0	**945**	248	0	0	**248**	**1,193**	**2,385**
CRJ100/200	Bombardier CRJ 100/200	4,761	1,491	**6,252**	4,290	351	313	**4,954**	1,297	0	0	**1,297**	**6,252**	**12,503**
CRJ7	Bombardier CRJ-700	1,060	332	**1,393**	894	31	179	**1,104**	289	0	0	**289**	**1,393**	**2,785**
CRJ9	Bombardier CRJ-900	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**
Total Operations		**11,850**	**3,714**	**15,573**	**9,949**	**1,177**	**1,214**	**12,341**	**3,232**	**0**	**0**	**3,232**	**15,573**	**31,146**

Source: 2011 OAG Data, CAK ATCT, CAK Airport Authority, RW Armstrong

Table 5-3 – 2014 Passenger Carrier Operations

Aircraft Code	Model	Arrivals			Departures								Total Departures	Total Operations
					Day				Night					
		Day	Night	Total	SL1	SL2	SL3	Total	SL1	SL2	SL3	Total		
A320	Airbus Industrie A320	596	187	**783**	360	261	0	**621**	163	0	0	**163**	**783**	**1,566**
B717-200	Boeing 717	1,908	598	**2,506**	1,738	248	0	**1,986**	520	0	0	**520**	**2,506**	**5,012**
B733	Boeing 737-300	333	104	**438**	138	49	160	**347**	91	0	0	**91**	**438**	**876**
B737	Boeing 737-700	1,105	346	**1,450**	458	162	530	**1,149**	301	0	0	**301**	**1,450**	**2,901**
B738	Boeing 737-800	89	28	**116**	37	13	42	**92**	24	0	0	**24**	**116**	**233**
MD80	McDonnell Douglas Md80	143	45	**188**	137	12	0	**149**	39	0	0	**39**	**188**	**376**
DC9	McDonnell Douglas DC-9	72	22	**94**	74	0	0	**74**	20	0	0	**20**	**94**	**188**
ERJ4	Embraer ERJ 145	1,026	321	**1,347**	1,067	0	0	**1,067**	280	0	0	**280**	**1,347**	**2,694**
CRJ100/200	Bombardier CRJ 100/200	3,506	1,098	**4,604**	3,537	0	112	**3,649**	956	0	0	**956**	**4,604**	**9,209**
CRJ7	Bombardier CRJ-700	2,433	762	**3,195**	1,904	377	251	**2,532**	663	0	0	**663**	**3,195**	**6,390**
CRJ9	Bombardier CRJ-900	716	224	**940**	558	62	124	**745**	195	0	0	**195**	**940**	**1,879**
Total Operations		**11,926**	**3,735**	**15,661**	**10,008**	**1,184**	**1,219**	**12,411**	**3,250**	**0**	**0**	**3,250**	**15,661**	**31,323**

Source: 2011 OAG Data, CAK ATCT, CAK Airport Authority, RW Armstrong

Table 5-4 – 2019 Passenger Carrier Operations

Aircraft Code	Model	Arrivals			Departures								Total Departures	Total Operations
					Day				Night					
		Day	Night	Total	SL1	SL2	SL3	Total	SL1	SL2	SL3	Total		
A320	Airbus Industrie A320	649	203	**853**	392	284	0	**676**	177	0	0	**177**	**853**	**1,705**
B717-200	Boeing 717	2,078	651	**2,728**	1,892	270	0	**2,162**	566	0	0	**566**	**2,728**	**5,457**
B733	Boeing 737-300	494	155	**648**	286	53	174	**514**	135	0	0	**135**	**648**	**1,296**
B737	Boeing 737-700	1,635	512	**2,147**	948	176	577	**1,701**	446	0	0	**446**	**2,147**	**4,294**
B738	Boeing 737-800	131	41	**172**	76	14	46	**136**	36	0	0	**36**	**172**	**344**
MD80	McDonnell Douglas Md80	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**
DC9	McDonnell Douglas DC-9	0	0	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**
ERJ4	Embraer ERJ 145	935	293	**1,228**	973	0	0	**973**	255	0	0	**255**	**1,228**	**2,455**
CRJ100/200	Bombardier CRJ 100/200	1,039	325	**1,364**	1,081	0	0	**1,081**	283	0	0	**283**	**1,364**	**2,728**
CRJ7	Bombardier CRJ-700	3,610	1,130	**4,740**	3,081	405	270	**3,757**	984	0	0	**984**	**4,740**	**9,481**
CRJ9	Bombardier CRJ-900	2,415	756	**3,172**	2,189	68	257	**2,513**	658	0	0	**658**	**3,172**	**6,343**
Total Operations		**12,985**	**4,067**	**17,052**	**10,918**	**1,270**	**1,324**	**13,513**	**3,539**	**0**	**0**	**3,539**	**17,052**	**34,104**

Source: 2011 OAG Data, CAK ATCT, CAK Airport Authority, RW Armstrong

6 Cargo Carrier Operations Forecast

Similar to most sectors within the aviation industry, air cargo activity and demand is cyclical in nature and fluctuates based upon both national and global economic trends. According to the *FAA Aerospace Forecasts, FY2012-2032,* specific factors that influence air cargo activity include economic market conditions, fuel price instability, and globalization. Domestic air cargo growth potential at CAK is very limited. According to the FAA, air cargo is projected to grow at an AAGR of 4.9 percent throughout the forecast period. However, domestic air cargo growth is forecast to increase at a modest AAGR of 1.8 percent. The *FAA Aerospace Forecast 2012-2032* predicts an incremental annual growth in volume and operations which will likely be accommodated by existing operations or the introduction of Southwest transporting belly cargo serving CAK.

Air cargo traffic is comprised of freight and express cargo, and mail. CAK air cargo is transported by three different methods: commercial air carrier "belly cargo", dedicated all-cargo aircraft, or charter service cargo. Belly cargo is defined as cargo transported in the "belly" compartment during a commercial air carrier operation. In 2011, of the 31,146 commercial aircraft operations at CAK, approximately 10,286 operations contained belly cargo. Additionally, in 2011 there were 1,460 charter cargo general aviation operations at CAK. According to the commercial air carriers and charter cargo service operators at CAK, Southwest Airlines will begin operating additional flights with belly cargo in the latter half of 2012. It was also indicated that the potential exists for increased operations by the existing charter cargo service providers, including expanded international cargo.

For the purposes of this forecast, there were no all-cargo operations scenarios calculated based on the cargo operations fleet mix at CAK being commercial aircraft carrying belly cargo (i.e., Boeing 737) or charter cargo operations that are categorized under General Aviation (i.e., Cessna Grand Caravan). Although the FAA Aerospace Forecast projects an increased air cargo operations trend, the cargo operations at CAK are not projected to include an all-cargo carrier.

6.1 General Aviation Operations Forecast

There are a variety of aviation activities that comprise the broad definition of GA. GA includes all segments of the aviation industry except commercial air carriers/regional/commuter service, scheduled commercial cargo, and military operations.

GA represents the largest percentage of civil aircraft in the U.S. and accounts for the majority of operations handled by towered and non-towered airports, as well as the majority of certificated pilots. Its activities include: flight training, sightseeing, aerial photography, recreational, law enforcement, and medical flights, as well as business, corporate, and personal travel via air taxi 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 at CAK are divided into four categories: Single Engine Piston, Multi Engine Piston, Turbo Prop, and Business Jet. Due to the differing growth rates of each type of aircraft, each is forecasted with a unique forecast factor derived from the Airport's historic growth rate for GA operations and adjusted for each aircraft type using the *FAA Aerospace Forecast for Years 2012-2032*.

CAK GA growth rates for the forecast period, as presented in the TAF, show Local and Civil operations growing at an AAGR of 0.2% from 2012-2032. The CAK TAF predicts GA operations to grow at a rate above that of the national average for both GA and military operations. Simply put, the CAK TAF already adjusts the national growth rates for GA operations to levels that reflect the incremental growth predicted in the Airport's market area. However, the projected growth must be adjusted for each aircraft type to reflect their differing growth rates within the overall GA fleet. The forecast scenario utilizes TAF-based growth factors applied to actual 2011 operations.

For the purposes of the approved forecast, the CAK TAF annual growth numbers were used as the variable for yearly GA operations growth. However, the individual aircraft types were adjusted based on the FAA Aerospace Forecast data.

Table 6-1 shows the *FAA Aerospace Forecast for Years 2012-2032* annual growth rates predictions for active aircraft within the GA fleet, it is important to note that these numbers represent the fleet growth per aircraft type, not to be confused with operations growth:

Table 6-1 – National GA Fleet Growth Rates

Year	Single Engine Piston*	Multi Engine Piston	Turbo Prop	Turbo Jet
2012-2017 AAGR	-0.2%	-0.4%	0.8%	3.7%
2017-2022 AAGR	0.1%	-0.4%	0.7%	3.2%
2022-2027 AAGR	0.4%	-0.3%	0.9%	3.4%
2027-2032 AAGR	0.6%	-0.4%	0.8%	3.5%

Source: *FAA Aerospace Forecast FY 2012-2032*, RW Armstrong 2012
*Note: Single Engine includes Experimental and Sport aircraft category.

Again, note that these forecast factors do not represent anticipated growth in operations by the respective aircraft type, but rather indicate the anticipated growth in their numbers within the GA fleet. These figures do however provide insight into what aircraft will drive incremental operations growth at CAK; piston operations will be stagnant or in decline; modest growth for turbo prop operations; and jet operations form the bulk of incremental GA activity.

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PASSUR data provided by HMMH was used as the basis of this forecast scenario. The fleet mix composition along with operations per aircraft was used to calculate the baseline scenario. Operations per individual aircraft were calculated based on PASSUR data percentages during a four-month observation period. These months consisted of two peak months and two months during periods with less aircraft activity (i.e., January, April, July, and October). This data was analyzed and applied to individual aircraft types to calculate the 2011 baseline operations data for GA operations.

The next step was to apply the previously mentioned growth rates provided by the approved forecast to calculate the operations per aircraft for the 2014 and 2019 calendar years. **Tables 6-2** through **6-4** show a summary of these operations by the aircraft categories previously mentioned; Single Engine, Multi-Engine, Turbo Prop, and Business Jet. A detailed breakdown of operations by specific aircraft model is provided in **Appendix B**. The following provides an outline of the assumptions and methodologies that were applied to the forecast:

Assumptions/Methodologies

- PASSUR data acquired from HMMH provided the following:
  - Fleet mix composition
  - Arrival and Departure operations split
  - Percentage split for day/night operations
  - Stage Length composition
- The approved CAK forecast provided the following:
  - Total GA Operations counts
  - Based aircraft percentage split
- PASSUR data was analyzed to split the operations into aircraft type (e.g., Single, Multi, Turbo, Jet, and GA Misc.)
  - GA Misc. were operations that could not be identified
- The PASSUR data was then used to calculate a percentage split for day/night arrivals and departures for 2011
- These percentages were then applied to the approved forecast GA Operations count to calculate day/night arrivals and departures for the following areas: Single Engine, Multi-Engine, Turbo Prop, and Business Jet
- The remaining GA Misc. operations were split between the previous four categories based on the approved forecast based aircraft fleet mix
- The 2014 and 2019 forecasts were calculated with the same methodology as the baseline 2011 forecast, however the percentages applied coincided with the year of the forecast (i.e., the 2014 GA based aircraft fleet mix was applied to the 2014 forecast to account for the fleet mix changes over the course of the forecast period)

Table 6-2 – 2011 General Aviation Operations

	Arrivals			Departures									
				Day				Night				Total	Total
Aircraft Type	Day	Night	Total	SL1	SL2	SL3	Total	SL1	SL2	SL3	Total	Departures	Operations
Single Engine Piston	5,236	231	**5,468**	5,236	0	0	5,236	231	0	0	231	**5,468**	**10,936**
Multi-Engine Piston	1,192	608	**1,800**	1,192	0	0	1,192	608	0	0	608	**1,800**	**3,599**
Turbo Prop	3,779	1,208	**4,987**	3,779	0	0	3,779	1,208	0	0	1,208	**4,987**	**9,974**
Business Jet	10,789	777	**11,566**	10,789	0	0	10,789	777	0	0	777	**11,566**	**23,131**
Total Operations	**20,996**	**2,824**	**23,820**	**20,996**	**0**	**0**	**20,996**	**2,824**	**0**	**0**	**2,824**	**23,820**	**47,641**

Source: CAK Airport Authority, PASSUR Data, HMMH, RW Armstrong

Table 6-3 – 2014 General Aviation Operations

	Arrivals			Departures									
				Day				Night				Total	Total
Aircraft Type	Day	Night	Total	SL1	SL2	SL3	Total	SL1	SL2	SL3	Total	Departures	Operations
Single Engine Piston	5,286	234	**5,519**	5,286	0	0	5,286	234	0	0	234	**5,519**	**11,039**
Multi-Engine Piston	1,199	612	**1,811**	1,199	0	0	1,199	612	0	0	612	**1,811**	**3,621**
Turbo Prop	3,844	1,229	**5,072**	3,844	0	0	3,844	1,229	0	0	1,229	**5,072**	**10,145**
Business Jet	10,951	789	**11,740**	10,951	0	0	10,951	789	0	0	789	**11,740**	**23,480**
Total Operations	**21,280**	**2,863**	**24,142**	**21,280**	**0**	**0**	**21,280**	**2,863**	**0**	**0**	**2,863**	**24,142**	**48,285**

Source: CAK Airport Authority, PASSUR Data, HMMH, RW Armstrong

Table 6-4 – 2019 General Aviation Operations

	Arrivals			Departures									
				Day				Night				Total	Total
Aircraft Type	Day	Night	Total	SL1	SL2	SL3	Total	SL1	SL2	SL3	Total	Departures	Operations
Single Engine Piston	5,377	238	**5,615**	5,377	0	0	5,377	238	0	0	238	**5,615**	**11,229**
Multi-Engine Piston	1,207	616	**1,823**	1,207	0	0	1,207	616	0	0	616	**1,823**	**3,646**
Turbo Prop	3,953	1,264	**5,217**	3,953	0	0	3,953	1,264	0	0	1,264	**5,217**	**10,433**
Business Jet	11,226	809	**12,035**	11,226	0	0	11,226	809	0	0	809	**12,035**	**24,070**
Total Operations	**21,763**	**2,926**	**24,689**	**21,763**	**0**	**0**	**21,763**	**2,926**	**0**	**0**	**2,926**	**24,689**	**49,378**

Source: CAK Airport Authority, PASSUR Data, HMMH, RW Armstrong

7 Military Operations Forecast

Military operations forecasts and projected fleet mix composition at CAK are based on OANG data for the 2011 calendar year and subsequent information provided for future fleet mix structure. Military aircraft and operations are simply defined as aircraft and operations conducted by the nation's military forces. Military aircraft are also included in the based aircraft and operations projections, but are not forecast in the same manner as GA 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, for the purposes of this forecast, the military operations were projected to remain static at baseline year levels throughout the forecast period.

Military operations at CAK are derived in two ways: based military aircraft and transient military operations (i.e., military aircraft not attached to the OANG based at CAK). Transient military operations include both rotorcraft and fixed wing operations. The transient aircraft mix is varied and difficult to predict through the forecast period; for the purposes of this forecast, it is assumed that the transient military fleet mix will remain constant. Additionally, based on OANG data, all military projected operations are assumed to be stage length one (SL1).

During conversations with the OANG, based military aircraft at CAK are comprised by only two types of air vehicles: the LH-72 Lakota and the Boeing CH-47 Chinook. Currently, there are 10 rotorcraft based at the Airport; four of which are Lakotas and the other six the Chinook. According to the OANG, new "K" type Chinooks are to be expected during the summer of 2013; increasing the based Chinooks from six to nine for a total of 13 based rotorcraft. According to ATCT data, transient military fleet mix operations consist of three primary types of aircraft: Sikorsky UH-60 Blackhawks, Lockheed C-130 Hercules, and the F-16 Falcon. For the purposes of this forecast, all transient military operations are categorized as itinerant operations.

OANG estimates for increased training activity and an increase in based rotorcraft over the forecast period are applied to based aircraft activity only. In line with the CAK and national TAF, transient military activity is estimated to remain flat through the forecast period.

The following provides a summary of the assumptions and methodologies used to calculate the 2014 and 2019 Military Operations forecasts.

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Assumptions

- All operation counts are under the assumption of six flights/day four days/week, based on conversations with the OANG.
- The occasional non based AC military operations were split evenly between the C-130 and F16.
- Night operations only occur from 10pm - 1am on Tuesdays, Wednesdays, and Fridays; therefore a ratio split of 5:1 was used to split the day/night operations.
- Military based aircraft fleet mix will increase to four Lakotas and nine Chinooks in the summer of 2013, according to the OANG.
- It is assumed that there are two C-130 operations per month (1 arrival, 1 departure), two F16 operations per month (1 arrival, 1 departure) totaling 24 operations for each aircraft annually.
- Sikorsky Blackhawks account for 260 operations per year.
- All non-based aircraft operations are itinerant operations.

Methodologies

- The based military operations were allocated based on the percentage of the fleet mix (i.e., 2011 feet mix consisted of four Lakotas and six Chinooks, therefore the operations split was 40/60).
- Arrivals and departures were split evenly based on the fact that all based aircraft depart and then return, and non-based aircraft always arrive and then depart (i.e., touch and go operations).
- The total non-based aircraft operations were subtracted from the 2011 itinerant counts.
- The remaining operations were split based on the aforementioned fleet mix percentage for the respective year (e.g., 40/60 split for 2011 and a 31/69 split for 2014 and 2019).
- The split was then calculated and split evenly for arrivals and departure operations.

Table 7-1 presents the 2011 baseline military operations data, while **Table 7-2** and **Table 1-3** present the 2014 and 2019 forecasted operations respectively.

Table 7-1 – 2011 Military Operations

Aircraft		Arrivals			Departures								Total	Total
					Day				Night					
Code	Model	Day	Night	Total	SL1	SL2	SL3	Total	SL1	SL2	SL3	Total	Departures	Operations
LH72	LH-72 Lakota	385	385	**770**	77	0	0	**77**	77	0	0	**77**	**154**	**924**
CH47F	Boeing CH-47 Chinook	578	578	**1,155**	116	0	0	**116**	116	0	0	**116**	**231**	**1,386**
UH-60	Sikorsky UH-60 Blackhawk	130	130	**260**	0	0	0	**0**	0	0	0	**0**	**0**	**260**
C130	Lockheed C-130 Hercules	12	12	**24**	0	0	0	**0**	0	0	0	**0**	**0**	**24**
F16	F-16 Falcon	12	12	**24**	0	0	0	**0**	0	0	0	**0**	**0**	**24**
Total Operations		**1,117**	**1,117**	**2,233**	**193**	**0**	**0**	**193**	**193**	**0**	**0**	**193**	**385**	**2,618**

Source: OANG, CAK Airport Authority, HMMH, RW Armstrong

Table 7-2 – 2014 Military Operations

Aircraft		Arrivals			Departures								Total	Total
					Day				Night					
Code	Model	Day	Night	Total	SL1	SL2	SL3	Total	SL1	SL2	SL3	Total	Departures	Operations
LH72	LH-72 Lakota	296	296	**592**	59	0	0	**59**	59	0	0	**59**	**118**	**711**
CH47F	Boeing CH-47 Chinook	666	666	**1,333**	133	0	0	**133**	133	0	0	**133**	**267**	**1,599**
UH-60	Sikorsky UH-60 Blackhawk	130	130	**260**	0	0	0	**0**	0	0	0	**0**	**0**	**260**
C130	Lockheed C-130 Hercules	12	12	**24**	0	0	0	**0**	0	0	0	**0**	**0**	**24**
F16	F-16 Falcon	12	12	**24**	0	0	0	**0**	0	0	0	**0**	**0**	**24**
Total Operations		**1,117**	**1,117**	**2,233**	**193**	**0**	**0**	**193**	**193**	**0**	**0**	**193**	**385**	**2,618**

Source: OANG, CAK Airport Authority, HMMH, RW Armstrong

Table 7-3 – 2019 Military Operations

Aircraft Code	Model	Arrivals Day	Arrivals Night	Arrivals Total	Departures Day SL1	Departures Day SL2	Departures Day SL3	Departures Day Total	Departures Night SL1	Departures Night SL2	Departures Night SL3	Departures Night Total	Total Departures	Total Operations
LH72	LH-72 Lakota	296	296	**592**	59	0	0	**59**	59	0	0	**59**	**118**	**711**
CH47F	Boeing CH-47 Chinook	666	666	**1,333**	133	0	0	**133**	133	0	0	**133**	**267**	**1,599**
UH-60	Sikorsky UH-60 Blackhawk	130	130	**260**	0	0	0	**0**	0	0	0	**0**	**0**	**260**
C130	Lockheed C-130 Hercules	12	12	**24**	0	0	0	**0**	0	0	0	**0**	**0**	**24**
F16	F-16 Falcon	12	12	**24**	0	0	0	**0**	0	0	0	**0**	**0**	**24**
Total Operations		**1,117**	**1,117**	**2,233**	**193**	**0**	**0**	**193**	**193**	**0**	**0**	**193**	**385**	**2,618**

Source: OANG, CAK Airport Authority, HMMH, RW Armstrong

8 Forecast Summary

The Operations Forecast Summary encapsulates the total operations profile of CAK through the forecast period by aviation activity type and aircraft type. Though this forecast is designed to provide a highly detailed picture of CAK's current and projected operations for use in updating the Airport's Part 150 Noise Exposure Maps and Noise Compatibility Program, it equally provides a broad overview of the Airport, its users, and the internal and external factors that will influence future growth. The data gathered, analyzed and presented, coupled with industry research and a range of meetings with the Airport Authority and tenants, were all instrumental in gaining a full understanding of the driving forces behind CAK's future activity levels. In order to ensure the greatest confidence in the findings of this Part 150 forecast, the approach, level of research, data analysis, and due diligence applied were completed to Airport Master Plan forecasting standards.

The following sets of tables and exhibits are provided in order to present the forecast findings in a concise, yet comprehensive, format that brings together all of the elements from the Part 150 forecast effort. These individual elements (e.g., passenger carrier, cargo carrier, GA, and military) are combined and presented in total as follows:

- By activity type
- By aircraft type
- Detailed summary

CAK operations by activity type are shown in **Table 8-1** and **Figure 8-1**. Overall, operations are projected to grow at an annual rate of 0.7 percent, with passenger carrier operations growing the most and military operations growing the least in percentage terms.

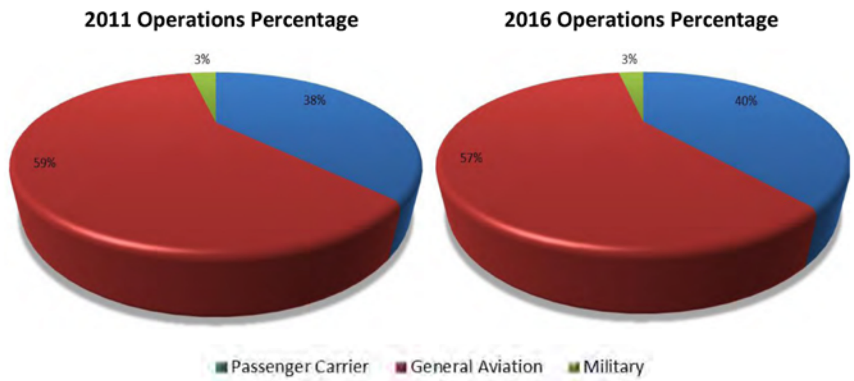
Table 8-1 – Operations Forecast Summary by Activity Type

Aviation Activity	2011	2014	2019	AAGR
Passenger Carrier	31,146	31,323	34,104	**1.1%**
General Aviation	47,641	48,285	49,378	**0.4%**
Military	2,618	2,618	2,618	**0.0%**
Total	**81,405**	**82,225**	**86,100**	**0.7%**

Source: 2011 OAG Data, CAK ATCT, CAK Airport Authority, OANG, HMMH, PASSUR Data, RW Armstrong

Figure 1-4 compares the percent of operations by activity type in 2011 to that projected in 2019. Shifts in overall activity type distribution operations are marginal, with GA activity showing the greatest gains in operations share, moving from 38 to 40 percent of total operations due to the anticipated increase in business jet activity at the Airport.

Figure 8-1 – 2011-2019 Operations by Activity Type (Percent Total)



Source: RW Armstrong

Table 8-2 and **Figure 8-3** examine the same metrics as the previous table and chart, but categorize the data by aircraft type. The greatest shift in CAK's fleet mix is anticipated to be the replacement of the under 50-seat regional jets with larger 70-plus seat regional jets and narrowbody jets.

Table 8-2 – Operations Forecast Summary by Aircraft Type

Aircraft Type	2011	2014	2019	2011-2019 AAGR
Narrowbody Jet	13,473	11,151	13,096	**-0.4%**
Regional Jet Over 50 Seats	2,785	8,269	15,824	**24.3%**
Regional Jet Under 50 Seats	14,888	11,903	5,184	**-12.4%**
Single Engine Piston	10,936	11,039	11,229	**0.3%**
Multi-Engine Piston	3,502	3,523	3,547	**0.2%**
Turbo Prop	9,999	10,169	10,458	**0.6%**
Business/Military Jet	23,252	23,602	24,192	**0.5%**
Rotor	2,570	2,570	2,570	**0.0%**
Total Operations	**81,405**	**82,225**	**86,100**	**0.7%**

Source: 2011 OAG Data, CAK ATCT, CAK Airport Authority, OANG, HMMH, PASSUR Data, RW Armstrong

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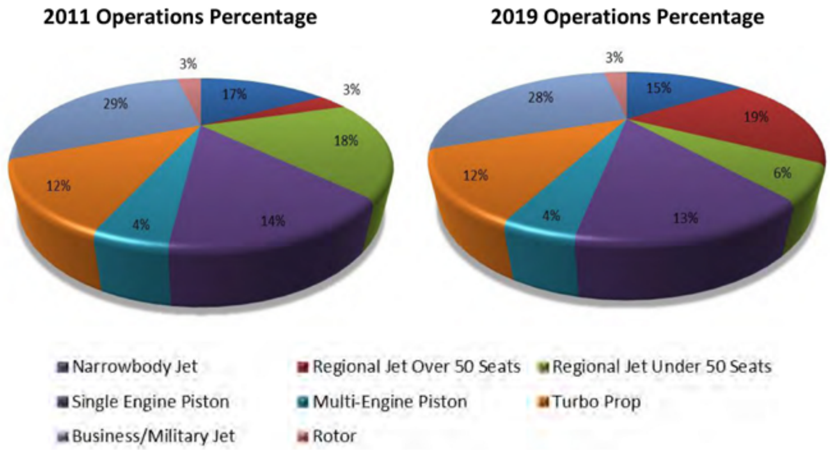
Figure 8-2 – 2011-2019 Operations by Aircraft Type (Percent Total)



Source: RW Armstrong

Note that, as shown in **Table 8-3**, the Part 150 level of total operations for CAK at the end of the forecast period is 23.6 percent higher than what is reported in the TAF total operations projections, this difference is attributed to a higher reported operations count of 81,405 in 2011 by CAK, as opposed to the TAF reported operations of 69,610 in 2011.

Table 8-3 – Operations Forecast Summary by Activity Type

Year	TAF	Preferred	Difference
2011*	69,610	81,405	**16.9%**
2014	66,028	82,225	**24.5%**
2019	69,675	86,100	**23.6%**
2011-2019 AAGR	**0.01%**	**0.70%**	

Source: 2011 OAG Data, CAK ATCT, CAK Airport Authority, OANG, RW Armstrong.
*Preferred operations count provided CAK Airport Authority

Table 8-4 through **Table 8-6** summarize the Part 150 forecast operations levels by activity and aircraft type, complete with arrival and departure splits, daytime and nighttime operations splits, and stage length identification. Note that for summary purposes, individual aircraft models are summarized by type; inputs for the Noise Exposure Map model identify specific aircraft models included in each category and are available in **Appendix B**.

Table 8-4 – 2011 Total Operations Summary

Aircraft Code	Model	Arrivals			Departures								Total Departures	Total Operations
					Day				Night					
		Day	Night	Total	SL1	SL2	SL3	Total	SL1	SL2	SL3	Total		
Passenger Carrier Operations														
Narrowbody Jet		5,130	1,606	**6,736**	4,093	523	722	**5,338**	1,398	0	0	**1,398**	**6,736**	**13,473**
Regional Jet Over 50 Seats		1,060	332	**1,393**	894	31	179	**1,104**	289	0	0	**289**	**1,393**	**2,785**
Regional Jet Under 50 Seats		5,669	1,775	**7,444**	4,962	624	313	**5,899**	1,545	0	0	**1,545**	**7,444**	**14,888**
Passenger Carrier Operations		**11,859**	**3,714**	**15,573**	**9,949**	**1,177**	**1,214**	**12,341**	**3,232**	**0**	**0**	**3,232**	**15,573**	**31,146**
General Aviation Operations														
Single Engine Piston		5,236	231	**5,468**	5,236	0	0	**5,236**	231	0	0	**231**	**5,468**	**10,936**
Multi-Engine Piston		1,159	592	**1,751**	1,159	0	0	**1,159**	592	0	0	**592**	**1,800**	**3,551**
Turbo Prop		3,787	1,212	**4,999**	3,787	0	0	**3,787**	1,212	0	0	**1,212**	**4,987**	**9,986**
Business Jet		10,813	789	**11,602**	10,813	0	0	**10,813**	789	0	0	**789**	**11,566**	**23,168**
General Aviation Operations		**20,996**	**2,824**	**23,820**	**20,996**	**0**	**0**	**20,996**	**2,824**	**0**	**0**	**2,824**	**23,820**	**47,641**
Military Operations														
LH72	LH-72 Lakota	385	77	**462**	385	0	0	**385**	77	0	0	**77**	**462**	**924**
CH47F	Boeing CH-47 Chinook	578	116	**693**	578	0	0	**578**	116	0	0	**116**	**693**	**1,386**
UH-60	Blackhawk	130	0	**130**	130	0	0	**130**	0	0	0	**0**	**130**	**260**
C130	Lockheed C-130 Hercules	12	0	**12**	12	0	0	**12**	0	0	0	**0**	**12**	**24**
F16	F-16 Falcon	12	0	**12**	12	0	0	**12**	0	0	0	**0**	**12**	**24**
Military Operations		**1,117**	**193**	**1,309**	**1,117**	**0**	**0**	**1,117**	**193**	**0**	**0**	**193**	**1,309**	**2,618**
Total Operations		**33,972**	**6,731**	**40,703**	**32,062**	**1,177**	**1,214**	**34,453**	**6,249**	**0**	**0**	**6,249**	**40,703**	**81,405**

Source: 2011 OAG Data, CAK ATCT, CAK Airport Authority, OANG, HMMH, PASSUR Data, RW Armstrong

Table 8-5 – 2014 Total Operations Summary

Aircraft Code	Model	Arrivals Day	Arrivals Night	Arrivals Total	Departures Day SL1	Day SL2	Day SL3	Day Total	Departures Night SL1	Night SL2	Night SL3	Night Total	Total Departures	Total Operations
Passenger Carrier Operations														
Narrowbody Jet		4,246	1,330	**5,575**	2,941	745	732	**4,418**	1,157	0	0	**1,157**	**5,575**	**11,151**
Regional Jet Over 50 Seats		3,149	986	**4,135**	2,462	439	375	**3,276**	858	0	0	**858**	**4,135**	**8,269**
Regional Jet Under 50 Seats		4,532	1,419	**5,951**	4,604	0	112	**4,716**	1,235	0	0	**1,235**	**5,951**	**11,903**
Passenger Carrier Operations		**11,926**	**3,735**	**15,661**	**10,008**	**1,184**	**1,219**	**12,411**	**3,250**	**0**	**0**	**3,250**	**15,661**	**31,323**
General Aviation Operations														
Single Engine Piston		5,286	234	**5,519**	5,286	0	0	**5,286**	234	0	0	**234**	**5,519**	**11,039**
Multi-Engine Piston		1,167	595	**1,762**	1,167	0	0	**1,167**	595	0	0	**595**	**1,762**	**3,523**
Turbo Prop		3,852	1,233	**5,085**	3,852	0	0	**3,852**	1,233	0	0	**1,233**	**5,085**	**10,169**
Business Jet		10,975	801	**11,777**	10,975	0	0	**10,975**	801	0	0	**801**	**11,777**	**23,554**
General Aviation Operations		**21,280**	**2,863**	**24,142**	**21,280**	**0**	**0**	**21,280**	**2,863**	**0**	**0**	**2,863**	**24,142**	**48,285**
Military Operations														
LH72	LH-72 Lakota	296	59	**355**	296	0	0	**296**	59	0	0	**59**	**355**	**711**
CH47F	Boeing CH-47 Chinook	666	133	**800**	666	0	0	**666**	133	0	0	**133**	**800**	**1,599**
UH-60	Blackhawk	130	0	**130**	130	0	0	**130**	0	0	0	**0**	**130**	**260**
C130	Lockheed C-130 Hercules	12	0	**12**	12	0	0	**12**	0	0	0	**0**	**12**	**24**
F16	F-16 Falcon	12	0	**12**	12	0	0	**12**	0	0	0	**0**	**12**	**24**
Military Operations		**1,117**	**193**	**1,309**	**1,117**	**0**	**0**	**1,117**	**193**	**0**	**0**	**193**	**1,309**	**2,618**
Total Operations		**34,323**	**6,790**	**41,113**	**32,404**	**1,184**	**1,219**	**34,807**	**6,306**	**0**	**0**	**6,306**	**41,113**	**82,225**

Source: 2011 OAG Data, CAK ATCT, CAK Airport Authority, OANG, HMMH, PASSUR Data, RW Armstrong

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Table 8-6 – 2019 Total Operations Summary

Aircraft Code	Model	Arrivals			Departures								Total Departures	Total Operations
					Day				Night					
		Day	Night	Total	SL1	SL2	SL3	Total	SL1	SL2	SL3	Total		
Passenger Carrier Operations														
Narrowbody Jet		4,986	1,562	**6,548**	3,594	797	797	**5,189**	1,359	0	0	**1,359**	**6,548**	**13,096**
Regional Jet Over 50 Seats		6,025	1,887	**7,912**	5,270	473	527	**6,270**	1,642	0	0	**1,642**	**7,912**	**15,824**
Regional Jet Under 50 Seats		1,974	618	**2,592**	2,054	0	0	**2,054**	538	0	0	**538**	**2,592**	**5,184**
Passenger Carrier Operations		**12,985**	**4,067**	**17,052**	**10,918**	**1,270**	**1,324**	**13,513**	**3,539**	**0**	**0**	**3,539**	**17,052**	**34,104**
General Aviation Operations														
Single Engine Piston		5,377	238	**5,615**	5,377	0	0	**5,377**	238	0	0	**238**	**5,615**	**11,229**
Multi-Engine Piston		1,174	599	**1,774**	1,174	0	0	**1,174**	599	0	0	**599**	**1,774**	**3,547**
Turbo Prop		3,961	1,268	**5,229**	3,961	0	0	**3,961**	1,268	0	0	**1,268**	**5,229**	**10,458**
Business Jet		11,251	821	**12,072**	11,251	0	0	**11,251**	821	0	0	**821**	**12,072**	**24,144**
General Aviation Operations		**21,763**	**2,926**	**24,689**	**21,763**	**0**	**0**	**21,763**	**2,926**	**0**	**0**	**2,926**	**24,689**	**49,378**
Military Operations														
LH72	LH-72 Lakota	296	59	**355**	296	0	0	**296**	59	0	0	**59**	**355**	**711**
CH47F	Boeing CH-47 Chinook	666	133	**800**	666	0	0	**666**	133	0	0	**133**	**800**	**1,599**
UH-60	Blackhawk	130	0	**130**	130	0	0	**130**	0	0	0	**0**	**130**	**260**
C130	Lockheed C-130 Hercules	12	0	**12**	12	0	0	**12**	0	0	0	**0**	**12**	**24**
F16	F-16 Falcon	12	0	**12**	12	0	0	**12**	0	0	0	**0**	**12**	**24**
Military Operations		**1,117**	**193**	**1,309**	**1,117**	**0**	**0**	**1,117**	**193**	**0**	**0**	**193**	**1,309**	**2,618**
Total Operations		**35,865**	**7,185**	**43,050**	**33,798**	**1,270**	**1,324**	**36,393**	**6,657**	**0**	**0**	**6,657**	**43,050**	**86,100**

Source: 2011 OAG Data, CAK ATCT, CAK Airport Authority, OANG, HMMH, PASSUR Data, RW Armstrong

Appendix A - CAK Approved Aviation Activity Forecast

Part 150 Noise Study Activity Forecast 2014-2019 // Akron-Canton Regional Airport

Approved Forecast Summary

Year	Based Aircraft	Enplanements	Operations			
			Air Carrier	GA	Military	Total Operations
2011	146	834,454	31,146	47,641	2,618	**81,405**
Projected:						
2012	146	942,343	31,190	47,854	2,618	**81,662**
2013	146	1,018,000	31,250	48,069	2,618	**81,937**
2014	146	1,051,400	31,323	48,285	2,618	**82,225**
2015	146	1,086,500	32,154	48,501	2,618	**83,273**
2016	146	1,118,900	32,224	48,719	2,618	**83,561**
2017	147	1,144,900	32,839	48,938	2,618	**84,395**
2018	147	1,171,600	33,467	49,158	2,618	**85,243**
2019	147	1,199,000	34,104	49,378	2,618	**86,100**
2020	147	1,228,600	34,755	49,600	2,618	**86,972**
2021	148	1,257,500	35,419	49,823	2,618	**87,860**
2022	148	1,313,200	36,090	50,046	2,618	**88,755**
2023	149	1,343,500	36,776	50,271	2,618	**89,665**
2024	149	1,374,600	37,478	50,497	2,618	**90,593**
2025	150	1,406,500	38,195	50,724	2,618	**91,537**
2026	151	1,441,600	38,929	50,952	2,618	**92,499**
2027	152	1,475,400	39,680	51,181	2,618	**93,478**
2028	152	1,510,100	40,447	51,411	2,618	**94,476**
2029	156	1,548,100	41,232	51,642	2,618	**95,492**
2030	154	1,584,900	42,035	51,874	2,618	**96,527**
2031	155	1,622,700	42,857	52,107	2,618	**97,582**
2032	156	1,661,600	43,696	52,341	2,618	**98,655**
2012-2032 Growth	**6.8%**	**76.3%**	**40.1%**	**9.4%**	**0.0%**	**20.8%**
2012-2032 AAGR	**0.3%**	**2.9%**	**1.7%**	**0.5%**	**0.0%**	**0.9%**

Source: Akron-Canton Airport Authority, FAA CAK TAF, 2012-2032 FAA Aerospace Forecast, RW Armstrong 2012

Appendix B - Detailed General Aviation Operations Forecast

Part 150 Noise Study Activity Forecast 2014-2019 // Akron-Canton Regional Airport

2011

	Arrivals			Departures									
				Day Ops				Night Ops					
INM Type	**Day Ops**	**Night Ops**	**Total Arrivals**	**SL1**	**SL2**	**SL3**	**Total**	**SL1**	**SL2**	**SL3**	**Total**	**Total Departures**	**Total Operations**
Single Engine Piston Operations													
M20L (Aerostar 200)	728	32	**761**	728	0	0	728	32	0	0	32	**761**	**1,521**
Beech Bonanza	512	23	**534**	512	0	0	512	23	0	0	23	**534**	**1,069**
Beech 33 Debonair	118	5	**123**	118	0	0	118	5	0	0	5	**123**	**247**
Beech Mentor	20	1	**21**	20	0	0	20	1	0	0	1	**21**	**41**
Buccaneer	20	1	**21**	20	0	0	20	1	0	0	1	**21**	**41**
Cessna 172	413	18	**432**	413	0	0	413	18	0	0	18	**432**	**863**
Cessna 177	20	1	**21**	20	0	0	20	1	0	0	1	**21**	**41**
Cessna 182	453	20	**473**	453	0	0	453	20	0	0	20	**473**	**946**
Cessna 206	118	5	**123**	118	0	0	118	5	0	0	5	**123**	**247**
CNA210 (Centurion)	276	12	**288**	276	0	0	276	12	0	0	12	**288**	**576**
SR22	610	27	**637**	610	0	0	610	27	0	0	27	**637**	**1,274**
PA32	1,949	86	**2,035**	1,949	0	0	1,949	86	0	0	86	**2,035**	**4,070**
Total Single Operations	**5,236**	**231**	**5,468**	**5,236**	**0**	**0**	**5,236**	**231**	**0**	**0**	**231**	**5,468**	**10,936**
Multi-Engine Piston Operations													
Aerostar 600	572	292	**863**	572	0	0	572	292	0	0	292	**863**	**1,727**
Beechcraft Baron 55	8	4	**12**	8	0	0	8	4	0	0	4	**12**	**24**
Beechcraft Baron 58	129	66	**195**	129	0	0	129	66	0	0	66	**195**	**389**
Cessna 310	40	21	**61**	40	0	0	40	21	0	0	21	**61**	**122**
Cessna 340	56	29	**85**	56	0	0	56	29	0	0	29	**85**	**170**
CNA402 (Cessna 400/402)	72	37	**109**	72	0	0	72	37	0	0	37	**109**	**219**
Cessna 414	105	53	**158**	105	0	0	105	53	0	0	53	**158**	**316**
Cessna 421	97	49	**146**	97	0	0	97	49	0	0	49	**146**	**292**
Cessna 425	32	16	**49**	32	0	0	32	16	0	0	16	**49**	**97**
DA42 (Diamond Star DA-40/42)	48	25	**73**	48	0	0	48	25	0	0	25	**73**	**146**

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Total Multi Operations	**1,159**	**592**	**1,751**	**1,159**	**0**	**0**	**1,159**	**592**	**0**	**0**	**592**	**1,751**	**3,502**
Turbo Prop Operations													
Beech 1900	26	8	**34**	26	0	0	26	8	0	0	8	**34**	**68**
Beech Airliner 95	5	2	**7**	5	0	0	5	2	0	0	2	**7**	**14**
Beech Airliner 99	5	2	**7**	5	0	0	5	2	0	0	2	**7**	**14**
Bombardier Challenger 300	391	125	**516**	391	0	0	391	125	0	0	125	**516**	**1,031**
Cessna 441	8	4	**12**	8	0	0	8	4	0	0	4	**12**	**24**
Cessna Grand Caravan	1,685	540	**2,226**	1,685	0	0	1,685	540	0	0	540	**2,226**	**4,451**
AC50 (Commander 50)	5	2	**7**	5	0	0	5	2	0	0	2	**7**	**14**
AC95 (Commander 90/95/1000)	72	23	**95**	72	0	0	72	23	0	0	23	**95**	**190**
RWCM12 (Commander 112)	5	2	**7**	5	0	0	5	2	0	0	2	**7**	**14**
DHC8 (De Havilland Dash-8 Q100/200)	31	10	**41**	31	0	0	31	10	0	0	10	**41**	**81**
DHC830 (De Havilland Dash-8 Q300/400)	26	8	**34**	26	0	0	26	8	0	0	8	**34**	**68**
De Havilland DHC-6	5	2	**7**	5	0	0	5	2	0	0	2	**7**	**14**
PC12 (Eagle)	154	49	**204**	154	0	0	154	49	0	0	49	**204**	**407**
Embraer Bandeirante	5	2	**7**	5	0	0	5	2	0	0	2	**7**	**14**
Embraer Brasilia	5	2	**7**	5	0	0	5	2	0	0	2	**7**	**14**
King Air 90	118	38	**156**	118	0	0	118	38	0	0	38	**156**	**312**
King Air 100	26	8	**34**	26	0	0	26	8	0	0	8	**34**	**68**
Jetstream 41	6	0	**7**	6	0	0	6	0	0	0	0	**7**	**14**
Mitsubishi MU 2B	21	7	**27**	21	0	0	21	7	0	0	7	**27**	**54**
Mitsubishi MU 30	5	2	**7**	5	0	0	5	2	0	0	2	**7**	**14**
P-180 Avanti	211	68	**278**	211	0	0	211	68	0	0	68	**278**	**556**
Short 330	10	3	**14**	10	0	0	10	3	0	0	3	**14**	**27**
Short 360	6	0	**7**	6	0	0	6	0	0	0	0	**7**	**14**
Super King Air 200	293	94	**387**	293	0	0	293	94	0	0	94	**387**	**774**
BEC300 (Super King Air 300/350)	452	145	**597**	452	0	0	452	145	0	0	145	**597**	**1,194**
Swearingen Merlin	144	46	**190**	144	0	0	144	46	0	0	46	**190**	**380**
TBM700 (TBM700/800	67	21	**88**	67	0	0	67	21	0	0	21	**88**	**176**

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Total Turbo Prop Operations	**3,787**	**1,212**	**4,999**	**3,787**	**0**	**0**	**3,787**	**1,212**	**0**	**0**	**1,212**	**4,999**	**9,999**
					Jet Operations								
1124 Westwind	63	5	**68**	63	0	0	63	5	0	0	5	**68**	**136**
1125 Astra	13	1	**14**	13	0	0	13	1	0	0	1	**14**	**27**
G200	120	9	**129**	120	0	0	120	9	0	0	9	**129**	**258**
Beechjet 400	678	49	**727**	678	0	0	678	49	0	0	49	**727**	**1,454**
Bombardier 600	38	3	**41**	38	0	0	38	3	0	0	3	**41**	**82**
Canadair Challenger 600	723	52	**775**	723	0	0	723	52	0	0	52	**775**	**1,549**
Citation 500	6	0	**7**	6	0	0	6	0	0	0	0	**7**	**14**
Citation 501	95	7	**102**	95	0	0	95	7	0	0	7	**102**	**204**
Citation 510	127	9	**136**	127	0	0	127	9	0	0	9	**136**	**272**
C525C (Citation 525)	1,203	97	**1,300**	1,203	0	0	1,203	97	0	0	97	**1,300**	**2,601**
CNA550 (Citation 550/Embraer 500/505)	666	48	**714**	666	0	0	666	48	0	0	48	**714**	**1,427**
Citation 560	1,743	126	**1,869**	1,743	0	0	1,743	126	0	0	126	**1,869**	**3,737**
Citation 650	216	16	**231**	216	0	0	216	16	0	0	16	**231**	**462**
Citation 680	1,109	80	**1,189**	1,109	0	0	1,109	80	0	0	80	**1,189**	**2,378**
Citation 750	228	16	**245**	228	0	0	228	16	0	0	16	**245**	**489**
Fairchild 328	241	17	**258**	241	0	0	241	17	0	0	17	**258**	**516**
Falcon 10	57	4	**61**	57	0	0	57	4	0	0	4	**61**	**122**
Falcon 20	76	5	**82**	76	0	0	76	5	0	0	5	**82**	**163**
Falcon 50	76	5	**82**	76	0	0	76	5	0	0	5	**82**	**163**
FAL900 (Falcon 7X/900)	44	3	**48**	44	0	0	44	3	0	0	3	**48**	**95**
Falcon 2000	349	25	**374**	349	0	0	349	25	0	0	25	**374**	**747**
Gulfstream 2	13	1	**14**	13	0	0	13	1	0	0	1	**14**	**27**
Gulfstream 4	203	15	**217**	203	0	0	203	15	0	0	15	**217**	**435**
Gulfstream 5	63	5	**68**	63	0	0	63	5	0	0	5	**68**	**136**
G150 (Gulfstream G150/EX)	70	5	**75**	70	0	0	70	5	0	0	5	**75**	**149**
Hawker 390	184	13	**197**	184	0	0	184	13	0	0	13	**197**	**394**
Hawker 4000	6	0	**7**	6	0	0	6	0	0	0	0	**7**	**14**

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LEAR25	114	8	**122**	114	0	0	114	8	0	0	8	**122**	**245**
LEAR35 (Hawker 800/900)	2,250	162	**2,412**	2,250	0	0	2,250	162	0	0	162	**2,412**	**4,824**
Sabre 60	38	3	**41**	38	0	0	38	3	0	0	3	**41**	**82**
Total Jet Operations	**10,813**	**789**	**11,602**	**10,813**	**0**	**0**	**10,813**	**789**	**0**	**0**	**789**	**11,602**	**23,204**
2011 Total Operations	**20,996**	**2,824**	**23,820**	**20,996**	**0**	**0**	**20,996**	**2,824**	**0**	**0**	**2,824**	**23,820**	**47,641**

2014

	Arrivals			Departures									
				Day Ops				Night Ops					
INM Type	**Day Ops**	**Night Ops**	**Total Arrivals**	**SL1**	**SL2**	**SL3**	**Total**	**SL1**	**SL2**	**SL3**	**Total**	**Total Departures**	**Total Operations**
Single Engine Piston Operations													
M20L (Aerostar 200)	735	32	**768**	735	0	0	735	32	0	0	32	**768**	**1,535**
Beech Bonanza	517	23	**539**	517	0	0	517	23	0	0	23	**539**	**1,079**
Beech 33 Debonair	119	5	**124**	119	0	0	119	5	0	0	5	**124**	**249**
Beech Mentor	20	1	**21**	20	0	0	20	1	0	0	1	**21**	**41**
Buccaneer	20	1	**21**	20	0	0	20	1	0	0	1	**21**	**41**
Cessna 172	417	18	**436**	417	0	0	417	18	0	0	18	**436**	**871**
Cessna 177	20	1	**21**	20	0	0	20	1	0	0	1	**21**	**41**
Cessna 182	457	20	**477**	457	0	0	457	20	0	0	20	**477**	**954**
Cessna 206	119	5	**124**	119	0	0	119	5	0	0	5	**124**	**249**
CNA210 (Centurion)	278	12	**290**	278	0	0	278	12	0	0	12	**290**	**581**
SR22	616	27	**643**	616	0	0	616	27	0	0	27	**643**	**1,286**
PA32	1,967	87	**2,054**	1,967	0	0	1,967	87	0	0	87	**2,054**	**4,108**
Total Single Operations	**5,286**	**234**	**5,519**	**5,286**	**0**	**0**	**5,286**	**234**	**0**	**0**	**234**	**5,519**	**11,039**
Multi-Engine Piston Operations													
Aerostar 600	575	293	**869**	575	0	0	575	293	0	0	293	**869**	**1,737**
Beechcraft Baron 55	8	4	**12**	8	0	0	8	4	0	0	4	**12**	**24**

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Beechcraft Baron 58	130	66	**196**	130	0	0	130	66	0	0	66	**196**	**391**
Cessna 310	41	21	**61**	41	0	0	41	21	0	0	21	**61**	**122**
Cessna 340	57	29	**86**	57	0	0	57	29	0	0	29	**86**	**171**
CNA402 (Cessna 400/402)	73	37	**110**	73	0	0	73	37	0	0	37	**110**	**220**
Cessna 414	105	54	**159**	105	0	0	105	54	0	0	54	**159**	**318**
Cessna 421	97	50	**147**	97	0	0	97	50	0	0	50	**147**	**294**
Cessna 425	32	17	**49**	32	0	0	32	17	0	0	17	**49**	**98**
DA42 (Diamond Star DA-40/42)	49	25	**73**	49	0	0	49	25	0	0	25	**73**	**147**
Total Multi Operations	**1,167**	**595**	**1,762**	**1,167**	**0**	**0**	**1,167**	**595**	**0**	**0**	**595**	**1,762**	**3,523**
					Turbo Prop Operations								
Beech 1900	26	8	**35**	26	0	0	26	8	0	0	8	**35**	**69**
Beech Airliner 95	5	2	**7**	5	0	0	5	2	0	0	2	**7**	**14**
Beech Airliner 99	5	2	**7**	5	0	0	5	2	0	0	2	**7**	**14**
Bombardier Challenger 300	397	127	**524**	397	0	0	397	127	0	0	127	**524**	**1,049**
Cessna 441	8	4	**12**	8	0	0	8	4	0	0	4	**12**	**24**
Cessna Grand Caravan	1,714	549	**2,264**	1,714	0	0	1,714	549	0	0	549	**2,264**	**4,527**
AC50 (Commander 50)	5	2	**7**	5	0	0	5	2	0	0	2	**7**	**14**
AC95 (Commander 90/95/1000)	73	23	**97**	73	0	0	73	23	0	0	23	**97**	**193**
RWCM12 (Commander 112)	5	2	**7**	5	0	0	5	2	0	0	2	**7**	**14**
DHC8 (De Havilland Dash-8 Q100/200)	31	10	**41**	31	0	0	31	10	0	0	10	**41**	**83**
DHC830 (De Havilland Dash-8 Q300/400)	26	8	**35**	26	0	0	26	8	0	0	8	**35**	**69**
De Havilland DHC-6	5	2	**7**	5	0	0	5	2	0	0	2	**7**	**14**
PC12 (Eagle)	157	50	**207**	157	0	0	157	50	0	0	50	**207**	**414**
Embraer Bandeirante	5	2	**7**	5	0	0	5	2	0	0	2	**7**	**14**
Embraer Brasilia	5	2	**7**	5	0	0	5	2	0	0	2	**7**	**14**
King Air 90	120	39	**159**	120	0	0	120	39	0	0	39	**159**	**317**
King Air 100	26	8	**35**	26	0	0	26	8	0	0	8	**35**	**69**
Jetstream 41	6	0	**7**	6	0	0	6	0	0	0	0	**7**	**14**
Mitsubishi MU 2B	21	7	**28**	21	0	0	21	7	0	0	7	**28**	**55**

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Mitsubishi MU 30	5	2	**7**	5	0	0	5	2	0	0	2	**7**	**14**
P-180 Avanti	214	69	**283**	214	0	0	214	69	0	0	69	**283**	**566**
Short 330	10	3	**14**	10	0	0	10	3	0	0	3	**14**	**28**
Short 360	6	0	**7**	6	0	0	6	0	0	0	0	**7**	**14**
Super King Air 200	298	95	**393**	298	0	0	298	95	0	0	95	**393**	**787**
BEC300 (Super King Air 300/350)	460	147	**607**	460	0	0	460	147	0	0	147	**607**	**1,215**
Swearingen Merlin	146	47	**193**	146	0	0	146	47	0	0	47	**193**	**386**
TBM700 (TBM700/800	68	22	**90**	68	0	0	68	22	0	0	22	**90**	**179**
Total Turbo Prop Operations	**3,852**	**1,233**	**5,085**	**3,852**	**0**	**0**	**3,852**	**1,233**	**0**	**0**	**1,233**	**5,085**	**10,169**
					Jet Operations								
1124 Westwind	64	5	**69**	64	0	0	64	5	0	0	5	**69**	**138**
1125 Astra	13	1	**14**	13	0	0	13	1	0	0	1	**14**	**28**
G200	122	9	**131**	122	0	0	122	9	0	0	9	**131**	**262**
Beechjet 400	688	50	**738**	688	0	0	688	50	0	0	50	**738**	**1,476**
Bombardier 600	39	3	**41**	39	0	0	39	3	0	0	3	**41**	**83**
Canadair Challenger 600	734	53	**786**	734	0	0	734	53	0	0	53	**786**	**1,573**
Citation 500	6	0	**7**	6	0	0	6	0	0	0	0	**7**	**14**
Citation 501	97	7	**103**	97	0	0	97	7	0	0	7	**103**	**207**
Citation 510	129	9	**138**	129	0	0	129	9	0	0	9	**138**	**276**
C525C (Citation 525)	1,221	99	**1,320**	1,221	0	0	1,221	99	0	0	99	**1,320**	**2,639**
CNA550 (Citation 550/Embraer 500/505)	676	49	**724**	676	0	0	676	49	0	0	49	**724**	**1,449**
Citation 560	1,769	127	**1,897**	1,769	0	0	1,769	127	0	0	127	**1,897**	**3,794**
Citation 650	219	16	**235**	219	0	0	219	16	0	0	16	**235**	**469**
Citation 680	1,126	81	**1,207**	1,126	0	0	1,126	81	0	0	81	**1,207**	**2,414**
Citation 750	232	17	**248**	232	0	0	232	17	0	0	17	**248**	**497**
Fairchild 328	245	18	**262**	245	0	0	245	18	0	0	18	**262**	**524**
Falcon 10	58	4	**62**	58	0	0	58	4	0	0	4	**62**	**124**
Falcon 20	77	6	**83**	77	0	0	77	6	0	0	6	**83**	**166**
Falcon 50	77	6	**83**	77	0	0	77	6	0	0	6	**83**	**166**

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FAL900 (Falcon 7X/900)	45	3	**48**	45	0	0	45	3	0	0	3	**48**	**97**
Falcon 2000	354	25	**379**	354	0	0	354	25	0	0	25	**379**	**759**
Gulfstream 2	13	1	**14**	13	0	0	13	1	0	0	1	**14**	**28**
Gulfstream 4	206	15	**221**	206	0	0	206	15	0	0	15	**221**	**441**
Gulfstream 5	64	5	**69**	64	0	0	64	5	0	0	5	**69**	**138**
G150 (Gulfstream G150/EX)	71	5	**76**	71	0	0	71	5	0	0	5	**76**	**152**
Hawker 390	187	13	**200**	187	0	0	187	13	0	0	13	**200**	**400**
Hawker 4000	6	0	**7**	6	0	0	6	0	0	0	0	**7**	**14**
LEAR25	116	8	**124**	116	0	0	116	8	0	0	8	**124**	**249**
LEAR35 (Hawker 800/900)	2,284	165	**2,449**	2,284	0	0	2,284	165	0	0	165	**2,449**	**4,897**
Sabre 60	39	3	**41**	39	0	0	39	3	0	0	3	**41**	**83**
Total Jet Operations	**10,975**	**801**	**11,777**	**10,975**	**0**	**0**	**10,975**	**801**	**0**	**0**	**801**	**11,777**	**23,554**
2014 Total Operations	**21,280**	**2,863**	**24,142**	**21,280**	**0**	**0**	**21,280**	**2,863**	**0**	**0**	**2,863**	**24,142**	**48,285**

2019

	Arrivals			Departures									
				Day Ops				Night Ops					
INM Type	**Day Ops**	**Night Ops**	**Total Arrivals**	**SL1**	**SL2**	**SL3**	**Total**	**SL1**	**SL2**	**SL3**	**Total**	**Total Departures**	**Total Operations**
				Single Engine Piston Operations									
M20L (Aerostar 200)	748	33	**781**	748	0	0	748	33	0	0	33	**781**	**1,562**
Beech Bonanza	526	23	**549**	526	0	0	526	23	0	0	23	**549**	**1,098**
Beech 33 Debonair	121	5	**127**	121	0	0	121	5	0	0	5	**127**	**253**
Beech Mentor	20	1	**21**	20	0	0	20	1	0	0	1	**21**	**42**
Buccaneer	20	1	**21**	20	0	0	20	1	0	0	1	**21**	**42**
Cessna 172	425	19	**443**	425	0	0	425	19	0	0	19	**443**	**887**
Cessna 177	20	1	**21**	20	0	0	20	1	0	0	1	**21**	**42**
Cessna 182	465	21	**485**	465	0	0	465	21	0	0	21	**485**	**971**

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Cessna 206	121	5	**127**	121	0	0	121	5	0	0	5	**127**	**253**
CNA210 (Centurion)	283	13	**296**	283	0	0	283	13	0	0	13	**296**	**591**
SR22	627	28	**654**	627	0	0	627	28	0	0	28	**654**	**1,309**
PA32	2,001	88	**2,090**	2,001	0	0	2,001	88	0	0	88	**2,090**	**4,179**
Total Single Operations	**5,377**	**238**	**5,615**	**5,377**	**0**	**0**	**5,377**	**238**	**0**	**0**	**238**	**5,615**	**11,229**
Multi-Engine Piston Operations													
Aerostar 600	579	295	**874**	579	0	0	579	295	0	0	295	**874**	**1,749**
Beechcraft Baron 55	8	4	**12**	8	0	0	8	4	0	0	4	**12**	**25**
Beechcraft Baron 58	130	67	**197**	130	0	0	130	67	0	0	67	**197**	**394**
Cessna 310	41	21	**62**	41	0	0	41	21	0	0	21	**62**	**123**
Cessna 340	57	29	**86**	57	0	0	57	29	0	0	29	**86**	**172**
CNA402 (Cessna 400/402)	73	37	**111**	73	0	0	73	37	0	0	37	**111**	**222**
Cessna 414	106	54	**160**	106	0	0	106	54	0	0	54	**160**	**320**
Cessna 421	98	50	**148**	98	0	0	98	50	0	0	50	**148**	**296**
Cessna 425	33	17	**49**	33	0	0	33	17	0	0	17	**49**	**99**
DA42 (Diamond Star DA-40/42)	49	25	**74**	49	0	0	49	25	0	0	25	**74**	**148**
Total Multi Operations	**1,174**	**599**	**1,774**	**1,174**	**0**	**0**	**1,174**	**599**	**0**	**0**	**599**	**1,774**	**3,547**
Turbo Prop Operations													
Beech 1900	27	9	**35**	27	0	0	27	9	0	0	9	**35**	**71**
Beech Airliner 95	5	2	**7**	5	0	0	5	2	0	0	2	**7**	**14**
Beech Airliner 99	5	2	**7**	5	0	0	5	2	0	0	2	**7**	**14**
Bombardier Challenger 300	408	131	**539**	408	0	0	408	131	0	0	131	**539**	**1,079**
Cessna 441	8	4	**12**	8	0	0	8	4	0	0	4	**12**	**25**
Cessna Grand Caravan	1,763	565	**2,328**	1,763	0	0	1,763	565	0	0	565	**2,328**	**4,656**
AC50 (Commander 50)	5	2	**7**	5	0	0	5	2	0	0	2	**7**	**14**
AC95 (Commander 90/95/1000)	75	24	**99**	75	0	0	75	24	0	0	24	**99**	**199**
RWCM12 (Commander 112)	5	2	**7**	5	0	0	5	2	0	0	2	**7**	**14**
DHC8 (De Havilland Dash-8 Q100/200)	32	10	**43**	32	0	0	32	10	0	0	10	**43**	**85**
DHC830 (De Havilland Dash-8 Q300/400)	27	9	**35**	27	0	0	27	9	0	0	9	**35**	**71**

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De Havilland DHC-6	5	2	**7**	5	0	0	5	2	0	0	2	**7**	**14**
PC12 (Eagle)	161	52	**213**	161	0	0	161	52	0	0	52	**213**	**426**
Embraer Bandeirante	5	2	**7**	5	0	0	5	2	0	0	2	**7**	**14**
Embraer Brasilia	5	2	**7**	5	0	0	5	2	0	0	2	**7**	**14**
King Air 90	124	40	**163**	124	0	0	124	40	0	0	40	**163**	**326**
King Air 100	27	9	**35**	27	0	0	27	9	0	0	9	**35**	**71**
Jetstream 41	7	0	**7**	7	0	0	7	0	0	0	0	**7**	**14**
Mitsubishi MU 2B	21	7	**28**	21	0	0	21	7	0	0	7	**28**	**57**
Mitsubishi MU 30	5	2	**7**	5	0	0	5	2	0	0	2	**7**	**14**
P-180 Avanti	220	71	**291**	220	0	0	220	71	0	0	71	**291**	**582**
Short 330	11	3	**14**	11	0	0	11	3	0	0	3	**14**	**28**
Short 360	7	0	**7**	7	0	0	7	0	0	0	0	**7**	**14**
Super King Air 200	306	98	**405**	306	0	0	306	98	0	0	98	**405**	**809**
BEC300 (Super King Air 300/350)	473	152	**625**	473	0	0	473	152	0	0	152	**625**	**1,249**
Swearingen Merlin	150	48	**199**	150	0	0	150	48	0	0	48	**199**	**397**
TBM700 (TBM700/800	70	22	**92**	70	0	0	70	22	0	0	22	**92**	**185**
Total Turbo Prop Operations	**3,961**	**1,268**	**5,229**	**3,961**	**0**	**0**	**3,961**	**1,268**	**0**	**0**	**1,268**	**5,229**	**10,458**
					Jet Operations								
1124 Westwind	66	5	**71**	66	0	0	66	5	0	0	5	**71**	**141**
1125 Astra	13	1	**14**	13	0	0	13	1	0	0	1	**14**	**28**
G200	125	9	**134**	125	0	0	125	9	0	0	9	**134**	**269**
Beechjet 400	706	51	**757**	706	0	0	706	51	0	0	51	**757**	**1,513**
Bombardier 600	40	3	**42**	40	0	0	40	3	0	0	3	**42**	**85**
Canadair Challenger 600	752	54	**806**	752	0	0	752	54	0	0	54	**806**	**1,612**
Citation 500	7	0	**7**	7	0	0	7	0	0	0	0	**7**	**14**
Citation 501	99	7	**106**	99	0	0	99	7	0	0	7	**106**	**212**
Citation 510	132	10	**141**	132	0	0	132	10	0	0	10	**141**	**283**
C525C (Citation 525)	1,251	101	**1,352**	1,251	0	0	1,251	101	0	0	101	**1,352**	**2,704**
CNA550 (Citation 550/Embraer 500/505)	693	50	**742**	693	0	0	693	50	0	0	50	**742**	**1,485**

Part 150 Noise Study Activity Forecast 2014-2019 // Akron-Canton Regional Airport

Citation 560	1,814	131	**1,945**	1,814	0	0	1,814	131	0	0	131	**1,945**	**3,889**
Citation 650	224	16	**240**	224	0	0	224	16	0	0	16	**240**	**481**
Citation 680	1,154	83	**1,237**	1,154	0	0	1,154	83	0	0	83	**1,237**	**2,475**
Citation 750	237	17	**255**	237	0	0	237	17	0	0	17	**255**	**509**
Fairchild 328	251	18	**269**	251	0	0	251	18	0	0	18	**269**	**537**
Falcon 10	59	4	**64**	59	0	0	59	4	0	0	4	**64**	**127**
Falcon 50	79	6	**85**	79	0	0	79	6	0	0	6	**85**	**170**
FAL900 (Falcon 7X/900)	46	3	**49**	46	0	0	46	3	0	0	3	**49**	**99**
Falcon 2000	363	26	**389**	363	0	0	363	26	0	0	26	**389**	**778**
Gulfstream 2	13	1	**14**	13	0	0	13	1	0	0	1	**14**	**28**
Gulfstream 4	211	15	**226**	211	0	0	211	15	0	0	15	**226**	**453**
Gulfstream 5	66	5	**71**	66	0	0	66	5	0	0	5	**71**	**141**
G150 (Gulfstream G150/EX)	73	5	**78**	73	0	0	73	5	0	0	5	**78**	**156**
Hawker 390	191	14	**205**	191	0	0	191	14	0	0	14	**205**	**410**
Hawker 4000	7	0	**7**	7	0	0	7	0	0	0	0	**7**	**14**
LEAR35 (Hawker 800/900)	2,579	186	**2,765**	2,579	0	0	2,579	186	0	0	186	**2,765**	**5,530**
Total Jet Operations	**11,251**	**821**	**12,072**	**11,251**	**0**	**0**	**11,251**	**821**	**0**	**0**	**821**	**12,072**	**24,144**
2019 Total Operations	**21,763**	**2,926**	**24,689**	**21,763**	**0**	**0**	**21,763**	**2,926**	**0**	**0**	**2,926**	**24,689**	**49,378**

APPENDIX D FAA APPROVAL OF PART 150 FORECASTS

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APPENDIX E CORRESPONDENCE WITH THE FAA REGARDING INM SUBSTITUTE

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May 8, 2013

Ms. Katherine S. Delaney
Community Planner
Federal Aviation Administration
Detroit Airports District Office
11677 B South Wayne Road, Room 107
Romulus, MI 48174

Subject: INM Aircraft Type Substitution Request
Reference: CAK Part 150 Noise Exposure Map Update, HMMH Project 305231

Dear Ms. Delaney:

hmmh

As you are aware, HMMH, in association with R.W. Armstrong (RWA), is preparing a 14 C.F.R. Part 150 Update for Akron-Canton Airport (CAK). The study will address aircraft noise and land-use compatibility projections for 2014 and 2019, based on Day-Night Average Sound Level contours developed using the most current release of the Integrated Noise Model (INM); i.e., Version 7.0c. This letter presents a request, on behalf of CAK, for FAA approval of a modeling substitute for the Eurocopter UH-72 "Lakota," which is not addressed in the INM 7.0c database.

Background

The Ohio Army National Guard has four UH-72s based at the "Army Aviation Support Facility No. 1" at CAK. The UH-72 is an unarmed militarized version of the Eurocopter EC145. The INM 7.0c database does not include either the EC145 or the UH-72, nor does the model identify a preapproved modeling substitute for either aircraft type. Therefore, we require FAA approval of a "non-standard" modeling substitute.

Proposed Substitution

Consistent with established practice, we offer for FAA consideration the INM 7.0c Bell B222 aircraft type as a modeling substitute for the UH-72. Our proposal is based on comparison of B222 and UH-72 specifications, and on recent FAA approvals for other Part 150 studies.

Comparison of Specifications

The following table compares the aircraft specifications of the UH-72 version based at CAK to the proposed B222 INM 7.0c substitute. It also presents specifications for the EC145 (the civilian version of the UH-72) for reasons discussed under "Recent Comparable FAA Approvals."

Manufacturer	Type Designation	Maximum Takeoff Weight (pounds)	Number Engines and Type	Shaft Horsepower per Engine	Fast Cruise Speed (knots)
American Eurocopter	UH-72	7,903	2 Turbomeca Arriel 1E2	738	133
American Eurocopter	EC145	7,903	2 Turbomeca Arriel 1E2	738	133
Bell	B222	7,850	2 Lycoming LTS-101-650C-3	618	147

Sources: "UH-72A Lakota Specifications." *American Eurocopter*. Web. 29 Apr 2013. <http://www.eurocopterusa.com/products/UH-72A-specifications.asp>.
"EC145 specifications." *American Eurocopter*. Web. 29 Apr 2013. <http://www.eurocopterusa.com/products/EC145-specs.asp>.
"Bell 222." *Wikipedia*. Wikimedia Foundation, Inc., 23 Mar 2013. Web. 29 Apr 2013. <http://en.wikipedia.org/wiki/Bell_222>.

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Recent Comparable FAA Approvals

The preceding table includes the specifications for the EC145 (the civilian version of the UH-72), because the FAA provided HMMH with guidance to use the B222 as a modeling substitute for that aircraft in the following recent Part 150 noise studies:

- Van Nuys (CA) Airport (VNY) Part 150 Update with INM 7.0b, HMMH Project No. 304380, FAA approval issued March 14, 2011.
- Martin County (FL) Airport / Witham Field (SUA) Part 150 Update with INM 7.0b, HMMH Project No. 303880, FAA approval issued June 11, 2010.

We can provide copies of the above documents upon request.

Request

Based on the preceding information, we request FAA approval to use the B222 as the modeling substitute for the UH-72 in the CAK Part 150 Update, or designation of an alternate substitute, if the FAA believes another aircraft type in the INM 7.0c database would be a better surrogate.

In accordance with FAA policy, we understand that FAA's Airport Planning and Environmental Division (APP-400) and Office of Environment and Energy Noise Division (AEE-100) will review this request. We would be pleased to respond to any questions that you or staff in either of those headquarters groups may have regarding this request.

Thank you for your assistance on this matter.

Sincerely yours,
HARRIS MILLER MILLER & HANSON INC.

Justin Divens

Justin Divens
Consultant

c: Mr. McQueen (CAK)
Mr. Clarke (RWA)
Mr. Baldwin (HMMH)

U.S. Department of Transportation
Federal Aviation Administration

Office of Environment and Energy

800 Independence Ave., S.W.
Washington, D.C. 20591

Date: June 11, 2013

Lindsay Butler-Guttilla, MPA
Regional Environmental Specialist
FAA-Great Lakes Region

Dear Ms. Guttilla:

The Office of Environment and Energy (AEE) has received your email dated June 3rd, 2013, requesting review of the proposed substitution for modeling the UH-72 helicopter. The request addresses aircraft noise and land-use compatibility projections for 2014 and 2019 in preparing Part 150 Update for Akron-Canton Airport (CAK). The Integrated Noise Model (INM) Version 7.0c is used in this study.

AEE does not approve the proposed use of the Bell B222 helicopter as substitution in modeling noise of the UH-72 helicopter. Instead, AEE recommends that the Bell B429 helicopter be used. The B429 helicopter data was added to the INM version 7.0c at the end of 2011. Like the UH-72, the B429 has four rotor blades as well. This recommendation is also consistent with the helicopter substitution list in the INM Version 7.0d that was released on May 31, 2013.

Please understand that this approval is limited to the Part 150 study at CAK. Any additional projects or non-standard aircraft input will require separate approval.

Sincerely,

P.P. Rebecca Cointin, Manager
AEE/Noise Division

cc: Jim Byers

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