FLAGSTAFF PULLIAM AIRPORT

14 CFR PART 150 NOISE COMPATIBILITY STUDY

NOISE EXPOSURE MAPS

FLAGSTAFF PULLIAM AIRPORT

F.A.R. Part 150
Noise Compatibility Study

NOISE EXPOSURE MAPS

Prepared For
The City of Flagstaff

By
Coffman Associates, Inc.

May 2004

The preparation of this document was financed in part through a planning grant from the Federal Aviation Administration (FAA) as approved under the Airport and Airway Improvement Act of 1982, as amended. The contents of this report do not necessarily reflect the official views or policy of the FAA. Acceptance of this report by the FAA does not in any way constitute a commitment on the part of the United States to participate in any development depicted therein, nor does it indicate that the proposed development is environmentally acceptable in accordance with applicable public laws.

FLAGSTAFF
PULLIAM AIRPORT

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FLAGSTAFF
PULLIAM AIRPORT

NOISE EXPOSURE MAPS

NOISE EXPOSURE MAPS

This document is the Noise Exposure Map document prepared for Flagstaff Pulliam Airport, which is owned and operated by the City of Flagstaff.

The Noise Exposure Maps documentation for the Airport presents current aircraft noise impacts and anticipated impacts in five years. The documentation contains sufficient information so that reviewers unfamiliar with local conditions and the local public unfamiliar with the technical aspects of aircraft noise can understand the findings.

This Noise Exposure Maps document includes the first four chapters of the complete Title 14, Code of Federal Regulations (CFR), Part 150 Noise Compatibility Study. Chapter One, Inventory, presents an overview of the airport, airspace, aviation facilities, existing land uses, and local land use policies and regulations.

Chapter Two, Aviation Forecasts, examines the existing and potential demand for aviation activity at the airport.

Chapter Three, Aviation Noise, explains the methodology used to develop aircraft noise contours. It also describes the key input assumptions used for noise modeling.

Chapter Four, Noise Impacts, presents existing and forecast aircraft noise exposure based on the assumption of no additional noise abatement efforts. This provides baseline data for evaluating potential noise abatement strategies in the second part of the study. It also analyzes the impact of the baseline aircraft noise on noise-sensitive land uses and the resident population.

Supplemental information is provided in appendixes and Technical Information Papers. Appendix A lists the members of the Planning Advisory Committee (PAC) that were consulted throughout the planning process. It also includes an explanation of the role of the PAC in the process.

Appendix B, Coordination, Consultation and Public Involvement, summarizes the planning process, local coordination, and the public involvement process.

Appendix C contains the INM Assumptions and Output Report. This report provides detailed tables which depict reported aircraft operations, runway use, and day/nighttime operation split by aircraft type.

Five Technical Information Papers are provided for reference and background. These papers include the Glossary of Noise Compatibility Terms, The Measurement and Analysis of Sound, Effects of Noise Exposure, Measuring the Impact of Noise on People, and Noise and Land Use Compatibility Guidelines.

The official Noise Exposure Maps are presented in this section following page viii. For the convenience of FAA reviewers, the FAA's official Noise Exposure Map checklist is presented on pages iii through vii.

14 CFR, PART 150
NOISE EXPOSURE MAP CHECKLIST

AIRPORT NAME: Flagstaff Pulliam Airport
Flagstaff, Arizona

REVIEWER: ________________

	Yes/No/NA	Page No./ Other Reference
I. **IDENTIFICATION AND SUBMISSION OF MAP DOCUMENT:** A. Is this submittal appropriately identified as one of the following, submitted under 14 CFR Part 150: 1. a NEM only? 2. a NEM and NCP? 3. a revision to NEMs which have previously been determined by FAA to be in compliance with Part 150?	 Yes No No	Title Page, p. i
B. Is the airport name and the qualified airport operator identified?	Yes	Title Page, p. i
C. Is there a dated cover letter from the airport operator which indicates the documents are submitted under Part 150 for appropriate FAA determination?	Yes	p. viii
II. **CONSULTATION: [150.21(b), A150.105(a)]** A. Is there a narrative description of the consultation accomplished, including opportunities for public review and comment during map development?	Yes	Appendix B; and supplemental volume, *Supporting Information on Project Coordination and Local Consultation*
B. Identification: 1. Are the consulted parties identified?	Yes	Appendices A and B; and supplemental volume, *Supporting Information on Project Coordination and Local Consultation*
2. Do they include all those required by 150.21(b) and A150.105(a)?	Yes	Appendices A and B; and supplemental volume, *Supporting Information on Project Coordination and Local Consultation*
C. Does the documentation include the airport operator's certification, and evidence to support it, that interested persons have been afforded adequate opportunity to submit their views, data, and comments during map development and in accordance with 150.21(b)?	Yes	p. viii; Appendix B, and supplemental volume, *Supporting Information on Project Coordination and Local Consultation*
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?	Yes	Appendix B, and supplemental volume, *Supporting Information on Project Coordination and Local Consultation*

14 CFR, PART 150
NOISE EXPOSURE MAP CHECKLIST

AIRPORT NAME: Flagstaff Pulliam Airport ***REVIEWER: ________________***
Flagstaff, Arizona

	Yes/No/NA	Page No./ Other Reference
III. **GENERAL REQUIREMENTS: [150.21]** A. Are there two maps, each clearly labeled on the face with year (existing condition year and 5-year)?	Yes	See NEM Maps, Exhibits 1 & 2 after p. viii
B. Map currency: 1. Does the existing condition map year match the year on the airport operator's submittal letter?	No	
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?	No	
3. If the answer to 1 & 2 above is no, has the airport operator verified in writing that data in the documentation are representative of existing condition and 5-year forecast conditions as of the date of submission?	Yes	Current year is labeled 2003, based on actual operations for that year (includes estimate of operation when tower is closed). This is a fair representation of the existing (2004) conditions. Based on the 12 months ending February 2004, total operations were 54,979 (includes estimate of operation when tower is closed); 7.6 percent less than the operations modeled for 2003.
C. **If the NEM and NCP 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?	N/A	
2. If the 5-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?	N/A N/A	
3. If the 5-year NEM does not incorporate program implementation, has the airport operator included an additional NEM for FAA determination after the program is approved which shows program implementation conditions and which is intended to replace the 5-year NEM as the new official 5-year map?	N/A	

14 CFR, PART 150
NOISE EXPOSURE MAP CHECKLIST

AIRPORT NAME: Flagstaff Pulliam Airport ***REVIEWER: ________________***
Flagstaff, Arizona

	Yes/No/NA	Page No./ Other Reference
IV. **MAP SCALE, GRAPHICS, AND DATA REQUIREMENTS: [A150.101, A150.103, A150.105, 150.21(a)]** A. Are the maps sufficient scale to be clear and readable (they must not be less than 1" to 8,000'), and is the scale indicated on the maps?	Yes	See NEM Maps after p. viii
B. Is the quality of the graphics such that required information is clear and readable?	Yes	See NEM Maps after p. viii
C. Depiction of the airport and its environs. 1. Is the following graphically depicted to scale on both the existing conditions and 5-year maps: a. airport boundaries? b. runway configurations with runway end numbers?	 Yes Yes	 See NEM Maps after p. viii See NEM Maps after p. viii
2. Does the depiction of the off-airport data include: a. a land use base map depicting streets and other identifiable geographic features? b. the area within the 65 Ldn (**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 Ldn (or beyond, at local discretion)?	 Yes Yes Yes	 See NEM Maps after p. viii See NEM Maps after p. viii See NEM Maps after p. viii
D. 1. Continuous contours for at least the 65, 70, and 75 Ldn?	Yes	See NEM Maps after p. viii
2. Based on current airport and operational data for the existing condition year NEM, and forecast data for the 5-year NEM?	Yes	See 2008 NEM after p. viii; Chapter Two, p. 2-1, pp. 2-8 - 2-17
E. Flight tracks for the existing condition and 5-year forecast timeframes (these may be on supplemental graphics which must use the same land use base map as the existing condition and 5-year NEM), which are numbered to correspond to accompanying narrative?	Yes	Chapter Three, Exhibits 3E, 3F,and 3G after p. 3-12
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 NEMs)	Yes	Chapter Three, Exhibit 3A after p. 3-4
G. Noncompatible land use identification: 1. Are noncompatible land uses within at least the 65 Ldn depicted on the maps?	 Yes	 See NEM Maps after p. viii
2. Are noise-sensitive public buildings identified?	Yes	See NEM Maps after p. viii

14 CFR, PART 150
NOISE EXPOSURE MAP CHECKLIST

AIRPORT NAME: Flagstaff Pulliam Airport **_REVIEWER: ________________**
Flagstaff, Arizona

	Yes/No/NA	Page No./ Other Reference
3. Are the noncompatible uses and noise-sensitive public buildings readily identifiable and explained on the map legend?	Yes	See NEM Maps after p. viii
4. Are compatible land uses, which would normally be considered noncompatible, explained in the accompanying narrative?	N/A	
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 NEMs are based adequately described in the narrative?	Yes	Chapter Three, pp. 3-7 - 3-13
2. Are the underlying technical data and planning assumptions reasonable?	Yes	Chapter Three, pp. 3-7 - 3-13
B. Calculation of Noise Contours: 1. Is the methodology indicated? a. is it FAA approved?	 Yes Yes	 Chapter Three, p. 3-7 Chapter Three, p. 3-7
b. was the same model used for both maps?	Yes	Chapter Three, p. 3-7
c. has AEE approval been obtained for use of a model other than those which have previous blanket FAA approval?	N/A	
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?	 No	 Chapter Three, pp. 3-9 - 3-11. No calibrations done. Some composite aircraft descriptors used.
b. if so, does this have written approval from AEE?	N/A	All aircraft INM designators used are on AEE's pre-approved list of substitutions.
3. If noise monitoring was used, does the narrative indicate that Part 150 guidelines were followed?	Yes	Our measurement program is discussed in Chapter 3 and can be described as a "survey type" program. Please see FAA AC 150/5020-1, Noise Control and Compatibility Planning for Airports, pp. 12-17. Our results indicate reasonable agreement between measurements and INM predictions. Where the measured values deviated from INM predictions, it was explained by operations differing from average annual conditions

14 CFR, PART 150
NOISE EXPOSURE MAP CHECKLIST

AIRPORT NAME: Flagstaff Pulliam Airport, Flagstaff, Arizona ***REVIEWER:*** ________________

	Yes/No/NA	Page No./ Other Reference
4. For noise contours below 65 Ldn, does the supporting documentation include explanation of local reasons? (Narrative explanation is highly desirable but not required by the Rule.)	Yes	Chapter Three, p. 3-14, Chapter Four, pp. 4-3 - 4-4, T.I.P., Noise and Land Use Compatibility Guidelines
C. Noncompatible Land Use Information: 1. Does the narrative give estimates of the number of people residing in each of the contours (Ldn 65, 70, and 75 at a minimum) for both the existing condition and 5-year maps?	Yes	Chapter Four, pp. 4-7 - 4-10
2. Does the documentation indicate whether Table 1 of Part 150 was used by the airport operator?		Chapter Four, pp. 4-2 -4-3
a. If a local variation to Table 1 was used;		
(1) does the narrative clearly indicate which adjustments were made and the local reasons for doing so?	N/A	
(2) does the narrative include the airport operators complete substitution for Table 1?	N/A	
3. Does the narrative include information on self-generated or ambient noise where compatible/noncompatible land use identification consider non-airport/aircraft sources?	No	
4. Where normally noncompatible land uses are not depicted as such on the NEMs, does the narrative satisfactorily explain why, with reference to the specific geographic areas?	N/A	
5. Does the narrative describe how forecasts will affect land use compatibility?	Yes	Chapter Four, pp. 4-5 - 4-11
VI. **MAP CERTIFICATIONS: [150.21(b), 150.21(e)]** A. Has the operator certified in writing that interested persons have been afforded adequate opportunity to submit views, data, and comments concerning the correctness and adequacy of the draft maps and forecasts?	Yes	Certification statements on NEM Maps and p. viii
B. Has the operator certified in writing that each map and description of consultation and opportunity for public comment are true and complete?	Yes	Certification statements on NEM Maps and p. viii

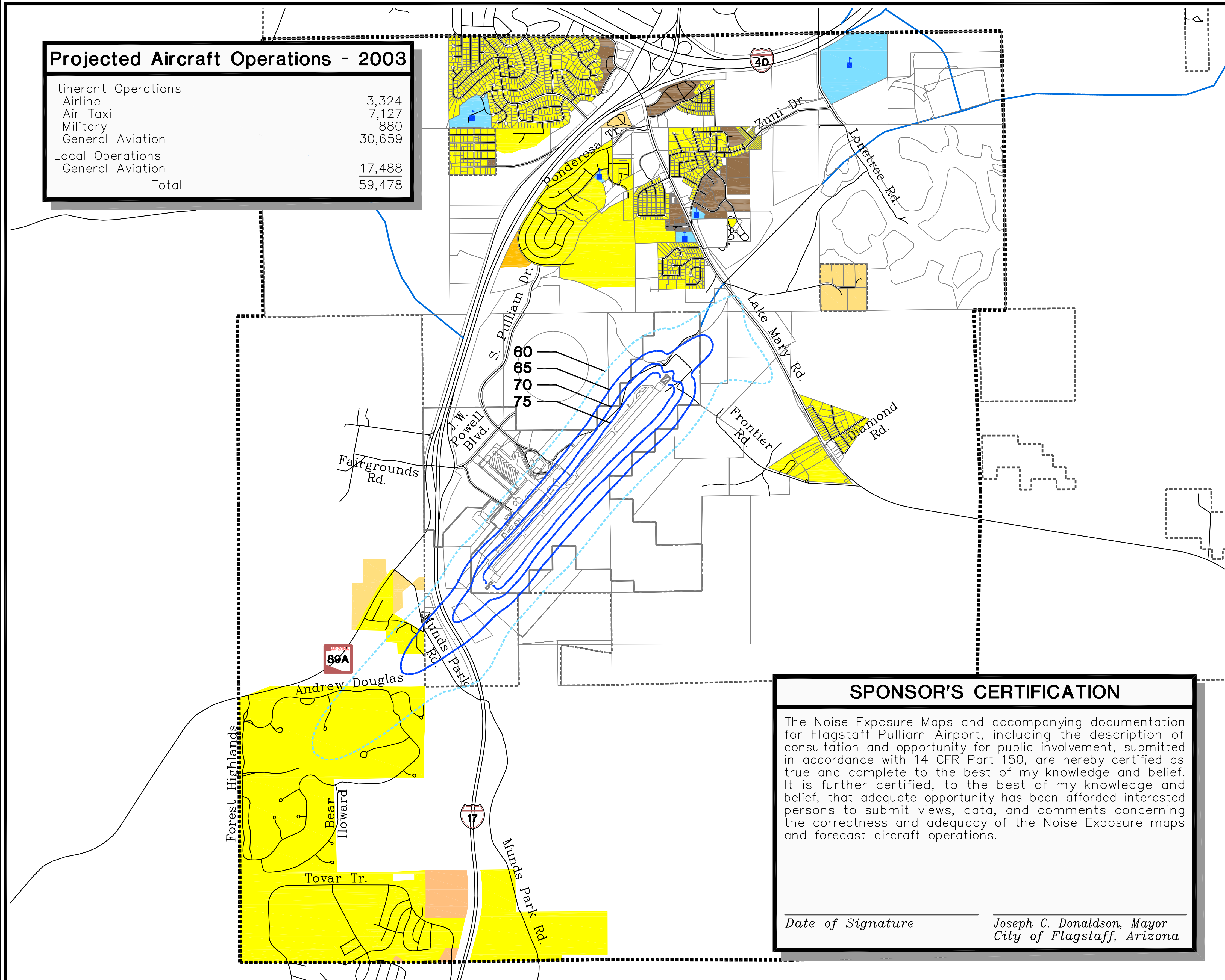
SPONSOR'S CERTIFICATION

The Noise Exposure Maps and accompanying documentation for Flagstaff Pulliam Airport, including the description of consultation and opportunity for public involvement, submitted in accordance with 14 CFR Part 150, and hereby certified as true and complete to the best of my knowledge and belief. It is hereby certified that adequate opportunity has been afforded interested persons to submit views, data, and comments on the Noise Exposure maps and forecasts. It is further certified that the 2003 Noise Exposure Map and supporting data are fair and reasonable representations of existing conditions at the airport.

____
Date of Signature

____
Mayor Joseph C. Donaldson
City of Flagstaff, Arizona

02MP09-1-06/03/04



Projected Aircraft Operations - 2003

Itinerant Operations	
Airline	3,324
Air Taxi	7,127
Military	880
General Aviation	30,659
Local Operations	
General Aviation	17,488
Total	59,478

LEGEND

- Detailed Land Use Study Area
- Municipal Boundary
- Airport Property
- 2003 Noise Exposure Contour, Marginal Effect
- 2003 Noise Exposure Contour, Significant Effect
- Very Low Density Residential (0-0.9 du/ac)
- Low Density Residential (1-5 du/ac)
- Medium Density Residential (6-12 du/ac)
- High Density Residential (12+ du/ac)
- Residential Manufactured Housing
- Noise Sensitive Institutions
- School
- Place of Worship

Source: Flagstaff Geographic Information System, November 2002. Coffman Associates Analysis.

SPONSOR'S CERTIFICATION

The Noise Exposure Maps and accompanying documentation for Flagstaff Pulliam Airport, including the description of consultation and opportunity for public involvement, submitted in accordance with 14 CFR Part 150, are hereby certified as true and complete to the best of my knowledge and belief. It is further certified, to the best of my knowledge and belief, that adequate opportunity has been afforded interested persons to submit views, data, and comments concerning the correctness and adequacy of the Noise Exposure maps and forecast aircraft operations.

Date of Signature

Joseph C. Donaldson, Mayor
City of Flagstaff, Arizona

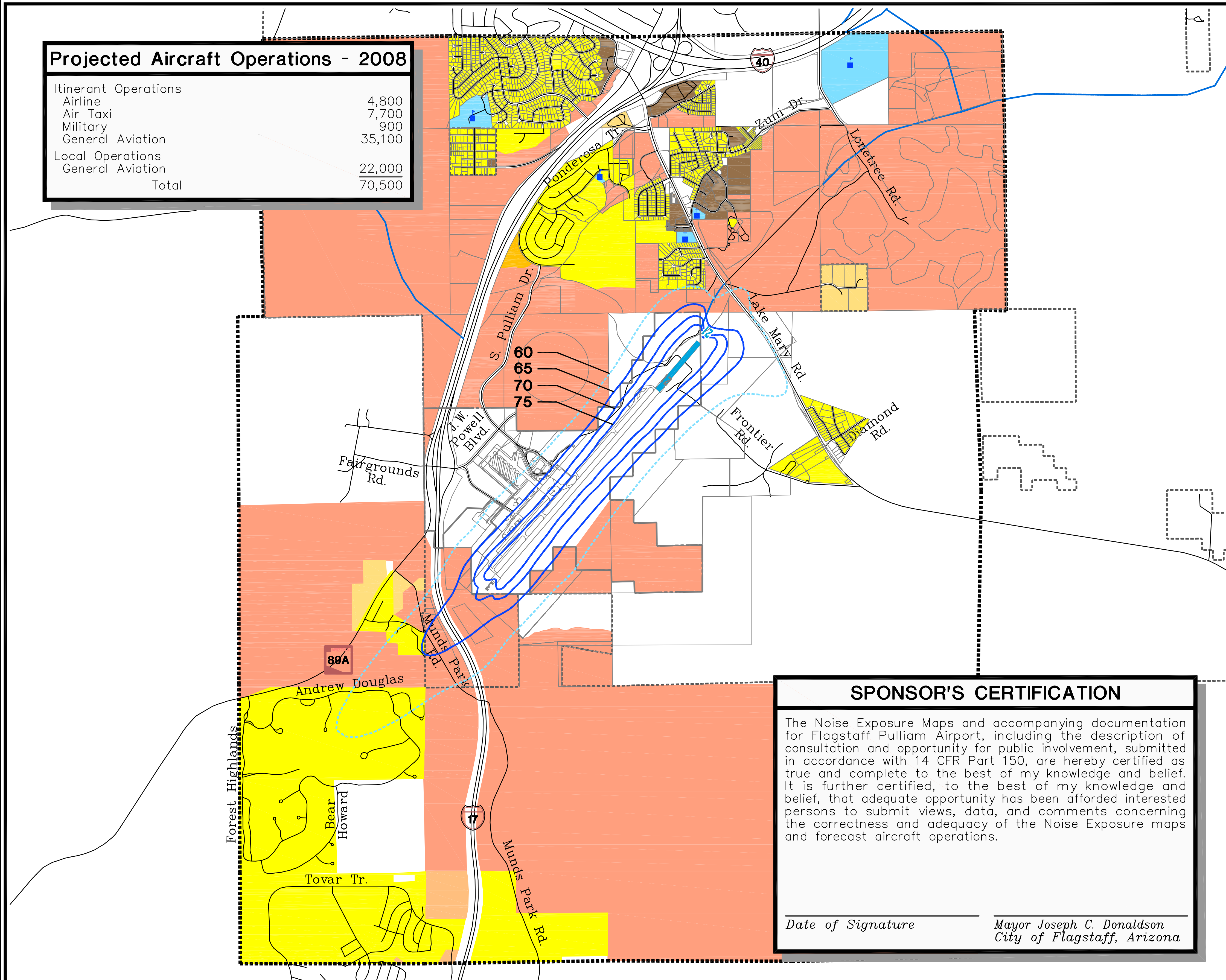
FLAGSTAFF PULLIAM AIRPORT

Exhibit 1
2003 NOISE EXPOSURE MAP

02MP09-2-06/03/04

Projected Aircraft Operations - 2008

Itinerant Operations	
Airline	4,800
Air Taxi	7,700
Military	900
General Aviation	35,100
Local Operations	
General Aviation	22,000
Total	70,500



SPONSOR'S CERTIFICATION

The Noise Exposure Maps and accompanying documentation for Flagstaff Pulliam Airport, including the description of consultation and opportunity for public involvement, submitted in accordance with 14 CFR Part 150, are hereby certified as true and complete to the best of my knowledge and belief. It is further certified, to the best of my knowledge and belief, that adequate opportunity has been afforded interested persons to submit views, data, and comments concerning the correctness and adequacy of the Noise Exposure maps and forecast aircraft operations.

Date of Signature

Mayor Joseph C. Donaldson
City of Flagstaff, Arizona

LEGEND

- Detailed Land Use Study Area
- Municipal Boundary
- Airport Property
- 2008 Noise Exposure Contour, Marginal Effect
- 2008 Noise Exposure Contour, Significant Effect
- Runway Extension Per 2003/04 Airport Master Plan Update
- Very Low Density Residential (0-0.9 du/ac)
- Low Density Residential (1-5 du/ac)
- Medium Density Residential (6-12 du/ac)
- High Density Residential (12+ du/ac)
- Residential Manufactured Housing
- Noise Sensitive Institutions
- Potential Noise-Sensitive Growth Risk Areas
- School
- Place of Worship

Source: Flagstaff Geographic Information System, November 2002. Coffman Associates Analysis.

NORTH

0 3000
SCALE IN FEET

FLAGSTAFF PULLIAM AIRPORT

Exhibit 2
2008 NOISE EXPOSURE MAP

Chapter One

INVENTORY

Chapter One

INVENTORY

This chapter presents an overview of Flagstaff Pulliam Airport (FLG) and its relationship to the surrounding community. The background information provided in this chapter will be used in later stages of the noise compatibility planning process and contains the following.

A description of the setting, local climate, and history of the airport.

- A description of airspace and air traffic control.
- A description of key airport facilities and navigational aids.
- A description of existing land uses within the study area.
- A discussion of the local land use planning and regulatory framework within the study area.

This noise study involves the preparation of two official documents: the Noise Exposure Maps (NEM) and the Noise Compatibility Program (NCP). The NEM document contains a baseline analysis which shows existing and potential future noise conditions at the airport. The document will include Chapters One, Two, Three, and Four of this study. The NCP document, which will include Chapters Five, Six, and Seven, presents a plan for effectively dealing with adverse noise impacts based on a three-step process. First, it addresses alternatives to abate or reduce aircraft noise. Second, it addresses noise mitigation techniques to reduce the impact of noise on sensitive land uses in the area. Third, it addresses land use planning to encourage future development that is compatible with the airport.

A glossary of airport terms and acronyms is found in the section titled "Technical Information Papers" at the back of this document.

JURISDICTIONS AND RESPONSIBILITIES

Reduction of aircraft noise impacts is a complex issue with several parties sharing in the responsibility: the federal government, state and local governments, planning agencies, the airport proprietor, airport users, and local residents. All interests must be considered in the noise compatibility planning process.

FEDERAL

Aviation plays a vital role in interstate commerce. Recognizing this, the federal government has assumed the role of coordinator and regulator of the nation's aviation system. Congress has assigned administrative authority to the Federal Aviation Administration (FAA). Specific responsibilities of the FAA include:

- The regulation of air commerce in order to promote its development, safety, and to fulfill the requirements of national defense.

- The control of the use of navigable airspace and the regulation of civil and military aircraft operations to promote the safety and efficiency of both.

- The development and operation of a common system of air traffic control and navigation for both military and civil aircraft.

The FAA also administers a program of federal grants-in-aid for the development of airport master plans, the acquisition of land, and for planning, design, and construction of eligible airport improvements for public use airports. In addition, Congress passed legislation and the FAA established regulations governing the preparation of noise compatibility programs. Laws and regulations were also implemented that required the conversion of the commercial aircraft fleet to quieter aircraft.

Part 150
Noise Compatibility Studies

The *Aviation Safety and Noise Abatement Act of 1979* (ASNA, P.L. 96-193), signed into law on February 18, 1980, was enacted, ". . . to provide and carry out noise compatibility programs, to provide assistance to assure continued safety in aviation, and for other purposes." The FAA was vested with the authority to implement and administer the Act.

Title 14, Code of Federal Regulations (CFR), Part 150, the administrative rule promulgated to implement the Act, sets requirements for airport operators who choose to undertake an airport noise compatibility study with federal funding assistance. As previously discussed, Part 150 provides for the development of two final documents: the Noise Exposure Maps and the Noise Compatibility Program.

Noise Exposure Maps. The Noise Exposure Maps (NEM) document describes existing and future noise conditions at the airport. It can be thought of as a baseline analysis defining the scope of the noise situation at the airport and including maps of noise exposure for the current year, five-year, and long-range forecasts. The noise contours are depicted on various land use maps to reveal areas of non-compatible land use. Included in the document is detailed supporting information which explains the methods used to develop the maps.

Part 150 requires the use of standard methodologies and metrics for analyzing and describing noise. It also establishes guidelines for the identification of land uses which are incompatible with different noise levels. Airport proprietors are required to update noise exposure maps when changes in the operation of the airport would create any new, substantial non-compatible use. This is defined as an increase in the yearly day-night average sound level (DNL) of 1.5 decibels over noncompatible land uses.

A limited degree of legal protection can be afforded to the airport proprietor through preparation and submission of noise exposure maps. Section 107(a) of the ASNA Act [49 U.S.C. 2107(a-b)] provides that:

> *No person who acquires property or an interest therein . . . in an area surrounding an airport with respect to which a noise exposure map has been submitted . . . shall be entitled to recover damages with respect to the noise attributable to such airport if such person had actual or constructive knowledge of the existence of such noise exposure map unless . . . such person can show –*
>
> *(i) A significant change in the type or frequency of aircraft operations at the airport; or*
>
> *(ii) A significant change in the airport layout; or*
>
> *(iii) A significant change in the flight patterns; or*
>
> *(iv) A significant increase in nighttime operations occurred after the date of acquisition of such property . . .*

The ASNA Act provides that "constructive knowledge" shall be attributed to any person if a copy of the noise exposure map was provided to him at the time of property acquisition, or if notice of the existence of the noise exposure map was published three times in a newspaper of general circulation in the area. In addition, Part 150 defines "significant increase" as an increase of 1.5 DNL. (See 14 CFR, Part 150, Section 150.21 (d), (f), and (g); and Airport Environmental Handbook, Order 5050.4A, 47e(1)(a).) For purposes of this provision, FAA officials consider the term "area surrounding an airport" to mean an area within the 65 DNL contour.

Acceptance of the noise exposure maps by the FAA is required before it will approve a noise compatibility program for the airport.

Noise Compatibility Program. A Noise Compatibility Program (NCP) includes provisions for the abatement of aircraft noise through aircraft operating procedures, air traffic control procedures, airport regulations, or airport facility modifications. It also includes provisions for land use compatibility planning and may include actions to mitigate the impact of noise on noncompatible land uses. The program must contain provisions for updates and periodic revisions.

Part 150 establishes procedures and criteria for FAA evaluation of noise compatibility programs. Among these, two criteria are of particular importance: the airport proprietor may take no action that imposes an undue burden on interstate or foreign commerce, nor may the proprietor unjustly discriminate between different categories of airport users.

With an approved noise compatibility program, an airport proprietor becomes eligible for funding through the Federal Airport Improvement Program (AIP) to implement the eligible items of the program.

In 1998, the FAA established a policy for Part 150 approval and funding of noise mitigation measures. The policy states that the FAA will not approve measures in Noise Compatibility Programs that propose corrective noise mitigation actions for new, noncompatible development, which is allowed to occur in the vicinity of airports after October 1, 1998, the effective date of the policy. As of the same effective date, AIP funding under the noise set-aside will be determined using criteria consistent with this policy. Specifically, corrective noise mitigation measures for new noncompatible development that occurs after October 1, 1998 will not be eligible for AIP funding under the noise set-aside regardless of previous FAA approvals under Part 150.

This policy increases the incentives for airport operators to discourage the development of new non-compatible land uses around airports, and to assure the most cost-effective use of federal funds spent on noise mitigation measures.

The new policy does not affect funding under the Airport Improvement Program for noise mitigation projects that do not require Part 150 approval, that can be funded with Passenger Facility Charges (PFCs) revenue, or that are included in FAA-approved environmental documents for airport development.

14 CFR Parts 36 And 91 Federal Aircraft Noise Regulations

The FAA has required reduction of aircraft noise at the source through certification, modification of engines, or replacement of aircraft. Part 36 prohibits the further escalation of noise levels of subsonic civil turbojet and transport category aircraft and also requires new airplane types to be markedly quieter than earlier models. Subsequent amendments have extended the noise standards to include small, propeller-driven airplanes and supersonic transport aircraft.

Part 36 has three stages of certification. Stage 3 is the most rigorous and applies to aircraft certificated since November 5, 1975; Stage 2 applies to aircraft certificated between December 1, 1969 and November 5, 1975; and Stage 1 includes all previously certificated aircraft.

Part 91, Subpart I, commonly known as the "Fleet Noise Rule," mandated a compliance schedule under which Stage 1 aircraft were to be retired or refitted with hush kits or quieter engines by January 1, 1988. A very limited number of exemptions have been granted by the U.S. Department of Transportation for foreign aircraft operating into specified international airports.

Pursuant to the Congressional mandate in the *Airport Noise and Capacity Act of 1990* (ANCA), FAA has established amendments to Part 91 by setting December 31, 1999 as the date for discontinuing use of all Stage 2 aircraft exceeding 75,000 pounds. Stage 2 aircraft operating non-revenue flights can operate beyond the December 31, 1999 deadline for the following purposes:

– To sell, lease, or scrap the aircraft;

– To obtain modifications to meet Stage III standards;
– To obtain scheduled heavy maintenance or significant modifications;

– To deliver the aircraft to a lessee or return it to a lessor;

– To park or store the aircraft;

– To prepare the aircraft for any of these events; or

– To operate under an experimental airworthiness certificate.

Neither Part 36 nor Part 91 apply to military aircraft. Nevertheless, many of the advances in quiet engine technology are being used by the military as they upgrade aircraft to improve performance and fuel efficiency.

14 CFR Part 161 Regulation Of Airport Noise And Access Restrictions

Part 161 sets forth requirements for notice and approval of local restrictions on aircraft noise levels and airport access. Part 161, which was developed in response to the ANCA, applies to local airport restrictions that would have the effect of limiting operations of Stage 2 or 3 aircraft. Restrictions regulated under Part 161 include direct limits on maximum noise levels, nighttime curfews, and special fees intended to encourage changes in airport operations to lessen noise.

In order to implement noise or access restrictions on Stage 2 aircraft, the airport operator must provide public notice of the proposal and provide at least a 45-day comment period. This includes notification of FAA and publication of the proposed restriction in the *Federal Register*. An analysis must be prepared describing the proposal, alternatives to the proposal, and the costs and benefits of each.

Noise or access restrictions on Stage 3 aircraft can be implemented only after receiving FAA approval. Before granting approval, the FAA must find that the six conditions specified in the regulation, and listed below, are met.

(1) The restriction is reasonable, non-arbitrary, and nondiscriminatory.

(2) The restriction does not create an undue burden on interstate or foreign commerce.

(3) The proposed restriction maintains safe and efficient use of the navigable airspace.

(4) The proposed restriction does not conflict with any existing federal statute or regulation.

(5) The applicant has provided adequate opportunity for public comment on the proposed restriction.

(6) The proposed restriction does not create an undue burden on the national aviation system.

In its application for FAA review and approval of the restriction, the airport operator must include an environmental assessment of the proposal and a complete analysis addressing the six conditions. Within 30 days of the receipt of the application, the FAA must determine whether the application is complete. After a complete application has been filed, the FAA publishes a notice of the proposal in the *Federal Register*. FAA must approve or disapprove the restriction within 180 days of receipt of the completed application. Very few Part 161 studies have been undertaken since the enactment of ANCA. **Table 1A** summarizes the studies that have been done to date. Currently, only one Part 161 Study, in Naples, Florida, has been deemed complete by FAA. However, FAA has not ruled on whether or not the restriction is a violation of grant assurances Naples signed when accepting federal funds.

Airport operators that implement noise and access restrictions in violation of Part 161 are subject to termination of eligibility for airport grant funds and authority to impose and collect passenger facility charges.

TABLE 1A
Summary of Part 161 Studies

Airport	Year		Cost	Proposal, Status
	Started	Ended		
Aspen-Pitkin County Airport, Aspen, Colorado	N.A.	N.A.	N.A.	The study has not yet been submitted to FAA.
Kahului Airport, Kahului, Maui, Hawaii	1991	1994	$50,000 (est.)	Proposed nighttime prohibition of Stage 2 aircraft pursuant to court stipulation. Cost-benefit and statewide impact analysis found to be deficient by FAA. Airport never submitted a complete Part 161 Study. Suspended consideration of restriction.
Minneapolis-St. Paul International Airport, Minneapolis, Minnesota	1992	1992	N.A.	Proposed nighttime prohibition of Stage 2 aircraft. Cost-benefit analysis was deficient. Never submitted complete Part 161 study. Suspended consideration of restriction and entered into negotiations with carriers for voluntary cooperation.
Pease International Tradeport, Portsmouth, New Hampshire	1995	N.A.	N.A.	Have not yet submitted Part 161 study for FAA review.
San Francisco International Airport, San Francisco, California	1998	1999	$200,000	Proposing extension of nighttime curfew on Stage 2 aircraft over 75,000 pounds. Started study in May 1998. Submitted to FAA in early 1999 and subsequently withdrawn.
San Jose International Airport, San Jose, California	1994	1997	Phase 1 - $400,000 Phase 2 - $5 to $10 million (est.)	Study undertaken as part of a legal settlement agreement. Studied a Stage 2 restriction. Suspended study after Phase 1 report showed costs to airlines at San Jose greater than benefits in San Jose. Never undertook Phase 2, systemwide analysis. Never submitted study for FAA review.
Burbank-Glendale-Pasadena Airport	2000	Ongoing	Phase 1 - $1 million (est.)	Proposed curfew restricting all aircraft operations from 10:00 p.m. to 7 a.m.

TABLE 1A (Continued) Summary of Part 161 Studies				
	Year			
Airport	Started	Ended	Cost	Proposal, Status
Naples Municipal Airport Naples, Florida	2000	2000	Currently over $730,000 Expect an additional cost of $1.5 to $3.0 million in legal fees due to litigation.	Enactment of a total ban on Stage 2 general aviation jet aircraft under 75,000 pounds (the airport is currently restricted to aircraft under 75,000 pounds). Airport began enforcing the restriction on March 1, 2002. FAA has deemed the Part 161 Study complete; however, FAA has not ruled on federal grant assurance violations.
Van Nuys Airport Van Nuys, California	2004	Ongoing	NA	Proposing to prohibit Stage 2 aircraft from the airport and establish a curfew for Stage 3 aircraft.
Los Angeles International Airport, Los Angeles, California	NA	NA	NA	The study has not begun. The purpose of the study will be to prohibit east departures from 12:00 a.m. to 6:30 a.m.

N.A. - Not available.

Sources: Telephone interviews with Federal Aviation Administration officials and staffs of various airports.

Air Traffic Control

The FAA is responsible for the control of navigable airspace and the operation of air traffic control systems at the nation's airports. Airport proprietors have no direct control over airspace management and air traffic control, although they can propose changes in procedures.

The FAA reviews any proposed changes in flight procedures, such as flight tracks or runway use programs proposed for noise abatement, on the basis of safety of flight operations, safe and efficient use of navigable airspace, management and control of the national airspace and traffic control systems, effect on security and national defense, and compliance with applicable laws and regulations. Typically, FAA implements and regulates flight procedures pertaining to noise abatement through the local air traffic control manager.

An Airport Traffic Control Tower (ATCT) is located north of the terminal building at the end of West Liberator Lane.

STATE AND LOCAL

Control of land use in noise-impacted areas around airports is a key tool in limiting the number of citizens exposed to noise. The FAA encourages land use compatibility in the vicinity of airports, and Part 150 has guidelines relating to land use compatibility based on varying levels of noise exposure. Nevertheless, the federal government has no direct legal authority to regulate land use. That responsibility rests exclusively with state and local governments.

State

Although the State of Arizona does not directly implement and administer general purpose land use regulations, it has vested counties, cities, and towns with that power through enabling legislation. *Arizona Revised Statutes* do not require the establishment of planning commissions, agencies, or departments in municipalities; however, where such appointments are made, the municipality is required to prepare and adopt a long-range general plan, and may regulate zoning, subdivision, and land development, consistent with the plan.

The State of Arizona provides for the disclosure of aviation activities to prospective buyers of real estate. In 1997, the state adopted legislation allowing airport sponsors to identify Airport Influence Areas (AIA) around public and commercial use airports. The establishment of an AIA is voluntary and requires a public hearing. The boundary of the AIA must be recorded with the county in which the airport resides.

In addition, the 1999 Arizona State Legislature adopted legislation requiring the state real estate department to prepare and maintain a series of maps depicting the traffic pattern airspace of each public airport in the state. These maps are to be provided to the public on request. The purpose of the maps is similar to the purpose of the AIA maps in that they are intended to provide disclosure of the presence of the airport as well as the potential influence the airport will have on surrounding property.

The AIA for Flagstaff Pulliam Airport is depicted on **Exhibit 1A**. Boundaries of the AIA follow section lines in order to make the map easier to interpret. The AIA boundary is based on areas which receive overflight activity from the airport as well as the airport's 14 CFR Part 77 surface. The issuance of avigation easements is a required prior to the development of land for residential uses within the AIA.

City and County

In the Flagstaff Pulliam Airport study area, land use regulation is controlled by the City of Flagstaff and Coconino County.

The City of Flagstaff operates under a mayor-council form of government. The Flagstaff City Council consists of seven members including the mayor who acts as the Chairman of the City Council. The City Manager is appointed by the

Council and is responsible for the day-to-day operation of the City including keeping the Council informed on important decisions and undertakings.

In Coconino County, the five elected County Supervisors are the overall governing and management body. The County Supervisors are members of the Board of Supervisors which establish administrative policy and direction for the County. The Board has budgetary oversight over all County departments to assure County revenues are expended within established guidelines.

In addition to regulating land use, local governments may also acquire property to mitigate or prevent airport noise impacts or may sponsor sound insulation programs for this purpose.

AIRPORT PROPRIETOR

Flagstaff Pulliam Airport is owned and operated by the City of Flagstaff. The Airport Manager is assisted by a seven member Airport Commission, appointed by the Mayor and City Council, for staggered three year terms of office. The Airport Commission is responsible for reviewing and reporting to Council on the development of the Airpark and on matters affecting the operation and efficiency of the airport, using the Airport Master Plan as a guide.

As airport proprietor, the City has limited power to control what types of civil aircraft use its airport or to impose curfews or other use restrictions. This power is limited by the rules of Part 161, described earlier. Airport proprietors may not take actions that (1) impose an undue burden on interstate or foreign commerce, (2) unjustly discriminate between different categories of airport users, and (3) involve unilateral action in matters preempted by the federal government.

The City of Flagstaff may take steps to control on-airport noise by installing sound barriers and acoustical shielding and by controlling the times when aircraft engine maintenance run-up operations may take place. Within the limits of the law and financial feasibility, airport proprietors may mitigate noise, acquire land or partial interests in land, such as air rights, easements, and development rights, to assure the use of property for purposes which are compatible with airport operations.

AIRPORT SETTING

The *National Plan of Integrated Airport Systems* (NPIAS), as established by the FAA, identifies 3,344 airports that are important to national transportation. The NPIAS identifies Flagstaff Pulliam Airport as a primary commercial service airport. Flagstaff Pulliam Airport is also classified as a primary commercial service airport within the Arizona Airport System.

LOCALE

As depicted on **Exhibit 1B**, Flagstaff Pulliam Airport is located in the southern portion of the City, approximately five miles from the

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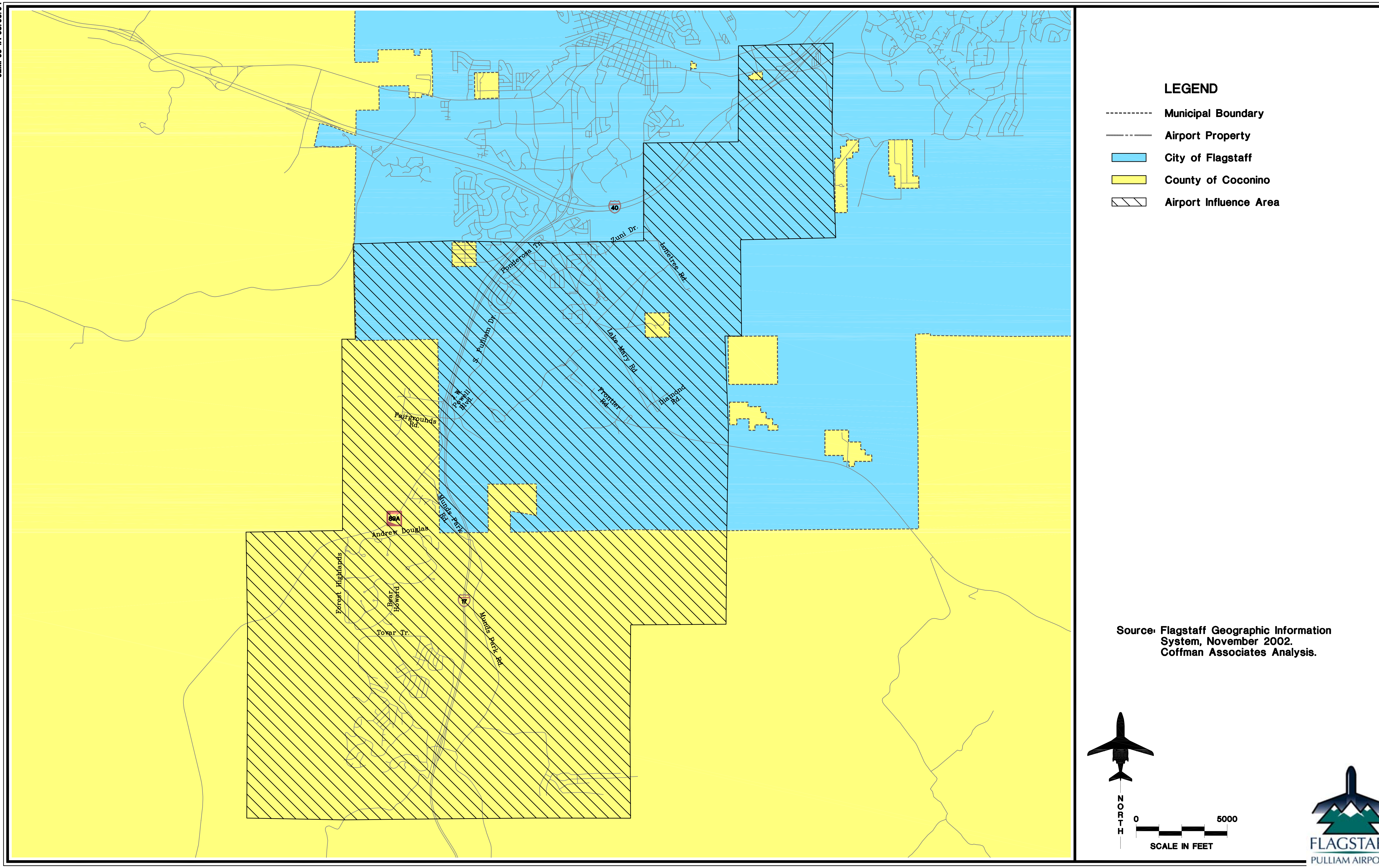

Exhibit 1A
AIRPORT INFLUENCE AREA

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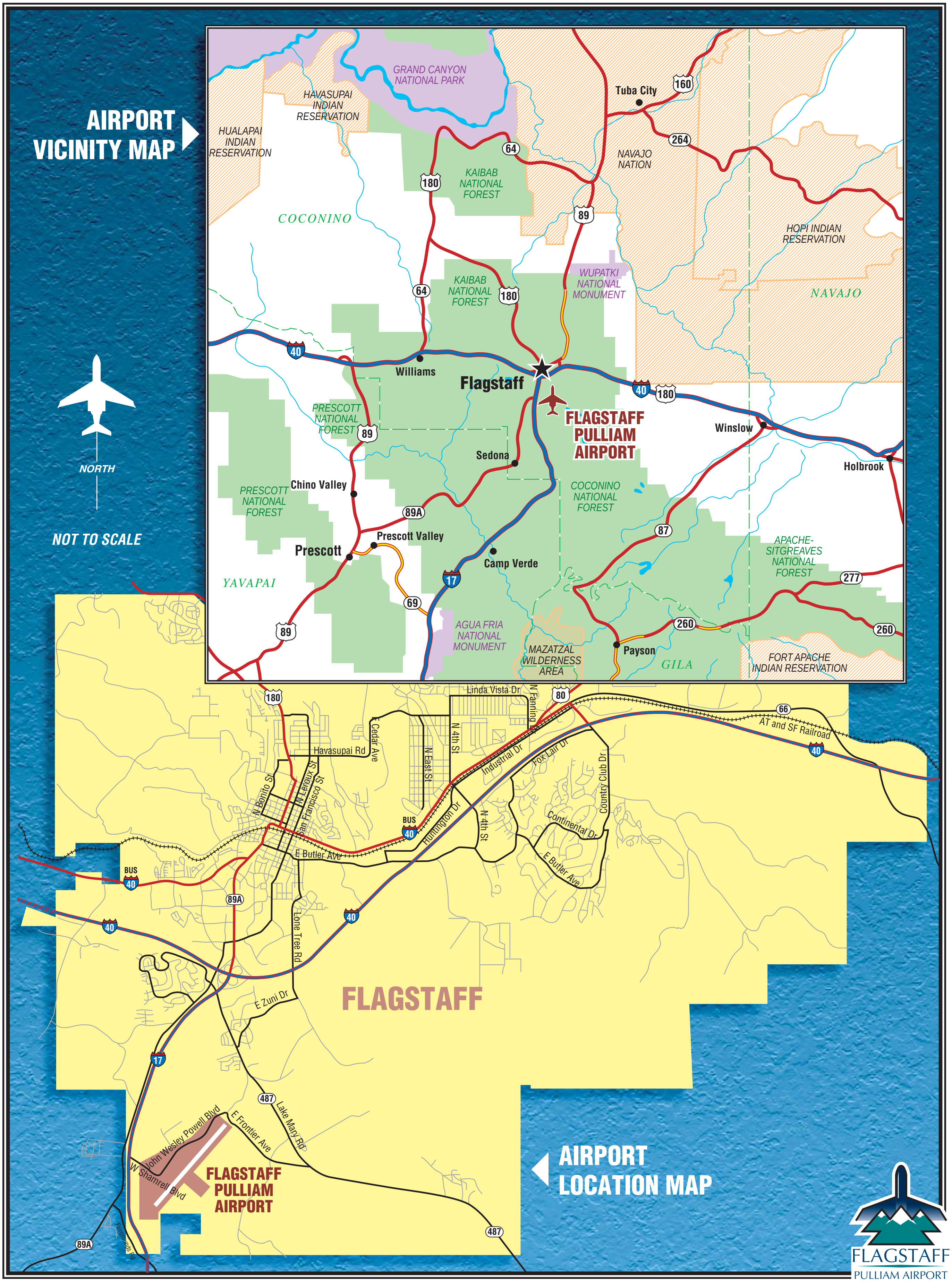

Exhibit 1B
LOCATION MAP

central business district. Primary access to the airport is via Interstate 17, although Lake Mary Road and John Wesley Powell Boulevard also provide local access to airport property.

CLIMATE

Weather plays an important role in the operational capabilities of an airport. Temperature is an important factor in determining runway length required for aircraft operations. The percentage of time that visibility is impaired due to cloud coverage is a major factor in determining the use of instrument approach aids. Wind speed and direction determine runway selection and operational flow.

Flagstaff is located at an elevation of 7,014 feet. The climate in Flagstaff can be considered mild, with cold winters, mild pleasantly cool summers, and low humidity. The Flagstaff area is semi-arid and it is not uncommon for several months to go by with little or no precipitation. Annual precipitation averages 19.80 inches with 84.40 inches of snowfall. The area experiences an average of 288 annual average days of sunshine.

The mean maximum daily temperature during July, the hottest month, is 81 degrees F. The mean maximum daily temperature during January, the coldest month, is 42 degrees F. The average annual temperature of the region is approximately 61 degrees F. Annual precipitation averages 26.9 inches per year, with May and June being the wettest months.

AIRPORT HISTORY

Flagstaff Pulliam Airport was constructed in 1949 on United States Forest Service land deeded to the City though the Federal Airport Act. Originally constructed to a length of 5,300 feet, the runway was lengthened to 6,300 feet in 1955 and to its present length, 6,999 feet, in 1969. Recent improvements at the airport include the construction of a new terminal building, new parking facilities, a parallel taxiway, as well as new facilities for fixed base operators (FBOs).

AIRPORT FACILITIES

Airfield facilities influence the utilization of airspace and are important to the noise compatibility planning process. These facilities can be divided into two distinct categories: airside facilities and landside facilities. Airside facilities include those directly associated with aircraft operation. Landside facilities include those necessary to provide a safe transition from surface to air transportation and support aircraft servicing, storage, maintenance, and operational safety. Current airfield facilities at Flagstaff Pulliam Airport are depicted on **Exhibit 1C.**

AIRSIDE FACILITIES

Airside facilities include the runway and taxiway systems, and aircraft and terminal activity areas.

Runways

The existing airfield configuration at Flagstaff Pulliam Airport consists of one runway, Runway 3-21, which is oriented in a northeast-southwest alignment. Runway information is summarized in **Table 1B**.

Runway 3-21 is 6,999 feet long by 150 feet wide. The runway is strength-rated to 30,000 pounds single-wheel loading (SWL), 95,000 pounds dual-wheel loading (DWL), and 140,000 pounds dual tandem wheel loading (DTWL). SWL refers to the design of the aircraft landing gear that has a single wheel on each main landing gear strut; DWL refers to landing gear that has dual wheels on each main landing gear strut; and DTWL refers to dual landing gear with two wheels on each landing gear strut. The runway is constructed of asphalt and has been equipped with high-intensity runway lighting (HIRL).

Taxiways

The taxiway system at Flagstaff Pulliam Airport consists of parallel, entrance/exit, connecting, and access taxiways. Runway 3-21 is equipped with a full length parallel taxiway.

The location of connecting taxiways are important as they provide airfield access to all aircraft. Taxiway W is 100 feet wide and connects the T-hangers to the runway. Taxiway T connects the apron area adjacent to the terminal building to the main parallel taxiway. Seven entrance/exit taxiways are provided allowing seven points of access along the runway. Taxiway A provides access to the end of Runway 21 and Taxiway G provides access to the end of Runway 3. Taxiways B, C, D, E, and F provide access between the parallel taxiway and Runway 3-21.

Airfield Lighting

Airfield lighting systems extend an airport's usefulness into periods of darkness and/or poor visibility. A variety of lighting systems are installed at Flagstaff Pulliam Airport for this purpose. These lighting systems, categorized by function, are summarized as follows.

Identification Lighting: The location of an airport at night is universally indicated by a rotating beacon which projects two beams of light, one white and one green, 180 degrees apart. The rotating beacon at Flagstaff Pulliam Airport is located where Shamrell Boulevard meets the apron facility area.

Runway and Taxiway Lighting: Runway and taxiway lighting utilizes light fixtures placed near the pavement edge to define the lateral limits of the pavement. This lighting is essential for maintaining safe operations at night and/or during times of poor visibility in order to maintain safe and efficient access from the runway and aircraft parking areas. HIRL is provided on Runway 3-21.

Approach Lighting: Visual glide slope indicators (VGSIs) provide visual descent guidance to pilots during an approach to a runway. When

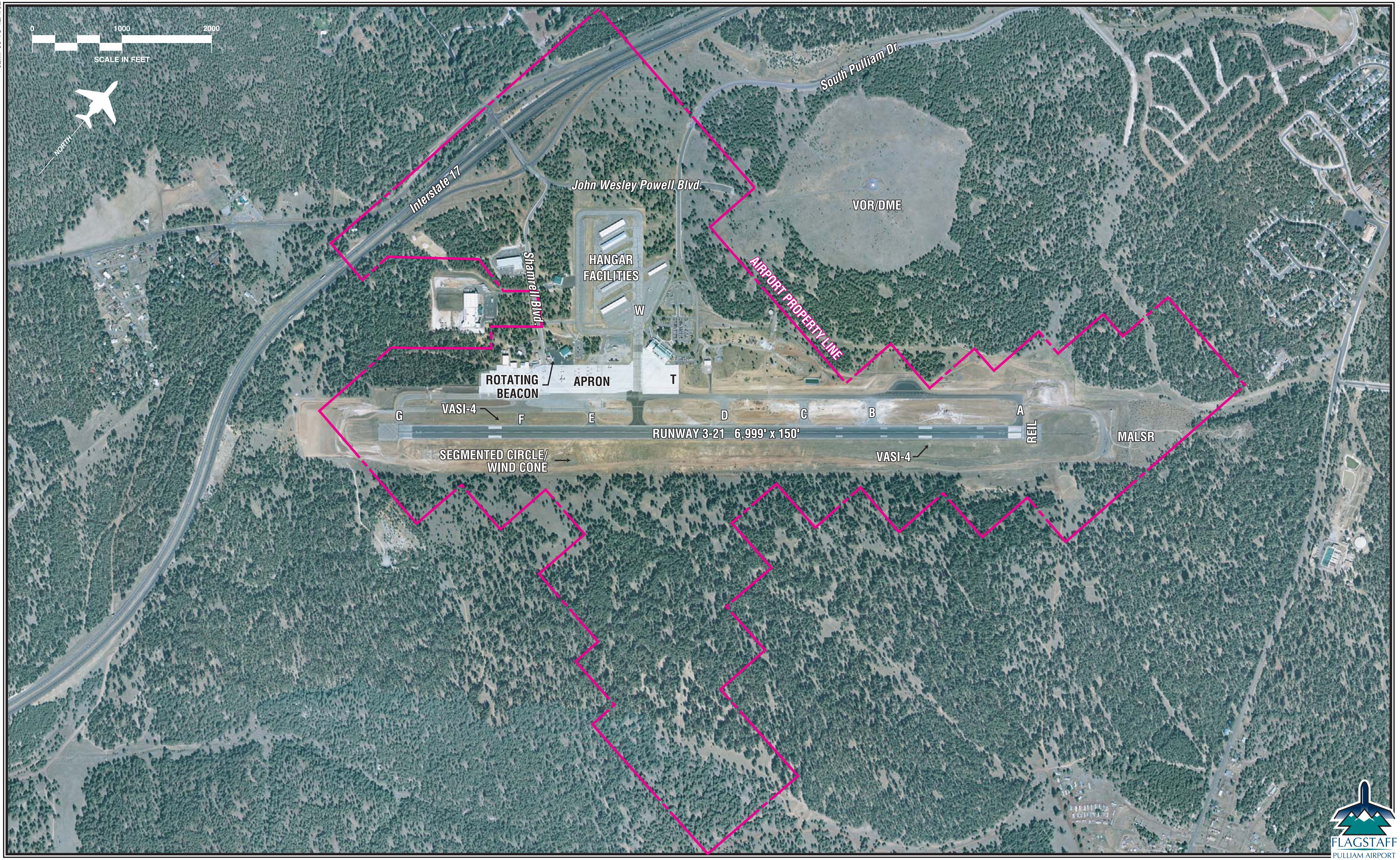

Exhibit 1C
EXISTING AIRFIELD FACILITIES

intercepted by the pilot, VGSIs give an indication of whether the aircraft is above, below, or within the designed descent path to the runway.

At Flagstaff Pulliam Airport, a four-box visual approach slope indicator (VASI-4L) is installed on the left side of each runway end. In addition, a medium intensity approach lighting system with runway alignment indicator lights (MASLR) is located at the end of Runway 21.

TABLE 1B
Runway Information

	Runway	
	3	**21**
Runway Length (feet) Runway Width (feet)	6,999 150	
Runway Surface Material	asphalt/porous friction courses	
Displaced Threshold	none	
Runway Load Bearing Strength SWL DWL DTWL	 30,000 95,000 140,000	
Approach Aids VASI MALSR	 yes no	 yes yes
Markings	non- precision instrument	precision instrument
Lighting	HIRL	
Instrument Approach Procedures	VOR, GPS	ILS, NDB, VOR, GPS
Traffic Pattern	left	left

Source: Airport Facility Directory, North Central United States, November 28, 2002

Notes:
SWL - Single wheel loading
DWL - Dual wheel loading
DTWL - Dual tandem wheel loading
VASI - Visual Approach Slope Indicator
MIRL - Medium intensity runway lighting
HIRL - High intensity runway lighting
MALSR - Medium intensity approach lighting system with runway alignment indicator lights

LANDSIDE FACILITIES

Landside facilities are the ground-based facilities that support the aircraft and pilot/passenger handling functions. These facilities typically include the passenger terminal complex, aircraft storage/maintenance hangars, aircraft parking apron and support facilities, such as fuel storage, automobile parking, and roadway access. Landside facilities at Flagstaff Pulliam Airport are identified on **Exhibit 1D**.

Passenger Terminal Complex

The Flagstaff Pulliam Airport passenger terminal complex is located at the end of South Pulliam Drive. The terminal building consists of two stories with baggage claim, a café, ticketing, airline gates, and car rental located on the main floor and airport administration and operations offices located upstairs.

General Aviation Complex

General aviation services are provided exclusively by private businesses at Flagstaff Pulliam Airport. One major fixed base operator (FBO), Wiseman Aviation, provides service at the airport. Facilities utilized by this FBO are located on the south side of the airfield at the termination of Shamrell Boulevard.

Services provided by the FBO include: fuel (100LL and Jet A), parking, hangers, general aviation passenger terminal and lounge, flight school/flight training, aircraft rentals, sightseeing tours/rides, aircraft maintenance, aircraft modification, aircraft parts, aviation accessories, etc.

OTHER FACILITIES

Other facilities located at Flagstaff Pulliam Airport include Guardian Air Ambulance, and Advantage Air Flight. The airport is also equipped with an Airport Rescue and Fire Fighting (ARFF) facility which is located off the main apron facility adjacent to Shamrell Boulevard.

AIRSPACE AND AIR TRAFFIC CONTROL

The Federal Aviation Administration (FAA) Act of 1958 established the FAA as the responsible agency for the control and use of navigable airspace within the United States. The FAA Western-Pacific Region, with offices in Hawthorne, California, controls the airspace in Flagstaff, Arizona.

The FAA has established the National Airspace System (NAS) to protect persons and property on the ground and to establish a safe and efficient airspace environment for civil, commercial, and military aviation. The NAS covers the common network of U.S. airspace, including: air navigation facilities; airports and landing areas; aeronautical charts; associated rules, regulations, and procedures; technical information; and personnel and material. The system also includes components shared jointly with the military.

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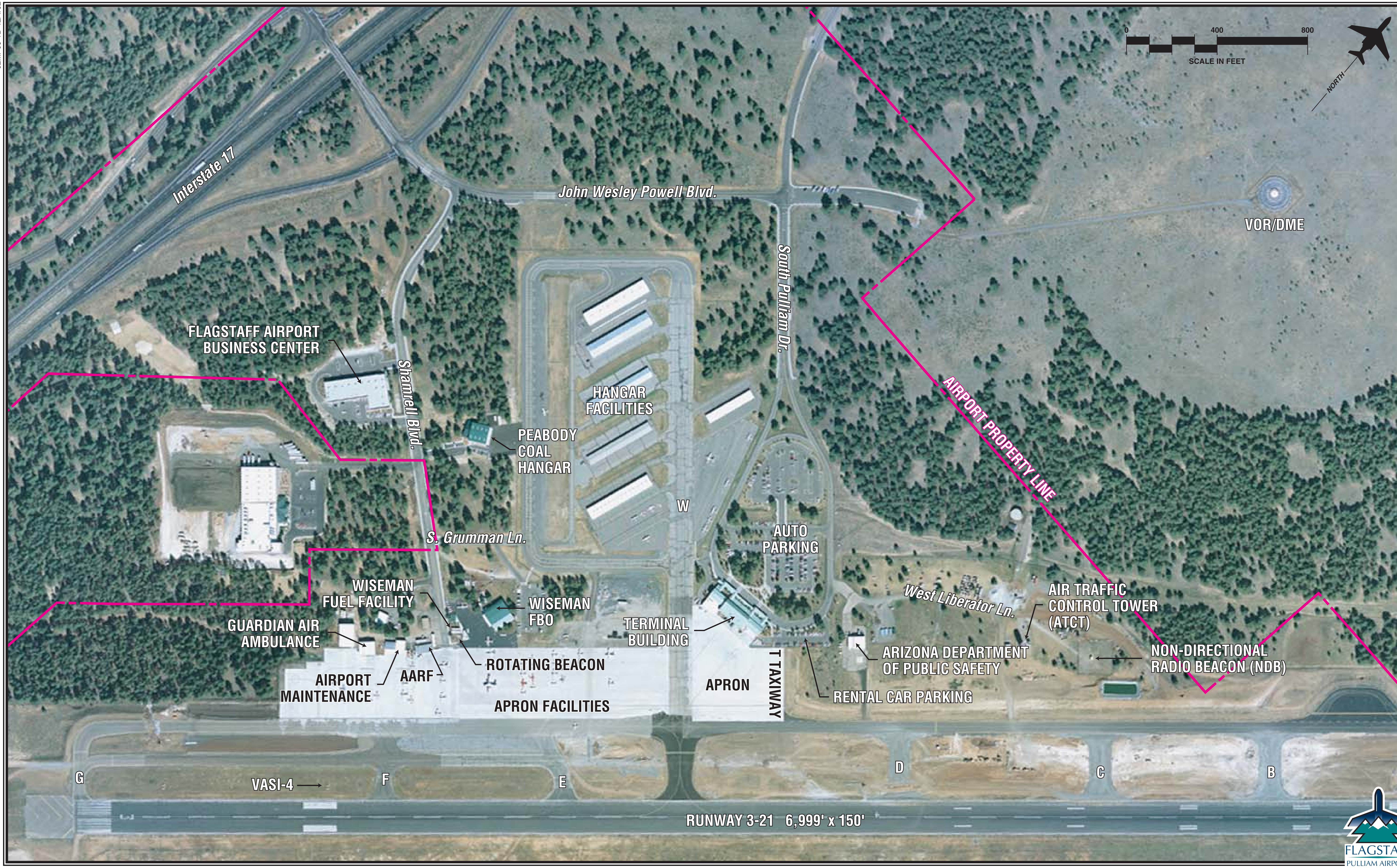

Exhibit 1D
EXISTING LANDSIDE FACILITIES

AIRSPACE STRUCTURE

Since the inception of aviation, nations have set up procedures within their territorial boundaries to regulate the use of airspace. Airspace is still broadly classified as either "controlled" or "uncontrolled" in the United States. The difference between controlled and uncontrolled airspace relates primarily to requirements for pilot qualifications, ground-to-air communications, navigation and air traffic services, and weather conditions. Six classes of airspace have been designated in the United States. **Exhibit 1E** shows the airspace classifications and terminology. Airspace designated as Class A, B, C, D, or E is considered controlled airspace. Aircraft operating within controlled airspace are subject to varying requirements for positive air traffic control. Several types of controlled airspace exist in the Flagstaff Pulliam area and are listed below.

- Class A airspace governs operations above 18,000 feet mean sea level (MSL).
- Class D airspace encompasses traffic areas for airports with ATCTs, like Flagstaff Pulliam Airport.
- Class E airspace encompasses airports without ATCTs.
- Class G airspace covers uncontrolled airspace.

Classes B and C airspace are not present in the Flagstaff area. These airspace classifications are reserved for airports with the greatest traffic volume in terms of instrument flight rule (IFR) operations and enplaned passengers, such as Phoenix Sky Harbor International Airport. Airspace within the study area is depicted on **Exhibit 1F**.

Class A Airspace

Class A airspace includes all airspace from 18,000 feet MSL to flight level (FL) 600 (approximately 60,000 feet MSL). This airspace is designated in 14 CFR Part 71.193 for positive control of aircraft. The Positive Control Area (PCA) allows flights governed only under IFR operations. The aircraft must have special radio and navigation equipment, and the pilot must obtain clearance from an air traffic control (ATC) facility to enter Class A airspace. In addition, the pilot must possess an instrument rating.

Class D Airspace

Class D airspace is controlled airspace surrounding airports with an ATCT. The Class D airspace typically constitutes a cylinder with a horizontal radius of four or five nautical miles (NM) from the airport, extending from the surface up to a designated vertical limit, typically set at approximately 2,500 feet above the airport elevation. If an airport has an instrument approach or departure, the Class D airspace extends along the approach or departure path.

Flagstaff Pulliam Airport has Class D airspace during the months of April 1st through September 30th during the hours of 6:00 a.m. to 9:00 p.m. and October 1st through March 31st from the hours of 7:00 a.m. to 7:00 p.m. These are the operational hours of the ATCT. At all other times, Class G airspace surrounds the airport.

Class E Airspace

Class E airspace consists of controlled airspace designed to contain IFR operations during portions of the terminal operation and while transitioning between the terminal and enroute environments. Unless otherwise specified, Class E airspace terminates at the base of the overlying airspace. Only aircraft operating under IFR are required to be in contact with air traffic control when operating in Class E airspace.

Flagstaff Pulliam Airport has airport-specific Class E airspace beyond their designated Class D airspace from the southwest to the northeast. This airspace begins at the floor and extends to 1,200 feet above the surface. In addition, Class E transition surfaces encompass both classes of airspace and reaches south to include Sedona Airport. These areas are controlled airspace having a floor of 700 feet above the surface.

Class G Airspace

Airspace not designated as Class A, B, C, D, or E is considered uncontrolled, or Class G, airspace. Air traffic control does not have the responsibility to exercise control over air traffic within this airspace. Class G airspace lies between the surface and the overlaying Class E airspace (700 to 1,200 feet above ground level [AGL]). Flagstaff Pulliam Airport utilizes Class G airspace when the ATCT is closed.

Additional FAA rules regulate flight altitudes over congested residential areas, national parks, and outdoor recreational areas, which are often located under Class G airspace. The overall amount of Class G airspace is continuing to decline due to the need for more coordinated air traffic activity.

Special Use Airspace

Special use airspace is defined as airspace where activities must be confined because of their nature, or where limitations are imposed on aircraft not taking part in those activities. There are a number of special use airspace designations within the study area of Flagstaff Pulliam Airport including one Military Operations Area (MOA) and 11 wilderness areas.

The Sunny Military Operations Area is approximately 20 nautical miles north of the airport. This area is reserved for military use and is designed to separate nonparticipating aircraft from military training operations.

Aircraft overflying the wilderness areas are typically requested to maintain a minimum altitude of 2,000 feet. FAA

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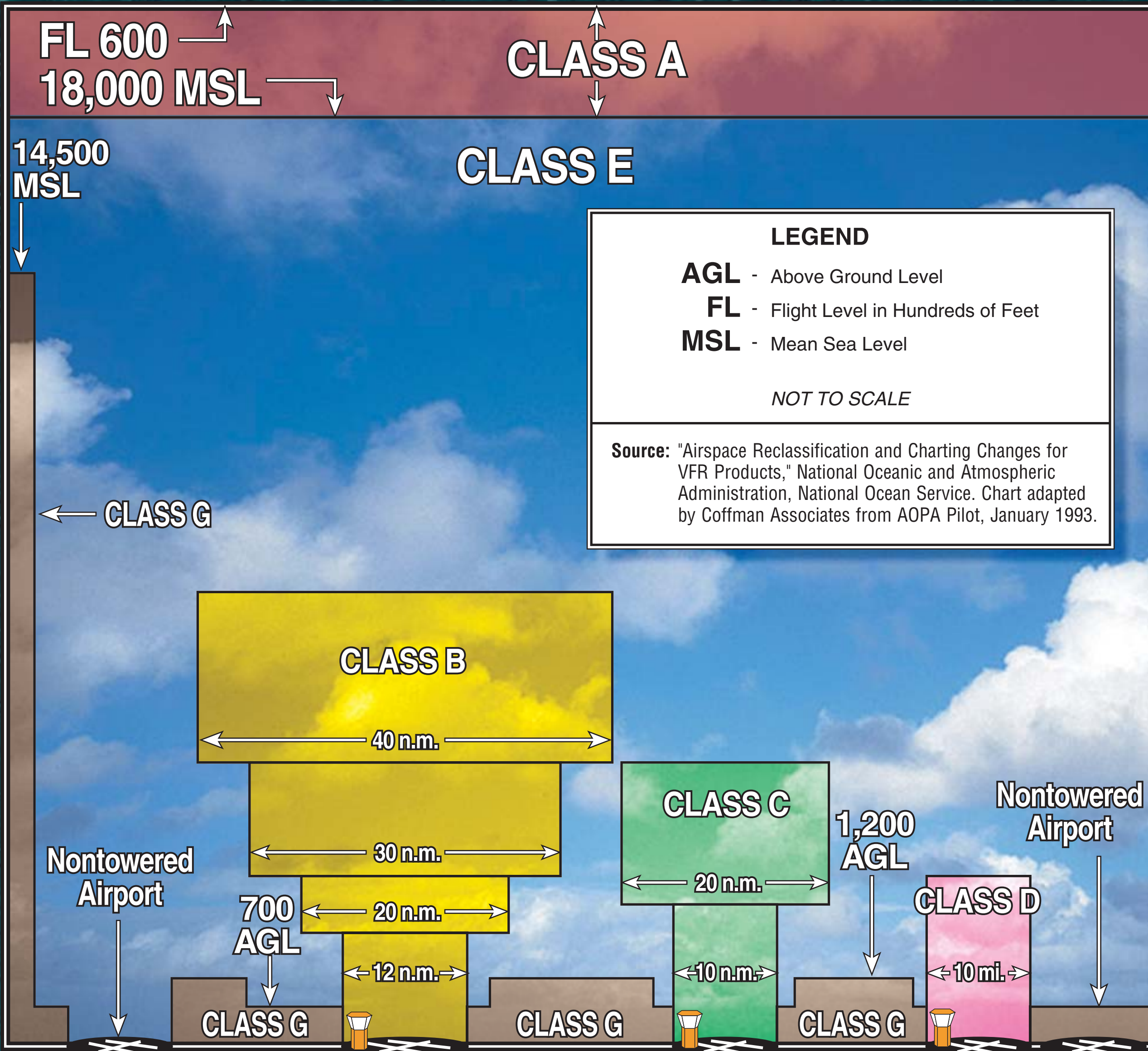

CLASSIFICATION	DEFINITION
CLASS A	Generally airspace above 18,000 feet MSL up to and including FL 600 .
CLASS B	Generally multi-layered airspace from the surface up to 10,000 feet MSL surrounding the nation's busiest airports.
CLASS C	Generally airspace from the surface to 4,000 feet AGL surrounding towered airports with service by radar approach control.
CLASS D	Generally airspace from the surface to 2,500 feet AGL surrounding towered airports.
CLASS E	Generally controlled airspace that is not Class A, Class B, Class C, or Class D.
CLASS G	Generally uncontrolled airspace that is not Class A, Class B, Class C, Class D, or Class E.

FLAGSTAFF
PULLIAM AIRPORT

Exhibit 1E
AIRSPACE CLASSIFICATION

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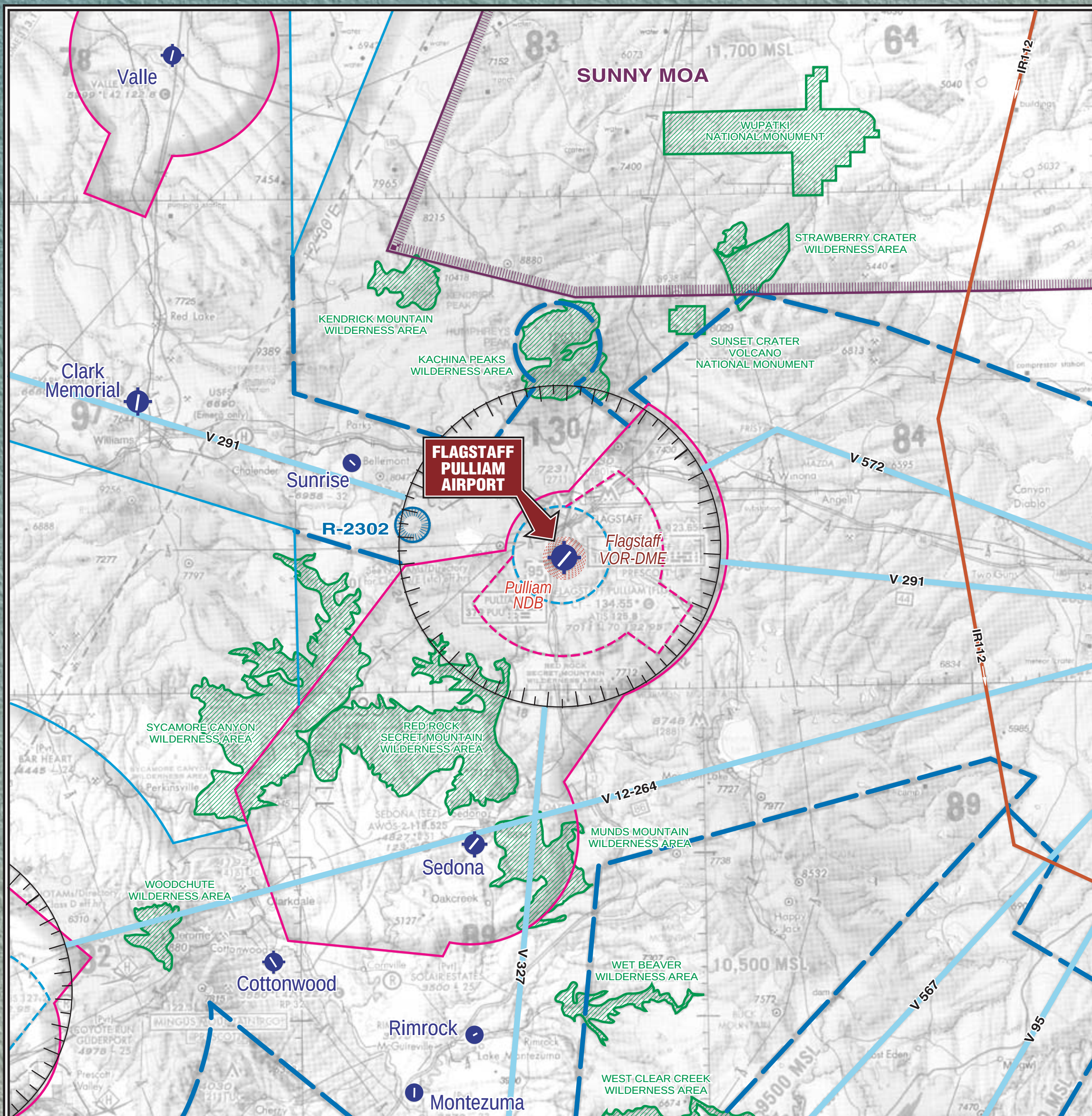

LEGEND

- Airport with other than hard-surfaced runways
- Airport with hard-surfaced runways 1,500' to 8,069' in length
- Airports with hard-surfaced runways greater than 8,069' or some multiple runways less than 8,069'
- Non-Directional Radiobeacon (NDB)
- VOR-DME
- Compass Rose
- Class D Airspace
- Class E Airspace
- Class E Airspace with floor 700 ft. above surface
- Class E Airspace with floor 1,200 ft. or greater above surface
- Differentiates Floors of Class E Airspace greater than 700 ft. above surface
- Victor Airways
- MOA - Military Operations Area
- Prohibited, Restricted, Warning and Alert Areas
- Military Training Routes
- Wilderness Areas

Source: Phoenix Sectional Chart, US Department of Commerce, National Oceanic and Atmospheric Administration May 16, 2002

FLAGSTAFF PULLIAM AIRPORT

Exhibit 1F
AIRSPACE MAP

Advisory Circular 91-36C defines the "surface" as the highest terrain within 2,000 feet laterally of the route of flight or the upper-most rim of the canyon or valley.

ENROUTE NAVIGATIONAL AIDS

Enroute navigational aids (NAVAIDS) are established for the purposes of accurate enroute air navigation. Various devices use ground-based transmission facilities and on-board receiving instruments. Enroute NAVAIDS often provide navigation to more than one airport as well as to aircraft traversing the area. Enroute NAVAIDS that operate in the study area are discussed below.

The VOR (very high frequency omnidirectional range) provides course guidance to aircraft by means of a VHF radio frequency. Distance measuring equipment (DME) is sometimes collocated with VOR facilities. DME emits signals enabling pilots of properly equipped aircraft to determine their line-of-sight distance from the facility. Flagstaff Pulliam Airport is equipped with a VOR/DME.

VORs define low-altitude (Victor) and high altitude airways (Jet Routes) through the area. Most aircraft enter the Flagstaff area via one of these federal airways. Aircraft assigned to altitudes above 18,000 feet MSL use the Jet Route system. Other aircraft use the low altitude airways. Radials off VORs define the centerline of these flight corridors.

There are three Victor Airways in the immediate vicinity of the airport: V-291,V-572, and V-327. All of these airways are defined using radials from the Flagstaff VORDME.

AREA AIRPORTS

There are four public-use airport and five private airports within 40 nautical miles of Flagstaff Pulliam Airport. The following four airports are open to the public.

Sedona Airport, located 22 nautical miles south-southwest, is served by one runway and a heliport. Runway 3-21, which is an asphalt runway in good condition, is 5,132 feet long and 75 feet wide. The heliport is concrete and is 50 feet by 50 feet. There are 101 based aircraft at the airport. General aviation services are available including 100LL and JetA fuel.

H.A. Clark Memorial Field Airport, located 27.4 nautical miles west-northwest, is served by one runway. Runway 18-36, which is an asphalt runway in good condition, is 5,992 feet long and 100 feet wide. There are 15 based aircraft at the airport. General aviation services are available including 100LL fuel.

Cottonwood Airport, located 33.9 nautical miles southwest, is served by one runway. Runway 14-32, which is an asphalt runway in good condition, is 4,250 feet long and 75 feet wide. There are 30 based aircraft at the airport. General aviation services are available including 100LL and JetA fuel.

Valle Airport, located 36.5 nautical miles northwest, is served by one runway. Runway 1-19, which is an asphalt runway in good condition, is 4,262 feet long and 45 feet wide. There are 5 based aircraft at the airport. Limited general aviation services are available at the airport including 100LL and JetA fuel.

Exhibit 1D illustrates the location of several area airports.

INSTRUMENT APPROACHES

Instrument approaches are defined with the use of electronic and visual navigational aids in order to assist pilots in landing when visibility is reduced below specified minimums. While these are especially helpful during poor weather conditions, they are often used by commercial pilots when visibility is good. Instrument approaches are classified as precision and nonprecision. Both provide runway alignment and course guidance, while precision approaches also provide glide slope information for the descent to the runway. The instrument approaches for the Flagstaff Pulliam Airport are depicted on **Exhibit 1G**.

Precision Instrument Approaches

Most precision instrument approaches in use in the United States today are instrument landing systems (ILS). An ILS provides an approach path for exact alignment and descent of an aircraft on final approach to a runway. The system provides three functions: guidance, provided vertically by a glide slope (GS) antenna and horizontally by a localizer (LOC); range, furnished by marker beacons or distance measuring equipment (DME); and visual alignment, supplied by the approach light systems and runway edge lights.

Flagstaff Pulliam Airport has one published precision approach. Runway 21 is equipped with an ILS consisting of a localizer, glide slope antenna, and a medium intensity approach lighting system with MALSR. The Runway 21 ILS uses a standard 3.0 degree glide slope. The Category I ILS approach to Runway 21 can be flown when cloud ceilings are 7,250 feet MSL or greater and visibility is one-half mile or greater.

Nonprecision Approaches

Flagstaff Pulliam Airport has a number of nonprecision approaches available. The following paragraphs describe nonprecision approaches available for the runways.

Runway 3. The GPS approach to Runway 3 uses VOR signals and fixes to ensure adequate terrain and obstruction clearance during final approach to the runway. The Flagstaff VOR/DME is used to define the approach, although GPS can also be used to simulate the positions of required location fixes. This approach to Runway 3 can be flown when cloud ceilings are 7,380 feet MSL or greater with one mile visibility for categories A, B, and C aircraft and visibility of 1-1/4 miles for category D aircraft. A circling approach can be flown with cloud

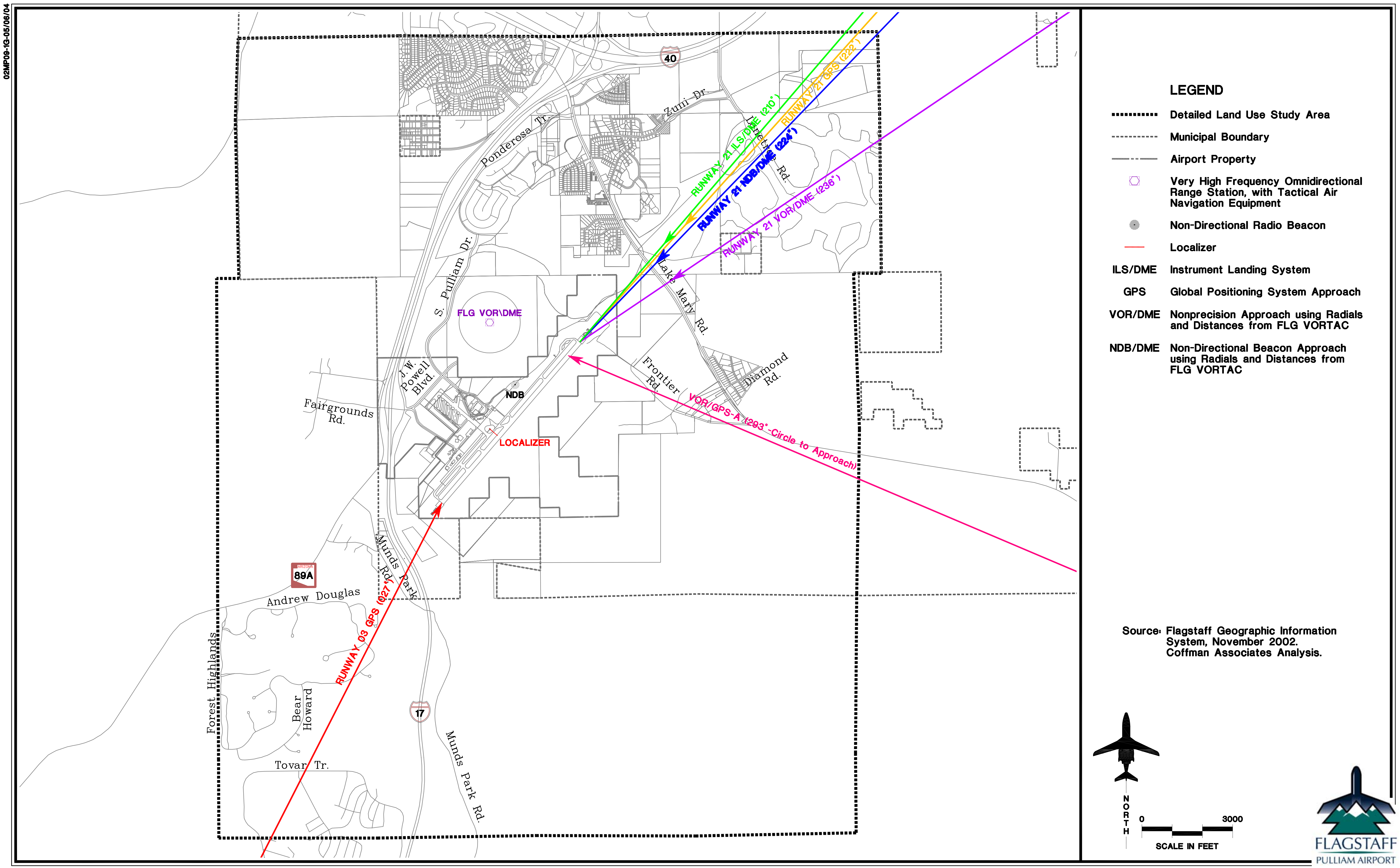

Exhibit 1G
PUBLISHED INSTRUMENT PROCEDURES

ceilings at 7,480 feet minimums, with one mile visibility for category A aircraft; 7,540 feet cloud ceiling minimums with one mile visibility for category B aircraft; 7,540 feet cloud ceiling minimums with 1-1/2 miles visibility for category C aircraft; and 7,680 feet cloud ceiling minimums with two miles visibility for category D aircraft.

Runway 21. Runway 21 utilizes many nonprecision approaches. The VOR/DME approaches can be flown when cloud ceilings are 7,400 feet MSL or greater and visibility is one mile for categories A, B, and C aircraft, and a visibility of 1-1/4 miles for category D aircraft. A circling approach can be flown with cloud ceiling minimums of 7,630 feet and visibility at one mile for category A aircraft; 7,640 feet cloud ceiling minimums with one mile visibility for category B aircraft; 7,640 cloud ceiling minimums with visibility at 1-1/4 miles for category C aircraft; and 7,660 feet cloud ceiling minimums with two miles visibility for category D aircraft.

The VOR or GPS-A approach to Runway 21 is used during circling approaches. This approach can be flown with cloud ceiling minimums of 7,700 feet and visibility of one mile for categories A and B aircraft, two miles visibility for category C aircraft, and 2-1/4 miles visibility for category D aircraft.

The NDB/DME approach for Runway 21 can be flown at 7,760 feet minimums for both straight-in and circling approaches. Visibility for both approaches are: one mile for category A aircraft; 1-1/4 miles for category B aircraft; 2-1/4 for category C aircraft; and 2-1/2 for category D aircraft.

The GPS straight-in approach for Runway 21 can be flown at 7,420 feet with a visibility of one mile for both categories A and B aircraft, and 1-1/4 miles visibility for categories C and D aircraft. The circling approach can be flown at 7,600 feet cloud ceiling minimums with one mile visibility for category A aircraft; 7,620 feet cloud ceiling with one mile visibility for category B aircraft; 7,620 feet cloud ceiling with 1-3/4 miles visibility for category C aircraft; and 7,660 feet cloud ceiling minimums with two miles visibility for category D aircraft.

CUSTOMARY ATC AND FLIGHT PROCEDURES

Flights to and from Flagstaff Pulliam Airport are conducted using both IFR and VFR procedures. Instrument Flight Rules (IFR) are those that govern the procedures for conducting instrument flight. Visual Flight Rules (VFR) govern the procedures for conducting flight under visual conditions (good weather). Most air carrier, military, and general aviation jet operations are conducted under IFR regardless of the weather conditions.

Visual Flight Rule Procedures

Under VFR conditions, the pilot is responsible for collision avoidance and will typically announce on the radio, when approximately 10 miles from the airport, their intention to enter the traffic pattern.

Typically, VFR general aviation traffic stays clear of the more congested airspace and follows recommended VFR flyways in the area. **Exhibit 1F** illustrates a view of Flagstaff vicinity airspace with the recommended VFR routes.

Instrument Flight Rule Procedures

Albuquerque Approach/Departure Control handles all IFR traffic to and from Flagstaff Pulliam Airport.

EXISTING NOISE ABATEMENT PROCEDURES

Formal noise abatement procedures have not been established at Flagstaff Pulliam Airport; however, a procedure has been established to reduce the effects of noise on surrounding noise-sensitive areas. This procedure includes the avoidance of overflight of Kachina Village which is three miles south of the Airport. This can be accomplished by using a left turn pattern when departing Runway 21.

STUDY AREA

The study area, as depicted in **Exhibit 1H**, is generally centered on the airport. Both the City of Flagstaff and Coconino County have planning jurisdiction within the study area as the entire study area is not contained within the city limits. Boundaries of the study area were determined based on previous noise contours prepared for the airport as well as the F.A.R. Part 77 surface. Section line boundaries were used as the boundary in order to allow for easy interpretation.

The study area defines the area within which detailed existing land use information will be presented. It is intended to contain the area expected to be impacted by present and future aircraft noise exposure contours.

Modifications to the study area can be made later in the study if deemed necessary as the study area boundaries were established for statistical convenience. It should be emphasized that this area is for the presentation of detailed background data - it is not a definition of the noise impact area. Areas adversely affected by aircraft noise will be defined in later analyses.

EXISTING LAND USE

Existing land use in the study area is shown in **Exhibit 1J**. The map was developed with the use of aerial photography provided by the Michael Baker Corporation. Other sources of land use information that were consulted include street maps and land use maps prepared by the City of Flagstaff. The land use categories shown on the map were selected to fit the requirements of noise and land use compatibility planning. **Table 1C** lists the land use categories shown on the existing land use map.

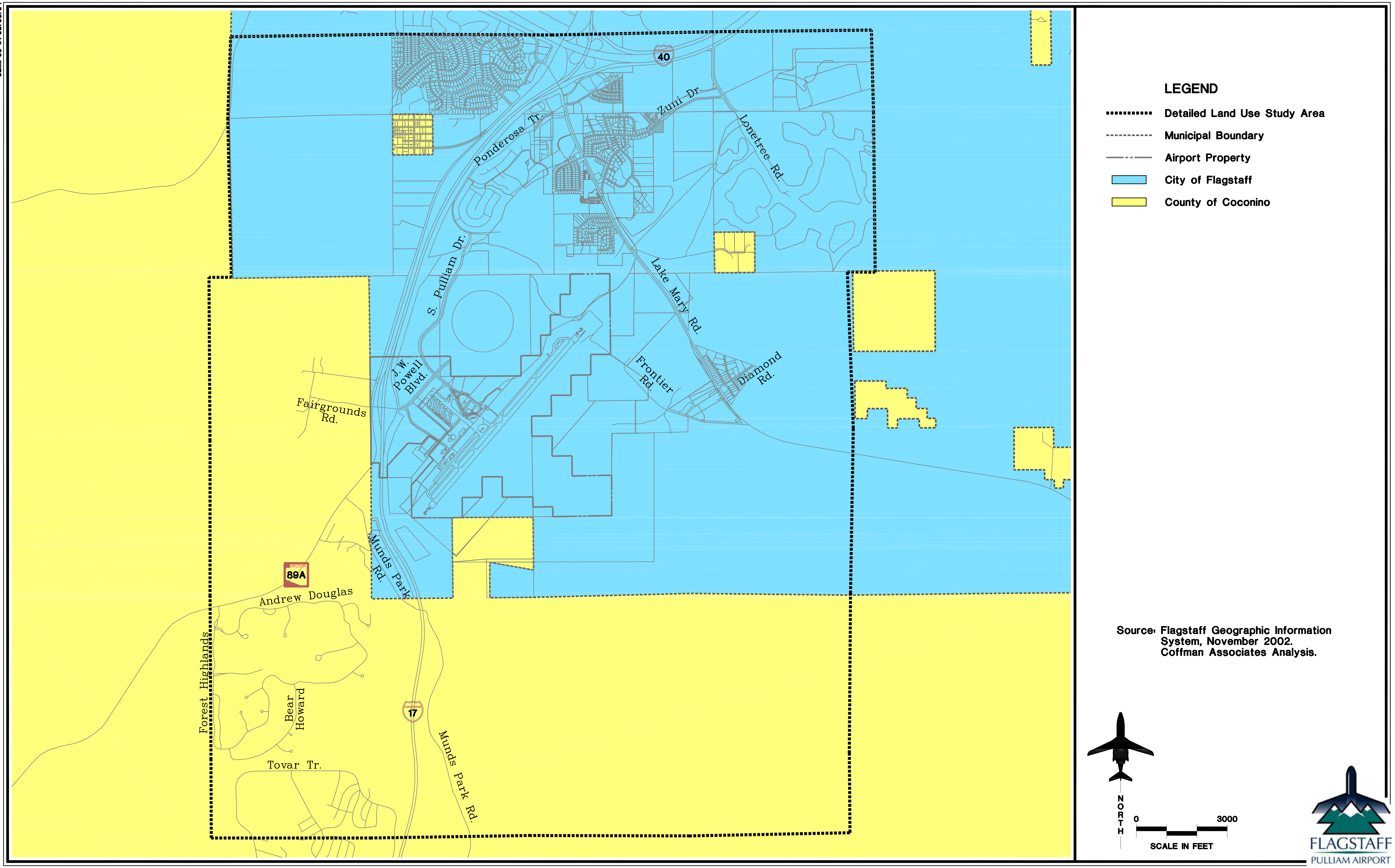

Exhibit 1H
STUDY AREA AND JURISDICTIONAL BOUNDARIES

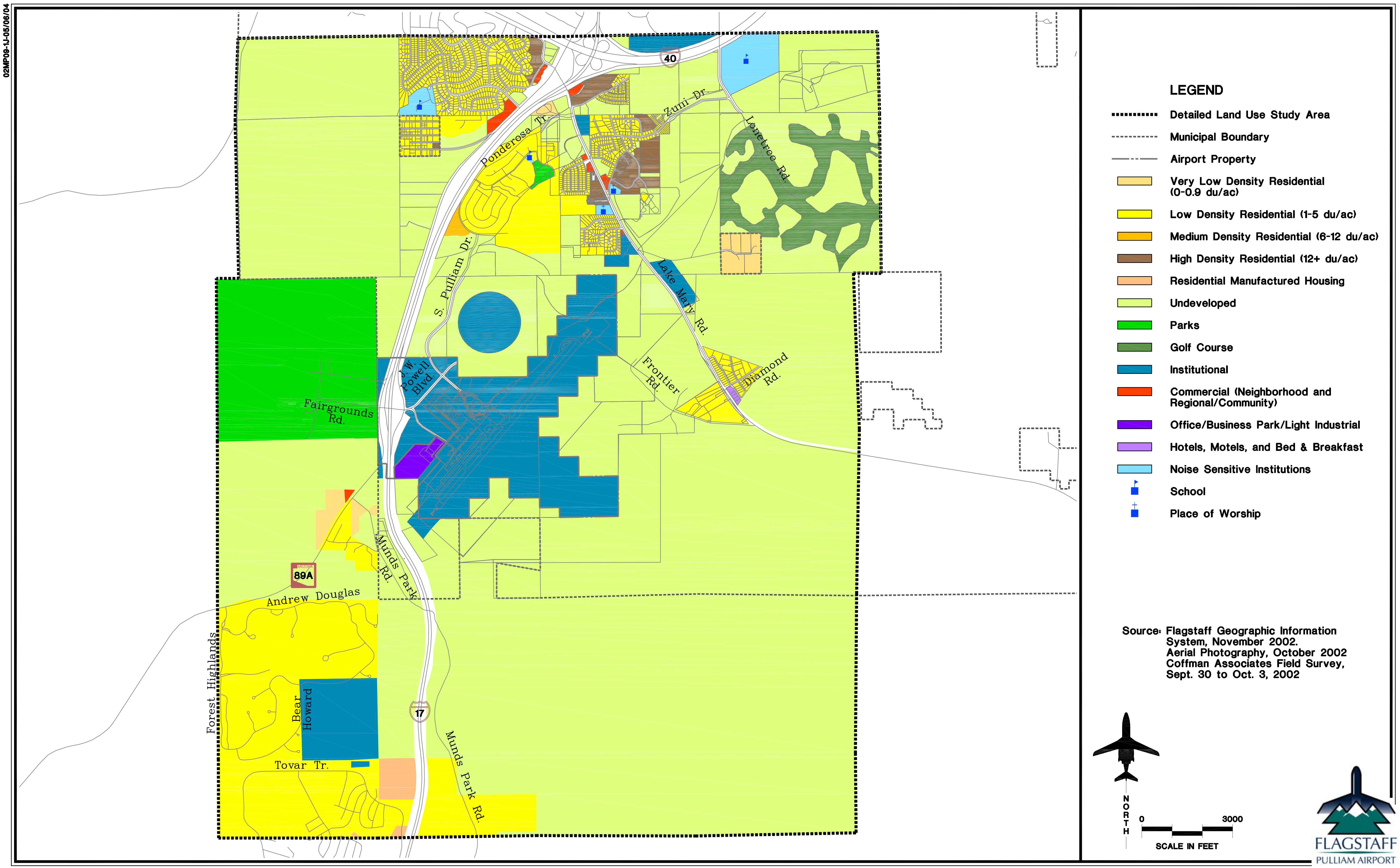

Exhibit 1J
GENERALIZED EXISTING LAND USE

TABLE 1C Land Use Categories Illustrated on Land Use Map	
Category	**Land Uses Included**
Very Low Density Residential	Single-family homes
Low Density Residential	Single-family homes
Medium Density Residential	Single-family homes Duplexes
High Density Residential	Triplexes Apartments
Park & Open space	Parks Golf courses Cemeteries
Public	Public owned properties
Commercial	Businesses Offices Government offices
Industrial	Manufacturing Light Industry Heavy Industry Warehousing
Noise-Sensitive	Schools Places of Worship Historical Structures Libraries

NOISE-SENSITIVE INSTITUTIONS

Approximately five noise-sensitive institutions are present within the study area. As illustrated in **Exhibit 1J**, these institutions are located in the northern portion of the study area and include two churches and three schools.

The three schools consist of one elementary school, De Miguel Elementary; one charter school; and one community college, Coconino Community College. The two places of worship within the study area include the Bethel Baptist Church and the Church of Jesus Christ of Latter Day Saints.

A review of historic resources contained within the *Flagstaff Area Regional Land Use and Transportation Plan* revealed that no historic resources are present within the study area.

LAND USE PLANNING POLICIES AND REGULATIONS

In most cities and counties, land use planning occurs through both regulatory and non-regulatory means. Regulatory tools for directing land use include the zoning ordinance, which limits the type, size, and density of uses allowed in various locations; subdivision regulations, which regulate the platting and dividing of land; and building codes, which establish precise requirements for building. Non-regulatory means of land use planning include the comprehensive plan, which is also referred to as the master or general plan, and the local capital improvements program. The comprehensive plan provides the basis for the zoning ordinance and sets guidelines for future development. The capital improvements program is typically a short-term schedule for constructing and improving public facilities such as streets, sewer, and water lines.

The following paragraphs provide descriptions of the various land use planning tools currently in place within the study area. From these descriptions, one can begin to gain an understanding of the regulations impacting the study area.

REGULATORY FRAMEWORK

In the Flagstaff Pulliam Airport study area, the City of Flagstaff and Coconino County share the responsibility for land use regulation. Each jurisdiction administers zoning ordinances, subdivision regulations, and building codes.

Arizona state law allows counties to prepare a comprehensive, generalized land use plan for the development of land within their jurisdiction. The county also provides for zoning and the delineation of zoning districts. The county is also responsible for regulating the subdivision of all lands within its jurisdiction, except subdivisions which are regulated by municipalities. Coconino County regulates the unincorporated areas within the study area.

Municipalities are also permitted to prepare, adopt, and implement comprehensive, long-range, generalized land use plans for land both under their current jurisdiction and for unincorporated (extraterritorial) sections of the county which are likely to be annexed by the city or town. General land use plans include plans and policies outlining the community's goals, objectives, principles, and standards for overall growth and development.

Local governments are required to regulate the subdivision of all lands within their corporate limits and may also prepare and adopt zoning ordinances and building codes. Zoning ordinances must be consistent with the general plan, where one has been prepared.

Within the study area, both Coconino County and the City of Flagstaff have prepared and adopted general plans, zoning ordinances, subdivision regulations, and building codes. These planning and development tools are described in the following sections.

GENERAL PLAN

A community's general plan sets the standards and guidelines for future development and provides the legal basis for the zoning ordinance. The plan represents a generalized guideline, as opposed to a precise blueprint, for locating future development. During the preparation of a plan, existing land uses are evaluated, and based on the evaluation, future land uses and facilities are determined. By illustrating preferred land use patterns, a general plan can be used by community decisionmakers and staff, developers, investors, and citizens to assist them in evaluating future development opportunities.

Flagstaff Area Regional Land Use and Transportation Plan

The *Flagstaff Area Regional Land Use and Transportation Plan* was prepared by the City of Flagstaff and Coconino County. The plan is an expansion of, and an update to, the existing city and county general and comprehensive plans. The purpose of the plan is to provide a regional approach to planning in the Flagstaff region.

Planned future land uses around the airport, as presented within the *Flagstaff Area Regional Land Use and Transportation Plan,* are depicted on **Exhibit 1K**. As depicted on the exhibit, future land uses are anticipated to be primarily industrial and commercial in nature to the north, east, and west, and open space to the south.

Various components of a number of planning documents have been incorporated into the *Flagstaff Area Regional Land Use and Transportation Plan* including the *Coconino County Comprehensive Plan, A Vision for our Community - Flagstaff 2020*, and the *Flagstaff Area Open Spaces and Greenways Plan*. Following are brief descriptions of each of these plans.

- *Coconino County Comprehensive Plan*

  The *Coconino County Comprehensive Plan* contains a number of goals and policies for the growth and development of the county. The plan is divided into several elements which were designed to assist the Board of Supervisors and the Planning Commission in making future land use decisions. The elements contained within the plan include Land Use, Natural Resources and Environmental Quality, Circulation, Public Safety, and Housing. The various goals and policies outlined within the comprehensive plan have been incorporated into the *Flagstaff Area Regional Land Use and Transportation Plan* as appropriate.

- *A Vision for Our Community - Flagstaff 2020*

  The purpose of the process behind the development of *A Vision for Our Community - Flagstaff 2020* was to involve the residents of the City of Flagstaff in the future development of the City. A number of goals were developed during the process and are outlined within the vision plan. One of the key results of the public involvement process conducted during the preparation of the vision statement was the request by the citizens for cooperative long-range planning efforts between the City and County. This request resulted in the preparation of the *Flagstaff Area Regional Land Use and Transportation Plan.* The goals contained within *A Vision for Our Community - Flagstaff 2020* are the foundation of the regional plan.

- *Greater Flagstaff Area Open Spaces and Greenways Plan*

  The purpose of the *Greater Flagstaff Area Open Spaces and Greenways Plan* was to identify the sensitive natural areas within the Flagstaff area as well as formulate a strategy for protecting these areas. Preparation of the plan involved not only the City of Flagstaff and Coconino County, but also the Arizona State Land Department, Arizona Game and Fish Department, the National Park Service, and the Coconino National Forest. Recommendations from this plan were incorporated into the *Flagstaff Area Regional Land Use and Transportation Plan.*

The *Flagstaff Area Regional Land Use and Transportation Plan* incorporated the goals and policies of the three documents described above to guide the future development of the Flagstaff area. The document consists of eight elements which each address a number of goals and policies for the development of the Flagstaff area. The elements, and their relation to Flagstaff Pulliam Airport, are described in the following paragraphs.

Land Use and Growth Management Element. This element identifies not only the growth goals and policies, but also the areas where land uses will be permitted to occur in the future.

Transportation Element. The purpose of this element is to identify existing and future means of transportation within the region.

Community Character and Design Element. Within this element, design standards are developed to enhance the region's history, culture, and natural and built environments.

Natural and Cultural Resources and the Environment Element. This element provides for the protection of resources within the region including soil, air, water, wildlife, dark skies, natural landscapes, and historic sites.

Water Resources Element. The utility plans for water and wastewater are described and developed within this element.

Community Facilities and Services Element. Within this element, Strategy CFS1.3(b) - Continue Services at Flagstaff Pulliam Airport states the following. "The Flagstaff Pulliam Airport shall continue its development as a local service general aviation and commercial airport. The city shall seek to mitigate noise, safety, and other impacts of airport operations while assuring that new development in proximity shall be compatible with existing and planned use of the airport per approved Airport Master Plan's usage and zoning."

This element also defines the Airport Noise Sensitive Zone as the areas within the 60 Ldn noise contour established within the *1991 Pulliam Airport Master Plan*. Residential development is discouraged within this

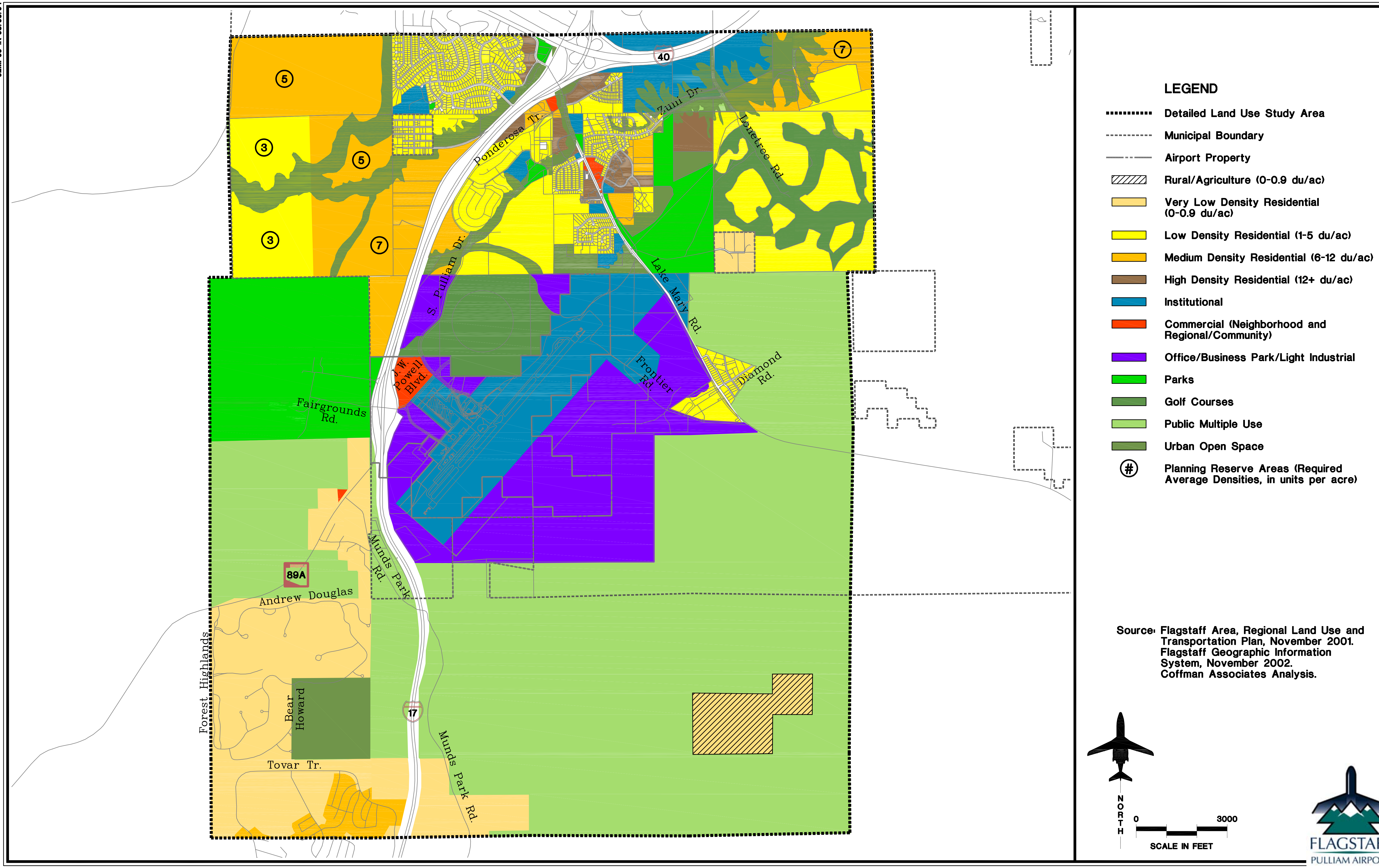

Exhibit 1K
GENERALIZED COMPREHENSIVE LAND USE

zone in the interest of protecting not only the airport, but also the general public.

Public Safety Element. This element focuses on the public safety systems plan.

ZONING

While comprehensive plans are intended to establish policies to guide development and land use, cities and counties actually control land use through zoning ordinances and development codes.

The purpose of this section is to summarize the various land use controls that apply within the airport study area. The summarized information provided below will be used in subsequent chapters to identify zoning districts which provide a compatible land use buffer and those that allow encroachment by noise-sensitive land uses. For zoning districts which permit noise-sensitive land uses, this information will provide insights into how the district regulations may be amended to promote noise-compatible development.

City of Flagstaff, Land Development Code

The zoning ordinance for the City of Flagstaff is contained within the Land Development Code. This code was adopted by the Flagstaff City Council on April 8, 1991.

Zoning designations within the Land Development Code are broken into two categories. One category contains the zoning and development criteria for districts which were in place at the time of adoption of the Land Development Code. These districts are denoted with the suffix "E," for Established, in the code. The other category identifies the development criteria for districts developed or identified as part of the adoption of the Land Development Code. **Table 1D** presents the two zoning categories, the zoning districts contained within each category, and the noise-sensitive uses allowed in each district.

Combined, the zoning categories contain a total of 35 zoning districts including 15 residential districts and 20 non-residential districts. These zones include two overlay zones, one of which is an airport overlay. Lot sizes in many of the districts are dependant on the type of land use planned for the parcel (i.e. single-family dwelling, office space, etc.).

TABLE 1D Summary of Zoning Ordinance City of Flagstaff	Noise-Sensitive Uses		
Zoning Districts	**Allowed**	**Permitted Conditional/Special Uses**	**Minimum Lot Size or Dwelling Units (du)/Acre**
Zoning for Existing Development			
R-R-E, single-family residential rural	Single-family dwellings Condominiums Bed and breakfast establishments	Churches and church-related facilities Day nurseries Schools Hospitals Residential housing for chronically ill, domestic violence victims, outpatient clinics, and developmentally disabled	1 acre
R-S-E, single-family suburban residential	Same as R-R-E	Same as R-R-E	Single-family, 1 du/ 15,000 s.f.
R-1-E, single family residential	Same as R-R-E	Same as R-R-E	Single-family, 1du/ 7,000 s.f.
RM-L-E, one and two-family residential	Same as R-R-E Two-family dwellings Secondary single-family	Same as R-R-E	Single-family, 1 du/ 6,000 s.f. Two-family, 3,000 s.f. per family
RM-M-E, multiple-family residential	Same as RM-L-E Multiple-family dwellings Planned residential development	Same as R-R-E Fraternities and fraternity houses and sororities and sorority houses	Minimum lot size 1,500 s.f.
M-H-E, manufactured home park	Manufactured home subdivision Manufactured homes Manufactured home rental park	Same as R-R-E Civic and community clubs Single-family residence for owner or park manager Schools Recreational vehicle or travel trailer parks and facilities	Minimum lot size 4,000 s.f.

TABLE 1D (Continued) **Summary of Zoning Ordinance** **City of Flagstaff**	**Noise-Sensitive Uses**		
Zoning Districts	**Allowed**	**Permitted Conditional/Special Uses**	**Minimum Lot Size or Dwelling Units (du)/Acre**
Zoning for Existing Development (Continued)			
C-1-E, neighborhood commercial	Bed and breakfast establishments	Same as R-R-E Single-family residences	N/A
C-2-E, community commercial	Bed and breakfast establishments Small unit single-family	Same as R-R-E Trade schools Lodges or fraternal associations including union halls Fraternities and fraternity houses and sororities and sorority houses Residential uses	N/A
C-3-E, highway commercial	Motels, hotels, and bed and breakfasts Recreational vehicle or travel trailer parks Small unit single-family	Same as R-R-E Large scale planned development Trade schools Lodges or fraternal associations including union halls Residential uses	N/A
C-4-E, commercial service	Travel trailer parks and facilities Bed and breakfast establishments	Same as R-R-E Trade schools Lodges or fraternal association including union halls Single-family residence or apartment for owner, manager, or caretaker of permitted use	N/A
C-5-E, Central business	Hotels and motels Bed and breakfast establishments	Same as R-R-E Trade schools Lodges or fraternal associations including union halls Single-family, two-family, and multiple-family	N/A

TABLE 1D (Continued)
Summary of Zoning Ordinance
City of Flagstaff

	Noise-Sensitive Uses		
Zoning Districts	**Allowed**	**Permitted Conditional/Special Uses**	**Minimum Lot Size or Dwelling Units (du)/Acre**
Zoning for Existing Development (Continued)			
I-1-E, Restricted industrial	None	Same as R-R-E Trade schools Single-family residence for owner, manager or caretaker of a permitted use	N/A
I-2-E, Intermediate industrial	None	Same as I-1-E	N/A
I-3-E, Intensive industrial	None	Same as I-1-E	N/A
R&D-E, Research and development industrial	Traded or vocational training schools Living quarters for caretaker or security personnel	None	N/A
PL-O&B-E, Public lands open space and buildings	Public schools Universities or Colleges Museums, observatories, and similar quasi-public facilities	Residences for caretakers and necessary employees and associates	N/A
Zoning for New Development			
RR, rural residential	Single-family Cluster Planned Bed and breakfast establishments	Commercial camp ground	0.2 du/1 acre
ER, estate residential	Same as RR	Institutional residential	1 du/acre
SR, suburban residential	Same as RR	Same as ER	1 du/15,000 s.f.
R-1, residential	Same as RR	Same as ER	1 du/7,000 s.f.
UR, urban residential	Same as RR	Same as ER	1 du/6,000 s.f.
MR, medium density residential	Single-family Planned Bed and breakfast establishments	Same as ER	determined by type of structure

TABLE 1D (Continued) Summary of Zoning Ordinance City of Flagstaff	Noise-Sensitive Uses		
Zoning Districts	Allowed	Permitted Conditional/Special Uses	Minimum Lot Size or Dwelling Units (du)/Acre
Zoning for New Development (Continued)			
HR, high density residential	Same as MR	Fraternities and sororities Institutional residential	determined by type of structure
RB, residential business	Single-family Commercial apartments	Planned Fraternities and sororities Institutional residential	1 du/5,000 s.f.
MH, manufactured homes	Single-family Planned Manufactured homes parks and subdivisions	Institutional residential	Minimum lot size 4,000 s.f.
UC, urban commercial	Commercial apartments Small unit single-family	Planned Institutional residential	N/A
SC, suburban commercial	Commercial apartments	Institutional residential Commercial camp grounds	N/A
BP, business park	None	None	N/A
BPI, business park intermediate	None	None	N/A
LI, light industrial	None	Commercial apartments	N/A
HI, heavy industrial	None	None	N/A
PL, public lands	Universities	Institutional residential	N/A
PLF, public lands forest	None	None	N/A
Source: City of Flagstaff Land Development Code			

- OVERLAY DISTRICTS

Overlay zoning is intended to provide a layer of special purpose regulations in order to address special environmental constraints or problems. This is accomplished by setting performance standards and creating one or more special zoning districts that supplement, or combine with, the regulations of the general purpose zoning districts.

Overlay zoning regulations are usually established as "combining" regulations in that the underlying zoning remains in place and is supplemented by the noise overlay zone. The land within the noise overlay zone is subject to the requirements of two zoning districts – the underlying zone and the overlay zone. The strictest requirements of both zones apply to the affected property. The two overlay districts contained within the Land Development Code are as follows.

Historic Design Review Overlay. The purpose of this overlay district is to provide design guidelines for the development of properties which are contained within the overlay district. The overlay is intended to preserve the uniqueness of the structures within the district.

Airport Overlay District. The purpose of this district is to ensure compatible development within airport environs. Both land use and height restrictions are outlined within the overlay district. Furthermore, the district is provided to inform landowners and future landowners of the potential affect of airport operations on their property.

Three Airport Noise Impact Areas and one Clear Zone Area are established within these overlay zones. The purpose of the Clear Zone Area is to regulate the height of structures within the airport environs. The boundaries of the Airport Noise Impact Areas regulate land uses within the three impact areas. These impact areas change automatically as new contours are developed as part of the Airport Master Plan Updates. The boundaries of the three impact areas are depicted on **Exhibit 1L** and described as follows:

- AP-1 contains the areas within the 60 to 65 DNL noise contour.
- AP-2 contains the areas within the 65 to 70 DNL noise contour.
- AP-3 contains the areas within the 70 to 75 DNL noise contour.

Table 1E contains a modification of the uses allowed within each zone according to Table 10-03-008-0002 of the Land Development Code.

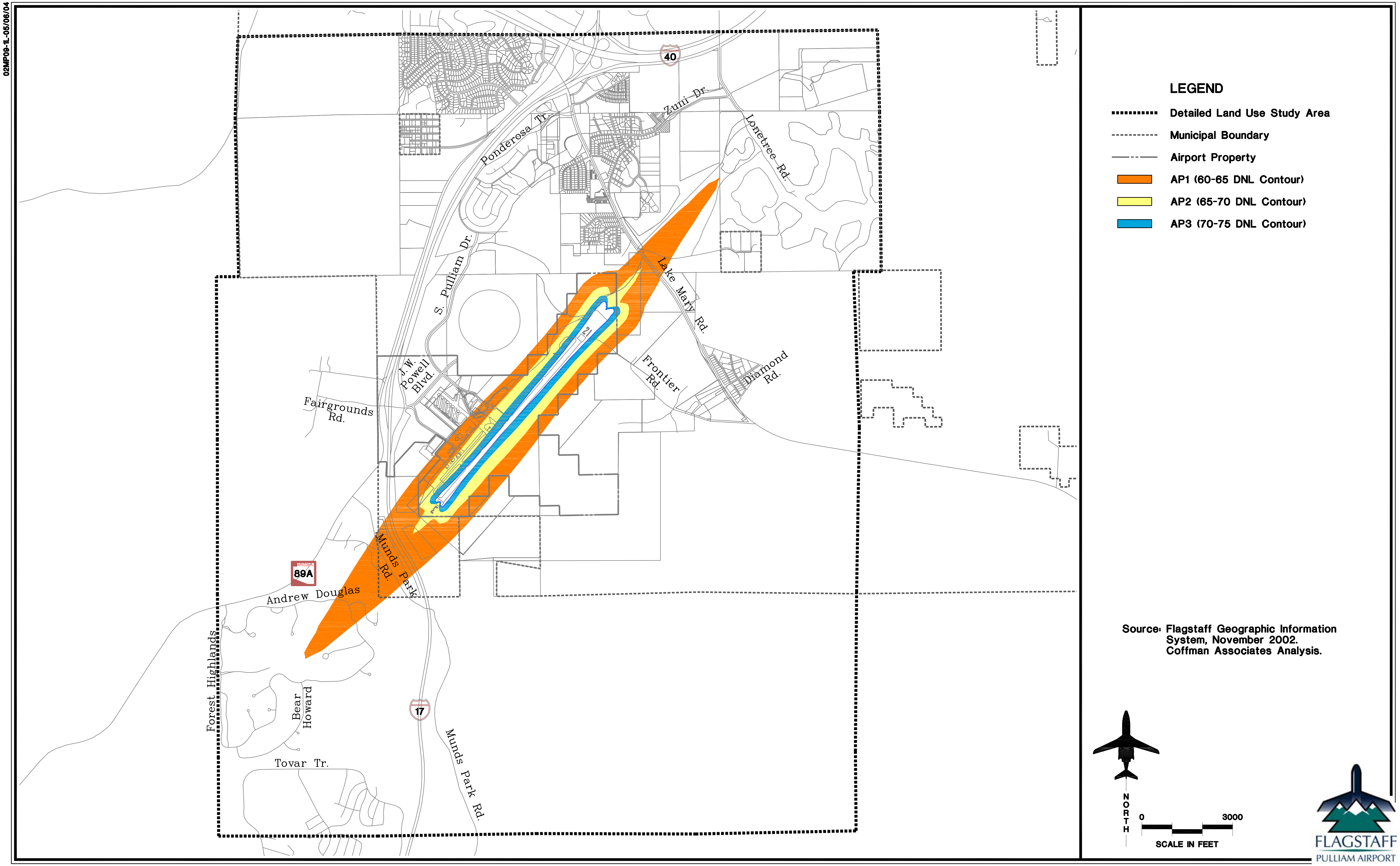

Exhibit 1L
AIRPORT OVERLAY DISTRICTS

TABLE 1E
Airport Overlay District

Land Use	AP-1 60-65 DNL Contour	AP-2 65-70 DNL Contour	AP-3 70-75 DNL Contour
Ranching and Forestry	Y[4]	Y[4]	Y[5]
Residential:			
Single-family	25	25[1]	N
Cluster	25	25[1]	N
Planned	25	25[1]	N
Manufactured Housing	N	N	N
Commercial Apartments	25	25[1]	N
Fraternities/Sororities	25	25[1]	N
Industrial Uses	Y	Y	Y[2]
Commercial Retail	Y	Y	Y[5]
Heavy Retail/Heavy Services	Y	Y	Y[2]
Offices and Services	Y	Y	Y
Institutional Uses:			
Hospitals, nursing homes	N	N	N
Other medical facilities	Y	Y	25
Governmental	Y*	Y*	25*
Educational	N	N	N
Miscellaneous	Y	Y	25
Cultural, including churches	Y*	25*	30*
Nature exhibits	Y*	Y*	N
Public assembly	Y	Y	N
Auditoriums, concert halls	Y	25	30
Outdoor music shells, amphitheaters	Y*	N	N
Outdoor sports arenas, spectator sports	Y	Y[3]	Y[3]
Golf courses	Y*	Y*	25*
Resorts and group camps	Y*	Y*	N
Parks	Y*	Y*	Y*
Other	Y*	Y*	Y*

TABLE 1E (Continued)
Airport Overlay District

Land Use	AP-1 60-65 DNL Contour	AP-2 65-70 DNL Contour	AP-3 70-75 DNL Contour

Notes:

Y Yes. Land use and related structures compatible without restrictions.

Y* Yes, with restrictions. Measures to achieve a reduction of 25dB must be incorporated into the design and construction of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.

N No. Land use and related structures are not compatible and shall be prohibited.

* The designation of these uses as "compatible" in this area reflects individual federal agencies' consideration of general cost and feasibility factors, as well as past community experiences and objectives.

25 or 30 Land use and related structures generally compatible; measures to achieve a reduction of 25 or 30 dB must be incorporated into design and construction of structure.

25* or 30* Land uses generally compatible; however, measures to achieve overall reduction do not necessarily solve noise difficulties and additional evaluation is warranted.

1 (a) Although local conditions may require residential use, it is discouraged in AP-2 and strongly discouraged in AP-3. The absence of viable alternative development options should be determined and an evaluation indicating that a demonstrated community need for residential use would not be met if development were prohibited in these areas and should be conducted prior to approvals.

(b) Where the City determines that residential uses must be allowed, measures to achieve outdoor-to-indoor noise level reduction of at least 25 dB (AP-2) and 30 dB (AP-3) should be incorporated into building codes and be considered individual approvals.

(c) Noise level reduction criteria will not eliminate outdoor noise problems. However, building location and site planning, design and use of berms and barriers can help mitigate outdoor noise exposure particularly from ground level sources. Measures that reduce noise at a site should be used wherever practicable in preference to measures which only protect interior spaces.

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

3 Land use compatible provided special sound reinforcement systems are installed which mitigated indoor sound impacts.

4 These buildings intended for human occupancy require a net level reduction of 25 dB.

5 Residential buildings require a net level reduction of 30 dB.

- AVIGATION AREA ZONE

The Avigation Area Zone (also referred to as the airport influence area) depicted on **Exhibit 1A** was established to protect the airport from continued encroachment and development as well as to make existing and potential landowners aware of the impact the airport may have on property. The owners of property within the Avigation Area Zone shall dedicate an avigation easement to the City of Flagstaff upon one or more of the following events:

1. Annexation into the City of Flagstaff.
2. Rezoning for uses allowed under the Land Development Code.
3. Approval of a subdivision plat or replat.
4. Approval of a conditional use permit.
5. Approval of a variance.
6. Approval of a lot split.
7. Approval of an amendment to the General Plan.
8. Issuance of a building permit for a residential dwelling when the proposed construction is equal to either 50 percent of the square footage of the dwelling or 50 percent of the appraised value of the dwelling.

Coconino County Zoning Ordinance

The zoning ordinance for Coconino County was adopted by the County Board of Supervisors on August 3, 1981. The ordinance contains a total of 26 zoning districts including one general zone, nine residential zones, and two planned development zones. Lot sizes in many of the districts are dependant on the type of land use planned for the parcel (i.e. single-family dwelling, office space, etc.). **Table 1F** summarizes the Coconino County's zoning districts and the noise-sensitive uses allowed in each district.

TABLE 1F
Summary of Zoning Ordinance
Coconino County

	Noise-Sensitive Uses		
Zoning Districts	**Allowed**	**Permitted Conditional/Special Uses**	**Minimum Lot Size or Dwelling Units (du)/Acre**
G, General Zone	Single-family dwelling or modular home Manufactured home Day care center Group homes for the disabled Guest houses	Travel trailer Pre-school Hospitals Churches and church-related facilities Educational institutions Libraries and museums Other group homes Bed and breakfast establishments	1 du/10 acres
AR, Agricultural Residential Zone	Same as G	Same as G	1 du/acre
RR, Rural Residential Zone	Single-family dwelling or modular home Day care center Group homes for the disabled Guest houses	Same as G	1 du/acre
RS-6000, Residential Single-Family Zone	Same as RR	Other group homes Pre-school Hospitals Churches and other church-related facilities Educational institutions Libraries and museums	6 du/acre
RS-10000, Residential Single-Family Zone	Same as RR	Same as RS-6000	4 du/acre
RS-18000, Residential Single-Family Zone	Same as RR	Same as RS-6000	2 du/acre
RS-36000, Residential Single-Family Zone	Same as RR	Same as RS-6000	1 du/acre
RM-10/A, Residential Multiple-Family Zone	Same as RR Apartments Day care	Same as RS-6000 Condominiums Dormitories Bed and breakfast establishments	10 du/acre
RM-20/A, Residential Multiple-Family Zone	Same as RM-10/A	Same as RM-10/A	20 du/acre

TABLE 1F (Continued)
Summary of Zoning Ordinance
Coconino County

	Noise-Sensitive Uses		
Zoning Districts	**Allowed**	**Permitted Conditional/Special Uses**	**Minimum Lot Size or Dwelling Units (du)/Acre**
CN-2/A, Commercial Neighborhood Zone	None	Day care centers and pre-schools Commercial trade or Vocational schools Libraries and museums	N/A
CG-10000, Commercial General Zone	None	Recreational vehicle and travel trailer parks Hotels and motels Day care centers and pre-schools Churches and church-related facilities Clubs and lodges	N/A
CH-10000, Commercial Heavy Zone	Hotels and motels	Same as CG-10000	N/A
MP-20000, Industrial Park Zone	Caretakers living quarters	None	N/A
M-1-10000, Light Industrial Zone	Same as MP-20000	None	N/A
M-2-6000, Heavy Industrial Zone	Same as MP-20000	None	N/A
MHP, Mobile Home Park Zone	Manufactured home, Mobile home Modular home Day care centers	Pre-schools Group homes Churches and church-related facilities Educational institutions	Minimum lot size, 4000 s.f. (Parks and rental spaces) Minimum lot size, 5000 s.f. (Subdivided lots)
PRD, Planned Residential Development	Planned residential developments Guest house and accessory living quarters Day care centers	None	Determined by type of structure
PC, Planned Community Zone	Continuation of all existing land uses	N/A	Determined by type of structure

TABLE 1F (Continued) Summary of Zoning Ordinance Coconino County	Noise-Sensitive Uses		
Zoning Districts	**Allowed**	**Permitted Conditional/Special Uses**	**Minimum Lot Size or Dwelling Units (du)/Acre**
PS, Public and Semi-Public Zone	None	Hospitals Public or Private non-profit schools and colleges	N/A
OS, Open Space and Conservation Zone	None	None	N/A
FPM, Flood Plain Management Overlay Zone	N/A	N/A	N/A
RC, Resort Commercial Zone	Residential units of various types designed for resort guests	None	N/A
P, Parking Zone	None	None	N/A
MR, Mineral Resource Zone	Caretakers or watchmen residences	None	N/A
DRO, Design Review Overlay Zone	N/A	N/A	N/A
RMH, Residential and Mobile Home Zone	Single-family dwellings Manufactured or modular homes Day care centers	Same as RS-6000	6 du/acre

Source: Coconino County Zoning Ordinance

Summary of Zoning Classifications

The various zoning districts of each jurisdiction have been combined into generalized zoning categories. The generalized zoning patterns within the study area are shown in **Exhibit 1M** and summarized in **Table 1G**.

- RESIDENTIAL CATEGORIES

The "Very Low Density Residential" category applies to districts with densities of 0.20 dwelling units or less per acre. The "Low Density Residential" category applies to districts with densities of .021 to 5.0 dwelling

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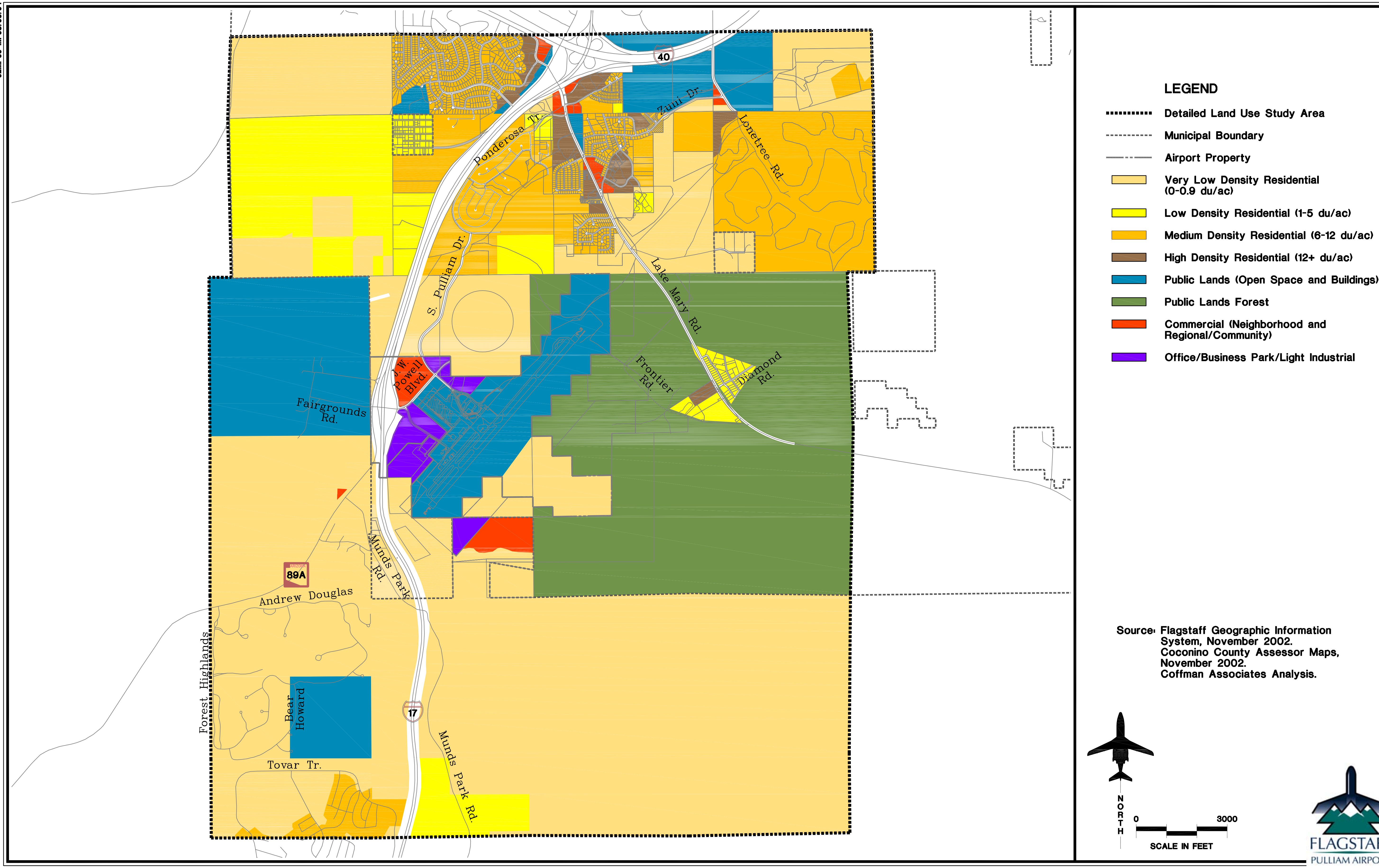

Exhibit 1M
GENERALIZED ZONING MAP

units per acre. The "Medium Density Residential" category applies to districts with densities of 5.1 to 12.0 dwelling units per acre. The "High Density Residential" category applies to single-family and multi-family zones with densities greater than 12 dwelling units per acre. The density of units allowed in the "Planned Development" category is determined during the plan approval and/or permitting process.

- NON-RESIDENTIAL CATEGORIES

The "Commercial" and "Industrial and Transportation" categories include office, manufacturing, and service districts. "Public" refers to districts containing public uses such as schools and the airport. "Parks and Open Space" includes the parks and public areas within the study area.

TABLE 1G
Classification of Zoning Districts

Generalized Zoning Category	City of Flagstaff	Coconino County
Very Low Density Residential (<0.20 du/acre)	RR	G
Low Density Residential (0.021 - 5.0 du/acre)	R-R-E, R-S-E, ER, SR	AR, RR, RS-10,000, RS-18,000, RS-36,000
Medium Density Residential (5.1 - 12.0 du/acre)	R-1-E, M-H-E, R1, UR, MR, RB, MH	RS-6,000, RM-10/A, MHP, RMH
High Density Residential (12.0+ du/acre)	R-M-M-E, HR, RM-L-E	RM-20/A
Planned Development		PRD, PC
Commercial	C-1-E, C-2-E, C-3-E, C-4-E, C-5-E, UC, SC	CN-2/A, CG-10000, CH-10000, RC
Industrial and Transportation	I-1-E, I-2-E, I-3-E, R&D-E, BP, LI, HI	MP-20000, MI-10000, M2-6000
Public	PL-O, B-E	PS
Parks and Open Space	PL, PLF	OS, MR

SUBDIVISION REGULATIONS

Subdivision regulations apply in cases where a parcel of land is proposed to be divided into lots or tracts. They are established to ensure the proper arrangement of streets, adequate and convenient open space, efficient movement of traffic, adequate and properly located utilities, access for firefighting apparatus, avoidance of congestion, and the orderly and efficient layout and use of the land.

Subdivision regulations can be used to enhance noise-compatible land development by requiring developers to plat and develop land so as to minimize noise impacts or reduce the noise sensitivity of new development. The regulations can also be used to protect the airport proprietor from litigation for noise impacts at a later date. The most common requirement is the dedication of a noise or avigation easement to the Airport proprietor by the land developer as a condition of development approval. The easement authorizes overflights of the property, with noise levels attendant to such operations. It also requires the developer to provide noise insulation in the construction of buildings.

Both the City of Flagstaff and Coconino County have adopted subdivision regulations. A description of the various regulations is contained within the following sections.

City of Flagstaff

The City of Flagstaff's subdivision regulations are contained within the City's Land Development Code. The purpose of the City's subdivision regulations is to ensure that the policies outlined in the City's general plan are reflected within each subdivision; needed housing is provided; growth occurs in an orderly manner ensuring that proper public facilities are provided (i.e. fire stations, schools); and to protect the health, safety, and welfare of the community at-large.

The development regulations for the areas surrounding the airport, as outlined within the zoning ordinance for the City, are not directly referenced within the subdivision regulations. However, reference is made to complying with all requirements of the zoning for specific parcels of land.

Coconino County

Coconino County's subdivision ordinance was adopted on May 3, 1982. Existing regulations relating to land use around the airport are not referred to within the ordinance.

BUILDING CODES

Building codes regulate the construction of buildings, ensuring that they are constructed to safe standards. Building codes may be used to require sound insulation in new residential, office, and institutional buildings when warranted by existing or potential high aircraft noise levels. The City of Flagstaff and Coconino County have both adopted building codes. No additional regulations related to noise in the vicinity of Flagstaff Pulliam Airport have been adopted.

CAPITAL IMPROVEMENT PROGRAM

Capital improvement programs (CIPs) are multi-year plans, typically covering five or six years, which outline major capital improvements planned to be undertaken by a particular jurisdiction. The CIP does not include facility improvements that are proposed to be funded entirely by developers.

Most capital improvements have no direct bearing on noise compatibility as few municipal developments are noise-sensitive. The obvious exceptions to this are schools and, in certain circumstances, libraries, medical facilities, and cultural/recreational facilities. The noise compatibility planning process includes a review of planned facilities of these types as a matter of course.

Some capital improvements, however, may have an indirect, but more profound, relationship to noise compatibility. For instance, sewer and water facilities may open up large vacant areas for private development of noise-sensitive residential uses. In contrast, the same types of facilities, sized for industrial users, could permit industrial development in the same noise impacted area that might otherwise be attractive for residential development on septic tanks.

CIP projects in the vicinity of Flagstaff Pulliam Airport are outlined within the *Flagstaff Area Regional Land Use and Transportation Plan* and consist primarily of the construction of roadways.

SUMMARY

The information presented in this chapter provides a foundation upon which the remaining elements of the planning process will be constructed. Information on current airport facilities and utilization serve as a basis for the development of the aircraft noise analyses during the next phase of the study. This information will, in turn, provide guidance to the assessment of potential changes to aviation facilities or procedures necessary to meet the goals of the planning process. The inventory of the airport environs will allow the assessment of airport noise impacts.

FLAGSTAFF
PULLIAM AIRPORT

Chapter Two

FORECASTS

Chapter Two

FORECASTS

The purpose of this chapter is to examine the existing and potential demand for aviation activity at Flagstaff Pulliam Airport (FLG). This begins with a definition of the demand that may occur over a specified period. The projected demand levels can then be analyzed to determine future noise exposure and impacts in the vicinity of Flagstaff Pulliam Airport.

Air transportation is a unique industry that has experienced wide fluctuations in growth and decline. For this reason, it is important for airports to evaluate their current position and examine future demand potential on a regular basis. This holds especially true today given limited public funding mechanisms and increased needs of the aviation community.

The primary objective of this planning effort is to define the magnitude of change that can be expected over time. Because of the cyclical nature of the economy, it is virtually impossible to predict with certainty year-to-year fluctuations in activity when looking as far as ten years into the future. However, a trend can be established which delineates long-term growth potential. While a single line is often used to express the anticipated growth, actual growth may fluctuate above and below this line. It is important to understand that forecasts serve primarily as guidelines, as aviation activity is affected by many external influences, especially by the types of aircraft used and the nature of available facilities.

Although publicly owned and operated, airports operate in a similar manner to the private business environment. Airports provide much needed services to the community and should recognize their position and establish well-planned goals in order to better serve

the community. Marketing efforts and facility development are matched to goals so that the airport can best serve the community.

In order to fully assess current and future aviation demand for Flagstaff Pulliam Airport, an examination of several key factors is needed. Forecasting should consider national and regional aviation trends, historical and forecast socioeconomic and demographic information of the area, and competing transportation modes and facilities. Consideration and analysis of these factors will ensure a comprehensive outlook for future aviation demand at the Flagstaff Pulliam Airport.

NATIONAL AVIATION TRENDS

Each year, the Federal Aviation Administration (FAA) publishes its national aviation forecast. Included in this publication are forecasts for air carriers, regional/commuters, general aviation, and FAA workload measures. The forecasts are prepared to meet budget and planning needs of the constituent units of the FAA and to provide information that can be used by state and local authorities, the aviation industry, and by the general public.

The current edition when this chapter was prepared was FAA **Aerospace Forecasts-Fiscal Years 2002-2013**, published in March 2002. The forecasts use the economic performance of the United States as an indicator of future aviation industry growth. Similar economic analyses are applied to the outlook for aviation growth in international markets.

In 2002, the overall demand for aviation services was expected to decline significantly. Positive growth was not expected to be achieved until 2003, and even then, the level of enplanements may not return to or surpass those of 2001, until 2004. While the majority of this decline was forecast to occur with the large air carriers, the regional airline industry was expected to achieve small levels of growth in 2002, possibly returning to its long-term historical growth trend in 2003. Air cargo traffic was expected to grow at rates similar to those predicted for passenger traffic. After 2004, general aviation is expected to achieve low-to-moderate increases in the active fleet and hours flown, with most of the growth occurring in business/corporate flying. Combined aviation activity at FAA and contract airport traffic control facilities is expected to increase at significantly higher rates than those predicted for general aviation.

The forecasts prepared by the FAA assume that aviation demand will follow a similar path to recovery, as with previous terrorist or war-related incidents. In each instance, traffic and revenue growth resumed within a year. However, the events of September 11 have had a much more significant effect on the aviation industry and, therefore, must be taken into consideration in the following forecasts.

MAJOR AIRLINES

Immediately after September 11, the air carriers in the United States reduced their domestic capacity (available seat-miles) 20 percent. The FAA projects this capacity to gradually return to pre-September 11 capacity levels over a three-year period. After that, capacity is projected to increase at an annual rate of 4.1 percent. Revenue passenger miles (RPMs) and enplanements were expected to decline in 2002, recover in 2003, then return to normal growth trends of 4.2 and 3.8 percent annually.

Domestic load factors declined in 2001 and 2002 to 68.2 percent, but are now expected to grow back to 72.5 percent over the next two years, then slowly increase to 73.2 percent by 2013. Passenger yields also took a hit after September 11. Yields declined by 3.5 percent in 2001, with another decline of 3.4 percent expected in 2002. The FAA forecasts yields to rebound in 2003 (7.9 percent), then average 1.2 percent growth per year. This equates to a 1.2 percent annual decline in inflation-adjusted yields. This is expected as the low-fare carriers continue to exert pressure to keep prices competitive.

This is leading to structural changes in the higher cost airlines to increase efficiency and productivity. The airlines have laid off thousands of employees and retired hundreds of aircraft over the past year. Airline negotiations with many of its unions have centered primarily around concessions by the labor groups. This includes not only wage expectations, but also accelerated transfer of routes to regional airline affiliates. The anticipated trends for the regional/commuter airlines are discussed next.

REGIONAL/COMMUTER AIRLINES

The regional/commuter airline industry, defined as air carriers providing regularly scheduled passenger service and fleets composed primarily of aircraft having 60 seats or less, continues to be the strongest growth sector of the commercial air carrier industry. Dramatic growth in code-sharing agreements with the major carriers, followed by a wave of air carrier acquisitions and purchases of equity interests, has resulted in the transfer of large numbers of short-haul jet routes to their regional partners, fueling the industry's growth.

Despite the events of September 11, many regionals/commuters were able to maintain their previous flight schedules. Many have even increased their flight schedules in response to the transfer of additional routes from their larger code-sharing partners. Regional/commuter capacity and traffic continued to grow in 2001, enplaning 79.4 million passengers in the fiscal year. This is an increase of 0.8 percent over 2000. The regionals/commuters achieved a load factor of 58.6 percent in 2001, an increase of 0.3 percent over the previous year.

Industry growth is expected to outpace that of the larger commercial air carriers. The introduction of new state-of-the-art aircraft, especially high-speed turboprops and regional jets with trip ranges of well over 1,000 miles, is expected to open up new opportunities for growth in non-traditional markets. The regional airline industry will also continue to benefit from continued integration with the larger air carriers. The further need for larger commercial air carriers to reduce costs and fleet size will insure that these carriers continue to transfer smaller, marginally profitable routes to the regional air carriers.

Likewise, the increased use of regional jets is expected to lead to another round of route rationalization by the larger commercial carriers, particularly on low-density routes in the 500-mile range. Regional jet aircraft can serve these markets with the speed and comfort of a large jet, while at the same time providing greater service frequency that is not economically feasible with the speed and comfort of a large jet. This is expected to contribute to strong growth during the early portion of the planning period, although this phenomenon is expected to diminish during the mid-to-latter portion.

Passenger enplanements are expected to increase at an average annual rate of 5.5 percent during the FAA's 12-year forecast period, from 79.7 million in 2001, to 151.5 million in 2013. In 2013, regionals/commuters are expected to transport 16.6 percent of all passengers in scheduled domestic air service. This is an increase of 12.7 percent from 2001. This greater use of regional jets results in the average seating capacity of the regional fleet increasing from 39.9 seats in 2001, to 48.4 seats in 2013. **Exhibit 2A** depicts passenger enplanements and fleet mix forecasts for the U.S. regional/commuter market.

GENERAL AVIATION

Following more than a decade of decline, the general aviation industry was revitalized with the passage of the *General Aviation Revitalization Act* in 1994, which limits the liability on general aviation aircraft to 18 years from the date of manufacture. This legislation sparked an interest to renew the manufacturing of general aviation aircraft due to the reduction in product liability, as well as renewed optimism for the industry. The high cost of product liability insurance was a major factor in the decision by many American aircraft manufacturers to slow or discontinue the production of general aviation aircraft.

However, this continued growth in the general aviation industry appears to have slowed considerably in 2001, negatively impacted by the events of September 11. Thousands of general aviation aircraft were grounded for weeks, due to "no-fly zone" restrictions imposed on operations of aircraft in security-sensitive areas. Well into 2002,some U.S. airports in and around Washington, D.C., and New York City remained closed to visual flight rules (VFR) traffic. This, in addition to the economic recession already taking place in 2001-02, has had a profoundly negative impact on the general aviation industry.

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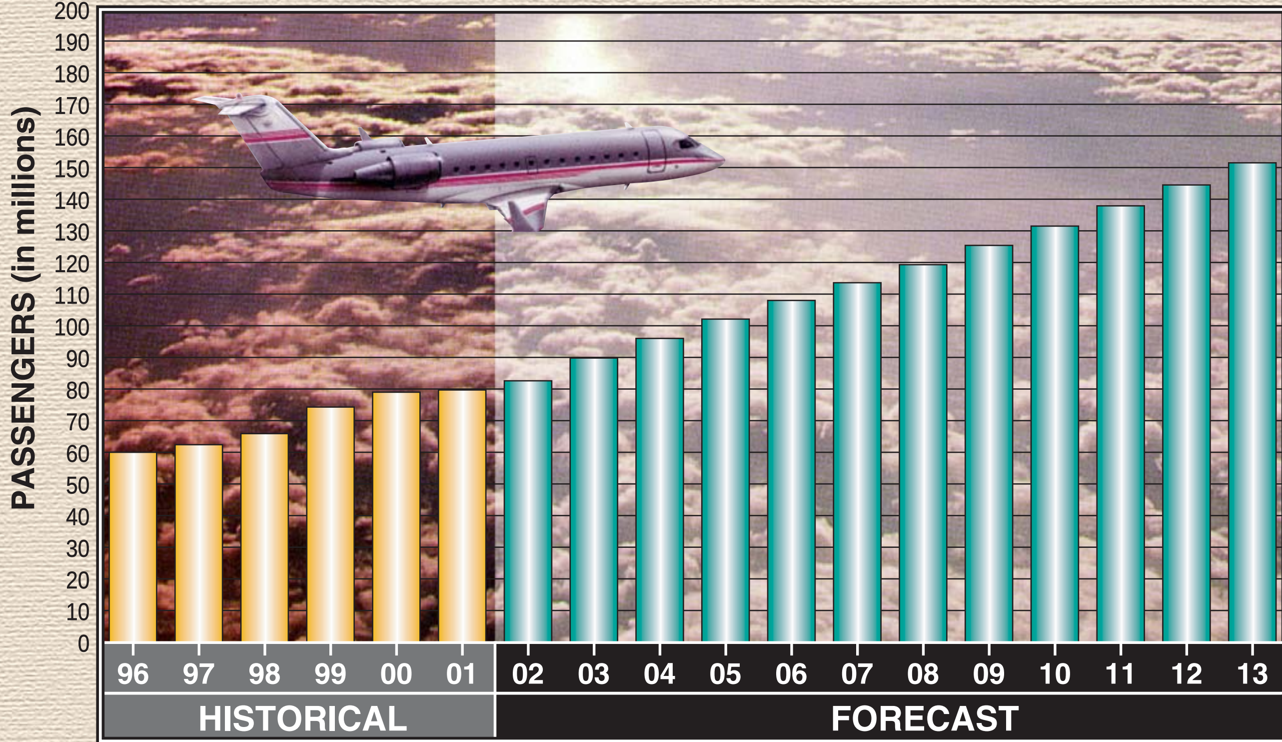
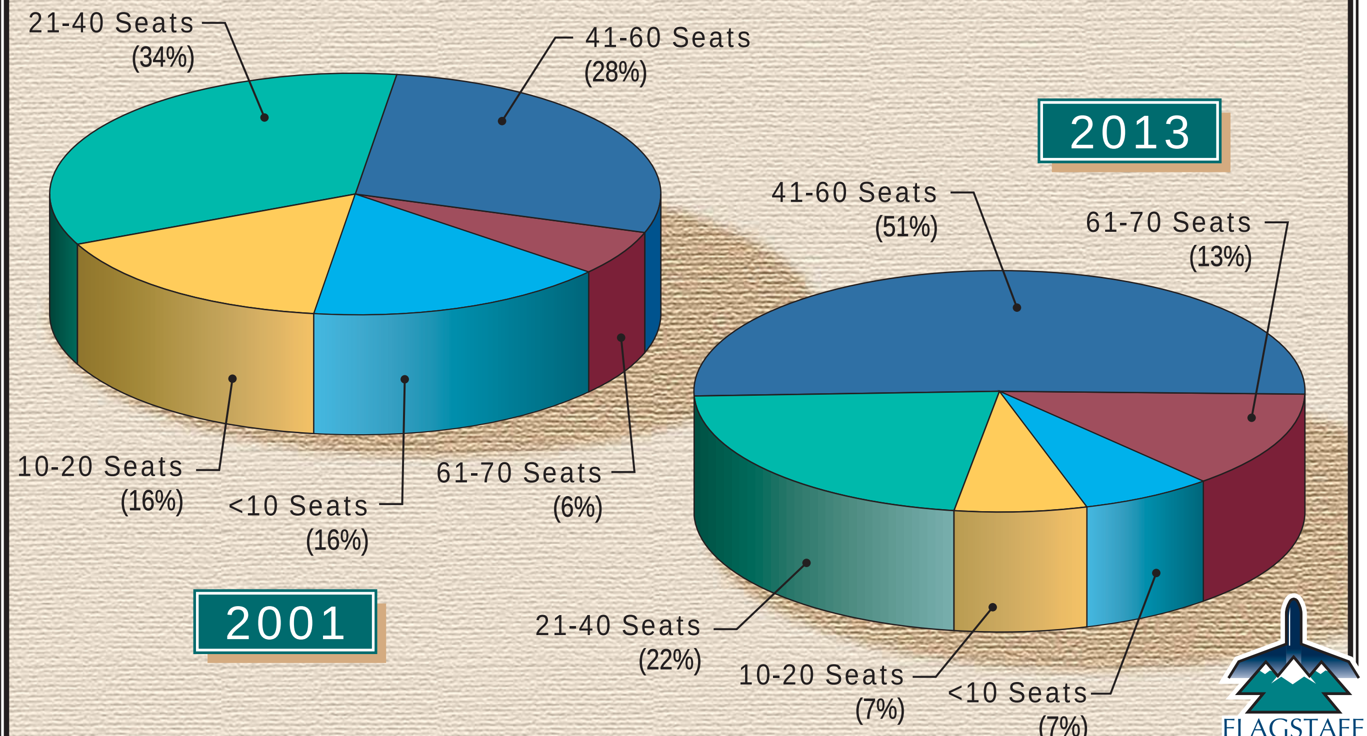
U.S. REGIONAL/COMMUTER SCHEDULED PASSENGER ENPLANEMENTS



Source: FAA Aerospace Forecasts, FY 2002-2013

PERCENT BY AIRCRAFT SEAT SIZE



FLAGSTAFF PULLIAM AIRPORT

Exhibit 2A
U.S. REGIONAL/COMMUTER FORECASTS

According to a report released by the General Aviation Manufacturers Association (GAMA), aircraft shipments in 2001 were down 13.4 percent for the third quarter and 6.2 percent year-to-date. The Aerospace Industries Association of America (AIAA) expects general aviation shipments to decline for the first time since 1994, down 8.8 percent, to 2,556 aircraft. The number of general aviation hours flown is projected to decline by 2.2 percent in 2002 and increase by only 0.4 percent the following year.

At the end of 2001, the total pilot population, including student, private, commercial, and airline transport, was estimated at 649,957. This is an increase of 3.9 percent, or 24,000 pilots, from 2000. Student pilots were the only group to experience a decrease in 2001, down 6.6 percent from 2000. The number of student pilots is projected to decline by 4.5 percent in 2002, and an additional 1.2 percent the following year. After 2004, the number of student pilots is expected to increase at an average annual rate of 1.0 percent, totaling 90,000 in 2013, which is less than the number recorded in 2000 (93,064).

However, the events of September 11 have not had the same negative impact on the business/corporate side of general aviation. The increased security measures placed on commercial flights has increased interest in fractional and corporate aircraft ownership, as well as on-demand charter flights. This is reflected in the forecast of active general aviation pilots (excluding air transport pilots), which are projected to increase by 54,000 (0.8 percent annually) over the forecast period.

According to the FAA, general aviation operations and general aviation aircraft handled at enroute traffic control centers increased for the ninth consecutive year. The forecast for general aviation aircraft assumes that business use of general aviation will expand much more rapidly than personal/sport use, due largely to the expected growth in fractional ownership.

In 2000, there was an estimated 217,533 active general aviation aircraft, representing a decrease of 0.9 percent from the previous year and the first decline in five years. **Exhibit 2B** depicts the FAA forecast for active general aviation aircraft in the United States. The FAA forecasts general aviation aircraft to increase at an average annual rate of 0.3 percent over the 13-year forecast period. Single-engine piston aircraft are expected to decline in the short-term, and then begin a period of growth after 2004. Multi-engine piston aircraft are expected to remain relatively flat throughout the forecast period. Turbine-powered aircraft are expected to grow at an average annual rate of 2.1 percent over the forecast period, while turbojet aircraft are expected to grow at an annual average growth rate of 3.4 percent. This strong growth rate for turbojet aircraft can be attributed to the growth in the fractional ownership industry, new product offerings (which include new entry level aircraft and long-range global jets), and a shift away from commercial travel by many travelers and corporations.

Manufacturer and industry programs and initiatives continue to revitalize the general aviation industry with a variety of programs. For example, Piper Aircraft Company has created Piper Financial Services (PFS) to offer competitive interest rates and/or leasing of Piper aircraft. Manufacturer and industry programs include the "No Plane, No Gain" program promoted jointly by the General Aviation Manufacturers Association (GAMA) and the National Business Aircraft Association (NBAA). This program was designed to promote the use of general aviation aircraft as an essential, cost-effective tool for businesses. Other programs are intended to promote growth in new pilot starts and to introduce people to general aviation. These include "Project Pilot" sponsored by the Aircraft Owners and Pilots Association (AOPA), "Flying Start" sponsored by the Experimental Aircraft Association (EAA), "Be a Pilot" jointly sponsored and supported by more than 100 industry organizations, and "Av Kids" sponsored by the NBAA. Over the years, programs such as these have played an important role in the success of general aviation and will continue to be vital to its growth in the future.

SERVICE AREA

The service area of an airport is defined by its proximity to other airports providing similar service. Flagstaff Pulliam Airport is one of three commercial airline airports in Coconino County. Coconino County has the largest land area in the state, virtually encompassing north-central Arizona. It is also the second largest county in the United States, but one of the most sparsely populated.

There are only five incorporated communities in Coconino County, with much of the County's land area dedicated to Indian Reservations, National Parks, forests, and recreation areas. The five cities support 54 percent of the County's population. Twenty (20) percent live on Indian Reservations, while 1.5 percent live on National Park Lands (primarily Grand Canyon Village). The remaining 24.5 percent live in unincorporated areas, 76 percent of which are within 10 miles of Flagstaff. Thus, more than 60 percent of the local County's population is within 10 miles of Flagstaff.

Page Municipal Airport's location in the northern reaches of the county, 134 miles from Flagstaff, limits its service primarily to the Page community, nearby Navajo Indian reservations, and the recreation and tourism generated from Lake Powell and the Glen Canyon Recreation Area. Grand Canyon Airport is 99 miles from Flagstaff. Its traffic is generated primarily by tourists to Grand Canyon National Park. Flagstaff Pulliam Airport also serves visitors to the Grand Canyon and its flight schedule is listed under Grand Canyon in the **Official Airline Guide (OAG)**.

The closest commercial service airport to Flagstaff is actually outside Coconino County to the southwest in Prescott.

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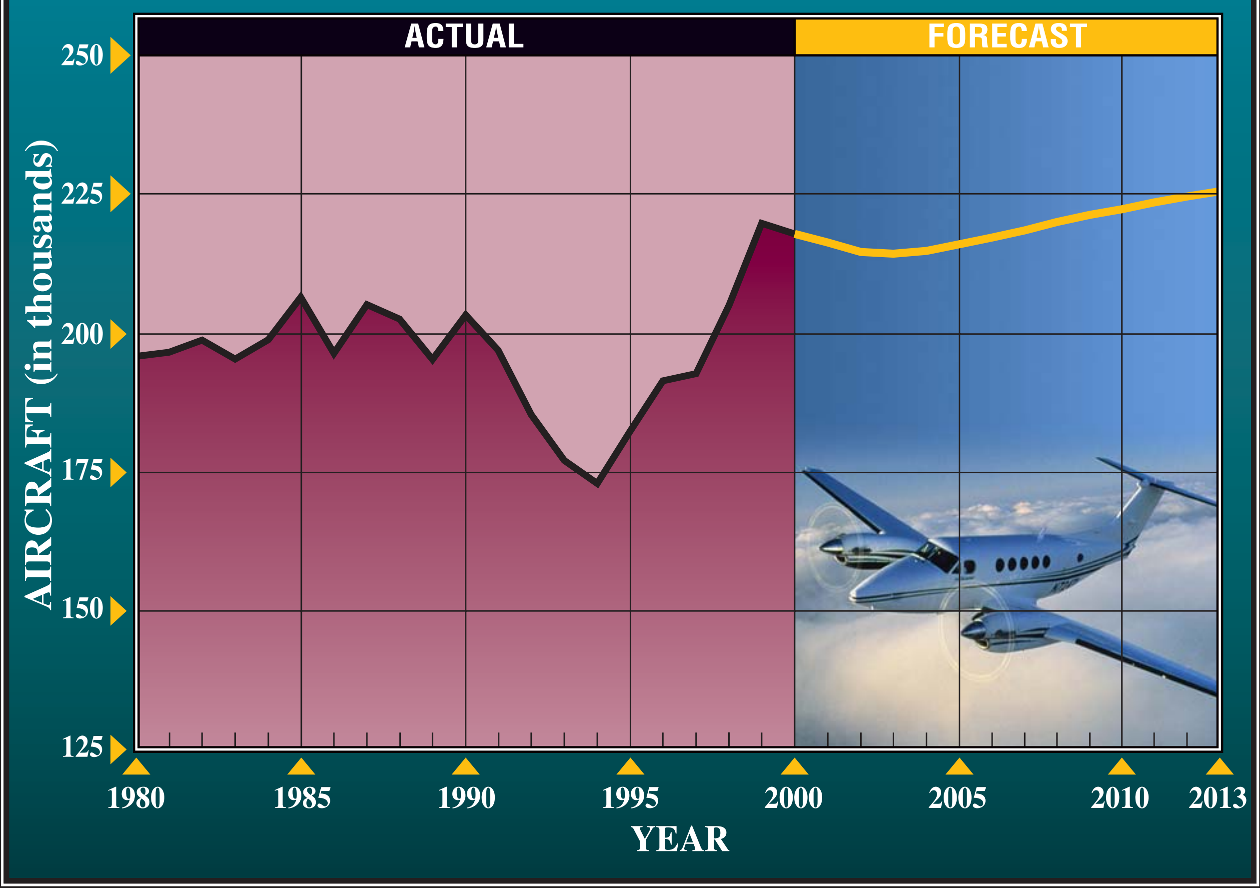
ACTIVE GENERAL AVIATION AIRCRAFT



U.S. ACTIVE GENERAL AVIATION AIRCRAFT (in thousands)

Year	FIXED WING				ROTORCRAFT				
	PISTON		TURBINE						
	Single Engine	Multi-Engine	Turboprop	Turbojet	Piston	Turbine	Experimental	Other	Total
2000 (Actual)	149.4	21.1	5.8	7.0	2.7	4.5	20.4	6.7	217.6
2003	146.0	20.7	5.7	7.5	2.6	4.3	20.4	6.7	213.9
2008	148.7	20.7	5.8	9.6	2.8	4.5	20.8	6.8	219.7
2013	152.0	20.7	5.9	10.9	2.9	4.6	21.4	6.9	225.3

Sources: FAA General Aviation and Air Taxi Activity (and Avionics) Surveys.
FAA Aerospace Forecasts, Fiscal Years 2002-2013.

Notes: An active aircraft is one that has a current registration and was flown at least one hour during the calendar year.

FLAGSTAFF
PULLIAM AIRPORT

Exhibit 2B
U.S. ACTIVE GENERAL AVIATION AIRCRAFT FORECASTS

This airport is more than 90 miles from Flagstaff. To the west, the closest airport with commercial service is in Show Low, over 140 miles away. Phoenix Sky Harbor International Airport is the destination for all Flagstaff Pulliam Airport scheduled service, but it also has the strongest pull on the Flagstaff market area. Located approximately 140 miles from Flagstaff, Sky Harbor draws many potential air travelers south on Interstate 17.

The general aviation service area is smaller than the commercial service area as there are other general aviation airports in closer proximity. In addition to the airports discussed previously, general aviation airports are located to the west at Williams, to the east at Winslow, and to the south at Sedona.

SOCIOECONOMIC TRENDS

Local and regional forecasts developed for key socioeconomic variables provide an indicator of the potential for creating growth in aviation activities at an airport. Three variables typically useful in evaluating potential for traffic growth are population, employment, and per capita personal income (PCPI).

Most of this data is readily available on an annual historic basis at the county level. Annual population estimates were available for Flagstaff as well, but have yet to be updated to coincide with the 2000 census. **Table 2A** presents the historic population information for Flagstaff and Coconino County. Since 1990, the annual information is based upon estimates, with the exception of the 2000 census data for Coconino County. The County estimates for 1991-1999 have been updated. This is important in that the estimates for 1999, prepared prior to the census, were nearly 8.0 percent higher than the census count for both the County and the City. County planning since the 2000 Census cites the census information, while City documents utilize the higher estimates.

The Arizona Department of Economic Security (DES) provides population forecasts for counties and communities in Arizona approximately every five years. The most recent projections were released in 1997. A check with the DES indicated that they will not submit a new set of projections until the Spring of 2003. **Table 2A** presents the DES forecasts for Flagstaff and Coconino County.

A more recent forecast of the county population by Woods and Poole takes into account the 2000 Census, and is presented on **Table 2B**. While this is not an officially accepted forecast, it does provide a more recent perspective of population trends for the area. Woods and Poole also provide forecasts of employment and per capita personal income by county. The Coconino County projections of these indicators are included in the table as well.

TABLE 2A
Population
Flagstaff and Coconino County

Year	City Population	County Population	City % of County
1970	26,117	48,326	54.04%
1980	34,743	75,008	46.32%
1990	45,857	96,591	47.48%
1991	47,881	99,647	48.05%
1992	49,460	102,498	48.25%
1993	51,030	105,570	48.34%
1994	52,599	108,680	48.40%
1995	53,711	110,954	48.41%
1996	54,979	112,686	48.79%
1997	56,383	114,444	49.27%
1998	56,787	114,874	49.43%
1999	57,078	115,307	49.50%
2000	57,200	116,320	49.17%
2001	57,700	118,290	48.78%
FORECASTS			
2005	66,552	135,595	49.08%
2010	71,981	147,352	48.85%
2015	77,133	158,753	48.59%
2025	86,697	179,555	48.28%

Forecasts: Arizona Department of Economic Security, April 1997.
Historic Data: U.S. Bureau of Economic Analysis.

AIRLINE ACTIVITY FORECASTS

Airline activity at Flagstaff Pulliam Airport has been primarily comprised of regional/commuter service since deregulation. Prior to deregulation, Flagstaff Pulliam Airport was served by Frontier Airlines and Cochise Airlines. Frontier utilized Convair 580 turboprops and DC-9s, while Cochise Airlines used small twin-engine aircraft.

With deregulation in place, Frontier ended service in August 1979, while Cochise Airlines continued to serve Flagstaff Pulliam Airport until declaring bankruptcy in 1982. During this period, SkyWest and Sun West Airlines started service to Flagstaff Pulliam Airport. This service was generally with a 19-seat turboprop or smaller aircraft.

In 1987, America West Airlines entered the market. The airline primarily used 37-seat DeHavilland Dash 8 turboprop aircraft, but occasionally brought in a Boeing 737. Sun West dropped out of the market, but both America West and SkyWest (operating as Delta Connection) continued to serve the airport for several years. In 1993, America West turned over its presence to Mesa Airlines under the code-share name America West Express. With this change, service converted to Beech 1900s, making all service by 19-seat aircraft. In the summer of 1994, SkyWest dropped its service to Flagstaff Pulliam Airport. America West Express continues to serve Flagstaff Pulliam Airport, although service has transitioned back to the Dash 8 aircraft.

TABLE 2B
Socioeconomic Statistics
Coconino County

Year	Population	Employment	PCPI (1996$)
1980	75,008	35,290	$14,168
1985	84,431	41,920	$15,609
1990	96,591	49,010	$16,400
1991	99,647	50,220	$16,406
1992	102,498	52,110	$16,924
1993	105,570	54,180	$16,758
1994	108,680	56,940	$17,301
1995	110,954	59,390	$17,563
1996	112,686	62,140	$18,051
1997	114,444	63,150	$18,599
1998	114,874	63,860	$19,620
1999	115,307	65,460	$20,311
2000	116,320	66,760	$20,541
2001	118,290	68,000	$20,808
FORECASTS			
2005	124,650	72,840	$21,807
2010	132,370	79,140	$23,115
2015	141,140	85,920	$24,491
2025	158,920	101,580	$27,492

Source: CEDDS 2002; Woodson Poole Economics, January 2002.

Table 2C depicts the annual enplaned passengers at Flagstaff Pulliam Airport since 1980. Prior to deregulation in 1979, the airport's highest annual boardings were around 16,000. After deregulation, traffic remained in the low teens until 1984 when commuter service began to improve. A significant jump occurred in 1987 when America West started service. Traffic continued to grow to the end of the decade as service continued to improve under SkyWest and America West. Traffic began to decline during the early 1990s

TABLE 2C
Enplanement Market Share
Flagstaff Pulliam Airport

Year	Annual Enplaned	U.S. Domestic Enplanements (millions)[1]	Flagstaff Pulliam Airport % Market Share
1980	14,877	287.9	0.0052%
1981	14,784	274.7	0.0054%
1982	15,319	286.0	0.0054%
1983	13,000	308.1	0.0042%
1984	19,089	333.8	0.0057%
1985	19,140	369.9	0.0052%
1986	23,203	404.7	0.0057%
1987	41,463	441.2	0.0094%
1988	47,006	441.2	0.0107%
1989	51,891	443.6	0.0117%
1990	51,687	456.6	0.0113%
1991	48,304	445.9	0.0108%
1992	49,508	464.7	0.0107%
1993	42,262	470.4	0.0090%
1994	41,138	511.3	0.0080%
1995	39,213	531.1	0.0074%
1996	47,171	558.1	0.0085%
1997	46,704	579.1	0.0081%
1998	39,573	592.1	0.0067%
1999	36,656	613.3	0.0060%
2000	34,483	640.5	0.0054%
2001	31,370	627.5	0.0050%
ESTIMATED 2002			
2002	39,500	550.3	0.0072%
DECLINING SHARE PROJECTION			
2005	44,239	680.6	0.0065%
2010	48,924	815.4	0.0060%
2015	54,406	989.2	0.0055%
2025	65,894	1,464.3	0.0045%
CONSTANT SHARE PROJECTION			
2005	51,045	680.6	0.0075%
2010	61,155	815.4	0.0075%
2015	74,190	989.2	0.0075%
2025	109,822	1,464.3	0.0075%
INCREASING MARKET SHARE			
2005	**81,540**	680.6	0.0085%
2010	85,617	815.4	**0.0100%**
2015	123,650	989.2	0.0125%
2025	226,967	1,464.3	0.0155%

[1] FAA Aerospace Forecasts FY 2002-2013; FAA ADO-02-01, March 2002.

as the service transitioned to all 19-seat aircraft, but regained momentum in the mid-1990s when America West Express increased its service frequency to 16 daily flights. Since 1997, however, traffic declined each year through 2001.

Exhibit 2C depicts 12-month moving totals for enplanements at Flagstaff Pulliam Airport since December 1997. The moving totals represent a year's worth of enplanements, ending with the month shown. The moving totals declined steadily from the end of 1997 through August 1999. Traffic grew for just over a year, until September 2000. This decline continued until August 2001. This occurred as America West Express transitioned back to the larger Dash 8, but reduced flight frequency to the current five daily flights.

Just when traffic appeared poised to rebound, the events of September 11 came. This sent the 12-month totals downward through the end of the year. Unlike the majority of locations, however, Flagstaff Pulliam Airport appears to be rebounding well. The 12-month totals are once again growing, and traffic in 2002 is at least 25 percent ahead of 2001.

ENPLANEMENT FORECASTS

The fluctuation in commercial passenger activity at Flagstaff over the years, is not unusual for a small commercial market with Interstate highway access to a large hub airport within 150 miles. The level of usage does not reflect the passengers generated by the market. In fact, the level of usage can vary with the level of service provided. Major factors include fares, frequency of service, size and type of aircraft, destinations, and airline reliability.

As a result, typical correlation and trend line analyses do not apply in projecting future activity at Flagstaff Pulliam Airport. Rather, the potential or ability to capture a larger market share in the future is evaluated. **Table 2C** depicts Flagstaff Pulliam Airport's share of the United States Domestic passenger market every year since 1980. Just after deregulation went into effect, Flagstaff Pulliam Airport had a market share of 0.0052 percent in 1980. The market share dropped to a low of 0.0042 percent in 1983, then climbed to a high of 0.0117 percent in 1989. Since that high point, the market share has declined every year, with the exception of 1996. In 2001, the market share was at 0.0050 percent, or essentially the same as in 1980. Based upon nine months of passenger data, however, it appears that the local market share for 2002 will increase to over 0.0070 percent.

As discussed in the previous section, the passenger traffic and market share reached its peak in 1989 when America West and SkyWest were serving the airport. America West ran into financial difficulties in the early 1990s and transferred service in its smaller feeder markets in the southwest to Mesa Airlines to operate under contract as America West Express.

Mesa maintained the frequency of service, but used a 19-seat Beech 1900, instead of the Dash 8. In fact, in 1993, Mesa and SkyWest combined for 17 daily flights on 19-seat aircraft. After SkyWest left the market in 1994, Mesa began to increase its flight frequency, reaching 16 daily flights by 1996. The result was a bit of a rebound in enplanements. In 1998, Mesa reduced in half the number of flights, but began to use Dash 8 aircraft. The response to less frequency was a decline in passengers, even with the larger aircraft.

The rebound in 2002 shows other factors such as fares affect the local market as well. Flagstaff Pulliam Airport traffic has risen even when flight frequency did not change and the national passenger traffic was declining in 2002.

Future air service at Flagstaff Pulliam Airport could be dependent upon the airport's ability to accommodate regional jets. Mesa Airlines is moving toward an all regional jet (RJ) fleet in its southwest service as America West Express. The current phase-out plan for the Dash-8s is 2007.

The entry of RJs would be a service improvement that would have the potential to recapture a significant share of the local market that is currently driving I-17 to Phoenix Sky Harbor International Airport. An air service study prepared in February 1998 for Flagstaff Pulliam Airport by The Boyd Group/ASRC, Inc., included a survey that indicated just 26 percent of the local air carrier traffic was utilizing Flagstaff Pulliam Airport. From this information and other data, the study indicated that 265,000 passengers (132,500 enplanements) annually leak to other airports, including as many as 250,000 to Sky Harbor.

Thus, the total enplanement potential for 1997 was approximately 180,000 or 0.0311 percent of the U.S. domestic enplanement market. A capture of 20 to 30 percent of the local market is very typical of commuter turboprop markets within 150 miles of a larger hub airport. In fact, a share of 10 to 20 percent is common in smaller commuter markets.

While the capture can increase with improved service and fares, it would still be very difficult to attain a complete recapture of the local market. Based upon experience in similar cases, The Boyd Group indicated that it is likely 50 percent of the leakage could never be captured, simply because the discount fares and service at the large hub in Phoenix could never be completely matched in a market such as Flagstaff. This would mean that Flagstaff Pulliam Airport could attract up to 62.5 percent of its own market demand with service improvements.

Coffman Associates' experience confirms this statement. A recapture in the range of 60 to 70 percent is a maximum level for smaller markets within reasonable driving distance of a large hub airport.

For forecasting purposes, three different market share scenarios were considered. The first is a low range projection that assumes the airport does not undertake any improvements to accommodate regional jets. Under this

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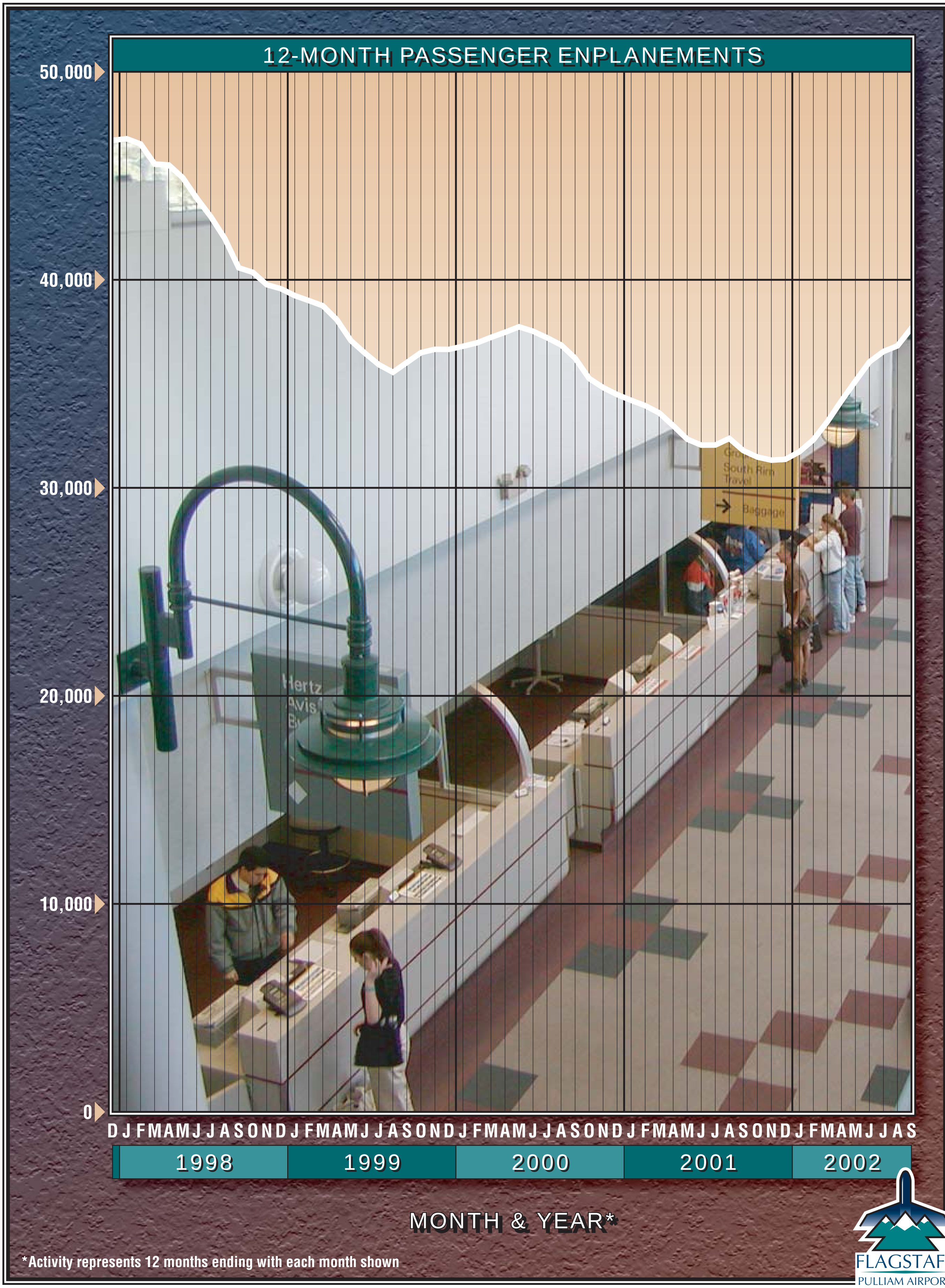

Exhibit 2C
12-MONTH MOVING
TOTALS ENPLANEMENTS

scenario, the airport could actually experience a further decline in market share as the local air service is left with the few commuter airlines that will continue to operate turboprop aircraft. The resulting projection is presented in **Table 2C** as well as **Exhibit 2D**.

The next scenario assumes the Flagstaff Pulliam Airport market share would continue to fluctuate with ups and downs in air service, but maintain the average of the last two decades. This is called the constant share projection on **Table 2C** and **Exhibit 2D**.

The increasing market share scenario, also presented on the table and exhibit, considers a market recapture projected to gradually grow to 50 percent of the total Flagstaff service area demand over the long term. From the base year of 1997, this would be equivalent to 90,000 annual enplanements, or 0.0155 percent of the U.S. domestic enplanements. For this scenario to be realized, several conditions would need to occur. The first is an upgrade in service to regional jets. Also key is the introduction of additional airlines into the market, additional frequency, more nonstop and/or direct destinations, and fare competition. Under this scenario, the airport could grow to over 200,000 passenger enplanements over the long term.

The market share scenarios are compared to previous forecasts and the FAA's **Terminal Area Forecasts** (TAF) 2001-2015 for Flagstaff Pulliam Airport on **Table 2D**, and **Exhibit 2D**. The **1991 Master Plan** forecasts were based upon the passenger growth experienced in the 1980s, as traffic more than tripled from 15,000 to over 50,000 annual enplanements. The TAF updates its forecasts every year and they are typically adjusted to the most recent base year. As depicted on the table and the exhibit, the TAF projections are already underestimating traffic for 2002. In fact, the 2015 projection is lower than the actual traffic will be for 2002.

Given the service potentials discussed earlier, the growth of commercial service passenger traffic at Flagstaff Pulliam Airport is not likely to follow a steady growth pattern over the course of twenty years. Changes in service over the time frame are more likely to be met with sharp increases or declines. If service continues to upgrade, the increasing market share scenario has a strong chance to happen. For the purposes of the Part 150 Noise Compatibility Study, it is recommended that the increasing market share projections be considered over the long term.

AIRLINE OPERATIONS AND FLEET MIX

The commercial service fleet mix defines a number of key parameters in airport planning, including critical aircraft (for pavement designs and ramp geometry), terminal complex layout, and maximum stage length capabilities (affecting runway length evaluations). A projection of fleet mix has been developed for Flagstaff Pulliam Airport by reviewing equipment used by the airline serving the airport, as well as the equipment of airlines with potential to serve Flagstaff in the future.

TABLE 2D
Enplanement Projections
Flagstaff Pulliam Airport

	2000	2005	2010	2015	2025
1991 Master Plan	88,700	113,300	144,500	N/A	N/A
FAA-TAF (2001)	32,898	33,733	34,303	34,874	N/A
Market Share Scenarios					
Declining	34,500	44,200	48,900	54,400	65,900
Constant	34,500	51,000	61,200	74,200	109,800
Increasing	34,500	57,900	86,600	124,000	227,000

Changes in equipment, airframes, and engines have always had a significant impact on airlines and airport planning. There are many ongoing programs by the manufacturers to improve performance characteristics. These programs are focusing on improvements in fuel efficiency, noise suppression, and the reduction of air emissions. As indicated earlier, many commuter airlines such as Mesa Airlines are in the process of adding regional jets and phasing out their turboprop aircraft.

The current service by Mesa Airlines under the code-share name America West Express utilizes the 37-seat Dash 8 aircraft for its four daily flights. Mesa Airlines' website listed a total fleet of 126 aircraft, effective November 2, 2002, including 64 business jets comprised of 32 Embraer 145 (ERJ-145) aircraft, and 32 Canadair Regional Jet 200 (CRJ-200) aircraft. Both of these regional jets types have 50-seat capacities. The remaining aircraft are turboprops, including 17 DeHavilland Dash 8s (37-seat) and 45 Beech 1900s (19-seat). The regional jets are used in several markets served by Mesa across the country, including Phoenix. The Dash 8 aircraft operate out of the Phoenix hub under the America West Express name. The Beech 1900 aircraft are used primarily in the Midwest under the Air Midwest subsidiary. The airline has recently acquired two 70-seat CRJ-700 aircraft, as well. Mesa continues to acquire regional jet aircraft and is phasing out its Dash 8 turboprop aircraft.

SkyWest is an airline that has served Flagstaff in the past, and is an example of an airline that could provide service again in the future. According to its website, SkyWest is also adding more CRJs, while reducing its turboprop fleet. The airline has orders or options for 109 more CRJs over the next four years. Over that same time frame, it expects to remove 21 Embraer 120 turboprops from service.

Table 2E presents the fleet mix by seating capacity for the past two years, as well as a projection for the future. The table shows that the fleet mix has been transitioning from the 19-seat Beech 1900s to the 37-seat Dash 8s. The current year, 2002, has a 100 percent fleet of the Dash 8s, except for an occasional Beech 1900.

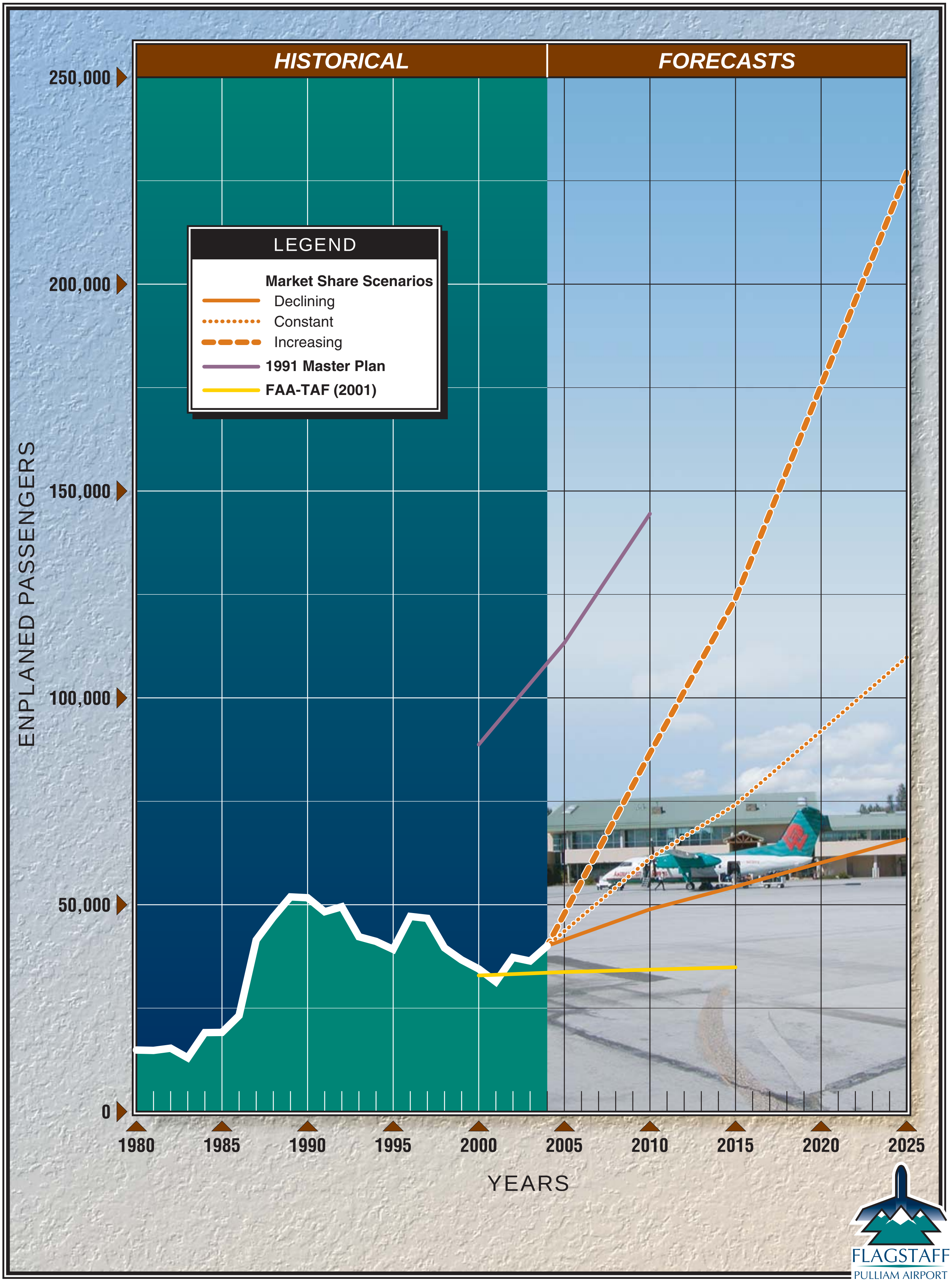

Exhibit 2D
ENPLANEMENT FORECASTS

TABLE 2E
Airline Fleet Mix and Operations Forecast
Flagstaff Pulliam Airport

	ACTUAL		FORECAST			
Fleet Mix Seating Capacity	**2000**	**2001**	**2005**	**2010**	**2015**	**2025**
COMMUTER AIRLINES						
60+	0.0%	0.0%	0.0%	0.0%	10.0%	15.0%
45-59	0.0%	0.0%	0.0%	100.0%	80.0%	75.0%
35-44	58.0%	79.0%	100.0%	0.0%	10.0%	10.0%
20-34	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
10-19	42.0%	21.0%	0.0%	0.0%	0.0%	0.0%
Totals	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Seats/Departure	29.4	33.2	37.0	50.0	50.7	51.7
Boarding Load Factor	50.1%	52.5%	**65.0%**	**59.0%**	**60.0%**	**62.0%**
Enplanements/Departure	14.7	17.4	**24.1**	**29.5**	**30.4**	**32.1**
Annual Enplanements	34,483	31,370	51,000	82,000	124,000	227,000
Annual Departures	2,340	1,799	**2,120**	**2,780**	**4,076**	**7,082**
Annual Operations	4,680	3,598	**4,241**	**5,560**	**8,152**	**14,164**

The forecast indicates that little change in the fleet mix is anticipated in the immediate term, however, the conversion by Mesa to the 50-seat RJs will be in place by 2010, provided the runway is capable of accommodating the aircraft by then. If it is, at least one additional airline can be expected to follow suit. Over the planning period, the airport could experience some service by RJs with seating capacities from 30 to 70 seats, however, the 50-seat aircraft will still make up the majority of the aircraft serving Flagstaff in the future.

The fleet mix projections have been used to calculate the average seats per departure, which (after applying a load factor) were used to project annual departures. The boarding load factor for Flagstaff Pulliam Airport may fluctuate with periodical changes in air service, but is expected to remain around **60** percent through at least the short term as the aircraft upgrade occurs, and if there are new entries into service. After that, the load factor can be expected to rise slightly. Annual operations were then calculated based on boarding load factors. **Table 2E** summarizes the fleet mix and operations forecast for Flagstaff Pulliam Airport.

GENERAL AVIATION FORECASTS

General aviation is defined as that portion of civil aviation which encompasses all portions of aviation except commercial operations. To determine the types and sizes of facilities that should be planned to accommodate general aviation activity, certain elements of this activity must be forecast. These indicators of general aviation demand include based aircraft, aircraft fleet mix, and annual operations.

BASED AIRCRAFT

The number of based aircraft is the most basic indicator of general aviation demand. By first developing a forecast of based aircraft, the growth of other general aviation activities and demands can be projected.

As depicted on **Exhibit 2E**, the based aircraft totals at Flagstaff Pulliam Airport have hardly changed for the past 12 years. This may be due, in part, to the fact that the number of aircraft storage units has changed very little over that same time frame. A current listing of based aircraft by N-number, model, and type is provided in **Appendix B**.

A check of based aircraft at the two closest public-use general aviation airports, Sedona Airport and Clark Memorial in Williams, shows they have not seen any appreciable growth in basing either. The number of registered aircraft in Coconino County, however, has risen by 20 percent (249 to 300) since 1991. According to the FAA registrar, there are over 30 aircraft registered to Flagstaff addresses that are not included on the basing list in **Appendix B**.

While aircraft registered to a local address do not necessarily have to be based in that immediate area, this is a larger than ordinary number, suggesting there may be some demand based elsewhere due to a lack of hangar space. The City of Flagstaff has 42 T-hangars units and 38 shade hangar units that are all full. The City also leases out individual tie-downs to 18 aircraft. The remainder of the based aircraft on the airport is in private hangars.

A historical listing of based aircraft at Flagstaff Pulliam Airport back to 1980 is provided on **Table 2F.** In contrast to many locations around the country, based aircraft at Flagstaff Pulliam Airport grew throughout the 1980s. The based aircraft forecast in the **1991 Master Plan** was based upon the trend in the 1980s, and is depicted on **Exhibit 2E**. Since growth went flat in the 1990s, the Master Plan forecast has proven to be high with 133 projected for the year 2000 compared to the actual 112.

The last **Terminal Area Forecast (TAF)** prepared by the FAA projected that based aircraft would remain at 112 through at least 2015. This is also depicted on **Exhibit 2E**. A waiting list for hangars suggests that there would be more based aircraft at Flagstaff Pulliam Airport if space were made available. Thus, several different methods were used to estimate the potential for growth if hangar space were provided on an as-needed basis.

First, an updated trend line or "time-series" analysis was conducted for the period of 1980-2002. The historical data provided a correlation coefficient or r-value of 0.73. An r-value of at least 0.90 is necessary be considered a significant statistical fit. Still, the

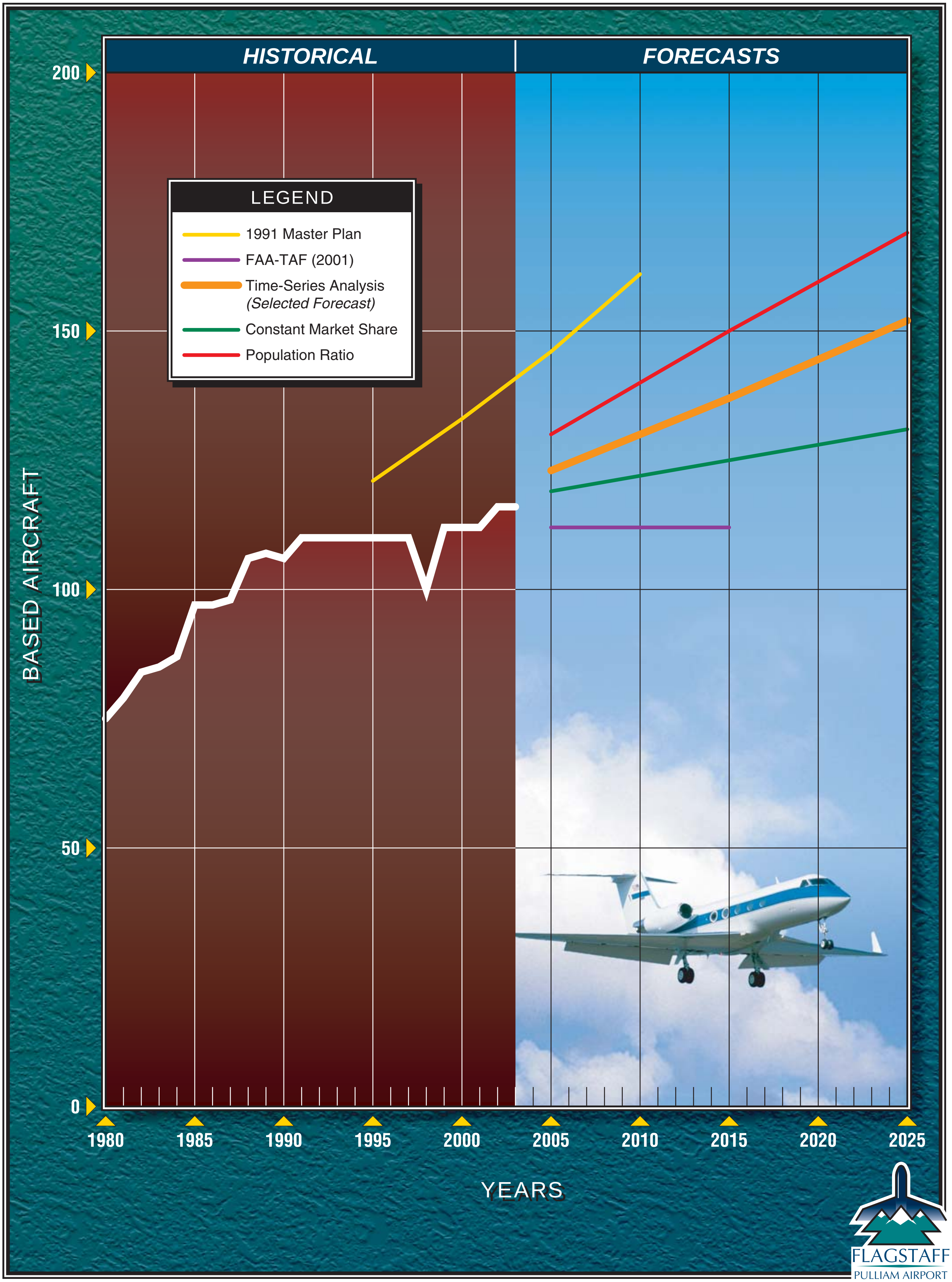

Exhibit 2E
BASED AIRCRAFT

TABLE 2F
Based Aircraft
Flagstaff Pulliam Airport

Year	Flagstaff Pulliam Airport Based	U.S. Active Aircraft	Flagstaff Pulliam Airport Market Share	City Population	Aircraft per 1,000 Population
1980	75			34,743	2.16
1981	79				
1982	84				
1983	85				
1984	87				
1985	97				
1986	97				
1987	98				
1988	106				
1989	107				
1990	106			45,857	2.31
1991	110			47,881	2.30
1992	110			49,460	2.22
1993	110	177,719	0.0619%	51,030	2.16
1994	110	172,936	0.0636%	52,599	2.09
1995	110	188,089	0.0585%	53,711	2.05
1996	110	191,129	0.0576%	54,979	2.00
1997	110	192,414	0.0572%	56,383	1.95
1998	100	204,710	0.0488%	56,787	1.76
1999	112	219,464	0.0510%	57,078	1.96
2000	112	217,533	0.0515%	57,200	1.96
2001	112	216,150	0.0518%	57,700	1.94
2002	112	214,350	0.0523%		
Time-Series Projection					
2005	123	215,690	0.0570%	66,552	1.85
2010	130	222,410	0.0585%	71,981	1.81
2015	137	227,160	0.0603%	77,133	1.78
2025	152	238,300	0.0638%	86,697	1.75

TABLE 2F (Continued) Based Aircraft Flagstaff Pulliam Airport					
Year	Flagstaff Pulliam Airport Based	U.S. Active Aircraft	Flagstaff Pulliam Airport Market Share	City Population	Aircraft per 1,000 Population
Constant Market Share Projection					
2005	112	215,690	0.0520%	66,552	1.69
2010	116	222,410	0.0520%	71,981	1.61
2015	118	227,160	0.0520%	77,133	1.53
2025	124	238,300	0.0520%	86,697	1.43
Increasing Market Share Projection					
2005	121	215,690	0.0560%	66,552	1.81
2010	129	222,410	0.0580%	71,981	1.79
2015	136	227,160	0.0600%	77,133	1.77
2025	153	238,300	0.0640%	86,697	1.76
Constant Ratio: Aircraft per 1,000 Population					
2005	130	215,690	0.0602%	66,552	1.95
2010	140	222,410	0.0631%	71,981	1.95
2015	150	227,160	0.0662%	77,133	1.95
2025	169	238,300	0.0709%	86,697	1.95

time-series analysis does reflect the average growth trend over the 22-year period. The results of this analysis are shown on **Table 2F** and **Exhibit 2E.** The time-series extrapolation predicts that based aircraft will grow from 112 to 152 by the year 2025.

The lack of growth over the last decade, while other independent variables such as population, employment, and per capita income have grown, suggests that further regression analyses would not turn up any significant correlations. Thus, market share and the aircraft-to-population ratio were examined in lieu of the standard statistical fits.

As would be expected, the Flagstaff Pulliam Airport market share of the United States active general aviation aircraft has declined over the decade. A constant market share was projected, based upon the airport maintaining at least its average share over the last two years. This results in a growth to 124 based aircraft over the planning period, as depicted on **Table 2F** and **Exhibit 2E** for comparison. An increasing market share that recaptures the highest market share experienced over the past nine years was considered as well. This results in a projection very similar to that of the time-series projection.

Finally, a constant ratio of aircraft per 1,000 population in Flagstaff was developed for comparison. The changing ratios and market shares for each projection are presented in the table as well. Each of the previous projections resulted in a declining ratio of aircraft to population, so the constant ratio resulted in the highest forecast.

Since general aviation aircraft in the United States are not expected to grow as fast as the Flagstaff population, a decline in the aircraft to population ratio should be anticipated over the long term. The addition of hangars, however, could create a short term spike in based aircraft that would, in turn, raise the ratio and market shares. For the purposes of this forecast, a forecast similar to the time-series and increasing market projections is recommended. This forecast is presented on **Table 2G**.

TABLE 2G
Based Aircraft Fleet Mix

Year	Single-Engine	Multi-Engine	Turbo-prop	Jet	Rotor	Total
ACTUAL						
2002	99	5	5	1	2	112
FORECAST						
2005	108	7	5	1	2	123
2010	112	7	6	2	3	130
2015	116	7	7	4	3	137
2025	126	7	8	7	4	152

BASED AIRCRAFT FLEET MIX

The current based aircraft fleet mix at Flagstaff Pulliam Airport is presented on **Table 2G**. This was compared to the existing and forecast U.S. general aviation fleet mix trends as presented in FAA **Aerospace Forecasts Fiscal Years 2002-2013**. The current based aircraft fleet mix at Flagstaff Pulliam Airport has a higher than average percentage of rotorcraft and multi-engine piston aircraft, lower than average turboprops, and one business jet.

According to the FAA forecasts, active single-engine aircraft will dip in the short term, as older aircraft are retired, then have a slow growth trend. Experimental aircraft, which tend to consist primarily of single-engine models, are expected to experience a 0.3 percent per year growth. So the overall percentage of single-engine and experimental aircraft will remain fairly constant in the future.

The number of multi-engine piston aircraft will remain relatively constant according to the FAA forecasts. Turboprop aircraft are expected to experience only marginal gains, approximately 15 per year nationwide. The largest percentage growth is anticipated in the business jet market, where an average annual increase of 3.4 percent is expected. This relates to a net gain of approximately 300 business jets a year. Rotorcraft are anticipated to show a growth rate slightly better than the single engine and experimental aircraft.

The fleet mix for Flagstaff Pulliam Airport is forecast to evolve into a similar make-up as that on the national level. The single-engine percentage will decline slowly and the number of multi-engine piston aircraft is forecast to remain static after an immediate increase, resulting in a percentage decline. The percentages of turbine-powered aircraft at the airport can be expected to increase, with a net increase of three turboprops and six business jets over the planning period.

GENERAL AVIATION OPERATIONS

General aviation operations are classified by the airport traffic control tower (ATCT) as either local or itinerant. A local operation is a take-off or landing performed by an aircraft that operates within sight of the airport, or which executes simulated approaches or touch-and-go operations at the airport. Itinerant operations are those performed by aircraft with a specific origin or destination away from the airport. Generally, local operations are characterized by training operations. Typically, itinerant operations increase with business and commercial use, since business aircraft are operated on a high frequency.

Itinerant Operations

Table 2H depicts the history of general aviation itinerant operations at Flagstaff Pulliam Airport since 1990. Itinerant operations have varied from a high of 29,187 in 1991 to a low of 21,541 in 1998. The Flagstaff Pulliam Airport market share as a percentage of general aviation itinerant operations at towered airports across the country has fluctuated around an average of 0.12 percent, with a low of 0.097 percent and a high of 0.131 percent. The ratio of operations per based aircraft has remained relatively stable as well, with an average of 239. The ratio has varied between 202 and a high of 265.

Based upon nine months of data in 2002, general aviation itinerant operations are up nearly 11 percent over 2001, and nine percent over 2000. This may be indicative of more use of general aviation for travel to and from Flagstaff in the wake of September 11, 2001. The table depicts an estimate of 28,500 general aviation itinerant operations for the calendar year 2002, and also shows the market share based upon the FAA's forecast for towered general aviation itinerant operations for 2002. The operations will likely be at the second highest total in the past 13 years and at the highest market share. The operations per based aircraft ratio of 254 would be the third highest of the period.

In **FAA Aerospace Forecasts Fiscal Years 2002-2013**, the FAA projects itinerant general aviation operations will be recovering the operation level lost in 2001 in the immediate term, then grow at approximately 1.4 percent annually. **Table 2H** presents this forecast and includes a projection for Flagstaff Pulliam Airport based upon maintaining a constant of the itinerant market. The share depicted is at the higher end of the range experienced since 1990, but slightly lower than that shown for 2002.

TABLE 2H General Aviation Itinerant Operations Forecast Flagstaff Pulliam Airport					
		U.S. ATCT General Aviation			
Year	Flagstaff Pulliam Airport General Aviation Itinerant	Itinerant (millions)	Flagstaff Pulliam Airport Market Share (%)	Flagstaff Pulliam Airport Based AC	Itinerant Ops Per AC
1990	27,250	23.1	0.118%	106	257
1991	29,187	22.2	0.131%	110	265
1992	27,539	22.1	0.125%	110	250
1993	26,827	21.1	0.127%	110	244
1994	26,990	21.1	0.128%	110	245
1995	27,412	20.9	0.131%	110	249
1996	26,775	20.8	0.129%	110	243
1997	22,195	21.7	0.102%	110	202
1998	21,541	22.1	0.097%	100	215
1999	25,743	23.0	0.112%	112	230
2000	26,082	22.9	0.114%	112	233
2001	25,731	21.4	0.120%	112	230
ESTIMATED					
2002	28,500	21.1	0.135%	112	254
FORECAST					
2005	30,030	23.1	0.130%	123	244
2010	32,240	24.8	0.130%	130	248
2015	34,580	26.6	0.130%	137	252
2025	39,780	30.6	0.130%	152	262

Because of the close relationship of itinerant operations to based aircraft that has been displayed at Flagstaff Pulliam Airport, the projected increase in based aircraft can be expected to be followed with an increase in itinerant operations. The future ratio shown in the table was used as a check of the reasonableness of the itinerant operations forecast. As can be seen from the table, the ratio grows slightly over the planning period, but stays within the range experienced over the past decade.

The itinerant operations forecast is depicted on **Exhibit 2F** and compared to the forecasts of the **1991 Master Plan** and the **2001 FAA-TAF**. The **TAF** forecasts show no growth and will be exceeded in 2002 by nearly 10 percent. The **1991 Master Plan** anticipated over 57,000 itinerant operations by 2000. The new forecast developed expects growth in operations, but at a rate well below that anticipated in the previous master plan.

Local Operations

A similar methodology was utilized to forecast local operations. **Table 2J** depicts the history of local operations at

Flagstaff Pulliam Airport, and examines its historic market share of general aviation local operations at towered airports in the United States. After 23,754 operations in 1991, the local total declined to 10,450 in 1997. Since that time, local operations have climbed back into the 17,000 to 18,000 range and have remained there for the past three years. An estimate for 2002, based upon the first nine months, indicates that local operations will be down slightly, but still in the same general range.

TABLE 2J
General Aviation Local Operations Forecast
Flagstaff Pulliam Airport

		U.S. ATCT General Aviation			
Year	**Flagstaff Pulliam Airport General Aviation Itinerant**	**Itinerant (millions)**	**Flagstaff Pulliam Airport Market Share (%)**	**Flagstaff Pulliam Airport Based AC**	**Itinerant Ops Per AC**
1990	22,774	17.1	0.133%	106	215
1991	23,754	16.6	0.143%	110	216
1992	21,513	16.3	0.132%	110	196
1993	17,611	15.5	0.114%	110	160
1994	17,459	15.2	0.115%	110	159
1995	16,192	15.1	0.107%	110	147
1996	13,468	14.5	0.093%	110	122
1997	10,450	15.2	0.069%	110	95
1998	13,916	16.0	0.087%	100	139
1999	17,811	17.0	0.105%	112	159
2000	17,450	17.0	0.103%	112	156
2001	17,829	16.2	0.110%	112	159
ESTIMATED					
2002	17,000	16.2	0.105%	112	152
FORECAST					
2005	19,680	18.1	0.109%	123	160
2010	20,800	19.0	0.109%	130	160
2015	21,920	20.0	0.110%	137	160
2025	24,340	22.1	0.110%	152	160

The share of the U.S. market has averaged 0.109 percent since 1990, ranging between 0.069 percent and 0.143 percent. Local operations per based aircraft have averaged 160, with a range between a low of 95 and a high of 216.

The FAA **Aerospace Forecasts** projects a 1.0 percent per year increase in local operations nationwide. As with itinerant operations, this would indicate an increase in operations per active aircraft since general aviation is projected to grow at a slower rate.

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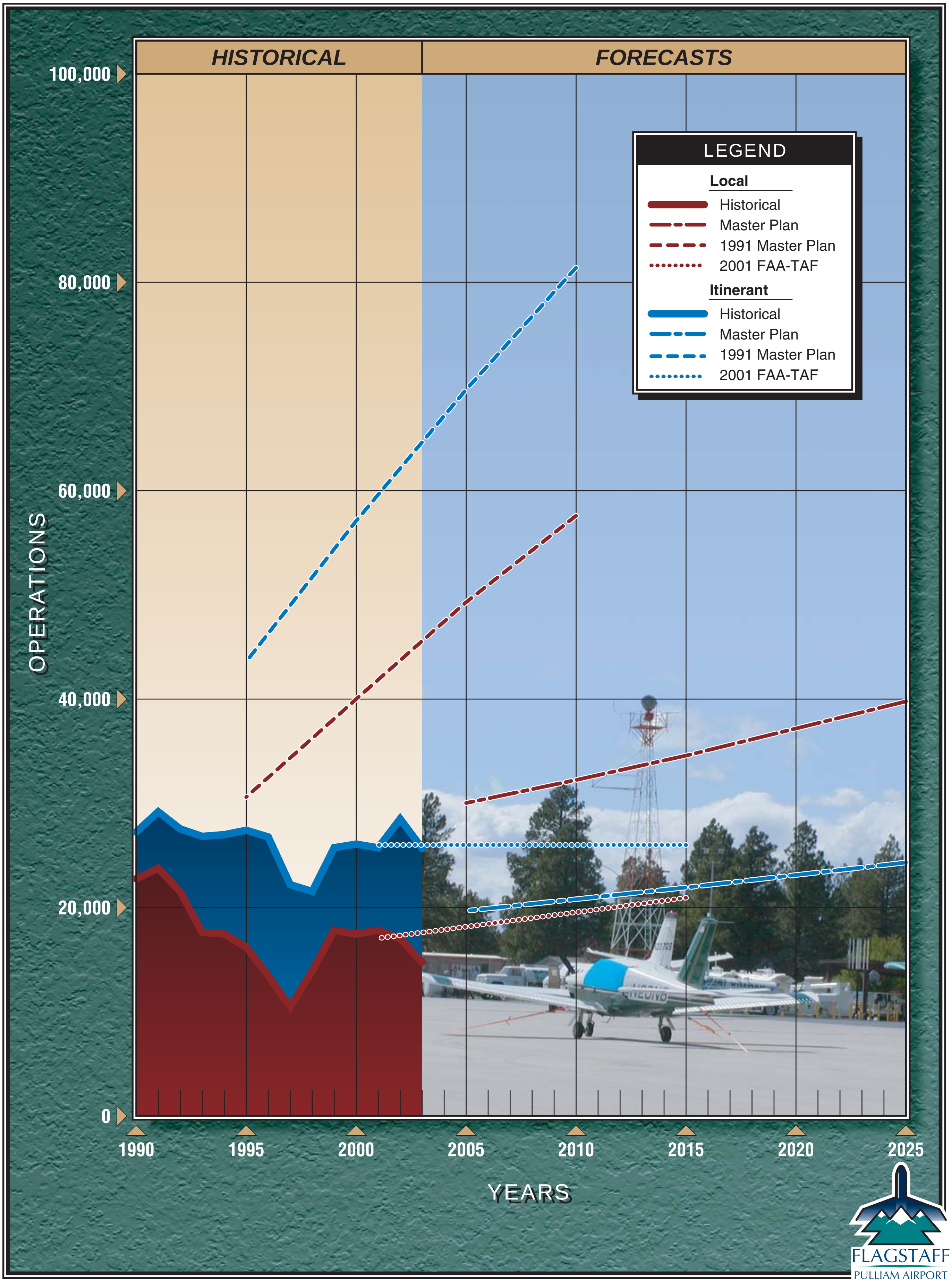


Exhibit 2F
GENERAL AVIATION OPERATIONS

Training activity is not expected to increase significantly at Flagstaff Airport. Thus, the local operations forecast assumes a growth associated with the based aircraft ratio. As can be seen from the table, the local share of the national market will also remain constant in this scenario.

Exhibit 2F provides a summary of the general aviation local operations forecasts for Flagstaff Pulliam Airport, along with the **1991 Master Plan** and the **FAA Terminal Area Forecasts** for 2001. The previous master plan forecast has proven to be optimistic, while the more recent **TAF** anticipates some growth, although lower than that projected here.

AIR CARGO FORECASTS

Air cargo is basically comprised of air freight and air mail. Both are handled by the passenger airlines as well as by all-cargo airlines. The enplaned and deplaned freight recorded at Flagstaff Pulliam Airport since 1998 is reported on **Table 2K**.

TABLE 2K
Air Cargo Forecasts
Flagstaff Pulliam Airport

Year	Enplaned Tons	Deplaned Tons	Total Tons
1998	516	580	1,096
1999	457	615	1,072
2000	460	609	1,069
2001	424	441	865
ESTIMATED			
2002	430	580	1,010
FORECAST			
2005	456	615	1,071
2010	733	988	1,721
2015	1,065	1,437	2,502
2025	1,844	2,487	4,332

Besides America West Express, the airport is also served by four small all-cargo airlines. This includes FedEx, Airborne, UPS, and US Delivery. All use small commuter aircraft such as the Cessna Caravan or the Piper Navajo. All operate from the general aviation ramp. Flagstaff's proximity to Phoenix, combined with the recreational and tourism economy, does limit the level of air cargo shipped from Flagstaff Pulliam Airport. A continued broadening of the local economic base could also increase demand.

Other than a decline in 2001, air cargo has not change significantly in the past four years. Based upon nine months data, 2002 is estimated to also fall into the range of 1,000 tons of cargo. This is to be expected with the type and size of commuter aircraft that have been serving Flagstaff Pulliam Airport. With the potential for service by regional jets, there will be opportunities for increases in air cargo. The cargo potential was projected to increase at a rate similar to the seating capacity and frequency of airline flights in the future. This is reflected in **Table 2K**, where air cargo is projected to grow to 4,300 tons over the planning period.

OTHER AIR TAXI

The air taxi category includes aircraft involved in on-demand passenger or small parcel transport. The control tower counts air taxi in the same category as commuter airline operations. Since the airport keeps track of airline operations from the airline landing reports, the commuter operations can be subtracted from the tower count to determine the air taxi operations**.**

In 2000, the tower counted 7,470 air taxi and commuter operations. The commuter airlines reported a total of 2,340 landings for a total of 4,680 annual operations. Thus, there were 2,790 other air taxi operations. In 2001, there were 8,123 operations in the tower count, and 3,598 were by the commuters, leaving **4,525** other air taxi operations.

A review of monthly operational statistics reveals that other air taxi operations have risen substantially since September. This suggests September 11 may have been a factor in a nearly 50 percent increase in air taxi operations at Flagstaff Pulliam Airport.

Air taxi operations **totaled 5,965** in 2002. While not being experienced at every airport across the country, some are experiencing an increase in air taxi use by businesses for air travel that avoids the security issues at airport terminals.

This growth is not expected to continue to be so pronounced, but growth in general aviation business travel is expected to continue. For this forecast, other air taxi operations are projected to grow at a rate similar to that of general aviation itinerant operations. The air taxi forecasts are presented on **Table 2L**.

TABLE 2L
Air Taxi and Military Operations
Flagstaff Pulliam Airport

	Air Taxi	Military
ACTUAL		
2000	2,790	327
2001	4,525	688
2002	**5,965**	**824**
FORECAST		
2010	**6,600**	800
2015	**7,100**	800
2025	**8,200**	800

MILITARY

Military activity accounts for the smallest portion of the operational traffic at Flagstaff Pulliam Airport. Since 1990, annual military operations have fluctuated between a high of 1,088 in 1990 and a low of 301 in 1997. Between 1990 and 2002, military operations have averaged 522 annually. While the percentage fluctuates from year-to-year, itinerant operations average two-thirds of all military operations at the airport.

The **1991 Master Plan** projected military operations to average 400 annually. For the purposes of this forecast, military operations were projected to average 800 per year over the planning period. **Table 2L** includes the military forecast.

SUMMARY

This chapter has outlined the various activity levels that might be anticipated over the planning period. Airline passenger activity has good potential for growth, provided the airport is prepared to accommodate the expected transition by the primary commuter airlines to a full fleet of regional jets. This, coupled with additional flights to more destinations and relatively competitive air fares, could allow Flagstaff Pulliam Airport to recapture some of its market currently driving to Phoenix Sky Harbor International Airport.

Based aircraft at Flagstaff Pulliam Airport have not grown appreciably in the past decade. This can be attributed, at least in part, to no net change in the number of hangar spaces available. There is a demand for hangars that is not being met. Should additional hangars be developed, growth in based aircraft can be expected. General aviation operations will also follow suit, although some growth in itinerant operations can be expected, regardless.

Air cargo activity will be dependent somewhat on the types of aircraft that the airlines utilize in the future. Other air taxi operations have grown at Flagstaff Pulliam Airport in the aftermath of September 11, 2001. They can be expected to continue to grow with increased business use of general aviation. Military activity is expected to continue to be a small part of the mix at Flagstaff Pulliam Airport.

Exhibit 2G is a summary of the aviation forecasts prepared in this chapter. Actual activity is included for 2001, as well as estimated activity for 2002, based upon extrapolations from nine months of data. This column will be updated to actual figures prior to completion of this study.

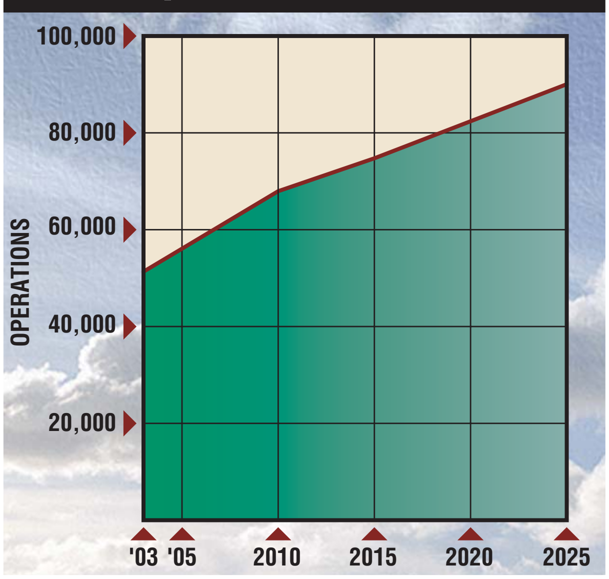
The next step in the planning process is to assess the capacity of the existing facilities to determine what upgrades may be necessary to meet future demands. The forecasts developed here will be taken forward in the next chapter as planning horizon activity levels that will serve milestones or activity benchmarks in evaluating facility requirements. Peak activity characteristics will also be determined for the various activity levels, for use in determining facility needs.

02MP09-2G-7/6/05

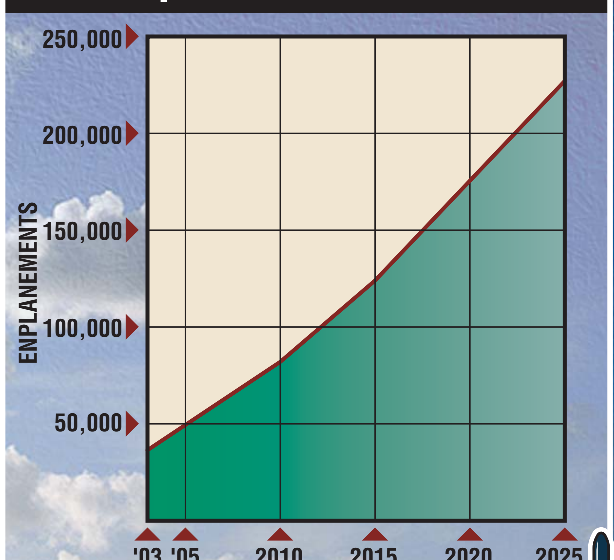
SUMMARY OF AVIATION ACTIVITY FORECASTS

	Actual		*Forecasts*		
CATEGORY	**2002**	**2003**	**2010**	**2015**	**2025**
Annual Operations					
General Aviation					
Itinerant	27,447	25,541	32,200	34,600	39,800
Local	16,033	15,363	20,800	21,900	24,300
Total General Aviation	**43,480**	**40,904**	**53,000**	**56,500**	**64,100**
Airline	3,324	3,118	5,600	8,200	14,200
Other Air Taxi	4,965	6,376	6,600	7,100	8,200
Military	824	955	800	800	800
Total Operations	**53,593**	**51,353**	**66,000**	**72,600**	**87,300**
Annual Enplanements					
Enplaned Passengers	**37,257**	**36,400**	**82,000**	**124,000**	**227,000**
Based Aircraft					
Single Engine	99	99	110	115	125
Multi-Engine	7	7	8	8	8
Turboprop	7	7	8	9	10
Jet	1	1	2	4	7
Rotorcraft	2	2	3	3	4
Total Based Aircraft	**116**	**116**	**131**	**139**	**154**
Annual Air Cargo					
Total Cargo (Tons)	**960**	**934**	**1,700**	**2,500**	**4,300**

Operations Forecast



Enplanements Forecast



FLAGSTAFF
PULLIAM AIRPORT

Exhibit 2G
FORECAST SUMMARY

FLAGSTAFF
PULLIAM AIRPORT

Chapter Three

AVIATION NOISE

Chapter Three

AVIATION NOISE

This chapter describes the noise exposure maps (NEM) for Flagstaff Pulliam Airport. Noise contour maps are presented for three study years: 2003, 2008, and 2025. The 2003 noise contour map shows the current noise levels based on operations for the latest twelve months of activity. The 2008 map is based on levels from the operation forecast outlined in Chapter Two, Aviation Forecasts. The 2003 and 2008 maps are the basis for the official "Noise Exposure Maps" required under 14 Code of Federal Regulations, Part 150 (Part 150).

The 2025 noise contour map was developed to present a long term view of potential future noise exposure at Flagstaff Pulliam Airport. Based on forecasts developed in the concurrent Flagstaff Pulliam Airport Master Plan Update, these maps can be helpful in providing guidance for long term land use planning which is discussed at a later point in the Part 150 Study process.

These noise contour maps are considered baseline analyses. They assume operations based on the existing procedures at Flagstaff Pulliam Airport. No additional noise abatement procedures have been assumed in these analyses. The noise contour maps will serve as baselines against which potential noise abatement procedures will be compared at a later point in the study.

The noise analysis presented in this chapter relies on complex analytical methods and uses numerous technical terms. A ***Technical Information Paper (T.I.P.)*** included in the last section of this document, ***The Measurement and Analysis of Sound***, presents helpful background information on noise measurement and analysis.

AIRCRAFT NOISE MEASUREMENT PROGRAM

A noise measurement program was conducted over a six-day period from September 28, 2002, through October 3, 2002. The field measurement program was designed and undertaken to provide real data for comparison with the computer-predicted values. These comparisons provide insight into the actual noise conditions around the airport and can serve as a guide for evaluating the assumptions developed for computer modeling.

It must be recognized that field measurements made over a 24-hour period are applicable only to that period of time and may not -- in fact, in many cases, do not -- reflect the average conditions present at the site over a much longer period of time. The relationship between field measurements and computer-generated noise exposure forecasts is analogous to the relationship between weather and climate. While an area may be characterized as having a cool climate, many individual days of high temperatures may occur. In other words, the modeling process derives overall average annual conditions (climate), while field measurements reflect daily fluctuations (weather).

Information collected during the noise monitoring program included 24-hour measurements for comparison with computer-generated DNL values. DNL -- day-night sound level -- is a measure of cumulative sound energy during a 24-hour period. All noise occurring from 10:00 p.m. to 7:00 a.m. is assigned a 10-decibel (dB) penalty because of the greater annoyance typically caused by nighttime noise. Use of the DNL noise metric in airport noise compatibility studies is required by Part 150. Additional information collected on single event measurements is used as an indicator of typical dB and Sound Exposure Levels (SEL) within the study area, as well as comparative ambient noise measurements in areas affected by aircraft noise. All procedures and equipment involved in the aircraft noise measurement program were performed pursuant to guidelines set forth by Part 150, Section A150.3.

ACOUSTICAL MEASUREMENTS

This section provides a technical description of the acoustical measurements which were performed for the Flagstaff Pulliam Airport Part 150 Noise Compatibility Study. Described here are the instrumentation, calibration procedures, general measurement set-ups, and related data collection items.

Instrumentation

Four sets of acoustical instrumentation, the components of which are listed in **Table 3A**, were used to measure noise. Each set consisted of a high quality microphone connected to a 24-hour environmental noise monitor unit. Each unit was calibrated to assure consistency between measurements at different locations. A calibrator, with an accuracy of 0.5 decibels, was used for all measurements. At the completion of each field measurement, the calibration was rechecked, the accumulated output data was downloaded to a portable computer, and the data memories were cleared before the unit was placed at a new site. The equipment listed in **Table 3A** was supplemented by accessory cabling, windscreens, tripods, security devices, etc., as appropriate to each measurement site.

TABLE 3A
Acoustical Measurement Instrumentation

4	Larson Davis 820 Portable Noise Monitors and Pre-amplifiers
4	Larson Davis Model 2559 - ½" Microphones
1	Model CA250 Sound Level Calibrator
1	Portable Computer

Measurement Procedures

Two methods were used to attempt to minimize the potential for non-aircraft noise sources to unduly influence the results of the measurements. First, for single event analysis, minimum noise thresholds of 5-10 dB greater than ambient levels were programmed into the monitor. This procedure resulted in the requirement that a single noise event exceed a threshold of 60 dB at each site. Second, a minimum event duration, longer than the time associated with ambient single events above the threshold (for example, road traffic), was set (generally at five seconds). The combination of these two factors limited the single events analyzed in detail to those which exceeded the preset threshold for longer than the preset duration. In spite of these efforts, contamination of single event data is always possible.

Although only selected single events were specially retained and analyzed, the monitors do, however, cumulatively consider all noise present at the site, regardless of its level, and provide hourly summations of Equivalent Noise Levels (Leq). Additionally, the equipment optionally provides information on the hourly maximum decibel level, SEL values for each event which exceeds the preset threshold and duration, and distributions of decibel levels throughout the measurement period.

Weather Information

The noise measurements taken during this study were obtained during a period of average fall weather for the Flagstaff Pulliam area. On the first three days, weather conditions were generally considered to be adequate for aircraft using visual flight rules (VFR) which call for cloud ceilings greater than 3,000 feet above ground level (AGL), visibility greater than five miles, light winds, and temperatures in the low 70s.

A storm system came through the area during the last two days of the measurement program, dropping the temperatures into the 30s and 40s, with increased winds and rain.

Aircraft Noise Measurement Sites

Noise measurement sites are shown on **Exhibit 3A**. They were selected on the basis of background information, local observations during the field effort, and suggestions from airport management based on noise complaint history. Specific selection criteria include the following:

- Emphasis on areas of marginal or greater than marginal aircraft noise exposure according to earlier evaluations.

- Screening of each site for local noise sources or unusual terrain characteristics which could affect measurements.

- Location in or near areas from which a substantial number of complaints about aircraft noise were received, or where there are concentrations of people exposed to significant aircraft overflights.

While there is no end to the number of locations available for monitoring, the selected sites fulfill the above criteria and provide a representative sampling of the varying noise conditions in the airport vicinity. Two sites were measured for 96 hours and four sites for a 48-hour period.

The noise data collected during the measurement period is presented in **Table 3B**. The information includes the average 24-hour Leq for each site. The Leq metric is derived by accumulating all noise during a given period and logarithmically averaging it. It is similar to the DNL metric except that no extra weight is attached to nighttime noise. The DNL (24) value represents the DNL from all noise sources.

In addition, L(50) values for each site are presented. These values represent sound levels above which 50 percent of the samples were recorded.

The table also presents data on other measures of noise that may be useful for comparisons. These include:

- Maximum recorded noise level in dB (Lmax);

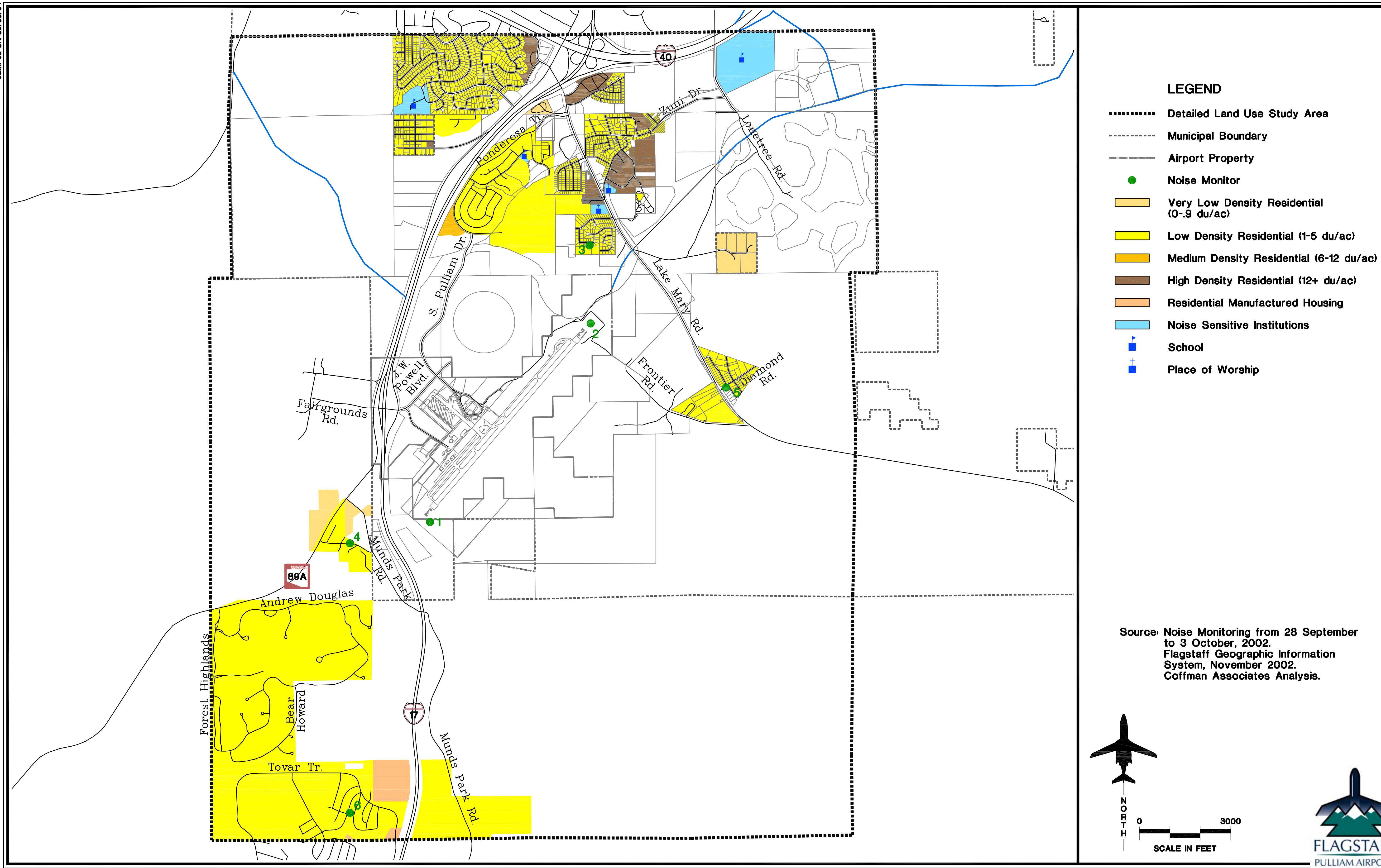
- Maximum recorded sound exposure level (SELmax);

- Longest single event duration in seconds (Max Duration); and

- Number of single events above SEL 70, 80, 90, and 100.

For comparative purposes, normal conversation is generally at a sound level of 60 decibels, while a busy street is approximately 70 decibels along the adjacent sidewalk.

Site 1 is located on airport property approximately 600 feet south of the Runway 3 threshold. This location was selected due to the likelihood that this area would receive regular arrival and departure traffic. The monitor was placed at the edge of airport property



Source: Noise Monitoring from 28 September to 3 October, 2002.
Flagstaff Geographic Information System, November 2002.
Coffman Associates Analysis.

Exhibit 3A
AIRCRAFT NOISE MEASUREMENT SITES

TABLE 3B
Noise Measurement Summary
Flagstaff Pulliam Airport

	Site 1				Site 2			
Measurement Dates	**Day 1 9/28 to 9/29**	**Day 2 9/29 to 9/30**	**Day 3 9/30 to 10/1**	**Day 4 10/1 to 10/2**	**Day 1 9/28 to 9/29**	**Day 2 9/29 to 9/30**	**Day 3 9/30 to 10/1**	**Day 4 10/1 to 10/2**
Cumulative Data								
LEQ(24)	68.1	65.1	58.6	64.3	62.2	61.7	60.6	61.5
DNL(24)	68.2	65.7	61.6	64.5	63.8	62.4	61.9	62.5
L(50)	49.9	49.9	49.9	49.9	45.0	45.0	45.0	45.0
Single Event Data								
L(max)	108.3	109.1	95.0	107.3	102.5	99.6	100.4	100.4
SEL(max)	112.8	114.0	100.6	112.4	104.9	104.4	102.5	103.0
Max Duration (sec)	73.18	62.81	45.00	69.71	139.15	223.40	66.90	953.25
Number of Single Events above 60 dB (Lmax)	70	108	78	39	123	84	94	73
Number of Single Events Above								
SEL 70 dB	70	108	78	39	75	56	65	46
SEL 80 dB	50	42	67	30	33	23	36	27
SEL 90 dB	18	5	13	15	9	9	8	12
SEL 100 dB	6	1	1	2	1	0	1	1

	Site 3		Site 4		Site 5[1]		Site 6	
Measurement Dates	**Day 1 9/28 to 9/29**	**Day 2 9/29 to 9/30**	**Day 1 9/30 to 10/1**	**Day 2 10/1 to 10/2**	**Day 1 10/1 to 10/2**	**Day 2 10/2 to 10/3**	**Day 1 10/1 to 10/2**	**Day 2 10/2 to 10/3**
Cumulative Data								
LEQ(24)	54.3	49.5	56.6	54.4	N/A	N/A	49.1	48.8
DNL(24)	54.7	49.5	56.8	54.4	N/A	N/A	51.7	51.8
L(50)	40.6	40.6	45.9	45.9	48.0	—	48.8	48.8
Single Event Data								
L(max)	86.6	84.5	96.9	92.8	85.1	N/A	82.1	82.8
SEL(max)	99.6	93.5	103.2	102.7	89.8	N/A	89.5	93.0
Max Duration (sec)	110.46	51.93	41.81	60.71	17.21	N/A	44.06	40.59
Number of Single Events above 60 dB (Lmax)	87	27	44	36	12	N/A	62	34
Number of Single Events Above								
SEL 70 dB	35	21	24	20	8	N/A	22	25
SEL 80 dB	6	7	7	3	2	N/A	2	4
SEL 90 dB	0	0	2	1	0	N/A	0	0
SEL 100 dB	0	0	0	0	0	N/A	0	0

[1] Monitor cable cut after 11 hours of monitoring.
N/A Not available
Source: Coffman Associates, Inc.

near the airport access road. The 24-hour Leq for Site 1 varied considerably during the four-day monitoring period, ranging from 68.1 to 58.6 dBA. Two-hundred ninety-five (295) noise events were recorded during the four-day period that exceeded the preset threshold of 60 dBA.

Site 2 is located approximately 800 feet northeast of the Runway 21 threshold. The site is in an area that would likely receive regular arrival and departure overflight noise from the airport. The equipment was set up in an open area next to the airport's MALSR (medium intensity approach lighting system with runway alignment indicator lights). The 24-hour Leq for Site 2 for the four-day measurement period ranged from 62.2 to 60.6 dBA. Two-hundred forty-two (242) noise events were recorded during the four-day period that exceeded the preset threshold of 60 dBA.

Site 3 is located at 4545 South Lance Road, approximately 3,200 feet north of the Runway 21 threshold. The site is a single-family residential area. The site is in an area that would likely receive regular overflight noise from the airport. The equipment was set up in the rear yard of the residence. The 24-hour Leq for the first day at Site 3 was 54.3 and 49.5 for the second day. Fifty-six (56) noise events were recorded during the four-day period that exceeded the preset threshold of 60 dBA.

Site 4 is located at 13 Del Pine Drive, approximately 3,100 feet southwest of the Runway 3 threshold. Site 4 is located in a single family residential area. The equipment was set up in the front yard of the residence. The 24-hour Leq for the first day at Site 4 was 56.6 and 54.4 the second day. Fifty-six (56) noise events were recorded during the four-day period that exceeded the preset threshold of 60 dBA.

Site 5 is located at a Bed and Breakfast along Lake May Road, approximately 4,200 feet east of Runway 21. The site is located in an area of large lot single-family residential dwellings. The site is in an area that would likely receive regular overflight noise from the airport. The equipment was set up in the rear yard of the business. The 24-hour Leq for Site 5 was 43.3. During the 11th hour of monitoring, the cable between the monitor and microphone was cut. Therefore, complete noise monitoring information is not available for this site. A total of only 12 events was recorded during the 11 hours the monitor was operational.

Site 6 is located near the intersection of Tolani Trail and Tolani Place, approximately 10,500 feet south of the Runway 3 threshold. The area is comprised of single-family homes. One single-engine aircraft overflight was observed west of Site 6 during the monitor set-up. The 24-hour Leq for the first day at Site 6 was 49.1 and 48.8 for the second day. Ninety-six (96) noise events were recorded during the four-day period that exceeded the preset threshold of 60 dBA.

MEASUREMENT SUMMARY

The program resulted in a total of 971 single events that exceeded the preset threshold of 60 dBA and 347 average hourly sound levels were calculated and recorded.

Poor weather conditions during the last portion of the measurement period may have reduced the number of aircraft operations that normally occur at the airport. Daily operations dropped from a high of 175 operations on September 30, 2002, to a low of 45 on October 2, 2002. Therefore, noise measurement levels are anticipated to be lower than predicted levels described in the next section of this chapter.

AIRCRAFT NOISE ANALYSIS METHODOLOGY

The standard methodology for analyzing the prevailing noise conditions at airports involves the use of a computer simulation model. The Federal Aviation Administration (FAA) has approved the Integrated Noise Model (INM) for use in Part 150 Noise Compatibility Studies. The latest versions of the INM are quite sophisticated in predicting noise levels at a given location, accounting for such variables as airfield elevation, temperature, headwinds, and local topography. INM Version 6.1 was used to prepare noise exposure maps for the Flagstaff Pulliam Airport noise analyses.

Inputs to the INM include runway configuration, flight track locations, aircraft fleet mix, stage length (trip length) for departures, and numbers of daytime and nighttime operations by aircraft type. The INM provides a database for general aviation aircraft which commonly operate at Flagstaff Pulliam Airport. **Exhibit 3B** depicts the INM input assumptions.

The INM computes typical flight profiles for aircraft operating at the assumed airport location, based upon the field elevation, temperature, and flight procedure data provided by aircraft manufacturers. The INM will also accept user-provided input, although the FAA reserves the right to accept or deny the use of such data depending upon its statistical validity.

The INM predicts noise levels at a set of grid points surrounding an airport. The numbers and locations of grid points are established during the INM run to determine noise levels in the areas where operations are concentrated, depending upon the tolerance and level of refinement specified by the user. The noise level values at the grid points are used to prepare noise contours which connect points of equal noise exposure. The INM will also calculate noise levels at a user-specified location such as previously described noise monitoring sites.

INM INPUT

AIRPORT AND STUDY AREA DESCRIPTION

The runways were input into the INM in terms of latitude and longitude, as well as elevation. As previously mentioned, the INM computes typical flight profiles for aircraft operating at the airport location, based upon the field elevation, temperature, and flight procedure data provided by aircraft manufacturers. The Flagstaff Pulliam Airport's field elevation is 7,014 feet above mean sea level (MSL) and its average annual temperature is 45.8 degrees Fahrenheit (F).

It is also possible to incorporate a topographic database into the INM which allows the INM to account for the changes in distances from aircraft in flight to elevated receiver locations. Topographic data from the U.S. Geographical Survey was used in the development of the noise exposure contours for Flagstaff Pulliam Airport.

ACTIVITY DATA

Noise evaluations made for the current year (2003) are based on operational counts from the Flagstaff Pulliam ATCT (airport traffic control tower) for calender year 2002, with an adjustment for nighttime operations when the ATCT is closed. Five-year (2008) and long-term (2025) contour sets were prepared based upon forecasts presented in Chapter Two and prepared in the Flagstaff Pulliam Airport Master Plan Update being prepared concurrently with this study. Existing and forecasted annual operations are summarized in **Table 3C**.

TABLE 3C
Operations Summary
Flagstaff Pulliam Airport

		FORECASTS	
Operations	**Existing 2003[1]**	**2008[2]**	**2025[2]**
Itinerant Operations			
Airline	3,324	4,800	14,200
Air Taxi	7,127	7,700	9,900
Military	880	900	900
General Aviation	30,659	35,100	44,600
Local Operations			
General Aviation	17,488	22,000	26,200
Total Operations	***59,478***	***70,500***	***95,800***

[1] Year 2003 operations are based on calender year 2002 ATCT counts, with an adjustment for nighttime operations when the ATCT is closed.
[2] Flagstaff Pulliam Airport Master Plan Update, 2003.

OPERATIONS AND FLEET MIX

For this analysis, current aircraft operations data (takeoffs and landings) and forecasts of future activity (2008 and 2025) were used for noise modeling. Annual aircraft operations are converted into average daily operations

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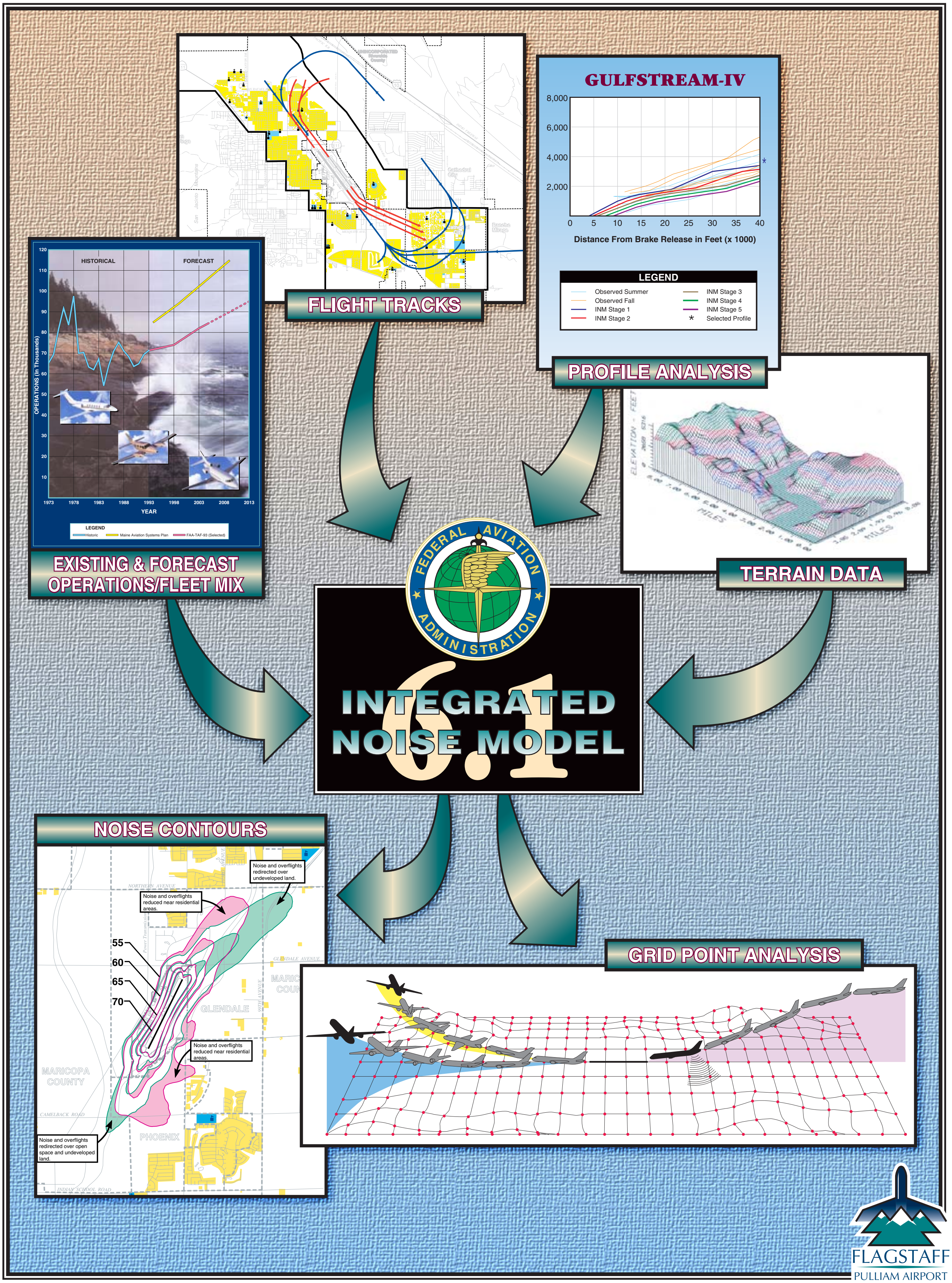

Exhibit 3B
INM PROCESS

by dividing total annual operations by 365 days.

The selection of individual aircraft types is important to the modeling process because different aircraft types generate different noise levels. The noise footprints presented in **Exhibit 3C** and **Exhibit 3D** illustrate this concept graphically. The footprints represent the noise pattern generated by one departure and one arrival of the given aircraft type. The aircraft illustrated are some of those commonly found at Flagstaff Pulliam Airport.

The distribution of these operations among various categories, users, and types of aircraft is critical to the development of the input model data. **Table 3D** lists the annual operations by aircraft type.

DATABASE SELECTION

To select the proper aircraft from the INM database, a review of the current fleet mix for each airline and user group at Flagstaff Pulliam Airport was conducted. Regional jet and turboprop aircraft in the commuter fleet are represented by the INM designators CL601, CL600, DHC8, and DHC6. These selections are commensurate with the Approved Substitution List.

The air taxi/air cargo operations at Flagstaff Pulliam Airport are distributed between six generalized aircraft types. The single engine piston, multi-engine piston, light turboprop, heavy turboprop, Lear 35, and Boeing 737 are modeled with INM designators GASEPF, BEC58P, CNA441, HS748A, LEAR35, and 737300, respectively.

Military operations at Flagstaff Pulliam Airport are distributed between two generalized categories of aircraft. The fixed wing military aircraft are modeled with INM designators C-12. Military helicopter operations are modeled with the Bell 212 (B212) helicopter.

The FAA aircraft substitution list indicates that the general aviation single-engine variable pitch propeller model, the GASEPV, represents a number of single-engine general aviation aircraft. These include, among others, the Beech Bonanza, Cessna 177 and 180, Piper Cherokee Arrow, Piper PA-32, and the Mooney. The general aviation single-engine fixed pitch propeller model, the GASEPF, also represents several single-engine general aviation aircraft. These include the Cessna 150 and 172, Piper Archer, Piper PA-28-140 and 180, and the Piper Tomahawk.

The FAA's substitution list recommends the BEC58P, the Beech Baron, to represent light twin-engine aircraft such as the Piper Navajo, Beech Duke, Cessna 310, and others. The CNA441 effectively represents light turboprop and twin-engine piston aircraft such as the King Air, Cessna 402, Gulfstream Commander, and others.

The INM provides data for most of the business turbojet aircraft in the national fleet. The CNA500 effectively represents the Cessna Citation I, II, and V series aircraft. The LEAR25 is used to represent the LearJet 23, 24, and 25

TABLE 3D
Aircraft Operations
Flagstaff Pulliam Airport

Aircraft Type	INM Designator	2002[1] Annual Operations	2008[2] Annual Operations	2025[2] Annual Operations
AIRLINES				
CRJ-200/700	CL601	0	4,800	12,800
EMB-135	CL600	0	0	1,400
DH-8	DHC8	3,324	0	0
B-1900	DHC6	0	0	0
Subtotal		***3,324***	***4,800***	***14,200***
AIR TAXI/CARGO				
B737	737300	37	50	600
Heavy Turboprop	HS748A	90	150	600
Lear 35	Lear 35	800	1,000	1,900
Light Turboprop	CNA441	3,100	3,300	4,400
MEP	BEC58P	2,100	2,100	1,600
C208	GASEPF	1,000	1,100	800
Subtotal		***7,127***	***7,700***	***9,900***
GA ITINERANT				
Single-Engine Piston - Fixed Pitch	GASEPF	11,900	13,200	16,000
Single-Engine Piston - Variable Pitch	GASEPV	11,900	13,200	16,000
Multi-Engine Piston	BEC58P	2,059	2,400	3,000
Turboprop	CNA441	1,500	2,000	3,000
Citation 500	CNA500	400	600	1,300
Lear 24	LEAR25	1,000	1,000	200
Lear 35	LEAR35	200	500	1,300
CL-600	CL600	400	600	1,400
G-V	GV	100	200	600
Helicopter	B206L	1,200	1,400	1,800
Subtotal		***30,659***	***35,100***	***44,600***
GA LOCAL				
Single-Engine Piston - Fixed Pitch	GASEPF	7,500	9,500	11,250
Single-Engine Piston - Variable Pitch	GASEPV	7,500	9,500	11,250
Multi-Engine Piston	BEC58P	1,000	1,200	1,400
Turboprop	CNA441	488	600	800
Helicopter	B206L	1,000	1,200	1,500
Subtotal		***17,488***	***22,000***	***26,200***
MILITARY				
Helicopter	B212	550	550	550
C-12	C12	330	350	350
Subtotal		***880***	***900***	***900***
Total		**59,478**	**70,500**	**95,800**

[1] Year 2003 operations are based on calendar year 2002 ATCT counts, with an adjustment for nighttime operations when the ATCT is closed.
[2] Flagstaff Pulliam Airport Master Plan Update, 2003.

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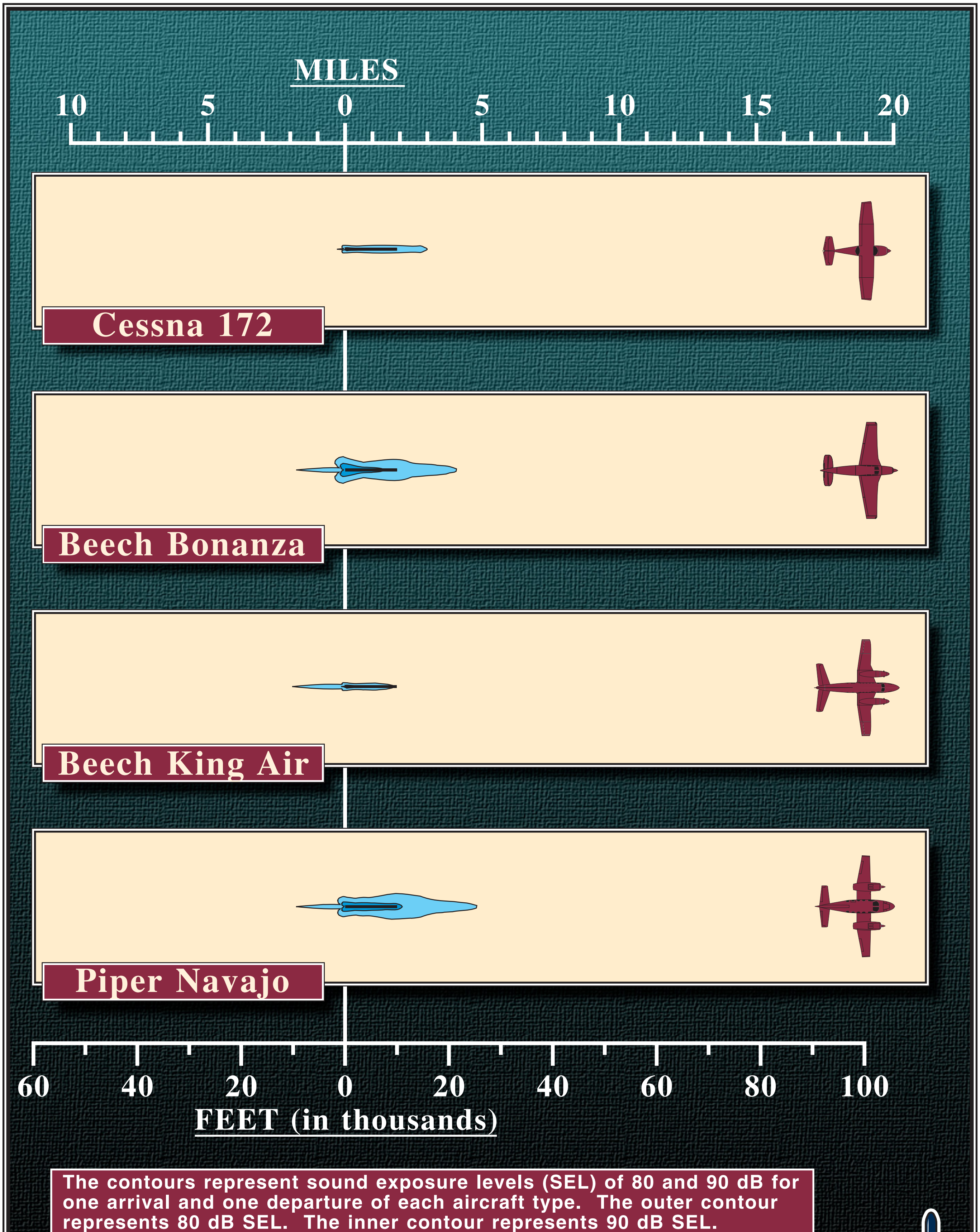

Source: Coffman Associates 1999

FLAGSTAFF
PULLIAM AIRPORT

Exhibit 3C
PROPELLER AIRCRAFT NOISE
FOOTPRINT COMPARISON

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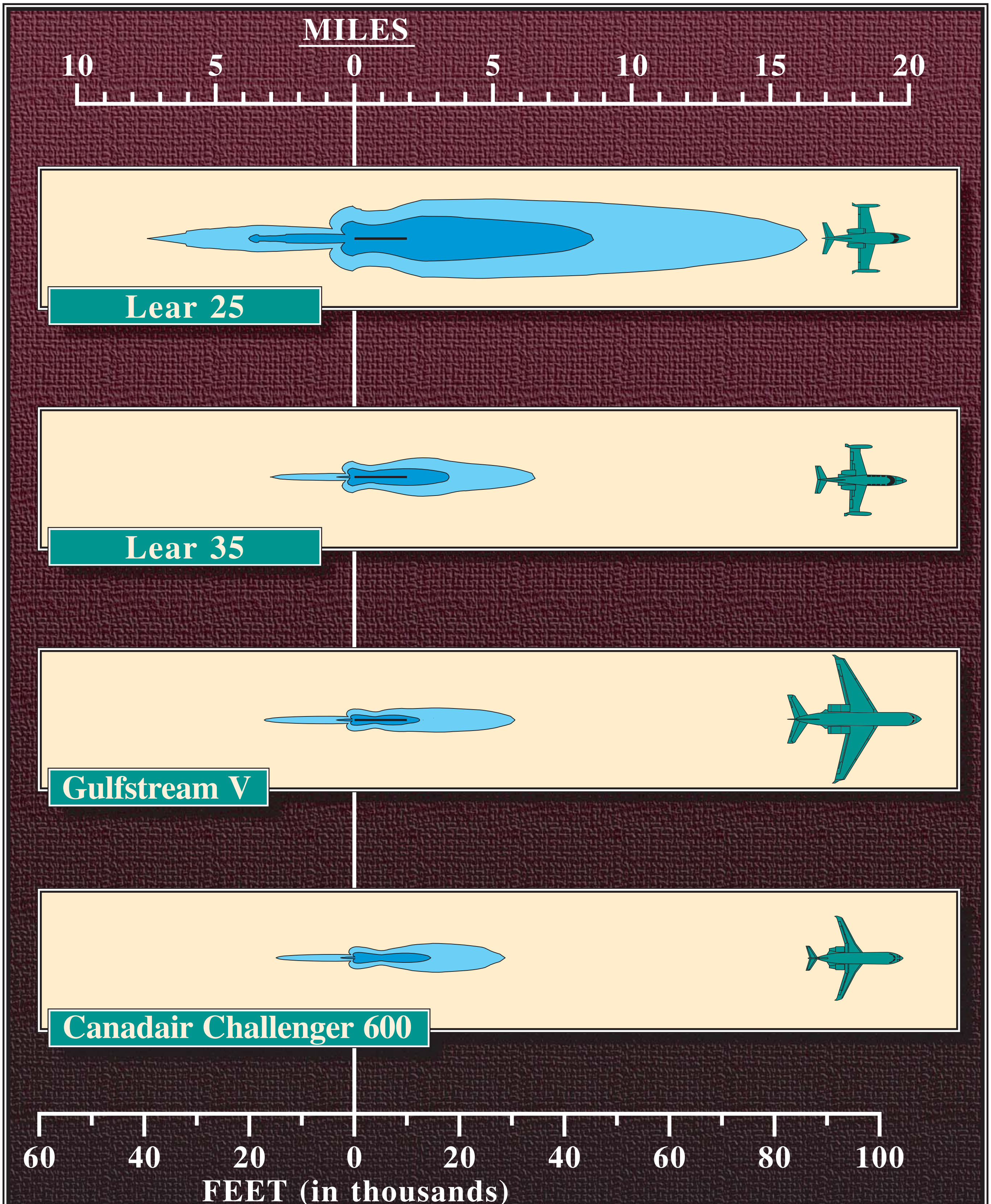

The contours represent sound exposure levels (SEL) of 80 and 90 dB for one arrival and one departure of each aircraft type. The outer contour represents 80 dB SEL. The inner contour represents 90 dB SEL.

Source: Coffman Associates 1999

FLAGSTAFF
PULLIAM AIRPORT

Exhibit 3D
TURBOJET AIRCRAFT NOISE
FOOTPRINT COMPARISON

series aircraft. Aircraft such as the Lear 30, 40, 50, and 60 series, in addition to the Hawker 800 and 1000, are effectively represented by the LEAR 35 designator. Both the Canadair Challenger 600 and Falcon 2000 are modeled using the CL600. The GV represents the Gulfstream V series of aircraft.

Helicopters operating at Flagstaff Pulliam Airport are modeled using the B206L designator. All substitutions are commensurate with published FAA guidelines.

TIME-OF-DAY

The time-of-day at which operations occur is important as input to the INM due to the 10 decibel weighting of nighttime (10:00 p.m. to 7:00 a.m.) flights. In calculating airport noise exposure, one operation at night has the same noise emission value as 10 operations during the day by the same aircraft. While Flagstaff Pulliam Airport does have an ATCT, it is closed between 7:00 p.m. and 7:00 a.m., October 1 to May 31, and from 9:00 p.m. to 6:00 a.m., April 1 to September 31. Specific counts for nighttime activity were derived from air carrier and cargo flight schedules, as well as interviews with airport users and airport staff. Information obtained from these sources and interviews were used to determine nighttime aircraft operations (between 10:00 p.m. and 7:00 a.m.) for modeling the 2003 noise exposure contours. This percentage of operations was applied to both future forecast scenarios. A detailed breakdown of nighttime operations by aircraft type can be found in **Appendix C**.

RUNWAY USE

Runway usage data is another essential input to the INM. For modeling purposes, wind data analysis usually determines runway use percentages. Aircraft will normally land and takeoff into the wind. However, wind analysis provides only the directional availability of a runway and does not consider pilot selection, primary runway operations, or local operating conventions.

The runway usage at Flagstaff Pulliam Airport was established through discussions with the ATCT manager and staff. In addition, a supplemental wind analysis was conducted which supported that wind conditions are consistent for runway use as stated by the ATCT. **Table 3E** summarizes the runway use percentages for existing and future conditions.

FLIGHT TRACKS

A review of local and regional air traffic control procedures, as well as interviews with ATCT staff were used to develop consolidated flight tracks. The resulting analysis is a series of consolidated flight tracks describing the average corridors that lead to and from Flagstaff Pulliam Airport.

At an air carrier/general aviation, airport such as Flagstaff Pulliam, aircraft traffic is expected over most areas around the airport. The density of the air traffic generally increases closer to the airport. The flight tracks were developed to reflect these common patterns and to account for the inevitable flight track dispersions around the airport.

TABLE 3E Existing Runway Use				
Runway	**Commercial**	**Business Jet**	**Military**	**General Aviation Turboprop & Piston**
Arrivals and Departures				
3 21	30% 70%	30% 70%	30% 70%	30% 70%
Touch-And-Go's				
3 21	NA NA	NA NA	NA NA	20% 80%

Exhibit 3E illustrates the flight tracks used for the modeling of the departure operations at Flagstaff Pulliam Airport. The departure traffic follows different procedures off each end of Runway 3-21. In order to avoid noise-sensitive residential areas, most of the traffic at Flagstaff Pulliam Airport departing to the south from Runway 21 turns to the southeast and follows Interstate Highway 17. Departure tracks to the north, west, and southeast are also provided for Runway 21. Departure tracks on Runway 3 are provided for the dispersed straight-out and turns to the north and southwest.

The consolidated arrival flight tracks for Flagstaff Pulliam Airport are presented in **Exhibit 3F**. Arrival patterns to all four runway ends are generally straight-in close to the airport. Arrivals from the direction opposite the runway flow typically enter the traffic pattern at about a 45-degree angle and follow it around and into the airport. Aircraft approaching the airport from the south occasionally cross over the top of the airport to join the traffic pattern.

Exhibit 3G illustrates the touch-and-go pattern tracks and the helicopter flight tracks developed for this analysis. The series of concentric oval-shaped tracks represent the observed variance in the size of the training pattern at Flagstaff Pulliam Airport. These tracks represent the observed dispersion of the touch-and-go traffic and are adequate for modeling purposes.

FLIGHT PROFILES

The standard arrival profiles used in the INM program are three- and five-degree approaches. Conversations with air traffic controllers, the airport management, and the local FBO gave no indication that there was any variation on this standard procedure at Flagstaff Pulliam Airport. Therefore, the standard five-degree approaches were used for single and multi-engine

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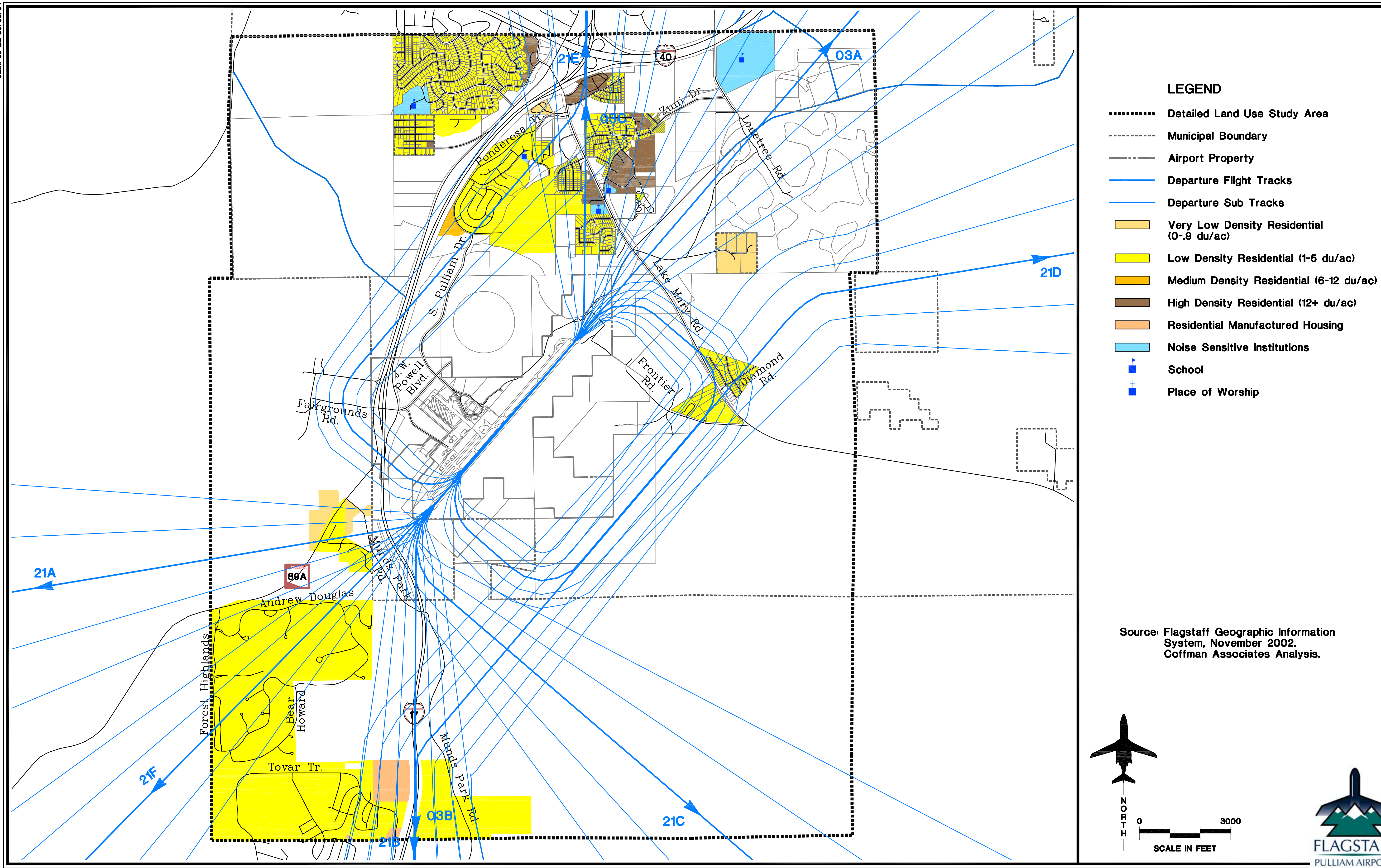

Exhibit 3E
EXISTING AND FUTURE CONSOLIDATED DEPARTURE TRACKS

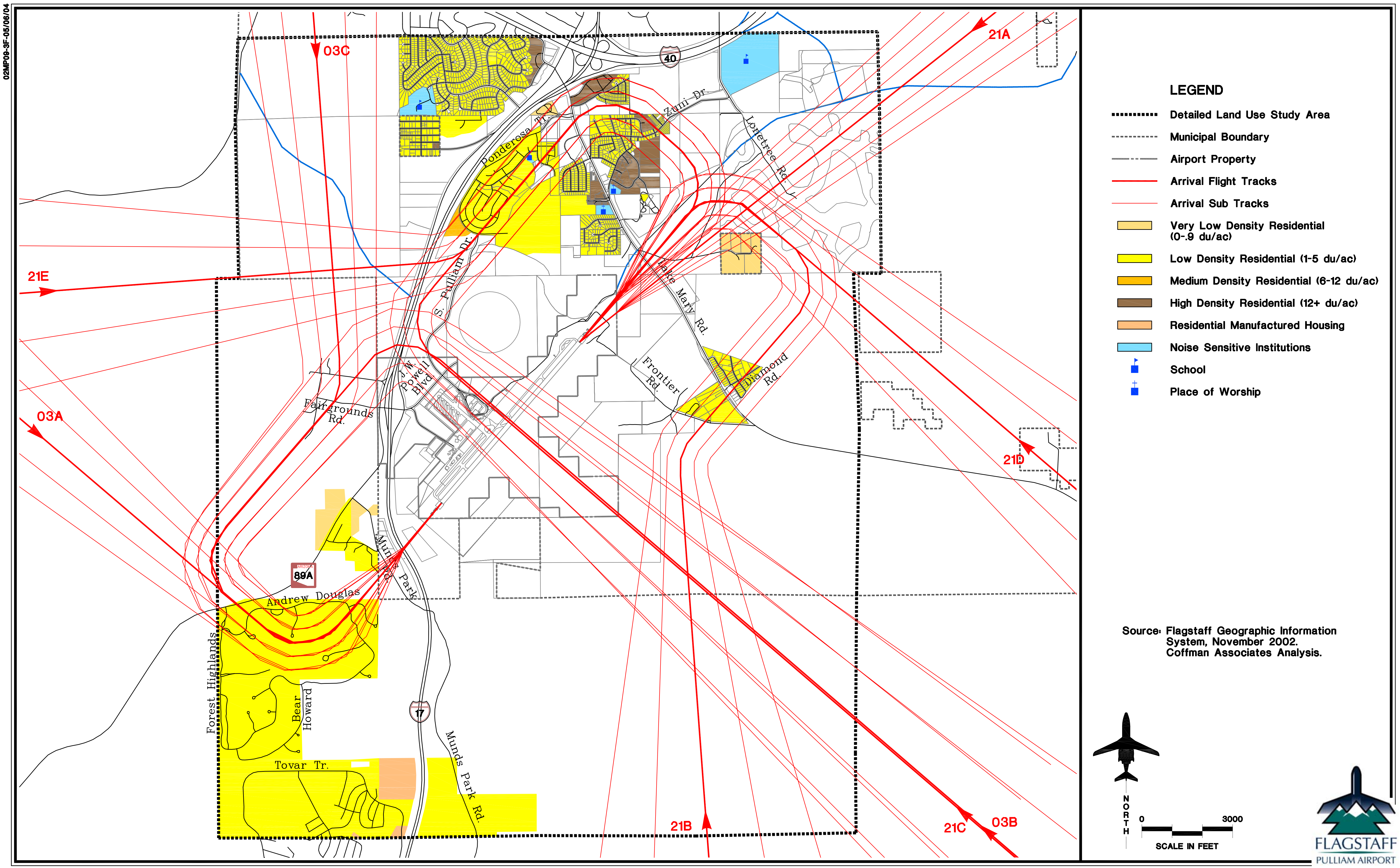

Exhibit 3F
EXISTING AND FUTURE CONSOLIDATED ARRIVAL TRACKS

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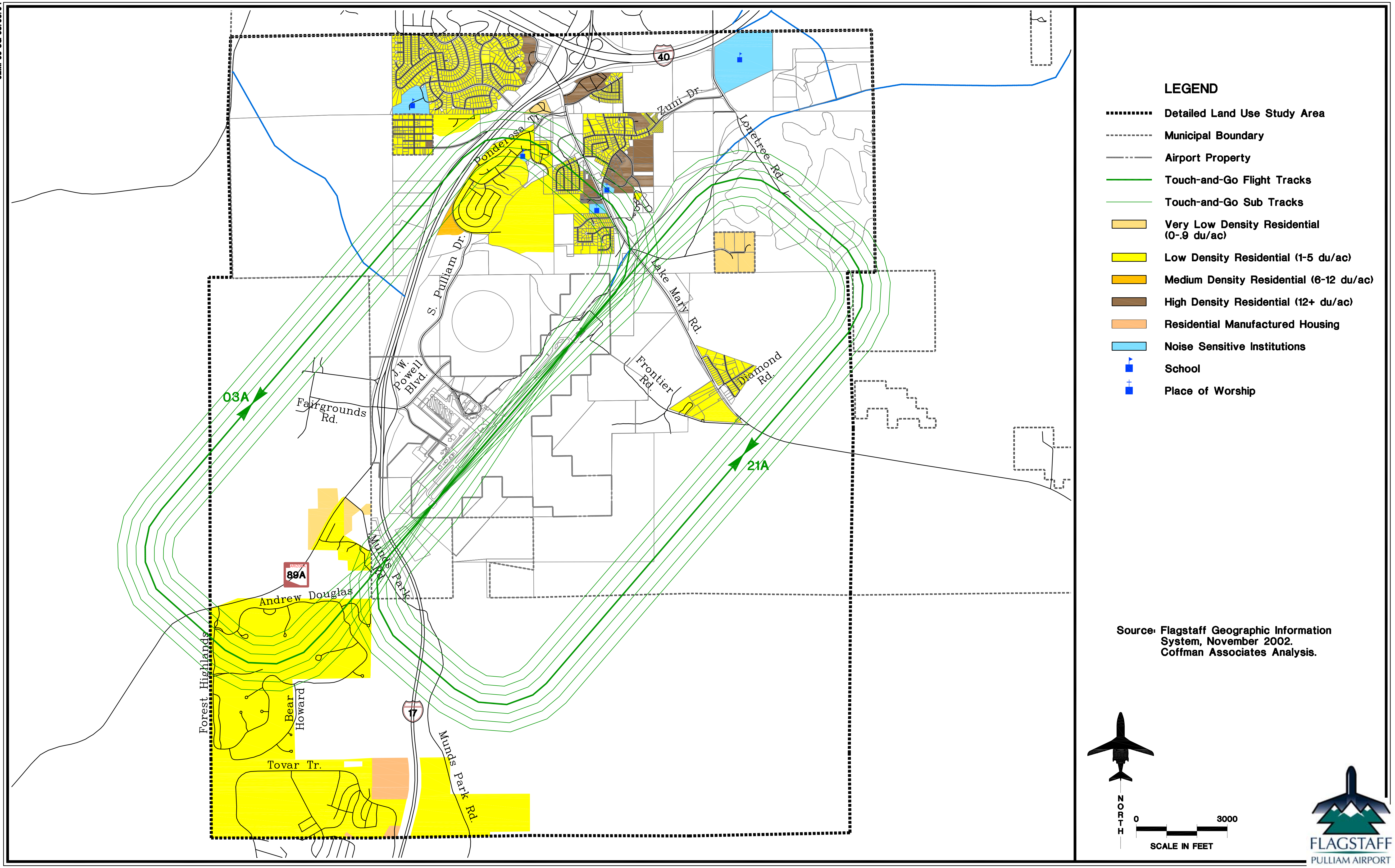

Exhibit 3G
EXISTING AND FUTURE CONSOLIDATED TOUCH AND GO AND HELICOPTER TRACKS

aircraft and three-degree approaches were used for the remaining fleet.

INM Version 6.1, which was used in this analysis, actually computes the takeoff profiles based on the user-supplied airport elevation and the average annual temperature entries in the input batch. At Flagstaff Pulliam Airport, the elevation is 7,014 MSL and the average annual temperature is 45.8 degrees F. If other than standard conditions (temperature of 59 degrees F. and elevations of zero feet MSL) are specified by the user, the profile generator automatically computes the takeoff profiles using the airplane performance coefficients in the data base and the equations in the Society of Automotive Engineers Aerospace Information Report 1845 (SAE/AIR 1845).

The INM computes separate departure profiles (altitude at a specified distance from the airport with associated velocity and thrust settings) for each of the various types of aircraft using the airport.

ASSIGNMENT OF FLIGHT TRACKS

The final step in developing input data for the INM model is the assignment of aircraft to specific flight tracks. Prior to this step, specific flight tracks, runway utilization, and operational statistics for the various aircraft models using Flagstaff Pulliam Airport were evaluated.

Discussions with ATCT staff were used to delineate the proportion of traffic using each consolidated flight track. This analysis resulted in a percentage of use for each flight track. These percentages were then used to assign the different aircraft types to the flight tracks. These assignments resulted in the majority of the traffic being assigned to the arrival tracks northeast of the airport and departure tracks southwest of the airport. This is in keeping with the standard procedures at Flagstaff Pulliam Airport. Helicopter traffic and touch-and-go traffic were also assigned to tracks based on the same methodology.

To determine the specific number of aircraft assigned to any one flight track, a long series of calculations was performed. This included a number of specific aircraft of one group, factored by runway utilization and flight track percentage. A detailed breakdown of the flight track assignments can be found in **Appendix C**.

INM OUTPUT

Output data selected for calculation by the INM were annual average noise contours in DNL. Part 150 requires that 65, 70, and 75 DNL contours must be mapped in the official Noise Exposure Maps (NEM). While the 65 DNL contour is considered the threshold of significance by the FAA, the 60 DNL noise contour is also mapped in this study as a guideline for future noise abatement and land use planning. For purposes of this Part 150 study, Flagstaff Pulliam Airport is considering noise between 60 and 65 DNL to have a marginal effect. See the "Land Use Compatibility Guidelines at Flagstaff Pulliam Airport" section on page 4-3 for more detail. This section presents the results of the contour analysis for current and forecast noise exposure conditions, as developed from the Integrated Noise Model.

2003 NOISE EXPOSURE CONTOURS

Exhibit 3H presents the plotted results of the INM contour analysis for 2003 conditions using input data described in the preceding pages. The areas within each contour are presented in **Table 3F**.

TABLE 3F
Comparative Areas of Noise Exposure
Flagstaff Pulliam Airport

	Area in Square Miles		
DNL Contour	**2003**	**2008**	**2025**
60	1.51	1.59	1.32
65	0.70	0.78	0.68
70	0.35	0.42	0.37
75	0.19	0.24	0.20

The shape and extent of the 2003 noise exposure contours depicted on **Exhibit 3H** reflect the underlying flight track assumptions. The outermost noise contour represents the 60 DNL contour. This contour is asymmetrical off the ends of Runway 3-21, reflecting the predominate flow to the southwest. To the northeast of Runway 3-21, the two bulges in the contour reflect arrival patterns, the straight-in approach, and the circling approach. To the southwest, the noise contour extends southward, across Interstate Highway 17. The 65 DNL follows a similar path to the southwest where the contour across the highway. To the northeast, the contour becomes thinner and longer as the two approach paths merge into one. The 70 and 75 DNL contours generally encompasses the runway.

The 60 DNL contour extends approximately 6,500 feet from airport property over Interstate Highway 17 to the south. To the northeast, the 60 DNL contour extends about 2,000 feet away from airport property, crossing Lake Mary Road.

The 65 DNL contour is smaller and generally the same shape as the 60 DNL. The contour extends approximately 3,200 feet to the southwest. To the northeast, the contour extends approximately 500 feet off airport property. The 65 DNL contour primarily follows the property line to the west and east.

The 70 DNL noise contour is smaller and similar in general shape to the 65 DNL contour. To the southwest, the 70 DNL contour extends approximately

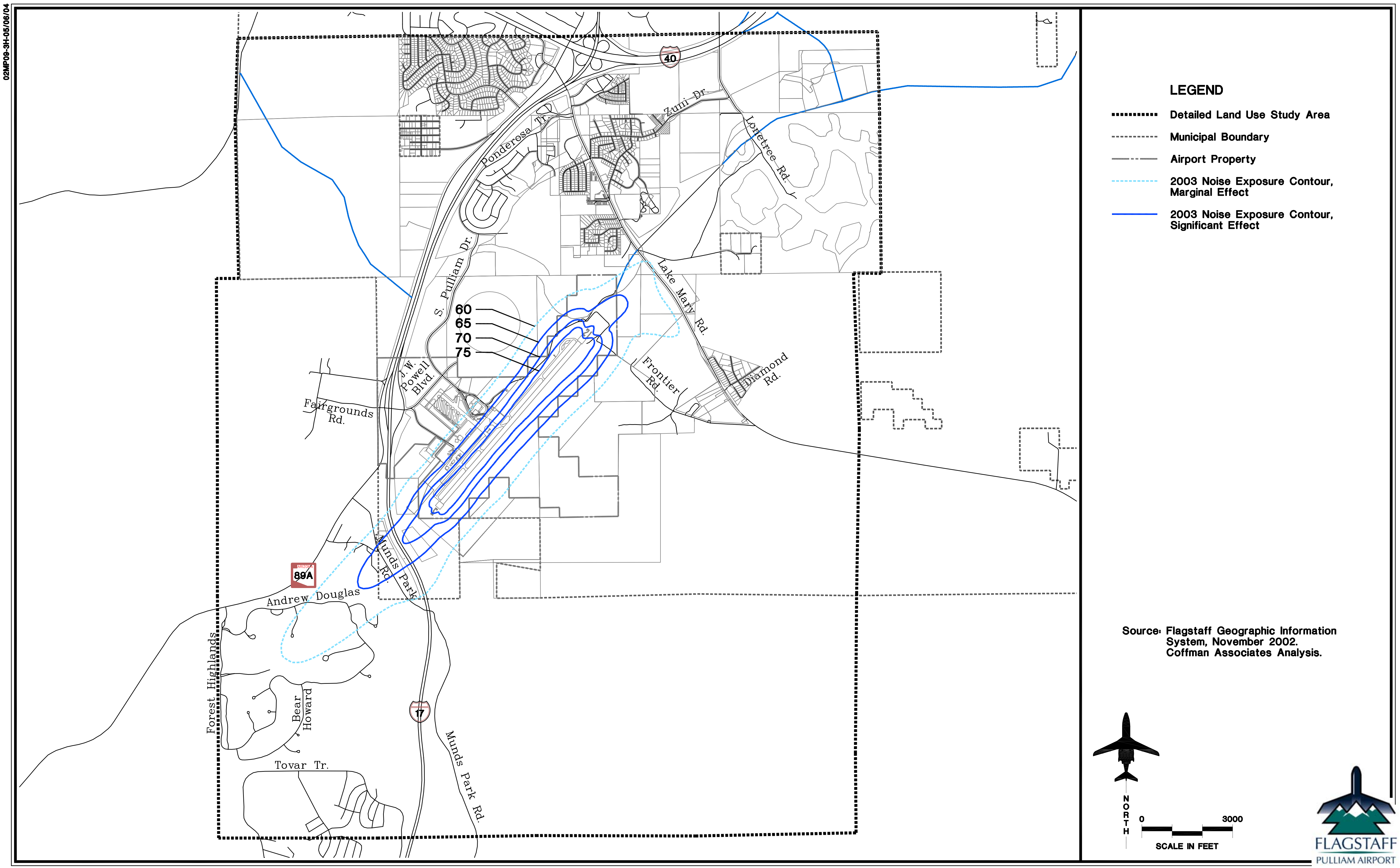

Exhibit 3H
2003 NOISE EXPOSURE MAP

1,100 feet off airport property. To the northeast, the 70 DNL contour is completely contained within airport property. The east and west are almost completely contained within airport property except for small portions southeast and west of the airport.

The 75 DNL contour remains close to the runway and is contained entirely on airport property.

COMPARATIVE MEASUREMENT ANALYSIS

A comparison of the average measured DNL(24) versus the computer-predicted cumulative DNL noise value for each measurement site has been developed. In this case, it is important to remember what each of the two noise levels indicates. The computer-modeled DNL contours are analogous to the climate of an area and represent the noise levels on an average day of the period under consideration. In contrast, the field measurements reflect only the noise levels on the specific days of measurement. Additionally, the field measurements consider all the noise events that exceed a prescribed threshold and duration, while the computer model only calculates the noise due to aircraft events. As previously discussed, the field measurements can easily be contaminated by ambient noise sources other than aircraft around the measurement sites. With this understanding in mind, it is useful to evaluate the comparative aircraft DNL levels of the measurement sites.

DNL Comparison

This analysis provides a direct comparison of the measured DNL(24) and predicted values for each noise measurement site. In order to facilitate such a comparison, it is necessary to ensure that the computer model input is representing the observed reality as accurately as possible within the capabilities of the model.

As previously mentioned, field noise measurements were taken during primarily average fall weather for the Flagstaff Pulliam area. The first three days of the measurement period, weather conditions were generally considered to be adequate for aircraft using VFR. During the last 48 hours of monitoring, weather conditions deteriorated as rainstorms passed through the Flagstaff Pulliam area. This resulted in a drop in daily operations from a high of 175 operations on September 30, 2002, to a low of 45 on October 2, 2002, with an average of 109.2 operations over the measurement period. Annual average operations assumed for the 2003 noise exposure contours are 162.9 operations.

A difference of three to four DNL is generally not considered a significant deviation between measured and calculated noise, particularly at levels above 65 DNL. Additional deviation is expected at levels below 65 DNL. In this case, four of the noise monitor sites fall outside the 65 DNL noise contour.

The measured and predicted 2003 noise exposure contours for the annual average condition are presented for each aircraft noise measurement site on **Exhibit 3J** and **Table 3G**. As seen in **Table 3G**, in most cases the INM over-predicted sound levels at the noise monitor sites. The over-prediction ranges from 1.8 to 6.2 decibels. As previously mentioned, the rainstorms during the later portion of the monitoring period reduced aircraft operations during this time, which contributed to the lower measured DNL(24) levels at sites 1 and 2. Site 6, to the south, was the only site under predicted (-2.4 DNL). As previously mentioned, the deviation of 2.4 DNL is well within the tolerance of the INM.

TABLE 3G
Noise Measurement DNL(24) vs. Predicted DNL Values
Flagstaff Pulliam Airport

Monitor Site	Measured DNL(24)[1]	Predicted 2003[2]	Difference
1	65.6	70.1	4.5
2	62.7	68.9	6.2
3	52.8	54.6	1.8
4	55.8	60.1	4.3
5	N/A[3]	56.6	N/A
6	51.8	49.4	-2.4

Source: Coffman Associates analysis
1 Measurements were taken Sept 28 to Oct. 2, 2002. This information is for comparative purposes only and not for input into the Integrated Noise Model (INM).
2 Annual average 2003 noise exposure contours.
3 Monitor cable cut after 11 hours of monitoring.

2008 NOISE EXPOSURE CONTOURS

The 2008 noise contours represent the estimated noise conditions based on the forecasts of future operations and includes the planned 1,801-foot runway extension to the northeast (shown in light blue on **Exhibit 3K**). The Runway 21 landing threshold is planned to remain in its current location. This analysis provides a near-future baseline which can subsequently be used to judge the effectiveness of proposed noise abatement procedures. **Exhibit 3K** presents the results of the INM contour analysis for 2008 conditions using input data that has been described in the preceding pages.

The 2008 noise contours are similar in shape to their 2003 counterparts. The contours are slightly larger in size, primarily due to the anticipated increase in aircraft operations during the next five years.

The 60 DNL contour extends about 2,000 feet from airport property, beyond Lake Mary Road to the northeast. To the southwest, the 60 DNL noise contour extends approximately 5,500.

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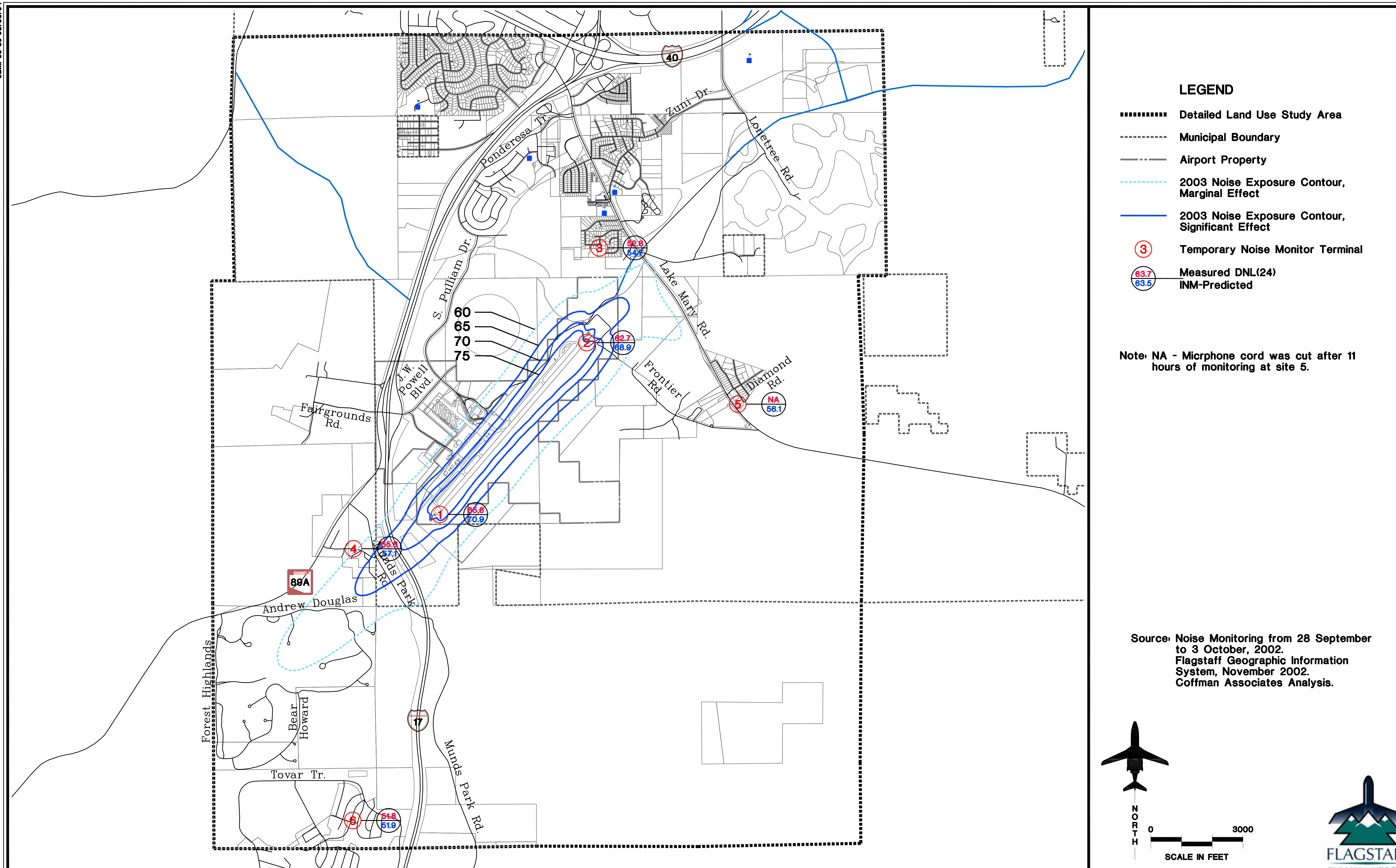

Exhibit 3J
MEASURED AND MODELED NOISE

02MP09-3K-05/06/04

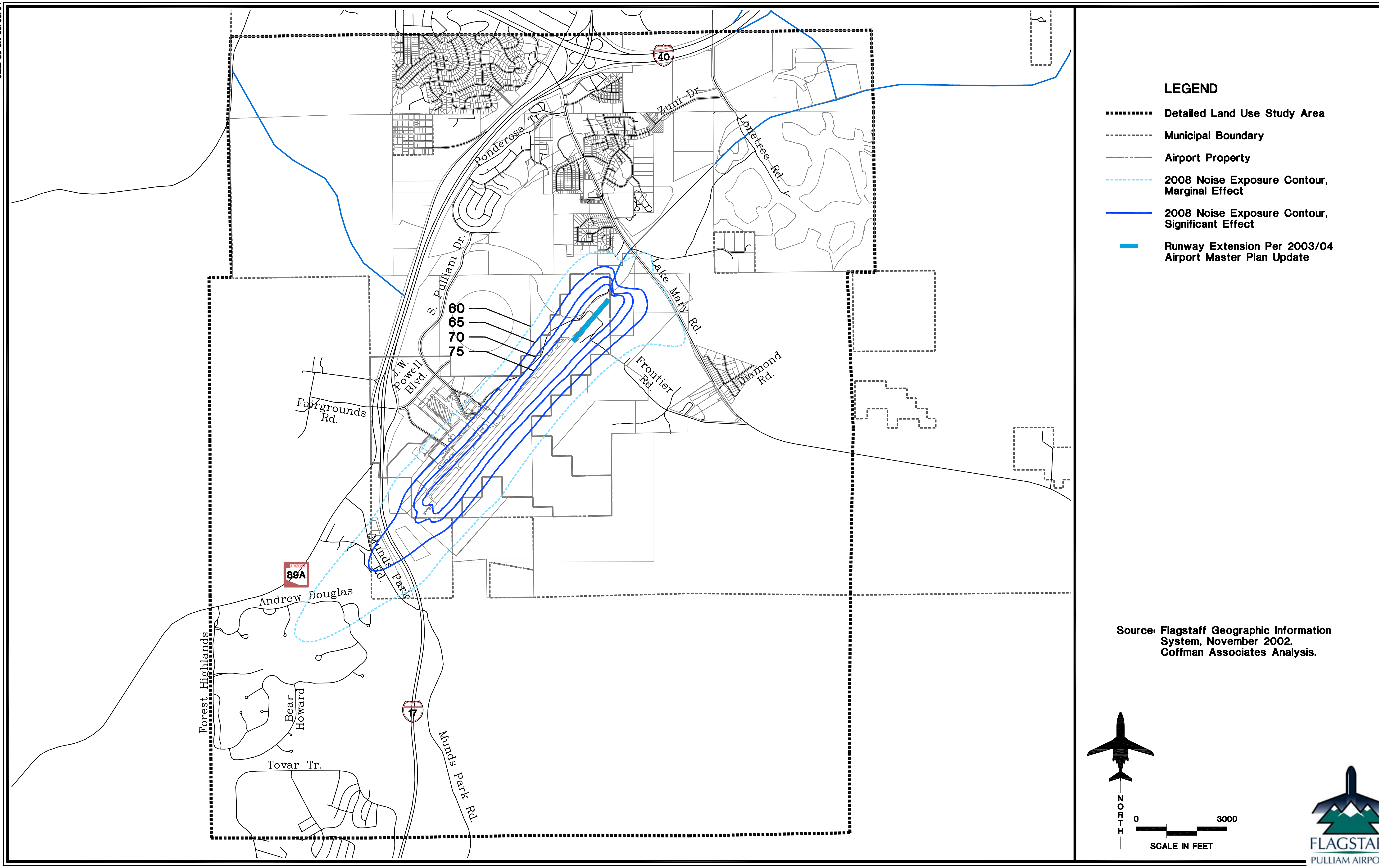

Exhibit 3K
2008 NOISE EXPOSURE MAP

The 60 DNL contour extends an average distance of approximately 500 feet to the west and east.

The 65 DNL contour is smaller and generally the same shape as the 60 DNL. The contour extends approximately 500 feet to the northeast. To the southwest, the contours extend about 2,100 feet off airport property. The 65 DNL noise contour extends an average distance of approximately 300 feet to the east and west.

The 70 DNL noise contour is primarily contained to airport property with the exception of slight bulges to the southwest and northeast. The 75 DNL noise contour is contained entirely on airport property. The surface areas of the 2008 noise exposure contour are presented for comparison in **Table 3F**.

2025 NOISE EXPOSURE CONTOURS

The 2025 noise contours represent the estimated noise conditions based on the forecasts of future long range operations. This analysis also includes the planned 1,801-foot runway extension to the northeast (shown in light blue on **Exhibit 3L**). The Runway 21 landing threshold is planned to remain in its current location. This analysis provides a long term future baseline which can also be used to judge the effectiveness of proposed noise abatement procedures and land use planning recommendations. The 2025 contours are being provided for informational purposes only. Only the existing (2003) and five-year (2008) noise contours will be accepted by the FAA. **Exhibit 3L** presents the plotted results of the INM contour analysis for 2025 conditions using input data described in the preceding pages.

Due to the reduction of louder Stage 2 business jet aircraft by 2025, the 2025 noise contours are smaller than both the 2003 and 2008 noise contours. To the northeast, the 60 DNL noise contour extends about 1,050 feet, just reaching Lake Mary Road. The 60 DNL noise contour extends approximately 3,500 feet to the southwest across Interstate Highway 17. To the east and west, the 60 DNL noise contour extends approximately 400 feet on average from airport property.

The 65 DNL noise contour extends approximately 300 feet from on airport property to the northeast. To the southwest, the contour extends about 1,000 feet from airport property. To the east and west, the contour extends an average of 200 feet from airport property.

The 70 DNL noise contour extends about 375 feet to the northeast. To the southwest, the contour remains on airport property. To the east and west the contour remains on airport property.

The 75 DNL noise contour primarily remains on airport property except for a small bulge to the northeast. The surface areas of the 2025 noise exposure contour are presented for comparison in **Table 3F**.

SUMMARY

The information presented in this chapter defines the noise patterns for current and future aircraft activity, without additional abatement measures, at Flagstaff Pulliam Airport. It does not make an attempt to evaluate or otherwise include that activity over which the airport has no control -- such as other aircraft transiting the area and not stopping at the airport.

The current (2003) contours are based on operational counts from the Flagstaff Pulliam ATCT for calender year 2002. The 2008 and 2025 contours are based on aviation forecasts outlined in Chapter Two. The 2008 and 2025 contours also included the planned 1,801-foot runway extension to the northeast. The noise exposure levels around the airport can be expected to increase slightly in the short term as operations increase. However, the business jet fleet's transition to new, more efficient and quieter aircraft will reduce the overall size of the long range noise exposure contours.

It is stressed that DNL contour lines drawn on a map do not represent absolute boundaries of acceptability or unacceptability in personal response to noise, nor do they represent the actual noise conditions present on any specific day, but rather the conditions of an average day derived from annual average information.

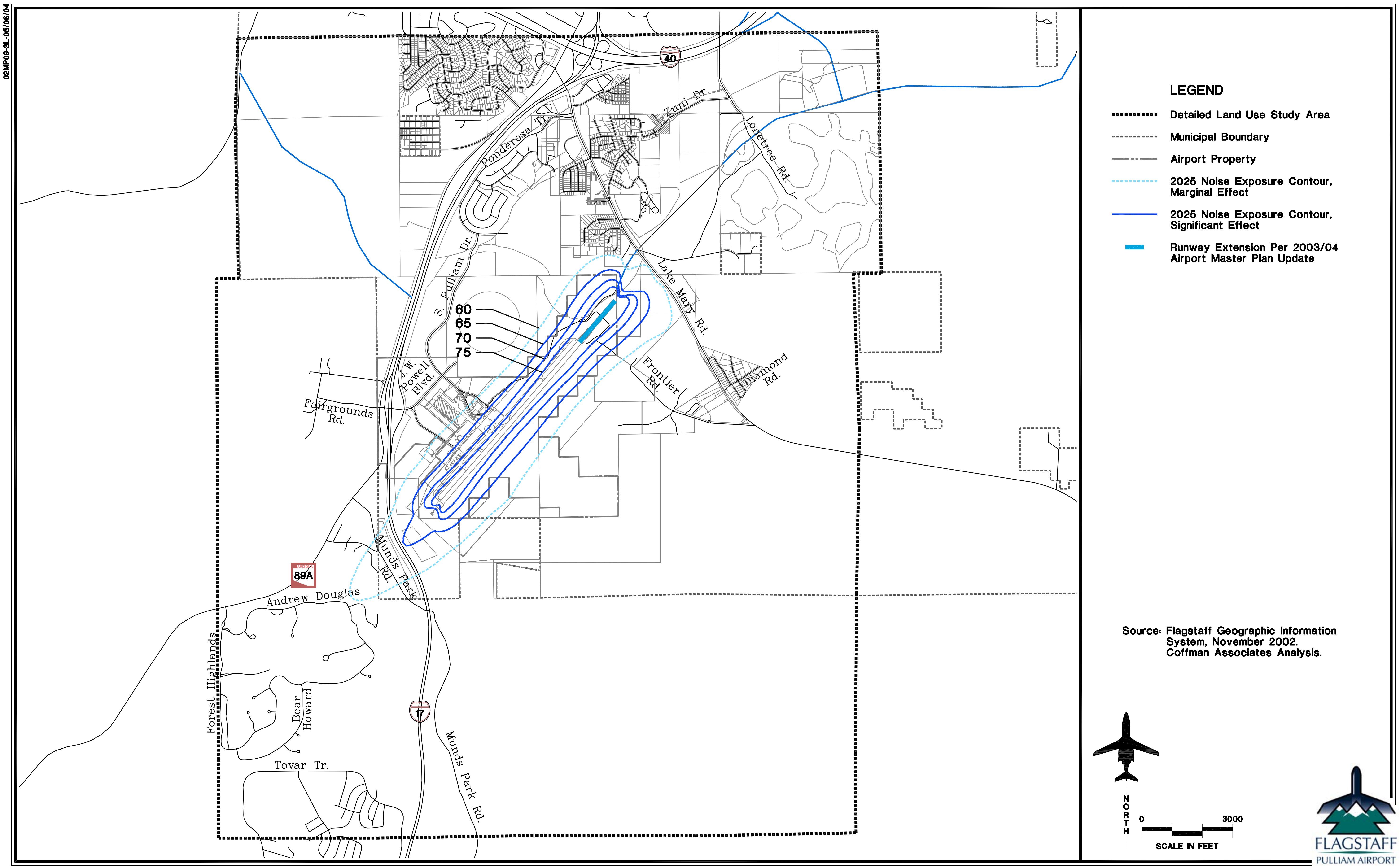

Exhibit 3L
2025 NOISE EXPOSURE MAP

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Chapter Four

NOISE IMPACTS

Chapter Four

NOISE IMPACTS

This chapter examines the impacts of aircraft noise on existing and future land use and population within the study area. The effects of noise on people can include hearing loss, other ill health effects, and annoyance. While harm to physical health is generally not a problem in neighborhoods near airports, annoyance is a common problem. Annoyance can be caused by sleep disruption, interruption of conversations, interference with radio and television listening, and disturbance of quiet relaxation.

Individual responses to noise are highly variable, thus making it very difficult to predict how any person is likely to react to environmental noise. However, the response of a large group of people to environmental noise is much less variable and has been found to correlate well with cumulative noise metrics such as day-night average sound level (DNL). The development of aircraft noise impact analysis techniques has been

based on this relationship between average community response and cumulative noise exposure.

For more detailed information on the effects of noise exposure, refer to the ***Technical Information Paper (T.I.P.), Effects of Noise Exposure***.

The major sections in this chapter include the following:

- Land Use Compatibility
- Noise Complaints
- Current Noise Exposure
- Potential Growth Risk
- 2008 Noise Exposure
- 2025 Noise Exposure

LAND USE COMPATIBILITY

The degree of annoyance which people suffer from aircraft noise varies depending on their activities at any given time. People rarely are as disturbed by aircraft noise when they are shopping, working, or driving as when they are at home. Transient hotel and motel residents seldom express as much concern with aircraft noise as do permanent residents of an area.

The concept of "land use compatibility" has arisen from this systematic variation in human tolerance to aircraft noise. Studies by governmental agencies and private researchers have defined the compatibility of different land uses with varying noise levels. (A review of these guidelines is presented in the ***T.I.P., Noise and Land Use Compatibility Guidelines***.) The Federal Aviation Administration (FAA) has established guidelines for defining land use compatibility for use in 14 CFR Part 150 (Part 150) studies.

PART 150 GUIDELINES

The FAA adopted land use compatibility guidelines when it promulgated Part 150 in the early 1980s. (The Interim Rule was adopted on January 19, 1981; the Final Rule was adopted on December 13, 1984, was published in the Federal Register on December 18, 1985, and became effective on January 18, 1985.) These new guidelines were based on earlier studies and guidelines developed by federal agencies (Federal Interagency Committee of Urban Noise, 1980). These land use compatibility guidelines are only advisory; they are not regulations. Part 150 explicitly states that determinations of noise compatibility and regulation of land use are purely local responsibilities. (See Section A150.101(a) and (d) and explanatory note in Table 1 of Part 150.) **Exhibit 4A** illustrates the FAA guidelines.

The FAA uses the Part 150 guidelines as the basis for defining areas within which noise compatibility projects may be eligible for federal funding through the noise set-aside funds of the Airport Improvement Program (AIP). In general, noise compatibility projects must be within the 65 DNL contour to be eligible for federal funding. According to the AIP Handbook, "Noise compatibility projects usually must be located in areas where noise measured in day-night average sound level (DNL) is 65 (dB) or greater." (See FAA Order 5100.38A, Chapter 7, paragraph 710.b.) Funding is permitted outside the 65 DNL contour only where the airport sponsor has determined that non-compatible land uses exist at lower levels and the FAA has explicitly concurred with that determination.

The FAA guidelines outlined in **Exhibit 4A** show that residential development, including standard construction (residential construction without special acoustical treatment), mobile homes, and transient lodging are incompatible with noise above 65 DNL. Homes of standard construction and transient lodgings may be considered compatible where local communities have determined these uses are permissible;

02MP09-4A-3/25/03

LAND USE	Yearly Day-Night Average Sound Level (DNL) in Decibels					
	Below 65	65-70	70-75	75-80	80-85	Over 85
RESIDENTIAL						
Residential, other than mobile homes and transient lodgings	Y	N[1]	N[1]	N	N	N
Mobile home parks	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
Government 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	25	30	N	N
Utilities	Y	Y	Y[2]	Y[3]	Y[4]	N
Communication	Y	Y	25	30	N	N
MANUFACTURING AND PRODUCTION						
Manufacturing, general	Y	Y	Y[2]	Y[3]	Y[4]	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y[6]	Y[7]	Y[8]	Y[8]	Y[8]
Livestock farming and breeding	Y	Y[6]	Y[7]	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
RECREATIONAL						
Outdoor sports arenas and spectator sports	Y	Y[5]	Y[5]	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts, and camps	Y	Y	Y	N	N	N
Golf courses, riding stables, and water recreation	Y	Y	25	30	N	N

The designations contained in this table do not constitute a federal determination that any use of land covered by the program is acceptable 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.

See other side for notes and key to table.

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Exhibit 4A
LAND USE COMPATIBILITY GUIDELINES

02MP09-4A-3/25/03

KEY

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

NOTES

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

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

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

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

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

6 Residential buildings require a NLR of 25.

7 Residential buildings require a NLR of 30.

8 Residential buildings not permitted.

Source: ***F.A.R. Part 150***, Appendix A, Table 1.

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Exhibit 4A (Continued)
LAND USE COMPATIBILITY GUIDELINES

however, sound insulation measures are recommended. Schools and other public use facilities are also generally incompatible with noise between 65 DNL and 75 DNL, but, again, the guidelines note that, where local communities determine that these uses are permissible, sound insulation measures should be used. Other land uses considered incompatible at levels exceeding 65 DNL include outdoor music shells and amphitheaters.

Land uses considered incompatible at levels above 75 DNL include hospitals, nursing homes, places of worship, auditoriums, concert halls, livestock breeding, amusement parks, resorts, and camps. Many of these incompatible land uses are considered compatible in areas subject to noise between 65 DNL and 75 DNL if prescribed levels of noise level reduction can be achieved through sound insulation. These include hospitals, nursing homes, places of worship, auditoriums, and concert halls.

Historic properties are identified in compliance with Part 150, Section 4(f) of the *Department of Transportation Act* (DOT Act), and the *National Historic Preservation Act of 1966*, as amended. In general, these properties are not any more sensitive to noise than are other properties of the same use; however, these federal regulations require that noise effects on these properties be considered when evaluating the effects of an action, such as a noise abatement or land use management procedure.

The strictest of these requirements is the DOT Act. Section 4(f) of the DOT Act provides that the U.S. Secretary of Transportation shall not approve any program (such as a Noise Compatibility Plan) or project which requires the use of any historic site of national, state, or local significance unless there is no feasible and prudent alternative to the use of such land. The FAA is required to consider both the direct physical taking of eligible property (such as acquisition and demolition of historic structures) and the indirect use of or adverse impact to eligible property (such as the 65 DNL noise contour). When evaluating the affects of the noise abatement and land use management alternatives later in this report, it is necessary to also identify whether the proposed action conflicts with or is compatible with the normal activity of aesthetic value of any historical properties not already significantly affected by noise. The Noise Exposure Map (NEM) contours are not evaluated under Section 4(f).

Land Use Guidelines at Flagstaff Pulliam Airport

For purposes of the Part 150 Noise Compatibility Study at Flagstaff Pulliam Airport, the FAA's land use compatibility guidelines will be used as the basis for making determinations about land use compatibility in the airport area.

While the FAA considers the 65 DNL as the threshold of significant impact on noise-sensitive uses, the noise analysis at Flagstaff Pulliam Airport goes down to the 60 DNL level. This is partly in response to a federal report which has recommended the need to examine potential noise impacts below 65 DNL in environmental documents where significant increases in noise may be expected (FICON, 1992, p. 3-5) and partly in response to local regulations. Local regulations, specifically those contained within the Airport Overlay District, provide sound insulation requirements for development within the 60, 65, 70, and 75 DNL noise contours.

For purposes of this Part 150 Study, Flagstaff Pulliam Airport is considering noise between 60 and 65 DNL to have a marginal effect on the following noise-sensitive land uses:

- Residential;
- Schools;
- Hospitals and nursing homes;
- Churches, auditoriums, and concert halls;
- Outdoor music shells and amphitheaters.

While research has shown that significantly fewer people are affected as noise decreases below 65 DNL, aircraft noise continues to be a problem for at least some people at even extremely low DNL levels. This is indicated in the two graphs illustrated on **Exhibit 4B** relating to annoyance with DNL levels. (Also see the ***T.I.P., Noise and Land Use Compatibility Guidelines***.)

NOISE COMPLAINTS

Before assessing the exposure of local land use and population to existing aircraft noise levels, recent noise complaints, and the methods for receiving complaints, should be evaluated. By themselves, complaints cannot be taken as a complete assessment of a noise problem at an airport. Many unpredictable variables can influence whether a person chooses to file a noise complaint. Many people who are annoyed may find it inconvenient or intimidating to call and complain. Others who decide to complain may be unusually sensitive to noise or may be especially anxious about aircraft overflights. Unusual events, rather than a long-term situation, may also stimulate a complaint. Despite the limits of complaint information, it can aid in understanding the geographic pattern of concern about the noise created by the use of the airport.

Flagstaff Pulliam Airport does not have a formal method of receiving aircraft noise complaints. Noise complaints are registered at several locations on the airport and include the airport administration office, on-airport operations offices within the fire station, the airport traffic control tower, and the fixed base operator. Airport staff indicated that an average of two aircraft noise complaints are received per month. According to airport staff, most of these complaints are concerning military and older Stage 2 business jet aircraft operations.

CURRENT NOISE EXPOSURE

This section describes the exposure of existing land uses and population as they relate to the 2003 noise contours.

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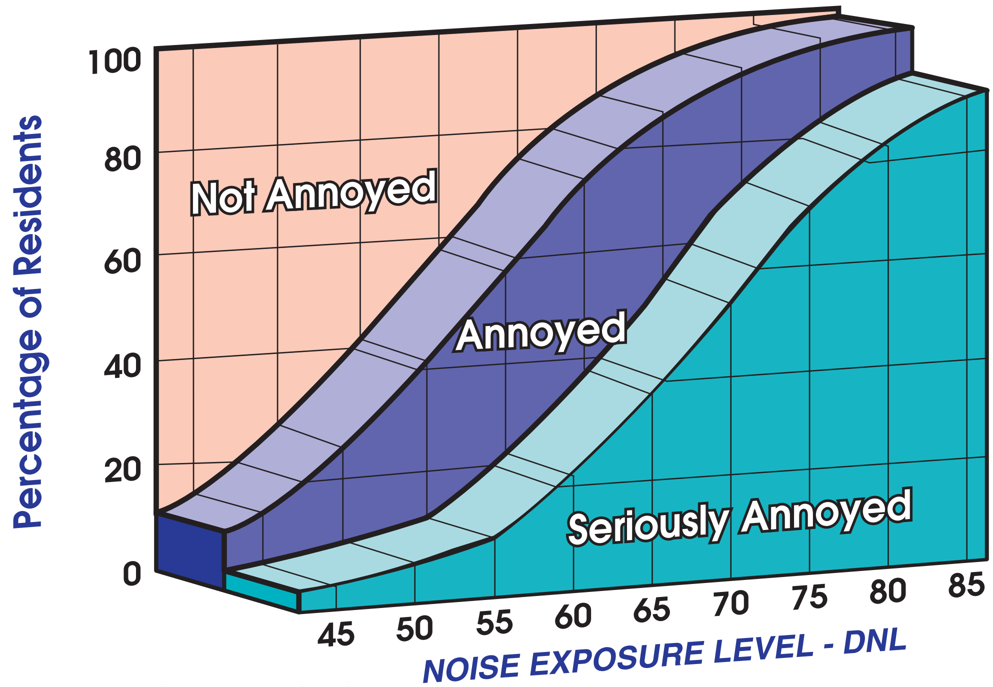
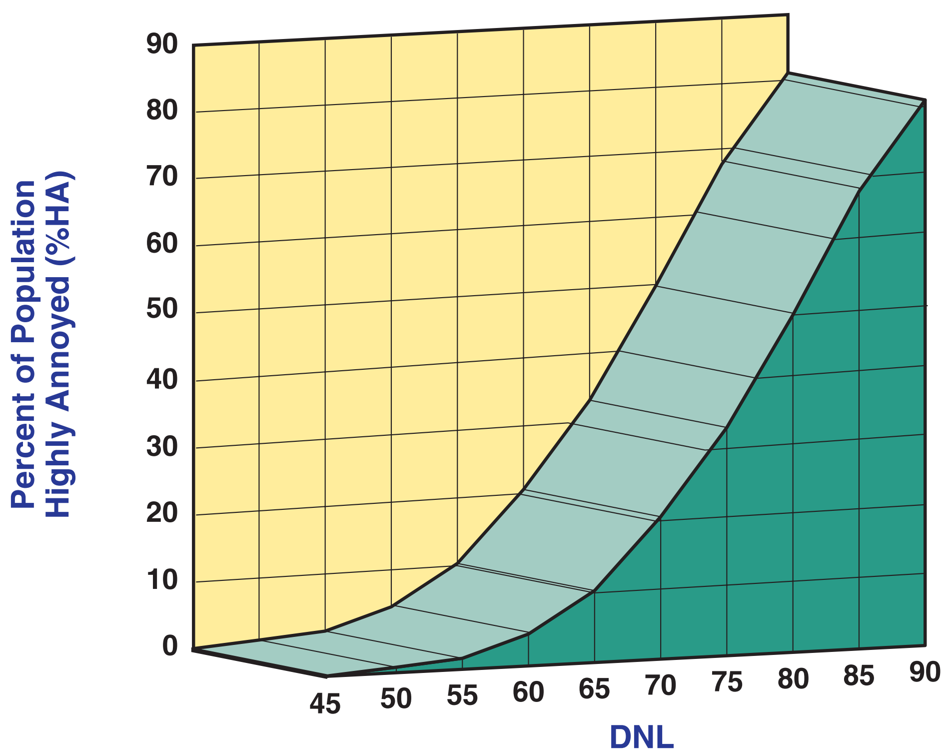


Source: Richards and Ollerhead 1973, p.31



Equation for Curve: $\% HA = \frac{100}{1 + e\,(11.13 - .14\ Ldn)}$

Source: Finegold et al. 1992 and 1994.

UPDATED SCHULTZ CURVE

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Exhibit 4B
ANNOYANCE CAUSED BY AIRCRAFT NOISE IN RESIDENTIAL AREAS

For the purposes of this study, noise in excess of 60 DNL will be discussed for the purposes of evaluating future land use planning alternatives. It must be noted that only noise-sensitive land uses within the 65 DNL contour will likely be eligible for federal funding assistance.

LAND USES EXPOSED TO 2003 NOISE

The location of existing noise-sensitive land uses, in relation to the 2003 noise contours at Flagstaff Pulliam Airport, is shown on **Exhibit 4C**. Noise-sensitive land uses shown on the exhibit are based on Part 150 land use compatibility guidelines and include uses considered incompatible with noise above 65 DNL and marginally incompatible with noise above 60 DNL.

2003 Contour Description

The 2003 noise exposure contours are depicted on **Exhibit 4C**. The 60 DNL contour extends approximately 6,500 feet from airport property over Interstate 17 to the south. To the northeast, the 60 DNL contour extends approximately 2,000 feet from airport property, crossing Lake Mary Road. The 65 DNL contour is smaller and generally the same shape as the 60 DNL. The contour extends approximately 3,200 feet to the southwest. To the northeast, the contour extends approximately 500 feet off airport property. The 65 DNL contour primarily follows the property line to the west and east.

The 70 DNL noise contour is smaller and similar in general shape to the 65 DNL contour. To the southwest, the 70 DNL contour extends approximately 1,000 feet off airport property. To the northeast, the 70 DNL contour is completely contained within airport property. The east and west are almost completely contained within airport property except for small portions on the east and west side of the airport.

The 75 DNL contour remains close to the runway and is contained entirely on airport property.

2003 Land Use Impacts

The number of dwelling units within each noise contour range is determined by computer-generated counts based on an underlying housing database. (Dwelling units, for the purposes of this study, include single family homes, mobile homes, and apartment and condominium units.) This database was developed with the use of geographical information system (GIS) data provided by the Flagstaff Planning Department in November 2002, aerial photography taken in October 2002, and field surveys conducted in late-September and early-October 2003. The location and number of noise- sensitive institutions was derived from the GIS data and notations made during the May 2002 field survey.

To determine the presence of historical or archaeological sites within the study area, the City of Flagstaff's GIS data was consulted. It was determined that no historic structures are located within the study area.

The 2003 land use impacts are summarized in **Table 4A** and described below.

A total of 44 dwelling units are located within the 60 DNL noise contour. The majority of these dwelling units are located within the 60 to 65 DNL contour which has a total of 30 dwelling units consisting primarily of single family homes. Within the 65 to 70 DNL contour are 14 dwelling units which also consist primarily of single family homes. No dwelling units are found within the 70 DNL contour.

As depicted on **Exhibit 4C**, all of the dwelling units affected by noise are found to southwest of the airport. No noise-sensitive institutions are contained within the various noise contours.

TABLE 4A
Noise-Sensitive Land Uses Exposed to 2003 Aircraft Noise
Flagstaff Pulliam Airport

	Noise Contour (DNL)				
LAND USE	**60-65**	**65-70**	**70-75**	**75+**	**Total**
Existing Dwelling Units	30	14	0	0	44
Noise Sensitive Institutions					
Places of Worship	0	0	0	0	0
Schools	0	0	0	0	0
Other (Library, Museum, Etc.)	0	0	0	0	0
Total Noise Sensitive Institutions	0	0	0	0	0
Historic Resources	0	0	0	0	0

POPULATION EXPOSED TO 2003 NOISE

In assessing community noise impacts, the number of people exposed, and the level of noise to which they are exposed, must be considered. While lower noise levels cover a larger area and usually affect more people, they are less annoying than higher noise levels. To assess the intensity of the impact, it is helpful to have a way of jointly considering both population and noise level. The level-weighted population (LWP) methodology provides such an approach.

The LWP methodology assumes that increasing proportions of people are annoyed as noise increases. A detailed description of this methodology is provided in the ***T.I.P., Measuring the Impact of Noise on People***. In the 55 to 60 DNL range, it is assumed that 10.7 percent of the population are annoyed by noise. In the 60 to 65 DNL range, 20.5 percent; in the 65 to 70 DNL range, 37.6 percent; in the 70 to 75 DNL

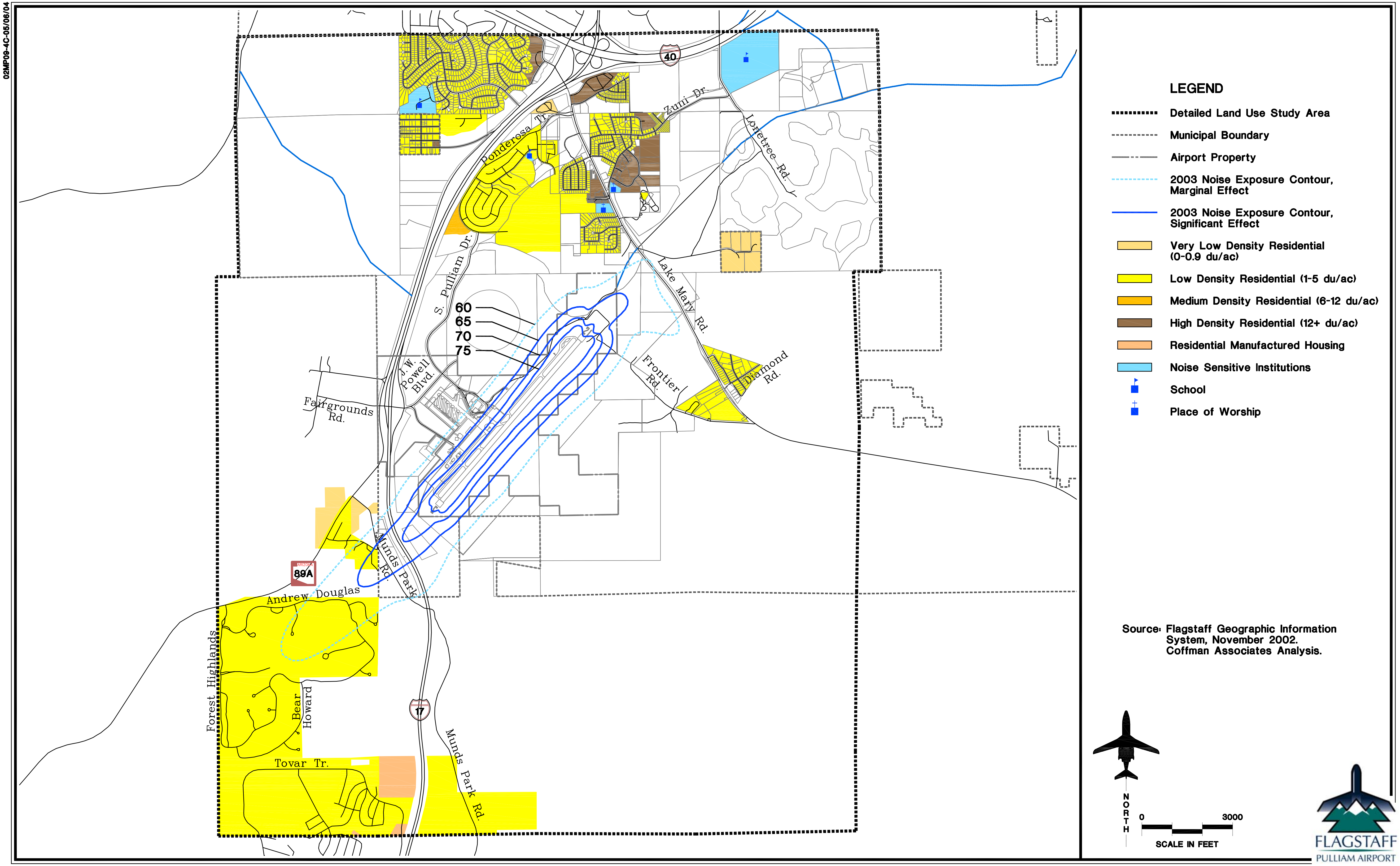

Exhibit 4C
2003 NOISE EXPOSURE CONTOUR WITH NOISE-SENSITIVE LAND USE

range, 64.4 percent; and above 75 DNL, 100 percent of the population are annoyed by noise.

Table 4B outlines the population, expressed in both absolute numbers and level-weighted population (LWP), exposed to various levels of existing noise. The population is calculated by counting the number of dwelling units within a given contour range and multiplying that number by the average household size. According to the 2000 U.S. Census, the average household size within the study area is 2.64.

As presented in **Table 4B**, the majority of the affected population, totaling approximately 79 individuals, reside within the 60 to 65 DNL noise contour. Approximately 37 individuals reside within the 65 to 70 DNL contour and no residents are exposed to noise levels in excess of 75 DNL. The LWP of residents within the 60 DNL contour is 30 individuals. The LWP decreases to 14 residents within the 65 DNL contour. The entire affected population resides to the southwest of the airport.

TABLE 4B
Population Exposed to 2003 Aircraft Noise
Flagstaff Pulliam Airport

	Noise Contour (DNL)				Total Above 60 DNL		Total Above 65 DNL	
	60-65	65-70	70-75	75+	Residents	LWP	Residents	LWP
Existing Population	79	37	0	0	116	30	37	14

Notes: LWP = Level-weighted population; an estimate of the number of people actually annoyed by aircraft noise. It is derived by multiplying the population in each DNL contour range by the appropriate LWP response factor. The factors used are as follows: 0.205 for 60-65 DNL, 0.376 for 65-70 DNL, 0.644 for 70-75 DNL, and 1.000 for 75+ DNL.
Source: Coffman Associates analysis.

POTENTIAL GROWTH RISK

Before evaluating the impact of future aircraft noise, the likelihood of future noise-sensitive development in the area must be understood. Development trends in the vicinity of the Airport are critical to noise compatibility planning. Future residential growth can constrain the operation of the Airport if it occurs beneath aircraft flight tracks and within areas subject to high noise levels. The following paragraphs describe population growth and potential dwelling unit development within the study area in order to determine the potential growth risk. The focus of discussion includes population projections, residential development projects, and other noise-sensitive development.

POPULATION PROJECTIONS

As shown in **Table 4C**, the population of the City of Flagstaff, Coconino County, and the State of Arizona have increased steadily since 1990. The State of Arizona has experienced a growth rate of 40 percent from 1990 to 2000 verses 13.1 percent for the country. Coconino County and the City of Flagstaff have also experienced a significant growth rate. Coconino County's population increased from 96,591 in 1990 to 116,320 in 2000, a growth rate of 20 percent. The City of Flagstaff's population increased from 45,857 in 1990 to 52,894 in 2000, a growth rate of 15.3 percent.

TABLE 4C
City, State and County Population

Year	City of Flagstaff	Coconino County	State of Arizona
1970[1]	N/A	N/A	1,770,900
1980[1]	N/A	N/A	2,718,215
1990[1]	45,857	96,591	3,665,228
2000[1]	52,894	116,320	5,130,632
Forecasts			
2005	69,838	142,666	5,230,000
2010	75,114	154,293	5,805,000
2015	80,061	165,177	7,113,854
2020	84,804	175,479	6,412,000

Source: Arizona Department of Economic Security
[1] United States Census

Based on population forecasts developed by the Arizona Department of Economic Security, the future growth of the region is expected to continually increase. The City of Flagstaff is expected to grow at a steady pace, with a projected population of 81,972 in 2020.

To accommodate the projected population growth, it is anticipated that additional residential development will be needed. New and in-fill residential development within the study area is expected to satisfy some of this anticipated growth. **Exhibit 4D** depicts the areas which are planned or zoned to accommodate the future growth of the area, as outlined within the *Flagstaff Area Regional Land Use and Transportation Plan.*

RESIDENTIAL AND NOISE-SENSITIVE LAND USE GROWTH RISK

The growth risk analysis focuses on undeveloped, or nearly undeveloped, land which is planned or zoned for

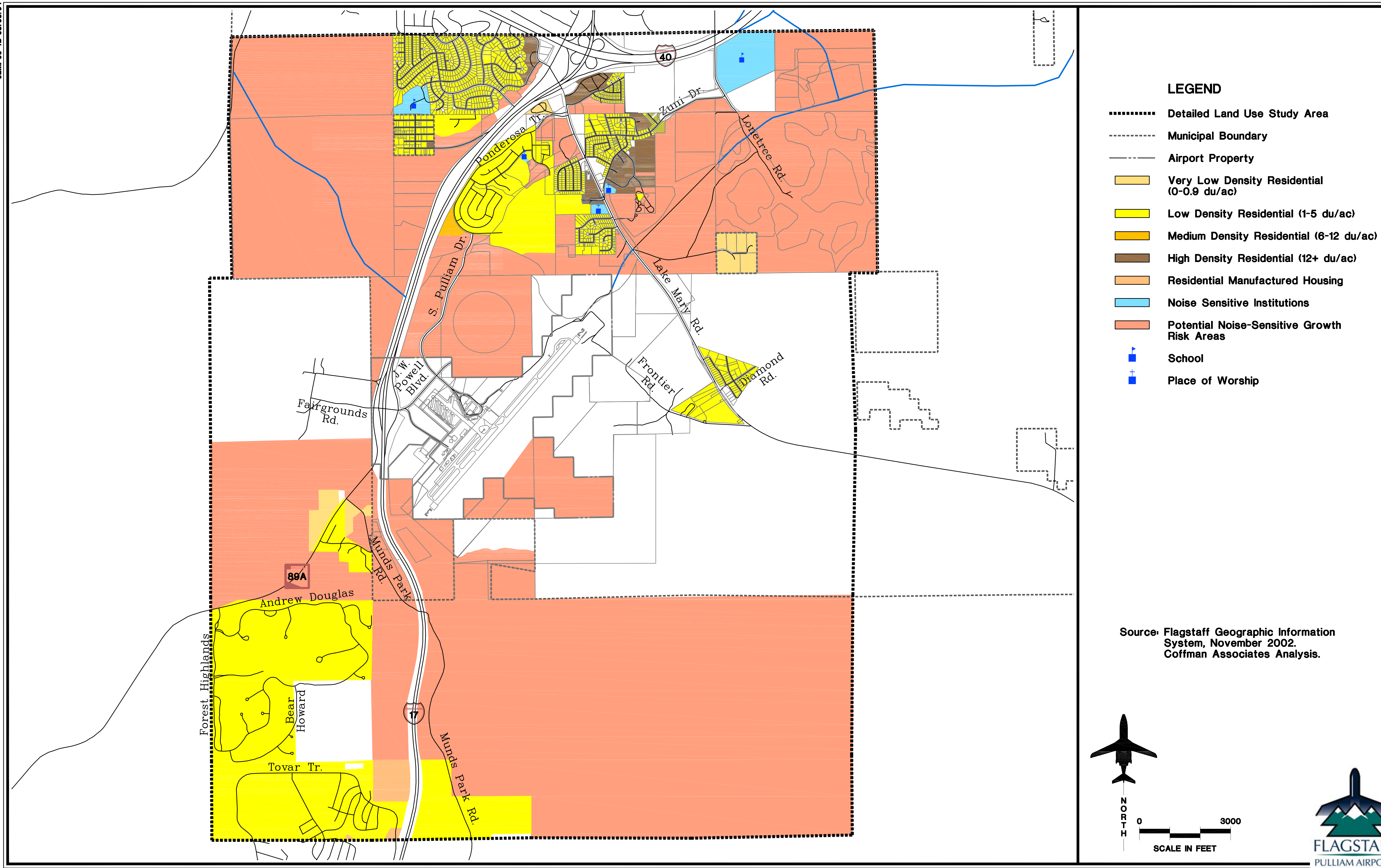

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Exhibit 4D

POTENTIAL NOISE-SENSITIVE GROWTH RISK AREAS future residential or noise-sensitive use. Additional development may also occur through in-filling or redevelopment of developed areas.

As illustrated on **Exhibit 4D**, there are a number of areas within the study area which may experience either in-fill or new development. The areas which are most likely to experience the greatest amount of potential new non-compatible development (i.e. residential development) are found to the immediate north and south of the airport. A majority of close-in potential noise-sensitive growth areas are planned for compatible land uses but are zone for very low residential development. (See Exhibits 1K and 1M in Chapter One, Inventory.)

Land use density figures used to calculate the growth risk were obtained from the *Flagstaff Area Regional Land Use and Transportation Plan.* Areas planned for very low density residential development within the comprehensive plan were assigned a "worst case" density of 0.9 dwelling units per acre; areas planned for low density residential were assigned a "worst case" density of five dwelling units per acre; areas planned for medium density were assigned a "worst case" density of 12 dwelling units per acre; and, areas planned for high density were assigned a "worst case" density of 15 dwelling units per acre.

2008 NOISE EXPOSURE

This section describes the exposure of existing and potential land uses and population to aircraft noise in 2008.

LAND USES EXPOSED TO 2008 NOISE

The forecasted 2008 noise contours are presented in **Exhibit 4E** along with existing and potential future noise-sensitive land uses within the study area.

Contour Descriptions

The 2008 contours are slightly larger than the existing noise contours. The 60 DNL contour extends about 2,000 feet from airport property, beyond Lake Mary Road to the northeast. To the southwest, the 60 DNL noise contour extends approximately 5,500 feet. The 60 DNL extends an average distance of approximately 500 feet to the west and east.

The 65 DNL contour is smaller and generally the same shape as the 60 DNL. The contour extends approximately 500 feet to the northeast. To the south, the contours extend about 2,100 feet off airport property. The 65 DNL contour extends an average distance of approximately 300 feet to the east and west.

The 70 DNL contour is primarily contained to airport property with the exception of slight bulges to the southwest and northeast. The 75 DNL remains completely on airport property.

2008 Land Use Impacts

Noise-sensitive land uses potentially affected by noise in 2008 are shown in

Table 4D. In the year 2008, approximately 41 dwelling units are affected by noise within the 60 DNL noise contour. Three of these units are within the 60 DNL contour. The 2008 noise exposure contours also do not impact noise-sensitive institutions and historic resources. **Exhibit 4E** illustrates the location of noise-sensitive land uses with respect to the 2008 noise exposure contours.

Based on the growth risk analysis, there is the potential for approximately 252 additional dwelling units exposed to 2008 aircraft noise. Of these impacts, 191 are contained within the 60 DNL noise contours, 59 are contained within the 65 to 70 DNL noise contour, and 2 are contained within the 70-75 DNL noise contour. There are no potential dwelling units within the 75+ DNL noise contour. As seen on **Exhibit 4E**, the growth potential exists primarily to the south of the airport.

TABLE 4D
Noise-Sensitive Land Uses Exposed to 2008 Aircraft Noise
Flagstaff Pulliam Airport

	Noise Contour (DNL)				
LAND USE	**60-65**	**65-70**	**70-75**	**75+**	**Total**
DWELLING UNITS					
Existing Dwelling Units	39	3	0	0	42
Future Potential Dwelling Units	191	59	2	0	252
Total Dwelling Units	**230**	**62**	**2**	**0**	**294**
NOISE-SENSITIVE INSTITUTIONS					
Places of Worship	0	0	0	0	0
Schools	0	0	0	0	0
Other (Library, Museum, Etc.)	0	0	0	0	0
Total Noise-Sensitive Institutions	**0**	**0**	**0**	**0**	**0**
HISTORIC RESOURCES					
Total Historic Resources	**0**	**0**	**0**	**0**	**0**

POPULATION EXPOSED TO 2008 NOISE

Table 4E outlines the population, expressed in both absolute numbers and LWP, exposed to various levels of noise in 2008.

Existing population impacts within the 2008 60 DNL noise exposure contour total approximately 111 of these impacts; 8 are within the 65 DNL noise contour. Total future potential population exposed to noise above 60 DNL is 776 with an LWP of 189. **Table**

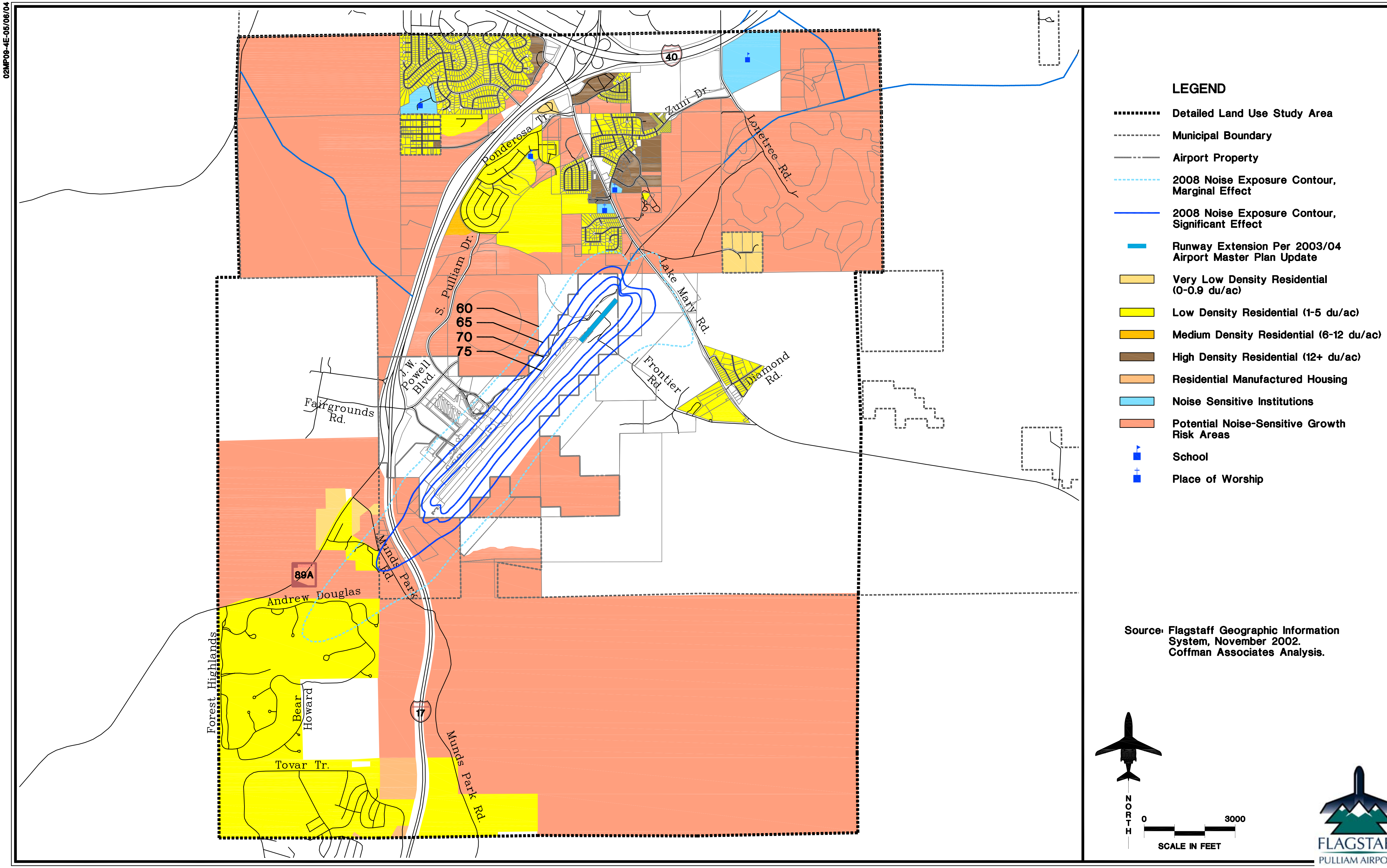

Exhibit 4E
2008 NOISE EXPOSURE CONTOUR WITH NOISE-SENSITIVE LAND USE

4E presents the impacts of 2008 noise on the existing/future local population.

The potential population found within the 60 to 65 DNL noise contour is 504. Within the 65 to 70 DNL noise contour, there are 164 potential residents. There are 5 residents who could be potentially exposed to noise within the 70 DNL noise contour. There is no potential population impacted by noise above 75 DNL.

TABLE 4E
Population Exposed to 2008 Aircraft Noise
Flagstaff Pulliam Airport

	Noise Contour (DNL)				**Total Above 60 DNL**		**Total Above 65 DNL**	
	60-65	**65-70**	**70-75**	**75+**	**Residents**	**LWP**	**Residents**	**LWP**
Existing Population	103	8	0	0	111	24	8	3
Potential Population	504	156	5	0	665	165	161	62
Total Population	**607**	**164**	**5**	**0**	**776**	**189**	**169**	**65**

Notes: LWP = Level-weighted population is an estimate of the number of people actually annoyed by aircraft noise. It is derived by multiplying the population in each DNL contour range by the appropriate LWP response factor. The factors used are as follows: 0.205 for 60-65 DNL; 0.376 for 65-70 DNL; 0.644 for 70-75 DNL; and 1.000 for 75+ DNL.
Source: Coffman Associates analysis.

2025 NOISE EXPOSURE

This section describes the exposure of existing and potential land uses and population to aircraft noise in 2025.

LAND USES EXPOSED TO 2025 NOISE

Exhibit 4F illustrates the forecast 2025 noise contours together with both existing and potential future noise-sensitive land uses within the study area.

Contour Descriptions

Noise contours in 2025 demonstrate a decrease in noise levels as a result of a change in future fleet mix. As the Stage 2 business jets are phased out of the fleet because of age, noise contours will become smaller. To the northeast, the 60 DNL noise contour extends about 1,050 feet, just reaching Lake Mary Road. The 60 DNL noise contour extends approximately 3,500 feet to the south. To the east and west, the 60 DNL noise contour extends approximately 400 feet, on average, from airport property.

The 65 DNL noise contour extends approximately 300 feet from airport property to the northeast. To the south, the contour extends about 1,000 feet from airport property. To the east and west, the contour extends an average of 200 feet from airport property.

The 70 DNL noise contour extends about 375 feet to the northeast. To the southwest, the contour remains on airport property. To the east and west, the contour remains on airport property. The 75 DNL noise contour primarily remains on airport property except for a slight bulge to the northeast.

Land Use Impacts

Noise-sensitive land uses potentially impacted by noise in 2025 are presented in **Table 4F**. Approximately 21 existing dwelling units could be exposed to noise within the 2025 DNL noise contours. The number of potential impacts within the 2025 DNL noise contour has decreased when compared to the impacts in 2008. The greatest number of future potential impacts continue to be south of the airport.

TABLE 4F
Noise-Sensitive Land Uses Exposed to 2025 Aircraft Noise
Flagstaff Pulliam Airport

	Noise Contour (DNL)				
LAND USE	**60-65**	**65-70**	**70-75**	**75+**	**Total**
DWELLING UNITS					
Existing Dwelling Units	21	0	0	0	21
Future Potential Dwelling Units	166	28	0	0	194
Total Dwelling Units	**187**	**28**	**0**	**0**	**215**
NOISE-SENSITIVE INSTITUTIONS					
Places of Worship	0	0	0	0	0
Schools	0	0	0	0	0
Other (Library, Museum, Etc.)	0	0	0	0	0
Total Noise-Sensitive Institutions	**0**	**0**	**0**	**0**	**0**
HISTORIC RESOURCES					
Total Historic Resources	**0**	**0**	**0**	**0**	**0**

Based on the growth risk analysis, the potential future dwelling units affected by noise above 60 DNL in 2025 decreases from 252 in 2008 to 194 in 2025. The decrease in impacts is a result of the smaller contours which, as stated previously, are a result of quieter aircraft in the future. All potential

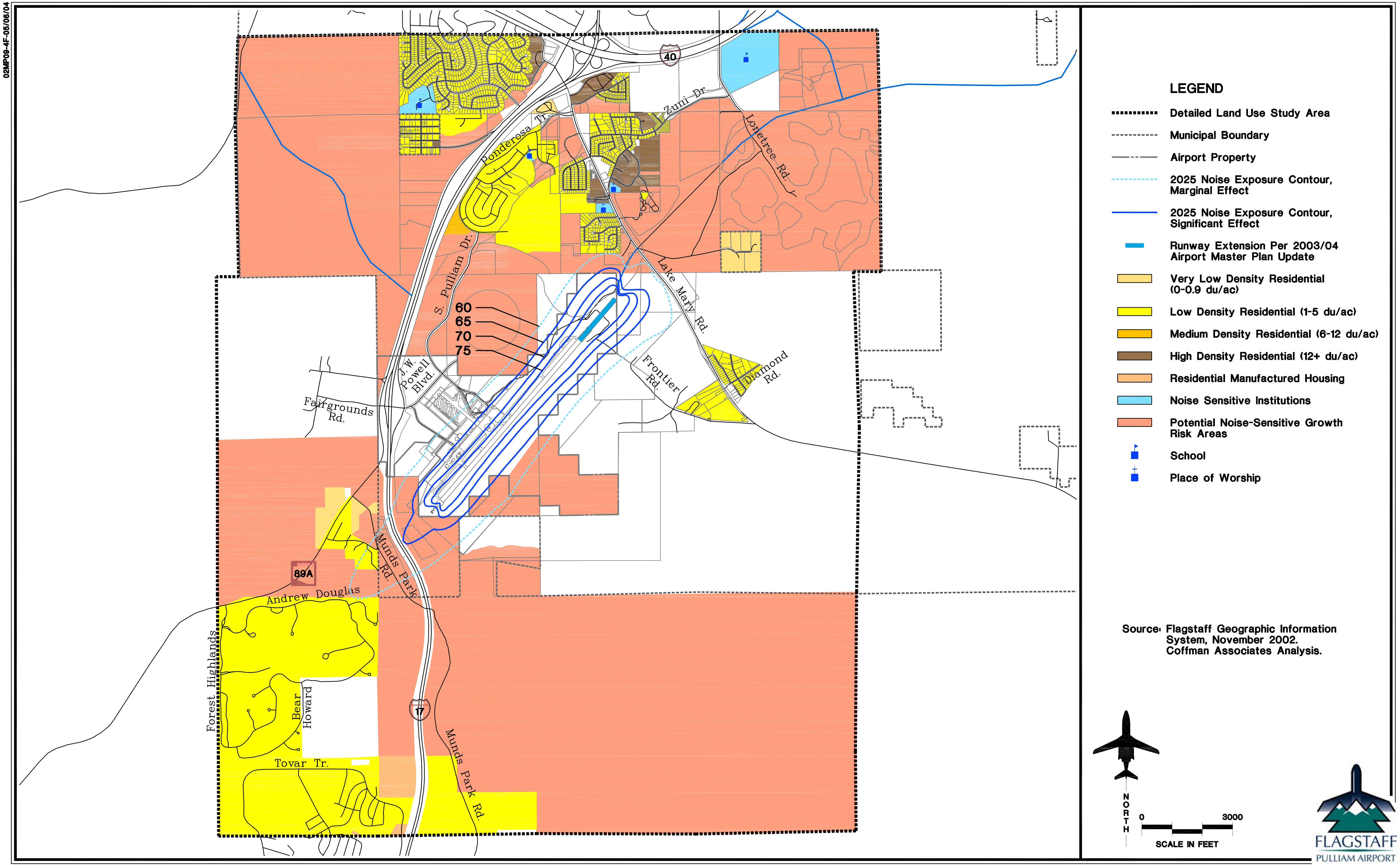

Exhibit 4F
2025 NOISE EXPOSURE CONTOUR WITH NOISE-SENSITIVE LAND USE

future impacts are contained within the 60 to 70 DNL noise contours. There are no dwelling units exposed to noise above 75 DNL in 2025. Potential future dwellings decrease from 191 to 166 within the 60-65 DNL contour, from 62 to 28 with the 65-70 DNL contour, and from two to zero in the 2025 noise exposure contour condition.

POPULATION EXPOSED TO 2025 NOISE

The total future potential population exposed to noise above 60 DNL decreases from 776 total potential population in 2008 to 567 total potential population in 2025, which corresponds to a decrease in LWP from 189 to 129. **Table 4G** presents the impacts of 2025 noise on the existing/future local population.

The potential population found within the 60 to 65 DNL noise contour is 493. Within the 65 to 70 DNL noise contour, there are 74 potential residents. There are no residents who could be potentially exposed to noise within the 70 DNL noise contour.

TABLE 4G
Population Exposed to 2025 Aircraft Noise
Flagstaff Pulliam Airport

	Noise Contour (DNL)				Total Above 60 DNL		Total Above 65 DNL	
	60-65	65-70	70-75	75+	Residents	LWP	Residents	LWP
Existing Population	55	0	0	0	55	11	0	0
Potential Population	438	74	0	0	512	118	74	28
Total Population	**493**	**74**	**0**	**0**	**567**	**129**	**74**	**28**

Notes: LWP = Level-weighted population is an estimate of the number of people actually annoyed by aircraft noise. It is derived by multiplying the population in each DNL contour range by the appropriate LWP response factor. The factors used are as follows: 0.205 for 60-65 DNL; 0.376 for 65-70 DNL; 0.644 for 70-75 DNL; and 1.000 for 75+ DNL.
Source: Coffman Associates analysis.

SUMMARY

This chapter has analyzed the impacts of aircraft noise on existing and future land use and population in the vicinity of Flagstaff Pulliam Airport. **Table 4H** summarizes the land use and population impacts. As seen in **Table 4H**, the current zoning, planned land uses, and approved development plans within the study area allow for the potential increase in future residential development within the 2008 and 2025 noise exposure contours.

TABLE 4H
Land Uses and Population Impact Summary
Flagstaff Pulliam Airport

	2003		2008		2025	
Land Use						
	60 DNL	**65 DNL**	**60 DNL**	**65 DNL**	**60 DNL**	**65 DNL**
DWELLING UNITS						
Existing Dwelling units	44	14	42	3	21	0
Future Potential Dwelling Units	NA	NA	252	61	194	28
Total Dwelling Units	**44**	**14**	**294**	**64**	**215**	**28**
NOISE-SENSITIVE INSTITUTIONS						
Places of Worship	0	0	0	0	0	0
Schools	0	0	0	0	0	0
Other (Libraries, Museums, etc.)	0	0	0	0	0	0
Total Noise-Sensitive Institutions	**0**	**0**	**0**	**0**	**0**	**0**
HISTORIC RESOURCES						
Total Historic Resources	**0**	**0**	**0**	**0**	**0**	**0**
Population						
Total Existing Population above 60 DNL	116		111		55	
Total Existing LWP above 60 DNL	30		24		11	
Total Potential Population above 60 DNL	NA		665		512	
Total Potential LWP above 60 DNL	NA		165		118	
Total Existing Population above 65 DNL	37		8		0	
Total Existing LWP above 65 DNL	14		3		0	
Total Potential Population above 65 DNL	NA		101		74	
Total Potential LWP above 65 DNL	NA		62		28	

Notes: LWP = Level-weighted population is an estimate of the number of people actually annoyed by aircraft noise. It is derived by multiplying the population in each DNL contour range by the appropriate LWP response factor. The factors used are as follows: 0.205 for 60-65 DNL; 0.376 for 65-70 DNL; 0.644 for 70-75 DNL; and 1.000 for 75+ DNL.
Source: Coffman Associates analysis.

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Appendix A

WELCOME TO THE PLANNING ADVISORY COMMITTEE

Appendix A

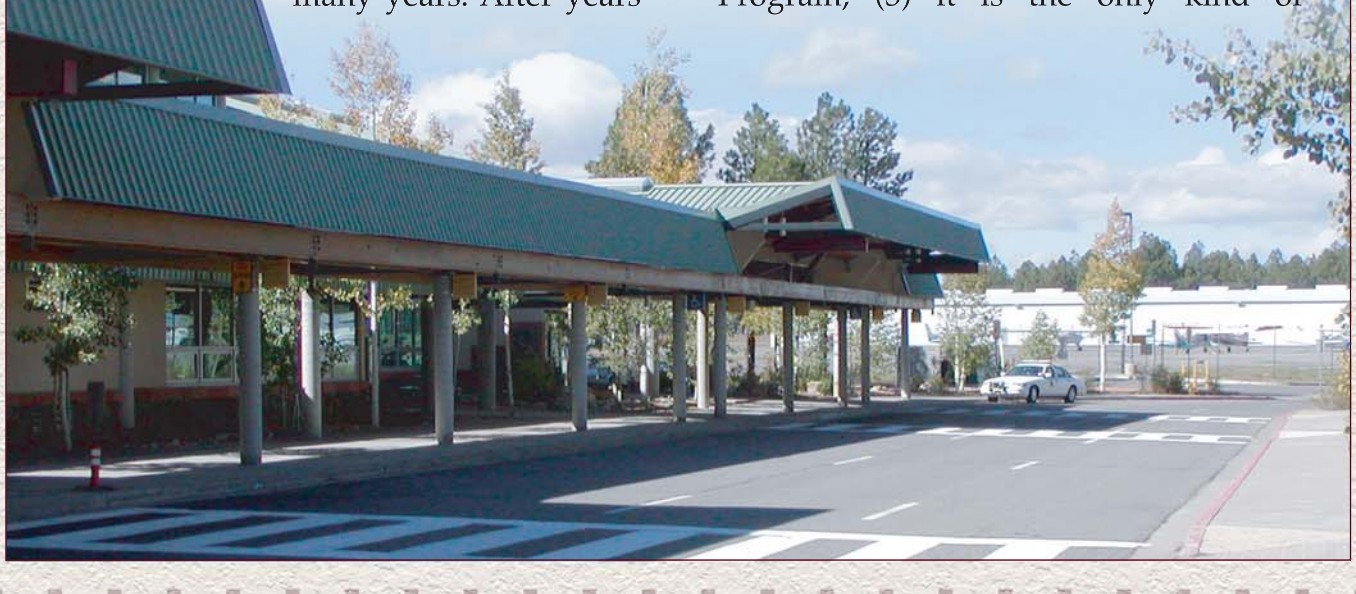
WELCOME TO THE PLANNING ADVISORY COMMITTEE

The City of Flagstaff and its consultant, Coffman Associates, Inc., are pleased to welcome you to the Planning Advisory Committee (PAC) for the Part 150 Noise Compatibility Study Update. We appreciate your interest in this Study. Over the next several months you will be able to make an important contribution to the project. We believe that you will find your participation with the committee to be an interesting and rewarding experience.

WHAT IS A NOISE COMPATIBILITY STUDY?

The impact of aircraft noise on development around airports has been a major environmental issue in the United States for many years. After years of study and demonstration programs, Congress authorized full-scale Federal support for airport noise compatibility programs through the Aviation Safety and Noise Abatement Act of 1979. In response to that Act, the Federal Aviation Administration (FAA) adopted 14 Code of Federal Regulation (CFR), Part 150 to set minimum standards for the preparation of such studies.

A Noise Compatibility Program is intended to promote aircraft noise control and land use compatibility. Three things make such a study unique: (1) it is the only comprehensive approach to preventing and reducing airport noise and community land use conflicts; (2) eligible items in the approved plan may be funded from a special account in the Federal Airport Improvement Program; (3) it is the only kind of



airport study sponsored by the FAA primarily for the benefit of airport neighbors.

The principal objectives of any Noise Compatibility Program are to:

- Identify the current and projected aircraft noise levels and their impact on the airport environs.

- Propose ways to reduce the impact of aircraft noise through changes in aircraft operations or airport facilities.

- In undeveloped areas where aircraft noise is projected to remain, encourage future land use which is compatible with the noise, such as agriculture, commercial or industrial.

- In existing residential areas which are expected to remain impacted by noise, determine ways of reducing the adverse impacts of noise.

- Establish procedures for implementing, reviewing, and updating the plan.

WHAT IS THE ROLE OF THE COMMITTEE?

The PAC will play an important role in the Noise Compatibility Study. We want to benefit from your unique viewpoints, to have access to the people and resources you represent, to work with you in a creative atmosphere, and to gain your support in achieving results. Specifically, your role in the PAC is as follows:

- Sounding Board - The consultants need a forum in which to present information, findings, ideas, and recommendations during the course of the study. Everyone involved with the study will benefit from this forum because it allows diverse interests an opportunity to experience the viewpoints, ideas, and concerns of other members directly.

- Linkage to the Community-Each of you represents one or more constituent interests -- neighborhood residents, local businesses, public agencies, and aviation users. As a committee member, you can bring together the consultant and the people you represent, you can inform your constituents about the study as it progresses, and you can bring into the committee the views of others.

- Resource - An airport noise compatibility study is very complex; it has an almost unlimited demand for information. Many of you have access to specialized information and can ensure that it is used in the study to its fullest potential.

- Think Tank - "Too many cooks spoil the broth" reflects the difficulty committees have in writing a report. On the other hand, "two heads are better than one" tells us that creative thinking is best accomplished by a group of concerned people who represent a diversity of backgrounds and views on a subject. We need all of the creative input we can get. PAC member ideas have literally "made the difference" on other studies of this type across the country.

- Critical Review - The study team needs their work scrutinized closely for accuracy, completeness of detail, clarity of thought, and intellectual honesty. We want you to point out any shortcomings in our work and to help us improve on it.

- Implementation - A Part 150 Noise Compatibility Plan depends on the actions of many different agencies and organizations for implementation. Each of you has a unique role to play in implementing the plan and demonstrating leadership among your constituent interests. Inform and educate them about the importance of your effort on their behalf and work with them to see that the final plan is carried out.

WHO IS ON THE COMMITTEE?

Many organizations have been contacted and invited to designate representatives to serve on the PAC. The attached list of invited officials and organizations shows a broad range of interests to be represented -- local businesses and residents, pilots, fixed-base operators, national aviation organizations, Federal Aviation Administration, and state and local governments.

HOW WILL THE PAC OPERATE?

The PAC will operate as informally as possible -- no compulsory attendance, and no voting. The meetings will be conducted by the consultant and will be called at milestone points in the study (a total of four) when committee input is especially needed. Ordinarily, meetings will be scheduled with sufficient advance notice to permit you to arrange your schedule.

To keep you informed of the proceedings at the PAC meetings, we will prepare summary minutes and will distribute them after each meeting. These will be particularly helpful if you are unable to attend a meeting.

We will hold four public information workshops during the preparation of the study so that we may report to the community at large and elicit their views and input. We strongly urge you to represent the PAC at the evening workshops. The workshops will be organized to maximize the opportunity for two-way communication. At these important meetings, you will have the chance to hear from local citizens and share your views and expertise with them.

Prior to each PAC meeting, the consultant will distribute working papers to you. These are draft chapters of the Noise Compatibility Study, and they will be a focus for discussion at the meetings. In addition, we will provide an outline of the subjects to be covered in the next phase of the project so that you may interject your ideas and concerns and have them addressed in the next working paper.

To help you keep your materials organized, we will give you a study workbook (a three-ring binder with a special cover and tab dividers) to hold working papers, technical information papers, PAC membership lists, meeting notes, and other resource material.

WHERE CAN YOU GET MORE INFORMATION?

For specific information about the study, please contact:

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FLAGSTAFF PULLIAM AIRPORT
MASTER PLAN &
F.A.R. PART 150 NOISE COMPATIBILITY STUDY
PLANNING ADVISORY COMMITTEE (PAC)

NAME / TITLE	REPRESENTING	ADDRESS	PHONE / FAX
Mr. William Menard Public Works Director	**City of Flagstaff**	City Hall 211 W. Aspen Avenue Flagstaff, AZ 86001	(928) 779-7660 wmenard@ci.flagstaff.az.us
Mr. Michael Covalt Airport Manager	**Flagstaff Pulliam Airport**	6200 S. Pulliam Drive, Suite 204 Flagstaff, AZ 86001	(928) 556-1234 x10 mcovalt@ci.flagstaff.az. us
Mr. Libby Silva Council Representative	**City of Flagstaff Airport Commission**	City Hall 211 W. Aspen Avenue Flagstaff, AZ 86001	(928) 774-5527 council@ci.flagstaff.az.us
Mr. Rory Madden Airport Commission Chairman	**City of Flagstaff Airport Commission**	City Hall 1310 N. McMillian Road Flagstaff, AZ 86001	
Mr. Ken Jacobs Lands & Minerals Staff	**U.S. Forest Service**	4373 S. Lake Mary Road Flagstaff, AZ 86001	
Mr. Bill Towler Community Development Director	**Coconino County**	2500 N. Ft. Valley Road Flagstaff, AZ 86001	(928) 226-2700
Mr. Neil Gullickson Associate Planner	**City of Flagstaff**	City Hall 211 W. Aspen Avenue Flagstaff, AZ 86001	(928) 779-7632
Ms. Leslie Connell Convention & Visitors Bureau Director	**City of Flagstaff**	City Hall 211 W. Aspen Avenue Flagstaff, AZ 86001	(928) 779-7611 lconnell@ci.flagstaff.az.us
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FLAGSTAFF PULLIAM AIRPORT MASTER PLAN & F.A.R. PART 150 NOISE COMPATIBILITY STUDY PLANNING ADVISORY COMMITTEE (PAC)			
NAME / TITLE	**REPRESENTING**	**ADDRESS**	**PHONE / FAX**
Mr. Kevin Flynn Lead Engineer State of Arizona	**FAA-Western Pacific Region**	FAA-Western Pacific Region Airports Division, AWP 623 15000 Aviation Blvd. Lawndale, CA 92061	(310) 725-3632 (310) 725-6847 f
Ms. Stacy Howard Western Regional Representative	**Aircraft Owners & Pilots Association (AOPA)**	Aircraft Owners & Pilots Association (AOPA) 41695 N. Coyote Road Queen Creek, AZ 85242	(480) 987-9165 (480) 987-0352 f
Mr. James Timm President	**Arizona Pilots Association (APA)**	220 E. Ellis Drive Tempe, AZ 85282	(480) 839-9187 jtimm@amug.org
Mr. Orville Wiseman President	**Wiseman Aviation**	2650 W. Shamrell Blvd. Flagstaff, AZ 86001	(928) 779-9585
Ms. Kate Coffin Station Manager	**America West / Mesa Airlines**	6200 S. Pulliam Drive Flagstaff, AZ 86001	
Mr. Marc Gosik Manager	**ATCT**	5960 S. Liberator Lane Flagstaff, AZ 86001	(928) 774-7435
Mr. Dan Burkhart Regional Representative Environmental Services	**National Business Aircraft Association**	10164 Meadow Glen Way, E. Escondido, CA 92026	(760) 749-6303 (760) 749-6313 f
	Kachina Village		
Mr. Jack Greham General Manager	**Forest Highlands**	657 Forest Highlands Flagstaff, AZ 86001	
Mr. Sam Wheeler Asst. V.P., Univ. SVC	**Northern Arizona University**	P.O. Box 4088 Flagstaff, AZ 86011-4088	
Mr. Larry Capek Vice President	**FMC/Guardian Medical**	P.O. Box 387 Flagstaff, AZ 86002	
Mr. John Beerling	**Pine Canyon**	1211 W. Warner Rd., Ste. 109 Tempe, AZ 85284	

FLAGSTAFF PULLIAM AIRPORT MASTER PLAN & F.A.R. PART 150 NOISE COMPATIBILITY STUDY PLANNING ADVISORY COMMITTEE (PAC)			
NAME / TITLE	**REPRESENTING**	**ADDRESS**	**PHONE / FAX**
Mr. Dave Wessel Director	**Flagstaff Metropolitan Planning Organization**	City Hall 211 W. Aspen Avenue Flagstaff, AZ 86001	
Ms. Stephanie McKinney Executive Director	**Greater Flagstaff Economic Council**	1300 S. Milton, Suite 125 Flagstaff, AZ 86001	
Mr. Terry Hanson Chairman	**Arizona Military Airspace Working Group (AMAWG)**	7224 N. 139th Drive Luke Air Force Base, AZ 85309	(623) 856-5856 (623) 856-7096 f

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Appendix B

SUPPORTING INFORMATION ON PROJECT COORDINATION AND LOCAL CONSULTATION

Appendix B
COORDINATION, CONSULTATION, AND PUBLIC INVOLVEMENT

INTRODUCTION

As part of the planning process, the public, airport users, and local, state, and federal agencies were given the opportunity to review and comment on the Noise Exposure Maps (NEM) and supporting documentation. Materials prepared by the consultant were submitted for local review, discussion, and revision at several points during the process.

Much of the local coordination was handled through a special study committee formed specifically to provide advise and feedback on the 14 CFR Part 150 Noise Compatibility Study. Known as the Planning Advisory Committee (PAC), it included representatives of all affected groups, including local residents, airport users, officials from the City of Flagstaff and Coconino County, aviation organizations, fixed base operators, and the Federal Aviation Administration (FAA). (A list of the PAC members is presented in **Appendix A**.)

The PAC reviewed and commented on the working papers, prepared by the consultant, and provided guidance for the next phase of the study. Most comments were made orally during the meetings, but some were followed by written confirmation. All comments were appropriately incorporated into this document or otherwise addressed.

The PAC met two times during the preparation of the Noise Exposure Maps (NEM). The first meeting was held on

December 11, 2002 to introduce the participants, describe the study process, discuss goals and objectives, distribute the study workbooks, and hear comments and views pertaining to conditions at the airport. Chapter One (Inventory) was presented at this meeting.

The second PAC meeting was held on July 30, 2003. Chapter Two (Aviation Noise) and Chapter Three (Noise Impacts) were discussed.

Following the PAC meetings the general public was invited to a series of Public Information Workshops. These workshops were structured as an informal open-house, with display boards and information posted throughout the meeting room. The meetings allowed citizens to acquire information about the Part 150 Study process, aircraft operations forecasts, baseline noise analysis, and noise impacts, ask questions, and express concerns. The meetings were also intended to encourage two-way communication between the airport staff, consultants and local citizens.

In addition to formal meetings, many written and verbal contacts were also made between project management staff and officials of local, state, and federal agencies, representatives of various aviation user groups, and local residents. These were related to the day-to-day management of the project, as well as the resolution of specific questions and concerns arising from the working papers.

A supplemental volume entitled, "Supporting Information on Project Coordination and Local Consultation" contains detailed information in support of the Noise Exposure Maps document. It includes copies of meeting announcements, sign-in sheets, and all written comments received on the Noise Exposure Maps study.

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Appendix C

INM Input Assumptions and Output Report

Appendix C INM Input Assumptions and Output Report

This appendix provides detailed tables depicting reported aircraft operations, runway use, and day/nighttime operation split by aircraft type used to develop the 2003 noise exposure map contours for Flagstaff Pulliam Airport.

INM 6.1 ECHO REPORT 06-May-04 10:24

STUDY: C:\INM6.1\FLAGSTAFFAZ\
Created : 11-Feb-03 09:02
Units : English
Airport : FLG
Description :
Flagstaff Part 150 Noise Compatibility Study

CASE: 2003NEM
Created : 12-Feb-03 20:31
Description : 2003 Noise Exposure Map Contour

STUDY AIRPORT
Latitude : 35.138444 deg
Longitude : -111.671222 deg
Elevation : 7014.0 ft
Temperature : 45.8 F
Pressure : 29.92 in-Hg
AverageWind : 8.0 kt
ChangeNPD : No

STUDY RUNWAYS
03
Latitude : 35.131219 deg
Longitude : -111.678921 deg
Xcoord : -0.3789 nmi
Ycoord : -0.4328 nmi
Elevation : 7013.9 ft
OtherEnd : 21
Length : 6996 ft
Gradient : -0.23 %
RwyWind : 8.0 kt
TkoThresh : 0 ft
AppThresh : 0 ft
21
Latitude : 35.145689 deg
Longitude : -111.663519 deg
Xcoord : 0.3790 nmi
Ycoord : 0.4340 nmi
Elevation : 6997.8 ft
OtherEnd : 03
Length : 6996 ft
Gradient : 0.23 %
RwyWind : 8.0 kt
TkoThresh : 0 ft
AppThresh : 0 ft

STUDY TRACKS
RwyId-OpType-TrkId
Sub PctSub TrkType Delta(ft)
03-APP-1
0 100.00 Vectors 0.0
03-APP-2
0 100.00 Vectors 0.0
03-APP-3
0 100.00 Vectors 0.0
03-APP-99
0 100.00 Vectors 0.0
03-APP-A
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
03-APP-B
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
03-APP-C
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
03-DEP-1
0 100.00 Vectors 0.0
03-DEP-2
0 100.00 Vectors 0.0
03-DEP-3
0 100.00 Vectors 0.0
03-DEP-99
0 100.00 Vectors 0.0
03-DEP-A
0 31.24 Points 0.0
1 23.44 Points 0.0
2 23.44 Points 0.0
3 9.38 Points 0.0
4 9.38 Points 0.0
5 1.56 Points 0.0
6 1.56 Points 0.0
03-DEP-B
0 31.24 Points 0.0
1 23.44 Points 0.0
2 23.44 Points 0.0
3 9.38 Points 0.0
4 9.38 Points 0.0
5 1.56 Points 0.0
6 1.56 Points 0.0
03-DEP-C
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
03-TGO-1
0 100.00 Vectors 0.0

03-TGO-A
0 31.24 Points 0.0
1 23.44 Points 0.0
2 23.44 Points 0.0
3 9.38 Points 0.0
4 9.38 Points 0.0
5 1.56 Points 0.0
6 1.56 Points 0.0
21-APP-1
0 100.00 Vectors 0.0
21-APP-2
0 100.00 Vectors 0.0
21-APP-3
0 100.00 Vectors 0.0
21-APP-4
0 100.00 Vectors 0.0
21-APP-5
0 100.00 Vectors 0.0
21-APP-A
0 31.24 Points 0.0
1 23.44 Points 0.0
2 23.44 Points 0.0
3 9.38 Points 0.0
4 9.38 Points 0.0
5 1.56 Points 0.0
6 1.56 Points 0.0
21-APP-B
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
21-APP-C
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
21-APP-D
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
21-APP-E
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
21-DEP-1
0 100.00 Vectors 0.0
21-DEP-2
0 100.00 Vectors 0.0
21-DEP-3
0 100.00 Vectors 0.0
21-DEP-4
0 100.00 Vectors 0.0
21-DEP-5
0 100.00 Vectors 0.0
21-DEP-A
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
21-DEP-B
0 25.00 Points 0.0
1 20.00 Points 0.0
2 20.00 Points 0.0
3 9.00 Points 0.0
4 15.00 Points 0.0
5 3.00 Points 0.0
6 8.00 Points 0.0
21-DEP-C
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
21-DEP-D
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
21-DEP-E
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
21-DEP-F
0 39.00 Points 0.0
1 24.00 Points 0.0
2 24.00 Points 0.0
3 6.50 Points 0.0
4 6.50 Points 0.0
21-TGO-1
0 100.00 Vectors 0.0
21-TGO-A
0 31.24 Points 0.0
1 23.44 Points 0.0
2 23.44 Points 0.0
3 9.38 Points 0.0
4 9.38 Points 0.0
5 1.56 Points 0.0
6 1.56 Points 0.0
OVF-OVF-Z
0 100.00 Points 0.0

STUDY TRACK DETAIL

RwyId-OpType-TrkId-SubTrk	SegType	Dist/Angle	Radius(nmi)
03-APP-1-0			
1	Straight	2.0000 nmi	
2	Straight	2.0000 nmi	
3	Left-Turn	90.0000 deg	0.2500
4	Straight	0.9000 nmi	
03-APP-2-0			
1	Straight	4.0000 nmi	
2	Right-Turn	45.0000 deg	0.2500
3	Straight	0.9000 nmi	
4	Left-Turn	90.0000 deg	0.2500
5	Straight	0.3000 nmi	
6	Left-Turn	90.0000 deg	0.2500
7	Straight	0.9000 nmi	
03-APP-3-0			
1	Straight	4.0000 nmi	
2	Left-Turn	90.0000 deg	0.2500
3	Straight	1.2300 nmi	
4	Left-Turn	90.0000 deg	0.2500
5	Straight	0.3000 nmi	
6	Left-Turn	90.0000 deg	0.2500
7	Straight	0.9000 nmi	
03-APP-99-0			
1	Straight	2.0000 nmi	
2	Straight	2.0000 nmi	
3	Straight	2.0000 nmi	
4	Straight	2.0000 nmi	
03-APP-A-0			
1	Points	-4.3563 nmi	1.5158
2	Points	-1.3352 nmi	-1.1128
3	Points	-1.1840 nmi	-1.1884
4	Points	-1.0296 nmi	-1.1621
5	Points	-0.9014 nmi	-1.0504
6	Points	-0.5793 nmi	-0.6659
7	Points	-0.3789 nmi	-0.4328
03-APP-A-1			
1	Points	-4.1922 nmi	1.7044
2	Points	-1.2935 nmi	-1.0505
3	Points	-1.1730 nmi	-1.1142
4	Points	-1.0617 nmi	-1.0944
5	Points	-0.9549 nmi	-0.9979
6	Points	-0.5794 nmi	-0.6658
7	Points	-0.3790 nmi	-0.4327
03-APP-A-2			
1	Points	-4.5204 nmi	1.3272
2	Points	-1.3769 nmi	-1.1752
3	Points	-1.1950 nmi	-1.2626
4	Points	-0.9974 nmi	-1.2299
5	Points	-0.8478 nmi	-1.1029
6	Points	-0.5792 nmi	-0.6660
7	Points	-0.3788 nmi	-0.4329
03-APP-A-3			
1	Points	-4.0281 nmi	1.8930
2	Points	-1.2518 nmi	-0.9882
3	Points	-1.1620 nmi	-1.0401
4	Points	-1.0938 nmi	-1.0266
5	Points	-1.0085 nmi	-0.9454
6	Points	-0.5795 nmi	-0.6658
7	Points	-0.3791 nmi	-0.4327
03-APP-A-4			
1	Points	-4.6845 nmi	1.1386
2	Points	-1.4186 nmi	-1.2375
3	Points	-1.2061 nmi	-1.3368
4	Points	-0.9653 nmi	-1.2977
5	Points	-0.7943 nmi	-1.1554
6	Points	-0.5792 nmi	-0.6660
7	Points	-0.3787 nmi	-0.4329
03-APP-B-0			
1	Points	2.5895 nmi	-2.2620
2	Points	-0.3821 nmi	0.3463
3	Points	-0.5004 nmi	0.4153
4	Points	-0.6155 nmi	0.4285
5	Points	-0.7338 nmi	0.3759
6	Points	-1.5422 nmi	-0.5443
7	Points	-1.6047 nmi	-0.6265
8	Points	-1.6408 nmi	-0.7349
9	Points	-1.5708 nmi	-0.9111
10	Points	-1.2925 nmi	-1.1523
11	Points	-1.2136 nmi	-1.1884
12	Points	-1.0986 nmi	-1.1819
13	Points	-0.9901 nmi	-1.1391
14	Points	-0.5826 nmi	-0.6790
15	Points	-0.3789 nmi	-0.4328
03-APP-B-1			
1	Points	2.4246 nmi	-2.4499
2	Points	-0.4406 nmi	0.2652
3	Points	-0.5320 nmi	0.3204
4	Points	-0.6003 nmi	0.3296
5	Points	-0.6745 nmi	0.2953
6	Points	-1.4842 nmi	-0.5918
7	Points	-1.5384 nmi	-0.6615
8	Points	-1.5659 nmi	-0.7328
9	Points	-1.5097 nmi	-0.8677
10	Points	-1.2519 nmi	-1.0892
11	Points	-1.1997 nmi	-1.1147
12	Points	-1.1147 nmi	-1.1086
13	Points	-1.0331 nmi	-1.0777
14	Points	-0.5827 nmi	-0.6790
15	Points	-0.3790 nmi	-0.4327
03-APP-B-2			
1	Points	2.7544 nmi	-2.0741
2	Points	-0.3237 nmi	0.4275
3	Points	-0.4689 nmi	0.5102
4	Points	-0.6306 nmi	0.5273
5	Points	-0.7930 nmi	0.4565
6	Points	-1.6003 nmi	-0.4968
7	Points	-1.6710 nmi	-0.5914
8	Points	-1.7158 nmi	-0.7370

9 Points -1.6320 nmi -0.9545
10 Points -1.3331 nmi -1.2153
11 Points -1.2275 nmi -1.2621
12 Points -1.0825 nmi -1.2551
13 Points -0.9471 nmi -1.2006
14 Points -0.5825 nmi -0.6791
15 Points -0.3788 nmi -0.4329
03-APP-B-3
1 Points 2.2597 nmi -2.6378
2 Points -0.4990 nmi 0.1840
3 Points -0.5635 nmi 0.2256
4 Points -0.5851 nmi 0.2308
5 Points -0.6153 nmi 0.2148
6 Points -1.4261 nmi -0.6392
7 Points -1.4720 nmi -0.6965
8 Points -1.4909 nmi -0.7307
9 Points -1.4485 nmi -0.8242
10 Points -1.2113 nmi -1.0261
11 Points -1.1858 nmi -1.0410
12 Points -1.1307 nmi -1.0353
13 Points -1.0761 nmi -1.0162
14 Points -0.5828 nmi -0.6789
15 Points -0.3791 nmi -0.4327
03-APP-B-4
1 Points 2.9193 nmi -1.8862
2 Points -0.2652 nmi 0.5086
3 Points -0.4374 nmi 0.6051
4 Points -0.6458 nmi 0.6262
5 Points -0.8523 nmi 0.5370
6 Points -1.6584 nmi -0.4493
7 Points -1.7373 nmi -0.5564
8 Points -1.7908 nmi -0.7391
9 Points -1.6931 nmi -0.9979
10 Points -1.3737 nmi -1.2784
11 Points -1.2414 nmi -1.3358
12 Points -1.0664 nmi -1.3284
13 Points -0.9041 nmi -1.2620
14 Points -0.5825 nmi -0.6792
15 Points -0.3787 nmi -0.4329
03-APP-C-0
1 Points -1.1883 nmi 4.2654
2 Points -0.9277 nmi 0.3595
3 Points -0.9277 nmi 0.2182
4 Points -0.9540 nmi 0.1294
5 Points -1.5521 nmi -0.5509
6 Points -1.6310 nmi -0.6823
7 Points -1.6310 nmi -0.8006
8 Points -1.5817 nmi -0.9058
9 Points -1.3122 nmi -1.1326
10 Points -1.2070 nmi -1.1851
11 Points -1.0887 nmi -1.1786
12 Points -0.9671 nmi -1.1194
13 Points -0.5892 nmi -0.6823
14 Points -0.3789 nmi -0.4328
03-APP-C-1
1 Points -0.9388 nmi 4.2820
2 Points -0.8277 nmi 0.3628
3 Points -0.8287 nmi 0.2038
4 Points -0.8664 nmi 0.0811
5 Points -1.4915 nmi -0.5951
6 Points -1.5587 nmi -0.7023
7 Points -1.5578 nmi -0.7843
8 Points -1.5222 nmi -0.8601
9 Points -1.2710 nmi -1.0699
10 Points -1.1918 nmi -1.1117
11 Points -1.1076 nmi -1.1060
12 Points -1.0128 nmi -1.0599
13 Points -0.5893 nmi -0.6823
14 Points -0.3790 nmi -0.4327
03-APP-C-2
1 Points -1.4377 nmi 4.2487
2 Points -1.0276 nmi 0.3561
3 Points -1.0266 nmi 0.2325
4 Points -1.0415 nmi 0.1778
5 Points -1.6127 nmi -0.5066
6 Points -1.7032 nmi -0.6623
7 Points -1.7042 nmi -0.8169
8 Points -1.6412 nmi -0.9515
9 Points -1.3534 nmi -1.1952
10 Points -1.2222 nmi -1.2586
11 Points -1.0699 nmi -1.2512
12 Points -0.9214 nmi -1.1789
13 Points -0.5891 nmi -0.6824
14 Points -0.3788 nmi -0.4329
03-APP-C-3
1 Points -0.6894 nmi 4.2987
2 Points -0.7278 nmi 0.3661
3 Points -0.7297 nmi 0.1895
4 Points -0.7789 nmi 0.0327
5 Points -1.4310 nmi -0.6393
6 Points -1.4864 nmi -0.7224
7 Points -1.4846 nmi -0.7680
8 Points -1.4627 nmi -0.8144
9 Points -1.2298 nmi -1.0072
10 Points -1.1766 nmi -1.0383
11 Points -1.1264 nmi -1.0334
12 Points -1.0585 nmi -1.0005
13 Points -0.5893 nmi -0.6822
14 Points -0.3791 nmi -0.4327
03-APP-C-4
1 Points -1.6871 nmi 4.2321
2 Points -1.1276 nmi 0.3528
3 Points -1.1256 nmi 0.2469
4 Points -1.1290 nmi 0.2261
5 Points -1.6732 nmi -0.4624
6 Points -1.7755 nmi -0.6423
7 Points -1.7774 nmi -0.8332
8 Points -1.7006 nmi -0.9971
9 Points -1.3946 nmi -1.2579
10 Points -1.2374 nmi -1.3320

11 Points -1.0510 nmi -1.3237
12 Points -0.8757 nmi -1.2383
13 Points -0.5890 nmi -0.6824
14 Points -0.3787 nmi -0.4329

03-DEP-1-0
1 Straight 1.1519 nmi
2 Right-Turn 11.0000 deg 0.0000
3 Straight 7.2000 nmi

03-DEP-2-0
1 Straight 1.3000 nmi
2 Right-Turn 90.0000 deg 0.2500
3 Straight 0.3000 nmi
4 Right-Turn 90.0000 deg 0.2500
5 Straight 2.3000 nmi
6 Left-Turn 40.0000 deg 0.3000
7 Straight 8.0000 nmi

03-DEP-3-0
1 Straight 1.1200 nmi
2 Left-Turn 40.0000 deg 0.3000
3 Straight 8.0000 nmi

03-DEP-99-0
1 Straight 2.0000 nmi
2 Straight 2.0000 nmi
3 Straight 2.0000 nmi
4 Straight 2.0000 nmi

03-DEP-A-0
1 Points -0.3789 nmi -0.4328
2 Points 0.3787 nmi 0.4352
3 Points 0.5552 nmi 0.6364
4 Points 4.8892 nmi 5.5947

03-DEP-A-1
1 Points -0.3790 nmi -0.4328
2 Points 0.3786 nmi 0.4352
3 Points 0.5501 nmi 0.6408
4 Points 4.3873 nmi 6.0334

03-DEP-A-2
1 Points -0.3788 nmi -0.4328
2 Points 0.3788 nmi 0.4352
3 Points 0.5603 nmi 0.6320
4 Points 5.3911 nmi 5.1560

03-DEP-A-3
1 Points -0.3790 nmi -0.4327
2 Points 0.3786 nmi 0.4353
3 Points 0.5451 nmi 0.6453
4 Points 3.8854 nmi 6.4721

03-DEP-A-4
1 Points -0.3788 nmi -0.4329
2 Points 0.3788 nmi 0.4351
3 Points 0.5653 nmi 0.6275
4 Points 5.8930 nmi 4.7173

03-DEP-A-5
1 Points -0.3791 nmi -0.4327
2 Points 0.3785 nmi 0.4353
3 Points 0.5400 nmi 0.6497
4 Points 3.3835 nmi 6.9108

03-DEP-A-6
1 Points -0.3787 nmi -0.4329
2 Points 0.3789 nmi 0.4351
3 Points 0.5704 nmi 0.6231
4 Points 6.3949 nmi 4.2786

03-DEP-B-0
1 Points -0.3789 nmi -0.4328
2 Points 0.3727 nmi 0.4295
3 Points 0.5138 nmi 0.5819
4 Points 0.5843 nmi 0.6210
5 Points 0.6750 nmi 0.6310
6 Points 0.7519 nmi 0.6184
7 Points 0.8086 nmi 0.5844
8 Points 1.0748 nmi 0.3548
9 Points 1.1250 nmi 0.2745
10 Points 1.1399 nmi 0.1826
11 Points 1.1235 nmi 0.0982
12 Points 1.0748 nmi 0.0135
13 Points -0.3908 nmi -1.6728
14 Points -0.4410 nmi -1.7230
15 Points -0.4912 nmi -1.8033
16 Points -0.5012 nmi -1.9037
17 Points -0.5012 nmi -2.0342
18 Points -0.6718 nmi -9.8638

03-DEP-B-1
1 Points -0.3790 nmi -0.4328
2 Points 0.3727 nmi 0.4295
3 Points 0.5056 nmi 0.5924
4 Points 0.5762 nmi 0.6464
5 Points 0.6761 nmi 0.6710
6 Points 0.7691 nmi 0.6654
7 Points 0.8379 nmi 0.6250
8 Points 1.1254 nmi 0.3982
9 Points 1.1874 nmi 0.2980
10 Points 1.2065 nmi 0.1816
11 Points 1.1860 nmi 0.0749
12 Points 1.1291 nmi -0.0251
13 Points -0.3176 nmi -1.7410
14 Points -0.3627 nmi -1.7853
15 Points -0.3965 nmi -1.8356
16 Points -0.4013 nmi -1.9087
17 Points -0.4012 nmi -2.0353
18 Points -0.0053 nmi -9.8783

03-DEP-B-2
1 Points -0.3788 nmi -0.4328
2 Points 0.3727 nmi 0.4295
3 Points 0.5220 nmi 0.5714
4 Points 0.5924 nmi 0.5956
5 Points 0.6739 nmi 0.5910
6 Points 0.7347 nmi 0.5714
7 Points 0.7793 nmi 0.5438
8 Points 1.0242 nmi 0.3114
9 Points 1.0626 nmi 0.2510
10 Points 1.0733 nmi 0.1836
11 Points 1.0610 nmi 0.1215

12 Points	1.0205 nmi	0.0521
13 Points	-0.4640 nmi	-1.6046
14 Points	-0.5193 nmi	-1.6607
15 Points	-0.5859 nmi	-1.7710
16 Points	-0.6011 nmi	-1.8987
17 Points	-0.6012 nmi	-2.0331
18 Points	-1.3383 nmi	-9.8493

03-DEP-B-3

1 Points	-0.3790 nmi	-0.4327
2 Points	0.3726 nmi	0.4296
3 Points	0.4973 nmi	0.6029
4 Points	0.5681 nmi	0.6718
5 Points	0.6771 nmi	0.7110
6 Points	0.7863 nmi	0.7124
7 Points	0.8673 nmi	0.6656
8 Points	1.1760 nmi	0.4416
9 Points	1.2498 nmi	0.3214
10 Points	1.2731 nmi	0.1805
11 Points	1.2485 nmi	0.0516
12 Points	1.1833 nmi	-0.0638
13 Points	-0.2445 nmi	-1.8093
14 Points	-0.2844 nmi	-1.8476
15 Points	-0.3018 nmi	-1.8680
16 Points	-0.3014 nmi	-1.9136
17 Points	-0.3012 nmi	-2.0364
18 Points	0.6612 nmi	-9.8928

03-DEP-B-4

1 Points	-0.3788 nmi	-0.4329
2 Points	0.3728 nmi	0.4294
3 Points	0.5303 nmi	0.5609
4 Points	0.6005 nmi	0.5702
5 Points	0.6729 nmi	0.5510
6 Points	0.7175 nmi	0.5244
7 Points	0.7499 nmi	0.5032
8 Points	0.9736 nmi	0.2680
9 Points	1.0002 nmi	0.2276
10 Points	1.0067 nmi	0.1847
11 Points	0.9985 nmi	0.1448
12 Points	0.9663 nmi	0.0908
13 Points	-0.5371 nmi	-1.5363
14 Points	-0.5976 nmi	-1.5984
15 Points	-0.6806 nmi	-1.7386
16 Points	-0.7010 nmi	-1.8938
17 Points	-0.7012 nmi	-2.0320
18 Points	-2.0048 nmi	-9.8348

03-DEP-B-5

1 Points	-0.3791 nmi	-0.4327
2 Points	0.3726 nmi	0.4296
3 Points	0.4891 nmi	0.6134
4 Points	0.5600 nmi	0.6972
5 Points	0.6782 nmi	0.7510
6 Points	0.8036 nmi	0.7594
7 Points	0.8966 nmi	0.7061
8 Points	1.2266 nmi	0.4850
9 Points	1.3122 nmi	0.3449
10 Points	1.3397 nmi	0.1795
11 Points	1.3110 nmi	0.0283
12 Points	1.2376 nmi	-0.1024
13 Points	-0.1713 nmi	-1.8775
14 Points	-0.2061 nmi	-1.9099
15 Points	-0.2070 nmi	-1.9003
16 Points	-0.2015 nmi	-1.9186
17 Points	-0.2012 nmi	-2.0375
18 Points	1.3277 nmi	-9.9074

03-DEP-B-6

1 Points	-0.3787 nmi	-0.4329
2 Points	0.3728 nmi	0.4294
3 Points	0.5385 nmi	0.5504
4 Points	0.6086 nmi	0.5448
5 Points	0.6718 nmi	0.5110
6 Points	0.7002 nmi	0.4774
7 Points	0.7206 nmi	0.4627
8 Points	0.9230 nmi	0.2246
9 Points	0.9378 nmi	0.2041
10 Points	0.9401 nmi	0.1857
11 Points	0.9360 nmi	0.1681
12 Points	0.9120 nmi	0.1294
13 Points	-0.6103 nmi	-1.4681
14 Points	-0.6759 nmi	-1.5361
15 Points	-0.7754 nmi	-1.7063
16 Points	-0.8009 nmi	-1.8888
17 Points	-0.8012 nmi	-2.0309
18 Points	-2.6713 nmi	-9.8202

03-DEP-C-0

1 Points	-0.3789 nmi	-0.4328
2 Points	0.3740 nmi	0.4320
3 Points	0.3959 nmi	0.4648
4 Points	0.4168 nmi	0.5140
5 Points	0.4316 nmi	0.5965
6 Points	0.4328 nmi	0.6469
7 Points	0.6053 nmi	9.8049

03-DEP-C-1

1 Points	-0.3790 nmi	-0.4327
2 Points	0.3739 nmi	0.4321
3 Points	0.3871 nmi	0.4695
4 Points	0.4025 nmi	0.5183
5 Points	0.3918 nmi	0.6005
6 Points	0.3829 nmi	0.6480
7 Points	-0.3945 nmi	9.8237

03-DEP-C-2

1 Points	-0.3788 nmi	-0.4329
2 Points	0.3741 nmi	0.4319
3 Points	0.4047 nmi	0.4600
4 Points	0.4312 nmi	0.5097
5 Points	0.4714 nmi	0.5924
6 Points	0.4828 nmi	0.6458
7 Points	1.6051 nmi	9.7860

03-DEP-C-3

1 Points	-0.3791 nmi	-0.4327
2 Points	0.3738 nmi	0.4321

3	Points	0.3783 nmi	0.4743
4	Points	0.3881 nmi	0.5226
5	Points	0.3520 nmi	0.6045
6	Points	0.3329 nmi	0.6491
7	Points	-1.3944 nmi	9.8425

03-DEP-C-4

1	Points	-0.3787 nmi	-0.4329
2	Points	0.3742 nmi	0.4319
3	Points	0.4135 nmi	0.4553
4	Points	0.4456 nmi	0.5054
5	Points	0.5112 nmi	0.5884
6	Points	0.5328 nmi	0.6448
7	Points	2.6050 nmi	9.7672

03-TGO-1-0

1	Straight	1.5000 nmi	
2	Left-Turn	90.0000 deg	0.3500
3	Straight	0.4000 nmi	
4	Left-Turn	90.0000 deg	0.3500
5	Straight	2.5000 nmi	
6	Left-Turn	90.0000 deg	0.3500
7	Straight	0.4000 nmi	
8	Left-Turn	90.0000 deg	0.3500
9	Straight	1.0000 nmi	

03-TGO-A-0

1	Points	-0.3789 nmi	-0.4328
2	Points	0.6115 nmi	0.6932
3	Points	0.6648 nmi	0.7864
4	Points	0.6932 nmi	0.9263
5	Points	0.6741 nmi	1.0487
6	Points	0.5977 nmi	1.1710
7	Points	0.2536 nmi	1.4691
8	Points	0.1504 nmi	1.5265
9	Points	0.0052 nmi	1.5418
10	Points	-0.0866 nmi	1.5265
11	Points	-0.2089 nmi	1.4347
12	Points	-1.8640 nmi	-0.4612
13	Points	-1.9290 nmi	-0.5530
14	Points	-1.9519 nmi	-0.6600
15	Points	-1.9519 nmi	-0.7441
16	Points	-1.8946 nmi	-0.8893
17	Points	-1.5238 nmi	-1.2257
18	Points	-1.3977 nmi	-1.2945
19	Points	-1.2448 nmi	-1.3022
20	Points	-1.0970 nmi	-1.2417
21	Points	-0.9817 nmi	-1.1263
22	Points	-0.3789 nmi	-0.4328

03-TGO-A-1

1	Points	-0.3790 nmi	-0.4328
2	Points	0.5708 nmi	0.7223
3	Points	0.6180 nmi	0.8040
4	Points	0.6432 nmi	0.9275
5	Points	0.6272 nmi	1.0312
6	Points	0.5596 nmi	1.1384
7	Points	0.2250 nmi	1.4282
8	Points	0.1354 nmi	1.4787
9	Points	0.0067 nmi	1.4919
10	Points	-0.0668 nmi	1.4804
11	Points	-0.1748 nmi	1.3980
12	Points	-1.8247 nmi	-0.4922
13	Points	-1.8833 nmi	-0.5730
14	Points	-1.9022 nmi	-0.6653
15	Points	-1.9029 nmi	-0.7348
16	Points	-1.8534 nmi	-0.8609
17	Points	-1.4949 nmi	-1.1850
18	Points	-1.3841 nmi	-1.2464
19	Points	-1.2532 nmi	-1.2529
20	Points	-1.1247 nmi	-1.2001
21	Points	-1.0182 nmi	-1.0922
22	Points	-0.3790 nmi	-0.4328

03-TGO-A-2

1	Points	-0.3788 nmi	-0.4328
2	Points	0.6522 nmi	0.6641
3	Points	0.7116 nmi	0.7688
4	Points	0.7432 nmi	0.9252
5	Points	0.7210 nmi	1.0661
6	Points	0.6357 nmi	1.2035
7	Points	0.2823 nmi	1.5101
8	Points	0.1655 nmi	1.5742
9	Points	0.0037 nmi	1.5917
10	Points	-0.1063 nmi	1.5725
11	Points	-0.2430 nmi	1.4714
12	Points	-1.9033 nmi	-0.4303
13	Points	-1.9747 nmi	-0.5329
14	Points	-2.0017 nmi	-0.6547
15	Points	-2.0010 nmi	-0.7534
16	Points	-1.9358 nmi	-0.9178
17	Points	-1.5528 nmi	-1.2665
18	Points	-1.4112 nmi	-1.3427
19	Points	-1.2364 nmi	-1.3514
20	Points	-1.0693 nmi	-1.2833
21	Points	-0.9452 nmi	-1.1604
22	Points	-0.3788 nmi	-0.4328

03-TGO-A-3

1	Points	-0.3790 nmi	-0.4327
2	Points	0.5302 nmi	0.7513
3	Points	0.5712 nmi	0.8216
4	Points	0.5933 nmi	0.9286
5	Points	0.5803 nmi	1.0137
6	Points	0.5216 nmi	1.1059
7	Points	0.1964 nmi	1.3873
8	Points	0.1203 nmi	1.4310
9	Points	0.0082 nmi	1.4419
10	Points	-0.0471 nmi	1.4343
11	Points	-0.1407 nmi	1.3613
12	Points	-1.7854 nmi	-0.5231
13	Points	-1.8375 nmi	-0.5931
14	Points	-1.8524 nmi	-0.6705
15	Points	-1.8538 nmi	-0.7254
16	Points	-1.8122 nmi	-0.8324
17	Points	-1.4659 nmi	-1.1443

18 Points -1.3705 nmi -1.1982
19 Points -1.2616 nmi -1.2036
20 Points -1.1524 nmi -1.1585
21 Points -1.0548 nmi -1.0582
22 Points -0.3790 nmi -0.4327
03-TGO-A-4
1 Points -0.3788 nmi -0.4329
2 Points 0.6928 nmi 0.6351
3 Points 0.7584 nmi 0.7512
4 Points 0.7932 nmi 0.9241
5 Points 0.7679 nmi 1.0836
6 Points 0.6737 nmi 1.2361
7 Points 0.3109 nmi 1.5510
8 Points 0.1806 nmi 1.6220
9 Points 0.0022 nmi 1.6416
10 Points -0.1260 nmi 1.6186
11 Points -0.2770 nmi 1.5081
12 Points -1.9426 nmi -0.3993
13 Points -2.0205 nmi -0.5128
14 Points -2.0515 nmi -0.6494
15 Points -2.0501 nmi -0.7628
16 Points -1.9770 nmi -0.9463
17 Points -1.5817 nmi -1.3072
18 Points -1.4248 nmi -1.3909
19 Points -1.2279 nmi -1.4007
20 Points -1.0416 nmi -1.3249
21 Points -0.9086 nmi -1.1944
22 Points -0.3788 nmi -0.4329
03-TGO-A-5
1 Points -0.3791 nmi -0.4327
2 Points 0.4895 nmi 0.7804
3 Points 0.5244 nmi 0.8392
4 Points 0.5433 nmi 0.9297
5 Points 0.5334 nmi 0.9962
6 Points 0.4835 nmi 1.0734
7 Points 0.1677 nmi 1.3464
8 Points 0.1052 nmi 1.3832
9 Points 0.0097 nmi 1.3920
10 Points -0.0274 nmi 1.3882
11 Points -0.1066 nmi 1.3246
12 Points -1.7461 nmi -0.5541
13 Points -1.7918 nmi -0.6132
14 Points -1.8026 nmi -0.6758
15 Points -1.8047 nmi -0.7161
16 Points -1.7710 nmi -0.8039
17 Points -1.4369 nmi -1.1035
18 Points -1.3570 nmi -1.1500
19 Points -1.2700 nmi -1.1543
20 Points -1.1800 nmi -1.1169
21 Points -1.0913 nmi -1.0241
22 Points -0.3791 nmi -0.4327
03-TGO-A-6
1 Points -0.3787 nmi -0.4329
2 Points 0.7335 nmi 0.6060
3 Points 0.8052 nmi 0.7336
4 Points 0.8432 nmi 0.9229
5 Points 0.8148 nmi 1.1011
6 Points 0.7118 nmi 1.2686
7 Points 0.3396 nmi 1.5919
8 Points 0.1957 nmi 1.6697
9 Points 0.0007 nmi 1.6915
10 Points -0.1457 nmi 1.6647
11 Points -0.3111 nmi 1.5448
12 Points -1.9820 nmi -0.3684
13 Points -2.0662 nmi -0.4927
14 Points -2.1012 nmi -0.6442
15 Points -2.0991 nmi -0.7721
16 Points -2.0182 nmi -0.9748
17 Points -1.6107 nmi -1.3479
18 Points -1.4384 nmi -1.4390
19 Points -1.2195 nmi -1.4500
20 Points -1.0140 nmi -1.3665
21 Points -0.8721 nmi -1.2285
22 Points -0.3787 nmi -0.4329
21-APP-1-0
1 Straight 2.0000 nmi
2 Straight 2.0000 nmi
3 Straight 2.0000 nmi
4 Straight 2.0000 nmi
21-APP-2-0
1 Straight 4.0000 nmi
2 Right-Turn 45.0000 deg 0.2500
3 Straight 0.9000 nmi
4 Left-Turn 90.0000 deg 0.2500
5 Straight 0.3000 nmi
6 Left-Turn 90.0000 deg 0.2500
7 Straight 0.9000 nmi
21-APP-3-0
1 Straight 4.0000 nmi
2 Right-Turn 90.0000 deg 0.2500
3 Straight 1.2300 nmi
4 Right-Turn 90.0000 deg 0.2500
5 Straight 0.3000 nmi
6 Right-Turn 90.0000 deg 0.2500
7 Straight 0.9000 nmi
21-APP-4-0
1 Straight 8.0000 nmi
2 Left-Turn 90.0000 deg 0.2500
3 Straight 0.9000 nmi
21-APP-5-0
1 Straight 4.0000 nmi
2 Left-Turn 45.0000 deg 0.2500
3 Straight 0.9000 nmi
4 Right-Turn 90.0000 deg 0.2500
5 Straight 0.3000 nmi
6 Right-Turn 90.0000 deg 0.2500
7 Straight 0.9000 nmi
21-APP-A-0
1 Points 6.1073 nmi 4.8871
2 Points 1.3031 nmi 1.1564

3 Points	0.5769 nmi	0.5881
4 Points	0.3790 nmi	0.4340
21-APP-A-1		
1 Points	6.2300 nmi	4.7291
2 Points	1.3339 nmi	1.1169
3 Points	0.5769 nmi	0.5881
4 Points	0.3790 nmi	0.4340
21-APP-A-2		
1 Points	5.9846 nmi	5.0451
2 Points	1.2724 nmi	1.1959
3 Points	0.5768 nmi	0.5882
4 Points	0.3790 nmi	0.4340
21-APP-A-3		
1 Points	6.3527 nmi	4.5712
2 Points	1.3647 nmi	1.0775
3 Points	0.5770 nmi	0.5880
4 Points	0.3790 nmi	0.4340
21-APP-A-4		
1 Points	5.8620 nmi	5.2031
2 Points	1.2416 nmi	1.2354
3 Points	0.5768 nmi	0.5883
4 Points	0.3790 nmi	0.4340
21-APP-A-5		
1 Points	6.4753 nmi	4.4132
2 Points	1.3954 nmi	1.0380
3 Points	0.5771 nmi	0.5879
4 Points	0.3790 nmi	0.4340
21-APP-A-6		
1 Points	5.7393 nmi	5.3610
2 Points	1.2108 nmi	1.2748
3 Points	0.5767 nmi	0.5884
4 Points	0.3790 nmi	0.4340
21-APP-B-0		
1 Points	1.1777 nmi	-4.2433
2 Points	0.9209 nmi	-0.2990
3 Points	0.9229 nmi	-0.2062
4 Points	0.9570 nmi	-0.1232
5 Points	1.0315 nmi	-0.0349
6 Points	1.5783 nmi	0.5843
7 Points	1.6309 nmi	0.6950
8 Points	1.6206 nmi	0.8243
9 Points	1.5611 nmi	0.9270
10 Points	1.2655 nmi	1.1754
11 Points	1.1895 nmi	1.1939
12 Points	1.0992 nmi	1.1959
13 Points	1.0355 nmi	1.1733
14 Points	0.9596 nmi	1.1138
15 Points	0.5717 nmi	0.6459
16 Points	0.3790 nmi	0.4340
21-APP-B-1		
1 Points	0.6788 nmi	-4.2757
2 Points	0.8459 nmi	-0.3007
3 Points	0.8495 nmi	-0.1909
4 Points	0.8928 nmi	-0.0844
5 Points	0.9747 nmi	0.0141
6 Points	1.5157 nmi	0.6256
7 Points	1.5571 nmi	0.7086
8 Points	1.5490 nmi	0.8020
9 Points	1.5037 nmi	0.8787
10 Points	1.2316 nmi	1.1085
11 Points	1.1797 nmi	1.1195
12 Points	1.1111 nmi	1.1219
13 Points	1.0717 nmi	1.1076
14 Points	1.0119 nmi	1.0600
15 Points	0.5718 nmi	0.6459
16 Points	0.3791 nmi	0.4339
21-APP-B-2		
1 Points	1.6767 nmi	-4.2108
2 Points	0.9959 nmi	-0.2974
3 Points	0.9964 nmi	-0.2215
4 Points	1.0211 nmi	-0.1621
5 Points	1.0882 nmi	-0.0839
6 Points	1.6409 nmi	0.5430
7 Points	1.7046 nmi	0.6814
8 Points	1.6922 nmi	0.8467
9 Points	1.6185 nmi	0.9752
10 Points	1.2993 nmi	1.2423
11 Points	1.1993 nmi	1.2682
12 Points	1.0873 nmi	1.2700
13 Points	0.9994 nmi	1.2390
14 Points	0.9073 nmi	1.1676
15 Points	0.5716 nmi	0.6460
16 Points	0.3789 nmi	0.4341
21-APP-B-3		
1 Points	0.1798 nmi	-4.3082
2 Points	0.7710 nmi	-0.3023
3 Points	0.7761 nmi	-0.1756
4 Points	0.8287 nmi	-0.0455
5 Points	0.9179 nmi	0.0631
6 Points	1.4531 nmi	0.6669
7 Points	1.4834 nmi	0.7222
8 Points	1.4774 nmi	0.7797
9 Points	1.4462 nmi	0.8305
10 Points	1.1977 nmi	1.0416
11 Points	1.1700 nmi	1.0451
12 Points	1.1230 nmi	1.0478
13 Points	1.1078 nmi	1.0419
14 Points	1.0642 nmi	1.0063
15 Points	0.5718 nmi	0.6458
16 Points	0.3791 nmi	0.4339
21-APP-B-4		
1 Points	2.1756 nmi	-4.1783
2 Points	1.0709 nmi	-0.2958
3 Points	1.0698 nmi	-0.2368
4 Points	1.0852 nmi	-0.2010
5 Points	1.1450 nmi	-0.1329
6 Points	1.7035 nmi	0.5017
7 Points	1.7784 nmi	0.6679
8 Points	1.7638 nmi	0.8690
9 Points	1.6759 nmi	1.0235

10	Points	1.3332 nmi	1.3092
11	Points	1.2091 nmi	1.3426
12	Points	1.0754 nmi	1.3440
13	Points	0.9633 nmi	1.3048
14	Points	0.8550 nmi	1.2213
15	Points	0.5715 nmi	0.6461
16	Points	0.3789 nmi	0.4341

21-APP-C-0

1	Points	4.4629 nmi	-3.9150
2	Points	-0.4384 nmi	0.3789
3	Points	-0.4863 nmi	0.4610
4	Points	-0.5020 nmi	0.5493
5	Points	-0.4877 nmi	0.6478
6	Points	-0.4076 nmi	0.7484
7	Points	0.3458 nmi	1.6167
8	Points	0.3827 nmi	1.6599
9	Points	0.4854 nmi	1.7173
10	Points	0.5942 nmi	1.7194
11	Points	0.7155 nmi	1.6731
12	Points	0.9514 nmi	1.4607
13	Points	1.0109 nmi	1.3766
14	Points	1.0314 nmi	1.2924
15	Points	1.0232 nmi	1.2103
16	Points	0.9986 nmi	1.1466
17	Points	0.5717 nmi	0.6562
18	Points	0.3790 nmi	0.4340

21-APP-C-1

1	Points	4.1993 nmi	-4.2159
2	Points	-0.4963 nmi	0.3312
3	Points	-0.5567 nmi	0.4352
4	Points	-0.5770 nmi	0.5481
5	Points	-0.5565 nmi	0.6776
6	Points	-0.4653 nmi	0.7963
7	Points	0.2890 nmi	1.6657
8	Points	0.3352 nmi	1.7179
9	Points	0.4658 nmi	1.7897
10	Points	0.6071 nmi	1.7933
11	Points	0.7546 nmi	1.7371
12	Points	1.0074 nmi	1.5106
13	Points	1.0792 nmi	1.4077
14	Points	1.1063 nmi	1.2976
15	Points	1.0962 nmi	1.1929
16	Points	1.0628 nmi	1.1079
17	Points	0.5718 nmi	0.6561
18	Points	0.3791 nmi	0.4339

21-APP-C-2

1	Points	4.7265 nmi	-3.6142
2	Points	-0.3805 nmi	0.4266
3	Points	-0.4159 nmi	0.4869
4	Points	-0.4270 nmi	0.5505
5	Points	-0.4188 nmi	0.6180
6	Points	-0.3499 nmi	0.7005
7	Points	0.4026 nmi	1.5678
8	Points	0.4303 nmi	1.6018
9	Points	0.5050 nmi	1.6449
10	Points	0.5813 nmi	1.6455
11	Points	0.6764 nmi	1.6091
12	Points	0.8953 nmi	1.4109
13	Points	0.9427 nmi	1.3455
14	Points	0.9566 nmi	1.2872
15	Points	0.9503 nmi	1.2277
16	Points	0.9344 nmi	1.1854
17	Points	0.5716 nmi	0.6563
18	Points	0.3789 nmi	0.4341

21-APP-C-3

1	Points	3.9358 nmi	-4.5168
2	Points	-0.5541 nmi	0.2835
3	Points	-0.6271 nmi	0.4093
4	Points	-0.6520 nmi	0.5469
5	Points	-0.6253 nmi	0.7074
6	Points	-0.5230 nmi	0.8443
7	Points	0.2322 nmi	1.7147
8	Points	0.2877 nmi	1.7759
9	Points	0.4461 nmi	1.8621
10	Points	0.6200 nmi	1.8672
11	Points	0.7937 nmi	1.8010
12	Points	1.0635 nmi	1.5604
13	Points	1.1474 nmi	1.4387
14	Points	1.1811 nmi	1.3029
15	Points	1.1691 nmi	1.1754
16	Points	1.1270 nmi	1.0692
17	Points	0.5718 nmi	0.6561
18	Points	0.3792 nmi	0.4339

21-APP-C-4

1	Points	4.9901 nmi	-3.3133
2	Points	-0.3226 nmi	0.4743
3	Points	-0.3455 nmi	0.5128
4	Points	-0.3520 nmi	0.5517
5	Points	-0.3500 nmi	0.5882
6	Points	-0.2922 nmi	0.6525
7	Points	0.4594 nmi	1.5188
8	Points	0.4778 nmi	1.5438
9	Points	0.5246 nmi	1.5726
10	Points	0.5684 nmi	1.5716
11	Points	0.6372 nmi	1.5451
12	Points	0.8393 nmi	1.3611
13	Points	0.8744 nmi	1.3144
14	Points	0.8818 nmi	1.2819
15	Points	0.8773 nmi	1.2451
16	Points	0.8702 nmi	1.2241
17	Points	0.5715 nmi	0.6563
18	Points	0.3788 nmi	0.4341

21-APP-D-0

1	Points	7.3508 nmi	-4.1200
2	Points	1.2702 nmi	1.1800
3	Points	1.1572 nmi	1.1903
4	Points	1.0647 nmi	1.1903
5	Points	1.0031 nmi	1.1595
6	Points	0.9723 nmi	1.1184
7	Points	0.5717 nmi	0.6665

8 Points 0.3790 nmi 0.4340
21-APP-D-1
1 Points 7.0223 nmi -4.4969
2 Points 1.2407 nmi 1.1111
3 Points 1.1538 nmi 1.1154
4 Points 1.0820 nmi 1.1173
5 Points 1.0512 nmi 1.1019
6 Points 1.0304 nmi 1.0710
7 Points 0.5718 nmi 0.6664
8 Points 0.3791 nmi 0.4339
21-APP-D-2
1 Points 7.6794 nmi -3.7431
2 Points 1.2996 nmi 1.2490
3 Points 1.1606 nmi 1.2652
4 Points 1.0475 nmi 1.2633
5 Points 0.9550 nmi 1.2171
6 Points 0.9142 nmi 1.1658
7 Points 0.5716 nmi 0.6665
8 Points 0.3789 nmi 0.4341
21-APP-D-3
1 Points 6.6938 nmi -4.8738
2 Points 1.2112 nmi 1.0421
3 Points 1.1504 nmi 1.0405
4 Points 1.0992 nmi 1.0443
5 Points 1.0992 nmi 1.0443
6 Points 1.0885 nmi 1.0236
7 Points 0.5718 nmi 0.6663
8 Points 0.3792 nmi 0.4339
21-APP-D-4
1 Points 8.0079 nmi -3.3662
2 Points 1.3291 nmi 1.3180
3 Points 1.1640 nmi 1.3402
4 Points 1.0303 nmi 1.3363
5 Points 0.9070 nmi 1.2747
6 Points 0.8561 nmi 1.2132
7 Points 0.5715 nmi 0.6666
8 Points 0.3788 nmi 0.4341
21-APP-E-0
1 Points -4.3689 nmi 0.6151
2 Points -0.3973 nmi 0.8757
3 Points -0.3050 nmi 0.9003
4 Points -0.2311 nmi 0.9475
5 Points 0.3848 nmi 1.6578
6 Points 0.4813 nmi 1.7153
7 Points 0.5901 nmi 1.7235
8 Points 0.7112 nmi 1.6783
9 Points 0.9391 nmi 1.4730
10 Points 1.0130 nmi 1.3786
11 Points 1.0294 nmi 1.2965
12 Points 1.0273 nmi 1.2247
13 Points 1.0007 nmi 1.1528
14 Points 0.6065 nmi 0.6971
15 Points 0.3790 nmi 0.4340
21-APP-E-1
1 Points -4.3950 nmi 1.0143
2 Points -0.4095 nmi 0.9497
3 Points -0.3352 nmi 0.9690
4 Points -0.2801 nmi 1.0043
5 Points 0.3367 nmi 1.7153
6 Points 0.4587 nmi 1.7868
7 Points 0.6006 nmi 1.7978
8 Points 0.7501 nmi 1.7425
9 Points 0.9939 nmi 1.5242
10 Points 1.0811 nmi 1.4099
11 Points 1.1041 nmi 1.3028
12 Points 1.1010 nmi 1.2103
13 Points 1.0652 nmi 1.1146
14 Points 0.6066 nmi 0.6970
15 Points 0.3791 nmi 0.4339
21-APP-E-2
1 Points -4.3427 nmi 0.2160
2 Points -0.3852 nmi 0.8017
3 Points -0.2747 nmi 0.8317
4 Points -0.1820 nmi 0.8908
5 Points 0.4329 nmi 1.6003
6 Points 0.5039 nmi 1.6438
7 Points 0.5796 nmi 1.6492
8 Points 0.6723 nmi 1.6142
9 Points 0.8842 nmi 1.4219
10 Points 0.9448 nmi 1.3473
11 Points 0.9547 nmi 1.2902
12 Points 0.9537 nmi 1.2390
13 Points 0.9361 nmi 1.1910
14 Points 0.6064 nmi 0.6971
15 Points 0.3789 nmi 0.4341
21-APP-E-3
1 Points -4.4212 nmi 1.4134
2 Points -0.4217 nmi 1.0237
3 Points -0.3654 nmi 1.0376
4 Points -0.3291 nmi 1.0610
5 Points 0.2885 nmi 1.7728
6 Points 0.4361 nmi 1.8583
7 Points 0.6111 nmi 1.8720
8 Points 0.7890 nmi 1.8066
9 Points 1.0487 nmi 1.5754
10 Points 1.1493 nmi 1.4412
11 Points 1.1789 nmi 1.3092
12 Points 1.1746 nmi 1.1960
13 Points 1.1297 nmi 1.0764
14 Points 0.6067 nmi 0.6969
15 Points 0.3792 nmi 0.4339
21-APP-E-4
1 Points -4.3165 nmi -0.1832
2 Points -0.3730 nmi 0.7277
3 Points -0.2445 nmi 0.7630
4 Points -0.1330 nmi 0.8340
5 Points 0.4811 nmi 1.5428
6 Points 0.5265 nmi 1.5723
7 Points 0.5690 nmi 1.5750
8 Points 0.6334 nmi 1.5501

9 Points 0.8294 nmi 1.3707
10 Points 0.8767 nmi 1.3160
11 Points 0.8799 nmi 1.2839
12 Points 0.8801 nmi 1.2533
13 Points 0.8716 nmi 1.2292
14 Points 0.6064 nmi 0.6972
15 Points 0.3788 nmi 0.4341
21-DEP-1-0
1 Straight 1.2000 nmi
2 Right-Turn 40.0000 deg 0.3000
3 Straight 8.0000 nmi
21-DEP-2-0
1 Straight 1.2000 nmi
2 Left-Turn 40.0000 deg 0.3000
3 Straight 8.0000 nmi
21-DEP-3-0
1 Straight 1.2000 nmi
2 Left-Turn 90.0000 deg 0.3000
3 Straight 8.0000 nmi
21-DEP-4-0
1 Straight 0.9000 nmi
2 Left-Turn 90.0000 deg 0.2500
3 Straight 0.3000 nmi
4 Left-Turn 90.0000 deg 0.2500
5 Straight 1.8000 nmi
6 Right-Turn 40.0000 deg 0.3000
7 Straight 8.0000 nmi
21-DEP-5-0
1 Straight 0.9000 nmi
2 Right-Turn 90.0000 deg 0.2500
3 Straight 0.3000 nmi
4 Right-Turn 90.0000 deg 0.2500
5 Straight 1.8000 nmi
6 Left-Turn 40.0000 deg 0.3000
7 Straight 8.0000 nmi
21-DEP-A-0
1 Points 0.3790 nmi 0.4340
2 Points -0.3761 nmi -0.4251
3 Points -0.4495 nmi -0.5059
4 Points -0.5289 nmi -0.5523
5 Points -0.6276 nmi -0.5715
6 Points -0.7036 nmi -0.5831
7 Points -8.5153 nmi -1.8109
21-DEP-A-1
1 Points 0.3791 nmi 0.4339
2 Points -0.3760 nmi -0.4252
3 Points -0.4432 nmi -0.5137
4 Points -0.5148 nmi -0.5897
5 Points -0.6190 nmi -0.6208
6 Points -0.6944 nmi -0.6423
7 Points -8.3600 nmi -2.7987
21-DEP-A-2
1 Points 0.3789 nmi 0.4341
2 Points -0.3762 nmi -0.4250
3 Points -0.4558 nmi -0.4981
4 Points -0.5430 nmi -0.5149
5 Points -0.6362 nmi -0.5222
6 Points -0.7128 nmi -0.5239
7 Points -8.6705 nmi -0.8230
21-DEP-A-3
1 Points 0.3792 nmi 0.4338
2 Points -0.3759 nmi -0.4253
3 Points -0.4369 nmi -0.5215
4 Points -0.5007 nmi -0.6271
5 Points -0.6105 nmi -0.6701
6 Points -0.6852 nmi -0.7016
7 Points -8.2048 nmi -3.7866
21-DEP-A-4
1 Points 0.3788 nmi 0.4342
2 Points -0.3763 nmi -0.4249
3 Points -0.4621 nmi -0.4903
4 Points -0.5571 nmi -0.4775
5 Points -0.6447 nmi -0.4729
6 Points -0.7220 nmi -0.4646
7 Points -8.8258 nmi 0.1649
21-DEP-B-0
1 Points 0.3790 nmi 0.4340
2 Points -0.3775 nmi -0.4302
3 Points -0.4382 nmi -0.5038
4 Points -0.4603 nmi -0.5431
5 Points -0.4878 nmi -0.6631
6 Points -0.4899 nmi -0.7500
7 Points -0.5084 nmi -2.0095
8 Points -0.6702 nmi -9.8594
21-DEP-B-1
1 Points 0.3791 nmi 0.4340
2 Points -0.3774 nmi -0.4302
3 Points -0.4327 nmi -0.5076
4 Points -0.4510 nmi -0.5467
5 Points -0.4547 nmi -0.6672
6 Points -0.4466 nmi -0.7508
7 Points -0.4085 nmi -2.0113
8 Points -0.0037 nmi -9.8731
21-DEP-B-2
1 Points 0.3789 nmi 0.4340
2 Points -0.3776 nmi -0.4302
3 Points -0.4437 nmi -0.5000
4 Points -0.4696 nmi -0.5395
5 Points -0.5209 nmi -0.6590
6 Points -0.5332 nmi -0.7492
7 Points -0.6083 nmi -2.0077
8 Points -1.3367 nmi -9.8457
21-DEP-B-3
1 Points 0.3791 nmi 0.4339
2 Points -0.3774 nmi -0.4303
3 Points -0.4272 nmi -0.5114
4 Points -0.4417 nmi -0.5503
5 Points -0.4216 nmi -0.6714
6 Points -0.4033 nmi -0.7517
7 Points -0.3086 nmi -2.0130

8 Points 0.6628 nmi -9.8869

21-DEP-B-4

1	Points	0.3789 nmi	0.4341
2	Points	-0.3776 nmi	-0.4301
3	Points	-0.4492 nmi	-0.4962
4	Points	-0.4789 nmi	-0.5359
5	Points	-0.5540 nmi	-0.6548
6	Points	-0.5765 nmi	-0.7483
7	Points	-0.7082 nmi	-2.0060
8	Points	-2.0032 nmi	-9.8319

21-DEP-B-5

1	Points	0.3792 nmi	0.4339
2	Points	-0.3773 nmi	-0.4303
3	Points	-0.4217 nmi	-0.5151
4	Points	-0.4324 nmi	-0.5539
5	Points	-0.3885 nmi	-0.6755
6	Points	-0.3600 nmi	-0.7525
7	Points	-0.2087 nmi	-2.0148
8	Points	1.3293 nmi	-9.9006

21-DEP-B-6

1	Points	0.3788 nmi	0.4341
2	Points	-0.3777 nmi	-0.4301
3	Points	-0.4547 nmi	-0.4925
4	Points	-0.4882 nmi	-0.5323
5	Points	-0.5871 nmi	-0.6507
6	Points	-0.6198 nmi	-0.7475
7	Points	-0.8081 nmi	-2.0042
8	Points	-2.6697 nmi	-9.8182

21-DEP-C-0

1	Points	0.3790 nmi	0.4340
2	Points	-0.3761 nmi	-0.4270
3	Points	-0.4602 nmi	-0.5432
4	Points	-0.4878 nmi	-0.6569
5	Points	-0.4651 nmi	-0.7728
6	Points	-0.4237 nmi	-0.8535
7	Points	-0.3575 nmi	-0.9135
8	Points	5.6423 nmi	-6.1604

21-DEP-C-1

1	Points	0.3791 nmi	0.4339
2	Points	-0.3760 nmi	-0.4271
3	Points	-0.4511 nmi	-0.5474
4	Points	-0.4728 nmi	-0.6572
5	Points	-0.4179 nmi	-0.7564
6	Points	-0.3721 nmi	-0.8139
7	Points	-0.3076 nmi	-0.8575
8	Points	6.3006 nmi	-5.4076

21-DEP-C-2

1	Points	0.3789 nmi	0.4341
2	Points	-0.3762 nmi	-0.4269
3	Points	-0.4693 nmi	-0.5390
4	Points	-0.5028 nmi	-0.6566
5	Points	-0.5123 nmi	-0.7892
6	Points	-0.4753 nmi	-0.8931
7	Points	-0.4074 nmi	-0.9695
8	Points	4.9840 nmi	-6.9132

21-DEP-C-3

1	Points	0.3792 nmi	0.4339
2	Points	-0.3759 nmi	-0.4271
3	Points	-0.4420 nmi	-0.5516
4	Points	-0.4578 nmi	-0.6576
5	Points	-0.3706 nmi	-0.7400
6	Points	-0.3205 nmi	-0.7744
7	Points	-0.2577 nmi	-0.8015
8	Points	6.9589 nmi	-4.6548

21-DEP-C-4

1	Points	0.3788 nmi	0.4341
2	Points	-0.3763 nmi	-0.4269
3	Points	-0.4784 nmi	-0.5348
4	Points	-0.5178 nmi	-0.6562
5	Points	-0.5596 nmi	-0.8056
6	Points	-0.5269 nmi	-0.9326
7	Points	-0.4573 nmi	-1.0255
8	Points	4.3257 nmi	-7.6660

21-DEP-D-0

1	Points	0.3790 nmi	0.4340
2	Points	-0.2402 nmi	-0.2783
3	Points	-0.2685 nmi	-0.3465
4	Points	-0.2767 nmi	-0.4127
5	Points	-0.2638 nmi	-0.4837
6	Points	-0.2416 nmi	-0.5323
7	Points	-0.2105 nmi	-0.5741
8	Points	0.0254 nmi	-0.7831
9	Points	0.0937 nmi	-0.8307
10	Points	0.1889 nmi	-0.8556
11	Points	0.2758 nmi	-0.8411
12	Points	0.3606 nmi	-0.7997
13	Points	0.4268 nmi	-0.7273
14	Points	1.5123 nmi	0.5216
15	Points	1.5751 nmi	0.5876
16	Points	1.6382 nmi	0.6385
17	Points	1.7152 nmi	0.6811
18	Points	1.9021 nmi	0.7078
19	Points	9.6460 nmi	1.9147

21-DEP-D-1

1	Points	0.3791 nmi	0.4339
2	Points	-0.2401 nmi	-0.2784
3	Points	-0.2588 nmi	-0.3491
4	Points	-0.2567 nmi	-0.4121
5	Points	-0.2256 nmi	-0.4717
6	Points	-0.1986 nmi	-0.5068
7	Points	-0.1663 nmi	-0.5335
8	Points	0.0718 nmi	-0.7242
9	Points	0.1251 nmi	-0.7626
10	Points	0.1923 nmi	-0.7806
11	Points	0.2529 nmi	-0.7696
12	Points	0.3157 nmi	-0.7396
13	Points	0.3708 nmi	-0.6774
14	Points	1.4014 nmi	0.6225
15	Points	1.4734 nmi	0.6979
16	Points	1.5545 nmi	0.7630

17 Points 1.6675 nmi 0.8233
18 Points 1.8800 nmi 0.8561
19 Points 9.4920 nmi 2.9028
21-DEP-D-2
1 Points 0.3789 nmi 0.4341
2 Points -0.2403 nmi -0.2782
3 Points -0.2782 nmi -0.3439
4 Points -0.2967 nmi -0.4133
5 Points -0.3020 nmi -0.4957
6 Points -0.2846 nmi -0.5578
7 Points -0.2547 nmi -0.6147
8 Points -0.0210 nmi -0.8420
9 Points 0.0623 nmi -0.8988
10 Points 0.1855 nmi -0.9306
11 Points 0.2987 nmi -0.9126
12 Points 0.4055 nmi -0.8598
13 Points 0.4828 nmi -0.7772
14 Points 1.6232 nmi 0.4207
15 Points 1.6768 nmi 0.4773
16 Points 1.7219 nmi 0.5140
17 Points 1.7629 nmi 0.5389
18 Points 1.9242 nmi 0.5595
19 Points 9.8000 nmi 0.9266
21-DEP-D-3
1 Points 0.3792 nmi 0.4339
2 Points -0.2400 nmi -0.2784
3 Points -0.2492 nmi -0.3516
4 Points -0.2367 nmi -0.4116
5 Points -0.1875 nmi -0.4597
6 Points -0.1555 nmi -0.4814
7 Points -0.1221 nmi -0.4929
8 Points 0.1182 nmi -0.6653
9 Points 0.1565 nmi -0.6945
10 Points 0.1957 nmi -0.7056
11 Points 0.2300 nmi -0.6981
12 Points 0.2707 nmi -0.6795
13 Points 0.3148 nmi -0.6275
14 Points 1.2905 nmi 0.7234
15 Points 1.3718 nmi 0.8083
16 Points 1.4708 nmi 0.8875
17 Points 1.6198 nmi 0.9654
18 Points 1.8578 nmi 1.0044
19 Points 9.3380 nmi 3.8909
21-DEP-D-4
1 Points 0.3788 nmi 0.4341
2 Points -0.2404 nmi -0.2782
3 Points -0.2878 nmi -0.3414
4 Points -0.3167 nmi -0.4138
5 Points -0.3401 nmi -0.5077
6 Points -0.3277 nmi -0.5832
7 Points -0.2989 nmi -0.6553
8 Points -0.0674 nmi -0.9009
9 Points 0.0309 nmi -0.9669
10 Points 0.1821 nmi -1.0056
11 Points 0.3216 nmi -0.9841
12 Points 0.4505 nmi -0.9199
13 Points 0.5388 nmi -0.8271
14 Points 1.7341 nmi 0.3198
15 Points 1.7784 nmi 0.3669
16 Points 1.8056 nmi 0.3895
17 Points 1.8106 nmi 0.3968
18 Points 1.9464 nmi 0.4112
19 Points 9.9540 nmi -0.0615
21-DEP-E-0
1 Points 0.3790 nmi 0.4340
2 Points -0.2316 nmi -0.2505
3 Points -0.2809 nmi -0.2968
4 Points -0.3306 nmi -0.3175
5 Points -0.3988 nmi -0.3287
6 Points -0.4571 nmi -0.3223
7 Points -0.5333 nmi -0.2927
8 Points -0.8268 nmi -0.0345
9 Points -0.8665 nmi 0.0384
10 Points -0.8769 nmi 0.1108
11 Points -0.8735 nmi 0.1755
12 Points -0.8500 nmi 0.2308
13 Points -0.8035 nmi 0.2981
14 Points 0.3053 nmi 1.5645
15 Points 0.3870 nmi 1.6637
16 Points 0.4221 nmi 1.7338
17 Points 0.4454 nmi 1.8330
18 Points 0.4512 nmi 1.9497
19 Points 0.5855 nmi 8.6436
21-DEP-E-1
1 Points 0.3791 nmi 0.4339
2 Points -0.2315 nmi -0.2506
3 Points -0.2755 nmi -0.3052
4 Points -0.3251 nmi -0.3367
5 Points -0.3977 nmi -0.3687
6 Points -0.4690 nmi -0.3709
7 Points -0.5645 nmi -0.3440
8 Points -0.8855 nmi -0.0814
9 Points -0.9377 nmi 0.0148
10 Points -0.9518 nmi 0.1074
11 Points -0.9466 nmi 0.1924
12 Points -0.9156 nmi 0.2669
13 Points -0.8627 nmi 0.3442
14 Points 0.1910 nmi 1.6616
15 Points 0.2613 nmi 1.7455
16 Points 0.2810 nmi 1.7849
17 Points 0.2969 nmi 1.8540
18 Points 0.3013 nmi 1.9549
19 Points -0.4143 nmi 8.6637
21-DEP-E-2
1 Points 0.3789 nmi 0.4341
2 Points -0.2317 nmi -0.2504
3 Points -0.2863 nmi -0.2884
4 Points -0.3361 nmi -0.2983
5 Points -0.3999 nmi -0.2887
6 Points -0.4452 nmi -0.2737

7	Points	-0.5021 nmi	-0.2414
8	Points	-0.7681 nmi	0.0124
9	Points	-0.7953 nmi	0.0620
10	Points	-0.8020 nmi	0.1142
11	Points	-0.8004 nmi	0.1586
12	Points	-0.7844 nmi	0.1947
13	Points	-0.7443 nmi	0.2520
14	Points	0.4196 nmi	1.4674
15	Points	0.5127 nmi	1.5819
16	Points	0.5632 nmi	1.6827
17	Points	0.5939 nmi	1.8120
18	Points	0.6011 nmi	1.9445
19	Points	1.5853 nmi	8.6235
21-DEP-E-3			
1	Points	0.3791 nmi	0.4339
2	Points	-0.2315 nmi	-0.2506
3	Points	-0.2700 nmi	-0.3136
4	Points	-0.3196 nmi	-0.3560
5	Points	-0.3967 nmi	-0.4087
6	Points	-0.4809 nmi	-0.4194
7	Points	-0.5956 nmi	-0.3953
8	Points	-0.9441 nmi	-0.1282
9	Points	-1.0089 nmi	-0.0089
10	Points	-1.0267 nmi	0.1040
11	Points	-1.0197 nmi	0.2093
12	Points	-0.9813 nmi	0.3031
13	Points	-0.9219 nmi	0.3903
14	Points	0.0767 nmi	1.7587
15	Points	0.1355 nmi	1.8272
16	Points	0.1400 nmi	1.8360
17	Points	0.1484 nmi	1.8749
18	Points	0.1514 nmi	1.9602
19	Points	-1.4141 nmi	8.6837
21-DEP-E-4			
1	Points	0.3789 nmi	0.4341
2	Points	-0.2317 nmi	-0.2504
3	Points	-0.2918 nmi	-0.2800
4	Points	-0.3416 nmi	-0.2790
5	Points	-0.4009 nmi	-0.2487
6	Points	-0.4333 nmi	-0.2252
7	Points	-0.4710 nmi	-0.1901
8	Points	-0.7095 nmi	0.0592
9	Points	-0.7241 nmi	0.0857
10	Points	-0.7271 nmi	0.1176
11	Points	-0.7273 nmi	0.1417
12	Points	-0.7187 nmi	0.1585
13	Points	-0.6851 nmi	0.2059
14	Points	0.5339 nmi	1.3703
15	Points	0.6385 nmi	1.5002
16	Points	0.7042 nmi	1.6316
17	Points	0.7424 nmi	1.7911
18	Points	0.7510 nmi	1.9392
19	Points	2.5851 nmi	8.6035
21-DEP-F-0			
1	Points	0.3790 nmi	0.4340
2	Points	-0.3910 nmi	-0.4432
3	Points	-3.3261 nmi	-3.3783
4	Points	-4.5818 nmi	-4.6339
21-DEP-F-1			
1	Points	0.3791 nmi	0.4339
2	Points	-0.3909 nmi	-0.4433
3	Points	-3.0786 nmi	-3.6258
4	Points	-4.2282 nmi	-4.9875
21-DEP-F-2			
1	Points	0.3789 nmi	0.4341
2	Points	-0.3911 nmi	-0.4431
3	Points	-3.5736 nmi	-3.1308
4	Points	-4.9353 nmi	-4.2804
21-DEP-F-3			
1	Points	0.3792 nmi	0.4339
2	Points	-0.3909 nmi	-0.4433
3	Points	-2.8311 nmi	-3.8732
4	Points	-3.8746 nmi	-5.3411
21-DEP-F-4			
1	Points	0.3788 nmi	0.4341
2	Points	-0.3912 nmi	-0.4431
3	Points	-3.8210 nmi	-2.8833
4	Points	-5.2889 nmi	-3.9268
21-TGO-1-0			
1	Straight	1.5000 nmi	
2	Left-Turn	90.0000 deg	0.3500
3	Straight	0.4000 nmi	
4	Left-Turn	90.0000 deg	0.3500
5	Straight	2.5000 nmi	
6	Left-Turn	90.0000 deg	0.3500
7	Straight	0.4000 nmi	
8	Left-Turn	90.0000 deg	0.3500
9	Straight	1.0000 nmi	
21-TGO-A-0			
1	Points	0.3790 nmi	0.4340
2	Points	-0.3781 nmi	-0.4385
3	Points	-0.6436 nmi	-0.7375
4	Points	-0.6963 nmi	-0.8634
5	Points	-0.6871 nmi	-1.0077
6	Points	-0.6115 nmi	-1.1543
7	Points	-0.2795 nmi	-1.4474
8	Points	-0.1513 nmi	-1.5206
9	Points	0.0022 nmi	-1.5344
10	Points	0.1441 nmi	-1.4840
11	Points	0.2174 nmi	-1.4222
12	Points	1.8744 nmi	0.4676
13	Points	1.9470 nmi	0.6052
14	Points	1.9546 nmi	0.7237
15	Points	1.9317 nmi	0.8155
16	Points	1.8706 nmi	0.9187
17	Points	1.5189 nmi	1.2283
18	Points	1.4080 nmi	1.2971
19	Points	1.2934 nmi	1.3124
20	Points	1.1396 nmi	1.2746
21	Points	1.0553 nmi	1.2080

22	Points	0.3790 nmi	0.4340

21-TGO-A-1

1	Points	0.3791 nmi	0.4340
2	Points	-0.3406 nmi	-0.4715
3	Points	-0.6013 nmi	-0.7640
4	Points	-0.6470 nmi	-0.8717
5	Points	-0.6389 nmi	-0.9944
6	Points	-0.5720 nmi	-1.1235
7	Points	-0.2504 nmi	-1.4067
8	Points	-0.1363 nmi	-1.4729
9	Points	-0.0041 nmi	-1.4848
10	Points	0.1192 nmi	-1.4405
11	Points	0.1824 nmi	-1.3864
12	Points	1.8332 nmi	0.4960
13	Points	1.8989 nmi	0.6188
14	Points	1.9049 nmi	0.7192
15	Points	1.8854 nmi	0.7965
16	Points	1.8321 nmi	0.8868
17	Points	1.4891 nmi	1.1881
18	Points	1.3912 nmi	1.2501
19	Points	1.2961 nmi	1.2625
20	Points	1.1616 nmi	1.2296
21	Points	1.0898 nmi	1.1718
22	Points	0.3791 nmi	0.4340

21-TGO-A-2

1	Points	0.3789 nmi	0.4340
2	Points	-0.4156 nmi	-0.4055
3	Points	-0.6859 nmi	-0.7109
4	Points	-0.7455 nmi	-0.8552
5	Points	-0.7353 nmi	-1.0210
6	Points	-0.6510 nmi	-1.1850
7	Points	-0.3086 nmi	-1.4881
8	Points	-0.1662 nmi	-1.5684
9	Points	0.0084 nmi	-1.5840
10	Points	0.1691 nmi	-1.5275
11	Points	0.2525 nmi	-1.4579
12	Points	1.9156 nmi	0.4393
13	Points	1.9951 nmi	0.5917
14	Points	2.0044 nmi	0.7283
15	Points	1.9780 nmi	0.8345
16	Points	1.9090 nmi	0.9506
17	Points	1.5487 nmi	1.2685
18	Points	1.4249 nmi	1.3441
19	Points	1.2906 nmi	1.3623
20	Points	1.1176 nmi	1.3196
21	Points	1.0208 nmi	1.2442
22	Points	0.3789 nmi	0.4340

21-TGO-A-3

1	Points	0.3791 nmi	0.4339
2	Points	-0.3030 nmi	-0.5044
3	Points	-0.5591 nmi	-0.7906
4	Points	-0.5978 nmi	-0.8800
5	Points	-0.5907 nmi	-0.9810
6	Points	-0.5325 nmi	-1.0927
7	Points	-0.2212 nmi	-1.3660
8	Points	-0.1213 nmi	-1.4252
9	Points	-0.0104 nmi	-1.4352
10	Points	0.0942 nmi	-1.3970
11	Points	0.1473 nmi	-1.3507
12	Points	1.7920 nmi	0.5243
13	Points	1.8507 nmi	0.6324
14	Points	1.8551 nmi	0.7147
15	Points	1.8392 nmi	0.7774
16	Points	1.7936 nmi	0.8549
17	Points	1.4592 nmi	1.1480
18	Points	1.3744 nmi	1.2032
19	Points	1.2988 nmi	1.2126
20	Points	1.1836 nmi	1.1847
21	Points	1.1242 nmi	1.1356
22	Points	0.3791 nmi	0.4339

21-TGO-A-4

1	Points	0.3789 nmi	0.4341
2	Points	-0.4532 nmi	-0.3726
3	Points	-0.7281 nmi	-0.6844
4	Points	-0.7948 nmi	-0.8469
5	Points	-0.7835 nmi	-1.0344
6	Points	-0.6906 nmi	-1.2158
7	Points	-0.3378 nmi	-1.5288
8	Points	-0.1812 nmi	-1.6161
9	Points	0.0147 nmi	-1.6336
10	Points	0.1940 nmi	-1.5710
11	Points	0.2875 nmi	-1.4936
12	Points	1.9567 nmi	0.4110
13	Points	2.0433 nmi	0.5781
14	Points	2.0542 nmi	0.7328
15	Points	2.0243 nmi	0.8535
16	Points	1.9475 nmi	0.9825
17	Points	1.5785 nmi	1.3087
18	Points	1.4417 nmi	1.3911
19	Points	1.2879 nmi	1.4122
20	Points	1.0956 nmi	1.3645
21	Points	0.9864 nmi	1.2804
22	Points	0.3789 nmi	0.4341

21-TGO-A-5

1	Points	0.3792 nmi	0.4339
2	Points	-0.2655 nmi	-0.5374
3	Points	-0.5168 nmi	-0.8172
4	Points	-0.5485 nmi	-0.8882
5	Points	-0.5425 nmi	-0.9677
6	Points	-0.4930 nmi	-1.0619
7	Points	-0.1921 nmi	-1.3253
8	Points	-0.1063 nmi	-1.3775
9	Points	-0.0167 nmi	-1.3856
10	Points	0.0693 nmi	-1.3535
11	Points	0.1122 nmi	-1.3150
12	Points	1.7509 nmi	0.5526
13	Points	1.8026 nmi	0.6460
14	Points	1.8053 nmi	0.7102
15	Points	1.7929 nmi	0.7584
16	Points	1.7551 nmi	0.8230

17 Points 1.4294 nmi 1.1078
18 Points 1.3575 nmi 1.1562
19 Points 1.3015 nmi 1.1627
20 Points 1.2056 nmi 1.1397
21 Points 1.1587 nmi 1.0994
22 Points 0.3792 nmi 0.4339
21-TGO-A-6
1 Points 0.3788 nmi 0.4341
2 Points -0.4907 nmi -0.3396
3 Points -0.7704 nmi -0.6578
4 Points -0.8440 nmi -0.8386
5 Points -0.8317 nmi -1.0477
6 Points -0.7301 nmi -1.2466
7 Points -0.3669 nmi -1.5695
8 Points -0.1962 nmi -1.6638
9 Points 0.0210 nmi -1.6832
10 Points 0.2190 nmi -1.6145
11 Points 0.3226 nmi -1.5294
12 Points 1.9979 nmi 0.3826
13 Points 2.0914 nmi 0.5645
14 Points 2.1040 nmi 0.7373
15 Points 2.0705 nmi 0.8725
16 Points 1.9860 nmi 1.0143
17 Points 1.6084 nmi 1.3488
18 Points 1.4585 nmi 1.4380
19 Points 1.2852 nmi 1.4621
20 Points 1.0736 nmi 1.4095
21 Points 0.9519 nmi 1.3166
22 Points 0.3788 nmi 0.4341
OVF-OVF-Z-0
1 Points -0.8370 nmi -0.6520
2 Points -1.0375 nmi -0.6790

STUDY AIRCRAFT
737300 Standard data
B206L User-defined
Descrip : Bell 206L
UserID : HEL
WgtCat : Small
OwnerCat : Commercial
EngType : Jet
NoiseCat : None
Type : Jet
NumEng : 1
NoiseId : B206L
ATRS : No
TkoWgt : 4000 lb
LndWgt : 4000 lb
LndDist : 0 ft
StaticThr : 0 lb
B212 User-defined
Descrip : Bell 212 (UH-1N)
UserID : HEL
WgtCat : Small
OwnerCat : Commercial
EngType : Jet
NoiseCat : None
Type : Jet
NumEng : 1
NoiseId : B212
ATRS : No
TkoWgt : 10500 lb
LndWgt : 10500 lb
LndDist : 0 ft
StaticThr : 0 lb
BEC58P Standard data
C12 Standard data
CL600 Standard data
CL601 Standard data
CNA441 Standard data
CNA500 Standard data
DHC6 Standard data
DHC8 Standard data
GASEPF Standard data
GASEPV Standard data
GV Standard data
HS748A Standard data
LEAR25 Standard data
LEAR35 Standard data

STUDY SUBSTITUTION AIRCRAFT
Name Description
Acft Percent

USER-DEFINED NOISE CURVES
Type Thrust Op 200 400 630 1000 2000 4000 6300 10000 16000 25000
B212 type=other model=INM app=221 dep=114 afb=304
SEL 1.00 A 92.1 88.8 86.6 84.1 80.1 75.2 71.4 66.7 62.0 57.6
SEL 1.00 D 89.1 85.9 83.5 80.9 76.6 71.3 67.2 62.2 57.1 52.3
SEL 1.00 X 93.8 90.4 88.0 85.3 80.8 75.6 71.5 66.8 62.0 57.5
SEL 2.00 A 92.1 88.8 86.6 84.1 80.1 75.2 71.4 66.7 62.0 57.6
SEL 2.00 D 89.1 85.9 83.5 80.9 76.6 71.3 67.2 62.2 57.1 52.3
B222 type=other model=INM app=218 dep=115 afb=304
SEL 1.00 A 91.0 87.6 85.3 82.9 78.9 74.3 70.7 66.7 62.5 58.6
SEL 1.00 D 86.6 82.9 80.2 77.5 72.8 67.5 63.5 59.0 54.4 50.0
SEL 1.00 X 90.8 87.1 84.5 81.7 77.0 71.8 67.8 63.3 58.7 54.4
SEL 2.00 A 91.0 87.6 85.3 82.9 78.9 74.3 70.7 66.7 62.5 58.6

SEL 2.00 D 86.6 82.9 80.2 77.5 72.8 67.5 63.5 59.0 54.4 50.0
H500D type=other model=INM app=217 dep=116 afb=304
SEL 1.00 A 86.0 82.6 80.2 77.6 73.2 67.8 63.4 58.1 52.7 47.6
SEL 1.00 D 84.1 80.8 78.5 75.9 71.7 66.5 62.3 57.1 51.9 46.9
SEL 1.00 X 84.9 81.5 79.2 76.6 72.4 67.2 63.3 58.5 53.7 49.1
SEL 2.00 A 86.0 82.6 80.2 77.6 73.2 67.8 63.4 58.1 52.7 47.6
SEL 2.00 D 84.1 80.8 78.5 75.9 71.7 66.5 62.3 57.1 51.9 46.9
S61 type=other model=INM app=219 dep=120 afb=303
SEL 1.00 A 91.6 88.2 85.8 83.2 78.8 73.5 69.4 64.7 59.9 55.3
SEL 1.00 D 92.8 89.3 86.8 84.0 79.2 73.5 69.0 63.7 58.4 53.3
SEL 1.00 X 94.0 90.5 88.0 85.2 80.5 74.7 70.2 64.8 59.3 54.2
SEL 2.00 A 91.6 88.2 85.8 83.2 78.8 73.5 69.4 64.7 59.9 55.3
SEL 2.00 D 92.8 89.3 86.8 84.0 79.2 73.5 69.0 63.7 58.4 53.3

USER-DEFINED METRICS
Name Type Family Day Eve Night 10Log(T)

USER-DEFINED PROFILE IDENTIFIERS

Op	Profile	Stg	Weight(lb)
B206L			
APP	USER	1	4000
DEP	USER	1	4000
TGO	USER	1	4000
B212			
APP	USER	1	10500
DEP	USER	1	10500
OVF	USER	1	10500
OVF	USER	2	10500

USER-DEFINED FIXED-POINT PROFILES

#	Dist(ft)	Alt(ft)	Spd(kt)	Thrust	OpMode
B206L-APP-USER-1					
1	-23697.0	1500.0	100.0	1.0	A
2	-18836.0	1000.0	100.0	1.0	A
3	-14583.0	1000.0	100.0	1.0	A
4	-9772.0	1000.0	100.0	1.0	A
5	-4861.0	500.0	60.0	1.0	A
6	-50.0	15.0	3.0	1.0	A
7	0.0	0.0	3.0	1.0	A
B206L-DEP-USER-1					
1	0.0	0.0	5.0	1.0	D
2	50.0	0.0	15.0	1.0	D
3	1000.0	133.0	60.0	1.0	D
4	3750.0	500.0	60.0	1.0	X
5	7500.0	1000.0	100.0	1.0	X
6	24280.0	1000.0	100.0	1.0	X
7	54280.0	5000.0	100.0	1.0	X
B206L-TGO-USER-1					
1	-14750.0	850.0	100.0	1.0	X
2	-14583.0	850.0	100.0	1.0	X
3	-9772.0	850.0	100.0	1.0	A
4	-4861.0	500.0	60.0	1.0	A
5	-50.0	15.0	3.0	1.0	A
6	0.0	0.0	5.0	1.0	D
7	50.0	0.0	5.0	1.0	D
8	1000.0	133.0	60.0	1.0	D
9	3750.0	500.0	60.0	1.0	X
10	7500.0	850.0	100.0	1.0	X
11	13400.0	850.0	100.0	1.0	X
B212-APP-USER-1					
1	-23697.0	1500.0	100.0	1.0	A
2	-18836.0	1000.0	100.0	1.0	A
3	-14583.0	1000.0	100.0	1.0	A
4	-9772.0	1000.0	100.0	1.0	A
5	-4861.0	500.0	60.0	1.0	A
6	-50.0	15.0	3.0	1.0	A
7	0.0	0.0	3.0	1.0	A
B212-DEP-USER-1					
1	0.0	0.0	5.0	1.0	D
2	50.0	0.0	15.0	1.0	D
3	1000.0	133.0	60.0	1.0	D
4	3750.0	500.0	60.0	1.0	X
5	7500.0	1000.0	100.0	1.0	X
6	24280.0	1000.0	100.0	1.0	X
7	54280.0	5000.0	100.0	1.0	X
B212-OVF-USER-1					
1	0.0	0.0	5.0	1.0	D
2	500.0	200.0	15.0	1.0	D
3	1000.0	500.0	70.0	1.0	X
4	2000.0	500.0	70.0	1.0	A
5	3900.0	300.0	15.0	1.0	A
6	5800.0	0.0	5.0	1.0	A
B212-OVF-USER-2					
1	0.0	0.0	5.0	1.0	D
2	500.0	200.0	15.0	1.0	D
3	1000.0	500.0	70.0	1.0	X
4	65277.0	500.0	70.0	1.0	A
5	67177.0	300.0	15.0	1.0	A
6	69077.0	0.0	5.0	1.0	A

USER-DEFINED FLAP COEFFICIENTS

USER-DEFINED JET THRUST COEFFICIENTS
Acft ThrType Coeff-E Coeff-F Coeff-Ga Coeff-Gb Coeff-H

USER-DEFINED PROP THRUST COEFFICIENTS

Name	ThrType	Efficiency	Power

USER-DEFINED GENERAL THRUST COEFFICIENTS

Acft	Type	Coeff-E	Coeff-F	Coeff-Ga	Coeff-Gb	Coeff-H	Coeff-K1	Coeff-K2

CASE FLIGHT OPERATIONS

Acft	Op	Profile	Stg	Rwy	Track	Sub	Group	Day	Evening	Night
737300	APP	STANDARD	1	03	A	0	COM	0.0012	0.0000	0.0000
737300	APP	STANDARD	1	03	A	1	COM	0.0007	0.0000	0.0000
737300	APP	STANDARD	1	03	A	2	COM	0.0007	0.0000	0.0000
737300	APP	STANDARD	1	03	A	3	COM	0.0002	0.0000	0.0000
737300	APP	STANDARD	1	03	A	4	COM	0.0002	0.0000	0.0000
737300	APP	STANDARD	1	03	B	0	COM	0.0035	0.0000	0.0000
737300	APP	STANDARD	1	03	B	1	COM	0.0022	0.0000	0.0000
737300	APP	STANDARD	1	03	B	2	COM	0.0022	0.0000	0.0000
737300	APP	STANDARD	1	03	B	3	COM	0.0006	0.0000	0.0000
737300	APP	STANDARD	1	03	B	4	COM	0.0006	0.0000	0.0000
737300	APP	STANDARD	1	03	C	0	COM	0.0012	0.0000	0.0000
737300	APP	STANDARD	1	03	C	1	COM	0.0007	0.0000	0.0000
737300	APP	STANDARD	1	03	C	2	COM	0.0007	0.0000	0.0000
737300	APP	STANDARD	1	03	C	3	COM	0.0002	0.0000	0.0000
737300	APP	STANDARD	1	03	C	4	COM	0.0002	0.0000	0.0000
737300	APP	STANDARD	1	21	A	0	COM	0.0055	0.0000	0.0000
737300	APP	STANDARD	1	21	A	1	COM	0.0041	0.0000	0.0000
737300	APP	STANDARD	1	21	A	2	COM	0.0041	0.0000	0.0000
737300	APP	STANDARD	1	21	A	3	COM	0.0017	0.0000	0.0000
737300	APP	STANDARD	1	21	A	4	COM	0.0017	0.0000	0.0000
737300	APP	STANDARD	1	21	A	5	COM	0.0003	0.0000	0.0000
737300	APP	STANDARD	1	21	A	6	COM	0.0003	0.0000	0.0000
737300	APP	STANDARD	1	21	B	0	COM	0.0048	0.0000	0.0000
737300	APP	STANDARD	1	21	B	1	COM	0.0030	0.0000	0.0000
737300	APP	STANDARD	1	21	B	2	COM	0.0030	0.0000	0.0000
737300	APP	STANDARD	1	21	B	3	COM	0.0008	0.0000	0.0000
737300	APP	STANDARD	1	21	B	4	COM	0.0008	0.0000	0.0000
737300	APP	STANDARD	1	21	C	0	COM	0.0007	0.0000	0.0000
737300	APP	STANDARD	1	21	C	1	COM	0.0004	0.0000	0.0000
737300	APP	STANDARD	1	21	C	2	COM	0.0004	0.0000	0.0000
737300	APP	STANDARD	1	21	C	3	COM	0.0001	0.0000	0.0000
737300	APP	STANDARD	1	21	C	4	COM	0.0001	0.0000	0.0000
737300	APP	STANDARD	1	21	D	0	COM	0.0007	0.0000	0.0000
737300	APP	STANDARD	1	21	D	1	COM	0.0004	0.0000	0.0000
737300	APP	STANDARD	1	21	D	2	COM	0.0004	0.0000	0.0000
737300	APP	STANDARD	1	21	D	3	COM	0.0001	0.0000	0.0000
737300	APP	STANDARD	1	21	D	4	COM	0.0001	0.0000	0.0000

737300	APP	STANDARD	1	21	E	0	COM	0.0007	0.0000	0.0000
737300	APP	STANDARD	1	21	E	1	COM	0.0004	0.0000	0.0000
737300	APP	STANDARD	1	21	E	2	COM	0.0004	0.0000	0.0000
737300	APP	STANDARD	1	21	E	3	COM	0.0001	0.0000	0.0000
737300	APP	STANDARD	1	21	E	4	COM	0.0001	0.0000	0.0000
737300	DEP	STANDARD	1	03	A	0	COM	0.0014	0.0000	0.0000
737300	DEP	STANDARD	1	03	A	1	COM	0.0011	0.0000	0.0000
737300	DEP	STANDARD	1	03	A	2	COM	0.0011	0.0000	0.0000
737300	DEP	STANDARD	1	03	A	3	COM	0.0004	0.0000	0.0000
737300	DEP	STANDARD	1	03	A	4	COM	0.0004	0.0000	0.0000
737300	DEP	STANDARD	1	03	A	5	COM	0.0001	0.0000	0.0000
737300	DEP	STANDARD	1	03	A	6	COM	0.0001	0.0000	0.0000
737300	DEP	STANDARD	1	03	B	0	COM	0.0028	0.0000	0.0000
737300	DEP	STANDARD	1	03	B	1	COM	0.0021	0.0000	0.0000
737300	DEP	STANDARD	1	03	B	2	COM	0.0021	0.0000	0.0000
737300	DEP	STANDARD	1	03	B	3	COM	0.0009	0.0000	0.0000
737300	DEP	STANDARD	1	03	B	4	COM	0.0009	0.0000	0.0000
737300	DEP	STANDARD	1	03	B	5	COM	0.0001	0.0000	0.0000
737300	DEP	STANDARD	1	03	B	6	COM	0.0001	0.0000	0.0000
737300	DEP	STANDARD	1	03	C	0	COM	0.0006	0.0000	0.0000
737300	DEP	STANDARD	1	03	C	1	COM	0.0004	0.0000	0.0000
737300	DEP	STANDARD	1	03	C	2	COM	0.0004	0.0000	0.0000
737300	DEP	STANDARD	1	03	C	3	COM	0.0001	0.0000	0.0000
737300	DEP	STANDARD	1	03	C	4	COM	0.0001	0.0000	0.0000
737300	DEP	STANDARD	1	21	A	0	COM	0.0007	0.0000	0.0000
737300	DEP	STANDARD	1	21	A	1	COM	0.0004	0.0000	0.0000
737300	DEP	STANDARD	1	21	A	2	COM	0.0004	0.0000	0.0000
737300	DEP	STANDARD	1	21	A	3	COM	0.0001	0.0000	0.0000
737300	DEP	STANDARD	1	21	A	4	COM	0.0001	0.0000	0.0000
737300	DEP	STANDARD	1	21	B	0	COM	0.0013	0.0000	0.0000
737300	DEP	STANDARD	1	21	B	1	COM	0.0011	0.0000	0.0000
737300	DEP	STANDARD	1	21	B	2	COM	0.0011	0.0000	0.0000
737300	DEP	STANDARD	1	21	B	3	COM	0.0005	0.0000	0.0000
737300	DEP	STANDARD	1	21	B	4	COM	0.0008	0.0000	0.0000
737300	DEP	STANDARD	1	21	B	5	COM	0.0002	0.0000	0.0000
737300	DEP	STANDARD	1	21	B	6	COM	0.0004	0.0000	0.0000
737300	DEP	STANDARD	1	21	C	0	COM	0.0005	0.0000	0.0000
737300	DEP	STANDARD	1	21	C	1	COM	0.0003	0.0000	0.0000
737300	DEP	STANDARD	1	21	C	2	COM	0.0003	0.0000	0.0000
737300	DEP	STANDARD	1	21	C	3	COM	0.0001	0.0000	0.0000
737300	DEP	STANDARD	1	21	C	4	COM	0.0001	0.0000	0.0000
737300	DEP	STANDARD	1	21	D	0	COM	0.0004	0.0000	0.0000
737300	DEP	STANDARD	1	21	D	1	COM	0.0003	0.0000	0.0000
737300	DEP	STANDARD	1	21	D	2	COM	0.0003	0.0000	0.0000
737300	DEP	STANDARD	1	21	D	3	COM	0.0001	0.0000	0.0000
737300	DEP	STANDARD	1	21	D	4	COM	0.0001	0.0000	0.0000
737300	DEP	STANDARD	1	21	E	0	COM	0.0004	0.0000	0.0000
737300	DEP	STANDARD	1	21	E	1	COM	0.0003	0.0000	0.0000
737300	DEP	STANDARD	1	21	E	2	COM	0.0003	0.0000	0.0000
737300	DEP	STANDARD	1	21	E	3	COM	0.0001	0.0000	0.0000
737300	DEP	STANDARD	1	21	E	4	COM	0.0001	0.0000	0.0000
737300	DEP	STANDARD	1	21	F	0	COM	0.0097	0.0000	0.0000
737300	DEP	STANDARD	1	21	F	1	COM	0.0060	0.0000	0.0000
737300	DEP	STANDARD	1	21	F	2	COM	0.0060	0.0000	0.0000
737300	DEP	STANDARD	1	21	F	3	COM	0.0016	0.0000	0.0000

737300	DEP	STANDARD	1	21	F	4	COM	0.0016	0.0000	0.0000
B206L	APP	USER	1	03	A	0	HEL	0.0362	0.0000	0.0023
B206L	APP	USER	1	03	A	1	HEL	0.0222	0.0000	0.0014
B206L	APP	USER	1	03	A	2	HEL	0.0222	0.0000	0.0014
B206L	APP	USER	1	03	A	3	HEL	0.0060	0.0000	0.0004
B206L	APP	USER	1	03	A	4	HEL	0.0060	0.0000	0.0004
B206L	APP	USER	1	03	B	0	HEL	0.1085	0.0000	0.0069
B206L	APP	USER	1	03	B	1	HEL	0.0667	0.0000	0.0043
B206L	APP	USER	1	03	B	2	HEL	0.0667	0.0000	0.0043
B206L	APP	USER	1	03	B	3	HEL	0.0181	0.0000	0.0012
B206L	APP	USER	1	03	B	4	HEL	0.0181	0.0000	0.0012
B206L	APP	USER	1	03	C	0	HEL	0.0362	0.0000	0.0023
B206L	APP	USER	1	03	C	1	HEL	0.0222	0.0000	0.0014
B206L	APP	USER	1	03	C	2	HEL	0.0222	0.0000	0.0014
B206L	APP	USER	1	03	C	3	HEL	0.0060	0.0000	0.0004
B206L	APP	USER	1	03	C	4	HEL	0.0060	0.0000	0.0004
B206L	APP	USER	1	21	A	0	HEL	0.0507	0.0000	0.0032
B206L	APP	USER	1	21	A	1	HEL	0.0380	0.0000	0.0024
B206L	APP	USER	1	21	A	2	HEL	0.0380	0.0000	0.0024
B206L	APP	USER	1	21	A	3	HEL	0.0152	0.0000	0.0010
B206L	APP	USER	1	21	A	4	HEL	0.0152	0.0000	0.0010
B206L	APP	USER	1	21	A	5	HEL	0.0025	0.0000	0.0002
B206L	APP	USER	1	21	A	6	HEL	0.0025	0.0000	0.0002
B206L	APP	USER	1	21	B	0	HEL	0.2531	0.0000	0.0161
B206L	APP	USER	1	21	B	1	HEL	0.1558	0.0000	0.0099
B206L	APP	USER	1	21	B	2	HEL	0.1558	0.0000	0.0099
B206L	APP	USER	1	21	B	3	HEL	0.0422	0.0000	0.0027
B206L	APP	USER	1	21	B	4	HEL	0.0422	0.0000	0.0027
B206L	APP	USER	1	21	C	0	HEL	0.0422	0.0000	0.0027
B206L	APP	USER	1	21	C	1	HEL	0.0260	0.0000	0.0017
B206L	APP	USER	1	21	C	2	HEL	0.0260	0.0000	0.0017
B206L	APP	USER	1	21	C	3	HEL	0.0070	0.0000	0.0004
B206L	APP	USER	1	21	C	4	HEL	0.0070	0.0000	0.0004
B206L	APP	USER	1	21	D	0	HEL	0.0422	0.0000	0.0027
B206L	APP	USER	1	21	D	1	HEL	0.0260	0.0000	0.0017
B206L	APP	USER	1	21	D	2	HEL	0.0260	0.0000	0.0017
B206L	APP	USER	1	21	D	3	HEL	0.0070	0.0000	0.0004
B206L	APP	USER	1	21	D	4	HEL	0.0070	0.0000	0.0004
B206L	APP	USER	1	21	E	0	HEL	0.0211	0.0000	0.0014
B206L	APP	USER	1	21	E	1	HEL	0.0130	0.0000	0.0008
B206L	APP	USER	1	21	E	2	HEL	0.0130	0.0000	0.0008
B206L	APP	USER	1	21	E	3	HEL	0.0035	0.0000	0.0002
B206L	APP	USER	1	21	E	4	HEL	0.0035	0.0000	0.0002
B206L	DEP	USER	1	03	A	0	HEL	0.0290	0.0000	0.0018
B206L	DEP	USER	1	03	A	1	HEL	0.0217	0.0000	0.0014
B206L	DEP	USER	1	03	A	2	HEL	0.0217	0.0000	0.0014
B206L	DEP	USER	1	03	A	3	HEL	0.0087	0.0000	0.0006
B206L	DEP	USER	1	03	A	4	HEL	0.0087	0.0000	0.0006
B206L	DEP	USER	1	03	A	5	HEL	0.0014	0.0000	0.0001
B206L	DEP	USER	1	03	A	6	HEL	0.0014	0.0000	0.0001
B206L	DEP	USER	1	03	B	0	HEL	0.0869	0.0000	0.0056
B206L	DEP	USER	1	03	B	1	HEL	0.0652	0.0000	0.0042
B206L	DEP	USER	1	03	B	2	HEL	0.0652	0.0000	0.0042
B206L	DEP	USER	1	03	B	3	HEL	0.0261	0.0000	0.0017
B206L	DEP	USER	1	03	B	4	HEL	0.0261	0.0000	0.0017

B206L	DEP	USER	1	03	B	5	HEL	0.0043	0.0000	0.0003
B206L	DEP	USER	1	03	B	6	HEL	0.0043	0.0000	0.0003
B206L	DEP	USER	1	03	C	0	HEL	0.0362	0.0000	0.0023
B206L	DEP	USER	1	03	C	1	HEL	0.0222	0.0000	0.0014
B206L	DEP	USER	1	03	C	2	HEL	0.0222	0.0000	0.0014
B206L	DEP	USER	1	03	C	3	HEL	0.0060	0.0000	0.0004
B206L	DEP	USER	1	03	C	4	HEL	0.0060	0.0000	0.0004
B206L	DEP	USER	1	21	A	0	HEL	0.0211	0.0000	0.0014
B206L	DEP	USER	1	21	A	1	HEL	0.0130	0.0000	0.0008
B206L	DEP	USER	1	21	A	2	HEL	0.0130	0.0000	0.0008
B206L	DEP	USER	1	21	A	3	HEL	0.0035	0.0000	0.0002
B206L	DEP	USER	1	21	A	4	HEL	0.0035	0.0000	0.0002
B206L	DEP	USER	1	21	B	0	HEL	0.1217	0.0000	0.0078
B206L	DEP	USER	1	21	B	1	HEL	0.0973	0.0000	0.0062
B206L	DEP	USER	1	21	B	2	HEL	0.0973	0.0000	0.0062
B206L	DEP	USER	1	21	B	3	HEL	0.0438	0.0000	0.0028
B206L	DEP	USER	1	21	B	4	HEL	0.0730	0.0000	0.0047
B206L	DEP	USER	1	21	B	5	HEL	0.0146	0.0000	0.0009
B206L	DEP	USER	1	21	B	6	HEL	0.0389	0.0000	0.0025
B206L	DEP	USER	1	21	C	0	HEL	0.1055	0.0000	0.0067
B206L	DEP	USER	1	21	C	1	HEL	0.0649	0.0000	0.0042
B206L	DEP	USER	1	21	C	2	HEL	0.0649	0.0000	0.0042
B206L	DEP	USER	1	21	C	3	HEL	0.0176	0.0000	0.0011
B206L	DEP	USER	1	21	C	4	HEL	0.0176	0.0000	0.0011
B206L	DEP	USER	1	21	D	0	HEL	0.0422	0.0000	0.0027
B206L	DEP	USER	1	21	D	1	HEL	0.0260	0.0000	0.0017
B206L	DEP	USER	1	21	D	2	HEL	0.0260	0.0000	0.0017
B206L	DEP	USER	1	21	D	3	HEL	0.0070	0.0000	0.0004
B206L	DEP	USER	1	21	D	4	HEL	0.0070	0.0000	0.0004
B206L	DEP	USER	1	21	E	0	HEL	0.0422	0.0000	0.0027
B206L	DEP	USER	1	21	E	1	HEL	0.0260	0.0000	0.0017
B206L	DEP	USER	1	21	E	2	HEL	0.0260	0.0000	0.0017
B206L	DEP	USER	1	21	E	3	HEL	0.0070	0.0000	0.0004
B206L	DEP	USER	1	21	E	4	HEL	0.0070	0.0000	0.0004
B206L	DEP	USER	1	21	F	0	HEL	0.0211	0.0000	0.0014
B206L	DEP	USER	1	21	F	1	HEL	0.0130	0.0000	0.0008
B206L	DEP	USER	1	21	F	2	HEL	0.0130	0.0000	0.0008
B206L	DEP	USER	1	21	F	3	HEL	0.0035	0.0000	0.0002
B206L	DEP	USER	1	21	F	4	HEL	0.0035	0.0000	0.0002
B206L	TGO	USER	1	03	A	0	HEL	0.0804	0.0000	0.0051
B206L	TGO	USER	1	03	A	1	HEL	0.0604	0.0000	0.0038
B206L	TGO	USER	1	03	A	2	HEL	0.0604	0.0000	0.0038
B206L	TGO	USER	1	03	A	3	HEL	0.0242	0.0000	0.0015
B206L	TGO	USER	1	03	A	4	HEL	0.0242	0.0000	0.0015
B206L	TGO	USER	1	03	A	5	HEL	0.0040	0.0000	0.0003
B206L	TGO	USER	1	03	A	6	HEL	0.0040	0.0000	0.0003
B206L	TGO	USER	1	21	A	0	HEL	0.3218	0.0000	0.0206
B206L	TGO	USER	1	21	A	1	HEL	0.2415	0.0000	0.0154
B206L	TGO	USER	1	21	A	2	HEL	0.2415	0.0000	0.0154
B206L	TGO	USER	1	21	A	3	HEL	0.0966	0.0000	0.0062
B206L	TGO	USER	1	21	A	4	HEL	0.0966	0.0000	0.0062
B206L	TGO	USER	1	21	A	5	HEL	0.0161	0.0000	0.0010
B206L	TGO	USER	1	21	A	6	HEL	0.0161	0.0000	0.0010
B212	APP	USER	1	03	A	0	HEL	0.0176	0.0000	0.0000
B212	APP	USER	1	03	A	1	HEL	0.0108	0.0000	0.0000

B212	APP	USER	1	03	A	2	HEL	0.0108	0.0000	0.0000
B212	APP	USER	1	03	A	3	HEL	0.0029	0.0000	0.0000
B212	APP	USER	1	03	A	4	HEL	0.0029	0.0000	0.0000
B212	APP	USER	1	03	B	0	HEL	0.0529	0.0000	0.0000
B212	APP	USER	1	03	B	1	HEL	0.0325	0.0000	0.0000
B212	APP	USER	1	03	B	2	HEL	0.0325	0.0000	0.0000
B212	APP	USER	1	03	B	3	HEL	0.0088	0.0000	0.0000
B212	APP	USER	1	03	B	4	HEL	0.0088	0.0000	0.0000
B212	APP	USER	1	03	C	0	HEL	0.0176	0.0000	0.0000
B212	APP	USER	1	03	C	1	HEL	0.0108	0.0000	0.0000
B212	APP	USER	1	03	C	2	HEL	0.0108	0.0000	0.0000
B212	APP	USER	1	03	C	3	HEL	0.0029	0.0000	0.0000
B212	APP	USER	1	03	C	4	HEL	0.0029	0.0000	0.0000
B212	APP	USER	1	21	A	0	HEL	0.0247	0.0000	0.0000
B212	APP	USER	1	21	A	1	HEL	0.0185	0.0000	0.0000
B212	APP	USER	1	21	A	2	HEL	0.0185	0.0000	0.0000
B212	APP	USER	1	21	A	3	HEL	0.0074	0.0000	0.0000
B212	APP	USER	1	21	A	4	HEL	0.0074	0.0000	0.0000
B212	APP	USER	1	21	A	5	HEL	0.0012	0.0000	0.0000
B212	APP	USER	1	21	A	6	HEL	0.0012	0.0000	0.0000
B212	APP	USER	1	21	B	0	HEL	0.1234	0.0000	0.0000
B212	APP	USER	1	21	B	1	HEL	0.0759	0.0000	0.0000
B212	APP	USER	1	21	B	2	HEL	0.0759	0.0000	0.0000
B212	APP	USER	1	21	B	3	HEL	0.0206	0.0000	0.0000
B212	APP	USER	1	21	B	4	HEL	0.0206	0.0000	0.0000
B212	APP	USER	1	21	C	0	HEL	0.0206	0.0000	0.0000
B212	APP	USER	1	21	C	1	HEL	0.0126	0.0000	0.0000
B212	APP	USER	1	21	C	2	HEL	0.0126	0.0000	0.0000
B212	APP	USER	1	21	C	3	HEL	0.0034	0.0000	0.0000
B212	APP	USER	1	21	C	4	HEL	0.0034	0.0000	0.0000
B212	APP	USER	1	21	D	0	HEL	0.0206	0.0000	0.0000
B212	APP	USER	1	21	D	1	HEL	0.0126	0.0000	0.0000
B212	APP	USER	1	21	D	2	HEL	0.0126	0.0000	0.0000
B212	APP	USER	1	21	D	3	HEL	0.0034	0.0000	0.0000
B212	APP	USER	1	21	D	4	HEL	0.0034	0.0000	0.0000
B212	APP	USER	1	21	E	0	HEL	0.0103	0.0000	0.0000
B212	APP	USER	1	21	E	1	HEL	0.0063	0.0000	0.0000
B212	APP	USER	1	21	E	2	HEL	0.0063	0.0000	0.0000
B212	APP	USER	1	21	E	3	HEL	0.0017	0.0000	0.0000
B212	APP	USER	1	21	E	4	HEL	0.0017	0.0000	0.0000
B212	DEP	USER	1	03	A	0	HEL	0.0141	0.0000	0.0000
B212	DEP	USER	1	03	A	1	HEL	0.0106	0.0000	0.0000
B212	DEP	USER	1	03	A	2	HEL	0.0106	0.0000	0.0000
B212	DEP	USER	1	03	A	3	HEL	0.0042	0.0000	0.0000
B212	DEP	USER	1	03	A	4	HEL	0.0042	0.0000	0.0000
B212	DEP	USER	1	03	A	5	HEL	0.0007	0.0000	0.0000
B212	DEP	USER	1	03	A	6	HEL	0.0007	0.0000	0.0000
B212	DEP	USER	1	03	B	0	HEL	0.0424	0.0000	0.0000
B212	DEP	USER	1	03	B	1	HEL	0.0318	0.0000	0.0000
B212	DEP	USER	1	03	B	2	HEL	0.0318	0.0000	0.0000
B212	DEP	USER	1	03	B	3	HEL	0.0127	0.0000	0.0000
B212	DEP	USER	1	03	B	4	HEL	0.0127	0.0000	0.0000
B212	DEP	USER	1	03	B	5	HEL	0.0021	0.0000	0.0000
B212	DEP	USER	1	03	B	6	HEL	0.0021	0.0000	0.0000
B212	DEP	USER	1	03	C	0	HEL	0.0176	0.0000	0.0000

B212	DEP	USER	1	03	C	1	HEL	0.0108	0.0000	0.0000
B212	DEP	USER	1	03	C	2	HEL	0.0108	0.0000	0.0000
B212	DEP	USER	1	03	C	3	HEL	0.0029	0.0000	0.0000
B212	DEP	USER	1	03	C	4	HEL	0.0029	0.0000	0.0000
B212	DEP	USER	1	21	A	0	HEL	0.0206	0.0000	0.0000
B212	DEP	USER	1	21	A	1	HEL	0.0126	0.0000	0.0000
B212	DEP	USER	1	21	A	2	HEL	0.0126	0.0000	0.0000
B212	DEP	USER	1	21	A	3	HEL	0.0034	0.0000	0.0000
B212	DEP	USER	1	21	A	4	HEL	0.0034	0.0000	0.0000
B212	DEP	USER	1	21	B	0	HEL	0.0461	0.0000	0.0000
B212	DEP	USER	1	21	B	1	HEL	0.0369	0.0000	0.0000
B212	DEP	USER	1	21	B	2	HEL	0.0369	0.0000	0.0000
B212	DEP	USER	1	21	B	3	HEL	0.0166	0.0000	0.0000
B212	DEP	USER	1	21	B	4	HEL	0.0277	0.0000	0.0000
B212	DEP	USER	1	21	B	5	HEL	0.0055	0.0000	0.0000
B212	DEP	USER	1	21	B	6	HEL	0.0148	0.0000	0.0000
B212	DEP	USER	1	21	C	0	HEL	0.0720	0.0000	0.0000
B212	DEP	USER	1	21	C	1	HEL	0.0443	0.0000	0.0000
B212	DEP	USER	1	21	C	2	HEL	0.0443	0.0000	0.0000
B212	DEP	USER	1	21	C	3	HEL	0.0120	0.0000	0.0000
B212	DEP	USER	1	21	C	4	HEL	0.0120	0.0000	0.0000
B212	DEP	USER	1	21	D	0	HEL	0.0206	0.0000	0.0000
B212	DEP	USER	1	21	D	1	HEL	0.0126	0.0000	0.0000
B212	DEP	USER	1	21	D	2	HEL	0.0126	0.0000	0.0000
B212	DEP	USER	1	21	D	3	HEL	0.0034	0.0000	0.0000
B212	DEP	USER	1	21	D	4	HEL	0.0034	0.0000	0.0000
B212	DEP	USER	1	21	E	0	HEL	0.0206	0.0000	0.0000
B212	DEP	USER	1	21	E	1	HEL	0.0126	0.0000	0.0000
B212	DEP	USER	1	21	E	2	HEL	0.0126	0.0000	0.0000
B212	DEP	USER	1	21	E	3	HEL	0.0034	0.0000	0.0000
B212	DEP	USER	1	21	E	4	HEL	0.0034	0.0000	0.0000
BEC58P	APP	STANDARD	2	03	A	0	GA	0.1226	0.0000	0.0107
BEC58P	APP	STANDARD	2	03	A	1	GA	0.0755	0.0000	0.0066
BEC58P	APP	STANDARD	2	03	A	2	GA	0.0755	0.0000	0.0066
BEC58P	APP	STANDARD	2	03	A	3	GA	0.0204	0.0000	0.0018
BEC58P	APP	STANDARD	2	03	A	4	GA	0.0204	0.0000	0.0018
BEC58P	APP	STANDARD	2	03	B	0	GA	0.3679	0.0000	0.0321
BEC58P	APP	STANDARD	2	03	B	1	GA	0.2264	0.0000	0.0197
BEC58P	APP	STANDARD	2	03	B	2	GA	0.2264	0.0000	0.0197
BEC58P	APP	STANDARD	2	03	B	3	GA	0.0613	0.0000	0.0053
BEC58P	APP	STANDARD	2	03	B	4	GA	0.0613	0.0000	0.0053
BEC58P	APP	STANDARD	2	03	C	0	GA	0.1226	0.0000	0.0107
BEC58P	APP	STANDARD	2	03	C	1	GA	0.0755	0.0000	0.0066
BEC58P	APP	STANDARD	2	03	C	2	GA	0.0755	0.0000	0.0066
BEC58P	APP	STANDARD	2	03	C	3	GA	0.0204	0.0000	0.0018
BEC58P	APP	STANDARD	2	03	C	4	GA	0.0204	0.0000	0.0018
BEC58P	APP	STANDARD	2	21	A	0	GA	0.1719	0.0000	0.0150
BEC58P	APP	STANDARD	2	21	A	1	GA	0.1290	0.0000	0.0113
BEC58P	APP	STANDARD	2	21	A	2	GA	0.1290	0.0000	0.0113
BEC58P	APP	STANDARD	2	21	A	3	GA	0.0516	0.0000	0.0045
BEC58P	APP	STANDARD	2	21	A	4	GA	0.0516	0.0000	0.0045
BEC58P	APP	STANDARD	2	21	A	5	GA	0.0086	0.0000	0.0007
BEC58P	APP	STANDARD	2	21	A	6	GA	0.0086	0.0000	0.0007
BEC58P	APP	STANDARD	2	21	B	0	GA	0.8584	0.0000	0.0748
BEC58P	APP	STANDARD	2	21	B	1	GA	0.5282	0.0000	0.0461

BEC58P	APP	STANDARD	2	21	B	2	GA	0.5282	0.0000	0.0461
BEC58P	APP	STANDARD	2	21	B	3	GA	0.1431	0.0000	0.0125
BEC58P	APP	STANDARD	2	21	B	4	GA	0.1431	0.0000	0.0125
BEC58P	APP	STANDARD	2	21	C	0	GA	0.1431	0.0000	0.0125
BEC58P	APP	STANDARD	2	21	C	1	GA	0.0880	0.0000	0.0077
BEC58P	APP	STANDARD	2	21	C	2	GA	0.0880	0.0000	0.0077
BEC58P	APP	STANDARD	2	21	C	3	GA	0.0238	0.0000	0.0021
BEC58P	APP	STANDARD	2	21	C	4	GA	0.0238	0.0000	0.0021
BEC58P	APP	STANDARD	2	21	D	0	GA	0.1431	0.0000	0.0125
BEC58P	APP	STANDARD	2	21	D	1	GA	0.0880	0.0000	0.0077
BEC58P	APP	STANDARD	2	21	D	2	GA	0.0880	0.0000	0.0077
BEC58P	APP	STANDARD	2	21	D	3	GA	0.0238	0.0000	0.0021
BEC58P	APP	STANDARD	2	21	D	4	GA	0.0238	0.0000	0.0021
BEC58P	APP	STANDARD	2	21	E	0	GA	0.0715	0.0000	0.0062
BEC58P	APP	STANDARD	2	21	E	1	GA	0.0440	0.0000	0.0038
BEC58P	APP	STANDARD	2	21	E	2	GA	0.0440	0.0000	0.0038
BEC58P	APP	STANDARD	2	21	E	3	GA	0.0119	0.0000	0.0010
BEC58P	APP	STANDARD	2	21	E	4	GA	0.0119	0.0000	0.0010
BEC58P	DEP	STANDARD	1	03	A	0	GA	0.0982	0.0000	0.0086
BEC58P	DEP	STANDARD	1	03	A	1	GA	0.0737	0.0000	0.0064
BEC58P	DEP	STANDARD	1	03	A	2	GA	0.0737	0.0000	0.0064
BEC58P	DEP	STANDARD	1	03	A	3	GA	0.0295	0.0000	0.0026
BEC58P	DEP	STANDARD	1	03	A	4	GA	0.0295	0.0000	0.0026
BEC58P	DEP	STANDARD	1	03	A	5	GA	0.0049	0.0000	0.0004
BEC58P	DEP	STANDARD	1	03	A	6	GA	0.0049	0.0000	0.0004
BEC58P	DEP	STANDARD	1	03	B	0	GA	0.2947	0.0000	0.0257
BEC58P	DEP	STANDARD	1	03	B	1	GA	0.2211	0.0000	0.0193
BEC58P	DEP	STANDARD	1	03	B	2	GA	0.2211	0.0000	0.0193
BEC58P	DEP	STANDARD	1	03	B	3	GA	0.0885	0.0000	0.0077
BEC58P	DEP	STANDARD	1	03	B	4	GA	0.0885	0.0000	0.0077
BEC58P	DEP	STANDARD	1	03	B	5	GA	0.0147	0.0000	0.0013
BEC58P	DEP	STANDARD	1	03	B	6	GA	0.0147	0.0000	0.0013
BEC58P	DEP	STANDARD	1	03	C	0	GA	0.1226	0.0000	0.0107
BEC58P	DEP	STANDARD	1	03	C	1	GA	0.0755	0.0000	0.0066
BEC58P	DEP	STANDARD	1	03	C	2	GA	0.0755	0.0000	0.0066
BEC58P	DEP	STANDARD	1	03	C	3	GA	0.0204	0.0000	0.0018
BEC58P	DEP	STANDARD	1	03	C	4	GA	0.0204	0.0000	0.0018
BEC58P	DEP	STANDARD	1	21	A	0	GA	0.0715	0.0000	0.0062
BEC58P	DEP	STANDARD	1	21	A	1	GA	0.0440	0.0000	0.0038
BEC58P	DEP	STANDARD	1	21	A	2	GA	0.0440	0.0000	0.0038
BEC58P	DEP	STANDARD	1	21	A	3	GA	0.0119	0.0000	0.0010
BEC58P	DEP	STANDARD	1	21	A	4	GA	0.0119	0.0000	0.0010
BEC58P	DEP	STANDARD	1	21	B	0	GA	0.4127	0.0000	0.0360
BEC58P	DEP	STANDARD	1	21	B	1	GA	0.3301	0.0000	0.0288
BEC58P	DEP	STANDARD	1	21	B	2	GA	0.3301	0.0000	0.0288
BEC58P	DEP	STANDARD	1	21	B	3	GA	0.1486	0.0000	0.0130
BEC58P	DEP	STANDARD	1	21	B	4	GA	0.2476	0.0000	0.0216
BEC58P	DEP	STANDARD	1	21	B	5	GA	0.0495	0.0000	0.0043
BEC58P	DEP	STANDARD	1	21	B	6	GA	0.1321	0.0000	0.0115
BEC58P	DEP	STANDARD	1	21	C	0	GA	0.3577	0.0000	0.0312
BEC58P	DEP	STANDARD	1	21	C	1	GA	0.2201	0.0000	0.0192
BEC58P	DEP	STANDARD	1	21	C	2	GA	0.2201	0.0000	0.0192
BEC58P	DEP	STANDARD	1	21	C	3	GA	0.0596	0.0000	0.0052
BEC58P	DEP	STANDARD	1	21	C	4	GA	0.0596	0.0000	0.0052
BEC58P	DEP	STANDARD	1	21	D	0	GA	0.1431	0.0000	0.0125

BEC58P	DEP	STANDARD	1	21	D	1	GA	0.0880	0.0000	0.0077
BEC58P	DEP	STANDARD	1	21	D	2	GA	0.0880	0.0000	0.0077
BEC58P	DEP	STANDARD	1	21	D	3	GA	0.0238	0.0000	0.0021
BEC58P	DEP	STANDARD	1	21	D	4	GA	0.0238	0.0000	0.0021
BEC58P	DEP	STANDARD	1	21	E	0	GA	0.1431	0.0000	0.0125
BEC58P	DEP	STANDARD	1	21	E	1	GA	0.0880	0.0000	0.0077
BEC58P	DEP	STANDARD	1	21	E	2	GA	0.0880	0.0000	0.0077
BEC58P	DEP	STANDARD	1	21	E	3	GA	0.0238	0.0000	0.0021
BEC58P	DEP	STANDARD	1	21	E	4	GA	0.0238	0.0000	0.0021
BEC58P	DEP	STANDARD	1	21	F	0	GA	0.0715	0.0000	0.0062
BEC58P	DEP	STANDARD	1	21	F	1	GA	0.0440	0.0000	0.0038
BEC58P	DEP	STANDARD	1	21	F	2	GA	0.0440	0.0000	0.0038
BEC58P	DEP	STANDARD	1	21	F	3	GA	0.0119	0.0000	0.0010
BEC58P	DEP	STANDARD	1	21	F	4	GA	0.0119	0.0000	0.0010
BEC58P	TGO	STANDARD	1	03	A	0	GA	0.0804	0.0000	0.0051
BEC58P	TGO	STANDARD	1	03	A	1	GA	0.0604	0.0000	0.0038
BEC58P	TGO	STANDARD	1	03	A	2	GA	0.0604	0.0000	0.0038
BEC58P	TGO	STANDARD	1	03	A	3	GA	0.0242	0.0000	0.0015
BEC58P	TGO	STANDARD	1	03	A	4	GA	0.0242	0.0000	0.0015
BEC58P	TGO	STANDARD	1	03	A	5	GA	0.0040	0.0000	0.0003
BEC58P	TGO	STANDARD	1	03	A	6	GA	0.0040	0.0000	0.0003
BEC58P	TGO	STANDARD	1	21	A	0	GA	0.3218	0.0000	0.0206
BEC58P	TGO	STANDARD	1	21	A	1	GA	0.2415	0.0000	0.0154
BEC58P	TGO	STANDARD	1	21	A	2	GA	0.2415	0.0000	0.0154
BEC58P	TGO	STANDARD	1	21	A	3	GA	0.0966	0.0000	0.0062
BEC58P	TGO	STANDARD	1	21	A	4	GA	0.0966	0.0000	0.0062
BEC58P	TGO	STANDARD	1	21	A	5	GA	0.0161	0.0000	0.0010
BEC58P	TGO	STANDARD	1	21	A	6	GA	0.0161	0.0000	0.0010
C12	APP	STANDARD	1	03	A	0	MIL	0.0106	0.0000	0.0000
C12	APP	STANDARD	1	03	A	1	MIL	0.0065	0.0000	0.0000
C12	APP	STANDARD	1	03	A	2	MIL	0.0065	0.0000	0.0000
C12	APP	STANDARD	1	03	A	3	MIL	0.0018	0.0000	0.0000
C12	APP	STANDARD	1	03	A	4	MIL	0.0018	0.0000	0.0000
C12	APP	STANDARD	1	03	B	0	MIL	0.0317	0.0000	0.0000
C12	APP	STANDARD	1	03	B	1	MIL	0.0195	0.0000	0.0000
C12	APP	STANDARD	1	03	B	2	MIL	0.0195	0.0000	0.0000
C12	APP	STANDARD	1	03	B	3	MIL	0.0053	0.0000	0.0000
C12	APP	STANDARD	1	03	B	4	MIL	0.0053	0.0000	0.0000
C12	APP	STANDARD	1	03	C	0	MIL	0.0106	0.0000	0.0000
C12	APP	STANDARD	1	03	C	1	MIL	0.0065	0.0000	0.0000
C12	APP	STANDARD	1	03	C	2	MIL	0.0065	0.0000	0.0000
C12	APP	STANDARD	1	03	C	3	MIL	0.0018	0.0000	0.0000
C12	APP	STANDARD	1	03	C	4	MIL	0.0018	0.0000	0.0000
C12	APP	STANDARD	1	21	A	0	MIL	0.0148	0.0000	0.0000
C12	APP	STANDARD	1	21	A	1	MIL	0.0111	0.0000	0.0000
C12	APP	STANDARD	1	21	A	2	MIL	0.0111	0.0000	0.0000
C12	APP	STANDARD	1	21	A	3	MIL	0.0045	0.0000	0.0000
C12	APP	STANDARD	1	21	A	4	MIL	0.0045	0.0000	0.0000
C12	APP	STANDARD	1	21	A	5	MIL	0.0007	0.0000	0.0000
C12	APP	STANDARD	1	21	A	6	MIL	0.0007	0.0000	0.0000
C12	APP	STANDARD	1	21	B	0	MIL	0.0741	0.0000	0.0000
C12	APP	STANDARD	1	21	B	1	MIL	0.0456	0.0000	0.0000
C12	APP	STANDARD	1	21	B	2	MIL	0.0456	0.0000	0.0000
C12	APP	STANDARD	1	21	B	3	MIL	0.0123	0.0000	0.0000
C12	APP	STANDARD	1	21	B	4	MIL	0.0123	0.0000	0.0000

C12	APP	STANDARD	1	21	C	0	MIL	0.0123	0.0000	0.0000
C12	APP	STANDARD	1	21	C	1	MIL	0.0076	0.0000	0.0000
C12	APP	STANDARD	1	21	C	2	MIL	0.0076	0.0000	0.0000
C12	APP	STANDARD	1	21	C	3	MIL	0.0021	0.0000	0.0000
C12	APP	STANDARD	1	21	C	4	MIL	0.0021	0.0000	0.0000
C12	APP	STANDARD	1	21	D	0	MIL	0.0123	0.0000	0.0000
C12	APP	STANDARD	1	21	D	1	MIL	0.0076	0.0000	0.0000
C12	APP	STANDARD	1	21	D	2	MIL	0.0076	0.0000	0.0000
C12	APP	STANDARD	1	21	D	3	MIL	0.0021	0.0000	0.0000
C12	APP	STANDARD	1	21	D	4	MIL	0.0021	0.0000	0.0000
C12	APP	STANDARD	1	21	E	0	MIL	0.0062	0.0000	0.0000
C12	APP	STANDARD	1	21	E	1	MIL	0.0038	0.0000	0.0000
C12	APP	STANDARD	1	21	E	2	MIL	0.0038	0.0000	0.0000
C12	APP	STANDARD	1	21	E	3	MIL	0.0010	0.0000	0.0000
C12	APP	STANDARD	1	21	E	4	MIL	0.0010	0.0000	0.0000
C12	DEP	STANDARD	1	03	A	0	MIL	0.0085	0.0000	0.0000
C12	DEP	STANDARD	1	03	A	1	MIL	0.0064	0.0000	0.0000
C12	DEP	STANDARD	1	03	A	2	MIL	0.0064	0.0000	0.0000
C12	DEP	STANDARD	1	03	A	3	MIL	0.0025	0.0000	0.0000
C12	DEP	STANDARD	1	03	A	4	MIL	0.0025	0.0000	0.0000
C12	DEP	STANDARD	1	03	A	5	MIL	0.0004	0.0000	0.0000
C12	DEP	STANDARD	1	03	A	6	MIL	0.0004	0.0000	0.0000
C12	DEP	STANDARD	1	03	B	0	MIL	0.0254	0.0000	0.0000
C12	DEP	STANDARD	1	03	B	1	MIL	0.0191	0.0000	0.0000
C12	DEP	STANDARD	1	03	B	2	MIL	0.0191	0.0000	0.0000
C12	DEP	STANDARD	1	03	B	3	MIL	0.0076	0.0000	0.0000
C12	DEP	STANDARD	1	03	B	4	MIL	0.0076	0.0000	0.0000
C12	DEP	STANDARD	1	03	B	5	MIL	0.0013	0.0000	0.0000
C12	DEP	STANDARD	1	03	B	6	MIL	0.0013	0.0000	0.0000
C12	DEP	STANDARD	1	03	C	0	MIL	0.0106	0.0000	0.0000
C12	DEP	STANDARD	1	03	C	1	MIL	0.0065	0.0000	0.0000
C12	DEP	STANDARD	1	03	C	2	MIL	0.0065	0.0000	0.0000
C12	DEP	STANDARD	1	03	C	3	MIL	0.0018	0.0000	0.0000
C12	DEP	STANDARD	1	03	C	4	MIL	0.0018	0.0000	0.0000
C12	DEP	STANDARD	1	21	A	0	MIL	0.0123	0.0000	0.0000
C12	DEP	STANDARD	1	21	A	1	MIL	0.0076	0.0000	0.0000
C12	DEP	STANDARD	1	21	A	2	MIL	0.0076	0.0000	0.0000
C12	DEP	STANDARD	1	21	A	3	MIL	0.0021	0.0000	0.0000
C12	DEP	STANDARD	1	21	A	4	MIL	0.0021	0.0000	0.0000
C12	DEP	STANDARD	1	21	B	0	MIL	0.0277	0.0000	0.0000
C12	DEP	STANDARD	1	21	B	1	MIL	0.0222	0.0000	0.0000
C12	DEP	STANDARD	1	21	B	2	MIL	0.0222	0.0000	0.0000
C12	DEP	STANDARD	1	21	B	3	MIL	0.0100	0.0000	0.0000
C12	DEP	STANDARD	1	21	B	4	MIL	0.0166	0.0000	0.0000
C12	DEP	STANDARD	1	21	B	5	MIL	0.0033	0.0000	0.0000
C12	DEP	STANDARD	1	21	B	6	MIL	0.0089	0.0000	0.0000
C12	DEP	STANDARD	1	21	C	0	MIL	0.0432	0.0000	0.0000
C12	DEP	STANDARD	1	21	C	1	MIL	0.0266	0.0000	0.0000
C12	DEP	STANDARD	1	21	C	2	MIL	0.0266	0.0000	0.0000
C12	DEP	STANDARD	1	21	C	3	MIL	0.0072	0.0000	0.0000
C12	DEP	STANDARD	1	21	C	4	MIL	0.0072	0.0000	0.0000
C12	DEP	STANDARD	1	21	D	0	MIL	0.0123	0.0000	0.0000
C12	DEP	STANDARD	1	21	D	1	MIL	0.0076	0.0000	0.0000
C12	DEP	STANDARD	1	21	D	2	MIL	0.0076	0.0000	0.0000
C12	DEP	STANDARD	1	21	D	3	MIL	0.0021	0.0000	0.0000

C12	DEP	STANDARD	1	21	D	4	MIL	0.0021	0.0000	0.0000
C12	DEP	STANDARD	1	21	E	0	MIL	0.0123	0.0000	0.0000
C12	DEP	STANDARD	1	21	E	1	MIL	0.0076	0.0000	0.0000
C12	DEP	STANDARD	1	21	E	2	MIL	0.0076	0.0000	0.0000
C12	DEP	STANDARD	1	21	E	3	MIL	0.0021	0.0000	0.0000
C12	DEP	STANDARD	1	21	E	4	MIL	0.0021	0.0000	0.0000
CL600	APP	STANDARD	1	03	A	0	GA	0.0123	0.0000	0.0005
CL600	APP	STANDARD	1	03	A	1	GA	0.0076	0.0000	0.0003
CL600	APP	STANDARD	1	03	A	2	GA	0.0076	0.0000	0.0003
CL600	APP	STANDARD	1	03	A	3	GA	0.0021	0.0000	0.0001
CL600	APP	STANDARD	1	03	A	4	GA	0.0021	0.0000	0.0001
CL600	APP	STANDARD	1	03	B	0	GA	0.0369	0.0000	0.0015
CL600	APP	STANDARD	1	03	B	1	GA	0.0227	0.0000	0.0009
CL600	APP	STANDARD	1	03	B	2	GA	0.0227	0.0000	0.0009
CL600	APP	STANDARD	1	03	B	3	GA	0.0062	0.0000	0.0003
CL600	APP	STANDARD	1	03	B	4	GA	0.0062	0.0000	0.0003
CL600	APP	STANDARD	1	03	C	0	GA	0.0123	0.0000	0.0005
CL600	APP	STANDARD	1	03	C	1	GA	0.0076	0.0000	0.0003
CL600	APP	STANDARD	1	03	C	2	GA	0.0076	0.0000	0.0003
CL600	APP	STANDARD	1	03	C	3	GA	0.0021	0.0000	0.0001
CL600	APP	STANDARD	1	03	C	4	GA	0.0021	0.0000	0.0001
CL600	APP	STANDARD	1	21	A	0	GA	0.0575	0.0000	0.0024
CL600	APP	STANDARD	1	21	A	1	GA	0.0432	0.0000	0.0018
CL600	APP	STANDARD	1	21	A	2	GA	0.0432	0.0000	0.0018
CL600	APP	STANDARD	1	21	A	3	GA	0.0173	0.0000	0.0007
CL600	APP	STANDARD	1	21	A	4	GA	0.0173	0.0000	0.0007
CL600	APP	STANDARD	1	21	A	5	GA	0.0029	0.0000	0.0001
CL600	APP	STANDARD	1	21	A	6	GA	0.0029	0.0000	0.0001
CL600	APP	STANDARD	1	21	B	0	GA	0.0503	0.0000	0.0021
CL600	APP	STANDARD	1	21	B	1	GA	0.0309	0.0000	0.0013
CL600	APP	STANDARD	1	21	B	2	GA	0.0309	0.0000	0.0013
CL600	APP	STANDARD	1	21	B	3	GA	0.0084	0.0000	0.0004
CL600	APP	STANDARD	1	21	B	4	GA	0.0084	0.0000	0.0004
CL600	APP	STANDARD	1	21	C	0	GA	0.0072	0.0000	0.0003
CL600	APP	STANDARD	1	21	C	1	GA	0.0044	0.0000	0.0002
CL600	APP	STANDARD	1	21	C	2	GA	0.0044	0.0000	0.0002
CL600	APP	STANDARD	1	21	C	3	GA	0.0012	0.0000	0.0001
CL600	APP	STANDARD	1	21	C	4	GA	0.0012	0.0000	0.0001
CL600	APP	STANDARD	1	21	D	0	GA	0.0072	0.0000	0.0003
CL600	APP	STANDARD	1	21	D	1	GA	0.0044	0.0000	0.0002
CL600	APP	STANDARD	1	21	D	2	GA	0.0044	0.0000	0.0002
CL600	APP	STANDARD	1	21	D	3	GA	0.0012	0.0000	0.0001
CL600	APP	STANDARD	1	21	D	4	GA	0.0012	0.0000	0.0001
CL600	APP	STANDARD	1	21	E	0	GA	0.0072	0.0000	0.0003
CL600	APP	STANDARD	1	21	E	1	GA	0.0044	0.0000	0.0002
CL600	APP	STANDARD	1	21	E	2	GA	0.0044	0.0000	0.0002
CL600	APP	STANDARD	1	21	E	3	GA	0.0012	0.0000	0.0001
CL600	APP	STANDARD	1	21	E	4	GA	0.0012	0.0000	0.0001
CL600	DEP	STANDARD	1	03	A	0	GA	0.0148	0.0000	0.0006
CL600	DEP	STANDARD	1	03	A	1	GA	0.0111	0.0000	0.0005
CL600	DEP	STANDARD	1	03	A	2	GA	0.0111	0.0000	0.0005
CL600	DEP	STANDARD	1	03	A	3	GA	0.0044	0.0000	0.0002
CL600	DEP	STANDARD	1	03	A	4	GA	0.0044	0.0000	0.0002
CL600	DEP	STANDARD	1	03	A	5	GA	0.0007	0.0000	0.0000
CL600	DEP	STANDARD	1	03	A	6	GA	0.0007	0.0000	0.0000

CL600	DEP	STANDARD	1	03	B	0	GA	0.0296	0.0000	0.0012
CL600	DEP	STANDARD	1	03	B	1	GA	0.0222	0.0000	0.0009
CL600	DEP	STANDARD	1	03	B	2	GA	0.0222	0.0000	0.0009
CL600	DEP	STANDARD	1	03	B	3	GA	0.0089	0.0000	0.0004
CL600	DEP	STANDARD	1	03	B	4	GA	0.0089	0.0000	0.0004
CL600	DEP	STANDARD	1	03	B	5	GA	0.0015	0.0000	0.0001
CL600	DEP	STANDARD	1	03	B	6	GA	0.0015	0.0000	0.0001
CL600	DEP	STANDARD	1	03	C	0	GA	0.0062	0.0000	0.0003
CL600	DEP	STANDARD	1	03	C	1	GA	0.0038	0.0000	0.0002
CL600	DEP	STANDARD	1	03	C	2	GA	0.0038	0.0000	0.0002
CL600	DEP	STANDARD	1	03	C	3	GA	0.0010	0.0000	0.0000
CL600	DEP	STANDARD	1	03	C	4	GA	0.0010	0.0000	0.0000
CL600	DEP	STANDARD	1	21	A	0	GA	0.0072	0.0000	0.0003
CL600	DEP	STANDARD	1	21	A	1	GA	0.0044	0.0000	0.0002
CL600	DEP	STANDARD	1	21	A	2	GA	0.0044	0.0000	0.0002
CL600	DEP	STANDARD	1	21	A	3	GA	0.0012	0.0000	0.0001
CL600	DEP	STANDARD	1	21	A	4	GA	0.0012	0.0000	0.0001
CL600	DEP	STANDARD	1	21	B	0	GA	0.0138	0.0000	0.0006
CL600	DEP	STANDARD	1	21	B	1	GA	0.0110	0.0000	0.0005
CL600	DEP	STANDARD	1	21	B	2	GA	0.0110	0.0000	0.0005
CL600	DEP	STANDARD	1	21	B	3	GA	0.0050	0.0000	0.0002
CL600	DEP	STANDARD	1	21	B	4	GA	0.0083	0.0000	0.0003
CL600	DEP	STANDARD	1	21	B	5	GA	0.0017	0.0000	0.0001
CL600	DEP	STANDARD	1	21	B	6	GA	0.0044	0.0000	0.0002
CL600	DEP	STANDARD	1	21	C	0	GA	0.0057	0.0000	0.0002
CL600	DEP	STANDARD	1	21	C	1	GA	0.0035	0.0000	0.0001
CL600	DEP	STANDARD	1	21	C	2	GA	0.0035	0.0000	0.0001
CL600	DEP	STANDARD	1	21	C	3	GA	0.0010	0.0000	0.0000
CL600	DEP	STANDARD	1	21	C	4	GA	0.0010	0.0000	0.0000
CL600	DEP	STANDARD	1	21	D	0	GA	0.0043	0.0000	0.0002
CL600	DEP	STANDARD	1	21	D	1	GA	0.0026	0.0000	0.0001
CL600	DEP	STANDARD	1	21	D	2	GA	0.0026	0.0000	0.0001
CL600	DEP	STANDARD	1	21	D	3	GA	0.0007	0.0000	0.0000
CL600	DEP	STANDARD	1	21	D	4	GA	0.0007	0.0000	0.0000
CL600	DEP	STANDARD	1	21	E	0	GA	0.0043	0.0000	0.0002
CL600	DEP	STANDARD	1	21	E	1	GA	0.0026	0.0000	0.0001
CL600	DEP	STANDARD	1	21	E	2	GA	0.0026	0.0000	0.0001
CL600	DEP	STANDARD	1	21	E	3	GA	0.0007	0.0000	0.0000
CL600	DEP	STANDARD	1	21	E	4	GA	0.0007	0.0000	0.0000
CL600	DEP	STANDARD	1	21	F	0	GA	0.1005	0.0000	0.0042
CL600	DEP	STANDARD	1	21	F	1	GA	0.0619	0.0000	0.0026
CL600	DEP	STANDARD	1	21	F	2	GA	0.0619	0.0000	0.0026
CL600	DEP	STANDARD	1	21	F	3	GA	0.0168	0.0000	0.0007
CL600	DEP	STANDARD	1	21	F	4	GA	0.0168	0.0000	0.0007
CNA441	APP	STANDARD	1	03	A	0	COM	0.1282	0.0000	0.0192
CNA441	APP	STANDARD	1	03	A	1	COM	0.0789	0.0000	0.0118
CNA441	APP	STANDARD	1	03	A	2	COM	0.0789	0.0000	0.0118
CNA441	APP	STANDARD	1	03	A	3	COM	0.0214	0.0000	0.0032
CNA441	APP	STANDARD	1	03	A	4	COM	0.0214	0.0000	0.0032
CNA441	APP	STANDARD	1	03	B	0	COM	0.3847	0.0000	0.0577
CNA441	APP	STANDARD	1	03	B	1	COM	0.2367	0.0000	0.0355
CNA441	APP	STANDARD	1	03	B	2	COM	0.2367	0.0000	0.0355
CNA441	APP	STANDARD	1	03	B	3	COM	0.0641	0.0000	0.0096
CNA441	APP	STANDARD	1	03	B	4	COM	0.0641	0.0000	0.0096
CNA441	APP	STANDARD	1	03	C	0	COM	0.1282	0.0000	0.0192

CNA441	APP	STANDARD 1	03	C	1	COM	0.0789	0.0000	0.0118
CNA441	APP	STANDARD 1	03	C	2	COM	0.0789	0.0000	0.0118
CNA441	APP	STANDARD 1	03	C	3	COM	0.0214	0.0000	0.0032
CNA441	APP	STANDARD 1	03	C	4	COM	0.0214	0.0000	0.0032
CNA441	APP	STANDARD 1	21	A	0	COM	0.1797	0.0000	0.0270
CNA441	APP	STANDARD 1	21	A	1	COM	0.1349	0.0000	0.0202
CNA441	APP	STANDARD 1	21	A	2	COM	0.1349	0.0000	0.0202
CNA441	APP	STANDARD 1	21	A	3	COM	0.0540	0.0000	0.0081
CNA441	APP	STANDARD 1	21	A	4	COM	0.0540	0.0000	0.0081
CNA441	APP	STANDARD 1	21	A	5	COM	0.0090	0.0000	0.0013
CNA441	APP	STANDARD 1	21	A	6	COM	0.0090	0.0000	0.0013
CNA441	APP	STANDARD 1	21	B	0	COM	0.8975	0.0000	0.1346
CNA441	APP	STANDARD 1	21	B	1	COM	0.5523	0.0000	0.0828
CNA441	APP	STANDARD 1	21	B	2	COM	0.5523	0.0000	0.0828
CNA441	APP	STANDARD 1	21	B	3	COM	0.1496	0.0000	0.0224
CNA441	APP	STANDARD 1	21	B	4	COM	0.1496	0.0000	0.0224
CNA441	APP	STANDARD 1	21	C	0	COM	0.1496	0.0000	0.0224
CNA441	APP	STANDARD 1	21	C	1	COM	0.0921	0.0000	0.0138
CNA441	APP	STANDARD 1	21	C	2	COM	0.0921	0.0000	0.0138
CNA441	APP	STANDARD 1	21	C	3	COM	0.0249	0.0000	0.0037
CNA441	APP	STANDARD 1	21	C	4	COM	0.0249	0.0000	0.0037
CNA441	APP	STANDARD 1	21	D	0	COM	0.1496	0.0000	0.0224
CNA441	APP	STANDARD 1	21	D	1	COM	0.0921	0.0000	0.0138
CNA441	APP	STANDARD 1	21	D	2	COM	0.0921	0.0000	0.0138
CNA441	APP	STANDARD 1	21	D	3	COM	0.0249	0.0000	0.0037
CNA441	APP	STANDARD 1	21	D	4	COM	0.0249	0.0000	0.0037
CNA441	APP	STANDARD 1	21	E	0	COM	0.0748	0.0000	0.0112
CNA441	APP	STANDARD 1	21	E	1	COM	0.0460	0.0000	0.0069
CNA441	APP	STANDARD 1	21	E	2	COM	0.0460	0.0000	0.0069
CNA441	APP	STANDARD 1	21	E	3	COM	0.0125	0.0000	0.0019
CNA441	APP	STANDARD 1	21	E	4	COM	0.0125	0.0000	0.0019
CNA441	DEP	STANDARD 1	03	A	0	COM	0.1027	0.0000	0.0154
CNA441	DEP	STANDARD 1	03	A	1	COM	0.0771	0.0000	0.0116
CNA441	DEP	STANDARD 1	03	A	2	COM	0.0771	0.0000	0.0116
CNA441	DEP	STANDARD 1	03	A	3	COM	0.0308	0.0000	0.0046
CNA441	DEP	STANDARD 1	03	A	4	COM	0.0308	0.0000	0.0046
CNA441	DEP	STANDARD 1	03	A	5	COM	0.0051	0.0000	0.0008
CNA441	DEP	STANDARD 1	03	A	6	COM	0.0051	0.0000	0.0008
CNA441	DEP	STANDARD 1	03	B	0	COM	0.3081	0.0000	0.0462
CNA441	DEP	STANDARD 1	03	B	1	COM	0.2312	0.0000	0.0347
CNA441	DEP	STANDARD 1	03	B	2	COM	0.2312	0.0000	0.0347
CNA441	DEP	STANDARD 1	03	B	3	COM	0.0925	0.0000	0.0139
CNA441	DEP	STANDARD 1	03	B	4	COM	0.0925	0.0000	0.0139
CNA441	DEP	STANDARD 1	03	B	5	COM	0.0154	0.0000	0.0023
CNA441	DEP	STANDARD 1	03	B	6	COM	0.0154	0.0000	0.0023
CNA441	DEP	STANDARD 1	03	C	0	COM	0.1282	0.0000	0.0192
CNA441	DEP	STANDARD 1	03	C	1	COM	0.0789	0.0000	0.0118
CNA441	DEP	STANDARD 1	03	C	2	COM	0.0789	0.0000	0.0118
CNA441	DEP	STANDARD 1	03	C	3	COM	0.0214	0.0000	0.0032
CNA441	DEP	STANDARD 1	03	C	4	COM	0.0214	0.0000	0.0032
CNA441	DEP	STANDARD 1	21	A	0	COM	0.0748	0.0000	0.0112
CNA441	DEP	STANDARD 1	21	A	1	COM	0.0460	0.0000	0.0069
CNA441	DEP	STANDARD 1	21	A	2	COM	0.0460	0.0000	0.0069
CNA441	DEP	STANDARD 1	21	A	3	COM	0.0125	0.0000	0.0019
CNA441	DEP	STANDARD 1	21	A	4	COM	0.0125	0.0000	0.0019

CNA441	DEP	STANDARD	1	21	B	0	COM	0.4315	0.0000	0.0647
CNA441	DEP	STANDARD	1	21	B	1	COM	0.3452	0.0000	0.0518
CNA441	DEP	STANDARD	1	21	B	2	COM	0.3452	0.0000	0.0518
CNA441	DEP	STANDARD	1	21	B	3	COM	0.1553	0.0000	0.0233
CNA441	DEP	STANDARD	1	21	B	4	COM	0.2589	0.0000	0.0388
CNA441	DEP	STANDARD	1	21	B	5	COM	0.0518	0.0000	0.0078
CNA441	DEP	STANDARD	1	21	B	6	COM	0.1381	0.0000	0.0207
CNA441	DEP	STANDARD	1	21	C	0	COM	0.3740	0.0000	0.0561
CNA441	DEP	STANDARD	1	21	C	1	COM	0.2301	0.0000	0.0345
CNA441	DEP	STANDARD	1	21	C	2	COM	0.2301	0.0000	0.0345
CNA441	DEP	STANDARD	1	21	C	3	COM	0.0623	0.0000	0.0093
CNA441	DEP	STANDARD	1	21	C	4	COM	0.0623	0.0000	0.0093
CNA441	DEP	STANDARD	1	21	D	0	COM	0.1496	0.0000	0.0224
CNA441	DEP	STANDARD	1	21	D	1	COM	0.0921	0.0000	0.0138
CNA441	DEP	STANDARD	1	21	D	2	COM	0.0921	0.0000	0.0138
CNA441	DEP	STANDARD	1	21	D	3	COM	0.0249	0.0000	0.0037
CNA441	DEP	STANDARD	1	21	D	4	COM	0.0249	0.0000	0.0037
CNA441	DEP	STANDARD	1	21	E	0	COM	0.1496	0.0000	0.0224
CNA441	DEP	STANDARD	1	21	E	1	COM	0.0921	0.0000	0.0138
CNA441	DEP	STANDARD	1	21	E	2	COM	0.0921	0.0000	0.0138
CNA441	DEP	STANDARD	1	21	E	3	COM	0.0249	0.0000	0.0037
CNA441	DEP	STANDARD	1	21	E	4	COM	0.0249	0.0000	0.0037
CNA441	DEP	STANDARD	1	21	F	0	COM	0.0748	0.0000	0.0112
CNA441	DEP	STANDARD	1	21	F	1	COM	0.0460	0.0000	0.0069
CNA441	DEP	STANDARD	1	21	F	2	COM	0.0460	0.0000	0.0069
CNA441	DEP	STANDARD	1	21	F	3	COM	0.0125	0.0000	0.0019
CNA441	DEP	STANDARD	1	21	F	4	COM	0.0125	0.0000	0.0019
CNA441	TGO	STANDARD	1	03	A	0	COM	0.0393	0.0000	0.0025
CNA441	TGO	STANDARD	1	03	A	1	COM	0.0295	0.0000	0.0019
CNA441	TGO	STANDARD	1	03	A	2	COM	0.0295	0.0000	0.0019
CNA441	TGO	STANDARD	1	03	A	3	COM	0.0118	0.0000	0.0008
CNA441	TGO	STANDARD	1	03	A	4	COM	0.0118	0.0000	0.0008
CNA441	TGO	STANDARD	1	03	A	5	COM	0.0020	0.0000	0.0001
CNA441	TGO	STANDARD	1	03	A	6	COM	0.0020	0.0000	0.0001
CNA441	TGO	STANDARD	1	21	A	0	COM	0.1570	0.0000	0.0100
CNA441	TGO	STANDARD	1	21	A	1	COM	0.1178	0.0000	0.0075
CNA441	TGO	STANDARD	1	21	A	2	COM	0.1178	0.0000	0.0075
CNA441	TGO	STANDARD	1	21	A	3	COM	0.0472	0.0000	0.0030
CNA441	TGO	STANDARD	1	21	A	4	COM	0.0472	0.0000	0.0030
CNA441	TGO	STANDARD	1	21	A	5	COM	0.0078	0.0000	0.0005
CNA441	TGO	STANDARD	1	21	A	6	COM	0.0078	0.0000	0.0005
CNA500	APP	STANDARD	1	03	A	0	GA	0.0123	0.0000	0.0005
CNA500	APP	STANDARD	1	03	A	1	GA	0.0076	0.0000	0.0003
CNA500	APP	STANDARD	1	03	A	2	GA	0.0076	0.0000	0.0003
CNA500	APP	STANDARD	1	03	A	3	GA	0.0021	0.0000	0.0001
CNA500	APP	STANDARD	1	03	A	4	GA	0.0021	0.0000	0.0001
CNA500	APP	STANDARD	1	03	B	0	GA	0.0369	0.0000	0.0015
CNA500	APP	STANDARD	1	03	B	1	GA	0.0227	0.0000	0.0009
CNA500	APP	STANDARD	1	03	B	2	GA	0.0227	0.0000	0.0009
CNA500	APP	STANDARD	1	03	B	3	GA	0.0062	0.0000	0.0003
CNA500	APP	STANDARD	1	03	B	4	GA	0.0062	0.0000	0.0003
CNA500	APP	STANDARD	1	03	C	0	GA	0.0123	0.0000	0.0005
CNA500	APP	STANDARD	1	03	C	1	GA	0.0076	0.0000	0.0003
CNA500	APP	STANDARD	1	03	C	2	GA	0.0076	0.0000	0.0003
CNA500	APP	STANDARD	1	03	C	3	GA	0.0021	0.0000	0.0001

CNA500	APP	STANDARD	1	03	C	4	GA	0.0021	0.0000	0.0001
CNA500	APP	STANDARD	1	21	A	0	GA	0.0575	0.0000	0.0024
CNA500	APP	STANDARD	1	21	A	1	GA	0.0432	0.0000	0.0018
CNA500	APP	STANDARD	1	21	A	2	GA	0.0432	0.0000	0.0018
CNA500	APP	STANDARD	1	21	A	3	GA	0.0173	0.0000	0.0007
CNA500	APP	STANDARD	1	21	A	4	GA	0.0173	0.0000	0.0007
CNA500	APP	STANDARD	1	21	A	5	GA	0.0029	0.0000	0.0001
CNA500	APP	STANDARD	1	21	A	6	GA	0.0029	0.0000	0.0001
CNA500	APP	STANDARD	1	21	B	0	GA	0.0503	0.0000	0.0021
CNA500	APP	STANDARD	1	21	B	1	GA	0.0309	0.0000	0.0013
CNA500	APP	STANDARD	1	21	B	2	GA	0.0309	0.0000	0.0013
CNA500	APP	STANDARD	1	21	B	3	GA	0.0084	0.0000	0.0004
CNA500	APP	STANDARD	1	21	B	4	GA	0.0084	0.0000	0.0004
CNA500	APP	STANDARD	1	21	C	0	GA	0.0072	0.0000	0.0003
CNA500	APP	STANDARD	1	21	C	1	GA	0.0044	0.0000	0.0002
CNA500	APP	STANDARD	1	21	C	2	GA	0.0044	0.0000	0.0002
CNA500	APP	STANDARD	1	21	C	3	GA	0.0012	0.0000	0.0001
CNA500	APP	STANDARD	1	21	C	4	GA	0.0012	0.0000	0.0001
CNA500	APP	STANDARD	1	21	D	0	GA	0.0072	0.0000	0.0003
CNA500	APP	STANDARD	1	21	D	1	GA	0.0044	0.0000	0.0002
CNA500	APP	STANDARD	1	21	D	2	GA	0.0044	0.0000	0.0002
CNA500	APP	STANDARD	1	21	D	3	GA	0.0012	0.0000	0.0001
CNA500	APP	STANDARD	1	21	D	4	GA	0.0012	0.0000	0.0001
CNA500	APP	STANDARD	1	21	E	0	GA	0.0072	0.0000	0.0003
CNA500	APP	STANDARD	1	21	E	1	GA	0.0044	0.0000	0.0002
CNA500	APP	STANDARD	1	21	E	2	GA	0.0044	0.0000	0.0002
CNA500	APP	STANDARD	1	21	E	3	GA	0.0012	0.0000	0.0001
CNA500	APP	STANDARD	1	21	E	4	GA	0.0012	0.0000	0.0001
CNA500	DEP	STANDARD	1	03	A	0	GA	0.0148	0.0000	0.0006
CNA500	DEP	STANDARD	1	03	A	1	GA	0.0111	0.0000	0.0005
CNA500	DEP	STANDARD	1	03	A	2	GA	0.0111	0.0000	0.0005
CNA500	DEP	STANDARD	1	03	A	3	GA	0.0044	0.0000	0.0002
CNA500	DEP	STANDARD	1	03	A	4	GA	0.0044	0.0000	0.0002
CNA500	DEP	STANDARD	1	03	A	5	GA	0.0007	0.0000	0.0000
CNA500	DEP	STANDARD	1	03	A	6	GA	0.0007	0.0000	0.0000
CNA500	DEP	STANDARD	1	03	B	0	GA	0.0296	0.0000	0.0012
CNA500	DEP	STANDARD	1	03	B	1	GA	0.0222	0.0000	0.0009
CNA500	DEP	STANDARD	1	03	B	2	GA	0.0222	0.0000	0.0009
CNA500	DEP	STANDARD	1	03	B	3	GA	0.0089	0.0000	0.0004
CNA500	DEP	STANDARD	1	03	B	4	GA	0.0089	0.0000	0.0004
CNA500	DEP	STANDARD	1	03	B	5	GA	0.0015	0.0000	0.0001
CNA500	DEP	STANDARD	1	03	B	6	GA	0.0015	0.0000	0.0001
CNA500	DEP	STANDARD	1	03	C	0	GA	0.0062	0.0000	0.0003
CNA500	DEP	STANDARD	1	03	C	1	GA	0.0038	0.0000	0.0002
CNA500	DEP	STANDARD	1	03	C	2	GA	0.0038	0.0000	0.0002
CNA500	DEP	STANDARD	1	03	C	3	GA	0.0010	0.0000	0.0000
CNA500	DEP	STANDARD	1	03	C	4	GA	0.0010	0.0000	0.0000
CNA500	DEP	STANDARD	1	21	A	0	GA	0.0072	0.0000	0.0003
CNA500	DEP	STANDARD	1	21	A	1	GA	0.0044	0.0000	0.0002
CNA500	DEP	STANDARD	1	21	A	2	GA	0.0044	0.0000	0.0002
CNA500	DEP	STANDARD	1	21	A	3	GA	0.0012	0.0000	0.0001
CNA500	DEP	STANDARD	1	21	A	4	GA	0.0012	0.0000	0.0001
CNA500	DEP	STANDARD	1	21	B	0	GA	0.0138	0.0000	0.0006
CNA500	DEP	STANDARD	1	21	B	1	GA	0.0110	0.0000	0.0005
CNA500	DEP	STANDARD	1	21	B	2	GA	0.0110	0.0000	0.0005

CNA500	DEP	STANDARD	1	21	B	3	GA	0.0050	0.0000	0.0002
CNA500	DEP	STANDARD	1	21	B	4	GA	0.0083	0.0000	0.0003
CNA500	DEP	STANDARD	1	21	B	5	GA	0.0017	0.0000	0.0001
CNA500	DEP	STANDARD	1	21	B	6	GA	0.0044	0.0000	0.0002
CNA500	DEP	STANDARD	1	21	C	0	GA	0.0057	0.0000	0.0002
CNA500	DEP	STANDARD	1	21	C	1	GA	0.0035	0.0000	0.0001
CNA500	DEP	STANDARD	1	21	C	2	GA	0.0035	0.0000	0.0001
CNA500	DEP	STANDARD	1	21	C	3	GA	0.0010	0.0000	0.0000
CNA500	DEP	STANDARD	1	21	C	4	GA	0.0010	0.0000	0.0000
CNA500	DEP	STANDARD	1	21	D	0	GA	0.0043	0.0000	0.0002
CNA500	DEP	STANDARD	1	21	D	1	GA	0.0026	0.0000	0.0001
CNA500	DEP	STANDARD	1	21	D	2	GA	0.0026	0.0000	0.0001
CNA500	DEP	STANDARD	1	21	D	3	GA	0.0007	0.0000	0.0000
CNA500	DEP	STANDARD	1	21	D	4	GA	0.0007	0.0000	0.0000
CNA500	DEP	STANDARD	1	21	E	0	GA	0.0043	0.0000	0.0002
CNA500	DEP	STANDARD	1	21	E	1	GA	0.0026	0.0000	0.0001
CNA500	DEP	STANDARD	1	21	E	2	GA	0.0026	0.0000	0.0001
CNA500	DEP	STANDARD	1	21	E	3	GA	0.0007	0.0000	0.0000
CNA500	DEP	STANDARD	1	21	E	4	GA	0.0007	0.0000	0.0000
CNA500	DEP	STANDARD	1	21	F	0	GA	0.1005	0.0000	0.0042
CNA500	DEP	STANDARD	1	21	F	1	GA	0.0619	0.0000	0.0026
CNA500	DEP	STANDARD	1	21	F	2	GA	0.0619	0.0000	0.0026
CNA500	DEP	STANDARD	1	21	F	3	GA	0.0168	0.0000	0.0007
CNA500	DEP	STANDARD	1	21	F	4	GA	0.0168	0.0000	0.0007
DHC8	APP	STANDARD	1	03	A	0	COM	0.1065	0.0000	0.0000
DHC8	APP	STANDARD	1	03	A	1	COM	0.0656	0.0000	0.0000
DHC8	APP	STANDARD	1	03	A	2	COM	0.0656	0.0000	0.0000
DHC8	APP	STANDARD	1	03	A	3	COM	0.0178	0.0000	0.0000
DHC8	APP	STANDARD	1	03	A	4	COM	0.0178	0.0000	0.0000
DHC8	APP	STANDARD	1	03	B	0	COM	0.3196	0.0000	0.0000
DHC8	APP	STANDARD	1	03	B	1	COM	0.1967	0.0000	0.0000
DHC8	APP	STANDARD	1	03	B	2	COM	0.1967	0.0000	0.0000
DHC8	APP	STANDARD	1	03	B	3	COM	0.0533	0.0000	0.0000
DHC8	APP	STANDARD	1	03	B	4	COM	0.0533	0.0000	0.0000
DHC8	APP	STANDARD	1	03	C	0	COM	0.1065	0.0000	0.0000
DHC8	APP	STANDARD	1	03	C	1	COM	0.0656	0.0000	0.0000
DHC8	APP	STANDARD	1	03	C	2	COM	0.0656	0.0000	0.0000
DHC8	APP	STANDARD	1	03	C	3	COM	0.0178	0.0000	0.0000
DHC8	APP	STANDARD	1	03	C	4	COM	0.0178	0.0000	0.0000
DHC8	APP	STANDARD	1	21	A	0	COM	0.4979	0.0000	0.0000
DHC8	APP	STANDARD	1	21	A	1	COM	0.3736	0.0000	0.0000
DHC8	APP	STANDARD	1	21	A	2	COM	0.3736	0.0000	0.0000
DHC8	APP	STANDARD	1	21	A	3	COM	0.1495	0.0000	0.0000
DHC8	APP	STANDARD	1	21	A	4	COM	0.1495	0.0000	0.0000
DHC8	APP	STANDARD	1	21	A	5	COM	0.0249	0.0000	0.0000
DHC8	APP	STANDARD	1	21	A	6	COM	0.0249	0.0000	0.0000
DHC8	APP	STANDARD	1	21	B	0	COM	0.4351	0.0000	0.0000
DHC8	APP	STANDARD	1	21	B	1	COM	0.2677	0.0000	0.0000
DHC8	APP	STANDARD	1	21	B	2	COM	0.2677	0.0000	0.0000
DHC8	APP	STANDARD	1	21	B	3	COM	0.0725	0.0000	0.0000
DHC8	APP	STANDARD	1	21	B	4	COM	0.0725	0.0000	0.0000
DHC8	APP	STANDARD	1	21	C	0	COM	0.0622	0.0000	0.0000
DHC8	APP	STANDARD	1	21	C	1	COM	0.0383	0.0000	0.0000
DHC8	APP	STANDARD	1	21	C	2	COM	0.0383	0.0000	0.0000
DHC8	APP	STANDARD	1	21	C	3	COM	0.0104	0.0000	0.0000

DHC8	APP	STANDARD	1	21	C	4	COM	0.0104	0.0000	0.0000
DHC8	APP	STANDARD	1	21	D	0	COM	0.0622	0.0000	0.0000
DHC8	APP	STANDARD	1	21	D	1	COM	0.0383	0.0000	0.0000
DHC8	APP	STANDARD	1	21	D	2	COM	0.0383	0.0000	0.0000
DHC8	APP	STANDARD	1	21	D	3	COM	0.0104	0.0000	0.0000
DHC8	APP	STANDARD	1	21	D	4	COM	0.0104	0.0000	0.0000
DHC8	APP	STANDARD	1	21	E	0	COM	0.0622	0.0000	0.0000
DHC8	APP	STANDARD	1	21	E	1	COM	0.0383	0.0000	0.0000
DHC8	APP	STANDARD	1	21	E	2	COM	0.0383	0.0000	0.0000
DHC8	APP	STANDARD	1	21	E	3	COM	0.0104	0.0000	0.0000
DHC8	APP	STANDARD	1	21	E	4	COM	0.0104	0.0000	0.0000
DHC8	DEP	STANDARD	1	03	A	0	COM	0.1024	0.0000	0.0256
DHC8	DEP	STANDARD	1	03	A	1	COM	0.0769	0.0000	0.0192
DHC8	DEP	STANDARD	1	03	A	2	COM	0.0769	0.0000	0.0192
DHC8	DEP	STANDARD	1	03	A	3	COM	0.0308	0.0000	0.0077
DHC8	DEP	STANDARD	1	03	A	4	COM	0.0308	0.0000	0.0077
DHC8	DEP	STANDARD	1	03	A	5	COM	0.0051	0.0000	0.0013
DHC8	DEP	STANDARD	1	03	A	6	COM	0.0051	0.0000	0.0013
DHC8	DEP	STANDARD	1	03	B	0	COM	0.2049	0.0000	0.0512
DHC8	DEP	STANDARD	1	03	B	1	COM	0.1537	0.0000	0.0384
DHC8	DEP	STANDARD	1	03	B	2	COM	0.1537	0.0000	0.0384
DHC8	DEP	STANDARD	1	03	B	3	COM	0.0615	0.0000	0.0154
DHC8	DEP	STANDARD	1	03	B	4	COM	0.0615	0.0000	0.0154
DHC8	DEP	STANDARD	1	03	B	5	COM	0.0102	0.0000	0.0026
DHC8	DEP	STANDARD	1	03	B	6	COM	0.0102	0.0000	0.0026
DHC8	DEP	STANDARD	1	03	C	0	COM	0.0426	0.0000	0.0106
DHC8	DEP	STANDARD	1	03	C	1	COM	0.0262	0.0000	0.0066
DHC8	DEP	STANDARD	1	03	C	2	COM	0.0262	0.0000	0.0066
DHC8	DEP	STANDARD	1	03	C	3	COM	0.0071	0.0000	0.0018
DHC8	DEP	STANDARD	1	03	C	4	COM	0.0071	0.0000	0.0018
DHC8	DEP	STANDARD	1	21	A	0	COM	0.0497	0.0000	0.0124
DHC8	DEP	STANDARD	1	21	A	1	COM	0.0306	0.0000	0.0077
DHC8	DEP	STANDARD	1	21	A	2	COM	0.0306	0.0000	0.0077
DHC8	DEP	STANDARD	1	21	A	3	COM	0.0083	0.0000	0.0021
DHC8	DEP	STANDARD	1	21	A	4	COM	0.0083	0.0000	0.0021
DHC8	DEP	STANDARD	1	21	B	0	COM	0.0957	0.0000	0.0239
DHC8	DEP	STANDARD	1	21	B	1	COM	0.0765	0.0000	0.0191
DHC8	DEP	STANDARD	1	21	B	2	COM	0.0765	0.0000	0.0191
DHC8	DEP	STANDARD	1	21	B	3	COM	0.0344	0.0000	0.0086
DHC8	DEP	STANDARD	1	21	B	4	COM	0.0574	0.0000	0.0143
DHC8	DEP	STANDARD	1	21	B	5	COM	0.0115	0.0000	0.0029
DHC8	DEP	STANDARD	1	21	B	6	COM	0.0306	0.0000	0.0076
DHC8	DEP	STANDARD	1	21	C	0	COM	0.0398	0.0000	0.0099
DHC8	DEP	STANDARD	1	21	C	1	COM	0.0245	0.0000	0.0061
DHC8	DEP	STANDARD	1	21	C	2	COM	0.0245	0.0000	0.0061
DHC8	DEP	STANDARD	1	21	C	3	COM	0.0066	0.0000	0.0017
DHC8	DEP	STANDARD	1	21	C	4	COM	0.0066	0.0000	0.0017
DHC8	DEP	STANDARD	1	21	D	0	COM	0.0298	0.0000	0.0074
DHC8	DEP	STANDARD	1	21	D	1	COM	0.0184	0.0000	0.0046
DHC8	DEP	STANDARD	1	21	D	2	COM	0.0184	0.0000	0.0046
DHC8	DEP	STANDARD	1	21	D	3	COM	0.0050	0.0000	0.0012
DHC8	DEP	STANDARD	1	21	D	4	COM	0.0050	0.0000	0.0012
DHC8	DEP	STANDARD	1	21	E	0	COM	0.0298	0.0000	0.0074
DHC8	DEP	STANDARD	1	21	E	1	COM	0.0184	0.0000	0.0046
DHC8	DEP	STANDARD	1	21	E	2	COM	0.0184	0.0000	0.0046

DHC8	DEP	STANDARD	1	21	E	3	COM	0.0050	0.0000	0.0012
DHC8	DEP	STANDARD	1	21	E	4	COM	0.0050	0.0000	0.0012
DHC8	DEP	STANDARD	1	21	F	0	COM	0.6963	0.0000	0.1739
DHC8	DEP	STANDARD	1	21	F	1	COM	0.4285	0.0000	0.1070
DHC8	DEP	STANDARD	1	21	F	2	COM	0.4285	0.0000	0.1070
DHC8	DEP	STANDARD	1	21	F	3	COM	0.1160	0.0000	0.0290
DHC8	DEP	STANDARD	1	21	F	4	COM	0.1160	0.0000	0.0290
GASEPF	APP	STANDARD	2	03	A	0	GA	0.3586	0.0000	0.0550
GASEPF	APP	STANDARD	2	03	A	1	GA	0.2207	0.0000	0.0338
GASEPF	APP	STANDARD	2	03	A	2	GA	0.2207	0.0000	0.0338
GASEPF	APP	STANDARD	2	03	A	3	GA	0.0598	0.0000	0.0092
GASEPF	APP	STANDARD	2	03	A	4	GA	0.0598	0.0000	0.0092
GASEPF	APP	STANDARD	2	03	B	0	GA	1.0757	0.0000	0.1648
GASEPF	APP	STANDARD	2	03	B	1	GA	0.6620	0.0000	0.1014
GASEPF	APP	STANDARD	2	03	B	2	GA	0.6620	0.0000	0.1014
GASEPF	APP	STANDARD	2	03	B	3	GA	0.1793	0.0000	0.0275
GASEPF	APP	STANDARD	2	03	B	4	GA	0.1793	0.0000	0.0275
GASEPF	APP	STANDARD	2	03	C	0	GA	0.3586	0.0000	0.0550
GASEPF	APP	STANDARD	2	03	C	1	GA	0.2207	0.0000	0.0338
GASEPF	APP	STANDARD	2	03	C	2	GA	0.2207	0.0000	0.0338
GASEPF	APP	STANDARD	2	03	C	3	GA	0.0598	0.0000	0.0092
GASEPF	APP	STANDARD	2	03	C	4	GA	0.0598	0.0000	0.0092
GASEPF	APP	STANDARD	2	21	A	0	GA	0.5026	0.0000	0.0770
GASEPF	APP	STANDARD	2	21	A	1	GA	0.3771	0.0000	0.0578
GASEPF	APP	STANDARD	2	21	A	2	GA	0.3771	0.0000	0.0578
GASEPF	APP	STANDARD	2	21	A	3	GA	0.1509	0.0000	0.0231
GASEPF	APP	STANDARD	2	21	A	4	GA	0.1509	0.0000	0.0231
GASEPF	APP	STANDARD	2	21	A	5	GA	0.0251	0.0000	0.0038
GASEPF	APP	STANDARD	2	21	A	6	GA	0.0251	0.0000	0.0038
GASEPF	APP	STANDARD	2	21	B	0	GA	2.5100	0.0000	0.3846
GASEPF	APP	STANDARD	2	21	B	1	GA	1.5446	0.0000	0.2367
GASEPF	APP	STANDARD	2	21	B	2	GA	1.5446	0.0000	0.2367
GASEPF	APP	STANDARD	2	21	B	3	GA	0.4183	0.0000	0.0641
GASEPF	APP	STANDARD	2	21	B	4	GA	0.4183	0.0000	0.0641
GASEPF	APP	STANDARD	2	21	C	0	GA	0.4183	0.0000	0.0641
GASEPF	APP	STANDARD	2	21	C	1	GA	0.2574	0.0000	0.0395
GASEPF	APP	STANDARD	2	21	C	2	GA	0.2574	0.0000	0.0395
GASEPF	APP	STANDARD	2	21	C	3	GA	0.0697	0.0000	0.0107
GASEPF	APP	STANDARD	2	21	C	4	GA	0.0697	0.0000	0.0107
GASEPF	APP	STANDARD	2	21	D	0	GA	0.4183	0.0000	0.0641
GASEPF	APP	STANDARD	2	21	D	1	GA	0.2574	0.0000	0.0395
GASEPF	APP	STANDARD	2	21	D	2	GA	0.2574	0.0000	0.0395
GASEPF	APP	STANDARD	2	21	D	3	GA	0.0697	0.0000	0.0107
GASEPF	APP	STANDARD	2	21	D	4	GA	0.0697	0.0000	0.0107
GASEPF	APP	STANDARD	2	21	E	0	GA	0.2092	0.0000	0.0321
GASEPF	APP	STANDARD	2	21	E	1	GA	0.1287	0.0000	0.0197
GASEPF	APP	STANDARD	2	21	E	2	GA	0.1287	0.0000	0.0197
GASEPF	APP	STANDARD	2	21	E	3	GA	0.0349	0.0000	0.0053
GASEPF	APP	STANDARD	2	21	E	4	GA	0.0349	0.0000	0.0053
GASEPF	DEP	STANDARD	1	03	A	0	GA	0.3129	0.0000	0.0183
GASEPF	DEP	STANDARD	1	03	A	1	GA	0.2348	0.0000	0.0138
GASEPF	DEP	STANDARD	1	03	A	2	GA	0.2348	0.0000	0.0138
GASEPF	DEP	STANDARD	1	03	A	3	GA	0.0940	0.0000	0.0055
GASEPF	DEP	STANDARD	1	03	A	4	GA	0.0940	0.0000	0.0055
GASEPF	DEP	STANDARD	1	03	A	5	GA	0.0156	0.0000	0.0009

GASEPF	DEP	STANDARD	1	03	A	6	GA	0.0156	0.0000	0.0009
GASEPF	DEP	STANDARD	1	03	B	0	GA	0.9387	0.0000	0.0550
GASEPF	DEP	STANDARD	1	03	B	1	GA	0.7043	0.0000	0.0413
GASEPF	DEP	STANDARD	1	03	B	2	GA	0.7043	0.0000	0.0413
GASEPF	DEP	STANDARD	1	03	B	3	GA	0.2819	0.0000	0.0165
GASEPF	DEP	STANDARD	1	03	B	4	GA	0.2819	0.0000	0.0165
GASEPF	DEP	STANDARD	1	03	B	5	GA	0.0469	0.0000	0.0027
GASEPF	DEP	STANDARD	1	03	B	6	GA	0.0469	0.0000	0.0027
GASEPF	DEP	STANDARD	1	03	C	0	GA	0.3906	0.0000	0.0229
GASEPF	DEP	STANDARD	1	03	C	1	GA	0.2404	0.0000	0.0141
GASEPF	DEP	STANDARD	1	03	C	2	GA	0.2404	0.0000	0.0141
GASEPF	DEP	STANDARD	1	03	C	3	GA	0.0651	0.0000	0.0038
GASEPF	DEP	STANDARD	1	03	C	4	GA	0.0651	0.0000	0.0038
GASEPF	DEP	STANDARD	1	21	A	0	GA	0.2279	0.0000	0.0133
GASEPF	DEP	STANDARD	1	21	A	1	GA	0.1402	0.0000	0.0082
GASEPF	DEP	STANDARD	1	21	A	2	GA	0.1402	0.0000	0.0082
GASEPF	DEP	STANDARD	1	21	A	3	GA	0.0380	0.0000	0.0022
GASEPF	DEP	STANDARD	1	21	A	4	GA	0.0380	0.0000	0.0022
GASEPF	DEP	STANDARD	1	21	B	0	GA	1.3146	0.0000	0.0770
GASEPF	DEP	STANDARD	1	21	B	1	GA	1.0517	0.0000	0.0616
GASEPF	DEP	STANDARD	1	21	B	2	GA	1.0517	0.0000	0.0616
GASEPF	DEP	STANDARD	1	21	B	3	GA	0.4732	0.0000	0.0277
GASEPF	DEP	STANDARD	1	21	B	4	GA	0.7887	0.0000	0.0462
GASEPF	DEP	STANDARD	1	21	B	5	GA	0.1577	0.0000	0.0092
GASEPF	DEP	STANDARD	1	21	B	6	GA	0.4207	0.0000	0.0246
GASEPF	DEP	STANDARD	1	21	C	0	GA	1.1393	0.0000	0.0668
GASEPF	DEP	STANDARD	1	21	C	1	GA	0.7011	0.0000	0.0411
GASEPF	DEP	STANDARD	1	21	C	2	GA	0.7011	0.0000	0.0411
GASEPF	DEP	STANDARD	1	21	C	3	GA	0.1899	0.0000	0.0111
GASEPF	DEP	STANDARD	1	21	C	4	GA	0.1899	0.0000	0.0111
GASEPF	DEP	STANDARD	1	21	D	0	GA	0.4557	0.0000	0.0267
GASEPF	DEP	STANDARD	1	21	D	1	GA	0.2804	0.0000	0.0164
GASEPF	DEP	STANDARD	1	21	D	2	GA	0.2804	0.0000	0.0164
GASEPF	DEP	STANDARD	1	21	D	3	GA	0.0760	0.0000	0.0045
GASEPF	DEP	STANDARD	1	21	D	4	GA	0.0760	0.0000	0.0045
GASEPF	DEP	STANDARD	1	21	E	0	GA	0.4557	0.0000	0.0267
GASEPF	DEP	STANDARD	1	21	E	1	GA	0.2804	0.0000	0.0164
GASEPF	DEP	STANDARD	1	21	E	2	GA	0.2804	0.0000	0.0164
GASEPF	DEP	STANDARD	1	21	E	3	GA	0.0760	0.0000	0.0045
GASEPF	DEP	STANDARD	1	21	E	4	GA	0.0760	0.0000	0.0045
GASEPF	DEP	STANDARD	1	21	F	0	GA	0.2279	0.0000	0.0133
GASEPF	DEP	STANDARD	1	21	F	1	GA	0.1402	0.0000	0.0082
GASEPF	DEP	STANDARD	1	21	F	2	GA	0.1402	0.0000	0.0082
GASEPF	DEP	STANDARD	1	21	F	3	GA	0.0380	0.0000	0.0022
GASEPF	DEP	STANDARD	1	21	F	4	GA	0.0380	0.0000	0.0022
GASEPF	TGO	STANDARD	1	03	A	0	GA	0.6034	0.0000	0.0385
GASEPF	TGO	STANDARD	1	03	A	1	GA	0.4527	0.0000	0.0289
GASEPF	TGO	STANDARD	1	03	A	2	GA	0.4527	0.0000	0.0289
GASEPF	TGO	STANDARD	1	03	A	3	GA	0.1812	0.0000	0.0116
GASEPF	TGO	STANDARD	1	03	A	4	GA	0.1812	0.0000	0.0116
GASEPF	TGO	STANDARD	1	03	A	5	GA	0.0301	0.0000	0.0019
GASEPF	TGO	STANDARD	1	03	A	6	GA	0.0301	0.0000	0.0019
GASEPF	TGO	STANDARD	1	21	A	0	GA	2.4136	0.0000	0.1541
GASEPF	TGO	STANDARD	1	21	A	1	GA	1.8110	0.0000	0.1156
GASEPF	TGO	STANDARD	1	21	A	2	GA	1.8110	0.0000	0.1156

GASEPF	TGO	STANDARD	1	21	A	3	GA	0.7247	0.0000	0.0463
GASEPF	TGO	STANDARD	1	21	A	4	GA	0.7247	0.0000	0.0463
GASEPF	TGO	STANDARD	1	21	A	5	GA	0.1205	0.0000	0.0077
GASEPF	TGO	STANDARD	1	21	A	6	GA	0.1205	0.0000	0.0077
GASEPV	APP	STANDARD	2	03	A	0	GA	0.3586	0.0000	0.0229
GASEPV	APP	STANDARD	2	03	A	1	GA	0.2207	0.0000	0.0141
GASEPV	APP	STANDARD	2	03	A	2	GA	0.2207	0.0000	0.0141
GASEPV	APP	STANDARD	2	03	A	3	GA	0.0598	0.0000	0.0038
GASEPV	APP	STANDARD	2	03	A	4	GA	0.0598	0.0000	0.0038
GASEPV	APP	STANDARD	2	03	B	0	GA	1.0757	0.0000	0.0687
GASEPV	APP	STANDARD	2	03	B	1	GA	0.6620	0.0000	0.0423
GASEPV	APP	STANDARD	2	03	B	2	GA	0.6620	0.0000	0.0423
GASEPV	APP	STANDARD	2	03	B	3	GA	0.1793	0.0000	0.0114
GASEPV	APP	STANDARD	2	03	B	4	GA	0.1793	0.0000	0.0114
GASEPV	APP	STANDARD	2	03	C	0	GA	0.3586	0.0000	0.0229
GASEPV	APP	STANDARD	2	03	C	1	GA	0.2207	0.0000	0.0141
GASEPV	APP	STANDARD	2	03	C	2	GA	0.2207	0.0000	0.0141
GASEPV	APP	STANDARD	2	03	C	3	GA	0.0598	0.0000	0.0038
GASEPV	APP	STANDARD	2	03	C	4	GA	0.0598	0.0000	0.0038
GASEPV	APP	STANDARD	2	21	A	0	GA	0.5026	0.0000	0.0321
GASEPV	APP	STANDARD	2	21	A	1	GA	0.3771	0.0000	0.0241
GASEPV	APP	STANDARD	2	21	A	2	GA	0.3771	0.0000	0.0241
GASEPV	APP	STANDARD	2	21	A	3	GA	0.1509	0.0000	0.0096
GASEPV	APP	STANDARD	2	21	A	4	GA	0.1509	0.0000	0.0096
GASEPV	APP	STANDARD	2	21	A	5	GA	0.0251	0.0000	0.0016
GASEPV	APP	STANDARD	2	21	A	6	GA	0.0251	0.0000	0.0016
GASEPV	APP	STANDARD	2	21	B	0	GA	2.5100	0.0000	0.1602
GASEPV	APP	STANDARD	2	21	B	1	GA	1.5446	0.0000	0.0986
GASEPV	APP	STANDARD	2	21	B	2	GA	1.5446	0.0000	0.0986
GASEPV	APP	STANDARD	2	21	B	3	GA	0.4183	0.0000	0.0267
GASEPV	APP	STANDARD	2	21	B	4	GA	0.4183	0.0000	0.0267
GASEPV	APP	STANDARD	2	21	C	0	GA	0.4183	0.0000	0.0267
GASEPV	APP	STANDARD	2	21	C	1	GA	0.2574	0.0000	0.0164
GASEPV	APP	STANDARD	2	21	C	2	GA	0.2574	0.0000	0.0164
GASEPV	APP	STANDARD	2	21	C	3	GA	0.0697	0.0000	0.0045
GASEPV	APP	STANDARD	2	21	C	4	GA	0.0697	0.0000	0.0045
GASEPV	APP	STANDARD	2	21	D	0	GA	0.4183	0.0000	0.0267
GASEPV	APP	STANDARD	2	21	D	1	GA	0.2574	0.0000	0.0164
GASEPV	APP	STANDARD	2	21	D	2	GA	0.2574	0.0000	0.0164
GASEPV	APP	STANDARD	2	21	D	3	GA	0.0697	0.0000	0.0045
GASEPV	APP	STANDARD	2	21	D	4	GA	0.0697	0.0000	0.0045
GASEPV	APP	STANDARD	2	21	E	0	GA	0.2092	0.0000	0.0133
GASEPV	APP	STANDARD	2	21	E	1	GA	0.1287	0.0000	0.0082
GASEPV	APP	STANDARD	2	21	E	2	GA	0.1287	0.0000	0.0082
GASEPV	APP	STANDARD	2	21	E	3	GA	0.0349	0.0000	0.0022
GASEPV	APP	STANDARD	2	21	E	4	GA	0.0349	0.0000	0.0022
GASEPV	DEP	STANDARD	1	03	A	0	GA	0.2872	0.0000	0.0183
GASEPV	DEP	STANDARD	1	03	A	1	GA	0.2155	0.0000	0.0138
GASEPV	DEP	STANDARD	1	03	A	2	GA	0.2155	0.0000	0.0138
GASEPV	DEP	STANDARD	1	03	A	3	GA	0.0862	0.0000	0.0055
GASEPV	DEP	STANDARD	1	03	A	4	GA	0.0862	0.0000	0.0055
GASEPV	DEP	STANDARD	1	03	A	5	GA	0.0143	0.0000	0.0009
GASEPV	DEP	STANDARD	1	03	A	6	GA	0.0143	0.0000	0.0009
GASEPV	DEP	STANDARD	1	03	B	0	GA	0.8617	0.0000	0.0550
GASEPV	DEP	STANDARD	1	03	B	1	GA	0.6465	0.0000	0.0413

GASEPV	DEP	STANDARD	1	03	B	2	GA	0.6465	0.0000	0.0413
GASEPV	DEP	STANDARD	1	03	B	3	GA	0.2587	0.0000	0.0165
GASEPV	DEP	STANDARD	1	03	B	4	GA	0.2587	0.0000	0.0165
GASEPV	DEP	STANDARD	1	03	B	5	GA	0.0430	0.0000	0.0027
GASEPV	DEP	STANDARD	1	03	B	6	GA	0.0430	0.0000	0.0027
GASEPV	DEP	STANDARD	1	03	C	0	GA	0.3586	0.0000	0.0229
GASEPV	DEP	STANDARD	1	03	C	1	GA	0.2207	0.0000	0.0141
GASEPV	DEP	STANDARD	1	03	C	2	GA	0.2207	0.0000	0.0141
GASEPV	DEP	STANDARD	1	03	C	3	GA	0.0598	0.0000	0.0038
GASEPV	DEP	STANDARD	1	03	C	4	GA	0.0598	0.0000	0.0038
GASEPV	DEP	STANDARD	1	21	A	0	GA	0.2092	0.0000	0.0133
GASEPV	DEP	STANDARD	1	21	A	1	GA	0.1287	0.0000	0.0082
GASEPV	DEP	STANDARD	1	21	A	2	GA	0.1287	0.0000	0.0082
GASEPV	DEP	STANDARD	1	21	A	3	GA	0.0349	0.0000	0.0022
GASEPV	DEP	STANDARD	1	21	A	4	GA	0.0349	0.0000	0.0022
GASEPV	DEP	STANDARD	1	21	B	0	GA	1.2067	0.0000	0.0770
GASEPV	DEP	STANDARD	1	21	B	1	GA	0.9654	0.0000	0.0616
GASEPV	DEP	STANDARD	1	21	B	2	GA	0.9654	0.0000	0.0616
GASEPV	DEP	STANDARD	1	21	B	3	GA	0.4344	0.0000	0.0277
GASEPV	DEP	STANDARD	1	21	B	4	GA	0.7240	0.0000	0.0462
GASEPV	DEP	STANDARD	1	21	B	5	GA	0.1448	0.0000	0.0092
GASEPV	DEP	STANDARD	1	21	B	6	GA	0.3861	0.0000	0.0246
GASEPV	DEP	STANDARD	1	21	C	0	GA	1.0458	0.0000	0.0668
GASEPV	DEP	STANDARD	1	21	C	1	GA	0.6436	0.0000	0.0411
GASEPV	DEP	STANDARD	1	21	C	2	GA	0.6436	0.0000	0.0411
GASEPV	DEP	STANDARD	1	21	C	3	GA	0.1743	0.0000	0.0111
GASEPV	DEP	STANDARD	1	21	C	4	GA	0.1743	0.0000	0.0111
GASEPV	DEP	STANDARD	1	21	D	0	GA	0.4183	0.0000	0.0267
GASEPV	DEP	STANDARD	1	21	D	1	GA	0.2574	0.0000	0.0164
GASEPV	DEP	STANDARD	1	21	D	2	GA	0.2574	0.0000	0.0164
GASEPV	DEP	STANDARD	1	21	D	3	GA	0.0697	0.0000	0.0045
GASEPV	DEP	STANDARD	1	21	D	4	GA	0.0697	0.0000	0.0045
GASEPV	DEP	STANDARD	1	21	E	0	GA	0.4183	0.0000	0.0267
GASEPV	DEP	STANDARD	1	21	E	1	GA	0.2574	0.0000	0.0164
GASEPV	DEP	STANDARD	1	21	E	2	GA	0.2574	0.0000	0.0164
GASEPV	DEP	STANDARD	1	21	E	3	GA	0.0697	0.0000	0.0045
GASEPV	DEP	STANDARD	1	21	E	4	GA	0.0697	0.0000	0.0045
GASEPV	DEP	STANDARD	1	21	F	0	GA	0.2092	0.0000	0.0133
GASEPV	DEP	STANDARD	1	21	F	1	GA	0.1287	0.0000	0.0082
GASEPV	DEP	STANDARD	1	21	F	2	GA	0.1287	0.0000	0.0082
GASEPV	DEP	STANDARD	1	21	F	3	GA	0.0349	0.0000	0.0022
GASEPV	DEP	STANDARD	1	21	F	4	GA	0.0349	0.0000	0.0022
GASEPV	TGO	STANDARD	1	03	A	0	GA	0.6034	0.0000	0.0385
GASEPV	TGO	STANDARD	1	03	A	1	GA	0.4527	0.0000	0.0289
GASEPV	TGO	STANDARD	1	03	A	2	GA	0.4527	0.0000	0.0289
GASEPV	TGO	STANDARD	1	03	A	3	GA	0.1812	0.0000	0.0116
GASEPV	TGO	STANDARD	1	03	A	4	GA	0.1812	0.0000	0.0116
GASEPV	TGO	STANDARD	1	03	A	5	GA	0.0301	0.0000	0.0019
GASEPV	TGO	STANDARD	1	03	A	6	GA	0.0301	0.0000	0.0019
GASEPV	TGO	STANDARD	1	21	A	0	GA	2.4136	0.0000	0.1541
GASEPV	TGO	STANDARD	1	21	A	1	GA	1.8110	0.0000	0.1156
GASEPV	TGO	STANDARD	1	21	A	2	GA	1.8110	0.0000	0.1156
GASEPV	TGO	STANDARD	1	21	A	3	GA	0.7247	0.0000	0.0463
GASEPV	TGO	STANDARD	1	21	A	4	GA	0.7247	0.0000	0.0463
GASEPV	TGO	STANDARD	1	21	A	5	GA	0.1205	0.0000	0.0077

GASEPV	TGO	STANDARD	1	21	A	6	GA	0.1205	0.0000	0.0077
GV	APP	STANDARD	1	03	A	0	GA	0.0031	0.0000	0.0001
GV	APP	STANDARD	1	03	A	1	GA	0.0019	0.0000	0.0001
GV	APP	STANDARD	1	03	A	2	GA	0.0019	0.0000	0.0001
GV	APP	STANDARD	1	03	A	3	GA	0.0005	0.0000	0.0000
GV	APP	STANDARD	1	03	A	4	GA	0.0005	0.0000	0.0000
GV	APP	STANDARD	1	03	B	0	GA	0.0092	0.0000	0.0004
GV	APP	STANDARD	1	03	B	1	GA	0.0057	0.0000	0.0002
GV	APP	STANDARD	1	03	B	2	GA	0.0057	0.0000	0.0002
GV	APP	STANDARD	1	03	B	3	GA	0.0015	0.0000	0.0001
GV	APP	STANDARD	1	03	B	4	GA	0.0015	0.0000	0.0001
GV	APP	STANDARD	1	03	C	0	GA	0.0031	0.0000	0.0001
GV	APP	STANDARD	1	03	C	1	GA	0.0019	0.0000	0.0001
GV	APP	STANDARD	1	03	C	2	GA	0.0019	0.0000	0.0001
GV	APP	STANDARD	1	03	C	3	GA	0.0005	0.0000	0.0000
GV	APP	STANDARD	1	03	C	4	GA	0.0005	0.0000	0.0000
GV	APP	STANDARD	1	21	A	0	GA	0.0144	0.0000	0.0006
GV	APP	STANDARD	1	21	A	1	GA	0.0108	0.0000	0.0004
GV	APP	STANDARD	1	21	A	2	GA	0.0108	0.0000	0.0004
GV	APP	STANDARD	1	21	A	3	GA	0.0043	0.0000	0.0002
GV	APP	STANDARD	1	21	A	4	GA	0.0043	0.0000	0.0002
GV	APP	STANDARD	1	21	A	5	GA	0.0007	0.0000	0.0000
GV	APP	STANDARD	1	21	A	6	GA	0.0007	0.0000	0.0000
GV	APP	STANDARD	1	21	B	0	GA	0.0126	0.0000	0.0005
GV	APP	STANDARD	1	21	B	1	GA	0.0077	0.0000	0.0003
GV	APP	STANDARD	1	21	B	2	GA	0.0077	0.0000	0.0003
GV	APP	STANDARD	1	21	B	3	GA	0.0021	0.0000	0.0001
GV	APP	STANDARD	1	21	B	4	GA	0.0021	0.0000	0.0001
GV	APP	STANDARD	1	21	C	0	GA	0.0018	0.0000	0.0001
GV	APP	STANDARD	1	21	C	1	GA	0.0011	0.0000	0.0000
GV	APP	STANDARD	1	21	C	2	GA	0.0011	0.0000	0.0000
GV	APP	STANDARD	1	21	C	3	GA	0.0003	0.0000	0.0000
GV	APP	STANDARD	1	21	C	4	GA	0.0003	0.0000	0.0000
GV	APP	STANDARD	1	21	D	0	GA	0.0018	0.0000	0.0001
GV	APP	STANDARD	1	21	D	1	GA	0.0011	0.0000	0.0000
GV	APP	STANDARD	1	21	D	2	GA	0.0011	0.0000	0.0000
GV	APP	STANDARD	1	21	D	3	GA	0.0003	0.0000	0.0000
GV	APP	STANDARD	1	21	D	4	GA	0.0003	0.0000	0.0000
GV	APP	STANDARD	1	21	E	0	GA	0.0018	0.0000	0.0001
GV	APP	STANDARD	1	21	E	1	GA	0.0011	0.0000	0.0000
GV	APP	STANDARD	1	21	E	2	GA	0.0011	0.0000	0.0000
GV	APP	STANDARD	1	21	E	3	GA	0.0003	0.0000	0.0000
GV	APP	STANDARD	1	21	E	4	GA	0.0003	0.0000	0.0000
GV	DEP	STANDARD	1	03	A	0	GA	0.0037	0.0000	0.0002
GV	DEP	STANDARD	1	03	A	1	GA	0.0028	0.0000	0.0001
GV	DEP	STANDARD	1	03	A	2	GA	0.0028	0.0000	0.0001
GV	DEP	STANDARD	1	03	A	3	GA	0.0011	0.0000	0.0000
GV	DEP	STANDARD	1	03	A	4	GA	0.0011	0.0000	0.0000
GV	DEP	STANDARD	1	03	A	5	GA	0.0002	0.0000	0.0000
GV	DEP	STANDARD	1	03	A	6	GA	0.0002	0.0000	0.0000
GV	DEP	STANDARD	1	03	B	0	GA	0.0074	0.0000	0.0003
GV	DEP	STANDARD	1	03	B	1	GA	0.0056	0.0000	0.0002
GV	DEP	STANDARD	1	03	B	2	GA	0.0056	0.0000	0.0002
GV	DEP	STANDARD	1	03	B	3	GA	0.0022	0.0000	0.0001
GV	DEP	STANDARD	1	03	B	4	GA	0.0022	0.0000	0.0001

GV	DEP	STANDARD	1	03	B	5	GA	0.0004	0.0000	0.0000
GV	DEP	STANDARD	1	03	B	6	GA	0.0004	0.0000	0.0000
GV	DEP	STANDARD	1	03	C	0	GA	0.0015	0.0000	0.0001
GV	DEP	STANDARD	1	03	C	1	GA	0.0009	0.0000	0.0000
GV	DEP	STANDARD	1	03	C	2	GA	0.0009	0.0000	0.0000
GV	DEP	STANDARD	1	03	C	3	GA	0.0003	0.0000	0.0000
GV	DEP	STANDARD	1	03	C	4	GA	0.0003	0.0000	0.0000
GV	DEP	STANDARD	1	21	A	0	GA	0.0018	0.0000	0.0001
GV	DEP	STANDARD	1	21	A	1	GA	0.0011	0.0000	0.0000
GV	DEP	STANDARD	1	21	A	2	GA	0.0011	0.0000	0.0000
GV	DEP	STANDARD	1	21	A	3	GA	0.0003	0.0000	0.0000
GV	DEP	STANDARD	1	21	A	4	GA	0.0003	0.0000	0.0000
GV	DEP	STANDARD	1	21	B	0	GA	0.0034	0.0000	0.0002
GV	DEP	STANDARD	1	21	B	1	GA	0.0028	0.0000	0.0001
GV	DEP	STANDARD	1	21	B	2	GA	0.0028	0.0000	0.0001
GV	DEP	STANDARD	1	21	B	3	GA	0.0012	0.0000	0.0001
GV	DEP	STANDARD	1	21	B	4	GA	0.0021	0.0000	0.0001
GV	DEP	STANDARD	1	21	B	5	GA	0.0004	0.0000	0.0000
GV	DEP	STANDARD	1	21	B	6	GA	0.0011	0.0000	0.0000
GV	DEP	STANDARD	1	21	C	0	GA	0.0014	0.0000	0.0001
GV	DEP	STANDARD	1	21	C	1	GA	0.0009	0.0000	0.0000
GV	DEP	STANDARD	1	21	C	2	GA	0.0009	0.0000	0.0000
GV	DEP	STANDARD	1	21	C	3	GA	0.0002	0.0000	0.0000
GV	DEP	STANDARD	1	21	C	4	GA	0.0002	0.0000	0.0000
GV	DEP	STANDARD	1	21	D	0	GA	0.0011	0.0000	0.0000
GV	DEP	STANDARD	1	21	D	1	GA	0.0007	0.0000	0.0000
GV	DEP	STANDARD	1	21	D	2	GA	0.0007	0.0000	0.0000
GV	DEP	STANDARD	1	21	D	3	GA	0.0002	0.0000	0.0000
GV	DEP	STANDARD	1	21	D	4	GA	0.0002	0.0000	0.0000
GV	DEP	STANDARD	1	21	E	0	GA	0.0011	0.0000	0.0000
GV	DEP	STANDARD	1	21	E	1	GA	0.0007	0.0000	0.0000
GV	DEP	STANDARD	1	21	E	2	GA	0.0007	0.0000	0.0000
GV	DEP	STANDARD	1	21	E	3	GA	0.0002	0.0000	0.0000
GV	DEP	STANDARD	1	21	E	4	GA	0.0002	0.0000	0.0000
GV	DEP	STANDARD	1	21	F	0	GA	0.0251	0.0000	0.0011
GV	DEP	STANDARD	1	21	F	1	GA	0.0155	0.0000	0.0006
GV	DEP	STANDARD	1	21	F	2	GA	0.0155	0.0000	0.0006
GV	DEP	STANDARD	1	21	F	3	GA	0.0042	0.0000	0.0002
GV	DEP	STANDARD	1	21	F	4	GA	0.0042	0.0000	0.0002
HS748A	APP	STANDARD	1	03	A	0	COM	0.0025	0.0000	0.0004
HS748A	APP	STANDARD	1	03	A	1	COM	0.0015	0.0000	0.0003
HS748A	APP	STANDARD	1	03	A	2	COM	0.0015	0.0000	0.0003
HS748A	APP	STANDARD	1	03	A	3	COM	0.0004	0.0000	0.0001
HS748A	APP	STANDARD	1	03	A	4	COM	0.0004	0.0000	0.0001
HS748A	APP	STANDARD	1	03	B	0	COM	0.0074	0.0000	0.0013
HS748A	APP	STANDARD	1	03	B	1	COM	0.0045	0.0000	0.0008
HS748A	APP	STANDARD	1	03	B	2	COM	0.0045	0.0000	0.0008
HS748A	APP	STANDARD	1	03	B	3	COM	0.0012	0.0000	0.0002
HS748A	APP	STANDARD	1	03	B	4	COM	0.0012	0.0000	0.0002
HS748A	APP	STANDARD	1	03	C	0	COM	0.0025	0.0000	0.0004
HS748A	APP	STANDARD	1	03	C	1	COM	0.0015	0.0000	0.0003
HS748A	APP	STANDARD	1	03	C	2	COM	0.0015	0.0000	0.0003
HS748A	APP	STANDARD	1	03	C	3	COM	0.0004	0.0000	0.0001
HS748A	APP	STANDARD	1	03	C	4	COM	0.0004	0.0000	0.0001
HS748A	APP	STANDARD	1	21	A	0	COM	0.0115	0.0000	0.0020

HS748A	APP	STANDARD	1	21	A	1	COM	0.0086	0.0000	0.0015
HS748A	APP	STANDARD	1	21	A	2	COM	0.0086	0.0000	0.0015
HS748A	APP	STANDARD	1	21	A	3	COM	0.0034	0.0000	0.0006
HS748A	APP	STANDARD	1	21	A	4	COM	0.0034	0.0000	0.0006
HS748A	APP	STANDARD	1	21	A	5	COM	0.0006	0.0000	0.0001
HS748A	APP	STANDARD	1	21	A	6	COM	0.0006	0.0000	0.0001
HS748A	APP	STANDARD	1	21	B	0	COM	0.0100	0.0000	0.0018
HS748A	APP	STANDARD	1	21	B	1	COM	0.0062	0.0000	0.0011
HS748A	APP	STANDARD	1	21	B	2	COM	0.0062	0.0000	0.0011
HS748A	APP	STANDARD	1	21	B	3	COM	0.0017	0.0000	0.0003
HS748A	APP	STANDARD	1	21	B	4	COM	0.0017	0.0000	0.0003
HS748A	APP	STANDARD	1	21	C	0	COM	0.0014	0.0000	0.0002
HS748A	APP	STANDARD	1	21	C	1	COM	0.0009	0.0000	0.0001
HS748A	APP	STANDARD	1	21	C	2	COM	0.0009	0.0000	0.0001
HS748A	APP	STANDARD	1	21	C	3	COM	0.0002	0.0000	0.0000
HS748A	APP	STANDARD	1	21	C	4	COM	0.0002	0.0000	0.0000
HS748A	APP	STANDARD	1	21	D	0	COM	0.0014	0.0000	0.0002
HS748A	APP	STANDARD	1	21	D	1	COM	0.0009	0.0000	0.0001
HS748A	APP	STANDARD	1	21	D	2	COM	0.0009	0.0000	0.0001
HS748A	APP	STANDARD	1	21	D	3	COM	0.0002	0.0000	0.0000
HS748A	APP	STANDARD	1	21	D	4	COM	0.0002	0.0000	0.0000
HS748A	APP	STANDARD	1	21	E	0	COM	0.0014	0.0000	0.0002
HS748A	APP	STANDARD	1	21	E	1	COM	0.0009	0.0000	0.0001
HS748A	APP	STANDARD	1	21	E	2	COM	0.0009	0.0000	0.0001
HS748A	APP	STANDARD	1	21	E	3	COM	0.0002	0.0000	0.0000
HS748A	APP	STANDARD	1	21	E	4	COM	0.0002	0.0000	0.0000
HS748A	DEP	STANDARD	1	03	A	0	COM	0.0029	0.0000	0.0005
HS748A	DEP	STANDARD	1	03	A	1	COM	0.0022	0.0000	0.0004
HS748A	DEP	STANDARD	1	03	A	2	COM	0.0022	0.0000	0.0004
HS748A	DEP	STANDARD	1	03	A	3	COM	0.0009	0.0000	0.0002
HS748A	DEP	STANDARD	1	03	A	4	COM	0.0009	0.0000	0.0002
HS748A	DEP	STANDARD	1	03	A	5	COM	0.0001	0.0000	0.0000
HS748A	DEP	STANDARD	1	03	A	6	COM	0.0001	0.0000	0.0000
HS748A	DEP	STANDARD	1	03	B	0	COM	0.0059	0.0000	0.0010
HS748A	DEP	STANDARD	1	03	B	1	COM	0.0044	0.0000	0.0008
HS748A	DEP	STANDARD	1	03	B	2	COM	0.0044	0.0000	0.0008
HS748A	DEP	STANDARD	1	03	B	3	COM	0.0018	0.0000	0.0003
HS748A	DEP	STANDARD	1	03	B	4	COM	0.0018	0.0000	0.0003
HS748A	DEP	STANDARD	1	03	B	5	COM	0.0003	0.0000	0.0001
HS748A	DEP	STANDARD	1	03	B	6	COM	0.0003	0.0000	0.0001
HS748A	DEP	STANDARD	1	03	C	0	COM	0.0012	0.0000	0.0002
HS748A	DEP	STANDARD	1	03	C	1	COM	0.0007	0.0000	0.0001
HS748A	DEP	STANDARD	1	03	C	2	COM	0.0007	0.0000	0.0001
HS748A	DEP	STANDARD	1	03	C	3	COM	0.0002	0.0000	0.0000
HS748A	DEP	STANDARD	1	03	C	4	COM	0.0002	0.0000	0.0000
HS748A	DEP	STANDARD	1	21	A	0	COM	0.0014	0.0000	0.0002
HS748A	DEP	STANDARD	1	21	A	1	COM	0.0009	0.0000	0.0001
HS748A	DEP	STANDARD	1	21	A	2	COM	0.0009	0.0000	0.0001
HS748A	DEP	STANDARD	1	21	A	3	COM	0.0002	0.0000	0.0000
HS748A	DEP	STANDARD	1	21	A	4	COM	0.0002	0.0000	0.0000
HS748A	DEP	STANDARD	1	21	B	0	COM	0.0027	0.0000	0.0005
HS748A	DEP	STANDARD	1	21	B	1	COM	0.0022	0.0000	0.0004
HS748A	DEP	STANDARD	1	21	B	2	COM	0.0022	0.0000	0.0004
HS748A	DEP	STANDARD	1	21	B	3	COM	0.0010	0.0000	0.0002
HS748A	DEP	STANDARD	1	21	B	4	COM	0.0016	0.0000	0.0003

HS748A	DEP	STANDARD	1	21	B	5	COM	0.0003	0.0000	0.0001
HS748A	DEP	STANDARD	1	21	B	6	COM	0.0009	0.0000	0.0002
HS748A	DEP	STANDARD	1	21	C	0	COM	0.0011	0.0000	0.0002
HS748A	DEP	STANDARD	1	21	C	1	COM	0.0007	0.0000	0.0001
HS748A	DEP	STANDARD	1	21	C	2	COM	0.0007	0.0000	0.0001
HS748A	DEP	STANDARD	1	21	C	3	COM	0.0002	0.0000	0.0000
HS748A	DEP	STANDARD	1	21	C	4	COM	0.0002	0.0000	0.0000
HS748A	DEP	STANDARD	1	21	D	0	COM	0.0009	0.0000	0.0002
HS748A	DEP	STANDARD	1	21	D	1	COM	0.0005	0.0000	0.0001
HS748A	DEP	STANDARD	1	21	D	2	COM	0.0005	0.0000	0.0001
HS748A	DEP	STANDARD	1	21	D	3	COM	0.0001	0.0000	0.0000
HS748A	DEP	STANDARD	1	21	D	4	COM	0.0001	0.0000	0.0000
HS748A	DEP	STANDARD	1	21	E	0	COM	0.0009	0.0000	0.0002
HS748A	DEP	STANDARD	1	21	E	1	COM	0.0005	0.0000	0.0001
HS748A	DEP	STANDARD	1	21	E	2	COM	0.0005	0.0000	0.0001
HS748A	DEP	STANDARD	1	21	E	3	COM	0.0001	0.0000	0.0000
HS748A	DEP	STANDARD	1	21	E	4	COM	0.0001	0.0000	0.0000
HS748A	DEP	STANDARD	1	21	F	0	COM	0.0200	0.0000	0.0035
HS748A	DEP	STANDARD	1	21	F	1	COM	0.0123	0.0000	0.0022
HS748A	DEP	STANDARD	1	21	F	2	COM	0.0123	0.0000	0.0022
HS748A	DEP	STANDARD	1	21	F	3	COM	0.0033	0.0000	0.0006
HS748A	DEP	STANDARD	1	21	F	4	COM	0.0033	0.0000	0.0006
LEAR25	APP	STANDARD	1	03	A	0	GA	0.0308	0.0000	0.0013
LEAR25	APP	STANDARD	1	03	A	1	GA	0.0189	0.0000	0.0008
LEAR25	APP	STANDARD	1	03	A	2	GA	0.0189	0.0000	0.0008
LEAR25	APP	STANDARD	1	03	A	3	GA	0.0051	0.0000	0.0002
LEAR25	APP	STANDARD	1	03	A	4	GA	0.0051	0.0000	0.0002
LEAR25	APP	STANDARD	1	03	B	0	GA	0.0923	0.0000	0.0039
LEAR25	APP	STANDARD	1	03	B	1	GA	0.0568	0.0000	0.0024
LEAR25	APP	STANDARD	1	03	B	2	GA	0.0568	0.0000	0.0024
LEAR25	APP	STANDARD	1	03	B	3	GA	0.0154	0.0000	0.0006
LEAR25	APP	STANDARD	1	03	B	4	GA	0.0154	0.0000	0.0006
LEAR25	APP	STANDARD	1	03	C	0	GA	0.0308	0.0000	0.0013
LEAR25	APP	STANDARD	1	03	C	1	GA	0.0189	0.0000	0.0008
LEAR25	APP	STANDARD	1	03	C	2	GA	0.0189	0.0000	0.0008
LEAR25	APP	STANDARD	1	03	C	3	GA	0.0051	0.0000	0.0002
LEAR25	APP	STANDARD	1	03	C	4	GA	0.0051	0.0000	0.0002
LEAR25	APP	STANDARD	1	21	A	0	GA	0.1438	0.0000	0.0060
LEAR25	APP	STANDARD	1	21	A	1	GA	0.1079	0.0000	0.0045
LEAR25	APP	STANDARD	1	21	A	2	GA	0.1079	0.0000	0.0045
LEAR25	APP	STANDARD	1	21	A	3	GA	0.0432	0.0000	0.0018
LEAR25	APP	STANDARD	1	21	A	4	GA	0.0432	0.0000	0.0018
LEAR25	APP	STANDARD	1	21	A	5	GA	0.0072	0.0000	0.0003
LEAR25	APP	STANDARD	1	21	A	6	GA	0.0072	0.0000	0.0003
LEAR25	APP	STANDARD	1	21	B	0	GA	0.1257	0.0000	0.0052
LEAR25	APP	STANDARD	1	21	B	1	GA	0.0773	0.0000	0.0032
LEAR25	APP	STANDARD	1	21	B	2	GA	0.0773	0.0000	0.0032
LEAR25	APP	STANDARD	1	21	B	3	GA	0.0209	0.0000	0.0009
LEAR25	APP	STANDARD	1	21	B	4	GA	0.0209	0.0000	0.0009
LEAR25	APP	STANDARD	1	21	C	0	GA	0.0179	0.0000	0.0007
LEAR25	APP	STANDARD	1	21	C	1	GA	0.0110	0.0000	0.0005
LEAR25	APP	STANDARD	1	21	C	2	GA	0.0110	0.0000	0.0005
LEAR25	APP	STANDARD	1	21	C	3	GA	0.0030	0.0000	0.0001
LEAR25	APP	STANDARD	1	21	C	4	GA	0.0030	0.0000	0.0001
LEAR25	APP	STANDARD	1	21	D	0	GA	0.0179	0.0000	0.0007

LEAR25	APP	STANDARD	1	21	D	1	GA	0.0110	0.0000	0.0005
LEAR25	APP	STANDARD	1	21	D	2	GA	0.0110	0.0000	0.0005
LEAR25	APP	STANDARD	1	21	D	3	GA	0.0030	0.0000	0.0001
LEAR25	APP	STANDARD	1	21	D	4	GA	0.0030	0.0000	0.0001
LEAR25	APP	STANDARD	1	21	E	0	GA	0.0179	0.0000	0.0007
LEAR25	APP	STANDARD	1	21	E	1	GA	0.0110	0.0000	0.0005
LEAR25	APP	STANDARD	1	21	E	2	GA	0.0110	0.0000	0.0005
LEAR25	APP	STANDARD	1	21	E	3	GA	0.0030	0.0000	0.0001
LEAR25	APP	STANDARD	1	21	E	4	GA	0.0030	0.0000	0.0001
LEAR25	DEP	STANDARD	1	03	A	0	GA	0.0370	0.0000	0.0015
LEAR25	DEP	STANDARD	1	03	A	1	GA	0.0278	0.0000	0.0011
LEAR25	DEP	STANDARD	1	03	A	2	GA	0.0278	0.0000	0.0011
LEAR25	DEP	STANDARD	1	03	A	3	GA	0.0111	0.0000	0.0005
LEAR25	DEP	STANDARD	1	03	A	4	GA	0.0111	0.0000	0.0005
LEAR25	DEP	STANDARD	1	03	A	5	GA	0.0018	0.0000	0.0001
LEAR25	DEP	STANDARD	1	03	A	6	GA	0.0018	0.0000	0.0001
LEAR25	DEP	STANDARD	1	03	B	0	GA	0.0739	0.0000	0.0031
LEAR25	DEP	STANDARD	1	03	B	1	GA	0.0555	0.0000	0.0023
LEAR25	DEP	STANDARD	1	03	B	2	GA	0.0555	0.0000	0.0023
LEAR25	DEP	STANDARD	1	03	B	3	GA	0.0222	0.0000	0.0009
LEAR25	DEP	STANDARD	1	03	B	4	GA	0.0222	0.0000	0.0009
LEAR25	DEP	STANDARD	1	03	B	5	GA	0.0037	0.0000	0.0002
LEAR25	DEP	STANDARD	1	03	B	6	GA	0.0037	0.0000	0.0002
LEAR25	DEP	STANDARD	1	03	C	0	GA	0.0154	0.0000	0.0006
LEAR25	DEP	STANDARD	1	03	C	1	GA	0.0095	0.0000	0.0004
LEAR25	DEP	STANDARD	1	03	C	2	GA	0.0095	0.0000	0.0004
LEAR25	DEP	STANDARD	1	03	C	3	GA	0.0026	0.0000	0.0001
LEAR25	DEP	STANDARD	1	03	C	4	GA	0.0026	0.0000	0.0001
LEAR25	DEP	STANDARD	1	21	B	0	GA	0.0345	0.0000	0.0014
LEAR25	DEP	STANDARD	1	21	B	1	GA	0.0276	0.0000	0.0012
LEAR25	DEP	STANDARD	1	21	B	2	GA	0.0276	0.0000	0.0012
LEAR25	DEP	STANDARD	1	21	B	3	GA	0.0124	0.0000	0.0005
LEAR25	DEP	STANDARD	1	21	B	4	GA	0.0207	0.0000	0.0009
LEAR25	DEP	STANDARD	1	21	B	5	GA	0.0041	0.0000	0.0002
LEAR25	DEP	STANDARD	1	21	B	6	GA	0.0110	0.0000	0.0005
LEAR25	DEP	STANDARD	1	21	F	0	GA	0.3052	0.0000	0.0127
LEAR25	DEP	STANDARD	1	21	F	1	GA	0.1878	0.0000	0.0078
LEAR25	DEP	STANDARD	1	21	F	2	GA	0.1878	0.0000	0.0078
LEAR25	DEP	STANDARD	1	21	F	3	GA	0.0509	0.0000	0.0021
LEAR25	DEP	STANDARD	1	21	F	4	GA	0.0509	0.0000	0.0021
LEAR35	APP	STANDARD	1	03	A	0	GA	0.0293	0.0000	0.0028
LEAR35	APP	STANDARD	1	03	A	1	GA	0.0180	0.0000	0.0017
LEAR35	APP	STANDARD	1	03	A	2	GA	0.0180	0.0000	0.0017
LEAR35	APP	STANDARD	1	03	A	3	GA	0.0049	0.0000	0.0005
LEAR35	APP	STANDARD	1	03	A	4	GA	0.0049	0.0000	0.0005
LEAR35	APP	STANDARD	1	03	B	0	GA	0.0877	0.0000	0.0085
LEAR35	APP	STANDARD	1	03	B	1	GA	0.0540	0.0000	0.0052
LEAR35	APP	STANDARD	1	03	B	2	GA	0.0540	0.0000	0.0052
LEAR35	APP	STANDARD	1	03	B	3	GA	0.0146	0.0000	0.0014
LEAR35	APP	STANDARD	1	03	B	4	GA	0.0146	0.0000	0.0014
LEAR35	APP	STANDARD	1	03	C	0	GA	0.0293	0.0000	0.0028
LEAR35	APP	STANDARD	1	03	C	1	GA	0.0180	0.0000	0.0017
LEAR35	APP	STANDARD	1	03	C	2	GA	0.0180	0.0000	0.0017
LEAR35	APP	STANDARD	1	03	C	3	GA	0.0049	0.0000	0.0005
LEAR35	APP	STANDARD	1	03	C	4	GA	0.0049	0.0000	0.0005

LEAR35	APP	STANDARD	1	21	A	0	GA	0.1366	0.0000	0.0132
LEAR35	APP	STANDARD	1	21	A	1	GA	0.1025	0.0000	0.0099
LEAR35	APP	STANDARD	1	21	A	2	GA	0.1025	0.0000	0.0099
LEAR35	APP	STANDARD	1	21	A	3	GA	0.0410	0.0000	0.0040
LEAR35	APP	STANDARD	1	21	A	4	GA	0.0410	0.0000	0.0040
LEAR35	APP	STANDARD	1	21	A	5	GA	0.0068	0.0000	0.0007
LEAR35	APP	STANDARD	1	21	A	6	GA	0.0068	0.0000	0.0007
LEAR35	APP	STANDARD	1	21	B	0	GA	0.1194	0.0000	0.0115
LEAR35	APP	STANDARD	1	21	B	1	GA	0.0735	0.0000	0.0071
LEAR35	APP	STANDARD	1	21	B	2	GA	0.0735	0.0000	0.0071
LEAR35	APP	STANDARD	1	21	B	3	GA	0.0199	0.0000	0.0019
LEAR35	APP	STANDARD	1	21	B	4	GA	0.0199	0.0000	0.0019
LEAR35	APP	STANDARD	1	21	C	0	GA	0.0170	0.0000	0.0016
LEAR35	APP	STANDARD	1	21	C	1	GA	0.0105	0.0000	0.0010
LEAR35	APP	STANDARD	1	21	C	2	GA	0.0105	0.0000	0.0010
LEAR35	APP	STANDARD	1	21	C	3	GA	0.0028	0.0000	0.0003
LEAR35	APP	STANDARD	1	21	C	4	GA	0.0028	0.0000	0.0003
LEAR35	APP	STANDARD	1	21	D	0	GA	0.0170	0.0000	0.0016
LEAR35	APP	STANDARD	1	21	D	1	GA	0.0105	0.0000	0.0010
LEAR35	APP	STANDARD	1	21	D	2	GA	0.0105	0.0000	0.0010
LEAR35	APP	STANDARD	1	21	D	3	GA	0.0028	0.0000	0.0003
LEAR35	APP	STANDARD	1	21	D	4	GA	0.0028	0.0000	0.0003
LEAR35	APP	STANDARD	1	21	E	0	GA	0.0170	0.0000	0.0016
LEAR35	APP	STANDARD	1	21	E	1	GA	0.0105	0.0000	0.0010
LEAR35	APP	STANDARD	1	21	E	2	GA	0.0105	0.0000	0.0010
LEAR35	APP	STANDARD	1	21	E	3	GA	0.0028	0.0000	0.0003
LEAR35	APP	STANDARD	1	21	E	4	GA	0.0028	0.0000	0.0003
LEAR35	DEP	STANDARD	1	03	A	0	GA	0.0351	0.0000	0.0034
LEAR35	DEP	STANDARD	1	03	A	1	GA	0.0263	0.0000	0.0025
LEAR35	DEP	STANDARD	1	03	A	2	GA	0.0263	0.0000	0.0025
LEAR35	DEP	STANDARD	1	03	A	3	GA	0.0105	0.0000	0.0010
LEAR35	DEP	STANDARD	1	03	A	4	GA	0.0105	0.0000	0.0010
LEAR35	DEP	STANDARD	1	03	A	5	GA	0.0018	0.0000	0.0002
LEAR35	DEP	STANDARD	1	03	A	6	GA	0.0018	0.0000	0.0002
LEAR35	DEP	STANDARD	1	03	B	0	GA	0.0703	0.0000	0.0068
LEAR35	DEP	STANDARD	1	03	B	1	GA	0.0527	0.0000	0.0051
LEAR35	DEP	STANDARD	1	03	B	2	GA	0.0527	0.0000	0.0051
LEAR35	DEP	STANDARD	1	03	B	3	GA	0.0211	0.0000	0.0020
LEAR35	DEP	STANDARD	1	03	B	4	GA	0.0211	0.0000	0.0020
LEAR35	DEP	STANDARD	1	03	B	5	GA	0.0035	0.0000	0.0003
LEAR35	DEP	STANDARD	1	03	B	6	GA	0.0035	0.0000	0.0003
LEAR35	DEP	STANDARD	1	03	C	0	GA	0.0146	0.0000	0.0014
LEAR35	DEP	STANDARD	1	03	C	1	GA	0.0090	0.0000	0.0009
LEAR35	DEP	STANDARD	1	03	C	2	GA	0.0090	0.0000	0.0009
LEAR35	DEP	STANDARD	1	03	C	3	GA	0.0024	0.0000	0.0002
LEAR35	DEP	STANDARD	1	03	C	4	GA	0.0024	0.0000	0.0002
LEAR35	DEP	STANDARD	1	21	A	0	GA	0.0170	0.0000	0.0016
LEAR35	DEP	STANDARD	1	21	A	1	GA	0.0105	0.0000	0.0010
LEAR35	DEP	STANDARD	1	21	A	2	GA	0.0105	0.0000	0.0010
LEAR35	DEP	STANDARD	1	21	A	3	GA	0.0028	0.0000	0.0003
LEAR35	DEP	STANDARD	1	21	A	4	GA	0.0028	0.0000	0.0003
LEAR35	DEP	STANDARD	1	21	B	0	GA	0.0328	0.0000	0.0032
LEAR35	DEP	STANDARD	1	21	B	1	GA	0.0262	0.0000	0.0025
LEAR35	DEP	STANDARD	1	21	B	2	GA	0.0262	0.0000	0.0025
LEAR35	DEP	STANDARD	1	21	B	3	GA	0.0118	0.0000	0.0011

LEAR35	DEP	STANDARD	1	21	B	4	GA	0.0197	0.0000	0.0019
LEAR35	DEP	STANDARD	1	21	B	5	GA	0.0039	0.0000	0.0004
LEAR35	DEP	STANDARD	1	21	B	6	GA	0.0105	0.0000	0.0010
LEAR35	DEP	STANDARD	1	21	C	0	GA	0.0137	0.0000	0.0013
LEAR35	DEP	STANDARD	1	21	C	1	GA	0.0084	0.0000	0.0008
LEAR35	DEP	STANDARD	1	21	C	2	GA	0.0084	0.0000	0.0008
LEAR35	DEP	STANDARD	1	21	C	3	GA	0.0023	0.0000	0.0002
LEAR35	DEP	STANDARD	1	21	C	4	GA	0.0023	0.0000	0.0002
LEAR35	DEP	STANDARD	1	21	D	0	GA	0.0102	0.0000	0.0010
LEAR35	DEP	STANDARD	1	21	D	1	GA	0.0063	0.0000	0.0006
LEAR35	DEP	STANDARD	1	21	D	2	GA	0.0063	0.0000	0.0006
LEAR35	DEP	STANDARD	1	21	D	3	GA	0.0017	0.0000	0.0002
LEAR35	DEP	STANDARD	1	21	D	4	GA	0.0017	0.0000	0.0002
LEAR35	DEP	STANDARD	1	21	E	0	GA	0.0102	0.0000	0.0010
LEAR35	DEP	STANDARD	1	21	E	1	GA	0.0063	0.0000	0.0006
LEAR35	DEP	STANDARD	1	21	E	2	GA	0.0063	0.0000	0.0006
LEAR35	DEP	STANDARD	1	21	E	3	GA	0.0017	0.0000	0.0002
LEAR35	DEP	STANDARD	1	21	E	4	GA	0.0017	0.0000	0.0002
LEAR35	DEP	STANDARD	1	21	F	0	GA	0.2388	0.0000	0.0230
LEAR35	DEP	STANDARD	1	21	F	1	GA	0.1469	0.0000	0.0142
LEAR35	DEP	STANDARD	1	21	F	2	GA	0.1469	0.0000	0.0142
LEAR35	DEP	STANDARD	1	21	F	3	GA	0.0398	0.0000	0.0038
LEAR35	DEP	STANDARD	1	21	F	4	GA	0.0398	0.0000	0.0038

CASE RUNUP OPERATIONS

Acft	RunupId	X(nmi)	Y(nmi)	Head	Thrust	Dur(sec)	Day	Evening	Night

CASE GRID DEFINITIONS

Name	Type	X(nmi)	Y(nmi)	Ang(deg)	DisI(nmi)	DisJ(nmi)	NI	NJ	Thrsh	dAmb	(hr)
01	Detailed	-0.4022	-0.5387	0.0	0.0000	0.0000	1	1	85.0	0.0	0.00
02	Standard	0.4552	0.5446	0.0	0.0000	0.0000	1	1	85.0	0.0	0.00
03	Standard	0.4478	0.9659	0.0	0.0000	0.0000	1	1	85.0	0.0	0.00
04	Standard	-0.8349	-0.6578	0.0	0.0000	0.0000	1	1	85.0	0.0	0.00
05	Standard	1.1919	0.2035	0.0	0.0000	0.0000	1	1	85.0	0.0	0.00
06	Standard	-0.8213	-2.1169	0.0	0.0000	0.0000	1	1	85.0	0.0	0.00
CONTOUR	Contour	-2.5000	-2.5000	0.0	5.0000	5.0000	2	2	85.0	0.0	0.00
LOCATION	Location	0.0000	0.0000	0.0	0.0000	0.0000	1	1	85.0	0.0	0.00

CASE RUN OPTIONS

Run Type : Single-Metric
NoiseMetric : DNL
Do Terrain : Yes
Do Contour : No
Ground Type : All-Soft-Ground
Do Population : No
Do Locations : Yes
Do Standard : Yes
Do Detailed : Yes
Show All Ops : Yes
Compute System Metrics:
DNL : Yes
CNEL : No
LAEQ : No
LAEQD : No
LAEQN : No

SEL : No
LAMAX : No
TALA : No
NEF : No
WECPNL : No
EPNL : No
PNLTM : No
TAPNL : No
CEXP : No
LCMAX : No
TALC : No

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TECHNICAL INFORMATION PAPER

Glossary of Noise Compatibility Terms

TECHNICAL INFORMATION PAPER

GLOSSARY OF NOISE COMPATIBILITY TERMS

A-WEIGHTED SOUND LEVEL - A sound pressure level, often noted as dBA, which has been frequency filtered or weighted to quantitatively reduce the effect of the low frequency noise. It was designed to approximate the response of the human ear to sound.

AMBIENT NOISE - The totality of noise in a given place and time — usually a composite of sounds from varying sources at varying distances.

APPROACH LIGHT SYSTEM (ALS) - An airport lighting facility which provides visual guidance to landing aircraft by radiating light beams in a directional pattern by which the pilot aligns the aircraft with the extended centerline of the runway on the final approach for landing.

ATTENUATION - Acoustical phenomenon whereby a reduction in sound energy is experienced between the noise source and receiver. This energy loss can be attributed to atmospheric conditions, terrain, vegetation, and man-made and natural features.

AZIMUTH - Horizontal direction expressed as the angular distance between true north and the direction of a fixed point (as the observer's heading).

BASE LEG - A flight path at right angles to the landing runway off its approach end. The base leg normally extends from the downwind leg to the intersection of the extended runway centerline. See "traffic pattern."

CNEL - The 24-hour average sound level, in A-weighted decibels, obtained after the addition of 4.77 decibels to sound levels between 7 p.m. and 10 p.m. and 10 decibels to sound levels between 10 p.m. and 7 a.m., as averaged over a span of one year. In California, it is the required metric for determining the cumulative exposure of individuals to aircraft noise. Also see "Leq" and "DNL".

COMMUNITY NOISE EQUIVALENT LEVEL - See CNEL.

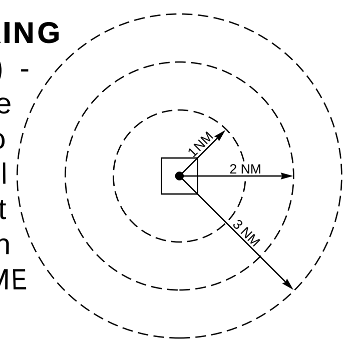
CROSSWIND LEG - A flight path at right angles to the landing runway off its upwind end. See "traffic pattern."

DAY-NIGHT AVERAGE SOUND LEVEL - See DNL.

DECIBEL (dB) - The physical unit commonly used to describe noise levels. The decibel represents a relative measure or ratio to a reference power. This reference value is a sound pressure of 20 micropascals which can be referred to as 1 decibel or the weakest sound that can be heard by a person with very good hearing in an extremely quiet room.

DISPLACED THRESHOLD - A threshold that is located at a point on the runway other than the designated beginning of the runway.

DISTANCE MEASURING EQUIPMENT (DME) - Equipment (airborne and ground) used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid.



DNL - The 24-hour average sound level, in A-weighted decibels, obtained after the addition of ten decibels to sound levels for the periods between 10 p.m. and 7 a.m. as averaged over a span of one year. It is the FAA standard metric for determining the cumulative exposure of individuals to noise. Also see "Leq."

DOWNWIND LEG - A flight path parallel to the landing runway in the direction opposite to landing. The downwind leg normally extends between the crosswind leg and the base leg. Also see "traffic pattern."

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DURATION - Length of time, in seconds, a noise event such as an aircraft flyover is experienced. (May refer to the length of time a noise event exceeds a specified dB threshold level.)

EASEMENT - The legal right of one party to use a portion of the total rights in real estate owned by another party. This may include the right of passage over, on, or below the property; certain air rights above the property, including view rights; and the rights to any specified form of development or activity, as well as any other legal rights in the property that may be specified in the easement document.

EQUIVALENT SOUND LEVEL - See Leq.

FINAL APPROACH - A flight path in the direction of landing along the extended runway centerline. The final approach normally extends from the base leg to the runway. See "traffic pattern."

FIXED BASE OPERATOR (FBO) - A provider of services to users of an airport. Such services include, but are not limited to, hangaring, fueling, flight training, repair and maintenance.

GLIDE SLOPE (GS) - Provides vertical guidance for aircraft during approach and landing. The glide slope consists of the following:

1. Electronic components emitting signals which provide vertical guidance by reference to airborne instruments during instrument approaches such as ILS, or

2. Visual ground aids, such as VASI, which provide vertical guidance for VFR approach or for the visual portion of an instrument approach and landing.

GLOBAL POSITIONING SYSTEM - See "GPS."

GPS - GLOBAL POSITIONING SYSTEM - A system of 24 satellites used as reference points to enable navigators equipped with GPS receivers to determine their latitude, longitude, and altitude. The accuracy of the system can be further refined by using a ground receiver at a known location to calculate the error in the satellite range data. This is known as Differential GPS (DGPS).

GROUND EFFECT - The attenuation attributed to absorption or reflection of noise by man-made or natural features on the ground surface.

HOURLY NOISE LEVEL (HNL) - A noise summation metric which considers primarily those single events which exceed a specified threshold or duration during one hour.

INSTRUMENT APPROACH - A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing, or to a point from which a landing may be made visually.

INSTRUMENT FLIGHT RULES (IFR) -Rules governing the procedures for conducting instrument flight. Also a term used by pilots and controllers to indicate type of flight plan.

INSTRUMENT LANDING SYSTEM (ILS) - A precision instrument approach system which normally consists of the following electronic components and visual aids:

1. Localizer.
2. Glide Slope.
3. Outer Marker.
4. Middle Marker.
5. Approach Lights.

Ldn - (See DNL). Ldn used in place of DNL in mathematical equations only.

Leq - Equivalent Sound Level. The steady A-weighted sound level over any specified period (not necessarily 24 hours) that has the same acoustic energy as the fluctuating noise during that period (with no consideration of a nighttime weighting.) It is a measure of cumulative acoustical energy. Because the time interval may vary, it should be specified by a subscript (such as Leq 8) for an 8-hour exposure to workplace noise) or be clearly understood.

LOCALIZER - The component of an ILS which provides course guidance to the runway.

MERGE - Combining or merging of noise events which exceed a given threshold level and occur within a variable selected period of time.

MISSED APPROACH COURSE (MAC) - The flight route to be followed if, after an instrument approach, a landing is not effected, and occurring normally:

1. When the aircraft has descended to the decision height and has not established visual contact, or

2. When directed by air traffic control to pull up or to go around again.

NOISE CONTOUR - A continuous line on a map of the airport vicinity connecting all points of the same noise exposure level.

NONDIRECTIONAL BEACON (NDB) -A beacon transmitting nondirectional signals whereby the pilot of an aircraft equipped with direction finding equipment can determined his bearing to and from the radio beacon and home on or track to or from the station. When the radio beacon is installed in conjunction with the Instrument Landing System marker, it is normally called a Compass Locator.

NONPRECISION APPROACH - A standard instrument approach procedure providing runway alignment but no glide slope or descent information.

PRECISION APPROACH - A standard instrument approach procedure providing runway alignment and glide slope or descent information.

PRECISION APPROACH PATH INDICATOR (PAPI) - A lighting system providing visual approach slope guidance to aircraft during a landing approach. It is similar to a VASI but provides a sharper transition between the colored indicator lights.

PROFILE - The physical position of the aircraft during landings or takeoffs in terms of altitude in feet above the runway and distance from the runway end.

PROPAGATION - Sound propagation refers to the spreading or radiating of sound energy from the noise source. Propagation characteristics of sound normally involve a reduction in sound energy with an increased distance from source. Sound propagation is affected by atmospheric conditions, terrain, and man-made and natural objects.

RUNWAY END IDENTIFIER LIGHTS (REIL) - Two synchronized flashing lights, one on each side of the runway threshold, which provide rapid and positive identification of the approach end of a particular runway.

RUNWAY USE PROGRAM - A noise abatement runway selection plan designed to enhance noise abatement efforts with regard to airport communities for arriving and departing aircraft. These plans are developed into runway use programs and apply to all turbojet aircraft 12,500 pounds or heavier. Turbojet aircraft less than 12,500 pounds are included only if the airport proprietor determines that the aircraft creates a noise problem. Runway use programs are coordinated with FAA offices as outlined in Order 1050.11. Safety criteria used in these programs are developed by the Office of Flight Operations. Runway use programs are administered by the Air Traffic Service as “Formal” or “Informal” programs.

RUNWAY USE PROGRAM (FORMAL) - An approved noise abatement program which is defined and acknowledged in a Letter of Understanding between FAA - Flight Standards, FAA - Air Traffic Service, the airport proprietor, and the users. Once established, participation in the program is mandatory for aircraft operators and pilots as provided for in F.A.R. Section 91.87.

RUNWAY USE PROGRAM (INFORMAL) - An approved noise abatement program which does not require a Letter of Understanding and participation in the program is voluntary for aircraft operators/pilots.

SEL - Sound Exposure Level. SEL expressed in dB, is a measure of the effect of duration and magnitude for a single-event measured in A-weighted sound level above a specified threshold which is at least 10 dB below the maximum value. In typical aircraft noise model calculations, SEL is used in computing aircraft acoustical contribution to the Equivalent Sound Level (Leq), the Day-Night Sound Level (DNL), and the Community Noise Equivalent Level (CNEL).

SINGLE EVENT - An occurrence of audible noise usually above a specified minimum noise level caused by an intrusive source such as an aircraft overflight, passing train, or ship's horn.

SLANT-RANGE DISTANCE - The straight line distance between an aircraft and a point on the ground.

SOUND EXPOSURE LEVEL - See SEL.

TACTICAL AIR NAVIGATION (TACAN) -An ultra-high frequency electronic air navigation system which provides suitably-equipped aircraft a continuous indication of bearing and distance to the TACAN station.

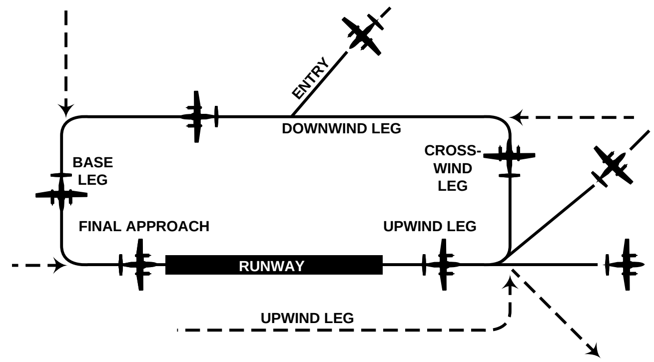
TERMINAL RADAR SERVICE AREA (TRSA) - Airspace surrounding designated airports wherein ATC provides radar vectoring, sequencing, and separation on a full-time basis for all IFR and participating VFR aircraft. Service provided in a TRSA is called Stage III Service.

THRESHOLD - Decibel level below which single event information is not printed out on the noise monitoring equipment tapes. The noise levels below the threshold are, however, considered in the accumulation of hourly and daily noise levels.

TIME ABOVE (TA) - The 24-hour TA noise metric provides the duration in minutes for which aircraft-related noise exceeds specified A-weighted sound levels. It is expressed in minutes per 24-hour period.

TOUCHDOWN ZONE LIGHTING (TDZ) -Two rows of transverse light bars located symmetrically about the runway centerline normally at 100 foot intervals. The basic system extends 3,000 feet along the runway.

TRAFFIC PATTERN - The traffic flow that is prescribed for aircraft landing at or taking off from an airport. The components of a typical traffic pattern are the upwind leg, crosswind leg, downwind leg, base leg, and final approach.

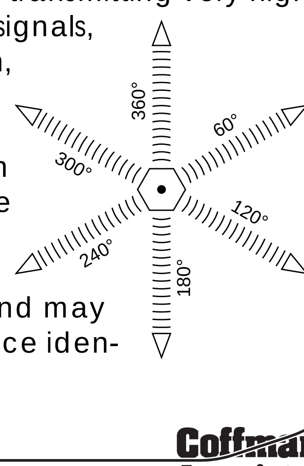


UNICOM - A nongovernment communication facility which may provide airport information at certain airports. Locations and frequencies of UNICOM's are shown on aeronautical charts and publications.

UPWIND LEG - A flight path parallel to the landing runway in the direction of landing. See "traffic pattern."

VECTOR - A heading issued to an aircraft to provide navigational guidance by radar.

VERY HIGH FREQUENCY OMNIDIRECTIONAL RANGE STATION (VOR) - A ground-based electric navigation aid transmitting very high frequency navigation signals, 360 degrees in azimuth, oriented from magnetic north. Used as the basis for navigation in the national airspace system. The VOR periodically identifies itself by Morse Code and may have an additional voice identification feature.



VERY HIGH FREQUENCY OMNIDIRECTIONAL RANGE STATION/TACTICAL AIR NAVIGATION (VORTAC) - A navigation aid providing VOR azimuth, TACAN azimuth, and TACAN distance-measuring equipment (DME) at one site.

VICTOR AIRWAY - A control area or portion thereof established in the form of a corridor, the centerline of which is defined by radio navigational aids.

VISUAL APPROACH - An approach wherein an aircraft on an IFR flight plan, operating in VFR conditions under the control of an air traffic control facility and having an air traffic control authorization, may proceed to the airport of destination in VFR conditions.

VISUAL APPROACH SLOPE INDICATOR (VASI) - An airport lighting facility providing vertical visual approach slope guidance to aircraft during approach to landing by radiating an directional pattern of high intensity red and white focused light beams which indicate to the pilot that he is on path if he sees red/white, above path if white/white, and below path if red/red. Some airports serving large aircraft have three-bar VASI's which provide two visual guide paths to the same runway.

VISUAL FLIGHT RULES (VFR) - Rules that govern the procedures for conducting flight under visual conditions. The term VFR is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate type of flight plan.

VOR - See "Very High Frequency Omnidirectional Range Station."

VORTAC - See "Very High Frequency Omnidirectional Range Station/Tactical Air Navigation."

YEARLY DAY-NIGHT AVERAGE SOUND LEVEL - See DNL.

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TECHNICAL INFORMATION PAPER

The Measurement and Analysis of Sound

TECHNICAL INFORMATION PAPER

THE MEASUREMENT AND ANALYSIS OF SOUND

Rock-and-roll on the stereo of the resident of apartment 3A is music to her ears, but it is intolerable racket to the next door neighbor in 3B.

Sound is energy — energy that conveys information to the listener. Although measuring this energy is a straightforward technical exercise, describing sound energy in ways that are meaningful to people is complex. This TIP explains some of the basic principles of sound measurement and analysis.

NOISE - UNWANTED SOUND

Noise is often defined as unwanted sound. For example, rock-and-roll on the stereo of the resident of apartment 3A is music to her ears, but it is intolerable racket to the next door neighbor in 3B. One might think that the louder the sound, the more likely it is to be considered noise. This is not necessarily true. In our example, the resident of apartment 3A is surely exposed to higher sound levels than her neighbor in 3B, yet she considers the sound as pleasant while the neighbor considers it “noise.” While it is possible to measure the sound level objectively, characterizing it as “noise” is a subjective judgement.

The characterization of a sound as “noise” depends on many factors, including the information content of the sound, the familiarity of the sound, a person’s control over the sound, and a person’s activity at the time the sound is heard.

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A person's ability to hear a sound depends on its character as compared with all other sounds in the environment.

MEASUREMENT OF SOUND

A person's ability to hear a sound depends on its character as compared with all other sounds in the environment. Three characteristics of sound to which people respond are subject to objective measurement: magnitude or loudness; the frequency spectrum; and the time variation of the sound.

LOUDNESS

The unit used to measure the magnitude of sound is the decibel. Decibels are used to measure loudness in the same way that "inches" and "degrees" are used to measure length and temperature. Unlike the linear length and temperature scales, the decibel scale is logarithmic. By definition, a sound which has ten times the mean square sound pressure of the reference sound is 10 decibels (dB) greater than the reference sound. A sound which has 100 times (10 x 10 or 10^2) the mean square sound pressure of the reference sound is 20 dB greater (10 x 2).

The logarithmic scale is convenient because the mean square sound pressures of normal interest extend over a range of 11 trillion to one. This huge number (a "1" followed by 14 zeros or 10^{14}) is much more conveniently represented on the logarithmic scale as 140 dB (10 x 14).

The use of the logarithmic decibel scale requires different arithmetic than we use with linear scales. For example, if two equally loud but independent noise sources operate simultaneously, the measured mean square sound pressure from both sources will be twice as great as either source operating alone. When expressed on the decibel scale, however, the sound pressure level from the combined sources is only 3 dB higher than the level produced by either source alone. Furthermore, if we have two sounds of different magnitude from independent sources, then the level of the sum will never be more than 3 dB above the level produced by the greater source alone.

This equation describes the mathematics of sound level summation:

$$S_t = 10 \log \sum_i 10^{S_i/10}$$

The loudest sound levels are the dominant influence in the averaging process.

where S_t is the total sound level, in decibels, and S_i is the sound level of the individual sources.

A simpler process of summation is also available and often used where a level of accuracy of less than one decibel is not required. Table 1 lists additive factors applicable to the difference between the sound levels of two sources.

TABLE 1

ADDITIVE FACTORS FOR SUMMATION OF TWO SOUND TYPES

DIFFERENCE IN SOUND LEVEL (DB)	ADD TO LARGER LEVEL (DB)	DIFFERENCE IN SOUND LEVEL (DB)	ADD TO LARGER LEVEL (DB)
0	3.0	8	0.6
1	2.5	9	0.5
2	2.1	10	0.4
3	1.8	12	0.3
4	1.5	14	0.2
5	1.2	16	0.1
6	1.0	Greater than 16	0
7	0.8		

Source: HUD 1985, p. 51.

The noise values to be added should be arrayed from lowest to highest. The additive factor derived from the difference between the lowest and next highest noise level should be added to the higher level. An example is shown below.

EXAMPLE OF SOUND LEVEL SUMMATION

59.0 dB } Add 2.5 to 60 = 62.5
60.0 dB

} Add 1.5 to 66.5 = 68
66.5 dB

59 dB + 60 dB + 66.5 dB = 68 dB

Logarithmic math also produces interesting results when averaging sound levels. As the following example shows, the loudest sound levels are the dominant influence in the averaging process. In the example, two sound levels of equal duration are averaged. One is 100 dB; the other 50 dB. The result is not 75 as it would be with linear math but 97 dB. This is because 100 dB contains 100,000 times the sound energy as 50 dB.

EXAMPLE OF SOUND LEVEL SUMMATION

59.0 dB } Add 2.5 to 60 = 62.5
60.0 dB

} Add 1.5 to 66.5 = 68

66.5 dB

59 dB + 60 dB + 66.5 dB = 68 dB

Scientists researching human hearing have determined that most people perceive a 10 dB increase in sound energy over a given frequency range as roughly a doubling of the loudness.

Another interesting attribute of sound is the human perception of loudness. Scientists researching human hearing have determined that most people perceive a 10 dB increase in sound energy over a given frequency range as, roughly, a doubling of the loudness. Recalling the logarithmic nature of the decibel scale, this means that most people perceive a ten-fold increase in sound energy as a two-fold increase in loudness (Kryter 1984, p. 188). Furthermore, when comparing sounds over the same frequency range, most people cannot distinguish between sounds varying by less than two or three decibels.

Exhibit A presents examples of various noise sources at different noise levels, comparing the decibel scale with the relative sound energy and the human perception of loudness. In the exhibit, 60 dB is taken as the reference or "normal" sound level. A sound of 70 dB, involving ten times the sound energy, is perceived as twice as loud. A sound of 80 dB contains 100 times the sound energy and is perceived as four times as loud as 60 dB. Similarly, a sound of 50 dB contains ten times less sound energy than 60 dB and is perceived as half as loud.

FREQUENCY WEIGHTING

Two sounds with the same sound pressure level may "sound" quite different (e.g., a rumble versus a hiss) because of differing distributions of sound energy in the audible frequency range. The distribution of sound energy as a function of frequency is known as the "frequency spectrum." The spectrum is important to the measurement of sound because the human ear is more sensitive to sounds at some frequencies than others.

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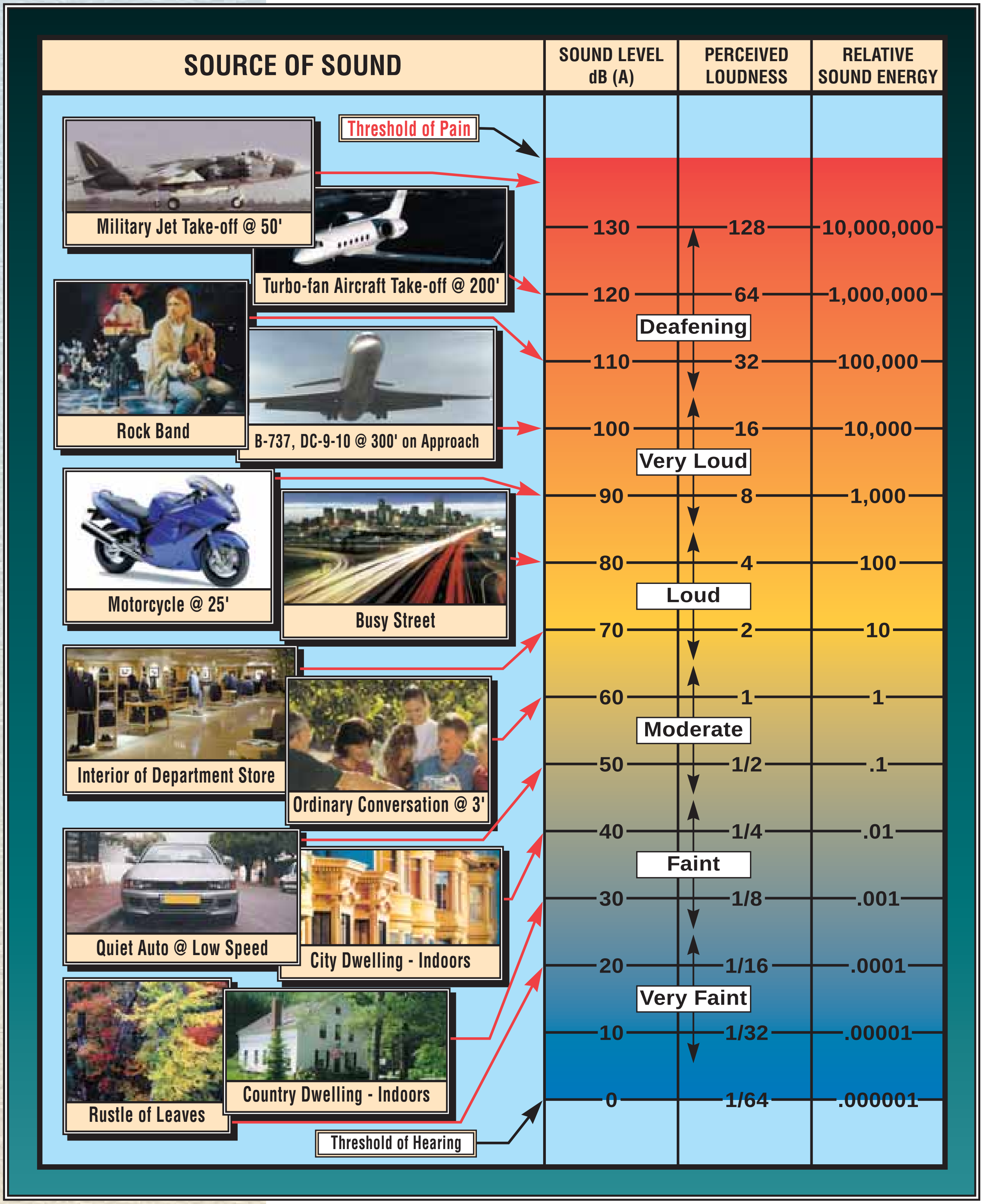
TYPICAL SOUND LEVELS



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People hear best in the frequency range of 1,000 to 5,000 cycles per second (Hertz) than at very much lower or higher frequencies. If the magnitude of a sound is to be measured so that it is proportional to its perception by a human, it is necessary to weight more heavily that part of the sound energy spectrum humans hear most easily.

An important advantage of the Leq metric is that it correlates well with the effects of noise on humans.

Over the years, many different sound measurement scales have been developed, including the A-weighted scale (and also the B, C, D, and E-weighted scales). A-weighting, developed in the 1930s, is the most commonly used scale for approximating the frequency spectrum to which humans are sensitive. Because of its universality, it was adopted by the U.S. Environmental Protection Agency and other government agencies for the description of sound in the environment.

The zero value on the A-weighted scale is the reference pressure of 20 micro-newtons per square meter (or micro-pascals). This value approximates the smallest sound pressure that can be detected by a human. The average sound level of a whisper at a distance of 1 meter is 40 dB; the sound level of a normal voice at 1 meter is 57 dB; a shout at 1 meter is 85 dB; and the threshold of pain is 130 dB.

TIME VARIATION OF SOUND LEVEL

Generally, the magnitude of sound in the environment varies randomly over time. Of course, there are many exceptions. For example, the sound of a waterfall is steady with time, as is the sound of a room air conditioner or the sound inside a car or airplane cruising at a constant speed. But, in most places, the loudness of outdoor sound is constantly changing because it is influenced by sounds from many sources.

While the continuous variation of sound levels can be measured, recorded, and presented, comparisons of sounds at different times or at different places is very difficult without some way of reducing the time variation. One way of doing this is to calculate the value of a steady-state sound which contains the same amount of sound energy as the time-varying sound under consideration. This value is known as the Equivalent Sound Level (Leq). An important advantage of the Leq metric is that it correlates well with the effects of noise on humans. On the basis of research, scientists have formulated the "equal energy rule." It is the total sound energy perceived by a human that accounts for the effects of the sound on the person. In other words, a very loud noise lasting a short time will have the same effect as a quieter noise lasting a longer time if the total energy of both sound events (the Leq value) is the same.

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The SEL is the quantity that best describes the total noise from an aircraft overflight.

KEY DESCRIPTORS OF SOUND

Four descriptors or metrics are useful for quantifying sound (Newman and Beattie 1985, pp. 9-15). All are based on the logarithmic decibel (dB) scale and incorporate A-weighting to account for the frequency response of the ear.

Sound Level

The sound level (L) in decibels is the quantity read on an ordinary sound level meter. It fluctuates with time following the fluctuations in magnitude of the sound. Its maximum value (Lmax) is one of the descriptors often used to characterize the sound of an airplane overflight. However, Lmax only gives the maximum magnitude of a sound — it does not convey any information about the duration of the sound. Clearly, if two sounds have the same maximum sound level, the sound which lasts longer will cause more interference with human activity.

Sound Exposure Level

Both loudness and duration are included in the Sound Exposure Level (SEL), which adds up all sound occurring in a stated time period or during a specific event, integrating the total sound over a one-second duration. The SEL is the quantity that best describes the total noise from an aircraft overflight. Based on numerous sound measurements, the SEL from a typical aircraft overflight is usually four to seven decibels higher than the Lmax for the event.

Exhibit B shows graphs of two different sound events. In the top half of the graph, we see that the two events have the same Lmax, but the second event lasts longer than the first. It is clear from the graph that the area under the noise curve is greater for the second event than the first. This means that the second event contains more total sound energy than the first, even though the peak levels for each event are the same. In the bottom half of the graph, the Sound Exposure Levels (SELs) for each event are compared. The SELs are computed by mathematically compressing the total sound energy into a one-second period. The SEL for the second event is

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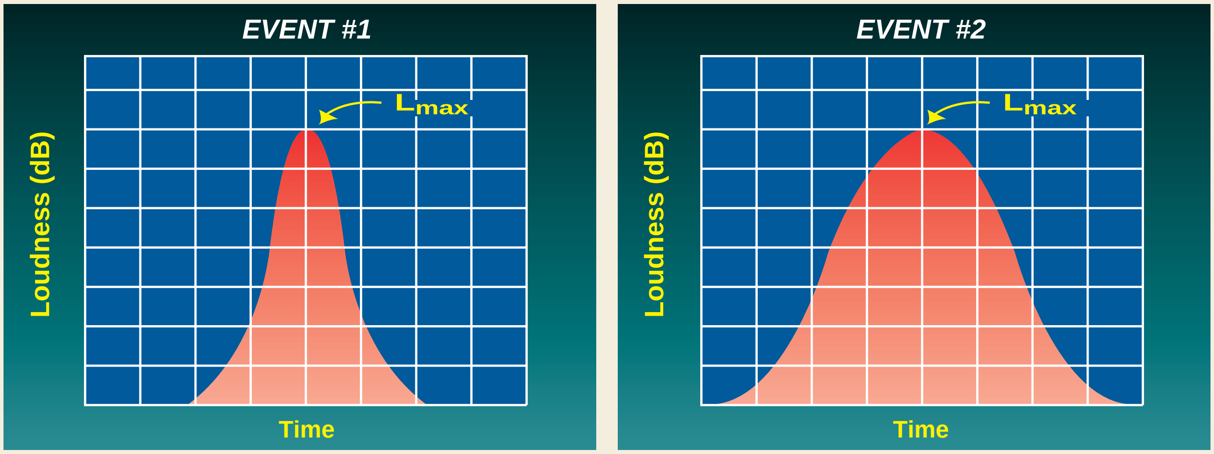
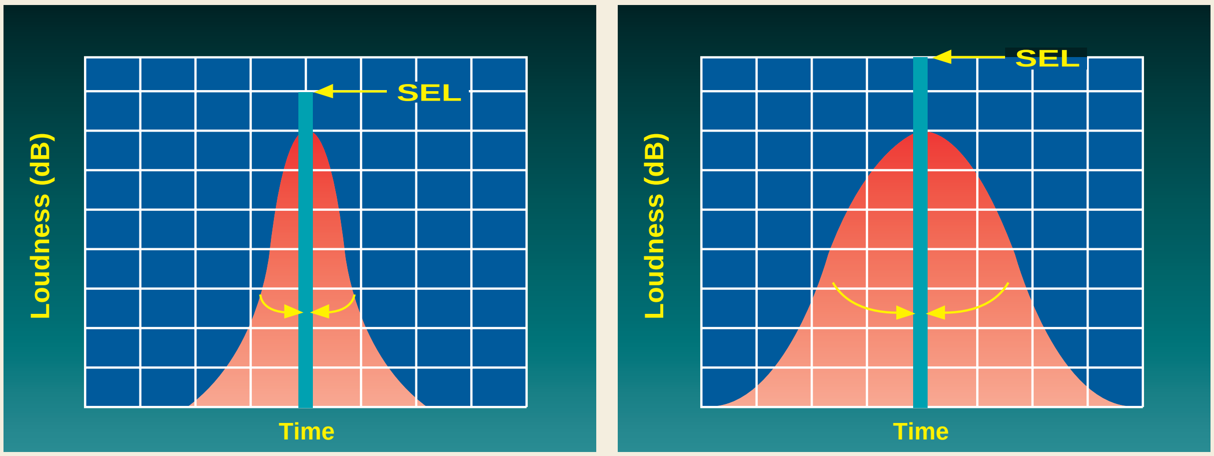
COMPARISON OF L_{max} AND SEL

Two sound events with the same maximum sound level (L_{max}).



Different sound exposure levels (SEL) for two sound events with the same L_{max}.



greater than the SEL for the first. Again, this simply means that the total sound energy for the second event is greater than for the first.

Equivalent Sound Level

The equivalent sound level (Leq) is simply the logarithm of the average value of the sound exposure during a stated time period. It is typically used for durations of one hour, eight hours, or 24 hours. In airport noise compatibility studies, use of the Leq term applies to 24-hour periods unless otherwise noted. It is often used to describe sounds with respect to their potential for interfering with human activity.

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The multiplication factor of 10 applied to nighttime sound is often referred to as a 10 decibel penalty. It is intended to account for the increased annoyance attributable to noise during the night when ambient levels are lower and people are trying to sleep.

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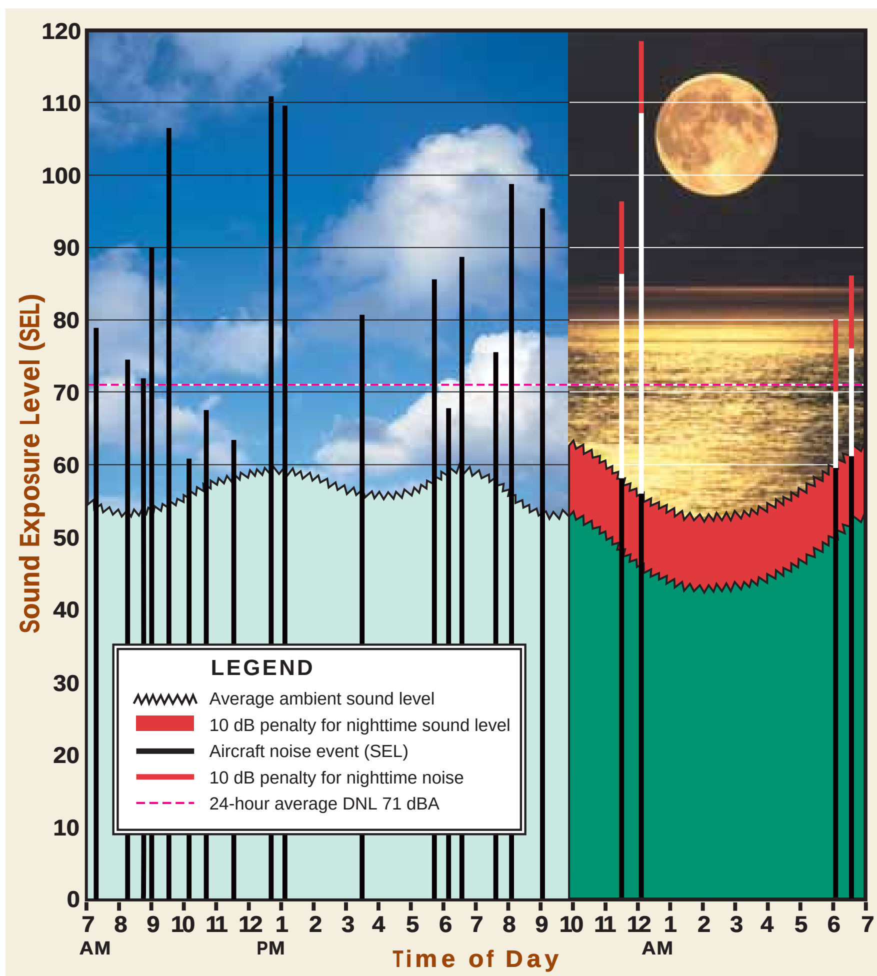
Day-Night Sound Level

A special form of Leq is the day-night sound level, abbreviated as DNL in discussions and Ldn in equations. DNL is calculated by summing the sound exposure during daytime hours (0700 - 2200) plus 10 times the sound exposure occurring during nighttime hours (2200 - 0700) and averaging this sum by the number of seconds during a 24-hour day. The multiplication factor of 10 applied to nighttime sound is often referred to as a 10 decibel penalty. It is intended to account for the increased annoyance attributable to noise during the night when ambient levels are lower and people are trying to sleep.

Exhibit C shows how the sound occurring during a 24-hour period is weighted and averaged by the DNL descriptor (or metric). In that example, the sound

EXHIBIT C

TYPICAL NOISE PATTERN AND DNL SUMMATION



Source: Coffman Associates 2003

occurring during the period, including aircraft noise and background sound, yields a DNL value of 71. As a practical matter, this is a reasonably close estimate of the aircraft noise alone because, in this example, the background noise is low enough to contribute only a little to the overall DNL value during the period of observation.

Where the basic element of sound measurement is Leq, DNL is calculated from:

$$Ldn = 10\log\frac{1}{24}\left(\sum_{d=1}^{15} 10^{[Leq(d)]/10} + \sum_{n=1}^{9} 10^{[Leq(n)+10]/10}\right)$$

where DNL is represented mathematically as Ldn, and Leq(d) and Leq(n) are the daytime and nighttime hour values combined. This expression is convenient where Leq values for only a few hours are available and the values for the remainder of the day can be predicted from a knowledge of day/night variation in levels. The hourly Leq values are summed for the 15 hours from 0700 to 2200 and added to the sum of hourly Leq figures for the 9 nighttime hours with a 10 dB penalty added to the nighttime Leqs.

Another way of computing DNL is described in this equation:

$$Ldn = 10\log\frac{1}{86400}\left(\int_{day} 10^{LA/10}\,dt + \int_{night} 10^{(LA+10)}\,dt\right)$$

where LA is the time-varying, A-weighted sound level, measured with equipment meeting the requirements for sound level meters (as specified in a standard such as ANSI SI.4-1971), and dt is the duration of time in seconds. The averaging constant of 86,400 is the number of seconds in a day. The integrals are taken over the daytime (0700 - 2200) and the nighttime (2200 - 0700) periods, respectively. If the sound level is sampled at a rate of once per second rather than measured continuously, the equation still applies if the samples replace LA and the integrals are changed to summations.

The DNL developed over a long period of time, for example one year, defines the noise environment of the area, allowing us to make predictions about the average response of people living in areas exposed to various DNL levels.

Use of the DNL metric to describe aircraft noise is required for all airport noise studies developed under the regulations of F.A.R. Part 150. In addition, DNL is preferred by all federal agencies as the appropriate single measure of cumulative sound exposure. These agencies include the FAA, the Federal Highway Administration, Environmental Protection Agency, Department of Defense, and Department of Housing and Urban Development.

One might think of the DNL metric as a summary description of the "noise climate" of an area. DNL accumulates the noise energy from passing aircraft in the same way that a precipitation gauge accumulates rain from passing storms. This analogy is presented in **Exhibit D**. Rain usually starts as a light sprinkle, building in intensity as the squall line passes over, then diminishing as the squall moves on. At the end of a 24-hour period, a rain gauge indicates the total rainfall received for that day, although the rain fell only during brief, sometimes intense, showers. Over a year, total precipitation is summarized in inches. When snow falls, it is converted to its equivalent measure as water. Although the total volume of precipitation during the year may be billions or trillions of gallons of water, its volume is expressed in inches because it provides for easier summation and description. We have learned how to use total annual precipitation to describe the climate of an area and make predictions about the environment.

Aircraft noise is similar to precipitation. The noise level from a single overflight begins quietly and builds in intensity as the aircraft draws closer. The sound of the aircraft is loudest as it passes over the receiver, diminishing as it passes. The total noise occurring during the event is accumulated and described as a Sound Exposure Level (SEL). Over a 24-hour period, the SELs can be summed, adding a special 10-decibel factor for nighttime noise, yielding a DNL value. The DNL developed over a long period of time, for example one year, defines the noise environment of the area, allowing us to make predictions about the average response of people living in areas exposed to various DNL levels.

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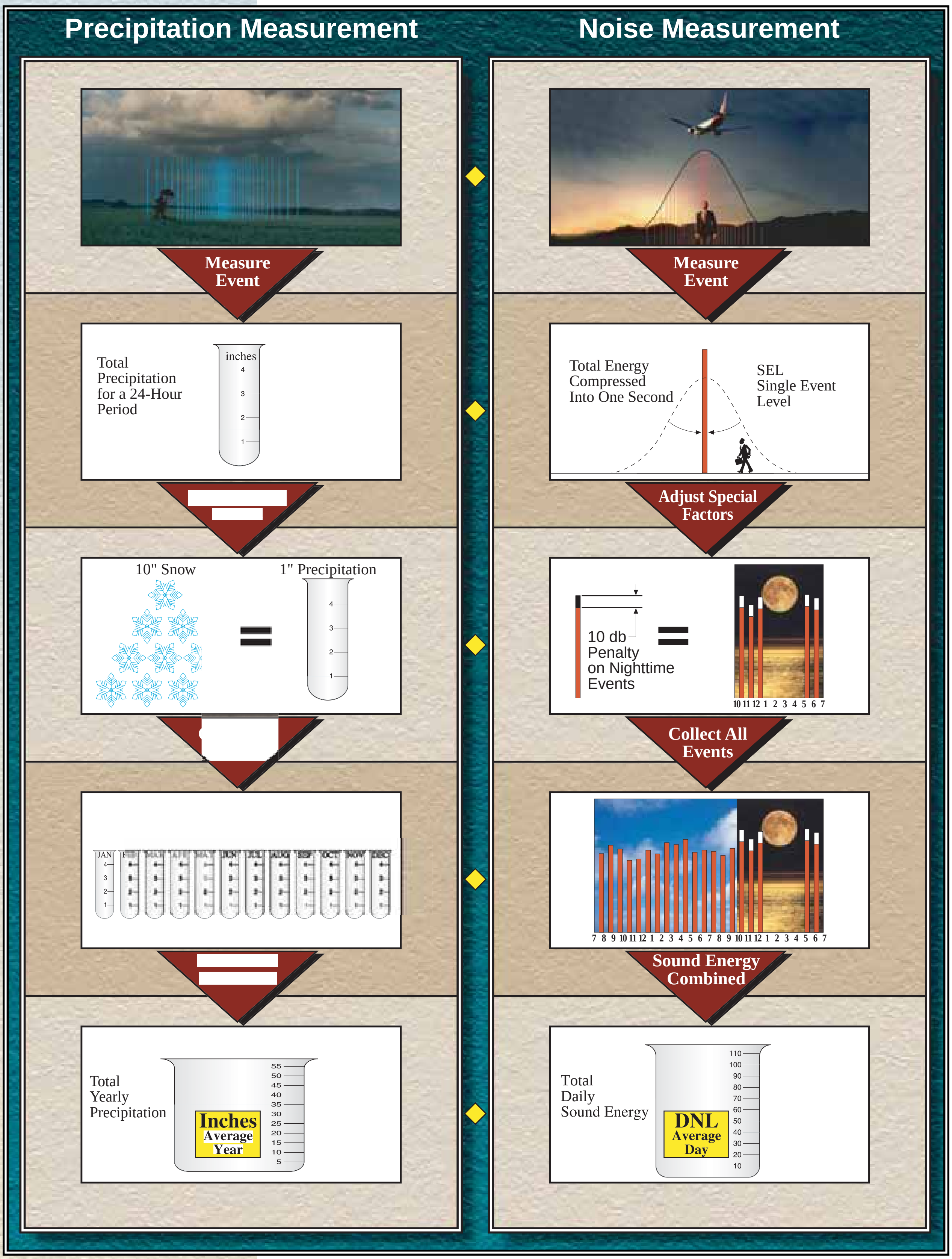
EXHIBIT D

PRECIPITATION AND NOISE MEASUREMENT COMPARISON



Source: Coffman Associates 1990

HELPFUL RULES-OF-THUMB

Despite the complex mathematics involved in noise analysis, several simple rules-of-thumb can help in understanding the noise evaluation process.

- *When sound events are averaged, the loud events dominate the calculation.*
- *A 10 decibel change in noise is equal to a tenfold change in sound energy. For example, the noise from ten aircraft is ten decibels louder than the noise from one aircraft of the same type, operated in the same way.*
- *Most people perceive an increase of 10 decibels as a relative doubling of the sound level.*
- *The DNL metric assumes one nighttime operation (between 10:00 p.m. and 7:00 a.m.) is equal in impact to ten daytime operations by the same aircraft.*
- *A doubling of aircraft operations results in a three decibel noise increase if done by the same aircraft operated in the same way.*

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Effects of Noise Exposure

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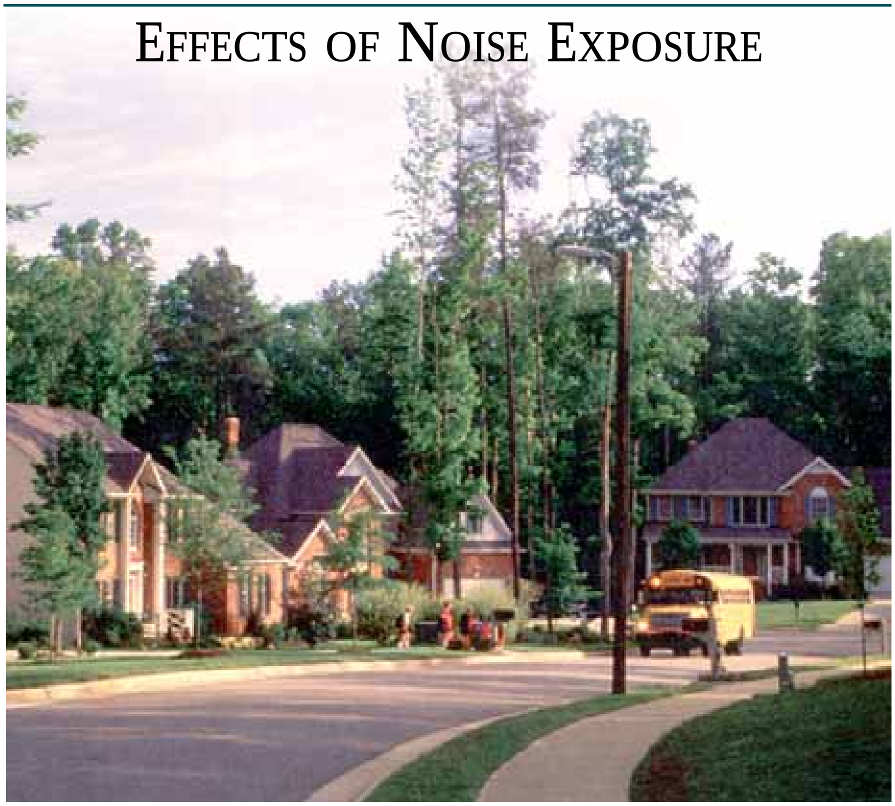
EFFECTS OF NOISE EXPOSURE



Studies which examined hearing loss among people living near airports found that, under normal circumstances, people in the community near an airport are at no risk of suffering hearing damage from aircraft noise.

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Aircraft noise can affect people both physically and psychologically. It is difficult, however, to make sweeping generalizations about the impacts of noise on people because of the wide variations in individual reactions. While much has been learned in recent years, some physical and psychological responses to noise are not yet fully understood and continue to be debated by researchers.

EFFECTS ON HEARING

Hearing loss is the major health danger posed by noise. A study published by the U.S. Environmental Protection Agency (1974) found that exposure to noise of 70 Leq or higher on a continuous basis, over a very long time, at the human ear's most damage-sensitive frequency, may result in a very small but permanent loss of hearing. (Leq is a pure noise dosage metric, measuring cumulative noise energy over a given time.)

In Aviation Noise Effects (Newman and Beattie, 1985, pp. 33-42), three studies are cited which examined hearing

Airport noise in areas off airport property is far too low to be considered potentially damaging to hearing. Those most at risk [of hearing loss] are personnel in the transportation industry, especially airport ground staff.

loss among people living near airports. They found that, under normal circumstances, people in the community near an airport are at no risk of suffering hearing damage from aircraft noise.

The Occupational Safety and Health Administration (OSHA) has established standards for permissible noise exposure in the work place to guard against the risk of hearing loss. Hearing protection is required when noise levels exceed the legal limits. The standards, shown in **Table 1**, establish a sliding scale of permissible noise levels by duration of exposure. The standards permit noise levels of up to 90 dBA for eight hours per day without requiring hearing protection. The regulations also require employers to establish hearing conservation programs where noise levels exceed 85 Leq during the 8-hour workday. This involves the monitoring of work place noise, the testing of employees' hearing, the provision of hearing protectors to employees at risk of hearing loss, and the establishment of a training program to inform employees about the effects of work place noise on hearing and the effectiveness of hearing protection devices.

TABLE 1

PERMISSIBLE NOISE EXPOSURE - OSHA STANDARDS

DURATION PER DAY, HOURS	SOUND LEVEL dBA SLOW RESPONSE	DURATION PER DAY, HOURS	SOUND LEVEL dBA SLOW RESPONSE
8	90	$1\frac{1}{2}$	102
6	92	1	105
4	95	$\frac{1}{2}$	110
3	97	$\frac{1}{4}$ or less	115
2	100		

Source: 29 CFR Ch. XVII, Section 1910.95(b)

Experience at other airports has shown that even at sites with cumulative noise exposure near 75 DNL, the total time noise levels exceed 80 dBA typically ranges from 10 to 20 minutes, far below the critical hearing damage thresholds (Coffman Associates 1993, pp. 2-11). This supports the conclusion that airport noise in areas off airport property is far too low to be considered potentially damaging to hearing.

With respect to the risk of hearing loss, the authors of an authoritative summary of the research conclude: "Those most at risk [of hearing loss] are personnel in the transportation industry, especially airport ground staff.

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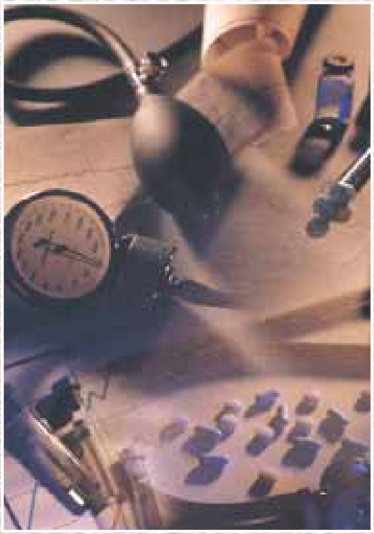
Beyond this group, it is unlikely that the general public will be exposed to sustained high levels of transportation noise sufficient to result in hearing loss. Transportation noise control in the community can therefore not be justified on the grounds of hearing protection." (See Taylor and Wilkins 1987.)



There is no strong evidence that noise has a direct causal effect on such health outcomes as cardiovascular disease, reproductive abnormality, or psychiatric disorder.

NON-AUDITORY HEALTH EFFECTS

It is sometimes claimed that aviation noise can harm the general physical and mental health of airport neighbors. Effects on the cardiovascular system, mortality rates, birth weights, achievement scores, and psychiatric admissions have been examined in the research literature. The question of pathological effects remains unsettled because of conflicting findings based on differing methodologies and uneven study quality. It is quite possible that the contribution of noise to pathological effects is so low that it has not been clearly isolated. While research is continuing, there is insufficient scientific evidence to support these concerns (Newman and Beattie 1985, pp. 59-62). Taylor and Wilkins (1987, p. 4/10) offer the following conclusions in their review of the research.

The evidence of non-auditory effects of transportation noise is more ambiguous, leading to differences of opinion regarding the burden of prudence for noise control. There is no strong evidence that noise has a direct causal effect on such health outcomes as cardiovascular disease, reproductive abnormality, or psychiatric disorder. At the same time, the evidence is not strong enough to reject the hypothesis that noise is in someway involved in the multi-causal process leading to these disorders. . . . But even with necessary improvements in study design, the inherent difficulty of isolating the effect of a low dose agent such as transportation noise within a complex aetiological system will remain. It seems unlikely, therefore, that research in the near future will yield findings which are definitive in either a positive or negative direction. Consequently, arguments for transportation noise control will probably continue to be based primarily on welfare criteria such as annoyance and activity disturbance.

Recent case studies on mental illness and hypertension indicate that this conclusion remains valid. Yoshida and Nakamura (1990) found that long-term exposure to

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Reviews of laboratory research on sleep disturbance report that the level of noise which can cause awakenings or interfere with falling asleep ranges from 35 dBA to 80 dBA, depending on the sleep stage and variability among individuals.

sound pressure levels above 65 DNL may contribute to reported ill effects on mental well-being. This case study, however, concluded that more research is needed because the results also contained some contrary effects, indicating that in some circumstances, ill effects were negatively correlated with increasing noise.

Griefahn (1992) studied the impact of noise exposure ranging from 62 dBA to 80 dBA on people with hypertension. She found that there is a tendency for vasoconstriction to increase among untreated hypertensive people as noise levels increase. However, she also found that beta-blocking medication prevented any increase in vasoconstriction attributable to noise. She concluded that while noise may be related to the onset of hypertension, especially in the presence of other risk factors, hypertensive people do not run a higher risk of ill-health effects if they are properly treated.

A three-year study sponsored by the European Commission titled Road Traffic and Aircraft Noise Exposure and Children's Cognition and Health (RANCH) studied nearly 3,000 children in schools located near busy roads and airports. The study evaluated the effects of chronic noise exposure on children's reading development. The study suggests that long-term noise exposure can delay a child's reading age up to two months. Additionally, the study found that persistent noise exposure increases the level of annoyance in children. While the effect was found to be significant, researchers felt it was small in magnitude and that the long-term effects remain unclear.

SLEEP DISTURBANCE

There is a large body of research documenting the effect of noise on sleep disturbance, but the long-range effects of sleep disturbance caused by nighttime airport operations are not well understood. It is clear that sleep is essential for good physical and emotional health, and noise can interfere with sleep, even when the sleeper is not consciously awakened. While the long-term effect of sleep deprivation on mental and physical function is not clear, it is known to be harmful. It is also known that sleepers do not fully adjust to noise disruption over time. Although they may awaken less often and have fewer conscious memories of disturbance, noise-induced shifts in sleep levels continue to occur.

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Research has shown that, when measured through awakenings, people tend to become somewhat accustomed to noise.

Reviews of laboratory research on sleep disturbance report that the level of noise which can cause awakenings or interfere with falling asleep ranges from 35 dBA to 80 dBA, depending on the sleep stage and variability among individuals (Newman and Beattie 1985, pp. 51-58; Kryter 1984, pp. 422-431). There is evidence that older people tend to be much more sensitive to noise-induced awakenings than younger people. Research has shown that, when measured through awakenings, people tend to become somewhat accustomed to noise. On the other hand, electroencephalograms, which reveal information about sleep stages, show little habituation to noise. Kryter describes these responses to noise as "alerting responses." He suggests that because they occur unconsciously, they may simply be reflexive responses, reflecting normal physiological functions which are probably not a cause of stress to the organism.

Most studies of sleep disturbance have been conducted under controlled laboratory conditions. The laboratory studies do not allow generalizations about the potential for sleep disturbance in an actual airport setting, and, more importantly, the impact of these disturbances on the residents. Furthermore, the range of sound levels required to cause sleep disturbance, ranging from a whisper to a shout (35 dB to 80 dB), and the prevalence of sleep disruption in the absence of any noise, greatly complicates the making of reasonable generalizations about the effect of noise on sleep.

Fortunately, some studies have examined the effect of nighttime noise on sleep disturbance in actual community settings. One report summarizes the results of eight studies conducted in homes (Fields 1986). Four studies examined aircraft noise, the others highway noise. In all of them, sleep disturbance was correlated with cumulative noise exposure metrics such as Leq and L10. All studies showed a distinct tendency for increased sleep disturbance as cumulative noise exposure increased. The reviewer notes, however, that sleep disturbance was very common, regardless of noise levels, and that many factors contributed to it. He points out that, "the prevalence of sleep disturbance in the absence of noise means that considerable caution must be exercised in interpreting any reports of sleep disturbance in noisy areas."

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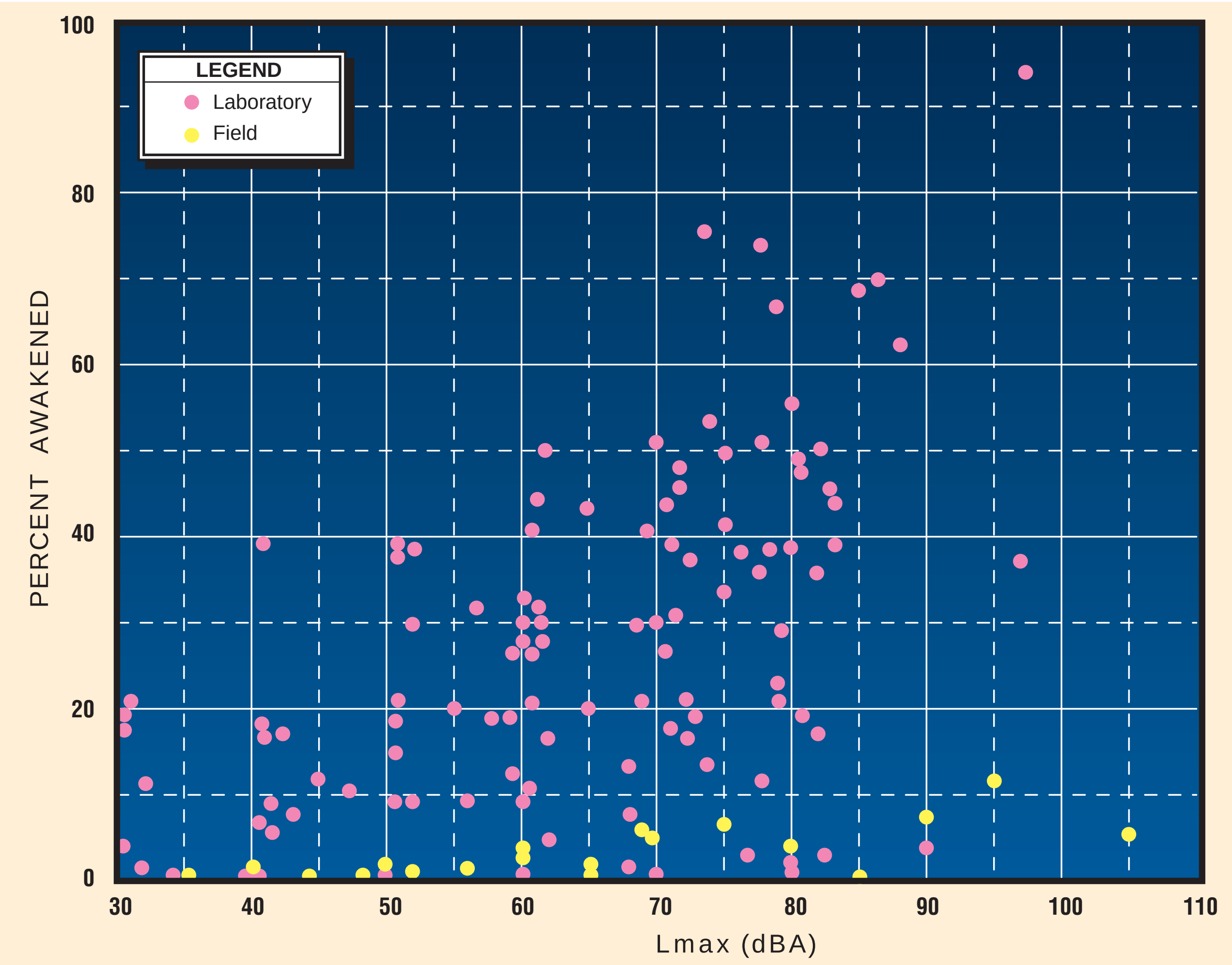
A recent review of the literature, Pearsons, et al. (1990), compared the data and findings of laboratory and field studies conducted in the homes of subjects. They found that noise-induced awakenings in the home were much less prevalent than in the laboratory. They also found that much higher noise levels were required to induce awakenings in the home than in the laboratory. **Exhibit A** compares the percentage of people awakened at different sound levels in laboratory and field studies. The graph clearly shows a marked tendency for people in laboratory settings to be much more sensitive to noise than in their homes. The reason for the large difference is apparently that people in their homes are fully habituated to their environment, including the noise levels.

EXHIBIT A

COMPARISON OF AWAKENING DUE TO NOISE EVENTS FROM LABORATORY VERSUS FIELD STUDIES

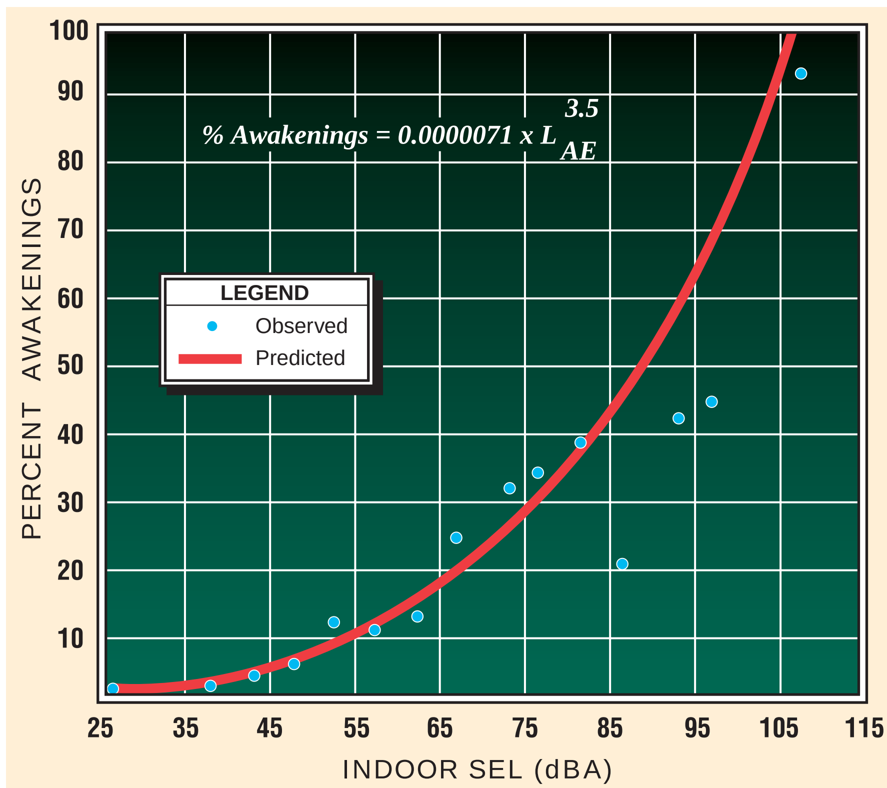


Source: Pearson, K.S. et al. 1990.

Finegold et al. (1994) reviewed the data in the Pearsons report of 1990 and developed a regression analysis. As shown in **Exhibit B**, an exponential curve was found to fit the categorized data reasonably well. They recommend that this curve be used as a provisional means of predicting potential sleep disturbance from aircraft noise. They caution that because the curve was derived using Pearsons' laboratory, as well as in-home data, the predictions of sleep disruption in an actual community setting derived from this curve are likely to be high.

EXHIBIT B

FINEGOLD'S SLEEP DISTURBANCE CURVE

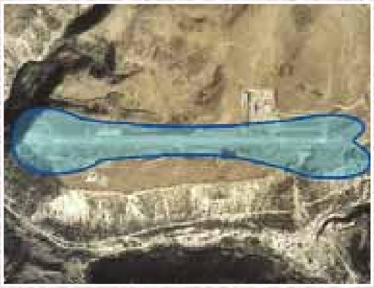


Source: Finegold et al. 1994.
Note: Based on laboratory and field data reported in Pearsons et al. 1989.

The findings of many of these sleep disturbance studies, while helping to answer basic research questions, are of little usefulness to policy-makers and airport residents. For them, the important question is, "When does sleep disturbance caused by environmental noise become severe enough to constitute a problem in the community?" Kryter (1984, pp. 434-443) reviews in detail one important study that sheds light on this question. The Directorate of Operational Research and Analysis (DORA) of the British Civil Aviation Authority conducted an in-depth survey of 4,400 residents near London's Heathrow

The findings of many of these sleep disturbance studies are of little usefulness to policy-makers and airport residents. For them, the important question is, "When does sleep disturbance caused by environmental noise become severe enough to constitute a problem in the community?"

and Gatwick Airports over a four-month period in 1979 (DORA 1980). The study was intended to answer two policy-related questions: “What is the level of aircraft noise which will disturb a sleeping person?” and “What level of aircraft noise prevents people from getting to sleep?”



The 65 DNL contour defines a noise impact envelope which encompasses all of the area within which significant sleep disturbance may be expected.

Analysis of the survey results indicated that the best correlations were found using cumulative energy dosage metrics, namely Leq. Kryter notes that support for the use of the Leq metric is provided by the finding that some respondents could not accurately recall the time association of a specific flight with an arousal from sleep. This suggests that the noise from successive overflights increased the general state of arousability from sleep.

With regard to difficulty in getting to sleep, the study found 25 percent of the respondents reporting this problem at noise levels of 60 Leq, 33 percent at 65 Leq, and 42 percent at 70 Leq. The percentage of people who reported being awakened at least once per week by aircraft noise was 19 percent at 50 Leq, 24 percent at 55 Leq, and 28 percent at 60 Leq. The percentage of people bothered “very much” or “quite a lot” by aircraft noise at night when in bed was 22 percent at 55 Leq and 30 percent at 60 Leq. Extrapolation of the trend line would put the percentage reporting annoyance at 65 Leq well above 40 percent.

DORA concluded with the following answers to the policy-related questions: (1) A significant increase in reports of sleep arousal will occur at noise levels at or above 65 Leq; (2) A significant increase in the number of people reporting difficulty in getting to sleep will occur at noise levels at or above 70 Leq. Kryter disagrees with these findings. He believes that a more careful reflection upon the data leads to the conclusion that noise levels approximately 10 decibels lower would represent the appropriate thresholds — 55 and 60 Leq.

At any airport, the 65 DNL contour developed from total daily aircraft activity will be larger than the 55 Leq developed from nighttime activity only. (At an airport with only nighttime use, the 65 DNL contour will be identical with the 55 Leq contour because of the effect of the 10 dB penalty in the DNL metric.) Thus, the 65 DNL contour defines a noise impact envelope which encompasses all of the area within which significant sleep disturbance may be expected based on Kryter’s interpretation of the DORA findings discussed above.A

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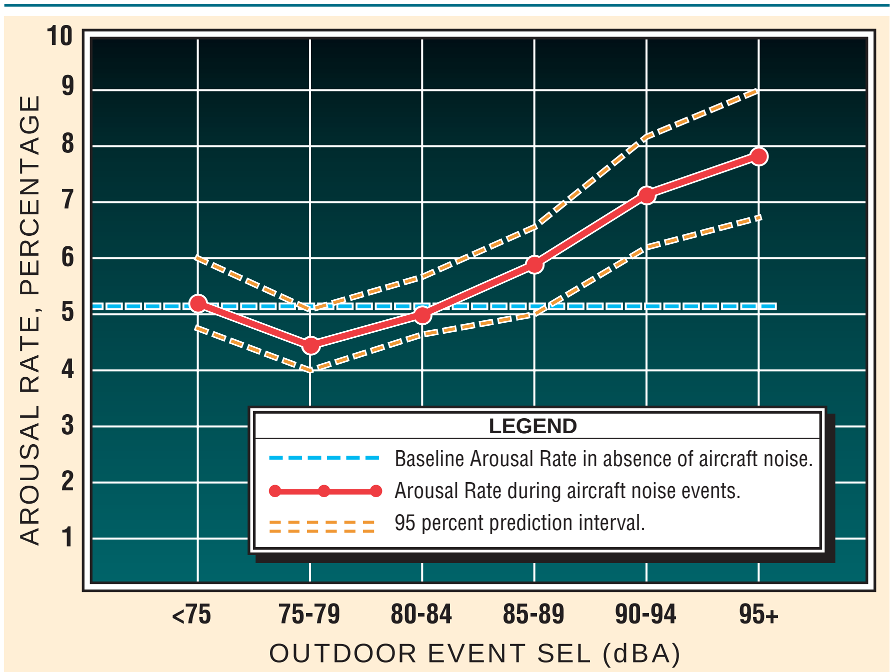
Researchers found that for aircraft noise events below 90 SEL, as measured outdoors, there was likely to be no measurable increase in rates of sleep disturbance.

recent study was conducted by the British Civil Aviation Authority to examine the relationship of nighttime aircraft noise and sleep disturbance near four major airports — Heathrow, Gatwick, Stansted, and Manchester (Ollerhead, et al. 1992). A total of 400 subjects were monitored for a total of 5,742 subject-nights. Nightly awakenings were found to be very common as part of natural sleep patterns. Researchers found that for aircraft noise events below 90 SEL, as measured outdoors, there was likely to be no measurable increase in rates of sleep disturbance. (The indoor level can be roughly estimated as approximately 20 to 25 decibels less than the outdoor level.) Where noise events ranged from 90 to 100 SEL, a very small rate of increase in disturbance was possible. Overall, rates of sleep disturbance were found to be more closely correlated with sleep stage than with periods of peak aircraft activity. That is, sleep was more likely to be disrupted, from any cause, during light stages than during heavy stages.

Exhibit C shows the relationship between arousal from sleep and outdoor sound exposure levels (SELs) found in the 1992 British study. The results have been statistically adjusted to control for the effects of individual variability in sleep disturbance. The study found that the arousal

EXHIBIT C

RELATIONSHIP BETWEEN AVERAGE SLEEP DISTURBANCE AND AIRCRAFT NOISE LEVEL



Source: Ollerhead, J.B. et al. 1992, p. 25.
Note: Estimates controlled for the effects of individual arousability.

While vibration contributes to annoyance reported by residents near airports, especially when it is accompanied by high audible sound levels, it rarely carries enough energy to damage safely constructed structures.

rate for the average person, with no aircraft noise, was 5.1 percent. Aircraft noise of less than SEL 90 dBA was found not to be statistically significant as a cause of sleep disturbance. (According to the study, this would correspond to an Lmax of approximately 81 dBA. Lmax is the loudest sound the human ear would actually hear during the 90 SEL noise event. The interior Lmax would be approximately 20 to 25 decibels less — roughly 56 to 61 dBA.) The 95 percent prediction interval is shown on the graph not to rise above the 5.1 percent base arousal rate until it is above 90 dBA. Again, it should be emphasized that these conclusions relate to the average person. More easily aroused people will be disturbed at lower noise levels, but they are also more likely to be aroused from other sources (Ollerhead, et al. 1992).

STRUCTURAL DAMAGE

Structural vibration from aircraft noise in the low frequency ranges is sometimes a concern of airport neighbors. While vibration contributes to annoyance reported by residents near airports, especially when it is accompanied by high audible sound levels, it rarely carries enough energy to damage safely constructed structures. High-impulse sounds such as blasting, sonic booms, and artillery fire are more likely to cause damage than continuous sounds such as aircraft noise. A document published by the National Academy of Sciences suggested that one may conservatively consider noise levels above 130 dB lasting more than one second as potentially damaging to structures (CHABA 1977). Aircraft noise of this magnitude occurs on the ramp and runway and seldom, if ever, occurs beyond the boundaries of a commercial or general aviation airport.

The risk of structural damage from aircraft noise was studied as part of the environmental assessment of the Concorde supersonic jet transport. The probability of damage from Concorde overflights was found to be extremely slight. Actual overflight noise from the Concorde at Sully Plantation near Dulles International Airport in Fairfax County, Virginia was recorded at 115 dBA. No damage to the historic structures was found, despite their age. Since the Concorde causes significantly more vibration than conventional commercial jet aircraft, the risk of structural damage caused by aircraft noise near airports is considered to be negligible (Hershey et al. 1975; Wiggins 1975).

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OTHER ANNOYANCES

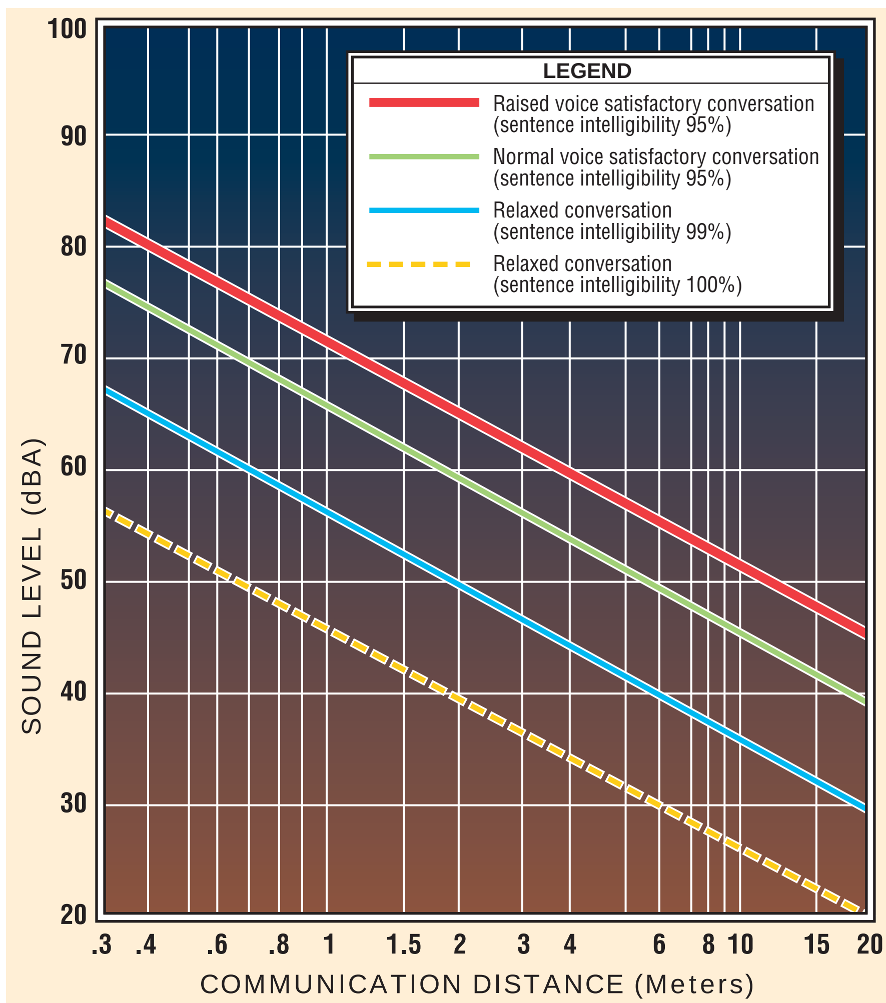
The psychological impact of aircraft noise is a more serious concern than direct physical impact.

The psychological impact of aircraft noise is a more serious concern than direct physical impact. Studies conducted in the late 1960s and early 1970s found that the interruption of communication, rest, relaxation, and sleep are important causes for complaints about aircraft noise. Disturbance of television viewing, radio listening, and telephone conversations are also sources of serious annoyance.

Exhibit D shows the relationship between sound levels and communicating distance for different voice levels. Assuming a communicating distance of 2 meters, communication becomes unsatisfactory with a steady

EXHIBIT D

MAXIMUM DISTANCES OUTDOORS OVER WHICH CONVERSATION IS SATISFACTORILY INTELLIGIBLE IN STEADY NOISE



Source: U.S. Environmental Protection Agency, 1974. Cited in Caltrans, 1993.

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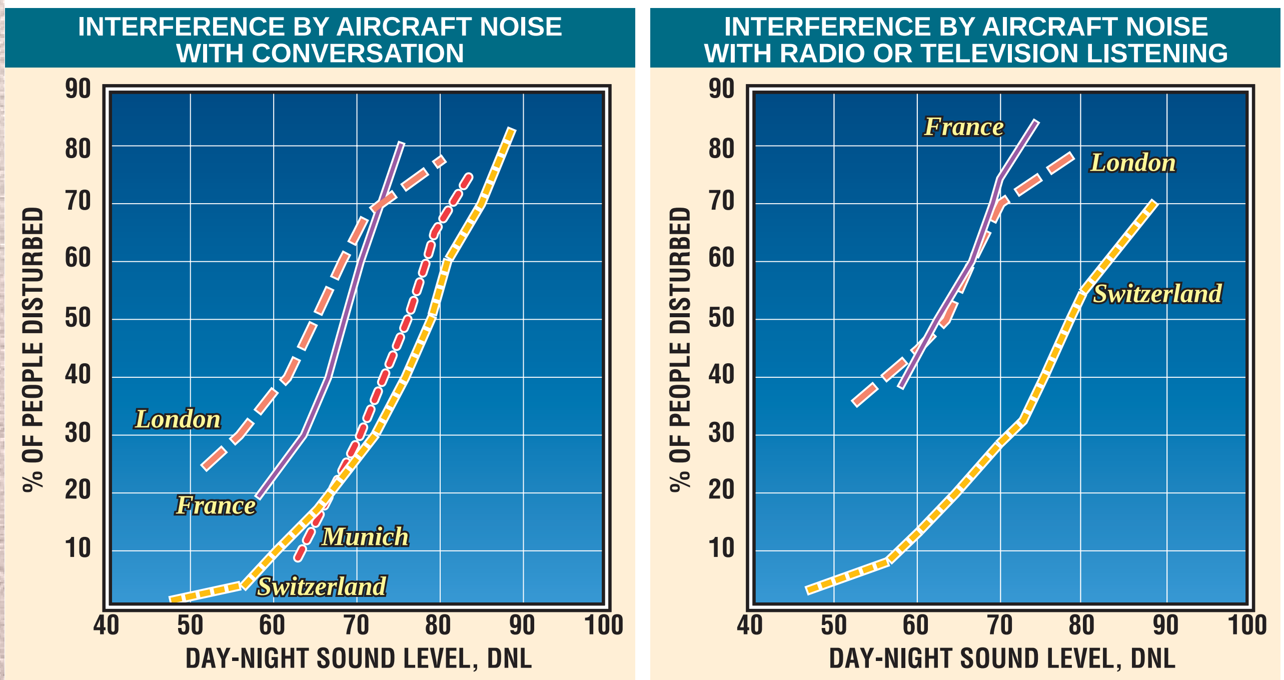
noise level above approximately 65 decibels. At 65 decibels, a raised voice is required to maintain satisfactory conversation. Another way to interpret this is that a raised voice would be interrupted by a sound event above 65 decibels. A normal voice would be interrupted, at 2 meters, by a sound event of 60 decibels.

Exhibit E shows the impact of aircraft noise on conversation and radio or television listening. These results, summarized by Schultz (1978), were derived from surveys conducted in London, France, Munich, and Switzerland. Differences in the amount of disturbance reported in each study are based on how each survey defined disturbance. The British study counted mild disturbance, the French moderate disturbance, and the German and Swiss great disturbance.

EXHIBIT E

INTERFERENCE BY AIRCRAFT NOISE WITH VARIOUS ACTIVITIES



Note: Differences in amount of interference reported are related to how individual surveys defined interference. London counted mild disturbance, France moderate disturbance, and Munich and Switzerland great disturbance.

Source: Shultz, T.J. 1978.

In the case of conversation disruption, nine percent were greatly annoyed by noise of 60 DNL in the Swiss study. About 12 to 16 percent of those in the Swiss and German studies considered themselves to be greatly disturbed by aircraft noise of 65 DNL. At 75 DNL, 40 to 50 percent

Individual human response to noise is highly variable and is influenced by many emotional and physical factors.

considered themselves greatly disturbed. In the French study, 23 percent considered themselves moderately disturbed by aircraft noise at 60 DNL, 35 percent at 65 DNL, and 75 percent at 75 DNL. In the British study, 37 percent were mildly disturbed by aircraft noise at 60 DNL, 50 percent at 65 DNL, and about 72 percent at 75 DNL.

Regarding interference with television and radio listening, about 13 percent in the Swiss study were greatly disturbed by aircraft noise above 60 DNL, 21 percent at 65 DNL, and 40 percent at 75 DNL. In the British and French studies, 42 to 45 percent were mildly to moderately disturbed by noise at 60 DNL, 55 percent at 65 DNL, and 75 to 82 percent at 75 DNL.

In some cases, noise is only an indirect indicator of the real concern of airport neighbors — safety. The sound of approaching aircraft may cause fear in some people about the possibility of a crash. This fear is a factor motivating some complaints of annoyance in neighborhoods near airports around the country. (See Richards and Ollerhead 1973; FAA 1977; Kryter 1984, p. 533.) This effect tends to be most pronounced in areas directly beneath frequently used flight tracks (Gjestland 1989).

The EPA has also found that continuous exposure to high noise levels can affect work performance, especially in high-stress occupations. Based on the FAA's land use compatibility guidelines, discussed in the Technical Information Paper on Noise and Land Use Compatibility, these adverse affects are most likely to occur within the 75 DNL contour.

Individual human response to noise is highly variable and is influenced by many factors. These include emotional variables, feelings about the necessity or preventability of the noise, judgments about the value of the activity creating the noise, an individual's activity at the time the noise is heard, general sensitivity to noise, beliefs about the impact of noise on health, and feelings of fear associated with the noise. Physical factors influencing an individual's reaction to noise include the background noise in the community, the time of day, the season of the year, the predictability of the noise, and the individual's control over the noise source.

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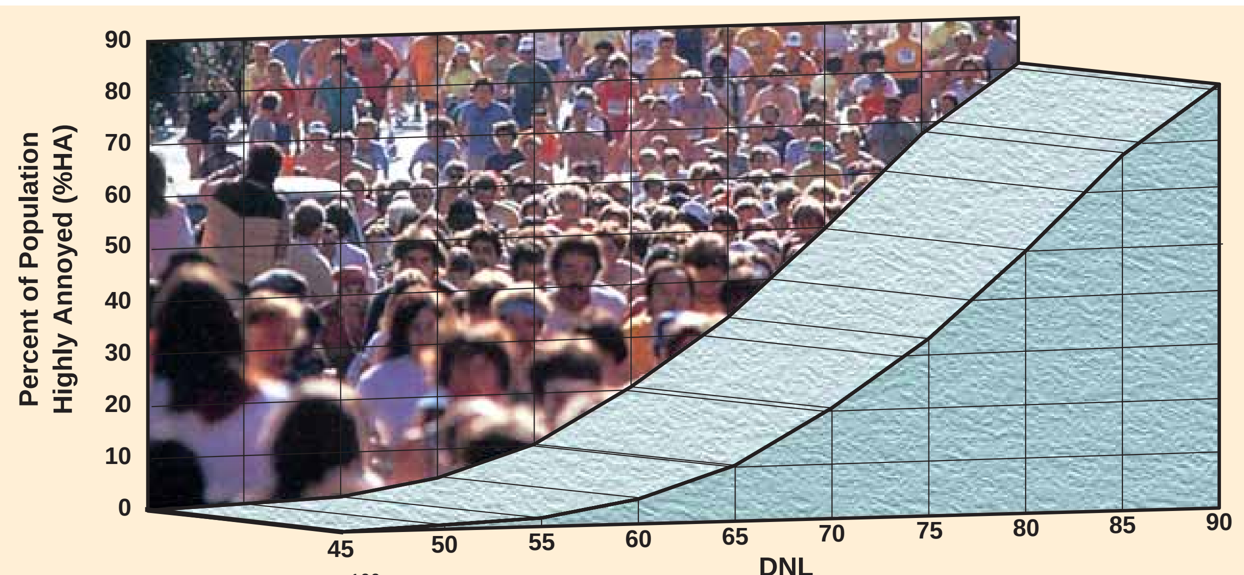
AVERAGE COMMUNITY RESPONSE TO NOISE

Although individual responses to noise can vary greatly, the average response among a group of people is much less variable. This enables us to generalize about the average impacts of aircraft noise on a community despite the wide variations in individual response.

Many studies have examined average residential community response to noise, focusing on the relationship between annoyance and noise exposure. (See DORA 1980; Fidell et al. 1989; Finegold et al. 1992 and 1994; Great Britain Committee on the Problem of Noise 1963; Kryter 1970; Richards and Ollerhead 1973; Schultz 1978; U.S. EPA 1974.) These studies have produced similar results, finding that annoyance is most directly related to cumulative noise exposure, rather than single-event exposure.

EXHIBIT F

PERCENTAGE OF POPULATION HIGHLY ANNOYED BY GENERAL TRANSPORTATION NOISE



Equation for Curve: $\% HA = \frac{100}{1 + e^{(11.13 - .14 Ldn)}}$

PERCENT HIGHLY ANNOYED AT SELECTED NOISE LEVELS

DNL	45	50	55	60	65	70	75	80	85	90
%HA	0.8%	1.6%	3.1%	6.1%	11.6%	20.9%	34.8%	51.7%	68.4%	81.3%

Source: Finegold et al. 1992 and 1994.

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Annoyance has been found to increase along an S-shaped or logistic curve as cumulative noise exposure increases, as shown in **Exhibit F**. Developed by Finegold et al. (1992 and 1994), it is based on data derived from a

The updated Schultz Curve shows that annoyance is measurable beginning at 45 DNL, where 0.8 percent of people are highly annoyed. It increases gradually to 6.1 percent at 60 DNL. Starting at 65 DNL, the percentage of people expected to be highly annoyed increases steeply from 11.6 percent up to 68.4 percent at 85 DNL.

number of studies of transportation noise (Fidell 1989). It shows the relationship between DNL levels and the percentage of people who are highly annoyed. Known as the "updated Schultz Curve" because it is based on the work of Schultz (1978), it represents the best available source of data for the noise dosage-response relationship (FICON 1992, Vol. 2, pp. 3-5; Finegold et al. 1994, pp. 26-27).

The updated Schultz Curve shows that annoyance is measurable beginning at 45 DNL, where 0.8 percent of people are highly annoyed. It increases gradually to 6.1 percent at 60 DNL. Starting at 65 DNL, the percentage of people expected to be highly annoyed increases steeply from 11.6 percent up to 68.4 percent at 85 DNL. Note that this relationship includes only those reported to be "highly annoyed." Based on other research, the percentages would be considerably higher if they also included those who were "moderately or mildly annoyed" (Richards and Ollerhead 1973; Schultz 1978).

SUMMARY

The effects of noise on people include hearing loss, other ill health effects, and annoyance. While harm to physical health is generally not a problem in neighborhoods near airports, annoyance is a common problem. Annoyance is caused by sleep disruption, interruption of conversations, interference with radio and television listening, and disturbance of quiet relaxation.

Individual responses to noise are highly variable, making it very difficult to predict how any person is likely to react to environmental noise. The average response among a large group of people, however, is much less variable and has been found to correlate well with cumulative noise dosage metrics such as Leq, DNL, and CNEL. The development of aircraft noise impact analysis techniques has been based on this relationship between average community response and cumulative noise exposure.

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TECHNICAL INFORMATION PAPER

Measuring the Impact of Noise on People

TECHNICAL INFORMATION PAPER

MEASURING THE IMPACT OF NOISE ON PEOPLE

In aircraft noise analysis, the effect of noise on residents near airports is often the most important concern.

In aircraft noise analysis, the effect of noise on residents near airports is often the most important concern. While certain public institutions and, at very high noise levels, some types of businesses may also be disturbed by noise, people in their homes are typically the most vulnerable to noise problems.

The most common way to measure the impact of noise on residents is to estimate the number of people residing within the noise contours. This is done by overlaying noise contours on census block maps or on maps of dwelling units. The number of people within each 5 DNL range (e.g., from 65 to 70 DNL, from 70 to 75 DNL, etc.) is then estimated.

This is the approach required in F.A.R. Part 150 noise compatibility studies. While it has the advantage of simplicity, it has one disadvantage: it implicitly assumes that all people are equally affected by noise, regardless of the noise level they experience. Clearly, however, the louder the noise, the greater the noise problem. As noise increases, more people become concerned about it, and the concerns of each individual become more serious.

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Although individual responses to noise can vary greatly, the average response among a group of people is much less variable. This enables us to generalize about the average impacts of aircraft noise on a community despite the wide variations in individual response.

AVERAGE COMMUNITY RESPONSE TO NOISE

Individual human response to noise is highly variable and is influenced by many factors. These include emotional variables, feelings about the necessity or preventability of the noise, judgments about the value of the activity creating the noise, an individual's activity at the time the noise is heard, general sensitivity to noise, beliefs about the impact of noise on health, and feelings of fear associated with the noise.

Physical factors influencing an individual's reaction to noise include the background noise in the community, the time of day, the season of the year, the predictability of the noise, and the individual's control over the noise source.

Although individual responses to noise can vary greatly, the average response among a group of people is much less variable. This enables us to generalize about the average impacts of aircraft noise on a community despite the wide variations in individual response.

Many studies have examined average community response to noise, focusing on the relationship between annoyance and noise exposure. (See DORA 1980; Fidell et al. 1989; Finegold et al. 1992 and 1994; Great Britain Committee on the Problem of Noise 1963; Kryter 1970; Richards and Ollerhead 1973; Schultz 1978; U.S. EPA 1974.) These studies have produced similar results, finding that annoyance is most directly related to cumulative noise exposure, rather than single-event exposure.

Annoyance has been found to increase along an S-shaped or logistic curve as cumulative noise exposure increases, as shown in **Exhibit A**. This graph shows the percentage of residents either somewhat annoyed or seriously annoyed by noise of varying DNL levels. It was developed from research in the early 1970s (Richards and Ollerhead 1973). It is interesting that the graph indicates that at even extremely low noise levels, below 45 DNL, a very small percentage of people remain annoyed by aircraft noise. Conversely, the graph shows that while the percentage of people annoyed by noise exceeds 95 percent at 75 DNL, it only approaches, and does not reach, 100 percent even at the extremely high noise level of 85 DNL.

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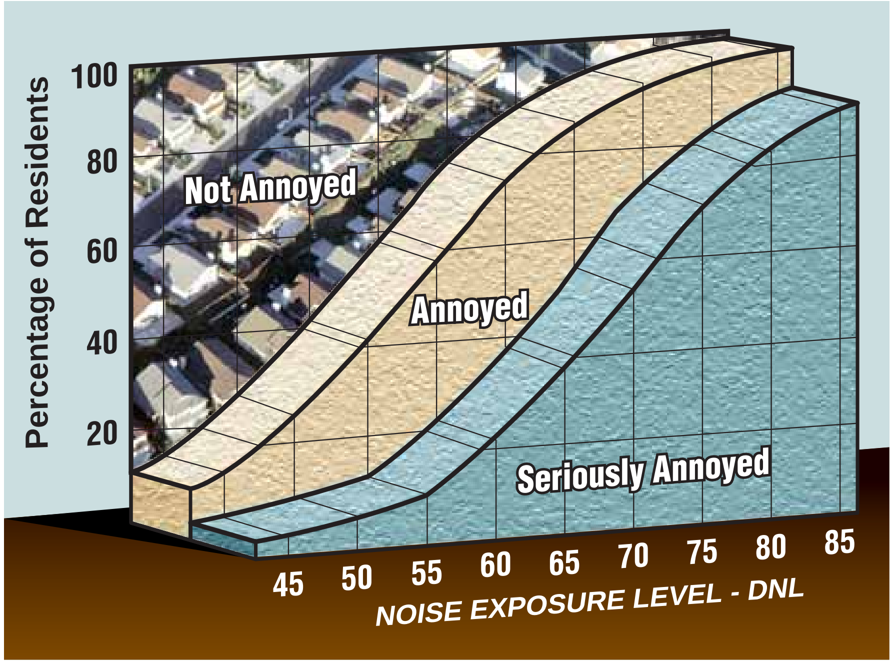
EXHIBIT A

ANNOYANCE CAUSED BY AIRCRAFT NOISE IN RESIDENTIAL AREAS



Source: Richards and Ollerhead 1973, p.31

Starting at 65 DNL, the percentage of people expected to be highly annoyed increases steeply from 11.6 percent up to 68.4 percent at 85 DNL.

A similar graph is shown in **Exhibit B**. Developed by Finegold et al. (1992 and 1994), it is based on data derived from a number of studies of transportation noise (Fidell 1989). It shows the relationship between DNL levels and the percentage of people who are highly annoyed. Known as the "updated Schultz Curve" because it is based on the work of Schultz (1978), it represents the best available source of data for the noise dosage-response relationship (FICON 1992, Vol. 2, pp. 3-5; Finegold et al. 1994, pp. 26-27).

The updated Schultz Curve shows that annoyance is measurable beginning at 45 DNL, where 0.8 percent of people are highly annoyed. It increases gradually to 6.1 percent at 60 DNL. Starting at 65 DNL, the percentage of people expected to be highly annoyed increases steeply from 11.6 percent up to 68.4 percent at 85 DNL. Note that this relationship includes only those reported to be "highly annoyed." Based on the findings shown in **Exhibit A**, the percentages would be considerably higher if they also included those who were "moderately annoyed."

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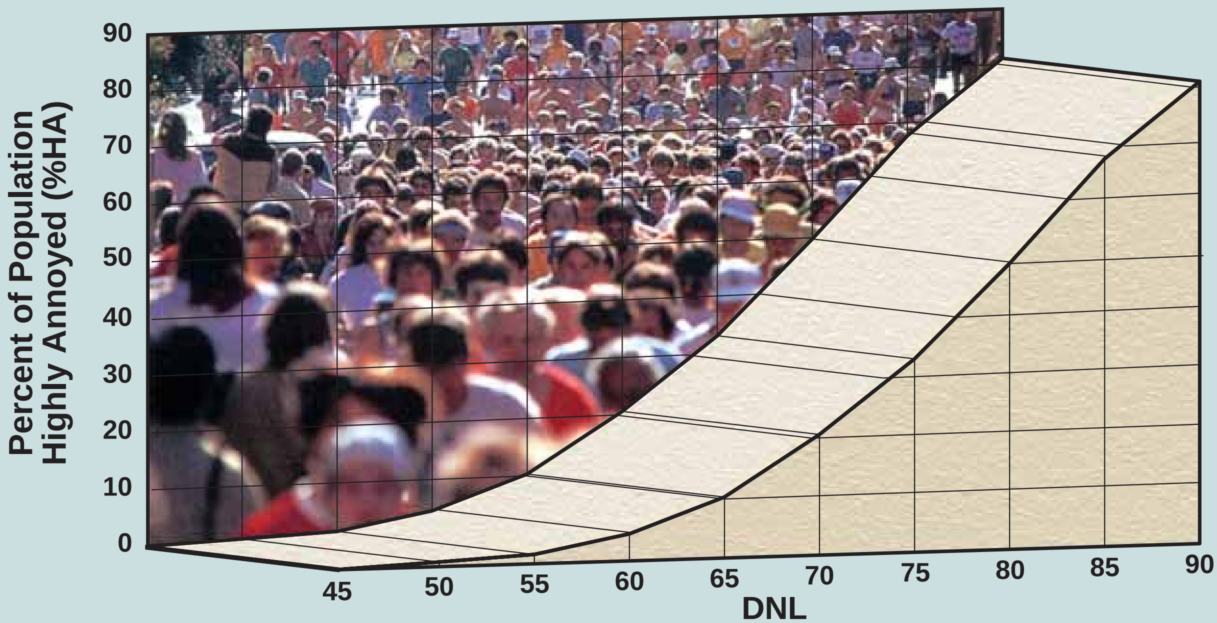
EXHIBIT B

PERCENTAGE OF POPULATION HIGHLY ANNOYED BY GENERAL TRANSPORTATION NOISE



Equation for Curve: $\% HA = \frac{100}{1 + e^{(11.13 - .14 Ldn)}}$

PERCENT HIGHLY ANNOYED AT SELECTED NOISE LEVELS

DNL	45	50	55	60	65	70	75	80	85	90
%HA	0.8%	1.6%	3.1%	6.1%	11.6%	20.9%	34.8%	51.7%	68.4%	81.3%

Source: Finegold et al. 1992 and 1994.

THE DEVELOPMENT OF WEIGHTING FUNCTIONS

Recognizing the tendency of annoyance response rates to increase systematically as noise increases, researchers in the 1960s began developing weighting functions to help estimate the total impact of noise on a population (CHABA 1977, p. B-1). The population impacted by noise at a given level would be multiplied by the appropriate weighting function. The higher the noise level, the higher the weighting function. The results for all noise levels would be added together. The sum would be a single number purported to represent the net impact of noise on the affected population.

The CHABA report (p. VII-5) recommended the use of the original Schultz Curve as the basis for developing weighting functions. It recommended that weighting functions be developed by calculating the percentage of people likely to be highly annoyed by noise at various DNL levels. These values were then converted to weighting functions by arbitrarily setting the function for 75 DNL at 1.00. Functions for the other noise levels were set in proportion to the percent highly annoyed. The results of applying these weighting functions to a population was known as the "sound level-weighted population" impacted by noise, or the "level-weighted population."

UPDATED LEVEL-WEIGHTED POPULATION FUNCTIONS

As discussed above, the original Schultz Curve has been updated to take into account additional studies of community response to noise. The updated curve is shown in **Exhibit B**. Coffman Associates has updated the weighting functions developed by CHABA (1977, p. B-7) to correspond with the updated Schultz Curve. **Table 1** shows the percentage of people likely to be highly annoyed by aircraft noise for 5 DNL increments ranging from 45 to 80 DNL. It also shows weighting functions for use in calculating level-weighted population. These were developed by setting the function for the 75 to 80 DNL range at unity (1.000). The other functions were computed in proportion to the values for "percent highly annoyed."

TABLE 1

PERCENT HIGHLY ANNOYED AND WEIGHTED FUNCTION BY DNL RANGE

DNL RANGE	AVERAGE PERCENT HIGHLY ANNOYED	WEIGHTING FUNCTION
45-50	1.19%	0.028
50-55	2.36%	0.055
55-60	4.63%	0.107
60-65	8.87%	0.205
65-70	16.26%	0.376
70-75	27.83%	0.644
75-80	43.25%	1.000

Based on the response curve shown in **Exhibit A**, the weighting functions can be considered as roughly equivalent to the proportion of people likely to be either highly annoyed or somewhat annoyed by noise.

Based on the response curve shown in Exhibit A, the weighting functions can be considered as roughly equivalent to the proportion of people likely to be either highly annoyed or somewhat annoyed by noise.

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The response to noise among a group of people varies systematically with changes in noise levels. As noise increases, the proportion of people disturbed by noise increases.

EXAMPLE USE OF LEVEL-WEIGHTED POPULATION

In airport noise compatibility planning, the level-weighted population (LWP) methodology is particularly useful in comparing the results of different noise analysis scenarios. Since the percentage of people who are highly annoyed increases with increasing noise levels, the LWP values may differ between operating scenarios even though the total population within the noise impact boundary is equal. An example below illustrates the LWP methodology. Scenarios A and B show the effects of two airport operating scenarios. While the population subject to noise above 65 DNL is the same for both, Scenario B has a lower LWP because fewer people are impacted by the higher noise levels.

TABLE 2

LEVEL-WEIGHTED POPULATION METHODOLOGY - EXAMPLE

	SCENARIO A			SCENARIO B		
DNL Range	LWP Factor	Population	LWP	LWP Factor	Population	LWP
65-70	.376	x 2,000	= 752	.376	x 3,000	= 1,128
70-75	.644	x 1,400	= 902	.644	x 700	= 451
75+	1.000	x 600	= 600	1.000	x 300	= 300
Total		4,000	2,254		4,000	1,879

SUMMARY

The response to noise among a group of people varies systematically with changes in noise levels. As noise increases, the proportion of people disturbed by noise increases. This relationship has been estimated and is presented in the "updated Schultz Curve" shown in **Exhibit B**.

The data in the updated Schultz Curve can be used to develop weighting functions for computing the numbers of people likely to be annoyed by noise. This is especially useful in comparing the net impact of different noise scenarios.

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TECHNICAL INFORMATION PAPER

Aircraft Noise and Land Use Compatibility Guidelines

TECHNICAL INFORMATION PAPER

AIRCRAFT NOISE AND LAND USE COMPATIBILITY GUIDELINES

DNL accumulates the total noise occurring over a 24-hour period, with a 10 decibel penalty applied to noise occurring between 10:00 p.m. and 7:00 a.m.

In past years, noise has become a recognized factor in the land use planning process for cities, metropolitan planning organizations, counties, and states. Significant strides have been made in the reduction of noise at its source; however, noise cannot be entirely eliminated. Local, state, and federal agencies, in recognition of this fact, have developed guidelines and regulations to address noise within the land use planning process.

The fundamental variability in the way individuals react to noise makes it impossible to accurately predict how any one individual will respond to a given noise level. However, when one considers the community as a whole, trends emerge which relate noise to annoyance. This enables us to make reasonable evaluations of the average impacts of aircraft noise on a community.

According to scientific research, noise response is most readily correlated with noise as measured with cumulative noise metrics. A variety of cumulative noise exposure metrics have been used in research studies over the years. In the United States, the DNL (day-night noise level) metric has been widely used. DNL accumulates the total noise occurring over a 24-hour period, with a 10 decibel penalty applied to noise occurring between 10:00 p.m. and 7:00 a.m. DNL correlates well with average community response to

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Research has shown that even at extremely high noise levels, there are at least some people, albeit a small percentage, who are not annoyed. Conversely, it also shows that at even very low noise levels, at least some people will be annoyed.

noise. (For more information on noise measurement, see the TIP entitled, "The Measurement and Analysis of Sound.")

In California, the CNEL (community noise equivalent level) metric is used instead of the DNL metric. The two metrics are very similar. DNL accumulates the total noise occurring during a 24-hour period, with a 10 decibel penalty applied to noise occurring between 10:00 p.m. and 7:00 a.m. The CNEL metric is the same except that it also adds a 4.77 decibel penalty for noise occurring between 7:00 p.m. and 10:00 p.m. There is little actual difference between the two metrics in practice. Calculations of CNEL and DNL from the same data generally yield values with less than a 0.7 decibel difference (Caltrans 1983, p. 37).

The results of studies on community noise impacts show that the number of people expressing concerns with noise increases as the noise level increases. The level of concern increases along an S-shaped curve, as shown in **Exhibit A**. Research has shown that even at extremely high noise levels, there are at least some people, albeit a small percentage, who are not annoyed. Conversely, it also shows that at even very low noise levels, at least some people will be annoyed.

AMBIENT NOISE LEVEL AS A FACTOR OF ANNOYANCE LEVEL

Noise analysts have speculated that the overall ambient noise level in an environment determines to what degree people will be annoyed by a given level of aircraft noise. That is, in a louder environment it takes a louder level of aircraft noise to generate complaints than it does in a quieter environment.

Kryter (1984, p. 582) reviewed some of the research on this question. He noted that the effects of laboratory tests and attitude surveys on this question are somewhat inconclusive. A laboratory test he reviewed found that recordings of aircraft noise were judged to be less intrusive as the background road traffic noise was increased. On the other hand, an attitude survey in the Toronto Airport area found that the effects of background noise were not significant.

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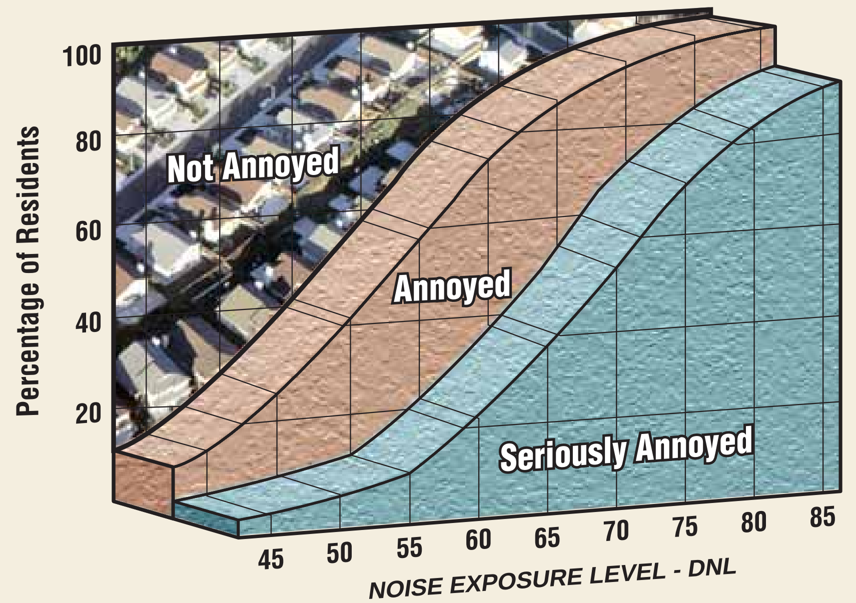
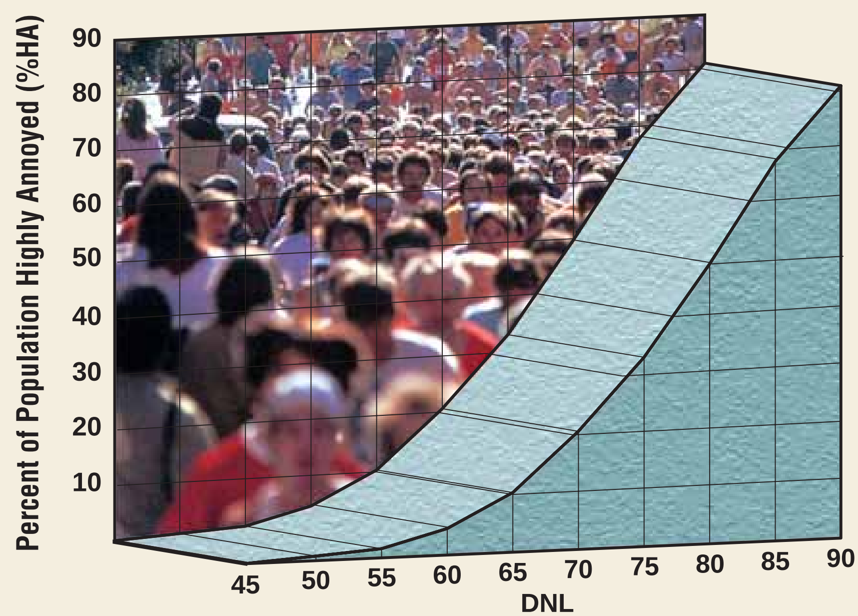
ANNOYANCE CAUSED BY AIRCRAFT NOISE IN RESIDENTIAL AREAS



Source: Richards and Ollerhead 1973, p.31

UPDATED SCHULTZ CURVE



Equation for Curve: $\% HA = \frac{100}{1 + e^{(11.13 - .14 Ldn)}}$

Source: Finegold et al. 1992 and 1994.

Noise analysts have speculated that the overall ambient noise level in an environment determines to what degree people will be annoyed by a given level of aircraft noise.

The studies reviewed by Kryter were intended to evaluate whether or not background noise provided some degree of masking of aircraft noise. They did not, however, take into consideration the subjects' rating of the overall quality of the noise environment.

The U.S. Environmental Protection Agency (EPA) has provided guidelines to address the question of background noise and its relationship to aircraft noise.

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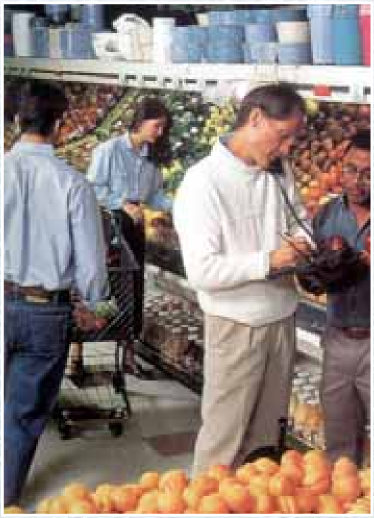

The degree of annoyance which people suffer from aircraft noise varies depending on their activities at any given time.

The EPA has determined that complaints can be expected when the intruding DNL exceeds the background DNL by more than 5 decibels (U.S. EPA 1974). The California Department of Transportation (Caltrans 2000, pp. 7- 24 - 7-25) notes that the level of background (ambient) noise should be used in determining the suitable aircraft noise contour of significance. Specifically, adjustments have been made in areas with quiet background noise levels of 50 to 55 CNEL. In those cases, aircraft CNEL contours are prepared down to 55 or 60 CNEL, and land use compatibility criteria are adjusted to apply to those areas. The State of Oregon Department of Aviation (Oregon 2003) also requires the preparation of noise contours down to the 55 DNL level. This noise contour is used to establish the noise impact boundary for air carrier airports within the state.

The Federal Interagency Committee on Noise (FICON 1992, p. 2-6) examined the question of background noise and its relationship to perceptions of aircraft noise. It reviewed the research in this field, concluding that there was a basis for believing that, in addition to the magnitude of aircraft noise, the difference between background noise and aircraft noise was in some way related to human perceptions of noise disturbance. It noted, however, that there was insufficient scientific data to provide authoritative guidance on the consideration of these effects. FICON advocated further research in this area.

LAND USE COMPATIBILITY GUIDELINES

The degree of annoyance which people suffer from aircraft noise varies depending on their activities at any given time. People rarely are as disturbed by aircraft noise when they are shopping, working, or driving as when they are at home. Transient hotel and motel residents seldom express as much concern with aircraft noise as do permanent residents of an area. The concept of "land use compatibility" has arisen from this systematic variation in human tolerance to aircraft noise. Since the 1960s, many different sets of land use compatibility guidelines have been proposed and used. This section reviews some of the more well known guidelines.

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The U.S. Department of Housing and Urban Development (HUD) first published noise assessment requirements in 1971 for evaluating the acceptability of sites for housing assistance.

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FEDERAL LAND USE COMPATIBILITY GUIDELINES

FAA-DOD Guidelines

In 1964, the Federal Aviation Administration (FAA) and the U.S. Department of Defense (DOD) published similar documents setting forth guidelines to assist land use planners in areas subjected to aircraft noise from nearby airports. These guidelines, presented in **Table 1**, establish three zones and the expected responses to aircraft noise from residents of each zone. In Zone 1, areas exposed to noise below 65 DNL, essentially no complaints would be expected although noise could be an occasional annoyance. In Zone 2, areas exposed to noise between 65 and 80 DNL, individuals may complain, perhaps vigorously. In Zone 3, areas in excess of 80 DNL, vigorous complaints would be likely and concerted group action could be expected.

TABLE 1

CHART FOR ESTIMATING RESPONSE OF COMMUNITIES EXPOSED TO AIRCRAFT NOISE - 1964 FAA-DOD GUIDELINES

NOISE LEVEL	ZONE	DESCRIPTION OF EXPECTED RESPONSE
Less than 65 DNL	1	No complaints would be expected. The noise may, however, interfere occasionally with certain activities of the residents.
65 to 80 DNL	2	Individuals may complain, perhaps vigorously. Concerted group action is possible.
Greater than 80 DNL	3	Individual reactions would likely include repeated, vigorous complaints. Concerted group action might be expected.

Source: U.S. DOD 1964. Cited in Kryter 1984, p. 616.

HUD Guidelines

The U.S. Department of Housing and Urban Development (HUD) first published noise assessment requirements in 1971 for evaluating the acceptability of sites for housing assistance. These requirements contained standards for exterior noise levels along with policies for approving HUD-supported or assisted housing projects in high noise areas. In general, the requirements established three zones: an acceptable zone where all projects could be approved, a normally unacceptable zone where

mitigation measures would be required and where each project would have to be individually evaluated for approval or denial, and an unacceptable zone in which projects would not, as a rule, be approved.

In 1979, HUD issued revised regulations which kept the same basic standards, but adopted new descriptor systems which were considered advanced over the old system. **Table 2** summarizes the revised HUD requirements.

TABLE 2

SITE EXPOSURE TO AIRCRAFT NOISE
1979 HUD REQUIREMENTS

ACCEPTABLE CATEGORY	DAY-NIGHT AVERAGE SOUND LEVEL	SPECIAL APPROVALS AND REQUIREMENTS
Acceptable	Not exceeding 65 dB	None
Normally Unacceptable	Above 65 dB but not exceeding 75 dB	Special approvals, environmental review, attenuation
Unacceptable	Above 75 dB	Special approvals, environmental review, attenuation

Source: U.S. HUD 1979

Veterans Administration Guidelines

The Veterans Administration has established policies and procedures for the appraisal and approval of VA loans relative to residential properties located near major civilian airports and military air bases. The agency's regulations, contained within M26-2, Change 15, state that "the VA must recognize the possible unsuitability for residential use of certain properties and the probable adverse effect on livability and/or value of homes in the vicinity of major airports and air bases. Such adverse effects may be due to a variety of factors including noise intensity." **Table 3** contains the VA's noise zones and associated development requirements and limitations.

EPA Guidelines

The U.S. Environmental Protection Agency published a document in 1974 suggesting maximum noise exposure levels to protect public health with an adequate margin of safety. These are shown in **Table 4**. They note that the risk of hearing loss may become a concern with exposure

TABLE 3

VETERANS ADMINISTRATION NOISE GUIDELINES NOVEMBER 23, 1992

NOISE ZONE	CNR (Composite Noise Rating)	NEF (Noise Exposure Forecasts)	DNL (Day/Night Average Sound Level)
1	Under 100	Under 30	Under 65
2	100-115	30-40	65-75
3	Over 115	Over 40	Over 75

Specific Limitations:

(1) Proposed or existing properties located in zone 1 are generally acceptable as security for VA-guaranteed loans.

(2) Proposed construction to be located in zone 2 will be acceptable provided:

- (a) Sound attenuation features are built into the dwelling to bring the interior DNL of the living unit to 45 decibels or below.
- (b) There is evidence of market acceptance of the subdivision.
- (c) The veteran-purchaser signs a statement which indicates his/her awareness that (1) the property being purchased is located in an area adjacent to an airport, and (2) the aircraft noise may affect normal livability, value, and marketability of the property.

(3) Proposed subdivisions located in zone 3 are not generally acceptable. The only exception is a situation in which VA has previously approved a subdivision, and the airport noise contours are subsequently changed to include the subdivision in zone 3. In such cases, VA will continue to process loan applications provided the requirements in the above subparagraphs (2) are met.

(4) Existing dwellings in zones 2 and 3 are not to be rejected because of airport influence if there is evidence of acceptance by a fully informed veteran.

Source: Veterans Administration, M26-2, June 1992

TABLE 4

SUMMARY OF NOISE LEVELS IDENTIFIED AS REQUISITE TO PROTECT PUBLIC HEALTH AND WELFARE WITH AN ADEQUATE MARGIN OF SAFETY - 1974 EPA GUIDELINES

EFFECT	LEVEL	AREA
Hearing loss	75 DNL and above	All areas
Outdoor activity interference and annoyance	55 DNL and above	Outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis of use.
	59 DNL and above	Outdoor areas where people spend limited amounts of time, such as school years, playgrounds, etc.
Indoor activity interference and annoyance	45 DNL and above	Indoor residential areas
	49 DNL and above	Other indoor areas with human activities such as schools, etc.

Note: All Leq values from EPA document were converted by FAA to DNL for ease of comparison. (DNL=Leq(24) + 4 dB).

Source: U.S. EPA 1974. Cited in FAA 1977a, p. 26.

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LAND USE GUIDANCE CHART I: AIRPORT NOISE INTERPOLATION

LAND USE GUIDANCE ZONES (LUG)	NOISE EXPOSURE CLASS	INPUTS: AIRCRAFT NOISE ESTIMATING METHODOLOGIES				HUD NOISE ASSESSMENT GUIDELINES (1977)	SUGGESTED NOISE CONTROLS
		Ldn DAY-NIGHT AVERAGE SOUND LEVEL	NEF NOISE EXPOSURE FORECAST	CNR COMPOSITE NOISE RATING	CNEL COMMUNITY NOISE EQUIVALENT LEVEL		
A	MINIMAL EXPOSURE	0 TO 55	0 TO 20	0 TO 90	0 TO 55	"CLEARLY ACCEPTABLE"	NORMALLY REQUIRES NO SPECIAL CONSIDERATIONS
B	MODERATE EXPOSURE	55 TO 65	20 TO 30	90 TO 100	55 TO 65	"NORMALLY ACCEPTABLE"	LAND USE CONTROLS SHOULD BE CONSIDERED
C	SIGNIFICANT EXPOSURE	65 TO 75	30 TO 40	100 TO 115	65 TO 75	"NORMALLY UNACCEPTABLE"	NOISE EASEMENTS, LAND USE, AND OTHER COMPATIBILITY CONTROLS RECOMMENDED
D	SEVERE EXPOSURE	75 & HIGHER	40 & HIGHER	115 & HIGHER	75 & HIGHER	"CLEARLY UNACCEPTABLE"	CONTAINMENT WITHIN AIRPORT BOUNDARY OR USE OF POSITIVE COMPATIBILITY CONTROLS RECOMMENDED

Source: FAA 1977b, p. 12.

to noise above 74 DNL. Interference with outdoor activities may become a problem with noise levels above 55 DNL. Interference with indoor residential activities may become a problem with interior noise levels above 45 DNL. If we assume that standard construction attenuates noise by about 20 decibels, with doors and windows closed, this corresponds to an exterior noise level of 65 DNL.

FAA Land Use Guidance System

In 1977, FAA issued an advisory circular on airport land use compatibility planning (FAA 1977b). It describes land use guidance (LUG) zones corresponding to aircraft noise of varying levels as measured by four different noise metrics **(Exhibit B)**. It also includes suggested land use noise sensitivity guidelines **(Exhibit C)**.

In **Exhibit B**, LUG Chart I, four land use guidance zones are described, corresponding to DNL levels of 55 or less (A), 55 to 65 (B), 65 to 75 (C), and 75 and over (D). LUG Zone

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In 1979, the Federal Interagency Committee on Urban Noise (FICUN), including representatives of the Environmental Protection Agency, the Department of Transportation, the Housing and Urban Development Department, the Department of Defense, and the Veterans Administration, was established to coordinate various federal programs relating to the promotion of noise-compatible development.

A is described as minimal exposure, normally requiring no special noise control considerations. LUG Zone B is described as moderate exposure where land use controls should be considered. LUG Zone C is subject to significant exposure, and various land use controls are recommended. In LUG Zone D, severe exposure, containment of the area within airport property, or other positive control measures, are suggested.

In LUG Chart II, **Exhibit C**, most noise-sensitive uses are suggested as appropriate only within LUG Zone A. These include single-family and two-family dwellings, mobile homes, cultural activities, places of public assembly, and resorts and group camps. Uses suggested for Zones A and B include multi-family dwellings and group quarters; financial, personal, business, governmental, and educational services; and manufacturing of precision instruments. In Zones C and D, various manufacturing, trade, service, resource production, and open space uses are suggested.

Federal Interagency Committee on Urban Noise

In 1979, the Federal Interagency Committee on Urban Noise (FICUN), including representatives of the Environmental Protection Agency, the Department of Transportation, the Housing and Urban Development Department, the Department of Defense, and the Veterans Administration, was established to coordinate various federal programs relating to the promotion of noise-compatible development. In 1980, the Committee published a report which contained detailed land use compatibility guidelines for varying DNL noise levels (FICUN 1980). The work of the Interagency Committee was very important as it brought together for the first time all federal agencies with a direct involvement in noise compatibility issues and forged a general consensus on land use compatibility for noise analysis on federal projects.

The Interagency guidelines describe the 65 DNL contour as the threshold of significant impact for residential land uses and a variety of noise-sensitive institutions (such as hospitals, nursing homes, schools, cultural activities, auditoriums, and outdoor music shells). Within the 55 to 65 DNL contour range, the guidelines note that cost and

EXHIBIT C

LAND USE GUIDANCE CHART II: LAND USE NOISE SENSITIVITY INTERPOLATION

LAND USE		LUG ZONE[1]
SLUCM No.	**Name**	**Suggested**
10	**Residential**	**A-B**
11	Household units.	
11,11	Single units - detached.	A
11,12	Single units - semi attached.	A
11,13	Single units - attached row.	B
11,21	Two units - side-by-side.	A
11,22	Two units - one above the other.	A
11,31	Apartments - walk up.	B
11,32	Apartments - elevator.	B-C
12	Group quarters.	A-B
13	Residential hotels.	B
14	Mobile home parks or courts.	A
15	Transient lodgings.	C
19	Other residential.	A-C
20	**Manufacturing[2]**	**C-D**
21	Food and kindred products-manufacturing.	
22	Textile mill products-manufacturing.	C-D
23	Apparel and other finished products made from fabrics, leather, and similar materials-manufacturing.	C-D
24	Lumber and wood products (except furniture)-manufacturing.	C-D
25	Furniture and fixtures-manufacturing.	C-D
26	Paper and allied products-manufacturing.	C-D
27	Printing, publishing, and allied industries.	C-D
28	Chemicals and allied products-manufacturing.	C-D
29	Petroleum refining and related industries.[3]	C-D
30	**Manufacturing[2]**	
31	Rubber and miscellaneous plastic products-manufacturing.	C-D
32	Stone, clay, and glass products-manufacturing.	C-D
33	Primary metal industries.	D
34	Fabricated metal products-manufacturing.	D
35	Professional, scientific, and controlling instruments: photographic and optical goods; watches and clocks-manufacturing.	B
39	Miscellaneous manufacturing.	C-D
40	**Transportation, communications, and utilities**	
41	Railroad, rapid rail transit, and street railway transportation.	D
42	Motor vehicle transportation.	D
43	Aircraft transportation.	D
44	Marine craft transportation.	D
45	Highway and street right-of-way.	D
46	Automobile parking.	D
47	Communication.	A-D
48	Utilities.	D
49	Other transportation communications and utilities.	A-D

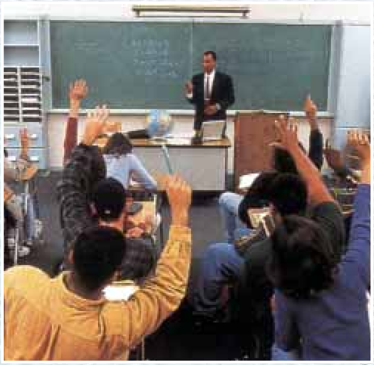
LAND USE		LUG ZONE[1]
SLUCM No.	**Name**	**Suggested**
50	**Trade[4]**	
51	Wholesale trade.	C-D
52	Retail trade-building materials, hardware, and farm equipment.	C
53	Retail trade-general merchandise.	C
54	Retail trade-food.	C
55	Retail trade-automotive, marine craft, aircraft and accessories.	C
56	Retail trade-apparal and accessories.	C
57	Retail trade-furniture, home furnishings, and equipment.	C
59	Retail trade-eating and drinking.	C-D
	Other retail trade.	
60	**Services[4]**	
61	Financial, insurance, and real estate services.	B
62	Personal services.	B
63	Business services.	B
64	Repair services.	C
65	Professional services.	B-C
66	Contract construction services.	C
67	Governmental services.	B
68	Educational services.	A-B
69	Miscellaneous services.	A-C
70	**Cultural, entertainment, and recreational**	
71	Cultural activities and nature exhibitions.	A
72	Public assembly.	A
73	Amusements.	C
74	Recreational activities.[5]	B-C
75	Resorts and group camps.	A
76	Parks.	A-C
79	Other cultural, entertainment, and recreational.[5]	A-B
80	**Resource production and extraction**	
81	Agriculture.	C-D
82	Agricultural related activities.	C-D
83	Forestry activities and related services.	D
84	Fishing activities and related services.	D
85	Mining activities and related services.	D
89	Other resource production and extraction.	C-D
90	**Undeveloped land and water areas**	
91	Undeveloped and unused land area (excluding noncommercial forest development).	D
92	Noncommercial forest development.	D
93	Water areas.	A-D
94	Vacant floor area.	A-D
95	Under construction.	A-D
99	Other undeveloped land and water areas.	A-D

1 Refer to Land Use Guidance Chart I, Exhibit C-1.
2 Zone "C" suggested maximum except where exceeded by self generated noise.
3 Zone "D" for noise purposes; observe normal hazard precautions.
4 If activity is not in substantial, air-conditioned building, go to next higher zone.
5 Requirements likely to vary - individual appraisal recommended.

SLUCM: *Standard Land Use Coding Manual*, U.S. Urban Renewal Administration and Bureau of Public Roads, 1965.

Source: FAA 1977b, p. 14.

feasibility factors were considered in defining residential development and several of the institutions as compatible. In other words, the guidelines are not based solely on the effects of noise. They also consider the cost and feasibility of noise control.



The ANSI standard acknowledges the potential for noise effects below the 65 DNL level, describing several uses as "marginally compatible" with noise below 65 DNL.

ANSI Guidelines

In 1980, the American National Standards Institute (ANSI) published recommendations for land use compatibility with respect to noise (ANSI 1980). Kryter (1984, p. 621) notes that no supporting data for the recommended standard is provided.

The ANSI guidelines are shown in **Exhibit D**. While generally similar to the Federal Interagency guidelines, there are some important differences. First, ANSI's land use classification system is less detailed. Second, the ANSI standard acknowledges the potential for noise effects below the 65 DNL level, describing several uses as "marginally compatible" with noise below 65 DNL. These include single-family residential (from 55 to 65 DNL), multi-family residential, schools, hospitals, and auditoriums (60 to 65 DNL), and outdoor music shells (50 to 65 DNL). Other outdoor activities, such as parks, playgrounds, cemeteries, and sports arenas, are described as marginally compatible with noise levels as low as 55 or 60 DNL.

14 CFR Part 150 Guidelines

The FAA adopted a revised and simplified version of the Federal Interagency guidelines when it promulgated Title 14, Part 150 of the Code of Federal Regulations in the early 1980s. (The Interim Rule was adopted on January 19, 1981. The final rule was adopted on December 13, 1984, published in the Federal Register on December 18, and became effective on January 18, 1985.) Among the changes made by FAA include the use of a coarser land use classification system and the deletion of any reference to any potential for noise impacts below the 65 DNL level.

The determination of the compatibility of various land uses with various noise levels, however, is very similar to the Interagency determinations.

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EXHIBIT D

LAND USE COMPATIBILITY WITH YEARLY DAY-NIGHT AVERAGE SOUND LEVEL AT A SITE FOR BUILDINGS AS COMMONLY CONSTRUCTED

LAND USE	Yearly Day-Night Average Sound Level (DNL) in Decibels			
	50-60	60-70	70-80	80-90
Residential - Single Family, Extensive Outdoor Use	Compatible / With Insulation	With Insulation / Incompatible	Incompatible	Incompatible
Residential - Multiple Family, Moderate Outdoor Use	Compatible	With Insulation / Incompatible	Incompatible	Incompatible
Residential - Multi-Story, Limited Outdoor Use	Compatible	With Insulation / Marginally Compatible	Marginally Compatible / Incompatible	Incompatible
Transient Lodging	Compatible	Compatible / With Insulation	Marginally Compatible / Incompatible	Incompatible
School Classrooms, Libraries, Religious Facilities	Compatible	With Insulation / Marginally Compatible	Marginally Compatible / Incompatible	Incompatible
Hospitals, Clinics, Nursing Homes, Health-Related Facilities	Compatible	With Insulation / Marginally Compatible	Marginally Compatible / Incompatible	Incompatible
Auditoriums, Concert Halls	Compatible	With Insulation / Incompatible	Incompatible	Incompatible
Music Shells	With Insulation	With Insulation / Incompatible	Incompatible	Incompatible
Sports Arenas, Outdoor Spectator Sports	Compatible	With Insulation	Incompatible	Incompatible
Neighborhood Parks	Compatible / With Insulation	With Insulation	Incompatible	Incompatible
Playgrounds, Golf Courses, Riding Stables, Water Rec., Cemeteries	Compatible	With Insulation	With Insulation / Incompatible	Incompatible
Office Buildings, Personal Services, Business and Professional	Compatible	Compatible / With Insulation	With Insulation / Incompatible	Incompatible
Commercial - Retail, Movie Theaters, Restaurants	Compatible	Compatible / With Insulation	With Insulation / Incompatible	Incompatible
Commercial - Wholesale, Some Retail, Ind., Mfg., Utilities	Compatible	Compatible	With Insulation	Incompatible
Livestock Farming, Animal Breeding	Compatible	Compatible / With Insulation	With Insulation / Incompatible	Incompatible
Agriculture (Except Livestock)	Compatible	Compatible	Compatible / With Insulation	With Insulation / Incompatible
Extensive Natural Wildlife and Recreation Areas	Compatible	With Insulation	With Insulation / Incompatible	Incompatible

LEGEND

Compatible — with Insulation — Marginally Compatible — Incompatible

Source: ANSI 1980. Cited in Kryter 1984, p. 624.

Exhibit E lists the Part 150 land use compatibility guidelines. These are only guidelines. Part 150 explicitly states that determinations of noise compatibility and regulation of land uses are purely local responsibilities.

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14 CFR PART 150 LAND USE COMPATIBILITY GUIDELINES

LAND USE	Yearly Day-Night Average Sound Level (DNL) in Decibels					
	Below 65	65-70	70-75	75-80	80-85	Over 85
RESIDENTIAL						
Residential, other than mobile homes and transient lodgings	Y	N[1]	N[1]	N	N	N
Mobile home parks	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
Government 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	25	30	N	N
Utilities	Y	Y	Y[2]	Y[3]	Y[4]	N
Communication	Y	Y	25	30	N	N
MANUFACTURING AND PRODUCTION						
Manufacturing, general	Y	Y	Y[2]	Y[3]	Y[4]	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y[6]	Y[7]	Y[8]	Y[8]	Y[8]
Livestock farming and breeding	Y	Y[6]	Y[7]	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
RECREATIONAL						
Outdoor sports arenas and spectator sports	Y	Y[5]	Y[5]	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts, and camps	Y	Y	Y	N	N	N
Golf courses, riding stables, and water recreation	Y	Y	25	30	N	N

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The designations contained in this table do not constitute a federal determination that any use of land covered by the program is acceptable 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.

See other side for notes and key to table.

14 CFR PART 150 LAND USE COMPATIBILITY GUIDELINES

KEY

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

NOTES

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

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

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

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

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

6 Residential buildings require a NLR of 25.

7 Residential buildings require a NLR of 30.

8 Residential buildings not permitted.

Source: ***14 CFR Part 150***, Appendix A, Table 1.

SELECTED STATE LAND USE COMPATIBILITY GUIDELINES

State of Oregon

The State of Oregon's Airport Planning Rule (APR) establishes a series of local government requirements and rules which pertain to aviation facility planning. These requirements are intended to promote land use compatibility around airports as well as promote a convenient and economic system of airports in the state. To assist local governments and airports in meeting the requirements of the APR, the Oregon Department of Aviation published the *Airport Land Use Compatibility Guidebook* in January 2003.

The State of Oregon recognizes that, in some instances, land use controls and restrictions that apply to the 65 DNL may be appropriate for applications to areas impacted by noise levels above 55 DNL.

The Oregon guidelines contained within the guidebook, as they relate to land use compatibility around airports, are based on administrative regulations of the Department of Environmental Quality, adopted by the Oregon Environmental Quality Commission in 1979 (Oregon Administrative Rules, Chapter 340, Division 35, Section 45). Although the FAA regards the 65 DNL contours and above as significant, the State of Oregon considers the 55 and 60 DNL contours as significant. The state recognizes that, in some instances, land use controls and restrictions that apply to the 65 DNL may be appropriate for applications to areas impacted by noise levels above 55 DNL. For example, a rural area exposed to 55 to 65 DNL noise levels may be more affected by these levels than an urban area. This is because there is typically a higher level of background noise associated with an urban area (Oregon 2003). Air carrier airports are required to do studies defining the airport impact boundary, corresponding to the 55 DNL contour. Where any noise-sensitive property occurs within the noise impact boundary, the airport must develop a noise abatement program.

An Oregon airport noise abatement program may include many different recommendations for promoting land use compatibility. These include changes in land use planning, zoning, and building codes within the 55 DNL contour. In addition, disclosure of potential noise impacts may be required and purchase of land for non-noise sensitive public uses may be permitted within the 55 DNL contour.

Within the 65 DNL contour, purchase assurance, voluntary relocation, soundproofing, and purchase of land is permitted.

State of California

California law sets the standard for the acceptable level of aircraft noise for persons residing near airports at 65 CNEL (California Code of Regulations, Title 21, Division 2.5, Chapter 6). The 65 CNEL criterion was chosen for urban residential areas where houses are of typical construction with windows partially open. Four types of land uses are defined as incompatible with noise above 65 CNEL: residences, schools, hospitals and convalescent

The guidelines contained within the California Airport Land Use Planning Handbook suggest that no new residential uses should be permitted within the 65 CNEL noise contour.

homes, and places of worship. These land uses are regarded as compatible if they have been insulated to assure an interior sound level, from aircraft noise, of 45 CNEL. They are also to be considered compatible if an avigation easement over the property has been obtained by the airport operator.

California noise insulation standards apply to new hotels, motels, apartment buildings, and other dwellings, not including detached single-family homes. They require that "interior noise levels attributable to outdoor sources shall not exceed 45 decibels (based on the DNL or CNEL metric) in any habitable room." In addition, any of these residential structures proposed within a 60 CNEL noise contour requires an acoustical analysis to show that the proposed design will meet the allowable interior noise level standard. (California Code of Regulations, Title 24, Part 2, Appendix Chapter 35.)

In the *California Airport Land Use Planning Handbook* (Caltrans 2002), land use compatibility guidelines are suggested for use in the preparation of comprehensive airport land use plans. The guidelines suggest that no new residential uses should be permitted within the 65 CNEL noise contour. In quiet communities, it is recommended that the 60 CNEL should be used as the maximum permissible noise level for residential uses. At rural airports, it is noted that 55 CNEL may be suitable for use as a maximum permissible noise level for residential uses.

These guidelines are similar to those proposed in earlier editions of the *Airport Land Use Planning Handbook*. However, the 2003 handbook provides much more definitive guidance for compatible land use planning around airports.

State of Florida

In 1990, the State of Florida passed legislation which created the Airport Safety and Land Use Compatibility Study Commission. The charge to this commission was to assure that airports in Florida will have the capacity to accommodate future growth without jeopardizing public health, safety, and welfare. One of the Commissions' recommendations was to require the Florida Department

Within the State of Florida's Airport Compatible Land Use Guidance for Florida Communities, it was requested that each local government prohibit new residential development and other noise-sensitive uses for areas within the 65 DNL contour. Where practical, new residential development should be limited in areas down to the 55 DNL contour.

of Transportation (FDOT) to establish guidelines regarding compatible land use around airports. In 1994, FDOT responded to this recommendation by publishing a guidance document entitled *Airport Compatible Land Use Guidance for Florida Communities*.

As part of this document's conclusions, it was recommended that all commercial service airports, or airports with significant numbers of general aviation operations, establish a noise compatibility planning program in accordance with the provisions of F.A.R. Part 150. All communities within the airport environs should participate in the preparation of this program. It was requested that each local government prohibit new residential development and other noise-sensitive uses for areas within the 65 DNL contour. Where practical, new residential development should be limited in areas down to the 55 DNL contour.

State of Wisconsin

Wisconsin State Law 114.136 was established to give local governments the authority to regulate land uses within three miles of the airport boundary. These land use controls supercede any other applicable zoning limits by other jurisdictions that may apply to the area surrounding the airport. To assist airports with the development of land use controls, the Wisconsin Department of Transportation (WisDOT) published a document titled *Land Use Planning Around Airports in Wisconsin* in 2001. Various land use tools such as avigation easements, noise overlay zones, height and hazard zoning, and subdivision regulations are presented within the land use planning guide. WisDOT has recognized that the types of airport compatible land uses depend on the location and size of the airport as well as the type and volume of aircraft using the facility. The 65 DNL contour should be used as a starting point for land use regulations, but lesser contours should be considered if deemed necessary.

The 1985 Wisconsin Act 136 takes State Law 114.136 one step further by requiring counties and municipalities to depict airport locations and areas affected by aircraft operations on official maps. The law also requires the zoning authority to notify the airport owner of any proposed zoning changes within the airport environs.

Within the Airports and Compatible Land Use document, jurisdictions are encouraged to work with airports to ensure that airport noise is factored into land use decisions for the protection of the health, safety, and welfare of its residents.

State of Washington

In 1996, Washington State Senate Bill 6442 was passed. This bill requires that every city, town, and county, having a general aviation airport in its jurisdiction, discourage the siting of land uses that are incompatible with airport operations. Policies protecting airport facilities must be implemented within the comprehensive plan and development regulations. Formal consultation with the aviation community is required and all plans must be filed with the Washington State Department of Transportation Aviation Division (WADOT). To assist jurisdictions with establishing appropriate land use planning tools and regulations, WADOT published a revised *Airports and Compatible Land Use* document in February 1999. Within this planning document, jurisdictions are encouraged to work with airports to ensure that airport noise is factored into land use decisions for the protection of the health, safety, and welfare of its residents.

TRENDS IN LAND USE COMPATIBILITY GUIDELINES

In recent years, citizen activists, anti-noise groups, and environmental organizations have become concerned that the current methods of assessing aircraft noise are not sufficient. Among the concerns is that 65 DNL does not adequately represent the true threshold of significant noise impact. It has been argued that the impact threshold should be lowered to 60 or even 55 DNL, especially in areas of quiet background noise and in areas impacted by large increases in noise (ANR, V. 4, N. 12, p. 91; V. 5, No. 3, p. 21; V. 5, N. 11, p. 82). The purpose of this section is to provide a time line of events which, taken together, indicate a distinct movement toward the consideration of airport noise impacts below the 65 DNL level.

Y E A R

1992

In the 1992 session of Congress, a bill was introduced to lower the threshold for non-compatible land uses from 65 to 55 DNL (ANR, V. 4, N. 11, p. 83). The bill, however, was not passed. In 1995, a bill (HR 1971) was introduced in the House of Representatives to require the Department of Transportation to develop a plan to reduce the number of people residing within the 60 DNL contours around airports by 75 percent by January 1, 2001 (ANR, V. 7, N.

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13, p. 101). This bill was not passed either. Nevertheless, these developments indicate concerns about aircraft noise below 65 DNL are coalescing into specific proposals to address the situation.

Also in 1992, an important arbitration proceeding between Raleigh-Durham International Airport and airport neighbors was concluded. Residents residing between the 55 and 65 DNL contours were awarded compensation for noise damages. This was apparently the first time damages had been awarded beyond the 65 DNL contour at any domestic airport (ANR V. 4, No. 14, p. 107). While, strictly speaking, this case sets no legal precedent, it provides further evidence that a change in the definition of the threshold of significant noise impact may be gathering momentum.

After the arbitration was concluded, the Raleigh-Durham Airport Authority developed a model noise ordinance that would require new housing between the 55 and 60 DNL contours to be sound-insulated to achieve an outdoor-to-indoor noise level reduction of 30 dB. Between the 60 and 65 DNL contours, a 35 dB reduction would be required. The model ordinance was proposed for use by local governments exercising land use control. (See ANR, V. 6, N. 3, p. 17.)

In August 1992, the Federal Interagency Committee on Noise (FICON 1992) issued its final report. FICON included representatives of the Departments of Transportation, Defense, Justice, Veterans Affairs, Housing and Urban Development; the Environmental Protection Agency; and the Council on Environmental Quality. FICON was formed to review federal policies for the assessment of aircraft noise in environmental studies. The Committee advocated the continued use of the DNL metric as the principal means of assessing long-term aircraft noise exposure. It further reinforced the designation of 65 DNL as the threshold of significant impact on non-compatible land use. FICON recognized, however, the potential for noise impacts down to the 60 DNL level, providing guidance for analyzing noise between 60 and 65 DNL in reports prepared under the National Environmental Policy Act (NEPA). This includes environmental assessments and environmental impact statements. (It does not include F.A.R. Part 150 studies.) FICON offered this explanation for this action (FICON 1992, p. 3-5).

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1992 (cont.)

There are a number of reasons for moving in this direction at this time. First, the Schultz Curve [see the bottom panel in **Exhibit A**] recognizes that some people will be highly annoyed at relatively low levels of noise. This is further evidenced from numerous public response forums that some people living in areas exposed to DNL values less than 65 dB believe they are substantially impacted (U.S. EPA 1991). Secondly, the FICON Technical Subgroup has shown clearly that large changes in levels of noise exposure (on the order of 3 dB or more) below DNL 65 dB can be perceived by people as a degradation of their noise environment. Finally, there now exist computational techniques that allow for cost-effective calculation of noise exposure and impact data in the range below DNL 65 dB.

The specific FICON recommendation was as follows (FICON 1992, p. 3-5):

If screening analysis shows that noise-sensitive areas will be at or above DNL 65 dB and will have an increase of DNL 1.5 dB or more, further analysis should be conducted of noise-sensitive areas between DNL 60-65 dB having an increase of DNL 3 dB or more due to the proposed airport noise exposure.

FICON further recommended that if any noise-sensitive areas between 60 and 65 DNL are projected to have an increase of 3 DNL or more as a result of the proposed airport noise exposure, mitigation actions should be included for those areas (FICON 1992, p. 3-7). The FICON recommendations represent the first uniform guidelines issued by the federal government for the consideration of aircraft noise impacts below the 65 DNL level. At this time, these remain recommendations and are not official policy.

1995

The Federal Transit Administration (FTA) released a guidance document entitled *Transit Noise and Vibration Impact Assessment*. Within this document, FTA cites the EPA recommendation of 55 DNL to develop their curve of impact. Further, FTA states that they use the FAA criteria of 65 DNL to define their curve of severe impact.

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1996

The American National Standards Institute (ANSI) recommends 55 DNL as the criterion level for housing and similar noise-sensitive land uses within their report *ANSI Quantities and Procedures for Description and Measurement of Environmental Sounds - Part 3: Short-Term Measurements with an Observer Present*.

The International Organization for Economic Cooperation and Development suggests the following environmentally sustainable transport noise levels: 55 DNL in urban areas and 50 DNL in rural areas.

1998

Within the Federal Railroad Administration's (FRA) *High-Speed Ground Transportation Noise and Vibration Impact Assessment*, the same criteria used by the FTA is used to assess impacts of new, high-speed trains.

In this same year, the Surface Transportation Board (STB) utilizes 55 DNL as a threshold of impact within the Draft Environmental Impact Statement for the proposed Conrail acquisition by Norfolk Southern Railway Company.

The World Bank Group (WBG) set noise limits for general industrial projects to ensure that projects they fund, such as iron and steel manufacturing and thermal power plants, do not negatively impact noise-sensitive development. The WBG set their threshold of impact at 55 DNL.

1999

The Federal Energy Regulatory Commission adopts a revision to their regulations (Part 157) which states "the noise attributable to any new compressor stations, compression added to an existing station, or any modification, upgrade, or update of an existing station, must not exceed a day-night level (Ldn) of 55 dBA at any pre-existing noise-sensitive area."

The World Health Organization's *Guidelines for Community Noise* recommends a "criteria of annoyance" daytime threshold of 55 DNL and nighttime threshold of 50 DNL for residential areas.

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RECENT DEVELOPMENTS AT THE FAA

In the late 1990s, the Naples Airport Authority determined that the short-term viability of the airport was in jeopardy due to the noise impacts at the airport. An F.A.R. Part 150 Study determined that the majority of the noise complaints were from individuals which reside outside the 65 DNL noise contour and were, therefore, not eligible for federal mitigation funding.

For several decades, the airport authority had led efforts to balance the competing needs of airport users with those of the surrounding community and had adopted numerous measures to control noise and limit incompatible land uses surrounding the facility. The surrounding jurisdictions had gone as far as to adopt the 60 DNL noise contour as the threshold of significant impact and had limited development within this contour.

Naples adopted a ban on Stage 2 aircraft under 75,000 pounds in June 2000 pursuant to the Noise Act and its implementing regulations, commonly referred to as Part 161. The restriction at Naples is important not only because it was the first, but also because it was, and is, the subject of several challenges, the results of which may prove precedential for other airport operators' efforts to address local noise issues.

Early in 2003, the FAA announced the establishment of the Center of Excellence for Aircraft Noise Mitigation. This research center is a partnership between academia, industry, and government. Part of the center's focus will be on what level of noise is significant as well as other noise metrics that can be used to assess the impact of aircraft noise on individuals.

On March 10, 2003, the FAA ruled that the ban on Stage 2 business jet operations imposed by Naples Airport Authority violates federal grant assurance obligations. This ruling came after years of research and debate regarding the restriction at Naples Airport.

Early in 2003, the FAA announced the establishment of the Center of Excellence for Aircraft Noise Mitigation. This research center is a partnership between academia, industry, and government. Part of the center's focus will be on what level of noise is significant as well as other noise metrics that can be used to assess the impact of aircraft noise on individuals.

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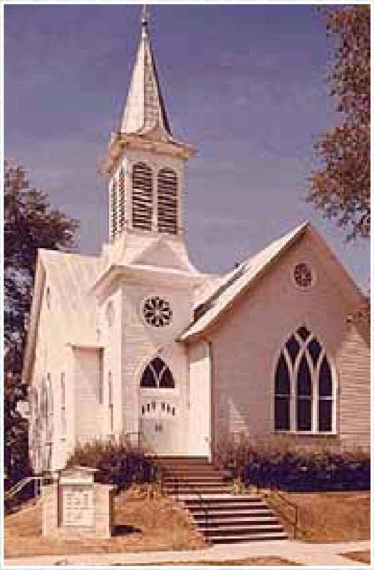
CONCLUSIONS

This technical information paper has presented information on land use compatibility guidelines with respect to noise. It is intended to serve as a reference for the development of policy guidelines for F.A.R. Part 150 Noise Compatibility Studies.

There is a strong and long-lasting consensus among various government agencies that 65 DNL represents an appropriate threshold for defining significant impacts on non-compatible land use. Nonetheless, both research and empirical evidence suggest that noise at levels below 65 DNL is often a concern. Increased concern about these lower levels of noise has been registered in public forums across the country. Official responses by public agencies indicate at least a partial acknowledgment of these concerns. Indeed, according to many agencies and organizations as well as in the states of Oregon, Florida, Wisconsin, and California, airport noise analysis and compatibility planning below the 65 DNL level is strongly advised or required.



There is a strong and long-lasting consensus among various government agencies that 65 DNL represents an appropriate threshold for defining significant impacts on non-compatible land use. Nonetheless, both research and empirical evidence suggest that noise at levels below 65 DNL is often a concern.

In urbanized areas with relatively high background noise levels, 65 DNL continues to be a reasonable threshold for defining airport noise impacts. In suburban and rural locations, lower noise thresholds deserve consideration. Given emerging national trends and the experience at many airports, it can be important to assess aircraft noise below 65 DNL, especially in areas with significant amounts of undeveloped land where land use compatibility planning is still possible. Future planning in undeveloped areas around airports should recognize that the definition of critical noise thresholds is undergoing transition. In setting a prudent course for future land use near airports, planners and policy-makers should try to anticipate these changes.

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