COUNTY of VENTURA
Department of Airports

555 Airport Way, Suite B
Camarillo, CA 93010
Phone: (805) 388-4372
Fax: (805) 388-4366
www.ventura.org/airports

August 25, 2022

Subject: Supplement to the 1998 Oxnard Airport FAR Part 150 Noise Compatibility Study

Dear Reader,

The document appearing after this cover letter is a FINAL DRAFT of a Part 150 Noise Compatibility Study conducted in 1998.

The Oxnard Airport Federal Aviation Regulation (FAR) Part 150 Noise Compatibility Study (Part 150 Study) was prepared with financial assistance and using approved methodology developed by the Federal Aviation Administration (FAA) in place at the time of the study. Please see *Title 14 of the Code of Federal Regulations Part 150, Noise Compatibility Planning* (https://www.faa.gov/airports/environmental/airport_noise) to view current guidance, as well as references to other relevant documents pertaining to the preparation of a Part 150 Study.

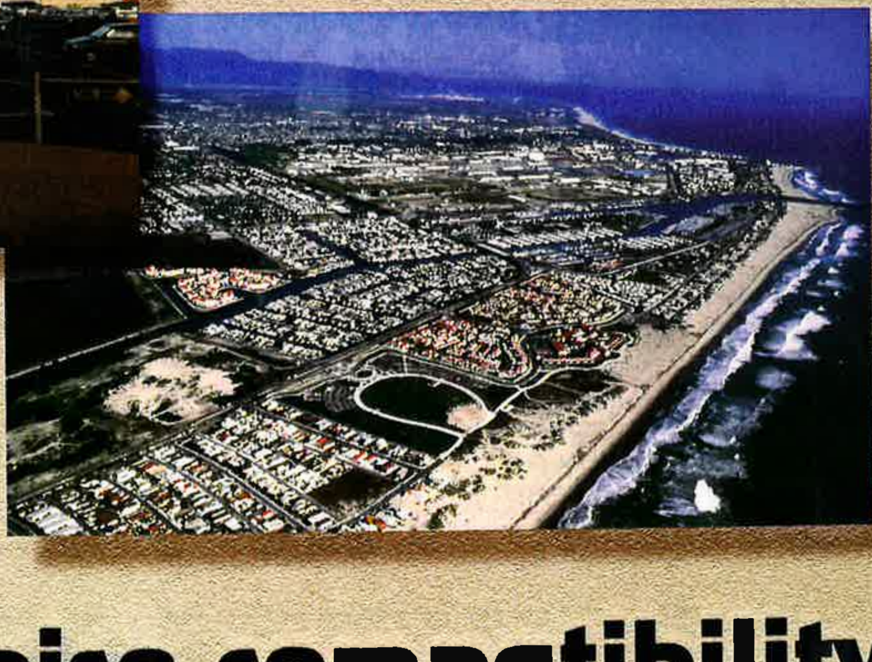
The Noise Compatibility Program (NCP) proposed in the 1998 study was not adopted by County Board of Supervisors at the time. And while the draft final document was provided to the FAA on February 15, 2000, it's review/approval by the FAA was not a requirement of the grant and no subsequent action was taken to formally approve the document. Please note however, that a majority of the recommendations made in the study have been adopted into the Department of Airports' voluntary measures aimed at reducing noise exposure, which are still in place today.

In August 2022 the County of Ventura received a grant from the FAA to prepare an update to the Part 150 Study at Oxnard Airport. This FINAL DRAFT of the 1998 Part 150 Noise Compatibility Study is being circulated to provide a benchmark for the upcoming study effort to begin in late 2022.

Keith Freitas, A.A.E., C.A.E.
Director of Airports

FINAL DRAFT – NOT APPROVED BY BOS OR FAA

Oxnard Airport



f.a.r. part 150

noise compatibility study

planning advisory committee workbook

FINAL DRAFT – NOT APPROVED BY BOS OR FAA

county of ventura
DEPARTMENT OF AIRPORTS

555 Airport Way ◆ Camarillo, CA 93010 ◆ (805) 388-4274 ◆ Fax: (805) 388-4366

February 15, 2000

Mr, Brian Armstrong
Airport Planner, AWT - 61 1 .1
FEDERAL AVIATION ADMINISTRATION
WESTERN - PACIFIC REGION
P.O. Box 92007
World Way Postal Center
Los Angeles, CA 90009-2007

RE: Oxnard Airport-F.A.R. Part 150 Noise Compatibility Program

Dear Brian:

Enclosed please find one (1) copy of the Noise Compatibility Program (NCP) for the Oxnard Airport. In addition, one (1) copy of the supporting documentation for the NCP is also enclosed. We understand that according to FAA's Airport Improvement Program (AIP) Handbook (Order 5100.38A), "Submission of noise exposure maps and noise compatibility programs for determinations under Part 150 are not required by the grant". As you know, the County previously submitted the Noise Exposure Map (NEM) document to your office in May of 1998. The NEM was subsequently accepted by FAA on September 10, 1998. Although work on the NCP has also been completed, at this time the County has elected not to submit the NCP for formal FAA review/approval. In the future, if authorized by the County Board of Supervisors, we will officially submit the NCP for FAA review/approval with the appropriate revisions and/or updates.

The County has not received the final invoice form Coffman Associates as of this time, so we are not able to submit a final "Request for Payment" and request that the grant be closed. The County will process a final "Request for Payment" as soon as the final invoice is received.

FINAL DRAFT – NOT APPROVED BY BOS OR FAA

As always, the County appreciates your continued support of the Oxnard Airport and we thank you for your participation and input during the preparation of the F.A.R. Part 150 Noise Compatibility Study. In the meantime, if you have any questions or need additional information to close out this project, please do not hesitate to call.

Sincerely,
DEPARTMENT OF AIRPORTS

Rodney L. Murphy, C.A.E.
Director of Airports

Enclosures
c: Mr. Jim Harris, Coffman Associates
Mr. David Fitz, Coffman Associates

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County of Ventura, California

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Chapter Three
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OXNARD AIRPORT
Oxnard, California

F.A.R. Part 150 Noise Compatibility Study
Planning Advisory Committee Members

October 30, 1998

Enclosed are materials for the F.A.R. Part 150 Noise Compatibility Study. Please put these behind the appendices tab in your notebook.

A public hearing on the proposed Noise Compatibility Plan is set for Monday, November 9, at 7:30 p.m. in Meeting Room "B" of the Oxnard Public Library, 251 South "A" Street, Oxnard, California. An informal open house will precede the hearing, starting at 6:30 p.m. We will not be holding another PAC meeting.

F.A.R. PART 150 NOISE COMPATIBILITY STUDY

Appendix D - Grid Point Analysis

☐ *I have read the working paper and have no comments.*

☐ *I have read the working paper and have the following comments. (Please add extra sheets if necessary.)*

Please mail this response sheet by November 19, 1998 to:

COFFMAN ASSOCIATES, INC.
237 N.W. Blue Parkway, Suite 100
Lee's Summit, Missouri 64063
Attn: Mark Johnson

Name: ____________________

Representing: ____________________

Phone: ____________________

OXNARD AIRPORT
Oxnard, California

F.A.R. Part 150 Noise Compatibility Study
Planning Advisory Committee Members

August 24, 1998

Enclosed are materials for the F.A.R. Part 150 Noise Compatibility Study. Please put them behind the appropriate tabs in your notebooks. The next PAC meeting is scheduled for **Wednesday, September 2, 1998 at 3:00 p.m.** The meeting will be held in the Ventura County Department of Aviation offices at Camarillo Airport, 555 Airport Way. The Public Information Meeting will be held the same day from 7:00 p.m. to 8:30 p.m. at the Oxnard Community Center, Thousand Oaks Room, 800 Hobson Way.

F.A.R. PART 150 NOISE COMPATIBILITY STUDY
Chapter Six - Noise Compatibility Plan
Appendix C - Implementation Materials

☐ *I have read the working paper and have no comments.*

☐ *I have read the working paper and have the following comments. (Please add extra sheets if necessary.)*

Please mail this response sheet by October 2, 1998 to:

COFFMAN ASSOCIATES, INC.
237 N.W. Blue Parkway, Suite 100
Lee's Summit, Missouri 64063
Attn: Mark Johnson

Name: ____________________
Representing: ____________________
Phone: ____________________

OXNARD AIRPORT
Oxnard, California

F.A.R. Part 150 Noise Compatibility Study
Planning Advisory Committee Members

December 16, 1997

Enclosed are materials for the F.A.R. Part 150 Noise Compatibility Study. Please put them behind the appropriate tabs in your notebooks. The next PAC meeting is scheduled for **Wednesday, January 7, 1998 at 3:00 p.m.** The meeting will be held in the Ventura County Department of Aviation offices at Camarillo Airport, 555 Airport Way.

F.A.R. PART 150 NOISE COMPATIBILITY STUDY
Updated PAC List
Minutes of 12/3/97 PAC Meeting
Minutes of 12/3/97 Public Information Meeting

☐ *I have read the working paper and have no comments.*

☐ *I have read the working paper and have the following comments. (Please add extra sheets if necessary.)*

Please mail this response sheet by January 20, 1998 to:

COFFMAN ASSOCIATES, INC.
237 N.W. Blue Parkway, Suite 100
Lee's Summit, Missouri 64063
Attn: Mark Johnson

Name: ______________________
Representing: ______________________
Phone: ______________________

OXNARD AIRPORT
F.A.R. PART 150 NOISE COMPATIBILITY STUDY

PLANNING ADVISORY COMMITTEE MEETING
December 3, 1997

Location: Ventura County Airport Department Offices
Attendance: See attached sign-in sheets

The meeting was opened at 3:15 p.m. by Rod Murphy, Director of Airports. Those in attendance introduced themselves. Mark Johnson of Coffman Associates, the prime consultant on the project, presented an overview of the planning process. He then reviewed Chapter One, Inventory. It was noted that some churches had been left off the future land use map. Steve Buratti noted that the residential area immediately east of the Airport was built long before the Airport.

Dave Fitz then discussed Chapter Two, Aviation Noise. He began with a discussion of noise metrics taken from one of the Technical Information Papers (TIPs). There was considerable discussion of the flight track exhibits. Some needed revisions were pointed out. Steve Buratti said that he was very concerned about the enlargement of the noise contour east of the airport that was projected over time. He wanted to know why it was getting larger. It was explained that the type of aircraft using the airport was not expected to change, so the sound of individual aircraft was not expected to become greater. The CNEL noise contour is projected to become larger because more aircraft overflights are projected in the future. This will increase the total noise exposure in the area.

Dick Maggio asked if the noise contours used in this study and in the Comprehensive Airport Land Use Plan (CLUP) would be consistent. Mark Johnson said that the noise contours developed in the Part 150 Study would be used in the CLUP.

Mark Johnson then reviewed Chapter Three, Noise Impacts. He explained that the consultant counted the number of dwelling units inside each 5-CNEL contour range. An estimate of the resident population within each contour range was developed by multiplying the number of dwellings by an estimated average household size. Dick Maggio asked how the population per dwelling unit was determined. Mark Johnson explained that 1990 Census data was used. He said the total Oxnard population in households was divided by the number of housing units in the City.

Dick Maggio asked if there were some examples of the sound of 65 CNEL that the consultant could provide. Mark Johnson explained that it was not exactly feasible to demonstrate such a sound. He said that it is possible Mr. Maggio was recalling a computer model that was capable of producing the sounds of different kinds of aircraft with an exact reproduction of the varying magnitudes of sound. He said the FAA used this model, called ISIS, on occasion.

The meeting was closed at approximately 4:30 p.m.

Prepared by Mark R. Johnson, Coffman Associates

FINAL DRAFT – NOT APPROVED BY BOS OR FAA

F.A.R PART 150 NOISE COMPATIBILITY STUDY

MEETING ATTENDANCE RECORD

'or Oxnard Airport, Oxnard CA

OXNARD AIRPORT

Meeting: P.A.C. Mtg

Date: 12/3/97 Time: 3:00 pm

Place: Ventura Co. Dept of Airports Offices

Please print neatly

NAME	REPRESENTING	PHONE NUMBER
1. Mark Johnson	Coffman Assoc.	816-524-3500
2. Dave Fitz	Coffman Assoc.	816-524-3500
3. Charles Liebek	FAA	310-725-3614
4. Christine Eberhard	CommuniQuest	310-546-5713
5. Dick Maggio	City of Oxnard	805-385-7850
6. Gary Barber	Aviation Advisory/VTA	805-659-4319
7. Michael Musca	Dept of Airports county	805 388 4201
8. Steve Buratti	Resident	805 483-2012
9. Barbara S. Sominsky	Dept. of Airports Ventura Co	805 388-4205
10. Lois Colstrello	County Ventura CAO	805 654-2690
11. Tad Dougherty	Oxnard Airport Manager	805 382-3024
12. Charles W. McLaughlin	Aspen Helicopters, Inc	(805) 985-5416
13. Rod Murphy	Dept. of Airports	805/388-4200
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15.		
16.		
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OXNARD AIRPORT
F.A.R. PART 150 NOISE COMPATIBILITY STUDY

PUBLIC INFORMATION MEETING
December 3, 1997

LOCATION: Oxnard Community Center, Thousand Oaks Room, 800 Hobson Way
ATTENDANCE: See attached sign-in sheets

The meeting was opened at 7:00 p.m. and continued until 9:00 p.m. An informal open house format was used for most of the evening. Materials were on display around the meeting room and airport officials and consultants were posted at different stations.

Rod Murphy, Director of Aviation, and Mark Johnson of Coffman Associates gave brief presentations explaining the study process and describing initial findings of the study.

The following concerns were raised by people attending the meeting.

- Encourage late night arrivals to land on Runway 8.
- Questions were asked about helicopter routes into and out of the airport.
- The suggestion was made that single event noise exposure levels be presented in addition to CNEL levels.
- Some people were concerned about the prospects of noise exposure east of the airport increasing over time, as shown in the noise contour projections.

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F.A.R PART 150 NOISE COMPATIBILITY STUDY
PUBLIC MEETING ATTENDANCE RECORD
For Oxnard Airport, Oxnard CA

OXNARD AIRPORT

1

Meeting: Public Info Mtg

Date: 12/3/97 Time: 7:00 pm

Place: Oxnard Community Ctr.

Please print neatly

NAME	ADDRESS	PHONE NUMBER
1. Charles McLaughlin	706 Rosebud Dr	
2. VINCE COX	1820 LA QUINTA W	981-0850
3. PATRICIA + KEITH MURPHY	324 So. G St., OXNARD	
4. DEAN + TONI MAULHARDT	300 W. 3rd St OX	339-4150
5. GARY PETROWSKI	4270 GRAND AVE, OJAI	985-3390.
6. Robert W. Phillips	3720 Monte Carlo Dr Ox	985-2778
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F.A.R PART 150 NOISE COMPATIBILITY STUDY

PUBLIC MEETING ATTENDANCE RECORD

For Oxnard Airport, Oxnard CA

OXNARD AIRPORT

2

Meeting: PUBLIC INFO MTG

Date: 12/3/97 Time: 7:00 pm

Place: Oxnard Community Ctr.

Please print neatly

	NAME	ADDRESS	PHONE NUMBER
1.	George Neusse	5540 W 5th #153 OXNARD	984-0427
2.	Ada Calderwood	5540 W. 5th #153 Oxnard Shores	984-0427
3.	Dave & Diane Johnson	1537 Little Farms Rd	382-2100
4.	DAVE PAPCKE	3601 MONTE CARLO DR	385-2686
5.	CHRISTINE EBERHARD	CommuniQuest	310-546-5713
6.	Mark Johnson	Coffman Assoc	816-524-3500
7.	Dave Fitz	Coffman Assoc.	" "
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OXNARD AIRPORT
Oxnard, California

F.A.R. Part 150 Noise Compatibility Study
Planning Advisory Committee Members

December 1, 1997

Enclosed are draft working papers for the F.A.R. Part 150 Noise Compatibility Study. Please put them behind the appropriate tabs in your notebooks. They will be presented at the next PAC meeting scheduled for **Wednesday, December 3, 1997 at 3:00 p.m.** The meeting will be held in the Ventura County Department of Aviation offices at Camarillo Airport, 555 Airport Way. (Also enclosed is an updated list of PAC members.)

F.A.R. PART 150 NOISE COMPATIBILITY STUDY
CHAPTER TWO - AVIATION NOISE
CHAPTER THREE - NOISE IMPACTS

☐ *I have read the working paper and have no comments.*

☐ *I have read the working paper and have the following comments. (Please add extra sheets if necessary.)*

Please mail this response sheet by January 16, 1998 to:

COFFMAN ASSOCIATES, INC.
237 N.W. Blue Parkway, Suite 100
Lee's Summit, Missouri 64063
Attn: Mark Johnson

Name: ____________________
Representing: ____________________
Phone: ____________________

FINAL DRAFT – NOT APPROVED BY BOS OR FAA

OXNARD AIRPORT
Oxnard, California

F.A.R. Part 150 Noise Compatibility Study
Planning Advisory Committee Members

November 21, 1997

Enclosed is a draft working paper for the F.A.R. Part 150 Noise Compatibility Study. It will be presented at the first PAC meeting scheduled for **Wednesday, December 3, 1997 at 3:00 p.m.** The meeting will be held in the Ventura County Department of Aviation offices at Camarillo Airport, 555 Airport Way.

F.A.R. PART 150 NOISE COMPATIBILITY STUDY
CHAPTER ONE - INVENTORY

☐ *I have read the working paper and have no comments.*

☐ *I have read the working paper and have the following comments. (Please add extra sheets if necessary.)*

Please mail this response sheet by December 30, 1997 to:

COFFMAN ASSOCIATES, INC.
237 N.W. Blue Parkway, Suite 100
Lee's Summit, Missouri 64063
Attn: Mark Johnson

Name: ______________________
Representing: ______________________
Phone: ______________________

FINAL DRAFT – NOT APPROVED BY BOS OR FAA

OXNARD AIRPORT
Oxnard, California

F.A.R. Part 150 Noise Compatibility Study
Planning Advisory Committee Members

April 30, 1998

Enclosed are materials for the F.A.R. Part 150 Noise Compatibility Study. Please put them behind the appropriate tabs in your notebooks. The next PAC meeting is scheduled for **Wednesday, May 6, 1998 at 3:00 p.m.** The meeting will be held in the Ventura County Department of Aviation offices at Camarillo Airport, 555 Airport Way. The Public Information Meeting will be held the same day from 7:00 p.m. to 8:30 p.m. at the Oxnard Community Center, Thousand Oaks Room, 800 Hobson Way.

F.A.R. PART 150 NOISE COMPATIBILITY STUDY
Chapter Five - Land Use Alternatives

☐ *I have read the working paper and have no comments.*

☐ *I have read the working paper and have the following comments. (Please add extra sheets if necessary.)*

Please mail this response sheet by May 22, 1998 to:

COFFMAN ASSOCIATES, INC.
237 N.W. Blue Parkway, Suite 100
Lee's Summit, Missouri 64063
Attn: Mark Johnson

Name: ____________________
Representing: ____________________
Phone: ____________________

OXNARD AIRPORT
Oxnard, California

F.A.R. Part 150 Noise Compatibility Study
Planning Advisory Committee Members

April 27, 1998

Enclosed are materials for the F.A.R. Part 150 Noise Compatibility Study. Please put them behind the appropriate tabs in your notebooks. The next PAC meeting is scheduled for **Wednesday, May 6, 1998 at 3:00 p.m.** The meeting will be held in the Ventura County Department of Aviation offices at Camarillo Airport, 555 Airport Way. The Public Information Meeting will be held the same day from 7:00 p.m. to 8:30 p.m. at the Oxnard Community Center, Thousand Oaks Room, 800 Hobson Way.

F.A.R. PART 150 NOISE COMPATIBILITY STUDY

Chapter Four - Noise Abatement Alternatives
Chapter Five - Land Use Alternatives (forthcoming)

☐ *I have read the working paper and have no comments.*

☐ *I have read the working paper and have the following comments. (Please add extra sheets if necessary.)*

Please mail this response sheet by May 22, 1998 to:

COFFMAN ASSOCIATES, INC.
237 N.W. Blue Parkway, Suite 100
Lee's Summit, Missouri 64063
Attn: Mark Johnson

Name: ____________________
Representing: ____________________
Phone: ____________________

FINAL DRAFT – NOT APPROVED BY BOS OR FAA

Coffman Associates
Airport Consultants

MEMORANDUM

October 15, 1997

To: Members of the Planning Advisory Committee, Oxnard Airport
From: Mark R. Johnson, Study Technical Manager
Re: F.A.R. Part 150 Noise Compatibility Study for Oxnard Airport - Distribution of Study Workbooks

Transmitted herewith is a copy of the Study Workbook we will use during the Part 150 Study process. The divider tabs indicate the place where you can file future working papers. Immediately behind this memo is a section explaining the role of the Planning Advisory Committee. Behind the last tab are five technical information papers (TIPs) explaining different technical aspects of noise compatibility planning. These will be helpful during the study if you have technical questions as you are reviewing the study working papers. The TIPs include a 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. We encourage you to review the TIPs to familiarize yourselves with some basic information we will be referring to during the study.

We expect to mail the first three working papers to you within the next few weeks. These will include Chapter One, Inventory, Chapter Two, Aviation Noise, and Chapter Three, Noise Impacts. We will be notifying you of the next Planning Advisory Meeting soon.

Please call me at 1-800-892-7772 if you have any questions.

Kansas City • Phoenix

237 N.W. Blue Parkway, Suite 100, Lee's Summit, MO 64063
816-524-3500 • FAX 524-2575 • coffman@coffmanassoc.com

WELCOME TO THE PLANNING ADVISORY COMMITTEE

The Ventura County Department of Airports and its consultants, Coffman Associates and CommuniQuest, are pleased to welcome you to the Planning Advisory Committee (PAC) for the F.A.R. Part 150 Noise Compatibility Study. We very much appreciate the interest you have in this project. Over the next several months you will be able to make an important contribution to the study. We believe that you, in turn, will find your participation with the committee to be an interesting and profitable experience.

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 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 represent one or more constituent interests — neighbor-hood 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. We will provide our presentation materials to all PAC members who might wish to volunteer to make presentations to their own constituents. Call the consultants at any time for advice and assistance.

- **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 Planning Advisory Committee. The attached list shows the broad range of interests to be represented -- local businesses and residents, air traffic controllers, pilots, fixed-base operators, national aviation organizations, and local governments and planning officials.

HOW WILL THE PAC OPERATE?

The PAC will operate as informally as possible -- no rules, no compulsory attendance, no voting, and no offices. The meetings will be conducted by the consultant and will be called at various points in the study (approximately four) when committee input is especially needed. Meetings will be scheduled with sufficient advance notice to permit you to arrange your schedule. We will initially schedule meetings in the afternoon and will continue to do so if the time is generally acceptable.

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

In the evening after each PAC meeting, we will hold a public information workshop so that we may report to the community at large and elicit their views and input. We invite you to attend these evening workshops. They 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.

When they are in the local area, the consultants will make themselves available for small group meetings at private homes, user group meetings, and similar gatherings. Please contact the consultants if you wish to arrange or host such meetings.

Before 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. Copies of the final reports will also be provided to each committee member at the end of the study.

SEE YOU AT THE MEETINGS!

Once again, welcome to the PAC and thanks for accepting the invitation to participate. We will do everything we can to make sure your participation is a worthwhile and satisfying experience. All users and neighbors of Oxnard Airport will be better served as a result of these efforts.

OXNARD AIRPORT
NOISE COMPATIBILITY STUDY
PLANNING ADVISORY COMMITTEE

John Flynn
Supervisor
County of Ventura
800 South Victoria Avenue
Ventura, CA 93009

Terry Dryer
Program Management Analyst
County of Ventura
800 South Victoria Avenue
Ventura, CA 93009

Manuel Lopez
Mayor
City of Oxnard
305 West Third Street
Oxnard, CA 93030

Pricilla Hernandez
City Manager
City of Oxnard
305 W. Third Street
Oxnard, CA 93030

Mr. Richard Maggio
Director of Community Development
City of Oxnard
305 West Third Street
Oxnard, CA 93030

Gary Barber
Chairman
Aviation Advisory Commission
10686 Loma Vista Road
Ventura, CA 93004

Mr. Steve Buratti
234 South "F" Street
Oxnard, CA 93030

Mr. Tim Rawle
5540 W. Harbor Blvd.
Space 63
Oxnard, CA 93030

Tad Dougherty
Airport Manager
555 Airport Way
Camarillo, CA 93010

Bruce Troyer
FAA Tower Manager
Oxnard Airport
2889 West Fifth Street
Oxnard, CA 93030

Lt. Brett Easler
ATC
U.S. Naval Air Station
Code 6130
Point Mugu, CA 93042

Mr. Dick Dyer
CALTRANS Aeronautics Program
M.S. #40
P.O. Box 942874
Sacramento, CA 94274

Mr. Charles B. Lieber, AWP-611.1
FAA Regional Office
P.O. Box 92007, WWPC
Los Angeles, CA 90009

Mr. Charles McLaughlin
President
Aspen Helicopters, Inc.
2899 W. Fifth Street
Oxnard, CA 93030

OXNARD AIRPORT
NOISE COMPATIBILITY STUDY
PLANNING ADVISORY COMMITTEE

Mr. John Flynn
Supervisor
County of Ventura
800 South Victoria Avenue
Ventura, CA 93009
(805) 654-2661
FAX (805) 654-2630

Ms. Lois Calatrello
Program Management Analyst
County of Ventura
800 South Victoria Avenue
Ventura, CA 93009
(805) 654-2690
FAX (805) 654-2630

Mr. Manuel Lopez
Mayor
City of Oxnard
305 West Third Street
Oxnard, CA 93030
(805) 385-7858
FAX (805) 385-7417

Ms. Priscilla Hernandez
City Manager
City of Oxnard
305 W. Third Street
Oxnard, CA 93030
(805) 385-7858
FAX (805) 385-7417

Mr. Richard Maggio
Director of Community Development
City of Oxnard
305 West Third Street
Oxnard, CA 93030
(805) 385-7850
FAX (805) 385-7417

Mr. Gary Barber
Chairman
Aviation Advisory Commission
10686 Loma Vista Road
Ventura, CA 93004
(805) 659-4319

Mr. Steve Buratti
234 South "F" Street
Oxnard, CA 93030
(805) 483-2012

Mr. Tad Dougherty
Airport Manager
County of Ventura - Dept. of Airports
555 Airport Way
Camarillo, CA 93010
(805) 382-3024
FAX (805) 382-9845

Mr. Bruce Troyer
FAA Tower Manager
Oxnard Airport
2889 West Fifth Street
Oxnard, CA 93030

Lt. Brett Easler
ATC
U.S. Naval Air Station
Code 6130
Point Mugu, CA 93042

Mr. Dick Dyer (Richard G.)
Airport Environmental Specialist
CALTRANS Aeronautics Program
M.S. #40
1130 K Street, 4th Floor
P.O. Box 942874
Sacramento, CA 94274
(916) 654-5507
FAX (916) 653-9531

Mr. Charles B. Lieber, AWP-611.1
FAA Regional Office
Western Pacific Region
P.O. Box 92007, WWPC
Los Angeles, CA 90009
or
15000 Aviation Blvd.
Lawndale, CA 90261
(310) 725-3614
FAX (310) 297-1213

Mr. Charles McLaughlin
President
Aspen Helicopters, Inc.
2899 W. Fifth Street
Oxnard, CA 93030
(805) 985-5416

Ms. Michelle Williams
Station Manager
United Express
2889 W. Fifth Street
Oxnard, CA 93030

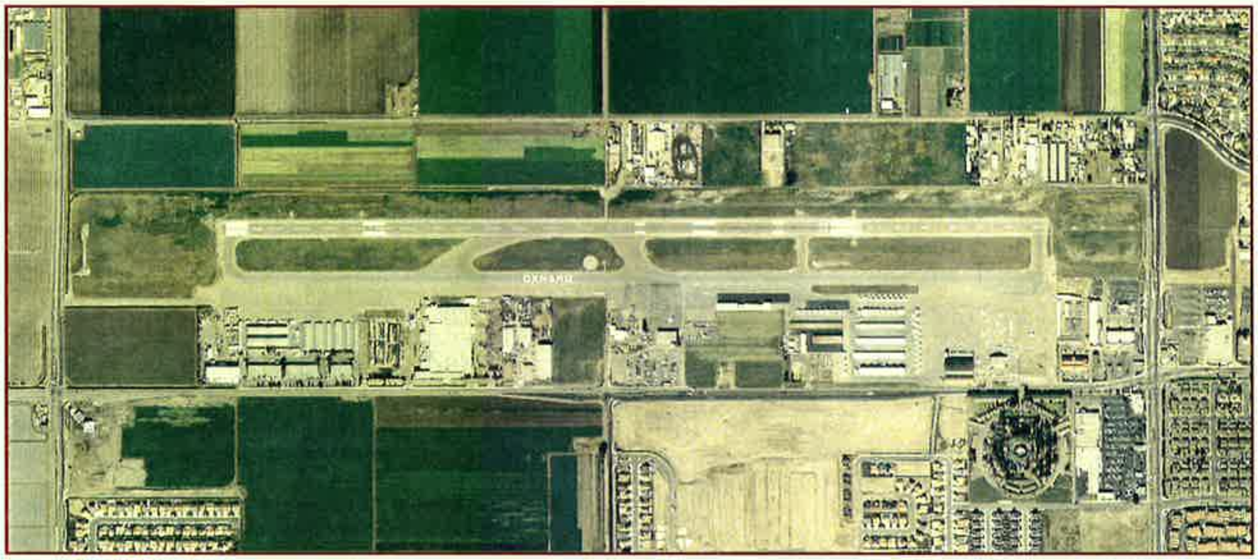
Mr. Bruce Smith
Manager, General Plan Section
Vta Cty Resource Mgmt. Agency
800 S. Victoria Avenue
Ventura, CA 93009
(805) 654-2497
FAX (805) 654-2630

Mr. Christopher Stephens
Manager, Planning & Highway Programs
Ventura County
Transportation Commission
950 County Square Drive, Ste. 207
Ventura, CA 93003
(805) 642-1591
(805) 654-2888
FAX (805) 642-4860

Mr. Rodney L. Murphy
Director of Airports
Ventura County
555 Airport Way
Camarillo, CA 93010
(805) 388-4200
FAX (805) 388-4366

Chapter One

INVENTORY



This chapter presents an overview of Oxnard Airport and its relationship to the surrounding community. The background information in this chapter, which will be used in later stages of the noise compatibility planning process, is as follows:

- A description of the setting, local climate, and historical perspective 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 in 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 is a baseline analysis showing existing and potential future noise conditions at the airport. The NCP document presents a plan for effectively dealing with adverse noise impacts based on a three-part perspective. First, it addresses steps to reduce or shift the noise by changing air traffic control or aircraft operating procedures. Second, it provides land use planning recommendations to promote noise-compatible land uses in undeveloped areas exposed to aircraft noise. Third, it addresses special noise mitigation techniques to reduce the impact of noise on sensitive land uses in the area.

A glossary in the section titled "Technical Information Papers" behind the last tab of this document provides a description of airport terms and acronyms.

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 and planning agencies, the airport proprietor, military and civilian airport users, shippers of cargo, 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 promotion, encouragement and development of civil aeronautics.
- 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 the planning, design and construction of eligible airport improvements. In addition, Congress has passed legislation and the FAA has established regulations governing the preparation of noise compatibility programs. They have also created laws and regulations requiring the conversion of the commercial aircraft fleet to quieter aircraft.

F.A.R. 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.

Federal Aviation Regulation (F.A.R.) 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. Part 150 provides for the development of two final documents: noise exposure maps and a noise compatibility program.

Noise Exposure Maps. The noise exposure maps document (NEM) shows 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. It includes maps of noise exposure for the current year and a five-year forecast. The noise contours are shown on a land use map to reveal areas of non-compatible land use. The document includes detailed supporting information explaining 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 noise of different 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 noise levels of 1.5 Yearly Day-Night Average Sound Level (DNL) over noncompatible land uses. (In California, the Community Noise Equivalent Level -- CNEL – is used in place of DNL.)

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 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 night-time 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 (or, in California, 1.5 CNEL). For purposes of this provision, FAA officials consider the term "area surrounding an airport" to mean an area within the 65 DNL (or CNEL) contour. (See F.A.R. Part 150, Section 150.21 (d), (f) and (g).)

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 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 updating and periodic revision.

F.A.R. 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 to implement the eligible items of the program.

The FAA recently closed the comment period (June 27, 1997) on a new policy for Part 150 approval and funding of noise mitigation measures. This policy increases the incentives for airport operators to prevent development of new noncompatible land uses around airports and to assure the most cost-effective use of Federal funds spent on noise mitigation measures. The FAA will not approve measures in Noise Compatibility Programs proposing corrective noise mitigation actions for new noncompatible development that is allowed to occur in the vicinity of airports after January 1, 1998, the effective date of this 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 January 1, 1998 will not be eligible for AIP funding under the noise set-aside, regardless of previous FAA approvals under Part 150. In addition, the FAA will not approve the use of passenger facility charge (PFC) funding to correct noise impacts for new noncompatible development that occurs after January 1, 1998.

F.A.R. 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. F.A.R. Part 36 prohibits the further escalation of noise levels of subsonic civil turbojet and transport category aircraft. It 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.

F.A.R. 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. Stage 1 includes all previously certificated aircraft.

F.A.R. Part 91, Subpart I, 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*, FAA has established amendments to F.A.R. Part 91 by setting December 31, 1999 as the date for discontinued use of all Stage 2 aircraft exceeding 75,000 pounds. FAA may grant an airline an extension of the deadline to December 31, 2003 if, by July 1, 1999, their fleets include no more than 15 percent Stage 2 aircraft. The Part 91 amendments also provide for two alternative phase-out schedules through the 1990s. The first is described in terms of the phase-out of Stage 2 aircraft; the second in terms of the phase-in of Stage 3 aircraft.

Under the first alternative, an airline must have eliminated or retrofitted 25 percent of its Stage 2 fleet by the end of 1994, 50 percent by the end of 1996, and 75 percent by the end of 1998. Under the second alternative, an airline must have a fleet of no less than 55 percent Stage 3 aircraft by the end of 1994, 65 percent by the end of 1996, and 75 percent by the end of 1998.

Neither F.A.R. 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.

F.A.R. Part 161 Regulation Of Airport Noise And Access Restrictions

F.A.R. Part 161 sets forth requirements for notice and approval of local restrictions on aircraft noise levels and airport access. Part 161 was developed in response to the *Airport Noise and Capacity Act of 1990*. It applies to local airport restrictions on operations by Stage 2 or 3 aircraft. These 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 six conditions specified in the statute, 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. It must approve or disapprove the restriction within 180 days of receipt of the completed application.

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

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 the 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.

STATE GOVERNMENT

California State law authorizes local governments to regulate land use with general plans and zoning ordinances. The State has also established airport noise standards and noise insulation standards.

General Plan

The State of California performs many functions affecting local governments. Most important to the Part 150 process is the requirement for each local jurisdiction to develop a "long range General Plan for the development of the city or county" which ". . . shall consist of a statement of development policies and shall include diagrams and text setting forth objectives, principles, standards, and plan proposals." Of the seven mandatory elements in the General Plan, two are especially important to the Part 150 study -- land use and noise.

The land use element of a general plan designates the proposed general distribution and intensity of uses of the land. This element serves as a framework for the plan and is intended to correlate all land use issues into a set of development policies. The land use element must include standards of population density and building intensity.

The noise element identifies and evaluates the noise situation in the community. The projected noise levels are calculated and mapped for airports and other major noise sources. Projected noise levels are used as a guide for establishing a pattern of land uses in the land use element that minimizes the exposure of residents to excessive noise.

Airport Noise Standards

The California Aeronautics Program's noise rules and regulations provide noise standards governing the operation of aircraft at all airports operating under a valid permit. (See Title 21, Subchapter 6, Sections 5000, *et seq.*) The regulations are designed to cause the airport proprietor, aircraft operator, local governments, and the State to work together to diminish noise. If an airport has a "noise problem", defined as incompatible land uses within the 65 CNEL contour, the airport proprietor must develop a noise program to reduce the noise impact. The F.A.R. Part 150 Noise Compatibility Program satisfies this requirement. Airports with noise problems are also required to conduct regular noise monitoring.

According to the statute, incompatible land uses include single and multi-family dwellings, trailer parks, and schools of standard construction. Land uses deemed compatible with airport noise include agriculture, airport property, industrial, commercial, zoned open space, and property subject to a navigation easement for noise. (See Section 5014.) Proprietors of airports with incompatible land uses within the 65 CNEL contour are able to operate the airport only if they are issued a variance by the California Aeronautics Program. Variances can be issued for periods up to one year.

Noise Insulation Standards

The California Noise Insulation Standards are found in California Administrative Code, Title 24, Part 6, Division T25, Chapter 1, Subchapter 1, Article 4. These standards establish uniform minimum noise insulation performance standards to protect persons within new multi-family residential structures and hotels from the effects of noise. Once these buildings are sound-insulated to the proper performance standards they are not considered "noise impacted". These minimum noise insulation performance standards require that the CNEL shall not exceed 45 dB in any habitable room with all doors and windows closed.

LOCAL GOVERNMENT

In the Oxnard Airport Study Area, Ventura County and the cities of Oxnard and Port Hueneme share responsibilities for land use regulation. In addition to land use regulation, local governments are important to the Part 150 noise compatibility planning process because they are potential sponsors of special noise mitigation programs that can be established through Part 150 Noise Compatibility Programs. If the local government is designated in the Noise Compatibility Program as a sponsor of an approved project, they are eligible to apply for grants through the Federal Airport Improvement Program.

AIRPORT PROPRIETOR

Oxnard Airport is owned by Ventura County and is operated by the Ventura County Department of Airports. This branch of county government is charged with day-to-day operation, repair, maintenance, and administration of the airport.

As airport proprietor, the County has limited power to control what types of civil aircraft use its airport and to impose curfews or other use restrictions. This power is limited by the rules of F.A.R. 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 County 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 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

Oxnard Airport is classified in the *National Plan of Integrated Airports*

(NPIAS) as a primary commercial service airport. Oxnard is also considered a non-hub commercial airport because it enplanes less than 0.05 percent of U.S. domestic passengers.

LOCALE

Situated along the coastal edge of the 200-square mile Oxnard Plain, the City of Oxnard lies equidistant between Santa Barbara to the northwest and Los Angeles to the southeast. Immediately adjacent to the City of Oxnard is the City of Port Hueneme which operates the largest deep sea port between San Francisco and Los Angeles. **Exhibit 1A** depicts the location of Oxnard Airport in its regional setting.

Oxnard Airport lies one and one-half miles east of the Pacific Ocean coastline on approximately 216 acres of land. The airport is bordered on three sides by major arterial roadways. Ventura Road and Victoria Avenue run north-south along the eastern and western edge of airport property, respectively. Fifth Avenue, running east-west along the southern edge of airport property between Ventura Road and Victoria Avenue, provides primary airport access. The airport is afforded regional access by the Ventura Freeway (U.S. Highway 101) located four miles north of the airport and the Pacific Coast Highway (State Highway 1) located approximately one mile east of the airport.

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.

The Oxnard area enjoys what can be characterized as a Mediterranean climate. The winters remain mild, while summers remain relatively cool and dry. The proximity to the ocean typically contributes to morning fog and/or mist and mainly sunny days and cool breezy evenings.

On an annual basis, normal daily mean temperatures range between 53.3 degrees Fahrenheit in January to 64.8 degrees in July. The annual mean temperature is 59.4 degrees. Annual precipitation for the Oxnard area typically reaches 15 inches with most of the precipitation falling between November and March.

AIRPORT HISTORY

Oxnard Airport was officially commissioned by the County of Ventura in 1934 with a 3,500 foot long, dirt runway. Four years later, the runway was paved with asphalt, and Hangar Two was erected. In 1940, the U.S.

Army Air Corps moved onto the airport establishing a primary training base for its pilots. The training facility was named the Mira Loma Flight Academy. The housing facility used by the pilots and their trainers is now the Mira Loma Apartments. During the same year, the Army built Hangars One and Three to house and maintain their aircraft.

In 1944, the Army moved off the airfield and the Navy moved in. The Navy used the airport as an interim facility while Point Mugu was under construction. One year later, the Navy moved to Point Mugu, and the County resumed control of the airport. Southwest Airlines provided the first commercial passenger service to the airport in 1946. The airline flew DC-3s with scheduled flights into Los Angeles and San Francisco.

The Federal Aviation Administration (FAA) opened a new airport traffic control tower on the airport in 1960. Three years later, Runway 7-25 was extended to its present length of 5,947 feet. In 1968, commuter flights were available on Cable Airlines.

Several major airport improvements were completed in the 1970s. The passenger terminal building was erected and dedicated in 1971. Taxiway lighting was installed two years later. Radar approach control was established at Point Mugu in 1974, allowing positive radar coverage to aircraft into and out of Oxnard. The precision instrument landing and approach lighting systems were installed in 1976.

AIR TRAFFIC ACTIVITY

Air traffic activities at Oxnard Airport are recorded by the airport management staff from information supplied by the FAA. The FAA's airport traffic control tower (ATCT) is operated under contract by SENCO which collects and reports aircraft operations (takeoffs and landings) at the airport. Aircraft operations are reported as being either local or itinerant. Local operations are typically associated with training operations. Itinerant operations are those performed by an aircraft with a specific origin or destination away from the airport. **Table 1A** depicts a historical operation summary for the airport.

As indicated on **Table 1A**, aircraft operations at Oxnard declined annually between 1990 and 1995 from 143,526 to 94,569 total operations. Over the last two years, however, operational levels have increased. Operational levels for the twelve-month period from November 1996 through October 1997 reached 119,562 even though air taxi/commuter operations have decreased due to the loss of a commuter carrier.

Also presented on **Table 1A** are the operational forecasts produced in the Airport Master Plan completed in 1996. As indicated in the table, the forecasts are segregated into three planning horizons: short term, intermediate term, and long range. Although forecasts were first developed according to years in time, the accepted forecast levels

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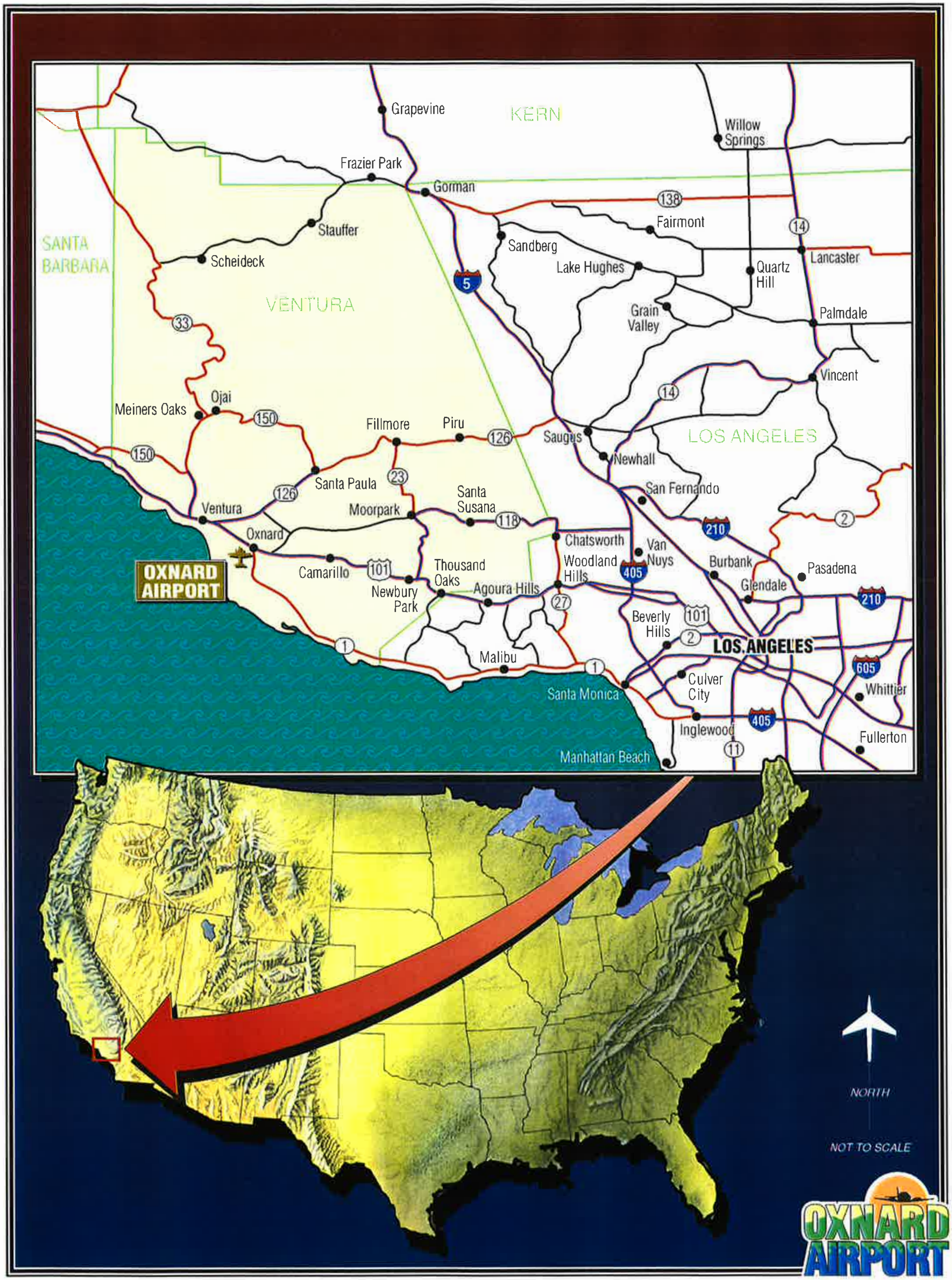

Exhibit 1A
LOCATION MAP

were translated to these planning horizons or milestones. It was the intent of the master plan to provide for flexibility for growth within the high and low range of projections as well as provide forecasts which were demand-based rather than time-based. Utilizing planning horizons instead of years allows the airport staff to adjust facility planning according to current trends rather than dates in time. If the airport experiences rapid growth, facilities needed to accommodate this growth can be considered at that time, or, if growth occurs at a much slower rate, facility development may also be slowed. **Table 1A** indicates that operational levels at Oxnard will continue to grow, reaching 194,000 total operations by the long range planning horizon.

TABLE 1A
Historic and Forecast Aircraft Operations
Oxnard Airport

		General Aviation			
Year	**Air Taxi/ Commuter**	**Local**	**Itinerant**	**Military**	**Total**
1990	23,684	51,844	65,890	2,108	143,526
1991	22,207	49,436	60,905	1,936	134,484
1992	18,516	53,866	58,146	2,450	132,978
1993	20,283	59,660	55,311	2,626	137,880
1994	17,357	39,293	36,811	1,963	95,424
1995	17,602	39,927	34,588	2,452	94,569
1996	20,247	38,030	50,396	1,742	110,415
1997*	13,768	45,302	54,049	1,789	119,562
FORECAST					
Short Term	23,300	60,000	60,000	2,200	145,500
Intermediate Term	26,400	67,000	68,000	2,200	163,600
Long Range	31,800	80,000	80,000	2,200	194,000

* 1997 operational data is for the twelve-month period from November 1996 through October 1997.
Sources: FAA Air Traffic Control Statistical Report. Forecasts from Airport Master Plan for Oxnard Airport, August 1996, p. 2-24.

AIRPORT FACILITIES

Airfield facilities influence the utilization of airspace and are important to the noise compatibility planning process. These facilities include the runway and taxiway systems and aircraft and terminal activity areas. **Exhibit 1B** is a recent aerial photograph showing existing airport facilities. As mentioned in the previous section, the airport master plan study was recently competed. The main focus of an airport master plan is to provide an airport layout plan (ALP) which includes a graphical representation of existing and planned airport facilities. Because planned facilities will be considered in this study, **Exhibit 1C, Airport Layout Plan**, has been included for reference.

RUNWAYS

Oxnard Airport is served by Runway 7-25 which is 5,950 feet long by 100 feet wide aligned in an east-west direction. The Runway 25 threshold has been displaced 1,372 feet for obstacle clearance safety.

The runway surface is asphalt and is in good condition. The current *Airport/Facility Directory* listing for Oxnard Airport indicates the following runway load bearing strength for Runway 7-25: 30,000 pounds for single wheel loading and 60,000 pounds for dual wheel loading (National Ocean Service 1997a). Runway data for the airport is summarized in **Table 1B**. As indicated on **Exhibit 1C**, no changes to the runway system are planned.

TABLE 1B
Runway Data
Oxnard Airport

	RUNWAYS	
	7	**25**
Length (ft.) Width (ft.) Surface Material	6,032 150 Asphalt	
Pavement Strength (lbs.) Single Wheel Loading Dual Wheel Loading	 30,000 60,000	
Approach Slope Ratio	34:1	34:1
Approach Aids ILS VOR/DME GPS VASI MALSR	 No Yes Yes V4L No	 Yes Yes Yes V4L Yes
Runway Lighting	MIRL	
Runway Marking	Nonprecision	Precision

Source: *Airport/Facility Directory*, National Ocean Service 1997a, p. 89.

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Exhibit 1B
AIRFIELD FACILITIES

TAXIWAYS

Exhibit 1B details the existing taxiway system at Oxnard Airport. Runway 7-25 is served by a full length parallel taxiway (Taxiway A) on the south side of the runway. The runway is also served by five entrance/exit taxiways which run between the parallel taxiway and the runway. Taxiway B is an exit/entrance taxiway located just west of the Runway 25 displaced threshold. Taxiways C and D are high speed exits from Runway 7-25. **Exhibit 1C** indicates the construction of two exit taxiways in the future (one near each runway end). The additional taxiway exits will improve airfield capacity by giving aircraft additional options for exiting from the runway.

PASSENGER TERMINAL

The passenger terminal at Oxnard is located on the south side, approximately midfield of Runway 7-25. The terminal building provides space for United Express Airlines, rental car and travel agencies, and a restaurant. The terminal building is afforded automobile access via Fifth Street. **Exhibit 1C** indicates that passenger terminal building is planned to be expanded in the future. Expansion of the building will be considered if enplanement levels warrant its justification.

GENERAL AVIATION COMPLEX

Two master tenants provide services or sublease to tenants who provide services at Oxnard Airport. Aeroflight Flight Academy and Sam's Aircraft Service are both located on the southeast side of Runway 7-25. These FBO's provide a full range of general aviation services including aircraft maintenance, fueling, and pilot training.

OTHER FACILITIES

Aspen Helicopters is a specialty business operator located immediately west of the ATCT. This operator maintains 17 aircraft (12 helicopters) in providing commercial charter and flight training operations.

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 Lawndale, CA, controls the airspace in southern California.

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; personnel and material. The system also includes components shared jointly with the military.

AIR TRAFFIC CONTROL

Air Route Traffic Control Center (ARTCC)

The FAA has established 21 Air Route Traffic Control Centers (ARTCC) in the continental United States to control aircraft operating under instrument flight rules (IFR) within controlled airspace and while in the enroute phase of flight. An ARTCC assigns specific routes and altitudes along federal airways to maintain separation and orderly air traffic flow. ARTCCs use radio communication and long range radar with automatic tracking capability to provide enroute air traffic services. Typically, the ARTCC splits its airspace into sectors and assigns a controller or team of controllers to each sector. As an aircraft travels through the ARTCC, one sector hands off control to another. Each sector guides the aircraft using discrete radio frequencies.

The Los Angeles ARTCC located in Los Angeles, California, controls IFR aircraft entering and leaving the southern California area. The area of jurisdiction for the Los Angeles center includes most of the State of California, and portions of Nevada, Arizona, and Utah.

Radar Air Traffic Control Facility (RATCF)

The ARTCC delegates certain airspace to local terminal facilities which are responsible for the orderly flow of air traffic arriving and departing the major terminals. The Los Angeles ARTCC has delegated airspace to Point Mugu radar air traffic control facility (RATCF). The RATCF is staffed and operated by the U.S. Navy and is under contract with the FAA for terminal control of civilian aircraft.

The RATCF uses direct radio communications and the latest Automated Radar Terminal tracking system (ARTS IIIA) to control air traffic within its jurisdiction. Air traffic control services provided by Point Mugu RATCF include radar vectoring, sequencing and separation of IFR aircraft, and traffic advisories for all aircraft. The RATCF provides air traffic control services between 6:00 a.m. and 10:00 p.m. Between 10:00 p.m. and 6:00 a.m. air traffic control services is provided by the Los Angeles ARTCC.

Oxnard Airport Traffic Control Tower (ATCT)

The Oxnard Airport control tower operates daily from 7:00 a.m. to 9:00 p.m. local time, controlling aircraft movement within the Class D Airspace and on the runway and taxiway system. The IFR arrivals and departures from Oxnard Airport are coordinated with Point Mugu RATCF.

AIRSPACE STRUCTURE

Since the inception of aviation, nations have set up procedures within their territorial boundaries to regulate the use of airspace. Until recently, the system used to regulate airspace in the United States was different from other countries. The FAA has taken the lead

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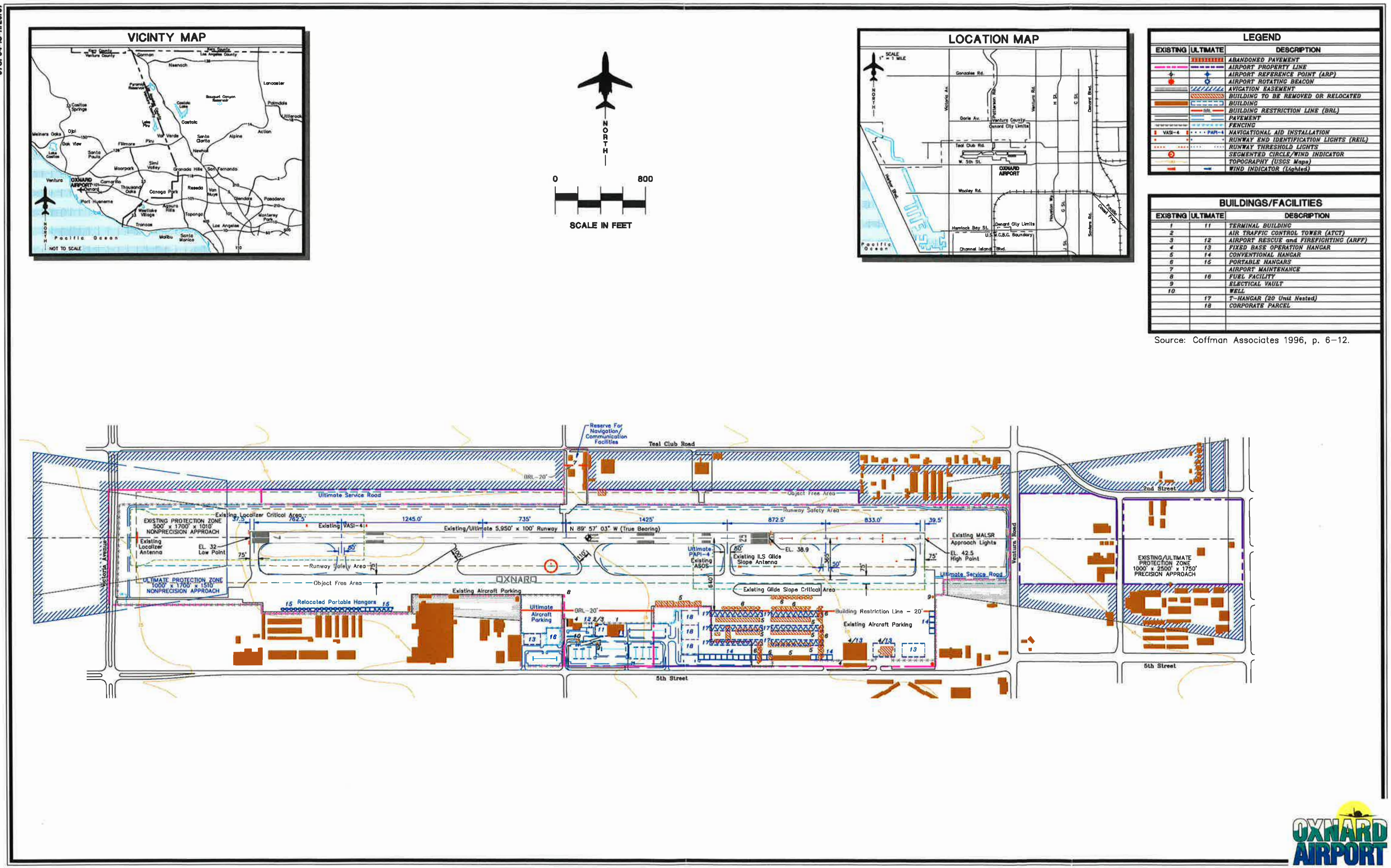

LEGEND

EXISTING	ULTIMATE	DESCRIPTION
		ABANDONED PAVEMENT
		AIRPORT PROPERTY LINE
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIGATION EASEMENT
		BUILDING TO BE REMOVED OR RELOCATED
		BUILDING
	BRL	BUILDING RESTRICTION LINE (BRL)
		PAVEMENT
		FENCING
VASI-4	PAPI-4	NAVIGATIONAL AID INSTALLATION
		RUNWAY END IDENTIFICATION LIGHTS (REIL)
		RUNWAY THRESHOLD LIGHTS
		SEGMENTED CIRCLE/WIND INDICATOR
		TOPOGRAPHY (USGS Maps)
		WIND INDICATOR (Lighted)

BUILDINGS/FACILITIES

EXISTING	ULTIMATE	DESCRIPTION
1	11	TERMINAL BUILDING
2		AIR TRAFFIC CONTROL TOWER (ATCT)
3	12	AIRPORT RESCUE and FIREFIGHTING (ARFF)
4	13	FIXED BASE OPERATION HANGAR
5	14	CONVENTIONAL HANGAR
6	15	PORTABLE HANGARS
7		AIRPORT MAINTENANCE
8	16	FUEL FACILITY
9		ELECTICAL VAULT
10		WELL
	17	T-HANGAR (20 Unit Nested)
	18	CORPORATE PARCEL

Source: Coffman Associates 1996, p. 6-12.

OXNARD AIRPORT

Exhibit 1C

AIRPORT LAYOUT PLAN

role in international efforts to standardize airspace nomenclature and flight rules. On September 16, 1993, all airspace within the United States was reclassified to provide consistency with international standards. However, the basic premise of the use of airspace in the United States remains the same, and airspace is still broadly classified as either "controlled" or "uncontrolled."

The difference between controlled versus 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. **Exhibit 1D** 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. The airspace for the study area is depicted on **Exhibit 1E**.

Class A Airspace

Class A airspace is designated in F.A.R. Part 71.33 for positive control of aircraft. The area includes specified airspace within the coterminous United States from 18,000 feet above mean sea level (MSL) to and including Flight Level 600 (60,000 feet MSL). Within Class A airspace only Instrument Flight Rules (IFR) operations are allowed. The aircraft must have special radio and navigation equipment and the pilot must obtain an air traffic control (ATC) clearance to enter Class A airspace. The pilot must have at least an instrument rating.

Class B Airspace

Class B airspace has been established at 29 high density airports in the United States as a means of regulating air traffic activity in these areas. They are established on the basis of a combination of enplaned passengers and volume of operations. Los Angeles International Airport (LAX), located 41 nautical miles (nm) south of Oxnard, is the only airport with Class B airspace in the area.

Class B airspace is designed to regulate the flow of uncontrolled traffic above, around and below the arrival and departure airspace required for high performance, passenger-carrying aircraft at major airports. Aircraft operating in Class B airspace must have special radio and navigation equipment and must obtain an air traffic control (ATC) clearance. In order to operate within Class B airspace, a pilot must have at least a private pilot's certificate or be a student pilot who has met the requirements of F.A.R. 61.95, requiring special ground and flight training for the Class B airspace. The LAX Class B airspace has an irregular shape due to the terrain and the number of airports in the vicinity of the airport.

The Mode C veil, an area associated with Class B airspace, extends for 30 nautical miles from LAX. When operating within this area, all aircraft must be equipped with a transponder with altitude encoder (Mode C).

Class C Airspace

The FAA has established Class C airspace at 120 airports around the country as a means of regulating air traffic activity in these areas. In order to fly inside Class C airspace, the aircraft must have a two-way radio and an encoding transponder, and the pilot must obtain an ATC clearance. Pilots must have at least a student pilot certificate to fly in Class C airspace.

Burbank-Glendale-Pasadena Airport located approximately 41 nautical miles east southeast and Santa Barbara Airport located 40 nautical miles northwest of Oxnard Airport are surrounded with Class C airspace.

Class D Airspace

Class D airspace is normally a circular area with a radius of four to five miles around the primary airport and any extensions necessary to include instrument approach and departure paths. This controlled airspace typically extends upward from the surface to about 2,500 feet above the elevation of airports with operating control towers. Oxnard Airport, Camarillo Airport, and Naval Air Weapons Station (NAWS) Point Mugu are encompassed by Class D airspace.

As depicted on **Exhibit 1E**, Oxnard's Class D airspace is interrupted to the southeast by NAWS Point Mugu's Class D airspace, and to the east by Camarillo Airport's Class D airspace. The ceiling of Oxnard and Camarillo Class D airspace is 2,000 feet mean sea level (MSL). NAWS Point Mugu's Class D airspace has a ceiling of 3,000 feet MSL.

Class E Airspace

The Class E category contains airspace formerly designated as control zones for non-towered airports and transition surfaces. The Class E airspace for a non-towered airport extends from the surface upward to overlying or adjacent controlled airspace. Otherwise, Class E airspace terminates at the base of Class A airspace. When Class E airspace is designated as a surface area, it is configured to contain all instrument approaches. When designated as an extension of Class B, Class C, or Class D airspace, the extension allows standard instrument approach procedures without communications requirements for VFR operations.

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 authority or responsibility to exercise control over air traffic within this airspace. Class G airspace lies between the surface and 700 feet above the surface underneath much of the Class E transition surfaces in the study area. Also, the Oxnard and Camarillo Class D airspace reverts to Class G airspace when the ATCT is not operational.

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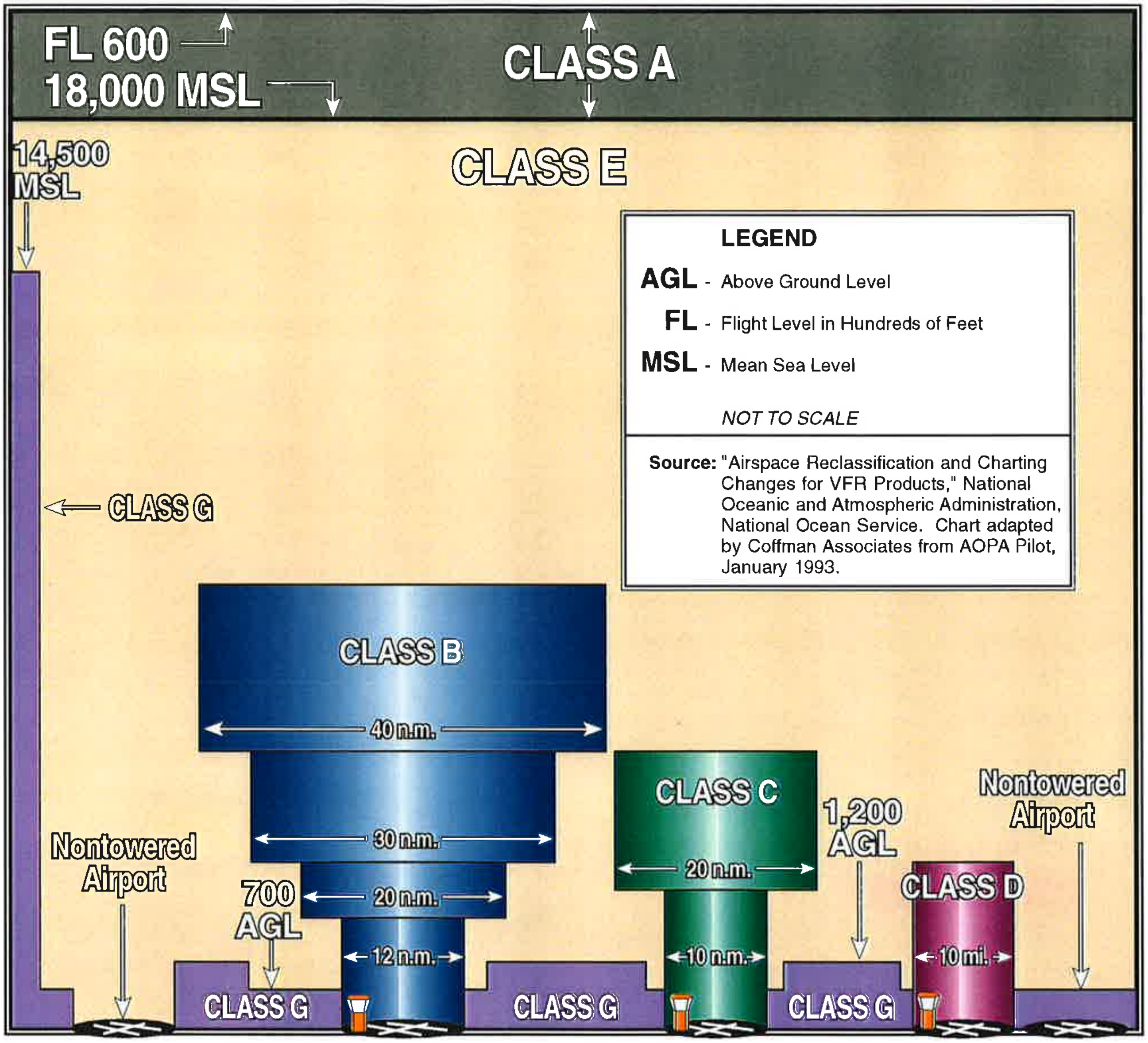

CLASSIFICATION	DEFINITION
CLASS A	Generally airspace above 18,000 feet MSL up to an including FL 600 .
CLASS B	Generally multi-layered airspace from the surface up to 10,000 feet MSL surrounding the nation's busiest airports.
CLASS C	Generally airspace from the surface to 4,000 feet AGL surrounding towered airports with service by radar approach control.
CLASS D	Generally airspace from the surface to 2,500 feet AGL sourrounding 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.

OXNARD AIRPORT

Exhibit 1D
AIRSPACE CLASSIFICATION

FINAL DRAFT – NOT APPROVED BY BOS OR FAA

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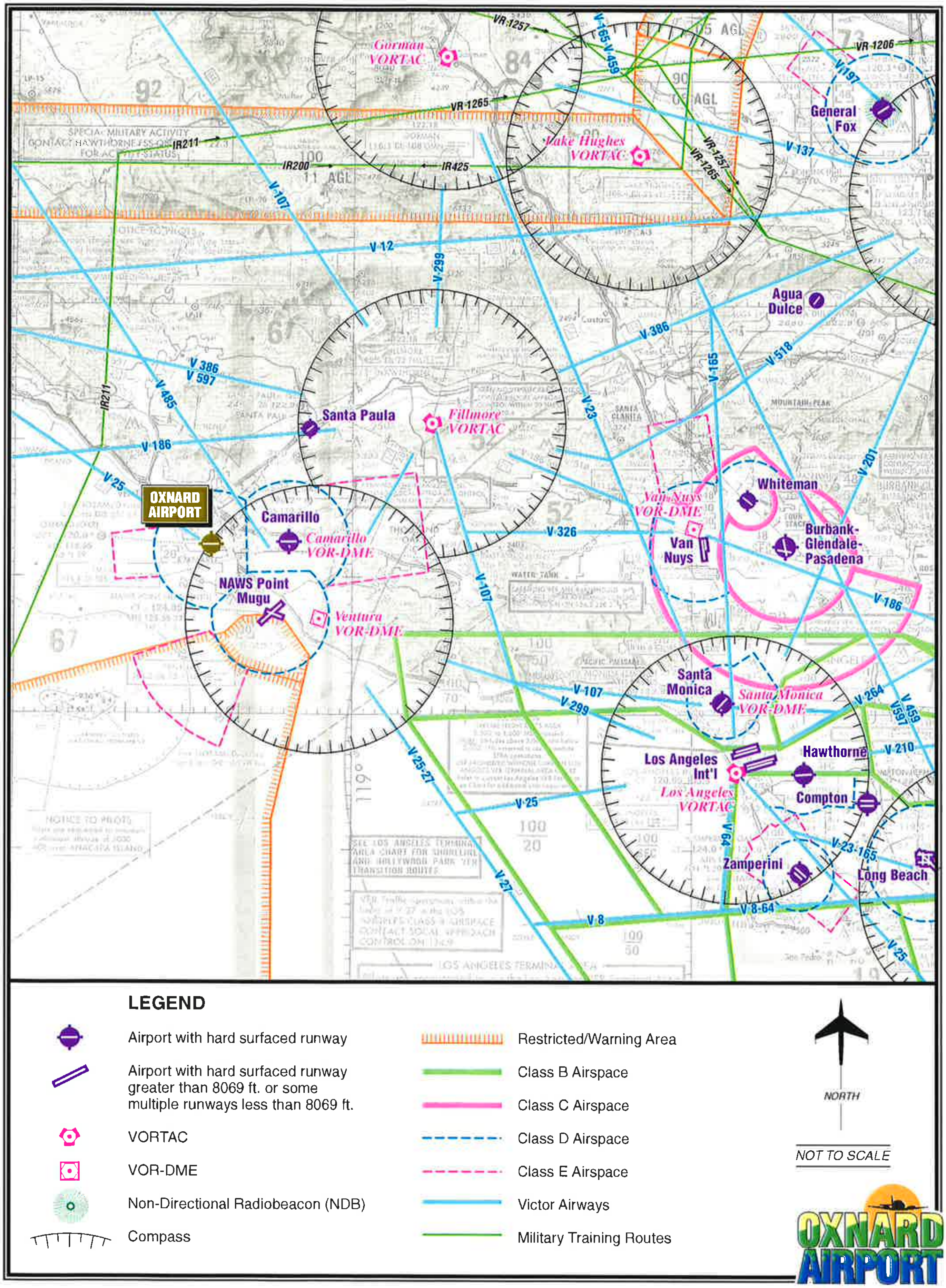

Exhibit 1E
REGIONAL AIRSPACE

Special Use Airspace

Immediately adjacent to and south of NAWS Point Mugu lies an area of restricted airspace (R-2519). This area is operated continuously and has an unlimited floor and ceiling. The airspace is restricted due to ground-to-air missile firings from NAWS Point Mugu out over the Pacific Ocean.

Approximately 10 nautical miles due south of Oxnard Airport is Warning Area 289. In general, restricted and warning areas indicate the existence of unusual, often invisible, hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. Warning areas are established beyond the three-mile limit along U.S. coastlines. Though the activities conducted within warning areas may be as hazardous as those in restricted areas, warning areas cannot be legally designated as restricted areas because they are over international waters. Penetrations of warning areas during periods of activity may be hazardous to aircraft not participating in national defense operations. Los Angeles ARTCC is the controlling facility for the warning area. The warning area extends from NAWS Point Mugu out into the Pacific Ocean in a triangular shape. The warning area is used for weapons training by Navy and Marine high performance aircraft.

Approximately 20 nautical miles north of Oxnard, an eight-mile wide corridor, which runs in an east-west direction, is designated as special military use airspace. Flights in this area are not restricted, however, pilots must be aware of the potential airspace conflict in the area. The sectional chart lists the floors and ceilings of the operations, and instructs navigators to contact Hawthorne Flight Service Station (FSS) to receive activity status of military operations in the area.

Airspace Conflicts

There are a number of airspace conflicts in the Oxnard Airport area including obstructions, terrain, and congested airspace.

The location of Oxnard Airport in proximity to NAWS Point Mugu and Camarillo Airport limits the available area near the airport for unrestricted VFR flying. For safety purposes, the air traffic controllers at Oxnard must call RATCF and wait for approval, prior to releasing aircraft on instrument departures from Oxnard Airport. After permitting an instrument departure from Oxnard Airport, RATCF will not permit another departure until positive radar contact is established with the first aircraft.

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. TACAN (Tactical Air Navigation), primarily a military-oriented facility, is often collocated with a VOR station. TACAN provides both course guidance and line-of-sight distance measurement from a UHF transmitter. A properly equipped aircraft translates the VORTAC signals into a visual display of both azimuth and distance. Distance measuring equipment (DME) is also sometimes collocated with VOR facilities. DME emits signals enabling pilots of properly equipped aircraft to determine their line-of-sight distance from the facility. One VORTAC facility, the Fillmore VORTAC, offers navigational assistance in the study area. Two combined VOR/DME units are in the study area: Camarillo and Ventura.

VORs define low-altitude (Victor) and high altitude airways (Jet Routes) through the area. Because of the area's congested airspace, most aircraft enter Southern California, especially the Los Angeles basin, via one of these numerous federal airways. Aircraft assigned to altitudes above 18,000 feet MSL use the Jet Route system. Other aircraft use low altitude airways, also known as Victor Airways. Radials off VORs define the centerline of these flight corridors.

Three Victor Airways are in the immediate vicinity of Oxnard Airport. V25 lies immediately above the airport and runs in a northwest-southeast direction between the Ventura VOR/DME and the San Marcus VORTAC. V27-485 is less than two nautical miles east of the airport and runs in a northwest-southeast direction. V299 is approximately ten nautical miles east of the airport and runs in a northeast-southwest direction.

The advancement of technology has been one of the most important factors in the growth of the aviation industry in the twentieth century. Much of the civil aviation and aerospace technology has been derived and enhanced from the initial development of technological improvements for military purposes. The use of orbiting satellites to confirm an aircraft's location is the latest military development to be made available to the civil aviation community.

Global positioning systems (GPS) use two or more satellites to derive an aircraft's location by a triangulation method. The accuracy of these systems has been remarkable, with initial degrees of error of only a few meters. As the technology improves, it is anticipated that GPS may be able to provide accurate enough position information to allow Category II and III precision instrument approaches, independent of any existing ground-based navigational facilities. In addition to the navigational benefits, it has been estimated that GPS equipment will be much less costly than existing precision instrument landing systems.

AREA AIRPORTS

Oxnard Airport is the only airport served by commercial (commuter) airlines in the immediate vicinity. The

Los Angeles Basin, however, is served by a number of commercial service airports as illustrated on **Exhibit 1E**. They include Los Angeles International, Burbank-Glendale-Pasadena, Long Beach, Ontario International, and John Wayne-Orange County, all of which are served by major airlines. Approximately 40 nautical miles to the northwest, Santa Barbara Airport is the only other commercial service airport within relatively close proximity of Oxnard Airport.

Two public use general aviation airports and one military airport are located in or near the Oxnard Airport study area. Camarillo Airport is a public use general aviation airport approximately five miles east of Oxnard Airport. Owned and operated by Ventura County, this airport is served by a single runway and has more than 500 based aircraft and over 150,000 operations annually. Santa Paula Airport is a privately owned public use airport. Located approximately nine nautical miles northeast of Oxnard, Santa Paula has one runway and more than 250 based aircraft.

Naval Air Weapons Station (NAWS) Point Mugu is a Navy/Marine Airbase located approximately eight miles southeast of Oxnard Airport. The airbase serves military aircraft ranging from the large C-130 transport to the high performance F-18A fighter/attack jet aircraft. Due to the orientation of the airbase's two runways, Point Mugu's flight pattern does not conflict with Oxnard Airport's airspace.

Although only three other airports are within the vicinity of Oxnard Airport, it is important to note the large number of airports in the greater Los Angeles Area. In addition to the commercial service airports, 20 public use general aviation airports, seven private airports, and four military airports are in the greater Los Angeles area.

INSTRUMENT APPROACHES

Instrument approaches are defined using electronic and visual navigational aids to assist pilots in landing when visibility is reduced below specified minimums. While these are especially helpful during periods of poor visibility, they often are 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.

Precision Instrument Approaches

Most precision 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.

Oxnard Airport has one published precision approach to Runway 25. Runway 25 is equipped with an ILS consisting of a localizer , glide slope , and a medium intensity approach lighting system with runway alignment lights (MALSR) in addition to middle and outer marker beacons. The precision ILS approach to Runway 25 at Oxnard uses a standard 3.0 degree glide slope.

Typically, a precision ILS approach aided by a localizer, glideslope, and MALSR will provide Category I minimums (one-half mile visibility and 200-foot cloud ceiling). For Oxnard, however, obstructions located in the approach require weather minimums for the ILS Runway 25 approach to be at or above one mile visibility and 300-foot cloud ceilings.

Nonprecision Approaches

Utilizing the Camarillo VOR/DME or the global positioning system (GPS), two nonprecision approaches are available at Oxnard. The VOR or GPS Runway 25 approach can be flown when cloud ceilings are 500 feet above ground level (AGL) or greater and visibility is one mile for aircraft with approach speeds of up to 121 knots, 1-1/4 miles for aircraft with approach speeds less than 141 knots, and 1-1/2 miles for aircraft with approach speeds less than 166 knots. The VOR or GPS Runway 25 approach also provides for a circling approach. The circling approach also requires a cloud ceiling of 500 feet AGL for aircraft with approach speeds less than 141 knots. Visibility requirements are the same for aircraft with approach speeds less than 121 knots, but increase to 1-1/2 miles for aircraft with approach speeds less than 141 knots. For aircraft with approach speeds greater than 141 knots but less than 166 knots, the circling approach minimums increase to 700 feet AGL cloud ceilings and 2-1/4 mile visibility.

The VOR/DME or GPS approach to Runway 7 is the second published nonprecision approach at Oxnard. VOR signals used with DME fixes ensure adequate terrain and obstruction clearances during final approach to the runway. The VOR/DME or GPS approach to Runway 7 can be flown when cloud ceilings are 500 feet AGL or greater and visibility is one mile for aircraft with approach speeds of less than 121 knots, 1-1/4 miles for aircraft with approach speeds greater than 121 but less than 141 knots, and 1-1/2 miles for aircraft with approach speeds greater than 141 knots but less than 166 knots. The VOR/DME or GPS Runway 7 approach also allows a circling approach. The minimums for the circling approach are the same as the circling VOR or GPS approach to Runway 25.

Standard Instrument Departures

Currently, two Standard Instrument Departure (SID) procedures are published for Oxnard Airport -- the Skiff Four and the Camarillo Three SID. Each of these SIDs have two procedures: take-off and transition routing. The take-off procedures are designed to get the aircraft off the ground to a specified point. Once aircraft reach the designated point, they continue to their destination via transition routes or routes assigned by air traffic control. Transition routes are paths delineated by VOR/DME radials.

Aircraft departing Runway 7 utilizing the Skiff Four SID are directed to turn left after take-off and intercept the Camarillo VOR/DME radial 249. Aircraft are to continue climbing westbound to the Skiff intersection then via a transition or assigned route. Aircraft departing Runway 25 climb via the Camarillo VOR/DME radial 249 to the Skiff intersection. Once at the Skiff intersection, aircraft continue via a transition route or other route assigned by air traffic control.

Aircraft departing Runway 7 utilizing the Camarillo Four departure climb to the Camarillo VOR/DME thence via an assigned or transition route. Aircraft utilizing the Camarillo Three SID departing Runway 25 turn right after take-off and intercept the Camarillo VOR/DME radial 249 thence via an assigned or transition route.

Although the airport is supported by the aforementioned SIDs, discussions with Oxnard ATCT staff indicate that they are not often used. For noise abatement purposes, radar vectors are given to aircraft in order to avoid noise-sensitive areas. ATCT staff indicate that aircraft departing Runway 25 are assigned a heading of 270 degrees between 7:00 and 8:00 a.m. and 255 degrees between 8:00 a.m. and 9:00 p.m.

Customary ATC
And Flight Procedures

Flights to and from Oxnard Airport are conducted using both Instrument Flight Rules (IFR) and Visual Flight Rules (VFR). Instrument Flight Rules are those that govern the procedures for conducting instrument flight. Visual Flight Rules 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 contact the tower when approximately 10 miles from the airport for sequencing into the traffic pattern.

Generally, VFR general aviation traffic stays clear of the more congested airspace and follows recommended VFR flyways in the area. There are no VFR fly routes located in the vicinity of the Oxnard Airport; however, many VFR fly routes are located to the southeast in the greater Los Angeles area.

Instrument Flight Rule Procedures: The Point Mugu RATCF handles all IFR traffic to and from Oxnard Airport. IFR arrival traffic is transferred to the RATCF by the ARTCC as traffic enters RATCF airspace. Traffic approaching from the southeast is typically vectored to the Camarillo or Ventura VOR/DME and then to the airport via the precision approach procedure. Aircraft approaching from the north/northwest are typically provided vectors to intercept the ILS signal. IFR departures require clearance from the Point Mugu RATCF before takeoff unless RATCF is closed. When the RATCF is closed, aircraft receive IFR clearance once airborne from the Los Angeles ARTCC.

Local ATC Procedures: At present there is no formal runway use program at Oxnard Airport that dictates the use of one runway over another. Arrivals and departures, however, are almost exclusively on Runway 25 due to the prevailing westerly winds. Arrivals and departures occur occasionally on Runway 7. Operations on this runway usually occur in Santa Ana wind conditions (strong winds from the north and east) or if requested by the pilot.

Noise Abatement Procedures

At Oxnard Airport, the airport traffic control tower, the Ventura County Department of Aviation, and the airport users have developed noise abatement procedures for VFR operations. Instructions are outlined regarding departures, arrivals, and pattern procedures at the airport which are aimed at minimizing noise exposure over noise-sensitive areas without compromising safety. Pilots are requested to follow the published procedures unless it is considered unsafe, weather conditions do not allow, or they are otherwise instructed to deviate by the airport traffic control tower. Procedures include:

- Aircraft are instructed to stay as high as practical over residential areas during overflight, approaches, and departures.
- Use best rate of climb when departing any runway.
- No formation take-offs or landings without prior written approval of the Airport Administrator.
- Touch-and-go/stop-and-go operations are prohibited between the hours of 8:00 p.m. and 7:00 a.m.
- Full stop/taxi back operations will be permitted only if the aircraft plans to depart the airport traffic area.
- No high power engine runups for maintenance between 7:00 p.m. and 7:00 a.m. the following day.
- Runway 7-25 traffic pattern - Published traffic pattern altitude (TPA) is established as 1,043 MSL feet for single engine aircraft and 1,443 MSL feet for twin engine/turbine aircraft. Utilize the best rate of climb, conditions permitting, turn crosswind when reaching the departure end of the runway and an altitude within 300 feet of pattern altitude. Maintain pattern altitude until turning base leg.

- Runway 25 Departure - When departing the airport traffic area use best rate of climb, remain on runway heading until beyond the departure end of the runway and 700 feet AGL before proceeding on course.

- Runway 25 Arrival - Straight-in cross the Camarillo Airport at or above 2,000 feet and remain as high as practical over the city until commencing final descent. Exercise extreme caution due to Camarillo traffic and instrument approaches being conducted to OXR Runway 25.

- Runway 7 Departure - Departures from the mid-field intersection (Taxiway C) are prohibited. When departing the airport traffic area use best rate of climb and remain on runway heading until reaching the airport boundary (Ventura Road) before proceeding on course. Exercise extreme caution due to opposite direction instrument approach traffic.

- A left-hand traffic pattern is in effect when the airport traffic control tower is closed.

Letters Of Agreement

The Oxnard ATCT has entered into several letters of agreement with local aircraft operators. The letters of agreement serve both the ATCT personnel and the aircraft operators in establishing specific procedures to minimize operational conflicts and promote efficient use of the airfield and airspace. The following paragraphs detail the letters of agreement.

One letter of agreement has been established between the Oxnard and Camarillo ATCT, NAWS Point Mugu RATCF, Aspen Helicopters, and Sinton Helicopters. It defines operational procedures for agriculture helicopters requesting special visual flight rules (SVFR) operations during IFR weather conditions. Helicopter pilots are to maintain contact with the appropriate ATC facility and adequate separation as assigned by the controlling ATC facility.

The letter of agreement also designates SVFR routes for arrivals/departures to and from Oxnard and Camarillo Airports. For Oxnard, four routes have been established: SVFR Routes Victor, Romeo, Foxtrot, and Papa. Route Victor directs aircraft from the western boundary of Oxnard Airport direct to the Ventura Marina at or below 500 feet. Route Romeo directs aircraft from the eastern boundary of the Oxnard Airport direct to the Financial Plaza to remain west of the Saticoy Bridge, and clear of the Camarillo Surface Area at or below 500 feet. Route Foxtrot runs from the airport via Fifth Street westward to the shoreline at or below 500 feet. Route Papa directs southwest bound aircraft via Victoria Road to the Port Hueneme Harbor at of below 500 feet.

The Oxnard ATCT has also entered into an agreement with Aspen and Petroleum Helicopters for VFR helicopter arrival/departure procedures. These procedures apply to VFR conditions during ATCT operational hours only. These procedures include:

- Helicopters shall operate at or below 500 feet AGL unless otherwise instructed.
- Helicopters shall avoid the following noise sensitive areas: Deckside Villas, just south/southwest of Wooley Road; Oxnard Shores area south of Fifth Street along the shoreline; housing development just south/southeast of the airport in the vicinity of Ventura Road and Wooley Road; directly over the homes just north of the east end of Runway 7-25.

Specific arrival routes include:

- Fifth Street Arrival, from east or west -- proceed via Fifth Street to the Airport
- Teal Club Arrival, from east or west -- proceed via Teal Club Road to the Airport (note: an imaginary line extends Teal Club Road to the shoreline on the west or Rice Road on the east).
- Victoria Road Arrival, from north or south -- proceed via Victoria Road to the Airport remaining north or south of runway/taxiway. If crossing is desired, advise controller on initial contract.

Departure routes have been established as follows:

- Fifth Street Departure, east or west -- proceed via Fifth Street either west to the shoreline or east to Rice Road.
- Teal Club Road Departure, east or west -- proceed via Teal Club Road west to the shoreline or east to Rice Road.
- Victoria Street Departure, south -- proceed westbound via Fifth Street to Victoria Road then south to southwest bound to beach area.
- Victoria Street Departure, north -- proceed westbound via Teal Club Road to Victoria Road then north bound out of the Class D Surface Area.

STUDY AREA

Exhibit 1F, Study Area and Jurisdictional Boundaries, shows an area ranging from Bard Road on the south, approximately one-half mile west of Rice Road on the east, to the Olivas Park and Buenaventura Municipal golf courses to the north, and the Pacific Ocean coastline on the west. It includes parts of the cities of Oxnard, Port Hueneme, Ventura, and parts of unincorporated Ventura County.

An oval-shaped area, designated the detailed land use study area, is in the middle of the map. It corresponds to the outer boundary of the F.A.R. Part 77 conical surface around the airport. Existing and future land use designations will be provided in this area. The detailed land use study area is primarily for statistical convenience and can be modified later in the study if

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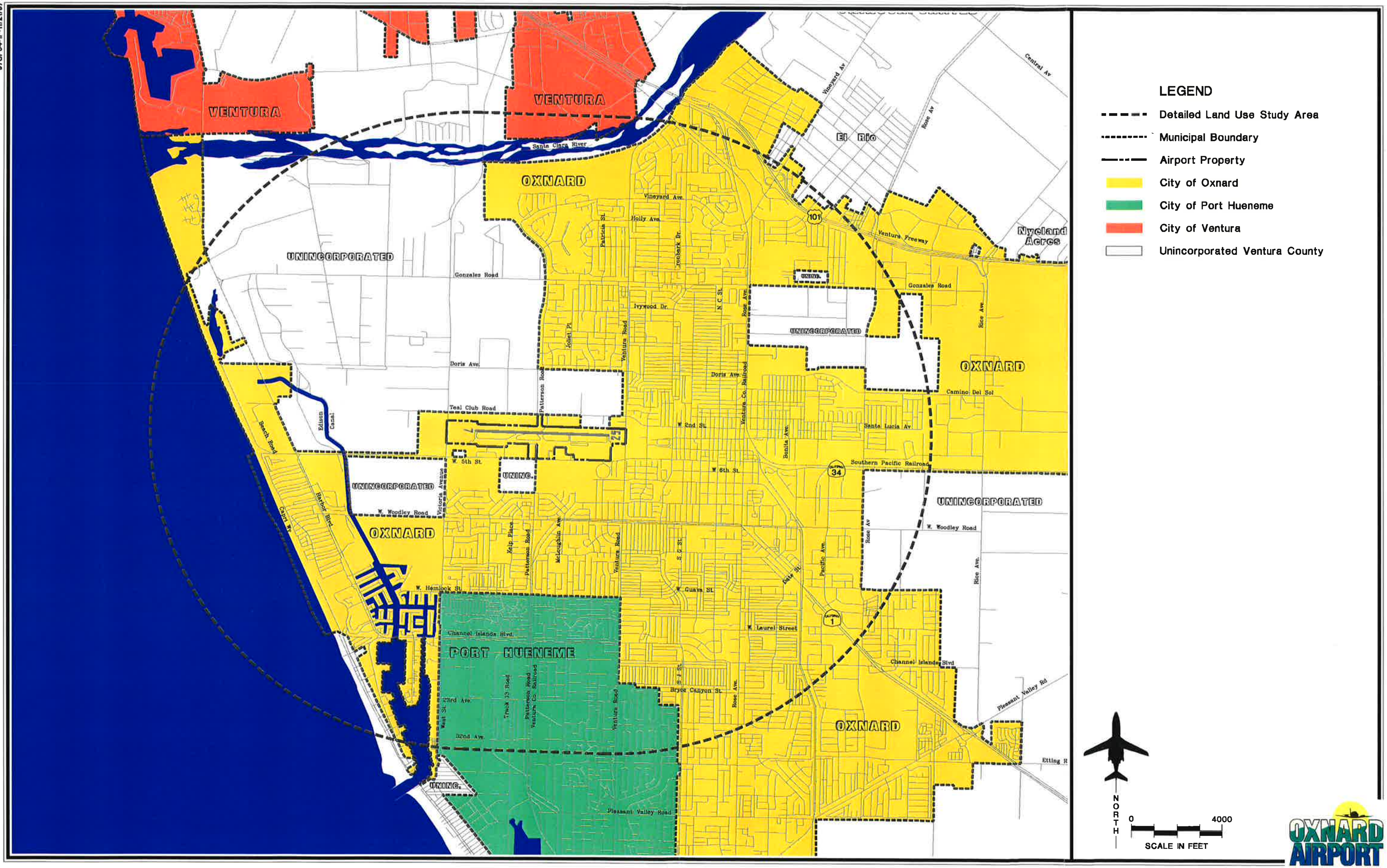

Exhibit 1F

STUDY AREA AND JURISDICTIONAL BOUNDARIES necessary. 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

Exhibit 1G shows existing land use in the study area. The land use classification system, shown in **Table 1C**, has been designed to fit the requirements of airport noise compatibility planning. Three categories of residential land use are identified -- single-family, multi-family, and mobile homes. Noise-sensitive institutions are also identified. The other land use categories are generally considered to be compatible with aircraft noise. They include commercial, industrial, transportation, and utilities; agriculture; parks and open space; and undeveloped land.

Most of the south and east parts of the study area is urbanized. Residential neighborhoods in Oxnard lie southwest, south, east, and north of the airport. Commercial and industrial development is concentrated near the airport, in downtown Oxnard just east of the airport, along Vineyard Avenue between the Ventura Freeway and State Highway 1, and in Port Hueneme south of the airport.

Most of the northwest quadrant of the study area is in agricultural use. A large park and open space area is at the north edge of the study area along the Santa Clara River.

Noise-sensitive institutions, including schools, places of worship, one hospital, and one library are scattered through the east and south parts of the study area.

The Regional Information Center for the California Historic Resources Inventory was contacted for information about any sites in the study area determined to be of historical significance. One building, the former Oxnard Public Library at 424 South C Street, is listed on the National Register of Historic Places. This building now houses the Carnegie Cultural Arts Center. No sites are listed as California Historical Landmarks or California Points of Historical Interest.

LAND USE PLANNING POLICIES AND REGULATIONS

The State of California requires all local governments to enact a “general plan” establishing framework policies for future development of the city or county. (See Government Code, Sections 65300, *et seq.*) The local general plan is the most important land use regulatory instrument in California. It establishes overall development policy and provides the legal foundation for all other kinds of land use and development regulation in the community.

The policies of the general plan are implemented through specific ordinances regulating development. Chief among these is the zoning

TABLE 1C
Land Use Categories Shown on Existing Land Use Map

Category	Land Uses Included
Single-family Residential	Single-family homes.
Multi-family Residential	Duplexes; Townhouses; Apartment and condominium buildings.
Mobile Homes	Mobile and manufactured homes.
Commercial, Industrial, Transportation, Utilities	Businesses; Offices; Industrial uses; Utilities; Transportation facilities; Intensively developed commercial agriculture areas including equipment storage areas and greenhouses.
Noise-Sensitive Institutions	Places of worship; Schools; Nursing homes; Residential group quarters; Hospitals; Community centers.
Agriculture	Orchards; Cultivated fields.
Parks and Open Space	Parks; Golf courses; Cemeteries; Ponds; Nature preserves.
Undeveloped	Vacant lots; Open parcels of uncultivated land.

ordinance. Zoning regulates the use of land, the density of development, and the height and bulk of buildings. Subdivision regulations are another important land use regulatory tool, regulating the platting of land. Local communities also regulate development through building codes which set detailed standards for construction.

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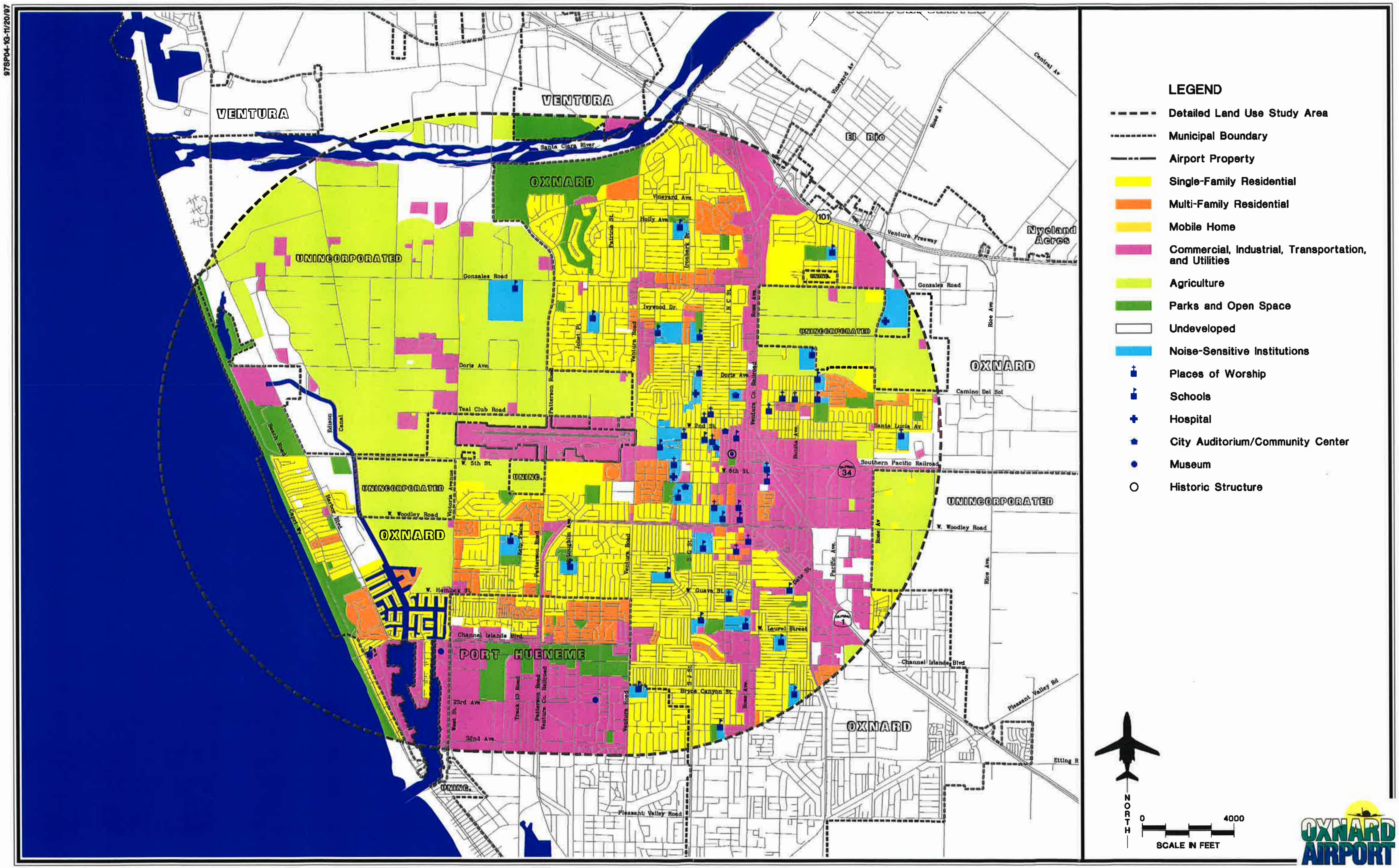

Exhibit 1G
GENERALIZED EXISTING LAND USE

GENERAL PLANS

A community's general plan sets standards and guidelines for future development and provides the legal basis for the zoning ordinance. According to California law, the general plan must contain at least seven elements: land use, circulation, housing, conservation, open space, noise, and safety (Curtin 1996, pp. 9-10). Other elements may be prepared as needed and desired.

Oxnard General Plan

The Oxnard General Plan was adopted in 1990. It includes eleven planning elements: growth management, land use, circulation, public facilities, open space/conservation, safety, noise, economic development, community design, parks and recreation, and housing. The City also has developed a Coastal Land Use Plan for the coastal zone (City of Oxnard 1982.) Policies and land use designations of the Coastal Land Use Plan have been incorporated into the City's General Plan.

The plan discusses regional plans and policies of significance in the Oxnard planning area. Among the most important are the "Guidelines for Orderly Development." These regional policies were adopted by Ventura County, all municipalities in the County, and the Ventura County Local Agency Formation Commission. These guidelines clarify the relationship between the County and the cities in matters of urban planning and the provision of services. The primary intent of the guidelines is to see that urban development occurs within incorporated areas whenever practical (City of Oxnard 1990, p. III-6).

Growth Management Element. This element of the General Plan has some goals and objectives that indirectly relate to airport compatibility planning (City of Oxnard 1990, p. IV-19).

> **A. Goals**
> 2. Maintain the quality of life desired by the residents of Oxnard.
>
> **B. Objectives**
> 2. Insure that new development avoids or fully mitigates impacts on air quality, traffic congestion, noise and resource protection. . . .
>
> 5. Create an appropriate balance between urban development and preservation of agricultural uses within the Planning Area.

The Growth Management Element also includes a number of principles, policies, and implementation measures. The policy with the most direct relevance to the Oxnard Airport Noise Compatibility Study is to cooperate with the City of San Buenaventura (Ventura) and Ventura County in creating an Oxnard/Ventura Greenbelt that would designate land for permanent agriculture/open space. Since the plan was approved, a greenbelt agreement was enacted and the greenbelt established. It is west and northwest of the airport as shown in **Exhibit 1H**.

Land Use Element. This element includes the following goals and objectives which are indirectly relevant to the airport compatibility planning process (City of Oxnard 1990, p. V-24).

A. Goals

1. A balanced community meeting housing, commercial and employment needs consistent with the holding capacity of the City.

2. Preservation of scenic views, natural topography, natural physical amenities, and air quality.

B. Objectives

1. Limit the urbanized area of the City and facilitate a permanent greenbelt between Oxnard and neighboring cities. . . .

3. Preserve permanent agricultural land within the Oxnard Planning Area.

Exhibit 1H shows the future land use plan for the Oxnard portion of the Oxnard Airport study area. Land west and northwest of the airport is designated for agriculture. Most of this area is covered by the San Buenaventura-Oxnard Greenbelt Agreement. Most of the land north and south of the airport is designated for low-density residential development. Due east of the airport the land is designated for commercial and industrial use and includes the Oxnard central business district and the central industrial area.

Open Space/Conservation Element. This element includes goal, objectives, and policies for open space for the preservation of natural resources, the managed production of resources, outdoor recreation, and public health and safety. Goals, objectives, and policies with a relationship to airport compatibility planning are quoted below (City of Oxnard 1990, pp. VII-60 to VII-72).

A. Goals

1. Maintenance and enhancement of natural resources and open space.

B. Objectives

3. Protect agricultural lands from premature and unnecessary urbanization. . . .

6. Manage urban development to protect open space areas that provide for public health and safety.

C. Policies

25. The City should provide a mechanism for approval of conservation easements and land banking to establish agricultural open space areas to be managed by either public or private conservation organizations or agencies.

26. The City shall continue the commitment of maintaining the existing Oxnard-Camarillo Greenbelt Agreement, as well as evaluating the possibility of expanding that agreement and creating a new Greenbelt in the

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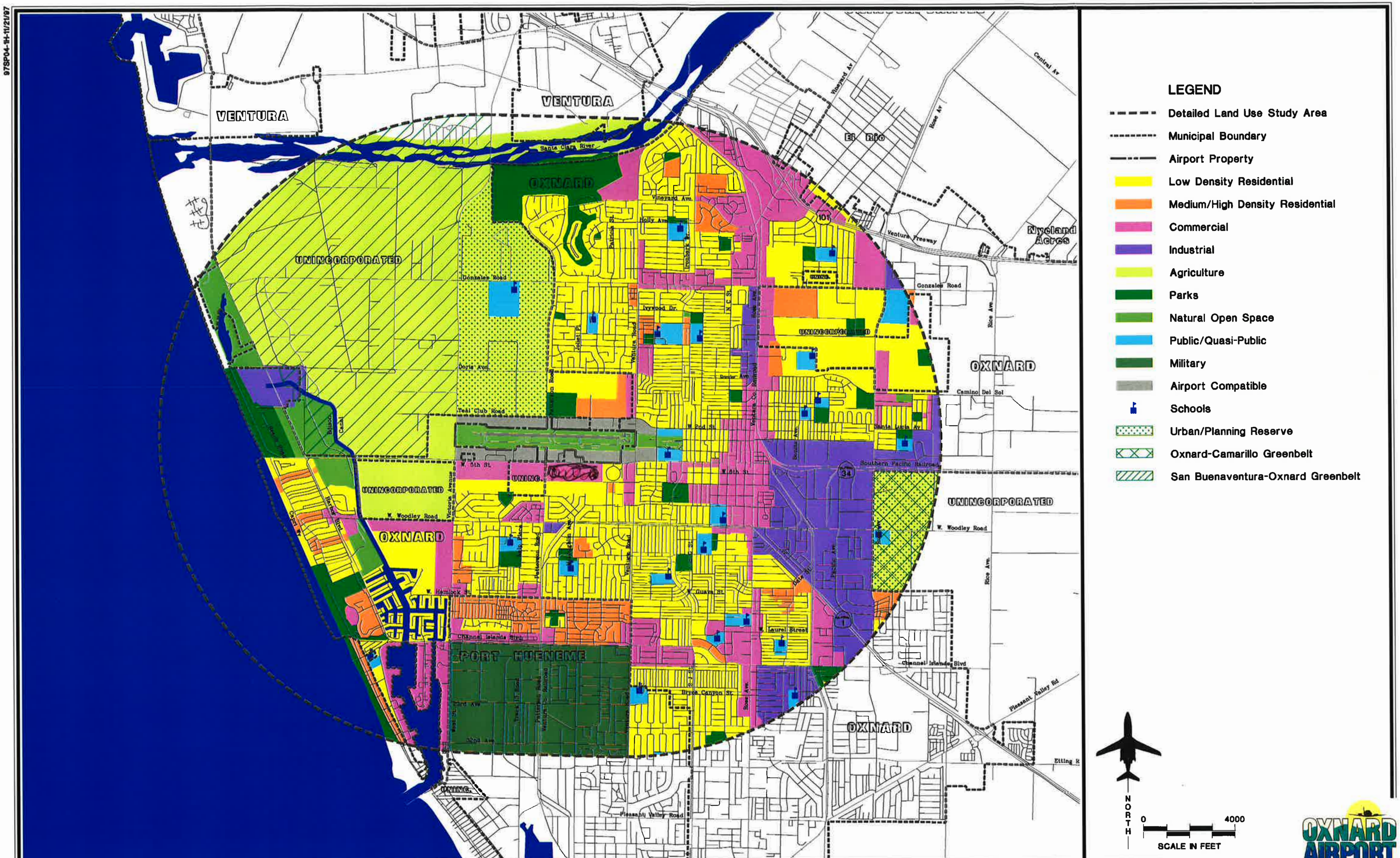

Exhibit 1H
FUTURE LAND USE PER GENERAL PLANS

northwest portion of the Planning Area. [This area has since become the San Buenaventura-Oxnard Greenbelt.]

27. The City should encourage the use and formation of Land Conservation Act contracts and other related agreements to offset the costs to property owners of identified agricultural lands. . . .

29. The City should consider adopting a farmland protection program utilizing such land use planning tools as transfer of development rights, purchase of development rights or conservation easements, farmland trusts and greenbelt agreements. . . .

42. Land within the 100-year floodplain is to be designated permanent open space as shown on the Land Use Map.

43. Land within the airport hazard area is to be designated permanent open space as shown on the Land Use Map.

Open space areas are designated on the 2020 Land Use Map in the General Plan. This is shown for the Oxnard Airport study area in **Exhibit 1H**. Open space is designated west and northwest of the airport. A narrow band of open space is designated immediately east of the airport.

Noise Element. The Noise Element includes several goals and policies related to noise and land use compatibility planning. Specific goals, objectives, and policies of interest are quoted below (City of Oxnard 1999, p. IX-16).

A. Goals

1. A quiet environment for the residents of Oxnard.

B. Objectives

1. Provide acceptable noise levels for residential and other noise-sensitive land uses consistent with State guidelines.

2. Protect noise sensitive uses from areas with high ambient noise levels.

3. Integrate noise considerations into the community planning process to prevent noise/land use conflicts.

C. Policies

5. Municipal policies shall be consistent with the Ventura County Airport Land Use Commission's adopted land use plan. . . .

7. The City shall prohibit the development of noise-sensitive land uses within the Oxnard Airport 65 dB(A) CNEL contour.

8. The City shall continue to enforce State Noise Insulation Standards for proposed projects in suspected high noise environments. The Planning Division shall notify prospective developers that, as a condition of permit issuance, they must comply with noise mitigation measures, which are designed by an acoustical engineer. No building

permits will be issued without City staff approval of the acoustical report/design.

Circulation Element. The Circulation Element includes one goal and several policies relating to Oxnard Airport and the potential civilian use of NAWS Pt. Mugu.

A. Goals

3. A regional airport in Ventura County capable of commercial air service. . . .

C. Policies

32. The City should support the location of a regional airport in Ventura County capable of air carrier service.

33. Oxnard Airport should remain as a general aviation facility (operated as a commuter service airport) and operating levels should not be increased.

34. Land uses adjacent to Oxnard Airport should be restricted as set forth in the Land Use Element in order to reduce potential noise and safety problems.

35. If the airport within the Pt. Mugu facility is declared surplus, or made available on a shared basis, the City should promote use of this facility as an air carrier airport.

Port Hueneme General Plan

The Port Hueneme General Plan was adopted in 1997 and establishes policies for a planning period through the year 2015 (Cotton/Beland/Associates, Inc., 1997). It includes seven elements: land use, circulation/infrastructure, housing, conservation/open space/environmental resources, noise, public safety and facilities, and economic development. The Land Use Element is the only element that is directly relevant to this F.A.R. Part 150 Noise Compatibility Study. (According to the Noise Element, the primary source of noise in the City is road noise. The City is not adversely affected by aircraft noise.)

Port Hueneme also has a Local Coastal Program certified by the California Coastal Commission. The updated General Plan reflects the policies of the Local Coastal Program.

"The Land Use Element and Land Use Policy Map are the two most important components of the General Plan. Together, these two parts of the Plan establish the overall policy direction for land use planning decisions in the City." (See Cotton/Beland/Associates, Inc. 1997, p. 1.)

The City of Port Hueneme has very little undeveloped land. Much of the Land Use Element, therefore, is devoted to neighborhood preservation and redevelopment to strengthen the City's economic base. The Land Use Element sets forth six goals:

Goal 1: Continued development of land uses which will create and sustain a strong, viable economic base for the city.

Goal 2: Creative utilization and responsible conservation of the City's major natural asset -- the beach and harbor environment.

Goal 3: Development and maintenance of a housing stock with a broader range of choice for local residents.

Goal 4: "Fair Share" payment for use of City services and facilities.

Goal 5: Protect the City's interests by continued participation with adjacent and regional jurisdictions to address common issues; including air quality, transportation, water quality and supply, and solid waste disposal.

Goal 6: Create an aesthetically pleasing and efficiently organized city.

Exhibit 1H shows the future land use designations in the Oxnard Airport Study Area which includes the northern edge of Port Hueneme. Most of the area north of Channel Islands Boulevard is designated for a mix of residential uses. Commercial use is designated along most of Channel Islands Boulevard. Land south of Channel Islands Boulevard and west of Ventura Road is designated for military use.

Ventura County General Plan

The Ventura County General Plan was adopted in 1988 and has been amended several times since then. The Plan includes several documents. The overall framework of goals and policies is in a document called *Goals, Policies and Programs* (Ventura County 1996a.) Supporting documentation is in a series of technical appendices (Ventura County 1994a, 1994b, 1994c, 1996b). The General Plan also includes several area plans where local issues and concerns are dealt with in greater detail than in the framework document.

The *Goals, Policies and Programs* document is organized into four substantive chapters dealing with different planning issues: resources, hazards, land use, and public facilities and services. The goals, policies, and programs that directly or indirectly relate to airport land use compatibility issues are summarized below.

Resources -- Farmland. Agriculture is a major industry in Ventura County. The County General Plan establishes policies to encourage the preservation of prime farmland. Since agriculture is a land use that is compatible with airport noise, the farmland preservation policies can indirectly also promote airport compatibility objectives. Relevant goals and policies are quoted below (Ventura County 1996a, p. 21).

1.6.1 Goals

1. Preserve and protect irrigated agricultural lands as a nonrenewable resource to assure the continued availability of such lands for the production of food, fiber and ornamentals.

1.6.2 Policies

3. Land Conservation Act (LCA) contracts shall be encouraged on irrigated farmlands. . . .

5. The County shall preserve agricultural land by retaining and expanding the existing Greenbelt Agreements and encouraging the formation of additional Greenbelt Agreements.

The LCA (also known as the Williamson Act) was adopted by the State in 1966. It enabled Counties to set up programs allowing farmers to enter into contracts of at least ten years duration to keep their land exclusively in farm use in return for a reduced tax assessment based on the agricultural use of the property. Ventura County entered this program in 1969 (Ventura County 1994c, p. 73).

Greenbelt agreements have been formed between various cities in Ventura County. The agreements delineate areas between the cities which are declared to be off limits to urban development and preserved for agriculture and open space. The cities of Ventura and Oxnard have a greenbelt agreement for the area between the two cities northwest of Oxnard Airport. This is shown in **Exhibit 1K**.

Airport Hazards. The County General Plan includes goals and policies applying to airport hazards, quoted below (Ventura County 1996a, p. 20).

2.10.1 Goal

Minimize the risk of loss of life, injury, damage to property, and economic and social dislocations resulting from airport hazards.

2.10.2 Policies

To avoid accidents, land in airport approach and departure zones shall be designated Agriculture or Open Space on the General Plan Land Use Map . . .

California law provides for the establishment of airport land use commissions (ALUC) in each county with a public use airport. The Ventura County Transportation Commission acts as the ALUC for Ventura County. It has established an *Airports Comprehensive Land Use Plan* for all airports in the County, including Oxnard. The land use plan includes policies promoting airport noise compatibility, safety compatibility, and airspace protection. The plan is currently being updated.

Hazards -- Flood. Ventura County's flood hazard goals and policies are intended to reduce risks of damage and injury due to floods (Ventura County 1996a, p. 43). In areas of greatest risk, only open space uses are to be permitted. In other areas of flood hazard, development is to be protected from a 100-year flood by being raised above the flood elevation. To the extent that flood hazard areas coincide with airport noise areas, these flood hazard policies also indirectly promote airport compatibility objectives.

Hazards -- Noise. The County General Plan declares that the County should attempt to eliminate or avoid the exposure of County residents to adverse noise impacts (Ventura County 1996a, p. 49). It notes that noise-sensitive land uses are considered to be residential, educational and health facilities, research institutions, certain recreational and entertainment facilities, and churches. The Plan sets forth the following policies with respect to development in areas exposed to aircraft noise (Ventura County 1996a, p. 50).

> **2.16.2 Policies**
> 1.(3) Noise sensitive uses proposed to be located near airports:
> a. Shall be prohibited if they are in a CNEL 65 or greater noise contour.
> b. Shall be permitted in the CNEL 60 to CNEL 65 noise contour area only if means will be taken to ensure interior noise levels of CNEL 45 or less.

Land Use. The County General Plan includes general land use goals, policies, and programs and sets of specialized goals, policies, and programs in the following policy areas: land use map designations, population and housing, and employment and commerce/ industry. One general goal is specifically relevant to airport land use compatibility planning:

> **3.1.1 Goals**
> 4. Ensure that land uses are appropriate and compatible with each other and guide development in a pattern that will minimize land use conflicts between adjacent land uses.

In the Camarillo Airport study area, the County's future land use designations in most of the unincorporated area outside the City's Sphere of Influence is primarily agricultural, a use that is compatible with aircraft noise. This is shown in **Exhibit 1K**.

Public Facilities and Services -- Transportation/Circulation. The Transportation/Circulation section of the General Plan has two policies related to airport land use compatibility.

> **4.2.2 Policies**
> 11. Discretionary development which would endanger the efficient, safe operation of an airport or would result in significant land use incompatibility with an airport shall be prohibited.
>
> 12. The Ventura County General Plan shall remain consistent with the Ventura County Master Airport Plan for Camarillo Airport and Oxnard Airport, which includes the Airport Noise Control and Land Use Compatibility Study (ANCLUC), for the purpose of ensuring compatible land uses around the Camarillo and Oxnard Airports.

Coastal Area Plan. The County's Coastal Area Plan establishes different land use and conservation policies in the coastal zone. Most of the area within the County's jurisdiction in the Oxnard Airport Study Area is designated as agriculture. This is reflected in **Exhibit 1H**. Smaller areas are designated as open space, including the McGrath Lake area and the beach west of Channel Islands Harbor.

VENTURA COUNTY AIRPORTS COMPREHENSIVE LAND USE PLAN

The Ventura County Transportation Commission serves as the Airport Land Use Commission (ALUC) authorized by State law. (See Public Utilities Code, Division 9, Aviation, Part 1, Chapter 4, Article 3.5, Section 21670 et seq.) The ALUC is responsible for preparing a comprehensive airport land use plan for each public use airport in the County. The County's Plan was last updated in 1991 (P&D Aviation 1991). It established a "land use planning boundary" around Oxnard Airport based on the projected 60 CNEL noise contour and designated safety zones. This planning area extended 4,000 feet off the sides of the runway centerline, 5,300 feet west of the runway end, and 5,300 feet east of the east end of the displaced threshold for Runway 25. Different land use compatibility standards apply in each safety zone and in each 5 CNEL contour range from 60 to 75 CNEL.

The County's *Comprehensive Airports Land Use Plan* is being updated concurrently with this Part 150 Noise Compatibility Study.

ZONING

Zoning ordinances are important in noise compatibility planning because they control the type and intensity of land uses in the area. State law requires the zoning ordinance to be in conformance with the general plan. The zoning ordinances of each study area jurisdiction are summarized in this section.

City of Oxnard

The Zoning Ordinance for the City of Oxnard is in Chapters 34 and 36 of *The Oxnard Municipal Code*. The Building Department is responsible for administering and enforcing the Zoning Ordinance.

Variances from the regulations may be authorized by the Planning Commission where strict application of the regulations would impose severe hardships or produce results inconsistent with the general purpose of the zoning ordinance. The Planning Commission must hold a public hearing and make specific findings noting the rationale for the variance. Decisions of the Planning Commission may be appealed to the City Council.

Amendments to the zoning ordinance and map may be made from time to time. These may be initiated by the Planning Commission, City Council, or property owner. The Planning Commission holds a hearing on the request and makes a recommendation to the Council. The Council then holds a hearing and makes a final decision. (See Sections 34-123 through 34-145.)

Table 1D summarizes the provisions of the Oxnard Zoning Ordinance as they apply to airport noise compatibility planning. The Code provides for 19 zoning districts, including five residential districts, five commercial districts, three manufacturing districts.

TABLE 1D
Summary of Zoning Provisions for Noise-Sensitive Land Uses
City of Oxnard

	Noise-Sensitive Uses		Minimum Lot Size Per Dwelling (sq. ft.)
Zoning District	**Permitted**	**Special**	
R-1, Single-Family	Single-family dwelling; Residential care facility; Children's day care facility; Adult day care facility; Manufactured housing; Second units; Bed and breakfast.	Churches; Townhouse condominiums.	6,000 s.f.
R-2, Multiple-Family	Multiple-family dwellings; Other uses per R-1, except manufactured housing and mobile homes.	Convents; Schools; Residential care facility; Adult day care facility; Children's day care facility; Condominiums; Residential stock cooperatives.	3,500 s.f.
MH-PD, Mobile Home Planned Development	Mobile home parks; Residential mobile homes.	None.	6.5 homes per acre
R-3, Garden Apartment	Garden apartments; Others per R-2.	Hospitals; Bed and breakfast inns; Others per R-2.	2,400 s.f.
R-4, High Rise Residential	High rise or high density apartments; Others per R-3.	Same as R-3.	1,500 s.f.
C-O, Commercial Office	None.	Hospitals; Hotels.	N.A.
C-1, Neighborhood Shopping Center	None.	None.	N.A.

TABLE 1D (Continued)
Summary of Zoning Provisions for Noise-Sensitive Land Uses
City of Oxnard

Zoning District	Noise-Sensitive Uses: Permitted	Noise-Sensitive Uses: Special	Minimum Lot Size Per Dwelling (sq. ft.)
C-2, General Commercial	Commercial school; Conservatory of music.	Same as permitted and special uses in R-3.	600 s.f.
C-M, Commercial and Light Manufacturing	None.	Motels; Caretaker's residence.	N.A.
M-L, Limited Manufacturing	Churches; Broadcasting studios.	None.	N.A.
M-1, Light Manufacturing	Same as M-L.	None.	N.A.
M-2 Heavy Manufacturing	None	None	N.A.
C-R, Community Reserve	None.	Farm labor housing; Mobile home used as temporary housing; Schools; Summer camps.	N.A.
CBD, Central Business District	Art galleries; Museums; Theaters and cinemas.	Assembly or concert halls; Hotels/motels; Nursery schools and day care centers; Churches; Schools; Bed and breakfast inn.	N.A.
R-P-D, Residential Planned Development	None.	Same as permitted uses in R-1, R-2, R-3, R-4.	Per special use permit.
C-P-D, Commercial Planned Development	None.	Same as permitted uses in C-2.	N.A.

TABLE 1D (Continued)
Summary of Zoning Provisions for Noise-Sensitive Land Uses
City of Oxnard

	Noise-Sensitive Uses		Minimum Lot Size Per Dwelling (sq. ft.)
Zoning District	**Permitted**	**Special**	
M-P-D, Manufacturing Planned Development	None.	Same as permitted uses in M-2.	N.A.
BRP, Business and Research Park	None.	Motels, hotels; Hospitals.	N.A.
Airport Hazard Overlay Zone	Per underlying zone.	Per underlying zone.	Per underlying zone.

N.A. - Not applicable.

It also provides for a "community reserve" district and a "business and research park" district. The ordinance provides for three planned development districts which permit the use of flexible development standards subject to the approval of a detailed development plan. The ordinance also has an "airport hazard overlay" district. It provides for special review of development projects proposed within the airport influence area around Oxnard Airport. Developers of property within this overlay zone are required to prepare an aircraft hazard and land use risk assessment relating to the proposed use. The proposed project also must be submitted to the Federal Aviation Administration and the Oxnard Airport Authority for review before Planning Commission action on the proposal.

Uses noted as "permitted" are enabled to operate after the issuance of any necessary permits by City officials. Before issuing permits, those officials would confirm zoning compliance.

Uses noted as "special uses" are subject to a special review process and issuance of a special use permit. Special use permits can be issued only after a public hearing before the Planning Commission. The Commission may attach conditions to the issuance of a permit. Decisions of the Planning Commission may be appealed to the City Council.

Noise-sensitive land uses are permitted outright or as special uses in all zoning districts except the C-1, Neighborhood Commercial, and M-2, Heavy Manufacturing, districts. Most of the noise-sensitive uses permitted in the commercial and manufacturing districts are institutional uses such as schools, churches, museums, assembly halls, hospitals, and similar uses. A limited number of noise-sensitive commercial uses, including hotels, theaters, and broadcasting studios, are also permitted in some commercial and manufacturing districts.

The City of Oxnard also has a Coastal Zoning Ordinance, Chapter 37 of the City Code. The Coastal Zoning Ordinance establishes 16 special zoning districts. Eight districts are for residential development, two for commercial, three for industrial or resource development uses, and three are open space preservation or resource protection.

The Coastal Zoning Ordinance also provides for the transfer of development rights from the Oxnard Shores area to residentially zoned areas in the coastal zone or elsewhere in the City. The purpose is to provide a means of preserving undeveloped land in the Oxnard Shores area for public access and recreation. (The eligible sending area lies between the ocean and the first public street from Fifth Street south to Amalfi Way.) That area is also subject to geological hazards. The transfer of development rights ordinance enables owners of undeveloped property in Oxnard Shores to sell their development rights and thus realize an economic return on their land while preserving the land for public use. (See Article 6 of the Coastal Zoning Ordinance.)

City of Port Hueneme

The Port Hueneme Zoning Regulations are in Article 10 of the City Code. They are administered and enforced by the Department of Community Development. No premises can be occupied and no building erected or altered until a certificate of zoning compliance has been issued by the Building Inspector. The City Council is authorized to issue variances from the zoning regulations, after a public hearing, in case of special circumstances applicable to the property which deprive the property of privileges enjoyed by other property in the vicinity under the same zoning classification. (See Sections 10005 and 10352.) Variances involving routine and minor adjustments may be granted administratively by the Department of Community Development (Sections 10005 and 10353).

Amendments to the zoning map and text may be made from time to time by the City Council. These may be initiated by the City Council, or upon recommendation of the Department of Community Development, or by a property owner as part of a proposed development project. The City Council Commission must hold a public hearing on the proposed amendment before making a decision.

Table 1E summarizes the provisions of the Camarillo Zoning Ordinance as they apply to airport noise compatibility planning. The Ordinance provides for 12 zoning districts, including four residential districts, two commercial districts, two industrial districts, one

TABLE 1E
Summary of Zoning Provisions for Noise-Sensitive Land Uses
City of Port Hueneme

	Noise-Sensitive Uses		Minimum Lot Size Per Dwelling (sq. ft.)
Zoning District	**Permitted**	**Conditional or Administrative Uses**	
R-1, Single Family	One-family dwellings; Mobile homes; Community care facilities serving six or fewer people.	Community care facilities serving seven or more people; Mobile home parks; Schools; Community centers; Places of worship; Hospitals; Boarding and lodging houses.	6,000 s.f.
R-2, Limited Multifamily	One-family dwellings; Mobile homes; Two-family dwellings; Condominiums, apartments, or townhouses; Community care facilities serving six or fewer people.	Community care facilities serving seven or more people; Mobile home parks; Schools; Community centers; Places of worship; Hospitals; Boarding and lodging houses.	2,904 to 6,000 s.f.
R-3, Multiple Family	One-family dwellings; Two-family dwellings; Multiple family dwellings; Community care facilities serving six or fewer people.	Community care facilities serving seven or more people; Mobile home parks; Schools; Community centers; Places of worship; Hospitals; Boarding and lodging houses.	1,742 to 6,000 s.f.
R-4, Transitional Residential and Coastal-Related Industry	One-family dwellings; Two-family dwellings; Condominiums, apartments, or townhouses; Community care facilities serving six or fewer people.	None.	1 to 30 units per acre.
C-1, General Commercial	Conservatory of music.	Hospitals; Hotels, motels, and boatels.	N.A.
C-S, Special Commercial	Hotels, motels, and boatels; Museums; Music and theater/entertainment establishments.	None.	N.A.

TABLE 1E (Continued)
Summary of Zoning Provisions for Noise-Sensitive Land Uses
City of Port Hueneme

	Noise-Sensitive Uses		Minimum Lot Size Per Dwelling (sq. ft.)
Zoning District	**Permitted**	**Conditional or Administrative Uses**	
P-R, Park Reserve	None.	Community centers.	N.A.
M-CR, Coastal-Related Industry	None.	None.	N.A.
M-CD, Coastal-Dependent Industry	None.	None.	N.A.
PD, Planned Development	None.	Per permitted and conditional uses in underlying zone.	Per underlying zone. Average single-family lot size may be reduced to 5,000 s.f.
F-H, Flood Hazard Overlay	Per underlying zone.	Per underlying zone.	Per underlying zone.
D-R, Development Reserve Overlay	None.	Special development permit required for any development.	Per development permit.

N.A. - Not applicable.

park reserve district, one planned development district, and two overlay districts. Noise-sensitive land uses permitted in each zoning district are noted in the table. Uses noted as "permitted" are enabled to operate after the issuance of the required permits by City officials.

Uses noted as "conditional uses" are subject to a special review and approval process. Conditional uses may be established only after the issuance of a conditional use permit by the City Council holding a public hearing. The Council may attach special conditions on the permit as deemed necessary to protect the public health, safety, and general welfare.

Noise-sensitive land uses are permitted in all residential districts. Residential uses are permitted outright, while various noise-sensitive institutional uses, such as schools and places of worship, are permitted as conditional uses. Certain noise-sensitive uses are also permitted in the two commercial districts, including music conservatories, hotels, museums, and theaters. Community centers are permitted as conditional uses in the P-R, Park Reserve, district.

The D-R, Development Reserve Overlay, district is unusual. It applies to all areas under the control of the U.S. Government. The Federal Government facilities at Port Hueneme are not subject to the City's direct zoning control. If the government divests itself of any part of its land, that area becomes subject to the D-R zoning regulations which require that any proposed development go through a special review and approval process.

Ventura County

The Ventura County Non-Coastal Zoning Ordinance is in Division 8, Chapter 1, of the County Code. The County Planning Director is responsible for administering and enforcing the Zoning Ordinance.

Amendments to the Zoning Ordinance and map may be made from time to time. These may be initiated by the Board of Supervisors, the Planning Commission, the Planning Director, or property owner. The Planning Commission must hold a hearing on the requested amendment and make a decision. If the Planning Commission favors approval of the amendment, the request is sent to the Board of Supervisors. The Board must hold a public hearing and make the final decision. If the Planning Commission disapproves an amendment initiated by itself, the Planning Director, or a property owner, the proposed amendment is considered to be denied. The proposal will be forwarded to the Board of Supervisors only if an appeal is filed. (See Article 15.)

Variances from the regulations may be authorized by the Planning Commission where strict application of the regulations would impose practical difficulties or unnecessary hardships and where special circumstances apply to the subject property which do not burden other property similarly situated. Minor variances may be granted by the Planning Director. More significant variances must be considered by the Planning Commission. The Commission must hold a public hearing and make a decision on the requested variance. Decisions of the Planning Commission may be appealed to the Board of Supervisors. (See Sections 8111-1.2.2 and 8111-2 *et seq.*)

Table 1F summarizes the provisions of the Ventura County Non-Coastal Zoning Ordinance as it relates to airport noise compatibility planning. The ordinance establishes 19 zoning districts including three open space/

TABLE 1F
Summary of Zoning Provisions for Noise-Sensitive Land Uses
Ventura County

	Noise-Sensitive Uses		Minimum Lot Size Per Dwelling (sq. ft.)
Zoning District	**Permitted**	**Conditional**	
O-S, Open Space	Farm worker dwellings; Family day care homes; Single-family dwellings.	Mobile home; Farm labor group quarters; Colleges and universities; Correctional institutions; Campgrounds; R.V. parks; Retreats.	10 acres
A-E, Agricultural Exclusive	Farm worker dwellings; Family day care homes; Single-family dwellings.	Mobile home; Farm labor group quarters.	40 acres
R-A, Rural Agricultural	Farm worker dwellings; Family day care homes; Single-family dwellings.	Boarding houses; Bed and breakfast inns; Day care centers; Intermediate care homes; Places of worship; Mobile home; Colleges and universities; Schools; Correctional institutions; Libraries; Mobile home parks; Camps; Campgrounds; R.V. parks; Retreats.	1 acre
R-E, Rural Exclusive	Family day care homes; Single-family dwellings.	Boarding houses; Bed and breakfast inns; Day care centers; Intermediate care homes; Places of worship; Mobile home; Schools; Libraries; Mobile home parks; Camps; Campgrounds; R.V. parks; Retreats.	10,000 s.f.

TABLE 1F (Continued)
Summary of Zoning Provisions for Noise-Sensitive Land Uses
Ventura County

	Noise-Sensitive Uses		Minimum Lot Size Per Dwelling (sq. ft.)
Zoning District	**Permitted**	**Conditional**	
R-O, Single-Family Estate	Family day care homes; Single-family dwellings.	Mobile home; Schools; Libraries; Mobile home parks.	20,000 s.f.
R-1, Single-Family Residential	Family day care homes; Single-family dwellings.	Boarding houses; Bed and breakfast inns; Day care centers; Intermediate care homes; Places of worship; Mobile home; Schools; Libraries; Mobile home parks.	6,000 s.f.
R-2, Two-Family Residential	Family day care homes; Single-family dwellings; Two-family dwellings.	Boarding houses; Bed and breakfast inns; Day care centers; Intermediate care homes; Places of worship; Mobile home; Schools; Libraries; Mobile home parks.	3,500 s.f.
R-P-D, Residential Planned Development	Family day care homes.	Boarding houses; Bed and breakfast inns; Day care centers; Intermediate care homes; Places of worship; Mobile home; Single-family dwellings; Two-family dwellings; Multi-family dwellings; Schools; Hospitals; Libraries; Mobile home parks.	1 to 30 d.u./acre

TABLE 1F (Continued)
Summary of Zoning Provisions for Noise-Sensitive Land Uses
Ventura County

	Noise-Sensitive Uses		Minimum Lot Size Per Dwelling (sq. ft.)
Zoning District	**Permitted**	**Conditional**	
C-O, Commercial Office	None	Intermediate and residential care center; Places of worship; Colleges and universities; Schools; Hospitals; Libraries and information centers.	N.A.
C-1, Neighborhood Commercial	None	Day care center; Places of worship; Professional, vocational, art, craft schools; Libraries and information centers; Dwelling for superintendent or owner.	N.A.
C-P-D, Commercial Planned Development	None	Art galleries, museums, and botanical gardens; Day care center; Intermediate and residential care center; Places of worship; Broadcasting stations; Colleges and universities; Schools; Hospitals; Hotels, motels, and boarding houses; Libraries and information centers; Dwelling for superintendent or owner.	N.A.
M-1, Industrial Park	None	Day care center; Places of worship; Broadcasting stations; Colleges and universities; Schools; Dwelling for superintendent or owner; Dwelling for caretaker.	N.A.

TABLE 1F (Continued)
Summary of Zoning Provisions for Noise-Sensitive Land Uses
Ventura County

	Noise-Sensitive Uses		Minimum Lot Size Per Dwelling (sq. ft.)
Zoning District	**Permitted**	**Conditional**	
M-2, Limited Industrial	None	Broadcasting stations; Dwelling for superintendent or owner; Dwelling for caretaker.	N.A.
M-3, General Industrial	None	Broadcasting stations; Dwelling for superintendent or owner; Dwelling for caretaker.	N.A.
S-P, Specific Plan	Per approved plan.	Per approved plan.	Per approved plan.
T-P, Timberland Preserve	Single-family dwellings.	Mobile home.	160 acres
SRP, Scenic Resource Protection Overlay	Per underlying zone.	Per underlying zone.	Per underlying zone.
MRP, Mineral Resources Protection Overlay	Per underlying zone.	Per underlying zone.	Per underlying zone.
SHP, Scenic Highway Protection Overlay	Per underlying zone.	Per underlying zone.	Per underlying zone.

N.A. - Not Applicable

agriculture/timber districts, six residential districts, three commercial districts, three industrial districts, and three overlay districts. One "specific plan" district is also established.

Residential uses are permitted outright in the residential and open space districts (O-S, A-E, T-P). No noise-sensitive uses are permitted outright in the commercial or industrial districts.

Various noise-sensitive institutions are permitted as conditional uses in nearly all zoning districts.

Ventura County also has a Zoning Ordinance for the Coastal Zone. It is in Division 8, Chapter 1.1 of the County Code. It establishes zoning requirements for the unincorporated part of the coastal zone. Thirteen special coastal zoning districts are created by the ordinance, as listed in **Table 1G**. (See Articles 1 and 3 of the Coastal Zoning Ordinance.)

TABLE 1G
Summary of Coastal Zoning Districts
Ventura County Coastal Zoning Ordinance

Zoning District	Purpose of Zones	Minimum Lot Area
C-O-S, Coastal Open Space	To provide for preservation, maintenance, and enhancement of natural and recreational resources in coastal areas.	10 acres
C-A, Coastal Agriculture	To preserve and protect commercial agricultural lands; to preserve and maintain agriculture as a major industry in the coastal zone; to protect these areas from encroachment of nonresidential uses which would have detrimental effects on agriculture.	40 acres
C-R, Coastal Rural	To provide for and maintain a rural residential setting where a variety of agricultural uses are permitted, while surrounding land uses are protected.	1 acre
C-R-E, Coastal Rural Exclusive	To provide for residential areas with semi-rural atmosphere, but exclude agricultural uses to a great extent and concentrate on residential uses.	20,000 s.f.
C-R-1, Coastal Single-Family Residential	To provide for and maintain, areas along the coast for more traditional single-family developments and lots significantly larger than those permitted in the R-B or R-B-H zones.	7,000 s.f.
C-R-2, Coastal Two-Family Residential	To provide for, and maintain, areas along the coast where single and two-family dwellings are allowed, but on lots sizes significantly larger than those permitted in the higher density R-B and R-B-H zones.	7,000 s.f.
R-B, Residential Beach	To provide for the development and preservation of small-lot, beach-oriented residential communities.	3,000 s.f.

TABLE 1G (Continued)
Summary of Coastal Zoning Districts
Ventura County Coastal Zoning Ordinance

Zoning District	Purpose of Zones	Minimum Lot Area
R-B-H, Residential Beach Harbor	To provide for development and preservation of unique beach-oriented residential communities with small lot subdivision patterns.	1,750 s.f.
C-R-PD, Coastal Residential Planned Development	To provide for the development of land as a unit for residential use by taking advantage of innovative site planning techniques.	As specified by permit.
H-P-D, Harbor Planned Development	To provide for uses consistent with harbor-oriented and tourist-oriented developments.	As specified by permit.
C-C, Coastal Commercial	To provide for the development of retail and service commercial uses which are intended to be neighborhood-serving or visitor-serving.	20,000 s.f.
C-M, Coastal Industrial	To establish an industrial zone consistent with the unique features of the coastal zone.	10 acres
M, Santa Monica Mountains Overlay	To provide specific protective measures for the mountains which provide habitats for several unique, rare, or endangered plant and animal species.	Not applicable

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 fire-fighting apparatus, avoidance of congestion, and the orderly and efficient layout and use of land.

Oxnard, Port Hueneme, and Ventura County all administer subdivision regulations in the study area. None have special standards related to airport land use compatibility.

BUILDING CODES

Building codes regulate the construction of buildings, ensuring that they are built to safe standards. Building codes may be used to require sound insulation in new residential, office, and institutional building construction when warranted by existing or potential high aircraft noise levels.

Most features of building codes intended for energy efficiency also provide acoustical insulation. Caulking of joints, continuous sheathing, dead air spaces, and use of materials with high R-values are construction techniques which can attenuate aircraft noise while conserving energy used for home heating and cooling. Other measures which are not always justifiable for energy efficiency alone, are vent baffling and year-round, closed-window ventilation systems. Surprisingly, some highly energy-efficient storm window designs are less efficient for sound insulation than other older style designs.

Building codes apply to existing buildings only when remodeling or expansion is contemplated. Therefore, amendments to building codes are of little value in correcting noise sensitivity problems in completely developed areas. In those circumstances, sound insulation programs must be instituted retroactively.

Oxnard, Port Hueneme, and Ventura County all administer building codes. None has special provisions relating to sound insulation of residential buildings in the vicinity of airports.

SUMMARY

The information discussed 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 aircraft noise analyses during the next phase of the study. The land use information in the airport environs will allow the assessment of the impact of airport noise on local residents. This information will, in turn, provide guidance to the assessment of potential noise abatement and land use management procedures necessary to reduce the impact of aircraft noise on existing and potential future residents of the study area.

REFERENCES

City of Oxnard, 1990. *City of Oxnard 2020 General Plan.* Adopted by City Council Resolutions 10050 and 10052, October 7 and 14, 1990.

City of Oxnard 1982. *Coastal Land Use Plan.* Prepared by Oxnard Community Development Department. Latest revision, July 1988.

Coffman Associates, 1996. *Airport Master Plan for Oxnard Airport, Oxnard California.* Prepared for Ventura County, August 1996.

Cotton/Beland/Associates, Inc. 1997. *City of Port Hueneme General Plan*, hearing draft. Prepared by Cotton/Beland for City of Port Hueneme, April 1997.

Curtin, Daniel J., Jr., 1996. *California Land Use and Planning Law*, 16th edition. Solano Press Books, Point Arena, CA.

Dames & Moore, 1992. *NAWS Point Mugu Air Installation Compatible Use Zones (AICUZ) Study Update.* Prepared for Western Division, Naval Facilities Engineering Command, San Bruno, California.

National Ocean Service, 1997a. *Airport / Facility Directory, Southwest U.S.* Effective 11 September 1997. National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

National Ocean Service, 1997b. *U.S. Terminal Procedures, Southwest, Volume 2 of 2.* Effective 11 September 1997. National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

P&D Aviation, 1991. *Airports Comprehensive Land Use Plan Update for Ventura County.* Prepared for the Ventura County Airport Land Use Commission and the Ventura County Transportation Commission. Adopted November 1, 1991.

Ventura County, 1994a. *Ventura County General Plan: Hazards Appendix.* Adopted by the Ventura County Board of Supervisors, May 24, 1988, with amendments through July 12, 1994.

Ventura County, 1994b. *Ventura County General Plan: Public Facilities and Services Appendix.* Adopted by the Ventura County Board of Supervisors, May 24, 1988, with amendments through December 20, 1994.

Ventura County, 1994c. *Ventura County General Plan: Resources Appendix.* Adopted by the Ventura County Board of Supervisors, May 24, 1988, with amendments through July 12, 1994.

Ventura County, 1996a. *Ventura County General Plan: Goals, Policies and Programs*. Adopted by the Ventura County Board of Supervisors, May 24, 1988, with amendments through December 17, 1996.

Ventura County, 1996b. *Ventura County General Plan: Land Use Appendix*. Adopted by the Ventura County Board of Supervisors, May 24, 1988, with amendments through December 10, 1996.

Ventura County, 1996c. *Coastal Area Plan of the Ventura County General Plan*. Adopted by the Ventura County Board of Supervisors, November 18, 1980, with amendments through December 10, 1996.

Chapter Two

AVIATION NOISE

This chapter describes the methodology and key input assumptions that will be used to develop noise exposure maps for Oxnard Airport. Noise contour maps will be prepared for three study years: 1998, 2003, and 2018. The 1998 noise contour map will show the current noise levels based on current operations. The 2003 map will be based on forecast operation levels presented in the 1996 Airport Master Plan. The 1998 and 2003 maps are the basis for the official "Noise Exposure Maps" required under F.A.R. Part 150.

One additional noise contour map will be developed for the year 2018 to present a long term view of potential future noise exposure at Oxnard Airport.

The aircraft noise analysis relies on complex analytical methods and uses numerous technical terms. A Technical Information Paper 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 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 two models for use in F.A.R. Part 150 Noise Compatibility Studies — NOISEMAP and the Integrated Noise Model (INM). NOISEMAP is used most often at military airports, while the INM is most commonly used at civilian airports.

The Integrated Noise Model (INM) was developed by the Transportation Systems Center of the U.S. Department of Transportation at Cambridge, Massachusetts. It is undergoing continuous refinement. The model is designed as a conservative planning tool, tending to slightly overstate noise. The model and its database are periodically updated based on the philosophy that each version should err on the side of over prediction while each subsequent update moves closer to reality.

Version 5.1 is the most current version of the model at this time. It is the version used for the noise analysis described in this chapter.

The INM works by defining a network of grid points at ground level around the airport. It then selects the shortest distance from each grid point to each flight track and computes the noise exposure for each aircraft operation, by aircraft type and engine thrust level, along each flight track. Corrections are applied for air-to-ground acoustical attenuation, acoustical shielding of the aircraft engines by the aircraft itself, and aircraft speed variations. The noise exposure levels for each aircraft are then summed at each grid location. The cumulative noise exposure levels at all grid points are then used to develop noise exposure contours for selected values (e.g., 60, 65, 70, and 75 CNEL). Noise contours can be plotted using the Leq or CNEL metrics.

In addition to the mathematical procedures defined in the model, the INM has another very important element. This is a data base containing tables correlating noise, thrust settings, and flight profiles for most of the civilian aircraft, and many common military aircraft, operating in the United States. This data base, often referred to as the noise curve data, has been developed under FAA guidance based on rigorous noise monitoring in controlled settings. In fact, the INM database was developed through more than a decade of research including extensive field measurements of more than 10,000 aircraft operations.

The database also includes performance data for each aircraft to allow for the computation of airport-specific flight profiles (rates of climb and descent).

INM INPUT

A variety of user-supplied input data is required to use the Integrated Noise Model. This includes the airport elevation, airport area terrain, a mathematical definition of the airport runways, the mathematical description of ground tracks above which aircraft fly, and the assignment of specific aircraft with specific engine types at specific takeoff weights to individual flight tracks. This is summarized in **Exhibit 2A, INM Process**. In addition, aircraft not included in the model's data base may be defined for modeling, subject to FAA approval.

ACTIVITY DATA

For this analysis, current aircraft operations (takeoffs and landings) data and forecasts of future 2003 and 2018

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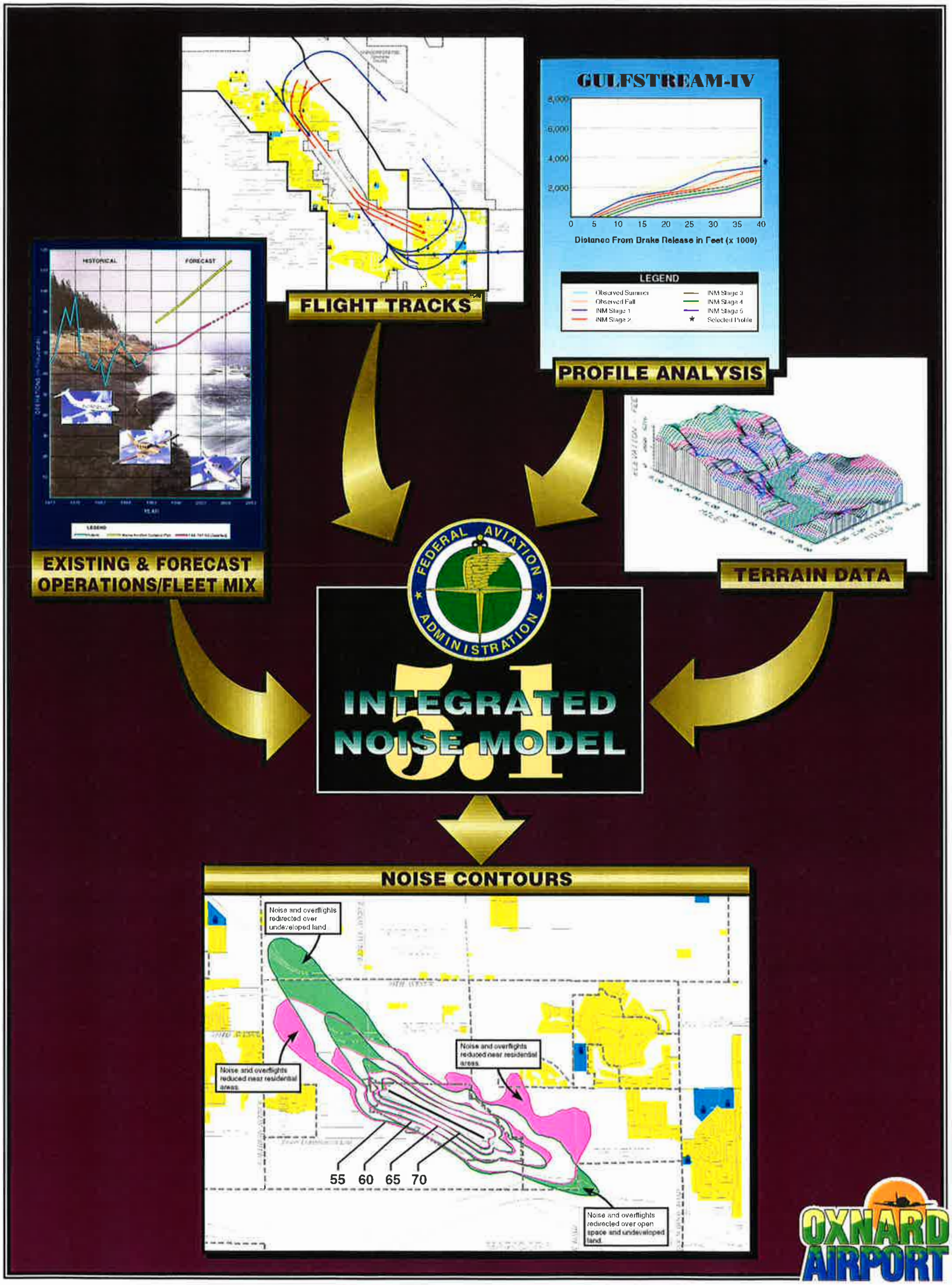

Exhibit 2A
INM PROCESS

forecasts of future 2003 and 2018 activity prepared for this study were used for noise modeling. These are briefly summarized in **Table 2A.**

Average daily aircraft operations were calculated by dividing total annual operations by 365 days. The distribution of these operations among various categories, users, and types of aircraft is critical to the development of the input model data.

TABLE 2A
Operations Summary
Oxnard Airport

Operations	Existing 1998[1]	2003[2]	2018[2]
Itinerant			
Air Taxi	18,345	23,300	31,800
General Aviation	53,072	60,000	80,000
Military	1,915	1,900	1,900
Subtotal	73,332	85,200	113,700
Local			
General Aviation	45,774	60,000	80,000
Military	300	300	300
Total	119,406	145,500	194,000

[1] Based on airport traffic control operation records from November 1996 through October 1997.
[2] Forecast operations levels from the 1996 Airport Master Plan

FLEET MIX

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 2B** and **Exhibit 2C,** 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 Oxnard Airport.

The business jet and turboprop fleet mix was developed based on airport landing fee reports for aircraft weighing more than 12,500 pounds. The smaller prop aircraft fleet mix was developed using a based aircraft list provided by airport staff. **Table 2B** summarizes the fleet mix data input into the noise analysis by annual aircraft operations.

DATABASE SELECTION

In order to select the proper aircraft from the INM database, a review of the current fleet mix for Oxnard Airport was conducted.

TABLE 2B
Fleet Mix Data
Oxnard Airport

	1998	2003	2018
Itinerant Operations			
Commuter			
Beech 1900	7,300	7,950	4,470
SF 340	0	1,325	2,980
Dash 8	0	1,325	2,980
ATR-72	0	0	1,490
Canadair Regional Jet	0	0	2,980
Air Taxi			
Beech Super King Air	1,100	1,900	4,225
Twin Engine turboprop	1,660	3,180	5,915
Twin Engine	6,085	5,080	3,380
Bell 206 Helicopter	1,100	1,270	1,690
Bell 222 Helicopter	1,100	1,270	1,690
GENERAL AVIATION			
LEAR-25	126	210	0
Gulfstream III	30	60	0
LEAR-35	108	180	720
Citation 500 series	68	110	515
Falcon 50	50	80	305
Westwind	68	110	515
Beech Super King Air	25	100	500
Convair	25	100	500
Twin Engine turboprop	1,842	2,390	3,915
Twin Engine	5,530	6,775	9,790
Light Single-Variable Pitch Propeller	14,000	14,745	17,130
Light Single-Fixed Pitch Propeller	15,200	15,940	18,110
Bell 206 Helicopter	12,000	14,400	21,000
Bell 222 Helicopter	1,600	1,920	2,800
Robinson 22	2,400	2,880	4,200
Military:			
Beech King Air	965	950	950
UH-1	950	950	950
Subtotal Itinerant	73,332	85,200	113,700
Local Operations			
GENERAL AVIATION			
Twin Turboprop	2,290	3,600	6,400
Light Twin	6,860	10,200	16,000
Light Single-Variable Pitch Propeller	17,400	22,200	28,000
Light Single-Fixed Pitch Propeller	19,224	24,000	29,600
Military:			
Beech King Air	150	150	150
UH-1	150	150	150
Subtotal Local	46,074	60,300	80,300
Total	119,406	145,500	194,000

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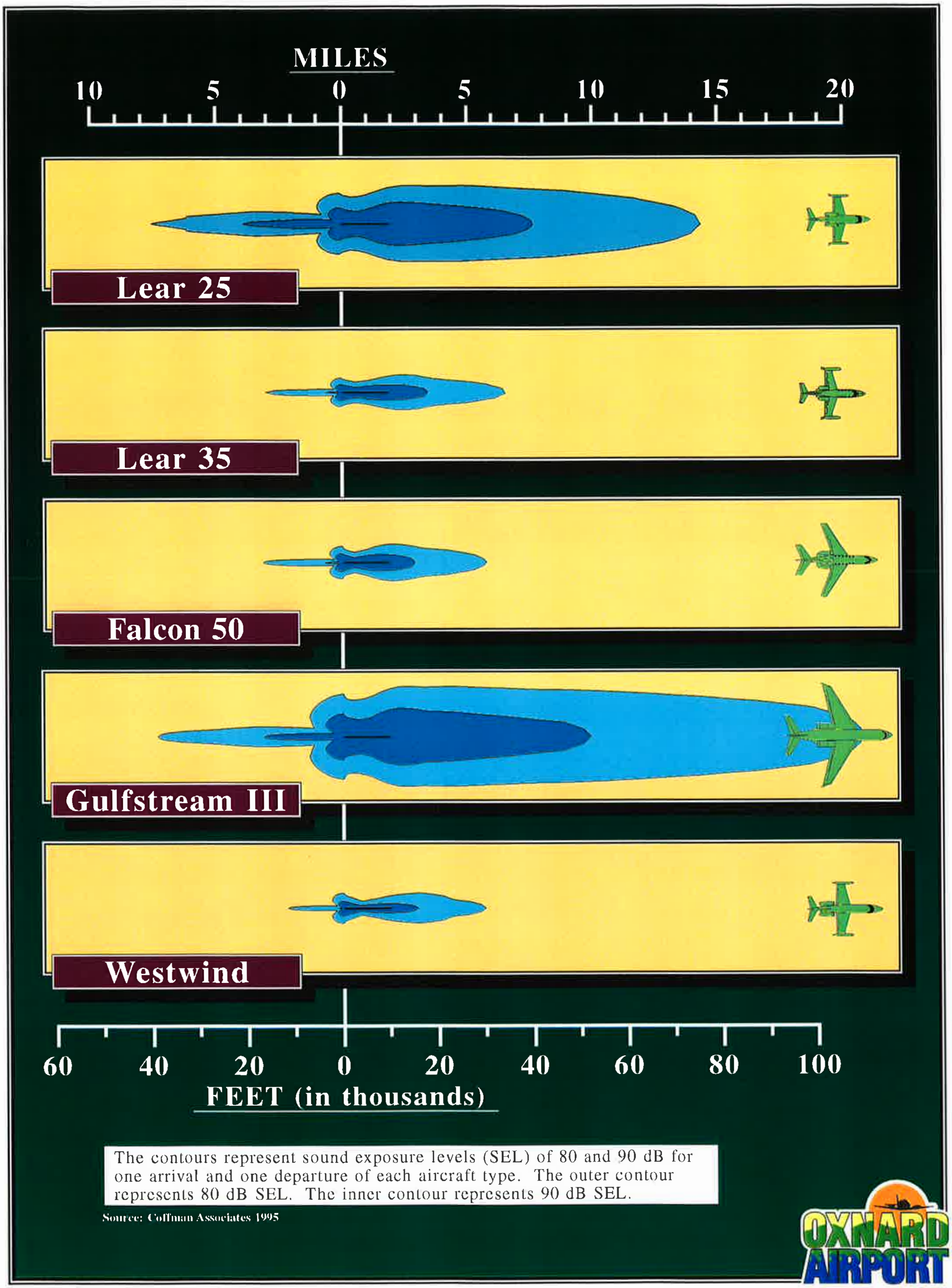

Exhibit 2B
BUSINESS JET NOISE
FOOTPRINT COMPARISON

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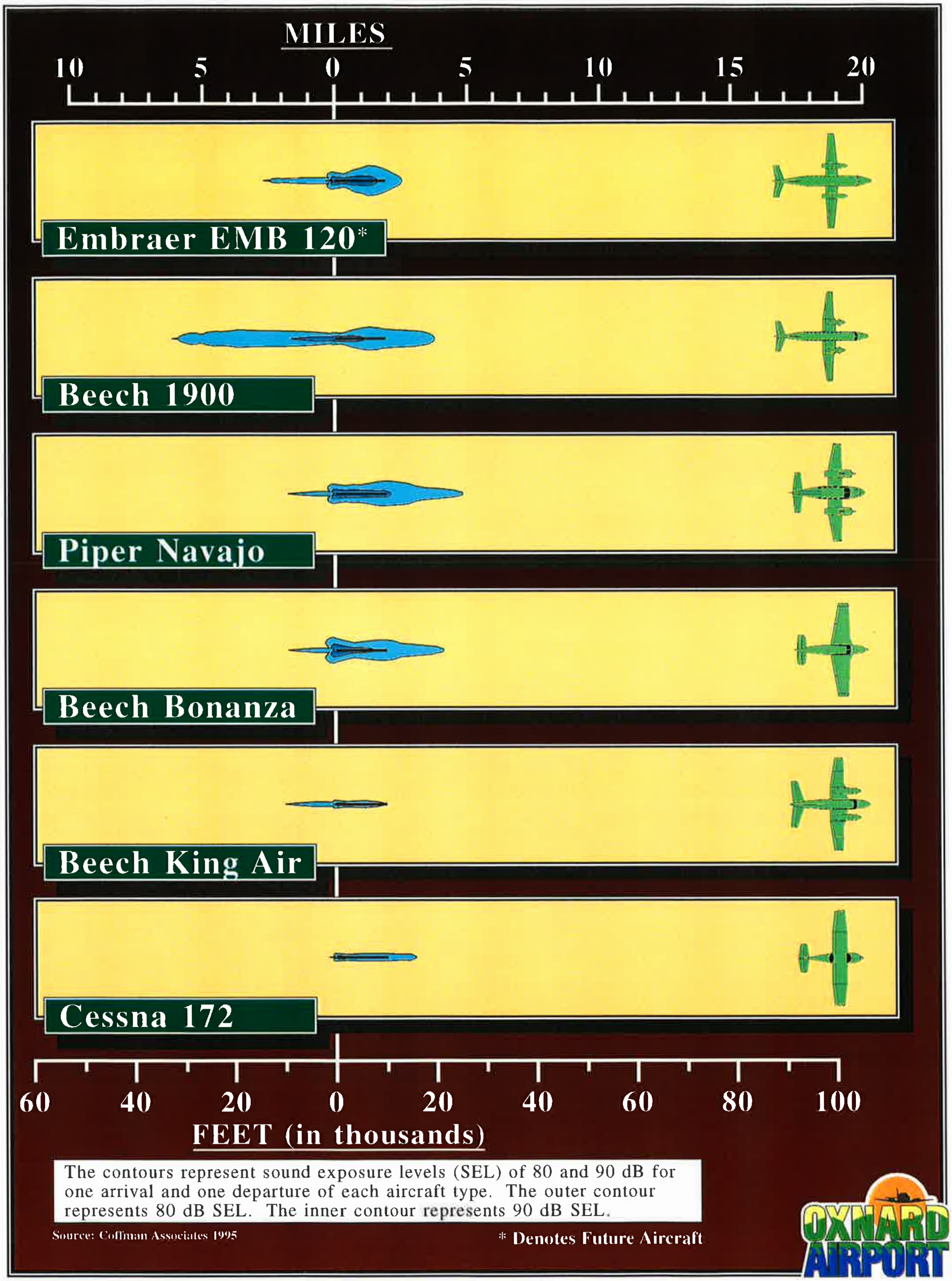

Exhibit 2C
PROPELLER AIRCRAFT NOISE
FOOTPRINT COMPARISON

The Jetstream 31 aircraft was recorded as operating in the commuter fleet. The INM designator DHC6 was used to model the Jetstream 31 aircraft. The future commuter fleet mix includes the Saab 340, Dash 8, ATR 72, and the Canadair Regional Jet. The SF340, DHC8, HS748A, and the CL601 INM designators represent Saab 340, Dash 8, ATR 72 and the Canadair Regional Jet aircraft, respectively.

Fixed wing aircraft in the air taxi category include the Beech Super King Air, Beech- 20, Beech-90, Cessna 441, Beech-95, Cessna 200, 300, 400 series, Piper 28, 31, and 32 aircraft. The INM designator DHC6 was used to model the Beech Super King Air. The CNA441 INM designator was used to represent the Beech-20, Beech-90, and the Cessna 441. The Beech-95, Cessna 200, 300, 400 series, Piper 28, 31, and 32 aircraft were modeled with INM designator BEC58P.

Helicopters in the air taxi category include the Bell 206 and 222. Helicopter data for these aircraft were extracted from the FAA's Heliport Noise Model (HNM) to simulate the helicopter air taxi and general aviation activity.

The INM provides data for most of the business turbojet aircraft that frequent Oxnard. The LEAR25 effectively represents the Lear 23 and 24 series aircraft. INM designator GIIB was used to model the Gulfstream III. The LEAR35 effectively represents the Lear 30 and 50 series aircraft. The INM designator MU3001 was used to model the Citation V aircraft. The Falcon 50 was modeled with the LEAR35 INM designator with 1.8 dB added to its SEL and EPNDB noise data. The IAI1125 Westwind was modeled with the INM designator IAI1125.

The FAA's substitution list indicates that the general aviation single engine variable pitch propeller model, the GASEPV, represents a number of single engine general aviation aircraft. Among others these include 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 list recommends the BEC58P, the Beech Baron, to represent the light twin-engine aircraft such as the Piper Navajo, Beech Duke, Cessna 31, and others. The CNA441 effectively represents the light turboprop and twin-engine piston aircraft such as the King Air, Cessna 402, Gulfstream Commander, and others.

Military operations at Oxnard are minimal and constitute less than 2 percent of the total annual operations at the airport. For modeling purposes the operations were divided between the Beech King Air and the UH-1 helicopter. The INM DHC6 was used for the Beech King Air and the helicopter data was extracted from the HNM to simulate the helicopter activity.

These choices are in accordance with the Pre-Approved Substitution List published by the FAA Office of Environment and Energy (AEE) branch in Washington.

TIME-OF-DAY

The time-of-day at which operations occur is important as input to the INM due to the extra weighting of evening (7:00 p.m. to 10:00 p.m.) and nighttime (10:00 p.m. to 7:00 a.m.) flights. In calculating airport noise exposure, one evening operation has the same noise emission value as three daytime operations by the same aircraft (a weight of 4.8 extra decibels). One nighttime operation has the same noise emission value as 10 daytime operations (a weight of 10 extra decibels).

Evening operations were determined using the airport control tower activity records. The tower closes at 9:00 p.m. An additional 33 percent was added to the evening percentage to account for the hour of evening activity not recorded.

Airport nighttime activity logs (August 8 to November 11, 1997) were used to determine nighttime percentages by aircraft type. **Table 2C** summarizes the time-of-day percentages used in this analysis.

TABLE 2C
Time of Day

	Evening Percentage[1]		Night Percentage[2]	
Aircraft Type	Departure	Arrival	Departure	Arrival
Commuter and Air Taxi	6.0%	6.0%	13.0%	9.0%
Business Jets	8.0%	8.0%	8.0%	3.5%
General Aviation Multi-Engine	8.0%	8.0%	2.9%	0.5%
General Aviation Single Engine	8.0%	8.0%	1.5%	1.5%
Helicopter	8.0%	8.0%	1.8%	0.0%

Source: [1] Airport control tower records
[2] Airport nighttime activity logs August 8 to November 11, 1997

RUNWAY USE

Runway usage data is another essential input to the INM. For modeling purposes, wind data analysis usually determines runway use percentages. However, wind analysis provides only the directional availability of a runway and does not consider pilot selection, primary runway operations, or local operating conventions. Continuous records of the runway usage at Oxnard Airport are not kept by the air traffic control tower. Tower staff indicated that approximately 90 percent of the aircraft arrive and depart on Runway 25.

FLIGHT TRACKS

Flight track data was derived from discussions with air traffic controllers.

These discussions were used to develop consolidated flight tracks. These consolidated flight tracks describe the average corridors that lead to and from the various flight routes to and from Oxnard Airport.

Although the consolidated flight tracks appear as distinct paths, they actually represent averages of the tower procedures and tower-observed tracks and are reflected that way on the exhibits. They illustrate the areas of the community where aircraft operations most often can be expected. At a commercial service airport such as Oxnard, aircraft traffic is expected over most areas around the airport. The density of the air traffic generally increases closer to the airport. While the observed tracks indicated variances from track to track, there were readily discernable areas of common overflights. The consolidated tracks were developed to reflect these common patterns and to account for the inevitable flight track dispersions around the airport.

Exhibit 2D, Departure Tracks, illustrates the consolidated flight tracks used for the modeling of the departure operations at Oxnard.

The majority of the departure traffic from Runway 25 fly runway heading until reaching the ocean before turning to their destination headings. Three departure tracks from Runway 25 fly to the SKIFF fix approximately 10,000 feet south west of the airport before being assigned to a route or transition. Departures from Runway 25 to the east turn right until intercepting the 249 radial from the CMA VOR/DME then to an assigned route or transition.

Departures from Runway 7 generally use the same fixes used from Runway 25. Departures from Runway 7 fly runway heading or use the CMA VOR/DME. Departures from Runway 7 to the west turn left and intercept the SKIFF fix before being assigned to a route or transition.

The consolidated arrival flight tracks for Oxnard are presented in **Exhibit 2E.** Arrival patterns from both directions are generally straight-in close to the airport with most traffic accessing the final approach course from the east. VOR and GPS approaches are available to Runway 25 from the east using global positioning equipment and the CMA VOR/DME. VOR/DME and GPS approaches are also available to Runway 7 from the west using the same navigational aids.

Exhibit 2F, Helicopter and Touch-and-Go Tracks, illustrates the touch-and-go pattern tracks and the helicopter flight tracks developed for this analysis. The concentric oval shaped track represents the touch-and-go pattern at Oxnard. The helicopter routes represent both arrival and departure traffic. Helicopter traffic is directed down to 5th Street from the airport and directed to follow 5th Street to the east or west.

ASSIGNMENT OF AIRCRAFT TO 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 Oxnard Airport were evaluated.

A review of tower observations and records used to delineate the consolidated flight corridors were also used to identify 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 from the east and departure tracks to the west of the airport. This is in keeping with the standard procedures at Oxnard. 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. In general, the number of specific aircraft of one group was factored by runway utilization and flight track percentage. The process of track assignments continued until all operations, in all directions, by all types of aircraft using the airport had been evaluated.

FLIGHT PROFILES

The standard arrival profile used in the INM program is a three-degree approach. 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 Oxnard. Therefore, the standard approach included in the model was used as representative of local operating conditions.

INM Version 5.1 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 Oxnard Airport, the elevation is 43 feet mean sea level (MSL) and the average annual temperature is 60.3 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.

INM OUTPUT

Output data selected for calculation by the INM were annual average noise contours in CNEL. F.A.R. Part 150 requires that 65, 70 and 75 CNEL contours must be mapped in the official Noise Exposure Maps. In addition, 60 CNEL noise contour is also mapped in this study as a guideline for future noise abatement and land use planning. This section presents the results of the contour analysis for current and forecast noise exposure conditions, as developed from the Integrated Noise Model.

FINAL DRAFT – NOT APPROVED BY BOS OR FAA

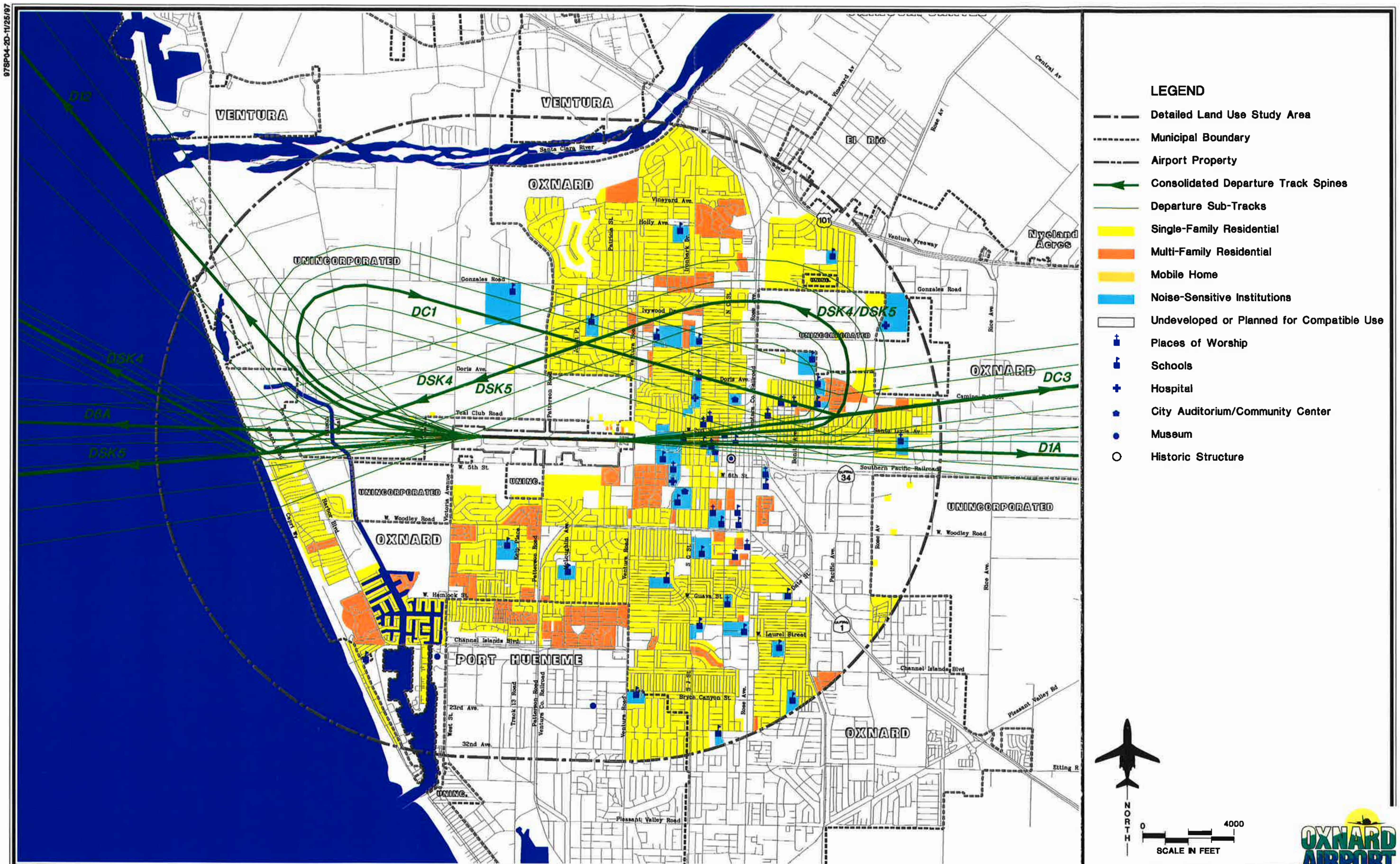

Exhibit 2D
DEPARTURE TRACKS

FINAL DRAFT – NOT APPROVED BY BOS OR FAA

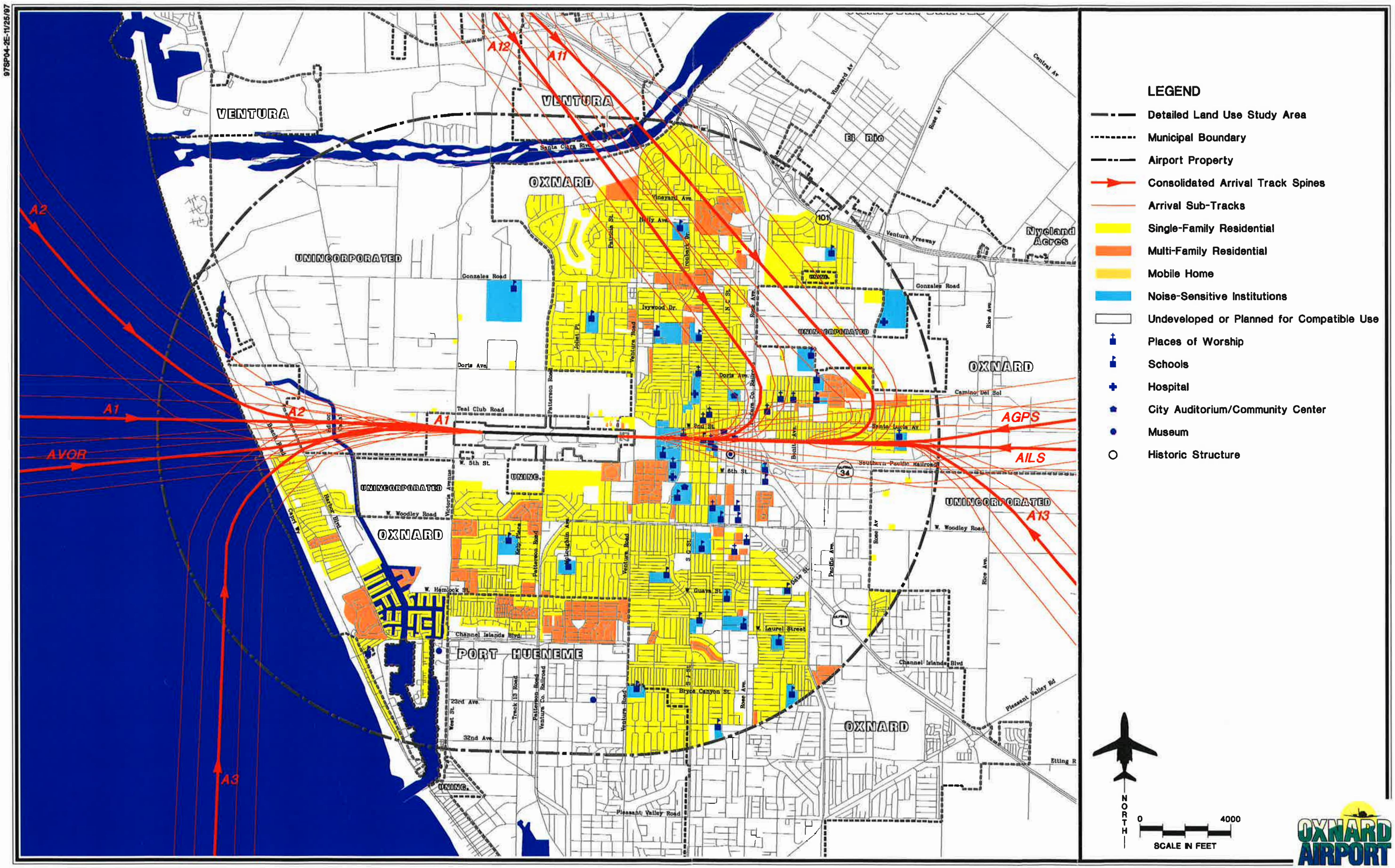

Exhibit 2E
ARRIVAL TRACKS

FINAL DRAFT – NOT APPROVED BY BOS OR FAA

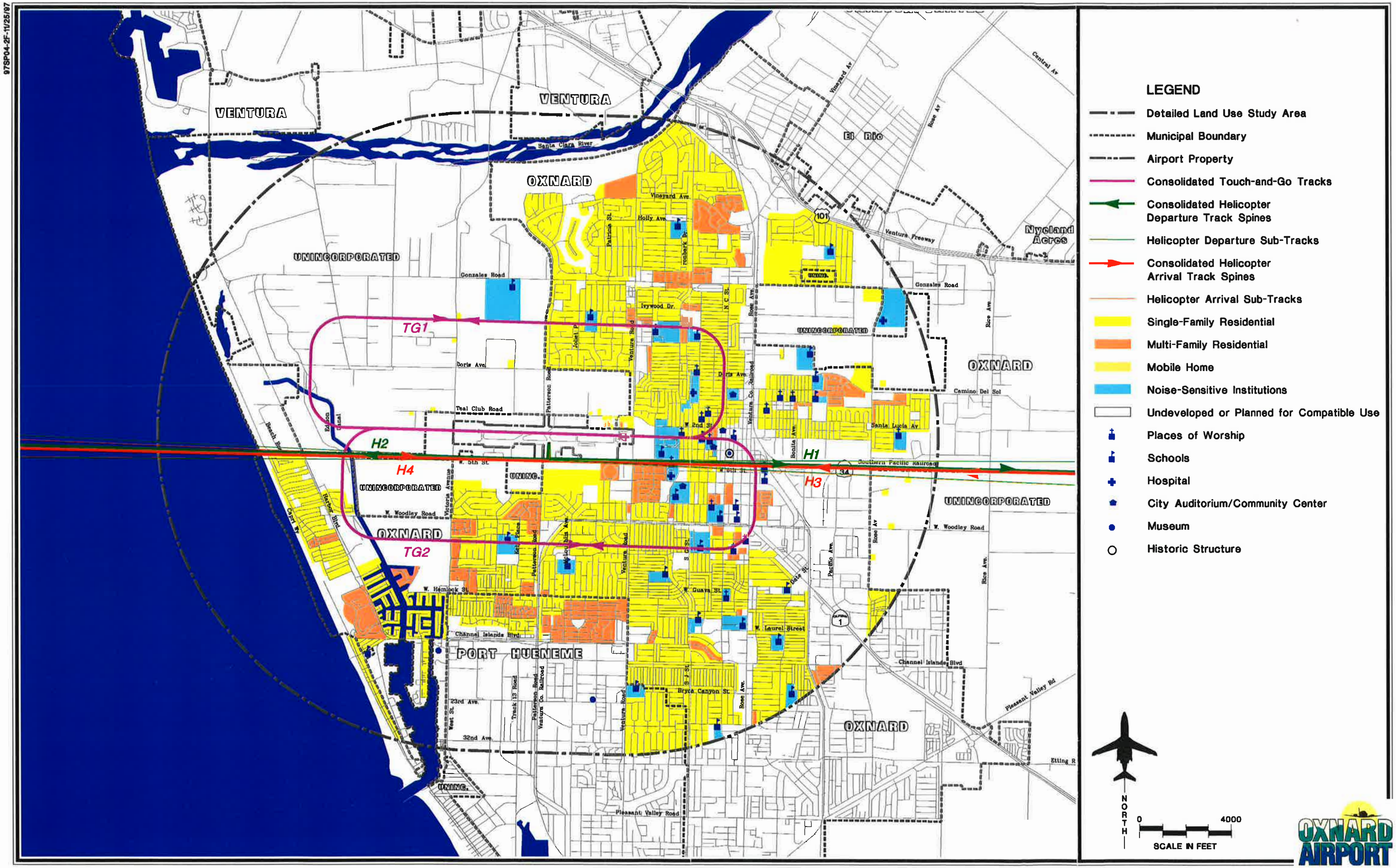

Exhibit 2F
HELICOPTER AND TOUCH-AND-GO TRACKS

1998 NOISE EXPOSURE CONTOURS

Exhibit 2G presents the plotted results of the INM contour analysis for 1998 conditions using input data described in the preceding pages. The surface areas within each contour are presented in **Table 2D**.

The overall shape of the noise pattern around the airport reflects the more common traffic patterns west of the airport. The contours are longer and wider to the west reflecting the higher runway use in this direction. A small node in the 65 and 70 CNEL noise contours is present to the south reflecting the helicopter activity.

To the east, the 60 CNEL contour extends just over 3,500 feet and approximately 4,300 feet west of the airport. The 60 CNEL contour bows out along 5th Street due to the helicopter activity.

The 65 CNEL noise contour has a similar shape to the west, however, the 65 CNEL contour does not extend to the east like the 60 CNEL contour. The 65 CNEL contour is heart shaped to the east due to the departure engine spool-up noise from the aircraft. To the east, this contour extends about 500 feet from the runway and 1,700 feet to the south. A small node on the 65 CNEL contour extends south due to the helicopter activity.

The 70 and 75 CNEL noise contours remain close to the runway and are elongated about the runway centerline. These contours are mostly on airport property. A small island of 70 CNEL is created south of the airport due to helicopter activity.

2003 NOISE EXPOSURE CONTOURS

The 2003 noise contours represent the estimated noise conditions based on the forecasts of future operations without any changes in operational procedures. This analysis provides a near-future baseline that can subsequently be used to judge the effectiveness of proposed noise abatement procedures. **Exhibit 2H** presents the plotted results of the INM contour analysis for 2003 conditions using input data described in the preceding pages.

Generally the 2003 noise contours are similar in shape to their 1998 counterparts. This is due to the use of similar modeling input assumptions for the consistency of the baseline case. The contours are slightly larger than the 1998 contours due to the forecast increase in operations.

The surface areas of the 2003 noise exposure are presented for comparison in **Table 2D**.

2018 NOISE EXPOSURE CONTOURS

The 2018 noise contours represent the estimated noise conditions based on the forecasts of future operations without any changes in operational procedures. This analysis provides a long-term baseline that can subsequently be used to judge the effectiveness of proposed noise abatement procedures. **Exhibit 2J** presents the plotted results of the INM contour analysis for 2018 conditions using input data described in the preceding pages.

TABLE 2D
Comparative Areas of Noise Exposure
Oxnard Airport

	Area in Square Miles		
CNEL Contour	**1998**	**2003**	**2018**
60	0.89	1.09	1.06
65	0.38	0.47	0.44
70	0.18	0.22	0.19
75	0.09	0.11	0.08

The 2018 noise contours are also similar in shape to their 1998 and 2003 counterparts. Similar modeling input assumptions are also used in development of the 2018 noise contours for the consistency with the baseline case. The contours are slightly larger than the 1998 contours due to the forecast increase in operations. However, the 2018 noise contours are smaller than the 2003 noise contours. This is due the retirement of older Stage 2 business jets from the fleet by the year 2018.

The surface areas of the 2018 noise exposure are presented for comparison in **Table 2D**.

SUMMARY

The information presented in this chapter defines the noise patterns for current and future aircraft activity, without additional abatement measures, at Oxnard Airport.

The current contours are based on an average day's activity for the 1996-97 operational year and are presented as the 1998 noise exposure contours. The five-year noise exposure level around the airport can be expected to increase slightly as the airport becomes busier in the future.

It is stressed that CNEL 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.

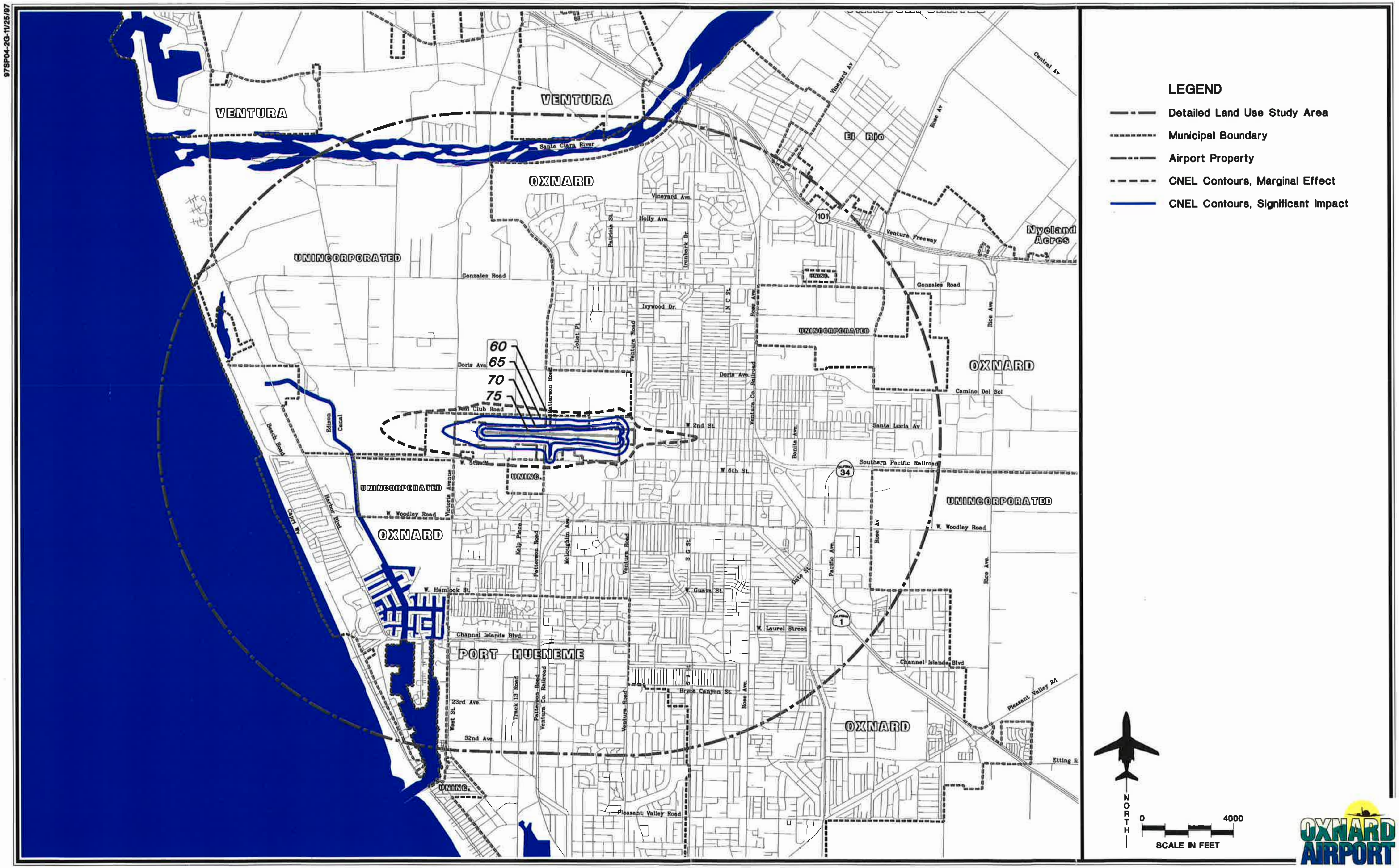

Exhibit 2G
1998 NOISE EXPOSURE

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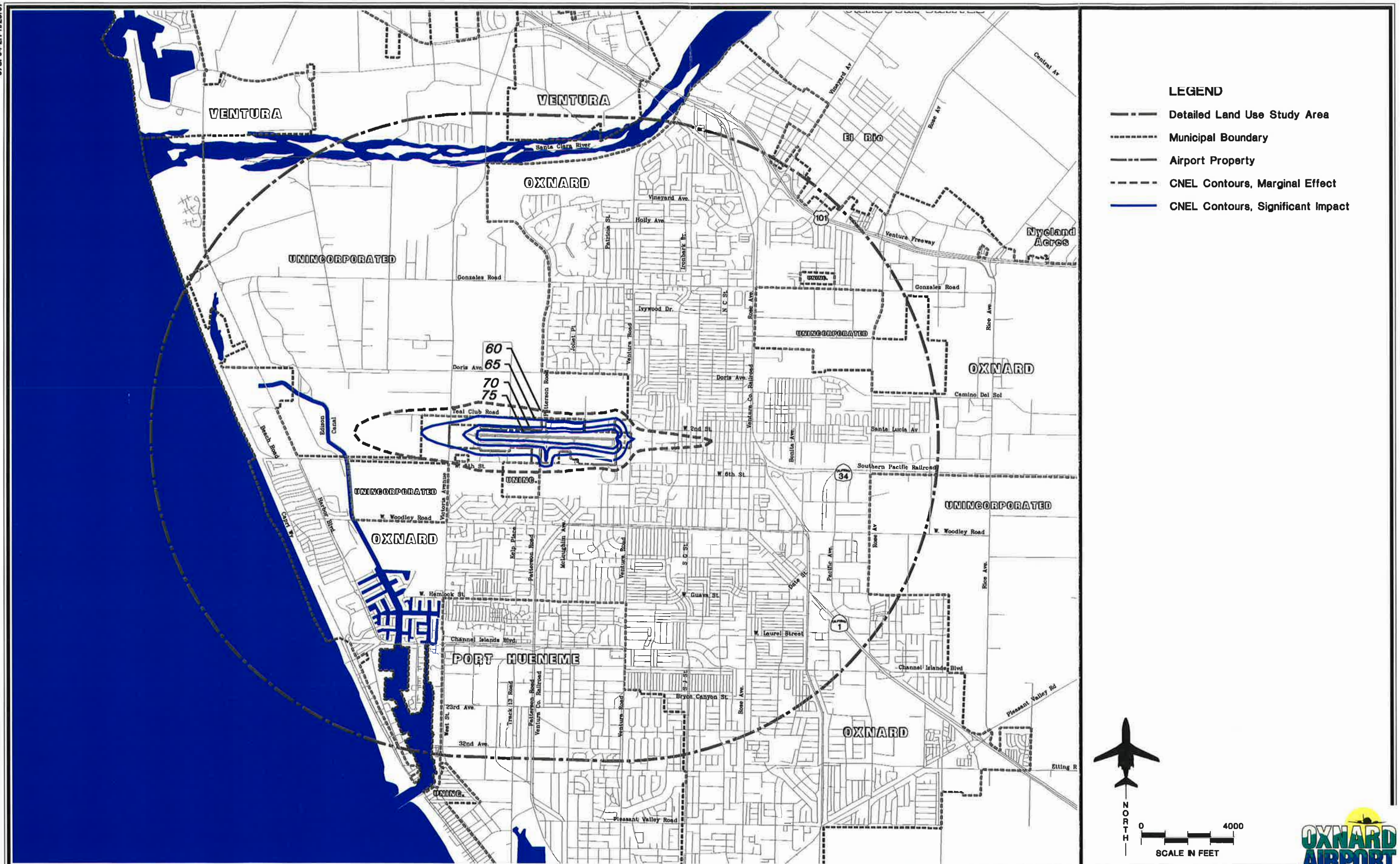

OXNARD AIRPORT

Exhibit 2H
2003 NOISE EXPOSURE

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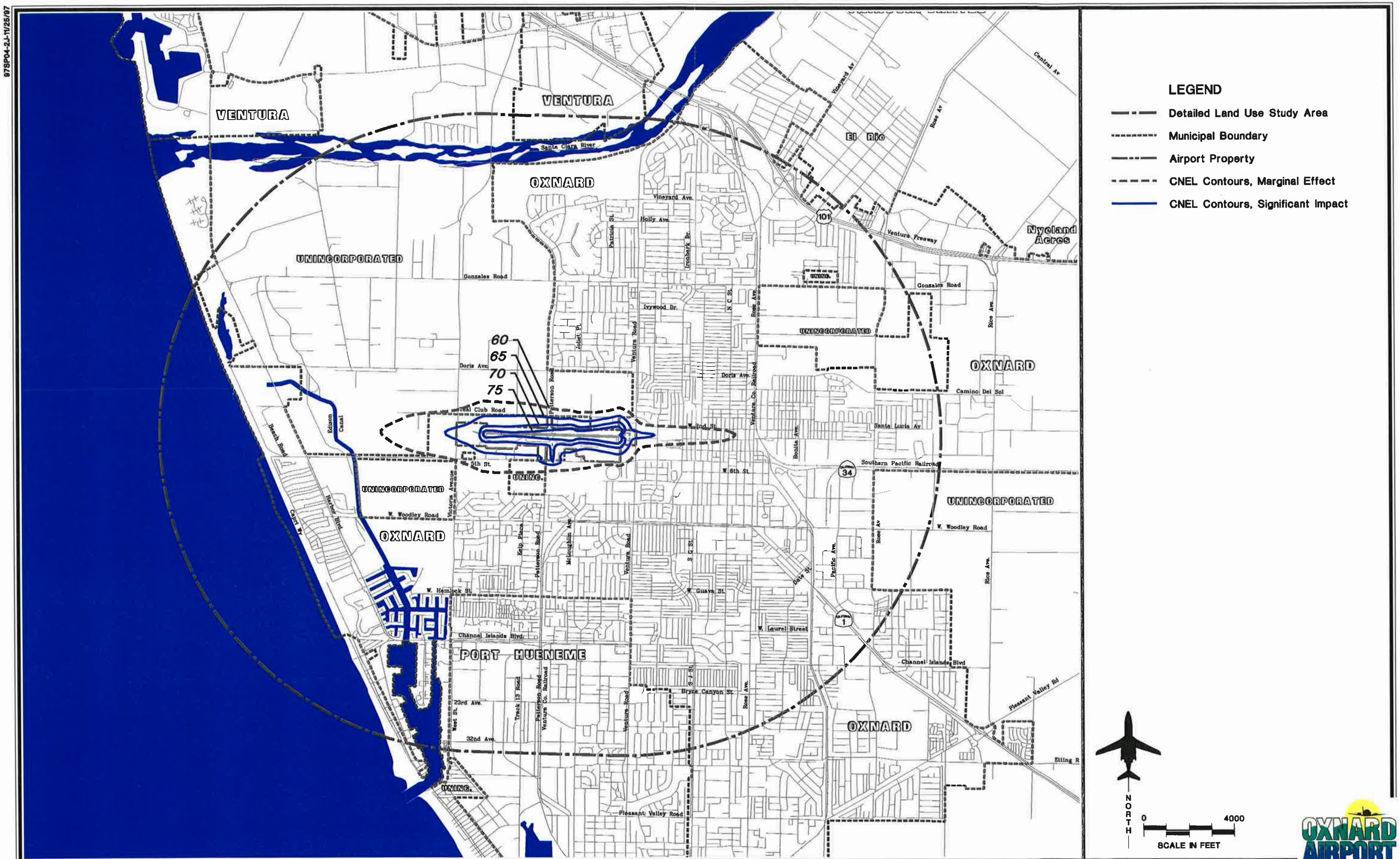

Exhibit 2J
2018 NOISE EXPOSURE

Chapter Three

NOISE IMPACTS

The impacts of aircraft noise on existing and future land use and population are examined in this chapter. 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. For more detailed information on the effects of noise exposure, refer to the Technical Information Paper (T.I.P.), "Effects of Noise Exposure," behind the last tab in this workbook.

This chapter deals with the following topics:

- Land Use Compatibility
- Current Noise Impacts
- Future Noise Impacts

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. The FAA has established guidelines for defining land use compatibility for use in Federal Aviation Regulation (F.A.R.) Part 150 studies.

F.A.R. PART 150 GUIDELINES

The FAA adopted land use compatibility guidelines when it promulgated F.A.R. Part 150 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.) These were based on earlier studies and guidelines developed by federal agencies (FICUN 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 F.A.R. Part 150). **Exhibit 3A** lists the F.A.R. Part 150 land use compatibility guidelines.

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 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 Airport Improvement Program (AIP) Handbook, "Noise compatibility projects usually must be located in areas where noise measured in day-night average sound level (DNL) is 65 decibels (dB) or greater" (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 noise levels and the FAA has explicitly concurred with that determination.

The FAA guidelines in **Exhibit 3A** show that residential development is incompatible with noise above 65 DNL. Schools and other public use facilities are generally incompatible with noise between DNL 65 and DNL 75, but the guidelines note that, where local communities determine that these uses are permissible, sound insulation measures should be used.

Nature exhibits and zoos are considered incompatible at levels exceeding 70 DNL. Several other uses including hospitals, nursing homes, churches, auditoriums, concert halls, livestock breeding, amusements, resorts, and camps are considered incompatible at levels above 75 DNL.

97SP04-3A-11/19/97

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 responsbility 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 3A
F.A.R. PART 150
LAND USE COMPATIBILITY GUIDELINES

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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.*

OXNARD AIRPORT

Many 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, churches, auditoriums, and concert halls.

STATE OF CALIFORNIA LAND USE COMPATIBILITY STANDARDS

In California, the CNEL (community noise equivalent level) metric is used instead of the DNL metric. The two are actually very similar. DNL accumulates the total noise occurring during a 24-hour period, with a 10 decibel weight 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 4.8 decibel weight 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 decibels difference (Metropolitan Transportation Commission 1983, p. 37).

California law sets the standard for the acceptable level of aircraft noise for persons residing near airports as 65 CNEL (California Code of Regulations, Title 21, Chapter 2.5, Subchapter 6, Sections 5000 et seq.). Four types of land uses are defined as incompatible with noise above 65 CNEL: residences, schools, hospitals and convalescent 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." (California Code of Regulations, Title 24, Part 2, Appendix Chapter 35.)

LOCAL LAND USE COMPATIBILITY GUIDELINES

The Noise Element of the Oxnard General Plan includes a policy stating that the "City shall prohibit the development of noise-sensitive land uses within the . . . 65 dB(A) CNEL contour." (City of Oxnard 1990, p. IX-17).

The *Ventura County Airports Comprehensive Land Use Plan* declares that housing is an unacceptable land use within the 65 CNEL noise contour (P&D Aviation 1991, Table 1-1 after p. 7). Mobile home parks and outdoor amphitheaters are unacceptable between 60 and 65 CNEL. Single and multi-family residential and noise-sensitive institutions are considered conditionally compatible. An acoustical analysis of noise reduction requirements is necessary.

For this Part 150 Noise Compatibility Study, the FAA's land use compatibility guidelines will be used as the basis for making determinations about land use compatibility in the airport area. These guidelines recognize that significant noise impacts begin at CNEL levels above 65 decibels. They are in general agreement with State and local noise compatibility policies.

Additional attention will be paid to noise between 60 and 65 CNEL. Experience in the local area and elsewhere in the country indicates that aircraft noise between 60 and 65 DNL is often a concern in quiet rural and suburban neighborhoods. In recognition of the local concern with noise between 60 and 65 CNEL, as expressed in official policy documents, noise between 60 and 65 DNL is considered to be of marginal impact on the following noise-sensitive land uses:

1. Residential, including mobile home parks;
2. Schools, hospitals, nursing homes;
3. Churches, auditoriums, and concert halls; and
4. Outdoor music shells, amphitheaters.

In describing noise between 60 and 65 DNL as causing a "marginal impact", it is recognized that it is less intrusive than noise above 65 DNL. Nevertheless, it is loud enough to cause concerns among many airport area residents. This is discussed in more detail in the T.I.P. on "Noise and Land Use Compatibility Guidelines" in the Appendices.

Above 65 DNL, the following uses, in addition to those above, are considered significantly impacted and non-compatible:

1. Hospitals and nursing homes;
2. Churches, auditoriums, and concert halls; and
3. Resorts and camps.

Transient lodgings are considered compatible with noise between 65 and 75 DNL, provided that sound insulation is installed to achieve a noise level reduction of 25 to 30 dB.

CURRENT NOISE IMPACTS

LAND USE IMPACTS

Exhibit 3B, 1998 Aviation Noise and Land Use, shows the location of noise-sensitive land uses and the 1998 noise contours at Oxnard Airport. Noise-sensitive land uses shown on the exhibit are based on the FAA's land use compatibility guidelines presented in **Exhibit 3A**.

The 60 CNEL contour extends approximately 4,000 feet off the west end of the runway and 3,500 feet off the east end. At its widest point, the west end of the runway, the contour is 2,800 feet wide. The contour is 2,500 feet wide at the east end of the runway. The shape of the contour reflects the predominance of departures to the west and arrivals from the east. The wide contour on the west side is characteristic of a noise contour dominated by departure noise. The

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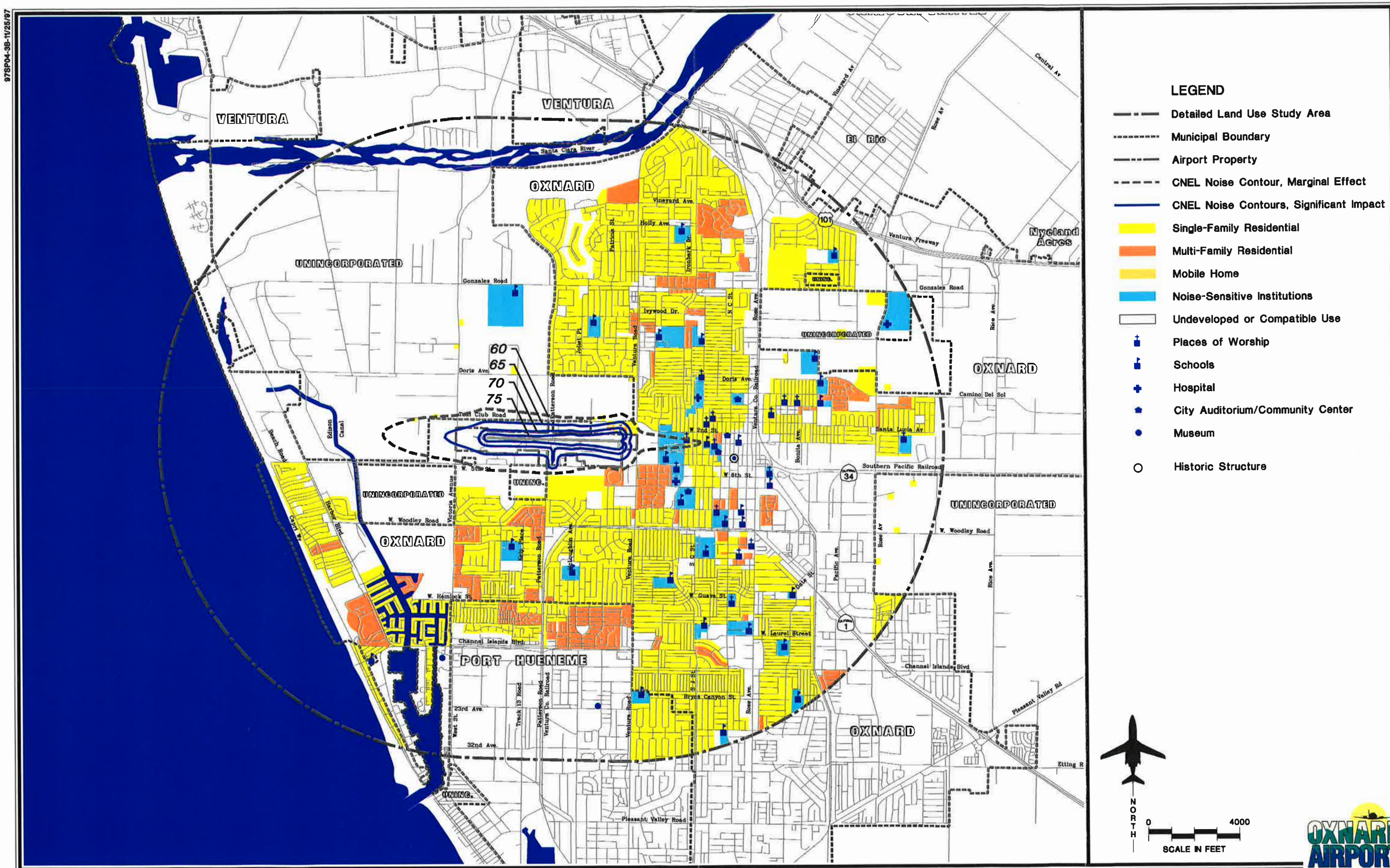

Exhibit 3B
1998 AIRCRAFT NOISE AND LAND USE

narrow contour to the east reflects the dominance of aircraft arrivals from that direction.

Two homes on Teal Club Road, west of the airport, are exposed to noise above 60 CNEL. On the east side, several homes between Teal Club Road and the airport are exposed to noise between 60 and 65 CNEL. Along the extended runway centerline, several other homes are within the 60 CNEL range.

The 65 CNEL contour extends 1,800 feet off the west end of the runway and just beyond the airport property line. The contour runs just south of and parallel to Teal Club Road on the north. The contour is widest at the east end of the runway where it is 1,800 feet wide. The shape of the contour on the east end reflects the dominance of takeoff noise from Runway 25 departures caused by the initial application of takeoff thrust. The only noise-sensitive land uses impacted by noise above 65 CNEL are south of Teal Club Road and immediately north of the east end of the runway. Eleven homes and two duplexes in this area are exposed to noise between 65 and 70 CNEL.

The 70 CNEL contour is almost completely contained on airport property. It extends beyond airport property at the east end of the runway where it impacts one single-family home, one duplex, and one four-unit apartment building.

The 75 CNEL contour lies very close to the runway and does not leave airport property.

Table 3A summarizes noise-sensitive land uses impacted by airport noise in 1998.

TABLE 3A
Noise-Sensitive Land Uses Impacted by Airport Noise, 1998
Oxnard Airport

	60-65 CNEL	65-70 CNEL	70-75 CNEL	75+ CNEL	Total
Residential					
Single-family Dwellings	21	11	1	0	33
Mobile Homes	0	0	0	0	0
Multi-family Dwellings	0	4	6	0	10
Total Dwelling Units	21	15	7	0	43
Noise Sensitive Institutions					
Churches	0	0	0	0	0
Schools	0	0	0	0	0

Source: Coffman Associates analysis.

POPULATION IMPACTS

In assessing community noise impacts, the number of people impacted and the level of noise impacting them 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 provides an estimate of the number of persons who are annoyed by noise at their residences.

The methodology assumes that increasing proportions of people are annoyed as noise increases. In the 60-65 CNEL range, it is assumed that 20.5 percent of people are annoyed by noise. In the 65-70 CNEL range, 37.6 percent are annoyed; in the 70-75 CNEL range, 64.4 percent; and above 75 DNL, 100 percent. A detailed description of this methodology and its empirical foundation is in the Technical Information Paper, "Measuring the Impact of Noise on People," behind the last tab in this workbook.

Table 3B shows the population, expressed in both absolute numbers and LWP, impacted by 1998 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 (3.58) for the City of Oxnard according to the 1990 Census.

TABLE 3B
Population Impacted by Noise, 1998
Oxnard Airport

CNEL Contour Range	Population
60-65	75
65-70	54
70-75	25
75+	0
Total	154
LWP[1]	52
Total Above 65 CNEL	79
LWP[1] Above 65 CNEL	36

[1] 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 CNEL contour range by the appropriate LWP response factor: 60-65 CNEL = .205; 65-70 CNEL = .376; 70-75 CNEL = .644; 75+ CNEL = 1.000. See the Technical Information Paper, "Measuring the Impact of Noise on People."

Source: Coffman Associates analysis.

The noise impacts on population parallel the pattern observed for land use impacts. A total of 154 people are exposed to noise above 60 CNEL. This equates to a level-weighted population of 52. (This is an estimate of the number of people expected to be annoyed by the noise.) Seventy-five people are between the 60 and 65 CNEL contours, 54 between 65 and 70 CNEL, and 25 between 70 and 75 CNEL.

FUTURE NOISE IMPACTS

2003 LAND USE AND POPULATION IMPACTS

Exhibit 3C shows the noise projected at Oxnard Airport for the year 2003. Existing noise-sensitive land uses are shown on the exhibit as are areas designated in the General Plan for future residential development. The noise contours for the year 2003 are similar in shape to the 1998 contours but are slightly larger. This is because of the projected increase in operations during the period.

The 60 CNEL contour extends about one statute mile beyond the west end of the runway. It extends about 4,300 feet east of the opposite end of the runway. The contour is 3,000 feet wide at the west end of the runway and 2,800 feet wide at the east end. **Table 3C** shows that 41 single family homes and two churches are in the 60 to 65 CNEL range. No areas of future residential development lie within the 60 CNEL contour.

The 65 CNEL contour extends 1,700 feet west of the runway end and only 700 feet east of the runway. North of the airport, the contour runs along Teal Club Road. Twelve homes are exposed to noise in the 65 to 70 CNEL range.

The 70 CNEL contour lies beyond the airport property only on the north side of the airport. Three homes and 10 multi-family units are impacted by noise between 70 and 75 CNEL.

The 75 CNEL contour is almost completely contained on airport property, although it extends a small distance off the property just north of the east end of the runway. No noise-sensitive land uses are exposed to noise above 75 CNEL.

The population exposed to projected noise in the year 2003 is shown in **Table 3D**. A total of 236 people are projected to be exposed to noise above 60 CNEL in 2003. This includes 147 in the 60 to 65 CNEL range, 43 in the 65 to 70 CNEL range, and 47 in the 70 to 75 CNEL range. The level-weighted population, an estimate of the number of people who actually will be annoyed by the noise, is estimated at 76.

2018 LAND USE AND POPULATION IMPACTS

Exhibit 3D shows the noise projected at Oxnard Airport for the year 2018. It also shows existing and potential future areas of noise-sensitive land uses. The 2018 noise contours are generally similar to the contours for 1998 and 2003, although some differences are apparent. The 2018 contours are wider than the other sets and are larger east of the airport.

TABLE 3C
Noise-Sensitive Land Uses Impacted by Future Aircraft Noise
Oxnard Airport

Land Use	CNEL Contour Range 60-65	65-70	70-75	+75	Total
2003					
Existing Residential					
Single-family Dwellings	41	12	3	0	56
Multi-family Dwellings	0	0	10	0	10
Total Existing Residential	41	12	13	0	66
Existing Noise Sensitive Institutions					
Church	2	0	0	0	2
Community Center	0	0	0	0	0
School	0	0	0	0	0
2018					
Existing Residential					
Single-family Dwellings	63	12	3	0	78
Multi-family Dwellings	24	0	10	0	34
Total Existing Residential	87	12	13	0	112
Existing Noise Sensitive Institutions					
Church	2	0	0	0	2
Community Center	1	0	0	0	1
School	1	0	0	0	1

Source: Coffman Associates analysis.

The 60 CNEL contour extends about 4,500 feet beyond the west end of the runway, about 700 feet less than the 60 CNEL contour for the year 2003. It extends 5,000 feet east of the opposite runway end, about 700 feet further than the 2003 noise contour. The 60 CNEL contour is roughly the same width in 2018 as it was in 2003. It is 3,300 feet wide at the west end of the runway and 2,800 feet wide at the east end.

These uneven changes in the size and shape of the noise contours from 2003 to 2018 are caused by a combination of two factors. First, the forecasts assume no Stage 2 jets will be operating at Oxnard in the year 2018. They will be replaced by Stage 3 jets which are much quieter on takeoff. Even though the number of jet operations is projected to increase, the total amount of departure noise will lessen because of the fleet transition. This accounts for the shorter noise contour west of the airport. (The noise contour on the west side is driven by departure noise.)

The second important factor is the projected increase in total operations at the airport. Even with the transition to quieter Stage 3 jets, the size of the noise contour east of the airport increases. This is because the difference between

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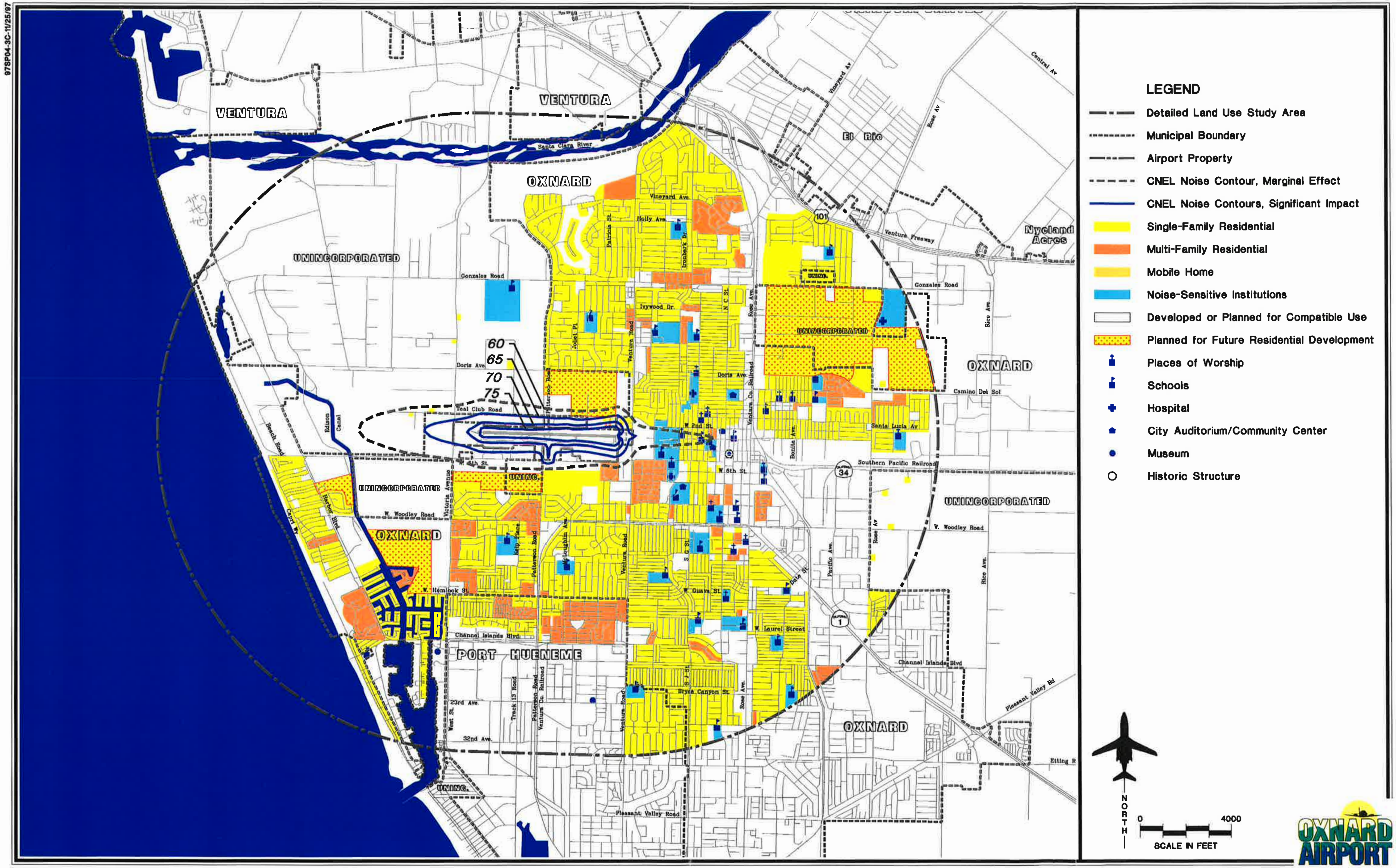

Exhibit 3C
2003 AIRCRAFT NOISE AND LAND USE

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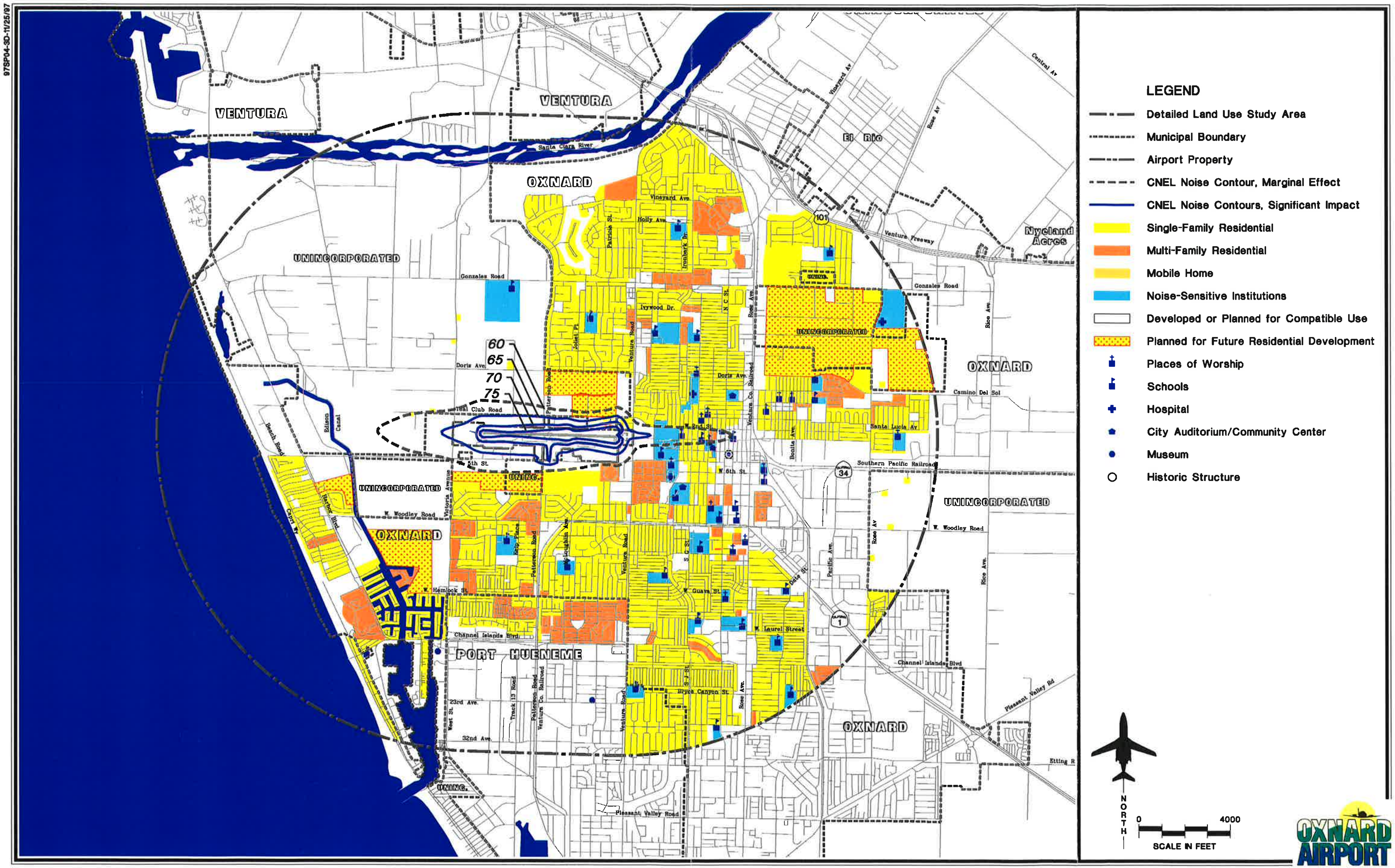


Exhibit 3D
2018 AIRCRAFT NOISE AND LAND USE

TABLE 3D
Population Impacted by Projected Future Noise
Oxnard Airport

CNEL Contour Range	Population 2003	Population 2018
60-65	147	311
65-70	43	43
70-75	47	47
75+	0	0
Total	236	401
LWP[1]	76	110
Total Above 65 CNEL	90	90
LWP[1] Above 65 CNEL	46	46

[1] 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 CNEL contour range by the appropriate LWP response factor: 60-65 CNEL = .205; 65-70 CNEL = .376; 70-75 CNEL = .644; 75+ CNEL = 1.000. See the Technical Information Paper, "Measuring the Impact of Noise on People."

Source: Coffman Associates analysis.

Stage 2 and Stage 3 approach noise is not nearly as great as the difference in departure noise. The effect of the quieter Stage 3 jets on the east side is overcome by the projected increase in aircraft operations, so the contour becomes larger.

Sixty-three homes, 24 multi-family dwelling units, two churches, one community center, and one school are exposed to noise between 60 and 65 CNEL. Most of these are east of the airport directly beneath the final approach to Runway 25. No areas designated for future residential development lie within the 60 CNEL contour.

The 65 CNEL contour extends about 1,700 feet west of the runway end and 1,500 feet east of the runway. North of the airport, the contour runs along Teal Club Road. Twelve single-family homes are in the 65 to 70 CNEL range.

As in the 2003 case, the 70 CNEL contour lies beyond the airport property only on the north side of the airport. Three single-family homes and ten multi-family units are within the 70 to 75 CNEL contour range.

The 75 CNEL contour is completely contained on airport property.

The population exposed to projected noise in the year 2018 is shown in **Table 3D**. A total of 401 people are exposed to noise above 60 CNEL. This includes 311 between 60 and 65 CNEL, 43 between 65 and 70 CNEL, and 47 between 70 and 75 CNEL. The level-weighted population, an estimate of the number of people who actually will be annoyed by the noise, is 110.

SUMMARY

This chapter has analyzed the impacts of existing and projected future aircraft noise on noise-sensitive land use and population in the vicinity of Oxnard Airport. The population exposed to noise is projected to increase in the future as noise increases due to the projected increase in operations at the airport. The gradual retirement of Stage 2 business jets through the planning period will help ameliorate this effect to a degree.

One question raised by the noise impact analysis is what can be done to mitigate the impact of aircraft noise on existing homes north of the east end of the runway. While that is the only area of incompatible land use expected to be impacted by noise above 65 CNEL, consideration also must be given to areas east of the airport exposed to noise above 60 CNEL. The projected increase in the width of the noise contours also may have implications for future land use planning north and south of the airport. These issues will be considered in the next phase of the study -- the analysis of noise abatement and land use management alternatives.

References

City of Oxnard, 1990. *City of Oxnard 2020 General Plan.* Adopted by City Council Resolutions 10050 and 10052, October 7 and 14, 1990.

Federal Interagency Committee on Urban Noise (FICUN) 1980. *Guidelines for Considering Noise in Land Use Planning and Control.*

Federal Interagency Committee on Noise (FICON), 1992. *Federal Agency Review of Selected Airport Noise Analysis Issues.*

Metropolitan Transportation Commission 1983. *Airport Land Use Planning Handbook: A Reference and Guide for Local Agencies.* Prepared for California Department of Transportation, Division of Aeronautics by the Metropolitan Transportation Commission and the Association of Bay Area Governments. July 1983.

P&D Aviation, 1991. *Airports Comprehensive Land Use Plan Update for Ventura County*. Prepared for the Ventura County Airport Land Use Commission and the Ventura County Transportation Commission. Adopted November 1, 1991.

Chapter Four

NOISE ABATEMENT ALTERNATIVES

The DOT/FAA Aviation Noise Abatement Policy of 1976, the Airport Safety and Noise Abatement Act of 1979, and the Airport Noise and Capacity Act of 1990 have outlined the framework needed to assure a coordinated approach to tackling the difficult task of noise abatement and mitigation of noise impacts. Responsibilities are shared among the airport users, aircraft manufacturers, airport proprietors, federal, state, and local governments, and residents of communities near the airport. The following is a brief synopsis of each participant's unique role and responsibility in this effort.

- The federal government has the authority and responsibility to control aircraft noise sources, implement and enforce flight operational procedures, and manage the air traffic control system in ways that minimize noise impacts on populated areas.

- The aircraft manufacturers have the responsibility for incorporating quiet engine technology into the new aircraft designs in order to meet federal noise standards.

- Airport proprietors are responsible for planning and implementing airport development actions designed to reduce noise. Such actions include improvements in airport design and noise abatement ground procedures, in addition to evaluating and recommending restrictions on airport use that do not unjustly discriminate against any user, impede the federal interest in safety and management of the air navigation system, or

unreasonably interfere with interstate commerce.

- Local government and planning agencies have the responsibility for providing land use planning, zoning, and housing regulation that will encourage development or redevelopment of land that is compatible with present and projected airport operations.

- General aviation operators have the responsibility to use proper aircraft maintenance and good neighbor flying techniques to minimize their noise output.

- Air travelers and shippers generally should bear the cost of noise reduction, consistent with established federal economic and environmental policy which states that the adverse environmental consequences of a service or product should be reflected in its price.

- Residents and prospective residents in areas surrounding airports should seek to understand the aircraft noise problem and what steps can and cannot be taken to minimize its effect on people. Prospective residents of areas impacted by aircraft noise should be aware of the effect of noise on their quality of life and make their locational decisions with that in mind.

The development of a noise abatement program has three primary objectives:

1. To reduce the noise in the study area, within practical cost constraints.

2. To minimize, where practical, the exposure of the local population to noise events of very high levels. These high levels, which are often manifested by single event noise levels outside of the CNEL contours, can be an annoyance to airport neighbors and warrant attention.

3. To insure maximum compatibility of existing and future land uses with noise generated by aircraft using the airport.

If the level of aircraft noise impacts in the airport vicinity is to be reduced, good-faith efforts are required from all responsible parties including airport and aviation system managers, owners and operators of aircraft, and land use regulatory agencies. While Chapter Five reviews the alternative measures that the land use regulatory agencies should consider, this chapter is concerned with measures that would alter the use or configuration of air space, flight tracks, and airport facilities to reduce or shift the location of noise. These potential measures are listed in **Exhibit 4A**.

The techniques tend to produce one of two general effects. They either reduce the overall size of the noise contours, or they move the noise to other areas.

97SP04-4A-4/2/98

RUNWAY USE AND FLIGHT ROUTES

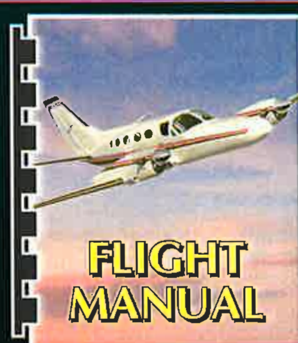
- Noise - Compatible Corridors
- Departure Turns
- Visual Final Approaches
- Preferential Runway Use
- Nighttime Preferences

FACILITIES DEVELOPMENT

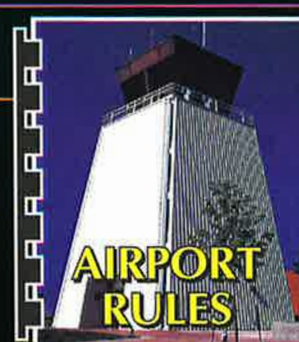
- Runway Lengthening
- New Runways
- Displaced / Relocated Thresholds
- High Speed Exits
- Terminal Relocation
- Ground Activity Relocation
- Acoustical Shielding
- Navigational Aids

AIRCRAFT OPERATING PROCEDURES

- Reduced Thrust Takeoffs
- Thrust Cutback Departures
- Maximum Climb Departures
- Minimum Approach Altitude
- Approach Flap Adjustments
- Two-Stage Descents
- Raised Glide Slope Angle
- Limited Reverse Thrust



AIRPORT RESTRICTIONS & REGULATIONS



- Nighttime Curfews
- Aircraft Type Restrictions Based On Noise Level
- Capacity Limitations (Operational Cap or Noise Budget)
- Variable Landing Fees Based on Noise Level or Time of Day
- Ground Activity Restrictions
- Training Activity Restrictions

OXNARD AIRPORT

Exhibit 4A
POSSIBLE NOISE ABATEMENT TECHNIQUES

In order to reduce the overall noise levels around the airport it is necessary to reduce the total sound energy emitted by the aircraft activity at the airport. This can be accomplished through either the modification of aircraft operating procedures or the imposition of restrictions on the number or type of aircraft allowed to operate at the airport. These measures are often difficult to implement and enforce as they can erode aircraft operational safety margins or discriminate against certain operators and cause an undue burden on interstate commerce.

As a result, it is often more effective and less disruptive to try to move the noise to areas that either are compatible or contain a minimum of noise-sensitive areas. This opportunity is usually realized through runway use and flight routing techniques or airport facility development.

The subsequent sections of this chapter will review and evaluate a variety of potential noise abatement techniques. To judge the effectiveness and appropriateness of a particular technique, it is important to consider the magnitude of the noise impacts around the Oxnard Airport. The previous chapter of this study has evaluated the impact and effects of noise on population around the airport. Based on the current conditions, there are 154 persons exposed to noise of 60 CNEL or greater. Based on the forecast for 2003, there are 193 persons exposed to noise of 60 CNEL or greater. In 2018, 401 persons are expected to be exposed to noise. Impacts at the 65 CNEL level and higher are of special note because it is the impacts at this level that the FAA customarily uses to determine the acceptability of any proposed noise abatement measures. There are 79 people in the current year and 90 people in the 2003 65 CNEL contour. It should also be noted that the FAA only considers the current and five-year noise contours when evaluating noise abatement recommendations.

While the current noise exposure around Oxnard Airport indicates a need for concern and proper planning, it does not constitute a dramatic problem by most standards. The fact that there are 90 persons exposed to noise levels above 65 CNEL in five years should be considered when formulating expectations regarding the potential benefits of noise abatement techniques. Simply put, the smaller the problem, the smaller the potential benefit that a particular procedure will yield. Furthermore, the cost of the solution must be commensurate with the magnitude of the problem.

POTENTIAL NOISE ABATEMENT MEASURES

A variety of measures for noise abatement merit investigation and should be reviewed for possible application at Oxnard Airport. A preliminary review of a number of these measures was conducted during the Aviation Technical Conference held on January 7, 1998. This conference was a gathering of aviation professionals who are responsible for the administration, control, and operation of aircraft and facilities at and around Oxnard Airport.

During the conference, experts in air traffic control, airspace, safety, airports, noise, and aircraft piloting provided guidance on what is and is not technically feasible at Oxnard. The insights from this discussion have been incorporated into the subsequent alternatives analysis.

This discussion provides a comprehensive evaluation of all reasonable noise abatement techniques that deserve consideration. The extent to which these measures might apply at Oxnard depends on the probable noise reduction over developed or developing areas, the extent to which the measures would compromise safety margins and the ability of the airport to perform its intended function, and their apparent ability to be implemented considering the legal, political and financial climate of the area. If a measure fails to be viable for one of the above reasons, its inclusion in a final program at Oxnard would not be warranted.

All analyses of noise abatement alternatives are conducted for the year 2003 to provide a consistency of evaluation and a look at the worst case future conditions within the FAA's five-year planning scope for a Part 150 document.

Noise abatement measures considered in this study are procedures that have the potential to reduce the noise exposure of persons living in the airport environs. The evaluation of most of these alternatives is required under F.A.R. Part 150, even if they may have little utility for local application. These measures fall into four categories:

- Runway Use and Flight Routing
- Airport Regulations
- Aircraft Operating Procedures
- Airport Facilities Development

Measures in the first three categories generally may be implemented within a relatively short period of time, while those in the last category usually require a longer time to implement due to environmental assessment and construction activities.

RUNWAY USE AND FLIGHT ROUTING

The pattern of land use around the airport provides clues to the design of arrival and departure patterns for noise abatement. By redirecting air traffic over areas with more compatible land uses, noise effects may often be significantly reduced.

Runway Use Programs

FAA Order 8400.9 describes national safety and operational criteria for establishing runway use programs. It defines two classes of programs: informal and formal. A formal program must be defined and acknowledged in a Letter of Understanding between FAA's Flight Standards Division and Air Traffic Service, the airport proprietor, and the airport users. Once established, participation by aircraft operators is mandatory. Formal programs can be extremely difficult to establish, especially at airports with many different users.

An informal program is an approved runway use system that does not require the Letter of Understanding. Informal programs are typically implemented through a Tower Order and publication of the procedure in the *Airport/Facility Directory*. Participation in the program is voluntary.

There are two general types of runway use programs, rotational and preferential. Rotational runway use is intended to distribute aircraft noise equally off all runway ends. Preferential runway use programs are intended to direct as much aircraft noise as possible in one direction.

Oxnard Airport is bordered by extensive residential development to the north, south, and east. Additional residential development is proposed the north and west of the airport.

Current runway use patterns favor departures to the west approximately 90 percent of the time at Oxnard. This is mainly due to predominant winds coming from the ocean. For noise abatement, a western flow is desired because louder departure operation are sent to the west and away from residential development off the extended runway centerline to the east.

Conclusion. Oxnard currently operates to the west 90 percent of the time. This is the best operating configuration to promote noise abatement. Therefore, a special preferential runway use program is not needed.

Departure Turns

The turning of departing aircraft to avoid populated areas is an accepted method of noise abatement that has been implemented in numerous areas. At Oxnard, with the populated areas generally located to the north, south, and east, noise abatement departure turns away from the populated areas might be beneficial for noise reduction.

When considering noise abatement departure turns for Oxnard, recalling the existing noise abatement departure procedures is necessary. Aircraft departing Runway 25 are asked to remain on runway heading until beyond the departure end and 700 feet above ground level (AGL). Complaints have been generated by aircraft departing Runway 25 and turning south over a residential area southwest of the airport along the ocean. Airport staff have been working on a procedure that requests south bound aircraft departing Runway 25 to remain on runway heading until reaching the ocean.

The Runway 25 straight-out departure procedure was modeled in the Integrated Noise Model (INM) and the results are depicted on **Exhibit 4B**. As seen on Exhibit 4B, no visible change in the contours occurs. A subsequent grid point analysis was done and is summarized on **Table 4A**. The CNEL value was calculated at each grid point for the 2003 baseline and straight-out departure alternative. This cumulative noise metric considers the average annual daily operations over a 24-hour period with a 4.77 dB penalty for evening operations and 10 dB penalty for nighttime operations.

The noise level at grid point 6 near the area of concern decreased slightly from 53.9 CNEL to 53.0 CNEL. This procedure would cut down the number of overflights in this area and should be added to the noise abatement procedures and included in pilot education literature.

Noise abatement departure turns from Runway 7 are limited by the City of Oxnard to the north, south, and east of the airport. The current published noise abatement departure procedure from Runway 7 requests pilots to remain on runway heading until reaching the airport boundary (Ventura Road) before proceeding on course. Reenforcing this procedure with taxiway signage or a pilots guide outlining the procedure and noise sensitive land use should be considered.

TABLE 4A
Runway 25 Straight-out Departure
CNEL Grid Point Analysis
Oxnard Airport

Grid Point	2003 Baseline	Straight-out Departure
1	61.0	61.0
2	60.2	60.2
3	61.1	61.1
4	59.5	59.5
5	65.0	65.0
6	53.9	53.0

Source: Coffman Associates Analysis.

Conclusion. In addition to the established noise abatement procedures for VFR departures, the airport should consider requesting south bound aircraft fly runway heading until reaching the ocean north of the City when departing Runway 25. Additional reenforcement of current procedures, taxiway signage and pilot guides, should be used to educate pilots of VFR noise abatement departure procedures.

Visual Approach Procedures

Approaches involving turns relatively close to the airport can sometimes be defined over noise-compatible areas for use under VFR conditions. However, most aircraft typically require a stabilized approach of one to three miles. The greatest advantage to establishing visual approach procedures is to utilize a noise-compatible corridor when an airport is more or less surrounded by noise-sensitive uses.

Approximately 90 percent of the approaches to Oxnard Airport occur on Runway 25. Concentrated residential and other noise sensitive land uses east of the airport eliminate any potential noise abatement corridors. For noise abatement, aircraft on approach to Runway 25 are currently requested to remain as high as practical over Oxnard until commencing final descent.

Given the wide undeveloped area west of the airport, special noise abatement approaches for Runway 7 are not needed.

Conclusion. The airport has established a noise abatement procedure for VFR approaches to Runway 25. This procedure generally keeps VFR aircraft as high as practical over noise sensitive areas before final descent. Due to the existing land use pattern, addition VFR arrival procedures are not suggested.

Instrument Approach Procedures

Oxnard has one precision and two nonprecision approaches. Runway 25 has the only precision approach. It is straight-in with a 3-degree glide slope. Utilizing the Camarillo VOR/DME or the global positioning system (GPS), nonprecision approaches are available to both Runways 7 and 25. The VOR/GPS approach to Runway 7 is angled to the south due to the location of the VOR/DME at Camarillo Airport. The VOR/GPS approach to Runway 25 is angled to the north also due to the location of the VOR/DME at Camarillo Airport. The angle of the nonprecision approach causes aircraft to overfly residential areas off both runway ends.

The nonprecision approach to Runway 7 overflies a residential area south of the airport along the ocean. A stand alone straight-in GPS approach to Runway 7 is being flight tested by the Flight Standards division of the Federal Aviation Administration. If this straight-in GPS approach is feasible and safe, overflights of the residential areas southwest of the airport along the ocean could be reduced.

For modeling the straight-in approach to Runway 7, approximately 75 percent of the operations using the VOR/GPS approach were moved to the straight-in instrument approach. No visible change was in the alternative noise contours when compared to the baseline contours. However, a grid point analysis did show a 1 CNEL decrease at grid point 6 in the area of concern. **Table 4B** depicts the grid point analysis results. The grid point locations are depicted on **Exhibit 4B**.

Adjustments in the precision and nonprecision approaches to Runway 25 would move overflights from one noise-sensitive area to another.

TABLE 4B
Straight-in Instrument Approach to Runway 25
CNEL Grid Point Analysis
Oxnard Airport

Grid Point	2003 Baseline	Straight-in Instrument Approach
1	61.0	61.0
2	60.2	60.2
3	61.1	61.1
4	59.5	59.5
5	65.0	65.0
6	53.9	52.9

Source: Coffman Associates Analysis.

Conclusion. A straight-in approach may be possible using GPS technology to move instrument approaches further north and away from residential areas along the ocean. The benefits of a straight-in approach to Runway 7 from a noise abatement standpoint are extremely small.

Movement of the existing instrument approaches to Runway 25 is not recommended due to the location of navigational aids and noise-sensitive land uses.

Traffic Pattern Changes

The current traffic pattern altitude is 1,000 feet above field level (AFL) for single engine aircraft and 1,400 feet AFL for twin engine/ turbine engine aircraft. Pilots are requested to use the best rate of climb and turn on the crosswind leg when reaching the end of the runway and within 300 feet of the traffic pattern altitude.

Raising the pattern altitude results in a larger traffic pattern due to the increased distance needed to climb and descend from the designated altitude. The net result of raising the pattern altitude would be to extend the pattern over residential areas. Therefore increasing the pattern altitude is not suggested.

Currently the established traffic pattern for both runways is a standard left pattern. In a west flow on Runway 25, the pattern is on the south side of the airport. In an east flow on Runway 7 it is on the north side. Due to the noise-sensitive land use pattern around the airport, moving the current pattern to one side or the other would concentrate aircraft operations over one portion of the City. Changing the current traffic pattern location is not recommended.

FINAL DRAFT – NOT APPROVED BY BOS OR FAA

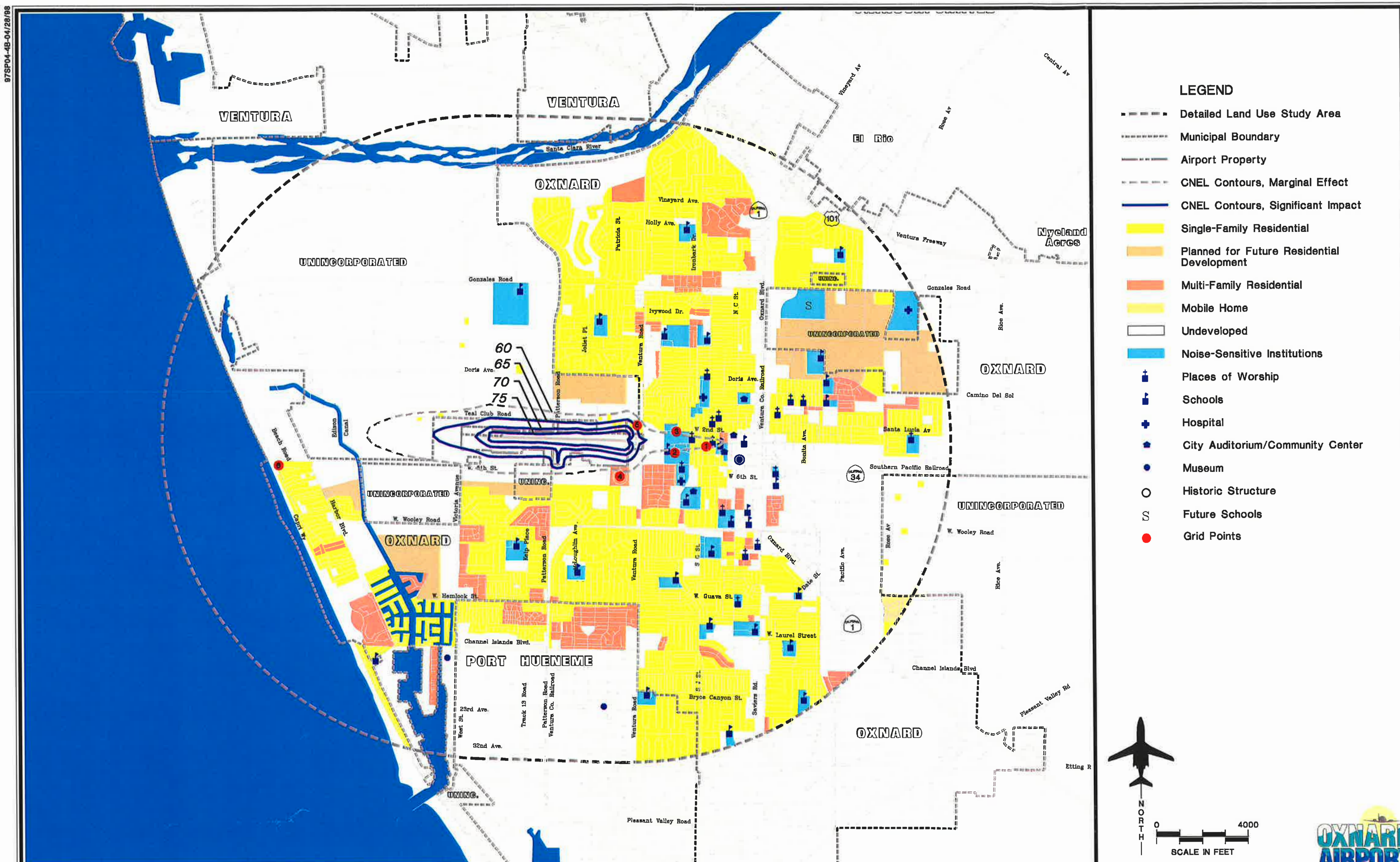


Exhibit 4B
2003 BASELINE AIRCRAFT NOISE EXPOSURE

Conclusion. The current traffic pattern altitude and location have been established to keep the aircraft operations as high as possible over noise-sensitive land uses, without extending the pattern more than necessary over noise-sensitive areas. Changes to the traffic pattern are not suggested.

AIRPORT REGULATIONS

The courts traditionally have recognized the right of airport proprietors to reduce their liability for aircraft noise by imposing restrictions that are reasonable, nondiscriminatory, and do not interfere with interstate commerce or violate a contractual agreement with the FAA made as a condition of receiving federal aid.

With the passage of the Airport Noise and Capacity Act of 1990, Congress not only established a national phase-out policy for large Stage 2 aircraft, but it also set forth the analytical requirements that must be met for an individual airport to establish noise or access restrictions on Stage 2 or Stage 3 aircraft beyond the national policy. Although the act does not require the phase-out of Stage 2 aircraft under 75,000 pounds, that occasionally utilize Oxnard Airport, it does specifically require special analysis for any measure that restricts these aircraft. The requirements are set forth in F.A.R. Part 161.

The actions required by F.A.R. Part 161 include the following:

- A technical analysis that evaluates costs and benefits of the proposed restriction, alternative restrictions, and alternative measures that do not include restrictions.
- Notice of the proposed restriction and opportunity for comment on the analysis.

While implementation of a Stage 2 aircraft operating restriction does not require FAA approval, the FAA does determine whether adequate analysis and notification have been conducted.

In order to establish a local restriction on Stage 3 aircraft, Part 161 requires a much more rigorous analysis as well as final FAA approval of the restriction. The conditions for approval of a Stage 3 restriction require that the analysis provide evidence of the following conditions:

- The restriction is reasonable, nonarbitrary, and nondiscriminatory.
- The restriction does not create an undue burden on interstate or foreign commerce.
- The restriction maintains safe and efficient use of navigable airspace.
- The restriction does not conflict with any existing federal statute or regulation.

- The restriction does not create an undue burden on the national aviation system.

These requirements clearly indicate that restrictions on either Stage 2 or Stage 3 aircraft are considered as methods of last resort for noise abatement. The analytical requirements alone ensure that all other noise abatement alternatives should be exhausted before pursuing these types of restrictions. Since virtually any regulatory alternative at Oxnard Airport would result in limiting either Stage 2 or Stage 3 aircraft access, it is certain that the requirements in Part 161 would have to be met.

The relationship of F.A.R. Part 150 to Part 161 deserves some explanation. Part 150 specifically requires that airport operators discuss the potential use of operating restrictions for noise abatement purposes in noise compatibility studies. If, through the Part 150 process, an airport operator decides to pursue an airport operating restriction, the proper procedure is to describe it as a proposed noise abatement measure, noting that a Part 161 study would have to be undertaken before the restriction could be implemented. The FAA will then review the final noise compatibility plan, which includes the proposed restriction. If the FAA decides that adequate documentation is provided to show that the proposed restriction has merit, it may approve the proposed restriction *for purposes of Part 150.* A Part 150 approval is not sufficient to implement the restriction. It merely represents the clearing of the first hurdle. Completion of a Part 161 study then becomes the next step.

The FAA has made it clear that the approval of an operating restriction in an F.A.R. Part 150 document would be predicated on the noise abatement benefit of the restriction at noise levels of 65 CNEL or higher. These benefits would have to be demonstrated for the current or five-year conditions that are officially required in the document. With 54 persons currently exposed to noise levels of 65 CNEL or higher, and 43 expected to be within the 65 CNEL noise contour in five years, operating restrictions are not likely to be approved by the FAA at Oxnard Airport.

Despite the extremely remote possibility that operating restrictions at Oxnard could be approved by the FAA, F.A.R. Part 150 requires that restrictions be discussed in noise compatibility studies. Types of operating restrictions include the following:

- Nighttime curfews.
- Landing fees based on noise or time of arrival.
- Airport capacity limitations based on relative noisiness.
- Restriction of aircraft based on F.A.R. Part 36 noise levels.
- Restrictions on engine run-ups.

- Restrictions on training activity.

Curfews

FAA Advisory Circular 150/5020-1 indicates that curfews may be an effective though potentially costly method of controlling airport noise. Since unwanted noise intrusions are most pronounced in the late evening or early morning hours, curfews are usually implemented to restrict operations during those periods.

Curfews are not without costs. They can have economic impacts upon airport users, upon those providing airport-related services, and upon the community as a whole.

A blanket prohibition on air traffic during the noise-sensitive hours can place undue constraints on users of the airport who are not major contributors to the noise contours. Not only would the loudest operations be prohibited, but operations by quiet aircraft also would be banned.

Conclusion. At Oxnard Airport, the low percentage of nighttime operations and very slight impacts in the critical 65 CNEL noise contour precludes any significant benefit from a curfew. Given the likelihood of FAA disapproval, curfews need not be considered further.

Landing Fees

The initiation of differential landing fees based on either the noise level or the time of arrival have been used at some airports as incentives to use quieter aircraft or to operate at less sensitive times. A variable schedule of landing fees would be established based on the relative loudness of the aircraft, with arrivals by loud aircraft at night being charged the most and arrivals by quiet aircraft during the day being charged the least. To avoid being discriminatory, the fee must relate to both the time of day and certificated approach noise levels of each aircraft. Fees from such a program can finance noise abatement activities. This restriction does not provide a noise abatement benefit unless the fees are high enough to actually discourage use of the airport by the loudest aircraft.

Conclusion. Oxnard Airport currently charges landing fees for aircraft weighing more than 12,500 pounds. Adding a noise-based landing fee would require a Part 161 analysis. Given the high cost of a Part 161 study and the small number of people within the 65 CNEL contour, development of a differential landing fee schedule does not warrant further consideration.

Capacity Limitations

Capacity limits based on either total operations or relative noisiness of aircraft have been used by severely impacted airports as a method of controlling the total cumulative noise exposure. Due to the unscheduled nature of most operations at Oxnard, the airport could not enforce a capacity limit to control noise.

Conclusion. Given the small number of people exposed to noise above 65 CNEL and the impracticality of enforcing capacity limits, they do not deserve further consideration at Oxnard.

Restrictions Based On F.A.R. Part 36

Outright restrictions on the use of aircraft exceeding certain noise levels can reduce cumulative noise exposure at an airport. Aircraft producing noise above certain thresholds, as defined in F.A.R. Part 36, could be prohibited from operating at the airport at all or certain times of the day. A variation is to impose a non-addition rule, prohibiting the addition of new flights by aircraft exceeding the threshold level at all or certain times of the day. These restrictions would be subject to the special analysis procedures of F.A.R. Part 161. Any restrictions affecting Stage 3 aircraft would have to receive FAA approval.

Noise limits based on F.A.R. Part 36 certification levels have the virtue of being fixed national standards understood by all in the industry. They are average values, however, and do not consider variations in noise levels based on different methods of operating the aircraft. As an alternative, restrictions could be based on measured noise levels at the airport. This has the advantage of focusing on noise produced in a given situation and, in theory, gives aircraft operators increased flexibility to comply with the restrictions by designing special approach and departure procedures to minimize noise. It has the disadvantage of requiring the installation of noise monitoring equipment and extra administrative effort to design testing procedures, monitor tests, interpret monitoring data, and design the restrictions.

Conclusion. Since the number of people exposed to noise above 65 CNEL is quite small, this restriction would produce negligible benefits recognized by the FAA. It does not merit further consideration.

Engine Run-up Restrictions

Engine run-ups are a necessary and critical part of aircraft operation and maintenance. Engine run-ups are often more annoying than aircraft overflight noise because they are more unpredictable and usually last longer than overflights.

Because there are no large maintenance facilities at Oxnard Airport, engine maintenance run-ups are limited to the general aviation fixed based operators. Currently an average of two maintenance run-ups occur per week at Oxnard Airport.

Pre-flight run-ups are a necessary part of checking the aircraft before takeoff. Pre-flight run-ups have not been a significant source of annoyance around the airport.

Conclusion. Maintenance run-up activity is not common at Oxnard and has not been a problem. Neither have pre-flight engine run-ups been cited as significant annoyances. Thus, restrictions on run-ups are not warranted.

Touch-and-Go Restrictions

Restrictions on touch-and-go or multiple approach operations can be effective in reducing noise when those operations are extremely noisy, unusually frequent, or occur at very noise-sensitive times of the day. At many airports, touch-and-goes are associated with primary pilot training, although this type of operation is also done by licensed pilots practicing approaches.

Touch-and-goes and multiple approaches are frequently done at Oxnard Airport. In 1998, there were 46,074 local general aviation operations (generally involving multiple approaches or touch-and-goes). The touch-and-go operations were done mainly by light, single-engine aircraft.

Touch-and-go operations are currently prohibited between 8:00 p.m. and 7:00 a.m. at Oxnard Airport. While a full prohibition on training operations would certainly ensure that this concern would be alleviated in the future, it would also seriously reduce the business and revenues generated at the airport. Also a prohibition of this nature would certainly have legal ramifications as it could put any flight schools or pilot training services that are currently at the airport out of business. This could easily be viewed as discriminatory.

Conclusion. As discussed in previous restrictions, the noise impact reductions in the 65 CNEL noise contour or higher would be the measure of acceptability for a touch-and-go restriction. Given the small number of people within the 65 CNEL contour and the burden of the additional Part 161 analysis that would be required, this restriction should not be considered further.

AIRCRAFT OPERATING PROCEDURES

Aircraft operating procedures that may reduce noise impacts may apply to either departures or arrivals. They include:

- Reduced thrust takeoffs.
- Thrust cutbacks after takeoff.

- Maximum climb departures.
- Minimum approach altitude.
- Use of minimum flaps during approaches.
- Steeper approach angles.
- Limits the use of reverse thrust during landings.

Reduced Thrust Takeoffs

Reduced thrust takeoffs involve the use of a reduced power setting throughout both takeoff roll and climb. Use of the procedure depends upon aircraft weight, weather and wind conditions, pavement conditions and available runway length. Since these conditions vary considerably, it is not possible to mandate safely the use of reduced thrust departures.

In fact, aircraft operators often use reduced thrust departures to conserve fuel, minimize engine wear, and abate noise when the safe use of the procedure is indicated. Additional efforts by airport management to encourage the use of deeper thrust reductions are unlikely to yield significant noise abatement benefits.

Requiring takeoff thrust settings to be reduced beyond the normal settings appropriate for the aircraft type, weight, temperature, etc., not only can erode safety margins but also tend to drag noise out further from the airport.

Conclusion. Because of the safety implications of these procedures, they are best left to the discretion of aircraft operators. An airport policy mandating the use of reduced thrust takeoffs is not considered an effective noise abatement measure for Oxnard Airport.

Thrust Cutbacks For Business Jets

As a service to the general aviation industry, the National Business Aircraft Association (NBAA) prepared a series of noise abatement takeoff and arrival procedures for its membership in 1967. This program has virtually become an industry standard for operators of business jet aircraft since that time. The departure procedures are of two types: the **standard departure procedure** and the **close-in departure procedure**. The selection of the applicable noise abatement departure procedure depends on the proximity of the nearest noise-sensitive area.

The NBAA standard departure procedure calls for a thrust cutback at 1,000 feet above ground level (AGL) and a 1,000 feet per minute climb to 3,000 feet altitude during acceleration and clean-up. The close-in procedure is similar but calls for a thrust cutback at 500 feet AGL. While both procedures are effective in reducing noise impacts on surrounding land uses, the locations of the reduction vary with each. The standard procedure will result in lower noise levels over down-range locations, while the close-in procedure will result in lower noise levels near the airport. Neither NBAA procedure is intended to supplant a procedure recommended by the manufacturer, when one is included in the aircraft operating manual.

An attempt by airport management to actively enforce a procedure of this nature requires some way of verifying its usage. In order to ensure the promised changes in noise exposure, a permanent system of noise and flight track data and profile acquisition is necessary. These systems typically cost from $500,000 to $1,000,000 and are also expensive to maintain. Additionally, a specialized staff is necessary to analyze and interpret the data, again, a substantial cost.

Conclusion. At Oxnard Airport, with few noise impacts within the 65 CNEL level and a relatively low level of business jet operations, aggressive promotion of these thrust cutback procedures is not necessary; however, the airport should encourage and remind pilots to use quiet flying procedures whenever possible.

Maximum Climb Departures

The use of maximum climb, or best angle, departure procedures can, in some cases, help reduce noise exposure over populated areas some distance from the airport. The procedure requires the use of maximum thrust with no cutback on departure. Consequently, the potential noise reductions in the outlying areas are at the expense of dramatic noise increases closer to the airport.

Airspace conflicts with NAWS Point Mugu are a concern when considering a maximum climb procedure. A maximum climb procedure from Runway 7 would conflict with NAWS Point Mugu arrivals from the north. A maximum climb departure from Runway 25 would be of no practical benefit.

This type of procedure can also be costly to aircraft operators. The use of maximum climb procedures can increase fuel usage and wear and tear on engines and equipment.

Conclusion. The negligible benefits of maximum climb departures at Oxnard Airport are coupled with the increased danger of airspace conflicts with aircraft approaching nearby airports. The procedure is not considered effective or safe and has been dropped from further consideration.

Minimum Approach Altitudes

A minimum approach altitude procedure would entail an ATC requirement that all positively-controlled aircraft approaches be conducted at a specified minimum altitude until the aircraft must begin its descent to land. Currently the pattern altitude at Oxnard Airport is 1,043 feet MSL for propeller aircraft and 1,443 feet MSL for jet aircraft. This translates to about 1,000 feet and 1,400 feet above field level (AFL) respectively. Minimum altitudes would apply to aircraft some distance from the airport and well outside the noise contour area. Increases in approach altitude can yield only small reductions in noise. It would require the doubling of the altitude of an aircraft in a downwind or circling approach to achieve a noise reduction of four to six decibels. Additionally, raising the pattern altitude would enlarge the pattern as departing aircraft have to extend their upwind and crosswind legs to achieve the pattern altitude as they turn on the downwind leg of the pattern.

Conclusion. Increased approach altitudes do not significantly reduce cumulative noise levels because takeoff noise normally dominates the situation. Thus, the measure is not considered further.

Noise Abatement Approach Procedures

Approach procedures to reduce noise impacts were attempted in the early days of noise abatement, but are no longer favorably received. The procedures include the minimal use of flaps in order to reduce power settings and airframe noise, two stage descent profiles, and increased approach slope.

Follow-up studies have found that these techniques cause concern for safety because they are nonstandard and require an aircraft to be operated outside of its optimal safe operating configurations. Furthermore, some of these procedures actually were found to increase noise because of power applications required to arrest high sink rates.

Increasing the approach angle or glide slope was considered for approaches to Runway 25 in the 1996 Airport Master Plan. However, the runway length available for landing (4,578 feet) on Runway 25 currently does not meet design requirements for business jet landings during wet or slippery conditions (Coffman Associates, 1996). The increase of an approach slope angle requires that the aircraft land with higher approach speeds. Higher approach speeds require more runway length for stopping. Because Runway 25 does not meet design requirements for business jets in certain conditions, increasing the approach slope is not prudent without increasing the current runway length available for landing.

Conclusion. Higher sink rates and faster speeds associated with steeper descent approaches can reduce pilot reaction time and erode safety margins. This is particularly a concern with the short runway available for landing on Runway 25. Approach slope increases should not be considered unless an adjustment to the available landing length is made to Runway 25. A small increase in the approach angle or glide slope for the Runway 25 approach could be considered if the landing threshold was also shifted to increase the available runway length for landing.

Reverse Thrust Restrictions

Thrust reversal is routinely used to slow jet aircraft immediately after touchdown. This is an important safety procedure that has the added benefit of reducing brake wear. Restrictions on the use of thrust reversal can reduce noise impacts off the sides of the runways, although they would not significantly reduce the size of the noise contours. Enforced restrictions on the use of reverse thrust, however, are not considered fully safe.

Given the location of noise-sensitive uses in the Oxnard Airport vicinity, a restriction on thrust reversal would not result in significant benefits. Reverse thrust restrictions tend to erode landing safety margins, increase runway occupancy time, and increase brake wear on aircraft.

Conclusion. Limitations on the use of reverse thrust are inadvisable at Oxnard because of the likelihood for minimal benefits and decreased safety margins.

AIRPORT FACILITIES DEVELOPMENT

The development of on-airport facilities to improve off-airport noise levels is an accepted technique in noise abatement. Airport facilities can be constructed or modified to reduce aircraft noise or shift it to compatible areas. Other facility changes that may offer some degree of noise abatement are displaced runway thresholds and acoustical barriers or shielding.

Runway Extensions And New Runways

New runways aligned with compatible land development, or runway extensions shifting aircraft operations further away from residential areas are a proven means of noise abatement. New runways are most effective where there are large compatible areas near an airport, and existing runways are aligned with residential areas. Runway extensions are usually beneficial where there is substantial residential development very close to one end of a runway and not the other.

As previously discussed, noise sensitive land uses are fairly close to the airport to the east and undeveloped to the west. Extending Runway 7-25 to the west and relocating the east threshold would increase the height of aircraft over noise sensitive areas, thus reducing noise.

Exhibit 4C depicts noise contours developed for a 3,000-foot extension of Runway 7-25 to the west and corresponding relocation of the east threshold. As seen on **Exhibit 4C**, the noise contours shift to the west significantly. The 60 CNEL arrival spike to the east is drawn closer to airport property and away from concentrated residential areas.

Table 4C depicts the grid point analysis results for the relocation of the runway. The grid point locations are depicted on **Exhibit 4C**. The CNEL noise metric at grid points 1 through 5 all decrease with the shift of activity to the west. Grid point 5 northeast of the airport decreases the most, 10.1 CNEL. Grid point 6 to the west increased 2.7 CNEL with the runway relocation.

TABLE 4C
Relocation of Existing Runway
Oxnard Airport

	CNEL LEVEL	
Grid Point	**2003 Baseline**	**Runway Relocation**
1	61.0	59.3
2	60.2	58.7
3	61.1	59.4
4	59.5	55.3
5	65.0	54.9
6	53.9	55.7

Source: Coffman Associates Analysis.

Table 4D depicts a comparison of the baseline and runway relocation alternative population impacts. As seen in **Table 4D**, the population impacts drop considerably if Runway 7-25 is shifted.

While the impacts to noise-sensitive land uses are reduced, the cost of shifting Runway 7-25 and taxiways, relocation of navigational aids, purchasing land, additional fencing, hangar relocation, and moving Victoria Avenue would be approximately $47,000,000.

TABLE 4D
Population Exposed to Noise for
Relocation of Existing Runway
Oxnard Airport

	2003 Baseline	**Runway Relocation**
60-65 CNEL	193	10
65-70 CNEL	43	4
70-75 CNEL	43	0
75 + CNEL	4	0
Total Above 65	90	4

Source: Coffman Associates Analysis.

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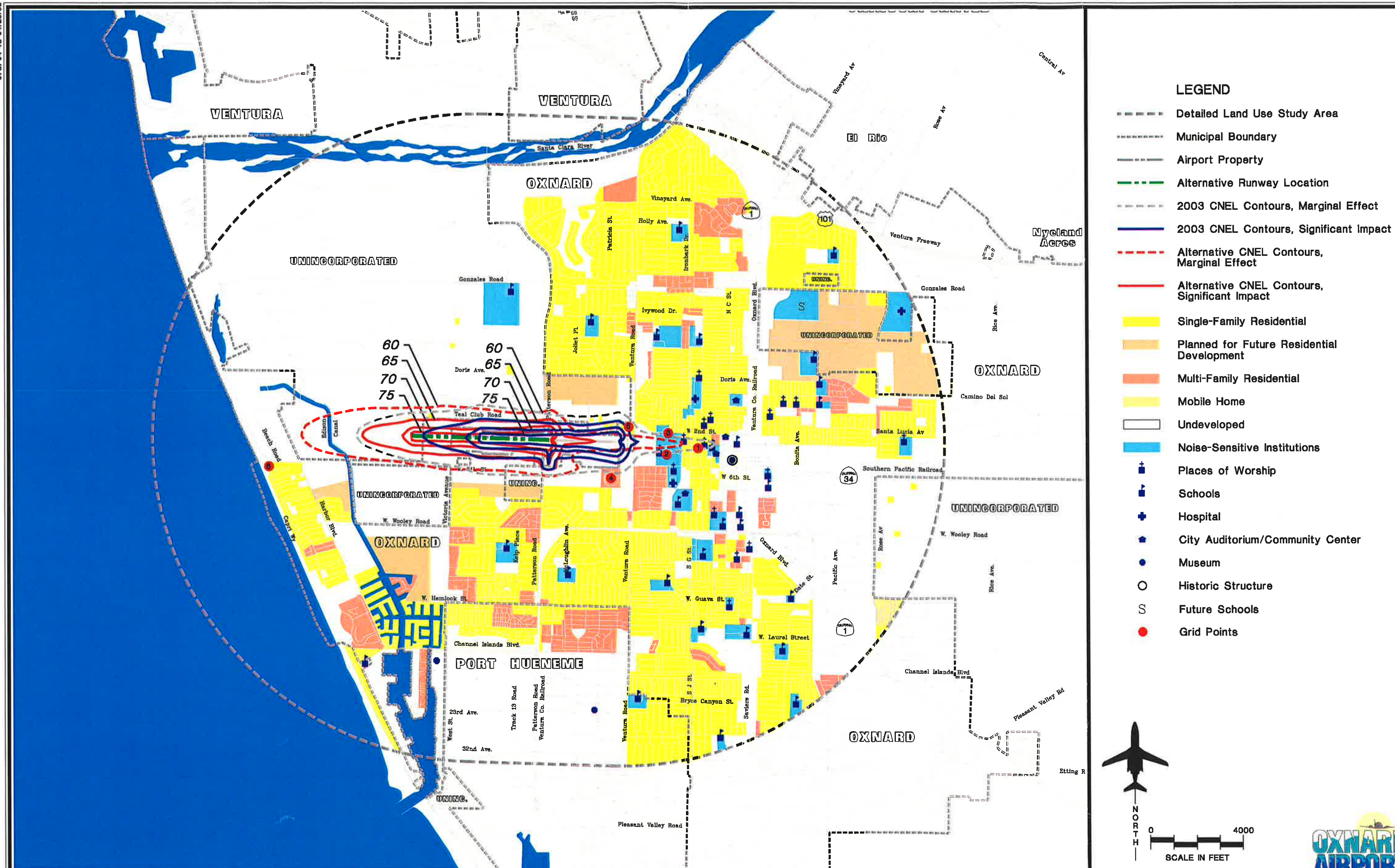

Exhibit 4C
2003 NOISE EXPOSURE WITH
RUNWAY RELOCATION

Conclusion. Shifting Runway 7-25 to the west provides some noise abatement benefit, however, the high cost prevents this alternative from being viable.

Displaced And Relocated Thresholds

A displaced threshold can provide some measure of noise abatement. To displace a threshold means that the touchdown zone for landing aircraft is moved further down the runway. The determination of the amount of displacement must consider the required runway lengths for landing as well as the amount of noise reduction associated with the displacement. For example, if the threshold of a runway were displaced 1,000 feet, the altitude of an aircraft along the approach path would be increased by only 70 feet. The single event noise levels associated with displaced thresholds would decrease slightly along the flight track, but by no more than two to three decibels over the closest noise-sensitive area under the approach track. These areas are much more impacted by departure noise.

Threshold relocation, where the point of touchdown and the point of takeoff are both shifted, can offer some small additional noise benefits to areas near a runway end by shifting takeoff noise associated with the start of the takeoff roll away from the former runway end.

Oxnard has a displacement on the east end of Runway 7-25. Additional threshold displacements would decrease the runway length available for landings, increasing the need for thrust reversal and potentially increasing aircraft brake wear, and reducing safety margins.

As discussed in a previous section, a reduction in the length of the displaced threshold, coupled with a raised glide slope angle may possibly provide a noise abatement benefit east of the airport.

For modeling, profiles for aircraft arriving on Runway 25 were adjusted to a 3.5 degree glide slope and the Runway 25 displaced threshold was moved from 1,372 feet to 772 feet. As seen on **Exhibit 4D** the alternative contours are very slightly reduced east of the runway along the extended centerline. The noise contours to the west of the airport are shifted slightly to the east. The small shift in the noise contours to the east is due to the shift in touch down and subsequent takeoff location of the touch-and-go operations.

A grid point analysis shows almost no change in noise east of the airport. Grid point 4 is the only grid point to change (0.2 CNEL increase). The grid point analysis is summarized on **Table 4E**.

Population impacts for raising the glide slope to 3.5 degrees and relocating the displaced threshold to 772 feet are depicted on **Table 4F**. As seen on Table 4F, only 10 people are removed from the 60 to 65 CNEL contour. The population impacts above 65 CNEL remain the same.

TABLE 4E
Increased Glide Slope With 772-Foot Displacement to Runway 25
Oxnard Airport

	CNEL LEVEL	
Grid Point	**2003 Baseline**	**Glide Slope and Threshold Adjustment**
1	61.0	61.0
2	60.2	60.2
3	61.1	61.1
4	59.5	59.7
5	65.0	65.0
6	53.9	53.9

Source: Coffman Associates Analysis.

An enlargement of the alternative and baseline contours east of the airport is depicted on **Exhibit 4E**. **Exhibit 4E** also has a chart demonstrating the altitude differences between the existing (3.0 degrees) and alternative (3.5 degrees) glide slope angles. As seen on **Exhibit 4E**, the reduced threshold displacement and higher glide slope results in higher aircraft altitudes over noise-sensitive areas east of H Street.

The noise reduction benefits of this alternative would increase further east of H Street. This can be demonstrated by running this alternative with 2018 operations levels. **Exhibits 4F** and **4G** depict the study area view and close-in view of the 2018 noise exposure contours with an increased glide slope and 772-foot threshold displacement.

As seen in **Exhibit 4G**, the separation between the baseline and alternative contours is considerably more noticeable.

The cost associated with shifting the displaced threshold and adjusting the instrument landing system would be approximately $100,000.

Conclusion. As seen from the analysis, the reduction of the threshold displacement and increase in the glide slope provides a very slight noise benefit to the east. In addition, the noise benefit increases the further east from the airport. The noise benefit, however is not enough to merit a reduction in the threshold displacement based solely for noise abatement.

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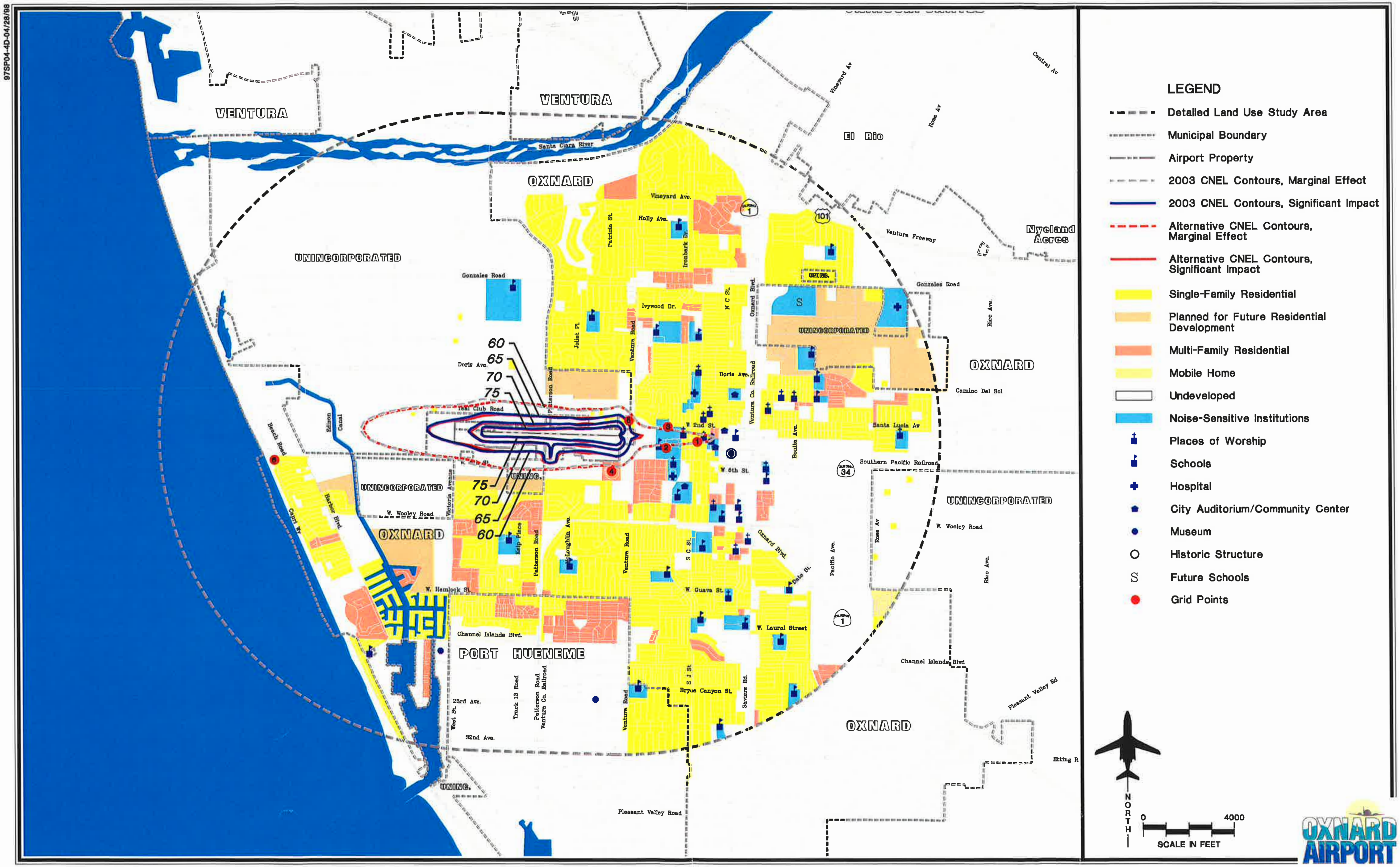

Exhibit 4D
2003 NOISE EXPOSURE WITH RAISED GLIDE SLOPE AND RUNWAY 25 THRESHOLD SHIFT

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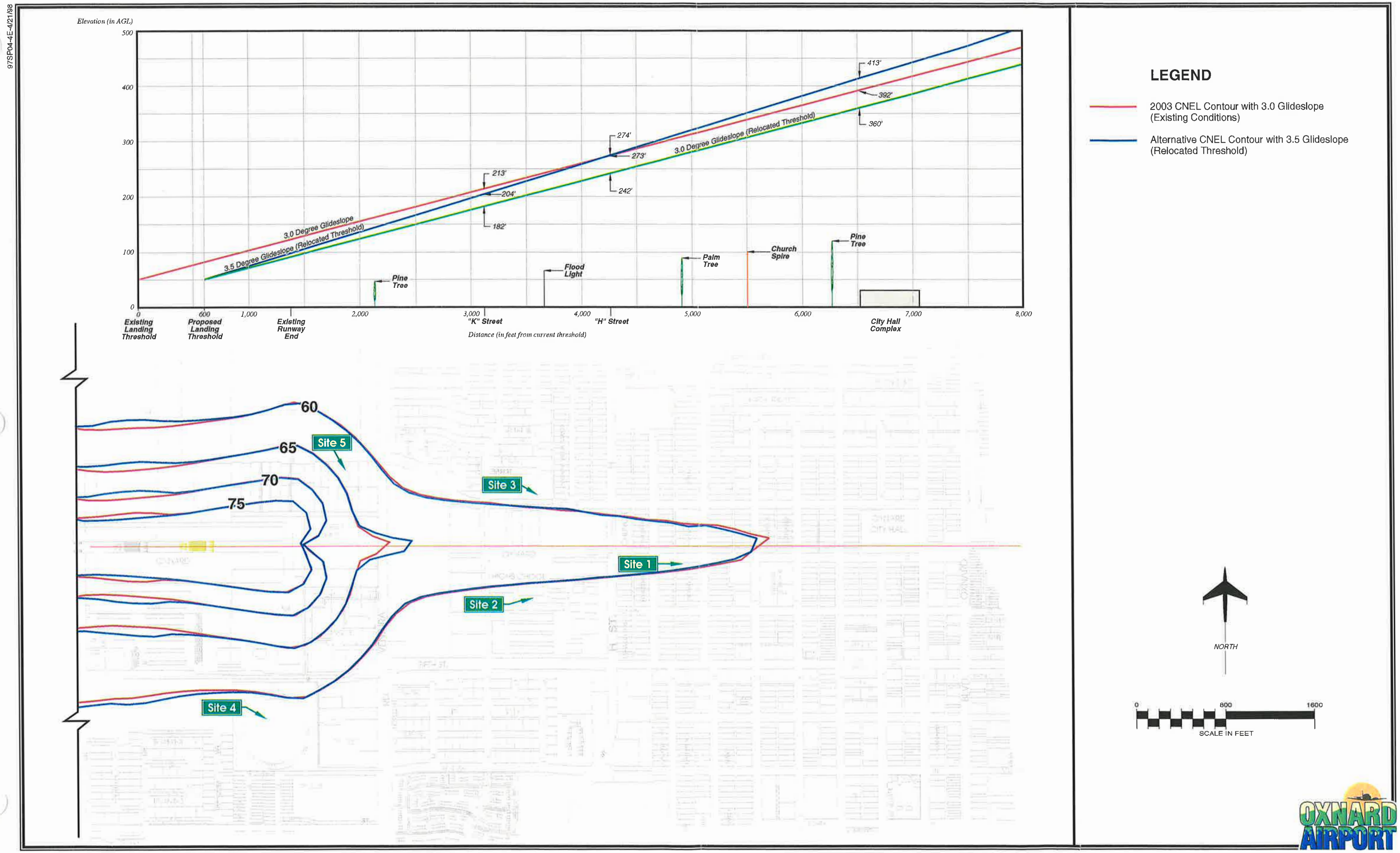

Exhibit 4E
2003 NOISE EXPOSURE WITH RAISED GLIDE SLOPE AND RUNWAY 25 THRESHOLD SHIFT

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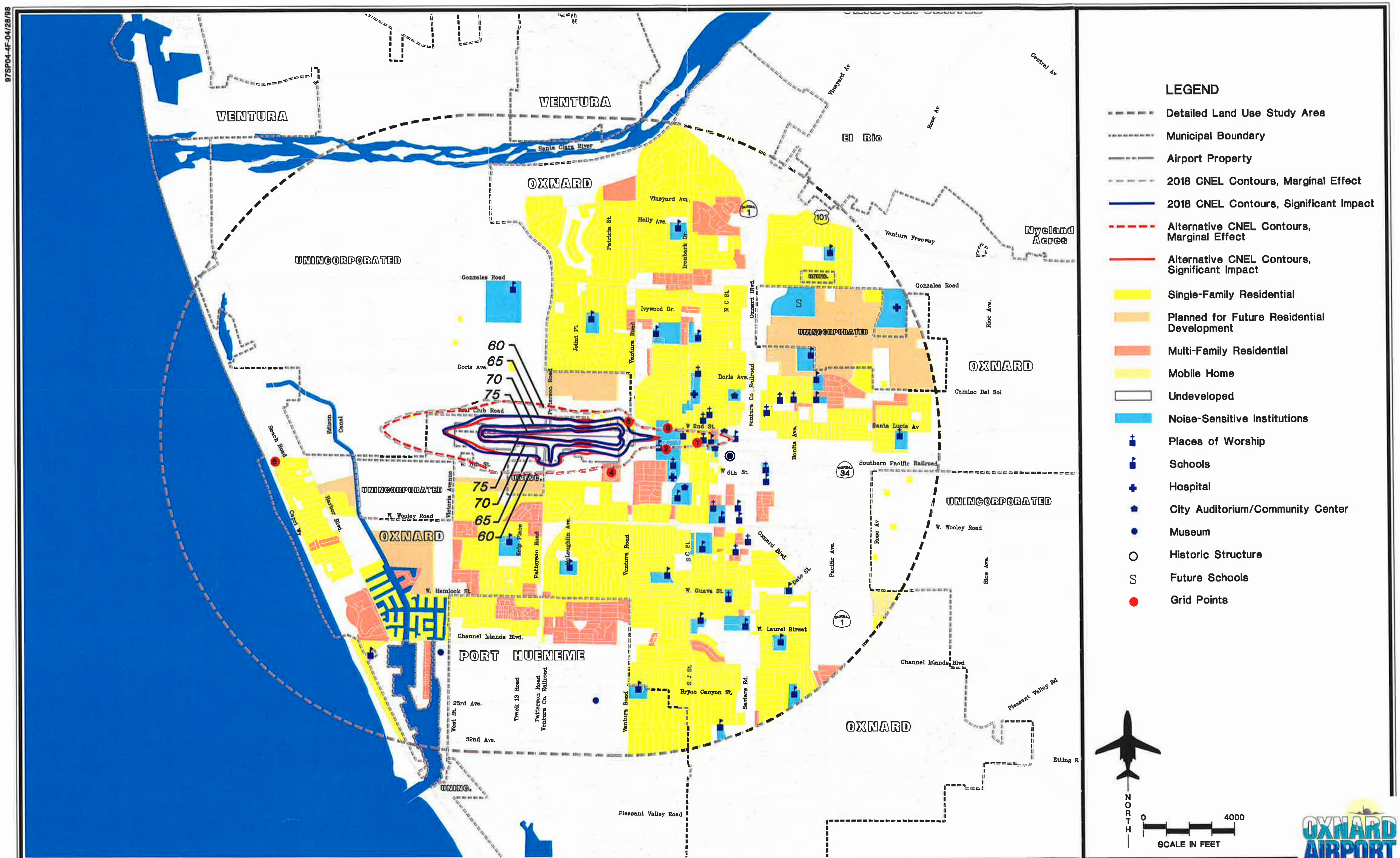


Exhibit 4F
2018 NOISE EXPOSURE WITH RAISED GLIDE SLOPE AND RUNWAY 25 THRESHOLD SHIFT

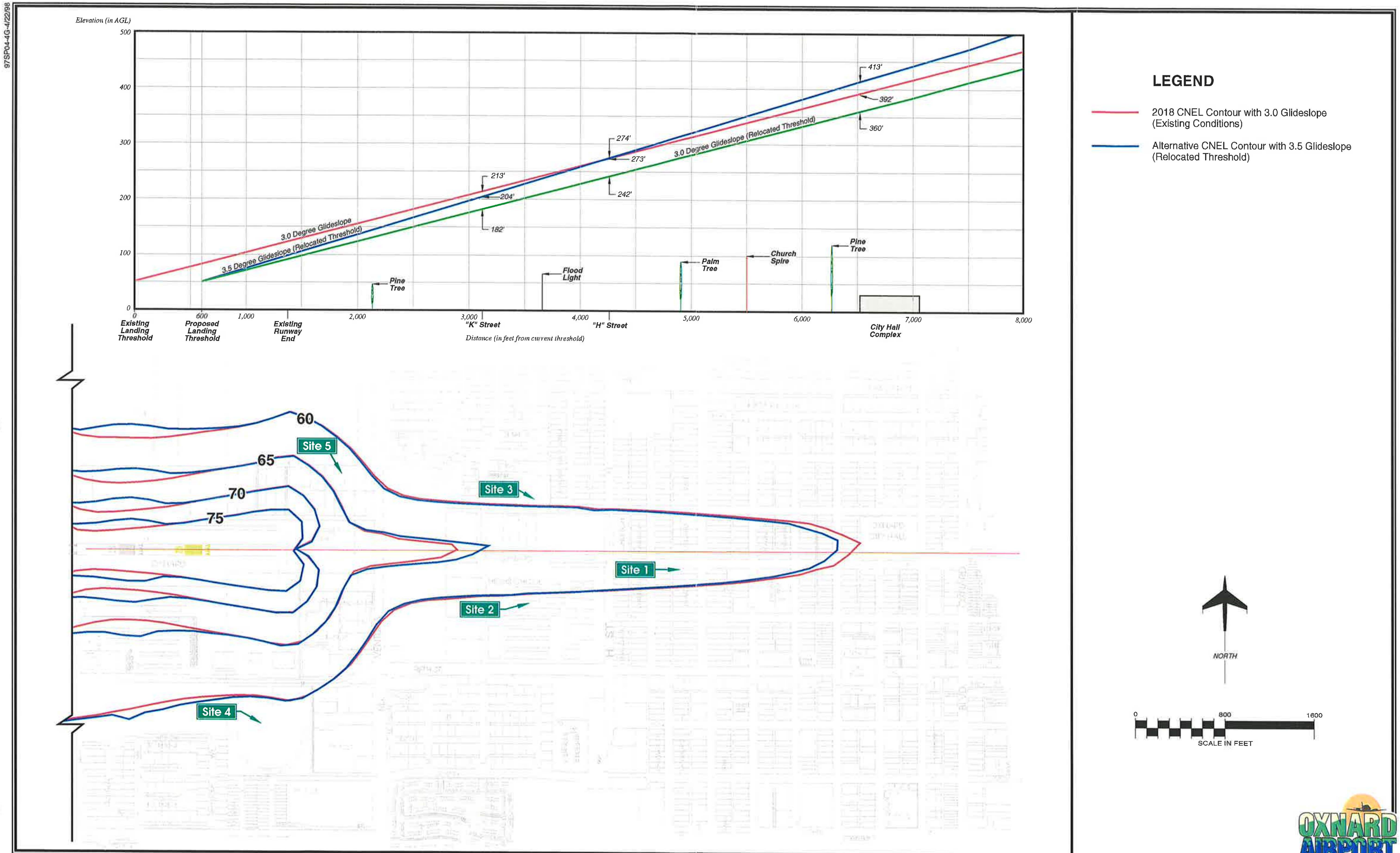


Exhibit 4G
2018 NOISE EXPOSURE WITH RAISED GLIDE SLOPE AND RUNWAY 25 THRESHOLD SHIFT

TABLE 4F
2003 Population Exposed to Noise for Raising the Glide Slope and Threshold Relocation
Oxnard Airport

	2003 Baseline	Glide Slope and Threshold Alternative
60-65 CNEL	193	183
65-70 CNEL	43	43
70-75 CNEL	43	43
75 + CNEL	4	4
Total Above 65	90	90

Source: Coffman Associates Analysis.

Acoustical Barriers

Acoustical barriers include noise walls, berms, and hush houses or run-up pens for containing engine maintenance run-up noise. Acoustical barriers are only useful for attenuating noise from aircraft activity on the ground. They have very limited application in special situations, act best over relatively short distances, and their benefits are greatly affected by surface topography and wind conditions. Furthermore, the effectiveness of a barrier is directly related to the distance of the noise source from the receiver and the distance of each from the barrier itself, as well as the angle between the ends of the berm and the receiver.

There are two noise-sensitive areas effected by ground noise at Oxnard Airport. Both of these areas are impacted by departure spool-up noise from aircraft departing Runway 25.

Aircraft hangar development along 5th Street currently provides some attenuation of ground noise for residential dwellings located south of the Runway 25 threshold. Additional hangar development planned for this area should continue to help attenuate ground noise impacts to the south. The close proximity of residential dwellings to the taxiway north of the Runway 25 threshold prevents any sizeable noise barrier from being constructed.

Conclusion. Noise berms or walls are ineffective for attenuation of aircraft overflight noise. Given the location of the residential areas around the airport, acoustical barriers would not be possible or of limited benefit. As such, this measure is not considered further.

SUMMARY

The previous sections have reviewed and analyzed a noise abatement techniques for Oxnard Airport. **Table 4G** summarizes the alternatives analyzed in this chapter. A straight-in approach to Runway 7 would reduce the number of overflights for residents southwest of the airport along the Ocean. Based on the grid point analysis, however, the residents in this area will receive very little noise benefit from a straight-in procedure.

Aircraft departing Runway 25 with a southern destination should be requested to fly runway heading until reaching the ocean. Incorporation of this procedure should be added to the noise abatement procedures literature and pilot guides. Posters and informational brochures also could be posted in the pilot lounges at the FBOs.

Movement of the runway for noise abatement is not a cost-effective solution given the scope of the problem. Raising the glide slope from 3.0 degrees to 3.5 degrees and reducing the displaced threshold to 772 feet does provide some limited benefit.

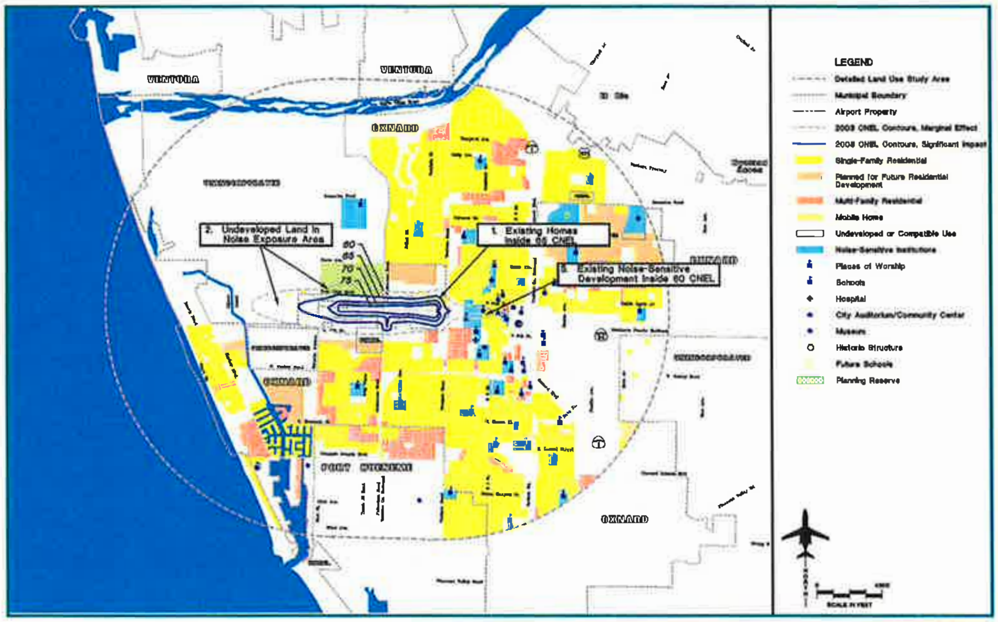
The results of this analysis must be reviewed by the Planning Advisory Committee, airport management, and the general public before final recommendations can be made. Final recommendations will be presented in Chapter Six, the Noise Compatibility Plan.

Table 4G
Noise Abatement Alternative Analysis Summary
Oxnard Airport

Alternative	Cost to Airport or Government	Direct Cost to Users
Runway 25 Straight-out Departures for South Bound Traffic	Administrative.	Very small increase in travel time and fuel use by aircraft.
Runway 7 Straight-GPS Approach	Administrative.	Very small increase in travel time and fuel use by aircraft.
Runway 7-25 Runway Relocation 3,000 Feet West	Ventura County would most likely be responsible for a majority of the cost of relocating the runway, $47,000,000.	Small increase in taxi time and fuel use by aircraft taxiing to relocated runway ends.
Increase Glide Slope to 3.5 Degrees and Reduce Threshold Displacement to 772 Feet	Relocation of Displaced threshold and ILS. $100,000.	None.

Chapter Five

LAND USE ALTERNATIVES



INTRODUCTION

The evaluation of noise abatement alternatives in Chapter Four resulted in tentative proposals to promote aircraft noise abatement in the airport area. Even if those are implemented, however, there will continue to be noise-sensitive land uses around the airport impacted by aircraft noise.

This chapter covers land use management alternatives intended to prevent or reduce future noise impacts. It begins by identifying broad planning issues and objectives to be addressed by the Noise Compatibility Plan. Land use management techniques are then evaluated to determine their potential usefulness in the Oxnard Airport study area. Finally, land use alternatives deserving serious consideration are summarized. The final land use management and noise abatement recommendations will be presented in Chapter Six, Noise Compatibility Plan.

LAND USE ISSUES

Exhibit 5A shows the projected noise contours for the year 2003. It also notes areas of concern with respect to existing or potential future noise impacts. These define the land use issues with which this chapter is concerned. These are briefly summarized below.

Issue 1: Noise exposure above 65 CNEL in residential area north of east end of Runway 7-25.

This is the only noise-sensitive area around the airport exposed to noise above 65 CNEL. Based on 2003 noise, 12 dwellings are between the 65 and 70 CNEL contours, 12 are in the 70 to 75 CNEL range, and one is inside the 75 CNEL. Based on the analysis in Chapter Four, potential noise abatement alternatives will be of little benefit here. Alternatives to mitigate the adverse effects of aircraft noise in this area will be examined in this chapter.

Issue 2: Existing and planned residential development north, east, and south of the airport underscores the importance of preserving the west side as a noise-compatible area.

The area west of the airport is currently undeveloped and designated in the Oxnard General Plan for agriculture and open space uses. Since the prevailing traffic flow is to the west, the west side is exposed to considerably more noise than the east side. (Most aircraft tend to be louder on departure than approach.) Given the prevailing winds and the dense residential development east of the airport, the prevailing traffic flow at the airport must continue to the west in the future. Thus, the current land use planning policies on the west side are consistent with preserving airport noise compatibility in this area. Recognizing that people in quiet suburban environments are often disturbed by aircraft noise at levels well below 60 CNEL, it would be prudent to ensure long-term land use compatibility west of the airport all the way to the Ocean. This issue will be considered in this chapter.

Issue 3: Existing residential development within the 60 CNEL contour east and south of the airport.

Aircraft on approach to Runway 25 are the primary source of noise in the neighborhood directly east of the airport and west of downtown. Aircraft departing on Runway 25 are the primary source of noise in the multi-family area directly south of the east end of the runway. Noise levels in these areas are less than 65 CNEL but, as the 60 CNEL contour indicates, are still loud enough to be disturbing to some people. Because these areas are exposed to noise below 65 CNEL, a program calling for Federal funding assistance to mitigate the effects of noise would not be approved by the Federal Aviation Administration (FAA). Thus, the noise concerns in these areas must be addressed solely through potential noise abatement alternatives. (Alternatives for abating noise in these areas are discussed in Chapter Four.)

LAND USE MANAGEMENT TECHNIQUES

Land use management techniques to promote noise compatibility are discussed in this section. These techniques are grouped under three headings: **policy** and **regulatory** techniques that guide future development, and **expenditure** techniques which involve potential payments for mitigation assistance. They are listed in **Exhibit 5B.**

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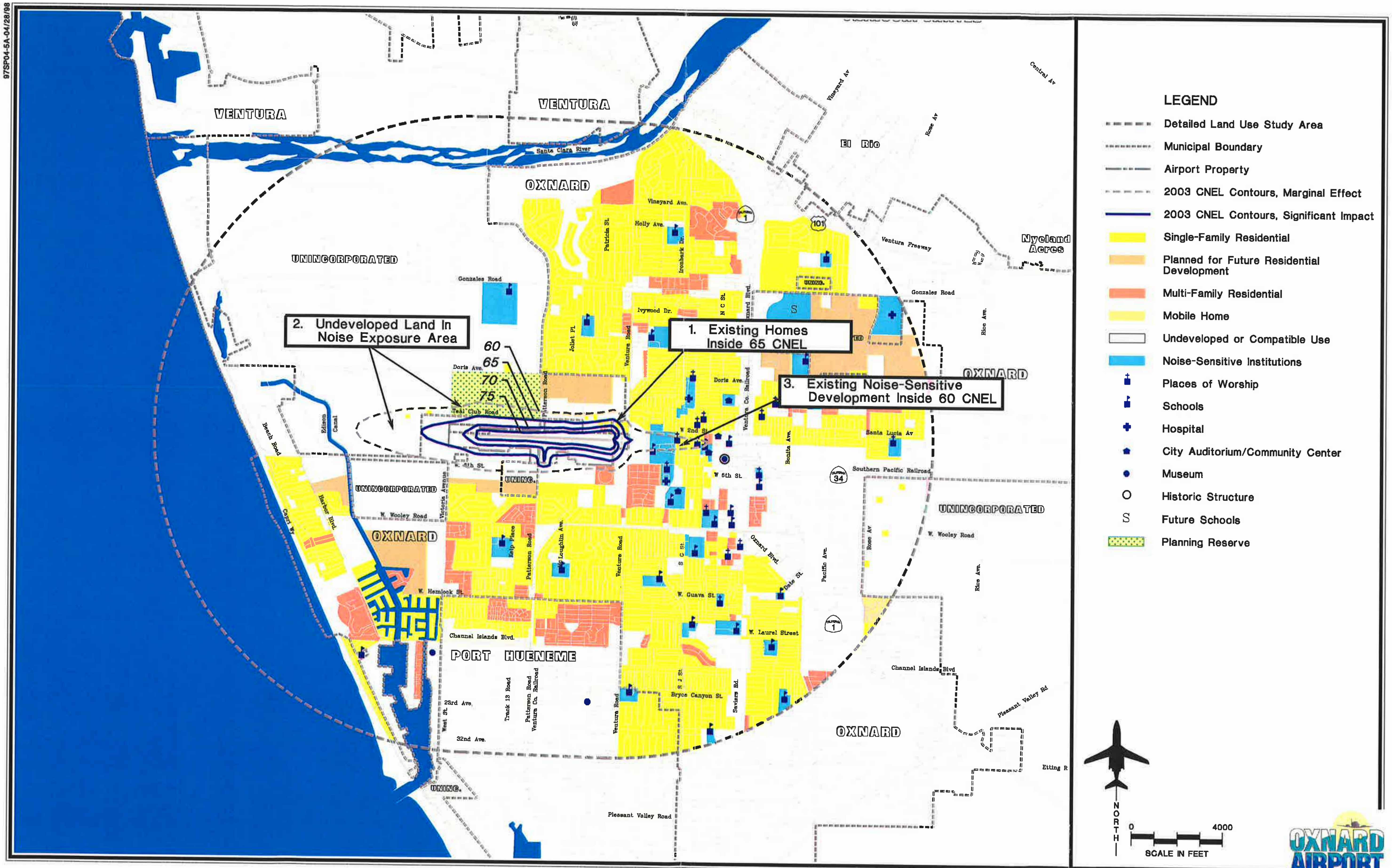

Exhibit 5A
LAND USE ISSUES

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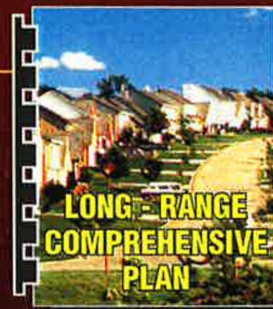
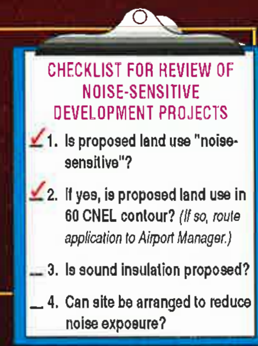
POLICIES

- Comprehensive / General Plan
- Project Review Guidelines




CHECKLIST FOR REVIEW OF NOISE-SENSITIVE DEVELOPMENT PROJECTS

✓ 1. Is proposed land use "noise-sensitive"?

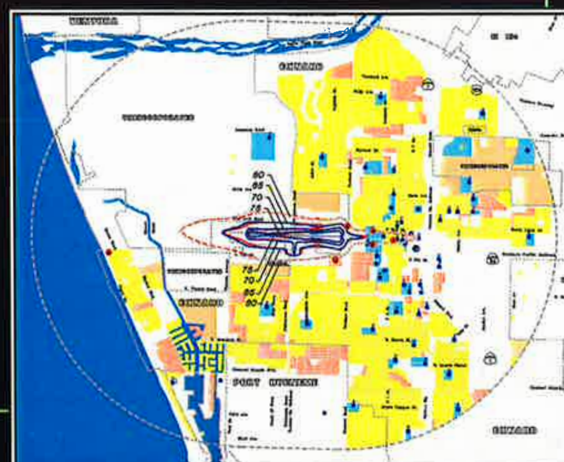
✓ 2. If yes, is proposed land use in 60 CNEL contour? *(If so, route application to Airport Manager.)*

_ 3. Is sound insulation proposed?

_ 4. Can site be arranged to reduce noise exposure?

REGULATIONS

- Compatible Use Zoning
- Zoning Changes - Residential Density
  - Large Lots, Planned Unit Development
- Airport Noise Overlay Zoning
- Subdivision Regulations
- Building Codes
- Transfer of Development Rights
- Environmental Zoning
- Fair Disclosure By Sellers



EXPENDITURES

- Property Acquisition
- Noise and Avigation Easement Purchase
- Development Rights Purchase
- Purchase Assurance
- Sales Assistance
- Sound Insulation

OXNARD AIRPORT

Exhibit 5B

LAND USE TECHNIQUES TO PROMOTE NOISE COMPATIBILITY

97SP04-5B-4/28/98

TECHNIQUES FOR GUIDING NEW DEVELOPMENT TO PREVENT FUTURE NOISE IMPACTS

POLICY TECHNIQUES - Non-regulatory governmental actions to encourage noise-compatible development near airport.

Comprehensive Planning: Policies supporting land use compatibility near airport. Involves land use plans and policies to guide consideration of rezonings, variances, conditional uses, public projects.

Project Review Guidelines: Adoption of guidelines which ensure that noise compatibility issues are considered during reviews of development proposals.

REGULATORY TECHNIQUES - Local land use regulations requiring compatible development in airport area.

Compatible Use Zoning: Commercial, industrial, agriculture, or open space zoning.

Zoning Changes, Residential Density: Large-lot zoning or planned unit development.

Noise Overlay Zoning: Special regulations within high-noise areas.

Subdivision Regulations: Require dedication of noise and avigation easements, plat notes.

Building Codes: Require sound insulation in new construction.

Transfer of Development Rights: Zoning framework to authorize private sale of development rights to encourage sparse development in high-noise areas.

Environmental Zoning: Environmental protection zoning to support airport land use compatibility.

Fair Disclosure Regulations: Require seller to notify buyer of aircraft noise.

TECHNIQUES FOR MITIGATING EXISTING NOISE IMPACTS

EXPENDITURE TECHNIQUES - Because of high costs, these techniques are usually applied only within 65 DNL contour where Federal funding assistance may be available.

Property Acquisition: Outright purchase of property.

Noise and Avigation Easement Purchase: Purchase of easement only.

Development Rights Purchase: Purchase of rights to develop property.

Purchase Assurance: Airport acts as buyer of last resort, then resells property and retains easements.

Sales Assistance: Provide assistance to property owners in selling homes. Airport retains noise easements.

Sound Insulation: Installation of sound insulation in existing homes and noise-sensitive institutions.

OXNARD AIRPORT

Exhibit 5B (Continued)
LAND USE TECHNIQUES TO PROMOTE
NOISE COMPATIBILITY

The potential suitability of each technique is discussed in this chapter and evaluated based on effectiveness and feasibility. The criteria for judging effectiveness include near and long-term effectiveness in addressing the land use issues discussed in the previous section.

If a technique appears to be effective and does not create undesirable side effects, the feasibility of implementing it is evaluated. The feasibility criteria include cost to local governments and citizens, eligibility for FAA financial aid, political acceptability, state statutory authorization, and administrative ease or complexity.

POLICY TECHNIQUES

Policy techniques which can be used to guide future development include:

- General Planning
- Project Review Guidelines

General Planning

A General Plan establishes policies for the development and improvement of the community. It provides the basis for the local zoning ordinance, the regulations governing the use and development of land.

The City of Oxnard's General Plan was reviewed in Chapter One and shown in Exhibit 1H. The General Plan currently promotes airport-compatible development in undeveloped areas around the airport. Areas off the runway sideline, directly north and south of the airport, are designated for future commercial use. Areas west of the airport are designated for agriculture. One area north of the airport, west of Patterson, between Teal Club Road and Doris Avenue is designated in the General Plan as "planning reserve." This means that, for the time-being, it will remain designated for agriculture. In the longer term future, however, the City intends to redesignate it for urban use. It would be helpful if the City could adopt policy language in the General Plan indicating that at least the south half of this area should be redesignated only for urban uses that are compatible with the airport, as shown in **Exhibit 5B.1**.

Unincorporated land north and west of the airport is currently designated in the Ventura County General Plan for agricultural use. Again, this promotes airport compatibility and is especially important west of the airport under the predominant departure corridor. If at all possible, the land between the airport and the Ocean should be preserved for future compatible uses as shown in **Exhibit 5B.1**. Even though much of this area is outside the 60 CNEL contour, experience at many airports has demonstrated that many people who are exposed to frequent low overflights and noise, even at levels below 60 CNEL, can be extremely annoyed by aircraft noise and activity. Since this area west of the airport will remain a critical departure corridor throughout the future, and residential development is encroaching in all other directions around the airport, it should remain free of residential and other noise-sensitive development if at all possible.

The City and County also have a variety of policies in the General Plan promoting airport-compatible development. These are reviewed in Chapter One. Current policies for both jurisdictions prohibit new noise-sensitive uses in areas exposed to noise above 65 CNEL. It would be helpful if these policies could be revised to prohibit new noise-sensitive uses within the 60 CNEL contour. That is consistent with the actual future land use designations for undeveloped areas around the airport.

The City and County should amend their general plans to reflect the updated noise contours at Oxnard Airport. For land use planning purposes, the airport noise scenario they use should reflect the area at risk of noise exposure through the near and long-term future. For that reason, they should seriously consider using a composite of the 2003 and 2018 noise contours as a "land use planning scenario." (The composite noise contours are shown in **Exhibit 5B.1**.) While those contours do not differ greatly, in some areas the 2003 noise contours are larger than the 2018 contours, and vice versa. A combination of both sets of contours would define a total noise exposure risk area based on the most up-to-date information.

Conclusion: The General Plans of both the City of Oxnard and Ventura County designate undeveloped areas within the airport noise contours for compatible development. It is important that these noise compatibility policies and land use designations be continued in the future. If at all possible, the area all the way to the Ocean due west of the airport should be preserved for compatible uses. It would also be helpful if Oxnard would consider adopting language in its General Plan noting that the "planning reserve" area between Teal Club Road and Doris Avenue, west of Patterson will be redesignated in the future only for airport-compatible urban uses.

Both the City and County should consider using the combined 2003 and 2018 noise contours as a "land use planning scenario" in their general plans. They should consider amending their current land use compatibility policies to prohibit new noise-sensitive land uses within the 60 CNEL contour at Oxnard Airport rather than only within the 65 CNEL contour. This is, in fact, consistent with the actual land use planning designations of their general plans in the Oxnard Airport area.

Project Review Guidelines

Planning commissions and local governing bodies are often required to use their own discretion and judgement in making recommendations and decisions on community development issues such as general plan amendments and rezonings, variances, conditional use applications, subdivision applications, and proposed public improvement projects. The exercise of this discretion is constrained by the legal requirements of the applicable ordinances. Where opportunities

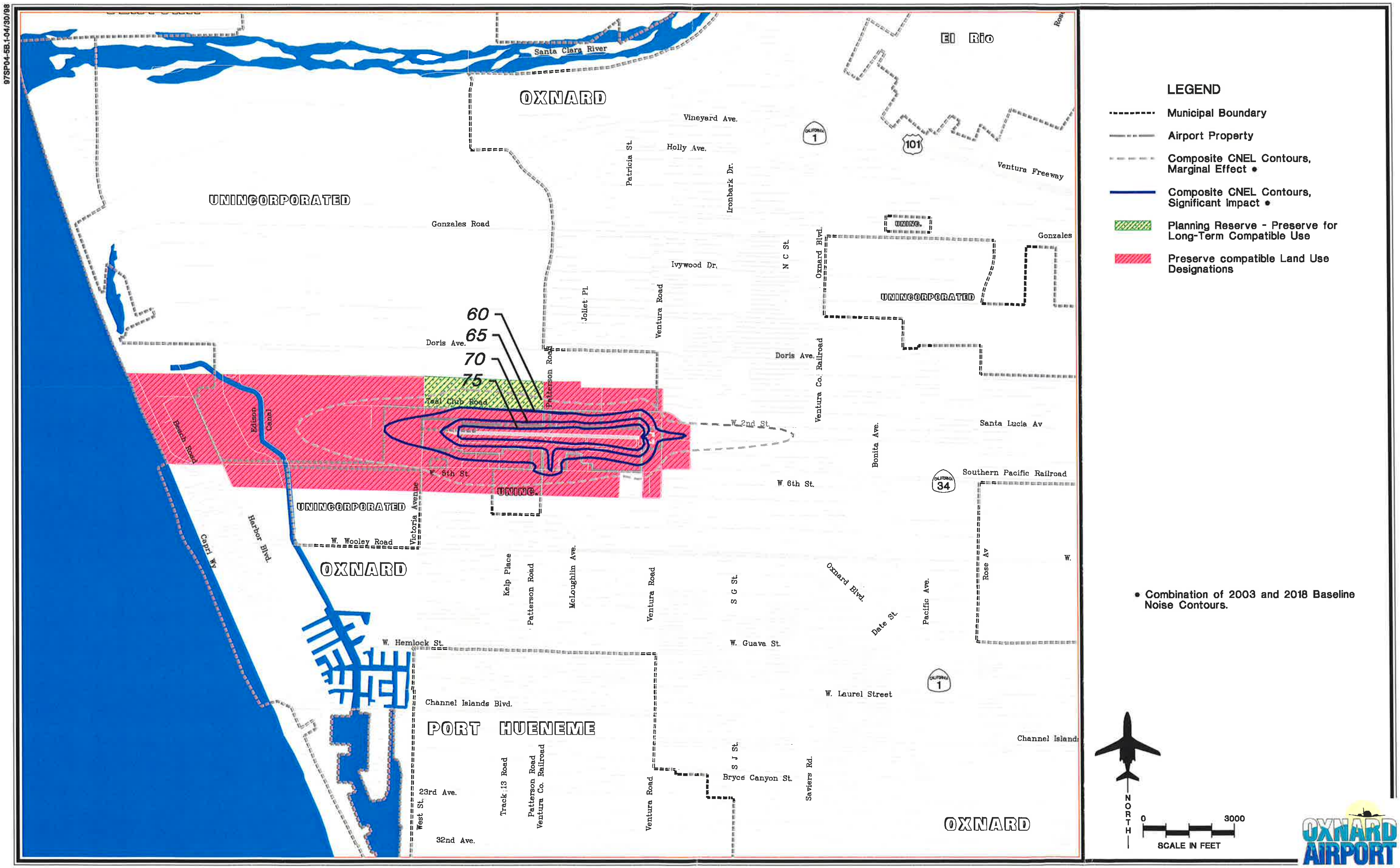


Exhibit 5B.1
POTENTIAL LAND USE PLANNING MEASURES

remain for planning commissions and governing bodies to use their own discretion in the review of development proposals, it may be appropriate to adopt procedures ensuring the consideration of noise compatibility issues in their deliberations.

Ventura County and the City of Oxnard could consider adopting airport land use compatibility guidelines for discretionary review of development projects within the 60 CNEL contour. These would be most appropriately contained in the general plans. This process would add little cost or administrative burden to the review process. A simple checklist could be prepared listing the important factors to consider in reviewing development proposals within the 60 CNEL noise contour. The following criteria are suggested:

A. Determine the sensitivity of the subject land use to aircraft noise levels. The F.A.R. Part 150 land use compatibility table can be used for this purpose. (See Exhibit 3A in Chapter Three.)

B. Advise the airport management of development proposals involving noise-sensitive land uses within the 60 CNEL noise contour.

C. Locate noise-sensitive public facilities outside the 60 CNEL contour, if possible. Otherwise, require building construction to provide an outdoor to indoor noise level reduction of 25 decibels. Also, require the dedication of noise and avigation easements to the County as airport proprietor and the recording of a fair disclosure agreement and covenant noting the proximity of the airport and the existing and projected airport noise contours.

D. Discourage the approval of rezonings, exceptions, variances, and conditional uses which introduce noise-sensitive development into areas impacted by noise exceeding 60 CNEL.

E. Where development within the 60 CNEL contour must be permitted, encourage developers to incorporate the following measures into their site designs.

   (1) Where noise-sensitive uses will be inside a larger, mixed use building, locate noise-sensitive activities on the side of the building opposite the airport or, if the building is beneath a flight track, opposite the prevailing direction of aircraft flight.

   (2) Where noise-sensitive uses are part of a larger mixed use development, use the height and orientation of compatible uses, and the height and orientation of landscape features such as natural hills, ravines and manmade berms, to shield noise-sensitive uses from ground-noise generated at the airport.

Conclusion: Ventura County and the City of Oxnard could consider adopting airport land use compatibility guidelines for review of development projects within the 60 CNEL contour. These would be appropriately included in each jurisdiction's general plan. (These guidelines would not be necessary if the two jurisdictions amend the policies of their general plans and completely prohibit new noise-sensitive land uses within the 60 CNEL contour, as discussed in the previous section.)

REGULATORY TECHNIQUES

Regulatory techniques are land use and development controls established through local legislation. These include:

- Compatible Use Zoning
- Zoning Changes/Residential Density
- Noise Overlay Zoning
- Subdivision Regulations
- Building Codes
- Transfer of Development Rights
- Environmental Zoning
- Fair Disclosure Regulations

Compatible Use Zoning

The most common zoning technique in noise compatibility planning is to eliminate residential zoning from the noise-impacted area and replace it with commercial, industrial, open space, or other compatible zoning designation.

In California, the zoning ordinance and map are required to be consistent with the community's general plan. As noted above, the general plans of Ventura County and the City of Oxnard call for compatible uses in undeveloped areas exposed to aircraft noise above 60 CNEL. Thus, the zoning maps also provide for compatible uses.

Conclusion: Since the undeveloped part of the noise-impacted area around the airport is already planned and zoned for compatible use, there is no need for further compatible use rezonings in the area.

Zoning Changes -- Residential Density

Another way of using conventional zoning to promote noise compatibility is to reduce the permitted housing density in an undeveloped area exposed to noise, thus reducing the number of future residents, rather than preventing residential development altogether. This is definitely a second-best approach and should be used only if compatible use planning and zoning are not feasible.

"Planned unit development" (PUD) is another technique which may offer some of the benefits of low-density (or large-lot) zoning. It allows development without having to follow the standard lot layout and siting requirements of the zoning ordinance. Planned unit developments can involve the clustering of buildings and the reservation of open space, as long as the overall dwelling unit density in the development is basically the same as the density permitted in the underlying zoning district. In addition, a variety of housing types, including townhouses, apartments, and condominiums, are often permitted. This could conceivably allow open space and parking areas to be placed within the noise impact area and housing to be clustered outside the area.

Conclusion: As already noted, the general plans and zoning maps of Ventura County and the City of Oxnard already provide for future compatible uses in undeveloped parts of the noise-impacted area. Thus, there is no need to consider low-density zoning or planned unit development as second best alternatives to compatible use designations.

Noise Overlay Zoning

Overlay zoning (sometimes called "combining zoning") is intended to provide a layer of special purpose regulations to address special environmental constraints or problems, setting performance standards to protect the public. Overlay zoning involves the creation of one or more special zoning districts supplementing or combining with the regulations of the general purpose zoning districts.

Noise overlay zoning is used around many airports in the country to establish special land use controls to protect the public health, safety, and welfare from conflicts which may arise between aviation and urban development. These controls often are used, for example, to regulate the height of structures within runway approach areas and in other areas near the airport, or to promote development which is compatible with aircraft noise levels.

Noise overlay zoning regulations are usually established as "combining" regulations in that the underlying zoning, (i.e., residential, commercial, industrial, etc.) 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.

Noise overlay zoning is intended to avoid the problems associated with incompatible development in high noise areas. Regulations in noise overlay zones can prohibit noise-sensitive uses, as long as the underlying zone permits enough other land uses to provide an opportunity for the economically viable use of the land. The regulations also can require sound insulation in the construction of noise-sensitive uses.

The boundaries of noise overlay zones are usually determined by the critical noise contours based on local perceptions -- often the 65, 70, and 75 CNEL contours, but with increasing emphasis on the 60 CNEL. The boundary may follow the actual contours or, for the sake of simplified administration, nearby streets, property lines, or natural features.

Noise overlay zoning is administered by the local land use regulatory agency. In areas where noise crosses jurisdictional boundary lines, as in the Oxnard

Airport area, it is helpful to local developers if the jurisdictions cooperate with a unified approach to overlay zoning.

Among the advantages of noise overlay zoning are the simplicity of the required amendments, the simplicity of administration, the clear relationship of the regulations to their purpose, and the minimal impact of the regulations on the application of the zoning ordinance in other parts of the community.

In the Oxnard Airport area, all of the undeveloped land exposed to noise above 60 CNEL is designated for compatible use in the General Plan and zoning ordinance. In addition, the General Plan establishes performance standards, including sound insulation, that must be met for new noise-sensitive development within the airport noise contours.

Conclusion: Because Oxnard and Ventura County have designated the area around Oxnard Airport, including all of the undeveloped area within the 60 CNEL contour, for compatible use in the general plans and zoning ordinances, there is no particular need for airport noise compatibility zoning in the area. The purposes that would be achieved by overlay zoning are already being achieved by conventional zoning and the performance standards set in the general plans.

Subdivision Regulations

Subdivision regulations control the platting of land by setting standards for site planning, lot layout, and the design of utilities and public improvements. They can encourage compatible development around an airport by requiring the consideration of aircraft noise during the plat review by public officials. This might take the form of requiring further noise attenuation features in the site plan or a decrease or shift in the density of portions of the development, although subdivision regulations are not well-suited to addressing needs for noise attenuation.

Subdivision regulations also can be used to inform prospective future property owners of the risk of aircraft noise. In some communities, noise levels are shown on the final subdivision plats either by drawing the noise contours on the plats or by assigning noise levels to the lots. This makes the noise information a matter of public record. An important disadvantage is that, while the plat is recorded and on file forever, noise levels can change.

Another approach is to write a note on the plat, or record a covenant with the plat, stating that the property is subject to potentially disruptive aircraft noise and advising consultation with local planning officials and the airport proprietor to get current information about the noise situation. As a practical matter, however, buyers of property rarely look at the plats.

Subdivision regulations can help protect the airport from the risk of noise damage suits while providing for notice to potential buyers of property by requiring, as a condition of subdivision approval, the dedication of noise and avigation easements and non-suit covenants in high-noise areas. This is similar to requirements for the dedication of street right-of-way or utility easements usually found in subdivision regulations.

An easement is a limited right to use property owned by another. A noise and avigation easement gives the airport, as owner of the easement, the right to direct aircraft over the property and thus to make noise. These easements serve notice that the property is subject to significant aircraft noise which may, at times, infringe on a resident's enjoyment of property and may, depending on the degree of acoustical treatment of the dwelling and the individual's sensitivity to noise, affect his or her well-being. The easement should state clearly that noise levels might increase in the future and that flight patterns or operating times might change. A noise and avigation easement often includes a covenant waiving the property owner's right to sue the airport proprietor for disturbances caused by aircraft noise.

Conclusion: Since the undeveloped area within the 60 CNEL is designated in the Oxnard and Ventura County general plans for compatible uses, there is no particular need for amendments to subdivision regulations to promote noise compatibility.

Building Codes

Building codes regulate the construction of buildings, setting standards for materials and construction techniques to protect the health, welfare, and safety of residents. Codes address structural concerns, ventilation, and insulation, each of which influences the noise attenuation capabilities of a building. Building codes commonly apply to both new construction and major alterations.

Building codes can require sound insulation in the construction of noise-sensitive uses in areas exposed to high aircraft noise levels. Although they are sometimes used within the 60 CNEL, requirements for sound insulation customarily are applied within the 65 CNEL contour with increasingly stringent standards in the 70 and 75 CNEL contours. Most sound insulation code standards describe in detail the required improvements needed to achieve a given level of noise reduction. The building inspector must see that the improvements have been properly made. If so, the builder is presumed to have met the sound insulation target without being required to do any special noise measurement tests.

Noise insulation standards for the State of California are in Title 24, Part 6, Division T25, Chapter 1, Subchapter 1, Article 4 of the California Administrative Code. They establish uniform minimum noise insulation standards for new multi-family dwellings and hotels, requiring that the CNEL shall not exceed 45 CNEL in any habitable room with all windows and doors closed.

In addition, the construction standards of the California building and energy conservation codes have been found through experience throughout the State to achieve a significant level of sound attenuation. Numerous acoustical tests have found that structures built to these standards can achieve an outdoor to indoor noise level reduction of at least 25 decibels. This is significant because these standards apply to all types of construction, including single-family residential.

Conclusion: For a variety of reasons, local building code amendments to establish sound insulation standards are not needed. The State noise insulation standards already provide for sound insulation of multi-family dwellings and hotels. In addition, the California building and energy codes achieve adequate outdoor to indoor noise level reductions for other types of construction, including single-family homes, given the magnitude of the noise levels around the airport.

Transfer of Development Rights

Land ownership actually includes a bundle of rights to the use of that land. These include rights of access, mineral rights, rights to the airspace above the land, and rights to develop the land. Transfer of development rights (TDR) is based on the idea that each right has a market value and can be separated and sold without selling the entire property.

TDR was developed as a way to preserve environmentally important areas without having to buy them with public funds. The technique begins by dividing the municipality into sending and receiving zones. The sending zones are areas where environmental preservation and minimal development are desired, and the receiving zones are areas where additional development is desired. Development rights, measured in terms of development density, are assigned through the zoning ordinance. If developers in the receiving areas can get additional development rights, they are allowed to build to higher densities than nominally allowed by the zoning ordinance. They would buy these rights from landowners in the sending zones. In this way, the public can benefit from preserving environmentally valuable land, the owner of that land can be paid for preserving it, and developers can reap higher profits.

Based on experience with these programs around the country, several conditions for the successful use of TDR have been identified. The receiving districts must be capable of immediate development, the regulatory process must have integrity and be trusted by developers, the regulatory agency must be able to inform and help property owners and developers, and programs must be as simple as possible and facilitate the self-interest of all involved parties. (See "Making TDR Work," by Peter J. Pizor, in the *Journal of the American Planning Association*, Vol. 52, No. 2, Spring 1986.)

A variation of TDR is density transfer zoning. This allows developers of several large tracts of land to move their allotted densities among tracts to reduce densities in areas worthy of preservation. This differs from TDR because only one owner is involved in the transfer, and a system for sale and purchase of development rights is not required. Density transfer zoning often can be achieved through creative use of the planned unit development process.

In rapidly growing areas with large amounts of vacant land, TDR can be an effective tool for airport land use compatibility planning. At no cost to the taxpayers, it can neatly deal with the problem of what to do with land in high noise zones when there are no practical alternatives to residential development.

TDR is a very complicated technique that is difficult to justify solely for the purposes of airport land use compatibility. If a local jurisdiction is already using or considering TDR, airport compatibility criteria could be included with other environmental criteria in the design of the program.

Conclusion: TDR is not currently being used by Oxnard or Ventura County nor is it needed for airport compatibility purposes. As already noted, undeveloped areas within the noise contours are already designated by the general plans and zoning ordinances for compatible uses.

Environmental Zoning

Special zoning regulations to preserve environmentally sensitive areas or protect development from environmental hazards also can promote land use compatibility near airports. Floodplain overlay zoning, which restricts or prohibits development in all or part of the floodplain, is the most common form of environmental zoning. Other environmental zoning regulations may include steep slope zoning requiring low development densities and special construction standards, wetland preservation zoning limiting densities and the design of drainage facilities, and groundwater recharge zones limiting building density and lot coverage. All can be used to restrict the development of noise-sensitive uses in environmentally sensitive areas that are also impacted by aircraft noise.

Conclusion: Various forms of environmental zoning regulations are already being used in the area. They do not directly lend themselves to also promoting airport noise compatibility. This technique does not deserve further consideration.

Fair Disclosure Regulations

Fair disclosure regulations are not actually land use regulations. They are intended to ensure that prospective buyers of property are informed that the property is or will be exposed to potentially disruptive aircraft noise. It is not uncommon around even major airports for newcomers to report having bought property without having been informed about airport noise levels.

At the most formal level, fair disclosure can be implemented through regulations requiring the seller or his agent to provide a notice of aircraft noise exposure on the real estate listing sheet and at the time that a sales contract is executed. In addition, any easements should be revealed at the time of closing. Although these measures are intended to protect buyers of property from being unaware of aircraft noise, a potential problem is that they can be difficult to enforce.

Fair disclosure regulations can place a serious responsibility on real estate agents and lenders. If the regulations are properly drafted, however, the responsibilities of real estate agents and sellers should be clearly defined and should be limited simply to disclosing the airport noise levels affecting the property and directing buyers to airport officials for more information. It should not be their legal responsibility to explain the meaning of these noise levels nor to predict a buyer's reaction to the noise level.

Another approach to fair disclosure is to require the recording of a fair disclosure agreement and covenant at the time of rezoning or subdivision plat approval. The agreement would require the property owner to disclose the airport noise situation to prospective buyers. As a covenant running with the land, this requirement would bind all future property owners.

A less direct approach to fair disclosure is to require the dedication of avigation easements as a condition of development approval within high-noise areas. The easements become a restriction on the deed to the property that must be revealed at the closing on subsequent sales. A more limited approach to fair disclosure is to require the recording of a notice with the plats of new subdivisions in the noise-impacted area. It would identify the subdivision as potentially impacted by aircraft noise and would advise that local planners and airport officials be contacted for the most recent information about noise levels impacting the property. These approaches have been discussed in the noise overlay zoning and subdivision regulations sections.

Article 1.5 of the California Civil Code establishes strict real estate disclosure standards. It requires the seller to fill out a detailed form regarding the condition of the property and various influences on the property and neighborhood. Among the things that must be disclosed is the presence of any "neighborhood noise problems or nuisances." Presumably, this requirement should apply to aircraft noise that the seller considers troublesome. This requirement, however, is subjective, and does not mandate the disclosure of noise information based on an objective standard. (For example, it does not require disclosure that a property is within a specific noise contour level.) Disclosure is required only if the seller considers noise a problem.

Conclusion: California law establishes certain requirements promoting fair disclosure of airport noise problems, as perceived by a property seller. This law falls short, however, of an air-tight guarantee of the disclosure of airport noise and overflight conditions in areas near an airport. If Oxnard and Ventura County are interested in more complete disclosure, they could amend their general plans to require the recording of fair disclosure agreements and covenants for new development within the 60 CNEL contour or possibly even a larger area considered subject to airport influences.

EXPENDITURE TECHNIQUES

Land use management techniques involving direct expenditures include the following:

- Property Acquisition
- Noise and Avigation Easement Purchase
- Development Rights Acquisition
- Purchase Assurance
- Sales Assistance
- Sound Insulation

These measures are usually considered as a last resort because they are expensive, often disruptive, and sometimes controversial. They are most often justified when aircraft noise impacts are severe and cannot be mitigated through noise abatement alone. These measures are potentially eligible for FAA funding assistance through the noise set-aside of the Airport Improvement Program if they are part of an FAA-approved Part 150 Noise Compatibility Program. In general, these programs can apply only within the 65 CNEL contour based on existing conditions or the five-year forecast condition to be eligible for FAA approval.

Property Acquisition

Acquisition of land and noise-sensitive land uses impacted by high noise levels is one method of ensuring noise compatibility around an airport. The primary intent of acquisition is to prevent incompatible uses from being developed near the airport and to remove residents from severely noise-impacted areas.

Property acquisition is the simplest and most complete way to ensure noise compatibility around an airport. The obvious drawback is its high cost. Land may be bought for noise compatibility by an airport owner, by other public agencies, and by quasi-public agencies such as industrial development corporations. The FAA supports airport ownership of land impacted by noise above 75 CNEL. Acquisition of areas impacted by noise down to 65 CNEL also may be justified to ensure land use compatibility. Property acquisition within the 65 CNEL contour is eligible for funding through the noise set-aside of the Federal Airport Improvement Program. It is often difficult, however, to secure federal grants for acquisition outside the 70 CNEL contour.

Typically, property acquisition needed for noise mitigation is accomplished through voluntary programs. The airport notifies property owners in a given area when it is ready to negotiate the purchase of their land and homes. Property owners are assured that the airport will buy their land, assuming a fair price can be negotiated. Property owners are under no obligation to participate and may decide to remain in their homes.

If Federal funds are used for property acquisition, the airport must comply with the Federal Uniform Relocation Assistance and Real Property Acquisition Act. (See 49 CFR Part 24.) Under these regulations, the fair market value of the home is established through two professional appraisals. The homeowner is also entitled to reimbursement of moving expenses and to compensation for other relocation expenses (such as closing costs and incidental expenses for a new home, and compensation for a higher interest rate on the new mortgage) up to a maximum of $22,500. If the maximum relocation benefit, in addition to the sale price of the home, is not enough to assure the displaced person of acquiring decent, safe, and sanitary housing, additional relocation payments may be available, subject to a case by case review.

In addition to clearing noise-sensitive land uses, property acquisition also can be used to promote the development of compatible uses. Land parcels can be bought, consolidated, and sold or leased for redevelopment of compatible industrial, commercial, and recreational uses. Redevelopment of noise-impacted property can ensure land use compatibility near the airport while promoting economic development. This can involve a full urban renewal or community redevelopment program or the simple sale of land for private development. A large-scale redevelopment program is potentially very complicated, however, and would be successful only if a variety of local conditions are favorable.

At Oxnard Airport, one residential area is a potential candidate for acquisition. This is a small mixed use neighborhood immediately north of the east end of the runway along Teal Club and Little Farms Roads. The homes in this area are exposed to noise from 60 CNEL to over 75 CNEL, as shown in **Exhibit 5C**. The non-residential uses in this area include offices, mini-warehouses, storage areas, and other businesses. The Oxnard General Plan designates this area for future "airport-compatible" development. Given the mixed land use in the area and the General Plan designation, this neighborhood does not appear to have long term viability as a residential area. Acquisition of the homes and relocation of the residents appears to be a reasonable option here.

Table 5A lists the number of dwellings in this area by noise contour. A total of 30 dwelling units and 24 residential buildings are in this area. All but six single-family homes are inside the 65 CNEL contour. Those six are between the 60 and 65 CNEL contours.

FINAL DRAFT – NOT APPROVED BY BOS OR FAA

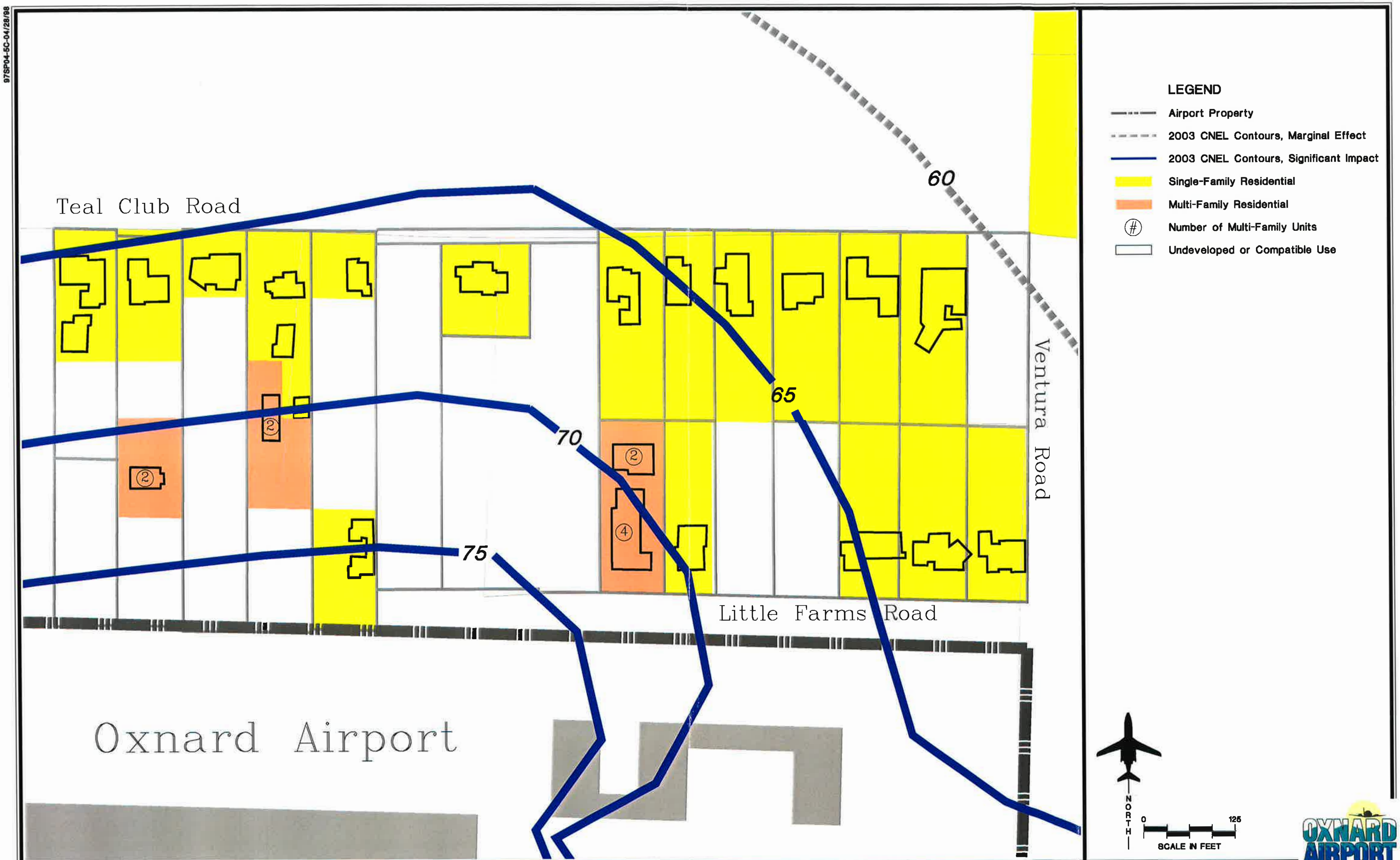


Exhibit 5C
NOISE-IMPACTED HOMES ON TEAL CLUB AND LITTLE FARMS ROADS

TABLE 5A
Noise-Impacted Homes on Teal Club and Little Farms Road

	CNEL Range				
Dwelling Type	**60-65**	**65-70**	**70-75**	**75 and over**	**Total**
Single-family	6	11	2	1	20
Multi-family Dwelling Units	0	2	8	0	10
Multi-family buildings	*0*	*1*	*3*	*0*	*4*
Total Dwelling Units	6	13	10	1	30

In defining the boundaries of an acquisition area, it makes sense to follow recognizable boundaries on the ground, and this philosophy is generally supported by the FAA. The reason is that the acquisition program should not adversely affect the character of the rest of the neighborhood that is not acquired. This prevents the potential for inadvertently damaging the property values of the homes in the remaining part of the neighborhood. In this case, the natural boundaries of the neighborhood lie along Teal Club and Ventura Roads and the airport property to the south. Another option would be to split the neighborhood, acquiring only the homes on Little Farms Road and others immediately north of the airport property. The homes with Teal Club Road frontage could remain. In either of these alternatives, some homes outside the 65 CNEL contour would be involved. The FAA is sympathetic to including some homes in an acquisition area that may be outside the 65 CNEL contour if needed to rationalize the boundaries of the area.

Two alternative property acquisition scenarios are suggested for purposes of discussion. The first involves the acquisition of all residential buildings in the area. The second involves the acquisition of the homes on Little Farms Road and at the south end of the lots fronting on Teal Club Road. The estimated costs of both alternatives are shown in **Table 5B**. Alternative 1, involving 24 residential buildings and 30 dwellings, would cost $6.0 million. Alternative 2, involving 10 residential buildings and 16 dwellings, would cost $2.8 million.

Conclusion: Acquisition of the homes in the Teal Club/Little Farms Road neighborhood by the Ventura County Department of Airports deserves serious consideration. Two alternatives have been developed involving all the homes (Alternative 1) and only the homes abutting airport property (Alternative 2). The costs would range from $2.8 million to $6.0 million. From a planning and redevelopment standpoint, it would be preferable to acquire all the homes, since the entire area is noise-impacted and designated for future airport-compatible use. Alternative 2 merits consideration if fiscal limitations make Alternative 1 impractical.

TABLE 5B
Cost of Residential Acquisition Alternatives

Alternative	Number of Buildings	Number of Dwelling Units	Estimated Cost*
Alternative 1 - Entire Teal Club/Little Farms Road Neighborhood	24	30	$6,000,000
Alternative 2 - Homes on Little Farms Road and South Half of Lots	10	16	$2,800,000

* These are rough estimates and include the cost of acquisition, relocation of residents, and building demolition. The actual value of the buildings would have to be established through professional appraisals.

If this acquisition program is included in the final Noise Compatibility Program, and if it is approved by the FAA, it would be eligible for up to 90 percent FAA funding assistance through the noise set-aside of the Airport Improvement Program.

Since this area already includes several commercial/industrial land uses, the acquired property should be offered for sale and future airport-compatible development if the Department of Airports determines that it is not needed for airport purposes. Any proceeds from the sale of property must be reinvested in other noise abatement and mitigation programs or returned to the FAA.

Sound Insulation

Dwellings and other noise-sensitive buildings can be sound-insulated to reduce interior noise levels. Sound insulation typically can improve the outdoor to indoor noise level reduction of a structure by five to ten decibels. Sound insulation may involve thermal insulation and weatherproofing, the baffling of vents and mail slots, the installation of solid-core wood doors or foam-core steel doors, the installation of acoustical windows with special noise attenuation characteristics, the installation of new interior walls along existing walls, and the installation and use of year-round air conditioning and ventilation systems.

Fresh air circulation systems or air conditioning systems are necessary if the full benefits of sound insulation are to be realized. This enables windows and doors to be closed throughout the year. If air conditioning is to be fully effective for sound insulation, the residents must accept the costs and inconvenience of operating the system until the heating season begins. As an alternative, a forced fresh air circulation system, capable of a complete change of air twice every hour and a 20 percent change of new fresh air every hour, equipped with acoustical baffling or other treatment of the air inlets, would permit closed doors and windows when neither air conditioning nor heating are required. Most forced air heating systems can be adapted to this purpose.

A sound insulation program requires considerable administrative support. Before beginning the program, the administering agency must establish program guidelines, train a technical staff or hire a qualified consultant, offer training to interested contractors, and develop a list of approved contractors.

After the program is underway, each case can become very time-consuming. The success of the program depends on a careful attention to detail. It may involve initial noise monitoring in the dwelling, a write-up of required sound insulation work by a qualified technician, approval of the work write-up by the property owner, selection of a contractor to do the work, inspection of the construction as it progresses, and final inspection of the work.

The FAA will assist in funding sound insulation of noise-sensitive buildings within the 65 CNEL contour if the buildings cannot achieve an outdoor to indoor noise level reduction of 20 decibels or more. (Within the 70 CNEL contour, the noise level reduction threshold increases to 25 decibels, and within the 75 CNEL contour to 30 decibels.) Sound insulation projects must be designed to achieve at least a 5 decibel improvement in noise level reduction. The target is to reduce interior noise levels to 45 CNEL or less. Sometimes, a supplementary criterion is used in actual project design to ensure that interior noise levels from individual overflights not exceed an SEL of 65 dB. (This is an estimate of the average speech interference level.)

Although fresh air ventilation systems are eligible for FAA funding, air conditioning is only partially eligible. FAA will fund the cost of installing air conditioning up to the amount that would have been required to install a fresh air ventilation system. The FAA requires that property owners and residents be notified of the utility and maintenance costs associated with these systems.

A publicly sponsored sound insulation program is most appropriate where many noise-sensitive land uses are impacted by high noise levels and where it is not possible to design a noise abatement program to reduce noise significantly. Sound insulation is particularly appropriate at airports with significant nighttime traffic. Sleep disruption caused by noise can be particularly annoying. At night, residents can conveniently close their windows, turn on their ventilation systems, and enjoy the full benefits of their sound-insulated homes. In other areas where daytime or early evening aircraft noise is a problem, people are more skeptical of sound insulation because noise disrupts their outdoor living as well as indoor activities.

In the Oxnard Airport area, only one neighborhood is impacted by noise above 65 CNEL -- the Teal Club/Little Farms Road area. This neighborhood is a good candidate for acquisition and clearance since it is a mixed commercial-residential area designated in the General Plan for future airport-compatible development. (This is discussed in the preceding section.) Sound insulation does not appear to be an attractive option for this area since the neighborhood's long-term viability is questionable. Furthermore, the Oxnard area is an excellent example of an environment where people highly value their outdoor living. Sound insulation can do nothing to improve this. In fact, sound insulation programs are often criticized by Southern California residents as being irrelevant to a significant part of their concerns with aircraft noise – the disruptions to outdoor living.

The costs of a sound insulation program are potentially significant. Depending on the design of the home, the type of improvements being undertaken, and local construction costs, the cost can range from $15,000 to $40,000 or more per home.

If the County decides to acquire only the homes on Little Farms Road, as discussed in the previous section (Alternative 2), it may wish to consider sound insulation of the remaining homes on Teal Club Road within the 65 CNEL contour. (That would include 10 homes.) Assuming an average sound insulation cost of $25,000 per home, that would cost $250,000. Additional costs would be incurred to administer and implement the program. These are estimated at $100,000, for a total of $350,000.

Conclusion: Sound insulation of homes within the 65 CNEL contour is not an attractive option at Oxnard because the affected neighborhood is a mixed use area which the City has designated in the General Plan for ultimate airport-compatible use. The neighborhood can be expected to have limited long-term viability, gradually converting to commercial/office use. A further concern is the inability of sound insulation to improve the outdoor residential living environment.

Acquisition of Noise and Avigation Easements

Noise and avigation easements would give the airport the right to direct aircraft over the homes, creating related annoyances, without the threat of a lawsuit. The easements would run with the land and would serve as a limited means of notifying prospective property owners of the impact of airport noise. The purchase of noise and avigation easements within the 65 CNEL is eligible for Federal funding assistance through the noise set aside of the Airport Improvement Program. Purchase of noise and avigation easements over existing homes may be appropriate if noise is so disturbing that it substantially interferes with the full enjoyment of the property. It may also be appropriate where, as part of a noise abatement or airport development program, noise is introduced to areas which formerly were not impacted.

The purchase of noise and avigation easements could conceivably be considered in the Teal Club/Little Farms Road area, the only neighborhood impacted by noise above 65 CNEL, as an alternative to property acquisition. As an acquisition of interest in property, easement acquisition is subject to the requirements of the Uniform Relocation Assistance and Real Property Acquisition Act. (See 49 CFR Part 24.) Thus, the value of easements must be determined through professional appraisals. The costs of easement acquisition are very difficult to estimate because of the limited market data available. It is thus difficult to establish a value for easements.

The advantages of purchasing noise and avigation easements include some legal protection for the airport and limited fulfillment of fair disclosure objectives. An additional benefit is that they compensate airport neighbors who have been heavily impacted by noise and who may have lost some of the potential enjoyment of their property. Of course, the purchase of a noise and avigation easement does not mitigate noise, it merely compensates people for the inconvenience caused by noise.

A disadvantage of an avigation easement purchase program is its potentially high cost. Easements generally are valued at a significant proportion of the total home value. For planning purposes only, one can estimate the value of a noise and avigation easement at roughly five percent of the value of the home and lot. There is also a risk that despite the expense of purchasing the easements, the airport may become the target of complaints, controversy, political pressure, and even lawsuits, if the noise environment or the attitude of easement grantors changes substantially.

Conclusion: Acquisition of noise and avigation easements is not an attractive option given the limited benefits to the County Department of Airports and the potentially affected property owners. Other options, particularly acquisition and clearance, are superior for dealing with the affected area.

Purchase Assurance

Purchase assurance programs are intended to assure homeowners in noise-impacted areas that they will be able to sell their property for fair market value. The airport proprietor would acquire the property if the homeowner was unable to sell it on the open market. The airport would then sell the home and retain a noise and avigation easement after, perhaps, making sound insulation or other property improvements.

Purchase assurance programs are most appropriate where there is a widespread concern that homeowners have difficulty selling homes because of noise intrusion. They are appropriate where the noise levels are not so severe as to make the neighborhood unlivable, or where it is impractical or otherwise inappropriate to acquire and clear neighborhoods.

A purchase assurance program allows the airport to address the concerns of people who are very annoyed by aircraft noise and who desire to leave the neighborhood without suffering financial loss. It can be fairly economical as, in many areas, property values do not experience declines because of aircraft noise. Thus, it may be possible for the airport to sell the home at or near the cost of purchase.

Purchase assurance programs can be fairly complex and time-consuming to administer. They also open up the risk that the airport will have to become a property manager or landlord if market conditions make it difficult to sell homes. The program should be carefully staged to prevent a glut of applicants at any one time. Otherwise, an adverse reaction in the larger real estate market could be caused.

Purchase assurance programs are usually intended to address the concerns of people who are highly sensitive to noise and worried about the potential for serious hardship. Program guidelines should be designed to make the program fair without being so attractive that applicants would flood to the program, regardless of their noise sensitivity.

Conclusion: This program is inappropriate in the Oxnard Airport area since the only potentially eligible area, the Teal Club/Little Farms Road area, is a mixed use area with limited long-term viability as a residential neighborhood.

Sales Assistance

With a sales assistance program, the airport would offer to supplement any bona fide purchase offer up to an amount equal to fair market value. These programs are typically structured very much like purchase assurance programs except that the airport never takes title to the property. The airport guarantees the property owner of receiving the appraised value, or some increment thereof, regardless of the final sales value that is negotiated with a buyer. In order to prevent collusion between buyer and seller, to the detriment of the airport, the airport must approve the listing price for the home and any downward adjustments of that price. In return for participation in the program, the airport would require the property owners to give the airport a noise and avigation easement. In other respects, the program guidelines would be similar to those described above for purchase assurance programs.

This program would achieve generally the same objectives as a purchase assurance program and would be somewhat easier to administer, although it would still be complex, requiring considerable commitments of staff time. It lacks the potential, however, to facilitate housing rehabilitation and sound insulation as can the purchase assurance program. One major advantage of sales assistance compared to purchase assurance is that the airport would never take title to the property.

Conclusion: This technique is not particularly appropriate at Oxnard given that the only potentially eligible neighborhood, the Teal Club/Little Farms Road area, is a mixed use area of limited long-term viability which has been designated in the Oxnard General Plan for future airport-compatible use.

Development Rights Acquisition

The ownership of land involves the ownership of a bundle of rights to the use of that land and to develop it to the extent permitted by government regulations such as zoning, health and safety laws, and environmental laws. A property owner can sell some of these rights while still retaining title to the land. For example, a property owner surrenders some of the rights to their property when he or she grants someone an easement or sells the mineral rights to the property. One of the rights a property owner can sell is the right to develop the property for urban uses.

A different legal instrument which has substantially the same effect as the purchase of development rights, is a restrictive land use easement. Purchase of such an easement can extinguish the rights to develop the property, rather than simply transfer them to another owner. This distinction can be important when the intent is to totally prevent the possibility of future development. (Theoretically, one might be able to argue that development rights that have been purchased from a property owner by the government could conceivably be sold back to that property owner at some point in the future.)

The purchase of development rights or a restrictive land use easement is appropriate when there is insufficient legal justification to use zoning to prevent incompatible uses or where there is strong local opposition to the use of zoning. Development rights purchase also can be an alternative to fee simple acquisition. This is especially appropriate where the land is undeveloped and being farmed or used for private recreation.

The extent of the acquired development rights can vary depending on the situation. The chief concern is to acquire the rights to develop noise-sensitive land uses. In some cases, that will be sufficient. The property owner would retain the right to develop the property for commercial and industrial use as well as low intensity uses such as parks, recreation, agriculture, grazing, and forestry. In other cases, it may be appropriate to acquire the rights for commercial and industrial development as well as noise-sensitive development.

The advantage of purchasing development rights is that complete protection from incompatible development can be assured, and the property owners can receive compensation for any perceived loss. In addition, the property can be kept in private ownership, in productive use, and on the tax rolls while protecting the airport from incompatible development. The main disadvantage is the potentially high cost of the development rights, in return for which the buyer receives only a very limited interest in the property. In urbanizing areas where property owners have a reasonable basis for development expectations, development rights can cost nearly as much as the full fee title. In rural areas, on the other hand, development rights can be an economical alternative to fee simple acquisition.

Conclusion: This option is not appropriate at Oxnard. All undeveloped land within the noise contours is currently designated in the Oxnard and Ventura County general plans for compatible uses. In this situation, there is no need to consider the purchase of development rights.

PRELIMINARY PREFERRED LAND USE ALTERNATIVES

Table 5C shows the preliminary preferred list of land use management alternatives. These are to be reviewed by the Planning Advisory Committee, the airport management, and the public. Refinements to these preliminary measures may be necessary before the final plan is developed. In addition, more detailed consideration of the implementation of these recommendations is necessary. It is important that realistic project priorities and timetables be developed so as not to leave area residents with misleading impressions about the pace of implementation.

TABLE 5C
Preliminary Preferred List of Land Use Management Alternatives
Oxnard Airport

Description	Cost	Implementing Agency
General Plan Amendment: Consider adopting a policy that the noise contours to be used for airport compatibility planning in the Oxnard Airport area shall be a composite of the 2003 and 2018 noise contours.	Administrative	City of Oxnard Ventura County
General Plan Amendment: Consider noting that the goal of the City and County is to retain compatible land use designations for undeveloped land within the 60 CNEL contour.	Administrative	City of Oxnard Ventura County
General Plan Amendment: Consider enacting a policy that the "planning reserve" area south of Doris Avenue within 60 CNEL contour will be reserved for airport-compatible uses.	Administrative	City of Oxnard
General Plan Amendment: Consider enacting guidelines specifying noise compatibility criteria for the review of development projects within the 60 CNEL contour.	Administrative	City of Oxnard Ventura County
General Plan Amendment: Consider requiring the recording of fair disclosure agreements and covenants for any new noise-sensitive development approved within the 60 CNEL contour.	Administrative	City of Oxnard Ventura County
Property Acquisition: Consider buying some or all of the homes and multi-family buildings in the Teal Club/Little Farms Road area.	$2,800,000 to $6,000,000	Ventura County Department of Airports

Chapter Six

NOISE COMPATIBILITY PLAN

The Noise Compatibility Plan for Oxnard Airport includes measures to abate aircraft noise, control land development, mitigate the impact of noise on non-compatible land uses, and implement and update the program. F.A.R. Part 150 requires that the plan apply to a period of no less than five years into the future, although it may apply to a longer period if the sponsor so desires. This Noise Compatibility Plan has been developed based on a 20-year planning period.

The objective of the noise compatibility planning process is improve the compatibility between aircraft operations and noise-sensitive land uses in the area, while allowing the airport to continue to serve its role in the community, state, and nation. The Noise Compatibility Plan includes three elements which are aimed at satisfying this objective.

- The **Noise Abatement Element** includes noise abatement measures selected from the alternatives evaluated in Chapter Four, Noise Abatement Alternatives.
- The **Land Use Management Element** includes measures to mitigate or prevent noise impacts on existing noise-impacted land uses and future land use development in the airport environs. Potential land use management techniques were evaluated in Chapter Five, Land Use Alternatives.
- The **Program Management Element** includes procedures and documents

for implementing the recommended noise abatement and land use measures, monitoring the progress of the program, and updating the Noise Compatibility Plan.

Each measure of the Noise Compatibility Plan is summarized in **Table 6E** at the end of the chapter. That table includes a brief description of the noise abatement, land use, and program management measures, the entity responsible for implementing each measure, the cost of each measure, the proposed timing for implementation of the measure, and potential sources of funding.

NOISE ABATEMENT ELEMENT

The recommended noise abatement measures are described in this section.

1. Continue prohibiting formation takeoffs and landings without prior permission from the Director of Airports.

Description. This is an existing policy at Oxnard Airport which promotes both noise abatement and safety. Formation takeoffs and landings produce significantly greater single event noise than do operations by single aircraft. For example, a formation takeoff by two identical aircraft will produce single event noise three decibels louder than a takeoff by a single aircraft. The difference is clearly noticeable by a person with normal hearing.

Implementation Actions. As an existing policy, no specific implementation actions are necessary. The County Department of Airports should continue to reflect this procedure in its policy manuals. Any new pilot guides produced by the Department of Airports should also reflect this policy. The Department also could arrange for publication of this policy in the *Airport / Facility Directory*.

Costs and Funding. Since this is an existing policy, no significant new costs would be involved for the Department of Airports or airport users. The Department would incur administrative costs to disseminate information about the policy and publish a pilot guide.

Timing. This is an existing measure which is recommended to be continued through the future.

2. Continue prohibiting touch-and-go's and stop-and-go's between 8:00 p.m. and 7:00 a.m.

Description. This is an existing policy at Oxnard. It is intended to prevent repetitive landings and takeoffs associated with training and pilot proficiency exercises during especially noise-sensitive hours. These repetitive operations can be annoying to residents directly beneath the traffic pattern and the final approach, especially in the evening and at night when people are trying to relax and sleep in their homes.

Implementation Actions. This procedure should continue to be reflected in airport policy manuals and in future airport pilot guides. The Department of Airports should also ensure that this restriction continues to be published in future editions of the *Airport / Facility Directory*.

Costs and Funding. As an existing procedure, no additional costs would be borne by the Department of Airports or airport users.

Timing. This is an existing procedure which is recommended to continue.

3. Continue prohibiting high power engine run-ups for maintenance between 7:00 p.m. and 7:00 a.m.

Description. This is an existing airport policy which should be continued. Engine maintenance run-ups can be extremely annoying to residents near airports. In some ways, they are inherently more annoying than overflights. Unlike overflights, which increase and then decrease in loudness in a predictable way and over a relatively brief period, run-ups have no predictable pattern. They can sometimes last a very long time compared to overflights. They can be especially annoying in the evening when people are relaxing in their homes and at night and in the early morning when people are trying to sleep.

Implementation Actions. The airport should continue to notify airport users of this restriction through its policy manuals, lease agreements, and in future published pilot guides.

Costs and Funding. As an existing procedure, no additional costs would be borne by airport users or the Department of Airports.

Timing. This is an existing procedure which is recommended to continue.

4. Continue prohibiting Runway 7 departures from midfield intersection (taxiway C).

Description. This is a continuation of an existing noise abatement measure. These operations were prohibited because they can all result in greater aircraft noise in residential areas east of the airport than conventional takeoffs beginning at the runway end. This is a particularly important consideration since residential areas are near the east end of the runway. Takeoffs from taxiway intersections short of the runway end result in aircraft being at lower altitudes east of the airport than they would be normally. This equates to higher noise levels.

Implementation Actions. As an existing policy, no specific implementation actions are required. The Department of Airports should continue to notify pilots of this restriction, noting in future published pilot guides. The local Tower Order should also reflect this policy.

Costs and Funding. Since this is an existing policy, no additional costs would be borne by the users or the air traffic control system. The Department of Airports may incur additional administrative costs for informational efforts.

Timing. This is an existing policy which is recommended to continue.

5. Designate Runway 25 as the calm wind runway.

Description. Currently, Runway 25 is used 90 percent of the time. This means that departures takeoff to the west and landings are made from the east. By directing departures to the west, away from the City, this runway use pattern helps to promote noise abatement. This is because, for most aircraft, departures are noisier than approaches.

This current runway use configuration is used because of the prevailing winds from the west. When winds are strong, aircraft landings and takeoffs must be made into the wind. When winds are light or calm, aircraft can operate in any direction. This policy would establish an official, informal runway use program, designating Runway 25 the "calm wind runway." This means that Runway 25 would be the runway of choice whenever winds are light or calm.

This measure would simply make current operating practice an official program. It would not result in significant operational changes at the Airport. Nevertheless, it is important to note on the official record the importance of this operating configuration for noise abatement.

This runway use program is recommended as an official, "informal" program. See the Glossary and pages 4-4 and 4-5 for an explanation of this terminology.

Implementation Actions. The Department of Airports should coordinate with the local Tower Manager in establishing this policy. The Tower Manager should establish a Tower Order setting forth the runway use program. The Department of Airports should see that the program is published in the *Airport/Facility Directory*. The Department should also note the program in future published pilot guides.

Costs and Funding. Since this will result in little change in airport operations, no additional costs would be borne by aircraft operators. The Airport Traffic Control Tower will incur administrative costs in establishing this policy through a Tower Order. The Department of Airports will incur administrative costs in distributing information about the preferential runway use program.

Timing. This is proposed for implementation in 1999.

6. Direct southbound departures from Runway 25 to fly to the coastline before turning left.

Description. This is intended to avoid overflights of the neighborhoods along the coast just south of the extended runway centerline. While this area is beyond the 60 CNEL noise contours, low-flying overflights can create disturbing single event noise and should be avoided whenever possible.

Implementation Actions. The Department of Airports should inform pilots of this policy through future published pilot guides. The Department should also request the Airport Traffic Control Tower to note this procedure in a Tower Order or in its internal operating policies.

Costs and Funding. Administrative costs would be borne by the Department of Airports and the Airport Traffic Control Tower in implementing this measure. These costs will be covered by the operating budgets of each agency. A very small increase in operating costs would be incurred by operators of southbound aircraft due to slightly greater flying distances.

Timing. This is proposed for implementation in 1999.

7. Promote use of NBAA standard noise abatement departure procedures by jets.

Description. The Department of Airports should actively encourage jet operators to use the National Business Aircraft Association (NBAA) Standard Noise Abatement Departure Procedures or equivalent quiet flying procedures developed by aircraft manufacturers. The NBAA standard procedure involves the management of thrust, flap settings, speed, and climb rate to reduce noise quickly after takeoff. (A complete description of the procedure is in Appendix C.) Several aircraft manufacturers have also developed and published similar procedures specifically for their own aircraft.

Given the small number of business jets using Oxnard, this procedure will not have a great effect on the CNEL noise contours. Nevertheless, it will reduce single event noise from jet departures and should be actively pursued.

Implementation Actions. The Department of Airports should notify pilots of this requested procedure in future airport pilot guides. In addition, signs should be installed on the exit/entrance taxiways requesting this procedure. The Department should prepare materials for posting in pilot lounges which explain the benefits of noise abatement departure procedures. The Department should also distribute through the pilot shops and FBO's copies of the NBAA procedure suitable for inserting into pilot manuals. Copies of the procedures are available from the NBAA.

Costs and Funding. These procedures impose no significant costs on aircraft operators. The Department of Airports would incur costs for publication of pilot guides, posters, and other promotional information. The cost of two signs, one near each runway end, is estimated at $10,000. Up to 90 percent may be eligible for FAA funding through the noise set aside of the Airport Improvement Program. The balance would be covered through the Department of Airports' operating fund.

Timing. This is recommended to be implemented in 1998.

8. Promote use of AOPA Noise Awareness Steps by light single and twin-engine aircraft.

Description. The Aircraft Owners and Pilots Association (AOPA) encourages quiet and neighborly flying by distributing generalized noise abatement procedures for use by propeller aircraft. These "Noise Awareness Steps" have recommendations on how to fly the aircraft, as well as where and when to fly. Most of the steps provide guidance on pilot technique when maneuvering near noise-sensitive areas. The steps also encourage cooperation with the airport staff on noise abatement issues. These procedures are listed in Appendix C of this document.

It is not possible to predict how often these procedures would be used, so it is not possible to quantify the effects of these procedures. Nevertheless, any use of these procedures will help the overall noise conditions around the airport. Consequently, the airport staff should encourage their use.

Implementation Actions. The Department of Airports management should encourage airport users to follow these procedures whenever possible. They should be published in a convenient format for insertion into pilot manuals. They could be included in future published pilot guides, or they could be published separately.

Costs and Funding. No specific costs, other than production and printing of flyers or pilot guides, are involved. The cost of publishing a pilot guide is included in Program Management Measure 3, discussed later in this chapter.

Timing. Implementation should begin in 1998 and should continue on an ongoing basis.

9. Request Part 36 Stage 2 aircraft to avoid takeoffs after 11:00 p.m. and before 6:00 a.m.

Description. This policy is intended to avoid takeoffs by loud jet aircraft late at night and early in the morning. It is proposed as a voluntary measure which the Department of Airports would actively promote. Given the location of residential areas at Oxnard, late night departures by loud aircraft are disruptive regardless of which runway is used. Takeoffs to the east on Runway 7 obviously would create disturbances as aircraft flew over the residential areas east of the airport. Takeoffs to the west would create high noise levels in the residential areas immediately north and south of the east end of the runway as the aircraft apply power to begin the takeoff roll.

Under Federal law, all Stage 2 jets over 75,000 pounds must be retired from the fleet or converted to comply with the quieter Stage 3 standards by the year 2000. Stage 2 jets under 75,000 pounds, however, may continue to operate indefinitely.

This is proposed as an advisory policy for voluntary compliance.

Implementation Actions. The Department of Airports should publicize this policy among members of the flying community. This information should be distributed to all local fixed base operators. The Department should also arrange for notice to be published in the *Airport/Facility Directory* and in the Aircraft Owners and Pilots Association's annual *Airport Directory*. The Department should also note this policy in future published pilot guides.

Costs and Funding. The Department of Airports would incur administrative costs to distribute information about this policy. Operators of jet aircraft who decide to comply with this policy may incur costs involving increased travel time and expense to use alternative airports.

Timing. This is proposed for implementation in 1998.

10. Request aircraft certificated as noisier than 84.7 dBA (L_{max}) on takeoff to avoid use of Airport.

Description. While Oxnard is not used by a large percentage of business jets, it is used on occasion. In the past, some of the jets using the Airport have been among the loudest in the civilian fleet and have caused serious noise complaints. As a suburban airport with close-in residential development and the potential for even more residential development nearby, it would be highly desirable for extremely loud aircraft to avoid use of the airport whenever possible.

The proposed restricted noise level would be based on the estimated A-weighted sound level on takeoff published in FAA Advisory Circular 36-3G (and in future updates of that Circular). These estimated sound levels, expressed using as a maximum sound level – L_{max} – are derived from F.A.R. Part 36 noise certification data for the aircraft. The level of 84.7 decibels was chosen to include the twelve loudest aircraft listed in the circular. **Table 6A** lists the aircraft that would be subject to this policy.

TABLE 6A
Aircraft Subject to Voluntary Restriction on Loud Aircraft
Oxnard Airport

Aircraft	***Engine***	***Max. Takeoff Weight (x 1,000 lbs.)***	***Est. dBA***
IAI 1121 Commodore	CJ610-5	18.50	89.7
IAI 1123 Westwind	CJ610-9	20.70	89.7
Messerschmidt HFB-320 Hansa	CJ610-9	20.30	89.7
Lockheed 1329 Jetstar	JT12A-8	42.00	88.7
Sabreliner Sabre 70	JT12A-8	21.00	87.9
General Dynamics CV-440	R-2800	48.00	86.0
Raytheon HS 125-400A	Viper-522	23.60	85.3
Douglas DC-3	R-1830-90C	25.20	85.0
Raytheon HS 125-3A/R	Viper-522	22.70	84.8
Raytheon HS 125-3A/RA	Viper-522	22.70	84.8
Learjet 23	CJ610-1	12.50	84.7
Sabreliner Sabre 60	JT12A-8	20.10	84.7

Source: Advisory Circular 36-3G, April 2, 1996. U.S. Department of Transportation, Federal Aviation Administration.

Ten of the aircraft subject to the policy are business jets. Two are propeller aircraft, the CV-440 and the DC-3. A number of quieter Stage 2 business jets could continue to operate at the Airport without being subject to this policy. These would include Gulfstream G-IIs, G-IIBs, and G-IIIs, and Lear 24s and 25s.

The Department of Airports also should request operators of loud aircraft for which data are not published in AC 36-3G to provide comparable data. This may be available from the aircraft manufacturer or other sources.

Since this policy would apply to relatively few aircraft which only rarely use the airport, it would not result in any changes to the CNEL noise contours. It would, however, help to avoid some extremely loud and disturbing single events.

This is proposed as an advisory policy for voluntary compliance.

Implementation Actions. The Department of Airports should publicize this policy among members of the flying community. This information should be distributed to all local fixed base operators. The Department should also arrange for notice to be published in the *Airport/Facility Directory* and in the Aircraft Owners and Pilots Association's annual *Airport Directory*. The Department should also note this policy in future published pilot guides.

Costs and Funding. The Department of Airports would incur administrative costs to distribute information about this policy. Operators of aircraft complying with this policy may incur costs involving increased travel time and expense to use alternative airports.

Timing. This is proposed for implementation in 1998.

NOISE CONTOURS

The recommended noise abatement measures do not involve any changes that would alter the existing and projected future noise contours. Thus, the noise contours would remain as they were presented in the baseline noise analysis in Chapters 2 and 3 of the Noise Exposure Maps document. These contours are reproduced in **Exhibits 6A, 6B**, and **6C**.

LAND USE MANAGEMENT ELEMENT

The recommended land use management measures for the Oxnard Airport vicinity are presented below. They are summarized in **Table 6E** at the end of this chapter.

1. Use combined 2003 and 2018 noise contours as basis for noise compatibility planning (Oxnard, Ventura County).

Description. Oxnard and Ventura County should amend their general plans to show the updated noise contours for Oxnard Airport. It is recommended that they use both the 2003 and 2018 noise contours as a basis for noise compatibility planning. This can be accomplished by preparing a combined noise contour, as shown in **Exhibit 6D**. This is justified because the noise contours are subject to change over time as the use of the airport changes. By defining a reasonable "worst case" noise contour for land use planning purposes, the boundaries of the compatible land use planning area can be kept constant over a longer period of time instead of being subject to small variations due to periodic changes in the noise contours.

Implementation Actions. This policy can be established by each jurisdiction (Oxnard and Ventura County) amending their general plans.

Cost and Funding. Adoption of this measure would involve administrative expenses for both Oxnard and Ventura County. These would have to be borne by the operating budgets of each city.

Timing. Amendments to general plans take time to prepare and process. The required general plan amendments are projected for 1999 to 2000.

2. Set 60 CNEL as the threshold for promoting airport-compatible development (Oxnard, Ventura County).

Description. It is recommended that Oxnard and Ventura County amend their general plans to establish 60 CNEL as the threshold for compatible land use planning around the airport. This is desirable to ensure that the airport is adequately buffered by compatible uses and to prevent future residents from locating in areas where noise is liable to be considered disturbing.

Two Technical Information Papers prepared for this study and included in the Noise Exposure Maps documentation provide the rationale for using 60 CNEL as a noise compatibility threshold – *Effects of Noise Exposure*, and *Noise and Land Use Compatibility Guidelines*. Key reasons are summarized here.

- Research on the effects of noise clearly demonstrates that noise of 60 CNEL causes disturbances for a measurable proportion of people in communities.
- Since as long ago as 1974, noise and land use compatibility guidelines developed by U.S. Government agencies and government-sponsored study committees have recognized the potential for adverse noise impacts on residential areas at levels as low as 55 CNEL.
- While land use compatibility guidelines of the Federal government in F.A.R. Part 150 and noise standards established in California law both define 65 CNEL (or DNL) as incompatible with housing, both standards tend to be focused on the effect of noise on *existing housing* and the need for and cost of mitigation actions or special aircraft noise abatement actions.
- Land use compatibility guidelines published by the California Department of Transportation in the 1993 edition of the *Airport Land Use Planning Handbook* advise that in quiet communities, 60 CNEL should be used as the maximum permissible noise level for residential uses. In rural areas, it advises that 55 CNEL may be a justifiable threshold. This guidance was a continuation of recommendations provided in the previous edition of the *Handbook* (1983).
- The 60 CNEL contour has been used by many other communities in California as a threshold for land use compatibility planning.
- In 1992, the Federal Interagency Committee on Noise (FICON) issued a report advising the analysis of noise down to 60 DNL in environmental assessments and impact statements under certain conditions. FICON further recommended that *mitigation actions* were justified and should be taken if the analysis found that the project under study would increase

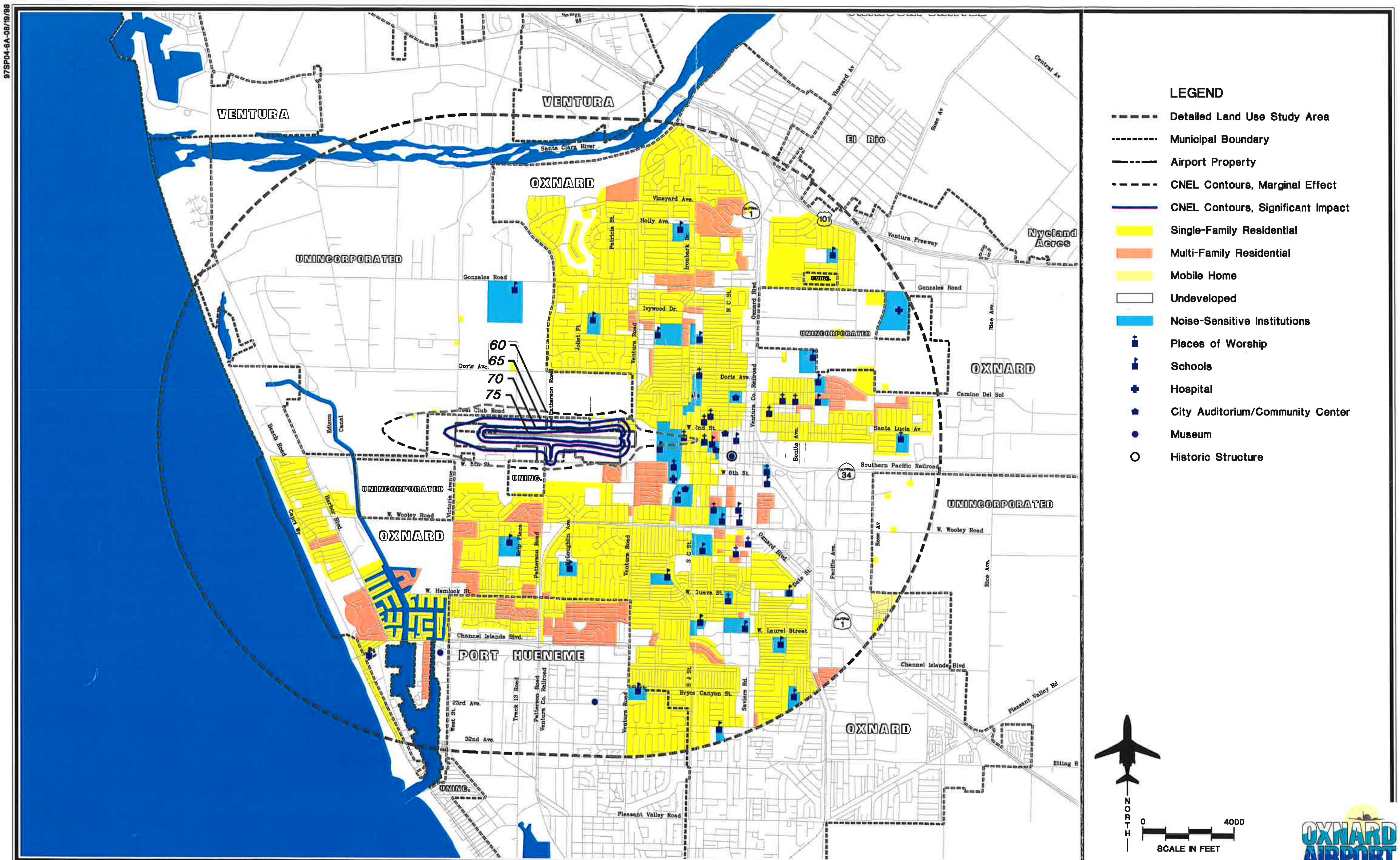


Exhibit 6A
1998 AIRCRAFT NOISE AND LAND USE

FINAL DRAFT – NOT APPROVED BY BOS OR FAA

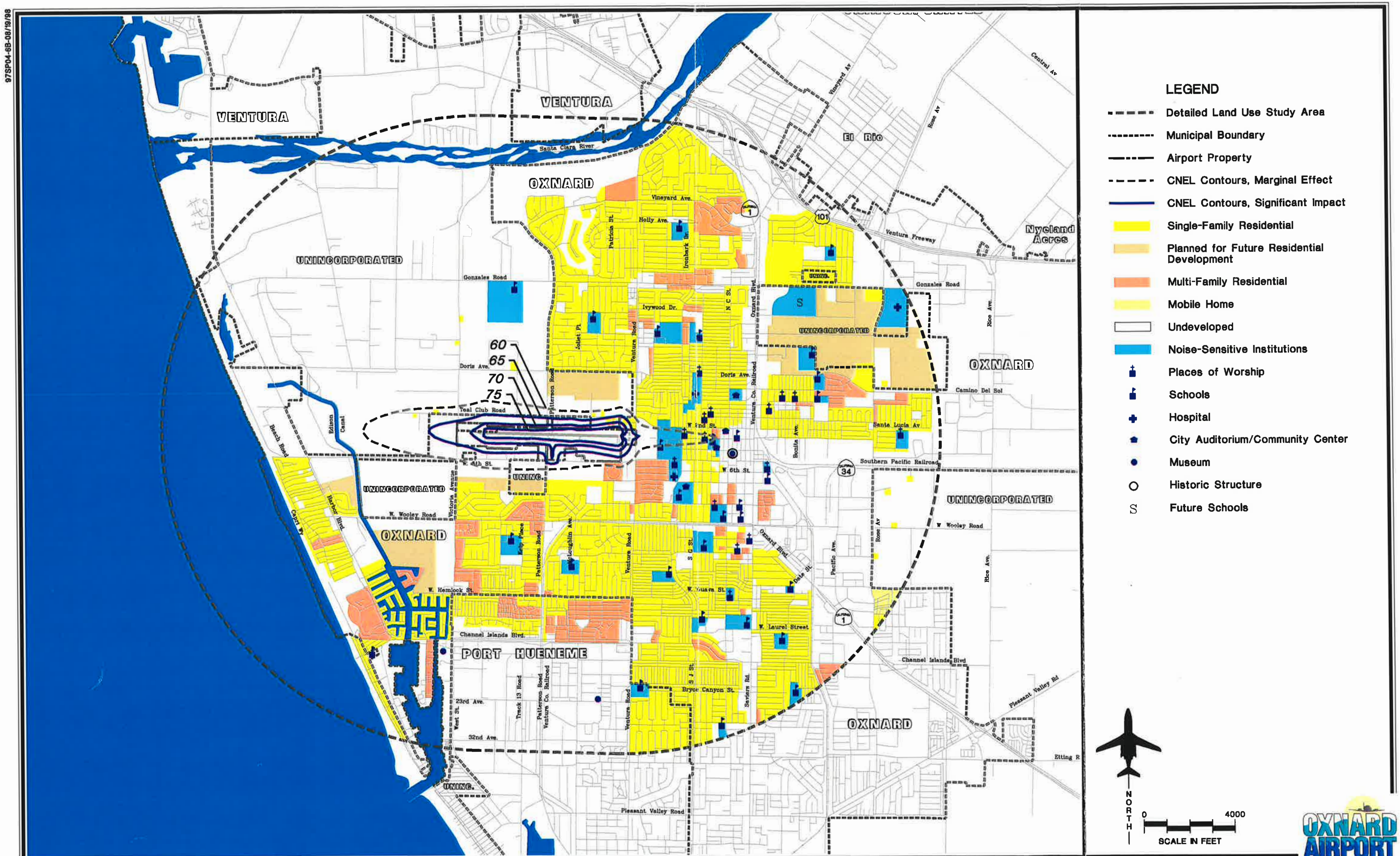


Exhibit 6B
FORECAST AIRCRAFT NOISE AND LAND USE - 2003

FINAL DRAFT – NOT APPROVED BY BOS OR FAA

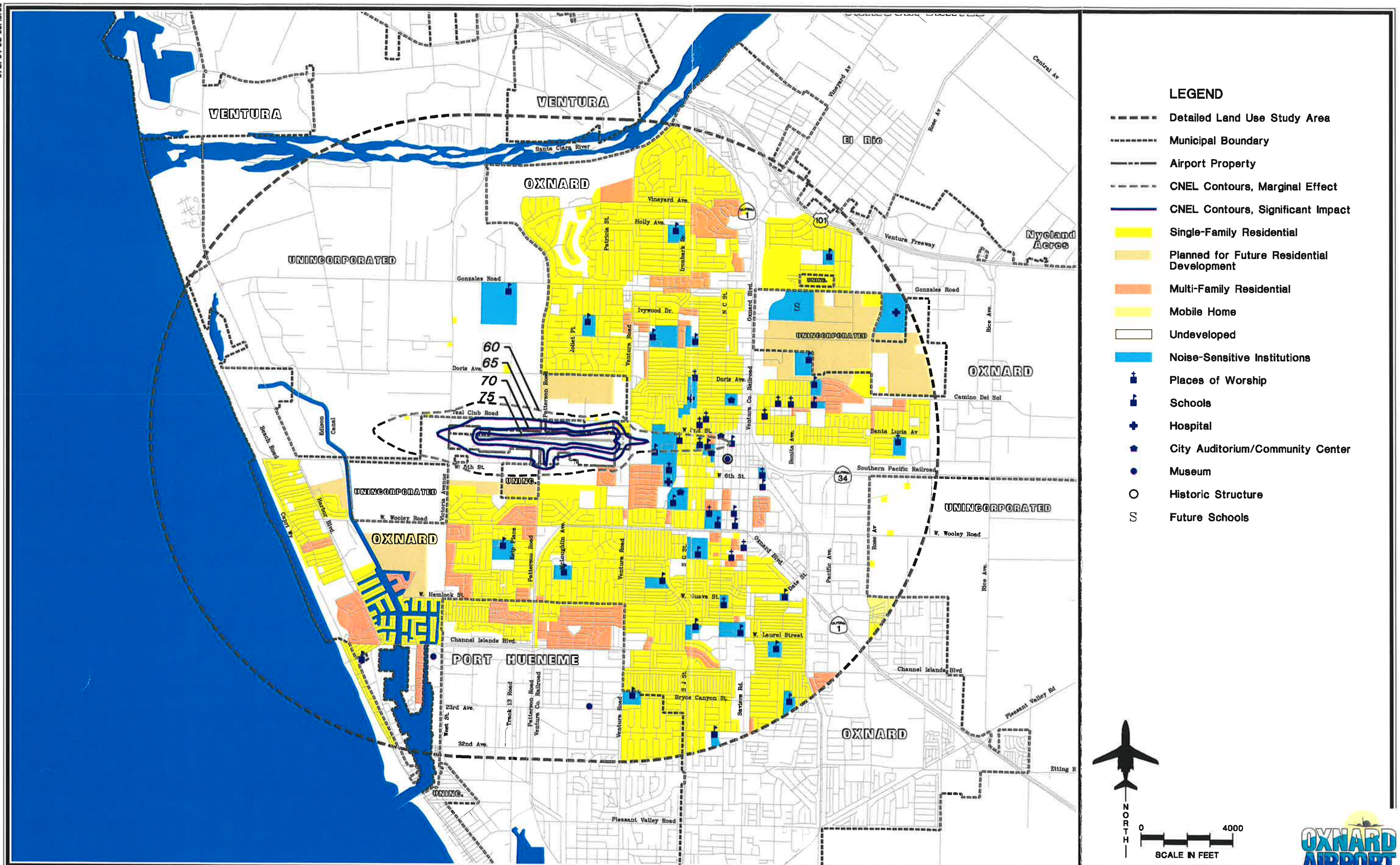


Exhibit 6C

FORECAST AIRCRAFT NOISE AND LAND USE - 2018

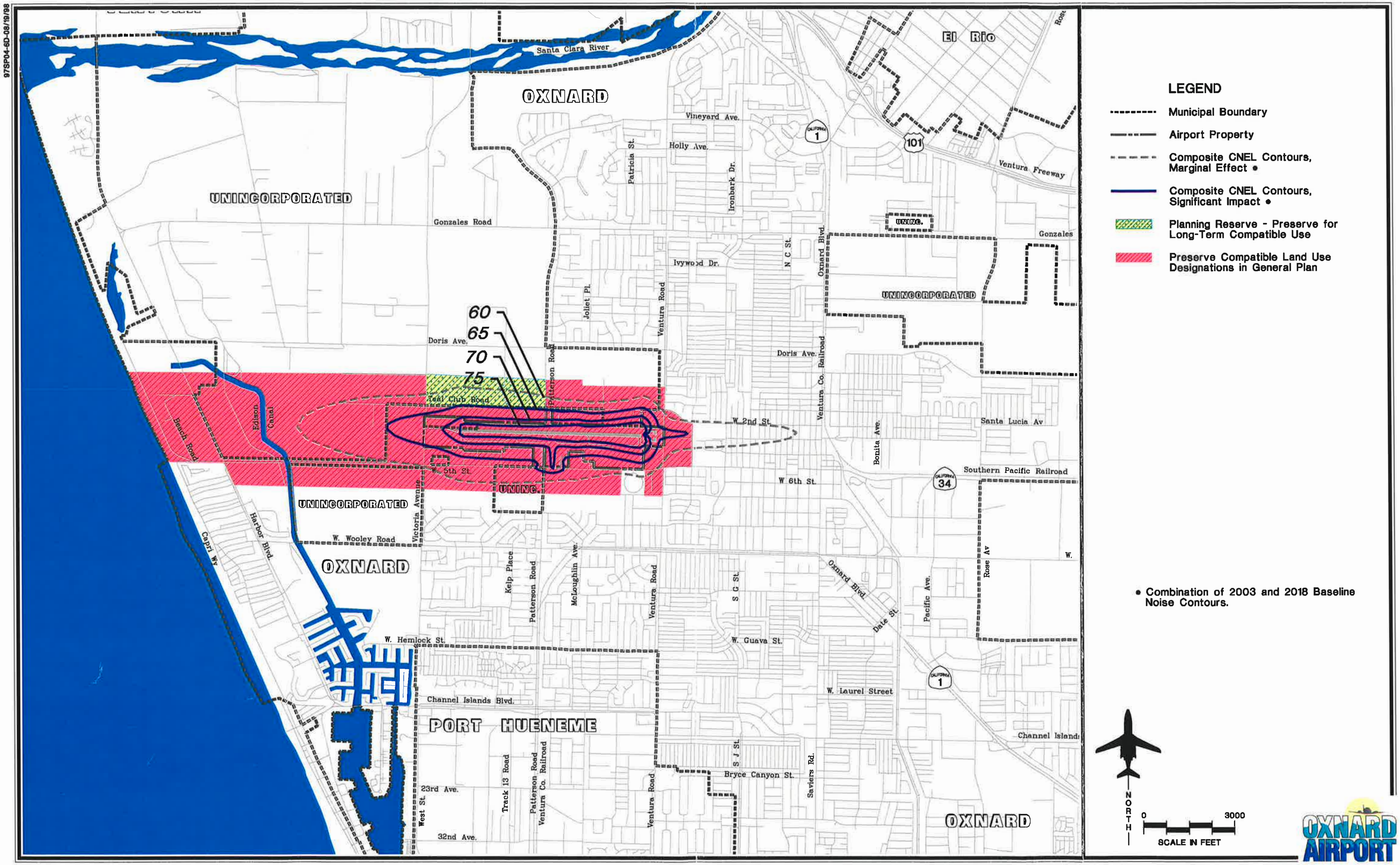


Exhibit 6D
RECOMMENDED LAND USE PLANNING MEASURES

noise by three decibels or more within the 60 DNL contour.

- In 1992, an arbitration proceeding between the Raleigh-Durham International Airport and airport neighbors awarded residents between the 55 and 65 DNL contours compensation for noise damages. This was apparently the first time damages had been awarded below the 65 DNL level in the United States.

- The FAA has acknowledged the importance of promoting compatible land use planning down to the 60 DNL (or CNEL) level. In 1994, the FAA explicitly endorsed a proposal by Fairfax County, Virginia to prohibit new housing within the 60 DNL contour around Dulles International Airport.

- The consultant's experience in noise compatibility studies around the country has revealed that noise complaints around airports of all sizes and in widely different environments are quite common from residential areas exposed to noise well below 65 CNEL. This is true of small general aviation airports, busy general aviation airports used heavily by jets, and large commercial service airports. (Examples airports in each airport category with which the consultant is directly familiar include Glendale and Scottsdale, Arizona; Burbank, California; and Milwaukee, Wisconsin.)

- Experience in Ventura County indicates that local residents exposed to aircraft noise well below 65 CNEL can become quite concerned and file complaints. This situation occurs at both Oxnard and Camarillo Airports.

Implementation Actions. This measure would be implemented through general plan amendments by the City of Oxnard and Ventura County.

Cost and Funding. This measure would involve administrative expenses. Funding would come from the operating budgets of each jurisdiction.

Timing. For planning purposes, implementation is projected for 1999 to 2000 to allow time for preparation and processing of the amendments.

3. Preserve existing airport-compatible land use designations within 60 CNEL and west to the coastline (Oxnard, Ventura County).

Description. This land use measure is closely related to Land Use Measure 2. The general plans of the City of Oxnard and Ventura County currently designate most of the area within the 60 CNEL contour and the land west of the airport to the coastline for airport-compatible uses. The City and County should retain compatible land use designations in these areas. **Exhibit 6D** shows the areas where this policy is proposed to apply.

The area between the 60 CNEL contour and the coast is important to preserve for compatible uses because low aircraft overflights routinely occur in this area. Single event noise in this area can be extremely loud. This policy should conveniently mesh with the current and planned uses of the land in this area. Most of the land is currently designated as part of the San Buenaventura-Oxnard Greenbelt. The area on the coast is occupied by park and industrial uses.

Implementation Actions. Since this would involve a continuation of current land use planning policy, no specific implementation actions would be absolutely necessary. It would be helpful, however, if the City of Oxnard and Ventura County would amend their general plans to point out the importance of ensuring long-term land use compatibility in this area.

Cost and Funding. This measure would involve administrative expenses if the City and County decide to amend their general plans. Funding would come from the operating budgets of each jurisdiction.

Timing. This is an ongoing effort. If Oxnard and Ventura County decide to amend their general plans, this would be projected for 1999 to 2000.

4. Designate the "planning reserve" area north of Teal Club Road between Victoria and Patterson for airport-compatible development (Oxnard).

Description. This area, shown on **Exhibit 6D,** is currently designated in the *Oxnard General Plan* as a "planning reserve" area. This means that the City anticipates using the area for urban development in the relatively distant future, but that it is premature to designate future land uses for the site. This measure would involve designating the area for future airport-compatible development. There is no need to be more specific than that at this time. It is important, however, to clearly state that the land should be considered off limits for future residential development. As shown in **Exhibit 6D**, most of the area is within the 60 CNEL contour.

Implementation Actions. This will require an amendment to the *Oxnard General Plan*.

Cost and Funding. This measure would involve administrative expenses. Funding would come from the operating budget of the City of Oxnard.

Timing. For planning purposes, action on this measure is projected for 1999 to 2000 to allow time for preparation and processing of plan amendments.

5. Establish noise compatibility guidelines for the review of development projects within the 60 CNEL contour and the "compatible land use preservation area" (Oxnard, Ventura County).

Description. This policy is proposed to apply throughout the 60 CNEL contour and the area shown in **Exhibit 6D** where airport-compatible land use designations should be preserved. Situations may arise from time to time where proposals are filed for development within those areas. The adoption of special project review criteria, specifically addressing airport land use compatibility needs, would help provide guidance to land use decision-makers as they review project proposals.

The following project review criteria should be included in the local general plans or as checklists for consideration of local planners, planning commissions, and governing bodies. These criteria are specifically suggested for use in reviewing general plan amendment, planned development, rezoning, special use, conditional use and variance applications within the compatible land use preservation area.

A. Determine whether the subject land use is "noise-sensitive." Land uses defined as not compatible with aircraft noise between 65 and 80 CNEL in the Federal Aviation Administration's land use compatibility guidelines shall be considered "noise-sensitive." (See Exhibit 3A in Chapter Three of the Noise Exposure Maps document.)

B. Advise the County Department of Airports of development proposals involving noise-sensitive land uses within the 60 CNEL contour and the compatible land use preservation area.

C. If possible, locate noise-sensitive public facilities outside the 60 CNEL contour and the compatible land use preservation area. Otherwise, encourage the buildings to be constructed to achieve an outdoor-to-indoor noise level reduction of at least 25 dBA.

D. Discourage the approval of general plan amendments, rezonings, exceptions, special uses, conditional uses, and variances that introduce noise-sensitive development into the 60 CNEL contour and the compatible land use preservation area.

E. Where noise-sensitive development within the 60 CNEL and the compatible land use preservation area must be permitted, require the recording of fair disclosure agreements and covenants. These agreements and covenants would require that property owners inform buyers of the presence of the airport and the potential for annoyances, including noise. The covenant would run with the land, binding all future property owners to make the same disclosure. (A model fair disclosure agreement is in Appendix C.)

F. Where noise-sensitive development within the 60 CNEL and the compatible land use preservation area must be permitted, encourage developers to incorporate the following measures into their site designs:

(1) Where noise-sensitive uses will be inside a mixed use building, locate noise-sensitive activities on the side of the building opposite the airport or, if the building is beneath a flight track, opposite the prevailing direction of aircraft flight.

(2) Where noise-sensitive uses are part of a larger mixed use development, use the height and orientation of compatible uses, and the height and orientation of landscape features such as natural hills, ravines and manmade berms, to shield noise-sensitive uses from ground noise generated at the airport.

Implementation Actions. The City of Oxnard and Ventura County would adopt these project review criteria either through general plan amendments.

Cost and Funding. This measure would involve administrative expenses. Funding would come from the operating budgets of each jurisdiction.

Timing. For planning purposes, this is projected for 1999 to 2000 to allow time for the preparation and processing of general plan amendments.

6. Purchase dwelling units on Little Farms Road (Ventura County Department of Airports).

Description. Several single-family houses and apartment buildings on Little Farms Road north of the east end of Runway 7-25 are exposed to noise above 70 CNEL. This is a mixed use area with a combination of residential and commercial/industrial land uses. The *Oxnard General Plan* designates the area for future airport-compatible development. Noise levels in this area are great enough that some form of mitigation should be offered to residents. Given the mixed use nature of the area and the City's future land use designation, property acquisition, relocation of the residents, and removal of the dwellings is the most justifiable action.

Exhibit 6E shows the area proposed for acquisition. It includes the dwellings closest to the airport – those fronting on Little Farms Road and those on the south half of the deep lots west of Little Farms Road. It includes one single-family house in the 75 CNEL contour, two single-family houses and three apartment buildings (with eight units) within the 70 to 75 CNEL range, one house and one duplex between 65 and 70 CNEL, and two houses between the 60 and 65 CNEL contours. This was considered a logical boundary for the acquisition program that would not cause adverse visual impacts on the homes remaining in the neighborhood. While the acquisition of property outside the 65 CNEL contour for noise mitigation is not normally eligible for funding assistance through the Airport Improvement Program's noise set-aside,

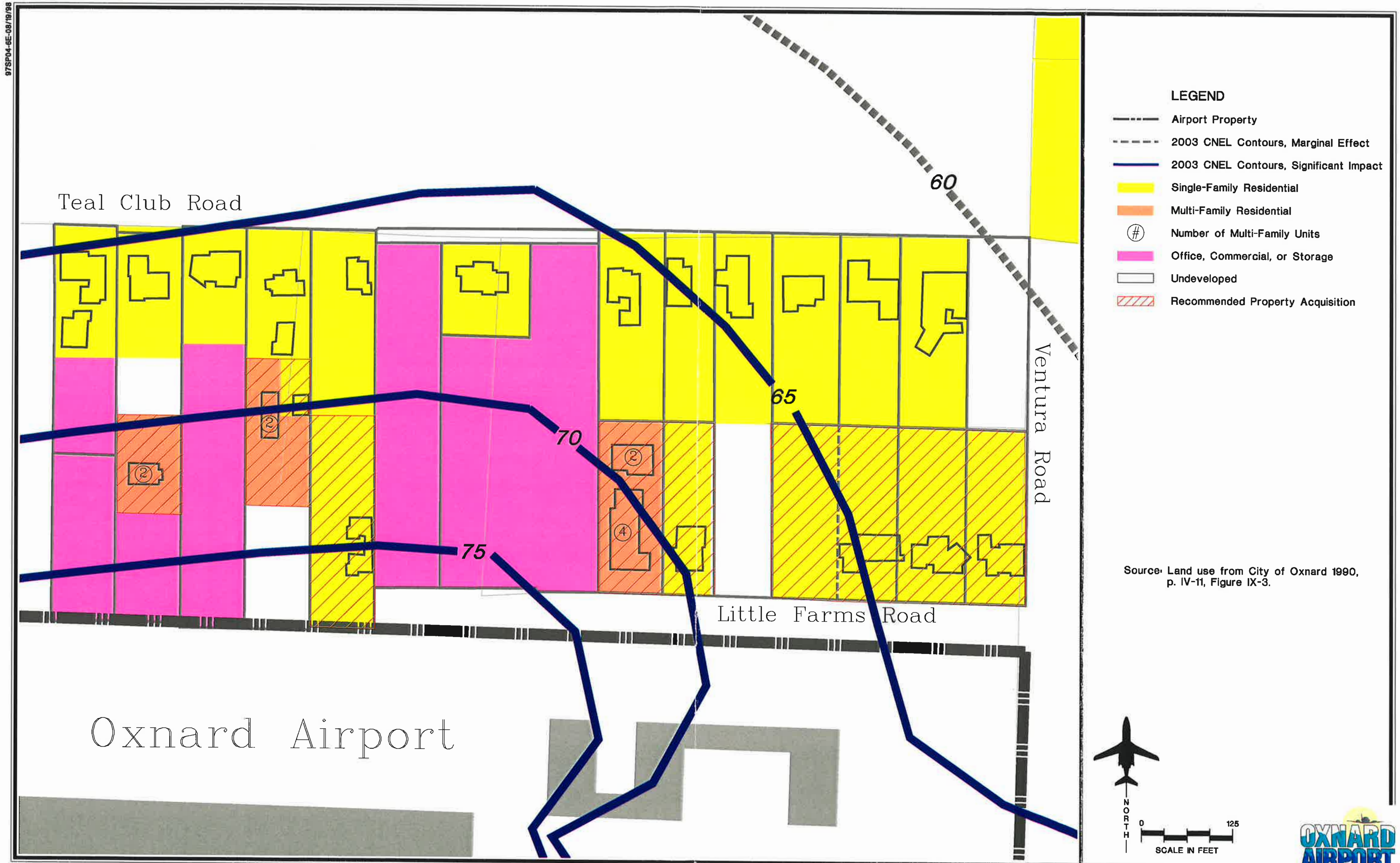


Exhibit 6E
RECOMMENDED PROPERTY ACQUISITION ON LITTLE FARMS ROAD

exceptions are made in cases where the acquisition is necessary to ensure that property owners are not adversely affected by the purchase and removal of homes in their neighborhoods. In this case, residents of the two homes on Little Farms Road outside the 65 CNEL contour would suffer from the change in the immediate area caused by removal of the dwellings and redevelopment of the property for compatible uses. For the sake of equity, they should also be given the opportunity to sell their houses to the Department of Airports if they so wish.

Since it is anticipated that the acquisition program would use Federal funding through the Airport Improvement Program, the requirements of the Uniform Relocation and Real Property Acquisition Act would have to be followed. This requires that the value of the property be established through two professional appraisals, that residents and property owners be assisted in finding replacement housing that is substantially the same as the purchased property, and that moving and relocation expenses be provided to residents and property owners.

This is proposed as a voluntary program. Property owners should be given the opportunity to participate, at their option, when the Department of Airports has enough funding to begin the program. Property acquired through the program should be held for airport-related development, if needed, or sold for commercial/industrial development. Any proceeds from sale or lease of the property would have to be returned to the Federal government or reinvested in other noise abatement and mitigation programs at the airport.

Implementation Actions. This program would be implemented by the County Department of Airports. After approval of the Noise Compatibility Program by the FAA, the Department should apply for a grant to purchase some or all of this property. It should produce and distribute materials clearly explaining the program to local residents. It may wish to seek professional assistance in explaining the requirements of the Uniform Act, as residents will undoubtedly have many questions about their rights and protections. This may be available through other County departments or through consultants. The County should then initiate appraisals and negotiations with interested property owners.

Cost and Funding. Total costs of property acquisition, demolition, and relocation assistance are estimated at $2,800,000 for this project. The Department of Airports will seek funding assistance through the noise set-aside of the Airport Improvement Program administered by the Federal Aviation Administration. It would be eligible for up to 90 percent funding. The local match would be provided through the capital budget of the County Department of Airports.

Timing. This is proposed for implementation whenever funding becomes available. For planning purposes only, this is projected for 2000 to 2002.

PROGRAM MANAGEMENT ELEMENT

The success of the Noise Compatibility Program requires a continuing effort to monitor compliance and identify new or unanticipated problems and changing conditions. Six program management measures are recommended at Oxnard Airport. The Ventura County Department of Airports is responsible for implementing these measures. They are discussed below and summarized in **Table 6E**.

1. Maintain system for receiving, analyzing, and responding to noise complaints.

Description. The airport has a system of recording and responding to noise complaints. In addition to recording and filing complaints, it is important for the airport management to respond to complaints, even if it is not possible to take remedial action. The airport management should map the noise complaints to see if any geographic patterns emerge which may deserve special attention.

Complaints are only an imperfect indicator of noise problems. The tendency of an individual to file a complaint depends on many personal variables including socioeconomic status, housing tenure, sensitivity to noise, feelings about the aviation industry, and expectations about overall neighborhood livability. Recognizing that complaints are limited in their ability clearly to reveal the existence and scope of noise problems, the staff should nevertheless periodically analyze the complaint records. If the geographic pattern of complaints, or the causes of complaints, indicate that consistent problems exist, the airport management should investigate and, if possible, seek corrective action.

Implementation Actions. This is an existing activity. No special implementation efforts are required.

Cost and Funding. This will involve administrative costs financed through the airport operating budget.

Timing. This is an ongoing activity that should be continued.

2. Review Noise Compatibility Plan implementation.

Description. The Department of Airports must monitor compliance with the Noise Abatement Element. This will involve checking periodically with the air traffic control manager regarding compliance with the procedures. Where appropriate, the airport management also should check occasionally with airport users. This is especially appropriate in checking on compliance with the NBAA standard noise abatement departure procedure (Noise Abatement Measure 7).

The airport management should develop informational and promotional materials explaining the noise abatement program to pilots. These materials should include an updated pilot guide, a detailed description of the NBAA standard noise abatement departure procedures, and an explanation of AOPA's noise awareness steps. These materials should be prepared in a format allowing for insertion into a standard Jeppesen manual. The airport management also could print a series of eye-catching posters for display in pilot lounges and at the FBOs explaining different aspects of the noise abatement program.

It may be necessary from time to time to arrange for noise monitoring, noise modeling, or flight track analysis to study issues that may arise in the future.

The Department of Airports also should maintain communications with Oxnard and Ventura County planning officials to follow their progress in implementing the relevant measures of the Land Use Management Element.

Implementation Actions. The administrative actions discussed above in the "Description" will be necessary.

Costs and Funding. This measure will require considerable administrative time and staff support. Expenditures for posters, promotional materials, and special noise monitoring or modeling studies could be necessary from time to time. For budgeting purposes, this cost is estimated at $30,000 every three years. This would be covered through the airport operating budget.

Timing. This is an ongoing activity that should begin as soon as the Noise Compatibility Program is approved.

3. Publish a pilot guide.

Description. A pilot guide describing airport noise abatement information should be prepared for wide distribution to pilots using Oxnard Airport. The guide should include an aerial photo showing the airport and the surrounding area, pointing out noise-sensitive land uses and preferred noise abatement procedures. It could also include other information about the airport that pilots would find useful. The guide should be suitable for insertion into a Jeppesen manual so that pilots will be able to conveniently use it.

The Department of Airports should distribute copies to all owners of aircraft based at the airport and to the fixed base operators so they can offer them to transient pilots.

Implementation. The Department of Airports is responsible for arranging for publication of a pilot guide.

Cost and Funding. The cost of a pilot guide is estimated at $5,000. It is currently budgeted as part of this F.A.R. Part 150 Study.

Timing. Publication of a pilot guide is planned for 1998.

4. Update Noise Exposure Maps and Noise Compatibility Program.

Description. The Department of Airports should review the Noise

Compatibility Plan (NCP) and consider revisions and refinements as necessary. A complete plan update will be needed periodically to respond to changing conditions in the local area and in the aviation industry. This can be anticipated every five to ten years. An update may be needed sooner, however, if major changes occur. An update may not be needed until later if conditions at the airport and in the surrounding area remain stable.

Proposed changes to the NCP should be reviewed by the FAA and all affected aircraft operators and local agencies. Proposed changes should be submitted to the FAA for approval after local consultation and a public hearing to comply with F.A.R. Part 150.

Even if the NCP does not need to be updated, it may become necessary to update the Noise Exposure Maps (NEMs). F.A.R. Part 150 requires the NEMs to be updated if any change in the operation of the airport would create a substantial, new non-compatible use. The FAA interprets this to mean an increase in noise levels of 1.5 CNEL or more, above 65 CNEL, over non-compatible areas that had formerly been compatible.

As a rule of thumb, the trigger for determining the need for contour updating is a 17 percent change in equivalent operations by the loudest aircraft regularly using the airport. To calculate "equivalent operations," any nighttime operations, (between 10:00 p.m. and 7:00 a.m.) must be multiplied by ten and added to daytime operations.

Implementation Actions. No specific implementation actions, other than those discussed above, are required.

Cost and Funding. Costs of a complete update of the Noise Compatibility Program are estimated at $225,000. This would be eligible for up to 90 percent funding from the FAA. The County Department of Airports would be responsible for remaining 10 percent. This would come from the airport operating budget.

Timing. This should be done as necessary. Updates are typically needed every five to ten years, depending on how much change occurs at the airport and in the local area. For planning purposes, two updates can be expected over the next 20 years.

5. Install noise and flight track monitoring system.

Description. The County should install a permanent noise monitoring and flight track data collection system for the airport. The system would include six permanent noise monitors, a system for collecting and processing flight track data, a central computer system, and related software.

The noise monitoring system would serve the following primary purposes.

- To monitor noise levels for comparison with predictions of the Integrated Noise Model made in the F.A.R. Part 150 Study.

- To monitor the degree to which the following noise abatement measures of the NCP are observed:

  Nighttime restrictions on touch-and-go's and stop-and-go's;

  Preferential runway use program;

  Runway 25 departures flying to the coast before turning left;

  Use of NBAA noise abatement departure procedures;

  Avoidance of nighttime takeoffs by Stage 2 aircraft;

  Avoidance of use of the airport by aircraft certificated as noisier than 84.7 dBA on takeoff.

- To provide data to assist in investigating and responding to noise complaints.

The system could also be used as an educational device. The Department could work with local aircraft operators to provide demonstrations of the effectiveness of various noise abatement measures, including NBAA noise abatement departure procedures and the AOPA noise awareness steps.

Six monitors should be located around the airport -- two or three on the east side and three or four on the west side. Suitable sites would be selected to monitor noise from approaches and departures along the runway centerline and under the departure paths most commonly used by larger aircraft.

The flight track monitoring system is necessary to enable noise events recorded by the noise monitors to be correlated with specific flights and aircraft types. If possible, the flight track system should be tied into the radar system at the Point Mugu radar air traffic control facility (RATCF). If this is not possible, the Department of Airports should consider acquiring a passive radar detection system, such as the PASSUR system developed by Bruel & Kjaer.

Implementation Actions: When the Department of Airports has the funding and is ready to begin the process of acquiring the noise monitoring system, it should secure the services of an acoustical engineer to assist in developing detailed system specifications and preparing a request for proposals from qualified suppliers. The acoustical engineer should help the airport staff in reviewing proposals, selecting the preferred firm, and overseeing installation. Various system manufacturers and providers are listed in Appendix C.

Cost and Funding. Costs of the system are listed in **Table 6B**. Each noise monitor will cost approximately $25,000, including mounting, anchoring, and weather protection equipment, and installation. The flight tracking system will cost approximately $150,000. A computer, peripherals, and communications equipment will cost approximately $50,000. Software for processing and linking the noise monitoring and flight track data will cost roughly $150,000. For planning purposes, a 25 percent factor for contingencies has been projected.

TABLE 6B
Estimated Costs of Permanent Noise and Flight Track Monitoring System
Oxnard Airport

System Components	Number of Units	Unit Cost	Cost
INITIAL INSTALLATION COSTS			
Noise Monitors	6	$25,000	$150,000
Flight Tracking System	1	$150,000	$150,000
Computer, Communications, and Peripherals	1	$50,000	$50,000
Software	1	$150,000	$150,000
Subtotal			*$500,000*
Contingencies (25%)			$125,000
Total Initial Cost			***$625,000***
ANNUAL OPERATING AND MAINTENANCE COSTS			
Software Support	1	$40,000	$40,000
Computer and Communications Service Agreement	1	$8,000	$8,000
Noise Monitor Recalibration	6	$1,500	$9,000
Staff – Salary and Benefits for Experienced Professional	1	$75,000	$75,000
Subtotal			*$132,000*
Contingencies (25%)			$33,000
Total Annual O&M Costs			***$165,000***

Source: Coffman Associates analysis. Based on interviews with hardware and software providers. A list of providers is in Appendix C.

Acquisition of the noise monitors would be eligible for Federal funding through the noise set-aside of the Airport Improvement Program. This would cover up to 90 percent of the costs. The balance would be covered through the airport capital budget.

The proper use of noise monitoring equipment and the proper interpretation of data takes considerable time and expertise. Annual operating and maintenance costs are estimated at $165,000. This includes a software support contract, a computer service agreement, regular recalibration of the noise monitors, and a full-time staff position for an experienced professional.

Timing. Installation of the system will depend on the availability of funding. For planning purposes, this is projected for the year 2000.

6. Prepare annual noise monitoring and modeling report.

Description. The County Department of Airports should prepare regular reports for the Airport Authority on the data collected with the monitoring system. These reports should be prepared at least annually and could be modeled on the quarterly reports prepared in accordance with State law by airports in California with statutorily defined "noise problems." The report would summarize the data developed by the noise monitoring system over the year, in terms of CNEL and possibly other summary noise metrics. Seasonal summaries could be provided if that would reveal interesting patterns of variation. Summaries of the flight track data could also be presented. Updated noise modeling could also be done to show how the activity over the past year is reflected in the average annual CNEL noise contours. The monitoring data would provide a source of information for validating the noise modeling.

The report should also discuss findings with respect to implementation of the noise abatement recommendations of the Noise Compatibility Plan. If desired, the annual report could also summarize noise complaints received during the year and the investigation and disposition of those complaints.

Implementation. The Department of Airports would be responsible for producing this report. It may be able to handle this with the staff person assigned to manage the system, depending on how time-consuming the regular duties become. The Department may also wish to use the services of a consultant to provide an independent look at the actual data and the data collection and management systems in place at the airport.

Cost and Funding. The cost of producing this study is estimated at $40,000 per year. The costs could be less depending on the exact scope of work and the level of detail desired. It would be covered through the operating budget of the Department of Airports.

Timing. This is an ongoing activity which should commence after the noise and flight track monitoring system has been in service for several months. This is projected to begin in the year 2001.

RESIDUAL NOISE IMPACTS

Table 6C shows the number of dwelling units exposed to noise for baseline conditions and after implementation of the Noise Compatibility Plan, specifically the proposed acquisition of dwellings on Little Farms Road. A total of 16 units are proposed for acquisition, including all 13 exposed to noise above 70 CNEL, one between 65 and 70 CNEL, and two between 60 and 65 CNEL. This will leave 11 homes exposed to noise above 65 CNEL in both the years 2003 and 2018. This compares to 22 in 1998.

In the year 2003, 50 homes would be exposed to noise above 60 CNEL and in the year 2018, 96 homes.

TABLE 6C
Dwelling Units Exposed to Noise With Noise Compatibility Plan Versus Baseline Conditions

	Baseline Noise (Without Plan)			With Noise Compatibility Plan	
	1998	**2003**	**2018**	**2003**	**2018**
60-65 CNEL	21	54	87	52	85
65-70 CNEL	15	12	12	11	11
70-75 CNEL	6	12	12	0	0
75+ CNEL	1	1	1	0	0
Total Above 60	43	79	112	63	96
Total Above 65	22	25	25	11	11

Source: Coffman Associates analysis.

Table 6D shows the population exposed to noise with implementation of the Noise Compatibility Plan in comparison with baseline conditions. With the purchase of 16 dwelling units, approximately 58 persons would be removed from the noise contours, including 47 above 70 CNEL, four between 65 and 70 CNEL, and seven between 60 and 65 CNEL in both the years 2003 and 2018. In both years, the total population exposed to noise above 65 CNEL would be 39, compared with 79 in 1998 and 90 for baseline 2003 and 2018 conditions. The level-weighted population exposed to noise above 65 CNEL would be 15 in 2003 and 2018 with the Plan, compared to 39 in 1998 and 47 in 2003 and 2018 without the Plan.

The population exposed to noise above 60 CNEL would be 225 in 2003 and 343 in 2018. This compares with 154 in 1998. For baseline conditions without the Plan, the numbers are 283 in 2003 and 401 in 2018.

The level-weighted population figures show an even greater improvement since the reduction in population with the Plan would be greatest in the highest noise contours. The level-weighted population within the 60 CNEL contours would be 53 in 2003 and 77 in 2018 with the Plan. This compares to 53 in 1998, 87 in 2003, and 111 in 2018 for baseline conditions without the Plan.

TABLE 6D
Population Exposed to Noise
With Noise Compatibility Plan Versus Baseline Conditions

	Baseline Noise (Without Plan)			With Noise Compatibility Plan	
	1998	2003	2018	2003	2018
60-65 CNEL	75	193	311	186	304
65-70 CNEL	54	43	43	39	39
70-75 CNEL	21	43	43	0	0
75+ CNEL	4	4	4	0	0
Total Above 60	154	283	401	225	343
Total Above 65	79	90	90	39	39
LWP[1] Above 60	53	87	111	53	77
LWP[1] Above 65	39	47	47	15	15

[1] LWP - level-weighted population is an estimated of the number of people actually annoyed by noise. The actual population within each 5 CNEL range is multiplied by the appropriate response factor to compute LWP. The factors are: 60-65 CNEL - .205; 65-70 CNEL - .376; 70-75 CNEL - .644; 75+ CNEL - 1.00. See the Technical Information Paper, **Measuring the Impact of Noise on People**.

Source: Coffman Associates analysis.

SUMMARY

The Noise Compatibility Plan for Oxnard Airport is summarized in **Table 6E** on the next page. The total cost of the program is estimated at $7,925,000. Most of the costs are related to the installation and use of a permanent noise and flight track monitoring system. These include $625,000 for initial installation of the system, $3,135,000 for operation and maintenance of the system over 19 years, and $720,000 for annual reports on the data collected through the monitoring system over 18 years. Other significant costs in include residential property acquisition ($2,800,000), future updates of the Plan ($450,000) and miscellaneous special studies that may be needed to assist with monitoring Plan implementation ($180,000).

Most of the cost ($4,080,500) would be covered through the County's airport operating budget. Forty-four percent of the cost ($3,501,000) would be eligible for FAA funding through the noise set-aside of the Federal Airport Improvement Program. Four percent ($343,500) would be covered through the County's airport capital budget.

The recommended noise abatement measures can reduce disturbing single event noise in the area. The Noise Compatibility Plan also can reduce the number of people exposed to aircraft noise through the proposed residential acquisition program. The land use planning measures also can help to limit the potential for future noise-sensitive development in the airport area. Continuing program management will provide for a timely response to conditions that may change over time and require a re-evaluation of future noise conditions. While the airport management must provide leadership and coordination of the entire program, success hinges on the cooperation of all involved parties.

TABLE 6E
Summary of Noise Compatibility Plan, 1998-2018
Oxnard Airport

Measure	Cost to Airport or Government	Direct Cost to Users[1]	Timing	Lead Responsibility[2]	Potential Funding Sources
NOISE ABATEMENT ELEMENT					
1. Continue prohibiting formation takeoffs and landings without prior permission of Director of Airports	None (existing measure)	None (existing measure)	Ongoing	County Department of Airports	N.A.
2. Continue prohibiting touch-and-go's and stop-and-go's between 8:00 p.m. and 7:00 a.m.	None (existing measure)	None (existing measure)	Ongoing	County Department of Airports	N.A.
3. Continue prohibiting high power engine run-ups for maintenance between 7:00 p.m. and 7:00 a.m.	None (existing measure)	None (existing measure)	Ongoing	County Department of Airports	N.A.
4. Continue prohibiting Runway 7 departures from midfield intersection (taxiway C).	None (existing measure)	None (existing measure)	Ongoing	County Department of Airports	N.A.
5. Designate Runway 25 as calm wind runway.	Administrative	None	1999	Airport Traffic Control Tower	Operating budget

TABLE 6E (Continued)
Summary of Noise Compatibility Plan, 1998-2018
Oxnard Airport

Measure	Cost to Airport or Government	Direct Cost to Users[1]	Timing	Lead Responsibility[2]	Potential Funding Sources
6. Direct southbound departures from Runway 25 to fly to coastline before turning left.	Administrative	Very small increase in aircraft operating costs	1999	Airport Traffic Control Tower	Operating budget
7. Promote use of NBAA noise abatement departures by jets.	Administrative + $10,000	Negligible	1998 and ongoing	County Department of Airports	Operating budget
8. Promote use of AOPA's "Noise Awareness Steps."	Administrative	Negligible	1998 and ongoing	County Department of Airports	Operating budget
9. Request Part 36, Stage 2 aircraft to avoid takeoffs after 11:00 p.m. and before 6:00 a.m.	Administrative	Cost of delaying departure or using alternative airport.	1998 and ongoing	County Department of Airports	Operating budget
10. Request aircraft certificated as noisier than 84.7 dBA (L_{max}) on takeoff to avoid use of Airport without prior permission of Director of Airports.	Administrative	Cost of using alternative airport.	1998 and ongoing	County Department of Airports	Operating budget

TABLE 6E (Continued)
Summary of Noise Compatibility Plan, 1998-2018
Oxnard Airport

Measure	Cost to Airport or Government	Direct Cost to Users[1]	Timing	Lead Responsibility[2]	Potential Funding Sources
LAND USE MANAGEMENT ELEMENT					
1. Use combined 2003 and 2018 noise contours as basis for noise compatibility planning.	Administrative	None	1999 - 2000	City of Oxnard Ventura County	Operating budget
2. Set 60 CNEL as threshold for promoting airport-compatible development.	Administrative	None	1999 - 2000	City of Oxnard Ventura County	Operating budget
3. Preserve existing airport-compatible land use designations within 60 CNEL contour and west to coastline.	None	None	Ongoing	City of Oxnard Ventura County	Operating budget
4. Designate "planning reserve" area north of Teal Club Road between Victoria and Patterson for airport-compatible development.	Administrative	None	1999 - 2000	City of Oxnard	Operating budget
5. Establish noise compatibility guidelines for the review of development projects within 60 CNEL.	Administrative	None	1999 - 2000	City of Oxnard Ventura County	Operating budget

TABLE 6E (Continued)
Summary of Noise Compatibility Plan, 1998-2018
Oxnard Airport

Measure	Cost to Airport or Government	Direct Cost to Users[1]	Timing	Lead Responsibility[2]	Potential Funding Sources
6. Purchase dwelling units on Little Farms Road.	$2,800,000	None	2000 - 2002 (based on available funding)	County Department of Airports	FAA (90%) Capital budget (10%)
PROGRAM MANAGEMENT ELEMENT					
1. Maintain system for receiving, analyzing, and responding to noise complaints.	Administrative	None	Ongoing	County Department of Airports	Operating budget
2. Review Noise Compatibility Plan implementation .	$180,000 (assumes average of $30,000 every three years)	None	Ongoing	County Department of Airports	Operating budget
3. Publish pilot guide.	$5,000	None	1998	County Department of Airports	FAA (90%) Operating budget (10%) (already budgeted)
4. Update Noise Exposure Maps and Noise Compatibility Program	$450,000 (assumes $225,000 every 5 to 10 years)	None	Update every 5 to 10 years as needed	County Department of Airports	FAA (90%) Operating budget (10%)
5. Install noise and flight track monitoring system.	Installation: $625,000 O&M: $$3,135,000 (assumes $165,000/year)	None	2000 (based on available funding)	County Department of Airports	Install: FAA (90%) Operating budget (10%) O&M: Operating budget

TABLE 6E (Continued)
Summary of Noise Compatibility Plan, 1998-2018
Oxnard Airport

Measure	Cost to Airport or Government	Direct Cost to Users[1]	Timing	Lead Responsibility[2]	Potential Funding Sources	
6. Prepare annual noise monitoring and modeling report.	$720,000 (assumes $40,000/year)	None	2001 and ongoing	County Department of Airports	Operating budget	
Total Costs and Funding		FAA Airport Operating Budget Airport Capital Budget		$3,501,000 $4,080,500 $343,500		44% 52% 4%
		Total		$7,925,000		100%

NOTES:

N.A. -- Not applicable.

[1] Airport users will be indirectly responsible for at least part of County Department of Airports' share of funding through lease payments and user fees.

[2] Where Ventura County does not have direct responsibility for implementing a given measure, the County Department of Airports will encourage the listed jurisdictions to implement measures as described.

Appendix C
IMPLEMENTATION MATERIALS

Part 150 Noise Compatibility Study

Appendix C
IMPLEMENTATION MATERIALS

The materials in this appendix are for use in implementing the Noise Compatibility Program for Oxnard Airport and include the following:

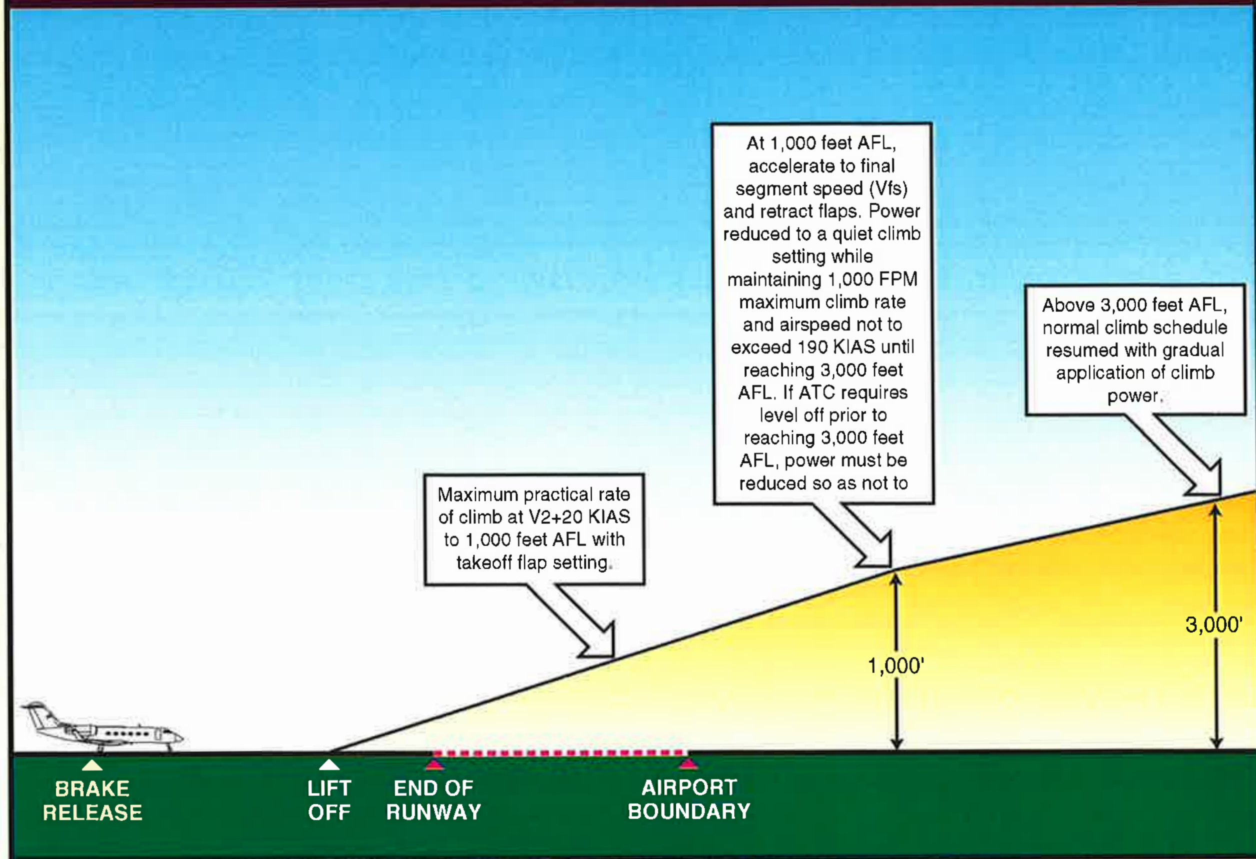
- A description of the National Business Aircraft Association's Standard Noise Abatement Departure Procedure;
- A list of noise and flight track monitoring system suppliers;
- A model agreement for noise disclosure and a disclosure statement;
- "Noise Awareness Steps" published by the Aircraft Owners and Pilots Association (AOPA)."

Note that the fair disclosure agreement has been drafted in anticipation of the establishment of an "Airport Influence Area" in the updated *Airport Comprehensive Land Use Plan for Ventura County*. Accordingly, the County Airport Land Use Commission is noted as a party to the fair disclosure agreement.

While care has been taken to ensure accuracy of the fair disclosure agreement and statement, the form and language of these instruments may need to be altered to conform with local laws and customs. They must be reviewed by attorneys representing local jurisdictions before their use or adoption.

97SP04-1D-9/25/97

NATIONAL BUSINESS AIRCRAFT ASSOCIATION (NBAA) STANDARD NOISE ABATEMENT DEPARTURE PROCEDURE



KEY

AFL - Above field elevation
ATC - Air traffic control
FPM - Feet per minute
KIAS - Knots, indicated airspeed

Note: It is recognized that aircraft performance will differ with aircraft type and takeoff conditions; therefore, the business aircraft operator must have the latitude to determine whether takeoff thrust should be reduced prior to, during, or after flap retraction.

Source: National Business Aircraft Association (NBAA), "NBAA Noise Abatement Program," January 1, 1993.

For copies of the NBAA's noise abatement program, suitable for insertion into pilot flight manuals, contact:

NBAA, Inc.
1200 Eighteenth St., NW
Washington, D.C. 20036
Phone: 202-783-9000
FAX: 202-331-8364

OXNARD AIRPORT

NOISE AND FLIGHT TRACK MONITORING SYSTEM MANUFACTURERS AND SUPPLIERS

Noise Monitoring Equipment

01 dB, Inc.
1583 East Genesee Street
P.O. Box 796
Skaneateles, NY 13152
(315) 685-3141
FAX: (315) 685-3194

CEL Instruments
1 Winchester Drive
Milford, NH 03055-3056
(603) 672-7383
800-366-2966
FAX: (603) 672-7382

Larson Davis Laboratories
1681 West 820 North
Provo, UT 84601
(801) 375-0177

Scantek, Inc.
916 Gist Avenue
Silver Spring, MD 20910
(301) 495-7738

Software

Dimensions International
7127 Four Rivers Road
Boulder, CO 80301
(303) 530-3710
(ACES System for ARTS data collection and editing.)

Harris Miller Miller & Hanson, Inc.
15 New England Executive Park
Burlington, MA 01803
(617) 221-0024
(ANOMS System for ARTS data collection and editing.)

Noise Monitoring Equipment and Software

Bruel & Kjaer
DK-2850 Naerum
Denmark
California Office: (714) 978-8066

Lochard Environment Systems Corp.
40 Speen Street
Framingham, MA 01701
(508) 872-3600

Tracor, Inc.
6500 Tracor Lane
Austin, TX 78725
Contact: David Rohde
(512) 929-2010
FAX: (512) 929-4089

Passive Radar Detection System

Bruel & Kjaer
DK-2850 Naerum
Denmark
California Office: (714) 978-8066

MODEL AGREEMENT FOR NOISE DISCLOSURE

This Agreement made and entered into this _____ day of ____________, 199__, by and between the Ventura County Airport Land Use Commission, hereinafter referred to as "ALUC", the ***[City of Oxnard; OR Ventura County]***, hereinafter referred to as ***["City" OR "County"]***, Ventura County Department of Airports, as proprietor of Oxnard Airport, hereinafter referred to as "Airport Proprietor," and ________________________, herein referred to as "Developer."

WITNESS, that

WHEREAS, Developer has an interest in a tract of land generally located at ____ in Ventura County, California, more specifically described in Exhibit "A" which is attached hereto and incorporated herein by reference, to be platted as ____________________, and referred to herein as "Developer's Property"; and

WHEREAS, Airport Proprietor owns and operates a certain airport known as Oxnard Airport located _________________________ of Developer's Property; and

WHEREAS, it is in the best interest of the ALUC, Airport Proprietor, ***[City OR County]***, and Developer to advise all future purchasers and lessees of the presence of the Airport and the potential for low-flying aircraft and noise attributable to aircraft operations at Oxnard Airport; and

WHEREAS, this Agreement is entered into for the purpose of advising said purchasers and lessees of the aircraft activity and potential for noise generation;

NOW, THEREFORE, for and in consideration of the mutual covenants and considerations herein contained, it is agreed as follows:

1. ALUC, ***[City OR County]***, Airport Proprietor, and Developer enter into this Agreement for the purpose of advising future purchasers and lessees of the activity, overflights, and noise attributable to aircraft operations at Oxnard Airport.

2. Developer agrees that in the sales listing information for each lot or separately transferrable property, he will include a notice that the property is in the Oxnard Airport Influence Area. The information shall include copies of a map showing the Airport Influence Area and the safety zones and noise contours taken from the most recent version of the ALUC's Airport Comprehensive Land Use Plan.

3. Developer agrees that as a part of closing of any real estate transaction conveying a fee simple interest or any lesser estate including leasehold interest that Developer will provide the transferee copies of the aforementioned map and further that Developer shall secure the acknowledgment on six copies of the Fair Disclosure Statement as set forth in Exhibit "B" attached hereto and incorporated herein by reference.

4. The ALUC shall provide Developer with copies of the most recent, official Airport Influence Area Map for Oxnard Airport at the request of Developer. Any request for said Map shall be in writing to the Ventura County Airport Land Use Commission, in care of the Ventura County Transportation Commission, 950 County Square Drive, Ventura, California, 93003, and shall be made not less than thirty (30) days before the date thereof.

5. After the execution of the Fair Disclosure Statement (Exhibit "B"), Developer shall record one copy at the County Recorder's office, file one copy with the City ***[OR County]*** Planning Department, one copy with the Airport Proprietor, one copy with the ALUC, retain one copy, and deliver the remaining copy to the transferee.

6. Developer further agrees that all transferees shall take subject to the terms of this Agreement and require the execution of the Fair Disclosure Statement as a part of any subsequent conveyance.

7. This Agreement shall be considered a covenant running with the land and be binding on all future transferees, assigns and successors of Developer inasmuch as the potential affects of the Airport operation is associated with the use of the land and indiscriminate of ownership.

8. This Agreement shall not be amended, modified, canceled, or abrogated without the written consent of the parties.

9. Invalidation of any part or parts of this Agreement by judgment or other court action shall in no way affect any of the other provisions which shall remain in full force and effect.

10. This contract shall be construed and enforced in accordance with the laws of the State of California.

11. Upon the effective date of this Agreement, the Agreement shall be recorded in the Office of the Recorder of Deeds, Ventura County, California.

12. This Agreement shall be binding on the parties hereto only after all legal requirements relating to ALUC and ***[City OR County]*** entering into this Agreement have been satisfied.

FINAL DRAFT – NOT APPROVED BY BOS OR FAA

VENTURA COUNTY
DEPARTMENT OF AIRPORTS

By: ______________________________
Director of Airports

ATTESTED TO:

____

Approved as to form and legality:

____
Legal Counsel

DEVELOPER

By: ______________________________

ATTEST:

____
Secretary

NOTARY'S CERTIFICATION:

____
Notary Public

[CITY OF ________________ OR VENTURA COUNTY]

By: ______________________________
Chief Executive Officer

ATTESTED TO:

____

Approved as to form and legality

____
Legal Counsel

AIRPORT LAND USE COMMISSION

By: ______________________________
Chairman

ATTESTED TO:

____

Approved as to form and legality

____
Legal Counsel

"EXHIBIT B"
MODEL FAIR DISCLOSURE STATEMENT

NOTICE TO PROSPECTIVE BUYERS OF REAL PROPERTY OR LESSEES OF RESIDENTIAL PROPERTY WITHIN OXNARD AIRPORT INFLUENCE AREA.

1. An Airport Influence Area exists in the environs of Oxnard Airport (herein referred to as the Airport). All land within the area is or may be at a future date exposed to low and frequent aircraft overflights or aircraft noise levels of 60 CNEL or higher. Low and frequent aircraft overflights and noise levels of 60 CNEL can be annoying or disturbing.

2. The undersigned acknowledges that he or she has been informed that the property being considered for ***[purchase OR lease]*** at:

   ____
   Address

   ____
   City State Zip Code

   is within the Airport Influence Area for the Airport. He or she further acknowledges that he or she has been given copies of the Airport Influence Area map (a copy of which is attached hereto).

The undersigned has read and fully understands all of the provisions relating to this Fair Disclosure statement.

IN WITNESS WHEREOF, the parties have executed this Statement as of the day and year written below.

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Date: ______________________________, 19___.

____	____
PRINT NAME OF BUYER OR LESSEE	PRINT NAME OF SELLER, LESSOR, BROKER
____	____
Current Address	Company
____	____
City State Zip Code	Address
	____
	City State Zip Code
____	____
Signature	Signature

State of ________________)
) ss
County of ______________)

BE IT REMEMBERED that on the _____ day of ____________________, 19___, before me, the undersigned notary public in and for the county and state aforesaid, came ____, to me personally known, who being by me duly sworn did say that he is the ____________________________________ ____________________________ of ____, a corporation, and that the seal affixed to the foregoing instrument is the corporate seal of said corporation and that said instrument was signed and sealed on behalf of said corporation by authority of its board of directors and said __________________________ ____________________________________ acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal, the day and year last above written.

____
Notary Public

My commission expires:

____

AIRCRAFT OWNERS AND PILOTS ASSOCIATION (AOPA) NOISE AWARENESS STEPS

Following are some general guidelines and techniques to minimize the noise impact produced by aircraft operating near the ground:

1. If practical, avoid noise-sensitive areas such as residential areas; open-air assemblies (e.g., sporting events and concerts), and national park areas. Make every effort to fly at or above 2,000 feet over the surface of such areas when overflight cannot be avoided.

2. Consider using a reduced power setting if flight must be low because of cloud cover or overlying controlled airspace or when approaching the airport of destination. Propellers generate more noise than engines; flying with the lowest practical rpm setting will reduce the aircraft's noise level substantially.

3. Perform stalls, spins, and other practice maneuvers over uninhabited terrain.

4. Many airports have established specific noise abatement procedures. Familiarize yourself and comply with these procedures.

5. Work with airport managers and fixed-base operators to develop procedures to reduce the impact on noise-sensitive areas.

6. To contain aircraft noise within airport boundaries, avoid performing engine runups at the ends of runways near housing developments. Instead, select a location for engine runup closer to the center of the field.

7. On takeoff, gain altitude as quickly as possible without compromising safety. Being takeoffs at the start of a runway, not at an intersection.

8. Retract the landing gear either as soon as a landing straight ahead on the runway can no longer be accomplished or as soon as the aircraft achieves a positive rate of climb. If practical, maintain best-angle-of-climb airspeed until reaching 50 feet or an altitude that provides clearance from terrain or obstacles. Then accelerate to best-rate-of-climb airspeed. If consistent with safety, make the first power reduction at 500 feet.

9. Fly a tight landing pattern to keep noise as close to the airport as possible. Practice descent to the runway at low power settings and with as few power changes as possible.

10. If a VASI or other visual approach guidance system is available, use it. These devices will indicate a safe glidepath and allow a smooth, quiet descent to the runway.

11. If possible, do not adjust the propeller control for flat pitch on the downwind leg; instead, wait until short final. This practice not only provides a quieter approach, but also reduces stress on the engine and propeller governor.

12. Avoid low-level, high-power approaches, which not only create high noise impacts, but also limit options in the event of engine failure.

Note: These recommendations are general in nature; some may not be advisable for every aircraft in every situation. No noise reduction procedure should be allowed to compromise flight safety.

Source: *AOPA's Aviation USA - 1994*

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OXNARD AIRPORT

Part 150 Noise Compatibility Study

Appendix D
GRID POINT ANALYSIS

Appendix D
GRID POINT ANALYSIS

This appendix provides the supporting data for Land Use Recommendation Six (Preserve existing airport-compatible land use designations within the 60 CNEL and west to the coastline) discussed in Chapter Six, Noise Compatibility Plan. Twelve grid points, depicted on **Exhibit D1**, were defined in the affected area and the loudness range of single events was computed at each point. The Integrated Noise Model was used to generate the top noise events by aircraft type. A summary of the grid point analysis for 2003 is depicted in **Table D1**. Printouts of the detailed grid point analysis output file is also attached to the back of this appendix.

The grid point analysis is described in two noise metrics, CNEL and SEL. CNEL is a scale which takes account of all the A-weighted sound received at each grid point, from all aircraft noise events. A 4.77 decibel weighting factor is applied to noise events occurring during the evening hours (7:00 p.m. to 10:00 p.m.). A 10 decibel weighting factor is applied to noise events at night (10:00 p.m. to 7:00 a.m.) in the CNEL metric.

SEL is a mathematical construct designed to consider the duration of a noise event as well as the loudness of the noise event. When the duration and the loudness of the noise event are mathematically combined, the resultant SEL is 5 to 10 decibels higher than the peak noise level (L_{max}) heard by the human ear for the same event.

Table D1
2003 Grid Point Analysis Summary
Oxnard Airport

Grid Point	CNEL	Stage 2 Biz Jet SEL Range	Stage 3 Biz Jet SEL Range	Twin Engine SEL Range	Single Engine SEL Range
D1	53.2	107.1 - 87.4	90.4 - 82.2	90.4 - 61.4	83.2 - 59.9
D2	56.8	109.5 - 92.3	92.9 - 85.2	91.7 - 66.3	84.3 - 66.9
D3	56.5	108.4 - 93.7	91.9 - 90.1	91.2 - 66.3	83.8 - 64.0
D4	58.5	110.3 - 92.3	93.5 - 90.7	92.6 - 71.3	84.8 - 70.5
D5	55.7	108.5 - 91.4	92.0 - 84.1	91.3 - 65.7	83.8 - 65.7
D6	57.4	109.8 - 102.3	93.4 - 86.8	93.4 - 73.0	84.6 - 72.9
D7	55.2	107.2 - 98.8	90.8 - 84.5	84.9 - 74.0	81.1 - 68.2
D8	57.5	107.1 - 99.2	91.9 - 88.6	86.9 - 73.6	84.8 - 73.6
D9	59.1	104.7 - 99.6	92.9 - 88.8	86.5 - 74.5	90.6 - 72.9
D10	57.0	102.1 - 81.7	88.2 - 85.1	84.7 - 70.9	90.0 - 68.9
D11	56.3	102.0 - 83.7	85.2 - 83.1	84.1 - 67.4	86.9 - 66.4
D12	55.9	105.3 - 94.2	89.4 - 87.0	84.3 - 74.6	82.3 - 70.8

N/A- Data not provided by the grid point analysis.

Integrated Noise Model Grid Point Analysis Output File Legend

Metric ID — Identifies the noise metric selected in the Integrated Noise Model.

Grid ID — Grid point number.

Aircraft ID — Aircraft identification.

OP Type — Operation type (A- arrival, D- departure, T- touch-and-go).

RWY ID — Runway/helipad identification.

TRK ID1 — Flight track identification.

Distance — Distance from the noise source (aircraft) to the receiver location (grid point).

Altitude — Altitude of the noise source (aircraft) above the receiver location (grid point).

Speed — Speed of the aircraft.

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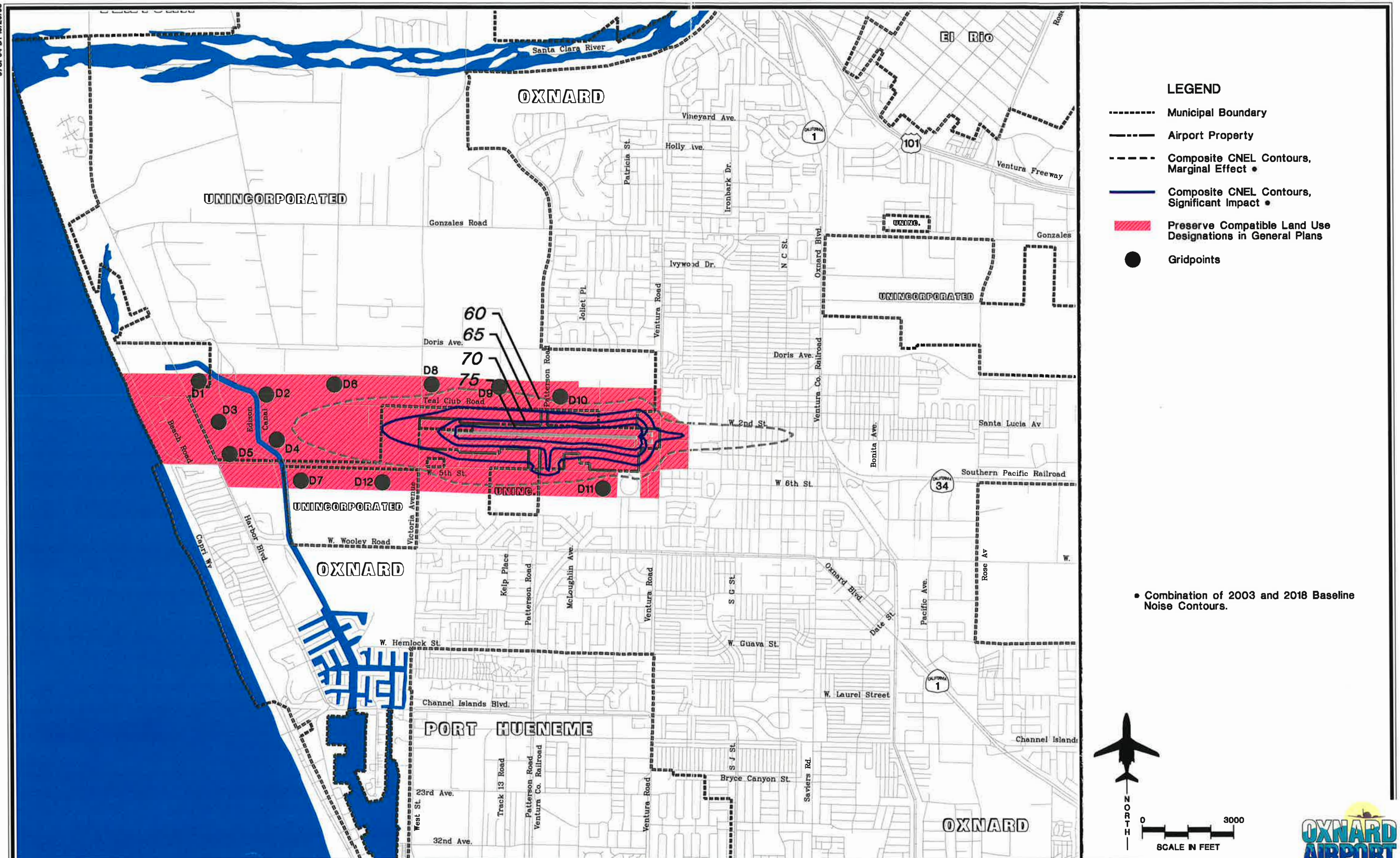

Exhibit D1
GRIDPOINT ANALYSIS FOR RECOMMENDED LAND USE PLANNING MEASURES

THR SET	Thrust setting of the aircraft
OPS EQUIV	Number of operations on the flight track per average day.
SEL	Sound Exposure Level. SEL expressed in dBA, is a measure of the combined duration and magnitude for a single-event. All the noise of the event is mathematically compressed into one second.

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Oxnard 2003 Gridpoint Analysis

METRIC_ID	GRID_ID	ACFT_ID	OP_TYPE	RWY_ID	TRK_ID1	DISTANCE	ALTITUDE	SPEED	THR_SET	OPS_EQUIV	SEL
SEL	D1	LEAR25	D	25	D6A	2215.2	1691	190.8	2434.85	0.0980	101.4
SEL	D1	LEAR25	D	25	D6A	1978.3	1696	191.3	2433.92	0.0603	103.2
SEL	D1	GIIB	D	25	D6A	2228.0	1707	187.0	9872.76	0.0280	104.5
SEL	D1	GIIB	D	25	D6A	1992.7	1713	187.5	9869.91	0.0172	106.2
SEL	D1	LEAR25	D	25	D6A	2496.8	1683	190.2	2436.09	0.0603	99.5
SEL	D1	LEAR25	D	25	D6A	1807.3	1700	191.6	2433.32	0.0163	104.1
SEL	D1	GIIB	D	25	D6A	2508.1	1699	186.5	9876.61	0.0172	102.8
SEL	D1	GIIB	D	25	D6A	1823.1	1716	187.8	9868.06	0.0047	107.1
SEL	D1	GASEPV	D	25	D12	1620.4	1595	102.6	87.64	1.5294	80.1
SEL	D1	BEC58P	D	25	D12	1496.3	1474	133.1	77.96	1.2281	81.0
SEL	D1	BEC58P	D	25	D12	1805.4	1430	133.0	77.88	1.9956	78.8
SEL	D1	GASEPV	D	25	D12	1896.9	1542	102.5	87.54	2.4853	76.7
SEL	D1	DHC6	D	25	D12	2666.7	2394	101.7	87.72	1.8340	77.9
SEL	D1	DHC6	D	25	D12	2531.9	2477	101.9	87.89	1.1286	79.4
SEL	D1	DHC6	D	25	DC1	2754.7	2337	101.7	87.60	1.4672	78.2
SEL	D1	LEAR25	D	25	D6A	2805.7	1674	189.4	2437.65	0.0163	97.7
SEL	D1	GASEPV	D	25	DC1	1778.3	1548	102.5	87.55	1.2235	78.9
SEL	D1	GASEPV	D	25	DC1	2060.9	1517	102.5	87.48	1.9883	76.7
SEL	D1	BEC58P	D	25	DC1	1981.9	1413	133.0	77.84	1.5965	77.6
SEL	D1	BEC58P	D	25	DC1	1678.2	1437	133.1	77.89	0.9824	79.6
SEL	D1	DHC6	A	07	A2	684.3	477	61.3	35.58	0.1433	87.8
SEL	D1	GASEPV	T	07	TG1	1148.2	761	70.5	38.14	3.2867	74.0
SEL	D1	DHC6	D	25	DC1	2583.1	2391	101.7	87.71	0.9029	79.3
SEL	D1	GASEPV	D	25	DSK1	2788.4	1540	102.5	87.53	1.4912	76.6
SEL	D1	BEC58P	D	25	DSK1	2726.9	1431	133.0	77.88	1.1973	77.2
SEL	D1	GIIB	D	25	D6A	2815.6	1690	185.7	9881.41	0.0047	101.1
SEL	D1	GASEPF	D	25	D12	1141.6	1119	84.5	84.77	1.6515	75.6
SEL	D1	DHC6	D	25	DSK1	3353.0	2378	101.7	87.68	1.1004	77.3
SEL	D1	DHC6	D	25	DSK2	3351.9	2377	101.7	87.68	1.0748	77.3
SEL	D1	GASEPV	D	25	DSK1	2583.1	1548	102.5	87.55	0.9177	77.4
SEL	D1	DHC6	A	07	A2	1120.0	475	61.3	35.58	0.2329	83.0
SEL	D1	BEC58P	D	25	DSK1	2515.3	1437	133.1	77.89	0.7368	78.0
SEL	D1	GASEPV	D	25	D6A	2118.9	1562	102.5	87.58	0.5680	78.9
SEL	D1	GASEPV	D	25	DC1	2412.8	1474	102.4	87.40	1.2235	75.5
SEL	D1	LEAR35	D	25	D6A	2264.0	1754	183.1	2707.56	0.0839	87.1
SEL	D1	DHC6	D	25	D6A	2841.8	2415	101.8	87.76	0.4192	80.1
SEL	D1	GASEPF	D	25	D12	1544.7	1090	83.7	87.58	2.6836	72.0
SEL	D1	DHC6	D	25	D12	3095.6	2326	101.6	87.58	1.1286	75.8
SEL	D1	GASEPV	D	25	DSK2	2787.2	1540	102.5	87.53	1.4565	74.7
SEL	D1	DHC6	A	07	A2	484.7	476	61.3	35.58	0.0388	90.4
SEL	D1	DHC6	D	25	DSK1	3190.6	2391	101.7	87.71	0.6772	77.9
SEL	D1	BEC58P	D	25	DSK2	2725.7	1431	133.0	77.88	1.1696	75.5
SEL	D1	BEC58P	D	25	DC1	2353.1	1379	132.9	80.64	0.9824	76.2
SEL	D1	BEC58P	D	25	D6A	2032.8	1448	133.1	77.91	0.4561	79.5
SEL	D1	DHC6	A	07	A1	735.4	471	61.3	35.57	0.0717	87.5
SEL	D1	B206	D	18H	H2	2799.2	1000	118.0	1.00	7.3264	67.3
SEL	D1	LEAR35	D	25	D6A	2032.8	1759	183.6	2705.94	0.0516	88.8
SEL	D1	BEC58P	D	25	D12	2443.3	1400	133.0	77.82	1.2281	74.9
SEL	D1	GASEPV	D	25	D6A	1870.1	1568	102.6	87.59	0.3496	80.3
SEL	D1	UH-1	D	18H	H2	2799.2	1000	124.0	1.00	0.4422	79.2
SEL	D1	GASEPV	D	25	D12	1831.2	1652	102.7	87.76	0.4142	79.4
SEL	D1	GASEPV	D	25	DC1	1620.2	1573	102.6	87.60	0.3314	80.2
SEL	D1	BEC58P	D	25	D12	1705.5	1527	133.2	78.05	0.3326	80.2
SEL	D1	GASEPV	D	25	DSK1	2995.5	1532	102.5	87.52	0.9177	75.8
SEL	D1	MU3001	D	25	D6A	2162.0	1625	158.4	1895.96	0.0560	87.9
SEL	D1	BEC58P	D	25	D6A	1770.4	1453	133.1	77.92	0.2807	80.9
SEL	D1	BEC58P	D	25	DC1	1502.6	1457	133.1	77.92	0.2661	81.1
SEL	D1	GASEPV	T	25	TG2	4096.7	900	91.4	49.37	29.5804	60.6
SEL	D1	BEC58P	D	25	DSK1	2939.5	1425	133.0	77.87	0.7368	76.4
SEL	D1	DHC6	D	25	DSK1	3520.9	2364	101.7	87.65	0.6772	76.8
SEL	D1	GASEPV	D	25	D12	2505.6	1505	102.5	87.46	1.5294	73.2
SEL	D1	DHC6	D	25	DC1	2998.0	2305	101.6	87.53	0.9029	75.5
SEL	D1	B206	A	18H	H3	2846.0	1000	118.0	1.00	7.3264	66.3
SEL	D1	MU3001	D	25	D6A	1917.1	1629	158.9	1895.31	0.0344	89.5
SEL	D1	DHC6	D	25	D6A	2668.1	2426	101.8	87.79	0.2580	80.7
SEL	D1	UH-1	A	18H	H3	2846.0	1000	124.0	1.00	0.4422	78.2
SEL	D1	BEC58P	T	07	TG1	1148.2	761	105.7	25.22	1.3972	73.2
SEL	D1	GASEPF	D	25	DC1	1756.0	1080	82.7	88.68	2.1469	71.2
SEL	D1	B222	D	18H	H2	3195.4	1812	123.0	3.00	1.4898	72.5

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SEL	D1	GASEPF	D	25	DC1	1389.4	1094	84.1	87.10	1.3212	73.0
SEL	D1	DHC6	D	25	DC1	2504.4	2434	101.8	87.80	0.2445	80.0
SEL	D1	IA1125	D	25	D6A	1877.0	1215	166.3	2872.14	0.0560	86.5
SEL	D1	IA1125	D	25	D6A	1590.9	1223	166.3	2872.46	0.0344	88.3
SEL	D1	DHC6	D	25	D12	2730.4	2571	102.0	88.09	0.3057	78.8
SEL	D1	DHC6	A	07	A1	484.1	473	61.3	35.57	0.0194	90.6
SEL	D1	GASEPF	T	25	TG2	4092.9	879	74.1	98.01	27.3739	59.0
SEL	D1	DHC6	D	25	D6A	3058.4	2400	101.8	87.73	0.2580	79.2
SEL	D1	H500D	D	18H	H2	2799.2	1000	139.0	1.00	1.3469	71.9
SEL	D1	GASEPV	A	07	A2	684.3	477	66.6	45.76	0.1942	80.3
SEL	D1	DHC6	A	07	A1	1281.4	466	61.3	35.56	0.1165	82.3
SEL	D1	GASEPV	D	25	D6A	2411.5	1553	102.5	87.56	0.3496	77.4
SEL	D1	BEC58P	D	25	D6A	2337.7	1441	133.1	77.90	0.2807	78.0
SEL	D1	LEAR35	D	25	D6A	2540.3	1747	182.5	2709.74	0.0516	85.4
SEL	D1	BEC58P	A	07	A2	684.3	477	99.9	39.29	0.1559	80.5
SEL	D1	BEC58P	T	25	TG2	4096.7	900	116.8	50.30	12.5747	61.4
SEL	D1	H500D	A	18H	H3	2846.0	1000	139.0	1.00	1.3470	71.0
SEL	D1	BEC58P	D	25	DSK1	2307.7	1442	133.1	77.90	0.1996	78.8
SEL	D1	LEAR25	A	07	A1	735.4	471	142.9	782.07	0.0067	93.5
SEL	D1	MU3001	D	25	D6A	2451.4	1619	157.9	1896.83	0.0344	86.3
SEL	D1	CNA441	T	07	TG1	975.2	468	102.4	36.65	0.4923	74.6
SEL	D1	GASEPF	D	25	DC1	1159.4	1105	84.5	85.94	0.3578	75.9
SEL	D1	LEAR35	D	25	D6A	1866.7	1763	183.9	2704.90	0.0140	89.7
SEL	D1	GASEPF	T	07	TG1	1148.2	761	62.7	33.26	3.0415	66.3
SEL	D1	DHC6	D	25	DSK1	3036.4	2402	101.8	87.74	0.1834	78.5
SEL	D1	GASEPF	D	25	DC1	2179.3	1062	80.8	90.88	1.3212	69.8
SEL	D1	GASEPF	D	25	DSK1	2561.4	1090	83.7	87.50	1.6102	68.9
SEL	D1	GASEPV	D	25	D6A	1688.4	1572	102.6	87.60	0.0947	81.2
SEL	D1	GASEPF	D	25	D12	2269.7	1071	81.7	89.80	1.6515	68.6
SEL	D1	CNA441	D	25	D12	2121.1	1799	144.1	90.18	0.9378	71.0
SEL	D1	CNA441	D	25	D12	1914.6	1874	144.3	90.33	0.5771	73.1
SEL	D1	BEC58P	D	25	D6A	1576.1	1456	133.1	77.92	0.0760	81.8
SEL	D1	B206	D	18H	H2	2574.3	1000	118.0	1.00	1.7033	68.3
SEL	D1	GASEPV	A	07	A2	1120.0	475	66.6	45.75	0.3155	75.5
SEL	D1	GASEPV	D	25	DSK1	2382.5	1554	102.5	87.56	0.2485	76.5
SEL	D1	DHC6	A	07	A2	1600.5	470	61.3	35.57	0.1433	78.8
SEL	D1	UH-1	D	18H	H2	2574.3	1000	124.0	1.00	0.1028	80.1
SEL	D1	GASEPV	A	07	A2	484.7	476	66.6	45.76	0.0526	83.0
SEL	D1	MU3001	D	25	D6A	1738.9	1631	159.1	1894.89	0.0093	90.4
SEL	D1	GASEPV	A	07	A1	735.4	471	66.6	45.75	0.0971	80.0
SEL	D1	IA1125	D	25	D6A	2201.9	1204	166.3	2871.70	0.0344	84.5
SEL	D1	CNA441	D	25	DC1	2250.7	1747	144.0	90.08	0.7502	71.1
SEL	D1	GASEPF	D	25	D6A	1796.9	1099	84.5	86.51	0.6134	71.9
SEL	D1	BEC58P	A	07	A2	1120.0	475	99.9	39.28	0.2534	75.7
SEL	D1	GASEPF	D	25	DSK1	2332.7	1093	84.1	87.12	0.9909	69.7
SEL	D1	GASEPF	D	25	D6A	1491.6	1103	84.5	86.18	0.3775	73.8
SEL	D1	LEAR25	A	07	A1	484.1	473	143.0	782.12	0.0018	97.0
SEL	D1	IA1125	D	25	D6A	1372.8	1229	166.3	2872.67	0.0093	89.9
SEL	D1	CNA441	D	25	DC1	2016.0	1797	144.1	90.17	0.4617	72.9
SEL	D1	DHC6	D	25	D6A	2548.5	2433	101.8	87.80	0.0699	81.1
SEL	D1	GASEPF	D	25	D12	1380.4	1160	84.6	81.24	0.4473	73.0
SEL	D1	B206	A	18H	H3	2674.1	1000	118.0	1.00	1.7033	67.1
SEL	D1	BEC58P	D	25	DC1	2744.5	1363	132.9	83.37	0.2661	75.1
SEL	D1	BEC58P	A	07	A2	484.7	476	99.9	39.28	0.0422	83.0
SEL	D1	UH-1	A	18H	H3	2674.1	1000	124.0	1.00	0.1028	79.0
SEL	D1	BEC58P	A	07	A1	735.4	471	99.9	39.28	0.0780	80.2
SEL	D1	HS748A	D	25	D12	1265.6	1243	128.1	93.54	0.0105	88.8
SEL	D1	GASEPF	D	25	DSK2	2560.2	1090	83.7	87.51	1.5728	67.1
SEL	D1	GASEPV	D	25	DSK1	3202.0	1524	102.5	87.50	0.2485	75.1
SEL	D1	DHC6	D	25	DSK1	3691.8	2349	101.7	87.62	0.1834	76.2
SEL	D1	BEC58P	D	25	DSK1	3150.8	1418	133.0	77.85	0.1996	75.8
SEL	D1	B206	D	18H	H2	3025.7	1000	118.0	1.00	1.7033	66.4
SEL	D1	B222	D	18H	H2	3005.4	1820	123.0	3.00	0.3464	73.3
SEL	D1	DHC6	D	25	D12	3711.5	2264	101.5	87.44	0.3057	73.7
SEL	D1	UH-1	D	18H	H2	3025.7	1000	124.0	1.00	0.1028	78.3
SEL	D1	DHC6	D	25	DC1	3303.0	2284	101.6	87.49	0.2445	74.4
SEL	D1	HS748A	D	25	D12	1628.4	1202	126.5	94.58	0.0171	85.8
SEL	D1	GASEPF	D	25	DSK1	2788.6	1087	83.4	87.90	0.9909	68.1
SEL	D1	BEC58P	D	25	D12	3220.4	1379	132.9	80.48	0.3326	72.8
SEL	D1	B206	A	18H	H3	3018.7	1000	118.0	1.00	1.7033	65.6
SEL	D1	H500D	D	18H	H2	2574.3	1000	139.0	1.00	0.3131	72.9

FINAL DRAFT – NOT APPROVED BY BOS OR FAA

SEL	D1	LEAR25	A	07	A1	1281.4	466	142.9	781.92	0.0109	87.4
SEL	D1	GASEPV	D	25	DC1	2793.3	1458	102.4	87.36	0.3314	72.6
SEL	D1	UH-1	A	18H	H3	3018.7	1000	124.0	1.00	0.1028	77.5
SEL	D1	FAL50	D	25	D6A	3432.8	3112	206.2	2377.22	0.0350	82.2
SEL	D1	GASEPV	A	07	A1	484.1	473	66.6	45.75	0.0263	83.2
SEL	D1	UH-1	T	07	TG1	1106.7	700	124.0	1.00	0.0200	84.2
SEL	D1	CNA441	A	07	A2	684.3	477	94.8	31.36	0.0733	78.6
SEL	D1	B222	D	18H	H2	3390.8	1804	123.0	3.00	0.3464	71.8
SEL	D1	CNA441	D	25	DSK1	2942.1	1784	144.1	90.15	0.5627	69.7
SEL	D1	CNA441	D	25	DSK2	2940.9	1784	144.1	90.15	0.5496	69.6
SEL	D10	GASEPV	T	25	TG2	1515.6	231	66.4	138.75	29.5804	87.5
SEL	D10	GASEPV	T	07	TG1	1621.3	611	66.7	139.89	3.2867	90.0
SEL	D10	BEC58P	T	25	TG2	1499.7	74	101.9	115.94	12.5747	81.4
SEL	D10	LEAR25	D	25	D6A	1507.9	0	111.7	2606.82	0.0980	98.7
SEL	D10	LEAR25	D	25	D6A	1507.9	0	111.7	2606.82	0.0603	98.7
SEL	D10	LEAR25	D	25	D6A	1507.9	0	111.7	2606.82	0.0603	98.7
SEL	D10	GIIB	D	25	D6A	1507.9	0	108.1	10405.86	0.0280	102.0
SEL	D10	BEC58P	D	25	D12	1509.8	97	104.0	113.85	1.9956	81.8
SEL	D10	BEC58P	D	25	DC1	1511.7	97	103.9	113.86	1.5965	82.4
SEL	D10	GIIB	D	25	D6A	1507.9	0	108.1	10405.86	0.0172	102.1
SEL	D10	GIIB	D	25	D6A	1507.9	0	108.1	10405.86	0.0172	102.0
SEL	D10	DHC6	D	25	D12	1530.0	267	88.5	98.34	1.8340	81.2
SEL	D10	GASEPV	D	25	DC1	1518.4	176	90.4	101.63	1.9883	80.6
SEL	D10	BEC58P	T	07	TG1	1517.4	246	115.7	101.98	1.3972	82.1
SEL	D10	GASEPV	D	25	D12	1516.6	176	90.4	101.63	2.4853	79.6
SEL	D10	DHC6	D	25	DC1	1531.8	266	88.5	98.34	1.4672	81.8
SEL	D10	GASEPF	T	25	TG2	1499.5	69	73.2	96.31	27.3739	68.9
SEL	D10	BEC58P	D	25	DC1	1511.7	97	103.9	113.86	0.9824	83.1
SEL	D10	BEC58P	D	25	D12	1509.8	97	104.0	113.85	1.2281	81.8
SEL	D10	BEC58P	D	25	D12	1509.8	97	104.0	113.85	1.2281	81.7
SEL	D10	BEC58P	D	25	DSK1	1513.2	97	103.9	113.87	1.1973	81.7
SEL	D10	BEC58P	D	25	DSK2	1510.7	97	103.9	113.86	1.1696	81.7
SEL	D10	BEC58P	D	25	DC1	1511.7	97	103.9	113.86	0.9824	82.1
SEL	D10	GASEPV	D	25	DC1	1518.4	176	90.4	101.63	1.2235	81.0
SEL	D10	DHC6	D	25	DC1	1531.8	266	88.5	98.34	0.9029	82.2
SEL	D10	DHC6	D	25	D12	1530.0	267	88.5	98.34	1.1286	81.2
SEL	D10	DHC6	D	25	D12	1530.0	267	88.5	98.34	1.1286	81.2
SEL	D10	DHC6	D	25	DSK1	1533.3	266	88.5	98.34	1.1004	81.1
SEL	D10	DHC6	D	25	DSK2	1530.9	267	88.5	98.34	1.0748	81.1
SEL	D10	GASEPV	D	25	D12	1516.6	176	90.4	101.63	1.5294	79.6
SEL	D10	GASEPV	D	25	D12	1516.6	176	90.4	101.63	1.5294	79.5
SEL	D10	GASEPV	D	25	DSK1	1519.9	176	90.4	101.63	1.4912	79.5
SEL	D10	GASEPV	D	25	DSK2	1517.5	176	90.4	101.63	1.4565	79.5
SEL	D10	GASEPV	D	25	DC1	1518.4	176	90.4	101.63	1.2235	80.3
SEL	D10	DHC6	D	25	DC1	1531.8	266	88.5	98.34	0.9029	81.5
SEL	D10	LEAR25	D	25	D6A	1507.9	0	111.7	2606.82	0.0163	98.7
SEL	D10	LEAR25	D	25	D6A	1507.9	0	111.7	2606.82	0.0163	98.7
SEL	D10	BEC58P	D	25	DSK1	1513.2	97	103.9	113.87	0.7368	81.7
SEL	D10	BEC58P	D	25	DSK1	1513.2	97	103.9	113.87	0.7368	81.7
SEL	D10	DHC6	D	07	DC2	1545.3	423	88.7	98.67	0.5225	82.7
SEL	D10	DHC6	D	25	DSK1	1533.3	266	88.5	98.34	0.6772	81.1
SEL	D10	DHC6	D	25	DSK1	1533.3	266	88.5	98.34	0.6772	81.1
SEL	D10	GASEPV	D	25	DSK1	1519.9	176	90.4	101.63	0.9177	79.5
SEL	D10	GASEPV	D	25	DSK1	1519.9	176	90.4	101.63	0.9177	79.5
SEL	D10	GASEPV	D	07	DC2	1511.7	283	90.6	101.86	0.7080	80.4
SEL	D10	GIIB	D	25	D6A	1507.9	0	108.1	10405.86	0.0047	102.1
SEL	D10	GIIB	D	25	D6A	1507.9	0	108.1	10405.86	0.0047	102.0
SEL	D10	BEC58P	D	07	DC2	1495.6	175	111.0	106.65	0.5686	81.0
SEL	D10	BEC58P	D	25	D6A	1510.4	97	103.9	113.85	0.4561	81.7
SEL	D10	BEC58P	D	25	DC1	1511.7	97	103.9	113.86	0.2661	83.7
SEL	D10	LEAR25	D	07	D1A	1507.4	0	139.9	2549.51	0.0108	97.4
SEL	D10	CNA441	T	25	TG2	1498.6	41	114.3	106.74	4.4308	70.9
SEL	D10	DHC6	D	25	D6A	1530.6	267	88.5	98.34	0.4192	81.2
SEL	D10	GASEPF	T	07	TG1	1513.1	219	73.4	96.63	3.0415	72.4
SEL	D10	DHC6	D	07	D1A	1565.1	421	88.7	98.67	0.2911	82.5
SEL	D10	GASEPV	D	25	D6A	1517.2	176	90.4	101.63	0.5680	79.5
SEL	D10	BEC58P	D	25	D12	1509.8	97	104.0	113.85	0.3326	81.8
SEL	D10	GASEPV	D	25	DC1	1518.4	176	90.4	101.63	0.3314	81.8
SEL	D10	BEC58P	D	25	D12	1509.8	97	104.0	113.85	0.3326	81.7
SEL	D10	B222	A	18H	H4	2135.2	-16	65.0	2.00	1.4898	75.2
SEL	D10	DHC6	D	25	DC1	1531.8	266	88.5	98.34	0.2445	82.5

SEL	D10	BEC58P	D	25	DC1	1511.7	97	103.9	113.86	0.2661	82.1
SEL	D10	BEC58P	D	25	D6A	1510.4	97	103.9	113.85	0.2807	81.7
SEL	D10	BEC58P	D	25	D6A	1510.4	97	103.9	113.85	0.2807	81.7
SEL	D10	GASEPV	D	07	D1A	1532.2	282	90.6	101.86	0.3945	80.2
SEL	D10	DHC6	D	25	D12	1530.0	267	88.5	98.34	0.3057	81.3
SEL	D10	DHC6	D	25	D12	1530.0	267	88.5	98.34	0.3057	81.1
SEL	D10	BEC58P	D	07	D1A	1516.5	174	110.9	106.73	0.3168	80.8
SEL	D10	GASEPV	D	25	D12	1516.6	176	90.4	101.63	0.4142	79.6
SEL	D10	LEAR25	D	07	D1A	1507.4	0	139.9	2549.51	0.0067	97.4
SEL	D10	GASEPV	D	25	D12	1516.6	176	90.4	101.63	0.4142	79.5
SEL	D10	LEAR25	D	07	D1A	1507.4	0	139.9	2549.51	0.0067	97.4
SEL	D10	SF340	D	25	D12	1515.6	165	117.4	109.09	0.2228	82.0
SEL	D10	DHC6	D	25	DC1	1531.8	266	88.5	98.34	0.2445	81.6
SEL	D10	GIIB	D	07	D1A	1507.4	0	135.3	10224.53	0.0031	100.6
SEL	D10	DHC6	D	25	D6A	1530.6	267	88.5	98.34	0.2580	81.2
SEL	D10	DHC6	D	25	D6A	1530.6	267	88.5	98.34	0.2580	81.2
SEL	D10	GASEPV	D	25	DC1	1518.4	176	90.4	101.63	0.3314	80.0
SEL	D10	GASEPF	D	25	DC1	1513.8	128	73.3	96.44	2.1469	71.8
SEL	D10	DHC6	D	07	D1A	1565.1	421	88.7	98.67	0.1791	82.5
SEL	D10	DHC6	D	07	D1A	1565.1	421	88.7	98.67	0.1791	82.5
SEL	D10	GASEPV	D	25	D6A	1517.2	176	90.4	101.63	0.3496	79.5
SEL	D10	GASEPV	D	25	D6A	1517.2	176	90.4	101.63	0.3496	79.5
SEL	D10	SF340	D	25	DC1	1517.4	164	117.4	109.08	0.1782	82.3
SEL	D10	BEC58P	D	25	DSK1	1513.2	97	103.9	113.87	0.1996	81.7
SEL	D10	BEC58P	D	25	DSK1	1513.2	97	103.9	113.87	0.1996	81.7
SEL	D10	GASEPF	D	25	DC1	1513.8	128	73.3	96.44	1.3212	73.3
SEL	D10	GASEPF	D	25	D12	1511.9	128	73.3	96.44	2.6836	70.2
SEL	D10	B206	D	18H	H2	1931.7	0	52.0	2.00	7.3264	65.7
SEL	D10	LEAR35	D	25	D6A	1507.9	0	141.5	2852.81	0.0839	85.1
SEL	D10	B222	A	18H	H3	2136.9	-16	65.0	2.00	1.4898	72.5
SEL	D10	GASEPV	D	07	D1A	1532.2	282	90.6	101.86	0.2428	80.2
SEL	D10	GASEPV	D	07	D1A	1532.2	282	90.6	101.86	0.2428	80.2
SEL	D10	DHC6	D	25	DSK1	1533.3	266	88.5	98.34	0.1834	81.1
SEL	D10	DHC6	D	25	DSK1	1533.3	266	88.5	98.34	0.1834	81.1
SEL	D10	BEC58P	D	07	D1A	1516.5	174	110.9	106.73	0.1950	80.8
SEL	D10	BEC58P	D	07	D1A	1516.5	174	110.9	106.73	0.1950	80.8
SEL	D10	B222	D	18H	H2	1931.6	9	65.0	1.00	1.4898	71.9
SEL	D10	FAL50	D	25	D6A	1511.0	100	158.6	2787.33	0.0350	88.2
SEL	D10	SF340	D	25	D12	1515.6	165	117.4	109.09	0.1371	82.1
SEL	D10	GASEPV	D	25	DSK1	1519.9	176	90.4	101.63	0.2485	79.5
SEL	D10	GASEPV	D	25	DSK1	1519.9	176	90.4	101.63	0.2485	79.5
SEL	D10	GIIB	D	07	D1A	1507.4	0	135.3	10224.53	0.0019	100.6
SEL	D10	GIIB	D	07	D1A	1507.4	0	135.3	10224.53	0.0019	100.6
SEL	D10	SF340	D	25	D12	1515.6	165	117.4	109.09	0.1371	82.0
SEL	D10	SF340	D	25	DSK1	1518.9	164	117.4	109.08	0.1337	82.0
SEL	D10	SF340	D	25	DSK2	1516.7	164	117.4	109.08	0.1306	82.0
SEL	D10	SF340	D	25	DC1	1517.4	164	117.4	109.08	0.1097	82.5
SEL	D10	SF340	D	07	DC2	1522.7	332	117.7	109.48	0.0635	84.7
SEL	D10	DHC6	D	07	DSK5	1548.3	423	88.7	98.67	0.0873	83.3
SEL	D10	SF340	D	25	DC1	1517.4	164	117.4	109.08	0.1097	82.2
SEL	D10	GASEPF	D	25	D12	1511.9	128	73.3	96.44	1.6515	70.3
SEL	D10	GASEPF	D	25	DC1	1513.8	128	73.3	96.44	1.3212	71.2
SEL	D10	GASEPF	D	25	D12	1511.9	128	73.3	96.44	1.6515	70.2
SEL	D10	GASEPF	D	25	DSK1	1515.3	128	73.3	96.44	1.6102	70.2
SEL	D10	LEAR35	D	25	D6A	1507.9	0	141.5	2852.81	0.0516	85.1
SEL	D10	GASEPV	D	07	DSK5	1514.9	283	90.6	101.86	0.1184	81.5
SEL	D10	B206	D	18H	H1	1931.7	0	52.0	2.00	7.3264	63.5
SEL	D10	LEAR35	D	25	D6A	1507.9	0	141.5	2852.81	0.0516	85.1
SEL	D10	GASEPF	D	25	DSK2	1512.9	128	73.3	96.44	1.5728	70.2
SEL	D10	BEC58P	D	07	DSK5	1498.8	175	111.0	106.66	0.0950	82.1
SEL	D10	H500D	D	18H	H2	1931.7	0	30.0	2.00	1.3469	70.4
SEL	D10	LEAR25	A	25	A10	1498.3	0	60.3	720.90	0.0980	81.7
SEL	D10	FAL50	D	25	D6A	1511.0	100	158.6	2787.33	0.0215	88.2
SEL	D10	FAL50	D	25	D6A	1511.0	100	158.6	2787.33	0.0215	88.1
SEL	D10	CNA441	T	07	TG1	1542.9	369	120.9	101.95	0.4923	74.3
SEL	D10	SF340	D	25	DSK1	1518.9	164	117.4	109.08	0.0823	82.0
SEL	D10	SF340	D	25	DSK1	1518.9	164	117.4	109.08	0.0823	81.9
SEL	D10	B222	A	18H	H4	2135.2	-16	65.0	2.00	0.3464	75.4
SEL	D11	GASEPV	T	25	TG2	1781.9	1	69.7	37.11	29.5804	82.2
SEL	D11	B222	A	18H	H4	694.8	372	65.0	2.00	1.4898	93.5
SEL	D11	GASEPV	T	07	TG1	1999.2	900	78.0	123.79	3.2867	86.9

SEL	D11	B222	D	18H	H1	841.1	554	96.3	2.08	1.4898	90.3
SEL	D11	B206	A	18H	H4	622.4	220	118.0	3.00	7.3264	82.5
SEL	D11	B206	D	18H	H1	913.8	652	72.1	1.70	7.3264	80.9
SEL	D11	B222	A	18H	H4	662.2	374	65.0	2.00	0.3464	93.9
SEL	D11	B222	A	18H	H4	727.8	370	65.0	2.00	0.3464	93.1
SEL	D11	UH-1	A	18H	H4	622.4	220	124.0	3.00	0.4422	91.9
SEL	D11	LEAR25	D	25	D6A	1777.6	0	59.1	2713.39	0.0980	98.2
SEL	D11	GIIB	D	25	D6A	1777.6	0	57.5	10743.07	0.0280	102.0
SEL	D11	BEC58P	T	25	TG2	1781.9	1	99.2	26.65	12.5747	75.4
SEL	D11	LEAR25	D	25	D6A	1777.6	0	59.1	2713.39	0.0603	98.2
SEL	D11	LEAR25	D	25	D6A	1777.6	0	59.1	2713.39	0.0603	98.2
SEL	D11	B222	D	18H	H1	815.0	557	96.5	2.09	0.3464	90.6
SEL	D11	H500D	D	18H	H1	913.8	652	77.1	1.70	1.3469	84.3
SEL	D11	B222	D	18H	H1	867.9	550	96.1	2.07	0.3464	90.0
SEL	D11	GASEPV	D	25	D12	1778.9	53	68.2	135.16	2.4853	81.4
SEL	D11	B206	A	18H	H4	585.0	221	118.0	3.00	1.7033	83.0
SEL	D11	GASEPV	D	25	DC1	1778.1	53	68.2	135.13	1.9883	81.7
SEL	D11	GIIB	D	25	D6A	1777.6	0	57.5	10743.07	0.0172	102.0
SEL	D11	GIIB	D	25	D6A	1777.6	0	57.5	10743.07	0.0172	102.0
SEL	D11	B206	A	18H	H4	659.9	219	118.0	3.00	1.7033	81.9
SEL	D11	UH-1	D	18H	H1	913.8	652	76.0	1.70	0.4422	87.2
SEL	D11	B206	D	18H	H1	890.1	656	72.5	1.69	1.7033	81.2
SEL	D11	GASEPV	D	25	D12	1778.9	53	68.2	135.16	1.5294	81.4
SEL	D11	GASEPV	D	25	D12	1778.9	53	68.2	135.16	1.5294	81.4
SEL	D11	GASEPV	D	25	DSK1	1777.4	54	68.2	135.11	1.4912	81.5
SEL	D11	GASEPV	D	25	DSK2	1778.5	53	68.2	135.15	1.4565	81.4
SEL	D11	B206	D	18H	H1	938.2	649	71.6	1.70	1.7033	80.7
SEL	D11	BEC58P	T	07	TG1	1842.3	456	116.0	102.44	1.3972	81.4
SEL	D11	GASEPV	D	25	DC1	1778.1	53	68.2	135.13	1.2235	81.9
SEL	D11	UH-1	A	18H	H4	585.0	221	124.0	3.00	0.1028	92.4
SEL	D11	GASEPV	D	25	DC1	1778.1	53	68.2	135.13	1.2235	81.6
SEL	D11	BEC58P	D	25	D12	1777.9	0	72.7	122.80	1.9956	79.2
SEL	D11	H500D	A	18H	H4	622.4	220	139.0	3.00	1.3470	80.7
SEL	D11	UH-1	A	18H	H4	659.9	219	124.0	3.00	0.1028	91.5
SEL	D11	BEC58P	D	25	DC1	1777.1	0	72.7	122.80	1.5965	79.4
SEL	D11	GASEPV	D	25	DSK1	1777.4	54	68.2	135.11	0.9177	81.5
SEL	D11	GASEPV	D	25	DSK1	1777.4	54	68.2	135.11	0.9177	81.4
SEL	D11	GASEPF	T	25	TG2	1781.9	1	62.0	32.36	27.3739	66.4
SEL	D11	LEAR25	D	25	D6A	1777.6	0	59.1	2713.39	0.0163	98.2
SEL	D11	LEAR25	D	25	D6A	1777.6	0	59.1	2713.39	0.0163	98.2
SEL	D11	BEC58P	D	25	D12	1777.9	0	72.7	122.80	1.2281	79.2
SEL	D11	BEC58P	D	25	D12	1777.9	0	72.7	122.80	1.2281	79.2
SEL	D11	BEC58P	D	25	DSK1	1776.4	0	72.8	122.80	1.1973	79.2
SEL	D11	BEC58P	D	25	DSK2	1777.5	0	72.7	122.80	1.1696	79.2
SEL	D11	BEC58P	D	25	DC1	1777.1	0	72.7	122.80	0.9824	80.0
SEL	D11	H500D	D	18H	H1	890.1	656	77.7	1.69	0.3131	84.5
SEL	D11	BEC58P	D	25	DC1	1777.1	0	72.7	122.80	0.9824	79.5
SEL	D11	H500D	D	18H	H1	938.2	649	76.5	1.70	0.3131	84.1
SEL	D11	GASEPV	D	25	D6A	1778.6	53	68.2	135.15	0.5680	81.4
SEL	D11	GIIB	D	25	D6A	1777.6	0	57.5	10743.07	0.0047	102.0
SEL	D11	GIIB	D	25	D6A	1777.6	0	57.5	10743.07	0.0047	102.0
SEL	D11	DHC6	D	07	DC2	1942.5	710	89.1	99.28	0.5225	81.2
SEL	D11	GASEPV	D	07	DC2	1864.8	479	90.8	102.30	0.7080	79.6
SEL	D11	BEC58P	D	25	DSK1	1776.4	0	72.8	122.80	0.7368	79.2
SEL	D11	BEC58P	D	25	DSK1	1776.4	0	72.8	122.80	0.7368	79.2
SEL	D11	BEC58P	D	07	DC2	1836.7	359	115.8	102.23	0.5686	80.3
SEL	D11	GASEPV	D	25	D12	1778.9	53	68.2	135.16	0.4142	81.4
SEL	D11	GASEPV	D	25	D12	1778.9	53	68.2	135.16	0.4142	81.4
SEL	D11	UH-1	D	18H	H1	890.1	656	76.5	1.69	0.1028	87.4
SEL	D11	GASEPV	D	25	DC1	1778.1	53	68.2	135.13	0.3314	82.0
SEL	D11	UH-1	D	18H	H1	938.2	649	75.5	1.70	0.1028	86.9
SEL	D11	GASEPV	D	25	D6A	1778.6	53	68.2	135.15	0.3496	81.4
SEL	D11	GASEPV	D	25	D6A	1778.6	53	68.2	135.15	0.3496	81.4
SEL	D11	GASEPV	D	25	DC1	1778.1	53	68.2	135.13	0.3314	81.6
SEL	D11	LEAR25	D	07	D1A	1772.6	105	164.0	2499.68	0.0108	96.2
SEL	D11	GASEPF	T	07	TG1	1817.4	349	73.5	96.90	3.0415	71.5
SEL	D11	H500D	A	18H	H4	585.0	221	139.0	3.00	0.3132	81.2
SEL	D11	DHC6	D	07	D1A	1915.5	712	89.1	99.29	0.2911	81.3
SEL	D11	BEC58P	D	25	D6A	1777.6	0	72.7	122.80	0.4561	79.2
SEL	D11	DHC6	D	25	DC1	1777.1	0	82.2	97.77	1.4672	74.1
SEL	D11	DHC6	D	25	D12	1777.9	0	82.2	97.77	1.8340	73.0

SEL	D11	GASEPV	D	25	DSK1	1777.4	54	68.2	135.11	0.2485	81.5
SEL	D11	GASEPV	D	25	DSK1	1777.4	54	68.2	135.11	0.2485	81.4
SEL	D11	GASEPV	D	07	D1A	1836.2	481	90.8	102.30	0.3945	79.3
SEL	D11	H500D	A	18H	H4	659.9	219	139.0	3.00	0.3132	80.2
SEL	D11	BEC58P	D	07	D1A	1807.5	361	115.8	102.23	0.3168	80.0
SEL	D11	B206	D	18H	H2	1848.4	216	52.0	2.00	7.3264	66.3
SEL	D11	LEAR35	D	25	D6A	1777.6	0	72.5	3119.30	0.0839	85.6
SEL	D11	BEC58P	D	25	DC1	1777.1	0	72.7	122.80	0.2661	80.3
SEL	D11	DHC6	D	25	DC1	1777.1	0	82.2	97.77	0.9029	74.9
SEL	D11	BEC58P	D	25	D12	1777.9	0	72.7	122.80	0.3326	79.2
SEL	D11	LEAR25	D	07	D1A	1772.6	105	164.0	2499.68	0.0067	96.2
SEL	D11	BEC58P	D	25	D12	1777.9	0	72.7	122.80	0.3326	79.2
SEL	D11	LEAR25	D	07	D1A	1772.6	105	164.0	2499.68	0.0067	96.1
SEL	D11	GIIB	D	07	D1A	1772.4	102	160.1	10058.87	0.0031	99.2
SEL	D11	DHC6	D	25	DC1	1777.1	0	82.2	97.77	0.9029	74.5
SEL	D11	DHC6	D	07	D1A	1915.5	712	89.1	99.29	0.1791	81.3
SEL	D11	CNA441	T	25	TG2	1782.1	21	101.8	36.06	4.4308	67.4
SEL	D11	DHC6	D	07	D1A	1915.5	712	89.1	99.29	0.1791	81.3
SEL	D11	BEC58P	D	25	D6A	1777.6	0	72.7	122.80	0.2807	79.2
SEL	D11	BEC58P	D	25	D6A	1777.6	0	72.7	122.80	0.2807	79.2
SEL	D11	LEAR25	A	25	A10	1783.5	20	142.0	769.27	0.0980	83.8
SEL	D11	BEC58P	D	25	DC1	1777.1	0	72.7	122.80	0.2661	79.4
SEL	D11	DHC6	D	25	D12	1777.9	0	82.2	97.77	1.1286	73.1
SEL	D11	DHC6	D	25	DSK1	1776.4	0	82.3	97.77	1.1004	73.1
SEL	D11	DHC6	D	25	D12	1777.9	0	82.2	97.77	1.1286	73.0
SEL	D11	DHC6	D	25	DSK2	1777.5	0	82.2	97.77	1.0748	73.1
SEL	D11	GASEPV	D	07	D1A	1836.2	481	90.8	102.30	0.2428	79.3
SEL	D11	GASEPV	D	07	D1A	1836.2	481	90.8	102.30	0.2428	79.3
SEL	D11	UH-1	T	25	TG2	1781.9	0	55.0	3.00	0.1794	80.4
SEL	D11	BEC58P	D	07	D1A	1807.5	361	115.8	102.23	0.1950	80.0
SEL	D11	BEC58P	D	07	D1A	1807.5	361	115.8	102.23	0.1950	80.0
SEL	D11	LEAR35	D	25	D6A	1777.6	0	72.5	3119.30	0.0516	85.6
SEL	D11	LEAR35	D	25	D6A	1777.6	0	72.5	3119.30	0.0516	85.6
SEL	D11	BEC58P	D	25	DSK1	1776.4	0	72.8	122.80	0.1996	79.2
SEL	D11	BEC58P	D	25	DSK1	1776.4	0	72.8	122.80	0.1996	79.2
SEL	D11	B222	A	18H	H3	1864.0	83	65.0	2.00	1.4898	70.4
SEL	D11	SF340	D	07	DC2	1917.5	640	118.3	110.21	0.0635	84.1
SEL	D11	GIIB	D	07	D1A	1772.4	102	160.1	10058.87	0.0019	99.2
SEL	D11	GIIB	D	07	D1A	1772.4	102	160.1	10058.87	0.0019	99.2
SEL	D11	H500D	D	18H	H2	1848.4	216	50.0	2.00	1.3469	70.4
SEL	D11	LEAR25	A	25	A10	1783.5	20	142.0	769.27	0.0603	83.8
SEL	D11	LEAR25	A	25	A10	1783.5	20	142.0	769.27	0.0603	83.7
SEL	D11	DHC6	D	25	DSK1	1776.4	0	82.3	97.77	0.6772	73.1
SEL	D11	DHC6	D	25	DSK1	1776.4	0	82.3	97.77	0.6772	73.1
SEL	D11	IA1125	D	25	D6A	1777.6	0	54.4	3244.51	0.0560	83.7
SEL	D11	DHC6	A	25	A10	1783.5	20	60.9	34.99	1.3624	69.9
SEL	D11	GASEPV	D	25	D6A	1778.6	53	68.2	135.15	0.0947	81.4
SEL	D11	GASEPV	D	25	D6A	1778.6	53	68.2	135.15	0.0947	81.4
SEL	D11	FAL50	D	25	D6A	1777.6	0	101.2	3008.35	0.0350	85.7
SEL	D11	GASEPF	D	25	D12	1778.1	21	66.8	106.12	2.6836	66.8
SEL	D11	DHC6	D	07	DSK5	1938.3	710	89.1	99.29	0.0873	81.6
SEL	D11	GASEPF	D	25	DC1	1777.3	21	66.8	106.10	2.1469	67.7
SEL	D11	CNA441	T	07	TG1	1912.4	671	121.4	102.63	0.4923	73.7
SEL	D11	MU3001	D	25	D6A	1777.6	0	58.7	2005.36	0.0560	83.1
SEL	D11	DHC6	A	25	A12	1783.3	20	60.9	34.99	1.1004	70.1
SEL	D11	DHC6	A	25	A11	1783.1	20	60.9	34.99	1.1004	70.0
SEL	D12	GASEPV	T	25	TG2	2046.4	900	91.4	49.37	29.5804	79.5
SEL	D12	BEC58P	T	25	TG2	1970.7	703	116.4	102.99	12.5747	82.3
SEL	D12	LEAR25	D	25	D6A	1887.6	507	172.6	2478.82	0.0980	100.9
SEL	D12	B206	A	18H	H3	772.7	484	118.0	3.00	7.3264	81.8
SEL	D12	LEAR25	D	25	D6A	1828.4	524	172.7	2478.60	0.0603	101.5
SEL	D12	GIIB	D	25	D6A	1890.5	516	168.6	9999.68	0.0280	104.1
SEL	D12	LEAR25	D	25	D6A	1942.9	489	172.6	2479.04	0.0603	100.3
SEL	D12	UH-1	A	18H	H3	772.7	484	124.0	3.00	0.4422	91.6
SEL	D12	GASEPF	T	25	TG2	1906.3	502	73.7	97.22	27.3739	72.9
SEL	D12	GIIB	D	25	D6A	1831.6	534	168.7	9999.28	0.0172	104.7
SEL	D12	GIIB	D	25	D6A	1945.4	498	168.6	10000.09	0.0172	103.5
SEL	D12	B206	D	18H	H2	1177.5	1000	118.0	1.00	7.3264	76.9
SEL	D12	BEC58P	D	25	D12	1999.4	729	116.5	103.05	1.9956	82.0
SEL	D12	B206	A	18H	H3	719.1	485	118.0	3.00	1.7033	82.5
SEL	D12	B222	A	18H	H3	1160.1	956	117.9	2.91	1.4898	82.8

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SEL	D12	LEAR25	D	25	D6A	1765.8	541	172.7	2478.39	0.0163	102.2
SEL	D12	GASEPV	D	25	D12	2038.1	828	91.3	103.07	2.4853	80.2
SEL	D12	BEC58P	D	25	DSK1	1836.9	764	116.5	103.13	1.1973	83.3
SEL	D12	UH-1	D	18H	H2	1177.5	1000	124.0	1.00	0.4422	87.6
SEL	D12	BEC58P	D	25	D12	1836.9	759	116.5	103.12	1.2281	83.1
SEL	D12	BEC58P	D	25	DSK2	1845.1	764	116.5	103.13	1.1696	83.3
SEL	D12	B206	A	18H	H3	828.7	483	118.0	3.00	1.7033	81.2
SEL	D12	B222	D	18H	H2	1177.5	1000	123.0	3.00	1.4898	81.7
SEL	D12	BEC58P	D	25	DC1	2044.6	668	116.4	102.91	1.5965	81.3
SEL	D12	GASEPV	D	25	DSK1	1880.0	862	91.3	103.14	1.4912	81.5
SEL	D12	DHC6	D	25	D12	2183.3	1127	99.8	89.21	1.8340	80.5
SEL	D12	GASEPV	D	25	D12	1879.9	857	91.3	103.13	1.5294	81.2
SEL	D12	GASEPV	D	25	DSK2	1888.0	862	91.3	103.15	1.4565	81.4
SEL	D12	GASEPV	D	25	DC1	2080.9	771	91.2	102.94	1.9883	79.8
SEL	D12	BEC58P	D	25	DSK1	1800.1	772	116.5	103.15	0.7368	83.6
SEL	D12	UH-1	A	18H	H3	719.1	485	124.0	3.00	0.1028	92.1
SEL	D12	H500D	D	18H	H2	1177.5	1000	139.0	1.00	1.3469	80.8
SEL	D12	DHC6	D	25	DC1	2214.4	1081	98.0	91.66	1.4672	80.3
SEL	D12	GIIB	D	25	D6A	1769.3	551	168.7	9998.90	0.0047	105.3
SEL	D12	BEC58P	D	25	D12	2143.0	695	116.4	102.97	1.2281	80.9
SEL	D12	LEAR25	D	25	D6A	1993.7	470	172.5	2479.27	0.0163	99.7
SEL	D12	DHC6	D	25	D12	2046.3	1165	99.9	88.30	1.1286	81.2
SEL	D12	BEC58P	D	25	DSK1	1873.2	756	116.5	103.11	0.7368	83.0
SEL	D12	DHC6	D	25	DSK1	2048.0	1170	99.9	88.16	1.1004	81.3
SEL	D12	H500D	A	18H	H3	772.7	484	139.0	3.00	1.3470	80.3
SEL	D12	BEC58P	D	25	DC1	2031.5	686	116.4	102.96	0.9824	81.6
SEL	D12	DHC6	D	25	DSK2	2055.4	1171	99.9	88.15	1.0748	81.2
SEL	D12	GASEPV	D	25	DSK1	1844.3	869	91.3	103.16	0.9177	81.7
SEL	D12	BEC58P	D	25	DC1	2049.9	649	116.3	102.87	0.9824	81.3
SEL	D12	UH-1	A	18H	H3	828.7	483	124.0	3.00	0.1028	91.0
SEL	D12	GASEPV	D	25	D12	2178.4	796	91.2	103.00	1.5294	79.2
SEL	D12	CNA441	T	25	TG2	2097.4	987	122.0	103.33	4.4308	74.6
SEL	D12	GASEPV	D	25	DSK1	1915.2	854	91.3	103.13	0.9177	81.2
SEL	D12	GASEPV	D	25	DC1	2068.5	789	91.2	102.98	1.2235	80.0
SEL	D12	GASEPV	D	25	DC1	2085.5	753	91.2	102.90	1.2235	79.9
SEL	D12	DHC6	D	25	D12	2306.5	1098	99.8	89.90	1.1286	79.8
SEL	D12	GASEPV	T	07	TG1	1844.6	147	69.8	37.30	3.2867	75.1
SEL	D12	DHC6	D	25	DC1	2202.9	1094	99.4	90.31	0.9029	80.5
SEL	D12	DHC6	D	25	DC1	2218.5	1067	96.6	93.03	0.9029	80.3
SEL	D12	DHC6	D	25	DSK1	2017.7	1180	99.9	87.94	0.6772	81.4
SEL	D12	GIIB	D	25	D6A	1996.0	479	168.5	10000.52	0.0047	102.9
SEL	D12	B206	D	18H	H2	1130.4	1000	118.0	1.00	1.7033	77.3
SEL	D12	BEC58P	D	25	D12	1665.5	786	116.6	103.18	0.3326	84.3
SEL	D12	DHC6	D	25	DSK1	2077.8	1161	99.9	88.40	0.6772	81.1
SEL	D12	BEC58P	D	25	D6A	1961.9	736	116.5	103.07	0.4561	82.4
SEL	D12	B206	D	18H	H2	1229.9	1000	118.0	1.00	1.7033	76.4
SEL	D12	GASEPV	D	25	D12	1713.5	882	91.4	103.19	0.4142	82.3
SEL	D12	B222	A	18H	H3	1126.9	958	118.2	2.92	0.3464	83.0
SEL	D12	GASEPV	D	25	D6A	2001.6	835	91.3	103.09	0.5680	80.6
SEL	D12	UH-1	D	18H	H2	1130.4	1000	124.0	1.00	0.1028	87.9
SEL	D12	LEAR35	D	25	D6A	1953.7	709	160.0	2786.20	0.0839	88.7
SEL	D12	B222	A	18H	H3	1196.3	953	117.6	2.91	0.3464	82.5
SEL	D12	B222	D	18H	H2	1130.4	1000	123.0	3.00	0.3464	82.0
SEL	D12	UH-1	D	18H	H2	1229.9	1000	124.0	1.00	0.1028	87.2
SEL	D12	BEC58P	D	25	D6A	1905.3	749	116.5	103.10	0.2807	82.8
SEL	D12	GASEPV	D	07	DC2	2315.7	0	16.0	163.84	0.7080	78.7
SEL	D12	DHC6	D	25	D6A	2151.4	1136	99.9	89.00	0.4192	80.7
SEL	D12	BEC58P	D	25	DSK1	1762.9	779	116.6	103.16	0.1996	83.9
SEL	D12	DHC6	D	25	D12	1904.0	1197	99.9	87.52	0.3057	82.0
SEL	D12	SF340	D	25	D12	2186.8	1140	124.0	107.17	0.2228	83.2
SEL	D12	B222	D	18H	H2	1229.9	1000	123.0	3.00	0.3464	81.3
SEL	D12	BEC58P	D	25	D6A	2014.7	722	116.5	103.04	0.2807	82.0
SEL	D12	GASEPV	D	25	D6A	1946.5	848	91.3	103.11	0.3496	81.0
SEL	D12	LEAR35	D	25	D6A	1898.1	726	160.0	2786.18	0.0516	89.3
SEL	D12	GASEPF	D	25	D12	1940.9	556	73.8	97.33	2.6836	71.9
SEL	D12	BEC58P	D	25	DC1	2011.0	705	116.4	103.00	0.2661	81.9
SEL	D12	H500D	D	18H	H2	1130.4	1000	139.0	1.00	0.3131	81.1
SEL	D12	GASEPV	D	25	DSK1	1808.2	876	91.4	103.18	0.2485	82.0
SEL	D12	SF340	D	25	DC1	2216.3	1078	121.8	108.89	0.1782	83.3
SEL	D12	BEC58P	D	25	DSK1	1908.6	748	116.5	103.09	0.1996	82.8
SEL	D12	H500D	A	18H	H3	719.1	485	139.0	3.00	0.3132	80.8

SEL	D12	UH-1	T	25	TG2	1966.9	700	124.0	1.00	0.1794	83.2
SEL	D12	GASEPV	D	25	D6A	2053.0	822	91.3	103.06	0.3496	80.2
SEL	D12	GASEPF	D	25	DSK1	1764.9	578	73.8	97.38	1.6102	73.6
SEL	D12	BEC58P	D	25	DC1	2050.0	646	116.3	102.87	0.2661	81.3
SEL	D12	GASEPF	D	25	DSK2	1773.3	578	73.8	97.38	1.5728	73.5
SEL	D12	GASEPV	D	25	DC1	2048.9	806	91.3	103.02	0.3314	80.3
SEL	D12	H500D	D	18H	H2	1229.9	1000	139.0	1.00	0.3131	80.4
SEL	D12	LEAR35	D	25	D6A	2005.5	692	159.9	2786.23	0.0516	88.2
SEL	D12	GASEPF	D	25	D12	1766.0	575	73.8	97.37	1.6515	73.1
SEL	D12	SF340	D	25	DSK1	2047.0	1176	125.4	106.17	0.1337	84.0
SEL	D12	DHC6	T	25	TG2	2112.4	1019	89.5	99.96	0.1794	82.7
SEL	D12	SF340	D	25	DSK2	2054.4	1176	125.4	106.16	0.1306	84.0
SEL	D12	BEC58P	D	25	D12	2259.6	658	116.4	102.89	0.3326	79.9
SEL	D12	SF340	D	25	D12	2046.0	1171	125.2	106.30	0.1371	83.8
SEL	D12	DHC6	D	25	D6A	2104.4	1152	99.9	88.60	0.2580	80.9
SEL	D12	GASEPV	D	25	DC1	2085.6	751	91.2	102.90	0.3314	79.8
SEL	D12	GASEPV	D	25	DSK1	1949.7	846	91.3	103.11	0.2485	81.0
SEL	D12	GASEPV	D	07	D1A	2315.7	0	16.0	163.84	0.3945	78.8
SEL	D12	GASEPF	D	25	DC1	1999.0	518	73.7	97.26	2.1469	71.4
SEL	D12	H500D	A	18H	H3	828.7	483	139.0	3.00	0.3132	79.8
SEL	D12	FAL50	D	25	D6A	2401.8	1568	175.0	2736.25	0.0350	89.2
SEL	D12	LEAR25	D	07	D1A	2315.7	0	16.0	2800.79	0.0108	94.2
SEL	D12	DHC6	D	25	D6A	2195.3	1119	99.8	89.40	0.2580	80.4
SEL	D12	GASEPV	D	25	D12	2292.2	762	91.2	102.92	0.4142	78.4
SEL	D12	DHC6	D	25	DC1	2186.3	1098	99.8	89.90	0.2445	80.6
SEL	D12	MU3001	D	25	D6A	1905.7	570	143.5	1857.52	0.0560	87.0
SEL	D12	DHC6	D	25	DSK1	1987.3	1189	99.9	87.72	0.1834	81.6
SEL	D12	DHC6	D	25	D12	2413.9	1074	97.3	92.34	0.3057	79.3
SEL	D12	DHC6	D	25	DC1	2218.5	1067	96.5	93.09	0.2445	80.3
SEL	D12	SF340	D	25	D12	2312.5	1105	122.8	108.14	0.1371	82.8
SEL	D12	GASEPF	D	25	DSK1	1724.7	583	73.8	97.39	0.9909	73.9
SEL	D12	SF340	D	25	DC1	2207.9	1097	122.5	108.36	0.1097	83.4
SEL	D12	SF340	D	25	DC1	2217.9	1065	121.3	109.24	0.1097	83.2
SEL	D12	DHC6	D	25	DSK1	2107.0	1150	99.9	88.64	0.1834	80.9
SEL	D12	SF340	D	25	DSK1	2015.6	1183	125.6	105.96	0.0823	84.2
SEL	D12	GASEPF	D	25	DSK1	1804.4	573	73.8	97.37	0.9909	73.3
SEL	D12	GIIB	D	07	D1A	2315.7	0	16.0	11019.63	0.0031	98.2
SEL	D12	SF340	D	25	DSK1	2077.9	1168	125.1	106.40	0.0823	83.9
SEL	D12	GASEPF	D	25	D12	2094.9	535	73.7	97.29	1.6515	70.8
SEL	D12	MU3001	D	25	D6A	1847.0	586	143.5	1858.50	0.0344	87.5
SEL	D12	GASEPF	D	25	DC1	1982.1	530	73.7	97.28	1.3212	71.7
SEL	D12	GASEPF	D	25	DC1	2007.7	506	73.7	97.23	1.3212	71.6
SEL	D12	FAL50	D	25	D6A	2356.9	1576	176.5	2730.61	0.0215	89.4
SEL	D12	GASEPV	D	07	D1A	2315.7	0	16.0	163.84	0.2428	78.8
SEL	D12	GASEPV	D	07	D1A	2315.7	0	16.0	163.84	0.2428	78.8
SEL	D12	LEAR25	D	07	D1A	2315.7	0	16.0	2800.79	0.0067	94.2
SEL	D12	LEAR25	D	07	D1A	2315.7	0	16.0	2800.79	0.0067	94.2
SEL	D12	FAL50	D	25	D6A	2444.1	1560	173.4	2742.10	0.0215	89.0
SEL	D12	BEC58P	D	07	DC2	2315.7	0	16.0	122.80	0.5686	74.6
SEL	D2	LEAR25	D	25	D6A	1808.9	1534	177.9	2460.89	0.0980	105.2
SEL	D2	LEAR25	D	25	D6A	1663.9	1537	178.2	2460.30	0.0603	106.2
SEL	D2	GIIB	D	25	D6A	1821.9	1549	174.8	9952.98	0.0280	108.2
SEL	D2	LEAR25	D	25	D6A	1996.9	1528	177.5	2461.74	0.0603	103.9
SEL	D2	GIIB	D	25	D6A	1678.1	1552	175.1	9951.15	0.0172	109.0
SEL	D2	GIIB	D	25	D6A	2008.6	1543	174.4	9955.59	0.0172	107.0
SEL	D2	LEAR25	D	25	D6A	1575.7	1539	178.4	2459.97	0.0163	106.7
SEL	D2	BEC58P	D	25	D12	1396.7	1309	132.6	92.43	1.9956	84.4
SEL	D2	GIIB	D	25	D6A	1590.8	1554	175.3	9950.12	0.0047	109.5
SEL	D2	BEC58P	D	25	DC1	1515.1	1292	131.8	93.02	1.5965	83.9
SEL	D2	BEC58P	D	25	D12	1399.4	1332	132.8	88.73	1.2281	84.4
SEL	D2	GASEPV	D	25	D12	1472.5	1386	102.3	87.22	2.4853	81.3
SEL	D2	BEC58P	D	25	DC1	1365.1	1305	132.5	92.55	0.9824	84.9
SEL	D2	LEAR25	D	25	D6A	2214.2	1522	177.0	2462.84	0.0163	102.3
SEL	D2	DHC6	D	25	D12	2200.1	2108	101.3	87.12	1.8340	81.4
SEL	D2	GASEPV	D	25	DC1	1581.2	1366	102.2	87.17	1.9883	80.9
SEL	D2	GASEPV	D	25	D12	1482.3	1415	102.3	87.28	1.5294	81.8
SEL	D2	GASEPV	T	07	TG1	907.9	650	70.4	37.99	3.2867	78.3
SEL	D2	DHC6	D	25	DC1	2256.9	2097	101.3	87.09	1.4672	81.7
SEL	D2	GASEPF	D	25	D12	1128.3	1024	76.8	95.36	2.6836	78.4
SEL	D2	GASEPV	D	25	DC1	1441.7	1382	102.3	87.21	1.2235	81.8
SEL	D2	BEC58P	D	25	D12	1846.4	1292	131.8	93.03	1.2281	81.6

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SEL	D2	BEC58P	D	25	DC1	1742.9	1276	131.0	93.62	0.9824	82.5
SEL	D2	DHC6	D	25	D12	2238.9	2160	101.4	87.22	1.1286	81.7
SEL	D2	GIIB	D	25	D6A	2224.7	1537	173.9	9958.97	0.0047	105.5
SEL	D2	GASEPF	T	25	TG2	2475.7	832	74.0	97.91	27.3739	67.4
SEL	D2	DHC6	D	25	DC1	2176.0	2113	101.3	87.12	0.9029	82.2
SEL	D2	BEC58P	D	25	DSK1	2106.7	1295	131.9	92.94	1.1973	80.9
SEL	D2	GASEPV	T	25	TG2	2499.6	900	91.4	49.37	29.5804	66.9
SEL	D2	DHC6	A	07	A2	497.9	380	61.2	35.45	0.1433	89.9
SEL	D2	BEC58P	D	25	DSK2	2104.2	1295	131.9	92.94	1.1696	80.7
SEL	D2	GASEPF	D	25	DC1	1281.9	1016	75.9	96.37	2.1469	77.6
SEL	D2	GASEPF	D	25	D12	1115.5	1037	78.1	93.87	1.6515	78.6
SEL	D2	LEAR35	D	25	D6A	1870.1	1605	170.7	2752.99	0.0839	91.5
SEL	D2	GASEPV	D	25	DC1	1797.2	1347	102.2	87.14	1.2235	79.7
SEL	D2	DHC6	D	25	DSK1	2689.8	2079	101.3	87.05	1.1004	80.1
SEL	D2	DHC6	D	25	D12	2487.9	2073	101.3	87.04	1.1286	79.9
SEL	D2	DHC6	D	25	DSK2	2687.7	2078	101.3	87.05	1.0748	80.1
SEL	D2	BEC58P	D	25	DSK1	1953.1	1299	132.1	92.78	0.7368	81.7
SEL	D2	GASEPF	D	25	DC1	1091.4	1023	76.6	95.57	1.3212	79.1
SEL	D2	GASEPV	D	25	D12	1901.0	1365	102.2	87.17	1.5294	78.4
SEL	D2	DHC6	D	25	DC1	2404.3	2084	101.3	87.06	0.9029	80.7
SEL	D2	BEC58P	D	25	D6A	1617.9	1307	132.6	92.49	0.4561	83.5
SEL	D2	GASEPV	D	25	DSK1	2155.2	1369	102.2	87.18	1.4912	78.3
SEL	D2	DHC6	A	07	A2	755.0	377	61.2	35.45	0.2329	86.3
SEL	D2	BEC58P	T	25	TG2	2499.6	900	116.8	50.30	12.5747	68.9
SEL	D2	GASEPV	D	25	DSK2	2152.7	1368	102.2	87.18	1.4565	78.0
SEL	D2	BEC58P	D	25	DC1	1328.5	1316	132.8	91.56	0.2661	85.2
SEL	D2	LEAR35	D	25	D6A	1730.3	1609	170.9	2751.95	0.0516	92.3
SEL	D2	DHC6	A	07	A1	470.5	380	61.2	35.45	0.0717	90.7
SEL	D2	BEC58P	T	07	TG1	907.9	650	101.8	26.61	1.3972	77.8
SEL	D2	MU3001	D	25	D6A	1787.2	1511	146.7	1914.11	0.0560	91.6
SEL	D2	BEC58P	D	25	D6A	1453.2	1310	132.7	92.37	0.2807	84.5
SEL	D2	DHC6	D	25	DSK1	2576.7	2088	101.3	87.07	0.6772	80.6
SEL	D2	BEC58P	D	25	DSK1	2263.8	1290	131.7	93.11	0.7368	80.1
SEL	D2	GASEPV	D	25	DSK1	2006.1	1374	102.3	87.19	0.9177	79.1
SEL	D2	GASEPV	D	25	D6A	1683.3	1383	102.3	87.21	0.5680	80.8
SEL	D2	DHC6	D	25	D6A	2344.2	2105	101.3	87.11	0.4192	81.8
SEL	D2	B206	D	18H	H2	2359.0	1000	118.0	1.00	7.3264	69.3
SEL	D2	DHC6	D	25	DSK1	2809.1	2069	101.3	87.03	0.6772	79.5
SEL	D2	MU3001	D	25	D6A	1639.4	1514	146.9	1913.70	0.0344	92.4
SEL	D2	DHC6	A	07	A2	391.3	383	61.2	35.46	0.0388	91.7
SEL	D2	UH-1	D	18H	H2	2359.0	1000	124.0	1.00	0.4422	81.0
SEL	D2	GASEPV	D	25	DC1	1410.2	1395	102.3	87.23	0.3314	82.2
SEL	D2	LEAR35	D	25	D6A	2052.6	1600	170.3	2754.47	0.0516	90.2
SEL	D2	GASEPV	D	25	DSK1	2308.2	1363	102.2	87.17	0.9177	77.6
SEL	D2	GASEPV	D	25	D6A	1526.5	1388	102.3	87.22	0.3496	81.7
SEL	D2	DHC6	A	07	A1	797.3	377	61.2	35.45	0.1165	86.5
SEL	D2	GASEPF	D	25	DC1	1552.7	1007	75.0	97.40	1.3212	75.8
SEL	D2	BEC58P	D	25	D12	1846.2	1362	132.9	83.61	0.3326	81.7
SEL	D2	IA1125	D	25	D6A	1371.9	985	165.7	2863.08	0.0560	89.4
SEL	D2	BEC58P	D	25	D6A	1826.6	1302	132.3	92.67	0.2807	82.3
SEL	D2	GASEPF	D	25	D12	1660.5	1016	75.9	96.39	1.6515	74.6
SEL	D2	IA1125	D	25	D6A	1173.9	991	165.7	2863.29	0.0344	91.0
SEL	D2	DHC6	D	25	D6A	2238.6	2112	101.3	87.12	0.2580	82.2
SEL	D2	DHC6	D	25	DC1	2168.0	2119	101.3	87.14	0.2445	82.4
SEL	D2	B206	A	18H	H3	2398.5	1000	118.0	1.00	7.3264	67.6
SEL	D2	CNA441	T	07	TG1	742.7	412	102.4	36.58	0.4923	79.2
SEL	D2	GASEPV	D	25	D12	1917.3	1452	102.4	87.35	0.4142	79.8
SEL	D2	B222	D	18H	H2	2654.0	1553	123.0	3.00	1.4898	74.3
SEL	D2	GASEPF	D	25	DSK1	1944.9	1017	76.0	96.23	1.6102	73.9
SEL	D2	UH-1	A	18H	H3	2398.5	1000	124.0	1.00	0.4422	79.3
SEL	D2	GASEPF	D	25	DSK2	1942.2	1017	76.0	96.24	1.5728	73.8
SEL	D2	MU3001	D	25	D6A	1978.5	1508	146.3	1914.70	0.0344	90.3
SEL	D2	DHC6	D	25	D12	2584.1	2224	101.5	87.36	0.3057	80.8
SEL	D2	BEC58P	D	25	DSK1	1805.8	1303	132.3	92.65	0.1996	82.5
SEL	D2	GASEPV	A	07	A2	497.9	380	66.5	45.60	0.1942	82.5
SEL	D2	LEAR25	A	07	A1	470.5	380	142.8	779.48	0.0067	97.1
SEL	D2	DHC6	D	25	D6A	2486.4	2094	101.3	87.09	0.2580	81.2
SEL	D2	GASEPF	T	07	TG1	907.9	650	62.6	33.13	3.0415	70.5
SEL	D2	BEC58P	D	25	DC1	2023.5	1272	130.8	93.77	0.2661	81.0
SEL	D2	H500D	D	18H	H2	2359.0	1000	139.0	1.00	1.3469	73.9
SEL	D2	GASEPF	D	25	DC1	1037.4	1028	77.2	94.91	0.3578	79.6

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SEL	D2	GASEPV	D	25	D6A	1883.8	1378	102.3	87.20	0.3496	79.6
SEL	D2	GASEPF	D	25	D6A	1393.8	1023	76.7	95.47	0.6134	77.2
SEL	D2	CNA441	D	25	D12	1632.7	1539	143.5	89.67	0.9378	75.2
SEL	D2	GASEPF	D	25	DSK1	1775.4	1019	76.3	95.97	0.9909	74.8
SEL	D2	DHC6	A	07	A2	1051.4	372	61.2	35.44	0.1433	83.0
SEL	D2	BEC58P	A	07	A2	497.9	380	99.8	39.15	0.1559	82.6
SEL	D2	DHC6	A	07	A1	417.3	380	61.2	35.45	0.0194	91.6
SEL	D2	GASEPF	D	25	D6A	1196.5	1025	76.9	95.27	0.3775	78.7
SEL	D2	LEAR35	D	25	D6A	1645.7	1610	171.1	2751.37	0.0140	92.8
SEL	D2	BEC58P	D	25	D6A	1350.9	1312	132.8	92.21	0.0760	85.1
SEL	D2	CNA441	D	25	DC1	1718.7	1507	143.5	89.61	0.7502	75.1
SEL	D2	GASEPV	A	07	A2	755.0	377	66.5	45.59	0.3155	78.8
SEL	D2	DHC6	D	25	DSK1	2472.0	2096	101.3	87.09	0.1834	81.1
SEL	D2	DHC6	D	25	DC1	2606.9	2052	101.2	87.00	0.2445	79.8
SEL	D2	B222	A	18H	H3	2398.5	1000	123.0	3.00	1.4898	71.9
SEL	D2	BEC58P	D	25	D12	2516.8	1282	131.3	93.41	0.3326	78.4
SEL	D2	GASEPV	D	25	DSK1	1863.8	1378	102.3	87.20	0.2485	79.6
SEL	D2	H500D	A	18H	H3	2398.5	1000	139.0	1.00	1.3470	72.2
SEL	D2	GASEPV	A	07	A1	470.5	380	66.5	45.60	0.0971	83.3
SEL	D2	GASEPV	D	25	DC1	2070.0	1344	102.2	87.13	0.3314	78.0
SEL	D2	CNA441	D	25	D12	1661.8	1585	143.6	89.76	0.5771	75.5
SEL	D2	IA1125	D	25	D6A	1612.0	978	165.7	2862.78	0.0344	87.6
SEL	D2	GASEPF	D	25	DSK1	2115.7	1015	75.8	96.53	0.9909	73.0
SEL	D2	BEC58P	A	07	A2	755.0	377	99.8	39.14	0.2534	78.9
SEL	D2	HS748A	D	25	D12	1191.4	1091	122.4	97.41	0.0171	90.5
SEL	D2	CNA441	T	25	TG2	2774.2	1500	143.4	32.75	4.4308	66.3
SEL	D2	LEAR25	A	07	A1	797.3	377	142.7	779.40	0.0109	92.3
SEL	D2	MU3001	D	25	D6A	1549.2	1515	147.1	1913.46	0.0093	92.9
SEL	D2	B206	D	18H	H2	2174.0	1000	118.0	1.00	1.7033	70.2
SEL	D2	DHC6	D	25	D12	3007.8	2051	101.2	86.99	0.3057	77.7
SEL	D2	CNA441	D	25	DC1	1602.2	1532	143.5	89.66	0.4617	75.8
SEL	D2	BEC58P	D	25	DSK1	2422.0	1285	131.4	93.30	0.1996	79.4
SEL	D2	BEC58P	A	07	A1	470.5	380	99.8	39.15	0.0780	83.4
SEL	D2	UH-1	T	07	TG1	911.7	655	124.0	1.39	0.0200	89.1
SEL	D2	UH-1	D	18H	H2	2174.0	1000	124.0	1.00	0.1028	81.9
SEL	D2	GASEPV	D	25	D6A	1430.0	1390	102.3	87.22	0.0947	82.1
SEL	D2	DHC6	A	07	A3	1019.0	369	61.2	35.44	0.0717	83.3
SEL	D2	DHC6	A	07	AVOR	1117.3	370	61.2	35.44	0.0717	83.2
SEL	D2	DHC6	D	25	DSK1	2932.4	2058	101.2	87.01	0.1834	79.0
SEL	D2	IA1125	D	25	D6A	1045.1	994	165.7	2863.40	0.0093	91.9
SEL	D2	GASEPF	D	25	D12	1627.4	1053	79.8	91.98	0.4473	75.0
SEL	D2	GASEPV	A	07	A2	391.3	383	66.5	45.60	0.0526	84.3
SEL	D2	DHC6	T	07	TG1	742.7	412	65.0	40.08	0.0200	88.5
SEL	D2	GASEPV	D	25	D12	2555.5	1353	102.2	87.15	0.4142	75.2
SEL	D2	GASEPF	D	25	D6A	1633.7	1021	76.4	95.77	0.3775	75.5
SEL	D2	DHC6	A	07	A1	1182.5	371	61.2	35.44	0.0717	82.7
SEL	D2	HS748A	D	25	D12	1188.4	1112	123.2	96.87	0.0105	90.9
SEL	D2	DHC6	A	07	AVOR	1425.3	365	61.2	35.43	0.1165	80.4
SEL	D2	GASEPV	A	07	A1	797.3	377	66.5	45.59	0.1578	79.0
SEL	D2	HS748A	D	25	DC1	1332.5	1076	121.8	97.78	0.0137	89.5
SEL	D2	GASEPV	D	25	DSK1	2462.7	1357	102.2	87.16	0.2485	76.9
SEL	D2	DHC6	D	25	D6A	2176.5	2116	101.3	87.13	0.0699	82.4
SEL	D2	B206	D	18H	H2	2546.4	1000	118.0	1.00	1.7033	68.4
SEL	D2	B206	A	18H	H3	2256.8	1000	118.0	1.00	1.7033	68.3
SEL	D2	FAL50	D	25	D6A	3032.0	2763	191.0	2422.47	0.0350	85.2
SEL	D2	LEAR25	A	07	A1	417.3	380	142.8	779.49	0.0018	98.0
SEL	D2	BEC58P	A	07	A2	391.3	383	99.8	39.15	0.0422	84.3
SEL	D2	SF340	D	25	D12	1863.5	1772	151.2	80.86	0.2228	77.1
SEL	D2	DHC6	A	07	A3	1346.1	361	61.2	35.43	0.1165	79.9
SEL	D3	LEAR25	D	25	D6A	1662.9	1634	186.2	2444.19	0.0980	105.5
SEL	D3	LEAR25	D	25	D6A	1656.1	1634	186.2	2444.17	0.0603	105.6
SEL	D3	GIIB	D	25	D6A	1678.8	1650	182.7	9901.55	0.0280	108.4
SEL	D3	LEAR25	D	25	D6A	1755.5	1632	186.0	2444.51	0.0603	105.0
SEL	D3	GIIB	D	25	D6A	1672.1	1650	182.7	9901.48	0.0172	108.4
SEL	D3	GIIB	D	25	D6A	1770.6	1648	182.5	9902.54	0.0172	107.9
SEL	D3	LEAR25	D	25	D6A	1735.7	1633	186.1	2444.44	0.0163	105.1
SEL	D3	LEAR25	D	25	D6A	1919.8	1629	185.7	2445.13	0.0163	104.0
SEL	D3	GIIB	D	25	D6A	1751.0	1649	182.5	9902.32	0.0047	108.0
SEL	D3	DHC6	A	07	A2	449.2	434	61.2	35.52	0.2329	90.9
SEL	D3	GIIB	D	25	D6A	1933.6	1644	182.2	9904.43	0.0047	107.0
SEL	D3	BEC58P	D	25	D12	1599.3	1381	132.9	80.18	1.2281	81.6

SEL	D3	GASEPV	D	25	DSK1	1842.6	1490	102.4	87.43	1.4912	80.5
SEL	D3	BEC58P	D	25	DSK1	1760.0	1392	133.0	78.35	1.1973	81.4
SEL	D3	GASEPV	D	25	D12	1686.7	1477	102.4	87.40	1.5294	80.2
SEL	D3	DHC6	A	07	A1	441.5	434	61.2	35.52	0.1165	91.2
SEL	D3	BEC58P	D	25	D12	2143.3	1343	132.9	86.83	1.9956	78.8
SEL	D3	BEC58P	D	25	DSK2	1758.8	1392	133.0	78.36	1.1696	80.9
SEL	D3	GASEPV	D	25	DSK2	1841.5	1490	102.4	87.43	1.4565	79.8
SEL	D3	B206	D	18H	H2	1740.4	1000	118.0	1.00	7.3264	72.7
SEL	D3	DHC6	D	25	DSK1	2568.0	2291	101.6	87.50	1.1004	80.7
SEL	D3	DHC6	D	25	DSK2	2567.2	2291	101.6	87.50	1.0748	80.7
SEL	D3	DHC6	A	07	A2	562.2	434	61.2	35.52	0.1433	89.4
SEL	D3	DHC6	D	25	D12	2779.9	2189	101.4	87.29	1.8340	78.3
SEL	D3	GASEPV	D	25	DSK1	1717.4	1494	102.4	87.44	0.9177	81.1
SEL	D3	LEAR35	D	25	D6A	1728.2	1701	178.7	2723.86	0.0839	91.5
SEL	D3	BEC58P	D	25	DSK1	1627.7	1394	133.0	77.92	0.7368	82.0
SEL	D3	DHC6	D	25	D12	2444.4	2268	101.6	87.45	1.1286	80.2
SEL	D3	B206	A	18H	H3	1779.6	1000	118.0	1.00	7.3264	72.0
SEL	D3	UH-1	D	18H	H2	1740.4	1000	124.0	1.00	0.4422	84.1
SEL	D3	GASEPV	T	07	TG1	971.4	672	70.4	38.02	3.2867	75.3
SEL	D3	GASEPV	D	25	D12	2200.7	1429	102.3	87.30	2.4853	76.3
SEL	D3	BEC58P	D	25	DC1	2375.6	1339	132.9	87.53	1.5965	77.9
SEL	D3	DHC6	D	25	DC1	2957.7	2175	101.4	87.26	1.4672	78.2
SEL	D3	UH-1	A	18H	H3	1779.6	1000	124.0	1.00	0.4422	83.4
SEL	D3	BEC58P	D	25	D6A	1426.4	1397	133.0	77.82	0.4561	82.8
SEL	D3	BEC58P	D	25	DSK1	1909.7	1389	133.0	78.89	0.7368	80.7
SEL	D3	BEC58P	D	25	DC1	2032.0	1358	132.9	84.17	0.9824	79.4
SEL	D3	GASEPV	T	25	TG2	3010.6	900	91.4	49.37	29.5804	64.6
SEL	D3	GASEPV	D	25	D6A	1529.2	1498	102.4	87.45	0.5680	81.8
SEL	D3	GASEPV	D	25	DSK1	1985.3	1487	102.4	87.42	0.9177	79.7
SEL	D3	MU3001	D	25	D6A	1609.6	1584	154.2	1902.47	0.0560	91.8
SEL	D3	DHC6	D	25	DSK1	2483.1	2296	101.6	87.51	0.6772	81.0
SEL	D3	DHC6	D	25	DC1	2715.6	2217	101.5	87.35	0.9029	79.4
SEL	D3	DHC6	A	07	A2	683.0	432	61.2	35.52	0.1433	87.4
SEL	D3	GASEPV	D	25	DC1	2426.7	1424	102.3	87.29	1.9883	75.7
SEL	D3	DHC6	D	25	DSK1	2668.4	2284	101.6	87.49	0.6772	80.4
SEL	D3	LEAR35	D	25	D6A	1721.7	1701	178.7	2723.82	0.0516	91.5
SEL	D3	IA1125	D	25	D6A	1171.5	1133	166.1	2868.89	0.0560	91.1
SEL	D3	GASEPV	D	25	DC1	2096.0	1448	102.4	87.34	1.2235	77.6
SEL	D3	GASEPV	A	07	A2	449.2	434	66.5	45.69	0.3155	83.5
SEL	D3	H500D	D	18H	H2	1740.4	1000	139.0	1.00	1.3469	77.1
SEL	D3	GASEPF	T	25	TG2	3006.7	887	74.1	98.03	27.3739	64.0
SEL	D3	B222	D	18H	H2	2251.1	1720	123.0	3.00	1.4898	76.5
SEL	D3	LEAR35	D	25	D6A	1817.6	1699	178.5	2724.42	0.0516	91.0
SEL	D3	GASEPF	D	25	D12	1328.8	1063	80.9	90.71	1.6515	75.8
SEL	D3	LEAR25	A	07	A1	441.5	434	142.9	781.03	0.0109	97.6
SEL	D3	DHC6	D	25	D6A	2361.6	2304	101.6	87.53	0.4192	81.7
SEL	D3	H500D	A	18H	H3	1779.6	1000	139.0	1.00	1.3470	76.4
SEL	D3	BEC58P	D	25	D12	1436.2	1422	133.0	77.86	0.3326	82.5
SEL	D3	GASEPV	D	25	D12	1546.8	1530	102.5	87.51	0.4142	81.4
SEL	D3	BEC58P	A	07	A2	449.2	434	99.8	39.22	0.2534	83.6
SEL	D3	BEC58P	D	25	D6A	1418.5	1398	133.0	77.82	0.2807	82.8
SEL	D3	BEC58P	T	25	TG2	3010.6	900	116.8	50.30	12.5747	66.3
SEL	D3	GASEPV	D	25	D6A	1521.9	1498	102.4	87.45	0.3496	81.8
SEL	D3	MU3001	D	25	D6A	1602.6	1584	154.2	1902.46	0.0344	91.9
SEL	D3	BEC58P	D	25	DC1	2741.1	1315	132.8	91.72	0.9824	77.1
SEL	D3	BEC58P	D	25	D6A	1533.9	1396	133.0	77.81	0.2807	82.3
SEL	D3	GASEPV	D	25	D6A	1629.4	1496	102.4	87.44	0.3496	81.3
SEL	D3	DHC6	A	07	AVOR	669.4	432	61.2	35.52	0.0717	88.1
SEL	D3	MU3001	D	25	D6A	1705.7	1583	154.1	1902.70	0.0344	91.3
SEL	D3	GASEPF	D	25	DSK1	1512.7	1069	81.5	90.04	1.6102	74.6
SEL	D3	BEC58P	D	25	D12	2850.4	1306	132.5	92.51	1.2281	75.7
SEL	D3	IA1125	D	25	D6A	1161.9	1133	166.1	2868.89	0.0344	91.2
SEL	D3	DHC6	D	25	D12	3325.8	2149	101.4	87.20	1.1286	75.8
SEL	D3	DHC6	A	07	A1	702.9	433	61.2	35.52	0.0717	87.8
SEL	D3	B206	D	18H	H2	1558.9	1000	118.0	1.00	1.7033	73.9
SEL	D3	DHC6	A	07	A1	712.3	433	61.2	35.52	0.0717	87.6
SEL	D3	GASEPF	D	25	DSK2	1511.4	1069	81.5	90.04	1.5728	74.2
SEL	D3	GASEPV	D	25	DC1	2781.4	1393	102.3	87.23	1.2235	75.3
SEL	D3	BEC58P	T	07	TG1	971.4	672	102.6	26.33	1.3972	74.7
SEL	D3	DHC6	D	25	DC1	3232.0	2122	101.3	87.14	0.9029	76.5
SEL	D3	GASEPF	D	25	D12	1965.4	1043	78.7	93.17	2.6836	71.7

SEL	D3	DHC6	D	25	D6A	2357.0	2304	101.6	87.53	0.2580	81.7
SEL	D3	GASEPV	A	07	A1	441.5	434	66.5	45.69	0.1578	83.8
SEL	D3	IA1125	D	25	D6A	1299.6	1130	166.1	2868.78	0.0344	90.3
SEL	D3	DHC6	D	25	D12	2408.5	2359	101.7	87.64	0.3057	80.8
SEL	D3	DHC6	D	25	D6A	2425.2	2300	101.6	87.52	0.2580	81.5
SEL	D3	GASEPF	D	25	DSK1	1354.9	1070	81.6	89.88	0.9909	75.6
SEL	D3	BEC58P	D	25	DSK1	1520.0	1396	133.0	77.81	0.1996	82.5
SEL	D3	GASEPF	D	25	D6A	1102.6	1072	81.8	89.66	0.6134	77.6
SEL	D3	DHC6	A	07	AVOR	984.8	429	61.2	35.52	0.1165	84.8
SEL	D3	B206	A	18H	H3	1638.5	1000	118.0	1.00	1.7033	72.9
SEL	D3	UH-1	D	18H	H2	1558.9	1000	124.0	1.00	0.1028	85.1
SEL	D3	BEC58P	D	25	DC1	1733.3	1374	132.9	81.45	0.2661	80.9
SEL	D3	DHC6	A	07	A3	768.2	433	61.2	35.52	0.0717	86.4
SEL	D3	GASEPV	D	25	DSK1	1616.4	1496	102.4	87.44	0.2485	81.0
SEL	D3	GASEPV	A	07	A2	562.2	434	66.5	45.69	0.1942	82.0
SEL	D3	BEC58P	A	07	A1	441.5	434	99.8	39.22	0.1267	83.8
SEL	D3	GASEPV	D	25	D12	2888.0	1383	102.3	87.21	1.5294	72.9
SEL	D3	GASEPV	D	25	DC1	1812.2	1468	102.4	87.38	0.3314	79.5
SEL	D3	DHC6	D	25	DC1	2523.2	2252	101.5	87.42	0.2445	80.5
SEL	D3	UH-1	A	18H	H3	1638.5	1000	124.0	1.00	0.1028	84.2
SEL	D3	BEC58P	A	07	A2	562.2	434	99.8	39.22	0.1559	82.1
SEL	D3	GASEPF	D	25	DC1	2217.8	1041	78.5	93.42	2.1469	70.6
SEL	D3	B206	D	18H	H2	1931.6	1000	118.0	1.00	1.7033	71.6
SEL	D3	DHC6	A	07	AVOR	460.2	436	61.2	35.53	0.0194	90.9
SEL	D3	GASEPF	D	25	D12	1096.3	1086	83.3	88.05	0.4473	77.3
SEL	D3	DHC6	D	25	DSK1	2416.9	2300	101.6	87.52	0.1834	81.1
SEL	D3	GASEPF	D	25	DC1	1836.8	1051	79.6	92.19	1.3212	72.4
SEL	D3	GASEPF	D	25	DSK1	1686.0	1067	81.3	90.24	0.9909	73.5
SEL	D3	GASEPF	D	25	D6A	1092.3	1072	81.8	89.65	0.3775	77.7
SEL	D3	B206	A	18H	H3	1925.9	1000	118.0	1.00	1.7033	71.0
SEL	D3	DHC6	A	07	A3	498.4	440	61.2	35.53	0.0194	90.4
SEL	D3	UH-1	D	18H	H2	1931.6	1000	124.0	1.00	0.1028	83.1
SEL	D3	H500D	D	18H	H2	1558.9	1000	139.0	1.00	0.3131	78.2
SEL	D3	BEC58P	D	25	DSK1	2070.8	1385	132.9	79.51	0.1996	79.9
SEL	D3	DHC6	A	07	A3	1135.5	417	61.2	35.50	0.1165	82.2
SEL	D3	GASEPV	A	07	A2	683.0	432	66.5	45.68	0.1942	80.0
SEL	D3	GASEPV	D	25	DSK1	2139.9	1482	102.4	87.41	0.2485	78.9
SEL	D3	B222	A	18H	H3	1954.3	1000	123.0	3.00	1.4898	71.0
SEL	D3	CNA441	T	07	TG1	810.6	415	102.4	36.58	0.4923	75.8
SEL	D3	B222	D	18H	H2	2117.4	1724	123.0	3.00	0.3464	77.3
SEL	D3	UH-1	A	18H	H3	1925.9	1000	124.0	1.00	0.1028	82.6
SEL	D3	LEAR35	D	25	D6A	1798.4	1699	178.5	2724.30	0.0140	91.1
SEL	D3	DHC6	D	25	DSK1	2781.0	2276	101.6	87.47	0.1834	79.9
SEL	D3	CNA441	A	07	A2	449.2	434	94.7	31.31	0.1191	81.7
SEL	D3	GASEPF	T	07	TG1	971.4	672	62.6	33.16	3.0415	67.4
SEL	D3	H500D	A	18H	H3	1638.5	1000	139.0	1.00	0.3132	77.3
SEL	D3	LEAR25	A	07	A1	702.9	433	142.9	780.98	0.0067	93.8
SEL	D3	BEC58P	A	07	A2	683.0	432	99.8	39.22	0.1559	80.1
SEL	D3	GASEPF	D	25	D6A	1239.7	1071	81.7	89.77	0.3775	76.2
SEL	D3	LEAR25	A	07	A1	712.3	433	142.9	780.98	0.0067	93.7
SEL	D3	CNA441	D	25	DSK1	2035.7	1705	143.9	90.00	0.5627	74.1
SEL	D3	LEAR35	D	25	D6A	1976.8	1695	178.2	2725.49	0.0140	90.1
SEL	D3	CNA441	D	25	DSK2	2034.7	1705	143.9	90.00	0.5496	74.1
SEL	D3	CNA441	D	25	D12	1886.8	1684	143.8	89.95	0.5771	73.9
SEL	D3	DHC6	A	07	A2	891.0	434	61.2	35.52	0.0388	85.4
SEL	D3	BEC58P	D	25	D6A	1511.1	1396	133.0	77.81	0.0760	82.4
SEL	D3	GASEPV	D	25	D6A	1608.0	1496	102.4	87.44	0.0947	81.4
SEL	D3	B222	D	18H	H2	2398.4	1715	123.0	3.00	0.3464	75.8
SEL	D3	MU3001	D	25	D6A	1685.2	1583	154.1	1902.65	0.0093	91.4
SEL	D3	GASEPF	A	07	A2	449.2	434	59.2	41.75	0.3408	75.8
SEL	D3	H500D	D	18H	H2	1931.6	1000	139.0	1.00	0.3131	76.1
SEL	D3	GASEPF	D	25	DC1	2612.7	1028	77.1	94.97	1.3212	69.6
SEL	D3	GASEPF	D	25	DSK1	1222.3	1071	81.7	89.76	0.2684	76.3
SEL	D3	CNA441	D	25	D12	2332.4	1607	143.7	89.80	0.9378	70.9
SEL	D3	GASEPV	A	07	AVOR	669.4	432	66.5	45.68	0.0971	80.7
SEL	D3	H500D	A	18H	H3	1925.9	1000	139.0	1.00	0.3132	75.6
SEL	D3	BEC58P	D	25	DC1	3109.0	1284	131.4	93.31	0.2661	76.3
SEL	D3	DHC8	A	07	A2	449.2	434	89.8	16.35	0.0283	86.0
SEL	D3	GASEPF	D	25	D12	2729.6	1023	76.7	95.51	1.6515	68.1
SEL	D3	GASEPF	D	25	DC1	1491.3	1059	80.5	91.18	0.3578	74.7
SEL	D3	DHC6	A	07	AVOR	1330.0	424	61.2	35.51	0.0717	81.7

SEL	D3	GASEPV	D	25	D6A	1805.1	1491	102.4	87.43	0.0947	80.5
SEL	D3	BEC58P	D	25	D6A	1720.4	1392	133.0	78.21	0.0760	81.4
SEL	D3	GIIB	A	07	A1	441.5	434	140.3	2646.73	0.0031	95.3
SEL	D3	GASEPV	A	07	A1	702.9	433	66.5	45.68	0.0971	80.3
SEL	D3	IA1125	D	25	D6A	1272.7	1131	166.1	2868.80	0.0093	90.5
SEL	D3	MU3001	D	25	D6A	1875.4	1580	153.8	1903.12	0.0093	90.4
SEL	D3	GASEPV	A	07	A1	712.3	433	66.5	45.68	0.0971	80.2
SEL	D4	LEAR25	D	25	D6A	1505.7	1401	174.9	2467.69	0.0980	107.1
SEL	D4	LEAR25	D	25	D6A	1447.3	1404	174.9	2467.65	0.0603	107.5
SEL	D4	GIIB	D	25	D6A	1534.4	1429	170.9	9979.15	0.0280	109.9
SEL	D4	LEAR25	D	25	D6A	1614.3	1395	174.9	2467.76	0.0603	106.3
SEL	D4	GIIB	D	25	D6A	1477.2	1432	170.9	9979.08	0.0172	110.3
SEL	D4	GIIB	D	25	D6A	1640.9	1423	170.9	9979.28	0.0172	109.2
SEL	D4	GASEPF	T	25	TG2	1303.8	887	74.1	98.03	27.3739	75.4
SEL	D4	LEAR25	D	25	D6A	1445.7	1404	174.9	2467.65	0.0163	107.6
SEL	D4	GASEPV	T	25	TG2	1313.0	900	91.4	49.37	29.5804	74.0
SEL	D4	LEAR25	D	25	D6A	1762.2	1386	174.9	2467.87	0.0163	105.2
SEL	D4	BEC58P	T	25	TG2	1313.0	900	116.8	50.30	12.5747	76.3
SEL	D4	GIIB	D	25	D6A	1475.7	1432	170.9	9979.08	0.0047	110.3
SEL	D4	BEC58P	D	25	DSK1	1273.0	1247	129.5	94.66	1.1973	86.1
SEL	D4	BEC58P	D	25	DSK2	1272.4	1247	129.5	94.66	1.1696	86.1
SEL	D4	BEC58P	D	25	D12	1384.6	1233	128.8	95.17	1.2281	85.1
SEL	D4	B206	A	18H	H3	1241.9	953	118.0	1.19	7.3264	76.6
SEL	D4	BEC58P	D	25	D12	1849.2	1205	127.4	96.21	1.9956	82.2
SEL	D4	B206	D	18H	H2	1250.2	1000	118.0	1.00	7.3264	76.3
SEL	D4	BEC58P	D	25	DSK1	1258.6	1247	129.5	94.65	0.7368	86.2
SEL	D4	GIIB	D	25	D6A	1786.3	1414	170.9	9979.48	0.0047	108.1
SEL	D4	BEC58P	D	25	DSK1	1312.3	1246	129.5	94.69	0.7368	85.9
SEL	D4	GASEPV	D	25	DSK1	1338.3	1311	102.2	87.06	1.4912	82.6
SEL	D4	GASEPV	D	25	DSK2	1337.9	1311	102.2	87.06	1.4565	82.5
SEL	D4	UH-1	D	18H	H2	1250.2	1000	124.0	1.00	0.4422	87.1
SEL	D4	GASEPV	T	07	TG1	733.1	547	70.3	37.85	3.2867	78.4
SEL	D4	GASEPV	D	25	D12	1441.4	1293	102.1	87.03	1.5294	81.4
SEL	D4	DHC6	D	25	DSK1	2028.3	1978	101.1	86.84	1.1004	82.8
SEL	D4	UH-1	A	18H	H3	1241.9	953	124.0	1.19	0.4422	86.7
SEL	D4	DHC6	D	25	DSK2	2028.1	1978	101.1	86.84	1.0748	82.8
SEL	D4	DHC6	D	25	D12	2386.0	1915	101.0	86.71	1.8340	80.3
SEL	D4	DHC6	A	07	AVOR	371.7	343	61.1	35.41	0.1165	92.2
SEL	D4	LEAR35	D	25	D6A	1620.3	1543	165.5	2771.92	0.0839	93.6
SEL	D4	BEC58P	D	25	DC1	2155.8	1210	127.6	96.03	1.5965	80.8
SEL	D4	DHC6	D	25	D12	2081.7	1966	101.1	86.81	1.1286	82.0
SEL	D4	GASEPF	D	25	DSK1	1009.3	980	74.2	98.22	1.6102	80.4
SEL	D4	GASEPV	D	25	D12	1886.9	1259	102.1	86.96	2.4853	78.5
SEL	D4	GASEPF	D	25	DSK2	1008.6	980	74.2	98.22	1.5728	80.4
SEL	D4	BEC58P	D	25	D6A	1336.4	1246	129.5	94.71	0.4561	85.7
SEL	D4	GASEPV	D	25	DSK1	1324.8	1311	102.2	87.06	0.9177	82.6
SEL	D4	B222	A	18H	H3	1274.9	1000	123.0	3.00	1.4898	80.4
SEL	D4	BEC58P	D	25	DC1	1896.5	1222	128.3	95.56	0.9824	82.2
SEL	D4	GASEPV	D	25	DSK1	1375.6	1310	102.2	87.06	0.9177	82.4
SEL	D4	DHC6	A	07	A3	421.9	344	61.1	35.41	0.1165	91.3
SEL	D4	H500D	A	18H	H3	1241.9	953	139.0	1.19	1.3470	80.4
SEL	D4	H500D	D	18H	H2	1250.2	1000	139.0	1.00	1.3469	80.3
SEL	D4	DHC6	D	25	DC1	2629.5	1903	101.0	86.68	1.4672	79.8
SEL	D4	BEC58P	D	25	D12	1280.7	1257	130.0	94.29	0.3326	86.1
SEL	D4	DHC6	D	25	DSK1	2019.8	1978	101.1	86.84	0.6772	82.9
SEL	D4	DHC6	D	25	DSK1	2052.1	1976	101.1	86.84	0.6772	82.7
SEL	D4	LEAR35	D	25	D6A	1564.8	1544	165.6	2771.52	0.0516	93.9
SEL	D4	B222	D	18H	H2	1646.0	1445	123.0	3.00	1.4898	79.3
SEL	D4	GASEPF	D	25	D12	1149.4	965	74.2	98.19	1.6515	78.7
SEL	D4	DHC6	A	07	A3	359.6	341	61.1	35.40	0.0717	92.2
SEL	D4	BEC58P	D	25	D6A	1268.1	1247	129.5	94.66	0.2807	86.1
SEL	D4	MU3001	D	25	D6A	1476.1	1376	145.2	1908.15	0.0560	93.1
SEL	D4	GASEPF	D	25	DSK1	991.1	980	74.2	98.23	0.9909	80.6
SEL	D4	DHC6	A	07	AVOR	389.5	340	61.1	35.40	0.0717	92.0
SEL	D4	DHC6	D	25	DC1	2437.0	1925	101.0	86.73	0.9029	80.8
SEL	D4	DHC6	A	07	A2	588.0	342	61.1	35.41	0.1433	88.8
SEL	D4	GASEPV	D	25	DC1	2189.0	1265	102.1	86.97	1.9883	77.3
SEL	D4	BEC58P	D	25	D12	2455.2	1172	125.7	97.40	1.2281	79.3
SEL	D4	LEAR35	D	25	D6A	1724.4	1540	165.2	2772.73	0.0516	92.9
SEL	D4	GASEPF	D	25	DSK1	1058.6	979	74.2	98.22	0.9909	80.0
SEL	D4	DHC6	A	07	A2	801.6	338	61.1	35.40	0.2329	86.1

FINAL DRAFT – NOT APPROVED BY BOS OR FAA

SEL	D4	BEC58P	D	25	DC1	2422.5	1193	126.8	96.63	0.9824	79.9
SEL	D4	GASEPV	D	25	D6A	1398.5	1309	102.2	87.06	0.5680	82.2
SEL	D4	B206	A	18H	H3	1156.7	954	118.0	1.18	1.7033	77.3
SEL	D4	IA1125	D	25	D6A	1011.7	889	165.5	2859.30	0.0560	92.1
SEL	D4	BEC58P	D	25	D6A	1461.4	1243	129.3	94.80	0.2807	85.1
SEL	D4	B206	D	18H	H2	1147.2	1000	118.0	1.00	1.7033	77.2
SEL	D4	GASEPV	D	25	DC1	1936.4	1280	102.1	87.00	1.2235	78.6
SEL	D4	BEC58P	T	07	TG1	733.1	547	100.0	27.19	1.3972	78.0
SEL	D4	BEC58P	D	25	DSK1	1271.7	1247	129.5	94.66	0.1996	86.1
SEL	D4	DHC6	D	25	D6A	2066.9	1975	101.1	86.83	0.4192	82.7
SEL	D4	GASEPF	D	25	D12	1684.0	935	74.2	98.13	2.6836	74.6
SEL	D4	MU3001	D	25	D6A	1416.2	1379	145.2	1908.32	0.0344	93.5
SEL	D4	DHC6	A	07	A1	494.7	344	61.1	35.41	0.0717	90.2
SEL	D4	GASEPV	D	25	D12	1348.6	1323	102.2	87.09	0.4142	82.5
SEL	D4	DHC6	D	25	D12	2841.6	1817	100.9	86.50	1.1286	78.1
SEL	D4	BEC58P	D	25	DSK1	1372.9	1245	129.4	94.74	0.1996	85.6
SEL	D4	DHC6	D	25	DC1	2842.9	1902	101.0	86.68	0.9029	78.9
SEL	D4	B206	A	18H	H3	1337.3	951	118.0	1.19	1.7033	75.8
SEL	D4	IA1125	D	25	D6A	919.9	892	165.5	2859.38	0.0344	92.7
SEL	D4	GASEPV	D	25	D6A	1333.8	1311	102.2	87.06	0.3496	82.6
SEL	D4	UH-1	D	18H	H2	1147.2	1000	124.0	1.00	0.1028	87.9
SEL	D4	DHC6	A	07	AVOR	554.3	344	61.1	35.41	0.0717	89.3
SEL	D4	BEC58P	D	25	DC1	1659.2	1232	128.8	95.20	0.2661	83.6
SEL	D4	MU3001	D	25	D6A	1587.5	1371	145.2	1907.62	0.0344	92.4
SEL	D4	GASEPV	D	25	DC1	2449.8	1244	102.1	86.93	1.2235	76.9
SEL	D4	CNA441	T	25	TG2	1780.9	1500	143.4	32.75	4.4308	71.3
SEL	D4	GASEPF	D	25	D6A	1088.4	979	74.2	98.22	0.6134	79.8
SEL	D4	B206	D	18H	H2	1372.1	1000	118.0	1.00	1.7033	75.3
SEL	D4	GASEPV	D	25	D12	2479.3	1219	102.0	86.87	1.5294	75.7
SEL	D4	DHC6	D	25	D12	2043.7	1989	101.1	86.86	0.3057	82.7
SEL	D4	UH-1	A	18H	H3	1156.7	954	124.0	1.18	0.1028	87.4
SEL	D4	DHC6	A	07	A2	415.6	345	61.1	35.41	0.0388	91.5
SEL	D4	UH-1	T	25	TG2	1183.7	700	124.0	1.00	0.1794	84.7
SEL	D4	DHC6	A	07	A1	780.3	340	61.1	35.40	0.1165	86.5
SEL	D4	GASEPV	D	25	D6A	1517.8	1306	102.2	87.05	0.3496	81.7
SEL	D4	DHC6	D	25	D6A	2025.4	1978	101.1	86.84	0.2580	82.9
SEL	D4	GASEPF	D	25	D12	1017.0	991	74.2	98.25	0.4473	80.3
SEL	D4	GASEPV	A	07	AVOR	371.7	343	66.4	45.54	0.1578	84.8
SEL	D4	DHC6	D	25	D6A	2146.1	1970	101.1	86.82	0.2580	82.5
SEL	D4	B222	A	18H	H3	1191.1	1000	123.0	3.00	0.3464	81.1
SEL	D4	GASEPV	D	25	DSK1	1337.1	1311	102.2	87.06	0.2485	82.5
SEL	D4	UH-1	D	18H	H2	1372.1	1000	124.0	1.00	0.1028	86.3
SEL	D4	GASEPF	D	25	DC1	2015.3	940	74.2	98.14	2.1469	73.1
SEL	D4	DHC6	A	07	A3	660.0	347	61.1	35.41	0.0717	87.7
SEL	D4	GASEPF	D	25	D6A	1003.1	980	74.2	98.22	0.3775	80.5
SEL	D4	UH-1	A	18H	H3	1337.3	951	124.0	1.19	0.1028	86.0
SEL	D4	CNA441	T	07	TG1	590.1	340	102.3	36.48	0.4923	79.2
SEL	D4	GASEPV	D	25	DSK1	1433.3	1308	102.2	87.06	0.2485	82.1
SEL	D4	IA1125	D	25	D6A	1171.5	885	165.5	2859.14	0.0344	90.7
SEL	D4	H500D	A	18H	H3	1156.7	954	139.0	1.18	0.3132	81.1
SEL	D4	H500D	D	18H	H2	1147.2	1000	139.0	1.00	0.3131	81.0
SEL	D4	GASEPF	D	25	DC1	1733.6	954	74.2	98.17	1.3212	74.7
SEL	D4	BEC58P	A	07	AVOR	371.7	343	99.7	39.09	0.1267	84.8
SEL	D4	GASEPV	A	07	A3	421.9	344	66.4	45.54	0.1578	83.9
SEL	D4	DHC6	D	25	DC1	2270.6	1946	101.1	86.77	0.2445	81.7
SEL	D4	DHC6	A	07	A1	351.6	345	61.1	35.41	0.0194	92.6
SEL	D4	DHC6	D	25	DSK1	2027.5	1978	101.1	86.84	0.1834	82.8
SEL	D4	DHC6	A	07	A2	1014.5	331	61.1	35.39	0.1433	83.9
SEL	D4	LEAR35	D	25	D6A	1563.3	1544	165.6	2771.51	0.0140	93.9
SEL	D4	GASEPF	T	07	TG1	733.1	547	62.5	33.01	3.0415	70.5
SEL	D4	DHC6	D	25	DSK1	2089.6	1973	101.1	86.83	0.1834	82.6
SEL	D4	GASEPV	D	25	DC1	1706.8	1293	102.1	87.02	0.3314	79.9
SEL	D4	B222	D	18H	H2	1571.1	1448	123.0	3.00	0.3464	79.6
SEL	D4	B222	A	18H	H3	1369.0	1000	123.0	3.00	0.3464	79.6
SEL	D4	BEC58P	D	25	D6A	1266.3	1247	129.5	94.66	0.0760	86.1
SEL	D4	BEC58P	A	07	A3	421.9	344	99.7	39.10	0.1267	83.9
SEL	D4	LEAR25	A	07	A1	494.7	344	142.7	778.45	0.0067	96.5
SEL	D4	GASEPF	D	25	DSK1	1007.6	980	74.2	98.22	0.2684	80.4
SEL	D4	H500D	A	18H	H3	1337.3	951	139.0	1.19	0.3132	79.7
SEL	D4	GASEPV	A	07	A3	359.6	341	66.4	45.53	0.0971	84.8
SEL	D4	GASEPV	A	07	AVOR	389.5	340	66.4	45.53	0.0971	84.5

SEL	D4	H500D	D	18H	H2	1372.1	1000	139.0	1.00	0.3131	79.4
SEL	D4	GASEPF	D	25	D6A	1239.1	976	74.2	98.22	0.3775	78.6
SEL	D4	GASEPV	A	07	A2	588.0	342	66.4	45.53	0.1942	81.3
SEL	D4	CNA441	D	25	DSK1	1459.4	1419	143.3	89.44	0.5627	76.7
SEL	D4	B222	D	18H	H2	1738.1	1443	123.0	3.00	0.3464	78.7
SEL	D4	CNA441	D	25	DSK2	1459.0	1420	143.3	89.44	0.5496	76.7
SEL	D4	GASEPF	D	25	DSK1	1133.1	978	74.2	98.22	0.2684	79.5
SEL	D4	BEC58P	A	07	A3	359.6	341	99.7	39.09	0.0780	84.8
SEL	D4	GASEPV	A	07	A2	801.6	338	66.4	45.53	0.3155	78.7
SEL	D4	BEC58P	A	07	AVOR	389.5	340	99.7	39.09	0.0780	84.6
SEL	D4	LEAR35	D	25	D6A	1867.0	1537	164.9	2773.93	0.0140	92.0
SEL	D4	BEC58P	A	07	A2	588.0	342	99.7	39.09	0.1559	81.4
SEL	D4	BEC58P	D	25	DC1	2689.0	1191	126.7	96.71	0.2661	78.9
SEL	D4	CNA441	D	25	D12	1543.6	1392	143.2	89.38	0.5771	75.6
SEL	D4	GASEPF	D	25	DC1	2300.0	923	74.1	98.10	1.3212	72.0
SEL	D4	MU3001	D	25	D6A	1414.6	1379	145.2	1908.32	0.0093	93.5
SEL	D4	GASEPF	D	25	D12	2336.4	900	74.1	98.06	1.6515	70.9
SEL	D4	BEC58P	A	07	A2	801.6	338	99.7	39.09	0.2534	78.8
SEL	D4	BEC58P	D	25	D6A	1628.0	1239	129.1	94.94	0.0760	84.0
SEL	D4	CNA441	D	25	D12	1950.5	1349	143.1	89.30	0.9378	73.0
SEL	D4	LEAR25	A	07	A1	780.3	340	142.7	778.36	0.0109	92.3
SEL	D4	GASEPV	A	07	A1	494.7	344	66.4	45.54	0.0971	82.8
SEL	D4	IA1125	D	25	D6A	917.4	892	165.5	2859.39	0.0093	92.7
SEL	D4	HS748A	D	25	DSK1	1063.4	1036	120.3	98.80	0.0103	92.2
SEL	D4	GASEPV	D	25	D6A	1332.1	1311	102.2	87.06	0.0947	82.6
SEL	D5	LEAR25	D	25	D6A	1943.1	1606	183.9	2448.92	0.0980	103.9
SEL	D5	LEAR25	D	25	D6A	1768.2	1610	184.2	2448.23	0.0603	105.0
SEL	D5	GIIB	D	25	D6A	1956.4	1621	180.4	9916.09	0.0280	107.0
SEL	D5	GIIB	D	25	D6A	1782.8	1626	180.8	9913.99	0.0172	108.0
SEL	D5	LEAR25	D	25	D6A	2165.8	1600	183.4	2449.89	0.0603	102.3
SEL	D5	LEAR25	D	25	D6A	1658.4	1612	184.4	2447.84	0.0163	105.7
SEL	D5	GIIB	D	25	D6A	2177.5	1615	180.0	9919.08	0.0172	105.4
SEL	D5	B206	D	18H	H2	1013.9	1000	118.0	1.00	7.3264	78.1
SEL	D5	B206	A	18H	H3	1020.6	1000	118.0	1.00	7.3264	78.0
SEL	D5	GIIB	D	25	D6A	1674.0	1628	180.9	9912.78	0.0047	108.5
SEL	D5	UH-1	D	18H	H2	1013.9	1000	124.0	1.00	0.4422	88.6
SEL	D5	UH-1	A	18H	H3	1020.6	1000	124.0	1.00	0.4422	88.5
SEL	D5	BEC58P	D	25	DSK1	1413.6	1378	132.9	80.73	1.1973	83.3
SEL	D5	BEC58P	D	25	DSK2	1414.1	1378	132.9	80.72	1.1696	83.1
SEL	D5	GASEPV	D	25	DSK1	1510.7	1473	102.4	87.39	1.4912	81.8
SEL	D5	GASEPV	D	25	DSK2	1511.2	1473	102.4	87.39	1.4565	81.6
SEL	D5	H500D	D	18H	H2	1013.9	1000	139.0	1.00	1.3469	81.8
SEL	D5	H500D	A	18H	H3	1020.6	1000	139.0	1.00	1.3470	81.7
SEL	D5	LEAR25	D	25	D6A	2419.6	1592	182.8	2451.13	0.0163	100.6
SEL	D5	GASEPV	T	25	TG2	2444.1	900	91.4	49.37	29.5804	67.7
SEL	D5	BEC58P	D	25	DSK1	1390.0	1378	132.9	80.67	0.7368	83.4
SEL	D5	DHC6	D	25	DSK1	2321.9	2261	101.5	87.44	1.1004	81.6
SEL	D5	DHC6	D	25	DSK2	2322.4	2261	101.5	87.44	1.0748	81.6
SEL	D5	BEC58P	D	25	DSK1	1474.5	1377	132.9	80.91	0.7368	83.0
SEL	D5	GASEPV	D	25	DSK1	1488.7	1474	102.4	87.40	0.9177	82.0
SEL	D5	GASEPV	D	25	DSK1	1567.5	1472	102.4	87.39	0.9177	81.5
SEL	D5	DHC6	A	07	A3	505.2	431	61.2	35.52	0.1165	90.2
SEL	D5	B222	D	18H	H2	1703.8	1673	123.0	3.00	1.4898	79.2
SEL	D5	BEC58P	T	25	TG2	2444.1	900	116.8	50.30	12.5747	69.6
SEL	D5	GIIB	D	25	D6A	2430.1	1608	179.4	9922.91	0.0047	103.8
SEL	D5	B206	D	18H	H2	1011.6	1000	118.0	1.00	1.7033	78.1
SEL	D5	B206	A	18H	H3	1006.6	1000	118.0	1.00	1.7033	78.1
SEL	D5	GASEPF	T	25	TG2	2444.1	900	74.1	61.93	27.3739	65.7
SEL	D5	B206	D	18H	H2	1063.9	1000	118.0	1.00	1.7033	77.7
SEL	D5	B206	A	18H	H3	1061.8	1000	118.0	1.00	1.7033	77.7
SEL	D5	DHC6	D	25	DSK1	2308.3	2262	101.5	87.44	0.6772	81.7
SEL	D5	BEC58P	D	25	D12	2210.4	1321	132.8	90.64	1.2281	79.0
SEL	D5	DHC6	A	07	AVOR	437.8	424	61.2	35.51	0.0717	91.3
SEL	D5	GASEPF	D	25	DSK1	1100.6	1062	80.7	90.92	1.6102	77.7
SEL	D5	DHC6	D	25	DSK1	2357.9	2258	101.5	87.43	0.6772	81.4
SEL	D5	GASEPF	D	25	DSK2	1101.2	1062	80.7	90.91	1.5728	77.7
SEL	D5	LEAR35	D	25	D6A	1999.7	1674	176.4	2732.10	0.0839	90.1
SEL	D5	DHC6	A	07	AVOR	624.0	426	61.2	35.51	0.1165	88.7
SEL	D5	BEC58P	D	25	D12	2914.3	1292	131.8	93.04	1.9956	76.1
SEL	D5	DHC6	D	25	D12	2803.9	2135	101.4	87.17	1.1286	78.5
SEL	D5	DHC6	A	07	A3	487.8	422	61.2	35.51	0.0717	90.2

SEL	D5	UH-1	D	18H	H2	1011.6	1000	124.0	1.00	0.1028	88.6
SEL	D5	UH-1	A	18H	H3	1006.6	1000	124.0	1.00	0.1028	88.6
SEL	D5	DHC6	D	25	D12	3357.1	2072	101.3	87.04	1.8340	76.0
SEL	D5	UH-1	D	18H	H2	1063.9	1000	124.0	1.00	0.1028	88.3
SEL	D5	UH-1	A	18H	H3	1061.8	1000	124.0	1.00	0.1028	88.3
SEL	D5	GASEPV	D	25	D12	2261.6	1401	102.3	87.25	1.5294	76.5
SEL	D5	LEAR35	D	25	D6A	1830.1	1677	176.7	2730.91	0.0516	91.1
SEL	D5	BEC58P	D	25	D6A	1751.4	1372	132.9	81.78	0.4561	81.6
SEL	D5	GASEPF	D	25	DSK1	1069.8	1062	80.7	90.89	0.9909	78.0
SEL	D5	MU3001	D	25	D6A	1905.2	1563	152.1	1905.76	0.0560	90.4
SEL	D5	GASEPV	D	25	D6A	1829.0	1466	102.4	87.38	0.5680	80.2
SEL	D5	DHC6	D	25	DC1	3581.6	2097	101.3	87.09	1.4672	75.9
SEL	D5	DHC6	D	25	D6A	2532.8	2247	101.5	87.41	0.4192	81.2
SEL	D5	B222	A	18H	H3	1138.5	1000	123.0	3.00	1.4898	75.6
SEL	D5	BEC58P	D	25	DC1	3170.8	1279	131.1	93.51	1.5965	75.2
SEL	D5	GASEPF	D	25	DSK1	1178.5	1061	80.7	90.98	0.9909	77.2
SEL	D5	BEC58P	D	25	D6A	1554.0	1376	132.9	81.14	0.2807	82.7
SEL	D5	GASEPV	D	25	D12	2949.1	1365	102.2	87.17	2.4853	73.1
SEL	D5	BEC58P	D	25	D12	1649.9	1356	132.9	84.63	0.3326	81.8
SEL	D5	MU3001	D	25	D6A	1725.2	1566	152.4	1905.29	0.0344	91.4
SEL	D5	H500D	D	18H	H2	1011.6	1000	139.0	1.00	0.3131	81.8
SEL	D5	H500D	A	18H	H3	1006.6	1000	139.0	1.00	0.3132	81.8
SEL	D5	GASEPV	D	25	D6A	1642.1	1470	102.4	87.39	0.3496	81.3
SEL	D5	DHC6	D	25	DC1	3283.7	2113	101.3	87.12	0.9029	77.0
SEL	D5	BEC58P	D	25	DC1	2821.7	1286	131.5	93.25	0.9824	76.6
SEL	D5	H500D	D	18H	H2	1063.9	1000	139.0	1.00	0.3131	81.5
SEL	D5	H500D	A	18H	H3	1061.8	1000	139.0	1.00	0.3132	81.4
SEL	D5	BEC58P	D	25	DSK1	1403.5	1378	132.9	80.70	0.1996	83.4
SEL	D5	GASEPV	D	25	D12	1727.4	1445	102.4	87.34	0.4142	79.9
SEL	D5	GASEPV	D	25	DSK1	1501.3	1473	102.4	87.40	0.2485	81.9
SEL	D5	IA1125	D	25	D6A	1543.2	1091	166.0	2867.24	0.0560	88.4
SEL	D5	DHC6	D	25	D6A	2406.3	2256	101.5	87.43	0.2580	81.6
SEL	D5	LEAR35	D	25	D6A	2216.7	1668	175.9	2733.79	0.0516	88.5
SEL	D5	GASEPV	D	25	DC1	3201.5	1353	102.2	87.15	1.9883	72.6
SEL	D5	IA1125	D	25	D6A	1316.1	1097	166.0	2867.48	0.0344	90.1
SEL	D5	BEC58P	D	25	DSK1	1569.8	1375	132.9	81.20	0.1996	82.5
SEL	D5	DHC6	D	25	D12	2438.9	2211	101.5	87.33	0.3057	80.6
SEL	D5	BEC58P	D	25	DC1	3529.6	1274	130.9	93.68	0.9824	75.2
SEL	D5	BEC58P	D	25	D6A	1996.6	1367	132.9	82.70	0.2807	80.4
SEL	D5	GASEPV	D	25	DSK1	1657.0	1470	102.4	87.39	0.2485	80.9
SEL	D5	GASEPV	A	07	A3	505.2	431	66.5	45.68	0.1578	82.8
SEL	D5	GASEPV	D	25	DC1	2857.1	1361	102.2	87.17	1.2235	73.9
SEL	D5	DHC6	A	07	A2	1048.4	420	61.2	35.51	0.1433	83.2
SEL	D5	DHC6	A	07	A3	828.8	431	61.2	35.52	0.0717	86.1
SEL	D5	DHC6	D	25	D6A	2700.9	2236	101.5	87.38	0.2580	80.5
SEL	D5	B222	D	18H	H2	1702.5	1673	123.0	3.00	0.3464	79.2
SEL	D5	GASEPV	T	07	TG1	1592.7	609	70.4	37.93	3.2867	69.4
SEL	D5	BEC58P	D	25	D12	3679.4	1268	130.6	93.89	1.2281	73.6
SEL	D5	B222	D	18H	H2	1733.3	1672	123.0	3.00	0.3464	79.0
SEL	D5	DHC6	D	25	D12	4020.7	2023	101.2	86.94	1.1286	73.8
SEL	D5	GASEPV	D	25	D6A	2063.8	1459	102.4	87.37	0.3496	78.9
SEL	D5	DHC6	D	25	DC1	3897.1	2065	101.3	87.02	0.9029	74.8
SEL	D5	DHC6	D	25	DSK1	2316.0	2261	101.5	87.44	0.1834	81.7
SEL	D5	MU3001	D	25	D6A	2133.1	1559	151.6	1906.44	0.0344	88.9
SEL	D5	DHC6	A	07	A1	889.9	425	61.2	35.51	0.0717	85.7
SEL	D5	GASEPV	D	25	DC1	3556.7	1347	102.2	87.14	1.2235	73.3
SEL	D5	BEC58P	A	07	A3	505.2	431	99.8	39.22	0.1267	82.9
SEL	D5	GASEPF	D	25	D12	2046.7	1031	77.5	94.57	1.6515	71.7
SEL	D5	DHC6	A	07	AVOR	931.2	426	61.2	35.51	0.0717	85.3
SEL	D5	DHC6	D	25	DSK1	2416.1	2255	101.5	87.42	0.1834	81.2
SEL	D5	GASEPV	A	07	AVOR	437.8	424	66.5	45.67	0.0971	83.8
SEL	D5	DHC6	A	07	A2	1425.0	414	61.2	35.50	0.2329	79.7
SEL	D5	DHC6	A	07	A1	503.6	428	61.2	35.52	0.0194	90.4
SEL	D5	GASEPV	A	07	AVOR	624.0	426	66.5	45.67	0.1578	81.3
SEL	D5	LEAR35	D	25	D6A	1724.2	1680	176.9	2730.22	0.0140	91.7
SEL	D5	GASEPF	D	25	D6A	1513.4	1058	80.4	91.30	0.6134	75.2
SEL	D5	DHC6	A	07	AVOR	520.6	422	61.2	35.51	0.0194	90.1
SEL	D5	DHC6	A	07	A2	699.8	425	61.2	35.51	0.0388	87.1
SEL	D5	CNA441	D	25	DSK1	1728.3	1678	143.8	89.94	0.5627	75.4
SEL	D5	CNA441	D	25	DSK2	1728.8	1678	143.8	89.94	0.5496	75.4
SEL	D5	BEC58P	A	07	AVOR	437.8	424	99.8	39.21	0.0780	83.9

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SEL	D5	GASEPV	A	07	A3	487.8	422	66.5	45.67	0.0971	82.8
SEL	D5	GASEPV	D	25	D12	3704.7	1337	102.2	87.11	1.5294	70.6
SEL	D5	BEC58P	A	07	AVOR	624.0	426	99.8	39.21	0.1267	81.4
SEL	D5	GASEPF	D	25	D12	2800.3	1015	75.9	96.42	2.6836	68.1
SEL	D5	BEC58P	D	25	DC1	2476.6	1306	132.5	92.52	0.2661	78.0
SEL	D5	GASEPF	D	25	D6A	1277.4	1060	80.6	91.07	0.3775	76.5
SEL	D5	CNA441	T	25	TG2	2724.3	1500	143.4	32.75	4.4308	65.7
SEL	D5	GASEPF	D	25	DSK1	1087.4	1062	80.7	90.91	0.2684	77.8
SEL	D5	GASEPF	D	25	D12	1404.0	1050	79.5	92.35	0.4473	75.6
SEL	D5	BEC58P	D	25	D6A	1427.2	1378	132.9	80.77	0.0760	83.2
SEL	D5	DHC6	D	25	DC1	3005.6	2134	101.4	87.17	0.2445	78.1
SEL	D5	IA1125	D	25	D6A	1815.5	1083	166.0	2866.91	0.0344	86.6
SEL	D5	DHC6	A	07	A1	1374.0	419	61.2	35.50	0.1165	81.3
SEL	D5	BEC58P	A	07	A3	487.8	422	99.8	39.21	0.0780	82.9
SEL	D5	MU3001	D	25	D6A	1611.8	1568	152.6	1905.01	0.0093	92.0
SEL	D5	GASEPV	D	25	D6A	1523.3	1473	102.4	87.39	0.0947	81.8
SEL	D5	B222	A	18H	H3	1126.5	1000	123.0	3.00	0.3464	75.7
SEL	D5	CNA441	D	25	DSK1	1709.5	1678	143.8	89.94	0.3462	75.5
SEL	D5	IA1125	D	25	D6A	1164.5	1101	166.0	2867.62	0.0093	91.1
SEL	D5	HS748A	D	25	DSK1	1193.2	1154	124.7	95.80	0.0103	90.7
SEL	D5	B222	A	18H	H3	1173.8	1000	123.0	3.00	0.3464	75.4
SEL	D5	GASEPF	D	25	DC1	3070.3	1006	74.9	97.56	2.1469	67.4
SEL	D5	GASEPV	D	25	DC1	2519.7	1383	102.3	87.21	0.3314	75.4
SEL	D5	HS748A	D	25	DSK2	1193.7	1154	124.8	95.79	0.0100	90.6
SEL	D5	CNA441	D	25	DSK1	1777.3	1675	143.8	89.94	0.3462	75.2
SEL	D5	GASEPF	D	25	DSK1	1296.8	1060	80.6	91.09	0.2684	76.3
SEL	D5	BEC58P	T	07	TG1	1592.7	609	100.4	27.13	1.3972	68.9
SEL	D5	DHC6	D	25	D6A	2329.9	2260	101.5	87.44	0.0699	81.8
SEL	D5	UH-1	T	25	TG2	2377.2	700	124.0	1.00	0.1794	77.6
SEL	D5	GASEPF	D	25	DC1	2705.8	1012	75.5	96.85	1.3212	68.8
SEL	D5	LEAR25	A	07	A1	889.9	425	142.8	780.77	0.0067	91.4
SEL	D5	FAL50	D	25	D6A	3240.0	3041	197.0	2406.39	0.0350	84.1
SEL	D6	LEAR25	D	25	D6A	1727.8	1056	174.0	2471.98	0.0980	104.6
SEL	D6	LEAR25	D	25	D6A	1578.0	1068	174.1	2471.83	0.0603	105.8
SEL	D6	GIIB	D	25	D6A	1741.8	1077	170.0	9987.08	0.0280	107.6
SEL	D6	LEAR25	D	25	D6A	1884.9	1041	174.0	2472.16	0.0603	103.4
SEL	D6	GIIB	D	25	D6A	1593.7	1089	170.0	9986.80	0.0172	108.7
SEL	D6	BEC58P	D	25	DC1	1199.2	1113	122.7	99.55	1.5965	87.8
SEL	D6	LEAR25	D	25	D6A	1440.2	1078	174.1	2471.71	0.0163	107.0
SEL	D6	BEC58P	D	25	D12	1440.2	1119	123.0	99.32	1.9956	86.2
SEL	D6	GIIB	D	25	D6A	1897.4	1062	170.0	9987.40	0.0172	106.5
SEL	D6	BEC58P	D	25	D12	1166.6	1122	123.1	99.21	1.2281	87.9
SEL	D6	GASEPF	T	25	TG2	1574.5	739	73.9	97.72	27.3739	74.2
SEL	D6	BEC58P	D	25	DC1	1131.0	1115	122.8	99.49	0.9824	88.3
SEL	D6	BEC58P	T	25	TG2	1654.4	900	116.8	50.30	12.5747	77.0
SEL	D6	GASEPV	T	25	TG2	1654.4	900	91.4	49.37	29.5804	73.2
SEL	D6	BEC58P	D	25	DC1	1310.4	1109	122.5	99.67	0.9824	87.1
SEL	D6	GASEPV	D	25	DC1	1232.6	1146	101.9	90.66	1.9883	83.9
SEL	D6	GIIB	D	25	D6A	1457.7	1099	170.1	9986.56	0.0047	109.8
SEL	D6	GASEPV	D	25	D12	1469.4	1154	101.9	90.19	2.4853	82.4
SEL	D6	GASEPV	D	25	D12	1203.1	1158	101.9	89.96	1.5294	83.9
SEL	D6	DHC6	D	25	DC1	1774.6	1692	100.7	86.24	1.4672	84.0
SEL	D6	DHC6	D	25	D12	1954.0	1705	100.7	86.26	1.8340	83.0
SEL	D6	GASEPV	D	25	DC1	1166.8	1149	101.9	90.52	1.2235	84.5
SEL	D6	BEC58P	D	25	D12	1821.8	1104	122.2	99.88	1.2281	83.9
SEL	D6	LEAR25	D	25	D6A	2045.5	1025	174.0	2472.36	0.0163	102.3
SEL	D6	DHC6	D	25	D12	1766.6	1712	100.7	86.28	1.1286	83.7
SEL	D6	GASEPF	D	25	DC1	949.2	838	74.1	97.93	2.1469	80.8
SEL	D6	GASEPV	D	25	DC1	1340.2	1142	101.9	90.90	1.2235	83.2
SEL	D6	DHC6	D	25	DC1	1732.1	1696	100.7	86.25	0.9029	84.2
SEL	D6	BEC58P	D	25	DSK1	2093.3	1079	120.9	100.79	1.1973	82.6
SEL	D6	BEC58P	D	25	D12	1133.6	1111	122.6	99.60	0.3326	88.1
SEL	D6	BEC58P	D	25	DSK2	2088.0	1078	120.9	100.80	1.1696	82.6
SEL	D6	DHC6	D	25	DC1	1847.0	1685	100.7	86.22	0.9029	83.6
SEL	D6	GASEPF	D	25	D12	905.3	848	74.1	97.95	1.6515	81.0
SEL	D6	GASEPF	D	25	DC1	860.9	840	74.1	97.93	1.3212	81.5
SEL	D6	BEC58P	D	25	DC1	1115.8	1115	122.8	99.47	0.2661	88.4
SEL	D6	GASEPF	D	25	D12	1238.7	844	74.1	97.94	2.6836	78.3
SEL	D6	GASEPV	D	25	D12	1842.5	1135	101.9	91.32	1.5294	80.4
SEL	D6	GIIB	D	25	D6A	2056.6	1046	169.9	9987.77	0.0047	105.5
SEL	D6	DHC6	D	25	D12	2226.0	1652	100.6	86.15	1.1286	81.5

SEL	D6	BEC58P	D	25	DSK1	1990.5	1083	121.2	100.62	0.7368	83.1
SEL	D6	BEC58P	D	25	D6A	1740.7	1093	121.7	100.26	0.4561	84.4
SEL	D6	GASEPF	D	25	DC1	1086.9	834	74.1	97.92	1.3212	79.6
SEL	D6	BEC58P	D	25	DSK1	2194.5	1074	120.7	100.98	0.7368	82.1
SEL	D6	DHC6	D	25	DSK1	2433.0	1619	100.6	86.08	1.1004	80.3
SEL	D6	DHC6	D	25	DSK2	2428.4	1619	100.6	86.08	1.0748	80.3
SEL	D6	LEAR35	D	25	D6A	1843.9	1233	161.2	2785.45	0.0839	91.3
SEL	D6	GASEPV	D	25	DSK1	2107.9	1105	101.8	93.20	1.4912	78.8
SEL	D6	CNA441	T	25	TG2	2042.4	1500	131.5	98.19	4.4308	74.1
SEL	D6	GASEPV	D	25	DSK2	2102.7	1104	101.8	93.21	1.4565	78.8
SEL	D6	BEC58P	D	25	DC1	1450.8	1105	122.3	99.84	0.2661	86.1
SEL	D6	GASEPV	D	25	D12	1168.5	1145	101.9	90.76	0.4142	84.1
SEL	D6	BEC58P	D	25	D6A	1587.4	1099	122.0	100.06	0.2807	85.4
SEL	D6	GASEPV	D	25	DC1	1152.2	1149	101.9	90.49	0.3314	84.6
SEL	D6	LEAR35	D	25	D6A	1705.2	1245	161.3	2785.44	0.0516	92.4
SEL	D6	DHC6	D	25	DSK1	2350.2	1629	100.6	86.10	0.6772	80.7
SEL	D6	GASEPV	D	25	DSK1	2006.6	1110	101.9	92.85	0.9177	79.3
SEL	D6	DHC6	D	25	D12	1728.9	1689	100.7	86.23	0.3057	83.7
SEL	D6	GASEPV	T	07	TG1	1387.1	393	70.1	37.64	3.2867	73.3
SEL	D6	DHC6	D	25	DC1	1722.8	1697	100.7	86.25	0.2445	84.4
SEL	D6	DHC6	D	25	DSK1	2515.8	1609	100.6	86.06	0.6772	79.9
SEL	D6	BEC58P	D	25	D6A	1901.3	1087	121.4	100.48	0.2807	83.6
SEL	D6	DHC6	D	25	D6A	2154.6	1651	100.6	86.15	0.4192	81.8
SEL	D6	MU3001	D	25	D6A	1731.0	1065	144.5	1888.59	0.0560	90.5
SEL	D6	GASEPV	D	25	D6A	1760.7	1123	101.9	92.10	0.5680	80.5
SEL	D6	GASEPV	D	25	DSK1	2208.3	1103	101.8	93.33	0.9177	78.3
SEL	D6	GASEPF	D	25	D12	865.2	836	74.1	97.92	0.4473	81.2
SEL	D6	GASEPF	D	25	D12	1669.0	828	74.0	97.91	1.6515	75.4
SEL	D6	GASEPV	D	25	DC1	1476.9	1137	101.9	91.24	0.3314	82.4
SEL	D6	LEAR35	D	25	D6A	1991.1	1219	161.2	2785.47	0.0516	90.3
SEL	D6	GASEPF	D	25	DC1	840.8	840	74.1	97.93	0.3578	81.7
SEL	D6	BEC58P	D	25	D12	2161.0	1069	120.5	101.14	0.3326	81.9
SEL	D6	DHC6	D	25	DC1	1943.0	1675	100.7	86.20	0.2445	83.2
SEL	D6	MU3001	D	25	D6A	1580.7	1076	144.6	1889.29	0.0344	91.6
SEL	D6	B206	A	18H	H3	2694.8	771	118.0	1.92	7.3264	68.2
SEL	D6	GASEPV	D	25	D6A	1610.2	1129	101.9	91.69	0.3496	81.3
SEL	D6	BEC58P	D	25	DSK1	1887.1	1088	121.4	100.46	0.1996	83.7
SEL	D6	DHC6	D	25	D6A	2039.5	1662	100.6	86.17	0.2580	82.5
SEL	D6	CNA441	D	25	DC1	1254.0	1159	142.7	88.93	0.7502	77.8
SEL	D6	B206	D	18H	H2	2735.9	1000	118.0	1.00	7.3264	67.6
SEL	D6	UH-1	D	18H	H2	2735.9	1000	124.0	1.00	0.4422	79.4
SEL	D6	CNA441	D	25	D12	1491.2	1171	142.8	88.95	0.9378	76.1
SEL	D6	GASEPF	D	25	DSK1	1964.7	801	74.0	97.85	1.6102	73.5
SEL	D6	GASEPF	D	25	DSK2	1959.2	801	74.0	97.85	1.5728	73.5
SEL	D6	CNA441	D	25	D12	1232.0	1177	142.8	88.96	0.5771	77.7
SEL	D6	DHC6	D	25	D6A	2279.4	1638	100.6	86.12	0.2580	81.1
SEL	D6	DHC6	A	07	A2	1202.1	249	61.1	35.28	0.2329	81.5
SEL	D6	UH-1	T	25	TG2	1555.3	700	124.0	1.00	0.1794	82.6
SEL	D6	GASEPV	D	25	D6A	1918.7	1115	101.9	92.57	0.3496	79.7
SEL	D6	BEC58P	D	25	D6A	1446.1	1103	122.2	99.90	0.0760	86.3
SEL	D6	DHC6	D	25	D12	2482.2	1599	100.6	86.04	0.3057	80.1
SEL	D6	LEAR35	D	25	D6A	1579.4	1254	161.3	2785.42	0.0140	93.4
SEL	D6	CNA441	D	25	DC1	1190.8	1163	142.7	88.93	0.4617	78.2
SEL	D6	GASEPV	D	25	D12	2175.3	1099	101.5	93.68	0.4142	78.7
SEL	D6	MU3001	D	25	D6A	1888.7	1052	144.5	1887.79	0.0344	89.5
SEL	D6	IA1125	D	25	D6A	1503.2	649	164.9	2849.84	0.0560	87.2
SEL	D6	BEC58P	D	25	DSK1	2293.8	1068	120.4	101.17	0.1996	81.6
SEL	D6	BEC58P	T	07	TG1	1387.1	393	99.8	27.04	1.3972	73.0
SEL	D6	B222	D	18H	H2	2810.1	1175	123.0	3.00	1.4898	72.7
SEL	D6	HS748A	D	25	DC1	981.4	872	118.8	99.45	0.0137	92.8
SEL	D6	GASEPF	D	25	DSK1	1854.3	806	74.0	97.86	0.9909	74.2
SEL	D6	SF340	D	25	D12	1767.9	1514	142.7	87.11	0.2228	80.6
SEL	D6	B222	A	18H	H3	2767.6	1000	123.0	3.00	1.4898	72.3
SEL	D6	IA1125	D	25	D6A	1322.4	658	164.9	2850.18	0.0344	88.6
SEL	D6	DHC6	T	25	TG2	2042.4	1500	100.4	71.96	0.1794	81.4
SEL	D6	SF340	D	25	DC1	1575.1	1507	142.2	87.45	0.1782	81.4
SEL	D6	CNA441	D	25	DC1	1357.9	1153	142.7	88.92	0.4617	77.2
SEL	D6	DHC6	D	25	DSK1	2268.2	1639	100.6	86.12	0.1834	81.2
SEL	D6	GASEPF	D	25	DC1	1253.5	829	74.0	97.91	0.3578	78.2
SEL	D6	GASEPF	D	25	D6A	1581.7	817	74.0	97.88	0.6134	75.8
SEL	D6	GASEPV	D	25	DSK1	1904.7	1116	101.9	92.52	0.2485	79.7

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SEL	D6	H500D	D	18H	H2	2735.9	1000	139.0	1.00	1.3469	72.2
SEL	D6	DHC6	A	07	A2	1200.7	259	61.1	35.30	0.1433	81.9
SEL	D6	H500D	A	18H	H3	2694.8	771	139.0	1.92	1.3470	72.1
SEL	D6	HS748A	D	25	D12	941.7	884	118.8	99.48	0.0105	92.9
SEL	D6	GASEPF	D	25	DSK1	2072.9	796	74.0	97.84	0.9909	72.9
SEL	D6	GASEPF	D	25	D6A	1410.3	823	74.0	97.89	0.3775	77.0
SEL	D6	SF340	D	25	D12	1554.3	1518	142.9	86.95	0.1371	81.4
SEL	D6	DHC6	A	07	A2	1202.1	249	61.1	35.28	0.1433	81.2
SEL	D6	HS748A	D	25	DC1	896.9	874	118.8	99.45	0.0084	93.4
SEL	D6	HS748A	D	25	D12	1264.9	880	118.8	99.47	0.0171	90.4
SEL	D6	DHC6	A	07	A1	1120.2	246	61.1	35.28	0.1165	82.0
SEL	D6	UH-1	A	18H	H3	2694.8	771	124.0	1.92	0.4422	76.1
SEL	D6	MU3001	D	25	D6A	1442.4	1085	144.6	1889.86	0.0093	92.7
SEL	D6	FAL50	D	25	D6A	2566.6	2099	189.2	2420.12	0.0350	86.8
SEL	D6	DHC6	A	07	A1	982.4	253	61.1	35.29	0.0717	83.6
SEL	D6	DHC6	D	25	DSK1	2598.0	1598	100.5	86.04	0.1834	79.5
SEL	D6	SF340	D	25	DC1	1524.6	1509	142.4	87.35	0.1097	81.6
SEL	D6	GASEPV	D	25	DSK1	2307.4	1098	101.4	93.74	0.2485	77.9
SEL	D7	GASEPV	T	25	TG2	910.0	900	91.4	49.37	29.5804	79.0
SEL	D7	BEC58P	T	25	TG2	910.0	900	116.8	50.30	12.5747	81.3
SEL	D7	LEAR25	D	25	D6A	2246.4	1243	174.5	2469.65	0.0980	101.4
SEL	D7	GASEPF	T	25	TG2	910.0	900	74.1	61.93	27.3739	76.6
SEL	D7	LEAR25	D	25	D6A	2049.9	1260	174.6	2469.44	0.0603	102.8
SEL	D7	GIIB	D	25	D6A	2261.6	1268	170.5	9982.78	0.0280	104.7
SEL	D7	GIIB	D	25	D6A	2067.0	1285	170.5	9982.39	0.0172	106.0
SEL	D7	LEAR25	D	25	D6A	2449.1	1224	174.5	2469.89	0.0603	100.0
SEL	D7	B206	A	18H	H3	1076.6	871	118.0	1.52	7.3264	78.4
SEL	D7	LEAR25	D	25	D6A	1864.8	1274	174.6	2469.27	0.0163	104.1
SEL	D7	GIIB	D	25	D6A	2462.6	1248	170.4	9983.22	0.0172	103.4
SEL	D7	B206	D	18H	H2	1201.2	1000	118.0	1.00	7.3264	76.7
SEL	D7	BEC58P	D	25	DSK1	1759.5	1191	126.7	96.71	1.1973	83.5
SEL	D7	BEC58P	D	25	DSK2	1762.9	1191	126.7	96.70	1.1696	83.5
SEL	D7	UH-1	D	18H	H2	1201.2	1000	124.0	1.00	0.4422	87.5
SEL	D7	GIIB	D	25	D6A	1884.0	1299	170.6	9982.06	0.0047	107.2
SEL	D7	B222	A	18H	H3	1181.0	1000	123.0	3.00	1.4898	81.6
SEL	D7	UH-1	T	25	TG2	711.0	700	124.0	1.00	0.1794	90.8
SEL	D7	H500D	A	18H	H3	1076.6	871	139.0	1.52	1.3470	81.7
SEL	D7	BEC58P	D	25	DSK1	1646.7	1194	126.8	96.59	0.7368	84.2
SEL	D7	UH-1	A	18H	H3	1076.6	871	124.0	1.52	0.4422	86.3
SEL	D7	DHC6	D	25	DSK1	2291.6	1858	100.9	86.59	1.1004	81.6
SEL	D7	H500D	D	18H	H2	1201.2	1000	139.0	1.00	1.3469	80.6
SEL	D7	DHC6	D	25	DSK2	2294.5	1859	100.9	86.59	1.0748	81.6
SEL	D7	BEC58P	D	25	D12	2170.0	1159	125.0	97.87	1.2281	80.8
SEL	D7	B222	D	18H	H2	1495.8	1322	123.0	3.00	1.4898	79.9
SEL	D7	GASEPV	D	25	DSK1	1796.4	1242	102.1	86.92	1.4912	79.8
SEL	D7	BEC58P	D	25	DSK1	1880.6	1187	126.5	96.84	0.7368	82.9
SEL	D7	GASEPV	D	25	DSK2	1799.8	1242	102.1	86.92	1.4565	79.8
SEL	D7	BEC58P	D	25	D12	2690.2	1122	123.1	99.22	1.9956	78.4
SEL	D7	B206	A	18H	H3	1007.2	871	118.0	1.51	1.7033	79.0
SEL	D7	LEAR25	D	25	D6A	2653.7	1202	174.4	2470.16	0.0163	98.8
SEL	D7	CNA441	T	25	TG2	1508.6	1500	143.4	32.75	4.4308	74.0
SEL	D7	DHC6	D	25	DSK1	2210.5	1865	101.0	86.60	0.6772	82.1
SEL	D7	GASEPV	D	25	DSK1	1686.8	1246	102.1	86.93	0.9177	80.5
SEL	D7	B206	A	18H	H3	1156.8	869	118.0	1.52	1.7033	77.6
SEL	D7	DHC6	D	25	D12	3001.5	1711	100.7	86.28	1.8340	77.2
SEL	D7	DHC6	D	25	D12	2588.9	1808	100.9	86.48	1.1286	79.2
SEL	D7	B206	D	18H	H2	1115.8	1000	118.0	1.00	1.7033	77.4
SEL	D7	DHC6	D	25	DSK1	2381.3	1850	100.9	86.57	0.6772	81.1
SEL	D7	BEC58P	D	25	DC1	3110.6	1126	123.3	99.08	1.5965	77.2
SEL	D7	GASEPV	D	25	D12	2195.3	1203	102.0	87.21	1.5294	77.1
SEL	D7	GASEPV	D	25	D12	2706.4	1157	101.9	89.98	2.4853	75.0
SEL	D7	GIIB	D	25	D6A	2665.8	1226	170.4	9983.72	0.0047	102.2
SEL	D7	GASEPV	D	25	DSK1	1914.5	1237	102.0	86.91	0.9177	79.2
SEL	D7	BEC58P	D	25	D12	1696.3	1188	126.5	96.82	0.3326	83.4
SEL	D7	DHC6	D	25	DC1	3386.5	1719	100.7	86.29	1.4672	76.7
SEL	D7	B206	D	18H	H2	1304.2	1000	118.0	1.00	1.7033	75.8
SEL	D7	UH-1	D	18H	H2	1115.8	1000	124.0	1.00	0.1028	88.0
SEL	D7	GASEPF	D	25	DSK1	1586.8	921	74.1	98.10	1.6102	76.0
SEL	D7	BEC58P	D	25	DC1	2870.1	1141	124.1	98.51	0.9824	78.0
SEL	D7	GASEPF	D	25	DSK2	1590.6	921	74.1	98.10	1.5728	76.0
SEL	D7	BEC58P	D	25	DSK1	1543.9	1197	127.0	96.49	0.1996	84.9

SEL	D7	BEC58P	D	25	D6A	2197.9	1176	125.9	97.24	0.4561	81.2
SEL	D7	LEAR35	D	25	D6A	2346.7	1412	161.6	2785.20	0.0839	88.3
SEL	D7	B222	A	18H	H3	1117.4	1000	123.0	3.00	0.3464	82.0
SEL	D7	BEC58P	D	25	D12	3142.0	1078	120.9	100.81	1.2281	76.5
SEL	D7	H500D	A	18H	H3	1007.2	871	139.0	1.51	0.3132	82.3
SEL	D7	GASEPV	D	25	DC1	3125.0	1162	101.9	89.69	1.9883	74.1
SEL	D7	BEC58P	D	25	DC1	3344.1	1108	122.4	99.71	0.9824	77.1
SEL	D7	UH-1	A	18H	H3	1007.2	871	124.0	1.51	0.1028	86.9
SEL	D7	DHC6	D	25	DC1	3180.3	1753	100.8	86.36	0.9029	77.4
SEL	D7	UH-1	D	18H	H2	1304.2	1000	124.0	1.00	0.1028	86.7
SEL	D7	GASEPF	D	25	DSK1	1460.3	924	74.1	98.11	0.9909	76.9
SEL	D7	BEC58P	D	25	D6A	1990.1	1184	126.3	96.97	0.2807	82.3
SEL	D7	LEAR35	D	25	D6A	2160.1	1428	161.7	2785.17	0.0516	89.5
SEL	D7	B222	A	18H	H3	1255.3	1000	123.0	3.00	0.3464	80.9
SEL	D7	DHC6	D	25	D6A	2627.2	1827	100.9	86.52	0.4192	79.9
SEL	D7	H500D	D	18H	H2	1115.8	1000	139.0	1.00	0.3131	81.2
SEL	D7	DHC6	D	25	D12	3379.5	1618	100.6	86.08	1.1286	75.5
SEL	D7	H500D	A	18H	H3	1156.8	869	139.0	1.52	0.3132	81.0
SEL	D7	DHC6	D	25	D12	2240.7	1864	100.9	86.60	0.3057	81.1
SEL	D7	UH-1	A	18H	H3	1156.8	869	124.0	1.52	0.1028	85.7
SEL	D7	GASEPV	D	25	D12	1734.0	1238	102.0	86.91	0.4142	79.6
SEL	D7	B222	D	18H	H2	1429.8	1324	123.0	3.00	0.3464	80.3
SEL	D7	DHC6	D	25	DC1	3589.5	1682	100.7	86.22	0.9029	76.1
SEL	D7	GASEPV	D	25	DC1	2887.3	1181	102.0	88.52	1.2235	74.7
SEL	D7	GASEPV	D	25	DC1	3355.9	1141	101.9	90.99	1.2235	74.6
SEL	D7	MU3001	D	25	D6A	2238.2	1234	144.9	1899.20	0.0560	87.9
SEL	D7	GASEPV	D	25	D6A	2225.4	1224	102.0	86.88	0.5680	77.7
SEL	D7	BEC58P	D	25	DSK1	2008.5	1183	126.2	97.00	0.1996	82.2
SEL	D7	GASEPV	D	25	D12	3151.8	1104	101.8	93.23	1.5294	73.3
SEL	D7	GASEPF	D	25	DSK1	1720.5	917	74.1	98.09	0.9909	75.2
SEL	D7	DHC6	D	25	DSK1	2138.8	1871	101.0	86.61	0.1834	82.4
SEL	D7	GASEPV	D	25	DSK1	1587.2	1249	102.1	86.94	0.2485	81.1
SEL	D7	DHC6	D	25	D6A	2464.6	1843	100.9	86.55	0.2580	80.7
SEL	D7	H500D	D	18H	H2	1304.2	1000	139.0	1.00	0.3131	79.9
SEL	D7	B222	D	18H	H2	1577.7	1320	123.0	3.00	0.3464	79.4
SEL	D7	DHC6	T	25	TG2	1508.6	1500	100.4	34.85	0.1794	82.2
SEL	D7	BEC58P	D	25	D6A	2410.9	1168	125.5	97.55	0.2807	80.2
SEL	D7	GASEPF	D	25	D12	2035.9	887	74.1	98.03	1.6515	72.3
SEL	D7	MU3001	D	25	D6A	2039.7	1249	144.9	1900.15	0.0344	89.1
SEL	D7	GASEPV	T	07	TG1	1935.6	477	70.2	37.75	3.2867	69.3
SEL	D7	LEAR35	D	25	D6A	2540.6	1393	161.6	2785.22	0.0516	87.0
SEL	D7	GASEPV	D	25	D6A	2021.6	1233	102.0	86.90	0.3496	78.7
SEL	D7	GASEPF	D	25	D12	2586.4	847	74.1	97.95	2.6836	69.4
SEL	D7	DHC6	D	25	D6A	2799.2	1809	100.9	86.48	0.2580	79.2
SEL	D7	DHC6	D	25	DSK1	2478.7	1841	100.9	86.55	0.1834	80.6
SEL	D7	BEC58P	D	25	DC1	2627.2	1155	124.8	98.00	0.2661	79.0
SEL	D7	GASEPV	D	25	DSK1	2039.6	1232	102.0	86.90	0.2485	78.5
SEL	D7	LEAR35	D	25	D6A	1986.0	1441	161.7	2785.15	0.0140	90.8
SEL	D7	GASEPF	D	25	D12	1516.8	917	74.1	98.09	0.4473	75.7
SEL	D7	BEC58P	D	25	D6A	1792.5	1190	126.6	96.75	0.0760	83.4
SEL	D7	GASEPV	D	25	D6A	2434.8	1213	102.0	86.86	0.3496	76.7
SEL	D7	MU3001	D	25	D6A	2442.8	1216	144.9	1898.11	0.0344	86.8
SEL	D7	DHC6	D	25	DC1	2976.0	1782	100.8	86.43	0.2445	78.2
SEL	D7	GASEPF	D	25	DSK1	1342.8	927	74.2	98.11	0.2684	77.7
SEL	D7	IA1125	D	25	D6A	2012.8	780	165.2	2854.98	0.0560	84.5
SEL	D7	CNA441	D	25	DSK1	1853.7	1310	143.1	89.22	0.5627	74.4
SEL	D7	CNA441	D	25	DSK2	1857.2	1311	143.1	89.22	0.5496	74.4
SEL	D7	GASEPF	D	25	DC1	3021.0	851	74.1	97.95	2.1469	68.2
SEL	D7	IA1125	D	25	D6A	1783.8	791	165.3	2855.44	0.0344	85.9
SEL	D7	BEC58P	D	25	DC1	3566.2	1090	121.5	100.39	0.2661	76.9
SEL	D8	GASEPV	T	25	TG2	1709.2	900	91.4	49.37	29.5804	82.3
SEL	D8	BEC58P	T	25	TG2	1589.8	634	116.3	102.84	12.5747	84.3
SEL	D8	LEAR25	D	25	D6A	1538.5	416	172.4	2479.94	0.0980	103.1
SEL	D8	LEAR25	D	25	D6A	1501.3	430	172.4	2479.77	0.0603	103.6
SEL	D8	GIIB	D	25	D6A	1540.7	424	168.4	10001.76	0.0280	106.1
SEL	D8	LEAR25	D	25	D6A	1572.3	401	172.4	2480.13	0.0603	102.6
SEL	D8	GASEPF	T	25	TG2	1527.3	460	73.6	97.13	27.3739	74.5
SEL	D8	GIIB	D	25	D6A	1503.8	438	168.4	10001.44	0.0172	106.6
SEL	D8	GIIB	D	25	D6A	1574.4	409	168.4	10002.10	0.0172	105.6
SEL	D8	BEC58P	D	25	DC1	1556.8	720	116.5	103.03	1.5965	85.5
SEL	D8	BEC58P	D	25	D12	1597.5	673	116.4	102.93	1.9956	84.5

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SEL	D8	GASEPV	D	25	DC1	1605.5	820	91.3	103.05	1.9883	83.7
SEL	D8	GASEPV	D	25	D12	1643.4	776	91.2	102.95	2.4853	82.7
SEL	D8	BEC58P	D	25	D12	1479.1	698	116.4	102.98	1.2281	85.5
SEL	D8	LEAR25	D	25	D6A	1461.2	444	172.5	2479.60	0.0163	104.2
SEL	D8	BEC58P	D	25	DC1	1524.9	733	116.5	103.06	0.9824	86.1
SEL	D8	DHC6	D	25	D12	1808.2	1085	98.4	91.26	1.8340	82.9
SEL	D8	DHC6	D	25	DC1	1781.7	1116	99.8	89.48	1.4672	83.7
SEL	D8	GASEPV	D	25	D12	1529.5	799	91.2	103.01	1.5294	83.5
SEL	D8	GASEPV	D	25	DC1	1575.1	833	91.3	103.08	1.2235	84.3
SEL	D8	BEC58P	D	25	DC1	1583.5	706	116.4	103.00	0.9824	85.2
SEL	D8	BEC58P	D	25	D12	1698.4	647	116.3	102.87	1.2281	83.6
SEL	D8	BEC58P	D	25	DSK1	1685.3	643	116.3	102.86	1.1973	83.6
SEL	D8	BEC58P	D	25	DSK2	1676.2	643	116.3	102.86	1.1696	83.6
SEL	D8	LEAR25	D	25	D6A	1602.6	387	172.3	2480.31	0.0163	102.2
SEL	D8	GASEPV	D	25	DC1	1630.9	807	91.3	103.02	1.2235	83.4
SEL	D8	DHC6	D	25	D12	1706.1	1098	99.8	89.90	1.1286	83.4
SEL	D8	GIIB	D	25	D6A	1463.9	452	168.5	10001.12	0.0047	107.1
SEL	D8	GASEPV	D	25	D12	1740.8	751	91.2	102.90	1.5294	81.9
SEL	D8	DHC6	D	25	DC1	1759.2	1132	99.8	89.08	0.9029	84.1
SEL	D8	GASEPV	D	25	DSK1	1727.8	747	91.2	102.89	1.4912	81.8
SEL	D8	GASEPV	D	25	DSK2	1718.9	747	91.2	102.89	1.4565	81.9
SEL	D8	GASEPV	T	07	TG1	1462.1	106	69.8	37.25	3.2867	78.3
SEL	D8	DHC6	D	25	DC1	1799.8	1099	99.8	89.88	0.9029	83.5
SEL	D8	DHC6	D	25	D12	1896.7	1066	96.4	93.15	1.1286	82.4
SEL	D8	DHC6	D	25	DSK1	1884.7	1063	96.1	93.44	1.1004	82.3
SEL	D8	DHC6	D	25	DSK2	1876.6	1063	96.1	93.45	1.0748	82.4
SEL	D8	BEC58P	D	25	DSK1	1670.9	650	116.3	102.88	0.7368	83.8
SEL	D8	CNA441	T	25	TG2	1714.2	888	121.8	103.11	4.4308	75.7
SEL	D8	BEC58P	D	25	DSK1	1698.0	636	116.3	102.84	0.7368	83.4
SEL	D8	GIIB	D	25	D6A	1604.5	394	168.3	10002.44	0.0047	105.1
SEL	D8	GASEPV	D	07	DC2	1735.2	0	16.0	163.84	0.7080	83.2
SEL	D8	BEC58P	D	25	D12	1351.3	719	116.5	103.03	0.3326	86.5
SEL	D8	GASEPV	D	25	DSK1	1714.0	754	91.2	102.91	0.9177	82.0
SEL	D8	GASEPV	D	25	DSK1	1739.9	741	91.2	102.88	0.9177	81.7
SEL	D8	BEC58P	D	25	D6A	1624.1	668	116.4	102.91	0.4561	84.2
SEL	D8	BEC58P	D	25	DC1	1488.4	746	116.5	103.09	0.2661	86.6
SEL	D8	DHC6	D	25	DSK1	1872.3	1068	96.7	92.92	0.6772	82.4
SEL	D8	GASEPV	D	25	D12	1407.2	819	91.3	103.05	0.4142	84.5
SEL	D8	DHC6	D	25	DSK1	1895.7	1058	95.6	93.96	0.6772	82.2
SEL	D8	LEAR35	D	25	D6A	1607.8	623	159.8	2786.32	0.0839	91.1
SEL	D8	GASEPV	D	25	DC1	1540.2	845	91.3	103.11	0.3314	84.8
SEL	D8	GASEPV	D	25	D6A	1669.0	771	91.2	102.94	0.5680	82.4
SEL	D8	LEAR25	D	07	D1A	1735.2	0	16.0	2800.79	0.0108	99.2
SEL	D8	SF340	D	25	D12	1811.7	1084	122.0	108.73	0.2228	86.0
SEL	D8	GASEPF	D	25	DC1	1484.1	550	73.7	97.32	2.1469	75.9
SEL	D8	GASEPV	D	07	D1A	1735.2	0	16.0	163.84	0.3945	83.2
SEL	D8	BEC58P	D	25	DC1	1604.6	692	116.4	102.97	0.2661	84.9
SEL	D8	BEC58P	D	25	D6A	1589.6	678	116.4	102.94	0.2807	84.5
SEL	D8	SF340	D	25	DC1	1787.3	1131	123.7	107.42	0.1782	86.5
SEL	D8	GASEPF	D	25	D12	1538.1	522	73.7	97.26	2.6836	74.7
SEL	D8	DHC6	D	25	D12	1604.8	1114	99.8	89.51	0.3057	84.1
SEL	D8	DHC6	D	25	D6A	1831.5	1080	98.0	91.68	0.4192	82.7
SEL	D8	LEAR35	D	25	D6A	1573.9	636	159.8	2786.31	0.0516	91.4
SEL	D8	DHC6	D	25	DC1	1732.9	1148	99.9	88.70	0.2445	84.6
SEL	D8	BEC58P	D	25	D6A	1655.4	656	116.4	102.89	0.2807	83.9
SEL	D8	GASEPV	D	25	DC1	1651.0	794	91.2	102.99	0.3314	83.1
SEL	D8	GASEPV	D	25	D6A	1635.9	781	91.2	102.97	0.3496	82.7
SEL	D8	BEC58P	D	25	D12	1778.2	620	116.3	102.81	0.3326	82.9
SEL	D8	GASEPF	D	25	D12	1408.5	537	73.7	97.29	1.6515	75.8
SEL	D8	GASEPF	D	25	DC1	1447.0	559	73.8	97.34	1.3212	76.7
SEL	D8	LEAR35	D	25	D6A	1638.6	609	159.8	2786.34	0.0516	90.7
SEL	D8	SF340	D	25	D12	1714.4	1108	122.9	108.05	0.1371	86.4
SEL	D8	GIIB	D	07	D1A	1735.2	0	16.0	11019.63	0.0031	102.9
SEL	D8	GASEPV	D	25	D6A	1699.2	760	91.2	102.92	0.3496	82.1
SEL	D8	LEAR25	D	07	D1A	1735.2	0	16.0	2800.79	0.0067	99.2
SEL	D8	LEAR25	D	07	D1A	1735.2	0	16.0	2800.79	0.0067	99.2
SEL	D8	GASEPV	D	25	D12	1817.8	726	91.2	102.84	0.4142	81.2
SEL	D8	DHC6	D	25	DC1	1815.4	1098	99.8	89.90	0.2445	83.2
SEL	D8	FAL50	D	25	D6A	2124.9	1527	167.1	2765.71	0.0350	91.6
SEL	D8	GASEPV	D	07	D1A	1735.2	0	16.0	163.84	0.2428	83.2
SEL	D8	GASEPV	D	07	D1A	1735.2	0	16.0	163.84	0.2428	83.2

SEL	D8	SF340	D	25	DC1	1762.9	1145	124.2	107.04	0.1097	86.6
SEL	D8	DHC6	D	25	D6A	1801.5	1088	98.8	90.91	0.2580	82.9
SEL	D8	SF340	D	25	DSK1	1882.5	1053	120.8	109.59	0.1337	85.7
SEL	D8	SF340	D	25	D12	1895.3	1057	121.0	109.47	0.1371	85.6
SEL	D8	BEC58P	D	25	DSK1	1654.9	658	116.4	102.89	0.1996	83.9
SEL	D8	SF340	D	25	DSK2	1874.4	1053	120.8	109.59	0.1306	85.8
SEL	D8	DHC6	D	25	D12	1967.0	1047	94.4	95.10	0.3057	82.0
SEL	D8	GASEPF	D	25	DC1	1515.5	542	73.7	97.31	1.3212	75.5
SEL	D8	SF340	D	25	DC1	1807.3	1117	123.2	107.81	0.1097	86.3
SEL	D8	DHC6	D	25	D6A	1858.8	1073	97.1	92.48	0.2580	82.5
SEL	D8	BEC58P	D	07	DC2	1735.2	0	16.0	122.80	0.5686	79.0
SEL	D8	MU3001	D	25	D6A	1559.5	489	143.3	1852.38	0.0560	89.0
SEL	D8	DHC6	T	25	TG2	1733.3	926	89.4	99.76	0.1794	83.9
SEL	D8	BEC58P	D	25	DSK1	1709.2	629	116.3	102.83	0.1996	83.3
SEL	D8	GASEPV	D	25	DSK1	1698.7	761	91.2	102.92	0.2485	82.1
SEL	D8	B206	A	18H	H3	2727.2	435	118.0	3.00	7.3264	67.4
SEL	D8	GASEPF	D	25	D12	1648.3	505	73.7	97.23	1.6515	73.7
SEL	D8	GASEPF	D	25	DSK1	1635.6	503	73.7	97.22	1.6102	73.8
SEL	D8	GASEPF	D	25	DSK2	1626.3	503	73.7	97.22	1.5728	73.8
SEL	D8	B206	D	18H	H2	2849.7	1000	118.0	1.00	7.3264	67.1
SEL	D8	UH-1	T	25	TG2	1610.5	684	124.0	1.03	0.1794	83.2
SEL	D8	GIIB	D	07	D1A	1735.2	0	16.0	11019.63	0.0019	102.9
SEL	D8	GIIB	D	07	D1A	1735.2	0	16.0	11019.63	0.0019	102.9
SEL	D8	B222	A	18H	H3	2825.0	829	103.2	2.66	1.4898	73.8
SEL	D8	GASEPV	D	25	DSK1	1750.6	734	91.2	102.86	0.2485	81.5
SEL	D8	UH-1	A	18H	H3	2727.2	435	124.0	3.00	0.4422	78.7
SEL	D8	DHC6	D	25	DSK1	1858.4	1073	97.2	92.40	0.1834	82.5
SEL	D8	FAL50	D	25	D6A	2100.0	1533	168.3	2761.08	0.0215	91.8
SEL	D8	UH-1	D	18H	H2	2849.7	1000	124.0	1.00	0.4422	78.6
SEL	D8	SF340	D	25	DSK1	1871.4	1060	121.1	109.38	0.0823	85.8
SEL	D8	SF340	D	25	DSK1	1892.3	1046	120.6	109.79	0.0823	85.6
SEL	D8	FAL50	D	25	D6A	2147.7	1520	165.8	2770.46	0.0215	91.5
SEL	D8	DHC6	D	25	DSK1	1905.3	1053	95.1	94.48	0.1834	82.2
SEL	D8	MU3001	D	25	D6A	1523.0	502	143.3	1853.19	0.0344	89.4
SEL	D8	GASEPV	D	07	DSK5	1735.2	0	16.0	163.84	0.1184	83.9
SEL	D8	B222	D	18H	H2	2849.7	1000	123.0	3.00	1.4898	72.9
SEL	D8	BEC58P	D	07	D1A	1735.2	0	16.0	122.80	0.3168	79.0
SEL	D8	MU3001	D	25	D6A	1592.7	475	143.3	1851.55	0.0344	88.6
SEL	D8	GASEPF	D	25	DSK1	1619.2	507	73.7	97.23	0.9909	74.0
SEL	D8	CNA441	D	25	DC1	1519.3	633	141.6	87.90	0.7502	75.0
SEL	D8	BEC58P	D	25	D6A	1552.5	689	116.4	102.96	0.0760	84.9
SEL	D8	GASEPF	D	25	DSK1	1650.2	498	73.7	97.21	0.9909	73.6
SEL	D8	GASEPF	D	25	D12	1267.3	550	73.7	97.32	0.4473	76.9
SEL	D8	BEC58P	T	07	TG1	1462.1	106	99.4	26.76	1.3972	71.9
SEL	D8	LEAR35	D	25	D6A	1537.3	650	159.8	2786.29	0.0140	91.9
SEL	D8	CNA441	D	25	D12	1561.1	581	141.5	87.80	0.9378	73.6
SEL	D8	H500D	D	18H	H2	2849.7	1000	139.0	1.00	1.3469	71.8
SEL	D8	SF340	D	25	D6A	1833.8	1078	121.8	108.90	0.0509	85.9
SEL	D8	GASEPF	D	25	DC1	1404.8	567	73.8	97.36	0.3578	77.3
SEL	D8	GASEPV	D	25	D6A	1600.2	791	91.2	102.99	0.0947	83.0
SEL	D8	SF340	D	25	D12	1611.2	1130	123.7	107.45	0.0371	86.9
SEL	D8	GASEPV	D	07	DSK5	1735.2	0	16.0	163.84	0.0728	84.0
SEL	D8	BEC58P	D	25	D6A	1683.3	645	116.3	102.86	0.0760	83.6
SEL	D8	GASEPV	D	07	DSK5	1735.2	0	16.0	163.84	0.0728	83.8
SEL	D8	GASEPF	D	25	D6A	1567.0	518	73.7	97.25	0.6134	74.5
SEL	D8	CNA441	D	25	DC1	1486.7	649	141.6	87.93	0.4617	75.6
SEL	D8	CNA441	D	25	D12	1439.7	608	141.6	87.85	0.5771	74.6
SEL	D8	BEC58P	D	07	D1A	1735.2	0	16.0	122.80	0.1950	79.0
SEL	D8	BEC58P	D	07	D1A	1735.2	0	16.0	122.80	0.1950	79.0
SEL	D9	GASEPV	T	25	TG2	1644.3	713	66.8	140.20	29.5804	90.6
SEL	D9	BEC58P	T	25	TG2	1509.0	311	115.8	102.12	12.5747	82.6
SEL	D9	GASEPV	T	07	TG1	1483.8	130	66.3	138.45	3.2867	85.7
SEL	D9	LEAR25	D	25	D6A	1498.4	93	163.1	2501.59	0.0980	99.7
SEL	D9	LEAR25	D	25	D6A	1498.4	93	163.1	2501.59	0.0603	99.7
SEL	D9	LEAR25	D	25	D6A	1498.4	93	163.1	2501.59	0.0603	99.6
SEL	D9	GASEPF	T	25	TG2	1499.3	259	73.4	96.71	27.3739	72.9
SEL	D9	GIIB	D	25	D6A	1498.2	90	159.2	10064.99	0.0280	102.6
SEL	D9	DHC6	D	25	D12	1646.4	690	89.1	99.24	1.8340	83.6
SEL	D9	BEC58P	D	25	D12	1531.7	344	115.8	102.20	1.9956	82.8
SEL	D9	GASEPV	D	25	D12	1562.7	465	90.8	102.27	2.4853	81.8
SEL	D9	DHC6	D	25	DC1	1649.4	689	89.1	99.24	1.4672	84.0

SEL	D9	GASEPV	D	25	DC1	1565.9	465	90.8	102.27	1.9883	82.4
SEL	D9	BEC58P	D	25	DC1	1534.9	344	115.8	102.20	1.5965	83.3
SEL	D9	GIIB	D	25	D6A	1498.2	90	159.2	10064.99	0.0172	102.6
SEL	D9	GIIB	D	25	D6A	1498.2	90	159.2	10064.99	0.0172	102.5
SEL	D9	DHC6	D	25	D12	1646.4	690	89.1	99.24	1.1286	83.7
SEL	D9	DHC6	D	25	D12	1646.4	690	89.1	99.24	1.1286	83.5
SEL	D9	BEC58P	D	25	D12	1531.7	344	115.8	102.20	1.2281	83.0
SEL	D9	DHC6	D	25	DSK1	1651.8	689	89.1	99.24	1.1004	83.4
SEL	D9	DHC6	D	25	DC1	1649.4	689	89.1	99.24	0.9029	84.3
SEL	D9	DHC6	D	25	DSK2	1647.9	690	89.1	99.24	1.0748	83.5
SEL	D9	GASEPV	D	25	D12	1562.7	465	90.8	102.27	1.5294	81.9
SEL	D9	GASEPV	D	25	DC1	1565.9	465	90.8	102.27	1.2235	82.9
SEL	D9	BEC58P	D	25	DC1	1534.9	344	115.8	102.20	0.9824	83.8
SEL	D9	BEC58P	D	25	D12	1531.7	344	115.8	102.20	1.2281	82.7
SEL	D9	GASEPV	D	25	D12	1562.7	465	90.8	102.27	1.5294	81.7
SEL	D9	DHC6	D	25	DC1	1649.4	689	89.1	99.24	0.9029	83.9
SEL	D9	BEC58P	D	25	DSK1	1537.6	344	115.8	102.20	1.1973	82.6
SEL	D9	GASEPV	D	25	DSK1	1568.5	465	90.8	102.27	1.4912	81.7
SEL	D9	BEC58P	D	25	DSK2	1533.3	344	115.8	102.20	1.1696	82.7
SEL	D9	GASEPV	D	25	DSK2	1564.3	465	90.8	102.27	1.4565	81.7
SEL	D9	GASEPV	D	25	DC1	1565.9	465	90.8	102.27	1.2235	82.2
SEL	D9	BEC58P	D	25	DC1	1534.9	344	115.8	102.20	0.9824	83.1
SEL	D9	GASEPV	D	07	DC2	1475.3	63	69.9	132.56	0.7080	83.9
SEL	D9	BEC58P	T	07	TG1	1479.2	30	97.9	120.05	1.3972	80.9
SEL	D9	LEAR25	D	25	D6A	1498.4	93	163.1	2501.59	0.0163	99.8
SEL	D9	DHC6	D	25	DSK1	1651.8	689	89.1	99.24	0.6772	83.4
SEL	D9	DHC6	D	25	DSK1	1651.8	689	89.1	99.24	0.6772	83.4
SEL	D9	LEAR25	D	25	D6A	1498.4	93	163.1	2501.59	0.0163	99.6
SEL	D9	LEAR25	D	07	D1A	1482.6	0	62.7	2706.18	0.0108	101.1
SEL	D9	BEC58P	D	25	DSK1	1537.6	344	115.8	102.20	0.7368	82.6
SEL	D9	GASEPV	D	25	DSK1	1568.5	465	90.8	102.27	0.9177	81.7
SEL	D9	BEC58P	D	25	DSK1	1537.6	344	115.8	102.20	0.7368	82.6
SEL	D9	GASEPV	D	25	DSK1	1568.5	465	90.8	102.27	0.9177	81.6
SEL	D9	CNA441	T	25	TG2	1536.6	422	121.0	102.07	4.4308	74.5
SEL	D9	B222	A	18H	H3	2710.6	-16	65.0	2.00	1.4898	78.9
SEL	D9	GASEPV	D	07	D1A	1483.2	62	69.8	132.78	0.3945	83.9
SEL	D9	SF340	D	25	D12	1618.1	618	118.2	110.16	0.2228	86.3
SEL	D9	DHC6	D	25	D6A	1647.4	690	89.1	99.24	0.4192	83.5
SEL	D9	GIIB	D	07	D1A	1482.6	0	60.9	10720.27	0.0031	104.7
SEL	D9	B222	D	18H	H2	2556.9	15	65.0	1.00	1.4898	77.7
SEL	D9	GIIB	D	25	D6A	1498.2	90	159.2	10064.99	0.0047	102.7
SEL	D9	LEAR25	D	07	D1A	1482.6	0	62.7	2706.18	0.0067	101.1
SEL	D9	LEAR25	D	07	D1A	1482.6	0	62.7	2706.18	0.0067	101.1
SEL	D9	BEC58P	D	25	D6A	1532.8	344	115.8	102.20	0.4561	82.7
SEL	D9	GASEPV	D	25	D6A	1563.8	465	90.8	102.27	0.5680	81.8
SEL	D9	GIIB	D	25	D6A	1498.2	90	159.2	10064.99	0.0047	102.5
SEL	D9	BEC58P	D	07	DC2	1474.6	0	77.8	122.80	0.5686	81.5
SEL	D9	SF340	D	25	DC1	1621.1	618	118.2	110.16	0.1782	86.4
SEL	D9	DHC6	D	25	D12	1646.4	690	89.1	99.24	0.3057	83.8
SEL	D9	BEC58P	D	25	DC1	1534.9	344	115.8	102.20	0.2661	84.3
SEL	D9	GASEPV	D	25	DC1	1565.9	465	90.8	102.27	0.3314	83.3
SEL	D9	DHC6	D	25	DC1	1649.4	689	89.1	99.24	0.2445	84.5
SEL	D9	BEC58P	D	25	D12	1531.7	344	115.8	102.20	0.3326	83.1
SEL	D9	FAL50	D	25	D6A	1695.9	766	160.1	2786.25	0.0350	92.9
SEL	D9	DHC6	D	25	D12	1646.4	690	89.1	99.24	0.3057	83.4
SEL	D9	GASEPV	D	25	D12	1562.7	465	90.8	102.27	0.4142	82.1
SEL	D9	LEAR35	D	25	D6A	1510.0	214	158.8	2786.91	0.0839	88.9
SEL	D9	SF340	D	25	D12	1618.1	618	118.2	110.16	0.1371	86.5
SEL	D9	BEC58P	D	25	D12	1531.7	344	115.8	102.20	0.3326	82.6
SEL	D9	GASEPV	D	25	D12	1562.7	465	90.8	102.27	0.4142	81.6
SEL	D9	GASEPV	D	07	D1A	1483.2	62	69.8	132.78	0.2428	83.9
SEL	D9	GASEPV	D	07	D1A	1483.2	62	69.8	132.78	0.2428	83.9
SEL	D9	DHC6	D	25	DC1	1649.4	689	89.1	99.24	0.2445	83.8
SEL	D9	DHC6	D	25	D6A	1647.4	690	89.1	99.24	0.2580	83.5
SEL	D9	GASEPF	D	25	D12	1525.7	318	73.5	96.83	2.6836	73.3
SEL	D9	SF340	D	25	D12	1618.1	618	118.2	110.16	0.1371	86.2
SEL	D9	DHC6	D	25	D6A	1647.4	690	89.1	99.24	0.2580	83.5
SEL	D9	SF340	D	25	DSK1	1623.6	618	118.2	110.16	0.1337	86.2
SEL	D9	GIIB	D	07	D1A	1482.6	0	60.9	10720.27	0.0019	104.7
SEL	D9	GIIB	D	07	D1A	1482.6	0	60.9	10720.27	0.0019	104.7
SEL	D9	SF340	D	25	DSK2	1620.0	618	118.2	110.16	0.1306	86.2

FINAL DRAFT – NOT APPROVED BY BOS OR FAA

SEL	D9	GASEPF	D	25	DC1	1529.0	317	73.5	96.83	2.1469	74.0
SEL	D9	BEC58P	D	25	D6A	1532.8	344	115.8	102.20	0.2807	82.8
SEL	D9	GASEPV	D	25	DC1	1565.9	465	90.8	102.27	0.3314	82.1
SEL	D9	GASEPV	D	25	D6A	1563.8	465	90.8	102.27	0.3496	81.8
SEL	D9	BEC58P	D	25	DC1	1534.9	344	115.8	102.20	0.2661	83.0
SEL	D9	BEC58P	D	25	D6A	1532.8	344	115.8	102.20	0.2807	82.7
SEL	D9	GASEPV	D	25	D6A	1563.8	465	90.8	102.27	0.3496	81.7
SEL	D9	SF340	D	25	DC1	1621.1	618	118.2	110.16	0.1097	86.5
SEL	D9	B206	D	18H	H2	2557.0	0	52.0	2.00	7.3264	68.2
SEL	D9	SF340	D	25	DC1	1621.1	618	118.2	110.16	0.1097	86.4
SEL	D9	BEC58P	D	07	D1A	1482.6	0	77.4	122.80	0.3168	81.4
SEL	D9	FAL50	D	25	D6A	1695.9	766	160.1	2786.25	0.0215	92.9
SEL	D9	FAL50	D	25	D6A	1695.9	766	160.1	2786.25	0.0215	92.8
SEL	D9	DHC6	D	25	DSK1	1651.8	689	89.1	99.24	0.1834	83.5
SEL	D9	GASEPF	D	25	DC1	1529.0	317	73.5	96.83	1.3212	74.9
SEL	D9	DHC6	D	25	DSK1	1651.8	689	89.1	99.24	0.1834	83.4
SEL	D9	LEAR35	D	25	D6A	1510.0	214	158.8	2786.91	0.0516	88.9
SEL	D9	LEAR35	D	25	D6A	1510.0	214	158.8	2786.91	0.0516	88.8
SEL	D9	DHC6	T	25	TG2	1554.1	482	88.8	98.81	0.1794	83.2
SEL	D9	BEC58P	D	25	DSK1	1537.6	344	115.8	102.20	0.1996	82.7
SEL	D9	GASEPV	D	25	DSK1	1568.5	465	90.8	102.27	0.2485	81.7
SEL	D9	GASEPF	D	25	D12	1525.7	318	73.5	96.83	1.6515	73.5
SEL	D9	GASEPV	D	25	DSK1	1568.5	465	90.8	102.27	0.2485	81.6
SEL	D9	BEC58P	D	25	DSK1	1537.6	344	115.8	102.20	0.1996	82.6
SEL	D9	GASEPF	D	25	D12	1525.7	318	73.5	96.83	1.6515	73.2
SEL	D9	SF340	D	25	DSK1	1623.6	618	118.2	110.16	0.0823	86.2
SEL	D9	SF340	D	25	DSK1	1623.6	618	118.2	110.16	0.0823	86.2
SEL	D9	GASEPF	D	25	DSK1	1531.7	317	73.5	96.83	1.6102	73.2

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TECHNICAL INFORMATION PAPER

GLOSSARY OF NOISE COMPATIBILITY TERMS

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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 - A scale which takes account of all the A-weighted sound received at a point, from all noise events causing noise levels above some prescribed value. A 4.77 decibel weighting factor is applied to noise events occurring during the evening hours (7:00 p.m. to 10:00 p.m.). A 10 decibel weighting factor is applied to noise events at night (10:00 p.m. to 7:00 a.m.). The CNEL metric is required by California state law for use in airport noise studies.

COMMUNITY NOISE EQUIVALENT LEVEL - See CNEL.

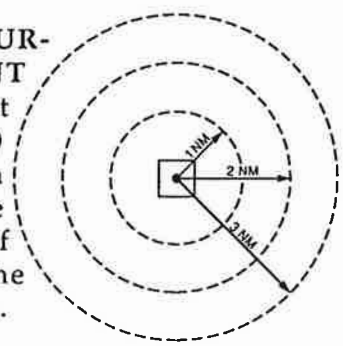
CROSSWIND LEG - A flight path at right angles to the landing runway off its upwind end. See "traffic pattern."

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 decibels, for the period from midnight to midnight, obtained after the addition of ten decibels to sound levels for the periods between midnight and 7 a.m. and between 10 p.m. and midnight, local time, as averaged

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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."

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

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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.

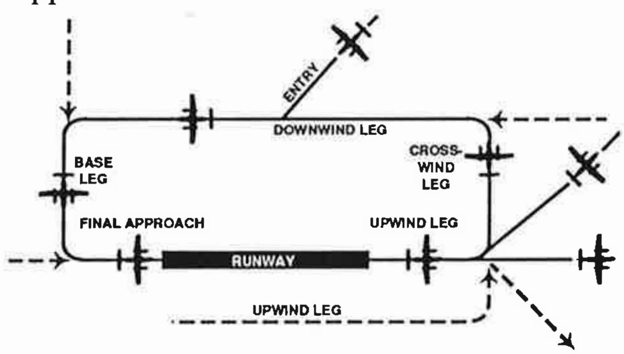
TERMINAL RADAR SERVICE AREA (TRSA) - Airspace surrounding designated airports wherein ATC provides radar vectoring, sequencing, and separation on a full-time basis for all IFR and participating VFR aircraft. Service provided in a TRSA is called Stage III Service.

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.

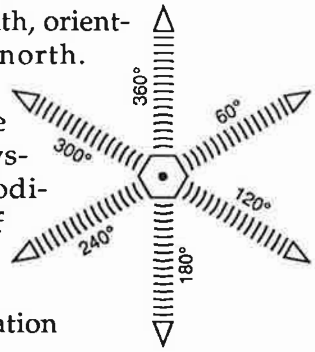


UNICOM - A nongovernment communication facility which may provide airport information at certain airports. Locations and frequencies of UNICOM's are shown on aeronautical charts and publications.

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

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TECHNICAL INFORMATION PAPER

THE MEASUREMENT AND ANALYSIS OF SOUND

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.

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

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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 100 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.

The equation below describes the mathematics of sound level summation:

$$S_t = 10 \log \sum_i 10^{S_i/10}$$

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 Levels

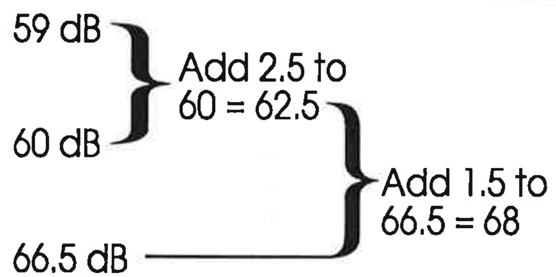
Difference in Sound Level (dB)	Add to Larger Level (dB)
0	3.0
1	2.5
2	2.1
3	1.8
4	1.5
5	1.2
6	1.0
7	0.8
8	0.6
9	0.5
10	0.4
12	0.3
14	0.2
16	0.1
Greater than 16	0

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

Sound Levels to be Added	Summation Process



59 dB + 60 dB + 66.5 dB = 68 dB

Logarithmic math also produces interesting results when averaging sound levels. As the example below 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 Averaging

Assume two sound levels of equal duration: 100 dB and 50 dB. What is the average sound level?

$$\frac{100dB + 50dB}{2} = 97dB$$

100 dB is 100,000 times more energy than 50 dB!

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. 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.

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; 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.

FINAL DRAFT – NOT APPROVED BY BOS OR FAA

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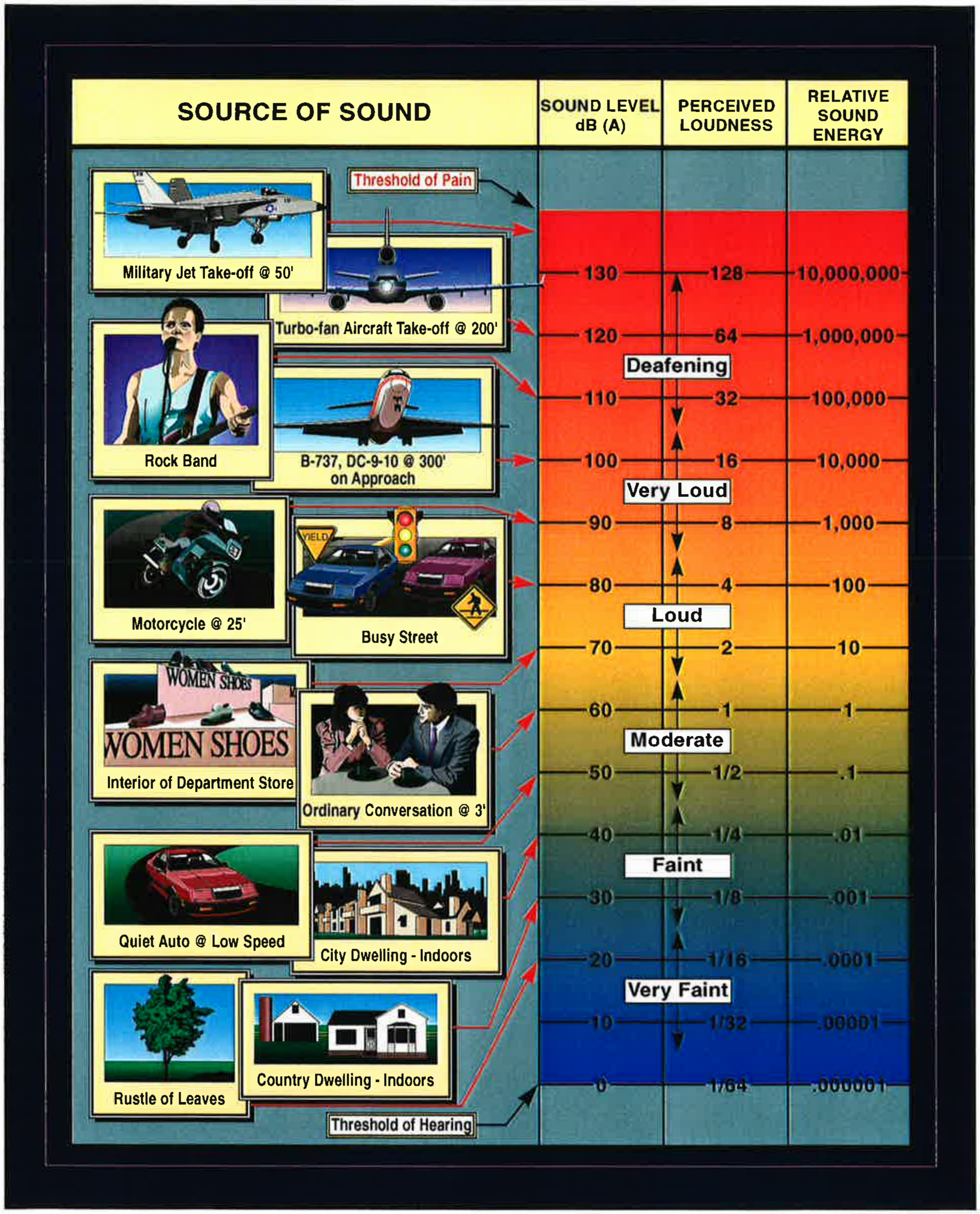

Source: Coffman Associates 1990

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CAL. Sound Exhibit A
TYPICAL SOUND LEVELS

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.

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 compress-ing the total sound energy into a one-second period. The SEL for the second event is 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.

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. DNL is preferred by all federal agencies as the appropriate single measure of cumulative sound exposure. Except in California, 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.

Community Noise Equivalent Level

In California, the Department of Transportation, Division of Aeronautics, has adopted the community noise equivalent level (CNEL) as its standard noise metric. The CNEL metric is required in all F.A.R. Part 150 studies done in California. CNEL differs from DNL only by including a 4.77 decibel weight for evening noise (7 p.m. to 10 p.m.). As a practical matter, there is little difference between DNL and CNEL. Studies reviewed by the California Department of Transportation found that calculations of CNEL and DNL from the same monitoring data generally result in less than a 0.7 decibel difference (Caltrans 1983, p. 37).

Where the basic element of sound measurement is the Leq, CNEL is calculated from the following equation:

$$CNEL = 10 Log \frac{1}{24}\left(\sum_{d=1}^{12} 10^{[Leq(d)]/10} + \sum_{e=1}^{3} 10^{[Leq(e)+4.77]/10} + \sum_{n=1}^{9} 10^{[Leq(n)+10]/10} \right)$$

where Leq(d), Leq(e), and Leq(n) are the daytime, evening, and nighttime hourly Leq values. The hourly Leq values are summed for the 12 hours from 7 a.m. to 7 p.m. and added to the sum of the three evening hours with a 4.77 decibel penalty and the nine nighttime hours with a 10 decibel penalty.

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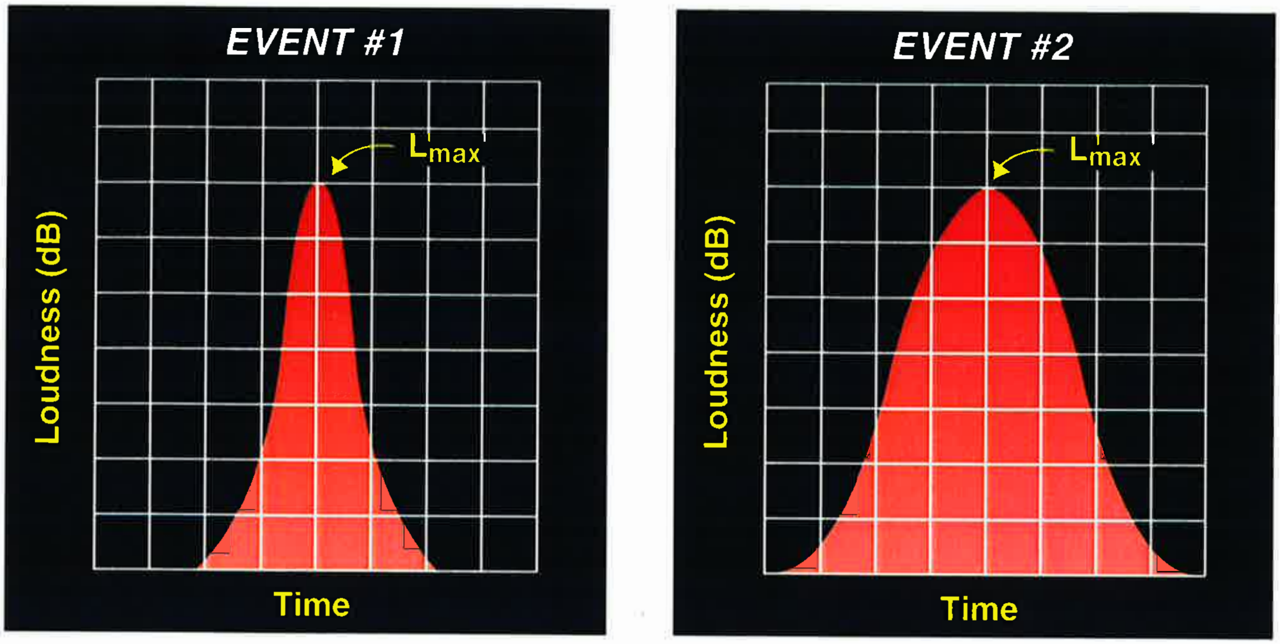
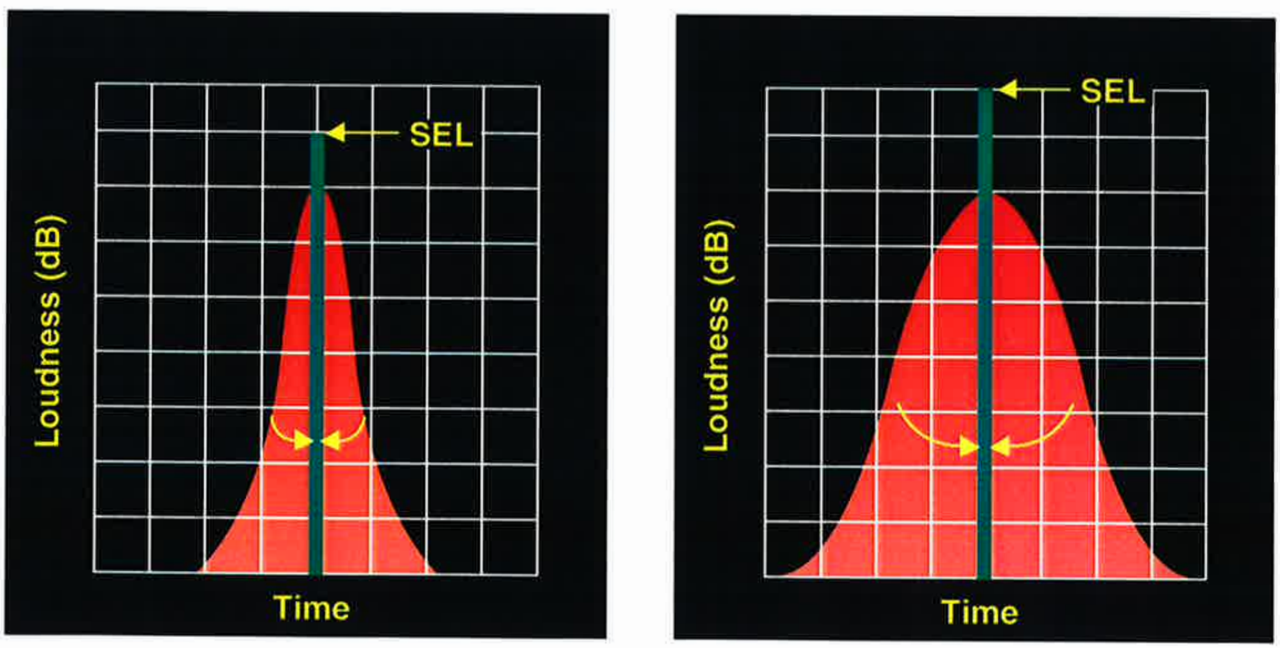


Two sound events with the same maximum sound level (L_{max}).



Different sound exposure levels (SEL) for two sound events with the same L_{max}.

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When the time-of-day weight is expressed in decibels it is called a "decibel weight". This decibel weight is added to the noise level of each noise event. Thus a decibel weight of 10 when added to a 60 decibel nighttime event gives a value of 70 decibels to the event before it is transformed and added into the noise descriptor.

The nighttime decibel weight of 10 is equivalent to a tenfold increase in nighttime sound events. The evening decibel weight of 4.77 is equivalent to a threefold increase in evening sound events. Thus, when computing CNEL, evening events can be increased by 4.77 decibels or multiplied by three. Nighttime events may be increased by 10 decibels or multiplied by 10.

CNEL may be calculated from the hourly noise levels by the following equation:

$$CNEL = 10 Log(1/24[\sum antilog(HNLd/10) + 3\sum antilog(HNLe/10) + 10\sum antilog(HNLn/10)]$$

where HNLd, HNLe, and HNLn are the hourly noise levels for the daytime, evening, and nighttime hours. The sum of the evening noise levels is multiplied by three and the sum of the nighttime noise levels is multiplied by 10.

Another way of computing CNEL is described in this equation:

$$CNEL = 10 Log \frac{1}{86400}\left(\int_{day} 10^{LA/10} dt + \int_{evening} 10^{(LA+4.77)/10} dt + \int_{night} 10^{(LA+10)/10} dt\right)$$

where LA is the A-weighted sound level, measured with equipment meeting the requirements for sound level meters (as specified in a standard such as ANSI S1.4-1971), 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, evening, and nighttime periods.

Exhibit C shows how the sound during a 24-hour period is weighted and averaged by the CNEL descriptor (or metric). In that example, the sound occurring during the period, including aircraft noise and background sound, yields a CNEL value of approximately 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 CNEL value during the period of observation.

One might think of the CNEL metric as a summary description of the "noise climate" of an area. CNEL 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. 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 may be considered similar to precipitation. The noise 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). In California, this value is called the Noise Exposure Level (NEL). Over a 24-hour period, the NELs can be summed, adding a 4.77 decibel penalty for evening events and a 10 decibel penalty for nighttime events, yielding the CNEL value. The CNEL developed over a long period of time, say a year, defines the noise environment of the area, allowing us to make predictions about the average response of people exposed to various CNEL levels.

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 CNEL metric assumes one evening operation (between 7 p.m. and 10 p.m.) is equal in impact to three daytime operations by the same aircraft. It also assumes that one nighttime operation (10 p.m. to 7 a.m.) is equal in impact to 10 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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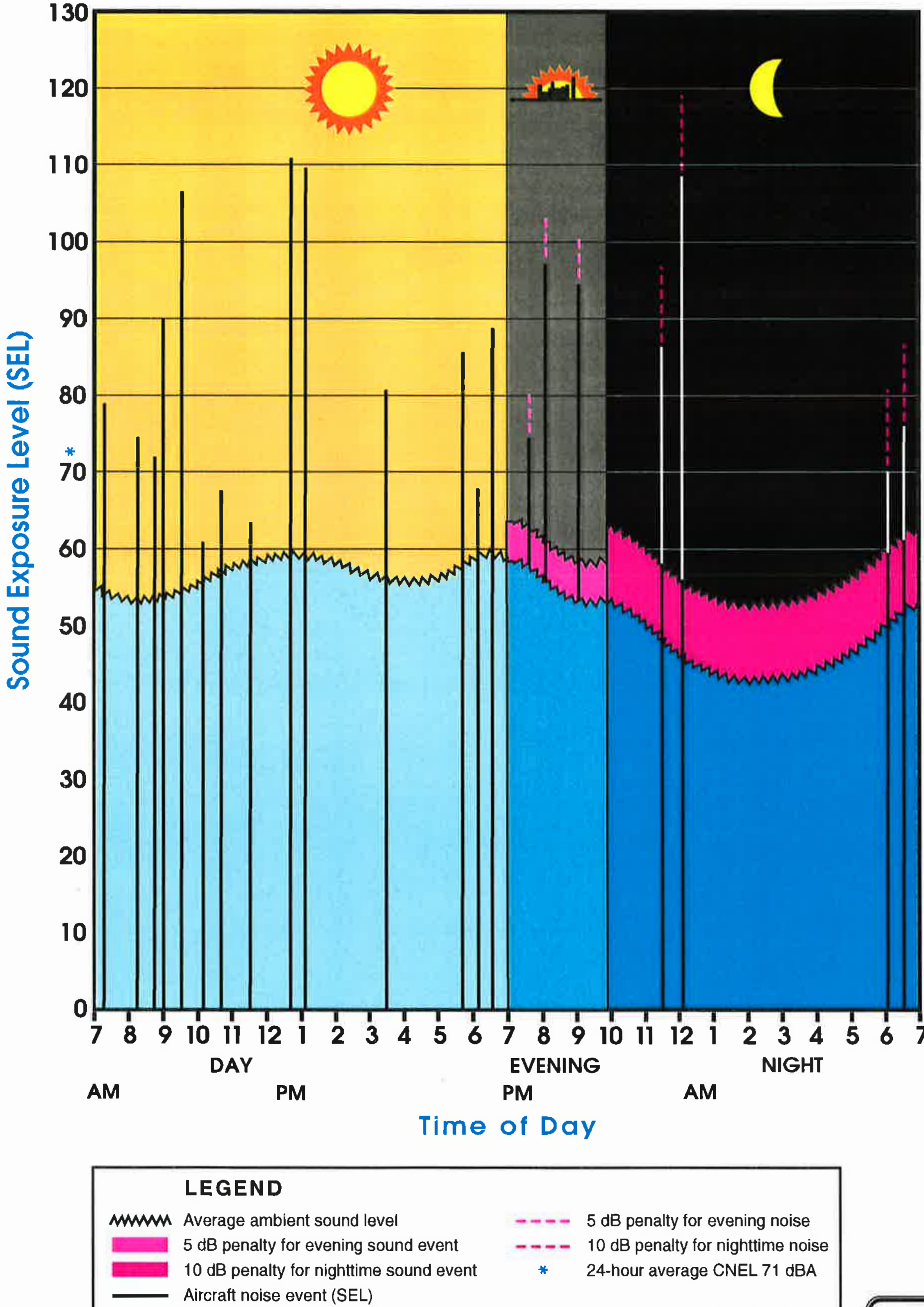
SOUND-C-3/15/94



Source: Coffman Associates 1993

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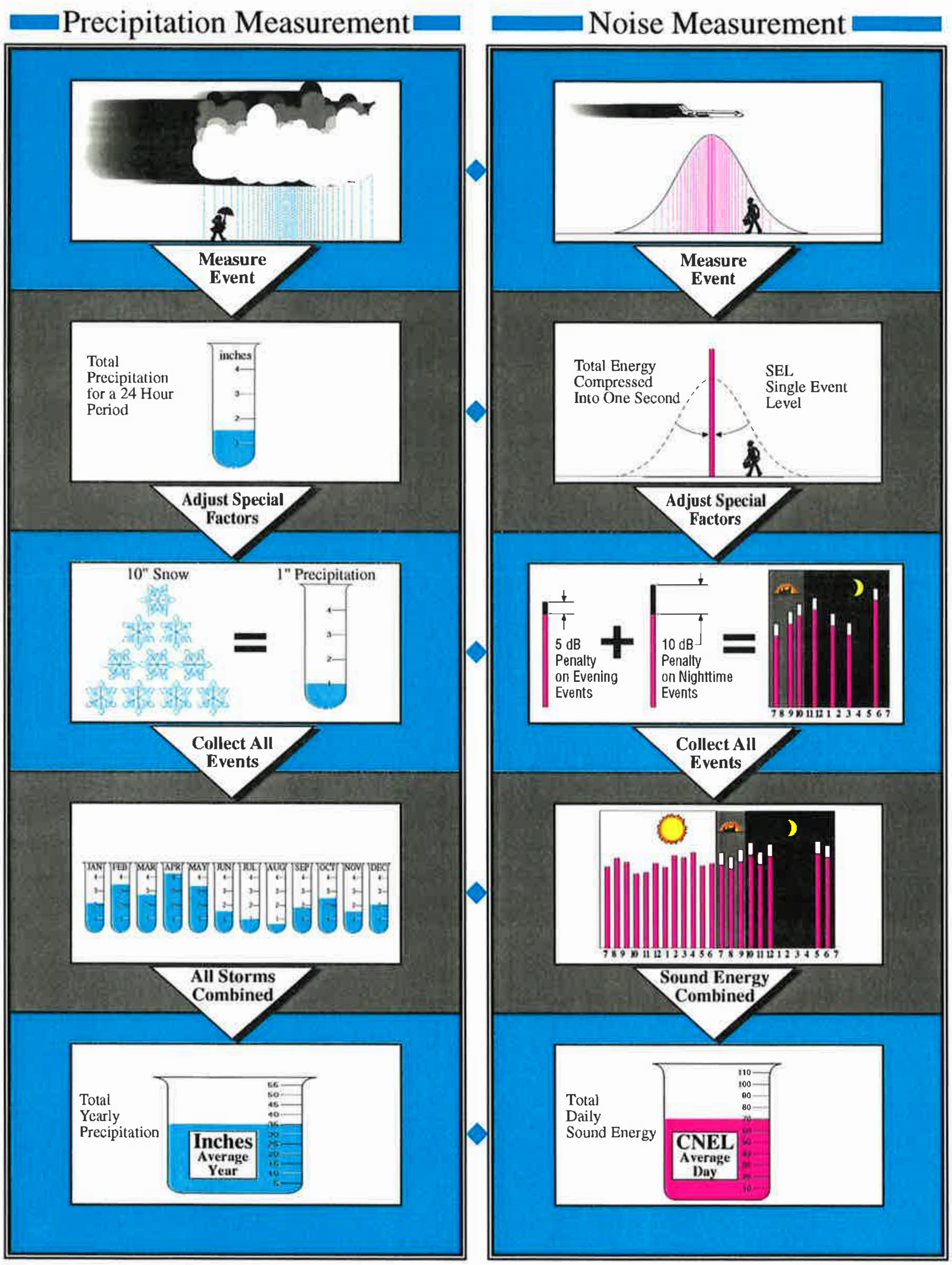
CAL.Sound Exhibit C

TYPICAL NOISE PATTERN AND CNEL SUMMATION

SOUND-D-3/15/94



Source: Coffman Associates 1990

Coffman Associates Airport Consultants

CAL.Sound Exhibit D

PRECIPITATION AND NOISE MEASUREMENT COMPARISON

References

Kryter, K.D. 1984. *Physiological, Psychological, and Social Effects of Noise*, NASA Reference Publication 1115.

Newman, Steven J. and Kristy R. Beattie, 1985. *Aviation Noise Effects*. Prepared for U.S. Department of Transportation, Federal Aviation Administration, Office of Environment and Energy, Washington, D.C., Report No. FAA-EE-85-2, March 1985.

HUD (U.S. Department of Housing and Urban Development) 1985. *The Noise Guidebook*, HUD-953-CPD Washington, D.C., Superintendent of Documents, U.S. Government Printing Office, March 1985.

Caltrans 1983. *Airport Land Use Planning Handbook: A Reference and Guide for Local Agencies*. Prepared for the California Department of Transportation, Division of Aeronautics by the Metropolitan Transportation Commission and the Association of Bay Area Governments, July 1983.

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TECHNICAL INFORMATION PAPER

EFFECTS OF NOISE EXPOSURE

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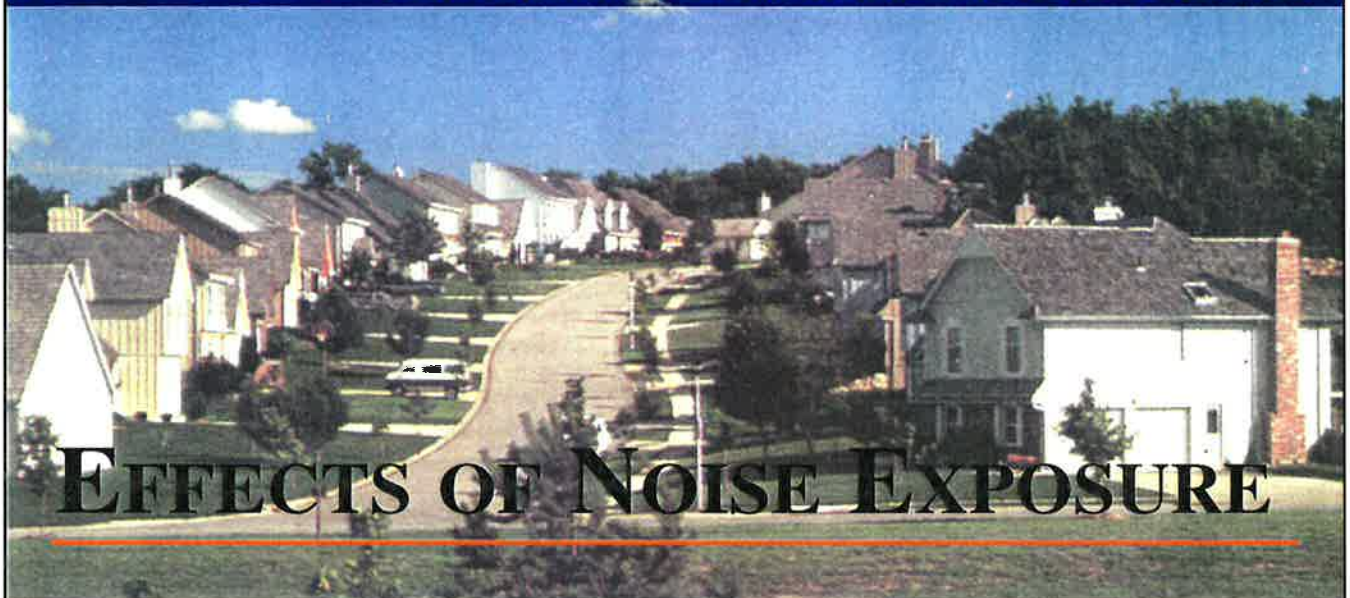
TECHNICAL INFORMATION PAPER



EFFECTS OF NOISE EXPOSURE

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 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 Exposures, OSHA Standards

Duration per day, hours	Sound Level dBA slow response
8	90
6	92
4	95
3	97
2	100
1 1/2	102
1	105
1/2	110
1/4 or less	115

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 the 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. 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.)

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

*DNL is the 24-hour day-night sound level. Seethe glossary for a definition.

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 some way 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 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 level increases. 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.

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.

Reviews of the 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."

A 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 if their homes. The reason for the large difference is apparently that people in their

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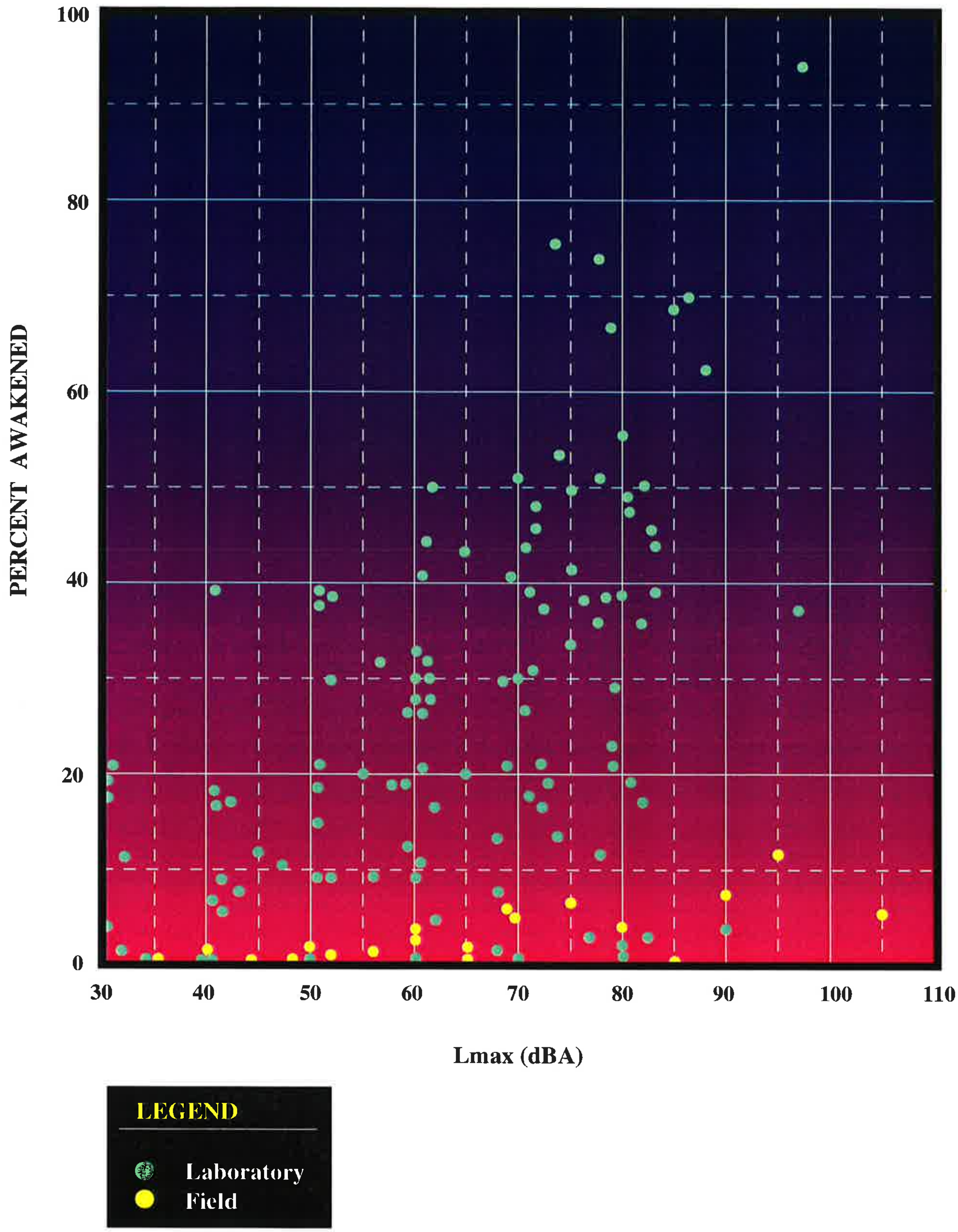

Source: Pearsons, K.S. et al. 1990.

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Effects Exhibit A
COMPARISON OF AWAKENING DUE TO NOISE
EVENTS FROM LABORATORY VERSUS FIELD STUDIES

homes are fully habituated to their environment, including the noise levels.

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.

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 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?"

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.

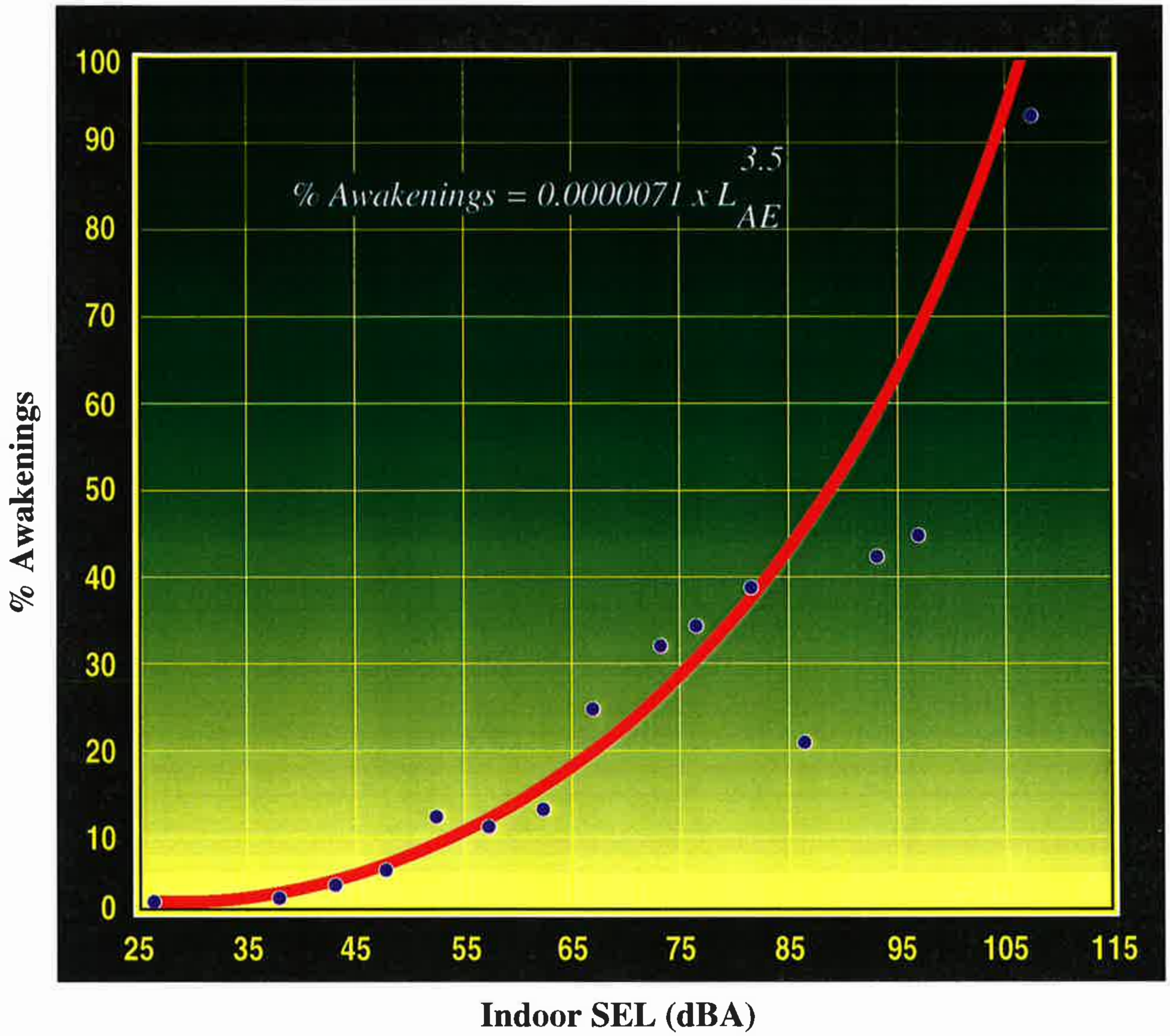
Another study was conducted by the British Civil Aviation Authority to examine the relationship of nighttime aircraft noise and sleep disturbance near four major airports -- Heathrow, Gatwick, Stansted, and Manchester (Ollerhead, et al. 1992). A total of 400 subjects were monitored for a total of 5,742 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 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

EFFECTS B-8/1/94



Note: *Based on laboratory and field data reported in Pearsons et al. 1989.*

Source: Finegold et al. 1994.

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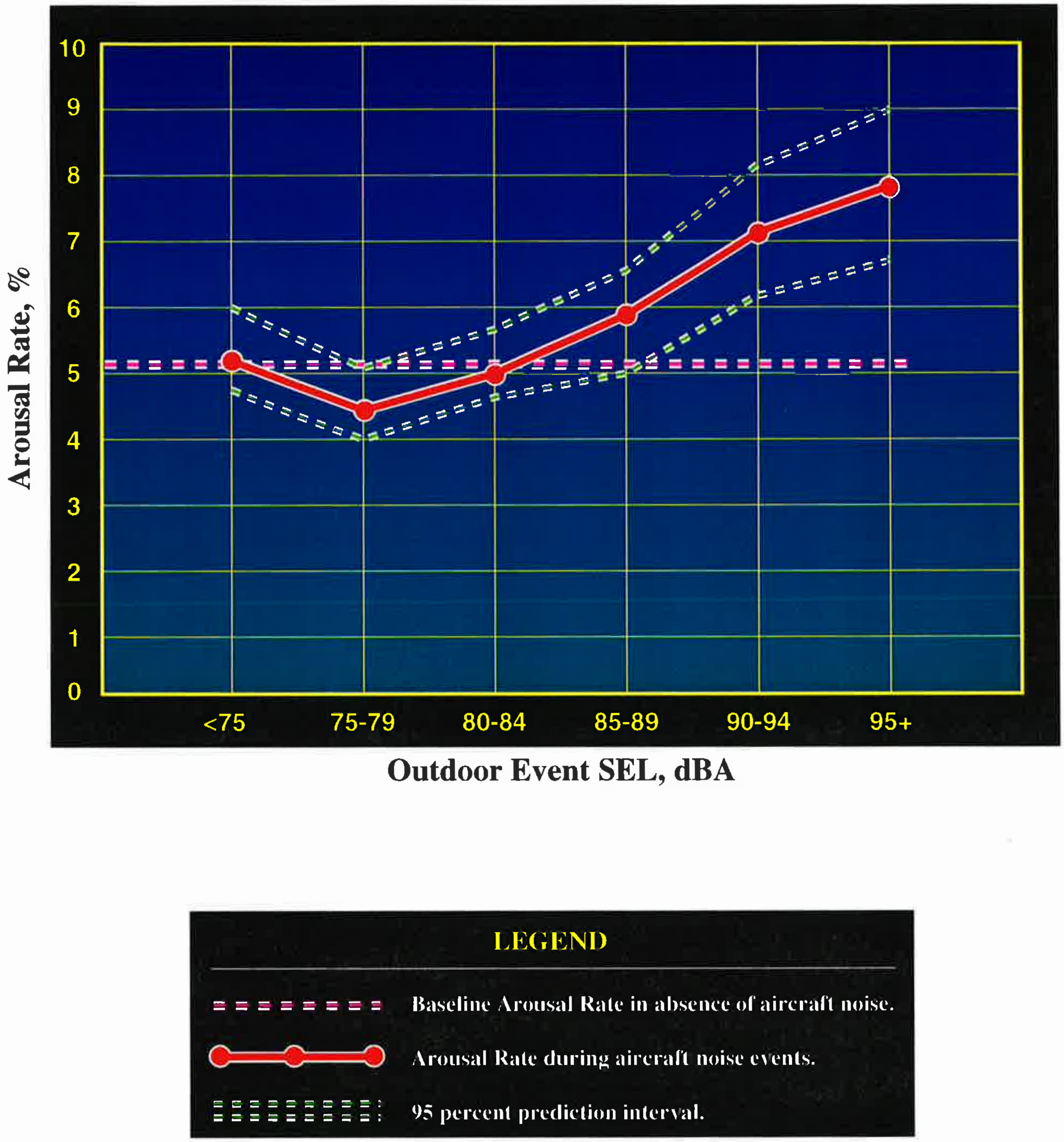
EFFECTS C-7/1/94



Note: Estimates controlled for the effects of individual arousability

Source: Ollerhead, J.B. et al. 1992, p.25.

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Effects Exhibit C
RELATIONSHIP BETWEEN AVERAGE SLEEP DISTURBANCE AND AIRCRAFT NOISE LEVEL

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).

OTHER ANNOYANCES

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 noise level above about 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 two 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.

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 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.

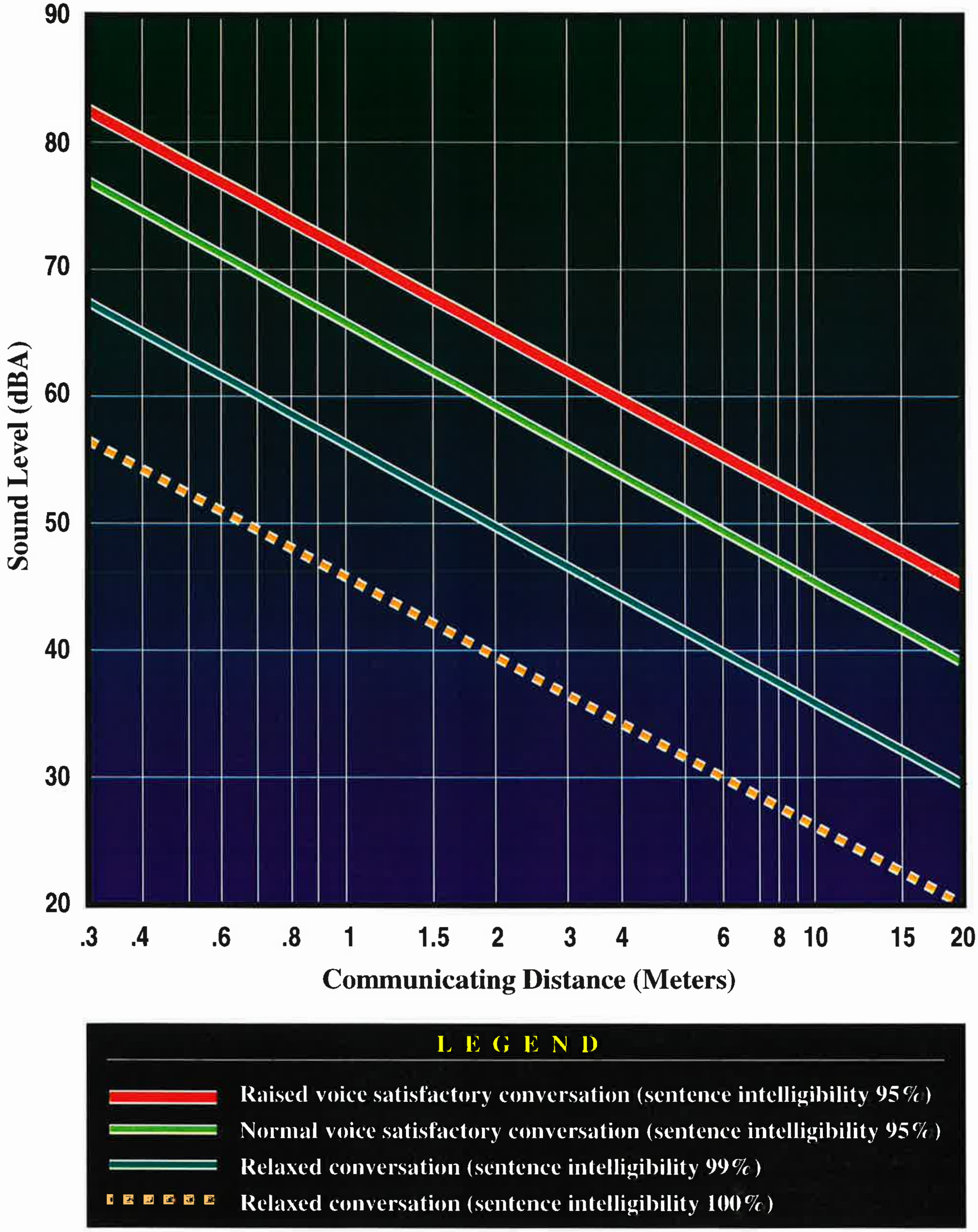
Individual human response to noise is highly variable and is influenced by many factors. These include emotional variables, feelings about the necessity or preventability of the noise, judgments about the value of the activity creating the noise, an individual's activity at the time the noise is heard, 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.

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.

EFFECTS D-8/1/94



Source: U.S. Environmental Protection Agency, 1974. Cited in Caltrans, 1993.

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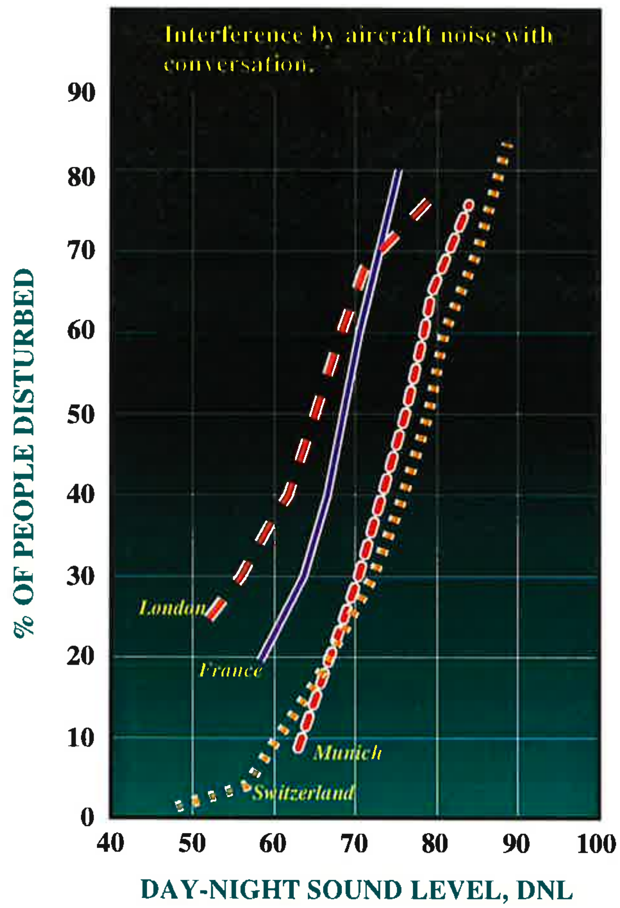
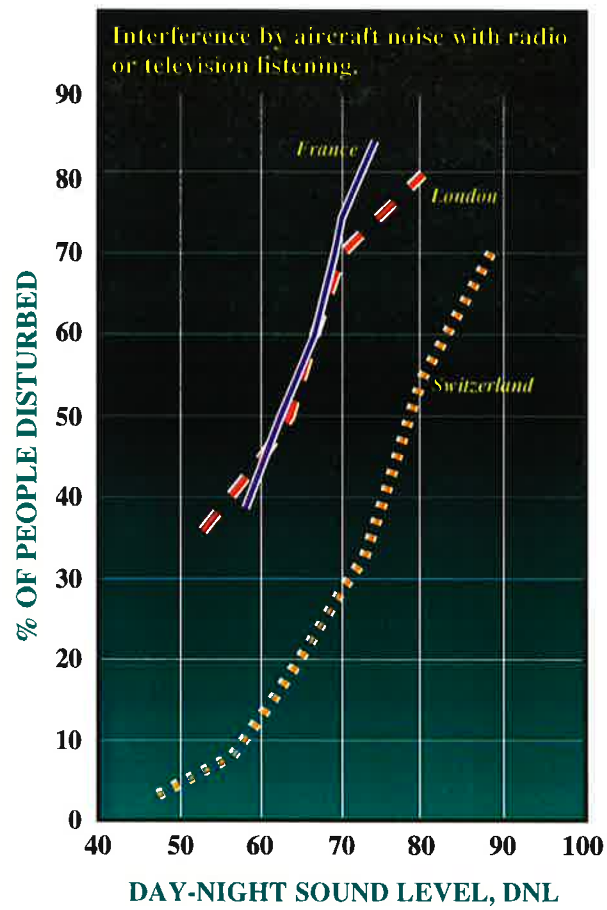
Effects Exhibit D
MAXIMUM DISTANCES OUTDOORS OVER WHICH CONVERSATION IS SATISFACTORILY INTELLIGIBLE IN STEADY NOISE





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: Schultz, T. J. 1978.

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Effects Exhibit E
INTERFERENCE BY AIRCRAFT
NOISE WITH VARIOUS ACTIVITIES

(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 F**. 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 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.

References

Caltrans 1993. *Airport Land Use Planning Handbook.* Prepared for California Department of Transportation, Division of Aeronautics by Hodges & Shutt. Sacramento: California Department of Transportation, December 1993.

CHABA 1977. *Guidelines for Preparing Environmental Impact Statements on Noise, Report of Working Group 69 on Evaluation of Environmental Impact of Noise.* Committee on Hearing, Bioacoustics, and Biomechanics, Assembly of Behavioral and Social Sciences, National Research Council, National Academy of Sciences, Washington, DC.

Coffman Associates, Inc. 1993. *General Mitchell International Airport, Milwaukee, Wisconsin, F.A.R. Part 150 Noise Compatibility Study, Noise Compatibility Program.* Coffman Associates.

Directorate of Operational Research and Analysis (DORA) 1980. *Aircraft Noise and Sleep Disturbance: Final Report.* DORA Rep. 8008, Civil Aviation Authority, London, 1980. Cited in Kryter 1984, p. 434.

Federal Aviation Administration (FAA) 1977. *Impact of Noise on People.* U.S. Department of Transportation, FAA, May 1977.

Federal Interagency Committee on Urban Noise (FICUN) 1980. *Guidelines for Considering Noise in Land Use Planning and Control.*

Federal Interagency Committee on Noise (FICON) 1992. *Federal Agency Review of Selected Airport Noise Analysis Issues.*

Fidell, S. et al. 1989. *Updating a Dosage-Effect Relationship for the Prevalence of Annoyance Due to General Transportation Noise.* HSD-TR-89-009. Wright-Patterson AFB, Ohio: U.S. Air Force, Noise and Sonic Boom Impact Technology. Cited in FICON 1992.

Fields, J.M. 1986. *Cumulative Airport Noise Exposure Metrics: An Assessment of Evidence for Time-of-Day Weightings*, Report No. DOT/FAA/EE-86/10, FAA, Washington, DC.

Finegold, L.S. et al. 1992. "Applied Acoustical Report: Criteria for Assessment of Noise Impacts on People." Submitted to *Journal of Acoustical Society of America.* June 1992. Cited in FICON 1992.

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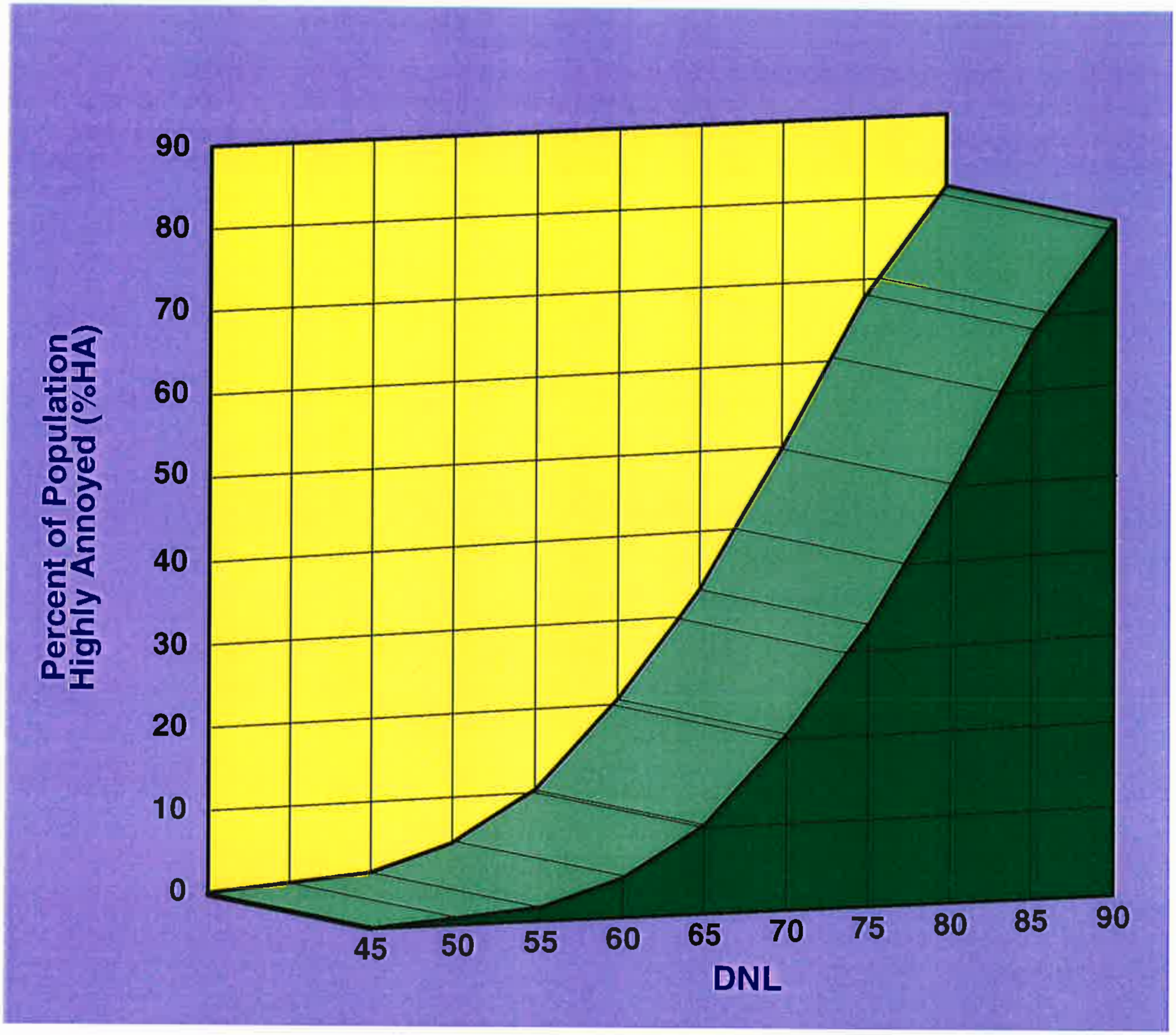

Equation for Curve: $\% HA = \frac{100}{1 + e^{(11.13 - .14 Ldn)}}$

Source: Finegold et al. 1992 and 1994.

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%

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Effects Exhibit F
PERCENTAGE OF POPULATION HIGHLY ANNOYED
BY GENERAL TRANSPORTATION NOISE

Finegold, L.S. et al. 1994. "Community Annoyance and Sleep Disturbance: Updated Criteria for Assessing the Impacts of General Transportation Noise on People." *Noise Control Engineering Journal*, Vol. 42, No. 1, Jan.-Feb. 1994.

Gjestland, T. 1989. "Aircraft Noise Annoyance." *1989 International Conference On Noise Control Engineering,* Vol 2, pp. 903-908.

Great Britain Committee on the Problem of Noise, 1963. *Noise, Final Report.* Presented to Parliament by Lord Minister for Science by Command of Her Majesty. H.M. Stationery Office, London, July 1963. Cited in Newman and Beattie 1985, p. 23.

Griefahn, B. 1989. "Critical Loads For Noise Exposure At Night." *1990 International Conference On Noise Control Engineering,* Vol 2, pp. 1163-1166.

Griefahn, B. 1992. "Hypertension -- A Particular Risk For Noise Exposure." *1992 International Conference On Noise Control Engineering,* Vol 2, pp. 1123-1126.

Hershey, R.L., et al. 1975. *Analysis of the Effect of Concorde Aircraft Noise on Historic Structures.* Report No. FAA-RD-75-118, July 1975. Cited in Newman and Beattie 1985, p. 70.

Kryter, K.D. 1970. *The Effects of Noise on Man.* Academic Press, New York. Cited in Newman and Beattie 1985, p. 22.

Kryter, K.D. 1984. *Physiological, Psychological, and Social Effects of Noise*, NASA Reference Publication 1115.

Newman, Steven J. and Kristy R. Beattie, 1985. *Aviation Noise Effects.* Prepared for U.S. Department of Transportation, Federal Aviation Administration, Office of Environmental and Energy, Washington, D.C., Report No. FAA-EE-85-2, March 1985.

Ollerhead, J.B. et al., 1992. *Report of a Field Study of Aircraft Noise and Sleep Disturbance.* A study commissioned by the Department of Transport from the Department of Safety, Environment and Engineering, Civil Aviation Authority (United Kingdom).

Pearsons, K.S. et al., 1990. *Analyses of the Predictability of Noise-induced Sleep Disturbance*, U.S. Air Force Report HSD-TR-89-029. Cited in Ollerhead, et al. 1992, p. 2.

Richards, E.J. and J.B. Ollerhead, 1973. "Noise Burden Factor -- A New Way of Rating Noise," *Sound and Vibration*, Vol. 7, No. 12, December.

Schuller W.M. and van der Ploeg F.D., 1993. "Recent Developments With Respect to Aircraft Noise And Sleep Disturbance." *1993 International Conference On Noise Control Engineering,* Vol 1, pp. 155-160.

Schultz, T.J. 1978. "Synthesis of Social Surveys on Noise Annoyance. *Journal of the Acoustical Society of America*, Vol. 64, No. 2, pp. 377-405. Cited in FICON 1992.

Taylor, S.M. and P.A. Wilkins, 1987. "Health Effects." In *Transportation Noise Reference Book*, Ed. P.M. Nelson. Butterworths.

U.S. Environmental Protection Agency (EPA), 1974. *Information on Levels of Environmental Noise Requisite to Protect Health and Welfare with an Adequate Margin of Safety*. EPA, Office of Noise Abatement and Control, Washington, DC, March 1974.

Wiggins, J.H. 1975. *The Influence of Concorde Noise on Structural Vibrations*. Report No. FAA-75-1241-1, July 1975. Cited in Newman and Beattie 1985, p. 70.

Yoshida T. and Nakamura S., 1990. "Community and Health of Inhabitants." *1990 International Conference On Noise Control Engineering,* Vol 2, pp. 1125-1128.

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TECHNICAL INFORMATION PAPER

MEASURING THE IMPACT OF NOISE ON PEOPLE

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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. 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.

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.

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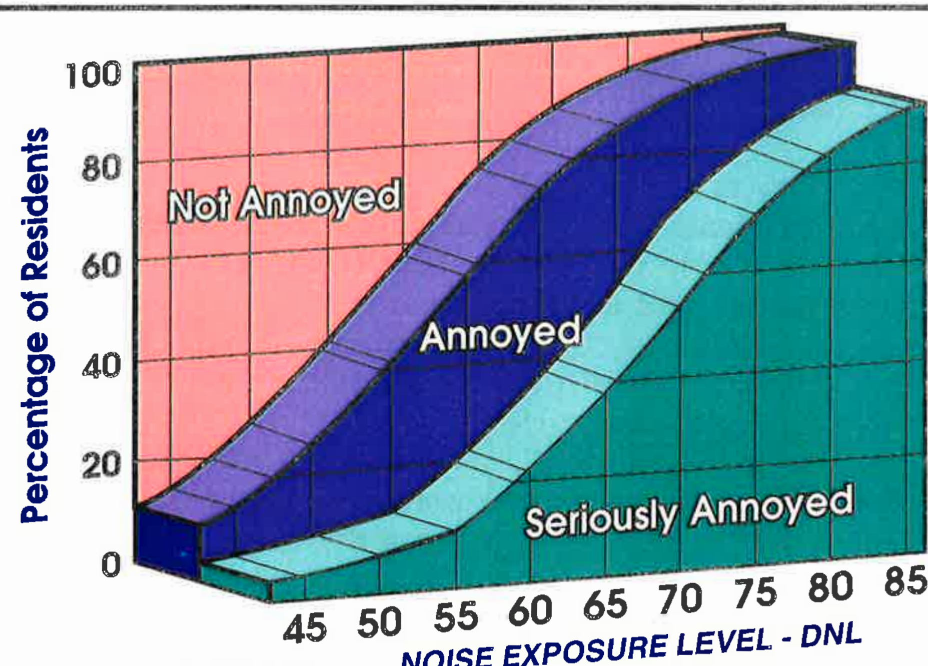
Physical factors influencing an individual's reaction to noise include the background noise in the community, the time of day, the season of the year, the predictability of the noise, and the individual's control over the noise source.

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 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.



Source: Richards and Ollerhead 1973, p.31

LWP Exhibit A
ANNOYANCE CAUSED BY AIRCRAFT NOISE IN RESIDENTIAL AREAS

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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".

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 Weighting 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.

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 with noise. This is especially useful in comparing the net impact of different noise scenarios.

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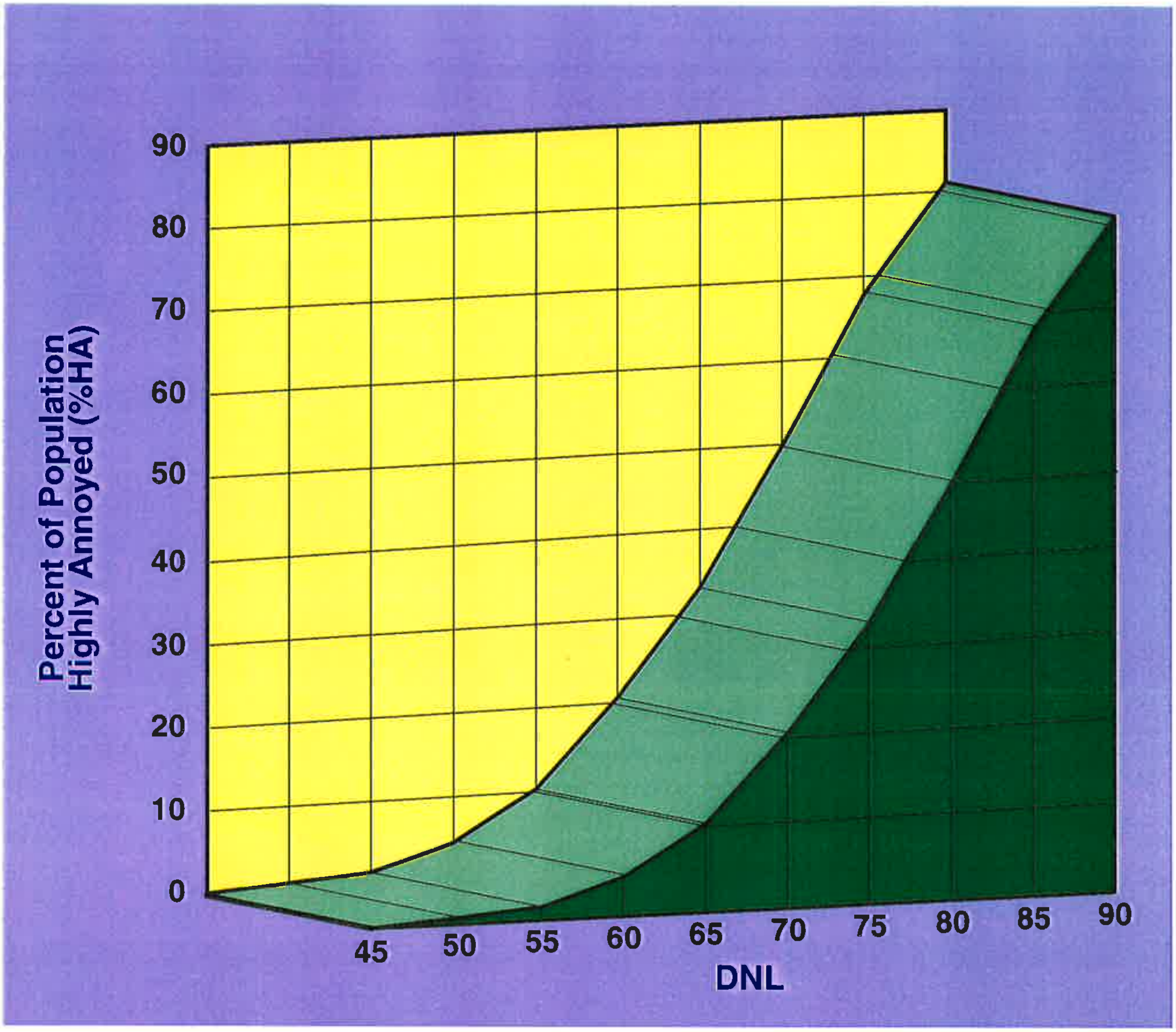

Equation for Curve: $\% HA = \frac{100}{1 + e\,(11.13 - .14\ Ldn)}$

Source: Finegold et al. 1992 and 1994.

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%

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LWP Exhibit B
PERCENTAGE OF POPULATION HIGHLY ANNOYED
BY GENERAL TRANSPORTATION NOISE

References

CHABA 1977. *Guidelines for Preparing Environmental Impact Statements on Noise, Report of Working Group 69 on Evaluation of Environmental Impact of Noise.* Committee on Hearing, Bioacoustics, and Biomechanics, Assembly of Behavioral and Social Sciences, National Research Council, National Academy of Sciences, Washington, DC.

Directorate of Operational Research and Analysis (DORA) 1980. *Aircraft Noise and Sleep Disturbance: Final Report*. DORA Rep. 8008, Civil Aviation Authority, London, 1980. Cited in Kryter 1984, p. 434.

Federal Interagency Committee on Noise (FICON) 1992. *Federal Agency Review of Selected Airport Noise Analysis Issues.*

Fidell, S. et al. 1989. *Updating a Dosage-Effect Relationship for the Prevalence of Annoyance Due to General Transportation Noise.* HSD-TR-89-009. Wright-Patterson AFB, Ohio: U.S. Air Force, Noise and Sonic Boom Impact Technology. Cited in FICON 1992.

Finegold, L.S. et al. 1992. "Applied Acoustical Report: Criteria for Assessment of Noise Impacts on People." Submitted to *Journal of Acoustical Society of America*. June 1992. Cited in FICON 1992.

Finegold, L.S. et al. 1994. "Community Annoyance and Sleep Disturbance: Updated Criteria for Assessing the Impacts of General Transportation Noise on People." *Noise Control Engineering Journal*, Vol. 42, No. 1, January - February 1994.

Great Britain Committee on the Problem of Noise, 1963. *Noise, Final Report*. Presented to Parliament by Lord Minister for Science by Command of Her Majesty. H.M. Stationery Office, London, July 1963. Cited in Newman and Beattie 1985, p. 23.

Kryter, K.D. 1970. *The Effects of Noise on Man*. Academic Press, New York. Cited in Newman and Beattie 1985, p. 22.

Kryter, K.D. 1984. *Physiological, Psychological, and Social Effects of Noise*, NASA Reference Publication 1115.

Newman, Steven J. and Kristy R. Beattie, 1985. *Aviation Noise Effects*. Prepared for U.S. Department of Transportation, Federal Aviation Administration, Office of Environmental and Energy, Washington, D.C., Report No. FAA-EE-85-2, March 1985.

Richards, E.J. and J.B. Ollerhead, 1973. "Noise Burden Factor -- A New Way of Rating Noise," *Sound and Vibration*, Vol. 7, No. 12, December.

Schultz, T.J. 1978. "Synthesis of Social Surveys on Noise Annoyance. *Journal of the Acoustical Society of America*, Vol. 64, No. 2, pp. 377-405. Cited in FICON 1992.

U.S. Environmental Protection Agency (EPA), 1974. *Information on Levels of Environmental Noise Requisite to Protect Health and Welfare with an Adequate Margin of Safety*. EPA, Office of Noise Abatement and Control, Washington, DC, March 1974.

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TECHNICAL INFORMATION PAPER

NOISE AND LAND USE COMPATIBILITY GUIDELINES

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TECHNICAL INFORMATION PAPER

NOISE AND LAND USE COMPATIBILITY GUIDELINES

Aircraft noise is often the most noticeable environmental effect an airport will produce on the surrounding community. If the sound is sufficiently loud or frequent in occurrence, it may interfere with various activities or be considered objectionable.

Individual human response to noise is highly variable and is influenced by many factors. Despite the variation among individuals, the average response among a group of people is much less variable. This enables us to make reasonable evaluations of the average impacts of aircraft noise on a community.

According to the 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 during 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 noise. (For more information on noise measurement, see the TIP entitled, "The Measurement and Analysis of Sound".)

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.

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EFFECT OF BACKGROUND NOISE ON REPORTED ANNOYANCE

Noise analysts have speculated that the overall ambient noise level in an environment determines to what degree people will be annoyed by aircraft noise of a given level. 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) reviews some of the research on this question. He notes that the effects of laboratory tests and attitude surveys on this question are somewhat inconclusive. A laboratory test he reviews 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.

The studies reviewed by Kryter were intended to see if 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.

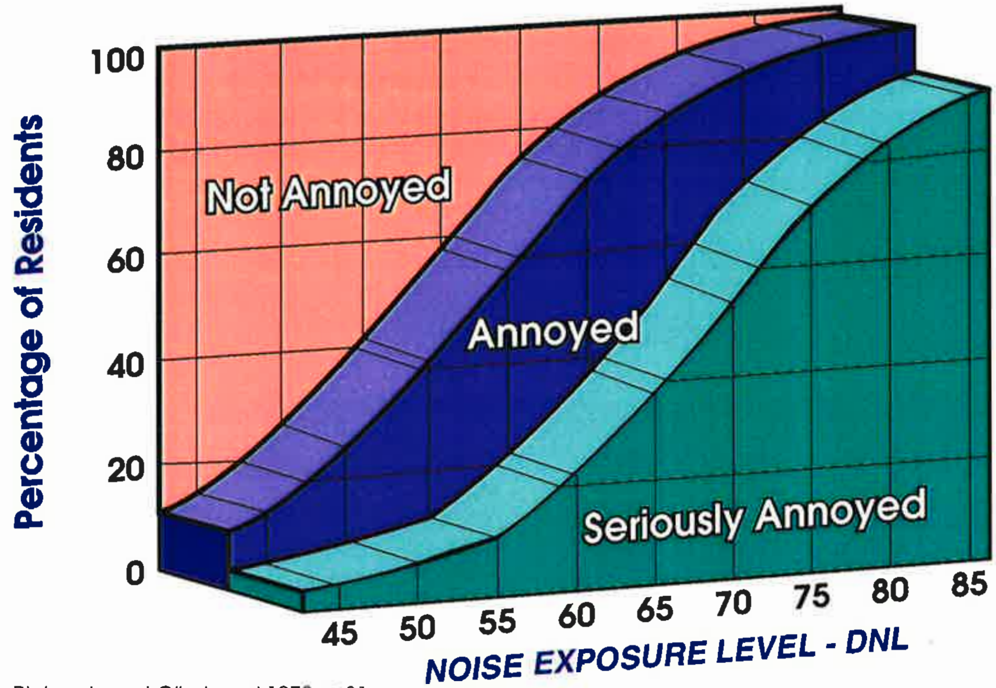
The U.S. Environmental Protection Agency has provided guidelines to address the question of background noise and its relationship to aircraft noise. EPA has determined that complaints can be expected when the intruding DNL exceeds the background DNL by more than 5 decibels (U.S. EPA 1974). The California Department of Transportation (Caltrans 1983, p. 52) notes that some Airport Land Use Commissions in California consider the effects of background noise in determining the 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 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. It advocated further research in this area.

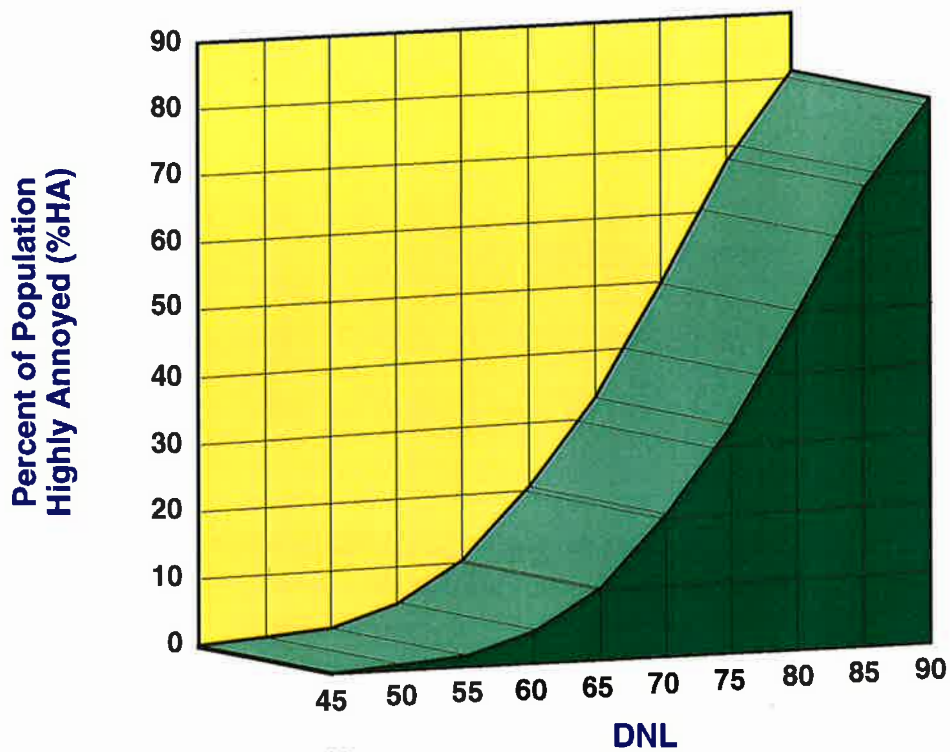
LAND USE COMPATIBILITY GUIDELINES

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.

LAND USE A-7/22/94



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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Land Use Exhibit A
ANNOYANCE CAUSED BY AIRCRAFT NOISE IN RESIDENTIAL AREAS

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.

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 planning in areas subjected to aircraft noise from nearby airports. These are presented in **Table 1**. The guidelines establish three zones, describing the expected responses to aircraft noise from residents of each zone. In Zone 1, corresponding to areas exposed to noise below 65 DNL, essentially no complaints would be expected, although noise could be an occasional nuisance. In Zone 2, corresponding to 65 to 80 DNL, individuals may complain, perhaps vigorously. In Zone 3, corresponding to 80 DNL and above, 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 Rating	Zone	Description of Expected Response
Less than 65 Ldn 100 CNR	1	Essentially no complaints would be expected. The noise may, however, interfere occasionally with certain activities of the residents.
65 to 80 Ldn 100 to 115 CNR	2	Individuals may complain, perhaps vigorously. Concerted group action is possible.
Greater than 80 Ldn 115 CNR	3	Individual reactions would likely include repeated, vigorous complaints. Concerted group action might be expected.

Note: CNR stands for "community noise rating", a cumulative noise descriptor similar to Ldn which is no longer in general use.

Source: U.S. DOD 1964. Cited in Kryter 1984, p. 616.

HUD Guidelines

In 1971, the U.S. Department of Housing and Urban Development published noise assessment guidelines for evaluating the acceptability of sites for housing assistance. The guidelines, shown in **Table 2**, establish four classes of noise impact. The first two categories refer to areas outside the 65 DNL contour, the first at a distance exceeding the distance between the 65 and 75 DNL contours, the second at a lesser distance. Housing is considered clearly acceptable in the first category and "normally acceptable" in the second. Housing is considered "normally unacceptable" in the 65 to 75 DNL range and clearly unacceptable inside the 75 DNL contour.

TABLE 2
Site Exposure to Aircraft Noise
1971 HUD Guidelines

Distance from site to the center of the area covered by the principal runways	Acceptability category
Outside the Ldn = 65 (NEF = 30, CNR = 100) contour at a distance greater than or equal to the distance between the contours Ldn = 65 and Ldn = 75	Clearly acceptable
Outside the Ldn = 65 contour, at a distance less than the distance between the Ldn = 65 and Ldn = 75	Normally acceptable
Between the Ldn = 65 and Ldn = 75 contours	Normally unacceptable
Within the Ldn = 75 contour	Clearly unacceptable

Note: CNR and NEF stand for "community noise rating", and "noise exposure forecast", cumulative noise descriptors which are no longer in general use.

Source: Schultz and McMahon 1971. Cited in Kryter 1984, p. 617.

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 3**. They note that the risk of hearing loss may become a concern with exposure 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, a standard estimate, 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 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.

TABLE 3
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	74 Ldn +	All areas
Outdoor activity interference and annoyance	55 Ldn +	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 for use.
	59 Ldn +	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, etc.
Indoor activity interference and annoyance	45 Ldn +	Indoor residential areas
	49 Ldn +	Other indoor areas with human activities such as schools, etc.

Note: All Leq values from EPA document converted by FAA to Ldn for ease of comparison (Ldn = Leq (24) + 4 dB).

Source: U.S. EPA 1974. Cited in FAA 1977a, p. 26.

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.

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94SP02-LU B-3/15/94

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.

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Land Use Exhibit B
LAND USE GUIDANCE CHART I:
AIRPORT NOISE INTERPOLATION

94SP02-LU C-3/15/94

LAND USE		LUG ZONE[1]	
SLUCM NO.	NAME	SUGGESTED	STUDY
10	Residential.	A-B	
11	Household units.		
11,11	Single units--detached.	A	
11,12	Single units--semiattached.	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 (Continued).[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, communication, 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 communication and utilities.	A-D	
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--apparel and accessories.	C	
57	Retail trade--furniture, home furnishings, and equipment.	C	
59	Retail trade--eating and drinking. Other retail trade.	C-D	
60	Services.[4]		
61	Finance, 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.

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Land Use Exhibit C
LAND USE GUIDANCE CHART II:
LAND USE NOISE SENSITIVITY INTERPOLATION

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). These are presented in **Table 4**. 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 feasibility factors were considered in defining residential development and several of the institutions as compatible. In other words, the guidelines are based not solely on the effects of noise. They also consider the cost and feasibility of noise control.

TABLE 4
Suggested Land Use Compatibility Guidelines
1980 Federal Interagency Committee on Urban Noise

SLUCM No.	Land Use Name	Noise Zones/DNL Levels in Ldn						
		A 0-55	B 55-65	C-1 65-70	C-2 70-75	D-1 75-80	D-2 80-85	D-3 85+
10	**Residential**							
11	Household Units							
11.11	Single Units - detached	Y	Y*	25[1]	30[1]	N	N	N
11.12	Single Units - semi-detached	Y	Y*	25[1]	30[1]	N	N	N
11.13	Single Units - attached row	Y	Y*	25[1]	30[1]	N	N	N
11.21	Two Units - side by side	Y	Y*	25[1]	30[1]	N	N	N
11.22	Two Units - one above the other	Y	Y*	25[1]	30[1]	N	N	N
11.31	Apartments - walk up	Y	Y*	25[1]	30[1]	N	N	N
11.32	Apartments - elevator	Y	Y*	25[1]	30[1]	N	N	N
12	Group Quarters	Y	Y*	25[1]	30[1]	N	N	N
13	Residential Hotels	Y	Y*	25[1]	30[1]	N	N	N
14	Mobile Home Park or Courts	Y	Y*	N	N	N	N	N
15	Transient Lodgings	Y	Y*	25[1]	30[1]	35[1]	N	N
16	Other Residential	Y	Y*	25[1]	30[1]	N	N	N
20	**Manufacturing**	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
21	Food and kindred products - manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
22	Textile mill products - manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
23	Apparel and other finished products made from fabrics, leather, and similar materials - manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
24	Lumber and wood products (except furniture) - manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
25	Furniture and fixtures - manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
26	Paper and allied products - manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
27	Printing, publishing, and allied industries	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
28	Chemicals and allied products manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
29	Petroleum refining and related industries	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
30	**Manufacturing (Continued)**							
31	Rubber and misc. plastic products - manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
32	Stone, clay, and glass products - manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
33	Primary metal industries	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
34	Fabricated metal products - manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
35	Professional, scientific, and controlling instruments; photographic and optical goods; watches and clocks - manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
39	Miscellaneous manufacturing	Y	Y	Y	25	30	N	N
40	**Transportation, communication, and utilities**							
41	Railroad, rapid rail transit, transit and street railway transportation	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
42	Motor vehicle transportation	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
43	Aircraft transportation	Y	Y	Y	Y[2]	Y[3]	Y[4]	N

TABLE 4 (Continued)
Suggested Land Use Compatibility Guidelines
1980 Federal Interagency Committee on Urban Noise

SLUCM No.	Land Use Name	Noise Zones/DNL Levels in Ldn						
		A 0-55	B 55-65	C-1 65-70	C-2 70-75	D-1 75-80	D-2 80-85	D-3 85+
44	Marine craft transportation	Y	Y	Y	Y[2]	Y[3]	Y[4]	Y
45	Highway and street right-of-way	Y	Y	Y	Y[2]	Y[3]	Y[4]	Y
46	Automobile parking	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
47	Communication	Y	Y	Y	25[5]	30[5]	N	N
48	Utilities	Y	Y	Y	Y[2]	Y[3]	Y[4]	Y
49	Other transportation, communication, and utilities	Y	Y	Y	25[5]	30[5]	N	N
50	Trade							
51	Wholesale trade	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
52	Retail trade - building materials, hardware and farm equipment	Y	Y	Y	Y[2]	Y[3]	N	N
53	Retail trade - general merchandise	Y	Y	Y	25	30	N	N
54	Retail trade - food	Y	Y	Y	25	30	N	N
55	Retail trade - automotive, marine craft, aircraft and accessories	Y	Y	Y	25	30	N	N
56	Retail trade - apparel and accessories	Y	Y	Y	25	30	N	N
57	Retail trade - furniture, home furnishings, and equipment	Y	Y	Y	25	30	N	N
58	Retail trade - eating and drinking establishments	Y	Y	Y	25	30	N	N
59	Other retail trade	Y	Y	Y	25	30	N	N
60	Services							
61	Finance, insurance, and real estate services	Y	Y	Y	25	30	N	N
62	Personal services	Y	Y	Y	25	30	N	N
62.4	Cemeteries	Y	Y	Y	Y[2]	Y[3]	Y[4,11]	Y[4,11]
63	Business services	Y	Y	Y	25	30	N	N
64	Repair services	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
65	Professional services	Y	Y	Y	25	30	N	N
65.1	Hospitals, nursing homes	Y	Y*	25*	30*	N	N	N
65.2	Other medical facilities	Y	Y	Y	25	30	N	N
66	Contract construction services	Y	Y	Y	25	30	N	N
67	Governmental services	Y	Y*	Y*	25*	30*	N	N
68	Educational services	Y	Y*	25*	30*	N	N	N
69	Miscellaneous	Y	Y	Y	25	30	N	N
70	Cultural, entertainment, and recreational							
71	Cultural activities (including churches)	Y	Y*	25*	30*	N	N	N
71.2	Nature exhibits	Y	Y*	Y*	N	N	N	N
72	Public assembly	Y	Y	Y	N	N	N	N
72.1	Auditoriums, concert halls	Y	Y	25	30	N	N	N
72.11	Outdoor music shells, amphitheaters	Y	Y*	N	N	N	N	N
72.2	Outdoor sports arenas, spectator sports	Y	Y	Y[7]	Y[7]	N	N	N
73	Amusements	Y	Y	Y	N	N	N	N
74	Recreational activities (including golf courses, riding stables, water recreation)	Y	Y*	Y*	25*	30*	N	N
75	Resorts and group camps	Y	Y*	Y*	Y*	N	N	N
76	Parks	Y	Y*	Y*	Y*	N	N	N
79	Other cultural, entertainment	Y	Y*	Y*	Y*	N	N	N

TABLE 4 (Continued)
Suggested Land Use Compatibility Guidelines
1980 Federal Interagency Committee on Urban Noise

SLUCM No.	Land Use Name	Noise Zones/DNL Levels in Ldn						
		A 0-55	B 55-65	C-1 65-70	C-2 70-75	D-1 75-80	D-2 80-85	D-3 85+
80	**Resource Production and extraction**							
81	Agriculture (except livestock)	Y	Y	Y[8]	Y[9]	Y[10]	Y[10,11]	Y[10,11]
81.5 to 81.7	Livestock farming and animal breeding	Y	Y	Y[8]	Y[9]	N	N	N
82	Agricultural-related activities	Y	Y	Y[8]	Y[9]	Y[10]	Y[10,11]	Y[10,11]
83	Forestry activities and related services	Y	Y	Y[8]	Y[9]	Y[10]	Y[10,11]	Y[10,11]
84	Fishing activities and related services	Y	Y	Y	Y	Y	Y	Y
85	Mining activities and related services	Y	Y	Y	Y	Y	Y	Y
89	Other source production and extraction	Y	Y	Y	Y	Y	Y	Y

NOTES

[1]a) Although local conditions may require residential use, it is discouraged in C-1 and strongly discouraged in C-2. 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 zones should be conducted prior to approvals.

b) Where the community determines that residential uses must be allowed measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB (Zone C-1) and 30 dB (Zone C-2) should be incorporated into building codes and be considered in individual approvals. Normal construction can be expected to provide a NLR of 20 dB, thus the reduction requirements are often stated as 5, 10, 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. Additional consideration should be given to modifying NLR levels based on peak noise levels.

c) NLR 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 practical in preference to measures which only protect interior spaces.*

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

[5] If noise sensitive use indicated NLR; if not use is compatible.

[6] No buildings.

[7] Land use compatible provided special sound reinforcement systems are installed.

[8] Residential buildings require a NLR of 25.

[9] Residential buildings require a NLR of 30.

[10] Residential buildings not permitted.

[11] Land use not recommended, but if community decides use is necessary, hearing protection devices should be worn by personnel.

TABLE 4 (Continued)
Suggested Land Use Compatibility Guidelines
1980 Federal Interagency Committee on Urban Noise

KEY	
SLUCM	**Standard Land Use Coding Manual**, (U.S. Urban Renewal Administration and Bureau of Public Roads, 1965).
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)	Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
Y*(Yes with restrictions)	Land Use and related structures generally compatible; see notes 2 through 4.
25, 30, or 35	Land Use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 must be incorporated into design and construction of structure.
25*, 30*, or 35*	Land Use generally compatible with NLR; however, measures to achieve an overall noise reduction do not necessarily solve noise difficulties and additional evaluation is warranted.
Y*	The designation of these uses as "compatible" in this zone reflects individual Federal agencies' consideration of general cost and feasibility factors as well as past community experiences and program objectives. Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider....

Source: *Guidelines For Considering Noise In Land Use Planning and Control*, Federal Interagency Committee on Urban Noise, June 1980, p.6.

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 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.

F.A.R. Part 150 Guidelines

The FAA adopted a revised and simplified version of the Federal Interagency guidelines when it promulgated F.A.R. Part 150 in the early

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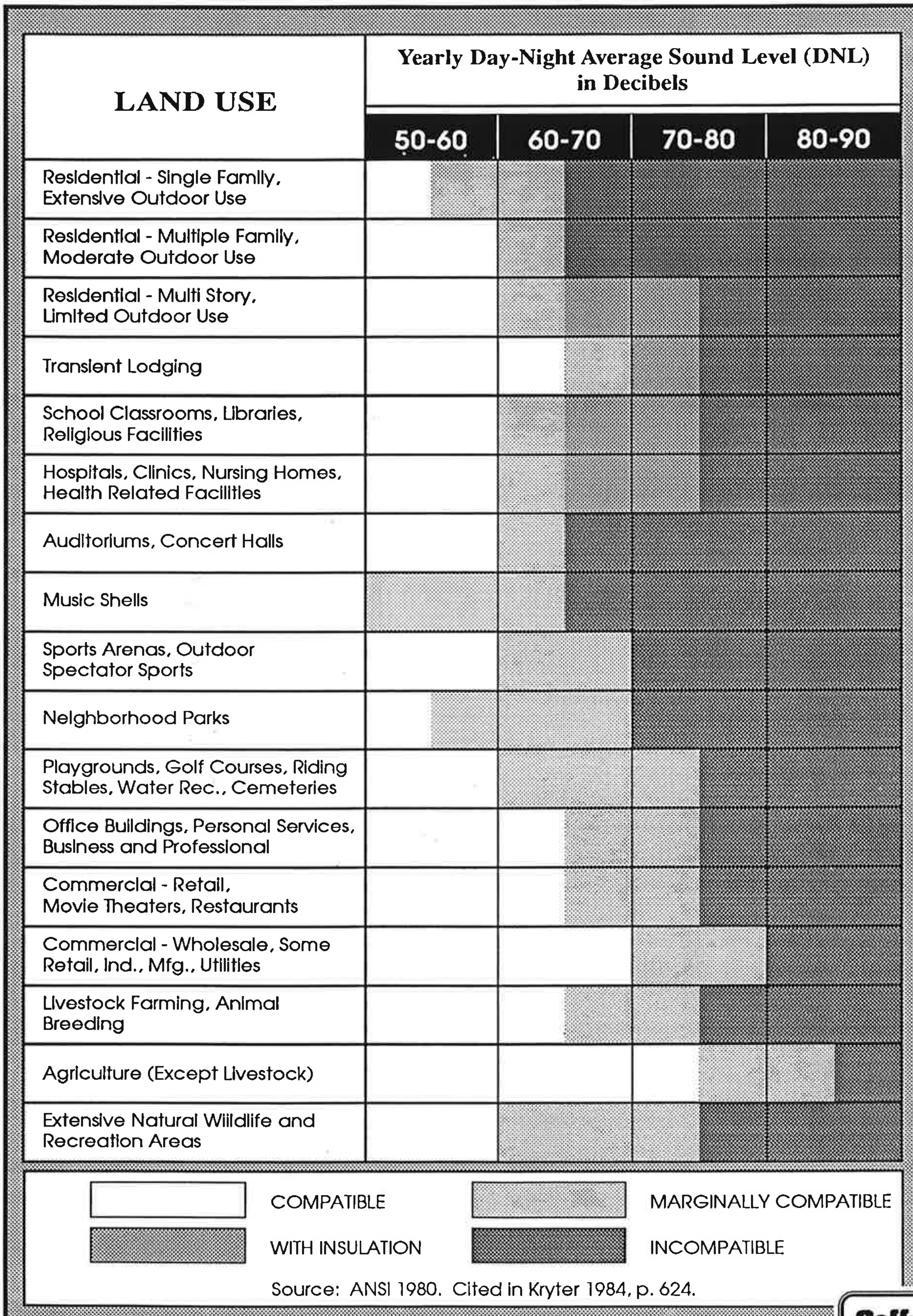
FINAL DRAFT – NOT APPROVED BY BOS OR FAA

94SP02-LU D-3/15/94



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Land Use Exhibit D

LAND USE COMPATIBILITY WITH YEARLY DAY-NIGHT AVERAGE SOUND LEVEL AT A SITE FOR BUILDINGS AS COMMONLY CONSTRUCTED

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.

Exhibit E lists the F.A.R. Part 150 land use compatibility guidelines. These are only guidelines. Part 150 explicitly states that determinations of noise compatibility and regulation of land use are purely local responsibilities. Lacking any specific guidance provided by State law or regulation, local airport sponsors around the country typically use the Part 150 land use guidelines as is when developing noise compatibility studies under F.A.R. Part 150.

SELECTED STATE LAND USE COMPATIBILITY GUIDELINES

Oregon Land Use Compatibility Guidelines

In 1981, the Oregon Department of Transportation published Volume VI of the State Aviation System Plan, *Airport Compatibility Guidelines*. It includes noise and land use compatibility guidelines. It defines three areas of impact and proposes general land use guidelines in each. The "severe noise impact zone" corresponds with the 70 DNL contour. The "substantial noise impact zone" corresponds with the area between 65 and 70 DNL. The "moderate noise impact zone" corresponds with the 55 to 65 DNL range. **Table 5** lists these guidelines.

The Oregon guidelines 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). 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 use may be permitted within the 55 DNL contour.

Within the 65 DNL contour, purchase assurance, voluntary relocation, soundproofing, and purchase of land is permitted.

LAND USE E-9/13/94

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 responsbility 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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Land Use Exhibit E

F.A.R. PART 150 LAND USE COMPATIBILITY GUIDELINES

LAND USE E-9/13/94

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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Land Use Exhibit E (Continued)
F.A.R. PART 150 LAND USE
COMPATIBILITY GUIDELINES

TABLE 5
Oregon Land Use Compatibility Guidelines

DNL Range	Impact Zone	Land Use Guidelines
55-65	Moderate Noise Impact	In urban areas, noise-sensitive uses may be marginally compatible. Sound insulation may be required. Outdoor activities more severely impacted. In rural areas, noise-sensitive uses may be incompatible.
65-70	Substantial Noise Impact	Uses which should be excluded are: residences, schools, churches, hospitals, residences. If these uses exist or are permitted, sound insulation and noise easements should be required.
70 +	Severe Noise Impact	Property should be acquired by airport.

Note: Noise-sensitive property includes: property used for sleeping, schools, churches, hospitals, and public libraries.

Source: ODOT 1981, pp. 77-78, 163.

California Guidelines

In California, the CNEL (community noise equivalent level) metric is used instead of the DNL metric. They are actually 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 decibels difference (Caltrans 1983, p. 37).

California law sets the standard for the acceptable level of aircraft noise for persons residing near airports as 65 CNEL (California Code of Regulations, Title 21, Chapter 2.5, Subchapter 6, Sections 5000 et seq.). Four types of land uses are defined as incompatible with noise above 65 CNEL: residences, schools, hospitals and convalescent 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 require 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 *Airport Land Use Planning Handbook* (Caltrans 1993, p. 3-3) land use compatibility guidelines are suggested for use in the preparation of comprehensive airport land use plans. The guidelines suggest that no 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 an earlier edition of the *Airport Land Use Planning Handbook* (Caltrans 1983, p. 50). The older guidelines had a more detailed list of land use compatibility criteria, although the recommended lowest thresholds for residential land use compatibility were essentially the same.

EMERGING 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, No. 12, p. 91; V. 5, No. 3, p. 21; V. 5, No. 11, p. 82).

In 1992 there were several significant events which, taken together, indicate a distinct movement toward the consideration of airport noise impacts below the 65 DNL level.

IN CONGRESS

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, No. 11, p. 83). While the bill was not passed, it indicates that these concerns are coalescing into specific proposals to recognize noise impacts below 65 DNL.

RALEIGH-DURHAM ARBITRATION

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.

FICON REPORT

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. 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).

> 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.

DEVELOPMENTS IN 1994

Early in 1994, the FAA explicitly endorsed a proposal by Fairfax County, Virginia to prohibit housing within the 60 DNL contour around Dulles International Airport. The County proposal also called for ensuring that new homes outside, but within one-half mile, of the 60 DNL be designed to ensure maximum interior sound levels of 45 decibels or less.

In 1993, the FAA established a study group to look at the issue of airport land use compatibility. The study group has not yet completed its work, but it has held a number of meetings and is considering some concrete proposals. Among the ideas actively being considered in early 1994 was the establishment of two DNL land use compatibility thresholds. One would be set at 60 DNL and would be the threshold at which new housing would not be compatible. The second threshold would remain at 65 DNL for existing residential development. It is not certain that this will be a final recommendation. Among the ideas actively being considered is to simply recommend further study of the desirability of a land use compatibility threshold lower than 65 DNL. (See *ANR*, V. 6, N. 5, p. 33 and *ANR*, V. 6, N. 12, p.93.)

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 acknow-ledgement of these concerns. Indeed, in Oregon and California, airport noise analysis and compatibility planning below the 65 DNL level is strongly advised or required.

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.

REFERENCES

ANR (Airport Noise Report), selected issues, Ashburn, VA.

ANSI 1980. *Sound Level Descriptors for Determination of Compatible Land Use.* American National Standards Institute, ANSI S3.23 - 1980 (ASA 22-1980).

Caltrans 1983. *Airport Land Use Planning Handbook - A Reference and Guide for Local Agencies.* Prepared for California Department of Transportation, Division of Aeronautics by the Metropolitan Transportation Commission and the Association of Bay Area Governments, July 1983.

Caltrans 1993. *Airport Land Use Planning Handbook.* Prepared for California Department of Transportation, Division of Aeronautics by Hodges & Shutt, Santa Rosa, California, in association with Flight Safety Institute; Chris Hunter & Associates; and University of California, Berkeley, Institute of Transportation Studies, December 1993.

FAA 1977a. *Impact of Noise on People.* U.S. Department of Transportation, Federal Aviation Administration, May 1977.

FAA 1977b. *Airport Land Use Compatibility Planning*, AC 150/5050-6. U.S. Department of Transportation, Federal Aviation Administration, Washington, DC.

FICON 1992. *Federal Agency Review of Selected Airport Noise Analysis Issues.* Federal Interagency Committee on Noise, Washington, DC.

FICUN 1980. *Guidelines for Considering Noise in Land Use Planning and Control.* Federal Interagency Committee on Urban Noise, Washington, DC.

Finegold, L.S. et al. 1992. "Applied Acoustical Report: Criteria for Assessment of Noise Impacts on People." Submitted to *Journal of Acoustical Society of America.* June 1992. Cited in FICON 1992.

Kryter, K.D. 1984. *Physiological, Psychological, and Social Effects of Noise*, NASA Reference Publication 1115.

ODOT 1981. *Airport Compatibility Guidelines, Oregon Aviation System Plan, Volume VI,* Oregon Department of Transportation, Aeronautics Division, Salem.

Richards, E.J. and J.B. Ollerhead, 1973. "Noise Burden Factor -- A New Way of Rating Noise," *Sound and Vibration*, Vol. 7, No. 12, December.

Schultz, T.J. and McMahon, N.M. 1971. *HUD Noise Assessment Guidelines.* Report No. HUD TE/NA 171, August 1971. (Available from NTIS as PB 210 590.)

U.S. DOD 1964. *Land Use Planning with Respect to Aircraft Noise*. AFM 86-5, TM 5-365, NAVDOCKS P-98, U.S. Department of Defense, October 1, 1964. (Available from DTIC as AD 615 015.)

U.S. EPA 1974. *Information on Levels of Environmental Noise Requisite to Protect Health and Welfare with an Adequate Margin of Safety*. U.S. Environmental Protection Agency, Office of Noise Abatement and Control, Washington, D.C., March 1974.

U.S. EPA 1991. *A Review of Recent Public Comments on the Application of Aircraft Noise Descriptors*. U.S. Environmental Protection Agency, Office of Noise Abatement and Control, Washington, DC. Cited in FICON 1992.

Coffman Associates Airport Consultants