AURORA STATE AIRPORT

Airport Master Plan Update

December 2012

Prepared for
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Acknowledgements

The following organizations and individuals contributed to this Master Plan Update. The study was funded by the Oregon Department of Aviation, along with a grant from the Federal Aviation Administration.

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EXECUTIVE SUMMARY

Airport Master Plan Update

Aurora State Airport

The Aurora State Airport Master Plan Update was undertaken to assess the Airport's role, evaluate the Airport's capabilities, forecast future aeronautical activity for the next 20 years, and plan for the timely development of any new or expanded Airport facilities needed to accommodate future aviation activity.

The owner and operator of the Airport, the Oregon Department of Aviation (ODA), obtained and matched a grant from the Federal Aviation Administration (FAA) to fund this study. ODA organized a Planning Advisory Committee (PAC), representing Airport users and neighbors, to participate in the planning process. In addition to six PAC meetings, public involvement in the master plan update included a website to disseminate information and gather comments and questions, and five open houses for the general public.

GOALS & ISSUES IDENTIFIED FOR THE PLAN - CHAPTER 1

Goals and issues for the master plan update were a subject of the first PAC meeting held on July 22, 2010. The common themes of PAC members' goal statements were divided between two categories – goals for the planning process and goals for the Master Plan itself. Issues identified by the PAC, ODA and airport users (via survey) are also included below.

Planning Process Goals

The goals for the planning process guided the conduct of ODA, ODA's consultants, and the PAC throughout the development of the master plan update. Planning process goals were:

- Be open-minded and proceed in good faith.
- Keep the focus more on the long-term future than the short-term future.
- Don't mix unrelated issues and don't be sidetracked by issues that don't relate to the master plan.
- Obtain high quality information for analysis and cite sources.
- Seek consensus for solutions that are acceptable, helpful, and clear.
- By the end of the planning process, establish a clear vision statement that defines what the Airport will be like in the foreseeable future (30 to 50 years) and that is overwhelmingly embraced by all stakeholders. The vision statement should encompass safety, noise, and development scale and flavor.

Master Plan Goals

The Master Plan goals guided the future development of the Airport. When it became time to evaluate alternative layouts for airport development, the goals were used as the evaluation criteria.

- Goal 1: Enhance safety
- Goal 2: Meet the current and projected needs of airport users, as feasible
- Goal 3: Consider all the off-airport impacts of Airport development; minimize negative impacts and maximize positive impacts

Issues

- Runway Extension
- Air Traffic Control Tower
- Impact of Airport Expansion on Surrounding Areas
- Calm Wind Runway Change
- Precision Instrument Approach
- Helicopter Operations (location on public property)

These goals and issues were used throughout the planning process to ensure the Master Plan acknowledged and incorporated concerns from the PAC and general public.

Airport Role Analysis

Aurora State Airport fits well within the OAP 2007 description of an Urban General Aviation Airport, which supports all general aviation aircraft and accommodate corporate aviation activity, including business jets, helicopters, and other general aviation activity. It is one of five GA airports in the region with facilities and services appropriate for business jets. The five airports are Aurora State, Hillsboro, McMinnville, McNary Field in Salem, and Troutdale. These airports are appropriately spaced to provide good accessibility to the population and businesses in the region without substantial service area overlap that might undermine the long-term viability of any of the airports.

The Airport has grown at a faster rate than past planning efforts expected. It has become popular for both personal and business GA use. The growth in business use is likely due to the Airport's location with access to Interstate 5, along with private development adjacent to the state-owned airport property. Considering prior investment in the Airport, its large and growing number of based aircraft, its eligibility for FAA funding, and its proven record for attracting private funding for landside facilities, it appears likely that Aurora State will remain a viable GA airport long into the future.

> Business aviation is anticipated to grow more than personal and recreational aviation, but the Airport's role in the future should not change from its current role—a busy airport handling a full range of GA, including helicopters and business jets.

The Master Plan recommends that Aurora State Airport continue to fulfill its role as an Urban General Aviation Airport.

AIRPORT INVENTORY - CHAPTER 2

An initial step in the planning effort was to collect data pertaining to the Airport and the area it serves. An inventory of the Airport was accomplished through physical observation of existing facilities, interviews with Airport users and business owners, ODA staff, and a review of previous Airport studies and records. Highlights of the information gathered included the information presented in **Table ES-1**.

Table ES-1. Aurora State Airport Inventory

Description	Existing
County	Marion
Ownership	Public (Oregon Department of Aviation)
Acreage	144
Airport Reference Code (ARC)	B-II
Runway Orientation	17/35
Runway Length x Width	5,004’ x 100’
Runway Pavement Strength	30,000 lbs (single wheel gear), 45,000 lbs (dual wheel gear)
Taxiway	Parallel
Approach Capabilities	Nonprecision (not lower than 1 statute mile)
Weather Reporting	ASOS (Automated Surface Observing System)
Based Aircraft (2010 data)	354
Annual Operations (2009 data)	89,495

The information gathered as part of this initial step was the foundation for various analyses completed in subsequent chapters of the Plan. An accurate inventory helped to produce an aviation demand forecast that was reasonable and aided in identifying future facility development needs.

AERONAUTICAL ACTIVITY FORECAST - CHAPTER 3

The aeronautical activity forecasts projected were unconstrained and assume ODA or others will be able to develop the various facilities necessary to accommodate based aircraft and future aircraft operations.

ODA has chosen not to constrain the forecasts because undeveloped land to accommodate growth is available.

The primary objective of forecasting was to define the magnitude of change that can be expected over time. Because of the cyclical nature of the economy, it is impossible to predict with certainty year-to-year fluctuations in activity when looking 20 years into the future. However, a trend can be established that characterizes long-term potential. Forecasts serve only as guidelines, and planning must remain flexible to respond to unforeseen changes in aviation activity and resultant facility needs.

Table ES-2. Summary of Forecasts

		2010	2015	2020	2030
Based Aircraft	Jet	23	27	33	47
	Turboprop (Multi-Engine)	16	19	20	26
	Multi-engine Piston	24	24	25	27
	Single Engine	261	276	288	316
	Helicopter	25	28	34	43
	Other	5	5	5	5
	Total	**354**	**379**	**405**	**464**
Aircraft Operations	*Itinerant Operations*				
	Air Taxi	10,000	10,815	11,697	13,682
	GA	48,395	52,354	56,635	66,272
	Military	250	250	250	250
	Subtotal	*58,645*	*63,419*	*68,582*	*80,205*
	Local Operations				
	GA	32,264	34,902	37,756	44,181
	Total	**90,909**	**98,321**	**106,338**	**124,386**
Operations Fleet Mix	Jet	12%	13%	15%	18%
	Turboprop	10%	11%	11%	12%
	Piston	48%	44%	42%	37%
	Helicopter	30%	32%	32%	33%
Peak Operations	Peak Month	10,000	10,815	11,697	13,682
	Design Day	328	355	384	449
	Design Hour	36	39	42	49

Source: WHPacific, Inc.

FACILITY REQUIREMENTS - CHAPTER 4

The following section summarizes the development recommendations given in Chapter 4, *Facility Requirements*, needed to accommodate forecasted aeronautical activity.

Airfield Requirements

- The runway length justification process analysis followed guidance provided in FAA Advisory Circular 150/5300-13, *Airport Design*, and demonstrated it is prudent to plan[1] for a runway extension now. The runway length justification process – approved by ODA, the Oregon Aviation Board, and the FAA – was founded on actual data of aircraft currently operating with constraints, such as reduced payload or shortened stage lengths, and aircraft forecasted to operate at and/or relocate to the Airport within the next five years and exceed 500 annual constrained operations. As a result of the analysis, an extension of at least 1,000 feet was recommended and subsequently approved by the FAA on October 19, 2012 and shown on the approved Airport Layout Plan. The runway length justification process is detailed in Chapter 4[2].

- The current runway strength of 45,000 pounds (dual-wheel gear) is adequate for the existing runway length, as several of the heavier aircraft operating at the Airport are constrained (*i.e.*, reduced fuel load or payload). However, with a runway extension it was recommended the pavement strength be increased to 60,000 pounds (dual-wheel gear), which is the same pavement strength as the parallel taxiway.

- It was recommended the approach lighting system be upgraded to a precision approach path indicator (PAPI).

- ODA should continue to emphasize departure procedures for Runway 17/35, to avoid flight over noise-sensitive areas, and change the altitude limit on left turns when departing Runway 35. (Note: ODA worked with the FAA to create these procedures, which were published in the fall of 2011.)

- A run-up area should be constructed near the northern end of the parallel taxiway to enhance the traffic flow.

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[1] *Planning for a runway extension does not give justification for federal funding. Based on the number of aircraft operations constrained by runway length projected into the future, justification for funding should occur within the 20-year planning period, although not within the next five years.*

[2] *Pages 4-10 through 4-13.*

Landside Requirements

- To meet 2030 hangar demand, approximately 23.0 acres will be needed.
- 25 aircraft parking positions, or approximately 6.5 acres, will be needed for aprons and aircraft parking by 2030. This includes fixed wing and helicopter parking.
- A cargo apron was recommended, per the Oregon Aviation Plan, which requires approximately one acre of land.
- Expansion of a current fixed base operator (FBO) or establishment of a new FBO will likely be needed to accommodate growing activity.
- Fuel tanks owned by Aurora Aviation should be relocated once they have exceeded their useful life, as the current location could better be used for aircraft-related uses. Off-airport operators may want to consider impacts of current fuel tank location and their impacts from future demand
- Approximately 2 acres of land should be reserved for the air traffic control tower (ATCT), parking and security requirements.
- A suitable location for the facility the Aurora Rural Fire Protection District wants to locate at the airport should be identified.
- ODA should work with and support Marion County and the City of Aurora as improvements to Airport Road are considered. The question of funding these improvements should be part of the discussions.

AIRPORT DEVELOPMENT ALTERNATIVES - CHAPTER 5

Four alternatives for the long-term future of the Airport were presented. Generally speaking, the alternatives can be described as such:

- **The No Build Alternative** assumed maintenance of existing facilities and no expansion of airfield or landside facilities on State-owned property. The Airport would remain designed to ARC B-II standards (approach minima to remain at visual and not lower than 1 sm). Adjacent, through-the-fence operators would still have the option to develop their property as the market demands.
- **Build Alternative 1** included a 600-foot extension to the north end of the runway and an instrument approach with visibility not lower than 1 sm. The ARC would remain B-II in this alternative.

- Build Alternative 2 incorporated a 1,000-foot extension to the south end of the runway and improved instrument approach capability (visibility greater than ¾ sm). This alternative reflected improvements to meet the design standards for ARC C-II.

- Build Alternative 3 depicted ARC C-II and instrument approaches with visibility minima lower than ¾ sm (precision approaches). No runway extension was shown on this alternative. However, in order to meet ARC C-II standards, with the lower instrument approach, the parallel taxiway would be relocated 100 feet to the east and multiple buildings would need to be removed or altered.

PREFERRED ALTERNATIVE

On March 10, 2011, the above alternatives were presented to the PAC and public. The purpose of the meeting was to gather input towards developing a preferred alternative. In addition to discussion during the meeting, comment forms were available at the meeting and on the project website, and comments were gathered for two weeks after the meeting. Comments varied greatly, from supporting the No Build Alternative to Airport expansion.

Since no consensus for a Preferred Alternative was reached at the PAC meeting, ODA considered PAC and public comments (gathered through March 24), and then presented a recommended Preferred Alternative for the Oregon Aviation Board's consideration. The Preferred Alternative **Exhibit ES-1** and presented in Chapter 5 as Exhibit 5J was the basis for revising the Airport Layout Plan, which established FAA grant funding eligibility for airport improvements and was approved by the FAA. Implementing the airfield improvements in the Preferred Alternative depends on FAA and ODA funding availability and the results of environmental analyses for individual projects. The private development of landside facilities will depend on the actual growth of aviation demand, market and financing conditions, and local laws and regulations.

AIRPORT LAYOUT PLAN DRAWING SET - CHAPTER 6

The Airport Layout Plan (ALP) drawings are a pictorial culmination of the master planning process. A major purpose of the ALP drawing set is to establish funding eligibility for the FAA's Airport Improvement Program (AIP), as capital projects must appear on an FAA-approved ALP to receive AIP grant funding.

The following sheets are included within the ALP drawing set.

- Cover Sheet. The cover sheet is an index to the airport layout plan drawing set.
- Airport Layout Plan. The ALP depicts the current airport layout and proposed improvements to the Airport for the 20-year planning period. The ALP is a development guide; the timing of development depends upon when it is needed and can be funded.
- Airport Airspace. This drawing shows the Airport Imaginary Surfaces for the future layout of the Airport with a USGS topographic map as the background.

Nov 8, 2012

SCALE
400 0 200 400
(FEET)
1 INCH = 400 FT.

Legend

- Property Line
- Future Property Line
- BRL — 35' Building Restriction Line
- RSA — Runway Safety Area
- ROFA — Runway Object Free Area
- TOFA — Taxiway Object Free Area
- Future Service Road
- Existing Buildings
- Future Buildings
- Future Pavement
- Air Traffic Control Tower (ATCT)
- Aurora Rural Fire Protection District
- Future Apron Area
- Cargo Apron
- Vehicular Parking
- Hangar Development
- Fuel Station
- Helicopter Parking
- Precision Approach Path Indicator (PAPI)
- Existing Building Removal
- Future Property Aquisition
- Future Avigation Easement

General Notes

Airport Reference Code (ARC) - C-II
Runway strengthened to 60,000 lbs dual wheel gear

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Aurora State Airport
Aurora, OR

Exhibit ES-1
Preferred Alternative
Revised 11/08/12

ACAD-034317-AIRP-EXES-1_MC_2004.DWG

- **Airport Approach Surfaces.** This drawing presents a larger scale plan and profile view of the approach surfaces shown in the Airport Airspace Drawing.
- **Inner Portion of the Runway 17/35 Approach Surfaces.** This drawing provides plan and profile views of the portions of approach surfaces that are closest to the runway, encompassing the existing and ultimate RPZs.
- **Terminal Area Plan.** The Terminal Area Plan drawing provides a large-scale view of the terminal area.
- **Land Use and Noise Contours.** A land use map was developed for the Airport and the surrounding area. This map includes the land uses on and around the Airport according to Marion and Clackamas Counties, as applicable.
- **Runway Departure Surfaces.** The Runway Departure Surfaces Plan depicts the plan and profile views of the Runway 17/35 departure surfaces, which apply to runways with instrument departure procedures.
- **Airport Property Map.** This drawing provides a history of the ODA's airport property acquisition by showing and listing all land transactions.

CAPITAL IMPROVEMENT PLAN - CHAPTER 7

Through the evaluation of the facility requirements, identification of the Preferred Alternative, and the development of the Airport Layout Plan, the improvements needed at the Aurora State Airport over the next 20-year period were determined. The Capital Improvement Plan (CIP) provided the basis for planning the funding of these improvements. The planned phases of development are in the 5-, 10- and 20-year time frames.

Table ES-3. Aurora State Airport Proposed Capital Improvement Plan with Costs

Aurora State Airport CIP 2012 – 2031							
#	**Year**	**Description**	**Total Cost**	**ODA share**	**FAA Share**	**Private Share**	**Other Funding**
Phase I (2012-2016)							
1	2012	Construct ATCT[1]	3,369,000	423,800	250,000	-	2,695,200
2	2012	Service Road	1,017,000	50,850	966,150	-	-
3	2013	PMP (2013)[2]	27,000	20,250	6,750	-	-
4	2014	Helicopter Landing Pads	11,000	550	10,450	-	-
5	2014	Ramp Reconstruction - State Leased	988,000	49,400	938,600	-	-
6	2014	Taxilane Development (Hangar Access)	43,000	-	-	43,000	-
7	2015	Hangar Development	2,088,000	-	-	2,088,000	-
8	2015	Carryover Entitlements	-	-	-	-	-
9	2016	Environmental Assessment (Runway Improvements)	350,000	17,500	332,500	-	-
10	2016	PMP (2016)	27,000	20,250	6,750	-	-
		Phase I Subtotal	*$7,920,000*	*$582,600*	*$2,511,200*	*$2,131,000*	*$2,695,200*

-Continued on following page-

Aurora State Airport CIP 2012 – 2031							
#	**Year**	**Description**	**Total Cost**	**ODA share**	**FAA Share**	**Private Share**	**Other Funding**
Phase II (2017-2021)							
11	2017	Aurora RFPD Response Facility	570,000	-	-	570,000	-
12	2017	Carryover Entitlements	-	-	-	-	-
13	2018	Property Acquisition (R35 RPZ)	2,561,000	128,050	2,432,950	-	-
14	2019	Keil Road Relocation	1,427,000	71,350	1,355,650	-	-
15	2020	Runway Extension (R35 - 1000')	3,035,000	151,750	2,883,250	-	-
16	2020	Install Runway 17 PAPIs	65,000	3,250	61,750	-	-
17	2019	PMP (2019)	27,000	20,250	6,750	-	-
18	2019	Taxilane Development (Hangar Access)	43,000	-	-	43,000	-
19	2020	R17/35 Strengthening Overlay	2,052,000	102,600	1,949,400	-	-
20	2021	Hangar Development	2,088,000	-	-	2,088,000	-
21	2021	Master Plan Update	200,000	10,000	190,000	-	-
		Phase II Subtotal	*$12,068,000*	*$487,250*	*$ 8,879,750*	*$2,701,000*	*$ -*
Phase III (2022-2031)							
22	-	PMP (2022, 2025, 2028, 2031)	108,000	81,000	27,000	-	-
23	-	Apron Development	1,638,000	81,900	1,556,100	-	-
24	-	Taxilane Development (Hangar Access)	43,000	-	-	43,000	-
25	-	Hangar Development	2,088,000	-	-	2,088,000	-
26	-	Cargo Apron	198,000	9,900	188,100	-	-
27	-	Relocate Fuel Tanks	89,000	4,450	84,550	-	-
28	-	R17 Run-Up Area[3]	355,000	17,750	337,250	-	-
		Phase III Subtotal	*$ 4,519,000*	*$ 195,000*	*$ 2,193,000*	*$ 2,131,000*	*$ -*
		Total Capital Costs	**$24,507,000**	**$1,264,850**	**$13,583,950**	**$6,963,000**	**$2,695,200**

[1] *Other Funding is Connect Oregon III Grant*
[2] *ODA share for PMP is 75% of total cost*
[3] *If no displaced threshold project; construct R17 run-up at same time as fuel tank relocation project.*

Financial Plan Summary

Based on anticipated CIP project costs and the projected operating income, annual income from the Airport's operation was shown to be sufficient to cover the ODA share of CIP project related costs in Phase I. The ODA share of CIP Phase I costs amounts to $582,600. When projected income was interpolated from the table above for each year FY2011 through FY2016, it was estimated that the Airport could expect about $610,000 in operating income over the 6-year period to go toward CIP projects. Additionally, ODA's projected income during CIP Phases II and III was expected to cover the agency's project share.

The primary goal is for the Airport to evolve into a facility that will best serve the air transportation needs of the region while simultaneously developing into a self-sustaining economic generator. This Master Plan Update can best be described as being the road map to helping the Airport achieve these goals. But it should be recognized that planning is a continuous process that does not end with the completion of the Master Plan in that the fundamental basic issues that have driven this Master Plan will remain valid for many years. Therefore, the ability to continuously monitor the existing and forecast status of airport activity will be a key ingredient in maintaining the applicability and relevance of this study.

CONTINUATION OF THE MASTER PLAN PROCESS

The FAA approved the ALP on October 19, 2012 (included as **Appendix B**). As stated in the Master Plan, ODA should consider working with Marion County to incorporate this document into the County's Comprehensive Plan. Additionally, the Master Plan should be a living document used to aid in decision-making, especially when prioritizing future projects based on demand.

Chapter One: INTRODUCTION

Airport Master Plan Update

Aurora State Airport

This update to the 2000 Airport Master Plan was undertaken to assess the role of the Aurora State Airport (Airport), evaluate the Airport's capabilities, forecast future aeronautical activity for the next 20 years, and plan for the timely development of any new or expanded Airport facilities needed to accommodate future aviation activity.

The owner and operator of the Airport, the Oregon Department of Aviation (ODA), obtained and matched a grant from the Federal Aviation Administration (FAA) to fund this study. ODA has organized a Planning Advisory Committee (PAC), representing Airport users and neighbors, to participate in the planning process. In addition to six PAC meetings, public involvement in the master plan update includes a website to disseminate information and gather comments and questions, and five open houses for the general public.

The purpose of this first draft chapter of the Airport Master Plan Update (Plan) is threefold:

- to summarize major issues that the Plan should address
- to identify goals for the planning process and for the future development of the Airport
- to determine the Airport’s current and future role within the system of airports

GOALS

Goals for the master plan update were a subject of the first PAC meeting held on July 22, 2010. The common themes of PAC members’ statements have been synthesized and are presented below.

The goals are divided between two categories – goals for the planning process and goals for the master plan itself.

Planning Process Goals

The goals for the planning process should guide the conduct of the ODA, ODA’s consultants, and the PAC throughout the development of the master plan update. Planning process goals are:

- Be open-minded and proceed in good faith.

- Keep the focus more on the long-term future than the short-term future.
- Don't mix unrelated issues and don't be sidetracked by issues that don't relate to the master plan.
- Obtain high quality information for analysis and cite sources.
- Seek consensus for solutions that are acceptable, helpful, and clear.
- By the end of the planning process, establish a clear vision statement that defines what the Airport will be like in the foreseeable future (30 to 50 years) and that is overwhelmingly embraced by all stakeholders. The vision statement should encompass safety, noise, and development scale and flavor.

Master Plan Goals

The master plan goals should guide the future development of the Airport. When it is time to evaluate alternative layouts for airport development, the goals should be the evaluation criteria.

Goal 1: Enhance safety.

Safety as a goal has broad support from PAC members, airport users, ODA, and the FAA. While aviation safety is the primary concern, the Plan should enhance other aspects of safety at the Airport, including vehicular and pedestrian safety. The primary way to enhance aviation safety is to comply with FAA airport design standards and other FAA guidance. The FAA and State have standards for land use compatibility that address the protection of people around airports from aviation accidents and aircraft noise, as well as the protection of aviators. Security is another component of aviation safety, so the master plan should comply with Transportation Security Administration recommendations for general aviation (GA) airports.

Goal 2: Meet the current and projected needs of airport users, as feasible.

Some PAC members who are airport users fear that community concerns will unduly constrain the growth of the Airport to meet their needs and the needs of businesses in the Airport's service area. They note that the Airport is a significant component of the national airspace system and should fulfill its role within the system. The areas of feasibility that could restrict the Airport from growing to meet users' needs include financial feasibility, environmental feasibility, and political feasibility. The financial feasibility of airfield expansion depends primarily on obtaining FAA grant funding; airfield improvements that do not meet FAA's standards for justifying need probably will not be built. The financial feasibility of landside development (hangars, etc.) depends primarily on market demand and the availability of private financing. In normal economic times, private financing is available if the demand for the facilities truly exists. Environmental feasibility depends upon the ability to mitigate negative impacts of airport development on the natural and manmade environment. Political feasibility depends upon the adoption of the Master Plan by Marion County and on support for the Master Plan by surrounding jurisdictions.

Goal 3: Consider all the off-airport impacts of Airport development; minimize negative impacts and maximize positive impacts.

The PAC expressed several objectives that relate to this goal:

- Involve all communities and jurisdictions in the Airport's influence area.

- Protect farming and farmland.
- Protect the livability of surrounding communities.
- Evaluate and minimize the impacts of airport growth on off-airport infrastructure, including ground and air transportation, fire protection, water, and sewer systems.
- Evaluate and maximize economic benefit.
- Balance the costs and benefits of airport development.

ISSUES

Issues that the master plan update should address were a subject of the first PAC meeting held on July 22, 2010. Other sources for issue identification were ODA and an Airport user survey that was conducted in the fall of 2009. (See the appendices for a summary of the Airport user survey.) The major issues are outlined below.

Runway Extension

Some Airport users report there are times that they must lessen their airplane's weight in order to depart from the Airport. Reducing weight means fewer passengers, less cargo, or, most often, less fuel—requiring them to make more refueling stops than the range of their aircraft requires. On hot days, some operators may reschedule a flight to a cooler time of day, due to the effect temperature has on the aircraft's takeoff performance. Some Airport users and businesses favor a runway extension of up to 1,500 feet, as expressed in a public meeting. The revenue of some businesses would increase if more fuel could be sold for the constrained aircraft and if more aircraft types could use the Airport. Airport neighbors are concerned that a runway extension would unduly disrupt the area and their quality of life, and encourage more and louder aircraft.

Air Traffic Control Tower

The FAA has performed a cost-benefit analysis that justified an air traffic control tower at the Airport. ODA has been seeking funding for building and operating the tower. Some PAC members and others have expressed concern that a control tower will increase traffic and noise at the Airport. They feel that the tower needs to be vetted by the current master planning process. Many Airport users feel strongly that a control tower is needed for safety. However, some Airport users do not want a control tower at the Airport because it would change the classification of airspace around the Airport and increase the requirements for pilot communication. At this time, the FAA and ODA have slowed down a control tower siting study to make better planning decisions when considering tower location and design.

Impact of Airport Expansion on Surrounding Areas

Concerns about Airport expansion include the effects on the capacity of surrounding infrastructure and environmental impacts.

Neighboring jurisdictions fear that off-Airport roads and utility systems cannot handle increased usage from Airport growth. The Aurora Fire District is concerned about having enough equipment and people to protect expanded Airport facilities. On the other hand, Airport businesses want to be able to grow, and Airport users want utility improvements, particularly sewer service, for existing and future facilities.

For example, the lack of sewer service is a major constraint for having a restaurant at the Airport. While ODA recognizes the complexities of Oregon's land use system and potential need for upgrades to City of Aurora utilities prior to annexation, ODA is generally supportive of annexation of the Airport by the City of Aurora due to the economic growth potential for the Airport if it were connected to City services.

Airport neighbors are also concerned about noise and other possible Airport impacts that could degrade the rural character, quality of life, and natural environment of the area.

Calm Wind Runway Change

When winds are calm, pilots are advised to use Runway 35 (northerly traffic flow) to reduce noise impact on surrounding areas. However, the favored instrument approach is to Runway 17 (southerly traffic flow), which results in conflicting traffic patterns and safety concerns. Several Airport users support designating Runway 17 as the calm wind runway, as it once was. Noise impact would move with the traffic, a concern for Airport neighbors. Residents from the Charbonneau area report the calm wind runway has never lessened their noise exposure, so reverting the calm wind runway is not a major concern.

Precision Instrument Approach

Business aviators especially would like to see the Airport's instrument approach capability upgraded from nonprecision to precision. A precision approach would allow them to land in lower visibility conditions. A precision approach could change the size of some FAA-required safety clearances, particularly at runway ends, which might affect Airport neighbors.

Helicopter Operations

Aurora State Airport has a large number of based and transient helicopter operations. Helicopters operating close to small fixed wing aircraft can be a concern, because of the potential damage to the fixed wing airplanes from rotorwash. Currently, most helicopters takeoff and land on tenant or private property. An area available to the public for the takeoff, landing, and parking of helicopters on ODA land may be needed. Airport users and businesses are likely not to agree on a location or need for a new public helicopter area.

Other Airport Improvements

Suggestions for Airport improvements have been made through the Airport user survey and interviews. These suggestions include internal road improvements, a run-up area for Runway 17, improved runway lighting, a restaurant, and radar/approach control coverage in the area. These improvements are not contentious, and will be analyzed later in the planning process, along with improvements resulting from the analysis of Airport capacity vs. demand, FAA design standards, TSA guidance, and industry standards. The PAC, Airport users, and others will have the opportunity to review the full range of Airport improvements that ODA considers in this Master Plan Update.

AIRPORT ROLE ANALYSIS

This section identifies the current role of the Airport and analyzes whether or not that role should change in the future. First, the current role assignment for the Airport within the national and state system of airports is described. Then, the Airport's role within the regional system of airports is examined in depth, including analysis of other airports in the region. Finally, the appropriate future role of the Airport is recommended.

Aurora State Airport's Role within the National System

The Airport is identified by the Federal Aviation Administration (FAA) as one of 2,564 General Aviation (GA) facilities nationwide and is included within the National Plan of Integrated Airport Systems (NPIAS). GA airports do not have scheduled passenger service. There are several criteria allowing an airport to be included in the NPIAS; however, the general criteria are that the airport has at least 10 based aircraft and is located at least 20 miles (30 minutes drive time) from another NPIAS airport. Aurora State Airport meets the based aircraft criteria; however, the Airport is within 13 miles (approximately 19 minutes drive time) of another NPIAS airport (Mulino State). This closer than 20-mile spacing of NPIAS airports is not unusual in urban areas where it is justified by the need for additional airport capacity.

Since it is in the NPIAS, the Airport is eligible to receive Federal grants under the Airport Improvement Program (AIP). Under the current AIP, federal grants cover up to 95% of GA airport eligible costs. Eligible costs include planning, development and noise compatibility projects. As part of receiving AIP grants, the ODA must accept all conditions and obligations under the FAA grant assurances. In general, such assurances require ODA to operate and maintain the Airport in a safe and serviceable condition, not grant exclusive rights, mitigate hazards to airspace, and use airport revenue properly.

Aurora State Airport's Role within the State of Oregon's System

The Oregon Aviation Plan 2007 (OAP 2007) classifies the Airport as a Category II, Urban General Aviation Airport. A Category II airport supports all general aviation aircraft and accommodates corporate aviation activity, including business jets and helicopters, and other general aviation activity. The primary users of these airports are personal and business related, and the airports serve a large geographic region. Key performance criteria associated with these airports are a FAA Airport Reference Code of C-II[1], minimum runway size of 5,000 feet by 100 feet, a precision instrument approach, and full service fixed base operations (FBOs).[2]

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[1] Generally, this means the airport is designed to handle medium-sized business jets.
[2] A full-service FBO is a business that provides a wide range of services, such as fuel sales, aircraft repair and maintenance, hangar and tiedown rentals, aircraft charters and rentals, flight training, and amenities for pilots and passengers.

Aurora State Airport's Regional Role

The Airport is an important GA airport serving the Portland metropolitan area and the northern Willamette Valley. It has a convenient location with direct access to Interstate 5. Virtually all types of GA activity occur at the Airport, which is home to multiple businesses offering an array of aviation services. The Airport provides significant economic benefit to the region. The OAP 2007 reported 781 jobs at the Airport, and the total number of jobs attributed to the Airport is 2,469 when direct off-airport and "spin-off" (multiplier) effects are included. Annual wages for these jobs amount to $59,326,000. Annual business sales, aviation and non-aviation related, total $147,862,000.

Efforts to understand more about how the Airport is used and by whom included reviewing the Airport user survey responses, interviewing FBOs in the region, analyzing the geographic location of airport users, and evaluating airports with service areas that overlap the Airport's.

Airport Use According to User Survey and FBO Interviews

The recent Airport user survey shows the Airport is used mostly for business[3]. Over 55% of survey participants reported using the airport for business purposes. Other uses were recreational (41%), training (18%), emergency (4%), and other (14%). The other uses cited included personal transportation and inspection work for a telephone/broadband utility.

Forty-nine of 61 respondents indicated that they own or fly an aircraft and the other 12 respondents do not. About two-thirds of the aircraft used by respondents were small, single engine piston aircraft, such as the Cessna 172. The remainder included helicopters, multi-engine piston and turboprop aircraft, and business jets.

About one-fourth of survey respondents do not base their aircraft at Aurora State Airport. Their aircraft are based at airports within and outside of the region: Corvallis, Hubbard (Lenhardt Airpark), Troutdale, Medford, La Grande, Newburg (Sportsman Airpark), Sunset Airpark, Hillsboro (Stark's Twin Oak), Scappoose, San Jose (CA), Eugene, and Salem. Those who do not keep an aircraft at the Aurora State Airport indicated why they do not. Most cited inconvenient location (67%). Other reasons were the cost of a hangar (25%), lack of a suitable hangar (17%), and inadequate runway length (8%).

FBOs at surrounding airports were contacted to ask how they use the Aurora State Airport. Four FBOs responded, from Hillsboro Airport, McMinnville Municipal, Scappoose Industrial Airpark, and Troutdale Airport. Their use of the Aurora State Airport is limited to picking up or dropping off charter clients. The aircraft used for these operations range from Twin Commanders to a Gulfstream IV. They do not see the Airport as a reliever to Portland International now. The Airport might become a reliever if certain improvements were undertaken--runway lengthening and strengthening, increased hangar availability, auto parking, and improved instrumentation for poor weather operations. The possibility of reliever status will be discussed later in this chapter. When asked about the potential air traffic control tower,

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[3] The Airport User Survey was not intended to be a statistical representation of airport users. Surveys were distributed through the project website, project meetings, and at local FBOs (Aurora State, Mulino State, Troutdale, McMinnville, Hillsboro and Scappoose).

all reported the tower would be a good safety enhancement, but that their use of the Airport would likely remain unchanged. One FBO operator indicated their operations might decrease if there were a tower, since operations into and out of Aurora State Airport are efficient now, and having air traffic controllers sequencing aircraft would reduce this efficiency.

Analysis of Airport Service Area and Other Airports in the Service Area

To determine better who uses the Airport, the mailing addresses of aircraft owners who have used the airport for Instrument Flight Rules (IFR) arrivals and departures were analyzed. While more Visual Flight Rules (VFR) operations than IFR operations occur at the Airport, records of the aircraft performing VFR operations are not available. However, IFR data alone suffice to determine how far the Airport's service area extends. This is because IFR flight occurs more often in larger, higher performance aircraft than VFR flight.[4] Pilots who typically fly by VFR in small aircraft can choose among multiple airports with facilities and services adequate for their needs, and will often base their airplanes at the airport that is closest to home. Owners of higher performance turboprop and jet aircraft have fewer airports to choose from, since they need a longer/stronger runway, instrument approach, jet fuel, larger hangar, more security, and/or other features not every GA airport has.

For a two-year period, between October 2007 and October 2009, the Airport hosted 14,186 IFR operations, a combination of arrivals and departures (FlightAware). Aircraft based at Aurora and transient aircraft based at other airports performed these operations. The aircraft owners' addresses were unknown for 9% of the total operations. For the 12,848 operations with known aircraft owner addresses, the zip codes were analyzed.[5]

Of the owners of aircraft conducting IFR operations, 77% have addresses in Oregon, 8% in Washington, 4% in California, and 11% in 42 other states. Of the Oregon addresses, about one-third were outside the Portland-Salem region (Aurora State Airport was the trip destination). About two-thirds of the Oregon addresses were within a 30-mile radius of the Airport (Aurora State Airport was the trip origin). The addresses within 30 miles of the Airport were distributed as follows:

- 20% within 10 miles of Aurora:
  - 10% Aurora[6]
  - 5% Canby
  - 2% Tualatin
  - 3% Hubbard, Wilsonville, Woodburn, and Sherwood
- 39% between 10 and 20 miles from Aurora:
  - 17% Portland (south part)
  - 16% Lake Oswego
  - 2% West Linn

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[4] Air taxi and corporate aircraft pilots usually fly IFR, due to regulatory requirements or company policy. In addition, the additional equipment and training expense for IFR flight is more often associated with more expensive, higher performance aircraft.
[5] Distances between zip codes were determined using xionetic.com.
[6] 2% of these aircraft are owned by Columbia Helicopters, which operates from facilities at Aurora State Airport, but their office in downtown Portland is listed as the aircraft owner's address.

  - 4% Beaverton, Molalla, Oregon City, Dayton, Dundee, Hillsboro (south part), Lafayette, Newberg, Milwaukie, Tigard, and Silverton
- 6% between 20 and 30 miles from Aurora:
  - 4% Portland (north part)
  - 2% Boring, Brightwood, Eagle Creek, Estacada, Fairview, Gresham, Sandy, Troutdale, Happy Valley, Hillsboro (north part), McMinnville, Salem

From this analysis, it appears that the Airport's core service area is within 20 miles (about 30 minutes driving time), but the service area extends up to 30 miles (about 45 minutes driving time). **Exhibit 1A** shows the area within 45 minutes driving time from the Airport, which represents the maximum extent of Aurora State Airport users. The airports within 45 minutes driving time from Aurora State Airport have service areas that overlap the Airport's service area. To help understand the regional role of Aurora State Airport, the characteristics of these "competing" airports were examined and compared to the Airport. The Airport's maximum service area covers portions of Clackamas, Marion, Multnomah, Washington, and Yamhill Counties, as well as Clark County in Washington and contains 46 airports.

Table 1A presents information about the 46 airports in order of vehicular drive time from the Airport. The information includes drive time and distance from the Airport, ownership and use, FAA and State status, numbers of based aircraft and aircraft operations, runway size, approach data, and the availability of fuel. Information sources were FAA Form 5010 Airport Master Records[7] and the OAP 2007.

[7] Found at: http://www.gcr1.com/5010Web/


Exhibit 1A
Maximum Service Area Map
Service Area
(45-minute drivetime zone)
Miles
0 5 10 15 20
Map Compiled by:
WHPacific, Inc.
August 2010
WHPacific
Notes: Service area determined using Microsoft Streets and Trips "create drivetime zone" tool, saving a jpeg, georeferencing the jpeg using ESRI "Streets" layer, and digitizing the polygon.
Background Map Source: ESRI, "Streets," August 17, 2010, Copyright: 2009 ESRI, AND, TANA, UNEP_WCMC, http://www.arcgis.com/home/group.html?q=tags:ArcMap93_Base&t=group&owner=esri&title=ESRI%20Maps%20and%20Data&sortField=title&sortOrder=asc&content=all.
Victoria
Seattle
WASHINGTON
Portland
OREGON
Boise City
Miles
0 200 400
N
W
E
S
Clark County
Mount Vista
Salmon Creek
Orchards
Vancouver
Pearson Field
Camas
Washougal
Portland International
Troutdale
Sunset Air Strip
Olinger Airpark
Hillsboro
Forest Park
Washington County
Forest Grove
Portland
Multnomah County
Harvey's Acres
Aloha
Beaverton
Gresham
Happy Valley
Krueger
Boring
Flying K Bar J Ranch
Stark's Twin Oaks Airpark
Flying K Ranch
Tigard
Lake Oswego
Bruce's
Meyer Riverside Airpark
Ribbon Ridge
Sherwood
Oregon City
Eagle Nest Ranch
Fairways
Nielson
Chahalem Airpark
Stan Jost
Aeroacres
Parson Landing
Warner's
Wilsonville
Beaver Oaks
Newberg
Sportsman Airpark
Skyhill
Dundee
Yamhill County
Canby
Dietz Airpark
Clackamas County
Lafayette Airstrip
Aurora State Airport
McGee
Compton
Mulino State
McMinnville
Workman Airpark
McMinnville
Lenhardt Airpark
Marion County
Woodburn
Skydive Oregon
Molalla
Sheridan
Yamhill County
Harchenko Industrial
Mount Angel
Hollin
Smith Private
Keizer
Silverton
Lusardi Field
Hayesville
Fly 'N' W
Blue Skies Farm
Salem
Iron Crown
Four Corners
Dallas
Polk County
Salem McNary
Monmouth
Independence
Wagoner
Flying E
Stayton

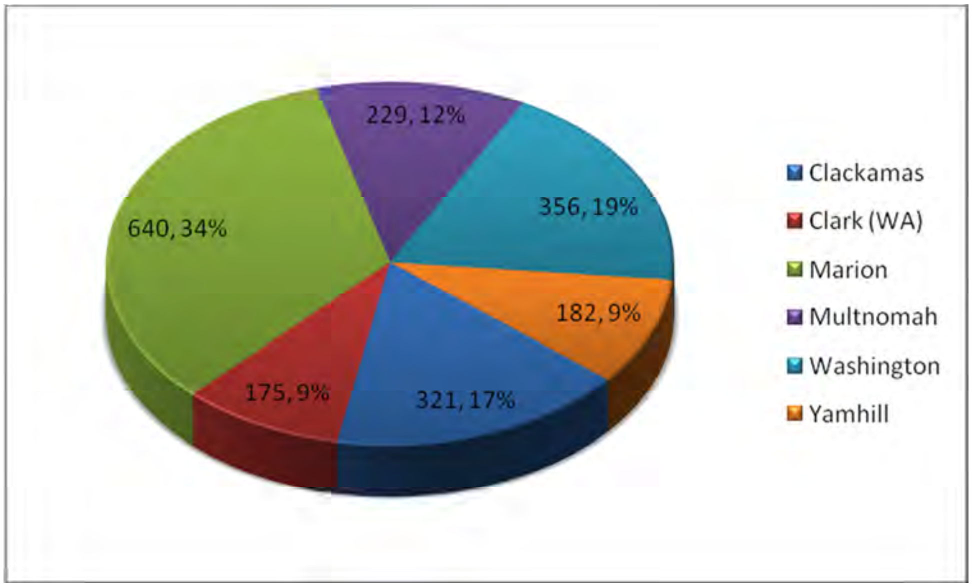
Table 1A. Information about Airports in the Region

AIRPORT NAME	ID	Drive Time	Distance & Direction	Ownership/ Use	NPIAS?	Oregon Cat.	Based Aircraft	Annual Ops	ARC	Rwy Type[8]	Rwy Length/Width	Rwy Alignment	Approach[9]	Fuel
Aurora State	UAO	0	0	State/Pub	Y	II	432	87,345	B-II	A	5004 x 100	17/35	Nonprec	Y
Compton	44OR	8	2.4 nm SE	Pvt/Pvt	N	-	3	0	-	T	2000 x 60	09/27	Visual	N
McGee	67OR	9	3.7 nm W	Pvt/Pvt	N	-	2	0	-	T	1960 x 90	16/34	Visual	N
Workman Airpark	OR41	10	4.9 nm SE	Pvt/Pvt	N	-	27	0	-	T	2240 x 100	07/25	Visual	N
Dietz Airpark	OR40	14	5.1 nm E	Pvt/Pvt	N	-	49	0	-	T	2640 x 60	16/34	Visual	N
Lenhardt Airpark	7S9	15	4.2 nm S	Pvt/Pub	N	IV	109	6,000	-	A	2956 x 45	02/20	Visual	Y
Meyer Riverside Airpark	OG34	18	9.5 nm N	Pvt/Pvt	N	-	4	0	-	T	1585 x 100	16/34	Visual	N
Mulino State	4S9	19	7.8 nm E	State/Pub	Y	IV	43	21,300	B-II	A	3425 x 100	14/32	Visual	Y
Flying K Ranch	OR00	20	12.2 nm N	Pvt/Pvt	N	-	4	0	-	T	1700 x 20	07/25	Visual	N
Sportsman Airpark	2S6	23	8.3 nm W	Pvt/Pub	Y	IV	51	11,650	-	A	2755 x 50	17/35	Visual	Y
Aeroacres	OG30	24	8.1 nm NE	Pvt/Pvt	N	-	3	0	-	T	1800 x 250	04/22	Visual	N
Harchenko Industrial	OR38	25	12.2 nm SW	Pvt/Pvt	N	-	6	0	-	A	2290 x 75	07/25	Visual	N
Fairways	OG20	27	10.2 nm NE	Pvt/Pvt	N	-	31	0	-	T	2900 x 160 [10]	16/34	Visual	N
Nielson	2OR0	28	12.1 nm NE	Pvt/Pvt	N	-	4	0	-	T	1150 x 50	09/27	Visual	N
Harvey's Acres	OR28	28	12.8 nm NW	Pvt/Pvt	N	-	1	0	-	T	2100 x 100	E/W	Visual	N
Hollin	7OR7	30	13.0 nm SW	Pvt/Pvt	N	-	1	0	-	T	1750 x 80	16/34	Visual	N
Bruce's	07OR	31	12.2 nm NE	Pvt/Pvt	N	-	1	0	-	T	1200 x 100	17/35	Visual	N
Parson Landing	7OR9	31	13.4 nm E	Pvt/Pvt	N	-	1	0	-	T	1300 x 50	06/24	Visual	N
Skydive Oregon	OL05	31	8.8 nm SE	Pvt/Pvt	N	-	16	0	-	A	2900 x 32	18/36	Visual	N
Stark's Twin Oaks Airpark	7S3	31	13.1 nm NW	Pvt/Pub	N	V	108	22195	-	A	2465 x 48	02/20	Visual	Y
Stan Jost	74OR	31	11.5 nm NW	Pvt/Pvt	N	-	1	0	-	T	1300 x 80	15/33	Visual	N
Smith Private	29OR	32	15.2 nm SW	Pvt/Pvt	N	-	1	0	-	T	2500 x 70	16/34	Visual	N
Happy Valley	OL03	34	16.6 nm NE	Pvt/Pvt	N	-	2	0	-	A	2264 x 25	16/34	Visual	N
Lusardi Field	4OR7	34	17.4 nm SW	Pvt/Pvt	N	-	8	0	-	T	2200 x 60	17/35	Visual	N
Salem McNary	SLE	34	22.5 nm SW	Pub/Pub	Y	I	185	52,976	C-II	A	5811 x 150	13/31	Prec	Y
Chehalem Airpark	17S	34	12.8 nm W	Pvt/Pub	Y	IV	22	12,500	-	A	2285 x 40	07/25	Visual	N
Blue Skies Farm	OR87	35	18.1 nm S	Pvt/Pvt	N	-	1	0	-	T	1345 x 45	01/19	Visual	N
Skyhill	1OR7	37	13.5 nm E	Pvt/Pvt	N	-	1	0	-	T	2500 x 66	07/25	Visual	N
Fly 'N' W	4OR5	37	18.3 nm SW	Pvt/Pvt	N	-	2	0	-	T	1500 x 30	N/S	Visual	N
Hillsboro	HIO	37	19.2 nm NW	Pub/Pub	Y	II	213	253,847	C-III	A	6600 x 150[8]	12/30	Prec	Y
Krueger	OR72	38	22.2 nm NE	Pvt/Pvt	N	-	0	0	-	T	1300 x 150	16/34	Visual	N
Wagoner	4OR8	38	26.5 nm SW	Pvt/Pvt	N	-	1	0	-	T	1050 x 75	E/W	Visual	N
Ribbon Ridge	73OR	38	14.5 nm NW	Pvt/Pvt	N	-	1	0	-	T	1200 x 50	16/34	Visual	N
Pearson Field	VUO	40	22.9 nm N	Pub/Pub	Y	-	175	53,500	B-I	A	3275 x 60	08/26	Nonprec	Y
Lafayette Airstrip	OR90	40	15.2 nm W	Pvt/Pvt	N	-	3	0	-	T	2700 x 70	03/21	Visual	N
Portland International	PDX	41	21.7 nm N	Pub/Pub	Y	I	84	230,253	D-V	A	11000 x 150	10/28	Prec	Y
Sunset Air Strip	1OR3	41	23.0 nm NW	Pvt/Pvt	N	-	13	0	-	T	3050 x 200	06/24	Visual	N
Flying E	OR25	43	24.8 nm S	Pvt/Pvt	N	-	0	0	-	T	2300 x 45	09/27	Visual	N
Iron Crown	22OR	43	18.3 nm S	Pvt/Pvt	N	-	1	0	-	T	2000 x 50	16/34	Visual	N
Flying K Bar J Ranch	OR35	44	22.3 nm NE	Pvt/Pvt	N	-	1	0	-	T	1450 x 100	17/35	Visual	N
Warner's	20OR	44	15.3 nm E	Pvt/Pvt	N	-	2	0	-	T	2640 x 150	17/35	Visual	N
Eagle Nest Ranch	OR65	45	19.0 nm E	Pvt/Pvt	N	-	19	0	-	T	2500 x 80	12/30	Visual	N
Olinger Airpark	OR81	45	21.5 nm NW	Pvt/Pvt	N	-	13	0	-	T	2000 x 80	07/25	Visual	N
McMinnville	MMV	45	15.8 nm W	Pub/Pub	Y	II	104	63,500	D-II	A	5420 x 150	04/22	Prec	Y
Beaver Oaks	OR66	46	17.6 nm E	Pvt/Pvt	N	-	9	0	-	T	1700 x 75	15/33	Visual	N
Troutdale	TTD	47	23.9 nm NE	Pub/Pub	Y	II	145	105,020	B-II	A	5399 x 150	07/25	Nonprec	Y

[8] A= Asphalt, T= Turf
[9] Visual = Visual approach only, Nonprec = Nonprecision instrument approach, Prec = Precision instrument approach
[10] For airports with multiple runways, largest runway data shown.

The majority of the airports in the region are privately owned and limited to private use. The 46 studied airports host 1,903 based aircraft; 73% of the aircraft are at publicly owned, public-use airports, 15% are at privately owned, public-use airports, and the remaining 12% are at privately owned, private-use airports. Only 19 airports have at least ten based aircraft. **Figure 1A** highlights each county's share of the 1,903 aircraft based at the 46 airports.

Figure 1A. Distribution of Regional Based Aircraft by County



Runway lengths at the 46 airports vary between 1,050 feet and 11,000 feet. Only 32% of the runways are paved, and only 21% of the airports have aircraft fueling capability.

OAP 2007 assigned categories to 11 of the 46 airports. Aurora State Airport and three other airports (Troutdale, Hillsboro, and McMinnville) are Category II, Urban General Aviation. Both Salem McNary and Portland International Airports are Category I, Commercial Service, airports that offer scheduled commercial airline service. Lenhardt Airpark, Mulino State, Chehalem Airpark, and Sportsman Airpark are Category IV, Local General Aviation. Category IV airports primarily support single engine GA aircraft, but are capable of accommodating smaller multi-engine GA aircraft. Stark's Twin Oaks is the only Category V airport; its primary role is to support single engine GA aircraft and provide access to remote areas or emergency service.

Few of the airports have a designated Airport Reference Code (ARC). An ARC represents an FAA-defined class of aircraft. The FAA uses ARCs to customize airport design standards for the most demanding aircraft that can use an airport. An ARC consists of a letter and a Roman numeral. The letter is the Aircraft Approach Category, determined by aircraft approach speed. The Roman numeral is the Airplane Design Group, determined by wingspan or tail height, whichever is more demanding. Below is a table that further explains the ARC components.

Aircraft Approach Category (Approach Speed)		Airplane Design Group (Wingspan / Tail Height)	
A	< 91 knots	I	< 49' / < 20'
B	91-121 knots	II	49'-79' / 20'-30'
C	121-141 knots	III	79’-118’ / 30’-45’
D	141-166 knots	IV	118’-171’ / 45’-60’
E	> 166 knots	V	171’-214’ / 60’-66’

According to the 2000 Master Plan, the ARC for Aurora State Airport is B-II. Other B-II airports are Mulino State and Troutdale. Pearson Field’s ARC is B-I. The ARCs for Salem McNary and Hillsboro are C-II and C-III, respectively. Portland International’s ARC is D-V, and McMinnville Municipal’s is D-II. The ARCs for the other 38 airports are not designated, but a review of the based aircraft fleet mix and runway dimensions indicates they would likely not accommodate or meet FAA standards for aircraft larger or faster than ARC B-I. Most single and twin-engine piston Beechcraft, Cessna and Piper aircraft are in ARC A-I or ARC B-I.

Seven of the airports have instrument approaches. At the other 39 airports, aircraft can only land when the weather is clear. Global Positioning System (GPS)-aided instrument approach procedures have been available for about 15 years. Since GPS approaches do not require costly ground-based equipment, such as required by traditional instrument approaches, the number of GA airports changing from visual to GPS-aided instrument runways has been growing nationwide. GPS navigation is becoming standard in GA aircraft, although most GA pilots still fly by VFR in visual meteorological conditions. Most business and corporate operators fly under IFR regardless of weather conditions, so they typically base their operations at airports with instrument approaches.

Only ten, or 22%, of the airports are eligible for federal funding due to their inclusion in the NPIAS. The other airports must rely solely on private funding. While there are many airports within the region, few have stable funding for planning and capital development. Facilities like Aurora State Airport play an important function within the region because they have viable, renewable sources of funding.

Supplemental information was gathered for the 19 largest airports--those with at least ten based aircraft. A description of these airports follows; each description provides, where possible, the following:

- The county in which the airport is located
- Total acres
- Accessibility by automobile
- Fuel services
- Instrument approaches
- Expansion potential

- Future development plans
- Hangar availability, rates, and fees
- Any other requirements

Accessibility was rated "good" if the airport is a short distance from an interstate or major highway. This information was acquired from available data on the ODA website, FAA Form 5010, and airport owner/manager interviews.

Aurora State Airport. Aurora State is located in Marion County and encompasses 144 acres (state-owned land only). It is easily accessible from Interstate 5, which runs north-south through the Willamette Valley. Aircraft maintenance, fuel services (Avgas and Jet Fuel) and flight training are among the many services offered at the Airport's three FBOs. Weather information is available from an Automated Surface Observing System (ASOS) and the Airport has GPS, instrument landing system localizer (ILS-LOC), and very high frequency omnidirectional range (VOR) approaches. The 2000 Master Plan states the ARC is B-II, indicating the most demanding aircraft with at least 500 annual itinerant operations is a Cessna Citation II or similar aircraft. Currently, there are 432 based aircraft at Aurora State. (More information on existing facilities follows in Chapter 2, *Inventory*.)

Workman Airpark Airport. Workman is a residential airpark located in Clackamas County, with 27 based aircraft. No services are available to the public. There are no plans to expand the airport or the number of hangars/homes located there. The FAA Form 5010 did not report acreage.

Dietz Airpark Airport. Dietz is a residential airpark located in Clackamas County, with good access to the Portland metro area. There are 49 aircraft based at the airport; in 2007, it was reported to have only 32 based aircraft. The FAA Form 5010 did not report acreage. There are no services available to the public.

Lenhardt Airpark Airport. Lenhardt Airpark is situated on approximately 30 acres within Clackamas County. Avgas is available for its 109 based aircraft and transient users. There is reportedly room to build additional hangars if needed.

Mulino State Airport. Mulino State is located in Clackamas County near Highway 213, and is owned and operated by ODA. Until recently, it was owned and operated by the Port of Portland. Access to the Portland metro area and Interstate 205 is good; however, direct access to Interstate 5 is poor. The airport is approximately 275 acres, with 43 based aircraft. New hangars have been constructed recently, and land is available for more hangar development. Self-service fuel is available. Mulino does not have an instrument approach.

Sportsman Airpark Airport. Sportsman Airpark is located in Yamhill County on approximately 60 acres, with good access to the Portland metro area. There are 51 based aircraft. Both Avgas and Jet Fuel are available. Land is available for hangar development and aviation-related businesses on the eastern portion of the airport.

Fairways Airport. Situated on approximately 40 acres within Clackamas County, Fairways supports 31 based aircraft. Reports have indicated this airport may be at risk of closure; however, the airport owner was not available to ask about future plans.

Skydive Oregon Airport. Skydive Oregon is located near Molalla in Clackamas County, with good access to the Portland metro area. The airport occupies approximately 42 acres. Available records show there are no services offered for the 16 based aircraft. Future plans for the airport are unknown. Aerial photography indicates there may be room for additional hangars.

Stark's Twin Oaks Airpark Airport. Stark's Twin Oaks Airpark is situated on approximately 65 acres in Washington County and has 108 based aircraft. There is good access to the Portland metro area. Avgas and maintenance services are available at this airport.

Salem McNary Field. McNary Field offers commercial airline service and is located in Marion County on 751 acres. It has 185 based aircraft, most of which are single engine. There is some development potential on the airport's south end. Records show the majority of operations are local and itinerant GA. Military aircraft accounted for nearly 4,000 operations in 2009. Access to Interstate 5 is excellent. The airport provides fuel and a variety of services. It also has precision and nonprecision instrument approaches.

Chehalem Airpark. Located in Yamhill County, Chehalem Airpark encompasses 28 acres. There are 22 based aircraft at the airport. It offers a wide range of aviation-related services such as Avgas, maintenance, aircraft rental, and charter services. It is privately-owned, but open to the public. Aerial photography indicates land is available for development.

Hillsboro Airport. The Port of Portland owns and operates the 900-acre Hillsboro Airport. The airport provides many services, such as fuel (Avgas and Jet Fuel), aircraft maintenance, flight instruction, and aircraft rental. It currently has 213 based aircraft. The airport is a designated reliever for Portland International and is experiencing a growing volume of corporate air traffic. The Airport Master Plan (2005, June) shows the Hillsboro Airport's ARC is C-III, meaning the most demanding aircraft using the airport would be a Gulfstream jet or similar. Both precision and nonprecision approaches (ILS, LOC, VOR/distance measuring equipment (DME), and NDB) are available to pilots, as well as an air traffic control tower. Access to the Portland metro area is very good along Highway 26.

Pearson Field. Pearson is the only airport within Aurora State Airport's maximum service area located outside of Oregon. It is located in Clark County, Washington, on approximately 104 acres, 73 of which are owned by the National Park Service and within the Vancouver National Historic Reserve. The airport is rich in aviation history and offers a variety of services. It has 150 GA hangars and a waiting list for those who want to hangar their airplane there. Records indicate 175 based aircraft.

Portland International Airport. Portland International Airport (PDX) is located in Multnomah County with excellent access to Interstate 5, Interstate 84, and Interstate 205. Owned and operated by the Port of Portland, it is the largest commercial service airport in Oregon. It occupies approximately

3,200 acres and in its immediate surroundings accommodates a variety of industrial and commercial uses. It hosts some GA activity and has 84 based aircraft, but focuses on airline service. The Port of Portland owns two reliever airports (Hillsboro and Troutdale) to "relieve" PDX of GA aircraft operations and maximize PDX's capacity for airline operations.

Sunset Air Strip. Sunset Air Strip is located on 14 acres in Washington County, just off Highway 26. It has 13 based aircraft. No services are available. It is a residential airpark, mostly surrounded by agricultural lands.

Eagle Nest Ranch. Eagle Nest Ranch is located in Clackamas County. Its acreage is unknown. It is a residential airstrip that appears to have recently expanded. In 2007, FAA records indicate it had 2 based aircraft; however, more recent data shows 19. Aerial photography indicates land is available for development.

Olinger Airpark. Olinger Airpark is a residential airstrip in Washington County with 13 based aircraft. There are no services available at this privately owned, private-use airport. Area for expansion is limited, based on aerial photography.

McMinnville Municipal. Located in Yamhill County, McMinnville has 104 based aircraft on 650 acres. Full services are available at this GA airport. It has both precision and nonprecision instrument approaches. Land is available for developing additional hangars. It is the home of Evergreen Aviation, which is the likely explanation for the ARC of D-II.

Troutdale Airport. Troutdale Airport encompasses 284 acres and is located in Multnomah County. It is owned and operated by the Port of Portland and is home to 145 based aircraft. It is a reliever for Portland International and attracts business and recreational GA traffic. Various services are offered for pilots, including fuel (Avgas and Jet Fuel), maintenance, aircraft rental, and flight instruction. The airport has an air traffic control tower and GPS and non-directional radio beacon (NDB) instrument approaches. The airport's Master Plan Update (2004, October) reports the ARC is B-II. The airport is located 10 miles east of PDX and has excellent access to Interstate 84.

Airport Role Conclusions and Recommendations

Aurora State Airport fits well the OAP 2007 description of an Urban General Aviation Airport. It is one of five GA airports in the region with facilities and services appropriate for business jets. The five airports are Aurora State, Hillsboro, McMinnville, McNary Field in Salem, and Troutdale. These airports are appropriately spaced to provide good accessibility to the population and businesses in the region without substantial service area overlap that might undermine the long-term viability of any of the airports.

Alternatives to continuing Aurora State Airport's Urban General Aviation role are undesirable:

- Downsizing the Airport's capability—attempting to limit it to smaller piston-powered, airplanes and recreational use--is an impractical future for the Airport. ODA would be violating grant assurances made to the FAA, the regional airport system would have a hole that would be costly and difficult to fill, and residents and businesses in the region would suffer economically.

- Commercial service is also not an appropriate future role for Aurora State Airport. Portland International Airport has the capacity to handle commercial passenger and cargo airline activity in the region for many years to come. If commercial service grows elsewhere in the region, it will likely be at Salem, which is more suitable for commuter airline service.

The Airport has grown at a faster rate than past planning efforts expected. It has become popular for both personal and business GA use. The growth in business use is likely due to the Airport's location with access to Interstate 5, along with aggressive private development adjacent to the state-owned airport property. Considering prior investment in the Airport, its large and growing number of based aircraft, its eligibility for FAA funding, and its proven record for attracting private funding for landside facilities, it appears likely that Aurora State will remain a viable GA airport long into the future. Business aviation will probably grow more than personal and recreational aviation, but the Airport's role in the future should not change from its current role—a busy airport handling a full range of GA, including helicopters and business jets.

As business aviation and higher performance aircraft traffic grows, some owners of smaller, personal use and recreational aircraft may want to relocate to a less busy airport where the other aircraft are smaller and slower. ODA now owns Mulino State Airport, which is a short distance from Aurora State Airport. Mulino is well suited to single engine and small multi-engine piston aircraft and VFR flying. It has hangars available and sufficient land for building many more hangars should minor infrastructure constraints be addressed. If Aurora State Airport becomes overutilized and Mulino State Airport remains underutilized, ODA may be able to structure its rates and charges to achieve maximize utilization of both airports' capacities.

Aurora State Airport is not an FAA-designated reliever airport for Portland International, although it is often referred to as one. The Airport could be officially designated a reliever in the short-term future, if ODA decides to pursue the designation and the FAA agrees. However, the advantages the reliever designation once held--more AIP entitlement funding and higher priority for discretionary AIP funding--have disappeared in recent years.

FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airports Systems (NPIAS),* explains the requirements for reliever designation. An existing public-use airport may be included in the NPIAS as a reliever airport if it substantially relieves airport congestion at a commercial service airport and provides GA access to the surrounding area. Although reliever airports are designated by thorough case-by-case reviews, general requirements are:

- A current activity level of at least 100 based aircraft or 25,000 annual itinerant operations
- An airport must have a forecasted activity level of at least 100 based aircraft or 25,000 annual itinerant operations for the period in which it is being designated as a reliever.
- The relieved airport (in this case, Portland International (PDX)):

- is a commercial service airport that serves a metropolitan area (MA) with a population of at least 250,000 persons or at least 250,000 annual enplaned passengers, and

- operates at 60% of its capacity, or would be operated at such a level before being relieved by one or more reliever airports, or is subject to restrictions that limit activity that would otherwise reach 60% of capacity.

Aurora State Airport meets the first two criteria on current activity levels. The relieved airport (PDX) also meets the first of two criteria. The 2010 Master Plan for PDX reports the FAA has set the airport's capacity upper limit at 500,000 annual operations. By 2035, PDX is forecasted to have 377,820 operations. This means that by 2035, PDX will be operating at 76% of its capacity.

PDX would be operating at 60% of its capacity now if Aurora State Airport did not exist and the operations that now occur at Aurora State were added to PDX operations. Using averages for the years 1998 through 2008 from the FAA's Terminal Area Forecast, PDX has 284,580 annual operations and Aurora State Airport has 79,953 operations.[11] Adding Aurora's operations to PDX's operations results in a total of 364,533 operations, or 73% of PDX capacity. These figures meet the last criteria needed for a proposed reliever airport.

However, the PDX Airport Layout Plan includes the addition of a third runway that would greatly increase PDX's capacity, thereby decreasing the demand/capacity utilization to less than 60%.

It is recommended that Aurora State Airport continue to fulfill its role as an Urban General Aviation Airport. The advantages and disadvantages of becoming a reliever airport should be discussed with the ODA, Port of Portland, and FAA.

[11] Eleven-year averages are used to reduce the effect of annual fluctuations. These annual numbers do not match any one specific year because they are averages.

Chapter Two: INVENTORY

Airport Master Plan Update

Aurora State Airport

An initial step in the preparation of this Master Plan (Plan) is to collect data pertaining to the Aurora State Airport (Airport) and the area it serves. An inventory of the Airport was accomplished through physical observation of existing facilities, interviews with Airport users and business owners, Oregon Department of Aviation (ODA) staff, and a review of previous Airport studies and records.

This chapter summarizes the Airport's background, existing airfield and landside facilities, airspace, land use and zoning, environmental issues, and historical aviation activity and financial data. The information gathered as part of this initial step is the foundation for various analyses completed in the subsequent chapters of this Plan. An accurate inventory helps produce an aviation demand forecast that is reasonable and aids in identifying future facility development needs.

BACKGROUND DATA

Airport Location and Access

The Airport is situated in the heart of the Willamette Valley in Marion County, Oregon and is adjacent to Clackamas County to the north. It is located on the southern extents of the Portland metropolitan area, but resides within the Salem Metropolitan Statistical Area – as it is mid-way between Portland and Salem. The city of Aurora is located approximately one-quarter mile southeast of the Airport. **Exhibit 2A** shows a map of the region and Airport vicinity.

The majority of the County is rural and has abundant agricultural lands, making it the largest producer of agricultural products in the state of Oregon. The County's economy is also heavily dependent on government, as the state's capital is located within its boundaries.

The Airport is conveniently located adjacent to Interstate 5, which is an essential commerce link for the western United States. Access to the Airport is also provided by Highway 551 (Canby-Hubbard Highway) from the north and south, Arndt Road from the east and west, and Airport Road from Aurora. Keil Road is located south of the Airport and provides additional airport business access from Highway 551 and Airport Road.

Other transportation modes are available near the Airport. Canby Area Transit offers public transportation, with a bus stop on Main Street in Aurora. Taxi service is also available in Aurora. Amtrak train and Greyhound bus services are available in Portland.

Area Topography

A mostly rural county, Marion encompasses agricultural and recreational lands (*i.e.*, Ankeny National Wildlife Refuge, Mount Hood National Forest and Willamette National Forest). Marion County is in the central area of the Willamette River Basin, which is surrounded by the Cascade Range to the east, the Coast Range to the west, the Calapooya Mountains to the south and the Columbia River to the north. Generally speaking, the area is level with rolling hills. The Airport's elevation is 200 feet above mean sea level (MSL).

Climate

The Aurora area has mild, wet winters, and warm, dry summers. Winter temperatures generally range from 45 to 55 degrees Fahrenheit, and summer temperatures generally range from 70 to 80 degrees Fahrenheit. Annual rainfall averages 40.7 inches, with the majority of it occurring from November through March. Annual snowfall averages two inches per year. The mean maximum temperature in the hottest month (August) is 84 degrees.

Community and Airport History

Dr. William Keil founded the Aurora Colony in 1856. The colony disbanded in 1883, but the community persisted due to the people's craftsmanship, and because of the stage and rail stop bringing visitors to the town's hotel. Today Aurora is recognized as a national historic district and is known for its numerous antique dealers. According to Census records, the population of Aurora in 2009 was 1,020.

The Airport was established in 1943 and was managed by the United States Bureau of Public Roads until 1953. The State of Oregon has operated the Airport since 1953, although ownership of the land was not actually transferred from the Highways Division to the Aeronautics Division (ODA's predecessor) until 1973.

The first Airport Master Plan was prepared in 1976, followed by major improvements in 1977-78, which included construction of a parallel taxiway, installation of a rotating beacon, runway reconstruction and narrowing (to 100 feet), drainage improvements, runway lighting, and tiedown apron construction. The 1976 Plan identified the need for an air traffic control tower. In 1979, a 22-acre parcel near midfield was purchased with Federal Aviation Administration (FAA) funds, which has since been leased to private parties who constructed aircraft hangars and other facilities on the property. In 1986, another 10 acres with a small tiedown apron was purchased near midfield. A second Airport Master Plan for the Airport was completed in 1988. In 1995, the runway was lengthened from 4,104 feet to 5,004 feet and a non-precision Localizer Landing System instrument approach was added to Runway 17. In 2004, the runway was reconstructed and in 2009, the parallel taxiway was relocated to meet FAA's design standard for runway-taxiway centerline separation.

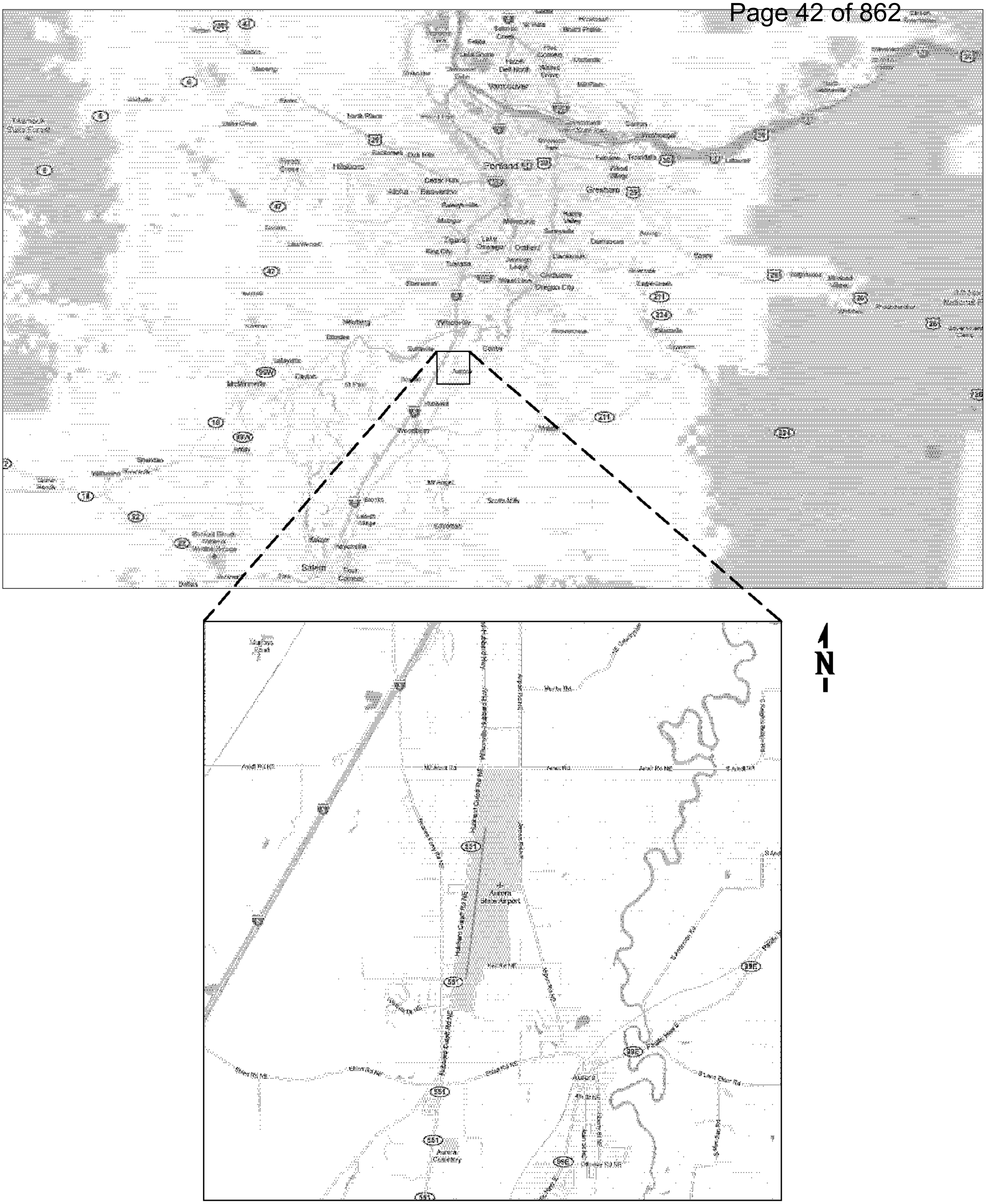


Exhibit 2A ~ Location & Vicinity Map

Aurora State Airport

Aurora, OR

August 20, 2010

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A unique public-private partnership has developed over the years at the Airport. The State's property is almost exclusively dedicated to airfield facilities (runway, taxiway, tiedown aprons, etc.), while the majority of tenants are located on adjacent private lands and access the Airport via through-the-fence agreements. This Plan will reference both "Airport Property" and "Airport Environs". Airport Property refers to the State's property owned in fee. Airport Environs encompasses the property used for airport-related activities, and includes public and privately owned property. The actual Airport fence encompasses the Airport Environs for safety and security purposes. The term through-the-fence is an FAA term used to describe aircraft accessing a public airfield from private land, and does not involve actual fences.

EXISTING FACILITIES

Existing facilities at the Airport are divided into three categories: airfield, landside, and support facilities. Airfield facilities include areas such as runways, taxiways, and aprons. Landside facilities include areas such as hangars, airport buildings, and auto parking. Support facilities include emergency services, utilities, and miscellaneous facilities that do not logically fall into either airfield or landside facilities. **Exhibit 2B** shows the existing facilities at the Airport.

Airfield Facilities

Airfield facilities include pavements used for the movement of aircraft (*i.e.*, runways, taxiways, taxilanes, aprons). In April 2008, as part of a three-year rotation, the Airport's Pavement Condition Index (PCI) was updated for those pavements located on Airport Property. The condition of the airport pavements were rated on a scale of 0-100 with 0 being an unusable paved surface and 100 reflecting a just-constructed paved surface. Generally, ratings with a PCI above 70 require only preventative maintenance in the short term, while ratings between 40 and 70 require major rehabilitation and ratings less than 40 typically require reconstruction. **Exhibit 2C** depicts the pavement condition map for the Airport. The exhibit does not show the recent Taxiway A relocation since the pavement survey was done before the taxiway project. At the time the PCI was updated, pavement sections were documented. Pavement sections describe how individual sections of pavement were constructed. In general, most pavements at the Airport consist of four inches of asphalt on top of 6-13 inches of a crushed aggregate base. **Exhibit 2D** provides a detailed graphic of the existing pavement sections at the Airport.

Runway. The Airport has one paved runway, 17/35, with the dimensions of 5,004 feet by 100 feet. The runway pavement surface is asphalt and in April 2008 was given a PCI rating of excellent. The pavement strength of the runway is rated as 30,000 pounds for Single Wheel Gear (SWG)[1] aircraft and

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[1] Single Wheel Gear is the term used to describe aircraft with one wheel per strut, while Dual Wheel Gear is for aircraft with more than one wheel per strut. An aircraft's landing gear configuration and gross weight are critical components in airfield pavement design and are used to characterize pavement strength.

45,000 pounds for Dual Wheel Gear (DWG). A 150-foot blast pad is located at the Runway 35 end. The runway supports general aviation, which include private and business operators but does not include commercial (airline) operators.

Taxiways and Taxilanes. Taxiways are constructed primarily to facilitate aircraft movements to and from the runway. Some taxiways are necessary simply to provide access between aprons and the runway, and other taxiways are necessary to provide safe and efficient use of the airfield.

Runway 17/35 has a full-length parallel taxiway (Taxiway A) that is 35 feet wide. Five taxiways connect Taxiway A to Runway 17-35; Taxiway A1 is located at the Runway 17 end, and A5 is located at the Runway 35 end.

From Taxiway A, ten taxilanes lead to aircraft parking, hangars, and airport businesses. Additional taxilanes are located between hangar buildings. Taxiways and taxilanes are constructed of asphalt and have PCI ratings between 70 and 100, which is representative of pavements in very good to excellent condition. Pavement condition was not rated for taxilanes on private property)

Aprons and Aircraft Parking. On state-owned property, there are 46 designated tiedown positions. On privately owned property, there are 37 designated tiedown positions with additional aprons for large aircraft parking. The 2000 Master Plan reported 180 tiedown positions; many of these were removed because of hangar construction and the taxiway relocation project. Additionally, there are two helipads on private property and a commercial helicopter operation area for Columbia Helicopters at the northeast end of the Airport.

Airfield Lighting. Airfield edge lighting systems are categorized as low, medium, or high intensity. The color of the lights is also important as it indicates to pilots where they are in the airport environment. For example, runway edge lights are white and taxiway edge lights are blue.

At the Airport, the lighting system is a medium intensity system, which is pilot controlled by keying the microphone inside of the aircraft. Edge lighting is located on the runway and parallel taxiways, while the apron and hangar taxilanes are lined with edge reflectors.

Airport Navigational Aids. Airport Navigational Aids, or NAVAIDS, provide navigational assistance to aircraft for approaches to an airport. NAVAIDS are classified as visual approach aids or instrument approach aids; the former providing a visual navigational tool and the latter being an instrument-based navigational tool. The types of approaches available at an airport are based on the NAVAIDS provided. The following sections describe existing NAVAIDS at the Airport.

Visual Approach Aids. The Airport has three forms of visual approach aids. A two-box Visual Approach Slope Indicator (VASI) is located at each runway end. VASIs give glide slope information to pilots on final approach by displaying sequences of different colored lights to maintain a safe glide slope for landing. Runway 17 has both an Omnidirectional Approach Lighting System (ODAL) and Runway End Identification Lights (REILs). The ODAL lighting system – typically associated with runways with instrument approach procedures – consists of a series of strobe lights that extends outward from the

Exhibit 2B ~ Existing Airport Facilities

Aurora State Airport

Aurora, OR

Legend

Bldg No.	Name / Owner	Use
1	Leased b y Aurora Jet Center	Maintenance, aircraft storage
2	Aurora Jet Center	Fixed Base Operator
3	Private Southend Hangar	Aircraft storage
4	Hogan's Hangar	Aircraft storage
5	Van's Aircraft	Business
6	Artex	Business
7, 8	Foxtrot Hangars / Southend Airpark	Aircraft storage
9	Hangar Row G / Southend Airpark	Aircraft storage
10	Hangar Row H / Southend Airpark	Business, aircraft storage
11	Hangar India, Juliet & Kilo / Southend Airpark	Business, aircraft storage
12	Winco	Business
13	Hangar November / Southend Airpark	Business, aircraft storage
14	Hangar Mike / Southend Airpark	Business, aircraft storage
16 - 17	Airport Aviation Condo Association	Aircraft storage

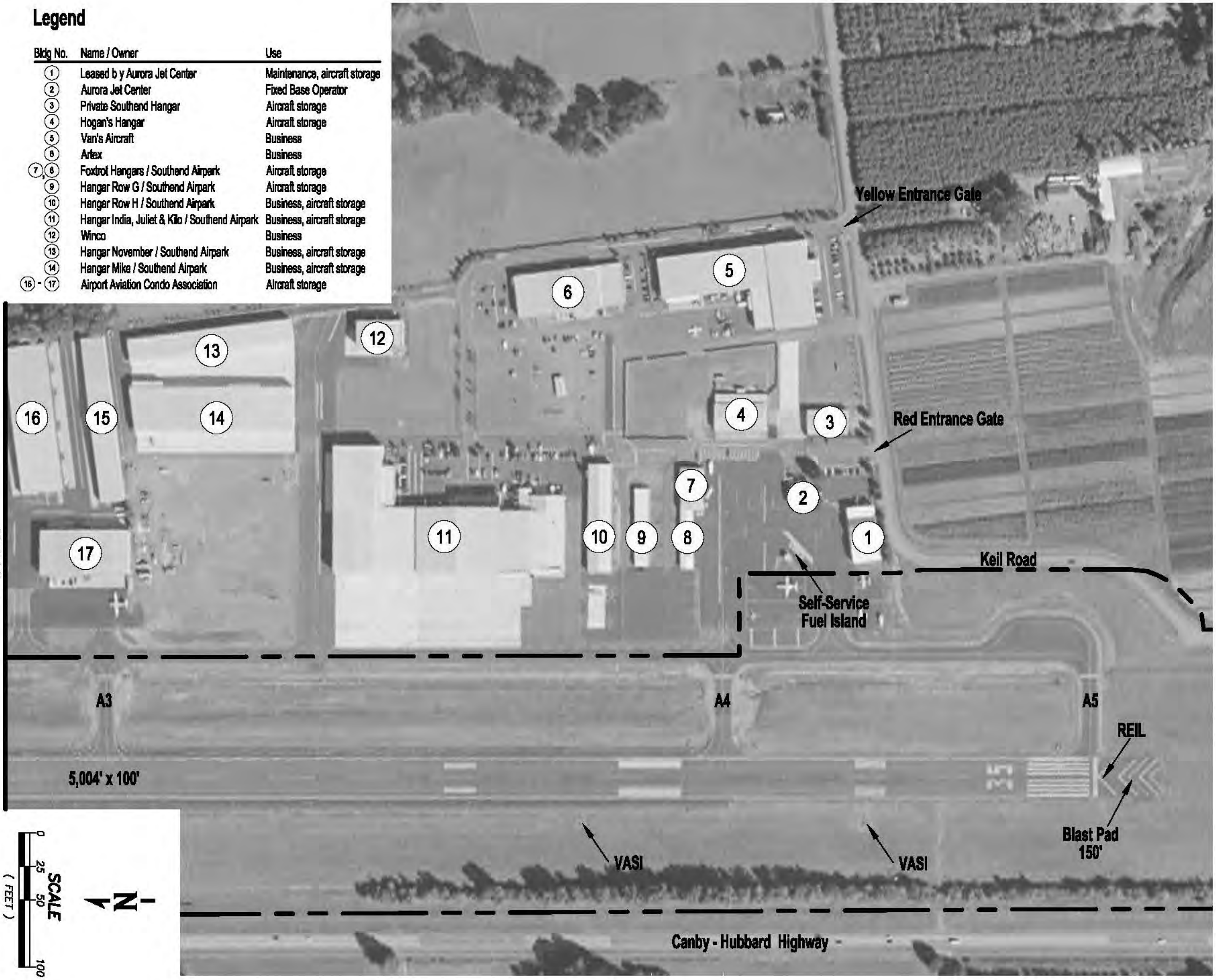

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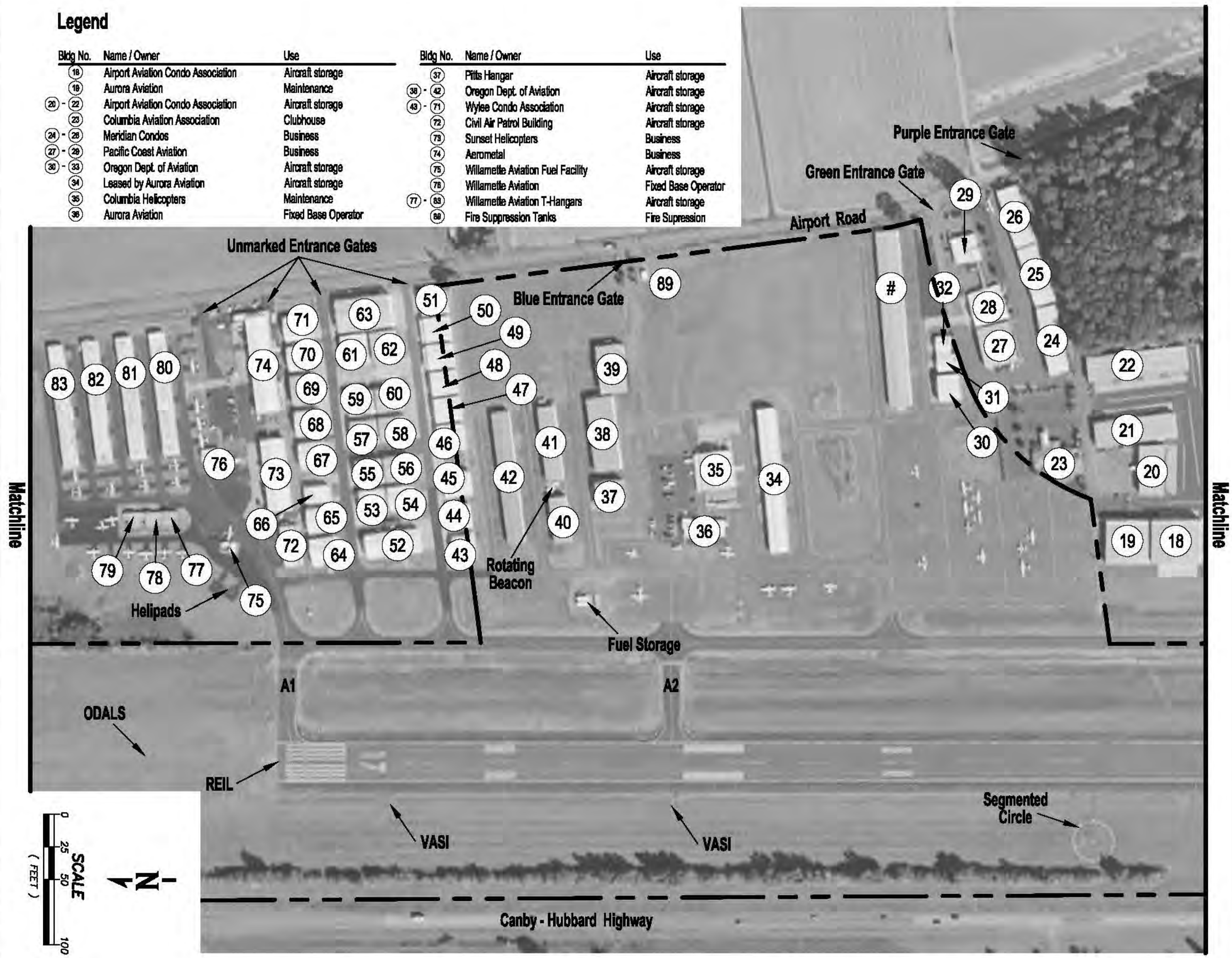
Exhibit 2B ~ Existing Airport Facilities

Aurora State Airport

Aurora, OR

Sept 16, 2010



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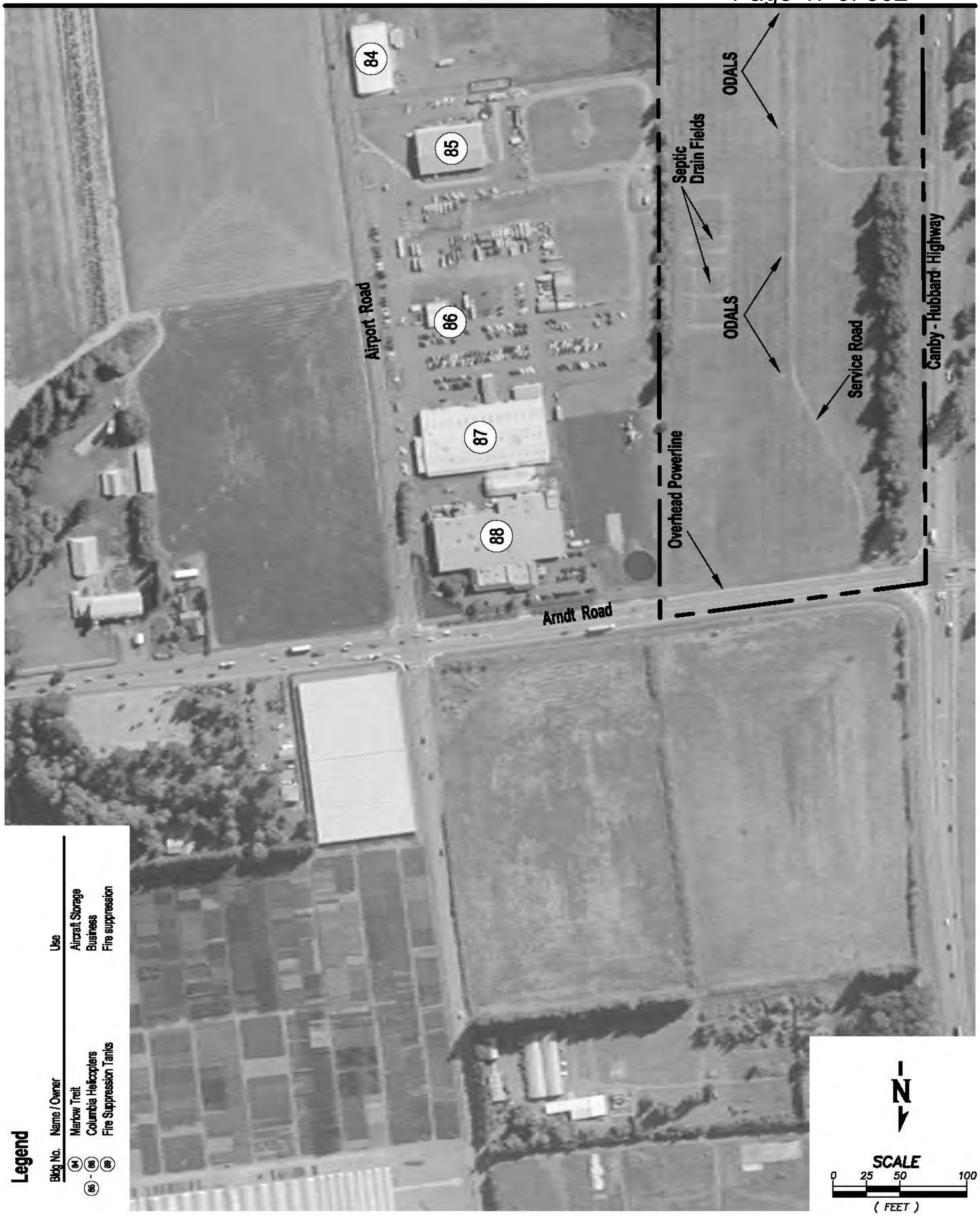

Exhibit 2B ~ Existing Airport Facilities

Sept 16, 2010

Aurora State Airport

Aurora, OR

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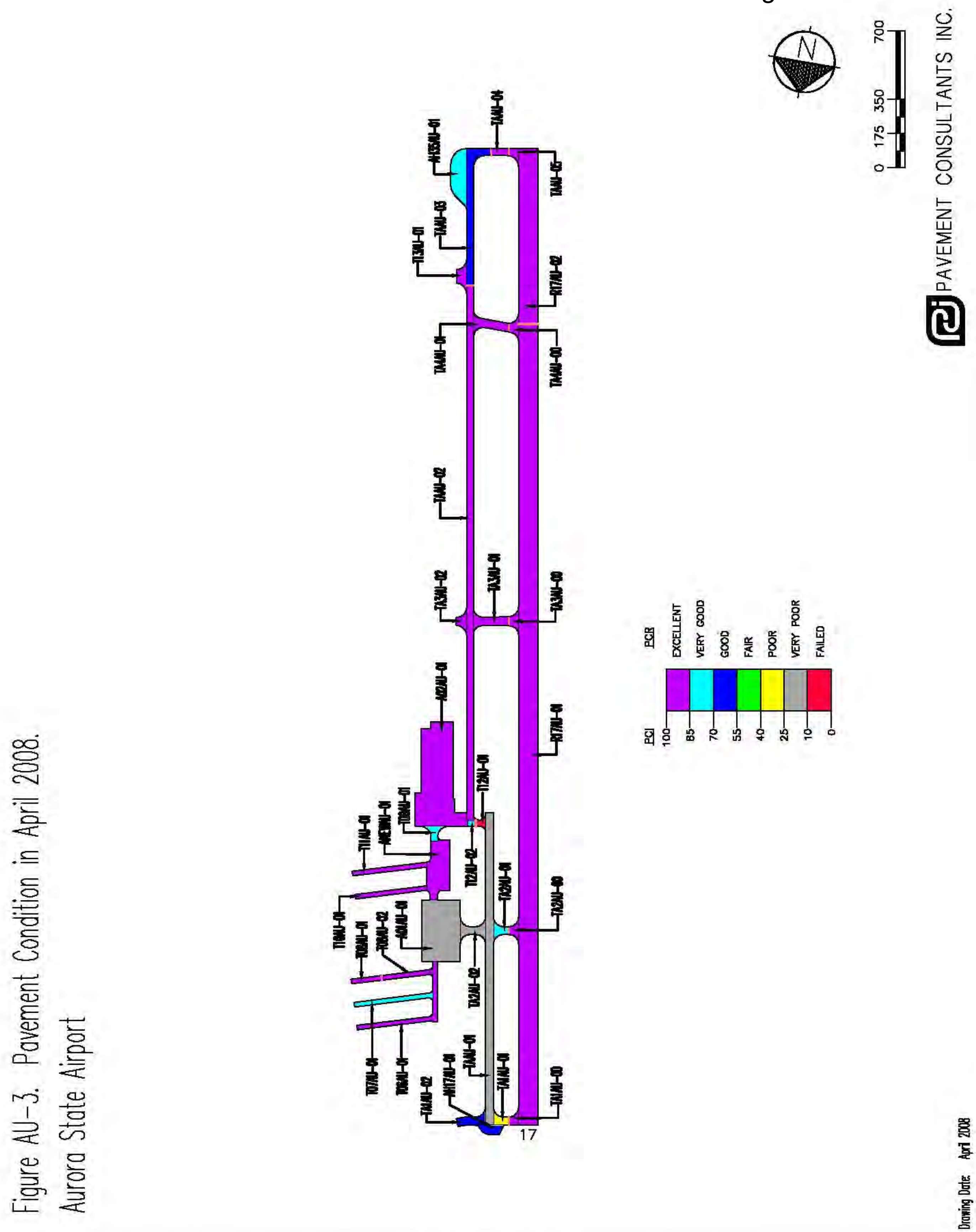

Exhibit 2C ~ Pavement Condition Map

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Aurora State Airport

Aurora, OR

Exhibit 2D ~ Pavement Section Map

Aurora State Airport

Aurora, OR

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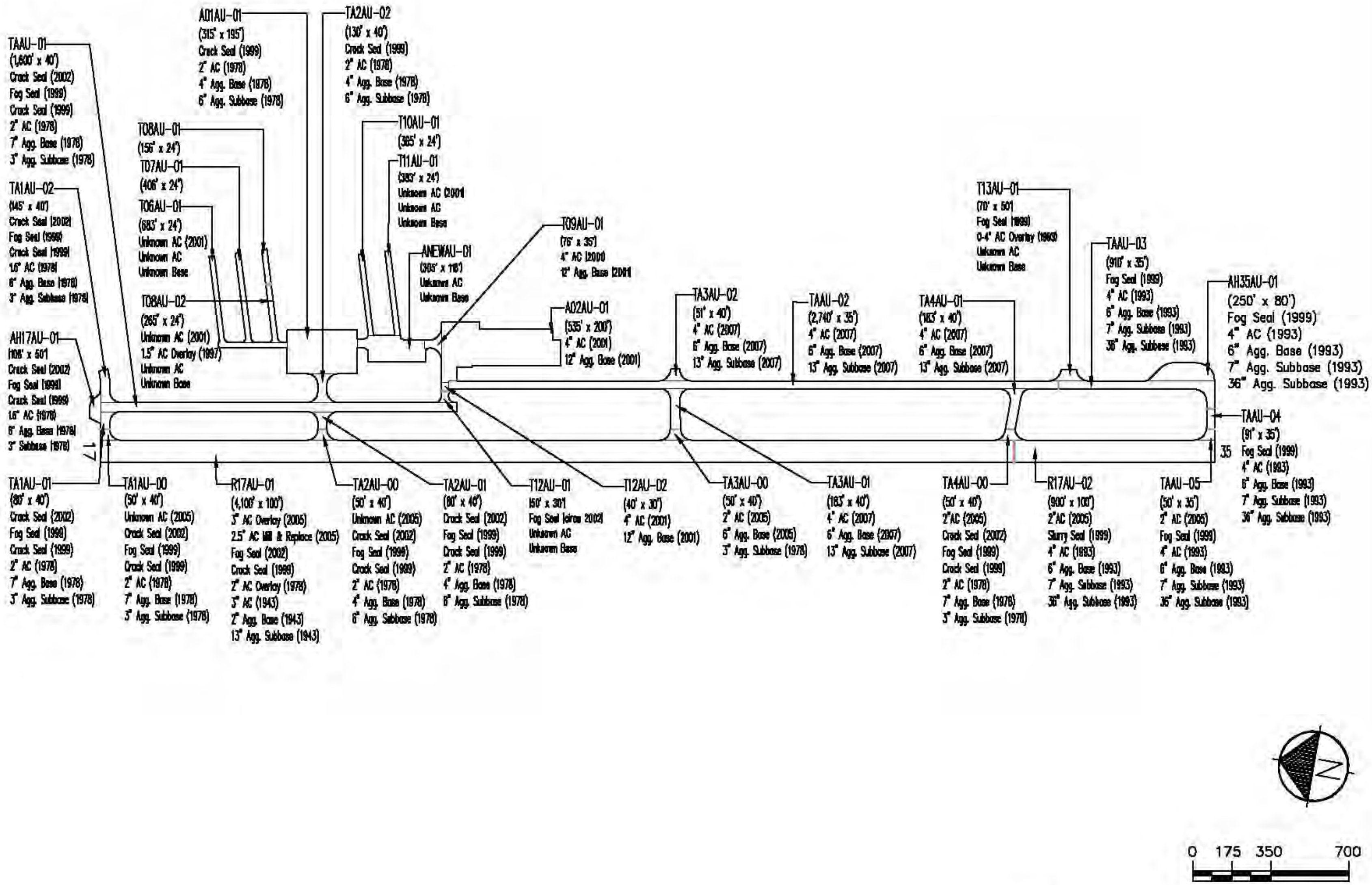
Figure AU-1. Airport Layout, Dimensions and Pavement Cross-Sections.

Aurora State Airport



PAVEMENT CONSULTANTS INC.

Drawing Date: April 2008

runway end and allows pilots to visually identify the runway environment. REILs are located at the Runway 17 threshold to provide rapid and positive identification of the runway end.

Instrument Approach Aids. Both Runway 17 and 35 have instrument approach procedures, which can be used when the visibility and cloud ceiling are below minimums for Visual Flight Rules (VFR) conditions. **Table 2A** details the approaches available at the Airport.

Additionally, the HELNS FOUR Standard Terminal Arrival (STAR) is available for pilots arriving at the Airport. A STAR is a published procedure followed by aircraft on an Instrument Flight Rules (IFR) flight plan just before reaching the Airport. Special departure procedures apply for aircraft departing the Airport during instrument conditions, as well.

Table 2A. Instrument Approaches and Approach Minima

Approach Name[2]	Runway End Serviced	Approach Minimums	
		Ceiling (feet)	Visibility (statute miles)
RNAV (GPS)	17	400	1 ¼
	35	500	1
RNAV (GPS)-B	17 and 35	500	1
LOC	17	400	1
VOR/DME-A	17 and 35	500	1

Other NAVAIDS. There is a lighted wind cone and segmented circle located west of the runway at the midfield point. A rotating beacon is located east of the runway between buildings 40 and 41, as shown on Exhibit 2B. An Automated Surface Observing System (ASOS) provides real-time weather information.

Landside Facilities

Hangars and Other Buildings. On the Airport Environs there are 89 buildings. On public property there are 14 buildings: five T-hangar buildings, seven conventional / multiple-aircraft hangars, and two other buildings (fixed base operator and fire suppression facility). On private property there are 75 buildings: six T-hangar buildings, 51 conventional / multiple-aircraft hangars, and twenty other buildings (businesses, office space, etc.). Below **Table 2B** lists those buildings, their ownership, and usage.

Aviation Services. A fixed based operator (FBO) is an individual or a business that offers aviation-related services such as flight instruction, aircraft rental, aircraft maintenance, hangar/tiedown storage,

[2] RNAV (Area Navigation) is a method of navigation that allows aircraft to choose any course within a network of navigation beacons, rather than navigating directly to and from the beacons. GPS (Global Positioning System) is a space-based global navigation satellite system. LOC (Localizer) is an approach type that provides runway centerline guidance to aircraft. VOR/DME (very high frequency omnidirectional radio range / distance measuring equipment) is a type of radio navigation system.

and aircraft fueling to Airport users. There are currently three FBOs at the Airport: Aurora Aviation, Aurora Jet Center, and Willamette Aviation Service.

Table 2B. Building Ownership and Use

Land Ownership	T-Hangar Buildings[3]	Conventional / Multiple-Aircraft	Other (business, office, etc)	Total
Public (ODA)	5	7	2	14
Private	6	51	18	75
Total	11	58	20	89

Airport Access and Vehicle Parking. There are multiple access points to the Airport. Exhibit 2B depicts these locations. A colored gate system has been employed by private businesses at the Airport to assist in emergency response and advertisement. These gates are also depicted on the exhibit. Businesses must offer adequate parking for employees and customers. Individual tenants park adjacent to or in their hangars while flying; some parking lots are available for their use, as well.

Airport Support Facilities

Emergency Services. The Aurora Rural Fire Protection District provides fire protection. A 500,000-gallon fire suppression system was recently installed to assist the District in protecting the Airport. The Marion County Sherriff Department and Oregon State Police provide emergency services.

Airport Maintenance. Airport maintenance is provided by ODA. Mowers, trucks, and other maintenance equipment are stored at their office/maintenance building in Salem. ODA has recently begun to utilize the services of the Oregon Department of Transportation (ODOT) for a majority of the mowing that occurs at the Airport. ODA provides snow removal services.

Airport Fencing. Fencing surrounds the perimeter of the Airport Environs. All access points are gated, although not all are automated. The non-automated gates sometimes remain open during normal business hours.

Utilities. Utilities and public services provided at the Airport include:

- Water – Individual well system
- Sanitary Sewer – Individual drain field / septic tank systems
- Telephone – Local franchise companies
- Electricity – Portland General Electric

[3] Multiple aircraft are stored in each T-Hangar building.

Surrounding communities have expressed concerns that additional growth at the Airport and the potential for Airport expansion will have negative impacts upon their water supplies and/or water quality. Advanced planning and feasibility assessments regarding the Airport's ability to meet water, sewer, and fire protection needs for development and expansion are of concern. While not required as part of the Airport Master Plan Update and not included in this document, the ODA recognized the importance of completion of this work in the future. ODA is supportive of pursuing funding options for such studies and supports surrounding communities in their support of funding such studies.

Airport Signage. Guidance signs to the Airport are located on Interstate 5, Highway 551, Arndt Road, Airport Road, and Keil Road and are maintained by ODOT. The colored gate system also provides signage to individual businesses.

Other Support Facilities. There are no restaurants on Airport; however, food service trucks are regularly located at the Airport. Additionally, Langdon Farms and the Cities of Aurora and Wilsonville offer restaurant options. Aurora offers public transportation, lodging, and tourism activities within walking distance of the Airport.

AIRSPACE

The FAA is responsible for the control and use of navigable airspace within the United States. Aircraft in flight, whether approaching or departing an airport, are subject to varying degrees of FAA control depending on location and meteorological conditions. These levels of control are called airspace classes. The alphabet characters A through G distinguish classes. Each class has its own unique shape and rules that govern such things as visibility minimums and cloud clearances.

The Airport is located in Class G airspace. Class G airspace is considered uncontrolled airspace in that pilots are not required to communicate with air traffic controllers; however regulations regarding visibility minimums and cloud clearances still apply. The Airport's airspace is depicted on the Seattle sectional chart (see **Exhibit 2E)**. The Airport is located south of Portland International Airport (PDX) and northeast of Salem McNary Field. Several private airports are also in the surrounding area. The Airport's location is such that it lies underneath two Victor Airways (V165 and V500), which are "highways in the sky." A Victor Airway is a corridor of protected airspace defined by radio navigational aids. In the case of the Airport, the Victor Airways (depicted with semi-transparent blue lines on Exhibit 2E) lead to PDX, making over flying traffic a common occurrence.

Traffic flows at the Airport are standard, left-hand patterns. Pilots are to fly the patterns at 1,000 feet above ground level (1,200 feet mean sea level). In 2002, ODA commissioned an airport noise mitigation study that recommended Runway 35 be designated the calm wind runway, to avoid frequent operations over noise-sensitive residential properties. ODA reports that complaints from neighboring Aurora have dropped since this designation was enacted, although complaint levels from the north have remained at a consistent level. There have been complaints by users that this scenario creates unnecessary conflicts between VFR traffic (landing northbound) and IFR traffic flying approaches to Runway 17 (landing southbound) during visual meteorological conditions.

LAND USE PLANNING AND ZONING

The following land use and zoning discussion focuses on four areas:

- Airport Environs zoning and land use.
- Surrounding area zoning and land uses.
- Protection of airport airspace to prevent hazards and land uses that may interfere with the safety of aircraft operations.
- Ownership/control of Airport runway protection zones to enhance the safety of people and property on the ground.

Federal, State, Regional, County, and City land use regulations need consideration when reviewing existing land uses for airport compatibility and when planning for future development at and around an airport.

Federal regulations are also concerned with airspace protection (14 CFR Part 77) and noise levels, particularly for areas that fall within the 65-decibel (dBA) noise contour line. 14 CFR Part 77, *Objects Affecting Navigable Airspace,* establishes obstruction standards used to identify potential adverse effects to air navigation and notice standards for proposed construction. Imaginary surfaces are the basis for protecting the airspace around runways. There are five imaginary surfaces: primary, approach, transitional, horizontal, and conical. Definitions of each imaginary surface will be discussed in a later chapter. These surfaces should be kept clear of all obstructions.

FAA guidelines state that before FAA grants can be received the Airport Sponsor must provide assurances that appropriate actions have been (or will be) taken, to the extent reasonable, to restrict the use of land adjacent to or in the immediate vicinity of the Airport to those that are compatible with normal airport operations.

Existing Airport Environs Zoning and Land Use

The entire Airport Environs is zoned as “Public” in the Marion County Zoning Code (see **Exhibit 2F**). Marion County is the planning and building permit authority for the Airport. The Airport’s existing zoning classification partially complies with Oregon Revised Statutes (ORS) 836.600 through 836.630, Local Government Airport Regulation. The county has adopted airport overlay imaginary surface protection which mirrors Part 77 imaginary surfaces. However, Marion County has not adopted the standards of ORS 836.616 which authorizes certain airport uses and activities to occur at the Airport.

Clackamas County and Aurora have both enacted Airport Overlay Zones as required by ORS 836.600 through 836.630.

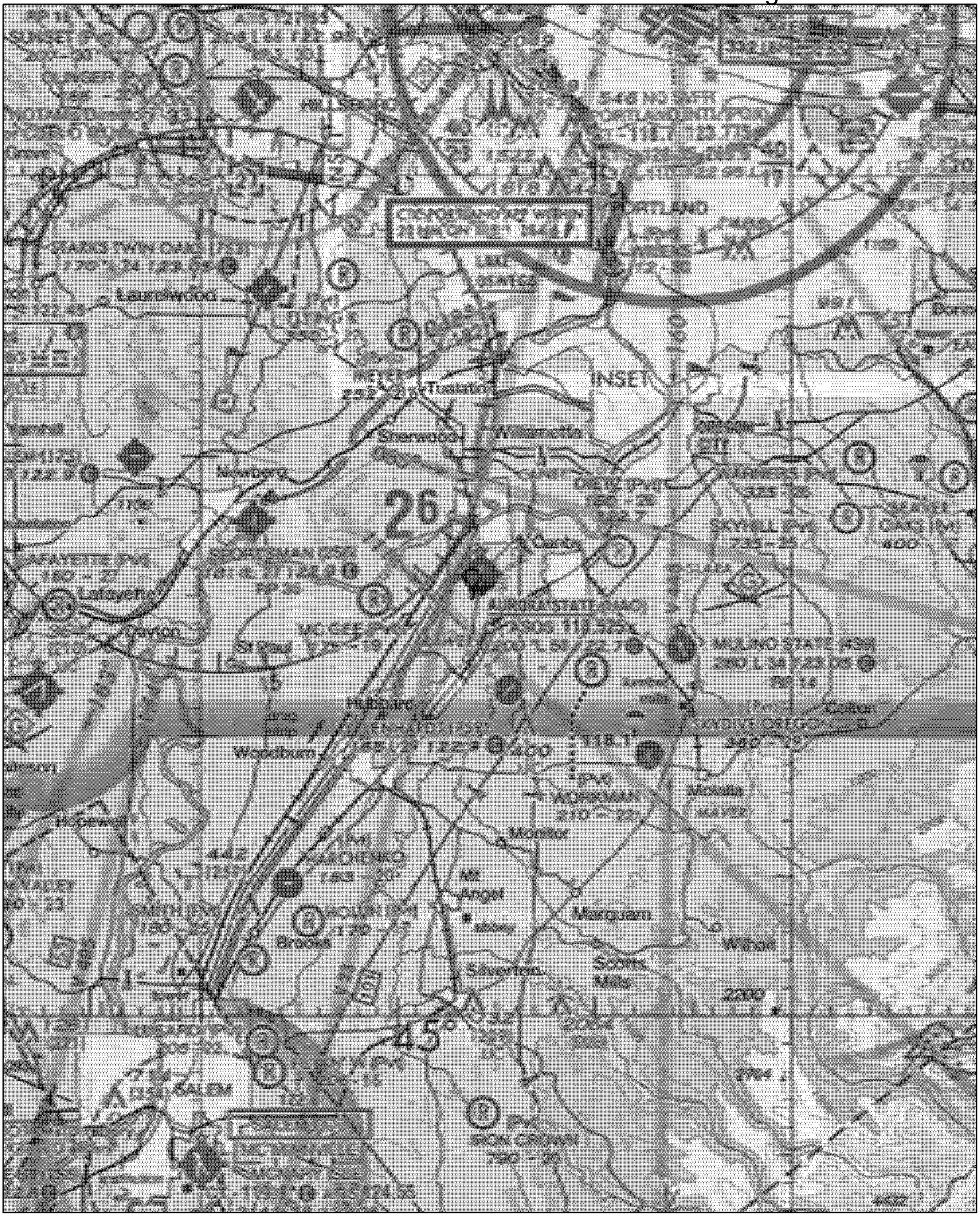


Exhibit 2E ~ Airspace

Aurora State Airport

Aurora, OR

August 20, 2010

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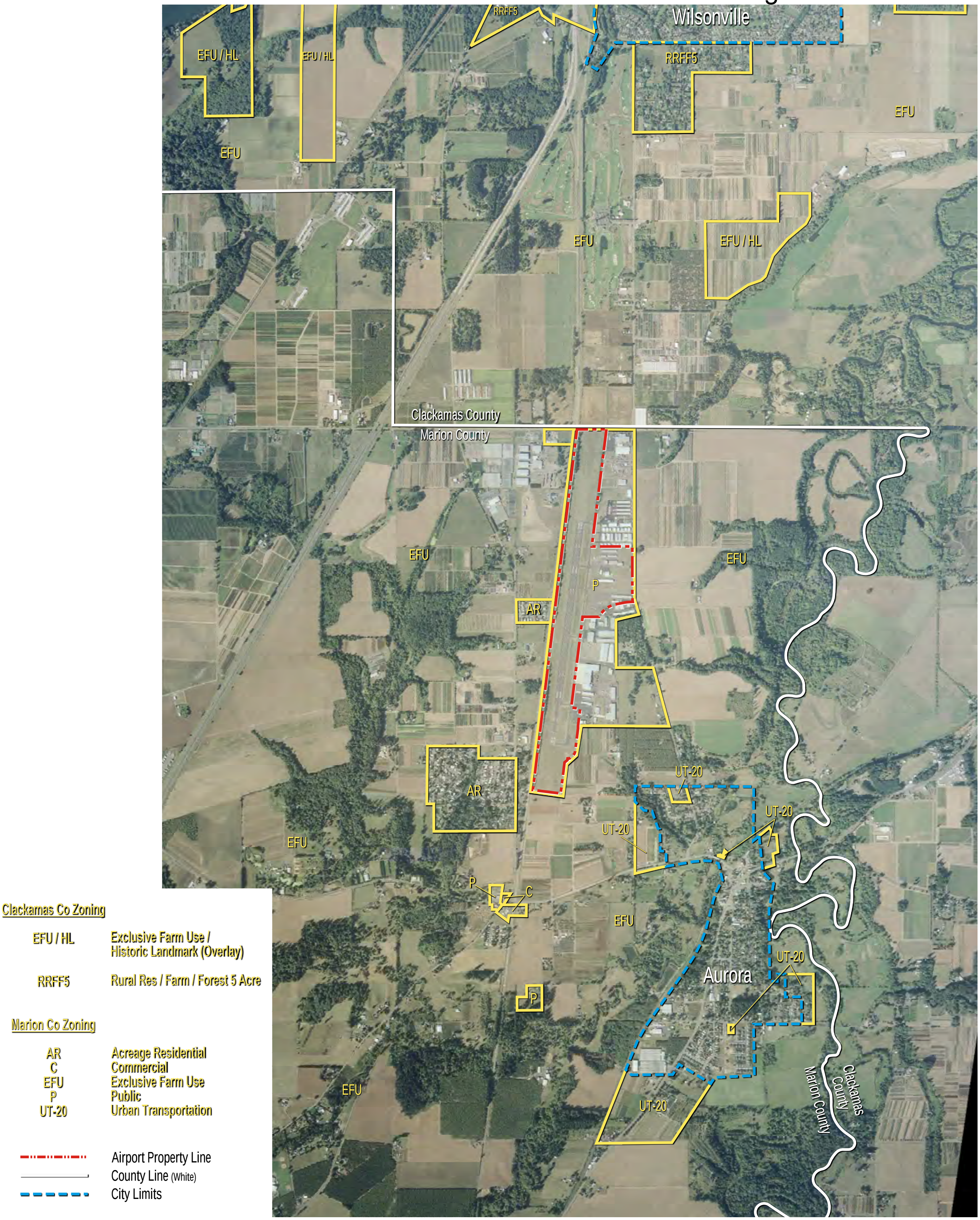

Exhibit 2F ~ Zoning Map

Aurora State Airport

Aurora, OR

August 20, 2010

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Surrounding Area Zoning and Land Use

The Airport is surrounded primarily by agricultural and rural residential land uses. Land to the east, south and west is within Marion County, while land to the north resides in Clackamas County. The zoning is predominantly Exclusive Farm Use, with two residential areas zoned Acreage Residential west of the Airport and a golf course and rural residential (5-acre) north of the Airport.

A section of the Airport and the surrounding lands are reference in the Urban Growth Boundary Coordination Agreement with Marion County, as an Area of Mutual Concern for the City of Aurora. Additionally, the ODA, Marion County, and City of Aurora have an Intergovernmental Agreement supporting communication between the involved parties relating to the Aurora State Airport. Within the City of Aurora Comprehensive Plan, the Airport is referenced in Goals 9, 11, and 14.

The Airport Master Plan is incorporated by reference in the 2005 Transportation System Plan (TSP) for Marion County, which is currently being updated. The TSP identified an Access Management Plan for the Wilsonville-Hubbard Highway (Highway 551) and Arndt Road intersection and indicated that the intersection would be operating at a level of service (LOS) 'F' (maximum volume/capacity) by 2015. The TSP identified improvements at this intersection as a 0-5 year priority to resolve congestion and safety problems. The TSP also indicated the intersection of Arndt Road and Airport Road would be operating at LOS ‘F’ in 2015. The TSP identifies this improvement as a 5-10 year priority to resolve congestion issues. Clackamas County TSP (2002) also identified improvements in the Arndt Road corridor from Airport Road to Ore 99E in its 20-year Capital Needs list (although this project was shelved in the County’s 2006-08 Capital Improvement Plan). The Clackamas County TSP states the goals of minimizing conflicts between airports and other uses, and coordination with Marion County to implement regulations on development near the Airport.

Protection of Airport Airspace

The FAA requires that airport sponsors – to the extent of their ability – restrict zoning on adjacent lands and lands within an airport’s immediate vicinity to compatible land uses. Marion County has established an Airport Overlay Zone to protect the Airport and its airspace from hazards to air navigation, such as tall structures and other non-compatible land uses. An overlay zone may restrict the height of buildings and other structures or trees. Airport overlay zones also may restrict any land use that would create such hazards as electrical interference with airport radio communications, cause glare or impair visibility near the airport or would attract wildlife.

Ownership/Control of Runway Protection Zones

Runway Protection Zones (RPZs) are designated areas off runway approaches that enhance the protection of people and property on the ground. RPZs are trapezoidal in shape and have dimensions determined by the aircraft type and runway approach visibility minimums. The FAA strongly encourages Airport Sponsors to either own or exercise land use control within the RPZs. If an airport does not own the RPZs in fee, control of obstructions to airspace can be achieved through avigation easements. ODA owns all property within the Airport’s two RPZs, except for a small portion that overruns onto Columbia Helicopters’ property.

ENVIRONMENTAL INVENTORY

The purpose of this section is to summarize the environmental setting of the Airport, and identify any potential environmental constraints.

Environmental constraints for airports typically fall into two general categories: human environment and natural environment. Human factors that can constrain airports include existing settlements and incompatible land use, noise, social or socioeconomic conditions, light and glare, and the general controversial nature of airports. Natural environmental elements include various aspects of air quality, water resources, fish and wildlife, hazardous materials, energy and other resource issues.

Human Factors

Noise. The Airport currently supports about 87,345 annual operations (2008 FAA Terminal Area Forecast), mostly single engine aircraft. The typical threshold of concern is when the 65 DNL contour extends over noise sensitive land uses. Because the majority of the adjacent land is in agricultural use, the number of noise sensitive uses is minimal. Another threshold of significance is 90,000 annual adjusted propeller operations. The current usage of the Airport is approaching this level. Noise modeling will be prepared as part of this Master Plan, and the 65 DNL contour will be identified for the future anticipated airport use. Per Oregon Department of Environmental Quality guidelines, the 55 DNL will also be shown, even though Oregon has suspended its noise program.

Noise associated with the Airport is an existing issue for the communities of Aurora and neighboring Charbonneau and Deer Creek. In 2002, ODA commissioned a noise mitigation study. Recommendations of that study were to adopt a noise abatement procedure and implementation program, and change the calm wind Runway designation to Runway 35. Both of these recommendations have since been implemented. Additionally, a noise committee has been formed in association with Positive Aurora Airport Management (PAAM) to monitor noise issues.

Land Use. The Marion County zoning map designation for the Airport Environs is Public. Airports and airport-related commercial and industrial uses are conditional uses in the Public zone. The airport is surrounded primarily by land zoned for Exclusive Farm Use. Further to the north of the Airport are rural residential-farm forest (5-acre) zoned lands and a golf course, along Airport Road. To the west, along the Wilsonville-Hubbard Highway and Boones Ferry Road, there are two residential areas zoned Acreage Residential. Marion County also has an Airport Overlay Zone for Aurora State Airport.

The Airport Master Plan is incorporated by reference in the 2005 Transportation System Plan for Marion County. This plan is currently being updated.

Social Impact and Induced Socioeconomic Issues. Social impacts are typically related to relocation of businesses, residences or the alteration of established patterns of life (e.g. roadway changes, new facilities that divide a community, et cetera.) per the National Environmental Policy Act. In the event the State acquires additional land for airport expansion, existing homes or businesses may be required to relocate.

Socioeconomic issues include the potential for the Airport to provide an economic attraction to the community, including on-airport jobs, off-airport jobs that are supported by the Airport, or some attraction that provides incentive to use the Airport. The Airport provides some positive economic benefit to the community—flight lessons, aircraft repair, and other services. The Airport also has land and buildings that provide rental income to the State. According to Airport Management, there have been two or three businesses considering locations in Clackamas or Marion counties, and the location of the Airport and the ability to base a corporate aircraft there have factored into these considerations.

Environmental Justice is a specific aspect of socioeconomic impact that addresses whether a facility places a disproportionate burden on a population that is otherwise subject to perceived discrimination or other burden, for example a low-income or ethnic minority community. There do not appear to be populations meeting the definition within the immediate airport vicinity.

Historic Properties, Cultural Resources (Section 106 Resources). The site has been an airport since 1943. The subject site has been disturbed during the construction of the initial airport, construction of private hangars and other structures, the extension of the runway and taxiway extension in 1990, and for more recent runway reconstruction and taxiway relocation projects at the Airport. During excavation for these activities, no artifacts were found.

Historically, the land fell into the range of the Ahantchuyuk tribe of the Kalapuya Indians, now one of the Confederated tribes of the Grand Ronde. Cultural resource studies and tribal consultation were performed for the 2005 taxiway relocation project. No resources were identified and the tribe concurred that the property is not of interest.

Recreational Lands (Section 4(f)) Resources. There do not appear to be any public recreation areas in the immediate vicinity of the Airport.

Wild and Scenic Rivers. There do not appear to be any designated or candidate Wild and Scenic Rivers in the immediate vicinity of the Airport.

Farmland Preservation. Certain types of soils are considered prime farmland because of their drainage, mineral, and other characteristics. These soils, when in urbanized or developed areas, are not considered prime due to the compaction and other activities that degrade the potential for farm use. The Natural Resources Conservation Service on-line soil database map (OR643 Soil Survey of Marion County, Oregon) found nine soil types in the Airport area. All but one of these soil types has the potential to be either prime farmland or farmland of statewide significance, under the NRCS classifications. Soils can meet these classifications with either irrigation or drainage, depending on the soil type. In addition, much of the area around the Airport is designated Exclusive Farm Use (EFU), a state-defined zoning category for land considered prime farmland. Furthermore, some of the farmland near the Airport has been classified by the Oregon Department of Agriculture as Foundation Farmland.

FAA Guidelines state that the Farmland Protection Policy Act (FPPA) is not applicable and no formal coordination with the Natural Resource Conservation Service (NRCS) is required if any of the following conditions apply:

- The land was purchased prior to August 6, 1984, for purposes of being converted.
- Acquisition does not directly or indirectly convert farmland (e.g., land acquired for clear zones or noise compatibility). Indirect conversion includes any use of land or operation of the facility, which would prohibit the land from being farmed.
- The land is not prime farmland as defined in the FPPA.
- The land is not unique farmland.
- The soils are not considered prime farmland.
- The land has not been determined by a state or local government agency, with concurrence of the Secretary of Agriculture, to be of statewide or local importance.

Development of any land acquired outside of the existing Airport would be subject to NRCS coordination. The NRCS coordination is conducted by FAA per NEPA requirements, once a project is identified and if the project includes a taking of farmland. Through consultation, the NRCS would need to be shown there is no feasible and prudent alternative to taking farmland for the use.

Light and Glare. On-airport lighting is focused for visibility to aviators, without creating a disturbance or distraction. Any additional facilities will need to consider the impact of light or glare, including the use of windows or roofing material, on aviation. Similarly, residences and other sensitive receptors are located some distance from the Airport. Any additional lighting or structures will need to be focused such that light or glare is not projected into the community.

Natural Factors

Air Quality. The Airport is just outside of the Portland Air Quality Maintenance Area, in a "non-classified" area. Any construction impacts will need to consider the impact of particulate material on the local environment, including water quality and other resources. There are no "air quality hot spots" for surface transportation facilities in the airport vicinity. General aviation airports typically do not generate significant amounts of surface traffic. However, to provide information for the Master Plan, the ODA is investigating the possibility of sampling traffic at Airport access drives, to quantify the Airport's contribution to traffic on surrounding roads.

Water Quality. The Airport site lies on the boundary between the Pudding River basin and Middle Willamette River subbasin. Creeks include Deer (Pudding basin), Senecal and Mill Creeks (both Middle Willamette). The Pudding River has been listed by the DEQ for exceeding standards for temperature, fecal coliform and DDT. Mill Creek has been listed for temperature.

Projects on the Airport to modify the taxiway included improvements to the stormwater collection system and a modification to the Airport's NPDES permit. Any additions to impervious surfaces or changes in drainage plans for the Airport must be evaluated in the context of the permit conditions.

Plants and Animals, Including Endangered and Threatened Species and Essential Fish Habitat (MSA resources). The Airport is located within the Willamette Valley Ecoregion, located between the Coast Range and the Western Cascades in northwestern Oregon. The abundant rainfall and fertile soils make the valley Oregon's most important agricultural region. As a result, the Willamette Valley comprises Oregon's most altered ecoregion.

The Willamette Valley's location on the Pacific Flyway makes it an important area for migrating and wintering waterfowl. Geese and shorebirds benefit from flooded agricultural lands, and the Willamette River and its many tributaries support salmon and steelhead runs, mostly of hatchery origin due to the large number of dams in the system. The valley's few remaining fragments of native prairie support many special plant species and endemic invertebrates, while the remaining wetlands provide habitat to the Oregon chub, the western pond turtle and many other sensitive animal species.

The Airport does not currently have any issues with wildlife or bird strikes.

The Airport Environs includes site conditions typical of an airport facility in regards to the maintenance of the grounds and vegetation. Existing vegetation includes a mixture of invasive and native species, predominantly made up of grasses and forbs. An extensive mowing schedule maintains all vegetation for airport safety and visibility as required by FAA regulations. A row of trees along the west side of the Airport will be removed in fall 2010, because many of the trees are obstructions that penetrate the imaginary transitional surface.

The nearest waterways are the Pudding River and Deer Creek. Each system is approximately the same distance from the Airport, with the nearest tributary drainage located approximately 3,300 feet from the Airport. The Pudding River has a documented population of both Upper Willamette River Steelhead and Chinook salmon, both listed as Threatened under the Federal Endangered Species Act (ESA).

Previous environmental reviews for projects at the Airport have identified the potential for the following listed species, as well as their critical habitat (where defined) in the airport vicinity: Upper Willamette River Steelhead (*Oncorhynchus mykiss*), Upper Willamette River Chinook Salmon (Oncorhynchus tshawytscha), Fender's blue butterfly (*Icaricia icarioides fenderi*), Golden Indian Paintbrush (*Castilleja levisecta*), Willamette Daisy (*Erigeron decumbens var. decumbens*), Howellia (*Howellia aquatilis*), Bradshaw's lomatium (*Lomatium bradshawii*), Kincaid's lupine (*Lupinus sulphureus var. kincaidii*), and Nelson's checker-mallow (*Sidalcea nelsoniana*). Several candidate species potentially may occur in the Airport area: Yellow-billed cuckoo (*Coccyzus americanus*), Streaked horned lark (*Eremophila alpestris strigata*), Oregon spotted frog (*Rana pretiosa*), and Taylor's checkerspot (*Euphydryas editha taylori*). The agencies found no proposed species within and/or adjacent to the area.

Any activity on the Airport would need to consider impacts to these species under the Endangered Species Act as well as habitat impacts under the Magnuson-Stevens Act.

Wetlands and Floodplains. Because of previous projects on the Airport, on-airport wetlands have been significantly reduced. A brief review of the Airport shows that some of the on-airport drainage ways are developing wetland-like characteristics, as has the septic drain field area. Because these are man-made wetlands in upland areas, they will likely not be considered jurisdictional. At the time of any development action affecting the infield area or drainage ways, a formal delineation will be prepared.

The Airport is outside of any known floodplain.

Energy Supply and Natural Resources. This category focuses on the impact of airport actions on energy and natural resources used in construction materials. In general, construction materials are not in short supply. Fuel for construction equipment is available nearby. The site has adequate electrical supply to provide power to navigation aids and security lighting on the Airport.

Solid Waste. Typically, general aviation airports do not generate significant amounts of solid waste. Often materials include food and beverage containers or packaging for aircraft maintenance products. Food containers may create a bird and rodent attractant.

During construction, pavement materials are often recycled into the new pavement, reducing the need for disposal.

Plans for future activity at the Airport should consider the manner in which waste is collected and removed.

Hazardous Materials. The Airport has four commercial fueling sites (Columbia Aviation, Aurora Jet Center, Aurora Aviation, and Willamette Aviation Service), and two private fuel sites.

There is potential for additional contamination anywhere maintenance or fueling takes place because of accidental spills. No exploration of this has occurred on the Airport. Any such areas where construction is proposed would need to undergo some level of due diligence such as a “Phase One Environmental Site Assessment” to identify any history of possible contamination.

Construction Impacts. Construction impacts typically include temporary noise, dust or traffic impacts, as well as the potential for erosion and water quality impacts associated with construction material spills. Once construction activities are identified, construction timing, phasing and mitigation measures need to be considered.

Controversy. Controversy is typically associated with off-airport impacts. In the case of Aurora, controversy appears to revolve around use of the Airport by jets and the associated noise. According to ODA, there are some members of the community who are against airport growth and desire closure of the Airport and release of the land to other uses. However, there are opinions that the Airport should exist but growth should have some constraints to insure livability in the community.

Other Issues. There do not appear to be any other environmental-related issues on or around the Airport.

Conclusion

The FAA considers public controversy to be an environmental issue. Beyond controversy over noise and airport expansion, there do not appear to be any significant environmental issues on the Airport or in the airport vicinity – with the exception of concerns over vehicular traffic/safety. Additional study regarding noise, threatened and endangered species, cultural resources, and possibly hazardous materials should be conducted once a project is defined.

AVIATION ACTIVITY DATA

There are two primary measures of aviation activity at a general aviation airport: based aircraft and aircraft operations. Each activity type is discussed below.

Based Aircraft

Based aircraft are the number of aircraft that are stored at an airport in a hangar or tied down on either a paved apron surface or a grassy area designated for such a use. ODA's records indicate that there are currently 432 aircraft based at the Airport. Of the aircraft based at the Airport, they can be further broken down into the following categories:

Table 2C. Based Aircraft

Aircraft Category	Number Based at Aurora State Airport
Single Engine	312
Jet	21
Multi-engine	59
Helicopter	35
Glider	1
Unknown Category	4
Total	432

Aircraft Operations

Annual operations are the total number of aircraft takeoffs and landings occurring at the Airport in a year. A touch-and-go, which occurs during pilot training, counts as two operations. Touch-and-go operations are categorized as local, along with other operations that remain within 20 miles of the Airport. Operations not categorized as local are categorized as itinerant. The latest estimated data from the FAA's December 2009 Terminal Area Forecast is for 2008, and is shown in **Table 2D**.

Table 2D. Operations Records

	FAA Terminal Area Forecast (2008)
Air Taxi	9,656
General Aviation Local	36,030
General Aviation Itinerant	41,409
Military	250
Total	87,345

AIRPORT FINANCIAL DATA

The following subsections provide a brief summary of historical financial information for the Airport.

Airport Operating Revenues and Expenses

Table 2E shows the Airport's revenues and expenses for the past five years.

Federal grants from the Airport Improvement Program (AIP) are the major source of funding for airport capital expenditures. **Table 2F** depicts the AIP funding the Airport has received for airport improvement projects between the years 2004 and 2009.

RATES AND CHARGES

ODA leases hangar space to users at a rate of $0.25 per square foot. The lease rate is determined by market rent surveys; the last survey was completed in 2008. By administrative rule[4], ODA must review lease rates at a minimum of every five years and can adjust lease rates at intervals not to exceed every two years.

[4] Oregon Administrative Rule (OAR) 738-010-0035, *Fair Market Value Cost of Construction – Adjustments of Unimproved Land, Improved Land and Facility Rents*.

Table 2E. Revenues and Expenses

	2006 Actual	2007 Actual	2008 Actual	2009 Actual	2010 Actual
Operating Revenues					
Land Lease / Tie Downs	43,749.44	42,305.83	53,110.54	45,855.59	46,823.02
Ingress/Egress & Hangar Fees	37,017.09	40,610.85	52,052.17	59,500.39	47,366.48
Fuel Flowage Fees	13,488.88	66,289.12	67,177.75	62,075.82	55,395.68
Federal Funds Revenue	117,339.12	84,469.00	2,599,549.00	1,809,250.04	294,010.79
Miscellaneous Fees	12,289.13	14,418.03	4,641.53	11,649.62	12,208.94
Total Operating Revenues	**$223,883.66**	**$248,092.83**	**$2,776,530.99**	**$1,988,331.46**	**$455,804.91**
Operating Expenses					
Personal Services	11,816.47	19,288.20	21,268.89	20,792.93	14,336.84
Agency Program Related SVCS & Supplies	2,101.26	2,629.91	14,074.00	813.63	845.36
Attorney General Legal Fees	-	13,023.00	21,478.36	16,455.14	29,369.77
Dues and subscriptions	-	-	-	-	75.00
Expendable Property $250-$5000	-	398.90	-	-	-
Facility Maintenance	8,414.91	10,276.43	6,270.62	3,290.91	4,610.89
Facilities Rent and Taxes	3,903.60	21,629.21	28,771.31	23,630.02	21,189.81
Fuels and Utilities	6,222.62	7,300.40	7,713.21	7,901.13	6,752.24
Instate Travel	294.28	39.00	36.31	-	-
Office Expenses	167.92	38.50	46.14	-	14.25
Other Services and Supplies	17.94	-	250.00	-	-
Professional Services	13,705.25	252,602.55	2,036,983.28	1,545,742.74	360,560.21
Publicity and Publications	-	-	-	15.08	-
Telecomm/Tech SVC and Supplies	2,282.19	1,950.75	2,018.26	404.80	-
Total Operating Expenses	**$48,926.44**	**$329,176.85**	**$2,138,910.38**	**$1,619,046.38**	**$437,754.37**

Source: Oregon Department of Aviation (2010, August). State Fiscal Year July 1 to June 30.

Table 2F. Recent Federal Grant Projects

Year	Project	AIP Funding Received
2004	Rehabilitate Runway 17/35, including runway lighting system (Phase 1)	$1,445,140.00
2005	Rehabilitate Runway 17/35, including runway lighting system and revising the ALP (Phase 2); Rehabilitate taxilane	$ 957,144.00
2007	Construct taxiway, including land acquisition and design (phase 2); Install medium intensity taxiway lighting (MITL); Replace beacon and tower	$1,959,856.00
2007	Construct taxiway (Phase 3), including revising the ALP; Install MITL; Replace beacon and tower (Phase 2)	$2,405,233.00
2009	Remove obstructions (Phase 1)	$ 100,000.00
2009	Master Plan Update/Control Tower Siting Study	$ 534,431.00
	Total Federal Dollars	$7,401,804.00

Source: Federal Aviation Administration (2010, August)

Chapter Three: AERONAUTICAL ACTIVITY FORECAST

Airport Master Plan Update

Aurora State Airport

Forecasting aviation demand helps determine the size and timing of needed airport improvements. This chapter indicates the types and levels of aviation activity expected at the Aurora State Airport (Airport) during a 20-year forecast period. Projections of aviation activity for the Airport were prepared for the near-term (2015), mid-term (2020), and long-term (2030) future.

These projections are unconstrained and assume the Oregon Department of Aviation (ODA) or others will be able to develop the various facilities necessary to accommodate based aircraft and future aircraft operations. When development alternatives are evaluated later in the planning process, ODA may choose not to meet the unconstrained demand. ODA has chosen not to constrain the forecasts because undeveloped land to accommodate growth is available. In addition, the preparation of unconstrained forecasts follows the typical Federal Aviation Administration (FAA) practice. In individual airport forecasts it prepares annually, the FAA "…assumes an unconstrained demand for aviation services based upon local and national economic conditions as well as conditions within the aviation industry. In other words, an airport's forecast is developed independent of the ability of the airport and the air traffic control system to furnish the capacity required to meet demand."[1]

The primary objective of forecasting is to define the magnitude of change that can be expected over time. Because of the cyclical nature of the economy, it is impossible to predict with certainty year-to-year fluctuations in activity when looking 20 years into the future. However, a trend can be established that characterizes long-term potential. While a single line expresses the anticipated growth, actual growth may fluctuate above and below this line. **Forecasts serve only as guidelines, and planning must remain flexible to respond to unforeseen changes in aviation activity and resultant facility needs.**

[1] Federal Aviation Administration. (December 2009). *Terminal Area Forecast Summary, Fiscal Years 2009-2030*. p. 3.

This chapter presents the following forecasts:

- **Based Aircraft, Including Fleet Mix.** The number and type of aircraft based at the Airport help determine the future aircraft hangar, apron, and auto parking facility requirements. Fleet Mix refers to the distribution of aircraft by type.

- **Aircraft Operations, Including Annual, Peak, Local vs. Itinerant, and Fleet Mix.** An operation is counted as an aircraft either landing or taking off (*i.e.*, an aircraft landing then taking off counts as two operations). Local operations are touch-and-go and other training operations that stay near the airport. The operations forecast helps in analyzing runway capacity and determining runway, taxiway, and navigational aid requirements. The aircraft operations forecast provides some of the input for the computer modeling that estimates future aircraft noise exposure.

- **Critical Aircraft and Airport Reference Code.** The critical aircraft is derived from the operational fleet mix. The critical aircraft and its airport reference code determine many airfield design requirements, such as runway and taxiway size and strength, and safety clearances around aircraft movement areas.

National, state, and regional trends and forecasts for the aviation industry are reviewed in this chapter, along with socioeconomic trends and forecasts, to assess their effect on past and future aviation activity at the Airport.

Historical activity at the Airport is analyzed for growth trends that help forecast aviation demand. Sources of historical data include the FAA's Terminal Area Forecast (TAF) and based aircraft inventory, ODA's record of current based aircraft and recent fuel flowage, records of flight plans filed under Instrument Flight Rules (IFR), the airport user survey conducted as part of this planning study, and anecdotal information provided by some businesses at the Airport.

The TAF is the FAA's annual forecasting for terminal control centers and for the approximately 3,300 individual airports that are in the National Plan of Integrated Airport Systems (NPIAS). "The TAF is prepared to assist the FAA in meeting its planning, budgeting, and staffing requirements. In addition, state aviation authorities and other aviation planners use the TAF as a basis for planning airport improvements."[2] The TAF provides a benchmark for individual master plan forecasts. The FAA may modify or update the TAF based on an approved master plan forecast. If an airport master plan forecast for operations exceeds the TAF by more than 10% in the first five years, FAA Headquarters must review the forecast. According to Par. 428.a, FAA Order 5100.38C, the lack of FAA acceptance of forecasts may delay any further planning or capital improvements depending on them.

Prior forecasts specific to Aurora State Airport are presented for comparison to the historical records of activity that have occurred and for comparison to the forecasts developed for this study. These other

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[2] Federal Aviation Administration. (December 2009). *Terminal Area Forecast Summary, Fiscal Years 2009-2030*. p. 3.

forecasts include the FAA's Terminal Area Forecast (December 2009), the Oregon Aviation Plan (2007), and the prior Aurora State Airport Master Plan (2000).

The forecasts presented in this chapter are consistent with the Airport's role as an urban general aviation airport; they do not anticipate a major role change, such as the initiation of commercial passenger or cargo service.

NATIONAL AVIATION TRENDS AND FORECASTS

Aurora State Airport is part of an air transportation system and, as such, is subject to national and regional aviation trends.

General aviation (GA) in the United States peaked in the 1970s, and then experienced years of decline until growth returned in the 1990s. The growth in the 1990s was due not only to an expanding economy, but also to the General Aviation Revitalization Act (GARA) of 1994. GARA set an 18-year limit on the liability of GA aircraft and component manufacturers, spurring production of single engine piston aircraft. Single engine piston is the aircraft type that accounts for the majority of the nation's GA activity.

The business aviation portion of GA grew rapidly in the 1990s and into the first part of the 21st century. Airplanes used for business tend to be larger and faster than those limited to personal use, although business use of GA aircraft ranges from small, single-engine aircraft rentals to multiple aircraft corporate fleets supported by dedicated flight crews and mechanics. Since 9/11, business aviation has benefited from airline service problems—the additional airline passenger and baggage security imposed and reductions in air service, particularly to smaller communities. Until 2008, business aviation grew rapidly as various chartering, leasing, time-sharing, fractional ownership,[3] interchange agreements, partnerships and management contracts emerged.

GA growth began to decline in 2008 and 2009, due primarily to the economic recession that began the end of 2007. Soaring fuel prices in mid-2008 kept some airplanes parked. From a high of $129.03 per barrel in July of 2008, the price of oil dropped to $37.45 in January 2009, when demand for oil plummeted with the economy. The recession dampened every aspect of GA—from flight training and aircraft production, to the number of pilots and the hours aircraft are flown. The harm to the development of new aviation technology and businesses is exemplified by the Eclipse and DayJet stories. Eclipse Aviation was the leading developer and manufacturer of a new aircraft type, the Very Light Jet (VLJ). The VLJ is a small, low-cost jet capable of using short runways and offering the speed and comfort of high-altitude jet flight. Eclipse was the first to deliver a VLJ in late 2006. DayJet, operating a fleet of Eclipse aircraft in the Southeastern U.S., employed a unique air taxi business model, "per seat, on-demand", which was a radical change from the tradition of a single customer chartering a whole aircraft.

[3] Fractional aircraft ownership is similar to real estate time-sharing.

After producing 260 VLJs, Eclipse Aviation declared bankruptcy in November 2008. DayJet ceased operating in September 2008, blaming the tight credit market for its demise.

According to the *FAA Aerospace Forecasts Fiscal Years 2010-2030* (March 2010), "Each passing month of 2009 saw the light on consumer confidence dim as housing foreclosures climbed, credit tightened, and unemployment surged." The bad news the FAA reported about 2009 included the following:

- The world economy declined 2.4%, while the U.S. economy declined 2.5%.
- The market for GA products and services declined sharply.
- Compared to 2008, which had declined from the previous year, U.S. manufacturer aircraft shipments declined 48.5% and billings fell 32.1%.
- Student pilots decreased 10.8%, the fifth straight year of decline.
- GA flight hours decreased 10.3%.
- GA aircraft operations recorded by air traffic control towers fell 11.7% in 2009, one of the largest declines in that measure ever reported.

The General Aviation Manufacturers Association (GAMA) reported that the 2009 business jet sector declined following five straight years of growth.[4] The number of worldwide fractional share owners fell for the first time, from 5,179 to 4,881, and the number of airplanes in the fractional fleet decreased 5.2%. Aircraft shipments in the first quarter of 2010 were down 15% compared to the same period in 2009, although billings were up 7.1%.[5]

In spite of all the bad news, the FAA's March 2010 forecast stated, "Even though the highly cyclical U.S. aviation industry went into a downward spiral during 2009, history has shown the demand for air travel is resilient and growth will return." The U.S. economy grew in the fourth quarter of 2009 for the first time in five quarters, and the economies of most regions of the world appear to be recovering.

GAMA also reported that at the end of 2009, there were hopeful signs—the availability of used aircraft was declining, aircraft utilization was stabilizing, availability of financing was improving, and inquiries for new orders were starting to grow. Corporate profits were beginning to recover; profits are historically related to new airplane demand.[6] In May 2010, the GAMA President and CEO reported that flight activity is on an upward trend and the used aircraft inventory is decreasing, but the industry is far from recovery. He noted that the U.S. Congress' continuation of bonus depreciation is crucial to the industry's recovery.[7]

FAA Aerospace Forecasts Fiscal Years 2010-2030 projects recovery for GA, using economic forecasts developed by Global Insight Inc. to project domestic aviation demand. **Table 3A** shows the FAA's forecast for active GA and air taxi aircraft. An active aircraft is one that has a current registration and was flown at least one hour during the calendar year. The source of historical numbers is the FAA General Aviation and Air Taxi Activity (and Avionics) Surveys.

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[4] General Aviation Manufacturers Association: 2009 General Aviation Statistical Databook & Industry Outlook
[5] GAMA News 10-12, released 5-10-2010, www.GAMA.aero
[6] General Aviation Manufacturers Association: 2009 General Aviation Statistical Databook & Industry Outlook
[7] GAMA News 10-12, released 5-10-2010, www.GAMA.aero

Table 3A. U.S. Active General Aviation and Air Taxi Aircraft Forecast

		Average Annual Growth			
	2009	2000-2009	2009-2010	2010-2020	2009-2030
Aircraft Type	Estimated	Historical		Forecast	
Piston Fixed Wing					
Single Engine	144,745	-0.4%	-0.4%	-0.1%	0.2%
Multi-engine	17,351	-2.1%	-1.0%	-0.8%	-0.8%
Total	162,096	-0.6%	-0.5%	-0.2%	0.1%
Turbine Fixed Wing					
Turboprop	9,010	5.1%	1.0%	1.5%	1.4%
Turbojet	11,418	5.6%	3.2%	4.3%	4.2%
Total	20,428	5.4%	2.2%	3.1%	3.1%
Rotorcraft					
Piston	3,666	3.5%	4.5%	3.9%	3.4%
Turbine	6,540	4.3%	2.7%	2.7%	2.4%
Total	10,206	4.0%	3.3%	3.2%	2.8%
Experimental	23,435	1.5%	0.7%	2.3%	1.8%
Sport Aircraft	7,311	N/A	5.5%	5.6%	3.9%
Other[8]	5,673	-1.8%	0.1%	-0.1%	-0.1%
Grand Total	229,149	0.6%	0.2%	0.8%	0.9%

Source: FAA Aerospace Forecasts Fiscal Years 2010-2030 (March 2010)

The FAA forecasts growth in business aviation demand over the long term, driven by a growing U.S. and world economy. The more expensive and sophisticated turbine-powered fleet, including helicopters, is projected to grow at an average of 3.0% per year. The worldwide delivery of VLJs has been refreshed with the introduction of Embraer's Phenom 100 to the market. The FAA expects 440 VLJs to enter the U.S. fleet in the next three years, with an average of 216 per year for the remainder of the forecast period. Piston-powered aircraft are expected to decline through 2017 and then grow at a low rate. The FAA expects VLJs and sport aircraft to erode the replacement market for traditional piston aircraft at the high and low ends of the market respectively. Rotorcraft (helicopters) have experienced high growth since 2000, and growth is projected to continue.

Table 3B presents the FAA's forecast for aircraft hours flown. The number of GA hours flown is projected to increase by 2.5% annually. A larger portion of the growth is expected to occur in the short-term, post-recession period, where low utilization rates experienced in 2009 will return to normal, particularly for jets. Rotorcraft hours were relatively immune to the recession compared to other categories.

[8] Gliders and lighter than air vehicles

Table 3B. U.S. Active General Aviation and Air Taxi Hours Flown Forecast

Aircraft Type	2009 Estimated	Average Annual Growth 2000-2009 Historical	2009-2010	2010-2020 Forecast	2009-2030
Piston Fixed Wing					
Single Engine	11,436,000	-5.0%	-3.8%	1.0%	1.2%
Multi-engine	2,132,000	-5.1%	-1.3%	-1.1%	-0.2%
Total	13,568,000	-5.0%	-3.4%	0.7%	1.0%
Turbine Fixed Wing					
Turboprop	2,241,000	1.4%	1.4%	2.3%	1.7%
Turbojet	2,902,000	0.6%	0.1%	8.8%	6.1%
Total	5,143,000	0.9%	0.7%	6.4%	4.6%
Rotorcraft					
Piston	709,000	3.3%	2.4%	4.2%	3.5%
Turbine	2,356,000	4.0%	0.6%	3.3%	2.8%
Total	3,065,000	3.8%	1.0%	3.5%	3.0%
Experimental	1,031,000	-2.6%	-3.0%	5.3%	3.3%
Sport Aircraft	314,000	N/A	5.5%	7.7%	5.9%
Other[9]	208,000	-6.3%	-0.4%	0.4%	0.4%
Grand Total	23,330,000	-2.8%	-1.8%	2.9%	2.5%

Source: FAA Aerospace Forecasts Fiscal Years 2010-2030 (March 2010).

GA aircraft operations at FAA and contract towers are expected to continue declining in 2010, 3.1% from 2009, then rise 1.2% in 2011 and 2012 as unemployment decreases. For the whole forecast period, the expected GA aircraft operations growth at towered airports is 1.1% per year on average. The FAA expects military aircraft activity to remain constant through the forecast period.

The FAA identified the following risks to their forecasts:

- **Oil Prices.** Although oil prices were much lower in 2009 than in 2008, there is risk of rising oil prices when economic growth resumes. FAA's forecast, based on Global Insight's October 2009 forecast, calls for steady increases in oil prices after 2009, but does not expect the price to exceed $100 per barrel until 2025.

- **Business Aviation Risks.** Business and corporate aviation grew strongly after 9/11 but fell sharply with the economic recession. Public perception of business and corporate aviation, potential environmental regulations and taxes, and increased security measures could place downward

[9] Gliders and lighter than air vehicles

pressure on the forecast. On the other hand, new and more efficient product offerings and increased competition from new manufacturers could broaden the appeal. The growth of the on-demand air taxi industry that was expected with the VLJ entry into the market could materialize.

- **Environmental Concerns.** Air transportation could be constrained from growth by environmental concerns that might limit airport expansion or new construction or by the cost of meeting new air emissions standards. On the other hand, research and technological breakthroughs may overcome these constraints. Breakthroughs in cleaner, quieter, more efficient aircraft are possible, and Nextgen—the FAA's air traffic modernization program—promises to increase capacity at some airports without physical expansion and to reduce air and noise pollution.

STATE AVIATION TRENDS AND FORECASTS

Since 2000, aviation in Oregon has seemed to trend with the nation. In 2008, Oregon's share of the nation's active GA and air taxi fleet was 2.0%, the same share it was in 2000. The number of these aircraft was virtually the same in both years—4,687 in 2000 and 4,614 in 2008. The number peaked at 6,029 in 2007, which was also the national peak. Hours flown in GA and air taxi aircraft hit a low point in 2008 in Oregon (431,000) and in the US (26,009,000). Oregon's share of U.S. hours flown, 1.7%, was lower in 2008 than in the 2000 to 2007 period.[10]

The *Oregon Aviation Plan 2007 (OAP 2007)* used 2005 as the base year for forecasting. For statewide based aircraft, the forecast was an increase from 4,875 to 6,225 by 2025—a 1.23% average annual increase. The annual rate of growth was slightly lower than the FAA's national forecasts for active GA and air taxi aircraft, 1.29%. The mix of based aircraft was projected to remain 81% single engine, 7% multi-engine, 3% jet, 4% helicopter, and 5% other. Aircraft operations were projected to grow at the same rate as based aircraft.

OAP 2007 was prepared before the economic recession. GA did grow in Oregon from 2005 to 2007, and then dropped in 2008. Based aircraft declined 9% and operations declined 5%, most likely due to the economic downturn. However, from 2008 through 2030, the FAA's Terminal Area Forecast shows average annual growth of 1.2% for based aircraft and 1.1% for GA operations.[11]

TRENDS AT AURORA STATE AIRPORT

The Airport began the 21st century with a surge in based aircraft (**Exhibit 3A**), in part, due to the increase in hangar capacity created by the Southend Airpark development. From 2001 to 2007, the number of based aircraft grew, and then declined in 2008 and 2009. In 2010, growth resumed.

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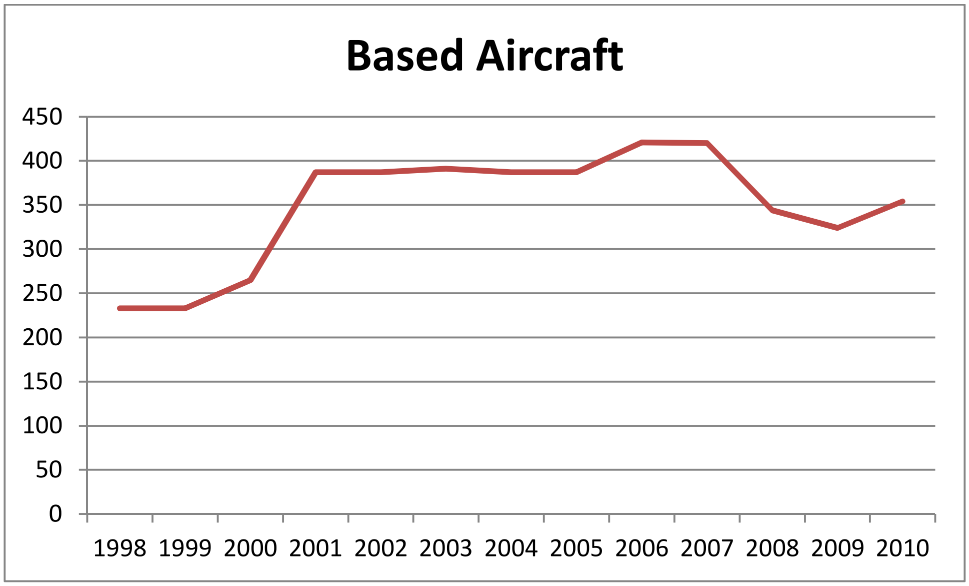
[10] General Aviation Manufacturers Association: 2009 General Aviation Statistical Databook & Industry Outlook
[11] FAA's Terminal Area Forecast (December 2009), which is limited to airports in the National Plan of Integrated Airport Systems (NPIAS)

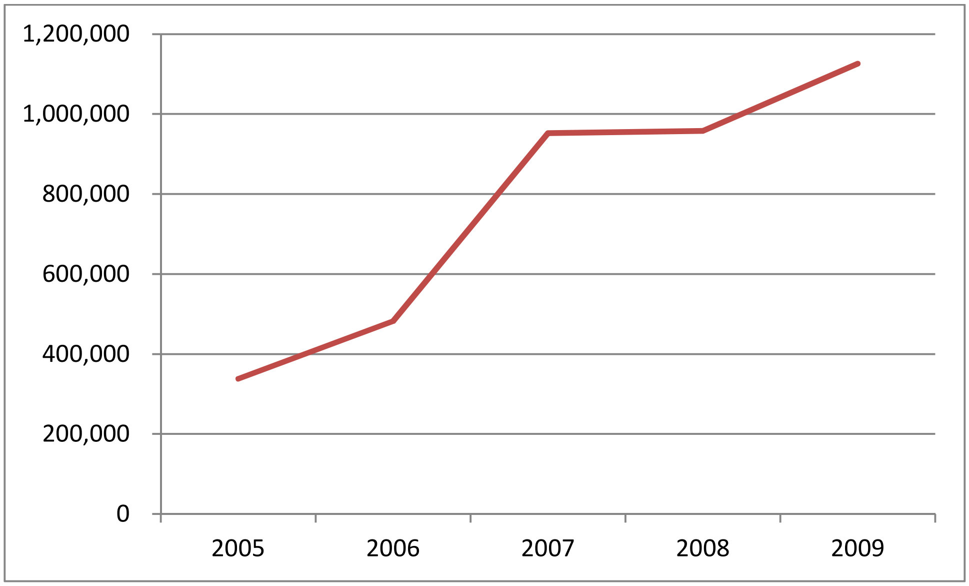
Exhibit 3A. Historical Based Aircraft at Aurora State Airport



Source: FAA Terminal Area Forecast (December 2010) for 1998 – 2010 numbers. ODA registration for 2010 numbers.

The ODA exacts fuel flowage fees on six businesses at the Airport: Aurora Aviation, Columbia Helicopters, Metal Innovations, Aurora Jet Center, TEC Equipment, and Willamette Aviation. Three of these businesses sell fuel to the operators of aircraft based at the Airport and to the operators of "transient" aircraft based at other airports. **Exhibit 3B** shows the combined fuel flowage of these businesses over the last five years. Fuel flowage is a relatively good indicator of the trend in aircraft operations, although fuel prices at other airports can affect where aircraft operators refuel. Exhibit 3B shows a sharp rise of 182% between 2005 and 2007, from 338,088 gallons to 951,870 gallons. Aviation gasoline (avgas) use dropped 47% from 2007 to 2008, while jet fuel gained 11%. Fuel flowage resumed growth in 2009, reaching 1,126,272 gallons.

Exhibit 3B. Historical Fuel Flowage at Aurora State Airport (gallons)

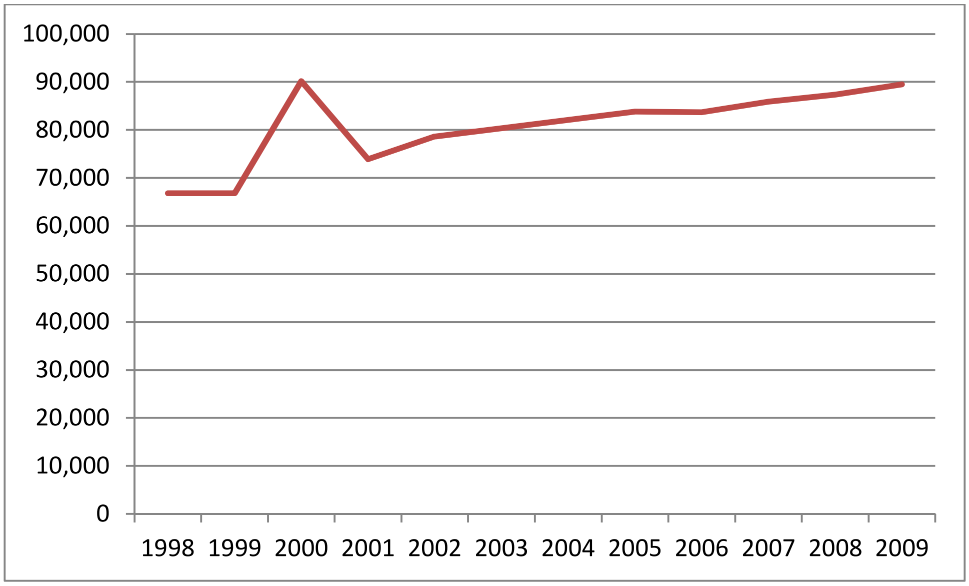


Source: Oregon Department of Aviation Records.

While the majority of aircraft based at and using the Airport are piston-powered and use avgas, about 85% of the fuel flowage is jet fuel and 15% is avgas. On average, jets have larger fuel tanks than piston-powered airplanes, and are flown more hours. ODA records and informal information from fueling operators indicate that jet fuel use is growing faster than avgas use. This implies operations by turbine-powered aircraft are growing more than piston-powered aircraft operations.

The FAA keeps records of estimated aircraft operations (takeoffs and landings) reported by airport owners on periodically updated Airport Master Records (FAA Form 5010). ODA submits Form 5010 updates every three years to the FAA Airport District Office in Seattle. The Airport District Office then reports estimated annual numbers to FAA Headquarters for inclusion in the TAF. **Exhibit 3C** shows the reported aircraft operations at Aurora State Airport for the years 1998 through 2009. Since 2001, operations at the Airport have grown slowly but steadily.

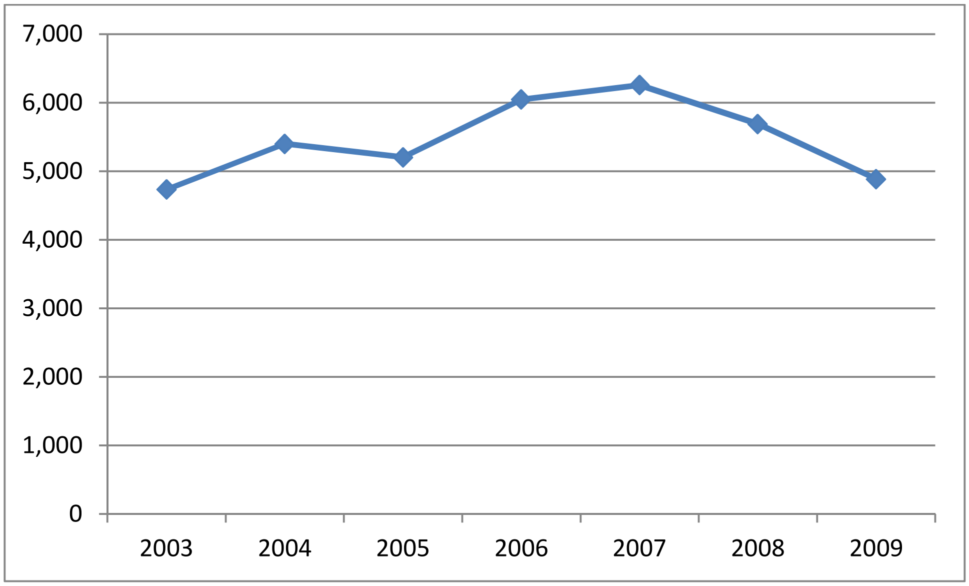
Exhibit 3C. Historical Aircraft Operations at Aurora State Airport



Source: FAA Terminal Area Forecast (December 2010).

IFR operations for the Airport appear in **Exhibit 3D**. These are actual IFR flight plans filed, although the records have been found to omit some flight plans filed after takeoff or cancelled before landing. Nevertheless, the operations in Exhibit 3D are more accurate than the total estimated operations shown in Exhibit 3C, although IFR traffic comprises only 5% to 10% of total traffic at the Airport. IFR traffic peaked at 6,257 operations in 2007, up 32% from the 4,734 operations recorded in 2003. Then traffic declined 9% to 5,688 operations in 2008. The decline continued (14% between 2008 and 2009), so that IFR ops in 2009 (4,886) were nearly the same as in 2003. The IFR activity of the last five years follows the trend of GA activity nationwide—growth to peak in 2007 and then decline in 2008 and 2009. Recovery appears to be underway. For the partial year 2010 (through August 18), IFR traffic is up 22% from the same period in 2009.

Exhibit 3D. Historical IFR Operations at Aurora State Airport



Source: Derived from IFR arrival and departure data, Airport IQ Data Center, GCR.

Businesses at the Airport have informally indicated that they have suffered during the recession. The decline in aircraft charters was the most severe, but hangar rentals, aircraft maintenance, aircraft sales and rentals, flight training, and avgas sales declined substantially. These businesses report they have fewer employees now than five years ago. However, they project business will grow between 1% and 3% per year in the future, and they will be expanding staff. Their projections for the Airport's future include continued increases in turbine-powered aircraft operations, more corporate and individual travel for business and pleasure, and declines in flight training and recreational flying.

SOCIOECONOMIC TRENDS AND FORECASTS

Aviation activity at an airport is usually tied closely to the population and economy within its service area. As the population around the airport grows, airport activity grows. Aviation activity has also traditionally been linked to employment and income factors because of the discretionary nature of personal and business travel.

This section defines the core service area for Aurora State Airport and analyzes the population and economy of the core service area and surrounding region.

Identification of Core Airport Service Area

As the strategic role analysis in Chapter 1 showed, the maximum extent of the Airport's service area is about 45 minutes. This 45-minute service area distance applies primarily to higher performance aircraft, particularly transient aircraft. This is because jet aircraft generally need longer runways, instrument approaches, and more services (jet fuel, etc.) than the average GA airport has. The occupants of some transient aircraft using the Airport may be destined for downtown Portland, but the owners of smaller aircraft do not need to travel farther than 30 minutes to find an adequate airport for basing their airplanes. The typical GA airport's service area is within a 30-minute drive from the airport, or about 20 miles, although it depends on population density, the road network, and the location and services provided at other airports in the vicinity.

Airport Service Area Population

A 20-mile distance from the Airport extends into 59 zip codes located in five counties—Clackamas (18 zip codes), Marion (10 zip codes), Multnomah (14 zip codes), Washington (13 zip codes), and Yamhill (4 zip codes). **Table 3C** shows the population within this core service area in 2000.[12] Approximately half of the residential population of the five counties lives within 20 miles of the Airport. While the Airport is located in Marion County, Marion County accounts for less than 10% of the service area population. More than two-thirds of the service area population is in Clackamas and Washington Counties.

Table 3C. Core Service Area Population (2000)

County	Population of County	Portion of County Population in Core Service Area	Population in Core Service Area
Clackamas	338,391	91%	307,936
Marion	284,834	21%	59,815
Multnomah	660,486	25%	165,122
Washington	445,342	73%	325,100
Yamhill	84,992	41%	34,847
Total	1,814,045		892,819

Source: U.S. Census Bureau population by zip code.

Different components of aviation activity have been analyzed to estimate how Airport users are distributed among the five counties. The analysis resulted in the following rough estimates of Aurora State Airport use:

- 42% of aviation activity is associated with Clackamas County.
- 9% of aviation activity is associated with Marion County.
- 13% of aviation activity is associated with Multnomah County.
- 32% of aviation activity is associated with Washington County.
- 4% of aviation activity is associated with Yamhill County.

Based on these estimates, nearly three-quarters of the Airport's aviation activity is associated with Clackamas and Washington Counties. **Table 3D** shows the derivation of these estimates of aviation use

[12] The most recent population numbers broken down by zip code are from 2000.

by county. The "Licensed Pilots" column indicates the distribution of 2,995 licensed pilots whose mailing addresses have zip codes within the Airport's core service area. The "Population" column shows the distribution of population that is within the core service area by county, using Table 3C as the source. The "IFR Operations" column indicates the distribution of owners' mailing addresses for aircraft on IFR flight plans to or from Aurora State Airport from October 2007 through October 2009.

Table 3D. Aviation Activity Indicators Distributed by County

County	Licensed Pilots	Population	IFR Operations	Average
Clackamas	40%	34%	52%	42%
Marion	6%	7%	14%	9%
Multnomah	11%	18%	11%	13%
Washington	37%	37%	20%	32%
Yamhill	6%	4%	3%	4%
Total	100%	100%	100%	100%

Source: FAA Civil Aviation Registry, U.S. Census 2000, IFR arrival and departure data for October 2007 through October 2009 from GCR's Airport IQ Data Center.

All the five service area counties, except Marion, are in the seven-county Portland-Beaverton-Vancouver OR-WA Primary Metropolitan Statistical Area (PMSA).[13] Metro, the regional government for three Greater Portland counties, recently published aggregate population forecasts for the PMSA. Metro projects that the seven-county area will grow from 1.9 million people in 2000 to between 2.9 and 3.2 million by 2030. The growth rates these high and low forecasts represent are compared with other forecasts in **Table 3E**. The table shows that higher population growth is expected for the Portland metro region than for Oregon or the United States.

Regional population growth, particularly in-migration, varies with economic growth. However, the Portland metropolitan area no longer experiences wide swings in population due to its size and maturity. The population growth of the 1990s (2.4% per year on average) has slowed in the last decade to 1.7% per year. Future growth is expected to slow as birth rates slowly decrease and stabilize near the national average, life expectancies no longer rise as sharply as in the past, and migration trends change. Migration trends of the last century have favored movement from rural to metropolitan areas and to states on the west coast, gulf coast, and eastern seaboard; in some areas, an emerging trend is to move back to rural communities.[14]

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[13] The seven counties are Clackamas, Columbia, Multnomah, Washington, and Yamhill in Oregon, and Clark and Skamania in Washington.

[14] Metro: 20 and 50 Year Regional Population and Employment Range Forecasts (April 2009 Draft)

Table 3E. Comparative Population Forecast Growth Rates, 2000 - 2030

Average Annual Growth	Geography of Forecast	Forecast Source
0.85%	United States	U.S. Census middle series (2004)
0.95%	United States	Global Insight (2008)
1.14%	Oregon	Global Insight (2008)
1.16%	Oregon	U.S. Census middle series (2004)
1.18%	Oregon	OR Office of Economic Analysis (2004)
1.28%	Portland metro region (3 counties)	OR Office of Economic Analysis (2004)
1.40%	Portland metro region (7 counties)	Global Insight Regional Service (2008)
1.37%	Portland metro region (7 counties)	Metro – low end of range (2009)
1.70%	Portland metro region (7 counties)	Metro – high end of range (2009)

Source: Metro: 20 and 50 Year Regional Population and Employment Forecasts, April 2009 Draft.

Since Metro's PMSA forecast did not distinguish individual counties, other sources were sought for county population forecasts. **Table 3F** shows historical and projected populations for the five counties in the Airport's service area. The highest growth since 1990 has been in Washington County, while the lowest growth has been in Multnomah County. Future populations forecast by the Oregon Office of Economic Analysis (OEA) and by Portland State University (for Marion County) show the highest growth rate in Washington County and the lowest in Multnomah County. In all five counties, future growth is expected to slow from the pace of the 1990s.

Applying the percentages of county populations in the Airport's core service area from Table 3C to the population projections in Table 3F results in an estimated Airport service area population of 1,407,579 in 2030. This shows considerable growth from the estimated 2000 service area population of 892,819. The average annual population growth in the core service area is 1.53% from 2000 to 2030, which is midway between the low (1.37%) and high (1.70%) rates that Metro forecast for the seven-county MSA.

Table 3F. Population History and Forecasts by County

	Clackamas County	Marion County	Multnomah County	Washington County	Yamhill County
1990	278,850	228,483	583,887	311,554	65,551
2000	338,391	284,834	660,486	445,342	84,992
2009	386,143	317,981	726,855	537,318	99,037
2030	536,123	410,431	800,565	788,162	141,505
			Average Annual Growth Rates		
1990-2009	1.73%	1.75%	1.16%	2.91%	2.20%
2000-2009	1.48%	1.23%	1.07%	2.11%	1.71%
2009-2030	1.57%	1.22%	0.46%	1.84%	1.71%

Source: For 1990, 2000, and estimated 2009 populations, U.S. Census Bureau. For 2030 forecast of Marion County, Portland State University forecast (Adopted by Marion County October 2009). For 2030 forecasts of other counties, Oregon Office of Economic Analysis, Department of Administrative Services, State of Oregon: Forecasts of Oregon's County Populations and Components of Change, 2000 - 2040 (Release: April 2004). The OEA's forecast for Marion County population in 2030 is 410,022.

Airport Service Area Economy

Air transportation use and aircraft ownership typically rises and falls with the airport service area economy. Aurora State Airport's core service area encompasses the diversity of Portland's urban economy, as well as the rural economies of northern Marion County and southern Clackamas County.

Although a recession officially began in December 2007, the Portland region's economy held steady until the fourth quarter of 2008, after the economic meltdown on Wall Street. Unemployment then rose rapidly. As of June 2010, the unemployment rate in the Portland-Vancouver-Hillsboro metropolitan area was 10.2%, down from 11.2% the previous year, but far above the 4.8% unemployment rate of 2007. Oregon's unemployment rate in June 2010 was 10.5%, down from 11.6% in June 2009. In comparison, the national unemployment rate was 9.5% in June 2010 and in June 2009.[15]

In 2009, Metro forecast employment in the PMSA. From 973,000 jobs in 2000, employment is projected to reach between 1.3 and 1.7 million in 2030. The low and high ranges for the forecast reflect average annual growth between 0.84% and 1.53%.[16] Nonfarm employment is projected to grow between 0.7% and 1.8% annually from 2008 to 2040. For manufacturing jobs, the employment forecast ranges from decline to slight growth. The highest job growth is projected for information services, business services, education and health services, and other/personal services.

Higher income often relates to higher levels of aircraft ownership, pilots per capita, and aircraft use. Higher income relates to more use of air transportation for business and more discretionary income for

[15] US Department of Labor, Bureau of Labor Statistics, http://www.bls.gov/home.htm.

[16] Metro: 20 and 50 Year Regional Population and Employment Range Forecasts (April 2009 Draft)

personal aviation use. **Table 3G** shows that the three most populous counties in the Airport service area have per capita incomes that exceed the U.S., Oregon, and Portland metropolitan area averages. Income projections for Oregon and the U.S. show declines in 2009, recovery to 2008 levels by 2010, and annual growth between 3.4% and 5.1% through 2017. Per capita income in Oregon is projected to stay below the average for the U.S. and to grow more slowly than in the U.S.as a whole.[17]

Table 3G. Per Capita Personal Income History (dollars)

Area Name	2000	2008	Average Annual Growth Rate 2000-2008
United States	30,318	40,166	3.58%
Oregon	28,718	36,365	3.00%
Clackamas County	37,212	44,803	2.35%
Marion County	25,038	32,565	3.34%
Multnomah County	33,122	41,222	2.77%
Washington County	33,942	40,188	2.13%
Yamhill County	24,420	32,700	3.72%
Portland Metropolitan Area	32,779	39,942	2.50%

Source: U.S. Department of Commerce, Bureau of Economic Analysis, www.bea.gov/regional/reis/drill.cfm

BASED AIRCRAFT FORECAST

The based aircraft forecast begins by presenting historical numbers of based aircraft. Then, various forecast models prepared for the Airport are analyzed and the preferred forecast for based aircraft and fleet mix through 2030 is presented.

Records of the numbers and types of aircraft based at the Airport back to 1998 appear in **Table 3H**. The numbers through 2009 were taken from the TAF, which relies on airport owner-reported estimates on periodically updated Airport Master Records (FAA 5010 forms). Oregon's aircraft registration requires an airplane owner to designate where the airplane is based, and ODA has used these registration logs to determine the based aircraft at the Airport. ODA validated the number of based aircraft for 2010 with the FAA's Civil Aviation Registry, Airport tenants, and hangar inspections.

Table 3H shows that the number of aircraft based at the Airport grew steadily through 2007 then declined in 2008 and 2009, increasing again in 2010. In 2007, the FAA launched a nationwide program to inventory based aircraft by their unique "N" numbers. The FAA contended that many of the "N" numbers reported for Aurora State Airport were also reported at other airports. The result was a

[17] Oregon Economic and Revenue Forecast, June 2010, Volume XXX, No. 2, prepared by Office of Economic Analysis, and U.S. Department of Commerce, Bureau of Economic Analysis, www.bea.gov/regional/reis/drill.cfm

decrease of 76 aircraft reported for Aurora State Airport between 2007 and 2008. Nevertheless, from 1998 through 2010 based aircraft grew at a 3.6% average rate. Jet aircraft grew at the highest annual rate, 15.3%, while the number of helicopters declined at a 1.5% average annual rate. Single engine aircraft have always dominated the based aircraft fleet, accounting for 74% in 2010.

Table 3H. Historical Based Aircraft at Aurora State Airport

Year	Single Engine	Jet	Multi-Engine	Helicopter	Other	Total
1998	175	4	22	30	2	233
1999	175	4	22	30	2	233
2000	193	5	30	35	2	265
2001	319	7	27	34	0	387
2002	319	7	27	34	0	387
2003	323	7	27	34	0	391
2004	319	7	27	34	0	387
2005	319	7	27	34	0	387
2006	322	5	66	27	1	421
2007	322	33	38	27	0	420
2008	276	14	30	24	0	344
2009	258	12	30	24	0	324
2010	261	23	40	25	5	354

Source: FAA Terminal Area Forecast, December 2010 for 1998 through 2009. ODA registration records for 2010.

It appears the number of aircraft jumped up when the Southend Airpark opened. Southend Airpark's increased hangar capacity and expansion of aircraft services may have led to the Airport gaining a greater share of regional aviation activity. **Table 3I** illustrates the change in market share. It provides based aircraft history for four airports with comparable facilities and services to the Airport. These four airports are located at the edges of Aurora State Airport's maximum service area—Hillsboro Airport, Troutdale Airport, McMinnville Municipal Airport, and McNary Field in Salem. These airports have roughly comparable runway length, runway strength, instrument approach capability, and services that make them "business jet-capable."[18] Other airports in the region are used almost exclusively by single engine and multi-engine piston aircraft and generally do not have the features needed or desired for business jets.

[18] Portland International Airport is capable of handling business jets and has based general aviation aircraft, but its role as a medium-hub commercial service airport constrains its use for general aviation. Consequently, it is excluded from the analysis.

Between 1998 and 2009, Aurora State Airport's market share of based aircraft grew from 21% to 30%. Two of the other airports lost market share and two increased slightly. Aurora State Airport gained in its share of single engine, jet, and multi-engine aircraft. The Airport's share of helicopters and other aircraft declined from 1998 to 2009.

Table 3I. Change in Based Aircraft Market Shares at "Jet-Capable" Airports

Year	Aircraft Type	Aurora	Hillsboro	Troutdale	McMinnville	McNary (Salem)	Total Based Aircraft
1998	Single engine	175 (21%)	288 (34%)	149 (18%)	76 (9%)	148 (18%)	836 (100%)
	Jet	4 (11%)	24 (69%)	2 (6%)	1 (3%)	4 (11%)	35 (100%)
	Multi-Engine	22 (18%)	60 (48%)	20 (16%)	5 (4%)	17 (14%)	124 (100%)
	Helicopter	30 (46%)	18 (28%)	5 (8%)	10 (15%)	2 (3%)	65 (100%)
	Other	2 (3%)	0 (0%)	1 (2%)	18 (31%)	38 (64%)	59 (100%)
	Total	233 (21%)	390 (35%)	177 (16%)	110 (10%)	209 (18%)	1,119 (100%)
2009	Single engine	258 (33%)	145 (19%)	129 (17%)	88 (11%)	153 (20%)	773 (100%)
	Jet	12 (18%)	38 (56%)	2 (3%)	5 (7%)	11 (16%)	68 (100%)
	Multi-Engine	30 (28%)	30 (28%)	14 (13%)	11 (11%)	21 (20%)	106 (100%)
	Helicopter	24 (25%)	40 (42%)	9 (9%)	11 (12%)	11 (12%)	95 (100%)
	Other	0 (0%)	0 (0%)	0 (0%)	17 (46%)	20 (54%)	37 (100%)
	Total	324 (30%)	253 (24%)	154 (14%)	132 (12%)	216 (20%)	1,079 (100%)

Source: FAA Terminal Area Forecast, December 2010.

While some aircraft may have relocated from the Hillsboro and Troutdale Airports to Southend Airpark at Aurora, this was not likely the only cause of the market shift. The removal of hangars at other airports in the region may have contributed to the gain in the Airport's market share. In 2008, Portland International

Airport removed 18 hangars for a road improvement project. Since 2001, the following private airports have closed in the region: Basl Hill Farms Airstrip, Bonney Acres, Clackamas Heights, Cup Port, Hayden Mountain, McGill, Myers, and Pat's Pasture. Farther away in Vancouver, Washington, the privately owned Evergreen Field, with up to 165 aircraft, closed in 2006.

For the 1998 through 2009 period, Aurora's average annual growth rate was the highest of the five airports (3.0%), followed by McMinnville (1.7%), Salem, (0.3%), Troutdale (-1.3%), and Hillsboro (-3.9%). Combining the five airports, the number of based aircraft declined at an average annual rate of 0.3% between 1998 and 2009. The highest rate of decline was for other aircraft (-4.2%). On average, multiengine aircraft declined 1.4% annually and single engine aircraft declined 0.7% annually. In contrast, jets and helicopters increased – at 6.2% and 3.5% average annual growth rates, respectively.

The overall decline in based aircraft may be due to slow recovery from the economic recession or the relocation of single engine and multi-engine aircraft to airports that are not "jet-capable." Overestimated 1998 numbers or underreported 2009 numbers may also account for the decline. The FAA's based aircraft inventory in 2007 generally found overestimated numbers at airports across the country. However, since the FAA performed its based aircraft inventory in 2007, updating that database has depended on airport owners doing so voluntarily.

Socioeconomic changes often result in changes in the number of based aircraft at an airport. The population within the Airport service area has grown. Employment and income also grew until the recession hit the region hard in late 2008. However, very low statistical correlation[19] was found between historical based aircraft numbers at Aurora State Airport and the historical population, employment, or income statistics of the service area. The Airport's abrupt change in market share due primarily to the Southend Airpark development is probably the reason based aircraft numbers do not correlate with socioeconomic data.

Although the historical relationship between aviation activity and socioeconomic variables cannot be used for linear regression forecasting of activity at the Airport, other forecasting models can be used. Trend analysis is a linear regression model that relies on projecting past trends into the future. In trend analysis, a regression equation uses time as the independent variable. Market share modeling assumes an airport will retain its share of the national or state market in the future, relying on forecasts prepared for the nation or state to determine the forecast for an individual airport.

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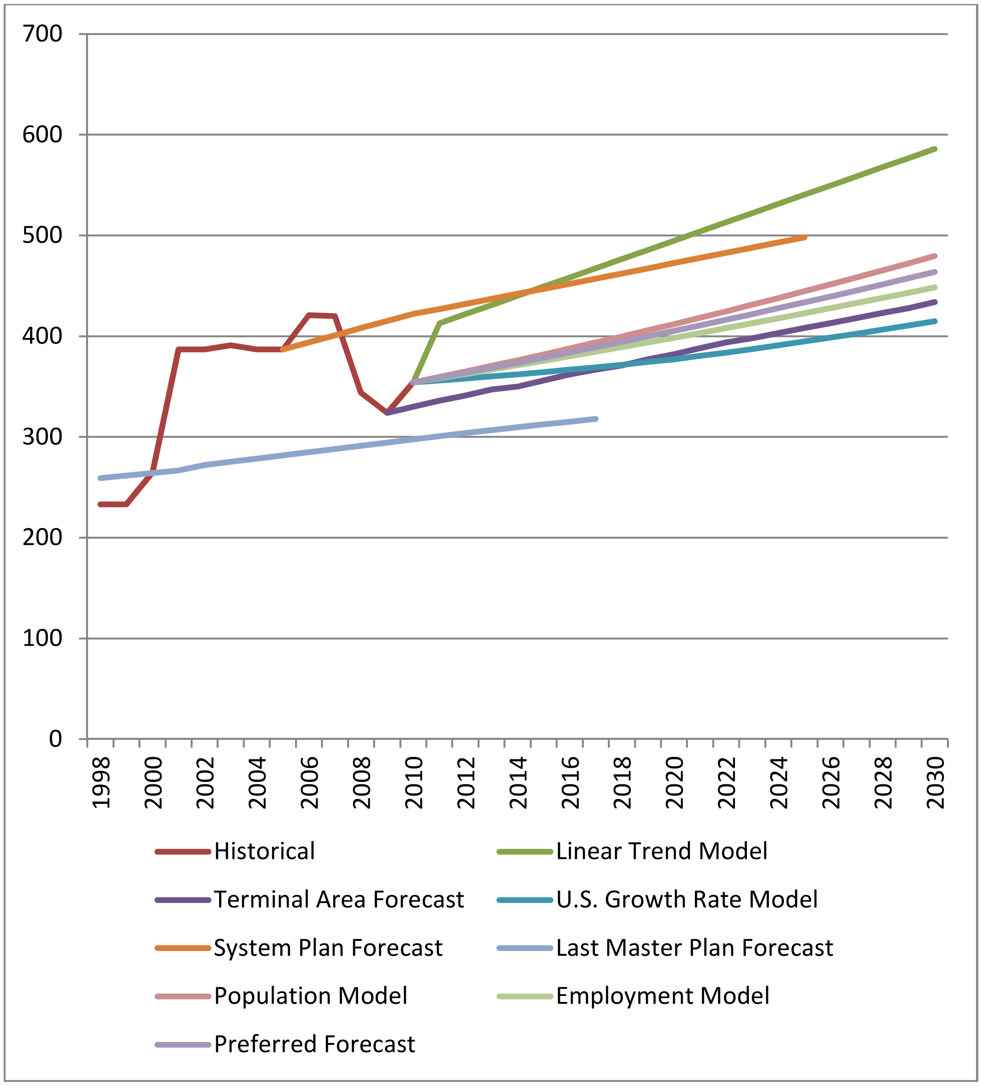
[19] Regression analysis is often used to forecast aviation activity. In regression analysis, the value being estimated (or forecast)—the dependent variable—is related to other variables—the independent or explanatory variables—that "explain" the estimated value. An example of a regression equation is to estimate based aircraft as a function of economic variables. The relationship is estimated using historic data for the independent and dependent variables. The explanatory power of the equation is measured by the R^2 statistic (called the coefficient of determination). An R^2 of 0 indicates that there is no statistical relationship between changes in the independent and dependent variables. R^2 values near 1.0 mean that there is a very strong statistical relationship. The R^2 values for Aurora State Airport based aircraft and regional population, income, and employment were less than 0.3.

Exhibit 3E shows the range of five forecast models and three other forecasts that were considered for the Aurora State Airport based aircraft forecast. They are described after the exhibit.

Exhibit 3E. Comparison of Based Aircraft Forecasts



U.S. Growth Rate Model (0.80% Annual Growth).

This is a market share model because it assumes that each type of aircraft at the Airport will retain its current share of the national market. Growth rates from the FAA's March 2010 forecasts were applied to the Airport's current fleet mix. The result is an average annual increase of 0.80% from 2010, to 415 aircraft in 2030. Growth in the first ten years is higher than in the last ten years of the forecast. The highest forecast growth rate is for jets (4.25%), followed by helicopters (3.0%), other aircraft (2.25%), multi-engine (0.65%, averaging the rates for multi-engine piston and turboprop aircraft), and single engine (0.05%). The composition of the 2030 fleet projected by this model is 264 single engine aircraft, 53 jets, 46 multi-engine aircraft, 45 helicopters, and 8 other aircraft. The drawback of this model is that the Airport's history has been to grow at a much higher rate than the nation as a whole. Population in the service area is also projected to grow at a higher rate than the U.S. population.

Linear Trend Model (2.55% Annual Growth).

This forecast model analyzes historical growth from 1998 through 2010 and continues that growth trend into the future. The result is an average annual growth rate of 2.55%, resulting in a projection of 586 based aircraft in 2030. From 2010 to 2030, single engine aircraft grow to 457 at 2.85% per year, jets grow to 48 at 3.76% per year, multi-engine aircraft grow to 69 at 2.75% per year, helicopters decline at 4.34% per year to 100, and other aircraft decline at 6.85% per year, to 1. The problem with this model is that the Airport's growing share of the regional market is likely to slow, and it is unlikely that all aircraft types will grow according to the historical trends. The model's strong growth in single engine aircraft and decline in helicopters opposes state and national trends. The decline in helicopters is also inconsistent with the fact that a new helicopter business is planning to operate from the Airport soon.

Population Model (1.53% Annual Growth).

While the historical based aircraft data did not correlate with historical population, both based aircraft and population in the service area increased between 1998 and 2010, showing they are moving in the same direction. The annual growth rate projected for the core service area population, 1.53%, is used to forecast 480 based aircraft in 2030.

Employment Model (1.19% Annual Growth).

Historical numbers of based aircraft did not correlate any better with employment data than with population. However, employment is usually a factor in based aircraft growth and decline. A 1.19% annual growth rate, the average of the high and low ranges of Metro's 2030 employment forecast, resulted in growth to 448 aircraft in 2030.

Terminal Area Forecast (1.40% Annual Growth).

The FAA's Terminal Area Forecast projects that based aircraft will grow to 424, reflecting 1.4% average annual growth from 2009 to 2030. Jet aircraft are forecast to grow at the highest rate, 6.93%, while multi-engine aircraft are projected to remain unchanged. The composition of the 2030 fleet according to the Terminal Area Forecast is 321 single engine aircraft, 49 jets, 30 multi-engine aircraft, and 34 helicopters.

System Plan Forecast (1.27% Annual Growth).

The *Oregon Aviation Plan 2007* used 2005 as the base year, when the Airport's based aircraft totaled 387. It projected yearly growth at 1.27% to 498 aircraft in 2025.

Last Master Plan Forecast (1.09% Annual Growth).

The 2000 Aurora State Airport Master Plan projected 1.09% annual growth in the number of based aircraft, from 259 in 1998 to 318 in 2017. This forecast was constrained, based on ODA's decision not to expand the Airport to serve a more demanding critical aircraft. An unconstrained forecast projected growth to 345 aircraft in 2017. The constrained and unconstrained forecasts for 2017 were reached by 2001.

Preferred Forecast (1.36% Annual Growth).

The preferred forecast uses the average of the growth rates in the Population and Employment Models, 1.36% per year, so that based aircraft reach 464 in 2030. The Preferred Forecast falls in the mid-range of the other forecasts and models. It is higher than national forecasts, but in line with growth projected by Airport businesses, between 1% and 3% per year over the next 20 years. While the Airport may experience a spurt in based aircraft resulting from additional landside development, the other comparable airports (Hillsboro, Troutdale, and McNary Field in Salem) may also expand to meet metropolitan area demand. The preferred forecast assumes it is more likely that Aurora State Airport will maintain its share of regional based aircraft than gain market share as it did in the last decade.

Table 3J presents the based aircraft forecast and fleet mix. The fleet mix was determined by averaging the fleet mixes of the Linear Trend and US Growth Rate Models, and then adjusting primarily the single engine and helicopter shares. The single engine share was lowered slightly and the helicopter share raised, to be more in line with expectations for the Airport. Multi-engine aircraft were divided between turboprop and piston, with turboprop aircraft growing faster than multi-engine piston aircraft. The resulting annual growth rates from 2010 to 2030 differ by aircraft type: 3.7% for jets, 2.6% for turboprop, 0.6% for multi-engine piston, 1.0% for single engine, 2.8% for helicopter, and 0.0% for other.

Table 3J. Based Aircraft and Fleet Mix Forecast

Year	Jet	Turboprop (Multi-engine)	Multi-engine Piston	Single Engine	Helicopter	Other	Total
2010	23	16	24	261	25	5	354
2015	27	19	24	276	28	5	379
2020	33	20	25	288	34	5	405
2030	47	26	27	316	43	5	464
				Fleet Mix			
2010	6%	5%	7%	74%	7%	1%	100%
2015	7%	5%	6%	73%	8%	1%	100%
2020	8%	5%	6%	71%	9%	1%	100%
2030	10%	6%	6%	68%	9%	1%	100%

Source: WHPacific, Inc.

The fleet mix is projected to shift over the 20-year forecast period, consistent with trends the FAA has projected nationally. Single engine aircraft remain predominant at the Airport, but decline from 74% to 68% over the next 20 years. The proportion of jets and helicopters increases over the planning period, while the proportion of total multi-engine aircraft stays about the same, with some shifting between the multi-engine turboprop and multi-engine piston shares.

AIRCRAFT OPERATIONS FORECAST

This section begins with a review of historical trends in aircraft operations. Previous aircraft operations forecasts are reviewed and the preferred aircraft operations forecast is explained and presented. The operations forecasts include total annual operations, local vs. itinerant operations, operational fleet mix, and peak activity.

Aircraft operations are difficult to measure at a non-towered airport. Research into the problem has concluded that the most accurate and cost-effective way to estimate aircraft operations at a non-towered airport is to sample traffic with an acoustical counter for two weeks for each of the four seasons and extrapolate that sample into an annual estimate.[20] However, acoustical counters can provide false readings from other sounds, miss landings and takeoffs at mid-field by quiet aircraft, and are less reliable for helicopters than fixed wing traffic when helicopters can use multiple takeoff and landing locations and routes.

From 1979 through 2003, ODA's Aircraft Traffic Monitoring Program employed acoustical counting to estimate the levels of annual aircraft operations at Oregon airports. No acoustical samples have been taken since 2003, and combined with the inherent flaws associated with this method, it has been determined that the FAA's Terminal Area Forecast is the best source of historical aircraft operations for the Airport. The Terminal Area Forecast reports periodically updated Airport Master Record estimates provided by ODA.

Table 3K shows the history of operations from 1998 to 2009. Operations peaked at 90,180 in 2000. Their decline to 72,895 in 2001 may be attributed to 9/11. Since 2001, operations have increased slowly to 89,495 in 2009, the last year of historical estimated operations records according to the Terminal Area Forecast.

The composition of operations has not varied substantially from 1998 through 2009. Air taxi (FAR Part 135) operations stayed close to 11% of total operations. Military operations remained a very small portion of total operations, and all military operations were itinerant. The split of GA aircraft operations between itinerant and local varied a bit more. Local operations ranged between 41% and 56% of total GA operations, averaging 45%.

[20] Transportation Research Board, Airport Cooperative Research Program, ACRP Synthesis 4: Counting Aircraft Operations at Non-Towered Airports (2007).

Table 3K. Historical Aircraft Operations at Aurora State Airport

Year	Air Taxi	GA Itinerant	Military Itinerant	Total Itinerant	GA Local	Total Local	Total Operations
1998	8,791	34,650	180	43,621	23,200	23,200	66,821
1999	8,791	34,650	180	43,621	23,200	23,200	66,821
2000	9,000	36,000	180	45,180	45,000	45,000	90,180
2001	6,190	39,475	250	45,915	27,980	27,980	73,895
2002	9,227	39,713	250	49,190	29,402	29,402	78,592
2003	9,325	39,951	250	49,526	30,824	30,824	80,350
2004	9,422	40,188	250	49,860	32,208	32,208	82,068
2005	9,520	40,426	250	50,196	33,628	33,628	83,824
2006	9,431	39,965	250	49,646	34,064	34,064	83,710
2007	9,564	41,176	250	50,990	34,892	34,892	85,882
2008	9,656	41,409	250	51,315	36,030	36,030	87,345
2009	9,788	42,592	250	52,630	36,865	36,865	89,495

Source: FAA Terminal Area Forecast, December 2010.

One method for forecasting aircraft operations at GA airports is to apply a ratio of operations per based aircraft (OPBA) to the based aircraft forecast. For each year in the forecast, operations equal the forecast number of based aircraft multiplied by an OPBA ratio. Some of the operations in an OPBA ratio are by based aircraft and some are by transient, or itinerant, aircraft. The FAA has provided the following guidelines for OPBA ratios:[21]

- 250 OPBA is typical at a rural GA airport with little itinerant traffic.
- 350 OPBA is typical at a busier GA airport with more itinerant traffic.
- 450 OPBA is typical at a busy reliever airport with a large amount of itinerant traffic.

The historical OPBA ratio for Aurora State Airport averages 240 per year,[22] varying from a high of 340 in 2000, to a low of 191 in 2001. In 2009, the OPBA was 276. For comparison, an OPBA ratio was extracted from the Airport user survey that was conducted as part of this Master Plan, in the fall of 2009. The survey asked airport owners and operators to estimate their annual number of landings. Information for fixed wing aircraft varied from 30 annual landings (about once every two weeks) to 300 annual landings (nearly once a day) per aircraft. The average per fixed wing aircraft was approximately 145 landings, which equates to 290 annual operations. The survey results covered a variety of aircraft

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[21] FAA Order 5090.3C, Field Formulation of the National Plan of Integrated Airport Systems (NPIAS)

[22] The number changed from the earlier forecast because three years of based aircraft numbers were lowered, which increased the ratio of operations per based aircraft for those years. Also, an additional year of operations was available.

types, from small single engine piston aircraft to mid-sized business jets. For helicopters, the number of landings per aircraft was much higher, up to 1,500 per year; however, 70% to 90% of the landings are not at the Airport. This illustrates the difference in how helicopters operate, compared to fixed wing aircraft.

The Airport has a lower OPBA than Hillsboro, McMinnville, Troutdale, and McNary Field in Salem. These other airports are located in the same region and, except for McMinnville, have more reliable records of aircraft operations because they have air traffic control towers. The average OPBA ratios for these airports from 1998 to 2008 are as follows:

- Hillsboro 639 OPBA
- McMinnville 592 OPBA
- Troutdale 419 OPBA
- Salem 411 OPBA

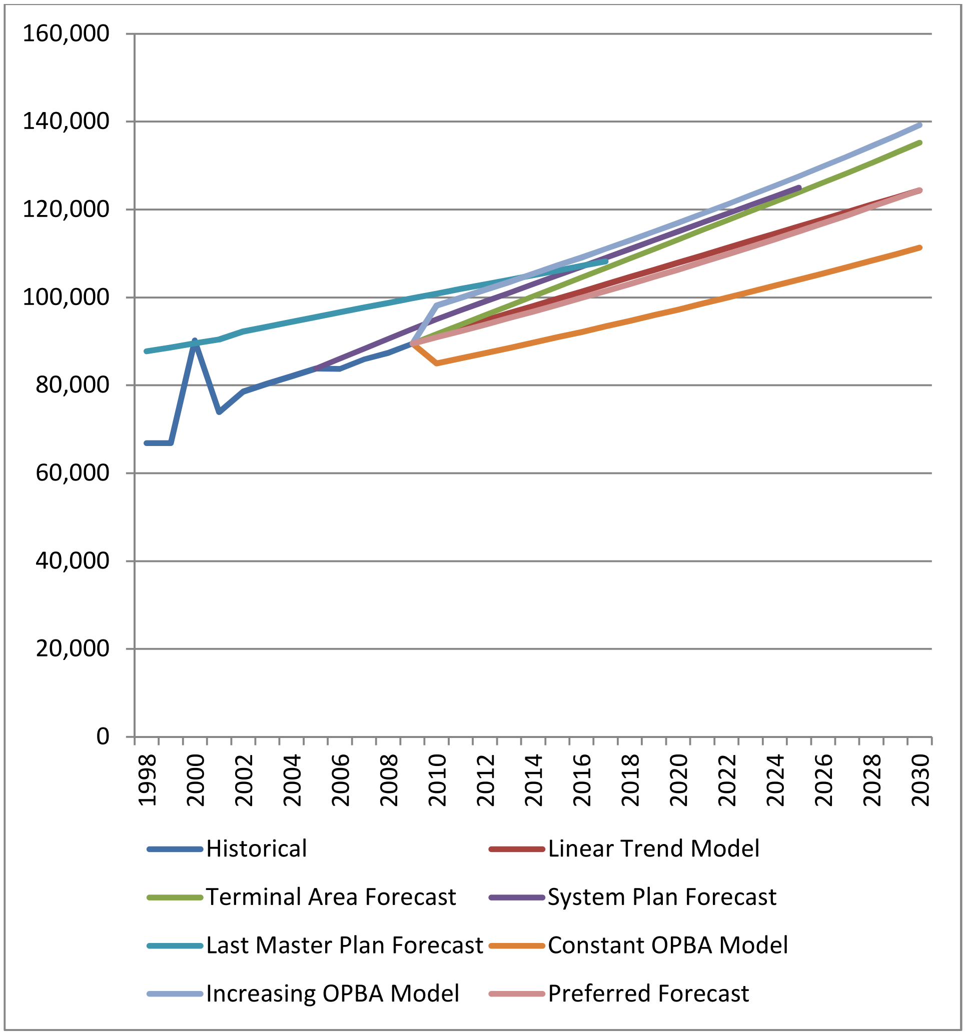
Aurora State Airport's lower OPBA ratio is probably due to a combination of factors, including a lower proportion of local operations (less flight training that entails a high number of touch-and-go operations per aircraft) and a large number of small aircraft that are flown infrequently.[23]

When an OPBA ratio is used for forecasting, the OPBA might be held constant over the forecast period, or it might increase over the forecast period. The projection of an increase in OPBA would be supported by the national trend and FAA's national forecasts over the last several years for increasing aircraft utilization. Put another way, GA and air taxi aircraft hours flown have been increasing faster than the active aircraft fleet, and the FAA has been forecasting higher growth rates for hours flown than for aircraft. Longer trips might account for some of the increase in hours flown, but most of the higher utilization translates to more trips per aircraft. More trips mean more takeoffs and landings per aircraft.

Forecast models for aircraft operations that used the OPBA model and those that did not were considered. **Exhibit 3F** compares the various forecast models and previous forecasts of aircraft operations at the Airport, which are described after the exhibit.

[23] The Airport user survey found many smaller piston airplanes are flown less than once a week, or less than 100 operations per year.

Exhibit 3F. Comparison of Aircraft Operations Forecasts for Aurora State Airport



Linear Trend Model (1.58% Annual Growth).

This model analyzes historical growth from 1998 through 2009 and continues that growth trend into the future. The result is an average annual growth rate of 1.58%, resulting in a projection of 124,347 operations in 2030. By 2030, the OPBA is 268.

Terminal Area Forecast (1.99% Annual Growth).

The FAA's Terminal Area Forecast projects that operations will grow to 135,240 in 2030, reflecting 1.99% average annual growth from 2009 to 2030. By 2030, the OPBA is 312.

System Plan Forecast (2.02% Annual Growth).

The *Oregon Aviation Plan 2007* used 2005 as the base year, when Aurora State Airport's aircraft operations totaled 83,824. It projected yearly growth at 2.02% to 124,978 operations in 2025. The OPBA ratio grew over the forecast period, from 217 to 251.

Last Master Plan Forecast (1.11% Annual Growth).

The 2000 Aurora State Airport Master Plan projected 1.11% annual growth in aircraft operations, from 87,714 in 1998 to 108,204 in 2017. The forecast was prepared by using a constant 339 OPBA ratio.

Constant OPBA Model (1.05% Annual Growth).

This model uses the average OPBA from the 1998 to 2009 period, 240. In 2030, aircraft operations reach 111,360, representing 1.05% average annual growth rate from 2009 to 2030. Since the OPBA in 2009 was 276, higher than the 11-year average, the resulting growth rate is slightly lower than the growth rate of the based aircraft forecast. This is inconsistent with the trend for higher aircraft utilization.

Increasing OPBA Model (2.13% Annual Growth).

This model follows the FAA's national forecast for higher aircraft utilization. Over the forecast period, the OPBA ratio is increased to 300. The resulting projection of aircraft operations in 2030 is 139,200, and the average annual growth rate is 2.13%.

Preferred Forecast (1.58% Annual Growth).

The preferred forecast uses the same growth rate as the linear trend[24]. In 2030, aircraft operations reach 124,386, representing 1.58% average annual growth rate from 2009 to 2030. The Preferred Forecast falls in the mid-range of the other forecasts and models. The growth rate is slightly higher than the growth rate of the based aircraft forecast, which is consistent with the trend for higher aircraft utilization. Over time, the OPBA ratio increases to reach 268 in 2030.

Table 3L distributes the preferred forecast for aircraft operations among the categories that the FAA uses for aircraft operations. Air taxi operations remain 11% of total aircraft operations. The split between GA itinerant and local operations is 60% itinerant and 40% local through the planning period. Compared to historical proportions of itinerant and local operations, future local operations are a smaller portion, which reflects the expectation of lessening flight training at the Airport. Itinerant military operations remain constant, and, consistent with the past, there are no local military aircraft operations in the forecast.

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[24] The previous operations preferred forecast used the constant OPBA model (1.9% average annual growth rate) from the 1998 to 2008 period. This update took a fresh look at the models and determined this model is no longer appropriate, as it is yields an average annual growth rate inconsistent with trends expected at the Airport and nationwide.

Table 3L. Aircraft Operations Forecast

Year	Itinerant Air Taxi	Itinerant GA	Itinerant Military	Total Itinerant	Local GA	Total Operations
2009 Historical	9,788	42,592	250	52,630	36,865	89,495
2010 Estimated	10,000	48,395	250	58,645	32,264	90,909
2015	10,815	52,354	250	63,419	34,902	98,321
2020	11,697	56,635	250	68,582	37,756	106,338
2030	13,682	66,272	250	80,205	44,181	124,386

Source: WHPacific, Inc., except Terminal Area Forecast for 2009.

Operations Fleet Mix Forecast

Because aircraft operations include those by transient aircraft as well as those by based aircraft, the operational fleet mix for the Airport is not the same as the based aircraft fleet mix (Table 3J). Since it is a non-towered airport, the operational fleet mix for the Airport must be estimated. IFR traffic records help with the estimate, although IFR operations account for a small portion of the total Airport traffic, and higher performance (turbine-powered) aircraft are disproportionately represented in the IFR traffic. The Airport users surveyed reported higher utilization for jets and turboprops than for piston airplanes.[25] Local operations are predominantly for training, and are reportedly dominated by piston aircraft and helicopters.

National data confirm that business jet aircraft are used more often than piston aircraft. Tables 3A and 3B show that piston aircraft are flown 83 hours per year and jet aircraft are flown 252 hours per year on average. Consequently, jets have a greater share of the operations at the Airport than their share of based aircraft. In addition, since Aurora State Airport is "jet-capable," and most of the 46 other airports in the service area are not, the Airport will be used more by transient jet aircraft than most of the other airports.

Using this information and considering national growth rates for hours flown, the operations fleet mix forecast was prepared (**Table 3M**). Piston-powered airplanes are projected to have a declining share of total operations, while jet, turboprop, and helicopter traffic have growing shares.

[25] For the 86 aircraft with use estimates in the user survey results, helicopters have the highest utilization—up to 1,500 operations per year per helicopter, although 70% to 90% of those operations are not at Aurora State Airport. The jets in the survey are used nearly 600 operations per year per aircraft. Piston aircraft have the lowest utilization, 60 to 150 operations per year.

Table 3M. Operations Fleet Mix Forecast

Year	Jet	Turboprop	Multi-engine Piston	Single Engine	Helicopter	Total Operations
2010	10,909	9,091	8,182	35,455	27,273	90,909
2015	12,782	10,815	7,866	35,396	31,463	98,321
2020	15,951	11,697	7,444	37,218	34,028	106,338
2030	22,389	14,926	8,707	37,316	41,047	124,386
			Fleet Mix			
2010	12%	10%	9%	39%	30%	100%
2015	13%	11%	8%	36%	32%	100%
2020	15%	11%	7%	35%	32%	100%
2030	18%	12%	7%	30%	33%	100%

Source: WHPacific, Inc.

Peak Aircraft Operations Forecast

As airport activity fluctuates from month to month, day to day, and hour to hour, airside and landside facilities should be designed to accommodate peak levels of use. The forecast of annual aircraft operations serves as the basis for generating forecasts of peak demand. Peak demand is usually expressed as "Peak Month" (the month in a calendar year when the highest level of activity occurs), "Design Day" (the average daily level of activity during the Peak Month), and "Design Hour" (the busiest hour within the Design Day).

Peak demand forecasts at the Airport are based on assumptions that consider the following:

- Peaking characteristics determined from fuel sales and IFR flight plan data
- Guidance regarding peak demand from FAA Advisory Circular 150150/5060-5, *Airport Capacity and Delay*

Historical fuel sales and IFR operations records are available by month. They indicate that May through September is typically the busiest time at the Airport, and the winter months are the slowest time. The single busiest month varies from year to year, but for both fuel and IFR activity, the busiest month accounts for 11% of the annual total, on average.

The Design Day is the average day of the Peak Month, calculated by dividing Peak Month operations by 30.5 days. Based on FAA guidance for the Airport's mix of aircraft, the Design Hour is estimated to contain 11% of the Design Day operations.[26] **Table 3N** presents the resulting peak demand forecasts for Aurora State Airport.

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[26]FAA Advisory Circular 150/5060-5, Airport Capacity and Delay, Table 2-1.

Table 3N. Peak Operations Forecast

Year	2010	2015	2020	2030
Annual	90,909	98,321	106,338	124,386
Peak Month	10,000	10,815	11,697	13,682
Design Day	328	355	384	449
Design Hour	36	39	42	49

Source: WHPacific, Inc.

CRITICAL AIRCRAFT AND AIRPORT REFERENCE CODE

According to FAA criteria, an airport's design is based on the characteristics of the critical aircraft, which is the most demanding aircraft that uses the airport "regularly" or "substantially." The FAA defines regular or substantial use as at least 500 annual itinerant operations. The Airport Reference Code (ARC) is the main criterion for determining applicable FAA airport design standards for dimensions such as runway and shoulder widths; separations of runways, taxiways, and taxilanes; and cleared areas. The Aircraft Approach Category and the Airplane Design Group of the critical aircraft define the ARC. The Aircraft Approach Category is determined by the approach speed, or 1.3 times the stall speed of the aircraft in its landing configuration at its maximum landing weight. The letters A, B, C, D, and E. represent the Aircraft Approach Category. The Airplane Design Group of the aircraft is based on the wingspan or tail height, and is defined by Roman numerals I, II, III, IV, V and VI. **Table 3O** shows the ARC component definitions and typical aircraft that meet these definitions.

According to the 2000 Airport Master Plan, the planned ARC was B-II, exemplified by the King Air turboprop and the Cessna Citation jet. At that time, ODA decided to constrain the forecast by keeping the airfield ARC at B-II. A runway designed for ARC B-II is adequate for about 45% of the business jets manufactured.[27]

[27] Central Region FAA Newsletter, October 2001.

Table 3O. Airport Reference Code (ARC) Components

Approach Category	Approach Speed	Typical Aircraft
A	Less than 91 knots	Cessna 150, 172, 206, Beech Bonanza
B	91 to 120 knots	King Air, Piper Navajo, Gulfstream I
C	121 to 140 knots	Boeing 727, 737, Learjet, Challenger
D	141 to 165 knots	Boeing 747, Gulfstream V
Airplane Design Group	**Wingspan**	**Typical Aircraft**
I	Less than 49 feet	King Air, Cessna 150, 172, 206, Gates Learjet, Beech Bonanza
II	49 to 78 feet	King Air, Super King Air, Cessna Citation, Dassault Falcon, Gulfstream I, Challenger
III	79 to 117 feet	Boeing 727, 737, DC-3, DC-6, Gulfstream V

Airplane Design Group may be determined by tail height, if more demanding than wingspan:

Airplane Design Group	Tail Height
I	Less than 20 feet
II	20 to 29 feet
III	30 to 44 feet

Source: FAA AC 150/5300-13, Airport Design

Note: Aircraft Approach Category E (166 knots or more) and Airplane Design Groups IV, V, and VI (118 feet or more) are not shown.

The Airport has now passed the 500 operations threshold for Aircraft Approach Category C, so the current ARC should be C-II. To prove this, **Table 3P** presents the distribution of documented[28] jet aircraft operations by ARC for FY 2007 and FY 2009. The two years represent recent peak and valley years, neither of which is typical of activity at the Airport. The peak year (2007) was the boom time immediately preceding the recession, and the valley year (2009) was the deepest part of the recession. The average of the two years reflects activity in a more normal year. The source of this information is IFR flight plan records. Undocumented VFR jet operations are not included in the table, nor are the many turboprop and piston aircraft operations that fall in Approach Categories A or B and in Airplane Design Groups I or II.

[28] Documentation is from IFR flight plans filed. They were reviewed, and VFR operations required to make trips whole were added. For example, if an individual aircraft's IFR record showed a flight from Aurora State to another airport, and its next sequential IFR operation originated at Aurora State, a VFR operation was added to bring the aircraft back to Aurora State for the next flight. One Flight Operations Director at the Airport confirmed that IFR clearance is sometimes obtained after VFR departure or cancelled prior to arrival, to save time.

Table 3P. Documented Jet Operations by Airport Reference Code

ARC	FY 2007	FY 2009	Average
B-I	689	273	481
B-II	883	785	834
B-III	0	4	2
C-I	293	209	251
C-II	406	181	293
C-III	2	0	1
D-I	8	0	4
D-II	2	2	2
D-III	0	2	1
Unknown or Other ARC	59	64	62
Total	2,342	1,520	1,931

Source: Derived from IFR flight plan data (Detailed GA Activity and Airline reports) obtained from GCR's Airport IQ Data Center. Note: during the update, more research was done to identify ARCs for the "Unknown" aircraft, which increased the number of B-I, B-II and C-II aircraft operations.

The Cessna Citation is the most prevalent jet aircraft represented in the documented operations and in the based aircraft fleet. In the FY 2007 data, the Cessna 525 Citation (ARC B-I, 10,400 pounds maximum takeoff weight) is predominant. In the FY 2009 data, the Cessna 560 Citation (ARC B-II, 16,300 pounds maximum takeoff weight) is predominant. Other models of the Cessna Citation[29] account for large numbers of operations at the Airport, along with the Dassault Falcon 900[30] and the Israel Aircraft Industries (IAI) Westwind 1124[31] and Astra 1125.[32]

Aircraft Approach Category C accounts for 701 documented operations in FY 2007 and 390 in FY 2009, resulting in an average of 545 operations. The number of Aircraft Approach Category D airplane operations is negligible, as are operations in Airplane Design Group III.

With more than 500 operations in Aircraft Approach Category C and more than 500 operations in Airplane Design Group II, the appropriate ARC for the Airport is C-II. With based jet aircraft and jet aircraft operations projected to grow at rates over 3% per year, the ARC is not likely to grow from

[29] ARC B-I and B-II, maximum takeoff weights up to 24,000 pounds
[30] ARC B-II, 45,500 pounds maximum takeoff weight
[31] ARC C-I, 23,500 pounds maximum takeoff weight
[32] ARC C-II, 23,500 pounds maximum takeoff weight

Aircraft Approach Category C to D or from Airplane Design Group II to III. Aurora State Airport meets many of the ARC C-II design criteria now, as the next chapter will show.

The current and forecast ARC is C-II, which reflects a family of business jets. The critical aircraft is the aircraft in ARC that uses the Airport the most. The current critical aircraft is the IAI Astra 1125. A runway designed for ARC C-II would be adequate for about 90% of the business jets manufactured.[33] In Table 3P, the Astra accounted for the largest number of C-II operations. An aircraft based in Eugene accounted for most of the Astra operations, and operations by Astra aircraft based elsewhere in Oregon and in California were also recorded. An Astra was recently based at the Airport.

In the future, a newer model of ARC C-II business jet, the Cessna Citation X, is projected to overtake the Astra as the predominant C-II aircraft. The Citation X (36,100 pounds maximum takeoff weight) is in the transient fleet using the Airport now, but is not yet part of the Airport's based aircraft fleet. An aircraft operator based at the Airport is buying a Citation X for its increased range capability, to be able to fly nonstop to the East Coast. The future critical aircraft is the Cessna Citation X.

The ARC does not determine the runway length required. Among other things, runway length differs with aircraft performance and with stage length (trip distance), which determines the fuel load. Runway length is examined in the next chapter.

SUMMARY OF FORECASTS

Table 3Q summarizes all the aviation demand forecasts presented previously in this chapter. **Appendix H** includes the FAA TAF Worksheet, which is used to compare the two forecasts.

With this forecast data, the next step in the master planning process is to calculate the ability of existing facilities to meet the forecasted demand. Additionally, the next chapter will identify needed enhancements of airside and landside facilities to accommodate forecasted demand.

[33] Central Region FAA Newsletter, October 2001.

Table 3Q. Summary of Forecasts

	2010	2015	2020	2030
Based Aircraft				
Jet	23	27	33	47
Turboprop (Multi-Engine)	16	19	20	26
Multi-engine Piston	24	24	25	27
Single Engine	261	276	288	316
Helicopter	25	28	34	43
Other	5	5	5	5
Total	**354**	**379**	**405**	**464**
Aircraft Operations				
Itinerant Operations				
Air Taxi	10,000	10,815	11,697	13,682
GA	48,395	52,354	56,635	66,272
Military	250	250	250	250
Subtotal	*58,645*	*63,419*	*68,582*	*80,205*
Local Operations				
GA	32,264	34,902	37,756	44,181
Total	**90,909**	**98,321**	**106,338**	**124,386**
Operations Fleet Mix				
Jet	12%	13%	15%	18%
Turboprop	10%	11%	11%	12%
Piston	48%	44%	42%	37%
Helicopter	30%	32%	32%	33%
Peak Operations				
Peak Month	10,000	10,815	11,697	13,682
Design Day	328	355	384	449
Design Hour	36	39	42	49

Source: WHPacific, Inc.

Chapter Four: FACILITY REQUIREMENTS

Airport Master Plan Update

Aurora State Airport

In this chapter, existing airport facilities are evaluated to identify their functionality, condition, compliance with design standards, and capacity to accommodate demand projected in Chapter Three, *Aeronautical Activity Forecasts*.

The objective of this effort is to identify what facilities are needed and the adequacy of the existing airport facilities in meeting those needs. Where differences between existing and needed facilities are noted, this chapter identifies when those additional facilities may be needed. Once the facility requirements have been established, alternatives for providing these facilities will be created with input from the Oregon Department of Aviation (ODA), the Federal Aviation Administration (FAA), and the Planning Advisory Committee (PAC). The alternatives will be discussed in Chapter Five.

FAA Advisory Circular 150/5070-6B, *Airport Master Plans*, states the following about this stage of the planning process:

> Planners should determine what, if any, additional facilities will be required to accommodate forecast activity. This task begins with an assessment of the ability of existing facilities to meet current and future demand. If they cannot, planners must determine what additional facilities will be needed to accommodate the unmet demand.
>
> In some cases, the airport sponsor may decide that it is in the community's best interest for the airport not to continue to grow to accommodate forecast activity, or to accommodate forecast activity only up to a point. In these cases, the master plan should document this decision and indicate the probable consequences of the decision (e.g., demand will be capped, the demand will go unmet, or the demand will be diverted to another airport).

At this time, ODA has not decided to constrain Aurora State Airport's ability to meet the unconstrained forecasts presented in Chapter Three. Such a decision may occur later. Facility requirements were constrained in the 2000 airport master plan update because ODA made a policy decision to do so. In the 2000 Master Plan update, forecasting determined the Airport Reference Code (ARC) as B-II, which meant that airport design should accommodate light jets and turboprop aircraft, as well as less demanding aircraft types. Unconstrained forecasting projected jet traffic at the Airport would grow so that the future ARC would be C-II, which meant that airport design should accommodate more medium-sized jets. ODA made a policy decision to constrain the forecasts by constraining the ARC to B-II. Since then, aircraft activity growth has exceeded both the unconstrained and constrained forecasts in the 2000 master plan update. Current activity has passed the FAA's threshold for the ARC to be C-II. This has been possible because the airfield is adequate for many operators of Aircraft Approach Category C airplanes, even though the Airport does not meet all design standards for ARC C-II. In this current master plan update, ODA will examine the impacts of meeting ARC C-II design standards and of accommodating the unconstrained forecasts from Chapter Three. It is anticipated that airport development alternatives analyzed in the next chapter will compare meeting the unconstrained demand forecasts fully, with accommodating no growth, and with accommodating constrained growth. This will allow ODA, with advice from the PAC, to make an informed decision about the possibility of constraining Airport growth.

BACKGROUND

Airport Planning and Development Criteria

Airport planning and development criteria are often defined by both federal and state agencies. The FAA provides specific guidance concerning dimensional standards and many state agencies provide generalized guidance based on facilities offered and aircraft activity levels. Both sets of planning criteria are discussed below, along with some industry criteria.

State and Federal Criteria

ODA has created general guidelines in the 2007 Oregon Aviation Plan (OAP) for airport planning and development based on the roles or categories of airports within the statewide system. The OAP identified five airport categories, each with its own set of performance criteria. The categories are based on factors such as the Airport's function, the type and level of activity at the Airport, and the facilities and services available. The Aurora State Airport (Airport) is classified as Category II – Urban General Aviation Airport. The function of this category is to support all general aviation aircraft and accommodate corporate aviation activity, including business jets, helicopters, and other general aviation activity. The OAP identified a few deficiencies at the Airport for meeting Category II minimum and desired criteria. To correct these deficiencies, the OAP recommends the Airport should:

- Increase Airport Reference Code from B-II to C-II
- Correct parallel taxiway / runway centerline separation (deficiency corrected in 2008)
- Install precision instrument approach
- Install medium intensity taxiway lighting (MITL) (deficiency corrected in 2008)
- Construct designated cargo apron

The FAA specifies design standards by ARC and instrument approach visibility minimums. The ARC is a coding system used to relate airport design criteria to the operational (Aircraft Approach Category – AAC) and the physical characteristics (Airplane Design Group – ADG) of the airplanes intended to operate at an airport. In the previous chapter, it was determined that the ARC at the Airport is C-II, which is exemplified by the IAI Astra 1125. The airport design standards applicable for the IAI Astra 1125 are also applicable for many mid-sized business jets. An AAC of C represents aircraft with an approach speed between 121 and 141 knots. An ADG of II represents aircraft with tail heights of 20 to 30 feet and wingspans from 49 to 79 feet.

The Airport currently has nonprecision instrument approaches. For determining airport design criteria, instrument approach visibility minimums are divided into three categories:

- Visual and not lower than one-mile (currently at the Airport)
- Not lower than ¾-mile
- Lower than ¾-mile

The 2007 OAP and multiple Airport users – by means of survey – have indicated that a precision instrument approach procedure at the Airport would be desirable. New technology allows instrument approaches using the Global Positioning System (GPS) at a minimal cost, in terms of navigational aids and cockpit equipment. For many general aviation airports however, the cost of upgrading facilities (*e.g.*, larger safety clearances, installing lights) to the minimum requirements for the different approach visibility categories is a significant constraint to establishing or improving an instrument approach. This chapter presents the requirements of all the different instrument approach visibility minimums to aid in assessing the feasibility of an instrument approach, considering existing constraints.

Industry Criteria

The next paragraphs outline criteria important to the users of business jets and other business-oriented components of general aviation. These criteria are useful for planning the Airport's future but do not provide sufficient justification for the FAA to fund a project.

The National Business Aviation Association (NBAA) provides optimum and acceptable airport guidelines for corporate jets and turboprops, as shown in **Table 4A**. The guidelines describe specific aspects of airports important to business aviation operators, but are not intended to replace or override airport requirements under federal funding requirements. Table 4A indicates several features that the Airport lacks, including more runway length and instrumentation.

Table 4A. National Business Aviation Association Airport Guidelines

Airport Feature	Optimum		Acceptable	
Runways	Dimensions (ft.)[1]	Weight Capacity (lbs)[2]	Dimensions (ft.)	Weight Capacity (lbs)
Heavy Jet (above 50,000 pounds)	8,603 x 150	120,000	6,314 x 100	75,000
Medium Jet (up to 50,000 pounds)	6,314 x 100	75,000	5,742 x 100	50,000
Light Jet (up to 25,000 pounds)	5,170 x 100	50,000	4,597 x 75	20,000
Very Light Jet / Turboprop (up to 12,500 pounds)	4,597 x 75	25,000	3,453 x 60	15,000
	Taxiways for all runways 200 x 300 ft. ramp area min. Stabilized overruns on longest runway		Adequate ramp for maneuvering / parking	
Air Traffic Control (ATC) Tower	24 hours		None	
Lighting	Full approach light system High intensity runway lights Visual glideslope indictor on all runways		Runway End Identifier Lights (REIL) or Omnidirectional Approach Lighting System (ODALS) Medium intensity runway lights Visual glideslope on instrument runway Pilot controlled lights	
Instrument Procedures	Area Navigation (RNAV) Standard Instrument Departures (SIDs) Standard Terminal Arrival Route (STARs)		Area Navigation (RNAV) Standard Instrument Departures (SIDs) Standard Terminal Arrival Route (STARs)	
Weather Reporting	ASOS		AWOS	
Services	Full-service Fixed Base Operator (FBO)[3] Transient hangar space FAR Part 107[4] type security De-icing		Enclosed passenger waiting area Fuel/tiedowns Elementary security Telephone	
Maintenance	FAR Part 145 Repair Station		Minimal maintenance (tire/battery service, etc.)	
Amenities	Nearby hotel/motel Nearby restaurant		Distant hotel/motel Vending machines	

Source: NBAA Airports Handbook.

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[1] *Runway lengths from NBAA (standard 59 degrees & sea level) were adjusted for Airport conditions (elevation, temperature, runway gradient) described later in this chapter. Actual runway lengths needed for specific aircraft in specific circumstances will vary.*

[2] *Aircraft weights shown are for the group's Maximum Takeoff Weight (MTOW). "Acceptable" runway weight capacities are to accommodate 100% of the fleet within each category. "Optimum" runway weight capacities accommodate 100% of the category's fleet, as well as occasional use by aircraft in larger categories.*

[3] *Staffed 24/7, fuel, passenger and crew lounge, rental cars, shuttle/crew car, vending machine*

[4] *Now TSR (Transportation Security Regulation) Part 1542.*

AIRFIELD REQUIREMENTS

As discussed in Chapter Two, airfield facilities are those related to the arrival, departure, and ground movement of aircraft. Airfield facility requirements are addressed for the following areas:

- Airfield Capacity
- Airfield Design Standards
- Runway Orientation, Length, Width, and Pavement Strength
- Taxiways
- Airport Visual Aids
- Airport Lighting
- Radio Navigational Aids and Instrument Approach Procedures
- Other Airfield Recommendations

Airfield Capacity

The capacity of the runway system to accommodate existing and future aircraft operations was determined using the FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*. This publication describes throughput methods for calculating airport capacity derived from computer models the FAA uses to analyze airport capacity and reduce aircraft delay.

Capacity determined by using the advisory circular reflects the level of aircraft operations at which average delay per aircraft is not more than four minutes. The advisory circular describes two different methods of calculating runway capacity. Both methods assume there are no airspace limitations that would adversely affect flight operations.

One method of calculating capacity is to look at runway diagrams in Figure 2.1 of the circular. The FAA recommends using the capacity numbers in Figure 2.1 only for long-range planning and acknowledges that the assumptions underlying the capacity numbers are not applicable to every airport. Figure 2.1 shows that the capacity of a single runway with a mix index[5] below 20% – conditions at Aurora State Airport – is as follows:

Annual Service Volume (ASV)	230,000 operations
Visual Flight Rules (VFR) Hourly Capacity	98 operations
Instrument Flight Rules (IFR) Hourly Capacity	59 operations

[5] *Mix index is the percentage of total aircraft operations by Class C aircraft (those with maximum takeoff weights between 12,500 and 300,000 pounds) plus three times the percentage of Class D aircraft (those over 300,000 pounds maximum takeoff weight). Mix index at Aurora State Airport was estimated assuming 80% of jet aircraft operations are in Class C, 10% of the turboprop aircraft operations are in Class C, and no operations are in Class D. Consequently, the estimated mix index for the Airport in 2010 is 11%. The mix index rises slightly over time, to 12% in 2015, 13% in 2020, and 16% in 2030.*

A more detailed analytical method from *Airport Capacity and Delay* found that specific circumstances at Aurora State Airport account for a lower estimation of the Airport's current capacity. The calculation of ASV considers three different weather conditions—92% of the time when weather is above VFR minimums, 3% of the time when weather is below VFR minimums but above the Airport's instrument approach minimums, and 5% of the time no operations occur because weather is below the instrument approach minimums.[6] Runway utilization (percentage of the time Runway 17 or 35 is used) was not a factor, since the taxiway exit locations are the same from either runway end.

Over the forecast period, the capacity of the Airport will decline as the mix index (percentage of airplanes with maximum takeoff weights over 12,500 pounds) increases. Other circumstances, such as the instrument approach visibility minimums, are assumed to remain the same. **Table 4B** shows how capacity declines and demand increases in the future. It compares annual and hourly capacity to annual and hourly demand over the forecast period.

Table 4B. Capacity Analysis (Aircraft Operations)

2010	**Annual**	**VFR Hourly**	**IFR Hourly**
Capacity	207,473	111	62
Demand	90,909	36	2
Ratio Demand to Capacity	44%	32%	3%
2015	Annual	VFR Hourly	IFR Hourly
Capacity	199,717	107	61
Demand	98,321	39	3
Ratio Demand to Capacity	50%	36%	5%
2020	Annual	VFR Hourly	IFR Hourly
Capacity	197,778	106	61
Demand	106,338	42	3
Ratio Demand to Capacity	55%	40%	5%
2030	Annual	VFR Hourly	IFR Hourly
Capacity	186,144	99	60
Demand	124,386	49	4
Ratio Demand to Capacity	67%	49%	7%

[6] *Instrument weather conditions were determined from Aurora State Airport weather data for 2000 through 2009 obtained from the National Oceanic and Atmospheric Administration (NOAA). The ten years of data included 77,646 weather observations made by the Airport's ASOS. Some data interpolation is required to estimate that IFR weather occurs 8% of the time. The lowest visibility minimums of instrument approaches to the Airport are 1 mile—a condition that is estimated to occur 5% of the time.*

The table shows that the demand forecast for the Airport stays below the capacity through 2030. FAA guidance[7] recommends planning for increased capacity (*e.g.*, additional taxiway exits, a new runway, or supplemental airport) when an airport reaches 60% to 75% of its capacity. Table 4B indicates that planning for additional capacity should not be required until near the end of the planning period.

Number and Orientation of Runways

The number of runways needed for an airport depends upon the level of aviation demand and wind coverage. The previous airfield capacity analysis concluded that an additional runway is not needed for the 2030 unconstrained forecast of aircraft operations. An analysis of wind coverage found that a crosswind runway is not needed at the Airport, as explained below.

For the operational safety and efficiency of an airport, it is desirable for the primary runway to be oriented as close as possible to the direction of the prevailing wind. This reduces the impact of crosswind components during landing or takeoff. Wind coverage is the percent of the time crosswind components are below an acceptable velocity. The desirable minimum wind coverage for an airport is 95%, based on maximum crosswind speeds that are defined for different sizes of aircraft (lower for smaller aircraft). Ten years of wind data (2000 through 2009) at Aurora State Airport were examined. The analysis found that Runway 17/35 exceeds the 95% threshold for a 10.5-knot (12 mph) crosswind, which is the maximum for the smallest airplanes.

Airfield Design Standards

FAA Advisory Circular 150/5300-13, *Airport Design,* sets forth the FAA's recommended standards for airport design. A few of the more critical design standards are those for runways and the areas surrounding runways, including:

- Runway Safety Area (RSA)
- Object Free Area (OFA)
- Obstacle Free Zone (OFZ)
- Runway Protection Zone (RPZ)

The RSA is a defined surface surrounding the runway that is prepared or suitable for reducing the risk of damage to airplanes in case of an airplane undershoot, overshoot, or an excursion from the runway.

The OFA is an area on the ground centered on the runway or taxiway centerline that is provided to enhance the safety of aircraft operations. No above ground objects are allowed except for those that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

The OFZ is a volume of airspace that is required to be clear of objects, except for frangible items required for the navigation of aircraft. It is centered along the runway and extended runway centerline.

The RPZ is an area off each runway end whose purpose is to enhance the protection of people and property on the ground. The RPZ is trapezoidal in shape and centered about the extended runway

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[7] *FAA Order 5090.3C, Field Formulation of the National Plan of Integrated Airport Systems (NPIAS), Table 3-2.*

centerline. The dimensions of an RPZ are a function of the runway ARC and approach visibility minimums. Among other things, the FAA recommends that RPZs be clear of all residences and places of public assembly (churches, schools, hospitals, etc.) and that airport owners acquire the land within the RPZs so they can control the use of land.

In addition to these design standards, the FAA provides recommended dimensions for runway width, taxiway width, taxiway safety areas, and others. **Table 4C** compares the Airport’s existing B-II dimensions to the design standards for ARC C-II. The ARC C-II standards in Table 4C are based on three approach categories. One column reflects the existing approach minimums – visual and not lower than 1 statute mile. The other approach categories are not lower than ¾ statute mile and lower than ¾ statute mile.

Table 4C. Airfield Design Standards

		Existing Dimensions (ARC B-II)	**ARC C-II Visual and not lower than 1 statute mile**	**ARC C-II Not lower than ¾ statute mile**	**ARC C-II Lower than ¾ statute mile**
Runway Width		100’	100’	100’	100’
Runway Centerline to Parallel Taxiway Centerline Separation		300’	300’	300’	400’
RSA	Width	150’	500’	500’	500’
	Length beyond runway end	300’	1,000’	1,000’	1,000’
OFA	Width	500’	800’	800’	800’
	Length beyond runway end	300’	1,000’	1,000’	1,000’
OFZ	Width	250’	400’	400’	400’
	Length beyond runway end	200’	200’	200’	200’
Precision OFZ [8]	Width	N/A	N/A	N/A	800’
	Length	N/A	N/A	N/A	200’
RPZ	Inner Width	500’[9]	500’	1,000’	1,000’
	Outer Width	700’	1,010’	1,510’	1,750’
	Length	1,000’	1,700’	1,700’	2,500’
Runway Blast Pads	Width	0’	120’	120’	120’
	Length	0’	150’	150’	150’
Runway Shoulder Width		10’	10’	10’	10’
Taxiway Width		35’	35’	35’	35’
Taxiway Safety Area Width		79’	79’	79’	79’
Taxiway Object Free Area Width		131’	131’	131’	131’

Source: FAA Advisory Circular 150/5300-13

[8] *A Precision OFZ (POFZ) is a volume of airspace beginning at the runway threshold and at the threshold elevation. It is in effect only when the following three conditions are met: Vertically guided approach, reported ceiling below 250’ and/or visibility less than ¾ mile, and an aircraft on final approach within two miles of runway threshold.*

[9] *Existing RPZ dimensions meet the ARC B-II criteria for approaches with minimums not lower than 1 mile, which represents the existing instrument approach procedures into the Airport.*

The Airport meets or exceeds all B-II design standards for visual/not lower than 1 statute mile. Except for RPZ size, the Airport also meets or exceeds B-II design standards for not lower than ¾ statute mile approach minimums. For ARC B-II with approach minimums lower than ¾ statute mile, the Airport is deficient for RSA, OFA, and RPZ standards. When upgrading an airport's ARC from B-II to C-II, there are prominent increases in the dimensions of RSA, OFA, OFZ width, and RPZ, as shown in Table 4C.

Runway Length

The runway length required for an aircraft is different for landing and for takeoff, and it depends on several factors such as airport elevation, temperature, runway gradient, airplane operating weights, runway surface conditions (*i.e.*, wet or dry), and others. A single airplane using Aurora State Airport will require different runway lengths at different times, depending on temperature, runway surface condition, the airplane's weight, which varies with the stage length (length of trip or distance between refueling stops), and other factors.

FAA Advisory Circular 150/5325-4B, *Runway Length Requirements for Airport Design*, the FAA's Airport Design Computer Program, and aircraft manufacturers' specifications were consulted for guidance on recommended runway length at the Airport. In addition, aircraft operators were surveyed to quantify operations that are constrained by the current runway length at Aurora State Airport.

Both the Advisory Circular and the FAA's computer program classify aircraft based on weight. For "small" airplanes (those with maximum takeoff weights of 12,500 pounds or less), the classifications are further divided into two additional categories - small airplanes with fewer than 10 passenger seats and small airplanes with 10 or more passenger seats. Additionally, the program displays recommended runway lengths for airplanes between 12,500 and 60,000 pounds maximum takeoff weight. The computer program, using site-specific data, reflects runway length recommendations by grouping general aviation aircraft into several categories, reflecting the percentage of the fleet within each category. **Table 4D** summarizes the FAA's generalized runway length recommendations for the Airport.

The current runway length of 5,004 feet accommodates 100% of the small aircraft fleet with fewer than 10 passenger seats. However, the recommended lengths for larger aircraft exceed the current runway length.

Table 4D indicates that a longer runway may be needed at Aurora State Airport for airplanes over 12 ,500 pounds maximum takeoff weight. Table 4A also indicated a longer runway might be needed at the Airport for light and medium jets, according to NBAA recommendations. Planning for a longer runway may be justified based on these two tables, but to obtain FAA funding for a runway extension requires additional justification that is described in the next paragraphs.

Table 4D. Runway Length Requirements

Airport and Runway Data	
Airport elevation	200 feet
Mean daily maximum temperature of the hottest month	84° F
Maximum difference in runway centerline elevation	2 feet
Wet and slippery runways	
Runway Lengths Recommended for Airport Design	
Small airplanes with less than 10 passenger seats	
To accommodate 75 percent of these small airplanes	2,510 feet
To accommodate 95 percent of these small airplanes	3,060 feet
To accommodate 100 percent of these small airplanes	3,630 feet
Small airplanes with 10 or more passenger seats	4,190 feet
Large airplanes of 60,000 pounds or less	
75% of these large airplanes at 60% useful load	5,330 feet
75% of these large airplanes at 90% useful load	7,000 feet
100% of these large airplanes at 60% useful load	5,500 feet
100% of these large airplanes at 90% useful load	7,850 feet

Source: FAA's Airport Design Computer Program, Version 4.2D, AC 150/5325-4B, Runway Length Requirements for Airport Design.

Runway Length Justification Process

FAA guidance states that to justify funding a runway extension, at least 500 annual itinerant aircraft operations must exhibit a need for an extension now or within the next five years. Determining the particular aircraft model(s) critical for runway length is much easier at a commercial service airport than at a general aviation airport because at a commercial service airport individual airlines mostly use the same type of airplanes and they publish flight schedules that facilitate quantifying numbers of operations and stage lengths. Gathering such data for a general aviation airport is more difficult. In addition, the FAA requires rigorous justification for extending runways at general aviation airports, including documentation from the operators of airplanes needing a longer runway with the individual N numbers of their airplanes and number of constrained operations. A constrained operation is one that must reduce payload for takeoff, or stop en route for fuel, for example.

To quantify constrained operations at Aurora State Airport, questionnaires were distributed to the operators of larger aircraft that use the Airport frequently. Transient aircraft operators were identified from IFR flight plan records. The questionnaires received are in **Appendix I** and the operators who identified constrained operations are listed in **Table 4E**.

Table 4E contains a list of business jets that have operated at the Airport in recent years, as documented by IFR flight plans. The table also indicates which airplane models are based at the Airport and gives the number of constrained operations reported by based and transient users of the Airport. The table lists airplane models in the order of runway length required at maximum takeoff weight, from shortest to longest. Many models listed in the table need a longer runway at maximum takeoff weight than Aurora State Airport's 5,004 feet; these airplanes can use the Airport because they are operating at less than their maximum takeoff weights and/or the temperature is lower than 84 degrees. Usually, airplanes are constrained for takeoff due to high summer temperatures; however, for some airplanes operating under air taxi or fractional jet regulations, the constrained operation is landing on a wet or slippery runway. In addition, the lengths in Table 4E are based solely on aircraft performance requirements. Some operators may have additional requirements based on company operations specifications or insurance.

Table 4E. Business Jet Runway Length Requirements at Aurora State Airport

TYPE	ARC	Max. Takeoff Weight (lbs)	Takeoff Distance (MTOW)	Based at UAO	Constrained Operations Reported
CESSNA 551 CITATION II/SP	B-II	12,500	3,042	No	
CESSNA 501 CITATION I/SP	B-I	11,850	3,249	Yes	
CESSNA 500 CITATION	B-I	11,850	3,364	No	
CESSNA 550 CITATION II	B-II	13,300	3,433	No	
CESSNA 525 CITATION (CJ-1)	B-I	10,400	3,536	Yes	
CESSNA 525B CITATIONJET III (CJ-3)	B-II	13,870	3,651	Yes	JHRD Investment
CESSNA 560 CITATION V ULTRA	B-II	16,300	3,651	Yes	
LEARJET 31	C-I	16,500	3,915	No	
CESSNA 525A CITATIONJET II (CJ-2)	B-II	12,500	3,926	Yes	
CESSNA 560 CITATION ENCORE	B-II	16,830	4,087	Yes	
CESSNA 560 CITATION EXCEL	B-II	20,000	4,121	Yes	Management West
CESSNA 550 CITATION BRAVO	B-II	14,800	4,133	No	
RAYTHEON 390 PREMIER	B-1	12,500	4,353	No	
BEECHJET 400A/T/ T-1A JAYHAWK	C-I	16,100	4,786	No	
LEARJET 45	C-I	20,200	4,845	Yes	Premier Air
MITSUBISHI MU-300	B-I	14,630	4,936	No	
DASSAULT FALCON 900	B-II	45,500	5,373	No	
DASSAULT FALCON 50	B-II	37,480	5,413	No	
CESSNA 650 CITATION VII	C-II	23,000	5,568	Yes	
DASSAULT FALCON 7X	B-II	69,000	5,586	Yes	
DASSAULT FALCON 900 EX	C-II	48,300	5,723	Yes	CSIM
LEARJET 35/36	C-I	18,300	5,740	No	
CESSNA 750 CITATION X	C-II	36,100	5,901	No*	RJ2/DB Aviation
CESSNA 650 CITATION III/VI	C-II	21,000	5,912	Yes*	RJ2/DB Aviation
DASSAULT FALCON 2000	B-II	35,800	6,016	No	
RAYTHEON/HAWKER 125-1000 HORIZON	C-II	36,000	6,027	Yes	

**RJ2/DB Aviation plans to replace the Cessna 650 Citation III/VI with the Cessna 750 Citation X in the near future.*

Table 4E. Business Jet Runway Length Requirements at Aurora State Airport (cont.)

TYPE	ARC	Max. Takeoff Weight (lbs)	Takeoff Distance (MTOW)	Based at UAO	Constrained Operations Reported
IAI - ASTRA 1125	C-II	23,500	6,084	Yes	Novellus, American Medical Concepts, Transcendent Investments
LEARJET 55	C-I	21,500	6,096	No	
LEARJET 60	D-I	23,500	6,153	No	
RAYTHEON/HAWKER 125-800	B-I	28,000	6,176	Yes	WAC Charter
EMBRAER 135	C-II	41,887	6,177	No	Aero Air
GULFSTREAM IV	D-II	71,780	6,257	No	
IAI - GALAXY 1126/Gulfstream G200	C-II	34,850	6,314	No	Anonymous
BOMBARDIER CL-601	C-II	41,250	6,544	No	Anonymous, Aero Air
BOMBARDIER CL-604	C-II	47,600	6,544	No	Anonymous
GULFSTREAM V	D-III	89,000	6,877	No	Vulcan Flight
BOMBARDIER BD-700 GLOBAL EXPRESS	C-III	93,500	7,232	No	Vulcan Flight, Y2K Aviation

Source: WHPacific, 2010, using business jet characteristics published by the Central Region FAA in 2001, manufacturers' specifications, based aircraft from Oregon Department of Aviation aircraft registration records, constrained operators from runway length survey conducted in 2009 and 2010. List includes only business jet models that have documented operations at the Airport according to IFR flight plan records or an operator who wants to use the Airport. Takeoff distances are based only on aircraft performance; federal aviation regulations, company policies, or insurance requirements may require more length. Takeoff distances for standard conditions were adjusted (+14.8%) to account for design conditions at Aurora state Airport.

The runway lengths listed in Table 4E use the manufacturers' takeoff distance for standard conditions (sea level and 59 degrees F). These lengths were increased 14.8% to account for the higher elevation (200 feet MSL), higher design temperature (84 degrees), and runway gradient (2 feet of difference between runway high and low points). The formula for determining the amount of increase is:

Altitude Correction	
(7% per 1,000' above sea level)	L = Takeoff length @ sea level
	L1 = Length corrected for altitude
	L1 = (.07 * E / 1000) * L + L
Temperature Correction	
(0.5% per degree above standard temperature in hottest month)	T1 = Adjusted Standard Temperature
	T = Mean Max High Temperature
	L2 = Length corrected for altitude & temperature
(Std Temp adjusted to Sea Level)	T1 = 59 - (3.566 * E / 1000)
	L2 = (.005*(T - T1)) * L1 + L1

Effective Gradient Correction (takeoff only)	
(10' for each 1' difference between	G = Difference between high / low point in feet
High / Low Point)	L3 = RW length corrected for altitude, temperature & gradient
	L3 = G * 10 + L2

For three aircraft models, operators report constrained operations although the takeoff distance listed in Table 4E is less than the length of Runway 17/35. Two mentioned constraints on hot summer days, which are likely days when the temperature exceeds 84 degrees.

The runway length survey (Appendix I) identified the number of aircraft operations constrained at the Airport annually total 473, using only existing aircraft with N numbers and operators' names identified and using the average number of constrained operations if the operator identified a range of operations. Operators who wished to remain anonymous identified 12 more annual constrained operations. One operator based at the Airport, RJ2/DB Aviation, plans to replace its 650 Citation III/VI with a 750 Citation X, which would be constrained by runway length more often (an estimated 40 times per year compared to 30 for the existing aircraft).

To justify funding a runway extension, the FAA will not accept information for which the operator or the aircraft is not specifically identified. The identified number of constrained operations, 473, does not meet the 500 operations threshold at present time. Applying to 473 an annual growth rate of 3.6%[10], the number of annual constrained operations would reach 500 in 2012.

The 500 annual constrained operations threshold is projected to occur within five years. Even if jet traffic does not grow as fast as projected, it is likely the number of constrained operations will exceed 500 within the 20-year planning period. Consequently, ODA may want to consider planning for a runway extension now, in order to protect the airspace needed, among other things. To justify FAA funding for a planned extension, operators may need to be surveyed again in the future to identify operations that may be constrained.

Table 4E indicates the longest runway required for ARC C-II aircraft (Bombardier CL-601 and CL-604) that use the Airport is 6,544 feet, at maximum takeoff weight. This is 1,540 feet longer than the existing Runway 17/35. The longest runway required for an Aircraft Approach Category B aircraft (Raytheon/Hawker 125-800) is 6,176 feet, at maximum takeoff weight. This is 1,172 feet longer than the existing Runway 17/35. Most takeoffs are at weights under the certified maximum, so that the runway length needed is less. On the other hand, temperatures in the summer can exceed the 84 degrees used to determine runway length in Table 4E.

In the formulation of development alternatives, one or more alternatives might consider a runway extension, in order to evaluate relevant consequences.

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[10] *Table 3M in Chapter Three shows the jet operations forecast, from 10,909 annual operations in 2010 to 22,389 annual operations in 2030, which equates to a 3.6% average annual growth rate.*

Runway Width

The current runway width of 100 feet meets the FAA's recommended standard for C-II aircraft and the current instrument approach, as well as for a precision approach with lower than ¾ mile visibility minimums.

Runway Pavement Strength

The most important feature of airfield pavement is its ability to withstand repeated use by the most weight-demanding aircraft that operates at an airport. The pavement strength rating of Runway 17/35 is 30,000 pounds for single wheel gear and 45,000 pounds for dual-wheel gear. The maximum takeoff weight of ARC C-II aircraft in Table 4E is more than 45,000 pounds (dual-wheel gear). The Airport's parallel taxiway is now designed for 60,000 pounds (dual-wheel gear), and this is the next "break point" in pavement design from the runway's current design strength. The current strength rating is adequate for the current runway length and using aircraft, because the larger aircraft are operating in a constrained situation – whether it is runway length or high ambient temperature – and are not likely at the maximum takeoff weight for that aircraft. Any future runway lengthening would affect the pavement strength required, as it would remove some of the constraints.

Taxiways

The runway currently has a full-length parallel taxiway. A full-length parallel taxiway provides a safe, efficient traffic flow and eliminates the need for aircraft to back-taxi before takeoff or after landing. The FAA recommends a parallel taxiway for nonprecision instrument approaches with visibility minimums of one mile or more and requires a parallel taxiway for instrument approaches with visibility minimums lower than one mile. The 2007 OAP recommends placement of high-speed (acute-angled) exit taxiways as part of the desired criteria. To have room for acute-angled exit taxiways, the runway centerline to parallel taxiway centerline spacing must be at least 400 feet for ADG II.

Runway centerline to parallel taxiway centerline separation distance is another important criterion to examine. The recommended distance is based on satisfying the requirement that no part of an aircraft on a taxiway or taxilane centerline is within the runway safety area or penetrates the runway obstacle free zone (OFZ). The current distance between the runway centerline and the parallel taxiway centerline is 300 feet, which meets the standard for C-II instrument runways with visibility minimums not lower than ¾ mile. However, it is deficient for the 400 feet for C-II runways with lower than ¾ mile visibility minimums.

Similar to runway width, taxiway width is also determined by the ADG of the most demanding aircraft to use the taxiway. The existing taxiways at the Airport are 35 feet wide, which meet the design standard.

The connectors and parallel taxiway system on Airport property meets FAA recommended standards and should be maintained through preventative pavement maintenance.

Taxilanes have object free area requirements, which are slightly less than for taxiways, because aircraft are moving more slowly on taxilanes than on taxiways. For ADG II, the taxilane OFA is 115 feet. Taxilanes in areas serving only ADG I aircraft should meet the 79-foot wide OFA requirement. Most taxilanes at the Airport are on private property. All taxilane development on private property should be designed to the same design standards as taxilanes on ODA property. However, if a situation is constrained from meeting taxiway/taxilane safety and object free areas, the FAA provides the following guidance for showing that a modification of these standards will provide an acceptable level of safety:

- Taxiway safety area width equals the airplane wingspan
- Taxiway OFA width equals 1.4 times airplane wingspan plus 20 feet
- Taxilane OFA width equals 1.2 times airplane wingspan plus 20 feet

Airport Visual Aids

Airports commonly include a variety of visual aids such as pavement markings and signage to assist pilots using the airport.

Pavement Markings. Runway markings are designed according to the type of instrument approach available on the runway. FAA Advisory Circular 150/5340-1J, *Standards for Airport Markings*, provides the guidance for airport markings. Precision markings are currently in place on Runway 17/35, which is adequate for all types of instrumentation currently at the Airport and for any upgrades to a precision approach.

There are runway holding position markings on all taxiways adjoining the runway. The purpose of these markings is to ensure that aircraft waiting for arriving or departing aircraft to clear the runway are not in the RSA. In addition to runway holding position markings, all taxiways are clearly marked with centerlines. Existing taxiway markings at the Airport are adequate.

Airfield Signage. The Airport currently has lighted hold signs on taxiways adjoining the runway. The existing signage is sufficient for the existing airfield layout. Any future additional taxiways and aprons will require additional signs. While not required to meet FAA design standards, it is recommended through-the-fence operators also install signage on future taxiways and taxilanes.

Airport Lighting

Beacon. The Airport's rotating beacon is adequate for the planning period.

Visual Approach Aids. As discussed in Chapter Two, the Airport has three forms of visual approach aids. A four-box Visual Approach Slope Indicator (VASI) is located on each runway end. Runway 17 also has an Omnidirectional Approach Lighting System (ODAL) and Runway End Identification Lights (REILs). A precision approach path indicator (PAPI) is similar to VASI, but the lights are in a single row, rather than two rows. A PAPI is a more precise form of glide slope indicator, and it is recommended that ODA upgrade to a PAPI system.

Runway and Taxiway Lighting. Airport lighting systems provide critical guidance to pilots at night and during low visibility conditions. Runway 17/35 and the parallel taxiway are equipped with medium intensity lighting. It is recommended this system be maintained throughout the planning period.

If a precision instrument approach were implemented, an instrument approach lighting system more extensive than the ODAL system would be required.

Effective ground movement of aircraft at night is enhanced by the availability of taxiway lighting. The adjacent taxiways or taxilanes at the Airport have edge reflectors, which is adequate for the planning period.

The Airport is equipped with pilot-controlled lighting (PCL). PCL allows pilots to turn runway lighting on and control its intensity using the radio transmitter in their aircraft. The PCL system is energy-efficient and should be maintained.

Radio Navigational Aids & Instrument Approach Procedures

Radio Navigational Aids. There is a localizer navigational aid at the Airport. Additionally, the Battle Ground and Newberg VORs (Very High Frequency Omni-Directional Range) can be used to guide a pilot to the Airport.

Instrument and Noise Abatement Procedures. The Airport has several nonprecision instrument approaches, as detailed in Chapter Two. The lowest visibility minimum for the approaches is 1 statute mile for aircraft in Aircraft Approach Categories A and B. For Aircraft Approach Category C, the lowest approach visibility minimums are 1-1/4 statute mile. For most instrument approaches, 1-1/2 mile visibility minimums apply for Category C, and minimums for Category D aircraft are generally higher. When weather is below the minimums prescribed by the Airport's instrument approaches, aircraft cannot land, and the Airport is closed in effect to air transportation.

The previous airfield capacity analysis estimated that weather is below 1-mile visibility 5% of the time. The Airport would be below Approach Category C and D minimums a higher percentage of the time. Low visibility weather is not spread evenly throughout the year. In the months of May through August, visibility is below 1-mile less than 1% of the time on average, but in the months of November through January the weather is below approach minimums more than 10% of the time.[11]

Having an approach that is usable in lower visibility minimums would make the Airport a more reliable mode of air transportation, which is particularly important for emergency and business use. Meeting the typical minimums for an Instrument Landing System (200-foot ceiling and/or ½-mile visibility) would halve the amount of Airport "closure," since weather is below these minimums 2.3% of the time. However, since lower visibility minimums would increase the size of certain FAA design standards shown in Table 4C, improving the instrument approach capability of the Airport to provide visibility minimums lower than 1 mile should be considered in the development alternatives for the Airport. Implementing any new instrument approach procedures will need evaluation by the FAA Flight Procedures Office.

If a better instrument approach is obtained, it should be for Runway 35, since that runway accommodates more traffic and is the preferential runway for noise abatement purposes. The

[11] *Weather data obtained from NOAA for 2000-2009.*

preferable and safest direction for takeoff and landing is into the wind, although wind is not a consideration in runway choice when winds are calm. At Aurora State Airport, the wind is calm (below 5 knots) about 60% of the time.[12] To reduce noise impact, Runway 35 has been designated the preferential/calm-wind runway. When the wind is strongest it is usually from the south, which for safety requires pilots to use Runway 17. The noise analysis prepared in 2002[13] estimated that 80% of aircraft operations could be on Runway 35 if it were designated the calm-wind runway and certain changes were made to instrument approaches and procedures. Runway 35 has since been designated the calm wind runway, but the other changes have not yet been implemented. The additional noise abatement procedures recommended in 2002 were as follows:

- Establish an additional departure procedure for Runway 35 that would allow a 90-degree right turn at 900 feet MSL. (The FAA is working on this now, at ODA's request.) These procedures would be mandatory when operating under instrument flight rules. Air traffic controllers could direct visual flight rules traffic to use the procedure.
- Change the altitude limit on left turns when departing Runway 35, which would allow turns at 900 feet MSL rather than the existing 1200 feet MSL.
- Investigate the potential to allow a back-course approach to Runway 35, which would utilize the Runway 17 localizer for approaches to Runway 35. According to the DECIBEL Committee and ODA, an upgrade to the existing Runway 17 DME is required before this is possible.

The back-course approach to Runway 35 relates to one of the planning issues identified in Chapter One. Flight students use the Runway 17 localizer approach to aid in training during calm-wind conditions, which creates conflicting traffic patterns with the preferential use of Runway 35. The FAA is transitioning to GPS-based approaches from traditional Instrument Landing Systems that use ground-based navigational aids such as localizers. Consequently, it may be difficult to upgrade a traditional radio-type navigational aid or obtain a new instrument approach using one.

Other Airfield Recommendations

Traffic Pattern. The current traffic pattern requires left hand traffic for Runways 17 and 35 for noise abatement. ODA has worked extensively to create noise abatement procedures to avoid flights over noise sensitive areas. **Exhibit 4A** depicts the fixed wing and helicopter traffic patterns at Aurora State. ODA will continue to work with airport users and educate them on the noise abatement procedures.

Wind Indicators/Segmented Circle. The existing windcone and segmented circle are located on the west side of the runway at about midfield. These facilities are adequate and should be maintained throughout the planning period.

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[12] NOAA weather data for 2000-2009 indicates the wind is between 0 and 3 knots 45.7% of the time and between 4 and 6 knots 28.4% of the time.
[13] Harris Miller Miller & Hanson Inc.: Final Memorandum to Daren Griffin, State Airports Manager Oregon Department of Aviation about Aurora State Airport Noise Mitigation Program, May 31, 2002.

Weather Reporting. Real-time weather reporting at the Airport is supplied via Automated Surface Observation System (ASOS). No changes are recommended.

LANDSIDE REQUIREMENTS

Landside facilities are those facilities necessary for handling aircraft on the ground and those facilities that provide an interface between the air and ground transportation modes. Landside requirements are addressed for the following facilities:

- Hangars
- Aprons and Aircraft Parking
- Aviation Businesses and Services
- Air Traffic Control Tower

As the following analysis shows, the amount of land currently owned by ODA and the adjacent undeveloped land that is appropriately zoned is insufficient to accommodate the landside development needed to meet the 20-year forecast. In the next stage of the planning process, in which development alternatives are evaluated, it will be decided if the land area for future based aircraft storage and other aviation purposes should be constrained or not. **Table 4F** summarizes the projections of additional land development needed to meet the forecast demand. The rest of this section describes how these land requirements were determined.

The projection of land needed to accommodate the forecast growth in aviation demand over the next 20 years is 39.6 acres. Currently, about 9 acres of ODA land are undeveloped, and about 26 acres of private property appropriately zoned for Airport development[14] are undeveloped.

Table 4F. Projected Landside Development Requirement (acres)

Facilities	2011-2015	2016-2020	2021-2030	Total
Hangars	4.9	5.4	12.7	23.0
Aprons	1.5	1.5	3.4	6.5
Cargo Apron	0.9	0.0	0.0	0.9
Aviation Businesses & Services	1.5	1.6	3.9	7.0
Air Traffic Control Tower	2.0	0.0	0.0	2.0
Fire Station	0.2	0.0	0.0	0.2
Total	11.0	8.5	20.0	39.6

Source: WHPacific, Inc., 2011.

[14] *This includes about half of the 27.5-acre site that was recently rezoned for Helicopter Transport Services. Helicopter Transport Services is now building on about half of the site. Zoning on that site only allows for helicopter-related uses at this time.*