AURORA AIRPORT NOISE ABATEMENT PROCEDURES:
PREFERRED TRAFFIC PATTERN

CALM WIND RWY 35

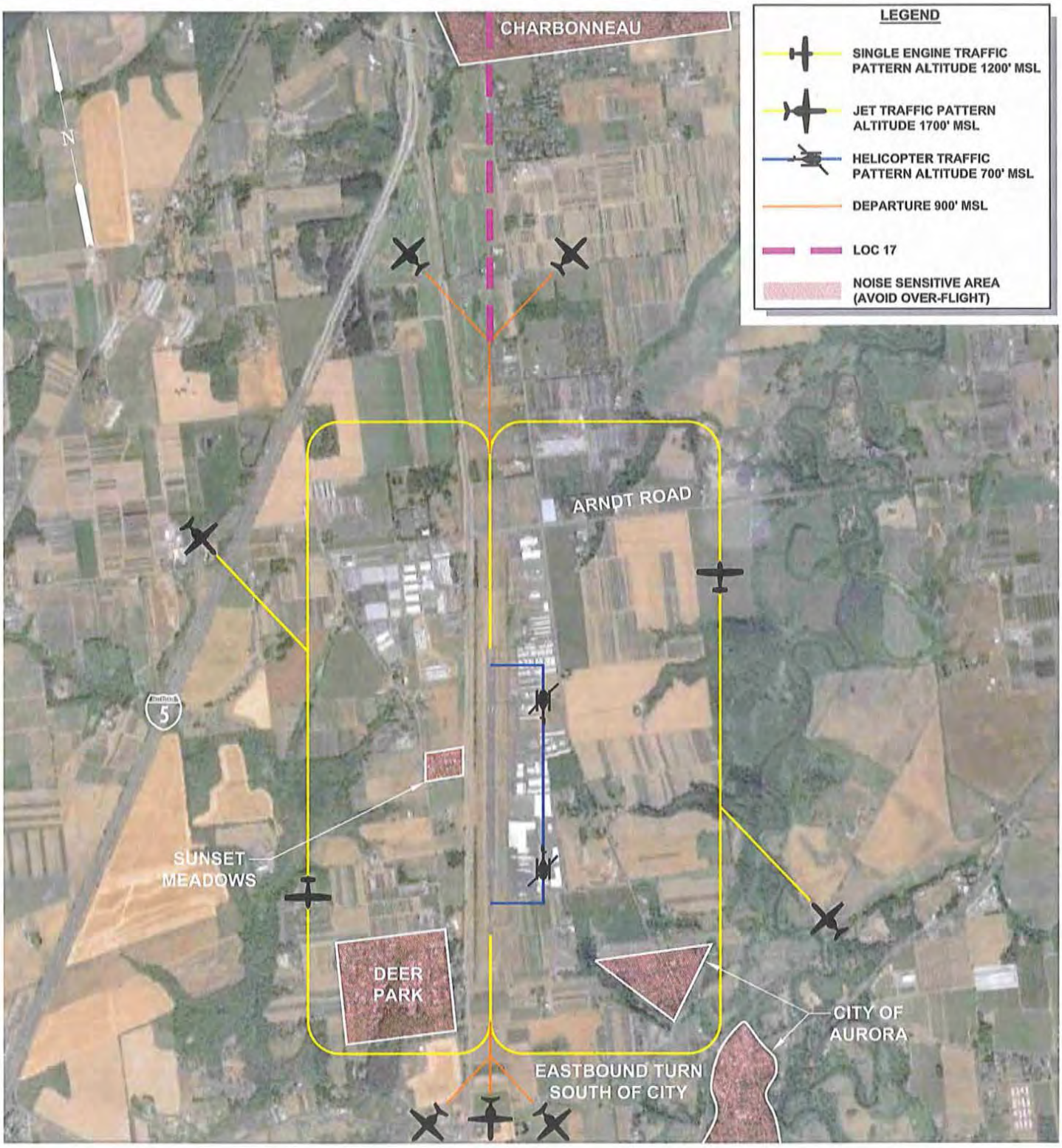


Exhibit 4A ~ Noise Abatement Procedures

Aurora State Airport
Aurora, OR

Nov 18, 2010

WHPacific

032033–PLAN–NA01.DWG

Hangars

Based aircraft can be stored in hangars or at apron tiedowns. Aircraft value, climate, security concerns, the relative cost and availability of hangars vs. tiedowns, and individual preference can influence an aircraft owner's choice between a hangar and a tiedown. Nationwide and at Aurora State Airport, the trend has been to favor hangars over tiedowns. Since the 2000 Master Plan Update, the number of tiedowns at the Airport has decreased from 180 to 83, due partly to hangar construction.

For this analysis, it is assumed that hangars will be built for all the additional based aircraft forecast, and the need for additional tiedowns and apron parking will be limited to transient aircraft. With few exceptions, hangars are not eligible for the FAA's Airport Improvement Program grant funding. Consequently new hangar construction on ODA-owned land would likely be privately funded on land leased from the ODA. Where "through-the-fence" access to the Airport is possible, private land ownership is possible.

Hangar facilities at the Airport consist of a combination of T-hangars and conventional hangars. T-hangars typically store one aircraft in one unit, which is attached to other units. Conventional hangars are stand-alone buildings that can store one or more aircraft.

The area required to store an aircraft varies not only with the size of the aircraft, but also with the hangar configuration and layout. T-hangars are especially efficient because each unit has a "T" shaped floor plan that molds to the shape of an airplane, and individual T-hangar units "nest" back-to-back to form a long rectangular building with aircraft access along two sides. Conventional hangars have rectangular floor plans and usually can store multiple aircraft of different sizes efficiently. Conventional hangars provide more storage flexibility than T-hangars, but have the disadvantage that it is sometimes necessary to move airplanes to get one out from behind another one. Within the Southend Airpark are some conventional hangars with aircraft doors on two (opposite) sides. This is highly convenient but uses more land.

FAA Advisory Circular 150/5300-13, *Airport Design*, Appendix 5, shows nested T-hangar layouts that accommodate between 10 and 14 aircraft per acre, depending upon whether the taxilanes between hangars allow two-way or one-way traffic. These layouts are based on hangars with clear door widths of 40 feet and depths of 30 feet, and would accommodate many Airplane Design Group I aircraft. Willamette Aviation's T-hangars numbered 80 through 83 on Exhibit 2B demonstrate this density of aircraft storage. Fourteen aircraft per acre would be the maximum density achievable at the Airport for the smallest airplanes.

Table 4G outlines the criteria used to project hangar requirements. The table lists a representative aircraft for each of the based aircraft types forecast in Chapter Three. The "footprint" of each aircraft example is the square footage resulting from multiplying the airplane's width (wingspan or rotor diameter) times its length. The table lists a low, high, and average hangar area for each aircraft type. The low hangar area for the single engine, multi-engine, and turboprop represents T-hangar area where the building shape conforms to the airplane shape. The table also lists low, high, and average ratios of

land area to hangar area. These account for the taxilanes necessary for aircraft circulation, as well as land around buildings for fire separation and drainage.

Table 4G. Criteria for Hangar Requirements

Criteria	Single Engine	Multi-Engine Piston	Turbo-prop	Jet	Heli-copter
Example Aircraft	Cessna 172	Beech Baron	King Air	Cessna Citation III	Bell 206B
Footprint (width x length, sq. ft.)	980	1,126	2,387	2,969	1,322
Low Hangar Area per Aircraft (sq. ft.)	1,000	1,200	2,500	3,500	1,500
High Hangar Area per Aircraft (sq. ft.)	2,000	3,000	4,000	5,000	3,000
Average Hangar Area per Aircraft (sq. ft.)	1,500	2,100	3,250	4,250	2,250
Average Vehicle Parking Space per Aircraft	0.2	0.2	0.5	1.5	0.2
Low Land Area per Aircraft including taxilanes = 3.1 x hangar area					
High Land Area per Aircraft including taxilanes = 4.3 x hangar area					
Average Land Area per Aircraft including taxilanes = 3.7 x hangar area					
Average Land Area per Vehicle Parking Space = 450 sq. ft.					

Source: WHPacific, Inc. 2010.

Vehicle access is another component of hangar development addressed in Table 4G. Aircraft owners typically park their vehicles in their individual hangars when they are flying, so vehicle parking in T-hangar and small conventional hangar areas are primarily needed when passengers drive separately from the pilot. For single-engine, multi-engine piston, and helicopter hangar areas, the ratio is one vehicle parking space to five aircraft. The higher vehicle parking ratios for turboprop and jet aircraft reflect higher aircraft utilization and higher passenger capacity. The land area per vehicle parking space, 450 square feet, provides for access drives and individual parking spaces.

Using the average criteria from Table 4G, the hangar building and land requirements for the next 20 years are as shown in **Table 4H**. Table 4H shows that the hangar development demand projected through 2030 needs a total of 23.0 acres.

Table 4H. Hangar Requirements

	Single Engine	Multi-Engine Piston	Turbo-prop	Jet	Helicopter	Total
Additional Aircraft						
2011-2015	15	0	3	4	3	25
2016-2020	12	1	1	6	6	26
2021-2030	28	2	6	14	9	59
Total	55	3	10	24	18	110
Additional Hangar Area (sq. ft.)						
2011-2015	22,500	0	9,750	17,000	6,750	56,000
2016-2020	18,000	2,100	3,250	25,500	13,500	62,350
2021-2030	42,000	4,200	19,500	59,500	20,250	145,450
Total	82,500	6,300	32,500	102,000	40,500	263,800
Additional Vehicle Parking Spaces						
2011-2015	3	0	2	6	1	11
2016-2020	2	0	1	9	2	14
2021-2030	6	0	3	21	2	32
Total	11	0	5	36	5	57
Additional Land Area (acres)						
2011-2015	1.9	0.0	0.8	1.5	0.6	4.9
2016-2020	1.6	0.2	0.3	2.3	1.2	5.4
2021-2030	3.6	0.4	1.7	5.3	1.7	12.7
Total	7.1	0.5	2.8	9.0	3.5	23.0

Source: WHPacific, Inc., 2011.

Aprons and Aircraft Parking

The FAA has developed an approach for determining the number of tiedowns needed for transient aircraft operating at an airport. The source of the methodology to determine the number of additional tiedowns needed in the future is *Airport Design*, Appendix 5:

1. Identify the increase in peak, or design, day operations
2. Divide by 2 (50% of operations are departures)
3. Multiply by 50% or 25% depending on aircraft type. Assume 50% of the fixed wing airplanes will be on the apron at the same time during the peak day. For helicopters use 25% to account for the higher ratio of operations per aircraft and other differences in helicopter usage.

The operations fleet mix and design day operations forecasts from Table 3Q were used to calculate the number of additional transient aircraft parking spaces needed. **Table 4I** shows that 25 additional transient parking spaces are needed over the 20-year planning period. The FAA recommends using a ratio of 360 square yards (3,240 sq. ft.) of transient tiedown apron per single engine piston aircraft. This apron area is 3.3 times larger than the footprint of the Cessna 172 (Table 4G) to account for spacing between aircraft and taxilanes. The 3.3 multiplier was applied to other example footprint areas from

Table 4G--turboprop (King Air), jet (Cessna Citation III), and helicopter (Bell 206B)--to determine apron area. To project the land area required for transient parking aprons, the apron area was multiplied by 1.5. Table 4I shows that from 2011 through 2030 25 additional transient parking places will be needed, requiring 187,780 square feet of apron and 6.5 acres.

Table 4I. Transient Tiedown Requirements

	Jet	Turboprop	Piston	Helicopter	Total
Additional Transient Aircraft Parking					
2011-2015	2	2	0	2	6
2016-2020	3	1	1	1	6
2021-2030	6	3	1	3	13
Total	11	6	2	6	25
Additional Apron Area (sq. ft.)					
2011-2015	19,600	15,760	0	8,740	44,100
2016-2020	29,400	7,880	3,240	4,370	44,890
2021-2030	58,800	23,640	3,240	13,110	98,790
Total	107,800	47,280	6,480	26,220	187,780
Additional Land Area (acres)					
2011-2015	0.7	0.5	0.0	0.3	1.5
2016-2020	1.0	0.3	0.1	0.2	1.5
2021-2030	2.0	0.8	0.1	0.5	3.4
Total	3.7	1.6	0.2	0.9	6.5

Source: WHPacific, Inc., 2011.

The amount of pavement needed for transient helicopter parking is actually less than shown in Table 4I, since helicopters can hover-taxi to parking positions. However, paving or otherwise controlling dust in the taxilanes and spaces between helicopter parking pads is recommended. While there are two helipads on private property, a public helicopter landing and takeoff area is needed on ODA property. Aurora State Airport has a considerable amount of helicopter traffic beyond that associated with tenants and through-the-fence helicopter operators. A new public helicopter takeoff and landing area with associated parking positions should be located to reduce potential conflict with fixed wing aircraft, enhance noise mitigation, and comply with the guidance in FAA Advisory Circular 150/5390-2B, *Heliport Design*.

The 2007 OAP recommends Category II airports have designated cargo aprons. A cargo apron for Aurora State Airport would need to be approximately 25,000 square feet to allow one of the larger Airplane Design Group II aircraft to taxi, turn, and maneuver on the ramp. This assumes truck loading/unloading on the ramp and no need for a cargo terminal building. The land area for this apron would be approximately 0.9 acres.

Aviation Businesses and Services

Excluded from the inventory of existing facilities in Chapter Two was the major heavy-lift helicopter charter business (Helicopter Transport Services) now building on 27.48 acres of privately owned land southeast of the Airport. Initially, about half the site will be developed, with a 126,000 square foot building, a heliport, and five helicopter parking positions. Undeveloped portions of the property will be available for Helicopter Transport Services expansion or other helicopter-related uses according to the zone change application approved by Marion County on March 10, 2010.

In addition to Helicopter Transport Services, other businesses are likely to establish or grow when and if the projected increase in based aircraft and aircraft operations occur. The projected based aircraft increase is 31% over the next 20 years. As discussed in Chapter Two, FBO services are provided by three vendors. At this time service from the existing FBOs is sufficient; however, growth in aviation activity may necessitate expansion of the existing businesses or even the establishment of a new FBO. A 31% increase in aviation activity would result in more revenue from fuel sales and other aviation services, probably more employees and vehicles, and possibly more building area devoted to repair and maintenance, pilot and passenger amenities, and flight training. More likely than the establishment of a fourth FBO would be the establishment of new specialized aviation service operators, providing specific aircraft repair or maintenance services.

Currently, AvGas and Jet A fuel is available for sale at the Airport from multiple vendors. To account for the additional fuel sales that would occur with the projected increase in aircraft operations, vendors may add storage tanks or increase the frequency of fuel deliveries. Fuel tanks owned by Aurora Aviation are located near the parallel taxiway, which is not ideal. A location convenient for truck deliveries would be better for fuel storage, and land near the parallel taxiway would be better used for aircraft. Consideration for relocating the fuel tanks once they have exceeded their useful life is recommended.

Estimating the additional building and land area that might be required to serve the additional aviation activity projected for the Airport is difficult, particularly considering that much of the growth will be on private property. Table 2B indicated 23% of the current buildings at the Airport contain businesses instead of aircraft storage. If the building area for new/expanded businesses equalled 23% of the additional based aircraft hangar area, the additional building area needed through 2030 would be approximately 60,700 square feet. The land area would be up to 7 acres to include land around buildings, aircraft and vehicular access, and adequate vehicular parking.

Air Traffic Control Tower (ACTC)

In April 2009, the FAA's Systems and Policy Analysis Division informed ODA that the Airport was eligible to apply for the Federal Contract Tower program based on its calculated 1.64 benefit/cost ratio. In the FAA's benefit/cost ratio, the denominator is the cost of air traffic controller staffing and the numerator sums the financial benefits from averted collisions, other accidents, and efficiency. The benefits increase over time with the FAA's Terminal Area Forecast for growth in based aircraft, general aviation aircraft operations, and air taxi operations. The 1.64 benefit/cost ratio is for a 15-year period; the calculated ratio exceeds 1.0 in the first year, and grows to over 2.0 in the fifteenth year. The FAA will

recalculate the ratio annually, and as long as the benefit/cost ratio remains over 1.0 and the program is funded, the FAA will fully fund personnel costs. The FAA will not fund the capital or operating costs of the tower. In 2010, the Oregon legislature awarded Aurora State Airport a $2.69 million grant for tower construction through the Connect Oregon III program.

Through this master planning process, and in conjunction with the FAA's Airport Facilities Terminal Integration Laboratory (AFTIL), ODA will be locating the ATCT site. Two acres are required for the building and its associated features (*i.e.*, parking lot, utility structures). For security purposes, the entire facility and parking must be enclosed with a fence. Alternative locations adequate for the ATCT will be identified in the development alternatives.

SUPPORT FACILITY REQUIREMENTS

Facilities and infrastructure that are not classified as airfield or landside are known as Support Facilities. The following support facilities were evaluated:

- Airport Access
- Emergency Services
- Airport Maintenance
- Airport Fencing
- Utilities
- Storm Drainage

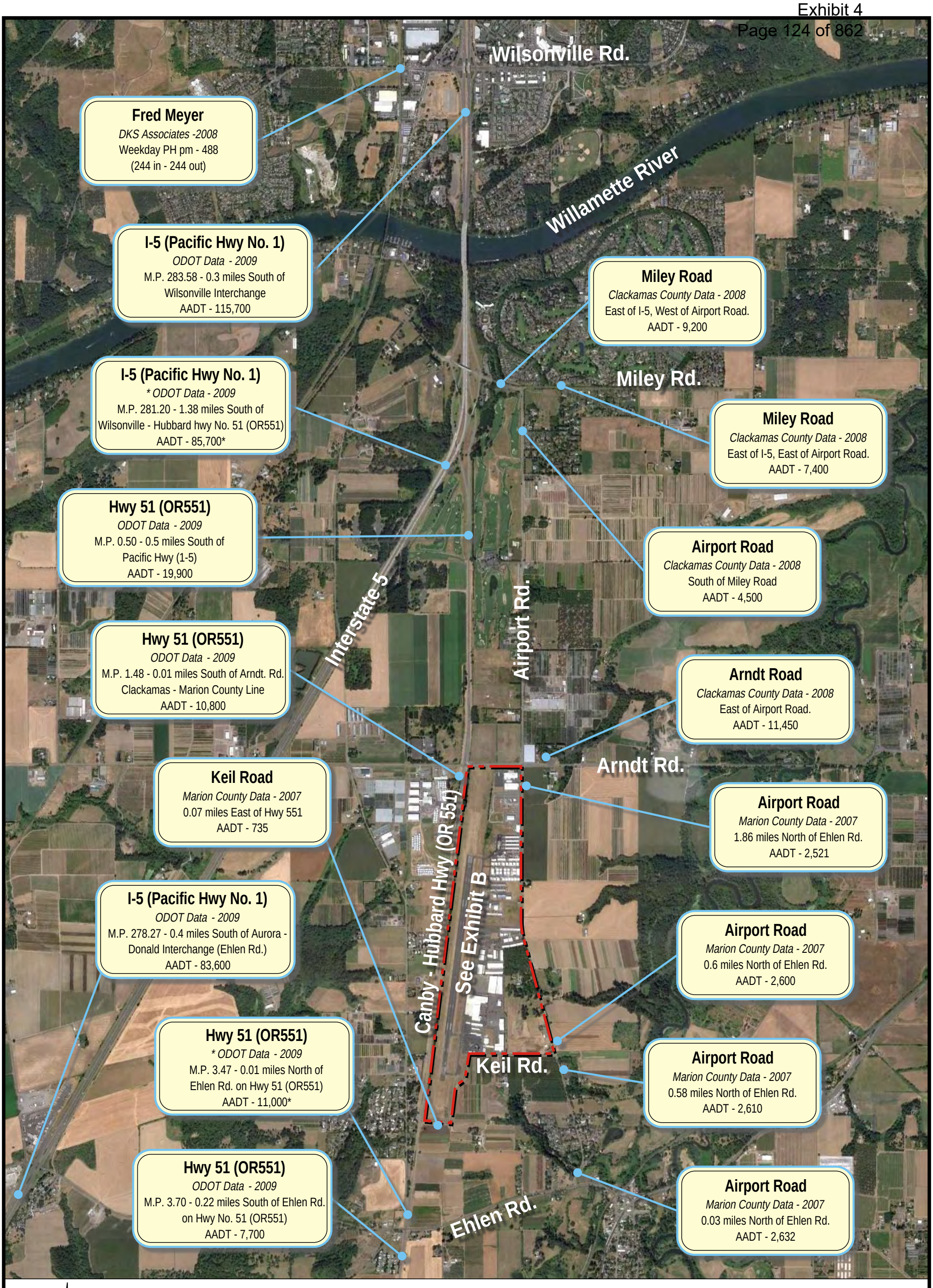
Airport Access

During the initial PAC meeting, several members expressed concern that the Master Plan process would not consider the automobile traffic impact to the surrounding roadways, specifically Airport Road and Interstate 5 (I-5) near Wilsonville. As a result, the following information has been incorporated in this Master Plan Update; data sheets and supplemental reports are included in **Appendix J**:

1. Traffic Count Information for the 11 Airport gates gathered by Oregon DOT (ODOT).
2. Traffic Count data from other available sources including Marion and Clackamas Counties, ODOT, DKS Associates, and Group Mackenzie.

ODOT's Transportation Data Section placed traffic counting tubes at the 11 gates at the Airport to determine the number of vehicles passing through the gates. The counters were placed on October 18, 2010 and removed on October 25, 2010. The Annual Average Daily Traffic (AADT) and Peak Hour traffic numbers were then generated. AADT represents the total number of vehicles traveling in both directions in a 24-hour period. The findings of this sampling is shown in **Table 4J**, as well as Exhibits **4B and 4C**.

Traffic count information, including the Rural Transportation System Plan 2005 update and the 2007 traffic count data, was obtained from the Marion County website. The Clackamas County website provided traffic data from the Comprehensive Plan with updates from January 17, 2008. Information for roads near the Airport is presented in **Table 4K and 4L**.



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SCALE
1000 0 500 1000
(FEET)
1 INCH = 1000 FT.

AADT = Annual Average Daily Traffic
PH = Peak Hour

* - Automatic Counter

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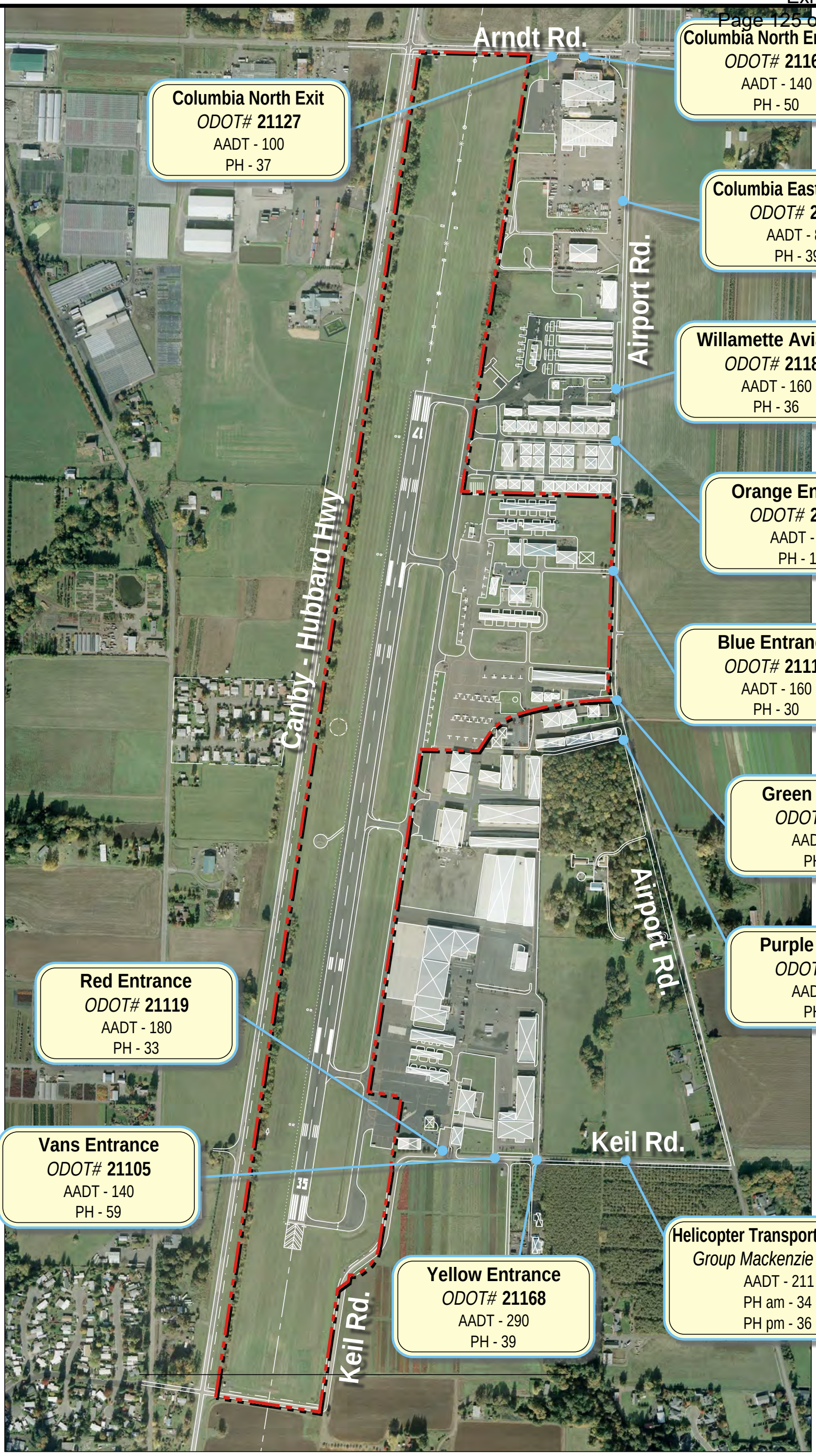
Aurora State Airport
Aurora, OR

January 27, 2011

Exhibit 4B
Traffic Study

034317-C-EP02.DWG



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SCALE
300 0 150 300
(FEET)
1 INCH = 300 FT.

AADT = Annual Average Daily Traffic
PH = Peak Hour

ODOT Data Collected 10/18/10 to 10/25/10

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Aurora State Airport
Aurora, OR

January 27, 2011

Exhibit 4C
Traffic Study

034317-C-EP02.DWG

Table 4J. Aurora State Airport Estimated AADT

Site number	Description	Estimated AADT	Peak Hour
21227	Columbia North Exit	100	37
21165	Columbia North Entrance	140	50
21157	Columbia East Entrance	890	396
21187	Willamette Aviation	160	36
21122	Orange Entrance	70	15
21114	Blue Entrance	160	30
21160	Green Entrance	140	29
21159	Purple Entrance	130	33
21168	Yellow Entrance	290	39
21105	Van's Entrance	140	59
21119	Red Entrance	180	33
	Total	**2,400**	

Table 4K. Marion and Clackamas Counties Roadway AADT

Marion County			
Road	**Description**	**AADT (2007)**	**Functional Classification**
Airport Road	0.30 miles north from Ehlen Rd	2,632	Major Collector
	0.58 miles from Ehlen Road (south of Keil Rd)	2,610	
	0.60 miles from Ehlen Road (north of Keil Rd)	2,600	
	1.86 miles from Ehlen Road (south of Airport Rd)	2,521	
Keil Road	0.07 miles from Hwy 551	735	Local
	0.89 miles from Hwy 551 (west of Airport Rd)	720	
Arndt Road	0.01 miles west of Airport Road	10,062	Local
	0.24 miles from Airport Rd (east of Hwy 551)	9,500	
	0.26m from Airport Rd (west of Hwy 551)	2,500	
Ehlen Road	west of Airport Rd	8,408	Arterial
	east of Airport Rd	9,500	
Clackamas County			
Road	**Description**	**AADT (2008)**	**Functional Classification**
Arndt Road	east of Airport Rd	11,450	Major Arterial
	Airport Rd (south on Miley Rd)	4,500	
Miley Road	east of Airport Rd	7,400	Collector
	east of I-5	9,200	Minor Arterial

Source: Marion County Rural Transportation System Plan 2005 and website and Clackamas County Comprehensive Plan 2004 and website.

As Table 4K illustrates, the AADT of the Airport Entrances represent a large portion of Airport Road's and Keil Road's AADTs.

Marion County roads are designed to accommodate certain levels of activity, as shown in Table 4L. As reported, many of the roadways within Marion County are currently exceeding the AADT to which the road was designed. Clackamas County does not design roads based on roadway volume; the qualitative design definition for Clackamas County roads indicates Arndt Road and Miley Road generally conform with the definition given.

Table 4L. Design Standards for Functional Classification

Functional Classification	Typical AADT	Definition
Marion County		
Arterial	1,000 - 10,000	A roadway intended to carry large volumes of traffic and connect major traffic generators, cities, recreational areas, and major segments of transportation networks. High capacity is achieved through allowing higher speed, limited access, wider roadway and movement preference at intersections with lesser standard roadways.
Major Collector	500 - 1,500	A roadway intended to carry intermediate volumes of traffic and collect and distribute traffic from local streets to arterials, state highways or small population centers.
Local	0 - 500	A roadway serving short distance, intra-neighborhood and residential needs. They are characterized by minimal access limitations, lowest traffic movement preference at intersections with collectors and arterials, and minimum widths. These factors lead to minimum traffic carrying capacity, but provide maximum access to adjacent property.
Clackamas County		
Major Arterial	--	Carries local and through traffic to and from destinations outside local communities and connects cities and rural centers. Moderate to heavy volume; moderate to high speed.
Minor Arterial	--	Connects collectors to higher order roadways. Carries moderate volume at moderate speed.
Collector	--	Principle carrier within neighborhoods or single land use areas. Links neighborhoods with major activity centers, other neighborhoods, and arterials. Generally not for through traffic. Low to moderate volume; low to moderate speed. New collectors should intersect minor arterials rather than major arterials.

Source: Marion County Public Works (2005) and Clackamas County Roadway Standards (2010).

Data for roads under the jurisdiction of ODOT was also obtained. **Table 4M** presents the AADT for both Interstate 5 and Highway 551. While the Airport influences Airport and Keil Roads, the Airport's impact to the ODOT roadways is minimal.

Table 4M. ODOT Roadway AADT

Road	Description	Milepost	AADT (2009)	Functional Classification
Interstate 5 (I-5)	0.4 miles south of Aurora Donald Interchange (Ehlen Rd)	278.27	83,600	Freeway
	1.38 miles south of Hwy 551	281.20	85,700	
	0.30 miles south of Wilsonville Interchange	283.58	115,700	
Highway 551	0.22 miles south of Ehlen Rd	3.70	7,700	Highway
	0.01 miles north of Ehlen Rd	3.47	11,000	
	0.01 miles south of Arndt Rd	1.48	10,800	
	0.50 miles south of I-5	0.50	19,900	

Source: ODOT website traffic counts.

The Helicopter Transport Services (HTS) Transportation Impact Analysis prepared by Group Mackenzie in May 2009 and the Fred Meyer Transportation Impact study in Wilsonville prepared by DKS Associates in August 2008 were obtained for comparative purposes. The HTS analysis reported an AADT of 211, with a morning peak hour of 34 and evening peak hour of 36. These results are typical of other Airport entrances. The Fred Meyer traffic study did not produce an AADT; however, the weekday afternoon peak hour was 488 (244 in and 244 out).

Aurora State Airport Traffic Summary. As stated above, a total of 11 gates (driveways) at the Airport were surveyed and the AADT and peak hour traffic volumes determined. The total AADT of all 11 gates equaled 2,400, plus the projected 211 AADT from HTS when their development is completed in 2011, for a total from the Airport of 2,611 AADT. It should be noted that the three Columbia Helicopters' gates contribute 1,130 AADT or 47% of the total airport-generated vehicular traffic volume. Columbia Helicopters' main activity is helicopter maintenance and support activities that do not rely on the runway and taxiway system or generate similar numbers of operations as the majority of the other airport businesses or FBOs.

Airport Road traffic Summary. As noted in Table 4K, the 2007 Marion County data indicates that approximately 2,600 vehicles travel along Airport Road between Ehlen Road and Arndt Road, utilizing it as a cut through between the City of Aurora and Hwy 551/I-5. According to Karen Odenthal, Marion County Planner, this data will be updated in 2011 and the numbers are anticipated to increase.

Aurora State Airport Vehicular Traffic Impact to the Boone Bridge. Assuming 75% of the Airport-generated traffic travels north and south on I-5 the Airport's impact to would equate to 1,800 AADT out of the 115,700 AADT as indicated by the ODOT counter just north of the Boone Bridge – or .015% of the AADT for I-5 at that location. The current employment numbers at the Airport are estimated to be approximately 750, which equates to 3.2 trips per employee. If a 1.19% employment growth rate (based on the Employment Model in Chapter Three, *Forecasts*, pg 3-21) is applied, the total employment in 2030 will be 950, which would equate to an Airport-generated AADT 0f 3,040; still an

insignificant impact when compared to that of a development such as a Fred Meyers with a peak hour volume of 488 vehicles to the roadway system.

Future Roadway improvements. Numerous improvements to the roadway transportation systems in the airport environs have been identified by the various agencies.

- **Marion County.** Ehlen Road at Boones Ferry and Highway 551, add a left turn lane on Ehlen Road; possible realignment; and possible traffic signal at Boones Ferry to be coordinated with State Highway signal.

  Airport Road is currently designated by Marion County as a Major Collector and is a two lane road with narrow shoulders and no pedestrian or bike lanes. According to Karen Odenthal, on January 25, 2011, Marion County is planning to update its Transportation System Plan. Ms. Odenthal indicated that improvements to Airport Road would likely be identified and a general recommendation would be made to widen the travel lanes, shoulders and add pedestrian/bike lanes. She was, however, uncertain as to the priority the potential project would be given.

- **City of Aurora.** Ehlen Road and Airport Road intersection, add a signal and a left turn lane eastbound on Ehlen Road to Airport Road northbound.

- **ODOT.** Ehlen Road and Hwy 551, signal improvements, left turn lane southbound to Ehlen Road, and coordinated improvements with Marion County. Highway 551 and Keil Road, possible left turn lane southbound along Hwy 551 to Keil Road.

- **Clackamas County.** Airport Road at Miley Road intersection, realign, add turn lanes and install signal. Airport Road between Arndt road and Miley Road, reconstruct and widen to rural standards.

Recommendations. It is recommended that ODA continue to work with and support Marion County and the City of Aurora as improvements to Airport Road are considered. It will be important that appropriate considerations be given to the entrances (gates) to the Airport and business along Airport Road. The question of funding these improvements should be part of the discussions and it is appropriate that future development, both public and private, participate on a similar proportionate share as HTS recently has; see Group Mackenzie report, HTS 2009 pgs 14 and 17 in Appendix J.

Emergency Services

The Marion County Sheriff Department and Oregon State Police provide emergency services at the Airport, since it is located within Marion County and also owned by the State of Oregon. For large-scale emergencies that have a regional or statewide impact, Marion County has entered into an Inter-County Mutual Aid Agreement, wherein other counties would be available to respond.

The Aurora Rural Fire Protection District (District) provides fire protection. A 500,000-gallon fire suppression system was recently installed to assist the District in protecting the Airport. There are no Aircraft Rescue and Firefighting (ARFF) facilities available at the Airport. The District was contacted to

solicit their concerns relating to the Airport. The foremost concern is to have a place at the Airport to house the District's airport fire response apparatus. The building needs only to accommodate a crash truck and a quick response medical unit. For planning purposes, a 2,000-square foot building on a 0.2-acre site should be adequate. The District's preference for the location is near the ATCT or near the fire water pump site.

Airport Maintenance

Airport maintenance is adequately provided by ODA and the Oregon Department of Transportation (ODOT). ODA provides snow removal services. No changes are recommended

Airport Fencing

Fencing surrounds the perimeter of the Airport Environs. All access points have gates, although not all gates are automated. It is advised that the non-automated gates be upgraded.

Utilities

Utilities available at the Airport include electricity, water, septic, and telephone. Septic needs are met by individual septic tanks and drain field systems. New septic systems will be required for buildings with sanitary facilities, and may limit growth potential at the Airport until sewer service is provided. The lack of sewer service is a particular problem for establishing food service facilities. Extensions of electricity, water, and telephone to future facilities will be required as needed. The City of Aurora has express concerns that additional groundwater wells or expansion of water facilities at the Airport will have negative impacts upon the City's current water supply. Drinking water quality is also a concern for the City. Continued development and/or potential expansion of airport facilities without proper advanced planning and feasibility assessments regarding the Airport's ability to meet water, sewer, and fire protection needs concerns the City.

Storm Drainage

The need for additional hangars, other buildings, aprons, and airfield pavements has been identified. These facilities will increase the Airport's existing impervious surfaces. These additional surfaces must be evaluated to ensure that the requirements of the 1200-Z[15] stormwater discharge permit are met. Because a specific layout for future development has not been defined yet, the exact amount of increased impervious surface is to be determined. The alternatives analysis will provide additional details regarding stormwater impacts of each alternative. The analysis will also include Department of Environmental Quality (DEQ) requirements, water treatment, and detention.

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[15] *The federal Clean Water Act mandates jurisdictional control of the quality of stormwater runoff. This mandated program is found in the Code of Federal Regulation part 122.26. The Airport may fall under the scope of these regulations and may need to apply for a National Pollution Discharge Elimination Permit (NPDES) for the discharge of rain water to the surface water system. In Oregon, this is typically referred to as a 1200-Z General Permit.*

Environmental review of individual development will be required to meet National Environmental Policy Act regulations where federal funding is used. All state and local regulations will be addressed, as required.

AIRSPACE

Currently the airspace surrounding the Airport is Class E, which has no communications requirements. The FAA has accepted the justification provided by ODA for an air traffic control tower and ODA has secured funding for its construction. When the ATCT is operational the airspace around the Airport will change to Class D. Class D has communications requirements and the ATCT will provide sequencing and traffic advisories to VFR aircraft operating into and out of the Airport, and IFR traffic separation. Most likely the ATCT will only operate part-time (closed at night), at which time the airspace will go back to Class E. ODA should coordinate with FAA regarding the airspace changes and help educate pilots of the new operating requirements.

LAND USE PLANNING & ZONING RECOMMENDATIONS

In general, the Airport meets State and County land use requirements. Even so, the ODA and Marion County should work towards several items regarding land use and zoning around the Airport. Recommendations are provided below.

Zoning Code

- ODA should consider working with Marion County to rezone the underlying designations within the Airport property as "Airport" to ensure that only compatible uses occur within the Airport property boundary. The rezoning would be based on Oregon Administrative Rules Division 13, *Airport Planning*, which provides guidelines for local government land use compatibility to encourage and support the continued operation and vitality of Oregon's airports.
- Marion County should consider adopting the standards of ORS 836.616, which authorizes certain airport uses and activities to occur at the Airport.
- A portion of the Airport Overlay, which protects FAR Part 77 Imaginary Surfaces, extends into Clackamas County. The Overlay should be maintained and updated as needed based on any airport layout changes recommended in this Master Plan.

Comprehensive Plan

- If Marion County adopts this Master Plan, it would adopt it as a component of the Marion County Comprehensive Plan and all projects identified within the Plan would receive "conditional use" approvals for development. As such, a Traffic Impact Analysis would be necessary for any projects that would have a significant impact on area ground transportation, prior to the County's adoption, in order to meet Statewide Goal 12. Alternatively, ODA could not submit the Plan to Marion County and instead apply for conditional approvals for individual projects. The advantages and disadvantages of these options will be further discussed in Chapter Five as development alternatives are identified.

- Adopt a title notice or similar requirement to inform purchasers of property within one mile of the Airport that their property is located adjacent to or in close proximity to the Airport and their property may be affected by a variety of aviation activities. Note that such activities may include but are not limited to noise, vibration, chemical odors, hours of operations, low overhead flights, and other associated activities.

Chapter Five: AIRPORT DEVELOPMENT ALTERNATIVES

Airport Master Plan Update

Aurora State Airport

The preceding chapter identified shortfalls of the Aurora State Airport (Airport) with respect to existing and anticipated aeronautical demand, which are consistent with current Federal Aviation Administration (FAA) design standards, along with industry and State of Oregon development guidelines. This chapter presents three development alternatives that focus on meeting the Airport's facility needs for the long-term future, along with the No Build Alternative.

The purpose of the build alternatives is to provide variations of how to meet forecasted demand, while the No Build Alternative serves as a baseline for comparison. The Oregon Department of Aviation (ODA) – with input from the FAA, Planning Advisory Committee (PAC), and public – will select a Preferred Alternative that will serve as the foundation for the Airport Layout Plan (Chapter 6). The Preferred Alternative will likely be a combination of elements from the alternatives.

The alternatives should be evaluated using the Master Plan Goals and Issues identified in Chapter 1, which were produced with PAC and public input.

SUMMARY OF FACILITY REQUIREMENTS

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

Airfield Requirements

- The Airport currently meets design standards for an Airport Reference Code (ARC) of B-II and C-II, with approach criteria minimums not lower than 1 statute mile (sm). As depicted in Table 4C, many design standards are deficient for ARC C-II, which represents the current and future critical aircraft. Table 4C also shows deficiencies if the Airport's instrument approach capability is improved (approach minimums are lowered).

- The runway length analysis demonstrated it is prudent to plan[1] for a runway extension now, based on aircraft currently operating and forecasted to operate at the Airport. Accordingly, two of the build alternatives show a runway extension, to a total length of 5,604 or 6,004 feet.

- 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 is recommended the pavement strength be increased to 60,000 pounds (dual-wheel gear), which is the same pavement strength as the parallel taxiway.

- If the instrument approach capability were improved to lower than ¾ sm visibility, then the parallel taxiway would need to be relocated another 100 feet east of the runway to satisfy design standards.

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

- An upgraded instrument approach lighting system is recommended if an approach with minima lower than ¾ sm visibility is selected.

- ODA should establish 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 is working with FAA to create these procedures and they should be published in the fall of 2011.)

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.

- A cargo apron is recommended, 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.

- 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

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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.*

- 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 will 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

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

- The No Build Alternative assumes 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 greater than 1 sm). Adjacent, through-the-fence operators would still have the option to develop their property as the market demands.

- Build Alternative 1 includes a 600-foot extension to the north end of the runway and an instrument approach with visibility greater than 1 sm. The ARC would remain B-II in this alternative.

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

- Build Alternative 3 depicts ARC C-II and instrument approaches with visibility minima lower than ¾ sm (precision approaches). No runway extension is 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.

In addition to these components, the three development alternatives depict additional hangar and apron expansions, area for helicopter operations on State-owned property, future fuel tank locations, and ATCT locations, among other items. As stated previously, there is an approximate need of 40 developable-acres to meet forecasted demand. Currently, ODA only has approximately nine acres of developable land, indicating development will be on a combination of public and private lands. The build alternatives focus on building aircraft storage and parking, ATCT, and the Fire District's facility. The land allowances for these facilities is approximately three to four times the building floor or individual vehicle/aircraft parking area, to account for circulation, fire separation and so on; however, the land allowance may not be enough for septic fields allowance.

The remaining demand will likely be met by private property owners and developers. Development of the Southend Airpark is shown on all build alternatives, based on the current site plan provided to the consulting team. However, actual development of Southend Airpark is dependent upon market demand, and is subject to change as needed. Including Southend Airpark, there are approximately 26 acres of privately-held developable land.

Combining nine acres of undeveloped State-owned property and 26 acres of undeveloped private property currently zoned for airport use, there is a shortfall of approximately 5 acres needed for airport-related development over the next 20 years. In all of the build alternatives, adjacent property is shown to be suitable for airport-related development. This area incorporates approximately 16 acres. This land, now used as a church camp, is not currently zoned Public in the Marion County Zoning Code; however, its location is immediately adjacent to existing airport development and the new Helicopter Transport Services (HTS) development.

Following is a discussion relative to each alternative.

No Build Alternative

Exhibit 5A illustrates the No Build Alternative. By showing the consequences of not developing the Airport, ODA – along with the FAA, PAC and public – can assess the advantages and disadvantages of the development alternatives.

As shown in Chapter 3, *Aeronautical Activity Forecast*, the Airport is expected to experience increased demand. If no development were to occur, the Airport would not be able to support forecasted aeronautical uses and demands. PAPIs, a cargo apron, helicopter parking, vehicle transportation scheme and additional hangars would not be built on State-owned property. The safety enhancements of an ATCT and a building for the Fire District to house emergency response vehicles would not occur. As such, the No Build Alternative would not optimize the Airport's potential.

While the No Build alternative is essentially a do-nothing option, it does not mean that there would be no financial impact to the Airport. Most prominently, there would still be a cost associated with maintaining the current pavements and facilities.

Development of private property, adjacent to the Airport and zoned Public, would be permitted – consistent with local and State regulations.

Build Alternative 1

Build Alternative 1 includes a 600-foot runway extension to the north. Instrument approach capability does not change (not lower than 1 sm visibility minima). **Exhibit 5B** illustrates this alternative. The change to the Airport's footprint would be a slightly larger area for easement acquisition to control building height west of the runway extension, in addition to identifying 16 acres of adjacent land suitable for airport-related development. The Runway 35 RPZ extends south of Keil Road and an avigation easement would be sought; however, this is no different from the existing condition.

Airfield. Airfield developments for Alternative 1 are outlined below.

Jan 18, 2011

N

SCALE
300 0 150 300
(FEET)
1 INCH = 300 FT.

Legend

- Property Line
- BRL — 35' Building Restriction Line
- RSA — Runway Safety Area
- ROFA — Runway Object Free Area
- TOFA — Taxiway Object Free Area
- Existing Buildings
- Future Buildings
- Existing Building Removal

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Aurora State Airport
Aurora, OR

Exhibit 5A
No Build Alternative

034317-AIRP-EX5A.DWG

01/19/11

N

SCALE
300 0 150 300
(FEET)
1 INCH = 300 FT.

Legend

- Property Line
- Future Property Line
- BRL — 35' Building Restriction Line
- RSA — Runway Safety Area
- RROFA — Runway Object Free Area
- TROFA — Taxiway Object Free Area
- Future Paved
- Existing Buildings
- Future Buildings
- Air Traffic Control Tower (ATCT)
- Aurora Rural Fire Protection District
- Future Apron Area
- Vehicular Parking
- Hangar Development
- Fuel Station
- Helicopter Parking
- Precision Approach Path Indicator (PAPI)
- Existing Building Removal

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Aurora State Airport
Aurora, OR

Exhibit 5B
Build Alternative 1

034317-AIRP-EX5B.DWG

- Runway 17 and parallel taxiway extension of 600 feet.
- Pavement would be strengthened to 60,000 pounds (dual-wheel gear).
- Instrument approach minimums not lower than 1 sm. This approach would be no change from the current design standards for ARC B-II, which includes the runway protection zone (RPZ).
- Designation of helicopter operations area in the northwest section of State-owned property.
- Installation of PAPIs.
- Hold area located off the parallel taxiway at the Runway 17 end.

Landside. The landside development features proposed in Alternative 1 include:

- ATCT located midfield on the east side.
- Majority of State-owned property to be developed as hangars.[2]
- Fire District's response building located near the ATCT.
- Fuel tank relocation shown south of Aurora Aviation.
- Adjacent land identified as suitable for airport-related development under private ownership, approximately 16 acres.

Build Alternative 1 has the potential to meet the forecasted demand for the Airport, with rezoning and development of the additional 16 acres of privately owned land east of the Airport.

Build Alternative 2

Build Alternative 2 includes upgrading to ARC C-II standards, extending the runway 1,000 feet to the south, and improving the instrument approach capability to visibility minimums lower than 1 sm but greater than 3/4 sm (see **Exhibit 5C**).

Airfield. Airfield development in Alternative 2 includes:

- Runway and parallel taxiway extension to the south of 1,000 feet, which would require the closure of Keil Road.
- The larger RPZs would require additional avigation easements or land acquisition.
- Pavement would be strengthened to 60,000 pounds (dual-wheel gear).
- Implementation of instrument approaches with minimums greater lower than ¾ sm and installation of approach lighting systems, as recommended by the FAA
- Designation of helicopter operations area, situated where the fuel tanks are currently located.
- Installation of PAPIs.

The runway extension would accommodate nearly all business jets with ARC C-II and below that could potentially operate at the Airport. Keil Road would be dead-ended, with no access to Highway 551. Access would be rerouted, most likely connecting with Ehlen Road. No frontage would be removed.

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[2] *Detailed vehicular access/traffic schemes for hangar development areas are not shown on the individual alternatives. A detailed plan will be developed for the Preferred Alternative.*

Landside. Alternative 2 consists of the following landside developments:

- Designation of a cargo apron facility, north of Aurora Aviation.
- Internal service road.
- ATCT centrally located within State-owned property, but north of the location in Alternative 1.
- Fuel tanks relocated northeast of Aurora Aviation.
- Fire District's response building located adjacent to the water suppression system.
- Development of hangar area and apron area on State-owned property.
- Adjacent land identified as suitable for airport-related development under private ownership, approximately 16 acres.

Build Alternative 2 has the potential to meet the forecasted demand for the Airport, with rezoning and development of the additional 16 acres of privately owned land east of the Airport.

Build Alternative 3

Development Alternative 3 depicts precision approaches (minimums lower than ¾ sm), with ARC C-II. No runway extension is shown for Build Alternative 3. However, relocation of the parallel taxiway is necessary, along with the removal and alteration of several buildings, to meet design standards. Build Alternative 3 is illustrated by **Exhibit 5D**. With a precision approach, the building restriction line[3] moves 250 feet farther from the runway than where it is located with the other alternatives.

Airfield. Alternative 3 has the following airfield features:

- Parallel taxiway relocation 100 feet to the east.
- Implementation of an instrument approach with minimums lower than ¾ sm.
- The larger RPZs would require additional avigation easements or land acquisition.
- Closure of Keil Road, due to increased design standard requirements.
- The building restriction line would extend to include many airport buildings, as well as private residences west of Highway 551.
- Installation of approach lighting, as required by the FAA.
- Designation of helicopter operations area, north of the current apron.

Landside. Significant landside developments within Alternative 3 are:

- ATCT located closer to the north end and farther from the runway than in the other two build alternatives.
- On State-owned land, more focus on apron areas than on any of the other alternatives.
- The Fire District's response building located east of the fire suppression system.

---

[3] *The building restriction line parallel to the runway is the point where the imaginary transitional surface is 35 feet higher than the runway. The transitional surface slopes up at 7:1 from the edge of the imaginary primary surface. The primary surface is centered on the runway and is 1,000 feet wide if the runway has a precision approach. The source of information for these imaginary surfaces is Title 14 of the Code of Federal Regulations, Part 77, Safe, Efficient Use, and Protection of Navigable Airspace.*

Mar 25, 2011

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
- Service Road
- Existing Buildings
- Future Buildings
- Future Paved
- 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
- Existing Road Removal

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Aurora State Airport
Aurora, OR

Exhibit 5C
Build Alternative 2

03437-AIRP-EX5C.DWG

Mar 25, 2011

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

Legend

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

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Aurora, OR

Exhibit 5D
Build Alternative 3

03437-AIRP-EX5D.DWG

- The cargo apron centrally located on State-owned property Future fuel tanks located at the south end of State-owned property.
- Adjacent land identified as suitable for airport-related development under private ownership, approximately 16 acres.
- Power lines located along Arndt Road relocated or buried, as they would be a hazard to air navigation.

While Build Alternative 3 shows the development of an additional 16 acres, it has less potential to meet the forecasted demand for the Airport. This is due to the loss of buildable land within the new building restriction line, which prohibits and/or limits development of facilities.

COMPARISON OF ALTERNATIVES

Detailed costs estimates were not prepared for each alternative; however, the alternatives are compared in order of magnitude costs. The No Build Alternative has the least cost associated with it, as costs only represent maintenance of existing facilities. Of the build alternatives, Alternative 1 is the least costly since its runway extension is less than what is shown in Alternative 2, and there is less land acquisition/easement required than with the other build alternatives. Alternative 2 has the mid-level financial cost of the build alternatives, due to the runway extension and additional requirements for land acquisition and easements. Alternative 3 is the most costly alternative, as it requires relocation of the parallel taxiway, the most land acquisition and easements, removal and relocation of businesses and residences, and relocation of the power lines located along Arndt Road.

Runway length would remain at 5,004 feet for the No Build Alternative and Build Alternative 3. The runway length would be 5,604 feet for Alternative 1 and 6,004 feet for Alternative 2. Land acquisition to the taxiway object free area (OFA) would be required for the extension shown in Alternative 1, while Alternative 2 would require acquisition to the extended runway OFA. Since they show no runway extensions, the No Build Alternative and Build Alternative 3 would keep the pavement strength rating at 45,000 pounds (dual wheel gear). On the other hand, Build Alternatives 1 and 2 would allow use by heavier aircraft (up to 60,000 pounds dual wheel gear).

Alternative 1 would keep the same approach minima – and therefore the same design standards – as what is currently at the Airport. Approach minima of greater than ¾ sm and lower than ¾ sm are included in Alternatives 2 and 3, respectively. Generally speaking, the better the instrument approach, the lower the visibility minima, and the larger the RPZ that ODA would need to control by means of acquisition or avigation easement. Additionally, the approach minima given for Build Alternative 3 would require reconstruction of the parallel taxiway 100 feet to the east, as well as removal and alteration of facilities penetrating the Airport's primary and transitional surfaces[4].

[4] *Primary and transitional surfaces are defined in FAR Part 77, Imaginary Surfaces. Further definition will be given in Chapter 6.*

Helicopter operations, which currently do not have a designated area on State-owned property, would be accommodated in all of the build alternatives near the Airport's mid-point.

As recommended, alternative sites for Aurora Aviation's fuel tanks were identified in each of the build alternatives. Relocation of the existing fuel tanks is only recommended once the tank's useful life has been exceeded.

All alternatives identify adjacent property that would be suitable for airport-related development. Prior to any development of the property, the appropriate land use approvals must be undertaken.

As development potential for the nine acres of State-owned land is limited, much of the development needed to meet forecasted demand will have to occur on privately-held lands. Consequently, it remains imperative that ODA administer through-the-fence agreements consistent with federal guidelines and state statutes, that not only promote development but that also protect the public investment. Chapter 7, *Capital Improvement Plan*, will further discuss this issue.

NOISE ANALYSIS

A noise analysis was completed for all alternatives. The study was performed in accordance with FAA regulations using the Integrated Noise Model (INM) version 7.0. All airport noise was assessed in terms of the yearly day-night average sound level (YDNL) contours. The FAA's INM is widely used by the civilian aviation community for evaluating aircraft noise impacts in the vicinity of airports. INM is an average-value model and is designed to estimate long-term effects using average annual input conditions. Under the FAA criteria, residential land use is not considered compatible with annual day-night noise levels that meet or exceed 65 dBA.

Four separate noise contour exhibits were prepared:

- Existing Noise Contours (2010) – **Exhibit 5E**
- No Build Alternative Noise Contours (2020) – **Exhibit 5F**
- Build Alternative 1 Noise Contours (2020) – **Exhibit 5G**
- Build Alternative 2 Noise Contours (2020) – **Exhibit 5H**

The existing noise contours are meant to be a baseline for comparison of all proposed alternatives. The remaining exhibits present the expected noise contours in 2020. A separate exhibit for Build Alternative 3 (2020) was not prepared, as it reflects the same physical layout of the No Build Alternative Nose Contours (Exhibit 5F).

Tables 5A and 5B present the assumptions used for the analysis for years 2010 and 2020, respectively. The aircraft fleet was determined by using the information provided by the Harris, Miller, Miller & Hanson (2002) noise study conducted for ODA. The aircraft shown are representative of aircraft within each sub-group (*i.e.*, turboprop, small prop, jets, etc.). The data used for operations is from the