Noise Contours Update

Introduction

In support of the Airport Master Plan (AMP), a noise analysis of the airport environment was conducted to evaluate noise exposure due to aircraft operations at Aurora State Airport. Noise contours were developed for the base year (2021), and future 20-year (2041) activity levels based on the FAA-approved 2021-2041 AMP forecast. The 2021 analysis is based on the existing airfield configuration, and the 2041 analysis is based on the future airfield configuration depicted on the AMP Preliminary Preferred Alternative.

For airport noise exposure analysis, the cumulative noise energy exposure of neighboring people and property resulting from airport operations is quantified in terms of yearly day/night average sound level (DNL).[1] The DNL methodology is used in conjunction with the standard A-weighted decibel scale (dB) which is measured on a logarithmic scale, by which is meant that for each increase in sound energy level by a factor of 10, there is a designated increase of 1 dB. DNL has been adopted by the U.S. Environmental Protection Agency (EPA), the Department of Housing and Urban Development (HUD), and the Federal Aviation Administration (FAA) for use in evaluating noise impacts. DNL provides an estimation of annual average aircraft related noise for a particular location such as a runway, but also includes a penalty for night operations as noise at night considered more of a disturbance than noise during the day.

Federal Noise and Land Use Compatibility Criteria

Federal regulatory agencies have adopted standards and suggested guidelines relating DNL to compatible land uses. Most of the noise and land-use compatibility guidelines strongly support the concept that significant annoyance from aircraft noise levels does not occur outside a 65 dB DNL noise contour. This concept is supported by several federal agencies including the Environmental Protection Agency, Department of Housing and Urban Development, and the Federal Aviation Administration.

Title 14 of the Code of Federal Regulations (CFR) Part 150, Airport Noise Compatibility Planning provides guidance for land-use compatibility around airports. **Table 1** summarizes the federal guidelines for compatibility or non-compatibility of various land uses and noise exposure levels. Under federal guidelines, all land uses, including residential, are considered compatible with noise exposure levels of 65 dB DNL and lower. Generally, residential and some public uses are not compatible within the 65-70 dB DNL, and above. As noted in this table, some degree of noise level reduction (NLR) from outdoor to indoor environments may be required for specific land uses located within higher-level noise contours. Land uses such as commercial, manufacturing, some recreational uses, and agriculture are compatible within 65-70 dB DNL contours.

Residential development within the 65 DNL contour and above is not recommended and should be discouraged. Care should be taken by local land use authorities to avoid creating potential long-term land use incompatibilities in the vicinity of the airport by permitting new development of incompatible land uses such as residential subdivisions in areas of moderate or higher noise exposure.

1 14 Code of Federal Regulations (CFR) Part 150, Airport Noise Compatibility Planning

TABLE 1 - LAND USE COMPATIBILITY* WITH YEARLY DAY-NIGHT AVERAGE SOUND LEVELS

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

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

Key to Table 1

SLUCM=Standard Land Use Coding Manual.
Y (Yes)=Land Use and related structures compatible without restrictions.
N (No)=Land Use and related structures are not compatible and should be prohibited.
NLR=Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
25, 30, or 35=Land use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structure.

Notes for Table 1

(1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide a NLR of 20 dB, thus, the reduction requirements are often stated as 5, 10 or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year-round. However, the use of NLR criteria will not eliminate outdoor noise problems.
(2) Measures to achieve NLR 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
(3) Measures to achieve NLR of 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
(4) Measures to achieve NLR 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal level is low.
(5) Land use compatible provided special sound reinforcement systems are installed.
(6) Residential buildings require an NLR of 25.
(7) Residential buildings require an NLR of 30.
(8) Residential buildings not permitted.

ADSB Data

Automatic Dependent Surveillance-Broadcast (ADSB) is an aviation monitoring technology which broadcasts in real-time an aircraft's position (latitude, longitude, and altitude) and other related flight data such as aircraft identifier, heading, speed, and squawk code. The broadcast enables an aircraft to be identified and tracked by other aircraft and air traffic control (ATC) to improve situational awareness and aid ATC in managing traffic.

With few exceptions – such as aircraft without engine-driven electrical systems - the technology is required to be installed in aircraft flying in the following airspace:

- Class A, B, and C airspace;
- Class E airspace at or above 10,000 feet MSL (mean sea level), excluding airspace at and below 2,500 feet AGL (above ground level);
- Within 30 nautical miles of a Class B primary airport (the Mode C veil);
- Above the ceiling and within the lateral boundaries of Class B or Class C airspace up to 10,000 feet (note that ADS-B is not required below a Class B or Class C airspace shelf, if it is outside of a Mode C veil);
- Class E airspace over the Gulf of Mexico, at and above 3,000 feet MSL, within 12 nm of the U.S. coast.

Aircraft without ADSB may operate in the areas described above, but pilots must receive prior approval from the ATC facility responsible for that airspace. Since Aurora State Airport airspace is classified as Class D when the control tower is in operation, and Class E when it is not, aircraft are not required to have ADSB to operate in Aurora State Airport airspace.

ADSB data were acquired from FlightAware.com for the period of January – October of 2021. They include all recorded aircraft positions within 5 nautical miles of the Airport at or below 3000 feet AGL. The data were used to aid in determining flight paths and estimating fleet mix splits.

Noise Modeling Methodology

Noise exposure to the surrounding environment was modeled using the FAA's current noise modeling software, AEDT (Aviation Environmental Design Tool), version 3G. AEDT models aircraft performance in space and time to estimate emissions, noise, and air quality consequences of aviation activity based on user-defined inputs including airport configuration, aircraft operation counts or estimates, fleet mix, and flight tracks. Only aircraft-generated noise exposure was evaluated in this study.

AIRPORT CONFIGURATION

Aviation-related noise at airports can be primarily attributed to aircraft takeoffs, landings, touch-and-go landings, and pre-takeoff engine run-ups. A touch-and-go is when an aircraft lands and immediately takes off without coming to a full stop. This procedure is often executed as an efficient method of practicing takeoffs and landings for flight training. Takeoffs, landings, and touch and go operations occur on runways or helicopter operation areas. Run-ups are a procedure where the pilot performs a series of final checks on the aircraft prior to takeoff with the engine running at increased throttle levels (typically 60%-70%). Run-ups are performed by piston-engine aircraft prior to departure, typically near the runway end.

Aurora State Airport, in its current configuration, has a single runway, 17/35. It has a paved asphalt surface 5,003 feet long and 100 feet wide oriented north and south. Runway 17 accounts for 26% of all arrivals and departures, and runway 36 accounts for 74%. The runway end locations from the current ALP were entered into AEDT to establish the existing runway used in the 2021 scenarios. There is a dedicated run-up apron on the south end of Taxiway A to accommodate run-ups by aircraft preparing to depart on Runway 35. There is no dedicated run-up area identified for aircraft departing on Runway 17. Instead, aircraft that intend to depart on Runway 17 complete run-ups at various locations on the airfield, including on the main apron and in adjacent hangar areas.

The Preliminary Preferred Alternative depicts a future runway extension of 497 feet on the 17 end, resulting in a future runway length of 5,500 feet. A new dedicated runup apron is proposed at the north end of Taxiway A to accommodate aircraft preparing to depart on Runway 17. The future runway end and runup locations from the preferred alternative were implemented into AEDT for use in the 2041 scenario.

While helicopters operate at the Airport, there are no designated helipad or operations areas on the airport, nor is a future facility proposed. Discussions with airport personnel and pilots familiar with the airport indicated that helicopters operate across the facility, but most commonly from the runway, Taxiway A, or adjacent through-the-fence (TTF) properties. However, there was little confidence in determining how many helicopter operations should be attributed to each of these areas. So, a single representative helipad was modeled at the current midpoint of Runway 17/35. This modeled helipad location was maintained for the 2021 and 2041 conditions. Helicopter activity attributed to neighboring helicopter facilities unrelated to Aurora State Airport were not included in the analysis.

AIRCRAFT OPERATIONS

Noise levels are dependent on the type and frequency of operations over a period, and the type of aircraft responsible for those operations. Annual operations estimates for the 2021 and the 2041 periods were developed as part of the Airport Master Plan. The Forecast Summary is presented in **Table 2**.

AIRCRAFT NOISE AND PERFORMANCE (ANP) PROFILES

AEDT uses Aircraft Noise and Performance (ANP) profiles to assign noise and performance details based on engine type, speed, climb rates, and other flight characteristics to groups of similar aircraft. For example, Cessna 172, Cessna 177, and Piper PA-22 are all represented by ANP CNA172. ANP profiles representing the current airport fleet were identified based on the based aircraft inventory, ADSB data, and Traffic Flow Management System Counts (TFMSC) records. A list of the selected ANP profiles and the aircraft they represent is included in **Table 3**.

TABLE 2 - MASTER PLAN FAA-APPROVED FORECAST SUMMARY

Forecast Summary	2021	2041
Based Aircraft		
Single Engine	220	146
Multi Engine	15	4
Jet	36	46
Helicopter	10	19
Total Based Aircraft	**281**	**215**
Aircraft Operations		
Itinerant		
Itinerant Air Taxi	2,006	2,214
Itinerant GA	36,390	39,544
Itinerant Military	79	79
Itinerant Total	38,475	41,838
Local		
Local GA	37,488	48,328
Local Military	65	65
Local Total	37,553	48,393
Total Operations	**76,028**	**90,230**
Aircraft Operations Fleet Mix		
Single Engine*	65,319	62,762
Multi Engine Piston	2,299	2,165
Turbo Prop	2,628	9,796
All Jets	5,022	14,378
Jets 12,500 lbs or Less	842	1,327
Jets 12,501 lbs and up to 60,000 lbs	4,088	12,739
Jets Greater than 60,000 lbs	92	312
Helicopter	760	1,130
Total Operations	**76,028**	**90,230**
Instrument Operations	**9,443**	**16,089**

TABLE 3 - ANP AIRCRAFT GROUPS

ANP	Representative Aircraft*
GASEPF	Beechcraft 23, Cessna 140, Cessna 150, Cessna 152, GC1 Globe Swift, Grumman AA-5B, Piper J-3, Piper PA-18, Piper PA-28, Stinson 108, Stinson Voyager, Vans RV-4
GASEPV	Beechcraft Bonanza, Cessna 180, Cessna 195, Cessna 210, Larkin Pitts Special, Mooney M20, Piper PA-24, Piper PA-32, Prisel-Ralph Skybolt, Raytheon A36, Ryan ST3KR, Vans RV-6, Vans RV-7, Vans RV-8, Vans RV-9, Vans RV-10
CNA172	Aeronca 7, Cessna 170, Cessna 172, Cessna 175, Cessna 177, Champion Citabria, Christen A-1, Piper PA-20, Piper PA-22
CNA182	Cessna 180, Cessna 182, Cessna 185
COMSEP	Cirrus SR20, Cirrus, SR22
BEC58P	Beechcraft 55, Beechcraft 58, Cessna 310, Piper PA-23, Piper PA-31, Piper PA-34
PA30	Diamond DA42, Diamond DA-62, Piper PA-30, Piper PA-44
CNA208	Beechcraft T-6, Cessna 208, Pilatus PC-12, EPIC LT/Dynasty, DeHavilland DHC-2, DeHavilland DHC-3, Socata TBM 700, Piper PA-46
DHC6	Raytheon King Air 90, Raytheon Beech 99, Raytheon Super King Air 200/300, DeHavilland DHC-6
CNA560E	Cessna 560 Encore, Hawker Beechjet 400
CNA525C	Cessna CitationJet CJ1, CJ2, CJ3, CJ4
CNA55B	Cessna 550 Citation II, Embraer Phenom 300, Embraer Legacy 500, Pilatus PC-24
CNA750	Cessna 750 Citation X, Raytheon Hawker 4000 Horizon, Dassault Falcon 2000
LEAR35	Learjet 31/35/36/40/45, Dassault Falcon 10/100, Hawker HS-125/ 800/900
CL600	Bombardier Challenger 300/350/600/601, Bombardier CRJ 100/200/400,
GIV	Gulfstream G300/G350/G400/G450, Dessault Falcon 8X
R22	Robinson R22, Guimbal Cabri G2*
EC130	Eurocopter EC-130, Eurocopter EC-135
B212	Bell 214
H500D	Hughes 500D, Schweizer S269D/330
CH47D**	Boeing CH-47D

Note: Above are examples of aircraft operating at UAO. Not a complete list.

* An ANP model for the Cabri G2 is not provided in AEDT 3G. R22 ANP was selected as a substitution as the aircraft are similar in size, have similar published noise levels, and are used primarily as trainers.

** Only operations by CH47D helicopters associated with UAO facilities are included in the analysis. Operations associated with neighboring facilities were not included.

After representative ANP groups were identified, a percentage of fleet for each ANP group was estimated using ADSB data, TFMSC records (turboprops and jets) and institutional knowledge provided by airport management. A summary of the annual operations by each ANP group for each study year is presented in **Table 4**.

TABLE 4 – OPERATIONS FLEET MIX

AC Class	Percent of Group	2021 Operations	2041 Operations
Total		**76,028**	**90,230**
Total Fixed Wing		**75,268**	**89,101**
Total SEP		**65,319**	**62,762**
CNA172	35%	22,862	21,967
GASEPF	25%	16,330	15,691
GASEPV	25%	16,330	15,691
CNA182	10%	6,532	6,276
COMSEP	5%	3,266	3,138
Total MEP		**2,299**	**2,165**
BEC58P	66%	1,517	1,429
PA30	34%	782	736
Total Turboprop		**2,628**	**9,796**
CNA208	50%	1,314	4,898
DHC6	50%	1,314	4,898
Total Jet		**5,022**	**14,378**
CNA560E	23%	1,155	3,307
CNA525C	36%	1,808	5,176
CNA55B	7%	352	1,006
CNA750	14%	703	2,013
LEAR35	9%	452	1,294
CL600	8%	402	1,150
GIV	3%	151	431
Total Helicopter		**760**	**1,130**
EC130	25%	190	283
B212	20%	152	226
R22	35%	266	396
H500D	15%	114	170
CH47D	5%	38	57

The annual operations estimate for each ANP group and study year was divided by 365 to calculate the average-annual daily operations. A 94%/6% day-night split identified in the airport master plan was applied to estimate day-time and night-time operations which were then assigned to the flight tracks described in the following section.

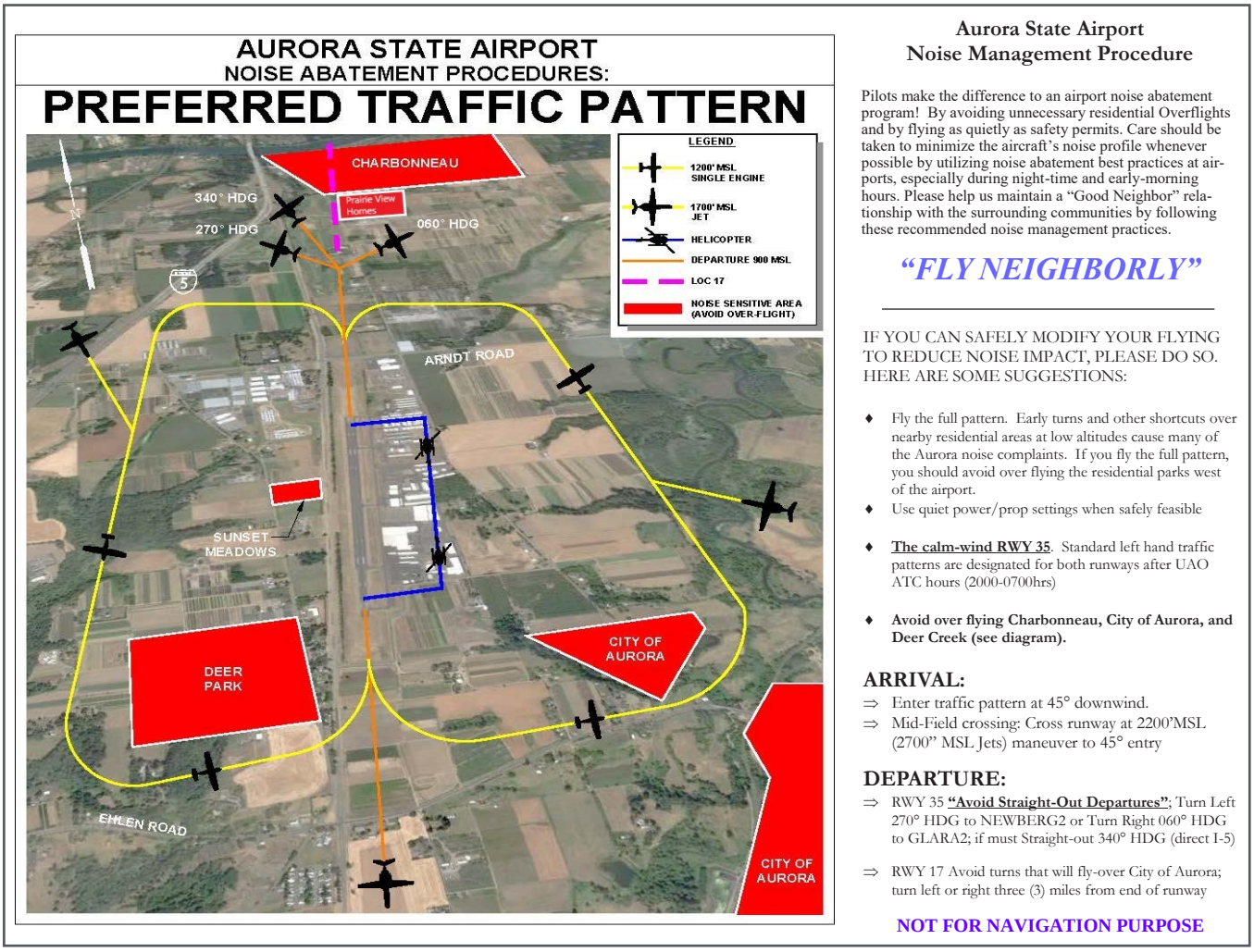
AIRCRAFT FLIGHT TRACKS

AEDT uses flight tracks to approximate the path over the ground that an aircraft flies to, from, or around an airport. The flight tracks do not account for the paths of every aircraft arrival and departure at the airport but are intended to represent the most commonly used flight paths taken to or from the airport. Flight tracks are categorized as one of three types: Arrival, Departure, or Touch and Go. Arrivals and departures are subclassified as either pattern, where the aircraft enters the airport's standard traffic pattern before landing or departing the area, or straight-in, where the aircraft fly directly to or from the runway or helipad without entering the pattern.

Noise Abatement Procedures

Aurora State Airport encourages pilots to follow flight tracks identified in published noise abatement procedures to minimize exposure of nearby noise sensitive residential areas to aircraft noise while ensuring safety of flight operations. While pilots are encouraged to follow these procedures whenever possible, they are not mandatory. Pilots are ultimately responsible for operating the aircraft in a safe manner based on the conditions at the time. They must also follow direction given by ATC. The procedures are illustrated and described in **Figure 1** below.

FIGURE 1 – AURORA STATE AIRPORT NOISE ABATEMENT PROCEDURES



Source: https://www.oregon.gov/aviation/airports/pages/airports/uao.aspx

2021 Flight Tracks

Fixed wing traffic at Aurora State Airport uses a standard left-hand traffic pattern at 1,000 feet above ground level (AGL). A review of the ADSB data suggests that the pattern differs from what is typical as well as what is described in the noise abatement procedures.

Due to regularly heavy traffic conditions, the pattern is longer than is typical and shifted toward the approach side of the pattern as pilots extend the downwind leg to allow others into the pattern and maintain safe distances from other aircraft. This occurs for both pattern approaches but is especially pronounced for the Runway 35 approach. The west side pattern (Runway 35 approach/Runway 17 departure) has shorter crosswind and base legs, resulting in a slightly compressed pattern compared to the east side pattern. This is likely due to pilots using I-5 as a visual cue to start the downwind turn. The pattern flight tracks are primarily used by aircraft operating under VFR, aircraft operating under IFR and utilizing a GPS circling approach, or aircraft doing touch-and-go landings.

Straight-in and straight-out tracks are aligned with the runway providing direct access to and from the runway while bypassing the local pattern. Each straight-in and straight-out track also includes east and west branches to account for traffic turning onto or out of the straight track.

Straight-in arrivals are primarily attributed to instrument flight rules (IFR) traffic approaching the airport using published approach procedures. Though, aircraft operating under visual flight rules (VFR) may also utilize a straight-in arrival track with clearance from ATC. Aurora State Airport has a localizer approach procedure to Runway 17, and RNAV GPS approaches to Runways 17 and 35.

Straight-out departures are not necessarily tied to IFR operations, but due to the heavy traffic conditions in the pattern, all IFR traffic and 90% of departing VRF traffic (not including touch-and-goes) are estimated to depart via a straight-out track from the runway. The Airport has three published RNAV GPS departure procedures: GLARA TWO, GNNET TWO, and NEWBERG TWO. Each of the procedures are described below.

GLARA TWO

Runway 17: Climb heading 172° to 1000, then climbing left turn direct GLARA. Thence, continue climb in GLARA holding pattern to cross GLARA at or above 4000 before proceeding on course.

Runway 35: Climb heading 352° to 700, then climbing right turn direct GLARA. Thence, continue climb in GLARA holding pattern to cross GLARA at or above 4000 before proceeding on course.

GNNET TWO

Runway 17: Climb heading 172° to 1000, then climbing right turn direct GNNET. Thence, continue climb in GNNET holding pattern to cross GNNET at or above 5000 before proceeding on course.

Runway 35: Climb heading 352° to 700, then climbing left turn direct GNNET. Thence, continue climb in GNNET holding pattern to cross GNNET at or above 5000 before proceeding on course.

NEWBERG TWO

Runway 17: Climb heading 172° to 1000, then climbing right turn direct UBG VOR/DM. Thence, continue climb in UBG VOR/DM holding pattern to cross UBG VOR/DM at or above 4000 before proceeding on course.

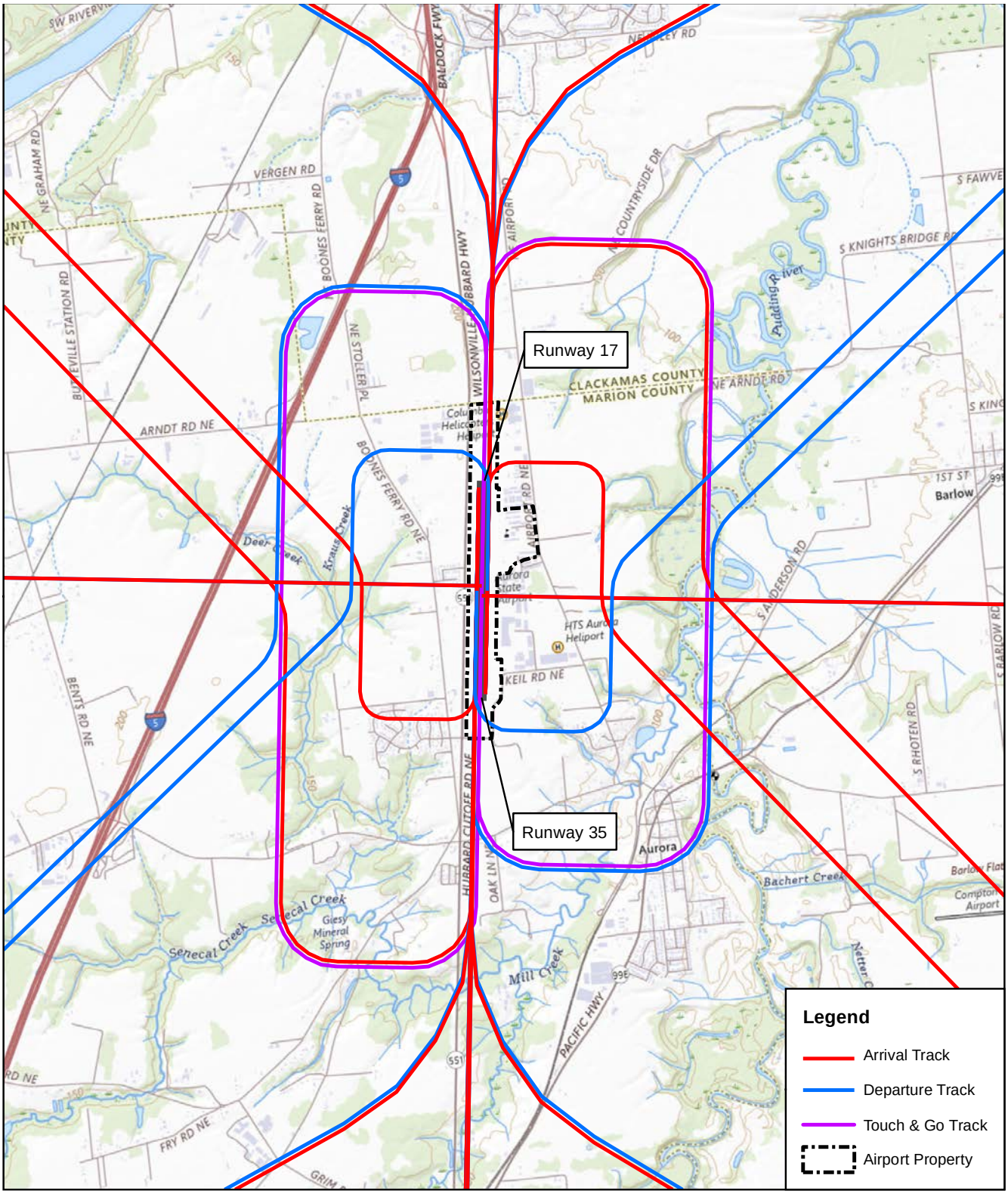
Runway 35: Climb heading 172° to 700, then climbing left turn direct UBG VOR/DM. Thence, continue climb in UBG VOR/DM holding pattern to cross UBG VOR/DM at or above 4000 before proceeding on course.

Touch and go flight tracks are used by pilots when performing touch and go landings. After the touch and go, the aircraft remains in the traffic pattern to fly the circuit and repeat the procedure. Based on the fleet mix, traffic conditions, and discussions with ATC personnel, it is assumed that nearly all touch and go operations at Aurora State Airport are attributed to single-engine piston and multi-engine piston aircraft.

Helicopters account for approximately 1% of the total airport operations and many helicopters are not equipped with ADSB equipment as they operate outside of airspace where it is required. As a result, representative helicopter flight tracks could not be derived from the ADSB data. Instead, the tracks were defined based on input from helicopter operators and airport personnel, and then compared to the available ADSB data as a check.

Based on the input received, helicopters operate using a left-hand traffic pattern at 500 feet above ground level (AGL). In order to separate helicopter activity from fixed-wing, the pattern is smaller in size with the downwind legs located 0.5 nautical miles from the runway. Many helicopters do not enter the pattern on arrival or departure, but instead fly directly to or from a location on the airport. Straight-in and straight-out arrival and departure tracks oriented in each cardinal direction are included to account for these operations.

The 2021 flight tracks described above are illustrated in **Figure 2**.



Note: Track lines are depicted as offset to improve visibility

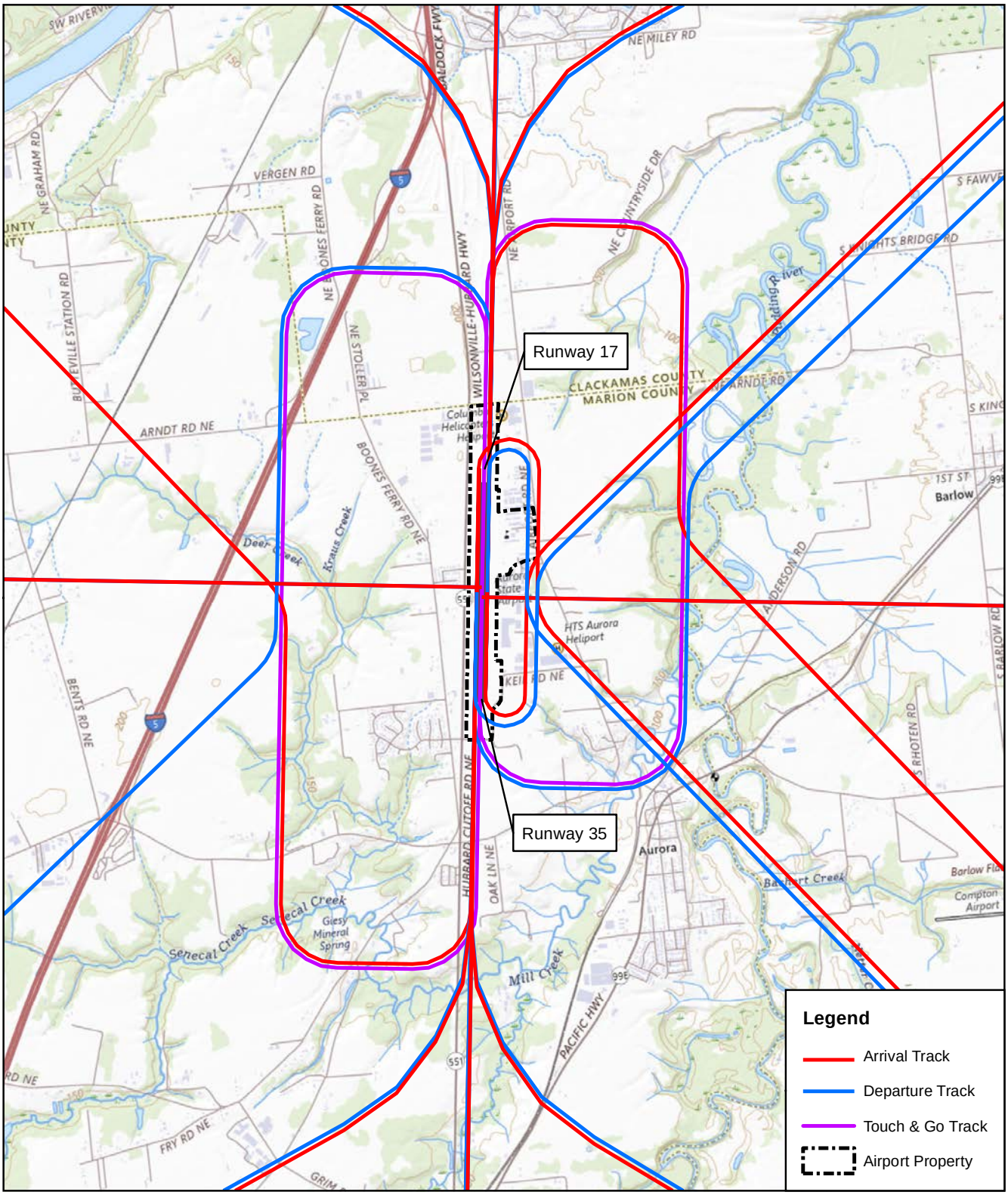
Figure 2	Aurora State Airport Flight Tracks - 2021	CENTURY WEST ENGINEERING

2041 Flight Tracks

The 2041 flight tracks are largely similar to the 2021 flight tracks, however adjustments were made to account for the proposed runway extension on Runway 17. Additionally, it is assumed that with further future coordination with ATC, operators, and neighbors regarding the published noise abatement procedures will result in a higher level of participation. As such, the 2041 tracks were adjusted to better reflect the procedures. The primary adjustments are listed below:

1. All tracks associated with Runway 17 end were shifted 497 feet north to match the proposed runway extension.
2. The crosswind leg of the Runway 17 departure track and the associated touch-and-go track were shifted approximately 0.3 nautical miles north to route departing aircraft away from the City of Aurora and through the undeveloped green space along Ehlen Road as described in the noise abatement procedures.
3. The west helicopter pattern is moved to the east side of the runway as described in the noise abatement procedures. This results in helicopters operating on Runway 35 employing a right-hand pattern while those operating on Runway 17 continue to employ a left-hand pattern.

The 2041 flight tracks are illustrated in **Figure 3**.



Note: Track lines are depicted as offset to improve visibility

Figure 3	Aurora State Airport Flight Tracks - 2041	CENTURY WEST ENGINEERING

DNL Contours

The above-described inputs were incorporated into the AEDT model for each scenario and DNL contours were generated at 5 dB intervals between 65 DB DNL and 80 DB DNL. The resulting noise exposure contours for each period were overlaid on the current Marion and Clackamas County Zoning to assess which land uses are impacted by airport-related noise and to what extent they are impacted. The DNL contours are described below and presented in **Figures 4 and 5**.

2021 DNL CONTOURS

The 2021 DNL contours are shown in **Figure 4**. The 65 dB DNL contour extends approximately 1,000 feet on either side of the of the runway. The north and south extents of the contour remain north of the south airport property line, but extends off property on the east and west sides. The contours are enlarged at each runway end due to the increase in noise generated during the initial application of power for takeoff and for the slower movement of the aircraft at the beginning of the takeoff roll. Run-up operations by piston engine aircraft on the run-up apron and the low altitude of aircraft during final approach and landing also contribute to concentrated areas of noise near the runway ends. Zoning districts impacted by the 65 DB DNL contour include P, EFU, and AR.

A continuous area of 70 DB DNL contours extend along the length of the runway and beyond the runway ends. This area is largely contained on the airport property, however it extends beyond the property boundary on either side of the runway and near the run-up apron. Zoning districts impacted by the 70 DB DNL contour include P, EFU, and AR.

A smaller continuous area of 75 DB DNL contour surrounds the runway and run-up apron in a similar manner to the 70 DB DNL. Nearly all of the 75 DB DNL contour is contained within the airport boundary with the exceptions of two small areas near runway end 17 and the associated run-up apron. Impacted zoning districts include P, and EFU.

Three small areas of 80 DB DNL contours are present near the runway ends and at the center of the runway where a helipad was (virtually) located in order to model the helicopter noise associated with the Airport. Nearly all of the 80 DB DNL contour area is contained on airport property with the exception of a small area (< 1 acre) east of the run-up apron. Impacted zoning districts include P and EFU.

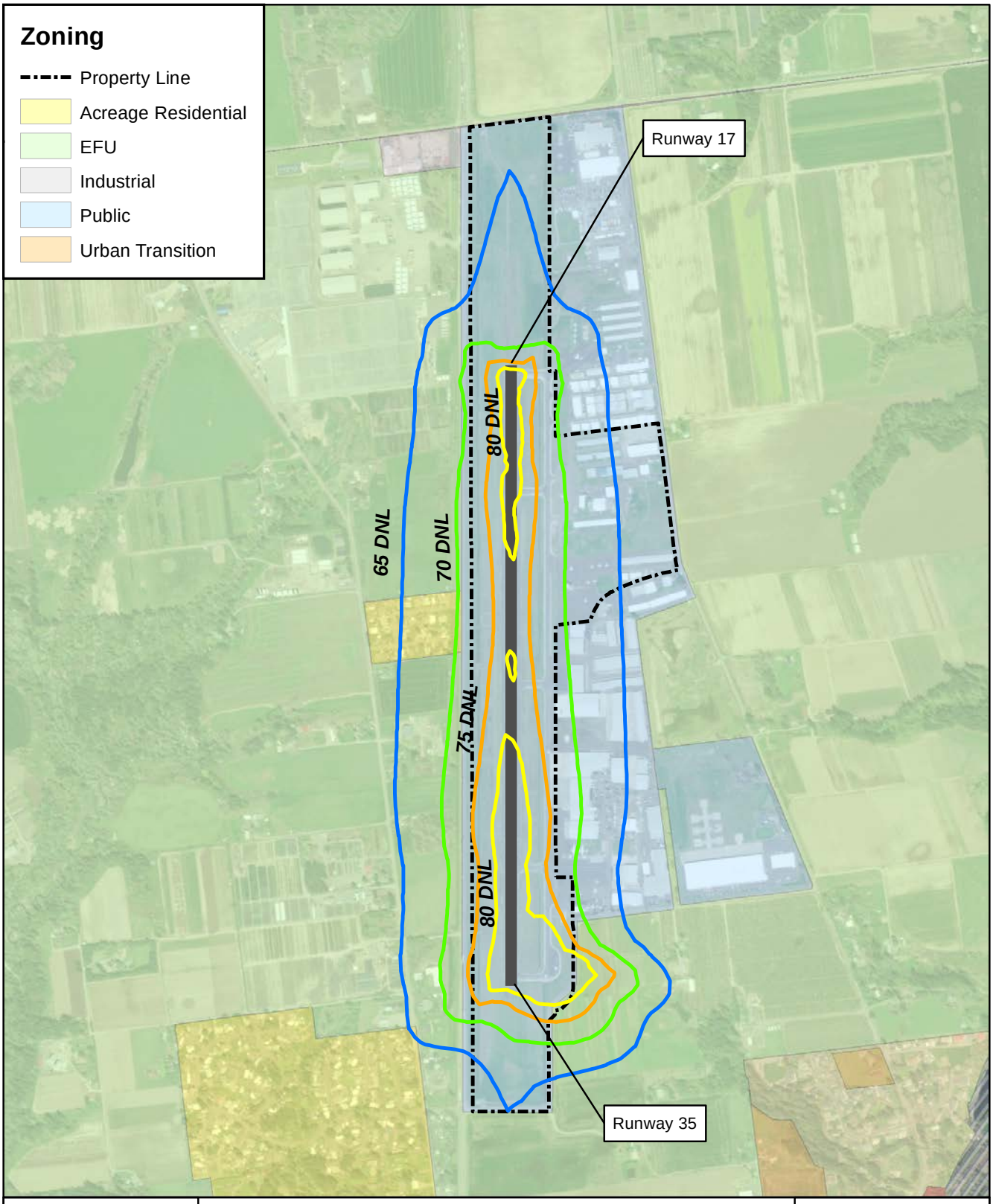


Figure 4

Aurora State Airport
Noise Impacted (65+ DNL) Zoning - 2021

2041 DNL CONTOURS

The 2041 DNL contours are shown in **Figure 5**. The 2041 contours have a largely similar shape to the 2021 contours and impact the many of the same zoning districts. There is a lengthening of the southernmost tip of the contour which extends approximately 600 feet south of the existing airport property line due to the forecasted increase in operations. A similar lengthening is observed on the north end again due to the projected increase in operations as well as the proposed 497-foot extension. The addition of a run-up apron at the north end of Taxiway A results in an enlargement of the contours in that area similar to the south end.

The total increase in area contained in the 65 dB DNL contour is 52.8 acres or approximately a 20% increase over the 2021 scenario, driven primarily by the extension of the runway. Similar to the 2021 contours nearly all of the 80 and 80 dB DNL contours are located on the existing airport property, with only small areas of the 80 dB DNL contour extending off the property on the south.

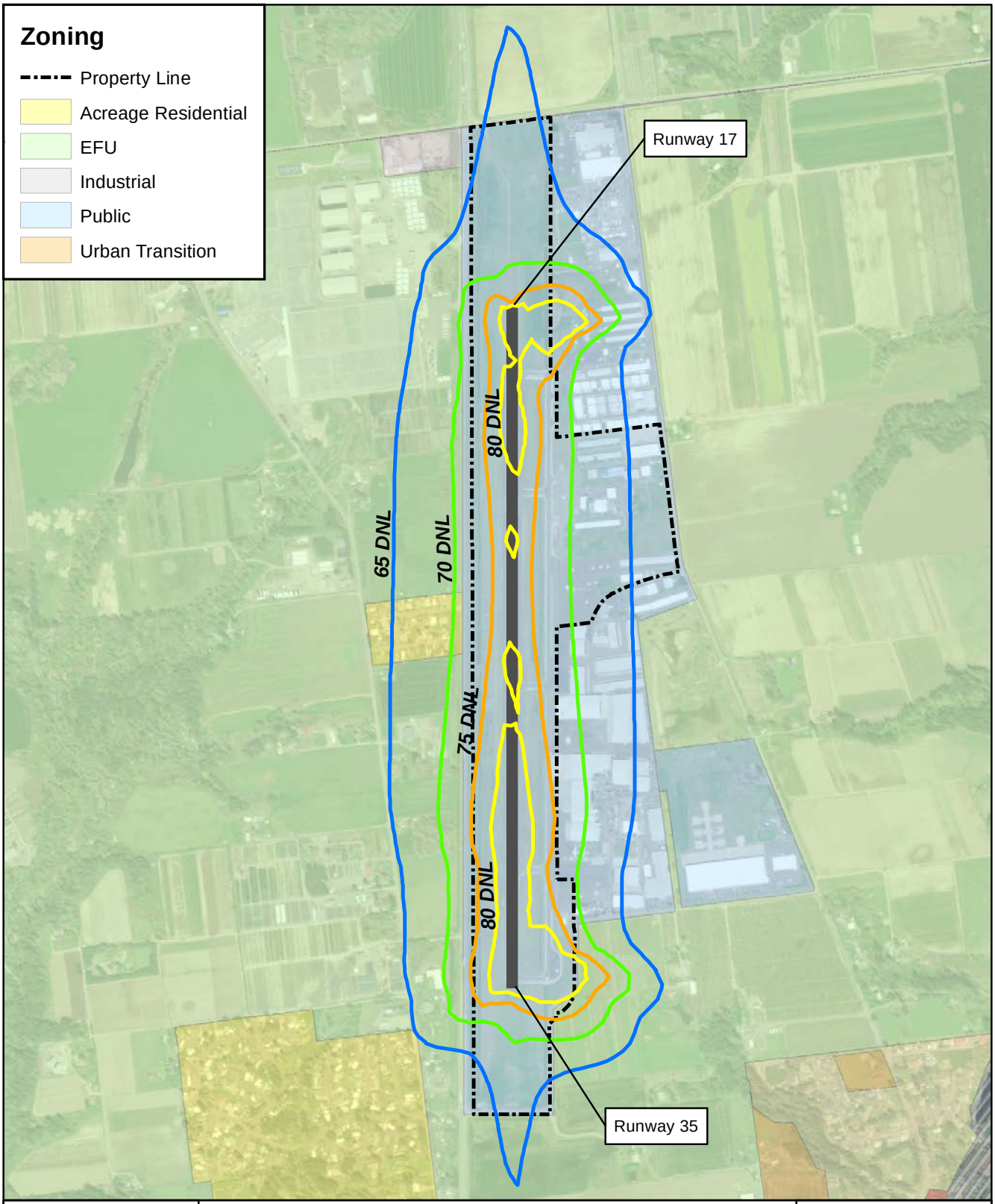


Figure 5	Aurora State Airport Noise Impacted (65+ DNL) Zoning - 2041	CENTURY WEST ENGINEERING

Airport and Vicinity Land Use Evaluation

The existing airport property totals 140 acres and is entirely characterized by a single land use designation type, Public (P). Also in the immediate vicinity of the Airport are Acreage Residential (AR), Exclusive Farm Use (EFU), Industrial (I), and Urban Transition (UT).

Based on updated noise modeling, three of the above land use designation types were identified as impacted by the 65 dB DNL contour or greater in the two study year scenarios. Those impacted are listed and described below.

Public Designation (P)

The existing airport property is zoned as Public (P) as defined in Marion County Code 17.171. The intent of the P zone is "to provide regulations governing the development of lands appropriate for specific public and semi-public uses and to ensure their compatibility with adjacent uses." Airports are regulated by Chapter 17.171, Section 030 - Conditional Uses, which states that "Airport and airport related commercial and industrial uses" are authorized under the procedure provided for conditional uses and are permitted in the P zone. This zone includes the existing airport property, TTF properties, and adjacent helicopter facilities.

Acreage Residential Designation (AR)

The AR zone (Marion County Code 17.128) facilitates the division and development of property suitable for development of acreage homesites. Allowed uses include single-family dwellings, agricultural development, planned developments, public parks and recreation facilities, religious organization use (less than 20,000 square feet in area), or replacement of an existing lawfully established dwelling.

Exclusive Farm Use Designation (EFU)

Marion and Clackamas Counties both have EFU zoning which are impacted in the 2041 scenario. The designations are described similarly in each of the respective County Code (Marion County Code 17.136, Clackamas County Code Section 401). The intent of the EFU zone to provide and preserve the continued practice of commercial agriculture. It is intended to be applied in areas composed of tracts that are predominantly high value farm soils. EFU zone generally prohibits the construction, use, or design of buildings and structures except for facilities used in agricultural or forestry operations, replacing or restoring a lawfully established dwellings, supporting exploration of geothermal or mineral resources, or supporting agri-tourism destinations and events. EFU zone also permits the construction of public roads, establishment or enhancement of wetlands, and the operation of composting facilities.

A detailed breakdown of all land uses impacted by airport noise in each of the time periods analyzed is presented in **Table 5**.

TABLE 5 - NOISE EXPOSURE AND LAND USE SUMMARY

	DNL (dB)	Impacted Land Use (Acres)			
		Public (P)	Acreage Residential (AR)	Exclusive Farm Use (EFU)	Total
2021	65-70	69.7	5.5	59.2	**134.4**
	70-75	54.5	0.4	14.8	**69.7**
	75-80	36.9	0	2.4	**39.3**
	>80	22.8	0	0.9	**23.7**
	Total	**183.9**	**5.9**	**77.3**	**267.1**
2041	65-70	83.4	5.9	74.3	**163.6**
	70-75	62.6	0.9	17.1	**80.6**
	75-80	45.5	0	2	**47.5**
	>80	27.9	0	0.3	**28.2**
	Total	**219.4**	**6.8**	**93.7**	**319.9**

The implementation of the preferred alternative may prompt changes in zoning districts for the properties involved. For the realignment of Hubbard Highway, the right-of-way would be relocated within an existing Residential Zone, changes to the zoning may be needed to accommodate the highway use. The proposed property acquisition to relocate Keil Road outside of the runway object free area (ROFA) may result in 7.8 acres of EFU zone being rezoned to P zone, of which 5.9 acres are within the 65 dB DNL contour.