Minneapolis St. Paul International Airport (MSP) Long-Term Plan (LTP)
Noise Contour Final Technical Memorandum

HNTB has been tasked to assist the Metropolitan Airports Commission (MAC) in support of the development of the 2040 Long-Term Plan (LTP) Noise Contours for the Minneapolis-St. Paul International Airport (MSP). This technical memorandum presents a summary of the methodologies and data sources used in the noise analysis, including the development of 2040 fleet mixes and subsequent modeling of the 2040 baseline, high scenario, and low scenario noise contours with the Federal Aviation Administration's (FAA) Aviation Environmental Design Tool (AEDT), version 3e. The 2018 Actual Noise Contour completed in February 2019 was used as the 2018 noise contour, which was modeled using AEDT version 2d.

1 Introduction

The MAC provided HNTB the summer Design Day Flight Schedule (DDFS) for the 2040 baseline condition. The DDFS was converted into an Average Annual Day (AAD) fleet mix as required by AEDT. The high and low scenario fleet mixes were developed from the 2040 baseline AAD fleet mix using adjustment factors. Following the development of the 2040 fleet mixes, the AEDT model was used to create the 2040 baseline, high scenario, and low scenario noise contours. The following sections describe the inputs and outputs of the AEDT modeling process.

2 AEDT Inputs

HNTB prepared the 2018 and 2040 noise contours using AEDT. The 2040 baseline fleet mix input was based on the 2040 baseline AAD fleet mix as documented in **Attachment 1: Noise Contour Fleet Mix Final Technical Memorandum**. The high and low scenario fleet mixes were based on the 2040 Long-Term Plan activity forecast[1] (2040 LTP Forecast). For the noise analysis, HNTB assigned AEDT Aircraft Noise and Performance (ANP) aircraft types and custom profiles, determined AEDT Equipment IDs, calculated day/night split, and estimated stage lengths. In instances when aircraft types did not have a direct AEDT ANP aircraft type, HNTB informally coordinated with the FAA's Office of Environment and Energy (AEE). The runway and flight track usages were based on the 2018 annual MAC Noise & Operations Monitoring System (MACNOMS) data. The proposed relocation of the Ground Run-up Enclosure (GRE) was also incorporated in the noise analysis. Engine maintenance run-up operations were projected based on operations growth from 2018 to 2040 for individual aircraft types that performed run-up operations in 2018. Default weather parameters in AEDT were applied.

2.1 Fleet Mix

The 2018 fleet mix was based on the 2018 annual MACNOMS data. The development of the 2040 baseline fleet mix input is documented in **Attachment 1: Noise Contour Fleet Mix Final Technical Memorandum**. The AEE coordination is included in **Attachment 2: AEE Coordination**. The fleet mixes with the AEDT ANP types are shown in **Attachment 3: 2040 Baseline, High Scenario, and Low Scenario AEDT Fleet Mixes**. This study modeled 1,115 AAD operations (406,913 annual operations) for 2018, 1,396 AAD operations (509,700 annual operations) for the 2040 baseline, 1,520 AAD operations (554,900 annual operations) for the 2040 high scenario, and 1,262 AAD operations (460,600 annual operations) for the 2040 low scenario.

[1] Minneapolis-Saint Paul International Airport, 2040 Long-Term Plan: Activity Forecast Summary Technical Memorandum, Ricondo, November 2021.

The baseline, high scenario, and low scenario operations were based on the 2040 LTP Forecast. The original baseline forecast was summarized in Chapter 8 of the 2040 LTP Forecast and was revised in September and October 2021 to consider the impacts of the COVID-19 pandemic and Delta Air Lines' systematic fleet mix changes. **Table 1** summarizes the revised baseline forecast high, and low forecasts.

Table 1: Baseline, High Scenario, and Low Scenario Annual Operations

Category	Revised Baseline	High	Low
Passenger	464,900	508,100	416,600
Air Cargo	19,700	21,500	18,600
GA/Air Taxi	22,900	23,100	23,200
Military[1]	2,200	2,200	2,200
Total	509,700	554,900	460,600

[1]: Military operations were assumed to remain constant.

Source: 2040 Long-Term Plan: Activity Forecast Summary Technical Memorandum, Ricondo, Nov 2021.

2.1.1 AEDT 3e ANP Aircraft and Substitution

The AEDT model includes a group of representative civilian fixed-wing, military fixed-wing, and helicopter types with noise parameters, referred to as ANP aircraft types. It also provides pre-approved aircraft substitutions for instances where an aircraft type does not have a direct match with the ANP aircraft types. However, in some instances, aircraft do not have an AEDT aircraft type or substitute aircraft. In these situations, the AEE provides guidance on the identification of a suitable aircraft (with similar noise characteristics) for use in the model.

Although this study is not a federally funded project, HNTB conducted an informal AEE coordination effort to seek AEE's technical recommendation of the appropriate ANP aircraft type for the Boeing 737 MAX 10. **Table 2** shows AEE's recommended AEDT aircraft parameters for the Boeing 737 MAX 10.

Table 2: Boeing 737 MAX 10 AEDT Inputs per AEE Recommendation

ID	ANP Code	Equipment ID	Airframe Code	Engine Model	BADA Code
B3XM	7378MAX	6383	5336	LEAP-1B27	B39M

Source: AEE recommendation, August 15, 2022.

2.2 Weather Parameters

The AEDT model allows for the modeling of atmospheric conditions when calculating noise exposure, taking into consideration temperature and humidity. Temperature is an important factor in aircraft performance, as higher temperatures decrease the density of air, which increases aircraft takeoff distance and reduces climb performance. This phenomenon generally results in increased noise propagation in hot temperatures as compared to colder temperatures.

Default weather parameters were applied in both the 2018 and 2040 noise analyses, as per FAA guidance on the AEDT application to the National Environmental Policy Act (NEPA)[2]. The default weather parameters in AEDT 3e represent 10-year average values and the default weather parameters in AEDT 2d represent 30-year average values recorded at the MSP weather station. The weather data in the AEDT Airport Database was obtained from station ID 25160 (MINNEAPOLIS-ST PAUL INTL/WOLD-CHAMBERLIN) from the Integrated Surface Database (ISD) of the National Oceanic and Atmospheric Administration (NOAA). **Table 3** shows the weather parameters used in the study that reflect the most recent 10-year average (2012 through 2021) for the 2040 baseline noise contour in AEDT 3e and the 30-year average when the 2018 Actual Noise Contour was modeled in AEDT 2d.

Table 3: 2018 and 2040 AEDT Weather Inputs

Variable	2018 AEDT Inputs[1]	2040 AEDT Inputs[2]
Temperature	45.0 degrees F	46.7 degrees F
Dew Point	35.9 degrees F	36.5 degrees F
Pressure	985.4 Millibars	984.5 Millibars
Humidity	67.7 %	67.4 %
Wind Speed	8.4 knots	8.1 knots

[1]: AEDT 2d.
[2]: AEDT 3e.
Source: AEDT default parameters at MSP, HNTB analysis, 2022.

2.3 Terrain

Terrain data is used to account for the effects that variations in terrain have on noise propagation. The 1/3 arc-second data from the United States Geological Survey (USGS) National Map (TNM) was used in this study.

2.4 DNL and Day/Night Split

The FAA uses the Day-Night Average Sound Level (DNL) metric to analyze noise impacts, with the exception of California, which uses the Community Noise Equivalent Level (CNEL). In DNL, a 10 decibel (dB) penalty is added to noise events occurring at nighttime (between 10 p.m. and 7 a.m.) to reflect the added intrusiveness of nighttime noise when background noise levels are low and people are at rest. From a noise modeling perspective, one nighttime operation is equivalent to ten daytime operations because of this penalty. To account for this penalty, fleet mixes were categorized into daytime operations (between 7 a.m. to 10 p.m.) and nighttime operations (between 10 p.m. and 7 a.m.), creating a day/night split.

Table 4 compares the day/night split in the 2018 Actual Noise Contour and 2040 scenarios. The percentage of nighttime operations is expected to increase slightly from 10.8% in 2018 to 11.5% in 2040 as a result of increased nighttime operations projected in the DDFS. Since one nighttime operation is equivalent to ten daytime operations, a 0.7%% increase in nighttime operations is equivalent to 7% increase in daytime operations.

[2] Guidance on Using the Aviation Environmental Design Tool (AEDT) to Conduct Environmental Modeling for FAA Actions Subject to NEPA, FAA, revised Oct 27, 2018.

Table 4: 2018 and 2040 AAD Day/Night Split Comparison

Day/Night Split	2018		2040 Baseline		2040 High		2040 Low	
Day	995	89.2%	1,236	88.5%	1,345	88.5%	1,116	88.5%
Night	120	10.8%	161	11.5%	175	11.5%	146	11.5%
Total	1,115	100.0%	1,396	100.0%	1,520	100.0%	1,262	100.0%

Totals may not sum up due to rounding
Sources: MAC and HNTB analysis, 2023.

2.5 Stage Length

Stage length is a term used in noise modeling that refers to trip distance for an aircraft departure from origin to destination and is a surrogate for aircraft weight. Each stage length assumes an aircraft take-off weight that increases when the stage length is higher. The trip distance influences the take-off weight (and therefore the thrust and performance) of the aircraft, as more fuel is required to fly longer distances, which adds weight to the aircraft. Departure stage lengths were calculated by the distances between MSP and destinations. In cases where there was no destination airport information, the average stage length in 2018 (Stage Length 2) was applied. **Table 5** compares the stage lengths in 2018 and 2040. The comparison shows that the percentage of departures with stage lengths 2 and 3 is expected to increase at the expense of stage length 1. This is due to a higher percentage of departures between 500 and 1,500 nautical mile ranges projected in the DDFS. Changes in other stage length brackets were expected to be relatively small.

Table 5: 2018 and 2040 Stage Length Comparison

Stage Length	Distance (nautical miles)	2018		2040 Baseline		2040 High		2040 Low	
		AAD	Percentage	AAD	Percentage	AAD	Percentage	AAD	Percentage
1	**0 - 500**	228	40.9%	221	31.7%	239	31.5%	202	32.1%
2	**500 - 1,000**	211	37.8%	321	46.0%	351	46.1%	289	45.8%
3	**1,000 - 1,500**	104	18.7%	137	19.6%	149	19.6%	123	19.4%
4	**1,500 - 2,500**	6	1.0%	7	1.0%	7	1.0%	6	1.0%
5	**2,500 - 3,500**	3	0.5%	4	0.5%	4	0.5%	3	0.5%
6	**3,500 - 4,500**	5	0.8%	7	1.0%	8	1.0%	6	1.0%
7	**4,500 - 5,500**	1	0.2%	1	0.1%	1	0.1%	1	0.1%
8	**5,500 - 6,500**	-	-	1	0.1%	1	0.1%	1	0.1%
Total		558	100.0%	698	100.0%	760	100.0%	631	100.0%

Number is shown as 0 when less than 0.5. Percentage is shown as 0.0% when less than 0.05%. Number is shown as "-" when it is 0.
Totals may not sum up due to rounding.
Sources: MAC and HNTB analysis, 2023.

2.6 Custom Profiles

AEDT provides 'standard' aircraft performance profiles for each ANP aircraft type that can be used in the noise modeling. In addition, HNTB and the MAC developed a group of custom profiles (DAL_DST, GEN_DST, CPZ_DST, and FDX_DST) to model the Noise Abatement Departure Procedure (NADP) flown at MSP. These custom profiles were developed for specific airlines or specific aircraft. The first three letters represent the airline code (GEN represents general NADP

profiles that apply to all airlines) and the last three letters represent NADP Distant procedures. The NADP Distant procedures are designed to abate noise impacts for areas further from the airport as compared with NADP Close-in procedures that are designed to abate noise impacts closer to the runway end. **Table 6** compares the 2018 and 2040 scenarios departure profiles. The percentage of departures modeled with 'standard' profiles in 2040 are much higher than in 2018 because the 2040 fleet mixes contain a significant portion of operations by newer aircraft types without custom profiles developed.

Table 6: 2021 and 2040 Departure Profile Comparison

Departure Profile[1]	2018		2040 Baseline		2040 High		2040 Low	
	AAD	Percentage	AAD	Percentage	AAD	Percentage	AAD	Percentage
STANDARD	219	39.2%	425	60.9%	462	60.9%	385	61.0%
DAL_DST	192	34.5%	157	22.5%	171	22.5%	140	22.3%
GEN_DST	143	25.6%	116	16.6%	126	16.6%	105	16.6%
CPZ_DST	4	0.7%	-	-	-		-	
FDX_DST	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Total	558	100.0%	697	100.0%	759	100.0%	630	100.0%

Note: [1]: Excluding Military NOISEMAP Profiles.

Number is shown as 0 when less than 0.5. Percentage is shown as 0.0% when less than 0.05%. Number is shown as "-" when it is 0.

Totals may not sum up due to rounding.

Sources: MAC Data and HNTB Analysis, 2023.

2.7 Runway Use

Runway use represents how aircraft utilize the runway(s) and helipad(s) at an airport and is a primary factor in the determination of noise exposure. Runway uses in 2040 scenarios by airline and aircraft were assumed to be consistent with the 2018 runway use. For aircraft not included in the 2018 fleet mix, it was assumed that their runway use would be the same as the aircraft they are expected to replace or similar aircraft types.

Table 7 compares the runway use in 2018 and 2040 scenarios. In general, the projected 2040 runway use is consistent with the 2018 runway use with minor variances. Compared with the 2018 runway use, the 2040 departures from Runway 12L decrease by approximately 1.7% and, from Runway 30L, increase by approximately 1.6% - 1.7%. The 2040 arrivals to Runway 30L increase by approximately 1.4% - 1.6%. Changes in other runways are less than 1%.

Table 7: 2018 and 2040 Runway Use Comparison

Average Annual Runway Use %[1]	Arrivals			Departures		
	Day	Night	Total	Day	Night	Total
2018 Base Year Condition						
Runway 4	0.1%	0.3%	0.1%	0.5%	1.0%	0.5%
Runway 22	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Runway 12L	22.2%	14.2%	21.3%	14.2%	18.6%	14.7%
Runway 30R	21.9%	16.6%	21.3%	21.6%	18.5%	21.3%
Runway 12R	25.6%	27.5%	25.8%	4.1%	24.9%	6.2%

Table 7: 2018 and 2040 Runway Use Comparison

Average Annual Runway Use %[1]	Arrivals			Departures		
	Day	Night	Total	Day	Night	Total
Runway 30L	24.8%	34.7%	25.9%	23.2%	25.0%	23.4%
Runway 17	0.0%	0.6%	0.1%	36.3%	11.7%	33.8%
Runway 35	5.4%	6.1%	5.5%	0.0%	0.2%	0.0%
Total	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*
2040 Baseline Forecast Scenario						
Runway 4	0.0%	0.2%	0.1%	0.5%	0.9%	0.5%
Runway 22	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Runway 12L	21.2%	15.4%	20.5%	12.3%	18.3%	13.0%
Runway 30R	20.8%	17.2%	20.3%	20.4%	19.9%	20.4%
Runway 12R	26.7%	25.2%	26.5%	4.8%	22.0%	6.7%
Runway 30L	26.6%	33.4%	27.4%	24.7%	27.7%	25.0%
Runway 17	0.0%	0.5%	0.1%	37.3%	11.0%	34.4%
Runway 35	4.7%	8.2%	5.1%	0.0%	0.2%	0.0%
Total	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*
2040 High Forecast Scenario						
Runway 4	0.0%	0.2%	0.1%	0.5%	0.9%	0.5%
Runway 22	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Runway 12L	21.2%	15.4%	20.5%	12.3%	18.4%	13.0%
Runway 30R	20.8%	17.2%	20.4%	20.4%	19.9%	20.4%
Runway 12R	26.7%	25.2%	26.5%	4.8%	22.0%	6.7%
Runway 30L	26.5%	33.3%	27.3%	24.6%	27.7%	25.0%
Runway 17	0.0%	0.5%	0.1%	37.3%	11.0%	34.4%
Runway 35	4.7%	8.2%	5.1%	0.0%	0.2%	0.0%
Total	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*
2040 Low Forecast Scenario						
Runway 4	0.0%	0.2%	0.1%	0.5%	0.9%	0.5%
Runway 22	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Runway 12L	21.2%	15.2%	20.4%	12.3%	18.2%	12.9%
Runway 30R	20.7%	17.0%	20.3%	20.4%	19.9%	20.3%
Runway 12R	26.7%	25.2%	26.5%	4.9%	21.9%	6.7%
Runway 30L	26.6%	33.7%	27.5%	24.7%	27.8%	25.1%
Runway 17	0.0%	0.5%	0.1%	37.2%	11.1%	34.3%
Runway 35	4.7%	8.1%	5.1%	0.0%	0.2%	0.0%
Total	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*

[1]: Excluding helipads.

Number is shown as 0 when less than 0.5. Percentage is shown as 0.0% when less than 0.05%. Number is shown as "-" when it is 0. Totals may not sum up due to rounding.

Sources: MAC Data and HNTB Analysis, 2023.

2.8 Flight Track Locations and Use

To determine projected noise levels on the ground, it is necessary to determine not only the frequency of aircraft operations, but also their altitudes and locations. Flight routes to and from an airport are generally a function of the geometry of the airport's runways and the surrounding airspace structure near the airfield. The 2040 flight track uses were assumed to be same as the 2018 flight track use for the same airline and aircraft. Detailed track use is included in **Attachment 4: Track Use**.

2.9 Maintenance Run-Up Operations

Engine run-ups can be modeled in AEDT, and depending on their frequency, may influence the size and location of noise exposure contours. The MAC provided 2018 run-up operations by daytime hours and nighttime hours. It was assumed that the 2040 run-up operations would increase at the same rate as an individual aircraft's growth rate from 2018 to 2040 by daytime hours and nighttime hours. Therefore, the day/night split of the 2040 run-up operations were based on the daytime and nighttime operation growth rates for individual aircraft from 2018 to 2040. **Table 8** depicts the 2018 and 2040 run-up operations. The LTP proposes relocating the GRE slightly to the east. The new GRE location was used for the 2040 run-up operations while the current location was used for the 2018 run-up operations.

Table 8: Run-up Operations

AEDT ANP Code	2018		2040 Baseline		2040 High		2040 Low	
	Day	Night	Day	Night	Day	Night	Day	Night
777200	16	-	-	-	-	-	-	-
717200	20	10	-	-	-	-	-	-
737700	-	6	-	32	-	35	-	29
737800	32	44	56	79	61	86	50	71
757300	110	50	392	109	428	119	351	98
757PW	2	-	-	-	0	-	0	-
A319-131	42	16	6	10	7	11	5	9
A320-232	44	12	9	4	10	4	8	4
A321-232	32	2	393	20	430	22	352	18
A330-301	50	12	-	-	-	-	-	-
BD-700-1A10	2	-	12	-	13	-	11	-
CL600	18	2	5	1	5	1	4	1
CNA208	2	-	1	-	1	-	1	-
CNA500	16	-	-	-	-	-	-	-
CNA510	2	-	7	-	8	-	6	-
CNA55B	6	-	12	-	13	-	11	-
CNA560U	6	2	21	-	23	-	19	-
CNA560XL	6	-	17	-	19	-	15	-
CNA680	12	-	13	-	14	-	12	-
CNA750	22	-	26	-	28	-	23	-
CRJ9-ER	92	42	48	19	52	21	43	17
EMB145	2	-	-	-	-	-	-	-
EMB170	4	-	1	-	1	-	1	-

Table 8: Run-up Operations

AEDT ANP Code	2018		2040 Baseline		2040 High		2040 Low	
	Day	Night	Day	Night	Day	Night	Day	Night
F-18	2	-	-	-	-	-	-	-
GV	12	-	14	-	15	-	13	-
IA1125	2	-	-	-	-	-	-	-
MD83	10	4	-	-	-	-	-	-
MD9025	166	114	1	-	1	-	1	-
Total	730	316	1,036	274	1,132	299	928	246

Number is shown as 0 when less than 0.5. Number is shown as "-" when it is 0.

Source: MAC and HNTB analysis, 2023.

3 AEDT Outputs

Using inputs described in the previous section, DNL noise exposure was calculated using AEDT in one decibel (dB) increments between 55 and 85 DNL with a standard grid. A standard grid is comprised of a group of evenly spaced grid points. In this study, a spacing of 0.025 nautical miles, approximately 152 feet, was applied. **Figure 1** depicts the 60 – 75 DNL noise contours in 5 dB increments for the 2018 Actual Noise Contour. **Figure 2** through

Figure 4 depict the 60 – 75 DNL noise contours in 5 dB increments for the 2040 baseline, high scenario, and low scenario noise contours. **Figure 5** compares the 2018 Actual Noise Contour, 2040 baseline, high scenario, and low scenario noise contours. **Table 9** compares the 60+ and 65+ DNL noise areas of the 2018 Actual Noise Contour and the 2040 baseline, high scenario, and low scenario noise contours.

Table 9: Noise Contour Area (acres)

DNL	2018 Area	2040 Area			% Changes vs. 2018		
		Baseline	High	Low	Baseline	High	Low
60+	11,323	15,775	17,017	14,443	39.3%	50.3%	27.6%
65+	4,444	5,933	6,393	5,435	33.5%	43.9%	22.3%

Sources: MAC Data and HNTB Analysis, 2023.

The 60+ DNL noise area of the 2040 baseline, high scenario, and low scenario noise contours are expected to increase 39.3%, 50.3%, and 27.6% as compared with the 2018 Actual Noise Contour. The 65+ DNL noise area of the 2040 baseline, high scenario, and low scenario noise contours are expected to increase 33.5%, 43.9%, and 22.3% as compared with the 2018 Actual Noise Contour. There are several factors that contribute to the increase of the contour size as described below.

First, the total number of operations in the 2040 baseline, high scenario, and low scenario noise contours are expected to increase 25.3%, 36.4%, and 13.2% from 2018. In addition, the nighttime operations in the 2040 baseline, high scenario, and low scenario noise contours are expected to increase 0.8%. Since one nighttime operation is equivalent to ten daytime operations, a 0.8% increase in nighttime operations is equivalent to 8% increase in daytime operations.

Second, there is an increase of approximately 9.1% - 10.7% of operations with stage lengths 2 and 3 at the expense of stage length 1 operations. Since departures with higher stage lengths

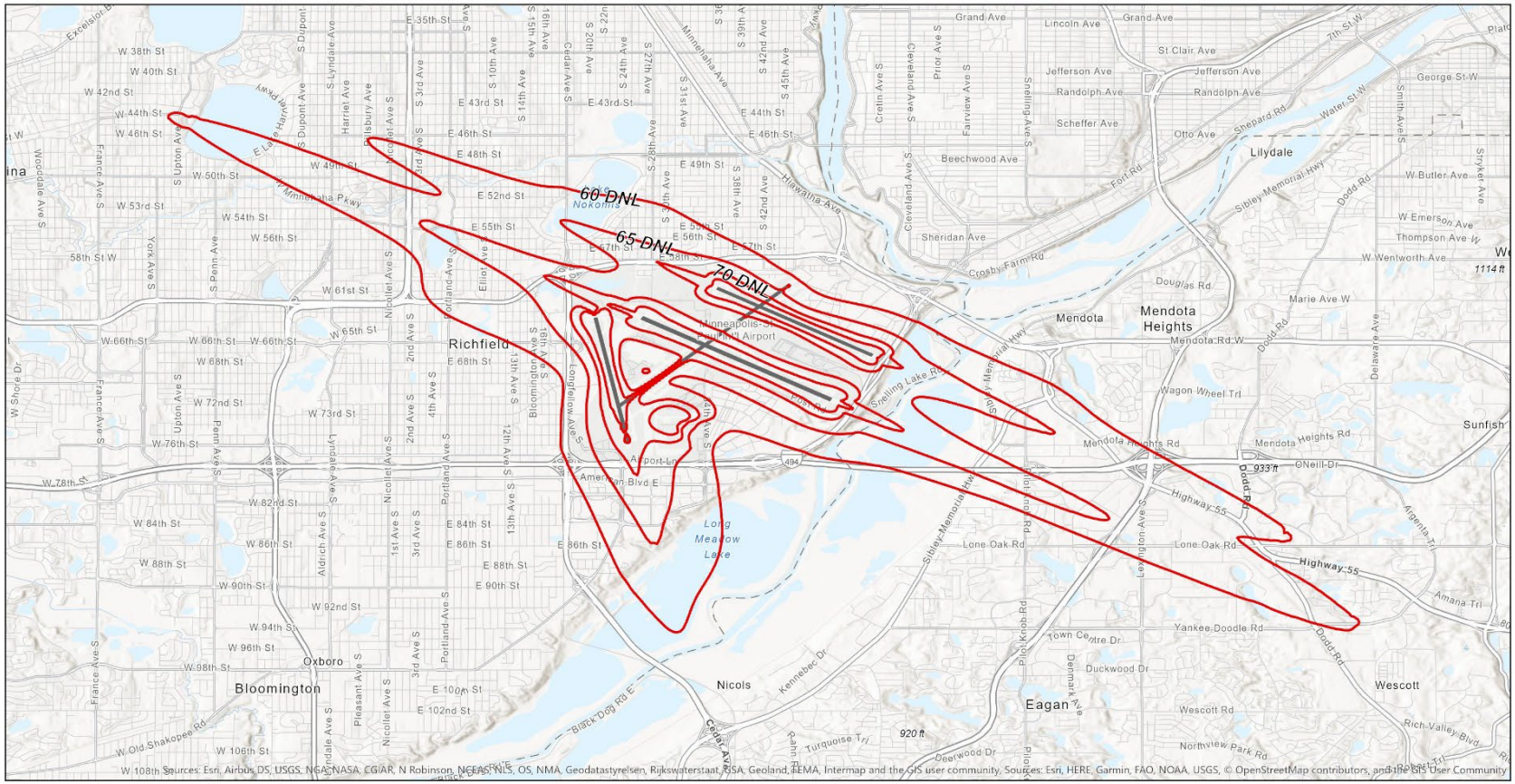
require more fuel, their climb rates are slower (closer to the ground). Therefore, the noise impacts of higher departure stage lengths are greater.

Third, the projected changes in the 2040 baseline, high scenario, and low scenario fleet mixes as compared with the 2018 fleet mix also contribute to a larger noise contour area. In the 2018 fleet mix, the top two aircraft types with the highest operations are regional jets (Bombardier CRJ-200 and CRJ-900). In the 2040 fleet mixes, the top two aircraft types with the highest operations are projected to be narrow body aircraft types (Airbus A220-100 and Airbus A319-NEO). Since noise signatures of narrow body aircraft are generally larger than those of regional jets, the increase of narrow body operations in the fleet mix is expected to contribute to the larger 2040 contours as well.

Finally, the 2018 Actual Noise Contour was modeled using AEDT 2d and the 2040 LTP Noise Contours was modeled using AEDT 3e. Differences between AEDT 2d and 3e that may contribute to changes in noise contours are included in **Attachment 5: AEDT 2d vs. AEDT 3e Comparison**.

Figure 1: MSP 2018 Actual Noise Contour

MSP - LTP Noise



LEGEND

MSP 2018 Actual Noise Contour

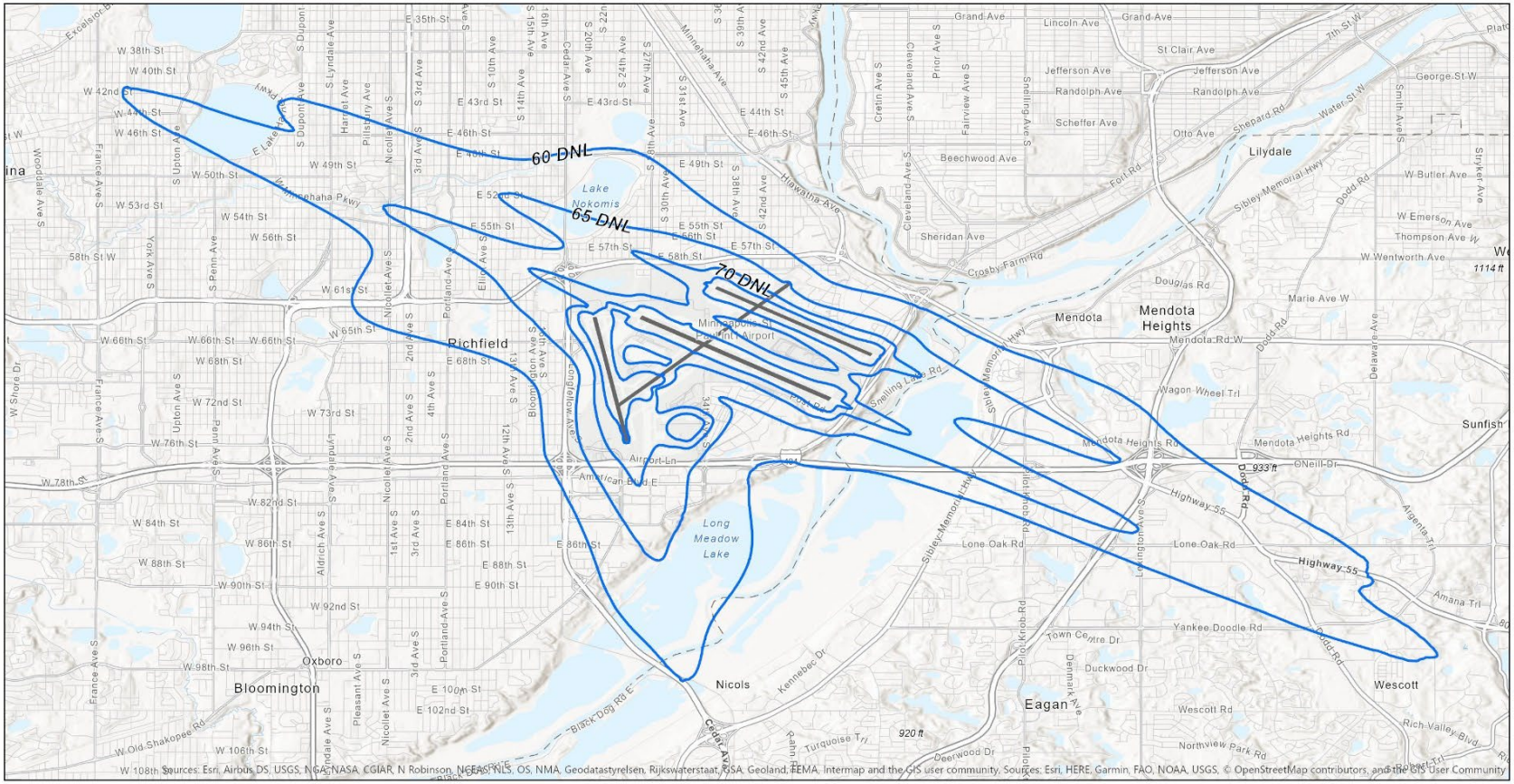
Figure 1
MSP 2018 Actual Noise Contour

0 3,000 6,000 12,000 Feet

N

Figure 2: MSP 2040 Baseline Noise Contour

MSP - LTP Noise



LEGEND

MSP 2040 Baseline Noise Contour

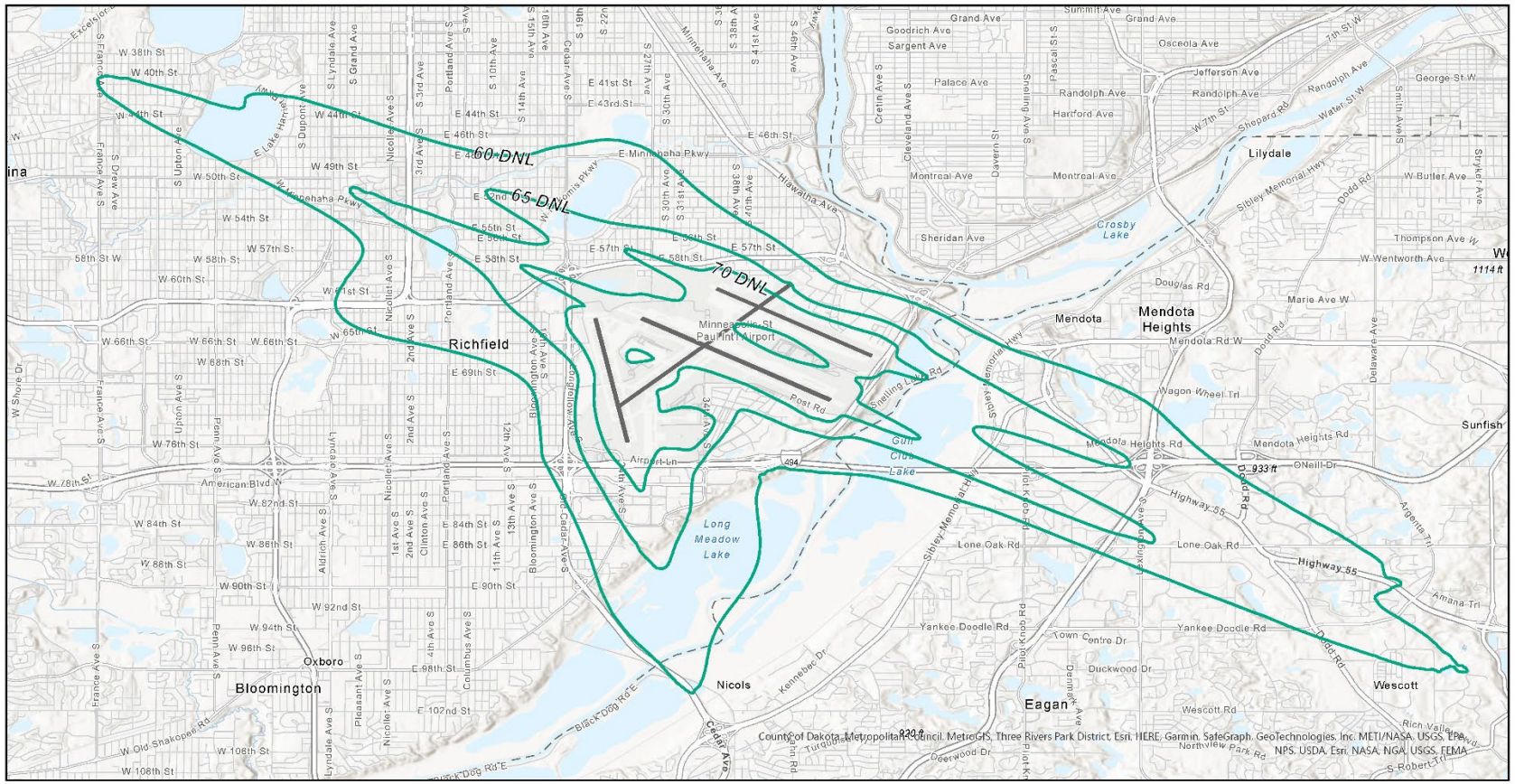
Figure 2
MSP 2040 Baseline Noise Contour

0 3,000 6,000 12,000 Feet

N

Figure 3: MSP 2040 High Scenario Noise Contour

MSP - LTP Noise



LEGEND

MSP 2040 High Scenario Noise Contour

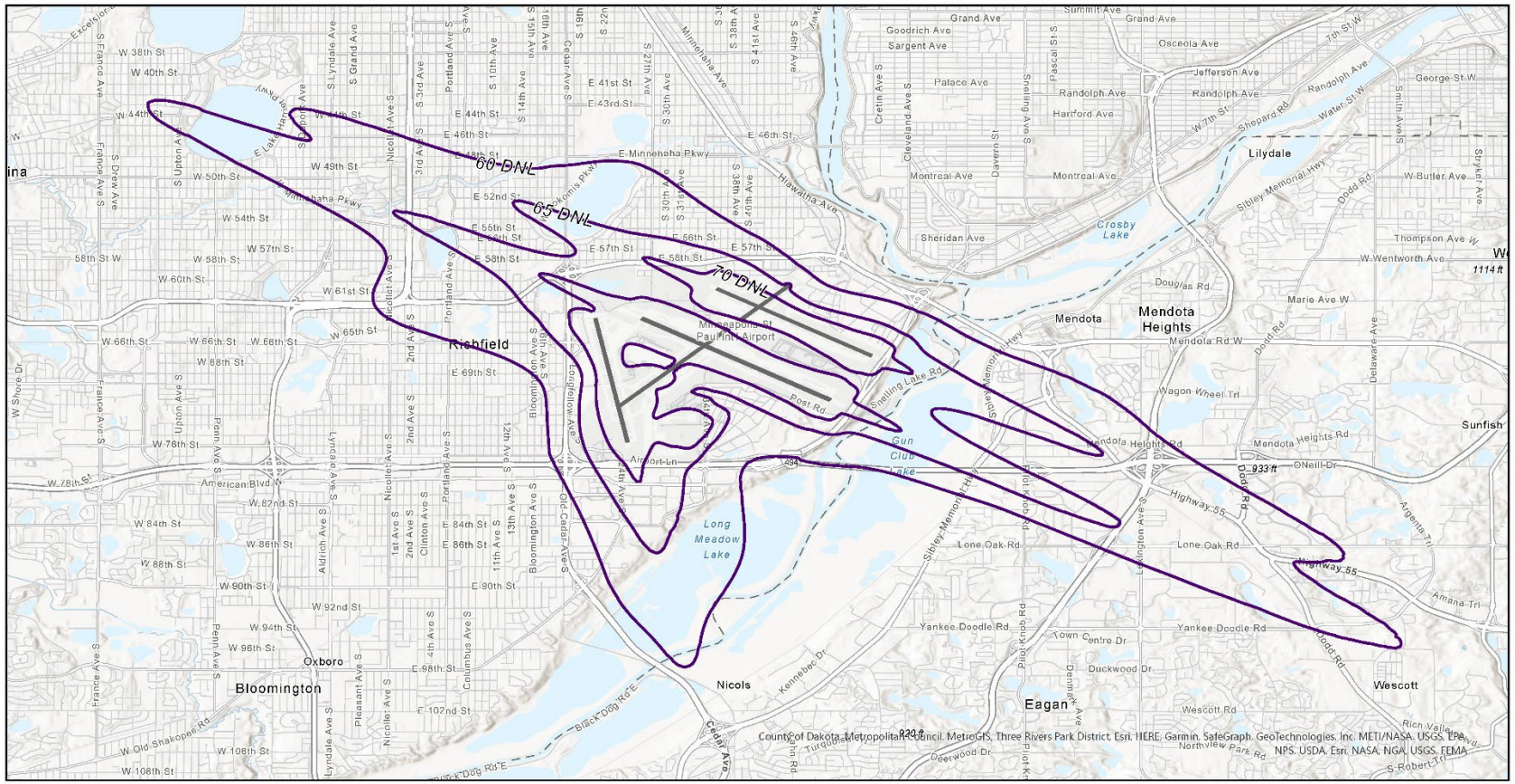
Figure 3
MSP 2040 High Scenario Noise Contour

0 3,000 6,000 12,000 Feet

N

Figure 4: MSP 2040 Low Scenario Noise Contour

MSP - LTP Noise



LEGEND

MSP 2040 Low Scenario Noise Contour

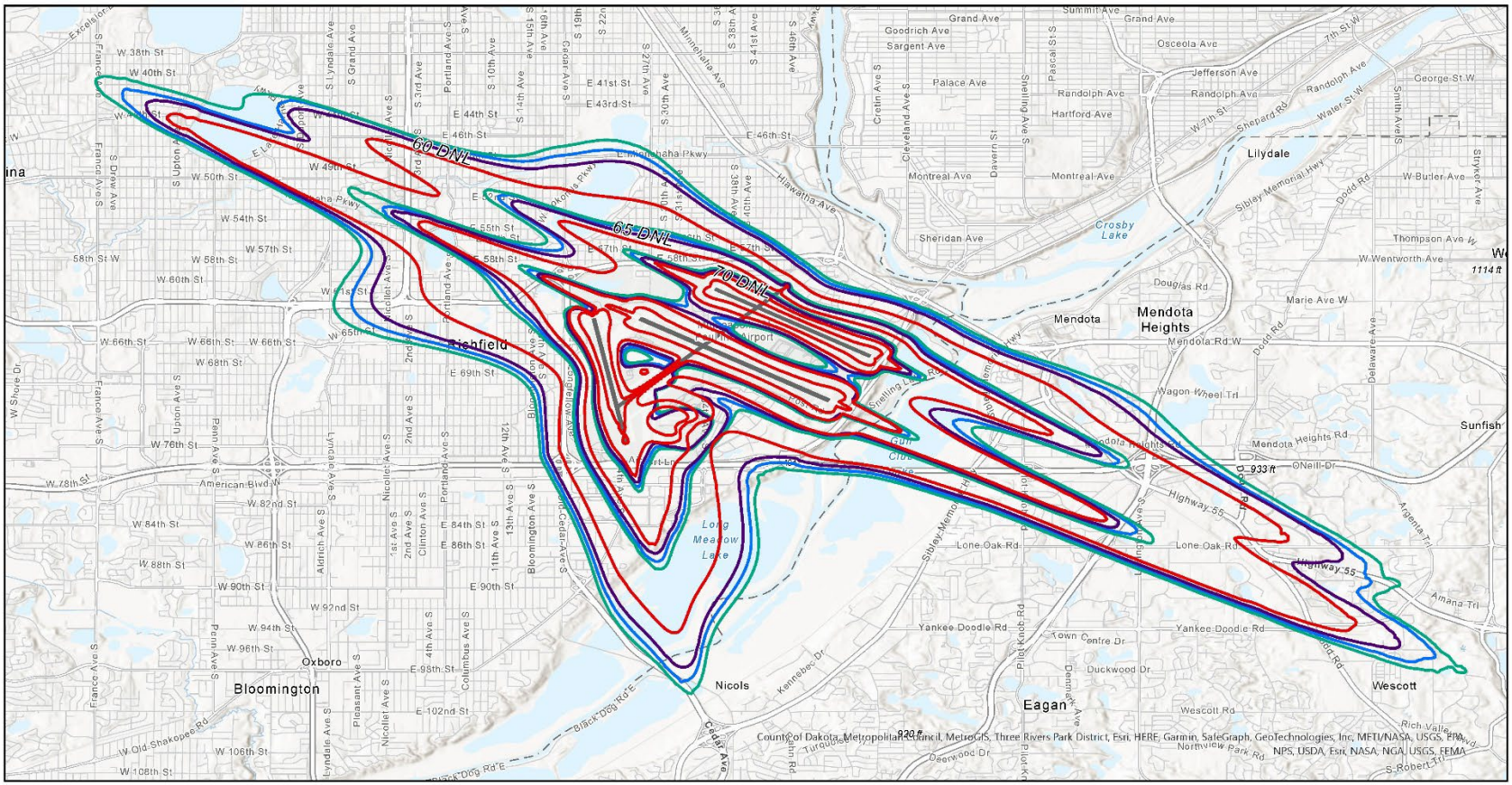
Figure 4
MSP 2040 Low Scenario Noise Contour

0 3,000 6,000 12,000 Feet

N

Figure 5: MSP 2018 Actual Noise Contour vs. MSP 2040 LTP Noise Contours

MSP - LTP Noise



LEGEND

- MSP 2018 Actual Noise Contour
- MSP 2040 Baseline Noise Contour
- MSP 2040 High Scenario Noise Contour
- MSP 2040 Low Scenario Noise Contour

Figure 5
MSP Baseline, High Scenario, and Low Scenario Noise Contours vs. 2018 Contour

0 3,000 6,000 12,000 Feet

N

4 Summary

This technical memorandum documents the methodologies and data sources in the modeling of the 2040 baseline, high scenario, and low scenario noise contours. A brief description of factors that may contribute to an increase of noise areas from 2018 Actual Noise Contour to 2040 noise contours was also included in the technical memorandum.

As always, we appreciate the opportunity to provide noise analysis and support to the MAC. Should you have any questions regarding the content of this technical memorandum, please do not hesitate to call me at 540-257-3728 or email yxu@hntb.com.

Best Regards,

Yue Xu, Ph.D., P.E.
Aviation/Environmental Planner
HNTB Corporation

Cc: Eric Gilles, MAC
Michele Ross, MAC
Dana Nelson, MAC
Kim Hughes, HNTB
Andrew Blaisdell, HNTB
Justin Bychek, HNTB

Attachment 1
Noise Contour Fleet Mix Final Technical Memorandum

Minneapolis St. Paul International Airport (MSP) Long-Term Plan (LTP)
Fleet Mix Final Technical Memorandum

HNTB has been tasked to assist the Metropolitan Airports Commission (MAC) in support of the development of the 2040 Long-Term Plan (LTP) Noise Contour for the Minneapolis-St. Paul International Airport (MSP). This technical memorandum presents a summary of the methodologies and data sources used in the analysis, specifically the development of a 2040 fleet mix and subsequent adjustments/refinements to various input parameters to facilitate modeling of the 2040 contour with the Federal Aviation Administration's (FAA) Aviation Environmental Design Tool (AEDT).

1. Methodology and Input Data

The MAC provided HNTB the summer Design Day Flight Schedule (DDFS) for the 2040 baseline condition. The DDFS was based on an Average Day of the Peak Month (ADPM) that includes operations by passenger carriers, cargo carriers, air taxi, General Aviation (GA), charter, and military. Since the DDFS represents an ADPM condition whereas the 2040 noise contour represents an Average Annual Day (AAD) condition, it was necessary to convert the ADPM fleet mix to the AAD fleet mix. Following the development and acceptance of the 2040 fleet mix, the FAA AEDT model, version 3e, will be used to create the 2040 baseline noise contours. The following sections describe the procedure of the fleet mix conversion as well as other inputs that will be used with the AEDT modeling process.

1.1 2040 Baseline AAD Fleet Mix

The latest annual MAC Noise & Operations Monitoring System (MACNOMS) and United States Department of Transportation (USDOT) T100 data (2021) were used to develop the ADPM-to-AAD conversion factors for passenger (domestic and international) and all-cargo airlines, as well as the airline market share. The 2021 data were used to ensure the forecast reflects the most recent market trends. Nighttime adjustment factors based on 2018 baseline simulation results and 2018 MACNOMS data were also incorporated to account for various delay components. Ultimately, operations were scaled to match the total 2040 baseline forecast operation by each operation category.

For other categories, including air taxi, charter, GA, and military, operations were scaled proportionally to match the total 2040 baseline forecast by category. **Table 1-1** shows the 2040 baseline forecast operations by category.

Table 1-1: 2040 Baseline Forecast

Category	Operations
Domestic Passenger	432,000
International Passenger	32,900
Air Cargo	19,700
GA/Air Taxi/ Charter	22,900
Military	2,200
Total	509,700

Source: Ricondo Forecast, 2021.

1.1.1 Operation Balancing

The baseline DDFS operations were balanced such that the number of arrivals would equal the number of departures for the same airline and aircraft. In instances where arrivals or departures for each airline and aircraft type were not equal, the operations were scaled up or down to ensure they were balanced.

1.1.2 ADPM to AAD Conversion

Using the 2021 MACNOMS data, ADPM to AAD conversion factors were developed by comparing the ADPM operations (July 28, 2021, Wednesday) with total annual operations of the same airline and aircraft. If a certain combination of airline and aircraft in the DDFS was not available on that day, the next date in July with operations closest to the July average was used to develop conversion factors.

The passenger and all-cargo airline market shares (domestic and international) in 2021 were calculated using MACNOMS data and were assumed to remain constant in 2040. The total baseline 2040 passenger (domestic and international) and all-cargo operations were multiplied by the airline market share to obtain total 2040 operations by each airline. Operations by each airline were subsequently scaled proportionally to match the total forecast 2040 baseline operations in **Table 1-1**.

1.1.3 Seasonal International Flights

There are several international carriers that provide seasonal flights from/to MSP. Since these carriers operate mostly during the summer months, assumptions were made to develop projections of 2040 operations. In general, the operational growth factor from 2021 to 2040 was applied to project the 2040 operations for these airlines. A weekly operation frequency was estimated to produce an annual operations projection close to the projected 2040 operation levels. The seasonal international airlines and their forecast operations are discussed below:

- **Air France**

Air France operates flights to/from MSP from June through September. In 2021, there were 126 operations. It was assumed that Air France would operate daily flights from June through September in 2040, which results in a total of 224 operations.

- **Icelandair**

Icelandair operates flights to/from MSP from June through mid-October. In 2021, there were 164 operations. It was assumed that Icelandair would operate ten weekly flights from June through mid-October in 2040, which results in a total of 280 operations.

- **KLM Royal Dutch Airlines**

KLM Royal Dutch Airlines operates flights to/from MSP from August through November. In 2021, there were 76 operations. It was assumed that KLM Royal Dutch Airlines would operate four weekly flights from August through November in 2040, which results in a total of 128 operations.

- **Condor Flugdienst**

Condor Flugdienst operates flights to/from MSP from June through mid-September. The route was dropped in 2021 but resumed in 2022. It was assumed that KLM Royal Dutch Airlines would operate five weekly flights from June through November in 2040, which results in a total of 140 operations.

- **Aer Lingus**

Aer Lingus operated flights to/from MSP in 2019 but suspended the route in 2020 due to the pandemic. The 2040 baseline DDFS assumed that Aer Lingus operation would resume post-pandemic. In 2019, there were five weekly flights in July, daily operations from August through November, and four weekly flights in December. It was assumed that Aer Lingus would operate daily flights in spring, summer, and fall. During the winter months (December to March), it was assumed that Aer Lingus would operate four weekly flights. These assumptions result in a total of 632 flights.

1.1.4 Day / Night Split Adjustment

AEDT considers different levels of annoyance during daytime hours (07:00 AM – 22:00 PM) as compared to nighttime hours (22:01 PM – 6:59 AM). “Day” and “Night” for noise modeling purposes are defined by the time an aircraft lands or takes off from a runway. A 10-dB penalty is added to nighttime operations due to their additional perceived annoyance when people are at rest and the ambient noise level is low, making it important to accurately capture whether operations would occur during daytime hours or nighttime hours (day/night split). Since the DDFS provides an At-Gate time stamp, the following steps were applied to estimate an overall day/night split that accounts for taxi times, airfield delay, system delay, non-airfield delay, and seasonality.

Step 1: Develop At-Gate Day Night Fleet Mix from Design Day DDFS:

- Average the arrivals and departures for each aircraft type when they differed.
- Annualize by multiplying the average by the ratio of annual forecast operations to design day operations from the DDFS in each major category (passenger, cargo, GA / air taxi / charter, military).
- Calculate the At-Gate day/night split and stage length distribution based on gate time and destination information in the DDFS.
- Convert to preliminary AAD by dividing by 365.

Step 2: Adjust At-Gate Day Night Fleet Mix for Taxi Time and Airfield Delay:

- Develop percentage of arrival and departure nighttime operations for each major category (passenger, cargo, other, etc.) for each runway use configuration that was simulated.
- Weight the percentage above by the assumed 2040 percentage of runway use configurations to arrive at a weighted nighttime average.
- Calculate the ratios of At-Runway nighttime percentages to At-Gate nighttime percentages for arrivals and departures for each major use category.
- Apply the nighttime ratios to the At-Gate Day/Night Fleet Mix to develop preliminary At-Runway Day/Night Fleet Mix.

Step 3: Adjust for System Delay, Non-Airfield Delay, and Seasonality:

- Factors that are not captured by the airfield simulation include propagated system delay generated outside of MSP, non-airfield delay such as mechanical issues, gate holds, holds for late arriving connecting passengers, and seasonal schedule changes.
- The 2018 MACNOMS AAD nighttime percentages for arrivals and departures in each major use category were divided by the nighttime percentages calculated from the 2018 airfield simulations to develop adjustment ratios for converting the At-Runway Day Night Fleet mix to a final AAD fleet mix that incorporates annual system delay, non-airfield delay and seasonality.
- These ratios were applied to the 2040 At-Runway Day Night Fleet Mix to develop a fleet mix for use in noise modeling.

Table 1-2 depicts the day / night splits for the 2018 base year, the 2040 baseline DDFS, and the 2040 baseline AAD scenarios. The 2040 baseline AAD nighttime percentage is lower than the 2040 baseline DDFS nighttime percentages as the DDFS represents the ADPM condition with more operations than the AAD condition. The 2040 baseline AAD nighttime percentage is higher than the 2018 AAD nighttime percentages because of the higher projected nighttime operations in the 2040 baseline DDFS.

Table 1-2: Day / Night Split

Operation Type	2018		2040 DDFS		2040 AAD	
	Day	Night	Day	Night	Day	Night
Arrival	88.6%	11.4%	86.2%	13.8%	88.0%	12.0%
Departure	89.8%	10.2%	85.8%	14.2%	89.0%	11.0%
Total	89.2%	10.8%	86.0%	14.0%	88.5%	11.5%

Source: MACNOMS data and HNTB analysis, 2022.

1.1.5 2040 Baseline AAD Fleet Mix

Table 1-3 shows the 2040 baseline AAD fleet mix.

Table 1-3: 2040 Baseline AAD Fleet Mix

Category	Type	Airline	Aircraft	Operations
Passenger	Domestic	Delta Air Lines	BCS1	142,117
			A19N	55,275
			B739	35,086
			A20N	34,781
			CRJ2	17,134
			CRJ9	13,401
			B753	11,625
			BCS3	11,509
			E175	7,670
			A321	5,652
			A339	3,729
			A350	311
		DAL Total		338,288
		United Airlines	E175	6,071
			BCS1	3,468
			BCS3	3,179
			B38M	1,921
			B3XM	388
		UAL Total		15,025
		American Airlines	B738	9,664
			BCS1	7,962
			E175	2,473
			B38M	899
		AAL Total		20,997

Table 1-3: 2040 Baseline AAD Fleet Mix

Category	Type	Airline	Aircraft	Operations
		Alaska Airlines	E175	1,640
			B39M	763
			B38M	562
		ASA Total		2,965
		Frontier Airlines	A20N	1,181
			A321	787
		FFT Total		1,968
		Sun Country Airlines	B738	29,589
		SCX Total		29,589
		Southwest Airlines	B737	8,778
			B38M	6,343
		SWA Total		15,121
		JetBlue Airways	A320	1,293
		JBU Total		1,293
		Spirit Airlines	A319	2,890
		Spirit Airlines	A19N	1,949
		Spirit Airlines	A20N	779
		NKS Total		5,618
		Boutique Air	PC12	695
		BTQ Total		695
		Air Choice One	C208	442
		ACO Total		442
	International	Delta Air Lines	BCS1	10,281
		Delta Air Lines	A350	7,118
		Delta Air Lines	CRJ9	4,029
		Delta Air Lines	BCS3	3,376
		Delta Air Lines	B739	2,617
		Delta Air Lines	A20N	1,465
		Delta Air Lines	E175	1,125
		Delta Air Lines	A339	326
		DAL Total		30,338
		Air Canada	E175	1,158
		ACA Total		1,158
		Air France	A359	224
		AFR Total		224
		Condor	B788	140
		CFG Total		140
		Aer Lingus	A21N	632
		EIN Total		632
		Icelandair	B39M	280

Table 1-3: 2040 Baseline AAD Fleet Mix

Category	Type	Airline	Aircraft	Operations
		ICE Total		280
		KLM	B78X	128
		KLM Total		128
Passenger Total				**464,900**
Cargo	Cargo	Bemidji Airlines	BE99	2,304
		Bemidji Airlines	BE65	2,004
		Bemidji Airlines	BE80	1,896
		Bemidji Airlines	SW4	1,540
		BMJ Total		7,743
		Kalitta Air	B763	6
		CKS Total		6
		FedEx	B763	2,472
		FedEx	B752	1,228
		FedEx	MD11	671
		FedEx	B77F	671
		FDX Total		5,042
		Atlas Air	B748	9
		Atlas Air	B763	9
		GTI Total		19
		Mountain Air Cargo	AT43	745
		MTN Total		745
		Polar Air Cargo	B748	5
		PAC Total		5
		Contract Air Cargo	CRJ2	550
		TSU Total		550
		UPS	B752	3,320
		UPS	B763	1,280
		UPS	MD11	702
		UPS	B748	288
		UPS Total		5,590
Cargo Total				**19,700**
Air Taxi	Air Taxi	Miscellaneous	B350	108
		Miscellaneous	C56X	1,341
		Miscellaneous	C680	268
		Miscellaneous	C68A	283
		Miscellaneous	C750	536
		Miscellaneous	CL30	1,846
		Miscellaneous	CL35	268
		Miscellaneous	CL60	536
		Miscellaneous	CRJ7	268
		Miscellaneous	E545	136

Table 1-3: 2040 Baseline AAD Fleet Mix

Category	Type	Airline	Aircraft	Operations
		Miscellaneous	E55P	777
		Miscellaneous	G280	268
		Miscellaneous	GLEX	268
		Miscellaneous	GLF4	536
		Miscellaneous	H25B	268
		Miscellaneous	HA4T	268
		Miscellaneous	LJ55	268
		Miscellaneous	SW4	145
Air Taxi Total				**8,392**
Charter	Charter	Miscellaneous	A319	142
		Miscellaneous	B738	1,743
		Miscellaneous	CRJ7	128
		Miscellaneous	CRJ9	104
		Miscellaneous	E170	258
		Miscellaneous	E75L	352
		Miscellaneous	MD90	117
Charter Total				**2,845**
GA	GA	Miscellaneous	B190	1,514
		Miscellaneous	B350	257
		Miscellaneous	BE20	513
		Miscellaneous	BE55	396
		Miscellaneous	C208	513
		Miscellaneous	C25B	513
		Miscellaneous	C560	513
		Miscellaneous	C56X	770
		Miscellaneous	C680	513
		Miscellaneous	C750	396
		Miscellaneous	CL35	257
		Miscellaneous	CL60	257
		Miscellaneous	F2TH	1,026
		Miscellaneous	FA50	513
		Miscellaneous	GLEX	257
		Miscellaneous	GLF4	513
		Miscellaneous	GLF5	653
		Miscellaneous	H25B	513
		Miscellaneous	LJ40	257
		Miscellaneous	LJ60	257
		Miscellaneous	M20P	494
		Miscellaneous	PC12	513
		Miscellaneous	SF50	257
GA Total				**11,663**

Table 1-3: 2040 Baseline AAD Fleet Mix

Category	Type	Airline	Aircraft	Operations
Military	Military	Miscellaneous	C130	1,833
	Military	Miscellaneous	K35R	367
Military Total				**2,200**
Grand Total				**509,700**

Source: HNTB analysis, 2022.

2. Summary

This technical memorandum documents the methodologies and data sources in the conversion of the 2040 DDFS fleet mix to the 2040 AAD fleet mix. The 2040 DDFS fleet mix (ADPM based) was converted to the 2040 AAD fleet mix by using the ADPM/AAD conversion factors after the arrivals and departures were balanced. Specific assumptions were made regarding future seasonal international flights. The day / night split was adjusted to account for taxi times, airfield delay, system delay, non-airfield delay, and seasonality. The total number of operations were scaled proportionally to match the forecast operations by category.

As always, we appreciate the opportunity to provide noise analysis and support to the MAC. Should you have any questions regarding the content of this technical memorandum, please do not hesitate to call me at 540-257-3728 or email yxu@hntb.com.

Best Regards,

Yue Xu, Ph.D., P.E.
Aviation/Environmental Planner
HNTB Corporation

Cc: Eric Gilles, MAC
Michele Ross, MAC
Dana Nelson, MAC
Kim Hughes, HNTB
Andrew Blaisdell, HNTB
Justin Bychek, HNTB

Attachment 2
AEE Coordination

MEMORANDUM

HNTB

To
Melissa M. Jennifer
Environmental Protection Specialist
Great Lakes Region
Dakota / Minnesota Airports District
Minneapolis Office
6020 28th Ave S, Ste 102
Minneapolis, MN 55450-2700

From
Yue Xu, HNTB

Cc
Brad Juffer, MAC
Michele Ross, MAC
Kim Hughes, HNTB

Subject
Submittal to FAA of Non-standard AEDT Aircraft Substitution for Minneapolis-St. Paul International Airport and Flying Cloud Airport Long Term Plan Noise Analysis

Date
August 1, 2022

For development of the Minneapolis-St. Paul International Airport (MSP) and Flying Cloud Airport (FCM) Long Term Plan (LTP), HNTB is conducting noise analyses for the base year (2021) and the future year (2040) using the Aviation Environmental Design Tool (AEDT) 3e. This request is in accordance with the required protocol to obtain approval of non-standard aircraft substitution related to AEDT. The Metropolitan Airports Commission (MAC), owner and operator of MSP and FCM, is requesting recommendation of eight non-standard substitutions (for both facilities), as discussed in **Section 1**. We understand the MSP and FCM LTP planning studies are not part of a federal process and thus a formal AEE coordination is not required. To ensure accuracy of the noise analyses, we would like to request AEE's technical opinions on the non-standard aircraft substitution through this informal coordination request.

1. Non-Standard Aircraft Substitution Table

The base year and future year fleet mixes prepared for this LTP include aircraft types for which there is no direct AEDT 3e type or pre-approved FAA substitution identified in the model. Consistent with FAA's policy for non-standard modeling procedures, this memorandum provides a list of these aircraft types with a suggested substitution. **Table 2-1** lists aircraft that are present in the base year and future year fleet mixes for which no suitable AEDT aircraft exists. HNTB requests concurrence or suggested replacement aircraft for use in the model.

Table 2-1: AEDT 3e Substitution Table

Non-standard AEDT Aircraft Substitution for MSP and FCM LTP

Aircraft ID	Aircraft Description	AEDT Equipment ID	AEDT ANP Code	AEDT Air Frame Code	AEDT Engine Model	AEDT BADA Code
B3XM	Boeing 737 MAX 10	6406	7378MAX	5337	LEAP-1B28/28B1/28B2/28B3	B39M
HCG2	Guimbal Cabri G2	3808	SC300C	5179	IO-360-B	P28A
R66	Robinson R66	3161	R44	5080	TIO-540-J2B2	P28A
PA16	Piper PA-16 Clipper	6311	GASEPF	5639	O-200	C172
STOL	Cub Crafters Carbon Cub CCK-2000	1880	GASEPF	5004	IO-320-D1AD	P28A
B58T	Beechcraft Baron 58 Turbo	6251	BEC58P	5630	TIO-540-J2B2	BE58
A5	ICON A5	1901	GASEPV	4950	TIO-540-J2B2	P28A
GYRO	AutoGyro GmbH Cavalon	3807	R22	5178	IO-320-D1AD	P28A

Source: HNTB Analysis, 2022.

2. Background Information

Boeing 737 MAX 10 (MSP LTP)

The Boeing 737 MAX 10 is the largest variant of the Boeing 737 MAX family with a Maximum Takeoff Weight (MTOW) of 197,900 lbs and a Maximum Landing Weight (MLW) of 163,900 lbs. It is equipped with two CFM LEAP-1B engines. HNTB proposes to use AEDT equipment 6406 as a substitute, which maps to ANP code 7378MAX, airframe 5337 (Boeing 737-9), engine model LEAP-1B28/28B1/28B2/28B3, and BADA code B39M.

Guimbal Cabri G2 (FCM LTP)

The Guimbal Cabri G2 is a light helicopter developed by Hélicoptères Guimbal. It has a maximum gross weight of 1,540 lbs and is equipped with a Lycoming O-360 J2A engine rated at 145 shp. HNTB proposes to use AEDT equipment 3808 as a substitute, which maps to ANP code SC300C, airframe code 5179 (Schweizer 300C), engine model IO-360-B, and BADA code P28A. The SC300C (Schweizer 300C) has a MTOW of 2,050 lbs and is equipped with a Lycoming HIO-360 D1A engine rated at 190 hp. It has heavier weights and is equipped with a similar but more powerful engine than the Guimbal Cabri G2. Therefore, it represents a conservative substitute for the Guimbal Cabri G2.

Robinson R66 (FCM LTP)

The Robinson R66 is a derived version of the Robinson R44. It has a maximum gross weight of 2,700 lbs and is equipped with a Rolls-Royce RR300 engine rated at 224 shp. AEDT airframe 5134 represents a direct representation of the Robinson R66. However, there's no AEDT equipment mapped to airframe 5134. Therefore, HNTB proposes to use AEDT equipment 3161 as a substitute, which maps to ANP code R44, airframe 5080 (Robinson R44 Raven / Lycoming O-540-F1B5), engine model TIO-540-J2B2, and BADA code P28A.

Piper PA-16 Clipper (FCM LTP)

The Piper PA-16 Clipper is a light high-wing single engine piston aircraft. It has an MTOW of 1,650 lbs and is equipped with a Lycoming O-235 engine rated at 115 hp. The PA-16 Clipper is an extended version of the PA-15 Vagabond, which shares many structural components of the Piper J-3 Cub. The Piper J-3 Cub has a standard substitution in AEDT 3e. Therefore, HNTB proposes to use equipment 6311 as a substitute, which maps to ANP code GASEPF, airframe 5639 (Piper J-3 Cub (FAS)), engine model O-200, and BADA code C172.

Cub Crafters Carbon Cub CCK-2000 (FCM LTP)

The Cub Crafters Carbon Cub CCK-2000 is an amateur built aircraft developed by Cub Crafters with an ECi CC340 engine rated at 180 hp. It has an MTOW of 1,865 lbs and is equipped with a two-bladed fixed pitch propeller. HNTB proposes to use the generic GA fixed pitch aircraft of equipment 1880 as a substitute, which maps to ANP code GASEPF, airframe 5004 (EADS Socata TB-9 Tampico), engine IO-320-D1AD, and BADA code P28A.

Beechcraft Baron 58 Turbo (FCM LTP)

The Beechcraft Baron 58 Turbo is powered by a pair of turbocharged Continental TIO-520s of 310–325 hp engines (310 hp – 325 hp) with a gross weight of 6,200. HNTB proposes to use equipment 6251 as a substitute, which maps to ANP code BEC58P, airframe 5630 (Beechcraft 56TC Baron (FAS)), engine model TIO-540-J2B2, and BADA code BE58.

ICON A5 (FCM LTP)

The ICON A5 is an amphibious light-sport aircraft (LSA) aircraft developed by ICON Aircraft. It has a maximum gross weight of 1,510 lbs and is equipped with a Rotax 912 iS engine rated at 100 hp. HNTB proposes to use the generic GA variable pitch aircraft of equipment 1901 as a substitute, which maps to ANP code GASEPV, airframe 4950 (Piper PA-24 Comanche), engine model TIO-540-J2B2, and BADA code P28A.

AutoGyro GmbH Cavalon (FCM LTP)

The AutoGyro GmbH Cavalon is an autogyro rotorcraft developed by AutoGyro GmbH. It has a maximum gross weight of 992 lbs and is equipped with a Rotax 912ULS engine rated at 100 hp. HNTB proposes to use AEDT equipment 3807 as a substitute, which maps to ANP code R22, airframe 5178 (Robinson R22B), engine model IO-320-D1AD, and BADA code P28A. It represents a light helicopter substitute with takeoff weight and engine thrust close to AutoGyro GmbH Cavalon's characteristics.

3. Summary

We are requesting, for use in the MSP and FCM LTP projects, the concurrence or recommendation of the non-standard AEDT aircraft substitutions. Should you have any additional questions, please do not hesitate to contact me. Thank you in advance for your consideration of this request.

Best regards,

Yue Xu, Ph.D., P.E.
Aviation/Environmental Planner
HNTB Corporation
Phone: (703) 253-5829
Email: yxu@hntb.com

Attachment 3
2040 Baseline, High Scenario, and Low Scenario AEDT Fleet Mixes

Table 3-1: 2040 LTP Fleet Mixes

Aircraft ID	Aircraft Description	AEDT ANP	Airframe	Engine	2040 Baseline		2040 High		2040 Low	
					Day	Night	Day	Night	Day	Night
221	Airbus A220-100	737700	Airbus A220-100	01P20PW183	423	26	462	29	379	24
223	Airbus A220-300	737700	Airbus A220-300	01P20PW184	45	5	49	5	40	4
319	Airbus A319 series	A319-131	Airbus A319-100 Series	7CM050	5	2	6	3	5	2
320	Airbus A320 series	A320-232	Airbus A320-200 Series	3IA007	2	1	3	1	2	1
321	Airbus A321 series	A321-232	Airbus A321-100 Series	1IA005	18	-	19	-	16	-
32N	Airbus A320NEO Series	A320-271N	Airbus A320-NEO	01P20CM128	98	4	107	5	87	4
32N	Airbus A320NEO Series	A320-272N	Airbus A320-NEO	01P18PW150	2	0	3	0	2	0
32Q	Airbus A321NEO Series	A321-232	Airbus A321-NEO	01P08CM103	2	-	2	-	2	-
339	Airbus A330-900	A330-343	Airbus A330-900N Series (Neo)	02P23RR141	10	1	11	1	9	1
350	Airbus A350	A350-941	Airbus A350-1000 Series	01P21RR125	10	0	11	0	9	0
350	Airbus A350	A350-941	Airbus A350-900 series	01P18RR124	8	2	9	2	7	2
359	Airbus A350-900	A350-941	Airbus A350-900 series	01P18RR124	1	-	1	-	1	-
3N1	Airbus A319NEO Series	A319-131	Airbus A319-NEO	01P20CM127	126	30	138	33	113	27
738	Boeing 737-800	737800	Boeing 737-800 Series	3CM034	66	20	72	21	59	18
739	Boeing 737-900	737800	Boeing 737-900 Series	8CM065	91	12	100	13	82	11
73H	Boeing 737-800	737800	Boeing 737-800 Series	3CM034	19	7	21	8	17	7
73W	Boeing 737-700	737700	Boeing 737-700 Series	3CM030	16	8	18	8	15	7
753	Boeing 757-300	757300	Boeing 757-300 Series	XPW204	30	2	33	2	27	2
781	Boeing 787-10 Dreamliner	7879	Boeing 787-10 Dreamliner	01P17GE211	0	-	0	-	0	-
788	Boeing 787 Dreamliner (800 Model)	7878R	Boeing 787-8 Dreamliner	9GENX3	0	-	0	-	0	-
7M1	Boeing 737 MAX 10	7378MAX	Boeing 737-9	01P20CM136	1	-	1	-	1	-
7M8	Boeing 737 MAX 8	7378MAX	Boeing 737-8	01P20CM136	20	6	22	7	18	6
7M9	Boeing 737 MAX 9	7378MAX	Boeing 737-9	01P20CM136	2	1	2	1	1	1
A319	Airbus A319 series	A319-131	Airbus A319-100 Series	7CM050	0	-	0	-	0	-

Table 3-1: 2040 LTP Fleet Mixes

Aircraft ID	Aircraft Description	AEDT ANP	Airframe	Engine	2040 Baseline		2040 High		2040 Low	
					Day	Night	Day	Night	Day	Night
AT43	Avions de Transport Régional ATR-43	DHC8	ATR 42-300	PW120	2	-	2	-	2	-
B190	Beechcraft 1900D	1900D	Raytheon Beech 1900-C	PT67B	3	1	4	1	4	1
B350	Beechcraft Super King Air 350/300B	DHC6	Raytheon Super King Air 300	P660AG	1	-	1	-	1	-
B748	Boeing 747-800	7478	Boeing 747-8	11GE139	1	0	1	0	1	0
B752	Boeing 757-200	757PW	Boeing 757-200 Series Freighter	4PW072	2	4	2	5	1	4
B752	Boeing 757-200	757RR	Boeing 757-200 Series Freighter	3RR028	2	5	2	5	2	5
B763	Boeing 767-300	767300	Boeing 767-300 Series	1RR011	7	4	7	4	6	3
B77F	Boeing 777 Freighter	777200	Boeing 777 Freighter	01P21GE216	1	-	1	-	1	-
B77F	Boeing 777 Freighter	777300	Boeing 777 Freighter	01P21GE217	1	-	1	-	1	-
BE20	Beechcraft Model 200 (Super) King Air 200	C12	Raytheon Super King Air 200	PT6A41	1	-	1	-	1	-
BE20	Beechcraft Model 200 (Super) King Air 200	DHC6	Raytheon C-12 Huron	PT6A42	1	-	1	-	1	-
BE55	Beechcraft Model E-55	T42	Raytheon Beech 55 Baron	TIO540	1	1	1	1	1	1
BE65	Beechcraft Model 65 Queen Air	BEC58P	Beechcraft Queen Air 65/70/80 (FAS)	TIO540	5	1	5	1	5	0
BE80	Beechcraft Model 80 Queen Air	BEC58P	Beechcraft Queen Air 65/70/80 (FAS)	TIO540	5	-	6	-	5	-
BE99	Beechcraft Airliner Model 99	DHC6	Raytheon Beech 99	PT6A28	6	-	7	-	6	-
C130	Lockheed Martin C-130	C130	Lockheed C-130 Hercules	T56-1	3	-	3	-	3	-
C130	Lockheed Martin C-130	C130E	Lockheed C-130 Hercules	T56-1	3	-	3	-	3	-
C208	Cessna 208 Caravan I	CNA208	Cessna 208 Caravan	PT6A14	1	-	1	-	1	-
C25B	Cessna CitationJet CJ3, 525B	CNA525C	Cessna CitationJet CJ3 (Cessna 525B)	1PW038	1	-	1	-	1	-

Table 3-1: 2040 LTP Fleet Mixes

Aircraft ID	Aircraft Description	AEDT ANP	Airframe	Engine	2040 Baseline		2040 High		2040 Low	
					Day	Night	Day	Night	Day	Night
C560	Cessna 560 Citation V, Ultra & Ultra Encore	CNA560E	Cessna 560 Citation Encore	PW530	1	-	1	-	1	-
C560	Cessna 560 Citation V, Ultra & Ultra Encore	CNA560U	Cessna 560 Citation V	1PW037	1	-	1	-	1	-
C56X	Cessna 560XL Citation Excel	CNA560XL	Cessna 560 Citation Excel	PW530	6	-	6	-	6	-
C680	Cessna 680 Citation Sovereign	CNA680	Cessna 680 Citation Sovereign	03P14PW194	2	-	2	-	2	-
C68A	Cessna Citation Latitude	CNA680	Cessna 680-A Citation Latitude	7PW078	1	-	1	-	1	-
C750	Cessna 750 series/Citation X	CNA750	Cessna 750 Citation X	8AL025	2	1	2	1	2	1
CL30	Bombardier Challenger 300	CL600	Bombardier Challenger 300	6AL006	4	1	4	1	4	1
CL35	Bombardier Challenger 350	CL600	Bombardier Challenger 300	6AL006	1	-	1	-	1	-
CL60	Canadair Bombardier CL600/610 Challenger Twin Jet	CL600	Bombardier Challenger 600	01P05GE189	1	-	1	-	1	-
CL60	Canadair Bombardier CL600/610 Challenger Twin Jet	CL601	Bombardier Challenger 600	1GE034	1	-	1	-	1	-
CNC	Cessna 208 Caravan I	CNA208	Cessna 208 Caravan	PT6A14	1	-	1	-	1	-
CR9	Bombardier CRJ 900 Regional Jet	CRJ9-ER	Bombardier CRJ-900	01P08GE190	45	2	50	3	41	2
CRJ	Bombardier CRJ 200 Regional Jet	CL600	Bombardier (Canadair) CRJ200 ExecLiner	1GE035	23	1	25	1	21	0
CRJ	Bombardier CRJ 200 Regional Jet	CRJ9-ER	Bombardier CRJ-200	1GE035	23	1	25	1	21	0
CRJ2	Bombardier CRJ 200 Regional Jet	CL600	Bombardier (Canadair) CRJ200PF Bulk Freighter	01P05GE189	-	2	-	2	-	1
CRJ7	Bombardier CRJ 700 Regional Jet	CRJ9-ER	Bombardier CRJ-700	01P05GE189	1	0	1	0	1	0

Table 3-1: 2040 LTP Fleet Mixes

Aircraft ID	Aircraft Description	AEDT ANP	Airframe	Engine	2040 Baseline		2040 High		2040 Low	
					Day	Night	Day	Night	Day	Night
CRJ9	Bombardier CRJ 900 Regional Jet	CRJ9-ER	Bombardier CRJ-900	01P08GE190	0	-	0	-	0	-
E170	Embraer ERJ-170	EMB170	Embraer ERJ170	01P08GE198	1	-	1	-	1	-
E545	Embraer Legacy 545	CNA510	Embraer Legacy 450 (EMB-545)	01P14HN014	0	-	0	-	0	-
E55P	Embraer EMB550 Phenom 300	CNA55B	Embraer Phenom 300 (EMB-505)	PW530	2	-	2	-	2	-
E75	Embraer ERJ-175	EMB175	Embraer ERJ175	01P08GE197	13	1	14	1	12	1
E75L	Embraer ERJ-175	EMB175	Embraer ERJ175-LR	01P08GE197	1	-	1	-	1	-
E7W	Embraer ERJ-175	EMB175	Embraer ERJ175	01P08GE197	37	4	40	4	33	4
F2TH	Dassault Falcon 2000	CNA750	Dassault Falcon 2000	03P14PW194	3	-	3	-	3	-
FA50	Dassault Falcon 50	FAL900EX	Dassault Falcon 50	1AS002	1	-	1	-	1	-
G280	Gulfstream G280	CL601	Gulfstream G280	01P11HN012	1	-	1	-	1	-
GLEX	Bombardier BD-700 Global Express	BD-700-1A10	Bombardier Global Express	4BR002	1	-	1	-	1	-
GLF4	Gulfstream IV	GIV	Gulfstream G400	11RR048	3	-	3	-	3	-
GLF5	Gulfstream V	GV	Gulfstream G-5 Gulfstream 5 / G-5SP Gulfstream G500	3BR001	1	1	1	1	1	1
H25B	Hawker 800/800 XP/850 XP Twin Turbojet/Bae 125-800	LEAR35	Hawker HS-125 Series 700	1AS002	2	-	2	-	2	-
HA4T	Hawker Beechcraft 4000 Horizon (Horizon 1000)	CNA750	Raytheon Hawker 4000 Horizon	01P07PW145	1	-	1	-	1	-
K35R	Boeing C-135R Stratotanker	KC135R	Boeing KC-135 Stratotanker	J57P22	1	-	1	-	1	-
LJ40	Learjet 40 Twin Jet	LEAR35	Bombardier Learjet 40	1AS001	1	-	1	-	1	-
LJ55	Learjet 55 Twin Jet	LEAR35	Bombardier Learjet 55	1AS002	1	-	1	-	1	-
LJ60	Learjet 60 Twin Jet	CNA750	Bombardier Learjet 60	6AL022	0	-	0	-	0	-
LJ60	Learjet 60 Twin Jet	LEAR35	Bombardier Learjet 60	TFE731	0	-	0	-	0	-
M20P	Mooney Mark 20 Series	GASEPV	Mooney M20-K	TSIO36	1	1	1	1	1	1

Table 3-1: 2040 LTP Fleet Mixes

Aircraft ID	Aircraft Description	AEDT ANP	Airframe	Engine	2040 Baseline		2040 High		2040 Low	
					Day	Night	Day	Night	Day	Night
MD11	McDonnell Douglas MD-11 (Mixed)	MD11GE	Boeing MD-11 Freighter	1GE031	1	1	1	1	1	1
MD11	McDonnell Douglas MD-11 (Mixed)	MD11PW	Boeing MD-11 Freighter	1PW052	1	1	1	1	1	1
MD90	McDonnell Douglas MD-90	MD9025	Boeing MD-90	1IA002	0	-	0	-	0	-
MD90	McDonnell Douglas MD-90	MD9028	Boeing MD-90	1IA004	0	-	0	-	0	-
PC12	Pilatus PC-12	CNA208	Pilatus PC-12	PT67B	1	-	1	-	1	-
PL2	Pilatus PC-12	CNA208	Pilatus PC-12	PT67B	2	-	2	-	2	-
SF50	Cirrus Vision SF50	CNA510	CIRRUS SF-50 Vision	1PW035	0	-	0	-	0	-
SF50	Cirrus Vision SF50	CNA510	Cirrus Vision SF50 (FAS)	BIZVERYLIGHTJET_F	0	-	0	-	0	-
SW4	Swearingen Merlin IV /Fairchild Merlin IV	DHC6	Fairchild SA-227-AC Metro III	PW125B	4	1	4	1	3	1
Grand Total					1,236	161	1,345	175	1,116	146

Number is shown as 0 when less than 0.5. Number is shown as "-" when it is 0.
Totals may not sum up due to rounding.
Source: MSP LTP DDFS and HNTB analysis, 2023.

Attachment 4
Track Use

Table 4-1
2018/2040 Average Daily Track Use Percentage by Runway and Operation Type

Runway	AEDT Track	OP Type	Track Use - Percentage (by Op Type)			Track Use - Percentage (by Op Type and Runway)		
			Day	Night	Total	Day	Night	Total
ARRIVALS								
4	A04A0	A	0.03%	0.24%	0.05%	58.33%	72.00%	64.78%
4	A04A1	A	0.00%	0.01%	0.00%	2.38%	2.67%	2.52%
4	A04A2	A	0.02%	0.08%	0.02%	35.72%	24.00%	30.19%
4	A04A4	A	0.00%	0.00%	0.00%	2.38%	1.33%	1.89%
4	A04A6	A	0.00%	-	0.00%	1.19%	-	0.63%
4 Total			*0.05%*	*0.33%*	*0.08%*	*100.00%*	*100.00%*	*100.00%*
22	A22A0	A	0.02%	-	0.01%	59.57%	-	59.57%
22	A22A1	A	0.00%	-	0.00%	2.13%	-	2.13%
22	A22A2	A	0.01%	-	0.01%	36.17%	-	36.17%
22	A22BL	A	0.00%	-	0.00%	2.13%	-	2.13%
22 Total			*0.03%*	*-*	*0.02%*	*100.00%*	*-*	*100.00%*
12L	A12LA0	A	17.23%	11.39%	16.56%	77.68%	80.17%	77.87%
12L	A12LA1	A	1.44%	0.63%	1.35%	6.48%	4.46%	6.33%
12L	A12LA10N	A	0.01%	-	0.01%	0.03%	-	0.03%
12L	A12LA11N	A	0.01%	0.00%	0.01%	0.03%	0.03%	0.03%
12L	A12LA12N	A	0.00%	0.00%	0.00%	0.02%	0.03%	0.02%
12L	A12LA14N	A	0.00%	-	0.00%	0.00%	-	0.00%
12L	A12LA15N	A	0.00%	-	0.00%	0.01%	-	0.01%
12L	A12LA16N	A	0.01%	-	0.00%	0.02%	-	0.02%
12L	A12LA2	A	0.30%	0.17%	0.29%	1.37%	1.23%	1.36%
12L	A12LA3	A	0.14%	0.06%	0.13%	0.63%	0.40%	0.61%
12L	A12LA4	A	0.01%	0.00%	0.01%	0.03%	0.03%	0.03%
12L	A12LA5	A	0.05%	0.02%	0.05%	0.24%	0.12%	0.24%
12L	A12LA7	A	0.03%	-	0.02%	0.12%	-	0.11%
12L	A12LA9N	A	0.01%	0.01%	0.01%	0.06%	0.06%	0.06%
12L	A12LBL	A	0.00%	-	0.00%	0.02%	-	0.01%
12L	A12LBR	A	0.00%	-	0.00%	0.00%	-	0.00%
12L	A12LCL	A	0.00%	0.03%	0.00%	0.01%	0.18%	0.02%
12L	A12LCLN	A	0.00%	-	0.00%	0.02%	-	0.02%
12L	A12LCR	A	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%
12L	A12LDL	A	0.00%	0.00%	0.00%	0.01%	0.03%	0.01%
12L	A12LDLN	A	0.01%	0.00%	0.01%	0.03%	0.03%	0.03%
12L	A12LDR	A	0.00%	0.00%	0.00%	0.01%	0.03%	0.01%
12L	A12LEL	A	0.02%	0.02%	0.02%	0.08%	0.15%	0.08%
12L	A12LELN	A	0.00%	0.03%	0.00%	0.01%	0.18%	0.02%

Table 4-1
2018/2040 Average Daily Track Use Percentage by Runway and Operation Type

Runway	AEDT Track	OP Type	Track Use - Percentage (by Op Type)			Track Use - Percentage (by Op Type and Runway)		
			Day	Night	Total	Day	Night	Total
12L	A12LER	A	0.00%	-	0.00%	0.02%	-	0.01%
12L	A12LERN	A	0.00%	0.00%	0.00%	0.02%	0.03%	0.02%
12L	A12LFL	A	0.03%	0.03%	0.03%	0.12%	0.18%	0.12%
12L	A12LFLN	A	0.01%	0.00%	0.01%	0.03%	0.03%	0.03%
12L	A12LFR	A	0.00%	0.02%	0.00%	0.01%	0.12%	0.02%
12L	A12LGL	A	0.07%	0.09%	0.07%	0.30%	0.61%	0.32%
12L	A12LGLN	A	0.00%	-	0.00%	0.01%	-	0.01%
12L	A12LGR	A	0.01%	0.00%	0.01%	0.03%	0.03%	0.03%
12L	A12LHL	A	0.12%	0.14%	0.12%	0.55%	0.95%	0.58%
12L	A12LHLN	A	0.00%	-	0.00%	0.00%	-	0.00%
12L	A12LHR	A	0.01%	0.02%	0.01%	0.04%	0.15%	0.05%
12L	A12LIL	A	0.30%	0.21%	0.29%	1.36%	1.44%	1.37%
12L	A12LILN	A	0.00%	-	0.00%	0.00%	-	0.00%
12L	A12LIR	A	0.01%	0.03%	0.01%	0.04%	0.22%	0.05%
12L	A12LJL	A	0.27%	0.19%	0.26%	1.23%	1.32%	1.23%
12L	A12LJR	A	0.02%	0.07%	0.02%	0.08%	0.46%	0.11%
12L	A12LKL	A	1.99%	0.97%	1.87%	8.96%	6.82%	8.80%
12L	A12LKR	A	0.03%	0.05%	0.03%	0.12%	0.34%	0.14%
12L	A12LLLN	A	0.03%	0.01%	0.03%	0.13%	0.09%	0.12%
12L	A12LLRN	A	0.01%	-	0.01%	0.05%	-	0.05%
12L Total			*22.18%*	*14.20%*	*21.27%*	*100.00%*	*100.00%*	*100.00%*
30R	A30RA0	A	13.40%	11.21%	13.15%	61.17%	67.65%	61.74%
30R	A30RA1	A	0.28%	0.26%	0.28%	1.28%	1.55%	1.30%
30R	A30RA10N	A	0.01%	-	0.00%	0.03%	-	0.02%
30R	A30RA11N	A	0.01%	0.00%	0.01%	0.04%	0.03%	0.04%
30R	A30RA2	A	1.13%	0.48%	1.06%	5.15%	2.90%	4.95%
30R	A30RA3	A	0.01%	0.01%	0.01%	0.03%	0.05%	0.03%
30R	A30RA4	A	0.20%	0.08%	0.19%	0.91%	0.50%	0.87%
30R	A30RA5	A	0.00%	0.00%	0.00%	0.01%	0.03%	0.01%
30R	A30RA6	A	0.03%	0.01%	0.02%	0.12%	0.05%	0.11%
30R	A30RA7	A	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%
30R	A30RA8	A	0.01%	-	0.01%	0.04%	-	0.04%
30R	A30RA9N	A	-	0.00%	0.00%	-	0.03%	0.00%
30R	A30RBL	A	0.00%	0.01%	0.00%	0.01%	0.05%	0.01%
30R	A30RBR	A	0.00%	-	0.00%	0.01%	-	0.01%
30R	A30RCL	A	0.00%	0.01%	0.00%	0.01%	0.08%	0.01%
30R	A30RCR	A	0.00%	0.00%	0.00%	0.02%	0.03%	0.02%

Table 4-1
2018/2040 Average Daily Track Use Percentage by Runway and Operation Type

Runway	AEDT Track	OP Type	Track Use - Percentage (by Op Type)			Track Use - Percentage (by Op Type and Runway)		
			Day	Night	Total	Day	Night	Total
30R	A30RCRN	A	0.01%	-	0.00%	0.02%	-	0.02%
30R	A30RDL	A	0.00%	0.01%	0.00%	0.01%	0.08%	0.01%
30R	A30RDR	A	0.00%	-	0.00%	0.01%	-	0.01%
30R	A30RDRN	A	0.01%	-	0.01%	0.05%	-	0.04%
30R	A30REL	A	0.00%	0.00%	0.00%	0.02%	0.03%	0.02%
30R	A30RER	A	0.02%	0.00%	0.01%	0.07%	0.03%	0.07%
30R	A30RERN	A	0.00%	-	0.00%	0.02%	-	0.01%
30R	A30RFL	A	0.00%	0.02%	0.00%	0.02%	0.11%	0.02%
30R	A30RFR	A	0.02%	0.02%	0.02%	0.10%	0.11%	0.10%
30R	A30RFRN	A	0.00%	-	0.00%	0.00%	-	0.00%
30R	A30RGL	A	0.01%	0.04%	0.01%	0.03%	0.26%	0.05%
30R	A30RGR	A	0.04%	0.04%	0.04%	0.20%	0.26%	0.21%
30R	A30RGRN	A	0.00%	-	0.00%	0.01%	-	0.00%
30R	A30RHL	A	0.01%	0.06%	0.02%	0.06%	0.34%	0.09%
30R	A30RHR	A	0.05%	0.07%	0.05%	0.21%	0.40%	0.23%
30R	A30RHRN	A	0.00%	-	0.00%	0.01%	-	0.00%
30R	A30RIL	A	0.03%	0.08%	0.03%	0.13%	0.50%	0.16%
30R	A30RIR	A	0.11%	0.14%	0.11%	0.49%	0.84%	0.52%
30R	A30RIRN	A	-	0.00%	0.00%	-	0.03%	0.00%
30R	A30RJL	A	0.05%	0.21%	0.07%	0.23%	1.24%	0.32%
30R	A30RJR	A	0.23%	0.18%	0.22%	1.03%	1.08%	1.03%
30R	A30RJRN	A	0.00%	-	0.00%	0.02%	-	0.02%
30R	A30RKL	A	5.26%	3.18%	5.02%	24.02%	19.18%	23.59%
30R	A30RKR	A	0.35%	0.16%	0.32%	1.57%	0.95%	1.52%
30R	A30RKRN	A	0.00%	-	0.00%	0.01%	-	0.01%
30R	A30RLR	A	0.00%	-	0.00%	0.00%	-	0.00%
30R	A30RLRN	A	0.00%	-	0.00%	0.02%	-	0.02%
30R	A30ROL	A	0.62%	0.27%	0.58%	2.82%	1.61%	2.71%
30R Total			*21.91%*	*16.57%*	*21.30%*	*100.00%*	*100.00%*	*100.00%*
12R	A12RA0	A	18.66%	21.88%	19.03%	72.89%	79.68%	73.71%
12R	A12RA1	A	0.33%	0.37%	0.33%	1.29%	1.34%	1.30%
12R	A12RA10N	A	0.00%	0.00%	0.00%	0.02%	0.02%	0.02%
12R	A12RA11N	A	0.00%	0.01%	0.00%	0.01%	0.03%	0.01%
12R	A12RA12N	A	0.01%	0.00%	0.01%	0.03%	0.02%	0.03%
12R	A12RA2	A	1.47%	0.73%	1.39%	5.74%	2.67%	5.37%
12R	A12RA3	A	0.03%	0.04%	0.03%	0.11%	0.14%	0.11%
12R	A12RA4	A	0.04%	0.03%	0.04%	0.17%	0.10%	0.16%

Table 4-1
2018/2040 Average Daily Track Use Percentage by Runway and Operation Type

Runway	AEDT Track	OP Type	Track Use - Percentage (by Op Type)			Track Use - Percentage (by Op Type and Runway)		
			Day	Night	Total	Day	Night	Total
12R	A12RA5	A	0.01%	0.01%	0.01%	0.02%	0.05%	0.02%
12R	A12RA6	A	0.02%	-	0.01%	0.06%	-	0.05%
12R	A12RA7	A	0.00%	-	0.00%	0.00%	-	0.00%
12R	A12RA8	A	0.01%	-	0.01%	0.03%	-	0.02%
12R	A12RA9N	A	0.00%	-	0.00%	0.00%	-	0.00%
12R	A12RALN	A	0.00%	-	0.00%	0.00%	-	0.00%
12R	A12RBL	A	0.00%	-	0.00%	0.01%	-	0.01%
12R	A12RBR	A	0.00%	0.02%	0.00%	0.00%	0.08%	0.01%
12R	A12RCL	A	0.00%	0.00%	0.00%	0.01%	0.02%	0.01%
12R	A12RCLN	A	0.00%	-	0.00%	0.02%	-	0.02%
12R	A12RCR	A	0.01%	0.02%	0.01%	0.02%	0.06%	0.02%
12R	A12RDL	A	0.00%	0.01%	0.00%	0.01%	0.05%	0.01%
12R	A12RDLN	A	0.01%	0.00%	0.00%	0.02%	0.02%	0.02%
12R	A12RDR	A	0.00%	0.04%	0.01%	0.01%	0.14%	0.03%
12R	A12RDRN	A	0.00%	0.02%	0.00%	0.01%	0.06%	0.02%
12R	A12REL	A	0.01%	0.03%	0.01%	0.03%	0.10%	0.03%
12R	A12RELN	A	0.01%	-	0.00%	0.02%	-	0.02%
12R	A12RER	A	0.01%	0.03%	0.01%	0.02%	0.11%	0.03%
12R	A12RFL	A	0.01%	0.01%	0.01%	0.05%	0.03%	0.05%
12R	A12RFLN	A	0.00%	0.01%	0.00%	0.01%	0.03%	0.01%
12R	A12RFR	A	0.01%	0.07%	0.02%	0.03%	0.24%	0.06%
12R	A12RFRN	A	0.00%	0.01%	0.00%	0.00%	0.03%	0.01%
12R	A12RGL	A	0.01%	0.03%	0.02%	0.05%	0.13%	0.06%
12R	A12RGLN	A	0.00%	-	0.00%	0.00%	-	0.00%
12R	A12RGR	A	0.02%	0.09%	0.03%	0.08%	0.32%	0.11%
12R	A12RGRN	A	-	0.01%	0.00%	-	0.03%	0.00%
12R	A12RHL	A	0.02%	0.11%	0.03%	0.07%	0.41%	0.11%
12R	A12RHLN	A	-	0.00%	0.00%	-	0.02%	0.00%
12R	A12RHR	A	0.04%	0.12%	0.05%	0.14%	0.45%	0.18%
12R	A12RIL	A	0.03%	0.16%	0.05%	0.12%	0.57%	0.18%
12R	A12RIR	A	0.09%	0.17%	0.10%	0.35%	0.64%	0.39%
12R	A12RJL	A	0.08%	0.24%	0.10%	0.33%	0.86%	0.39%
12R	A12RJR	A	0.19%	0.21%	0.19%	0.74%	0.75%	0.74%
12R	A12RKL	A	4.02%	2.68%	3.86%	15.69%	9.75%	14.97%
12R	A12RKR	A	0.29%	0.24%	0.28%	1.13%	0.87%	1.10%
12R	A12RLLN	A	0.16%	0.06%	0.15%	0.64%	0.21%	0.58%
12R Total			*25.61%*	*27.46%*	*25.82%*	*100.00%*	*100.00%*	*100.00%*

Table 4-1
2018/2040 Average Daily Track Use Percentage by Runway and Operation Type

Runway	AEDT Track	OP Type	Track Use - Percentage (by Op Type)			Track Use - Percentage (by Op Type and Runway)		
			Day	Night	Total	Day	Night	Total
30L	A30LA0	A	17.41%	27.12%	18.52%	70.17%	78.13%	71.38%
30L	A30LA1	A	0.80%	1.07%	0.83%	3.23%	3.08%	3.21%
30L	A30LA10N	A	0.00%	-	0.00%	0.01%	-	0.01%
30L	A30LA11N	A	0.00%	-	0.00%	0.00%	-	0.00%
30L	A30LA12N	A	0.00%	0.00%	0.00%	0.01%	0.01%	0.01%
30L	A30LA2	A	0.25%	0.30%	0.26%	1.02%	0.87%	1.00%
30L	A30LA3	A	0.04%	0.04%	0.04%	0.17%	0.13%	0.16%
30L	A30LA4	A	0.03%	0.04%	0.03%	0.11%	0.11%	0.11%
30L	A30LA5	A	0.01%	0.02%	0.01%	0.05%	0.05%	0.05%
30L	A30LA6	A	0.00%	-	0.00%	0.00%	-	0.00%
30L	A30LA7	A	0.01%	0.03%	0.01%	0.03%	0.08%	0.04%
30L	A30LA8	A	0.00%	-	0.00%	0.01%	-	0.01%
30L	A30LA9N	A	0.00%	-	0.00%	0.01%	-	0.01%
30L	A30LBL	A	0.00%	0.01%	0.00%	0.02%	0.03%	0.02%
30L	A30LBR	A	0.01%	0.02%	0.01%	0.02%	0.05%	0.03%
30L	A30LCL	A	0.00%	0.02%	0.01%	0.02%	0.05%	0.02%
30L	A30LCR	A	0.01%	0.02%	0.01%	0.03%	0.06%	0.03%
30L	A30LDL	A	0.01%	0.04%	0.01%	0.03%	0.11%	0.04%
30L	A30LDLN	A	0.01%	-	0.01%	0.04%	-	0.03%
30L	A30LDR	A	0.01%	0.03%	0.01%	0.03%	0.08%	0.04%
30L	A30LDRN	A	0.00%	0.01%	0.00%	0.01%	0.03%	0.02%
30L	A30LEL	A	0.01%	-	0.01%	0.04%	-	0.04%
30L	A30LELN	A	0.01%	0.08%	0.02%	0.03%	0.24%	0.07%
30L	A30LER	A	0.01%	0.03%	0.01%	0.03%	0.08%	0.04%
30L	A30LERN	A	0.00%	0.01%	0.00%	0.01%	0.04%	0.01%
30L	A30LFL	A	0.02%	0.06%	0.03%	0.09%	0.16%	0.10%
30L	A30LFLN	A	0.00%	-	0.00%	0.01%	-	0.01%
30L	A30LFR	A	0.01%	0.01%	0.01%	0.04%	0.04%	0.04%
30L	A30LFRN	A	0.00%	0.00%	0.00%	0.01%	0.01%	0.01%
30L	A30LGL	A	0.06%	0.16%	0.07%	0.24%	0.45%	0.28%
30L	A30LGR	A	0.01%	0.03%	0.02%	0.05%	0.10%	0.06%
30L	A30LGRN	A	0.00%	-	0.00%	0.01%	-	0.01%
30L	A30LHL	A	0.09%	0.31%	0.11%	0.35%	0.88%	0.43%
30L	A30LHR	A	0.02%	0.05%	0.03%	0.10%	0.15%	0.11%
30L	A30LHRN	A	0.00%	-	0.00%	0.01%	-	0.01%
30L	A30LIL	A	0.20%	0.37%	0.22%	0.80%	1.06%	0.84%
30L	A30LIR	A	0.02%	0.06%	0.02%	0.07%	0.18%	0.09%

Table 4-1
2018/2040 Average Daily Track Use Percentage by Runway and Operation Type

Runway	AEDT Track	OP Type	Track Use - Percentage (by Op Type)			Track Use - Percentage (by Op Type and Runway)		
			Day	Night	Total	Day	Night	Total
30L	A30LJL	A	0.28%	0.45%	0.30%	1.13%	1.30%	1.16%
30L	A30LJR	A	0.03%	0.05%	0.03%	0.12%	0.15%	0.12%
30L	A30LJRN	A	0.01%	-	0.01%	0.03%	-	0.02%
30L	A30LKL	A	5.25%	4.08%	5.11%	21.14%	11.75%	19.71%
30L	A30LKR	A	0.03%	0.08%	0.04%	0.13%	0.23%	0.15%
30L	A30LKRN	A	0.00%	0.01%	0.00%	0.01%	0.03%	0.02%
30L	A30LLLN	A	0.00%	0.01%	0.00%	0.01%	0.03%	0.01%
30L	A30LLRN	A	0.00%	-	0.00%	0.01%	-	0.01%
30L	A30LML	A	0.09%	0.08%	0.09%	0.37%	0.23%	0.35%
30L	A30LMRN	A	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%
30L	A30LNRN	A	0.00%	-	0.00%	0.00%	-	0.00%
30L	A30LOR	A	0.03%	0.02%	0.03%	0.12%	0.05%	0.11%
30L Total			*24.81%*	*34.71%*	*25.94%*	*100.00%*	*100.00%*	*100.00%*
17	A17A0	A	0.00%	0.48%	0.06%	54.55%	81.34%	79.31%
17	A17A1	A	-	0.02%	0.00%	-	2.98%	2.76%
17	A17A2	A	0.00%	0.08%	0.01%	27.27%	13.43%	14.48%
17	A17A5	A	-	0.01%	0.00%	-	1.49%	1.38%
17	A17A7	A	-	0.00%	0.00%	-	0.75%	0.69%
17	A17BR	A	0.00%	-	0.00%	18.18%	-	1.38%
17 Total			*0.01%*	*0.58%*	*0.07%*	*100.00%*	*100.00%*	*100.00%*
35	A35A0	A	3.59%	4.23%	3.66%	66.42%	68.82%	66.72%
35	A35A1	A	0.06%	0.11%	0.07%	1.17%	1.85%	1.26%
35	A35A2	A	1.63%	1.57%	1.63%	30.19%	25.57%	29.61%
35	A35A4	A	0.04%	0.03%	0.04%	0.71%	0.43%	0.68%
35	A35A6	A	-	0.01%	0.00%	-	0.14%	0.02%
35	A35A7	A	0.00%	-	0.00%	0.01%	-	0.01%
35	A35A8	A	0.00%	-	0.00%	0.01%	-	0.01%
35	A35BL	A	0.00%	-	0.00%	0.03%	-	0.03%
35	A35BR	A	0.00%	-	0.00%	0.01%	-	0.01%
35	A35CL	A	0.00%	-	0.00%	0.02%	-	0.02%
35	A35DL	A	0.00%	0.00%	0.00%	0.02%	0.07%	0.03%
35	A35EL	A	0.00%	-	0.00%	0.03%	-	0.03%
35	A35FL	A	0.00%	-	0.00%	0.04%	-	0.04%
35	A35GL	A	0.00%	-	0.00%	0.05%	-	0.05%
35	A35HL	A	0.01%	0.01%	0.01%	0.13%	0.21%	0.14%
35	A35HR	A	-	0.01%	0.00%	-	0.14%	0.02%
35	A35IL	A	0.01%	0.01%	0.01%	0.11%	0.21%	0.13%

Table 4-1
2018/2040 Average Daily Track Use Percentage by Runway and Operation Type

Runway	AEDT Track	OP Type	Track Use - Percentage (by Op Type)			Track Use - Percentage (by Op Type and Runway)		
			Day	Night	Total	Day	Night	Total
35	A35IR	A	0.00%	0.02%	0.00%	0.05%	0.28%	0.08%
35	A35JL	A	0.01%	0.01%	0.01%	0.21%	0.21%	0.21%
35	A35JR	A	0.00%	0.03%	0.01%	0.06%	0.43%	0.11%
35	A35KLN	A	0.04%	0.10%	0.05%	0.70%	1.63%	0.82%
35 Total			*5.41%*	*6.15%*	*5.49%*	*100.00%*	*100.00%*	*100.00%*
12LH	A12LH1	A	0.00%	-	0.00%	100.00%	-	100.00%
12LH Total			*0.00%*	*-*	*0.00%*	*100.00%*	*-*	*100.00%*
22H	A22XA2H	A	0.00%	-	0.00%	50.00%	-	50.00%
22H	A22XBRH	A	0.00%	-	0.00%	50.00%	-	50.00%
22H Total			*0.00%*	*-*	*0.00%*	*100.00%*	*-*	*100.00%*
30LH	A30LA7H	A	0.00%	-	0.00%	50.00%	-	50.00%
30LH	A30LBLH	A	0.00%	-	0.00%	50.00%	-	50.00%
30LH Total			*0.00%*	*-*	*0.00%*	*100.00%*	*-*	*100.00%*
35H	A35H1	A	0.00%	-	0.00%	100.00%	-	100.00%
35H Total			*0.00%*	*-*	*0.00%*	*100.00%*	*-*	*100.00%*
Arrivals Total			***49.63%***	***52.63%***	***49.95%***	***-***	***-***	***-***
DEPARTURES								
4	D04A1	D	0.04%	0.04%	0.04%	8.99%	4.23%	8.02%
4	D04A2	D	0.01%	-	0.01%	2.40%	-	1.91%
4	D04A3	D	0.01%	0.02%	0.01%	1.20%	2.35%	1.43%
4	D04B	D	0.07%	0.12%	0.08%	16.07%	11.74%	15.19%
4	D04C	D	0.03%	0.03%	0.03%	5.52%	2.82%	4.97%
4	D04D	D	0.01%	0.04%	0.02%	3.00%	3.76%	3.15%
4	D04E	D	0.01%	0.05%	0.02%	3.12%	4.70%	3.44%
4	D04F1	D	0.01%	0.06%	0.02%	2.88%	5.63%	3.44%
4	D04F2	D	0.01%	0.01%	0.01%	1.44%	1.41%	1.43%
4	D04F3	D	0.00%	-	0.00%	0.96%	-	0.76%
4	D04G	D	0.01%	0.07%	0.01%	1.56%	7.04%	2.67%
4	D04H1	D	0.01%	0.09%	0.02%	3.00%	8.45%	4.11%
4	D04H2	D	0.01%	0.05%	0.02%	2.76%	4.69%	3.15%
4	D04H3	D	0.01%	0.06%	0.01%	1.92%	5.63%	2.67%
4	D04J1	D	0.01%	0.02%	0.01%	2.88%	1.88%	2.67%
4	D04J2	D	0.03%	0.08%	0.03%	6.00%	7.98%	6.40%
4	D04J3	D	0.05%	0.08%	0.06%	11.51%	7.98%	10.79%
4	D04J4	D	0.05%	0.08%	0.05%	10.79%	7.98%	10.22%
4	D04J5	D	0.03%	0.05%	0.04%	7.31%	5.16%	6.88%

Table 4-1
2018/2040 Average Daily Track Use Percentage by Runway and Operation Type

Runway	AEDT Track	OP Type	Track Use - Percentage (by Op Type)			Track Use - Percentage (by Op Type and Runway)		
			Day	Night	Total	Day	Night	Total
4	D04J6	D	0.03%	0.07%	0.03%	6.71%	6.57%	6.69%
4 Total			*0.46%*	*1.03%*	*0.52%*	*100.00%*	*100.00%*	*100.00%*
22	D22A1	D	0.00%	-	0.00%	10.72%	-	10.35%
22	D22A2	D	0.00%	-	0.00%	5.36%	-	5.17%
22	D22A3	D	0.00%	-	0.00%	5.36%	-	5.17%
22	D22A4	D	0.00%	-	0.00%	1.79%	-	1.72%
22	D22A5	D	0.00%	-	0.00%	8.93%	-	8.62%
22	D22B1	D	0.00%	-	0.00%	1.79%	-	1.72%
22	D22B2	D	0.00%	-	0.00%	1.79%	-	1.72%
22	D22C1	D	0.00%	-	0.00%	1.79%	-	1.72%
22	D22C3	D	0.00%	-	0.00%	1.79%	-	1.72%
22	D22D1	D	0.00%	-	0.00%	1.79%	-	1.72%
22	D22D4	D	0.00%	-	0.00%	3.57%	-	3.45%
22	D22D5	D	0.00%	-	0.00%	1.79%	-	1.72%
22	D22D6	D	0.00%	-	0.00%	3.57%	-	3.45%
22	D22D7	D	0.00%	-	0.00%	14.29%	-	13.79%
22	D22E1	D	0.00%	-	0.00%	1.79%	-	1.72%
22	D22E2	D	0.00%	-	0.00%	1.79%	-	1.72%
22	D22E3	D	0.00%	-	0.00%	1.79%	-	1.72%
22	D22F1	D	0.00%	-	0.00%	8.93%	-	8.62%
22	D22F2	D	0.00%	0.00%	0.00%	5.36%	50.00%	6.90%
22	D22F3	D	0.00%	0.00%	0.00%	16.07%	50.00%	17.24%
22 Total			*0.03%*	*0.01%*	*0.03%*	*100.00%*	*100.00%*	*100.00%*
12L	D12LA1	D	0.09%	0.13%	0.09%	0.60%	0.68%	0.61%
12L	D12LA2	D	0.02%	0.03%	0.02%	0.14%	0.16%	0.15%
12L	D12LB1	D	0.01%	0.01%	0.01%	0.09%	0.05%	0.08%
12L	D12LB2	D	0.01%	0.01%	0.01%	0.10%	0.08%	0.10%
12L	D12LB3	D	0.02%	0.02%	0.02%	0.14%	0.10%	0.13%
12L	D12LB4	D	0.01%	0.00%	0.01%	0.10%	0.03%	0.09%
12L	D12LB5	D	0.07%	0.03%	0.06%	0.46%	0.16%	0.42%
12L	D12LC1	D	0.05%	0.01%	0.04%	0.32%	0.08%	0.29%
12L	D12LC2	D	0.04%	0.03%	0.04%	0.31%	0.18%	0.30%
12L	D12LC3	D	0.01%	0.01%	0.01%	0.09%	0.05%	0.08%
12L	D12LC4	D	0.03%	0.00%	0.02%	0.18%	0.03%	0.16%
12L	D12LD1	D	0.03%	0.03%	0.03%	0.23%	0.18%	0.22%
12L	D12LD2	D	0.03%	0.01%	0.03%	0.19%	0.08%	0.18%
12L	D12LD3	D	0.03%	0.01%	0.03%	0.24%	0.08%	0.22%

Table 4-1
2018/2040 Average Daily Track Use Percentage by Runway and Operation Type

Runway	AEDT Track	OP Type	Track Use - Percentage (by Op Type)			Track Use - Percentage (by Op Type and Runway)		
			Day	Night	Total	Day	Night	Total
12L	D12LD4	D	0.07%	0.03%	0.07%	0.50%	0.16%	0.45%
12L	D12LD5	D	0.08%	0.03%	0.08%	0.58%	0.16%	0.52%
12L	D12LD6	D	0.22%	0.11%	0.21%	1.53%	0.60%	1.41%
12L	D12LD7	D	0.25%	0.20%	0.24%	1.75%	1.09%	1.67%
12L	D12LDL1	D	0.04%	0.02%	0.04%	0.26%	0.13%	0.25%
12L	D12LDL2	D	0.08%	0.08%	0.08%	0.56%	0.42%	0.54%
12L	D12LDL3	D	0.21%	0.29%	0.22%	1.51%	1.56%	1.51%
12L	D12LDL4	D	0.34%	0.29%	0.33%	2.38%	1.56%	2.28%
12L	D12LDL5	D	0.37%	0.34%	0.36%	2.59%	1.82%	2.49%
12L	D12LDL6	D	0.86%	0.67%	0.84%	6.02%	3.62%	5.71%
12L	D12LDL7	D	0.67%	0.50%	0.66%	4.74%	2.68%	4.48%
12L	D12LDL8	D	0.56%	0.45%	0.54%	3.90%	2.42%	3.71%
12L	D12LDL9	D	0.43%	0.48%	0.43%	3.00%	2.55%	2.95%
12L	D12LEC1	D	0.11%	0.13%	0.11%	0.76%	0.68%	0.75%
12L	D12LEC2	D	0.22%	0.21%	0.22%	1.55%	1.15%	1.50%
12L	D12LEC3	D	1.33%	1.14%	1.31%	9.39%	6.09%	8.96%
12L	D12LEC4	D	1.11%	0.72%	1.07%	7.79%	3.88%	7.29%
12L	D12LEC5	D	0.09%	0.07%	0.09%	0.61%	0.39%	0.58%
12L	D12LEC6	D	0.70%	0.52%	0.68%	4.91%	2.81%	4.63%
12L	D12LEC7	D	0.17%	0.19%	0.17%	1.17%	1.02%	1.15%
12L	D12LEL1	D	0.43%	0.52%	0.44%	3.06%	2.81%	3.03%
12L	D12LEL2	D	0.19%	0.28%	0.20%	1.34%	1.48%	1.36%
12L	D12LEL3	D	0.82%	0.92%	0.83%	5.73%	4.92%	5.63%
12L	D12LEL4	D	0.48%	0.35%	0.47%	3.38%	1.90%	3.19%
12L	D12LEL5	D	0.08%	0.08%	0.08%	0.55%	0.44%	0.54%
12L	D12LEL6	D	0.03%	0.03%	0.03%	0.19%	0.18%	0.19%
12L	D12LEL7	D	0.60%	0.66%	0.61%	4.25%	3.54%	4.16%
12L	D12LER1	D	0.66%	0.65%	0.66%	4.62%	3.46%	4.47%
12L	D12LER2	D	0.53%	0.52%	0.53%	3.71%	2.79%	3.59%
12L	D12LER3	D	0.50%	0.59%	0.51%	3.54%	3.18%	3.49%
12L	D12LF1	D	0.30%	1.10%	0.38%	2.08%	5.91%	2.57%
12L	D12LF2	D	0.17%	0.65%	0.22%	1.19%	3.46%	1.48%
12L	D12LF3	D	0.32%	1.68%	0.46%	2.24%	9.04%	3.12%
12L	D12LF4	D	0.41%	2.03%	0.58%	2.90%	10.91%	3.94%
12L	D12LF5	D	0.14%	0.54%	0.18%	0.95%	2.89%	1.20%
12L	D12LF6	D	0.05%	0.21%	0.07%	0.34%	1.15%	0.45%
12L	D12LJ1	D	0.03%	0.29%	0.05%	0.19%	1.54%	0.36%

Table 4-1
2018/2040 Average Daily Track Use Percentage by Runway and Operation Type

Runway	AEDT Track	OP Type	Track Use - Percentage (by Op Type)			Track Use - Percentage (by Op Type and Runway)		
			Day	Night	Total	Day	Night	Total
12L	D12LJ2	D	0.01%	0.00%	0.01%	0.08%	0.03%	0.07%
12L	D12LL1	D	0.04%	0.13%	0.05%	0.27%	0.68%	0.32%
12L	D12LL2	D	0.01%	0.05%	0.02%	0.09%	0.26%	0.11%
12L	D12LL3	D	0.03%	0.02%	0.03%	0.19%	0.13%	0.18%
12L	D12LP	D	0.06%	0.48%	0.10%	0.43%	2.58%	0.71%
12L Total			*14.22%*	*18.63%*	*14.67%*	*100.00%*	*100.00%*	*100.00%*
30R	D30RAA1	D	0.06%	0.12%	0.06%	0.25%	0.66%	0.29%
30R	D30RAA2	D	0.05%	0.26%	0.07%	0.24%	1.39%	0.34%
30R	D30RAA3	D	0.20%	0.61%	0.24%	0.91%	3.30%	1.12%
30R	D30RAA4	D	0.12%	0.46%	0.15%	0.55%	2.46%	0.72%
30R	D30RAA5	D	0.15%	0.40%	0.17%	0.69%	2.15%	0.82%
30R	D30RAB1	D	0.24%	0.61%	0.28%	1.10%	3.30%	1.29%
30R	D30RAB2	D	0.08%	0.39%	0.11%	0.36%	2.10%	0.52%
30R	D30RAB3	D	0.10%	0.25%	0.11%	0.45%	1.34%	0.53%
30R	D30RB1	D	0.11%	0.24%	0.12%	0.50%	1.28%	0.57%
30R	D30RB2	D	0.21%	0.51%	0.24%	0.98%	2.78%	1.14%
30R	D30RD1	D	0.05%	0.11%	0.06%	0.23%	0.58%	0.26%
30R	D30RD2	D	0.06%	0.12%	0.07%	0.28%	0.63%	0.31%
30R	D30RD3	D	0.04%	0.11%	0.05%	0.19%	0.58%	0.23%
30R	D30RD4	D	0.10%	0.16%	0.10%	0.45%	0.84%	0.49%
30R	D30RD5	D	0.80%	0.81%	0.80%	3.70%	4.38%	3.76%
30R	D30RE1	D	1.09%	0.89%	1.07%	5.02%	4.80%	5.00%
30R	D30RE2	D	0.75%	0.61%	0.73%	3.45%	3.30%	3.44%
30R	D30RF1	D	1.06%	0.64%	1.02%	4.90%	3.43%	4.77%
30R	D30RF2	D	0.28%	0.28%	0.28%	1.29%	1.52%	1.31%
30R	D30RF3	D	0.31%	0.27%	0.31%	1.45%	1.47%	1.45%
30R	D30RF4	D	0.88%	0.65%	0.85%	4.06%	3.49%	4.01%
30R	D30RF5	D	0.25%	0.13%	0.24%	1.15%	0.71%	1.11%
30R	D30RF6	D	0.92%	0.51%	0.88%	4.25%	2.78%	4.12%
30R	D30RH1	D	0.32%	0.14%	0.30%	1.46%	0.76%	1.40%
30R	D30RH2	D	0.63%	0.44%	0.61%	2.91%	2.38%	2.86%
30R	D30RH3	D	1.35%	1.29%	1.35%	6.25%	6.94%	6.31%
30R	D30RH4	D	1.66%	1.75%	1.67%	7.66%	9.43%	7.82%
30R	D30RH5	D	0.76%	0.40%	0.72%	3.52%	2.18%	3.40%
30R	D30RH6	D	2.72%	1.56%	2.60%	12.58%	8.44%	12.22%
30R	D30RJ1	D	1.27%	0.71%	1.21%	5.86%	3.85%	5.68%
30R	D30RJ2	D	1.63%	1.13%	1.58%	7.55%	6.08%	7.42%

Table 4-1
2018/2040 Average Daily Track Use Percentage by Runway and Operation Type

Runway	AEDT Track	OP Type	Track Use - Percentage (by Op Type)			Track Use - Percentage (by Op Type and Runway)		
			Day	Night	Total	Day	Night	Total
30R	D30RJ3	D	0.54%	0.34%	0.52%	2.49%	1.86%	2.43%
30R	D30RJ4	D	2.09%	0.98%	1.98%	9.66%	5.32%	9.28%
30R	D30RJ5	D	0.21%	0.21%	0.21%	0.95%	1.13%	0.97%
30R	D30RJ6	D	0.46%	0.34%	0.44%	2.11%	1.83%	2.09%
30R	D30RJ7	D	0.12%	0.10%	0.12%	0.55%	0.55%	0.55%
30R Total			*21.64%*	*18.51%*	*21.32%*	*100.00%*	*100.00%*	*100.00%*
12R	D12RA	D	0.13%	0.38%	0.16%	3.19%	1.52%	2.51%
12R	D12RC1	D	0.02%	0.10%	0.03%	0.59%	0.41%	0.52%
12R	D12RC2	D	0.01%	0.05%	0.01%	0.25%	0.19%	0.23%
12R	D12RC3	D	0.01%	0.07%	0.01%	0.20%	0.29%	0.24%
12R	D12RD1	D	0.02%	0.07%	0.03%	0.51%	0.29%	0.42%
12R	D12RD2	D	0.07%	0.36%	0.10%	1.78%	1.44%	1.64%
12R	D12RE1	D	0.19%	1.10%	0.29%	4.72%	4.42%	4.59%
12R	D12RE2	D	0.26%	1.25%	0.37%	6.43%	5.02%	5.86%
12R	D12RF1	D	0.09%	0.54%	0.14%	2.30%	2.16%	2.25%
12R	D12RF2	D	0.38%	0.94%	0.44%	9.23%	3.76%	7.00%
12R	D12RF3	D	0.21%	3.79%	0.58%	5.14%	15.22%	9.25%
12R	D12RF4	D	0.08%	3.26%	0.41%	2.01%	13.08%	6.52%
12R	D12RG1	D	0.21%	1.26%	0.31%	5.01%	5.04%	5.02%
12R	D12RG2	D	0.08%	1.50%	0.22%	1.90%	6.01%	3.58%
12R	D12RG3	D	0.17%	1.50%	0.31%	4.19%	6.01%	4.94%
12R	D12RG4	D	0.30%	1.01%	0.37%	7.17%	4.05%	5.90%
12R	D12RG5	D	0.17%	0.54%	0.21%	4.21%	2.18%	3.38%
12R	D12RG6	D	0.09%	0.18%	0.10%	2.14%	0.74%	1.57%
12R	D12RG7	D	0.23%	0.53%	0.26%	5.49%	2.12%	4.12%
12R	D12RH1	D	0.06%	0.01%	0.06%	1.47%	0.06%	0.90%
12R	D12RH2	D	0.01%	0.00%	0.01%	0.36%	0.02%	0.22%
12R	D12RH3	D	0.01%	-	0.01%	0.20%	-	0.12%
12R	D12RH4	D	0.00%	0.01%	0.00%	0.09%	0.06%	0.08%
12R	D12RJ1	D	0.02%	0.23%	0.04%	0.37%	0.91%	0.59%
12R	D12RJ2	D	0.12%	0.77%	0.19%	2.96%	3.07%	3.01%
12R	D12RJ3	D	0.06%	0.73%	0.12%	1.35%	2.92%	1.99%
12R	D12RJ4	D	0.20%	1.31%	0.32%	4.97%	5.26%	5.09%
12R	D12RJ5	D	0.18%	0.32%	0.19%	4.26%	1.30%	3.05%
12R	D12RJ6	D	0.04%	0.03%	0.04%	1.06%	0.14%	0.68%
12R	D12RJ7	D	0.00%	-	0.00%	0.05%	-	0.03%
12R	D12RK1	D	0.00%	0.00%	0.00%	0.03%	0.02%	0.02%

Table 4-1
2018/2040 Average Daily Track Use Percentage by Runway and Operation Type

Runway	AEDT Track	OP Type	Track Use - Percentage (by Op Type)			Track Use - Percentage (by Op Type and Runway)		
			Day	Night	Total	Day	Night	Total
12R	D12RK2	D	0.00%	0.01%	0.00%	0.05%	0.04%	0.05%
12R	D12RK3	D	0.00%	0.00%	0.00%	0.03%	0.02%	0.02%
12R	D12RK4	D	0.00%	-	0.00%	0.07%	-	0.04%
12R	D12RL1	D	0.00%	0.00%	0.00%	0.05%	0.02%	0.04%
12R	D12RL2	D	0.00%	-	0.00%	0.05%	-	0.03%
12R	D12RL3	D	0.00%	0.00%	0.00%	0.05%	0.02%	0.04%
12R	D12RL4	D	0.00%	0.00%	0.00%	0.01%	0.02%	0.02%
12R	D12RL5	D	0.00%	0.00%	0.00%	0.03%	0.02%	0.02%
12R	D12RL6	D	0.00%	0.00%	0.00%	0.01%	0.02%	0.02%
12R	D12RM1	D	0.00%	0.01%	0.00%	0.08%	0.04%	0.06%
12R	D12RM2	D	0.00%	-	0.00%	0.08%	-	0.05%
12R	D12RN1	D	0.01%	0.65%	0.08%	0.28%	2.59%	1.22%
12R	D12RN2	D	0.23%	0.73%	0.28%	5.49%	2.92%	4.44%
12R	D12RP1	D	0.04%	0.51%	0.08%	0.86%	2.04%	1.34%
12R	D12RP2	D	0.15%	0.59%	0.20%	3.74%	2.35%	3.17%
12R	D12RP3	D	0.15%	0.38%	0.17%	3.60%	1.54%	2.76%
12R	D12RP4	D	0.06%	0.12%	0.06%	1.39%	0.47%	1.02%
12R	D12RQ	D	0.00%	0.01%	0.00%	0.08%	0.04%	0.06%
12R	D12RR	D	0.02%	0.03%	0.02%	0.38%	0.14%	0.28%
12R Total			*4.12%*	*24.92%*	*6.24%*	*100.00%*	*100.00%*	*100.00%*
30L	D30LAA1	D	0.32%	0.41%	0.33%	1.40%	1.65%	1.42%
30L	D30LAA2	D	0.24%	0.72%	0.29%	1.05%	2.87%	1.25%
30L	D30LAA3	D	0.22%	0.70%	0.27%	0.95%	2.82%	1.16%
30L	D30LAA4	D	0.09%	0.26%	0.11%	0.38%	1.05%	0.45%
30L	D30LAA5	D	0.44%	0.97%	0.50%	1.91%	3.86%	2.12%
30L	D30LAB1	D	0.70%	0.88%	0.72%	3.01%	3.51%	3.06%
30L	D30LAB2	D	3.89%	3.09%	3.81%	16.77%	12.35%	16.29%
30L	D30LAB3	D	6.21%	4.43%	6.03%	26.75%	17.75%	25.77%
30L	D30LAB4	D	4.41%	3.49%	4.32%	19.01%	13.98%	18.46%
30L	D30LAB5	D	0.88%	0.63%	0.85%	3.78%	2.50%	3.64%
30L	D30LB1	D	0.38%	0.19%	0.36%	1.64%	0.78%	1.55%
30L	D30LB2	D	0.40%	0.33%	0.39%	1.70%	1.32%	1.66%
30L	D30LB3	D	0.20%	0.09%	0.19%	0.88%	0.35%	0.82%
30L	D30LC1	D	0.37%	0.20%	0.35%	1.60%	0.80%	1.51%
30L	D30LC2	D	0.34%	0.11%	0.32%	1.48%	0.43%	1.36%
30L	D30LC3	D	0.35%	0.22%	0.34%	1.52%	0.89%	1.45%
30L	D30LC4	D	0.08%	0.04%	0.07%	0.33%	0.16%	0.31%

Table 4-1
2018/2040 Average Daily Track Use Percentage by Runway and Operation Type

Runway	AEDT Track	OP Type	Track Use - Percentage (by Op Type)			Track Use - Percentage (by Op Type and Runway)		
			Day	Night	Total	Day	Night	Total
30L	D30LD1	D	0.11%	0.14%	0.11%	0.46%	0.56%	0.47%
30L	D30LD2	D	0.07%	0.14%	0.08%	0.32%	0.54%	0.34%
30L	D30LE1	D	0.15%	0.36%	0.17%	0.63%	1.44%	0.72%
30L	D30LE2	D	0.41%	0.62%	0.43%	1.78%	2.47%	1.85%
30L	D30LE3	D	0.69%	0.68%	0.69%	2.99%	2.72%	2.96%
30L	D30LE4	D	0.06%	0.10%	0.06%	0.25%	0.41%	0.26%
30L	D30LE5	D	0.29%	0.29%	0.29%	1.24%	1.15%	1.23%
30L	D30LE6	D	0.04%	0.09%	0.05%	0.18%	0.35%	0.20%
30L	D30LF	D	0.08%	0.33%	0.10%	0.33%	1.34%	0.44%
30L	D30LG1	D	0.07%	0.09%	0.08%	0.32%	0.35%	0.32%
30L	D30LG2	D	0.10%	0.29%	0.12%	0.43%	1.15%	0.51%
30L	D30LH1	D	0.11%	0.17%	0.12%	0.48%	0.68%	0.51%
30L	D30LH2	D	0.12%	0.46%	0.16%	0.52%	1.84%	0.66%
30L	D30LH3	D	0.21%	0.51%	0.24%	0.89%	2.04%	1.01%
30L	D30LH4	D	0.31%	1.11%	0.39%	1.34%	4.45%	1.68%
30L	D30LH5	D	0.17%	0.55%	0.21%	0.72%	2.21%	0.88%
30L	D30LJ1	D	0.10%	0.17%	0.11%	0.43%	0.70%	0.46%
30L	D30LJ2	D	0.14%	0.60%	0.19%	0.60%	2.39%	0.80%
30L	D30LJ3	D	0.27%	0.86%	0.33%	1.18%	3.44%	1.43%
30L	D30LJ4	D	0.13%	0.42%	0.16%	0.54%	1.69%	0.67%
30L	D30LJ5	D	0.03%	0.09%	0.03%	0.12%	0.37%	0.15%
30L	D30LJ6	D	0.02%	0.16%	0.04%	0.09%	0.66%	0.15%
30L Total			*23.22%*	*24.98%*	*23.40%*	*100.00%*	*100.00%*	*100.00%*
17	D17A1	D	0.08%	0.01%	0.07%	0.22%	0.08%	0.21%
17	D17A2	D	0.07%	-	0.06%	0.18%	-	0.17%
17	D17B1	D	0.08%	0.03%	0.08%	0.22%	0.25%	0.22%
17	D17B2	D	0.05%	0.03%	0.05%	0.13%	0.25%	0.13%
17	D17B3	D	0.42%	0.07%	0.39%	1.16%	0.62%	1.14%
17	D17B4	D	0.50%	0.10%	0.46%	1.37%	0.83%	1.35%
17	D17B5	D	1.40%	0.14%	1.27%	3.86%	1.20%	3.76%
17	D17B6	D	1.79%	0.18%	1.63%	4.94%	1.57%	4.82%
17	D17B7	D	1.95%	0.18%	1.77%	5.36%	1.57%	5.23%
17	D17C1	D	1.67%	0.17%	1.52%	4.61%	1.49%	4.50%
17	D17C2	D	0.68%	0.11%	0.62%	1.87%	0.91%	1.83%
17	D17C3	D	1.16%	0.11%	1.06%	3.21%	0.91%	3.12%
17	D17C4	D	2.79%	0.45%	2.55%	7.68%	3.80%	7.54%
17	D17C5	D	1.40%	0.18%	1.28%	3.86%	1.53%	3.77%

Table 4-1
2018/2040 Average Daily Track Use Percentage by Runway and Operation Type

Runway	AEDT Track	OP Type	Track Use - Percentage (by Op Type)			Track Use - Percentage (by Op Type and Runway)		
			Day	Night	Total	Day	Night	Total
17	D17D1	D	1.68%	0.25%	1.54%	4.64%	2.15%	4.55%
17	D17D2	D	1.02%	0.20%	0.94%	2.82%	1.74%	2.78%
17	D17D3	D	0.71%	0.10%	0.65%	1.96%	0.87%	1.92%
17	D17D4	D	0.56%	0.72%	0.58%	1.55%	6.12%	1.71%
17	D17D5	D	0.45%	0.18%	0.43%	1.25%	1.53%	1.26%
17	D17E	D	1.86%	2.38%	1.91%	5.13%	20.25%	5.66%
17	D17F1	D	0.69%	0.28%	0.65%	1.90%	2.36%	1.91%
17	D17F2	D	2.44%	1.49%	2.34%	6.73%	12.69%	6.94%
17	D17G1	D	1.72%	0.52%	1.60%	4.74%	4.46%	4.73%
17	D17G2	D	0.39%	0.20%	0.37%	1.07%	1.69%	1.10%
17	D17G3	D	0.45%	0.26%	0.43%	1.24%	2.23%	1.28%
17	D17G4	D	1.61%	0.30%	1.47%	4.43%	2.52%	4.36%
17	D17G5	D	1.40%	0.27%	1.28%	3.85%	2.27%	3.80%
17	D17G6	D	2.59%	0.61%	2.39%	7.14%	5.21%	7.07%
17	D17G7	D	0.48%	0.09%	0.44%	1.32%	0.78%	1.30%
17	D17G8	D	1.15%	0.33%	1.07%	3.17%	2.81%	3.16%
17	D17G9	D	1.15%	0.27%	1.06%	3.15%	2.27%	3.12%
17	D17GL1	D	0.71%	0.24%	0.66%	1.95%	2.07%	1.95%
17	D17GL2	D	0.25%	0.05%	0.23%	0.69%	0.41%	0.68%
17	D17H1	D	0.13%	0.14%	0.13%	0.35%	1.16%	0.38%
17	D17H2	D	0.07%	0.07%	0.07%	0.19%	0.58%	0.21%
17	D17H3	D	0.36%	0.25%	0.35%	1.00%	2.15%	1.04%
17	D17H4	D	0.12%	0.10%	0.12%	0.34%	0.83%	0.36%
17	D17H5	D	0.10%	0.06%	0.10%	0.29%	0.54%	0.29%
17	D17J1	D	0.01%	0.03%	0.01%	0.02%	0.29%	0.03%
17	D17J2	D	0.08%	0.08%	0.08%	0.23%	0.70%	0.25%
17	D17K1	D	0.01%	0.07%	0.02%	0.04%	0.58%	0.06%
17	D17K2	D	0.00%	0.03%	0.01%	0.01%	0.29%	0.02%
17	D17K3	D	0.01%	0.15%	0.03%	0.03%	1.28%	0.07%
17	D17K4	D	0.05%	0.26%	0.07%	0.12%	2.19%	0.20%
17 Total			*36.30%*	*11.74%*	*33.79%*	*100.00%*	*100.00%*	*100.00%*
35	D35A2	D	0.00%	0.00%	0.00%	7.69%	2.63%	3.92%
35	D35A4	D	0.00%	0.00%	0.00%	15.38%	2.63%	5.88%
35	D35B1	D	-	0.00%	0.00%	-	2.63%	1.96%
35	D35B2	D	-	0.00%	0.00%	-	2.63%	1.96%
35	D35B3	D	0.00%	0.01%	0.00%	15.38%	5.26%	7.84%
35	D35D1	D	-	0.00%	0.00%	-	2.63%	1.96%

Table 4-1
2018/2040 Average Daily Track Use Percentage by Runway and Operation Type

Runway	AEDT Track	OP Type	Track Use - Percentage (by Op Type)			Track Use - Percentage (by Op Type and Runway)		
			Day	Night	Total	Day	Night	Total
35	D35E1	D	-	0.01%	0.00%	-	5.26%	3.92%
35	D35E2	D	-	0.02%	0.00%	-	10.53%	7.84%
35	D35E3	D	0.00%	0.00%	0.00%	7.69%	2.63%	3.92%
35	D35E4	D	-	0.00%	0.00%	-	2.63%	1.96%
35	D35F3	D	0.00%	0.02%	0.00%	7.69%	10.53%	9.80%
35	D35F4	D	0.00%	0.09%	0.01%	46.16%	50.00%	49.02%
35 Total			*0.01%*	*0.18%*	*0.03%*	*100.00%*	*100.00%*	*100.00%*
4H	MAC04HF	D	0.00%	-	0.00%	100.00%	-	100.00%
4H Total			*0.00%*	*-*	*0.00%*	*100.00%*	*-*	*100.00%*
12RH	D12RCD3H	D	0.00%	-	0.00%	33.33%	-	33.33%
12RH	DF12RI2H	D	0.00%	-	0.00%	66.67%	-	66.67%
12RH Total			*0.00%*	*-*	*0.00%*	*100.00%*	*-*	*100.00%*
17H	D17IH	D	0.00%	-	0.00%	100.00%	-	100.00%
17H Total			*0.00%*	*-*	*0.00%*	*100.00%*	*-*	*100.00%*
30LH	D30LF1H	D	0.00%	-	0.00%	100.00%	-	100.00%
30LH Total			*0.00%*	*-*	*0.00%*	*100.00%*	*-*	*100.00%*
Departures Total			**50.37%**	**47.37%**	**50.05%**	**-**	**-**	**-**
Grand Total			**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Number is shown as 0 when less than 0.5. Percentage is shown as 0.0% when less than 0.05%. Number is shown as "-" when it is 0.

Notes: Totals may differ due to rounding.

Source: MACNOMS data, HNTB 2022.

Attachment 5
AEDT 2d vs. AEDT 3e Comparison

Minneapolis St. Paul International Airport (MSP) Long-Term Plan (LTP)
Noise Contour Final Technical Memorandum
AEDT 2d vs. AEDT 3e Comparison

HNTB has been tasked to assist the Metropolitan Airports Commission (MAC) in support of the development of the 2040 Long-Term Plan (LTP) Noise Contours for the Minneapolis-St. Paul International Airport (MSP). The 2040 baseline, high scenario, and low scenario noise contours were modeled with the Federal Aviation Administration's (FAA) Aviation Environmental Design Tool (AEDT), version 3e (AEDT 3e). The 2018 Actual Noise Contour was used as the 2018 noise contour, which was modeled using AEDT version 2d (AEDT 2d). This technical memorandum presents a summary of the major differences between AEDT 2d and AEDT 3e that may introduce changes to the 2018 Actual Noise Contour if it were modeled in AEDT 3e. The scope of this task does not include remodeling the 2018 Actual Noise Contour in AEDT 3e or a discussion of actual resultant changes.

1 Introduction

Since the FAA adopted AEDT as the standard modeling tool for noise, air quality, and fuel analysis for federal actions, HNTB has used AEDT to assist the MAC in modeling noise impacts. The FAA continues to release new versions of AEDT to fix software bugs, expand modeling capability, introduce new aircraft noise parameters, and re-map various components in the fleet database. Since each release incorporates such changes, noise contours modeled with different AEDT versions may be slightly different. As the 2018 Actual Noise Contour was modeled with AEDT 2d and the 2040 LTP noise contours were modeled with AEDT 3e, this technical memorandum discusses major changes from AEDT 2d to AEDT 3e that may introduce changes in modeling results.

2 Weather Parameters

Default weather parameters were applied in both the 2018 and 2040 noise analyses. The default weather parameters in AEDT 3e represent 10-year average values and the default weather parameters in AEDT 2d represent 30-year average values recorded at the same MSP weather station. The weather data in the AEDT Airport Database was obtained from station ID 25160 (MINNEAPOLIS-ST PAUL INTL/WOLD-CHAMBERLIN) from the Integrated Surface Database (ISD) of the National Oceanic and Atmospheric Administration (NOAA). **Table 5-1** shows the weather parameters used in the 2040 noise contours that reflect the most recent 10-year average (2012 through 2021) in AEDT 3e and the 30-year average when the 2018 Actual Noise Contour was modeled in AEDT 2d. It is expected that the weather parameter differences in Table 1 would have minimal impacts on the noise contour results as the parameters are similar. Weather parameters generally do not change noise contours materially unless they vary significantly.

3 Noise Aircraft Types

Multiple representative noise aircraft were updated or added to the fleet database with the latest performance and noise characteristics in AEDT 3e compared to AEDT 2d. Since the release of AEDT 2d on May 29, 2015, four newer versions have been released, including AEDT 3b (September 24, 2019), AEDT 3c (March 6, 2020), AEDT 3d (March 29, 2021), and AEDT 3e (May 9, 2022).

Table 5-1: 2018 and 2040 AEDT Weather Inputs

Variable	2018 AEDT Inputs[1]	2040 AEDT Inputs[2]
Temperature	45.0 degrees F	46.7 degrees F
Dew Point	35.9 degrees F	36.5 degrees F
Pressure	985.4 Millibars	984.5 Millibars
Humidity	67.7 %	67.4 %
Wind Speed	8.4 knots	8.1 knots

[1]: AEDT 2d.
[2]: AEDT 3e.
Source: AEDT default parameters at MSP, HNTB analysis, 2022.

Table 5-2 depicts the new and updated noise aircraft types introduced since AEDT 2d and the number of operations in the 2018 Actual Noise Contour and the 2040 LTP noise contours. It should be noted that the 2018 Actual Noise Contour was not modeled with the following new noise aircraft types, including the G650ER, 737MAX8 (later renamed to 7378MAX), A320-271N, A320-272N, FAL900EX, ATR72-212A, 7673ER, 747400RN, and 7879 as they were not available in AEDT 2d. Operations by these aircraft were modeled by other noise aircraft types as shown in Error! Reference source not found.. The 2018 Actual Noise Contour was modeled with noise aircraft types including 737800, 767300, BEC58P, PA31, and BD-700-1A11, but were updated in subsequent releases.

The number of operations by new or updated noise aircraft types account for approximately 18.4% of the 2018 operations and 26.7% of the projected 2040 baseline operations. Noise aircraft types are one of the most critical components in AEDT as they represent aircraft performance and associated noise levels. It is expected that the new and updated noise aircraft types would introduce the most significant change from AEDT 2d to AEDT 3e. However, their impacts are expected to be relatively minor as the noise aircraft types they replace have similar performance and noise characteristics.

Table 5-2: New and Updated Aircraft Data Since AEDT 2d

Aircraft Name	AEDT 2d ANP Code	AEDT 3e ANP Code	Type of Update	Version	2018 Operations (2d)	2040 Baseline Operations (3e)
Gulfstream G650	GV	G650ER	New	3b	55	-
Boeing 737 Max 8	7378MAX	737MAX8	New		286	10,767
Boeing 737-800	737800	737800	Update		66,540	78,699
Airbus A320neo	A321-232	A320-271N	New		294	37,226
Airbus A320neo	A321-232	A320-272N	New		-	980
Dassault Falcon 900EX	CNA750 or COMJET	FAL900EX	New		858	513
ATR-72	DHC830 or HS748A	ATR72-212A	New	3c	4	-
Boeing 767-300	767300	767300	Update		2,998	3,767
Gulfstream G650	GV	G650ER	Update		55	-
Boeing 767-300ER	767300	7673ER	New	3d	-	-
Boeing 777-300ER	7773ER	7773ER	Update		-	-
Dassault Falcon 900EX	CNA750 or COMJET	FAL900EX	Update		858	513
Boeing 737 Max 8	7378MAX	7378MAX	Update		286	10,767

Aircraft Name	AEDT 2d ANP Code	AEDT 3e ANP Code	Type of Update	Version	2018 Operations (2d)	2040 Baseline Operations (3e)
BEECH 58 Baron	BEC58P	BEC58P	Update	3d	3,671	3,900
Piper PA-31 Navajo	PA31	PA31	Update		27	-
Boeing 747-400 with Reduced Noise PW4062A	747400	747400RN	New	3e	-	-
Boeing 787-9 Dreamliner	7878R	7879	New		145	128
Bombardier BD-700 Global Express	BD-700-1A10	BD-700-1A11	Update		82	-
Total[1]					74,960	135,980

[1]: Excludes duplicate aircraft types that were introduced as new aircraft types and later updated in subsequent releases (including Dassault Falcon 900 Ex and Gulfstream G650).

Source: FAA AEDT Release Notes and HNTB analysis, 2023.

4 Equipment Mapping

AEDT employs equipment codes to represent a combination of air frame, engine type, engine modification, and aircraft performance and noise models (equipment mapping). In each AEDT release, the equipment mapping is updated. Some equipment codes were removed and others re-mapped to other combinations. In AEDT 3e, several equipment codes used in the 2018 Actual Noise Contour (using AEDT 2d) are no longer available in the database, including equipment codes 2342, 2363, 2604, 2641, 2668, 2940, and 3305. These codes were removed in AEDT 3b. However, it is not expected that these changes will significantly change the outputs as they were re-mapped to similar aircraft models.

5 Summary

This technical memorandum documents the differences between AEDT 2d and AEDT 3e and their potential impacts on the difference between 2018 Actual Noise Contour and 2040 LTP noise contours. It is expected that the new and updated noise aircraft types would have the most significant impacts on the noise contours between AEDT 2d and AEDT 3e, however these impacts are anticipated to be minor.

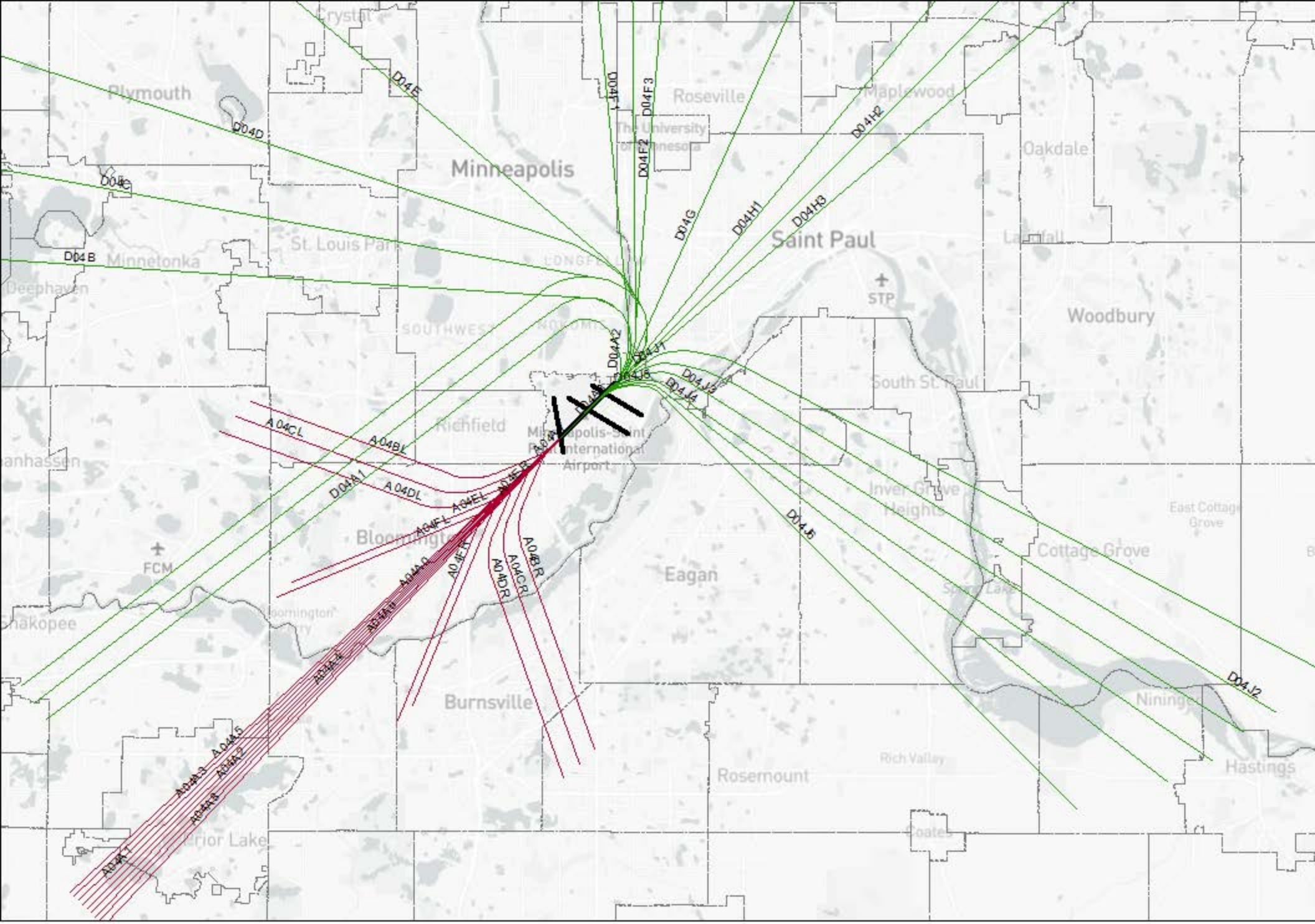
As always, we appreciate the opportunity to provide noise analysis and support to the MAC. Should you have any questions regarding the content of this technical memorandum, please do not hesitate to call me at 703-253-5829 or email yxu@hntb.com.

Best Regards,

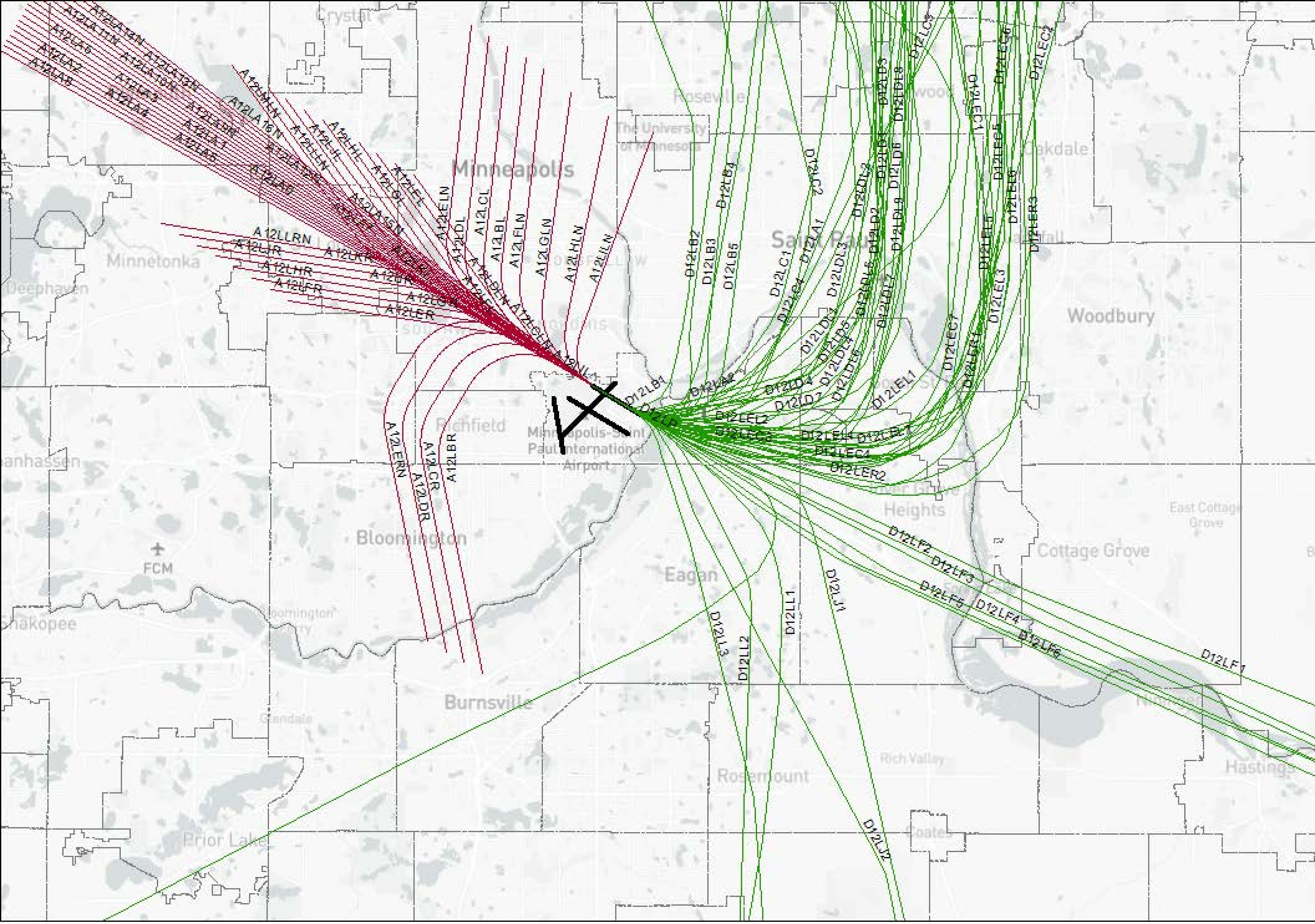
Yue Xu, Ph.D., P.E.
Aviation/Environmental Planner
HNTB Corporation

Cc: Eric Gilles, MAC
Michele Ross, MAC
Dana Nelson, MAC
Kim Hughes, HNTB
Andrew Blaisdell, HNTB
Justin Bychek, HNTB

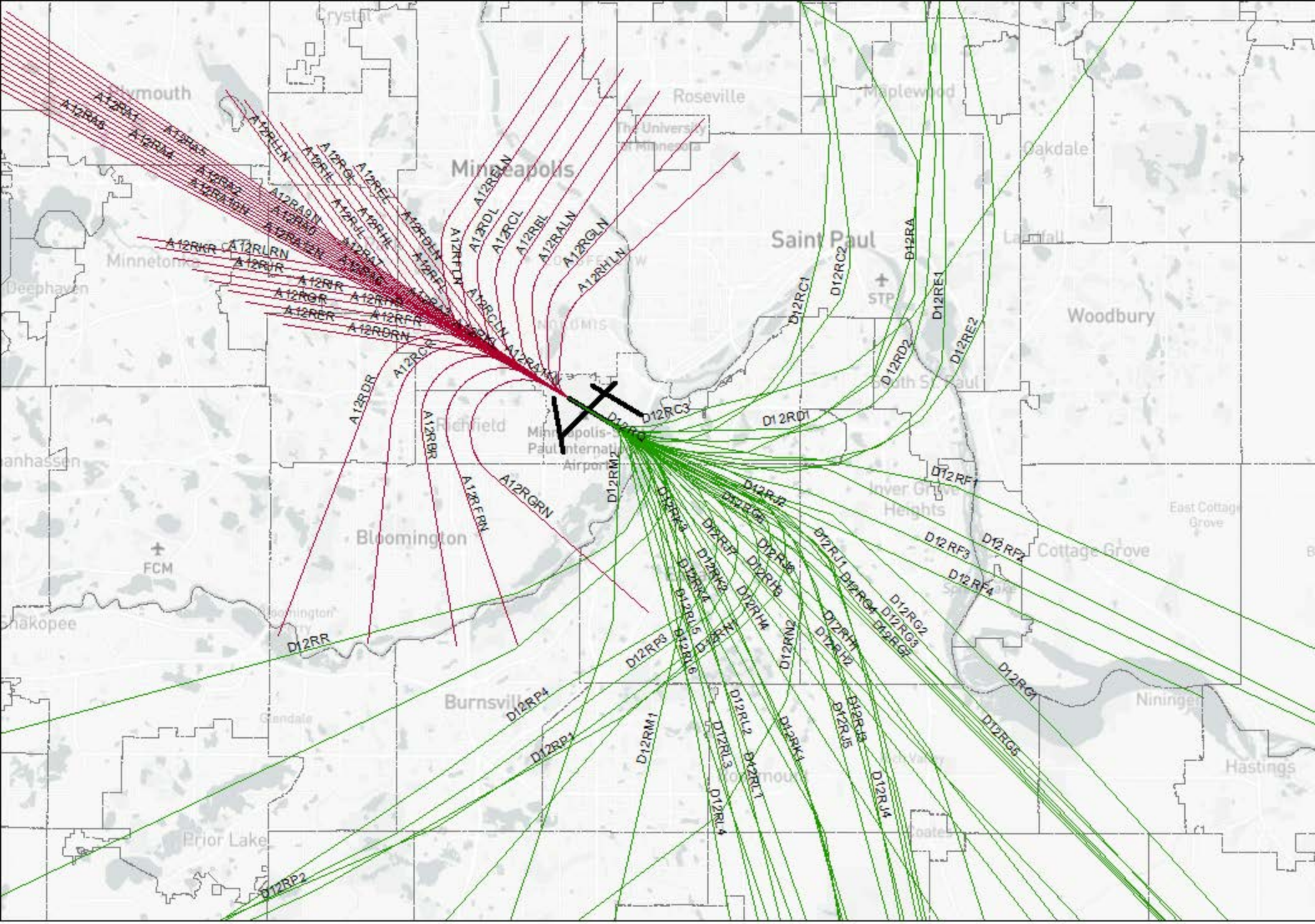
Attachment 6
AEDT Flight Track Figures



AEDT Model Flight Tracks - Runway 4



AEDT Model Flight Tracks - Runway 12L



AEDT Model Flight Tracks - Runway 12R

N

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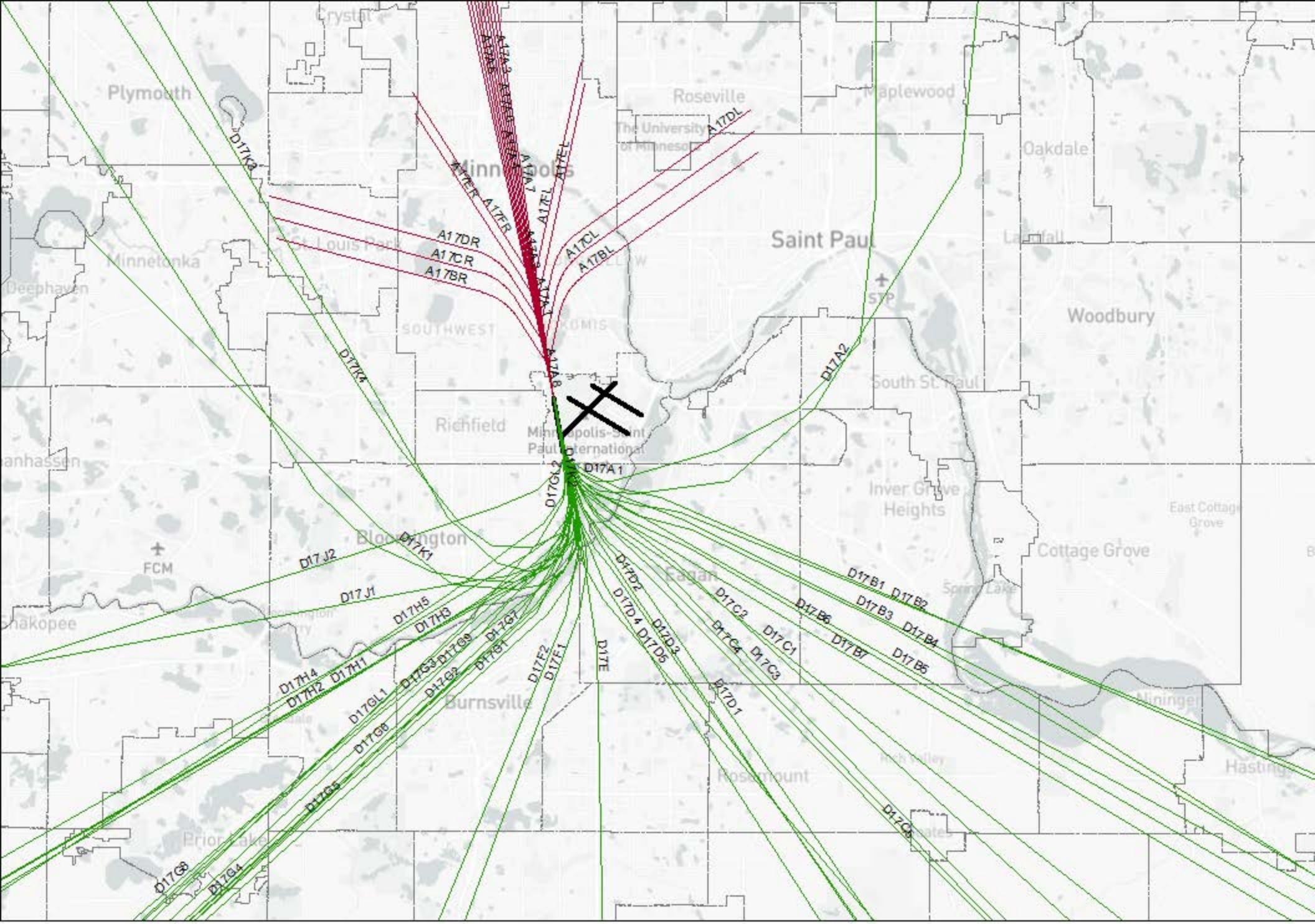

AEDT Model Flight Tracks - Runway 17

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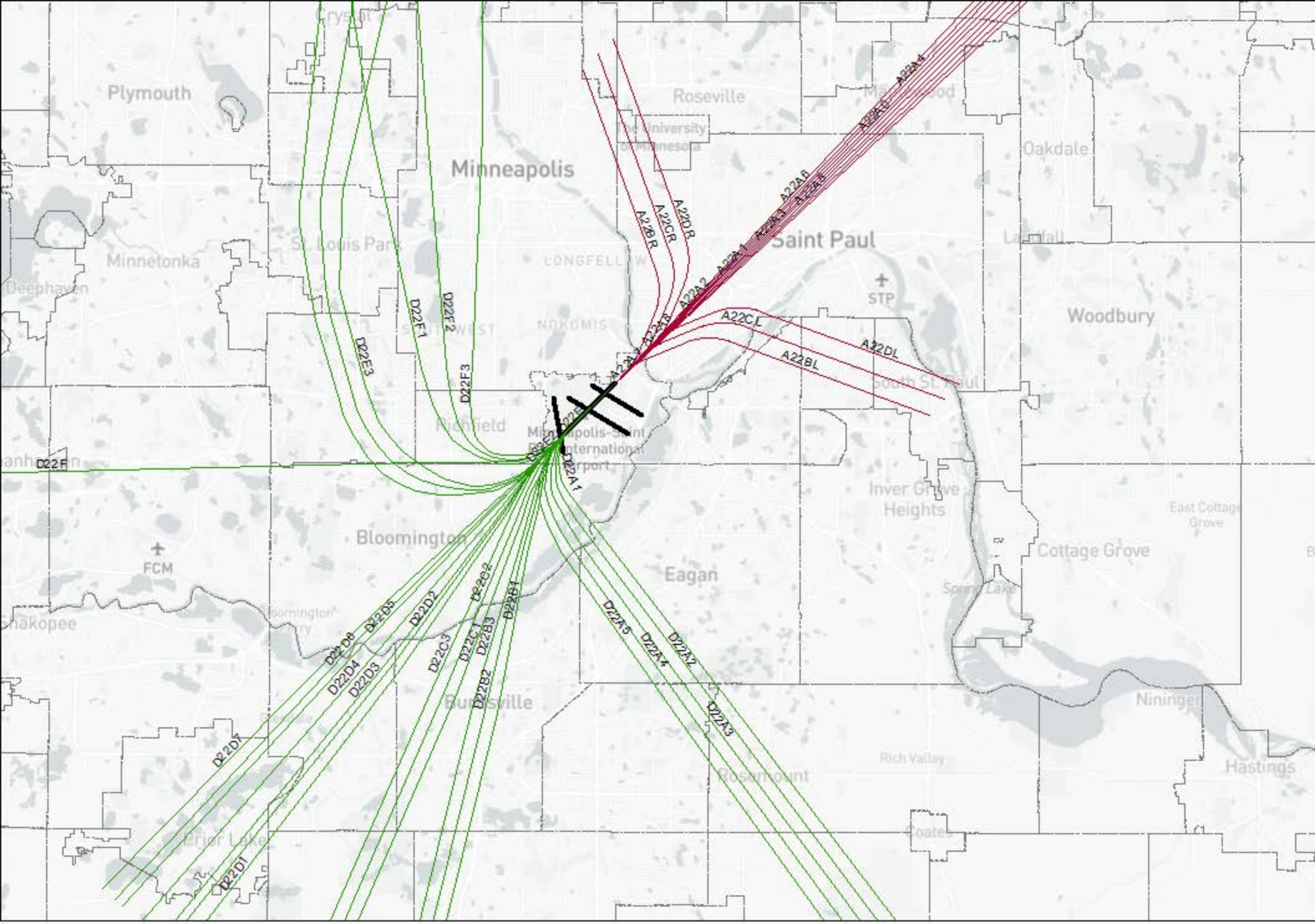

AEDT Model Flight Tracks - Runway 22

N

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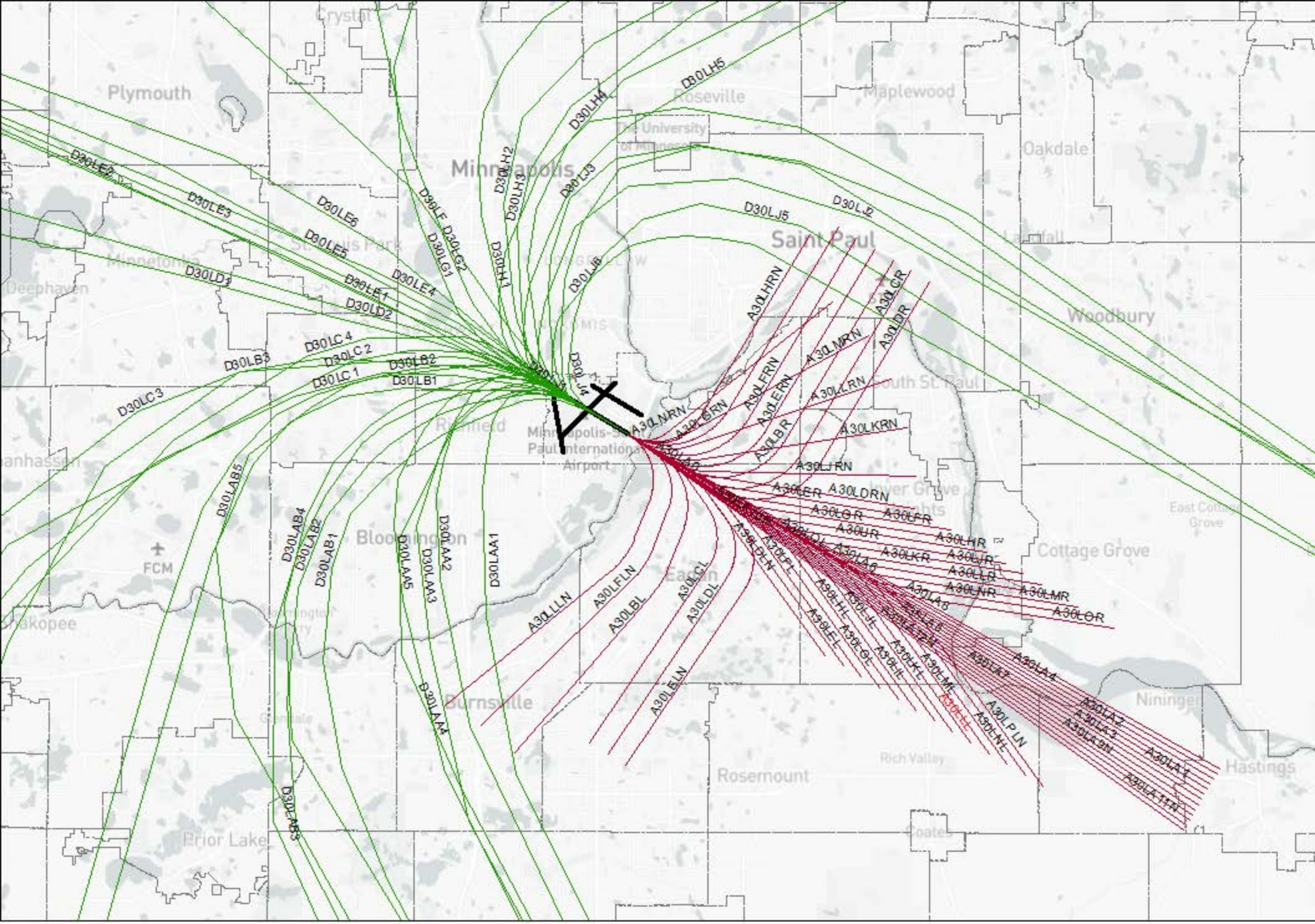
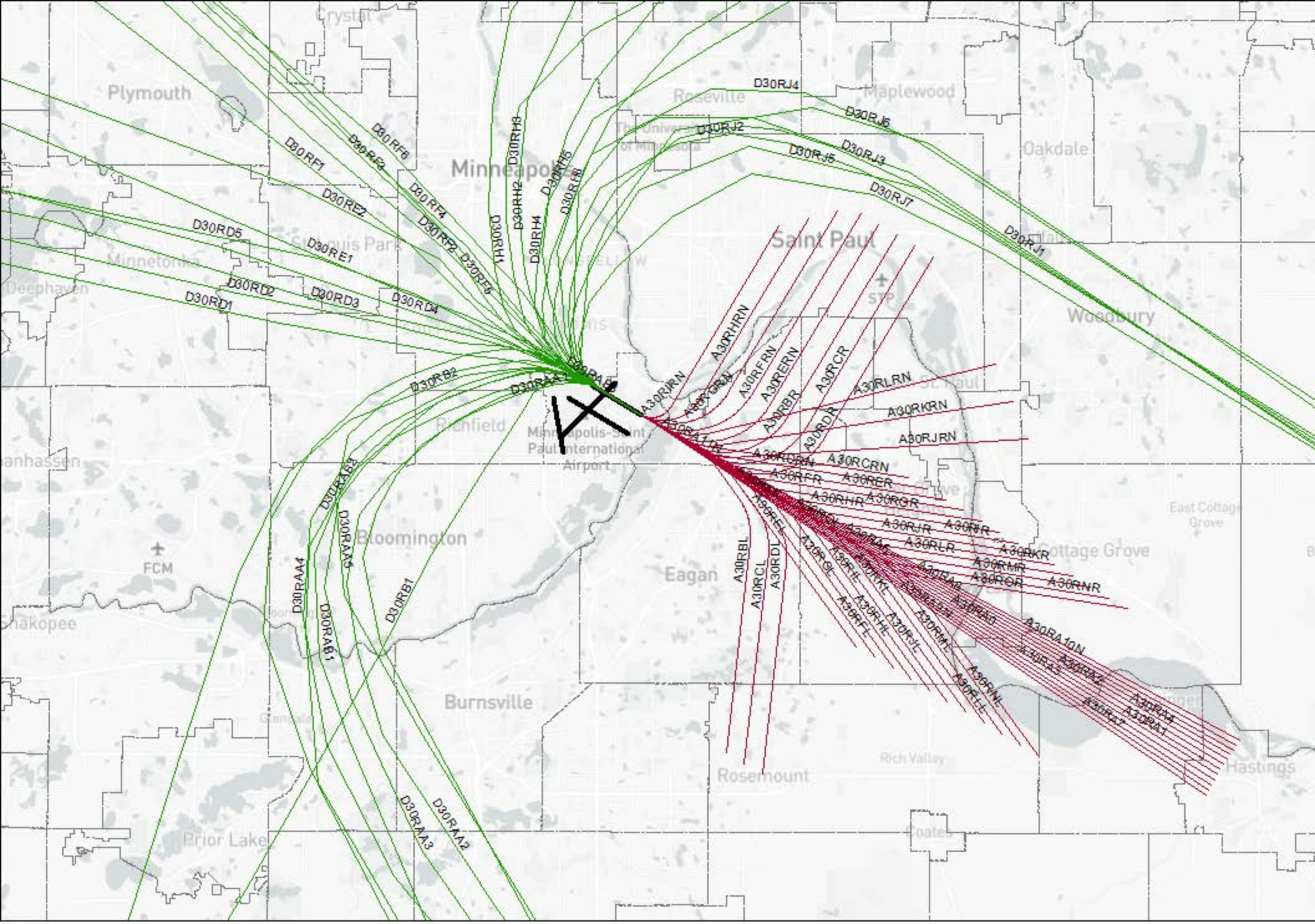
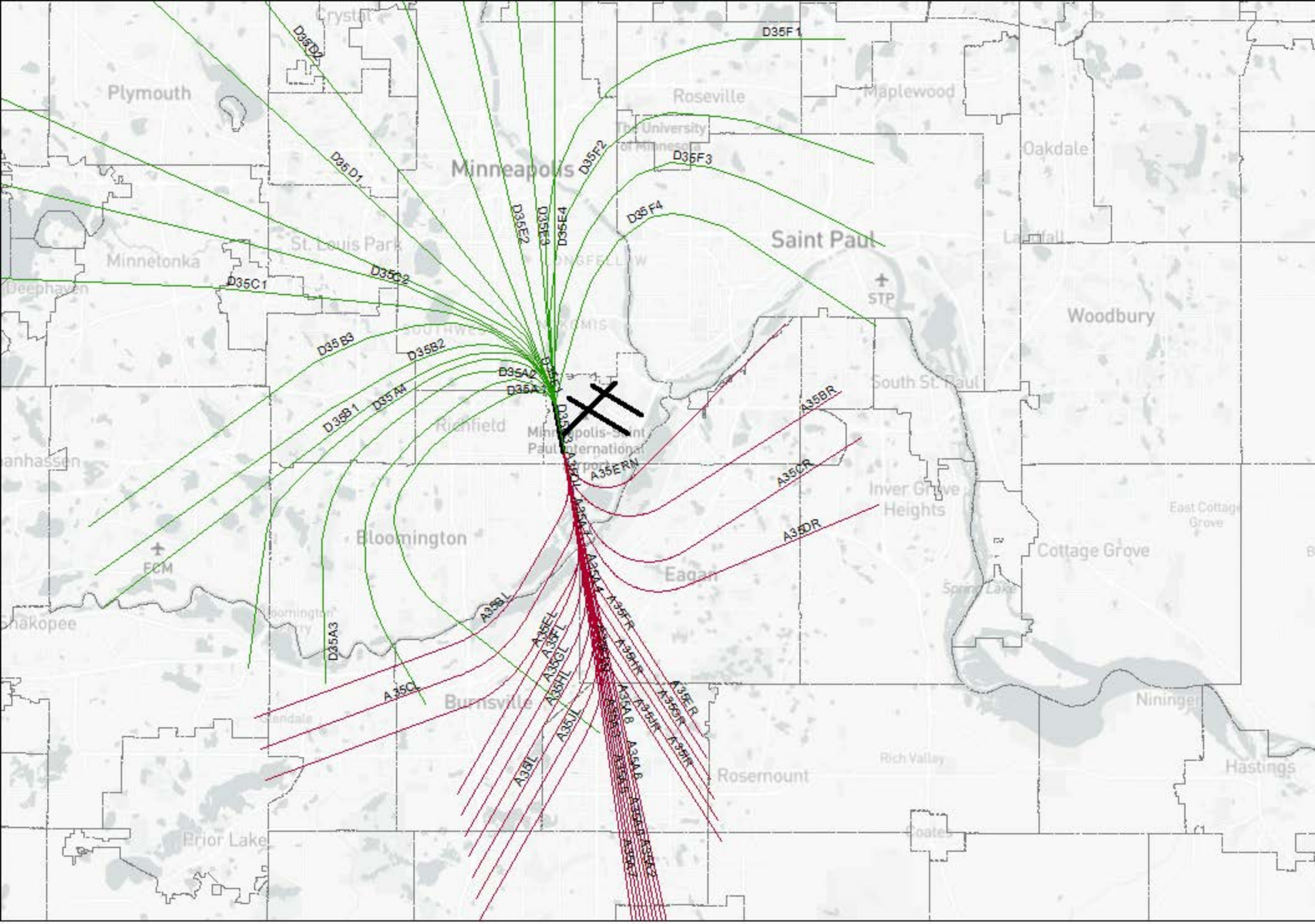


AEDT Model Flight Tracks - Runway 30L



AEDT Model Flight Tracks - Runway 30R



AEDT Model Flight Tracks - Runway 35