F.5 DATA DEVELOPMENT AND NOISE EXPOSURE FOR THE INTERIM PROPOSED ACTION

The Interim Condition of the Proposed Action Alternative is abbreviated herein as the "Interim Proposed Action."

Sections F.5.1 through **F.5.8** address the data input to AEDT for the aircraft noise modeling of the Interim Proposed Action. **Section F.5.9** presents the resultant Interim Proposed Action noise exposure and **Section F.5.10** compares that exposure to the Interim Proposed Action noise exposure.

F.5.1 Airfield Layout

The runway layout for the Interim Proposed Action is the same as that described for the Interim No Action (**Section F.5.1**). In the Interim Proposed Action, in addition to the Terminal 3 and 5 changes discussed in the Interim No Action, the taxiway geometry south of Runway 4L would be modified to encompass a construction work area between Taxiway T and Concourse C and Concourse E as shown in **Exhibit F-10**.

F.5.2 Meteorological and Terrain Data

The meteorological and terrain data for the Interim Proposed Action is the same as that described for the Interim No Action (**Section F.4.2**) and the Existing Condition (**Section F.3.2**).

F.5.3 Aircraft Noise and Performance Data

The aircraft noise and performance data for the Interim Proposed Action (AEDT standard data except the approved non-standard 737-800) is the same as that described for the Interim No Action (**Section F.4.4**) and the Existing Condition (**Section F.3.3**).

F.5.4 Aircraft Flight Operations

The aircraft flight operations data (level of operations and fleet mix) for the Interim Proposed Action would be the same as that described for the Interim No Action (**Section F.4.4**). The annual flight operations by body category are shown in **Table F-31**. The Interim Proposed Action would result in a less than one percent difference in the distribution of flight operations between daytime and nighttime periods among the Widebody Jet and Other Jet categories compared to the Interim No Action.

TABLE F-31
ANNUAL FLIGHT OPERATIONS FOR THE INTERIM PROPOSED ACTION

Body Category	Arrivals			Departures			Total			Total Percent
	Day	Night	Day	Day	Day	Night	Day	Night	Day	
Widebody Jet	33,314	10,266	43,580	33,188	10,392	43,580	66,502	20,658	87,160	9.2%
Other Jet	372,722	56,565	429,287	395,177	34,110	429,287	767,899	90,675	858,574	90.1%
Non-jet	3,040	338	3,378	3,378	0	3,378	6,418	338	6,756	0.7%
Total	**409,076**	**67,169**	**476,245**	**431,743**	**44,502**	**476,245**	**840,819**	**111,671**	**952,490**	**100.0%**
Percentage	43%	7%	50%	45%	5%	50%	88%	12%	100%	

Source: CDA, 2020; HMMH analysis, 2021

The overall daytime and nighttime arrival and departure operations for the Interim Proposed Action would be within 0.5 percent of the overall daytime and nighttime operations for the Interim No Action. **Table F-32** shows the differences in operations in each category. Positive values represent increases from the Interim No Action to the Interim Proposed Action, while negative values represent decreases.

TABLE F-32
CHANGE IN DISTRIBUTION OF ANNUAL FLIGHT OPERATIONS BETWEEN THE INTERIM NO ACTION AND THE INTERIM PROPOSED ACTION

	Arrivals		Departures		Total	
Body Category	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**
Widebody Jet	319	-319	-127	127	192	-192
Other Jet	-233	233	792	-792	559	-559
Non-jet	0	0	0	0	0	0
Total	**86**	**-86**	**665**	**-665**	**751**	**-751**

Source: CDA, 2020; HMMH analysis, 2021

Table F-33 details the Interim Proposed Action's 2,610 AAD flight operations by aircraft type. Rounding to two decimal places caused the total AAD count to be different from 2,610 by less than one AAD operation. A close comparison with the modeled AAD operations for the Interim No Action (shown in **Table F-20**) reveals the small changes in the distribution of flight operations between day and night periods. The overall daytime and nighttime arrival and departure operations differ by less than two operations per day.

TABLE F-33
AAD FLIGHT OPERATIONS BY AIRCRAFT TYPE FOR THE INTERIM PROPOSED ACTION

	Arrivals			Departures			
Aircraft ID (AEDT)	**Day**	**Night**	**Total**	**Day**	**Night**	**Total**	**Total**
Widebody Jet							
747400	1.85	4.63	6.48	5.55	0.93	6.48	12.96
7478	3.00	3.48	6.48	1.85	4.63	6.48	12.96
767300	5.03	4.22	9.25	2.75	6.51	9.26	18.51
777200	8.70	1.94	10.64	9.76	0.88	10.64	21.28
777300	1.86	3.69	5.55	3.66	1.90	5.56	11.11
7773ER	9.07	0.19	9.26	7.79	1.46	9.25	18.51
7878R	28.63	3.76	32.39	28.14	4.25	32.39	64.78
A300-622R	0.93	1.85	2.78	0.48	2.29	2.77	5.55
A300B4-203	0.93	-	0.93	-	0.93	0.93	1.86
A330-301	0.93	-	0.93	0.93	-	0.93	1.86
A330-343	27.53	0.69	28.22	24.71	3.52	28.23	56.45

	Arrivals			Departures			
Aircraft ID (AEDT)	**Day**	**Night**	**Total**	**Day**	**Night**	**Total**	**Total**
A380-841	1.85	-	1.85	1.85	-	1.85	3.70
A380-861	0.93	-	0.93	0.67	0.25	0.92	1.85
MD11GE	-	1.85	1.85	1.85	-	1.85	3.70
MD11PW	0.04	1.81	1.85	0.93	0.93	1.86	3.71
Widebody Jet Subtotals	**91.28**	**28.11**	**119.39**	**90.92**	**28.48**	**119.40**	**238.79**
Other Jet							
717200	12.03	-	12.03	11.10	0.93	12.03	24.06
737700	16.66	2.78	19.44	16.73	2.71	19.44	38.88
U_737800	183.17	38.92	222.09	196.67	25.41	222.08	444.17
7378MAX	46.13	8.93	55.06	48.55	6.50	55.05	110.11
757300	10.89	5.77	16.66	14.85	1.81	16.66	33.32
757RR	0.93	1.85	2.78	0.93	1.85	2.78	5.56
A319-131	54.70	5.45	60.15	52.07	8.08	60.15	120.30
A320-211	5.03	2.37	7.40	4.63	2.78	7.41	14.81
A320-232	45.09	12.29	57.38	54.53	2.84	57.37	114.75
A321-232	52.02	15.99	68.01	59.67	8.34	68.01	136.02
CRJ9-ER	171.35	17.42	188.77	176.88	11.89	188.77	377.54
EMB170	23.13	2.78	25.91	25.51	0.40	25.91	51.82
EMB175	138.39	11.52	149.91	140.72	9.18	149.90	299.81
CL600	115.73	13.82	129.55	125.82	3.73	129.55	259.10
CNA55B	-	0.93	0.93	0.93	-	0.93	1.86
CNA560XL	0.93	-	0.93	0.93	-	0.93	1.86
CNA680	1.85	-	1.85	1.85	-	1.85	3.70
CNA750	0.93	-	0.93	0.93	-	0.93	1.86
EMB145	3.70	-	3.70	3.70	-	3.70	7.40
EMB14L	137.58	14.18	151.76	144.76	7.00	151.76	303.52
LEAR35	0.93	-	0.93	0.93	-	0.93	1.86
Other Jet Subtotals	**1,021.17**	**155.00**	**1,176.17**	**1,082.69**	**93.45**	**1,176.14**	**2,352.31**
Non-jet							
BEC58P	**3.70**	**-**	**3.70**	**3.70**	**-**	**3.70**	**7.40**
CNA208	4.63	0.93	5.56	5.55	-	5.55	11.11
Non-jet Subtotals	**8.33**	**0.93**	**9.26**	**9.25**	**-**	**9.25**	**18.51**
Grand Totals	**1,120.78**	**184.04**	**1,304.82**	**1,182.86**	**121.93**	**1,304.79**	**2,609.61**

Source: CDA, 2020; HMMH analysis, 2021

F.5.5 Runway Use

The runway use for the Interim Build Out was derived from CDA's TAAM simulation data. As it is impractical to model all possible runway configurations, the CDA's TAAM modeling was limited to the most prevalent configurations, which cover over 98 percent of possible operating conditions. The CDA ran six operational experiments in TAAM for the Interim Proposed Action which are listed in **Table F-21** in **Section F.4.5** and include the resulting percent contribution (weighting) to the total yearly operations for each configuration. Using the weightings, the CDA developed annualized runway usage rates for the EA's noise and air quality modeling. On an annual basis, 56.5 percent of the flight operations would be in west flow and 43.5 percent would be in east flow, identical to the Interim No Action.

The annualized runway use from TAAM simulation results for the Interim Proposed Action is presented in **Table F-34**. The TAAM modeling assigned no arrivals to Runway 4L and no departures from Runway 22R since Runway 4L/22R is uni-directional (arrivals are not allowed to Runway 4L and departures are not allowed from Runway 22R). Due to the simulation using only primary operational configurations, the TAAM modeling resulted in several runways showing no use. The blank cells in **Table F-34** indicate the so-called "zero runway use" runways for each combination of runway, type of operation, and period. For example, the TAAM modeling did not predict any departures from Runway 9L during the day or night. While departures do not normally occur on that runway, the runway could be used for departures.

TABLE F-34
TAAM-OUTPUT RUNWAY USE PERCENTAGES FOR THE INTERIM PROPOSED ACTION

	Arrival (see notes 1 and 2)		Departure (see notes 1 and 2)	
Runway	Day	Night	Day	Night
9L	15.6	4	-	-
9C	9.7	8.2	-	1.3
9R	-	-	1	1.6
9RX[3]	n/a	n/a	21.1	31.1
10L	-	19.4	0.1	4.3
10LX[3]	n/a	n/a	21.2	6.2
10C	14.6	9.7	0.1	0.2
10R	3.7	2.1	-	-
4L	n/a	n/a	-	-
4R	-	-	-	-
27R	21.4	6.5	-	-
27C	16.6	13.2	-	1.7
27L	-	-	1.1	2.1
27LX[3]	n/a	n/a	16	17.5
28R	-	25	0.3	5.1
28RX[3]	n/a	n/a	21.8	20.2
28C	18.4	11.9	0.1	-
28L	-	-	-	-
22L	-	-	17.3	8.8

Runway	Arrival (see notes 1 and 2)		Departure (see notes 1 and 2)	
	Day	Night	Day	Night
22R	-	-	n/a	n/a
Notes: 1) Each column sums vertically to 100±0.1%. 2) Daytime is defined as 7:00:00 a.m. to 9:59:59 p.m.; nighttime is defined as 10:00:00 p.m. to 6:59:59 a.m. (local time). 3) The "X" notation means intersection departures from that runway; this runway would not be applicable to arrival operations.				
Source: CDA, 2020				

It is anticipated that, to some extent, all available runways[1] would be used for arrival and departure operations during a year to allow for safe and efficient operations during unforeseen circumstances such as runway maintenance closures or adverse weather. Therefore, the TAAM results were adjusted to allocate at least 0.1 percent of the flights to the runways where operations would be expected but where the TAAM modeling did not include/assign operations. In general, the adjustment methodology was to shift small percentages of operations from one runway to another by selecting the nearest runway with the same operation type and flow so that flights would remain over similar areas when possible. For example, Runway 9R departures could be shifted to nearby Runway 9L because both runways are in the same (east) flow and are on the same side of the airfield.

Except for nighttime departures from Runways 10C, 28C, and 4L, the value of 0.1 percent was chosen as the runway use percentage to be assigned[2] because a) it was the minimum non-zero runway use produced by the TAAM modeling and b) it was the average of Existing Condition runway use percentages less than or equal to 1.0 percent.[3]

Runways 10C, 28C, and 4L have Existing Condition nighttime departure use greater than 1.0 percent but no use assigned by the TAAM modeling. For each of these three runways, the following logic was applied to derive a reasonable percentage of night departure use:

- For Runway 10C: The Existing Condition use is 1.8 percent on Runway 10C and a combined 17.6 percent for Runways 10L and 10LX. The TAAM modeling assigned a combined 10.5 percent to Runways 10L and 10LX for the Interim Proposed Action. From 17.6 to 10.5 is a 40.3 percent reduction, so the 1.8 percent for Runway 10C was correspondingly reduced 40.3 percent. Therefore, the Runway 10C night departure percentage was set to 1.1 percent for the Interim Proposed Action.
- For Runway 28C: The Existing Condition use is 3.8 percent on Runway 28C and a combined 39.0 percent for Runways 28R and 28RX. The TAAM modeling assigned a combined 25.3 percent to Runways 28R and 28RX for the Interim Proposed Action. From 39.0 to 25.3 is a 35.1 percent reduction, so the 3.8 percent for Runway 28C was correspondingly reduced 35.1 percent. Therefore, the Runway 28C night departure percentage was set to 2.5 percent for the Interim Proposed Action.
- For Runway 4L: The Existing Condition use is 2.4 percent on Runway 4L and a combined 20.0 percent for Runways 9R and 9RX. The TAAM modeling assigned a combined 32.7 percent to Runways 9R and 9RX for the Interim Proposed Action. From 20.0 to 32.7 is a 63.5 percent increase, so the 2.4 percent for Runway 4L was correspondingly increased 63.5 percent. Therefore, the Runway 4L night departure percentage was set to 3.9 percent for the Interim Proposed Action.

[1] With the exception of Runway 4L arrivals and Runway 22R departures.
[2] In comparison, the 2015 EIS Re-Evaluation and the IFQ Re-Evaluation chose 0.5 percent and 0.2 percent as their adjustment values, respectively.
[3] For the purposes of averaging, the Existing Condition runway use percentages shown as "<0.05" percent, were assumed to be 0.025 percent.

The process had two additional customizations: 1) If departures needed to be shifted from Runway 10L/28R or 9R/27L, only departures from their runway intersections were moved; non-intersection departures were not adjusted. 2) Widebody Jet and Non-jet departures were excluded from being shifted to Runways 9L/27R and 10R/28L because it would be unlikely for Widebody Jet and Non-jet aircraft to use Runways 9L/27R or 10R/28L.

The resultant runway use percentages for the Interim Proposed Action are shown in **Tables F-35** through **F-37** for arrivals, departures, and overall flight operations, respectively, in terms of AAD operations and EDO. At nearly 13 percent of total operations, Runway 28R would be the most used runway at O'Hare, followed by Runways 10L and 9R, each with 11 percent of total operations. During the nighttime hours, Runway 28R would be the most used runway at 24 percent, followed by Runway 10L with 15 percent of nighttime operations.

TABLE F-35
RUNWAY USE PERCENTAGES FOR ARRIVALS FOR THE INTERIM PROPOSED ACTION

		Daytime (see notes 1 and 2)				Nighttime (see notes 1 and 2				Overall (see notes 1, 2, and 3)	
Flow	**Runway ID (d)**	**WBJ**	**OJ**	**NJ**	**Overall**	**WBJ**	**OJ**	**NJ**	**Overall**	**AAD**	**EDO**
E	9L	-	17.0	14.5	15.6	-	4.6	27.4	4.1	14.0	8.4
E	9C	27.9	8.0	3.1	9.6	8.0	8.1	15.9	8.1	9.4	8.7
E	9R	0.3	0.1	<0.05	0.1	0.1	0.1	0.2	0.1	0.1	0.1
E	10L	0.1	0.1	0.1	0.1	21.5	18.9	-	19.2	2.8	12.0
E	10C	15.4	14.2	18.1	14.4	12.3	9.3	-	9.7	13.7	11.5
E	10R	-	4.0	7.5	3.7	-	2.5	-	2.1	3.5	2.7
E	4L	-	-	-	-	-	-	-	-	-	-
E	4R	0.1	0.1	0.1	0.1	0.1	0.1	-	0.1	0.1	0.1
W	27R	-	23.2	23.2	21.3	-	7.4	56.5	6.5	19.3	12.1
W	27C	21.2	16.2	8.0	16.5	11.2	13.4	-	13.0	16.0	14.3
W	27L	0.1	0.1	<0.05	0.1	0.1	0.1	-	0.1	0.1	0.1
W	28R	0.2	0.1	0.1	0.1	27.9	24.4	-	24.8	3.6	15.4
W	28C	34.5	16.5	24.9	18.1	18.5	10.8	-	11.9	17.2	14.2
W	28L	-	0.1	-	0.1	-	0.1	-	0.1	0.1	0.1
W	22L	0.2	0.1	0.1	0.1	0.1	0.1	-	0.1	0.1	0.1
W	22R	-	0.1	0.1	0.1	0.1	0.1	-	0.1	0.1	0.1

Notes:
1) Each column sums vertically to 100±0.2%.
2) Daytime is defined as 7:00:00 a.m. to 9:59:59 p.m.; nighttime is defined as 10:00:00 p.m. to 6:59:59 a.m. (local time).
3) AAD pertains to annual average daily flight operations; EDO pertains to equivalent daily flight operations, i.e., daytime plus 10 times nighttime.
WBJ = Widebody Jet; OJ = Other Jet; NJ = Non-jet

Source: HMMH analysis, 2020

TABLE F-36
RUNWAY USE PERCENTAGES FOR DEPARTURES FOR THE INTERIM PROPOSED ACTION

		Daytime (see notes 1 and 2)				Nighttime (see notes 1 and 2)				Overall (see notes 1, 2, and 3)	
Flow	Runway ID (d)	WBJ	OJ	NJ	Overall	WBJ	OJ	NJ	Overall	AAD	EDO
E	9L	-	0.1	-	0.1	-	0.1	-	0.1	0.1	0.1
E	9C	0.1	0.1	0.1	0.1	5.6	-	-	1.3	0.2	0.7
E	9R	12.6	-	-	1.0	6.7	-	-	1.6	1.0	1.3
E	9RX[4]	19.5	20.8	25.9	20.8	11.7	31.8	-	27.1	21.4	24.0
E	10L	1.3	-	-	0.1	15.4	0.8	-	4.2	0.5	2.2
E	10LX[4]	8.7	22.0	17.3	21.0	1.4	6.3	-	5.1	19.5	12.9
E	10C	1.1	-	-	0.1	1.1	1.1	-	1.1	0.2	0.6
E	10R	-	0.1	-	0.1	-	0.1	-	0.1	0.1	0.1
E	4L	0.1	0.1	0.1	0.1	1.7	4.6	-	3.9	0.5	2.0
E	4R	<0.05	0.1	0.1	0.1	<0.05	0.1	-	0.1	0.1	0.1
W	27R	-	0.1	-	0.1	-	0.1	-	0.1	0.1	0.1
W	27C	0.1	0.1	<0.05	0.1	7.3	-	-	1.7	0.3	0.9
W	27L	14.0	-	-	1.1	9.2	-	-	2.1	1.2	1.6
W	27LX[4]	16.0	15.9	6.0	15.8	12.7	18.8	-	17.4	16.0	16.6
W	28R	3.3	-	-	0.3	17.0	1.5	-	5.1	0.7	2.7
W	28RX[4]	20.8	21.5	50.4	21.7	8.8	20.3	-	17.6	21.3	19.6
W	28C	1.7	-	-	0.1	1.2	2.9	-	2.5	0.4	1.3
W	28L	-	0.1	-	0.1	-	0.1	-	0.1	0.1	0.1
W	22L	0.6	18.9	-	17.3	-	11.5	-	8.8	16.5	13.0
W	22R	-	-	-	-	-	-	-	-	-	-

Notes:
1) Each column sums vertically to 100±0.1%.
2) Daytime is defined as 7:00:00 a.m. to 9:59:59 p.m.; nighttime is defined as 10:00:00 p.m. to 6:59:59 a.m. (local time).
3) AAD pertains to annual average daily flight operations; EDO pertains to equivalent daily flight operations, i.e., daytime plus 10 times nighttime.
4) The "X" notation means intersection departures from that runway.
WBJ = Widebody Jet; OJ = Other Jet; NJ = Non-jet

Source: HMMH analysis, 2020

TABLE F-37
OVERALL RUNWAY USE PERCENTAGES FOR THE INTERIM PROPOSED ACTION

		Daytime (see notes 1 and 2)				Nighttime (see notes 1 and 2)				Overall (see notes 1, 2, and 3)	
Flow	Runway ID	WBJ	OJ	NJ	Overall	WBJ	OJ	NJ	Overall	AAD	EDO
E	9L	-	8.3	6.9	7.7	-	2.9	27.4	2.5	7.1	4.7
E	9C	14.0	3.9	1.5	4.7	6.8	5.1	15.9	5.4	4.8	5.1
E	9R[4]	16.2	10.8	13.6	11.2	9.3	12.0	0.2	11.5	11.2	11.4
E	10L[4]	5.1	11.4	9.2	10.9	19.1	14.5	-	15.3	11.4	13.4
E	10C	8.2	6.9	8.6	7.0	6.7	6.2	-	6.3	6.9	6.6
E	10R	-	2.0	3.6	1.8	-	1.6	-	1.3	1.8	1.5
E	4L	<0.05	0.1	0.1	0.1	0.8	1.7	-	1.5	0.2	0.9
E	4R	0.1	0.1	0.1	0.1	0.1	0.1	-	0.1	0.1	0.1
W	27R	-	11.3	11.0	10.4	-	4.7	56.5	3.9	9.7	6.7
W	27C	10.7	7.9	3.8	8.1	9.3	8.4	-	8.5	8.1	8.3
W	27L[4]	15.0	8.2	3.2	8.7	11.1	7.1	-	7.8	8.6	8.2
W	28R[4]	12.1	11.1	26.6	11.3	26.8	23.4	-	24.0	12.8	18.5
W	28C	18.2	8.0	11.8	8.9	9.8	7.8	-	8.2	8.8	8.5
W	28L	-	0.1	-	0.1	-	0.1	-	0.1	0.1	0.1
W	22L	0.4	9.8	0.1	8.9	0.1	4.4	-	3.6	8.3	5.9
W	22R	-	0.1	0.1	<0.05	<0.05	0.1	-	0.1	<0.05	0.1

Notes:
1) Each column sums vertically to 100±0.2%.
2) Daytime is defined as 7:00:00 a.m. to 9:59:59 p.m.; nighttime is defined as 10:00:00 p.m. to 6:59:59 a.m. (local time).
3) AAD pertains to annual average daily flight operations; EDO pertains to equivalent daily flight operations, i.e., daytime plus 10 times nighttime.
4) The departure operations indicated for runways "9RX", "10LX", "27LX" and "28RX" are included in this table in the overall use of Runways 9R, 10L 27L and 28R, respectively.
WBJ = Widebody Jet; OJ = Other Jet; NJ = Non-jet

Source: HMMH analysis, 2020

F.5.6 Modeled Flight Tracks and Operational Assignments

For the Interim Proposed Action, the modeled flight tracks would be similar to those for the Interim No Action except that the downwind and final approach segments of arrival tracks to Runways 10R and 28L would revert to their offset characteristic from the Existing Condition. All southside downwinds on the west side of the airport would also be offset from the extended runway centerlines.

Table F-38 lists the counts of flight tracks by type of operation resulting from the TAAM Interim Proposed Action simulation. A total of 1,502 unique backbone tracks were developed, each having up to six sub-tracks, to represent the 952,490 annual flight operations at O'Hare for the Interim Condition. Of these track bundles, 657 were repeated for the purpose of separately modeling with ACC. Altitude data of the radar tracks in each bundle were used to determine average altitudes. **Section F.4.7** contains more information regarding ACC.

TABLE F-38
COUNTS OF FLIGHT TRACKS BY TYPE OF OPERATION FOR THE INTERIM PROPOSED ACTION

Track Set	Aircraft Category	Traffic Flow	Arrival Track Bundles (see note 1)			Departure Track Bundles (see note 1)			Total Track Bundles (see note 1)		
			Day	Night	Total	Day	Night	Total	Day	Night	Total
Regular Tracks (see note 1)	WBJ	East	62	73	135	63	81	144	125	154	279
		West	66	66	132	88	51	139	154	117	271
	OJ	East	121	111	232	72	89	161	193	200	393
		West	113	109	222	86	102	188	199	211	410
	NJ	East	27	28	55	35	0	35	62	28	90
		West	18	2	20	39	0	39	57	2	59
	Subtotals by Traffic Flow										
	East		210	212	422	170	170	340	380	382	762
	West		197	177	374	213	153	366	410	330	740
	Subtotals by Aircraft Category										
	WBJ		128	139	267	151	132	283	279	271	550
	OJ		234	220	454	158	191	349	392	411	803
	NJ		45	30	75	74	0	74	119	30	149
	Total Regular Tracks		**407**	**389**	**796**	**383**	**323**	**706**	**790**	**712**	**1,502**
Flight Tracks duplicated for Altitude Control Code Modeling (see note 2)	WBJ		86	70	156	88	62	150	174	132	306
	OJ		125	69	194	67	74	141	192	143	335
	NJ		8	0	8	8	0	8	16	0	16
	Total Duplicate Tracks		**219**	**139**	**358**	**163**	**136**	**299**	**382**	**275**	**657**

Track Set	Aircraft Category	Traffic Flow	Arrival Track Bundles (see note 1)			Departure Track Bundles (see note 1)			Total Track Bundles (see note 1)		
			Day	Night	Total	Day	Night	Total	Day	Night	Total
Total Flight Track Bundles (see note 2)	WBJ		214	209	423	239	194	433	453	403	856
	OJ		359	289	648	225	265	490	584	554	1,138
	NJ		53	30	83	82	0	82	135	30	165
	Grand Total		**626**	**528**	**1,154**	**546**	**459**	**1,005**	**1,172**	**987**	**2,159**

Notes:
1) Numbers indicate 'backbone' tracks only; each backbone track may have up to six associated sub-tracks to model dispersion around the backbone; "regular" flight tracks section excludes duplicate tracks for altitude control code modeling.
2) Numbers indicate duplicated tracks with ACC added to account for flight profile level off or hold downs.
WBJ = Widebody Jet; OJ = Other Jet; NJ = Non-jet

Source: CDA, 2020; HMMH analysis, 2021

Attachment F-3 contains the flight track use percentages (informed by the TAAM modeling) and modeled flight track depictions for arrivals and departures by runway end for each flow.

F.5.7 Flight Profiles

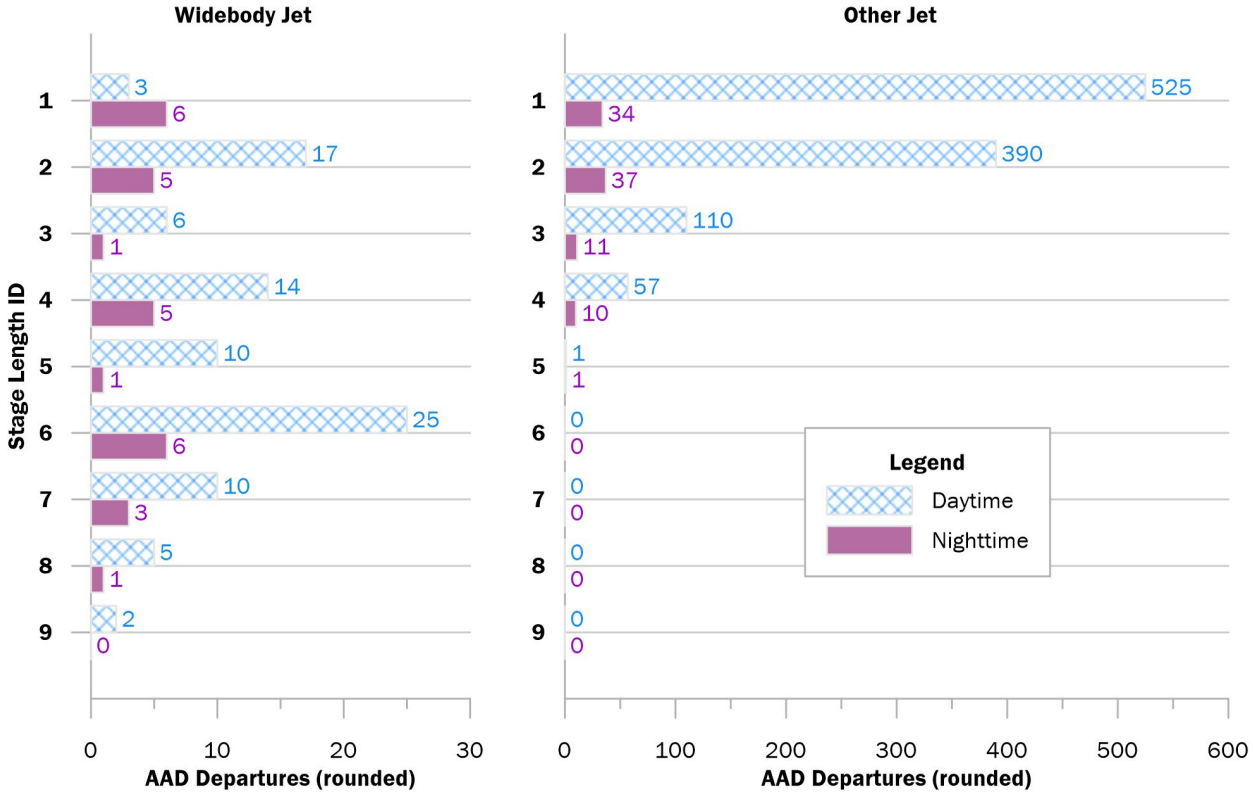
The same methodology used for development of the flight profiles for the Interim No Action (described in **Section F.4.7**) was applied to the development of flight profiles for the Interim Proposed Action.

The forecast's DDFS indicated destinations for each departure flight for the Interim Proposed Action. Using the distance between O'Hare and the destination airport, the EA team assigned an AEDT stage length (shown in **Table F-13** in **Section F.3.7**) to each departure. The modeled stage length distribution for the Interim Proposed Action is depicted in **Figure F-5** for the Widebody Jet and Other Jet categories.[4] The third category of aircraft, Non-jet, almost always has destinations within the stage length 1 range, thus are not shown. For the purposes of the figure, AAD departures were rounded to the nearest departure. As shown in the figure, the majority (about 70 percent of day and 60 percent of night) Widebody Jet flights were stage length 4 or higher, implying West Coast and international destinations. Most daytime or nighttime Other Jet flights would be stage lengths 3 or less.

Although AEDT performance profiles range from stage length 1 through 9, many AEDT aircraft types do not have flight profiles defined for the longest stage lengths and many GA aircraft types have a profile only for stage length 1. If the forecast indicated a departure stage length that exceeded that aircraft's available performance profiles, the profile for the greatest stage length available for that aircraft type was used instead.

[4] The scales of the two sides of the figure are different because there are more than ten times as many other jet operations as there are Widebody jet operations.

FIGURE F-5
DISTRIBUTION OF MODELED DEPARTURE STAGE LENGTHS FOR THE INTERIM PROPOSED ACTION



Source: HMMH analysis, 2021

F.5.8 Maintenance Run-Up Operations

The modeled run-up operations data for the Interim Proposed Action is the same as that described for the Interim No Action (**Section F.4.8**). The changes to the terminal layout included in the project would not affect the run-up operations.

F.5.9 Noise Exposure

Sections F.5.9.1 and **F.5.9.2** describe the resultant DNL contours and affected noise sensitive facilities, respectively.

F.5.9.1 DNL Contours

Using the input data documented in the preceding sections, AEDT calculated DNL at more than 118,000 evenly-spaced grid points throughout the PSA and SSA. **Exhibit F-13** provides the resulting DNL contours for the Interim Proposed Action.

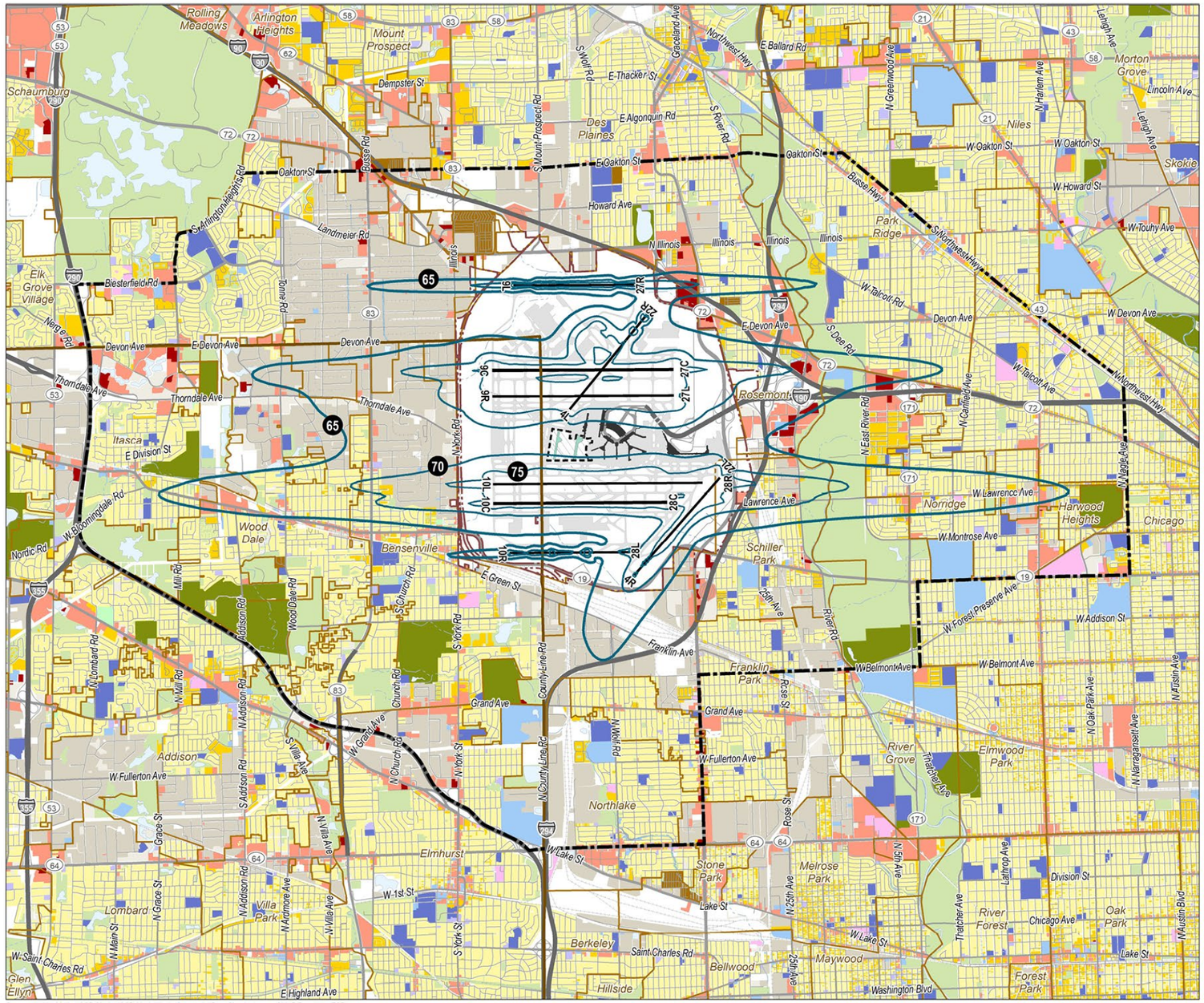
The DNL contours extend away from O'Hare on the east and west side in three main lobes (north, central, and south), and in a single lobe on the south side.

- The north east-west lobe would be due to flight operations to and from Runway 9L/27R. The east lobe of the 65 DNL contour would include residential areas of southern Des Plaines; it would extend into Chippewa Woods south of West Talcott Road ending west of South Dee Road. The west lobe of the 65 DNL contour, consisting mainly of commercial industrial parcels, ends just west of Busse Road.
- The central east-west lobe would be due to flight operations to and from Runways 9C/27C and 9R/27L. The east lobe of the 65 DNL contour would include residential areas of Rosemont and Park Ridge, extending just past Vine Avenue. The west lobe of the 65 DNL contour would extend west to North Mittel Boulevard and include primarily commercial industrial parcels and residential areas of Bensenville south of State Route 390.
- The south east-west lobe would be due to flight operations to and from Runways 10L/28R and 10C/28C. The east lobe of the 65 DNL contour would include residential areas of Schiller Park, Norridge, and Harwood Heights, extending to about two blocks west of the Ridgemoor Country Club golf course. The west lobe of the 65 DNL contour would include residential areas of Bensenville, Wood Dale, and Itasca, extending along Irving Park Road and ending at South Cheery Street.
- A smaller lobe of the 65 DNL contour would extend west from Runway 10R into Bensenville almost to South Addison Street.
- The south lobe of the 65 DNL contour, due to flight operations to and from Runway 4R/22L, extends over industrial property to Interstate 294.

The 70 DNL contour for Interim Proposed Action would include residential parcels, primarily in three areas: 1) Rosemont just east of Runway 27C, 2) Schiller Park east of Runway 28R, and 3) Bensenville west of Runways 10L and 10C.

Table F-39 shows the land uses that would be exposed to DNL greater than or equal to 65 dB for the Interim Proposed Action. The top portion of the table quantifies acreage in each contour band by land use category. The remainder of the table provides the count of noise-sensitive facilities and estimates of population and number of housing units for each DNL band. Under the Interim Proposed Action, no non-compatible land use would be exposed to DNL greater than or equal to 75 dB. Of the nearly 5,800 off-airport acres that would be exposed to 65 DNL or greater, 22 percent (approximately 1,300 acres) would consist of non-compatible land use.

There were an estimated 22,935 people in 9,156 housing units withhin the 65 DNL. Of the 9,156 housing units, 4,533 have been sound-insulated by the CDA and 223 are scheduled to be sound-insulated as part of Phase 18 and 19 of the CDA RSIP. Most non-mitigated homes within the Interim Proposed Action 65 DNL are currently not eligible, as they are outside the DNL noise contour used for the ongoing RSIP for the OMP. Ineligible locations include areas of Itasca and Wood Dale west of Runways 10C and 10L, areas of Norridge and Harwood Heights east of Runways 28C and 28R, and a small area of Rosemont northeast of Runway 27C. For comparison between the Interim No Action and the Interim Proposed Action (see **Table F-41**).



Chicago O'Hare International Airport

Terminal Area Plan and Air Traffic Procedures Environmental Assessment

- Interim Proposed Action DNL Contours (65, 70, 75 dB)
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- Airport Boundary
- Runways
- Taxiway / Apron
- County Boundary
- Community Boundary
- Highway
- Primary Roads
- Secondary Roads
- Local Roads
- Railroad Lines
- Single Family Residential
- Multi-Family Residential
- Mobile Home
- Transient Lodging
- School / Education
- Place of Worship
- Hospital / Medical
- Water / Stream
- Public Use
- Commercial
- Industrial
- Agriculture
- Open Space Recreation
- Golf
- Vacant / Undefined

0 1 2
Miles

Noise Exposure Contours for Interim Proposed Action

▸ Exhibit F-13

TABLE F-39
NOISE EXPOSURE FOR THE INTERIM PROPOSED ACTION

		DNL Contour Bands			
Land Use (Acres)	**Compatibility**	**65-70**	**70-75**	**75+**	**Total**
Single-Family Residential	Non-compatible	1,023.5	60.2	-	1,083.7
Multi-Family Residential		82.9	30.8	-	113.7
Transient Lodging (residential)		56.8	7.1	-	63.9
Mobile Home		-	-	-	-
School/Education		14.6	4.6	-	19.2
Commercial	Compatible	301.7	15.4	-	317.1
Industrial, Manufacturing, and Production		2,813.9	523.5	15.4	3,352.8
Recreational		474.8	71.2	-	546.0
Public Use (excluding School/Education)[1]		89.9	2.5	-	92.4
Undeveloped		163.7	21.3	0.4	185.4
Airport		2,286.1	1,703.0	1,855.6	5,844.7
Water		18.0	1.6	-	19.6
Subtotal Non-compatible Area (acres)		1,177.8	102.7	-	1,280.5
Subtotal Compatible Area (acres)		6,148.1	2,338.5	1,871.4	10,358.0
Total Area (acres)		**7,325.9**	**2,441.2**	**1,871.4**	**11,638.5**
Off-airport Total Area (acres)		**5,039.8**	**738.2**	**15.8**	**5,793.8**
Noise-Sensitive Facilities (count)					
Universities		1	-	-	1
Schools		4	1	-	5
Sound- Insulated Schools (Included above)		*4*	*1*	-	*5*
Libraries		1	-	-	1
Hospitals		-	-	-	-
Nursing Homes		1	-	-	1
Places of Worship		7	-	-	7
Parks and 4(f) Lands		25	2	-	27
Historic Properties		4	1	-	5
Total		**43**	**4**	**-**	**47**
Population and Housing (count)					
Population		19,654	3,281	-	22,935
Housing Units		7,888	1,268	-	9,156
Non-mitigated single-family housing units (Included above)[2]		*2,557*	*78*	-	*2,655*
Non-mitigated multi-family housing units (Included above)[2]		*1,968*	-	-	*1,968*
Sound-insulated single-family housing units (included above)		*3,327*	*1,190*	-	*4,517*

		DNL Contour Bands			
Land Use (Acres)	**Compatibility**	**65-70**	**70-75**	**75+**	**Total**
Sound-insulated multi-family housing units (included above)		*16*	-	-	*16*
Note 1: For the purposes of this document, Public Use (excluding School/Education) land use is considered compatible. Note 2: The majority (88.8%) of the non-mitigated housing units are not eligible under the existing ORD RSIP because these units are outside the current RSIP DNL 65 dB contour					
Sources: ORD Residential Sound Insulation Program, January 2021 database: City of Chicago 2020 U.S. Census Bureau Census Block Population Data Interim Proposed Action Noise Contours, Land Use, Noise-Sensitive Facilities, Population and Housing data: HMMH Analysis, October 2021					

F.5.9.2 Noise-Sensitive Facilities

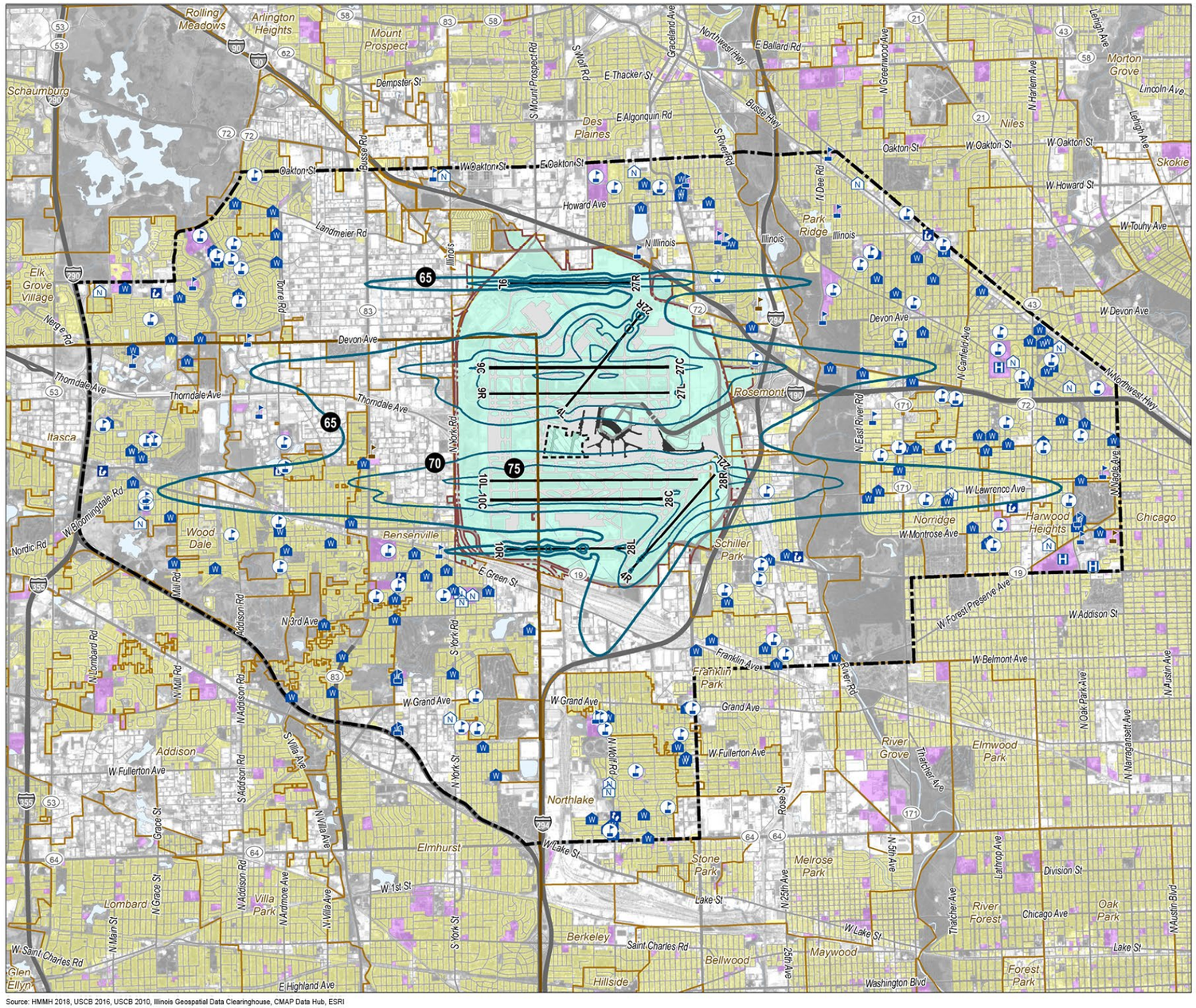
As listed in **Table F-39** and **Table F-40** and shown in **Exhibit F-14**, 47 noise-sensitive facilities in the PSA, primarily parks and 4(f) lands, would be exposed to 65 DNL or greater. None would be exposed to 75 DNL or greater. No hospitals in the PSA would be exposed to DNL greater than 65 dB. Seven learning institutions, consisting of one University (Logos Evangelical Seminary), five schools, and one library (Wood Dale Public Library District; L08) would be exposed to 65 DNL or greater. One school (Washington Elementary School; S81) would be exposed to a DNL of approximately 71 dB. All five (Kindergarden to 12th Grade) schools exposed to 65 DNL or greater have been sound-insulated by the CDA. Two of the 27 parks and 4(f) lands (Norridge Rec Center-East and The Dome at the Parkway Bank Sports Complex; IDs P132 and P188, respectively) which would be exposed to DNL greater than 65 dB do not have outdoor use. Noise results for all sites modeled within the PSA are provided in **Attachment F-5.**

TABLE F-40
NOISE-SENSITIVE FACILITIES WITH A DNL OF AT LEAST 65 DB FOR INTERIM PROPOSED ACTION

			DNL (dB) in DNL Contour Band		
Map ID	**Municipality**	**Name**	**65 - 70**	**70 - 75**	**Note**
Learning Institutions					
U01	Bensenville	Logos Evangelical Seminary	66.5	-	-
S28	Des Plaines	Orchard Place Elementary School	66.6	-	1
S58	Norridge	J Leigh Elementary School	66.9	-	1
S77	Rosemont	Rosemont Elementary School	69.0	-	1
S81	Schiller Park	Washington Elementary School	-	71.1	1
S83	Wood Dale	Early Childhood Education Center	65.3	-	1
L08	Wood Dale	Wood Dale Public Library District	66.0	-	-
Health Care Facilities					
N12	Norridge	Central Baptist Village	67.1	-	-
Places of Worship					
W006	Bensenville	First Baptist Church	67.0	-	-
W018	Chicago	All Saints Polish National Catholic Church	68.1	-	-

			DNL (dB) in DNL Contour Band		
Map ID	**Municipality**	**Name**	**65 - 70**	**70 - 75**	**Note**
W025	Chicago	Evangelical Lutheran Church In America	66.6	-	-
W034	Chicago	Our Lady Mother of the Church Roman Catholic Church	68.2	-	-
W038	Chicago	St. Joseph Ukrainian Church	66.2	-	-
W090	Norridge	Church Of Our Savior	66.5	-	-
W095	Norridge	Zion Evangelical Lutheran Church	68.8	-	-
Parks and 4(f) Lands					
FP06	Chicago	Robinson Woods South	68.7	-	-
FP26	Schiller Park	River Bend Family Picnic Area	66.2	-	-
FP27	Schiller Park	Robinson Homestead Family Picnic Area	65.2	-	-
P019	Bensenville	Mohawk Park	-	70.6	-
P027	Bensenville	Poplar Park	69.4	-	-
P066	Des Plaines	Orchard Place Elementary School Park	67.4	-	-
P089	Elk Grove Village	Pocket Park #5	65.0	-	-
P132	Harwood Heights	Norridge Rec Center-East	65.4	-	2
P143	Itasca	Schiller Park	65.4	-	-
P152	Norridge	Norridge Park	66.6	-	-
P162	Park Ridge	Brickton Park	65.1	-	-
P172	Park Ridge	Southwest Park	65.1	-	-
P177	Rosemont	Donald E. Stephens Athletic Complex	69.3	-	-
P180	Rosemont	Dunne Park	67.8	-	-
P181	Rosemont	Margaret J. Lange Park	67.5	-	-
P182	Rosemont	Monument Park	65.1	-	-
P183	Rosemont	Parkway Bank Park Entertainment District	65.5	-	-
P188	Rosemont	The Dome at the Parkway Bank Sports Complex	68.1	-	2
P189	Rosemont	Westin Park	67.7	-	-
P190	Schiller Park	"Bark" Park	67.7	-	-
P193	Schiller Park	Fairview Park	66.2	-	-
P195	Schiller Park	North Village Park	-	71.3	
P200	Schiller Park	Dooley Memorial Park	65.3	-	-
P205	Wood Dale	Central Park	69.3	-	-
P212	Wood Dale	Mohawk Manor Park	65.7	-	-
P213	Wood Dale	Veteran's Memorial Park	65.9	-	-
P216	Wood Dale	Wood Dale Water Park	67.2	-	-
Historic Properties					
HN08	Chicago	Rest Haven Cemetery	68.7	-	-
HN09	Chicago	Old Control Tower	67.8	-	-

			DNL (dB) in DNL Contour Band		
Map ID	**Municipality**	**Name**	**65 - 70**	**70 - 75**	**Note**
HN10	Chicago	United Terminal 1	69.1	-	-
HN11	Chicago	Rotunda	68.0	-	-
LS246	Schiller Park	20 Corner Store	-	71.5	-
Notes: 1) Sound-insulated 2) No outdoor use					
Source: HMMH, 2021					



Source: HMMH 2018, USCB 2016, USCB 2010, Illinois Geospatial Data Clearinghouse, CMAP Data Hub, ESRI

F.5.10 Comparison to the Interim No Action

F.5.10.1 DNL Contours

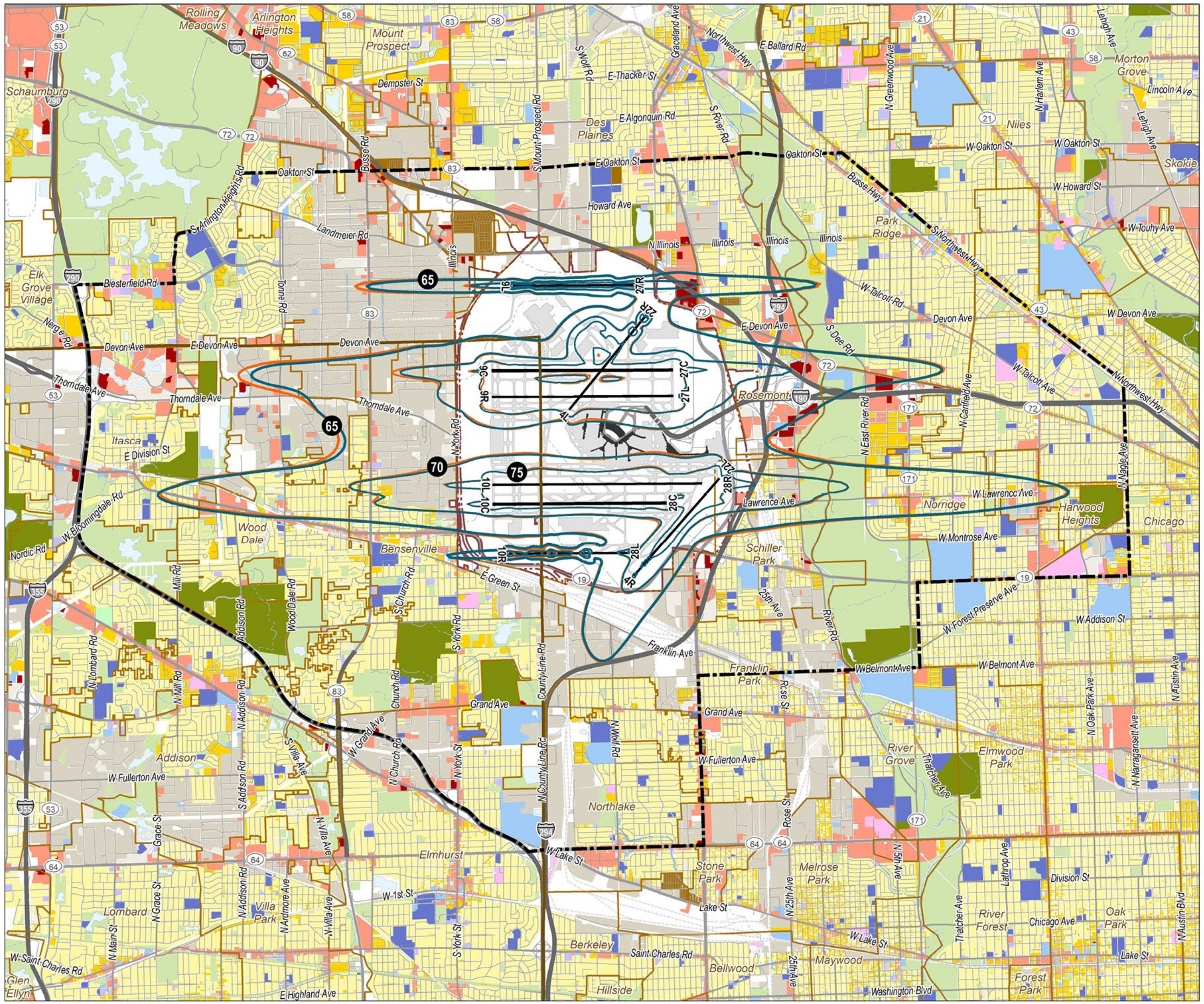
Exhibit F-15 and **Exhibit F-16** provide a comparison between the Interim No Action and the Interim Proposed Action DNL contours for this EA. In addition, the FAA identified changes in noise exposure levels based on grid point modeling. **Exhibit F-16** shows a small area of significant and reportable changes in noise between W. Green St. and the airport boundary in Bensenville. The color-coded dots mark areas of significant noise change within the Interim Proposed Action 65 DNL contour and a small area of three dB reportable noise change between the 60 and 65 DNL relative to the Interim No Action. The areas of significant noise change do not overlay any non-compatible land use, therefore there are no significant noise impacts for the Interim Proposed Action. The reportable noise change area overlays some residential land use just west of South Addison Street in Bensenville. The grid point analysis does not show any areas with a five dB or greater reportable change between the 45 and 60 DNL due to the Proposed Action.

The FAA needs to retain the offset air traffic approach capabilities due to the current requirements for simultaneous independent arrivals while allowing for increased efficiency, especially in poor weather during east flow operations (for the Runway 10R offset). This enables O'Hare to achieve its design operating capability, which results in greater distribution of arrivals to the six east-west runway ends in the Interim Proposed Action. When compared to the Interim No Action, arrivals to Runway 9L and Runway 9C decrease while arrivals to Runway 10C and Runway 10R increase. These changes in runway use result in smaller DNL 65 dB contours west of Runway 9L and Runway 9C and a larger DNL 65 dB contour west of Runway 10C and Runway 10R. The change in noise to the west of Runway 10R results in the small area of significant noise changes off airport property. However, no noise-sensitive land use would be impacted. A small area of reportable noise change between the 60 and 65 DNL in Bensenville is shown in **Exhibit F-16**.

Table F-41 also provides the changes in land use acreages and numbers of people and housing units exposed to a DNL of at least 65 dB for the Interim Condition. The Interim Proposed Action would result in:

- A net decrease of 170.5 off-airport acres exposed to a DNL of at least 65 dB,
- One less noise-sensitive facility exposed to a DNL of at least 65 dB, and
- A net reduction of 480 people in 203 housing units exposed to a DNL of at least 65 dB.

As shown by **Exhibit F-15**, and more clearly in **Exhibit F-16**, the Interim Proposed Action would result in no people or housing units significantly impacted by aircraft noise (i.e., the colored dots do not overlap any residential (yellow-shaded) areas). However, the Interim Proposed Action would introduce (newly include) 253 people in 82 housing units to DNL of at least 65 dB and would reduce the exposure of (newly exclude) 734 people in 285 housing units to DNL less than 65 dB.



Chicago O'Hare International Airport

Terminal Area Plan and Air Traffic Procedures Environmental Assessment

- Interim Proposed Action DNL Contours (65, 70, 75 dB)
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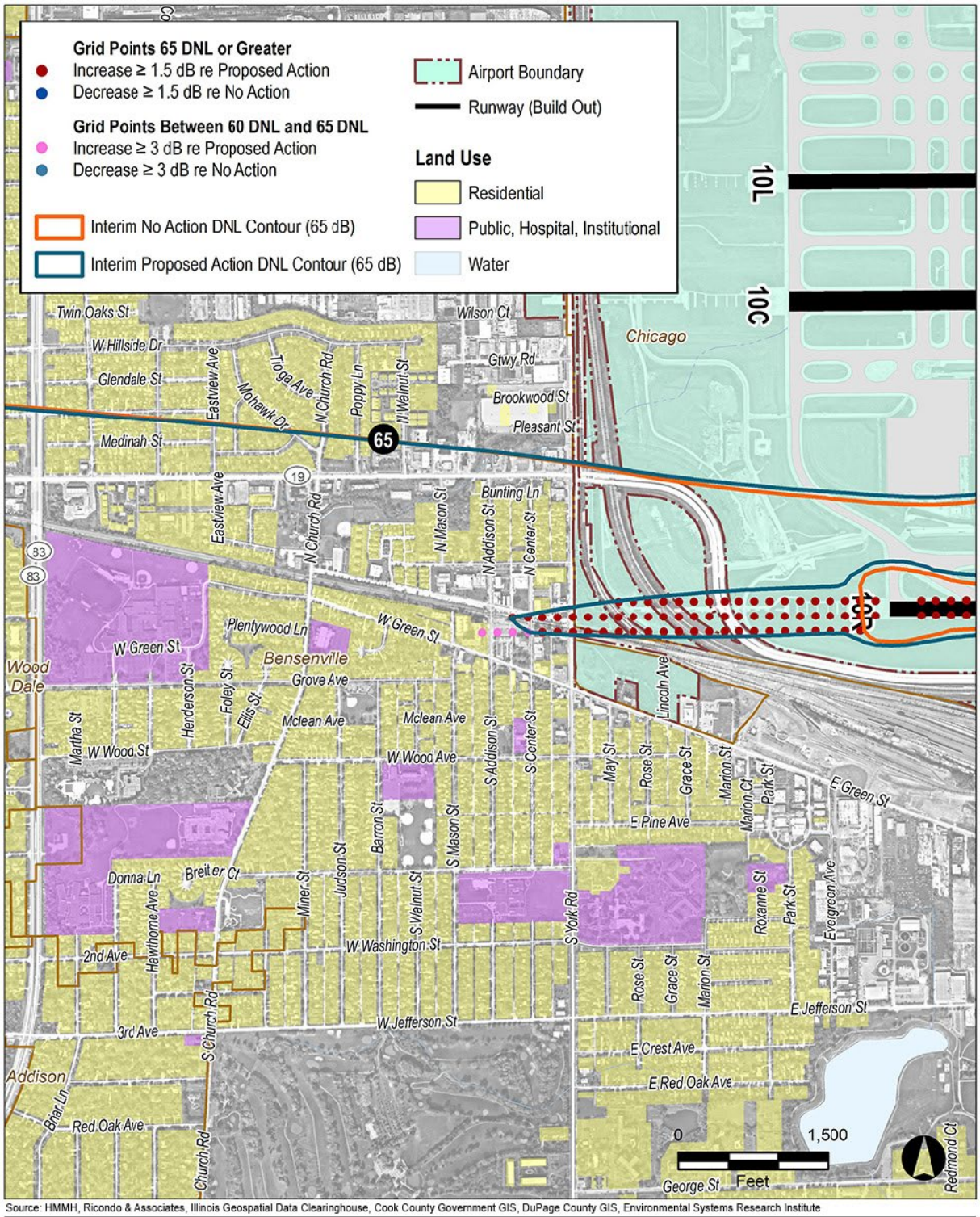
- Mobile Home
- Transient Lodging
- School / Education
- Place of Worship
- Hospital / Medical
- Water / Stream
- Public Use
- Commercial
- Industrial
- Agriculture
- Open Space Recreation
- Golf
- Vacant / Undefined

0 1 2 Miles

Comparison of Noise Exposure Contours for Interim No Action and Interim Proposed Action

Exhibit F-15



Source: HMMH, Ricondo & Associates, Illinois Geospatial Data Clearinghouse, Cook County Government GIS, DuPage County GIS, Environmental Systems Research Institute

Chicago O'Hare International Airport

Terminal Area Plan and Air Traffic Procedures Environmental Assessment

Interim No Action and Interim Proposed Action DNL Change

▶ Exhibit F-16

TABLE F-41
NOISE EXPOSURE CHANGE FOR INTERIM CONDITION

		Interim No Action	Interim Proposed Action	Change
Land Use (Acres)	**Compatibility**	**65+**	**65+**	**Total**
Single-Family Residential	Non-compatible	1,098.0	1,083.7	-14.3
Multi-Family Residential		115.4	113.7	-1.7
Transient Lodging (residential)		65.7	63.9	-1.8
Mobile Home		-	-	-
School/Education		19.7	19.2	-0.5
Commercial	Compatible	319.1	317.1	-2.0
Industrial, Manufacturing, and Production		3,473.0	3,352.8	-120.2
Recreational		566.3	546.0	-20.3
Public Use (excluding School/Education)[1]		93.5	92.4	-1.1
Undeveloped		193.8	185.4	-8.4
Airport		5,808.1	5,844.7	36.6
Water		19.8	19.6	-0.2
Subtotal Non-compatible Area (acres)		1,298.8	1,280.5	-18.3
Subtotal Compatible Area (acres)		10,473.6	10,358.0	-115.6
Total Area (acres)		**11,772.4**	**11,638.5**	**-133.9**
Off-airport Total Area (acres)		**5,964.3**	**5,793.8**	**-170.5**
Noise-Sensitive Facilities (count)				
Universities		1	1	0
Schools		5	5	0
Sound- Insulated Schools (Incl above)		*5*	*5*	*0*
Libraries		1	1	0
Hospitals		-	-	-
Nursing Homes		1	1	0
Places of Worship		7	7	0
Parks and 4(f) Lands		28	27	-1
Historic Properties		5	5	0
Total		**48**	**47**	**-1**
Population and Housing (count)				
Population		23,415	22,935	-480
Housing Units		9,359	9,156	-203
Non-mitigated single-family housing units (Included above)[2]		*2,746*	*2,655*	*-91*
Non-mitigated multi-family housing units (Included above)[2]		*2,046*	*1,968*	*-78*
Sound insulated single-family housing units (included above)		*4,551*	*4,517*	*-34*
Sound insulated multi-family housing units (included above)		*16*	*16*	*0*

Note 1: For the purposes of this document, Public Use (excluding School/Education) land use is considered compatible.
Note 2: The majority of the non-mitigated housing units for both Interim No Action (88.8%) and Interim Proposed Action (88.8%) are not eligible under the existing ORD RSIP because these units are outside the current RSIP DNL 65 dB contour.

Sources: ORD Residential Sound Insulation Program, January 2021 database: City of Chicago
2020 U.S. Census Bureau Census Block Population Data
Interm No Action and Proposed Action Noise Contours, Land Use, Noise Sensitive Facilities, Population and Housing data: HMMH Analysis, October 2021

F.5.10.2 Noise-Sensitive Facilities

As shown in **Table F-30** (in **Section F.4.9.2**) and **Table F-40**, 47 of the 48 noise sensitive facilities[5] that would be exposed to DNL of at least 65 dB in the Interim No Action would also be exposed to DNL of at least 65 dB under the Interim Proposed Action. No studied facility would be significantly impacted, significantly relieved, newly included, or have a reportable change in noise exposure under the Interim Proposed Action. Only the Wood Dale Recreation Complex (ID P215) would be newly excluded from the inventory of sites exposed to DNL of at least 65 dB under the Interim Proposed Action.

F.6 DATA DEVELOPMENT AND NOISE EXPOSURE FOR THE BUILD OUT NO ACTION

The Build Out Condition of the No Action Alternative is abbreviated herein as the "Build Out No Action."

Sections F.6.1 through **F.6.8** address the data input to AEDT for the aircraft noise modeling of the Build Out No Action. **Section F.6.9** presents the resultant Build Out No Action noise exposure.

F.6.1 Airfield Layout

The runway layout for the Build Out No Action is the same as that described for the Interim No Action (**Section F.4.1**). The Build Out No Action would have the same terminal layout as the the Interim No Action.

F.6.2 Meteorological and Terrain Data

The meteorological and terrain data for the Build Out No Action is the same as that described for the Interim Condition (**Section F.4.2**) and the Existing Condition (**Section F.4.3.2**).

F.6.3 Aircraft Noise and Performance Data

The aircraft noise and performance data for the Build Out Condition (AEDT standard data except the approved non-standard 737-800) is the same as that described for the Interim Condition (**Section F.4.3**) and the Existing Condition (**Section F.3.3**).

F.6.4 Aircraft Flight Operations

The CDA's forecast for the EA calls for 1,013,856 annual flight operations for the Build Out Condition, which equates to 2,778 AAD flight operations. Compared to the Interim Conditions, the Build Out Condition forecast includes additional retirements of older aircraft types such as 717200, MD11, and the 757300. Details on the forecast can be found in **Appendix C**. For purposes of studying airfield and airspace capacity, CDA modeled O'Hare with the TAAM which outputs flight operations from the forecast's DDFS. The DDFS, totaling 2,993 flight operations for the Build Out Condition, represents a single day flight schedule during the peak month of the year. Dividing the AAD total (2,778) by the DDFS total (2,993) yields a scale factor of 0.93. As some aircraft could remain at O'Hare overnight, the DDFS can be unbalanced, meaning that total arrivals do not equal total departures. For the purposes of the EA, the operations were balanced by summing the arrivals and departures then dividing by two for each AEDT aircraft type. Finally, the DDFS operations were multiplied by the scale factor to prepare the data for AEDT input.

[5] Noise modeling results for the Wood Dale Recreation Complex (ID P215) show 65.1 DNL under the Interim No Action and 64.9 dB under the Interim Proposed Action.

After assigning each AEDT aircraft type to a body category using **Table F-4**, the resultant annual flight operations by body category are shown in **Table F-42**. Widebody Jet operations would account for approximately 10 percent of the total operations. Approximately 90 percent of the total operations are expected to be conducted by Other Jet operations. Non-jet operations would be less than one percent of the total operations. Overall, nighttime operations at O'Hare would comprise nearly 12 percent of the total operations for the Build Out No Action.

TABLE F-42
ANNUAL FLIGHT OPERATIONS FOR THE BUILD OUT NO ACTION

Body Category	Arrivals			Departures			Total			Total Percent
	Day	Night	Total	Day	Night	Total	Day	Night	Total	
Widebody Jet	36,469	13,667	50,136	36,525	13,611	50,136	72,994	27,278	100,272	9.9
Other Jet	396,228	57,177	453,405	417,341	36,064	453,405	813,569	93,241	906,810	89.4
Non-jet	3,048	339	3,387	3,377	10	3,387	6,425	349	6,774	0.7
Total	435,745	71,183	506,928	457,243	49,685	506,928	892,988	120,868	1,013,856	100.0
Percentage	43%	7%	50%	45%	5%	50%	88%	12%	100%	

Source: CDA, 2020; HMMH analysis, 2021

Table F-43 details the Build Out No Action's 2,778 AAD flight operations by aircraft type. Rounding to two decimal places caused the total AAD count to differ from 2,778 by less than one AAD operation. The Build Out Condition forecast has five fewer aircraft types than the Interim Condition. The two MD11 Widebody aircraft and three aircraft in the Other Jet category (the 717200, 757300, and EMB145) are not included in the Build Out Condition forecast. There are also some significant shifts in fleet mix percentages. For example, the Widebody Jet 7878R would increase by about 30 AAD operations (a 46 percent increase) from the Interim Condition to the Build Out Condition. In the Other Jet category, 7378MAX, A321-232, and EMB170 aircraft operations would more than double, while U_737800, A320-232, and CL600 would each decrease by about 30 percent.

TABLE F-43
AAD FLIGHT OPERATIONS BY AIRCRAFT TYPE FOR THE BUILD OUT NO ACTION

Aircraft ID (AEDT)	Arrivals			Departures			Total
	Day	Night	Total	Day	Night	Total	
Widebody Jet							
747400	3.71	6.50	10.21	6.50	3.71	10.21	20.42
7478	2.78	5.57	8.35	1.86	6.50	8.36	16.71
767300pagepage	3.35	4.08	7.43	1.86	5.57	7.43	14.86
777200	2.78	1.86	4.64	2.79	1.86	4.65	9.29
777300	2.52	5.83	8.35	6.50	1.86	8.36	16.71
7773ER	10.60	0.54	11.14	8.32	2.82	11.14	22.28
7878R	39.01	8.32	47.33	40.53	6.80	47.33	94.66
A300-622R	0.93	1.85	2.78	0.13	2.65	2.78	5.56

	Arrivals			Departures			
Aircraft ID (AEDT)	**Day**	**Night**	**Total**	**Day**	**Night**	**Total**	**Total**
A300B4-203	0.93	-	0.93	-	0.93	0.93	1.86
A330-301	0.93	-	0.93	0.93	-	0.93	1.86
A330-343	29.59	2.89	32.48	28.77	3.71	32.48	64.96
A380-841	1.85	-	1.85	1.00	0.86	1.86	3.71
A380-861	0.93	-	0.93	0.90	0.03	0.93	1.86
Widebody Jet Subtotals	**99.91**	**37.44**	**137.35**	**100.09**	**37.30**	**137.39**	**274.74**
Other Jet							
737700	29.76	3.19	32.95	28.75	4.20	32.95	65.90
U_737800	130.61	33.19	163.80	144.73	19.07	163.80	327.60
7378MAX	105.05	19.77	124.82	111.92	12.91	124.83	249.65
757RR	0.93	2.78	3.71	0.96	2.75	3.71	7.42
A319-131	46.09	4.03	50.12	46.20	3.92	50.12	100.24
A320-211	11.09	1.90	12.99	9.20	3.79	12.99	25.98
A320-232	31.14	8.30	39.44	36.84	2.61	39.45	78.89
A321-232	116.51	25.02	141.53	124.72	16.81	141.53	283.06
CRJ9-ER	231.62	26.38	258.00	246.54	11.46	258.00	516.00
EMB170	54.02	4.91	58.93	57.10	1.83	58.93	117.86
EMB175	158.84	12.85	171.69	161.41	10.28	171.69	343.38
CL600	74.75	6.46	81.21	79.16	2.04	81.20	162.41
CNA55B	-	0.93	0.93	0.93	-	0.93	1.86
CNA560XL	0.93	-	0.93	0.93	-	0.93	1.86
CNA680	1.86	-	1.86	1.86	-	1.86	3.72
CNA750	0.93	-	0.93	0.93	-	0.93	1.86
EMB14L	90.04	6.94	96.98	89.84	7.14	96.98	193.96
LEAR35	1.39	-	1.39	1.39	-	1.39	2.78
Other Jet Subtotals	**1,085.56**	**156.65**	**1,242.21**	**1,143.41**	**98.81**	**1,242.22**	**2,484.43**
Non-jet							
BEC58P	3.71	-	3.71	3.71	-	3.71	7.42
CNA208	4.64	0.93	5.57	5.54	0.03	5.57	11.14
Non-jet Subtotals	**8.35**	**0.93**	**9.28**	**9.25**	**0.03**	**9.28**	**18.56**
Grand Totals	**1,193.82**	**195.02**	**1,388.84**	**1,252.75**	**136.14**	**1,388.89**	**2,777.73**
Source: CDA, 2020; HMMH analysis, 2021							

F.6.5 Runway Use

The runway use for the Build Out Condition was derived from CDA's TAAM simulation data. As it is impractical to model all possible runway configurations, CDA's TAAM modeling was limited to the most prevalent configurations, which cover over 98 percent of possible operating conditions. CDA ran six operational experiments in TAAM for the Build Out No Action and six experiments for the Build Out Proposed Action. These experiments are listed in **Table F-44**, including the resulting percent contribution (weighting) to the total yearly operations for each configuration. Using the weightings, the CDA developed

annualized runway usage rates for the EA's noise and air quality modeling. On an annual basis for the Build Out No Action, 56.5 percent of the flight operations would be in west flow, and 43.5 percent would be in east flow. The configuration weightings for the Build Out No Action are the same as the Interim Condition. The Build Out Proposed Action uses different logic to assign flow operations during low-demand situations, resulting in different weightings and greater use of east flow than the Build Out No Action.

TABLE F-44
ANNUALIZED OPERATING CONFIGURATION WEIGHTINGS FOR THE BUILD OUT CONDITION

Operating Configuration	Weather Condition	Experiment Number (No Action)	Annualized Weightings (No Action)	Experiment Number (Proposed Action)	Annualized Weightings (Proposed Action)	Difference between No Action and Proposed Action
VFR West With LAHSO	VFR	911	37.7%	931	37.2%	-0.5%
VFR West Without LAHSO	VFR	912	14.5%	932	14.2%	-0.3%
IFR West Without LAHSO	IFR	913	4.3%	933	2.2%	-2.1%
VFR East With LAHSO	VFR	914	24.3%	934	24.6%	0.3%
VFR East Without LAHSO	VFR	915	16.1%	935	16.6%	0.5%
IFR East Without LAHSO	IFR	916	3.1%	936	5.2%	2.1%
Total	-	-	100.0%	-	100.0%	-

VFR = Visual Flight Rules; IFR = Instrument Flight Rules
LAHSO = Land and Hold Short

Source: CDA, 2020

The annualized runway use TAAM simulation results for the Build Out No Action are presented in **Table F-45**. The TAAM modeling assigned no arrivals to Runway 4L and no departures from Runway 22R since Runway 4L/22R is uni-directional (arrivals are not allowed to Runway 4L and departures are not allowed from Runway 22R). Due to simulating only the primary operational configurations, the TAAM modeling resulted in several runways showing no use. The blank cells in **Table F-45** indicate the so-called "zero runway use" runways for each combination of runway, type of operation, and period. For example, the TAAM modeling did not predict any departures from Runway 9L during the day or night. While departures do not normally occur on that runway, the runway could be used for departures.

TABLE F-45
TAAM-OUTPUT RUNWAY USE PERCENTAGES FOR THE BUILD OUT NO ACTION

Runway	Arrival		Departure	
	Day (see notes 1 and 2)	Night (see notes 1 and 2)	Day (see notes 1 and 2)	Night (see notes 1 and 2)
9L	16	4.9	-	-
9C	11.9	8.1	-	1.4
9R	-	-	1.0	1.4
9RX[3]	n/a	n/a	20.2	27.1
10L	-	19.4	0.1	5.3
10LX[3]	n/a	n/a	21.9	9.2
10C	14.9	10.8	0.1	0.3
10R	0.7	0.4	-	-
4L	n/a	n/a	-	-
4R	-	-	-	-
27R	21.5	7.3	-	-
27C	16.4	12.2	-	2.3
27L	-	-	1.2	1.8
27LX[3]	n/a	n/a	15.8	15.4
28R	-	25.6	0.2	5.9
28RX[3]	n/a	n/a	21.2	20.3
28C	18.7	11.3	0.1	0.4
28L	-	-	-	-
22L	-	-	18.1	9.3
22R	-	-	n/a	n/a

Notes:
1) Each column sums vertically to 100±0.1%.
2) Daytime is defined as 7:00:00 a.m. to 9:59:59 p.m.; nighttime is defined as 10:00:00 p.m. to 6:59:59 a.m. (local time).
3) The "X" notation means intersection departures from that runway; this runway would not be applicable to arrival operations.

Source: CDA, 2020

It is anticipated that all available runways[6] would, to some extent, be used for arrival and departure operations over the course of a year to allow for safe and efficient operations during unforeseen circumstances such as runway maintenance closures or adverse weather. Therefore, the TAAM results were adjusted to allocate at least 0.1 percent of the flights to the runways where operations would be expected but that TAAM modeling did not include/assign operations. In general, the adjustment methodology was to shift small percentages of operations from one runway to another by selecting the nearest runway with the same operation type and flow so that flights would remain over similar areas to the greatest possible extent. For example, Runway 9R departures could be shifted to nearby Runway 9L because both runways are in the same (east) flow and on the same side of the airfield.

[6] With the exception of Runway 4L arrivals and Runway 22R departures.

Except for nighttime departures from Runways 10C, 28C, and 4L, the value of 0.1 percent was chosen as the runway use percentage[7] because a) it was the minimum non-zero runway use produced by the TAAM modeling and b) it was the average of Existing Condition runway use percentages less than or equal to 1.0 percent.[8]

Runways 10C, 28C, and 4L have Existing Condition nighttime departure use greater than one percent but no use assigned by the TAAM modeling. For each of these runways, the following logic was applied to derive a reasonable percentage of night departure use:

- For Runway 10C, the Existing Condition usage is 1.8 percent on Runway 10C and a combined 17.6 percent for Runways 10L and 10LX. The TAAM modeling assigned a combined 14.5 percent to Runways 10L and 10LX for the Build Out No Action. From 17.6 to 14.5 is a 17.6 percent reduction, so the 1.8 percent for Runway 10C was correspondingly reduced 17.6 percent. Therefore, the Runway 10C night departure percentage was set to 1.5 percent for the Build Out No Action.
- For Runway 28C, the Existing Condition usage is 3.8 percent on Runway 28C and a combined 39.0 percent for Runways 28R and 28RX. The TAAM modeling assigned a combined 26.2 percent to Runways 28R and 28RX for the Build Out No Action. From 39.0 to 26.2 is a 32.8 percent reduction, so the 3.8 percent for Runway 28C was correspondingly reduced 32.8 percent. Therefore, the Runway 28C night departure percentage was set to 2.6 percent for the Build Out No Action.
- For Runway 4L, the Existing Condition usage is 2.4 percent on Runway 4L and a combined 20.0 percent for Runways 9R and 9RX. The TAAM modeling assigned a combined 28.5 percent to Runways 9R and 9RX for the Build Out No Action. From 20.0 to 28.5 is a 42.5 percent increase, so the 2.4 percent for Runway 4L was correspondingly increased 42.5 percent. Therefore, the Runway 4L night departure percentage was set to 3.4 percent for the Build Out No Action.

The process had two additional customizations: 1) if departures needed to be shifted from Runway 10L/28R or 9R/27L, only departures from their runway intersections were moved; non-intersection departures were not adjusted. 2) Widebody Jet and Non-jet departures were excluded from being shifted to Runways 9L/27R and 10R/28L because it would be unlikely for Widebody Jet and Non-jet aircraft to use Runways 9L/27R or 10R/28L.

The resultant runway use percentages for the Build Out No Action are shown in **Tables F-46** through **F-48**, for arrivals, departures, and overall flight operations, respectively, in terms of AAD operations and EDO. At nearly 13 percent of total operations, Runway 28R would be the most used runway at O'Hare, followed by Runways 10L and 9R, with 12 and 11 percent of total operations respectively. During the nighttime hours, Runway 28R would be the most used runway at 25 percent, followed by Runway 10L with 17 percent.

[7] In comparison, the 2015 EIS Re-Evaluation and the IFQ Re-Evaluation chose 0.5 percent and 0.2 percent as their adjustment values, respectively.

[8] For the purposes of averaging, the Existing Condition runway use percentages shown as "<0.05" percent were assumed to be 0.025 percent.

TABLE F-46
RUNWAY USE PERCENTAGES FOR ARRIVALS FOR THE BUILD OUT NO ACTION

		Daytime (see notes 1 and 2)				Nighttime (see notes 1 and 2)				Overall (see notes 1, 2, and 3)	
Flow	Runway ID (d)	WBJ	OJ	NJ	Overall	WBJ	OJ	NJ	Overall	AAD	EDO
E	9L	-	17.5	14.5	16.0	-	5.9	43.5	4.9	14.5	9.1
E	9C	33.9	9.7	12.0	11.8	10.8	7.3	-	8.0	11.2	9.4
E	9R	0.3	0.1	0.1	0.1	0.1	0.1	-	0.1	0.1	0.1
E	10L	0.1	0.1	0.1	0.1	21.7	18.8	-	19.3	2.8	12.0
E	10C	8.7	15.2	16.3	14.7	10.9	10.8	-	10.8	14.1	12.3
E	10R	0.1	0.7	0.3	0.7	-	0.6	-	0.4	0.6	0.5
E	4L	-	-	-	-	-	-	-	-	-	-
E	4R	0.1	0.1	0.1	0.1	0.1	0.1	-	0.1	0.1	0.1
W	27R	-	23.4	21.1	21.4	-	8.7	56.5	7.3	19.4	12.6
W	27C	20.8	15.9	10.1	16.3	13.5	11.8	-	12.0	15.7	13.6
W	27L	0.1	0.1	0.1	0.1	0.1	0.1	-	0.1	0.1	0.1
W	28R	0.2	0.1	0.1	0.1	27.1	25.1	-	25.4	3.6	15.8
W	28C	35.6	16.8	24.9	18.4	15.4	10.4	-	11.3	17.4	14.0
W	28L	-	0.1	-	0.1	-	0.1	-	0.1	0.1	0.1
W	22L	0.2	0.1	0.1	0.1	0.1	0.1	-	0.1	0.1	0.1
W	22R	-	0.1	0.1	0.1	0.1	0.1	-	0.1	0.1	0.1

Notes:
1) Each column sums vertically to 100±0.2%.
2) Daytime is defined as 7:00:00 a.m. to 9:59:59 p.m.; nighttime is defined as 10:00:00 p.m. to 6:59:59 a.m. (local time).
3) AAD pertains to annual average daily flight operations; EDO pertains to equivalent daily flight operations, i.e., daytime plus 10 times nighttime.
WBJ = Widebody Jet; OJ = Other Jet; NJ = Non-jet

Source: HMMH analysis, 2020

TABLE F-47
RUNWAY USE PERCENTAGES FOR DEPARTURES FOR THE BUILD OUT NO ACTION

		Daytime (see notes 1 and 2)				Nighttime (see notes 1 and 2)				Overall (see notes 1, 2, and 3)	
Flow	Runway ID (d)	WBJ	OJ	NJ	Overall	WBJ	OJ	NJ	Overall	AAD	EDO
E	9L	-	0.1	-	0.1	-	0.1	-	0.1	0.1	0.1
E	9C	0.3	0.1	0.1	0.1	5.1	-	-	1.4	0.2	0.8
E	9R	12.4	<0.05	-	1.0	5.2	-	-	1.4	1.0	1.2
E	9RX[4]	18.2	20.0	25.6	19.9	11.6	28.2	87.4	23.6	20.3	21.9
E	10L	2.0	<0.05	-	0.2	17.3	0.8	-	5.3	0.7	2.8
E	10LX[4]	9.4	22.8	17.4	21.7	2.0	10.0	-	7.8	20.3	14.5

		Daytime (see notes 1 and 2)				Nighttime (see notes 1 and 2)				Overall (see notes 1, 2, and 3)	
Flow	Runway ID (d)	WBJ	OJ	NJ	Overall	WBJ	OJ	NJ	Overall	AAD	EDO
E	10C	0.8	-	-	0.1	1.4	1.5	-	1.5	0.2	0.8
E	10R	-	0.1	-	0.1	-	0.1	-	0.1	0.1	0.1
E	4L	0.1	0.1	0.1	0.1	1.7	4.1	12.6	3.4	0.4	1.8
E	4R	<0.05	0.1	0.1	0.1	<0.05	0.1	-	0.1	0.1	0.1
W	27R	-	0.1	-	0.1	-	0.1	-	0.1	0.1	0.1
W	27C	0.6	0.1	0.1	0.1	8.4	-	-	2.3	0.4	1.3
W	27L	14.9	<0.05	-	1.2	6.6	-	-	1.8	1.3	1.5
W	27LX[4]	16.5	15.5	11.3	15.5	11.6	16.7	-	15.3	15.5	15.4
W	28R	3.2	<0.05	-	0.3	20.0	0.5	-	5.9	0.8	3.2
W	28RX[4]	20.4	20.9	44.9	21.1	7.1	22.1	-	18.0	20.8	19.5
W	28C	1.1	-	-	0.1	2.2	2.7	-	2.5	0.3	1.4
W	28L	-	0.1	-	0.1	-	0.1	-	0.1	0.1	0.1
W	22L	<0.05	19.8	0.4	18.1	-	12.8	-	9.3	17.2	13.5
W	22R	-	-	-	-	-	-	-	-	-	-

Notes:
1) Each column sums vertically to 100±0.1%.
2) Daytime is defined as 7:00:00 a.m. to 9:59:59 p.m.; nighttime is defined as 10:00:00 p.m. to 6:59:59 a.m. (local time).
3) AAD pertains to annual average daily flight operations; EDO pertains to equivalent daily flight operations, i.e., daytime plus 10 times nighttime.
4) The "X" notation means intersection departures from that runway
WBJ = Widebody Jet; OJ = Other Jet; NJ = Non-jet

Source: HMMH analysis, 2020

TABLE F-48
OVERALL RUNWAY USE PERCENTAGES FOR THE BUILD OUT NO ACTION

		Daytime (see notes 1 and 2)				Nighttime (see notes 1 and 2)				Overall (see notes 1, 2, and 3)	
Flow	Runway ID	WBJ	OJ	NJ	Overall	WBJ	OJ	NJ	Overall	AAD	EDO
E	9L	-	8.6	6.9	7.9	-	3.7	42.2	2.9	7.3	5.0
E	9C	17.1	4.8	5.8	5.8	8.0	4.5	-	5.3	5.7	5.5
E	9R	15.5	10.3	13.5	10.8	8.4	11.0	2.6	10.4	10.7	10.5
E	10L	5.7	11.8	9.2	11.2	20.5	15.7	-	16.7	11.9	14.4
E	10C	4.8	7.4	7.7	7.2	6.2	7.2	-	7.0	7.2	7.1
E	10R	<0.05	0.4	0.2	0.4	-	0.4	-	0.3	0.4	0.3
E	4L	<0.05	0.1	0.1	0.1	0.8	1.6	0.4	1.4	0.2	0.8
E	4R	0.1	0.1	0.1	0.1	0.1	0.1	-	0.1	0.1	0.1
W	27R	-	11.4	10.0	10.5	-	5.4	54.8	4.3	9.8	7.0

		Daytime (see notes 1 and 2)				Nighttime (see notes 1 and 2)				Overall (see notes 1, 2, and 3)	
Flow	**Runway ID**	**WBJ**	**OJ**	**NJ**	**Overall**	**WBJ**	**OJ**	**NJ**	**Overall**	**AAD**	**EDO**
W	27C	10.7	7.8	4.8	8.0	11.0	7.2	-	8.0	8.0	8.0
W	27L	15.8	8.0	5.9	8.6	9.1	6.5	-	7.1	8.4	7.7
W	28R	11.9	10.8	23.7	11.0	27.1	24.1	-	24.7	12.6	18.9
W	28C	18.3	8.2	11.8	9.0	8.8	7.4	-	7.7	8.9	8.3
W	28L	-	0.1	-	0.1	-	0.1	-	0.1	0.1	0.1
W	22L	0.1	10.2	0.3	9.3	0.1	5.0	-	3.9	8.7	6.2
W	22R	-	0.1	<0.05	<0.05	0.1	0.1	-	0.1	<0.05	0.1

Notes:
1) Each column sums vertically to 100±0.2%.
2) Daytime is defined as 7:00:00 a.m. to 9:59:59 p.m.; nighttime is defined as 10:00:00 p.m. to 6:59:59 a.m. (local time).
3) AAD pertains to annual average daily flight operations; EDO pertains to equivalent daily flight operations, i.e., daytime plus 10 times nighttime.
4) The departure operations indicated for runways "9RX", "10LX", "27LX" and "28RX" are included in this table in the overall use of Runways 9R, 10L 27L and 28R, respectively.
WBJ = Widebody Jet; OJ = Other Jet; NJ = Non-jet

Source: HMMH analysis, 2020

F.6.6 Modeled Flight Tracks and Operational Assignments

The modeled flight tracks and track use for the Build Out No Action are similar to the Interim No Action. Both No Action Alternatives have final approach segments of arrival tracks to Runways 10R and 28L coinciding with their extended runway centerlines and both No Action southside downwind segments of arrival tracks to all west side runway ends and the downwind to Runway 28L would be parallel to the final approach segments (i.e., no offset arrival procedures). **Table F-49** lists the counts of flight tracks by type of operation resulting from the TAAM Build Out No Action simulation. 1,538 unique backbone tracks were developed, each having up to six sub-tracks, to represent the 1,013,856 annual flight operations at O'Hare for the Build Out Condition. Of these track bundles, 831 were repeated for the purpose of separately modeling with ACC. Altitude data of the radar tracks in each bundle was used to determine the average altitudes. **Section F.4.7** contains more information regarding ACC.

TABLE F-49
COUNTS OF FLIGHT TRACKS BY TYPE OF OPERATION FOR THE BUILD OUT NO ACTION

Track Set	Aircraft Category	Traffic Flow	Arrival Track Bundles (see note 1)			Departure Track Bundles (see note 1)			Total Track Bundles (see note 1)		
			Day	Night	Total	Day	Night	Total	Day	Night	Total
Regular Tracks (see note 1)	WBJ	East	79	74	153	63	82	145	142	156	298
		West	66	69	135	88	53	141	154	122	276
	OJ	East	116	115	231	72	89	161	188	204	392
		West	113	111	224	86	102	188	199	213	412
	NJ	East	24	6	30	35	32	67	59	38	97
		West	18	2	20	43	0	43	61	2	63
	Subtotals by Traffic Flow										
	East		219	195	414	170	203	373	389	398	787
	West		197	182	379	217	155	372	414	337	751
	Subtotals by Aircraft Category										
	WBJ		145	143	288	151	135	286	296	278	574
	OJ		229	226	455	158	191	349	387	417	804
	NJ		42	8	50	78	32	110	120	40	160
	Total Regular Tracks		**416**	**377**	**793**	**387**	**358**	**745**	**803**	**735**	**1,538**
Flight Tracks duplicated for Altitude Control Code Modeling (see note 2)	WBJ		62	84	146	102	81	183	164	165	329
	OJ		136	105	241	165	81	246	301	186	487
	NJ		9	0	9	6	0	6	15	0	15
	Total Duplicate Tracks		**207**	**189**	**396**	**273**	**162**	**435**	**480**	**351**	**831**
Total Flight Track Bundles (see note 2)	WBJ		207	227	434	253	216	469	460	443	903
	OJ		365	331	696	323	272	595	688	603	1,291
	NJ		51	8	59	84	32	116	135	40	175
	Grand Total		**623**	**566**	**1,189**	**660**	**520**	**1,180**	**1,283**	**1,086**	**2,369**

Notes:
1) Numbers indicate 'backbone' tracks only; each backbone track may have up to six associated sub-tracks to model dispersion around the backbone; "regular" flight tracks section excludes duplicate tracks for altitude control code modeling.
2) Numbers indicate duplicated tracks with ACC added to account for flight profile level off or hold downs.
WBJ = Widebody Jet; OJ = Other Jet; NJ = Non-jet

Source: CDA, 2020; HMMH analysis, 2021

Attachment F-3 contains the flight track use percentages (informed by the TAAM modeling) and modeled flight track depictions for arrivals and departures by runway end for each flow.

F.6.7 Flight Profiles

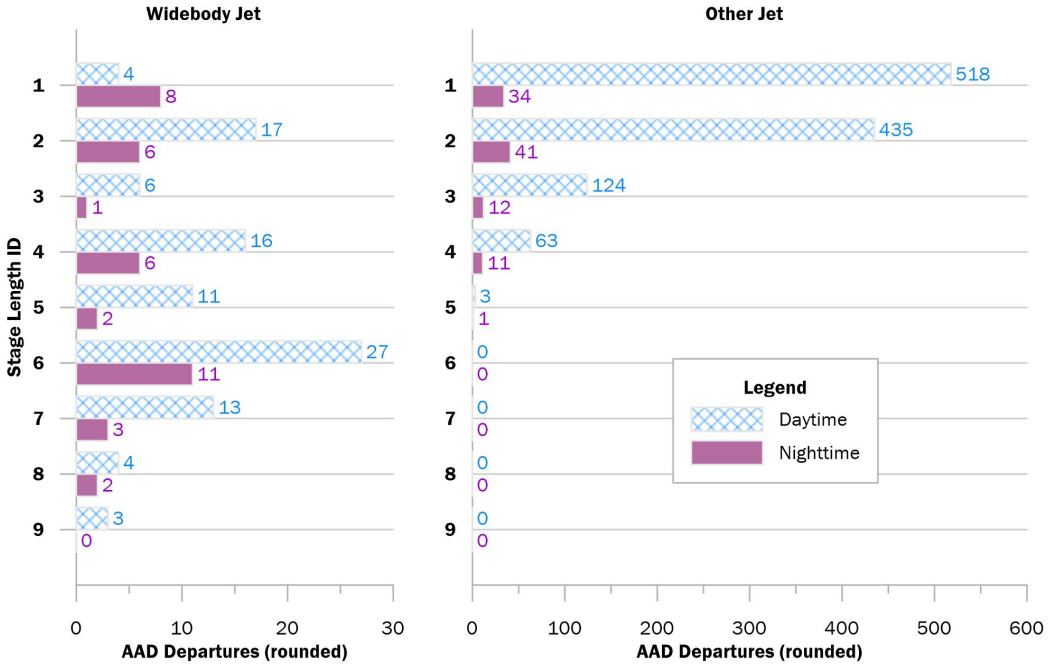
With the same methodology as used for the Interim Condition (**Section F.4.7**), the EA team modeled the O'Hare arrival and departure operations for the Build Out Condition using the standard AEDT flight

profiles in conjunction with ACC methodology to accurately represent aircraft altitudes along level flight segments. The application of ACCs were informed by the TAAM modeling.

The forecast's DDFS indicated destinations for each departure flight for the Build Out No Action. Using the distance between O'Hare and the destination airport, the EA team assigned an AEDT stage length to each departure. The modeled stage length distribution for the Build Out No Action is depicted in **Figure F-6**, for the Widebody Jet and Other Jet categories.[9] The third aircraft type, Non-jet, almost always has destinations in the stage length 1 range, thus are not shown. For the purposes of the figure, AAD departures were rounded to the nearest departure. As shown in the figure, the majority (about 70 percent of day and 60 percent of night) Widebody Jet flights were stage length 4 or higher, implying West Coast and international destinations. Most day or night Other Jet flights would be stage length 3 or less.

Although AEDT performance profiles range from stage length 1 through 9, many AEDT aircraft types do not have flight profiles defined for the longest stage lengths and many GA aircraft types have a profile only for stage length 1. If the forecast indicated a departure stage length that exceeded that aircraft's available performance profiles, the profile for the greatest stage length available for that aircraft type was used.

FIGURE F-6
DISTRIBUTION OF MODELED DEPARTURE STAGE LENGTHS FOR THE BUILD OUT NO ACTION



Source: HMMH analysis, 2021

F.6.8 Maintenance Run-Up Operations

The CDA provided estimates of future maintenance run-up operations, locations, and duration for the Build Out conditions, including aircraft type. AEDT aircraft types were assigned by matching CDA-

[9] The scales of the two sides of the figure are different because there are more than ten times as many Other Jet operations as there are Widebody Jet operations

specified aircraft types with modeled Interim Condition flight operations. Run-ups were modeled at six[10] distinct locations, shown in **Exhibit F-10** (**Section F.4.8**). Most run-ups would be conducted at O'Hare's GRE, at the same location as modeled for the Interim Condition.

The CDA provided the magnetic headings of the aircraft during run-ups. All run-ups at the GRE were modeled at a heading of 315 degrees (i.e., toward the northwest which is the open end of the GRE). Headings of non-GRE run-ups were modeled at 220, 220, 315, 135, 100, and 280 for Spots 1 through 6 respectively.

Table F-50 and **Table F-51** summarize the modeled run-up operations for the Build Out Condition. **Table F-50** presents the information by run-up location, while **Table F-51** presents totals. More than 93 percent of the modeled run-up operations would be by Narrowbody jets, and 90 percent would be at the GRE. Nearly 40 percent of the run-up operations would be conducted during the DNL nighttime period. The maximum nighttime event duration, nearly 55 minutes, would be conducted by 7878R aircraft at Spot 3 location. No Non-jet run-ups would be conducted.

Relative to the Interim Condition, the Build Out Condition excludes run-ups of the 757300 aircraft type. All other modeled aircraft types for run-ups from the Interim Condition are carried forward to the Build Out Condition. In terms of total run-up time, the Build Out Condition modeling assumes a six percent increase over the Interim Condition. Between the two forecast conditions, there are also some shifts in the run-up fleet mix; for example, 7378MAX run-ups would increase by over 150 percent, A321-232 run-ups would increase by over 240 percent, and U_737800 run-ups would decrease by about 23 percent.

The CDA does not record power settings; therefore,aircraft run-ups were modeled with same four power settings as modeled for the Interim Condition and the Existing Condition: 7, 30, 85, and 100 percent of maximum thrust. Consistent with the air quality modeling, the noise modeling for run-ups equally divided the run-up operations among these four power settings. It was assumed that all engines would operate simultaneously at these power settings for each run-up operation for the durations shown in **Table F-50**. One Widebody Jet aircraft, the 747400, has four engines. All Other Jet aircraft have two engines, most of which are mounted under the wing. The CL600, CNA55B, CRJ9-ER, and GV aircraft have rear-mounted engines.

The modeling of run-ups at the GRE location did not include the noise reduction capability of the GRE, as AEDT does not have the ability to model noise barriers. The run-ups in the GRE were modeled with the same four aforementioned power settings as the non-GRE locations, which is consistent with the air quality modeling.

[10] CDA identified a total of seven locations: spots 1 through 6 and the GRE.

TABLE F-50
MODELED MAINTENANCE RUN-UP OPERATIONS FOR THE BUILD OUT CONDITION

Run-up Location	Heading (degrees magnetic)	AEDT Aircraft ID	Daytime		Nighttime		Total Annual Events
			Annual Events	Duration per Event (minutes)	Annual Events	Duration per Event (minutes)	
Ground Run-Up Enclosure	315	737700	5	20.0	1	10.0	6
		7378MAX	108	23.4	69	25.5	177
		U_737800	106	26.2	72	25.4	178
		7878R	6	39.5	1	45.0	7
		A319-131	41	28.9	25	18.0	66
		A320-211	3	10.0	2	15.0	5
		A320-232	17	20.5	18	31.8	35
		A321-232	82	25.6	67	31.0	149
		A330-343	1	10.0	2	15.0	3
		CL600	50	26.6	34	26.3	84
		CNA55B	1	20.0	1	20.0	2
		CRJ9-ER	169	27.3	90	22.8	259
		EMB14L	61	26.5	45	26.6	106
		EMB170	36	22.9	28	23.6	64
		EMB175	107	20.6	74	24.3	181
		GV	2	27.5	2	15.0	4
Spot 1	220	7773ER		-	1	10.0	1
		7878R	3	10.0	3	13.3	6
		A330-343	1	10.0	3	20.0	4
Spot 2	220	7773ER		-	1	45.0	1
		7878R	8	16.3	3	21.7	11
		A330-343	4	40.8	2	15.0	6
Spot 3	315	7378MAX	1	30.0	3	20.0	4
		U_737800	10	34.7	4	20.0	14
		7773ER	1	88.4		-	1
		7878R	7	39.5	3	54.5	10
		A319-131	2	15.0		-	2
		A320-232	2	15.0	2	20.0	4
		A321-232	3	16.7	4	15.0	7
		A330-343	5	24.0	4	34.6	9
Spot 4	135	7378MAX	4	23.8	4	49.6	8
		U_737800	5	28.0	5	22.0	10
		7878R	6	36.4	4	34.6	10
		A319-131	2	27.5		-	2
		A320-232	1	20.0	1	20.0	2
		A321-232	5	23.0	4	34.6	9
		A330-343	5	14.0	4	17.5	9
		CRJ9-ER	1	30.0		-	1

Run-up Location	Heading (degrees magnetic)	AEDT Aircraft ID	Daytime		Nighttime		Total Annual Events
			Annual Events	Duration per Event (minutes)	Annual Events	Duration per Event (minutes)	
Spot 5	100	747400	3	16.7		-	3
		767300	1	10.0		-	1
		777200	2	20.0		-	2
		7878R	4	17.5		-	4
		A330-343	2	20.0		-	2
Spot 6	280	747400	2	25.0		-	2
		767300	1	10.0		-	1
		777200	1	10.0		-	1
		7773ER	1	10.0		-	1
		7878R	3	20.0		-	3
Source: CDA, 2020; HMMH analysis, 2020							

TABLE F-51
SUMMARY OF MODELED MAINTENANCE RUN-UP OPERATIONS FOR THE BUILD OUT CONDITION

Aircraft Category (see note 1)	Aircraft Type	Daytime		Nighttime		Total	
		Annual Events	Annual Hours (see note 1)	Annual Events	Annual Hours (see note 2)	Annual Events	Annual Hours
WBJ	747400	5	1.7		-	5	1.7
WBJ	767300	2	0.3		-	2	0.3
WBJ	777200	3	0.8		-	3	0.8
WBJ	7773ER	2	1.6	2	0.9	4	2.5
WBJ	7878R	37	17.0	14	7.5	51	24.5
WBJ	A330-343	18	6.9	15	5.5	33	12.4
OJ	737700	5	1.7	1	0.2	6	1.9
OJ	7378MAX	113	44.2	76	33.6	189	77.8
OJ	U_737800	121	54.4	81	33.7	202	88.1
OJ	A319-131	45	21.2	25	7.5	70	28.7
OJ	A320-211	3	0.5	2	0.5	5	1.0
OJ	A320-232	20	6.6	21	10.5	41	17.1
OJ	A321-232	90	37.7	75	37.9	165	75.6
OJ	CL600	50	22.2	34	14.9	84	37.1
OJ	CNA55B	1	0.3	1	0.3	2	0.6
OJ	CRJ9-ER	170	77.5	90	34.2	260	111.7
OJ	EMB14L	61	26.9	45	20.0	106	46.9
OJ	EMB170	36	13.7	28	11.0	64	24.7
OJ	EMB175	107	36.7	74	30.0	181	66.7
OJ	GV	2	0.9	2	0.5	4	1.4

Total	891	373.0	586	248.8	1,477	621.8
Subtotal by Location						
Ground Run-up Enclosure	795	333.0	531	224.3	1,326	557.4
Spot 1	4	0.7	7	1.8	11	2.5
Spot 2	12	4.9	6	2.3	18	7.2
Spot 3	31	16.2	20	9.0	51	25.2
Spot 4	29	12.4	22	11.3	51	23.6
Spot 5	12	3.5		-	12	3.5
Spot 6	8	2.3		-	8	2.3
Total	891	373.0	586	248.8	1,477	621.8

Notes:
1) WBJ = Widebody Jet; OJ = Other Jet; NJ = Non-jet
2) Computed from sum of seconds, rounded to the nearest 0.1 hour

Source: CDA, 2020; HMMH analysis, 2020

F.6.9 Noise Exposure

Sections F.6.9.1 and **F.6.9.2** describe the resultant DNL contours and affected Noise-Sensitive Facilities, respectively.

F.6.9.1 DNL Contours

Using the input data documented in the preceding sections, AEDT calculated DNL at more than 118,000 evenly-spaced grid points throughout the PSA and SSA. **Exhibit F-17** provides the the resultant DNL contours for the Build Out No Action.

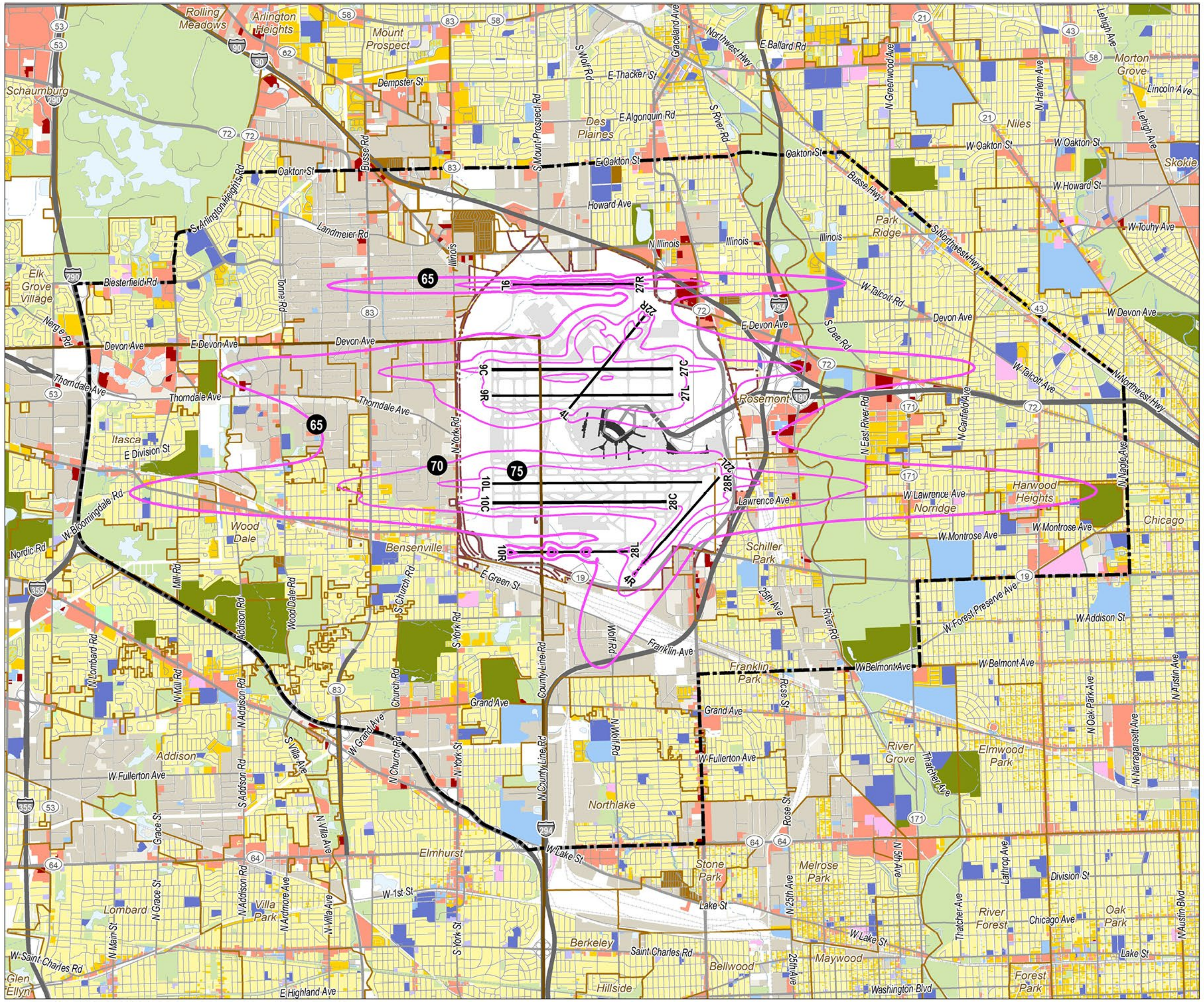
In the Build Out No Action, the DNL contours extend away from O'Hare on the east and west side in three main lobes (north, central, and south) and in a single lobe on the south side.

- The north east-west lobe would be due to flight operations to and from Runway 9L/27R. The east lobe of the 65 DNL contour would include residential areas of Des Plaines and extend across South Dee Road ending at South Hamlin Avenue. The west lobe of the 65 DNL contour would include mainly commercial industrial parcels and extend past Busse Road almost to Lively Boulevard.
- The central east-west lobe would be due to flight operations to and from Runways 9C/27C and 9R/27L. The east lobe of the 65 DNL contour would include residential areas of Rosemont and Park Ridge extending about a block past North Canfield Avenue. The west lobe of the 65 DNL contour extends south of Devon Avenue westward to the Salt Creek Golf Club and includes primarily commercial industrial parcels and residential areas of Bensenville south of State Route 390.
- The south east-west lobe would be due to flight operations to and from Runways 10L/28R and 10C/28C. The east lobe of the 65 DNL contour would include residential areas of Schiller Park, Norridge, and Harwood Heights, extending into the Ridgemoor Country Club golf course. The west lobe of the 65 DNL contour would include residential areas of Bensenville, Wood Dale, and Itasca, extending along Irving Park Road to the intersection of West Bloomingdale Road and South Maple Street.
- The south lobe of the 65 DNL contour, due to flight operations to and from Runway 4R/22L, extends over industrial property to just beyond Interstate 294.

The 70 DNL contour for Build Out No Action would include residential parcels, primarily in three areas: 1) Rosemont just east of Runway 27C, 2) Schiller Park east of Runway 28R, and 3) Bensenville west of Runways 10L and 10C.

Table F-52 shows the land use categories exposed to DNL greater than or equal to 65 dB under the Build Out No Action. The top portion of the table quantifies acreage in each contour band by land use category. The remainder of the table provides the count of noise-sensitive facilities and estimates of population and number of housing units for each DNL band. Under the Build Out No Action, no non-compatible land use would be exposed to DNL greater than or equal to 75 dB. Of the roughly 6,900 off-airport acres that would be exposed to 65 DNL or greater, 23 percent (approximately 1,600 acres) would consist of non-compatible land use.

There were an estimated 27,783 people in 11,055 housing units within the 65 DNL. Of the 11,055 housing units, 4,884 have been sound-insulated by the CDA and 259 are scheduled to be sound-insulated as part of Phase 18 and 19 of the CDA RSIP. Most non-mitigated homes within the Build Out No Action 65 DNL are currently not eligible as they are outside the DNL noise contour used for the ongoing RSIP for the OMP. Ineligible locations include areas of Itasca and Wood Dale west of Runways 10C and 10L, areas of Norridge and Harwood Heights east of Runways 28C and 28R, and a small area of Rosemont northeast of Runway 27C.



Source: HMMH 2018, USCB 2016, USCB 2010, Illinois Geospatial Data Clearinghouse, CMAP Data Hub, ESRI

Chicago O'Hare International Airport

Terminal Area Plan and Air Traffic Procedures Environmental Assessment

- Build Out No Action DNL Contours (65, 70, 75 dB)
- Primary Study Area
- Airport Boundary
- Runways
- Taxiway / Apron
- County Boundary
- Community Boundary
- Highway
- Primary Roads
- Secondary Roads
- Local Roads
- Railroad Lines
- Single Family Residential
- Public Use
- Multi-Family Residential
- Commercial
- Mobile Home
- Industrial
- Transient Lodging
- Agriculture
- School / Education
- Open Space Recreation
- Place of Worship
- Golf
- Hospital / Medical
- Vacant / Undefined
- Water / Stream

0 1 2
Miles

Noise Exposure Contours for Build Out No Action

Exhibit F-17

TABLE F-52
NOISE EXPOSURE FOR THE BUILD OUT NO ACTION

		DNL Contour Bands			
Land Use (Acres)	**Compatibility**	**65-70**	**70-75**	**75+**	**Total**
Single-Family Residential	Non-compatible	1,220.6	96.6	-	1,317.2
Multi-Family Residential		102.6	33.0	-	135.6
Transient Lodging (residential)		72.2	13.9	-	86.1
Mobile Home		-	-	-	-
School/Education		33.0	5.2	-	38.2
Commercial	Compatible	350.9	18.5	-	369.4
Industrial, Manufacturing, and Production		3,250.7	654.4	24.3	3,929.4
Recreational		573.0	122.2	-	695.2
Public Use (excluding School/Education)[1]		96.2	3.3	-	99.5
Undeveloped		198.8	24.3	0.6	223.7
Airport		2,176.6	1,769.6	1,982.2	5,928.4
Water		20.3	2.7	-	23.0
Subtotal Non-compatible Area (acres)		1,428.4	148.7	-	1,577.1
Subtotal Compatible Area (acres)		6,666.5	2,595.0	2,007.1	11,268.6
Total Area (acres)		**8,094.9**	**2,743.7**	**2,007.1**	**12,845.7**
Off-airport Total Area (acres)		**5,918.3**	**974.1**	**24.9**	**6,917.3**
Noise-Sensitive Facilities (count)					
Universities		1	-	-	1
Schools		5	1	-	6
Sound-Insulated Schools (Included above)		*5*	*1*	-	*6*
Libraries		1	-	-	1
Hospitals		-	-	-	-
Nursing Homes		1	-	-	1
Places of Worship		7	-	-	7
Parks and 4(f) Lands		33	3	-	36
Historic Properties		4	1	-	5
Total		**52**	**5**	**-**	**57**
Population and Housing (count)					
Population		23,890	3,893	-	27,783
Housing Units		9,583	1,472	-	11,055
Non-mitigated single-family housing units (Included above)[2]		*3,586*	*96*	-	*3,682*
Non-mitigated multi-family housing units (Included above)[2]		*2,489*	-	-	*2,489*
Sound-insulated single-family housing units (Included above)		*3,492*	*1,376*	-	*4,868*
Sound-insulated multi-family housing units (Included above)		*16*	-	-	*16*

Note 1: For the purposes of this document, Public Use (excluding School/Education) land use is considered compatible.
Note 2: The majority (89.6%) of the non-mitigated housing units are not eligible under the existing ORD RSIP because these units are outside the current RSIP DNL 65 dB contour.

Sources: ORD Residential Sound Insulation Program, January 2021 database: City of Chicago
2020 U.S. Census Bureau Census Block Population Data
Build Out No Action Noise Contours, Land Use, Noise-Sensitive Facilities, Population and Housing data: HMMH Analysis, October 2021

F.6.9.2 Noise-Sensitive Facilities

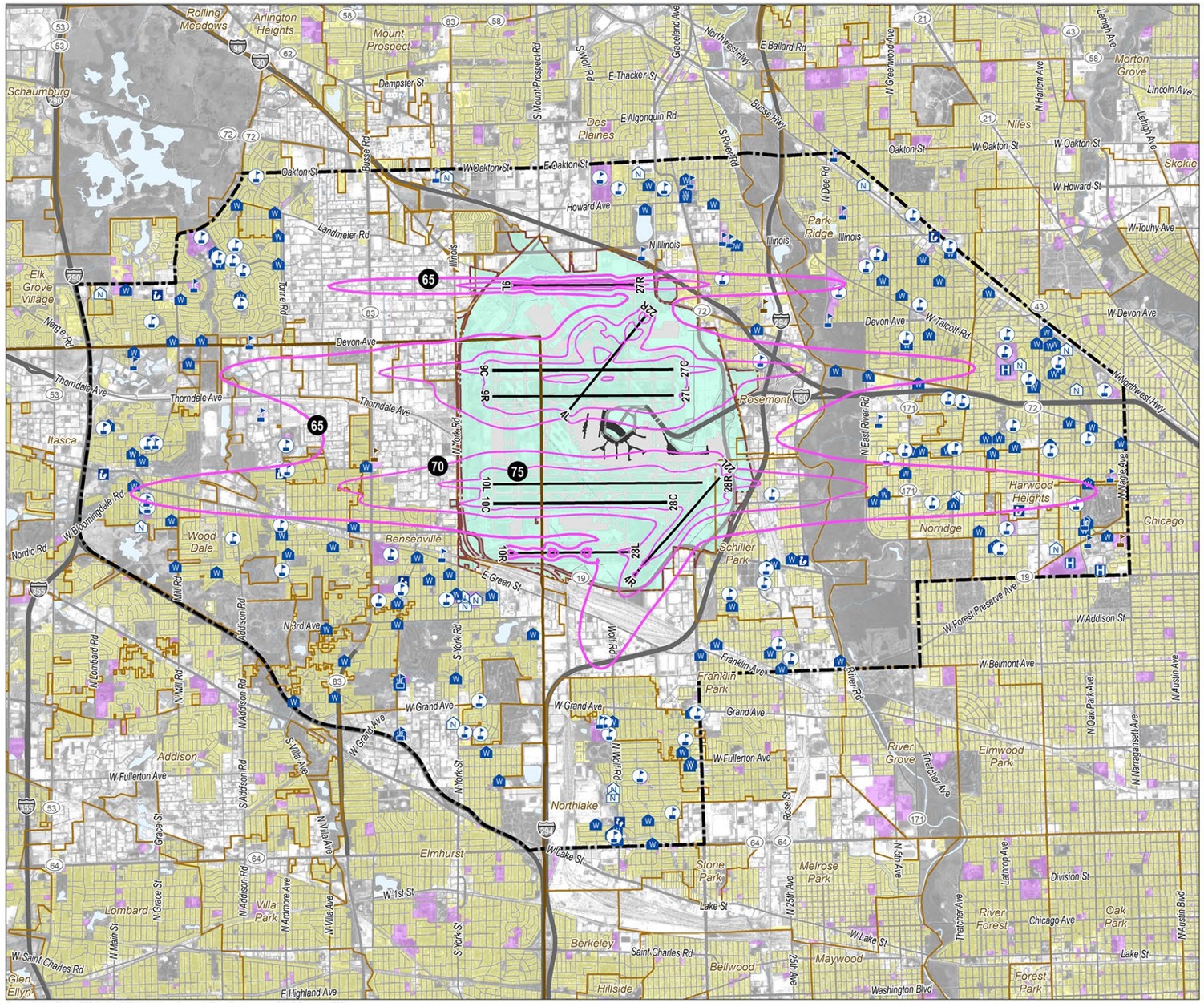
As listed in **Table F-52** and **Table F-53** and shown in **Exhibit F-18**, 57 noise-sensitive facilities in the PSA, primarily parks and 4(f) lands, would be exposed to 65 DNL or greater. None would be exposed to 75 DNL or greater. No hospitals in the PSA would be exposed to DNL greater than 65 dB. Eight learning institutions, consisting of one university (Logos Evangelical Seminary), six schools, and one library (Wood Dale Public Library District; ID L08) would be exposed to 65 DNL or greater. One school (Washington Elementary School; ID S81) would be exposed to a DNL of approximately 72 dB. All six (Kindergarden to 12th Grade) schools exposed to 65 DNL or greater have been sound-insulated by the CDA. Four of the 36 parks and 4(f) lands (Harwood Heights Recreation Center, Norridge Recreation Center-East, The Dome at the Parkway Bank Sports Complex, and Wood Dale Recreation Complex; IDs P130, P132, P188, and P215, respectively) that would be exposed to DNL greater than 65 dB do not have outdoor use. Noise results for all sites modeled within the PSA are provided in **Attachment F-5.**

TABLE F-53
NOISE-SENSITIVE FACILITIES WITH A DNL OF AT LEAST 65 DB FOR THE BUILD OUT NO ACTION

			DNL (dB) in DNL Contour Band		
Map ID	**Municipality**	**Name**	**65-70**	**70-75**	**Note**
Learning Institutions					
U01	Bensenville	Logos Evangelical Seminary	67.2	-	-
S28	Des Plaines	Orchard Place Elementary School	67.3	-	1
S54	Itasca	Raymond Benson Primary School	65.1	-	1
S58	Norridge	J Leigh Elementary School	67.4	-	1
S77	Rosemont	Rosemont Elementary School	69.6	-	1
S81	Schiller Park	Washington Elementary School	-	71.8	1
S83	Wood Dale	Early Childhood Education Center	65.8	-	1
L08	Wood Dale	Wood Dale Public Library District	66.6	-	-
Health Care Facilities					
N12	Norridge	Central Baptist Village	67.6	-	-
Places of Worship					
W006	Bensenville	First Baptist Church	67.7	-	-
W018	Chicago	All Saints Polish National Catholic Church	68.7	-	-
W025	Chicago	Evangelical Lutheran Church In America	67.2	-	-
W034	Chicago	Our Lady Mother of the Church Roman Catholic Church	68.8	-	-
W038	Chicago	St. Joseph Ukrainian Church	66.8	-	-
W090	Norridge	Church Of Our Savior	67.0	-	-
W095	Norridge	Zion Evangelical Lutheran Church	69.3	-	-
Parks and 4(f) Lands					
FP06	Chicago	Robinson Woods South	69.3	-	-
FP26	Schiller Park	River Bend Family Picnic Area	67.0	-	-

			DNL (dB) in DNL Contour Band		
Map ID	**Municipality**	**Name**	**65-70**	**70-75**	**Note**
FP27	Schiller Park	Robinson Homestead Family Picnic Area	65.9	-	-
P019	Bensenville	Mohawk Park	-	71.1	-
P027	Bensenville	Poplar Park	-	70.0	-
P066	Des Plaines	Orchard Place Elementary School Park	68.1	-	-
P086	Elk Grove Village	Pocket Park #2 (under construction)	65.0	-	-
P089	Elk Grove Village	Pocket Park #5	66.1	-	-
P090	Elk Grove Village	Pocket Park #6 (Future)	65.2	-	-
P091	Elk Grove Village	Pocket Park #7	65.2	-	-
P095	Elk Grove Village	Pocket Park #11 (Future)	65.1	-	-
P130	Harwood Heights	Harwood Heights Recreation Center	65.0	-	2
P131	Harwood Heights	Norridge Park District Facilities Complex	65.3	-	-
P132	Harwood Heights	Norridge Rec Center-East	66.0	-	2
P143	Itasca	Schiller Park	66.0	-	-
P147	Itasca	Washington Park	65.4	-	-
P152	Norridge	Norridge Park	67.1	-	-
P162	Park Ridge	Brickton Park	65.9	-	-
P172	Park Ridge	Southwest Park	65.9	-	-
P176	Rosemont	Burgermeister Park	65.0	-	-
P177	Rosemont	Donald E. Stephens Athletic Complex	69.9	-	-
P180	Rosemont	Dunne Park	68.4	-	-
P181	Rosemont	Margaret J. Lange Park	67.8	-	-
P182	Rosemont	Monument Park	65.6	-	-
P183	Rosemont	Parkway Bank Park Entertainment District	65.7	-	-
P188	Rosemont	The Dome at the Parkway Bank Sports Complex	68.3	-	2
P189	Rosemont	Westin Park	68.3	-	-
P190	Schiller Park	"Bark" Park	68.4	-	-
P193	Schiller Park	Fairview Park	66.9	-	-
P195	Schiller Park	North Village Park	-	71.9	-
P200	Schiller Park	Dooley Memorial Park	65.9	-	-
P205	Wood Dale	Central Park	69.8	-	-
P212	Wood Dale	Mohawk Manor Park	66.2	-	-
P213	Wood Dale	Veteran's Memorial Park	66.3	-	-
P215	Wood Dale	Wood Dale Recreation Complex	65.4	-	2
P216	Wood Dale	Wood Dale Water Park	67.7	-	-
Historic Properties					
HN08	Chicago	Rest Haven Cemetery	69.1	-	-
HN09	Chicago	Old Control Tower	67.7	-	-

			DNL (dB) in DNL Contour Band		
Map ID	**Municipality**	**Name**	**65-70**	**70-75**	**Note**
HN10	Chicago	United Terminal 1	68.7	-	-
HN11	Chicago	Rotunda	68.1	-	-
LS246	Schiller Park	20 Corner Store	-	72.1	-
Notes: 1) Sound-insulated 2) No outdoor use					
Source: HMMH, 2021					



Chicago O'Hare International Airport

Terminal Area Plan and Air Traffic Procedures Environmental Assessment

- Build Out No Action DNL Contours (65, 70, 75 dB)
- Primary Study Area
- Airport Boundary
- Runways
- Taxiway / Apron
- County Boundary
- Community Boundary
- Highway
- Primary Roads
- Secondary Roads
- Local Roads
- Railroad Lines
- School
- Library
- Sound Insulated School
- Nursing Home
- College/University
- Hospital
- Place of Worship
- Residential
- Public, Hospital, Institutional
- Compatible
- Water / Stream

0 1 2
Miles

Noise Exposure Contours for Build Out No Action and Noise Sensitive Facilities

▸ Exhibit F-18

F.7 DATA DEVELOPMENT AND NOISE EXPOSURE FOR THE BUILD OUT PROPOSED ACTION

The Build Out Condition of the Proposed Action Alternative is abbreviated herein as the "Build Out Proposed Action."

Sections F.7.1 through **F.7.8** address the data input to AEDT for the aircraft noise modeling of the Build Out Proposed Action **Section F.7.9** presents the resultant Build Out Proposed Action noise exposure and **Section 0** compares that exposure to the Build Out Proposed Action's noise exposure.

F.7.1 Airfield Layout

The runway layout data for the Build Out Proposed Action are the same as those as described for the Interim Condition (**Section F.4.1**). The Build Out Proposed Action includes the Terminal 3 and 5 changes discussed in the Build Out No Action, as well as two additional high speed taxiway exists are added to Runway 9L-27R, the taxiway geometry south of Runway 4L would change to support the new terminal and concourses and the taxiway configuration south of Terminal 5 near the end of Runway 22L would be modified as shown in **Exhibit F-19**.

F.7.2 Meteorological and Terrain Data

The meteorological and terrain data for the Build Out Proposed Action is the same as that described for the Build Out No Action (**Section F.6.2**) and the Existing Condition (**Section F.3.2**).

F.7.3 Aircraft Noise and Performance Data

The aircraft noise and performance data for the Build Out Proposed Action (AEDT standard data except the approved non-standard 737-800) is the same as that described for the Build Out No Action (**Section F.6.3**) and the Existing Condition (**Section F.3.3**).

F.7.4 Aircraft Flight Operations

The aircraft flight operations data for the Build Out Proposed Action would be the same as that described for the Build Out No Action (**Section F.6.4**). The annual flight operations by body category are shown in **Table F-54**. The Build Out Proposed Action would result in an approximate four percent difference in the distribution of Widebody flight operations between day and night periods (and less difference for the Other Jets and Non-jets) compared to the Build Out No Action. The overall day and night arrival and departure operations for the Build Out Proposed Action would be within 0.5 percent of the overall day and night operations for the Build Out No Action. **Table F-55** shows the differences in operations in each category. Positive values represent increases from the Build Out No Action to the Build Out Proposed Action while negative values represent decreases.

TABLE F-54
ANNUAL FLIGHT OPERATIONS FOR THE BUILD OUT PROPOSED ACTION

Body Category	Arrivals			Departures			Total			Total Percent
	Day	Night	Total	Day	Night	Total	Day	Night	Total	
Widebody Jet	36,323	13,813	50,136	37,819	12,317	50,136	74,142	26,130	100,272	9.9%
Other Jet	395,355	58,050	453,405	417,133	36,272	453,405	812,488	94,322	906,810	89.4%
Non-jet	3,048	339	3,387	3,387	0	3,387	6,435	339	6,774	0.7%
Total	434,726	72,202	506,928	458,339	48,589	506,928	893,065	120,791	1,013,856	100.0%
Percentage	43%	7%	50%	45%	5%	50%	88%	12%	100%	

Source: CDA, 2020; HMMH analysis, 2021

TABLE F-55
CHANGE IN DISTRIBUTION OF ANNUAL FLIGHT OPERATIONS BETWEEN THE BUILD OUT NO ACTION AND THE BUILD OUT PROPOSED ACTION

Body Category	Arrivals		Departures		Total	
	Day	Night	Day	Night	Day	Night
Widebody Jet	-146	146	1,294	-1,294	1,148	-1,148
Other Jet	-873	873	-208	208	-1,081	1,081
Non-jet	0	0	10	-10	10	-10
Total	**-1,019**	**1,019**	**1,096**	**-1,096**	**77**	**-77**

Source: CDA, 2020; HMMH analysis, 2021

Table F-56 details the Build Out Proposed Action's 2,778 AAD flight operations by aircraft type. Rounding to two decimal places caused the total AAD count to differ from 2,778 by less than one AAD operation.

A close comparison with the modeled AAD operations for the Build Out No Action (shown in **Table F-43**) reveals the small changes in the distribution of flight operations between day and night periods. The overall day and night arrival and departure operations differ by about three operations per day.

TABLE F-56
AAD FLIGHT OPERATIONS BY AIRCRAFT TYPE FOR THE BUILD OUT PROPOSED ACTION

	Arrivals			Departures			
Aircraft ID (AEDT)	Day	Night	Total	Day	Night	Total	Total
Widebody Jet							
747400	3.71	6.50	10.21	6.50	3.71	10.21	20.42
7478	2.78	5.57	8.35	1.86	6.49	8.35	16.70
767300	3.21	4.21	7.42	1.86	5.57	7.43	14.85
777200	2.73	1.91	4.64	2.79	1.86	4.65	9.29
777300	2.07	6.28	8.35	6.50	1.86	8.36	16.71
7773ER	10.78	0.36	11.14	9.29	1.85	11.14	22.28
7878R	39.07	8.26	47.33	41.81	5.52	47.33	94.66
A300-622R	0.93	1.85	2.78	0.48	2.31	2.79	5.57
A300B4-203	0.93	-	0.93	-	0.93	0.93	1.86
A330-301	0.93	-	0.93	0.93	-	0.93	1.86
A330-343	29.59	2.90	32.49	28.83	3.65	32.48	64.97
A380-841	1.85	-	1.85	1.85	-	1.85	3.70
A380-861	0.93	-	0.93	0.93	-	0.93	1.86
Widebody Jet Subtotals	**99.51**	**37.84**	**137.35**	**103.63**	**33.75**	**137.38**	**274.73**
Other Jet							
737700	30.10	2.85	32.95	28.81	4.14	32.95	65.90
U_737800	131.07	32.73	163.80	145.50	18.30	163.80	327.60
7378MAX	104.93	19.89	124.82	110.76	14.06	124.82	249.64
757RR	0.93	2.78	3.71	0.93	2.78	3.71	7.42
A319-131	45.51	4.61	50.12	46.22	3.89	50.11	100.23
A320-211	10.59	2.40	12.99	9.28	3.71	12.99	25.98
A320-232	31.17	8.28	39.45	36.37	3.07	39.44	78.89
A321-232	116.54	24.99	141.53	124.30	17.23	141.53	283.06
CRJ9-ER	231.33	26.67	258.00	246.49	11.51	258.00	516.00
EMB170	53.30	5.63	58.93	56.92	2.01	58.93	117.86
EMB175	158.27	13.42	171.69	161.80	9.89	171.69	343.38
CL600	74.70	6.51	81.21	79.13	2.08	81.21	162.42
CNA55B	-	0.93	0.93	0.93	-	0.93	1.86

	Arrivals			Departures			
Aircraft ID (AEDT)	**Day**	**Night**	**Total**	**Day**	**Night**	**Total**	**Total**
CNA560XL	0.93	-	0.93	0.93	-	0.93	1.86
CNA680	1.86	-	1.86	1.86	-	1.86	3.72
CNA750	0.93	-	0.93	0.93	-	0.93	1.86
EMB14L	89.62	7.36	96.98	90.28	6.70	96.98	193.96
LEAR35	1.39	-	1.39	1.39	-	1.39	2.78
Other Jet Subtotals	**1,083.17**	**159.05**	**1,242.22**	**1,142.83**	**99.37**	**1,242.20**	**2,484.42**
Non-jet							
BEC58P	3.71	-	3.71	3.71	-	3.71	7.42
CNA208	4.64	0.93	5.57	5.57	-	5.57	11.14
Non-jet Subtotals	**8.35**	**0.93**	**9.28**	**9.28**	**-**	**9.28**	**18.56**
Grand Totals	**1,191.03**	**197.82**	**1,388.85**	**1,255.74**	**133.12**	**1,388.86**	**2,777.71**
Source: HMMH analysis, 2021							

F.7.5 Runway Use

Runway use for the Build Out Proposed Action was derived from CDA's TAAM simulation data. As it is impractical to model all possible runway configurations, TAAM modeling was limited to the most prevalent configurations, which cover over 98 percent of possible operating conditions. CDA ran six operational experiments in TAAM for Build Out Proposed Action. These experiments are listed in **Table F-44** in **Section F.6.5**, including the resulting percent contribution (weighting) to the total yearly operations for each configuration. Using the weightings, the CDA developed annualized runway usage rates for the EA's noise and air quality modeling. On an annual basis, 53.6 percent of the flight operations would be in west flow and 46.4 percent in east flow.

The annualized runway use TAAM simulation results for the Build Out Proposed Action are presented in **Table F-57**. The TAAM modeling assigned no arrivals to Runway 4L and no departures from Runway 22R since Runway 4L/22R is a uni-directional runway (arrivals are not allowed to Runway 4L and departures are not allowed from Runway 22R). Due to the simulation of only the primary operational configurations, the TAAM modeling resulted in several runways showing no use. The blank cells in **Table F-57** indicate the so-called "zero runway use" runways for each combination of runway, type of operation, and period. For example, the TAAM modeling did not predict any departures from Runway 9L during the day or night periods. While departures do not normally occur on that runway, the runway could be used for departures.

TABLE F-57
TAAM-OUTPUT RUNWAY USE PERCENTAGES FOR THE BUILD OUT PROPOSED ACTION

Runway	Arrival (see notes 1 and 2)		Departure (see notes 1 and 2)	
	Day	Night	Day	Night
9L	16.2	5.5	-	-
9C	9.3	7.2	0.1	1.3
9R	-	-	1.0	2.0
9RX[3]	n/a	n/a	21.3	30.1
10L	-	20.3	0.3	5.5
10LX[3]	n/a	n/a	23.5	9.1
10C	14.6	12.1	-	-
10R	6.4	1.3	-	-
4L	n/a	n/a	-	-
4R	-	-	-	-
27R	19.3	6.5	-	-
27C	15.8	11.4	0.1	1.5
27L	-	-	1.0	2.3
27LX[3]	n/a	n/a	16.9	15.6
28R	-	23.6	0.4	5.9
28RX[3]	n/a	n/a	22.5	18.4
28C	15.2	12.2	-	-
28L	3.2	-	-	-
22L	-	-	12.9	8.3
22R	-	-	n/a	n/a

Notes:
1) Each column sums vertically to 100±0.1%.
2) Daytime is defined as 7:00:00 a.m. to 9:59:59 p.m.; nighttime is defined as 10:00:00 p.m. to 6:59:59 a.m. (local time).
3) The "X" notation means intersection departures from that runway; this runway would not be applicable to arrival operations.

Source: CDA, 2020

It is anticipated that all available runways[11] would be used for arrival and departure operations, to some extent, over the course of a year, to allow for safe and efficient operations during unforeseen circumstances such as runway maintenance closures or adverse weather. Therefore, the TAAM results were adjusted to allocate at least 0.1 percent of the flights to the runways in which operations would be expected but TAAM modeling did not include/assign operations. In general, the adjustment methodology was to shift small percentages of operations from one runway to another by selecting the nearest runway with the same operation type and flow so that flights would remain over similar areas to the extent possible. For example, Runway 9R departures could be shifted to nearby Runway 9L because both runways are in the same (east) flow and are on the same side of the airfield.

[11] With the exception of Runway 4L arrivals and Runway 22R departures.

Except for nighttime departures from Runways 10C, 28C, and 4L, the value of 0.1 percent was chosen as the runway use percentage to be assigned[12] because a) it was the minimum non-zero runway use produced by the TAAM modeling and b) it was the average of Existing Condition runway use percentages less than or equal to one percent.[13]

Runways 10C, 28C, and 4L have Existing Condition nighttime departure use greater than one percent but no use assigned by the TAAM modeling. For each of these three runways, the following logic was applied to derive a reasonable percentage of night departure use:

- For Runway 10C: The Existing Condition use is 1.8 percent on Runway 10C and a combined 17.6 percent for Runways 10L and 10LX. The TAAM modeling assigned a combined 14.6 percent to Runways 10L and 10LX for the Build Out Proposed Action. From 17.6 to 14.6 is a 17.0 percent reduction, so the 1.8 for Runway 10C was correspondingly reduced 17.0 percent. Therefore, the Runway 10C night departure percentage was set to 1.5 percent for the Build Out Proposed Action.
- For Runway 28C: The Existing Condition use is 3.8 percent on Runway 28C and a combined 39.0 percent for Runways 28R and 28RX. The TAAM modeling assigned a combined 24.3 percent to Runways 28R and 28RX for the Build Out Proposed Action. From 39.0 to 24.3 is a 37.7 percent reduction, so the 3.8 for Runway 28C was correspondingly reduced 29.5 percent. Therefore, the Runway 28C night departure percentage was set to 2.4 percent for the Build Out Proposed Action.
- For Runway 4L: The Existing Condition use is 2.4 percent on Runway 4L and a combined 20.0 percent for Runways 9R and 9RX. The TAAM modeling assigned a combined 32.1 percent to Runways 9R and 9RX for the Build Out Proposed Action. From 20.0 to 32.1 is a 60.5 percent increase, so the 2.4 for Runway 4L was correspondingly increased 60.5 percent. Therefore, the Runway 4L night departure percentage was set to 3.9 percent for the Build Out Proposed Action.

The process had two additional customizations: 1) if departures needed to be shifted from Runway 10L/28R or 9R/27L, only departures from their runway intersections were moved; non-intersection departures were not adjusted. 2) Widebody Jet and Non-jet departures were excluded from being shifted to Runways 9L/27R and 10R/28L because it would be unlikely for Widebody Jet and Non-jet aircraft to use Runways 9L/27R or 10R/28L.

The resultant runway use percentages for the Build Out Proposed Action are shown in **Tables F-58** through **F-60**, for arrivals, departures, and overall flight operations, respectively, in terms of AAD operations and EDO. At 13 percent of total operations, Runway 28R would be the most used runway at O'Hare, followed by Runways 10L and 9R, with nearly 13 and over 11 percent of total operations respectively. During the night hours, Runway 28R would be the most used runway at 23 percent, followed by Runway 10L with 17 percent.

[12] In comparison, the 2015 EIS Re-Evaluation and the IFQ Re-Evaluation chose 0.5 percent and 0.2 percent as their adjustment values respectively.

[13] For the purposes of averaging, the Existing Condition runway use percentages shown as "<0.05" percent were assumed to be 0.025 percent.

TABLE F-58
RUNWAY USE PERCENTAGES FOR ARRIVALS FOR THE BUILD OUT PROPOSED ACTION

		Daytime (see notes 1 and 2)				Nighttime (see notes 1 and 2)				Overall (see notes 1, 2, and 3)	
Flow	Runway ID (d)	WBJ	OJ	NJ	Overall	WBJ	OJ	NJ	Overall	AAD	EDO
E	9L	-	17.7	14.9	16.2	-	6.6	41.2	5.5	14.7	9.5
E	9C	28.4	7.5	-	9.2	7.3	7.1	5.1	7.1	8.9	7.8
E	9R	0.3	0.1	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1
E	10L	0.8	0.1	0.1	0.1	12.6	7.0	1.9	7.5	1.1	4.6
E	10C	17.7	14.1	13.6	14.4	15.1	11.5	-	12.1	14.1	13.0
E	10R	-	6.9	17.7	6.4	-	1.6	-	1.3	5.6	3.2
E	4L	-	-	-	-	-	-	-	-	-	-
E	4R	0.1	0.1	0.1	0.1	0.1	0.1	-	0.1	0.1	0.1
W	27R	-	21.0	17.8	19.2	-	7.8	39.4	6.5	17.4	11.3
W	27C	20.3	15.4	6.3	15.7	12.2	10.9	14.0	11.2	15.1	12.9
W	27L	0.1	0.1	<0.05	0.1	0.1	0.1	0.1	0.1	0.1	0.1
W	28R	0.2	0.1	0.2	0.1	25.7	22.9	-	23.3	3.4	14.6
W	28C	32.5	13.4	23.2	15.1	16.6	11.3	-	12.3	14.7	13.3
W	28L	-	3.5	6.0	3.2	-	0.1	-	0.1	2.8	1.3
W	22L	0.2	0.1	0.2	0.1	0.1	0.1	-	0.1	0.1	0.1
W	22R	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

Notes:
1) Each column sums vertically to 100±0.2%.
2) Daytime is defined as 7:00:00 a.m. to 9:59:59 p.m.; nighttime is defined as 10:00:00 p.m. to 6:59:59 a.m. (local time).
3) AAD pertains to annual average daily flight operations; EDO pertains to equivalent daily flight operations, i.e., daytime plus 10 times nighttime.
WBJ = Widebody Jet; OJ = Other Jet; NJ = Non-jet

Source: HMMH analysis, 2020

TABLE F-59
RUNWAY USE PERCENTAGES FOR DEPARTURES FOR THE BUILD OUT PROPOSED ACTION

		Daytime (see notes 1 and 2)				Nighttime (see notes 1 and 2)				Overall (see notes 1, 2, and 3)	
Flow	Runway ID (d)	WBJ	OJ	NJ	Overall	WBJ	OJ	NJ	Overall	AAD	EDO
E	9L	-	0.1	-	0.1	-	0.1	-	0.1	0.1	0.1
E	9C	0.8	-	-	0.1	5.0	-	-	1.3	0.2	0.7
E	9R	11.9	-	-	1.0	7.9	-	-	2.0	1.1	1.5
E	9RX[4]	19.2	21.2	27.8	21.1	12.1	30.9	-	26.1	21.6	23.7
E	10L	3.1	-	-	0.3	18.7	1.0	-	5.5	0.8	3.0

		Daytime (see notes 1 and 2)				Nighttime (see notes 1 and 2)				Overall (see notes 1, 2, and 3)	
Flow	Runway ID (d)	WBJ	OJ	NJ	Overall	WBJ	OJ	NJ	Overall	AAD	EDO
E	10LX[4]	10.5	24.4	18.4	23.2	1.3	9.6	-	7.5	21.7	15.1
E	10C	0.5	0.1	0.1	0.1	0.3	1.9	-	1.5	0.3	0.8
E	10R	-	0.1	-	0.1	-	0.1	-	0.1	0.1	0.1
E	4L	0.1	0.1	0.1	0.1	1.8	4.6	-	3.9	0.5	2.1
E	4R	<0.05	0.1	0.1	0.1	<0.05	0.1	-	0.1	0.1	0.1
W	27R	-	0.1	-	0.1	-	0.1	-	0.1	0.1	0.1
W	27C	1.0	-	-	0.1	5.9	-	-	1.5	0.2	0.8
W	27L	12.6	-	-	1.0	9.2	-	-	2.3	1.2	1.7
W	27LX[4]	18.8	16.7	9.3	16.8	11.6	16.9	-	15.5	16.7	16.2
W	28R	4.5	-	-	0.4	21.8	0.5	-	5.9	0.9	3.2
W	28RX[4]	16.5	22.6	44.0	22.3	3.9	19.9	-	15.8	21.7	19.0
W	28C	0.6	0.1	0.2	0.1	0.6	3.0	-	2.4	0.4	1.3
W	28L	-	0.1	-	0.1	-	0.1	-	0.1	0.1	0.1
W	22L	-	14.2	-	12.9	-	11.1	-	8.3	12.5	10.5
W	22R	-	-	-	-	-	-	-	-	-	-

Notes:
1) Each column sums vertically to 100±0.1%.
2) Daytime is defined as 7:00:00 a.m. to 9:59:59 p.m.; nighttime is defined as 10:00:00 p.m. to 6:59:59 a.m. (local time).
3) AAD pertains to annual average daily flight operations; EDO pertains to equivalent daily flight operations, i.e., daytime plus 10 times nighttime.
4) The "X" notation means intersection departures from that runway.
WBJ = Widebody Jet; OJ = Other Jet; NJ = Non-jet

Source: HMMH analysis, 2020

TABLE F-60
OVERALL RUNWAY USE PERCENTAGES FOR THE BUILD OUT PROPOSED ACTION

		Daytime (see notes 1 and 2)				Nighttime (see notes 1 and 2)				Overall (see notes 1, 2, and 3)	
Flow	Runway ID	WBJ	OJ	NJ	Overall	WBJ	OJ	NJ	Overall	AAD	EDO
E	9L	-	8.7	7.1	7.9	-	4.1	41.2	3.3	7.4	5.3
E	9C	14.3	3.6	-	4.5	6.2	4.3	5.1	4.7	4.5	4.6
E	9R	16.0	10.9	14.6	11.4	9.5	11.9	0.1	11.4	11.4	11.4
E	10L	7.0	12.6	9.7	12.1	21.4	16.2	-	17.3	12.7	15.1
E	10C	8.9	6.9	6.5	7.1	8.1	7.8	-	7.9	7.2	7.5
E	10R	-	3.4	8.4	3.1	-	1.0	-	0.8	2.9	1.8
E	4L	<0.05	0.1	0.1	0.1	0.8	1.8	-	1.6	0.2	0.9
E	4R	0.1	0.1	0.1	0.1	0.1	0.1	-	0.1	0.1	0.1
W	27R	-	10.3	8.4	9.4	-	4.9	39.4	3.9	8.7	6.2
W	27C	10.4	7.5	3.0	7.7	9.2	6.7	14.0	7.3	7.6	7.5

		Daytime (see notes 1 and 2)				Nighttime (see notes 1 and 2)				Overall (see notes 1, 2, and 3)	
Flow	**Runway ID**	**WBJ**	**OJ**	**NJ**	**Overall**	**WBJ**	**OJ**	**NJ**	**Overall**	**AAD**	**EDO**
W	27L	16.1	8.6	4.9	9.2	9.9	6.6	0.1	7.3	9.0	8.1
W	28R	10.8	11.7	23.2	11.7	25.7	21.9	-	22.7	13.0	18.0
W	28C	16.2	6.6	11.1	7.4	9.1	8.1	-	8.3	7.5	7.9
W	28L	-	1.7	2.8	1.6	-	0.1	-	0.1	1.4	0.7
W	22L	0.1	7.3	0.1	6.7	0.1	4.3	-	3.4	6.3	4.8
W	22R	-	0.1	<0.05	<0.05	0.1	0.1	0.1	0.1	<0.05	0.1

Notes:
1) Each column sums vertically to 100±0.2%.
2) Daytime is defined as 7:00:00 a.m. to 9:59:59 p.m.; nighttime is defined as 10:00:00 p.m. to 6:59:59 a.m. (local time).
3) AAD pertains to annual average daily flight operations; EDO pertains to equivalent daily flight operations, i.e., daytime plus 10 times nighttime.
4) The departure operations indicated for runways "9RX", "10LX", "27LX" and "28RX" are included in this table in the overall use of Runways 9R, 10L 27L and 28R, respectively.
WBJ = Widebody Jet; OJ = Other Jet; NJ = Non-jet

Source: HMMH analysis, 2020

F.7.6 Modeled Flight Tracks and Operational Assignments

For the Build Out Proposed Action, the modeled flight tracks would resemble those for the Build Out No Action except the downwind and final approach segments of arrival tracks to Runways 10R and 28L would revert to their offset characteristic from the Existing Condition. All southside downwinds on the west side of the airport would also be offset from the extended runway centerlines.

Table F-61 lists the counts of flight tracks by type of operation resulting from the TAAM Build Out Proposed Action simulation. A total of 1,450 unique backbone tracks were developed, each having up to six sub-tracks, to represent the 1,013,856 annual flight operations at O'Hare for the Build Out Condition. Of these track bundles, 811 were repeated for the purpose of separately modeling with ACC. Altitude data of the radar tracks in each bundle was used to determine the average altitudes. **Section F.4.7** contains more information regarding ACC.

TABLE F-61
COUNTS OF FLIGHT TRACKS BY TYPE OF OPERATION FOR THE BUILD OUT PROPOSED ACTION

			Arrival Track Bundles (see note 1)			Departure Track Bundles (see note 1)			Total Track Bundles (see note 1)		
Track Set	**Aircraft Category**	**Traffic Flow**	**Day**	**Night**	**Total**	**Day**	**Night**	**Total**	**Day**	**Night**	**Total**
	WBJ	East	62	73	135	63	80	143	125	153	278
		West	66	66	132	60	48	108	126	114	240
	OJ	East	121	111	232	62	89	151	183	200	383
		West	113	109	222	85	102	187	198	211	409
	NJ	East	21	28	49	24	0	24	45	28	73
		West	25	4	29	38	0	38	63	4	67
	Subtotals by Traffic Flow										

Track Set	Aircraft Category	Traffic Flow	Arrival Track Bundles (see note 1)			Departure Track Bundles (see note 1)			Total Track Bundles (see note 1)		
			Day	Night	Total	Day	Night	Total	Day	Night	Total
	East		204	212	416	149	169	318	353	381	734
	West		204	179	383	183	150	333	387	329	716
	Subtotals by Aircraft Category										
	WBJ		128	139	267	123	128	251	251	267	518
	OJ		234	220	454	147	191	338	381	411	792
	NJ		46	32	78	62	0	62	108	32	140
	Total Regular Tracks		**408**	**391**	**799**	**332**	**319**	**651**	**740**	**710**	**1,450**
Flight Tracks duplicated for Altitude Control Code Modeling (see note 2)	WBJ		111	73	184	99	52	151	210	125	335
	OJ		193	95	288	86	83	169	279	178	457
	NJ		11	0	11	8	0	8	19	0	19
	Total Duplicate Tracks		**315**	**168**	**483**	**193**	**135**	**328**	**508**	**303**	**811**
Total Flight Track Bundles (see note 2)	WBJ		239	212	451	222	180	402	461	392	853
	OJ		427	315	742	233	274	507	660	589	1,249
	NJ		57	32	89	70	0	70	127	32	159
	Grand Total		**723**	**559**	**1,282**	**525**	**454**	**979**	**1,248**	**1,013**	**2,261**

Notes:
1) Numbers indicate 'backbone' tracks only; each backbone track may have up to six associated sub-tracks to model dispersion around the backbone; "regular" flight tracks section excludes duplicate tracks for altitude control code modeling.
2) Numbers indicate duplicated tracks with ACC added to account for flight profile level off or hold downs.
WBJ = Widebody Jet; OJ = Other Jet; NJ = Non-jet

Source: CDA 2020, HMMH analysis 2021

Attachment F-3 contains the flight track use percentages (informed by the TAAM modeling) and modeled flight track depictions for arrivals and departures by runway end for each flow.

F.7.7 Flight Profiles

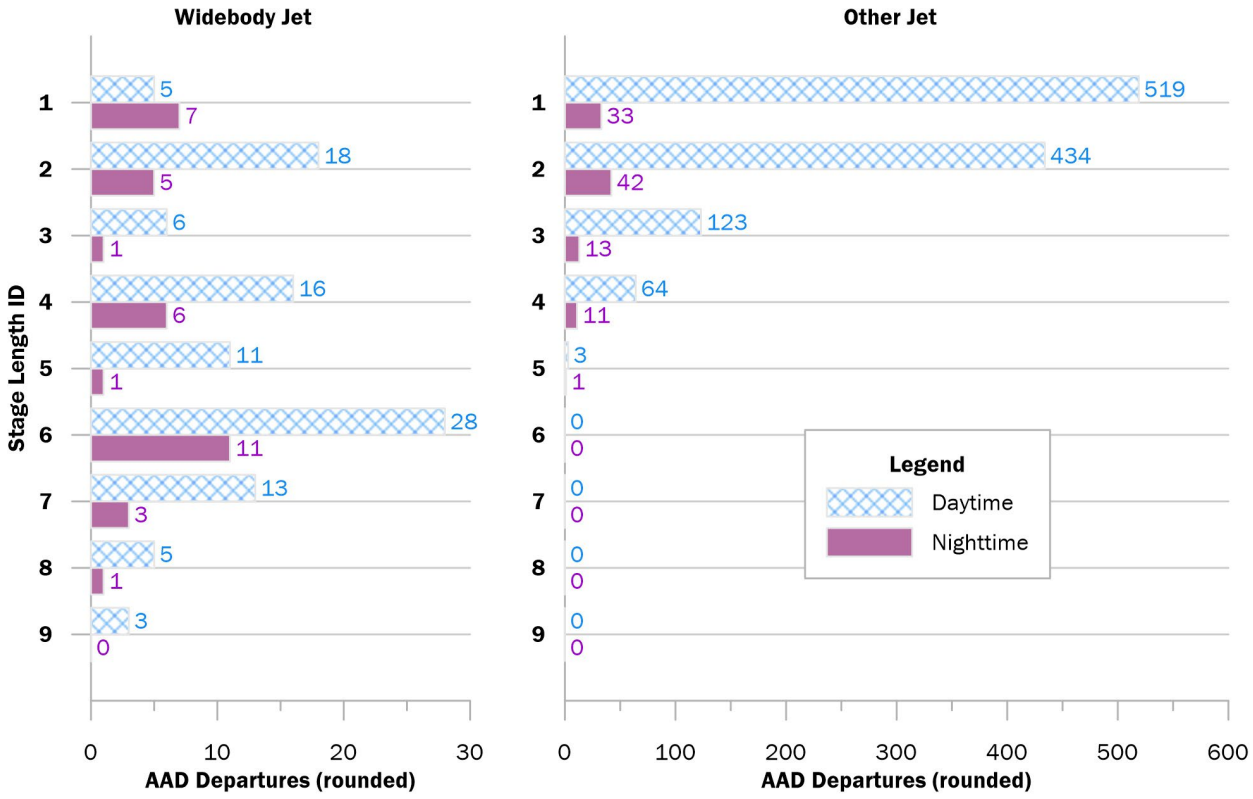
The same methodology used for development of the flight profiles for the Build Out No Action (described in **Section F.6.7**) was applied to the development of flight profiles for the Build Out Proposed Action.

The forecast's DDFS indicated destinations for each departure flight for the Build Out Proposed Action. Using the distance between O'Hare and the destination airport, the EA team assigned an AEDT stage length to each departure. The modeled stage length distribution for the Build Out Proposed Action is depicted in **Figure F-7**, for the Widebody Jet and Other Jet categories.[14] The third category of aircraft, Non-jet, almost always has destinations within the stage length 1 range and are not shown. For the purposes of the figure, AAD departures were rounded to the nearest departure. As shown in the figure, the majority (about 70 percent of day and 60 percent of night) of Widebody Jet flights were stage length 4 or higher, implying West Coast and international destinations. Most daytime or nighttime Other Jet flights would be stage length 3 or less.

[14] The scales of the two sides of the figure are different because there are more than ten times as many Other Jet operations as there are Widebody Jet operations.

Although AEDT performance profiles range from stage length 1 through 9, many AEDT aircraft types do not have flight profiles defined for the longest stage lengths; many GA aircraft types have a profile only for stage length 1. If the forecast indicated a departure stage length that exceeded that aircraft's available performance profiles, the profile for the greatest stage length available for that aircraft type was used instead.

FIGURE F-7
DISTRIBUTION OF MODELED DEPARTURE STAGE LENGTHS FOR THE BUILD OUT PROPOSED ACTION



Source: HMMH analysis, 2021

F.7.8 Maintenance Run-Up Operations

The modeled run-up operations data for the Build Out Proposed Action is the same as that described for the Build Out No Action (**Section F.6.8**). The changes to the terminal layout caused by the Proposed Action would not affect the maintenance run-up operations.

F.7.9 Noise Exposure

Sections F.7.9.1 and **F.7.9.2** describe the resultant DNL contours and affected noise-sensitive facilities respectively.

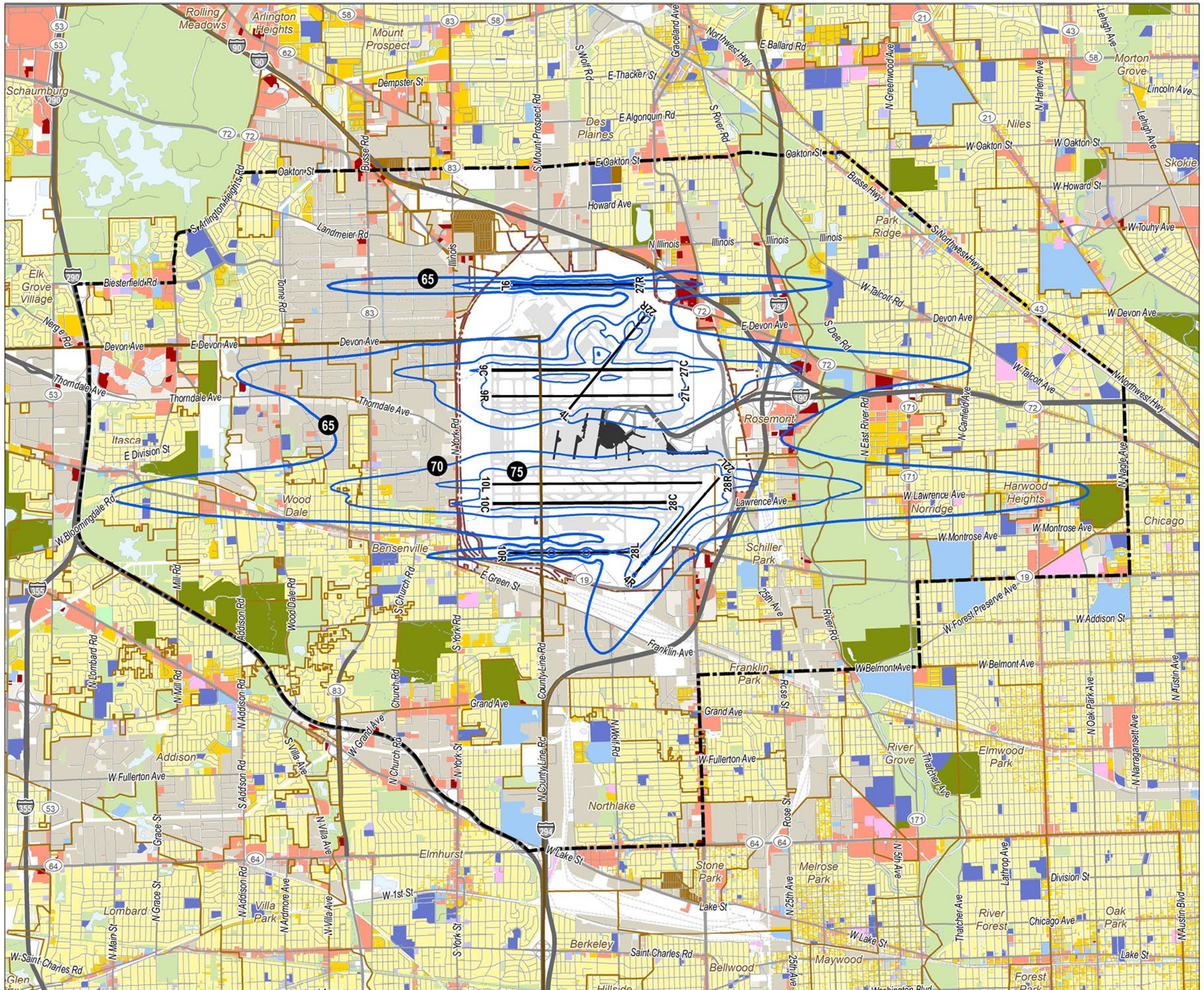
F.7.9.1 DNL Contours

Using the input data documented in the preceding sections, AEDT calculated DNL at more than 118,000 evenly-spaced grid points throughout the PSA and SSA. **Exhibit F-19** provides the the resulting DNL contours for the Build Out Proposed Action.

In the Build Out Proposed Action, the DNL contours extend away from O'Hare on the east and west side in three main lobes (north, central, and south), and in a single lobe on the south side.

- The north east-west lobe would be due to flight operations to and from Runway 9L/27R. The east lobe of the 65 DNL contour would include residential areas of Des Plaines and extend across South Dee Road into the ballfields of Maine South High School. The west lobe of the 65 DNL contour, which would include mainly commercial industrial parcels, extends past Busse Road almost to Lively Boulevard.
- The central east-west lobe would be due to flight operations to and from Runways 9C/27C and 9R/27L. The east lobe of the 65 DNL contour would include residential areas of Rosemont and Park Ridge extending to North Canfield Avenue. The west lobe of the 65 DNL contour would extend west past North Mittel Boulevard to Salt Creek and include primarily commercial industrial parcels and residential areas of Bensenville south of State Route 390.
- The south east-west lobe would be due to flight operations to and from Runways 10L/28R and 10C/28C. The east lobe of the 65 DNL contour would include residential areas of Schiller Park, Norridge, and Harwood Heights, extending into the Ridgemoor Country Club golf course. The west lobe of the 65 DNL contour would include residential areas of Bensenville, Wood Dale, and Itasca, extending along Irving Park Road almost to the Springbrook Nature Center.
- A smaller lobe of the 65 DNL contour would extend west from Runway 10R into Bensenville to the intersection of West Green Street and Gaylin Court.
- The south lobe of the 65 DNL contour, due to flight operations to and from Runway 4R/22L, extends over industrial property almost to Interstate 294.

The 70 DNL contour for Build Out Proposed Action would include residential parcels, primarily in three areas: 1) Rosemont just east of Runway 27C, 2) Schiller Park east of Runway 28R, and 3) Bensenville west of Runways 10L and 10C.



Source: HMMH 2018, USCB 2016, USCB 2010, Illinois Geospatial Data Clearinghouse, CMAP Data Hub, ESRI

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- Local Roads
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- Single Family Residential
- Public Use
- Multi-Family Residential
- Commercial
- Mobile Home
- Industrial
- Transient Lodging
- Agriculture
- School / Education
- Open Space Recreation
- Place of Worship
- Golf
- Hospital / Medical
- Vacant / Undefined
- Water / Stream

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Noise Exposure Contours for Build Out Proposed Action

Exhibit F-19

Table F-62 shows the land uses exposed to DNL greater than or equal to 65 dB for the Build Out Proposed Action. The top portion of the table quantifies acreage in each contour band by land use category. The remainder of the table provides the count of noise-sensitive facilities and estimates of population and number of housing units for each DNL band. Under the Build Out Proposed Action, no non-compatible land use would be exposed to DNL greater than or equal to 75 dB. Of the nearly 6,700 off-airport acres that would be exposed to 65 DNL or greater, 24 percent (approximately 1,600 acres) would consist of non-compatible land use.

There were an estimated 28,503 people in 11,379 housing units within the 65 DNL. Of the 11,379 housing units, 5,102 have been sound-insulated by the CDA and 266 are scheduled to be sound-insulated as part of Phase 18 and 19 of the CDA RSIP. Most non-mitigated homes within the Build Out Proposed Action 65 DNL are currently not eligible, as they are outside the DNL noise contour used for the ongoing RSIP for the OMP. Ineligible locations include areas of Itasca and Wood Dale west of Runways 10C and 10L, areas of Norridge and Harwood Heights east of Runways 28C and 28R, and a small area of Rosemont northeast of Runway 27C.

TABLE F-62
NOISE EXPOSURE FOR THE BUILD OUT PROPOSED ACTION

		DNL Contour Bands			
Land Use (Acres)	**Compatibility**	**65 - 70**	**70 - 75**	**75+**	**Total**
Single-Family Residential	Non-compatible	1,219.6	115.3	-	1,334.9
Multi-Family Residential		105.9	33.2	-	139.1
Transient Lodging (residential)		75.0	11.4	-	86.4
Mobile Home		-	-	-	-
School/Education		23.7	5.2	-	28.9
Commercial	Compatible	365.4	16.9	-	382.3
Industrial, Manufacturing, and Production		3,056.9	625.4	24.6	3,706.9
Recreational		574.4	113.4	-	687.8
Public Use (excluding School/Education)[1]		97.0	3.0	-	100.0
Undeveloped		183.5	23.6	0.6	207.7
Airport		2,229.6	1,780.7	1,915.7	5,926.0
Water		20.2	2.6	-	22.8
Subtotal Non-compatible Area (acres)		1,424.2	165.1	-	1,589.3
Subtotal Compatible Area (acres)		6,527.0	2,565.6	1,940.9	11,033.5
Total Area (acres)		**7,951.2**	**2,730.7**	**1,940.9**	**12,622.8**
Off-airport Total Area (acres)		**5,721.6**	**950.0**	**25.2**	**6,696.8**
Noise-Sensitive Facilities (count)					
Universities		1	-	-	1
Schools		7	1	-	8
Sound-Insulated Schools (Included above)		*6*	*1*	-	*7*
Libraries		1	-	-	1

		DNL Contour Bands			
Land Use (Acres)	**Compatibility**	**65 - 70**	**70 - 75**	**75+**	**Total**
Hospitals		-	-	-	-
Nursing Homes		1	-	-	1
Places of Worship		9	-	-	9
Parks and 4(f) Lands		33	4	-	37
Historic Properties		9	1	-	10
Total		**61**	**6**	**-**	**67**
Population and Housing (count)					
Population		24,331	4,172	-	28,503
Housing Units		9,815	1,564	-	11,379
Non-mitigated single-family housing units (Included above)[2]		*3,662*	*104*	-	*3,766*
Non-mitigated multi-family housing units (Included above)[2]		*2,511*	-	-	*2,511*
Sound-insulated single-family housing units (incl above)		*3,626*	*1,460*	-	*5,086*
Sound-insulated multi-family housing units (incl above)		*16*	-	-	*16*

Note 1: For the purposes of this document, Public Use (excluding School/Education) land use is considered compatible.
Note 2: The majority (89.9%) of the non-mitigated housing units are not eligible under the existing ORD RSIP because these units are outside the current RSIP DNL 65 dB contour.

Sources: ORD Residential Sound Insulation Program, January 2021 database: City of Chicago
2020 U.S. Census Bureau Census Block Population Data
Build out Proposed Action Noise Contours, Land Use, Noise-Sensitive Facilities, Population and Housing data: HMMH Analysis, October 2021

F.7.9.2 Noise-Sensitive Facilities

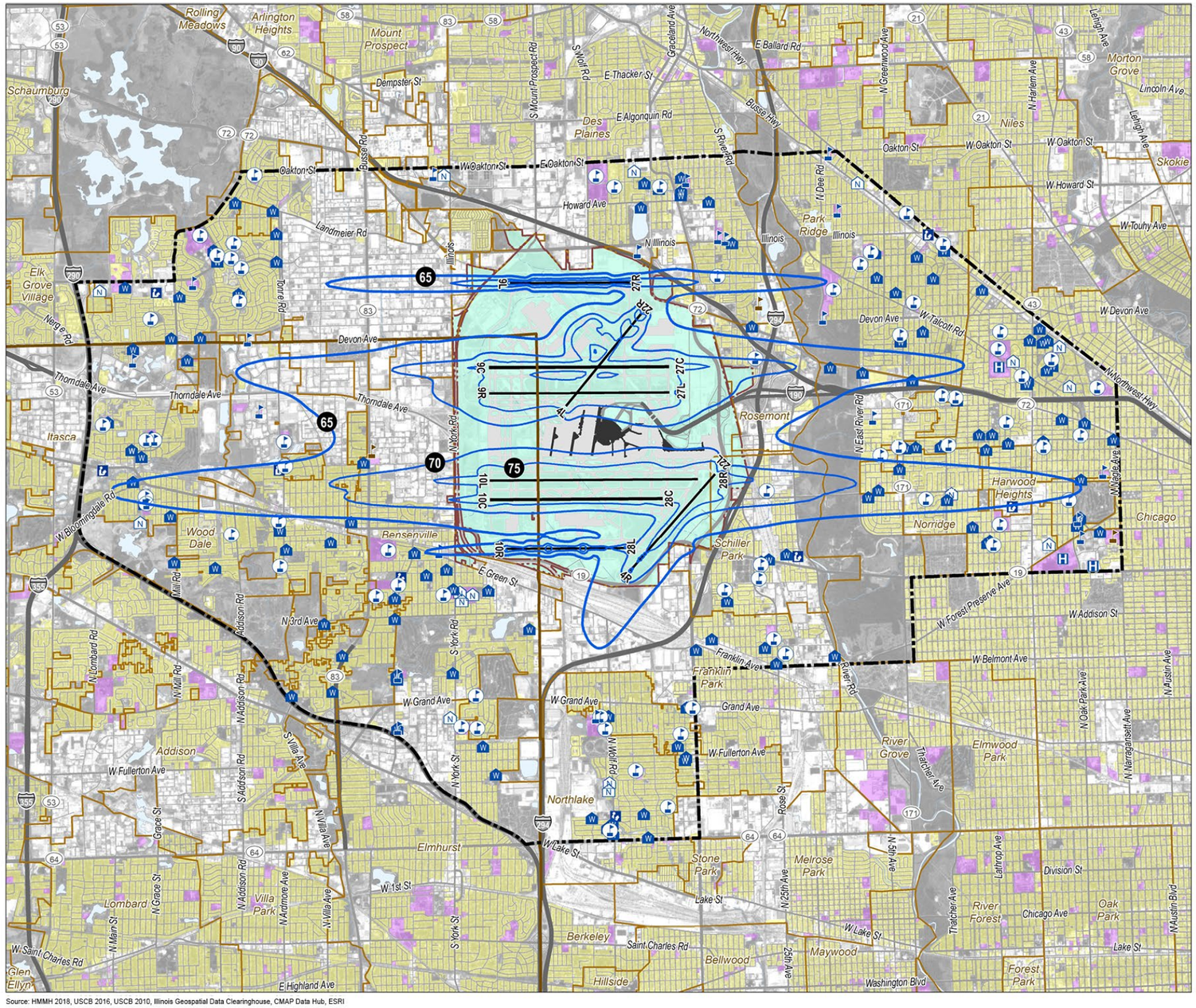
As listed in **Tables F-62** and **F-63** and shown in **Exhibit F-20**, 67 noise-sensitive facilities in the PSA—primarily parks and 4(f) lands—would be exposed to 65 DNL or greater. None would be exposed to 75 DNL or greater. No hospitals in the PSA would be exposed to DNL greater than 65 dB. Ten learning institutions, consisting of one university (Logos Evangelical Seminary), eight schools, and one library (Wood Dale Public Library District; ID L08) would be exposed to 65 DNL or greater. One school (Washington Elementary School; ID S81) would be exposed to a DNL of approximately 72 dB. The CDA has sound-insulated seven (Kindergarden to 12th Grade) schools exposed to 65 DNL or greater except for the Transition Learning Center. Four of the 37 parks and 4(f) lands (Bensenville Theatre, Norridge Rec Center-East, The Dome at the Parkway Bank Sports Complex, and Wood Dale Recreation Complex; IDs P005, P132, P188, and P215, respectively) that would be exposed to DNL greater than 65 dB do not have outdoor use. Noise results for all sites modeled within the PSA are provided in **Attachment F-5.**

TABLE F-63
NOISE-SENSITIVE FACILITIES WITH A DNL OF AT LEAST 65 DB FOR THE BUILD OUT PROPOSED ACTION

			DNL (dB) in DNL Contour Band		
Map ID	**Municipality**	**Name**	**65 - 70**	**70 - 75**	**Note**
Learning Institutions					
U01	Bensenville	Logos Evangelical Seminary	66.8	-	-
S07	Bensenville	Transition Learning Center	65.8	-	-
S28	Des Plaines	Orchard Place Elementary School	66.9	-	1
S53	Itasca	Lutheran School Of St. Luke	65.0	-	1
S54	Itasca	Raymond Benson Primary School	65.5	-	1
S58	Norridge	J Leigh Elementary School	67.3	-	1
S77	Rosemont	Rosemont Elementary School	69.5	-	1
S81	Schiller Park	Washington Elementary School	-	71.7	1
S83	Wood Dale	Early Childhood Education Center	65.8	-	1
L08	Wood Dale	Wood Dale Public Library District	66.6	-	-
Health Care Facilities					
N12	Norridge	Central Baptist Village	67.5	-	-
Places of Worship					
W006	Bensenville	First Baptist Church	67.4	-	-
W018	Chicago	All Saints Polish National Catholic Church	68.6	-	-
W025	Chicago	Evangelical Lutheran Church In America	67.1	-	-
W034	Chicago	Our Lady Mother of the Church Roman Catholic Church	68.7	-	-
W038	Chicago	St. Joseph Ukrainian Church	66.7	-	-
W078	Itasca	Itasca Baptist Church	65.0	-	-
W080	Itasca	Lutheran Church of St Luke	65.0	-	-
W090	Norridge	Church Of Our Savior	66.9	-	-
W095	Norridge	Zion Evangelical Lutheran Church	69.2	-	-
Parks and 4(f) Lands					
FP06	Chicago	Robinson Woods South	69.2	-	-
FP26	Schiller Park	River Bend Family Picnic Area	67.0	-	-
FP27	Schiller Park	Robinson Homestead Family Picnic Area	65.9	-	-
P005	Bensenville	Bensenville Theatre	65.0	-	2
P019	Bensenville	Mohawk Park	-	71.6	-
P027	Bensenville	Poplar Park	-	70.4	-
P066	Des Plaines	Orchard Place Elementary School Park	67.7	-	-
P086	Elk Grove Village	Pocket Park #2 (under construction)	65.0	-	-
P089	Elk Grove Village	Pocket Park #5	66.2	-	-
P090	Elk Grove Village	Pocket Park #6 (Future)	65.2	-	-

			DNL (dB) in DNL Contour Band		
Map ID	**Municipality**	**Name**	**65 - 70**	**70 - 75**	**Note**
P091	Elk Grove Village	Pocket Park #7	65.3	-	-
P095	Elk Grove Village	Pocket Park #11 (Future)	65.1	-	-
P131	Harwood Heights	Norridge Park District Facilities Complex	65.2	-	-
P132	Harwood Heights	Norridge Rec Center-East	65.8	-	2
P143	Itasca	Schiller Park	66.2	-	-
P147	Itasca	Washington Park	65.7	-	-
P148	Itasca	Wesley G. Usher Memorial Park	65.0	-	-
P152	Norridge	Norridge Park	67.0	-	-
P162	Park Ridge	Brickton Park	65.8	-	-
P172	Park Ridge	Southwest Park	65.9	-	-
P177	Rosemont	Donald E. Stephens Athletic Complex	69.9	-	-
P180	Rosemont	Dunne Park	68.4	-	-
P181	Rosemont	Margaret J. Lange Park	67.9	-	-
P182	Rosemont	Monument Park	65.6	-	-
P183	Rosemont	Parkway Bank Park Entertainment District	65.9	-	-
P188	Rosemont	The Dome at the Parkway Bank Sports Complex	68.5	-	2
P189	Rosemont	Westin Park	68.2	-	-
P190	Schiller Park	"Bark" Park	68.3	-	-
P193	Schiller Park	Fairview Park	67.0	-	-
P195	Schiller Park	North Village Park	-	71.8	-
P200	Schiller Park	Dooley Memorial Park	66.0	-	-
P205	Wood Dale	Central Park	-	70.1	-
P211	Wood Dale	Lionwood Park	65.2	-	-
P212	Wood Dale	Mohawk Manor Park	65.9	-	-
P213	Wood Dale	Veteran's Memorial Park	66.8	-	-
P215	Wood Dale	Wood Dale Recreation Complex	65.3	-	2
P216	Wood Dale	Wood Dale Water Park	68.1	-	-
Historic Properties					
HN08	Chicago	Rest Haven Cemetery	69.2	-	-
HN09	Chicago	Old Control Tower	67.7	-	-
HN10	Chicago	United Terminal 1	68.8	-	-
HN11	Chicago	Rotunda	68.1	-	-
LS056	Bensenville	Private Home (1919)	65.3	-	-
LS057	Bensenville	Private Home (1923)	65.4	-	-
LS058	Bensenville	Private Home (1923)	65.4	-	-
LS059	Bensenville	Private Home (1919)	65.3	-	-
LS154	Itasca	Itasca Baptist Church	65.0	-	-

			DNL (dB) in DNL Contour Band		
Map ID	**Municipality**	**Name**	**65 - 70**	**70 - 75**	**Note**
LS246	Schiller Park	20 Corner Store	-	72.0	-
Notes: 1) Sound-insulated 2) No outdoor use					
Source: HMMH, 2021					



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- Secondary Roads
- Local Roads
- Railroad Lines
- School
- Library
- Sound Insulated School
- Nursing Home
- College/University
- Hospital
- Place of Worship
- Residential
- Public, Hospital, Institutional
- Compatible
- Water / Stream

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Noise Exposure Contours for Build Out Proposed Action and Noise Sensitive Facilities

▸ Exhibit F-20

F.7.10 Comparison to Build Out No Action Alternative

F.7.10.1 DNL Contours

Exhibit F-21 and **Exhibit F-22** provide a comparison between the Build Out No Action and the Build Out Proposed Action DNL contours for this EA. **Exhibit F-22** shows areas of significant and reportable changes in noise extending west through Bensenville and Wood Dale. Color-coded dots mark areas of significant and reportable noise change relative to the Build Out No Action. The areas of significant noise change overlay non-compatible land use (residential and one school) in Bensenville, therefore there are areas ofsignificant noise impacts for the Build Out Proposed Action. No areas outside the 60 DNL contour show a five decibel or greater reportable change due to the Proposed Action.

The Air Traffic Control working group allocated weather conditions and flow using historical crosswind and tailwind information which applied to all future conditions. The working group also developed a methodology to allocate unassigned observations, which are the same across conditions except for under IFR conditions. Under IFR conditions in Build Out Proposed Action, east flow is preferred due to Proposed Action improvements and was assigned instead of west flow. This results in the Build Out Proposed Action being in East Flow three percent more than Build Out No Action.

The FAA needs to retain the offset air traffic approach capabilities due to the current requirements for simultaneous independent arrivals while allowing for increased efficiency, especially in poor weather during east flow operations (for the Runway 10R offset). This enables O'Hare to achieve its design operating capability, which results in greater distribution of arrivals to the six north-south runway ends in the Build Out Proposed Action. Arrivals to Runway 9C decrease overall while overall arrivals to Runway 10R increase compared to the Build Out No Action. Also, night arrivals to Runway 10C and Runway 10L increase compared to the Build Out No Action. These changes in runway use result in smaller DNL 65 dB contours to the west of Runway 9C and a larger DNL 65 dB contour to the west of Runway 10C and Runway 10R. The increase in noise to the west of Runway 10R results in a small area in Bensenville of significant impacts to residential land use and one school and an extended area to the west of reportable noise increases primarily over residential land use in Bensenville and Wood Dale, as shown in **Exhibit F-16.**

Table F-64 also provides the changes in land use acreage and numbers of people and housing units exposed to a DNL of at least 65 dB for the two Alternatives of the Build Out Condition. The Build Out Proposed Action would result in:

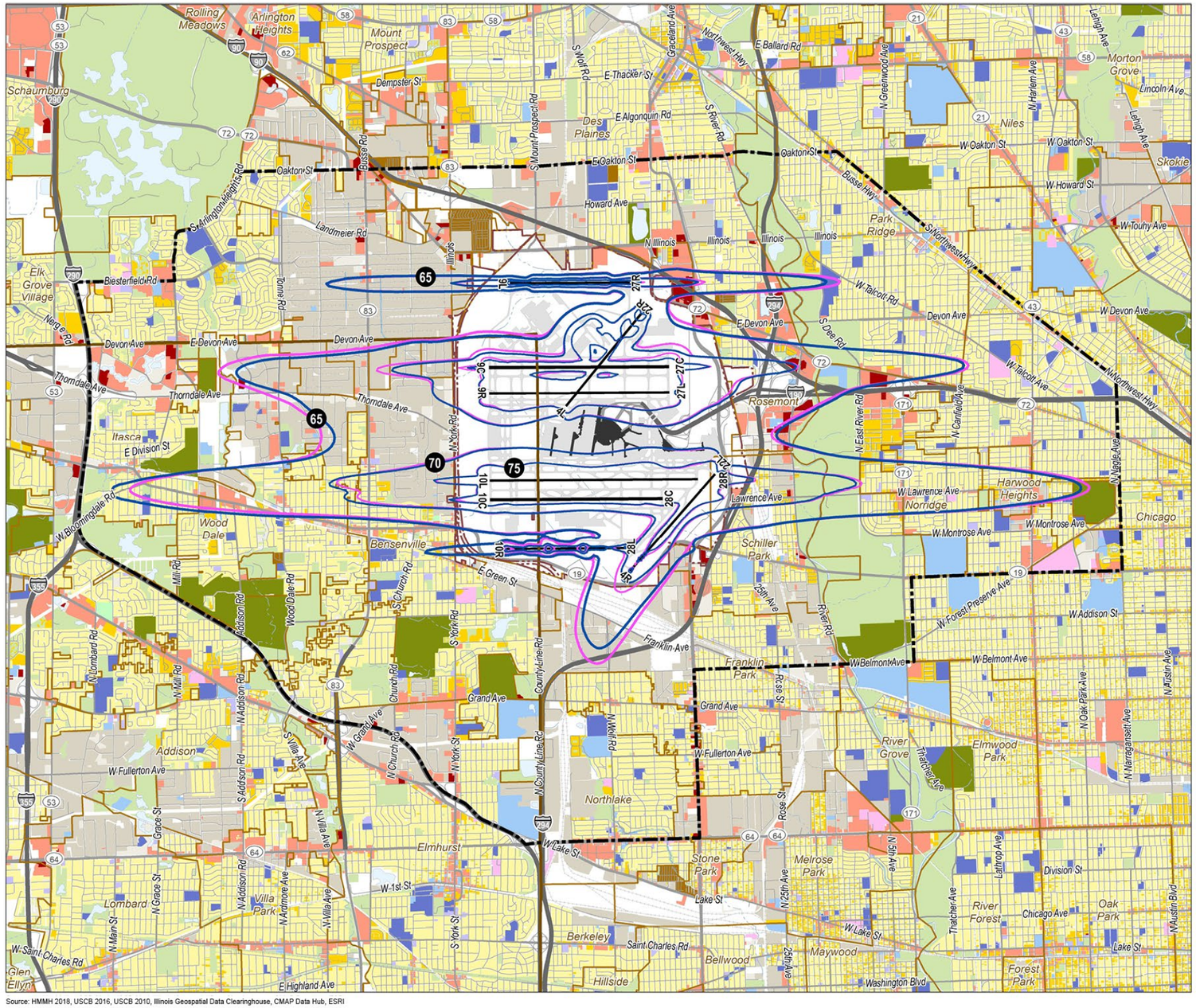
- A net decrease of 220.5 off-airport acres exposed to a DNL of at least 65 dB,
- An increase of ten noise-sensitive facilities exposed to a DNL of at least 65 dB (listed in **Section 0**), and
- A net increase of 720 people in 324 housing units exposed to a DNL of at least 65 dB.

As shown in **Exhibit F-21**, and more clearly in **Exhibit F-22**, the Build Out Proposed Action would result in some residential areas being significantly impacted by aircraft noise, i.e., where the colored dots overlap the yellow-shaded area west of Runway 10R. **Table F-62** indicates that 2.9 acres of non-compatible land use, 433 people, and 227 housing units would be significantly impacted by aircraft noise; however, all but three of the 227 housing units have been sound-insulated by the CDA. Two of the housing units have enrolled in the existing mitigation program, one in Phase 18 and one in Phase 19. The third home has been offered sound insulation eight times since 2012 but has declined the invitation.

As shown in **Exhibit F-22**, one school, a theater and four historical homes would be exposed to a significant noise increase compared to the Build Out No Action. The school has not been sound-insulated previously

by the CDA and is potentially eligible for mitigation. Eligibility will be determined by FAA as the school is located on the first floor of a residential apartment building in which all residential units have been sound insulated by the CDA. While the theater will be exposed to a significant noise increase the facility is compatible for land use purposes (compatible with noise below DNL 75 dB) and the four historical homes have all been sound-insulated by the CDA, therefore they are not significantly impacted due to the Build Out Proposed Action. Further details on these properties can be found in **Appendix H**. One place of worship in Bensenville will be exposed to a reportable noise increase due to the Build Out Proposed Action as shown on **Exhibit F-22**; however, this property based on its use remains compatible with aircraft noise, since the DNL levels are below 65 dB.

The Build Out Proposed Action would introduce (newly include) 1,350 people in 571 housing units to DNL of at least 65 dB and present a reportable increase in DNL to 351 people in 161 housing units. At the same time, the Build Out Proposed Action would reduce the exposure of (newly exclude) 631 people in 247 housing units to DNL less than 65 dB. None would experience a significant relief in noise exposure or present a reportable decrease.



Source: HMMH 2018, USCB 2016, USCB 2010, Illinois Geospatial Data Clearinghouse, CMAP Data Hub, ESRI

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- Place of Worship
- Hospital / Medical
- Water / Stream
- Public Use
- Commercial
- Industrial
- Agriculture
- Open Space Recreation
- Golf
- Vacant / Undefined

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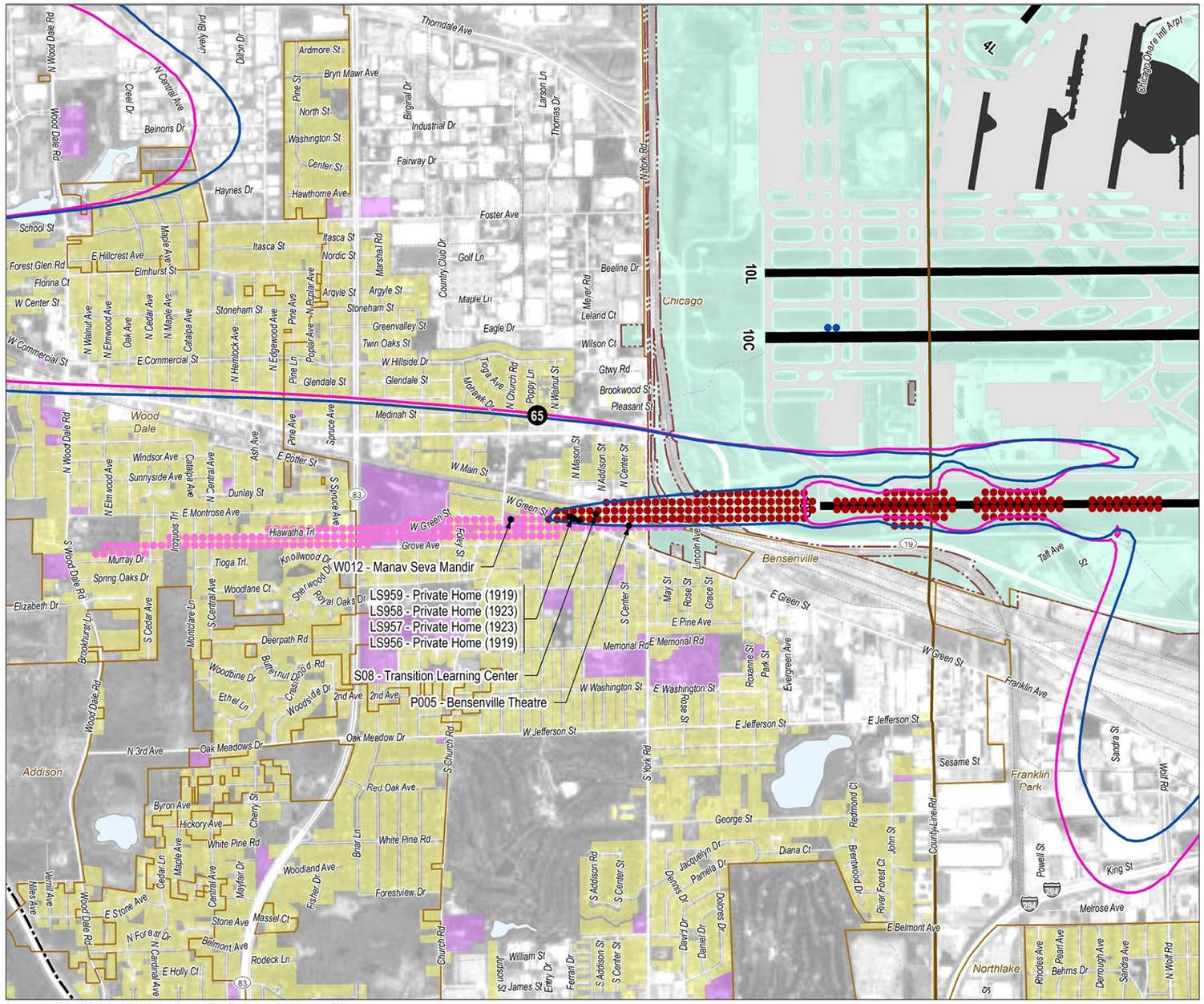
Comparison of Noise Exposure Contours for Build Out No Action and Build Out Proposed Action

▸ Exhibit F-21



Source: HMMH 2018, USCB 2016, USCB 2010, Illinois Geospatial Data Clearinghouse, CMAP Data Hub, ESRI

Chicago O'Hare International Airport

Terminal Area Plan and Air Traffic Procedures Environmental Assessment

- Build Out Proposed Action DNL Contour (65 dB)
- Build Out No Action DNL Contour (65 dB)

Grid Points 65 DNL or Greater
- Increase ≥ 1.5 dB re Proposed Action
- Decrease ≥ 1.5 dB re No Action

Grid Points Between 60 DNL and 65 DNL
- Increase ≥ 3 dB re Proposed Action
- Decrease ≥ 3 dB re No Action

- Airport Boundary
- Runways
- Taxiway / Apron
- County Boundary
- Community Boundary
- Residential
- Public, Hospital, Institutional
- Compatible
- Water / Stream

0 1,000 2,000
Feet

Potential Significant Impact Area Build Out Comparison

▸ Exhibit F-22

TABLE F-64
NOISE EXPOSURE CHANGE FOR THE BUILD OUT CONDITION

		Build Out No Action	Build Out Proposed Action	Change
Land Use (Acres)	**Compatibility**	**65+**	**65+**	**Total**
Single-Family Residential	Non-compatible	1,317.2	1,334.9	17.7
Multi-Family Residential		135.6	139.1	3.5
Transient Lodging (residential)		86.1	86.4	0.3
Mobile Home		-	-	-
School/Education		38.2	28.9	-9.3
Commercial	Compatible	369.4	382.3	12.9
Industrial, Manufacturing, and Production		3,929.4	3,706.9	-222.5
Recreational		695.2	687.8	-7.4
Public Use (excluding School/Education)[1]		99.5	100.0	0.5
Undeveloped		223.7	207.7	-16.0
Airport		5,928.4	5,926.0	-2.4
Water		23.0	22.8	-0.2
Subtotal Non-compatible Area (acres)		**1,577.1**	**1,589.3**	**12.2**
Subtotal Compatible Area (acres)		**11,268.6**	**11,033.5**	**-235.1**
Total Area (acres)		**12,845.7**	**12,622.8**	**-222.9**
Off-airport Total Area (acres)		**6,917.3**	**6,696.8**	**-220.5**
Noise-Sensitive Facilities (count)				
Universities		1	1	0
Schools		6	8	2
Sound-Insulated Schools (Included above)		*6*	*7*	*1*
Libraries		1	1	0
Hospitals		-	-	-

Nursing Homes	1	1	0
Places of Worship	7	9	2
Parks and 4(f) Lands	36	37	1
Historic Properties	5	10	5
Total	**57**	**67**	**10**
Population and Housing (count)			
Population	27,783	28,503	720
Housing Units	11,055	11,379	324
Non-mitigated single-family housing units (Included above)[2]	*3,682*	*3,766*	*84*
Non-mitigated multi-family housing units (Included above)[2]	*2,489*	*2,511*	*22*
Sound-insulated single-family housing units (incl above)	*4,868*	*5,086*	*218*
Sound-insulated multi-family housing units (incl above)	*16*	*16*	*0*

Note 1: For the purposes of this document, Public Use (excluding School/Education) land use is considered compatible.
Note 2: The majority for both Build Out No Action (89.6%) and Build Out Proposed Action (89.9%) of the non-mitigated housing units are not eligible under the existing ORD RSIP because these units are outside the current RSIP DNL 65 dB contour.

Sources: ORD Residential Sound Insulation Program, January 2021 database: City of Chicago
2020 U.S. Census Bureau Census Block Population Data
Build Out No Action and Build Out Proposed Action Noise Contours, Land Use, Noise-Sensitive Facilities, Population and Housing data: HMMH Analysis, October 2021

F.7.10.2 Noise-Sensitive Facilities

As shown in **Table F-53** (in **Section F.6.9.2**) and **Table F-63**, 70 noise sensitive facilities would be exposed to a DNL of at least 65 dB in the Build Out Condition (No Action and/or Build Out Alternatives). One school (Transition Learning Center in Bensenville), one park/4(f) land (Bensenville Theatre), and four historic properties (all private homes in Bensenville) would be potentially significantly impacted. In comparison to the No Action Alternative, 13 facilities would be introduced (newly included) to DNL of at least 65 dB. One place of worship (Manav Seva Mandir in Bensenville) would experience a reportable increase in DNL; this site is between DNL 60 and 65 dB under both of the Build Out Condition alternatives and would experience a DNL increase of 3.3 dB due to the Proposed Action. The Build Out Proposed Action would reduce the exposure (newly exclude) of three parks/4(f) lands but would not significantly relieve or provide a reportable decrease to any of the studied facilities.

F.8 CONSTRUCTION NOISE

Construction noise would temporarily increase sound levels in the immediate vicinity of construction and land clearing. Pile driving, pavement removal, and grading operations are the noisiest, with such equipment generating noise levels as high as 75 to 95 dB within 50 feet of its operation. Distance rapidly diminishes noise levels, so depending on the distance from each site, area residents would likely experience some increase in noise during construction hours. The potential noise impact associated with the operation of on-site machinery would be temporary and can be reduced using construction timing and staging. To further minimize potential noise, construction equipment would be maintained to meet manufacturers' operating specifications. The following five areas at the airport were evaluated:

- Central Terminal area,
- Runway 9L/27R exit taxiways,
- Multimodal Hotel and mixed-use development area along Mannheim Road,
- Centralized Distribution and Receiving Facility on the southwest side of the airport, and
- West Employee Ground Transportation Facility on the west side of the airport.

The Central Terminal Area construction is located near the center of the airfield. The nearest residential area (Rosemont) is approximately 1.4 NM away. Due to the distances to the nearest noise-sensitive areas and noise levels associated with airfield operations, there would be a minimal-to-no temporary effect on off-airport noise-sensitive sites. The Runway 9L/27R exit taxiway construction areas are located near each end of the runway.

For the Runway 27R end, the nearest residential area is approximately 0.4 NM away, with commercial and industrial facilities and Interstate 90 between the airport and the nearest residential receptor; this makes elevated construction noise unlikely to occur in the community.

For the Runway 9L end, the nearest residential area is approximately 0.6 NM away, with commercial facilities, railroad tracks, and Route 72 between the airport; this makes it unlikely that elevated construction noise will occur in the community.

The distance between the Multimodal Hotel development area along Mannheim Road and the nearest sensitive area (i.e., residence) is approximately 0.2 NM. However, the O'Hare Rental Car Facility and the Chicago Transit Authority railroad tracks are located between the proposed facility and the nearest

residential area. The rental car building will minimize off-airport construction noise, making it unlikely that elevated temporary construction noise will occur in the community.

The Centralized Distribution and Receiving Facility is 0.3 NM from the nearest residential land use on North York Road. However, the elevated rail line runs along the other side of North York Road and will help reduce temporary construction noise from the proposed facility.

The distance between the West Employee Ground Transportation Facility and the nearest sensitive area (i.e., residence) is approximately 0.5 NM. However, there are commercial and industrial facilities between the airport and the nearest residential receptor, which make it unlikely that elevated construction noise will occur in the community.

Impacts related to the delivery of materials may be minimized by requiring that the contractor use designated haul routes that directly connect to the airport and avoid residential and other noise-sensitive areas. Overall, construction noise is expected to have a minor and temporary impact, and no permanent impact, to noise-sensitive land or facilities.

F.9 SUMMARY RESULTS FOR ALL ALTERNATIVES

Table F-65 compares the operations and results for all five conditions. The top rows provide the number of modeled aircraft operations split out by day and night. While the total operations between the Proposed Action and No Action are the same for each condition, the numbers for day and night differ due to the Proposed Action. In both conditions, the proposed action has more daytime operations than the No Action due to reduced aircraft operational delay in the Proposed Action.

TABLE F-65
OPERATIONS AND NOISE EXPOSURE RESULTS FOR ALL CONDITIONS

	Existing Condition	Interim No Action	Interim Proposed Action	Build Out No Action	Build Out Proposed Action
Operations					
Day	801,580	840,068	840,819	892,988	893,065
Night	102,168	112,422	111,671	120,868	120,791
Total	903,748	952,490	952,490	1,013,856	1,013,856
Land Use (Acres)	**65+**	**65+**	**65+**	**65+**	**65+**
Subtotal Non-compatible Area (acres)	1,133.8	1,298.8	1,280.5	1,577.1	1,589.3
Subtotal Compatible Area (acres)	9,146.1	10,473.6	10,358.0	1,268.6	11,033.5
Total Area (acres)	10,279.9	11,772.4	11,638.5	12,845.7	12,622.8
Off-airport Total Area (acres)	5,080.4	5,964.3	5,793.8	6,917.3	6,696.8
Noise-Sensitive Facilities (count)	**65+**	**65+**	**65+**	**65+**	**65+**
Universities	1	1	1	1	1
Schools	7	5	5	6	8
Sound-Insulated Schools (Included above)	*6*	*5*	*5*	*6*	*7*

	Existing Condition	Interim No Action	Interim Proposed Action	Build Out No Action	Build Out Proposed Action
Libraries	-	1	1	1	1
Hospitals	-	-	-	-	-
Nursing Homes	1	1	1	1	1
Places of Worship	11	7	7	7	9
Parks and 4(f) Lands	25	28	27	36	37
Historic Properties	13	5	5	5	10
Total	**58**	**48**	**47**	**57**	**67**
Population and Housing (count)					
Population	18,894	23,415	22,935	27,783	28,503
Housing Units	7,255	9,359	9,156	11,055	11,379
Non-mitigated single-family housing units (Included above)	*1,461*	*2,746*	*2,655*	*3,682*	*3,766*
Non-mitigated multi-family housing units (Included above)	*950*	*2,046*	*1,968*	*2,489*	*2,511*
Total non-mitigated housing units	***2,411***	***4,792***	***4,623***	***6,171***	***6,277***
Enrolled in Phase 18 or Phase 19 of the existing RSIP (included. above)	252	228	223	259	266
Remaining eligible units under the existing RSIP (Included above)	249	299	284	370	360
Sound insulated single-family housing units (included above)	*4,826*	*4,551*	*4,517*	*4,868*	*5,086*
Sound insulated multi-family housing units (included above)	*18*	*16*	*16*	*16*	*16*
Total Sound Insulated housing units	***4,844***	***4,567***	***4,533***	***4,884***	***5,102***

Sources: ORD Residential Sound Insulation Program, January 2021 database: City of Chicago
2020 U.S. Census Bureau Census Block Population Data
Noise Contours, Land Use, Noise- Sensitive Facilities, Population and Housing data: HMMH Analysis, October 2021

F.10 MITIGATION AND MINIMIZATION

NEPA regulations require that FAA consider mitigation of significant adverse impacts that are reasonably foreseeable. In addition, 49 USC 47106 (c)(2)(B) imposes an obligation upon the Agency to document appropriate mitigation in such context. Accordingly, the FAA could require the CDA to take steps to minimize any significant noise impacts as a result of any Build Alternative, if selected.

There are 227 residential housing units that would be exposed to a significant noise impact; 224 have been previously mitigated with sound insulation by the CDA, making them compatible structures. Two of the three remaining residences are scheduled to be completed as part of the CDA's ongoing RSIP for the OMP. One residence declined the invitation for sound insulation; therefore, the FAA has determined that the residence is compatible for noise purposes. The one school (Transition Learning Center) exposed to a significant noise impact is potentially eligible for mitigation, however the CDA and FAA will need to determine the eligibility of the school since it is located on the first floor of an apartment building.

As a further possible minimization measure, the CDA could expand its ongoing RSIP to include areas that have not participated in the program and are within the Build Out Proposed Action 65 DNL contour. There are 6,277 potentially eligible homes[15] within the Build Out Proposed Action 65 DNL contour.

Other noise minimization measures that the CDA intends to continue are:

- Continuation of the existing Fly Quiet Program,
- Continued use of the Airport Noise Management System,
- Continued use of the ground run-up enclosure during engine run-up testing, and
- Continuation of cooperation with ONCC to oversee noise mitigation efforts around O'Hare.

TABLE F-66
MITIGATION COMMITMENTS

Commitment	Description	Status
Noise and Land Use		
Residential Sound Insulation for Build Out Proposed Action 65 DNL Contour	Sound-insulate all eligible residences in the Build Out Proposed Action noise contour for this EA.	There are 6,277 potentially eligible homes. Of these 6,277 units, 266 units are enrolled in the existing RSIP underway for OMP, and 360 remain eligible under the existing program but did not enroll.
School Sound Insulation for Build Out Proposed Action 65 DNL Contour	Determine eligibility for of the Transitional Learning Center for sound insulation.	The school is potentially eligible for sound insulation.
Continuation of cooperation with the O'Hare Noise Compatibility Commission (ONCC) to oversee noise mitigation efforts around O'Hare	Continue cooperation with ONCC.	In consultation with ONCC.

[15] This includes 266 units scheduled to be sound-insulated under Phase 18 and Phase 19 and 360 remaining eligible units of the existing RSIP.

ATTACHMENT F-1
BASICS OF NOISE AND TERMINOLOGY

This attachment introduces the basic terms needed to understand the noise analysis in this EA. The FAA specifies how to analyze aviation noise. Day-Night Average Sound Level (DNL) is the most important metric used to assess overall cumulative noise exposure. For a given location and a given year, the DNL value represents all the aviation noise over the course of an average annual day. Other simpler noise metrics build to the final DNL calculation. The following sections introduce basic acoustics terms. **Attachment F-5** presents currently accepted guidelines for land use within certain noise levels.

F.1 INTRODUCTION TO ACOUSTICS AND NOISE TERMINOLOGY

Noise is a complex physical quantity. To understand the DNL metric, you need some knowledge of the more basic sound metrics. This chapter introduces the following related sound metrics:

- Decibel (dB)
- A-Weighted Decibel (dBA)
- Maximum Sound Level (Lmax)
- Sound Exposure Level (SEL)
- Day-Night Average Sound Level (DNL)

F.1.1 The Decibel (dB)

All sounds come from a source, such as a musical instrument, a voice speaking, or an airplane passing overhead. It takes energy to produce sound. The sound energy produced by any noise source travels through the air in waves: tiny, quick oscillations of pressure just above and just below atmospheric pressure. These waves enter the ear and are perceived as sounds.

Humans cannot detect small differences in the wide range of sound pressures that we can hear. Using the logarithmic concept of sound pressure level (SPL), we can mathematically chart how humans hear sound. SPL is basically a comparison of the sound pressure from a given noise source to the quietest sound that a person can detect. Decibels (abbreviated dB) are the units of SPL.

Because decibels are logarithmic quantities, we cannot add them like common numbers. For example, if two sound sources each produce 100 dB at the same time, they combine to produce only 103 dB (not 200 dB, as one might expect). Four equal 100 dB simultaneous sounds result in a total SPL or noise level of 106 dB. In fact, each time the number of equal sources doubles, the noise level rises by 3 dB.

If one source is much louder than another, the two sources together produce the same noise level (and sound to our ears) as if the louder source were operating alone. For example, a 100 dB source plus an 80 dB source produces 100 dB when operating together (rounding to the nearest whole decibel). The louder

source "masks" the quieter one. If the quieter source gets louder, it will have an increasing effect on the total noise level. People hear noise level changes according to the following principles:

1) Generally, a change of 1 dB or less to a given noise level is not noticeable except in a laboratory setting;

2) A 5 dB change in sound level is generally noticeable in a community setting; and

3) It takes approximately a 10 dB increase to be heard as a doubling of a sound's loudness. Similarly, it takes about a 10 dB decrease to be judged as a halving of noise.

F.1.2 A-Weighted Decibel (dBA)

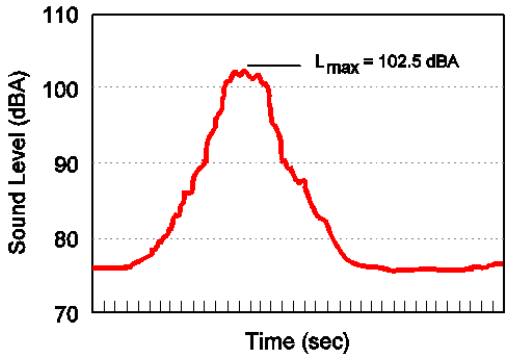
Frequency (sometimes called pitch) is another important quality of sound. Frequency is the rate of repetition of the sound waves as they reach our ears. The units of frequency are known as Hertz (Hz). The human ear does not respond equally to equal noise levels at different frequencies. The normal frequency range of hearing for most people goes from a low of about 20 Hz to a high of up to 20,000 Hz. However, people are most sensitive to sounds in the voice range, about 500 Hz to 2,000 Hz.

To adjust noise levels to resemble the way they are heard by humans, the "A-weighting" is applied. The resulting value is the A-weighted sound level, with units noted as dBA. A-weighting discounts sound waves in the range of frequencies that people do not hear well. The weighting has very little effect in the middle range, between 500 and 10,000 Hz. Studies have shown that A-weighted sound levels of transportation noise sources, such as aircraft noise, compare well with human judgment of "noisiness." Most government agencies, including the FAA, have adopted the A-weighted level as the basic measure of environmental sound.

F.1.3. Maximum A-Weighted Noise Level (L_{max})

Sound levels vary over time. Even peaceful background noise varies; birds chirp, the wind blows, or a vehicle passes by. As an aircraft approaches, the sound level increases, then falls and blends into the background as the aircraft recedes into the distance. This change in sound level over time often makes it convenient to describe a particular "noise event" by its maximum sound level, abbreviated as L_{max}. **Figure F.1-1** illustrates this concept showing a noise event with an L_{max} of about 102.5 dB. The L_{max} happens at one instant in time.

FIGURE F.1-1
VARIATIONS IN THE A-WEIGHTED SOUND LEVEL OVER TIME



Source: HMMH

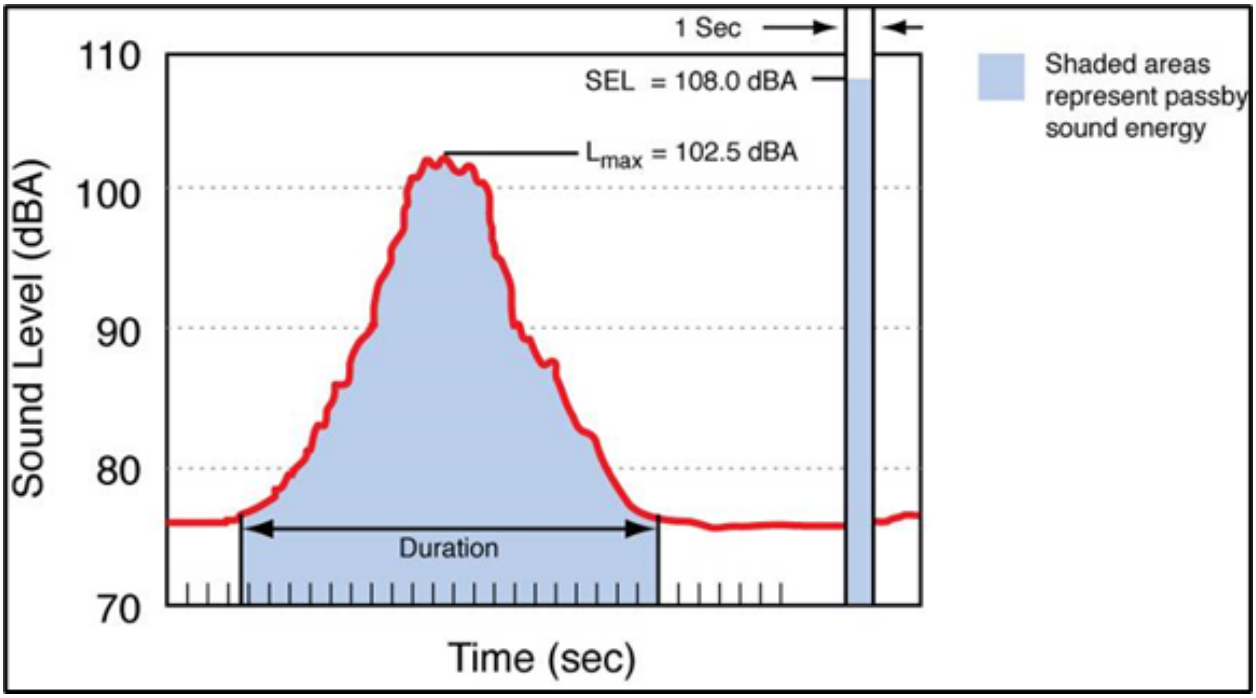
The maximum level (in this example, the number 102.5 dB) describes only one dimension of the noise event. It provides no information about cumulative noise exposure. In fact, two events with the same L_{max} may produce very different human responses. One may be of very short duration, while the other may continue for an extended period and be perceived as much more annoying. To account for the duration of noise events, we use the Sound Exposure Level metric.

F.1.4. Sound Exposure Level (SEL)

Sound Exposure Level measures the total noise energy produced during an individual event. To calculate SEL, we first define a threshold just above the background noise level. The noise event starts when the sound level first exceeds the threshold and ends when the sound level drops below the threshold. Next, we convert the total noise energy for the event into its logarithmic (decibel) form as if it had lasted exactly one second. A steady noise lasting just one second that is equal in noise energy to an actual longer-duration, time-varying noise event has the same SEL value. In other words, SEL "squeezes" the entire noise event into one second.

The SEL metric allows for comparison of noise events with different durations, since SEL "normalizes" the duration in every case to one second. **Figure F.1-2** depicts this process for a sample noise event. In this example, the event threshold is approximately 75 dB. The duration shows the times at which the noise exceeded and then dropped below the threshold value. The blue shading includes the entire noise event, which lasted many seconds and had a maximum (L_{max}) of about 102.5 dB. The shaded vertical bar, which is 108.0 dB high and just one second long (wide), contains the same exact sound energy as the full event.

FIGURE F.1-2
SOUND EXPOSURE LEVEL



Source: HMMH

The SEL value is always larger than the L_{max} number for an event that lasts longer than one second. For most aircraft overflights, the SEL is normally about 7 to 12 dB higher than the L_{max}. Longer exposure to slower, quieter aircraft (such as propeller models) can yield the same or higher SEL values than a shorter time exposure to faster, louder aircraft (such as corporate jets). SEL provides a basis for comparing noise events that generally match our impression of their overall "noisiness," including the effects of both duration and level; the higher the SEL, the more annoying a noise event is likely to be.

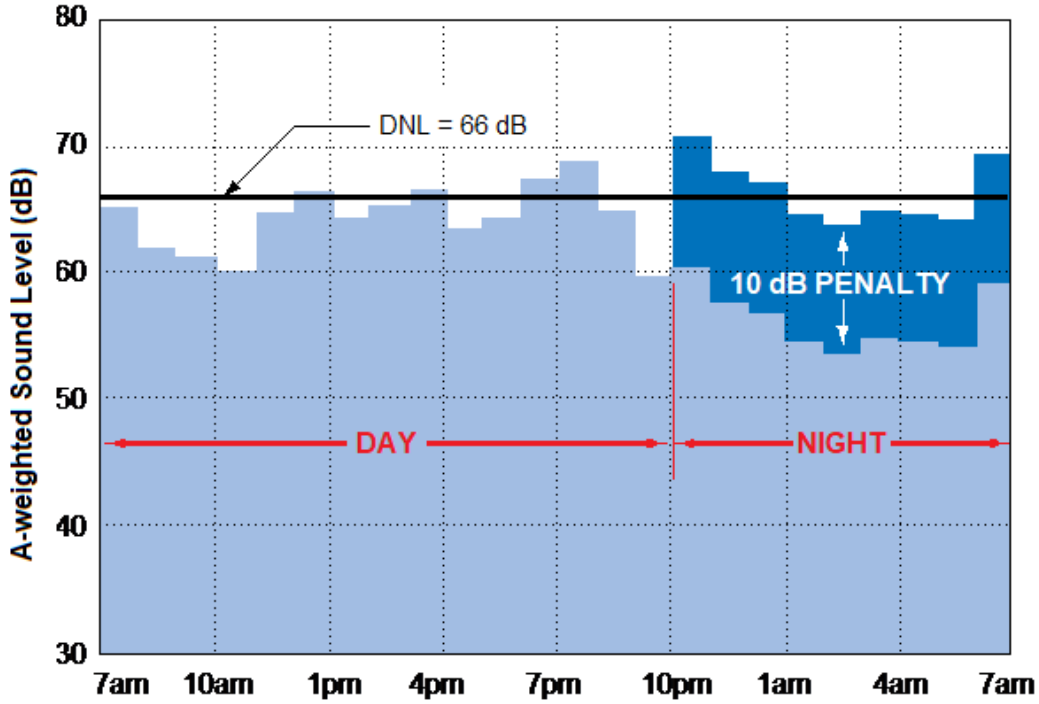
Aircraft noise models use SEL as the basis for computing exposure from multiple events such as the computation of DNL.

F.1.5 Day-Night Average Sound Level (DNL)

The previous sections address noise measures that account for short term fluctuations in A-weighted levels as sound sources come and go, affecting the overall noise environment. The DNL represents noise as it occurs over a 24-hour period, with one important exception: DNL treats noise occurring at night differently from daytime noise. The calculation adds 10 decibels to events between 10:00:00 p.m. and 6:59:59 a.m. This increase reflects the fact that people have a greater sensitivity to nighttime sound. People often judge noises at night as more intrusive because background noise at night is generally lower.

Figure F.1-3 depicts this adjustment graphically.

FIGURE F.1-3
EXAMPLE OF A DAY-NIGHT AVERAGE SOUND LEVEL CALCULATION



Source: HMMH

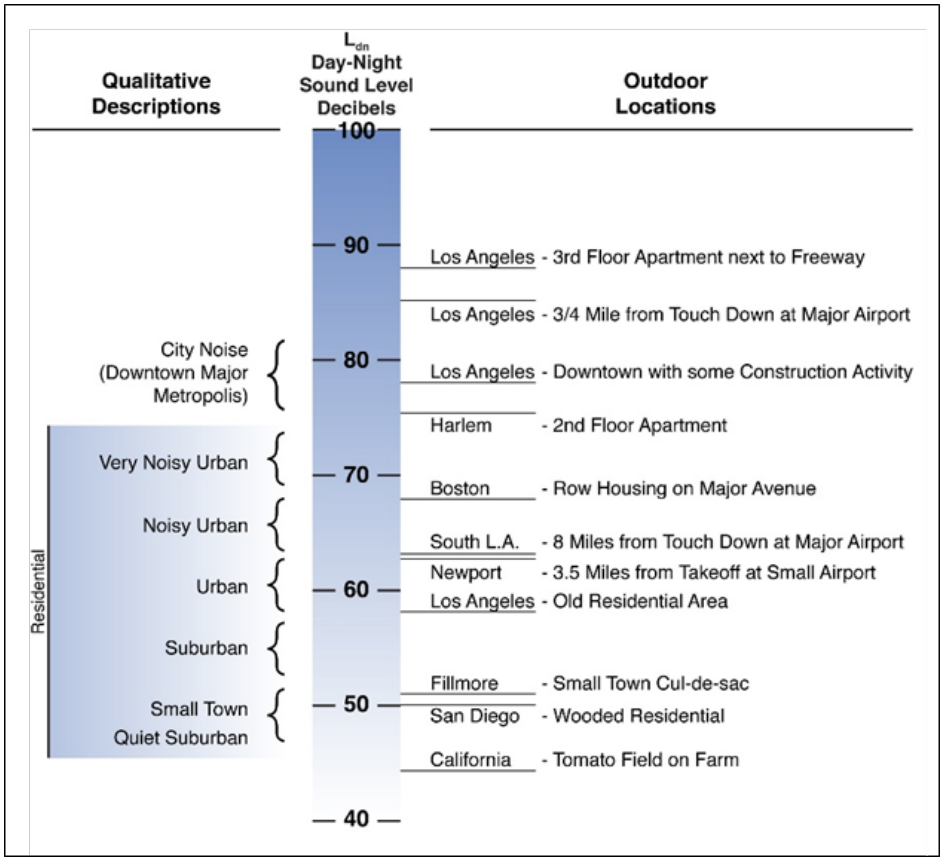
We can either measure or estimate DNL. To measure DNL, we must place noise monitors in the community. We can measure DNL values only for a limited number of points, and unless we have a permanently installed monitoring system, we can measure only for relatively short time periods. Most noise studies use computer-generated DNL estimates. The computer model adds up all the SEL values from separate events that make up the total noise dose at a given location. The calculation of an average annual day includes an entire year's aircraft operations. A map displays the computed DNL values, showing equal-exposure noise contours visually. The contours usually reflect long-term (annual average) operating conditions, considering the average flights per day, how often each runway is used throughout the year, and where over the surrounding communities the aircraft normally fly. Sometimes color-coded grid points on a map report the computed DNL at locations of interest.

For reference, **Figure F.1-4** shows how DNL values may vary for a variety of noise environments.

FAA recently completed the analysis on a key step in a multi-year Noise Research Program that will update the scientific evidence on the relationship between aircraft noise exposure and its effects on communities around airports. For further information on that research, see **Attachment F-7**.

Most public agencies dealing with noise exposure, including the FAA, Department of Defense, and Department of Housing and Urban Development, have adopted DNL in their guidelines and regulations.

FIGURE F.1-4
EXAMPLES OF DAY-NIGHT AVERAGE SOUND LEVELS (DNL)



Source: Figure 1; Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, Page 14, March 1974.

ATTACHMENT F-2
AEDT MODELING MEMORANDUMS

F-2.1 FAA NON-STANDARD MODELING DATA APPROVAL

This EA includes updated Boeing 737800 data provided by the FAA Office of Environment and Energy (AEE). This data is considered non-standard for AEDT and required FAA AEE approval, which was provided September 6, 2019. The FAA AEE approval is provided below.

U.S. Department
of Transportation
**Federal Aviation
Administration**

Office of Environment and Energy

800 Independence Ave., S.W.
Washington, D.C. 20591

9/6/2019

Amy Hanson
Environmental Protection Specialist
Federal Aviation Administration
Chicago Airports District Office
2300 E. Devon Ave
Des Planes, IL 60018

Dear Amy,

The Office of Environment and Energy (AEE) has received the memo from HMMH dated August 30, 2019 referencing an Environmental Assessment for Chicago O'Hare International Airport (ORD) requesting approval for use of updated Boeing 737800 ANP data.

AEE has reviewed the request and approves use of the updated 737800 ANP data in AEDT 2d, for aircraft equipment with a standard ANP mapping to the 737800 ANP type.

Please understand that this approval is limited to this particular Environmental Assessment for Chicago O'Hare International Airport for use with AEDT 2d only. Further non-standard AEDT inputs for additional projects at this or any other site will require separate approval.

Sincerely,

Donald Scata
Acting Manager
AEE-100/Noise Division

cc: Tom Cuddy APP-400

F-2.2 ZERO RUNWAY USE MEMORANDUMS

HMMH
700 District Avenue Suite 800
Burlington, Massachusetts 01803
781.229.0707
www.hmmh.com

TECHNICAL MEMORANDUM

To:	Amy Hanson Environmental Specialist Federal Aviation Administration 2300 E. Devon Ave Room 320 Des Plaines, IL 60018
From:	Robert Mentzer, Noise Lead Joseph Czech
Date:	May 20, 2021
Subject:	Revised FINAL - Interim No Action Scenario's Zero Runway Use Adjustment Methodology for Chicago O'Hare International Airport Terminal Area Plan and Air Traffic Procedures Environmental Assessment
Reference:	HMMH Project Number 307171.002.007.012

1. Introduction

The Total Airspace and Airport Modeler (TAAM) program was used by the City of Chicago Department of Aviation (CDA) to model the most commonly used runway configurations for the Interim No Action scenario for the Chicago O'Hare International Airport Terminal Area Plan and Air Traffic Procedures Environmental Assessment (TAP EA). As it is impractical to model all the many runway configurations, the CDA's TAAM modeling was limited to modeling the most prevalent configurations. As a result, the TAAM modeling assigned no usage to several lesser-used runways. Under the TAP EA's Interim No Action scenario, we anticipate all runways, with the exception of arrivals to Runway 4L and departures from Runway 22R, would likely be used to some extent over the course of a year to allow for safe and efficient operations during unforeseen circumstances, such as runway maintenance closures or adverse weather conditions. Therefore, adjustment to the TAAM results prior to noise modeling is required to allocate flights to the runways with no TAAM-assigned utilization (except arrivals to Runway 4L and departures from 22R).

The purpose of this Technical Memorandum (Tech Memo) is to document the adjustments to be applied to the Interim No Action scenario.

2. TAAM Runway Use

Annualization of the TAAM modeling's 24-hour simulation results[1] provides the basis for the annual average daily runway use to be modeled for the Interim No Action scenario. Table 1 presents the daytime (7:00 a.m. to 9:59 p.m.), nighttime (10:00 p.m. to 6:59 a.m.), and 24-hour (overall) runway use percentages produced by TAAM. As mentioned above, the TAAM modeling resulted in multiple runways with a zero percent utilization, the so-called "zero runway use" runways, for arrivals and/or departures.

[1] CDA provided the TAAM Annualized results on August 27, 2020.

Table 1. Runway Use Percentages from TAAM for Interim No Action

Source: CDA, 2020

Runway	Arrival			Departure			Overall		
	Day	Night	Overall	Day	Night	Overall	Day	Night	Overall
9L	15.8	5.4	14.3	-	-	-	7.7	3.3	7.2
9C	12.3	8.0	11.7	-	1.2	0.1	6.0	5.3	5.9
9R	-	-	-	0.9	1.6	1.0	0.5	0.7	0.5
9R(INT)	n/a	n/a	n/a	20.6	27.7	21.3	10.6	11.1	10.6
10L	-	19.1	2.7	0.1	4.5	0.5	0.1	13.3	1.6
10L(INT)	n/a	n/a	n/a	21.7	9.2	20.5	11.1	3.7	10.3
10C	14.7	10.2	14.0	0.1	-	0.1	7.2	6.1	7.1
10R	0.7	0.5	0.7	-	-	-	0.3	0.3	0.3
27L	-	-	-	1.1	2.3	1.2	0.6	0.9	0.6
27L(INT)	n/a	n/a	n/a	16.1	15.6	16.1	8.3	6.3	8.0
27C	17.1	12.8	16.5	-	1.7	0.2	8.3	8.3	8.3
27R	21.1	7.5	19.1	-	-	-	10.3	4.5	9.6
28L	-	-	-	-	-	-	-	-	-
28C	18.4	12.2	17.5	0.1	-	0.1	9.0	7.3	8.8
28R	-	24.2	3.4	0.3	5.4	0.7	0.1	16.7	2.1
28R(INT)	n/a	n/a	n/a	21.1	22.1	21.2	10.8	8.9	10.6
22L	-	-	-	17.8	8.7	16.9	9.1	3.5	8.5
22R	-	-	-	n/a	n/a	n/a	-	-	-
4L	n/a	n/a	n/a	-	-	-	-	-	-
4R	-	-	-	-	-	-	-	-	-

Notes:
1) Each column sums vertically to 100±0.2%
2) Annualized (Experiments 901 through 906)
3) "(INT)" represents departures from a taxiway intersection on the identified runway. There are no arrivals to (INT) runway locations.

3. Runway Use for Existing Condition

As detailed in our Existing Condition Noise Modeling Technical Memo (HMMH 2020), runway utilization for the Existing Condition scenario for the TAP EA was developed from scaled 2018 Airport Noise Management System (ANMS) and Aerobahn® data provided by the CDA. Table 2 shows the runway use percentages modeled for the Existing Condition scenario.

Table 2. Runway Use Percentages for Existing Condition

Source: HMMH, 2020

Runway	Arrival			Departure			Overall		
	Day	Night	Overall	Day	Night	Overall	Day	Night	Overall
9L	16.2	6.2	14.9	<0.05	-	<0.05	7.9	3.6	7.5
9R	0.7	1.3	0.8	22.9	20.0	22.6	12.0	9.1	11.7
10L	0.1	7.5	1.1	5.4	11.2	5.9	2.8	9.1	3.5
10L(INT)	n/a	n/a	n/a	14.6	6.4	13.8	7.4	2.7	6.9
10C	18.4	23.2	19.0	<0.05	1.8	0.2	9.0	14.3	9.6
10R	7.7	1.6	6.9	<0.05	-	<0.05	3.8	0.9	3.4
27L	23.1	28.4	23.8	0.2	0.3	0.2	11.4	16.7	12.0
27R	17.2	6.7	15.8	-	<0.05	<0.05	8.4	3.9	7.9
28L	-	-	-	<0.05	-	<0.05	<0.05	-	<0.05
28C	16.3	18.6	16.6	0.1	3.8	0.5	8.1	12.4	8.5
28R	0.2	5.8	0.9	11.2	21.6	12.2	5.8	12.4	6.5
28R(INT)	n/a	n/a	n/a	24.1	17.4	23.5	12.3	7.3	11.7
22L	<0.05	0.1	<0.05	21.5	14.7	20.8	11.0	6.2	10.4
22R	<0.05	0.3	0.1	<0.05	<0.05	<0.05	<0.05	0.2	<0.05
4L	n/a	n/a	n/a	0.1	2.4	0.3	0.1	1.0	0.2
4R	<0.05	0.2	0.1	<0.05	0.1	<0.05	<0.05	0.2	<0.05
15	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05
33	n/a	n/a	n/a	0.1	0.4	0.1	<0.05	0.2	<0.05

Notes:

1) Gray shading indicates zero TAAM daytime runway use (shading not done for overall percentages or 22R departures)

2) Blue shading indicates zero TAAM nighttime runway use (shading not done for overall percentages or 22R departures)

3) Each column sums vertically to 100±0.2%

4) "(INT)" represents departures from a taxiway intersection on the identified runway. There are no arrivals to (INT) runway locations

5) Runway 15/33 closed permanently in March 2018

As indicated in Table 2 footnotes, values are shaded either gray or blue if we propose to adjust the TAAM modeling output to a runway usage value other than zero in either the daytime or nighttime periods, respectively. For Runway 27L arrivals, (which are shaded in Table 2), we anticipate relatively low usage in the Interim No Action scenario, because most arrivals will switch from Runway 9R/27L to Runway 9C/27C in late 2020, as dictated by the O'Hare Modernization Program (OMP).[2] Therefore, the arrival runway use for Runway 27L shown in Table 2 is not applicable to the following analysis.

[2] OMP is expected to be completed in 2021.

For daytime, half of the gray-shaded cells are less than 0.05 percent. Excluding the arrival usage for Runway 27L, the daytime average[3] of arrivals and departures is 0.1 percent. For nighttime, the blue-shaded cells range from less than 0.05 percent to 3.8 percent. Several runways have nighttime usage higher than 1.0 which will be evaluated individually. Excluding all runways with usage greater than 1.0, the nighttime average[4] of arrivals and departures is 0.1 percent. Combining daytime and nighttime and excluding all usage greater than 1.0, the overall average is 0.1 percent. As shown in Table 1, the minimum non-zero runway usage value produced by the TAAM modeling[5] was 0.1 percent (for Runways 10C, 10L and 28C). For these reasons, we chose 0.1 percent as the primary value to which all applicable daytime and nighttime zero runway use occurrences from the TAAM modeling will be adjusted.[6] The following paragraph lists exceptions to that rule:

- Zero runway use for arrivals to Runway 4L, and departures from Runway 22R, is correct for the Interim No Action scenario because Runway 4L/22R is a unidirectional runway (Runway end 4L is closed for arrivals and Runway end 22R is closed for departures)
- Runway 10C, Runway 28C, and Runway 4L have nighttime departure usage greater than 1.0 percent for the Existing Condition case as shown in Table 2, therefore these three runway ends were evaluated separately. The percent difference in runway utilization percentages from Existing Condition to Interim No Action for the group of runways associated with the target runway was applied to the Existing Condition runway percentage for that runway to derive the runway percentage for the Interim No Action scenario.
    - Runway 10C Existing Condition usage is 1.8 percent. The percent difference in percentages between Existing Condition and Interim No Action for Runways 10L and 10L(INT) is -22.2 percent. Applying a 22.2 percent reduction to 1.8 percent is 1.4 percent. Therefore, TAAM's Runway 10C percentage will be set at 1.4 percent for the Interim No Action scenario.
    - Runway 28C Existing Condition usage is 3.8 percent. The percent difference in percentages between Existing Condition and Interim No Action for Runways 28R and 28R(INT) is -29.5 percent. Applying a 29.5 percent reduction to 3.8 percent is 2.7 percent. Therefore, TAAM's Runway 28C percentage will be set at 2.7 percent for the Interim No Action scenario.
    - Runway 4L Existing Condition usage is 2.4 percent. The percent difference in percentages between Existing Condition and Interim No Action for Runways 9R and 9R(INT) is +46.5 percent. Applying a 46.5 percent increase to 2.4 percent is 3.5 percent. Therefore, we will set the Runway 4L percentage at 3.5 percent for the Interim No Action scenario.
- For departures shifting from Runways 10L/28R or 09R/27L, only departures from the runway intersections will be subtracted from these runways.
- Wide-body Jet and Non-Jet departures will only be excluded from being shifted to Runways 9L/27R and 10R/28L.

In general, the adjustment methodology was to shift small percentages of operations from one runway to another by selecting the nearest runway with the same operation type and flow, so that flights would remain over similar areas to the extent possible. For example, Runway 9R departures could be shifted to nearby Runway 9L because both runways are in the same (easterly) flow and are on the same side of the airfield.

4. Proposed Runway Use Adjustments and Final Runway Use Percentages for Interim No Action

Table 3 presents the proposed runway use percentage adjustments for the Interim No Action scenario.

[3] Runways with less than 0.05 percent were set to 0.025 percent for purposes of this analysis.
[4] Runways with less than 0.05 percent were set to 0.025 percent for purposes of this analysis.
[5] Rounded to the nearest 0.1 percent.
[6] In comparison, the 2015 EIS Re-Evaluation, on average, chose 0.5 percent as the adjustment value and the IFQ Re-Evaluation chose 0.2 percent.

Table 3. Runway Use Adjustments for Interim No Action

Source: HMMH, 2020

Day/Night	Operation Type	Source Runway	Receiving Runway	Adjustment Percent
Day	Arrival	9C	9R	0.1
Day	Arrival	10C	10L	0.1
Day	Arrival	27C	27L	0.1
Day	Arrival	28C	28L	0.1
Day	Arrival	28C	28R	0.1
Day	Arrival	28C	22L	0.1
Day	Arrival	27R	22R	0.1
Day	Arrival	10C	4R	0.1
Night	Arrival	9C	9R	0.1
Night	Arrival	27C	27L	0.1
Night	Arrival	28R	22L	0.1
Night	Arrival	28R	28L	0.1
Night	Arrival	27C	22R	0.1
Night	Arrival	10L	4R	0.1
Day	Departure	9R(INT)	9L	0.1
Day	Departure	9R(INT)	9C	0.1
Day	Departure	10L(INT)	10R	0.1
Day	Departure	27L(INT)	27C	0.1
Day	Departure	27L(INT)	27R	0.1
Day	Departure	28R(INT)	28L	0.1
Day	Departure	9R(INT)	4L	0.1
Day	Departure	10L(INT)	4R	0.1
Night	Departure	9R(INT)	9L	0.1
Night	Departure	10L(INT)	10C	1.4
Night	Departure	10L(INT)	10R	0.1
Night	Departure	27L(INT)	27R	0.1
Night	Departure	28R(INT)	28L	0.1
Night	Departure	28R(INT)	28C	2.7
Night	Departure	9R(INT)	4L	3.5
Night	Departure	10L(INT)	4R	0.1

Note: Wide-body Jet departures would be excluded from any adjustments

As shown in Table 4, applying the adjustments shown in Table 3 to the runway use percentages in Table 1 yield the final runway use percentages for noise modeling of the Interim No Action scenario. In Table 4, the runway

use percentages are listed alongside the runway use percentages for the Existing Condition (from Table 2) for ease of comparison.

Table 4. Runway Utilization Percentages for Interim No Action Compared to Existing Condition

Source: HMMH, 2020

Runway	Daytime Arrivals		Nighttime Arrivals		Daytime Departures		Nighttime Departures	
	Existing Condition	Interim No Action	Existing Condition	Interim No Action	Existing Condition	Interim No Action	Existing Condition	Interim No Action
9L	16.2	15.8	6.2	5.4	<0.05	0.1	-	0.1
9C	n/a	12.2	n/a	7.9	n/a	0.1	n/a	1.2
9R	0.7	0.1	1.3	0.1	22.9	0.9	20.0	1.6
9R(INT)	n/a				n/a	20.3	n/a	24.1
10L	0.1	0.1	7.5	19.0	5.4	0.1	11.2	4.5
10L(INT)	n/a				14.6	21.5	6.4	7.6
10C	18.4	14.5	23.2	10.2	<0.05	0.1	1.8	1.4
10R	7.7	0.7	1.6	0.5	<0.05	0.1	-	0.1
27L	23.1	0.1	28.4	0.1	0.2	1.1	0.3	2.3
27L(INT)	n/a				n/a	15.9	n/a	15.5
27C	n/a	17.0	-	12.6	n/a	0.1	n/a	1.7
27R	17.2	21.0	6.7	7.5	-	0.1	<0.05	0.1
28L	-	0.1	-	0.1	<0.05	0.1	-	0.1
28C	16.3	18.1	18.6	12.2	0.1	0.1	3.8	2.7
28R	0.2	0.1	5.8	24.0	11.2	0.3	21.6	5.4
28R(INT)	n/a				24.1	21.0	17.4	19.3
22L	<0.05	0.1	0.1	0.1	21.5	17.8	14.7	8.7
22R	<0.05	0.1	0.3	0.1	<0.05	n/a	<0.05	-
4L	n/a				0.1	0.1	2.4	3.5
4R	<0.05	0.1	0.2	0.1	<0.05	0.1	0.1	0.1

Notes:

1) Each column for Interim No Action sums vertically to 100±0.1

2) Values for Existing Condition are only shown for comparison purposes and do not sum vertically to 100% due to exclusion of Runway 15/33

3) "(INT)" represents departures from a taxiway intersection on the identified runway. There are/would be no arrivals to (INT) runway locations

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TECHNICAL MEMORANDUM

To:	Amy Hanson Environmental Specialist Federal Aviation Administration 2300 E. Devon Ave Room 320 Des Plaines, IL 60018
From:	Robert Mentzer, Noise Lead Joseph Czech
Date:	November 23, 2020
Subject:	Revised Final - Interim with Project Scenario's Zero Runway Use Adjustment Methodology for Chicago O'Hare International Airport Terminal Area Plan and Air Traffic Procedures Environmental Assessment
Reference:	HMMH Project Number 307171.002.007.012

1. Introduction

The Total Airspace and Airport Modeler (TAAM) program was used by the City of Chicago Department of Aviation (CDA) to model the most commonly used runway configurations for the Interim with Project scenario for the Chicago O'Hare International Airport Terminal Area Plan and Air Traffic Procedures Environmental Assessment (TAP EA). As it is impractical to model all the many runway configurations, the CDA's TAAM modeling was limited to modeling the most prevalent configurations. As a result, the TAAM modeling assigned no usage to several lesser-used runways. Under the TAP EA's Interim with Project scenario, we anticipate all runways, with the exception of arrivals to Runway 4L and departures from Runway 22R, would likely be used to some extent over the course of a year to allow for safe and efficient operations during unforeseen circumstances, such as runway maintenance closures or adverse weather conditions. Therefore, adjustment to the TAAM results prior to noise modeling is required to allocate flights to the runways with no TAAM-assigned utilization (except arrivals to Runway 4L and departures from 22R).

The purpose of this Technical Memorandum (Tech Memo) is to document the adjustments to be applied to the Interim with Project scenario.

2. TAAM Runway Use

Annualization of the TAAM modeling's 24-hour simulation results[1] provides the basis for the annual average daily runway use to be modeled for the Interim with Project scenario. Table 1 presents the daytime (7:00 AM to 9:59 PM), nighttime (10:00 PM to 6:59 AM), and 24-hour (overall) runway use percentages produced by TAAM. As mentioned above, the TAAM modeling resulted in multiple runways with a zero percent utilization, the so-called "zero runway use" runways, for arrivals and/or departures.

[1] CDA provided the TAAM Annualized results on June 19, 2020.

Table 1. Runway Use Percentages from TAAM for Interim with Project

Source: CDA, 2020

Runway	Arrival			Departure			Overall		
	Day	Night	Overall	Day	Night	Overall	Day	Night	Overall
9L	15.6	4.0	14.0	-	-	-	7.6	2.4	7.0
9C	9.7	8.2	9.5	-	1.3	0.1	4.7	5.5	4.8
9R	-	-	-	1.0	1.6	1.0	0.5	0.6	0.5
9R(INT)	n/a	n/a	n/a	21.1	31.1	22.0	10.8	12.4	11.0
10L	-	19.4	2.7	0.1	4.3	0.5	0.1	13.3	1.6
10L(INT)	n/a	n/a	n/a	21.2	6.2	19.8	10.9	2.5	9.9
10C	14.6	9.7	13.9	0.1	0.2	0.1	7.1	5.9	7.0
10R	3.7	2.1	3.5	-	-	-	1.8	1.3	1.7
27L	-	-	-	1.1	2.1	1.2	0.5	0.8	0.6
27L(INT)	n/a	n/a	n/a	16.0	17.5	16.2	8.2	7.0	8.1
27C	16.6	13.2	16.1	-	1.7	0.2	8.1	8.6	8.2
27R	21.4	6.5	19.3	-	-	-	10.4	3.9	9.7
28L	-	-	-	-	-	-	-	-	-
28C	18.4	11.9	17.4	0.1	-	0.1	9.0	7.2	8.8
28R	-	25.0	3.5	0.3	5.1	0.7	0.1	17.1	2.1
28R(INT)	n/a	n/a	n/a	21.8	20.2	21.6	11.2	8.1	10.8
22L	-	-	-	17.3	8.8	16.5	8.9	3.5	8.3
22R	-	-	-	n/a	n/a	n/a	-	-	-
4L	n/a	n/a	n/a	-	-	-	-	-	-
4R	-	-	-	-	-	-	-	-	-

Notes:
1) Each column sums vertically to 100±0.1%
2) Annualized (Experiments 921 through 926)
3) "(INT)" represents departures from a taxiway intersection on the identified runway. There are no arrivals to (INT) runway locations.

3. Runway Use for Existing Condition

As detailed in our Existing Condition Noise Modeling Technical Memo (HMMH 2020), runway utilization for the Existing Condition scenario for the TAP EA was developed from scaled 2018 Airport Noise Management System (ANMS) and Aerobahn® data provided by the CDA. Table 2 shows the runway use percentages modeled for the Existing Condition scenario.

Table 2. Runway Use Percentages for Existing Condition

Source: HMMH, 2020

Runway	Arrival			Departure			Overall		
	Day	Night	Overall	Day	Night	Overall	Day	Night	Overall
9L	16.2	6.2	14.9	<0.05	-	<0.05	7.9	3.6	7.5
9R	0.7	1.3	0.8	22.9	20.0	22.6	12.0	9.1	11.7
10L	0.1	7.5	1.1	5.4	11.2	5.9	2.8	9.1	3.5
10L(INT)	n/a	n/a	n/a	14.6	6.4	13.8	7.4	2.7	6.9
10C	18.4	23.2	19.0	<0.05	1.8	0.2	9.0	14.3	9.6
10R	7.7	1.6	6.9	<0.05	-	<0.05	3.8	0.9	3.4
27L	23.1	28.4	23.8	0.2	0.3	0.2	11.4	16.7	12.0
27R	17.2	6.7	15.8	-	<0.05	<0.05	8.4	3.9	7.9
28L	-	-	-	<0.05	-	<0.05	<0.05	-	<0.05
28C	16.3	18.6	16.6	0.1	3.8	0.5	8.1	12.4	8.5
28R	0.2	5.8	0.9	11.2	21.6	12.2	5.8	12.4	6.5
28R(INT)	n/a	n/a	n/a	24.1	17.4	23.5	12.3	7.3	11.7
22L	<0.05	0.1	<0.05	21.5	14.7	20.8	11.0	6.2	10.4
22R	<0.05	0.3	0.1	<0.05	<0.05	<0.05	<0.05	0.2	<0.05
4L	n/a	n/a	n/a	0.1	2.4	0.3	0.1	1.0	0.2
4R	<0.05	0.2	0.1	<0.05	0.1	<0.05	<0.05	0.2	<0.05
15	<0.05			-	<0.05	<0.05	<0.05	<0.05	<0.05
33	n/a	n/a	n/a	0.1	0.4	0.1	<0.05	0.2	<0.05

Notes:
1) Gray shading indicates zero TAAM daytime runway use (shading not done for overall percentages or 22R departures)
2) Blue shading indicates zero TAAM nighttime runway use (shading not done for overall percentages or 22R departures)
3) Each column sums vertically to 100±0.2%
4) "(INT)" represents departures from a taxiway intersection on the identified runway. There are no arrivals to (INT) runway locations
5) Runway 15/33 closed permanently in March 2018

As indicated in Table 2 footnotes, values are shaded either gray or blue if we propose to adjust the TAAM modeling output to a runway usage value other than zero in either the daytime or nighttime periods, respectively. For Runway 27L arrivals, (which are shaded in Table 2), we anticipate relatively low usage in the Interim with Project scenario, because most arrivals will switch from Runway 9R/27L to Runway 9C/27C in late 2020, as dictated by the O'Hare Modernization Program (OMP)[2]. Therefore, the arrival runway use for Runway 27L shown in Table 2 is not applicable to the following analysis.

For daytime, half of the gray-shaded cells are less than 0.05 percent. Excluding the arrival usage for Runway 27L, the daytime average[3] of arrivals and departures is 0.1 percent. For nighttime, the blue-shaded cells range from less than 0.05 percent to 3.8 percent. Several runways have nighttime usage higher than 1.0 which will be evaluated individually. Excluding all runways with usage greater than 1.0, the nighttime average[4] of arrivals and departures is 0.1 percent. Combining daytime and nighttime and excluding all usage greater than 1.0, the overall average is 0.1 percent. As shown in Table 1, the minimum non-zero runway usage value produced by

[2] OMP is expected to be completed in 2021.
[3] Runways with less than 0.05 percent were set to 0.025 percent for purposes of this analysis.
[4] Runways with less than 0.05 percent were set to 0.025 percent for purposes of this analysis.

the TAAM modeling[5] was 0.1 percent (for Runways 9C and 28C). For these reasons, we chose 0.1 percent as the primary value to which all applicable daytime and nighttime zero runway use occurrences from the TAAM modeling will be adjusted[6]. The following paragraph lists exceptions to that rule:

- Zero runway use for arrivals to Runway 4L, and departures from Runway 22R, is correct for the Interim with Project scenario because Runway 4L/22R is a unidirectional runway (Runway end 4L is closed for arrivals and Runway end 22R is closed for departures)
- Runway 10C, Runway 28C, and Runway 4L have nighttime departure usage greater than 1.0 percent for the Existing Condition case as shown in Table 2, therefore these three runway ends were evaluated separately. The percent difference in runway utilization percentages from Existing Condition to Interim with Project for the group of runways associated with the target runway was applied to the Existing Condition runway percentage for that runway to derive the runway percentage for the Interim with Project scenario.
    - Runway 10C Existing Condition usage is 1.8 percent. The percent difference in percentages between Existing Condition and Interim with Project for Runways 10L and 10L(INT) is -40 percent. Applying a 40 percent reduction to 1.8 percent is 1.1 percent. Therefore, TAAM's Runway 10C percentage of 0.2 percent will be increased by 0.9 percent to 1.1 percent for the Interim with Project scenario.
    - Runway 28C Existing Condition usage is 3.8 percent. The percent difference in percentages between Existing Condition and Interim with Project for Runways 28R and 28R(INT) is -35 percent. Applying a 35 percent reduction to 3.8 percent is 2.5 percent. Therefore, TAAM's Runway 28C percentage will be set at 2.5 percent for the Interim with Project scenario.
    - Runway 4L Existing Condition usage is 2.4 percent. The percent difference in percentages between Existing Condition and Interim with Project for Runways 9R and 9R(INT) is +61 percent. Applying a 61 percent increase to 2.4 percent is 3.9 percent. Therefore, we will set Runway 4L percentage at 3.9 percent for the Interim with Project scenario.
- For departures shifting from Runways 10L/28R or 09R/27L, only departures from the runway intersections will be subtracted from these runways.
- Wide-body Jet and Non-Jet departures will only be excluded from being shifted to Runways 9L/27R and 10R/28L.

In general, the adjustment methodology was to shift small percentages of operations from one runway to another by selecting the nearest runway with the same operation type and flow, so that flights would remain over similar areas to the extent possible. For example, Runway 9R departures could be shifted to nearby Runway 9L because both runways are in the same (easterly) flow and are on the same side of the airfield.

[5] Rounded to the nearest 0.1 percent.
[6] In comparison, the 2015 EIS Re-Evaluation, on average, chose 0.5 percent as the adjustment value and the IFQ Re-Evaluation chose 0.2 percent.

4. Proposed Runway Use Adjustments and Final Runway Use Percentages for Interim with Project

Table 3 presents the proposed runway use percentage adjustments for the Interim with Project scenario.

Table 3. Runway Use Adjustments for Interim with Project
Source: HMMH, 2020

Day/Night	Operation Type	Source Runway	Receiving Runway	Adjustment Percent
Day	Arrival	9C	9R	0.1
Day	Arrival	10C	10L	0.1
Day	Arrival	27C	27L	0.1
Day	Arrival	28C	28L	0.1
Day	Arrival	28C	28R	0.1
Day	Arrival	28C	22L	0.1
Day	Arrival	27R	22R	0.1
Day	Arrival	10C	4R	0.1
Night	Arrival	9C	9R	0.1
Night	Arrival	27C	27L	0.1
Night	Arrival	28R	22L	0.1
Night	Arrival	28R	28L	0.1
Night	Arrival	27C	22R	0.1
Night	Arrival	10L	4R	0.1
Day	Departure	9R(INT)	9L	0.1
Day	Departure	9R(INT)	9C	0.1
Day	Departure	10L(INT)	10R	0.1
Day	Departure	27L(INT)	27C	0.1
Day	Departure	27L(INT)	27R	0.1
Day	Departure	28R(INT)	28L	0.1
Day	Departure	9R(INT)	4L	0.1
Day	Departure	10L(INT)	4R	0.1
Night	Departure	9R(INT)	9L	0.1
Night	Departure	10L(INT)	10C	0.9
Night	Departure	10L(INT)	10R	0.1
Night	Departure	27L(INT)	27R	0.1
Night	Departure	28R(INT)	28L	0.1
Night	Departure	28R(INT)	28C	2.5
Night	Departure	9R(INT)	4L	3.9
Night	Departure	10L(INT)	4R	0.1

Note: Wide-body Jet and non-jet departures are only excluded from being shifted from any runway to Runways 9L/27R and 10R/28L

As shown in Table 4, applying the adjustments shown in Table 3 to the runway use percentages in Table 1 yields the final runway use percentages for noise modeling the Interim with Project scenario. In Table 4, the

runway use percentages are listed alongside the runway use percentages for the Existing Condition (from Table 2) for ease of comparison.

Table 4. Runway Utilization Percentages for Interim with Project Compared to Existing Conditions

Source: HMMH, 2020

Runway	Daytime Arrivals		Nighttime Arrivals		Daytime Departures		Nighttime Departures	
	Existing Condition	Interim w/Project	Existing Condition	Interim w/Project	Existing Condition	Interim w/Project	Existing Condition	Interim w/Project
9L	16.2	15.6	6.2	4.0	<0.05	0.1	-	0.1
9C	n/a	9.6	n/a	8.1	n/a	0.1	n/a	1.3
9R	0.7	0.1	1.3	0.1	22.9	1.0	20.0	1.6
9R(INT)	n/a	n/a	n/a	n/a	n/a	20.8	n/a	27.1
10L	0.1	0.1	7.5	19.3	5.4	0.1	11.2	4.3
10L(INT)	n/a	n/a	n/a	n/a	14.6	21.0	6.4	5.1
10C	18.4	14.4	23.2	9.7	<0.05	0.1	1.8	1.1
10R	7.7	3.7	1.6	2.1	<0.05	0.1	-	0.1
27L	23.1	0.1	28.4	0.1	0.2	1.1	0.3	2.1
27L(INT)	n/a	n/a	n/a	n/a	n/a	15.8	n/a	17.4
27C	n/a	16.5	n/a	13.0	n/a	0.1	n/a	1.7
27R	17.2	21.3	6.7	6.5	-	0.1	<0.05	0.1
28L	-	0.1	-	0.1	<0.05	0.1	-	0.1
28C	16.3	18.1	18.6	11.9	0.1	0.1	3.8	2.5
28R	0.2	0.1	5.8	24.8	11.2	0.3	21.6	5.1
28R(INT)	n/a	n/a	n/a	n/a	24.1	21.7	17.4	17.6
22L	<0.05	0.1	0.1	0.1	21.5	17.3	14.7	8.8
22R	<0.05	0.1	0.3	0.1	<0.05	n/a	<0.05	n/a
4L	n/a	n/a	n/a	n/a	0.1	0.1	2.4	3.9
4R	<0.05	0.1	0.2	0.1	<0.05	0.1	0.1	0.1

Notes:
1) Each column for Interim with Project sums vertically to 100±0.1
2) Values for Existing Condition are only shown for comparison purposes and do not sum vertically to 100% due to exclusion of Runway 15/33
3) "(INT)" represents departures from a taxiway intersection on the identified runway. There are/would be no arrivals to (INT) runway locations

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TECHNICAL MEMORANDUM

To:	Amy Hanson Environmental Specialist Federal Aviation Administration 2300 E. Devon Ave Room 320 Des Plaines, IL 60018
From:	Robert Mentzer, Noise Lead Joseph Czech
Date:	May 20, 2021
Subject:	Revised FINAL - Build Out No Action Scenario's Zero Runway Use Adjustment Methodology for Chicago O'Hare International Airport Terminal Area Plan and Air Traffic Procedures Environmental Assessment
Reference:	HMMH Project Number 307171.002.007.012

1. Introduction

The Total Airspace and Airport Modeler (TAAM) program was used by the City of Chicago Department of Aviation (CDA) to model the most commonly used runway configurations for the Build Out No Action scenario for the Chicago O'Hare International Airport Terminal Area Plan and Air Traffic Procedures Environmental Assessment (TAP EA). As it is impractical to model all the many runway configurations, the CDA's TAAM modeling was limited to the most prevalent configurations. As a result, the TAAM modeling assigned no usage to several lesser-used runways. Under the TAP EA's Build Out No Action scenario, we anticipate all runways, with the exception of arrivals to Runway 4L and departures from Runway 22R, would likely be used to some extent over the course of a year to allow for safe and efficient operations during unforeseen circumstances, such as runway maintenance closures or adverse weather conditions. Therefore, adjustment to the TAAM results prior to noise modeling is required to allocate flights to the runways with no TAAM-assigned utilization (except arrivals to Runway 4L and departures from 22R).

The purpose of this Technical Memorandum (Tech Memo) is to document the adjustments to be applied to the Build Out No Action scenario.

2. TAAM Runway Use

Annualization of the TAAM modeling's 24-hour simulation results[1] provide the basis for the annual average daily runway use to be modeled for the Build Out No Action scenario. Table 1 presents the daytime (7:00 AM to 9:59 PM), nighttime (10:00 PM to 6:59 AM) and 24-hour (overall) runway use percentages produced by TAAM. As mentioned above, the TAAM modeling resulted in multiple runways with a zero percent utilization, the so-called "zero runway use" runways, for arrivals and/or departures.

[1] CDA provided the TAAM Annualized results on July 31, 2020.

Table 1. Runway Use Percentages from TAAM for Build Out No Action

Source: CDA, 2020

	Arrival			Departure			Overall		
Runway	Day	Night	Overall	Day	Night	Overall	Day	Night	Overall
9L	16.0	4.9	14.4	-	-	-	7.8	2.9	7.2
9C	11.9	8.1	11.3	-	1.4	0.2	5.8	5.3	5.8
9R	-	-	-	1.0	1.4	1.0	0.5	0.6	0.5
9R(INT)	n/a	n/a	n/a	20.2	27.1	20.9	10.3	11.1	10.4
10L	-	19.4	2.7	0.1	5.3	0.7	0.1	13.6	1.7
10L(INT)	n/a	n/a	n/a	21.9	9.2	20.7	11.2	3.7	10.3
10C	14.9	10.8	14.3	0.1	0.3	0.1	7.3	6.5	7.2
10R	0.7	0.4	0.6	-	-	-	0.3	0.3	0.3
27L	-	-	-	1.2	1.8	1.2	0.6	0.7	0.6
27L(INT)	n/a	n/a	n/a	15.8	15.4	15.7	8.0	6.3	7.8
27C	16.4	12.2	15.8	-	2.3	0.3	8.0	8.2	8.1
27R	21.5	7.3	19.5	-	-	-	10.5	4.3	9.8
28L	-	-	-	-	-	-	-	-	-
28C	18.7	11.3	17.7	0.1	0.4	0.1	9.2	6.8	8.9
28R	-	25.6	3.6	0.2	5.9	0.8	0.1	17.5	2.2
28R(INT)	n/a	n/a	n/a	21.2	20.3	21.1	10.8	8.3	10.5
22L	-	-	-	18.1	9.3	17.2	9.2	3.8	8.6
22R	-	-	-	n/a	n/a	n/a	-	-	-
4L	n/a	n/a	n/a	-	-	-	-	-	-
4R	-	-	-	-	-	-	-	-	-

Notes:
1) Each column sums vertically to 100±0.1%
2) Annualized (Experiments 911 through 916)
3) "(INT)" represents departures from a taxiway intersection on the identified runway. There are no arrivals to (INT) runway locations.

3. Runway Use for Existing Condition

As detailed in our Existing Condition Noise Modeling Technical Memo (HMMH 2020), runway utilization for the Existing Conditions scenario for the TAP EA was developed from scaled 2018 Airport Noise Management System (ANMS) and Aerobahn® data provided by the CDA. Table 2 shows the runway use percentages modeled for the TAP EA's Existing Condition scenario.

Table 2. Runway Use Percentages for Existing Condition

Source: HMMH, 2020

	Arrival			Departure			Overall		
Runway	Day	Night	Overall	Day	Night	Overall	Day	Night	Overall
9L	16.2	6.2	14.9	<0.05	-	<0.05	7.9	3.6	7.5
9R	0.7	1.3	0.8	22.9	20.0	22.6	12.0	9.1	11.7
10L	0.1	7.5	1.1	5.4	11.2	5.9	2.8	9.1	3.5
10L(INT)	n/a	n/a	n/a	14.6	6.4	13.8	7.4	2.7	6.9
10C	18.4	23.2	19.0	<0.05	1.8	0.2	9.0	14.3	9.6
10R	7.7	1.6	6.9	<0.05	-	<0.05	3.8	0.9	3.4
27L	23.1	28.4	23.8	0.2	0.3	0.2	11.4	16.7	12.0
27R	17.2	6.7	15.8	-	<0.05	<0.05	8.4	3.9	7.9
28L	-	-	-	<0.05	-	<0.05	<0.05	-	<0.05
28C	16.3	18.6	16.6	0.1	3.8	0.5	8.1	12.4	8.5
28R	0.2	5.8	0.9	11.2	21.6	12.2	5.8	12.4	6.5
28R(INT)	n/a	n/a	n/a	24.1	17.4	23.5	12.3	7.3	11.7
22L	<0.05	0.1	<0.05	21.5	14.7	20.8	11.0	6.2	10.4
22R	<0.05	0.3	0.1	<0.05	<0.05	<0.05	<0.05	0.2	<0.05
4L	n/a	n/a	n/a	0.1	2.4	0.3	0.1	1.0	0.2
4R	<0.05	0.2	0.1	<0.05	0.1	<0.05	<0.05	0.2	<0.05
15	<0.05			-	<0.05	<0.05	<0.05	<0.05	<0.05
33	n/a	n/a	n/a	0.1	0.4	0.1	<0.05	0.2	<0.05

Notes:
1) Gray shading indicates zero TAAM daytime runway use (shading not done for overall percentages)
2) Blue shading indicates zero TAAM nighttime runway use (shading not done for overall percentages)
3) Each column sums vertically to 100±0.2%
4) "(INT)" represents departures from a taxiway intersection on the identified runway. There are no arrivals to (INT) runway locations.
5) Runway 15/33 closed permanently in March 2018

As indicated in the footnotes of Table 2, values are shaded either gray or blue if we propose to adjust the TAAM modeling output to a runway usage value other than zero in either the daytime or nighttime periods, respectively. For Runway 27L arrivals, (which are shaded in Table 2), we anticipate relatively low usage in the Build Out No Action scenario, because most arrivals will switch from Runway 9R/27L to Runway 9C/27C in late 2020, as dictated by the O'Hare Modernization Program (OMP)[2]. Therefore, the arrival runway use for Runway 27L shown in Table 2 is not applicable to the following analysis.

For daytime, half of the gray-shaded cells are less than 0.05 percent. Excluding the arrival usage for Runway 27L, the daytime average[3] of arrivals and departures is 0.1 percent. For nighttime, the blue-shaded cells range from less than 0.05 percent to 3.0 percent. Several runways have nighttime usage higher than 1.0 which will be evaluated individually. Excluding all runways with usage greater than 1.0, the nighttime average[4] of arrivals and departures is 0.1 percent. Combining daytime and nighttime and excluding all usage greater than 1.0, the overall average is 0.1 percent. As shown in Table 1, the minimum runway usage value produced by the TAAM

[2] OMP is expected to be completed in 2021.
[3] Runways with less than 0.05 percent were set to 0.025 percent for purposes of this analysis.
[4] Runways with less than 0.05 percent were set to 0.025 percent for purposes of this analysis.

modeling[5] was 0.1 percent (for Runways 10L, 10C and 28C). For these reasons, we chose 0.1 percent as the primary value to which all applicable daytime and nighttime zero runway use occurrences from the TAAM modeling will be adjusted[6]. The following paragraph lists exceptions to that rule.

- Zero runway use for arrivals to Runway 4L, and departures from Runway 22R, is correct for the Build Out No Action scenario because Runway 4L/22R is a unidirectional runway (Runway end 4L is closed for arrivals and Runway end 22R is closed for departures).
- Runway 10C, Runway 28C, and Runway 4L have nighttime departure usage greater than 1.0 percent for the Existing Condition case as shown in Table 2, therefore these three runway ends were evaluated separately. The percent difference in runway utilization percentages from Existing Condition to Build Out No Action for the group of runways associated with the target runway was applied to the Existing Condition runway percentage for that runway to derive the runway percentage for the Build Out No Action scenario.
    - Runway 10C's Existing Condition usage is 1.8 percent. The percent difference in percentages between Existing Condition and Build Out No Action for Runways 10L and 10L(INT) is -17.6 percent. Applying a 17.6 percent reduction to 1.8 percent is 1.5 percent. Therefore, TAAM's Runway 10C percentage of 0.3 percent will be increased by 1.2 percent to 1.5 percent for the Build Out No Action scenario.
    - Runway 28C's Existing Condition usage is 3.8 percent. The percent difference in percentages between Existing Condition and Build Out No Action for Runways 28R and 28R(INT) is -32.8 percent. Applying a 32.8 percent reduction to 3.8 percent is 2.6 percent. Therefore, TAAM's Runway 28C percentage of 0.4 percent will be increased by 2.2 percent to 2.6 percent for the Build Out No Action scenario.
    - Runway 4L's Existing Condition usage is 2.4 percent. The percent difference in percentages between Existing Condition and Build Out No Action for Runways 9R and 9R(INT) is +42.5 percent. Applying a 42.5 percent increase to 2.4 percent is 3.4 percent. Therefore, we will set the Runway 4L percentage at 3.4 percent for the Build Out No Action scenario.
- For departures shifting from Runways 10L/28R or 09R/27L, only departures from the runway intersections will be subtracted from these runways.
- Wide-body Jet departures and Non-Jet departures will only be excluded from being shifted to Runway 9L/27R and 10R/28L.

In general, the adjustment methodology was to shift small percentages of operations from one runway to the another by selecting the nearest runway with the same operation type and flow, so that flights would remain over similar areas to the extent possible. For example, Runway 9R departures could be shifted to nearby Runway 9L because both runways are in the same (easterly) flow and are on the same side of the airfield.

[5] Rounded to the nearest 0.1 percent

[6] In comparison, the 2015 EIS Re-Evaluation, on average, chose 0.5 percent as the adjustment value and IFQ chose 0.2 percent.

4. Proposed Runway Use Adjustments and Final Runway Use Percentages for Build Out No Action

Table 3 presents the proposed runway use percentage adjustments for the Build Out No Action scenario.

Table 3. Runway Use Adjustments for Build Out No Action

Source: HMMH, 2020

Day/Night	Operation Type	Source Runway	Receiving Runway	Adjustment Percent
Day	Arr	9C	9R	0.1
Day	Arr	10C	10L	0.1
Day	Arr	27C	27L	0.1
Day	Arr	28C	28L	0.1
Day	Arr	28C	28R	0.1
Day	Arr	28C	22L	0.1
Day	Arr	27R	22R	0.1
Day	Arr	10C	4R	0.1
Night	Arr	9C	9R	0.1
Night	Arr	27C	27L	0.1
Night	Arr	28R	22L	0.1
Night	Arr	28R	28L	0.1
Night	Arr	27C	22R	0.1
Night	Arr	10L	4R	0.1
Day	Dep	9R(INT)	9L	0.1
Day	Dep	9R(INT)	9C	0.1
Day	Dep	10L(INT)	10R	0.1
Day	Dep	27L(INT)	27C	0.1
Day	Dep	27L(INT)	27R	0.1
Day	Dep	28R(INT)	28L	0.1
Day	Dep	9R(INT)	4L	0.1
Day	Dep	10L(INT)	4R	0.1
Night	Dep	9R(INT)	9L	0.1
Night	Dep	10L(INT)	10C	1.2
Night	Dep	10L(INT)	10R	0.1
Night	Dep	27L(INT)	27R	0.1
Night	Dep	28R(INT)	28L	0.1
Night	Dep	28R(INT)	28C	2.2
Night	Dep	9R(INT)	4L	3.4
Night	Dep	10L(INT)	4R	0.1

Note: Wide-body Jet departures and non-jet departures are only excluded from being shifted from any runway to Runways 9L/27R and 10R/28L

As shown in Table 4, applying the adjustments shown in Table 3 to the runway use percentages in Table 1 yields the final runway use percentages for noise modeling of the Build Out No Action scenario. In Table 4, the

runway use percentages are listed alongside the runway use percentages for the Existing Condition (from Table 2) for ease of comparison.

Table 4. Runway Utilization Percentages for Build Out No Action Compared to Existing Condition

Source: HMMH, 2020s

Runway	Daytime Arrivals		Nighttime Arrivals		Daytime Departures		Nighttime Departures	
	Existing Condition	Build Out No Action	Existing Condition	Build Out No Action	Existing Condition	Build Out No Action	Existing Condition	Build Out No Action
9L	16.2	16.0	6.2	4.9	<0.05	0.1	-	0.1
9C	n/a	11.8	n/a	8.0	n/a	0.1	n/a	1.4
9R	0.7	0.1	1.3	0.1	22.9	1.0	20.0	1.4
9R(INT)	n/a	n/a	n/a	n/a	n/a	19.9	n/a	23.6
10L	0.1	0.1	7.5	19.3	5.4	0.1	11.2	5.3
10L(INT)	n/a	n/a	n/a	n/a	14.6	21.7	6.4	7.8
10C	18.4	14.7	23.2	10.8	<0.05	0.1	1.8	1.5
10R	7.7	0.7	1.6	0.4	<0.05	0.1	-	0.1
27L	23.1	0.1	28.4	0.1	0.2	1.2	0.3	1.8
27L(INT)	n/a	n/a	n/a	n/a	n/a	15.6	n/a	15.3
27C	n/a	16.3	n/a	12.0	n/a	0.1	n/a	2.3
27R	17.2	21.4	6.7	7.3	-	0.1	<0.05	0.1
28L	-	0.1	-	0.1	<0.05	0.1	-	0.1
28C	16.3	18.4	18.6	11.3	0.1	0.1	3.8	2.6
28R	0.2	0.1	5.8	25.4	11.2	0.2	21.6	5.9
28R(INT)	n/a	n/a	n/a	n/a	24.1	21.1	17.4	18.0
22L	<0.05	0.1	0.1	0.1	21.5	18.1	14.7	9.3
22R	<0.05	0.1	0.3	0.1	<0.05	n/a	<0.05	n/a
4L	n/a	n/a	n/a	n/a	0.1	0.1	2.4	3.4
4R	<0.05	0.1	0.2	0.1	<0.05	0.1	0.1	0.1

Notes:
1) Each column for Build Out No Action sums vertically to 100±0.1
2) Values for Existing Conditions are only shown for comparison purposes and do not sum vertically to 100% due to exclusion of Runway 15/33
3) "(INT)" represents departures from a taxiway intersection on the identified runway. There are/would be no arrivals to (INT) runway locations.

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TECHNICAL MEMORANDUM

To:	Amy Hanson Environmental Specialist Federal Aviation Administration 2300 E. Devon Ave Room 320 Des Plaines, IL 60018
From:	Robert Mentzer, Noise Lead Joseph Czech
Date:	May 20, 2021
Subject:	Revised FINAL - Build Out with Project Scenario's Zero Runway Use Adjustment Methodology for Chicago O'Hare International Airport Terminal Area Plan and Air Traffic Procedures Environmental Assessment
Reference:	HMMH Project Number 307171.002.007.012

1. Introduction

The Total Airspace and Airport Modeler (TAAM) program was used by the City of Chicago Department of Aviation (CDA) to model the most commonly used runway configurations for the Build Out with Project scenario for the Chicago O'Hare International Airport Terminal Area Plan and Air Traffic Procedures Environmental Assessment (TAP EA). As it is impractical to model all the many runway configurations, the CDA's TAAM modeling was limited to modeling the most prevalent configurations. As a result, the TAAM modeling assigned no usage to several lesser-used runways. Under the TAP EA's Build Out with Project scenario, we anticipate all runways, with the exception of arrivals to Runway 4L and departures from Runway 22R, would likely be used to some extent over the course of a year to allow for safe and efficient operations during unforeseen circumstances, such as runway maintenance closures or adverse weather conditions. Therefore, adjustment to the TAAM results prior to noise modeling is required to allocate flights to the runways with no TAAM-assigned utilization (except arrivals to Runway 4L and departures from 22R).

The purpose of this Technical Memorandum (Tech Memo) is to document the adjustments to be applied to the Build Out with Project scenario.

2. TAAM Runway Use

Annualization of the TAAM modeling's 24-hour simulation results[1] provide the basis for the annual average daily runway use to be modeled for the Build Out with Project scenario. Table 1 presents the daytime (7:00 AM to 9:59 PM), nighttime (10:00 PM to 6:59 AM) and 24-hour (overall) runway use percentages produced by TAAM. As mentioned above, the TAAM modeling resulted in multiple runways with a zero percent utilization, the so-called "zero runway use" runways, for arrivals and/or departures.

[1] CDA provided the TAAM Annualized results on April 26, 2020.

Table 1. Runway Use Percentages from TAAM for Build Out with Project

Source: CDA 2020

	Arrival			Departure			Overall		
Runway	Day	Night	Overall	Day	Night	Overall	Day	Night	Overall
9L	16.2	5.5	14.7	-	-	-	7.9	3.3	7.4
9C	9.3	7.2	9.0	0.1	1.3	0.2	4.6	4.8	4.6
9R	-	-	-	1.0	2.0	1.1	0.5	0.8	0.5
9R(INT)		n/a		21.3	30.1	22.1	10.9	12.1	11.0
10L	-	20.3	2.9	0.3	5.5	0.8	0.1	14.4	1.8
10L(INT)		n/a		23.5	9.1	22.2	12.0	3.7	11.0
10C	14.6	12.1	14.2	-	-	-	7.2	7.2	7.2
10R	6.4	1.3	5.6	-	-	-	3.1	0.8	2.8
27L	-	-	-	1.0	2.3	1.2	0.5	0.9	0.6
27L(INT)		n/a		16.9	15.6	16.8	8.6	6.3	8.4
27C	15.8	11.4	15.2	0.1	1.5	0.2	7.8	7.4	7.7
27R	19.3	6.5	17.5	-	-	-	9.4	3.9	8.8
28L	3.2	-	2.7	-	-	-	1.6	-	1.4
28C	15.2	12.2	14.8	-	-	-	7.5	7.3	7.4
28R	-	23.6	3.4	0.4	5.9	0.9	0.2	16.5	2.1
28R(INT)		n/a		22.5	18.4	22.1	11.5	7.4	11.0
22L	-	-	-	12.9	8.3	12.5	6.6	3.3	6.2
22R	-	-	-		n/a		-	-	-
4L		n/a		-	-	-	-	-	-
4R	-	-	-	-	-	-	-	-	-

Notes:
1) Each column sums vertically to 100±0.1%
2) Annualized (Experiments 931 through 936)
3) "(INT)" represents departures from a taxiway intersection on the identified runway. There are no arrivals to (INT) runway locations.

3. Runway Use for Existing Conditions

As detailed in our Existing Conditions Noise Modeling Technical Memo (HMMH 2020), runway utilization for the Existing Conditions scenario for the TAP EA was developed from scaled 2018 Airport Noise Management System (ANMS) and Aerobahn® data provided by the CDA. Table 2 shows the runway use percentages modeled for the TAP EA's Existing Conditions scenario.

Table 2. Runway Use Percentages for Existing Conditions

Source: HMMH 2020

	Arrival			Departure			Overall		
Runway	Day	Night	Overall	Day	Night	Overall	Day	Night	Overall
9L	16.2	6.2	14.9	<0.05	-	<0.05	7.9	3.6	7.5
9R	0.7	1.3	0.8	22.9	20.0	22.6	12.0	9.1	11.7
10L	0.1	7.5	1.1	5.4	11.2	5.9	2.8	9.1	3.5
10L(INT)		n/a		14.6	6.4	13.8	7.4	2.7	6.9
10C	18.4	23.2	19.0	<0.05	1.8	0.2	9.0	14.3	9.6
10R	7.7	1.6	6.9	<0.05	-	<0.05	3.8	0.9	3.4
27L	23.1	28.4	23.8	0.2	0.3	0.2	11.4	16.7	12.0
27R	17.2	6.7	15.8	-	<0.05	<0.05	8.4	3.9	7.9
28L	-	-	-	<0.05	-	<0.05	<0.05	-	<0.05
28C	16.3	18.6	16.6	0.1	3.8	0.5	8.1	12.4	8.5
28R	0.2	5.8	0.9	11.2	21.6	12.2	5.8	12.4	6.5
28R(INT)		n/a		24.1	17.4	23.5	12.3	7.3	11.7
22L	<0.05	0.1	<0.05	21.5	14.7	20.8	11.0	6.2	10.4
22R	<0.05	0.3	0.1	<0.05	<0.05	<0.05	<0.05	0.2	<0.05
4L		n/a		0.1	2.4	0.3	0.1	1.0	0.2
4R	<0.05	0.2	0.1	<0.05	0.1	<0.05	<0.05	0.2	<0.05
15	<0.05			-	<0.05	<0.05	<0.05	<0.05	<0.05
33		n/a		0.1	0.4	0.1	<0.05	0.2	<0.05

Notes:
1) Gray shading indicates zero TAAM daytime runway use (shading not done for overall percentages or 22R departures)
2) Blue shading indicates zero TAAM nighttime runway use (shading not done for overall percentages or 22R departures)
3) Each column sums vertically to 100±0.2%
4) "(INT)" represents departures from a taxiway intersection on the identified runway. There are no arrivals to (INT) runway locations.
5) Runway 15/33 closed permanently in March 2018

As indicated in Table 2's footnotes, values are shaded either gray or blue if we propose to adjust the TAAM modeling output to a runway usage value other than zero in either the daytime or nighttime periods, respectively. For Runway 27L arrivals, (which are shaded in Table 2), we anticipate relatively low usage in the Build Out with Project scenario, because most arrivals will switch from Runway 9R/27L to Runway 9C/27C in late 2020, as dictated by the O'Hare Modernization Program (OMP)[2]. Therefore, the arrival runway use for Runway 27L shown in Table 2 is not applicable to the following analysis.

For daytime, more than half of the gray-shaded cells are less than 0.05 percent. Excluding the arrival usage for Runway 27L, the daytime average[3] of arrivals and departures is 0.1 percent. For nighttime, the blue-shaded cells range from less than 0.05 percent to 3.8 percent. Several runways have nighttime usage higher than 1.0 which will be evaluated individually. Excluding all runways with usage greater than 1.0, the nighttime average[4] of arrivals and departures is 0.1 percent. Combining daytime and nighttime and excluding all usage greater than 1.0, the overall average is 0.1 percent. As shown in Table 1, the minimum runway usage value produced by the TAAM modeling[5] was 0.1 percent (for Runways 9C and 27C). For these reasons, we chose 0.1 percent as

[2] OMP is expected to be completed in 2021.
[3] Runways with less than 0.05 percent were set to 0.025 percent for purposes of this analysis.
[4] Runways with less than 0.05 percent were set to 0.025 percent for purposes of this analysis.
[5] Rounded to the nearest 0.1 percent

the primary value to which all applicable daytime and nighttime zero runway use occurrences from the TAAM modeling will be adjusted[6]. The following paragraph lists exceptions to that rule.

Other operational considerations for the TAP EA are:

- Zero runway use for arrivals to Runway 4L, and departures from Runway 22R, is correct for the Build Out with Project scenario because potential intersecting operations from Runway 10L/28R prevent such use of Runways 4L and 22R.
- Runway 10C, Runway 28C, and Runway 4L have nighttime departure usage greater than 1.0 percent for the Existing Conditions (EC) case as shown in Table 2, therefore these three runway ends were evaluated separately. The percent difference in runway utilization percentages from EC to Build Out with Project for the group of runways associated with the target runway was applied to the EC runway percentage for that runway to derive the runway percentage for the Build Out with Project scenario.
    - Runway 10C's EC usage is 1.8 percent. The percent difference in percentages between EC and Build Out with Project for Runways 10L and 10L(INT) is -17.0 percent. Applying a 17.0 percent reduction to 1.8 percent is 1.5 percent. Therefore, we propose to set Runway 10C's percentage at 1.5 percent for the Build Out with Project scenario.
    - Runway 28C's EC usage is 3.8 percent. The percent difference in percentages between EC and Build Out with Project for Runways 28R and 28R(INT) is -37.7 percent. Applying a 37.7 percent reduction to 3.8 percent is 2.4 percent. Therefore, we propose to set Runway 28C's percentage at 2.4 percent for the Build Out with Project scenario.
    - Runway 4L's EC usage is 2.4 percent. The percent difference in percentages between EC and Build Out with Project for Runways 9R and 9R(INT) is +60.5 percent. Applying a 60.5 percent increase to 2.4 percent is 3.9 percent. Therefore, we propose to set Runway 4L's percentage at 3.9 percent for the Build Out with Project scenario.
- For departures shifting from Runways 10L/28R or 09R/27L, only departures from the runway intersections would be subtracted from these runways.
- Wide-body Jet departures are excluded from being shifted from any runway.

In general, the adjustment methodology was to shift small percentages of operations from one runway to the another by selecting the nearest runway with the same operation type and flow, so that flights would remain over similar areas to the extent possible. For example, Runway 9R departures could be shifted to nearby Runway 9L because both runways are in the same (easterly) flow and are on the same side of the airfield.

4. Proposed Runway Use Adjustments and Final Runway Use Percentages for Build Out with Project

Table 3 presents the proposed runway use percentage adjustments for the Build Out with Project scenario.

[6] In comparison, the 2015 EIS Re-Evaluation, on average, chose 0.5 percent as the adjustment value and IFQ chose 0.2 percent.

Table 3. Runway Use Adjustments for Build Out with Project

Source: HMMH analysis

Day/Night	Operation Type	Source Runway	Receiving Runway	Adjustment Percent
Day	Arrival	9C	9R	0.1
Day	Arrival	10C	10L	0.1
Day	Arrival	27C	27L	0.1
Day	Arrival	28C	28R	0.1
Day	Arrival	28C	22L	0.1
Day	Arrival	27R	22R	0.1
Day	Arrival	10C	4R	0.1
Night	Arrival	9C	9R	0.1
Night	Arrival	27C	27L	0.1
Night	Arrival	28R	22L	0.1
Night	Arrival	28R	28L	0.1
Night	Arrival	27C	22R	0.1
Night	Arrival	10L	4R	0.1
Day	Departure	9R(INT)	9L	0.1
Day	Departure	10L(INT)	10C	0.1
Day	Departure	10L(INT)	10R	0.1
Day	Departure	27L(INT)	27R	0.1
Day	Departure	28R(INT)	28L	0.1
Day	Departure	28R(INT)	28C	0.1
Day	Departure	9R(INT)	4L	0.1
Day	Departure	10L(INT)	4R	0.1
Night	Departure	9R(INT)	9L	0.1
Night	Departure	10L(INT)	10C	1.5
Night	Departure	10L(INT)	10R	0.1
Night	Departure	27L(INT)	27R	0.1
Night	Departure	28R(INT)	28L	0.1
Night	Departure	28R(INT)	28C	2.4
Night	Departure	9R(INT)	4L	3.9
Night	Departure	10L(INT)	4R	0.1

Note: Wide-body Jet departures would be excluded from any adjustments

Applying the adjustments shown in Table 3 to the runway use percentages in Table 1 yields the final runway use percentages for noise modeling the Build Out with Project scenario for the TAP EA, shown in Table 4. In Table 4, the scenario's runway use percentages are listed alongside the runway use percentages for the Existing Conditions (from Table 2) for ease of comparison.

Table 4. Runway Utilization Percentages for Build Out with Project Compared to Existing Conditions

Source: HMMH analysis

Runway	Daytime Arrivals		Nighttime Arrivals		Daytime Departures		Nighttime Departures	
	Existing Condition	Build Out w/Project	Existing Condition	Build Out w/Project	Existing Condition	Build Out w/Project	Existing Condition	Build Out w/Project
9L	16.2	16.2	6.2	5.5	<0.05	0.1	-	0.1
9C	n/a	9.2	n/a	7.1	n/a	0.1	n/a	1.3
9R	0.7	0.1	1.3	0.1	22.9	1.0	20.0	2.0
9R(INT)		n/a			n/a	21.1	n/a	26.1
10L	0.1	0.1	7.5	20.2	5.4	0.3	11.2	5.5
10L(INT)		n/a			14.6	23.2	6.4	7.4
10C	18.4	14.4	23.2	12.1	<0.05	0.1	1.8	1.5
10R	7.7	6.4	1.6	1.3	<0.05	0.1	-	0.1
27L	23.1	0.1	28.4	0.1	0.2	1.0	0.3	2.3
27L(INT)		n/a			n/a	16.8	n/a	15.5
27C	n/a	15.7	n/a	11.2	n/a	0.1	n/a	1.5
27R	17.2	19.2	6.7	6.5	-	0.1	<0.05	0.1
28L	-	3.2	-	0.1	<0.05	0.1	-	0.1
28C	16.3	15.0	18.6	12.2	0.1	0.1	3.8	2.4
28R	0.2	0.1	5.8	23.4	11.2	0.4	21.6	5.9
28R(INT)		n/a			24.1	22.3	17.4	15.9
22L	<0.05	0.1	0.1	0.1	21.5	12.9	14.7	8.3
22R	<0.05	0.1	0.3	0.1	<0.05	n/a	<0.05	n/a
4L		n/a			0.1	0.1	2.4	3.9
4R	<0.05	0.1	0.2	0.1	<0.05	0.1	0.1	0.1

Notes:
1) Each column for Build Out with Project sums vertically to 100±0.1
2) Values for Existing Conditions are only shown for comparison purposes and do not sum vertically to 100% due to exclusion of Runway 15/33
3) "(INT)" represents departures from a taxiway intersection on the identified runway. There are/would be no arrivals to (INT) runway locations.