APPENDIX I
AIRCRAFT NOISE TECHNICAL REPORT

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I.1 INTRODUCTION

This technical report presents the aircraft noise exposure for the San Antonio International Airport (SAT) New Terminal Project Environmental Assessment (EA). The noise analysis was prepared to comply with the National Environmental Policy Act (NEPA) of 1969; Federal Aviation Administration (FAA) Order 1050.1F, *Environmental Impacts: Policies and Procedures*;[1] and FAA Order 5050.4B, *NEPA Implementing Instructions for Airport Actions*.[2] The following sections describes the regulatory background, noise analysis methodology, noise model input data, and noise exposure results.

I.2 REGULATORY GUIDELINES AND AIRCRAFT NOISE MODEL

The noise analysis was developed using the FAA's Aviation Environmental Design Tool (AEDT) Version 3e.[3] The AEDT is the required FAA tool to evaluate potential noise impacts from actions subject to NEPA. The AEDT produces aircraft noise contours that delineate areas of equal day-night average sound level (DNL). The DNL is a 24-hour time-weighted sound level that is expressed in A-weighted decibels. The FAA and other federal agencies use DNL as the primary measure of noise impacts because it correlates well with the results of attitudinal surveys regarding noise; increases with the duration of noise events; and accounts for an increased sensitivity to noise at night by increasing each noise event that occurs during nighttime hours (i.e., 10:00 p.m. to 6:59 a.m.) by 10 decibels (dB).

The AEDT defines a network of grid points at ground level around an airport. The model then selects the shortest distance from each grid point to each flight track and computes the noise exposure generated by each aircraft operation, along each flight track. Customizations are applied for atmospheric acoustical attenuation, acoustical shielding of the aircraft engines by the aircraft itself, and aircraft speed variations. The noise exposure levels for each aircraft are then summed at each grid location. The cumulative noise exposure levels at all grid points are then used to develop aviation noise exposure contours for selected values (e.g., DNL 65, 70 and 75).

[1] Federal Aviation Administration. 2015. Order 1050.1F, Environmental Impacts: Policies and Procedures. Retrieved March 2024 from https://www.faa.gov/documentlibrary/media/order/faa_order_1050_1f.pdf

[2] Federal Aviation Administration. 2006. National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions. Retrieved March 2024 from https://www.faa.gov/documentLibrary/media/Order/5050.4B.pdf

[3] Federal Aviation Administration. 2022. Aviation Environmental Design Tool (AEDT) Version 3e. Retrieved March 2024 from https://aedt.faa.gov/3e_information.aspx

Guidelines regarding the compatibility of land uses within various DNL contour intervals are specified in Appendix A of 14 Code of Federal Regulations (CFR) Part 150.[4] As shown in

Table *I-1*, the FAA identifies, as a function of annual (365-day average) DNL values, land uses which are compatible and land uses which are not compatible in an airport environment. The FAA determined all the land uses listed in the table are compatible with aircraft noise exposure below the 65 DNL contour. When evaluating land use compatibility, attention is therefore focused on land uses within the 65 DNL contour or greater.

TABLE I-1 FAA LAND USE COMPATIBILITY GUIDELINES - 14 CFR PART 150

Category	Land Use	Below 65 DNL	65-70 DNL	70-75 DNL	75-80 DNL	70-85 DNL	Over 85 DNL
Residential	Residential, other than mobile homes and transient lodgings	Y	N(1)	N(1)	N	N	N
Residential	Mobile home parks	Y	N	N	N	N	N
Residential	Transient lodgings	Y	N(1)	N(1)	N(1)	N	N
Public Use	Schools	Y	N(1)	N(1)	N	N	N
Public Use	Hospitals and nursing homes	Y	25	30	N	N	N
Public Use	Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Public Use	Governmental services	Y	Y	25	30	N	N
Public Use	Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Public Use	Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
Commercial Use	Offices, business and professional	Y	Y	25	30	N	N
Commercial Use	Wholesale and retail—building materials, hardware and farm equipment	Y	Y	Y(2)	Y(3)	Y(4)	N
Commercial Use	Retail trade—general	Y	Y	25	30	N	N
Commercial Use	Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Commercial Use	Communication	Y	Y	25	30	N	N
Manufacturing and Production	Manufacturing, general	Y	Y	Y(2)	Y(3)	Y(4)	N
Manufacturing and Production	Photographic and optical	Y	Y	25	30	N	N
Manufacturing and Production	Agriculture (except livestock) and forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)

[4] Title 14 Code of Federal Regulations Part 150 – Airport Noise Compatibility Planning. Retrieved March 2024 from https://www.ecfr.gov/current/title-14/chapter-I/subchapter-I/part-150

Category	Land Use	Below 65 DNL	65-70 DNL	70-75 DNL	75-80 DNL	70-85 DNL	Over 85 DNL
Manufacturing and Production	Livestock farming and breeding	Y	Y(6)	Y(7)	N	N	N
Manufacturing and Production	Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
Recreational	Outdoor sports arenas and spectator sports	Y	Y(5)	Y(5)	N	N	N
Recreational	Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Recreational	Nature exhibits and zoos	Y	Y	N	N	N	N
Recreational	Amusements, parks, resorts and camps	Y	Y	Y	N	N	N
Recreational	Golf courses, riding stables and water recreation	Y	Y	25	30	N	N

Table Notes: SLUCM=Standard Land Use Coding Manual. Y (Yes) = Land Use and related structures compatible without restrictions. N (No) = Land Use and related structures are not compatible and should be prohibited. NLR = Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.

25, 30, or 35=Land use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structure.

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

Source: 14 CFR Part 150

I.3 EXISTING NOISE EXPOSURE

In the development of DNL contours, the AEDT uses both default and airport-specific factors. The default factors include meteorological data, engine noise levels, thrust settings, aircraft arrival and departure flight profiles, and aircraft speed. The airport-specific factors include the number of aircraft operations, the types of aircraft, runway use, the assignment of aircraft operations to flight tracks, operational time (day/night), and, for departures, the stage (i.e., trip) length. The following sections describe these data.

I.3.1 Meteorological Data

The AEDT accounts for the influences of meteorological conditions on aircraft performance and atmospheric sound absorption. Meteorological conditions affect the transmission of aircraft noise through the air. Humidity and temperature materially affect the transmission of air-to-ground sound through absorption associated with the instability and viscosity of the air. The AEDT uses temperature and relative humidity to calculate atmospheric absorption coefficients, which in turn are used to adjust aircraft performance and noise propagation. The 10-year (2012-2021) average meteorological conditions included in the AEDT for SAT are:

- Temperature: 69.9° Fahrenheit
- Barometric pressure: 987.4 millibars
- Relative humidity: 65.0%

I.3.2 2022 Aircraft Operations and Fleet

The aircraft operations[5] modeled for 2022 were obtained from FAA's Air Traffic Activity System (ATADS)[6] for fiscal year 2022 (October 1, 2021, through September 30, 2022). These data, by aircraft category, are provided in **Table I-2**. As shown, the 2022 annual operations totaled 154,256, which is an average of about 423 operations per day.

TABLE I-2 2022 ANNUAL AIRCRAFT OPERATIONS

Air Carrier	Air Taxi & General Aviation	Military	Total
81,590	68,976	3,690	154,256

Source: FAA ATADS

For the purposes of preparing DNL contours, operational data were segregated by aircraft type. Aircraft operations and flight track data for 2022 were obtained from SAT's Noise and Operations Monitoring System (NOMS). The operations data

[5] An operation is defined as one arrival or one departure.

[6] Federal Aviation Administration. Air Traffic Activity System (ATADS): Airport Operations. Accessed March 2024 from https://aspm.faa.gov/opsnet/sys/airport.asp

included the specific aircraft type, the origin/destination, and the time which the operation occurred. The data was reviewed, and each aircraft type was assigned the corresponding AEDT aircraft type. The 2022 modeled aircraft operations and fleet are provided in **Table I-3**.

TABLE I-3 2022 AIRCRAFT OPERATIONS AND FLEET

Category	Representative Aircraft Type (s)	AEDT Aircraft	2022 Annual Operations
Air Carrier / Cargo	Boeing 737-800/900	737800	20,276
	Boeing 737-700	737700	14,971
	Airbus A320-200	A320-211	8,301
	Airbus A321-200/321neo	A321-232	7,165
	Airbus A319-100	A319-131	7,093
	Airbus A220-100/300	737700	3,646
	Embraer 170	EMB170	2,937
	Boeing 737 MAX8	7378MAX	2,742
	Airbus A320neo	A320-271N	2,479
	Embraer 175	EMB175	2,394
	Embraer 190/195	EMB190	1,958
	Boeing 757-200	757PW	1,871
	Airbus A300-600	A300B4-203	1,545
	McDonnell Douglas MD-11	MD11GE	1,267
	Boeing 737-300	737300	815
	Boeing 767-300	767300	609
	Canadair CRJ 700/900	CRJ9-ER	508
	McDonnell Douglas DC-10	DC1030	355
	Boeing 737-400	737400	349
	Boeing 787-9	7879	66
	Boeing 727-200	727EM2	45
	McDonnell Douglas DC-9	DC93LW	45
	Boeing 777-200	777200	41
	Boeing 787-8	7878R	33
	Boeing 767-200	767CF6	31
	Boeing 777-300	7773ER	29
	McDonnell Douglas MD-83	MD83	19
Air Taxi / GA Jet	Cessna 525 Citation Jet CJ1/CJ3/CJ4	CNA525C	4,489
	Learjet 35/40/45/60/75, Hawker 800	LEAR35	4,324
	Bombardier Challenger 300/350/600	CL600	3,004
	Citation II/Bravo, Phenom 300, Embraer Legacy	CNA55B	2,951
	Cessna Sovereign/Latitude	CNA680	2,577
	Beechjet 400, HondaJet	MU3001	2,021
	Cessna 560 Citation XLS	CNA560XL	1,999
	Cessna 650 Citation III	CIT3	1,920
	Cessna 750 Citation X, Falcon 2000	CNA750	1,738

Category	Representative Aircraft Type (s)	AEDT Aircraft	2022 Annual Operations
	Cessna 560	CNA560E	1,203
	Gulfstream GIV, Falcon 7X	GIV	936
	Cessna Citation Mustang, Phenom 100	CNA510	926
	Eclipse 500	ECLIPSE500	882
	Gulfstream GV/G-7	GV	879
	Dassault Falcon 50/900	FAL900EX	693
	Cessna 500 Citation I	CNA500	629
	Gulfstream G280	CL601	247
	Gulfstream G150	IA1125	213
	Embraer ERJ 135/145	EMB145	206
	Bombardier Global 7000/Global Express	BD-700-1A10	149
	Bombardier Global 5000	BD-700-1A11	63
Air Taxi / GA Turboprop	Beech King Air 90/200/300	DHC6	6,738
	Pilatus PC12, Cessna 208, Socata TBM-700	CNA208	4,856
	Raytheon Beech 1900-D	1900D	1,425
	Piper Malibu Meridian, Piper PA-46 M600	GASEPV	547
	Cessna 425/441, Socata TBM-850	CNA441	538
GA Piston	Baron 58, Cessna 310/340, Aztec, Aerostar	BEC58P	9,096
	Piper PA-28 Cherokee, Cessna 150	GASEPF	3,285
	AA-5A, Bonanza 36, Vans, Mooney	GASEPV	3,162
	Cirrus SR20/22	COMSEP	1,802
	Piper PA-30/44	PA30	1,014
	Cessna 172/177	CNA172	774
	Cessna 182/185	CNA182	700
	Cessna T-206	CNA20T	400
	Cessna 206 Stationair	CNA206	139
GA Helicopter	Aerospatiale SA-350D Astar (AS-350)	SA350D	732
	Eurocopter EC-130	EC130	607
	Bell 407	B407	552
	Bell 429	B429	341
	Bell 206 JetRanger	B206L	219
Military	Beechcraft T-6 Texan 2	CNA208	1,107
	Beechcraft Beechjet 400T T-1A Jayhawk	ECLIPSE500	1,107
	Sikorsky UH-60 Black Hawk	S70	553
	Beechcraft Super King Air 200/300	DHC6	369
	Gulfstream IV/V	GV	369

Category	Representative Aircraft Type (s)	AEDT Aircraft	2022 Annual Operations
	T-38 Talon	T-38A	185
	Total		**154,256**

Source: RS&H, Inc.; FAA ATADS, Fiscal Year 2022; ATCT Personnel; SAT NOMS, October 1, 2021, through September 30, 2022

I.3.3 Time of Day

Aircraft operations modeled in the AEDT are assigned as occurring during daytime (7:00 a.m. to 9:59 p.m.) or nighttime (10:00 p.m. to 6:59 a.m.). The DNL calculation includes an additional weight of 10 dB for those aircraft events occurring at night. The modeled time-of-day percentages by aircraft type for arrivals and departures are shown in **Table I-4**.

TABLE I-4 MODELED AIRCRAFT TIME OF DAY

AEDT Aircraft	Day Arrivals	Night Arrivals	Day Departures	Night Departures
737800	78.0%	22.0%	81.7%	18.3%
737700	78.3%	21.7%	83.0%	17.0%
A320-211	90.5%	9.5%	90.4%	9.6%
A321-232	79.5%	20.5%	78.7%	21.3%
A319-131	72.0%	28.0%	73.0%	27.0%
737700	78.3%	21.7%	83.0%	17.0%
EMB170	87.7%	12.3%	94.6%	5.4%
7378MAX	71.0%	29.0%	72.8%	27.2%
A320-271N	93.6%	6.4%	86.5%	13.5%
EMB175	87.9%	12.1%	91.6%	8.4%
EMB190	100.0%		99.8%	0.2%
757PW	61.7%	38.3%	71.3%	28.7%
A300B4-203	44.6%	55.4%	42.9%	57.1%
MD11GE	49.0%	51.0%	59.3%	40.7%
737300	92.3%	7.7%	65.0%	35.0%
767300	68.9%	31.1%	46.0%	54.0%
CRJ9-ER	81.0%	19.0%	81.1%	18.9%
DC1030	52.0%	48.0%	64.5%	35.5%
737400	91.1%	8.9%	81.4%	18.6%
7879	96.6%	3.4%	100.0%	
727EM2	78.3%	21.7%	71.4%	28.6%
DC93LW	47.6%	52.4%	63.6%	36.4%
777200	84.6%	15.4%	78.6%	21.4%
7878R	100.0%		100.0%	
767CF6	88.2%	11.8%	70.6%	29.4%
7773ER	85.7%	14.3%	83.3%	16.7%
MD83	50.0%	50.0%	60.0%	40.0%

AEDT Aircraft	Day Arrivals	Night Arrivals	Day Departures	Night Departures
CNA525C	96.8%	3.2%	93.0%	7.0%
LEAR35	93.1%	6.9%	93.2%	6.8%
CL600	97.5%	2.5%	91.4%	8.6%
CNA55B	96.1%	3.9%	96.3%	3.7%
CNA680	97.2%	2.8%	93.2%	6.8%
MU3001	86.2%	13.8%	89.6%	10.4%
CNA560XL	96.0%	4.0%	95.0%	5.0%
CIT3	91.9%	8.1%	92.4%	7.6%
CNA750	95.2%	4.8%	94.8%	5.2%
CNA560E	92.8%	7.2%	95.5%	4.5%
GIV	93.5%	6.5%	94.1%	5.9%
CNA510	98.3%	1.7%	94.6%	5.4%
ECLIPSE500	94.6%	5.4%	89.2%	10.8%
GV	93.8%	6.2%	89.7%	10.3%
FAL900EX	96.0%	4.0%	95.6%	4.4%
CNA500	92.3%	7.7%	89.8%	10.2%
CL601	98.4%	1.6%	98.4%	1.6%
IA1125	96.3%	3.7%	100.0%	
EMB145	95.0%	5.0%	95.2%	4.8%
BD-700-1A10	98.7%	1.3%	97.2%	2.8%
BD-700-1A11	96.8%	3.2%	93.8%	6.2%
DHC6	85.8%	14.2%	86.1%	13.9%
CNA208	86.0%	14.0%	82.7%	17.3%
1900D	97.7%	2.3%	83.5%	16.5%
GASEPV	97.8%	2.2%	97.1%	2.9%
CNA441	96.1%	3.9%	96.2%	3.8%
BEC58P	97.6%	2.4%	96.5%	3.5%
GASEPF	95.9%	4.1%	91.9%	8.1%
GASEPV	97.8%	2.2%	97.1%	2.9%
COMSEP	95.6%	4.4%	95.6%	4.4%
PA30	94.4%	5.6%	94.0%	6.0%
CNA172	93.6%	6.4%	85.4%	14.6%
CNA182	99.1%	0.9%	98.9%	1.1%
CNA20T	98.4%	1.6%	96.6%	3.4%
CNA206	98.1%	1.9%	95.9%	4.1%
SA350D	93.4%	6.6%	93.4%	6.6%
EC130	100.0%		100.0%	
B407	93.4%	6.6%	93.4%	6.6%
B429	100.0%		100.0%	
B206L	93.4%	6.6%	93.4%	6.6%
CNA208	86.0%	14.0%	82.7%	17.3%
ECLIPSE500	94.6%	5.4%	89.2%	10.8%
S70	93.4%	6.6%	93.4%	6.6%

AEDT Aircraft	Day Arrivals	Night Arrivals	Day Departures	Night Departures
DHC6	85.8%	14.2%	86.1%	13.9%
GV	93.8%	6.2%	89.7%	10.3%
T-38A	93.4%	6.6%	93.4%	6.6%
OVERALL	84.9%	15.1%	85.4%	14.6%

Source: RS&H, Inc.; SAT NOMS

I.3.4 Departure Stage Lengths

The noise exposure from aircraft departures varies depending on takeoff weight. For example, a fully loaded aircraft departing on a long-haul flight[7] weighs more on departure than the same fully loaded aircraft departing on a short-haul flight[8] due to the weight of the additional fuel needed to travel a longer distance. A heavier aircraft typically requires higher power (thrust settings) to reach its takeoff speed, uses more runway length, and climbs at a slower rate than lighter aircraft (see

Figure *I-1*). To account for this, the AEDT contains 11 departure climb profiles (corresponding to different departure weights) depending on the type of aircraft. These profiles represent aircraft origin-to-destination trip lengths from less than 500 nautical miles to over 8,500 nautical miles. The distances for each stage length and the percentage of operations modeled for the air carrier and cargo aircraft for the noise analysis are shown in **Table I-5**. All general aviation and military aircraft were modeled with a stage length 1.

FIGURE I-1 DEPARTURE STAGE LENGTH COMPARISON

[7] Long-haul are flights lasting greater than 6 hours.

[8] Short haul are flights lasting 3 hours or less.

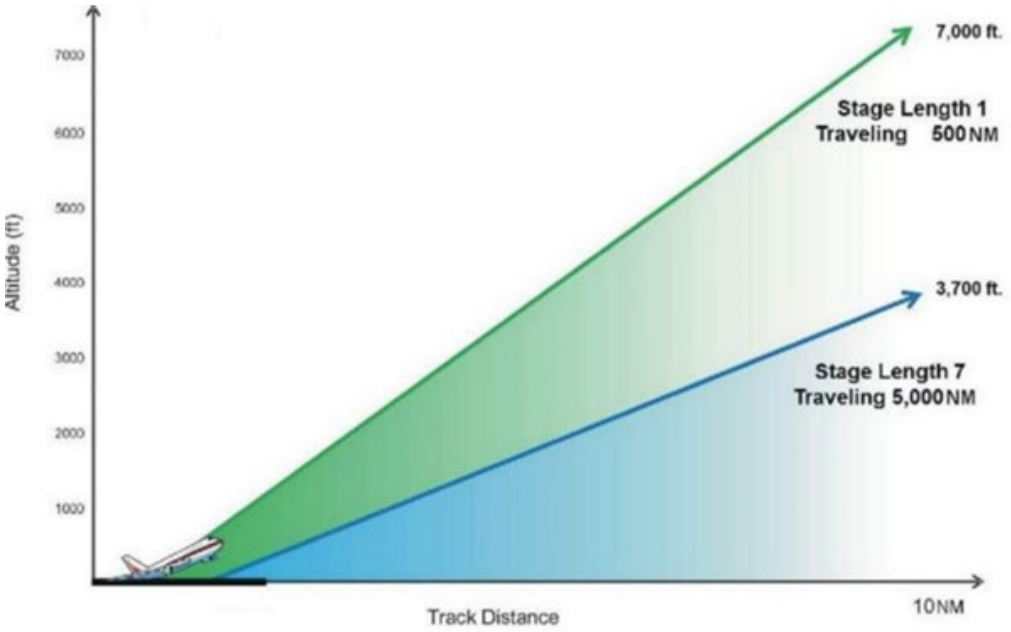


TABLE I-5 MODELED AIRCRAFT DEPARTURE STAGE LENGTHS BY NAUTICAL MILES

AEDT Aircraft	Stage Length 1 (<500 nm)	Stage Length 2 (501-1000nm)	Stage Length 3 (1001-1500nm)	Stage Length 4 (1501-2500nm)	Total
737800	40%	48%	9%	3%	100.0%
737700	37%	45%	15%	3%	100.0%
A320-211	21%	63%	16%		100.0%
A321-232	38%	62%			100.0%
A319-131	18%	53%	29%		100.0%
737700	100%				100.0%
EMB170		100%			100.0%
7378MAX	33%	55%	12%		100.0%
A320-271N	21%	79%			100.0%
EMB175		100%			100.0%
EMB190		100%			100.0%
757PW	67%	33%			100.0%
A300B4-203	56%	44%			100.0%
MD11GE		100%			100.0%
737300	100%				100.0%
767300	100%				100.0%
CRJ9-ER		100%			100.0%
DC1030		100%			100.0%
737400	100%				100.0%
7879			100%		100.0%
727EM2	100%				100.0%

AEDT Aircraft	Stage Length 1 (<500 nm)	Stage Length 2 (501-1000nm)	Stage Length 3 (1001-1500nm)	Stage Length 4 (1501-2500nm)	Total
DC93LW	100%				100.0%
777200	100%				100.0%
7878R	100%				100.0%
767CF6		100%			100.0%
7773ER	92%		8%		100.0%
MD83		100%			100.0%
OVERALL	32%	57%	10%	1%	100.0%

Source: RS&H, Inc.; SAT NOMS

I.3.5 Runway Use and Flight Tracks

Runway use refers to the frequency with which aircraft utilize each runway end for departures and arrivals. The more often a runway is used, the more noise is generated in areas located off each end of that runway. Wind direction and speed primarily dictate the runway directional use (or flow) of airports. From a safety and operational standpoint, it is preferable for aircraft to arrive and depart into the wind.

SAT has three runways, Runway 4/22, which is 8,505 feet long by 150 feet wide; Runway 13R/31L, which is 8,502 feet long by 150 feet wide; and Runway 13L/31R, which is 5,519 feet long by 100 feet wide. Modeled runway use by aircraft category for daytime and nighttime are included in **Table I-6**. Runway 13L/31R was closed for construction during 2022. The runway use percentages used in the modeling the 2022 DNL contours were taken from the 2021 SAT Noise Exposure Map Update Report for that runway only.

Flight tracks refer to the route an aircraft follows when arriving to or departing from a runway. The location of flight tracks is a key factor in determining the geographic distribution of noise on the ground. The AEDT uses airport-specific ground tracks and vertical flight profiles to compute three-dimensional flight paths for each modeled aircraft operation. The "default" AEDT vertical profiles, which consist of altitude, speed, and thrust settings, are compiled from data provided by aircraft manufacturers. The AEDT flight tracks were developed from the SAT NOMS radar track data. The AEDT flight tracks are depicted in **Figure I-2** and **Figure I-3**. The modeled flight track use percentages for departures are shown in **Table I-7**. As arrivals need to be aligned with the runway end several miles from touch down, arrivals for all aircraft categories for all runway ends were modeled straight in/out on one flight track.

TABLE I-6 MODELED RUNWAY USE BY AIRCRAFT CATEGORY

Category	Operation Type	AEDT Time	Runway 04	Runway 22	Runway 13R	Runway 31L	Runway 13L	Runway 31R	Total
Widebody	Departures	Day	40.0%	28.2%	19.7%	12.1%			100%
Narrowbody		Day	41.1%	2.9%	46.3%	9.7%			100%
Regional Jet		Day	24.3%	13.8%	50.5%	11.4%			100%
General Aviation Jet		Day	29.5%	2.4%	49.8%	10.4%	7.1%	0.8%	100%
General Aviation Turboprop		Day	30.1%	12.4%	30.1%	9.0%	10.6%	7.8%	100%
General Aviation Piston		Day	25.0%	2.9%	45.8%	8.6%	12.5%	5.2%	100%
Military		Day	6.0%	3.0%	80.0%	11.0%			100%
Widebody		Night	45.3%	29.5%	17.0%	8.2%			100%
Narrowbody		Night	47.8%	2.5%	39.2%	10.5%			100%
Regional Jet		Night	27.4%	29.2%	34.7%	8.7%			100%
General Aviation Jet		Night	30.8%	0.9%	52.7%	11.5%	3.6%	0.5%	100%
General Aviation Turboprop		Night	44.2%	15.8%	20.1%	5.6%	4.6%	9.7%	100%
General Aviation Piston		Night	32.6%	2.2%	39.9%	6.7%	15.4%	3.2%	100%
Military		Night	6.0%	3.0%	80.0%	11.0%			100%
Widebody	Arrivals	Day	16.5%	1.4%	72.4%	9.7%			100%
Narrowbody		Day	12.5%	2.8%	75.5%	9.2%			100%
Regional Jet		Day	17.0%	2.9%	70.5%	9.6%			100%
General Aviation Jet		Day	12.1%	2.7%	68.9%	10.6%	4.8%	0.9%	100%
General Aviation Turboprop		Day	11.8%	1.8%	51.1%	7.1%	24.6%	3.6%	100%
General Aviation Piston		Day	8.0%	2.1%	50.8%	6.9%	27.8%	4.4%	100%
Military		Day	10.0%	4.0%	77.0%	9.0%			100%
Widebody		Night	8.8%	2.3%	78.3%	10.6%			100%
Narrowbody		Night	10.0%	2.9%	78.7%	8.4%			100%
Regional Jet		Night	8.7%	2.1%	80.7%	8.5%			100%
General Aviation Jet		Night	8.7%	4.5%	73.7%	12.5%	0.6%		100%
General Aviation Turboprop		Night	20.1%	2.5%	61.6%	9.6%	4.8%	1.4%	100%
General Aviation Piston		Night	5.8%	3.9%	69.1%	6.8%	13.0%	1.4%	100%
Military		Night	10.0%	4.0%	77.0%	9.0%			100%

Source: SAT NOMS, 2022; RS&H, 2024.

TABLE I-7 MODELED FLIGHT TRACK USE PERCENTAGES BY AIRCRAFT CATEGORY - DEPARTURES

	Track ID	Track ID	Track ID	Track ID	Track ID	Total
Runway 4	**04D1**	**04D2**	**04D3**	**04D4**		
Widebody	50%	4%	19%	27%		100%
Narrowbody	49%	5%	27%	19%		100%
Regional Jet	56%	3%	20%	21%		100%
General Aviation Jet	54%	5%	18%	23%		100%
General Aviation Turboprop	15%	39%	13%	33%		100%
General Aviation Piston	15%	32%	16%	37%		100%
Military	100%					100%
Runway 22	**22D1**	**22D2**				
Widebody	100%					100%
Narrowbody	100%					100%
Regional Jet	100%					100%
General Aviation Jet	100%					100%
General Aviation Turboprop	29%	71%				100%
General Aviation Piston	28%	72%				100%
Military	100%					100%
Runway 13R	**13RD1**	**13RD2**	**13RD3**	**13RD4**	**13RD5**	
Widebody	27%	21%	43%	9%		100%
Narrowbody	37%	10%	43%	10%		100%
Regional Jet	49%	10%	25%	15%	1%	100%
General Aviation Jet	49%	11%	28%	11%	1%	100%
General Aviation Turboprop		45%	3%	4%	48%	100%
General Aviation Piston		48%			52%	100%
Military	100%					100%
Runway 31L	**31LD1**	**31LD2**	**31LD3**	**31LD4**	**31LD5**	
Widebody	45%		20%	35%		100%
Narrowbody	52%		7%	41%		100%
Regional Jet	59%		13%	28%		100%
General Aviation Jet	52%		16%	32%		100%
General Aviation Turboprop	4%	38%	4%	12%	42%	100%
General Aviation Piston		43%			57%	100%
Military	100%					100%

Source: RS&H, Inc.; SAT NOMS

I.3.6 2022 DNL Contours

The 2022 65, 70, and 75 DNL contours are provided on **Figure I-4**. **Table I-8** summarizes the acreage, by land use category, located within the DNL contour intervals. The total area encompassed by the 2022 65 DNL contour is 1,700 acres. As shown in **Table I-8**, the 2022 65 DNL and higher contours contain approximately 9 acres of single family residential and 10 acres of multi-family residential land use between the 65 and 70 DNL contours. Most of the land uses exposed to aircraft noise of 65 DNL and higher is Airport Property (1,350 acres). Other compatible land uses within the 2022 65 DNL and higher contours include 164 acres of Commercial, 30 acres of Industrial, 96 acres of Transportation/Right-of-Way, and 41 acres of Open Space/Recreation.

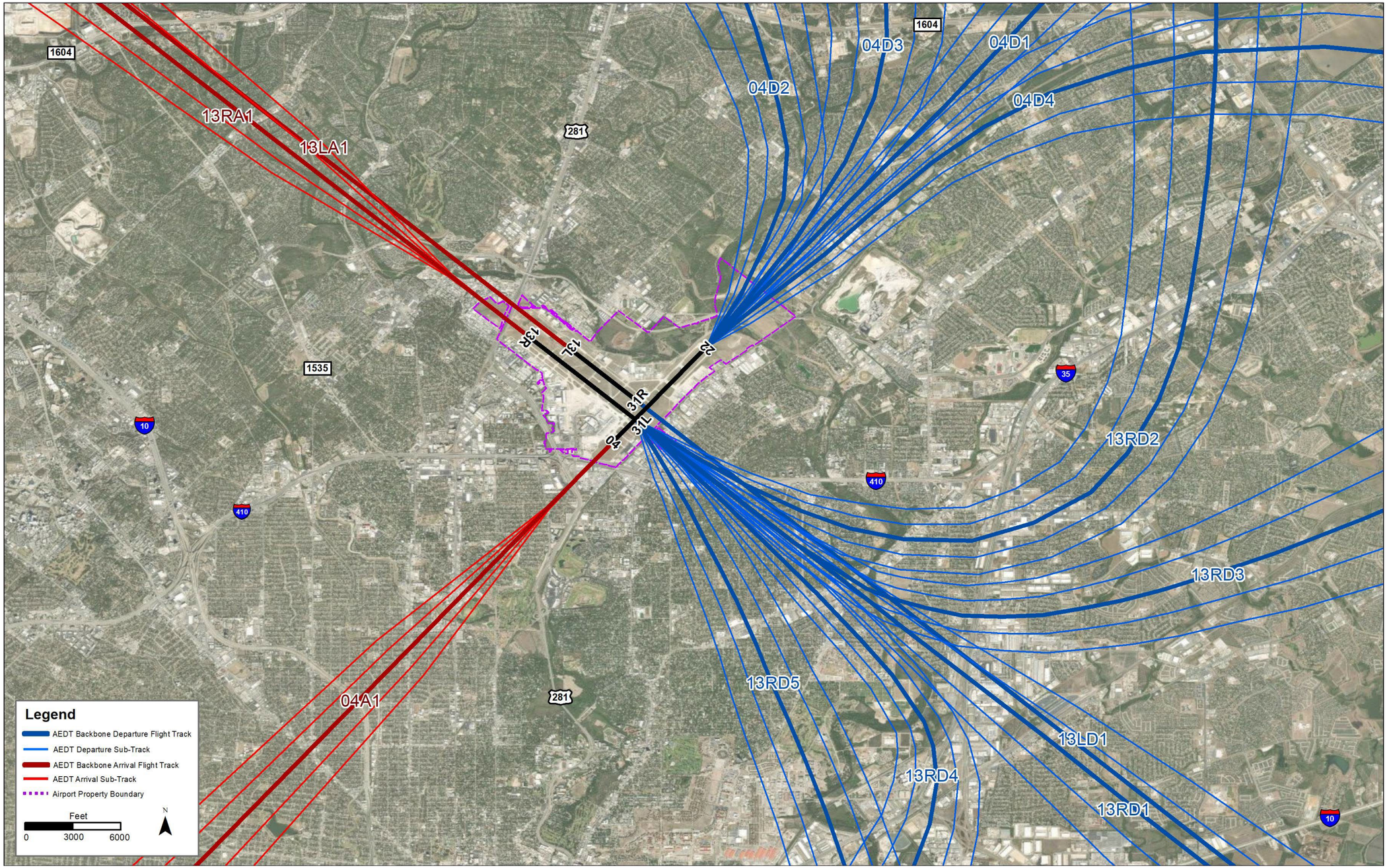
The number of housing units within the contours was determined by using parcel data and aerial imagery. The population within the contours was determined by calculating the average number of persons per household in the 2020 census blocks within the 65 DNL contour and multiplying that number by the number of housing units. The census data showed an average of 2.03 persons per household within the 65 DNL. The estimated population was rounded to the nearest whole number. There are approximately 344 housing units located within the limits of the 2022 65 DNL contour. The 344 housing units account for 697 people. Of the 344 housing units, there are 72 single family and 272 multi-family housing units located between the 65 and 70 DNL. There are no housing units located within the 70 and greater DNL contours.

TABLE I-8 LAND USE AND POPULATION WITHIN THE 2022 DNL CONTOURS

LAND USE CATEGORY	65-70 DNL (ACRES)	70-75 DNL (ACRES)	75+ DNL (ACRES)	TOTAL (ACRES)	HOUSING UNITS	ESTIMATED POPULATION
Single Family Residential	9			9	72	146
Multi-Family Residential	10			10	272	551
Commercial	162	2		164		
Industrial	30			30		
Transportation/ Right-of Way	88	8		96		
Open Space / Recreation	41			41		
Airport Property	672	394	284	1,350		
Total	1,012	404	284	1,700	344	697

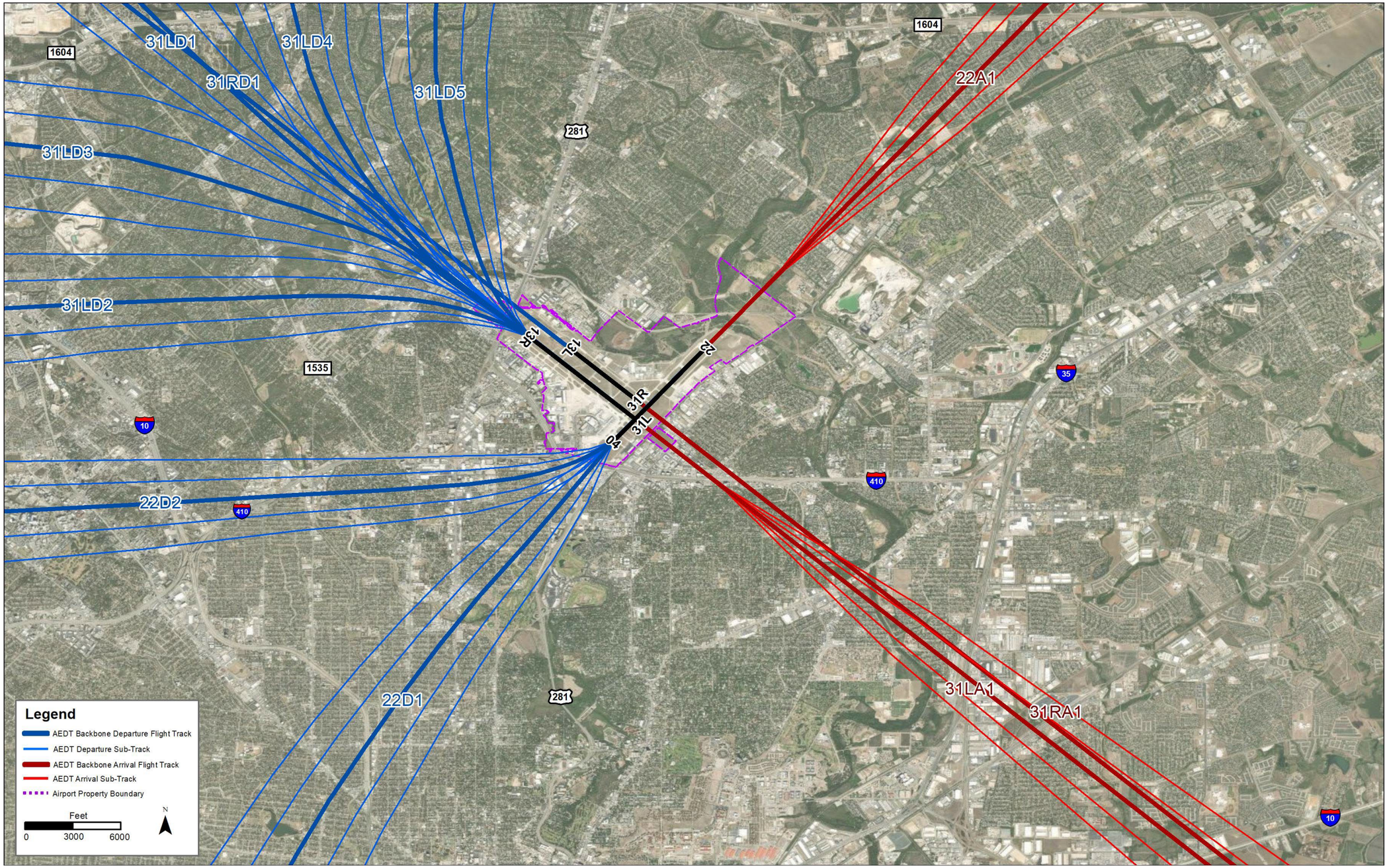
Source: RS&H, Inc.

FIGURE I-2 MODELED AIRCRAFT FLIGHT TRACKS – EAST/NORTHEAST FLOW



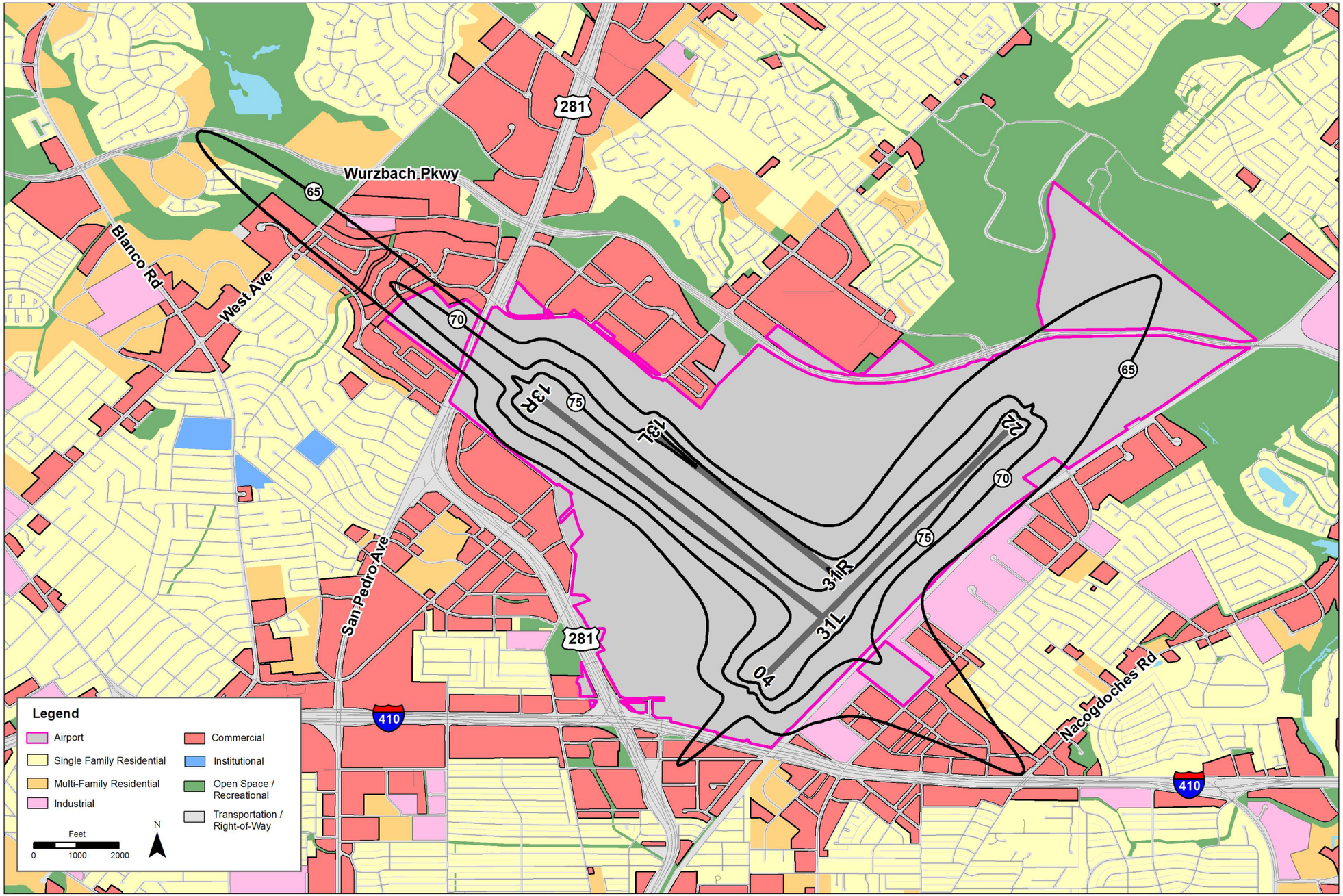
Source: RS&H, Inc.; SAT NOMS

FIGURE I-3 MODELED AIRCRAFT FLIGHT TRACKS – WEST/SOUTHWEST FLOW



Source: RS&H, Inc.; SAT NOMS

FIGURE I-4 2022 DNL CONTOURS



Source: RS&H, Inc.

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I.4 FUTURE NOISE EXPOSURE

This section describes the methodology and significance threshold pertaining to noise and compatible land use, and the potential effect that the Proposed Project would have on aircraft noise exposure.

I.4.1 Methodology and Significance Threshold

Per FAA Order 1050.1F, "a significant noise impact would occur if the action would increase noise by DNL 1.5 dB or more for a noise sensitive area that is [already] exposed to noise at or above the DNL 65 dB noise exposure level, or that will be exposed at or above the DNL 65 dB level due to a DNL 1.5 dB or greater increase, when compared to the no action alternative for the same timeframe." Noise sensitive areas include residential neighborhoods; educational, health, and religious facilities; and cultural and historic sites.

The methodology for assessing noise impacts included comparing DNL contours for the No Action Alternative and Proposed Project for the years 2028 and 2033. The No Action Alternative and Proposed Project would have the same aircraft operations but would be accommodated by SAT through different methods. The No Action Alternative would accommodate the operations in part through the use of by remote gates while the Proposed Project would accommodate the operations with gates at Terminal C. When compared to the No Action Alternative, the Proposed Project would not result in a change in aircraft operations (takeoffs and landings), and the existing runway configuration, arrival/departures procedures, and runway use percentages would remain unchanged. Therefore, there would be no change in aircraft noise exposure when comparing the No Action Alternative to the Proposed Project in 2028 and 2033.

I.4.2 2028 and 2033 Aircraft Operations

The 2028 and 2033 No Action Alternative and Proposed Project aircraft operations were obtained from the FAA's February 2023 Terminal Area Forecast (TAF). **Table *I-9*** shows the aircraft operations by category.

TABLE I-9 2028 AND 2033 ANNUAL AIRCRAFT OPERATIONS

Year	Air Carrier	Air Taxi & General Aviation	Military	Total
2028	107,125	70,248	3,690	181,063
2033	118,579	71,567	3,690	193,836

Source: FAA TAF

The 2028 and 2033 fleet mixes were determined by multiplying the 2022 operations by the growth percentages in the FAA TAF for 2028 and 2033. The runway use, flight tracks, flight track use, stage lengths, and time of day modeled for 2028 and 2033 are the same as for the 2022 fleet mix. The 2028 and 2033 modeled aircraft operations and fleet are shown in **Table I-10**.

Four aircraft types were added to the 2028 and 2033 fleet mix, the Boeing 747-400, Boeing 747-8, Airbus A330-900neo and Airbus A350-900.

TABLE I-10 2028 AND 2033 NO ACTION AND PROPOSED PROJECT AIRCRAFT OPERATIONS AND FLEET

Category	Representative Aircraft Type (s)	AEDT Aircraft	2028 Annual Operations	2033 Annual Operations
Air Carrier / Cargo	Boeing 737-800/900	737800	26,235	24,439
	Boeing 737-700	737700	16,043	13,916
	Airbus A320-200	A320-211	9,882	10,527
	Airbus A321-200/321neo	A321-232	10,506	13,500
	Airbus A319-100	A319-131	8,552	7,359
	Airbus A220-100/300	737700	5,696	7,603
	Embraer 170	EMB170	2,204	1,430
	Boeing 737 MAX8	7378MAX	9,164	18,083
	Airbus A320neo	A320-271N	5,660	9,393
	Embraer 175	EMB175	2,018	1,645
	Embraer 190/195	EMB190	2,564	2,487
	Boeing 757-200	757PW	2,296	1,635
	Airbus A300-600	A300B4-203	1,604	1,940
	McDonnell Douglas MD-11	MD11GE	831	284
	Boeing 737-300	737300	604	356
	Boeing 767-300	767300	801	1,228
	Canadair CRJ 700/900	CRJ9-ER	609	377
	McDonnell Douglas DC-10	DC1030	339	258
	Boeing 737-400	737400	252	184
	Boeing 787-9	7879	327	555
	Airbus A330–900neo	A330-343	98	130
	Boeing 727-200	727EM2	22	-
	McDonnell Douglas DC-9	DC93LW	22	-
	Boeing 777-200	777200	80	100
	Boeing 787-8	7878R	366	490
	Boeing 767-200	767CF6	43	63
	Boeing 777-300	7773ER	24	28
	McDonnell Douglas MD-83	MD83	10	-
	Boeing 747-8	7478	11	62
	Boeing 747-400	747400	16	23
	Airbus A350–900/neo	A350-941	246	484
Air Taxi / GA Jet	Cessna 525 Citation Jet CJ1/CJ3/CJ4	CNA525C	4,572	4,658

Category	Representative Aircraft Type (s)	AEDT Aircraft	2028 Annual Operations	2033 Annual Operations
	Learjet 35/40/45/60/75, Hawker 800	LEAR35	4,404	4,486
	Bombardier Challenger 300/350/600	CL600	3,059	3,117
	Citation II/Bravo, Phenom 300, Embraer Legacy	CNA55B	3,005	3,062
	Cessna Sovereign/Latitude	CNA680	2,625	2,674
	Beechjet 400, HondaJet	MU3001	2,058	2,097
	Cessna 560 Citation XLS	CNA560XL	2,036	2,074
	Cessna 650 Citation III	CIT3	1,955	1,992
	Cessna 750 Citation X, Falcon 2000	CNA750	1,770	1,803
	Cessna 560	CNA560E	1,225	1,248
	Gulfstream GIV, Falcon 7X	GIV	953	971
	Cessna Citation Mustang, Phenom 100	CNA510	943	961
	Eclipse 500	ECLIPSE500	898	915
	Gulfstream GV/G-7	GV	895	912
	Dassault Falcon 50/900	FAL900EX	706	719
	Cessna 500 Citation I	CNA500	641	653
	Gulfstream G280	CL601	252	256
	Gulfstream G150	IA1125	217	221
	Embraer ERJ 135/145	EMB145	210	214
	Bombardier Global 7000/Global Express	BD-700-1A10	152	155
	Bombardier Global 5000	BD-700-1A11	64	65
Air Taxi / GA Turboprop	Beech King Air 90/200/300	DHC6	6,862	6,991
	Pilatus PC12, Cessna 208, Socata TBM-700	CNA208	4,946	5,038
	Raytheon Beech 1900-D	1900D	1,451	1,479
	Piper Malibu Meridian, Piper PA-46 M600	GASEPV	557	568
	Cessna 425/441, Socata TBM-850	CNA441	548	558
GA Piston	Baron 58, Cessna 310/340, Aztec, Aerostar	BEC58P	9,264	9,438
	Piper PA-28 Cherokee, Cessna 150	GASEPF	3,346	3,408

Category	Representative Aircraft Type (s)	AEDT Aircraft	2028 Annual Operations	2033 Annual Operations
	AA-5A, Bonanza 36, Vans, Mooney	GASEPV	3,220	3,281
	Cirrus SR20/22	COMSEP	1,835	1,870
	Piper PA-30/44	PA30	1,033	1,052
	Cessna 172/177	CNA172	788	803
	Cessna 182/185	CNA182	713	726
	Cessna T-206	CNA20T	407	415
	Cessna 206 Stationair	CNA206	142	144
GA Helicopter	Aerospatiale SA-350D Astar (AS-350)	SA350D	745	759
	Eurocopter EC-130	EC130	618	630
	Bell 407	B407	562	573
	Bell 429	B429	347	354
	Bell 206 JetRanger	B206L	224	227
Military	Beechcraft T-6 Texan 2	CNA208	1,107	1,107
	Beechcraft Beechjet 400T T-1A Jayhawk	ECLIPSE500	1,107	1,107
	Sikorsky UH-60 Black Hawk	S70	553	553
	Beechcraft Super King Air 200/300	DHC6	369	369
	Gulfstream IV/V	GV	369	369
	T-38 Talon	T-38A	185	185
		Total	**181,063**	**193,836**

Source: RS&H, Inc.; FAA TAF; SAT NOMS

I.4.3 2028 No Action Alternative and Proposed Project DNL Contours

Figure I-5 presents the 2028 No Action and Proposed Project 65, 70, and 75 DNL contours. As shown in **Table I-11**, the 2028 No Action and Proposed Project 65 DNL and higher contours contain approximately 29 acres of single family residential and 20 acres of multi-family residential land use between the 65 and 70 DNL contours. Most of the land uses exposed to aircraft noise of 65 DNL and higher is Airport Property (1,488 acres). Other compatible land uses within the 2028 No Action and Proposed Project 65 DNL and higher contours include 219 acres of Commercial, 42 acres of Industrial, 147 acres of Transportation/Right-of-Way, and 67 acres of Open Space/Recreation.

There are approximately 632 housing units located within the limits of the 2028 No Action and Proposed Project 65 DNL contour. The 632 housing units account for 1,280 people. Of the 632 housing units, there are 148 single family and 484 multi-

family housing units located between the 65 and 70 DNL. There are no housing units located within the 70 and greater DNL contours.

TABLE I-11 LAND USE AND POPULATION WITHIN THE 2028 NO ACTION AND PROPOSED PROJECT DNL CONTOURS

Land Use Category	65-70 DNL (acres)	70-75 DNL (acres)	75+ DNL (acres)	Total (acres)	Housing Units	Estimated Population
Single Family Residential	29			29	148	300
Multi-Family Residential	20			20	484	980
Commercial	210	9		219		
Industrial	42			42		
Transportation/Right-of Way	134	13		147		
Open Space / Recreation	67			67		
Airport Property	727	438	323	1,488		
Total	1,229	460	323	2,012	632	1,280

Source: RS&H, Inc.

I.4.4 2033 No Action Alternative and Proposed Project DNL Contours

Figure I-6 presents the 2033 No Action and Proposed Project 65, 70, and 75 DNL contours. As shown in **Table I-12**, the 2033 No Action and Proposed Project 65 DNL and higher contours contain approximately 40 acres of single family residential and 22 acres of multi-family residential land use between the 65 and 70 DNL contours. Most of the land uses exposed to aircraft noise of 65 DNL and higher is Airport Property (1,524 acres). Other compatible land uses within the 2033 No Action and Proposed Project 65 DNL and higher contours include 236 acres of Commercial, 47 acres of Industrial, 160 acres of Transportation/Right-of-Way, and 78 acres of Open Space/Recreation.

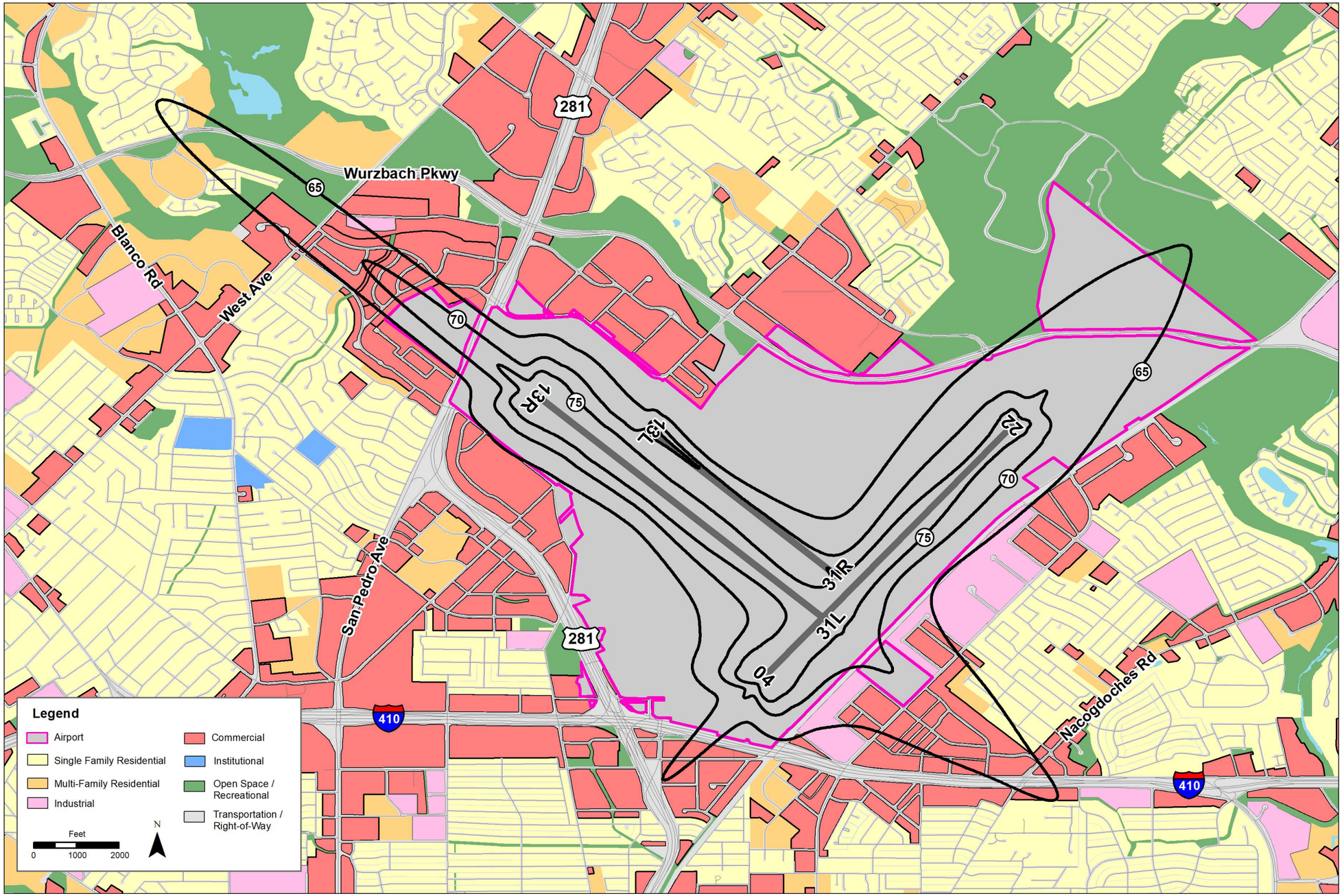
There are approximately 689 housing units located within the limits of the 2033 No Action and Proposed Project 65 DNL contour. The 689 housing units account for 1,395 people. Of the 689 housing units, there are 185 single family and 504 multi-family housing units located between the 65 and 70 DNL. There are no housing units located within the 70 and greater DNL contours.

TABLE I-12 LAND USE AND POPULATION WITHIN THE 2033 NO ACTION AND PROPOSED PROJECT DNL CONTOURS

Land Use Category	65-70 DNL (acres)	70-75 DNL (acres)	75+ DNL (acres)	Total (acres)	Housing Units	Estimated Population
Single Family Residential	40			40	185	375
Multi-Family Residential	22			22	504	1,020
Commercial	224	12		236		
Industrial	47			47		
Transportation/ Right-of Way	145	15		160		
Open Space / Recreation	78			78		
Airport Property	735	453	336	1,524		
Total	1,291	480	336	2,107	689	1,395

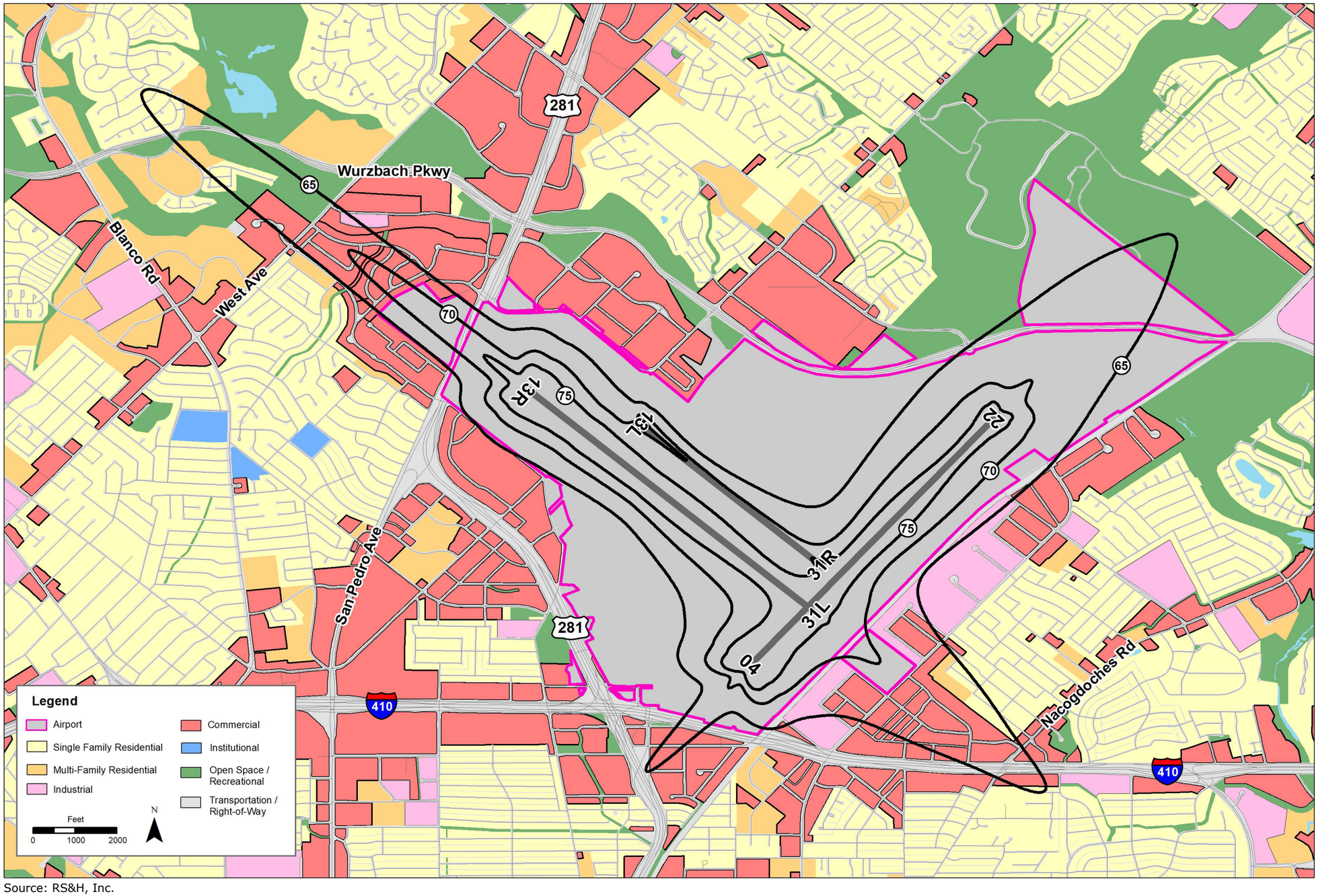
Source: RS&H, Inc.

FIGURE I-5 2028 NO ACTION AND PROPOSED PROJECT DNL CONTOURS



Source: RS&H, Inc.

FIGURE I-6 2033 NO ACTION AND PROPOSED PROJECT DNL CONTOURS



Source: RS&H, Inc.