# *APPENDIX B*
# *AIRCRAFT NOISE ANALYSIS*

# AIRCRAFT NOISE

A noise screening analysis has been prepared to evaluate the potential changes in noise associated with the Proposed Project. 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; and FAA Order 5050.4B, NEPA Implementing Instructions for Airport Actions.

## Methodology

The potential for changes in noise exposure due to the Proposed Project was assessed by comparing the 2032 Proposed Project to the 2032 No Action Alternative.[1] For projects in which the planned changes involve only aircraft operations and fleet mix (and not flight tracks, flight profiles, or runway modifications), the procedure for assessing noise exposure for an airport NEPA assessment is two-tiered:

Step 1: Conduct a noise screening analysis using the FAA's Area Equivalent Method (AEM) model. If the potential for significant noise impact results, proceed to Step 2.

Step 2: Conduct detailed noise contour modeling and develop Day-Night Average Sound Level (DNL) contours using the FAA's Aviation Environmental Design Tool (AEDT).

For step 1, the regulations stipulate that a 17% or greater increase in the 65 DNL contour area could result in a 1.5 DNL increase. If AEM computes an increase of less than 17%, then there are no significant noise impacts, and no further noise analysis is required. The AEM does not produce noise contours, only an estimate (in square miles) of the area potentially affected. The most recent available version of AEM, Version 2c SP2, was used for this analysis.

## Aircraft Operations and Fleet Mix

The aircraft operations[2] for 2032 were obtained from the FAA's Terminal Area Forecast (TAF), issued February 2023. These data, by aircraft category, are provided in ***Table 1***. As shown, the 2032 forecast annual operations total 271,488, which is an average of 744 operations per day.

***Table 1: 2032 Annual Aircraft Operations***

| Air Carrier | Air Taxi & Commuter | General Aviation | Military | Sum |
|---|---|---|---|---|
| 216,615 | 24,935 | 29,241 | 697 | 271,488 |

Source: FAA TAF, February 2023

[1] The 2032 study year has the greatest difference in aircraft operations, therefore, the 2027 aircraft operations are not included in the AEM study.

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

The 2032 aircraft fleet mix was based on a recent noise study prepared by the Hillsborough County Aviation Authority (HCAA). In December 2021, the HCAA finalized a 14 CFR Part 150 (Part 150) Noise Exposure Map Update (NEM) for Tampa International Airport (TPA). Included in this study were forecast projections of operations by specific aircraft types for the future year 2026. This data was compared to the aircraft operations and fleet that occurred at TPA in 2022 to identify if any notable changes to the aircraft types have occurred since the development of the Part 150 NEM.

The HCAA maintains an aircraft operations monitoring system that records aircraft flights at TPA. The system records the aircraft type, the origin/destination, and the time of the departure/arrival. Calendar year 2022 information for TPA was obtained and reviewed.

The aircraft types that comprised the top ten in air carrier operations in 2022 are the same as the top ten aircraft types in 2026 included in the FAR Part 150 NEM. The day/night split for these ten in 2022 were 89% occurred during the day (7:00 a.m. – 9:59 p.m.) and 11% occurred at night (10:00 p.m. - 6:59 a.m.) and the 2026 Part 150 NEM forecast has these ten at 90% day and 10% at night. The review of the 2022 data showed that while there were some changes in the aircraft fleet mix and time of day compared to the Part 150 NEM data, these changes are minor and would not result in notably different noise exposure results. Therefore, the year 2026 fleet mix of aircraft (and the time of day) included in the Part 150 NEM have been applied to the operations for the year 2032.

## Proposed Project Aircraft Operations

This section provides the total passenger airline operations considered under the No Action Alternative and Proposed Project. The Airport's passenger airline operations were developed using the methodology summarized below.

- Annual passenger operations and design day flight schedules for 2028 (Gate Test), Planning Activity Level (PAL) 1 (2032), PAL 2 (2037), and PAL 3 (2042) were established as part of the TPA Master Plan Update based on the projections of aviation activity that FAA approved on April 29, 2022.
- Annual passenger airline operations by day for 2027 and 2032 were determined by extrapolating growth trends from forecast and design day flight schedule development to determine daily operations for the particular years. This resulted in the "extrapolated daily operations."
- Previous analyses were reviewed to identify the number of operations associated with each design flight schedule and the maximum operational capability associated with the existing gates. This resulted in the "maximum daily operations."
- The difference between extrapolated daily operations and the maximum daily operations was summed and identified as the operations associated with the additional gates (i.e., Airside D's 16 gates). This resulted in "additional operations."
- The total additional operations were subtracted from the forecasted passenger airline operations established in the FAA-approved forecast to determine the annual passenger airline operations without Airside D development.

***Table 2*** includes the 2027 and 2032 Proposed Project and No Action Alternative passenger airline operations.

***Table 2: Proposed Project and No Action Alternative Passenger Airline Operations***

| | | 2027 | 2032 |
|---|---|---|---|
| Proposed Project Operations | | 198,625 | 220,500 |
| No Action Alternative Operations | | 198,163 | 218,500 |
| Difference | | 462 | 2,000 |

Source: Ricondo & Associates, Inc. 2023

The 2032 No Action Alternative and Proposed Project total annual aircraft operations and fleet mix are shown in ***Table 3.***

***Table 3: 2032 Annual Aircraft Operations and Fleet***

| Category | Aircraft | 2032 No Action Alternative | 2032 Proposed Project | Difference |
|---|---|---|---|---|
| Air Carrier / Cargo | Boeing 737-800 Series | 43,389 | 43,786 | 397 |
| | Boeing 737-8 (MAX8) | 36,752 | 37,088 | 336 |
| | Airbus A320-200 Series | 34,378 | 34,693 | 315 |
| | Boeing 737-700 Series | 31,859 | 32,151 | 292 |
| | Airbus A321-200 Series | 28,216 | 28,474 | 258 |
| | Airbus A320-NEO | 21,575 | 21,772 | 197 |
| | Airbus A319-100 Series | 12,564 | 12,679 | 115 |
| | Boeing 767-300 ER | 5,927 | 5,981 | 54 |
| | Boeing 757-200 Series | 3,083 | 3,083 | - |
| | Airbus A300F4-600 Series | 2,336 | 2,336 | - |
| | Boeing 757-200 Series | 2,283 | 2,311 | 28 |
| | Boeing MD-11 | 1,475 | 1475 | - |
| | Boeing 757-300 Series | 475 | 479 | 4 |
| | Airbus A350-900 series | 274 | 277 | 3 |
| | Embraer ERJ190 | 9 | 10 | 1 |
| Air Taxi / Commuter | DeHavilland DHC-8-300 | 4,881 | 4,881 | - |
| | DeHavilland DHC-6-300 | 4,580 | 4,580 | - |
| | Embraer ERJ175 | 4,237 | 4,237 | - |
| | Bombardier Challenger 600 | 2,163 | 2,163 | - |
| | Bombardier CRJ-900-ER | 437 | 437 | - |
| | Bombardier Challenger 601 | 411 | 411 | - |
| | Embraer ERJ170 | 245 | 245 | - |
| General Aviation | Bombardier Learjet 35 | 4,718 | 4,718 | - |
| | Cessna 550 Citation II | 3,112 | 3,112 | - |
| | Cessna 500 Citation I | 2,713 | 2,713 | - |
| | Raytheon Beech Baron 58 | 1,839 | 1,839 | - |
| | Cessna 750 Citation X | 1,694 | 1,694 | - |
| | Cessna 560 Citation Excel | 1,594 | 1,594 | - |
| | 1985 1-ENG COMP | 1,554 | 1,554 | - |

| Category | Aircraft | 2032 No Action Alternative | 2032 Proposed Project | Difference |
|---|---|---|---|---|
| | Cessna 680 Citation | 1,476 | 1,476 | - |
| | Cessna 208 Caravan | 1,427 | 1,427 | - |
| | Cessna 180 | 1,222 | 1,222 | - |
| | Gulfstream V | 1,152 | 1,152 | - |
| | Gulfstream IV | 898 | 898 | - |
| | Cessna Citation 510 | 847 | 847 | - |
| | Dassault Falcon 900-EX | 738 | 738 | - |
| | Bell 427 | 717 | 717 | - |
| | Cessna 560 Citation Encore | 590 | 590 | - |
| | Cessna 560 Citation V | 478 | 478 | - |
| | Bell 407 | 311 | 311 | - |
| | Cessna 172 Skyhawk | 305 | 305 | - |
| | Cessna 150 Series | 254 | 254 | - |
| | Bombardier Global Express | 212 | 212 | - |
| | Cessna 650 Citation III | 197 | 197 | - |
| | Bell 206 Jet Ranger | 154 | 154 | - |
| | Cessna 441 Conquest II | 127 | 127 | - |
| | Cessna 182 | 124 | 124 | - |
| | Bombardier Global 5000 | 121 | 121 | - |
| | Cessna 525 Citation Jet | 121 | 121 | - |
| | Gulfstream G650 | 109 | 109 | - |
| | Robinson R44 Raven | 106 | 106 | - |
| | Israel IAI-1121 | 82 | 82 | - |
| | Eclipse 500 | 73 | 73 | - |
| | Sikorsky S-76 | 48 | 48 | - |
| | Cessna 206 | 33 | 33 | - |
| | Aerospatiale SA-350D | 21 | 21 | - |
| | Piper PA-42 Cheyenne | 18 | 18 | - |
| | Bell Iroquois | 18 | 18 | - |
| | Robinson R22 Mariner | 12 | 12 | - |
| | Hawker HS748-2A | 9 | 9 | - |
| | Piper PA-30 | 9 | 9 | - |
| | Dassault Falcon 20-C | 3 | 3 | - |
| | Raytheon Beech 1900-C | 3 | 3 | - |
| | Bell 429 | 3 | 3 | - |
| Military | Lockheed C-130 Hercules | 697 | 697 | |
| | | **271,488** | **273,488** | **2,000** |

Source: 2021 TPA FAR Part 150 NEM Update, December 2021; FAA TAF, February 2023; RS&H 2023

Each aircraft type has been assigned the corresponding AEM aircraft type. As required for use in the AEM, aircraft operations have been converted to daily landing-takeoff cycles (LTOs). One LTO equals two operations. Aircraft operations modeled in the AEM 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 calculation includes an additional weight of 10 decibels for those operations occurring at night. The 2032 No Action Alternative and Proposed Project modeled daily LTOs by time of day are shown in ***Table 4***.

***Table 4: 2032 Daily LTOs***

| | | | 2032 No Action Alternative | | 2032 Proposed Project | |
|---|---|---|---|---|---|---|
| **Category** | **Aircraft** | **AEM ID** | Day | Night | Day | Night |
| Air Carrier / Cargo | Boeing 737-800 Series | 737800 | 52.48 | 6.95 | 52.97 | 7.02 |
| | Boeing 737-8 (MAX8) | 737800 | 43.33 | 7.02 | 43.73 | 7.08 |
| | Airbus A320-200 Series | A320-232 | 43.20 | 3.89 | 43.60 | 3.92 |
| | Boeing 737-700 Series | 737700 | 39.65 | 3.99 | 40.01 | 4.03 |
| | Airbus A321-200 Series | A321-232 | 34.01 | 4.65 | 34.32 | 4.69 |
| | Airbus A320-NEO | A320-211 | 25.13 | 4.43 | 25.36 | 4.47 |
| | Airbus A319-100 Series | A319-131 | 15.64 | 1.58 | 15.78 | 1.59 |
| | Boeing 767-300 ER | 767300 | 6.23 | 1.89 | 6.29 | 1.91 |
| | Boeing 757-200 Series | 757PW | 2.15 | 2.07 | 2.15 | 2.07 |
| | Airbus A300F4-600 Series | A300- | 2.07 | 1.13 | 2.07 | 1.13 |
| | Boeing 757-200 Series | 757RR | 2.53 | 0.60 | 2.56 | 0.61 |
| | Boeing MD-11 | MD11PW | 1.34 | 0.68 | 1.34 | 0.68 |
| | Boeing 757-300 Series | 757300 | 0.54 | 0.11 | 0.54 | 0.11 |
| | Airbus A350-900 series | A340-211 | 0.37 | 0.00 | 0.37 | 0.00 |
| | Embraer ERJ190 | EMB190 | 0.01 | 0.00 | 0.01 | 0.00 |
| Air Taxi / Commuter | DeHavilland DHC-8-300 | DHC830 | 6.69 | 0.00 | 6.69 | 0.00 |
| | DeHavilland DHC-6-300 | DHC6 | 5.95 | 0.32 | 5.95 | 0.32 |
| | Embraer ERJ175 | EMB175 | 5.55 | 0.25 | 5.55 | 0.25 |
| | Bombardier Challenger 600 | CL600 | 2.81 | 0.16 | 2.81 | 0.16 |
| | Bombardier CRJ-900-ER | CRJ9-ER | 0.60 | 0.00 | 0.60 | 0.00 |
| | Bombardier Challenger 601 | CL601 | 0.54 | 0.03 | 0.54 | 0.03 |
| | Embraer ERJ170 | EMB170 | 0.34 | 0.00 | 0.34 | 0.00 |
| General Aviation | Bombardier Learjet 35 | LEAR35 | 5.79 | 0.68 | 5.79 | 0.68 |
| | Cessna 550 Citation II | CNA55B | 4.04 | 0.22 | 4.04 | 0.22 |
| | Cessna 500 Citation I | CNA500 | 3.44 | 0.27 | 3.44 | 0.27 |
| | Raytheon Beech Baron 58 | BEC58P | 1.91 | 0.61 | 1.91 | 0.61 |
| | Cessna 750 Citation X | CNA750 | 2.22 | 0.10 | 2.22 | 0.10 |
| | Cessna 560 Citation Excel | CNA560X | 2.12 | 0.07 | 2.12 | 0.07 |
| | 1985 1-ENG COMP | COMSEP | 2.08 | 0.05 | 2.08 | 0.05 |
| | Cessna 680 Citation | CNA680 | 1.94 | 0.08 | 1.94 | 0.08 |
| | Cessna 208 Caravan | CNA208 | 1.85 | 0.11 | 1.85 | 0.11 |

| | | | 2032 No Action Alternative | | 2032 Proposed Project | |
|---|---|---|---|---|---|---|
| **Category** | **Aircraft** | **AEM ID** | Day | Night | Day | Night |
| | Cessna 180 | GASEPV | 1.62 | 0.06 | 1.62 | 0.06 |
| | Gulfstream V | GV | 1.42 | 0.16 | 1.42 | 0.16 |
| | Gulfstream IV | GIV | 1.16 | 0.07 | 1.16 | 0.07 |
| | Cessna Citation 510 | CNA510 | 0.96 | 0.20 | 0.96 | 0.20 |
| | Dassault Falcon 900-EX | CNA750 | 0.98 | 0.03 | 0.98 | 0.03 |
| | Bell 427 | DHC6 | 0.73 | 0.25 | 0.73 | 0.25 |
| | Cessna 560 Citation Encore | CNA560E | 0.76 | 0.05 | 0.76 | 0.05 |
| | Cessna 560 Citation V | CNA560E | 0.51 | 0.14 | 0.51 | 0.14 |
| | Bell 407 | DHC6 | 0.28 | 0.15 | 0.28 | 0.15 |
| | Cessna 172 Skyhawk | CNA172 | 0.29 | 0.13 | 0.29 | 0.13 |
| | Cessna 150 Series | GASEPF | 0.33 | 0.02 | 0.33 | 0.02 |
| | Bombardier Global Express | GV | 0.27 | 0.02 | 0.27 | 0.02 |
| | Cessna 650 Citation III | CIT3 | 0.25 | 0.02 | 0.25 | 0.02 |
| | Bell 206 Jet Ranger | DHC6 | 0.19 | 0.02 | 0.19 | 0.02 |
| | Cessna 441 Conquest II | CNA441 | 0.17 | 0.01 | 0.17 | 0.01 |
| | Cessna 182 | CNA182 | 0.15 | 0.02 | 0.15 | 0.02 |
| | Bombardier Global 5000 | GV | 0.15 | 0.01 | 0.15 | 0.01 |
| | Cessna 525 Citation Jet | CNA525C | 0.16 | 0.00 | 0.16 | 0.00 |
| | Gulfstream G650 | GV | 0.14 | 0.01 | 0.14 | 0.01 |
| | Robinson R44 Raven | DHC6 | 0.13 | 0.01 | 0.13 | 0.01 |
| | Israel IAI-1121 | IA1125 | 0.10 | 0.01 | 0.10 | 0.01 |
| | Eclipse 500 | ECLIPSE50 | 0.10 | 0.00 | 0.10 | 0.00 |
| | Sikorsky S-76 | DHC6 | 0.07 | 0.00 | 0.07 | 0.00 |
| | Cessna 206 | CNA206 | 0.05 | 0.00 | 0.05 | 0.00 |
| | Aerospatiale SA-350D | DHC6 | 0.015 | 0.036 | 0.015 | 0.036 |
| | Piper PA-42 Cheyenne | PA42 | 0.02 | 0.00 | 0.02 | 0.00 |
| | Bell Iroquois | DHC6 | 0.02 | 0.00 | 0.02 | 0.00 |
| | Robinson R22 Mariner | DHC6 | 0.02 | 0.00 | 0.02 | 0.00 |
| | Hawker HS748-2A | HS748A | 0.01 | 0.00 | 0.01 | 0.00 |
| | Piper PA-30 | PA30 | 0.01 | 0.00 | 0.01 | 0.00 |
| | Dassault Falcon 20-C | CNA750 | 0.01 | 0.00 | 0.01 | 0.00 |
| | Raytheon Beech 1900-C | 1900D | 0.01 | 0.00 | 0.01 | 0.00 |
| | Bell 429 | DHC6 | 0.01 | 0.00 | 0.01 | 0.00 |
| Military | Lockheed C-130 Hercules | C130E | 0.89 | 0.00 | 0.89 | 0.00 |
| | | | **328.535** | **43.366** | **330.955** | **43.686** |

Source: 2021 TPA FAR Part 150 NEM Update, December 2021; FAA TAF, February 2023; RS&H 2023

## AEM Results

The AEM results indicate that the Proposed Project, when compared to the No Action Alternative, would increase the 65 DNL contour area by 0.6% in 2032. The 0.6% increase is well below the FAA's noise criterion of 17% for additional noise analysis. Therefore, the Proposed Project does not result in a significant noise impact and no further analysis is necessary. The AEM input and results are shown in ***Figure 1***.

### *Figure 1: AEM Results*

**Federal Aviation Administration**
Office of Environment and Energy
http://www.faa.gov/about/office_org/headquarters_offices/apl/research/models/aem_model/

**Area Equivalent Method (AEM) Version 2c SP2**

| Airport Name/Code: | TPA 2032 |
|---|---|

| DNL (dBA) | Baseline Area (Sq. Mi.) | Alternative Area (Sq. Mi.) | Percent Change in Area |
|---|---|---|---|
| 65 | 3.62 | 3.65 | 0.6% |
| | | | |

| | BASE Case | | ALTERNATIVE Case | |
|---|---|---|---|---|
| Aircraft Type | Daytime LTO Cycles | Nighttime LTO Cycles | Daytime LTO Cycles | Nighttime LTO Cycles |
| 737700 | 39.654 | 3.989 | 40.017 | 4.026 |
| 737800 | 95.810 | 13.972 | 96.687 | 14.100 |
| 757300 | 0.539 | 0.111 | 0.544 | 0.112 |
| 767300 | 6.227 | 1.892 | 6.284 | 1.909 |
| 1900D | 0.004 | 0.000 | 0.004 | 0.000 |
| 757PW | 2.154 | 2.070 | 2.154 | 2.070 |
| 757RR | 2.529 | 0.598 | 2.560 | 0.606 |
| A300-622R | 2.066 | 1.134 | 2.066 | 1.134 |
| A319-131 | 15.635 | 1.576 | 15.778 | 1.590 |
| A320-211 | 25.126 | 4.429 | 25.355 | 4.469 |
| A320-232 | 43.204 | 3.890 | 43.599 | 3.925 |
| A321-232 | 34.006 | 4.645 | 34.318 | 4.688 |
| A340-211 | 0.375 | 0.000 | 0.378 | 0.000 |
| BEC58P | 1.906 | 0.613 | 1.906 | 0.613 |
| C130E | 0.955 | 0.000 | 0.955 | 0.000 |
| CIT3 | 0.249 | 0.021 | 0.249 | 0.021 |
| CL600 | 2.806 | 0.156 | 2.806 | 0.156 |
| CL601 | 0.536 | 0.027 | 0.536 | 0.027 |
| CNA172 | 0.286 | 0.133 | 0.286 | 0.133 |
| CNA182 | 0.153 | 0.017 | 0.153 | 0.017 |
| CNA206 | 0.046 | 0.000 | 0.046 | 0.000 |
| CNA208 | 1.848 | 0.108 | 1.848 | 0.108 |
| CNA441 | 0.166 | 0.008 | 0.166 | 0.008 |
| CNA500 | 3.443 | 0.273 | 3.443 | 0.273 |
| CNA510 | 0.957 | 0.203 | 0.957 | 0.203 |
| CNA525C | 0.162 | 0.004 | 0.162 | 0.004 |
| CNA55B | 4.043 | 0.220 | 4.043 | 0.220 |
| CNA560E | 1.272 | 0.191 | 1.272 | 0.191 |
| CNA560XL | 2.117 | 0.066 | 2.117 | 0.066 |
| CNA680 | 1.943 | 0.079 | 1.943 | 0.079 |
| CNA750 | 3.198 | 0.137 | 3.198 | 0.137 |
| COMSEP | 2.076 | 0.054 | 2.076 | 0.054 |
| CRJ9-ER | 0.599 | 0.000 | 0.599 | 0.000 |
| DHC6 | 7.415 | 0.765 | 7.415 | 0.765 |
| DHC830 | 6.689 | 0.000 | 6.689 | 0.000 |
| ECLIPSE500 | 0.095 | 0.004 | 0.095 | 0.004 |
| EMB170 | 0.335 | 0.000 | 0.335 | 0.000 |
| EMB175 | 5.550 | 0.255 | 5.550 | 0.255 |
| EMB190 | 0.012 | 0.000 | 0.012 | 0.000 |
| GASEPF | 0.327 | 0.021 | 0.327 | 0.021 |
| GASEPV | 1.616 | 0.058 | 1.616 | 0.058 |
| GIV | 1.160 | 0.070 | 1.160 | 0.070 |
| GV | 1.980 | 0.203 | 1.980 | 0.203 |
| HS748A | 0.008 | 0.004 | 0.008 | 0.004 |
| IA1125 | 0.104 | 0.008 | 0.104 | 0.008 |
| LEAR35 | 5.787 | 0.675 | 5.787 | 0.675 |
| MD11PW | 1.338 | 0.683 | 1.338 | 0.683 |
| PA30 | 0.012 | 0.000 | 0.012 | 0.000 |
| PA42 | 0.021 | 0.004 | 0.021 | 0.004 |
| **Total LTOs** | 328.535 | 43.366 | 330.955 | 43.686 |

Source: RS&H, 2023