

2024 PHX East Annual Summary

1. Introduction

This report is an annual summary of aircraft operations and noise mitigation flight procedures at Phoenix Sky Harbor International Airport (PHX) over the City of Tempe (Tempe). The City of Tempe is located directly east of PHX.

This summary is prepared for the Tempe Aviation Commission (TAVCO). TAVCO consists of nine Tempe residents appointed by the Tempe Mayor with approval of the Tempe City Council. The objective of TAVCO is to advise the Mayor and Council and assist City staff regarding the impact of airport and aircraft operations on Tempe residents. The Commission is monitoring the implementation of the 1994 Intergovernmental Agreement (IGA) between the cities of Tempe and Phoenix regarding noise mitigation flight procedures. The procedures attempt to (1) contain jet departures to the area over the dry Salt River riverbed and Tempe Town Lake in North Tempe and (2) equalize the burden of PHX departures east and west of the airport.

Report prepared for the
Tempe Aviation Commission - TAVCO
by the City of Tempe
31 E Fifth St.
Tempe, AZ 85281



January 27, 2025

2. Executive Summary

Departures:

Most jet departures over the City of Tempe from PHX follow Standard Instrument Departure procedures, (SIDs), which delay the first turns to the area of the SR202/101 intersection in North Tempe, (4-DME), which is located close to the border to the City of Mesa. How well the departures can stay over to the riverbed and the Tempe Town Lake area, and avoid residential areas depend on several factors, but the most significant is how the SIDs being used are designed. Therefore, the annual report distinguishes between SIDs that include a first navigation fix at 4-DME and those that do not. The trend is that the area navigation (RNAV) SIDs at PHX have improved navigation accuracy of east departures, particularly the departures that use RNAV SIDs that have a first waypoint at 4-DME. Most SIDs used at PHX program departing aircraft to find the most efficient path between navigation fixes after 4-DME. This causes departure divergences depending on which SID is used and other factors like wind and separation to other aircraft. PHX uses a measure for tolerance, (PHX Gate), to determine which departures are out of compliance with the typical departure flight paths at 4-DME. Among the busier airlines at PHX, Southwest Airlines got the most deviation notices in 2024.

Departure Split East and West:

The departure flow east and west of PHX is quite constant, viewed on an annual basis. Over 24 hours the flow is close to 40/60%, and the opposite during nighttime. Through the year, the stable weather conditions at PHX, create a flow east and west which corresponds to the prevailing wind directions, east in the mornings and from the west in the afternoons. Departures occur against the winds through most days when the winds are very light at PHX.

Complaints:

Almost all airport noise complaints from Tempe residents are filed with the City of Phoenix. The trend is that Tempe receives far less complaints than during previous years and this year most of the complaints to the City of Tempe were received during the first quarter of the year.

Noise:

PHX noise monitoring sites in Tempe register noise exposure at eight locations in North Tempe, Registered noise events are subject to filtering to determine which are likely caused by aircraft and measured in commonly used metrics. The measurements can be used to determine average noise exposure and event-based noise exposure. The trend is that the average exposure over the years is incrementally being reduced with the airlines' fleet upgrades.

1. East/West Equalization

The flow of jet and large turboprop aircraft departures east and west of the airport over the year attempts to reach the goal of a 50/50 split.



Figure 1: Annual jet departure split west and east, day and night

In 2024 44% went east and 56% went west. Looking at day flows and night flows separately, the west side of the airport receives the most of these departures during daytime hours, while most departures during nighttime go towards the east. 42% of the daytime departures went east and 58% went west, while 60% of nighttime departures went east and 40% went west.

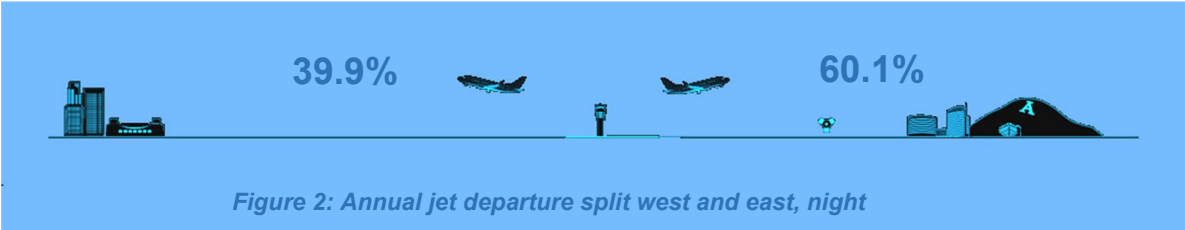


Figure 2: Annual jet departure split west and east, night

Daytime hours are defined as the hours between 7:00 a.m. and 10:00 p.m. local time, and nighttime hours the hours between 10:00 p.m. through 7:00 a.m. local time.

2. Noise Complaints

The City of Tempe registered and responded to 18 noise complaints from Tempe residents in 2024.

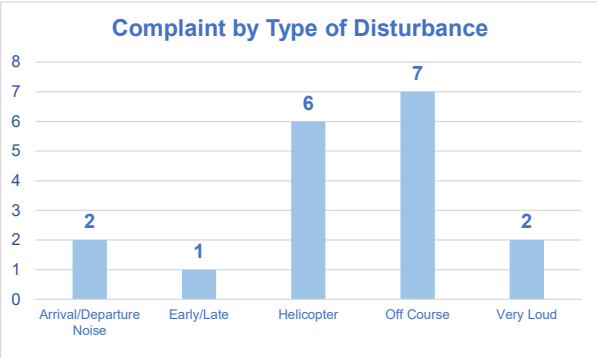


Figure 3: Complaints with cause to the City of Tempe

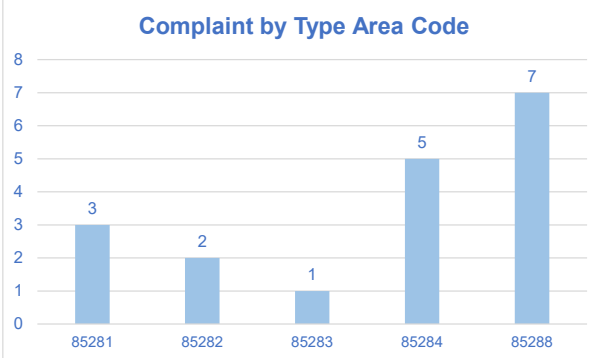


Figure 4: Complaints to the City of Temp by ZIP code

| PHX East | 2020 | 2021 | 2022 | 2023 | 2024 |
|-----------------|--------|---------|---------|---------|---------|
| East Departures | 74,493 | 92,800 | 97,855 | 103,688 | 110,726 |
| West Arrivals | 84,325 | 111,689 | 112,630 | 125,245 | 134,246 |
| Complaints | 7 | 7 | 9 | 8 | 18 |

Figure 5: Jet operations over the east side of PHX and the annual number of complaints received by the City of Tempe since 2020.

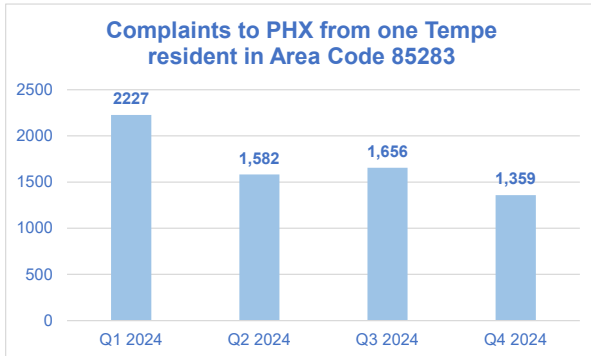


Figure 6: Complaints from one Tempe address to the City of Phoenix.

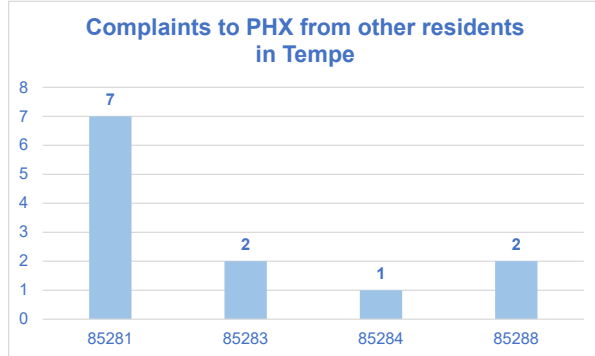
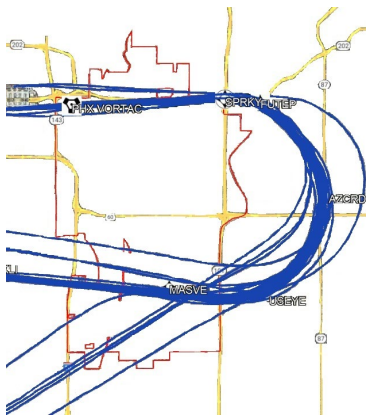


Figure 7: Complaints from other Tempe addresses registered by the City of Phoenix.



The City of Phoenix Aviation Department receives a proportionally high number of their Tempe complaints from one address in area code 85283 located close to the Western Canal under the departure route to destinations in California.

Figure 8: One day of flights on the KEENS & FYRBD RNAV SIDs.

3. Average Noise Exposure

The City of Phoenix operates twenty noise monitoring sites (NMS) on both sides of PHX of which eight are in the City of Tempe. The system is used to monitor and compute noise exposure impact over time typically for airport noise exposure contour mapping.

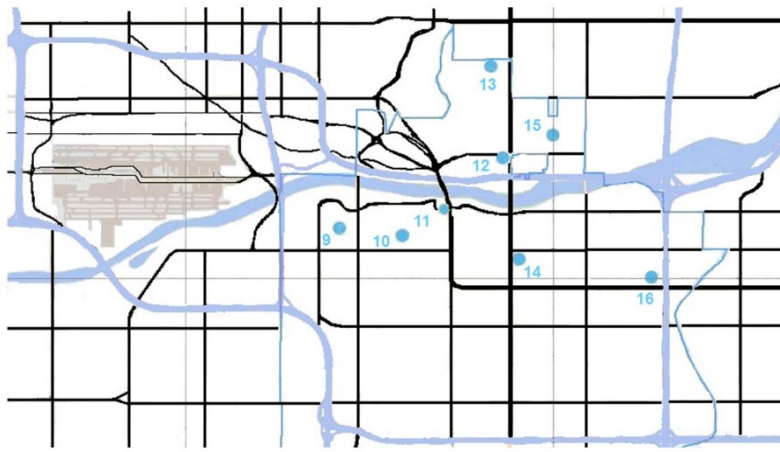


Figure 9: PHX NMS in Tempe

The noise exposure contours determine compatible land uses, expressed in a sound metric called Ldn (A) or Day Night Level (DNL) exposure. The 2024 Lden (A) levels for NMS in Tempe are shown below. Lden includes noise events registered during evenings, weighted with a 5dB penalty, in addition to the 10dB penalty for registered night events. Due to higher traffic volumes, the last and also the first quarter of the year have a higher number of noise events than the second and third quarter.

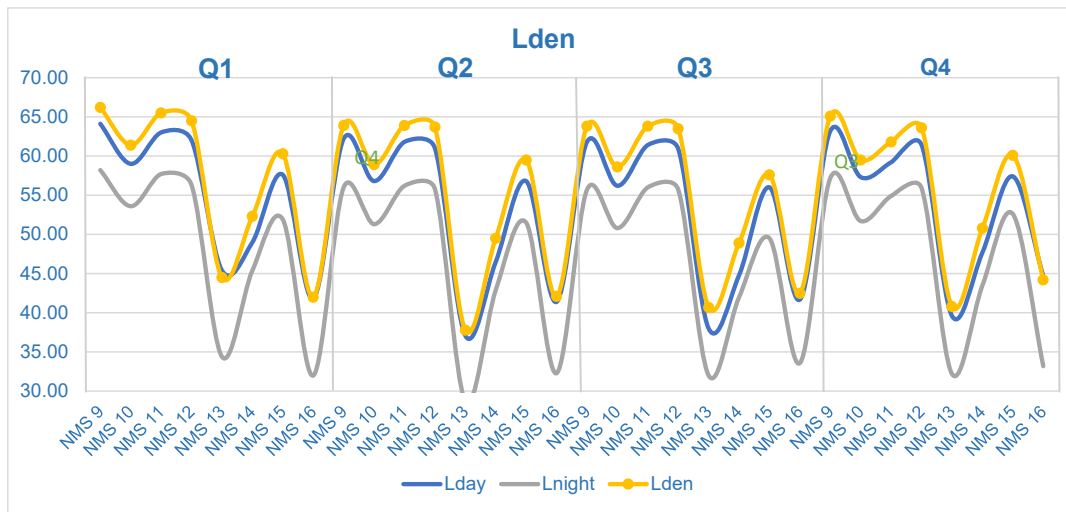
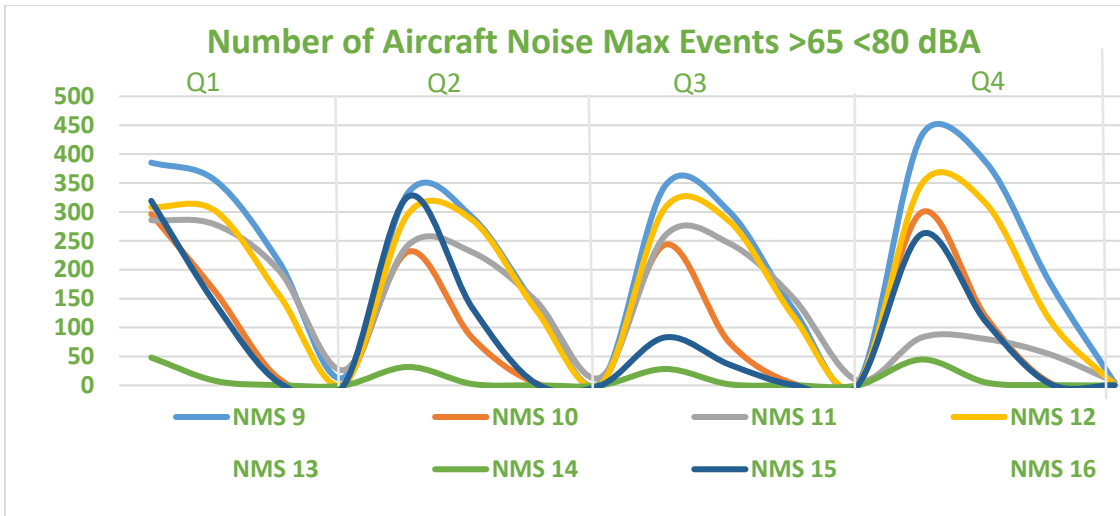


Figure 10: PHX NMS averaged sound levels in North Tempe.

| Average (DNL) | NMS09 | NMS10 | NMS11 | NMS12 | NMS13 | NMS14 | NMS15 | NMS16 |
|---------------|-------|-------|-------|-------|-------|-------|-------|-------|
| 2020 | 62.1 | 52.9 | 62.0 | 59.6 | 36.3 | 39.9 | 53.9 | 37.5 |
| 2023 | 65.0 | 60.1 | 64.3 | 63.5 | 40.7 | 49.9 | | 41.9 |
| 2024 | 64.8 | 59.6 | 63.8 | 63.8 | 41.0 | 50.4 | 59.4 | 42.7 |

Figure 11: PHX NMS historic averaged sound levels in North Tempe.



4. Eastbound departure compliance

Most jets which depart PHX use area navigation (RNAV) Standard Instrument Departure procedures (SIDs). Under the 1994 IGA with the City of Phoenix jet departures to the east are required to delay turns away from the riverbed until 4-DME or the SR202/101 intersection. Most of the east bound RNAV departure procedures (SIDs) include a first fly-over waypoint at 4-DME. The fly-over waypoint at 4-DME was implemented with the FAA’s airspace update in 2014, and helps the airlines comply with the 4-DME departure procedure to mitigate noise exposure over North Tempe residential areas. Two RNAV SID procedures with the first fix close to 5-DME, use a fly-by waypoint, with turns south, causing most of the departures to stay on paths farther away from the first waypoint than departures using procedures with a first waypoint at 4-DME. PHX classic SIDs that use departure headings off the PHX runways have almost gone out of use by the airlines.

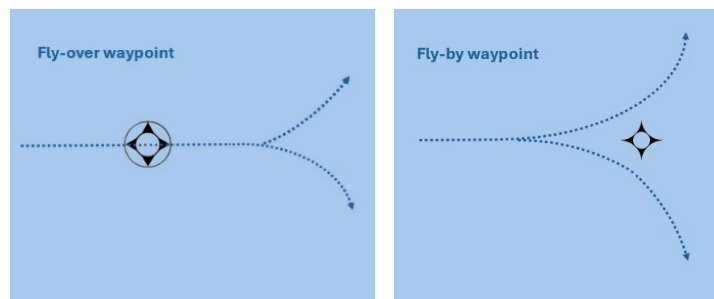


Figure 12: Area navigation waypoints

The required lateral accuracy for airline navigation in the airport terminal area when RNAV1 procedures are used, is 1 nautical mile, or three tenths of a nautical mile, if the airline has special FAA authorization. A Required Navigation Performance of 0.3 means the aircraft navigation system must be able to calculate the position accuracy down to three tenths of a nautical mile from the waypoint. Maximum cross-track deviation limit for aircraft operating on RNAV1 procedures is

0.5 nautical miles (NM). Airline departure accuracy is separated into three categories in this report. For the RNAV departures with a first fly-over waypoint at 4-DME a circle with 0,3 NM radius is used. For RNAV departures to a first fly-by waypoint after 4-DME, a circle with 0.5 NM radius is used, and the same 0.5 NM circle radius is used at the 4-DME waypoint for classic SID departures.

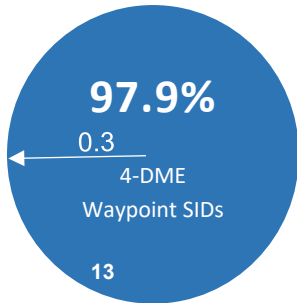


Figure 13: Departure accuracy for jets using RNAV SIDs, (7), with a fly-over waypoint at 4-

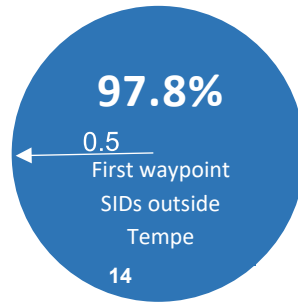


Figure 14: Departure accuracy for jets using RNAV SIDs, (2), with a first fly-by waypoint after

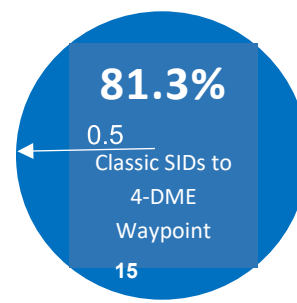


Figure 15: Departure accuracy for jets using classic SIDs to 4-DME, (3), with headings off the runways.

Airline departures with no information about assigned SID are not included. During the year, 2.3% of the jet departures going east had no information on the SIDs being used. Large turboprop aircraft departures are also subject to the 1994 IGA but were not made subject to the mitigation flight procedures and do no longer operate at PHX.

City of Phoenix notifies airlines about departures that fail to comply with the 4-DME noise mitigation flight procedure. The city uses an imaginary 5,500 feet wide gate that runs parallel to the SR-101 to identify violators.

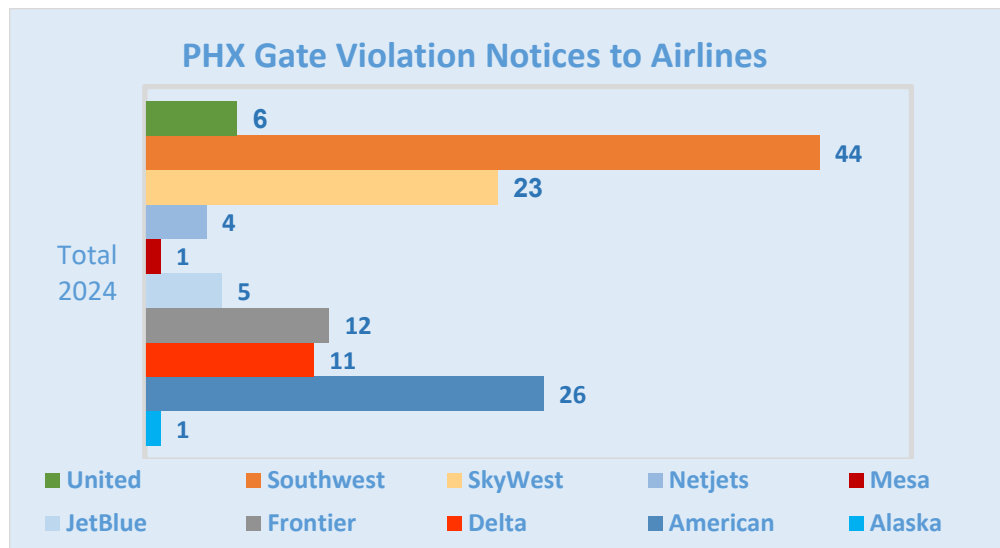


Figure 16: City of Phoenix Notices to Airlines