CITY OF PALO ALTO

Dear Chair Simitian and Select Committee Members,

Thank you for your commitment to listening to community concerns about the air craft noise and working to find recommendations to Congressional Representatives Farr, Speier and Eshoo.

We understand the complexities of finding a regional solution. Our search for solutions is guided by the perspective that our community and neighboring cities should be affected no more than other communities of the Mid-Peninsula and South Bay. The FAA can and should work to deconcentrate noise in the region.

To this regard, on March 2, 2016 in an open letter, we provided four specific recommendations to Mr. Glen Martin (FAA Western Regional Administrator). On July 7, 2016 we issued another open letter to further define and add to those recommendations. Simply put, we believe the FAA can:

1. Create more "points" for aircraft to use while entering SFO. There is currently one point used for flights coming in from the north, west, or south. This point centralizes all arrival aircraft and noise over Menlo Park, East Palo Alto and Palo Alto. Creating new points can provide multiple alternative turning options in lieu of the MENLO point therefore ensuring fair distribution of noise.

2. Redirect flights arriving from the south to the east; away from the Pacific Ocean coast to the mountains west of Interstate 5 and have aircraft enter the Bay from the east. This option would help mitigate flights over all affected communities from Monterey County to San Mateo County and place flights over the uninhabited regions of California.

3. Shift the flights arriving from the north away from the Peninsula to Bay. This option eliminates the flights that do a left U-turn over Mid-Peninsula and positions then down the middle of the Bay to do a right turn into SFO. Thus keeping low altitude impacts over water not over noise sensitive residential areas.

4. Ensure that the divisions and staff within FAA are working in partnership with each other to minimize noise through efficient organization of aircraft and utilizing arrival descents that limit speed brakes.

Attached to the July 7, 2016 letter, we also released a Historical Noise Assessment. Upon release several local engineers and professors reviewed the report and provided substantive feedback. The feedback was analyzed by our consultants and on August 8,

2016 the City received a revised report, which is at your desk (and attached). To take a step back, the data for this report was obtained through a Freedom of Information Act request from the FAA with the support of Congresswoman Eshoo.

The report investigated all flight tracks and computed the day-night average noise level (DNL) contours over Palo Alto from San Francisco International Airport arrivals for July 10, 2008 and July 9, 2015. The days selected were the second Thursday in July of each year with similar weather conditions and typical air traffic control operations. The results of this assessment show 473 arrivals over Palo Alto on the July 10, 2008 and 518 arrivals on the July 9, 2015, a 9.5 percent increase. The flights have also shifted south. Please see Figure 4.2.

Additionally, the study indicated an increase DNL ranging from 5.1 to 9.8 db. See Figure 1.1 on the screen. As you can see, this increase varies throughout Palo Alto due primarily to changes in aircraft routes and altitude. This analysis used FAA noise and flight track data, in the FAA standard noise model, to demonstrate that noise has exceeded the impact criteria defined in FAA Order 1050.1F for the two days analyzed. This assessment validates the concerns of our citizens that noise has increased.

To highlight this further, I would like to show the DNL heat maps comparing the two days. As you can see the data shows the increase in DNL. Note how in Figure 4.3 Palo Alto, shaded in light blue, is in the 40-45 DNL zone (little orange). Now notice how in Figure 4.4 Palo Alto becomes purple, indicating the noise has increased by 5 DNL. To zoom in, please view Figure 5.1 and 5.2.

These results are encouraging in documenting substantial noise impacts to the City in terms of the new FAA Order 1050.1F, if even only for a single day. This suggests that a noise impact may exist for other periods and in nearby communities as well. Pending the Select Committee report and outcome, if needed, the City is prepared to conduct further analysis to demonstrate the negative impacts to our citizens and neighboring cities.

We appreciate the Committee efforts, we are grateful for the FAA's commitment to finding solutions for the Mid-Peninsula. As mentioned before, we have dedicated staff resources, hired technical consultants, and prioritized this topic for our federal legislative consultants. These resources are available to you collectively or individually.

Finally, and most importantly, we believe that an ongoing structure needs to be in place to ensure our citizens can continue to work directly with SFO and the FAA to eliminate or reduce noise impacts to the Mid-Peninsula.

Thank you again for your time and hard work.

Vice Mayor Greg Scharff

Proof of Concept – Task 2

Historical Noise Assessment

Submitted to the City of Palo Alto

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8 August 2016

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1. EXECUTIVE SUMMARY

This report describes the process and results of the Historical Noise Assessment of aircraft activity over Palo Alto on two days, seven years apart. It is prepared in compliance with Task 2 of the City of Palo Alto Airplane Noise Assessment & Mitigation, Proof of Concept, Project contract of 22 March 2016 with Freytag & Associates, LLC (C16161182). The report investigates all flight tracks and computes the resultant day-night average noise level (DNL) contours over Palo Alto from San Francisco International Airport (SFO) arrivals for July 10, 2008 and July 9, 2015. The days selected were the second Thursday in July of each year with similar weather conditions and typical air traffic control (ATC) operations. Since this report uses many technical terms and metrics, a glossary of terms is included at the end of the document.

The results of this assessment show 473 arrivals over Palo Alto on the 2008 day and 518 arrivals on the 2015 day, a 9.5 percent increase. Flight tracks differ for the two days and an increase in traffic volume is evident. The DNL noise exposure contours are also larger for the 2015 day. Noise exposure is affected by flight tracks, volume of activity, individual aircraft altitudes, aircraft types, and throttle settings.

An important criterion for this assessment is from the Federal Aviation Administration (FAA) Order 1050.1F, which defines an environmental noise impact as:

- DNL 65 dB+: 1.5 dB increase
- DNL 60 – 65 dB: 3 dB increase
- DNL 45 – 60 dB: 5 dB increase

The City of Palo Alto lies in or below the third category (DNL 45 dB – 60 dB). Therefore, the criterion for significant impact according to the FAA is an increased DNL of at least 5 dB in an area where the later DNL (i.e., 2015) aircraft noise exposure is at least 45 dB. An area of approximately 20 square miles within Palo Alto was found to exceed this criterion for the two days analyzed. Figure 1.1, Palo Alto Noise Impact, shows the impacted areas.

Figure 1.1 is the arithmetic difference between the DNL computations for the two years. We first computed DNL values for every point on a 0.25 NM (nautical mile) grid for YR2008, and then computed all values on the identical grid for YR2015. Figure 1.1 was created by subtracting the 2008 DNL values from the 2015 DNL values (at each grid point). Those points with YR2015 DNL values below 45 dB were eliminated, because the FAA criterion was not met. All areas shown in the map exceed the FAA criteria, and the amount of DNL increase (2015 vs. 2008) is color-coded as indicated in the legend (i.e., darker reds correspond to higher noise increases).

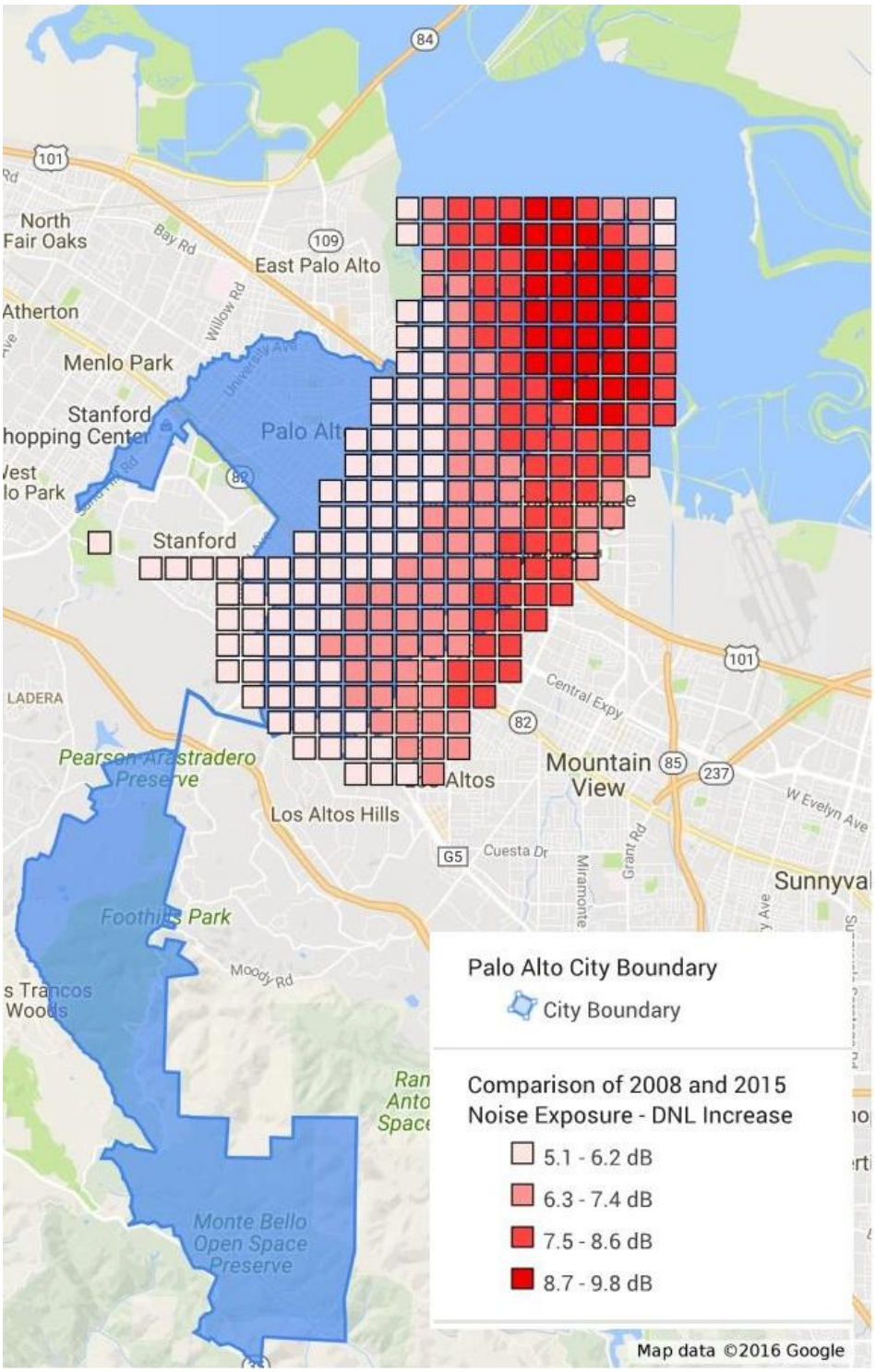


Figure 1.1: Palo Alto Noise Impact – 2015 Increase over 2008 Noise Levels

This noise increase is considerably above the preliminary findings reported in the June 8 Palo Alto community meeting. The change resulted from computer processing errors in the Aviation Environmental Design Tool (AEDT) mandated by the FAA. Numerous errors and data import issues were reported to and addressed by MITRE/VOLPE, the group now contracted by the FAA to correct and maintain the AEDT. Some changes from the preliminary report also resulted from initially running the program on an undersized area where aircraft entered and exited the analysis boundaries causing omission of some flights or incorrect modeling of these flights by the AEDT.

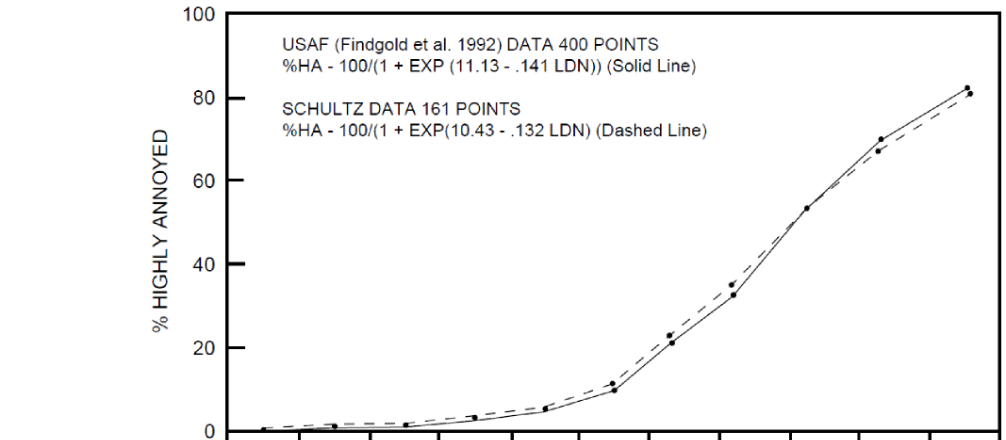
2. DNL NOISE EXPOSURE

The DNL noise exposure metric integrates the level and duration of noise over a day, and penalizes nighttime noise by 10 B to account for increased sensitivity to nighttime noise. DNL is a daily noise dose with the dose divided by the 24-hour period (thus termed an average) to express a constant value whose noise energy is equivalent over that period. A common misnomer is that DNL averages out high-level short durations events such as aircraft flyovers. This is false because the averaging is computed on an energy basis (e.g., the energy average of a period with equal times at 70 dB and 80 dB is 77.4 dB, not 75 dB).

The only noise exposure standard adopted by the EPA and throughout California is the DNL metric; it is also the only standard used by the FAA and all government agencies to quantify community noise annoyance. DNL is used for aircraft noise, highway noise, industrial noise and all other noise sources assessed under the National Environmental Policy Act (NEPA). The DNL is also the only noise metric for which there is a comprehensive assessment of the degree of community noise annoyance. It has been evaluated and reconfirmed as the national standard several times by experts from various government organizations.

In 1979, the Federal Interagency Committee on Urban Noise (FICUN) was formed to develop Federal policy and guidance on noise. The FICUN issued its report, “Guidelines for Considering Noise in Land Use Planning and Control”, June 1980, stating that standard residential construction was compatible for noise exposure up to a DNL of 65 dB. The FAA has adopted the 65 dB standard as the basis for mitigating noise exposure to residents around airports; specifically, some homes may be eligible for sound insulation under the FAR Part 150 program.

In 1991, the FAA and EPA initiated the Federal Interagency Committee on Noise (FICON) to review technical and policy issues related to assessment of noise impacts around airports. With respect to DNL, the FICON found that there are no new descriptors or metrics of sufficient scientific standing to substitute for the present DNL cumulative noise exposure metric. It further recommended continuing the use of the DNL metric as the principal means for describing long-term noise exposure of civil and military aircraft operations. The FICON conducted several studies including a reassessment of the original noise annoyance curve. This curve, with corresponding values of the population that will be highly annoyed (HA), is shown in Figure 2.1.



Day - Night Average Sound Level in dB	40	45	50	55	60	65	70	75	80	85	100
Calculated %HA Points: USAF	0.41	0.831	1.66	3.31	6.48	12.29	22.1	36.47	53.74	70.16	82.64
SCHULTZ	0.576	1.11	2.12	4.03	7.52	13.59	23.32	37.05	53.25	68.78	81

Figure 2.1: Comparison of logistic fits to original 161 data points of Schultz (1978) and USAF analysis with 400 points (data provided by USAF Armstrong Laboratory).

In 1993, the Federal Interagency Committee on Aviation Noise (FICAN) was formed based on the FICON report's policy recommendation to form a standard interagency committee for facilitating research on methodology development and on the impact of aircraft noise. The FICAN recommended that FAA and other Federal agencies use the yearly day-night average sound level (DNL) metric as the primary measure of noise impacts on people and land uses. This cumulative metric is the Federal standard because it:

- Correlates well with the results of attitudinal surveys of residential noise impact;
- Increases with the duration of noise events, which is important to people's reaction;
- Takes into account the number of noise events of the full 24 hours in a day, which also is important to people's reaction;
- Takes into account the increased sensitivity to noise at night by including a 10-dB nighttime penalty between 10:00 p.m. and 7:00 a.m. to compensate for sleep disturbance and other effects;
- Allows composite measurements of all sources of community noise; and
- Allows quantitative comparison of noise from various sources with a community.

All three committees were comprised of members from various government agencies including the EPA, FAA, HUD, DOD, VA, DOT and NASA. Each of these federal organizations employs the DNL metric exclusively for assessing compatible land use and in assessing community noise annoyance.

3. THE ANALYSIS PROCESS

Task 2, Historical Noise Assessment, followed Task 1, Historical Operations Assessment, completed and described in our report of 1 June to the City. Task 1 collected files for the two days from Federal Aviation Administration (FAA) National Offload Program (NOP), verified data validity, filtered the data, and prepared files for input to the FAA Aviation Environmental Design Tool (the AEDT, the aircraft computer program for modeling noise exposure and other environmental factors).

Task 1 was formidable because it required collecting the NOP files for 24 continuous hours for both days. The NOP file is a series of radar location records for each aircraft noting the time, latitude, longitude, altitude (from transponder transmissions), aircraft identification and other information. The volume of information is considerable in that radar records are recorded every few seconds on each of the more than 1200 flights per day to and from SFO. Results from the Task 1 analyses are a series of coordinates showing the precise latitude, longitude, altitude and aircraft identification for each aircraft.

The Task 1 data was then processed to identify the specific aircraft type from the airline identification information. Next, a computer program was written to translate the sequence of three-dimensional aircraft locations (a vector) into the XML (Extensible Markup Language) format required for input to the AEDT. Using NOP data for input to the AEDT had never been done before, since the AEDT is a new computer program, the NOP data files are large and the XML translation program is complex.

During the translation of NOP data into the AEDT, numerous errors and issues were found with the AEDT software; some of which the software authors have promised to fix in future revisions. Nevertheless, we were successful in translating NOP data into the AEDT to model the noise exposure for the two days. The exact flight tracks (from the NOP data), aircraft type, altitude, and arrival time of each flight was modeled in the AEDT.

Per an FAA Guidance Memo on FAA Order 1050.1E (AEE-400, March 21, 2012), “Guidance on Using AEDT 2a to Conduct Environmental Modeling for FAA Air Traffic Airspace and Procedure Actions,” AEDT 2a replaces the Noise Integrated Routing System (NIRS) as the required model for aircraft noise, fuel burn and emissions modeling for FAA air traffic airspace and procedure actions. There is an exemption for projects whose environmental analysis began before March 1, 2012; hence, the NorCal OAPM EA was grandfathered and used the latest version of NIRS.

4. HISTORICAL NOISE ASSESSMENT RESULTS

The flight tracks for the YR2008 day and the YR2015 day are shown in Figures 4.1 and 4.2. While the major flight tracks are somewhat similar, there appears to be considerably more flyover activity in the areas west and south of the City.

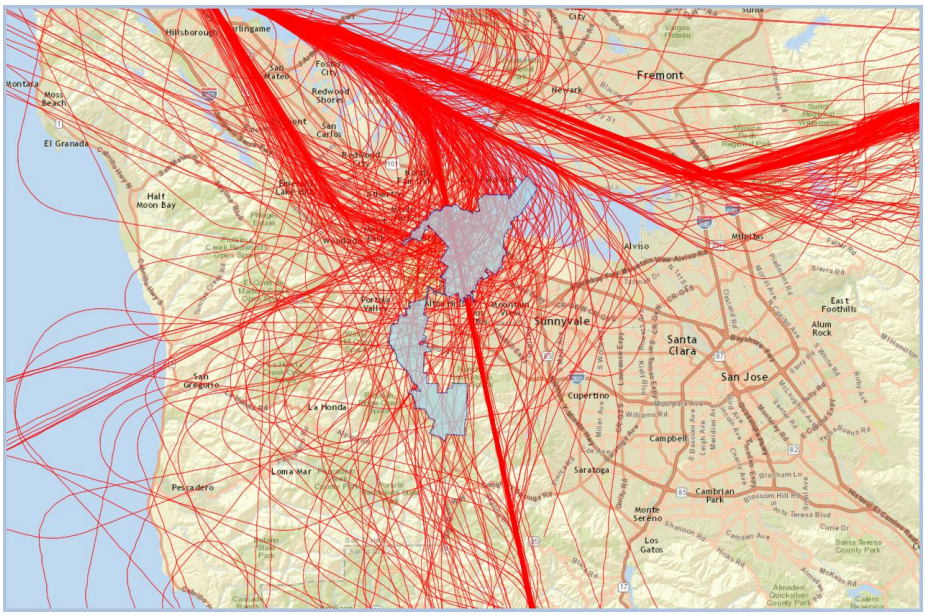


Figure 4.1: July 10, 2008 Flight Tracks

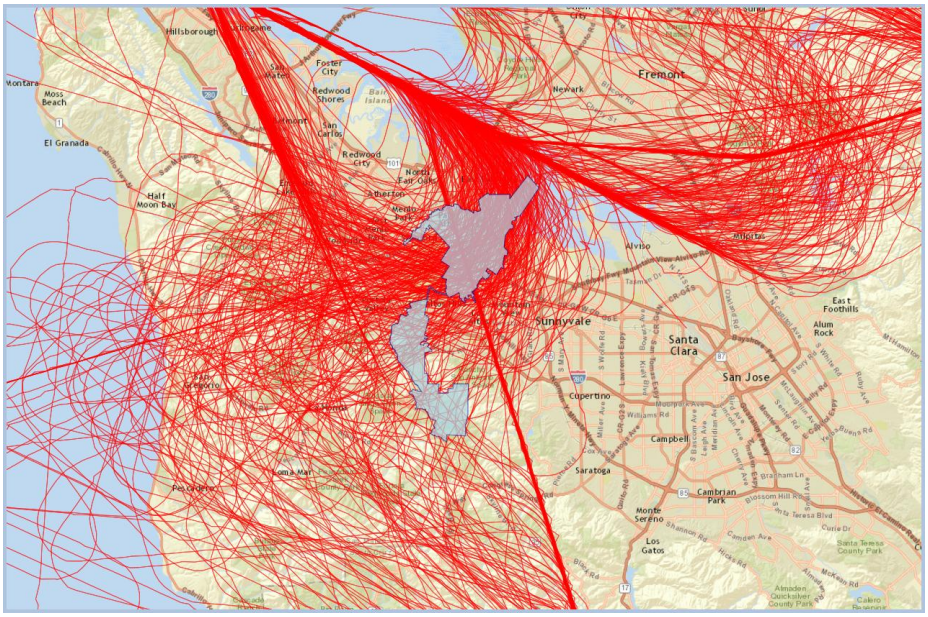


Figure 4.2: July 9, 2015 Flight Tracks

The respective DNL noise contour heat maps are shown adjacently in Figures 4.3 and 4.4. These maps have shaded areas color coded to more clearly show the range of DNL noise exposure rather than contour lines demarking borders.

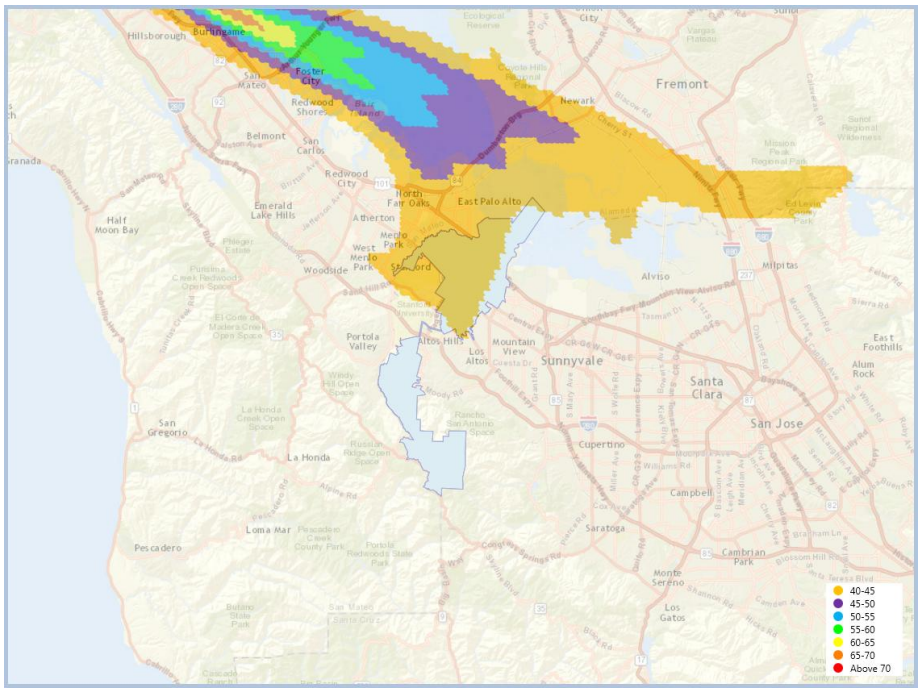


Figure 4.3: July 10, 2008 DNL Heat Map

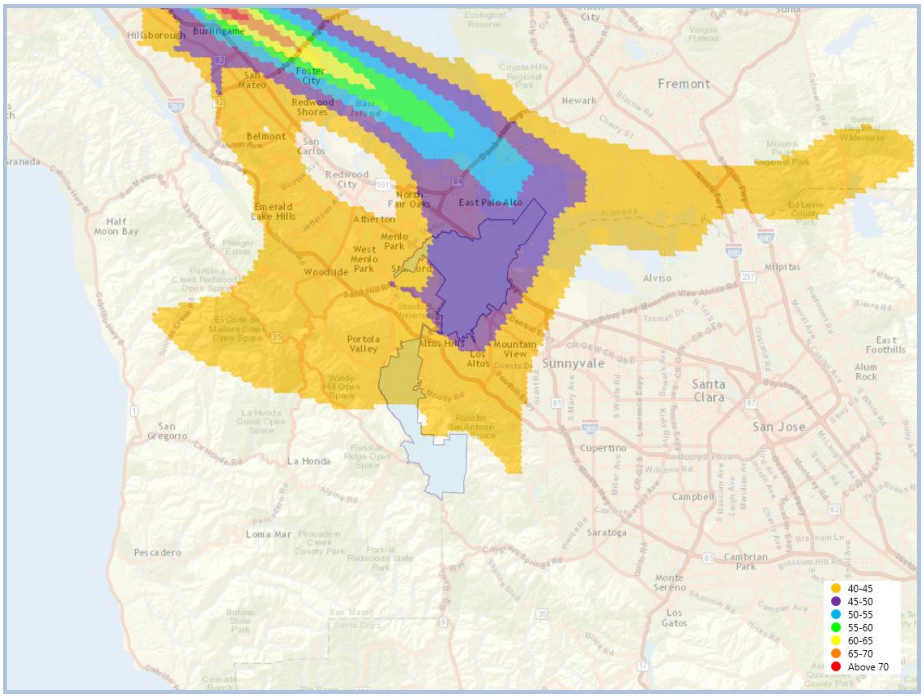


Figure 4.4: July 9, 2015 DNL Heat Map

5. The Palo Alto Community

Figures 5.1 and 5.2 zoom in on the heat maps for the City to more clearly identify those areas most affected in the course of the seven years from 2008 to 2015.

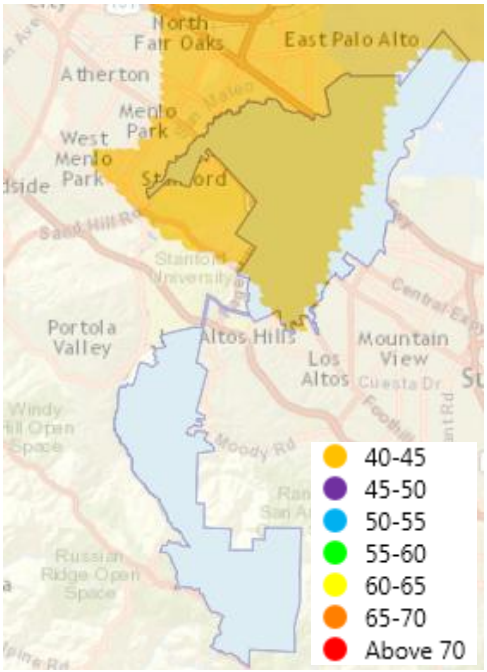


Figure 5.1: July 10, 2008 Palo Alto DNL Map

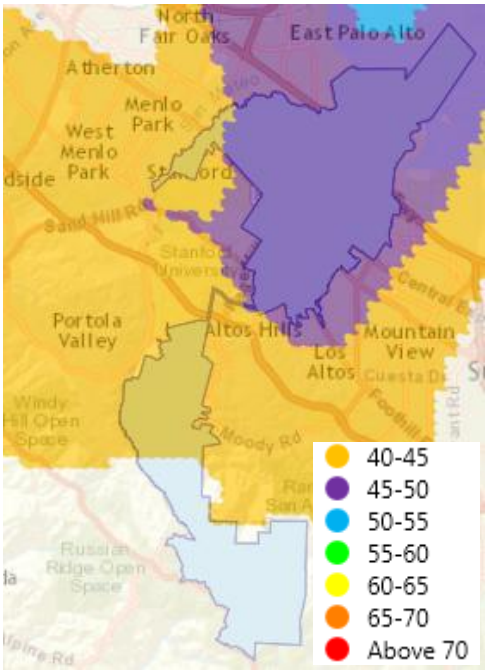


Figure 5.2: July 9, 2015 Palo Alto DNL Map

6. DISCUSSION

As mentioned before, changes in noise exposure are caused by changes in traffic volume, changes in noise emissions from individual aircraft, flight track locations and altitudes (changing the distance from the aircraft noise source to the receiver). Minor changes arise from meteorological changes. For this comparison, the 9.5 percent increase in traffic would (all other factors unchanged) result in less than a 0.4 dB increase in noise, and the aircraft fleet in 2015 should be slightly less noisy with the retirement of older noisier aircraft; for example, there were no (noisy) MD-80 aircraft found in the 2015 NOP data. Therefore, the noise exposure increase must arise from new flight tracks and/or lower altitudes. In fact, there is general evidence of both. Low altitude delayed vectoring directs air traffic over new areas, often at lower altitudes.

With the increased low altitude vectored traffic from the SERFR and aircraft arriving SFO, particularly at peak traffic hours, there is a need for delayed vectoring to allow safe sequencing of aircraft onto the SFO RWY 28L/R approach. From those being off-loaded from the POINT REYES, BDEGA and Golden Gate arrivals in a west tear drop maneuver over extending west of Woodside into a southeasterly flow over MENLO. This accounts for the increase in flight tracks south

and west of the City. While there is only a moderate increase in aircraft arrivals, more aircraft appear to require flying over new areas awaiting the clearance for runway approach. In addition, much of this delayed vectoring may be at lower altitudes in 2015 than in 2008 creating higher noise levels to residents below. For the days modeled, aircraft in 2015 appear to utilize a north-northwest route over the southern areas of the City not used before.

While many areas of the City received increased noise exposure, the most affected areas are the Midtown and Palo Verde neighborhoods.

It is interesting to compare the results of this Historical Noise Assessment with those of Sky Posse, the local Palo Alto group of citizen noise investigators. Sky Posse has gathered sorted and published a number of interesting reports on sample volume and altitude of aircraft activity in recent years over Palo Alto. Likewise, other such groups have also assimilated similar data over other areas such as Los Altos. This information, along with that from this report serves to develop a more complete assessment of the change in airport noise over Palo Alto in the past 10 to 15 years.

The Sky Posse reports elucidate the change in volume and altitude of aircraft activity over the years. However, these data cannot identify the specific aircraft, their noise emissions or air route. This study gathers that information, but only for two sample days and therefore cannot document the extent of the impact over a substantial period. In order to bolster these initial findings (i.e., prove the 5 dB DNL increase in Palo Alto), it would be necessary to model multiple days in 2008 and multiple days in 2015, as the additional days would provide a higher level of statistical validity to any findings.

This Historical Noise Assessment study, a part of the Proof of Concept project, has been successful in developing a means of extracting NOP data and inputting it into the AEDT computer model to document the DNL change over a period.

7. CONCLUSIONS

The results of the 2008 versus 2015 noise exposure impact are encouraging in documenting a substantial noise impact to the City in terms of the new FAA Order 1050.1F criteria, if even only for a single day. This suggests that a noise impact may exist for other periods and in nearby communities as well. While the FAA standard does not specify the periods for which an impact must be documented, it is unlikely that a single day will suffice to initiate FAA action. DNL analyses for Part 150 studies, planning and environmental assessments are computed for average annual conditions. The FAA may expect average annual noise exposure assessments to document an environmental impact prompting their action to mitigate.

It would likely be quite labor-intensive to collect daily NOP data for an entire year, input it to the AEDT and compute average annual DNL values. The work required for this computation, for only the two days reported here, was substantial. However, NOP data may be viable to use for some other representative sample periods. Additionally, it may be practical to compute such AEDT analyses from the ANOMS (Airport Noise Monitoring and Management System) operated at SFO. The information recorded is similar to that from the NOP system, but it may prove more readily input to the AEDT for noise exposure computation. Until recently, ANOMS information from SFO was not available to the public, but that limitation may now have changed.

We recommend that Palo Alto and other communities consider obtaining NOP and/or ANOMS data for several periods, inputting it to the AEDT and computing the annual DNL values and DNL increase over time. This would document the noise environment and change in accordance with the FAA criteria, contrary to the FONSI-ROP results of the NorCal OAPM. This may prompt the FAA to revise their EA decision and undertake noise mitigation.

GLOSSARY OF TERMS

AEDT: Aviation Environmental Design Tool: The FAA mandated software system designed to model aviation related operations in space and time to compute, noise, emissions, and fuel consumption.

ANOMS: Airport Noise Monitoring and Management System: A private system that monitors and records aircraft identification and flight track information using passive radar (i.e., it records reflections from FAA radar but does not transmit).

ATAC Corporation: The software development company who wrote the AEDT program under contract to the FAA.

ATC: Air Traffic Control: An FAA service provided to aircraft by ground-based controllers.

BDEGA: An airspace approach procedure into SFO.

DNL: day-night average sound level: The U.S. national standard metric for measurement as assessment of community noise exposure.

DOD: Department of Defense.

DOT: Department of Transportation.

EA: Environmental Assessment: An environmental study and conclusions for a proposed project.

EPA: Environmental Protection Agency.

FAA: Federal Aviation Administration.

FICAN: Federal Interagency on Aviation Noise: A committee of government experts formed in 1993 to facilitate research and development regarding aircraft noise.

FICON: Federal Interagency on Noise: A committee of government experts formed in 1991 to review technical and policy issues about noise around airports.

FICUN: Federal Interagency on Urban Noise: A committee of government experts formed in 1979 to develop policy and guidance on noise.

FONSI-ROD: Finding of No Significant Impact and Record of Decision: One conclusion from an Environmental Assessment (EA).

Heat maps: Maps depicting various ranges of DNL noise exposure by color-coding.

HUD: Department of Housing and Urban Development.

MENLO: One 'fix' or location used by aircraft approaching SFO RWY 28L/R by several Standard Arrival Routes.

MD-80: McDonnell Douglas MD-80: A series of twin-engine aircraft produced between 1979 and 1999.

Mitre Corporation (MITRE): An American not-for-profit organization managing Federally Funded Research and Development Centers (FFRDCs) supporting the DOD, the FAA, IRS and various other government organization.

NM: Nautical Mile: A distance of 1852 meters (~6076 ft. or ~1.15 miles).

NASA: National Aeronautics and Space Administration.

NEPA: National Environmental Policy Act: A United States environmental law that promotes the enhancement of the environment and established the President's Council on Environmental Quality (CEQ)

NIRS: Noise Integrated Routing System: A noise-assessment program designed to provide an analysis of air traffic changes over broad areas

NOP: National Offload Program: Historical radar track and flight plan data around airports collected and managed by the FAA.

NorCal OAPM: Northern California Optimization of Airspace and Procedures in the Metroplex: The Environmental Assessment (EA) prepared by the FAA to issue a Finding of No Significant Impact and Record of Decision (FONSI-ROD) for the change in SFO arrival and departure routes.

POINT REYES: An airspace approach procedure into SFO.

RWY 28L/R: Two parallel runways used primarily for arrivals to SFO. Runways are typically labeled according to their approximate magnetic heading divided by ten (e.g., RWY 28L/R is oriented at about 280°).

SERFR: An airspace approach procedure into SFO.

SFO: San Francisco International Airport

Transponder – flight transponder: A device that emits an identifying signal in response to an interrogating received signal.

VA: Department of Veterans Affairs

VOLPE: John A. Volpe National Transportation System Center Acoustics Facility (Volpe Center): A federal research agency supporting transportation projects.

XML: Extensible Markup Language: A markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine.