249 Pennsylvania Avenue Project

Noise Technical Report

prepared for

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1 Project Description

1.1 Introduction

This study analyzes the potential noise exposure for the proposed 249 Pennsylvania Avenue Project (project) located in the City of San Francisco within San Francisco County, California. The purpose of this study is to evaluate future traffic noise impacts upon the project relative to the United States Department of Housing and Urban Development (HUD) Site Acceptability Standards. The HUD Statutory Checklist for Noise Control (24 Code of Federal Regulations Part 51, Sub-part B) is included as Attachment A.

1.2 Project Summary

Project Location

The project site is located at 249 Pennsylvania Avenue in San Francisco, California and within the City's South of Market District and Potrero Hill neighborhood. The project site is comprised of an approximately 21,625 square foot (0.5-acre) parcel (Block 3999, Lot 015) situated directly southeast of the intersection of Pennsylvania Avenue and Mariposa Street. Additionally, the project site is located directly west of an Interstate 280 (I-280) overpass, with associated entrance and exit ramps joining this interstate near the vicinity of the site. The site is zoned Urban Mixed Use (UMU) and is currently vacant, with a concrete foundation and retaining walls along the south and west site boundaries. Adjacent land uses include additional UMU properties to the north and east and residential properties to the south and west. Figure 1 shows the project site's regional location and Figure 2 shows an aerial view of the project site and surrounding area.

Project Description

The project would involve construction of a new nine-story mixed-use building consisting of approximately 82,900 square feet of residential space, 2,000 square feet of commercial space, and 1,200 square feet of social service space, as well as open space areas such as a garden, courtyard, rain garden, and rooftop urban farm. Residential space would consist of 50 studio apartments (20,000 square feet), 40 2-bedroom apartments (32,000 square feet) and 30 3-bedroom apartments (30,900 square feet). The proposed building would be shaped to shield the courtyard from prevailing west winds, would include large murals that display the neighborhood's character, would offer urban agriculture and pollinator gardens, and would include ancillary spaces for laundry, bicycle parking, trash, storage, and property management.

Figure 1 Regional Location

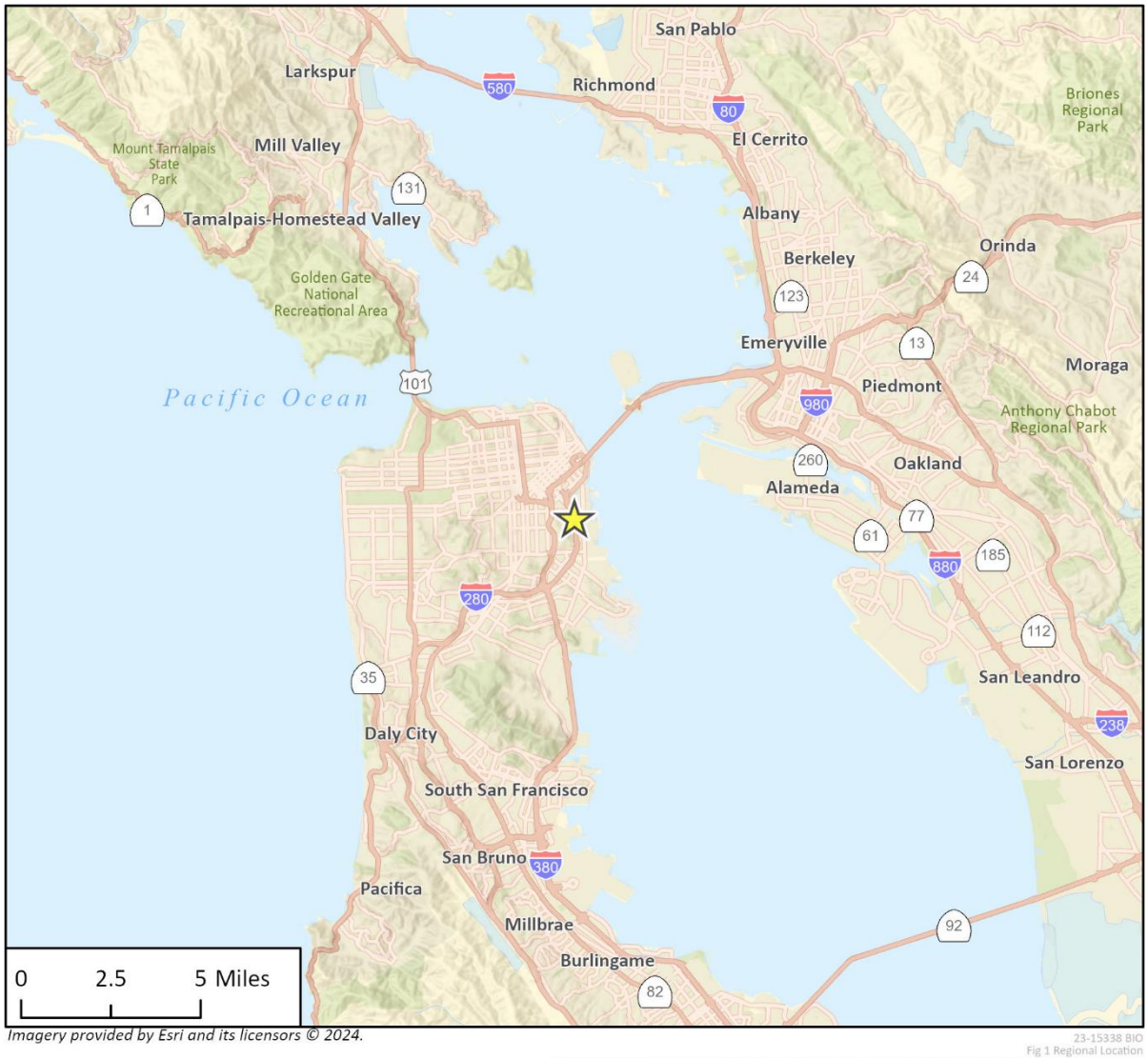

Figure 2 Location of Project Site

2 Background

2.1 Overview of Sound Measurement

Sound is a vibratory disturbance created by a moving or vibrating source, which is capable of being detected by the hearing organs. Noise is defined as sound that is loud, unpleasant, unexpected, or undesired and may therefore be classified as a more specific group of sounds. The effects of noise on people can include general annoyance, interference with speech communication, sleep disturbance, and, in the extreme, hearing impairment (California Department of Transportation [Caltrans] 2013).

Noise levels are commonly measured in decibels (dB) using the A-weighted sound pressure level (dBA). The A-weighting scale is an adjustment to the actual sound pressure levels so that they are consistent with the human hearing response, which is most sensitive to frequencies around 4,000 Hertz (Hz) and less sensitive to frequencies around and below 100 Hz (Kinsler, et. al. 1999). Decibels are measured on a logarithmic scale that quantifies sound intensity in a manner similar to the Richter scale used to measure earthquake magnitudes. A doubling of the energy of a noise source, such as doubling of traffic volume, would increase the noise level by 3 dB; dividing the energy in half would result in a 3 dB decrease (Crocker 2007).

Human perception of noise has no simple correlation with sound energy: the perception of sound is not linear in terms of dBA or in terms of sound energy. Two sources do not "sound twice as loud" as one source. It is widely accepted that the average healthy ear can barely perceive changes of 3 dBA, increase or decrease (i.e., twice the sound energy); that a change of 5 dBA is readily perceptible; and that an increase (or decrease) of 10 dBA sounds twice (half) as loud (Crocker 2007).

Sound changes in both level and frequency spectrum as it travels from the source to the receiver. The most obvious change is the decrease in level as the distance from the source increases. The manner by which noise reduces with distance depends on factors such as the type of sources (e.g., point or line, the path the sound will travel, site conditions, and obstructions). Noise levels from a point source typically attenuate, or drop off, at a rate of 6 dBA per doubling of distance (e.g., construction, industrial machinery, ventilation units). Noise from a line source (e.g., roadway, pipeline, railroad) typically attenuates at about 3 dBA per doubling of distance (Caltrans 2013). The propagation of noise is also affected by the intervening ground, known as ground absorption. A hard site, such as a parking lot or smooth body of water, receives no additional ground attenuation and the changes in noise levels with distance (drop-off rate) result from simply the geometric spreading of the source. An additional ground attenuation value of 1.5 dBA per doubling of distance applies to a soft site (e.g., soft dirt, grass, or scattered bushes and trees) (Caltrans 2013). Noise levels may also be reduced by intervening structures; the amount of attenuation provided by this "shielding" depends on the size of the object and the frequencies of the noise levels. Natural terrain features such as hills and dense woods, and man-made features such as buildings and walls, can significantly alter noise levels. Generally, any large structure blocking the line of sight will provide at least a 5-dBA reduction in source noise levels at the receiver (Federal Highway Administration [FHWA] 2011). Structures can substantially reduce exposure to noise as well. The FHWA's guidelines indicate that modern building construction generally provides an exterior-to-interior noise level reduction of 20 to 35 dBA with closed windows.

The impact of noise is not a function of loudness alone. The time of day at which noise occurs and the duration of the noise are also important factors of Project noise impacts. Most noise that lasts for more than a few seconds is variable in its intensity. Consequently, a variety of noise descriptors have been

developed. One of the most frequently used noise metrics is the equivalent noise level (L_{eq}); it considers both duration and sound power level. L_{eq} is defined as the single steady A-weighted level equivalent to the same amount of energy as that contained in the actual fluctuating levels over time.

The sound level that is exceeded "n" percent of time during a given sample period. For example, the L_{50} level is the statistical indicator of the time-varying noise signal that is exceeded 50 percent of the time (during each sampling period); that is, half of the sampling time, the changing noise levels are above this value and half of the time they are below it. This is called the "median sound level." The L_{10} level, likewise, is the value that is exceeded 10 percent of the time (i.e., near the maximum) and this is often known as the "intrusive sound level." The L_{90} is the sound level exceeded 90 percent of the time and is often considered the "effective background level" or "residual noise level."

Noise that occurs at night tends to be more disturbing than that occurring during the day. Community noise is usually measured using Day-Night Average Level (DNL), which is the 24-hour average noise level with a +10 dBA penalty for noise occurring during nighttime (10:00 PM to 7:00 AM) hours. It is also measured using CNEL, which is the 24-hour average noise level with a +5 dBA penalty for noise occurring from 7:00 p.m. to 10:00 p.m. and a +10 dBA penalty for noise occurring from 10:00 PM to 7:00 AM (Caltrans 2013). Noise levels described by DNL and CNEL usually differ by about 1 dBA. The relationship between the peak-hour L_{eq} value and the DNL/CNEL depends on the distribution of traffic during the day, evening, and night.

3 Project Site Noise Setting

The primary source of noise in the project site vicinity is vehicular traffic on I-280 and associated entrance and exit ramps, Pennsylvania Avenue, and Mariposa Street. To characterize ambient sound levels at the project site, three short-term (15-minute) and two long-term (24-hour) sound level measurements were conducted on January 25 and 26, 2024.

Short-term noise measurement (ST-) 1 was conducted at the northern edge of the project site to capture noise levels attributable to Mariposa Street, ST-2 was conducted near the northwestern corner of the project site to capture noise levels attributable to Pennsylvania Avenue, and ST-3 was conducted near the southeastern corner of the project site to capture noise levels attributable to I-280 and its associated on and off ramps. Long-term noise measurement (LT-) 1 was conducted near the northeastern corner of the project site and LT-2 was conducted near the southeastern corner of the project site.

Table 1 summarizes the results of the short-term noise measurements, Table 2 shows results of the traffic counts collected during the noise measurement survey, Table 3 and Table 4 summarize the results of the long-term noise measurements at LT-1 and LT-2, respectively, and Figure 3 shows the approximate locations of noise measurements conducted on the project site. Graphical noise measurement data are provided in Appendix B.

Table 1 Short-Term Noise Measurement Results

Measurement Location		Sample Times	Approximate Distance to Primary Noise Source	Leq (dBA)	Lmin (dBA)	Lmax (dBA)
ST-1	Northern edge of project site	12:09–12:24 p.m.	Approximately 35 feet to Mariposa Street centerline	69.3	62.3	83.0
ST-2	Northwestern corner of project site	12:26–12:41 p.m.	Approximately 44 feet to Pennsylvania Avenue centerline	67.8	61.7	79.5
ST-3	Southeastern corner of project site	12:44–12:59 p.m.	Approximately 45 feet to I-280 southbound exit ramp centerline	73.1	62.2	89.4

Note: See Figure 3 for approximate noise measurement locations.

Table 2 Noise Monitoring Traffic Counts

Measurement	Roadway	Traffic	Autos	Medium Trucks	Heavy Trucks
ST-1	Mariposa Street	15-minute count	37	1	0
		One-hour equivalent	148	4	0
Percent			**97.3%**	**2.7%**	**0.0%**
ST-2	Pennsylvania Avenue	15-minute count	26	0	0
		One-hour equivalent	104	0	0
Percent			**100.0%**	**0.0%**	**0.0%**

Note: See Figure 3 for approximate noise measurement locations.

Table 3 Long-Term Noise Level Measurement Results (LT-1)

Sample Time	dBA L_{eq}	Sample Time	dBA L_{eq}
24-hour Measurement – January 25–26, 2024			
12:00 p.m.	70	12:00 a.m.	66
1:00 p.m.	71	1:00 a.m.	61
2:00 p.m.	72	2:00 a.m.	60
3:00 p.m.	73	3:00 a.m.	61
4:00 p.m.	73	4:00 a.m.	64
5:00 p.m.	72	5:00 a.m.	67
6:00 p.m.	72	6:00 a.m.	70
7:00 p.m.	72	7:00 a.m.	71
8:00 p.m.	69	8:00 a.m.	70
9:00 p.m.	69	9:00 a.m.	72
10:00 p.m.	69	10:00 a.m.	70
11:00 p.m.	70	11:00 a.m.	71
24-hour Noise Level (dBA DNL)			**74**

dBA = A-weighted decibels; L_{eq} = equivalent noise level; DNL = day-night average noise level

See Figure 3 for approximate noise measurement locations; see Appendix B for graphical measurement data.

Table 4 Long-Term Noise Level Measurement Results (LT-2)

Sample Time	dBA L_{eq}	Sample Time	dBA L_{eq}
24-hour Measurement – January 25–26, 2024			
12:00 p.m.	73	12:00 a.m.	70
1:00 p.m.	70	1:00 a.m.	66
2:00 p.m.	71	2:00 a.m.	61
3:00 p.m.	72	3:00 a.m.	60
4:00 p.m.	73	4:00 a.m.	61
5:00 p.m.	73	5:00 a.m.	64
6:00 p.m.	72	6:00 a.m.	67
7:00 p.m.	72	7:00 a.m.	70
8:00 p.m.	72	8:00 a.m.	71
9:00 p.m.	69	9:00 a.m.	70
10:00 p.m.	69	10:00 a.m.	72
11:00 p.m.	69	11:00 a.m.	70
24-hour Noise Level (dBA DNL)			**73**

dBA = A-weighted decibels; L_{eq} = equivalent noise level; DNL = day-night average noise level

See Figure 3 for approximate noise measurement locations; see Appendix B for graphical measurement data.

Figure 3 Approximate Noise Measurement Locations

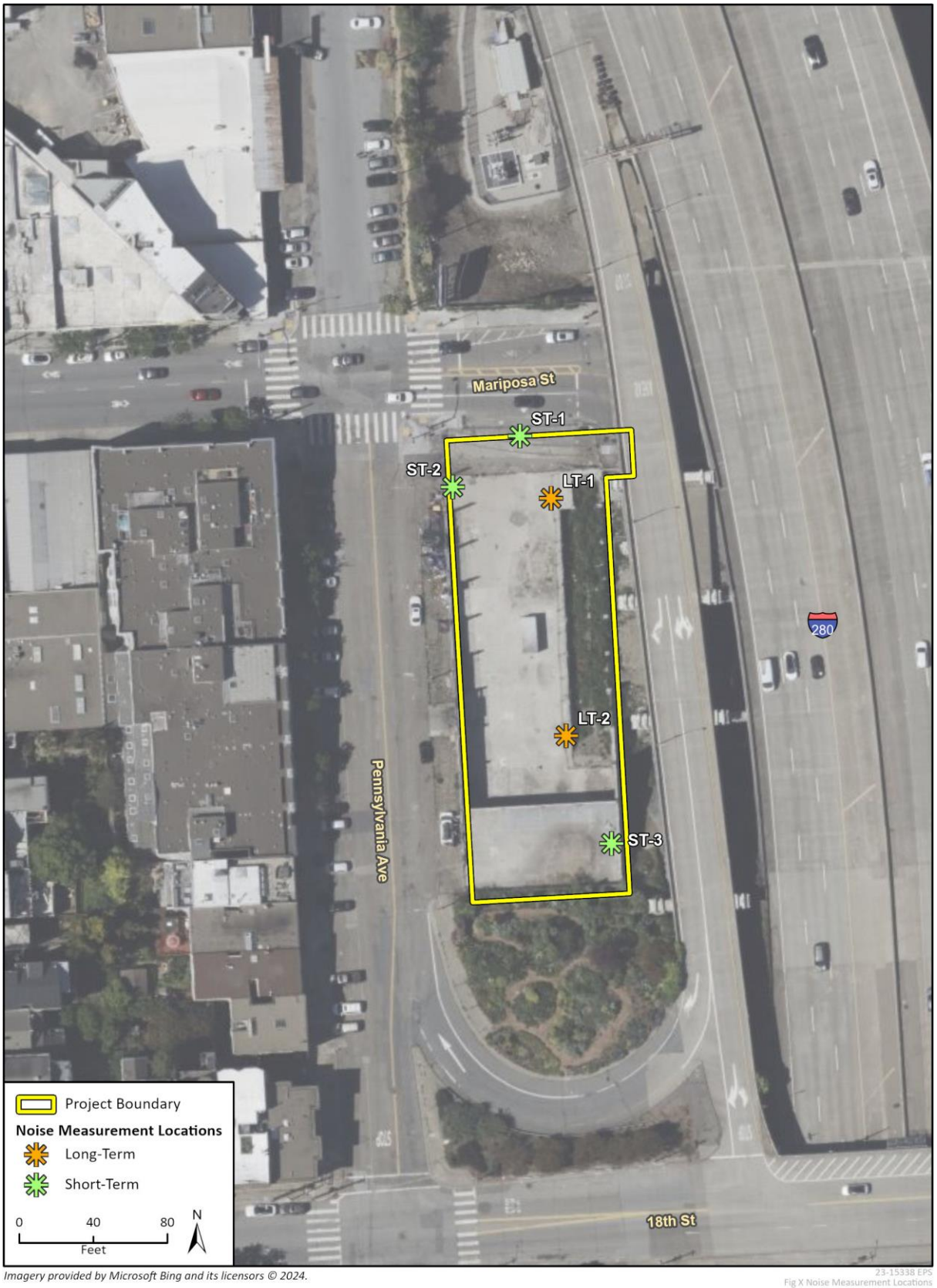

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Fig X Noise Measurement Locations

4 Regulatory Setting

4.1 United States Department of Housing and Urban Development

Chapter 24 of the Code of Federal Regulations (CFR) contains environmental noise standards established by the United States Department of Housing and Urban Development (HUD). In July 1979, the CFR Title 24, Part 51 – Environmental Criteria and Standards were amended to include Subpart B, Noise Abatement and Control. The amendments establish that projects receiving assistance from HUD and that propose new construction of noise sensitive uses must be sited in acceptable noise environments; HUD is prohibited from supporting new construction on sites with unacceptable noise exposure.

Exterior Noise Goals

Section 51.101, Policy 8 establishes that sites with a sound level of 65 dB DNL and below are acceptable and are allowable. Unacceptable noise exposure is above 75 dB DNL. Full noise compatibility standards are shown in Table 5.

Table 5 Site Acceptability Standards

	Day-night Average Sound Level	Special Approvals and Requirements
Acceptable	Not Exceeding 65 dB[1]	None.
Normally Unacceptable	Above 65 dB but not exceeding 75 dB	Special Approvals[2] Environmental Review[3] Attenuation[4]
Unacceptable	Above 75 dB	Special Approvals[2] Environmental Review[3] Attenuation[5]

[1] Acceptable threshold may be shifted to 70 dB in special circumstances pursuant to §51.105(a).

[2] See § 51.104(b) for requirements.

[3] See § 51.104(b) for requirements.

[4] 5 dB additional attenuation required for sites above 65 dB but not exceeding 70 dB and 10 dB additional attenuation required for sites above 70 dB but not exceeding 75 dB (See § 51.104(a).)

[5] Attenuation measures to be submitted to the Assistant Secretary or Certifying Officer for approval on a case-by-case basis.

Interior Noise Goals

Section 51.101, Policy 9 establishes that for HUD projects "the interior auditory environment shall not exceed 45 dB DNL." Attenuation measures to meet these interior goals shall be employed where feasible. Emphasis shall be given to noise-sensitive interior spaces such as bedrooms.

Acoustical Privacy in Multifamily Buildings

Section 51.101, Policy 10 establishes that HUD shall require the use of building design and acoustical treatment to afford acoustical privacy in multifamily buildings.

5 Methodology

Due to the complexity of the project site and surroundings (i.e., significant changes in ground elevation and elevated freeways adjacent to the site), traffic noise exposure was estimated at the project site through computer modeling using SoundPLAN Version 9.0, a three-dimensional noise modeling program that incorporates noise propagation algorithms to predict noise levels at select locations within and throughout a defined study area. SoundPLAN uses reference sound levels published by various government agencies, the scientific community, and/or user-input data specific to the case being studied.

Noise exposure at the project site would primarily be due to traffic noise on nearby roadways (I-280 and its associated on and off ramps near the site, Pennsylvania Avenue, Mariposa Street, and 18th Street) and trains passing on the nearby Caltrain railroad near the site. These transportation sources were included in the computer model.

Data for the roadways in the vicinity of the project site were taken from average annual daily traffic (AADT) volumes and truck percentages published by San Francisco Municipal Transportation Agency (SFMTA) (SFMTA 2015) and Caltrans (Caltrans 2022). Neither SFMTA nor Caltrans publishes nighttime traffic percentages; therefore, in absence of this information, it was assumed that 85 percent of the AADT volumes occurred during daytime hours and 15 percent of the AADT volumes occurred during nighttime hours, per Chapter 5 of the HUD Noise Guidebook (HUD 2009).

Data for the Caltrain railroad was taken from the U.S. Department of Transportation Federal Railroad Administration (FRA) Crossing Inventory Form for the railroad crossing nearest to the project site (Crossing Inventory Number 754749Y). The Crossing Inventory Form specified 104 daily train trips near the site, with 64 occurring between 6:00 a.m. and 6:00 p.m. and 40 occurring between 6:00 p.m. and 6:00 a.m. (FRA 2023).

Future traffic volumes were determined by assuming a conservative, two percent growth factor, compounded annually, on all surrounding roadways until the year 2034.[1] Modeled traffic data, including existing and future AADT volumes, speeds, nighttime traffic percentages, and truck percentages are summarized in Table 6.

In addition, existing site and surrounding topography from San Francisco's Open Data Portal (SFData) and existing surrounding buildings near the project site were included in the model to more accurately account for the way these features affect noise propagation throughout the environment. Noise levels at the project site were estimated in SoundPLAN using algorithms and reference traffic noise reference levels from the FHWA's Traffic Noise Model (TNM). To determine future noise impact upon the proposed project, exterior traffic noise levels at the proposed building facades on Floors 2 through 9 were modeled. Noise levels were not modeled on Floor 1, as noise-sensitive residential spaces are not proposed for this floor. Based on the site plan, Floor 1 will consist of a lobby, offices, mailroom, conference room, a laundry room, and back-of-house facilities.

[1] Chapter 2, §51.106 of the *HUD Noise Guidebook* states that "…noise exposure shall be projected to be representative of conditions that are expected to exist at a time at least 10 years beyond the date of the project or action under review…" therefore, traffic volumes were projected 10 years into the future from the date of this analysis.

Table 6 Modeled Traffic Data

Roadway	Segment	Existing AADT Volume	Future (year 2034) AADT Volume	Modeled Speed (mph)	Nighttime Traffic Percentage[1]	Total Truck Percentage[2]
Pennsylvania Avenue	Northbound	747	911	30	15%	2.5%
	Southbound	2,576	3,140	30	15%	2.5%
Mariposa Street	Eastbound	1,531	1,866	30	15%	2.5%
	Westbound	1,298	1,582	30	15%	2.5%
18th Street	Eastbound	903	1,101	30	15%	2.5%
	Westbound	1,257	1,532	30	15%	2.5%
I-280	Northbound	49,000	60,340	70	15%	2.5%
	Southbound	49,000	60,340	70	15%	2.5%
I-280 Ramps	Southbound ramp onto Mariposa Street	1,001	1,220	40	15%	2.5%
	Southbound ramp onto 18th Street	1,001	1,220	40	15%	2.5%
	Entrance ramp onto I-280	1,001	1,220	40	15%	2.5%

[1] Nighttime traffic percentages were not available through Caltrans or SFMTA; therefore, per Chapter 5 of the *HUD Noise Guidebook*, 15% of nighttime traffic percentages were assumed to occur on all roadways.

[2] Vehicle class percentage data was only available for I-280; therefore, it was assumed that all other roadways in the vicinity of the project site would have a similar auto/truck percentage.

6 Noise Impact Analysis

Following the methodology discussed in Section 5, future transportation noise levels based on traffic volumes projected 10 years into the future were modeled at receiver locations along all proposed building facades on Floors 2 through 9, where proposed living units would be located. Estimated noise levels upon the future project building by elevation are summarized in Table 7. Ground-level (five feet above ground) and upper level (25 feet above ground) noise contours were also calculated to present how noise levels vary with respect to height. Ground-level and upper-level noise contours are shown in Figure 4 and Figure 5, respectively. Noise modeling data is included as Appendix C.

Table 7 Future (Year 2034) Transportation Noise Impact by Building Elevation

Building Elevation	Future (Year 2034) Transportation Noise Impact (dBA DNL)
North	70–79
East	78–79
South	69–76
West	66–76

Note: See Appendix C for noise modeling data.

As shown in Table 7, transportation noise impact upon all future building elevations would exceed 65 dBA DNL. Therefore, the project would require noise insulation features to ensure that interior noise levels within all future living units remain at 45 dBA DNL and below to comply with HUD Site Acceptability Standards. Additionally, noise levels along all building elevations would exceed 75 dBA DNL, therefore the noise insulation features must be submitted to the Certifying Officer for review and approval.

In addition, noise levels in the ground level residential open space courtyard to the west of the building would exceed 65 dBA DNL. However, as discussed between the San Francisco Mayor's Office of Housing and Community Development (MOHCD) and HUD, this outdoor courtyard is not considered a noise-sensitive use under HUD guidance. As a result, MOHCD, as the Responsible Entity, is pursuing a noise waiver for the proposed action (MOHCD 2024), pursuant to accordance with 24 CFR Subpart B §51.104(b)(2). Similarly, the proposed roof urban farm is depicted as a non-accessible space on the site plan and is not considered a noise-sensitive outdoor activity area.

Figure 4 Ground Level Noise Contours

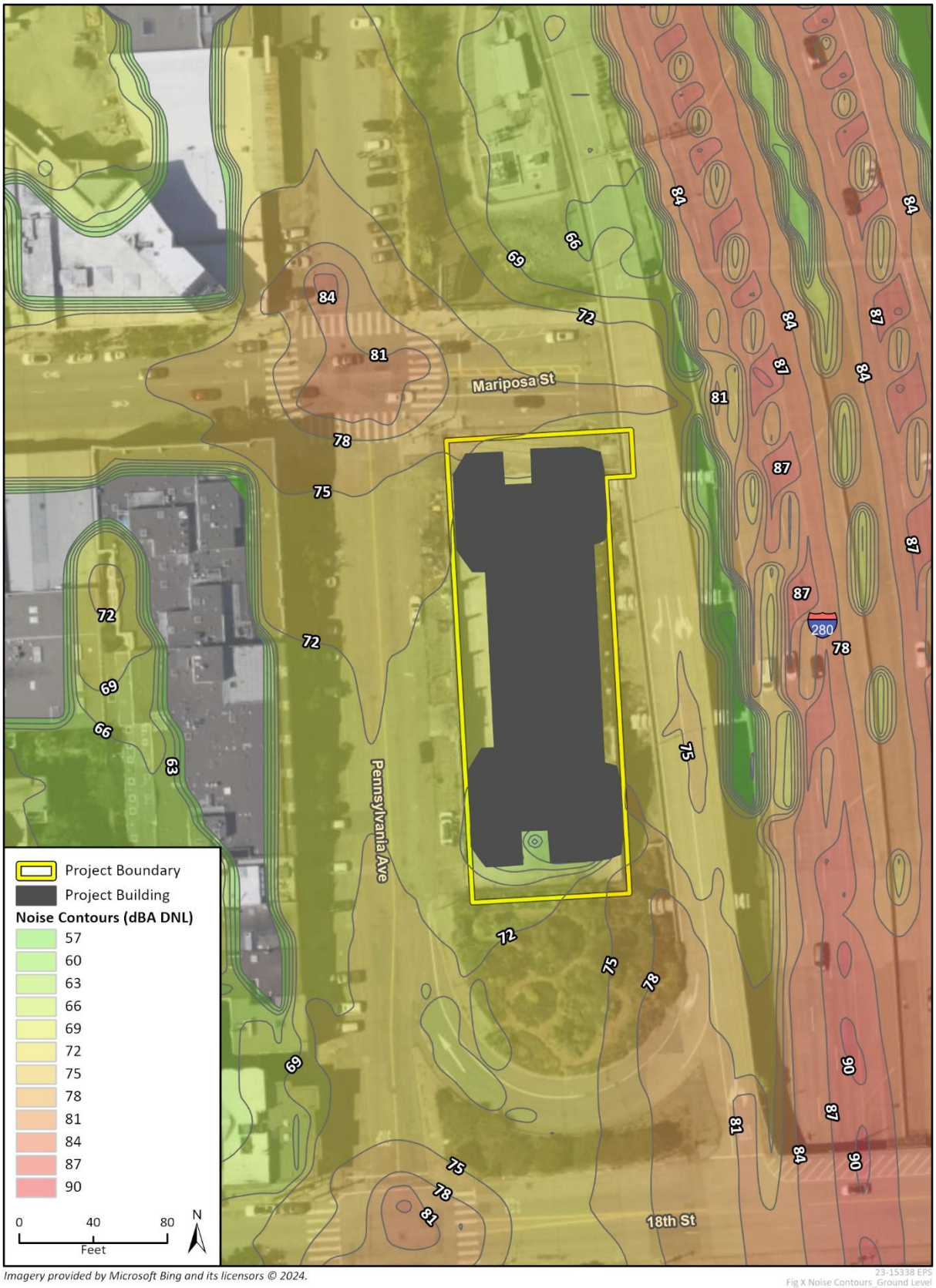

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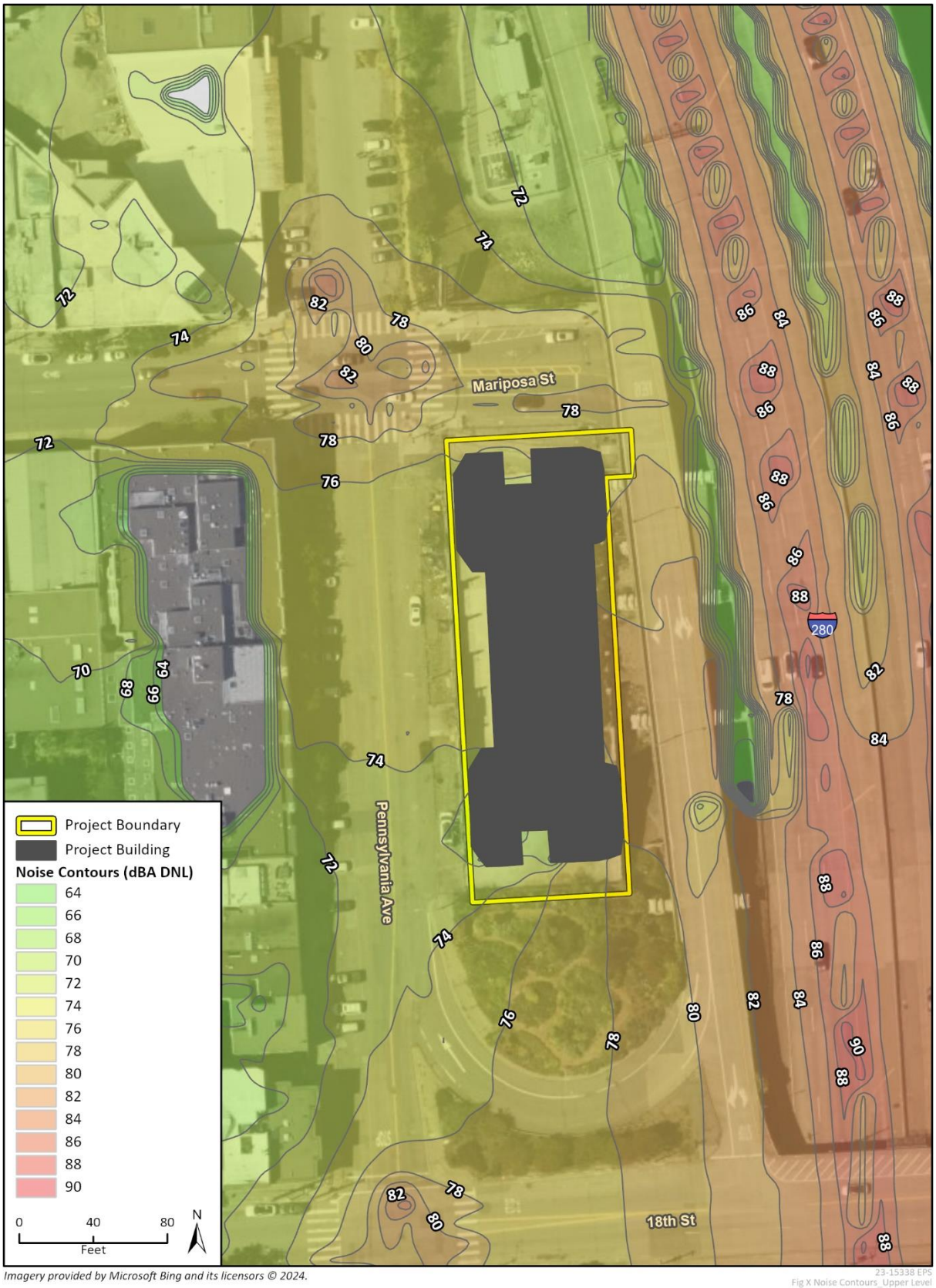
Fig X Noise Contours_Ground Level

Figure 5 Upper Level Noise Contours



Noise Attenuation Measures

At the time of this analysis, detailed architectural plans were not available, therefore room and window dimensions were estimated based on the limited information shown on the provided site plans. In order to reduce exterior noise levels to HUD's required interior limit of 45 dBA DNL within all living units, the following noise attenuation measures shall be implemented:

- Provide mechanical ventilation so that windows may be left closed by occupants. This can be achieved passively with z-ducts, fresh air ducts, or an approved equal.
- Exterior wall, window, and private balcony/patio doors must meet the minimum Sound Transmission Class (STC) ratings shown in Table 8. Transmission loss calculations are included in Appendix D.

Table 8 Minimum STC Rating Requirements

		Minimum Required STC Ratings		
Building Elevation	**Floor**	**Exterior Walls[1]**	**Windows**	**Private Balcony/Patio Doors**
North	2–7	46 STC	32 STC	35 STC
	8 and 9		30 STC	
East	2–9		34 STC	
South	2–9		30 STC	
West	2–9		30 STC	29 STC

[1] Exterior walls shall meet an STC rating of at least 46. One method to achieve this would be to construct standard exterior walls with 6-inch studs, R-13 insulation or thicker, a minimum 7/8 exterior surface stucco plaster, and interior finish with 5/8-inch drywall. Note that this recommendation is based on a closed-windows condition.

See Appendix D for transmission loss calculations.

- Use permanently nonhardening sealant around perimeters of window frames.
- Window assemblies shall be constructed with effective nonporous gaskets or weatherstripping to minimize air infiltration and sound leakage.
- Provide airtight construction at all exterior walls with acoustical or other nonhardening sealant at floor plates.
- Use door jamb and head gasketing and door bottom gasketing at entry doors to seal the solid core doors against weather and sound.
- All entry doors shall be insulated against weather and sound with nonporous seals. Caulk entry door thresholds as they are placed.

Implementation of the above noise attenuation measures would ensure that interior noise levels within the proposed project's living units would be maintained at approximately 44 dBA DNL and below, thus complying with HUD's interior noise limit of 45 dBA DNL. Note that once detailed architectural plans are completed and available, an updated interior noise analysis shall be completed to verify that the building construction requirements specified herein will be sufficient to reduce exterior noise to the required interior level of 45 dBA DNL. Additionally, pursuant to HUD requirements, prior to the issuance of a construction permit, the project applicant shall be required to submit the window and door schedule (with STC ratings) to the Certifying Officer for review and approval.

7 Conclusion

Living units along all elevations of the proposed 249 Pennsylvania Avenue multifamily building will be exposed to future transportation noise levels exceeding 65 dBA DNL. As a result, noise attenuation measures will be necessary in order to maintain interior noise levels within all proposed living units below HUD's required limit of 45 dBA DNL. Noise attenuation measures include incorporation of building elements (exterior walls, windows, and private balcony/patio doors) that meet the minimum STC ratings as described in this report. Implementation of the recommended noise abatement measures provided herein would reduce interior noise levels within all living units to levels consistent with HUD's Site Acceptability Standards.

8 References

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Appendix A

Noise (EA) Partner Worksheet

OMB No. 2506-0177
(exp.2/28/2025)

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
WASHINGTON, DC 20410-1000

This Worksheet was designed to be used by those "Partners" (including Public Housing Authorities, consultants, contractors, and nonprofits) who assist Responsible Entities and HUD in preparing environmental reviews, but legally cannot take full responsibilities for these reviews themselves. Responsible Entities and HUD should use the RE/HUD version of the Worksheet.

Noise (EA Level Reviews) – PARTNER

https://www.hudexchange.info/programs/environmental-review/noise-abatement-and-control

1. **What activities does your project involve? Check all that apply:**

   ☑ New construction for residential use

   NOTE: HUD assistance to new construction projects is generally prohibited if they are located in an Unacceptable zone, and HUD discourages assistance for new construction projects in Normally Unacceptable zones. See 24 CFR 51.101(a)(3) for further details.
   → *Continue to Question 2.*

   ☐ Rehabilitation of an existing residential property
   NOTE: For major or substantial rehabilitation in Normally Unacceptable zones, HUD encourages mitigation to reduce levels to acceptable compliance standards. For major rehabilitation in Unacceptable zones, HUD strongly encourages mitigation to reduce levels to acceptable compliance standards. See 24 CFR 51 Subpart B for further details.
   → *Continue to Question 2.*

   ☐ None of the above

   → *If the RE/HUD agrees with this recommendation, the review is in compliance with this section. Continue to the Worksheet Summary below.*

2. **Complete the Preliminary Screening to identify potential noise generators in the vicinity (1000' from a major road, 3000' from a railroad, or 15 miles from an airport).**
   Indicate the findings of the Preliminary Screening below:

   ☐ There are no noise generators found within the threshold distances above.

   → *If the RE/HUD agrees with this recommendation, the review is in compliance with this section. Continue to the Worksheet Summary below. Provide a map showing the location of the project relative to any noise generators.*

   ☑ Noise generators were found within the threshold distances.

   → *Continue to Question 3.*

3. **Complete the Noise Assessment Guidelines to quantify the noise exposure. Indicate the findings of the Noise Assessment below:**

☐ Acceptable (65 decibels or less; the ceiling may be shifted to 70 decibels in circumstances described in §24 CFR 51.105(a))

Indicate noise level here: Click here to enter text.
→ *If the RE/HUD agrees with this recommendation, the review is in compliance with this section. Continue to the Worksheet Summary below. Provide noise analysis, including noise level and data used to complete the analysis.*

☐ Normally Unacceptable: (Above 65 decibels but not exceeding 75 decibels; the floor may be shifted to 70 decibels in circumstances described in 24 CFR 51.105(a))

Indicate noise level here: Click here to enter text.

<u>If project is rehabilitation:</u>
→ *Continue to Question 4. Provide noise analysis, including noise level and data used to complete the analysis.*

<u>If project is new construction:</u>
Is the project in a largely undeveloped area[1]?

☐ No
☐ Yes → ***The project requires completion of an Environmental Impact Statement (EIS) pursuant to 51.104(b)(1)(i).***

→ *Continue to Question 4. Provide noise analysis, including noise level and data used to complete the analysis.*

☑ Unacceptable: (Above 75 decibels)
Indicate noise level here: 79 dBA DNL

<u>If project is rehabilitation:</u>
HUD strongly encourages conversion of noise-exposed sites to land uses compatible with high noise levels. Consider converting this property to a non-residential use compatible with high noise levels.
→ *Continue to Question 4. Provide noise analysis, including noise level and data used to complete the analysis, and any other relevant information.*

<u>If project is new construction:</u>
The project requires completion of an Environmental Impact Statement (EIS) pursuant to 51.104(b)(1)(i). *Work with HUD or the RE to either complete an EIS or obtain a waiver signed by the appropriate authority.*
→ *Continue to Question 4.*

[1] A largely undeveloped area means the area within 2 miles of the project site is less than 50 percent developed with urban uses and does not have water and sewer capacity to serve the project.

4. **HUD strongly encourages mitigation be used to eliminate adverse noise impacts. Work with the RE/HUD on the development of the mitigation measures that must be implemented to mitigate for the impact or effect, including the timeline for implementation.**

☑ Mitigation as follows will be implemented:

- Provide mechanical ventilation so that windows may be left closed by occupants. This can be achieved passively with z-ducts, fresh air ducts, or an approved equal.
- Exterior wall, window, and private balcony/patio doors must meet the minimum Sound Transmission Class (STC) ratings shown in **Error! Reference source not found.**. Transmission loss calculations are included in Appendix D.

Minimum STC Rating Requirements

		Minimum Required STC Ratings		
Building Elevation	**Floor**	**Exterior Walls[1]**	**Windows**	**Private Balcony/Patio Doors**
North	2–7	46 STC	32 STC	35 STC
	8 and 9		30 STC	
East	2–9		34 STC	
South	2–9		30 STC	
West	2–9		30 STC	29 STC

[1] Exterior walls shall meet an STC rating of at least 46. One method to achieve this would be to construct standard exterior walls with 6-inch studs, R-13 insulation or thicker, a minimum 7/8 exterior surface stucco plaster, and interior finish with 5/8-inch drywall. Note that this recommendation is based on a closed-windows condition.

See Appendix D for transmission loss calculations.

- Use permanently nonhardening sealant around perimeters of window frames.
- Window assemblies shall be constructed with effective nonporous gaskets or weatherstripping to minimize air infiltration and sound leakage.
- Provide airtight construction at all exterior walls with acoustical or other nonhardening sealant at floor plates.
- Use door jamb and head gasketing and door bottom gasketing at entry doors to seal the solid core doors against weather and sound.
- All entry doors shall be insulated against weather and sound with nonporous seals. Caulk entry door thresholds as they are placed.

→ *Provide drawings, specifications, and other materials as needed to describe the project's noise mitigation measures.*
Continue to the Worksheet Summary.

☐ No mitigation is necessary.

Explain why mitigation will not be made here:
Click here to enter text.
→ *Continue to the Worksheet Summary.*

Worksheet Summary

Provide a full description of your determination and a synopsis of the information that it was based on, such as:

- Map panel numbers and dates
- Names of all consulted parties and relevant consultation dates
- Names of plans or reports and relevant page numbers
- Any additional requirements specific to your program or region

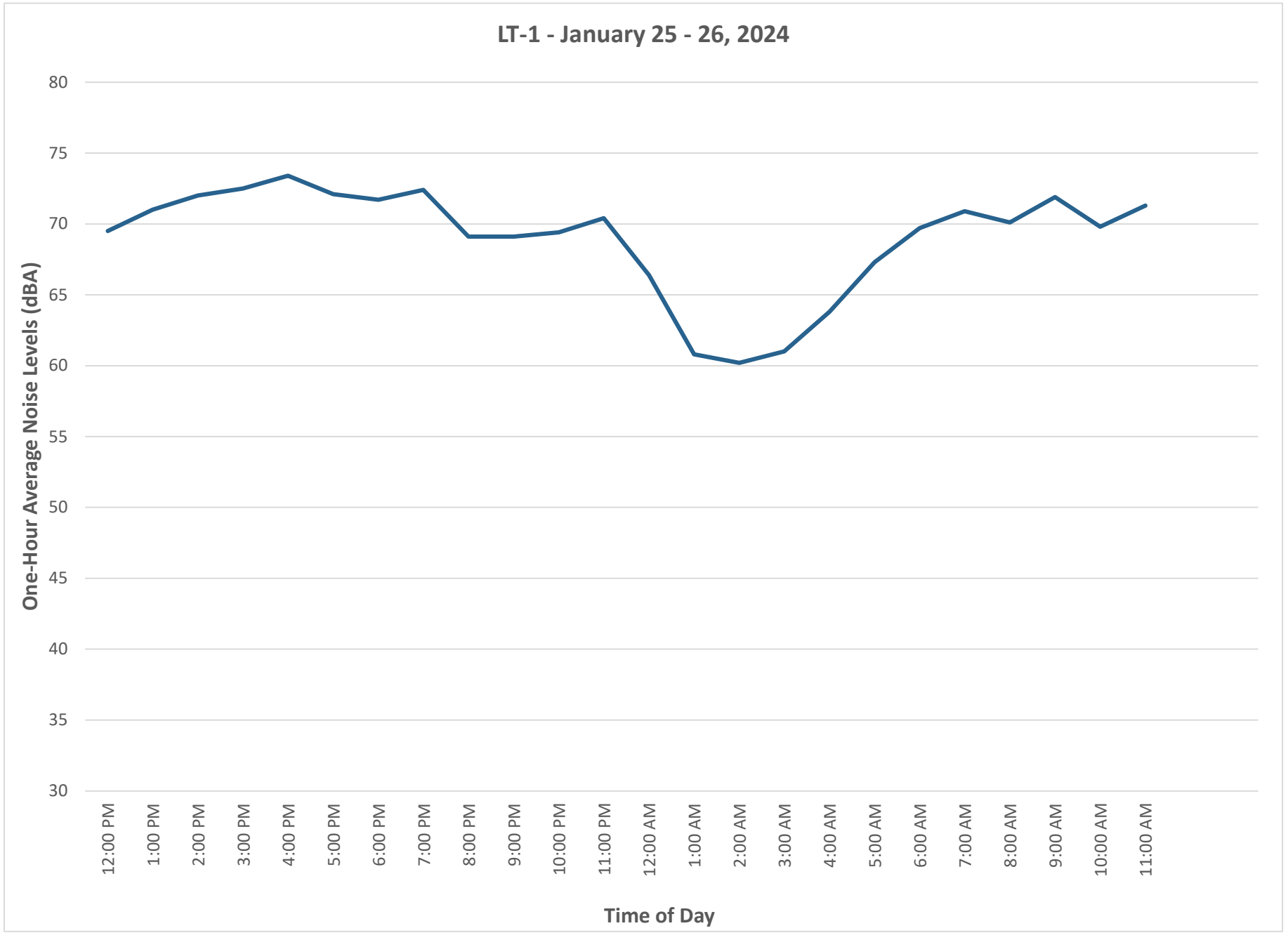
The project site is located adjacent to various roadways, including elevated freeways, and in the vicinity of a railway. Noise exposure at the project site was determined using a combination of onsite noise measurements and three-dimensional computerized noise modeling due to the complexity of the site and surroundings (i.e., significant changes in ground elevation and elevated freeways). The computer model included topography, transportation sources (roadways, including elevated portions of freeway, and the railway), and buildings adjacent to the project site to account for reflected/redirected noise near the site. Traffic data for roadways in the vicinity of the site was obtained from the California Department of Transportation (Caltrans) and the San Francisco Municipal Transportation Agency (SFMTA). Data for the railway was obtained from the Federal Railroad Administration (FRA). The computer model predicted future noise impact upon the future project building along all building facades and at varying heights (2nd through 9th Floors) based on traffic volumes projected 10 years into the future (to the year 2034). Results indicate that the future project building will be exposed to future transportation noise levels up to 79 dBA DNL. Therefore, window and doors which achieve the minimum STC ratings specified in the table above will be necessary to reduce exterior noise levels to the required interior level of 45 dBA DNL. Note that this analysis is based on the 249 Pennsylvania Avenue Feasibility Study drawings dated 10/25/22 (by Leddy Maytum Stacy Architects) and the “Updated Design Approach” PDF (undated, provided on 3/22/2024).

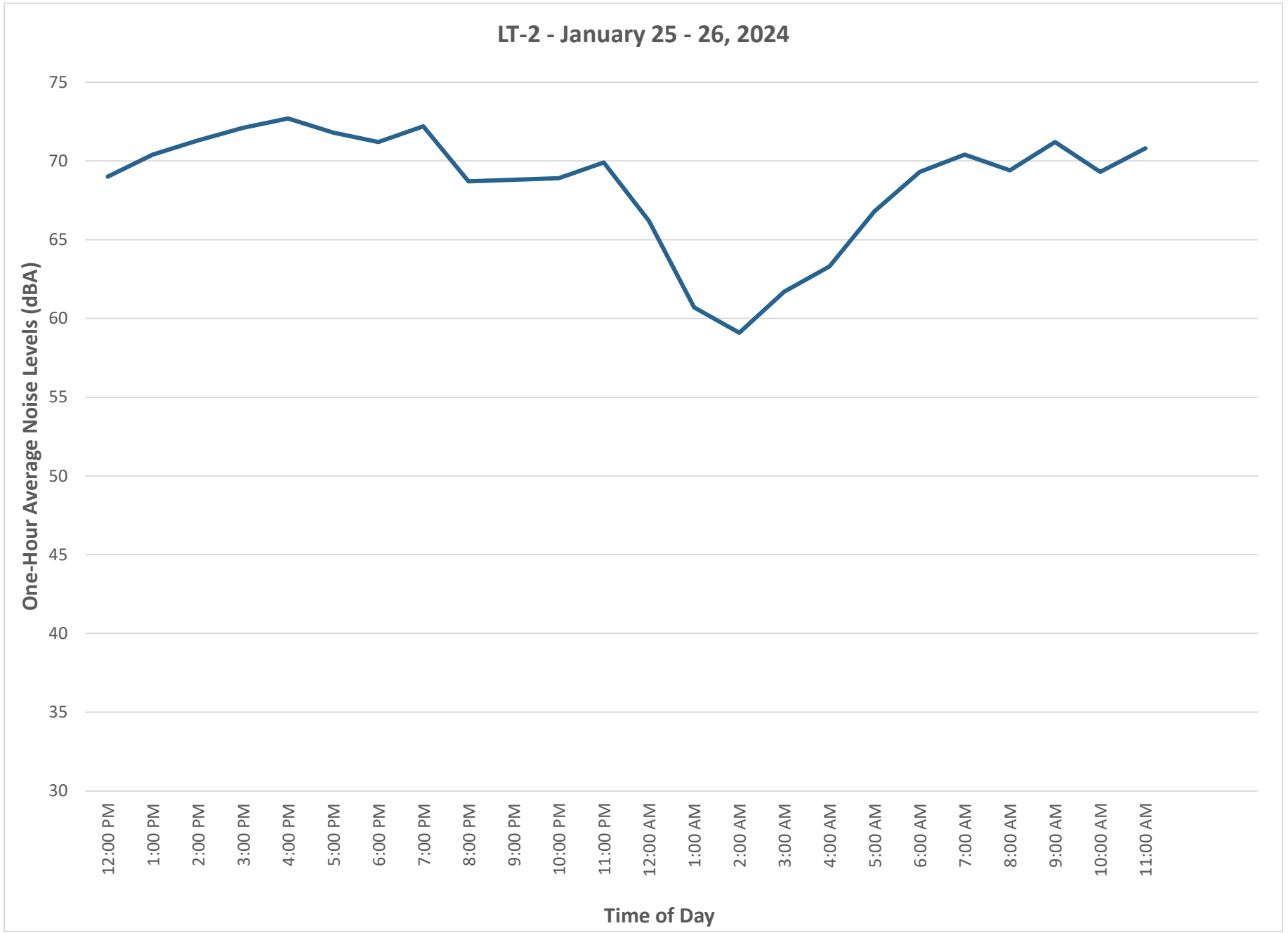
Include all documentation supporting your findings in your submission to HUD.

Click here to enter text.

Appendix B

Onsite Noise Measurements Graphical Data (January 25 and 26, 2024)


LT-1 - January 25 - 26, 2024
One-Hour Average Noise Levels (dBA)
80
75
70
65
60
55
50
45
40
35
30
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
Time of Day


LT-2 - January 25 - 26, 2024
One-Hour Average Noise Levels (dBA)
75
70
65
60
55
50
45
40
35
30
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
Time of Day

Appendix C

Computerized Noise Modeling Results

249 Pennsylvania Ave
Run info
Future Noise Impact (GL Contours)_Grid Map_04172024

Project info

Project title:	249 Pennsylvania Ave
Project No.:	23-15338
Project engineer:	Kyle Pritchard
Customer:	

Description:
Traffic noise impact analysis for 249 Pennsylvania Ave mixed-use project.

Run description

Calculation type:	Grid Map
Title:	Future Noise Impact (GL Contours)_Grid Map_04172024
Calculation group	
Run file:	RunFile.runx
Result number:	13
Local calculation (ThreadCount=12)	
Calculation start:	4/17/2024 10:55:12 AM
Calculation end:	4/17/2024 11:41:34 AM
Calculation time:	46:18:542 [m:s:ms]
No. of points:	5675
No. of calculated points:	5675
Kernel version:	SoundPLANnoise 9.0 (2/28/2024) - 64 bit

Run parameters

Reflection order:	3	
Maximum reflection distance to receiver		200 m
Maximum reflection distance to source		50 m
Search radius	5000 m	
Weighting:	dB(A)	
Allowed tolerance:	0.100 dB	
Create ground effect areas from road surfaces:		Yes
Treat roads as terrain following:	No	
5 dB bonus for railway is set	No	

Standards:

Road:	TNM 2.5	
Emission according to:	TNM 2.5/3.0	
Road gradient smoothed with smooth length of:		15 m
Air absorption:	ISO 9613-1	

Side diffraction: disabled
Allow changes (bugs) to be conform with TNM 2.5
Environment:

Air pressure	1013.3 mbar
rel. humidity	50.0 %
Temperature	20.0 °C

Dissection parameters:

Distance to diameter factor	8

Minimal distance		1 m
Attenuation		
Foliage:	ISO 9613-2	
Built-up area:	ISO 9613-2	
Industrial site:	ISO 9613-2	
Railway:	FTA: 2018 / FRA - HSGT: 2005	
Emission according to:	FTA: 2018 / FRA - HSGT: 2005	

Side diffraction: disabled
Calculate strictly in agreement with FRA 2005 standard (can lead to rising levels with rising screens!)

Attenuation		
Foliage:	User defined	
Built-up area:	User defined	
Industrial site:	User defined	
Assessment:	Day Night Level LDN	

Grid Noise Map:

Grid space:	3.00 m	
Height above ground:	1.500 m	
Grid interpolation:		
	Field size =	9x9
	Min/Max =	10.0 dB
	Difference =	0.2 dB
	Limit level=	40.0 dB

Geometry data

Future Model.sit	4/17/2024 10:55:06 AM	
- contains:		
Bridges.geo	4/17/2024 9:23:02 AM	
Existing Buildings.geo	2/8/2024 3:07:02 PM	
Existing Topography_GIS.geo		2/8/2024 2:30:28 PM
Future Project Building_03112024.geo		3/25/2024 10:30:04 AM
Geo-File1.geo	3/25/2024 10:30:04 AM	
Open Space_03112024.geo	3/25/2024 10:49:56 AM	
Project Boundary.geo	2/8/2024 1:52:36 PM	
Railways.geo	2/8/2024 3:04:46 PM	
Receivers (Facades)_03112024.geo		3/26/2024 12:55:14 PM
Roads.geo	4/17/2024 10:52:50 AM	
Calculation Area.geo	4/17/2024 10:50:40 AM	
RDGM0008.dgm	2/8/2024 2:44:16 PM	

249 Pennsylvania Ave
Run info
Future Noise Impact (UL Contours)_Grid Map_04172024

Project info

Project title:	249 Pennsylvania Ave
Project No.:	23-15338
Project engineer:	Kyle Pritchard
Customer:	

Description:
Traffic noise impact analysis for 249 Pennsylvania Ave mixed-use project.

Run description

Calculation type:	Grid Map
Title:	Future Noise Impact (UL Contours)_Grid Map_04172024
Calculation group	
Run file:	RunFile.runx
Result number:	14
Local calculation (ThreadCount=12)	
Calculation start:	4/17/2024 11:41:38 AM
Calculation end:	4/17/2024 12:26:45 PM
Calculation time:	45:01:300 [m:s:ms]
No. of points:	5675
No. of calculated points:	5675
Kernel version:	SoundPLANnoise 9.0 (2/28/2024) - 64 bit

Run parameters

Reflection order:	3	
Maximum reflection distance to receiver		200 m
Maximum reflection distance to source		50 m
Search radius	5000 m	
Weighting:	dB(A)	
Allowed tolerance:	0.100 dB	
Create ground effect areas from road surfaces:		Yes
Treat roads as terrain following:	No	
5 dB bonus for railway is set	No	

Standards:

Road:	TNM 2.5	
Emission according to:	TNM 2.5/3.0	
Road gradient smoothed with smooth length of:		15 m
Air absorption:	ISO 9613-1	

Side diffraction: disabled
Allow changes (bugs) to be conform with TNM 2.5
Environment:

Air pressure	1013.3 mbar
rel. humidity	50.0 %
Temperature	20.0 °C

Dissection parameters:

Distance to diameter factor	8

Minimal distance		1 m
Attenuation		
Foliage:	ISO 9613-2	
Built-up area:	ISO 9613-2	
Industrial site:	ISO 9613-2	
Railway:	FTA: 2018 / FRA - HSGT: 2005	
Emission according to:	FTA: 2018 / FRA - HSGT: 2005	

Side diffraction: disabled
Calculate strictly in agreement with FRA 2005 standard (can lead to rising levels with rising screens!)

Attenuation		
Foliage:	User defined	
Built-up area:	User defined	
Industrial site:	User defined	
Assessment:	Day Night Level LDN	

Grid Noise Map:

Grid space:	3.00 m	
Height above ground:	7.620 m	
Grid interpolation:		
	Field size =	9x9
	Min/Max =	10.0 dB
	Difference =	0.2 dB
	Limit level=	40.0 dB

Geometry data

Future Model.sit	4/17/2024 10:55:06 AM	
- contains:		
Bridges.geo	4/17/2024 9:23:02 AM	
Existing Buildings.geo	2/8/2024 3:07:02 PM	
Existing Topography_GIS.geo		2/8/2024 2:30:28 PM
Future Project Building_03112024.geo		3/25/2024 10:30:04 AM
Geo-File1.geo	3/25/2024 10:30:04 AM	
Open Space_03112024.geo	3/25/2024 10:49:56 AM	
Project Boundary.geo	2/8/2024 1:52:36 PM	
Railways.geo	2/8/2024 3:04:46 PM	
Receivers (Facades)_03112024.geo		3/26/2024 12:55:14 PM
Roads.geo	4/17/2024 10:52:50 AM	
Calculation Area.geo	4/17/2024 10:50:40 AM	
RDGM0008.dgm	2/8/2024 2:44:16 PM	

249 Pennsylvania Ave
Run info
Future Noise Impact (Facades)_Single Points_03112024

Project info

Project title:	249 Pennsylvania Ave
Project No.:	23-15338
Project engineer:	Kyle Pritchard
Customer:	

Description:
Traffic noise impact analysis for 249 Pennsylvania Ave mixed-use project.

Run description

Calculation type:	Single Point Sound
Title:	Future Noise Impact (Facades)_Single Points_03112024
Calculation group	
Run file:	RunFile.runx
Result number:	12
Local calculation (ThreadCount=12)	
Calculation start:	3/26/2024 10:49:24 AM
Calculation end:	3/26/2024 10:51:58 AM
Calculation time:	02:29:812 [m:s:ms]
No. of points:	88
No. of calculated points:	88
Kernel version:	SoundPLANnoise 9.0 (2/28/2024) - 64 bit

Run parameters

Reflection order:	3	
Maximum reflection distance to receiver		200 m
Maximum reflection distance to source		50 m
Search radius	5000 m	
Weighting:	dB(A)	
Allowed tolerance (per individual source):		0.100 dB
Create ground effect areas from road surfaces:		Yes
Treat roads as terrain following:	No	
5 dB bonus for railway is set	No	

Standards:

Road:	TNM 2.5	
Emission according to:	TNM 2.5/3.0	
Road gradient smoothed with smooth length of:		15 m
Air absorption:	ISO 9613-1	

Side diffraction: disabled
Allow changes (bugs) to be conform with TNM 2.5
Environment:

Air pressure	1013.3 mbar
rel. humidity	50.0 %
Temperature	20.0 °C

Dissection parameters:

Distance to diameter factor	8

Minimal distance 1 m
Attenuation
Foliage: ISO 9613-2
Built-up area: ISO 9613-2
Industrial site: ISO 9613-2

Railway: FTA: 2018 / FRA - HSGT: 2005
Emission according to: FTA: 2018 / FRA - HSGT: 2005
Side diffraction: disabled
Calculate strictly in agreement with FRA 2005 standard (can lead to rising levels with rising screens!)
Attenuation
Foliage: User defined
Built-up area: User defined
Industrial site: User defined

Assessment: Day Night Level LDN
Reflection of "own" facade is suppressed

Geometry data

Future Model.sit	3/26/2024 10:48:10 AM	
- contains:		
Bridges.geo	3/26/2024 10:12:16 AM	
Calculation Area_open space.geo		3/26/2024 8:07:06 AM
Existing Buildings.geo	2/8/2024 3:07:02 PM	
Existing Topography_GIS.geo		2/8/2024 2:30:28 PM
Future Project Building_03112024.geo		3/25/2024 10:30:04 AM
Geo-File1.geo	3/25/2024 10:30:04 AM	
Open Space_03112024.geo	3/25/2024 10:49:56 AM	
Project Boundary.geo	2/8/2024 1:52:36 PM	
Railways.geo	2/8/2024 3:04:46 PM	
Roads.geo	2/8/2024 3:35:48 PM	
Receivers (Facades)_03112024.geo		3/26/2024 10:48:08 AM
RDGM0008.dgm	2/8/2024 2:44:16 PM	

Appendix D

Transmission Loss Calculations

N Elevation

A-weighting Corrections	*-16.1*	*-13.4*	*-10.9*	*-8.6*	*-6.6*	*-4.8*	*-3.2*	*-1.9*	*-0.8*	*0*	*0.6*	*1*	*1.2*	*1.3*	*1.2*	*1*			
	125	*160*	*200*	*250*	*315*	*400*	*500*	*630*	*800*	*1000*	*1250*	*1600*	*2000*	*2500*	*3150*	*4000*	**Flat**	**A-wht**	**DNL**
DNL Source Spectrum	**80**	**75**	**74**	**70**	**68**	**69**	**69**	**70**	**72**	**72**	**70**	**68**	**66**	**63**	**61**	**57**	**84**	**79.0**	**79.0**
3B Unit																			
Total Area=	270																		
Window Area =	48	0.18																	
Door Area =	18.0	0.07																	
Equivalent Wall Area =	204	0.76	1.00																
	125	*160*	*200*	*250*	*315*	*400*	*500*	*630*	*800*	*1000*	*1250*	*1600*	*2000*	*2500*	*3150*	*4000*			
H Slider 3/16Mono-7/16AS-1/8DblS -STC 32	22	23	23	22	23	27	29	32	34	36	37	36	35	35	35	32			
Stucco ext 1 lyr. Int insulated wood stud wall STC 46	25	30	42	41	44	43	45	45	46	45	46	48	50	50	50	55			
STC 35 Sliding Glass Door	22	24	27	22	30	30	34	35	35	35	32	37	39	37	38	41			
Derate for Field Construction	-1	-1	-1	-1	-1	-1	-1	-1	-2	-2	-2	-2	-3	-3	-4	-4			
Actual TL	**25**	**29**	**41**	**40**	**43**	**42**	**44**	**44**	**44**	**43**	**44**	**46**	**47**	**47**	**46**	**51**			
Composite TL =	**23.7**	**26.9**	**29.7**	**27.9**	**30.0**	**33.3**	**35.5**	**37.8**	**39.3**	**39.9**	**39.7**	**41.1**	**41.0**	**40.7**	**40.8**	**39.1**			
	125	*160*	*200*	*250*	*315*	*400*	*500*	*630*	*800*	*1000*	*1250*	*1600*	*2000*	*2500*	*3150*	*4000*	**Flat**	**A-wht**	**DNL**
DNL INTERIOR LEVEL	56.4	47.8	44.1	42.0	37.8	35.4	33.9	31.7	32.7	31.7	30.5	27.3	25.0	22.3	20.2	17.6	**57**	**44.5**	**44.5**
DNL EXTERIOR LEVEL	**79**																**Reduction =**	**34.5**	

E Elevation

A-weighting Corrections	*-16.1*	*-13.4*	*-10.9*	*-8.6*	*-6.6*	*-4.8*	*-3.2*	*-1.9*	*-0.8*	*0*	*0.6*	*1*	*1.2*	*1.3*	*1.2*	*1*			
	125	*160*	*200*	*250*	*315*	*400*	*500*	*630*	*800*	*1000*	*1250*	*1600*	*2000*	*2500*	*3150*	*4000*	**Flat**	**A-wht**	**DNL**
DNL Source Spectrum	**80**	**75**	**74**	**70**	**68**	**69**	**69**	**70**	**72**	**72**	**70**	**68**	**66**	**63**	**61**	**57**	**84**	**79.0**	**79.0**
ST Unit																			
Total Area=	378																		
Window Area =	48	0.13																	
Door Area =	18.0	0.05																	
Equivalent Wall Area =	312	0.83	1.00																
	125	*160*	*200*	*250*	*315*	*400*	*500*	*630*	*800*	*1000*	*1250*	*1600*	*2000*	*2500*	*3150*	*4000*			
V.Slider (3/16Mono-7/16AS -1/8DblS) -STC 33	22	20	22	19	22	25	29	32	35	37	38	37	37	37	38	37			
Stucco ext 1 lyr. Int insulated wood stud wall STC 46	25	30	42	41	44	43	45	45	46	45	46	48	50	50	50	55			
STC 35 Sliding Glass Door	22	24	27	22	30	30	34	35	35	35	32	37	39	37	38	41			
Derate for Field Construction	-1	-1	-1	-1	-1	-1	-1	-1	-2	-2	-2	-2	-3	-3	-4	-4			
Actual TL	**25**	**29**	**41**	**40**	**43**	**42**	**44**	**44**	**44**	**43**	**44**	**46**	**47**	**47**	**46**	**51**			
Composite TL =	**23.9**	**26.2**	**30.2**	**27.0**	**30.5**	**33.0**	**36.7**	**38.8**	**40.7**	**41.0**	**40.8**	**42.4**	**43.3**	**42.9**	**43.3**	**44.5**			
	125	*160*	*200*	*250*	*315*	*400*	*500*	*630*	*800*	*1000*	*1250*	*1600*	*2000*	*2500*	*3150*	*4000*	**Flat**	**A-wht**	**DNL**
DNL INTERIOR LEVEL	56.2	48.6	43.6	42.9	37.3	35.7	32.7	30.7	31.2	30.7	29.4	25.9	22.7	20.2	17.6	12.2	**57**	**44.2**	**44.2**
DNL EXTERIOR LEVEL																	**Reduction =**	**34.8**	

S Elevation

A-weighting Corrections	*-16.1*	*-13.4*	*-10.9*	*-8.6*	*-6.6*	*-4.8*	*-3.2*	*-1.9*	*-0.8*	*0*	*0.6*	*1*	*1.2*	*1.3*	*1.2*	*1*			
	125	*160*	*200*	*250*	*315*	*400*	*500*	*630*	*800*	*1000*	*1250*	*1600*	*2000*	*2500*	*3150*	*4000*	**Flat**	**A-wht**	**DNL**
DNL Source Spectrum	**77**	**72**	**71**	**67**	**65**	**66**	**66**	**67**	**69**	**69**	**67**	**65**	**63**	**60**	**58**	**54**	**81**	**76.0**	**76.0**
3B Unit																			
Total Area=	270																		
Window Area =	48	0.18																	
Door Area =	18.0	0.07																	
Equivalent Wall Area =	204	0.76	1.00																
	125	*160*	*200*	*250*	*315*	*400*	*500*	*630*	*800*	*1000*	*1250*	*1600*	*2000*	*2500*	*3150*	*4000*			
Sgl. Hung 1/8DblS-1/2AS-1/8DblS -STC 30	17	22	18	19	19	25	28	31	34	35	35	35	35	32	32	29			
Stucco ext 1 lyr. Int insulated wood stud wall STC 46	25	30	42	41	44	43	45	45	46	45	46	48	50	50	50	55			
STC 35 Sliding Glass Door	22	24	27	22	30	30	34	35	35	35	32	37	39	37	38	41			
Derate for Field Construction	-1	-1	-1	-1	-1	-1	-1	-1	-2	-2	-2	-2	-3	-3	-4	-4			
Actual TL	**25**	**29**	**41**	**40**	**43**	**42**	**44**	**44**	**44**	**43**	**44**	**46**	**47**	**47**	**46**	**51**			
Composite TL =	**21.8**	**26.5**	**25.2**	**25.6**	**26.3**	**31.7**	**34.7**	**37.1**	**39.3**	**39.5**	**38.9**	**40.5**	**41.0**	**38.5**	**38.5**	**36.3**			
	125	*160*	*200*	*250*	*315*	*400*	*500*	*630*	*800*	*1000*	*1250*	*1600*	*2000*	*2500*	*3150*	*4000*	**Flat**	**A-wht**	**DNL**
DNL INTERIOR LEVEL	55.4	45.3	45.5	41.3	38.5	34.0	31.8	29.4	29.7	29.2	28.2	24.9	22.0	21.5	19.4	17.4	**56**	**43.4**	**43.4**
DNL EXTERIOR LEVEL	**76**																**Reduction =**	**32.6**	

W Elevation

A-weighting Corrections	*-16.1*	*-13.4*	*-10.9*	*-8.6*	*-6.6*	*-4.8*	*-3.2*	*-1.9*	*-0.8*	*0*	*0.6*	*1*	*1.2*	*1.3*	*1.2*	*1*			
	125	*160*	*200*	*250*	*315*	*400*	*500*	*630*	*800*	*1000*	*1250*	*1600*	*2000*	*2500*	*3150*	*4000*	**Flat**	**A-wht**	**DNL**
DNL Source Spectrum	**77**	**72**	**71**	**67**	**65**	**66**	**66**	**67**	**69**	**69**	**67**	**65**	**63**	**60**	**58**	**54**	**81**	**76.0**	**76.0**
ST Unit																			
Total Area=	378																		
Window Area =	48	0.13																	
Door Area =	18.0	0.05																	
Equivalent Wall Area =	312	0.83	1.00																
	125	*160*	*200*	*250*	*315*	*400*	*500*	*630*	*800*	*1000*	*1250*	*1600*	*2000*	*2500*	*3150*	*4000*			
Sgl. Hung 1/8DblS-1/2AS-1/8DblS -STC 30	17	22	18	19	19	25	28	31	34	35	35	35	35	32	32	29			
Stucco ext 1 lyr. Int insulated wood stud wall STC 46	25	30	42	41	44	43	45	45	46	45	46	48	50	50	50	55			
STC 29 Sliding Glass Door	19	21	12	17	19	24	26	29	32	33	32	37	39	37	37	29			
Derate for Field Construction	-1	-1	-1	-1	-1	-1	-1	-1	-2	-2	-2	-2	-3	-3	-4	-4			
Actual TL	**25**	**29**	**41**	**40**	**43**	**42**	**44**	**44**	**44**	**43**	**44**	**46**	**47**	**47**	**46**	**51**			
Composite TL =	**22.2**	**26.7**	**22.9**	**25.8**	**26.5**	**31.9**	**34.5**	**37.1**	**39.6**	**39.9**	**39.9**	**41.4**	**42.1**	**39.7**	**39.7**	**36.4**			
	125	*160*	*200*	*250*	*315*	*400*	*500*	*630*	*800*	*1000*	*1250*	*1600*	*2000*	*2500*	*3150*	*4000*	**Flat**	**A-wht**	**DNL**
DNL INTERIOR LEVEL	55.0	45.0	47.8	41.1	38.4	33.7	32.0	29.5	29.4	28.8	27.3	23.9	20.9	20.3	18.3	17.2	**56**	**43.5**	**43.5**
DNL EXTERIOR LEVEL	**76**																**Reduction =**	**32.5**	