320 Sheridan Drive

Menlo Park, CA

UPDATED ENVIRONMENTAL NOISE ASSESSMENT

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Salter Project 24-0069

INTRODUCTION

This report summarizes our environmental noise assessment for the 320 Sheridan Drive residential project (the "Project") located at 320 Sheridan Drive in Menlo Park, California. Our analysis is based on the Planning Submittal drawing set dated February 26, 2024. The Project proposes to construct three three-story apartment buildings, a community center with a laundry room, fitness center, computer area and office, and outdoor use spaces provided via a BBQ area and Tot Lot in the southern portion of the approximately 2.52-acre site. The Project would include a total of 88 dwelling units. Following is a summary of our findings:

- Exterior-to-Interior Noise –
  - Residential – Sound rated construction will be needed to reduce environmental noise to the City and State standard of DNL[1] 45 dB[2] in habitable rooms. Initial estimates suggest that windows and exterior doors with sound insulation ratings of up to STC[3] 48, as well as upgraded exterior walls in some units, will be needed. The exterior skin will need to be treated, including louvers and vents, to maintain sound isolation. Final details should be determined during the design phase and incorporated into the project drawings to meet the applicable standard.
  - Amenities – Initial estimates suggest that windows and exterior doors with sound insulation ratings of up to STC 32 will be needed to reduce hourly average noise levels to the CALGreen criterion of L_{eq}(h)[4] 50 dB in non-residential spaces.
- Outdoor Use Space –
  - Community outdoor use space will include a BBQ area and Tot Lot. Based on distance and shielding from the nearby roadways and other noise sources, estimated future transportation noise levels are expected to be DNL 66 dB or below in the outdoor use spaces, which falls into the 'Normally Acceptable' and 'Conditionally Acceptable' categories for residential land use in Menlo Park.

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1 DNL (Day-Night Average Sound Level) – A descriptor for a 24-hour A-weighted average noise level. DNL accounts for the increased acoustical sensitivity of people to noise during the nighttime hours. DNL penalizes sound levels by 10 dB during the hours from 10 PM to 7 AM. For practical purposes, the DNL and CNEL are usually interchangeable. DNL is sometimes written as L_{dn}.

2 A-Weighted Sound Level – The A-weighted sound pressure level, expressed in decibels (dB). Sometimes the unit of sound level is written as dB(A). A weighting is a standard weighting that accounts for the sensitivity of human hearing to the range of audible frequencies. People perceive a 10 dB increase in sound level to be twice as loud.

3 STC (Sound Transmission Class) – A single-number rating defined in ASTM E90 that quantifies the airborne sound insulating performance of a partition under laboratory conditions. Increasing STC ratings correspond to improved airborne sound insulation.

4 L_{eq}(h) – The equivalent steady-state A-weighted sound level that, in an hour, would contain the same acoustic energy as the time-varying sound level during the same period.

ACOUSTICAL CRITERIA

Menlo Park General Plan

Policy N1.1 of the Noise Goals, Policies, and Programs section of the Menlo Park General Plan states that new projects must be required to comply with the noise standards of local, regional, and building code regulations, including but not limited to the City's Municipal Code, Title 24 of the California Code of Regulations, and subdivision and zoning codes.

Policy N1.2 includes land use compatibility guidelines for environmental noise. Noise levels are characterized in terms of Day Night Average Sound Level (DNL). Table 1 below summarizes these guidelines for multi-family residential land use.

Table 1: Summary of Land Use Compatibility Noise Standards for New Development

Land Use Category Residential – Multi-Family	Land Use Compatibility
65 dB or below	*Normally Acceptable: Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal construction, without any special noise insulation requirements.*
60 – 70 dB	*Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise reduction features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.*
70 – 75 dB	*Normally Unacceptable: New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.*
75 dB or above	*Clearly Unacceptable: New construction or development should generally not be undertaken.*

Policy N1.3: Strive to achieve acceptable interior noise levels and exterior noise levels for backyards and/or common usable outdoor areas in new residential development, and reduce outdoor noise levels in existing residential areas where economically and aesthetically feasible.

Policy N1.4: Protect existing residential neighborhoods and noise sensitive uses from unacceptable noise levels and vibration impacts. Noise sensitive uses include, but are not limited to, hospitals, schools, religious facilities, convalescent homes and businesses with highly sensitive equipment. Discourage having noise-sensitive uses in areas in excess of 65 dB DNL without appropriate mitigation and locate noise sensitive uses away from noise sources unless mitigation measures are included in development plans.

Policy N1.5: Design residential developments to minimize the transportation-related noise impacts to adjacent residential areas and encourage new development to be site planned and architecturally designed to minimize noise impacts on noise sensitive spaces. Proper site planning can be effective in reducing noise impacts.

Policy N1.6: Encourage the use of construction methods, state-of-the-art noise abating materials and technology and creative site design including, but not limited to, open space, earthen berms, parking, accessory buildings, and landscaping to buffer new and existing development from noise and to reduce potential conflicts between ambient noise levels and noise-sensitive land uses. Use sound walls only when other methods are not practical or when recommended by an acoustical expert.

California Building Code

The 2022 California Building Code, Section 1206.4, states that interior noise attributable to exterior noise sources shall not exceed DNL 45 dB in any habitable room. These standards apply to all residential units in the Project.

California Green Building Standards Code (CALGreen)

Sections 5.507.4.1 & 2 of the CALGreen[5] code provide alternative prescriptive and performance-based methods for exterior to interior noise transmission for non-residential spaces exposed to noise levels of L_{eq}(h) 65 dB or higher, which are summarized as follows:

- Prescriptive Method – Exterior wall and roof-ceiling assemblies shall have a composite STC of 45 with minimum STC 40 windows.
- Performance Method – Exterior wall and roof-ceiling assemblies shall reduce hourly average levels to L_{eq}(h) 50 dB in occupied areas during any hour of operation.

This assessment uses the less restrictive Performance Method described above. We have assumed that normal hours of operation for the amenity spaces will be from 8 a.m. to 10 p.m. and used the loudest L_{eq}(h) during that period as the basis of the design.

NOISE ENVIRONMENT

The Project site is located in Menlo Park and is bordered by Highway 101 to the north with an existing concrete masonry wall (CMU) separating the site from the highway, existing 1 and 2-story single-family residences to the east, existing 1-story multi-family residences to the west, and a public park to the south. The site is generally flat, and the noise environment is predominantly controlled by vehicular traffic on Highway 101.

To quantify the existing noise environment, we conducted three multi-day measurements between 26 and 28 February 2024. In addition, we conducted 15-minute 'spot' measurements at two additional locations and compared the data with corresponding time periods of the multi-day monitors to help

5 California Code of Regulations, Part 11: 2022 California Green Building Standards Code, Nonresidential Mandatory Measures, Section 5.507.4

determine how noise levels vary with location and elevation. Table 2, below, summarizes the measured noise levels and Figure 1, attached, shows the approximate measurement locations.

Table 2: Existing Noise Environment

Monitor[6]	Location	Date/Time	DNL
LT-1	Flood Park monitor Approx. 5' from south property line	26 to 28 February 2024	70 dB
LT-2	Southwest property line monitor Approx. 20' from west property line		68 dB
LT-3	Highway 101 monitor Approx. 150' from roadway centerline		73 dB
ST-1[7]	Building 1 setback spot Approx. 120' from Hwy 101 centerline First floor/Second & Third Stories	28 February 14:35 – 14:50	69 dB / 85 dB
ST-2	Buildings 2 & 3 setback spot Approx. 260' from Hwy 101 centerline First floor/Second & Third Stories	28 February 15:05 – 15:20	69 dB / 73 dB

We also measured L_{eq}(h) levels, and these were typically 2 dB quieter than the measured DNL levels at each monitor. Based on our measured data, we calculated the noise levels expected at the building facades. Our estimates include a 1 decibel increase across the site to account for future traffic increases[8].

ANALYSIS AND RECOMMENDATIONS

Exterior-to-Interior Noise

Residential

To meet the California Building Code interior DNL 45 dB requirement for residences, it will be necessary for the building shell in habitable rooms in the units to be sound rated. Preliminary estimates for minimum recommended sound insulation ratings, in terms of Sound Transmission Class (STC), needed at windows and exterior doors to meet the City and State criterion are shown in Figures 2 and 3, attached.[9]

6 Multi-day monitors were at approximate heights of 10 to 12 feet above grade. Short term monitors were at approximate heights of 5 feet above grade for ST-1 and ST-4, 16 feet for ST-2 and ST-5 and 26 feet for ST-3 and ST-6.

7 Data for the short-term monitors was calculated using the offset from the Highway 101 multi-day monitor LT-3.

8 The California Department of Transportation assumes a traffic volume increase of three percent per year, which corresponds to a 1 dB increase over a ten-year period.

9 For reference, typical construction-grade dual-pane windows provide sound insulation of approximately STC 28, dual pane windows with different glass thickness using laminated glass may achieve up to STC 33 to 35, and specialty dual sash windows with three or four panes of glass may have sound ratings in the low 40s. Higher sound insulation ratings may require additional solid storm doors and windows.

They are based on the floor plans and elevations shown in the Planning Submittal drawing set dated 26 February 2024 and assume the following:

- Exterior walls will be a combination of lap siding, board & batten, and plaster as shown on the exterior elevations.
  - The base wall assembly is understood to be a single stud wall with batt insulation in the stud cavities and one layer of gypsum board on the interior.
  - Assemblies with lap siding and board & batten should include a layer of plywood sheeting or exterior gypsum board (i.e., Densglass).
- Where enhanced exterior wall assemblies are indicated in the attached Figures, insulated double-stud walls with at least 3 total layers of gypsum board may be needed.
- The current design calls for northern facing patios and decks to be fully enclosed with operable windows, which will reduce window and door STC ratings at these locations.
- The exterior shell will need to be sealed to maintain sound isolation. We expect this will include caulking joints, treating penetrations, adding backdraft dampers, and vent treatment, etc.
- Since windows will need to be closed to meet the interior noise criteria, the mechanical design should meet ventilation requirements with windows in the closed position. The system will need to be reviewed as the design progresses and must not compromise sound insulation of the building shell.
- Sound insulation ratings should be for the complete assembly, including glass and frame, and should be based on laboratory test reports of similar sized samples from an NVLAP accredited lab.

The design outlined above is expected to reduce transportation noise to the City and State criteria in residences. Note there are different ways to achieve the interior noise standard. Final STC ratings for windows and exterior doors, and details for both the exterior wall assemblies and exterior shell treatments, will need to be developed during the design phase.

Amenity

To meet the CALGreen interior noise criterion of L_{eq}(h) 50 dB or below, it will be necessary for the windows and exterior door assemblies to be sound rated. These preliminary estimates for minimum recommended sound insulation ratings, in terms of Sound Transmission Class (STC), needed at windows and exterior doors to meet the criterion are shown in the attached Figure 2. Initial estimates are based on the floor plans and elevations shown in the Planning Submittal drawing set dated 26 February 2024 and assumes that exterior walls will be a combination of lap siding, board & batten, and plaster. Similar to the residential portion above, final details should be developed during the design phase.

Outdoor Use Space

Community outdoor use space will include a BBQ area and Tot Lot towards the southern portion of the site. Based on distance and shielding from roadways and other noise sources, estimated future traffic levels are expected to be DNL 66 dB or below in these spaces, which falls into the 'Normally Acceptable' and 'Conditionally Acceptable' categories for multi-family residential land use in Menlo Park.

The design will include combination solid and glass walls at corridor openings facing the freeway on all buildings. While not required, this will reduce traffic noise at residential entries across the site. As indicated above, second and third floor decks facing the freeway will be fully enclosed with operable windows. For reference, estimated transportation noise at non-enclosed unit patios and decks will range from DNL 62 to 74 dB. We note the General Plan does not identify the quantitative noise goal for individual patios and decks.

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320 SHERIDAN DRIVE
NOISE MEASUREMENT LOCATIONS

FIGURE 1

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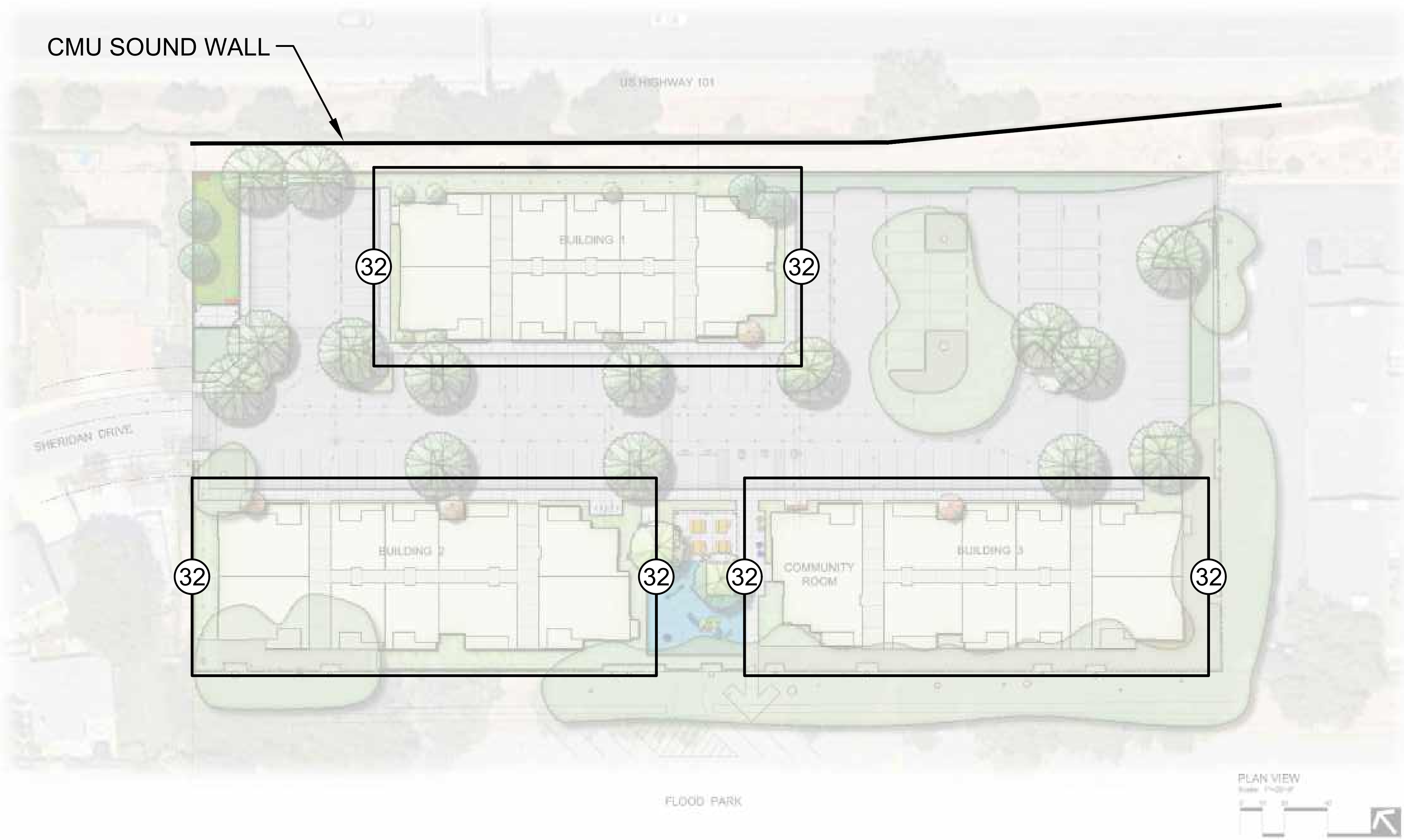

NOTE: STC RATINGS ARE FOR THE COMPLETE ASSEMBLY (E.G., GLASS, FRAME, AND OPERABLE SECTIONS) BASED ON TEST REPORTS FROM AN NVLAP-ACCREDITED LAB

320 SHERIDAN DRIVE
MINIMUM RECOMMENDED STC RATINGS FOR WINDOWS AND EXTERIOR DOORS (FLOOR 1)

FIGURE 2

Salter # 24–0069

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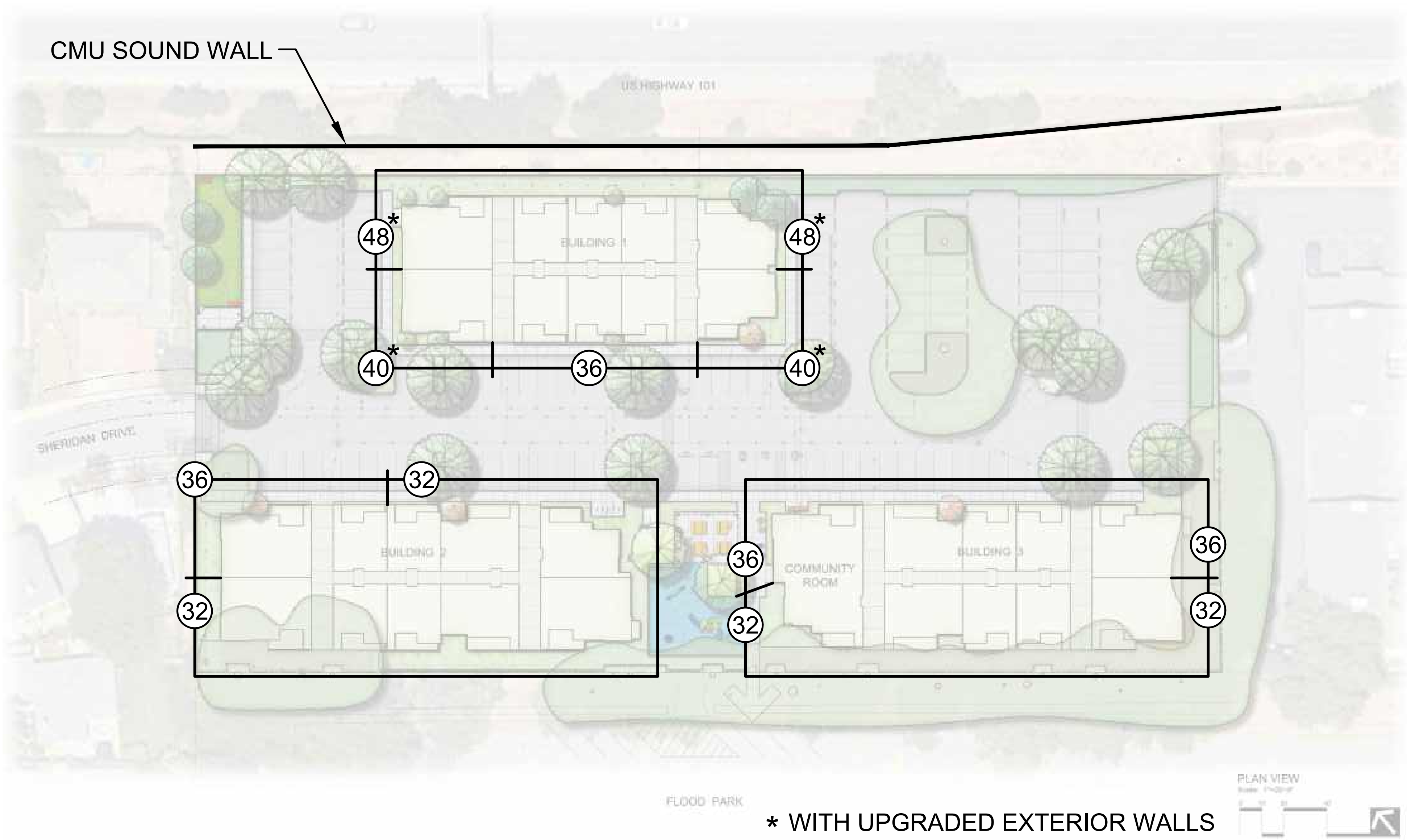

NOTE: STC RATINGS ARE FOR THE COMPLETE ASSEMBLY (E.G., GLASS, FRAME, AND OPERABLE SECTIONS) BASED ON TEST REPORTS FROM AN NVLAP-ACCREDITED LAB

320 SHERIDAN DRIVE
MINIMUM RECOMMENDED STC RATINGS FOR WINDOWS AND EXTERIOR DOORS (FLOORS 2 AND 3)

FIGURE 3

Salter # 24–0069

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APPENDIX A

Fundamental Concepts of Environmental Noise

This section provides background information to aid in understanding the technical aspects of this report. Three dimensions of environmental noise are important in determining subjective response. These are:

- The intensity or level of the sound
- The frequency spectrum of the sound
- The time-varying character of the sound

Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. Sound levels are usually measured and expressed in decibels (dB), with 0 dB corresponding roughly to the threshold of hearing.

The "frequency" of a sound refers to the number of complete pressure fluctuations per second in the sound. The unit of measurement is the cycle per second (cps) or hertz (Hz). Most of the sounds which we hear in the environment, do not consist of a single frequency, but of a broad band of frequencies, differing in level. The name of the frequency and level content of a sound is its sound spectrum. A sound spectrum for engineering purposes is typically described in terms of octave bands, which separate the audible frequency range (for human beings, from about 20 to 20,000 Hz) into ten segments.

Many rating methods have been devised to permit comparisons of sounds having quite different spectra. Surprisingly, the simplest method correlates with human response practically as well as the more complex methods. This method consists of evaluating all of the frequencies of a sound in accordance with a weighting that progressively de-emphasizes the importance of frequency components below 1000 Hz and above 5000 Hz. This frequency weighting reflects the fact that human hearing is less sensitive at low frequencies and at extreme high frequencies relative to the mid-range.

The weighting system described above is called "A"-weighting, and the level so measured is called the "A-weighted sound level" or "A-weighted noise level." The unit of A-weighted sound level is sometimes abbreviated "dB." In practice, the sound level is conveniently measured using a sound level meter that includes an electrical filter corresponding to the A-weighting characteristic. All U.S. and international standard sound level meters include such a filter. Typical sound levels found in the environment and in industry are shown below.

Although a single sound level value may adequately describe environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise is a conglomeration of distant noise sources, which results in a relatively steady background noise having no identifiable source. These distant sources may include traffic, wind in trees, industrial activities, etc. and are relatively constant from moment to moment. As natural forces change or as human activity follows its daily cycle, the sound level may vary slowly from hour to hour. Superimposed on this slowly varying background is a succession of identifiable noisy events of brief duration. These may include nearby activities such as single vehicle pass-bys, aircraft flyovers, etc. which cause the environmental noise level to vary from instant to instant.

To describe the time-varying character of environmental noise, statistical noise descriptors were developed. "L10" is the A-weighted sound level equaled or exceeded during 10 percent of a stated time period. The L10 is considered a good measure of the maximum sound levels caused by discrete noise events. "L50" is the A-weighted sound level that is equaled or exceeds 50 percent of a stated time period; it represents the median sound level. The "L90" is the A-weighted sound level equaled or exceeded during 90 percent of a stated time period and is used to describe the background noise.

As it is often cumbersome to quantify the noise environment with a set of statistical descriptors, a single number called the average sound level or "Leq" is now widely used. The term "Leq" originated from the concept of a so-called equivalent sound level which contains the same acoustical energy as a varying sound level during the same time period. In simple but accurate technical language, the Leq is the average A-weighted sound level in a stated time period. The Leq is particularly useful in describing the subjective change in an environment where the source of noise remains the same but there is change in the level of activity. Widening roads and/or increasing traffic are examples of this kind of situation.

In determining the daily measure of environmental noise, it is important to account for the different response of people to daytime and nighttime noise. During the nighttime, exterior background noise levels are generally lower than in the daytime; however, most household noise also decreases at night, thus exterior noise intrusions again become noticeable. Further, most people trying to sleep at night are more sensitive to noise. To account for human sensitivity to nighttime noise levels, a special descriptor was developed. The descriptor is called the Ldn (Day/Night Average Sound Level), which represents the 24-hour average sound level with a penalty for noise occurring at night. The Ldn computation divides the 24-hour day into two periods: daytime (7:00 am to 10:00 pm); and nighttime (10:00 pm to 7:00 am). The nighttime sound levels are assigned a 10 dB penalty prior to averaging with daytime hourly sound levels.

For highway noise environments, the average noise level during the peak hour traffic volume is approximately equal to the DNL.

The effects of noise on people can be listed in three general categories:

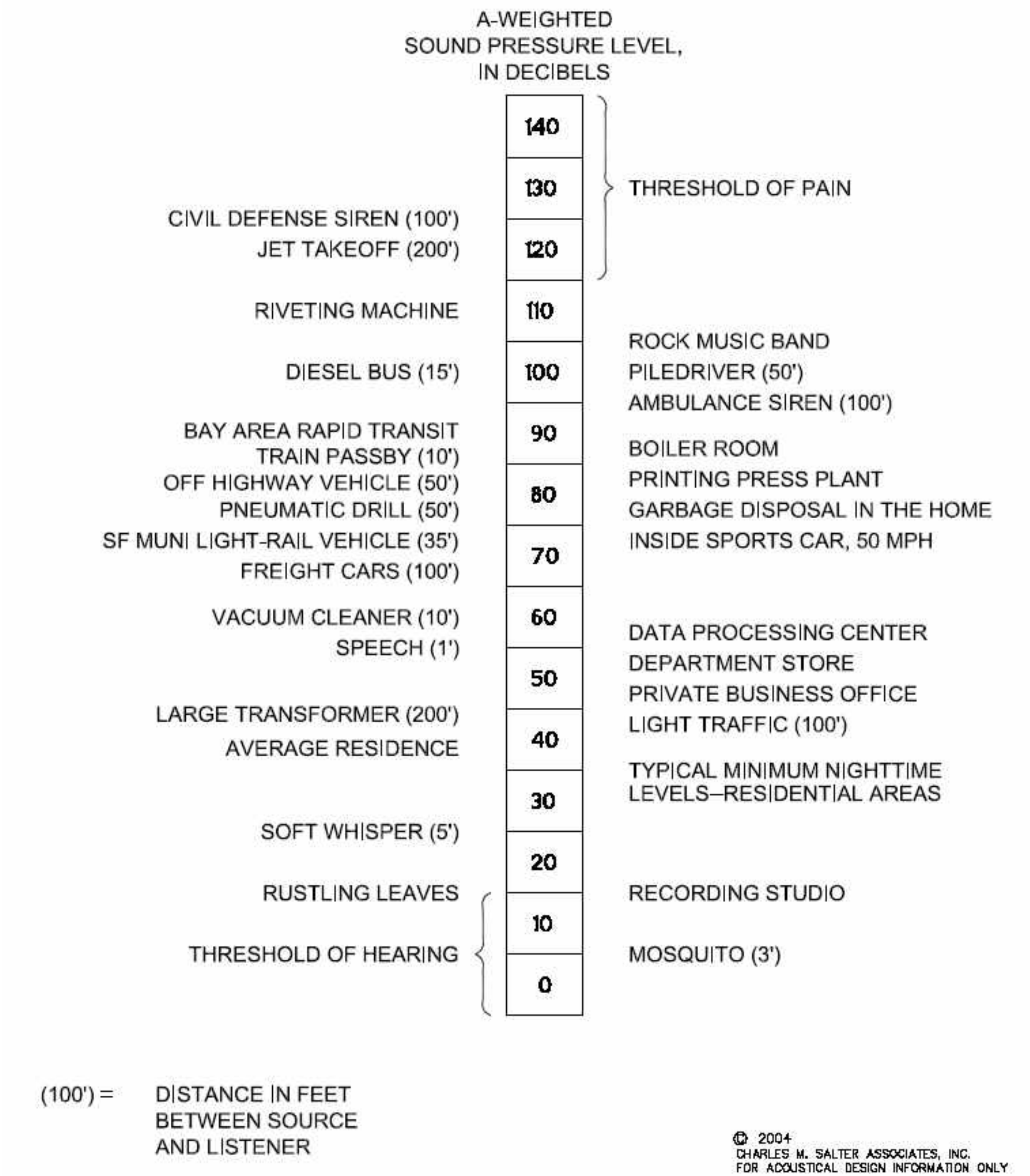
- Subjective effects of annoyance, nuisance, dissatisfaction
- Interference with activities such as speech, sleep, and learning
- Physiological effects such as startle, hearing loss

The sound levels associated with environmental noise usually produce effects only in the first two categories. Unfortunately, there has never been a completely predictable measure for the subjective effects of noise nor of the corresponding reactions of annoyance and dissatisfaction. This is primarily because of the wide variation in individual thresholds of annoyance and habituation to noise over time.

Thus, an important factor in assessing a person's subjective reaction is to compare the new noise environment to the existing noise environment. In general, the more a new noise exceeds the existing, the less acceptable the new noise will be judged.

With regard to increases in noise level, knowledge of the following relationships will be helpful in understanding the quantitative sections of this report:

Except in carefully controlled laboratory experiments, a change of only 1 dB in sound level cannot be perceived. Outside of the laboratory, a 3 dB change is considered a just-noticeable difference. A change in level of at least 5 dB is required before any noticeable change in community response would be expected. A 10 dB change is subjectively heard as approximately a doubling in loudness and would almost certainly cause an adverse community response.



TYPICAL SOUND LEVELS MEASURED IN THE ENVIRONMENT AND INDUSTRY

FIGURE

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