Appendix H:
Noise Supporting Information

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H.1 - Environmental Noise Assessment (January 2021)

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Oak Road Townhouse Condos

Contra Costa County, California

ENVIRONMENTAL NOISE ASSESSMENT

29 January 2021

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Salter Project 20-0343

INTRODUCTION

This draft report summarizes our environmental noise assessment for the Oak Road Townhouse Condos project located at 2740 Jones Road in unincorporated Walnut Creek, under the jurisdiction of Contra Costa County, California. The project consists of approximately 125 townhouse-style for sale condominium units. The three-story units are planned to occupy the site which was previously occupied by a school and is east of I-680, BART tracks, and Jones Road and west of Oak Road. Following is a summary of our findings:

- Estimated environmental noise levels, due to transportation sources, fall into the County's *normally acceptable* to *normally unacceptable* land use compatibility categories for multi-family residences. Noise reduction measures, in the form of sound-rated windows and exterior doors, will be needed to meet the County and State noise goals.
- Preliminary estimates show that windows and exterior doors with sound insulation ratings of up to STC 39 will be needed to meet the County and State criteria for interior noise due to exterior sources.
- Outdoor use space will be provided in the form of second-story balconies at some unit plans, and roof decks at units along Oak Road. A common open space is provided mid-site to meet the County's guidelines.

ACOUSTIC CRITERIA

Contra Costa County General Plan

Policy 11-1 of the Noise Element of the 2005-2020 Contra Costa General Plan provides Noise and Land Use Compatibility Guidelines for new multi-family residential projects, which are summarized in Table 1.

Table 1: Summary of Noise Land Use Compatibility Guidelines for Multi-family Residential Projects

Exterior DNL	Land Use Category
60 dB[1] or less	*Normally Acceptable*: Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.
55 to 70 dB	*Conditionally Acceptable*: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements and needed noise insulation features included in the design.
70 to 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(A) or higher	Unacceptable: New construction or development clearly should not be undertaken.

The County's General Plan also includes the following policies:

- Policy 11-2 provides a goal for outdoor noise levels in residential areas of DNL[2] 60 dB. The policy notes this might not be achievable in all residential areas due to economic or aesthetic constraints (e.g., at small balconies associated with multi-family housing). Where this is the case, the policy proposes an alternate of providing a common outdoor use area that meets the goal.
- Policy 11-3 provides an alternative outdoor noise goal of DNL 70 dB in areas where the primary noise source is BART passbys.
- Policy 11-4 reinforces the State requirement of interior noise level of DNL 45 dB or less, due to exterior sources.
- Policy 11-5 provides a goal to reduce instantaneous noise from BART events to 50 dB in bedrooms and 55 dB in other habitable rooms.

California Building Code

Title 24, Part 2 of the California Code of Regulations requires that new multi-family residential projects achieve an interior noise level of DNL 45 dB or less, due to exterior environmental sources.

[1] dB (Decibel) – A unit that describes the magnitude of a sound with respect to a reference sound level near the threshold of hearing. Decibels are based on a logarithmic scale and therefore cannot be added arithmetically.

[2] 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. DNL is sometimes written as L_{dn}.

NOISE ENVIRONMENT

The noise environment at the project site is influenced by vehicle traffic on Oak Road, Jones Road, and Interstate I-680, as well as from BART trains on the adjacent tracks. To help quantify environmental noise levels, a monitor continuously measured noise levels at the site between 7 and 11 December 2020. In addition, two short-term "spot" measurements were conducted to help determine how noise levels vary with location and elevation. For reference, a COVID-19 health order took effect on 5 December 2020, which was understood to reduce the volume of traffic on the roadways.[3] Figure 1, attached, summarizes the noise measurement locations, and Table 2, below, summarizes the measured noise levels.

Table 2: Measured Noise Levels

Site	Location	Date/Time	DNL
L1	Oak Road Monitor Approximately 40' west of Oak Road centerline, 12' above grade	7 to 11 December 2020	DNL 68 dB
L2	Mid-Site Monitor Approximately 210' west of Oak Road centerline, 12' above grade	7 to 11 December 2020	DNL 60 dB
L3	Jones Road/BART/I-680 Monitor Approximately 35' east of Jones Road centerline, 12' above grade	7 to 11 December 2020	DNL 65 dB
S1	Oak Road Spot Approximately 50' west of Oak Road, 5' above grade	7 December 2020 3:50-4:05 PM	DNL 66 dB
S2	Jones Road Spot Approximately 35' east of Jones Road centerline, 5'/16' above grade	11 December 2020 8:15-8:35 AM	DNL 66/67 dB

In addition to the average levels identified above, measured typical maximum instantaneous noise levels due to BART passbys were approximately L_{max30} 80 dB[4] at monitor location L3 (i.e., the monitoring location closest to the BART). In our analysis and recommendations section below, we have added 1 dB to account for future traffic volume increases.[5]

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[3] Consider conducting additional measurements when traffic patterns return to normal, prior to construction, to confirm estimated levels.

[4] L_{max30} (Typical Maximum Sound Level) – There is no standardized metric to quantify "typical" maximum sound levels in an environment (instead of the absolute maximum sound level for a measurement period). The metric L_{max30} comes from a paper by Rob Greene ("Max Level Intrusive Noise Limit: 1982 National Conference on Environmental and Occupational Noise"). It is based on the logarithmic average of the noisiest 30 percent of single events (e.g., train passbys, aircraft flyovers).

[5] The California Department of Transportation assumes a traffic volume increase of three percent per year, which corresponds to a 1 dB increase in DNL over a ten-year period. This should be reviewed when the traffic study for the project is available, as long-term impacts to traffic patterns associated with COVID-19 are not yet known and could affect future environmental noise levels.

ANALYSIS AND RECOMMENDATIONS

Estimated future noise levels at future facades range from DNL 60 dB at interior shielded portions of the site to approximately DNL 74 dB at elevated locations nearest the BART tracks and I-680.[6] This falls into the County's *normally acceptable* to *normally unacceptable* land use compatibility categories for multi-family residences. Therefore, exterior building assemblies will need to be sound rated to reduce transportation noise to the criteria outlined above.

Exterior-to-Interior Noise

As indicated above, the interior noise criteria are DNL 45 dB in residences due to all outdoor environmental sources, and L_{max} 50 and 55 dB, due to BART, in bedrooms and other habitable rooms, respectively. Preliminary estimates show window and exterior door ratings up to STC[7] 39 will be needed, as shown in Figure 2, attached. These preliminary estimates are based on the following, and will need to be updated based on finalized floor plans, elevations, and window sizes prior to construction.

- Conceptual floor plans and elevations per the P-1 Rezoning Preliminary Final Development Plan dated 23 December 2020
- Exterior walls will be equivalent to stucco over wood sheeting with batt insulation in stud cavities and at least 1 layer of gypsum board on the interior
- Flooring in bedrooms will be carpet over pad

Window and door sound insulation ratings must be for the complete tested assembly, including glass and frame, and should be based on laboratory test reports of similar sized samples from an NVLAP accredited lab. For reference, typical construction grade dual-pane windows achieve sound insulation ratings of approximately STC 28. Where no rating is indicated in Figure 2, these ratings are assumed.

Ventilation systems must not compromise sound insulation of the exterior wall assemblies. Where windows will need to be closed to meet the interior noise criterion, an alternate means of providing outside air to habitable spaces should be provided. The ventilation systems will need to maintain the exterior-to-interior noise reduction of the overall facade. Details should be developed during the design phase.

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6 Estimates are based on noise levels measured at the site along with published levels identified in the Contra Costa County General Plan, Walnut Creek General Plan, Walnut Creek BART Transit Village Draft EIR, and Caltrans traffic counts.

7 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.

Outdoor noise

Conceptual unit plans include 2nd floor decks for some units, and roof decks at units along Oak Road. Following is a discussion comparing levels with the County's General Plan policies:

- Along Oak Road levels will exceed the County's DNL 60 dB goal. Therefore, common open space is provided towards the center of the site where transportation noise is consistent with the goal.
- Along Jones Road the measured level at the second story elevation was DNL 67 dB, which is consistent with the County's goal for outdoor locations exposed to BART noise. Therefore, noise reduction measures are not required.

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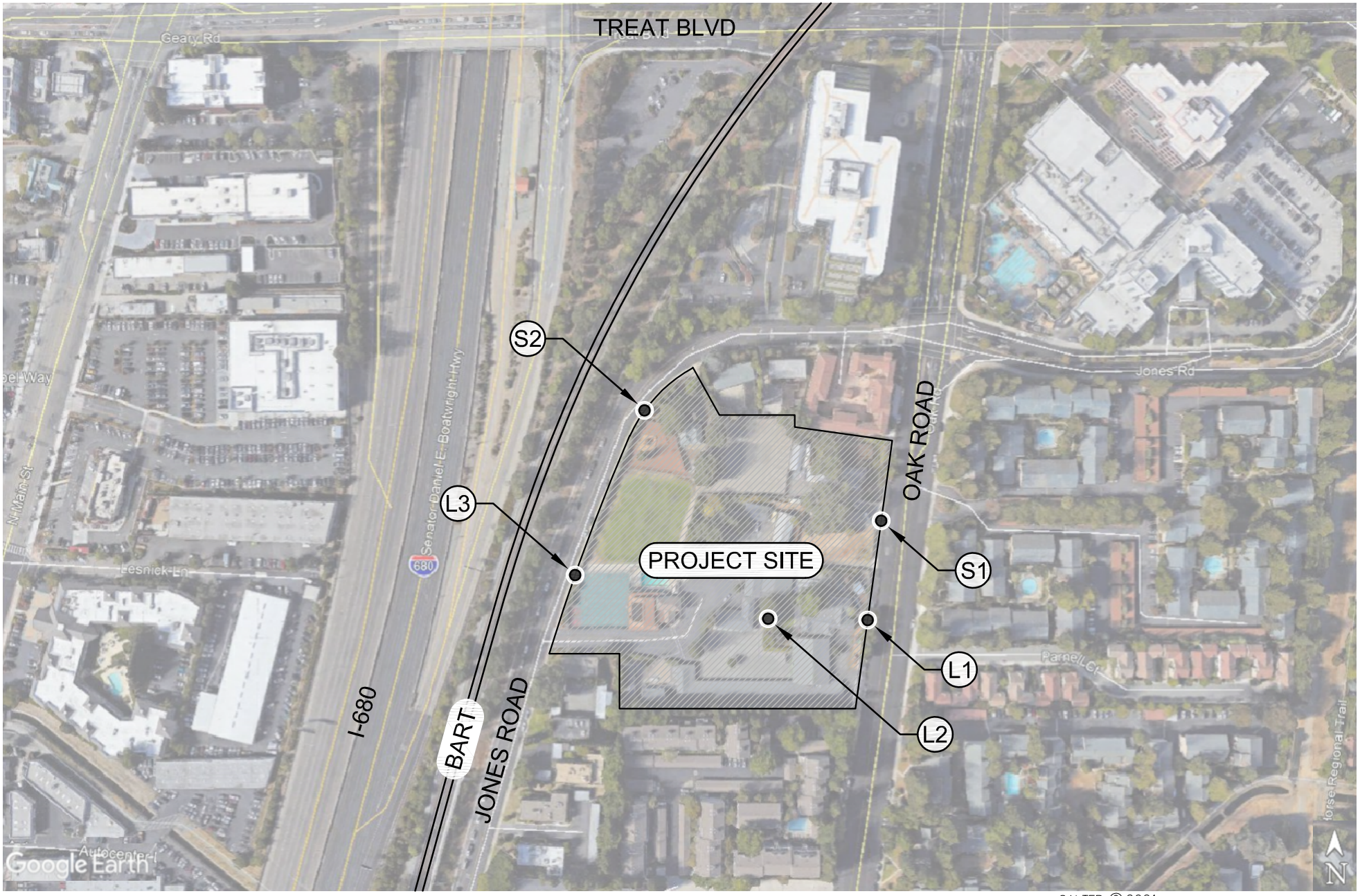

OAK ROAD
NOISE MEASUREMENT LOCATIONS

FIGURE 1

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NOTES:
1. WHERE NO STC RATING SHOWN, USE STC 28
2. STC RATINGS ARE FOR THE COMPLETE ASSEMBLY (E.G., GLASS, FRAME, AND OPERABLE SECTIONS) BASED ON TEST REPORTS FROM AN NVLAP-ACCREDITED LAB

2740 JONES ROAD
MINIMUM RECOMMENDED STC RATINGS FOR WINDOWS AND EXTERIOR DOORS (ALL FLOORS)

FIGURE 2

Salter # 20-0343

JPR/JMR
01.29.21

H.2 - Draft Environmental Noise Assessment (May 2021)

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Oak Road Townhouse Condos

Contra Costa County, California

DRAFT ENVIRONMENTAL NOISE ASSESSMENT

7 May 2021

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Salter Project 20-0343

INTRODUCTION

This report summarizes our environmental noise assessment for the Oak Road Townhouse Condos project located at 2740 Jones Road in unincorporated Walnut Creek, under the jurisdiction of Contra Costa County, California. The project consists of approximately 125 townhouse-style for sale condominium units. The three-story units are planned to occupy the site which was previously occupied by a school and is east of I-680, BART tracks, and Jones Road and west of Oak Road. Following is a summary of our findings:

- Estimated environmental noise levels, due to transportation sources, fall into the County's *normally acceptable* to *normally unacceptable* land use compatibility categories for multi-family residences. Noise reduction measures, in the form of sound-rated windows and exterior doors, will be needed to meet the County and State noise goals.
- Preliminary estimates show that windows and exterior doors with sound insulation ratings of up to STC 39 will be needed to meet the County and State criteria for interior noise due to exterior sources.
- Outdoor use space will be provided in the form of second-story balconies at some unit plans, and roof decks at units along Oak Road. A common open space is provided mid-site to meet the County's guidelines.
- Project-generated traffic will not significantly increase environmental noise in the project vicinity.
- Noise from outdoor condensing units should be evaluated during the design phase. Based on the existing noise environment, including noise from I-680 and BART, operational noise from mechanical equipment shall be limited to DNL 60 dB at adjacent receivers.
- Consistent with the General Plan, construction hours shall be limited to reduce the impact on adjacent off-site receivers.

For readers less familiar with the fundamental concepts of environmental noise, please refer to Appendix A attached.

ACOUSTIC CRITERIA

Contra Costa County General Plan (GP)

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- Policy 11-3 provides an alternative outdoor noise goal of DNL 70 dB in areas where the primary noise source is BART passbys.
- Policy 11-4 reinforces the State requirement of interior noise level of DNL 45 dB or less, due to exterior sources.
- Policy 11-5 provides a goal to reduce instantaneous noise from BART events to 50 dB in bedrooms and 55 dB in other habitable rooms.
- Policy 11-8 states "Construction activities shall be concentrated during the hours of the day that are not noise-sensitive for adjacent land uses and should be commissioned to occur during normal work hours of the day to provide relative quiet during the more sensitive evening and early morning periods."

California Building Code (CBC)

Title 24, Part 2 of the California Code of Regulations requires that new multi-family residential projects achieve an interior noise level of DNL 45 dB or less, due to exterior environmental sources.

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1 dB (Decibel) – A unit that describes the magnitude of a sound with respect to a reference sound level near the threshold of hearing. Decibels are based on a logarithmic scale and therefore cannot be added arithmetically. All sound levels in this report are A-weighted.

2 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. DNL is sometimes written as L_{dn}.

California Environmental Quality Act (CEQA)

The 2018 Amendments to the CEQA Guidelines contain a checklist intended to determine whether the project would create a noise impact on the surrounding community. The checklist items ask whether the project would:

- Generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local General Plan or Noise Ordinance, or applicable standards of other agencies?
- Generate excessive ground-borne vibration or ground-borne noise levels?
- For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

NOISE ENVIRONMENT

The noise environment at the project site is influenced by vehicle traffic on Oak Road, Jones Road, and Interstate I-680, as well as from BART trains on the adjacent tracks. To help quantify environmental noise levels, a monitor continuously measured noise levels at the site between 7 and 11 December 2020. In addition, two short-term "spot" measurements were conducted to help determine how noise levels vary with location and elevation. For reference, a COVID-19 health order took effect on 5 December 2020, which was understood to reduce the volume of traffic on the roadways.[3] Figure 1, attached, summarizes the noise measurement locations, and Table 2, below, summarizes the measured noise levels.

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[3] Consider conducting additional measurements when traffic patterns return to normal, prior to construction, to confirm estimated levels.

In addition to the average levels identified above, measured typical maximum instantaneous noise levels due to BART passbys were approximately L_{max30} 80 dB[4] at monitor location L3 (i.e., the monitoring location closest to the BART). In our analysis and recommendations section below, we have added 1 dB to account for future traffic volume increases.[5]

ANALYSIS AND RECOMMENDATIONS

Estimated future noise levels at future facades range from DNL 60 dB at interior shielded portions of the site to approximately DNL 74 dB at elevated locations nearest the BART tracks and I-680.[6] This falls into the County's *normally acceptable* to *normally unacceptable* land use compatibility categories for multi-family residences. Therefore, exterior building assemblies will need to be sound rated to reduce transportation noise to the criteria outlined above.

Exterior-to-Interior Noise (GP and CBC)

As indicated above, the interior noise criteria are DNL 45 dB in residences due to all outdoor environmental sources, and L_{max} 50 and 55 dB, due to BART, in bedrooms and other habitable rooms, respectively. Preliminary estimates show window and exterior door ratings up to STC[7] 39 will be needed, as shown in Figure 2, attached. These preliminary estimates are based on the following, and will need to be updated based on finalized floor plans, elevations, and window sizes prior to construction.

- Conceptual floor plans and elevations per the P-1 Rezoning Preliminary Final Development Plan dated 25 March 2021
- Exterior walls will be equivalent to stucco over wood sheeting with batt insulation in stud cavities and at least 1 layer of gypsum board on the interior
- Flooring in bedrooms will be carpet over pad

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4 L_{max30} (Typical Maximum Sound Level) – There is no standardized metric to quantify "typical" maximum sound levels in an environment (instead of the absolute maximum sound level for a measurement period). The metric L_{max30} comes from a paper by Rob Greene ("Max Level Intrusive Noise Limit: 1982 National Conference on Environmental and Occupational Noise"). It is based on the logarithmic average of the noisiest 30 percent of single events (e.g., train passbys, aircraft flyovers).

5 The California Department of Transportation assumes a traffic volume increase of three percent per year, which corresponds to a 1 dB increase in DNL over a ten-year period. This should be reviewed when the traffic study for the project is available, as long-term impacts to traffic patterns associated with COVID-19 are not yet known and could affect future environmental noise levels.

6 Estimates are based on noise levels measured at the site along with published levels identified in the Contra Costa County General Plan, Walnut Creek General Plan, Walnut Creek BART Transit Village Draft EIR, and Caltrans traffic counts.

7 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.

Window and door sound insulation ratings must be for the complete tested assembly, including glass and frame, and should be based on laboratory test reports of similar sized samples from an NVLAP accredited lab. For reference, typical construction grade dual-pane windows achieve sound insulation ratings of approximately STC 28. Where no rating is indicated in Figure 2, these ratings are assumed.

Ventilation systems must not compromise sound insulation of the exterior wall assemblies. Where windows will need to be closed to meet the interior noise criterion, an alternate means of providing outside air to habitable spaces should be provided. The ventilation systems will need to maintain the exterior-to-interior noise reduction of the overall facade. Details should be developed during the design phase.

Outdoor Noise (GP)

Conceptual unit plans include 2nd floor decks for some units, and roof decks at units along Oak Road. Following is a discussion comparing levels with the County's General Plan policies:

- Along Oak Road levels will exceed the County's DNL 60 dB goal. Therefore, common open space is provided towards the center of the site where transportation noise is consistent with the goal.
- Along Jones Road the measured level at the second story elevation was DNL 67 dB, which is consistent with the County's goal for outdoor locations exposed to BART noise. Therefore, noise reduction measures are not required.

Potential Noise Impacts and Mitigation Measures (CEQA)

Overall changes to the noise environment, attributable to the project, include the following:

- Project-related traffic increases (permanent)
- Potential rooftop mechanical equipment noise (permanent)
- Short-term construction noise and vibration (temporary)

The following summarizes the portion of the CEQA checklist pertaining to noise. CEQA does not define what noise level increase would be considered significant. Typically, a project is considered to have a significant impact if it would increase DNL by more than 3 dB (the minimum increase generally perceptible to most people) and cause ambient noise levels to exceed the normally acceptable guidelines in the General Plan. Where existing levels are well below the General Plan guidelines, a somewhat higher increase (i.e., 5 dB) may be tolerated before the impact is considered significant. For the purpose of this analysis, an increase exceeding 3 dB is considered significant for permanent noise sources.

Would the project result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

This analysis compares noise from the following long and short-term generators with the CEQA guidelines: project generated traffic and temporary noise from construction activities.

Project-Generated Traffic

Vehicles will enter and exit the site via driveways on Jones Road and Oak Road. A draft traffic study for the project, titled *Transportation Analysis for the Summerhill Homes Townhome Condo Site Residential Redevelopment at 2740 Jones Road in Walnut Creek, California*, by Hexagon Transportation Consultants, Inc. and dated 22 March 2021, includes existing and project-generated AM and PM peak-hour traffic volumes at four study intersections in the project vicinity. The intersections are Oak Road and Jones Road, Oak Road and Treat Boulevard, Jones Road and the project driveway, and Oak Road and the project driveway. The intersection volume data indicates that peak hour traffic volumes will increase by 3 percent of less, which corresponds with less than a 1 dB increase in the DNL. Therefore, project-generated traffic will result in a less-than-significant increase.

Mechanical Equipment

Residences are expected to include outdoor condensing units for air conditioning systems. These will be located at-grade, approximately 15 feet and farther from adjacent off-site residential property lines. Based on the noise levels measured at the site and summarized in Table 2 above, and the allowable increase of up to 3 dB, the cumulative operational noise level from outdoor condensing units shall not exceed DNL 60 dB at adjacent off-site residential receivers. Incorporating the following mitigation measure will ensure this is a less than significant impact.

Mitigation Measure 1: *Require an acoustic analysis prior to construction confirming that operational noise from outdoor mechanical equipment associated with the project is DNL 60 dB or lower at adjacent off-site residences.*

Construction Noise

Construction of the project is expected to occur over approximately a 36-month period. Noise levels from construction activities will vary, depending on the type of equipment being used, the process, and the location. The loudest phases of construction are expected to be demolition, grading/excavation, and foundations. Table 3, below, provides a list of construction equipment expected to be used in each phase and estimates the phase duration. Table 4 provides reference sound levels for construction equipment at a distance of 50 feet.

Table 3: Construction Equipment and Estimated Phase Duration

Phase	Equipment
Demolition	Concrete Saws, Excavators, Rubber-Tired Dozers, Haul Trucks
Site Preparation, Rough Grading	Rubber-Tired Dozers, Tractors, Loaders, Backhoes
Grading, Wet/Dry Utilities	Excavators, Graders, Rubber-Tired Dozers, Tractors, Loaders, Backhoes
Building Construction	Crane, Forklifts, Generator Sets, Tractors, Loaders, Backhoes, Welders
Paving	Pavers, Paving Equipment, Rollers
Architectural Coating	Air Compressors

Table 4: Typical Construction Equipment Noise Levels[8]

Equipment	Noise Level (dB) at 50 feet
Backhoe	80 dB
Bulldozer	85 dB
Compressor (air)	81 dB
Concrete Trucks	85 dB
Crane	88 dB
Excavator	81 dB
Gypcrete Pump	82 dB
Plaster Pump	82 dB
Pneumatic Tool	85 dB
Pumps	77 dB
Rebar Saw	76 dB
Trucks (traveling)	84 dB

The nearest neighboring residential budlings appear to be approximately 20 to 50 feet from the first row of planned homes. Construction-generated noise typically drops off at a rate of approximately 6 dB for each doubling of distance, therefore noise levels from individual construction activities shown in Table 4 may be up to 8 dB louder than shown in the table when working along the building edges nearest the residences. Construction noise will be lower during quieter phases, as homes are built farther from the property line, and as the nearest homes are built and effectively shield remaining construction activities from off-site receivers. Background traffic noise from I-680 and BART trains will help mask construction noise during the quieter phases.

The project shall implement the following noise reduction measures to help reduce the impact of construction on neighbors:

[8] Based on the Federal Highway Administration document "FHWA Highway Construction Noise Handbook" Tables 7.3 and 9.9, Federal Transit Administration document "Transit Noise and Vibration Impact Assessment" Table 12-1, US EPA document, "Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances" (1971), and data from other Salter construction noise monitoring projects.

1. Construction activities shall be limited to between 7:00 AM and 6:00 PM Monday through Saturday, unless permission is granted with a development permit or other planning approval. Construction will not occur on Sundays and Federal holidays.
2. Construction activity should be conducted to minimize the noise impact at adjacent off-site receivers wherever feasible.
3. Equip all internal combustion engines-driven equipment intake and exhaust mufflers that are in good conditions and appropriate for the equipment.
4. Unnecessary idling of internal combustion engines should be strictly prohibited.
5. Locate stationary noise-generating equipment, such as air compressors or portable power generators, as far as possible from sensitive receptors as feasible.
6. Utilize “quiet” air compressors and other stationary equipment where technology exists.
7. Construction staging areas, including truck loading and unloading operations, shall be scheduled and located so they minimize the noise impact on adjacent off-site residences.
8. Control noise from construction workers' radios to a point where they are not audible at existing residences bordering the project site.
9. Designate a "disturbance coordinator" who would be responsible for responding to any complaints about construction noise. The disturbance coordinator will determine the cause of the noise complaint (e.g., bad muffler, etc.) and will require that reasonable measures be implemented to correct the problem.
10. Conspicuously post a telephone number for the disturbance coordinator at the construction site.

Would the project result in generation of excessive ground-borne vibration or ground-borne noise levels?

Construction activities may generate temporary ground-borne vibration. The buildings will all be above grade with poured slab on grade construction, and the nearest adjacent off-site receivers are residences located to the north and south approximately 20 feet and farther from the planned homes. The adjacent residences appear to be of normal conventional construction, and we are not aware of specific vibration-sensitive uses or sensitivity of these buildings.

As indicated above, construction of the project will include demolition of existing buildings, site preparation and utilities, foundations, and new building framing and finishing, and is expected to use the equipment included in Table 3 above. Published vibration levels for common construction equipment at a reference distance of 25 feet, and corresponding estimated levels at the approximate distance of the nearest adjacent residential buildings, are summarized in Table 5 below.[9]

[9] Reference and estimated levels are based on Table 18 and Equation 12 of the Transportation- and Construction-Induced Vibration Guidance Manual, California Department of Transportation, June 2004.

Table 2: Measured Noise Levels

Equipment	Reference PPV (in/sec) at 25'	Estimated PPV (in/sec) at 20'
Hoe Ram	0.089	0.114
Large Bulldozer	0.089	0.114
Loaded Trucks	0.076	0.097
Jackhammer	0.035	0.045
Small Bulldozer	0.003	0.004

The document titled Transportation- and Construction-induced Vibration Guidance Manual, by the California Department of Transportation, identifies 0.5 PPV (peak particle velocity in inches per second) as the threshold for continuous and frequent intermittent construction vibration to avoid damage at residential buildings. Construction vibration levels may vary, depending on factors such as soil conditions, construction methods, equipment location, etc., and may be perceptible on adjacent sites. However, the estimated vibration levels in Table 5 above, at the approximate distances of the nearest adjacent off-site residential buildings, are all well below the 0.5 PPV threshold.

For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

The project site is located over five miles from local airports including Buchanan Field and the Byron Airport.

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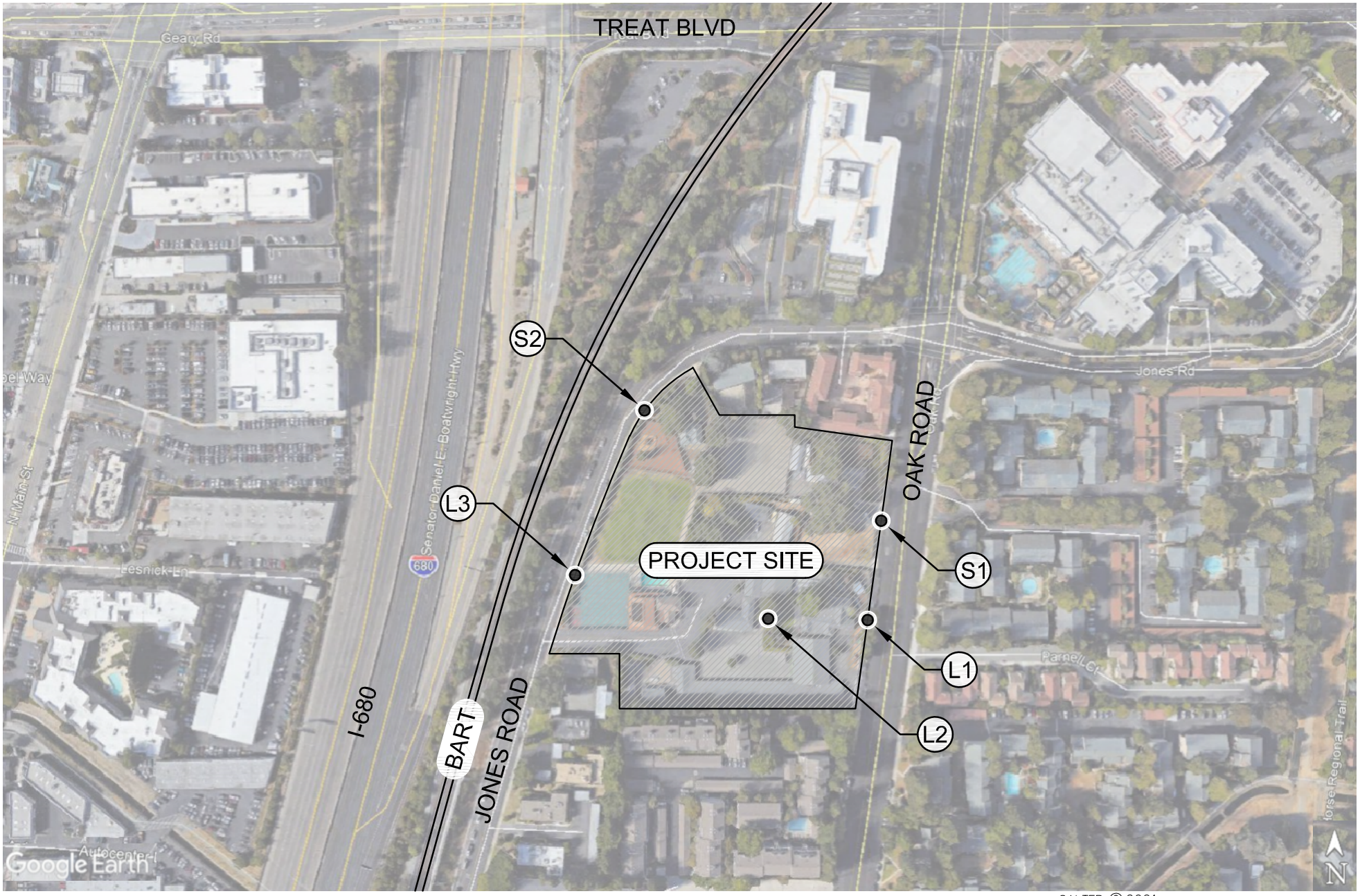

OAK ROAD
NOISE MEASUREMENT LOCATIONS

FIGURE 1

Salter #	JPR/JMR
20-0343	01.29.21

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NOTES:
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2740 JONES ROAD
MINIMUM RECOMMENDED STC RATINGS FOR WINDOWS AND EXTERIOR DOORS (ALL FLOORS)

FIGURE 2

Salter # 20-0343

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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 in Figure A-1.

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 exceeded 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 "L_{eq}" is now widely used. The term "L_{eq}" 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 L_{eq} is the average A-weighted sound level in a stated time period. The L_{eq} 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 L_{dn} (Day/Night Average Sound Level), which represents the 24-hour average sound level with a penalty for noise occurring at night. The L_{dn} 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 L_{dn}.

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

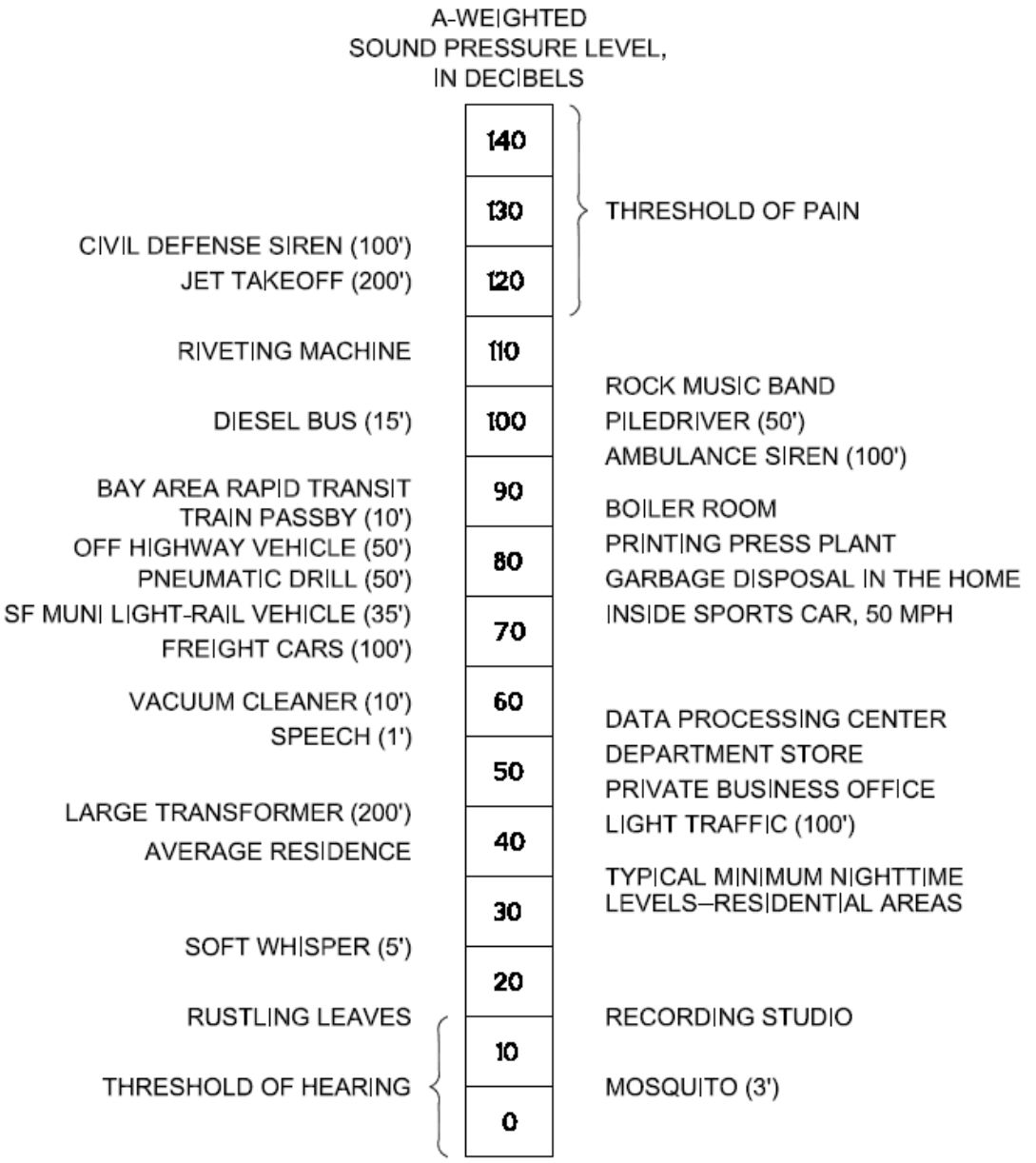
- Subjective effects of annoyance, nuisance, dissatisfaction
- Interference with activities such as speech, sleep, and learning
- Physiological effects such as startle, hearing loss

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.


A-WEIGHTED
SOUND PRESSURE LEVEL,
IN DECIBELS
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
THRESHOLD OF PAIN
CIVIL DEFENSE SIREN (100')
JET TAKEOFF (200')
RIVETING MACHINE
DIESEL BUS (15')
ROCK MUSIC BAND
PILEDRIVER (50')
AMBULANCE SIREN (100')
BAY AREA RAPID TRANSIT
TRAIN PASSBY (10')
OFF HIGHWAY VEHICLE (50')
PNEUMATIC DRILL (50')
BOILER ROOM
PRINTING PRESS PLANT
GARBAGE DISPOSAL IN THE HOME
SF MUNI LIGHT-RAIL VEHICLE (35')
FREIGHT CARS (100')
INSIDE SPORTS CAR, 50 MPH
VACUUM CLEANER (10')
SPEECH (1')
DATA PROCESSING CENTER
DEPARTMENT STORE
PRIVATE BUSINESS OFFICE
LARGE TRANSFORMER (200')
AVERAGE RESIDENCE
LIGHT TRAFFIC (100')
TYPICAL MINIMUM NIGHTTIME
LEVELS–RESIDENTIAL AREAS
SOFT WHISPER (5')
RUSTLING LEAVES
RECORDING STUDIO
THRESHOLD OF HEARING
MOSQUITO (3')
(100') = DISTANCE IN FEET
BETWEEN SOURCE
AND LISTENER
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FOR ACOUSTICAL DESIGN INFORMATION ONLY
TYPICAL SOUND LEVELS
MEASURED IN THE
ENVIRONMENT AND INDUSTRY
FIGURE
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