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June 23, 2023 12919

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Subject: Otay Ranch Town Center Redevelopment Project Acoustical Assessment

Dear Mr. Pauker:

Dudek has completed this site-specific acoustical assessment for the Otay Ranch Town Center Redevelopment (TCR or "Project") located in the City of Chula Vista, California (City).

The project proposes a General Plan Amendment (GPA), Otay Ranch General Development Plan Amendment (Otay Ranch GDPA), Sectional Planning Area (SPA) Plan Amendment, and Planned Community (PC) Rezone. These amendments for FC-1 would allow development of 840 residential units (10% of which will be designated low-income), while reducing the allowed commercial square footage from 960,000 square feet to 816,000 square feet. Development of the residential uses would be centered within the northwest portion of FC-1 and would have a density range of 18 to 56 units per acre. This area would have a new land use and zoning designation of Mixed-Use/Residential (MU/R). A total of three buildings are proposed; two residential buildings, and one mixed-use/residential building.

The proposed amendment would also change the name of the existing SPA from Freeway Commercial SPA to Otay Ranch Town Center SPA. In addition, the proposed amendment also includes 2.16 acres of public plaza/park space. The existing Town Center would continue to operate; however, demolition of 37,200 square feet of existing commercial space is proposed, and the addition of 146,000 square feet of new commercial uses would be constructed.

The purpose of this acoustical assessment is to support a fourth Addendum to the Final Environmental Impact Report for the Otay Ranch Freeway Commercial SPA Plan Planning Area 12 (FEIR), which already features noise-related mitigation measures (reproduced for reader convenience) as follows:

5.5-1. Prior to the approval of site development plans, the Applicant shall submit a supplemental noise analysis acceptable to the Director of Planning and Building demonstrating:

- Noise levels at the exterior use areas of the proposed hotels would not exceed 65 decibels (dBA) Community Noise Level Equivalent (CNEL).

- Interior noise levels in habitable rooms of the proposed hotels would not exceed 45 dBA CNEL.
- Noise levels generated on the project site, being the combined noise levels of HVAC equipment, truck traffic, loading and unloading, and trash collection, where these may occur simultaneously, would not exceed the applicable limits of the noise ordinance.

In the context of the proposed project, this acoustical assessment presumes that the exterior use areas of proposed residential units would be subject to the same exterior noise threshold of 65 dBA CNEL; and, the inhabited interiors would need to comply with a background sound level (due to exterior-to-interior intrusion of traffic and other outdoor noise) of 45 dBA CNEL. Both of these standards are also consistent with City policies.

1 Introduction

1.1 Acoustical Fundamentals

Although the terms may be used interchangeably in the right context, "sound" is defined as any gas or fluid pressure variation detected by the human ear, and "noise" is unwanted sound. The preferred unit for measuring sound is the decibel (dB), which by way of expressing the ratio of sound pressures to a reference value logarithmically enables a wide range of audible sound to be evaluated and discussed conveniently. On the low end of this range, zero dB is not the absence of sound energy, but instead corresponds approximately to the threshold of average healthy human hearing; and, on the upper end, 120–140 dB corresponds to an average person's threshold of pain.

The human ear is not equally responsive to all frequencies of the audible sound spectrum. An electronic filter is normally used when taking noise measurements that de-emphasizes certain frequencies in a manner that mimics the human ear's response to sound; this method is referred to as A-weighting. Sound levels expressed under the A-weighted system are sometimes designated dBA. All sound levels discussed in this report are A-weighted.

The equivalent continuous sound level (L_{eq}) is a single dB value which, if held constant during the specified time period, would represent the same total acoustical energy of a fluctuating noise level over that same time period. L_{eq} values are commonly expressed for periods of one hour, but longer or shorter time periods may be specified.

The noise descriptor Community Noise Equivalent Level (CNEL) is typically used when describing community noise. CNEL energy-averages the varying sound levels occurring over a 24-hour period, but imparts a 10-decibel penalty to sound occurring between the hours of 10:00 p.m.–7:00 a.m. and a 5-dB penalty for noise between the hours of 7:00–10:00 p.m. as a means to account for increased noise sensitivity during nighttime and evening hours, respectively.

Additional common acoustical descriptors and terms that may assist the reader in framing the evaluation and discussion of noise in this report are provided in Appendix A.

Under controlled conditions in an acoustics laboratory, the trained, healthy human ear is able to discern changes in sound levels of 1 dBA when exposed to steady, single-frequency signals in the mid-frequency range. Outside such controlled conditions, the trained ear can detect changes of 2 dBA in normal environmental noise. It is widely

accepted that the average healthy ear, however, can barely perceive noise level changes of 3 dBA. A change of 5 dBA is readily perceptible, and a change of 10 dBA is perceived as twice (if a gain) or half (if a loss) as loud. A doubling of sound energy results in a 3-dBA increase in sound, which means that a doubling of sound energy (e.g., doubling the volume of traffic on a road) would result in a barely perceptible change in sound level.

Sound propagation (i.e., the traverse of sound from a noise emission source position to a receiver location) is influenced by multiple factors that include geometric spreading, ground absorption, atmospheric effects, and occlusion by natural terrain and/or features of the built environment.

Sound levels attenuate (or diminish) geometrically at a rate of approximately 6 dBA per doubling of distance from an outdoor point-type source due to the spherical spreading of sound energy with increasing distance travelled. The effects of atmospheric conditions such as humidity, temperature, and wind gradients are typically distance-dependent and can also temporarily either increase or decrease sound levels measured or perceived at a receptor location. In general, the greater the distance the receiver is from the source of sound emission, the greater the potential for variation in sound levels at the receptor due to these atmospheric effects. Additional attenuation can result from sound path occlusion and diffraction due to intervention of natural (ridgelines, dense forests, etc.) and built features (such as solid walls, buildings and other structures).

1.2 Vibration Fundamentals

Groundborne vibration is fluctuating or oscillatory motion transmitted through the ground mass (i.e., soils, clays, and rock strata). The strength of groundborne vibration attenuates rapidly over distance. Some soil types transmit vibration quite efficiently; other types (primarily sandy soils) do not. Several basic measurement units are commonly used to describe the intensity of ground vibration. The descriptors used by the Federal Transit Administration (FTA) are peak particle velocity (PPV), in units of inches per second (ips), and velocity decibel (VdB) that is based on a root-mean square (RMS) of the vibration signal magnitude. The calculation to determine PPV at a given distance is as follows:

$$PPV_{rcvr} = PPV_{ref}*(25/D)^{n}$$

Where:

PPV_{rcvr} is the peak particle velocity in inches per second of the equipment adjusted for distance (i.e., at the receiver); PPV_{ref} is the reference vibration level in inches per second at 25 feet; D = the distance from the equipment to the receiver; n is the Wiss exponent, for which a value of 1.5 would be consistent with FTA guidance. The above PPV_{rcvr} value can be converted to an RMS vibration velocity level as follows, where the crest factor (CF) is assumed to be a value of 4 per FTA guidance (FTA 2018):

$$VdB_{rcvr} = 20*LOG(PPV_{rcvr}/(CF*0.000001))$$

1.3 City of Chula Vista Standards

The City of Chula Vista General Plan Noise Element indicates that the maximum allowable exterior noise level for new residential developments is a Community Noise Equivalent Level (CNEL) of 65 A-weighted decibels (dBA) (City of Chula Vista 2005). Consistent with the California Building Code (CBC, Part 2, Title 24, California Code of Regulations) that stipulates "interior noise levels attributable to exterior sources shall not exceed 45 dB in any habitable room," the City of Chula Vista also requires that interior noise levels not exceed a CNEL of 45 dB within residences. Typically, with the windows open, building shells provide approximately 12-18 dB of noise reduction (OPR 2017). Therefore, rooms exposed to an exterior CNEL greater than 60 dB could result in an interior CNEL greater than 45 dB.

Section 19.68.030.A (Table III) of the City's Noise Ordinance sets exterior noise limits with respect to non-transportation sources from the Project as received by land use category type. For the multi-family residential buildings to the south of the Project, these limits are 60 dBA hourly L_{eq} during daytime hours (7:00 a.m. to 10:00 p.m.) and 50 dBA hourly L_{eq} during nighttime hours (10:00 p.m. to 7:00 a.m.).

2 Existing Conditions

2.1 Environmental Setting

FC-1 is 87.25 acres and is currently developed with commercial uses known as the Otay Ranch Town Center (Town Center). To date, 669,700 square feet of commercial area has been completed at the Town Center. Existing land uses at the Otay Ranch Town Center are primarily commercial in nature including retail, food and beverage, entertainment, and community-serving land uses (Figure 1 – Project Location).

2.2 Baseline Measurement Survey

An SPL measurement survey was conducted near the proposed project site on August 22, 2022, to quantify and characterize the representative existing outdoor ambient sound level. Table 3 provides the location, date, and time period at which these baseline noise level measurements were performed by an attending Dudek field investigator using a SoftdB-branded Model "Piccolo II" sound level meter (SLM) equipped with a 0.5 inch, pre-polarized condenser microphone with pre-amplifier. The SLM meets the current American National Standards Institute (ANSI) standard for a Type 2 sound level meter. The calibration status of the SLM was checked using a field calibrator before and after the measurements, and the measurements were conducted with the microphone positioned approximately 5 feet above the ground.

The SPL measurement locations are depicted as ST1, ST2, and ST3 in Figure 2 Baseline Noise Level Measurement Survey Locations. The measured L_{eq}, L_{max}, and L_{90} noise levels are provided in Table 1. The primary observed and perceived noise sources during the approximate 15-minute SPL measurement consisted of intermittent roadway traffic along the nearby roadways (local streets and State Route 125 [SR125]), distant roadway and aviation traffic, distant conversations, and occasional dog barks, and birdsong. Beyond the summarized information presented in

Table 1, detailed noise measurement data and photographs of the survey locations are included in Appendix B, Baseline Noise Measurement Field Data.

Table 1. Measured Baseline Outdoor Ambient Noise Levels

Site	Location (Address)	Date (yyyy-mm-dd) and Start Time (hh:mm)	L_{eq} (dBA)	L_{max} (dBA)	L_{90} (dBA)
ST1	Intersection of Wellbrook St. and Bedford Ave. (1585 Caminito Zaragosa)	2022-08-22 and 04:33 PM	56.9	82.3	49.6
ST2	Intersection of Impressionist Dr. and Canvas Dr. (1484 Canvas Drive)	2022-08-22 and 05:02PM	55.4	74.5	47.3
ST3	Near Town Center Dog Park, adjacent to SR125	2022-08-22 and 04:05 PM	60.9	71.0	55.3

Source: Appendix B.
Notes: L_{eq} = equivalent continuous sound level (time-averaged sound level); L_{max} = maximum sound level during the measurement interval; L_{90} = sound level exceeded 90% of the measurement interval; dBA = A-weighted decibels; ST = short-term noise measurement locations.

3 Methodology

3.1 Estimating Roadway Traffic Noise

The exterior noise analysis made use of the Federal Highway Administration (FHWA) Traffic Noise Model (TNM, version 2.5) (FHWA 2004) to predict future traffic noise exposure levels at multiple representative façade and balcony positions associated with the three-building project. Input data for the TNM modeling included the following: peak hour (PH) traffic volumes, vehicle speeds, and proportions of vehicle types. Peak hour traffic relied upon information displayed in Figure 5-2 and Figure 8-6 from the "Otay Ranch Town Center Reimagined Local Mobility Analysis" dated March 2nd (LLG 2022). Existing Traffic volumes for the SR125 freeway were based on the SANDAG Transportation Forecast Information Center Series ABM2+/2021 RP (SANDAG 2022).

Calculation of CNEL values from predicted hourly L_{eq} resulting from application of the TNM model using peak hour input data assumes the peak hour traffic volume is approximately equal to 10% of the average daily traffic (ADT). This relationship, based on typical traffic patterns, results in a CNEL value that is both comparable to the peak hour traffic L_{eq} estimate and representative of traffic noise resulting from typical daytime, evening and nighttime traffic distribution.

3.2 Estimating Construction Noise

Airborne construction noise and groundborne construction vibration are temporary phenomena, with emission levels varying from hour to hour and day to day, depending on the equipment in use, the operations performed, and

the distance between the source and receptor. Equipment that would be in use during construction would include, in part, an auger drill rig, man-lifts, excavators, backhoes, graders, loaders, cranes, flat-bed trucks, welders, pavers, rollers, and air compressors. The typical maximum noise levels at a distance of 50 feet from these various pieces of construction equipment and activities anticipated for use on the proposed project site are presented in Table 2. Note that the equipment noise levels presented in Table 2 are maximum noise levels. Usually, construction equipment operates in alternating cycles of full power and low power, producing average noise levels over time that are less than the maximum noise level. The average sound level of construction activity also depends on the amount of time that the equipment operates and the intensity of construction activities during that time.

Table 2. Typical Construction Equipment Maximum Noise Levels

Equipment Type(s)	Maximum Noise Level (L_{max}, dBA at 50 Feet)
Grader	85
Crane; Concrete Pump Truck; Excavator	81
Roller	80
Front End Loader	79
Backhoe; Compressor (air)	78
Paver	77
Man Lift	75
Flat Bed Truck	74
Welder / Torch	73

Source: FHWA 2006.
Note: L_{max} = maximum sound level; dBA = A-weighted decibels.

Aggregate noise emission from proposed project construction activities for each of the three anticipated buildings (MU/R-1, MU/R-2, MU/R-3), broken down by sequential phase, was predicted at an evaluation distance with respect to the nearest existing noise-sensitive receptor: the neighboring residence to the west of the proposed project. Because there are three anticipated buildings associated with the proposed project, this evaluation distance varies with the building (i.e., its construction site) geographic centroid position; hence, Table 3 presents a range of distance values with the smallest representing that of the closest proposed project mixed-use building.

Table 3. Estimated Distances between Construction Activities and the Noise-sensitive Receptor Positions

Construction Phase	Equipment Type(s) Involved	Distance to Fixed Noise-Sensitive Receptor Position from Construction Site Centroid (Feet)
Demolition	concrete/industrial saws, rubber tired dozers, loaders, excavators	555 to 1,050
Site Preparation	rubber tired dozers, tractors/loaders/backhoes	510 to 920
Underground Utilities	tractors/loaders/backhoes	505 to 900

Table 3. Estimated Distances between Construction Activities and the Noise-sensitive Receptor Positions

Construction Phase	Equipment Type(s) Involved	Distance to Fixed Noise-Sensitive Receptor Position from Construction Site Centroid (Feet)
Grading	excavators, graders, rubber tried dozers, tractors/loaders/backhoes	510 to 920
Building Construction	cranes, forklifts, generator sets, tractors/loaders/backhoes, welders	505 to 900
Paving	cement and mortar mixers, pavers, paving equipment, rollers, tractors/loaders/backhoes	460 to 870
Architectural Coating	air compressors	505 to 900

3.3 Estimating Construction Vibration

Section 1.2 provides the groundborne vibration propagation expression for estimating vibration velocity (in inches per second [ips] PPV) level at a receiving offsite structure. The typical vibration source amplitudes at a distance of 25 feet from the various pieces of construction equipment and activities anticipated for use on the proposed project site are presented in Table 4.

Table 4. Vibration Source Amplitudes for Construction Equipment

Equipment Type(s)	Reference PPV at 25 ft. (in/sec)
Vibratory roller	0.210
Large bulldozer	0.089
Loaded trucks	0.076
Small bulldozer	0.003

Source: Caltrans 2020a Table 18.
Note: PPV = Peak Particle Velocity.

3.4 Estimating Onsite Stationary Source Noise Propagation

Prediction of post-construction operation noise during nighttime hours attributed to operating onsite Project rooftop heating, ventilating, and air-conditioning (HVAC) equipment utilized Datakustik CadnaA that has algorithms based on the International Organization of Standardization (ISO) Standard 9613-2, "Attenuation of Sound During Propagation Outdoors, Part 2: General Method of Calculation" (ISO 1996). Source sound levels for the proposed Project and parameters utilized by the CadnaA outdoor sound propagation software are as follows:

- General Requirements B.1.b from the Master Precise Plan (Atlantis Group 2022) suggest proposed Project mechanical equipment would be located on building rooftops and "screened from view" with likely wells between or behind sloped gables or parapets; hence, the model assumes quantities of rooftop-mounted air-handling units (AHU), air-cooled chillers or condensing units (either termed "ACC" herein, meaning the outdoor-exposed components of air-conditioning systems), and ventilation fans (e.g., for the parking garages and commercial uses) are clustered within these visually bounded spaces and thus distributed across the roof of each building. While mechanical equipment schedules and roof plans showing locations of expected outdoor-exposed equipment for each building are not available at this time, a number of reasonable assumptions have been applied to estimate minimum outside air requirements, cooling load (i.e., refrigeration tonnage), and other parameters that in turn enable estimates of aggregate mechanical equipment noise emission from each mixed-used building. With more detail of the estimate calculations appearing in Appendix C, in summary these assumptions are as follows:
    - Each occupied 1,000 square feet of residential use is assumed to require 250 cubic feet per minute (CFM) of outside air (i.e., the introduction of "fresh" air for interior comfort); and, each 1,000 square feet of retail space is assumed to need 300 CFM (Loren Cook 1999).
    - Parking garages that may be wrapped by surrounding residential uses would be assumed to need mechanical ventilation on the order of 0.75 CFM per gross square foot (IMC 2015).
    - Residential units are assumed to require approximately one (1) ton of refrigeration per 400 square feet of inhabited space; and, retail (conservatively assumed to be restaurants or like uses) would need one ton per 125 square feet (Loren Cook 1999).

  Although actual proposed project building design parameters may be different from these above assumptions, they are meant to conservatively help estimate the sound magnitudes of major noise-producing equipment and facilitate the assessment of onsite stationary-source operations to the neighboring offsite community.
- Acoustical ground absorption coefficient is estimated to be 0.50, which represents a blend of hard reflective surfaces (e.g., parking area pavement, rooftop surface) and absorptive ground cover (e.g., grassy landscaping and natural terrain).
- Acoustical reflection order is set at one (1), to account for one sound path reflection when contact is made with a modeled building surface.
- Climate conditions are 50 degrees Fahrenheit, 70% relative humidity.
- Although the topography of existing terrain surrounding the proposed project has been conservatively ignored for purposes of this acoustical assessment, the proposed project mixed-use buildings have all been rendered as four-story structures.

4 Compliance Criteria

In light of the applicable City general plan policies and noise ordinance regulations summarized in Section 1.3, this analysis uses the following standards to evaluate proposed project compliance and potential adverse effects to the surrounding community.

- Construction noise – although the City lacks construction noise limits, consistent with the FEIR this analysis applies a threshold of 70 dBA CNEL for temporary construction noise.

- Onsite roadway traffic noise – for purposes for this analysis, a direct roadway noise impact would be considered significant if predicted noise levels are greater than 65 dBA CNEL at receiving exterior uses of future residential units (e.g., balconies).
- Offsite roadway traffic noise – would be considered significant if increases in roadway traffic noise levels attributed to the proposed project were greater than 3 dBA CNEL at an existing noise-sensitive land use.
- Off-site project-attributed stationary noise – predicted noise exposure levels attributed to onsite proposed Project outdoor-exposed HVAC systems as received by neighboring community multi-family residential land uses at nighttime would need to be less than the City's standard of 50 dBA hourly L_{eq}. The more stringent nighttime threshold of 50 dBA hourly L_{eq} is applied rather than the daytime threshold of 60 dBA hourly L_{eq} to assess impacts for continuous noise sources.
- Construction vibration – although the County has no groundborne vibration limits specified in its Noise Ordinance, and the proposed project is considered exempt from building and zoning codes, for informational purposes this analysis applies guidance from Caltrans that indicates a vibration velocity level of 0.2 ips PPV received at a structure would be considered annoying by occupants within (Caltrans 2020). As for the receiving structure itself, aforementioned Caltrans guidance from Section 2.2 recommends that a vibration level of 0.3 ips PPV would represent the threshold for building damage risk to "older residential structures" such as those apparent on the offsite northern neighboring property.

5 Exterior Noise and Vibration Analysis Results

5.1 Off-Site Traffic Noise Exposure

The proposed project would result in the creation of additional vehicle trips on local arterial roadways (i.e., Town Center Drive and Olympic Parkway), which could result in increased traffic noise levels at adjacent noise-sensitive land uses. Appendix D, Traffic Noise Modeling Input and Output, contains a spreadsheet with traffic volume data (average daily traffic) for Town Center Drive and California Street, based on the Otay Ranch Town Center Reimagined Local Mobility Analysis (LLG 2022) and SANDAG Transportation Forecast Information Center Series ABM2+/2021 RP (SANDAG 2022) used for the proposed project. Potential noise effects from vehicular traffic were assessed using the Federal Highway Administration's Traffic Noise Model (TNM) version 2.5 (FHWA 2004). Information used in the model included the roadway geometry, posted traffic speeds, and traffic volumes for the following scenarios: existing (year 2020) and existing plus project.

The City's Noise Element establishes a policy for exterior sensitive areas to be protected from high noise levels. The Noise Element sets 65 dBA CNEL for the outdoor areas and 45 dBA CNEL for interior areas as the normally acceptable levels. For the purposes of this noise analysis, such impacts are considered significant when they cause an increase of 3 dB from existing noise levels. An increase or decrease in noise level of at least 3 dB is required before any noticeable change in community response would be expected (Caltrans 2013). According to acoustical principles, the increase in traffic noise level relates directly to the increase in volumes by the following expression: $10*LOG(V_f/V_e)$, where V_f is the future traffic volume, V_e is the existing traffic volume, and vehicle speeds and proportion of vehicle types are essentially unchanged. The project would have to roughly double the traffic volumes on local roadways to increase traffic by 3 dBA.

Traffic noise levels were also modeled at representative offsite noise-sensitive receivers ST1, ST2, and ST3 as shown in Figure 2. The receivers were modeled to be 5 feet above the local ground elevation. The noise model results are summarized in Table 5.

Table 5. Roadway Traffic Noise Modeling Results

Modeled Receiver Tag	Existing (2020) Noise Level (dBA CNEL)	Existing (2020) Plus Project Noise Level (dBA CNEL)	Maximum Project-Related Noise Level Increase (dB)
ST1	68.2	68.2	< 0.1
ST2	68.8	68.8	< 0.1
ST3	60.9	60.9	< 0.1

Notes: dBA = A-weighted decibel; CNEL = Community Noise Equivalent Level; dB = decibel.

Table 4 shows that at all three listed representative receivers, the addition of proposed project traffic to the roadway network would result in a CNEL increase of less than 3 dB, which is below the discernible level of change for the average healthy human ear. Thus, a less-than-significant impact is expected for proposed project-related off-site traffic noise increases affecting existing residences in the vicinity.

5.2 Future Roadway Noise Exposures

Detailed site plan information provided by the Applicant was utilized to help properly depict roadway segments (i.e., Birch Road, Olympic Parkway, and Town Center Drive) and the exterior proposed Project facades, balconies, and patios. Representative consideration of proposed topography was also included in the traffic noise prediction model setup. For instance, the SR125 's grade sits approximately 15 feet below the grade of the project boundary. Figure 3 shows a plan view of the proposed Project tagged with callouts pointing to a large onsite open area and geographic locations of representative receivers along the street-facing facades of the planned three (3) Project buildings intended for residential occupation. Figure 4 displays an isometric view of the TNM model analysis space, showing all three (3) Project buildings and the proximity of the modeled roadway segments.

Table 6 presents the predicted exterior noise levels at the representative receptor locations appearing in Figures 3 and 4. Note that each of the three (3) residential building receptor locations includes four elevation positions that correspond with the building level or "floor" as identified in Table 6. Bold values are those that exceed 60 dBA CNEL, which would trigger the need for acoustical analysis as presented herein, and bold italicized values indicate predictions that exceed 65 dBA CNEL. Detailed input and output information from the TNM prediction model that supports these Table 6 values appear in Appendix D.

Table 6. Predicted Exterior Noise Levels due to nearby Future Roadway Traffic

Building	Floor	Modeled Receiver Location (see Figure 3)		
		1	2	3
1	1st	54.3	59.8	N/A
1	2nd	58.4	**64.3**	N/A
1	3rd	**60.0**	**65.0**	N/A

Table 6. Predicted Exterior Noise Levels due to nearby Future Roadway Traffic

Building	Floor	Modeled Receiver Location (see Figure 3)		
		1	2	3
1	4th	**60.4**	***65.8***	N/A
2	1st	51.3	N/A	N/A
2	2nd	55.6	N/A	N/A
2	3rd	57.7	N/A	N/A
2	4th	*58.8*	N/A	N/A
3	1st	*40.4*	51.6	51.9
3	2nd	44.2	55.5	54.9
3	3rd	46.1	59.5	56.9
3	4th	*47.9*	**60.2**	57.8
Open Space (OS) – 1 (Residential Courtyard)		35.8		

N/A = not available (position not modeled)

Predicted exterior sound levels presented in Table 5 that exceed 65 dBA CNEL proximate to a patio, balcony, or other usable outdoor space (e.g., open space) would need localized sound abatement to yield an outdoor level compliant with the City's 65 dBA CNEL standard. The prediction of traffic noise levels, with dominant acoustical contribution from the SR125 at Project buildout, as presented by the values in Table 6 is generally consistent with what would be expected from a high volume roadway at such distances, with exterior noise levels at the building facades increasing with floor height due to more direct traffic noise pathways to such receiver positions. The prediction of exterior noise levels at the western façade of Building MU/R-1 that exceed 65 dBA CNEL (due largely to exposure to SR125 traffic volumes and vehicle speeds) is also consistent with earlier traffic noise analyses from the EIR and previous Addenda. Consistent with Otay Ranch GDP policies, and as described in an earlier EIR Addendum, balconies planned on these residential units that are counted toward any open space requirements would incorporate appropriate sound attenuating project features around the perimeter of the balconies. An example means to provide this balcony sound abatement is presented in Section 7.1. As a result, these outdoor areas would not exceed the 65 dB CNEL threshold.

5.3 Construction Noise Emission

A Microsoft Excel–based noise prediction model emulating and using reference data from the Federal Highway Administration Roadway Construction Noise Model (RCNM) was used to estimate construction noise levels at the nearest occupied noise-sensitive land use. (Although the RCNM was funded and promulgated by the Federal Highway Administration, it is often used for non-roadway projects, because the same types of construction equipment used for roadway projects are often used for other types of construction.) Input variables for the predictive modeling consist of the equipment type, the duty cycle for each piece of equipment (e.g., percentage of time within a specific time period, such as an hour, when the equipment is expected to operate at full power or capacity and thus make noise at a level comparable to what is presented in Table 2), and the distance from the noise-sensitive receiver. The predictive model also considers how many hours that equipment may be on site and operating (or idling) within an established work shift. Conservatively, no topographical features were assumed in the modeling. The RCNM has default duty-cycle values (i.e., acoustical usage factor [AUF]) for the various pieces of

equipment, which were derived from an extensive study of typical construction activity patterns. Those default duty-cycle values were used for this noise analysis, which is detailed in Appendix E, Construction Noise Modeling Input and Output, and produce the predicted results displayed in Table 7.

Table 7. Predicted Construction Noise Levels per Activity Phase

Construction Phase	8-Hour L_{eq} at Nearest Noise-Sensitive Receptor
Demolition	65.5
Site Preparation	63.2
Underground Utilities	59.9
Grading	64.7
Building Construction	61.3
Paving	62.5
Architectural Coating	51.5

Source: Appendix E.

Notes: L_{eq} = equivalent noise level; dBA = A-weighted decibels.

As presented in Table 7, all proposed project construction activity noise levels would be less than the threshold of 70 dBA CNEL for temporary construction noise consistent with the FEIR, with most estimated to range between 60 and 65 dBA. However, under certain conditions construction noise may temporarily increase outdoor ambient levels above the daytime SPL measurements appearing in Table 1.

5.4 Construction Vibration

Paving at the MU/R-1 building site would appear to occur as close as 450 feet to the eastern façade of the western residence across from SR125. The roller exhibits the highest vibratory magnitude amongst the equipment involved in paving activities. At this distance, and using a reference groundborne PPV of 0.21 ips for the roller at a distance of 25 feet, the estimated PPV at the receiving building façade can be estimated as follows:

$$PPV_{rcvr} = 0.21*(25/450)^{1.5} = 0.003 \text{ ips}$$
$$VdB_{rcvr} = 20*LOG(0.003/(4*0.000001)) = 57$$

The predicted groundborne vibration velocity level is below the Caltrans guidance-based 0.3 ips PPV threshold for avoiding building damage to older residential structures.

For estimating potential building occupant annoyance, application of -3 VdB coupling loss on the above-estimated 57 VdB for the RMS signal would—by way of reverse-calculation of PPV from the reduced VdB—reduce the PPV as potentially perceived by building occupant to approximately 0.002 ips and thus less than the Caltrans-based guidance standard of 0.2 ips PPV for annoyance.

Subsequent onsite construction activities would involve greater quantities of equipment, but would be less vibratory than a roller and/or their distances would be much greater than this four hundred fifty-foot horizontal distance between the project site and the nearest residential building façade. Hence, groundborne vibration propagating from these more distance sources of onsite vibration would be substantially less than the preceding estimates for the roller and the Caltrans guidance-based vibration exposure thresholds.

5.5 Onsite Non-Transportation Noise Emission

The predicted aggregate hourly L_{eq} noise exposure from proposed Project onsite stationary sound sources is greater than 45.0 dBA but less than 50 dB at the two-nearest representative multi-family residential nearest sensitive receptors (i.e., ST1 and ST2, on the western side of ST125). Figure 5 displays these predicted operational sound levels visually across a horizontal plane on and beyond the proposed project site for the modeled nighttime scenario, which conservatively assumes residential and retail uses would be operating air-conditioning, ventilation, and refrigeration systems to keep building occupants (and refrigerated/frozen foods or other items) cool during hot summer months.

The more stringent nighttime threshold of 50 dBA hourly L_{eq} is applied rather than the daytime threshold of 60 dBA hourly L_{eq} to assess impacts for continuous noise sources. With the predicted noise exposure levels at nighttime being less than the City's standard of 50 dBA hourly L_{eq} for receiving multi-family residential land uses, Project onsite noise emission appears compliant and would not require implementation of special noise reduction measures.

6 Interior Noise Analysis

The prediction results from the preceding exterior noise analysis, provided in Table 5, indicate that future traffic noise levels at sample proposed project building facades would range close to but not exceed 66 dBA CNEL. With the 45 dBA CNEL interior background sound level limit, this means the minimum composite STC rating for the exterior shell separating the habitable interior space from the outdoor sound level should be at least 21. While this effective exterior-to-interior noise reduction value is greater than the aforementioned 12-17 dB range that can be expected from facades with open windows (OPR 2017), it is less than the 25-35 dB noise reduction range that FHWA guidance indicates can be achieved with closed storm windows on light-framed buildings or single-glazed closed windows on exterior masonry building walls (FHWA 2011). By way of example, a dual pane assembly composed of two 1/8"-thick glass panes separated by a 3/8" wide air-gap yields an STC rating of 31 (Viracon 2019). Because the City has adopted a thermal efficiency standard of a minimum U-factor of 0.58 (Chula Vista Municipal Code Sections 110.6, 150.0(q)), such dual-glazed window assemblies are expected and commonplace.

Hence, residential units with facades exposed to exterior noise levels greater than 65 dBA CNEL would be expected to have closed windows and balcony/patio doors in order to result in background sound levels that are compliant with the City's 45 dBA CNEL interior requirement (and be consistent with the California Building Code); thus, habitable spaces in such units would require mechanical means of ventilation and air-conditioning for interior comfort in order to keep such fenestration closed.

7 Recommendations

7.1 Exterior Noise

As discussed in Section 5.1, residential units on the 4th floor (or above, depending on final design) of Building MU/R-1 directly facing SR125 highway traffic noise would have acoustically upgraded balconies in order to reduce outdoor noise exposure for seated occupants to 65 dBA CNEL or below. Consistent with the recommended sound abatement approach on previous Otay Ranch multi-family residential projects, one technique to provide this identified noise reduction need on the order of 5 dBA or less is the addition of a solid and sufficiently massive material layer to planned metal railings on the balcony usable area perimeter. As depicted in Figure 6, showing detail from a previously studied project (and thus used merely for illustration purposes), proposed installation of a 6-millimeter (0.236 inch) sheet of plexiglass (acrylic) on the interior-facing side of the balcony railing structure would be expected to yield an effective STC rating of at least 15. Although the material itself has an STC rating of 29 (Arkema Group 2019), the approximate 1"-wide air gap between the bottom edge of the plexiglass panel and the balcony floor results in lower expected STC performance. In other words, the area of the gap as a fraction of the barrier material surface area causes the reduction in sound transmission loss performance.

Other barrier material options and designs are possible, subject to non-acoustical considerations such as desired barrier opacity, balcony deck drainage, etc., provided that the designed installation has barrier material having adequate mass and solidity that yield a minimum net STC rating of 15 and an approximate deck to top-edge height of 42 inches (3.5 feet). For instance, the outdoor-exposed balconies requiring such sound abatement could incorporate solid, non-porous walls of comparable height (3.5') as part of their design.

Additionally, the final design of building MU/R-1 could relocate potentially affected western façade residential balconies studied herein to other facades where the outdoor noise exposures are predicted to be compliant with 65 dBA CNEL.

With respect to non-transportation noise emission from the proposed Project towards the surrounding community, Section 5.4 determined that predicted levels should be compliant with relevant City standards and thus not require any noise-reducing means or measures that are not already present in the current proposed design and layout of the Project features.

7.2 Interior Noise

No special recommendations are needed with respect to providing an interior background sound level that is 45 dBA CNEL or less from the intrusion of future outdoor traffic noise. Customary closed dual-pane glazing on windows (and in the manufacture of balcony doors) as part of exterior building wall assemblies expected of modern building construction would provide anticipated and sufficient exterior-to-interior sound insulation to attain this City interior background noise threshold.

Dudek trusts that the results, findings, and recommendations presented in this letter report meet your needs for the proposed Project at this time. Should the City have comments on this report after its review, please let us know and we will address them at that time.

Sincerely,

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SOURCE: Bing Maps 2022

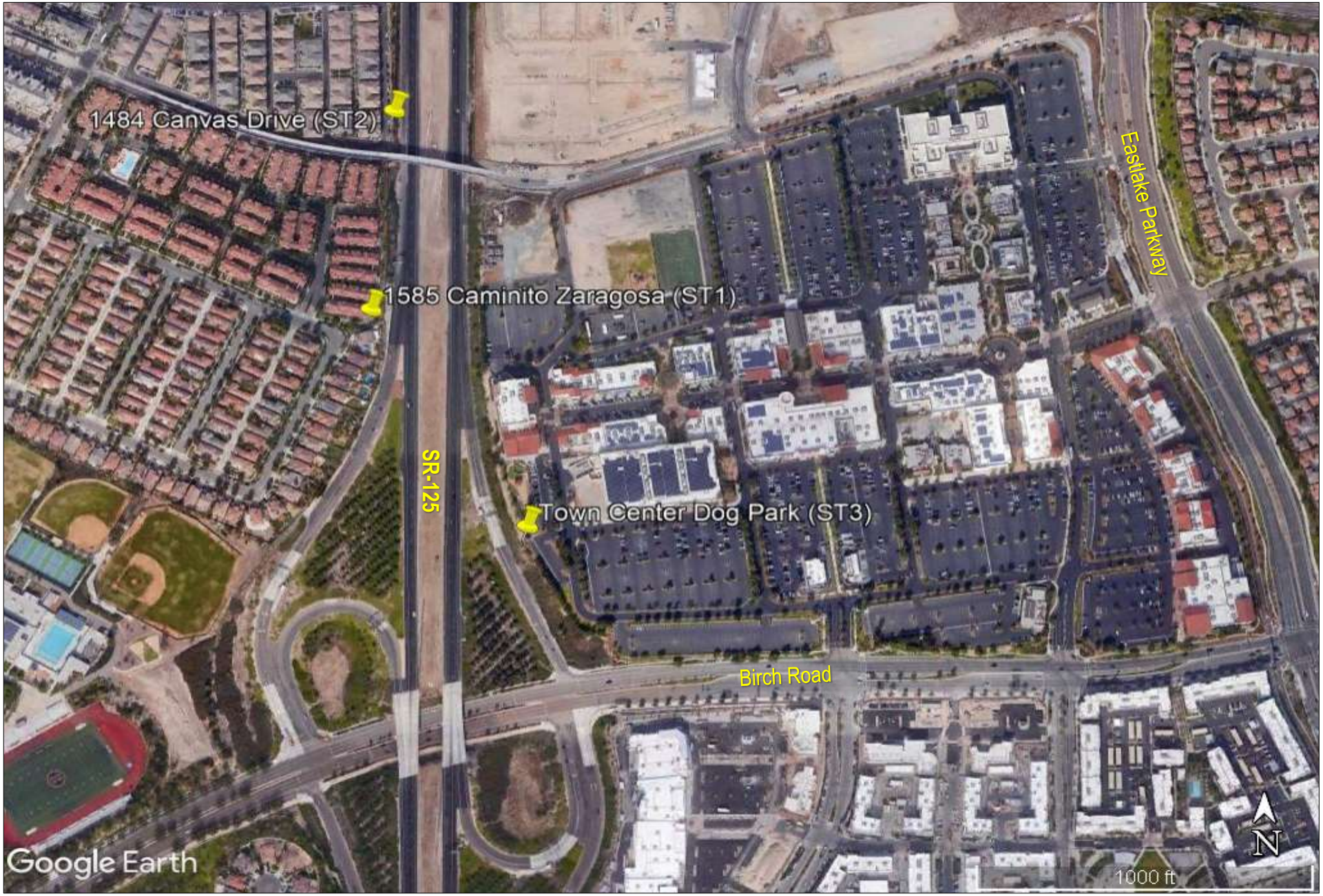
DUDEK

0 500 1,000 Feet

FIGURE 1

Project Location

Otay Ranch Town Center Redevelopment Project



SOURCE: Google 2018; Dudek 2022

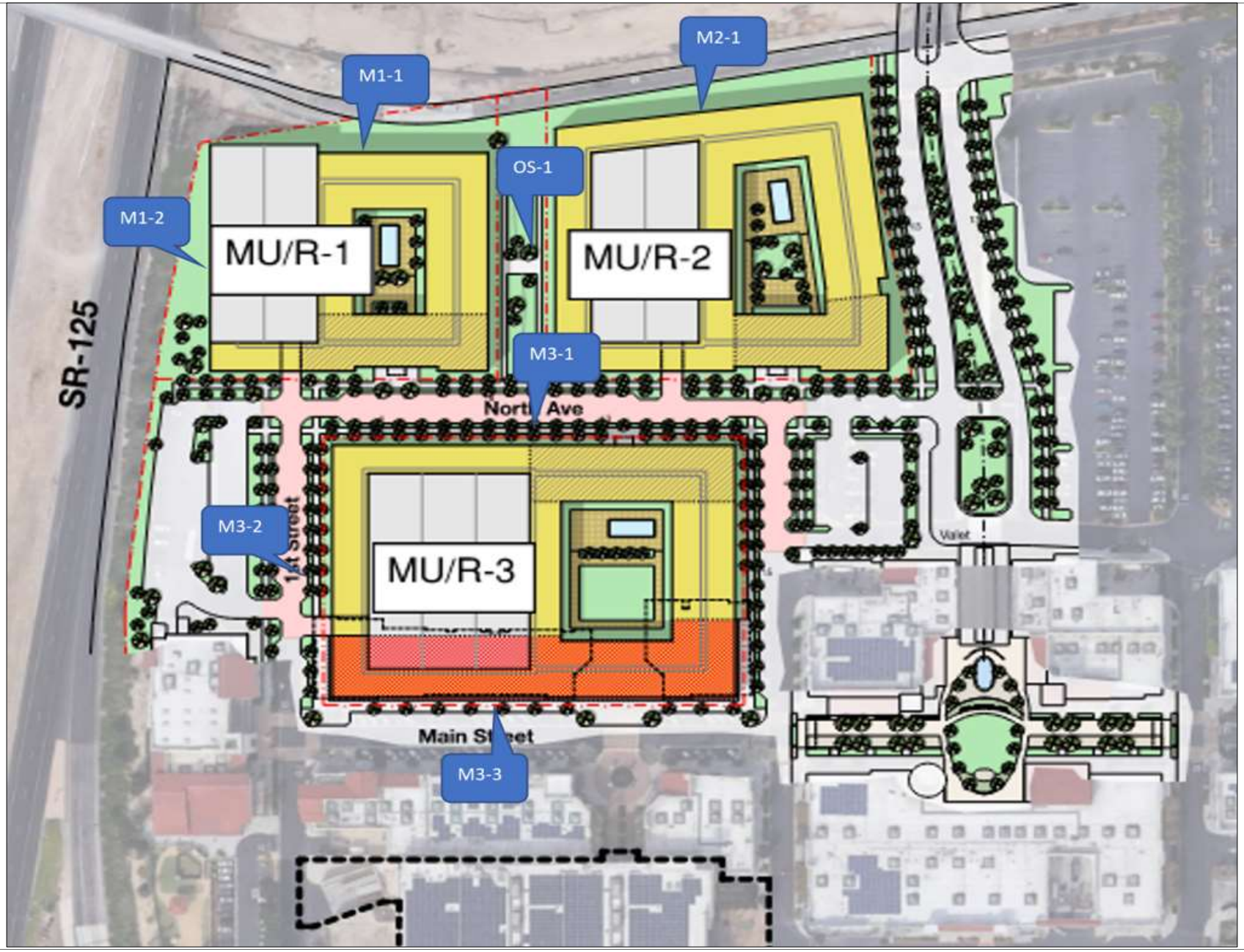
DUDEK

0 163.5 327 Feet

FIGURE 2

Baseline Noise Level Measurement Survey Locations

Otay Ranch Town Center Redevelopment Project



SOURCE: Brookfield 2022; Dudek 2022

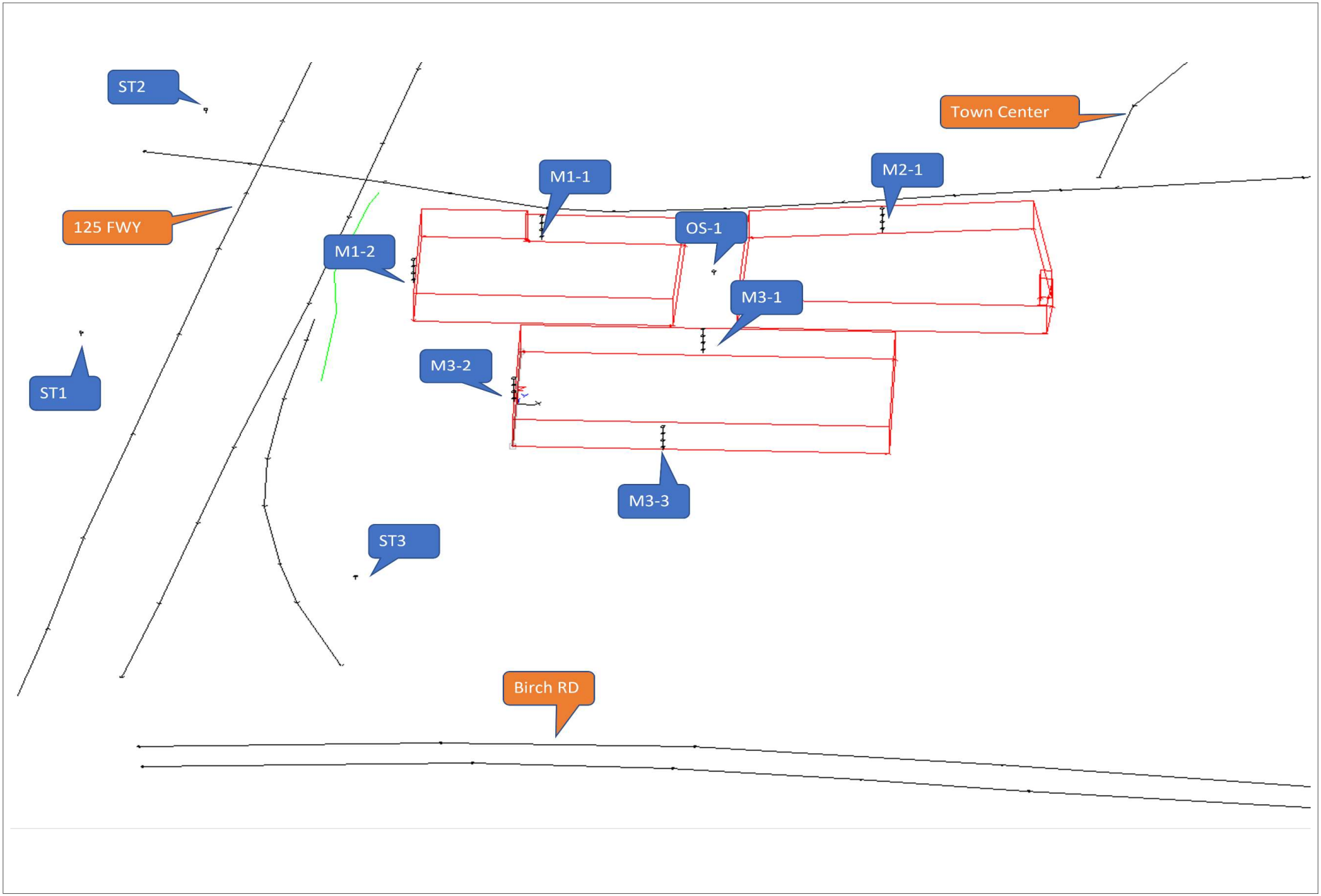
DUDEK

0 65.5 131 Feet

FIGURE 3

Plan View of Project Site and Tagged Representative Receptor Locations for Traffic Noise Analysis

Otay Ranch Town Center Redevelopment Project



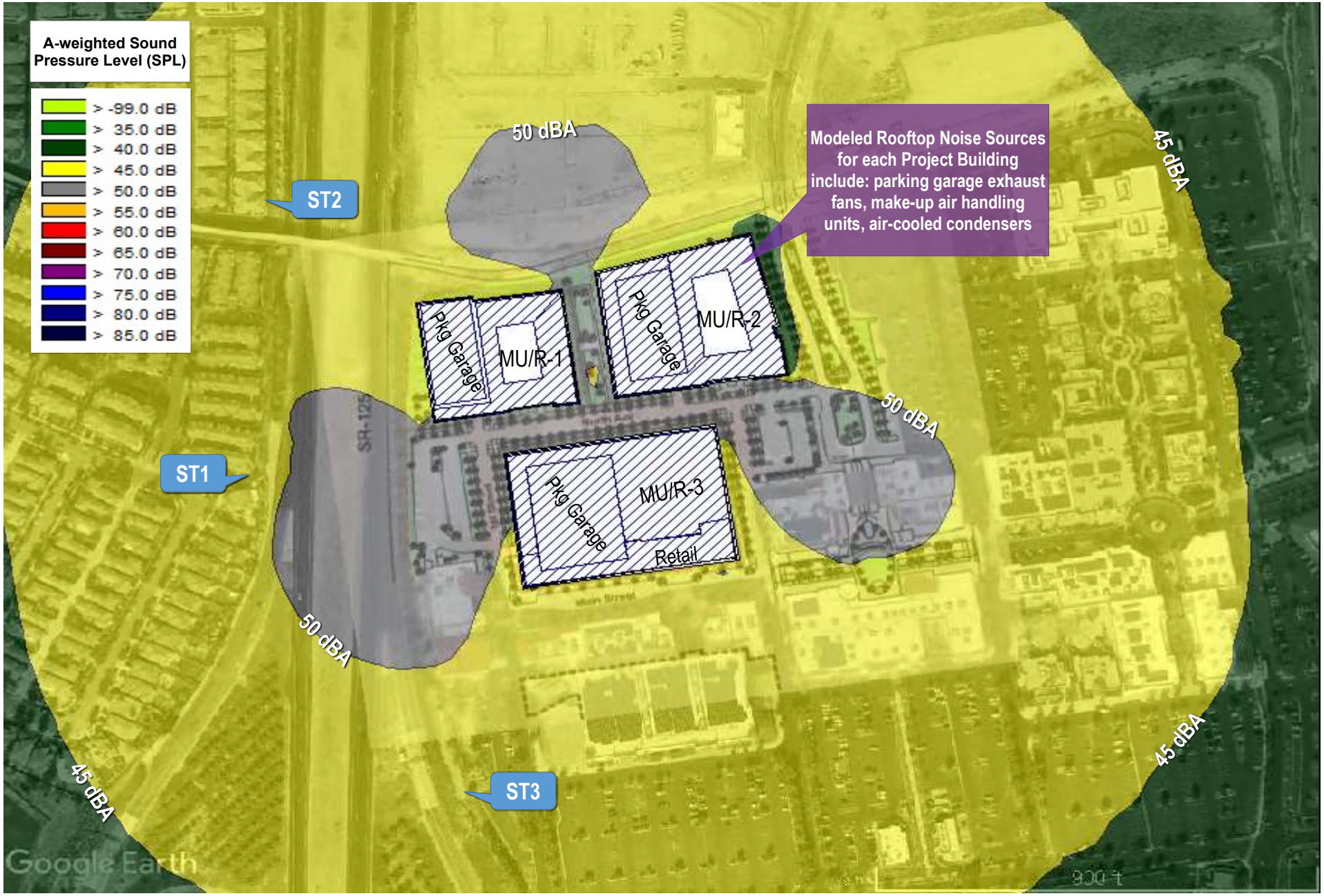
SOURCE: Brookfield 2022; Dudek 2022

DUDEK

FIGURE 4

Isometric View (looking north) of Traffic Noise Model Developed for the Project Exterior Noise Analysis with Sample Modeled Project Features and Receptor Locations

Otay Ranch Town Center Redevelopment Project



SOURCE: Google 2018; Dudek 2022

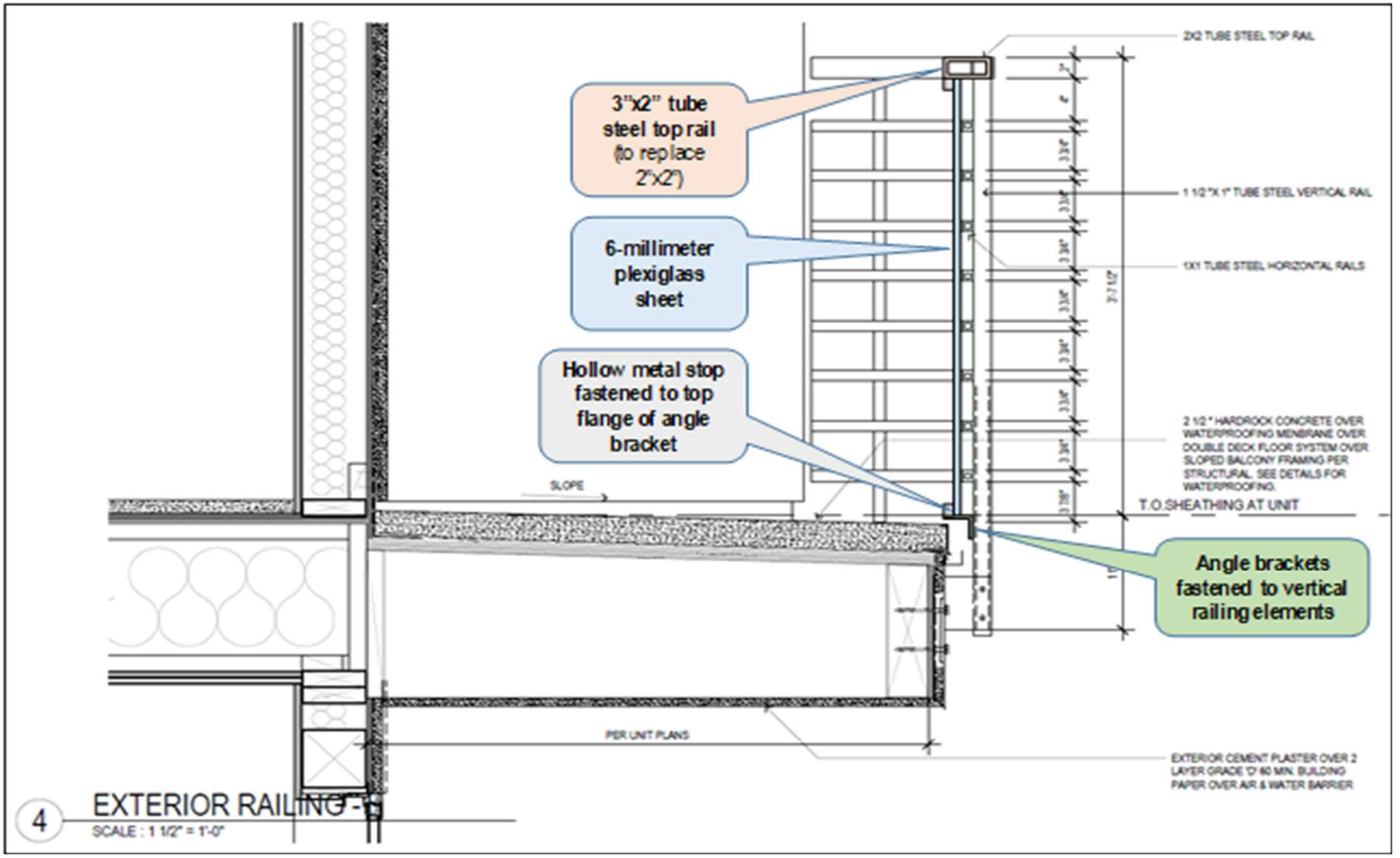
DUDEK

0 112.5 225 Feet

FIGURE 5

Aggregate Project Operation Noise Emission (receiving plane at 5' above grade)

Otay Ranch Town Center Redevelopment Project



SOURCE: Humpreys 2019; Dudek 2020

DUDEK

FIGURE 6

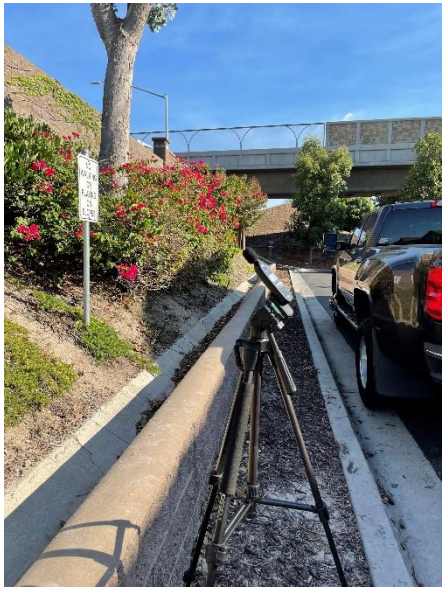
Elevation view of a typical balcony railing, with a recommended 6-millimeter plexiglass element added for noise reduction

Otay Ranch Town Center Redevelopment Project

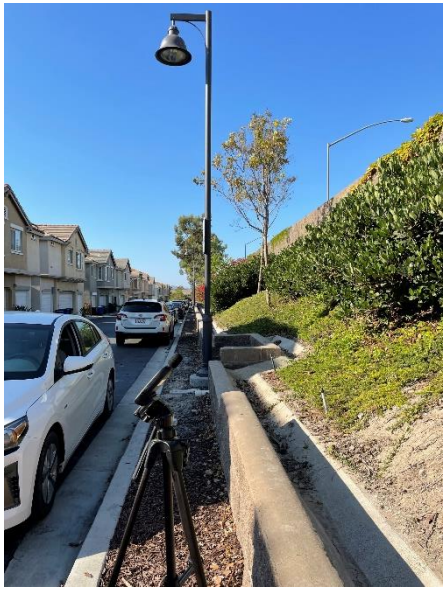
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
A-Weighted Sound Level (dBA)	The sound pressure level (SPL) in decibels as measured on a sound level meter (SLM) using the A-weighted filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the measured sound in a manner similar to the frequency response of the average healthy human ear, and thus correlates well with assessment of environmental noise in a community setting where noise-sensitive receptors may be present.
Decibel (dB)	The unit for expressing SPL and is equal to 10 times the logarithm (to the base 10) of the ratio of the measured sound pressure squared to a reference pressure, which is 20 micropascals.
Equivalent Sound Level (L_{eq})	The value corresponding to a steady-state sound level containing the same total energy as a time-varying signal over a given sample period.
Octave Band Center Frequency (OBCF)	Commonly discussed octave frequency bands are: 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz and 16 kHz. Each of these "center frequencies" represents an octave band defined by a lower band limit equal to 0.707 times the center frequency, and an upper band limit equal to 1.414 times the center frequency.
Sound Transmission Loss (TL)	The amount of sound, in decibels (dB), that is isolated by a material or partition in a particular OBCF or 1/3-OBCF. Example: 1/2″ drywall has a TL at 125 Hz of 15 dB.[1]
Sound Transmission Class (STC)	A single-number rating that can be used to conveniently compare, acoustical isolation properties of different materials or assemblies. Generally, higher numbers indicate a material will provide more sound insulation when used as a barrier. Plotted against standardized STC curves, with established curve-fit tolerances, the TL of a material (in dB) at 500 Hz serves as the STC rating.

[1] https://www.sweetwater.com/insync/sound-transmission-loss/

2103 - Looking east



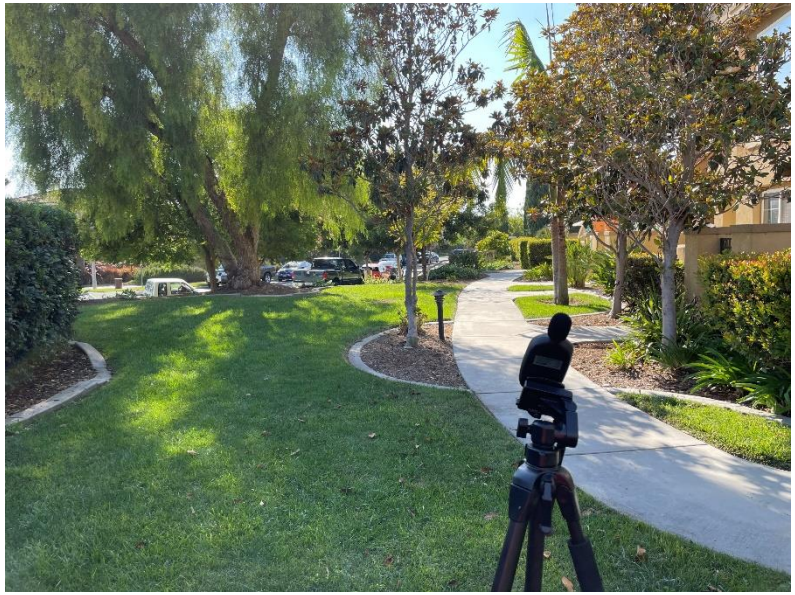
2105 - Looking south



2106 - Looking north

2107 - Looking west

2095 - Looking east



2098 - Looking west

2090 - Looking northwest

2092 - Looking north

2093 - Looking northeast

Number	Start Date	Start Time	End Time	Duration	Meas Mod	Input Rang	Input Type	SPL Time W	LN% Freq W	Overload	UnderRang	Sensitivity	LZeq	LCeq	LAeq
1	8/22/2022	4:05:07 PM	4:06:00 PM	0:00:53	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	78.1	72.8	60.4
2	8/22/2022	4:06:00 PM	4:07:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	78.6	72.8	59.7
3	8/22/2022	4:07:00 PM	4:08:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	78.8	73.3	59.1
4	8/22/2022	4:08:00 PM	4:09:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	76.7	73.8	61.8
5	8/22/2022	4:09:00 PM	4:10:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	76	72.8	60.9
6	8/22/2022	4:10:00 PM	4:11:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	76.8	73.2	61.5
7	8/22/2022	4:11:00 PM	4:12:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	76.9	72.1	60.3
8	8/22/2022	4:12:00 PM	4:13:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	80.3	74.5	61.5
9	8/22/2022	4:13:00 PM	4:14:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	75.4	71.5	61.7
10	8/22/2022	4:14:00 PM	4:15:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	75	70.7	62.2
11	8/22/2022	4:15:00 PM	4:16:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	74.5	70.2	59.9
12	8/22/2022	4:16:00 PM	4:17:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	79.2	73.6	59.5
13	8/22/2022	4:17:00 PM	4:18:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	77.6	72.8	62.5
14	8/22/2022	4:18:00 PM	4:19:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	Yes	No	16.44mV/P	82	76.7	59.7
15	8/22/2022	4:19:00 PM	4:20:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	75.6	71.2	60.6
16	8/22/2022	4:20:00 PM	4:21:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	75.5	71.4	61.1
17	8/22/2022	4:21:00 PM	4:22:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	76.6	71.8	61.1
18	8/22/2022	4:22:00 PM	4:22:14 PM	0:00:14	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	79	73.4	60.2
												overall values (4:06 p.m. to 4:22 p.m.):			**60.9**
19	8/22/2022	4:33:59 PM	4:34:00 PM	0:00:01	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	67.4	63.7	51.3
20	8/22/2022	4:34:00 PM	4:35:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	65.5	63	52.4
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27	8/22/2022	4:41:00 PM	4:42:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	65.7	63.5	50.5
28	8/22/2022	4:42:00 PM	4:43:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	74	71.3	67.2
29	8/22/2022	4:43:00 PM	4:44:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	69.6	66.2	52.2
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31	8/22/2022	4:45:00 PM	4:46:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	67.2	64.4	52
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33	8/22/2022	4:47:00 PM	4:48:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	66.9	63.5	50.8
34	8/22/2022	4:48:00 PM	4:49:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	66.2	63.3	50.6
35	8/22/2022	4:49:01 PM	4:49:40 PM	0:00:39	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	68	64.4	50.2
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36	8/22/2022	4:50:42 PM	4:51:00 PM	0:00:18	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	71.1	66.8	55.6
37	8/22/2022	4:51:00 PM	4:52:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	71.2	67.1	55.8
38	8/22/2022	4:52:01 PM	4:52:03 PM	0:00:02	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	74.5	68.8	55.7
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42	8/22/2022	5:04:00 PM	5:05:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	72.6	67.7	53
43	8/22/2022	5:05:00 PM	5:06:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	72.3	71	61.9
44	8/22/2022	5:06:00 PM	5:07:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	71.4	66.8	51.3
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46	8/22/2022	5:08:00 PM	5:09:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	71.7	67.2	51.9
47	8/22/2022	5:09:00 PM	5:10:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	70.3	67.3	54.1
48	8/22/2022	5:10:00 PM	5:11:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	74.6	69.2	53
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50	8/22/2022	5:12:00 PM	5:13:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	73.9	69.6	54.7
51	8/22/2022	5:13:00 PM	5:14:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	73.3	68.6	52.6
52	8/22/2022	5:14:00 PM	5:15:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	75.8	71.4	61
53	8/22/2022	5:15:00 PM	5:16:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	76.7	70.9	55.3
54	8/22/2022	5:16:00 PM	5:17:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	69.8	66.1	52.2
55	8/22/2022	5:17:00 PM	5:18:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	69.2	66.7	54.9
56	8/22/2022	5:18:00 PM	5:19:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	72.8	68.8	54.9
57	8/22/2022	5:19:00 PM	5:20:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	70.6	67.1	53
58	8/22/2022	5:20:00 PM	5:21:00 PM	0:01:00	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	67.2	64.8	52.9
59	8/22/2022	5:20:59 PM	5:21:15 PM	0:00:16	Auto	Low	Mic	Slow	dBA	No	No	16.44mV/P	72.5	67.7	53
												overall values (5:02 p.m. to 5:21 p.m.):			**55.4**

Number	LZSmax	LCSmax	LASmax	LZSmin	LCSmin	LASmin	LZE	LCE	LAE	LZpk	LCpk	LApk	LAS1%	LAS2%	LAS5%	LAS8%	LAS10%	LAS25%	LAS50%	LAS90%	LAS95%	LAS99%
1	84.8	79	63.6	68.5	65.9	55	95.3	90	77.6	100.1	97.2	86.3	63.5	63.4	62.9	62.7	62.7	61.9	59.5	56.6	56.1	55.2
2	86.2	79.7	62.8	70.4	67	53.8	96.4	90.6	77.5	98.9	93.6	81.4	62.5	62.3	62	61.9	61.8	61.2	60.3	55.1	54.4	54
3	86.2	79.9	61.7	68.3	65.2	53.7	96.6	91.1	76.9	99.7	93.4	76.7	61.6	61.6	61.4	61.3	61.2	60.4	58.9	56.1	55.5	54
4	82.3	80.8	66.7	71.4	67.7	55.3	94.5	91.6	79.6	96.3	89.8	80.1	66.5	66.5	65.5	64.5	64.4	63.3	60.6	57.6	56.6	55.5
5	83.2	80.4	71	68.5	66.3	52	93.8	90.6	78.7	97.3	90.8	82.4	70.5	69.8	64.5	63.1	62.9	61.6	57.4	52.5	52.2	52
6	84.4	81.9	68.4	70.1	66.4	50.5	94.6	91	79.3	96.9	93	78.5	68.1	67.7	65.9	65.1	64.7	63.1	60.5	53.7	51.4	50.7
7	85.8	79.9	66.3	68.3	65.9	54.1	94.7	89.9	78.1	100	94	79.5	65.9	65.5	64.7	63.9	63.6	61.1	59.7	54.9	54.4	54.2
8	88.3	81.6	65.9	71.5	68.3	53.1	98.1	92.3	79.3	101.7	98.1	79.7	65.6	65.5	65	64	63.7	62.4	61.4	55	53.8	53.3
9	83.3	76.7	67.2	69.3	66.5	53.9	93.2	89.3	79.5	97.9	90.6	83.4	67	66.6	65.6	65.2	64.9	63	60.5	57.6	56.3	54.2
10	81.1	75.2	67	69.8	65.9	52.8	92.8	88.5	80	93.3	89.2	85	66.8	66.4	66.1	65.9	65.8	64.1	60.6	54.1	53.6	52.8
11	81.3	75.2	64.7	69.2	66.3	53.6	92.3	88	77.7	94.1	89.2	80.2	64.4	64.2	63.5	62.2	62.1	61.1	59.8	54.8	54.1	53.7
12	84.8	79	67.3	71.1	67.4	51.5	97	91.4	77.3	99.3	94.3	81.6	66.8	65.8	63.9	62.7	61.9	60.6	58.6	51.9	51.8	51.6
13	87.3	81.1	69.9	67.9	65.9	52.5	95.4	90.6	80.3	97.6	93.6	84.4	69.4	68.9	67.2	65	64.9	63.3	61.6	57.4	54.8	52.6
14	93.9	89.3	65.3	66.9	65	52.5	99.8	94.5	77.5	110.9	104.7	82	65.2	65.2	64.1	63	62.2	60.2	58.8	55	53.9	52.7
15	82.5	77.1	67	69	65.7	54.7	93.4	89	78.4	94.9	93.7	79.3	66.7	66.6	65.3	64.4	64.1	61.1	59	56	55.6	54.9
16	81.9	76	66	69.3	66.7	53.3	93.3	89.2	78.9	94.7	88.7	78.2	65.8	65.8	65.4	64.7	64.5	63	58.6	54.8	54.1	53.5
17	84.6	78.7	65	69.9	67	57	94.4	89.6	78.9	98.4	94.5	80.7	64.8	64.7	63.4	63.2	63	61.7	60.9	58.6	57.9	57.2
18	83.5	77.5	64.2	73.9	69.6	57.2	90.5	84.9	71.7	96.7	93	80.4	64.2	64	63.6	62.8	62	60.6	58.4	57.6	57.5	57.3
			71.0			**50.5**														**55.3**		
19	67	63.5	52.7	65.5	62.9	51.7	67.4	63.7	51.3	78.5	73.9	65.5	52.7	52.7	52.7	52.7	52.7	52.6	52.3	51.8	51.8	51.7
20	71.8	68.4	54	62.4	60.7	50.5	83.3	80.8	70.2	83.4	81.1	70.6	53.9	53.7	53.3	53	52.9	52.6	52.4	51.5	50.9	50.7
21	68.9	65.7	53.8	63.3	60.6	49.1	84	81	68.5	83	79.1	66.2	53.7	53.5	53.1	52.2	51.9	51.1	50.4	49.6	49.4	49.2
22	73.1	68.8	54.5	62.6	60.3	49.6	86.4	83.2	69.6	87.6	81.2	66.9	54.3	54.1	53.7	53.4	53.3	52.6	51.6	49.9	49.8	49.6
23	72.2	70	55.9	62.7	60.4	49.1	85.5	83.3	69.2	84.4	81	70.5	55.7	55.3	53.9	53.1	52.8	52.1	51	49.6	49.5	49.3
24	74	69.6	56.9	62.4	60.3	49	85.3	82.3	69.8	86.1	81.8	69.9	56.7	56.4	54.6	54	53.5	52.5	51.6	49.6	49.3	49
25	88.5	83.3	63.2	63.6	61.1	48.3	90.5	86.3	70.7	107.8	101.4	92.2	62	60.8	58	55.6	54	52.3	50.9	49.1	49	48.4
26	72.7	68.3	62.9	61.6	59.1	48.6	85.8	82.3	70.3	86.4	85.4	86.6	62.2	60.8	56.7	55.9	54.3	51.2	50.5	49.3	48.8	48.7
27	72.3	71.4	54.9	61.9	59.3	48.9	83.5	81.3	68.3	82.7	80.7	67.6	54.6	54	53.1	52.4	51.9	50.7	49.9	49.3	49.1	48.9
28	89.3	84.1	82.3	62	59.8	49.2	91.8	89.1	85	108.1	101.8	97.8	81.5	79.2	75.6	68.8	64.2	53.7	50.4	49.5	49.3	49.2
29	75.4	73.3	61.8	64.3	61.7	49.4	87.4	84	70	89.3	83.8	80.3	60.3	59.4	55.4	54.6	54.1	51.7	50.7	49.9	49.7	49.4
30	76.7	72.1	58.1	63.1	61.1	48.9	87.8	84.1	70.2	89.4	84	70.3	57.9	57.7	56.1	54.7	54.3	52.6	51.8	49.6	49.2	49
31	72.8	70.3	57.4	64.5	62	49.4	85	82.2	69.8	84.3	82.5	79.6	57.2	57	56.2	55.5	54.8	51.9	50.8	49.7	49.6	49.4
32	72	69.4	63.8	62.7	60.2	48.8	84.6	82.1	71.2	83	82.5	77.2	63.5	63.2	59.6	56.3	55.3	51.5	50.2	49	48.9	48.8
33	75.3	69.2	54.2	62.9	59.9	49.2	84.7	81.3	68.6	87.4	80.1	66.8	54.1	53.8	53	52.6	52.4	51.4	50.2	49.4	49.3	49.2
34	71.6	69.1	53.7	61.8	59.4	48.6	84	81.1	68.4	83.8	79.7	67.1	53.6	53.4	53.1	52.9	52.9	51.1	49.7	49.1	48.9	48.7
35	72.8	68.2	53.2	62.7	60.4	48.9	83.9	80.3	66.1	86.3	81.5	76.2	53.1	52.9	51.7	51.4	51.4	50.2	49.6	49.2	49.1	48.9
			82.3			**48.3**														**49.6**		
36	75.2	70.1	56	66.1	64.2	55.1	83.7	79.4	68.2	89.5	83.6	72.9	56	55.9	55.9	55.8	55.8	55.7	55.6	55.3	55.2	55.2
37	79.1	73.5	58.4	66.1	64.3	55.2	89	84.9	73.6	92.9	88.1	86.9	57.6	57.3	56.8	56.4	56.3	55.9	55.7	55.4	55.4	55.3
38	76.8	71.2	55.8	73	68.1	55.7	77.5	71.8	58.7	90.3	81.5	68	55.8	55.8	55.8	55.8	55.8	55.7	55.7	55.7	55.7	55.6
			58.4			**55.2**														**55.4**		
39	74	72.8	69	63.5	60.9	49.1	83.6	81	74.7	86.6	84.9	82.4	68.8	68.5	68	67.2	66.5	61.4	54.5	49.4	49.2	49.1
40	79.6	73.7	58.9	63.8	61.1	45.7	89.9	85.3	70.3	92.9	85.3	78.1	58.7	58.4	56.1	55	54.7	53.5	52	47.5	46.9	45.8
41	77.9	72.5	58.5	64.7	61.9	47.3	89.7	85	71	92	88.6	79.7	58.1	57.5	56.8	56.4	56.1	54.4	52.3	48.5	48	47.4
42	85.2	78.9	61.8	62.3	59.4	44.9	90.4	85.5	70.8	98.2	93.8	77.5	59.7	57.6	56.9	56.6	56.2	53.3	50.3	47.4	46.1	45.1
43	82.6	82.1	74.5	64.4	62.1	48.1	90.1	88.8	79.7	95.3	95.5	93.5	73.9	73.3	70.2	67	64.9	56.3	53.6	50.3	49.7	48.2
44	80	72.7	57.7	61.4	59.2	43.4	89.2	84.6	69.1	94	90.5	82.3	57.5	57.4	56.6	55.6	54.9	52.7	49.8	44.2	43.8	43.5
45	76.5	71.5	58.3	61.8	59.3	44.8	86.6	83	70.7	89.7	85.9	71.2	57.8	57.6	56.7	56.3	56.2	54.5	51.7	46.9	45.8	44.9
46	81.9	74.3	55.8	60.9	58.3	45.4	89.5	85	69.7	96	89.3	71.1	55	54.8	54.5	54.3	54.1	53.2	51.7	47.3	46.3	45.5
47	76.1	74.2	58.9	63.5	60.9	46.5	88.1	85.1	71.9	88.6	83.6	74.6	58.7	58.5	57.5	56.6	56.3	55.2	53.6	49.4	48.3	46.5
48	83.8	77.3	60.4	64.1	60.7	45.7	92.4	87	70.8	98.8	91.3	72.7	60.2	60	58.6	56.2	55.7	53.7	51.6	47.6	47.2	46.3
49	77.7	74.2	65.2	62.9	60.2	46.8	88.8	84.6	72.8	93.4	93.1	78.8	65.1	64.2	60.2	59.4	58.8	54.1	51.7	47.6	47.1	46.9
50	80.3	74.6	60.5	64.2	60.8	44.5	91.7	87.4	72.5	95.3	87.5	73.7	60.4	60.2	59.8	58.8	57.9	56.2	53.1	45.5	45.1	44.6
51	86.4	80.4	59.9	62.5	59.9	44.2	91.1	86.4	70.4	101.9	93.9	73	59.6	59.2	58.6	57.8	57	52.5	49.8	45.7	45.3	44.3
52	81.7	76.6	68.3	67.5	64	49.7	93.6	89.2	78.8	95.6	91.9	83.3	68	67.8	67.2	65.6	65.2	62.1	58.1	52.2	50.8	49.9
53	87.5	80.7	63.1	65.9	62.6	48.4	94.5	88.7	73.1	101.8	94.3	77.5	63	63	60.3	57.6	56.8	55.3	53.9	50.9	49.9	48.7
54	76.8	71.5	58.4	62.4	59.8	42.7	87.6	83.9	70	93.3	86.4	72.3	58.1	58	57.3	56.3	55.5	53.3	51.4	45	43.7	42.8
55	76	75.3	63.9	62.8	59	42	87	84.5	72.7	87.8	86.3	78.5	63.7	63.4	61.4	59.3	58.4	53.8	50.5	43.6	42.6	42.3
56	79.4	75.9	63.9	65.5	62.6	45.6	90.6	86.6	72.7	91.5	86.5	76.4	63.6	63.1	59.3	58.7	58.4	56.1	53.5	48.9	46.8	46
57	78	74.2	59.4	62.3	60	42.1	88.4	84.9	70.8	92.2	86.7	72.5	59.1	58.9	57.3	55.7	55.3	54.7	52.1	43.2	42.8	42.2
58	76	72.8	58.5	61.7	59.6	45.1	85	82.6	70.7	84.4	82.7	70.8	58.4	58.1	56.8	56.4	56.2	54.8	51.7	47.6	46.9	45.3
59	77.9	72.4	56.5	65.1	62.8	49.7	84.5	79.7	65	90.4	88.7	73.1	56.4	56.4	56.1	55.9	55.8	54.3	51.8	50.1	49.8	49.7
			74.5			**42.0**														**47.3**		

Number	1/1 Oct. (dB)	31.5	63	125	250	500	1000	2000	4000	8000
1		32.4	41.6	46.6	45.7	52.1	57.7	53.6	46.4	36.3
2		32.5	41.6	46.1	46.4	51	57	53.1	44.2	33.7
3		33.3	42.3	45.7	46.4	49.6	56.4	52.6	44.1	33.8
4		30	41.9	54.5	48.9	53.2	58.7	54.4	46.4	35.6
5		28.9	41.8	52.3	50.9	55.3	56.9	51.6	42.7	32.2
6		30.6	40.9	53.1	48.3	53.3	58.4	53.3	44.1	32.9
7		31.4	41.7	46.9	47.1	51.4	57.7	53.7	45.5	35.6
8		34.8	42.5	45.3	46.2	53.4	58.9	54.6	46.3	35.4
9		30	41	47.4	49.9	55.3	58.3	54.8	48	37.6
10		30	39.7	43.5	46.7	54.7	59.8	55	46.3	35.6
11		29	39.7	45.2	47	51.7	57.4	53	45.2	34.5
12		34	42	44.2	44.9	49.9	56.9	53.7	44.7	33.4
13		31.5	41.6	48.2	50	55.2	60	54.5	46.1	35.9
14		36.7	46.2	49.7	48.7	50.8	56.4	52.2	44.5	34
15		30.3	39.9	46.8	48.5	54.4	57.3	52.8	46	36.8
16		30.7	40.9	45	48.5	53.7	58.5	53.6	46.6	39.7
17		31.2	40.7	45.9	47.5	53	58.5	54.3	46.2	36.2
18		32.9	42.2	47.5	45.6	51	57.4	54.1	44.1	33.3
19		23.6	32.6	37.6	40.7	44.1	48	43.6	37.2	30.4
20		21.9	32.9	38.7	41.8	45.2	49.3	44.8	38.4	30.3
21		22.6	33.1	38.7	41.3	44.1	46.9	43.2	36.8	28.9
22		24.1	35.9	41	43	45.4	47.5	43.6	36.7	29
23		24.1	37	39.2	41.9	44.7	47.6	43.8	36.8	28.9
24		23.5	33.7	41.4	45	46.4	46.7	43.2	36.4	29
25		28.8	38.1	39.8	41.5	45.4	47.5	46.2	45.1	36.5
26		24.6	34.2	37.1	40.7	44.6	47.7	46	44.9	36.8
27		21.2	34	41.6	40.7	43.4	46.6	42.8	36.5	28.7
28		28.5	36.4	38.6	44	63.1	64.9	48.4	45.6	38.6
29		25.1	36	43.2	39.7	44.1	49.2	44.4	37.2	29.7
30		26.3	35.7	40.2	44.2	46.8	47.9	43.6	36.9	28.9
31		23.4	34.3	39.9	43.3	45.8	47.9	44	37.5	30.1
32		23.7	33.9	38.5	44.9	49	48.9	43.8	37.2	28.8
33		23.3	33.2	37.1	40	44.2	47.3	43.3	36.6	28.6
34		23.3	33.2	36.6	39.9	43.3	47.2	43.7	36.9	28.7
35		24.9	33.5	37.3	40.8	42.9	46.3	43.2	36.9	29.2
36		25.8	34.6	44.5	43.8	48.6	52.1	47.2	43.2	39.2
37		25.6	35.7	44.4	43.8	48.8	52.2	48.1	43.7	39.6
38		27	37.9	44.5	44.4	48.9	51.9	47.6	43.2	39.3
39		25.1	36	41.1	46.7	54.2	58.8	51.4	42.1	32.5
40		27.9	36.8	40.3	39.6	45	49.1	45.6	38	30.4
41		27.2	36	41.6	40.7	46.1	49.7	46	39.9	32.3
42		26.9	37.4	41.2	39.9	45.2	49.7	46.1	39.1	31.3
43		25.2	42	48.3	52.3	57	55.7	55.7	50.1	39
44		26.6	36.4	40.7	39.4	43.6	47.8	44.1	38.1	31.5
45		24.1	35.4	40.1	40.2	46.3	49.4	46	38.4	29.6
46		25.9	38.3	40.7	39	43	48.6	45.1	37.7	29.6
47		25.4	37.6	44.8	40.8	48.4	49.9	46.2	39.3	31.2
48		29	38.3	41	39.9	48.3	48.7	45.1	38	30.2
49		25.1	36.1	41.7	48.3	51.2	48.6	43.7	39.3	31.2
50		28.6	39.6	44.8	44.3	49.6	50.3	46.3	40.1	31.8
51		28.5	37.9	41.5	41.9	47.4	48.3	44.1	38.2	31.4
52		30.8	38.8	46.4	53.5	55.7	56.7	51.7	45.3	35.2
53		30.8	39.4	43.5	41.5	50.9	50.6	46.2	40.2	32
54		25	36.2	42.2	41.8	44.2	48.5	45.3	38.8	29.9
55		23.6	37.9	42.4	47	49.1	50.4	45.6	39.8	32.8
56		27.2	39.4	43.8	47.5	48.7	50.1	46.9	40.6	32.2
57		25.7	37.3	43.5	41.8	45.2	49.3	45.9	38.4	29.9
58		23.7	34.8	41.6	40.5	47	49.5	44.7	37.7	29
59		27	37.3	41.4	42.3	47.1	49.2	45	37.6	28.7

AHUs (plenum-type return fan only, no condenser units [see separate worksheet]):

												A-weighting adjustments	26	13	9	3	0	-1	-1	1	
												average of values for the two fan diameter ranges, per Guyer (Table 12)	plug	40	40	38	34	29	23	19	16	
												average of values for the two fan diameter ranges, per Guyer (Table 12)	tube	47	44	46	47	44	45	38	35	
												per Guyer (Table 12, presumed based on Bies & Hansen ENC)	prop	46	48	55	53	52	48	43	38	
														A-weighted PWL (for CadnaA inputs)									
Phase	**Building Tag**	**GSF**	**Avg. SF/unit**	**Units**	**Adjusted Units**	**m^2**	**facility function**	**CFM pksf ***	**m^3/s per 1,000 m^2**	**Pressure (Pa)**	**Q (m^3/s)**	**fantype = plug, tube, or prop**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**OA dB**	**Q (cfm)**
return air fans in building rooftop AHUs:																						
MU/R-1	residential units	230000	1150.0	200	200	21379	residence	250	1.27	625	27	plug	69	82	84	86	84	79	75	70	**91**	58000
MU/R-2	residential units	365000	1140.6	320	320	33927	residence	250	1.27	625	43	plug	71	84	86	88	86	81	77	72	**93**	92000
MU/R-3	residential units	365000	1140.6	320	320	33927	residence	250	1.27	625	43	plug	71	84	86	88	86	81	77	72	**93**	92000
MU/R-3	M	37200				3458	retail	300	1.52	626	5	plug	62	75	77	79	77	72	68	63	**84**	12000

**source: Engineering Cookbook, 2nd ed., 1999 (Loren Cook Company)*

ACCs (air-cooled chillers on rooftops):

	tons	PWL
Bryant BH16 018	1.5	67
Bryant BH16 024	2	71
Trane CGA 040	4	72
Trane CGA 080	8	74
Trane Flex 155Z	16	79
Trane Flex 1110Z	30	86
Daikin AGZ-E 60 (w/out sound insulation)	60	91
Daikin AGZ-E 120 (w/out sound insulation)	120	95
Daikin AGZ-E 240 (w/out sound insulation)	241	100

Phase	Building Tag	GSF	Avg. SF/unit	Units	Adjusted Units	facility function	GSF per ton *	tons of refrig.	Approx. Qty. of ACCs	tons per ACC	Approx. Total PWL (dBA)	Notes
MU/R-1	residential units	230000	1150.0	200	200	apartment (high-rise), avg. of low and high	400	575.0	5	115	**98**	
MU/R-2	residential units	365000	1140.6	320	320	apartment (high-rise), avg. of low and high	400	912.5	7	130	**103**	
MU/R-3	residential units	365000	1140.6	320	320	apartment (high-rise), avg. of low and high	400	912.5	5	183	**102**	
	retail	37200				assume "restaurant" (avg. of hi and lo)	125	297.6	6	50	**94**	

**source: Engineering Cookbook, 2nd ed., 1999 (Loren Cook Company)*

Exhaust units (tubeaxial fans only):

								A-weighting adjustments	26	13	9	3	0	-1	-1	1	
								average of values for the two fan diameter ranges, per Guyer (Table 12)	plug	40	40	38	34	29	23	19	16	
								average of values for the two fan diameter ranges, per Guyer (Table 12)	tube	47	44	46	47	44	45	38	35	
								per Guyer (Table 12, presumed based on Bies & Hansen ENC)	prop	46	48	55	53	52	48	43	38	
				0.75	= CFM per square foot of parking													
Phase	**Building Tag**	**Parking Spaces**	**SF per pkg space**	**GSF**	**m^2**	**facility function**	**CFM**	**Pressure (Pa)**	**Q (m^3/s)**	**fantype = plug, tube, or prop**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**OA dB**
											A-weighted PWL								
fans exhausting at above-bldg roof level (near ingress and egress)																			
MU/R-1	residential units	300	400	120000	11154	parking	90000	375	42	tube	74	84	99	97	97	99	92	87	**104**
MU/R-2	residential units	480	400	192000	17847	parking	144000	375	68	tube	76	86	101	99	99	101	94	89	**106**
MU/R-3	residential units	570	400	228000	21193	parking	171000	375	81	tube	77	87	102	100	100	102	95	90	**107**

**source: INTEC Controls, IMC 2015 Changes Affecting Parking Garage Exhaust SystemsImplementation, Revision 2.0, 2015, last accessed on May 26, 2018:http://inteccontrols.com/pdfs/IMC_2015_Changes_for_Parking_Garages.pdf*

Dudek					**26 August 2022**							
CB					**TNM 2.5**							
INPUT: ROADWAYS							**Average pavement type shall be used unless**					
PROJECT/CONTRACT:	**Otay Village Town Center**						**a State highway agency substantiates the use**					
RUN:	**Existing**						**of a different type with the approval of FHWA**					
Roadway		**Points**										
Name	**Width**	**Name**	**No.**	**Coordinates (pavement)**			**Flow Control**			**Segment**		
				X	**Y**	**Z**	**Control Device**	**Speed Constraint**	**Percent Vehicles Affected**	**Pvmt Type**	**On Struct?**	
	ft			ft	ft	ft		mph	%			
125 South	55.0	point1	1	6,339,497.0	1,806,585.9	-15.00				Average		
		point2	2	6,339,495.5	1,806,799.0	-15.00				Average		
		point3	3	6,339,488.0	1,807,086.4	-15.00				Average		
		point4	4	6,339,490.0	1,807,415.0	-15.00				Average		
		point5	5	6,339,489.5	1,807,732.4	-15.00				Average		
		point6	6	6,339,490.0	1,808,004.1	-15.00				Average		
		point7	7	6,339,492.5	1,808,181.4	-15.00				Average		
		point8	8	6,339,495.5	1,808,410.0	-15.00				Average		
		point9	9	6,339,499.5	1,808,939.6	-15.00						
125 North	55.0	point10	10	6,339,629.5	1,808,904.9	-15.00				Average		
		point11	11	6,339,627.0	1,808,591.8	-15.00				Average		
		point12	12	6,339,625.5	1,808,355.0	-15.00				Average		
		point13	13	6,339,626.0	1,808,123.2	-15.00				Average		
		point14	14	6,339,625.5	1,807,848.8	-15.00				Average		
		point15	15	6,339,616.0	1,807,389.2	-15.00				Average		
		point16	16	6,339,614.5	1,807,149.6	-15.00				Average		
		point17	17	6,339,612.5	1,806,894.9	-15.00				Average		
		point18	18	6,339,609.0	1,806,659.5	-15.00						
Transit Rail	12.0	point19	19	6,341,131.0	1,808,543.9	0.00				Average		
		point20	20	6,340,975.5	1,808,495.1	0.00				Average		
		point21	21	6,340,728.0	1,808,412.6	0.00				Average		
		point22	22	6,340,516.0	1,808,342.9	0.00				Average		
		point23	23	6,340,449.5	1,808,323.9	0.00				Average		
		point24	24	6,340,327.5	1,808,286.0	0.00				Average		
		point25	25	6,340,201.5	1,808,241.9	0.00				Average		

		point26	26	6,340,065.5	1,808,197.2	0.00				Average	
		point27	27	6,339,936.5	1,808,166.2	0.00				Average	
		point28	28	6,339,856.0	1,808,163.1	0.00				Average	
		point29	29	6,339,733.0	1,808,189.5	0.00				Average	
		point30	30	6,339,650.5	1,808,210.2	0.00				Average	Y
		point31	31	6,339,568.5	1,808,223.2	0.00				Average	Y
		point32	32	6,339,482.5	1,808,238.0	0.00				Average	
		point33	33	6,339,351.5	1,808,254.2	0.00					
Town Center drive	12.0	point34	34	6,340,750.5	1,809,198.1	0.00				Average	
		point35	35	6,340,698.5	1,809,130.2	0.00				Average	
		point36	36	6,340,621.0	1,808,994.1	0.00				Average	
		point37	37	6,340,560.5	1,808,848.8	0.00				Average	
		point38	38	6,340,493.5	1,808,597.0	0.00				Average	
		point39	39	6,340,491.5	1,808,367.6	0.00					
Roadway5	45.0	point40	40	6,339,646.0	1,807,772.5	0.00				Average	
		point41	41	6,339,648.0	1,807,704.1	0.00				Average	
		point42	42	6,339,654.0	1,807,516.8	0.00				Average	
		point43	43	6,339,667.5	1,807,330.5	0.00				Average	
		point44	44	6,339,689.5	1,807,184.8	0.00				Average	
		point45	45	6,339,739.5	1,807,008.9	0.00				Average	
		point46	46	6,339,780.5	1,806,895.6	0.00				Average	
		point47	47	6,339,866.5	1,806,712.2	0.00					
Birch West	60.0	point48	48	6,342,049.0	1,806,628.9	0.00				Average	
		point49	49	6,341,718.5	1,806,557.0	0.00				Average	
		point50	50	6,341,498.5	1,806,534.4	0.00				Average	
		point51	51	6,341,239.5	1,806,545.9	0.00				Average	
		point52	52	6,340,691.5	1,806,547.0	0.00				Average	
		point53	53	6,340,320.5	1,806,539.1	0.00				Average	
		point54	54	6,340,020.5	1,806,498.2	0.00				Average	
		point55	55	6,339,668.0	1,806,423.4	0.00					
Birch east	60.0	point56	56	6,342,053.0	1,806,558.4	0.00				Average	
		point57	57	6,341,911.0	1,806,533.0	0.00				Average	
		point58	58	6,341,742.5	1,806,499.8	0.00				Average	
		point59	59	6,341,467.5	1,806,485.4	0.00				Average	
		point60	60	6,341,266.5	1,806,480.6	0.00				Average	
		point61	61	6,341,078.0	1,806,481.9	0.00				Average	
		point62	62	6,340,736.5	1,806,474.0	0.00				Average	
		point63	63	6,340,533.0	1,806,473.2	0.00				Average	
		point64	64	6,340,306.5	1,806,468.6	0.00				Average	

		point65	65	6,340,068.5	1,806,443.5	0.00				Average	
		point66	66	6,339,683.5	1,806,364.4	0.00					
Eastlake Pkwy	112.0	point67	67	6,341,641.5	1,808,823.6	0.00				Average	
		point68	68	6,341,658.0	1,808,531.8	0.00				Average	
		point69	69	6,341,674.0	1,808,284.4	0.00				Average	
		point70	70	6,341,729.0	1,808,023.6	0.00				Average	
		point71	71	6,341,794.0	1,807,792.6	0.00				Average	
		point72	72	6,341,912.0	1,807,499.4	0.00				Average	
		point73	73	6,341,988.0	1,807,319.1	0.00				Average	
		point74	74	6,342,087.0	1,807,055.8	0.00				Average	
		point75	75	6,342,125.0	1,806,860.6	0.00				Average	
		point76	76	6,342,168.0	1,806,599.8	0.00					
Olympic west	60.0	point77	77	6,339,721.5	1,810,449.5	0.00				Average	
		point78	78	6,339,934.5	1,810,298.0	0.00				Average	
		point79	79	6,340,247.0	1,810,029.6	0.00				Average	
		point80	80	6,340,524.0	1,809,614.9	0.00				Average	
		point81	81	6,340,742.0	1,809,370.5	0.00				Average	
		point82	82	6,340,941.0	1,809,234.1	0.00				Average	
		point83	83	6,341,257.0	1,809,090.2	0.00				Average	
		point84	84	6,341,595.0	1,808,969.2	0.00					
Olympic east	60.0	point85	85	6,341,594.5	1,808,888.2	0.00				Average	
		point86	86	6,341,296.5	1,808,969.2	0.00				Average	
		point87	87	6,341,120.0	1,809,026.4	0.00				Average	
		point88	88	6,340,879.0	1,809,164.2	0.00				Average	
		point89	89	6,340,645.0	1,809,369.5	0.00				Average	
		point90	90	6,340,487.0	1,809,526.4	0.00				Average	
		point91	91	6,340,376.0	1,809,672.0	0.00				Average	
		point92	92	6,340,286.0	1,809,816.9	0.00				Average	
		point93	93	6,340,186.5	1,809,952.0	0.00				Average	
		point94	94	6,340,076.0	1,810,076.4	0.00				Average	
		point95	95	6,339,967.0	1,810,185.8	0.00				Average	
		point96	96	6,339,713.5	1,810,370.8	0.00					

Dudek
CB

26 August 2022
TNM 2.5

INPUT: TRAFFIC FOR LAeq1h Volumes
PROJECT/CONTRACT: Otay Village Town Center
RUN: Existing

Roadway	Points		Segment									
Name	Name	No.	Autos		MTrucks		HTrucks		Buses		Motorcycles	
			V	S	V	S	V	S	V	S	V	S
			veh/hr	mph	veh/hr	mph	veh/hr	mph	veh/hr	mph	veh/hr	mph
125 South	point1	1	688	65	14	65	7	65	0	0	0	0
	point2	2	688	65	14	65	7	65	0	0	0	0
	point3	3	688	65	14	65	7	65	0	0	0	0
	point4	4	688	65	14	65	7	65	0	0	0	0
	point5	5	688	65	14	65	7	65	0	0	0	0
	point6	6	688	65	14	65	7	65	0	0	0	0
	point7	7	688	65	14	65	7	65	0	0	0	0
	point8	8	688	65	14	65	7	65	0	0	0	0
	point9	9										
125 North	point10	10	582	65	12	65	6	65	0	0	0	0
	point11	11	582	65	12	65	6	65	0	0	0	0
	point12	12	582	65	12	65	6	65	0	0	0	0
	point13	13	582	65	12	65	6	65	0	0	0	0
	point14	14	582	65	12	65	6	65	0	0	0	0
	point15	15	582	65	12	65	6	65	0	0	0	0
	point16	16	582	65	12	65	6	65	0	0	0	0
	point17	17	582	65	12	65	6	65	0	0	0	0
	point18	18										
Transit Rail	point19	19	0	0	0	0	0	0	0	0	0	0
	point20	20	0	0	0	0	0	0	0	0	0	0
	point21	21	0	0	0	0	0	0	0	0	0	0
	point22	22	0	0	0	0	0	0	0	0	0	0
	point23	23	0	0	0	0	0	0	0	0	0	0

	point24	24	0	0	0	0	0	0	0	0	0	0
	point25	25	0	0	0	0	0	0	0	0	0	0
	point26	26	0	0	0	0	0	0	0	0	0	0
	point27	27	0	0	0	0	0	0	0	0	0	0
	point28	28	0	0	0	0	0	0	0	0	0	0
	point29	29	0	0	0	0	0	0	0	0	0	0
	point30	30	0	0	0	0	0	0	0	0	0	0
	point31	31	0	0	0	0	0	0	0	0	0	0
	point32	32	0	0	0	0	0	0	0	0	0	0
	point33	33										
Town Center drive	point34	34	864	35	17	35	8	35	0	0	0	0
	point35	35	864	35	17	35	8	35	0	0	0	0
	point36	36	864	35	17	35	8	35	0	0	0	0
	point37	37	864	35	17	35	8	35	0	0	0	0
	point38	38	864	35	17	35	8	35	0	0	0	0
	point39	39										
Roadway5	point40	40	230	40	4	40	2	40	0	0	0	0
	point41	41	0	0	0	0	0	0	0	0	0	0
	point42	42	0	0	0	0	0	0	0	0	0	0
	point43	43	0	0	0	0	0	0	0	0	0	0
	point44	44	0	0	0	0	0	0	0	0	0	0
	point45	45	0	0	0	0	0	0	0	0	0	0
	point46	46	0	0	0	0	0	0	0	0	0	0
	point47	47										
Birch West	point48	48	1575	50	32	50	16	50	0	0	0	0
	point49	49	1575	50	32	50	16	50	0	0	0	0
	point50	50	1575	50	32	50	16	50	0	0	0	0
	point51	51	1575	50	32	50	16	50	0	0	0	0
	point52	52	1575	50	32	50	16	50	0	0	0	0
	point53	53	1575	50	32	50	16	50	0	0	0	0
	point54	54	1575	50	32	50	16	50	0	0	0	0
	point55	55										
Birch east	point56	56	1575	50	32	50	16	50	0	0	0	0
	point57	57	1575	50	32	50	16	50	0	0	0	0
	point58	58	1575	50	32	50	16	50	0	0	0	0
	point59	59	1575	50	32	50	16	50	0	0	0	0

	point60	60	1575	50	32	50	16	50	0	0	0	0
	point61	61	1575	50	32	50	16	50	0	0	0	0
	point62	62	1575	50	32	50	16	50	0	0	0	0
	point63	63	1575	50	32	50	16	50	0	0	0	0
	point64	64	1575	50	32	50	16	50	0	0	0	0
	point65	65	1575	50	32	50	16	50	0	0	0	0
	point66	66										
Eastlake Pkwy	point67	67	1626	50	33	50	16	50	0	0	0	0
	point68	68	1626	50	33	50	16	50	0	0	0	0
	point69	69	1626	50	33	50	16	50	0	0	0	0
	point70	70	1626	50	33	50	16	50	0	0	0	0
	point71	71	1626	50	33	50	16	50	0	0	0	0
	point72	72	1626	50	33	50	16	50	0	0	0	0
	point73	73	1626	50	33	50	16	50	0	0	0	0
	point74	74	1626	50	33	50	16	50	0	0	0	0
	point75	75	1626	50	33	50	16	50	0	0	0	0
	point76	76										
Olympic west	point77	77	1359	50	28	50	14	50	0	0	0	0
	point78	78	1359	50	28	50	14	50	0	0	0	0
	point79	79	1359	50	28	50	14	50	0	0	0	0
	point80	80	1359	50	28	50	14	50	0	0	0	0
	point81	81	1359	50	28	50	14	50	0	0	0	0
	point82	82	1359	50	28	50	14	50	0	0	0	0
	point83	83	1359	50	28	50	14	50	0	0	0	0
	point84	84										
Olympic east	point85	85	1359	50	28	50	14	50	0	0	0	0
	point86	86	1359	50	28	50	14	50	0	0	0	0
	point87	87	1359	50	28	50	14	50	0	0	0	0
	point88	88	1359	50	28	50	14	50	0	0	0	0
	point89	89	1359	50	28	50	14	50	0	0	0	0
	point90	90	1359	50	28	50	14	50	0	0	0	0
	point91	91	1359	50	28	50	14	50	0	0	0	0
	point92	92	1359	50	28	50	14	50	0	0	0	0
	point93	93	1359	50	28	50	14	50	0	0	0	0
	point94	94	1359	50	28	50	14	50	0	0	0	0
	point95	95	1359	50	28	50	14	50	0	0	0	0

	point96	96										

Dudek
CB

26 August 2022
TNM 2.5

INPUT: RECEIVERS
PROJECT/CONTRACT: Otay Village Town Center
RUN: Existing

Receiver

Name	No.	#DUs	Coordinates (ground)			Height above Ground	Input Sound Levels and Criteria				Active in Calc.
			X	Y	Z		Existing LAeq1h	Impact Criteria LAeq1h	Sub'l	NR Goal	
			ft	ft	ft	ft	dBA	dBA	dB	dB	
Town Center Dog Park	1	1	6,339,836.0	1,806,980.8	0.00	4.92	60.90	66	10.0	8.0	Y
ST1	2	1	6,339,381.0	1,807,674.9	0.00	4.92	56.90	66	10.0	8.0	Y
ST2	3	1	6,339,406.0	1,808,385.9	0.00	4.92	55.40	66	10.0	8.0	Y
M1-1	20	1	6,339,870.0	1,808,064.8	0.00	4.92	0.00	66	10.0	8.0	Y
M1-2	21	1	6,339,870.0	1,808,064.8	0.00	14.92	0.00	66	10.0	8.0	Y
M1-3	22	1	6,339,870.0	1,808,064.8	0.00	24.92	0.00	66	10.0	8.0	Y
M1-4	23	1	6,339,870.0	1,808,064.8	0.00	34.92	0.00	66	10.0	8.0	Y
M2-1	24	1	6,340,266.5	1,808,159.4	0.00	4.92	0.00	66	10.0	8.0	Y
M2-2	25	1	6,340,266.5	1,808,159.4	0.00	14.92	0.00	66	10.0	8.0	Y
M2-3	26	1	6,340,266.5	1,808,159.4	0.00	24.92	0.00	66	10.0	8.0	Y
M2-4	27	1	6,340,266.5	1,808,159.4	0.00	34.92	0.00	66	10.0	8.0	Y
M3-1	28	1	6,340,121.0	1,807,750.9	0.00	4.92	0.00	66	10.0	8.0	Y
M3-2	30	1	6,340,121.0	1,807,750.9	0.00	14.92	0.00	66	10.0	8.0	Y
M3-3	31	1	6,340,121.0	1,807,750.9	0.00	24.92	0.00	66	10.0	8.0	Y
M3-4	33	1	6,340,121.0	1,807,750.9	0.00	34.92	0.00	66	10.0	8.0	Y
M4-1	34	1	6,339,743.0	1,807,905.1	0.00	4.92	0.00	66	10.0	8.0	Y
M4-2	35	1	6,339,743.0	1,807,905.1	0.00	14.92	0.00	66	10.0	8.0	Y
M4-3	36	1	6,339,743.0	1,807,905.1	0.00	24.92	0.00	66	10.0	8.0	Y
M4-4	37	1	6,339,743.0	1,807,905.1	0.00	34.92	0.00	66	10.0	8.0	Y
M5-1	38	1	6,339,925.5	1,807,559.1	0.00	4.92	0.00	66	10.0	8.0	Y
M5-2	39	1	6,339,925.5	1,807,559.1	0.00	14.92	0.00	66	10.0	8.0	Y
M5-3	40	1	6,339,925.5	1,807,559.1	0.00	24.92	0.00	66	10.0	8.0	Y

M5-4	41	1	6,339,925.5	1,807,559.1	0.00	34.92	0.00	66	10.0	8.0	Y
M6-1	42	1	6,340,127.0	1,807,440.9	0.00	4.92	0.00	66	10.0	8.0	Y
M6-2	43	1	6,340,127.0	1,807,440.9	0.00	14.92	0.00	66	10.0	8.0	Y
M6-3	44	1	6,340,127.0	1,807,440.9	0.00	24.92	0.00	66	10.0	8.0	Y
M6-4	46	1	6,340,127.0	1,807,440.9	0.00	34.92	0.00	66	10.0	8.0	Y

Dudek 26 August 2022
CB TNM 2.5

INPUT: BARRIERS
PROJECT/CONTRACT: Otay Village Town Center
RUN: Existing

Barrier									Points										
Name	Type	Height		If Wall	If Berm			Add'tnl	Name	No.	Coordinates (bottom)			Height	Segment				
		Min	Max	$ per	$ per	Top	Run:Rise	$ per			X	Y	Z	at	Seg Ht	Perturbs		On	Important
				Unit	Unit	Width		Unit						Point	Incre-	#Up	#Dn	Struct?	Reflec-
				Area	Vol.			Length							ment				tions?
		ft	ft	$/sq ft	$/cu yd	ft	ft:ft	$/ft			ft	ft	ft	ft	ft				
Barrier1	W	0.00	99.99	0.00				0.00	point1	1	6,339,727.0	1,808,050.1	0.00	40.00	0.00	0	0		
									point2	2	6,339,763.0	1,807,788.5	0.00	40.00	0.00	0	0		
									point3	3	6,340,071.5	1,807,828.0	0.00	40.00	0.00	0	0		
									point4	4	6,340,042.0	1,808,077.9	0.00	40.00	0.00	0	0		
									point5	5	6,339,852.5	1,808,057.1	0.00	40.00	0.00	0	0		
									point6	6	6,339,852.5	1,808,066.1	0.00	40.00	0.00	0	0		
									point7	7	6,339,727.0	1,808,050.1	0.00	40.00					
Barrier2	W	0.00	99.99	0.00				0.00	point8	8	6,340,147.5	1,807,836.6	0.00	40.00	0.00	0	0		
									point9	9	6,340,514.0	1,807,881.5	0.00	40.00	0.00	0	0		
									point10	10	6,340,506.5	1,807,966.0	0.00	40.00	0.00	0	0		
									point11	11	6,340,491.5	1,807,966.5	0.00	40.00	0.00	0	0		
									point12	12	6,340,487.5	1,807,990.9	0.00	40.00	0.00	0	0		
									point13	13	6,340,500.5	1,807,992.1	0.00	40.00	0.00	0	0		
									point14	14	6,340,442.5	1,808,201.2	0.00	40.00	0.00	0	0		
									point15	15	6,340,112.5	1,808,113.8	0.00	40.00	0.00	0	0		
									point16	16	6,340,147.5	1,807,836.6	0.00	40.00					
Barrier3	W	0.00	99.99	0.00				0.00	point17	17	6,339,906.5	1,807,715.4	0.00	40.00	0.00	0	0		
									point18	18	6,339,949.0	1,807,421.2	0.00	40.00	0.00	0	0		
									point19	19	6,340,395.0	1,807,476.6	0.00	40.00	0.00	0	0		
									point20	20	6,340,350.0	1,807,770.9	0.00	40.00	0.00	0	0		
									point21	21	6,339,906.5	1,807,715.4	0.00	40.00					

Dudek			**26 August 2022**	
CB			**TNM 2.5**	
INPUT: TERRAIN LINES				
PROJECT/CONTRACT:	**Otay Village Town Center**			
RUN:	**Existing**			
Terrain Line	**Points**			
Name	**No.**	**Coordinates (ground)**		
		X	**Y**	**Z**
		ft	ft	ft
Terrain Line1	1	6,339,688.0	1,807,583.2	0.00
	2	6,339,667.5	1,807,799.5	0.00
	3	6,339,644.0	1,807,921.2	0.00
	4	6,339,647.5	1,808,134.1	0.00
	5	6,339,654.0	1,808,178.0	0.00

Dudek
CB
26 August 2022
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: Otay Village Town Center
RUN: Existing
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Town Center Dog Park	1	1	60.9	59.8	66	-1.1	10	----	59.8	0.0	8	-8.0
ST1	2	1	56.9	68.2	66	11.3	10	Both	68.2	0.0	8	-8.0
ST2	3	1	55.4	68.8	66	13.4	10	Both	68.8	0.0	8	-8.0
M1-1	20	1	0.0	54.6	66	54.6	10	----	54.6	0.0	8	-8.0
M1-2	21	1	0.0	58.4	66	58.4	10	----	58.4	0.0	8	-8.0
M1-3	22	1	0.0	59.9	66	59.9	10	----	59.9	0.0	8	-8.0
M1-4	23	1	0.0	60.3	66	60.3	10	----	60.3	0.0	8	-8.0
M2-1	24	1	0.0	50.8	66	50.8	10	----	50.8	0.0	8	-8.0
M2-2	25	1	0.0	55.1	66	55.1	10	----	55.1	0.0	8	-8.0
M2-3	26	1	0.0	57.2	66	57.2	10	----	57.2	0.0	8	-8.0
M2-4	27	1	0.0	57.6	66	57.6	10	----	57.6	0.0	8	-8.0
M3-1	28	1	0.0	40.4	66	40.4	10	----	40.4	0.0	8	-8.0
M3-2	30	1	0.0	44.1	66	44.1	10	----	44.1	0.0	8	-8.0
M3-3	31	1	0.0	46.1	66	46.1	10	----	46.1	0.0	8	-8.0
M3-4	33	1	0.0	47.8	66	47.8	10	----	47.8	0.0	8	-8.0
M4-1	34	1	0.0	58.3	66	58.3	10	----	58.3	0.0	8	-8.0
M4-2	35	1	0.0	63.6	66	63.6	10	----	63.6	0.0	8	-8.0
M4-3	36	1	0.0	65.0	66	65.0	10	----	65.0	0.0	8	-8.0
M4-4	37	1	0.0	65.8	66	65.8	10	----	65.8	0.0	8	-8.0
M5-1	38	1	0.0	51.6	66	51.6	10	----	51.6	0.0	8	-8.0
M5-2	39	1	0.0	55.4	66	55.4	10	----	55.4	0.0	8	-8.0
M5-3	40	1	0.0	59.5	66	59.5	10	----	59.5	0.0	8	-8.0
M5-4	41	1	0.0	60.2	66	60.2	10	----	60.2	0.0	8	-8.0
M6-1	42	1	0.0	51.6	66	51.6	10	----	51.6	0.0	8	-8.0

M6-2	43	1	0.0	54.6	66	54.6	10	----	54.6	0.0	8	-8.0
M6-3	44	1	0.0	56.6	66	56.6	10	----	56.6	0.0	8	-8.0
M6-4	46	1	0.0	57.6	66	57.6	10	----	57.6	0.0	8	-8.0

Dwelling Units	**# DUs**	**Noise Reduction**		
		Min	**Avg**	**Max**
		dB	**dB**	**dB**
All Selected	27	0.0	0.0	0.0
All Impacted	2	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

Dudek					**26 August 2022**							
CB					**TNM 2.5**							
INPUT: ROADWAYS								**Average pavement type shall be used unless**				
PROJECT/CONTRACT:	**Otay Village Town Center**							**a State highway agency substantiates the use**				
RUN:	**Existing + Project**							**of a different type with the approval of FHWA**				
Roadway		**Points**										
Name	**Width**	**Name**	**No.**	**Coordinates (pavement)**				**Flow Control**			**Segment**	
				X	**Y**	**Z**		**Control Device**	**Speed Constraint**	**Percent Vehicles Affected**	**Pvmt Type**	**On Struct?**
	ft			ft	ft	ft			mph	%		
125 South	55.0	point1	1	6,339,497.0	1,806,585.9	-15.00					Average	
		point2	2	6,339,495.5	1,806,799.0	-15.00					Average	
		point3	3	6,339,488.0	1,807,086.4	-15.00					Average	
		point4	4	6,339,490.0	1,807,415.0	-15.00					Average	
		point5	5	6,339,489.5	1,807,732.4	-15.00					Average	
		point6	6	6,339,490.0	1,808,004.1	-15.00					Average	
		point7	7	6,339,492.5	1,808,181.4	-15.00					Average	
		point8	8	6,339,495.5	1,808,410.0	-15.00					Average	
		point9	9	6,339,499.5	1,808,939.6	-15.00						
125 North	55.0	point10	10	6,339,629.5	1,808,904.9	-15.00					Average	
		point11	11	6,339,627.0	1,808,591.8	-15.00					Average	
		point12	12	6,339,625.5	1,808,355.0	-15.00					Average	
		point13	13	6,339,626.0	1,808,123.2	-15.00					Average	
		point14	14	6,339,625.5	1,807,848.8	-15.00					Average	
		point15	15	6,339,616.0	1,807,389.2	-15.00					Average	
		point16	16	6,339,614.5	1,807,149.6	-15.00					Average	
		point17	17	6,339,612.5	1,806,894.9	-15.00					Average	
		point18	18	6,339,609.0	1,806,659.5	-15.00						
Transit Rail	12.0	point19	19	6,341,131.0	1,808,543.9	0.00					Average	
		point20	20	6,340,975.5	1,808,495.1	0.00					Average	
		point21	21	6,340,728.0	1,808,412.6	0.00					Average	
		point22	22	6,340,516.0	1,808,342.9	0.00					Average	
		point23	23	6,340,449.5	1,808,323.9	0.00					Average	
		point24	24	6,340,327.5	1,808,286.0	0.00					Average	
		point25	25	6,340,201.5	1,808,241.9	0.00					Average	

		point26	26	6,340,065.5	1,808,197.2	0.00				Average	
		point27	27	6,339,936.5	1,808,166.2	0.00				Average	
		point28	28	6,339,856.0	1,808,163.1	0.00				Average	
		point29	29	6,339,733.0	1,808,189.5	0.00				Average	
		point30	30	6,339,650.5	1,808,210.2	0.00				Average	Y
		point31	31	6,339,568.5	1,808,223.2	0.00				Average	Y
		point32	32	6,339,482.5	1,808,238.0	0.00				Average	
		point33	33	6,339,351.5	1,808,254.2	0.00					
Town Center drive	12.0	point34	34	6,340,750.5	1,809,198.1	0.00				Average	
		point35	35	6,340,698.5	1,809,130.2	0.00				Average	
		point36	36	6,340,621.0	1,808,994.1	0.00				Average	
		point37	37	6,340,560.5	1,808,848.8	0.00				Average	
		point38	38	6,340,493.5	1,808,597.0	0.00				Average	
		point39	39	6,340,491.5	1,808,367.6	0.00					
Roadway5	45.0	point40	40	6,339,646.0	1,807,772.5	0.00				Average	
		point41	41	6,339,648.0	1,807,704.1	0.00				Average	
		point42	42	6,339,654.0	1,807,516.8	0.00				Average	
		point43	43	6,339,667.5	1,807,330.5	0.00				Average	
		point44	44	6,339,689.5	1,807,184.8	0.00				Average	
		point45	45	6,339,739.5	1,807,008.9	0.00				Average	
		point46	46	6,339,780.5	1,806,895.6	0.00				Average	
		point47	47	6,339,866.5	1,806,712.2	0.00					
Birch West	60.0	point48	48	6,342,049.0	1,806,628.9	0.00				Average	
		point49	49	6,341,718.5	1,806,557.0	0.00				Average	
		point50	50	6,341,498.5	1,806,534.4	0.00				Average	
		point51	51	6,341,239.5	1,806,545.9	0.00				Average	
		point52	52	6,340,691.5	1,806,547.0	0.00				Average	
		point53	53	6,340,320.5	1,806,539.1	0.00				Average	
		point54	54	6,340,020.5	1,806,498.2	0.00				Average	
		point55	55	6,339,668.0	1,806,423.4	0.00					
Birch east	60.0	point56	56	6,342,053.0	1,806,558.4	0.00				Average	
		point57	57	6,341,911.0	1,806,533.0	0.00				Average	
		point58	58	6,341,742.5	1,806,499.8	0.00				Average	
		point59	59	6,341,467.5	1,806,485.4	0.00				Average	
		point60	60	6,341,266.5	1,806,480.6	0.00				Average	
		point61	61	6,341,078.0	1,806,481.9	0.00				Average	
		point62	62	6,340,736.5	1,806,474.0	0.00				Average	
		point63	63	6,340,533.0	1,806,473.2	0.00				Average	
		point64	64	6,340,306.5	1,806,468.6	0.00				Average	

		point65	65	6,340,068.5	1,806,443.5	0.00				Average	
		point66	66	6,339,683.5	1,806,364.4	0.00					
Eastlake Pkwy	112.0	point67	67	6,341,641.5	1,808,823.6	0.00				Average	
		point68	68	6,341,658.0	1,808,531.8	0.00				Average	
		point69	69	6,341,674.0	1,808,284.4	0.00				Average	
		point70	70	6,341,729.0	1,808,023.6	0.00				Average	
		point71	71	6,341,794.0	1,807,792.6	0.00				Average	
		point72	72	6,341,912.0	1,807,499.4	0.00				Average	
		point73	73	6,341,988.0	1,807,319.1	0.00				Average	
		point74	74	6,342,087.0	1,807,055.8	0.00				Average	
		point75	75	6,342,125.0	1,806,860.6	0.00				Average	
		point76	76	6,342,168.0	1,806,599.8	0.00					
Olympic west	60.0	point77	77	6,339,721.5	1,810,449.5	0.00				Average	
		point78	78	6,339,934.5	1,810,298.0	0.00				Average	
		point79	79	6,340,247.0	1,810,029.6	0.00				Average	
		point80	80	6,340,524.0	1,809,614.9	0.00				Average	
		point81	81	6,340,742.0	1,809,370.5	0.00				Average	
		point82	82	6,340,941.0	1,809,234.1	0.00				Average	
		point83	83	6,341,257.0	1,809,090.2	0.00				Average	
		point84	84	6,341,595.0	1,808,969.2	0.00					
Olympic east	60.0	point85	85	6,341,594.5	1,808,888.2	0.00				Average	
		point86	86	6,341,296.5	1,808,969.2	0.00				Average	
		point87	87	6,341,120.0	1,809,026.4	0.00				Average	
		point88	88	6,340,879.0	1,809,164.2	0.00				Average	
		point89	89	6,340,645.0	1,809,369.5	0.00				Average	
		point90	90	6,340,487.0	1,809,526.4	0.00				Average	
		point91	91	6,340,376.0	1,809,672.0	0.00				Average	
		point92	92	6,340,286.0	1,809,816.9	0.00				Average	
		point93	93	6,340,186.5	1,809,952.0	0.00				Average	
		point94	94	6,340,076.0	1,810,076.4	0.00				Average	
		point95	95	6,339,967.0	1,810,185.8	0.00				Average	
		point96	96	6,339,713.5	1,810,370.8	0.00					

Dudek **26 August 2022**
CB **TNM 2.5**

INPUT: TRAFFIC FOR LAeq1h Volumes
PROJECT/CONTRACT: **Otay Village Town Center**
RUN: **Existing + Project**

Roadway	Points		Segment									
Name	Name	No.	Autos		MTrucks		HTrucks		Buses		Motorcycles	
			V	S	V	S	V	S	V	S	V	S
			veh/hr	mph	veh/hr	mph	veh/hr	mph	veh/hr	mph	veh/hr	mph
125 South	point1	1	688	65	14	65	7	65	0	0	0	0
	point2	2	688	65	14	65	7	65	0	0	0	0
	point3	3	688	65	14	65	7	65	0	0	0	0
	point4	4	688	65	14	65	7	65	0	0	0	0
	point5	5	688	65	14	65	7	65	0	0	0	0
	point6	6	688	65	14	65	7	65	0	0	0	0
	point7	7	688	65	14	65	7	65	0	0	0	0
	point8	8	688	65	14	65	7	65	0	0	0	0
	point9	9										
125 North	point10	10	582	65	12	65	6	65	0	0	0	0
	point11	11	582	65	12	65	6	65	0	0	0	0
	point12	12	582	65	12	65	6	65	0	0	0	0
	point13	13	582	65	12	65	6	65	0	0	0	0
	point14	14	582	65	12	65	6	65	0	0	0	0
	point15	15	582	65	12	65	6	65	0	0	0	0
	point16	16	582	65	12	65	6	65	0	0	0	0
	point17	17	582	65	12	65	6	65	0	0	0	0
	point18	18										
Transit Rail	point19	19	0	0	0	0	0	0	0	0	0	0
	point20	20	0	0	0	0	0	0	0	0	0	0
	point21	21	0	0	0	0	0	0	0	0	0	0
	point22	22	0	0	0	0	0	0	0	0	0	0
	point23	23	0	0	0	0	0	0	0	0	0	0

	point24	24	0	0	0	0	0	0	0	0	0	0
	point25	25	0	0	0	0	0	0	0	0	0	0
	point26	26	0	0	0	0	0	0	0	0	0	0
	point27	27	0	0	0	0	0	0	0	0	0	0
	point28	28	0	0	0	0	0	0	0	0	0	0
	point29	29	0	0	0	0	0	0	0	0	0	0
	point30	30	0	0	0	0	0	0	0	0	0	0
	point31	31	0	0	0	0	0	0	0	0	0	0
	point32	32	0	0	0	0	0	0	0	0	0	0
	point33	33										
Town Center drive	point34	34	1353	35	27	35	13	35	0	0	0	0
	point35	35	1353	35	27	35	13	35	0	0	0	0
	point36	36	1353	35	27	35	13	35	0	0	0	0
	point37	37	1353	35	27	35	13	35	0	0	0	0
	point38	38	1353	35	27	35	13	35	0	0	0	0
	point39	39										
Roadway5	point40	40	230	40	4	40	2	40	0	0	0	0
	point41	41	0	0	0	0	0	0	0	0	0	0
	point42	42	0	0	0	0	0	0	0	0	0	0
	point43	43	0	0	0	0	0	0	0	0	0	0
	point44	44	0	0	0	0	0	0	0	0	0	0
	point45	45	0	0	0	0	0	0	0	0	0	0
	point46	46	0	0	0	0	0	0	0	0	0	0
	point47	47										
Birch West	point48	48	1698	50	35	50	17	50	0	0	0	0
	point49	49	1698	50	35	50	17	50	0	0	0	0
	point50	50	1698	50	35	50	17	50	0	0	0	0
	point51	51	1698	50	35	50	17	50	0	0	0	0
	point52	52	1698	50	35	50	17	50	0	0	0	0
	point53	53	1698	50	35	50	17	50	0	0	0	0
	point54	54	1698	50	35	50	17	50	0	0	0	0
	point55	55										
Birch east	point56	56	1698	50	35	50	17	50	0	0	0	0
	point57	57	1698	50	35	50	17	50	0	0	0	0
	point58	58	1698	50	35	50	17	50	0	0	0	0
	point59	59	1698	50	35	50	17	50	0	0	0	0

	point60	60	1698	50	35	50	17	50	0	0	0	0
	point61	61	1698	50	35	50	17	50	0	0	0	0
	point62	62	1698	50	35	50	17	50	0	0	0	0
	point63	63	1698	50	35	50	17	50	0	0	0	0
	point64	64	1698	50	35	50	17	50	0	0	0	0
	point65	65	1698	50	35	50	17	50	0	0	0	0
	point66	66										
Eastlake Pkwy	point67	67	1626	50	33	50	16	50	0	0	0	0
	point68	68	1626	50	33	50	16	50	0	0	0	0
	point69	69	1626	50	33	50	16	50	0	0	0	0
	point70	70	1626	50	33	50	16	50	0	0	0	0
	point71	71	1626	50	33	50	16	50	0	0	0	0
	point72	72	1626	50	33	50	16	50	0	0	0	0
	point73	73	1626	50	33	50	16	50	0	0	0	0
	point74	74	1626	50	33	50	16	50	0	0	0	0
	point75	75	1626	50	33	50	16	50	0	0	0	0
	point76	76										
Olympic west	point77	77	1415	50	29	50	14	50	0	0	0	0
	point78	78	1415	50	29	50	14	50	0	0	0	0
	point79	79	1415	50	29	50	14	50	0	0	0	0
	point80	80	1415	50	29	50	14	50	0	0	0	0
	point81	81	1415	50	29	50	14	50	0	0	0	0
	point82	82	1415	50	29	50	14	50	0	0	0	0
	point83	83	1415	50	29	50	14	50	0	0	0	0
	point84	84										
Olympic east	point85	85	1415	50	29	50	14	50	0	0	0	0
	point86	86	1415	50	29	50	14	50	0	0	0	0
	point87	87	1415	50	29	50	14	50	0	0	0	0
	point88	88	1415	50	29	50	14	50	0	0	0	0
	point89	89	1415	50	29	50	14	50	0	0	0	0
	point90	90	1415	50	29	50	14	50	0	0	0	0
	point91	91	1415	50	29	50	14	50	0	0	0	0
	point92	92	1415	50	29	50	14	50	0	0	0	0
	point93	93	1415	50	29	50	14	50	0	0	0	0
	point94	94	1415	50	29	50	14	50	0	0	0	0
	point95	95	1415	50	29	50	14	50	0	0	0	0

	point96	96										

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26 August 2022
TNM 2.5

INPUT: RECEIVERS
PROJECT/CONTRACT: Otay Village Town Center
RUN: Existing + Project

Receiver

Name	No.	#DUs	Coordinates (ground)			Height above Ground	Input Sound Levels and Criteria				Active in Calc.
			X	Y	Z		Existing LAeq1h	Impact Criteria LAeq1h	Sub'l	NR Goal	
			ft	ft	ft	ft	dBA	dBA	dB	dB	
Town Center Dog Park	1	1	6,339,836.0	1,806,980.8	0.00	4.92	60.90	66	10.0	8.0	Y
ST1	2	1	6,339,381.0	1,807,674.9	0.00	4.92	56.90	66	10.0	8.0	Y
ST2	3	1	6,339,406.0	1,808,385.9	0.00	4.92	55.40	66	10.0	8.0	Y
B1-1-1	20	1	6,339,870.0	1,808,064.8	0.00	4.92	0.00	66	10.0	8.0	Y
B1-1-2	21	1	6,339,870.0	1,808,064.8	0.00	14.92	0.00	66	10.0	8.0	Y
B1-1-3	22	1	6,339,870.0	1,808,064.8	0.00	24.92	0.00	66	10.0	8.0	Y
B1-1-4	23	1	6,339,870.0	1,808,064.8	0.00	34.92	0.00	66	10.0	8.0	Y
B2-1-1	24	1	6,340,266.5	1,808,159.4	0.00	4.92	0.00	66	10.0	8.0	Y
B2-1-2	25	1	6,340,266.5	1,808,159.4	0.00	14.92	0.00	66	10.0	8.0	Y
B2-1-3	26	1	6,340,266.5	1,808,159.4	0.00	24.92	0.00	66	10.0	8.0	Y
B2-1-4	27	1	6,340,266.5	1,808,159.4	0.00	34.92	0.00	66	10.0	8.0	Y
B3-1-1	28	1	6,340,121.0	1,807,750.9	0.00	4.92	0.00	66	10.0	8.0	Y
B3-1-2	30	1	6,340,121.0	1,807,750.9	0.00	14.92	0.00	66	10.0	8.0	Y
B3-1-3	31	1	6,340,121.0	1,807,750.9	0.00	24.92	0.00	66	10.0	8.0	Y
B3-1-4	33	1	6,340,121.0	1,807,750.9	0.00	34.92	0.00	66	10.0	8.0	Y
B1-2-1	34	1	6,339,743.0	1,807,905.1	0.00	4.92	0.00	66	10.0	8.0	Y
B1-2-2	35	1	6,339,743.0	1,807,905.1	0.00	14.92	0.00	66	10.0	8.0	Y
B1-2-3	36	1	6,339,743.0	1,807,905.1	0.00	24.92	0.00	66	10.0	8.0	Y
B1-2-4	37	1	6,339,743.0	1,807,905.1	0.00	34.92	0.00	66	10.0	8.0	Y
B3-2-1	38	1	6,339,925.5	1,807,559.1	0.00	4.92	0.00	66	10.0	8.0	Y
B3-2-2	39	1	6,339,925.5	1,807,559.1	0.00	14.92	0.00	66	10.0	8.0	Y
B3-2-3	40	1	6,339,925.5	1,807,559.1	0.00	24.92	0.00	66	10.0	8.0	Y

B3-2-4	41	1	6,339,925.5	1,807,559.1	0.00	34.92	0.00	66	10.0	8.0	Y
B3-3-1	42	1	6,340,127.0	1,807,440.9	0.00	4.92	0.00	66	10.0	8.0	Y
B3-3-2	43	1	6,340,127.0	1,807,440.9	0.00	14.92	0.00	66	10.0	8.0	Y
B3-3-3	44	1	6,340,127.0	1,807,440.9	0.00	24.92	0.00	66	10.0	8.0	Y
B3-3-4	46	1	6,340,127.0	1,807,440.9	0.00	34.92	0.00	66	10.0	8.0	Y
OS-1	48	1	6,340,091.5	1,807,993.8	0.00	4.92	0.00	66	10.0	8.0	Y

Dudek 26 August 2022
CB TNM 2.5

INPUT: BARRIERS
PROJECT/CONTRACT: Otay Village Town Center
RUN: Existing + Project

Barrier									Points										
Name	Type	Height		If Wall	If Berm			Add'tnl	Name	No.	Coordinates (bottom)			Height	Segment				
		Min	Max	$ per	$ per	Top	Run:Rise	$ per			X	Y	Z	at	Seg Ht	Perturbs		On	Important
				Unit	Unit	Width		Unit						Point	Incre-	#Up	#Dn	Struct?	Reflec-
				Area	Vol.			Length							ment				tions?
		ft	ft	$/sq ft	$/cu yd	ft	ft:ft	$/ft			ft	ft	ft	ft	ft				
Barrier1	W	0.00	99.99	0.00				0.00	point1	1	6,339,727.0	1,808,050.1	0.00	40.00	0.00	0	0		
									point2	2	6,339,763.0	1,807,788.5	0.00	40.00	0.00	0	0		
									point3	3	6,340,071.5	1,807,828.0	0.00	40.00	0.00	0	0		
									point4	4	6,340,042.0	1,808,077.9	0.00	40.00	0.00	0	0		
									point5	5	6,339,852.5	1,808,057.1	0.00	40.00	0.00	0	0		
									point6	6	6,339,852.5	1,808,066.1	0.00	40.00	0.00	0	0		
									point7	7	6,339,727.0	1,808,050.1	0.00	40.00					
Barrier2	W	0.00	99.99	0.00				0.00	point8	8	6,340,147.5	1,807,836.6	0.00	40.00	0.00	0	0		
									point9	9	6,340,514.0	1,807,881.5	0.00	40.00	0.00	0	0		
									point10	10	6,340,506.5	1,807,966.0	0.00	40.00	0.00	0	0		
									point11	11	6,340,491.5	1,807,966.5	0.00	40.00	0.00	0	0		
									point12	12	6,340,487.5	1,807,990.9	0.00	40.00	0.00	0	0		
									point13	13	6,340,500.5	1,807,992.1	0.00	40.00	0.00	0	0		
									point14	14	6,340,442.5	1,808,201.2	0.00	40.00	0.00	0	0		
									point15	15	6,340,112.5	1,808,113.8	0.00	40.00	0.00	0	0		
									point16	16	6,340,147.5	1,807,836.6	0.00	40.00					
Barrier3	W	0.00	99.99	0.00				0.00	point17	17	6,339,906.5	1,807,715.4	0.00	40.00	0.00	0	0		
									point18	18	6,339,949.0	1,807,421.2	0.00	40.00	0.00	0	0		
									point19	19	6,340,395.0	1,807,476.6	0.00	40.00	0.00	0	0		
									point20	20	6,340,350.0	1,807,770.9	0.00	40.00	0.00	0	0		
									point21	21	6,339,906.5	1,807,715.4	0.00	40.00					

Dudek			26 August 2022	
CB			TNM 2.5	
INPUT: TERRAIN LINES				
PROJECT/CONTRACT:	Otay Village Town Center			
RUN:	Existing + Project			
Terrain Line	Points			
Name	No.	Coordinates (ground)		
		X	Y	Z
		ft	ft	ft
Terrain Line1	1	6,339,688.0	1,807,583.2	0.00
	2	6,339,667.5	1,807,799.5	0.00
	3	6,339,644.0	1,807,921.2	0.00
	4	6,339,647.5	1,808,134.1	0.00
	5	6,339,654.0	1,808,178.0	0.00

Dudek
CB
26 August 2022
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: Otay Village Town Center
RUN: Existing + Project
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Town Center Dog Park	1	1	60.9	60.0	66	-0.9	10	----	60.0	0.0	8	-8.0
ST1	2	1	56.9	68.2	66	11.3	10	Both	68.2	0.0	8	-8.0
ST2	3	1	55.4	68.8	66	13.4	10	Both	68.8	0.0	8	-8.0
B1-1-1	20	1	0.0	54.6	66	54.6	10	----	54.6	0.0	8	-8.0
B1-1-2	21	1	0.0	58.4	66	58.4	10	----	58.4	0.0	8	-8.0
B1-1-3	22	1	0.0	60.0	66	60.0	10	----	60.0	0.0	8	-8.0
B1-1-4	23	1	0.0	60.3	66	60.3	10	----	60.3	0.0	8	-8.0
B2-1-1	24	1	0.0	51.3	66	51.3	10	----	51.3	0.0	8	-8.0
B2-1-2	25	1	0.0	55.6	66	55.6	10	----	55.6	0.0	8	-8.0
B2-1-3	26	1	0.0	57.7	66	57.7	10	----	57.7	0.0	8	-8.0
B2-1-4	27	1	0.0	58.1	66	58.1	10	----	58.1	0.0	8	-8.0
B3-1-1	28	1	0.0	40.4	66	40.4	10	----	40.4	0.0	8	-8.0
B3-1-2	30	1	0.0	44.2	66	44.2	10	----	44.2	0.0	8	-8.0
B3-1-3	31	1	0.0	46.1	66	46.1	10	----	46.1	0.0	8	-8.0
B3-1-4	33	1	0.0	47.9	66	47.9	10	----	47.9	0.0	8	-8.0
B1-2-1	34	1	0.0	58.3	66	58.3	10	----	58.3	0.0	8	-8.0
B1-2-2	35	1	0.0	63.7	66	63.7	10	----	63.7	0.0	8	-8.0
B1-2-3	36	1	0.0	65.0	66	65.0	10	----	65.0	0.0	8	-8.0
B1-2-4	37	1	0.0	65.8	66	65.8	10	----	65.8	0.0	8	-8.0
B3-2-1	38	1	0.0	51.6	66	51.6	10	----	51.6	0.0	8	-8.0
B3-2-2	39	1	0.0	55.5	66	55.5	10	----	55.5	0.0	8	-8.0
B3-2-3	40	1	0.0	59.5	66	59.5	10	----	59.5	0.0	8	-8.0
B3-2-4	41	1	0.0	60.2	66	60.2	10	----	60.2	0.0	8	-8.0
B3-3-1	42	1	0.0	51.9	66	51.9	10	----	51.9	0.0	8	-8.0

B3-3-2	43	1	0.0	54.9	66	54.9	10	----	54.9	0.0	8	-8.0
B3-3-3	44	1	0.0	56.9	66	56.9	10	----	56.9	0.0	8	-8.0
B3-3-4	46	1	0.0	57.8	66	57.8	10	----	57.8	0.0	8	-8.0
OS-1	48	1	0.0	39.7	66	39.7	10	----	39.7	0.0	8	-8.0

Dwelling Units		**# DUs**	**Noise Reduction**		
			Min	**Avg**	**Max**
			dB	**dB**	**dB**
All Selected		28	0.0	0.0	0.0
All Impacted		2	0.0	0.0	0.0
All that meet NR Goal		0	0.0	0.0	0.0

noise level limit for construction phase at residential land use, per FTA guidance =	80
allowable hours over which Leq is to be averaged =	8

Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Client Equipment Description, Data Source and/or Notes	Source to NSR Distance (ft.)	*Temporary Barrier Insertion Loss (dB)*	*Additional Noise Reduction*	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq
Demolition	Concrete saw	1	20	90	Concrete/Industrial Saws	325	0.1		69.2	8	480	62
	Dozer	1	40	82		325	0.1		61.2	8	480	57
	front end loader	2	40	79		325	0.1		58.2	8	480	57
	excavator	2	40	81		325	0.1		60.2	8	480	59
									Total for Demolition Phase:			**65.5**
Site Preparation	Dozer	2	40	82		330	0.1		61.0	8	480	60
	Tractor	1	40	84		330	0.1		63.0	8	480	59
	front end loader	1	40	79		330	0.1		58.0	8	480	54
	Backhoe	0	40	78		330	0.1		57.0	8	480	0
									Total for Site Preparation Phase:			**63.2**
Underground Utilities	Tractor	1	40	84		340	0.1		62.7	8	480	59
	front end loader	1	40	79		340	0.1		57.7	8	480	54
	Backhoe	0	40	78		340	0.1		56.7	8	480	0
									Total for Underground Utilities Phase:			**59.9**
Grading	excavator	1	40	81		330	0.1		60.0	8	480	56
	grader	1	40	85		330	0.1		64.0	8	480	60
	dozer	1	40	82		330	0.1		61.0	8	480	57
	tractor	1	40	84		330	0.1		63.0	8	480	59
	front end loader	1	40	79		330	0.1		58.0	8	480	54
	backhoe	0	40	78		330	0.1		57.0	8	480	0
									Total for Grading Phase:			**64.7**
Building Construction	crane	1	16	81		340	0.1		59.7	7	420	51
	man lift	2	20	75	forklift	340	0.1		53.7	8	480	50
	generator	1	50	72		340	0.1		50.7	8	480	48
	tractor	1	40	84		340	0.1		62.7	7	420	58
	front end loader	1	40	79		340	0.1		57.7	7	420	53
	backhoe	1	40	78		340	0.1		56.7	7	420	52
	welder / torch	1	40	73		340	0.1		51.7	4	240	45
									Total for Building Construction Phase:			**61.3**
Paving	Concrete mixer truck	2	40	79	Cement and Mortar Mixers	450	0.1		55.0	6	360	53
	paver	1	50	77		450	0.1		53.0	8	480	50
	All Other Equipment > 5 HP	2	50	85	Paving Equipment	450	0.1		61.0	6	360	60
	roller	2	20	80		450	0.1		56.0	6	360	51
	tractor	1	40	84		450	0.1		60.0	8	480	56
	front end loader	0	40	79		450	0.1		55.0	8	480	0
	backhoe	0	40	78		450	0.1		54.0	8	480	0
									Total for Paving Phase:			**62.5**
Architectural Coating	compressor (air)	1	40	78		340	0.1		56.7	6	360	52
									Total for Architectural Coating Phase:			**51.5**

To User: bordered cells are inputs, unbordered cells have formulae

noise level limit for construction phase at residential land use, per FTA guidance =	80
allowable hours over which Leq is to be averaged =	8

Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Client Equipment Description, Data Source and/or Notes	Source to NSR Distance (ft.)	*Temporary Barrier Insertion Loss (dB)*	*Additional Noise Reduction*	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq
Demolition	Concrete saw	1	20	90	Concrete/Industrial Saws	555	0.1		64.0	8	480	57
	Dozer	1	40	82		555	0.1		56.0	8	480	52
	front end loader	2	40	79		555	0.1		53.0	8	480	52
	excavator	2	40	81		555	0.1		55.0	8	480	54
									Total for Demolition Phase:			**60.3**
Site Preparation	Dozer	2	40	82		510	0.1		56.8	8	480	56
	Tractor	1	40	84		510	0.1		58.8	8	480	55
	front end loader	1	40	79		510	0.1		53.8	8	480	50
	Backhoe	0	40	78		510	0.1		52.8	8	480	0
									Total for Site Preparation Phase:			**59.0**
Underground Utilities	Tractor	1	40	84		505	0.1		58.9	8	480	55
	front end loader	1	40	79		505	0.1		53.9	8	480	50
	Backhoe	0	40	78		505	0.1		52.9	8	480	0
									Total for Underground Utilities Phase:			**56.1**
Grading	excavator	1	40	81		510	0.1		55.8	8	480	52
	grader	1	40	85		510	0.1		59.8	8	480	56
	dozer	1	40	82		510	0.1		56.8	8	480	53
	tractor	1	40	84		510	0.1		58.8	8	480	55
	front end loader	1	40	79		510	0.1		53.8	8	480	50
	backhoe	0	40	78		510	0.1		52.8	8	480	0
									Total for Grading Phase:			**60.5**
Building Construction	crane	1	16	81		505	0.1		55.9	7	420	47
	man lift	2	20	75	forklift	505	0.1		49.9	8	480	46
	generator	1	50	72		505	0.1		46.9	8	480	44
	tractor	1	40	84		505	0.1		58.9	7	420	54
	front end loader	1	40	79		505	0.1		53.9	7	420	49
	backhoe	1	40	78		505	0.1		52.9	7	420	48
	welder / torch	1	40	73		505	0.1		47.9	4	240	41
									Total for Building Construction Phase:			**57.5**
Paving	Concrete mixer truck	2	40	79	Cement and Mortar Mixers	460	0.1		54.8	6	360	53
	paver	1	50	77		460	0.1		52.8	8	480	50
	All Other Equipment > 5 HP	2	50	85	Paving Equipment	460	0.1		60.8	6	360	60
	roller	2	20	80		460	0.1		55.8	6	360	51
	tractor	1	40	84		460	0.1		59.8	8	480	56
	front end loader	0	40	79		460	0.1		54.8	8	480	0
	backhoe	0	40	78		460	0.1		53.8	8	480	0
									Total for Paving Phase:			**62.3**
Architectural Coating	compressor (air)	1	40	78		505	0.1		52.9	6	360	48
									Total for Architectural Coating Phase:			**47.7**

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noise level limit for construction phase at residential land use, per FTA guidance = 80
allowable hours over which Leq is to be averaged = 8

Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Client Equipment Description, Data Source and/or Notes	Source to NSR Distance (ft.)	*Temporary Barrier Insertion Loss (dB)*	*Additional Noise Reduction*	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq
Demolition	Concrete saw	1	20	90	Concrete/Industrial Saws	705	0.1		61.7	8	480	55
	Dozer	1	40	82		705	0.1		53.7	8	480	50
	front end loader	2	40	79		705	0.1		50.7	8	480	50
	excavator	2	40	81		705	0.1		52.7	8	480	52
									Total for Demolition Phase:			**58.0**
Site Preparation	Dozer	2	40	82		700	0.1		53.8	8	480	53
	Tractor	1	40	84		700	0.1		55.8	8	480	52
	front end loader	1	40	79		700	0.1		50.8	8	480	47
	Backhoe	0	40	78		700	0.1		49.8	8	480	0
									Total for Site Preparation Phase:			**55.9**
Underground Utilities	Tractor	1	40	84		710	0.1		55.6	8	480	52
	front end loader	1	40	79		710	0.1		50.6	8	480	47
	Backhoe	0	40	78		710	0.1		49.6	8	480	0
									Total for Underground Utilities Phase:			**52.9**
Grading	excavator	1	40	81		700	0.1		52.8	8	480	49
	grader	1	40	85		700	0.1		56.8	8	480	53
	dozer	1	40	82		700	0.1		53.8	8	480	50
	tractor	1	40	84		700	0.1		55.8	8	480	52
	front end loader	1	40	79		700	0.1		50.8	8	480	47
	backhoe	0	40	78		700	0.1		49.8	8	480	0
									Total for Grading Phase:			**57.5**
Building Construction	crane	1	16	81		710	0.1		52.6	7	420	44
	man lift	2	20	75	forklift	710	0.1		46.6	8	480	43
	generator	1	50	72		710	0.1		43.6	8	480	41
	tractor	1	40	84		710	0.1		55.6	7	420	51
	front end loader	1	40	79		710	0.1		50.6	7	420	46
	backhoe	1	40	78		710	0.1		49.6	7	420	45
	welder / torch	1	40	73		710	0.1		44.6	4	240	38
									Total for Building Construction Phase:			**54.2**
Paving	Concrete mixer truck	2	40	79	Cement and Mortar Mixers	860	0.1		48.8	6	360	47
	paver	1	50	77		860	0.1		46.8	8	480	44
	All Other Equipment > 5 HP	2	50	85	Paving Equipment	860	0.1		54.8	6	360	54
	roller	2	20	80		860	0.1		49.8	6	360	45
	tractor	1	40	84		860	0.1		53.8	8	480	50
	front end loader	0	40	79		860	0.1		48.8	8	480	0
	backhoe	0	40	78		860	0.1		47.8	8	480	0
									Total for Paving Phase:			**56.2**
Architectural Coating	compressor (air)	1	40	78		710	0.1		49.6	6	360	44
									Total for Architectural Coating Phase:			**44.4**

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Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Client Equipment Description, Data Source and/or Notes	Source to NSR Distance (ft.)	*Temporary Barrier Insertion Loss (dB)*	*Additional Noise Reduction*	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq
Demolition	Concrete saw	1	20	90	Concrete/Industrial Saws	1050	0.1		57.8	8	480	51
	Dozer	1	40	82		1050	0.1		49.8	8	480	46
	front end loader	2	40	79		1050	0.1		46.8	8	480	46
	excavator	2	40	81		1050	0.1		48.8	8	480	48
									Total for Demolition Phase:			**54.1**
Site Preparation	Dozer	2	40	82		920	0.1		51.1	8	480	50
	Tractor	1	40	84		920	0.1		53.1	8	480	49
	front end loader	1	40	79		920	0.1		48.1	8	480	44
	Backhoe	0	40	78		920	0.1		47.1	8	480	0
									Total for Site Preparation Phase:			**53.2**
Underground Utilities	Tractor	1	40	84		900	0.1		53.3	8	480	49
	front end loader	1	40	79		900	0.1		48.3	8	480	44
	Backhoe	0	40	78		900	0.1		47.3	8	480	0
									Total for Underground Utilities Phase:			**50.5**
Grading	excavator	1	40	81		920	0.1		50.1	8	480	46
	grader	1	40	85		920	0.1		54.1	8	480	50
	dozer	1	40	82		920	0.1		51.1	8	480	47
	tractor	1	40	84		920	0.1		53.1	8	480	49
	front end loader	1	40	79		920	0.1		48.1	8	480	44
	backhoe	0	40	78		920	0.1		47.1	8	480	0
									Total for Grading Phase:			**54.8**
Building Construction	crane	1	16	81		900	0.1		50.3	7	420	42
	man lift	2	20	75	forklift	900	0.1		44.3	8	480	40
	generator	1	50	72		900	0.1		41.3	8	480	38
	tractor	1	40	84		900	0.1		53.3	7	420	49
	front end loader	1	40	79		900	0.1		48.3	7	420	44
	backhoe	1	40	78		900	0.1		47.3	7	420	43
	welder / torch	1	40	73		900	0.1		42.3	4	240	35
									Total for Building Construction Phase:			**51.9**
Paving	Concrete mixer truck	2	40	79	Cement and Mortar Mixers	870	0.1		48.7	6	360	46
	paver	1	50	77		870	0.1		46.7	8	480	44
	All Other Equipment > 5 HP	2	50	85	Paving Equipment	870	0.1		54.7	6	360	53
	roller	2	20	80		870	0.1		49.7	6	360	44
	tractor	1	40	84		870	0.1		53.7	8	480	50
	front end loader	0	40	79		870	0.1		48.7	8	480	0
	backhoe	0	40	78		870	0.1		47.7	8	480	0
									Total for Paving Phase:			**56.1**
Architectural Coating	compressor (air)	1	40	78		900	0.1		47.3	6	360	42
									Total for Architectural Coating Phase:			**42.1**

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Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Client Equipment Description, Data Source and/or Notes	Source to NSR Distance (ft.)	*Temporary Barrier Insertion Loss (dB)*	*Additional Noise Reduction*	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq
Demolition	Concrete saw	1	20	90	Concrete/Industrial Saws	330	0.1		69.0	8	480	62
	Dozer	1	40	82		330	0.1		61.0	8	480	57
	front end loader	2	40	79		330	0.1		58.0	8	480	57
	excavator	2	40	81		330	0.1		60.0	8	480	59
									Total for Demolition Phase:			**65.3**
Site Preparation	Dozer	2	40	82		320	0.1		61.3	8	480	60
	Tractor	1	40	84		320	0.1		63.3	8	480	59
	front end loader	1	40	79		320	0.1		58.3	8	480	54
	Backhoe	0	40	78		320	0.1		57.3	8	480	0
									Total for Site Preparation Phase:			**63.5**
Underground Utilities	Tractor	1	40	84		520	0.1		58.6	8	480	55
	front end loader	1	40	79		520	0.1		53.6	8	480	50
	Backhoe	0	40	78		520	0.1		52.6	8	480	0
									Total for Underground Utilities Phase:			**55.9**
Grading	excavator	1	40	81		320	0.1		60.3	8	480	56
	grader	1	40	85		320	0.1		64.3	8	480	60
	dozer	1	40	82		320	0.1		61.3	8	480	57
	tractor	1	40	84		320	0.1		63.3	8	480	59
	front end loader	1	40	79		320	0.1		58.3	8	480	54
	backhoe	0	40	78		320	0.1		57.3	8	480	0
									Total for Grading Phase:			**65.0**
Building Construction	crane	1	16	81		520	0.1		55.6	7	420	47
	man lift	2	20	75	forklift	520	0.1		49.6	8	480	46
	generator	1	50	72		520	0.1		46.6	8	480	44
	tractor	1	40	84		520	0.1		58.6	7	420	54
	front end loader	1	40	79		520	0.1		53.6	7	420	49
	backhoe	1	40	78		520	0.1		52.6	7	420	48
	welder / torch	1	40	73		520	0.1		47.6	4	240	41
									Total for Building Construction Phase:			**57.2**
Paving	Concrete mixer truck	2	40	79	Cement and Mortar Mixers	440	0.1		55.2	6	360	53
	paver	1	50	77		440	0.1		53.2	8	480	50
	All Other Equipment > 5 HP	2	50	85	Paving Equipment	440	0.1		61.2	6	360	60
	roller	2	20	80		440	0.1		56.2	6	360	51
	tractor	1	40	84		440	0.1		60.2	8	480	56
	front end loader	0	40	79		440	0.1		55.2	8	480	0
	backhoe	0	40	78		440	0.1		54.2	8	480	0
									Total for Paving Phase:			**62.7**
Architectural Coating	compressor (air)	1	40	78		520	0.1		52.6	6	360	47
									Total for Architectural Coating Phase:			**47.4**

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Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Client Equipment Description, Data Source and/or Notes	Source to NSR Distance (ft.)	*Temporary Barrier Insertion Loss (dB)*	*Additional Noise Reduction*	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq
Demolition	Concrete saw	1	20	90	Concrete/Industrial Saws	750	0.1		61.1	8	480	54
	Dozer	1	40	82		750	0.1		53.1	8	480	49
	front end loader	2	40	79		750	0.1		50.1	8	480	49
	excavator	2	40	81		750	0.1		52.1	8	480	51
									Total for Demolition Phase:			**57.4**
Site Preparation	Dozer	2	40	82		775	0.1		52.8	8	480	52
	Tractor	1	40	84		775	0.1		54.8	8	480	51
	front end loader	1	40	79		775	0.1		49.8	8	480	46
	Backhoe	0	40	78		775	0.1		48.8	8	480	0
									Total for Site Preparation Phase:			**54.9**
Underground Utilities	Tractor	1	40	84		785	0.1		54.7	8	480	51
	front end loader	1	40	79		785	0.1		49.7	8	480	46
	Backhoe	0	40	78		785	0.1		48.7	8	480	0
									Total for Underground Utilities Phase:			**51.9**
Grading	excavator	1	40	81		775	0.1		51.8	8	480	48
	grader	1	40	85		775	0.1		55.8	8	480	52
	dozer	1	40	82		775	0.1		52.8	8	480	49
	tractor	1	40	84		775	0.1		54.8	8	480	51
	front end loader	1	40	79		775	0.1		49.8	8	480	46
	backhoe	0	40	78		775	0.1		48.8	8	480	0
									Total for Grading Phase:			**56.5**
Building Construction	crane	1	16	81		785	0.1		51.7	7	420	43
	man lift	2	20	75	forklift	785	0.1		45.7	8	480	42
	generator	1	50	72		785	0.1		42.7	8	480	40
	tractor	1	40	84		785	0.1		54.7	7	420	50
	front end loader	1	40	79		785	0.1		49.7	7	420	45
	backhoe	1	40	78		785	0.1		48.7	7	420	44
	welder / torch	1	40	73		785	0.1		43.7	4	240	37
									Total for Building Construction Phase:			**53.2**
Paving	Concrete mixer truck	2	40	79	Cement and Mortar Mixers	730	0.1		50.4	6	360	48
	paver	1	50	77		730	0.1		48.4	8	480	45
	All Other Equipment > 5 HP	2	50	85	Paving Equipment	730	0.1		56.4	6	360	55
	roller	2	20	80		730	0.1		51.4	6	360	46
	tractor	1	40	84		730	0.1		55.4	8	480	51
	front end loader	0	40	79		730	0.1		50.4	8	480	0
	backhoe	0	40	78		730	0.1		49.4	8	480	0
									Total for Paving Phase:			**57.8**
Architectural Coating	compressor (air)	1	40	78		785	0.1		48.7	6	360	43
									Total for Architectural Coating Phase:			**43.4**