Creekside Assisted Living

Technical Appendices

Appendix I

Noise Report

NOISE ASSESSMENT

Creekside Assisted Living
City of San Marcos

Prepared for:

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Project: 19-85 Creekside Assisted Living Noise

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GLOSSARY OF TERMS

Sound Pressure Level (SPL): a ratio of one sound pressure to a reference pressure (L_{ref}) of 20 µPa. Because of the dynamic range of the human ear, the ratio is calculated logarithmically by 20 log (L/L_{ref}).

A-weighted Sound Pressure Level (dBA): Some frequencies of noise are more noticeable than others. To compensate for this fact, different sound frequencies are weighted more.

Minimum Sound Level (L_{min}): Minimum SPL or the lowest SPL measured over the time interval using the A-weighted network and slow time weighting.

Maximum Sound Level (L_{max}): Maximum SPL or the highest SPL measured over the time interval the A-weighted network and slow time weighting.

Equivalent sound level (L_{eq}): the true equivalent sound level measured over the run time. Leq is the A-weighted steady sound level that contains the same total acoustical energy as the actual fluctuating sound level.

Day Night Sound Level (Ldn): Representing the Day/Night sound level, this measurement is a 24 –hour average sound level where 10 dB is added to all the readings that occur between 10 pm and 7 am. This is primarily used in community noise regulations where there is a 10 dB "Penalty" for night time noise. Typically, Ldn's are measured using A weighting.

Community Noise Exposure Level (CNEL): The accumulated exposure to sound measured in a 24-hour sampling interval and artificially boosted during certain hours. For CNEL, samples taken between 7 pm and 10 pm are boosted by 5 dB; samples taken between 10 pm and 7 am are boosted by 10 dB.

Octave Band: An octave band is defined as a frequency band whose upper band-edge frequency is twice the lower band frequency.

Third-Octave Band: A third-octave band is defined as a frequency band whose upper band-edge frequency is 1.26 times the lower band frequency.

Response Time (F,S,I): The response time is a standardized exponential time weighting of the input signal according to fast (F), slow (S) or impulse (I) time response relationships. Time response can be described with a time constant. The time constants for fast, slow and impulse responses are 1.0 seconds, 0.125 seconds and 0.35 milliseconds, respectively.

EXECUTIVE SUMMARY

This noise study has been completed to determine the noise and vibration impacts to and from the proposed residential project. The project is located on the northeast corner of E. Mission Road and N. Twin Oaks Valley Road in the Richland neighborhood.

Construction Noise

Grading equipment activities have noise levels ranging between 70-90 dBA and are dependent on the type of equipment, time the equipment is operating and distance the equipment is operating. The grading equipment will be spread out over the project site from distances near the occupied property lines to distances of 300 feet or more away. Based upon the site plan the majority of the grading operations, on average, will occur more than 300 feet from the property lines. At an average distance of 150 feet from the construction activities to the nearest property line, noise levels will comply with the 75 dBA Leq standard over 8 hours at the property lines. Therefore, no impacts are anticipated and no mitigation is required during construction of the proposed Project. Additionally, all equipment should be properly fitted with mufflers and all staging and maintenance should be conducted as far away for the existing residence as possible.

Construction Vibration

The Federal Transit Administration (FTA) has determined vibration levels that would cause annoyance to a substantial number of people and potential damage to building structures. The FTA criterion for vibration induced structural damage is 0.20 in/sec for the peak particle velocity (PPV). The FTA criterion for infrequent vibration induced annoyance is 80 Vibration Velocity (VdB) for residential uses.

The nearest vibration-sensitive uses are the nearby retail and commercial uses located to the north and west, 100 feet or more from the proposed construction. The average vibration levels that would be experienced at the nearest vibration sensitive land uses to the east from temporary construction activities were found to be below 0.2 in/sec. Project construction activities would result in PPV levels below the FTA's criteria for vibration induced structural damage. Therefore, Project construction activities would not result in vibration induced structural damage to residential buildings near the construction areas. Construction activities were found to generate levels of vibration below 80 VdB and would not exceed the FTA criteria for nuisance for nearby residential uses. Therefore, vibration impacts would be less than significant.

Onsite Transportation Noise

The common use patios located along the north and east of the building were determined to be below the City's 65 dBA CNEL threshold without mitigation. The central courtyard area will be shielded by the proposed building and not exposed to traffic noise and therefore was not included in the model. The noise levels at the outdoor use areas will be below the City's 65 dBA CNEL standards without mitigation.

The project also proposes decks. Some are internal and shielded by the building and some are external facing the roadways. The deck(s) along Twin Oaks Valley Road, Mission Avenue and half the balconies on the eastern side of the building will need 4-foot barriers to reduce the noise levels to 65 dBA CNEL. The barriers must be constructed of a non-gapping material (i.e., masonry, stucco, ¼ inch thick glass or Plexiglas).

Additionally, a final noise assessment is required prior to the issuance of the first building permit since the building facades are above 60 dBA CNEL. This final report would identify the interior noise requirements based upon architectural and building plans. It should be noted; interior noise levels of 45 dBA CNEL can easily be obtained with conventional building construction methods and providing a closed window condition requiring a means of mechanical ventilation (e.g. air conditioning) for each building and upgraded windows for all sensitive rooms (e.g. bedrooms and living spaces).

<u>Offsite Transportation Noise</u>

The project does will not create a direct impact of more than 3 dBA CNEL on any roadway segment and no cumulative noise increase of 3 dBA CNEL or more were found. Therefore, the proposed project's direct and cumulative contributions to off-site roadway noise increases will not cause any significant impacts to any existing or future noise sensitive land uses.

<u>Onsite Train Vibration</u>

Train vibration depends on the weight of the train, travel speed, the condition of the track and soil characteristics. The proposed project buildings would be more than 175 feet from the centerline of the tracks. Federal Transit Administration Transit Noise and Vibration Impact Assessment Manual (FTA 2018) predicts that freight train vibration levels are as high as 73 VdB at 175 feet from the track centerline for a locomotive-powered freight train traveling at speeds of 50 MPH and up to 62 VdB for commuter rail train events at that speed.

Therefore, the infrequent freight train activities will be below the 80 VdB, infrequent event for the freight train and the frequent commuter train activities will be below the 72 VdB frequent event annoyance thresholds as identified by the FTA. Additionally, due to the close proximity of the Transit Center, the commuter trains will be traveling at a slower speed of approximately 15 MPH, which would reduce the vibration levels 8 VdB and the freight train travel at speeds of 30 MPH or less which would reduce the vibration levels at least 4 VdB. Therefore, the train activities would have a less than significant impact on the proposed project.

1.0 PROJECT INTRODUCTION

1.1 Purpose of this Study

The purpose of this Noise study is to determine any potential noise impacts due to the proposed construction and operations of the proposed project and also to determine potential noise impacts (if any) to the proposed project generated from offsite sources. Should impacts be determined, the intent of this study would be to recommend suitable mitigation measures to bring those impacts to a level that would be considered less then significant.

1.2 Project Location

The 3.78 acre project site is located north of Mission Road and east of North Twin Oaks Valley Road. The Project site is surrounded by mostly commercial developments and open space to the east. A project vicinity map and location map are shown in Figure 1-A.

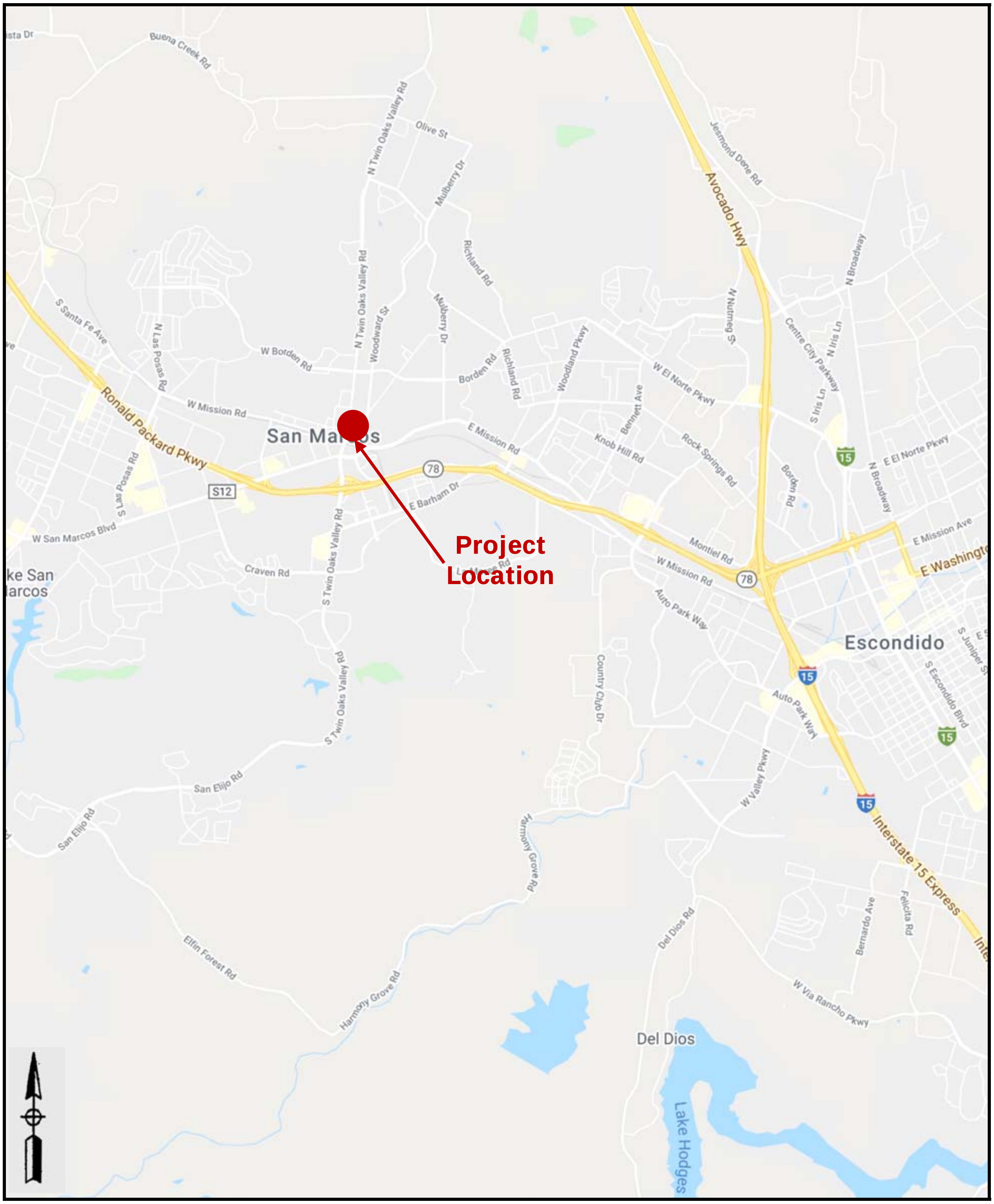
1.3 Project Description

The project applicant is requesting approval of a General Plan Amendment (GPA), Specific Plan Amendment (SPA), Conditional Use Permit (CUP) and Variance to construct and operate a 138-room assisted living facility.

A General Plan Amendment is proposed to: 1) revise the land use map in the General Plan by changing the designation of the project site from Richmar Specific Plan to Heart of the City Specific Plan; and 2) to remove the Richmar Avenue bridge from the Mobility Element. An amendment to the Heart of the City Specific Plan to remove the Richmar Specific Plan subplan designation from the property. The underlying "Commercial" designation will remain the same. The amendment includes an update to the land use tables to allow for an assisted living facility under the Commercial of the Heart of the City Specific Plan designation with approval of a CUP. A CUP for the design review and to allow the operation of an assisted living facility. Finally, a variance is required to allow for a reduction of the building and parking setback from the prime arteria right-of-way along Twin Oaks Valley Road and 20 feet along Mission Road.

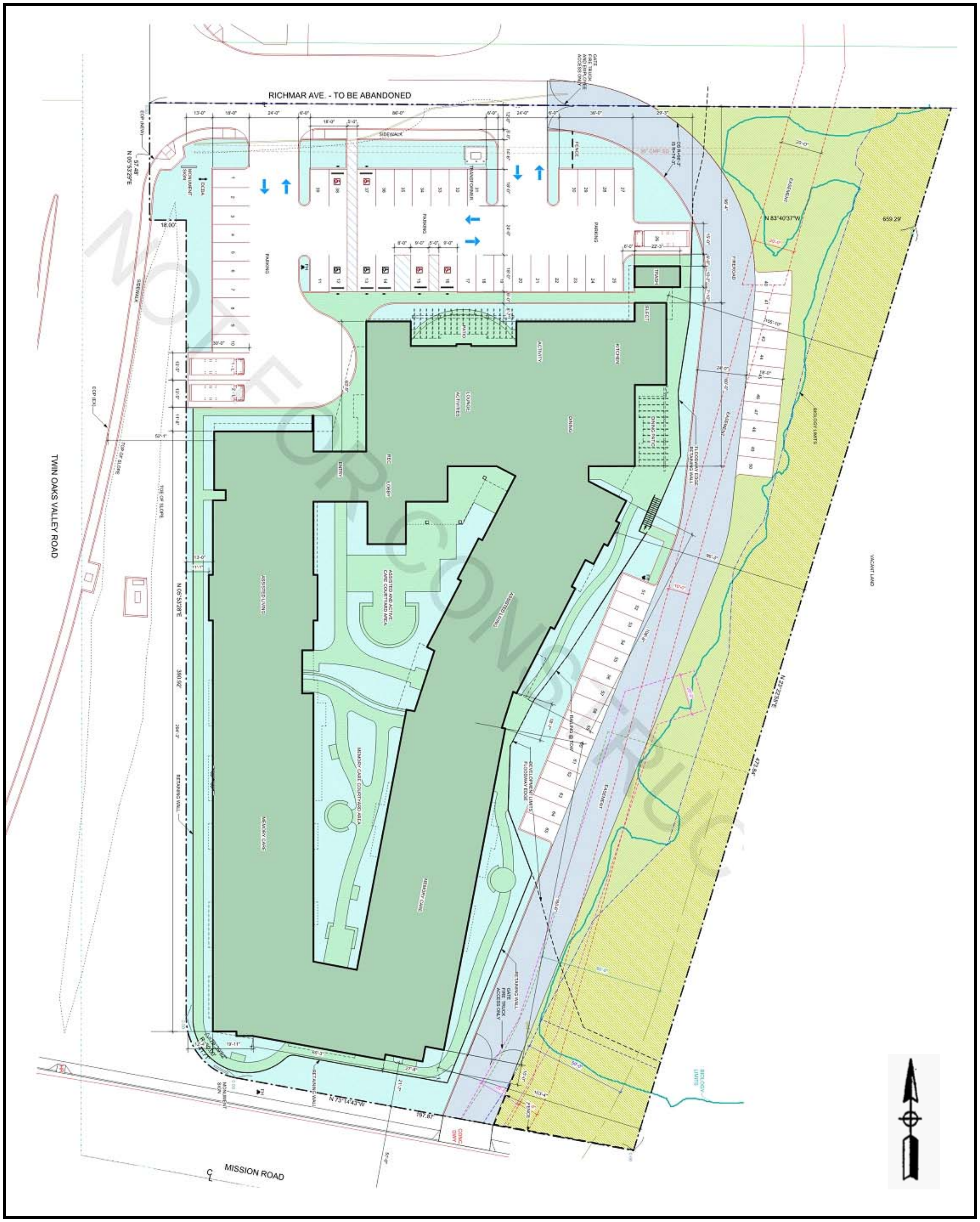
The project proposes to develop an 121,556 Square-foot (SF) 138-unit residential senior-care facility which would have 138 units with 174 total beds. The proposed project would be constructed on an undeveloped lot within the City of San Marcos. All phases (i.e. grading, paving and construction) of the proposed Project are anticipated to start in 2021 and be fully operational in 2022. The project development plan is shown on Figure 1-B of this report.

Figure 1-A: Project Vicinity Map



Source: Google Maps, 2020

Figure 1-B: Project Configuration



Source: Whitefield Associates, Inc., 2020

2.0 FUNDAMENTALS

2.1 Acoustical Fundamentals

Noise is defined as unwanted or annoying sound which interferes with or disrupts normal activities. Exposure to high noise levels has been demonstrated to cause hearing loss. The individual human response to environmental noise is based on the sensitivity of that individual, the type of noise that occurs and when the noise occurs. Sound is measured on a logarithmic scale consisting of sound pressure levels known as a decibel (dB). The sounds heard by humans typically do not consist of a single frequency but of a broadband of frequencies having different sound pressure levels. The method for evaluating all the frequencies of the sound is to apply an A-weighting to reflect how the human ear responds to the different sound levels at different frequencies. The A-weighted sound level adequately describes the instantaneous noise whereas the equivalent sound level depicted as Leq represents a steady sound level containing the same total acoustical energy as the actual fluctuating sound level over a given time interval.

The Community Noise Equivalent Level (CNEL) is the 24 hour A-weighted average for sound, with corrections or penalties for evening and nighttime hours. The corrections require an addition of 5 decibels to sound levels in the evening hours between 7 p.m. and 10 p.m. and an addition of 10 decibels to sound levels at nighttime hours between 10 p.m. and 7 a.m. These additions are made to account for the increased sensitivity during the evening and nighttime hours when sounds appear louder.

A vehicles noise level is generated from a combination of noise produced by the engine, exhaust and tires. The cumulative traffic noise levels along a roadway segment are based on three primary factors: the amount of traffic, the travel speed of the traffic, and the vehicle mix ratio or number of medium and heavy trucks. The intensity of traffic noise is increased by higher traffic volumes, greater speeds and increased number of trucks.

Because mobile/traffic noise levels are calculated on a logarithmic scale, a doubling of the traffic noise or acoustical energy results in a noise level increase of 3 dBA. Therefore, the doubling of the traffic volume, without changing the vehicle speeds or mix ratio, results in a noise increase of 3 dBA. Mobile noise levels radiant in an almost oblique fashion from the source and drop off at a rate of 3 dBA for each doubling of distance under hard site conditions and at a rate of 4.5 dBA for soft site conditions. Hard site conditions consist of concrete, asphalt and hard pack dirt while soft site conditions exist in areas having slight grade changes, landscaped areas and vegetation. On the other hand, fixed/point sources radiate outward uniformly as it travels away from the source. Their sound levels attenuate or drop off at a rate of 6 dBA for each doubling of distance.

The most effective noise reduction methods consist of controlling the noise at the source, blocking the noise transmission with barriers or relocating the receiver. Any or all of these methods may be required to reduce noise levels to an acceptable level.

2.2 Vibration Fundamentals

Vibration is a trembling or oscillating motion of the ground. Like noise, vibration is transmitted in waves, but in this case through the ground or solid objects. Unlike noise, vibration is typically felt rather than heard. Vibration can be either natural as in the form of earthquakes, volcanic eruptions; or manmade as from explosions, heavy machinery, or trains. Both natural and manmade vibration may be continuous, such as from operating machinery; or infrequent, as from an explosion.

As with noise, vibration can be described by both its amplitude and frequency. Amplitude may be characterized in three ways: displacement, velocity, and acceleration. Particle displacement is a measure of the distance that a vibrated particle travels from its original position and for the purposes of soil displacement is typically measured in inches or millimeters. Particle velocity is the rate of speed at which soil particles move in inches per second or millimeters per second. Particle acceleration is the rate of change in velocity with respect to time and is measured in inches per second or millimeters per second. Typically, particle velocity (measured in inches or millimeters per second) and/or acceleration (measured in gravities) are used to describe vibration. Table 2-1 shows the human reaction to various levels of peak particle velocity.

Vibrations also vary in frequency and this affects perception. Typical construction vibrations fall in the 10 to 30 hertz (Hz) range and usually occur around 15 Hz. Traffic vibrations exhibit a similar range of frequencies; however, due to their suspension systems, it is less common, to measure traffic frequencies above 30 Hz.

Propagation of ground-borne vibrations is complicated and difficult to predict because of the endless variations in the soil through which the waves travel. There are three main types of vibration propagation: surface, compression, and shear waves. Surface waves, or Rayleigh waves, travel along the ground's surface. These waves carry most of their energy along an expanding circular wave front, similar to ripples produced by dropping an object into water. P-waves, or compression waves, are waves that carry their energy along an expanding spherical wave front. The particle motion in these waves is longitudinal. S-waves, or shear waves, are also body waves that carry energy along an expanding spherical wave front. However, unlike P-waves, the particle motion is transverse, or side-to-side and perpendicular to the direction of propagation.

As vibration waves propagate from a source, the energy is spread over an ever-increasing area such that the energy level is reduced with the distance from the energy source. This geometric spreading loss is inversely proportional to the square of the distance. Wave energy is also reduced with distance as a result of material damping in the form of internal friction, soil layering, and special voids. The amount of attenuation provided by material damping varies with soil type and condition as well as the frequency of the wave.

Table 2-1: Human Reaction to Typical Vibration Levels

Vibration Level Peak Particle Velocity (in/sec)	Human Reaction	Effect on Buildings
0.006–0.019	Threshold of perception, possibility of intrusion	Vibrations unlikely to cause damage of any type
0.08	Vibrations readily perceptible	Recommended upper level of vibration to which ruins and ancient monuments should be subjected
0.10	Level at which continuous vibration begins to annoy people	Virtually no risk of "architectural" (i.e., not structural) damage to normal buildings
0.20	Vibrations annoying to people in buildings	Threshold at which there is a risk to "architectural" damage to normal dwelling – houses with plastered walls and ceilings
0.4–0.6	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges	Vibrations at a greater level than normally expected from traffic, but would cause "architectural" damage and possibly minor structural damage

Source: Caltrans, Division of Environmental Analysis, *Transportation Related Earthborne Vibration, Caltrans Experiences*, Technical Advisory, Vibration, TAV-02-01-R9601, 2002.

3.0 SIGNIFICANCE THRESHOLDS AND STANDARDS

3.1 Construction Noise

The Noise Element of the General Plan, limits construction activities to Monday through Friday 7:00 a.m. to 6:00 p.m. or on Saturdays 8:00 a.m. to 5:00 p.m. The City of San Marcos Municipal Code Title 17.32.180 addresses the time limits that apply to grading, extraction and construction activities between 7:00 a.m. and 4:30 p.m. Monday through Friday. Grading, extraction or construction is not allowed in the City on the weekends or holidays. The Municipal Code does not set noise limits on construction activities. Commonly, the City has utilized the County of San Diego's Noise Ordinance noise limit for construction activities of 75 dBA over an 8-hour period (Leq-8).

3.2 Transportation Noise Standards

To control transportation related noise sources such as arterial roads, freeways, airports and railroads, the City of San Marcos has established guidelines for acceptable community noise levels in the Noise Element of the General Plan. For noise sensitive rural and single family residential uses, schools, libraries, parks and recreational areas the City Noise Element requires an exterior noise level of less than 60 dBA CNEL for outdoor usable areas. For multi-family developments the standard is 65 dBA CNEL and a standard of 70 dBA CNEL is typically applied to commercial uses. The City has also established an interior noise limit of 45 dBA CNEL for all residential uses.

3.3 Vibration Standards

The City of San Marcos has not yet adopted vibration criteria. The United States Department of Transportation Federal Transit Administration (FTA) provides criteria for acceptable levels of groundborne vibration for various types of special buildings that are sensitive to vibration. For purposes of identifying potential project-related vibration impacts, the FTA criteria will be used. The human reaction to various levels of vibration is highly subjective. The upper end of the range shown for the threshold of perception, or roughly 65 vibration decibels (VdB), may be considered annoying by some people. Vibration below 65 VdB may also cause secondary audible effects, such as a slight rattling of doors, suspended ceilings/fixtures, windows, and dishes, any of which may result in additional annoyance. Table 3-1 on the following page, shows the FTA groundborne vibration and noise impact criteria for human annoyance.

In addition to the vibration annoyance standards presented above, the FTA also applies the following standards for construction vibration damage. As shown in Table 3-2 on the following page, structural damage is possible for typical residential construction when the peak particle velocity (PPV) exceeds 0.2 inch per second (in/sec). This criterion is the threshold at which there is a risk of damage to normal dwellings.

In the context of this analysis, the noise and vibration impacts associated with the project grading and construction will be conditioned to comply with the thresholds stated above. The potential noise and vibration impacts are analyzed separately below.

Table 3-1: Groundborne Vibration and Noise Impact Criteria (Human Annoyance)

Category	Groundborne Vibration Impact Levels (VdB re 1 microinch/second)			Groundborne Noise Impact Levels (dB re 20 micropascals)		
	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]
Category 1: Buildings where low ambient vibration is essential for interior operations.	65 VdB[4]	65 VdB[4]	65 VdB[4]	N/A[4]	N/A[4]	N/A[4]
Category 2: Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB	35 dBA	38 dBA	43 dBA
Category 3: Institutional land uses with primarily daytime use.	75 VdB	78 VdB	83 VdB	40 dBA	43 dBA	48 dBA

Source: United States Department of Transportation Federal Transit Administration (FTA), *Transit Noise and Vibration Impact Assessment,* June 2006.

1 "Frequent Events" are defined as more than 70 vibration events per day. Most rapid transit projects fall into this category.

2 "Occasional Events" are defined as between 30 and 70 vibration events of the same source per day. Most commuter truck lines have this many operations.

3 "Infrequent Events" are defined as fewer than 30 vibration events of the same kind per day. This category includes most commuter rail branch lines

4 This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration-sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.

5 Vibration-sensitive equipment is not sensitive to groundborne noise.

Table 3-2: Groundborne Vibration Impact Criteria (Structural Damage)

Building Category	PPV (in/sec)	VdB
I. Reinforced-concrete, steel, or timber (no plaster)	0.5	102
II. Engineered concrete and masonry (no plaster)	0.3	98
III. Non-engineered timber and masonry buildings	0.2	94
IV. Buildings extremely susceptible to vibration damage	0.12	90

Source: United States Department of Transportation Federal Transit Administration (FTA), *Transit Noise and Vibration Impact Assessment,* June 2006.

Notes: RMS velocity calculated from vibration level (VdB) using the reference of one microinch/second.

4.0 CONSTRUCTION NOISE AND VIBRATION

4.1 Construction Noise Methodology

Construction noise represents a short-term impact on the ambient noise levels. Noise generated by construction equipment includes haul trucks, water trucks, graders, dozers, loaders and scrapers can reach relatively high levels. Grading activities typically represent one of the highest potential sources for noise impacts. The most effective method of controlling construction noise is through local control of construction hours and by limiting the hours of construction to normal weekday working hours.

The U.S. Environmental Protection Agency (U.S. EPA) has compiled data regarding the noise generating characteristics of specific types of construction equipment. Noise levels generated by heavy construction equipment can range from 60 dBA to in excess of 100 dBA when measured at 50 feet. However, these noise levels diminish rapidly with distance from the construction site at a rate of approximately 6 dBA per doubling of distance. For example, a noise level of 75 dBA measured at 50 feet from the noise source to the receptor would be reduced to 69 dBA at 100 feet from the source to the receptor and reduced to 63 dBA at 200 feet from the source. Additionally, sound levels are logarithmic not linear, so adding two sources of 68 dBA plus 68 dBA is equal to 71 dBA not 136 dBA.

Using a point-source noise prediction model, calculations of the expected construction noise impacts were completed. The essential model input data for these performance equations include the source levels of each type of equipment, relative source to receiver horizontal and vertical separations, the amount of time the equipment is operating in a given day, also referred to as the duty-cycle and any transmission loss from topography or barriers.

The equipment needed for the development will consist of up to two large bulldozers, a medium bulldozer, three medium sized scrapers, a medium sized front loader, a medium sized crawler type excavator, a medium sized compactor, two small to medium sized road grader, a medium sized rubber tire backhoe and a water truck. Based on the EPA noise emissions, empirical data and the amount of equipment needed, worst case noise levels from the construction equipment for site preparation would occur during the grading operations.

4.2 Findings and Mitigation for Grading Activities

The grading activities will consist of the preparation of internal roadways, parking and the finished pad. The grading equipment will be spread out over the project site from distances near the occupied property lines to distances of 500 feet or more away. Based upon the site plan the majority of the grading operations, on average, will occur more than 300 feet from the property lines. This means that most of the time the average distance from all the equipment to the nearest property line is 300 feet. As can be seen in Table 4-1, at an average distance of 300 feet from the construction activities to the nearest property line would result in a noise attenuation of -15.6 dBA without shielding. Additionally, the amount of time equipment is operating during a normal work day, referred to as duty-cycle, is utilized in this analysis.

Table 4-1: Construction Noise Levels

Construction Equipment	Quantity	Source Level @ 50-Feet (dBA Leq)[1]	Duty Cycle (Hours/Day)	Cumulative Noise Level @ 50-Feet (dBA Leq-8)
Dozer – D8	1	74	8	74.0
Dozer – D6	1	74	6	72.8
Dozer – 450	1	74	6	72.8
Scraper – 621G	3	75	8	79.8
Wheel Loader – 972G	1	73	8	73.0
Excavator – 336E	1	72	8	72.0
Compactor – 815B	1	74	6	72.8
Grader – 160M	1	73	4	70.0
Grader – 14M	1	73	8	73.0
Backhoe	1	72	4	69.0
Water Truck	1	70	8	70.0
Cumulative Levels @ 50 Feet				84.2
Average Distance to Property Line (Feet)				300
Noise Reduction Due to Distance				-15.6
NEAREST PROPERTY LINE NOISE LEVEL				**68.6**
[1] Source: Empirical Data				

Given this, the noise levels will comply with the 75 dBA Leq standard average over 8 hours at the property lines. Therefore, no impacts are anticipated and no mitigation is required during construction of the proposed Project.

4.3 Findings and Mitigation for Construction Vibration

The nearest vibration-sensitive uses are the nearby retail and commercial uses located to the north and west of the project site, 100 feet or more from the proposed construction. Table 4-2 lists the average vibration levels that would be experienced at the nearest vibration sensitive land uses to the east from temporary construction activities.

The FTA has determined vibration levels that would cause annoyance to a substantial number of people and potential damage to building structures. The FTA criterion for vibration induced structural damage is 0.20 in/sec for the peak particle velocity (PPV). Project construction activities would result in PPV levels below the FTA's criteria for vibration induced structural damage.

Therefore, Project construction activities would not result in vibration induced structural damage to residential buildings near the construction areas. The FTA criterion for infrequent vibration induced annoyance is 80 Vibration Velocity (VdB) for residential uses. Construction activities would generate levels of vibration that would not exceed the FTA criteria for nuisance for nearby residential uses. Therefore, vibration impacts would be less than significant.

Table 4-2: Vibration Levels from Construction Activities (Residential Receptors)

Equipment	Approximate Velocity Level at 25 Feet (VdB)	Approximate RMS Velocity at 25 Feet (in/sec)	Approximate Velocity Level at 100 Feet (VdB)[1]	Approximate RMS Velocity at 100 Feet (in/sec)[2]
Small bulldozer	58	0.003	39.9	0.0004
Jackhammer	79	0.035	60.9	0.0044
Loaded trucks	86	0.076	67.9	0.0095
Large bulldozer	87	0.089	68.9	0.0111
		FTA Criteria	80	0.2
		Significant Impact?	**No**	**No**

[1] VdB = VdB(25 feet) – 30log(d/25) provided by the FTA

[2] PPV at Distance D = PPVref x $(25/D)^{1.5}$ provided by the FTA

5.0 TRANSPORTATION NOISE

5.1 Existing Noise Environment Onsite

To determine the existing noise environment and to assess potential noise impacts, a 24-hour measurement was taken at the project having a relatively flat terrain and no obstruction from trees or rock outcroppings. This was done to determine the worst-case conditions at the nearest proposed Noise Sensitive Land Use (NSLU). The noise measurements were recorded on February 3-5, 2020 by Ldn Consulting between approximately 4:00 p.m. and 12:00 p.m., two days later.

Noise measurements were taken using two Larson-Davis Spark Model 706 Type 2 precision sound level meters, programmed, in "slow" mode, to record noise levels in "A" weighted form. The sound level meter and microphone were mounted on a tripod, five feet above the ground and equipped with a windscreen during all measurements. The sound level meter was calibrated before and after the monitoring using a Larson-Davis calibrator, Model CAL 200.

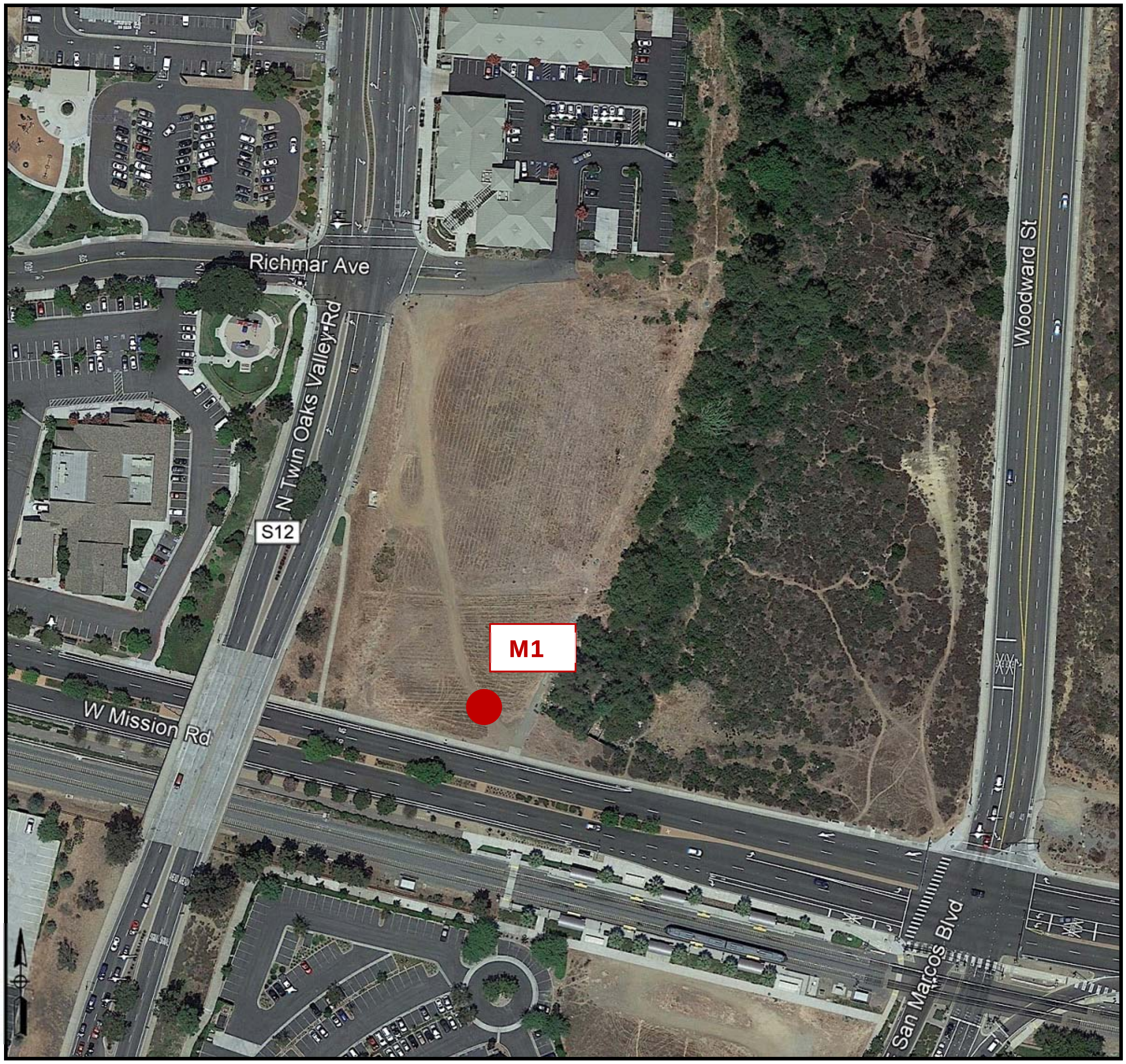
The noise measurement location was determined based on site access and noise impact potential to the proposed sensitive uses. Monitoring location 1 (M1) was located near the southern end of the project. The noise monitoring location is provided graphically in Figure 5-A on the following page.

The results of the noise level measurement is presented in Table 5-1. The ambient 24-hour CNEL noise levels measured in the area of the project was found to be roughly 53 dBA CNEL. The existing noise levels in the project area consisted primarily of traffic along E. Mission Road, and background noise from agricultural and equestrian operations in the distance.

Table 5-1: Measured Ambient Noise Levels

Measurement Identification	Description	Time	Noise Levels (dBA)					
			CNEL	Lmax	Lmin	L10	L50	L90
M1	Along E. Mission Road	February 3, 2020 4:00 p.m. – February 5, 2020 12:00 p.m.	52.5	85.4	35.3	54.0	49.5	39.5
Source: Ldn Consulting								

Figure 5-A: Ambient Monitoring Locations



5.2 Future Onsite Noise Prediction

To determine the future noise environment and impact potentials the Sound32 model was utilized. The critical model input parameters, which determine the projected vehicular traffic noise levels, include vehicle travel speeds, the percentages of automobiles, medium trucks and heavy trucks in the roadway volume, the site conditions and the peak hour traffic volume. The peak hour traffic volumes range between 6-12% of the average daily traffic (ADT) and 10% is generally acceptable for noise modeling.

Table 5-2 presents the roadway parameters used in the analysis including the peak traffic volumes, vehicle speeds and the hourly traffic flow distribution (vehicle mix). The vehicle mix provides the hourly distribution percentages of automobile, medium trucks and heavy trucks for input into the Sound32 Model. The Buildout conditions include the future year 2035 traffic volume forecasts provided by SANDAG Series 13 Traffic Prediction Model.

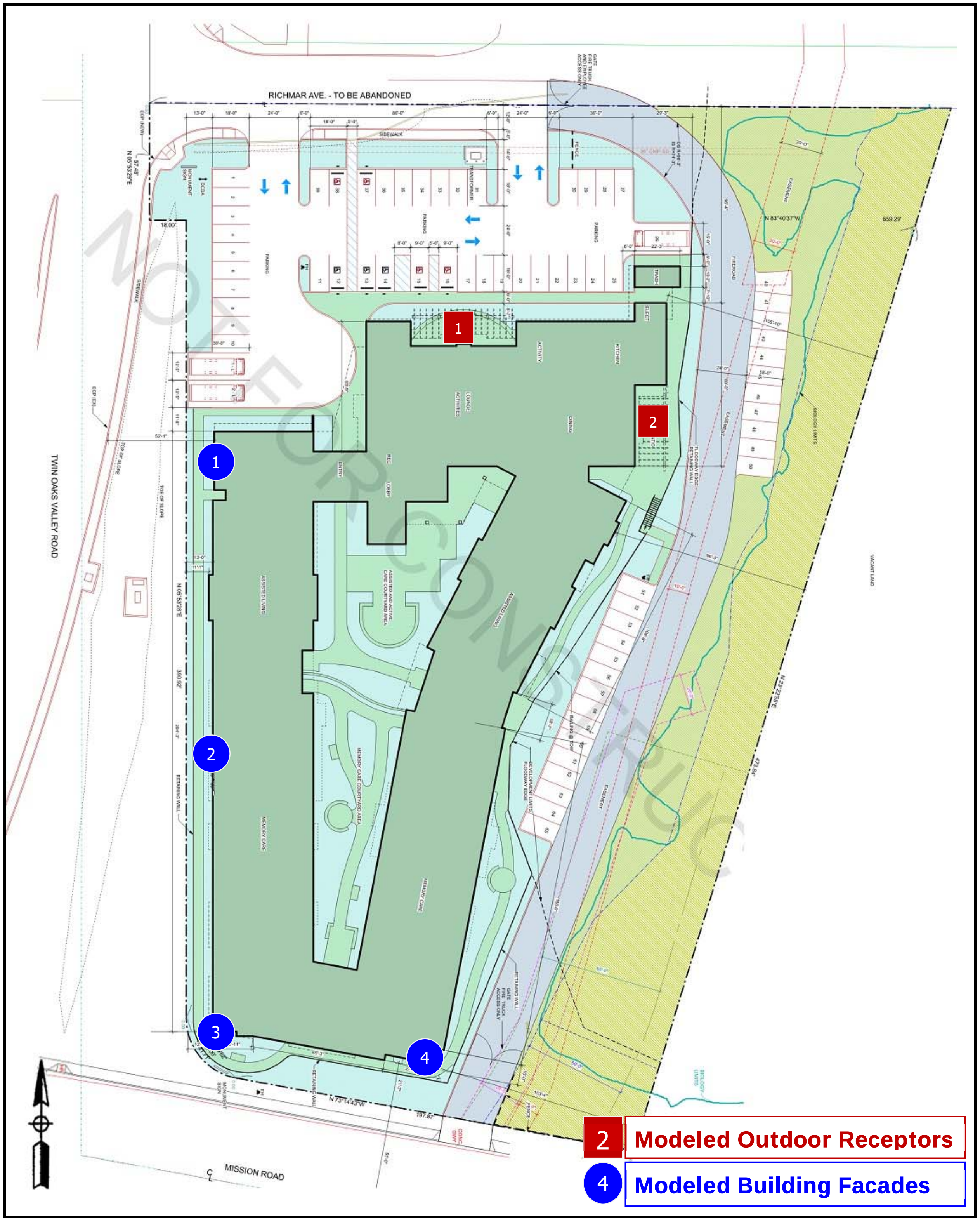
Table 5-2: Future Traffic Parameters

Roadway	Average Daily Traffic (ADT)[1]	Peak Hour Volumes[1]	Modeled Speeds (MPH)	Vehicle Mix %[2]		
				Auto	Medium Trucks	Heavy Trucks
E Mission Road	14,100	1,410	45	96	2	2
N Twin Oaks Valley Road	17,700	1,770	45	96	2	2

[1] Source: SANDAG Series 13 Traffic Prediction Model, Forecast Year 2035
[2] Typical vehicle mix

The required coordinate information necessary for the Sound32 model input was taken from the conceptual site plans provided by Whitfield Associates, 2020. The conceptual plans were used to identify the pad elevations, roadway elevations, and the relationship between the noise source(s) and the outdoor receptor areas. To evaluate the potential noise impacts on the proposed development, outdoor observers were located in the common patio areas located on the north and east side of the building and placed five feet above the finished pad elevation. The modeled observer locations for the potential outdoor use areas are presented in Figure 5-B.

Figure 5-B: Modeled Receptor Locations



5.3 Onsite Rail Line Noise

The proposed Project is located a minimum of 160 feet from the San Diego Northern Railroad (SDNR) consisting of Sprinter service operated by the North County Transit District (NCTD). According to the City of San Marcos General Plan Noise Element, the 65 dBA CNEL noise contour from the rail activity, with no shielding, is located 130 feet from the centerline of the railroad. No reduction factor was taken for the building facades.

5.4 Cumulative Onsite Noise Levels and Findings

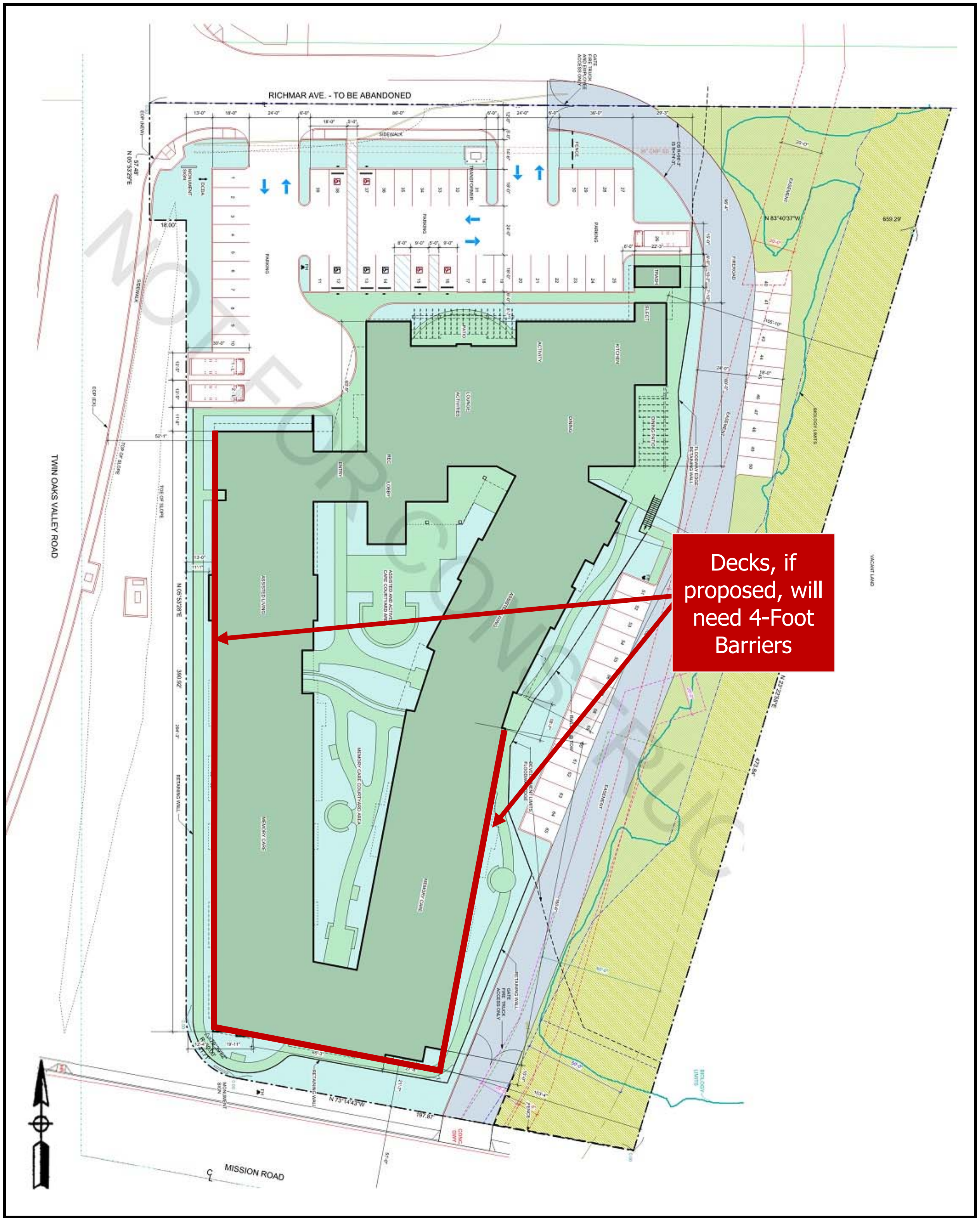
Common use patios were modeled to determine if shielding/mitigation is required to reduce the noise levels below the City's 65 dBA CNEL threshold. The central courtyard area will be shielded by the proposed building and not exposed to traffic noise and therefore was not included in the model. The noise levels determined for the roadway and train activities were combined to determine the overall cumulative noise levels at the proposed patios. The resultant cumulative noise levels from the traffic and train activities are provided below in Table 5-3 for each of the outdoor patios and the building facades, respectively. The exterior outdoor patios (Receptors 1 and 2) were found to comply with the City of San Marcos Noise standards of 65 dBA CNEL with no mitigation. The modeling results are provided in ***Attachment A***.

Table 5-3: Combined Future Exterior Noise Levels (Ground Floor)

Exterior Common Use Area Receptor Number	Unmitigated Noise Levels from all Sources (dBA CNEL)	Building Façade Receptor Number	Building Façade Noise Levels from all Sources (dBA CNEL)[1]
1	62	1	63
2	62	2	64
3	n/a	3	70
4	n/a	4	70
[1] Interior Noise Study required per City Guidelines if building façade is above 60 dBA CNEL.			

The project also proposes decks. Some are internal and shielded by the building and some are external facing the roadways. The deck(s) along Twin Oaks Valley Road, Mission Avenue and half the balconies on the eastern side of the building will need 4-foot barriers to reduce the noise levels to 65 dBA CNEL. The decks that will require the 4-foot barriers are identified in Figure 5-C. The barriers must be constructed of a non-gapping material (i.e., masonry, stucco, ¼ inch thick glass or Plexiglas).

Figure 5-C: Noise Barrier Locations



Additionally, a final noise assessment is required prior to the issuance of the first building permit since the building facades are above 60 dBA CNEL. This final report would identify the interior noise requirements based upon architectural and building plans to meet the City's established interior noise limit of 45 dBA CNEL. It should be noted; interior noise levels of 45 dBA CNEL can easily be obtained with conventional building construction methods and providing a closed window condition requiring a means of mechanical ventilation (e.g. air conditioning) for each building and upgraded windows for all sensitive rooms (e.g. bedrooms and living spaces).

5.5 Project Related Offsite Transportation Noise

To determine if direct or cumulative off-site noise level increases associated with the development of the proposed project would create noise impacts. The traffic volumes for the existing conditions were compared with the traffic volume increase of existing plus the proposed project. The project is estimated to only generate 345 daily trips. The existing average daily traffic (ADT) volumes on the area roadways are more than several thousand ADT. Typically, it requires a project to double (or add 100%) the traffic volumes to have a direct impact of 3 dBA CNEL or be a major contributor to the cumulative traffic volumes. The project will add less than a 1% increase to the exiting roadway volumes and no direct or cumulative impacts are anticipated.

5.6 Train Vibration

Train vibration depends on the weight of the train, travel speed, the condition of the track and soil characteristics. The proposed project buildings would be more than 175 feet from the centerline of the tracks. Federal Transit Administration Transit Noise and Vibration Impact Assessment Manual (FTA 2018) predicts that freight train vibration levels are as high as 73 VdB at 175 feet from the track centerline for a locomotive-powered freight train traveling at speeds of 50 MPH and up to 62 VdB for commuter rail train events at that speed.

Therefore, the infrequent freight train activities will be below the 80 VdB, infrequent event for the freight train and the frequent commuter train activities will be below the 72 VdB frequent event annoyance thresholds as identified in Category 2 of Table 3-1. Additionally, due to the close proximity of the Transit Center, the commuter trains will be traveling at a slower speed of approximately 15 MPH, which would reduce the vibration levels 8 VdB and the freight train travel at speeds of 30 MPH or less which would reduce the vibration levels at least 4 VdB. Therefore, the train activities would have a less than significant impact on the proposed project.

ATTACHMENT A

FUTURE EXTERIOR NOISE MODEL
INPUT AND OUTPUT FILES

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Creekside Assisted Living - Ground Level Unmitigated
T-PEAK HOUR TRAFFIC CONDITIONS, 1
 1354 , 45 , 28 , 45 , 28 , 45
T-PEAK HOUR TRAFFIC CONDITIONS, 2
 1699 , 45 , 35 , 45 , 35 , 45
L-MISSION, 1
N,202,679,582,
N,598,564,577,
N,750,519,574,
N,946,461,579,
N,1245,374,584,
L-TWIN OAKS, 2
N,372,229,588,
N,519,586,579,
N,634,827,589,
N,693,1066,582,
N,731,1440,586,
B-BUILDING, 1 , 2 , 0 ,0
928,845,574,589,
860,754,574,589,
806,578,574,589,
697,609,574,589,
730,901,574,589,
805,893,574,589,
811,946,574,589,
832,944,574,589,
B-BERM, 2 , 2 , 0 ,0
578,618,581,581,
672,814,592,592,
678,826,589,589,
683,864,589,589,
714,974,583,583,
733,1011,582,582,
R, 1 , 65 ,10
858,936,579,OUT1
R, 2 , 65 ,10
944,878,579,OUT2
R, 3 , 65 ,10
726,900,579,FAC1
R, 4 , 65 ,10
711,774,579,FAC2
R, 5 , 65 ,10
697,608,579,FAC3
R, 6 , 65 ,10
797,578,579,FAC4
C,C
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TITLE:
Creekside Assisted Living - Ground Level Unmitigated

REC	REC ID	DNL	PEOPLE	LEQ(CAL)
1	OUT1	65.	10.	61.4
2	OUT2	65.	10.	61.1
3	FAC1	65.	10.	62.5
4	FAC2	65.	10.	62.6
5	FAC3	65.	10.	69.9
6	FAC4	65.	10.	69.3