ACOUSTICAL SITE ASSESSMENT
TENTATIVE PARCEL MAP 21261
SAN DIEGO, CA

Submitted to:

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INTRODUCTION AND DEFINITIONS

Existing Site Characterization

The proposed Tentative Parcel Map 21261 site (APN 498-151-23) consists of approximately 2.6 acres of vacant land located in the Calavo Gardens community of San Diego County, as shown in Figures 1 and 2 on the following pages. Regional access is obtained solely from Fuerte Drive via either Chase Avenue to the northeast, or Avocado Boulevard to the west. The project site itself currently resides as an ungraded lot, as shown in Figure 3 on Page 4.

Surrounding land uses consist of single-family residential units and open space. Elevations across the project site range from approximately 595 to 620 feet above mean sea level (MSL).

Project Description

The proposed project would construct three single-family residential lots varying in size from 0.64 to 1.06 acres, as shown in Figure 4 on Page 5 of this report. Proposed Parcel 1 would gain access through the creation of a shared driveway to the north of the site, while Parcels 2 and 3 would take direct access off Fuerte Drive. The project would perform all necessary curb, gutter, and appurtenance improvements to facilitate site access.

Acoustical Definitions and Theory

Sound waves are linearly compressive mechanical waves, which propagate in solids, liquids, and gases. The medium transmitting the wave oscillates in the direction of propagation. All sound waves originate from a vibrating surface, which alternately compresses, and then expands, the transmitting medium. Noise, on the other hand, can be defined as the superposition of periodic sound waves with a large number of frequency components. It is experienced as unwanted, or annoying sound that interferes with, or disrupts, normal activities, and is affected by its perceived importance, the time of day, and the sensitivity of the individual hearing the sound.

The loudest sounds that the human ear can hear comfortably are approximately one trillion (or $1x10^{12}$) times the acoustic energy that the ear can barely detect. Because of this vast range, any attempt to represent the acoustic intensity of a particular sound on a linear scale becomes unwieldy. As a result, a logarithmic ratio, originally conceived for radio work, known as the decibel (dB), is commonly employed.[1]

[1] A unit used to express the relative magnitude of a sound wave. This level is defined as being equal to 20 times the common logarithm of the ratio of the pressure produced by a sound wave of interest, to a 'reference' pressure wave equal to 20 micro Pascal's (μPa) measured at a distance of 1 meter. 20 μPa is the smallest amount of pressure capable of producing the sensation of hearing in a human.

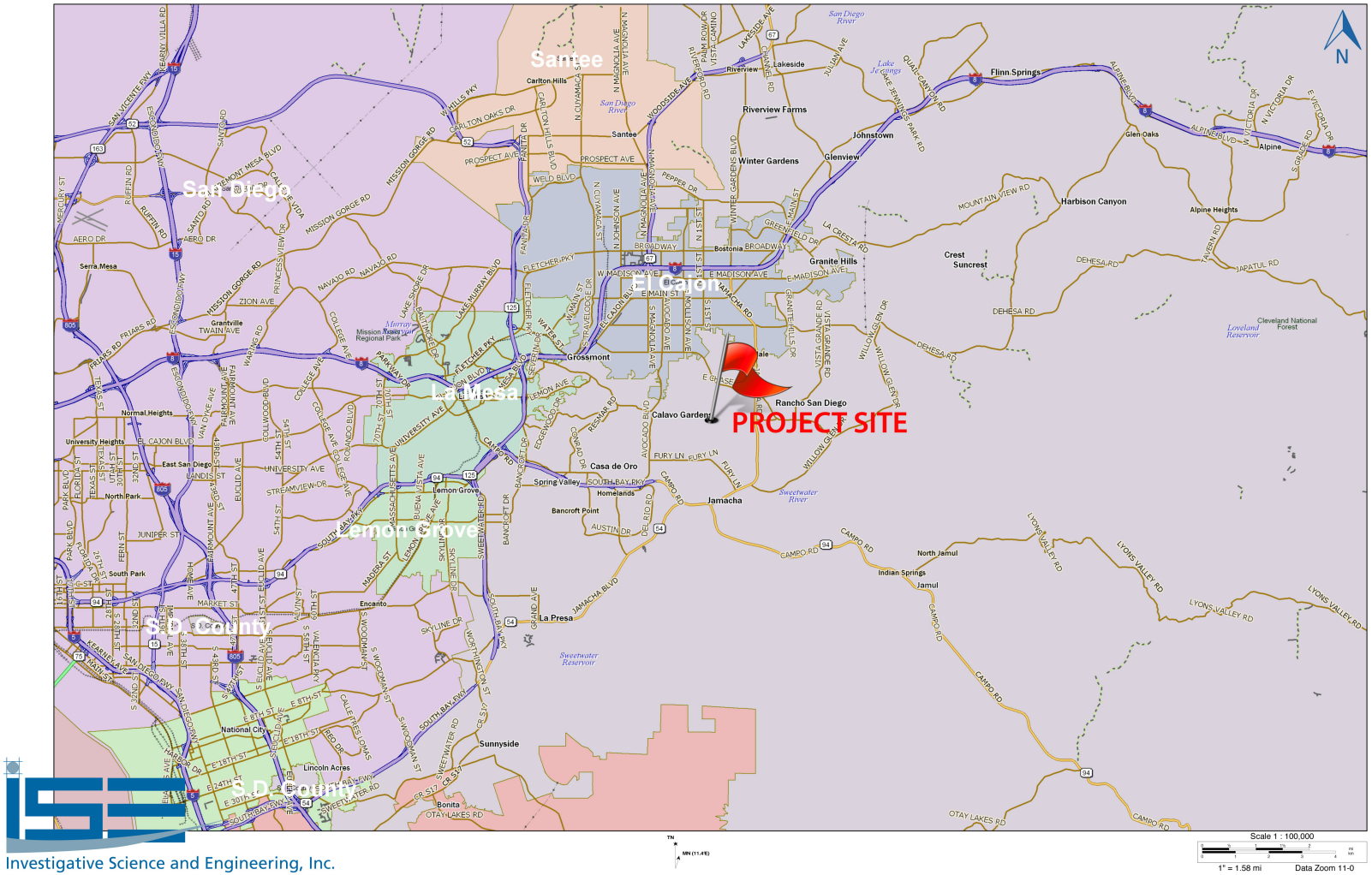

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FIGURE 1: Project Study Area Vicinity Map (ISE 5/18)

FIGURE 2: Project Study Area Parcel Map (ISE 5/18)

FIGURE 3: Panoramic Image Showing Proposed Development Area and Surrounding Uses (ISE 5/18)

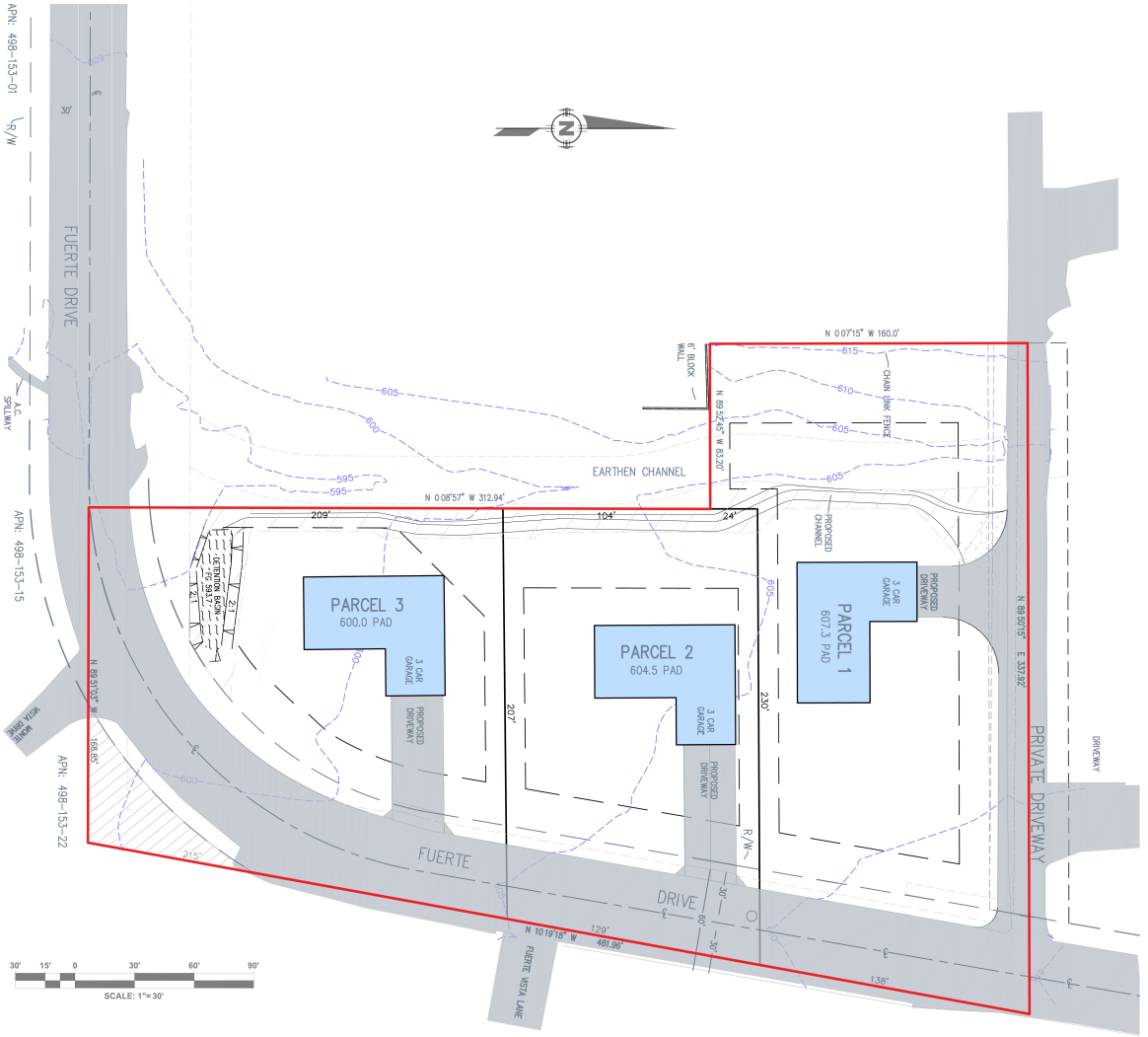

FIGURE 4: Proposed Tentative Parcel Map 21261 Development Plan (Walsh Engineering & Surveying, 3/18)

A sound level of zero "0" dB is scaled such that it is defined as the threshold of human hearing, and would be barely audible to a human of normal hearing under extremely quiet listening conditions. Sound levels above 120 dB roughly correspond to the threshold of pain. The minimum change in sound level that the human ear can detect is approximately 3.0 dBA.[2] A change in sound level of 10 dB is usually perceived by the average person as a doubling (or halving) of the sound's loudness.[3] This is due to the nonlinear response of the human ear to sound.

The method commonly used to quantify environmental sounds, consists of determining all of the frequencies of a sound according to a weighting system that reflects the nonlinear response characteristics of the human ear. This is called "A" weighting, and the decibel level measured is called the A-weighted sound level (or dBA). In practice, the level of a noise source is conveniently measured using a sound level meter that includes a filter corresponding to the dBA curve.

Although the A-weighted sound level may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously throughout the day. Most environmental noise includes a conglomeration of sounds from distant sources that create a relatively steady background noise in which no particular source is identifiable. For this type of noise, a single descriptor called the L_{eq} (or equivalent sound level) is used. L_{eq} is the energy-mean A-weighted sound level during a measured time interval, and would be defined mathematically by the following continuous integral,

$$L_{eq} = 10Log_{10}\left[\frac{1}{T}\int_{0}^{T} SPL(t)^2\,dt\right]$$

Where the following variables are defined:

L_{eq} = The energy equivalent sound level, '*t*' is the independent variable of time,

T = The total time interval of the event, and,

SPL = The sound pressure level *re. 20 μPa*.

Thus, L_{eq} is the 'equivalent' constant sound level that would have to be produced by a given source to equal the average of the fluctuating level measured. For most acoustical studies, the study interval is generally taken as one-hour and the abbreviation used is $L_{eq\text{-}h}$ or $L_{eq(h)}$; however, other time intervals are utilized depending on the jurisdictional preference.

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[2] Every 3 dB equates to a 50% drop (or increase) in wave strength; therefore a 6 dB drop/increase = a loss/increase of 75% of total signal strength and so on.

[3] This is a subjective reference based upon the nonlinear nature of the human ear.

Finally, the aggregate of all community noise events occurring in any given area are typically averaged into a single numerical metric known as the *Community Noise Equivalent Level* (CNEL). This descriptor is calculated by averaging all events over a specified time interval, and applying a 5-dBA penalty to any sounds occurring between 7:00 p.m. and 10:00 p.m., and a 10-dBA penalty to sounds that occur during nighttime hours (i.e., 10 p.m. to 7 a.m.). This penalty is applied to compensate for the increased sensitivity to noise during the quieter nighttime hours. Mathematically, CNEL can be derived via the following expression:

$$CNEL = 10Log_{10}\frac{1}{n}\sum_{i=1}^{n}\left(10^{\frac{Leq(day)_i}{10}} + 10^{\frac{Leq(evening+5)_i}{10}} + 10^{\frac{Leq(night+10)_i}{10}}\right)$$

With the following variables:

$L_{eq}(x)_i$ = The equivalent sound level during period '*x*' at time interval *'i'*, and,

n = The number of time intervals.

ENVIRONMENTAL SIGNIFICANCE THRESHOLDS

County of San Diego Community Noise Regulations

Transportation noise levels, such as those produced by roadways, railroads, airports, heliports, are governed under the *County of San Diego's Noise Element of the 2020 General Plan*. Chapter 8, Tables N-1 and N-2 of the General Plan specify exterior noise compatibility guidelines within the County, as shown in Table 1 on the following page. Thus, for the proposed TPM 21261 project site, an exterior noise abatement standard of 60 dBA CNEL would be applicable, as applied to areas previously identified under N-2(4).

State of California CCR Title 24

The California Code of Regulations (CCR), State Building Code, Part 2, Title 24, Appendix Chapter 35; "*Noise Insulation Standards for Multifamily Housing*" requires that multi-family dwellings, hotels, and motels located where the CNEL exceeds 60 dBA require an acoustical analysis showing that the proposed design will limit interior noise to less than 45 dBA CNEL for all residential spaces.[4] Worst-case noise levels, either existing or future, must be used. The County of San Diego has adopted the CCR Title 24 regulations for all types of residential dwellings as codified under the General Plan guidelines N-2(1)(2).

[4] This standard is also codified in the 2013 version of the California Code of Regulations, Title 24, Part 2, Volume 1, Chapter 12 – Interior Environment, Section 1207 et. seq.

TABLE 1: County of San Diego General Plan 2020 Noise Element Compatibility Guidelines

Table N-1 Noise Compatibility Guidelines

	Land Use Category	Exterior Noise Level (CNEL)						
			55	60	65	70	75	80
A	Residential—single family residences, mobile homes, senior housing, convalescent homes							
B	Residential—multi-family residences, mixed-use (commercial/residential)							
C	Transient lodging—motels, hotels, resorts							
D*	Schools, churches, hospitals, nursing homes, child care facilities							
E*	Passive recreational parks, nature preserves, contemplative spaces, cemeteries							
F*	Active parks, golf courses, athletic fields, outdoor spectator sports, water recreation							
G*	Office\professional, government, medical\dental, commercial, retail, laboratories							
H*	Industrial, manufacturing, utilities, agriculture, mining, stables, ranching, warehouse, maintenance/repair							

	ACCEPTABLE—Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal construction, without any special noise insulation requirements.
	CONDITIONALLY ACCEPTABLE—New construction or development should be undertaken only after a detailed noise analysis is conducted to determine if noise reduction measures are necessary to achieve acceptable levels for land use. Criteria for determining exterior and interior noise levels are listed in Table N-2, Noise Standards. If a project cannot mitigate noise to a level deemed Acceptable, the appropriate county decision-maker must determine that mitigation has been provided to the greatest extent practicable or that extraordinary circumstances exist.
	UNACCEPTABLE—New construction or development shall not be undertaken.

* Denotes facilities used for part of the day; therefore, an hourly standard would be used rather than CNEL (refer to Table N-2).

Table N-2 Noise Standards

1. The exterior noise level (as defined in Item 3) standard for Category A shall be 60 CNEL, and the interior noise level standard for indoor habitable rooms shall be 45 CNEL.
2. The exterior noise level standard for Categories B and C shall be 65 CNEL, and the interior noise level standard for indoor habitable rooms shall be 45 CNEL.
3. The exterior noise level standard for Categories D and G shall be 65 CNEL and the interior noise level standard shall be 50 dBA L_{eq} (one hour average).
4. For single-family detached dwelling units, "exterior noise level" is defined as the noise level measured at an outdoor living area which adjoins and is on the same lot as the dwelling, and which contains at least the following minimum net lot area: *(i)* for lots less than 4,000 square feet in area, the exterior area shall include 400 square feet, *(ii)* for lots between 4,000 square feet to 10 acres in area, the exterior area shall include 10 percent of the lot area; *(iii)* for lots over 10 acres in area, the exterior area shall include 1 acre.
5. For all other residential land uses, "exterior noise level" is defined as noise measured at exterior areas which are provided for private or group usable open space purposes. "Private Usable Open Space" is defined as usable open space intended for use of occupants of one dwelling unit, normally including yards, decks, and balconies. When the noise limit for Private Usable Open Space cannot be met, then a Group Usable Open Space that meets the exterior noise level standard shall be provided. "Group Usable Open Space" is defined as usable open space intended for common use by occupants of a development, either privately owned and maintained or dedicated to a public agency, normally including swimming pools, recreation courts, patios, open landscaped areas, and greenbelts with pedestrian walkways and equestrian and bicycle trails, but not including off-street parking and loading areas or driveways.
6. For non-residential noise sensitive land uses, exterior noise level is defined as noise measured at the exterior area provided for public use.
7. For noise sensitive land uses where people normally do not sleep at night, the exterior and interior noise standard may be measured using either CNEL or the one-hour average noise level determined at the loudest hour during the period when the facility is normally occupied.
8. The exterior noise standard does not apply for land uses where no exterior use area is proposed or necessary, such as a library.
9. For Categories E and F the exterior noise level standard shall not exceed the limit defined as "Acceptable" in Table N-1 or an equivalent one-hour noise standard.

APPROACH AND METHODOLOGY

Field Acoustical Reconnaissance

An independent monitoring location was selected within the project site for the purpose of determining the ambient baseline community noise levels during normal free-flow weekday traffic conditions. The instrumentation location, denoted as Monitoring Location ML 1, is shown in Figure 5 on Page 11 of this report.

For the field monitoring effort, a Quest SoundPro SP-DL-2 ANSI Type 2 integrating sound level meter was used as the data collection device. The meter was affixed to a tripod five-feet above ground level, in order to simulate the noise exposure of an average-height human being, and was calibrated in accordance with ANSI S1-4 1983 Type 2 and IEC 651 Type 2 standards.[5]

Photos of the test setup are shown in Figure 6 on Page 12. Measurements were performed on May 24, 2018 between approximately 2:15 p.m. and 3:15 p.m.

Exterior Traffic Noise Impact Assessment Approach

The *Traffic Noise Model version 2.5* (TNM 2.5) based on FHWA-PD-96-010 and FHWA/CA/TL-87/03 standards was used to calculate future onsite vehicular traffic noise levels. Currently, TNM 2.5 is the only noise-modeling program formally accepted for use within the State of California.

Dominant input to the acoustical model included the following:

- The proposed site development plan (Source: Walsh Engineering & Surveying, 3/18).
- A digitized line-of-sight representation of all major roadways affecting the project site under the worst-case future noise condition (i.e., Fuerte Drive).
- Future Average Daily Trips (ADT's) for the aforementioned roadway segment (Source: County of San Diego / SANDAG Horizon Year 2030 Traffic Forecast).
- A traffic mix of 88.4% LDA/LDT, 6.4% MDT, 4.7% HDT, and 0.5% MCY in accordance with the Caltrans ITS Transportation Protocols (Source: Caltrans Traffic Data Branch, 3/09). [6]
- A peak hour traffic percentage of 8% of the ADT.[7]

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[5] All testing and calibration is performed by ISE's Acoustics and Vibration Laboratory using a GPS and Rubidium atomic frequency and time standard traceable to National Institute of Standards & Technology (NIST). The time and frequency calibration signal has a long-term stability of 10^{-10}. Specifications for traceability can be obtained at *www.nist.gov*.

[6] The Caltrans vehicle classifications are as follows: LDA = Light Duty Automobile, LDT = Light Duty Truck, MDT = Medium Duty Truck, HDT = Heavy Duty Truck, and MCY = Motorcycle.

[7] For values between approximately 8 and 12 percent, the energy-mean A-weighted sound level is equivalent to the CNEL.

- Receptor and topographic elevations (Source: USGS Digital Elevation Model).
- A composite pavement type, consisting of an average of Portland Cement Concrete (PCC) and Dense-Graded Asphaltic Concrete (DGAC) in accordance with TNM 2.5 test results (1998).

Modeled receptor areas consisting of useable space locations within the project footprint, as well as exterior building façade points, were sampled at various locations to determine the variation of all acoustic sources across, and affecting, the project site.

FINDINGS AND RECOMMENDATIONS

Field Acoustical Reconnaissance Findings

The results of the field reconnaissance sound level monitoring are shown in Table 2 below with the field data record provided as an attachment to this report. The values for the equivalent sound level (L_{eq-h}), the maximum and minimum measured sound levels (L_{max} and L_{min}), and the statistical indicators L_{10} and L_{90}, are given for the monitoring location examined.

TABLE 2: Measured Onsite Ambient Sound Levels

		One-Hour Noise Level Descriptors in dBA				
Location	**Start Time**	**L_{eq}**	**L_{max}**	**L_{min}**	**L_{10}**	**L_{90}**
ML 1	2:15 p.m.	52.6	70.2	34.9	56.1	39.4

Monitoring Location ML 1: Centrally located within Parcel 3 of the proposed project.

GPS: N 32° 45.764', W 116° 56.528'
Temperature = 79.2 °F. Relative Humidity = 42%. Barometric Pressure = 29.32 in-Hg.

Measurements performed by ISE on 5/24/18. EPE = Estimated GPS Position Error = 12 ft.

Measurements collected reflect the ambient daytime community sound levels in the vicinity of the proposed project site. As can be seen, the hourly average sound level (or L_{eq-h}) recorded over the monitoring period was 52.6 dBA for ML 1. This sound level was observed to be due entirely to traffic noise along Fuerte Drive, and occasional small commercial aircraft. Thus, ambient sound levels were found to be in compliance with the County's 60 dBA CNEL noise compatibility standard.

FIGURE 5: Ambient Noise Monitoring Location ML 1 (ISE 5/18)

FIGURE 6: Photos for Ambient Monitoring Station ML 1 (ISE 5/18)

Future Traffic Noise Impacts to Proposed Development

Traffic noise affecting the proposed TPM 21261 project site is currently, and would continue to be, the aggregation of surface street traffic along Fuerte Drive. Figure 7 on the following page identifies future year 2030 worst-case average daily traffic (ADT) volumes for this roadway.

Given these traffic volumes, Table 3 on Page 15 shows the TNM receptor ID corresponding to the proposed physical lot number, and whether or not mitigation measures are indicated. The complete model runs are provided as an attachment to this report. For the purposes of analysis, it was assumed that each of the three proposed single-family structures are of two-story construction.

Based upon the findings, no outdoor usable space areas, defined as rear and/or side yards, were identified which would be subjected to sound levels in excess of the County's noise abatement standards. No significant exterior acoustical impacts are identified, and no mitigation is recommended.

Future first floor building façade noise levels were found to be above the CCR Title 24 noise insulation threshold of 60 dBA CNEL for both first- and second-floor locations on Lots 2 and 3, and would therefore require mitigation. Façade sound levels at the proposed Lot 1 structure were found to be below the 60 dBA CNEL Title 24 standard.

Prior to issuance of building permits for the proposed project, an interior noise analysis compliant with the California Code of Regulations (CCR), Title 24, noise insulation standards would be required for Lots 2 and 3. The acoustical analysis should demonstrate that the proposed architectural design would limit interior noise to 45 dBA CNEL or less. Worst-case noise levels, either existing or future, must be used for this determination.

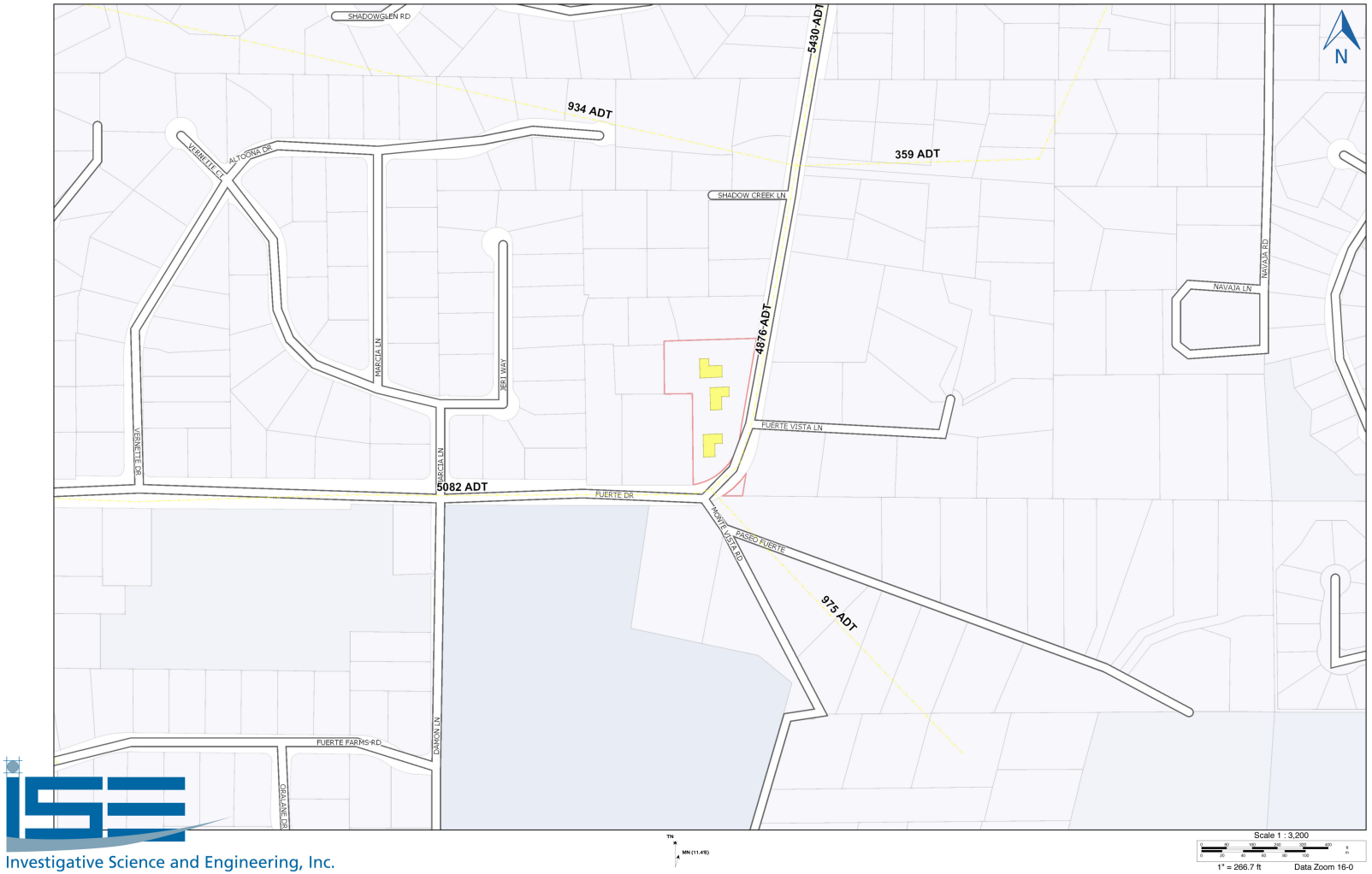

FIGURE 7: GP 2020 Future Year 2030 Traffic Volumes (ISE 5/18)

TABLE 3: Predicted Future Onsite Traffic Noise Levels

TNM Receptor ID	Area Examined	Unmitigated First Floor Levels in dBA	Unmitigated Second Floor Levels in dBA	General Plan *Exterior* Mitigation Required?	First Floor CCR Title 24 *Interior* Mitigation Required?	Second Floor CCR Title 24 *Interior* Mitigation Required?
Lot 1 Frontage (FF/SF)	Structure Facade Lot 1	58.0	58.3	- -	No	No
Lot 1 Rear Yard (OS)	Rear Yard Lot 1	53.4	- -	No	- -	- -
Lot 2 Frontage (FF/SF)	Structure Facade Lot 2	60.4	60.6	- -	Yes	Yes
Lot 2 Rear Yard (OS)	Rear Yard Lot 2	55.9	- -	No	- -	- -
Lot 3 Frontage (FF/SF)	Structure Facade Lot 3	61.6	61.7	- -	Yes	Yes
Lot 3 Rear Yard (OS)	Rear Yard Lot 3	57.5	- -	No	- -	- -

SPL values shown in dBA CNEL

CERTIFICATION OF ACCURACY AND QUALIFICATIONS

This report was prepared by Investigative Science and Engineering, Inc. (ISE). The members of its professional staff contributing to the report are listed below:

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ISE affirms to the best of its knowledge and belief that the statements and information contained herein are in all respects true and correct as of the date of this report. Content and information contained within this report is intended only for the subject project and is protected under 17 U.S.C. §§ 101 through 810.

Should the reader have any questions regarding the findings and conclusions presented in this report, please do not hesitate to contact ISE at (760) 787-0016.

Approved as to Form and Content:

Rick Tavares, Ph.D.

Project Principal
Investigative Science and Engineering, Inc. (ISE)

APPENDICES AND SUPPLEMENTAL INFORMATION

Field Reconnaissance Measurement Results

TPM 21261

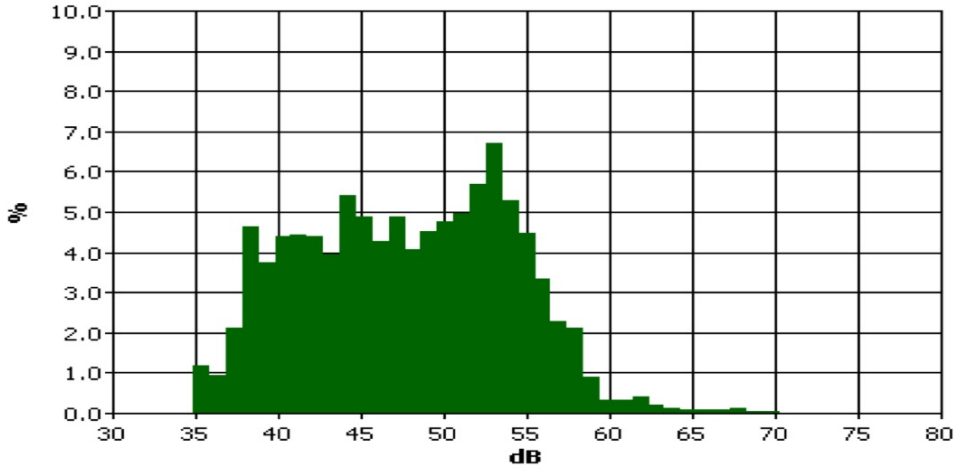
Information Panel

Name	ML 1
Start Time	Thursday, May 24, 2018 14:15:09
Stop Time	Thursday, May 24, 2018 15:15:51
Device Model Type	SoundPro DL
Comments	

General Data Panel

Description	Meter	Value	Description	Meter	Value
Leq	1	52.6 dB	Exchange Rate	1	3 dB
Weighting	1	A	Response	1	SLOW
Bandwidth	1	OFF	Exchange Rate	2	3 dB
Weighting	2	C	Response	2	FAST

Statistics Chart



Statistics Table

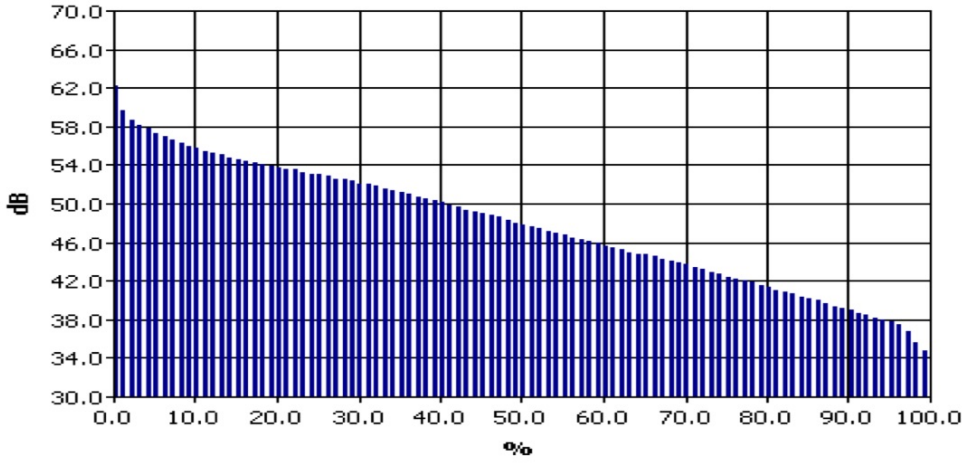
dB	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	%
30.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	1.2
36.0	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.9
37.0	0.1	0.2	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.4	2.1
38.0	0.5	0.5	0.4	0.4	0.4	0.5	0.5	0.6	0.4	0.4	4.6
39.0	0.4	0.3	0.4	0.4	0.3	0.4	0.4	0.4	0.4	0.3	3.7
40.0	0.4	0.5	0.4	0.4	0.4	0.5	0.4	0.5	0.5	0.4	4.4
41.0	0.4	0.4	0.4	0.4	0.5	0.5	0.4	0.4	0.5	0.5	4.4
42.0	0.6	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	4.4
43.0	0.4	0.3	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.4	4.0
44.0	0.5	0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.7	5.4
45.0	0.6	0.5	0.4	0.5	0.5	0.5	0.5	0.4	0.4	0.4	4.9
46.0	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	4.3
47.0	0.4	0.4	0.5	0.5	0.4	0.5	0.5	0.5	0.5	0.5	4.9
48.0	0.5	0.4	0.3	0.4	0.4	0.4	0.4	0.4	0.5	0.5	4.1
49.0	0.4	0.5	0.5	0.4	0.5	0.5	0.4	0.4	0.4	0.5	4.5
50.0	0.4	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.5	0.5	4.8
51.0	0.5	0.5	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	5.0
52.0	0.5	0.5	0.6	0.6	0.6	0.5	0.6	0.6	0.5	0.6	5.7
53.0	0.6	0.6	0.7	0.7	0.6	0.7	0.7	0.8	0.7	0.7	6.7
54.0	0.8	0.7	0.4	0.5	0.5	0.5	0.6	0.4	0.5	0.5	5.3
55.0	0.5	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.4	4.5
56.0	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.4	0.3	0.4	3.3
57.0	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	2.3
58.0	0.2	0.3	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	2.1

1

Statistics Table (cont'd)

dB	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	%
59.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.9
60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
61.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
62.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
63.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
64.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
65.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
66.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
67.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
68.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
69.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
71.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
72.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
73.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
74.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
76.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
77.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
78.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
79.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Exceedance Chart



Exceedance Table

	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%
0%		62.2	59.6	58.7	58.2	57.8	57.3	56.9	56.6	56.2
10%	55.9	55.7	55.5	55.3	55.1	54.8	54.6	54.4	54.2	54.0
20%	53.9	53.7	53.6	53.5	53.3	53.1	53.0	52.8	52.6	52.5
30%	52.3	52.1	52.0	51.8	51.6	51.4	51.2	51.0	50.7	50.5
40%	50.3	50.1	49.9	49.7	49.4	49.2	49.0	48.8	48.6	48.3
50%	48.0	47.8	47.6	47.4	47.2	47.0	46.8	46.5	46.3	46.1
60%	45.9	45.6	45.4	45.2	45.0	44.8	44.7	44.5	44.3	44.1
70%	43.9	43.7	43.4	43.2	42.9	42.7	42.4	42.2	42.0	41.8
80%	41.6	41.3	41.1	40.9	40.6	40.4	40.2	40.0	39.7	39.4
90%	39.2	38.9	38.6	38.5	38.2	38.0	37.8	37.5	36.8	35.6
100%	34.8									

TNM Model Input/Output Data

INPUT: ROADWAYS **18-006**

ISE					**30 May 2018**						
R. Tavares Ph.D.					**TNM 2.5**						
INPUT: ROADWAYS							**Average pavement type shall be used unless**				
PROJECT/CONTRACT:	**18-006**						**a State highway agency substantiates the use**				
RUN:	**TPM 21261 (Fuerte Rd)**						**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	%		
FUERTE DRIVE	24.0	FR1	146	6,349,089.0	1,858,575.0	623.10				Average	
		FR2	147	6,349,034.0	1,858,286.0	613.20				Average	
		FR3	148	6,348,953.0	1,857,914.0	598.60				Average	
		FR4	149	6,348,907.0	1,857,862.0	595.50				Average	
		FR5	150	6,348,851.0	1,857,828.0	595.50				Average	
		FR6	151	6,348,756.0	1,857,818.0	595.50				Average	
		FR7	152	6,348,514.0	1,857,817.0	600.00					

INPUT: TRAFFIC FOR LAeq1h Volumes **18-006**

ISE				**30 May 2018**								
R. Tavares Ph.D.				**TNM 2.5**								
INPUT: TRAFFIC FOR LAeq1h Volumes												
PROJECT/CONTRACT:	**18-006**											
RUN:	**TPM 21261 (Fuerte Rd)**											
Roadway	**Points**											
Name	**Name**	**No.**	**Segment**									
			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
FUERTE DRIVE	FR1	146	345	35	25	35	18	25	1	25	2	35
	FR2	147	345	35	25	35	18	25	1	25	2	35
	FR3	148	345	35	25	35	18	25	1	25	2	35
	FR4	149	345	35	25	35	18	25	1	25	2	35
	FR5	150	345	35	25	35	18	25	1	25	2	35
	FR6	151	345	35	25	35	18	25	1	25	2	35
	FR7	152										

INPUT: RECEIVERS **18-006**

ISE **30 May 2018**
R. Tavares Ph.D. **TNM 2.5**

INPUT: RECEIVERS
PROJECT/CONTRACT: **18-006**
RUN: **TPM 21261 (Fuerte Rd)**

Receiver Name	No.	#DUs	Coordinates (ground) X	Y	Z	Height above Ground	Input Sound Levels and Criteria: Existing LAeq1h	Impact Criteria LAeq1h	Impact Criteria Sub'l	NR Goal	Active in Calc.
			ft	ft	ft	ft	dBA	dBA	dB	dB	
Lot 1 Frontage (FF)	1013	1	6,348,902.0	1,858,201.5	607.30	5.00	0.00	60	10.0	8.0	Y
Lot 1 Frontage (SF)	1021	1	6,348,903.0	1,858,202.5	617.30	5.00	0.00	60	10.0	8.0	Y
Lot 1 Rear Yard (OS)	1022	1	6,348,787.5	1,858,208.5	607.30	5.00	0.00	60	10.0	8.0	Y
Lot 2 Frontage (FF)	1023	1	6,348,924.0	1,858,124.2	604.50	5.00	0.00	60	10.0	8.0	Y
Lot 2 Frontage (SF)	1025	1	6,348,925.0	1,858,125.2	614.50	5.00	0.00	60	10.0	8.0	Y
Lot 2 Rear Yard (OS)	1026	1	6,348,836.5	1,858,114.5	604.50	5.00	0.00	60	10.0	8.0	Y
Lot 3 Frontage (FF)	1028	1	6,348,902.0	1,857,974.5	600.00	5.00	0.00	60	10.0	8.0	Y
Lot 3 Frontage (SF)	1029	1	6,348,903.0	1,857,975.5	610.00	5.00	0.00	60	10.0	8.0	Y
Lot 3 Rear Yard (OS)	1030	1	6,348,821.0	1,857,979.4	600.00	5.00	0.00	60	10.0	8.0	Y

INPUT: BUILDING ROWS **18-006**

ISE					**30 May 2018**	
R. Tavares Ph.D.					**TNM 2.5**	
INPUT: BUILDING ROWS						
PROJECT/CONTRACT:	**18-006**					
RUN:	**TPM 21261 (Fuerte Rd)**					
Building Row			**Points**			
Name	**Average**	**Building**	**No.**	**Coordinates (ground)**		
	Height	**Percent**		**X**	**Y**	**Z**
	ft	%		ft	ft	ft
LOT 2 STRUCTURE	0.00	80	1458	6,348,864.0	1,858,149.5	30.00
			1459	6,348,919.5	1,858,150.4	30.00
			1460	6,348,919.5	1,858,120.8	30.00
			1461	6,348,898.0	1,858,120.0	30.00
			1462	6,348,898.0	1,858,079.4	30.00
			1463	6,348,862.0	1,858,079.0	30.00
			1464	6,348,862.0	1,858,150.0	30.00
LOT 3 STRUCTURE	0.00	80	1465	6,348,841.5	1,858,002.2	30.00
			1466	6,348,897.5	1,858,002.6	30.00
			1467	6,348,898.0	1,857,974.9	30.00
			1468	6,348,875.0	1,857,974.4	30.00
			1469	6,348,875.0	1,857,932.2	30.00
			1470	6,348,839.0	1,857,932.0	30.00
			1471	6,348,839.0	1,858,003.0	30.00
LOT 1 STRUCTURE	0.00	80	1472	6,348,829.0	1,858,240.6	30.00
			1473	6,348,857.0	1,858,240.9	30.00
			1474	6,348,857.0	1,858,218.0	30.00
			1475	6,348,898.0	1,858,219.0	30.00
			1476	6,348,898.5	1,858,180.6	30.00
			1477	6,348,828.0	1,858,180.0	30.00
			1478	6,348,828.0	1,858,241.0	30.00

INPUT: GROUND ZONES **18-006**

ISE				**30 May 2018**	
R. Tavares Ph.D.				**TNM 2.5**	
INPUT: GROUND ZONES					
PROJECT/CONTRACT:	**18-006**				
RUN:	**TPM 21261 (Fuerte Rd)**				
Ground Zone			**Points**		
Name	**Type**	**Flow**	**No.**	**Coordinates**	
		Resistivity		**X**	**Y**
		cgs rayls		ft	ft
TPM 21261 SITE	Hard Soil	5000	167	6,348,718.0	1,858,296.0
			168	6,349,011.0	1,858,300.0
			169	6,348,953.0	1,857,990.0
			170	6,348,946.0	1,857,960.0
			171	6,348,932.0	1,857,932.0
			172	6,348,919.0	1,857,912.0
			173	6,348,901.0	1,857,893.0
			174	6,348,882.0	1,857,876.0
			175	6,348,857.0	1,857,862.0
			176	6,348,833.0	1,857,851.0
			177	6,348,806.0	1,857,846.0
			178	6,348,804.0	1,858,130.0
			179	6,348,716.0	1,858,131.0

RESULTS: SOUND LEVELS **18-006**

ISE **30 May 2018**
R. Tavares Ph.D. **TNM 2.5**
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: **18-006**
RUN: **TPM 21261 (Fuerte Rd)**
BARRIER DESIGN: **INPUT HEIGHTS**
Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.
ATMOSPHERICS: **68 deg F, 50% RH**

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	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Lot 1 Frontage (FF)	1013	1	0.0	58.0	60	58.0	10	----	58.0	0.0	8	-8.0
Lot 1 Frontage (SF)	1021	1	0.0	58.3	60	58.3	10	----	58.3	0.0	8	-8.0
Lot 1 Rear Yard (OS)	1022	1	0.0	53.4	60	53.4	10	----	53.4	0.0	8	-8.0
Lot 2 Frontage (FF)	1023	1	0.0	60.4	60	60.4	10	Snd Lvl	60.4	0.0	8	-8.0
Lot 2 Frontage (SF)	1025	1	0.0	60.6	60	60.6	10	Snd Lvl	60.6	0.0	8	-8.0
Lot 2 Rear Yard (OS)	1026	1	0.0	55.9	60	55.9	10	----	55.9	0.0	8	-8.0
Lot 3 Frontage (FF)	1028	1	0.0	61.6	60	61.6	10	Snd Lvl	61.6	0.0	8	-8.0
Lot 3 Frontage (SF)	1029	1	0.0	61.7	60	61.7	10	Snd Lvl	61.7	0.0	8	-8.0
Lot 3 Rear Yard (OS)	1030	1	0.0	57.5	60	57.5	10	----	57.5	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	9	0.0	0.0	0.0
All Impacted	4	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

INDEX OF IMPORTANT TERMS