
APPENDIX I

ENVIRONMENTAL NOISE ASSESSMENT

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**CARMEL HIGH SCHOOL
STADIUM IMPROVEMENTS PROJECT**

(Update to the Carmel High School Stadium Lights Environmental Noise Assessment July 6, 2021)

WJVA Report No. 22-29

PREPARED FOR

**EMC PLANNING
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1. INTRODUCTION

Project Description

The Carmel Unified School District (school district) is proposing to install field lighting at the existing stadium at Carmel High School. In addition to the field lighting component, the project would also include the construction of two (2) new parking areas (one to be located in the vicinity of the exiting tennis courts with a second parking area to be located north of the stadium, near the swimming pool complex) as well as the construction of a new storage building within the stadium bleachers, to be used for the storage of athletic equipment. The school district also plans to replace the existing lights at the swimming pool complex with new LED lights.

Stadium Field Lights-

The school district is proposing to install field lighting at the existing stadium at Carmel High School, consistent with the school district's 2019 facilities master plan. Two of the lighting poles will be located behind the northern, home seating area and will extend 70 feet high accounting for a 10-foot higher grade than the south, visitor seating bleachers, which will be 80 feet high. Each pole will be on a pre-cast concrete base approximately 10 feet below ground. The project site plan (illumination summary) is provided as Figure 1.

Storage Building (At Existing Stadium)-

A new 20-foot by 120-foot storage building will be constructed immediately east of the existing home bleachers, consistent with the school district's 2019 facilities master plan. The storage building will measure 10 feet in height and will be built to align with the existing bleachers. A standing platform will sit on the roof of the storage building and will be open to spectators during sporting events. The storage building conceptual design is provided as Figure 2.

New Parking Lots-

Northeast of Existing Pool: An additional 35 parking spaces are proposed northeast of the existing pool facility where storage buildings and containers currently sit along where the campus ring road connects with the stadium. The two storage buildings and two storage containers will be removed and replaced by an area sufficient to accommodate the 35 parking spaces, which will be paved and striped. These 35 parking spaces are intended to accommodate students during the school day and then is to be used by staff and participants during sporting events. Spectators will not park in this area during any sporting events. This additional parking area will be accessed via Ocean Avenue and the campus ring road. Minimal grading will be required to accommodate the expanded paved parking area. No additional lighting is required for this new parking area. Conceptual project plans for the new parking area near the pool facility are provided as Figure 3.

South of Stadium (Current Tennis Courts): An additional, 0.62-acre parking lot with 76 parking spaces will be constructed to replace the existing tennis courts located immediately south of the stadium and north of Morse Drive. This parking lot will accommodate students for school day parking and students and visitors for all school-sponsored events including sporting events at the stadium. This parking lot will have two accesses. The first will be an 18-foot drive aisle, parallel to State Route 1, between the existing campus parking lot to the north and the new parking lot

to the south. The drive aisle will require demolition of the existing pedestrian walkway. The second access will be a 20-foot driveway providing access to Morse Drive and the existing access to the baseball field parking to the east. The new parking lot will be lighted and will feature cut-off luminaires on 12-foot-high poles with 3-foot concrete bases. Supplemental/replacement low level (4-foot +/-) pedestrian pathway lights would also be installed. The project plans for this new parking lot are provided as Figure 4.

Replacement of Existing Pool Light Fixtures-

In order to help address concerns about existing campus light spillage, the school district will replace the existing light fixtures attached to the 50-foot-high lighting poles at the pool facility, with LED light fixtures. These LED light fixtures will be Dark Sky compliant and will only be turned on for school-sponsored swim meets and practices.

Traffic Management Plan-

A proposed traffic management plan has been prepared to address access, circulation, and on- and off-campus parking, as a mitigation measure.

Schedule of Uses-

The proposed project is intended to expand the timing and use of the existing stadium facilities for several sports teams including the following: football (boys), soccer (boys and girls), lacrosse (boys and girls), track and field (boys and girls), and field hockey (girls). By allowing evening-hour use, the high school would provide enhanced opportunities for students to participate in school-sponsored sports. The timing of all other school-affiliated sporting activities that do not utilize the stadium for practices or games would remain the same. No uses of the stadium are proposed before sunrise.

Environmental Noise Assessment

This environmental noise assessment has been prepared to determine if significant noise impacts would be produced by the project and to describe mitigation measures for noise if significant impacts are determined. The environmental noise assessment, prepared by WJV Acoustics, Inc. (WJVA), is based upon the project site plan (illumination summary) provided by the project applicant, project-related traffic data provided by Hexagon Transportation Consultants and a project site visit on April 20 and 21, 2021 as well as March 22 and 23, 2022. Revisions to the site plan, project-related traffic data or other project-related information available to WJVA at the time the analysis was prepared may require a reevaluation of the findings and/or recommendations of the report.

Appendix A provides definitions of the acoustical terminology used in this report. Unless otherwise stated, all sound levels reported in this analysis are A-weighted sound pressure levels in decibels (dB). A-weighting de-emphasizes the very low and very high frequencies of sound in a manner similar to the human ear. Most community noise standards utilize A-weighted sound levels, as they correlate well with public reaction to noise. Appendix B provides typical A-weighted sound levels for common noise sources.

In terms of human perception, a 5 dB increase or decrease is considered to be a noticeable change in noise levels. Additionally, a 10 dB increase or decrease is perceived by the human ear as half as loud or twice as loud. In terms of perception, generally speaking the human ear cannot perceive an increase (or decrease) in noise levels less than 3 dB.

2. **THRESHOLDS OF SIGNIFICANCE**

The CEQA Guidelines apply the following questions for the assessment of significant noise impacts for a project:

- a. Would the project result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?
- b. Would the project result in generation of excessive groundborne vibration or groundborne noise levels?
- c. For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

a. **Noise Level Standards**

Monterey County

The Safety Element of the Monterey County General Plan¹ (adopted October 26, 2010) establishes land use compatibility criteria in terms of the Community Noise Equivalent Level (CNEL) to describe noise exposure for noise compatibility planning purposes. The CNEL is the time-weighted energy average noise level for a 24-hour day, with a 5 dB (technically 4.77 dB) penalty added to noise levels occurring during the evening hours between 7:00 p.m. and 10:00 p.m. and a 10 dB penalty added to noise levels occurring during the nighttime hours between 10:00 p.m. and 7:00 a.m. The CNEL represents cumulative exposure to noise over an extended period of time and is therefore calculated based upon *annual average* conditions.

Although not explicitly stated in the General Plan, exterior noise level standards are typically applied to “outdoor activity areas”. Outdoor activity areas are generally considered to be backyards of single-family residential land uses, common use outdoor areas and individual patios and balconies of multi-family residential land uses, and common use outdoor areas for transient lodging land uses.

The “Noise Hazards” section of the Safety Element provides the following Goals and Policies that are relevant to the project:

Goal S-7: ***Maintain a healthy and quiet environment free from annoying and harmful sounds.***

Policy S-7.1: New Noise Sensitive land uses may only be allowed in areas where existing and projected noise levels are “acceptable” according to “Land Use Compatibility for Community Noise Table” (Table I below).

- Policy S-7.2: Proposed development shall incorporate design elements necessary to minimize noise impacts on surrounding land uses and to reduce noise in indoor spaces to an acceptable level.
- Policy S-7.3: Development may occur in areas identified as “normally acceptable” provided effective measures to reduce both the indoor and outdoor noise levels to acceptable levels are taken.
- Policy S-7.4: New noise generators may be allowed in areas where projected noise levels are “conditionally acceptable” only after a detailed analysis of the noise reduction requirements is made and needed noise mitigation features are included in project design.
- Policy S-7.5: New noise generators shall be discouraged in areas identified as “normally unacceptable.” Where such new noise generators are permitted, mitigation to reduce both the indoor and outdoor noise levels will be required.
- Policy S-7.6: Acoustical Analysis shall be part of the environmental review process for projects when:
- a. Noise sensitive receptors are proposed in areas exposed to existing or projected noise levels that are “normally unacceptable” or higher according Table S-2 (“Land Use Compatibility for Community Noise”).
 - b. Proposed noise generators are likely to produce noise levels exceeding the levels shown in the adopted Community Noise Ordinance when received at existing or planned noise-sensitive receptors.
- Policy S-7.7: All proposed discretionary residential projects that are within roadway or railroad noise contours of 60 dB CNEL or greater shall include a finding of consistency with the provisions of the Noise Hazards section of the Safety Element. If found that the roadway noise exceeds 60 dB CNEL within the project site, a project-specific noise impact analysis shall be required. If impacts are identified, the applicant shall conduct mitigation analysis using published Caltrans/Federal Highway Administration guidelines and implement mitigation measures as required. Mitigation measures may include, but are not limited to sound walls, adjacent roadway design, dual pane glass, building location or design, etc. Any proposed mitigation measures shall be concurrently implemented with the implementation of the project.

Although not explicitly stated in the County’s General Plan, it is common to ensure interior noise levels attributable to exterior sources not exceed 45 dB CNEL (or L_{dn}) within residential land uses. This is consistent with Title 24 of the California Code of Regulations for residential construction and consistent with U.S. Department of Housing and Urban Development (HUD). The intent of the interior noise level guideline is to provide an acceptable noise environment for indoor communication and sleep.

Additionally, Section 1207.4 of the California Building Code states *“Interior noise levels attributable to exterior sources should not exceed 45 dB in any inhabitable room. The noise metric shall be the day-night average sound level (L_{dn}) or the community noise equivalent level (CNEL), consistent with the noise level of the local general plan.”* The section of the California Building Code applies to Hotels and Motels.

TABLE I COMMUNITY NOISE EXPOSURE LEVELS (L_{dn}, or CNEL, dBA) MONTEREY COUNTY				
Land Use Category	Noise Ranges (L _{dn} or CNEL), dB			
	I	II	III	IV
Residential - Low-density Single-family, Duplex, Mobile Homes	<60	55-70	70-75	75+
Residential - Multifamily	<65	60-70	70-75	75+
Transient Lodging – Motels, Hotels	<65	60-70	70-80	80+
Schools, Libraries, Churches, Hospitals, Nursing Homes	<70	60-70	70-80	80+
Auditoriums, Concert Halls, Amphitheaters	--	<70	65+	--
Sports Arena, Outdoor Spectator Sports	--	<75	70+	--
Playgrounds, Neighborhood Parks	<70	70-75	75+	--
Golf Courses, Riding Stables, Water Recreation, Cemeteries	<75	70-80	--	80+
Office Buildings, Business Commercial, Professional	<70	65-75	75+	--
Industrial, Manufacturing, Utilities, Agriculture	<75	70-80	75-85	-

NOTES:

- Noise Range I: Normally Acceptable. The specific land use is satisfactory based on the assumption that any buildings are of normal conventional construction.
- Noise Range II: Conditionally Acceptable. New construction or development should be undertaken only after a detailed analysis of noise reduction is made and noise insulation features are included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.
- Noise Range III: Normally Unacceptable. New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of noise reduction must be made and noise insulation features must be included in the design.
- Noise Range IV: Clearly Unacceptable. New construction or development should generally not be undertaken.

Source: County of Monterey 2010

The Monterey County Municipal Code² provides further exterior noise limits applicable to the project.

§10.60.030 – Operation of noise-producing devices restricted.

- At any time of the day, it is prohibited within unincorporated area of the County of Monterey to operate, assist in operating, allow, or cause to be operated any machine, mechanism, device or contrivance which produces a noise level exceeding eighty-five (85) dBA measured fifty (50) feet therefrom. The prohibition in this Section shall not apply to aircraft nor to any such machine, mechanism, device or contrivance that is operated in excess of two thousand five hundred (2,500) feet from any occupied dwelling unit.

§10.60.040 – Regulation of nighttime noise.

The following regulations shall apply to nighttime noise:

- a. It is prohibited within the unincorporated area of the County of Monterey to make, assist in making, allow, continue, create, or cause to be made any loud and unreasonable sound any day of the week from 10:00 p.m. to 7:00 a.m. the following morning.
- b. Within the period of 10:00 p.m. to 7:00 a.m. the following morning, and for the purposes of this Section, a loud and unreasonable sound shall include any sound that exceeds the exterior noise levels standards set forth in Table II below.

(Nighttime Only)

Table II	Standard
Nighttime hourly equivalent sound level (L_{eq} dBA)	45
Maximum (L_{max}) level, dBA	65

Section 10-060.040 (c) of Monterey County Municipal Code provides exemptions to the above-described noise standards:

The provisions of this Section are not intended to affect and shall not apply to:

1. Bells, chimes, carillons and similar devices while being used for religious purposes, or in conjunction with religious services, or for celebrations of public holidays; or
2. Outdoor gatherings, public dances, shows and sporting and entertainment events, provided such gathering, dance or event is conducted on commercial or institutional premises, pursuant to applicable rules, regulations and zoning restrictions and in compliance with all permits or licenses issued by a public agency relative to the staging of the gathering, dance or event; or
3. Emergency vehicles being operated by authorized personnel or equipment used in an emergency, such as chain saws; or
4. Commercial agricultural operations, not including activities at farm-related housing.

State of California

There are no state noise standards that are applicable to the project.

Federal Noise Standards

There are no federal noise standards that are applicable to the project.

b. Construction Noise and Vibration

The “Noise Hazards” section of the Safety Element of the Monterey County General Plan provides the following Policies pertaining to construction noise and vibration:

Policy S-7.8: All discretionary projects that propose the use of heavy construction equipment that has the potential to create vibrations that could cause structural damage to adjacent structures within 100 feet shall be required to submit a pre-construction vibration study prior to the approval of a building permit. Projects shall be required to incorporate specified measures and monitoring identified to reduce impacts. Pile driving or blasting are illustrative of the type of equipment that could subject to this policy.

Policy S-7.9: No construction activities pursuant to a County permit that exceed “acceptable” levels listed in Policy S-7.1 shall be allowed within 500 feet of a noise sensitive land use during the evening hours of Monday through Saturday, or anytime on Sunday or holidays, prior to completion of a noise mitigation study. Noise protection measures, in the event of any identified impact, may include but not be limited to:

- Constructing temporary barriers, or
- Using quieter equipment than normal.

Policy S-7.10: Construction projects shall include the following standard noise protection measures:

- Construction shall occur only during times allowed by ordinance/code unless such limits are waived for public convenience;
- All equipment shall have properly operating mufflers; and
- Lay-down yards and semi-stationary equipment such as pumps or generators shall be located as far from noise-sensitive land uses as practical.

Neither the General Plan nor the County’s Code of Ordinances provide specific prohibited hours of construction activities, however, it is typical to limit construction to the hours of (at a minimum) 7:00 a.m. to 7:00 p.m.

There are no Monterey County Vibration level standards. Some guidance is provided by the Caltrans Transportation and Construction Vibration Guidance Manual³. The Manual provides guidance for determining annoyance potential criteria and damage potential threshold criteria. These criteria are provided below in Table III and Table IV, and are presented in terms of peak particle velocity (PPV) in inches per second (in/sec).

TABLE III		
GUIDELINE VIBRATION ANNOYANCE POTENTIAL CRITERIA		
Human Response	Maximum PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Barely Perceptible	0.04	0.01
Distinctly Perceptible	0.25	0.04
Strongly Perceptible	0.9	0.1
Severe	2.0	0.4

Source: Caltrans

TABLE IV		
GUIDELINE VIBRATION DAMAGE POTENTIAL THRESHOLD CRITERIA		
Structure and Condition	Maximum PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile, historic buildings, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Source: Caltrans

3. SETTING

The project site is located in unincorporated Monterey County within the rural/suburban State Route 1 corridor running south to north between the Carmel River and the Big Sur coast to the south, the City of Carmel-by-the-Sea to the west, and the Del Monte Forest area and City of Monterey to the north. Hatton Canyon and residential neighborhoods sit to the immediate east of the campus while the greater Carmel Valley area sits further to the east.

The approximately 3.8-acre project site is the existing athletic stadium located on the south edge of the Carmel High School (high school) campus. Additionally, two new parking areas and a stadium storage building are included as part of the project. One new parking area would be located in the area of the existing tennis courts with a second new parking area north of the stadium, in the vicinity of the pool complex. The storage building would be constructed within the bleacher area of the stadium. The campus is located immediately east of State Route 1 and approximately 0.50 miles east of the City of Carmel-by-the-Sea in unincorporated Monterey County.

The stadium site is entirely flat and is placed on the lowest graded terrace of a series of north to south terraces that make up the larger high school campus. The south portion of the high school campus is largely made up of the high school's sports facilities, including a swimming facility, football/track and field stadium, tennis courts, and baseball diamond. The stadium site is entirely flat and is placed on the lowest graded terrace of a series of north to south terraces that make up the larger high school campus.

a. Background Noise Level Measurements

Existing ambient noise levels in the project vicinity are dominated by traffic noise along State Route 1 (SR-1) and other local roadways. Additional sources of noise observed during site inspection included noise associated with high school activities (alarm bells, on-site vehicle movements, voices, etc.) aircraft overflights, landscaping equipment, barking dogs and birds. The immediate project vicinity is also exposed to existing noise sources associated with various after school activities including sports practices and games at the football field, baseball field, tennis court and swimming pool areas as well as outdoor band practices and various other school-related activities.

Measurements of existing ambient noise levels in the project vicinity were conducted on April 20 and April 21, 2021 and March 22 and March 23, 2022. Long-term (24-hour) ambient noise level measurements were conducted at four (4) locations (sites LT-1, LT-2, LT-3 and LT-4).

- Long-term ambient noise measurement site LT-1 was located in the vicinity of existing residential land uses east of the stadium, along Flanders Drive, and was exposed to traffic noise associated localized traffic and other noise sources typical of residential neighborhoods.

- Long-term ambient noise measurement site LT-2 was located near residential land uses along Morse Drive. The meter was placed at the rear of the residential land uses, facing the stadium. Noise monitoring site LT-2 was exposed to traffic noise associated with SR-1 as well as localized traffic, activities occurring at the high school baseball field and the adjacent parking lot.
- Long-term ambient noise measurement site LT-3 was located at the rear of residential land uses along Morse Drive. The meter was placed at the rear of the residential land uses, facing the stadium. Noise monitoring site LT-3 was exposed to noise associated with school activities, including vehicle movements, human voices, school bells, sporting activities, landscaping activities, etc.
- Long-term ambient noise measurement site LT-4 was adjacent to the existing tennis court area. Noise monitoring site LT-4 was exposed to noise associated with traffic on CA State Route 1 and Morse Drive, as well as noise associated with school activities.

Additionally, short-term (15-minute) ambient noise level measurements were conducted at eight (8) locations (Sites ST-1 through ST-8). The project vicinity and locations of the noise monitoring sites are shown on Figure 5. Two (2) individual measurements were taken at each of the eight short-term sites to quantify ambient noise levels in the morning and afternoon hours.

Noise monitoring equipment consisted of Larson-Davis Laboratories Model LDL-820 sound level analyzers equipped with B&K Type 4176 1/2" microphones. The equipment complies with the specifications of the American National Standards Institute (ANSI) for Type I (Precision) sound level meters. The meters were calibrated with a B&K Type 4230 acoustic calibrator to ensure the accuracy of the measurements.

Measured hourly energy average noise levels (L_{eq}) at site LT-1 ranged from a low of 29.9 dB between midnight and 1:00 a.m. to a high of 53.8 dB between 4:00 p.m. and 5:00 p.m. Hourly maximum (L_{max}) noise levels at site LT-1 ranged from 34.9 to 74.4 dB. Residual noise levels at the monitoring site, as defined by the L_{90} statistical descriptor ranged from 28.5 to 37.7 dB. The L_{90} is a statistical descriptor that defines the noise level exceeded 90% of the time during each hour of the sample period. The L_{90} is generally considered to represent the residual (or background) noise level in the absence of identifiable single noise events from traffic, aircraft and other local noise sources. The measured CNEL value at site LT-1 during the 24-hour noise measurement period was 51.2 dB. Figure 6 graphically depicts hourly variations in ambient noise levels at the LT-1 long-term monitoring site as well as a site photograph.

Measured hourly energy average noise levels (L_{eq}) at site LT-2 ranged from a low of 35.5 dB between 1:00 a.m. and 2:00 a.m. to a high of 65.5 dBA between 10:00 a.m. and 11:00 a.m. Hourly maximum (L_{max}) noise levels at site LT-2 ranged from 47.3 to 81.1 dB. Residual noise levels at the monitoring site, as defined by the L_{90} , ranged from 31.1 to 41.6 dB. The measured CNEL value at site LT-2 during the 24-hour noise measurement period was 54.0 dB. Figure 7 graphically depicts hourly variations in ambient noise levels at the LT-2 long-term monitoring site as well as a site photograph.

Measured hourly energy average noise levels (L_{eq}) at site LT-3 ranged from a low of 32.5 dB between 3:00 a.m. and 4:00 a.m. to a high of 49.2 dBA between 10:00 a.m. and 11:00 a.m. Hourly maximum (L_{max}) noise levels at site LT-3 ranged from 39.1 to 73.2 dB. Residual noise levels at the monitoring site, as defined by the L_{90} , ranged from 31.3 to 38.6 dB. The measured CNEL value at site LT-3 during the 24-hour noise measurement period was 46.0 dB. Figure 8 graphically depicts hourly variations in ambient noise levels at the LT-3 long-term monitoring site as well as a site photograph.

Measured hourly energy average noise levels (L_{eq}) at site LT-4 ranged from a low of 44.6 dB between 3:00 a.m. and 4:00 a.m. to a high of 62.4 dBA between 8:00 a.m. and 9:00 a.m. Hourly maximum (L_{max}) noise levels at site LT-4 ranged from 64.3 to 88.5 dB. Residual noise levels at the monitoring site, as defined by the L_{90} , ranged from 34.2 to 55.4 dB. The measured CNEL value at site LT-4 during the 24-hour noise measurement period was 62.5 dB. Figure 9 graphically depicts hourly variations in ambient noise levels at the LT-4 long-term monitoring site as well as a site photograph.

The short-term site noise measurement data included energy average (L_{eq}) maximum (L_{max}) as well as five (5) individual statistical parameters. Observations were made of the dominant noise sources affecting the measurements. The statistical parameters describe the percent of time a noise level was exceeded during the measurement period. Table V summarizes short-term noise measurement results.

TABLE V SUMMARY OF SHORT-TERM NOISE MEASUREMENT DATA CARMEL HIGH SCHOOL STADIUM LIGHTS MONTEREY COUNTY APRIL 20 & 21, 2021 and March 22 & 23, 2022									
Site	Time	A-Weighted Decibels, dBA							Sources
		L_{eq}	L_{max}	L_2	L_8	L_{25}	L_{50}	L_{90}	
ST-1	8:05 a.m.	63.4	81.1	71.2	66.4	61.7	58.2	55.0	TR, L, B
ST-1	3:35 p.m.	61.9	77.4	70.7	65.9	60.3	56.1	54.1	TR, AC
ST-2	8:25 a.m.	61.8	75.9	69.4	63.7	62.0	56.6	51.7	TR, AC, L
ST-2	4:00 p.m.	62.4	80.0	69.2	64.1	61.8	55.5	52.0	TR, D
ST-3	8:50 a.m.	53.7	68.8	62.1	54.9	44.2	38.1	36.2	TR, B, AC
ST-3	4:25 p.m.	55.0	72.9	63.5	53.1	47.4	38.4	37.6	TR, D
ST-4	9:15 a.m.	56.1	75.4	66.2	57.1	50.3	41.1	39.7	TR, L, AC
ST-4	4:50 p.m.	57.4	79.5	67.1	60.3	52.3	53.9	41.1	TR, AC
ST-5	8:10 a.m.	53.2	76.0	64.2	55.5	43.8	39.1	36.6	TR, D, L
ST-5	3:40 p.m.	55.9	81.4	62.9	54.4	58.1	37.4	36.2	TR, V
ST-6	8:35 a.m.	61.8	76.2	68.0	63.1	60.5	58.3	54.0	TR, AC
ST-6	4:00 p.m.	61.6	77.4	67.2	62.1	59.4	57.6	53.8	TR, AC
ST-7	8:55 a.m.	56.4	72.3	62.1	58.2	56.4	53.2	42.8	TR, AC, B
ST-7	4:25 p.m.	56.1	73.5	63.1	57.0	55.4	50.2	39.7	TR
ST-8	9:15 a.m.	54.1	69.9	60.1	54.2	44.9	42.2	38.6	TR, B, D, V
ST-8	4:45 p.m.	52.4	68.6	60.3	55.5	43.8	41.1	38.2	TR, AC

TR: Traffic AC: Aircraft V: Voices D: Dogs Barking B: Birds R: Landscaping Activities: L

Source: WJV Acoustics, Inc.

Short-term noise measurements were conducted for 15-minute periods. Sites ST-1, ST-2 and ST-6 were located west of SR-1, and were exposed to traffic noise from SR-1 and local roadways. Sites ST-3, ST-4, ST-5, ST-7 and ST-8 were located east of SR-1, in neighborhood areas in the general vicinity of the high school. Sites ST-3, ST-4, ST-5, ST-7 and ST-8 were exposed to noise typical of residential land uses, including traffic on local roadways and residential human activities, including landscaping and construction activities, barking dogs and human voices.

4. PROJECT IMPACTS

a. Project Traffic Noise Impacts on Existing Noise-Sensitive Land Uses (Less Than Significant)

WJVA consulted with Hexagon Traffic Consultants, the project traffic engineer, regarding project-related traffic. The following is a description of project-related traffic, provided by Hexagon Traffic Consultants (August 11, 2022), regarding existing stadium-related traffic and anticipated increases in stadium attendance and subsequent associated traffic.

The proposed project is expected to result in an increase in attendance for the football games and other sporting events. The increase in attendees will result in an increase in vehicular trips that is currently generated by the events. Currently, football games with up to 500 attendees are played during afternoon hour or on weekends. The project is estimated to increase the attendance of football games on Friday nights from the current approximately 500 attendees to up to 800 attendees. The football season typically runs for ten (10) weeks between September and November with approximately four (4) to six (6) home games hosted by Carmel High School.

Due to pandemic conditions, there were no scheduled high school football games in the surrounding region for which observations of carpooling activity could be collected. Therefore, this analysis utilizes a vehicle occupancy rate based on data previously collected for a homecoming football game on a Friday night at Mitty High School in San Jose, California. Hexagon counted the number of vehicles parked at Mitty High School, at an adjacent church, and on the surrounding streets during the homecoming game on Friday, October 5, 2018 and on a regular Friday night on October 26, 2018. The difference between the two parking counts represents Mitty game night traffic. Based on the number of additional parked vehicles and the estimated attendance at the surveyed Friday night game, the vehicle occupancy rate was calculated to be an average of 3.24 persons per vehicle for the game attendees.

Utilizing the surveyed vehicle occupancy rate and anticipated attendance projections, the average trip increase per day for Friday night football games at Carmel High School would be approximately 37 trips ($300 \text{ attendees} / 3.24 \text{ persons per vehicle} \times 2 \text{ trips (inbound and outbound)} \times 1 \text{ event per week (185 on game day)} / 5 \text{ days per week} = \text{averaging to 37 trips per day}$). During a homecoming or rivalry game, attendance is estimated to increase from the current 1,500 attendees to 2,000 attendees. Therefore, using the same methodology, the worst-case average trip increase during the football season would be approximately 62 trips per day (309 on game day). It should be noted, traffic noise exposure (as defined by the CNEL metric) is calculated based upon annual average conditions.

The stadium lighting also would increase the attendance for soccer in winter by approximately 100 attendees. The total vehicular trips of non-football events would be lower than those of evening football games since the total attendance for non-football sports events will be less than Friday night football games. Moreover, fall sports (football) and winter sports (soccer), would not occur concurrently. Therefore, the evaluation of Friday evening football games represents a worst-case scenario in terms of total trips throughout the year.

During sporting events with anticipated high attendance, off-site parking would be provided at Carmel Middle School, located approximately two miles south of the Carmel High School campus along Carmel Valley Road. Attendees would be shuttled by bus between the off-site parking facility and Carmel High School. Up to 18 bus trips could be required before or after sporting events, for a total of up to 36 trips, with an average daily trip of 8.

The overall distribution of the 70 increased daily trips (62 additional vehicle and 8 shuttle bus trips) over local roadways was not analyzed as part of the traffic study. However, WJVA ran some basic calculations to determine noise levels that could be associated with an increase of 70 daily trips.

WJVA modeled the increased daily traffic trips to provide a generalized understanding of overall increases in traffic noise associated with the project. WJVA utilized the FHWA Traffic Noise Model⁴ to quantify generalized increases in traffic noise. The FHWA Model is a standard analytical method used for roadway traffic noise calculations. The model is based upon reference energy emission levels for automobiles, medium trucks (2 axles) and heavy trucks (3 or more axles), with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site. The FHWA Model was developed to predict hourly L_{eq} values for free-flowing traffic conditions, and is generally considered to be accurate within ± 1.5 dB. To predict CNEL values, it is necessary to determine the hourly distribution of traffic for a typical day and adjust the traffic volume input data to yield an equivalent hourly traffic volume.

As stated above, the distribution of the 70 increased average daily trips (62 additional vehicle and 8 shuttle bus trips) over the local roadways was not provided as part of the traffic study. For a generalized (and worst-case analysis), WJVA modeled anticipated noise levels that would occur if all 70 trips were along one single roadway. For the purpose of the analysis, WJVA assumed that half of the additional trips would occur during daytime hours (7:00 am to 7:00 p.m.) and half would occur during evening hours (7:00 pm to 10:00 pm). Assuming a vehicle speed of 35 miles per hour (mph) and a generalized setback distance of 100 feet from the roadway, noise levels associated with 70 vehicle trips (62 vehicle trips and 8 bus trips) on a single roadway would result in traffic noise exposure of approximately 43 dB CNEL, at a reference setback distance of 100 feet from the centerline of a roadway.

If this noise exposure level of 43 dB CNEL, associated with the 70 average daily project-related trips, was applied (added) to the four 24-hour ambient noise measurements sites described above (LT-1 through LT-4), taking into account the distance from each site to the closest roadway, noise levels at each of the four ambient noise measurement would site would increase by approximately 0-2 dB (2 dB at site LT-1 and 0 dB at sites LT-2, LT-3 and LT-4).

It is important to understand that this determination assumes that all 70 average project-related trips (62 vehicles and 8 bus trips) would occur along each roadway (not distributed across roadways), and should therefore be considered a worst-case assessment of project-related increases in traffic noise in the project vicinity. For example, the calculated increase of 2 dB was determined by applying all 70 average project trips (62 vehicle and 8 bus trips) along Flanders Drive (vicinity of ambient noise measurement site LT-1). However, Flanders Drive would be

designated as a no parking zone during stadium events and none of the anticipated bus trips would occur along Flanders Drive. This assessment has been provided for demonstrational purposes only. Project-related traffic noise is not expected to result in any measurable increase of traffic noise exposure along any roadways in the project vicinity.

Project-related increases would not result in noise levels that exceed the Monterey County noise level standards at any sensitive receiver (residential) location. Therefore, this impact is considered less than significant.

b. Noise Impacts from New Parking Areas (Less Than Significant)

New Parking Lots

The project would include two (2) new parking areas in the vicinity of the stadium. One new parking area would be located in the area of the existing tennis courts, south of the stadium (site plan provided as Figure 7). A second new parking area would be located north of the stadium, in the vicinity of the swimming pool complex (site plan provided as Figure 8).

Noise due to traffic in parking lots is typically limited by low speeds and is not usually considered to be significant. Human activity in parking lots that can produce noise includes voices, stereo systems and the opening and closing of car doors and trunk lids. Such activities can occur at any time the parking lot is open. The noise levels associated with these activities cannot be precisely defined due to variables such as the number of parking movements, time of day and other factors. It is typical for a passing car in a parking lot to produce a maximum noise level of 60 to 65 dBA at a distance of 50 feet, which is comparable to the level of a raised voice.

The proposed new parking area in the existing tennis court area would be located approximately 100 feet from residential land uses, and the proposed new parking area north of the stadium, in the vicinity of the swimming pool complex would be located approximately 200 feet from residential land uses. At these distances, maximum (L_{max}) parking lot vehicle movements would be expected to be approximately 54 to 59 dB at the closest residential land uses to the parking area in the tennis court area and approximately 48 to 53 dB at the closest residential land uses to the proposed parking areas near the swimming pool complex.

The parking lot-related noise levels at the closest residential land uses, described above, would not be expected to exceed any of the applicable noise levels standards. Additionally, parking lot noise levels would not be expected to exceed existing ambient noise levels at the closest residential land uses to the proposed new parking areas (see measured noise levels at site LT-2 and LT-4 (tennis court vicinity) and site LT-3 (swimming pool complex area)).

Traffic Control Measures

The school district and the project transportation consultant, TJKM, have developed a Traffic Management Plan (TMP), in an effort to further manage and reduce event-related traffic (and subsequent traffic noise) impacts on nearby residents in the general vicinity of the school and stadium. The intent of the TMP is to reduce parking demand for main campus areas and on surrounding residential streets. The following components of the proposed TMP have been identified:

- **Off-Campus Parking:** During night football games and other special events, the parking lot at Carmel Middle School located at 4380 Carmel Valley Road will be utilized for local attendees. All students, parents and other CHS-based attendees will drive to the Carmel Middle School campus and then be shuttled to CHS. The main campus parking located off of Ocean Avenue which has 165 parking stalls and the new 78 tennis court stalls (totally 243 stalls) will be reserved for all parking generated by the visiting team. The second parking lot which has 36 parking stalls and is located immediately south of the stadium and tennis courts next to the baseball diamond would be reserved for players and coaches only of the home team.
- **Shuttle Service from Carmel Middle School:** Bus pick-up services will be provided for attendees who will park at Carmel Middle School during the night football games and other special events. This service would pick-up local attendees from the middle school and shuttle them to the event on the CHS campus. During the nighttime football game more campus restrictions will be implemented. New restrictions during the nighttime football game and special events will include but not limited to:

- No pre game drop-offs of attendees at or near the CHS campus
- No post game pick-ups of attendees at or near the CHS campus

With a capacity of 56 passengers per bus, up to 18 bus trips could be required before and after the game to accommodate the attendees parking at Carmel Middle School and transporting them between the Middle School and the football stadium at CHS.

- **Alternative Mode Encouragement:** Employees and students can be asked to consider alternate mode of transportation during the night football games and special events. Families and employees within one mile of campus can be asked to consider walking to school. In addition, parents will be asked to drop off and pick up their children at the designated drop-off location at Carmel Middle School.
- **On-Site Amenities:** Amenities on-site include provision of a TMP contact person, bicycle storage, and related information at CHS during night football games and special events.

During night football games and special events, CHS will provide pedestrian wayfinding signage along its walkway system. In addition, signage directing students, employees, and visitors to transit, bike share, carshare, bicycle amenities, and other related items will be installed within CHS Campus and at Carmel Middle School Campus.

The TMP contact persons will be from on-site employees and will provide information and resources on transportation choices available to parents, students and visitors during evening games and events. Prior to the beginning of school year, the transportation coordinator will be provided transportation information packets that include information about transit routes and schedules, bus stop locations, CUSD shuttle bus options for events, and on-site bicycle parking.

To better inform parents of new students and new employees of the available transportation options to CHS during games and special events, information transportation packets can be distributed upon hire and at new student/parent orientations. Providing detailed overview of the available options faculty and students have to reach campus during night football games and special events.

- **On-Campus Supervision:** CHS will appoint a game day and weekend supervisor to supervise traffic and parking during nighttime football games and special events. One supervisor will be needed at the main entrance and exit driveway, one supervisor will be needed at the entrance only driveway located south of Ocean Avenue and one supervisor will be needed at the Morse Drive parking lot at the tennis courts. The appointed employees will also be on call should an unforeseen disruption occur. The supervisors will coordinate with traffic control officers to direct traffic to appropriate parking areas. They will be responsible for guiding motorists and enforcing traffic regulations in the main campus parking area.
- **Parking Management** Areas immediately around the CHS Campus will have barricade-mounted No Parking signs installed in several locations, limiting the area to residents only during special events. Carmel Hills Drive, Stewart Place Carmel High School TMP Report 13 and Morse Drive between SR 1 and Flanders Drive will be restricted to resident traffic prior to and during each home game.

Although most fines for parking violations are relatively inexpensive, a towed vehicle can prove expensive when wrecker fees are included. Violations that can result in towing include: parking along yellow curbs and inside fire lanes; blocking a fire hydrant, driveway, street, or alley; illegal use of handicapped parking; and illegally parking on private property. No Parking signs, traffic cones and barricades will be installed in the vicinity of School campus.

The implementation of the TMP, and the above-described components, would further reduce project-related traffic impacts at nearby residential and other noise-sensitive land uses by rerouting some traffic to Carmel Middle School, encouraging biking and walking, minimizing the use of adjacent residential street parking, and providing supervision to ensure the smooth flow of traffic and manage unforeseen disruptions.

c. Noise Impacts from Stadium Events (Less Than Significant)

Sporting events with PA system, cheering crowds, band performances, and half-time events currently take place during daylight hours. Therefore, the noise associated with these events is currently experienced by surrounding residents. However, the proposed project is expected to result in increased attendance for events held after dark. Therefore, the following analysis addresses the existing and increase in attendance and the noise effect on sporting events held after dark. It should be noted, the proposed changes in time of events such as football games, from the current daylight times to the proposed evening times (after the lights have been installed) would not result in noise occurring during nighttime hours (defined as 10:00 p.m. to 7:00 a.m. by Monterey County) as all games and stadium events would still conclude prior to

10:00 p.m. (the time at which Monterey County nighttime noise level standards apply, as provided above in Table II).

The noise levels associated with activities such as high school football games, other sporting events and other events held in the stadium cannot be precisely defined due to variables such as the number of attendees, atmospheric conditions and the topographical relationship between the stadium and off-site sensitive receptors. Additionally, as described above, due to pandemic conditions there were no high school football games held at the stadium or within the surrounding area last year, when this assessment was originally prepared. WJVA therefore reviewed noise level data previously collected for a different project, these noise levels are described below.

As described above, Section 10-060.040 (c) of Monterey County Municipal Code provides exemptions to the noise standards provided in the Municipal Code. Specifically relevant to the project, the Municipal Code states that the provisions of the noise ordinance shall not apply to *“Outdoor gatherings, public dances, shows and sporting and entertainment events, provided such gathering, dance or event is conducted on commercial or institutional premises, pursuant to applicable rules, regulations and zoning restrictions.”* However, typical noise levels associated with such events are described below.

Football Games (and other stadium events): Noise due to football games and other events held within the stadium would be extremely variable based upon such factors as the size of the crowd, volume of the public address system, and time of the day. As such quantifying and describing such noise levels can be problematic. Noise levels associated with evening football games would generally be limited to a few evening hours during each event, and would typically be limited to up to six (6) home games per year. As such, associated noise would occur very infrequently.

At the time this analysis was prepared, high school sporting activities (including football games), were not occurring as a result of the Covid-19 protocols. In order to assess potential football game noise levels, WJVA staff reviewed reference noise level measurements previously obtained by WJVA at Mineral King Bowl in Visalia, California on November 9, 2018 during a high school football game. It should be noted; the game was a sectional playoff game and crowd size and volume was likely louder than a “typical” game. Additionally, crowd size and PA system may not be comparable to that which would be expected at Carmel High School. The exact attendance at the football game was not determined, however, the Mineral King Bowl has a capacity of up to 8,500 during football games. The reference stadium (Mineral King Bowl) has existing lighting, and the game occurred during evening hours.

During the football game WJVA collected numerous 15-minute noise level samples. Noise level measurements were taken at a distance of approximately 200 feet from the center of the playing field. Figure 10 provides a graphic showing the reference noise measurement site at The Mineral King Bowl in Visalia.

At the above-described reference noise measurement site, average noise levels during the football game were approximately 60-66 dB L_{eq} with maximum (L_{max}) noise levels ranging between approximately 70-75 dB. The closest residential land uses to the football stadium are

located at distance of 350 feet or greater to the south, 500 feet or greater to the west and 650 feet or greater to the east. Applying the noise levels measured at the Visalia stadium location, such levels would be in the range of approximately 50-60 dB L_{eq} and 60-70 dB L_{max} , at the closest residential land uses.

The Mineral King Bowl reference noise levels measurements described above are likely significantly higher than those which would occur at Carmel High School due to crowd size of the event and overall stadium size and design. Additionally, the Carmel High School stadium is located at an elevation that is generally approximately 30 to 60 feet above the elevation of the residential land uses to the south and the east, providing topographic acoustic shielding from some of the noise sources, and noise levels associated with vehicle traffic on SR-1 would generally be higher at the homes to the west than noise levels associated with football game activities.

According to the school district, high school football games would typically take place between the hours of 5:00 p.m. to 9:30 p.m. Existing maximum noise levels measured at noise monitoring site LT-1 were in the range of approximately 66-74 dB between the hours of 5:00 p.m. and 10:00 p.m., existing maximum noise levels measured at noise monitoring site LT-2 were in the range of approximately 61 to 75 dB between the hours of 5:00 p.m. and 10:00 p.m. Existing maximum noise levels at noise monitoring site LT-3 were in the range of approximately 50 to 60 dB between the hours of 5:00 p.m. to 10:00 p.m., and existing maximum noise levels at noise monitoring site LT-4 were in the range of approximately 71 to 85 dB between the hours of 5:00 p.m. to 10:00 p.m. Maximum noise levels measured at the short-term noise monitoring sites ranged from 68 to 81 dB.

The worst-case assessment of football game maximum noise levels at nearby residential land uses is between approximately 60 to 70 dB. Such maximum noise levels could potentially exceed existing maximum noise levels in the vicinity of noise measurement site LT-3. However, such levels would not exceed any Monterey County noise standards. It should also be noted, Monterey County does not have applicable daytime noise level standards, and only provides nighttime (10:00 p.m. to 7:00 a.m.) noise standards (provided above as Table II).

While some noise associated with the cheering of crowds, band performances and half-time events would be expected to be audible during some events at some nearby residential land uses, such events would be extremely limited in both duration and frequency.

d. Noise From Construction (Less Than Significant)

Project construction (including required demolition activities) would likely occur in 2023, between approximately June through October, covering all proposed improvements. Construction activities would include materials delivery, excavation for pole foundation installation, installation via hydraulic crane of the lighting poles, mounting of the luminaires, and restoration of disturbed surfaces including pavement and landscaping that was removed during excavation and trenching. Additionally, the construction of the two new parking lot areas as well as the stadium storage building would occur as part of the project construction process.

Typical construction equipment would likely be used, such as an excavator, boring machine, concrete truck and pump, and a crane for pole installation and field lighting mounting, as well as semi-trucks for materials delivery. Construction would likely occur during daylight hours. Construction crews would primarily access the site via the access road (accessible only to school district personnel) which runs from Ocean Avenue to the north around the eastside of campus south to the stadium site. Access gates to the site would be locked outside of construction hours. Construction vehicles, equipment, and materials would be stored on the project site or adjacent facility storage buildings or the campus access road.

Construction noise is typically not considered to be a significant impact if construction is limited to the daytime hours and construction equipment is adequately maintained and muffled. Extraordinary noise-producing activities (e.g., pile driving) are not anticipated. In this case, all project construction activity must be confined to daytime hours, as the Monterey County Noise Element of the General Plan prohibits construction activity in the evening/nighttime hours as well as Sundays on Holidays. Neither the General Plan nor the County's Code of Ordinances provide specific prohibited hours of construction activities, however, it is typical to limit construction activities to the hours of (at a minimum) 7:00 a.m. to 7:00 p.m. Construction noise impacts could result in annoyance or sleep disruption for nearby residents if nighttime operations were to occur or if equipment is not properly muffled or maintained. For the purpose of providing generalized reference noise levels for typical construction activities, Table VI provides typical construction-related noise levels at distances of 100 feet, 200 feet, and 300 feet.

TABLE VI TYPICAL CONSTRUCTION EQUIPMENT MAXIMUM NOISE LEVELS, dBA			
Type of Equipment	100 Ft.	200 Ft.	300 Ft.
Concrete Saw	84	78	74
Crane	75	69	65
Excavator	75	69	65
Front End Loader	73	67	63
Jackhammer	83	77	73
Paver	71	65	61
Pneumatic Tools	79	73	69
Dozer	76	70	66
Rollers	74	68	64
Trucks	80	72	70
Pumps	74	68	64
Scrapers	81	75	71
Portable Generators	74	68	64
Backhoe	80	74	70
Grader	80	74	70

Source: FHWA

Noise Control for Buildings and Manufacturing Plants, Bolt, Beranek & Newman, 1987

e. Vibration Impacts (Less Than Significant)

The dominant sources of man-made vibration are sonic booms, blasting, pile driving, pavement breaking, demolition, diesel locomotives, and rail-car coupling. None of these activities are anticipated to occur with construction or operation of the proposed project. Typical vibration levels at distances of 100 feet and 300 feet are summarized in Table VII. These levels would not exceed any significant threshold levels for annoyance or damage, as provided above in Table III and Table IV.

TABLE VII TYPICAL VIBRATION LEVELS DURING CONSTRUCTION		
Equipment	PPV (in/sec)	
	@ 100'	@ 300'
Bulldozer (Large)	0.011	0.006
Bulldozer (Small)	0.0004	0.00019
Loaded Truck	0.01	0.005
Jackhammer	0.005	0.002
Vibratory Roller	.03	0.013
Caisson Drilling	.01	0.006
Source: Caltrans		

e. Noise Impacts from Nearby Airports or Airstrips (No Impact)

The Project site is not located within two miles of a public airport or private airstrip. The Monterey Regional Airport is located approximately four miles northeast of the project site.

5. IMPACT SUMMARY

The project would not be expected to result in any significant noise impacts at nearby noise-sensitive receptors. Project-related increases in traffic noise exposure would not exceed any Monterey County noise standards and would generally not increase traffic noise above existing (without project) noise exposure levels. Additionally, noise levels associated with stadium events (football games), new parking lot areas and stadium storage building would not be expected to result in noise levels exceeding any Monterey County noise level standards or existing (without project) ambient noise levels at nearby noise-sensitive land uses.

While some noise associated with the cheering of crowds, band performances and half-time events would be expected to be audible during some events at some nearby residential land uses, such events would be extremely limited in both duration and frequency. Noise levels associated with evening football games would generally be limited to a few evening hours during each event, and would typically be limited to up to six (6) home games per year. As such, associated noise would occur very infrequently.

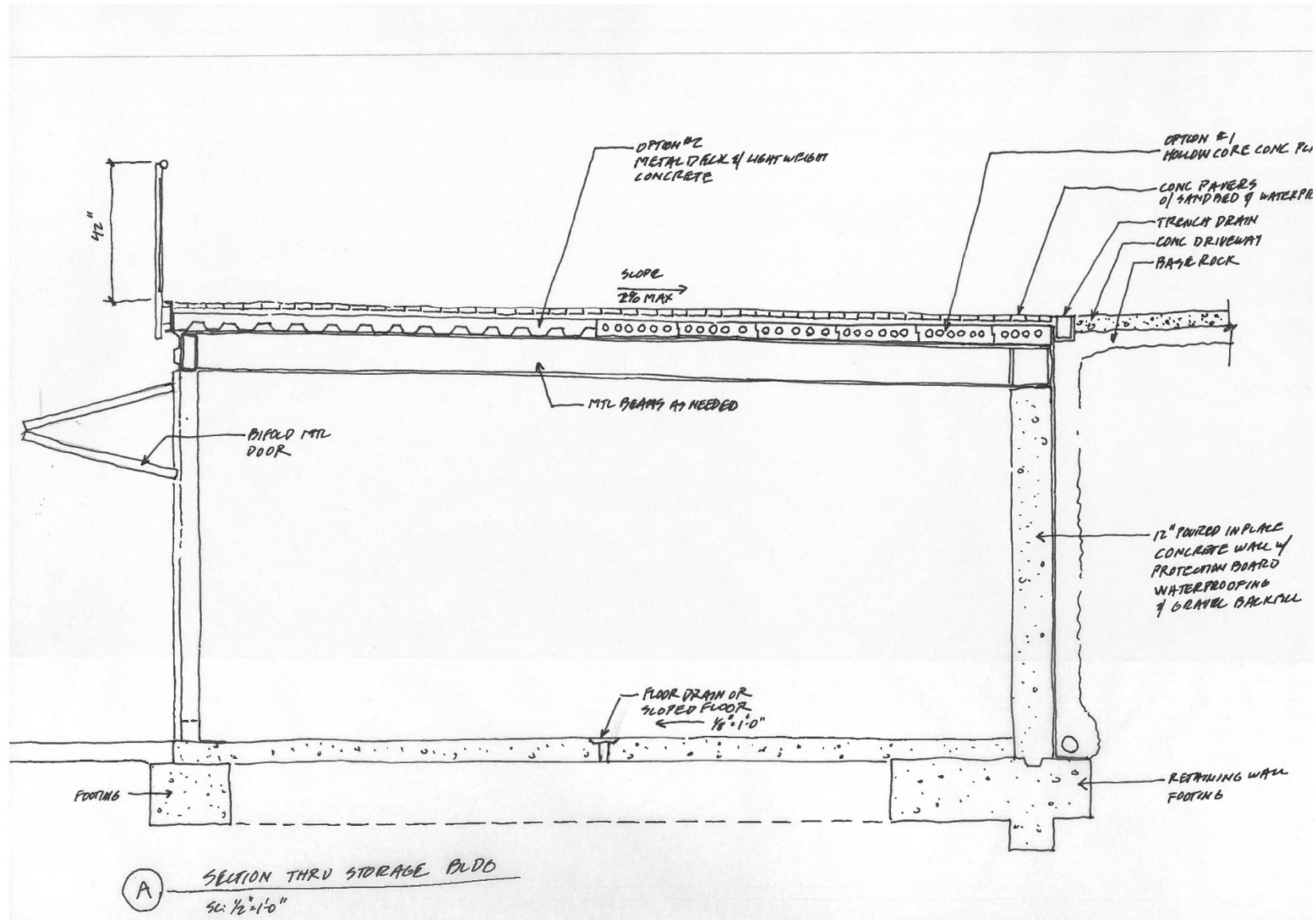
6. **SOURCES CONSULTED**

1. Monterey County General Plan, October 2010.
2. Monterey County Code of Ordinances, *Health and Safety*.
3. California Department of Transportation, *Transportation and Construction Vibration Guidance Manual*, April 2020.
4. Federal Highway Administration, *Traffic Noise Model, Version 2.5*, April 14, 2004

FIGURE 1: PROJECT SITE PLAN (ILLUMINATION SUMMARY)



FIGURE 2: STORAGE BUILDING CONCEPTUAL DESIGN



20 0 20 40
SCALE: 1" = 20'
7 / 8 / 2022
Project No. 2751.29



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Sheet 1 of 1

FIGURE 4: PROJECT SITE PLAN (TENNIS COURT PARKING AREA)

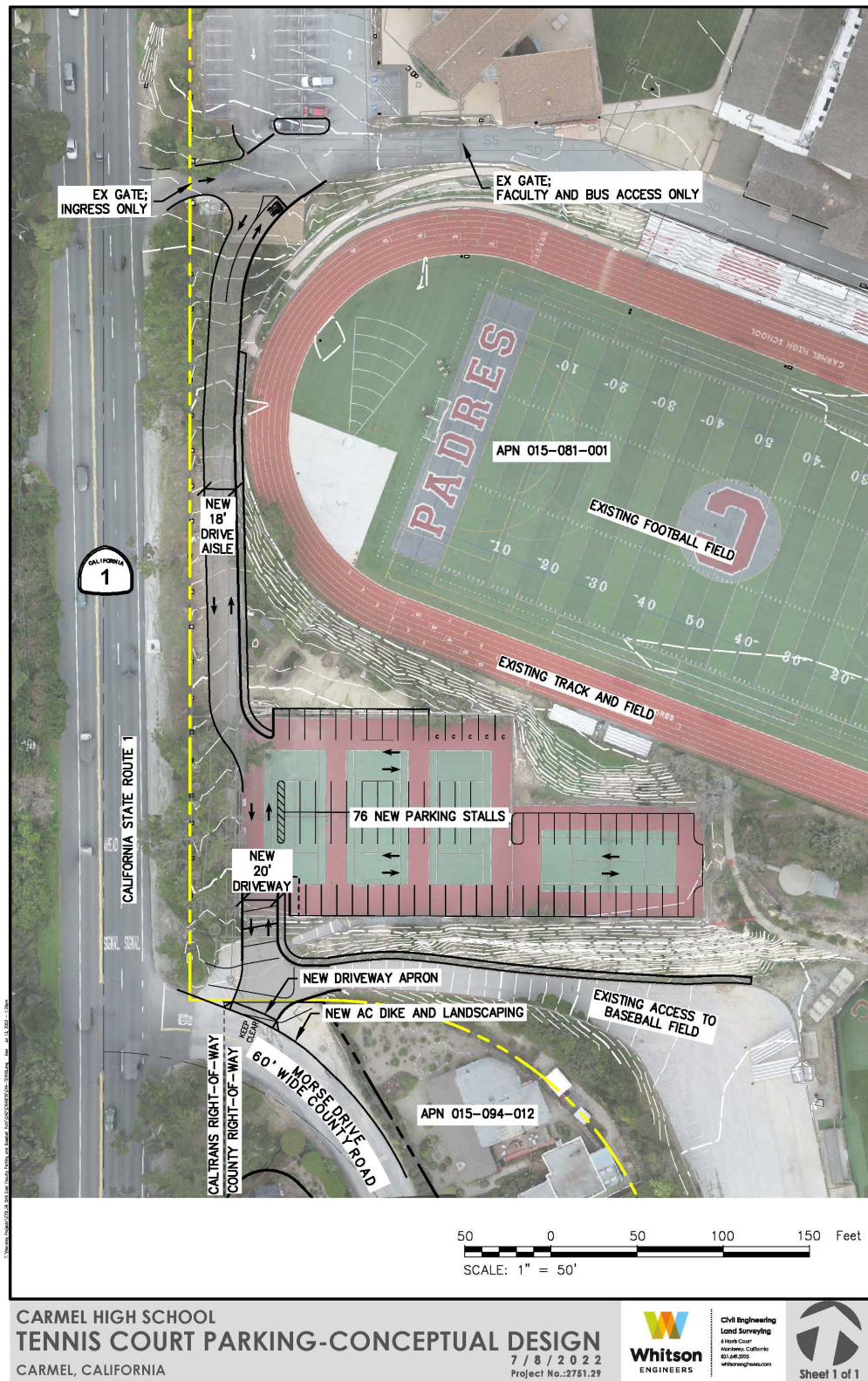


FIGURE 5: PROJECT VICINITY AND AMBIENT NOISE MONITORING SITES

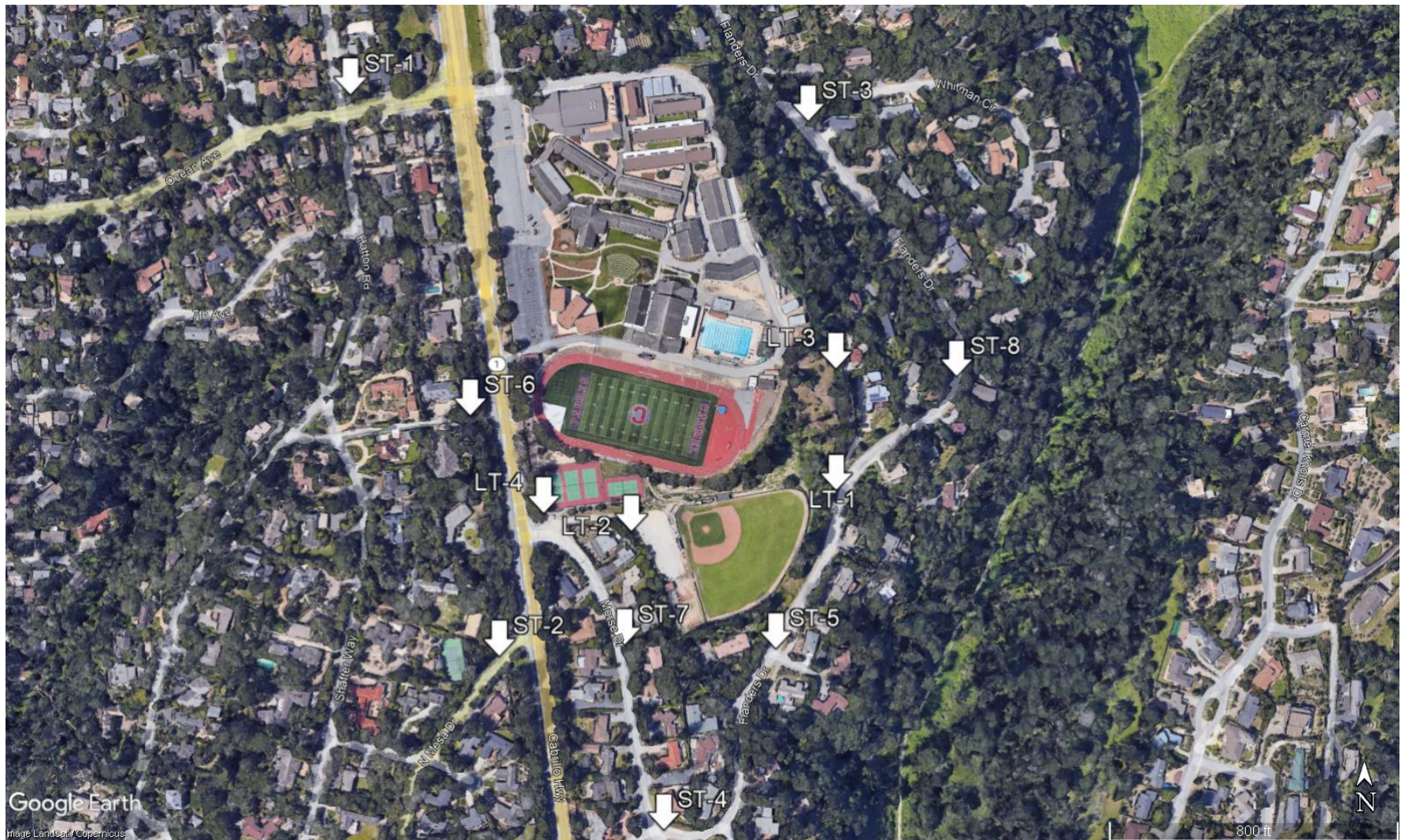


FIGURE 6: HOURLY NOISE LEVELS AT LONG-TERM MONITORING SITE LT-1

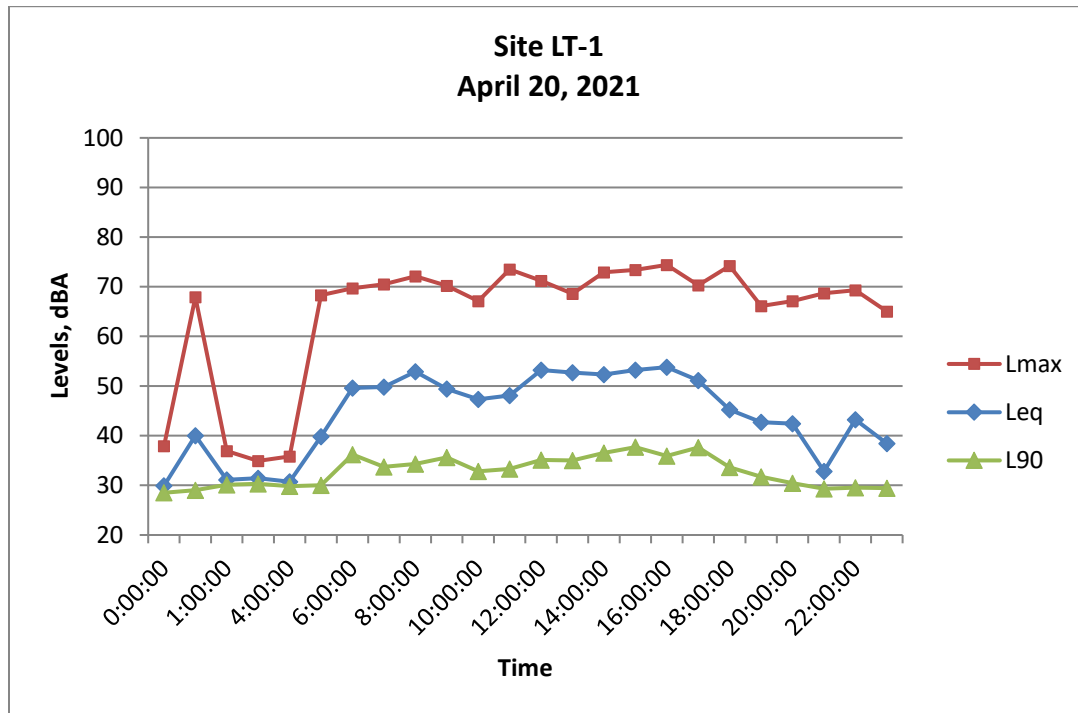


FIGURE 7: HOURLY NOISE LEVELS AT LONG-TERM MONITORING SITE LT-2

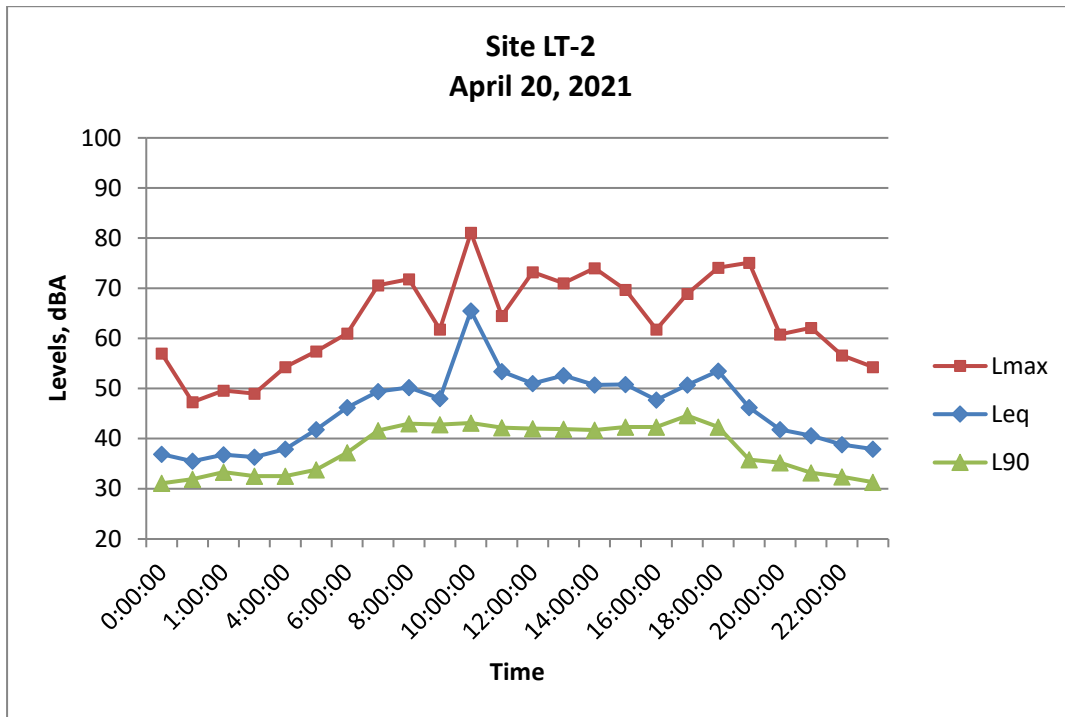


FIGURE 8: HOURLY NOISE LEVELS AT LONG-TERM MONITORING SITE LT-3

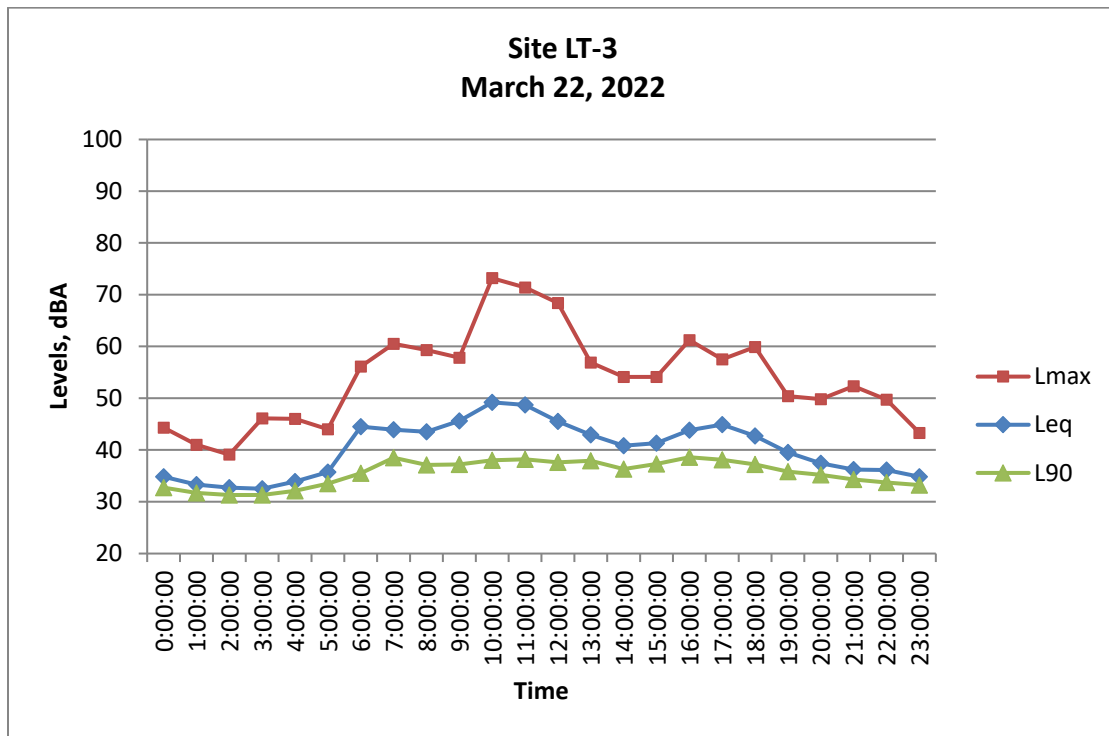


FIGURE 9: HOURLY NOISE LEVELS AT LONG-TERM MONITORING SITE LT-4

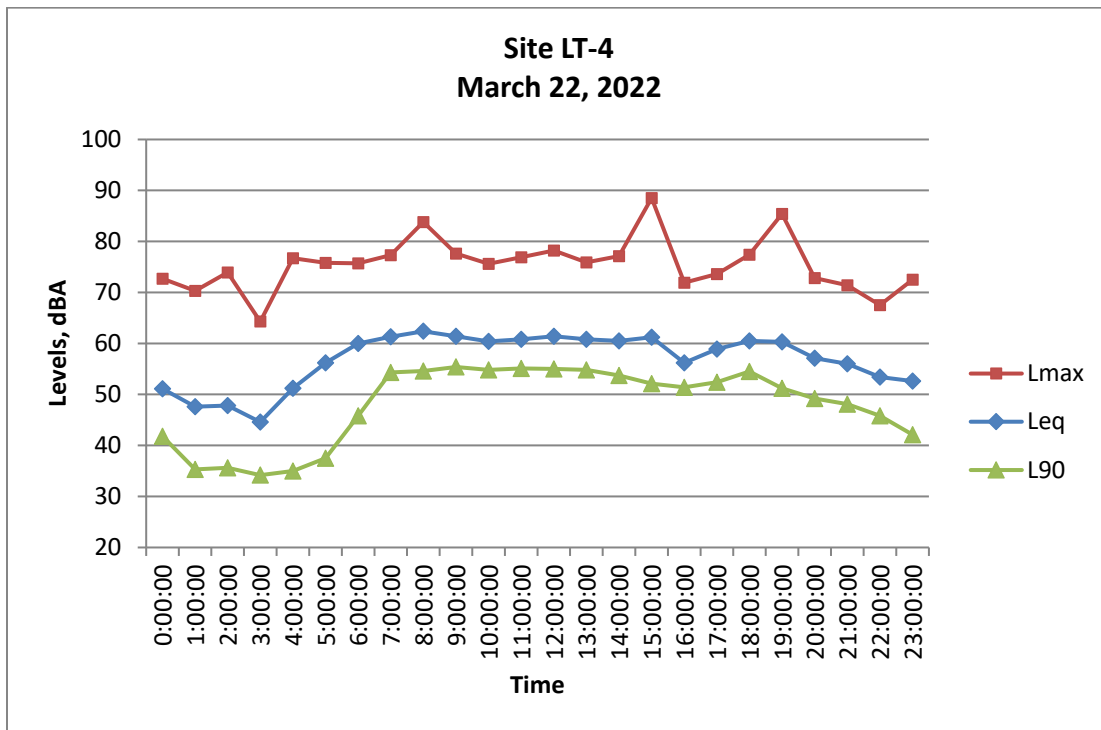


FIGURE 10: LOCATION OF REFERENCE NOISE MEASUREMENT SITE AT MINERAL KING BOWL, VISALIA



APPENDIX A-1

ACOUSTICAL TERMINOLOGY

AMBIENT NOISE LEVEL:	The composite of noise from all sources near and far. In this context, the ambient noise level constitutes the normal or existing level of environmental noise at a given location.
CNEL:	Community Noise Equivalent Level. The average equivalent sound level during a 24-hour day, obtained after addition of approximately five decibels to sound levels in the evening from 7:00 p.m. to 10:00 p.m. and ten decibels to sound levels in the night before 7:00 a.m. and after 10:00 p.m.
DECIBEL, dB:	A unit for describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
DNL/L_{dn}:	Day/Night Average Sound Level. The average equivalent sound level during a 24-hour day, obtained after addition of ten decibels to sound levels in the night after 10:00 p.m. and before 7:00 a.m.
L_{eq}:	Equivalent Sound Level. The sound level containing the same total energy as a time varying signal over a given sample period. L_{eq} is typically computed over 1, 8 and 24-hour sample periods.
NOTE:	The CNEL and DNL represent daily levels of noise exposure averaged on an annual basis, while L_{eq} represents the average noise exposure for a shorter time period, typically one hour.
L_{max}:	The maximum noise level recorded during a noise event.
L_n:	The sound level exceeded "n" percent of the time during a sample interval (L_{90} , L_{50} , L_{10} , etc.). For example, L_{10} equals the level exceeded 10 percent of the time.

A-2

ACOUSTICAL TERMINOLOGY

NOISE EXPOSURE CONTOURS:

Lines drawn about a noise source indicating constant levels of noise exposure. CNEL and DNL contours are frequently utilized to describe community exposure to noise.

NOISE LEVEL REDUCTION (NLR):

The noise reduction between indoor and outdoor environments or between two rooms that is the numerical difference, in decibels, of the average sound pressure levels in those areas or rooms. A measurement of “noise level reduction” combines the effect of the transmission loss performance of the structure plus the effect of acoustic absorption present in the receiving room.

SEL or SENEL:

Sound Exposure Level or Single Event Noise Exposure Level. The level of noise accumulated during a single noise event, such as an aircraft overflight, with reference to a duration of one second. More specifically, it is the time-integrated A-weighted squared sound pressure for a stated time interval or event, based on a reference pressure of 20 micropascals and a reference duration of one second.

SOUND LEVEL:

The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the response of the human ear and gives good correlation with subjective reactions to noise.

SOUND TRANSMISSION CLASS (STC):

The single-number rating of sound transmission loss for a construction element (window, door, etc.) over a frequency range where speech intelligibility largely occurs.

APPENDIX B
EXAMPLES OF SOUND LEVELS

