

Madison Avenue Road Improvements Project

Acoustical Analysis Report

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Acronyms and Abbreviations

ADT	average daily trips
ANSI	American National Standards Institute
CAD	Computer Aided Design
CadnaA	Computer Aided Noise Abatement
Caltrans	California Department of Transportation
City	City of Murrieta
CNEL	Community Noise Equivalent Level
County	County of Riverside
CY	Cubic Yards
dB	decibel
dBA	A-weighted decibel
Hz	Hertz
kHz	kilohertz
L _{DN}	Day Night sound level
L _{EQ}	time-averaged noise level
LLG	Linscott, Law & Greenspan Engineers
L _{MAX}	maximum sound level
mph	miles per hour
mPa	micro Pascal
NSLU	noise sensitive land use
PPV	peak particle velocity
RCNM	Roadway Construction Noise Model
SF	square foot/feet
SFR	Single-family Residential
SPL	sound pressure level
TIA	Traffic Impact Analysis
USDOT	U.S. Department of Transportation

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EXECUTIVE SUMMARY

This report presents an assessment of potential construction and operational noise impacts associated with the proposed Madison Avenue Road Improvements Project (project) located in the City of Murrieta (City).

The proposed improvements follow the existing road alignment of Madison Avenue between the intersections of Guava Street and approximately Elm Street. Additional improvements will occur on the intersecting Fig Street, Larchmont Lane, and Elm Street between Jefferson Avenue and Hoover Street. A temporary construction detour will be identified on Fig Street, Hoover Street, and Elm Street; as well as Guava Street, Monroe Avenue and Newton Azrak Street.

Project construction would include site preparation, demolition, grading, drainage/utilities/subgrade, and paving. Project construction noise would result in potentially significant noise levels above the City Noise Ordinance construction noise limits for mobile and stationary equipment at surrounding single-family residences and commercial land uses. This impact would be reduced to less than significant with implementation of mitigation measure NOI-1, which includes various measures to reduce construction noise. Project-generated traffic would result in less than significant noise impacts to off-site receptors.

Vibration from construction would not exceed thresholds for structural damage but may result in temporary human annoyance. Mitigation measure NOI-2 would be required to ensure use of the vibratory roller in static mode within 40 feet of nearby residences. No permanent sources of substantial vibration would be installed by the project. With implementation of mitigation measure NOI-2, vibration would be less than significant.

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1.0 INTRODUCTION

1.1 PROJECT LOCATION

The Madison Avenue Road Widening Project (project) is located in the southern portion of the City of Murrieta (City), within southwest Riverside County, California (see Figure 1, *Regional Location*, and Figure 2, *Project Location*). The project location is directly west of the interchange of Interstate (I-) 15 and I-215. The proposed improvements generally follow the existing road alignment of Madison Avenue between the intersections of Guava Street and Golden Gate Circle. Additional improvements would occur on the intersections of Fig Street, Larchmont Lane, and Elm Street between Jefferson Avenue and Hoover Street. A temporary construction detour route will be identified on Fig Street, Hoover Street, and Elm Street; as well as Guava Street, Monroe Avenue and Newton Azrak Street.

1.2 PROJECT DESCRIPTION

The proposed Project would involve the street improvements and widening of Madison Avenue. The project site is approximately 1.2 miles long and located within and along the existing Madison Avenue right-of-way (ROW). The project would widen the existing ROW to an 88-foot width, consistent with the City's "Secondary Highway" designation. The Project would construct a total pavement width of 44 feet. The project would construct a 5-foot-wide Class 2 bike lane and a 12-foot parkway and sidewalk adjacent to the southbound lanes. A 5-foot-wide striped Class 2 bike lane and 10-foot parkway would be installed adjacent to the northbound lane. The proposed improvements follow the existing roadway along most of its length, thereby minimizing the need for additional ROW.

A temporary access road would be constructed between Madison and Monroe Avenue to the south of Guava Avenue to provide access throughout construction.

The proposed Project's southern alignment would terminate at the location of a planned future bridge over Warm Springs Creek.

1.3 NOISE AND SOUND LEVEL DESCRIPTORS AND TERMINOLOGY

1.3.1 Descriptors

All noise level or sound level values presented herein are expressed in terms of decibels (dB), with A-weighting (dBA) to approximate the hearing sensitivity of humans. Time-averaged noise levels are expressed by the symbol L_{EQ} , with a specified duration. The Community Noise Equivalent Level (CNEL) is a 24-hour average, where noise levels during the evening hours of 7:00 p.m. to 10:00 p.m. have an added 5 dBA weighting, and noise levels during the nighttime hours of 10:00 p.m. to 7:00 a.m. have an added 10 dBA weighting. This is similar to the Day Night sound level (L_{DN}), which is a 24-hour average with an added 10 dBA weighting on the same nighttime hours but no added weighting on the evening hours. Sound levels expressed in CNEL are always based on dBA. These metrics are used to express noise levels for both measurement and municipal regulations, as well as for land use guidelines and enforcement of noise ordinances.

1.3.2 Terminology

1.3.2.1 Sound, Noise, and Acoustics

Sound can be described as the mechanical energy of a vibrating object transmitted by pressure waves through a liquid or gaseous medium (e.g., air) to a hearing organ, such as a human ear. Noise is defined as loud, unexpected, or annoying sound.

In the science of acoustics, the fundamental model consists of a sound (or noise) source, a receiver, and the propagation path between the two. The loudness of the noise source and obstructions or atmospheric factors affecting the propagation path to the receiver determines the sound level and characteristics of the noise perceived by the receiver. The field of acoustics deals primarily with the propagation and control of sound.

1.3.2.2 Frequency

Continuous sound can be described by frequency (pitch) and amplitude (loudness). A low-frequency sound is perceived as low in pitch. Frequency is expressed in terms of cycles per second, or Hertz (Hz) (e.g., a frequency of 250 cycles per second is referred to as 250 Hz). High frequencies are sometimes more conveniently expressed in kilohertz (kHz), or thousands of Hertz. The audible frequency range for humans is generally between 20 Hz and 20,000 Hz.

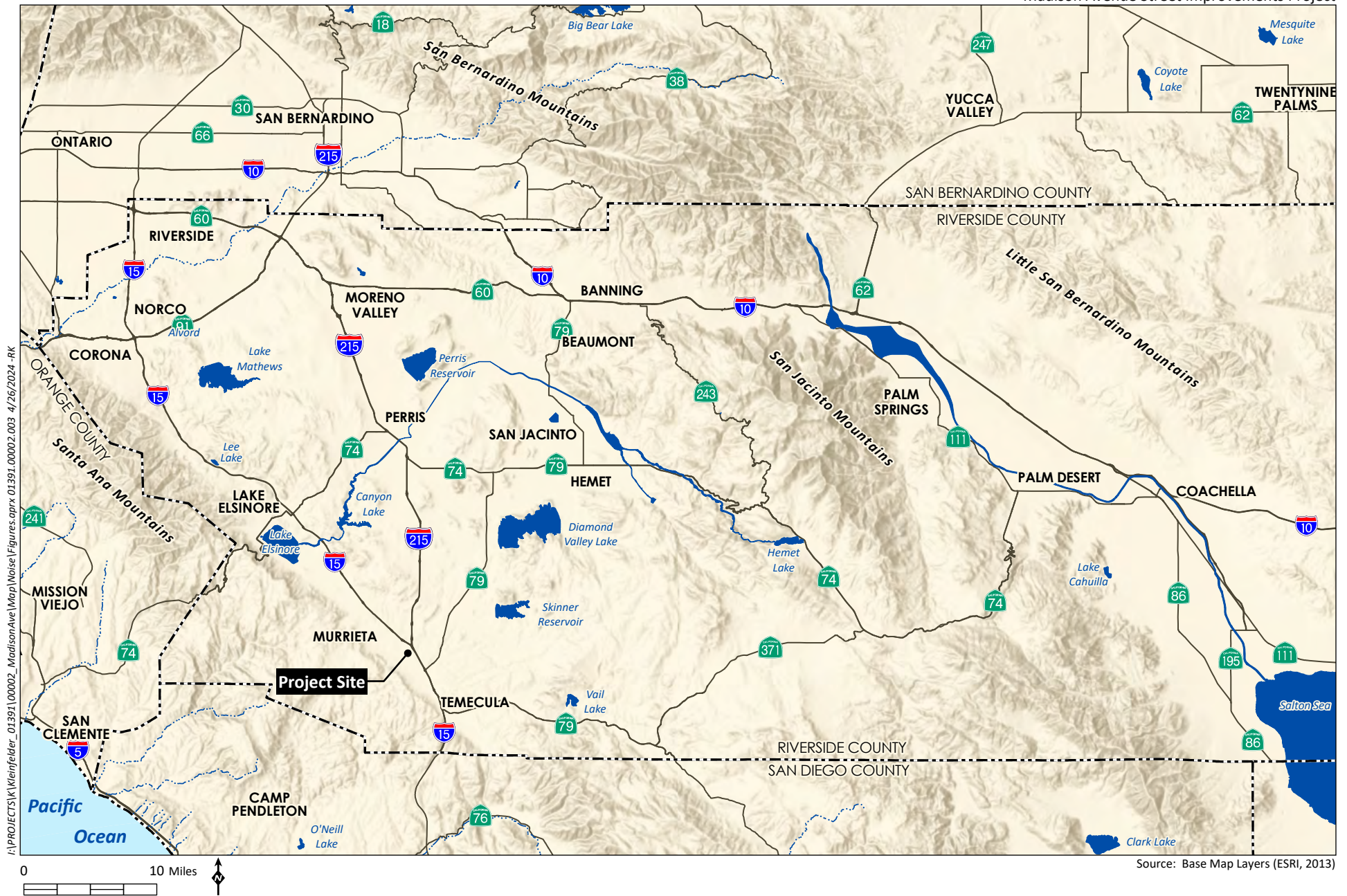
Sound Pressure Levels and Decibels

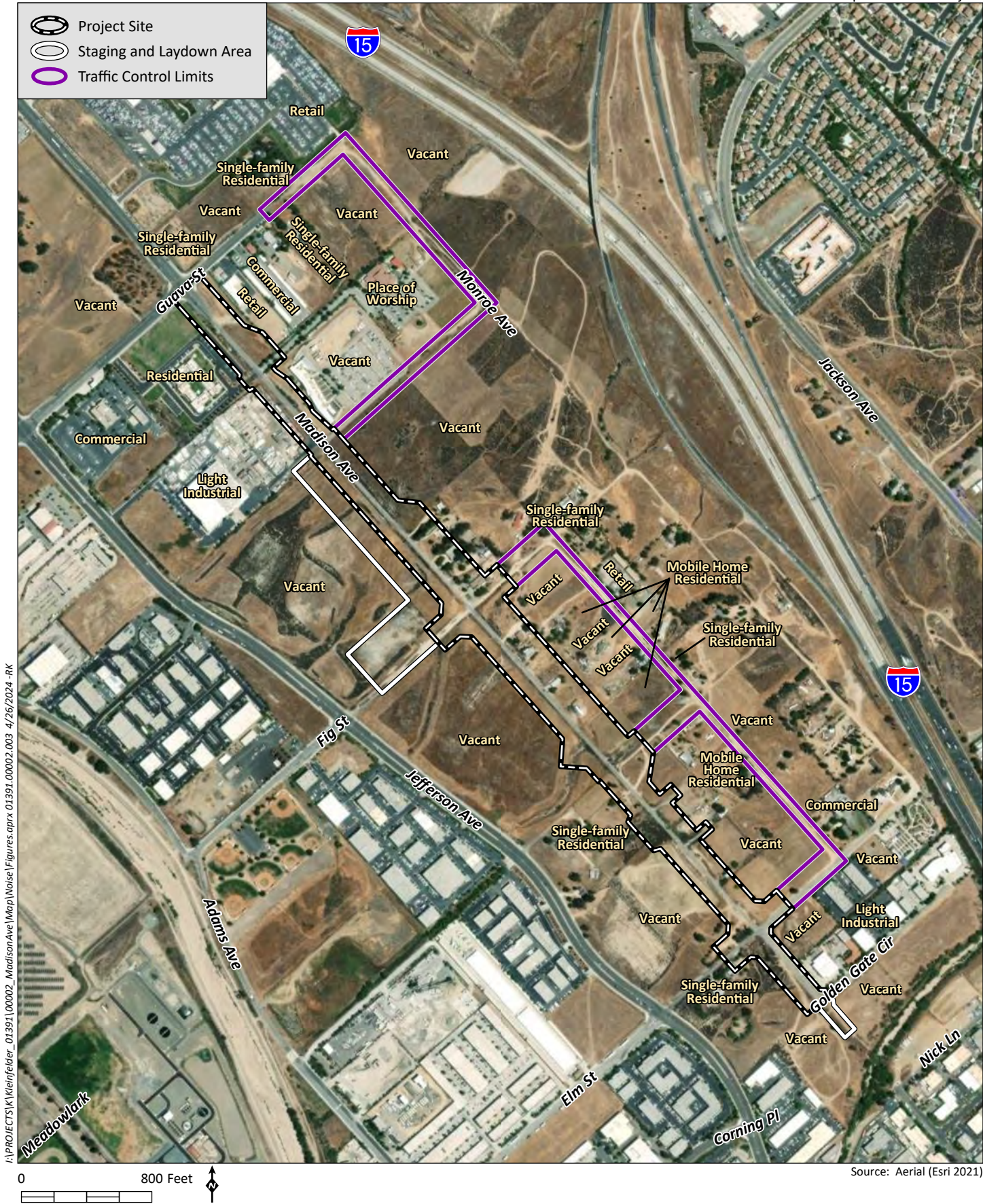
The amplitude of pressure waves generated by a sound source determines the loudness of that source. Sound pressure amplitude is measured in micro-Pascals (mPa). One mPa is approximately one hundred billionth (0.0000000001) of normal atmospheric pressure. Sound pressure amplitudes for different kinds of noise environments can range from less than 100 to 100,000,000 mPa. Because of this wide range of values, sound is rarely expressed in terms of mPa. Instead, a logarithmic scale is used to describe sound pressure level (SPL) in terms of dBA. The threshold of hearing for the human ear is about 0 dBA, which corresponds to 20 mPa.

1.3.2.3 Addition of Decibels

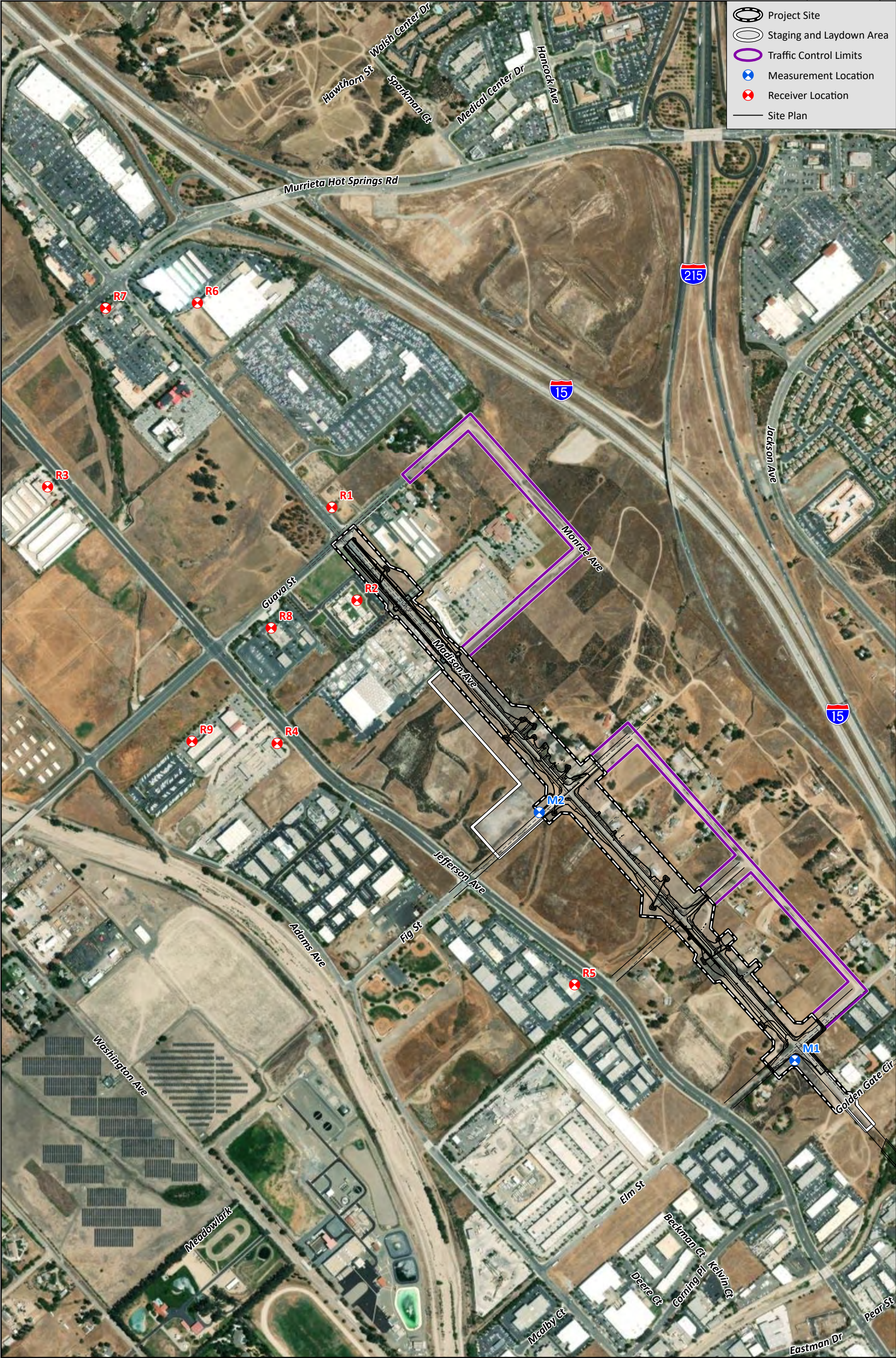
Because decibels are logarithmic units, SPL cannot be added or subtracted through standard arithmetic. Under the decibel scale, a doubling of sound energy corresponds to a 3 dBA increase. In other words, when two identical sources are each producing sound of the same loudness, the resulting sound level at a given distance would be 3 dBA higher than from one source under the same conditions. For example, if one automobile produces an SPL of 70 dB when it passes an observer, two cars passing simultaneously would not produce 140 dBA—rather, they would combine to produce 73 dBA. Under the decibel scale, three sources of equal loudness together produce a sound level 5 dBA louder than one source.

Under controlled conditions in an acoustical laboratory, the trained, healthy human ear is able to discern 1 dBA changes in sound levels, when exposed to steady, single-frequency (“pure-tone”) signals in the mid-frequency (1,000 Hz to 8,000 Hz) range. In typical noisy environments, changes in noise of 1 to 2 dBA are generally not perceptible. It is widely accepted, however, that people begin to detect sound level increases of 3 dB in typical noisy environments. Further, a 5 dBA increase is generally perceived as a distinctly noticeable increase, and a 10 dBA increase is generally perceived as a doubling of loudness.





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No known studies have directly correlated the ability of a healthy human ear to discern specific levels of change in traffic noise over a 24-hour period. Many ordinances, however, specify a change of 3 CNEL as the significant impact threshold. This is based on the concept of a doubling in noise energy resulting in a 3 dBA change in noise, which is the amount of change in noise necessary for the increase to be perceptible to the average healthy human ear.

1.4 NOISE AND VIBRATION SENSITIVE LAND USES

Noise-sensitive land uses (NSLUs) are land uses that may be subject to stress and/or interference from excessive noise, such as residential dwellings, schools, transient lodging (hotels), hospitals, educational facilities, and libraries. Industrial and commercial land uses are generally not considered sensitive to noise. NSLUs in the project area include single-family residences, and a school along Madison Avenue. The nearest NSLUs are residences 50 feet from Madison Avenue construction limits.

Land uses in which ground-borne vibration could potentially interfere with operations or equipment, such as research, manufacturing, hospitals, and university research operations (California Department of Transportation [Caltrans] 2013a) are considered “vibration-sensitive.” The degree of sensitivity depends on the specific equipment that would be affected by the ground-borne vibration. In addition, excessive levels of ground-borne vibration of either a regular or an intermittent nature can result in annoyance to residential uses or schools. Land uses in the project area that are subject to annoyance from vibration include the single-family residences along Madison Avenue.

1.5 REGULATORY FRAMEWORK

Applicable noise standards for the proposed project are codified in the following City regulations:

1.5.1 City of Murrieta Municipal Code

Construction noise is regulated by Section 16.30.130 of the City’s Municipal Code (City of Murrieta 1997). Construction noise limits are shown in Table 1, *City of Murrieta Construction Noise Limits*, below.

Table 1
CITY OF MURRIETA CONSTRUCTION NOISE LIMITS

Period	Single-family Residential		Multi-family Residential		Commercial	
	Mobile Equipment ¹	Stationary Equipment ²	Mobile Equipment	Stationary Equipment	Mobile Equipment	Stationary Equipment
Daily, except Sundays and legal holidays, 7:00 a.m. to 8:00 p.m.	75 dBA	60 dBA	80 dBA	65 dBA	85 dBA	70 dBA
Daily, 8:00 p.m. to 7:00 a.m. and all day Sunday and legal holidays	60 dBA	50 dBA	64 dBA	55 dBA	70 dBA	60 dBA

Source: City of Murrieta Municipal Code Section 16.30.130

¹ Mobile equipment is defined as nonscheduled, intermittent, short-term operations.

² Stationary equipment is defined as repetitively scheduled and relatively long-term operation periods (three days or more).

1.5.2 City of Murrieta General Plan 2035 Noise Element

The Noise Element of the City of Murrieta General Plan 2035 (City of Murrieta 2011a) and the Final EIR for the City of Murrieta General Plan 2035 (City of Murrieta 2011b) provides noise standards for land use compatibility in Murrieta. The normally acceptable exterior noise level in Murrieta for a multi-family residential land use is 65 CNEL. The interior noise standard is 45 CNEL.

1.5.3 Federal Transit Administration Transit Noise and Vibration Impact Assessment Manual

The Federal Transit Administration's (FTA's) Transit Noise and Vibration Impact Assessment Manual (FTA 2018) is a manual, first published in 1995 and last updated in 2018, to provide guidance for predicting and assessing noise and vibration impacts of proposed transit projects for different stages of project development and different levels of analysis. The document includes quantitative thresholds to determine noise impacts based upon varying levels of baseline noise levels, which is used in the noise analysis beginning under Section 4.0.

1.5.4 Caltrans Transportation and Construction Vibration Guidance Manual

Caltrans' Transportation and Vibration Guidance Manual (Caltrans 2013b) is a manual that provides guidance on addressing vibration issues associated with the construction, operation, and maintenance of transportation projects in California. The document includes quantitative thresholds to determine vibration impacts from construction equipment, which is used in the vibration analysis beginning under Section 4.0.

2.0 ENVIRONMENTAL SETTING

2.1 SURROUNDING LAND USES

The project site is a roadway with multiple adjacent sensitive land uses. The closest existing sensitive receptor to the project site is the school and residences located along the proposed widening of Madison Avenue. Residential land uses are also located along this road segment.

2.2 EXISTING NOISE ENVIRONMENT

2.2.1 Ambient Noise Survey

Two short-term ambient noise measurements (M1 and M2) were conducted during a site visit on January 31, 2024. A second site visit was conducted on April 24, 2024, where a third measurement (M3) was taken. The measured noise levels and related environmental conditions are shown in Table 2, *Noise Measurement Locations and Receivers*. See Figure 3 for noise measurement locations.

Table 2
NOISE MEASUREMENT RESULTS

Measurement 1	
Date:	January 31, 2024
Conditions:	Temperature: 70°F. Wind Speed: 8 mph. 67% humidity.
Time:	1:31 p.m. – 1:46 p.m.
Location:	Approximately 50 feet southwest of the intersection of Madison Avenue and Elm Street
Measured Noise Level:	54.4 dBA _{LEQ}
Notes:	Noise from traffic along Madison Avenue. Distant I-15 and I-215 freeway noise.
Measurement 2	
Date:	January 31, 2024
Conditions:	Temperature: 70°F. Wind Speed: 8 mph. 67% humidity.
Time:	2:04 p.m. – 2:19 p.m.
Location:	Approximately 250 feet southwest of the intersection of Madison Avenue and Fig Street
Measured Noise Level:	55.7 dBA _{LEQ}
Notes:	Noise from traffic along Madison Avenue. Distant I-15 and I-215 freeway noise.
Measurement 3	
Date:	April 24, 2024
Conditions:	Temperature: 68°F. Wind Speed: 8 mph. 57% humidity.
Time:	2:20 p.m. – 2:35 p.m.
Location:	Approximately 75 feet southwest of the intersection of Madison Avenue and Fig Street
Measured Noise Level:	54.8 dBA _{LEQ}
Notes:	Noise from traffic along Madison Avenue. Distant I-15 and I-215 freeway noise.

2.2.2 Existing Baseline Ambient Noise Modeling

To provide an additional assessment of existing baseline (pre-project) ambient noise conditions at nearby NSLUs, modeling was conducted using the assumptions and methodology described in Section 3.0, below. Modeling was conducted at a 50-foot distance from Madison Avenue to approximate the existing ambient noise levels from vehicular traffic. With pre-project conditions, the ambient noise level was modeled at 62.1 CNEL for the residences east of Madison Avenue.

3.0 ANALYSIS METHODOLOGY AND ASSUMPTIONS

3.1 METHODOLOGY AND EQUIPMENT

3.1.1 Ambient Noise Survey

The following equipment was used to measure existing noise levels at the project site:

- Larson Davis System LxT Integrating Sound Level Meters
- Larson Davis Model CAL250 Calibrator

- Windscreen and tripod for the sound level meter
- Piccolo II Integrating Sound Level Meter

The sound level meter was field-calibrated immediately before the noise measurements to ensure accuracy. All sound level measurements conducted and presented in this report were made with a sound level meter that conforms to the American National Standards Institute (ANSI) specifications for sound level meters (ANSI S1.4-1983 R2006). All instruments were maintained with National Institute of Standards and Technology traceable calibration per the manufacturers' standards.

3.1.2 Noise Modeling Software

Modeling of the exterior noise environment for this report was accomplished using Computer Aided Noise Abatement (CadnaA) version 2023. CadnaA is a model-based computer program developed by DataKustik for predicting noise impacts in a wide variety of conditions.

CadnaA assists in the calculation, presentation, assessment, and mitigation of noise exposure. It allows for the input of project related information, such as noise source data, barriers, structures, and topography to create a detailed model, and uses the most up-to-date calculation standards to predict outdoor noise impacts. CadnaA traffic noise prediction is based on the data and methodology used in the Traffic Noise Model released by the U.S. Department of Transportation (USDOT) and calculates the daytime average hourly L_{EQ} from three-dimensional model input and traffic data (Caltrans 2004).

Peak-hour traffic volumes were estimated based on the assumption that approximately 10 percent of the average daily traffic would occur during a peak hour. The one-hour L_{EQ} noise level is calculated utilizing peak-hour traffic. Peak hour L_{EQ} can be converted to CNEL using the following equation, where $L_{EQ}(h)_{pk}$ is the peak hour L_{EQ} , P is the peak hour volume percentage of the average daily trips (ADT), d and e are divisions of the daytime fraction of ADT to account for daytime and evening hours, and N is the nighttime fraction of ADT:

$$CNEL = L_{EQ}(h)_{pk} + 10\log_{10} 4.17/P + 10\log_{10}(d + 4.77e + 10N)$$

The model-calculated one-hour L_{EQ} noise output is therefore approximately equal to the CNEL when peak-hour traffic volumes are 10 percent of ADT (California Department of Transportation [Caltrans] 2013).

Project construction noise was analyzed using the Roadway Construction Noise Model (RCNM; USDOT 2008), which utilizes estimates of sound levels from standard construction equipment.

3.2 ASSUMPTIONS

3.2.1 Construction

Construction would require the use of equipment throughout the site for the full term of construction. Construction activities would include site preparation, grading, installation of a sidewalk and bike lanes, installation of drainage and utilities, and paving. The proposed Project is anticipated to require the use of construction equipment such as tractors, loaders, backhoes, excavators, forklifts, generators, pumps, sweepers, pavers, rollers, graders, and other off-highway vehicles. Table 3, *Construction Equipment Noise Levels*, provides the RCNM noise level results for expected construction equipment using the

50-foot distance. See Appendix A for the anticipated construction equipment provided by the project engineers.

Table 3
CONSTRUCTION EQUIPMENT NOISE LEVELS

Unit	Percent Operating Time	dBA L_{EQ} at 50 feet
Air Compressor	40	73.7
Compactor	20	76.2
Concrete Pump Truck	20	74.4
Dozer	40	77.7
Dump Truck	40	72.5
Excavator	40	76.7
Front End Loader	40	75.1
Generator	50	77.6
Grader	40	81.0
Jackhammer	20	81.9
Paver	50	74.2
Pneumatic Tools	50	82.2
Pickup Truck	40	71.0
Roller	20	73.0
Scraper	40	79.6
Tractor	40	80.0

Source: RCNM

dBA = A-weighted decibel; L_{EQ} = time-averaged noise level

The most likely source of vibration during project construction would be a vibratory roller, which may be used to achieve soil compaction as part of foundation construction and fill compaction.

Completion of the proposed Project would require grading within an approximately 15-acre area (approximately 9 acres within, and 6 acres outside of the existing ROW. During construction, material such as vegetation, soil, old asphalt, and concrete may be exported from the site and material such as soil, aggregate, asphalt, and concrete may be imported to the site. It is anticipated that 35,000 cubic yards (CY) of cut and 75,000 CY of fill would be required for the Project.

During site clearing and grubbing, 40,000 CY of material would be imported during grading activities. 270 one-way truck trips were conservatively assumed to be required during this construction phase. Exact routes to and from the project are not known at this time. For the purposes of this analysis, it is assumed that access would be via Madison Avenue.

As described in Section 1.4, the nearest residences are 50 feet east of the project boundary. Construction equipment would be continuously moving across the site, and equipment is not anticipated to be located at a single location during a typical workday or stationary at the project's boundary.

3.2.2 Operation

Vehicular Traffic Volumes

The Traffic Impact Analysis (TIA) for the project (Rick Engineering Company, 2023) provides average daily traffic volumes for the surrounding street segments, under existing (2023) and opening year (2026) scenarios, with and without the project. These traffic volumes are shown in Table 4, *Traffic Volumes with and without the Project*. Anticipated future traffic noise levels based on these forecasted traffic volumes.

Table 4
TRAFFIC VOLUMES WITH AND WITHOUT THE PROJECT

Roadway Segment	Traffic Volumes (ADT)		
	Existing (2023)	Opening Year (2026) Without Project	Opening Year (2026) With Project
Madison Avenue			
Murrieta Hot Springs Road to Guava Street	8,508	9,019	10,719
Guava Street to Fig Street	2,821	2,990	4,190
Fig Street to Elm Street	1,563	1,657	1,657
Jefferson Avenue			
Murrieta Hot Springs Road to Guava Street	25,183	26,694	31,861
Guava Street to Fig Street	23,950	25,387	27,123
Fig Street to Elm Street	18,098	19,184	20,867
Murrieta Hot Spring Road			
I-15 to Madison Avenue	38,395	40,699	60,668
Madison Avenue to Jefferson Avenue	19,041	20,184	29,862
Guava Street			
Madison Avenue to Jefferson Avenue	3,903	4,137	4,237
Jefferson Avenue to Adams Avenue	4,344	4,605	4,723
I-15			
Northbound	130,000	130,000	130,000
Southbound	110,000	110,000	110,000
I-215			
Northbound	119,000	119,000	119,000
Southbound	105,000	105,000	105,000

Source: Rick Engineering Company 2023, Caltrans 2022
ADT = Average Daily Traffic

Traffic for the nearby I-15 and I-215 freeways were obtained from the Caltrans Traffic Census Program (2022). According to Caltrans data, I-15 in the project vicinity carries approximately 9.0 percent trucks, consisting of approximately 4.1 medium trucks and 4.9 percent heavy trucks, and I-215 in the project vicinity carries approximately 7.2 percent trucks, consisting of approximately 3.6 medium trucks and 3.6 percent heavy trucks. Project-generated traffic would consist almost entirely of automobiles. Caltrans traffic data was only available for 2022, therefore the 2022 traffic volumes were used in this analysis.

The posted speed limits for the analyzed roads are 45 miles per hour (mph) for Murrieta Hot Springs Road, Guava Street, and Fig Street. 35 mph for Madison Avenue, 50 mph for Jefferson Avenue north of Murrieta Hot Springs Road, 45 mph south of Murrieta Hot Springs Road. A conservative breakdown of

97 percent automobiles, 2 percent medium trucks, and 1 percent heavy trucks was used for modeling existing and future noise conditions on local roads in the vicinity of the project for all segments in both the off-site and on-site scenarios. The aforementioned CadnaA software was used to calculate the noise contour distances for the off-site impacts.

4.0 IMPACTS

4.1 GUIDELINES FOR THE DETERMINATION OF SIGNIFICANCE AND CONDITIONS OF APPROVAL

The following thresholds are based on the City of Murrieta's General Plan 2035 Noise Element, General Plan 2035 Final EIR, and Noise Ordinance. A significant noise impact would occur if the project would:

1. Result in a substantial permanent increase in ambient noise levels in the project vicinity above existing levels without the project:
 - A substantial permanent increase would occur from traffic noise if implementation of the proposed project results in an ambient noise level that meets or exceeds the noise compatibility standards established in the City of Murrieta General Plan 2035, which includes 65 CNEL for multi-family residential exterior noise, and 45 CNEL for multi-family residential interior noise. Because the City does not have specific thresholds for traffic-related noise, this report uses the FTA's Transit Noise and Vibration Impact Assessment criteria (FTA 2018). A permanent increase in traffic noise at the following levels would be substantial and significant with a:
 - i. 3 dBA increase on roadways where the baseline noise level is less than 60 CNEL
 - ii. 2 dBA for roadways where the baseline noise level is 60-64 CNEL
 - iii. 1 dBA for roadways where the baseline noise level is 65 CNEL or over
2. Result in temporary construction noise that violates the limits established in the City Noise Ordinance (Table 1). The time period for the construction noise level limits are not specific in Table 1; analyzed noise levels are assumed to have a duration of one hour.
3. Expose persons to or generation of excessive ground-borne vibration or ground-borne noise levels.
 - Excessive ground-borne vibration would occur if construction-related ground-borne vibration exceeds the "severe" vibration annoyance potential criteria for human receptors, as specific by Caltrans (2013), of 0.4 inches per second peak particle velocity (PPV), and 0.5 inches per second PPV for damage to older residential structures for continuous/frequent intermittent construction sources (such as impact pile drivers, vibratory pile drivers, and vibratory compaction equipment).

5.0 IMPACT ANALYSIS

5.1 CONSTRUCTION NOISE GENERATION

5.1.1 Construction Equipment

Construction activities would include site preparation, grading, installation of a sidewalk and bike lanes, installation of drainage and utilities, and paving. The magnitude of the noise impact would depend on the type of construction activity, equipment used, duration of each construction phase, distance between the noise source and receiver, and any intervening structures. Construction would generate elevated noise levels that may disturb nearby NSLUs.

Construction equipment would operate at multiple locations across the project alignment, during various construction phases. As presented in Table 1, the City of Murrieta construction limits are based on equipment usage periods, as follows:

- Mobile Equipment: Non-scheduled, intermittent, short-term operation (less than 10 days)
- Stationary Equipment: Repetitively scheduled and relatively long-term operation (3 days or more)

Since the construction equipment and phasing would be variable in duration and location. The distance to impact noise contours for different land uses were calculated under the mobile and stationary construction noise limits. Construction equipment used during each phase were determined based on the anticipated construction equipment provided by the project engineers (refer to Appendix A). Table 5, *Distance to Impact – Mobile Construction Equipment*, and Table 6, *Distance to Impact – Stationary Construction Equipment* provide the distances to the noise contours which correspond to the applicable construction noise limit for mobile and stationary construction, respectively.

Table 5
DISTANCE TO IMPACT – MOBILE CONSTRUCTION EQUIPMENT

Phase Name	Single-Family Residential	Multi-family Residential	Commercial
	Distance to 75 dBA ¹ (feet)	Distance to 80 dBA ¹ (feet)	Distance to 85 dBA ¹ (feet)
Fence Installation	95	55	30
Clearing	90	50	30
Finish Grade	155	85	50
Paving	75	45	25
Milling	130	70	40
Asphalt Concrete Pulverizing	125	70	40
Embankment	145	80	45
Mass Excavation	210	120	65
Road Preparation	120	65	35
Curb & Gutter	120	65	35
Sidewalk	80	45	25
Striping	35	20	15
Asphalt Concrete Berm	50	25	15
Large Storm Drain Excavation & Installation	85	50	30
Storm Drain & Curb Inlet Excavation & Installation	100	55	30
Concrete Structure (Headwall)	100	60	30
Riprap Installation	85	50	25
Sewer Excavation & Backfill	100	55	30
Manhole Base	80	40	25
Waterline Excavation	100	55	30
Waterline Backfill	100	55	30
Waterline Test	100	50	30

¹ Noise level limits were assumed to be 1-hour L_{EQ} averages.

dBA = A-weighted decibel; L_{EQ} = time-averaged noise level

Source: RCNM

Table 6
DISTANCE TO IMPACT – STATIONARY CONSTRUCTION EQUIPMENT

Phase Name	Single-Family Residential	Multi-family Residential	Commercial
	Distance to 60 dBA ¹ (feet)	Distance to 65 dBA ¹ (feet)	Distance to 70 dBA ¹ (feet)
Fence Installation	500	300	170
Clearing	500	300	170
Finish Grade	800	480	250
Paving	450	250	135
Milling	625	350	200
Asphalt Concrete Pulverizing	670	380	220
Embankment	700	450	220
Mass Excavation	850	500	280
Road Preparation	650	375	210
Curb & Gutter	650	375	210
Sidewalk	450	250	145
Striping	210	120	65
Asphalt Concrete Berm	275	155	85
Large Storm Drain Excavation & Installation	500	280	155
Storm Drain & Curb Inlet Excavation & Installation	500	280	155
Concrete Structure (Headwall)	600	350	200
Riprap Installation	500	280	155
Sewer Excavation & Backfill	500	280	155
Manhole Base	435	245	140
Waterline Excavation	500	280	155
Waterline Backfill	500	280	155
Waterline Test	500	280	155

1- Noise level limits were assumed to be 1-hour L_{EQ} averages.

dBA = A-weighted decibel; L_{EQ} = time-averaged noise level

Source: RCNM

5.1.2 Significance of Impacts

On-site construction noise would be generated during the allowable daytime hours and would exceed the City's standards for mobile and stationary equipment at single-family residential, multi-family residential, and commercial land uses, if the construction equipment would operate within the distance to impact provided in Table 5 and Table 6.

5.1.3 Mitigation Measure

The following mitigation measure would be required to reduce construction noise levels to within City limits.

NOI-1 Construction Noise Management Plan. Noise levels from project-related construction activities shall not exceed the noise limits specified in Section 16.30.130 of the City of Murrieta Municipal Code for mobile and stationary construction equipment, when measured at the boundary line of the property where the noise is located or any occupied property where noise is being received. A Construction Management Plan that describes the measures included on the construction plans to ensure compliance with the noise limit shall be prepared by the project applicant and submitted to the City for approval before issuance of the grading permit. The following measures may be included to reduce construction noise:

- Construction equipment to be properly outfitted and maintained with manufacturer-recommended noise-reduction devices.
- Diesel equipment to be operated with closed engine doors and equipped with factory-recommended mufflers.
- Mobile or fixed “package” equipment (e.g., arc-welders and air compressors) to be equipped with shrouds and noise control features that are readily available for that type of equipment.
- Electrically powered equipment to be used instead of pneumatic or internal-combustion powered equipment, where feasible.
- Unnecessary idling of internal combustion engines (e.g., in excess of 5 minutes) to be prohibited.
- Material stockpiles and mobile equipment staging, parking, and maintenance areas to be located as far as practicable from noise-sensitive receptors.
- The use of noise-producing signals, including horns, whistles, alarms, and bells, shall be for safety warning purposes only.
- No project-related public address or music system shall be audible at any adjacent sensitive receptor.
- Temporary sound barriers or sound blankets may be installed between construction operations and adjacent noise-sensitive receptors. Due to equipment exhaust pipes being approximately 7 to 8 feet above ground, a sound wall at least 10 feet in height above grade, to block the line-of-sight between project construction activities and sensitive noise receivers. These barriers would mitigate noise levels to within acceptable levels. To effectively reduce noise levels, the sound barrier should be constructed of a material with an STC rating of 22 or 23 with no gaps or perforations and remain in place until the conclusion of demolition, grading, and construction activities.
- The project applicant shall notify residences within 100 feet of the project’s property line in writing within one week of any construction activity such as demolition, concrete sawing, asphalt removal, and/or heavy grading operations. The notification shall describe the activities anticipated, provide dates and hours, and provide contact information with a description of a complaint and response procedure.

- The on-site construction supervisor shall have the responsibility and authority to receive and resolve noise complaints. A clear appeal process for the affected resident shall be established before construction commencement to allow for the resolution of noise problems that cannot be immediately solved by the site supervisor.

5.1.3.1 Construction Traffic

Project construction traffic would be highest during site preparation and grading. As described in Section 3.2.1, this would result in approximately 270 ADT for import and export of material. Conservatively assuming an 8-hour workday, 33 trips per hour would be required. The exact routes the trucks would take is unknown at this time; however, trucks would likely use Madison Avenue for site access. Due to the existing high traffic volumes along Madison Avenue (8,508 trips north of Guava Street, 2,821 trips north of Fig Street, and 1,563 trips north of Elm Street), the addition of 33 truck trips per hour is not anticipated to noticeably increase noise levels, since the noise receivers on Madison Avenue are already exposed to higher traffic volumes from the I-15 and I-215 freeways. Therefore, the project's construction traffic would have a minor impact on noise and impacts would be less than significant.

5.1.4 Operational Off-site Transportation Noise

As noted in Section 3.2.2, existing (2023) traffic noise levels, and opening year (2026) traffic noise levels, with and without the project presented in this analysis are based on traffic volumes provided by Rick Engineering (2023). Traffic noise levels were calculated in CadnaA for the receivers shown in Figure 3. Table 7, *Off-Site Traffic Noise Levels* provides the modeled existing noise level at each receiver and the corresponding noise level with existing plus project traffic volumes.

Table 7
OFF-SITE TRAFFIC NOISE LEVELS

Roadway Segment and Receiver ID	Distance to Nearest Receiver (feet) ¹	Receiver Type	Traffic Noise Exposure (CNEL)					Significant Impact?
			Existing (2023)	Allowable Noise Increment	Opening Year (2026) Without Project	Opening Year (2026) With Project	Change in 2026 due to Project	
Madison Avenue								
Murrieta Hot Springs Road to Guava Street – R1	85	SFR	62.1	2	62.1	62.4	+0.3	No
Guava Street to Fig Street – R2	245	School	59.3	3	59.3	59.4	+0.1	No
Jefferson Avenue								
Murrieta Hot Springs Road to Guava Street – R3	145	Commercial	62.5	2	62.7	63.3	+0.6	No

Roadway Segment and Receiver ID	Distance to Nearest Receiver (feet) ¹	Receiver Type	Traffic Noise Exposure (CNEL)					Significant Impact?
			Existing (2023)	Allowable Noise Increment	Opening Year (2026) Without Project	Opening Year (2026) With Project	Change in 2026 due to Project	
Guava Street to Fig Street – R4	140	Commercial	60.8	2	61.0	61.3	+0.3	No
Fig Street to Elm Street – R5	145	Commercial	60.3	2	60.4	60.7	+0.3	No
Murrieta Hot Spring Road								
I-15 to Madison Avenue – R6	530	Commercial	64.7	1	64.7	64.8	+0.1	No
Madison Avenue to Jefferson Avenue – R7	115	Commercial	62.8	2	62.9	63.8	+0.9	No
Guava Street								
Madison Avenue to Jefferson Avenue – R8	160	Commercial	58.3	3	58.4	58.6	+0.2	No
Jefferson Avenue to Adams Avenue – R9	410	Commercial	56.4	3	56.6	56.8	+0.2	No

¹ Distance measured from roadway centerline

NSLU = Noise Sensitive Land Use; CNEL = Community Noise Equivalent Level; E = Existing; P = Project; B = Build-out; SFR = Single-family Residential

A direct significant impact would occur if exterior and interior noise levels are exposed to a 3 CNEL increase on roadways where the baseline (Existing) noise level is less than 60 CNEL; a 2 dBA increase for roadways where the baseline noise level is between 60 and 64 CNEL; and a 1 dBA increase for roadways where the baseline noise level is 65 CNEL or above. The nearest NSLU for each roadway is single-family residences.

As shown in Table 7, noise levels would not increase more than the allowable noise increment. Therefore, impacts from project-generated traffic would be less than significant.

5.1.5 Mitigation Measures

Because impacts related to operational off-site transportation noise would be less than significant, no mitigation is required.

5.1.6 Significance of Impacts After Mitigation

Impacts would be less than significant without mitigation.

5.2 GROUNDBORNE VIBRATION

Would the project result in generation of excessive groundborne vibration or groundborne noise levels?

5.2.1.1 Construction Vibration

Construction activities known to generate excessive ground-borne vibration, such as pile driving, would not be conducted by the project. A possible source of vibration during general project construction activities would be a vibratory roller, which may be used within 40 feet of the nearest off-site residence. A vibratory roller would create approximately 0.210 inch per second PPV at a distance of 25 feet (Caltrans 2013b). A 0.210 inch per second PPV vibration level would equal 0.125 inch per second PPV at a distance of 40 feet.¹ This would be higher than what is considered a “strongly perceptible” impact for humans of 0.1 inches per second PPV, but lower than the structural damage impact to older residential structures of 0.3 inch per second PPV. Therefore, impacts would be potentially significant without mitigation.

Mitigation measure NOI-2, below, would require vibratory rollers to be used in static mode within 40 feet of residences. With the implementation of mitigation measure NOI-2, impacts associated with a vibratory roller (and other potential equipment) would be less than significant.

5.2.2 Mitigation Measure

NOI-2 Vibratory Roller Usage Limits. Vibratory rollers shall be used in static mode only (no vibrations) when operating within 40 feet of an occupied residence. The contractor shall specify vibratory roller model, size, or operating mode restrictions on all grading, and construction permits.

5.2.3 Significance of Impacts After Mitigation

Impacts would be less than significant with the implementation of mitigation measure NOI-2.

5.3 AIRCRAFT NOISE

5.3.1 Impact Analysis

The closest airport to the project site is French Valley Airport, located approximately 3.5 miles to the northeast. The 65 CNEL contour for the airport is located approximately 3.3 miles north of the project (Coffman Associates, Inc. 2009). Therefore, airport noise would not create substantial noise at the project site. Impacts would be less than significant.

6.0 LIST OF PREPARERS

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¹ Equipment PPV = Reference PPV * (25/D)ⁿ (in/sec), where Reference PPV is PPV at 25 feet, D is distance from equipment to the receiver in feet, and n = 1.1 (the value related to the attenuation rate through the ground); formula from Caltrans 2013b.

7.0 REFERENCES

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Appendix A

Anticipated Construction Equipment

Crew Description	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6	Equipment 7	Equipment 8	Equipment 9	Labor (person)	Total Labor (person)	Labor Driving Self (person driving own car)
Fence Installation	Crew Truck	JD 410 Tractor								2	4	3
Clearing	Crew Truck	D4 Dozer	950 Loader	Semi End Dump						3	7	5
Finish Grade	Pick up	Motor Grader	Water Truck	Vibatory Roller	613 Scraper	Skip Loader				2	8	6
1st AC Paving	Crew Truck	Pickup	Paver	Roller	Roller	Roller	Water truck			4	11	8
2nd AC Paving	Crew Truck	Pickup	Paver	Roller	Roller	Roller	Water truck	Shuttle buggy	Distributor	4	13	10
Milling	Pick up	Pavement grinder	Semi Lowbed	Dump Truck	Dump Truck	Dump Truck	Sweeper			0	7	1
Pulverizer	Pick up	Pulverizer	Semi Lowbed							0	3	0
Embankment	Pick up	D9 Dozer	834 compactor	Water Truck	Motor Grader					2	7	5
Mass Excavation	Pick up	D9 Dozer	Motor grader	Water Truck	657 Scraper	657 Scraper	657 Scraper	657 Scraper		2	10	8
Road Preparation	Pick up	Motor Grader	Water Truck	Roller						0	4	2
Curb & Gutter	Pick up	Crew Truck	Motor grader	Water Truck	Roller					3	8	5
Sidewalk	Pick up	Crew Truck	Skiploader	Water Truck	Vibatory Plate					3	8	5
Striping	Striping Truck	Marker Truck	Stencil Truck							2	5	2
AC Berm	Pick up	Crew Truck	Berm Machine	Dump Truck	Dump Truck					3	8	4
Large SD Exc & Ins	Crew Truck	345 Excavator	980 Loader	Fork Lift						3	7	6
SD Backfill	Crew Truck	325 Excavator	980 Loader	Water Truck						2	6	4
SD Exc & Ins	Crew Truck	325 Excavator	950 Loader	Fork Lift						3	7	6
SD & Curb Inlet Exc & Ins	Crew Truck	325 Excavator	950 Loader	Crew Truck	Fork Lift					3	8	6
Concrete Structure (HW)	Crew Truck	Small Generator	Concrete Pump	Fork Lift		Concrete Pump				2	6	5
Riprap	Crew Truck	325 Excavator	966 Loader							3	6	5
Sewer Excavaton	Crew Truck	345 Excavator	980 Loader	Fork Lift						2	6	5
Sewer BF	Crew Truck	345 Excavator	980 Loader	Water Truck						2	6	4
MH Base	Crew Truck	Small Generator								3	5	4
Waterline Excavation	Crew Truck	325 Excavator	950 Loader	Fork Lift						1	5	4
Waterline BF	Crew Truck	325 Excavator	950 Loader	Water Truck						3	7	5
Waterline Test	Crew Truck	Small Generator	Air Compressor	Water Truck						1	5	3
										58	177	121