Technical Memorandum

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Date: August 18, 2022

Re: Adelanto TTM 20489: SFR 19 Development Project – Noise Assessment

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1.0 Purpose

The purpose of this memorandum is to document the impacts of construction, mobile, and operational noise as it relates to the potential environmental impacts associated with the construction and operation of the proposed 19 lot residential project on 5.08 acres.

2.0 Project Location & Description

2.1 Project Location: The proposed project site is located in the City of Adelanto, San Bernardino, California on the east side of Verbena Road, west of Milford Avenue and north of Wakefield Street, and is referred to as APN: 3132-161-61.

2.2 Description: The Applicant is proposing a tentative tract map to subdivide approximately 5.08 acres into 19 single-family residential lots with an average lot size of 8,268 square feet.

3.0 Noise Impacts

3.1 Ambient Noise: The Project site is in partially developed area of the City and currently does not generate noise. The existing noise environment in the Project area is characterized by the area's general level of development. The Project is located in an area developed with residential uses. Ambient noise levels are therefore increased as a result of roadway traffic, industrial activities, and other human activities. Table 3.1, *Population Density and Associated Ambient Noise Levels,* summarizes typical ambient noise levels based on level of development. Given the rural nature of the proposed Project area, baseline ambient noise levels are assumed to be approximately 50 – 55 dBA, Ldn.

Table 3.1. Population Density and Associated Ambient Noise Levels

Population Density	dBA, Ldn
Rural 40-50	40-50
Small town or quite suburban residential	50
Normal suburban residential	55
Urban residential	60
Noisy urban residential	65
Very noisy urban residential	70
Downtown, major metropolis	75-80
Area adjoining freeway or near major airport	80–90
Notes: dBA = A-weighed decibels Ldn = day-night level	

Source: Draft Initial Study / Mitigated Negative Declaration Silver Peak Solar Project, February 24, 2022

3.2 Construction Noise: Construction activities that would create noise include: site preparation, grading, building construction, paving, and architectural coating. Noise levels associated with the construction will vary with the different types of construction equipment, the duration of the activity, and distance from the source. Construction noise will have a temporary or periodic increase in the ambient noise level above the existing levels within the Project vicinity. The nearest sensitive receptor to the Project site are the single-family residential developments located adjacent to the north, east, and south with the closest residence approximately 25 feet south from Project boundary and approximately 200 feet to the nearest residence from the Project's center.

To estimate the potential impact of construction noise at the residences and school, equipment that is expected to be used during construction was input into the Federal Highway Administration Roadway Construction Noise Model (RCNM) to generate anticipated noise levels. The RCNM generates the maximum noise levels (Lmax) and the equivalent continuous sound level (Leq). The Leq is a calculation of the anticipated steady sound pressure level which, over a given time period (day, evening, night) has the same total energy as the actual fluctuating noise. The RCNM also uses an acoustical use factor in the noise calculations. The acoustical use factor is the percentage of time each piece of construction equipment is assumed to be operating at the full power level and is used to estimate the Leq values from the Lmax values. For example, typical operating cycles for these types of construction equipment may involve one or two minutes of full power operation followed by three to four minutes at lower power settings. Noise levels will be loudest during the site preparation and grading phases. Modeling was completed for distances of 25-feet, 50-feet, and 200-feet from the source to receptor. Table 3.2, *Construction Equipment Noise Levels at the Nearest Receptor,* identifies the level of noise generated by construction equipment.

Table 3.2 Construction Equipment Noise Levels at the Nearest Receptor

Source	Approximate Distance to Nearest Receptor [1] (Property Line to Construction Site) (feet)	Sound Level at Nearest Receptor		
		Lmax	Acoustical Use Factor (%)	Leq
Backhoe	25	83.6	40	79.6
Compactor (ground)	25	89.3	20	82.3
Compressor (air)	25	83.7	40	79.7
Crane	25	86.6	16	78.6
Concrete Mixer Truck	25	84.8	40	80.8
Dozer	25	87.7	40	83.7
Dump Truck	25	82.5	40	78.5
Excavator	25	86.7	40	82.8
Front End Loader	25	85.1	40	81.2
Generator	25	86.7	50	83.6
Grader	25	91.0	40	87.0
Offroad Forklift	25	89.4	40	85.4

Paver	25	83.2	50	80.2
Pickup Truck	25	81.0	40	77.0
Roller	25	86.0	20	79.0
Scraper	25	89.6	40	85.6
Welder Torch	25	80.0	40	76.0

1. Nearest Receptor – Residences at 25 feet from boundary.
   Source: FHWA – RCNM Version 1.1

The properties immediately around are all residential uses and the Project would be compatible with surrounding land uses and would not adversely impact sensitive receptors.

The City of Adelanto has set restrictions to control noise impacts from construction activities. Section 17.90.020(d)(1) of the Adelanto Municipal Code restricts construction activities between the hours of 7:00 AM to dusk on weekdays, and construction will not occur on weekends or state holidays.

Noise generation related to construction activities is addressed in §17.90.020(d) of the Zoning Ordinance which requires construction projects to list general noise reduction practices as "General Notes" on the construction drawings as part of the Project's conditions of approval (COA). These mandatory conditions are described as follows:

17.90.020 (d) Construction Practices
To reduce potential noise and air quality nuisances, the following items shall be listed as "General Notes" on the construction drawings:

(1) Construction activity and equipment maintenance is limited to the hours between 7:00 a.m. to dusk on weekdays. Construction may not occur on weekends or State holidays, without prior consent of the Building Official. Non-noise generating activities (e.g., interior painting) are not subject to these restrictions. City and State construction projects, such as road re-building or resurfacing, and any construction activity that is in response to an emergency, shall be exempt from this requirement.

(2) Stationary construction equipment that generates noise in excess of sixty-five (65) dBA at the project boundaries must be acoustically shielded and located at least one hundred feet (100') from occupied residences. The equipment area with appropriate acoustic shielding shall be designated on building and grading plans. Equipment and shielding shall remain in the designated location throughout construction activities.

(3) Construction routes are limited to City of Adelanto designated truck routes.

(4) Water trucks or sprinkler systems shall be used during clearing, grading, earth moving, excavation, or transportation of cut or fill materials to prevent dust from leaving the site and to create a crust after each day's activities cease. At a minimum, this would include wetting down such areas in the later morning and after work is completed for the day and whenever wind exceeds fifteen (15) miles per hour.

(5) A person or persons shall be designated to monitor the dust control program and to order increased watering as necessary to prevent transport of dust off-site. The name and telephone number of such person(s) shall be provided to the City.

(6) All grading equipment shall be kept in good working order per factory specifications.

With implementation of the above standard conditions of approval, construction noise impacts would be less than significant.

While the City establishes limits to the hours during which construction activity may take place, it does not identify specific noise level limits for construction noise levels. Therefore, to evaluate whether the Project will generate a substantial increase in the short-term noise levels at the offsite sensitive receptors (residences), the construction-related noise level threshold is based on the National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit (REL) for occupation noise exposure at 85 dBA, as an 8-hour time-weighted average (85 dBA – 8-hr TWA).

The highest equipment noise level at the nearest sensitive receptor as indicated in Table 3.2 will be a grader at 91.0 dBA (Lmax) and 87.0 dBA (Leq). The same piece of equipment operating at 50-feet from the nearest receptor would generate noise levels of 85.0 dBA (Lmax) and 81.0 dBA (Leq) and from the center of the site would generate noise levels of 73.0 dBA (Lmax) and 69.0 dBA (Leq). During the construction phase the noise levels will be the highest as heavy equipment pass along the Project site boundaries. During the site preparation and grading phases equipment will not be stationary, rather equipment will be moving throughout the site and varying speeds and power levels and as a result not operating at the maximum noise level for the entire work day. The levels of noise at the nearest receptor as indicated in Table 3.2 are all below the NIOSH REL of 85 dBA 8-hour TWA, and would be less than significant. Construction noise is of short-term duration and will not present any long-term impacts on the project site or the surrounding area.

3.3 Operational Noise:

3.3.1 Offsite Traffic Noise Impacts.

Vehicle noise is a combination of the noises produced by the engine, exhaust, and tires. The primary source of noise generated by the Project will be from the vehicle traffic generated by the vehicle ingress and egress to the Project site. Under existing conditions, the site does not generate any traffic noise that impacts the surrounding area.

According to the Federal Highway Administration*, Highway Traffic Noise Analysis and Abatement Policy and Guidance.* the level of roadway traffic noise depends on three things: (l) the volume of the traffic, (2) the speed of the traffic, and (3) the number of trucks in the flow of the traffic. Generally, the loudness of traffic noise is increased by heavier traffic volumes, higher speeds, and greater numbers of trucks. These factors are discussed below.

- *The Volume of the Traffic*

Upon buildout, the proposed Project is expected to generate approximately 179 average daily vehicle trips[1], which will increase the ambient traffic noise levels in the vicinity of the Project site in comparison to the existing site conditions.

The primary transportation routes for the Project site will be Mojave Drive as it provides paved access to Highway 395 and Aster Road which provides access to both Mojave Drive and Palmdale Road (State Route 18). Traffic from the site would also utilize Cactus Road, which intersects with Bellflower Road to the east.

Estimated traffic conditions for the area roadways are presented in Table 3.3.

Table 3.3 Estimated Traffic Roadway Conditions

Roadway	Number of Lanes	ADT
SR 395 / Holly	4	15,000(1)
Mojave Drive	4	9,589 (2)
Palmdale (SR18)	4	22,939
Aster Road	4	17,500 (3)
Cactus Road	2	6,800 (4)

Sources: Environmental Impact Report Volume 1 Adelanto North 2035 Comprehensive Sustainable Plan, March 2014 Table 4.16-1.
Adelanto Switching Station Expansion Project Initial Study, Mitigated Negative Declaration, February 2021.

(1) Caltrans 2020 Traffic Census Program.
(2) Assumes ½ of traffic on Mojave Drive east of 395 travels west on Mojave Drive.
(3) Table 4.16-1 Arterial/Highway Daily Volume Threshold.
(4) Table 4.16-2 Collector Daily Volume Threshold.

The Institute of Traffic Engineers (ITE) Land Use 210 designation was used for calculations to determine the average daily trips (ADT) generated by the Project. The ITE 210 Single-Family Housing Land Use designation estimates 9.44 daily trips per dwelling unit for a total of 179 trips per day (ADT).

The residential housing directly surrounding the Project site along Verena Road, west of Aster Road, north of Hook Blvd., and south of Mojave Drive consists of 477 SFR units and currently generates approximately 4,503 ADT. Although there are other residential communities in the area of the Project these homes have a direct impact on traffic along Verbena Road, Hook Blvd., and Mojave Drive and provides an overview of potential impacts from the proposed Project on traffic noise.

According to Caltrans, the human ear is able to begin to detect sound level increases of 3 decibels (dB) in typical noisy environments.[2] A doubling of sound energy (e.g., doubling the volume of traffic on a highway) that would result in a 3-dBA increase in sound, would

[1] Institute of traffic Engineers (ITE) Code 210 Single Family Detached Housing 9.44 ADT/dwelling unit.
[2] Caltrans, Traffic Noise Analysis Protocol, April 2020, p.7-1.

generally be barely detectable. As indicated above implementation of the Project will increase traffic volumes in the area by approximately 179 ADT, but not to the extent that traffic volumes will be doubled creating a +3dBA noise increase or result in a perceivable noise increase. Therefore, operational noise impacts would be less than significant.

- *The Speed of Traffic*

The speed limit along Verbena is posted at 45 mph, Hook at 35 mph, Mojave at 30 mph, and all other roadways around the project site are subject to a prima facie limit of 25 mph under the vehicle code. These low levels of speeds do not result in vehicles generating high levels of noise.

- *The Number of Trucks in the Flow of the Traffic*

The Project is a residential development and it will not routinely generate noise from large trucks.

3.3.2 Residential Activities

Typical operational sound levels generated by single-family residential activities include normal outdoor conversations, air conditioner units, and lawn care equipment with levels as indicated below:

- Normal conversation, air conditioner - 60 dBA
- Gas-powered lawnmowers and leaf blowers – 80 to 85 dBA.[3]

Noise generated from air conditioners and lawn care equipment are not at constant and consistent levels throughout the day. Lawn care is performed during daylight hours for short durations and although air conditioners are operating both day and night they are cycling on/off with windows closed conditions. As indicated in Section 3.2 of this memorandum noise levels would be attenuated as with mobile noise sources with standard building construction and windows closed by approximately 25 dBA.

The USEPA identifies noise levels affecting health and welfare as exposure levels over 70 dBA over a 24-hour period. Noise levels for various levels are identified according to the use of the area. Levels of 45 dbA are associated with indoor residential areas, hospitals, and schools, whereas 55 dBA is identified for outdoor areas where typical residential human activity takes place. According to the USEPA levels of 55 dbA outdoors and 45 dbA indoors are identified as levels of noise considered to permit spoken conversation and other activities such as sleeping, working, and recreation, which are part of the daily human condition.[4] Levels exceeding 55 dbA in a residential setting are normally short in duration and not significant in affecting health and welfare of residents.

3.4 Vibration

[3] Center for Disease Control, "*Loud Noised Can Cause Hearing Loss*". ,https://www.cdc.gov/nceh/hearing_loss/default.html, accessed on November 11, 2021.

[4] USEPA "EPA Identifies Noise Levels Affecting Health and Welfare" https://archive.epa.gov/epa/aboutepa/epa-identifies-noise-levels-affecting-health-and-welfare.html accessed August 17, 2022.

During construction the operation and movement of heavy equipment create seismic waves that radiate along the ground-surface in all directions. These waves are felt as ground vibrations. Vibrations from construction can result in effects ranging from annoyance to people to structure damage. Vibration levels are impacted by geology, distance, and frequencies. According to the Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual*, September 2018[37], while ground vibrations from construction activities do not often reach the levels that can damage structures, construction vibration may result in building damage or prolonged annoyance from activities such as blasting, piledriving, vibratory compaction, demolition, and drilling or excavation near sensitive structures. The Project does not require these types of construction activities.

Vibration amplitude and impact decreases with distance and perceptible goundborne vibration is generally limited to areas within one to two hundred feet of the construction activity.

The vibration standard used for the City is that no ground vibration shall be allowed that can be felt without the aid of instruments at or beyond the subject property line, nor will any vibration be permitted that produces a particle velocity greater than or equal to two-tenths of an inch per second measured at or beyond the lot line.

Table 3.6 Vibration Source Levels for Construction Equipment

Equipment	PPV (in/sec) at 25 feet
Small bulldozer	0.003
Jackhammer	0.035
Loaded Trucks	0.076
Large bulldozer	0.089

Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment, September 2018.

The closest sensitive receptor to the Project property line is minimally 80 feet from the property line. The estimated construction vibration level from a large bulldozer (worst case scenario) measured at 15-feet would create a vibration level of 0.191 in/sec which does not exceed the 0.2 in/sec threshold. Therefore, the vibrations at the nearest sensitive receptor will remain well below the strongly perceptible annoyance criteria and potential residential vibration damage criteria thresholds listed in the City of Adelanto Municipal Code Section 17.90.030 (vibration). This threshold requires that no vibration greater than 0.2 PPV be felt at or beyond the lot line. The proposed Project therefore is not considered to result in exposure of people to excessive ground vibration.

During operations of the Project following construction the primary source of vibration would be from vehicle traffic. Ground-borne vibration levels from automobile traffic are generally overshadowed by vibration generated by heavy trucks that roll over the same uneven roadway surfaces. However, due to the rapid drop-off rate of ground-borne vibration and the short duration of the associated events, vehicular traffic-induced ground-borne vibration is rarely

[37] https://www.transit.dot.gov/research-innovation/transit-noise-and-vibration-impact-assessment-manual-report-0123.

perceptible beyond the roadway right-of-way, and rarely results in vibration levels that would cause annoyance to people or damage to buildings in the vicinity.

4.0 Conclusion

Based on the assessment in Section 3.0 through compliance with mandatory City requirements and ordinances to reduce noise during construction, the Project's construction noise impacts will not result in the generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project. In addition, the Project's operational noise would be less than significant for mobile and operational noise and as such impacts to the environment for Noise are less than significant.

Appendix A

			Roadway Construction Noise Model (RCNM),Version 1.1				
Report date:	08/18/2022						
Case Description:	TTM20489						
				---- Receptor #1 ----			
		Baselines (dBA)					
Description	Land Use	Daytime	Evening	Night			
25 - Foot Distance	Residential	62.0	60.0	50.0			
				Equipment			
				Spec	Actual	Receptor	Estimated
		Impact		Lmax	Lmax	Distance	Shielding
Description		Device	Usage(%)	(dBA)	(dBA)	(feet)	(dBA)
Backhoe		No	40.0		77.6	25.0	0.0
Dozer		No	40.0		81.7	25.0	0.0
Scraper		No	40.0		83.6	25.0	0.0
Excavator		No	40.0		80.7	25.0	0.0
Grader		No	40.0	85.0		25.0	0.0
Scraper		No	40.0		83.6	25.0	0.0
Crane		No	16.0		80.6	25.0	0.0
Gradall		No	40.0		83.4	25.0	0.0
Generator		No	50.0		80.6	25.0	0.0
Welder / Torch		No	40.0		74.0	25.0	0.0
Compressor (air)		No	40.0		77.7	25.0	0.0
Paver		No	50.0		77.2	25.0	0.0
Roller		No	20.0		80.0	25.0	0.0
Pickup Truck		No	40.0		75.0	25.0	0.0
Compactor (ground)		No	20.0		83.2	25.0	0.0
Concrete Mixer Truck		No	40.0		78.8	25.0	0.0
Dump Truck		No	40.0		76.5	25.0	0.0
Front End Loader		No	40.0		79.1	25.0	0.0
		Results					
		Calculated (dBA)					
Equipment		*Lmax	Leq				
Backhoe		83.6	79.6				
Dozer		87.7	83.7				
Scraper		89.6	85.6				

Excavator		86.7	82.8				
Grader		91.0	87.0				
Scraper		89.6	85.6				
Crane		86.6	78.6				
Gradall		89.4	85.4				
Generator		86.7	83.6				
Welder / Torch		80.0	76.0				
Compressor (air)		83.7	79.7				
Paver		83.2	80.2				
Roller		86.0	79.0				
Pickup Truck		81.0	77.0				
Compactor (ground)		89.3	82.3				
Concrete Mixer Truck		84.8	80.8				
Dump Truck		82.5	78.5				
Front End Loader		85.1	81.2				
	Total	91.0	95.1				
		*Calculated Lmax is the Loudest value.					
				---- Receptor #2 ----			
		Baselines (dBA)					
Description	Land Use	Daytime	Evening	Night			
50 - Foot Distance	Residential	62.0	60.0	50.0			
				Equipment			
				Spec	Actual	Receptor	Estimated
		Impact		Lmax	Lmax	Distance	Shielding
Description		Device	Usage(%)	(dBA)	(dBA)	(feet)	(dBA)
Backhoe		No	40.0		77.6	50.0	0.0
Dozer		No	40.0		81.7	50.0	0.0
Scraper		No	40.0		83.6	50.0	0.0
Excavator		No	40.0		80.7	50.0	0.0
Grader		No	40.0	85.0		50.0	0.0
Scraper		No	40.0		83.6	50.0	0.0
Crane		No	16.0		80.6	50.0	0.0
Gradall		No	40.0		83.4	50.0	0.0
Generator		No	50.0		80.6	50.0	0.0
Welder / Torch		No	40.0		74.0	50.0	0.0
Compressor (air)		No	40.0		77.7	50.0	0.0
Paver		No	50.0		77.2	50.0	0.0
Roller		No	20.0		80.0	80.0	0.0
Pickup Truck		No	40.0		75.0	50.0	0.0

Compactor (ground)		No	20.0		83.2	50.0	0.0
Concrete Mixer Truck		No	40.0		78.8	50.0	0.0
Dump Truck		No	40.0		76.5	50.0	0.0
Front End Loader		No	40.0		79.1	50.0	0.0
		Results					
		Calculated (dBA)					
Equipment		*Lmax	Leq				
Backhoe		77.6	73.6				
Dozer		81.7	77.7				
Scraper		83.6	79.6				
Excavator		80.7	76.7				
Grader		85.0	81.0				
Scraper		83.6	79.6				
Crane		80.6	72.6				
Gradall		83.4	79.4				
Generator		80.6	77.6				
Welder / Torch		74.0	70.0				
Compressor (air)		77.7	73.7				
Paver		77.2	74.2				
Roller		75.9	68.9				
Pickup Truck		75.0	71.0				
Compactor (ground)		83.2	76.2				
Concrete Mixer Truck		78.8	74.8				
Dump Truck		76.5	72.5				
Front End Loader		79.1	75.1				
	Total	85.0	89.1				
		*Calculated Lmax is the Loudest value.					
				---- Receptor #3 ----			
		Baselines (dBA)					
Description	Land Use	Daytime	Evening	Night			
200 - Foot Center	Residential	62.0	60.0	50.0			
				Equipment			
				Spec	Actual	Receptor	Estimated
		Impact		Lmax	Lmax	Distance	Shielding
Description		Device	Usage(%)	(dBA)	(dBA)	(feet)	(dBA)
Backhoe		No	40.0		77.6	200.0	0.0
Dozer		No	40.0		81.7	200.0	0.0

Scraper		No	40.0		83.6	200.0	0.0
Excavator		No	40.0		80.7	200.0	0.0
Grader		No	40.0	85.0		200.0	0.0
Scraper		No	40.0		83.6	200.0	0.0
Crane		No	16.0		80.6	200.0	0.0
Gradall		No	40.0		83.4	200.0	0.0
Generator		No	50.0		80.6	200.0	0.0
Welder / Torch		No	40.0		74.0	200.0	0.0
Compressor (air)		No	40.0		77.7	200.0	0.0
Paver		No	50.0		77.2	200.0	0.0
Roller		No	20.0		80.0	200.0	0.0
Pickup Truck		No	40.0		75.0	200.0	0.0
Compactor (ground)		No	20.0		83.2	200.0	0.0
Concrete Mixer Truck		No	40.0		78.8	200.0	0.0
Dump Truck		No	40.0		76.5	200.0	0.0
Front End Loader		No	40.0		79.1	200.0	0.0
		Results					
		Calculated (dBA)					
Equipment		*Lmax	Leq				
Backhoe		65.5	61.5				
Dozer		69.6	65.6				
Scraper		71.5	67.6				
Excavator		68.7	64.7				
Grader		73.0	69.0				
Scraper		71.5	67.6				
Crane		68.5	60.6				
Gradall		71.4	67.4				
Generator		68.6	65.6				
Welder / Torch		62.0	58.0				
Compressor (air)		65.6	61.6				
Paver		65.2	62.2				
Roller		68.0	61.0				
Pickup Truck		63.0	59.0				
Compactor (ground)		71.2	64.2				
Concrete Mixer Truck		66.8	62.8				
Dump Truck		64.4	60.4				
Front End Loader		67.1	63.1				
	Total	73.0	77.1				
		*Calculated Lmax is the Loudest value.					