Lancaster Waste to Renewable Hydrogen (WTRH2) Project

NOISE TECHNICAL REPORT

Prepared for:

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Development Services Department
Community Development Division

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1. Introduction

This technical report has been prepared to document the preliminary findings of a Noise Assessment conducted for the Lancaster Waste to Renewable Hydrogen (WTRH2) Project (proposed project), a gasification facility that would produce hydrogen (H_2) from paper feedstock in Lancaster, California.

The Noise Technical Report provides background information on noise, describes the proposed project, the physical and regulatory setting of the project, and addresses the likely extent of potential noise impacts resulting from implementation of the project.

2. Understanding of the Project

Project Location

The proposed project site is located in the Antelope Valley in the southern portion of the City of Lancaster, just north of the City of Palmdale and is approximately 2 miles east of California State Route (CA-) 138/CA-14. The project would be constructed on an approximately 15-acre property located north of Avenue M between 5th and 6th Street East. The project site is located on three parcels (Assessor's Parcel Numbers [APNs] 3126-017-028, 3126-017-040, and 3126-017-039) and is bounded by East Avenue L-12 to the north, 6th Street East to the east, East Avenue M to the south, and 5th Street East to the west.

The parcels are surrounded by other vacant properties, industrial uses, and scattered residential properties. Industrial uses such as concrete, towing, and automotive wrecking facilities are located to the north of the site on East Avenue L-12. A single-family residential home and vacant lots are located to the east of the site on 6th Street East. Four water towers and vacant lots are located to the south of the site on East Avenue M. An automotive repair center, canine boarding service, adult day healthcare center, automotive lot, and two single-family residential homes are located to the west of the site on 5th Street East. Palmdale Regional Airport is located approximately 1 mile southeast of the project site, and Edwards Airforce Base is located approximately 21 miles northeast of the project site. Several military airplanes were observed flying overhead the project site, causing intermittent increases in noise levels.

East Avenue M is a paved secondary road that traverses east-west with relatively high-speed traffic. Both 5th Street East and 6th Street East are unpaved dirt roads with minimal vehicular traffic. East Avenue L-12 is a paved road that supports low-speed intermittent traffic. Intermittent industrial trucks, pickup trucks, and passenger vehicles were observed traveling on East Avenue L-12.

Project Description

The proposed project would consist of the construction and operation of a facility that would produce hydrogen (H_2) from paper feedstock. (Feedstock is defined as a raw material to supply or fuel a machine or industrial process.) The feedstock would be gasified (i.e., converted from a solid into a gas) to produce a H_2-rich gas that would be further processed to reach 99.99 percent pure renewable H_2 gas suitable for retail sale. The H_2 gas and produced carbon dioxide (CO_2) would be transported off-site by truck in pressurized containers.

Noise Generating Equipment Summary

The H_2 production process would introduce new sources of mechanical noise and stationary equipment to the site. The equipment added to the site by the project would include several continuously operating systems. Each of the louder equipment would be positioned to the middle of the site or within buildings to reduce noise measured at the fence lines (Data Request Response, 3.17c). The proposed project would include the systems shown in Table 1.

Table 1. WTRH2 Project Stationary Equipment

System No.	Equipment, Package Description	Intermittency of Noise Source
1	Air Separation Unit	Continuous
2	Feed Handling and Storage	Continuous
3	Biochar Handling and Storage	Intermittent, during unloading only
4	Gasification Island	Continuous
5	Heat Recovery Steam Generator	Intermittent, during startup only
6	Syngas Compressor	Continuous
7	Syngas Blower	Continuous
8	Cryocap System, H_2 Compression, CO_2 Removal and Liquefaction	Continuous
9	H_2 Booster Compressor	Continuous
10	Power Generation Package, Steam Turbine Generator	Continuous
11	Emergency Diesel Generator	Emergency Use Only
12	Emergency Fire Water Pump (Diesel Driven)	Emergency Use Only

Source: Data Request Response, 3.17c.

Truck Movements and Vehicle Noise

Approximately 75 light-duty vehicle roundtrips daily for employee commutes and 90 truck trips daily would be generated by the proposed project (Data Request Response, 3.1c). The heavy-duty truck traffic would provide transport, as follows:

- Deliveries: feedstock; biochar; lime; and chemicals and catalyst materials.
- Loadout: H_2 product; liquid CO_2 product; and solid waste, including slag and brine.

3. Environmental Setting

Fundamentals of Community Noise

To describe environmental noise and to assess project impacts on areas that are sensitive to community noise, a measurement scale that simulates human perception is used. The A-weighted scale of frequency sensitivity accounts for the sensitivity of the human ear, which is less sensitive to low frequencies, and correlates well with human perceptions of the annoying aspects of noise. The A-weighted decibel scale (dBA) is cited in most noise criteria. Decibels (dB) are logarithmic units that can be used to conveniently compare wide ranges of sound intensities.

Community noise levels can be highly variable from day to day as well as between day and night. For simplicity, sound levels are usually best represented by an equivalent level over a given time period (Leq) or

by an average level occurring over a 24-hour day-night period (Ldn). The Leq, or equivalent sound level, is a single value (in dBA) for any desired duration, which includes all of the time-varying sound energy in the measurement period, usually one hour. The L25 is the noise level exceeded 25 percent of the time. The L50 is the median noise level that is exceeded fifty percent of the time during a measurement interval, and the L90 is the noise level that is exceeded 90 percent of the time (the 10th percentile).

The Ldn, or day-night average sound level, is equal to the 24-hour A-weighted equivalent sound level with a 10-decibel penalty applied to nighttime sounds occurring between 10:00 p.m. and 7:00 a.m. Community Noise Equivalent Level (CNEL) is another metric that is the average equivalent A-weighted sound level during a 24-hour day, obtained after addition of five decibels to sound levels in the evening from 7:00 p.m. to 10:00 p.m. and after addition of 10 decibels to sound levels in the night from 10:00 p.m. to 7:00 a.m. To easily estimate the CNEL caused by any noise source emitting steadily and continuously over 24-hours, the CNEL is equal to 6.7 dBA more than the source's continuous Leq. For example, if an expected continuous noise level is 60.0 dBA Leq for every hour, the day-night equivalent is 66.7 dBA CNEL.

Community noise levels usually are closely related to the intensity of human activity. Noise levels generally are considered low when below 45 dBA, moderate in the 45 to 60 dBA range, and high above 60 dBA. In wilderness areas, the Ldn noise levels can be below 35 dBA. In small towns or wooded and lightly used residential areas, the Ldn is more likely to be around 50 or 60 dBA. Levels around 75 dBA are more common in busy urban areas, and levels up to 85 dBA occur near major freeways and airports. Although people often accept the higher levels associated with very noisy urban residential and residential-commercial zones, they nevertheless are considered to be detrimental to public health. Table 2 shows typical sound levels of various environmental noise sources.

Table 2. Typical Sound Levels Measured in the Environment and Industry

Noise Source and Distance	A-Weighted Sound Level (dBA)	Subjective Impression
Civil defense siren (100 ft)	130	Pain threshold
Jet takeoff (200 ft)	120	
Rock music concert (50 ft)	110	
Pile driver (50 ft)	100	Very loud
Ambulance siren (100 ft)	90	
Diesel locomotive (25 ft)	85	Loud
Pneumatic drill (50 ft)	80	
Freeway (100 ft)	70	Moderately loud
Vacuum cleaner (10 ft)	60	
Light traffic (100 ft)	50	
Large transformer (200 ft)	40	Quiet
Soft whisper (5 ft)	30	Threshold of hearing

Surrounding land uses dictate what noise levels would be considered acceptable or unacceptable. Lower levels are expected in rural or suburban areas than what would be expected for commercial or industrial zones. Nighttime ambient levels in urban environments are about seven decibels lower than the corresponding daytime levels. In rural areas away from roads and other human activity, the day-to-night difference can be considerably less. Areas with full-time human occupation and residency are often considered incompatible with substantial nighttime noise because of the likelihood of disrupting sleep. Noise levels above 45 dBA at night can result in the onset of sleep interference. At 70 dBA, sleep interference effects become considerable (U.S. EPA, 1974).

Noise-Sensitive Areas

Noise-sensitive receptors are areas where excessive noise may conflict with the intended use, examples include residential areas, schools, hospitals, day care centers, campgrounds, and certain other outdoor recreation areas. Noise-sensitive residences occur on parcels adjacent to the proposed project site, although no other noise-sensitive land uses, such as schools, community parks, or other recreational uses are within 1,000 feet of the site.

Current Site Conditions

The existing site consists of vacant land with some disturbance including dumped soil piles, graded dirt, and trash. The site has relatively flat topography with signs of an alluvial wash extending from the southwest to the northeast portion of the site.

Existing noise levels within the Antelope Valley result primarily from vehicular sources on the highways and secondary roads in the area. Aircraft noises also contribute to occasional short-term increases in the ambient noise levels; however, their contribution over a 24-hour Community Noise Equivalent Level (CNEL) exposure period is small, except for those areas in the immediate vicinity of Palmdale Regional Airport or Edwards Airforce Base.

On June 14, 2022, Aspen Environmental Group conducted six 15-minute ambient noise measurements (three daytime measurements and three evening measurements) for the proposed project during a site visit, as shown in Figure 1. These noise measurements, as well as noted sources, are presented in Table 3 and the following text.

Figure 1. Ambient Noise Measurement Locations

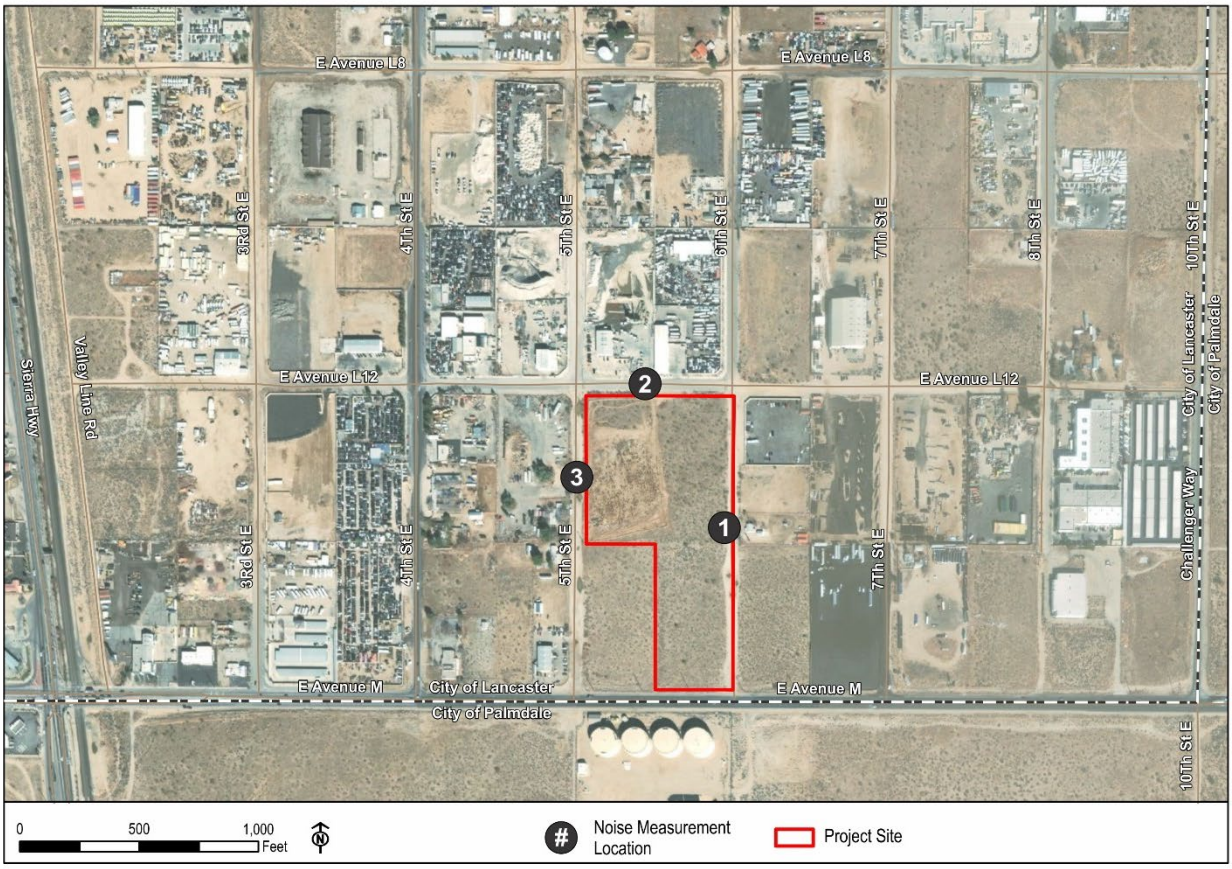

Table 3. WTRH2 Project Ambient Noise Measures

	Location ID	Location Description	Leq	Lmax	Lmin
Daytime Measurements	#1	East of project site on 6th Street East	58.2 dB	74.9 dB	40.6 dB
	#2	North of project site on East Avenue L-12	65.7 dB	89.4 dB	40.3 dB
	#3	West of project site on 5th Street East	56.1 dB	75.0 dB	42.5 dB
Evening Measurements	#1	East of project site on 6th Street East	67.0 dB	80.2 dB	48.4 dB
	#2	North of project site on East Avenue L-12	81.2 dB	93.8 dB	61.6dB
	#3	West of project site on 5th Street East	78.0 dB	87.8 dB	60.4 dB

Source: Aspen Environmental Group, field measurements: June 2022.
Notes: Two stray dogs were observed barking at 5th Street East during evening noise measurements. An increase in wind gusts was observed during evening measurements, explaining increased overall noise levels.

Location 1

Daytime: Located east of the project site on 6th Street East closest to the adjacent single-family residence to the east. The daytime noise measurement was taken in the afternoon (2:36 p.m. to 2:51 p.m.), where the noise sources included distance truck noise, distant traffic on East Avenue M, and intermittent vehicles driving on 6th Street East. There was little to no wind during this measurement period.

Evening: This measurement was taken from 7:03 p.m. to 7:18 p.m. Noise sources included wind gusts and distant traffic on East Avenue M.

Location 2

Daytime: Located center-north of the project site on East Avenue L-12 adjacent to the industrial operations to the north. The noise measurement was taken in the afternoon (2:58 p.m. to 3:13 p.m.), where the noise sources included adjacent industrial operational noise, truck beeping, a plane flying overhead, and intermittent large trucks driving on East Avenue L-12.

Evening: This measurement was taken from 7:24 p.m. to 7:39 p.m. Noise sources included a large truck, wind gusts, military planes flying overhead, and birds chirping.

Location 3

Daytime: Located west of the project site on 5th Street East adjacent to the single-family residence to the west. The noise measurement was taken in the afternoon (3:38 p.m. to 3:54 p.m.). Noise sources included intermittent vehicles driving on 5th Street East and large trucks driving along East Avenue L-12.

Evening: This measurement was taken from 7:49 p.m. to 8:04 p.m. Noise sources included military planes flying overhead, wind gusts, a distant train, birds chirping, and dogs barking.

The City's 2009 Master Environmental Assessment included estimates of citywide existing roadway noise levels. Existing noise levels near the project site result primarily from vehicular sources on highways and secondary roads in the area. Table 4 presents the 2009 modeled noise levels for roadways in the project area.

Table 4. Project Area Existing Roadway Noise Levels

Roadway	2009 Average Daily Traffic Volume	CNEL (dBA) at 100 feet from Centerline
Columbia Way (Avenue M): Sierra Highway to Business Center Parkway	23,400	68.6
Columbia Way (Avenue M): Business Center Parkway to Challenger Way (10th Street East)	17,900	67.5
Sierra Highway: Avenue L to Columbia Way (Avenue M)	23,800	68.7

Source: City of Lancaster, 2009a.

Regulatory Setting

Federal

Under the Occupational Safety and Health Act of 1970 (OSHA) (29 U.S.C. §651 et seq.), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) adopted regulations (29 CFR §1910.95) designed to protect workers against the effects of occupational noise exposure. These regulations list limits on noise exposure levels as a function of the amount of time during which the worker is exposed, as shown in Table 5.

Table 5. OSHA Permissible Noise Exposure Standards

Duration of Noise Exposure (hours per day)	Permissible Noise Exposure Level (dBA)
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 or less	115

Source: 29 CFR §1910.95, Table G-16.

The OSHA regulations further specify requirements for a hearing conservation program (§1910.95(c)), a monitoring program (§1910.95(d)), an audiometric testing (i.e., test of hearing ability) program (§1910.95(g)), and hearing protection (§1910.95(i)). There are no federal laws governing community noise.

State of California

California Government Code §65302 encourages each local government entity to implement a noise element as part of its general plan. In addition, the California Governor's Office of Planning and Research has developed guidelines for preparing noise elements, which include recommendations for evaluating the compatibility of various land uses as a function of community noise exposure. The recommendations established by the Office of Planning and Research (2017) specify that noise levels of 70 dB Ldn/CNEL or less would be normally acceptable for an industrial area such as that of the site and levels over 75 dB Ldn/CNEL would be normally unacceptable.

Local

City of Lancaster General Plan 2030

Within the City of Lancaster General Plan 2030, noise is addressed from the long-term planning perspective under the City's Plan for Public Health and Safety (City of Lancaster, 2009b). Objectives in the General Plan define the noise compatible land use relationships for new development in terms of the maximum exterior noise levels considered to be acceptable. For commercial and industrial uses, the maximum exterior noise level is 70 dBA CNEL. For residential uses, the maximum exterior noise level is 65 dBA CNEL for classrooms and 70 dBA CNEL for playgrounds (City of Lancaster, 2009b).

Under Policy 4.3.1 of the General Plan, where new development is likely to exceed the compatible noise levels, a detailed noise attenuation study should be prepared by a qualified acoustical engineer in order to determine appropriate mitigation and ways to incorporate such mitigation into the project design (City of Lancaster, 2009b).

City of Lancaster Municipal Code

The City of Lancaster Municipal Code addresses noise from non-transportation sources, such as stationary equipment, animals, construction, etc., in Title 8, Health and Safety, Chapter 8.24, Noise Regulations (City of Lancaster, 2022). Section 8.24.030 (Loud, unnecessary and unusual noises prohibited) states that "no

person shall make, cause or suffer, or permit to be made upon any premises owned, occupied or controlled by him/her any unnecessary noises or sounds which are physically annoying to persons of ordinary sensitiveness which are so harsh or so prolonged or unnatural or unusual in their use, time, or place as to occasion physical discomfort to the inhabitants of any neighborhood."

Additionally, Section 8.24.040 (Loud, unnecessary and unusual noise prohibited – Construction and building), prohibits any construction or repair work of any kind or performing any earth excavating, filling, or moving "where any of the foregoing entails the use of any air compressor, jack hammer, power-driven drill, riveting machine, excavator, diesel-powered truck, tractor or other earth-moving equipment, hard hammers on steel or iron or any other machine tool, device or equipment which makes loud noises within five hundred (500) feet of an occupied dwelling, apartment, hotel, mobile home or other place of residence" between the hours of 8:00 p.m. and 7:00 a.m. and at any time on Sunday.

4. Noise Impact Assessment

Construction-Related Noise

Construction activities for the proposed project would include mobilizing construction equipment, crews, and materials, and completing approximately 16 months of work to develop the site. Phases of construction include:

- Site preparation, grading, and paving;
- Installation of foundations and structural components for process equipment; and
- Underground trenching for utilities, including electrical, process and potable water piping, and sewer piping.

Construction activities would require use of vehicles and heavy-duty equipment capable of generating noise at the site, staging area, and along roadways used to access these locations. Construction noise sources would include trucks for delivery of equipment, materials, and work crews, and operation of backhoes, graders, loaders, and cranes, and other smaller equipment such as welders and pumps. Outside of the site, increased traffic noise would be caused by vehicles transporting equipment and supplies to the site, trucks removing debris, and workers commuting to and from work site. The construction workforce could range up to 281 personnel onsite during construction.

Table 6 summarizes the typical noise levels for individual pieces of construction equipment.

Table 6. Typical Noise Levels for Individual Construction Equipment

Equipment	Typical Lmax (dBA, at 50 ft)	Typical Leq (dBA, at 50 ft)
Drill rig, auger	84	77
Crane	81	73
Backhoe	78	74
Excavator	81	77
Compactor	83	76
Dump truck, haul truck, concrete mixer truck	76-79	73-76
Pickup truck, crew truck	75	62-71

Source: FHWA, 2006.

Lmax: Maximum noise level from Actual Measured in Roadway Construction Noise Model.
Leq: Equivalent noise level for one hour incorporating the Acoustical Usage Factor.

Construction activities could create both intermittent and continuous noises. Intermittent noise would be caused by periodic instances of short-term equipment use. For example, a backhoe or loader would cycle while placing foundations or creating trenches. Continuous noise would emanate from other equipment over longer periods, such as with the turning of a cement mixer or the lifting and positioning with a crane. Multiple work spreads could occur within the site and along adjacent roadways. The maximum intermittent noise levels from a construction work spread would typically range from 84 to 90 dBA at 50 feet. These would be the highest levels expected for foundation development or excavation activities. At 50 feet, continuous noise levels could range up to about 85 dBA. Because sound fades over distance, these levels would diminish over additional distance and could be reduced further by intervening structures. At 100 feet from a work spread, continuous noise levels could range up to 79 dBA and at 200 feet, up to 73 dBA.

Construction would temporarily increase the noise levels near the project site. Although the site is undeveloped, construction would occur near existing land uses that include occupied dwellings are sensitive to noise.

Construction noise would affect the locations closest to the work and staging areas and along site access routes used by haul trucks and other construction traffic. The surrounding land uses would experience a temporary increase in noise above the conditions that exist without project. However, the intermittent and variable nature of construction noise limits the potential for adverse effects such as annoyance to be experienced by off-site receptors, and sleep interference would not be a concern because work would occur at an industrial land use and most activities would occur during daylight hours. Construction noise during daytime hours would be exempt from the standards established in the City's Noise Ordinance.

Provided construction work is conducted during the hours specified in the City's Municipal Code (between 7:00 a.m. to 8:00 p.m. and not on Sunday) when occurring within 500 feet of an occupied residence, this short-term disturbance would not conflict with the local regulatory requirements.

Operational Noise

The proposed project would introduce new industrial process equipment to the setting. Within the site a range of stationary equipment and systems could create continuous mechanical noise (see Table 1). New traffic noise would also occur as heavy-duty trucks would deliver feed to the facility, export the products, and dispose of waste. Trucks would be used on the surrounding roadways for routine operational activities, and these would generate intermittent maximum noise levels of up to approximately 76 to 79 dBA Lmax at 50 feet during a pass-by (FHWA, 2006). This traffic noise would contribute to increased noise levels at the closest residential properties on parcels adjacent to the proposed project site. However, noise from routine operation of heavy-duty trucks serving the industrial facility would be consistent with the Heavy Industrial zoning of the site and would not conflict with the local planning standards or noise ordinance requirements for the protection of ambient noise levels.

The applicant proposes to design the plant so as to not exceed the property line noise limit of 70 dBA CNEL as set by the City of Lancaster, Plan for Public Health and Safety. The applicant also proposes to design the facility to achieve on-site noise levels within OSHA standards, so as not to exceed 85 dBA at 1 meter from the equipment, for hearing protection for the employees. The proposed plot plan would include a high block wall around the outside perimeter for security and noise. Louder equipment would be positioned to the middle of the site or within buildings to reduce noise measured at the fence lines. Compressors would have acoustic enclosures or containment for noise suppression, and the steam

generator would release to the atmosphere through a silencer in the steam discharge line (Data Request Response, 3.17c).

Consistent with Policy 4.3.1 of the General Plan, a detailed noise attenuation study would need to be prepared before a finding could be made on whether the project could exceed compatible noise levels. Achieving the City's standard of 70 dBA CNEL at property line would require the proposed project to achieve approximately 60 dBA Leq at the property line at all times to account for the +10 dBA adjustment that penalizes nighttime exterior noise levels in the CNEL metric. To ensure that the project achieves this standard, additional mitigation is recommended to ensure that new stationary sources are separated from the property boundary by at least 200 feet and provided with suitable enclosures or shielding.

Mitigation Measure MM NOI-1, Operational Noise Performance Standard, would require acoustical study and noise control features to ensure that on-site equipment noise would not exceed the property line threshold of 70 dBA CNEL.

MM NOI-1 **Operational Noise Performance Standard.** Prior to the issuance of building permits, the project design and implementation shall include appropriate noise control features adequate to ensure that the operation of the project will not cause the noise levels due to plant operation alone to exceed 60 dBA Leq or 70 dBA CNEL when measured at any property boundary [City of Lancaster, General Plan, Policy 4.3.1]. Stationary mechanical equipment that includes substantial sources of noise shall be located, enclosed, or shielded, if necessary, to meet this standard. No new pure-tone components shall be caused by mechanical equipment associated with the project. No single piece of equipment shall be allowed to stand out as a source of noise that draws legitimate complaints. To achieve this standard, the final project design in site plans shall avoid placing stationary sources of noise within 200 feet of any property boundaries. If the final design of the project includes any stationary source of noise within 200 feet of a property boundary, then a final, detailed noise attenuation study shall be prepared and submitted by a qualified acoustical engineer, in order to determine appropriate mitigation and ways to incorporate such mitigation into the project design, to the satisfaction of the City.

References

City of Lancaster. 2022. Municipal Code. Title 8 – Health and Safety; Chapter 8.24, Noise Regulations. [online]: https://library.municode.com/ca/lancaster/codes/code_of_ordinances?nodeId=TIT8HESA_CH8.24NORE. Accessed July 6, 2022.

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U.S. EPA (U.S. Environmental Protection Agency). 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. No. 550/9 74 004, Washington, D.C.

Attachment 1

Noise Calculation Worksheet

Noise Calculation, Construction Equipment & Stationary Source Noise

Project Number: 3454 Lancaster SGH2

Model Description: Composite Noise Level Calc, Various Distances, No Shielding
Model Approach and Cite: General Assesessment: FTA, 2018: Transit Noise and Vibration Impact Assessment Guidelines. Section 7.1
Levels and Use Factors: FHWA, 2006: Roadway Construction Noise Model, User's Guide. Table 1 (Actual measured Lmax).

		Construction Reference Distance (ft)						
		50						
Sources / Activity	**Equipment**	**Lmax @ Refc**	**Acoustic Use Factor**	**Refc Leq(h)**	**Receptor @ (ft)**	**Item @ Recept Leq (dBA)**		**Composite @ Receptor Leq (dBA)**
Construction: Site Preparation, Grading, Paving						Composite >>>>>>>>>>>>>>		85.2
	Grader	85	40	81	50	81	1.3E+08	
	Dozer	82	40	78	50	78	6.3E+07	
	Backhoe or Loader	79	40	75	50	75	3.2E+07	
	Excavator	81	40	77	50	77	5.0E+07	
	Compactor	83	20	76	50	76	4.0E+07	
	Dump Truck	76	40	72	50	72	1.6E+07	
						Composite >>>>>>>>>>>>>>		84.1
Construction: Process Equipment Installation	Crane	81	20	74	50	74	2.5E+07	
	Drill rig, auger	84	20	77	50	77	5.0E+07	
	Backhoe or Loader	79	40	75	50	75	3.2E+07	
	Concrete Mixer Truck	79	40	75	50	75	3.2E+07	
	Compactor	83	20	76	50	76	4.0E+07	
	Dump Truck	76	40	72	50	72	1.6E+07	
	Generator	81	50	78	50	78	6.3E+07	

Individual Construction Equipment (Typical Noise Levels)

Pile Driver (Impact; Table 7-1: FTA, 2018)	101	20	94
Pile Driver (Sonic; Table 7-1: FTA, 2018 & FHWA, 2006)	95	20	88
Mounted Impact Hammer (FHWA, 2006)	90	20	83
Scraper	84	40	80
Dozer	82	40	78
Grader	85	40	81
Forklift or Man Lift	75	20	68
Crane	81	20	74
Backhoe or Loader	79	40	75
Excavator	81	40	77
Compactor	83	20	76
Generator	81	50	78
Drill rig, auger	84	20	77

Operation Reference Distance (ft)

3.281

Operation Phase	Equipment	Lmax @ Refc	Acoustic Use Factor	Refc Leq(h)	Receptor @ (ft)	Item @ Recept Leq (dBA)		Composite @ Receptor Leq (dBA)
						Composite >>>>>>>>>>>>>>		58.6
Operations (Process Equip)	Packaged Equip (spec. 85 dBA @ 1 m)	85	100	85	200	49	8.5E+04	
	2 of 8	85	100	85	200	49	8.5E+04	
	3 of 8	85	100	85	200	49	8.5E+04	
	4 of 8	85	100	85	200	49	8.5E+04	
	5 of 8	85	100	85	200	49	8.5E+04	
	6 of 8	85	100	85	200	49	8.5E+04	
	7 of 8	85	100	85	200	49	8.5E+04	
	8 of 8	85	100	85	200	49	8.5E+04	
	Haul Truck (RCNM, sporadic use factor)	85	50	82	200	46	4.3E+04	
	Haul Truck (RCNM, sporadic use factor)	85	5	72	200	36	4.3E+03	

Hourly Leq to Day-Night Noise Calculation

Project Number: 3454 Lancaster SGH2
Model Description: Basic 24-hour Noise Exposure Calc
Model Assumptions: FTA, 2018. Transit Noise and Vibration Impact Assessment Guidelines, Section B.1.4.5

Hour beginning	Leq(h) (dBA)	Penalty (dBA)	w/o Penalty SPL(h)	w/ Penalty SPL(h)
0:00	58.6	10	727,643	7,276,434
1:00	58.6	10	727,643	7,276,434
2:00	58.6	10	727,643	7,276,434
3:00	58.6	10	727,643	7,276,434
4:00	58.6	10	727,643	7,276,434
5:00	58.6	10	727,643	7,276,434
6:00	58.6	10	727,643	7,276,434
7:00	58.6	0	727,643	727,643
8:00	58.6	0	727,643	727,643
9:00	58.6	0	727,643	727,643
10:00	58.6	0	727,643	727,643
11:00	58.6	0	727,643	727,643
12:00	58.6	0	727,643	727,643
13:00	58.6	0	727,643	727,643
14:00	58.6	0	727,643	727,643
15:00	58.6	0	727,643	727,643
16:00	58.6	0	727,643	727,643
17:00	58.6	0	727,643	727,643
18:00	58.6	0	727,643	727,643
19:00	58.6	5	727,643	2,301,010
20:00	58.6	5	727,643	2,301,010
21:00	58.6	5	727,643	2,301,010
22:00	58.6	10	727,643	7,276,434
23:00	58.6	10	727,643	7,276,434

w/o Penalty Sum SPL(24)	w/ Penalty Sum SPL(24)	w/o Penalty Leq(24) (dBA)	w/ Penalty Leq(24) (dBA)
17,463,441	81,122,656	58.6	65.3