4.11 <u>NOISE</u>

This Draft Environmental Impact Report (EIR) section analyzes potential noise and vibration impacts associated with development of the Project. This section provides background information on noise and noise assessment criteria; presents existing noise levels in the Project area; and examines noise and vibration impacts that could potentially occur with Project implementation. Noise monitoring data is included in Appendix H of this Draft EIR. Direct, indirect, and cumulative impacts are addressed for each threshold criteria below, and growth-inducing impacts are described in Sections 6.0, CEQA-Mandated Analyses, of this Draft EIR.

Throughout this Draft EIR, the City's portion of the Inglewood Oil Field (77.8 acres) is referred to as the "Project Site" or the "City IOF". The entire surface boundary limits of the Inglewood Oil Field, including lands within both the City and County, is referred to as "Inglewood Oil Field". The off-site portion of the Inglewood Oil Field that is within the jurisdiction of the County of Los Angeles is referred to as the "County IOF".

4.11.1 METHODOLOGY

Noise and Vibration Definitions

"Sound" is a vibratory disturbance created by a moving or vibrating source and is capable of being detected. "Noise" is defined as a sound that is loud, unpleasant, unexpected, or undesired and may therefore be classified as a more specific group of sounds. Although the terms "sound" and "noise" are often used synonymously, perceptions of sound and noise are highly subjective (Caltrans 2013a). The effects of noise on people can include general annoyance, interference with speech communication, sleep disturbance and, in the extreme, hearing impairment.

Decibels and Frequency

In its most basic form, a continuous sound can be described by its frequency or wavelength (pitch) and its amplitude (loudness). Frequency is expressed in cycles per second, or hertz. Frequencies are heard as the pitch or tone of sound. High-pitched sounds produce high frequencies; low-pitched sounds produce low frequencies. Sound pressure levels are described in units called the decibel (dB).

Decibels are measured on a logarithmic scale that quantifies sound intensity in a manner similar to the Richter scale used for earthquake magnitudes. Thus, noise levels are not numerically additive. A doubling of the energy of a noise source, such as doubling of traffic volume, would increase the noise level by 3 dB. For example, adding 48 dB and 48 dB would be 51 dB, and adding 48 dB and 38 dB would be 48.4 dB.

Perception of Noise and A-Weighting

A typical noise environment consists of a base of steady "background" noise that is the sum of many distant and indistinguishable noise sources. Superimposed on this background noise is the sound from individual local sources. The local sources can vary from an occasional aircraft or train passing by, to intermittent periods of sound (such as amplified music), to virtually continuous noise from, for example, traffic on a major highway.

The human ear is not equally sensitive to all frequencies within the sound spectrum. To accommodate this phenomenon, the A-scale was devised; the A-weighted decibel scale (dBA or db[A]) approximates the frequency response of the average healthy ear when listening to most

ordinary everyday sounds. When people make relative judgments of the loudness or annoyance of a sound, their judgments correlate well with the A-weighted sound levels of those sounds. Therefore, the "A-weighted" noise scale is used for measurements and standards involving the human perception of noise.

Human perception of noise has no simple correlation with acoustical energy. Due to subjective thresholds of tolerance, the annoyance of a given noise source is perceived very differently from person to person. The most common sounds vary between 40 dBA (very quiet) to 100 dBA (very loud). Normal conversation at three feet is approximately 60 dBA, while loud jet engine noises at 1,000 feet equate to 100 dBA, which can cause serious discomfort. Table 4.11-1 shows the relationship of various noise levels in dBA to commonly experienced noise events.

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities		
_	110	Rock Band		
Jet Fly-over at 300 m (1,000 ft)	100	_		
Gas Lawn Mower at 1 m (3 ft)	90	_		
Diesel Truck at 15 m (50 ft) at 80 km/hr (50 mph)	80	Food Blender at 1 m (3 ft), Garbage Disposal at 1 m (3 ft)		
Noisy Urban Area, Daytime Gas Lawn Mower at 30 m (100 ft)	70	Vacuum Cleaner at 3 m (10 ft)		
Commercial Area, Heavy Traffic at 90 m (300 ft)	60	Normal Speech at 1 m (3 ft)		
Quiet Urban Daytime	50	Large Business Office, Dishwasher in Next Room		
Quiet Urban Nighttime	40	Theater, Large Conference Room (Background)		
Quiet Suburban Nighttime	30	Library		
Quiet Rural Nighttime	20	Bedroom at Night, Concert Hall (Background)		
_	10	Broadcast/Recording Studio		
Lowest Threshold of Human Hearing	0	Lowest Threshold of Human Hearing		
dBA: A-weighted decibels, m: meter, km/hr: kilometers per hour, ft: feet, mph: miles per hour.				

TABLE 4.11-1 NOISE LEVELS FOR COMMON ACTIVITIES

Two noise sources do not "sound twice as loud" as one source. As stated above, a doubling of noise sources results in a noise level increase of 3 dBA. It is widely accepted that (1) the average healthy ear can barely perceive changes of a 3 dBA increase or decrease; (2) a change of 5 dBA is readily perceptible; and (3) an increase (or decrease) of 10 dBA sounds twice (or half) as loud (Caltrans 2013a). In community situations, noise exposure and changes in noise levels occur over a number of years, unlike the immediate comparison made in a field study situation. The generally accepted level at which changes in community noise levels become "barely perceptible" typically occurs at values greater than 3 dBA.

Sound Power

Sound power describes the total sound energy emitted by a source, also in decibels; sound power does not change with distance. Typical sound power levels range from 0 dB (threshold) to 160 dB (jet engine).

Noise Propagation

From the source to the receiver, noise changes both in level and frequency spectrum. The most obvious change is the decrease in noise level as the distance from the source increases. The manner in which noise reduces with distance depends on the factors described below.

Geometric Spreading from Point and Line Sources: Sound from a small localized source (approximating a "point" source) radiates uniformly outward as it travels away from the source in a spherical pattern. For point sources, such as Heating, Ventilation and Air Conditioning (HVAC) units or construction equipment, the sound level attenuates (or drops off) at a rate of 6 dBA for each doubling of the distance (i.e., if the noise level is 70 dBA at 25 feet, it is 64 dBA at 50 feet). Movement of numerous vehicles on a road makes the source of the sound appear to emanate from a line (line source) rather than a point when viewed over some time interval. The sound level attenuates or drops off at a rate of 3 dBA per doubling of distance for line sources.

Ground Absorption: To account for the ground-effect attenuation (absorption), two types of site conditions are commonly used in noise prediction: soft site and hard site conditions. Hard sites (i.e., sites with a reflective surface between the source and the receiver, such as parking lots or smooth bodies of water) receive no excess ground attenuation, and the changes in noise levels with distance (drop-off rate) are simply the geometric spreading of the source. Soft sites are sites that have an absorptive ground surface (e.g., soft dirt, grass, or scattered bushes and trees) and receive an excess ground attenuation value of 1.5 dBA per doubling of distance.

Atmospheric Effects: Wind speed will bend the path of sound to "focus" (increase) it on the downwind side and make a "shadow" (reduction) on the upwind side of the source. At short distances, the wind has minor influence on the measured sound level. For longer distances, the wind effect becomes appreciably greater. Temperature gradients create effects similar to those of wind gradients, except that they are uniform in all directions from the source. On a sunny day with no wind, temperature decreases with altitude, giving a shadow effect for sound. On a clear night, temperature may increase with altitude, focusing sound on the ground surface.

Shielding by Natural and Man-Made Features, Noise Barriers, Diffraction, and Reflection: A large object in the path between a noise source and a receiver can significantly attenuate noise levels at that receiver location. The amount of attenuation provided by this "shielding" depends on the size of the object and the frequencies of the noise levels. Natural terrain or landform features as well as man-made features (e.g., buildings and walls) can significantly alter noise levels. For a noise barrier to work, it must be high enough and long enough to block the view from the receiver to a road or to the noise source.

Noise Descriptors

Several rating scales (or noise "metrics") exist to analyze effects of noise on a community. These scales include the equivalent noise level (L_{eq}), the community noise equivalent level (CNEL), and the day-night average sound level (DNL or L_{dn}). Average noise levels over a period of minutes or hours are usually expressed as dBA L_{eq} , which is the equivalent noise level for that period of time. The period of time averaging may be specified; for example, $L_{eq(3)}$ would be a 3-hour average. When no period is specified, a one-hour average is assumed. Noise of short duration (i.e., substantially less than the averaging may seconds or a few minutes may have minimal effect on the measured sound level averaged over a one-hour period.

To evaluate community noise impacts, L_{dn} was developed to account for human sensitivity to nighttime noise. L_{dn} represents the 24-hour average sound level with a penalty for noise occurring at night. The L_{dn} computation divides the 24-hour day into two periods: daytime (7:00 AM to 10:00 PM) and nighttime (10:00 PM to 7:00 AM). The nighttime sound levels are assigned a 10 dBA penalty prior to averaging with daytime hourly sound levels. CNEL is similar to L_{dn} except that it separates a 24-hour day into 3 periods: daytime (7:00 AM to 7:00 PM), evening (7:00 PM to 10:00 PM), and nighttime (10:00 PM to 7:00 AM). The evening sound levels are assigned a 5 dBA penalty and the nighttime sound levels are assigned a 10 dBA penalty prior to averaging with daytime hourly sound levels are assigned a signed a 5 dBA penalty and the nighttime sound levels are assigned a 10 dBA penalty prior to averaging with daytime hourly sound levels.

Several statistical descriptors are often used to describe noise including L_{max} , L_{min} , and $L_{\%}$. L_{max} and L_{min} are respectively the highest and lowest A-weighted sound levels that occur during a noise event. The $L_{\%}$ signifies the noise level that is exceeded x percent of the time; for example, L_{10} denotes the level that was exceeded 10 percent of the time.

Point Source Noise

The distance from the noise source to a receptor is a primary consideration in determining the actual noise level experienced at the receptor. Most reference noise levels are specified at a distance of 50 feet from the source. The calculation of noise from a point source, such as construction or HVAC equipment, at other distances uses the equation

 $L_D = L_{ref} - 20 \log (D/ref)$, where

 L_D is the noise level at a distance D from the noise source,

L_{ref} is the noise level at a reference distance from the source, and

ref is the reference distance of the noise source.

The equation is the mathematical expression for a noise level being reduced by 6 dBA for each doubling of distance from the source.

Construction equipment can be considered to operate in two modes: stationary and mobile. Noise impacts from stationary equipment are assessed from the center of the equipment, while noise impacts for mobile construction equipment are assessed as emanating from the center of the equipment activity or construction site. For construction equipment, the average noise level, L_{eq} , is related to the maximum noise level, L_{max} , by the following equation:

 $L_{eq} = L_{max} + 10 \log (UF)$, where,

 L_{eq} is the average noise level from a piece of construction equipment at 50 feet,

 $L_{\mbox{\scriptsize max}}$ is the maximum noise level from a piece of construction equipment at 50 feet, and

UF is the acoustic utilization factor, which is the fraction of time that a piece of construction equipment is typically at full power.

The L_{max} and UF data for construction equipment are tabulated in the impact analysis in Table 4.11-7.

<u>SoundPLAN</u>

SoundPLAN is a computer-based program for environmental noise analysis of roads, railways and industrial facilities. SoundPLAN can create noise contour maps and forecast noise levels at specific receptors using traffic, sound power data, and three-dimensional topographical data. SoundPLAN was used for noise level calculations and noise contour map generation for this project.

Groundborne Vibration

Vibration is acoustic energy transmitted as pressure waves through a solid medium, such as soil or concrete. In contrast to airborne noise, groundborne vibration is not a common environmental problem. Some common sources of groundborne vibration are construction activities such as blasting, pile driving, and operating heavy earth-moving equipment. Trains and similar rail vehicles can also produce vibration. It is unusual for vibration from sources such as buses or trucks to be perceptible. Exhibit 4.11-1, Typical Vibration Amplitudes illustrates common vibration sources and typical human and structural responses.

In quantifying vibration, the peak particle velocity (ppv) is most frequently used to describe vibration impacts and is typically measured in inches per second (in/sec). Vibration levels that may cause annoyance to humans are described using the vibration decibel (VdB). Typically, groundborne vibration generated by man-made activities attenuates rapidly with distance from the source.

Vibration propagation is calculated using the following formula:

 $PPV_{equip} = PPV_{ref} \times (25/D)^n$ where

 $\mathsf{PPV}_{\mathsf{equip}}$ is the ppv in inches per second (in/sec) adjusted for distance of the receiver from the source,

PPV_{ref} is the ppv in in/sec at the reference distance of 25 feet,

D is the distance from the source to the receiver, and

n is a value based on soil material (FTA 2006).

The Federal Transit Administration (FTA) Office of Planning's *Transit Noise and Vibration Impact Assessment* (FTA Impact Assessment) suggests using a value of 1.5 for n for all equipment (FTA 2006).

4.11.2 REGULATORY SETTING

<u>Federal</u>

Occupational Health and Safety Act of 1970

This law limits worker noise exposure to 90 dBA over an eight-hour work shift. When information indicates that any employee's exposure may equal or exceed an 8-hour time-weighted average of 85 decibels, the Occupational Safety and Health Administration (OSHA) standards 1910.95(b)-1910.95(d) mandates that the employer must develop and implement programs that incorporate personal protective equipment to reduce sound levels experienced by the employee, hearing conservation measures and a noise-exposure monitoring program.



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Noise Control Act of 1972

This law was established in an effort to promote an environment for all Americans free from noise that could potentially jeopardize their health and/or welfare. In pursuit of this goal, the Noise Control Act (1) establishes a means for effective coordination of Federal research and activities in noise control; (2) authorizes the establishment of federal noise emission standards for products distributed in commerce; and (3) provides information to the public with respect to the noise emission and noise reduction characteristics of the products distributed in commerce (USEPA 2016a).

In 1974, the U.S. Environmental Protection Agency (USEPA) published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.* The primary purpose of this document is to provide a basis for state and local governments in setting noise standards. For example, the document determines that when developing noise standards, state and local governments should conduct a cost benefit analysis, consider the nature of a particular noise problem, and evaluate the means available to control environmental noise. In addition, the document determines that levels of 55 decibels outdoors and 45 decibels indoors are levels of noise that permit daily human activity free of noise interference and annoyance. Following the dissolution of the Office of Noise Abatement and Control in 1981, noise regulation shifted to state and local jurisdictions (USEPA 2016b).

Quiet Communities Act of 1978

This law amended the Noise Control Act of 1972 to give states and municipalities primary responsibility for noise control.

<u>State</u>

Though there are no state regulations to limit noise levels of oil and gas production, the California Noise Control Act of 1973 provides a framework for the Office of Noise Control to provide assistance to local communities for the development of noise control programs. Most local jurisdictions have adopted the Office of Planning and Research (OPR) guidelines as part of the Noise Element within the local general plan. These noise-compatible land use guidelines interpret the noise exposure levels based upon long-term day-night average levels or the Community Noise Equivalent Level (DOC 2015a).

Local

Culver City General Plan

The Culver City General Plan Noise Element includes standards developed from those of several federal and state agencies including the Federal Highway Administration (FHWA), the USEPA, the Department of Housing and Urban Development (HUD), the American National Standards Institute, and the California Department of Health Services (Culver City 1973). These standards set limits on the noise exposure level for various land uses throughout the City, as shown in Table 4.11-2, Culver City Interior and Exterior Noise Standards.

TABLE 4.11-2 CULVER CITY INTERIOR AND EXTERIOR NOISE STANDARDS

Proposed Land Use Categories		Design Standard CNEL		
Categories	Uses	Interior	Exterior	
	Single Family, Duplex,	45 ^a	65	
Residential	Multiple Family	45	65	
	Mobile Home		65 ^b	
	Hotel, Motel, Transient Lodging	45	65°	
	Commercial Retail, Bank, Restaurant	55	_	
Commercial	Office Building, Research and Development, Professional Offices, City Office Building	50	_	
Industrial	Amphitheater, Concert Hall, Auditorium, Meeting Hall	45	_	
	Gymnasium (Multipurpose)	50	_	
	Sports Club	55	-	
	Manufacturing, Warehousing, Wholesale, Utilities	65	_	
	Movie Theatres	45	_	
Institutional	Hospital, School Classroom	45	65	
	Church, Library	45	-	
Open Space	Parks	-	65	

provided as of Chapter 12, Section 1205 of the 1974 Uniform Building Code. Exterior noise levels should be such that interior noise level will not exceed 45 decibels Community Noise Equivalent Level. b с Except those areas affected by aircraft noise.

Source: Culver City 1973, as amended (Noise Element)

In addition to the noise standards discussed above, there are objectives and policies from the General Plan related to noise applicable to the Project site.

Land Use Element

The *City of Culver City General Plan Land Use Element* contains policies that address a number of diverse issues, including noise. Listed below are the objectives and policies that address noise and/or quality of the living environment relevant to the Project site:

Policy 1.B: Protect the City's residential neighborhoods from the encroachment of incompatible land uses and environmental hazards which may have negative impacts on the quality of life (such as traffic, noise, air pollution, building scale and bulk, and visual intrusions).

Objective 4. Neighborhood Conditions. Establish and maintain quality living environments throughout the City.

Policy 16.F: Establish noise, safety, aesthetic and access criteria for areas impacted by existing incompatible land uses.

Noise Element

The *City of Culver City Noise Element* identifies noise-sensitive land uses and noise sources, and defines areas of noise impact for local decision makers to use in achieving and maintaining land uses that minimize the exposure of the community to excessive noise intrusion. Listed below are the objectives and policies that address noise relevant to the Project site:

Objective 1. Land Use Compatibility. Ensure the compatibility of adjacent land uses with regard to noise sources and receptors.

Policy 1.A: Ensure the consistent application of adopted noise standards and criteria in the review of all discretionary land use decisions.

Objective 1.D: Investigate the opportunity to construct barriers to mitigate sound emissions where necessary and where feasible.

Objective 2. Stationary Noise Sources. Protect those areas that are or may be subject to unacceptable noise from stationary noise sources.

Policy 2.B. Require addition of noise reduction features to all existing and proposed stationary-related noise sources which exceed established noise standards to reduce impacts on noise sensitive land uses.

Policy 3.F. Limit truck movements to those arterials designed to handle the traffic, and those located farther from noise sensitive areas.

Culver City Municipal Code

Though the Culver City Municipal Code (CCMC) does not include quantified noise standards, the following Sections of Chapters 9.04 (Nuisances) and 9.07 (Noise Regulations) of the CCMC provide, in pertinent part:

Section 9.04.015.H

- 1. *General.* Any noise that is made, generated, produced, or continued, whether by a person, activity, animal, fowl, automobile, motorcycle, engine, machine, or other mechanical device, whether on public or private property, in such a manner that it unreasonably disturbs the peace and quiet of any neighborhood or which causes any discomfort or annoyance to any reasonable person of normal sensitivities, or that otherwise violates any provision of the Culver City Municipal Code, including the regulations set forth in Chapter 9.07 ("Noise Regulations") and/or the noise limits set forth in the Culver City Zoning Code. Factors which shall be considered in determining whether the noise is a nuisance shall include, but not be limited to the following:
 - (a) The volume of the noise;
 - (b) The intensity of the noise;
 - (c) Whether the nature of the noise is usual or unusual;
 - (d) Whether the origin of the noise is natural or unnatural;
 - (e) The volume and intensity of the background noise, if any;
 - (f) The proximity of the noise to residential sleeping facilities;
 - (g) The nature of the zoning of the area from which the noise emanates;
 - (h) The density of inhabitation of the area from which the noise emanates;
 - (i) The time of day or night the noise occurs;
 - (j) The duration of the noise;
 - (k) Whether the noise is recurrent, intermittent, or constant;
 - (I) Whether the noise is produced by commercial or noncommercial activity; and
 - (m) Whether the noise is a consequence or expected result of an otherwise lawful use. . .
- 4. Mechanical noise or construction noise near residential zones.
 - (a) The use or operation of any automobile, motorcycle, engine, machine, or mechanical device, or other contrivance or facility, or the carrying on of any trade or business, causing between the hours of 8:00 p.m. and 8:00 a.m., any loud or unusual noise or sound, disturbing the peace of residents of a residentially zoned neighborhood.
 - (b) Any construction or excavation work, except between the hours of 8:00 a.m. and 8:00 p.m. Mondays through Fridays, or between the hours of 9:00 a.m. and 7:00 p.m. on Saturdays, or between the hours of 10:00 a.m. and 7:00 p.m. on Sundays.
- 5. Mechanical devices, and the like, interfering with business or industrial operations. The operation of any automobile, motorcycle, engine, machine or mechanical device or other contrivance or facility, or the carrying on of any trade or business, any loud or unusual noise or sound from which interferes with the transaction or conduct of any business or industrial operation in the surrounding area, unless the making of such noise is incident to the construction or repair of buildings or equipment or is otherwise necessary to the protection or preservation of the property from which such noise or sound emanates.

Section 9.07.015.A. *Prima facie violation.* Any noise which is reasonably determined to be excessively loud, piercing, or offensive to occupants of neighboring properties or peace officers called to the location of the noise shall be deemed prima facie evidence of a violation of the provisions of this Chapter.

Section 9.07.020. No person shall unnecessarily make, continue, or cause to be made or continued, any noise disturbance.

Section 9.07.035

- A. All construction activity shall be prohibited, except between the hours of:
 - 8:00 AM and 8:00 PM Mondays through Fridays
 - 9:00 AM and 7:00 PM Saturdays
 - 10:00 AM and 7:00 PM Sundays
- B. It is prohibited for any person to operate any radio, disc player or cassette player or similar device at a construction site in a manner that results in noise levels that are audible beyond the construction site property line.
- C. In the case of an emergency, the Building Official may issue a permit for construction activity for periods during which construction activity is prohibited by Subsection A of this Section. Such permit shall be issued for only the period of the emergency.
- D. The City Council shall retain the right to impose more restrictive hours of construction upon any project by adding appropriate conditions of the approval of any Use Permits that are required for the project.

4.11.3 ENVIRONMENTAL SETTING

Psomas conducted ambient noise surveys to document the existing noise environment at five locations in the vicinity of the Project area, which are identified in Exhibit 4.11-2, Noise Monitoring Locations, to determine the Project's impact on nearby sensitive receptors. Four daytime surveys were conducted on October 19, 2015. As shown in Table 4.11-3 average noise levels (L_{eq}) ranged from 48 to 60 dBA.

At a fifth location, overnight noise monitoring commenced on October 19, 2015 and concluded on October 21, 2015, after approximately 46 hours (Location LT). The purpose of the monitoring was to determine the existing CNEL of the nearby residential community north of the Project Site. The measured existing CNEL is 55 dBA, as shown in Table 4.11-3 below. Noise measurement data can be found in Appendix F of this Draft EIR.



TABLE 4.11-3 EXISTING MEASURED NOISE LEVELS

		Time		Noise Level (dBA)			Comments
Location ID	Location Description (Latitude/Longitude)	Started (Duration) ^a	Major noise sources	L_{eq}	L _{max} b	L _{min} b	
1	Northwest corner of Blairstone Drive and Lenawee Avenue. (34.0157/-118.3749)	10:32 AM (25 min)	Vehicles	60	81	40	13 vehicles passed location during monitoring including 2 large trucks.
2	Parking lot of Baldwin Hills Scenic Overlook. (34.0160/-118.3826)	11:39 AM (25 min)	Background voices	49	64	42	Oil rigs visible but inaudible.
3	Jim Webb Trail, approximately 900 feet east of Baldwin Hills Scenic Overlook. (34.0148/-118.3786)	12:20 PM (25 min)	Emergency vehicle sirens, airplanes	52	71	33	8 planes flew over location during monitoring.
4	Eastern edge of Blair Hills Park. (34.0156/-118.3778)	1:41 PM (25 min)	Distant traffic	48	62	38	Children began playing in the park around 2:00 PM approximately 100 feet from the location.
LT	Southern edge of Blair Hills Park. (34.0153/-118.3785)	2:15 PM (46 hours)	Varied		86	32	CNEL is 55 dBA
dBA: A-weighted decibels; L _{eq} : Average noise level; L _{max} : Maximum noise level; L _{min} : Minimum noise level; ft: foot/feet; CNEL: Community Noise Equivalent Level; LT: Long-Term Monitoring							

^a Locations 1 through 4 were monitored on October 19, 2015; location LT was monitored on October 19–21, 2015.

^b Measurements for Locations 1 through 4 utilized 1-minute increments; LT measurement utilized 15-minute increments.

Sensitive Noise Receptors

The Culver City General Plan Noise Element defines sensitive land uses as single-family and multi-family homes; hotels and motels; long-term medical or mental care facilities; schools; libraries; business and professional office buildings; places of worship; concert halls; and restaurants. As oil and gas production operations are the sole use on the Project Site, there are no on-site sensitive receptors. However, the area surrounding the Project Site includes single-family and multi-family homes, nature center and parks, manufacturing, and office buildings. The southernmost portion of the Blair Hills residential community abuts the northeast boundary of the Project Site and a cluster of office buildings abuts the northern boundary of the Project Site's Area 4 (see Exhibit 2-3, Specific Plan Boundary and Adjacent Land Uses). The closest sensitive receptors are residences on Stoneview Drive adjacent to the northern Project boundary and offices adjacent to the western Project boundary near Jefferson Boulevard and College Boulevard, as shown in Exhibit 4.11-2, Noise Monitoring Locations. Additionally, the City IOF is adjacent to various recreation activities that are heavily utilized by the community, as shown on Exhibit 2-3, Specific Plan Boundary and Adjacent Land Uses, in Section 2.0, Environmental Setting.

4.11.4 SPECIFIC PLAN AND REGULATORY REQUIREMENTS

Specific Plan Drilling Regulations

- **Section 21.J.1 Drilling and Redrilling Setbacks**. The following setbacks shall apply within the Oil Field for drilling or redrilling:
 - 1. Drilling.
 - **a.** At least 400 feet from Developed Areas.
 - **b.** At least 75 feet from any public roadway.
 - **c.** The well hole setbacks prescribed in this subsection may be reduced at the discretion and approval of the City Council if it can be determined the setback reduction will not be detrimental to the public health, safety or welfare, or the environment.
 - **d.** As part of the Annual Consolidation and Drilling Plan (Section 31.B) the Operator shall provide an inventory of existing wells that encroach into the setback area specified above. Said inventory shall also include an estimated schedule for properly abandoning the wells encroaching into the setback area, based upon their respective current productive life without redrilling.
- **Section 22. Noise Attenuation.** All Oil Operations shall be conducted in a manner that implements and is consistent with the best available measures for the prevention of excessive and annoying noise, and shall comply with the following provisions:

A. Noise Limits.

- 1. All Oil Operations on the Oil Field shall comply with the noise provisions of the Culver City Municipal Code (Title 9, Chapter 9.07, Noise Regulations). In the event there are any inconsistencies between Chapter 9.07 and the provisions of this Specific Plan or the MMP, this Specific Plan and the MMP shall take precedence for Oil Operations.
- 2. Hourly, A-weighted equivalent noise levels associated with well drilling, redrilling, reworking and maintenance shall not elevate existing baseline levels by more than 5 dBA during daytime hours (7:00 AM to 10:00 PM).
- **3.** Operator shall limit the nighttime (10:00 PM to 7:00 AM) noise levels at any sensitive receptor to no more than 3 A-weighted decibels (dBA) above a one-hour baseline average for the defined nighttime period. If Operator violates the above noise requirements, Operator shall identify the source of the noise and take steps necessary to assure compliance with this subsection.
- 4. If well drilling, redrilling, reworking and maintenance operations elevate nighttime baseline noise levels by more than 10 dBA for more than 15 minutes in any 1 hour, as independently verified and determined by the City, the Operator, in consultation with the City, shall identify the cause and source of the noise and takes steps to avoid such extended periods of noise elevation in the future.

- **5.** Noise produced by Oil Operations shall include no pure tones when measured beyond the Outer Boundary.
- **B.** Backup Alarms. Backup alarms on all vehicles operating within the Oil Field shall be disabled between the hours of 8:00 PM and 8:00 AM During periods when the backup alarms are disabled, the Operator shall employ alternate, low-noise methods for ensuring worker safety during vehicle backup, such as the use of spotters.
- **C. Quiet Mode Drilling Plan.** Concurrent with the submission of the Comprehensive Drilling Plan, the Operator shall submit to the Community Development Director for review and approval a Quiet Mode Drilling Plan that would apply between the hours of 6:00 PM and 8:00 AM. All Oil Operations shall be conducted in conformity with the Quiet Mode Drilling Plan that has been reviewed and approved by the Community Development Director. The Quiet Mode Drilling Plan shall be reviewed by the Operator on an annual basis to determine if modifications to the Quiet Mode Drilling Plan are required and report findings to the Community Development Director. Such findings and the modified Quiet Mode Drilling Plan shall be submitted to the Community Development Director for review and approval. Operator shall comply with all provisions of the approved Quiet Mode Drilling Plan, which shall include, but is not limited to the following:
 - **1.** Installation of noise barriers.
 - **2.** Personnel shall take particular care when standing back while tripping out of hole to ensure that there is minimal clanging of pipe.
 - **3.** While tripping in the hole, steps shall be taken to ensure that the blocks are completely stopped prior to latching the elevators.
 - **4.** Whenever latching the elevators, personnel shall lay the pipe in the elevators and latch slowly and as quietly as possible.
 - **5.** When handling drill pipe or casing, personnel shall use measures that will prevent hitting the pipe against the cat walk, v-door or other surfaces that would create loud noise.
 - 6. Rubber shall be required on the v-door when picking up pipe.
 - **7.** Personnel shall place rubber or wood on the catwalk when rolling pipe off the pipe racks onto the catwalk.
 - **8.** Steps shall be taken to minimize any banging of pipe on the catwalk by careful use of the forklift.
 - 9. Hammering on or racking of pipe shall be not permitted.
 - **10.** Operation of the well cellar pump shall not be permitted.
 - **11.** Yelling to other on-location personnel shall not be permitted except to maintain worksite safety. Derrick personnel and the driller shall communicate with walkie talkies.
 - **12.** Horns shall not be used to give signals, except in the event of an emergency.
 - **13.** Any other additional information required by the Community Development Director.

- **D.** Engines. Critical grade or better exhaust muffler systems shall be used to reduce noise from diesel drilling rig engines. All other equipment powered by internal combustion engines shall use residential grade or better exhaust muffler systems to reduce noise.
- E. Equipment Servicing. All noise producing Oil Field equipment shall be regularly serviced and repaired to minimize increases in pure tones and other offensive noise output over time and to ensure that tonal and other offensive noise from worn bearings, metal-on-metal contact, valves and other equipment does not cause perceptible tonal or other offensive noise beyond the Outer Boundary. The Operator shall maintain an equipment service log for all noise-producing equipment, which shall be subject to inspection by the City.

F. Deliveries.

- Except as provided in Section 22.F.2, deliveries shall not be permitted after 8:00 PM and before 7:00 AM except in cases of emergency. Deliveries on Sundays or legal holidays shall not be permitted after 8:00 PM and before 9:00 AM, except in cases of emergency.
- 2. Deliveries within 500 feet of any residential property shall not be permitted after 5:00 PM and before 7:00 AM except in cases of emergency. Deliveries on Sundays or legal holidays shall not be permitted after 5:00 PM and before 9:00 AM, except in cases of emergency or as approved by the Community Development Director.
- **G.** Time Limits for Construction. Construction of permanent structures shall not be permitted after 7:00 PM and before 7:00 AM, or during Saturdays, Sundays, or legal holidays, except in cases of emergency or as approved by the Community Development Director.
- **H.** Construction Equipment. All construction equipment shall be selected for low-noise output. All construction equipment powered by internal combustion engines shall be properly muffled and maintained. The Operator shall maintain an equipment service log subject to inspection by the Public Works Director/City Engineer.
- **I. Construction Equipment Idling.** Unnecessary idling of construction equipment internal combustion engines is prohibited.
- J. Worker Notification. The Operator shall instruct employees and subcontractors about the noise provisions of these regulations prior to commencement of each and every drilling, redrilling, reworking, construction and maintenance operation, and shall annually certify to the Public Works Director/City Engineer that such employees and subcontractors have been properly trained to comply with such noise provisions. The Operator shall prominently post quiet mode policies at every drilling and redrilling site.
- **K.** Noise Monitoring and Reporting. The Operator shall employ an independent qualified acoustical engineer, approved by the Public Works Director/City Engineer to install equipment to continuously monitor and digitally record noise levels at and near the Oil Field or Drilling Project location. Such monitors shall be placed at locations and for the frequency and duration identified by the Public Works Director/City Engineer, and shall include adjacent sensitive receptor locations and at locations where

complaints were received regarding Drilling Project activities. The results of all monitoring shall be submitted to the Public Works Director/City Engineer on a quarterly basis. The monitoring required by this subsection shall be implemented no later than 180 days following the date of approval of the Comprehensive Drilling Plan or at such later date as may be approved by the Public Works Director/City Engineer, for good cause shown.

Section 23. Vibration Reduction.

All Oil Operations shall be conducted in a manner that minimizes vibration, and shall comply with the following provisions:

- **A.** Vibration levels from Oil Operations shall not exceed a velocity of 0.25 millimeters per second (mm/s) over the frequency range 1 to 100 hertz (Hz) at the Outer Boundary.
- **B.** Should vibration levels at any time exceed the thresholds specified above, or should the Operator otherwise fail to comply with all of the provisions specified herein, the Operator shall immediately notify the City and shut down the source of drilling and redrilling found to be in non-compliance with the thresholds specified in this Specific Plan, and no new drilling or redrilling activities may be commenced or approved until the Operator has taken all steps necessary to assure future compliance with the thresholds and other provisions. The foregoing remedies are not exclusive, but shall be in addition to any other remedies available for a violation of the CCMC.
- **C.** Vibration Reduction Monitoring and Reporting. The Operator shall hire an independent qualified engineer, approved by the Public Works Director/City Engineer, to install equipment to continuously monitor and digitally record vibration levels at the Outer Boundary. Such monitors shall be placed at locations selected by the Public Works Director/City Engineer and shall be implemented no later than 180 days following the date of approval of the Comprehensive Drilling Plan. The results of all such monitoring shall be submitted to the Public Works Director/City Engineer on a quarterly basis.
- **Section 31.B.1** The maximum number of wells to be drilled or redrilled on an annual basis, which shall be no more than two wells per year for the first two years; if in any year thereafter, the Community Development Director determines that this Specific Plan is protective of the public health, safety and welfare, and the environment, then three wells per year may be drilled, until such time that the Community Development Director determines otherwise or the maximum number of allowed new or redriilled wells is reached (as set forth in Section 21.J.1).
- **Section 31.B.2** No more than one drilling or redrilling rig erected at any one time.
- **Section 33.A.** (Well Reworking.) No more than two rigs used for reworking shall be present within the Oil Field at any one time, unless an emergency condition requires additional rigs.

Section 33.B. (Well Reworking.) With the exception of emergencies, well reworking operations shall not be allowed after 7:00 PM or before 7:00 AM, nor on Saturdays, Sundays or legal holidays.

Regulatory Requirements

RR NOI-1 Project approval includes amending CCMC Section 9.07.060 (Noise Regulations, Exemption from Provisions) to add that oil operations within the City IOF are exempt from the provisions of the Chapter 9.07 Noise Regulations, and instead will comply with the provisions of the Inglewood Oil Field Specific Plan.

4.11.5 THRESHOLDS OF SIGNIFICANCE

Thresholds Addressed in the Initial Study

The Initial Study prepared for the Project (included in Appendix A-1) and circulated with the Notice of Preparation (NOP), concludes that Project implementation would not result in significant impacts for the thresholds of significance listed below. Further analysis of these thresholds in this Draft EIR is not required:

- For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?
- For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

Thresholds Addressed in this Draft EIR

The Initial Study prepared for this Project concluded that additional project-level analysis of the following thresholds of significance is required in this Draft EIR. According to Appendix G of the California Environmental Quality Act (CEQA) Guidelines, a project would result in a significant adverse environmental impact related for noise and vibration if it would result in:

- **Threshold 11-1:** Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?
- **Threshold 11-2:** Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?
- **Threshold 11-3:** A substantial permanent increase in ambient noise levels in the Project vicinity above levels existing without the Project?
- **Threshold 11-4:** A substantial temporary or periodic increase in ambient noise levels in the Project vicinity above levels existing without the Project?

4.11.6 IMPACT ANALYSIS

Threshold 11-1: Would the Project result in exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

Baseline conditions for noise include the continued operation of 26 existing production wells and 10 injection wells in the City IOF at the time of NOP issuance. Impacts of the proposed Project's 30 new wells, in combination with the existing 36 active wells, are discussed under Section 4.11.7 Cumulative Impacts.

Besides the existing TVIC tank farm, there are no oil-related processing facilities located at the Project Site, and no new major processing facilities will be allowed to be constructed within the Project Site as part of the Specific Plan (Section 14). The long-term operation of the 30 new wells reflects the Project-related noise-generating activities that would most likely occur constantly, excluding other periodic short-term activities assumed in the Maximum Buildout Scenario such as grading/earthmoving activity, drilling, redrilling, and well stimulation activity, which would occur sporadically over time. The Maximum Buildout Scenario for simultaneous activities of short-term duration (e.g., drilling, hydraulic fracturing) is considered under Threshold 11-4 below.

The proposed 30 new wells that would be allowed under the Specific Plan were assumed to be at least at the setback requirement of 400 feet from Developed Areas and at least 75 feet from any public roadway, as required by Specific Plan Section 21.J.1. However, the specific locations of these future new wells are unknown at this time, and as a result, they were dispersed within the City IOF to generally reflect the dispersion of well locations in the current condition for noise analysis purposes, as depicted in Exhibit 4.11-3, Potential Future Operation Noise Contours. This graphic shows possible future 30 well locations that would be running concurrently for 24-hours per day in at full buildout, assuming the maximum number of wells are drilled per year as allowed by the Specific Plan.

A state of the art computer noise model, SoundPLAN, was used to predict future operational noise levels and generate noise contours. SoundPLAN takes a number of significant variables into account, including source sound power levels; the distance from sources to receivers; the heights of sources and receivers; barrier effects provided by walls or buildings; and topographical effects. Input data and assumptions include the following:

- According to the manufacturer's data and sound level measurements in oil fields from other noise studies, pumping units can generate a sound power level of 82.1 dBA from engine on pads (Behrens and Associates 2012). As a result, a sound power level of 85 dBA was conservatively assumed for each well. A source height of ten feet was assumed based on engineering judgment.
- Ground elevation contours from the U.S. Geologic Survey (USGS) National Elevation Dataset with ten feet increment accuracy were utilized in the noise model.
- A ground absorption factor of 1.0 was utilized in the noise model to represent the ground characteristics of the site (0 being hard ground and 1 being soft ground)

Two criteria were applied for thresholds of significance. One criterion is 65 dBA CNEL design standard for exterior residential land use and 50 dBA CNEL design standard for interior office building land use specified in Culver City General Plan (Table 4.11-2). The other criterion is that operations cause hourly, A-weighted equivalent noise levels at the property line of a neighboring use to be elevated by more than 5 dBA above the existing baseline value during the daytime

Potential Future Operation Noise Contours

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(defined in the Specific Plan as 7:00 AM to 10:00 PM), or more than 3 dBA above the existing baseline value during the nighttime (defined in the Specific Plan as 10:00 PM to 7:00 AM), as specified in Sections 22.A.2 and 22.A.3 of the Specific Plan.

The results of the analysis for the 30 new wells allowed under the Specific Plan are shown in Exhibit 4.11-3. The nearest distance from Project noise sources to residential receptors on Stoneview Drive adjacent to the northern property line is approximately 400 feet. The projected operation hourly L_{eq} from the Project at these receptors would be 35 dBA, as shown on Exhibit 4.11-3, which can be converted to a CNEL of 41 dBA assuming identical hourly L_{eq} (see the definition of CNEL in Section 4.11.1). Existing noise levels north of the Project Site were measured at 48 to 60 dBA L_{eq} with a CNEL of 55 dBA.

The Project-generated operational CNEL at the residential area north of the Project Site is estimated to be approximately 14 dBA less than the existing 55 dBA CNEL noise level. If the forecasted Project-generated operational noise is added to the existing measured noise, the noise level increase would be less than 0.3 dBA and would not result in a perceptible change in noise levels. (As described in Section 4.11.1, decibels are not numerically additive.) In addition, the predicted CNEL of 41 dBA would be less than the threshold of 65 dBA CNEL for exterior residential land use as specified in the Culver City General Plan.

The nearest noise receptors of office buildings are adjacent to the west Project boundary. The predicted exterior operation hourly L_{eq} from the Project at these receptors would be 32 dBA, which can be converted to a CNEL of 39 dBA assuming identical hourly L_{eq} . The predicted Project-generated operational CNEL at the office building west of the Project Site is estimated to be approximately 16 dBA lower than the existing 55 dBA CNEL noise levels. If the forecasted Project-generated operational noise is added to the existing measured noise, the noise level increase would be less than 1 dBA above existing CNEL and the predicted CNEL would be 55 dBA. Generally a minimum of 20 dBA exterior-to-interior noise reduction could be achieved with doors and windows closed for the office buildings. As a result, the predicted interior CNEL of the office buildings would be 35 dBA. The noise level would meet the 50 dBA CNEL design standard for interior office building land use, and the increase in noise level would be less than 5 dBA above the existing baseline value during the daytime. The main use of office buildings is during the daytime generally and the criterion of 3 dBA above the existing baseline value during the nighttime doesn't apply in this situation.

In summary, because Project-related operational noise from the 30 new wells at full buildout of the Specific Plan would be below the significance thresholds for noise, potential noise impacts would be less than significant from future oil and gas well operations. No mitigation is required.

Threshold 11-2: Would the Project result in exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

Well pad grading and earth-moving activities associated with the Project have the potential to generate vibration to the adjacent residences and their occupants. Operation of heavy equipment (e.g., drilling rig and workover rig) creates seismic waves that radiate along the surface of the earth and downward into the earth. These surface waves can be felt as ground vibration. Vibration from operation of this equipment can result in effects ranging from annoyance to structural damage. Activities that can result in significant levels of ground vibration generally falls into two categories that are best characterized by the cause of the vibration and its duration. Vibration that is steady-state and more or less continuous can be caused by vibratory compaction of soil, vibratory pile driving, movement of large equipment, and other sources. In contrast, vibration that is much more transient in nature and intermittent due to impulsive forces can be caused by pile

driving and blasting. The Project would not include pile driving or blasting, although there may be hydraulic fracturing.

The California Department of Transportation (Caltrans) vibration damage potential guideline thresholds are shown in Table 4.11-4 (Caltrans 2013b).

	Maximum ppv (in/sec)			
Structure and Condition	Transient Sources	Continuous/Frequent Intermittent Sources		
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08		
Fragile buildings	0.2	0.1		
Historic and some old buildings	0.5	0.25		
Older residential structures	0.5	0.3		
New residential structures	1.0	0.5		
Modern industrial/commercial buildings	2.0	0.5		
ppv: peak particle velocity; in/sec: inch(es) per second				
Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.				

 TABLE 4.11-4

 GUIDELINE VIBRATION DAMAGE POTENTIAL THRESHOLD CRITERIA

Source: Caltrans 2013b.

The nearest structures to the City IOF are the homes near the northern Project Site boundary. In terms of the classifications in Table 4.11-4, these structures are "older residential structures". Therefore, the criteria for a significant impact is 0.5 peak particle velocity (ppv) inch per second (in/sec) for transient sources and 0.3 ppv in/sec for continuous or frequent intermittent sources.

The Caltrans guideline vibration annoyance potential guideline thresholds are shown in Table 4.11-5 (Caltrans 2013b). Based on the guidance in Table 4.11-5, the "distinctly perceptible" vibration level of 0.24 ppv in/sec is considered as a threshold for a potentially significant vibration impact for human annoyance.

Average Human Response	ppv (in/sec)		
Severe	2.0		
Strongly perceptible	0.9		
Distinctly perceptible	0.24		
Barely perceptible	0.035		
ppv: peak particle velocity; in/sec: inch(es) per second			
Source: Caltrans 2013b.			

TABLE 4.11-5 GUIDELINE VIBRATION ANNOYANCE POTENTIAL CRITERIA

Table 4.11-6 summarizes typical vibration levels measured during construction activities for various vibration-inducing pieces of equipment at a distance of 25 feet.

Equipment		ppv at 25 ft (in/sec)		
Bile driver (impact)	upper range	1.518		
	typical	0.644		
Rile driver (vibratory)	upper range	0.734		
	typical	0.170		
Vibratory roller		0.210		
Large bulldozer		0.089		
Caisson drilling		0.089		
Loaded trucks		0.076		
Jackhammer		0.035		
Small bulldozer		0.003		
ppv: peak particle velocity; ft: feet; in/sec: inches per second.				
Source: Caltrans 2013b; FTA 2006.				

TABLE 4.11-6VIBRATION LEVELS FOR CONSTRUCTION EQUIPMENT

Operation of large bulldozers and loaded trucks near the residences would not occur due to the 400-foot buffer zone restriction set forth in the Specific Plan, which would not allow for new wells to be drilled, and therefore no new well pads, in the buffer zone. Groundborne vibration may be created by loaded trucks accessing the well pads to support the well stimulation treatment activities and drilling rigs. Because of the buffer zone requirement, trucks can only work as close as 400 feet away from the residences on the Stoneview Drive for well stimulation and drilling rig may produce 0.089 ppv in/sec at 25 feet. At a distance of 400 feet, a loaded truck may produce 0.0012 ppv in/sec and a drilling rig may produce 0.0014 ppv in/sec. The loaded truck vibration level would be less than 0.24 ppv in/sec threshold at the closest receptors and would be less than significant.

Based on a hydraulic fracturing study conducted in the Inglewood Oil Field, measured levels indicated that the maximum ground-borne vibration during high-volume hydraulic fracturing operations was 0.006 ppv in/sec, as measured 40 feet from the operation, and the vibration level was 0.001 ppv in/sec at 160 feet from the operation (Cardno Entrix 2012). Well stimulation events, as part of the Project, would be at least 400 feet from the closest receptor north of the Project Site. Well stimulation vibration levels would be less than 0.001 ppv in/sec at the closest receptors and would be less than significant.

A drilling rig would produce a vibration of 0.089 ppv in/sec at 25 feet. Well stimulation treatments, including a hydraulic fracturing operation, generally create lower levels than these at the surface under 0.02 ppv in/sec. No structural damage is anticipated, and these vibration levels fall below the "barely perceptible" human response at distances beyond 45 feet (DOC 2015a). The rumbling sound caused by the vibration of room surfaces is called groundborne noise. As the anticipated vibration levels would be well below the "barely perceptible" threshold of 0.035 ppv in/sec, there would not be significant impacts related to groundborne noise. The vibration impact from activities associated with the Project would be less than significant and no mitigation is required.

Threshold 11-3: Would the Project result in a substantial permanent increase in ambient noise levels in the Project vicinity above levels existing without the Project?

As discussed under Threshold 11-1 and shown in Exhibit 4.11-3, the operational 24-hour 65 dBA CNEL and the hourly noise contour would be contained within the Project Site for the 30 new wells allowed pursuant to the Specific Plan. Therefore, the long-term operation of the 30 new wells would not expose persons to or generate noise levels in excess of the 65 dBA CNEL standard established in City of Culver City and ambient noise would not be increased by more than 5 dBA above the existing baseline value of 55 dBA CNEL at the property line of a neighboring use during the day time. The noise impact would be less than significant from future oil field operation with the Project.

Based on data in Section 4.14, Transportation and Traffic, the expected Project-related traffic volume increase resulting from implementation of the Project would be less than 1 percent during the AM and PM peak hours for the four analyzed intersections. As described in Section 4.11.1, a doubling of traffic volume would increase noise levels by 3 dBA and a one percent increase in traffic volume would increase noise levels by less than 0.05 dBA. As a result, noise impact from increased traffic would be less than significant.

Threshold 11-4: Would the Project result in a substantial temporary or periodic increase in ambient noise levels in the Project vicinity above levels existing without the Project?

According to Section 3.2.4 in the Project Description, a reasonable Maximum Buildout Scenario for periodic noise-generating activity that could occur in any given year prior to 2032 could include the project-related simultaneous activities listed below:

- Drilling of 1 new well
- Rework at 2 well sites
- Hydraulic fracturing at 1 well site
- Construction-level grading activity at 1 well site location

The primary noise sources during typical well pad grading and earthmoving activities are the diesel engines of equipment. Variation in power is an element in characterizing the noise source level from equipment and is accounted for by describing the full power or maximum noise level and the duty cycle. The duty cycle is the percent of time that the equipment is operating at full power. Typical maximum noise levels and duty cycles of representative types of equipment are listed in Table 4.11-7.

TABLE 4.11-7
TYPICAL MAXIMUM NOISE LEVELS AND DUTY CYCLES
FOR CONSTRUCTION EQUIPMENT

Equipment	Noise Level (dBA) at 50 ft	Typical Duty Cycle		
Auger Drill Rig	85	20%		
Backhoe	80	40%		
Chain Saw	85	20%		
Compactor (ground)	80	20%		
Compressor (air)	80	40%		
Concrete Mixer Truck	85	40%		
Concrete Pump	82	20%		
Concrete Saw	90	20%		
Crane (mobile or stationary)	85	20%		
Dozer	85	40%		
Dump Truck	84	40%		
Excavator	85	40%		
Front End Loader	80	40%		
Generator (25 KVA or less)	70	50%		
Generator (more than 25 KVA)	82	50%		
Grader	85	40%		
Jackhammer	85	20%		
Mounted Jackhammer (hoe ram)	90	20%		
Paver	85	50%		
Pneumatic Tools	85	50%		
Pumps	77	50%		
Rock Drill	85	20%		
Scraper	85	40%		
Tractor	84	40%		
Vacuum Excavator (vac-truck)	85	40%		
Vibratory Concrete Mixer	80	20%		
Vibratory Pile Driver	95	20%		
dBA: A-weighted decibels; ft: feet; KVA: kilovolt amps				
Note: Machinery equipped with noise-control devices or other noise-reducing design features do not generate the same level of noise emissions as those shown in this table.				
Source: Thalheimer 2000; FHWA 2008				

As discussed above, the following four short-term/periodic activities could reasonably be expected occur simultaneously within the City IOF.

Well Pad Grading and Other Earth-Moving Activities

This Draft EIR assumes that in the Maximum Buildout Scenario, one well pad would be under construction on the Project Site at a time. Development of the well pad would include grading equipment, such as a bulldozer or backhoe, and one water truck. This equipment would be used on the day shift only. The noise levels for this equipment is shown in Table 4.11-7.

New Well Drilling (or Redrilling)

Only one drill rig can operate at a time, per the requirements of the Specific Plan. The drill rig would be in operation 24-hours per day, and depending on the depth of the well and characteristics of the subterranean soils/bedrock, could be in operation for weeks. The equipment used during the drilling includes drilling rig, mud pumps, water truck, and other service and equipment trucks. Table 4.11-8 indicates the sound power levels of the rig and ancillary equipment used from another noise study (Behrens and Associates 2012). The calculated noise level from this equipment would be in the mid-70s dBA at a distance of 100 feet. Another noise study showed that the combined drilling sound level was measured from 76 to 80 dBA at a distance of 100 feet from the drilling rig (Behrens and Associates 2006). The noise level of 80 dBA at a distance of 100 feet can be converted to a sound power level of 118 dBA.

Equipment	Sound Power Level (dBA)	Quantity		
Rig engines	99.4	2		
Shaker table	96.8	1		
Mud pumps	101.3	2		
Generators	103.2	3		
dBA: A-weighted decibels Source: Behrens and Associates 2012				

TABLE 4.11-8SOUND POWER LEVELS OF DRILLING RIG EQUIPMENT

Well Stimulation Techniques

A typical hydraulic fracturing event occurs over approximately 1 to 2 days and contains 3 to 5 stages, with a total of approximately 2 to 4 hours of pumping (20 to 60 minutes per stage), and the remaining time is used for a crew to set bridge plugs and perforate prior to each stage. Table 4.11-9 presents the noise assumptions data from hydraulic fracturing activities (DOC 2015a).

Sound Power Level Assumed Use **Equipment**^a Activity Number **Factor**^b (dBA) Van Data monitoring^c 2 107 100 Pump truck Pumping engine 4 132 17 4 17 Pump truck Pumps 106 Tanker/mixer (5,000 gallon) Gel storage and hydration unit 1 109 17 Blender Blend fluid and proppant 1 119 17 Crane Lifting heavy equipment 1 119 5 2 Sand chief (15-ton capacity) Sand storage 113 17 2 Pickup truck or van People/tools transport 86 5 dBA: A-weighted decibels

TABLE 4.11-9HYDRAULIC FRACTURING EQUIPMENT NOISE

^a 50 trips by water trucks, up to 12 sand trucks and other materials supply trucks will access the site prior to fracturing activities.
 ^b Percent of time equipment operating on site during the 48 hours of hydraulic fracturing activity.

Workers in the monitoring van include individual personnel responsible for: (1) status of equipment; (2) monitoring blending;
 (3) engineering; (4) quality control of the fluid being pumped; and (5) observation (from the operator company).

Source: Behrens and Associates, 2012.

Based on a typical hydraulic fracturing job in California, the required equipment includes pump truck, tanker/mixer, blender, crane, sand chief, and water tanks and trucks. Pumping is the loudest activity during the hydraulic fracturing process, as shown in Table 4.11-9. The calculated sound power level is 130 dBA from equipment with consideration of assumed use factor.

Well Rework

Only two rework rigs could operate at the same time per Specific Plan Section 33.A. A measurement showed a noise level of 50.7 dBA from a rework rig at a distance of 650 feet, which is equivalent to a noise level of 67.0 dBA at a distance of 100 feet (Central Valley Gas Storage 2010). Thus, noise from a well rework rig would be less than that of new well drilling. The measured well rework noise level can be converted to a sound power of 105 dBA.

Analysis of Temporary/Short-Term Activity

Based on the assumptions above for the Maximum Buildout Scenario, the SoundPLAN model was used to estimate combined activity short-term noise levels, which would include one new well drilling activity, two well rework activities, one well pad grading and earthmoving activity, and one hydraulic fracturing event being conducted simultaneously. As shown in Exhibit 4.11-4, Construction and Maintenance Noise Contours, these activities were modeled in possible locations throughout the City IOF, with the 24-hour drilling operation occurring in the most conservative location adjacent to the nearest sensitive receptor. Exhibit 4.11-4 shows the noise contours without any mitigation or noise barriers. Pre-mitigation impacts associated with these concurrent activities for daytime and nighttime scenarios are discussed below. Equipment sound power levels were taken directly from the data above or converted from sound pressure levels in Table 4.11-7.

Source heights were based on engineering judgment. Input data include the following:

- One backhoe and one water truck for well pad grading and earthmoving activity. Backhoe with a source height of five feet and a sound power level of 108 dBA and water truck with a source height of five feet and a sound power level of 104 dBA.
- Six trucks, one drilling rig, two diesel-powered mud pumps, and one water truck for new well drilling activity. Trucks with a source height of five feet and a sound power level of 73 dBA. Drilling rig with a source height of 10 feet and a sound power level of 118 dBA. Mud pumps with a source height of 5 feet and a sound power of 101 dBA, and water truck with a source height of 5 feet and a sound power level of 104 dBA.
- Pump truck, tanker/mixer, blender, crane, sand, trucks would be used for well stimulation activities. A combined source height of 10 feet and a sound power level of 130 dBA,
- Two rework rigs for rework activity. Rework rig with a source height of 10 feet and a sound power level of 105 dBA.
- Receiver height of five feet above ground.

Noise levels were modeled without and with barriers around the work areas. Based on iterations of barrier heights, a 20-foot-high barrier was selected to provide the necessary noise reduction to meet the significant impact noise criteria. Noise contours for the mitigated scenario with the 20-foot noise barrier (see MM NOI-1) is depicted in Exhibit 4.11-5, Construction and Maintenance Noise Contours With Barrier. Post-mitigation impacts associated with these concurrent activities for daytime and nighttime scenarios are discussed below.

Two criteria will be used for thresholds of significance. One criterion is 65 dBA CNEL design standard for exterior residential land use specified in Culver City General Plan (Table 4.11-2). The other criterion is that well drilling, redrilling, reworking, maintenance and well-stimulation activities must not elevate noise levels above the existing baseline value during the daytime (defined in the Specific Plan as 7:00 AM to 10:00 PM), or more than three dBA above the existing baseline value during the nighttime (defined in the Specific Plan as 10:00 PM to 7:00 AM), as specified in Sections 22.A.2 and 22.A.3 of the Specific Plan.

Daytime Activities

Exhibit 4.11-4 shows the noise contours from the Maximum Buildout Scenario, described above. Without noise abatement, the noise levels on the residential area adjacent to the northern Project Site would be in the high 50s dBA L_{eq} during daytime activities. For example, the noise level for the first row of residences on Stoneview Drive is calculated to be 62 dBA L_{eq} . A noise level of 62 dBA L_{eq} would be a 14 dBA increase when compared to the lowest Blair Hills neighborhood measured daytime noise level of 48 dBA (Table 4.11-3). This increase would exceed the five dBA limit of the Specific Plan, and would be a significant impact.

To mitigate the Maximum Buildout Scenario noise, a 20-foot-high acoustical barrier is recommended to be erected around work sites where daytime well rework and/or well pad construction would occur, as required in MM NOI-1. With the installation of noise barriers, a noise reduction of 10 dBA could be obtained for that first row of residences and the noise level would be reduced to approximately 52 dBA L_{eq}, as shown in Exhibit 4.11-5. The noise level increase above ambient conditions would be approximately 4 dBA based on measured lowest Led of 48 dBA; a 3 dBA noise change is the smallest perceivable noise level difference. After MM NOI-1 with 20-foot-high barriers, the Maximum Buildout Scenario noise increase during the daytime would be less than the 5 dBA daytime significance threshold at the nearest residential receptors. Similarly, the visitors at the Stoneview Nature Center and other recreational facilities adjacent to the Project Site would be separated by the 400-foot buffer and would receive a similar noise attenuation in accordance with MM NOI-1. As such, noise impacts related to the short-term and periodic daytime noise would be less than significant with mitigation. Additionally, MM NOI-3 requires that residents/property owners within 500 feet of a proposed well drilling, redrilling, reworking, or well stimulation event be notified of the short-term periodic construction-related activity on the City IOF, and shall be provided a method to report excessive noise, as described in MM NOI-3.

The predicted exterior noise level for the office building would be similar to that of residential properties because of the 400-foot buffer requirement set forth in the Specific Plan that prohibits new drilling and well stimulation activity within that area. The predicted interior noise level would be much less due to exterior-to-interior noise reduction expected through standard building construction. As a result, the noise impact at the office building would be less than significant. Noise levels are expected to be less with different rework, construction, and other activity locations because those well activity locations would be at greater distances from the sensitive receptor uses and because the number of concurrent operations would likely be less. For some or many activities, a barrier height of 20 feet may not be required and perhaps no barrier would be required. Therefore, it is recommended that the noise abatement requirements be determined on a case-by-case basis by noise analysis prior to approval of the Annual Drilling Plan as described in MM NOI-1.

Nighttime Activities

Although well rework, pad grading, and well stimulation are limited to daytime hours, well drilling for a new well, or redrilling for an existing well, is a continuous 24-hour operation. A separate noise analysis was conducted for well drilling activity during nighttime hours. To simulate a "worst-case" scenario, it was assumed that the well drilling is 400 feet from the northern Specific Plan boundary (i.e., closest proximity to residential sensitive receptors). In addition to the daytime noise increase limit of 5 dBA, Section 22.A.3 of the Specific Plan limits the nighttime noise levels at any sensitive receptor to no more than 3 dBA above a one-hour baseline average for the defined nighttime period. This criterion will be used for thresholds of significance. Without noise abatement, the predicted L_{eq} for the first row residences along Stoneview Drive would be 62 dBA, which would be a significant impact.

Per MM NOI-2, the Oil Field Operator must demonstrate prior to issuance of the Drilling Use Permit that all feasible measures have been incorporated to reduce nighttime noise levels to the limits set forth in the Specific Plan. A noise reduction of 10 dBA could be obtained with a 20-foothigh barrier and the mitigated exterior L_{eq} would be 52 dBA. The lowest hourly L_{eq} from the longterm measurement was 40 dBA from 2:30 AM to 3:30 AM. If the forecasted Project-generated drilling noise is added to the lowest measured noise, the noise level increase would be 12 dBA, which exceeds the 3 dBA nighttime significance criterion. Noise levels would be reduced with the implementation of a Quiet Mode Drilling Plan, as required by Section 22.C of the Specific Plan. However, the noise reduction from the Quiet Mode Drilling Plan cannot be reasonably quantified. Therefore, even with incorporation of MM NOI-2, depending on the location of the new well drilling equipment, the noise impact due to new well drilling during nighttime hours would remain significant and unavoidable.

Project-related noise levels occurring during the night are also evaluated relative to noise level thresholds for sleeping areas. Based on the Federal Transit Administration, sleeping areas should not be exposed to noise levels in excess of 40 dBA¹. As discussed previously, mitigated exterior noise levels would be 52 dBA L_{eq} from drilling proximate to the minimum setback distance of 400 feet. Residential structures are expected to attenuate noise levels by a minimum of 26 dBA under a windows closed condition². As such, interior noise levels produced by the nighttime drilling activity would be 26 dBA Leq. This noise level is below the noise limit for sleeping areas and consequently would not result in a significant noise impact relative to sleeping areas.

Noise levels would be less with different well drilling locations. Therefore, it is recommended that the noise barrier height be determined by noise analysis at the time the Drilling Use Permit is submitted for approval as described in MM NOI-2. In addition, MM NOI-3 requires the Oil Field Operator to provide appropriate notification and community outreach.

There is one mitigation measure in DOGGR's Draft Mitigation Policy Manual prepared pursuant to the Senate Bill (SB) 4 EIR, which is included in Appendix B-2 of this Draft EIR, that is applicable to the analysis of noise. The number and title of this DOGGR SB4 measure is listed below:

• SB4 NOI-1a: Control Noise Levels Near Sensitive Noise Levels

It has been determined that the requirements and protocols for the control of noise levels during well stimulation activities set forth in the DOGGR SB4 measure listed above are already incorporated into the Specific Plan and/or the mitigation program set forth in this Draft EIR. The

¹ Based on the Federal Transit Administration's *Transit Noise and Vibration Impact Assessment*, Table 7-1.

² Based on the Housing and Urban Development Sound Transmission Classification Assessment Tool for a 2,000 square feet residence with the lowest STC rated materials.

DOGGR SB4 measure would be duplicative of these requirements and do not need to be incorporated into this Draft EIR.

4.11.7 CUMULATIVE IMPACTS

In order for a cumulative noise impact to occur, noise generated from a relatively nearby future project would need to occur concurrently with the Project noise described above. Theoretically, construction noise and drilling noise is audible at a distance of ¼ mile. However, topography, barriers (e.g., buildings, walls), and ambient noise (e.g. traffic) make this distance measurably shorter. Cumulative projects generally considered for analysis of all issues in this Draft EIR are listed in Table 2-5, Cumulative Projects, and shown on Exhibit 2-5, Location of Cumulative Projects, in Section 2.0 of this Draft EIR. As shown on Exhibit 2-5, projects within ¼ mile of noise receptors that are also noise receptors for the Project are limited to the Stoneview Nature Center and the most northerly and northwesterly parts of the County portion of the Inglewood Oil Field.

Cumulative noise exposure is shown in Exhibit 4.11-6, Combined Noise Levels from Proposed and Existing Wells, for the 30 new wells allowed by the Specific Plan, in addition to the 36 existing production and injection wells. These noise levels represent the noise sources that would operate continuously. As shown in this Exhibit, noise levels are within the 65 dBA CNEL noise threshold for residential uses. Interior noise levels at the nearest office uses would also meet the 50 dBA CNEL threshold. Therefore, operational cumulative daytime noise from the City IOF would be less than significant and no mitigation is required.

Other construction of cumulative future projects would be limited to the daytime hours and other restrictions proscribed in the CCMC Sections 9.07.015, 9.07.020 and 9.04.015.H. Daytime noise level increases from drilling, rework, redrilling, and well stimulation activities associated with the Project were found to result in less than significant noise impacts with implementation of MM NOI-1. Daytime noise activities associated with the County IOF are located further from the noise sensitive uses proximate to the Project Site, which would result in a lesser contribution in to cumulative noise levels. With implementation of MM NOI-1, the daytime Project-related direct noise levels would be less than significant for short-term periodic activities, and would not cumulatively contribute to an exceedance of noise standards.

Nighttime drilling on the County IOF could occur concurrently with nighttime drilling on the City IOF. As described above, nighttime drilling from the Project site would result in a significant and unavoidable noise impact, even with implementation of MM NOI-1, MM NOI-2 and MM NOI-3. Therefore, any additional noise from drilling in the County IOF could increase the severity of the impact, depending on the location of the drilling, and the impact would be potentially cumulatively significant. The cumulative nighttime impact cannot be quantified because the details of drilling locations and equipment are not known. There are no feasible mitigation measures in addition to those required in this Draft EIR. Therefore, the potential nighttime cumulative impact would be significant and unavoidable.

4.11.8 MITIGATION MEASURES

MM NOI-1 Prior to the commencement of well rework, well stimulation activities, or well pad grading work, the Oil Field Operator shall implement noise-abatement measures as deemed appropriate on a case-by-case basis based on the site-specific factors at the site of activity. One option would be to install temporary 20-foot-high noise barriers adjacent to the work site facing sensitive receptors (i.e., as single-family and multi-family homes; hotels and motels; long-term medical or mental care facilities; schools; libraries; business and professional office buildings; places of

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worship; concert halls; and restaurants). The barrier shall be solid from the ground to the top and shall block the line of sight to the receptors. The barrier may be constructed of acoustical blankets, plywood, or other material with a transmission loss of at least 20 A-weighted decibels (dBA). The Oil Field Operator may demonstrate by noise analysis that alternate noise abatement measures other than 20-foot-high barriers would limit the activity-generated noise level increase at sensitive receptors, considering concurrent activities when applicable, to 5 dBA L_{eq} or less, and that the noise level at sensitive receptors would not exceed 65 dBA Community Noise Equivalent Level (CNEL). The noise abatement measures and proof of compliance with noise level restrictions set forth in the Specific Plan shall be included within the Annual Drilling Plan and shall be subject to review and approval by the City of Culver City.

- **MM NOI-2** Prior to the issuance of a Drilling Use Permit, the Oil Field Operator shall demonstrate by noise analysis that the proposed noise abatement, including but not limited to noise barriers and/or increasing distance from sensitive receptors, would limit nighttime noise level increases at sensitive receptors to three dBA or less. If these noise levels are not achievable, the Oil Field Operator shall demonstrate to the satisfaction of the Community Development Director that the maximum reasonable and feasible noise abatement measures shall be used for the drilling operation.
- **MM NOI-3** At least 30 days but no more than 45 days prior to the start of well drilling, well redrilling, well rework, or well stimulation activities, all property owners and occupants within 500 feet of the event activity shall be notified of the pending work. The notification shall include the construction start date, days and hours of work, and estimated completion date. The notification shall also state that the activities will include typical and sometimes loud noise and provide phone and email contact information for reporting of noise complaints.

4.11.9 LEVEL OF SIGNIFICANCE

Operational noise at full buildout of the Specific Plan is less than significant. Short-term construction-related daytime noise is less than significant with the incorporation of MM NOI-1 and MM NOI-2; MM NOI-3 provides notification of noise events for property owners and occupants within 5500 feet of the event activity.

Significant Unavoidable Impact NOI-1: Because noise reductions from the Specific Plan's Quiet Mode Drilling Plan requirement cannot be reasonably quantified, and because MM NOI-2 and MM NOI-3 would not adequately reduce new well drilling noise during nighttime hours at the closest sensitive receptor, direct impacts and cumulative impacts from 24-hour well drilling noise could be significant and unavoidable for some potential well locations located in proximity to residences.

Table 4.1-10 below summarizes the significance finding of each threshold addressed in this section before and after mitigation, where applicable.

TABLE 4.11-10 SIGNIFICANCE SUMMARY

	Threshold	Project Level of Significance	Mitigation Measure(s)	Level of Significance after Mitigation
11-1	Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	Less than Significant	N/A	Less than Significant
11-2	Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	Less than Significant	N/A	Less than Significant
11-3	A substantial permanent increase in ambient noise levels in the Project vicinity above levels existing without the Project?	Less than Significant	N/A	Less than Significant
11-4	A substantial temporary or periodic increase in ambient noise levels in the Project vicinity above levels existing without the Project?	Potentially Significant	MM NOI-1 through MM NOI-3	Significant and Unavoidable
N/A: not	applicable			

4.11.10 REFERENCES

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