4.9 Noise and Vibration

This section describes the concepts and terminology of noise, defines the existing noise levels at noise-sensitive locations nearest to the Project Site, and describes the regulatory settings associated with the Project. This section also identifies the applicable significance thresholds for noise impacts, assesses potential impacts of the Rail Spur Project and recommends measures to mitigate significant impacts. The section also provides a discussion of cumulative noise impacts.

4.9.1 Environmental Setting

Noise is often defined as unwanted sound, which is perceived subjectively by individuals. Noise levels at various locations of an area fluctuate and change character during different periods of the day. Exposure to severe noise levels over prolonged periods can cause physiological changes, including ear damage. The acceptability of more common noise levels and types of noise varies among neighborhoods, individuals, and time of day. The following sections describe the concepts and terminology of noise and vibration and documents existing noise levels at noise sensitive locations nearest to the Project Site.

4.9.1.1 Noise Effects

Noise levels are reduced the farther away a receptor is from the source because of several effects, including geometry, atmosphere, ground, and barriers.

Geometric Effects
Geometric effect refers to the spreading of sound energy as a result of the expansion of the wavefronts. Geometric spreading is independent of frequency and has a major effect in almost all sound propagation situations. There are two common kinds of geometric spreading: spherical and cylindrical spreading. In the case of spherical spreading from a point source, which is due to a noise source radiating sound equally in all directions, the sound level is reduced by 6 decibels (dB) for each doubling of distance from the source. A busy highway would be a cylindrical source with equal sound power output per unit length of highway. A cylindrical source will produce cylindrical spreading, resulting in a sound-level reduction of 3 dB per doubling of distance.

Atmospheric Effects
Atmospheric effects are due to air absorption and wind and temperature gradients. Air absorption is primarily due to the “molecular relaxation effect” between air molecules, where air molecules are excited and then relaxed by the passing sound pressure wave. High frequencies are absorbed more than low frequencies. The amount of absorption depends on the temperature and humidity of the atmosphere.

Precipitation (rain, snow, or fog) has a nominal effect on sound levels although the precipitation will affect the humidity and may also affect wind and temperature gradients. Atmospheric

absorption is only an issue at higher frequencies and is a strong function of humidity and temperature. For example, at 68 degrees Fahrenheit (°F) and 70% humidity, air absorption of sound at frequencies of 16,000 hertz (Hz) occurs at approximately 8 dB per 100 feet. However, at 0% humidity, the rate drops to approximately 1 dB per 100 feet.

Under normal circumstances, atmospheric absorption can be neglected except where long distances or high frequencies are involved (greater than 4,000 Hz). At less than 2,000 Hz, the rate of sound level drop, due to air absorption, is less than 0.25 dB per 100 feet (at 68°F and 70% humidity).

The speed that sound propagates in a gas depends on the temperature of the gas. Higher temperatures produce higher speeds of sound. Since the temperature of the atmosphere is not uniform, there are local variations in the sound speed. For example, under normal conditions the atmosphere is cooler at higher altitudes. This results in sound waves being 'bent' upwards. This will result in the formation of a shadow zone, which is a region in which sound does not penetrate. In reality, some sound will enter this zone due to scattering. Scattering occurs when sound waves are propagating through the atmosphere and meet a region of inhomogeneity (a local variation in sound speed or air density) and some of their energy is re-directed into many other directions. In environmental noise situations, scattering is caused by air turbulence, rough surfaces, and obstacles, such as trees. The scattering of sound by rain, snow, or fog at ordinary frequencies is insignificant.

Under conditions of a temperature inversion (temperature increasing with increasing height), the sound waves will be refracted downwards, and therefore may be heard over larger distances. This frequently occurs in winter and at sundown.

When a wind is blowing there will be a vertical wind gradient because the layer of air next to the ground is stationary. A vertical wind gradient results in sound waves propagating upwind being 'bent' upwards and those propagating downwind being 'bent' downwards. This effect can cause noise levels downwind to be higher than those upwind.

Temperature and wind gradients can result in measured sound levels being very different to those predicted from geometrical spreading and atmospheric absorption considerations alone. These differences may be as great as 20 dB. These effects are particularly important where sound is propagating over distances greater than 500 feet. Temperature inversions and winds can also result in the effectiveness of a barrier being dramatically reduced. These variables are addressed as part of the noise modeling conducted for the Rail Spur Project.

Ground and Barrier Effects

If sound is propagating over ground, attenuation will occur due to acoustic energy losses on reflection. These losses will depend on the surface. Smooth, hard surfaces will produce little absorption, whereas thick grass may result in sound levels being reduced by up to about 10 db per 300 feet at 2000 Hz. High frequencies are generally attenuated more than low frequencies.

Reflection from the ground can result in another mechanism by which sound levels are reduced. When the source and receiver are both close to the ground, the sound wave reflected from the ground may interfere destructively with the direct wave. This effect, called the ground effect, is

normally noticed over distances of several yards and more, and in the frequency range of 200 to 600 Hz.

Research on propagation through trees yields conflicting results. Dense shrubbery can produce effective noise attenuation. A band of trees several hundred feet deep is required to achieve significant attenuation.

Significant attenuation can be achieved with solid barriers. A barrier should be at least high enough to obscure the 'line of sight' between the noise source and receiver. A barrier is most effective for high frequencies since low frequencies are diffracted around the edge of a barrier more easily. The maximum performance of a barrier is limited to about 40 dB, due to scattering by the atmosphere. A barrier is most effective when placed either very close to the source or the receiver.

Barriers not built for acoustical purposes are often found in sound propagation situations. The most common of these are hills and buildings. In urban situations, buildings can be effective barriers. It is possible for buildings to produce a different acoustical effect. In a city street with tall buildings, multiple reflections from parallel building facades can result in considerable reverberation and consequently reduced attenuation.

The propagation of sound is very complex and influenced by a large number of factors. This report only examines the attenuation of sound due to geometry, barriers specifically placed by the Project or mitigation measures, and barriers such as the terrain, as well as air absorption for the linear decibel scale analysis.

Tonal Effects

Noise in which a single frequency stands out is said to contain a 'pure tone.' Sources that produce pure tones are often described as being 'tonal' and tend to be more noticeable – and potentially annoying – to humans than sources that do not contain pure tones. In assessing the subjective impact of tonal noise, it is common practice to take this increased annoyance into account by adding a 5-dBA penalty to the measured noise level. Section 4.9.1.2, Noise Terminology, describes the dBA rating scale.

Effects on Wildlife

Wildlife response to sound is dependent not only on the magnitude but also the characteristic of the sound, or the sound frequency distribution and whether the sound is natural or human made (noise). Wildlife is affected by a broader range of sound frequencies than humans. Therefore, a linear decibel scale (non-A weighted) analysis is preferred for wildlife impact analysis. Noise is known to affect an animal's physiology and behavior, and chronic noise-induced stress can be deleterious to an animal's energy budget, reproductive success, and long-term survival (Radle 2001).

Modeling Noise Impacts

Models are often used to estimate noise levels from proposed activities and to estimate noise levels under a range of meteorological conditions. In addition, modeling can estimate the effect of noise mitigation devices, such as sound walls and noise blankets. Noise models can incorporate a variety of environmental conditions, including the level of ground absorption,

humidity, temperature inversions, atmospheric absorption, terrain, building reflections, and road type, as well as sources including automobiles, railroads, aircraft, and industry. Both A-weighted and octave band analysis can be performed with models. In addition, models incorporate a number of standards and methods, including International Organization for Standards (ISO) 9613 and the FHWA Traffic Noise Model (TNM).

ISO 9613 specifies an engineering method for calculating the attenuation of sound during propagation outdoors to predict environmental noise levels at a distance from a variety of sources. ISO 9613 requires noise estimation using a downwind propagation under a mildly developed temperature inversion (both of which enhance sound propagation) and provides a case representation of potential effects during conditions that favor transmission of sound to the receptor. Since these conditions do not occur every day, model predictions using the ISO 9613 requirements are conservative.

In March 1998, the Federal Highway Administration (FHWA) released the traffic noise model (TNM), which was developed to aid compliance with policies and procedures under FHWA regulations. The FHWA TNM addresses five different vehicle types (automobiles, medium trucks, heavy trucks, buses, and motorcycles), constant- and interrupted-flow traffic, and different pavement types, as well as the effects of graded roadways.

The primary noise models currently available that incorporate ISO 9613 and TNM are SoundPlan and Computer Aided Noise Abatement (CadnaA). Each of these high-end computational models enables a wide range of analysis.

For assessing rail noise, the Federal transportation Administration (FTA) has developed specific noise models to assess railroad noise (FTA 2006) based on a variety of factors including locomotive types, number of locomotives, number of cars, speed, track type and horn activity.

Noise Mitigation

Since industry and transportation related noise can often impact sensitive receptors, many mitigation methods are available to reduce this noise, including walls, engine exhaust silencers, mufflers, acoustical equipment enclosures, noise-absorbing blankets and padding, and sound-dampening flooring and siding materials. Properly installed acoustical materials can reduce noise by up to 40 dB, averaged over the frequency range.

The noise-reducing efficiency of insulating and acoustical materials is greater for higher frequency noise. For example, sound with a frequency of 4,000 Hz could be reduced as much as 50 to 60 dB by the same materials that would reduce 125 Hz frequency noise by less than 10 dB. Therefore, the choice of material and noise barrier design are functions of the type of equipment generating the noise.

A sound transmission class (STC) number, expressed as a frequency, rates insulating and noise barrier material as an average decibel loss across several sound frequencies. The stated STC for a given material is generally the maximum decibel reduction achievable with a perfect enclosure. Table 4.9.1 lists several barrier materials and their STC ratings.

Both the engine operation and the exhaust system of internal combustion engines generate noise. Advanced silencers and mufflers can reduce exhaust system noise levels by 10 dBA for industrial grade and by as much as 40 dBA for hospital grade silencers.

Table 4.9.1 Sound Loss by Various Noise Barrier Materials

Sound Transmission Class of Materials	STC (dB)
Concrete, 12 inches thick	53
Concrete block wall, unpainted	44
Metal panel, 4 inches thick (solid and perforated)	41
Metal panel, 2 inches thick (solid and perforated)	35
Fiberglass curtain, 2 inches with barrier of 2.5 pounds per square foot	33
Steel wall, 3/16 inch thick	31
Gypsum wallboard, 5/8 inch thick	30
Fiberglass curtain, 1 inch, barrier of 1.3 pounds per square foot	27
Wood door, solid core, closed	27
Plasterboard, 3/8 inch	26
Barrier material, density of 1.5 pounds per square foot	27
Barrier material, density of 2.5 pounds per square foot	33
Steel, 22-gauge	25

Note: STC = Sound Transmission Class, a single number rating derived from decibel loss data at several frequencies.
Source: Smock & Schonthaler

Noise barriers attenuate sound in four ways: diffraction, absorption, reflection, and reduced transmission. Diffraction mechanisms reduce noise by extending the distance that noise waves travel to the receiver from the source (see Figure 4.9-1). The noise barrier material absorbs some noise energy, while some noise is transmitted through the barrier but at a reduced energy level, and some noise is reflected from the barrier and does not reach the receiver.

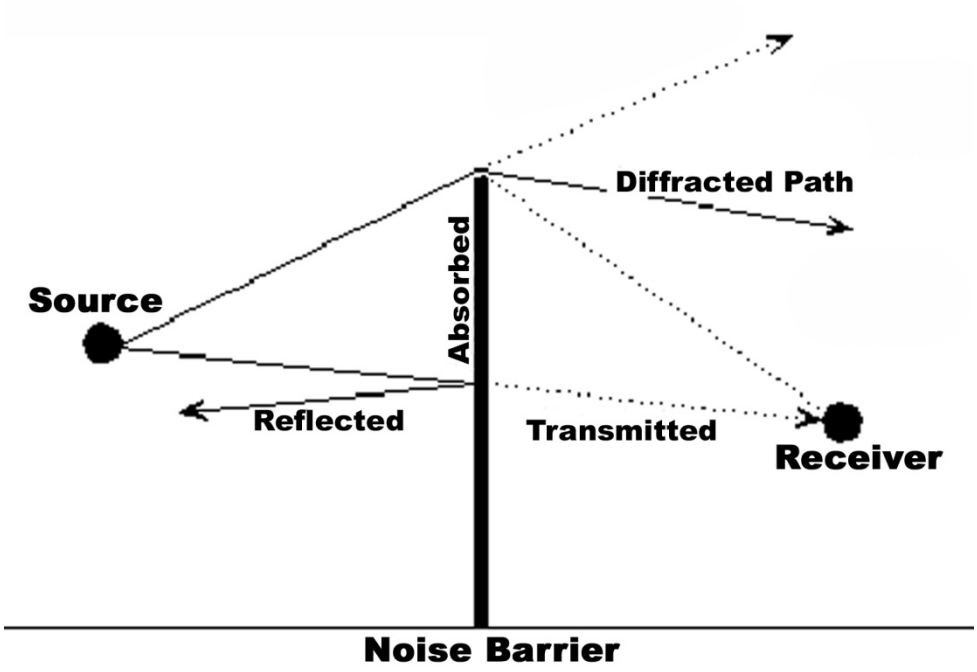
Transmitted noise is typically not taken into consideration when modeling noise attenuation by noise barriers because this noise is typically significantly lower than the source noise (FHWA 2006). The highest noise is from the diffracted portion of the attenuated noise.

4.9.1.2 Noise Terminology

Sound is technically described in terms of amplitude (loudness) and frequency (pitch). The standard unit of sound amplitude measurement is the decibel (dB). The decibel scale is a logarithmic scale that describes the physical intensity of the pressure vibrations that make up any sound. The pitch of the sound is related to the frequency of the pressure vibration. Because the human ear is not equally sensitive to a given sound level at all frequencies, a special frequency-dependent rating scale has been devised to relate noise to human sensitivity. The A-weighted

decibel scale (dBA) provides this compensation by discriminating against frequencies in a manner approximating the sensitivity of the human ear.

Figure 4.9-1 Noise Attenuation Mechanisms



Source: Adopted from FHWA 2000

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 are the sounds from individual local sources. These sounds can vary from an occasional aircraft flyover to virtually continuous noise from traffic on a nearby roadway. Table 4.9.2 lists representative noise levels for specific activities.

Several rating scales have been developed to analyze the adverse effect of noise on people. Because environmental noise fluctuates over time, these scales consider that the effect of noise upon people largely depends upon the total acoustical energy content of the noise, as well as the time of day when the noise occurs. The rating scales of Equivalent Continuous Sound Level (Leq), minimum instantaneous noise level (Lmin), and the maximum instantaneous noise level (Lmax) are measures of ambient noise, while the Day-Night Average Level (Ldn) and Community Noise Equivalent Level (CNEL) are measures of community noise (or noise levels with penalties for noise in the evening or nighttime). Leq is the average A-weighted sound level measured over a given time interval. Leq can be measured over any time period, but is typically measured for 1-minute, 15-minute, 1-hour, and 24-hour periods. CNEL is another A-weighted average sound level measured over a 24-hour time period.

Table 4.9.2 Representative Environmental Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	—110—	Rock Band
Jet Fly-over at 100 feet	—105—	
	—100—	
Gas Lawnmower at 3 feet	—95—	
	—90—	
	—85—	Food Blender at 3 feet
Diesel Truck going 50 mph at 50 feet	—80—	Garbage Disposal at 3 feet
Noisy Urban Area during Daytime	—75—	
Gas Lawnmower at 100 feet	—70—	Vacuum Cleaner at 10 feet
Commercial Area	—65—	Normal Speech at 3 feet
Heavy Traffic at 300 feet	—60—	
	—55—	Large Business Office
Quiet Urban Area during Daytime	—50—	Dishwasher in Next Room
	—45—	
Quiet Urban Area during Nighttime	—40—	Theater, Large Conference Room (background)
Quiet Suburban Area during Nighttime	—35—	
	—30—	Library
Quiet Rural Area during Nighttime	—25—	Bedroom at Night, Concert Hall (background)
	—20—	
	—15—	Broadcast/Recording Studio
	—10—	
	—5—	
Lowest Threshold of Human Hearing	—0—	Lowest Threshold of Human Hearing

Idling locomotive would have a noise level of about 75 dBA at 50 feet.
Source: FTA 2006

This noise scale is adjusted to account for some individuals' increased sensitivity to noise levels during the evening and nighttime hours. Leq, Lmin, and Lmax, as well as Ldn and CNEL are all applicable to this analysis and defined as follows:

- Leq, the equivalent energy noise level in dBA, is the average acoustic energy content of noise for a stated period of time. Thus, the Leq of a time-varying noise and that of a steady noise are the same if they deliver the same acoustic energy to the ear during exposure. For evaluating community impacts, this rating scale does not vary, regardless of whether the noise occurs during the day or the night.
- Ldn, the Day-Night Average Level, is a 24-hour average Leq with a 10 dBA 'weighting' or penalty added to noise the hours of 10:00 p.m. to 7:00 a.m. to account for people's increased noise sensitivity during the nighttime. The logarithmic effect of these additions is that a 60 dBA 24-hour Leq would result in a measurement of 66.4 dBA Ldn.
- CNEL, the Community Noise Equivalent Level, is a 24-hour average Leq with a 5 dBA "weighting" during the hours of 7:00 p.m. to 10:00 p.m. and a 10 dBA "weighting" added to noise during the hours of 10:00 p.m. to 7:00 a.m. to account for noise sensitivity in the evening and nighttime, respectively. The logarithmic effect of these additions is that a 60 dBA-24 hour Leq would result in a measurement of 66.7 dBA CNEL.

- Lmin is the minimum instantaneous noise level experienced during a given period of time, in dBA.
- Lmax is the maximum instantaneous noise level experienced during a given period of time, in dBA.

Noise environments and consequences of human activities are usually well represented by average noise levels during the day or night, or over a 24-hour period, as represented by the Ldn or the CNEL. Environmental noise levels are generally considered low when the CNEL is less than 60 dBA, moderate in the 60 to 70 dBA range, and high greater than 70 dBA. Examples of low daytime noise levels are isolated, natural settings that can provide noise levels under 30 dBA and quiet, suburban, residential streets that can provide noise levels around 40 dBA. Noise levels above 45 dBA at night can disrupt sleep. Examples of moderate-level noise environments are urban residential or semi-commercial areas (typically 55 to 60 dBA daytime Leq) and commercial locations (typically above 60 dBA daytime Leq). People may consider louder environments adverse, but most will accept the higher noise levels associated with more noisy urban residential or residential-commercial areas (60 to 75 dBA) or dense urban or industrial areas (65 to 80 dBA) due to the expectations within the land use. For example, people might accept these noise levels when out shopping, on the freeway or visiting their mechanic, but these levels would not be acceptable when at home.

When evaluating changes in 24-hour community noise levels, a difference of 3 dBA is a barely perceptible increase to most people (Caltrans 1998). A 5-dBA increase is readily noticeable, while a difference of 10 dBA would be perceived as a doubling of loudness. New development within a community could potentially lead to activities that increase the 24-hour community noise levels.

4.9.1.3 Vibration

Vibration is acoustic energy transmitted as pressure waves through a solid medium, such as soil or concrete. Like noise, the rate at which pressure changes occur is the frequency of the vibration, measured in hertz (Hz). Vibration may be the form of a single pulse of acoustical energy, a series of pulses, or a continuous oscillating motion.

Ground-Borne Vibration

The extent that vibration is transmitted through the ground depends on the soil type, the presence of rock formations or man-made features and the topography between the vibration source and the receptor location. These factors vary considerably from site to site and make accurate predictions of vibration levels at receptors distant from the source extremely difficult (often impossible) in practice.

As a general rule, vibration waves tend to dissipate and reduce in magnitude with distance from the source. Also, high frequency vibrations are generally attenuated rapidly as they travel through the ground, so that the vibration received at locations distant from the source tends to be dominated by low-frequency vibration. The frequencies of ground-borne vibration most perceptible to humans are in the range from less than 1 Hz up to 100 Hz.

When a ground-borne vibration arrives at a building, there is usually an initial ground-to-foundation coupling loss. However, once the vibration energy is in the building structure it can be amplified by the resonance of the walls and floors. Occupants can perceive vibration as motion of the building elements (particularly floors) and also rattling of lightweight components, such as windows, shutters, or items on shelves. Vibrating building surfaces can also radiate noise, which is typically heard as a low-frequency rumbling known as ground-borne noise. At very high levels, low-frequency vibration can cause damage to buildings.

Soil and subsurface conditions are known to have a strong influence on the levels of ground-borne vibration. Among the most important factors are the stiffness and internal damping of the soil and the depth to bedrock. Experience with ground-borne vibration is that vibration propagation is more efficient in stiff clay soils, and shallow rock seems to concentrate the vibration energy close to the surface and can result in ground-borne vibration problems at large distances from the track. Factors such as layering of the soil and depth to water table can have significant effects on the propagation of ground-borne vibration (FTA 2006).

Vibration Measurement

Vibration may be defined in terms of the displacement, velocity, or acceleration of the particles in the medium material. In environmental assessments, where human response is the primary concern, velocity is commonly used as the descriptor of vibration level, expressed in millimeters per second (mm/s). The amplitude of vibration can be expressed in terms of the wave peaks or as an average, called the root mean square (rms). The rms level is generally used to assess the effect of vibration on humans. Vibration levels for typical sources of ground-borne vibration are shown in Table 4.9.3 below.

Table 4.9.3 Typical Levels of Ground-Borne Vibration

Source	Typical Velocity at 50 feet (inches/second, rms)[a]	Human or Building Response
Pile Driver, impact, sheetpiling	0.54	Damage to fragile buildings
Blasting from construction projects	0.10	Minor cosmetic damage to fragile buildings
Bulldozers and other heavy tracked construction equipment.	0.06	Workplace annoyance; difficulty with vibration-sensitive tasks.
Commuter rail, upper range	0.02	
Rapid transit rail, upper range	0.010	Distinctly Perceptible Residential annoyance for infrequent events
Commuter rail, typical range	0.008	
Bus or truck over bump	0.004	Barely perceptible. Residential annoyance for frequent events
Rapid transit rail, typical range	0.003	
Bus or truck typical	0.002	Threshold of perception
Background vibration	0.0004	None

a. rms = root mean square
Source: FTA 2006, FHWA 1995

Vibration can produce several types of wave motion in solids including, compression, shear, and torsion, so the direction in which vibration is measured is significant and should generally be

stated as vertical or horizontal. Human perception also depends to some extent on the direction of the vibration energy relative to the axes of the body. In whole-body vibration analysis, the direction parallel to the spine is usually denoted as the z-axis, while the axes perpendicular and parallel to the shoulders are denoted as the x- and y-axes respectively.

Large vehicles can also increase ground vibration along streets that they travel. Vibration would be a function of the vehicle speeds and the condition of the pavement. Caltrans indicates that "vehicles traveling on a smooth roadway are rarely, if ever, the source of perceptible ground vibration" and that "vibration from vehicle operations is almost always the result of pavement discontinuities, the solution is to smooth the pavement to eliminate the discontinuities (CalTrans 2004)." Trucks traveling on area roadways could cause vibrations at nearby receptors if roadways are not maintained.

4.9.1.4 Sensitive Receptors

Some land uses are more sensitive to noise than others, due to the amount of noise exposure and the types of activities typically involved. Residential areas, schools, libraries, religious institutions, hospitals, nursing homes, parks, some wildlife areas, and quiet outdoor recreation areas are generally more sensitive to noise than are commercial and industrial land uses. Receptors near the Project Site include:

- Oceano Dunes State Vehicular Recreation Area (ODSRVA);
- Oso Flaco Lake and Dunes;
- Fire Station No. 22 to the north on State Route 1 (Willow Road);
- Residences along Monadella Street and areas to the north and south of State Route 1 (Willow Road);
- Commercial uses north and south of State Route 1 (Willow Road);
- Agricultural uses to the east and south along State Route 1 (Cabrillo Highway);
- Golf course and residences to the east along State Route 1 (Cabrillo Highway); and
- Residences along routes to and from U.S. Highways 101 and 166.

In addition, areas along the railroad route that runs from the SMR are exposed to elevated noise levels due to the passenger and freight trains that run along the railroad route.

4.9.1.5 Existing Noise Sources

Existing operations at the Project Site constitute one noise source. Other noise sources near the Project Site and nearby vicinity contributing to the noise environment include traffic on adjacent roads, railroad operations, and commercial and industrial operations at neighboring facilities. The following sections discuss each of these noise sources.

Traffic Noise

The predominant sources of traffic noise at the Project Site are vehicles on State Route 1. Noise levels from traffic are estimated in the San Luis Obispo County General Plan Noise Element for 2010 traffic levels, which are estimates generated at the time of the Noise Element adoption in 1992 (San Luis Obispo 1992). The Noise Element estimates that CNEL (or Ldn) noise levels along State Route 1 near the Rail Spur Project site exceed 65 dBA due to roadway noise. Table 4.9.4 shows centerline distances to specific noise levels.

Table 4.9.4 Roadway Noise Levels: Noise Element and Calculated Current

Roadway	Segment	Noise at 100 feet, CNEL	Distance to Noise Contour, feet		
			60 CNEL	65 CNEL	70 CNEL
FHWA Model Calculated Values: Current Traffic Levels (2008)					
State Route 1	At Santa Maria Refinery entrance	65.3	342	108	34
Noise Element Values (estimated for 2010)					
State Route 1	Santa Barbara County to Valley Road	-	136	63	29
State Route 1	Valley Road to Halcyon Road	-	223	104	48
Railroad	Grade Crossing	-	525	244	113

Notes: Distances are in feet from roadway centerline. Local streets based on San Luis Obispo County Public Works Traffic Counts December 2008. Time of day distribution based on Noise Element Technical Reference Document.

Existing traffic-generated noise levels were also modeled using a version of the Federal Highway Administration Traffic Noise Model and traffic data provided by the County of San Luis Obispo and Caltrans (FHWA 1998). This analysis was conducted in order to demonstrate the noise levels associated with current traffic levels (the Noise Element addresses estimated traffic levels for 2010). The analysis indicates that properties along State Route 1 near the Refinery are exposed to a traffic-generated CNEL of 65 dBA (at 100 feet from the road centerline) and noise levels of 60 dBA are experienced as far as 136 to 342 feet from the roadway.

Railroad Noise

The railroad runs through the SMR Site. Noise levels due to railroad activity are estimated in the San Luis Obispo County General Plan Noise Element. These estimates are based on ten freight and four passenger trains per day. Distances to the 60 dB contour value range up to 525 feet from a grade crossing (see Table 4.9.3). Other areas along the mainline track would experience similar higher rail road noise levels depending upon the amount of rail traffic. Increase levels of rail traffic such as in the Bay Area and the Los Angeles basin would tend to generate higher levels of noise than for areas with less train traffic.

Commercial, Industrial, Residential, and Recreational Noise

The area near the Project Site includes some industrial and commercial uses, as well as residential and recreational uses that could generate noise which include the following:

- Recreational vehicular uses to the west at the ODSVRA;

- County Fire Department activities to the north at Fire Station No. 22;
- Residential activities to the north along Monadella Street;
- Industrial and commercial uses along State Route 1 (Willow Road);
- Industrial uses, such as a junk yard, recreational vehicle storage and repair, and auto sales, to the northeast on Alley Oop Way and Gasoline Alley Place;
- Agricultural activities to the east and southwest; and
- Recreational and golf activities to the east at Monarch Dunes Golf Club along State Route 1 (Cabrillo Highway).

All of these locations potentially produce noise on an intermittent basis due to activities.

Agricultural Noise
The San Luis Obispo County General Plan Noise Element discusses noise associated with agricultural operations. Noise levels from agricultural sources that could be in the project vicinity include diesel engines (74 to 85 dBA at 50 feet) and tractors (72 to 75 dBA at 50 feet).

4.9.1.6 Noise Measurements

Noise measurements were obtained as part of previous EIR analysis' (SLOCAPCD 2012) on June 21, 2011 and January 27, 2014, in the vicinity of the Project Site, and along transportation routes. The 2011 measurements were taken at four locations during the day, evening, and nighttime to allow for a calculation of CNEL. The 2014 measurements were taken at three locations near residential areas and were monitored continuously from the afternoon of January 27 to the evening of January 29, 2014. The results of these measurements and their locations are shown in Table 4.9.5.

The noise baseline in the area is generally dominated by traffic noise, which produces a CNEL close to 69 dBA for areas close to roadways (along State Route 1). Residential areas close to the SMF experience noise levels ranging from approximately 52 to 69 dBA CNEL.

The Applicant also conducted noise measurements as submitted in their Application materials. Noise measurements were conducted October 18-19, 2012 at specific locations listed in Table 4.9.5 (measurements 1-4 and A1-A4).

Table 4.9.5 Existing Ambient Noise Levels Near the Project Site: Short Term Monitoring

#	Location	Daytime Leq (dBA)	Evening Leq (dBA)	Nighttime Leq (dBA)	CNEL (dBA)	Noise Sources
1	Oso Flaco Lake Parking lot	43.6	40.1	48.9	54.9	Visitors, wind, surf, automobiles, birds, frogs (at night) tractors
2	Willow Road and Guadalupe Road	65.8	65	60.9	68.9	Traffic noise on Willow and Highway 1

Table 4.9.5 Existing Ambient Noise Levels Near the Project Site: Short Term Monitoring

#	Location	Daytime Leq (dBA)	Evening Leq (dBA)	Nighttime Leq (dBA)	CNEL (dBA)	Noise Sources
3	Winterhaven Way	59.2	51.5	42.0	57.3	Traffic noise on Highway 1, dogs, fire station alarms, occasional alarms from the Refinery
4	Monadella Street	49.3	45	43.6	51.5	Traffic noise from Highway 1, birds, wind in trees
A1	Hwy 1 and Via Concha	54.5	-	45.6	-	-
A2	Near Nathan Way	51.0	-	40.0	-	-
A3	Olivera Avenue	49.5	-	40.4	-	-
A4	Gasoline Alley	56.1	-	41.7	-	-
5	Mesa View Storage	59.7	56.3	49.3	64.8	Traffic noise from Hwy 1
6	Olivera and Los Reyes	43.2	41.0	40.2	55.2	Traffic noise, occasional residential noise
7	1918 Eucalyptus Rd.	48.7	46.5	38.6	54.1	Traffic noise, occasional residential noise

Note: Source: In-field measurements 1-4 taken June 21, 2011 by MRS with a Quest 1900 noise meter. Measurements A1-A4 taken October 18-19, 2012 by Applicant. Measurements 5-7 taken January 27-29 by SRA under contract to MRS.

The Applicant also conducted long-term monitoring. The long-term monitoring was conducted at the eastern end of the refinery property for 9 days from October 10, 2012. The long-term monitoring showed that the average daytime noise levels range from 40.9 to 50.9 dBA Leq, and the average nighttime noise levels ranged from 37.5 to 42.8 dBA Leq. The average Leq over the week-long noise monitoring period during the daytime was 44.9 dBA and during the nighttime was 41.0 dBA. Noise monitoring conducted in January, 2014 by the EIR consultant, indicated that the nighttime periods were quieter than previous measurements by about 2.0 dBA along Eucalyptus Road.

The January 29, 2014 measurements were also taken during the daytime both at the residential areas and at the SMR during train movements. These measurements were taken by the EIR consultant. On January 29th, in the morning, 34 rail cars of coke were picked up by 2 locomotives from the coke area at the SMR (i.e., in the western portion of the proposed Rail Spur Project footprint). Noise monitoring was conducted during these activities to refine the noise levels used in the noise model and to assess the potential impacts of actual rail movements on area receptors. See Appendix D.1 for the monitoring report. Generally, the noise levels produced by the rail movements were slightly less than those estimated by the FTA models, most likely due to the inaccuracies of the FTA model at slower speeds. In each case, the estimated train noise level from the spur is more than 10 dBA below the daytime ambient noise levels at the receptors, which indicates that activity on the existing rail spur (which occurs only during the daytime) is inaudible. This conclusion is supported by review of the audio recordings made at 1918 Eucalyptus Road in which no discernable train noise could be heard.

4.9.2 Regulatory Setting

Regulations generally pertain to state regulations and local ordinances and codes. These are described below.

4.9.2.1 State Regulations

California Health and Safety Code, Division 28, Noise Control Act
The California Noise Control Act states that excessive noise is a serious hazard to public health and welfare and that it is the policy of the State to provide an environment for all Californians that is free from noise that jeopardizes their health or welfare.

California Government Code Section 65302
Section 65302(f) of the California Government Code and the Guidelines for the Preparation and Content of the Noise Element of the General Plan, prepared by the California Department of Health Services and included in the 1990 State of California General Plan Guidelines published by the State Office of Planning and Research, provide requirements and guidance to local agencies in the preparation of their Noise Elements. The Guidelines require that major noise sources and areas containing noise-sensitive land uses be identified and quantified by preparing generalized noise exposure contours for current and projected conditions. Contours may be prepared in terms of either the CNEL or the Ldn, which are descriptors of total noise exposure at a given location for an annual average day. The CNEL and Ldn are generally considered to be equivalent descriptors of the community noise environment within plus or minus 1.0 dB.

4.9.2.2 County Local Ordinances and Policies

The applicable noise standards governing the project area are the criteria in the County's Noise Element of the General Plan, which covers noise exposure from major sources in the County including roadways, railways, airports, and stationary sources, and the criteria in the County's Municipal Code, covering stationary noise sources such as loading docks, parking lots, and ventilation equipment.

The San Luis Obispo County Noise Element of the General Plan provides a policy framework for addressing potential noise impacts in the planning process. The Noise Element is directed at minimizing future noise conflicts, whereas a noise ordinance focuses on resolving existing noise conflicts. The Noise Element includes maps showing the extent of noise exposure from the major noise sources in the County (roadways, railways, airports, and stationary sources), along with the goals, policies, and implementation program adopted by the County to reduce future noise impacts. The goals of the Noise Element, compiled under the mandate of Section 65302(f) of the California Government Code and guidelines prepared by the California Department of Health Services, are to ensure that all areas of the County are free from excessive noise and that appropriate maximum levels are adopted for residential, commercial, and industrial areas; to reduce new noise sources to the maximum extent possible; to reduce, to the maximum extent possible, the impact of noise within the county; and to ensure that land uses are compatible with the related noise characteristics of those uses.

Among the most significant policies of the Noise Element are numerical noise standards that limit noise exposure within noise-sensitive land uses and performance standards for new commercial and industrial uses that might adversely impact noise-sensitive land uses. When the potential for adverse noise impacts is identified, mitigation is required to carry out the specific recommendations of an expert in acoustics or, under some circumstances, by implementing standard noise mitigation packages. When mitigation is required, highest priority is given to avoiding or reducing noise impacts through site planning and project design, and lowest priority given to structural mitigation measures such as construction of sound walls and acoustical treatment of buildings.

The County has identified these noise-sensitive uses:

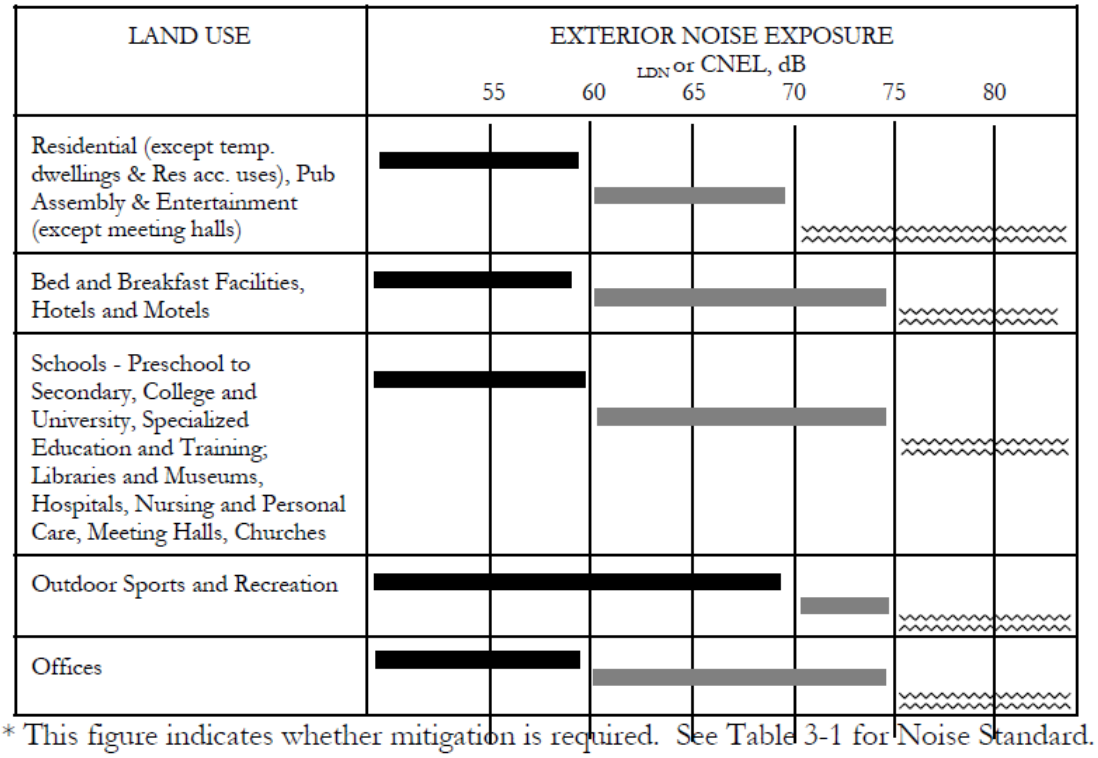
- Residential development, except temporary dwellings;
- Schools preschool to secondary; colleges and universities; specialized education and training;
- Health care services (hospitals);
- Nursing and personal care;
- Churches;
- Public assembly and entertainment;
- Libraries and museums;
- Hotels and motels;
- Bed and breakfast facilities;
- Outdoor sports and recreation; and
- Offices.

The Noise Element specifies the ranges of noise exposure from transportation noise sources which are considered to be acceptable, conditionally acceptable, or unacceptable for the development of different land uses. Figure 4.9-2 shows whether mitigation is needed for development of land uses near major transportation noise sources. In areas where the noise environment is acceptable, new development may be permitted without requiring noise mitigation. For areas where the noise environment is conditionally acceptable, new development would be allowed only after noise mitigation has been incorporated into the design of the project to reduce noise exposure. For areas where the noise environment is unacceptable, new development is usually not feasible.

For residential land uses, the Noise Element recommends an exterior noise standard of 60 dBA CNEL and an interior noise standard of 45 dBA CNEL. Table 4.9.6 lists the County’s maximum exterior noise levels for stationary noise sources. Table 4.9.7 lists the County’s maximum allowable noise exposure for noise from transportation noise sources.

If the baseline noise level during the day at some noise-sensitive locations exceed the thresholds, as per Title 22, section 22.10.120b2, "the applicable standard shall be adjusted so as to equal the ambient noise level plus one dB", which equates to an allowable increase of 1 dBA. When the receiving noise-sensitive land use is outdoor sports and recreation, the noise level standards shall be increased by 10 dB.

Figure 4.9-2 Land Use Compatibility for New Development near Transportation Noise Sources



* This figure indicates whether mitigation is required. See Table 3-1 for Noise Standard.

INTERPRETATION

ACCEPTABLE
(no mitigation required)

Specified land use is satisfactory.

CONDITIONALLY ACCEPTABLE
(mitigation required)

Use should be permitted only after careful study and inclusion of mitigation measures as needed to satisfy policies of the Noise Element.

UNACCEPTABLE
(mitigation may not be feasible)

Source: SLOC 1992

Table 4.9.6 Noise Element Maximum Allowable Noise Exposure - Stationary Sources

Level	Daytime (7:00 a.m.–10:00 p.m.)	Nighttime (10:00 p.m.–7:00 a.m.)
Hourly Leq	50	45
Maximum Level, Lmax	70	65
Maximum Level – Impulsive Noise, Lmax	65	60

Notes: As determined at the property line of the receiving land use. When determining the effectiveness of noise mitigation measures, the standards may be applied on the receptor side of the noise barrier or other property line noise mitigation measures. Nighttime applies only where the receiving land use operates or is occupied during nighttime hours.
Source: SLOC 1992

Table 4.9.7 Noise Element Maximum Allowable Noise Exposure - Transportation Sources

Land Use	Outdoor Areas	Interior Spaces	
	Ldn/CNEL, dB	Ldn/CNEL, dB	Leq dB
Residential (except temporary dwellings and residential accessory uses)	60	45	--
Bed and Breakfast Facilities, Hotels, and Motels	60	45	--
Hospitals, Nursing and Personal Care	60	45	--
Public Assembly and Entertainment (except Meeting Halls)	--	--	35
Offices	60	--	45
Churches, Meeting Halls	--	--	45
Schools – Preschool to Secondary, College and University, Specialized Education and Training, Libraries and Museums	--	--	45
Outdoor Sports and Recreation	70	--	--

Source: SLOC 1992

Chapter 6, Section 40 of Title 23 (23.06.040) of the County Code establishes standards for acceptable exterior and interior noise levels and describes how noise shall be measured. These standards are intended to protect persons from excessive noise levels, which are detrimental to the public health, welfare, and safety. Excessive noise levels are also contrary to the public interest because they can interfere with sleep, communication, relaxation, and full enjoyment of one's property; contribute to hearing impairment and a wide range of adverse physiological stress conditions; and adversely affect the value of real property. The interior and exterior noise standards established in the County's Land Use Ordinance are consistent with the noise exposure standards in the County's General Plan Noise Element.

The County Code exempts construction activities from the noise standards between the hours of 7:00 a.m. and 9:00 p.m., Monday through Friday, and between 8:00 a.m. and 5:00 p.m. Saturdays and Sundays.

4.9.3 Significance Criteria

The significance of potential noise and vibration impacts is based on thresholds identified within the County of San Luis Obispo Initial Study Checklist, which was developed in accordance with Appendix G of the CEQA Guidelines. The County Checklist provides the following thresholds for determining impact significance with respect to noise and vibration. Noise and vibration impacts would be considered significant if the proposed project would:

- Expose people to noise levels that exceed the County Noise Element thresholds.
- Generate permanent increases in the ambient noise level in the project vicinity.
- Cause a temporary or periodic increase in the ambient noise in the project vicinity.
- Expose people to sever noise or vibration.

The second and third significance criteria are associated with the issue of the issue of noise perceptibility, and do not assign a threshold of acceptability from increased levels of perceptibility. Due to the wide range of ambient noise levels between the urban and rural environments and the range of noisy activities allowed within each, this issue is evaluated on a case-by-case basis. For the purposes of CEQA, the County has determined that the following thresholds apply to new development.

- Any increase above background (ambient) noise that is less than 3 dBA is less than significant.
- When a project (plus the background noise) results in an increase in noise between 3 and 10 dBA as measured from the nearest sensitive receptor, it is considered adverse. Also, based on consideration of the factors specified below, there is a potential for a significant noise impact that needs further consideration.
- When a project (plus the background noise) results in an increase in noise greater than 10 dBA, as measured from the nearest sensitive receptor that is a potentially significant impact warranting mitigation.

A project-related noise increase of between 3 and 10 dBA is considered adverse, but could be either significant or insignificant, depending upon the particular circumstances of a particular case. Factors to be considered in determining the significance of an adverse impact as defined above include, but are not necessarily limited to:

- The resulting noise level;
- The duration and frequency of the noise;
- The number of people affected; and
- The land use designation of the affected receptor sites.

The significance criteria described above are based on hourly Leq noise levels. The intent is to provide a relatively simple, easily understood description of the noise environment that does not require overly complex analysis to measure or enforce.

Leq has been found to correlate well with subjective reaction to many environmental noise sources and has been widely-adopted in environmental noise impact studies. Because it is an energy average, Leq allows complex, time-varying noise environments to be described with a single figure, capturing contributions from noise sources that vary rapidly with time as well as those with a steady-state noise characteristic.

For this EIR a 5-dBA increase on the baseline noise level has been selected as a significance criterion is derived from typical human response to changes in noise level. A 5 dBA change in noise level is generally acknowledged to be readily perceptible to most people (a perceived increase in noise level of more than 40%, as per Caltrans). A 5-dBA change is low in the 3- to 10-dBA range indicated in the County Initial Study checklist for determining significance, and the 5-dBA change is used to provide a conservative estimate of significance.

For noise-sensitive land uses, Noise Element and County Code Tile 23, Section 23.06.040 defines threshold as 45 dBA Leq hourly nighttime, 50 dBA daytime at the receiving property parcel boundary. Noise-sensitive uses that have been identified by the County are the following:

1. Residential development, except temporary dwellings
2. Schools-preschool to secondary, college and university; specialized education and training
3. Health care services (hospitals)
4. Nursing and personal care
5. Churches
6. Public assembly and entertainment
7. Libraries and museums
8. Hotels and motels
9. Bed and breakfast facilities
10. Outdoor sports and recreation
11. Offices

If the baseline noise level during the day at some noise-sensitive locations exceed the thresholds, as per Title 23, Section 23.06.044(b), "the applicable standard shall be adjusted so as to equal the ambient noise level plus one dB", which equates to an allowable increase of 1 dBA.

Noise due to construction activities is considered to be insignificant when it falls under the hours and definition specified in the County's Noise Ordinance exception for construction activities. In terms of CEQA compliance, construction noise is usually considered less than significant if construction activities only occur during a fraction of the project lifetime, intermittently affect any one location, and limit heavy construction equipment use and noisy activities to daytime hours.

Long-term offsite impacts from traffic noise are measured against multiple criteria. Both of these criteria must be met for a significant impact to be identified:

- Traffic noise levels would increase by more than 3 dBA compared to existing conditions on a roadway and rail segment adjacent to a noise-sensitive land use; and
- The resulting traffic noise level would exceed the County criteria level for the noise-sensitive land use. In this case, the criteria level is 60 dBA CNEL for residential, hotel, hospital, and office uses and 70 dBA CNEL for outdoor sports and recreation uses land uses (as per the County Code).

Vibration impacts would be considered significant if the vibration levels generated by the project equipment exceeded a velocity of 0.01 inches/sec (0.25 mm/sec) at the property line of a neighboring use. This value corresponds with the perceptible level, and other jurisdictions, including the County of Los Angeles, define this level as a threshold for vibration impacts.

4.9.4 Project Impacts and Mitigation Measures

The Rail Spur Project would generate noise due to the following activities:

- Internal combustion engines associated with construction equipment;
- Trains positioning, idling, and unloading at the SMR;
- Electrical equipment including pumps, transformers, HVAC systems and air compressors that are used during the unloading operations; and
- Trains moving along the UPRR mainline tracks.

The remainder of this section discusses the impacts associated with the construction and operational noise levels.

Impact #	Impact Description	Phase	Impact Classification
N.1	Construction activities would generate noise that could exceed San Luis Obispo thresholds.	Construction	Class II

Noise impacts during construction would result from construction equipment with internal combustion engines (e.g., backhoes, cranes) operating at the site for grading, earth moving and

the installation of project related equipment. The Federal Highway Administration (FHWA) noise model was used to estimate the noise levels associated with construction activities. The peak construction noise levels are provided in Table 4.9.8.

Table 4.9.8 Construction Noise Levels

Location	Project Noise Level (dBA)		Baseline Noise Level (dBA)		Combined Noise Level (dBA)		Noise Level Increase (dBA)	
	Lmax	Leq	Day	Night	Day	Night	Day	Night
Trilogy Residences	41.4	44.7	48.7	38.6	50.2	45.7	1.5	7.1
Olivera Residences	45.2	48.6	43.2	40.2	49.7	49.2	6.5	9.0
Monadella Residences	42.5	45.8	49.3	43.6	50.9	47.8	1.6	4.2
Nathan Way Residences	42.1	45.5	51.0	40.0	52.1	46.6	1.1	6.6

The County Code exempts construction activities from the noise standards between the hours of 7:00 a.m. and 9:00 p.m., Monday through Friday, and between 8:00 a.m. and 5:00 p.m. Saturdays and Sundays. If construction activities were to occur outside of these times they would be subject to the County noise standards. As the data in Table 4.9.8 shows, all of the nighttime noise levels at the sensitive receptors would exceed the 45 dBA hourly threshold. Therefore, if construction was to occur outside of the allowable hours specified in the County Code, the impacts would be significant.

Mitigation Measures

N-1 *The Applicant shall ensure that all construction activity at the Project Site is limited to the hours of 7:00 A.M. to 9:00 P.M., Monday through Friday, and 8:00 A.M. to 5:00 P.M. on Saturdays and Sundays. This restriction shall be a note placed on all construction plans.*

Residual Impacts

Limiting the hours of construction activities to the hours specified in the County Code would reduce the impact of construction noise to *less than significant with mitigation (Class II).*

Impact #	Impact Description	Phase	Impact Classification
N.2	Operational activities would generate noise levels that exceed San Luis Obispo thresholds.	Operations	Class II

Noise generated during operations would result from a number of different sources and activities. These would include:

- Noise from the unit or manifest train approaching and entering the facility along the mainline;

- Noise from the locomotive engines doing switching activities along the spur to the east of the unloading area due to positioning of full tank cars before unloading and the delivery of empty tank cars to the empty tank car track after unloading;
- Noise from locomotive engines switching and idling near the unloading area associated with movement of empty and full tank cars;
- Noise from the locomotive engines idling along the spur to the east of the unloading area due to positioning of full tank cars before unloading;
- Noise from pumps operating to unload rail cars, 2 transformers, an HVAC system and an air compressor (to recharge the train brakes); and
- Noise from locomotive engines associated with a second train entering the facility, if two trains overlap.

The noise impact analysis has been based upon a unit train since this is the option that would generate the most amount of noise since the positioning activities would require more time.

Noise from locomotive engines and from trains during switching and idling were estimated using the FTA computational algorithms to estimate hourly equivalent noise levels based on train activity and characteristics (FTA 2006) and the noise monitoring conducted on the coke train in January, 2014 (see Appendix D). The FTA has developed a set of equations that estimates the noise levels of trains based on the number of train locomotives, the number of rail cars, the train speed, the track type, the locomotive type, and the throttle setting. These equations were used to estimate the noise levels of the trains traversing the spur and moving cars around on the spur in combination with the measured actual noise levels (from the January 2014 measurements) generated by coke trains moving on the existing spur. As the trains would be moving around along the entire length of the rail spur, these noise sources were treated like line sources.

For idling locomotives, the FTA equations associated with stationary sources were utilized, where the noise levels are a function of the number of sources and the duration of the source and the type of locomotive. As these sources would be located at a single location, these sources were considered point sources.

For pumps and other equipment at the unloading area, various sources were used to estimate the noise levels from this stationary equipment, including the FHWA Roadway Construction Noise Model (FWHA 2013) and the Applicant noise study conducted for this project. As these sources would be located at a single location, these sources were also considered point sources. Noise source levels used in the study are shown in Table 4.9.9.

The various sources associated with the rail spur would operate a varying amount of time. As described in Section 2.0, Project Description, idling of locomotives could occur at various locations along the spur for periods in excess of 1 hour increments during the course of the entire unloading operation. Movements along the rail spur to the far eastern end would occur associated with initial positioning of the rail cars into the unloading area, with 2 locomotives operating down the spur (sometimes one of those locomotives would be idling), as well as potential delivery of the empty rail cars (in sets of 10) by a single locomotive to the far end of the

rail spur empty car track after unloading. These various locomotive movements and the time in each mode and at each location were entered into the noise model. The Applicant has proposed various options for train movements, and the option related to nighttime movements was used in the noise model as the nighttime background noise levels are the lowest. Train activity during the nighttime would produce the greatest increase in noise.

Table 4.9.9 Operational Noise Source Levels

Source	Type	Number	Sound Level at 50 feet, dBA	Reference
Locomotives idling	Point	Up to 3	73.4	FTA Stationary source model
Locomotives (2) moving along spur, 3mph, with 10-80 cars	Line*	1	71.1**	2014 Coke Activity monitoring
Pumps	Point	20	81	FHWA construction database
Transformers	Point	2	65	Applicant data
HVAC	Point	1	65	Applicant data
Air Compressors	Point	1	80	FHWA construction database

Notes: * Line sources are the hourly average noise level experienced by a receptor located 50 feet from the railway centerline. Maximum sound level at 50 feet would be higher. ** Monitoring from January 2014 monitored sound level at 25 feet, which would be equivalent to 74.1 at 25 feet for a line source. For a single locomotive running with 1 locomotive idling, noise levels are reduced by 1 dBA.

In addition, the pumps would operate and produce noise while pumping crude oil from a rail car, but then would be shut off while the rail cars are switched and each car is re-connected and the pumps started again. It was determined that the pumps would operate a maximum of 60% of each hour.

This sequencing of locomotives and rail cars were entered into the noise model for the worst case scenario, starting at 11 p.m. and continuing all night long. It was also assumed that a second train would arrive during unloading operations, and wait until the first train had unloaded. Locomotives were assumed to be shut down on the second train after arrival.

The resulting noise levels at each receptor are listed in Table 4.9.10. Figure 4.9-3 shows the noise contours for the Rail Spur Project peak hour operating scenario.

Noise levels could increase at night by as much as 10.9 dBA at the closest area to the Project Site. However, for noise-sensitive receptors, the largest nighttime noise increase would be along Olivera Street (which has residences considered noise-sensitive receptors) and at the west end of Louise Lane. Noise levels at Monadella Street would increase above the allowable nighttime noise threshold of 45 dBA, and would have an increase of less than 5 dBA. Note that there are many exceptions to the codes and requirements, related to noise sensitive definitions and existing background noise levels (if already above the allowed code levels) and these are discussed in the footnotes to Table 4.9.10.

Table 4.9.10 Operational Noise Levels at Receptors: Unmitigated

Receptor	Baseline Night	Baseline Day	Noise Level with Project, Night	Noise Level Increase, Night	Noise Level with Project, Day	Noise Level Increase, Day	Signif-icant ?
Agricultural Area	43.6[1]	43.6	53.1	9.5	53.1	9.5	No[a]
Gentle Breeze	43.6[2]	49.3	44.6	1.0	49.6	0.3	No
Industrial Residence	40.4[3]	49.3	51.3	10.9	53.2	3.9	No[c]
Lake Oso	43.6[1]	43.6	45.3	1.7	45.3	1.7	No[b]
Louise Lane	38.6[7]	48.7	42.9	4.3	49.4	0.7	No
Monadella Street	43.6[2]	49.3	47.6	4.0	50.8	1.5	Yes
Nathan Way	40.0[4]	51.0	44.0	4.0	51.5	0.5	No[e]
Olivera Street	40.2[8]	49.3	47.5	7.3	48.3	5.1	Yes
Trilogy Pkwy	38.6[7]	48.7	42.9	4.3	49.4	0.7	No
Via Entrada	45.6[5]	54.5	46.9	1.3	54.7	0.2	No[d]
Winterhaven Residence	42.0[6]	59.2	47.7	5.7	59.4	0.2	No[c]

Notes: Baseline noise levels are based on the following locations 1) Oso Flaco 2) Monadella 3) Applicant ST Location 3 4) Nathan Way 5) Highway 1 and Concha 6) Winterhaven 7) 1918 Eucalyptus Road 8) Olivera

a) Agricultural areas are not considered to be noise-sensitive receptors.

b) This location is considered an outdoor sports and recreation location and its threshold is increased by 10 dBA.

c) Although this is a residential location, the land use category is industrial

d) This is not a noise-sensitive residential land use, but is currently zoned industrial. It could be developed with a noise-sensitive use if the business is a church or a daycare/school.

e) This location produces a daytime noise level above 50 dBA, but as the current background is above 50 dBA and the noise increase is less than 1 dBA, it would be less than significant.

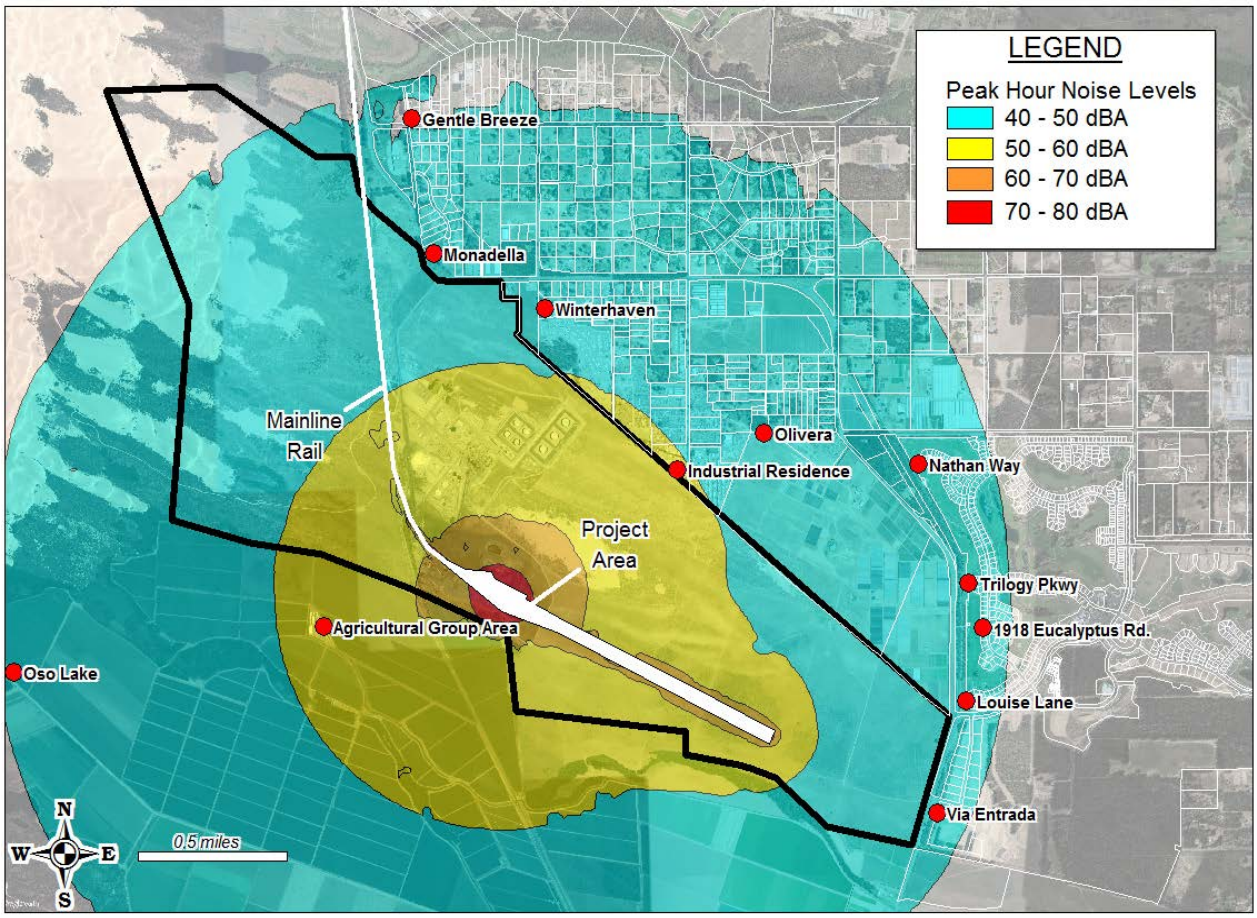
See Appendix D for the SoundPlan modeling files.

The primary sources contributing to the peak hour noise levels at these sources are activities along the spur east of the unloading area and the pumps.

Daytime noise levels would increase at the agricultural areas to the immediate south of the project site and at the closest noise-sensitive receptor.

There are a number of uncertainties associated with estimating noise impacts. Meteorological conditions can strongly affect noise propagation and impacts, as most people have had experiences of hearing noisy activities a long distance from the source when the conditions are right. In addition, characterizing noise sources is challenging, as there are a number of potential activities, including hooking up rail cars, potential emergency annunciators and the low frequency locomotive noises that can travel long distances. The models capture many of these issues, but there is not extensive data available on some of the issues, such as good octave band analysis of different locomotive arrangements, for example, that bring in a range of potential errors into the analysis. However, the noise levels estimated by the SoundPlan model are considered to be conservative and provide a good estimate of the peak hour noise levels associated with the Rail Spur Project.

Figure 4.9-3 Operational Noise Levels Contours Peak Hour: Unmitigated



Source: MRS SoundPlan Modeling Results. See Appendix D for the SoundPlan modeling files.

The noise levels measures in 2014 during the coke rail activities demonstrated that the FTA noise levels were very conservative in the November 2013 DEIR. Onsite noise measurements provide better quantification of actual noise levels that could be generated by the activities. These measured values were used in the noise model for the movements of the rail cars. This produced a decrease in the estimated noise levels at the receptors. Idling and arrival noise levels continued to utilize the FTA estimates. In addition, the lower background nighttime levels were used at the applicable noise receptors. The use of lower background noise levels caused a corresponding increase in the noise differentials. In summation, the noise model produced similar noise increases with the project as the November 2013 DEIR.

The exceedances of the noise thresholds at noise-sensitive receptors are a potentially significant impact. Mitigation measures recommended to reduce exceedances include modifications to the operational procedures to minimize locomotive use of the east end of the rail spur and a reduction in pumping noise.

Mitigation Measures

N-2a *Prior to issuance of the Notice to Proceed, the Applicant shall develop for review and approved by the County Department of Building and Planning a Rail Unloading and Management Plan that addresses procedures to minimize noise levels at the rail spur, including but not limited to the following: 1) All locomotives operating to the east of the unloading rack area between the hours of 10 P.M. and 7 A.M. shall be limited to a combined total of 100 locomotive-minutes (e.g. 2 locomotives for 50 minutes each or 1 locomotive for 100 minutes, etc. including switching and idling); 2) Arriving trains that enter the refinery between the hours of 10 P.M. and 7 A.M. and are not being immediately unloaded shall shutdown all locomotives once the train is on the refinery property; 3) No horns, annunciators or other signaling devices are allowed unless it is an emergency. If horns and annunciators are needed for worker safety, then warning devices shall be developed, to CPUC standards, to alert the safety of plant personnel when trains are in motion without an audible warning device; 4) No horns are to be used on the mainline siding track adjacent to the refinery unless it is an emergency; 5) Any trains repairs shall be conducted only between the hours of 7 A.M. and 7 P.M.; and (6) The Plan shall include a copy of the agreement between the Applicant and UPRR demonstrating the two parties have entered into a legally binding contractual arrangement ensuring implementation of the above requirements.*

N-2b *Prior to issuance of the Notice to Proceed, the Applicant shall provide to the County Department of Planning and Building evidence that each unloading pump and associated electric motor can achieve a noise level no greater than 71 dBA at 50 feet, including the installation of pump enclosures, or similar devices if necessary.*

N-2c *Prior to issuance of the Notice to Proceed, the Applicant shall submit to the County Department of Planning and Building for review and approval a Noise Monitoring Plan that outlines procedures for regular noise monitoring of the operational aspect of the Rail Spur facility. The Plan shall specify at a minimum the duration and location of monitoring activities with and without trains present at the SMR site. The monitoring locations shall include at least one location within 100 to 200 feet of the unloading activities and a monitoring location located at the property line of the nearest noise-sensitive receptor. The noise monitoring shall be conducted within one month of rail spur operations commencing. The results of the monitoring shall be reported to the County within one month of monitoring completion. If the results of the noise monitoring indicate that noise levels are above the thresholds, then the Applicant shall amend the Rail Unloading and Management Plan with additional mitigation measures that would reduce noise levels below County thresholds. Additional mitigation could include, but not be limited to, additional limits on the times of unloading activities.*

Residual Impacts

Noise levels with mitigation are shown in Table 4.9.11. The mitigated noise contours for the peak hour are shown in Figure 4.9-4.

Limiting the activities east of the unloading area closer to receptors, ensuring stationary equipment operates at or below the prescribed noise limits, and conducting monitoring to ensure compliance would ensure that impacts are *less than significant with mitigation (Class II)*.

Visual resources mitigation AV-1a requires the installation of a berm-type system to address potential visual impacts of the rail spur on areas located to the east.

Table 4.9.11 Operational Noise Levels at Receptors: Mitigated

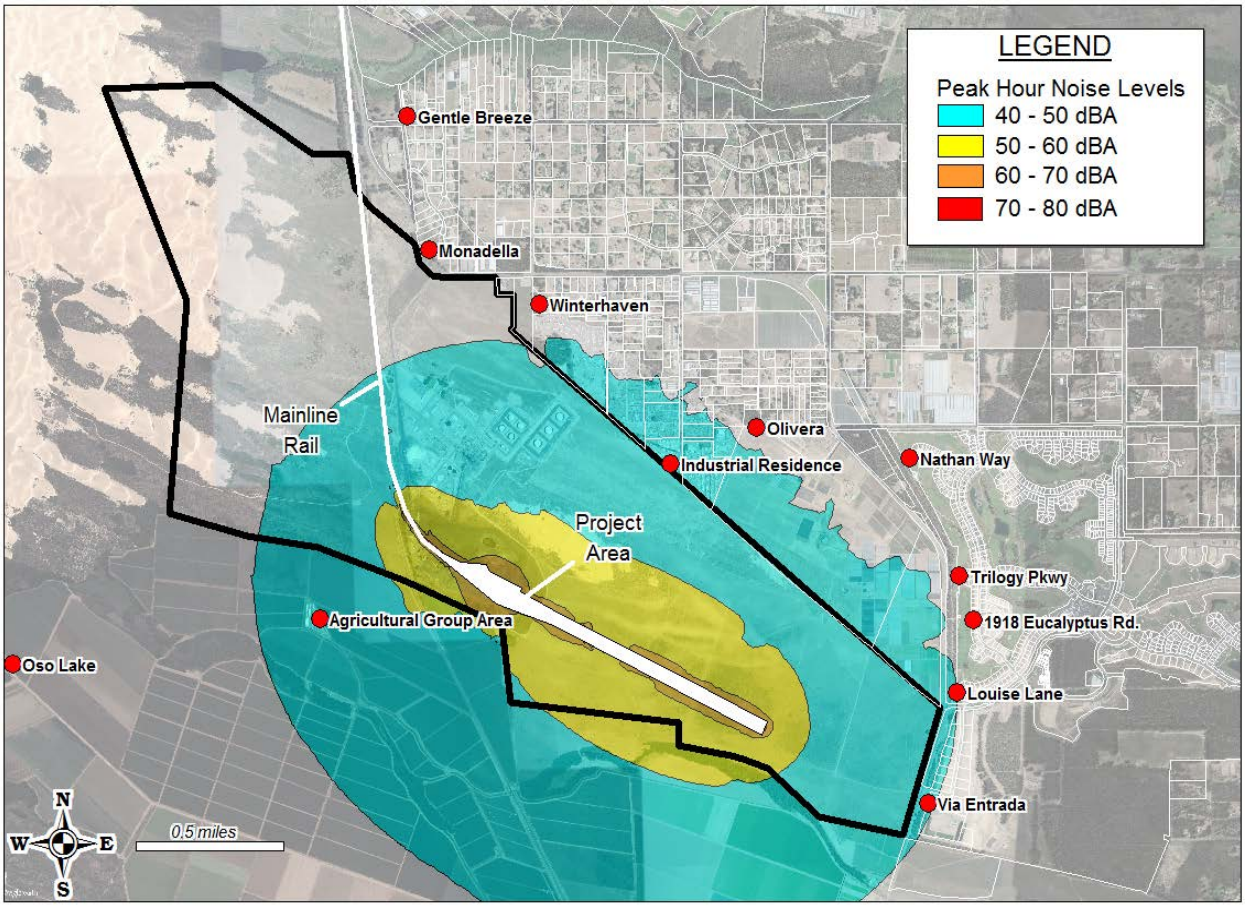
Receptor	Baseline Night	Baseline Day	Noise Level with Project, Night	Noise Level Increase, Night	Noise Level with Project, Day	Noise Level Increase, Day	Signif-icant ?
Agricultural Area	43.6[1]	43.6	46.5	2.9	46.5	2.9	No[a]
Gentle Breeze	43.6[2]	49.3	43.8	0.2	49.3	0.0	No
Industrial Residence	40.4[3]	49.3	44.7	4.3	50.2	0.9	No[c]
Lake Oso	43.6[1]	43.6	43.9	0.3	43.9	0.3	No[b]
Louise Lane	38.6[7]	48.7	42.2	3.6	49.2	0.5	No
Monadella Street	43.6[2]	49.3	44.4	0.8	49.5	0.2	No
Nathan Way	40.0[4]	51.0	41.6	1.6	51.2	0.2	No[e]
Olivera Street	40.4[3]	49.3	42.6	2.4	44.6	1.4	No
Trilogy Pkwy	38.6[7]	48.7	41.2	2.6	49.0	0.3	No
Via Entrade	45.6[5]	54.5	46.7	1.1	54.7	0.2	No[d]
Winterhaven Residence	42.0[6]	59.2	43.4	1.4	59.2	0.0	No[c]

Notes: Baseline noise levels are based on the following locations 1) Oso Flaco 2) Monadella 3) Applicant ST Location 3 4) Nathan Way 5) Highway 1 and Concha 6) Winterhaven 7) 1918 Eucalyptus Road 8) Olivera
a) Agricultural areas are not considered to be noise-sensitive receptors.
b) This location is considered an outdoor sports and recreation location and its threshold is increased by 10 dBA.
c) Although this is a residential location, the land use category is industrial
d) This is not a noise-sensitive residential land use, but is currently zoned business and could be if the business is a church or a daycare/school.
e) This location produces a daytime noise level above 50 dBA, but as the current background is above 50 dBA and the noise increase is less than 1 dBA, it would be less than significant.
See Appendix D for the SoundPlan modeling files.

The visual resource mitigation measures recommended a 10 to 20 foot tall berm at the top of the sloped grade at the end of the rail spur. The installation of a berm along the eastern portion of the rail spur could reduce noise impacts depending on the size and location of the berm. In order for berms to be effective noise mitigation, they need to be relatively close to the noise source and be higher than the noise source. The end of the rail spur would be about 15 feet below the surrounding grade. With a 10 to 20 foot tall berm the total height of the berm would be 25 to 35 feet (15 feet of grade and 10 to 20 foot berm). Assuming a 30 foot berm is located on the eastern 1,000 feet of spur track along the north side, noise levels at sensitive receptors could be reduced by about 0.2 dBA. This nominal reduction is due primarily to the relatively large width of the rail spur, constituting some 5 rail tracks, as well as the roadways alongside the rail tracks which requires that the berm be placed farther away from the noise sources.

The air quality mitigation measure AQ-4c would limit the unloading of trains at the SMR from between 7 A.M. and 7 P.M. This would serve to reduce the nighttime noise levels associated with the rail operations. There could still be some nighttime noise associated with trains arriving at the SMR. Trains that arrived at night would need to pull on to the SMR property and then would shutdown. Mitigation measure AQ-2b limits idling at the SMR to no more than 15 minutes. These air quality mitigation measures would reduce the frequency and level of nighttime noise at the SMR.

Figure 4.9-4 Operational Noise Levels Contours Peak Hour: Mitigated



Source: MRS SoundPlan Modeling Results. See Appendix D for the SoundPlan modeling files.

Impact #	Impact Description	Phase	Impact Classification
N.3	Operational activities along the UPRR mainline tracks would generate transportation related noise levels that exceed San Luis Obispo thresholds.	Operations	Class III

Noise from locomotive engines and from trains during mainline transportation while traveling along the mainline were estimated using the FTA computational algorithms to estimate hourly equivalent noise levels.

For freight trains, while the UPRR's primary California rail route runs through the Central Valley, the Coast Route serves markets along the coast and acts as a secondary route, providing "surge capacity" between the Los Angeles Basin and the San Francisco Bay area, northern California and the Pacific Northwest. Whenever UPRR experiences a line outage through the Central Valley, the Coast Route provides an available alternative route. The Coast Route also handles a number of daily passenger trains.

Caltrans had estimated in their 2013 Coast Daylight Service Development Plan that the existing freight train traffic on the Coast Line is two trains per day that travel the entire length of the line. The LOSSAN 2010 Corridor Strategic Assessment estimated that a peak of 8 freight trains per day currently operate on the Coast Line between Santa Barbara and San Luis Obispo, when there is an outage on the rail route through the San Joaquin Valley.

CNEL levels are increased for operations at night due to the 10 dBA penalty applied to nighttime activities. Therefore, for a train travelling at night, increases to that period's CNEL would be greater than traveling during the daytime. It was assumed that the trains would travel on the mainline tracks evenly by hour across day, evening and night time periods producing an annual average CNEL.

If one assumed the baseline traffic on the Coast Route is two freight trains and six passenger train per day, the addition of two crude oil trans would increase the CNEL noise level by about 2.5 dBA. With six freight trains and six passenger trains per day the CNEL noise level would increase by about 1.0 dBA with the addition of two crude oil trains per day. The higher increases would be for areas that have less existing train traffic. Increases to CNEL would be less than 1 dBA in areas that have higher levels of existing train traffic. In the Bay Area, Sacramento, and Los Angeles Basin where there are in excess of 20 freight and passenger trains per day, the increase in CNEL from two additional crude oil unit trains per day would be about 0.5 dBA. For all areas along the mainline within California an increase of between 1.0 and 2.5 dBA CNEL would be less than significant.

CNEL levels at the closest receptors near the SMR would be between 59 and 63 dBA with the additional unit train, depending upon the level of daily train traffic along the Coast Line. The higher number would be when freight trains are routed along the Coast Line due to an outage through the San Joaquin Valley. The contribution of the crude oil unit train would be between 1 and 2 dBA CNEL, which would be less than significant.

Mitigation Measures
No mitigation measures are required since the impact is less than significant.

Residual Impacts
Transportation related noise impacts associated with the project would be *less than significant (Class III)*.

Impact #	Impact Description	Phase	Impact Classification
N.4	Operational activities would produce vibration levels that exceed San Luis Obispo thresholds.	Operations	Class III

Vibration from locomotive engines and from train cars during mainline transportation or from unloading operations at the site would produce vibrations. The FTA has developed vibration criteria and vibration assessment methods in order to assess whether train activities could exceed the given criteria. Train vibrations are a function of train type, locomotive type, track arrangement and configuration and of the soil types between the train tracks and the receptor.

Although the perceptibility threshold for vibration is about 0.002 inches/sec, human response to vibration is not usually significant unless the vibration exceeds 0.003 inches/sec. Because of the heavy locomotives on diesel rail systems, the vibration levels can exceed the 0.01 inches/sec threshold defined in this EIR. The FTA has established a 0.004 inches/sec as an acceptable threshold.

The FTA screening assessment for residential locations indicates that residences should be located more than 200 feet from a railway with diesel locomotives traveling at 50 mph. For the rail spur area located within the SMR, locomotive speeds would be substantially below this and distances to receptors would be substantially more than 200 feet. Therefore, vibration impacts from the rail spur operations would be less than significant.

The addition of one train per day along the mainline would increase the frequency of trains passing by residential and other areas, but would not increase the peak vibration levels along the railway as freight trains already pass along the mainline track. Therefore, impacts from vibration would be less than significant.

Mitigation Measures
No mitigation measures are required since the impact is less than significant.

Residual Impacts
Vibration impacts associated with the project would be *less than significant (Class III)*.

4.9.5 Cumulative Analysis

None of the proposed development in the vicinity of the SMR found under the cumulative projects list (see Chapter 3.0, Cumulative Scenario and Methodology) would be constructed in the immediate vicinity of the Project (the closest project is greater than 4,000 feet to the north of project related activities) where there would be overlapping noise impacts associated with cumulative projects. All cumulative projects must comply with County noise standards. These, in concert with individual project mitigation measures, would ensure cumulative construction noise impacts would be less than significant.

None of the proposed development in the vicinity of the SMR would generate operational noise such that it would impact the operational noise levels in the vicinity of the SMR. This is primarily due to the types of cumulative projects and the fact that the nearest cumulative project is greater than 4,000 feet to the north of the SMR. All of the cumulative oil projects in Santa Barbara County (see Table 3.1) are located sufficiently far from the SMR that there would be no cumulative noise impacts. Therefore, none of the cumulative projects in the vicinity of the SMR or in Santa Barbara County would contribute to a cumulative noise effect, so the cumulative operational noise would be less than significant with the proposed project mitigation.

The level of noise impacts on the community would not increase due to the Throughput Increase Project at the SMR. Alarm frequency would remain the same. Although equipment use, such as the crude heaters, would increase, noise levels would not increase at receptors near the Refinery. The Throughput Increase Project would add less than four trucks per day to area traffic. Noise levels generated by this traffic scenario were estimated to increase by less than 0.1 dBA CNEL for a receptor 100 feet from the center of State Route 1. As such, there would be no cumulative effect associated with the Throughput Increase Project and the Rail Spur Project. Cumulative operational noise would be less than significant with the proposed mitigations.

There is the potential for cumulative impacts associated with the crude by rail project discussed in Chapter 3. If all of the crude by rail projects travel via the Roseville area, then up to eight crude oil trains per day could travel on the stretch of track between Sacramento, Roseville, and the California Boarder (two for Valero, one for Kinder Morgan, two for Alon, one for Targa, one for Plains All American, and one for the SMR). Using the FTA noise model it was estimated that CNEL noise levels could increase by about 0.7 dBA assuming baseline train traffic of about 60 trains per day, which is the estimate provided in the 2013 State Rail Plan for this stretch of track. This cumulative increase would be less than significant since it would be less than a 3 dBA increase.

From Sacramento the crude oil trains servicing the Valero Benicia and Kinder Morgan projects could use the same UPRR tracks as the Rail Spur Project from Sacramento to the Bay Area a distance of about 53 miles. This portion of track could have up to four crude oil trains per day (two for Valero, one for Kinder Morgan, and one for the SMR). Using the FTA noise model it was estimated that CNEL noise levels could increase by about 1.0 dBA assuming baseline train traffic of about 20 trains per day, which is the estimate provided in the 2013 State Rail Plan for this stretch of track. This cumulative increase would be less than significant since it would be less than a 3 dBA increase.

From Sacramento the crude oil trains servicing the Alon, Targa, and Plains All American projects could use the same tracks as the Rail Spur Project from Sacramento to Stockton a distance of about 46 miles. This portion of track could have up to five crude oil trains per day (two for Alon, one for Targa, one for Plains All American, and one for the SMR). Using the FTA noise model it was estimated that CNEL noise levels could increase by about 0.5 dBA assuming baseline train traffic of about 60 trains per day, which is the estimate provided in the 2013 State Rail Plan for this stretch of track. This cumulative increase would be less than significant since it would be less than a 3 dBA increase.

None of the other cumulative crude by rail projects would use the mainline tracks along the southern route thorough the Los Angeles Basin since the crude oil trains going to Bakersfield would use Tehachapi Pass via Barstow and would not travel has far west as Colton. However, up to four unit trains per day could share the route between Nevada and Barstow (two for Alon, one for Plains All American, and one for the SMR). Using the FTA noise model it was estimated that CNEL noise levels could increase by about 0.3 dBA assuming baseline train traffic of about 80 trains per day, which is the estimate provided in the 2013 State Rail Plan for this stretch of track. This cumulative increase would be less than significant since it would be less than a 3 dBA increase.

4.9.6 Mitigation Monitoring Plan

Mitigation Measure	Plan Requirements and Timing	Compliance Verification		
		Method	Timing	Responsible Party
N-1	The Applicant shall ensure that all construction activity at the Project Site is limited to the hours of 7:00 A.M. to 9:00 P.M., Monday through Friday, and 8:00 A.M. to 5:00 P.M. on Saturdays and Sundays. This restriction shall be a note placed on all construction plans.	Review of construction plan documents Site Inspection	Prior to grading permits	County Planning and Building
N-2a	Prior to issuance of the Notice to Proceed, the Applicant shall develop for review and approved by the County Department of Building and Planning a Rail Unloading and Management Plan that addresses procedures to minimize noise levels at the rail spur, including but not limited to the following: 1) All locomotives operating to the east of the unloading rack area between the hours of 10 P.M. and 7 A.M. shall be limited to a combined total of 100 locomotive-minutes (e.g. 2 locomotives for 50 minutes each or 1 locomotive for 100 minutes, etc. including switching and idling); 2) Arriving trains that enter the refinery between the hours of 10 P.M. and 7 A.M. and are not being immediately unloaded shall shutdown all locomotives once the train is on the refinery property; 3) No horns, annunciators or other signaling devices are allowed unless it is an emergency. If horns and annunciators are needed for worker safety, then warning devices shall be developed, to CPUC standards, to alert the safety of plant personnel when trains are in	Review of plan documents Site Inspection	Prior to construction permits	County Planning and Building

Mitigation Measure	Plan Requirements and Timing	Compliance Verification		
		Method	Timing	Responsible Party
	motion without an audible warning device; 4) No horns are to be used on the mainline siding track adjacent to the refinery unless it is an emergency; 5) Any trains repairs shall be conducted only between the hours of 7 A.M. and 7 P.M.; and (6) The Plan shall include a copy of the agreement between the Applicant and UPRR demonstrating the two parties have entered into a legally binding contractual arrangement ensuring implementation of the above requirements.			
N-2b	Prior to issuance of the Notice to Proceed, the Applicant shall provide to the County Department of Planning and Building evidence that each unloading pump and associated electric motor can achieve a noise level no greater than 71 dBA at 50 feet, including the installation of pump enclosures, or similar devices if necessary.	Review of plan documents Site Inspection	Prior to construction permits	County Planning and Building
N-2c	Prior to issuance of the Notice to Proceed, the Applicant shall submit to the County Department of Planning and Building for review and approval a Noise Monitoring Plan that outlines procedures for regular noise monitoring of the operational aspect of the Rail Spur facility. The Plan shall specify at a minimum the duration and location of monitoring activities with and without trains present at the SMR site. The monitoring locations shall include at least one location within 100 to 200 feet of the unloading activities and a monitoring location located at the property line of the nearest noise-sensitive receptor. The noise monitoring shall be conducted within one month of rail spur operations commencing. The results of the monitoring shall be reported to the County within one month of monitoring completion. If the results of the noise monitoring indicate that noise levels are above the thresholds, then the Applicant shall amend the Rail Unloading and Management Plan with additional mitigation measures that would reduce noise levels below County thresholds. Additional mitigation could include, but not be limited to, additional limits on the times of unloading activities.	Review of plan documents Site Inspection	Prior to construction permits	County Planning and Building

4.9.7 References

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