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MEMORANDUM

DATE: August 9, 2019

TO: John Arnau, Manager, Environmental Services, CEQA/Habitat Support, OC Waste & Recycling

FROM: Jason Lui, Associate/Senior Noise Specialist and Daniel Kaufman, Noise Analyst, LSA.

SUBJECT: Noise and Vibration Impact Analysis for the Capistrano Greenery at Prima Deshecha Landfill Project

This memorandum has been prepared to evaluate potential noise and vibration impacts associated with the proposed Capistrano Greenery Project (project) at the Prima Deshecha Landfill in the City of San Juan Capistrano (City), California. This report provides a project-specific noise and vibration impact analysis by examining the impacts of the proposed project on nearby sensitive uses.

PROJECT DESCRIPTION

OC Waste & Recycling (OCWR) proposes to implement a green waste composting operation at the 1,530-acre Prima Deshecha Landfill (landfill) property located in San Juan Capistrano, unincorporated Orange County, and San Clemente, California (Figure 1; all figures are attached). The proposed "Capistrano Greenery" will allow OCWR to assist Orange County cities and the County unincorporated area in meeting State recycling mandates for the recycling of organic waste materials.

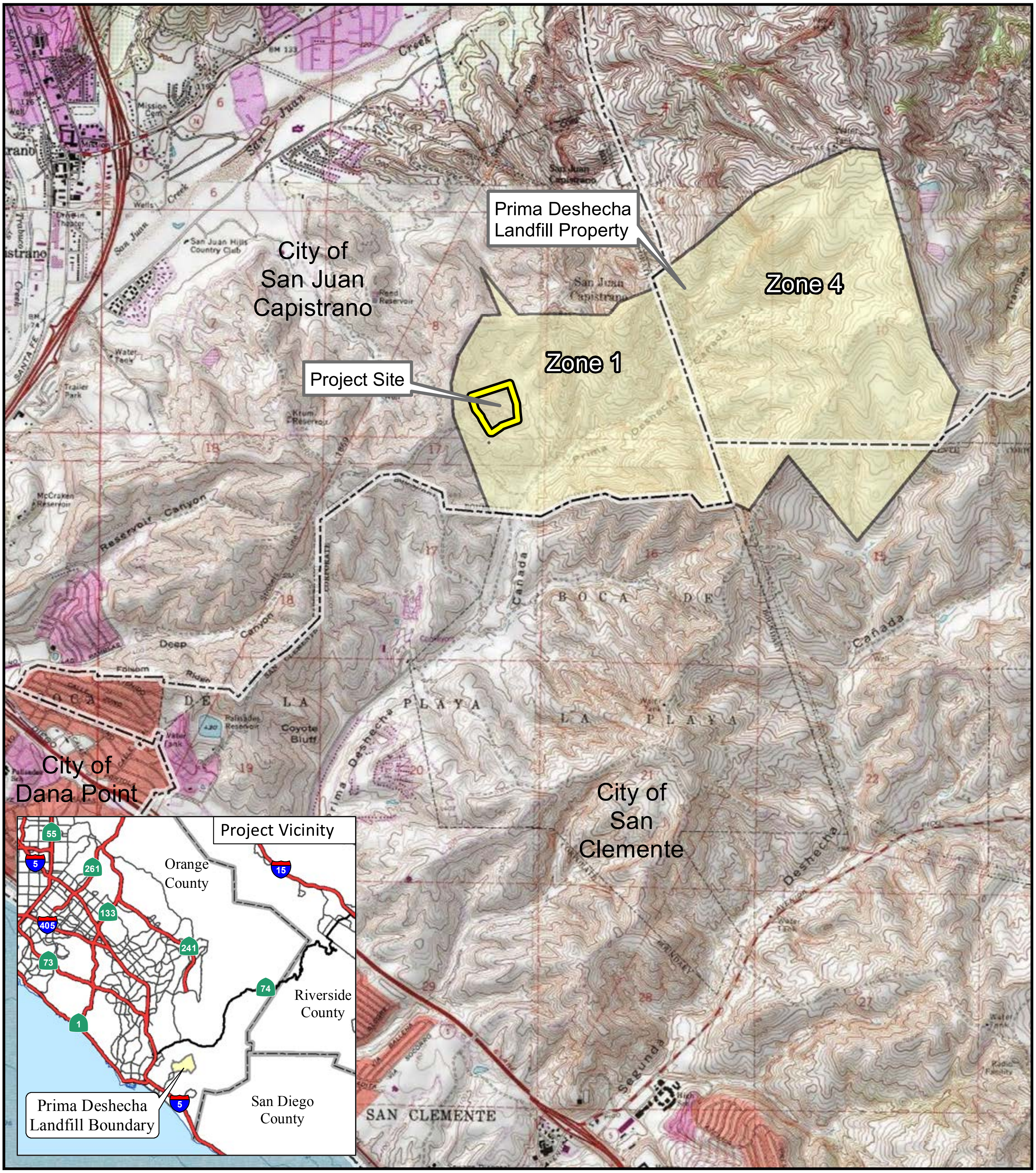
Currently, the landfill accepts approximately 100 tons per day (TPD) of processed green material (PGM) for beneficial reuse at the landfill, originating from incorporated cities in Orange County and the County unincorporated area. This material is ground and screened at existing materials recovery facilities and composting operations, and then loaded into transfer trucks that carry approximately 20-ton payloads for delivery to the landfill (i.e., approximately five two-way truck trips per day). This green waste material is predominantly from residential sources within Orange County. For the proposed Capistrano Greenery, it is anticipated that a maximum of 200 TPD of material will be composted per day, which will include PGM and horse manure. Under existing regulations, green waste composting operations can receive up to 20 percent manure by volume. Therefore, the Capistrano Greenery will have the ability to accept up to 40 TPD of horse manure for composting, although it is anticipated that the operation will receive much lower daily tonnages of horse manure. The 100 TPD of PGM that is already being received at the landfill will be transferred over to the Capistrano Greenery operation.

The Capistrano Greenery composting operation will be developed in an approximately 18.6-acre area of the western portion of the Zone 1 landfill, as shown on Figure 1, immediately south of Stockpile C, in an area that is not currently being used for active landfilling. A crushed asphalt base will be placed over the entire area that will be used for PGM storage and for composting operations. The Capistrano Greenery will accept a maximum of 200 TPD of PGM, with a maximum on-site storage of materials of 53,768 cubic yards (i.e., feedstock, compost – active, curing and final product) on-site at any given time. PGM will be brought to the Capistrano Greenery and placed in a designated unloading area (that can accommodate a storage of approximately 1,000 cubic yards of PGM). Since the PGM will have already been ground and screened before being brought to the landfill, the material will be transported by front-end loaders as soon as possible and placed into new compost piles. The layout of the compost piles is shown on Figure 2. Any highly contaminated or highly odorous loads will be immediately transported to the active landfill area and disposed. The active compost pile dimensions will be no greater than 8 feet (ft) in height, 20 ft wide, and 150 ft in length. The active compost process will take up to 72 days to complete.

Composting is a natural biological process that biodegrades organic waste and turns it into a valuable organic fertilizer. Composting is carried out under controlled aerobic conditions (i.e., requires oxygen). In this process, various microorganisms, including bacteria and fungi, break down organic material into simpler substances. The effectiveness of the composting process is dependent upon the environmental conditions present within the composting system, which include oxygen, temperature, moisture, material disturbance, organic material and the size and activity of microbial populations.

For the proposed Capistrano Greenery, OCWR is proposing to utilize open windrow composing methods. With open windrow composting, the green waste is placed in long rows called windrows. The windrows are turned (using a compost windrow turner or front-end loader) to improve porosity and oxygen content, mix in or remove moisture, and redistribute cooler and hotter portions of the pile. Open windrow composting is a commonly used composting operation method. Composting process control parameters include the initial ratios of carbon and nitrogen rich materials, the amount of bulking agent added to assure air porosity, the pile size, moisture content and turning frequency. The temperature of the windrows must be measured and logged constantly to determine the optimum time to turn them for quicker compost production.

Heavy equipment will include a windrow turner, two front-end loaders, a mobile screen, a water truck, and a truck. The Capistrano Greenery operation will require three employees to operate all of the heavy equipment described above for building, turning, watering and monitoring the compost piles, and performing other miscellaneous duties. Five full-time employees will be needed to provide sufficient staffing for days off, vacations, etc. For open-windrow composting, the windrow turner will turn each active compost pile as needed. Composting operations require significant volumes of water to facilitate the composting process, to regulate temperatures and to prevent fires. Water will also be required for dust control. The landfill operation currently uses both potable and reclaimed water. Landfill operations primarily use reclaimed water. Current reclaimed water usage for landfill operations is approximately 50,000 gallons per day. Potable water is used for the landfill administrative building and crew quarters and for habitat mitigation areas. The bulk of current potable water use is for the habitat mitigation areas. Current potable water consumption is approximately 133,000 gallons per day. For the 200 TPD composting operation, it is estimated that



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LEGEND

Prima Deshecha Landfill Boundary

Project Site

FIGURE 1

0 1600 3200
FEET

SOURCE: USGS 7.5' QUAD - Canada Gobernadora (1988); Dana Point (1975); San Clemente (1975), CA

Capistrano Greenery at Prima Deshecha Landfill

Regional and Project Location

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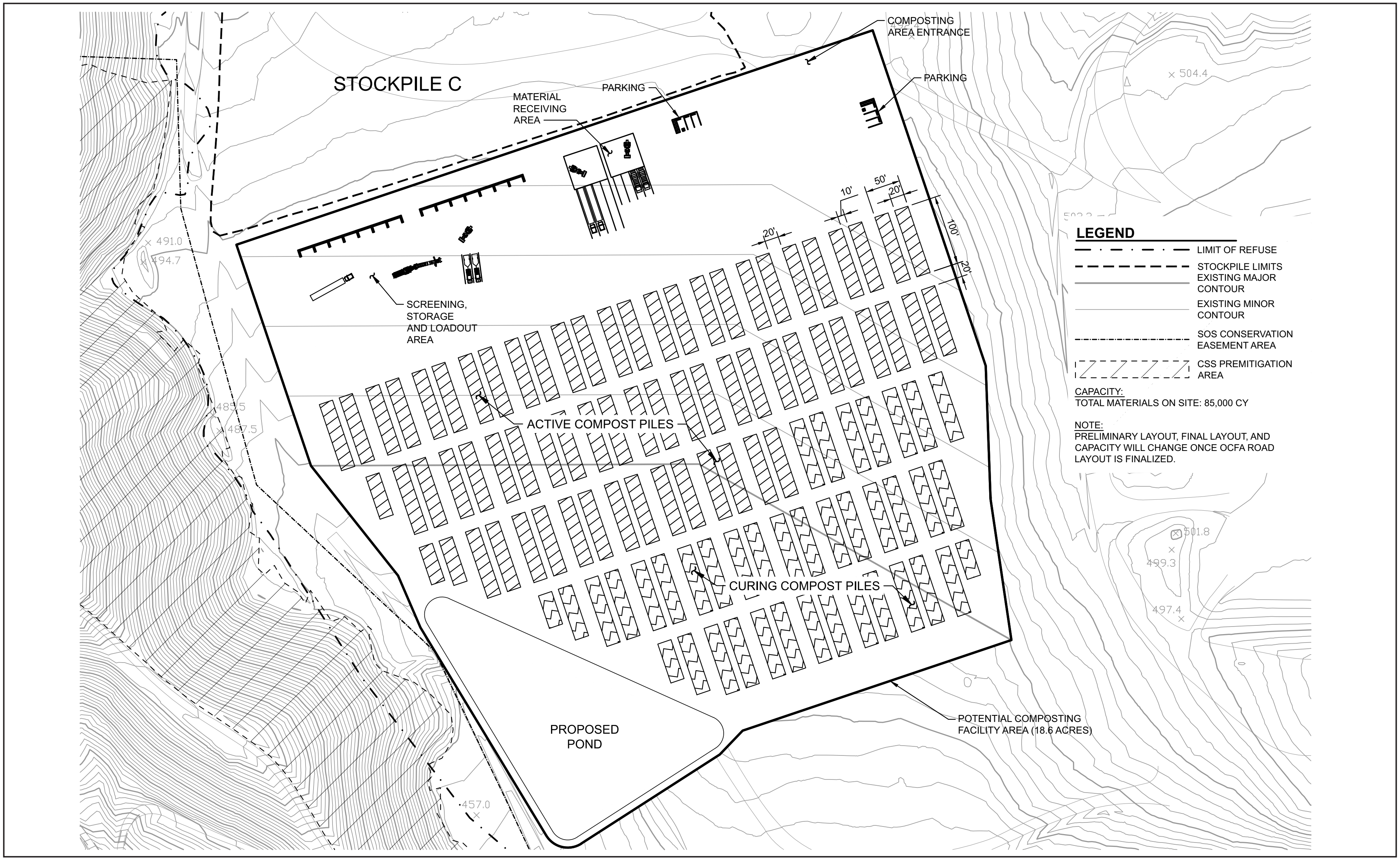

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FIGURE 2

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0 100 200

FEET

SOURCE: Tetra Tech

Capistrano Greenery at Prima Deshecha Landfill

Site Plan

I:\OCY1701.15\G\Site Plan.cdr (7/26/2019) up to 80,000 gallons of potable water will be needed each day for moistening the compost piles and for dust control. Altogether, the Prima Deshecha Landfill operation and the Capistrano Greenery will use approximately 213,000 gallons of potable water per day. As the windrows are turned, water will be added to maintain optimum moisture content of 45–60 percent within the piles. The temperature of each compost pile will be taken and recorded each operating day. Capistrano Greenery employees will continuously monitor the active compost piles for odor generation, vectors, and potential for fire generation.

After the active compost process has been completed, the compost will be placed in curing piles for further stabilization of the compost product. The layout of the curing piles is shown on Figure 2. The curing process will take up to 48 days to complete. After the curing process is complete, the finished compost will be screened to remove oversized uncomposted material and residual solid waste. Altogether, the composting process may take up to 120 days or 4 months. Finished compost will be placed in a temporary storage area that can accommodate up to 1,400 cubic yards of finished compost. The finished compost will be delivered to end users located within and outside of Orange County. At 200 TPD, and using 20-ton per load end dump trucks, the Capistrano Greenery will generate approximately 10 two-way new truck trips per day, with these trucks taking finished compost to end markets. In addition, there will be 5 additional new two-way truck trips associated with increasing the current amount of PGM accepted at the landfill from 100 TPD to 200 TPD.

OCWR will implement an odor impact minimization plan for the Capistrano Greenery operation. Testing of finished compost (i.e., after the curing process is complete) for pathogens and metals will be performed in accordance with California Code of Regulations (CCR) Title 14 requirements.

The Capistrano Greenery will be designed and operated to meet all Orange County Fire Authority (OCFA) requirements. This will include but not be limited to the spacing between windrows; the number, width and length of fire lanes; and the distance of the windrows and material storage areas to flammable vegetation. In addition, the Capistrano Greenery will have fire hydrants – the number and locations to be determined by OCFA. The fire hydrants, with a 2.5-inch outlet, will be located around the perimeter of the composting operation at spacing of approximately 1,000 ft. Fire hydrants shall be set back a minimum of 20 ft from any pile.

Methane generated by the underlying landfill area will not result in surface fires at the composting area through the effective maintenance and monitoring of the landfill gas collection system.

There is an existing City of San Juan Capistrano Water District 24-inch domestic potable water main located along the landfill ridgeline, approximately 600 ft west of the proposed composting facility location. A new 8-inch to 12-inch waterline would need to be constructed to bring water from the 24-inch water main to the proposed composting facility location. The new waterline would connect to a water distribution system within the composting area to provide operations water throughout the facility. It is estimated that the composting operation would require a maximum of approximately 80,000 gallons of potable water per day. Since the landfill operation uses approximately 133,000 gallons of potable water per day for the administration building/crew quarters and for the habitat mitigation areas; altogether, the composting operation and these landfill uses will use approximately 213,000 gallons of potable water per day.

Appropriate asphalt material will be placed over the entire landfill area where the composting will occur so that there will be no impacts to the underlying waste prism. The design of the proposed composting operation shall account for the underlying refuse and comply with any landfill-related regulations.

For the Capistrano Greenery, the site will be graded such that the center of each compost pile will be located on a high point and the compost deck will be graded at 2 percent toward the access lanes which will be graded at 2 percent to the south, conveying flows to an approximate 7.85-acre feet lined composting operation pond, that will be constructed to capture storm water runoff and leachate from the composting operation. The location of the lined composting operations pond is shown on Figure 2. The composting operation lined pond dimensions were determined based on National Oceanic and Atmospheric Administration (NOAA) precipitation data based for a 25-year, 24-hour storm event (per Order WQ 2015-0121-DWQ, General Waste Discharge Requirements for Composting Operations) and the appropriate tributary boundary of the compost area. The compost operating area will require perimeter berms between 2–3 ft high, depending on the location, to convey flows from a 25-year, 24-hour storm to the lined pond. In addition, in accordance with standard engineering practices, the pond will be designed to accommodate an additional 2 ft of freeboard above the water level of the design storm event to accommodate waves and splashing from water flows. OCWR shall fully contain all surface water runoff and leachate resulting from the composting operation. Collected surface water runoff and leachate will be collected on-site from the composting operation lined pond, and reused with the composting operation. Collected surface water runoff and leachate will not be discharged to the landfill storm water drainage system.

For the acceptance of green waste materials, the Capistrano Greenery will have the same hours of operation as the Prima Deshecha Landfill – Monday through Saturday, 7:00 a.m.–5:00 p.m. No incoming green waste materials will be accepted on Sundays and the six major holidays. The Capistrano Greenery will be open on Sundays for composting operations only, primarily to monitor the compost piles. The Capistrano Greenery will not be open to the public. OCWR shall maintain accurate records of various categories of waste materials processed at the Capistrano Greenery, including the residual waste that will be disposed at the Prima Deshecha Landfill, as required under the Disposal Reporting System regulations at Title 14, CCR, Sections 18800–18814.11.

CHARACTERISTICS OF SOUND

Noise is usually defined as unwanted sound. Noise consists of any sound that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, and sleep.

To the human ear, sound has two significant characteristics: pitch and loudness. Pitch is generally an annoyance, while loudness can affect the ability to hear. Pitch is the number of complete vibrations, or cycles per second, of a sound wave, which results in the tone's range from high to low. Loudness is the strength of a sound, and it describes a noisy or quiet environment; it is measured by the amplitude of the sound wave. Loudness is determined by the intensity of the sound wave combined with the reception characteristics of the human ear. Sound intensity refers to the power carried by sound waves per unit area in a direction perpendicular to that area. This characteristic of sound can be precisely measured with instruments. The analysis of a project defines the noise environment of the project area in terms of sound pressure level and its effect on adjacent sensitive land uses.

Measurement of Sound

Sound pressure level is measured with the A-weighted decibel scale to correct for the relative frequency response of the human ear. That is, an A-weighted noise level de-emphasizes low and very high frequencies of sound, similar to the human ear's de-emphasis of these frequencies. Decibels, unlike linear units (e.g., inches or pounds), are measured on a logarithmic scale representing points on a sharply rising curve.

For example, 10 decibels (dB) is 10 times more intense than 1 dB, 20 dB is 100 times more intense than 1 dB, and 30 dB is 1,000 times more intense than 1 dB. Thirty decibels (30 dB) represents 1,000 times as much acoustic energy as 1 dB. The decibel scale increases as the square of the change, representing the sound pressure energy. A sound as soft as human breathing is about 10 times greater than 0 dB. The decibel system of measuring sound gives a rough connection between the physical intensity of sound and its perceived loudness to the human ear. A 10 dB increase in sound level is perceived by the human ear as only a doubling of the sound's loudness. Ambient sounds generally range from 30 dB (very quiet) to 100 dB (very loud).

Sound levels are generated from a source, and their decibel level decreases as the distance from that source increases. Sound levels dissipate exponentially with distance from their noise sources. For a single point source, sound levels decrease approximately 6 dB for each doubling of distance from the source. This drop-off rate is appropriate for noise generated by stationary equipment. If noise is produced by a line source (e.g., highway traffic or railroad operations) the sound decreases 3 dB for each doubling of distance in a hard site environment. Line source sound levels decrease 4.5 dB for each doubling of distance in a relatively flat environment with absorptive vegetation.

There are many ways to rate noise for various time periods, but an appropriate rating of ambient noise affecting humans also accounts for the annoying effects of sound. The equivalent continuous sound level (L_{eq}) is the total sound energy of time-varying noise over a sample period. However, the predominant rating scales for human communities in the State of California are the L_{eq} and Community Noise Equivalent Level (CNEL) or the day-night average noise level (L_{dn}) based on A weighted decibels (dBA). CNEL is the time-varying noise over a 24-hour period, with a 5 dBA weighting factor applied to the hourly L_{eq} for noise occurring from 7:00 p.m. to 10:00 p.m. (defined as relaxation hours) and a 10 dBA weighting factor applied to noise occurring from 10:00 p.m. to 7:00 a.m. (defined as sleeping hours). L_{dn} is similar to the CNEL scale but without the adjustment for events occurring during the relaxation and sleeping hours. CNEL and L_{dn} are within 1 dBA of each other and are normally interchangeable. The City uses the CNEL noise scale for long-term noise impact assessment.

Other noise rating scales of importance when assessing the annoyance factor include the maximum instantaneous noise level (L_{max}), which is the highest exponential time-averaged sound level that occurs during a stated time period. The noise environments discussed in this analysis for short-term noise impacts are specified in terms of maximum levels denoted by L_{max}, which reflects peak operating conditions and addresses the annoying aspects of intermittent noise. It is often used together with another noise scale, or noise standards in terms of percentile noise levels, in noise ordinances for enforcement purposes. For example, the L_{10} noise level represents the noise level exceeded 10 percent of the time during a stated period. The L_{50} noise level represents the median noise level. Half the time the noise level exceeds this level, and half the time it is less than this level. The L_{90} noise level represents the noise level exceeded 90 percent of the time and is considered the background noise level during a monitoring period. For a relatively constant noise source, the L_{eq} and L_{50} are approximately the same.

Noise impacts can be described in three categories. The first category includes audible impacts that refer to increases in noise levels noticeable to humans. Audible increases in noise levels generally refer to a change of 3 dB or greater because this level has been found to be barely perceptible in exterior environments. The second category, potentially audible, refers to a change in the noise level between 1 dB and 3 dB. This range of noise levels has been found to be noticeable only in laboratory environments. The last category includes changes in noise levels of less than 1 dB, which are inaudible to the human ear. Only audible changes in existing ambient or background noise levels are considered potentially significant.

Physiological Effects of Noise

Physical damage to human hearing begins at prolonged exposure to sound levels higher than 85 dBA. Exposure to high sound levels affects the entire system, with prolonged sound exposure in excess of 75 dBA increasing body tensions, thereby affecting blood pressure and functions of the heart and the nervous system. In comparison, extended periods of sound exposure above 90 dBA would result in permanent cell damage. When the sound level reaches 120 dBA, a tickling sensation occurs in the human ear, even with short-term exposure. This level of sound is called the threshold of feeling. As the sound reaches 140 dBA, the tickling sensation is replaced by a feeling of pain in the ear (i.e., the threshold of pain). A sound level of 160–165 dBA will result in dizziness or a loss of equilibrium. The ambient or background noise problem is widespread and generally more concentrated in urban areas than in outlying, less-developed areas.

Table A lists definitions of acoustical terms, and Table B shows common sound levels and their sources.

Table A: Definitions of Acoustical Terms

Term	Definitions
Decibel, dB	A unit of sound level that denotes the ratio between two quantities that are proportional to power; the number of decibels is 10 times the logarithm (to the base 10) of this ratio.
Frequency, Hz	Of a function periodic in time, the number of times that the quantity repeats itself in 1 second (i.e., the number of cycles per second).
A-Weighted Sound Level, dBA	The sound level obtained by use of A-weighting. The A-weighting filter de-emphasizes the very low and very high-frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. (All sound levels in this report are A-weighted unless reported otherwise.)
L_{01}, L_{10}, L_{50}, L_{90}	The fast A-weighted noise levels that are equaled or exceeded by a fluctuating sound level 1%, 10%, 50%, and 90% of a stated time period, respectively.
Equivalent Continuous Noise Level, L_{eq}	The level of a steady sound that, in a stated time period and at a stated location, has the same A-weighted sound energy as the time varying sound.
Community Noise Equivalent Level, CNEL	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 5 dBA to sound levels occurring in the evening from 7:00 p.m. to 10:00 p.m. and after the addition of 10 dBA to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
Day/Night Noise Level, L_{dn}	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 10 dBA to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
L_{max}, L_{min}	The maximum and minimum A-weighted sound levels measured on a sound level meter, during a designated time interval, using fast time averaging.
Ambient Noise Level	The all-encompassing noise associated with a given environment at a specified time. It is usually a composite of sound from many sources from many directions, near and far; no particular sound is dominant.
Intrusive	The noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content, as well as the prevailing ambient noise level.

Source: *Handbook of Acoustical Measurements and Noise Control* (Harris 1991)

Table B: Common Sound Levels and Their Noise Sources

Noise Source	A-Weighted Sound Level in Decibels	Noise Environments	Subjective Evaluations
Near Jet Engine	140	Deafening	128 times as loud
Civil Defense Siren	130	Threshold of Pain	64 times as loud
Hard Rock Band	120	Threshold of Feeling	32 times as loud
Accelerating Motorcycle at a Few Feet Away	110	Very Loud	16 times as loud
Pile Driver; Noisy Urban Street/Heavy City Traffic	100	Very Loud	8 times as loud
Ambulance Siren; Food Blender	95	Very Loud	—
Garbage Disposal	90	Very Loud	4 times as loud
Freight Cars; Living Room Music	85	Loud	—
Pneumatic Drill; Vacuum Cleaner	80	Loud	2 times as loud
Busy Restaurant	75	Moderately Loud	—
Near Freeway Auto Traffic	70	Moderately Loud	Reference level
Average Office	60	Quiet	One-half as loud
Suburban Street	55	Quiet	—
Light Traffic; Soft Radio Music in Apartment	50	Quiet	One-quarter as loud
Large Transformer	45	Quiet	—
Average Residence without Stereo Playing	40	Faint	One-eighth as loud
Soft Whisper	30	Faint	—
Rustling Leaves	20	Very Faint	—
Human Breathing	10	Very Faint	Threshold of Hearing
—	0	Very Faint	—

Source: Compiled by LSA (2016).

FUNDAMENTALS OF VIBRATION

Vibration refers to ground-borne noise and perceptible motion. Ground-borne vibration is almost exclusively a concern inside buildings and is rarely perceived as a problem outdoors, where the motion may be discernible, but without the effects associated with the shaking of a building there is less adverse reaction. Vibration energy propagates from a source through intervening soil and rock layers to the foundations of nearby buildings. The vibration then propagates from the foundation throughout the remainder of the structure. Building vibration may be perceived by occupants as the motion of building surfaces, the rattling of items sitting on shelves or hanging on walls, or a low-frequency rumbling noise. The rumbling noise is caused by the vibration of walls, floors, and ceilings that radiate sound waves. Annoyance from vibration often occurs when the vibration exceeds the threshold of perception by 10 dB or less. This is an order of magnitude below the damage threshold for normal buildings.

Typical sources of ground-borne vibration are construction activities (e.g., blasting, pile-driving, and operating heavy-duty earthmoving equipment), steel-wheeled trains, and occasional traffic on rough roads. Problems with both ground-borne vibration and noise from these sources are usually localized to areas within approximately 100 ft from the vibration source, although there are examples of ground-borne vibration causing interference out to distances greater than 200 ft (*Transit Noise and Vibration Impact Assessment Manual,* Federal Transit Authority [FTA], 2018). When roadways are smooth, vibration from traffic, even heavy trucks, is rarely perceptible. It is assumed for most projects that the roadway surface will be smooth enough that ground-borne vibration from street traffic will not exceed the impact criteria; however, both construction of the project and the freight train operations could result in ground-borne vibration that may be perceptible and annoying.

Ground-borne noise is not likely to be a problem because noise arriving via the normal airborne path will usually be greater than ground-borne noise.

Ground-borne vibration has the potential to disturb people and damage buildings. Although it is very rare for train-induced ground-borne vibration to cause even cosmetic building damage, it is not uncommon for construction processes such as blasting and pile-driving to cause vibration of sufficient amplitudes to damage nearby buildings (FTA 2018). Ground-borne vibration is usually measured in terms of vibration velocity, either the root-mean-square (RMS) velocity or peak particle velocity (PPV). The RMS is best for characterizing human response to building vibration, and PPV is used to characterize potential for damage. Decibel notation acts to compress the range of numbers required to describe vibration. Vibration velocity level in decibels is defined as:

$$L_v = 20 \log_{10} [V/V_{ref}]$$

where "L_v" is the vibration velocity in decibels (VdB), "V" is the RMS velocity amplitude, and "V_{ref}" is the reference velocity amplitude, or 1×10^{-6} inches/second (in/sec) used in the United States. Table C illustrates human response to various vibration levels, as described in the *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).

Table C: Human Response to Different Levels of Ground-Borne Noise and Vibration

Vibration Velocity Level	Noise Level		Human Response
	Low Frequency[1]	Mid Frequency[2]	
65 VdB	25 dBA	40 dBA	Approximate threshold of perception for many humans. Low-frequency sound is usually inaudible; mid-frequency sound is excessive for quiet sleeping areas.
75 VdB	35 dBA	50 dBA	Approximate dividing line between barely perceptible and distinctly perceptible. Many people find transit vibration at this level unacceptable. Low-frequency noise is acceptable for sleeping areas; mid-frequency noise is annoying in most quiet occupied areas.
85 VdB	45 dBA	60 dBA	Vibration is acceptable only if there are an infrequent number of events per day. Low-frequency noise is unacceptable for sleeping areas; mid-frequency noise is unacceptable even for infrequent events with institutional land uses, such as schools and churches.

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018)
[1] Approximate noise level when vibration spectrum peak is near 30 Hz.
[2] Approximate noise level when vibration spectrum peak is near 60 Hz.
dBA = A-weighted decibels
FTA = Federal Transit Administration
Hz = Hertz
VdB = vibration velocity decibels

Factors that influence ground-borne vibration and noise include the following:

- **Vibration Source:** Vehicle suspension, wheel types and condition, railroad track/roadway surface, railroad track support system, speed, transit structure, and depth of vibration source.
- **Vibration Path:** Soil type, rock layers, soil layering, depth to water table, and frost depth.
- **Vibration Receiver:** Foundation type, building construction, and acoustical absorption.

Among the factors listed above, there are significant differences in the vibration characteristics when the source is underground compared to at the ground surface. In addition, soil 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 indicates: (1) vibration propagation is more efficient in stiff, clay soils than in loose, sandy soils; and (2) shallow rock seems to concentrate the vibration energy close to the surface and can result in ground-borne vibration problems at large distances from a railroad track. Factors such as layering of the soil and the depth to the water table can have significant effects on the propagation of ground-borne vibration. Soft, loose, sandy soils tend to attenuate more vibration energy than hard, rocky materials. Vibration propagation through groundwater is more efficient than through sandy soils.

REGULATORY SETTING

Federal Regulations

Federal Transit Administration

Vibration standards included in the FTA's *Transit Noise and Vibration Impact Assessment Manual* (2018) are used in this analysis for ground-borne vibration impacts on human annoyance, as shown in Table D. Table D provides the criteria for assessing the potential for interference or annoyance from vibration levels in a building.

Table D: Interpretation of Vibration Criteria for Detailed Analysis

Land Use	Max L_v (VdB)[1]	Description of Use
Workshop	90	Distinctly feelable vibration. Appropriate to workshops and non-sensitive areas.
Office	84	Feelable vibration. Appropriate to offices and non-sensitive areas.
Residential Day	78	Feelable vibration. Appropriate for computer equipment and low-power optical microscopes (up to 20X).
Residential Night and Operating Rooms	72	Vibration not feelable, but ground-borne noise may be audible inside quiet rooms. Suitable for medium-power microscopes (100X) and other equipment of low sensitivity.

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018)
[1] As measured in 1/3-octave bands of frequency over the frequency range 8 to 80 Hertz.
FTA = Federal Transit Administration
L_V = velocity in decibels
VdB = vibration velocity decibels

The criteria for environmental impact from ground-borne vibration and noise are based on the maximum levels for a single event. Table E lists the potential vibration building damage criteria associated with construction activities, as suggested in the *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018). FTA guidelines show that a vibration level of up to 102 VdB (equivalent to 0.5 in/sec in PPV) (FTA 2018) is considered safe for buildings consisting of reinforced concrete, steel, or timber (no plaster) and would not result in any construction vibration damage. For a non-engineered timber and masonry building, the construction building vibration damage criterion is 94 VdB (0.2 in/sec in PPV).

Table E: Construction Vibration Damage Criteria

Building Category	PPV (in/sec)	Approximate L_V (VdB)[1]
Reinforced concrete, steel, or timber (no plaster)	0.50	102
Engineered concrete and masonry (no plaster)	0.30	98
Non-engineered timber and masonry buildings	0.20	94
Buildings extremely susceptible to vibration damage	0.12	90

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018)
[1] RMS vibration velocity in decibels (VdB) re 1 µin/sec.
µin/sec = microinches per second
FTA = Federal Transit Administration
in/sec = inch/inches per second
L_V = velocity in decibels
PPV = peak particle velocity
RMS = root-mean-square
VdB = vibration velocity decibels

Local Regulations

City of San Juan Capistrano

Municipal Code. Section 9-3.531, Noise Standards (residential and non-residential), of the City's Municipal Code provides noise standards for non-transportation sources to be used as the basis of measurement for determining noise violations affecting uses within the residential, public and institutional, and commercial districts. Table F provides the exterior noise levels standards applicable for residential, public, and institutional districts, which would include the project site. In the event the existing ambient noise level exceeds the applicable noise limit categories, based on time duration of the potential impact, the existing ambient noise level shall be the new noise level standard for the same time duration. Each of the noise levels provided in Table F shall be reduced by 5 dBA for impacts of simple tone noises or noise consisting of speech or music. The City's Municipal Code provides the interior noise level standards for residential uses only during nighttime hours (10:00 p.m. to 7:00 a.m.). These standards would not be applicable to the project, because the project would operate from 7:00 a.m. to 5:00 p.m.

Table F: City of San Juan Capistrano Maximum Noise Level Standards

Land Use	Exterior/ Interior	Time Period	L_{50} (30 mins)	L_{25} (15 mins)	L_8 (5 mins)	L_2 (1 min)	L_{max} (Anytime)
Residential, Public, and Institutional	Exterior	7:00 a.m. to 7:00 p.m.	65	70	75	80	85
		7:00 p.m. to 10:00 p.m.	55	60	65	70	75
		10:00 p.m. to 7:00 a.m.	45	50	55	60	65

Source: City of San Juan Capistrano, 2019.

[1] The exterior noise standards are applicable to schools, hospitals, and churches while they are in use.

dBA = A-weighted decibels

L_{xx} = Average noise level over XX% of an hour

L_{max} = maximum instantaneous noise level

min/mins = minute/minutes

Section 9-3.531 (d), Special Provisions, specifies that construction activities which occur between the hours of 7:00 a.m. and 6:00 p.m., Monday through Friday, or from 8:30 a.m. to 4:30 p.m. on Saturday shall be exempted from these provisions. No construction shall be permitted outside of these hours or on Sundays and federal holidays.

EXISTING SETTING

Overview of the Existing Noise Environment

The primary existing noise sources in the project area are wind, birds, occasional distant heavy equipment movement and back-up beeps, and occasional aircraft flyovers. Traffic noise is not audible at the project site.

Existing Sensitive Land Uses in the Project Vicinity

The project site is surrounded by open space to the west and existing portions of the landfill to the north, east, and south. The closest residences are located approximately 1,180 ft from the boundary of the proposed composting facility.

Ambient Noise Measurements

One long-term (24-hour) noise level measurement was conducted from July 15 through July 16, 2019, using a Larson Davis Type 2 Spark 706RC dosimeter. Table G shows hourly L_{eq} results from the long-term noise level measurement, and Table H shows the calculated CNEL level from the long-term noise level measurement. As shown in Table H, the calculated CNEL level is 53 dBA at LT-1. Figure 3 shows the long-term monitoring location.

Table G: Long-Term (24-Hour) Noise Level Measurement Results at LT-1

	Start Time	Date	Noise Level (dBA L_{eq})
1	12:00 PM	7/15/19	51
2	1:00 PM	7/15/19	51
3	2:00 PM	7/15/19	52
4	3:00 PM	7/15/19	50
5	4:00 PM	7/15/19	50
6	5:00 PM	7/15/19	48
7	6:00 PM	7/15/19	49
8	7:00 PM	7/15/19	48
9	8:00 PM	7/15/19	45
10	9:00 PM	7/15/19	51
11	10:00 PM	7/15/19	47
12	11:00 PM	7/15/19	46
13	12:00 AM	7/16/19	42
14	1:00 AM	7/16/19	42
15	2:00 AM	7/16/19	47
16	3:00 AM	7/16/19	43
17	4:00 AM	7/16/19	41
18	5:00 AM	7/16/19	40
19	6:00 AM	7/16/19	45
20	7:00 AM	7/16/19	49
21	8:00 AM	7/16/19	49
22	9:00 AM	7/16/19	51
23	10:00 AM	7/16/19	48
24	11:00 AM	7/16/19	50

Source: Compiled by LSA (2019).
dBA L_{eq} = equivalent continuous sound level measured in A-weighted decibels

Table H: Long-Term Ambient Noise Level Measurements

Location Number	Location	Start Date	Start Time	Duration (hours)	Noise Level (dBA CNEL)	Noise Sources
LT-1	28522 Avenida Placida, in front of the residence.	7/15/19	12:00 p.m.	24	53	Wind and occasional vehicles and aircraft.

Source: Compiled by LSA Associates, Inc. (2019).
CNEL = Community Noise Equivalent Level
dBA = A-weighted decibels

LSA

LEGEND

Project Area

Prima Deshecha Boundary

Noise Monitoring Location

N

0 375 750
FEET

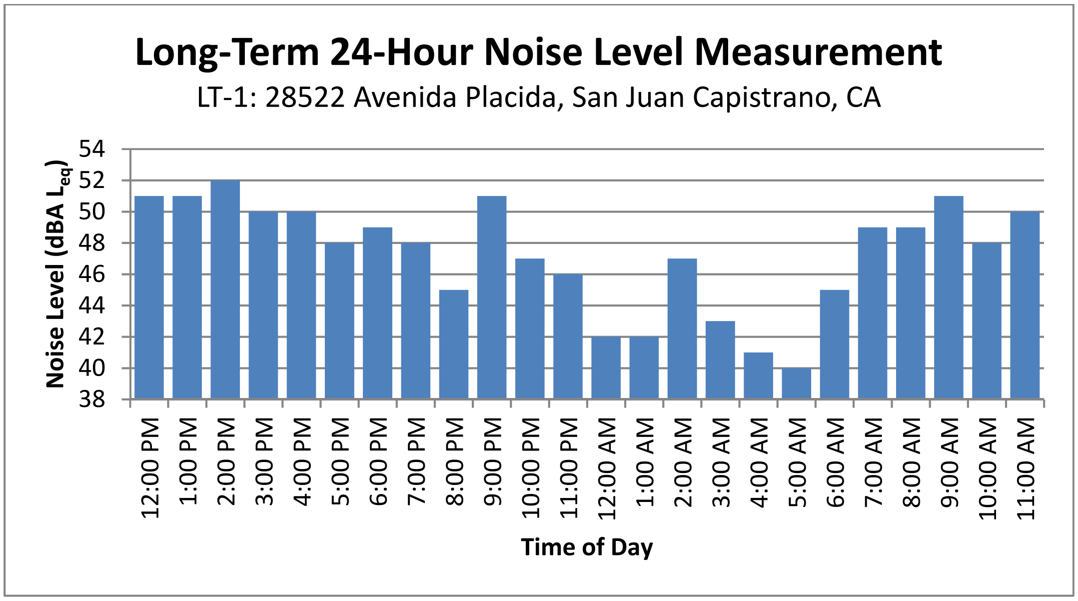
SOURCE: Google Maps, 2019

FIGURE 3

Capistrano Greenery at
Prima Deshecha Landfill

Noise Monitoring Location

I:\OCY1701.15\G\Noise\Noise_Monitor_Locs.ai (7/24/2019)



Existing Aircraft Noise

Airport-related noise levels are primarily associated with aircraft engine noise made while aircraft are taking off, landing, or running their engines while still on the ground. The project site is outside the 60 dBA CNEL noise contour of John Wayne Airport (JWA) based on the JWA Airport Impact Zones map in the Airport Environs Land Use Plan (Orange County Airport Land Use Commission 2008).

Existing Traffic Noise

The Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (FHWA-RD-77-108) was used to evaluate traffic-related noise conditions along roadway segments in the project vicinity. This model requires various parameters, including traffic volumes, vehicle mix, vehicle speed, and roadway geometry to compute typical equivalent noise levels during daytime, evening, and nighttime hours. The resultant noise levels are weighted and summed over 24-hour periods to determine the CNEL values. Traffic volumes were obtained from the *Capistrano Greenery Traffic Impact Analysis* (LSA 2019). The standard vehicle mix for Southern California roadways was used for traffic on the roadway segments in the project vicinity; and Table I provides the existing traffic noise levels in the project vicinity. These traffic noise levels are representative of a worst-case scenario that assumes a flat terrain and no shielding between the traffic and the noise contours. The specific assumptions used in developing these noise levels and the model printouts are provided in the FHWA traffic noise printouts, which are attached to this memorandum.

Table I: Existing Traffic Noise Levels Without Project

Roadway Segment	ADT	Centerline to 70 dBA CNEL (ft)	Centerline to 65 dBA CNEL (ft)	Centerline to 60 dBA CNEL (ft)	CNEL (dBA) 50 ft from Centerline of Outermost Lane
Ortega Highway from I-5 SB Ramps to I-5 NB Ramps	43,468	74	137	284	68.0
Ortega Highway from I-5 NB Ramps to Rancho Viejo Road	49,586	75	147	309	68.9
Ortega Highway from Rancho Viejo Road to La Novia Avenue	42,410	80	163	346	70.0
Ortega Highway from Via Cordova to Via Cristal	36,421	82	176	379	71.9
Ortega Highway from Via Errecarte and Shadetree Lane/Avenida Siega	35,968	82	175	376	71.9
Avenida La Pata south of Ortega Highway	16,960	71	149	319	70.3

Source: Compiled by LSA (2019).

ADT = average daily traffic
CNEL = Community Noise Equivalent Level
dBA = A-weighted decibels
ft = foot/feet
I-5 = Interstate 5
NB = Northbound
SB = Southbound

IMPACTS

Short-Term Construction Noise Impacts

Two types of short-term noise impacts would occur during construction on the project site. First, construction crew commutes and the transport of construction equipment to the project site would incrementally increase noise levels on access roads leading to the site. There would be a relatively high single-event noise exposure potential causing intermittent noise from large trucks passing at 50 ft that would generate up to a maximum of 84 dBA. The transport of construction equipment would be moved on-site just one time and would remain on site for the duration of each construction phase. This one-time trip, when heavy construction equipment is moved on and off-site, would not add to the daily traffic noise in the project vicinity. Construction crew commute trips and one-time off-road vehicle movement would reach up to 24 trips per day, which would be minimal when compared to existing average daily traffic volumes of 16,960 and 35,968 on Avenida La Pata and Ortega Highway, respectively, which are shown in Table I. Based on the above noise levels, no noise level increases in ambient noise from construction-related vehicle trips would result. Therefore, short-term, construction-related impacts associated with worker commutes and equipment transport to the project site would be less than significant.

The second type of short-term noise impact is related to noise generated during construction activities on the project site. Construction is completed in discrete steps, each of which has its own mix of equipment, and consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated on the project site. Therefore, the noise levels vary as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. Table J lists the typical construction equipment noise levels (L_{max}) recommended for noise impact assessments, based on a distance of 50 ft between the equipment and a noise receptor.

Table J: Typical Construction Equipment Noise Levels

Equipment Description	Acoustical Usage Factor (%)	Maximum Noise Level (L_{max}) at 50 ft[1]
Dozers	40	85
Dump Trucks	40	84
Excavators	40	85
Flat Bed Trucks	40	84
Forklifts	20	85
Loaders	40	80
Man Lifts	20	85
Pickup Trucks	40	55
Roller	20	85
Scrapers	40	85
Water Trucks (Flat Bed Truck)	40	84
Welder / Torch	40	73

Source: Roadway Construction Noise Model (Federal Highway Administration 2006)
Note: Noise levels reported in this table are rounded to the nearest whole number.
1 Maximum noise levels were developed based on Spec 721.560 from the Central Artery/Tunnel program to be consistent with the City of Boston's Noise Code for the "Big Dig" project.
ft = foot/feet
L_{max} = maximum instantaneous sound level
Spec = specification

Table K lists the composite noise levels generated by project construction activities for each construction phase and the associated pieces of construction equipment for each phase. These noise levels assume that each piece of construction equipment operates as an individual point source and each doubling of the sound source with equal strength increases the noise level by 3 dBA. Table K shows the composite L_{eq} noise level based on the maximum noise levels and acoustical usage factors shown in Table J. As shown in Table K, the Berm and Retention Basin Building would be the noisiest construction phase, which would generate a composite noise level of 92 dBA L_{max} (87 dBA L_{eq}).

The property line of the closest residence to the west is approximately 1,180 ft from the project construction boundary. Therefore, the closest residence may be subject to short-term noise reaching 65 dBA L_{max} (60 dBA L_{eq}) based on a distance attenuation of 27 dBA. In addition, these noise levels would be further reduced by an existing ridgeline with an elevation of 570 ft to 620 ft at the perimeter of the landfill between the construction boundary and the residences, which have elevations ranging from 340 ft to 370 ft. The implementation of measures that would minimize noise impacts from construction equipment include compliance with the construction hours and days specified in the City's Municipal Code, using construction equipment with noise mufflers that are properly operating and maintained, placing the construction staging area away from off-site sensitive uses, and placing all stationary construction equipment so that the emitted noise is

Table K: Construction Noise Levels by Phase

Phase	Equipment	Composite Noise Level at 50 ft	
		dBA L_{max}	dBA L_{eq}
Fine Grade Pad	Dozers, Scraper	90	86
Asphalt Grinding	Dozer, Excavator, Dump Trucks	91	87
Berm and Retention Basin Building	Dozers, Forklift, Roller, Generator, Welder	92	87
Water Line Installation	Dozer, Excavator, Forklift, Water Truck	91	86
Electrical Line Installation	Flat Bed Truck, Man Lift	88	82
All Work and Miscellaneous	Pickup Truck	58	54

Source: Compiled by LSA (2019)
dBA L_{eq} = average A-weighted hourly noise level
ft = foot/feet
L_{max} = maximum instantaneous noise level

directed away from sensitive receptors. Therefore, noise generated by project construction activities would be less than significant with the implementation of the minimization measures described above.

Short-Term Construction Vibration Impacts

This construction vibration impact analysis discusses the level of human annoyance using vibration levels in VdB and will assess the potential for building damage using vibration levels in PPV (in/sec) because vibration levels calculated in RMS are best for characterizing human response to building vibration, whereas vibration levels in PPV are best used to characterize potential for damage. As shown in Table E, the FTA guidelines indicate that a vibration level up to 102 VdB (equivalent to 0.5 PPV [in/sec]) is considered safe for buildings consisting of reinforced concrete, steel, or timber (no plaster), and would not result in any construction vibration damage (FTA 2018). For a non-engineered timber and masonry building, the construction vibration damage criterion is 94 VdB (0.2 PPV [in/sec]). For a fragile building, the construction vibration damage criterion is 90 VdB (0.12 PPV [in/sec]).

Table L shows the PPV and VdB values at a distance of 25 ft from the construction vibration source. As shown in Table L, bulldozers and other heavy-tracked construction equipment (except for pile drivers and vibratory rollers) generate approximately 87 VdB of ground-borne vibration when measured at a distance of 25 ft, based on the *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018). Project construction is expected to use a large bulldozer and a loaded truck. The greatest levels of vibration are anticipated to occur during the fine grade pad, asphalt grindings, berm and retention basin building, and water line installation. All other phases are expected to result in lower vibration levels. The distance to the nearest buildings for vibration impact analysis is measured between the nearest off-site buildings and the project boundary (assuming the construction equipment would be used at or near the project boundary) because vibration impacts normally occur within the buildings.

Table L: Vibration Source Amplitudes for Construction Equipment

Equipment	Reference PPV/L_V at 25 ft	
	PPV (in/sec)	L_V (VdB)[1]
Hoe Ram	0.089	87
Large Bulldozer	0.089	87
Caisson Drilling	0.089	87
Loaded Trucks	0.076	86
Jackhammer	0.035	79
Small Bulldozer	0.003	58
Vibratory Roller	0.210	94

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018)

[1] RMS VdB re 1 µin/sec.

µin/sec = microinches per second
ft = foot/feet
FTA = Federal Transit Administration
in/sec = inches per second
L_V = velocity in decibels
PPV = peak particle velocity
RMS = root-mean-square
VdB = vibration velocity in decibels

The formula for vibration transmission is provided below.

$$L_v dB\ (D) = L_v dB\ (25\ feet) - 30\ Log\ (D/25)$$

$$PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$$

Table M lists the projected vibration levels from various construction equipment expected to be used on the project site to the nearest buildings in the project vicinity. For typical construction activity, the equipment with the highest vibration generation potential includes the smooth drum roller (vibratory roller), the large bulldozer, and the loaded truck, which would generate 94 VdB (0.21 PPV [in/sec]), 87 VdB (0.089 PPV [in/sec]), and 86 VdB (0.076 PPV [in/sec] at 25 ft, respectively. As shown in Table M, the closest residence would experience vibration levels of up to 44 VdB (0.001 PPV [in/sec]).

Table M: Summary of Construction Vibration Levels

Land Use	Direction	Equipment/Activity	Reference Vibration Level (VdB) at 25 ft	Reference Vibration Level (PPV) at 25 ft	Distance[1] (ft)	Maximum Vibration Level (VdB)	Maximum Vibration Level (PPV)
Residential	West	Vibratory Roller	94	0.210	1,200	44	0.001
		Large Bulldozer	87	0.089		37	0.000
		Loaded Trucks	86	0.076		36	0.000

Source: Compiled by LSA (August 2019).
Note: Reference vibration levels are associated with a large bulldozer.
[1] Distances reflect the nearest structure of each land use category in a given direction to the nearest project construction boundary. All other structures of each land use category in the given direction would experience lower vibration levels.
ft = foot/feet
PPV = peak particle velocity
VdB = vibration velocity decibels

These vibration levels would not have the potential to result in community annoyance because vibration levels would not exceed the FTA's community annoyance threshold of 78 VdB for residential uses. In addition, these vibration levels would not exceed the FTA vibration damage threshold of 94 VdB (0.2 PPV [in/sec]) for non-engineered timber and masonry buildings, which was used because the structures were observed to be constructed of non-engineered timber. Therefore, vibration levels generated by project construction activities would be less than significant. No vibration reduction measures are required.

Long Term Traffic Noise Impacts

Traffic Noise Impacts to Off-Site Receivers

The FHWA Highway Traffic Noise Prediction Model (FHWA-RD-77 108) was used to evaluate highway traffic-related noise conditions along roadway segments in the project vicinity. This model requires various parameters, including traffic volumes, vehicle mix, vehicle speed, and roadway geometry, to compute typical equivalent noise levels during daytime, evening, and nighttime hours. The resultant noise levels are weighted and summed over 24-hour periods to determine the CNEL values. Table N provides the traffic noise levels for the existing with and without project scenarios. These noise levels represent the worst-case scenario, which assumes that no shielding is provided between traffic and the location where the noise contours are drawn. The traffic volumes of all scenarios were obtained from the *Capistrano Greenery Traffic Impact Analysis* (LSA 2019). The standard vehicle mix for Southern California roadways was used for traffic on these roadway segments. The specific assumptions used in developing these noise levels and the model printouts are provided in the FHWA printouts, attached to this memorandum.

Table N shows that there would be no project-related traffic noise increases. Therefore, traffic noise impacts from project-related traffic on off-site sensitive receptors would be less than significant, and no noise reduction measures are required.

Long-Term Off-Site Stationary Noise Impacts

Off-Road Equipment for Composting

The project would use off-road equipment on site for composting activities during project operation. It was anticipated that a windrow turner, two front-end loaders, one water truck, and one dump truck would be used. It was assumed that the windrow turner would generate similar levels of noise as bulldozers. The composite maximum noise level from all of the equipment described above during project operations would be 90 dBA L_{max} at 50 ft. The composite equivalent continuous noise level would be 86 dBA L_{eq} at 50 ft based on an acoustical usage factor of 40 percent for all of the equipment described above.

Table N: Existing Traffic Noise Levels Without and With Project

Roadway Segment	Without Project Traffic Conditions					With Project Traffic Conditions					
	ADT	Centerline to 70 dBA CNEL (ft)	Centerline to 65 dBA CNEL (ft)	Centerline to 60 dBA CNEL (ft)	CNEL (dBA) 50 ft from Centerline of Outermost Lane	ADT	Centerline to 70 dBA CNEL (ft)	Centerline to 65 dBA CNEL (ft)	Centerline to 60 dBA CNEL (ft)	CNEL (dBA) 50 ft from Centerline of Outermost Lane	Increase from Baseline Conditions
Ortega Highway from I-5 SB Ramps to I-5 NB Ramps	43,468	74	137	284	68.0	43,498	74	137	284	68.0	0.0
Ortega Highway from I-5 NB Ramps to Rancho Viejo Road	49,586	75	147	309	68.9	49,646	75	147	309	68.9	0.0
Ortega Highway from Rancho Viejo Road to La Novia Avenue	42,410	80	163	346	70.0	42,470	80	163	346	70.0	0.0
Ortega Highway from Via Cordova to Via Cristal	36,421	82	176	379	71.9	36,481	83	176	379	71.9	0.0
Ortega Highway from Via Errecarte and Shadetree Lane/Avenida Siega	35,968	82	175	376	71.9	36,028	82	175	376	71.9	0.0

Source: Compiled by LSA (2019)
ADT = average daily traffic
CNEL = Community Noise Equivalent Level
dBA = A-weighted decibels
ft = foot/feet
I-5 = Interstate 5
NB = Northbound
SB = Southbound

Table O shows the noise levels from off-road equipment for composting at the nearest noise-sensitive locations. As shown in Table O, the property line of the closest residence is approximately 1,180 ft west of the project. A distance of 1,180 ft would be attenuated by 27 dBA compared to the noise level measured at 50 ft from the source. Noise generated from on-site off-road equipment would potentially reach up to 63 dBA L_{max} (59 dBA L_{eq}). In addition, these noise levels would be further reduced by an existing ridgeline with an elevation of 570 ft to 620 ft at the perimeter of the landfill between the construction boundary and the residences, which have elevations ranging from 340 ft to 370 ft. Noise levels generated by the operations of the proposed project would not exceed the City's daytime exterior L_{50} (30-minute), L_{25} (15-minute), L_8 (5-minute), L_2 (1-minute), and L_{max} (any time) noise standard of 65, 70, 75, 80, and 85 dBA, respectively, for residential land uses. As the proposed project would not operate during evening or nighttime hours, the City's evening or nighttime noise standards would not be exceeded.

Table O: Summary of Off-Road Equipment Noise Levels

Land Use	Direction	Composite Noise Level (dBA L_{max}) at 50 ft	Composite Noise Level (dBA L_{eq}) at 50 ft	Usage Factor	Distance from Composting Site (ft)	Distance Attenuation (dBA)	Average Noise Level (dBA L_{max})	Average Noise Level (dBA L_{eq})
Residence	West	90	86	40	1,180	27	63	59

Source: Compiled by LSA (August 2019)
dBA = A-weighted decibels
ft = foot/feet
L_{max} = maximum instantaneous noise level
L_{eq} = equivalent continuous sound level

Based on the United States Environmental Protection Agency (EPA) *Protective Noise Levels, Condensed Version of EPA Levels Document* (1978), with a combination of exterior walls, doors, and windows, standard construction for Southern California (warm climate) buildings would provide attenuation of 24 dBA or more with windows closed (the national average is 25 dBA with windows closed). With windows and doors closed, the noise level would be reduced to 39 dBA L_{max} (63 dBA - 24 dBA = 39 dBA) and 35 dBA L_{eq} (59 dBA - 24 dBA = 35 dBA) at the closest residence. In addition, these noise levels would be further reduced by the existing ridgeline. The City does not have daytime interior noise standards and the City's nighttime interior noise standards would not be exceeded because the proposed project would not operate during nighttime hours. Therefore, noise levels generated by off-road equipment associated with project operations would be less than significant. No noise reduction measures are required.

Long-Term Vibration Impacts

The proposed project would generate vibration from on-site off-road equipment. The greatest levels of vibration would be generated by the windrow turner and dump truck. It was assumed that the windrow turner would generate similar levels of vibration as a large bulldozer. As shown in Table M, a large bulldozer and loaded truck would generate a vibration level of 87 VdB (0.089 PPV [in/sec]) and 86 VdB (0.076 PPV [in/sec]) at 25 ft, respectively. The closest residence is 1,200 ft to the west. At a distance of 1,200 ft, the operation of off-road equipment would generate ground-borne vibration levels of 37 VdB (0.000 PPV [in/sec]) and 36 VdB (0.000 PPV [in/sec]). These vibration levels would not have the potential to result in community annoyance because vibration levels would not exceed the FTA's community annoyance threshold of 78 VdB for residential uses. In addition, these vibration levels would not exceed the FTA vibration damage threshold of 94 VdB (0.2 PPV [in/sec]) for non-engineered timber and masonry buildings, which was used because the structures were observed to be constructed of non-engineered timber. In addition, vibration levels generated from project-related traffic on the adjacent roadways are unusual for on-road vehicles because the rubber tires and suspension systems of on-road vehicles provide vibration isolation. Therefore, vibration levels generated from project operations would be less than significant. No vibration reduction measures are required.

CONCLUSION

No short-term or long-term noise and vibration reduction measures are required.

Attachments: References
FHWA Traffic Noise Model Printouts

REFERENCES

Airport Land Use Commission. 2008. Airport Environs Land Use Plan for John Wayne Airport. April 17.

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Harris, Cyril M., editor. 1991. Handbook of Acoustical Measurements and Noise Control, Third Edition.

LSA Associates, Inc. (LSA). 2019. *Capistrano Greenery Traffic Impact Analysis*. August.

United States Environmental Protection Agency (EPA). 1978. *Protective Noise Levels, Condensed Version of EPA Levels Document*. EPA 550/9-79-100. November.

FHWA TRAFFIC NOISE MODEL PRINTOUTS

TABLE Existing Without Project-01

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 07/24/2019
ROADWAY SEGMENT: Ortega Highway from I-5 SB Ramps to I-5 NB Ramps
NOTES: Capistrano Greenery Project - Existing Without Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 43468   SPEED (MPH): 35   GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 42   SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 68.04

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
73.7	137.1	284.2	607.0

TABLE Existing Without Project-02

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 07/24/2019
ROADWAY SEGMENT: Ortega Highway from I-5 NB Ramps to Rancho Viejo Road
NOTES: Capistrano Greenery Project - Existing Without Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 49586   SPEED (MPH): 35   GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 36   SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 68.92

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
75.3	147.0	309.2	662.4

TABLE Existing Without Project-03

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 07/24/2019
ROADWAY SEGMENT: Ortega Highway from Rancho Viejo Road to La Novia Avenue
NOTES: Capistrano Greenery Project - Existing Without Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 42410 SPEED (MPH): 40 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 30 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 70.00

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
80.0	162.6	345.5	742.1

TABLE Existing Without Project-04

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 07/24/2019

ROADWAY SEGMENT: Ortega Highway from Via Cordova to Via Cristal

NOTES: Capistrano Greenery Project - Existing Without Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 36421 SPEED (MPH): 45 GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 12 SITE CHARACTERISTICS: SOFT

---

* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 71.92

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
82.5	176.2	378.9	815.8

TABLE Existing Without Project-05

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 07/24/2019

ROADWAY SEGMENT: Ortega Highway from Via Errecarte and Shadetree Lane/Avenida Siega

NOTES: Capistrano Greenery Project - Existing Without Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 35968   SPEED (MPH): 45   GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 12   SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 71.86

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
81.8	174.8	375.7	809.0

TABLE Existing Without Project-06

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 07/24/2019
ROADWAY SEGMENT: Avenida La Pata south of Ortega Highway
NOTES: Capistrano Greenery Project - Existing Without Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 16960   SPEED (MPH): 55   GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 18   SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 70.31

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
71.0	149.1	319.3	686.8

TABLE Existing With Project-01

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 07/24/2019

ROADWAY SEGMENT: Ortega Highway from I-5 SB Ramps to I-5 NB Ramps

NOTES: Capistrano Greenery Project - Existing With Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 43498   SPEED (MPH): 35   GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 42   SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 68.05

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
73.7	137.2	284.4	607.3

TABLE Existing With Project-02

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 07/24/2019
ROADWAY SEGMENT: Ortega Highway from I-5 NB Ramps to Rancho Viejo Road
NOTES: Capistrano Greenery Project - Existing With Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 49646   SPEED (MPH): 35   GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 36   SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 68.93

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
75.4	147.1	309.4	662.9

TABLE Existing With Project-03

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 07/24/2019

ROADWAY SEGMENT: Ortega Highway from Rancho Viejo Road to La Novia Avenue

NOTES: Capistrano Greenery Project - Existing With Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 42470   SPEED (MPH): 40   GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 30   SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 70.01

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
80.1	162.8	345.9	742.8

TABLE Existing With Project-04

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 07/24/2019
ROADWAY SEGMENT: Ortega Highway from Via Cordova to Via Cristal
NOTES: Capistrano Greenery Project - Existing With Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 36481   SPEED (MPH): 45   GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 12   SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 71.92

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
82.6	176.4	379.3	816.6

TABLE Existing With Project-05
FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 07/24/2019
ROADWAY SEGMENT: Ortega Highway from Via Errecarte and Shadetree Lane/Avenida Siega
NOTES: Capistrano Greenery Project - Existing With Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 36028   SPEED (MPH): 45   GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS	75.51	12.57	9.34
M-TRUCKS	1.56	0.09	0.19
H-TRUCKS	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 12   SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 71.87

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
81.9	174.9	376.1	809.9

TABLE Existing With Project-06

FHWA ROADWAY NOISE LEVEL ANALYSIS

RUN DATE: 07/24/2019
ROADWAY SEGMENT: Avenida La Pata south of Ortega Highway
NOTES: Capistrano Greenery Project - Existing With Project

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* * ASSUMPTIONS * *

AVERAGE DAILY TRAFFIC: 17020   SPEED (MPH): 55   GRADE: .5

TRAFFIC DISTRIBUTION PERCENTAGES

	DAY	EVENING	NIGHT
AUTOS			
	75.51	12.57	9.34
M-TRUCKS			
	1.56	0.09	0.19
H-TRUCKS			
	0.64	0.02	0.08

ACTIVE HALF-WIDTH (FT): 18   SITE CHARACTERISTICS: SOFT

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* * CALCULATED NOISE LEVELS * *

CNEL AT 50 FT FROM NEAR TRAVEL LANE CENTERLINE (dB) = 70.32

DISTANCE (FEET) FROM ROADWAY CENTERLINE TO CNEL

70 CNEL	65 CNEL	60 CNEL	55 CNEL
71.2	149.4	320.0	688.5
