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4.7 Noise

This section presents the noise impact assessment related to the Project. Section 4.7.1 discusses the fundamentals of acoustics. Section 4.7.2 describes the affected environment, including baseline noise level survey methodology and results. Section 4.7.3 presents an environmental analysis of the construction and operation of the energy storage center and associated facilities. Section 4.7.4 discusses cumulative effects. Section 4.7.5 discusses mitigation measures. Section 4.7.6 presents applicable laws, ordinances, regulations, and standards (LORS). Section 4.7.7 presents agency contacts, and Section 4.7.8 presents permit requirements and schedules. Section 4.7.9 contains the references used to prepare this section.

4.7.1 Fundamentals of Acoustics

4.7.1.1 Definitions and Terminology

Vibrations, traveling as waves through air from a source, exert a force perceived by the human ear as sound. Sound pressure level (referred to as sound level) is measured on a logarithmic scale in decibel (dB) that represents the fluctuation of air pressure above and below atmospheric pressure. Frequency, or pitch, is a physical characteristic of sound and is expressed in units of cycles per second or hertz. The normal frequency range of hearing for most people extends from about 20 to 20,000 hertz. The human ear is more sensitive to middle and high frequencies, especially when the noise levels are quieter. As noise levels get louder, the human ear starts to hear the frequency spectrum more evenly. To accommodate for this phenomenon, a weighting system to evaluate how loud a noise level is to a human was developed. The frequency weighting, called “A” weighting, is typically used for quieter noise levels, which de-emphasizes the low-frequency components of the sound in a manner similar to the response of a human ear. This A-weighted sound level is called the “noise level” and is referenced in units of A-weighted decibel (dBA). Table 4.7-1 presents typical noise levels for common outdoor and indoor activities. Since sound is measured on a logarithmic scale, a doubling of sound energy results in a 3-dBA increase in the noise level. Changes in a community noise level of less than 3 dBA are not typically noticed by the human ear (Caltrans 2020). Changes from 3 to 5 dBA may be noticed by some individuals who are extremely sensitive to changes in noise. A 5-dBA increase is readily noticeable (EPA 1974). The human ear perceives a 10-dBA increase in sound level as a doubling of the sound level (i.e., 65 dBA sounds twice as loud as 55 dBA to a human ear).

An individual’s noise exposure occurs over time; however, noise level is a measure of noise at a given instant in time. Community noise sources vary continuously, being the product of many noise sources at various distances, all of which constitute a relatively stable background or ambient noise environment. The background, or ambient, noise level gradually changes throughout a typical day, corresponding to distant noise sources such as traffic volume and changes in atmospheric conditions. The time-varying character of environmental noise is often described with use of statistical or percentile noise descriptors including L_{10}, L_{50}, and L_{90}. These are the noise levels equaled or exceeded during 10, 50, and 90 percent of the measured time interval. Sound levels associated with L_{10} typically describe transient or short-term events, such as the noise from distinct passing cars and trucks. L_{50} represents the median sound level during the measurement. Levels will be above and below this value exactly one-half of the accumulated measurement time. L_{90} is the sound level exceeded 90 percent of the time, and often is used to describe background noise conditions or sources that are continuous or “steady-state” in character.

Table 4.7-1. Typical Noise Levels Associated with Common Activities

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110	Rock Band
Jet Flyover at 1,000 feet		
	100	
Gas Lawn Mower at three feet		
	90	
Diesel Truck at 50 feet, 50 miles per hour		Food Blender at 3 feet
	80	Garbage Disposal at 3 feet
Noisy Urban Area, Daytime		
	70	Vacuum Cleaner at 10 feet
Commercial Area		Normal speech at 3 feet
Heavy Traffic at 300 feet	60	
		Large Business Office
Quiet Urban Daytime	50	Dishwasher (in next room)
Quiet Urban Nighttime	40	Theater, Large Conference Room (background)
Quiet Suburban Nighttime		
	30	Library
Quiet Rural Nighttime		Bedroom at Night, Concert Hall (background)
	20	
		Broadcast/Recording Studio
	10	
Lowest Threshold of Human Hearing (Healthy)	0	Lowest Threshold of Human Hearing (Healthy)

Source: Caltrans 2020.
Notes: dBA = A-weighted decibel; mph = miles per hour.

Noise levels are generally higher during the daytime and early evening when traffic (including airplanes), commercial, and industrial activity is the greatest. However, noise sources experienced during nighttime hours when background levels are generally lower can be potentially more conspicuous and irritating to the receiver. To evaluate noise in a way that considers periodic fluctuations experienced throughout the day and night, a concept termed "community noise equivalent level" (CNEL) was developed, wherein noise measurements are weighted, added, and averaged over a 24-hour period to reflect magnitude, duration, frequency, and time of occurrence.

Different types of measurements are used to characterize the time-varying nature of sound. These measurements include the equivalent sound level (L_{eq}), the minimum and maximum sound levels (L_{min} and L_{max}, respectively), percentile-exceeded sound level (L_{xx}), the day-night sound level (L_{dn}), and the CNEL. The following list provides brief definitions of noise terminology used in this report.

- **Decibel** (dB) is a unitless measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micropascals.

- **A-weighted decibel** (dBA) is an overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear.
- **Equivalent sound level** (L_{eq}) is the constant level that, over a given time period, transmits the same amount of acoustic energy as the actual time-varying sound. Equivalent sound levels are the basis for both the L_{dn} and CNEL scales.
- **Maximum sound level** (L_{max}) is the maximum sound level measured during the measurement period.
- **Minimum sound level** (L_{min}) is the minimum sound level measured during the measurement period.
- **Percentile-exceeded sound level** (L_{xx}) is the sound level exceeded X% of a specific time period. L_{10} is the sound level exceeded 10% of the time.
- **Day-Night Average Sound Level** (L_{dn}) is a 24-hour average A-weighted sound level with a 10 dB penalty added each of the hourly average noise levels occurring in the nighttime hours from 10:00 p.m. to 7:00 a.m. The 10 dB penalty is applied to account for increased noise sensitivity during the nighttime hours.
- **Community Noise Equivalent Level** (CNEL) is the average equivalent A-weighted sound level during a 24-hour day. CNEL accounts for the increased noise sensitivity during the evening hours (7:00 p.m. to 10:00 p.m.) and nighttime hours (10:00 p.m. to 7:00 a.m.) by adding 5 dB to the recorded hourly average sound levels in the evening and 10 dB to the hourly average sound levels at night.

4.7.1.2 Exterior Noise Distance Attenuation

Noise sources are classified in two forms: (1) point sources, such as stationary equipment or a group of construction vehicles and equipment working within a spatially limited area at a given time; and (2) line sources, such as a roadway with a large number of pass-by sources (motor vehicles). Sound generated by a point source typically diminishes (attenuates) at a rate of 6.0 dBA for each doubling of distance from the source to the receptor at acoustically “hard” sites and at a rate of 7.5 dBA for each doubling of distance from source to receptor at acoustically “soft” sites (Caltrans 2020). Sound generated by a line source (i.e., a roadway) typically attenuates at a rate of 3 dBA and 4.5 dBA per doubling distance, for hard and soft sites, respectively (Caltrans 2020). Sound levels can also be attenuated by human-made or natural barriers. For the purpose of a sound attenuation discussion, a hard or reflective site does not provide any excess ground-effect attenuation and is characteristic of asphalt or concrete ground surfaces, as well as very hard-packed soils. An acoustically soft or absorptive site is characteristic of unpaved loose soil or vegetated ground.

With respect to examples of this distance-attenuation relationship for exterior noise, a 60-dBA noise level measured at 50 feet from a tractor installing fenceposts within a packed earth feedlot site would diminish to 54 dBA at 100 feet from the source, and to 48 dBA at 200 feet from the source. This scenario is addressed by the point source attenuation for a hard site (6 dBA with each doubling of the distance). For the scenario where soft-site conditions exist between the point source and receptor, represented by natural vegetation, planted row crop, or plowed furrows adjacent to the work area, an attenuation rate of 7.5 dBA per doubling of distance would apply; the tractor noise measured as 60 dBA at 50 feet would diminish to 52.5 dBA at 100 feet from the source and to 45 dBA at 200 feet from the source, where soft ground exists between the sound source and the receptor location.

4.7.1.3 Structural Noise Attenuation

Sound levels can also be attenuated by human-made or natural barriers. Solid walls, berms, or elevation differences typically reduce noise levels in the range of approximately 5 to 15 dBA (Caltrans 2020). Structures can also provide noise reduction by insulating interior spaces from outdoor noise. The outside-to-inside noise attenuation provided by typical structures in California ranges between 17 to 30 dBA with open and closed windows, respectively, as shown in Table 4.7-2.

Table 4.7-2. Outside-to-Inside Noise Attenuation (dBA)

Building Type	Open Windows	Closed Windows
Residences	17	25
Schools	17	25
Churches	20	30
Hospitals/offices/hotels	17	25
Theaters	17	25

Source: Transportation Research Board, National Research Council 1971.
Notes: dBA = A-weighted decibel.
As shown, structures with closed windows can attenuate exterior noise by a minimum of 25 to 30 dBA

4.7.2 Affected Environment

4.7.2.1 Local Land Use and Noise Sources

Nearest noise-sensitive land uses in the Project vicinity are single-family residences along Baroness Lane (and its connected *cul de sacs* that extend eastward) to the west of the Project site, single-family residences on Hidden Creek Drive located southeast of Project site, and Saddleback Church located north of the Project site. Refer to Figure 4.7-1 that illustrates the location of these nearest offsite noise-sensitive receptors, as well as the locations of the 25-hour (minimum) and short-term (sub-hour) outdoor sound pressure level (SPL) measurements conducted to characterize the ambient noise levels in the Project vicinity. The Project site is located due west of the Interstate-5 (I-5) freeway, a substantial source of outdoor noise emission due to its large flows of high-speed automotive, motorcycle, bus, medium truck (2-axle), and heavy truck (3 or more axles) traffic during daytime and evening hours. While there are additional existing residences to the east of the Project site, they are physically separated from the Project site by multiple parallel roadways that include Camino Capistrano, southbound and northbound lanes of I-5, and Rancho Viejo Road. Due to their proximity to these surface transportation routes, along with the active railway that also parallels these busy traffic alignments, these eastern residences are already exposed to high levels of outdoor ambient noise.

4.7.2.2 Ambient Noise Survey

Short-term SPL survey measurement location ST1 and long-term measurement location LT1 were located along Camino Capistrano north of the residence of 29613 Camino Capistrano. Short-term measurement location ST2 and LT2 was located at the end of Treethorne Circle, west of the Project site. ST3 was located in a field south of Saddleback Church north of the Project site. The SPL measurements were completed using SoftdB Piccolo II sound level meters (SLM), which are classified as American National Standards Institute (ANSI) Type 2 instruments (general purpose sound level meter suitable for environmental noise surveys). The SLM were calibrated before conducting the reported SPL measurements herein with a Reed Instruments R8090 calibrator. Tables 4.7-3 and 4.7-4 provide summaries of field-measured hourly metrics and statistical levels collected from the two long-term monitoring locations (LT1 and LT2), which thus quantify sampling of the pre-Project outdoor ambient sound environment at their respective noise-sensitive receptor (NSR) positions within the Project vicinity. Residences to the southeast are adjacent to Interstate 5 freeway, which is a dominant contributor to the measured outdoor ambient noise levels, as well as an operating railway.

As illustrated in Table 4.7-3, daytime (7 AM to 7 PM) ambient noise levels are generally in the 62 to 69 dBA L_{eq} range; evening noise levels (7 PM to 10 PM) are in the 64 to 72 dBA L_{eq} range, and nighttime noise levels (10 PM to 7 AM) are in the 58 to 65 dBA L_{eq} range. These fluctuations in the levels between the periods of the day, evening and night are typical for areas with highway traffic noise exposure as the dominant noise source.

Table 4.7-3 Long-Term Outdoor Ambient Sound Pressure Level (SPL) Measurement Results at LT1, 45-hour Monitoring Period (March 24 to March 26, 2023)

Hour of Day (hh:mm)	Energy-Averaged Noise Level (Leq 1-hour) dBA	Statistical Noise Level (L10) dBA	Statistical Noise Level (L50) dBA	Statistical Noise Level (L90) dBA
08:45	65	66	65	63
09:45	65	66	65	63
10:45	64	65	63	62
11:45	68	65	63	61
12:45	64	63	60	59
13:45	62	63	61	59
14:45	62	64	61	59
15:45	63	64	62	60
16:45	63	65	62	61
17:45	64	66	64	62
18:45	66	68	66	64
19:45	69	68	66	65
20:45	68	68	66	65
21:45	72	68	65	63
22:45	64	66	63	61
23:45	62	64	62	58
00:45	61	63	59	55
01:45	59	61	57	53
02:45	59	61	57	52
03:45	60	62	58	54
04:45	63	65	62	59
05:45	66	68	66	63
06:45	68	69	68	66
07:45	70	68	66	65
08:45	71	67	64	63
09:45	61	61	61	56
10:45	65	61	53	53
11:45	66	61	52	51
12:45	61	62	54	53
13:45	65	62	54	52
14:45	67	63	54	52
15:45	67	63	53	52
16:45	69	64	52	51
17:45	70	66	51	49
18:45	65	66	50	49

Table 4.7-3 Long-Term Outdoor Ambient Sound Pressure Level (SPL) Measurement Results at LT1, 45-hour Monitoring Period (March 24 to March 26, 2023)

Hour of Day (hh:mm)	Energy-Averaged Noise Level (Leq 1-hour) dBA	Statistical Noise Level (L10) dBA	Statistical Noise Level (L50) dBA	Statistical Noise Level (L90) dBA
19:45	68	68	51	50
20:45	67	68	55	54
21:45	66	67	62	61
22:45	65	66	63	62
23:45	62	64	62	61
00:45	61	63	60	58
01:45	60	62	59	58
02:45	58	61	57	55
03:45	59	61	56	54
04:45	60	62	57	56

As illustrated in Table 4.7-4, daytime (7 AM to 7 PM) ambient noise levels are generally in the 61 to 70 dBA Leq range; evening noise levels (7 PM to 10 PM) are in the 64 to 67 dBA Leq range, and nighttime noise levels (10 PM to 7 AM) are in the 58 to 65 dBA Leq range. These fluctuations in the levels between the periods of the day, evening and night are typical for areas with roadway traffic noise exposure as the dominant noise source.

Table 4.7-4 Long-Term Outdoor Ambient Sound Pressure Level (SPL) Measurement Results at LT2, 45-hour Monitoring Period (March 24 to March 26, 2023)

Hour of Day (hh:mm)	Energy-Averaged Noise Level (Leq 1-hour) dBA	Statistical Noise Level (L10) dBA	Statistical Noise Level (L50) dBA	Statistical Noise Level (L90) dBA
08:45	71	67	64	63
09:45	61	61	61	56
10:45	65	61	53	53
11:45	66	61	52	51
12:45	61	62	54	53
13:45	65	62	54	52
14:45	67	63	54	52
15:45	67	63	53	52
16:45	69	64	52	51
17:45	70	66	51	49
18:45	65	66	50	49
19:45	68	68	51	50
20:45	67	68	55	54
21:45	66	67	62	61
22:45	65	66	63	62
23:45	62	64	62	61
00:45	61	63	60	58

Table 4.7-4 Long-Term Outdoor Ambient Sound Pressure Level (SPL) Measurement Results at LT2, 45-hour Monitoring Period (March 24 to March 26, 2023)

Hour of Day (hh:mm)	Energy-Averaged Noise Level (Leq 1-hour) dBA	Statistical Noise Level (L10) dBA	Statistical Noise Level (L50) dBA	Statistical Noise Level (L90) dBA
01:45	60	62	59	58
02:45	58	61	57	55
03:45	59	61	56	54
04:45	60	62	57	56
05:45	63	65	58	57
06:45	65	67	62	62
07:45	68	66	63	61
08:45	70	65	64	63
09:45	63	64	61	56
10:45	62	63	53	53
11:45	65	63	52	51
12:45	62	62	54	53
13:45	65	63	54	52
14:45	67	64	54	52
15:45	69	63	53	52
16:45	68	63	52	51
17:45	69	64	51	49
18:45	63	65	50	49
19:45	67	67	51	50
20:45	66	68	55	54
21:45	66	67	62	61
22:45	64	66	63	62
23:45	62	64	62	61
00:45	60	62	60	58
01:45	60	62	59	58
02:45	60	63	57	55
03:45	62	65	56	54
04:45	65	67	57	56

As illustrated in Table 4.7-5, one-minute average noise levels during the short-term measurement at ST1 ranged from 72.2 to 76.2 dBA L_{eq}, while those at ST2 ranged from 67.7 to 75.1 dBA L_{eq}. These short-term levels were similar to, but slightly greater than, the range of daytime noise levels documented at LT1, and also illustrate a noise environment dominated by traffic noise from the adjacent roadway.

Table 4.7-5 Short-Term Measurements Results Summary, One Minute Measurement Interval Periods

Location ST1			
Time	Energy-Averaged Noise Level (L_{eq}) dBA	Minimum noise level (L_{min}) dBA	Maximum noise level (L_{max}) dBA
10:05 AM	58.7	55.6	61.4
10:06 AM	59.4	56.3	62.6
10:07 AM	59.1	57.1	63.3
10:08 AM	60.5	58.2	62.4
10:09 AM	61.0	58.0	64.1
10:10 AM	60.1	56.7	63.8
10:11 AM	60.2	58.5	62.8
10:12 AM	61.5	59.1	64.2
10:13 AM	60.8	58.2	63.6
10:14 AM	59.3	57.3	62.5
10:15 AM	58.4	55.0	62.2
10:16 AM	58.3	54.8	62.2
10:17 AM	57.3	54.3	60.2
10:18 AM	57.8	54.1	60.8
10: 19 AM	59.9	58.1	62.4
10:20 AM	58.4	56.3	60.6
Calculated L_{eq} for ST1 Duration	**59.6**	n/a	n/a
Location ST2			
Time	Energy-Averaged Noise Level (L_{eq}) dBA	Minimum noise level (L_{min}) dBA	Maximum noise level (L_{max}) dBA
11:24 AM	47.2	45.0	49.7
11:25 AM	46.0	44.1	48.4
11:26 AM	49.8	45.1	56.2
11:27 AM	48.5	44.9	51.5
11:28 AM	49.9	47.0	56.5
11:29 AM	47.9	46.4	49.2
11:30 AM	50.8	48.0	54.2
11:31 AM	49.1	46.0	53.9
11:32 AM	48.6	46.1	54.1
11:33 AM	47.7	45.7	52.9
11:34 AM	48.9	45.5	52.1
11:35 AM	48.6	46.2	53.2
11:36 AM	48.4	46.0	51.6
11:37 AM	47.6	46.2	49.5
11:38 AM	49.4	45.8	54.8
11:39 AM	45.7	44.6	47.2
Calculated L_{eq} for ST2 Duration	**48.6**	n/a	n/a

Table 4.7-5 Short-Term Measurements Results Summary, One Minute Measurement Interval Periods

Location ST3			
Time	Energy-Averaged Noise Level (L_{eq}) dBA	Statistical Noise Level (L_{min}) dBA	Statistical Noise Level (L_{max}) dBA
10:39 AM	55.8	55.0	58.0
10:40 AM	54.7	52.7	55.6
10:41 AM	53.2	51.7	55.3
10:42 AM	53.3	51.7	55.0
10:43 AM	53.1	51.1	58.6
10:44 AM	52.7	51.2	54.1
10:45 AM	52.1	51.3	53.4
10:46 AM	51.8	50.1	53.1
10:47 AM	51.6	50.5	52.8
10:48 AM	52.2	50.9	53.8
10:49 AM	52.6	50.7	56.8
10:50 AM	52.5	50.7	54.5
10:51 AM	55.4	53.4	56.7
10:52 AM	54.5	52.6	57.5
10:53 AM	53.7	52.0	57.2
Calculated L_{eq} for ST3 Duration	**53.5**	**n/a**	**n/a**

4.7.3 Environmental Analysis

Noise will be produced during the construction and operation of the Project. Potential noise impacts from construction and operation activities are assessed in this subsection.

4.7.3.1 Significance Criteria

Following the California Environmental Quality Act guidelines (Title 14, California Code of Regulations [CCR], Appendix G, Section XI), the Project would cause a significant impact if it would result in the following:

- Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?
- Generation of excessive groundborne vibration or groundborne noise levels?
- For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

The design basis for noise control is the most stringent (lowest), noise level required by any of the applicable LORS. Therefore, noise from the Project is evaluated against City of San Juan Capistrano standards. The City has prohibited noise within sensitive land uses in Project impact areas as not to exceed 65 dBA as an L_{dn} in areas of outdoor activity and not to exceed 45 dBA as an L_{dn} within interior living spaces.

4.7.3.2 Construction Impacts

Construction of the Project would result in the temporary generation of noise emission from activities and operating heavy equipment at the staging area and on the Project site, with the primary construction noise generation occurring at the Project site during site preparation and grading phases of development progress. Construction would involve the use of heavy equipment and machinery, such as loaders, cranes, temporary generators, scrapers, and other equipment. Construction activities would generate noise exposure levels at offsite NSR that can vary from hour to hour and day to day depending on the equipment in use, the operations being performed, and the distance between the source and receptor.

The typical maximum noise levels (L_{max}) for various pieces of construction equipment at a distance of 50 feet are presented in Table 4.7-6. Typically, construction equipment operates in alternating cycles of full power and low power (or idling), producing time-averaged noise levels that are substantially less than the listed L_{max} values. The average sound level of construction activity also depends on the amount of time that the equipment actually operates onsite and the intensity of construction activity during that time.

Table 4.7-6 Construction Equipment – Typical Maximum Noise Levels

Equipment Type	Typical Equipment (dBA at 50 Feet)
Air Compressor	80
Backhoe	80
Compactor	82
Crane	83
Drill Rig	95
Dozer	85
Generator	82
Grader	85
Loader	80
Scraper	85
Truck	84

Source: FTA 2018
dBA = A-weighted decibels.

Aggregate noise emission from proposed Project construction activities, broken down by sequential phase, was predicted at two evaluation distances to the nearest existing noise-sensitive receptor: 1) from the nearest position of the construction site boundary and 2) from the geographic center of the construction site, which serves as the time-averaged location or geographic *acoustical centroid* of active construction equipment for the phase under study. Table 4.7-7 summarizes these two distances to the apparent closest noise-sensitive receptor for each of the five sequential construction phases. At the site boundary, this analysis assumes that up to only one piece of equipment of each listed type per phase will be involved in the construction activity for a limited portion of the 1-hour period. In other words, at such proximity, the operating equipment cannot “stack” or crowd the vicinity and still operate. For the acoustical centroid case, which intends to be a geographic average position for all equipment during the indicated phase, this analysis assumes that the equipment may be operating up to 1 hour per day.

Construction noise in a well-defined area typically attenuates at approximately 6 decibels (dB) per doubling of distance. Project construction would take place approximately 860 feet to 1,210 feet from the nearest existing noise-sensitive uses (residence west of the Project site). The results in Table 4.7-7 display the predicted noise levels for each construction phase with respect to the distance from the nearest noise-sensitive receptor to the construction site boundary, and the distance to the acoustical centroid of the site. Appendix 4.7B contains the construction noise modeling worksheets used to predict construction noise for the Project.

Table 4.7-7. Predicted Construction Noise Levels per Activity Phase

Construction Phase	Hourly L_{eq} at Nearest Noise-Sensitive Receptor to Construction Site Boundary (dBA) *860 ft*	Hourly L_{eq} at Nearest Noise-Sensitive Receptor to Acoustical Centroid of Site (dBA) *1210 ft*
Access Road Site preparation, Grading, and Paving	54.5	51.1
Site Preparation	56.9	53.5
Switchyard site Preparation	52.4	49.1
Grading	59.7	56.3
Switchyard grading	55.5	52.1
Battery/Container installation	56.2	52.8
Switchyard Installation	59.3	55.9
Loop-in Transmission Foundation and a Tower Erect	52.0	48.6
Loop-in Transmission Stringing and Pulling	53.4	50.0
Stormwater Detention Structures and Waterline Installation and Landscaping Installation	55.3	51.9
Decommissioning	58.7	55.3

Notes: L_{eq} = equivalent noise level; dBA = A-weighted decibels.

Although nearby off-site residences may be exposed to intermittent and momentary elevated construction noise levels (i.e., associated with occasional peaks or L_{max} values), these occurrences would be temporary and not endure beyond Project construction completion). Predicted hourly energy-equivalent levels (L_{eq}) appearing in Table 4.7-7 are all less than the pre-Project outdoor ambient noise levels measured at LT1 (as shown in Table 4.7-3). It is also anticipated that construction activities associated with the proposed Project would take place primarily within the allowable hours per the City of San Juan Capistrano Municipal Code. Therefore, on these bases, construction noise is not anticipated to adversely affect the nearest sensitive receptors.

Construction traffic (i.e., material haul trucks, delivery vehicles, and contractor personnel passenger vehicles) will travel along Camino Capistrano to and from the proposed Project site. Existing traffic was estimated along a segment of this travel route from 28722 Camino Capistrano to the Saddleback Church location. The estimated average traffic noise emission from this 28722 Camino Capistrano to Saddleback Church segment for existing conditions is 63.8 L_{eq} dBA. Construction requires a total of 240 passenger vehicles, 40 medium trucks, and 122 heavy trucks. As detailed in the Appendix 4.7C prediction worksheets, with the addition of Project traffic, the average traffic noise along this same studied route will increase by 0.4 L_{eq} dBA to a new plus-Project noise level of 64.2 dBA L_{eq} and thus represent an imperceptible difference to offsite receptors along this roadway segment.

Workers during construction and operation are anticipated to use hearing protection as required by the Occupational Safety and Health Administration (OSHA). During construction, noise levels from the various pieces of heavy equipment would be similar to those listed in Table 4.7-6 but would likely be less depending on use and distance.

4.7.3.3 Operational Impacts

Project Sound Propagation Prediction

Operationally, the primary noise sources of the Project would be operation of onboard thermal management components from the planned 408 Megapack battery energy storage system (BESS) units and the associated 96 medium-voltage (MV) transformers conveying electricity to and from the onsite collector substation (an additional larger step-up voltage transformer [from 34.5 kV to 138 kV] that also generates noise). General information on the Megapack battery containers appears in Appendix 4.7A. This set of onsite BESS equipment may not operate continuously, but could operate to charge or discharge energy at any time during a 24-hour period as market and/or others demands may dictate. Table 4.7-8 displays the A-weighted octave-band center frequency (OBCF) acoustical contribution from each type of listed onsite equipment.

Table 4.7-8 Unweighted OBCF Components of Generator Sets and Transformers

Operating Equipment Sample	A-weighted Sound Level (dBA) per Octave Band Center Frequency (OBCF) in Hertz (Hz)									Overall dBA
	31.5	63	125	250	500	1,000	2,000	4,000	8,000	
Megapack (at 40% cooling fan speed)	65	65	65	81	75.2	79	78	76	63	85.3
MV Transformer	30	49	61	63	69	66	62	57	48	72.4
Substation Transformer	56	75	87	89	95	92	88	83	74	98.4

Notes: OBCF = Octave Band Center Frequency

The switchyard, to be operated by SDG&E, that adjoins the BESS facility and conveys electricity to and from the aforementioned step-up transformer contains a variety of switches, breakers, and other related components that may occasionally produce intermittent or impulsive noise but not in a manner comparable to continuous-type sources of sound such as those appearing in Table 4.7-8 that are the focus of this operational noise assessment for purposes of assessing potentially significant environmental impacts.

The aggregate noise emission from these outdoor-exposed sound sources has been predicted with the Datakustik CadnaA sound propagation program. CadnaA is a commercially available software program for the calculation, presentation, assessment, and prediction of environmental noise based on algorithms and reference data per International Organization of Standardization (ISO) Standard 9613-2, "Attenuation of Sound During Propagation Outdoors, Part 2: General Method of Calculation" (ISO 1996). The CadnaA computer software allows one to position sources of sound emission in a simulated three-dimensional (3-D) space atop rendered "blocks" of Project building masses having heights and footprints consistent with Project architectural plans and elevations. In addition to the above-mentioned sound source inputs and building-block structures that define the three-dimensional sound propagation model space, the following assumptions and parameters are included in this CadnaA-supported stationary noise source assessment:

- Ground effect acoustical absorption coefficient equal to 0.8 which intends to represent an average or blending of ground covers that are characterized largely by hard reflective pavements and existing building surfaces across the Project site and the surroundings;
- Reflection order of 1, which allows for a single reflection of sound paths on encountered structural surfaces such as the modeled building masses;
- Calm meteorological conditions (i.e., no wind) with 68 degrees Fahrenheit and 50% relative humidity; and
- For purposes of impact assessment as evaluated herein, all modeled equipment is operating concurrently and continuously for a minimum period of 1 hour.

Noise modeling contours at the Project site are shown in Figure 4.7-2, with predicted noise exposure levels as follows for the four tagged noise-sensitive receptor (NSR) positions: NSR1 = 37.9 dBA; NSR2 = 23.8 dBA; NSR3 = 41.8 dBA; and NSR4 = 30.3 dBA. These stationary-source operations noise emission levels from the proposed Project are predicted to be lower than the measured ambient noise levels at the same locations found in Table 4.7-5. Therefore, operational noise is not anticipated to adversely affect the nearest sensitive receptors.

Figure 4.7-2 shows predicted operational noise levels within the Project site ranging from 40 dBA to exceeding 80 dBA, depending on proximity to the operating battery containers, inverters, and the collector substation step-up transformer.

Transmission Line Noise Levels

Audible noise (AN) is produced by the corona effect along transmission line conductors conveying electrical current. In summary, this corona effect results from dust or moisture on the conductor surfaces; hence, while sound may be generated from corona during dry, fair-weather conditions, it is louder and more likely to be audible depending on the outdoor background sound the proximity of the listener.

The Project collector substation sends 34.5 kilovolt (kV) electricity to the proposed adjoining SDG&E switchyard, which will step-up the voltage to 138 kV and connect to the regional grid via above-ground transmission lines, assumed herein (and based on Project plan information to date) as a single circuit with three conductor wires (one per each of three phases) on steel pole structures up to a maximum of 44 feet in height above grade. Assuming these alternating current (AC) conductors are aluminum conductor steel reinforced (ACSR) “Bluebird” type (i.e., 1.762” outer diameter) and have a maximum surface voltage gradient (“E”) of 19 kilovolts root-mean-square per centimeter (kVrms/cm), it is possible for them to emit audible noise under rainy conditions.

The L_{50} (a.k.a., median sound level) for audible corona can be predicted with algorithms and reference information found in the U.S. Department of Interior, Bonneville Power Administration (BPA), Technical Report No. ERJ-77-168. The mathematical expression for estimating an A-weighted SPL under *rainy* weather conditions and based on surface voltage gradient (E), conductor equivalent diameter (“d” in millimeters [mm]), and distance from a receiver position (“r” in meters [m]) is as follows:

$$SPL = 120*LOG(E) + 55*LOG(d) - 11.4*LOG(r) - 170.5$$

At a distance of 25 feet from either side of the power line conductors, the expected SPL is less than 32 dBA at a listener standing at grade.

Under “fair weather” conditions, and according to the same BPA report, the estimated median sound level would be 25 dB less than the predicted value associate with “rainy” or “foul” weather conditions. Therefore, although the overhead gen-tie line could produce audible noise, its audibility would depend on the weather conditions, the proximity of the listener, and the background sound level. Because the measured outdoor ambient sound environment is substantially higher than these predicted results, due to predominant highway traffic noise contribution from nearby Interstate-5, corona AN would represent a negligible increase to the pre-existing sound level.

4.7.4 Cumulative Effects

4.7.4.1 Noise in Excess of Standards

The proposed Project and related development projects within its area would all be subject to applicable noise standards (descriptions of the standards applicable within the City of San Juan Capistrano are described in Section 4.7.6.3). Because proposed Project noise impacts with respect to relevant standards are predicted to be less than significant, it would not contribute to cumulative exceedances of these noise standards, and its incremental effect is considered a less than significant impact. No mitigation is required.

4.7.4.2 Temporary/Periodic Increases in Ambient Noise Levels

The proposed Project would result in temporary noise increases to the surrounding outdoor ambient sound environment during construction, as discussed under Section 4.7.3.2 above. The proposed Project construction period has the potential to overlap with the construction of other projects in the City of San Juan Capistrano and those of adjoining municipalities (City of Laguna Niguel, City of Laguna Hills, City of Mission Viejo, and unincorporated Orange County). Due to the decrease in noise levels with distance and the presence of physical barriers (i.e., intervening buildings and natural topography), noise due to construction of other projects would not meaningfully combine with proposed Project to produce a cumulative noise effect. By way of illustration, if there are two concurrent construction projects of comparable sound emission intensity, and the activity nearest to the studied noise-sensitive receptor causes a noise level of X dBA Leq, the other activity could be no closer than three times the distance of the receptor to the nearest activity and not make a cumulatively measurable contribution to the total noise exposure level. If two concurrent projects were close to a receptor, the cumulative noise would be one of the following:

- The louder (in dBA) of the two concurrent activities; or,
- a logarithmic sum of the two activity noise levels that, per acoustic principles, cannot be more than 3 dBA greater than the louder of the two individual noise-producing activities.

In sum, cumulative construction noise is likely to be dominated by the closest or loudest activity to the receptor, and the combination will be no more than a barely perceptible difference (i.e., up to a 3 dBA change).

Among the cumulative projects appearing in Section 4 (Figure 4-1), the closest to the proposed project is #19 (CUSD Site [Paseo De Colinas] Townhomes) that is nearly one half-mile away. With respect to a potential common noise-sensitive receptor, Saddleback Church (i.e., near ST3), cumulative project #19 is approximately 1,800 feet away and thus more distant from this position than the proposed Project (approximately 1,200 feet from the northern boundary). Were cumulative project #19 to be under construction and exhibit comparable levels of onsite intensity as that of the proposed Project, its noise exposure levels at Saddleback Church would be less than that of the proposed Project during its concurrent construction. Compared to that of the proposed Project alone, the cumulative construction noise level from both project #19 and the proposed Project would be no greater than 3 dB (less than a perceptible difference) per the aforementioned acoustic principles, and therefore neither project would have a cumulatively considerable effect on the common noise-sensitive receptor. Additionally, these unrelated construction projects within their respective municipal or county jurisdictions would each be required to comply with limits on allowable construction hours and/or noise standards. Hence, for the above reasons, cumulative impacts due to cumulative construction noise are considered less than significant. No mitigation is required.

4.7.5 Mitigation Measures

The proposed Project would not result in a significant temporary or permanent increase in ambient noise levels; therefore, no mitigation is required.

4.7.6 Laws, Ordinances, Regulations, and Standards

The Laws, Ordinances, Regulations, and Standards (LORS) discussed in this section were used to evaluate the Project's noise impacts during construction and operation and are discussed briefly in previous subsections.

4.7.6.1 Federal LORS

Federal Aviation Administration Standards

Enforced by the Federal Aviation Administration, Code of Federal Regulations Title 14, Part 150, prescribes the procedures, standards, and methodology governing the development, submission, and review of airport noise exposure maps and airport noise compatibility programs, including the process for evaluating and approving or disapproving those programs. Title 14 also identifies those land uses that are normally compatible with various levels of exposure to noise by individuals. The Federal Aviation Administration has determined that interior sound levels up to 45 dBA L_{dn} (or CNEL) are acceptable within residential buildings. The Federal Aviation Administration also considers residential land uses to be compatible with exterior noise levels at or less than 65 dBA L_{dn} (or CNEL).

Federal Transit Administration (FTA)

In its Transit Noise and Vibration Impact Assessment guidance manual, the FTA recommends a daytime construction noise level threshold of 80 dBA $_{Leq}$ over an eight-hour period when detailed construction noise assessments are performed to evaluate potential impacts to community residences surrounding a project (FTA 2006). Although this FTA guidance is not a regulation, it can serve as a quantified standard in the absence of such limits at the state and local jurisdictional levels.

4.7.6.2 State LORS

California Noise Control Act of 1973

Sections 46000 through 46080 of the California Health and Safety Code, known as the California Noise Control Act of 1973, declares that excessive noise is a serious hazard to the public health and welfare and that exposure to certain levels of noise can result in physiological, psychological, and economic damage. It also identifies a continuous and increasing bombardment of noise in the urban, suburban, and rural areas. The California Noise Control Act declares that the State of California has a responsibility to protect the health and welfare of its citizens by the control, prevention, and abatement of noise. It is the policy of the state to provide an environment for all Californians free from noise that jeopardizes their health or welfare

California Department of Health Services

DHS has developed guidelines of community noise acceptability for use by local agencies, which have been published by the Governor's Office of Planning and Research (2003) as the Land Use Compatibility for Community Noise Environments Matrix. Selected relevant levels are listed here:

- Below 60 dBA CNEL: normally acceptable for low-density residential use
- 50 to 70 dBA: conditionally acceptable for low-density residential use
- Below 65 dBA CNEL: normally acceptable for high-density residential use and transient lodging
- 60 to 70 dBA CNEL: conditionally acceptable for high-density residential, transient lodging, churches, educational, and medical facilities

4.7.6.3 Local LORS

City of San Juan Capistrano General Plan

City of San Juan Capistrano General Plan. The Noise Element of the City's General Plan works to minimize the effects of noise through proper land use planning, minimize transportation-related noise impacts, and minimize non-transportation-related noise impacts. Applicable Noise Element policies include the following:

- **Policy 1.1:** Utilize noise/land use compatibility standards as a guide for future planning and development decisions.
- **Policy 1.2:** Provide noise control measures and sound-attenuating construction in areas of new construction or rehabilitation.
- **Policy 2.1:** Reduce transportation-related noise impacts to sensitive land uses through the use of noise control measures.
- **Policy 2.3:** Incorporate sound-reduction design in development projects impacted by transportation-related noise.
- **Policy 3.1:** Reduce the impacts of noise-producing land uses and activities on noise-sensitive land uses.
- **Policy 3.2:** Incorporate sound-reduction design in new construction or rehabilitation projects impacted by non-transportation-related noise.

In addition, noise standards specified in Table N-2 of the City's General Plan Noise Element (shown in Table 4.7-9 of this document) are used as a basis for development. These standards represent the maximum acceptable noise level, are used to determine noise impacts, and are a product of the Noise/Land Use Compatibility Matrix in Table N-3 of the City's General Plan Noise Element (shown in 4.7-10 of this document). The Noise/Land Use Compatibility Matrix is a planning tool used by the City's planning department to decide if a proposed Project is likely to be consistent with the policies and standards established by the City.

Table 4.7-9. Interior and Exterior Noise Standards

Land Use	Noise Standards[1]	
	Exterior (dBA)	Interior (dBA)
Residential (All)—Single Family, Multifamily, Duplex, Mobile Home	65	45
Residential—Transient Lodging, Hotels, Motels, Nursing Homes, Hospitals, Assisted-Care Facilities	65	45
Private Offices, Churches, Libraries, Theaters, Concert Halls, Meeting Halls, Schools	65	45
General Commercial, Retail, Reception, Restaurant	65	50
Manufacturing, Industrial2	--	--
Parks, Playgrounds	653	--
Golf Courses, Outdoor Spectator Sports	753	--

Notes: Source: City of San Juan Capistrano General Plan, Noise Element (1999).
1 In Community Noise Level Equivalent (CNEL).
2 Noise standards not applied to Industrial districts.
3 Outdoor environment limited to playground areas, picnic areas, and other areas of frequent human use.
dBA = A-weighted decibels

Table 4.7-10. Noise/Land Use Compatibility Matrix

Land Use Category	Community Noise Equivalent Level (CNEL) (dB)					
	55	60	65	70	75	80
Residential—Single Family, Multifamily, Duplex	A	B	B	C	--	--
Residential—Mobile Homes	A	B	C	C	--	--
Transient Lodging—Motels, Hotels	A	B	B	C	C	--
Schools, Libraries, Churches, Hospitals, Nursing Homes	A	B	C	C	--	--
Auditoriums, Concert Halls, Amphitheaters, Meeting Halls	B	C	C	--	--	--
Sports Arenas, Outdoor Spectator Sports, Amusement Parks	A	A	B	B	--	--
Playgrounds, Neighborhood Parks	A	A	B	C	--	--
Golf Courses, Riding Stables, Cemeteries	A	A	A	B	C	C
Office and Professional Buildings	A	A	B	B	C	--
Commercial Retail, Banks, Restaurants, Theaters	A	A	A	B	B	C
Industrial, Manufacturing, Utilities, Wholesale, Service Stations	A	A	A	B	B	B
Agriculture	A	A	A	A	A	A

Notes: Source: City of San Juan Capistrano General Plan, Noise Element (1999).
A = Normally Acceptable—Specified land use is satisfactory based on the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

B = Conditionally Acceptable—New construction or development should be undertaken only after a detailed analysis of the noise requirements is made and needed noise insulation features are included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning, will normally suffice.
C = Normally Unacceptable—New construction or development should generally be discouraged. If it does proceed, a detailed analysis of the noise reduction requirements must be made, and needed noise insulation features must be included in the design.
— = Clearly Unacceptable—New construction or development should generally not be undertaken.
CNEL = Community Noise Equivalent Level
dB = decibel(s)

City of San Juan Capistrano Municipal Code

Section 9-3.531 of the City's Municipal Code, Noise Standards (residential and non-residential), addresses the creation or permitting the creation of any noise that exceed the standards shown in Table 4.7-11 within a residential, public and institutional, or commercial district. In addition, Section 9-3.531 of the City's Municipal Code addresses construction noise and states that construction activity noise is exempt from the City's noise standards if conducted between the hours of 7:00 a.m. and 6:00 p.m. Monday through Friday or between the hours of 8:30 a.m. and 4:30 p.m. on Saturday. Construction noise is prohibited on Sundays and national holidays.

Table 4.7-11 Maximum Exterior Noise Standards

Land Use	Location	Time Period	L50 (30 mins)[1]	L25 (15 mins)[2]	L8 (5 mins)[3]	L2 (1 min)[4]	Lmax (Anytime)[5]
Residential and Public and Institutional Districts	Exterior	7:00 AM to 7:00 PM	65	70	75	80	85
		7:00 PM to 10:00 PM	55	65	70	75	80
		10:00 PM to 7:00 AM	45	50	55	65	70
Residential	Interior	10:00 PM to 7:00 AM	--	--	45	50	55
Commercial Districts	Exterior	At any time during the day	65	70	75	80	85

Notes: Source: City of San Juan Capistrano Municipal Code (October 2019).
No person at any location within San Juan Capistrano, including the industrial and open-space districts, shall create any noise, or permit the creation of any noise, which causes the noise level within a residential, public and institutional, or commercial district to exceed the standards by the amount and for the period of time identified above. Each of the noise levels set forth in this subsection shall be reduced by 5 dBA for impacts of simple tone noises or noises consisting of speech or music.
1 The noise standard for a cumulative period of more than 30 minutes in any hour.
2 The noise standard plus 5 dBA for a cumulative period of more than 15 minutes in any hour.
3 The noise standard plus 10 dBA for a cumulative period of more than 5 minutes in any hour.
4 The noise standard plus 15 dBA for a cumulative period of more than 1 minute in any hour.
5 The noise standard plus 20 dBA or the maximum measured ambient noise level for any period of time.
dBA = A-weighted decibels
min/mins = minute(s)
Lmax = maximum instantaneous noise level

4.7.7 Agency and Agency Contacts

No agencies were contacted directly to specifically discuss Project noise.

4.7.8 Permits and Permit Schedule

There are no applicable permits related to noise.

4.7.9 References

Caltrans. 2020. *Technical Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects.* California Department of Transportation Division of Environmental Analysis. April 2020.

City of San Juan Capistrano. 2019. San Juan Capistrano Municipal Code Section 9-3.531, Noise Standards. October.

City of San Juan Capistrano. 1999. San Juan Capistrano General Plan Noise Element. December 14.

Federal Highway Administration. 2006. FHWA Roadway Construction Noise Model: User's Guide. Final Report. FHWA-HEP-06-015. DOT-VNTSC-FHWA-06-02. Cambridge, Massachusetts: DOT, Research and Innovative Technology Administration. August 2006.

FHWA. 2008. Roadway Construction Noise Model (RCNM), Software Version 1.1. U.S. Department of Transportation, Research and Innovative Technology Administration, John A. Volpe National Transportation Systems Center, Environmental Measurement and Modeling Division. Washington, D.C. December 8, 2008.

State of California, Governor's Office of Planning and Research (OPR). 2003. General Plan Guidelines. October 2003.

Transportation Research Board, National Research Council. 1971. *Highway Noise: A Design Guide for Highway Engineers (1971), National Cooperative Highway Research Program Report 117*.

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SOURCE: Google 2023; Dudek 2023

DUDEK

0 120 240 Feet

FIGURE 4.7-1

Baseline Outdoor Ambient Sound Level Survey Measurement Locations

Compass BESS (Dudek Project No. 12755.47)

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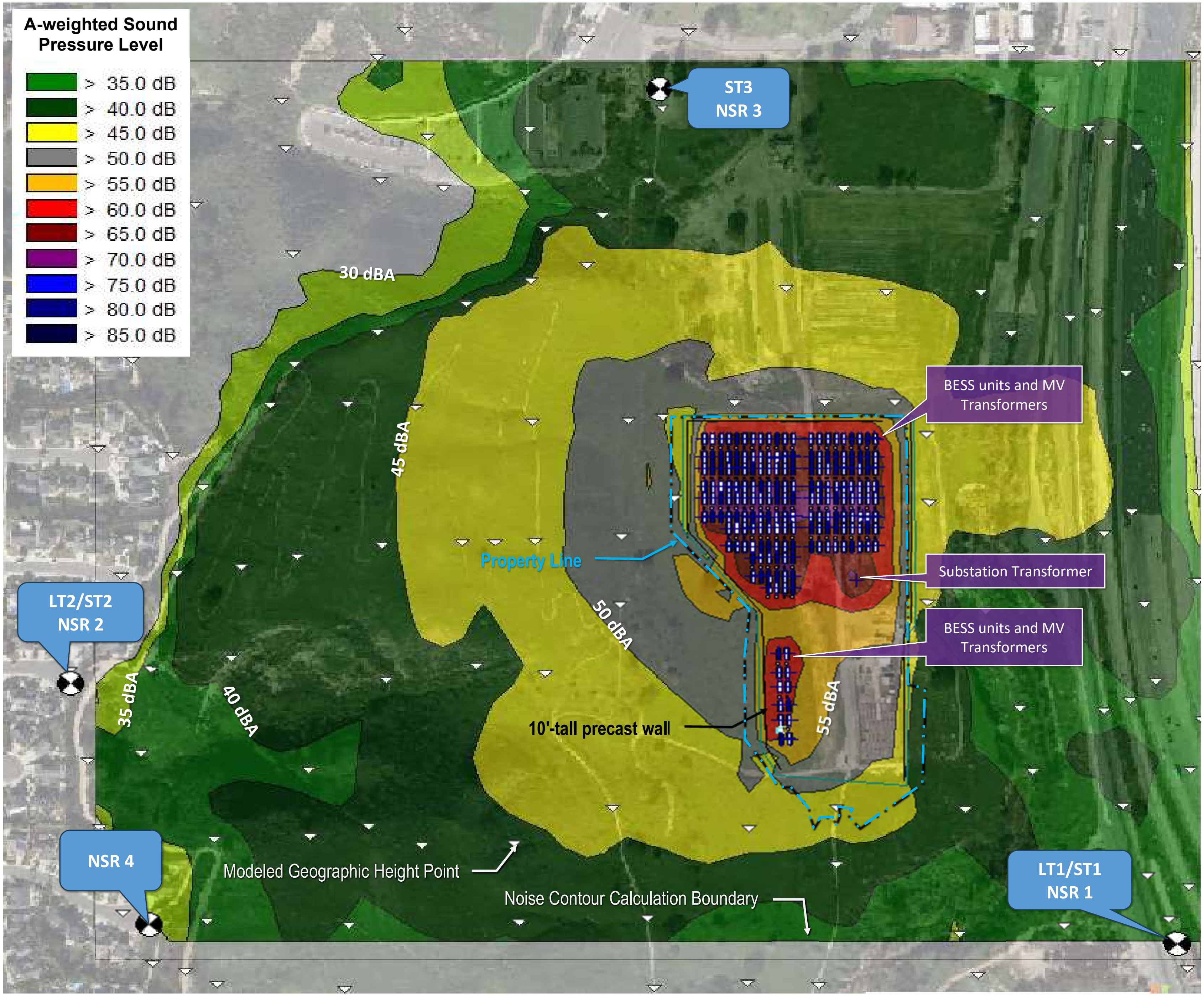

SOURCE: Google 2023; Dudek 2024

DUDEK

FIGURE 4.7-2

Predicted Aggregate Noise from Battery Energy Storage Facility Operations

Compass BESS (Dudek Project No. 12755.47)

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