Appendix I-a Noise Existing Condition Report

Appendices

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TECHNICAL MEMORANDUM

DATE	July 26, 2019
TO	City of Santa Ana Planning and Building Agency
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FROM	Joshua Carman, Senior Associate, Noise and Vibration Isabel Garcia, Project Planner, Noise and Vibration
SUBJECT	Santa Ana Noise Existing Conditions Report
PROJECT NUMBER	SNT-20

This memorandum presents existing noise and vibration conditions for the City of Santa Ana, California, and its sphere of influence. Long-term noise monitoring data, traffic and rail noise modeling inputs and outputs, common noise and vibration definitions, and local regulations are included in Attachment A.

Sound Fundamentals

Sound is a pressure wave transmitted through the air. It is described in terms of loudness or amplitude (measured in decibels), frequency or pitch (measured in Hertz [Hz] or cycles per second), and duration (measured in seconds or minutes). The standard unit of measurement of the loudness of sound is the decibel (dB). Changes of 1 to 3 dB are detectable under quiet, controlled conditions and changes of less than 1 dB are usually indiscernible. A 3 dB change in noise levels is considered the minimum change that is detectable with human hearing in outside environments. A change of 5 dB is readily discernable to most people in an exterior environment whereas a 10 dB change is perceived as a doubling (or halving) of the sound.

The human ear is not equally sensitive to all frequencies. Sound waves below 16 Hz are not heard at all and are "felt" more as a vibration. Similarly, while people with extremely sensitive hearing can hear sounds as high as 20,000 Hz, most people cannot hear above 15,000 Hz. In all cases, hearing acuity falls off rapidly above about 10,000 Hz and below about 200 Hz. Since the human ear is not equally sensitive to sound at all frequencies, a special frequency dependent rating scale is usually used to relate noise to human sensitivity. The A-weighted decibel scale (dBA) performs this compensation by weighting frequencies in a manner approximating the sensitivity of the human ear.

Noise is defined as unwanted sound, and is known to have several adverse effects on people, including hearing loss, speech and sleep interference, physiological responses, and annoyance. Based on these known adverse effects of noise, the federal government, the State of California, and many local governments have established criteria to protect public health and safety and to prevent disruption of certain human activities.

SOUND MEASUREMENT

Unlike linear units such as inches or pounds, decibels are measured on a logarithmic scale, representing points on a sharply rising curve. On a logarithmic scale, an increase of 10 dBA is 10 times more intense than 1 dBA, while 20 dBA is 100 times more intense, and 30 dBA is 1,000 times more intense. A sound as soft as human breathing is about 10 times greater than 0 dBA. The decibel system of measuring sound gives a rough connection between the physical intensity of sound and its perceived loudness to the human ear. Ambient sounds generally range from 30 dBA (very quiet) to 100 dBA (very loud).

Sound levels are generated from a source and their decibel level decreases as the distance from that source increases. Sound dissipates exponentially with distance from the noise source. This phenomenon is known as "spreading loss." For a single point source, sound levels decrease by approximately 6 dBA for each doubling of distance from the source. This drop-off rate is appropriate for noise generated by on-site operations from stationary equipment or activity at a project site. If noise is produced by a line source, such as highway traffic, the sound decreases by 3 dBA for each doubling of distance in a hard site environment. Line source noise in a relatively flat environment with absorptive vegetation decreases by 4.5 dBA for each doubling of distance.

Time variation in noise exposure is typically expressed in terms of a steady-state energy level equal to the energy content of the time varying period (called L_{eq}), or alternately, as a statistical description of the sound level that is exceeded over some fraction of a given observation period. For example, the L_{50} noise level represents the noise level that is exceeded 50 percent of the time. Half the time the noise level exceeds this level and half the time the noise level is less than this level. This level is also representative of the level that is exceeded 30 minutes in an hour. Similarly, the L_2, L_8 and L_{25} values represent the noise levels that are exceeded 2, 8, and 25 percent of the time, or 1, 5, and 15 minutes per hour. These "L_n" values are typically used to demonstrate compliance for stationary noise sources with a city's noise ordinance, as discussed below. Other values typically noted during a noise survey are the L_{min} and L_{max}. These values represent the minimum and maximum root-mean-square noise levels obtained over the measurement period.

Because community receptors are more sensitive to unwanted noise intrusion during the evening and at night, state law and the County require that, for planning purposes, an artificial dB increment be added to quiet time noise levels in a 24-hour noise descriptor called the Community Noise Equivalent Level (CNEL) or Day-Night Noise Level (Ldn). The CNEL descriptor requires that an artificial increment of 5 dBA be added to the actual noise level for the hours from 7:00 p.m. to 10:00 p.m. and 10 dBA for the hours from 10:00 p.m. to 7:00 a.m. The Ldn descriptor uses the same methodology but only adds a 10 dBA increment between 10:00 p.m. and 7:00 a.m. Both descriptors give roughly the same 24-hour level, with the CNEL being only slightly more restrictive (i.e., higher).

PSYCHOLOGICAL AND PHYSIOLOGICAL EFFECTS OF NOISE

Physical damage to human hearing begins at prolonged exposure to noise levels higher than 85 dBA. Exposure to high noise levels affects our entire system, with prolonged noise exposure in excess of 75 dBA increasing body tensions and thereby affecting blood pressure, the heart, and the nervous system. Extended periods of noise exposure above 90 dBA could result in permanent hearing damage. When the noise level reaches 120 dBA, a tickling sensation occurs in the human ear even with short-term exposure—this is called the threshold of feeling. As the sound reaches 140 dBA, the tickling sensation is replaced by pain in the ear, and this is called the threshold of pain. Table 1 shows typical noise levels from familiar noise sources.

Table 1 Typical Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
Onset of physical discomfort	120+	
	110	Rock Band (near amplification system)
Jet Flyover at 1,000 feet		
	100	
Gas Lawn Mower at three feet		
	90	
Diesel Truck at 50 feet, at 50 mph		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 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	0	Lowest Threshold of Human Hearing

Source: Caltrans 2013a.

Vibration Fundamentals

Vibration is an oscillating motion in the earth. Like noise, vibration is transmitted in waves, but in this case through the earth or solid objects. Unlike noise, vibration is typically of a frequency that is felt rather than heard. Vibration can be either natural, such as from earthquakes, volcanic eruptions, or landslides, or man-made, such as from explosions, heavy machinery, or trains. Both natural and man-made vibration may be continuous, such as from operating machinery, or impulsive, as from an explosion.

As with noise, vibration can be described by both its amplitude and frequency. Amplitude can be characterized in three ways—displacement, velocity, and acceleration. Particle displacement is a measure of the distance that a vibrated particle travels from its original position; for the purposes of soil displacement, it is typically measured in inches or millimeters. Particle velocity is the speed at which soil particles move, in

inches per second or millimeters per second. Particle acceleration is the rate of change in velocity over time and is measured in inches per second per second or millimeters per second per second. Vibration amplitudes are usually described in terms of either the peak particle velocity (PPV) or the root mean square (RMS) velocity. PPV is the maximum instantaneous peak of the vibration signal, and RMS is the square root of the average of the squared amplitudes of the signal. PPV is more appropriate for evaluating potential building damage, and RMS is typically more suitable for evaluating human response.

The units for PPV are normally inches per second (in/sec), but in order to compress the range of numbers, RMS vibration levels are often discussed in dB units relative to 1 micro-inch per second (abbreviated as VdB). Typically, groundborne vibration generated by human activities attenuates rapidly with distance from the source of the vibration. Table 2 presents the human reaction to various levels of peak particle velocity.

Table 2 Human Reaction to Typical Vibration Levels

Vibration Level Peak Particle Velocity (in/sec)	Human Reaction	Effect on Buildings
0.006–0.019	Threshold of perception, possibility of intrusion	Vibrations unlikely to cause damage of any type
0.08	Vibrations readily perceptible	Recommended upper level of vibration to which ruins and ancient monuments should be subjected
0.10	Level at which continuous vibration begins to annoy people	Virtually no risk of "architectural" (i.e., not structural) damage to normal buildings
0.20	Vibrations annoying to people in buildings	Threshold at which there is a risk to "architectural" damage to normal dwellings, i.e., houses with plastered walls and ceilings
0.4–0.6	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges	Vibrations at a greater level than normally expected from traffic, but would cause "architectural" damage and possibly minor structural damage

Source: Caltrans 2013b.

The way in which vibration is transmitted through the earth is called propagation. As vibration waves propagate from a source, the energy is spread over an ever-increasing area so that the energy level striking a given point is reduced with the distance from the energy source. This geometric spreading loss is inversely proportional to the square of the distance. Wave energy is also reduced with distance as a result of material damping in the form of internal friction, soil layering, and void spaces. The amount of attenuation provided by material damping varies with soil type and condition as well as the frequency of the wave.

Regulatory Framework

To limit population exposure to physically and/or psychologically damaging as well as intrusive noise levels, the federal government, the State of California, and local governments have established standards and ordinances to control noise.

FEDERAL REGULATIONS

Federal Highway Administration

Proposed federal or federal-aided highway construction projects at a new location, or the physical alteration of an existing highway that significantly changes the horizontal or vertical alignment or increases the number of through-traffic lanes, require an assessment of noise and consideration of noise abatement per 23 CFR Part 772, "Procedures for Abatement of Highway Traffic Noise and Construction Noise." The Federal Highway Administration (FHWA) has adopted noise abatement criteria (NAC) for sensitive receivers—such as picnic areas, recreation areas, playgrounds, active sport areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals—when "worst-hour" noise levels approach or exceed 67 dBA L_{eq} (Caltrans 2011).

US Environmental Protection Agency

In addition to FHWA standards, the EPA has identified the relationship between noise levels and human response. The EPA has determined that over a 24-hour period, an L_{eq} of 70 dBA will result in some hearing loss. Interference with activity and annoyance will not occur if exterior levels are maintained at an L_{eq} of 55 dBA and interior levels at or below 45 dBA. These levels are relevant to planning and design and useful for informational purposes, but they are not land use planning criteria because they do not consider economic cost, technical feasibility, or the needs of the community, and are, therefore, not mandated.

The EPA also set 55 dBA Ldn as the basic goal for exterior residential noise intrusion. However, other federal agencies, in consideration of their own program requirements and goals, as well as the difficulty of actually achieving a goal of 55 dBA Ldn, have settled on the 65 dBA Ldn level as their standard. At 65 dBA Ldn, activity interference is kept to a minimum, and annoyance levels are still low. It is also a level that can realistically be achieved.

Occupational Health and Safety Administration

The federal government regulates occupational noise exposure common in the workplace through the Occupational Health and Safety Administration (OSHA) under the EPA. Such limitations would apply to the operation of construction equipment and could also apply to any proposed industrial land uses. Noise exposure of this type is dependent on work conditions and is addressed through a facility's Health and Safety Plan, as required under OSHA, and is therefore not addressed further in this analysis.

US Department of Housing and Urban Development

The US Department of Housing and Urban Development (HUD) has set the goal of 65 dBA Ldn as a desirable maximum exterior standard for residential units developed under HUD funding. (This level is also generally accepted within the State of California.) Although HUD does not specify acceptable interior noise levels, standard construction of residential dwellings typically provides 20 dBA or more of attenuation with the windows closed. Based on this premise, the interior Ldn should not exceed 45 dBA.

STATE REGULATIONS

General Plan Guidelines

The State of California, through its General Plan Guidelines, discusses how ambient noise should influence land use and development decisions and includes a table of normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable uses at different noise levels, expressed in CNEL. A

conditionally acceptable designation implies new construction or development should be undertaken only after a detailed analysis of the noise reduction requirements for each land use and needed noise insulation features are incorporated in the design. By comparison, a normally acceptable designation indicates that standard construction can occur with no special noise reduction requirements. The general plan guidelines provide cities with recommended community noise and land use compatibility standards that can be adopted or modified at the local level based on conditions and types of land uses specific to that jurisdiction.

California Building Code

The California Building Code (CBC), Title 24, Part 2, Volume 1, Chapter 12, Interior Environment, Section 1207.11.2, Allowable Interior Noise Levels, requires that interior noise levels attributable to exterior sources not exceed 45 dBA in any habitable room. The noise metric is evaluated as either the day-night average sound level (Ldn) or the community noise equivalent level (CNEL), whichever is consistent with the noise element of the local general plan.

The California Green Building Standards Code (CALGreen), Chapter 5, Division 5.5, has additional requirements for insulation that affect exterior-interior noise transmission for nonresidential structures. Pursuant to CALGreen Section 5.507.4.1, Exterior Noise Transmission, an architectural acoustics study may be required when a project site is within a 65 dBA CNEL or Ldn noise contour of an airport, freeway or expressway, railroad, industrial source, or fixed-guideway source. Where noise contours are not readily available, if buildings are exposed to a noise level of 65 dBA L_{eq} during any hour of operation, specific wall and ceiling assembly and sound-rated windows may be necessary to reduce interior noise to acceptable levels. A performance method may also be used per Section 5.507.4.2 to show compliance with state interior noise requirements.

LOCAL REGULATIONS

City of Santa Ana General Plan Noise Element

The Noise Element of the Santa Ana General Plan contains objectives, policies, and programs to prevent significant increases in noise levels in the community and minimize the adverse effects of existing noise sources. Table 3 summarizes the City's noise and land use compatibility standards when siting new noise-sensitive development. The General Plan is currently in the process of being updated.

Table 3 Noise and Land Use Compatibility Standards

Categories	Land Use Categories	Interior CNEL[1]	Exterior CNEL[2]
Residential	Single-family, duplex, multi-family	45[3]	65
Institutional	Hospital, school classroom/playgrounds	45	65
	Church, library	45	--
Open Space	Parks	--	65

Source: Santa Ana General Plan.

Notes:

[1] Interior areas (to include but are not limited to: bedrooms, bathrooms, kitchens, living rooms, dining rooms, closets, corridors/hallways, private offices, and conference rooms.

[2] Exterior areas shall mean: private yards of single family homes, park picnic areas, school playgrounds, common areas, private open space, such as atriums on balconies, shall be excluded form exterior areas provided sufficient common area is included within the project.

[3] Interior noise level requirements contemplate a closed window condition. Mechanical ventilation system or other means of natural ventilation shall be provided per Chapter 12, Section 1305 of the Uniform Building Code.

City of Santa Ana Municipal Code

Chapter 18, Article VI, Noise Control, of the municipal code provides criteria for ambient noise measurements as well as noise standards for residential, school, hospital, and church uses. When nontransportation (stationary) noise is the noise source of concern, the City applies performance standards from Section 18.312 of the municipal code to ensure that noise producers do not adversely affect noise-sensitive land uses. Table 4, *Exterior Noise Standards*, summarizes the City's exterior noise standards.

Table 4 Exterior Noise Standards

Time Period	Noise Level (dBA)				
	L_{50}	L_{25}	L_8	L_2	L_{max}
7:00 a.m.–10:00 p.m.	55	60	65	70	75
10:00 p.m.–7:00 a.m.	50	55	60	65	70

Source: City of Santa Ana Municipal Code.
Note: A 5 dBA penalty shall be applied in the event of an alleged offensive noise such as impact noise, simple tones, speech, music, or any combination of thereof.
If the measured ambient level exceeds any of the first four noise limit categories, the allowable noise exposure standard shall be increased to reflect the ambient noise level. If the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under this category shall be increased to reflect the maximum ambient noise level.

CONSTRUCTION

The City of Santa Ana's noise ordinance exempts noise from construction activities that occur during the daytime. No construction is permitted outside of the hours specified in Section 18-314(e) of the Santa Ana Municipal Code, which restricts construction activities to the daytime hours of 7:00 AM to 8:00 PM Monday through Saturday.

VIBRATION

The City of Santa Ana does not have specific limits or thresholds for construction vibration. The Federal Transit Administration (FTA) provides criteria for acceptable levels of groundborne vibration for various types of buildings. Structures amplify groundborne vibration; wood-frame buildings, such as typical residential structures, are more affected by ground vibration than heavier buildings. The level at which groundborne vibration is strong enough to cause architectural damage has not been determined conclusively, but the standards recommended by the FTA are shown in Table 5.

Table 5 Building Architectural Damage Limits

Building Category		PPV (in/sec)
I.	Reinforced concrete, steel, or timber (no plaster)	0.5
II.	Engineered concrete and masonry (no plaster)	0.3
III.	Non-engineered timber and masonry buildings	0.2
IV.	Buildings extremely susceptible to vibration damage	0.12

Source: FTA 2018.

Existing Conditions

AMBIENT NOISE MONITORING

To determine a baseline noise level at different environments within the planning area, ambient noise monitoring was conducted in the City of Santa Ana by PlaceWorks staff in May 2019. Measurements were made during the weekday morning and evening commutes, that is, 7:00 am to 10:00 am and 3:00 pm to 7:00 pm. Long-term (48-hour) measurements were conducted at 5 locations, and short-term (15-minute) measurements were conducted at 16 locations in the planning area. The monitoring locations were generally chosen in the five focus areas. All measurements were conducted Monday, May 13, through Wednesday, May 15, 2019.

The primary noise sources during measurements were traffic, aircraft overflights, and railroad noise. Commercial, industrial and government operations, and animal activity (such as dogs barking and birds chirping) also contributed to the overall noise environment at some locations. Meteorological conditions during the measurement periods were favorable for outdoor sound measurements and were noted as representative of the typical conditions for the season. Generally, conditions included mostly cloudy, partly cloudy, and clear skies with daytime temperatures from 64 to 73 degrees Fahrenheit (°F), and average wind speeds between 1 to 5 miles per hour (mph). All sound level meters were equipped with a windscreen during measurements.

All sound level meters used for noise monitoring satisfy the American National Standards Institute (ANSI) standard for Type 1 instrumentation (Larson Davis LxT and 820 sound level meters were used). The sound level meters were set to "slow" response and "A" weighting (dBA). The meters were calibrated prior to and after the monitoring period. All measurements were at least five feet above the ground and away from reflective surfaces. Noise measurement locations are described below and shown in Figure 1, *Approximate Noise Monitoring Locations*.

» Long-Term Location 1 (LT-1) was in front of 2944 Fernwood Drive at the end of the street, south of State Route 22 (SR-22). A 48-hour noise measurement began at 8:00 PM on Monday, May 13, 2019. The noise environment of this site is characterized primarily by highway traffic on SR-22 and traffic on local roadways.

» Long-Term Location 2 (LT-2) was in front of 1406 N. Harbor Boulevard next to the Sunset Ridge Apartments. A 48-hour noise measurement began at 9:00 PM on Monday, May 13, 2019. The noise environment of this site is characterized primarily by traffic on Harbor Boulevard.

» Long-Term Location 3 (LT-3) was across from 1507 N. Fairmont Street. A 48-hour noise measurement began at 7:00 PM Monday, May 13, 2019. The noise environment of this site is characterized primarily by traffic on Lincoln Avenue, Fairmont Street, and railroad activity adjacent to Lincoln Avenue.

» Long-Term Location 4 (LT-4) was at the southeast corner of Normandy Place and Lyon Street. A 48-hour noise measurement began at 4:00 PM on Monday, May 13, 2019. The noise environment of this site is characterized primarily by traffic on Lyon Street and nearby railroad activity. While on-site, PlaceWorks staff observed several train pass-bys—two Amtrak Surfliners and one Metrolink.

» Long-Term Location 5 (LT-5) was southeast of 7 Hutton Center Drive (DoubleTree by Hilton) next to SR-55. A 48-hour noise measurement began at 3:00 PM on Monday, May 13, 2019. The noise environment of this site is characterized primarily by traffic on SR-55 and traffic on local roadways.

» **Short-Term Location 1 (ST-1)** was off Bristol Street south of Park Lane behind 2530 N. Greenbrier Street, approximately 45 feet east of the Bristol Street northbound centerline. A 15-minute noise measurement began at 7:17 AM on Tuesday, May 14, 2019. The noise environment of this site is characterized primarily by traffic on Bristol Street. Traffic noise levels generally ranged from 75 dBA to 83 dBA. Buses, work trucks, and garbage trucks were observed to be loudest, ranging from 79 dBA to 88 dBA. The background noise level was noted as low as 62 dBA during moments of slower speeds due to traffic signals and congestion.

» **Short-Term Location 2 (ST-2)** was outside of Main Place Mall off Main Street, approximately 35 feet west of the southbound centerline. A 15-minute noise measurement began at 7:54 AM on Tuesday, May 14, 2019. The noise environment of this site is characterized primarily by traffic noise. Secondary noise sources included distant landscape maintenance. Traffic noise levels generally ranged from 72 dBA to 80 dBA. Buses, work trucks, and semi-trailers were observed to be loudest, ranging from 78 dBA to 83 dBA. The background noise level was noted as low as 53 dBA during intermittent periods of little to no traffic.

» **Short-Term Location 3 (ST-3)** was near 13962 Nautilus Drive, off Westminster Avenue, approximately 42 feet north of the westbound centerline. A 15-minute noise measurement began at 4:59 PM on Tuesday, May 14, 2019. The noise environment of the site is primarily characterized by traffic. Traffic noise levels generally ranged from 68 dBA to 78 dBA. Buses, trucks, semis, and vehicles with modified mufflers were observed to be loudest, ranging from 76 dBA to 89 dBA. The background noise level was noted as low as 55 dBA during intermittent periods of little to no traffic.

» **Short-Term Location 4 (ST-4)** was outside Santa Ana Community College off West 17th Street, approximately 37 feet south of the eastbound centerline. A 15-minute noise measurement began at 3:16 PM on Tuesday, May 14, 2019. The noise environment of the site is primarily characterized by traffic noise. Traffic noise levels generally ranged from 70 dBA to 77 dBA. Buses, motorcycles, and vehicles with modified mufflers were observed to be loudest, ranging from 81 dBA to 91 dBA. The background noise level was noted as low as 51 dBA during the few intermittent periods of little to no traffic due to traffic signals.

» **Short-Term Location 5 (ST-5)** was across from the Santa Ana Regional Transportation Center off Santiago Street, approximately 30 feet west of the southbound centerline. A 15-minute noise measurement began at 8:29 AM on Tuesday, May 14, 2019. The noise environment of the site is primarily characterized by traffic noise. Traffic noise levels generally ranged from 70 dBA to 72 dBA. Buses and work trucks were observed to be loudest, ranging from 78 dBA to 80 dBA. The background noise level was noted as low as 50 dBA during periods of little to no traffic.

» **Short-Term Location 6 (ST-6)** was in front of 330 Euclid Street approximately 45 feet west of the southbound centerline. A 15-minute noise measurement began at 5:58 PM on Tuesday, May 14, 2019. The noise environment of the site is primarily characterized by traffic noise. Traffic noise levels generally ranged from 76 dBA to 82 dBA. Vehicles such as motorcycles, buses, and sports cars were observed to be loudest, ranging from 83 dBA to 87 dBA. The background noise level was noted as low as 61 dBA during intermittent periods of little to no traffic.

» **Short-Term Location 7 (ST-7)** was in front of 2335 1st Street approximately 45 feet north of the westbound centerline. A 15-minute noise measurement began at 4:03 PM on Tuesday, May 14, 2019. The noise environment of the site is primarily characterized by traffic noise. Traffic noise levels generally ranged from 72 dBA to 78 dBA. Vehicles such as buses, work trucks, and semis were observed to be

loudest, ranging from 75 dBA to 87 dBA. The background noise level was noted as low as 59 dBA during intermittent periods of little to no traffic.

» Short-Term Location 8 (ST-8) was near 412 Flower Street approximately 45 feet west of the southbound centerline. A 15-minute noise measurement began at 9:36 AM on Tuesday, May 14, 2019. The noise environment of the site is primarily characterized by traffic noise. Traffic noise levels generally ranged from 69 dBA to 76 dBA. Vehicles such as motorcycles and sport cars were observed to be loudest, ranging from 75 dBA to 80 dBA. The background noise level was noted as low as 48 dBA.

» Short-Term Location 9 (ST-9) was outside the Advanced Learning Academy off 1st Street near the southwest corner of 1st and Maple Street, approximately 40 feet south from the eastbound centerline. A 15-minute noise measurement began at 8:59 AM on Tuesday, May 14, 2019. The noise environment of the site is primarily characterized by traffic noise. Traffic noise levels generally ranged from 78 dBA to 80 dBA. Vehicles such as buses, work trucks, and semi-trailers were observed to be loudest, ranging from 81 dBA to 88 dBA. The background noise level was noted as low as 59 dBA during intermittent moments of little to no traffic.

» Short-Term Location 10 (ST-10) was at Centennial Park. A 15-minute noise measurement began at 3:19 PM on Wednesday, May 15, 2019. The noise environment of the site is primarily characterized by bird calls and park users. Noise levels generally ranged from 46 dBA to 74 dBA. Bird calls were up to 74 dBA when in flight overhead. Secondary noise sources were distant traffic noise from adjacent roadways and dogs barking in the distance.

» Short-Term Location 11 (ST-11) was across from 218 Edinger Street approximately 40 feet north of the westbound centerline. A 15-minute noise measurement began at 4:03 PM on Wednesday, May 15, 2019. The noise environment of the site is primarily characterized by traffic noise. Traffic noise levels generally ranged from 75 dBA to 80 dBA. Vehicles such as motorcycles, buses, and sports cars were observed to be loudest, ranging from 81 dBA to 87 dBA. The background noise level was noted as low as 50 dBA during moments of congestion.

» Short-Term Location 12 (ST-12) was in front of 2620 S. Bristol Street, approximately 40 feet west of southbound centerline. A 15-minute noise measurement began at 8:49 AM on Wednesday, May 15, 2019. The noise environment of the site is primarily characterized by traffic noise. Traffic noise levels generally ranged from 63 dBA to 76 dBA. Vehicles such as buses and sports cars were observed to be loudest, ranging from 75 dBA to 87 dBA. The background noise level was noted as low as 53 dBA during intermittent moments of little to no traffic.

» Short-Term Location 13 (ST-13) was in front of 2519 Main Street, approximately 42 feet west of the southbound centerline. A 15-minute noise measurement began at 9:27 AM on Wednesday, May 15, 2019. The noise environment of the site is primarily characterized by traffic noise. Traffic noise levels generally ranged from 68 dBA to 78 dBA. Buses were observed to be loudest at 80 dBA. The background noise level was noted as low as 51 dBA.

» Short-Term Location 14 (ST-14) was in front of 1821 Dyer Street, approximately 42 feet north of the westbound centerline. A 15-minute noise measurement began at 4:41 PM on Wednesday, May 15, 2019. The noise environment of the site is primarily characterized by traffic noise and aircraft overflights. The John Wayne Airport is approximately 2 miles southwest of this location. Traffic noise levels generally ranged from 57 dBA to 72 dBA, and aircraft overflights ranged from 78 dBA to 83 dBA. Overflights were all observed to be commercial aircraft. Traffic noise levels were lower than at other, similar locations

due to congestion and low travel speeds. The background noise level was noted to be 57 dBA, characterized by idling traffic.

» **Short-Term Location 15 (ST-15)** was in front of 2500 MacArthur Boulevard, approximately 45 feet south of the eastbound centerline. A 15-minute noise measurement began at 7:31 AM on Wednesday, May 15, 2019. The noise environment of the site is primarily characterized by traffic noise. Traffic noise levels generally ranged from 79 dBA to 82 dBA. Vehicles such as buses, work trucks, and semi-trailers were observed to be loudest, ranging from 82 dBA to 84 dBA. The background noise level was noted as low as 59 dBA during intermittent moments of light traffic.

» **Short-Term Location 16 (ST-16)** was in front of 3650 Bristol Street, approximately 55 feet west of the southbound centerline. A 15-minute noise measurement began at 8:11 AM on Wednesday, May 15, 2019. The noise environment of the site is primarily characterized by traffic noise. Traffic noise levels generally ranged from 74 dBA to 83 dBA. Vehicles such as buses, garbage trucks, and semi-trailers were observed to be loudest, ranging from 81 dBA to 87 dBA. The background noise level was noted as low as 55 dBA during intermittent moments of little to no traffic.

Ambient Noise Monitoring Results

During the ambient noise survey, the CNEL noise levels at monitoring locations ranged from 69 to 80 dBA CNEL. The long-term noise measurement results are summarized in Table 6, *Long-Term Noise Measurements Summary*. A graphical summary of the daily trend during long-term noise measurements is provided in Attachment A. The short-term noise measurement results are summarized in Table 7, *Short-Term Noise Measurements Summary*.

Table 6 Long-Term Noise Measurements Summary (dBA)

Monitoring Location	Description	CNEL	Lowest $L_{eq, 1\text{-}hr}$	Highest $L_{eq, 1\text{-}hr}$
LT-1	2944 Fernwood Drive	69	56.5	72.9
LT-2	1406 N Harbor Boulevard	78	64.8	79.0
LT-3	1507 North Fairmont Street	73	58.6	73.4
LT-4	Normandy and Lyon Street	79	52.9	78.4
LT-5	7 Hutton Center Drive, east of Double Tree Hotel	80	66.4	77.5

See Attachment A for a graphical display of long-term noise monitoring data.

Table 7 Short-Term Noise Measurements Summary (dBA)

Monitoring Location	Description	15-minute Noise Level, dBA						
		L_{eq}	L_{max}	L_{min}	L_2	L_8	L_{25}	L_{50}
ST-1	Bristol Street south of Park Lane ≈ 45 ft east of NB centerline 7:17 AM, 5/14/2019	78.5	87.9	62.4	83.5	82.1	79.8	77.5
ST-2	Main Street north of Memory Lane ≈ 35 ft west of SB centerline 7:54 AM, 5/14/2019	73.2	82.6	52.5	79.9	77.9	75.0	69.4
ST-3	Westminster near Nautilus Drive ≈ 42 ft north of WB centerline 4:59 PM, 5/14/2019	70.1	89.0	55.1	77.3	73.1	70.5	67.5
ST-4	17th Street west of Bristol Street ≈ 37 ft south of EB centerline 3:16 PM, 5/14/2019	73.3	90.9	51.2	79.6	77.2	74.5	70.5
ST-5	Santiago Street, Near Santa Ana Regional Transportation Center ≈ 30 ft west of SB centerline 8:29 AM, 5/14/2019	65.0	79.8	50.4	73.3	69.6	64.1	60.1
ST-6	Near 330 Euclid Street ≈ 45 ft west of SB centerline 5:58 PM, 5/14/2019	76.9	87.6	60.7	83.3	80.7	77.8	74.9
ST-7	Near 2335 1st Street ≈ 45 ft north of WB centerline 4:03 PM, 5/14/2019	73.6	87.5	59.0	80.5	77.3	74.3	71.6
ST-8	412 Flower Street ≈ 45 ft west of SB centerline 9:36 AM, 5/14/2019	68.7	80.2	48.3	75.9	73.7	70.0	64.7
ST-9	1st Street near Maple Street ≈ 40 ft south of EB centerline 8:59 AM, 5/14/2019	75.5	88.3	59.4	82.3	80.1	76.6	71.8
ST-10	Centennial Regional Park 3:19 PM, 5/15/2019	54.6	73.5	46.1	60.9	57.4	54.2	52.0
ST-11	Near 218 Edinger Street ≈ 40 ft north of WB centerline 4:03 PM, 5/15/2019	72.2	87.2	49.7	78.5	76.1	73.3	70.4
ST-12	Near 2620 South Bristol Street ≈ 40 ft west of SB centerline 8:49 AM, 5/15/2019	69.8	88.0	53.2	75.9	73.6	70.8	67.1
ST-13	Near 2519 Main Street ≈ 42 ft west of SB centerline 9:27 AM, 5/15/2019	70.8	80.7	51.0	77.1	75.2	72.4	68.9
ST-14	Near 1821 Dyer Street ≈ 42 ft north of WB centerline 4:41 PM, 5/15/2019	70.0	83.9	56.8	77.3	74.1	70.8	65.4
ST-15	Near 2500 MacArthur Boulevard ≈ 45 ft south of EB centerline 7:31 AM, 5/15/2019	76.4	84.3	59.3	81.8	80.5	78.0	75.0
ST-16	Near 3650 South Bristol Street ≈ 55 ft west of SB centerline 8:11 AM, 5/15/2019	76.1	86.9	55.2	82.3	80.5	78.0	73.1

Notes: ft = feet, NB = northbound, SB = southbound, EB = eastbound, WB = westbound

Summary of Ambient Noise Monitoring

The noise environment within the planning area is variable depending on location. However, freeway, rail, and local roadway traffic noise tends to dominate the noise environment, with the exception of ST-10 (Centennial Park) and ST-8 (412 Flower Street). The majority of Centennial Park is set back from adjacent roadways, and Flower Street is a lower-capacity roadway.

EXISTING TRAFFIC NOISE

On-road vehicles represent the most prominent source of noise in the plan area. Existing traffic noise conditions were modeled using the FHWA Highway Traffic Noise Prediction Model and average daily traffic volumes, vehicle mix, time of day splits, speed, and number of travel lanes data provided by IBI for highway and roadway segments in the plan area. Table 8 summarizes the calculated existing noise levels from roadways in the plan area at a distance of 50 feet from the roadway centerline, and shows the distances to the 60 dBA CNEL, 65 dBA CNEL, and 70+ dBA CNEL noise contours. The distances, conservatively, do not account for any noise reduction from topography or intervening features. Figures 2 through 5 illustrate the modeled roadways and existing noise contours for 60 dBA CNEL, 65 dBA CNEL, and 70+ dBA CNEL. Attachment A contains the inputs and outputs used in existing traffic noise modeling.

Table 8 Existing Roadway Noise Levels and Distances to Contour Lines

Roadway Segment	CNEL (dBA) at 50 Feet	Distance to Noise Contours (Feet)		
		70+ dBA CNEL	65 dBA CNEL	60 dBA CNEL
1st Street – Euclid Street to Newhope Street	72.6	75	162	348
Euclid Street – 1st Street to McFadden Avenue	75.0	107	231	497
Westminster Avenue – Harbor Boulevard to Fairview Street	74.2	95	205	442
Harbor Boulevard – Westminster Avenue/17th Street to Hazard Avenue	76.6	137	294	634
Edinger Avenue – Harbor Boulevard to Fairview Street	73.7	89	191	412
Warner Avenue – Harbor Boulevard to Fairview Street	74.8	104	224	483
Harbor Boulevard – Segerstrom Avenue to MacArthur Boulevard	76.6	138	297	641
Fairview Street – 1st Street to Willits Street	76.6	138	296	639
1st Street – Sullivan Street to Raitt Street	74.2	96	206	443
Bristol Street – 17th Street to Santa Clara Avenue	76.7	140	302	651
17th Street – College Avenue to Bristol Street	74.0	93	199	430
Bristol Street – 17th Street to Washington Avenue	75.7	119	257	554
Fairview Street – Trask Avenue to 17th Street	76.5	136	292	630
Bristol Street – 1st Street to Bishop Street	75.2	111	239	515
Civic Center Drive – Bristol Street to Flower Street	69.1	43	93	201
Flower Street – 1st Street to Bishop Street	68.9	42	91	195

Table 8 Existing Roadway Noise Levels and Distances to Contour Lines

Roadway Segment	CNEL (dBA) at 50 Feet	Distance to Noise Contours (Feet)		
		70+ dBA CNEL	65 dBA CNEL	60 dBA CNEL
Main Street – 17th Street to 20th Street	72.6	75	162	348
Main Street – Washington Street to Civic Center Drive	71.4	62	133	286
Civic Center Drive – Flower Street to Broadway	66.0	27	59	127
Santa Ana Boulevard – Flower Street to Broadway	67.3	33	71	153
1st Street – Main Street to Standard Avenue	75.2	111	240	517
Main Street – 1st Street to Bishop Street	72.2	70	150	323
Grand Avenue – Santa Clara Avenue to 17th Street	72.2	70	151	325
Grand Avenue – Santa Ana Boulevard to 4th Street	74.3	97	209	451
17th Street – Cabrillo Park Drive to Tustin Avenue	72.9	78	168	362
Tustin Avenue – Fruit Street to 4th Street	70.7	55	119	257
1st Street – Cabrillo Park Drive to Tustin Avenue	71.3	61	132	284
Fairview Street – Edinger Avenue to Harvard Street	76.6	138	297	640
Fairview Street – Warner Avenue to Segerstrom Avenue	76.0	125	269	579
Edinger Avenue – Fairview Street to Greenvile Street	72.2	70	151	325
McFadden Avenue – Fairview Street to Raitt Street	70.9	57	123	265
MacArthur Boulevard – Fairview Street to Raitt Street	72.3	72	154	333
Segerstrom Avenue – Fairview Street to Raitt Street	71.4	62	133	286
Bristol Street – Edinger Avenue to Warner Avenue	74.5	100	215	464
Bristol Street – Warner Avenue to Segerstrom Avenue	74.4	98	211	455
Warner Avenue – Raitt Street to Bristol Street	75.1	109	235	505
Bristol Street – MacArthur Boulevard to Sunflower Avenue	74.7	103	223	480
Flower Street – Warner Avenue to Segerstrom Avenue	70.0	50	107	231
Edinger Avenue – Flower Street to Main Street	73.5	86	184	397
Main Street – McFadden Avenue to Edinger Avenue	71.9	67	143	309
Main Street –Warner Avenue to Segerstrom Avenue	73.8	89	193	415
Dyer Road – Main Street to Halladay Street	74.8	104	225	484
MacArthur Boulevard – Flower Street to Main Street	74.1	93	201	434
Main Street – MacArthur Boulevard to Sunflower Avenue	72.9	78	168	362
Grand Avenue – Edinger Avenue to Saint Andrews Place	74.2	95	205	442

Table 8 Existing Roadway Noise Levels and Distances to Contour Lines

Roadway Segment	CNEL (dBA) at 50 Feet	Distance to Noise Contours (Feet)		
		70+ dBA CNEL	65 dBA CNEL	60 dBA CNEL
Edinger Avenue – Richie Street to Newport Avenue	76.0	126	271	585
Warner Avenue – Grand Avenue to Red Hill Avenue	73.0	79	169	365
Warner Avenue – Main Street to Standard Avenue	73.0	79	170	366
McFadden Avenue – Standard Avenue to Grand Avenue	71.0	58	125	269
1st Street – Bristol Street to Flower Street	75.0	108	233	502
I-5 – Chapman Avenue to Katella Avenue	87.2	700	1,508	3,249
I-5 – SR-22 to Main Street	88.6	868	1,869	4,028
I-5 – 17th Street /Penn Way to Grand Avenue	88.5	857	1,847	3,979
I-5 – 1st Street to SR-55	88.0	796	1,714	3,693
I-5 – Newport Avenue to Red Hill Avenue	88.0	787	1,696	3,654
I-405 – Brookhurst Avenue to Euclid Street	87.0	678	1,461	3,148
I-405 – Euclid Street to Harbor Boulevard	87.3	711	1,531	3,298
I-405 – Harbor Boulevard to SR-73	87.0	680	1,465	3,156
I-405 – Bristol Street to SR-55	86.3	608	1,310	2,821
I-405 – SR-55 to MacArthur Boulevard	86.9	674	1,452	3,128
SR-55 – 4th Street to 17th Street	87.1	694	1,495	3,221
SR-55 – Edinger Avenue to Dyer Road	87.6	750	1,615	3,480
SR-55 – Dyer Road to MacArthur Boulevard	86.9	669	1,442	3,106
SR-55 – MacArthur Boulevard to I-405	85.9	577	1,244	2,680
SR-55 – I-405 to SR-73	84.4	454	978	2,108
SR-22 – Euclid Street to Harbor Boulevard	85.9	578	1,245	2,683
SR-22 – The City Drive to Bristol Street	86.1	596	1,284	2,766
SR-22 – I-5 to Main Street	84.1	435	937	2,018
SR-22 – Glassell Street to Tustin Avenue	83.8	413	890	1,918

Source: Calculated using FHWA RD-77-108 model based on traffic data provided by IBI. See Attachment A.

AIRCRAFT NOISE

Aircraft noise is typically characterized as “occasional” throughout the City, but can be intrusive to nearby sensitive receptors closer to take-off and landing. There is one airport in the City of Santa Ana, John Wayne

Airport, for which existing noise contours are shown in Figure 6. The John Wayne Airport services commercial and private aircraft.

John Wayne Airport participates in a noise abatement program as part of California Airport Noise Standards and generates quarterly reports of long-term CNEL dB values. The noise abatement program has 10 noise monitoring sites (NMS) within the airport's neighboring cities, and one of them, NMS-9N, is at 1300 S Grand Avenue in Santa Ana.

RAILROAD NOISE

Railroad operations in the City are also a substantial source of noise in some areas. Day-night average noise levels vary throughout the county depending on the number of trains per day along a given rail line, the timing and duration of train pass-by events, and whether or not trains must sound their warning whistles near "at-grade" crossings. Noise levels commonly range from 65 to 75 dBA CNEL at land uses adjoining a railroad right-of-way. When trains approach a passenger station or at-grade crossing, they are required to sound their warning whistle within ¼ mile. Train warning whistles typically generate maximum noise levels of 105 to 110 dBA at 100 feet. The day-night average noise level at locations immediately adjacent to at-grade crossings and exposed to multiple train pass-by events per day can exceed 85 dBA Ldn/CNEL.

Existing railroad noise levels were projected using the FTA CREATE rail noise model and the Federal Rail Administration (FRA) Grade Crossing Horn Model, the average number of pass-bys, time of day, number of locomotives and type, number of rail cars and type, and speed. Santa Anta currently has two sets of rail lines that run within and through the City, owned by the Union Pacific (UP) and Southern California Regional Rail Authority (SCRRA). The SCRRA Orange subdivision services a mix of freight and passenger trains, such as Metrolink (Orange County and Inland Empire lines), Amtrak (Pacific Surfliner), and BNSF freight trains. The UP Santa Ana industrial lead services freight only. There are several crossings in Santa Ana that are designated "quiet zones," from 4th Street north to Santa Clara Avenue. In these locations, trains are not required to sound their warning whistle (though still may if the conductor deems it necessary for safety reasons). Table 9 contains the calculated distances to the 65 dBA CNEL contours from existing railroad noise, both from the mainline and within ¼ mile of grade crossings where horn warnings are required. The noise contours are displayed graphically in Figures 3 through 5.

Table 9 Existing Railroad Noise Levels

Operator	Subdivision	Distance (feet) to 65 dBA CNEL Contour (Mainline)	Distance (feet) to 65 dBA CNEL Contour (Within ¼ Mile of Grade Crossing)
UP	Santa Ana Industrial Lead	30	361
SCRRA	Orange Subdivision	210	978

Source: Calculated using the FTA CREATE Model and FRA Grade Crossing Horn Model. See Attachment A.

STATIONARY SOURCE NOISE

Stationary sources of noises may occur from all types of land uses. Residential uses would generate noise from landscaping, maintenance activities, and air conditioning systems. Commercial uses would generate noise from heating, ventilation, and air conditioning (HVAC) systems; loading docks; and other sources. Industrial uses may generate noise from HVAC systems, loading docks, and possibly machinery. Noise

generated by residential or commercial uses is generally short and intermittent. Industrial uses may generate noise on a more continual basis. Nightclubs, outdoor dining areas, gas stations, car washes, fire stations, drive-throughs, swimming pool pumps, school playgrounds, athletic and music events (such as at the Santa Ana Stadium), and public parks are other common noise sources.

EXISTING VIBRATION

Commercial and industrial operations in the City can generate varying degrees of ground vibration, depending on the operational procedures and equipment. Such equipment-generated vibrations spread through the ground and diminish with distance from the source. The effect on buildings in the vicinity of the vibration source varies depending on soil type, ground strata, and receptor-building construction. The results from vibration can range from no perceptible effects at the lowest vibration levels, to low rumbling sounds and perceptible vibrations at moderate levels, to slight structural damage at the highest levels. In addition, future sensitive receptors could be placed within close proximity to existing railroad lines through buildout in the General Plan Area. Screening distances for new vibration-sensitive development in the plan area will be addressed in the EIR.

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California Department of Transportation (Caltrans), 2011. *Traffic Noise Analysis Protocol*.

———. 2013a, September. *Technical Noise Supplement ("TeNS")*.

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Federal Highway Administration (FHWA). 1978, December. Federal Highway Traffic Noise Prediction Model. United States Department of Transportation Report No. FHWA-RD77-108.

Federal Transit Administration (FTA). 2018, September. *Transit Noise and Vibration Impact Assessment Manual.* US Department of Transportation.

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

Harris, Cyril M. 1998. *Handbook of Acoustical Measurements and Noise Control*. 3rd edition. Woodbury, NY: Acoustical Society of America.

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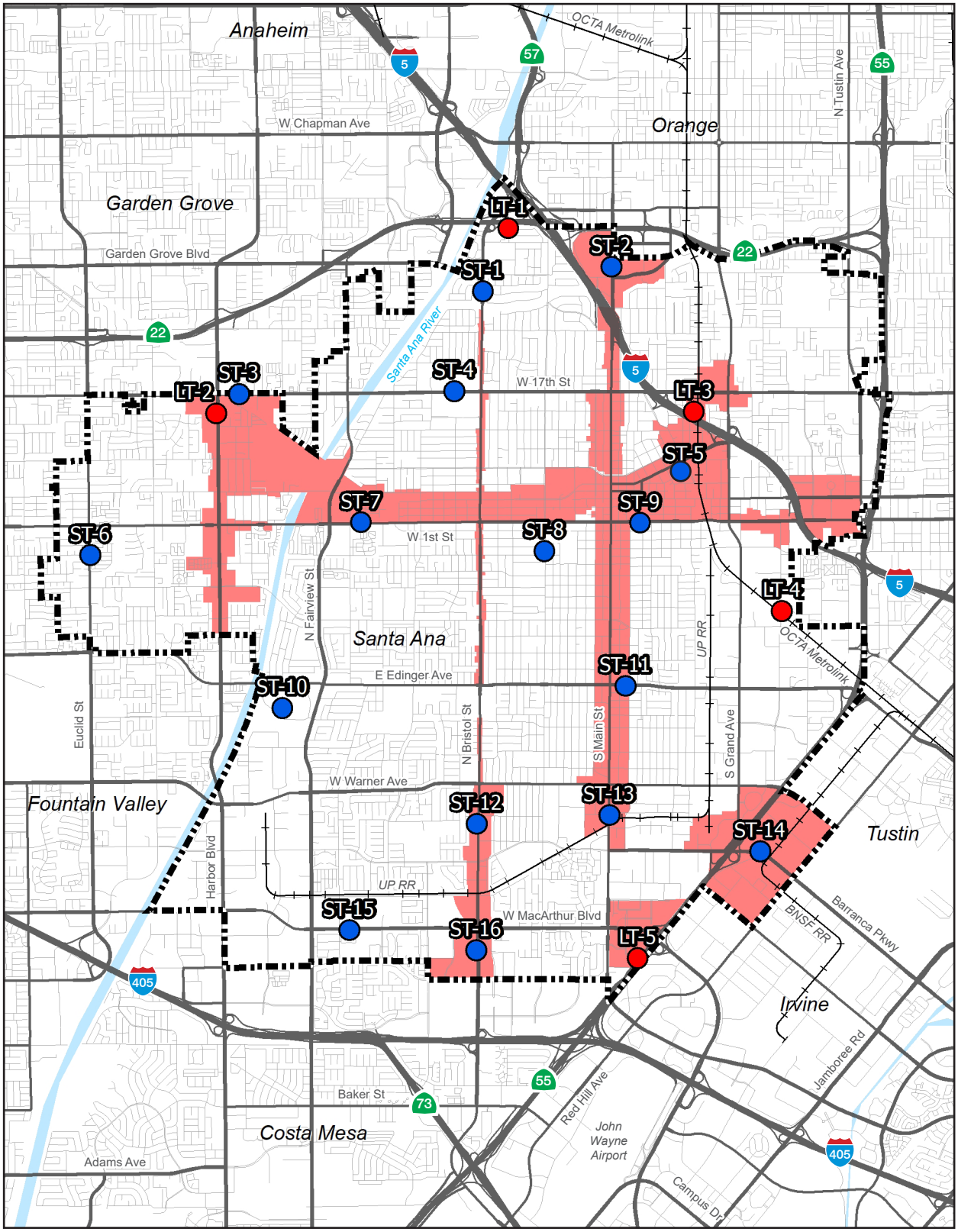
Figure 1 - Approximate Noise Monitoring Locations



PlaceWorks

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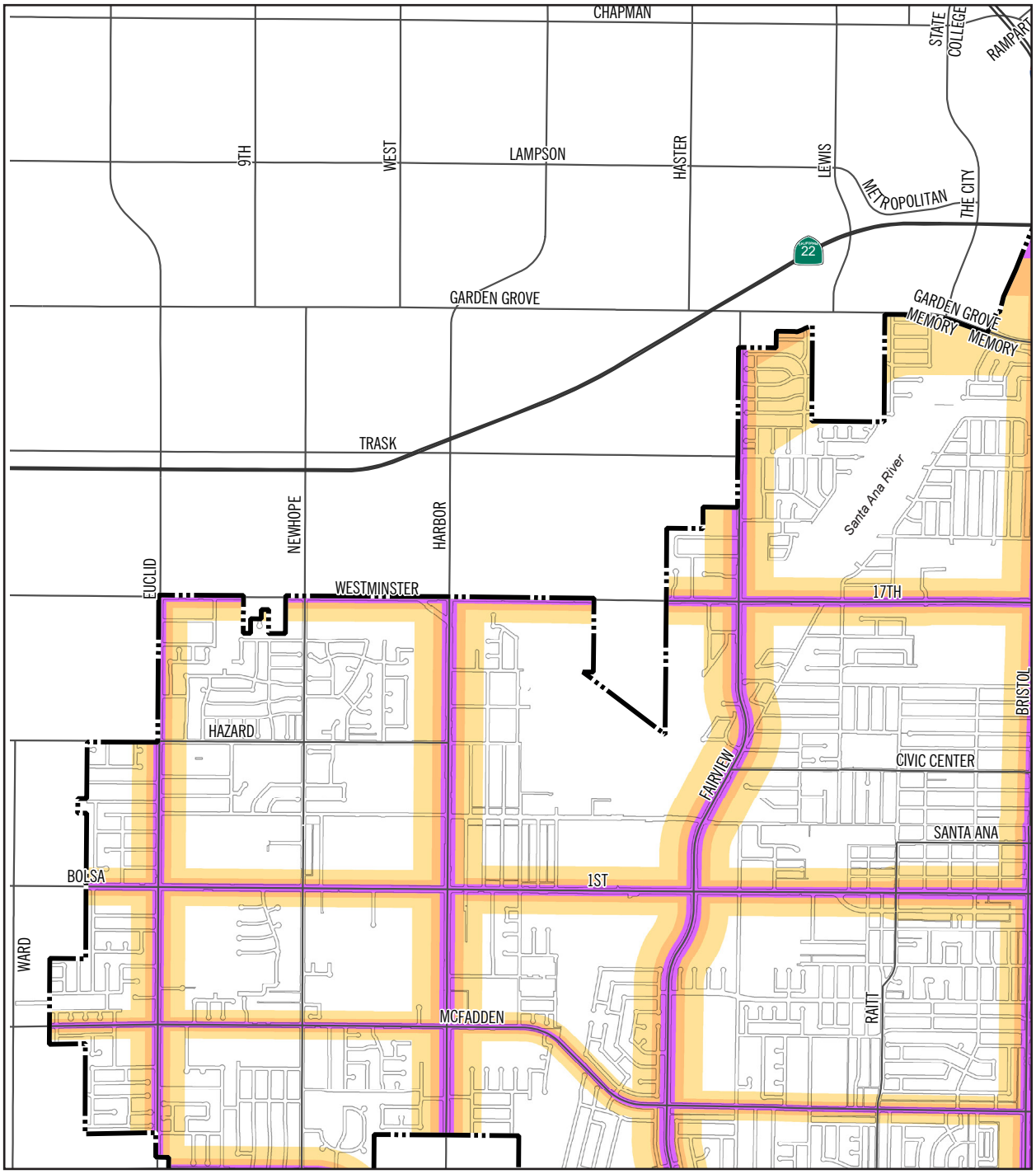
Figure 2 - Existing Transportation CNEL Noise Levels (Northwest Quadrant)



Existing Noise Contour

- 70+ dBA
- 65 dBA
- 60 dBA
- City of Santa Ana Boundary
- City of Santa Ana SOI
- Railway

Key Map

0 3,000
Scale (Feet)

Source: ESRI, 2019

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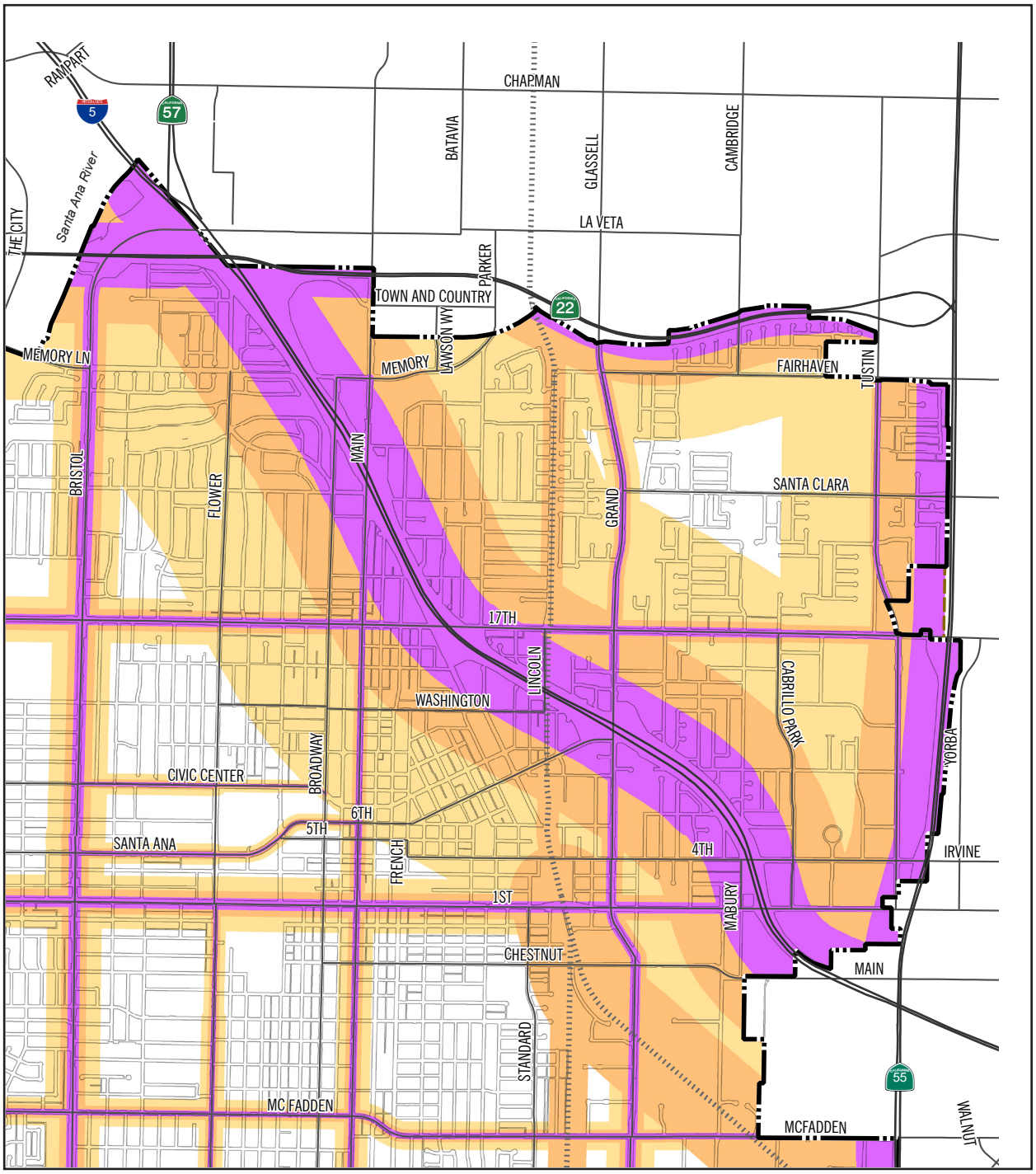
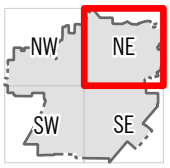
Figure 3 - Existing Transportation CNEL Noise Levels (Northeast Quadrant)



Existing Noise Contour

- 70+ dBA
- 65 dBA
- 60 dBA
- City of Santa Ana Boundary
- City of Santa Ana SOI
- Railway



Key Map

0 3,000
Scale (Feet)

Source: ESRI, 2019

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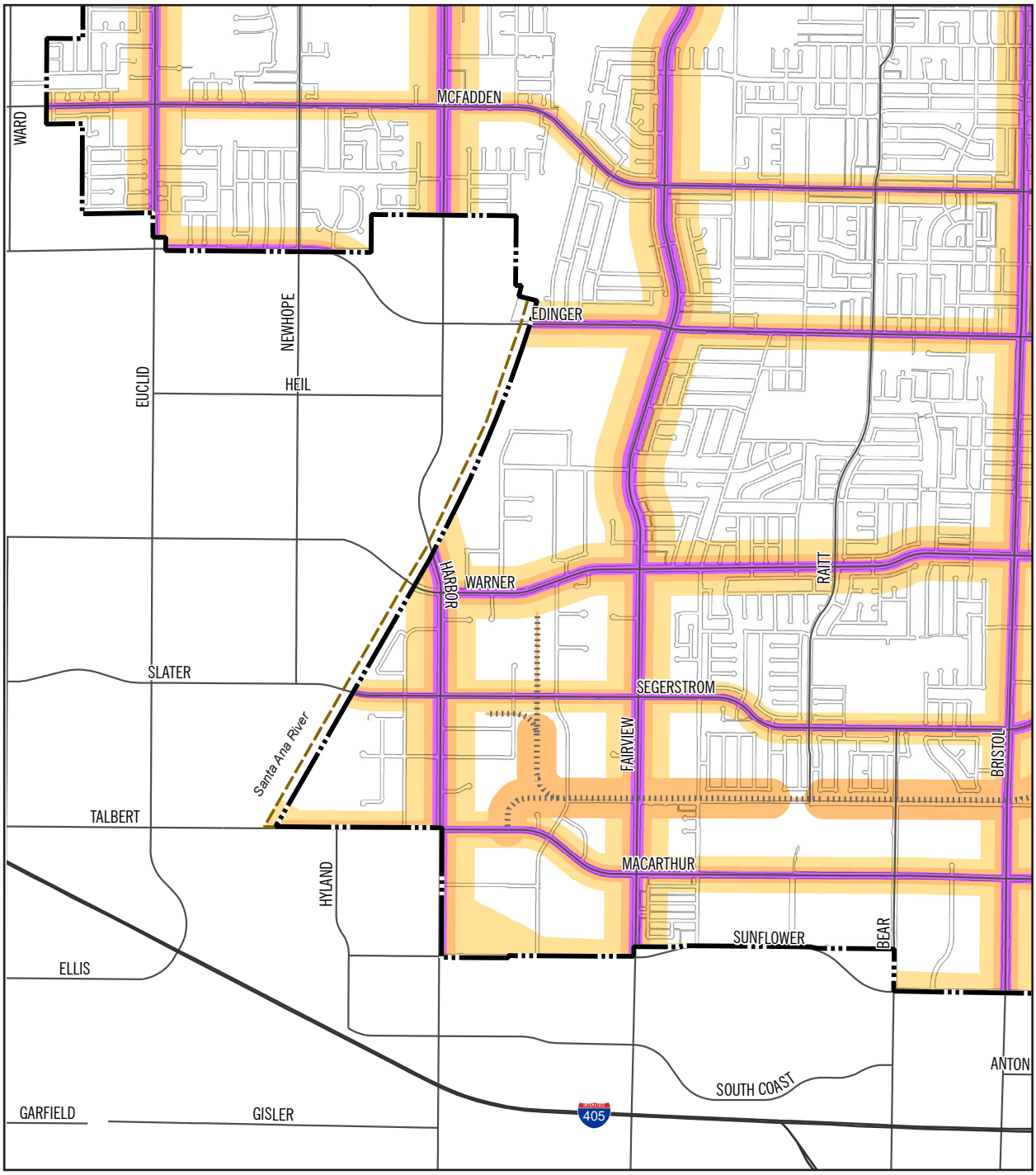
Figure 4 - Existing Transportation CNEL Noise Levels (Southwest Quadrant)



Existing Noise Contour

- 70+ dBA
- 65 dBA
- 60 dBA
- City of Santa Ana Boundary
- City of Santa Ana SOI
- Railway

Key Map

0 3,000
Scale (Feet)

Source: ESRI, 2019

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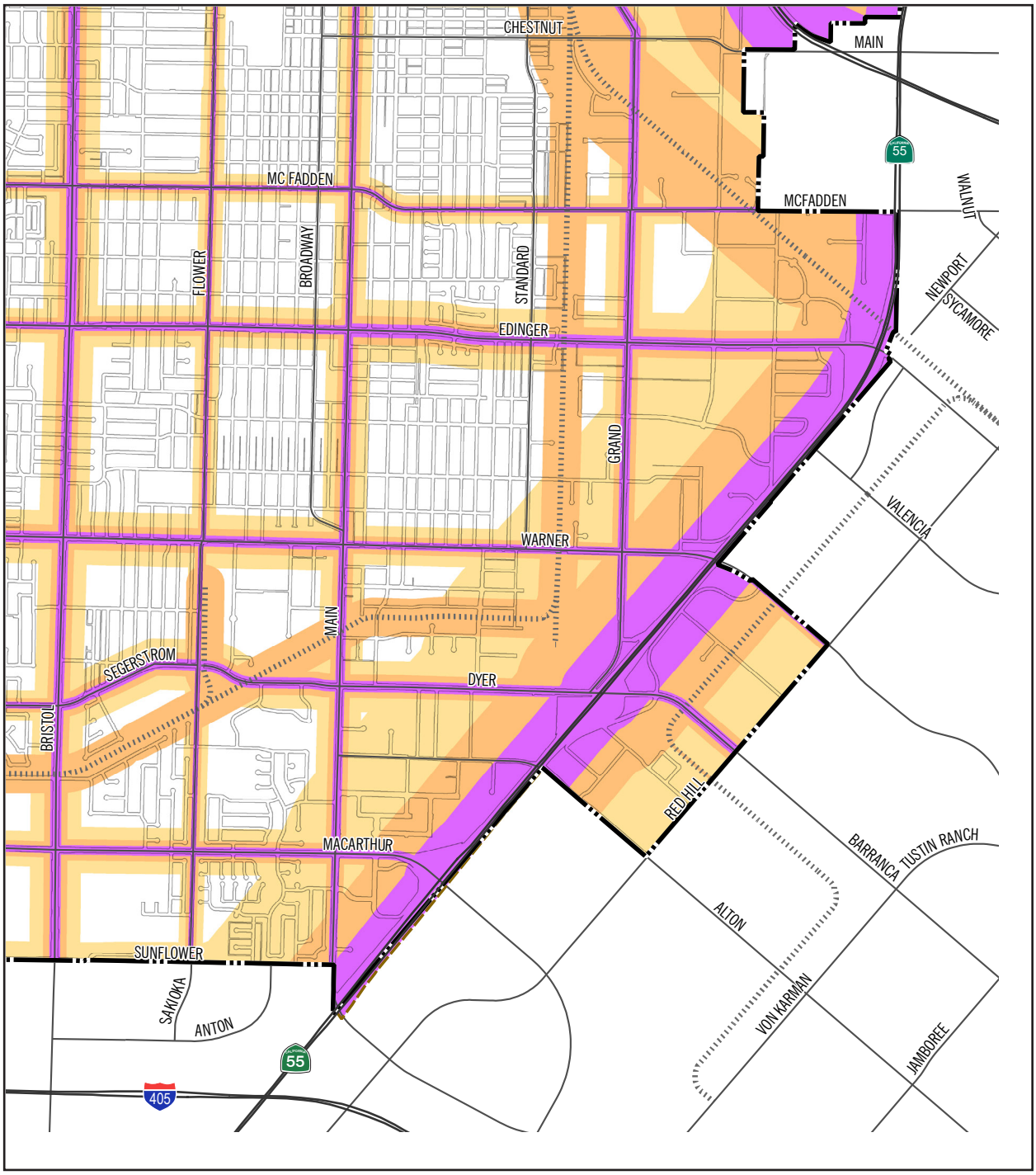
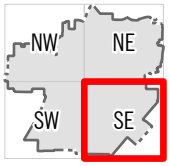
Figure 5 - Existing Transportation CNEL Noise Levels (Southeast Quadrant)



Existing Noise Contour

- 70+ dBA
- 65 dBA
- 60 dBA
- City of Santa Ana Boundary
- City of Santa Ana SOI
- Railway



Key Map

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Scale (Feet)

Source: ESRI, 2019

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Figure 6 - Existing John Wayne Airport Noise Contours

Source: John Wayne Airport, 2019

PlaceWorks

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Attachment A

Noise and Vibration Descriptors

The following are brief definitions of terminology used in this memo:

- **Sound.** A disturbance created by a vibrating object, which, when transmitted by pressure waves through a medium such as air, is capable of being detected by a receiving mechanism, such as the human ear or a microphone.

- **Noise.** Sound that is loud, unpleasant, unexpected, or otherwise undesirable.

- **Decibel (dB).** A unitless measure of sound, expressed on a logarithmic scale and with respect to a defined reference sound pressure. The standard reference pressure is 20 micropascals (20 μPa).

- **Vibration Decibel (VdB).** A unitless measure of vibration, expressed on a logarithmic scale and with respect to a defined reference vibration velocity. In the U.S., the standard reference velocity is 1 micro-inch per second ($1x10^{-6}$ in/sec).

- **A-Weighted Decibel (dBA).** An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear.

- **Equivalent Continuous Noise Level (L_{eq}); also called the Energy-Equivalent Noise Level.** The value of an equivalent, steady sound level which, in a stated time period (often over an hour) and at a stated location, has the same A-weighted sound energy as the time-varying sound. Thus, the L_{eq} metric is a single numerical value that represents the equivalent amount of variable sound energy received by a receptor over the specified duration.

- **Statistical Sound Level (L_n).** The sound level that is exceeded "n" percent of time during a given sample period. For example, the L_{50} level is the statistical indicator of the time-varying noise signal that is exceeded 50 percent of the time (during each sampling period); that is, half of the sampling time, the changing noise levels are above this value and half of the time they are below it. This is called the "median sound level." The L_{10} level, likewise, is the value that is exceeded 10 percent of the time (i.e., near the maximum) and this is often known as the "intrusive sound level." The L_{90} is the sound level exceeded 90 percent of the time and is often considered the "effective background level" or "residual noise level."

- **Day-Night Sound Level (L_{dn} or DNL).** The energy-average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the sound levels occurring during the period from 10:00 PM to 7:00 AM.

- **Community Noise Equivalent Level (CNEL).** The energy average of the A-weighted sound levels occurring during a 24-hour period, with 5 dB added from 7:00 PM to 10:00 PM and 10 dB from 10:00 PM to 7:00 AM. NOTE: For general community/environmental noise, CNEL and L_{dn} values rarely differ by more than 1 dB (with the CNEL being only slightly more restrictive – that is, higher than the L_{dn} value). As a matter of practice, L_{dn} and CNEL values are interchangeable and are treated as equivalent in this assessment.

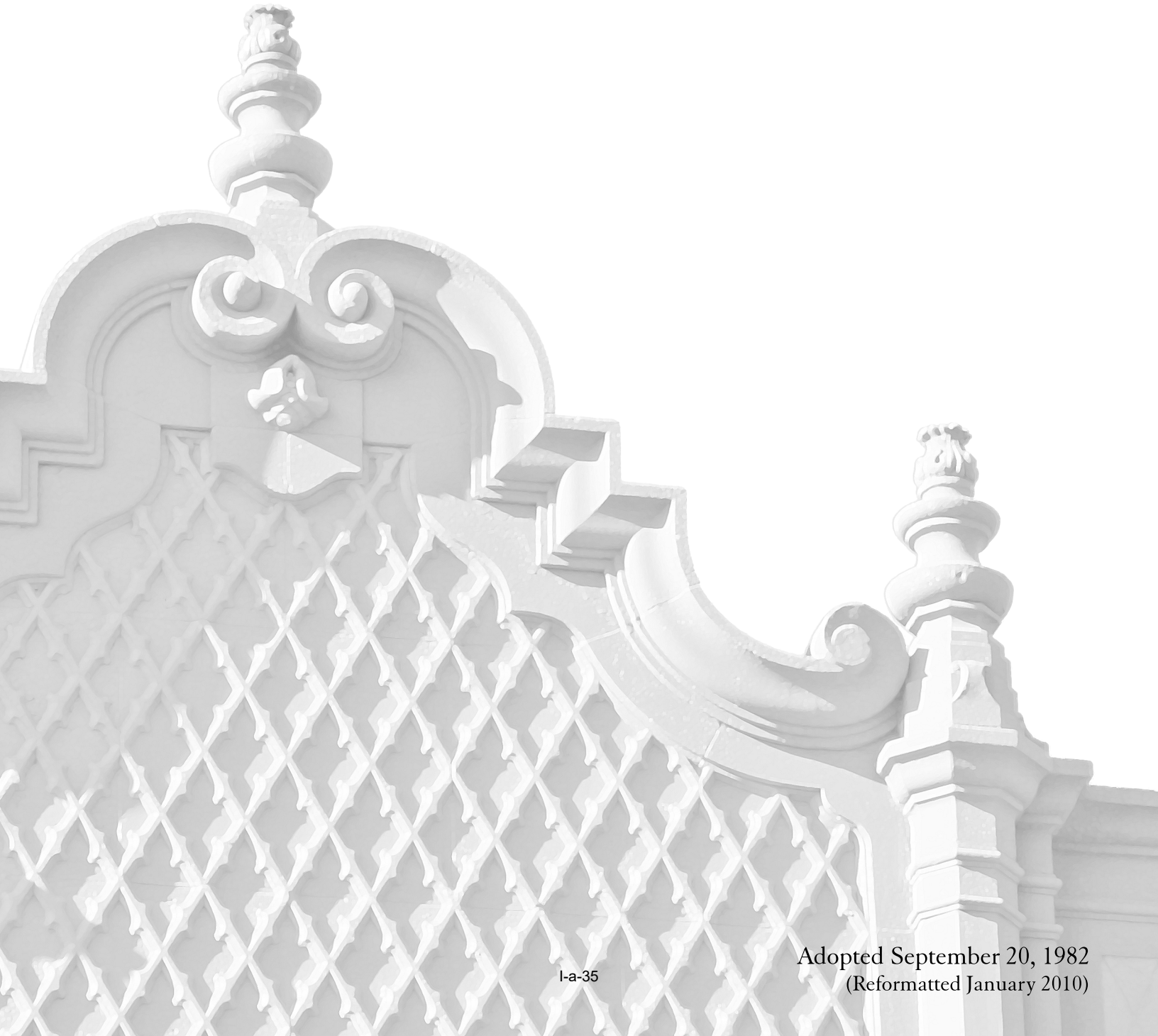
- **Peak Particle Velocity (PPV).** The peak rate of speed at which soil particles move (e.g., inches per second) due to ground vibration.

- **Sensitive Receptor.** Noise- and vibration-sensitive receptors include land uses where quiet environments are necessary for enjoyment and public health and safety. Residences, schools, motels and hotels, libraries, religious institutions, hospitals, and nursing homes are examples.

LOCAL NOISE STANDARDS

City of Santa Ana General Plan

Noise Element



Adopted September 20, 1982
(Reformatted January 2010)

City of Santa Ana General Plan

Noise Element

1982

City of Santa Ana
Planning Division

Adopted

September 20, 1982
(Reformatted January 2010)

This document includes revisions adopted by Santa Ana City Council February 2, 2009 (GPA 2004-03).

REL:adg
8/24/82

RESOLUTION NO. 82-122

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF SANTA ANA CERTIFYING THE COMPLETION OF A FINAL ENVIRONMENTAL IMPACT REPORT FOR THE REVISION OF THE GENERAL PLAN OF THE CITY OF SANTA ANA AND ADOPTING THE SAID REVISED GENERAL PLAN

WHEREAS, a proposed revision of the General Plan of the City of Santa Ana (hereinafter referred to as the "Revised General Plan") has been approved by the Planning Commission after public hearing in the manner required by law, and is now on file in the office of the Clerk of the Council; and

WHEREAS, the Revised General Plan includes a draft environmental impact report which has been duly noticed for public review and comment; and

WHEREAS, this Council has held a public hearing on the Revised General Plan, including the said draft environmental impact report, after notice in the manner required by law;

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SANTA ANA AS FOLLOWS:

1. The City Council has evaluated all comments and recommendations written and oral, received from persons who have reviewed the draft environmental impact report, and all responses thereto, including those made at the public hearing. The Clerk of the Council is hereby directed to attach all such written comments and responses and the minutes of the said public hearing to the draft environmental impact report, together with a list of persons, organizations and public agencies commenting on the draft environmental impact report. The said comments, responses, and list are hereby incorporated herein as part of the record and, together with the draft environmental impact report, are declared to constitute the final environmental impact report for the Revised General Plan.

2. The City Council hereby certifies that the final environmental impact report for the Revised General Plan has been completed in accordance with the California Environmental Quality Act, the State CEQA Guidelines and local procedures, and that the City Council has reviewed and considered the information contained in the final environmental impact report.

3. The City Council hereby finds, on the basis of the final environmental impact report and other substantial evidence in the record, that changes or alterations have been incorporated into the Revised General Plan which mitigate or avoid the following significant environmental effects identified in the final environmetal impact report: (1) additional traffic (2) reduced air quality (3) increases in noise levels, and (4) increases in energy consumption, and that such significant environmental effect have thereby been substantially lessened. This finding is supported by the following statement of facts:

(a) Although identified as significant effects of the project in the environmental impact report, such effects are not in fact caused by the adoption of the Revised General Plan, but rather by the expected growth and development of the City of Santa Ana and the surrounding region. Such effects would occur to an equal or greater extent under the previously adopted general plan or in the absence of any general plan.

(b) The Revised General Plan contains "Circulation," "Conservation," "Energy" and "Noise" elements of which the policies and programs are specifically designed to mitigate the said identified significant effects in a rational, coordinated manner so as to achieve minimal adverse effects consistent with reasonable growth and development.

4. The City Council hereby finds, on the basis of the final environmental impact report and other substantial evidence in the record, that specific economic, social and other consideration make infeasible the alternatives to the Revised General Plan identified in the final environmental impact report. This finding is supported by the following statement of facts:

(a) The Revised General Plan represents the best balance of competing goals and objectives: preservation of residential community integrity; maintenance of affordable housing; encouragement of economic development; avoidance of unacceptable levels of congestion and disruption.

(b) Greater restriction of residential development would discourage the new development of housing available to persons of low or moderate income. Increasing

population, with its consequent increased demand for housing, would result in increasing the cost of the existing housing supply. Less restriction of residential development would result in the disruption of established residential communities.

(c) Greater restriction of commercial-industrial development would reduce employment opportunities in the City of Santa Ana; would deny to City government a tax revenue base sufficient to meet the demand for governmental services; and would lead to stagnation and blight conditions in established commercial areas. Less restriction of commercial-industrial development would allow the inter-mixture of incompatible land uses and development which is beyond the capacity of streets and other public improvements to serve.

5. The City Council hereby finds, on the basis of the final environmental impact report and other substantial evidence in the record, that the changes in planned land use for areas of the City of Santa Ana accomplished by the adoption of the Revised General Plan are acceptable. Such changes are necessary for the general welfare of the people of the City of Santa Ana over the long-term, in order to achieve a balance between competing needs, as referenced in Section 4 herein, and in order to channel new development into areas in which it will be both financially feasible and compatible with existing uses.

6. The City Council hereby approves and adopts the Revised General Plan. Said Revised General Plan, together with the Revised Housing Element of the General Plan, adopted by the City Council by its Resolution No. 82-7 on January 18, 1982, shall constitute the General Plan of the City of Santa Ana required by Section 65300 of the Government Code of the State of California and the master plan required by Chapter 27 of the Santa Ana Municipal Code. All elements of the general or master plan or amendments thereto previously adopted or approved by the City Council, excepting only the aforesaid Revised Housing Element of the General Plan, are hereby repealed.

7. The Clerk of the Council is hereby directed to endorse the Revised General Plan to show that it has been adopted by the City Council and to retain the same on file in her office.

8. The Director of Planning and Development Services is hereby directed to:

(a) Send a copy of the Revised General Plan to the Planning Agency of Orange County.

(b) File a Notice of Determination with the County Clerk of Orange County pursuant to Section 21152 of the Public Resources Code and the State CEQA Guidelines.

ADOPTED this 20th day of September, 1982.

Gordon Bricken
Gordon Bricken, Mayor

ATTEST:

Janice C. Guy, Clerk of the Council

COUNCILMEMBERS:

Bricken	Aye
Luxembourger	Aye
Acosta	Aye
Serrato	Aye
Griset	Aye
Markel	Nay
McGuigan	Aye

Approved as to Form:

Edward J. Cooper by REL
Edward J. Cooper, City Attorney

Acknowledgments

CITY COUNCIL

Gordon Bricken, Mayor
Robert W. Luxembourger, Vice Mayor
John Acosta
Alfred C. Serrato
Patricia A. McGuigan
J. Ogden Markel
Daniel Griset

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Harold Gosse
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Wilson Hart

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PBQ&D, INC.
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James Douglas, Transportation Planner

ECONOMICS RESEARCH ASSOCIATES
Economists

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Geraldine Kennedy, Associate

MELVIN GREEN & ASSOCIATES, INC.
Seismic Safety

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Noise Element

SUMMARY

The new City of Santa Ana General Plan was developed through an extensive process of public participation involving citizens, elected and appointed City officials and City Staff.

The General Plan has been developed to conform to state law and to meet local planning needs through the year 2000. Periodic updates of the new General Plan are anticipated.

The General Plan builds upon Santa Ana's historical assets including the City's heritage as the governmental and financial center of Orange County and the buildings, districts and streetscapes which reflect this heritage.

The General Plan anticipates two major potentials that can shape Santa Ana over the next several decades. The plan anticipates and maximizes the probability of the Countywide rapid transit system to be located in Santa Ana and encourages mixed use development and preservation m corridors and centers relating to this new access and visibility.

The General Plan has three major sections: the Framework Plan, Policy Plan, and Environmental Impact Report.

1. The Framework Plan describes Santa Ana's overall planning strategy and program. This strategy reorganizes the City's land use and urban design structure to take maximum advantage of:

    - the economic development advantages offered by Santa Ana's historic regional location and functions
    - an improved multi-modal transportation system including:
        - Countywide rapid transit access to Santa Ana
        - improved local transit
        - improved auto access to major activity centers
        - a new Amtrak station
        - a downtown multi-modal transportation and bus center

  - a downtown shuttle system
  - new pedestrian connections within and between land use districts and to public transportation facilities.

The Framework Plan provides an overview of the City's implementation program which includes:

- continuing involvement of the community in developing the detailed implementation plans that will be developed for subareas of the Framework Plan
- efficient processing of development and rehabilitation proposals by means of a Development Review Team
- a carefully coordinated development program to foster and assist private investment through:
  - land assembly
  - coordinated provision of public improvements
  - Specific Plans
  - citizen participation coordination
  - low interest loans and grants
  - project promotion

2. The Policy Plan spells out the:

- goals and objectives which underlie the Framework Plan
- greater detail regarding implementation policies and programs supporting the Framework Plan.

Together, the Framework Plan and Policy Plan envision a new image for Santa Ana consisting of:

- increased economic activity to provide jobs and maintain a solid financial base for city services
- improvement of Santa Ana's housing stock for a full range of income groups and lifestyles
- the finest multi-modal transportation system in Orange County
- a new physical environment consisting of:
  - preserved and enhanced viable Neighborhoods
  - District Centers combining new shopping facilities with recreational, cultural, education, employment and special housing types
  - improvement of Santa Ana's major Industrial Districts
  - Mixed Use Corridors with a range of uses similar to the District Centers but with more facilities related to regional transit and auto access.

Exhibit 1 Framework Concept

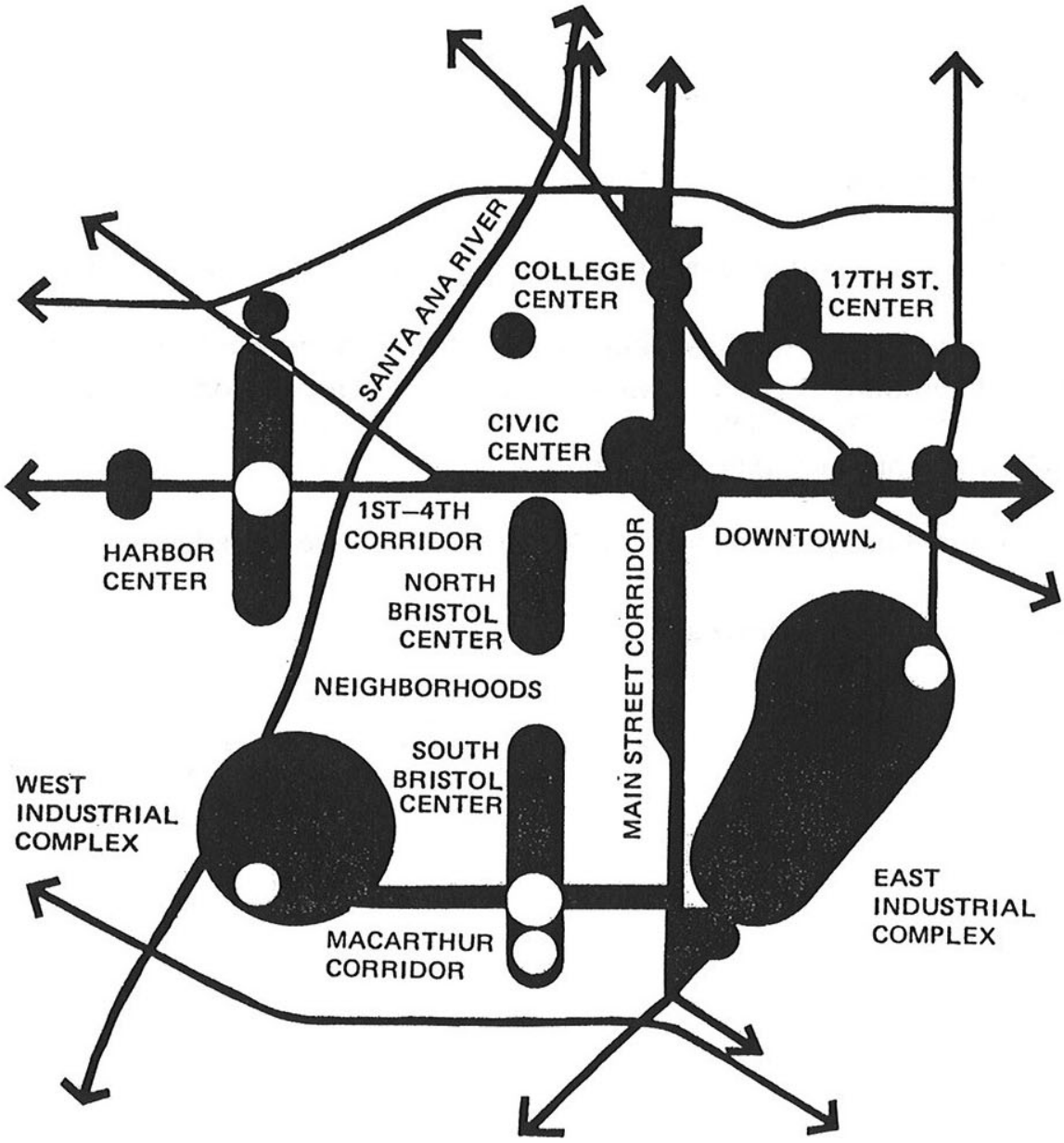

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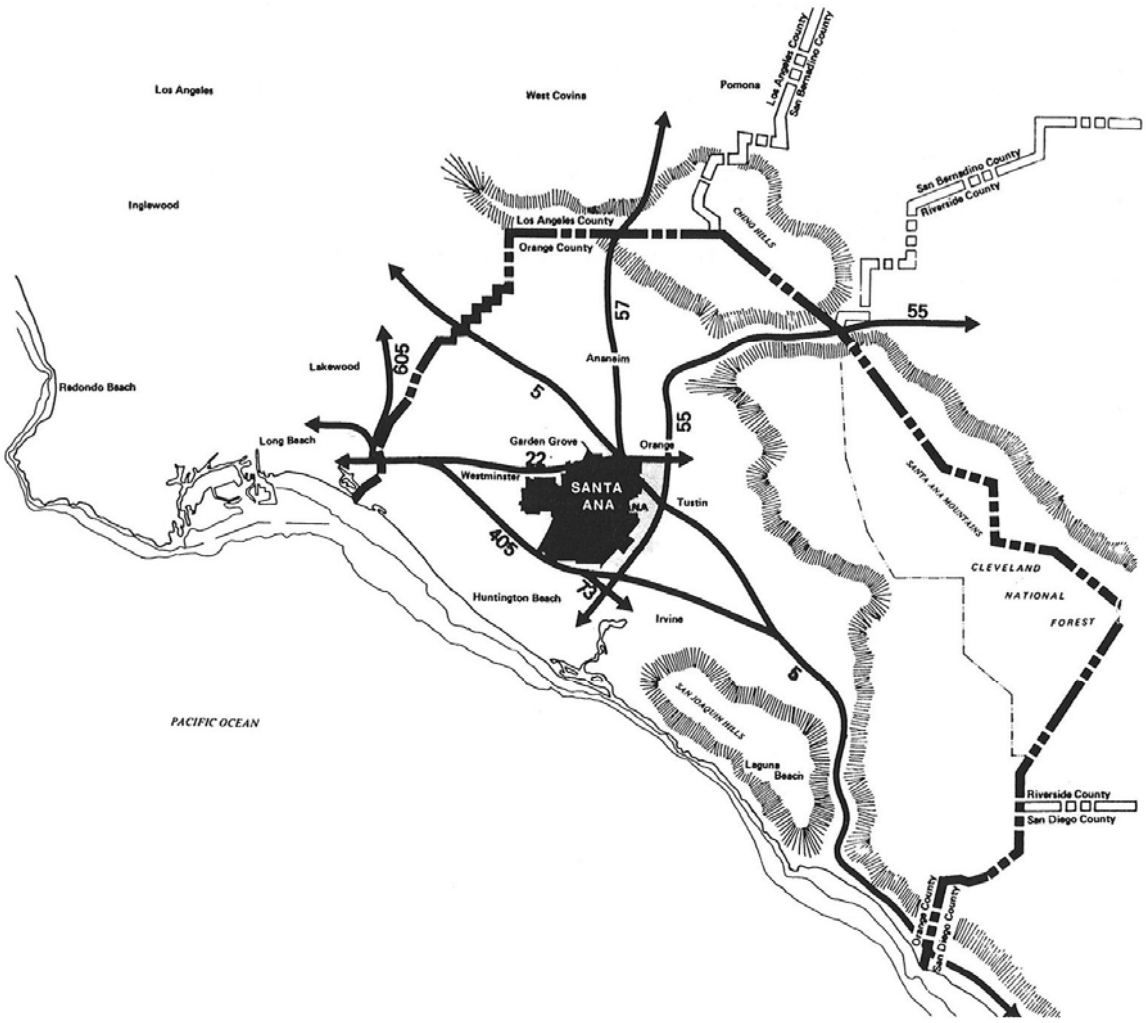
Exhibit 2 Regional Context



3. The Environmental Impact Report contains:

   - an analysis of the impacts of implementation of the General Plan
   - an evaluation of alternative strategies and
   - mitigation means to insure compatibility of the proposed plans and policies.

PLANNING CONTEXT

HISTORICAL

Santa Ana's rich history provides a legacy for community planning and revitalization in the 1980's. Santa Ana was founded in 1869 by William Spurgeon. The original town, laid out by Mr. Spurgeon, consisted of 24 blocks. The town served as a shopping center and post office for surrounding agricultural areas.

In 1878 the Southern Pacific Railroad arrived and the Santa Fe Railroad followed in 1886. This encouraged development of the City. In 1889 the County seat was located in Santa Ana and this further stimulated the development of businesses, stores, financial institutions and hotels serving the metropolitan population. Citrus and walnut farms were still plentiful and buying and selling land became the number one enterprise. The First to 17th Street area was subdivided during the building boom of the 1880's. Many of the structures in downtown and the surrounding bungalow homes were built in the early 1900's and 1920's.

The City is retaining and building upon its important governmental, retailing and employment roles in the County and the rich architectural and streetscapes heritage associated with the City's history.

REGIONAL

Santa Ana is geographically central to the developable land within Orange County. The City has excellent relationships to freeways, rail services via Amtrak and air transportation at the John Wayne Airport. Because of Santa Ana's geographic centrality and functional importance to the County, the Orange County Transit District is planning major fixed rail transit corridors in the Main Street and Pacific Electric right-of-ways. These regional transportation improvements, combined with improvements to freeway access points and local streets, provide Santa Ana with abundant development opportunities for the 1980's.

PLANNING PROCESS

The Planning Process used in creating the Santa Ana General Plan is summarized in Exhibit 3 and related photographs. The process involved:

- a 150-person Citizen Advisory Committee (CAC) to which all citizens applying were appointed by the City Council
- the Planning Commissioners who served as chairpersons of five CAC subcommittees: Land Use and Urban Design, Circulation, Housing, Economic Development and Environmental Factors
- the City Council who participated in goal setting and policy making workshops
- the public-at-large who participated in a series of Town Forums and Public Hearings
- City Staff who worked with The Arroyo Group (TAG) in conducting the planning process and who evaluated the program as it evolved.

The six key steps in the planning process were:

1. **Data Collection and Analysis.** The data base for the previous General Plan was outdated and up-to-date census data was not available. Emphasis was placed on community definition of problems and opportunities through CAC and Staff Steering Committee workshops and mapping. TAG subcontractors also gathered key data in areas such as market demand, traffic, seismic, etc. This data was summarized and analyzed in a separate Problems and Opportunities Report.

2. **Formulation of Goals and Objectives.** Initial goals and objectives were developed through workshops, with the CAC and City staff. Several cycles of refinement were done by TAG based on input from the Planning Commission, City Council, CAC and staff.

3. **Formulation of Subarea Alternatives.** Santa Ana has a large number of fixed elements such as streets and land uses. Therefore, subarea plans were developed to provide alternative land use patterns in different parts of the City. Each subarea plan was related to an urban design framework previously approved by the CAC, Planning Commission and City staff.

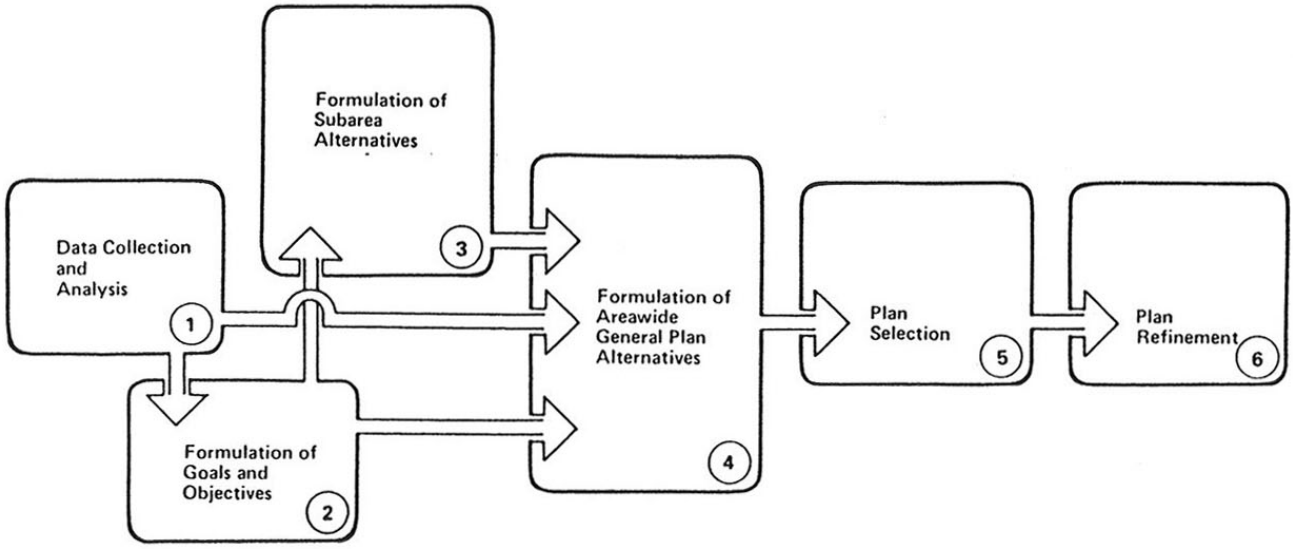
4. **Formulation of Areawide General Plan Alternatives.** Areawide General Plan alternatives focused on different combinations of subarea plans.

5. **Plan Selection Plan.** Selection was done through a series of meetings with the CAC, Planning Commission and City staff.

6. **Plan Refinement.** Plan refinement was accomplished by staff review of a Preliminary Draft, and CAC, Planning Commission and Public-at-Large comments on a Public Hearing Draft.

Exhibit 3 illustrates some of the materials utilized during the planning process.

Exhibit 3 Planning Process



POLICY PLAN

INTRODUCTION

The Policy Plan section of the General Plan sets forth the detailed policies of the City relative to the framework Plan described in Section 1.

Each element of the Policy Plan contains goals, objectives, implementation policies and implementation programs.

Each element also contains a Planning Factors section which reflects the major issues identified through the citizen participation process.

The Plan Components section of each element describes the planning and design concepts illustrated in the maps and provides an overview of implementation considerations.

Noise has many sources, including industrial processes, vehicular transportation, use of amplified sound, construction, and human speech. Through careful land use planning, Santa Ana can ensure that the activities which produce result in minimal interference with the activities which are sensitive to noise.

The City's goal is to minimize noise problems in areas sensitive to noise because Santa Ana is almost fully developed, the main focus of the Noise section is on remedial measures to deal with existing noise problems, prevention of new noise problems through proper arrangement of noise sensitive land uses in relationship to circulation systems and establishment of appropriate noise emission or insulation standards for the various land uses.

PLANNING FACTORS

Definition of undesirable or unhealthful noise levels must precede the goal of minimizing noise problems. The City adopts the following standards and guidelines for noise levels for land uses:

Table 1
Interior and Exterior Noise Standards

Categories	*Land Use Categories*	*Interior*[1]	*Exterior*[2]
Residential	Single-family, duplex, multi-family	45[3]	65
Institutional	Hospital, school classroom/playgrounds	45	65
	Church, library	45	--
Open Space	Parks	--	65

Notes:
[1] Interior areas (to include but are not limited to: bedrooms, bathrooms, kitchens, living rooms, dining rooms, closets, corridors/hallways, private offices, and conference rooms.
[2] Exterior areas shall mean: private yards of single family homes, park picnic areas, school playgrounds, common areas, private open space, such as atriums on balconies, shall be excluded form exterior areas provided sufficient common area is included within the project.
[3] Interior noise level requirements contemplate a closed window condition. Mechanical ventilation system or other means of natural ventilation shall be provided per Chapter 12, Section 1305 of the Uniform Building Code.

All Residential uses should be protected with sounds insulation over and above that provided by normal building construction when constructed in areas exposed to greater than 60 dB CNEL.

The above standards and guidelines represent an appreciation that higher intensity land uses bring with them higher noise levels simply because more people are using these areas. Insuring low noise levels will help to insure that housing is kept will-maintained and keeps value over time, reducing municipal expenditures and maintaining revenues.

NOISE ABATEMENT

Some areas of Santa Ana are exposed to levels of freeway or rail noise that are considered unacceptable for new residential development. Noise conflicts in such cases can be mitigated by providing barriers between the noise source and the residential use, or by providing sound insulation in existing residences. Generally, barriers should be provided to protect residential uses.

Exhibit 4 illustrates transportation noise sources in the City and classifies arterial streets by the expected distance from the arterial where the noise level will exceed 60 dB CNEL or Ldn and sound insulation or barriers should be provided to protect residential uses.

NOISE PREVENTION

Potential noise problems may be prevented by ensuring that planning for residential uses carefully considers proximity to major transportations corridors and other noise generators. Adherence to proper noise-related setbacks for noise sensitive uses can reduce noise to acceptable or desirable levels for those uses. The distance required varies with the expected volume of traffic. The distance may be reduced by providing walls or berms between the noise source and the use.

The graph below indicates the required distance from transportation noise sources to achieve desired noise levels for a range of traffic flows. At the time development takes place, developments proposed in zones that would be incompatible under standards of the noise abatement plan are required to include a report indicating how these standards will be achieved.

GOALS, OBJECTIVES, POLICIES AND PROGRAMS

GOALS

Goal 1

Prevent significant increases in noise levels in the community and minimize the adverse effects of currently-existing noise sources.

OBJECTIVES

1.1 Prevent creation of new and additional sources of noise.

1.2 Reduce current noise levels to acceptable standards.

POLICIES

- Require consideration of noise generation potential and susceptibility to noise impacts in the sitting, design and construction of new developments.
- Require mitigating site and building design features, traffic circulation alternatives, insulation, and other noise prevention

measures of those new developments which generate high noise levels.

- Sound insulate and/or buffer sensitive land uses such as housing from adverse noise impacts in noise-prone areas.
- Minimize noise generation in residential neighborhoods through control or elimination of truck traffic and through-traffic from these areas.

PROGRAMS

- Restrict new zoning in noise impact or abatement areas to non-residential uses.
- Review zoning ordinances and modify as necessary to assure appropriate insulation and/or other noise reduction actions with respect to interior and exterior power and mechanical equipment.
- Utilize the development approval process to assure that buildings are sited and internal and external traffic circulation systems designed so as to minimize the impact of noise-generating activities on nearby neighborhoods and noise-sensitive land uses.
- Work with the California Department of Transportation to develop a freeway noise mitigation program.
- Prohibit truck traffic in residential neighborhoods.
- Alleviate through-vehicular traffic in residential neighborhoods via implementation of recommendations in the Circulation section.

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Exhibit 4 Noise Abatement Areas

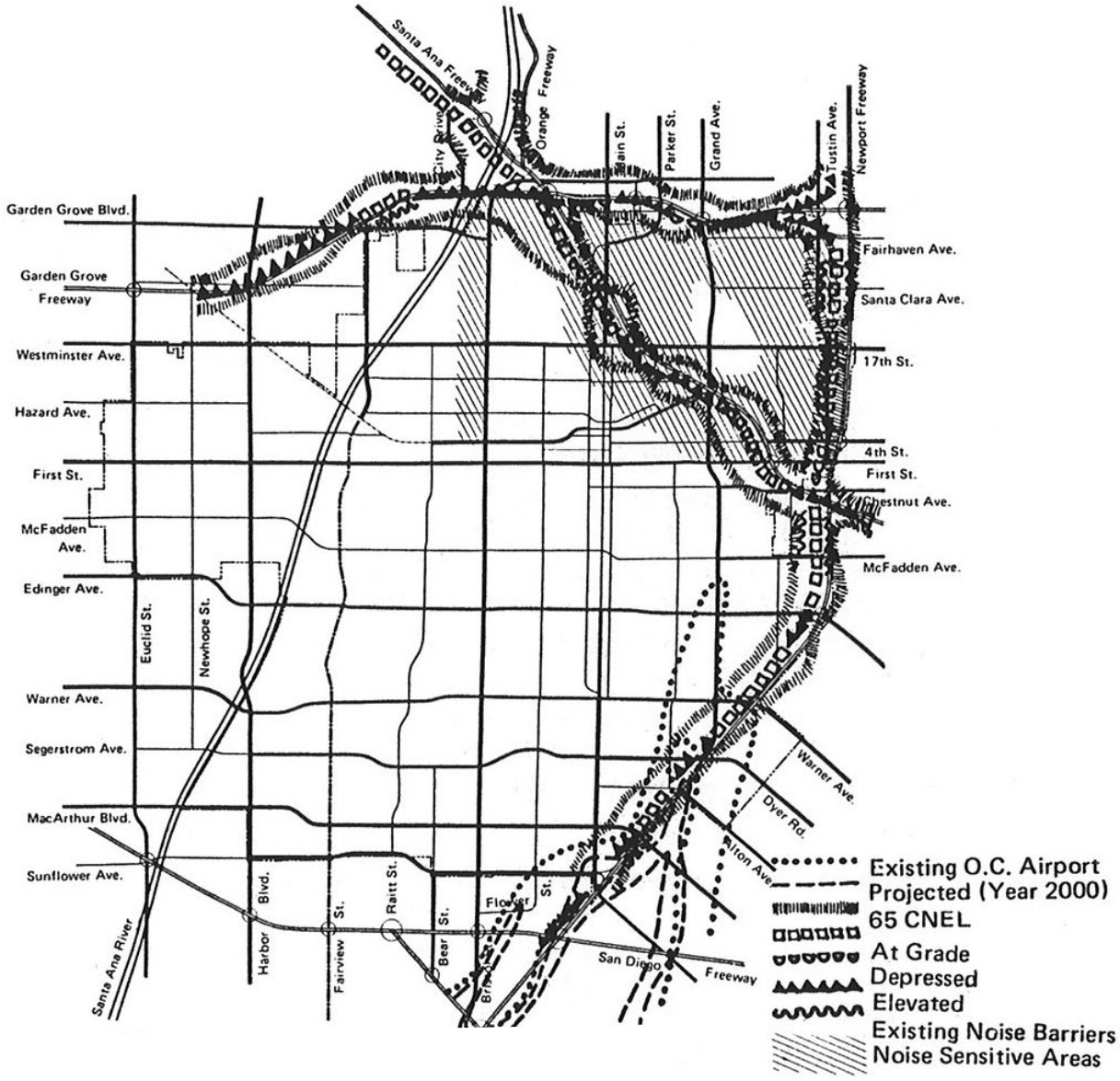

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Exhibit 5 Transportation Noise Sources

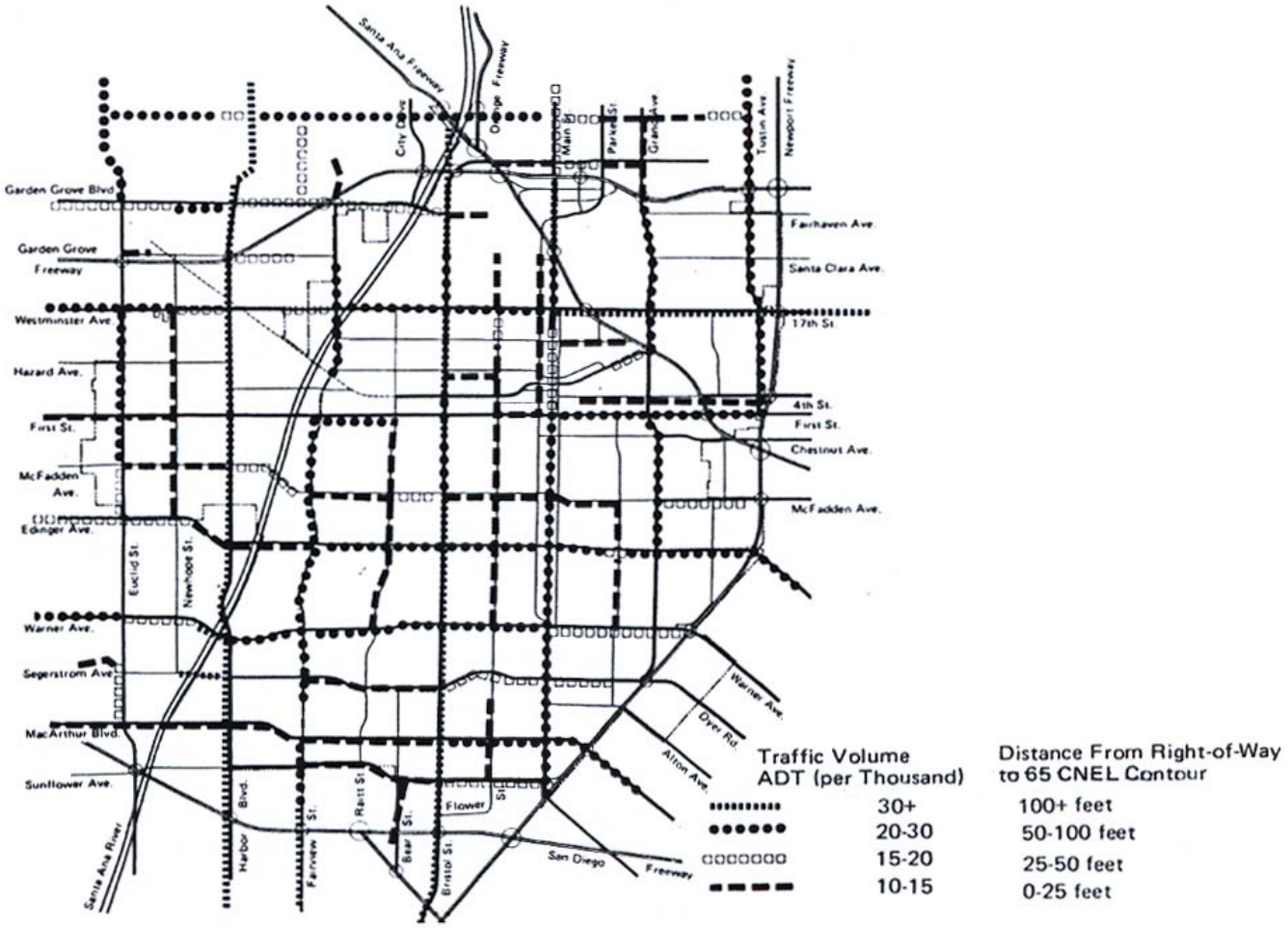

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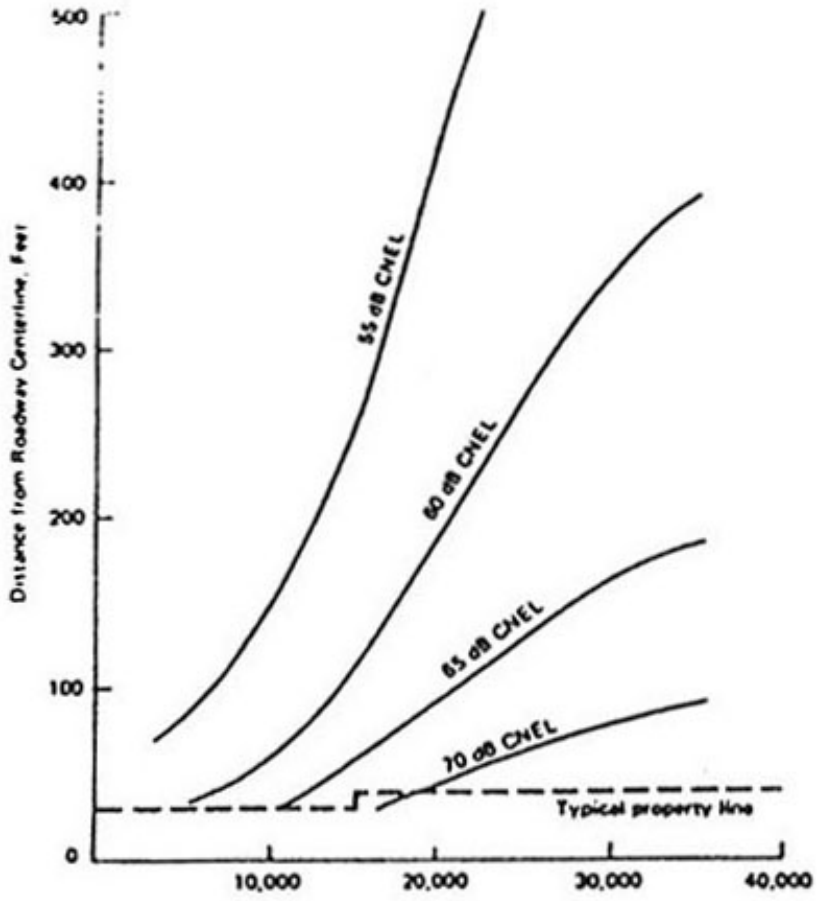
Exhibit 6 Required Distances from Transportation Noise Sources



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ARTICLE VI. - NOISE CONTROL

Sec. 18-308. - Declaration of policy.

In order to control unnecessary, excessive and annoying sounds emanating from areas of the city, it is hereby declared to be the policy of the city to prohibit such sounds generated from all sources as specified in this article.

It is determined that certain sound levels are detrimental to the public health, welfare and safety, and contrary to public interest.

(Ord. No. NS-1441, 1, 8-21-78)

Sec. 18-309. - Definitions.

The following words, phrases and terms as used in this article shall have the meaning as indicated below:

Ambient noise level shall mean the all-encompassing noise level associated with a given environment, being a composite of sounds from all sources, excluding the alleged offensive noise, at the location and approximate time at which a comparison with the alleged offensive noise is to be made.

Cumulative period shall mean an additive period of time composed of individual time segments which may be continuous or interrupted.

Decibel (dB) shall mean a unit which denotes the ratio between two (2) quantities which are proportional to power: The number of decibels corresponding to the ratio of two (2) amounts of power is ten (10) times the logarithm to the base ten (10) of this ratio.

Dwelling unit shall mean a single unit providing complete, independent living facilities for one or more persons including permanent provisions for living, sleeping, eating, cooking and sanitation.

Emergency machinery, vehicle or work shall mean any machinery, vehicle or work used, employed or performed in an effort to protect, provide or restore safe conditions in the community or for the citizenry, or work by private or public utilities when restoring utility service.

Fixed noise source shall mean a stationary device which creates sounds while fixed or motionless, including, but not limited to, industrial and commercial machinery and equipment, pumps, fans, compressors, generators, air conditioners and refrigeration equipment.

Grading shall mean any excavating or filling of earth material, or any combination thereof, conducted at a site to prepare said site for construction or other improvements thereon.

Impact noise shall mean the noise produced by the collision of one mass which may be either in motion or at rest.

Mobile noise source shall mean any noise source other than a fixed noise source.

Noise level shall mean the "A" weighted sound pressure level in decibels obtained by using a sound level meter at slow response with a reference pressure of twenty (20) micronewtons per square meter. The unit of measurement shall be designated as dB (A).

Person shall mean a person, firm, association, copartnership, joint venture, corporation or any entity, public or private in nature.

Residential property shall mean a parcel of real property which is developed and used either in part or in whole for residential purposes, other than transient uses such as hotels and motels.

Simple tone noise shall mean a noise characterized by a predominant frequency or frequencies so that other frequencies cannot be readily distinguished.

Sound level meter shall mean an instrument meeting American National Standard Institute's Standard S1.4-1971 for Type 1 or Type 2 sound level meters or an instrument and the associated recording and analyzing equipment which will provide equivalent data.

Sound pressure level of a sound, in decibels, shall mean twenty (20) times the logarithm to the base ten (10) of the ratio of the pressure of the sound to a reference pressure, which reference pressure shall be explicitly stated.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-310. - Noise level measurement criteria.

Any noise level measurements made pursuant to the provisions of this article shall be performed using a sound level meter as defined in section 18-309.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-311. - Designated noise zone.

The entire City of Santa Ana is hereby designated as "Noise Zone 1."

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-312. - Exterior noise standards.

(a) The following noise standards, unless otherwise specifically indicated, shall apply to all residential property within a designated noise zone:

NOISE STANDARDS

Noise Zone	Noise Level	Time Period
1	55 dB(A)	7:00 a.m.—10:00 p.m.
	50 dB(A)	10:00 p.m.— 7:00 a.m.

In the event the alleged offensive noise consists entirely of impact noise, simple tone noise, speech, music, or any combination thereof, each of the above noise levels shall be reduced by five (5) dB (A).

(b) It shall be unlawful for any person at any location within the City of Santa Ana to create any noise, or to allow

the creation of any noise on property owned, leased, occupied, or otherwise controlled by such person, when the foregoing causes the noise level, when measured on any other residential property, to exceed:

(1) The noise standard for a cumulative period of more than thirty (30) minutes in any hour; or

(2) The noise standard plus five (5) dB(A) for a cumulative period of more than fifteen (15) minutes in any hour; or

(3) The noise standard plus ten (10) dB(A) for a cumulative period of more than five (5) minutes in any hour; or

(4) The noise standard plus fifteen (15) dB(A) for a cumulative period of more than one minute in any hour; or

(5) The noise standard plus twenty (20) dB(A) for any period of time.

(c) In the event the ambient noise level exceeds any of the first four (4) noise limit categories above, the cumulative period applicable to said category shall be increased to reflect said ambient noise level. In the event the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under said category shall be increased to reflect the maximum ambient noise level.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-313. - Interior noise standards.

(a) The following interior noise standards, unless otherwise specifically indicated, shall apply to all residential property within a designated noise zone:

INTERIOR NOISE STANDARDS

Noise Zone	Noise Level	Time Period
1	55 dB(A)	7:00 a.m.—10:00 p.m.
	45 dB(A)	10:00 p.m.—7:00 a.m.

In the event the alleged offensive noise consists entirely of impact noise, simple tone noise, speech, music, or any combination thereof, each of the above noise levels shall be reduced by five (5) dB(A).

(b) It shall be unlawful for any person at any location within the City of Santa Ana to create any noise, or to allow the creation of any noise on property owned, leased, occupied, or otherwise controlled by such person, when the foregoing causes the noise level, when measured within any other dwelling unit on any residential property, to exceed:

(1) The interior noise standard for a cumulative period of more than five (5) minutes in any hour; or

(2) The interior noise standard plus five (5) dB(A) for a cumulative period of more than one minute in any hour; or

(3) The interior noise standard plus ten (10) dB(A) for any period of time.

(c) In the event the ambient noise level exceeds either of the first two (2) noise limit categories above, the cumulative period applicable to said category shall be increased to reflect said ambient noise level. In the event the ambient noise level exceeds the third noise limit category, the maximum allowable noise level under

said category shall be increased to reflect the maximum ambient noise level.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-314. - Special provisions.

The following activities shall be exempted from the provisions of this article:

(a) Activities conducted on the grounds of any public or private nursery, elementary, intermediate or secondary school or college.

(b) Outdoor gatherings, public dances and shows, provided said events are conducted pursuant to a license issued by the City of Santa Ana.

(c) Activities conducted on any park or playground, provided such park or playground is owned and operated by a public entity.

(d) Any mechanical device, apparatus or equipment used, related to or connected with emergency machinery, vehicle or work.

(e) Noise sources associated with construction, repair, remodeling, or grading of any real property, provided said activities do not take place between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday, or any time on Sunday or a federal holiday.

(f) All mechanical devices, apparatus or equipment which are utilized for the protection or salvage of agricultural crops during periods of potential or actual frost damage or other adverse weather conditions.

(g) Mobile noise sources associated with agricultural operations, provided such operations do not take place between the hours of 8:00 p.m. and 7:00 a.m. on weekdays, including Saturday, or at any time on Sunday or a federal holiday.

(h) Mobile noise sources associated with agricultural pest control through pesticide application, provided that the application is made in accordance with restricted material permits issued by or regulations enforced by the agricultural commissioner.

(i) Noise sources associated with the maintenance of real property, provided said activities take place between 7:00 a.m. and 8:00 p.m. on any day except Sunday or a federal holiday, or between the hours of 9:00 a.m. and 8:00 p.m. on Sunday or a federal holiday.

(j) Any activity to the extent regulation thereof has been preempted by state or federal law.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-315. - Schools, hospitals and churches; special provisions.

It shall be unlawful for any person to create any noise which causes the noise level at any school, hospital or church while the same is in use to exceed the noise limits as specified in section 18-312 prescribed for the assigned noise zone in which the school, hospital or church is located, or which noise level unreasonably interferes with the use of such institutions or which unreasonably disturbs or annoys patients in the hospital, provided conspicuous signs are displayed in three (3) separate locations within one-tenth (1/10) of a mile of the institution indicating the presence of a school, church or hospital.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-316. - Air conditioning and refrigeration; special provisions.

During the five-year period following the effective date of this article, the noise standards enumerated in sections 18-312 and 18-313 shall be increased eight (8) dB(A) where the alleged offensive noise source is an air conditioning or refrigeration system or associated equipment which was installed prior to the effective date of this article.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-317. - Noise level measurement.

The location selected for measuring exterior noise levels shall be at any point on the affected property. Interior noise measurements shall be made within the affected dwelling unit. The measurement shall be made at a point at least four (4) feet from the wall, ceiling, or floor nearest the alleged offensive noise source and may be made with the windows of the affected unit open.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-318. - Manner of enforcement.

The chief of police, the Orange County health officer and their duly authorized representatives are directed to enforce the provisions of this article. The chief of police, the Orange County health officer and their duly authorized representatives are authorized, pursuant to Penal Code Section 836.5, to arrest any person without a warrant when they have reasonable cause to believe that such person has committed a misdemeanor in their presence.

No person shall interfere with, oppose or resist any authorized person charged with the enforcement of this article while such person is engaged in the performance of his duty.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-319. - Variance procedure.

The owner or operator of a noise source which violates any of the provisions of this article may file an application with the Orange County health officer for a variance from the provisions thereof wherein said owner or operator shall set forth all actions taken to comply with said provisions, the reasons why immediate compliance cannot be achieved, a proposed method of achieving compliance, and a proposed time schedule for its accomplishment. Said application shall be accompanied by a fee as established by resolution of the city council. A separate application shall be filed for each noise source; provided however, that several mobile sources under common ownership, or several fixed sources on a single property may be combined into one application. Upon receipt of said application and fee, the health officer shall refer it with his recommendation thereon within thirty (30) days to the Orange County Noise Variance Board for action thereon in accordance with the provisions of applicable law.

An applicant for a variance shall remain subject to prosecution under the terms of this article until a variance is granted.

(Ord. No. NS-1441, § 1, 8-21-78)

Sec. 18-320. - Appeals.

Within fifteen (15) days following the decision of the Orange County Variance Board on an application, the applicant, the health officer, or any member of the city council, may appeal the decision to the city council by filing a notice of appeal with the secretary of the Orange County Variance Board. In the case of an appeal by the applicant for a variance, the notice of

appeal shall be accompanied by a fee to be computed by the secretary of the Orange County Variance Board on the basis of the estimated cost of preparing the materials required to be forwarded to the city council as discussed hereafter. If the actual cost of such preparation differs from the estimated cost appropriate payments shall be made either to or by the secretary of the Orange County Variance Board.

Within fifteen (15) days following receipt of a notice of appeal and the appeal fee, the secretary of the Variance Board shall forward to the city council copies of the application for variance; the recommendation of the health officer; the notice of appeal; all evidence concerning said application received by the variance board and its decision thereon. In addition, any person may file with the clerk of the city council written arguments supporting or attacking said decision and the city council may in its discretion hear oral arguments thereon. The clerk of the city council shall mail to the applicant a notice of the date set for hearing of the appeal. The notice shall be mailed at least ten (10) days prior to the hearing date.

Within sixty (60) days following its receipt of the notice of appeal, the city council shall either affirm, modify or reverse the decision, of the variance board. Such decision shall be based upon the city council's evaluation of the matters submitted to the city council in light of the powers conferred on the variance board and the factors to be considered, both as enumerated in section 18-319 and Orange County Ordinance section 4-6-13.

As part of its decision, the city council may direct the variance board to conduct further proceedings on said application. Failure of the city council to affirm, modify or reverse the decision of the variance board within said sixty-day period shall constitute an affirmance of the decision.

(Ord. No. NS-1441, § 1, 8-21-78)

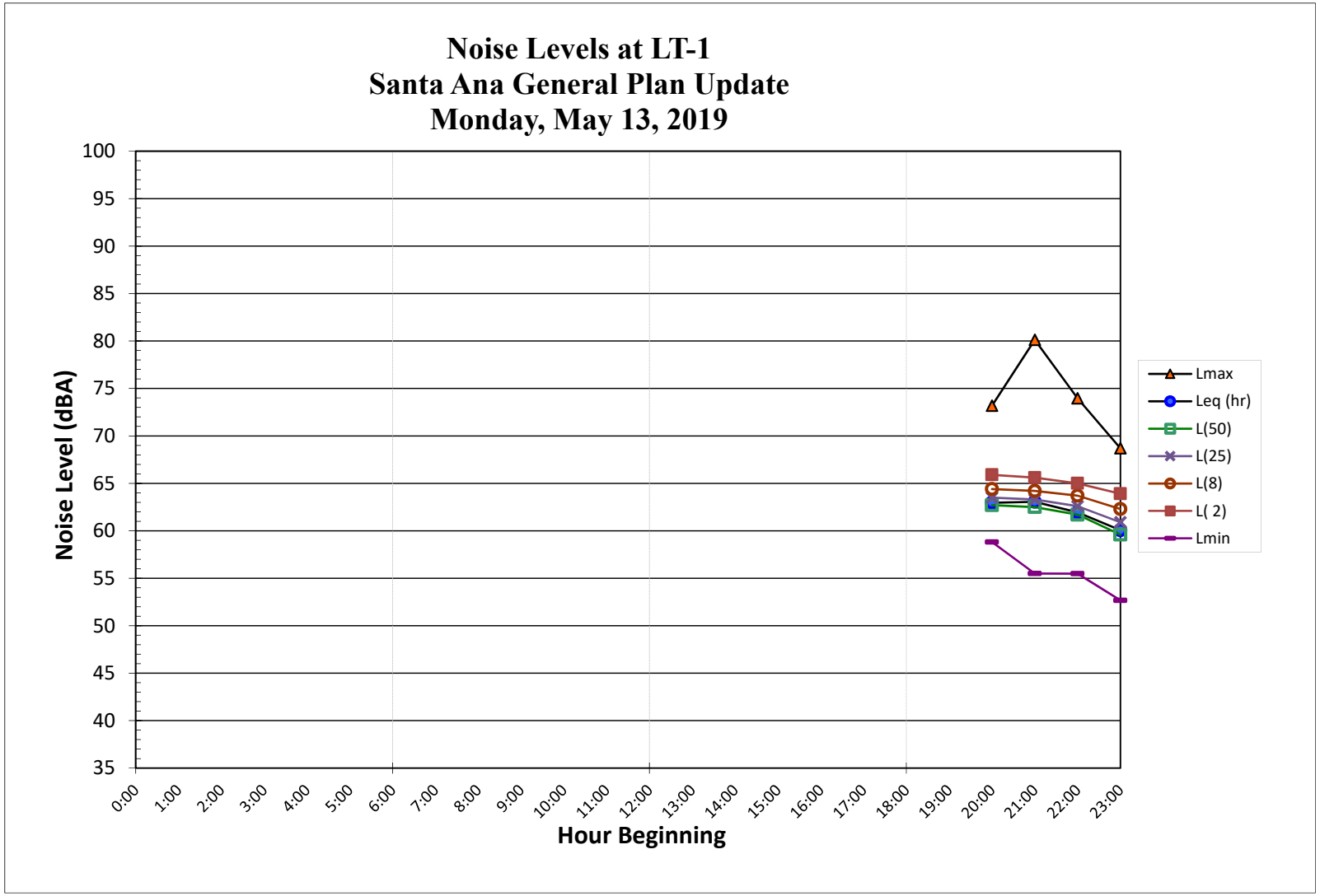
Sec. 18-321. - Violations; misdemeanors.

Any person violating any or the provisions of this article shall be deemed guilty of a misdemeanor. Each day such violation is committed or permitted to continue shall constitute a separate offense and shall be punishable as such. The provisions of this article shall not be construed as permitting conduct not prescribed herein and shall not affect the enforceability of any other applicable provisions of law.

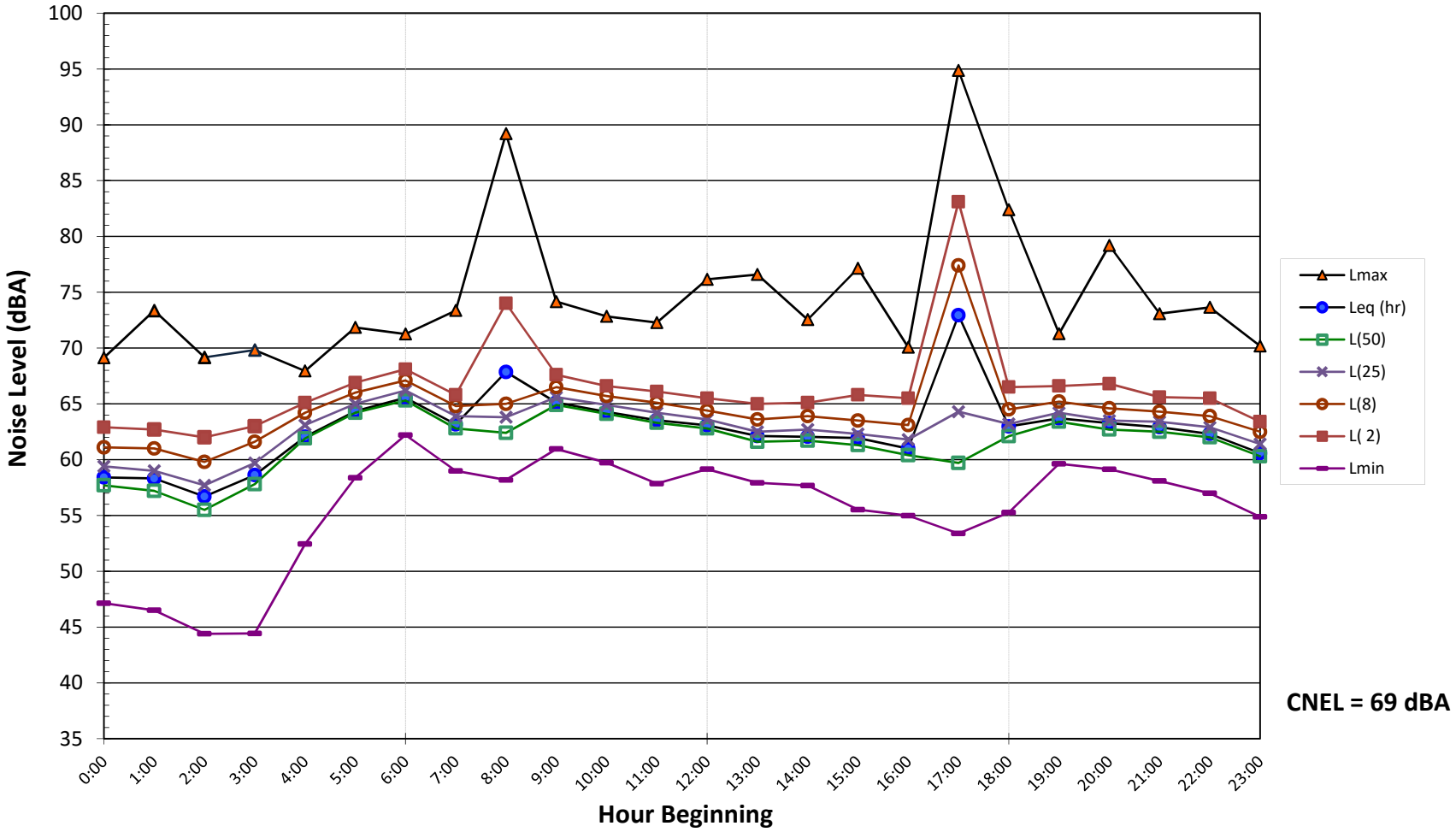
(Ord. No. NS-1441, § 1, 8-21-78)

Secs. 18-322—18-350. - Reserved.

AMBIENT NOISE MONITORING RESULTS

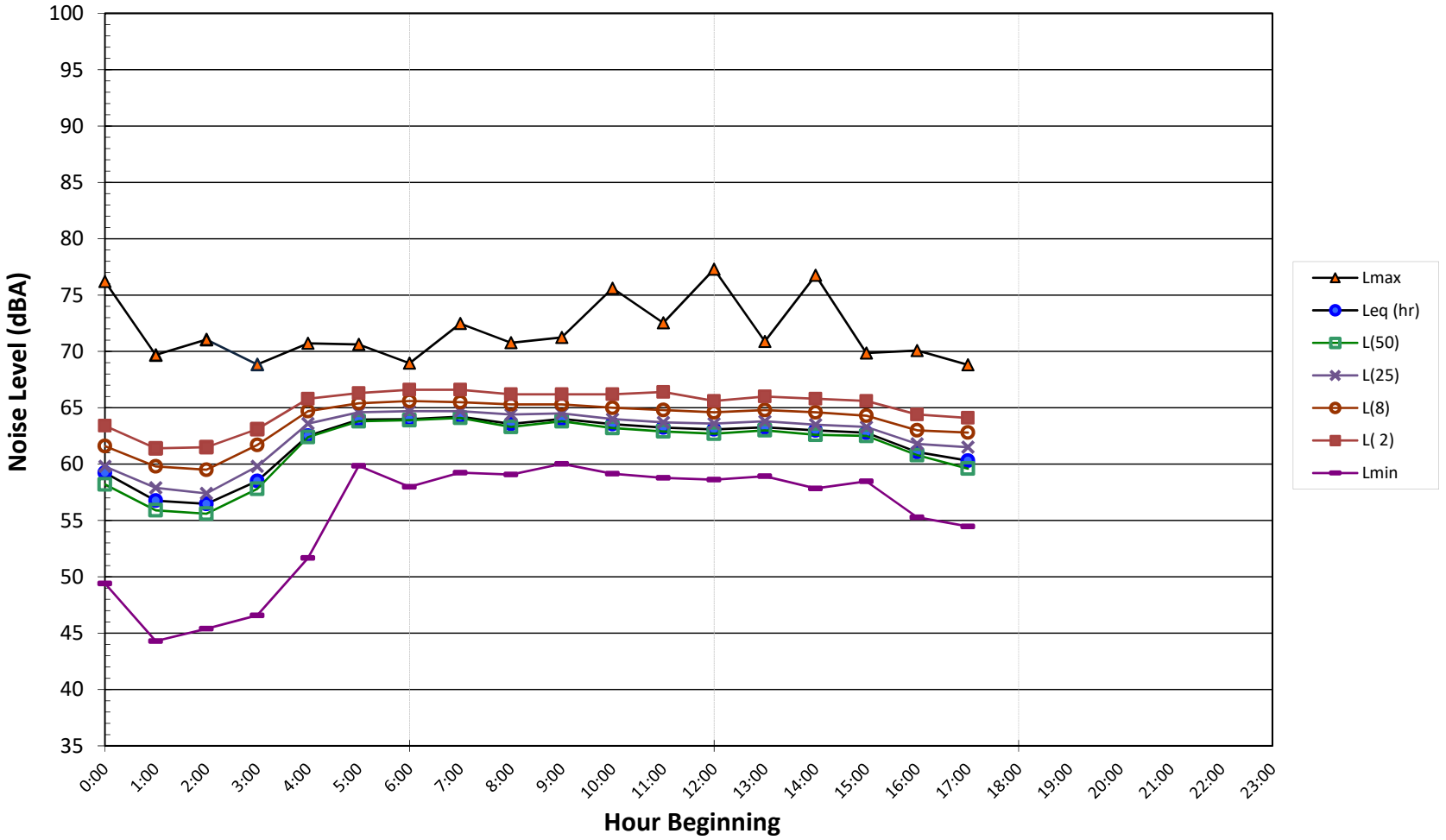

Noise Levels at LT-1
Santa Ana General Plan Update
Monday, May 13, 2019
Noise Level (dBA)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin

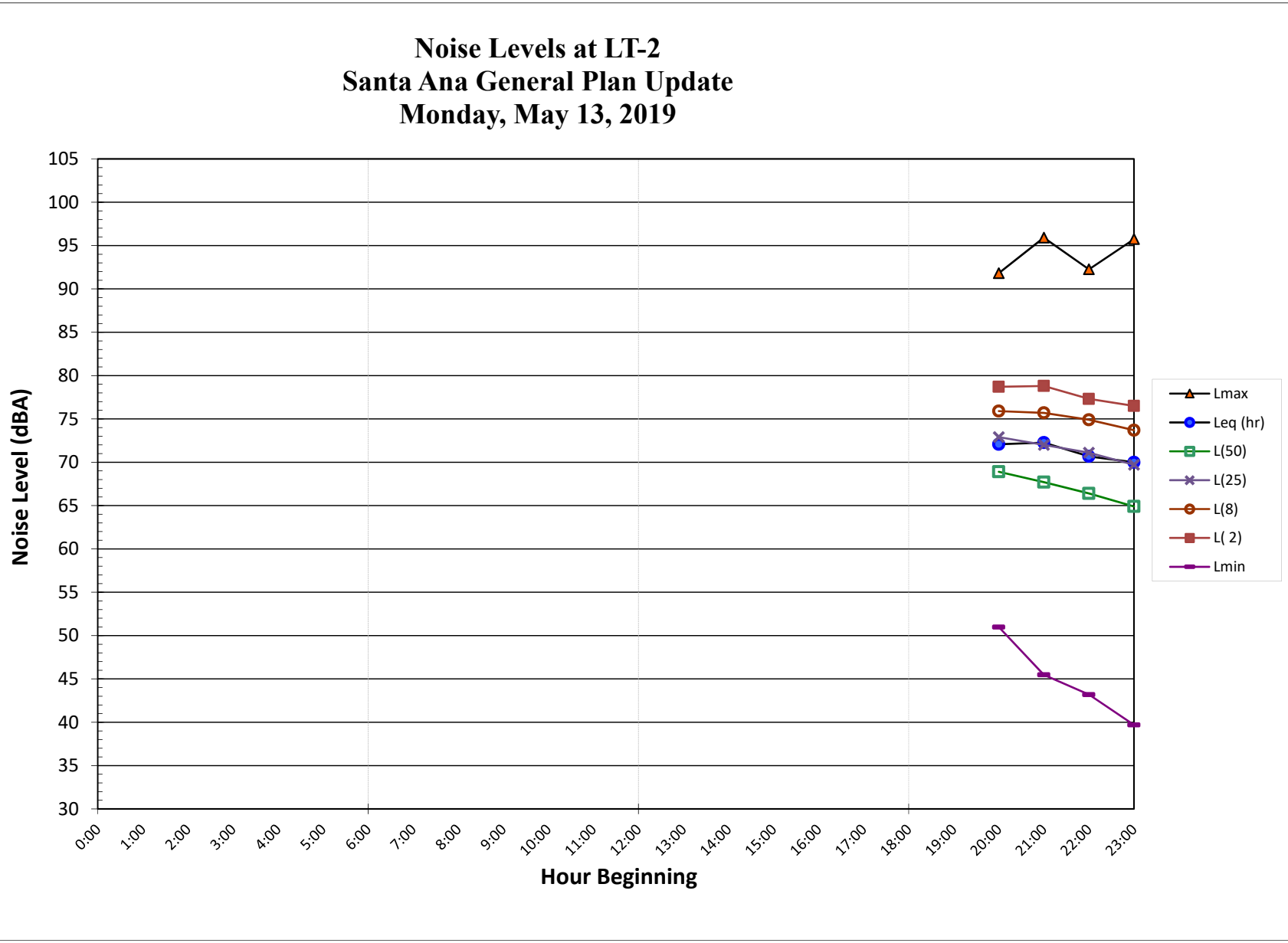
Noise Levels LT-1
Santa Ana General Plan Update
Tuesday, May 14, 2019



CNEL = 69 dBA

Noise Levels LT-1
Santa Ana General Plan Update
Wednesday, May 15, 2019




Noise Levels at LT-2
Santa Ana General Plan Update
Monday, May 13, 2019
Noise Level (dBA)
105
100
95
90
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65
60
55
50
45
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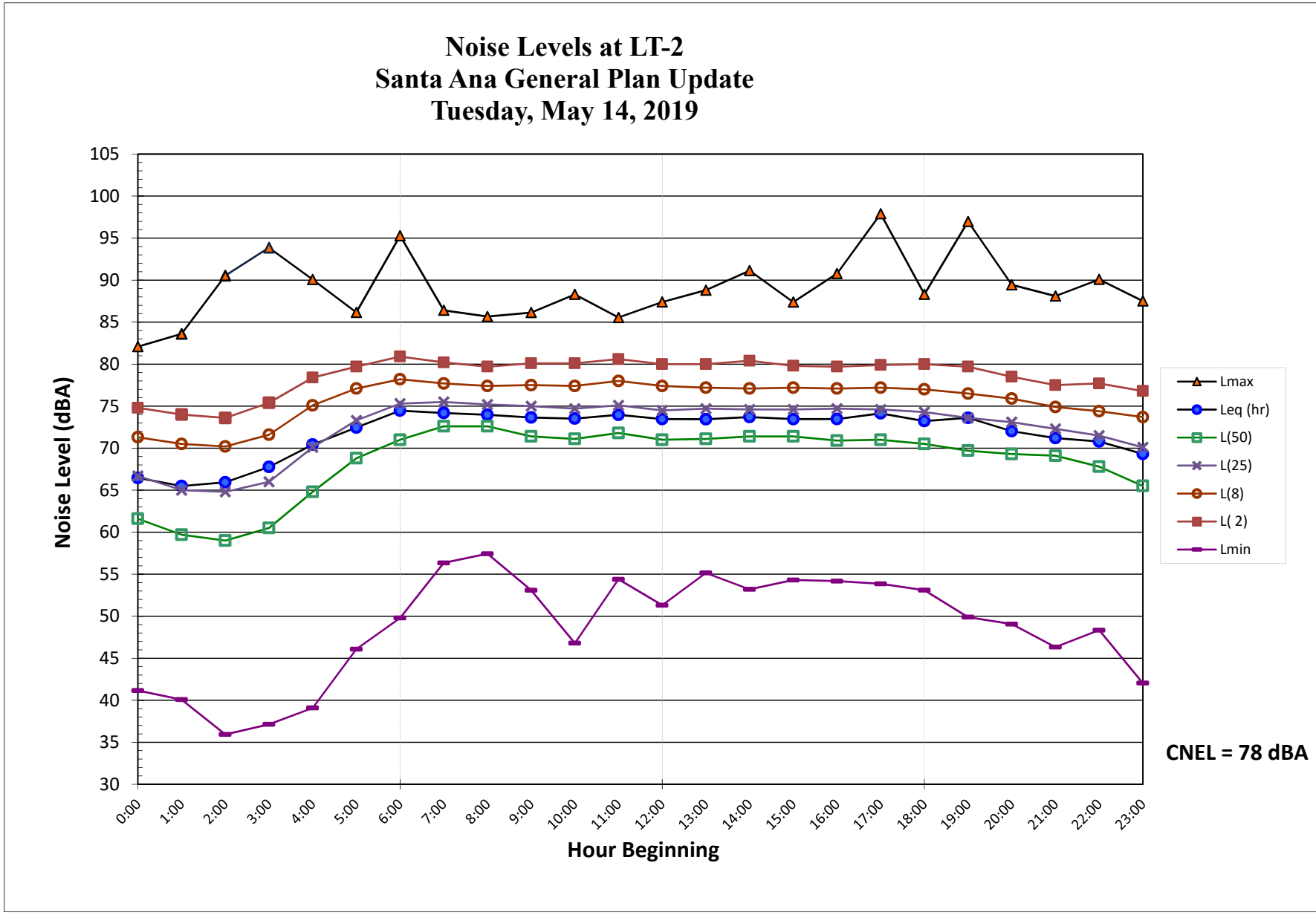
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin


Noise Levels at LT-2
Santa Ana General Plan Update
Tuesday, May 14, 2019
Noise Level (dBA)
105
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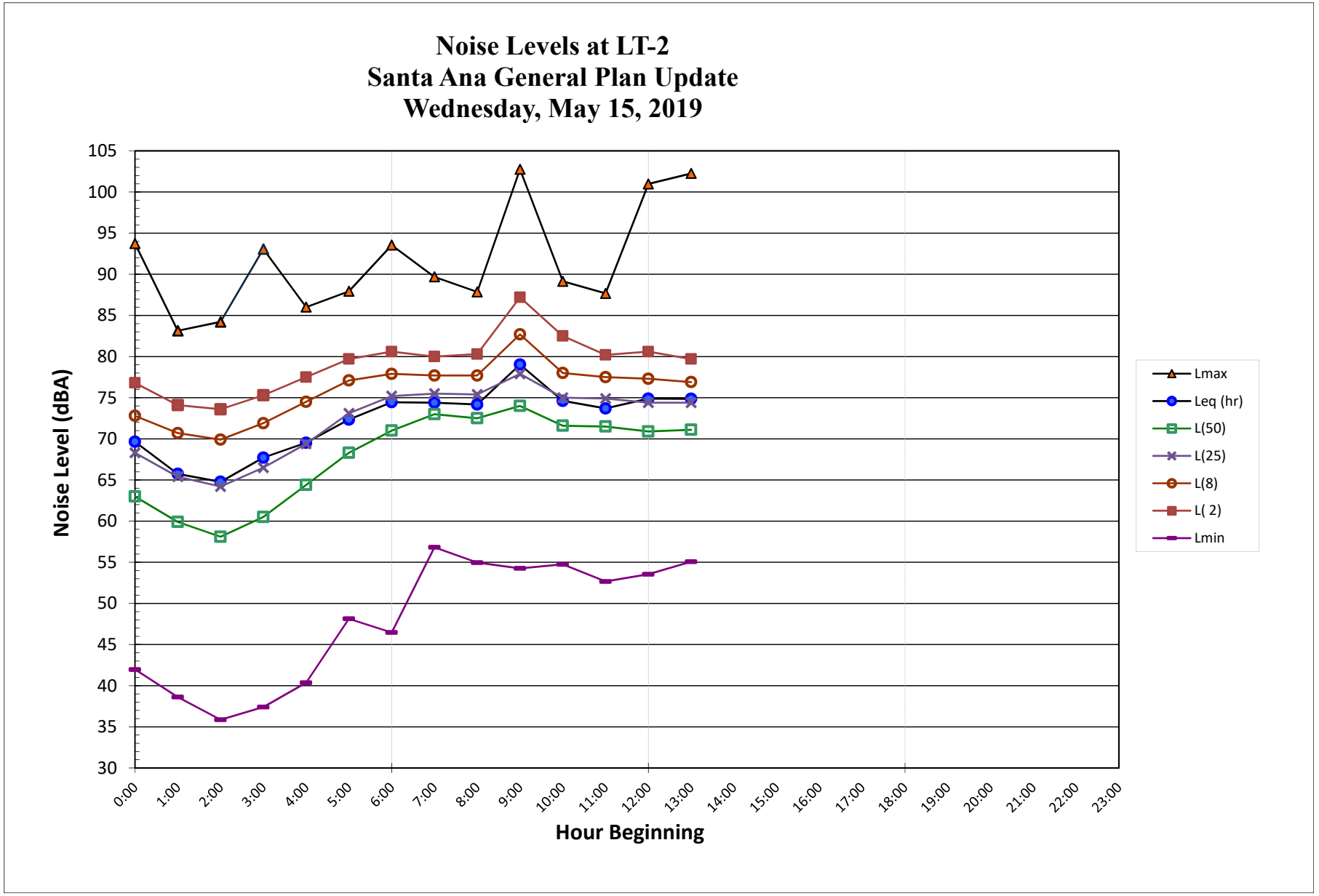
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin
CNEL = 78 dBA


Noise Levels at LT-2
Santa Ana General Plan Update
Wednesday, May 15, 2019
Noise Level (dBA)
105
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Hour Beginning
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Leq (hr)
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L(2)
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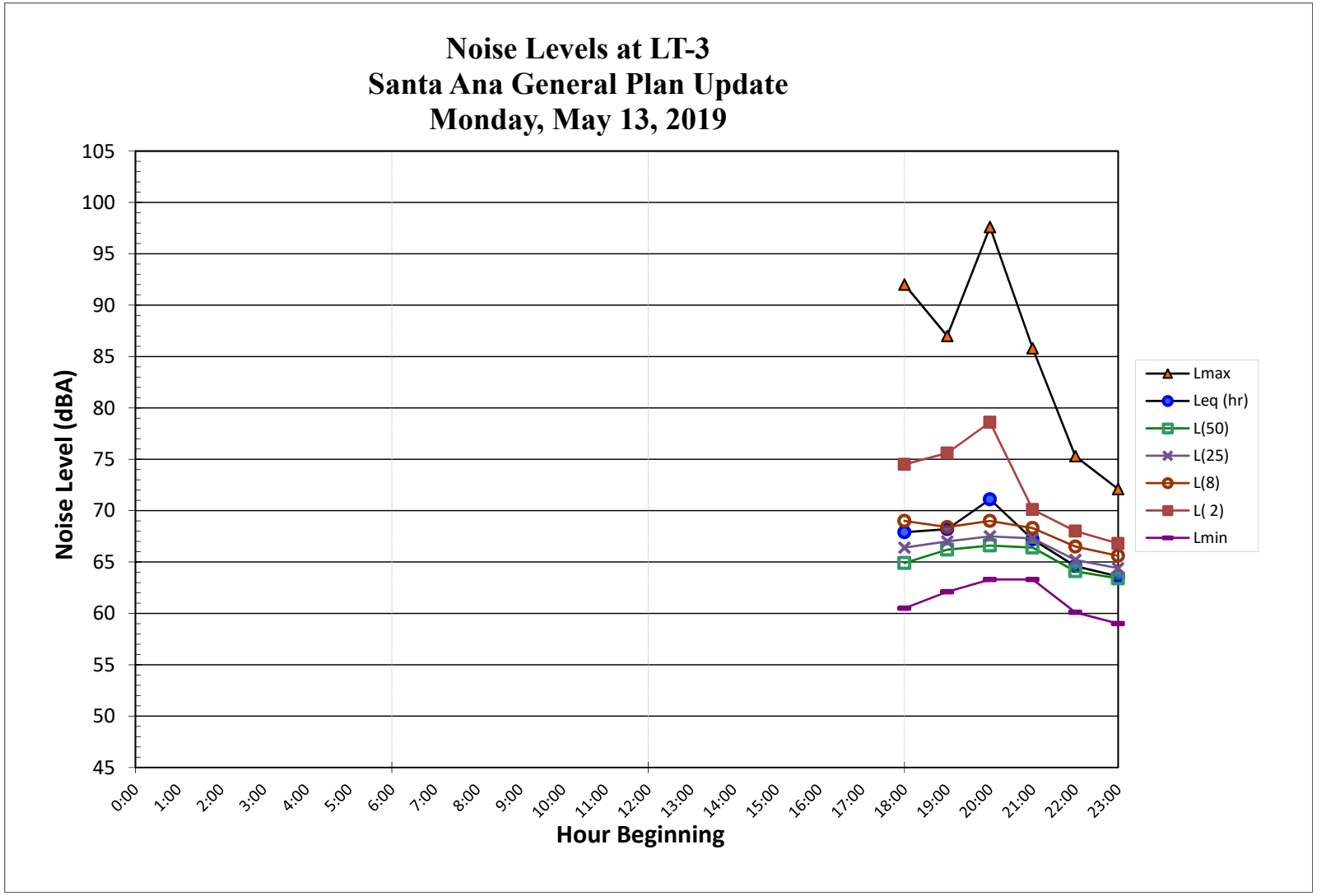
Noise Levels at LT-3
Santa Ana General Plan Update
Monday, May 13, 2019
Noise Level (dBA)
105
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Hour Beginning
Lmax
Leq (hr)
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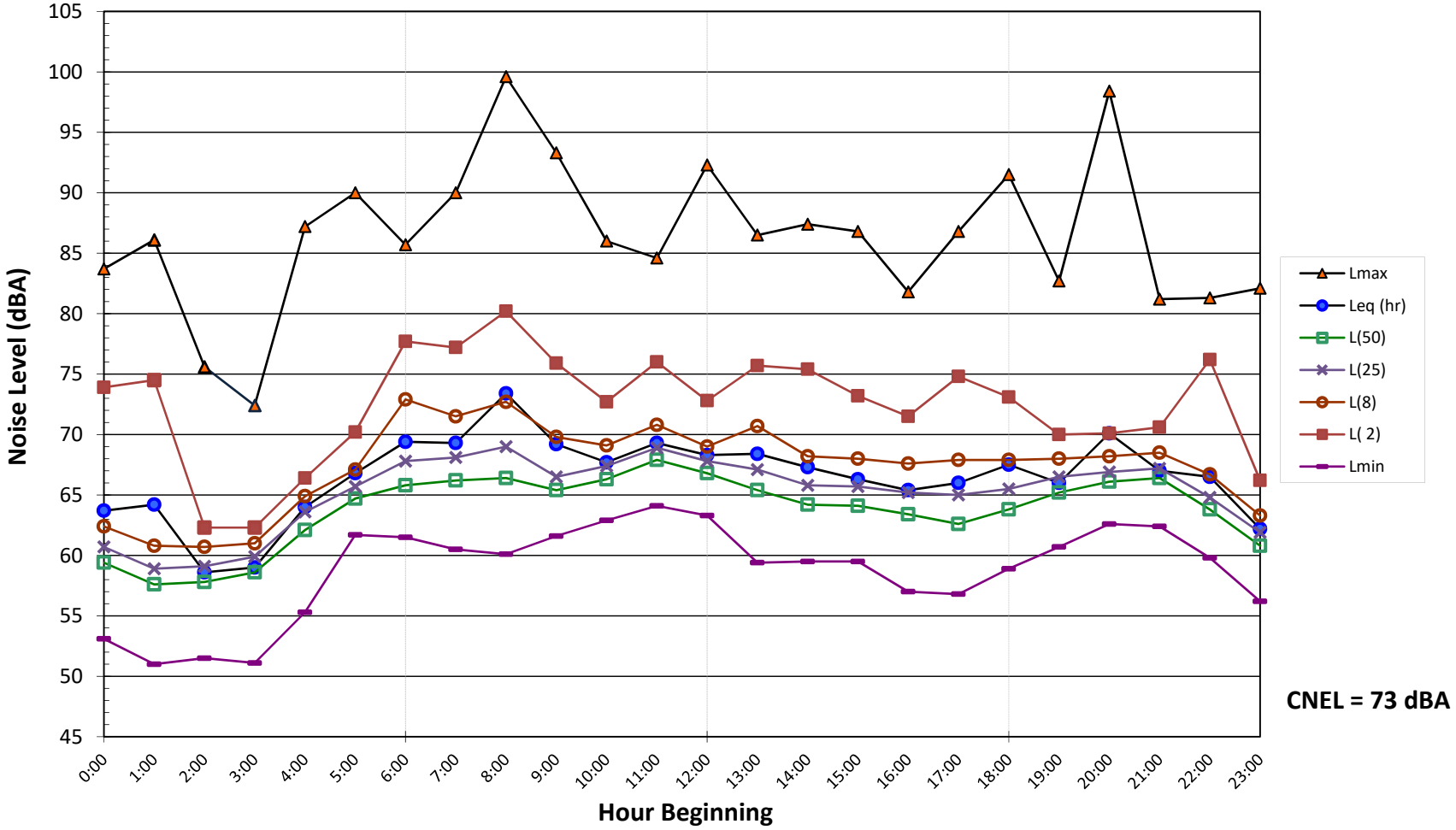
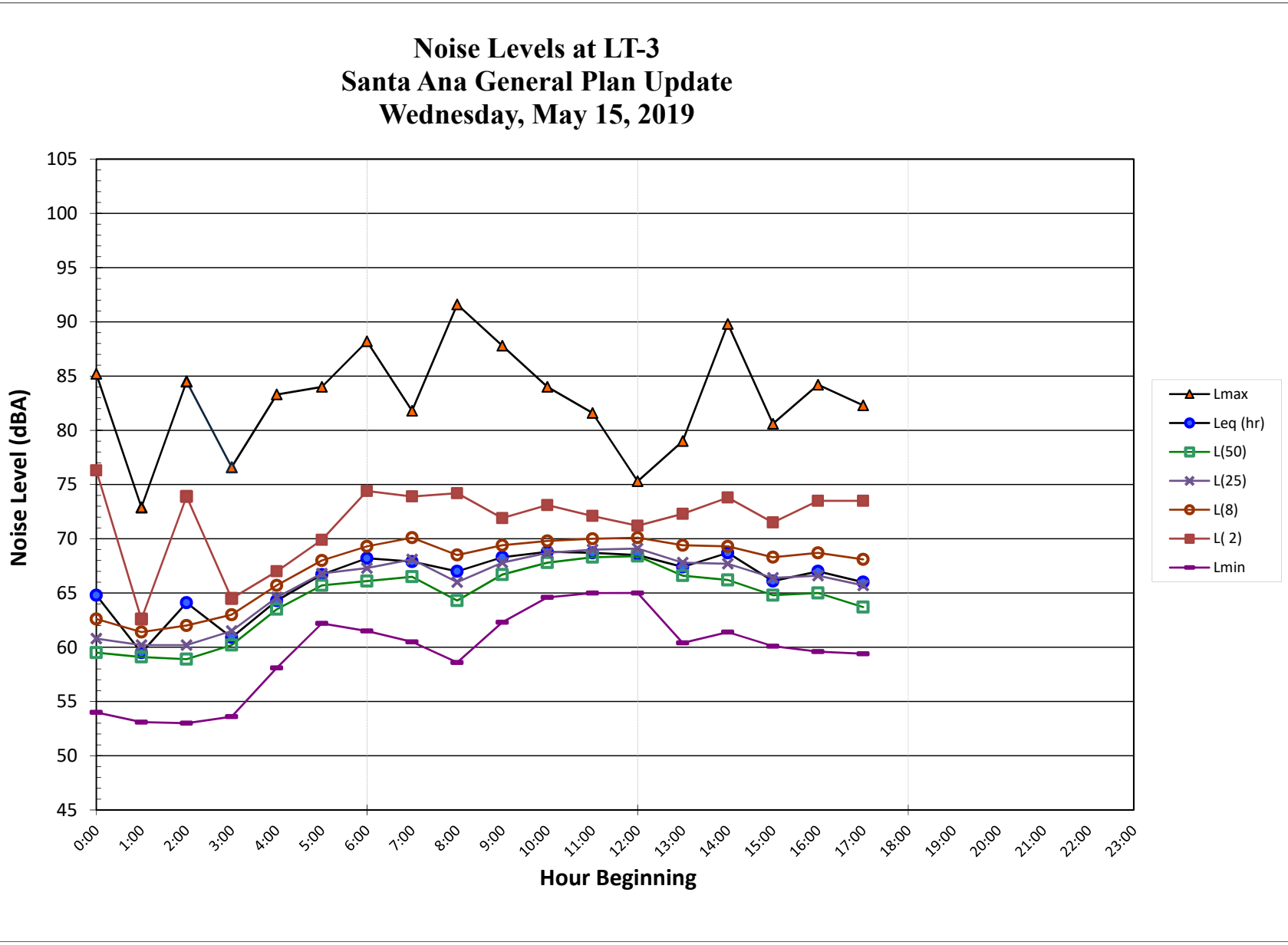
L(25)
L(8)
L(2)
Lmin

Noise Levels at LT-3
Santa Ana General Plan Update
Tuesday, May 14, 2019



CNEL = 73 dBA


Noise Levels at LT-3
Santa Ana General Plan Update
Wednesday, May 15, 2019
Noise Level (dBA)
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Hour Beginning
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Leq (hr)
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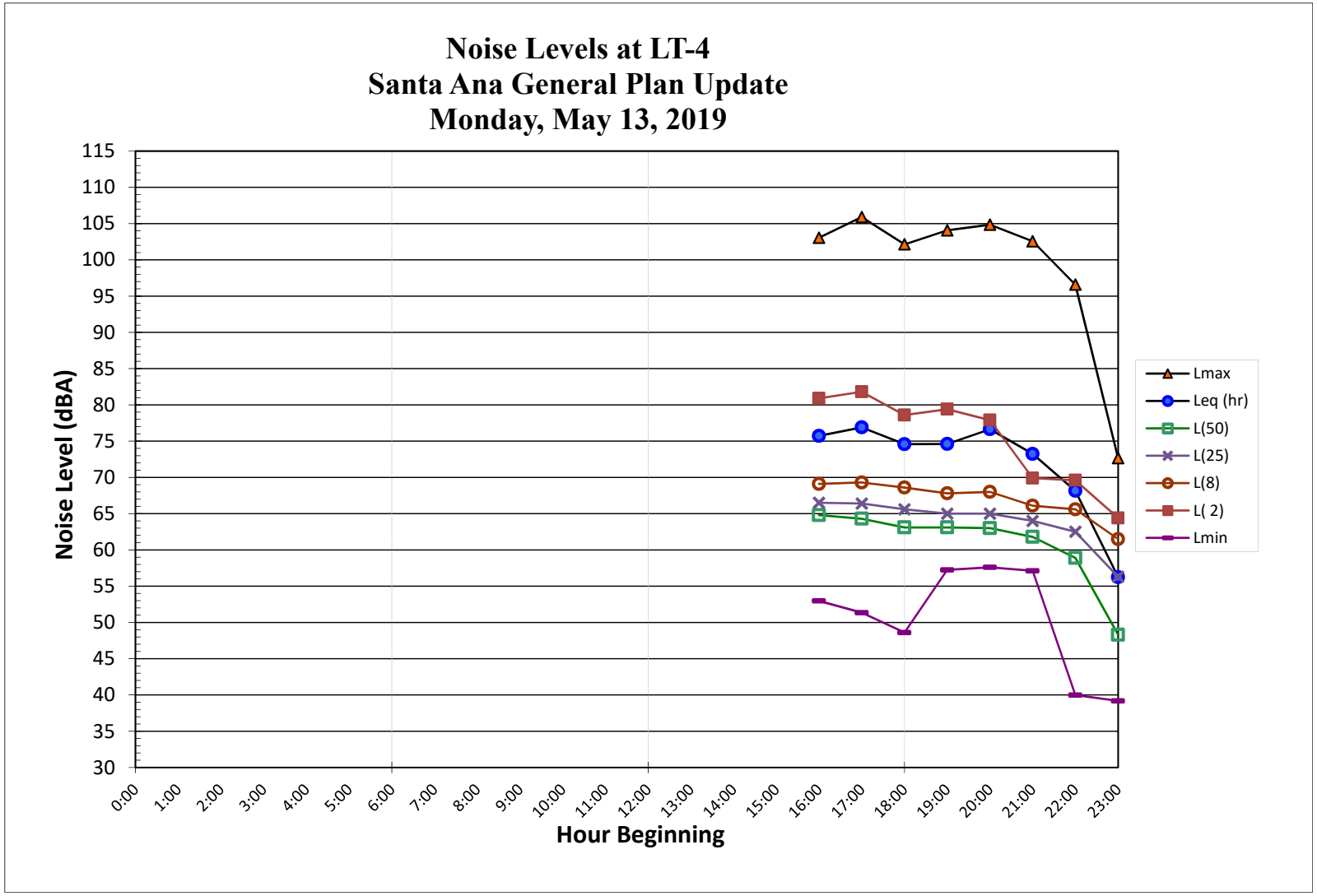
Noise Levels at LT-4
Santa Ana General Plan Update
Monday, May 13, 2019
Noise Level (dBA)
115
110
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Hour Beginning
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Leq (hr)
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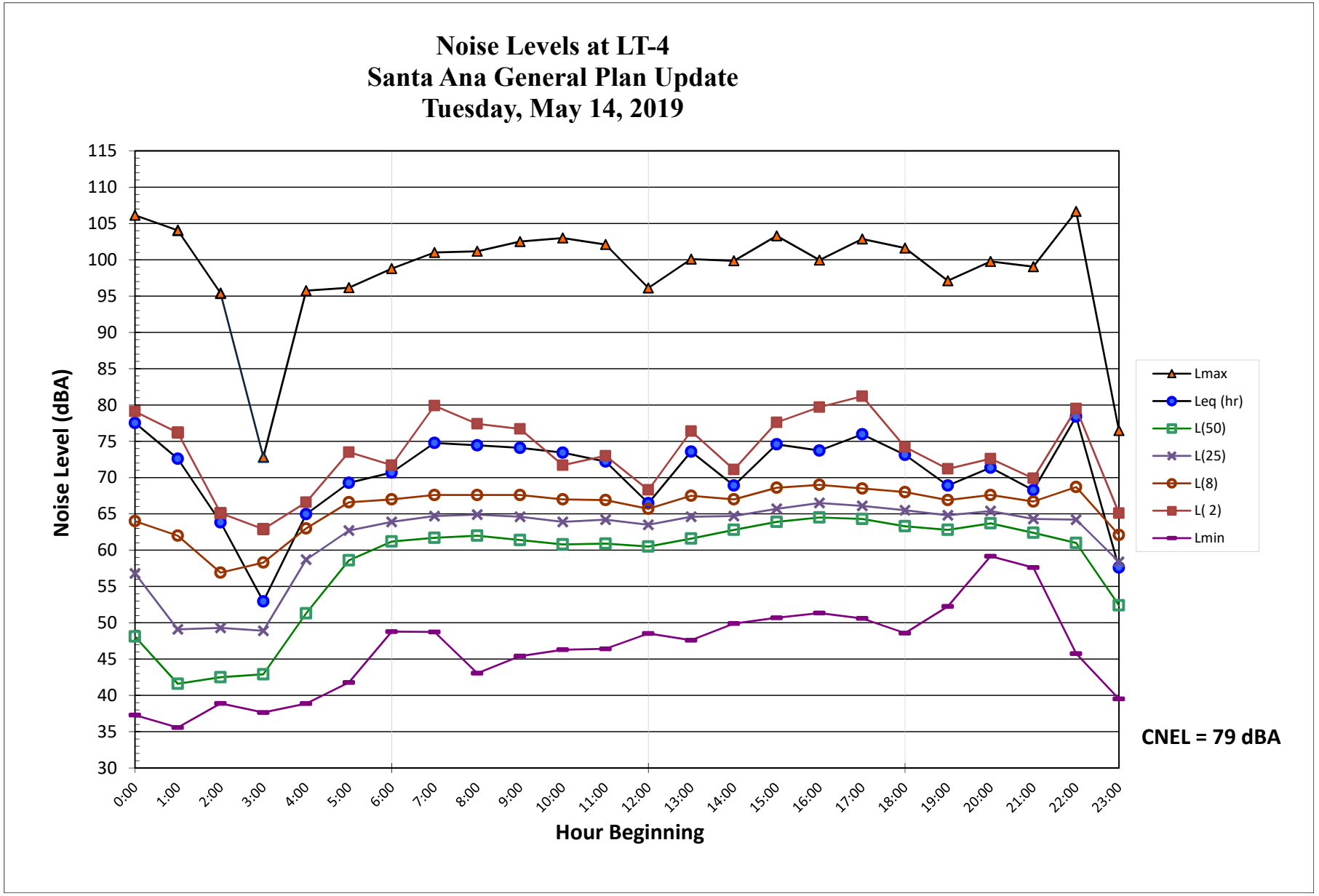
Noise Levels at LT-4
Santa Ana General Plan Update
Tuesday, May 14, 2019
Noise Level (dBA)
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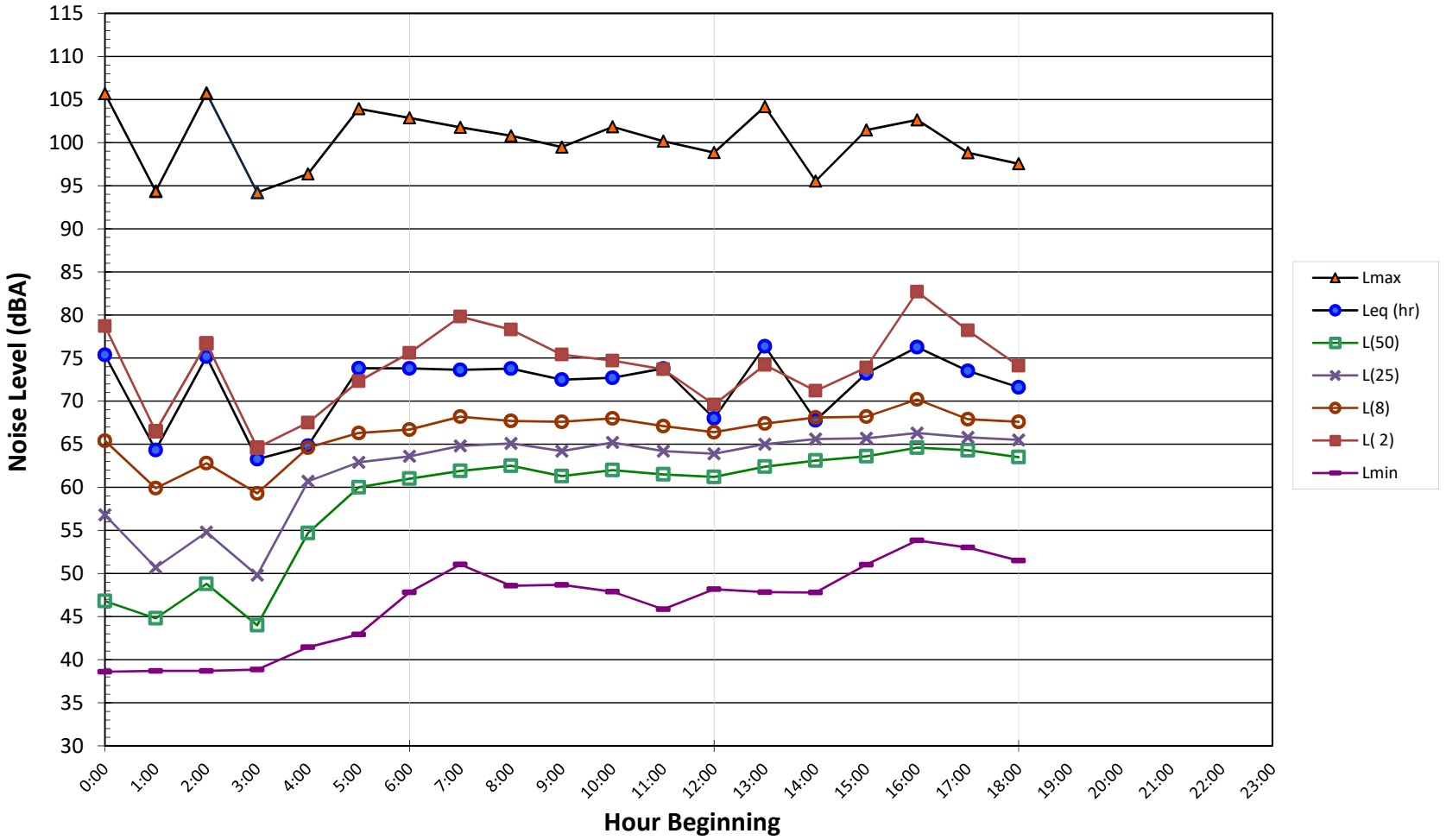
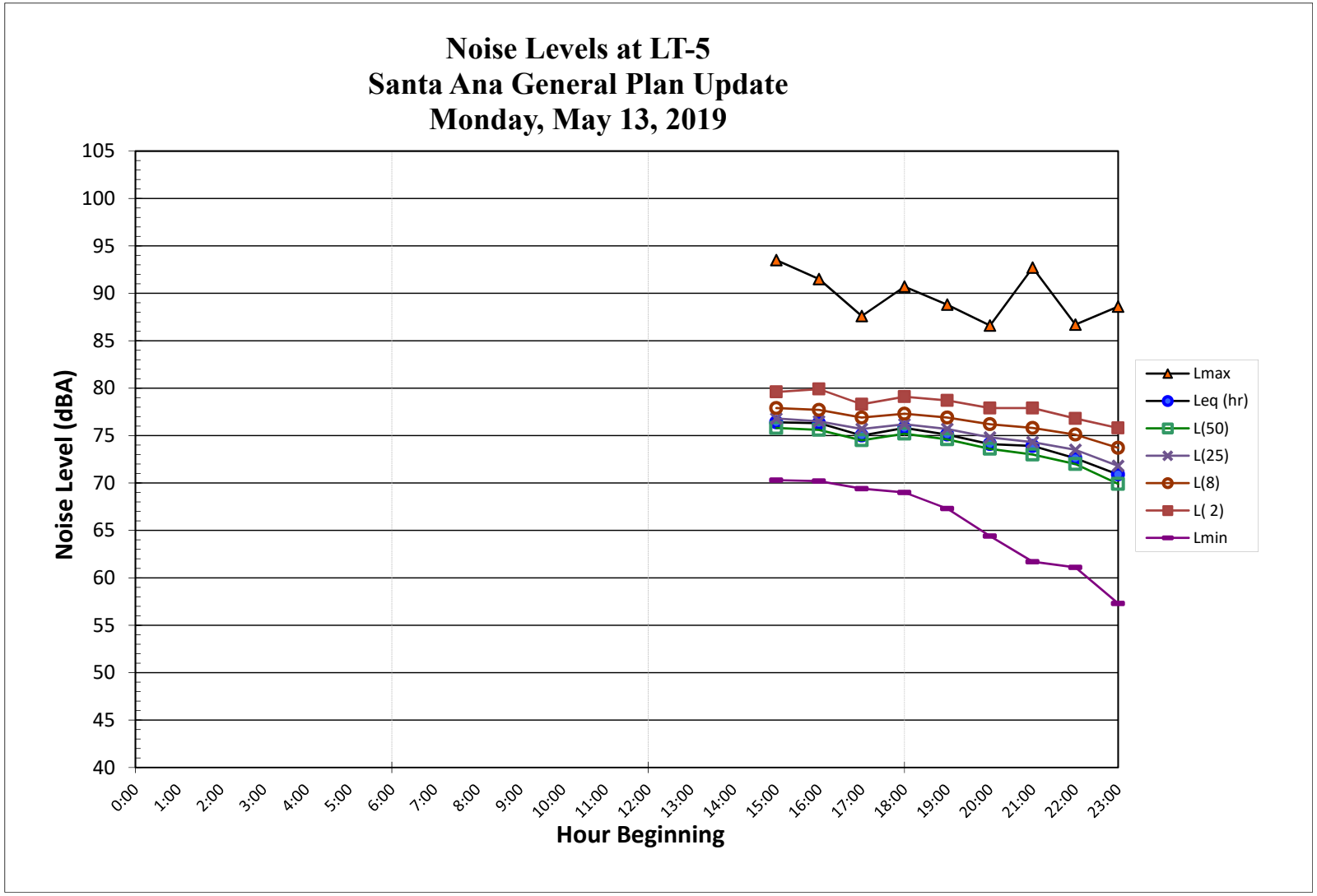
Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin
CNEL = 79 dBA

Noise Levels at LT-4
Santa Ana General Plan Update
Wednesday, May 15, 2019




Noise Levels at LT-5
Santa Ana General Plan Update
Monday, May 13, 2019
Noise Level (dBA)
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Hour Beginning
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Leq (hr)
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L(8)
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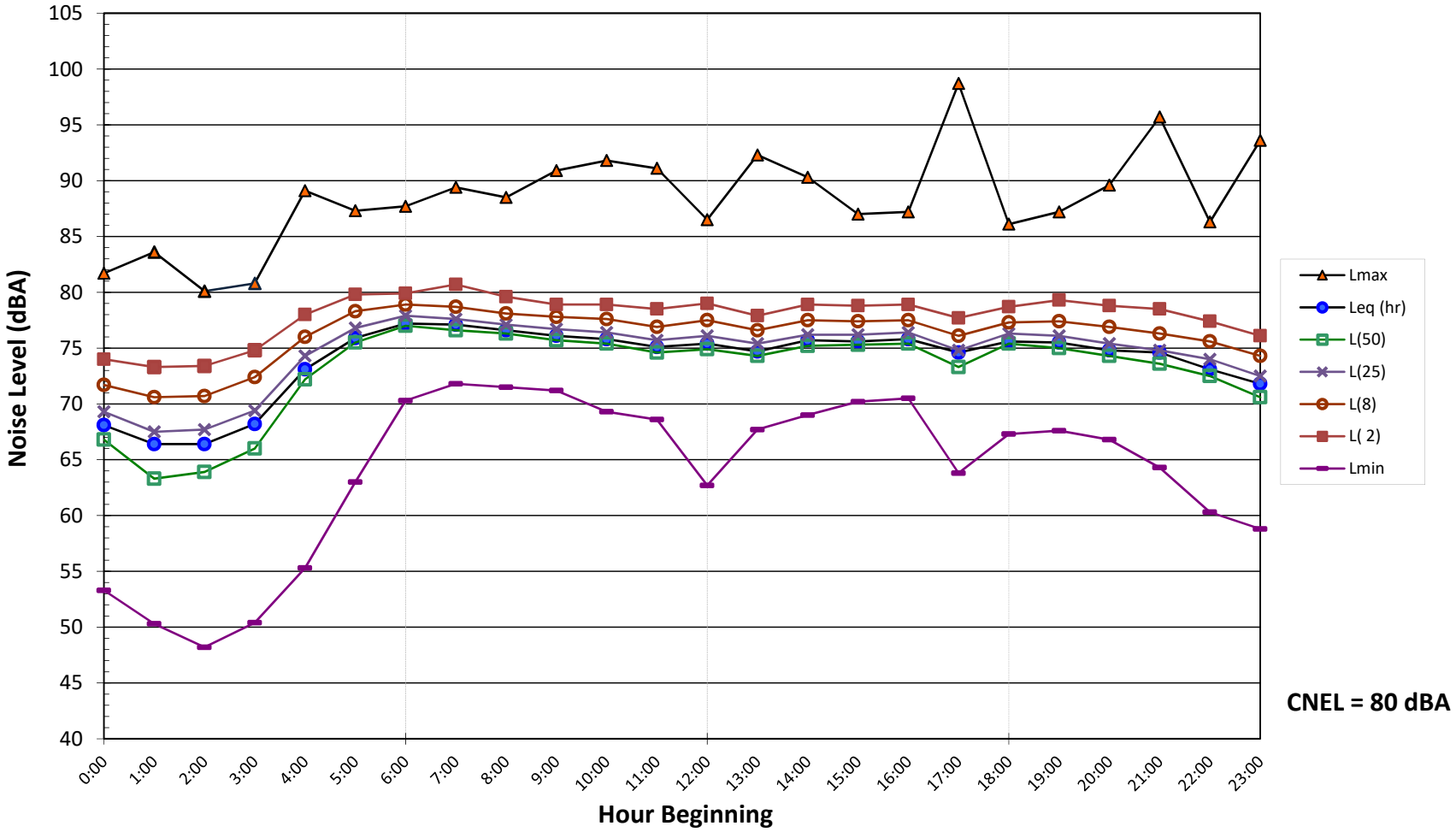
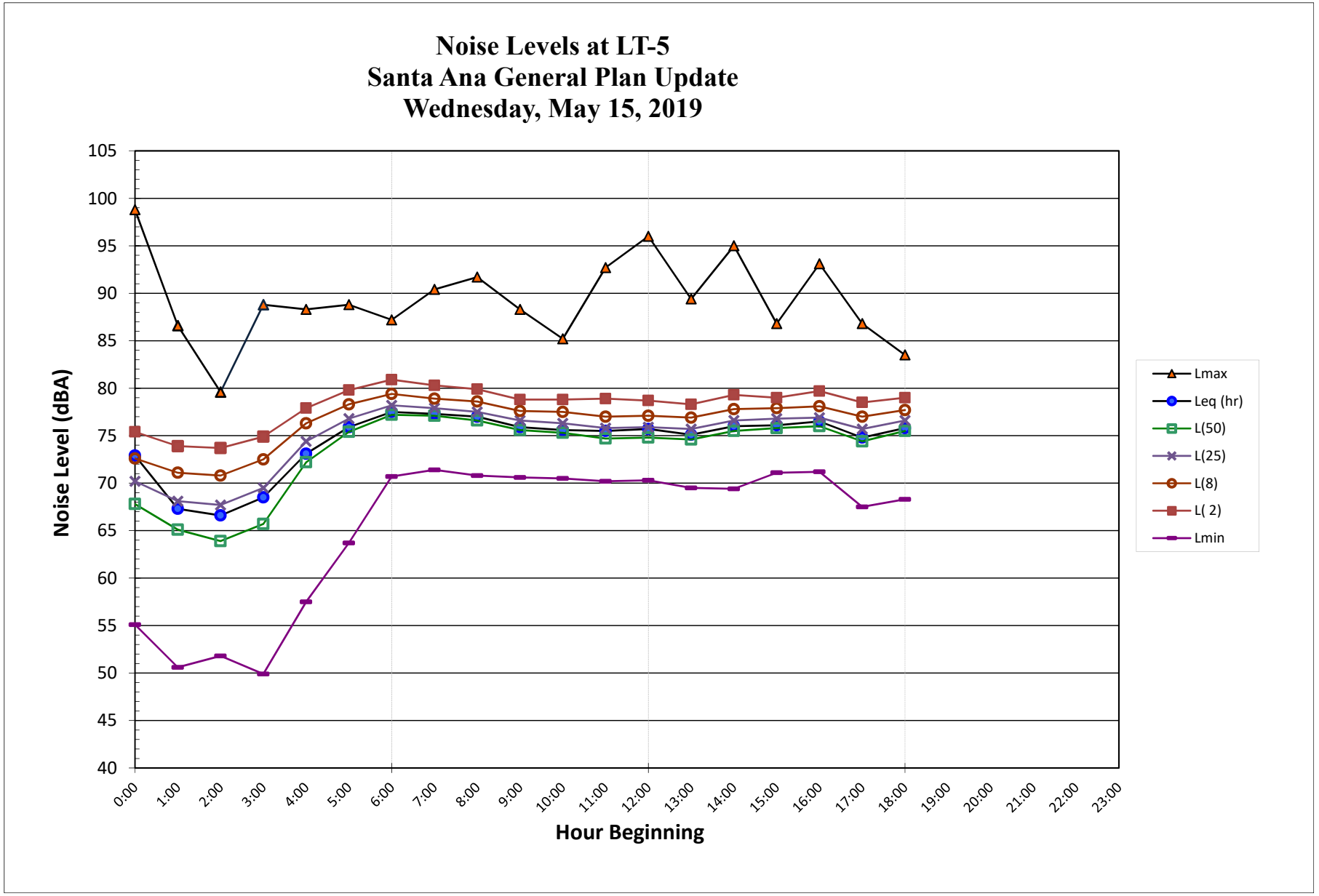
Noise Levels at LT-5
Santa Ana General Plan Update
Tuesday, May 14, 2019



CNEL = 80 dBA


Noise Levels at LT-5
Santa Ana General Plan Update
Wednesday, May 15, 2019
Noise Level (dBA)
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Hour Beginning
Lmax
Leq (hr)
L(50)
L(25)
L(8)
L(2)
Lmin

TRAFFIC NOISE INCREASE CALCULATIONS

Traffic Noise Calculator: FHWA 77-108 **Project Title: SNA-20**

	Output						Inputs														Auto Inputs	
	dBA at 50 feet			Distance to CNEL Contour																		
ID	$L_{eq\text{-}24hr}$	L_{dn}	CNEL	70 dBA	65 dBA	60 dBA	Roadway	Segment	ADT	Posted Speed Limit	Grade	% Autos	% Med Trucks	% Heavy Trucks	% Daytime	% Evening	% Night	Number of Lanes	Site Condition	Distance to Reciever	Ground Absorption	Lane Distance
1	69.3	72.1	72.6	75	162	348	1st Street	treet to Newhop	28219	40	0	94.9%	2.9%	2.2%	79%	11%	10%	6	Soft	50	0.5	68
2	71.0	74.5	75.0	107	231	497	Euclid Street	eet to McFadden	40832	40	0	94.9%	2.9%	2.2%	74%	12%	14%	6	Soft	50	0.5	68
3	70.9	73.6	74.2	95	205	442	Westminster Avenue	oulevard to Fairvi	30994	45	0	94.9%	2.9%	2.2%	78%	12%	10%	6	Soft	50	0.5	68
4	72.0	76.1	76.6	137	294	634	Harbor Boulevard	nue/17th Street t	51467	40	0	94.9%	2.9%	2.2%	70%	12%	18%	6	Soft	50	0.5	68
5	69.8	73.2	73.7	89	191	412	Edinger Avenue	oulevard to Fairvi	24396	45	0	94.9%	2.9%	2.2%	73%	14%	13%	6	Soft	50	0.5	68
6	71.0	74.4	74.8	104	224	483	Warner Avenue	oulevard to Fairvi	32360	45	0	94.9%	2.9%	2.2%	78%	9%	13%	6	Soft	50	0.5	68
7	72.5	76.2	76.6	138	297	641	Harbor Boulevard	venue to MacArt	45135	45	0	94.9%	2.9%	2.2%	74%	11%	15%	6	Soft	50	0.5	68
8	72.3	76.2	76.6	138	296	639	Fairview Street	Street to Willits St	43090	45	0	94.9%	2.9%	2.2%	72%	12%	16%	6	Soft	50	0.5	68
9	70.4	73.8	74.2	96	206	443	1st Street	an Street to Raitt	35964	40	0	94.9%	2.9%	2.2%	76%	11%	13%	6	Soft	50	0.5	68
10	72.4	76.2	76.7	140	302	651	Bristol Street	eet to Santa Clara	46452	45	0	94.9%	2.9%	2.2%	71%	13%	16%	4	Soft	50	0.5	44
11	70.6	73.4	74.0	93	199	430	17th Street	Avenue to Bristo	37885	40	0	94.9%	2.9%	2.2%	77%	13%	10%	6	Soft	50	0.5	68
12	71.1	75.2	75.7	119	257	554	Bristol Street	eet to Washingtor	44010	40	0	94.9%	2.9%	2.2%	69%	14%	17%	5	Soft	50	0.5	56
13	72.0	76.0	76.5	136	292	630	Fairview Street	Avenue to 17th S	42808	45	0	94.9%	2.9%	2.2%	70%	13%	17%	4	Soft	50	0.5	44
14	70.8	74.7	75.2	111	239	515	Bristol Street	Street to Bishop St	39847	40	0	94.9%	2.9%	2.2%	71%	13%	16%	6	Soft	50	0.5	68
15	65.6	68.6	69.1	43	93	201	Civic Center Drive	I Street to Flower	16615	35	0	94.9%	2.9%	2.2%	79%	10%	11%	4	Soft	50	0.5	44
16	65.6	68.4	68.9	42	91	195	Flower Street	Street to Bishop St	17101	35	0	94.9%	2.9%	2.2%	80%	10%	10%	2	Soft	50	0.5	20
17	68.5	72.2	72.6	75	162	348	Main Street	n Street to 20th St	32053	35	0	94.9%	2.9%	2.2%	73%	12%	15%	4	Soft	50	0.5	44
18	67.2	70.9	71.4	62	133	286	Main Street	n Street to Civic C	31850	30	0	94.9%	2.9%	2.2%	72%	13%	15%	4	Soft	50	0.5	44
19	62.8	65.6	66.0	27	59	127	Civic Center Drive	er Street to Broad	16285	25	0	94.9%	2.9%	2.2%	81%	9%	10%	4	Soft	50	0.5	44
20	63.9	66.9	67.3	33	71	153	Santa Ana Boulevard	er Street to Broad	14191	30	0	94.9%	2.9%	2.2%	80%	9%	11%	6	Soft	50	0.5	68
21	71.1	74.8	75.2	111	240	517	1st Street	treet to Standard	41765	40	0	94.9%	2.9%	2.2%	73%	12%	15%	6	Soft	50	0.5	68
22	67.7	71.7	72.2	70	150	323	Main Street	Street to Bishop St	26772	35	0	94.9%	2.9%	2.2%	71%	12%	17%	4	Soft	50	0.5	44
23	68.8	71.7	72.2	70	151	325	Grand Avenue	ara Avenue to 17	25988	40	0	94.9%	2.9%	2.2%	79%	10%	11%	4	Soft	50	0.5	44
24	70.2	73.9	74.3	97	209	451	Grand Avenue	na Boulevard to 4	36526	40	0	94.9%	2.9%	2.2%	75%	10%	15%	4	Soft	50	0.5	44
25	69.7	72.3	72.9	78	168	362	17th Street	'ark Drive to Tusti	32600	40	0	94.9%	2.9%	2.2%	79%	12%	9%	4	Soft	50	0.5	44
26	67.4	70.1	70.7	55	119	257	Tustin Avenue	it Street to 4th St	17862	40	0	94.9%	2.9%	2.2%	79%	11%	10%	6	Soft	50	0.5	68
27	68.1	70.8	71.3	61	132	284	1st Street	'ark Drive to Tusti	20946	40	0	94.9%	2.9%	2.2%	80%	10%	10%	6	Soft	50	0.5	68
28	72.2	76.2	76.6	138	297	640	Fairview Street	Avenue to Harvar	42145	45	0	94.9%	2.9%	2.2%	72%	11%	17%	6	Soft	50	0.5	68
29	71.8	75.5	76.0	125	269	579	Fairview Street	venue to Segerstro	38754	45	0	94.9%	2.9%	2.2%	74%	11%	15%	6	Soft	50	0.5	68
30	68.1	71.6	72.2	70	151	325	Edinger Avenue	Street to Greenv	29375	35	0	94.9%	2.9%	2.2%	72%	14%	14%	4	Soft	50	0.5	44
31	66.6	70.3	70.9	57	123	265	McFadden Avenue	ew Street to Raitt	20921	35	0	94.9%	2.9%	2.2%	71%	14%	15%	4	Soft	50	0.5	44
32	69.3	71.9	72.3	72	154	333	MacArthur Boulevard	ew Street to Raitt	27767	40	0	94.9%	2.9%	2.2%	81%	10%	9%	6	Soft	50	0.5	68
33	67.4	70.4	71.4	62	133	286	Segerstrom Avenue	ew Street to Raitt	19018	40	0	94.9%	2.9%	2.2%	66%	23%	11%	4	Soft	50	0.5	44
34	70.5	74.0	74.5	100	215	464	Bristol Street	Avenue to Warne	38527	40	0	94.9%	2.9%	2.2%	73%	13%	14%	4	Soft	50	0.5	44
35	70.5	73.8	74.4	98	211	455	Bristol Street	venue to Segerstro	36397	40	0	94.9%	2.9%	2.2%	73%	14%	13%	6	Soft	50	0.5	68
36	71.1	74.7	75.1	109	235	505	Warner Avenue	Street to Bristol S	34084	45	0	94.9%	2.9%	2.2%	76%	10%	14%	5	Soft	50	0.5	56
37	70.8	74.2	74.7	103	223	480	Bristol Street	oulevard to Sunfl	39737	40	0	94.9%	2.9%	2.2%	74%	13%	13%	6	Soft	50	0.5	68
38	66.5	69.5	70.0	50	107	231	Flower Street	venue to Segerstro	15420	40	0	94.9%	2.9%	2.2%	78%	11%	11%	4	Soft	50	0.5	44
39	69.2	73.1	73.5	86	184	397	Edinger Avenue	er Street to Main S	28733	40	0	94.9%	2.9%	2.2%	72%	12%	16%	4	Soft	50	0.5	44
40	67.8	71.4	71.9	67	143	309	Main Street	Avenue to Eding	27724	35	0	94.9%	2.9%	2.2%	74%	12%	14%	4	Soft	50	0.5	44
41	69.4	73.5	73.8	89	193	415	Main Street	venue to Segerstro	29713	40	0	94.9%	2.9%	2.2%	74%	9%	17%	5	Soft	50	0.5	56
42	70.7	74.4	74.8	104	225	484	Dyer Road	Street to Halladay	29938	45	0	94.9%	2.9%	2.2%	75%	10%	15%	6	Soft	50	0.5	68
43	70.5	73.6	74.1	93	201	434	MacArthur Boulevard	er Street to Main S	36466	40	0	94.9%	2.9%	2.2%	78%	10%	12%	6	Soft	50	0.5	68
44	69.5	72.5	72.9	78	168	362	Main Street	oulevard to Sunfl	22916	45	0	94.9%	2.9%	2.2%	81%	8%	11%	6	Soft	50	0.5	68
45	70.4	73.8	74.2	95	205	442	Grand Avenue	enue to Saint And	27838	45	0	94.9%	2.9%	2.2%	76%	11%	13%	6	Soft	50	0.5	68
46	71.8	75.7	76.0	126	271	585	Edinger Avenue	treet to Newport	38974	45	0	94.9%	2.9%	2.2%	76%	8%	16%	6	Soft	50	0.5	68
47	69.3	72.7	73.0	79	169	365	Warner Avenue	venue to Red Hill	21848	45	0	94.9%	2.9%	2.2%	81%	6%	13%	6	Soft	50	0.5	68
48	68.9	72.6	73.0	79	170	366	Warner Avenue	treet to Standard	26712	40	0	94.9%	2.9%	2.2%	75%	10%	15%	4	Soft	50	0.5	44
49	66.8	70.5	71.0	58	125	269	McFadden Avenue	I Avenue to Grand	21737	35	0	94.9%	2.9%	2.2%	73%	12%	15%	4	Soft	50	0.5	44
50	71.1	74.6	75.0	108	233	502	1st Street	I Street to Flower	41798	40	0	94.9%	2.9%	2.2%	75%	11%	14%	6	Soft	50	0.5	68
51	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!															0	#N/A
52	83.4	86.7	87.2	700	1508	3249	I-5	nan Ave. to Katell	240900	60	0	90.4%	6.0%	3.6%	76%	11%	13%	6	Soft	50	0.5	68
53	84.8	88.1	88.6	868	1869	4028	I-5	SR-22 to Main St.	366000	60	0	93.7%	3.1%	3.2%	76%	11%	13%	6	Soft	50	0.5	68
54	84.7	88.1	88.5	857	1847	3979	I-5	/Penn Way to Gra	359400	60	0	93.7%	3.1%	3.2%	76%	11%	13%	6	Soft	50	0.5	68
55	84.2	87.6	88.0	796	1714	3693	I-5	1st St. to SR-55	329500	60	0	94.5%	2.4%	3.1%	76%	11%	13%	6	Soft	50	0.5	68
56	84.1	87.5	88.0	787	1696	3654	I-5	ort Ave. to Red Hi	324300	60	0	94.5%	2.4%	3.1%	76%	11%	13%	6	Soft	50	0.5	68
57	83.2	86.5	87.0	678	1461	3148	I-405	churst Ave. to Euc	291300	60	0	96.5%	1.7%	1.8%	76%	11%	13%	6	Soft	50	0.5	68
58	83.5	86.8	87.3	711	1531	3298	I-405	lid St. to Harbor B	312400	60	0	96.5%	1.7%	1.8%	76%	11%	13%	6	Soft	50	0.5	68
59	83.2	86.6	87.0	680	1465	3156	I-405	arbor Blvd. to SR-	292400	60	0	96.5%	1.7%	1.8%	76%	11%	13%	6	Soft	50	0.5	68
60	82.5	85.8	86.3	608	1310	2821	I-405	Bristol St. to SR-55	239200	60	0	95.7%	2.3%	2.0%	76%	11%	13%	6	Soft	50	0.5	68
61	83.1	86.5	86.9	674	1452	3128	I-405	55 to MacArthur B	279200	60	0	95.7%	2.3%	2.0%	76%	11%	13%	6	Soft	50	0.5	68
62	83.3	86.7	87.1	694	1495	3221	SR-55	th St to 17th Stre	259400	60	0	93.0%	4.0%	3.0%	76%	11%	13%	6	Soft	50	0.5	68
63	83.8	87.2	87.6	750	1615	3480	SR-55	iner Ave. to Dyer	288600	60	0	92.8%	4.1%	3.1%	76%	11%	13%	6	Soft	50	0.5	68

64	83.1	86.4	86.9	669	1442	3106	SR-55	Rd. to MacArthur	277250	60	0	95.3%	3.0%	1.7%	76%	11%	13%	6	Soft	50	0.5	68
65	82.1	85.5	85.9	577	1244	2680	SR-55	cArthur Blvd. to I-	222150	60	0	95.3%	3.0%	1.7%	76%	11%	13%	6	Soft	50	0.5	68
66	80.6	83.9	84.4	454	978	2108	SR-55	I-405 to SR-73	155000	60	0	95.3%	3.0%	1.7%	76%	11%	13%	6	Soft	50	0.5	68
67	82.1	85.5	85.9	578	1245	2683	SR-22	lid St. to Harbor B	216500	60	0	94.3%	4.0%	1.7%	76%	11%	13%	6	Soft	50	0.5	68
68	82.3	85.7	86.1	596	1284	2766	SR-22	City Dr. to Bristo	235500	60	0	95.5%	2.9%	1.6%	76%	11%	13%	6	Soft	50	0.5	68
69	80.3	83.6	84.1	435	937	2018	SR-22	I-5 to Main St.	146700	60	0	95.5%	2.9%	1.6%	76%	11%	13%	6	Soft	50	0.5	68
70	79.9	83.3	83.8	413	890	1918	SR-22	ssell St. to Tustin	141800	60	0	96.6%	2.0%	1.4%	76%	11%	13%	6	Soft	50	0.5	68

RAILROAD NOISE MODELING

FRA Grade Crossing Noise Model

User Input	
Noise Situation (Pick from List)	1
Horn Lmax (dBA) @ 100 feet	110
Horn Location on Locomotive(Pick from List)	1
Non Train Noise Environment (pick from list)	2
Shielding (Pick from List)	2
Length of Impact Area (pick from list)	1
Existing Train Speed (mph)	50
Future Train Speed (mph)	50
Number of Existing Trains in one Direction	39
Number of Future Trains in one Direction	39
Existing Number of Day Trains (7 am to 10 p.m.)	31.5
Future Number of Day Trains (7 am to 10 p.m.)	31.5
Existing Number of Night Trains (10 p.m. to 7 am)	7.5
Future Number of Night Trains (10 p.m. to 7 am)	7.5
Existing Average Number of Cars	10.5
Future Average Number of Cars	10.5
Existing Average Number of Locomotives	1.5
Future Average Number of Locomotives	1.5

Noise Situation	
Horns Existing and Future	1
Horns in Future Only	2
No Horns Existing and Future	3

Horn Location on Locomotive			
National Average (50% front, 50% middle)			1
All Front Mounted			2
All Middle Mounted			3
User Defined	80	% front mounted horns	4

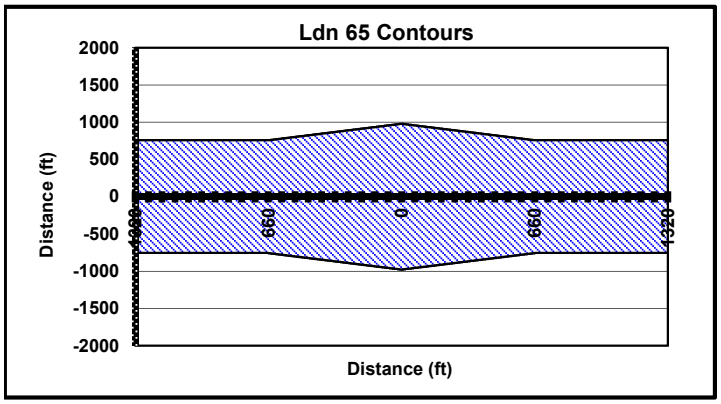
Non Train Noise Environment			
Urban			1
Suburban			2
Rural			3
User Defined Ldn =	50	dBA	4

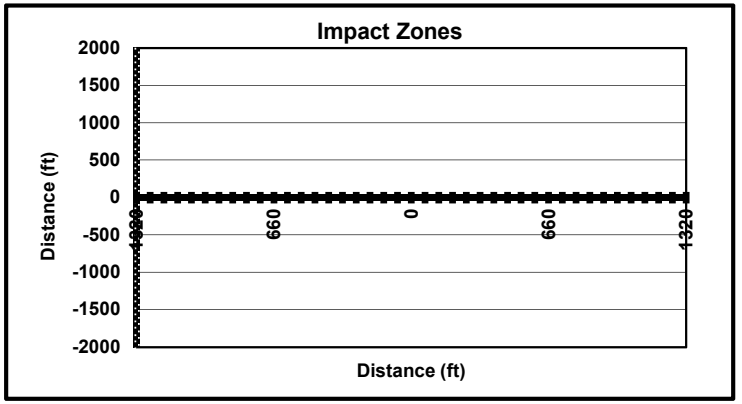
Shielding	
Dense Urban	1
Light Urban	2
Dense Suburban	3
Light Suburban	4
Rural	5
No Shielding	6

Length of Impact Area	
1/4 mile	1
20 seconds	2
15 seconds	3

Ldn 65 Contours Numeric Output (in feet)	
Existing 65 Ldn Contour at X-ing	978
Future 65 Ldn Contour at X-ing	978
Existing 65 Ldn Contour at 1/2 zone length	756
Future 65 Ldn Contour at 1/2 zone length	756
Zone Length	1320
1/2 Zone Length	660

Impact Zones Numeric Output (in feet)	
Impact Distance at X-ing	0
Severe Impact Distance at X-ing	0
Impact Distance at 1/2 zone length	0
Severe Impact Distance at 1/2 zone length	0
Zone Length	1320
1/2 Zone Length	660





Noise Model Based on Federal Transit Adminstration General Transit Noise Assessment
Developed for Chicago Create Project

Case: SCRRA Orange Subdivision

RESULTS			
Noise Source	**Ldn (dB)**	**Leq - daytime (dB)**	**Leq - nighttime (dB)**
All Sources	65	58	59
Source 1	62	54	56
Source 2	59	51	53
Source 3	54	51	46
Source 4	51	49	44
Source 5	51	48	44
Source 6	49	46	41
Source 7	0	0	0
Source 8	0	0	0

Enter noise receiver land use category below.

LAND USE CATEGORY	
Noise receiver land use category (1, 2 or 3)	2

Enter data for up to 8 noise sources below - see reference list for source numbers.

NOISE SOURCE PARAMETERS												
Parameter	**Source 1**		**Source 2**		**Source 3**		**Source 4**		**Source 5**		**Source 6**	
Source Num.	Freight Locomotive	9	Freight Cars	10	Commuter Diesel Locomotive	2	Commuter Rail Cars	3	Commuter Diesel Locomotive	2	Commuter Rail Cars	3
Distance (source to receiver)	distance (ft)	210	distance (ft)	210	distance (ft)	210	distance (ft)	210	distance (ft)	210	distance (ft)	210
Daytime Hours	speed (mph)	40	speed (mph)	40	speed (mph)	50	speed (mph)	50	speed (mph)	50	speed (mph)	50
(7 AM - 10 PM)	trains/hour	0.267	trains/hour	0.267	trains/hour	2.6	trains/hour	2.6	trains/hour	1.333	trains/hour	1.333
	locos/train	6	length of cars (ft) / train	3000	locos/train	1	cars/train	6	locos/train	1	cars/train	6
Nighttime Hours	speed (mph)	40	speed (mph)	40	speed (mph)	50	speed (mph)	50	speed (mph)	50	speed (mph)	50
(10 PM - 7 AM)	trains/hour	0.444	trains/hour	0.444	trains/hour	0.778	trains/hour	0.778	trains/hour	0.444	trains/hour	0.444
	locos/train	6	length of cars (ft) / train	3000	locos/train	1	cars/train	6	locos/train	1	cars/train	6
Wheel Flats?		0.00%	% of cars w/ wheel flats	0.00%		0.00%	% of cars w/ wheel flats	0.00%		0.00%	% of cars w/ wheel flats	0.00%
Jointed Track?	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n
Embedded Track?	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n
Aerial Structure?	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n
Barrier Present?	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n	Y/N	n
Intervening Rows of of Buildings	number of rows	0	number of rows	0	number of rows	0	number of rows	0	number of rows	0	number of rows	0

FRA Grade Crossing Noise Model

User Input	
Noise Situation (Pick from List)	1
Horn Lmax (dBA) @ 100 feet	110
Horn Location on Locomotive(Pick from List)	1
Non Train Noise Environment (pick from list)	2
Shielding (Pick from List)	2
Length of Impact Area (pick from list)	1
Existing Train Speed (mph)	10
Future Train Speed (mph)	10
Number of Existing Trains in one Direction	2
Number of Future Trains in one Direction	2
Existing Number of Day Trains (7 am to 10 p.m.)	1.25
Future Number of Day Trains (7 am to 10 p.m.)	1.25
Existing Number of Night Trains (10 p.m. to 7 am)	0.75
Future Number of Night Trains (10 p.m. to 7 am)	0.75
Existing Average Number of Cars	15
Future Average Number of Cars	15
Existing Average Number of Locomotives	2
Future Average Number of Locomotives	2

Noise Situation	
Horns Existing and Future	1
Horns in Future Only	2
No Horns Existing and Future	3

Horn Location on Locomotive			
National Average (50% front, 50% middle)			1
All Front Mounted			2
All Middle Mounted			3
User Defined	80	% front mounted horns	4

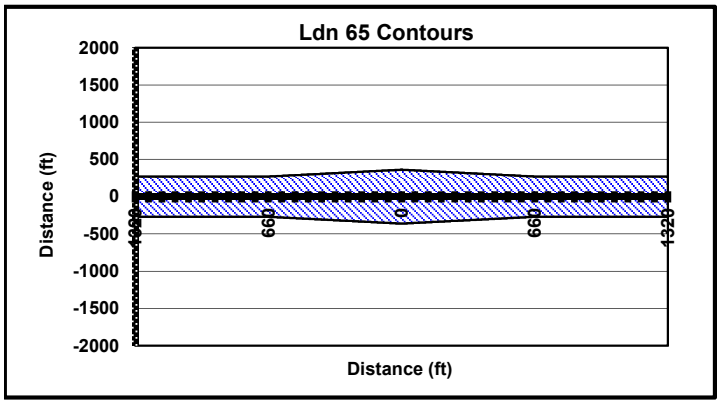
Non Train Noise Environment			
Urban			1
Suburban			2
Rural			3
User Defined Ldn =	50	dBA	4

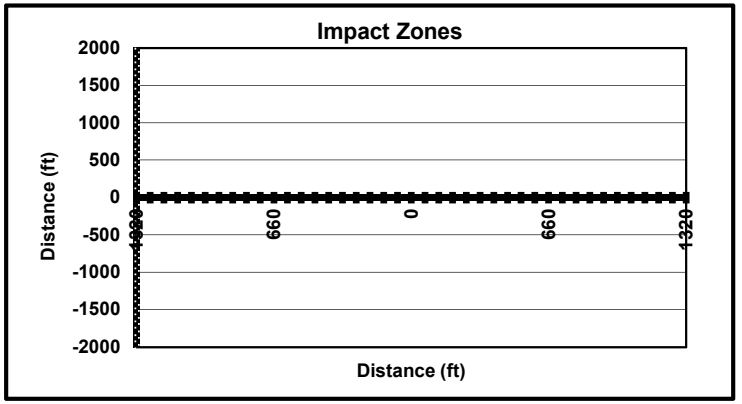
Shielding	
Dense Urban	1
Light Urban	2
Dense Suburban	3
Light Suburban	4
Rural	5
No Shielding	6

Length of Impact Area	
1/4 mile	1
20 seconds	2
15 seconds	3

Ldn 65 Contours Numeric Output (in feet)	
Existing 65 Ldn Contour at X-ing	361
Future 65 Ldn Contour at X-ing	361
Existing 65 Ldn Contour at 1/2 zone length	269
Future 65 Ldn Contour at 1/2 zone length	269
Zone Length	1320
1/2 Zone Length	660

Impact Zones Numeric Output (in feet)	
Impact Distance at X-ing	0
Severe Impact Distance at X-ing	0
Impact Distance at 1/2 zone length	0
Severe Impact Distance at 1/2 zone length	0
Zone Length	1320
1/2 Zone Length	660





Noise Model Based on Federal Transit Adminstration General Transit Noise Assessmen
Developed for Chicago Create Project

Case: UP Santa Ana Industrial Lead

RESULTS			
Noise Source	**Ldn (dB)**	**Leq - daytime (dB)**	**Leq - nighttime (dB)**
All Sources	65	57	59
Source 1	64	56	58
Source 2	58	49	52
Source 3	0	0	0
Source 4	0	0	0
Source 5	0	0	0
Source 6	0	0	0
Source 7	0	0	0
Source 8	0	0	0

Enter noise receiver land use category below.

LAND USE CATEGORY	
Noise receiver land use category (1, 2 or 3)	2

Enter data for up to 8 noise sources below - see reference list for source numbers.

NOISE SOURCE PARAMETERS						
Parameter	**Source 1**		**Source 2**		**Source 3**	
Source Num.	Freight Locomotive	9	Freight Cars	10		
Distance (source to receiver)	distance (ft)	30	distance (ft)	30		
Daytime Hours	speed (mph)	10	speed (mph)	10		
(7 AM - 10 PM)	trains/hour	0.133	trains/hour	0.133		
	locos/train	2	length of cars (ft) / train	900		
Nighttime Hours	speed (mph)	10	speed (mph)	10		
(10 PM - 7 AM)	trains/hour	0.222	trains/hour	0.222		
	locos/train	2	length of cars (ft) / train	900		
Wheel Flats?		0.00%	% of cars w/ wheel flats	0.00%		
Jointed Track?	Y/N	n	Y/N	n		
Embedded Track?	Y/N	n	Y/N	n		
Aerial Structure?	Y/N	n	Y/N	n		
Barrier Present?	Y/N	n	Y/N	n		
Intervening Rows of of Buildings	number of rows	0	number of rows	0		