NOISE AND VIBRATION TECHNICAL ASSESSMENT

1.0 INTRODUCTION

This study describes the existing noise and vibration environment of the proposed mixed-use development located between 501 and 601 East Compton Blvd. and evaluates the potential noise and vibration impacts of the proposed project pursuant to the California Environmental Quality Act (CEQA). This analysis considers both the temporary noise and vibration impacts that would result from project construction and the long-term impacts associated with the operation of the project.

1.1 Project Location

The site is located in Compton, California in Los Angeles County at 501, 515, 517, 535, 545, 601, 607, and 625 E. Compton Boulevard; 112 N. Willow Avenue; and 107 N. Santa Fe Avenue. The site is bound to the south by E. Compton Boulevard, to the west by N. Spring Avenue, to the north by low- and medium-density residential units, and to the east by N. Santa Fe Avenue. The site is identified by the Assessor's Parcel Numbers (APNs) 6166-022-900, 6166-022-901, 6166-022-902, 6166-022-903, 6166-022-904, 6166-022-905, 6166-023-900, 6166-023-901, 6166-023-902, 6166-023-903, and 6166-023-904.

Regional access to the project site is provided by State Route 91 (Artesia Freeway West) 1.8 miles to the south, Interstate 105 (Glenn Anderson Freeway East) 2.4 miles to the north, Interstate 110 (Harbor Freeway South) 3.9 miles to the west, and Interstate 710 (Long Beach Freeway South) 1.7 miles to the east. Major arterials that provide access to the project site include E. Compton Boulevard directly to the south, Santa Fe Avenue directly east, and Alameda Street to the west.

Transit facilities operated by the Los Angeles County Metropolitan Transportation Authority (Metro) in the vicinity of the project site include the Compton & Willow bus stop for Metro Bus Lines 60, 125, 127, and 128 located 0.04 mile from the site. Along Compton Boulevard between Alameda Street and Santa Fe Avenue, there are three bus stops in the westbound direction and three bus stops in the eastbound direction. In addition, there is a bus stop in the northbound direction along Santa Fe Avenue north of Compton Boulevard. In addition to bus service, the project site is located approximately 0.42 miles from the Metro A Line (Blue) Compton Station, which provides light-rail service to Downtown Los Angeles and Downtown Long Beach.

1.2 Project Description

The 501 and 601 Compton Boulevard Development Project (project) is a 93,046 square-foot site comprised of eleven parcels in Compton, California in Los Angeles County. The proposed project is a seven-story, 266,792 square-foot mixed-use development comprised of 7,734 square feet of retail/commercial uses, 300 residential units (including 20 percent affordable units), a pedestrian plaza (Willow Plaza), the Compton Innovation Hub and Creative Studios, and two parking garages with up to 407 spaces. The building would have a maximum height of 85 feet along Compton Boulevard and lower heights on the north side of the project.

In addition, the project includes the creation of a public pedestrian plaza by closing Willow Avenue to non-emergency vehicular traffic and reconfiguration of E. Compton Boulevard between Alameda Street East and Santa Fe Avenue, from two lanes in each direction to one lane in each direction. The project also includes streetscape improvements and bicycle parking on-site to encourage pedestrian and bicycle travel. The anticipated floor area ratio (FAR) is 2.86.

The project site currently contains four one-story structures that are vacant and partially demolished. All structures on the site would be demolished proposed as part of the proposed project. The project site also includes vacant land and surface parking.

2.0 ENVIRONMENTAL SETTING

2.1 Fundamentals of Noise and Vibration

Noise

Noise is usually defined as unwanted sound that is an undesirable byproduct of society's normal day-to-day activities. Sound becomes unwanted when it interferes with normal activities, when it causes actual physical harm, and/or when it has adverse effects on health. Noise is measured on a logarithmic scale of sound pressure level known as a decibel (dB). The human ear does not respond uniformly to sounds at all frequencies. For example, the human ear is less sensitive to low and high frequencies than medium frequencies, which more closely correspond with human speech. In response to the sensitivity of the human ear to different frequencies, the A-weighted noise level (or scale), which corresponds better with people's subjective judgment of sound levels, has been developed. This A-weighted sound level, referenced in units of dB(A), is measured on a logarithmic scale such that a doubling of sound energy results in a 3 dB(A) increase in noise level. Typically, changes in a community noise level of less than 3 dB(A) are not noticed by the human ear.[1] Changes from 3 to 5 dB(A) may be noticed by some individuals who are sensitive to changes in noise. A greater than 5 dB(A) increase is readily noticeable, while the human ear perceives a 10 dB(A) increase in sound level to be a doubling of sound.

On the A-weighted scale, the range of human hearing extends from approximately 3 to 140 dB(A). **Table 1, A-Weighted Decibel Scale**, provides examples of A-weighted noise levels from common sources. Noise sources occur in two forms: (1) point sources, such as stationary equipment or individual motor vehicles; and (2) line sources, such as a roadway with a large number of point sources (motor vehicles). Sound generated by a point source typically diminishes (attenuates) at a rate of 6 dB(A) for each doubling of distance from the source to the receptor at acoustically "hard" sites and 7.5 dB(A) at acoustically "soft" sites.[2] For example, if a noise source produces a noise level of 89 dB(A) at a reference distance of 50 feet, the noise level would be 83 dB(A) at a distance of 100 feet from the noise source, 77 dB(A) at a distance of 200 feet, and so on. Noise generated by a mobile source will decrease by approximately 3 dB(A) over hard surfaces and 4.5 dB(A) over soft surfaces for each doubling of distance.

Table 1
A-Weighted Decibel Scale

Typical A-Weighted Sound Levels	Sound Level (dB(A), Leq)
Threshold of Pain	140
Jet Takeoff at 100 Meters	125
Jackhammer at 15 Meters	95

Typical A-Weighted Sound Levels	Sound Level (dB(A), Leq)
Heavy Diesel Truck at 15 Meters	85
Conversation at 1 Meter	60
Soft Whisper at 2 Meters	35

Source: United States Occupational Safety & Health Administration, Noise and Hearing Conservation Technical Manual, 1999.

Sound levels also can be attenuated by man-made or natural barriers (e.g., sound walls, berms, ridges), as well as elevational differences. Noise is most audible when traveling by direct line-of-sight, an interrupted visual path between the noise source and noise receptor. Barriers, such as walls or buildings that break the line-of-sight between the source and the receiver, can greatly reduce noise levels from the source since sound can only reach the receiver by diffraction. Sound barriers can reduce sound levels by up to 20 dB(A) or more. However, if a barrier is not high or long enough to break the line-of-sight from the source to the receiver, its effectiveness is greatly reduced.

Solid walls and berms may reduce noise levels by 5 to 10 dB(A) depending on their height and distance relative to the noise source and the noise receptor.[3] Sound levels may also be attenuated 3 dB(A) by a first row of houses and 1.5 dB(A) for each additional row of houses.[4] The minimum noise attenuation provided by typical structures in California is provided in **Table 2, Building Noise Reduction Factors**.

Table 2
Building Noise Reduction Factors

Building Type	Window Condition	Noise Reduction Due to Exterior of the Structure (dB(A))
All	Open	10
Light Frame	Ordinary Sash (closed)	20
	Storm Windows	25
Masonry	Single Glazed	25
	Double Glazed	35

Source: Federal Highway Administration, Highway Traffic Noise: Analysis and Abatement Guidance. December 2011.

Sound Rating Scales

Various rating scales approximate the human subjective assessment to the "loudness" or "noisiness" of a sound. Noise metrics have been developed to account for additional parameters, such as duration and cumulative effect of multiple events. Noise metrics are categorized as single event metrics and cumulative metrics, as summarized below.

In order to simplify the measurement and computation of sound loudness levels, frequency weighted networks have obtained wide acceptance. The A-weighted scale, discussed above, has become the most prominent of these scales and is widely used in community noise analysis. Its advantages are that it has shown good correlation with community response and is easily measured. The metrics used in this analysis are all based upon the dB(A) scale.

Equivalent Noise Level

Equivalent Noise Level (Leq) is the sound level corresponding to a steady-state A-weighted sound level containing the same total energy as several single event noise exposure level events during a given sample period. Leq is the "acoustic energy" average noise level during the period of the sample. It is based on the observation that the potential for noise annoyance is dependent on the total acoustical energy content of the noise. The equivalent noise level is expressed in units of dB(A). Leq can be measured for any period, but is typically measured for 15 minutes, 1 hour, or 24 hours. Leq for a 1-hour period is used by the Federal Highway Administration (FHWA) for assessing highway noise impacts. Leq for 1 hour is referred to as the Hourly Noise Level (HNL) in the California Airport Noise Regulations and is used to develop Community Noise Equivalent Level values for aircraft operations. Construction noise levels and ambient noise measurements in this section use the Leq scale.

Community Noise Equivalent Level

Community Noise Equivalent Level (CNEL) is a 24-hour, time-weighted energy average noise level based on the A-weighted decibel. It is a measure of the overall noise experienced during an entire day. The term "time-weighted" refers to the penalties attached to noise events occurring during certain sensitive periods. In the CNEL scale, 5 dB are added to measured noise levels occurring between the hours of 7:00 p.m. and 10:00 p.m. For measured noise levels occurring between the hours of 10:00 p.m. and 7:00 a.m., 10 dB are added. These decibel adjustments are an attempt to account for the higher sensitivity to noise in the evening and nighttime hours and the expected lower ambient noise levels during these periods. Existing and projected future traffic noise levels in this section use the CNEL scale.

Day-Night Average Noise Level

The day-night average sound level (Ldn) is another average noise level over a 24-hour period. Noise levels occurring between the hours of 10:00 p.m. and 7:00 a.m. are increased by 10 decibels (dB). This noise is weighted to take into account the decrease in community background noise of 10 dB(A) during this period. Noise levels measured using the Ldn scale are typically similar to CNEL measurements.

Adverse Effects of Noise Exposure

Noise is known to have several adverse effects on humans, which has led to laws and standards being set to protect public health and safety, and to ensure compatibility between land uses and activities. Adverse effects of noise on people include hearing loss, communication interference, sleep interference, physiological responses, and annoyance. Each of these potential noise impacts on people is briefly discussed in the following narrative.

Hearing Loss

Hearing loss is generally not a community noise concern, even near a major airport or a major freeway. The potential for noise-induced hearing loss is more commonly associated with occupational noise exposures in heavy industry, very noisy work environments with long-term exposure, or certain very loud recreational activities (e.g., target shooting and motorcycle or car racing). The Occupational Safety and Health Administration (OSHA) identifies a noise exposure limit of 90 dB(A) for 8 hours per day to protect from hearing loss (higher limits are allowed for shorter duration exposures). Noise levels in neighborhoods, even in very noisy neighborhoods, are not sufficiently loud enough to cause hearing loss.

Communication Interference

Communication interference is one of the primary concerns in environmental noise. Communication interference includes speech disturbance and intrusion with activities such as watching television. Noise can also interfere with communications such as within school classrooms. Normal conversational speech is in the range of 60 to 65 dB(A) and any noise in this range or louder may interfere with speech.

Sleep Interference

Noise can make it difficult to fall asleep, create momentary disturbances of natural sleep patterns by causing shifts from deep to lighter stages, and cause awakening. Noise may even cause awakening that a person may or may not be able to recall.

Physiological Responses

Physiological responses are those measurable effects of noise on people that are realized as changes in pulse rate, blood pressure, and other physical changes. Studies to determine whether exposure to high noise levels can adversely affect human health have concluded that, while a relationship between noise and health effects seems plausible, there is no empirical evidence of the relationship.

Annoyance

Annoyance is an individual characteristic and can vary widely from person to person. Noise that one person considers tolerable can be unbearable to another of equal hearing capability. The level of annoyance depends both on the characteristics of the noise (including loudness, frequency, time, and duration), and how much activity interference (such as speech interference and sleep interference) results from the noise. However, the level of annoyance is also a function of the attitude of the receiver. Personal sensitivity to noise varies widely. It has been estimated that 2% to 10% of the population is highly susceptible to annoyance from any noise not of their own making, while approximately 20% are unaffected by noise.[5] Attitudes may also be affected by the relationship between the person affected and the source of noise, and whether attempts have been made to abate the noise.

Vibration

Vibration consists of waves transmitted through solid material. Groundborne vibration propagates from a source through the ground to adjacent buildings by surface waves. Vibration may comprise a single pulse, a series of pulses, or a continuous oscillatory motion. The frequency of a vibrating object describes how rapidly it is oscillating and is measured in hertz (Hz). Most environmental vibrations consist of a composite, or "spectrum" of many frequencies, and are generally classified as broadband or random vibrations. The normal frequency range of most groundborne vibration that can be felt generally starts from a low frequency of less than one Hz to a high of about 200 Hz. Vibration is often measured in terms of the peak particle velocity (PPV) in inches per second (in/sec) when considering impacts on buildings or other structures, as PPV represents the maximum instantaneous peak of vibration that can stress buildings. Because it is a representation of acute vibration, PPV is often used to measure the temporary impacts of short-term construction activities that could instantaneously damage built structures. Vibration is often also measured by the Root Mean Squared (RMS) because it best correlates with human perception and response. Specifically, RMS represents "smoothed" vibration levels over an extended period of time and is often used to gauge the long-term chronic impact of a project's operation on the adjacent environment. RMS amplitude is the average of a signal's squared amplitude. It is most commonly measured in decibel notation (VdB).

Vibration energy attenuates as it travels through the ground, causing the vibration amplitude to decrease with distance away from the source. High frequency vibrations reduce much more rapidly than low frequencies, so that in the far-field from a source, the low frequencies tend to dominate. Soil properties also affect the propagation of vibration. When groundborne vibration interacts with a building, there is usually a ground-to-foundation coupling loss (i.e., the foundation of the structure does not move in sync with the ground vibration), but the vibration can also be amplified by the structural resonances of the walls and floors. Vibration in buildings is typically perceived as rattling of windows or items on shelves, or the motion of building surfaces. At high levels, vibration can result in damage to structures.

Manmade groundborne vibration is generally limited to areas within a few hundred feet of certain types of construction activities, especially pile driving. Road vehicles rarely create enough groundborne vibration to be perceptible to humans unless the road surface is poorly maintained and there are potholes or bumps. If traffic induces perceptible vibration in buildings, such as window rattling or shaking of small loose items (typically caused by heavy trucks in passing), then it is most likely an effect of low-frequency airborne noise or ground characteristics. Human annoyance by vibration is related to the number and duration of events. The more events or the greater the duration, the more annoying it will be to humans.

2.2 Noise Sensitive Receptors

Noise-sensitive land uses are generally considered to include those uses where noise exposure could result in health-related risks to individuals, as well as places where quiet is an essential element of their intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels. Additional land uses such as natural parks and recreation areas, historic sites, and cemeteries are considered sensitive to increases in exterior noise levels. Schools, churches, hotels, libraries, and other places where low interior noise levels are essential are also considered noise-sensitive land uses. Noise-sensitive receptors surrounding the project site include residential uses to the north of the project site, the Kingdom Hall of Jehovah's Witnesses to the east of the project across Santa Fe Avenue, Lifeline Education Charter School south of the project area along Santa Fe Avenue, and residential uses south of the project across Compton Boulevard.

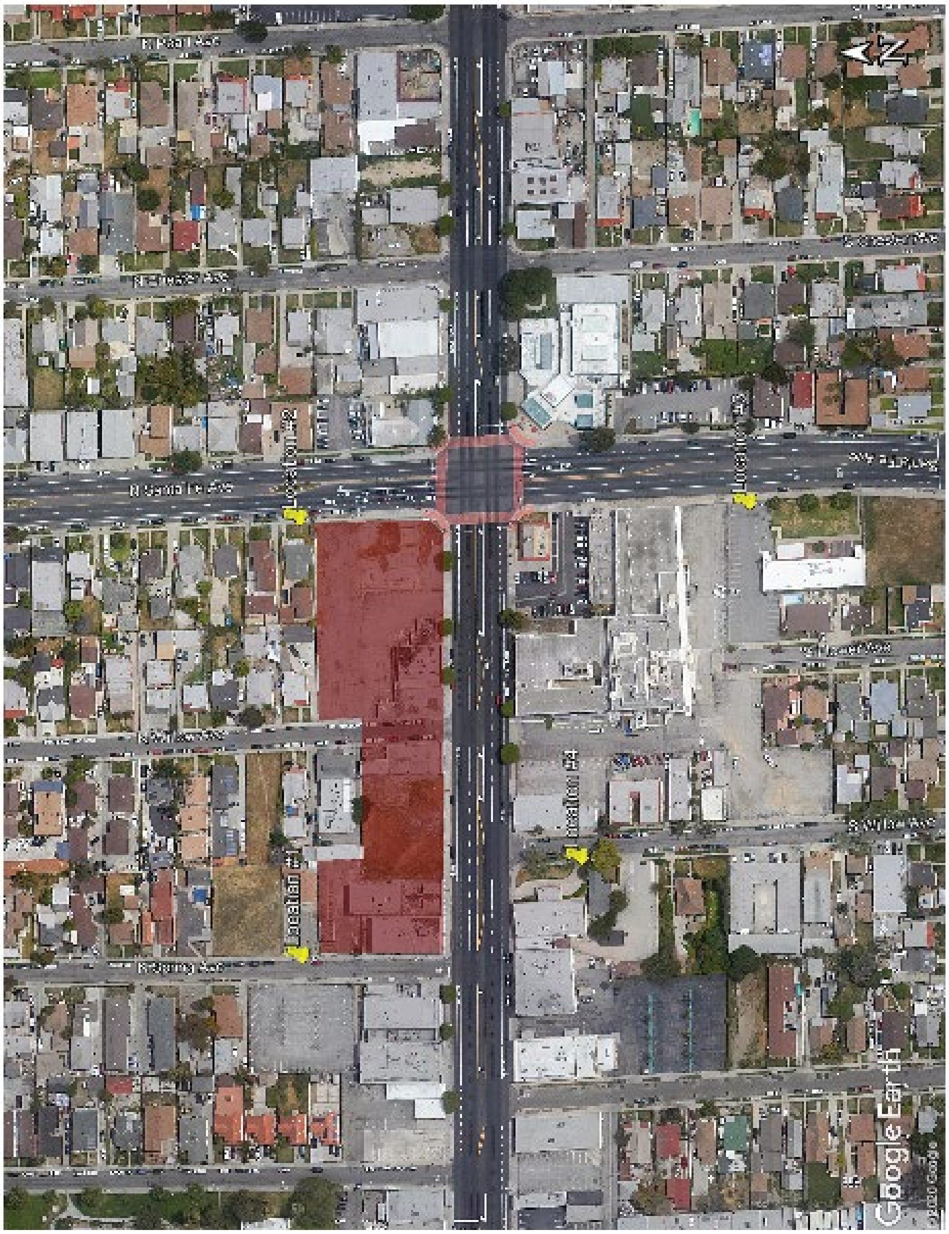
2.3 Existing Conditions

A noise monitoring survey was completed to establish existing noise levels in the City of Compton at locations near the project site. Transportation noise is the main source of noise in urban environments, largely from the operation of internal combustion engines and frictional contact between vehicles and ground and air.[6] It should be noted that due to the ongoing Coronavirus pandemic, traffic conditions are likely lower than usual. Therefore, noise measurements that were conducted in October 2020 are likely lower than pre-pandemic conditions and therefore conservative measurements for the existing noise environment. **Figure 1, Noise Monitoring Locations** maps the noise measurement locations relative to the project site. The existing average daily noise levels are presented in **Table 3, Ambient Sound-Level Readings**.

Table 3
Ambient Sound-Level Readings

Noise Measurement Location #	Date/Time	dBA Leq
1. Residence – Spring Avenue	10/14/2020; 8:03 a.m.	58.3
2. Residence – Santa Fe Avenue	10/14/2020; 8:33 a.m.	63.5
3. Lifeline Education Charter School	10/14/2020; 8:54 a.m.	66.8
4. Residence – Willow Avenue	10/14/2020; 9:16 a.m.	56.7

The only sources of groundborne vibration in the project site vicinity are heavy-duty vehicles (e.g., refuse trucks, delivery trucks, and school buses) traveling on local roadways. Trucks and buses typically generate groundborne vibration velocity levels of around 63 VdB, and these levels could reach 72 VdB where trucks and buses pass over bumps in the road.[7] In terms of PPV levels, a heavy-duty vehicle traveling at a distance of 50 feet can result in a vibration level of approximately 0.001 inch per second.



SOURCE: Google Earth, 2020

FIGURE 1

Noise Monitoring Locations

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3.0 REGULATORY FRAMEWORK

3.1 State Regulations

Title 24, California Code of Regulations

The California Noise Insulation Standards of 1988 (California Code of Regulations Title 24, Section 3501 et seq.) require that interior noise levels from the exterior sources not exceed 45 dB(A) Ldn/community noise equivalent level (CNEL)[8] in any habitable room of a multi-residential use facility (e.g., hotels, motels, dormitories, long-term care facilities, and apartment houses and other dwellings, except detached single-family dwellings) with doors and windows closed. Where exterior noise levels exceed 60 dB(A) CNEL/Ldn, an acoustical analysis is required to show that the building construction achieves an interior noise level of 45 dB(A) CNEL/Ldn or less.

3.2 Local

City of Compton General Plan

The City of Compton's 2030 General Plan Noise Element includes a series of goals and polices to achieve and maintain noise levels compatible with various types of land uses. Goals and policies relevant to the proposed project include:

Goal 1 Enforce transportation-related noise regulations.

Policy 1.4 The City of Compton will impose traffic restrictions to reduce transportation noise.

Goal 2 Incorporate noise considerations into land use planning decisions.

Policy 2.2 The City of Compton will review the site plan, building orientation, design, and interior layout of proposals for new development in noisy environments for solutions that lessen noise intrusion.

Policy 2.3 The City of Compton will require that mixed-use structures provide sufficient noise and vibration mitigation for the residential uses through noise-reducing design and materials.

Goal 3 Control non-transportation noise impacts.

Policy 3.1 The City of Compton will enforce the State standard of 65 dbA for exterior noise levels for all commercial uses.

Policy 3.3 The City of Compton will require sound attenuation devices on construction equipment.

City of Compton Municipal Code

Chapter 7-12, Noise, of the Compton Municipal Code (CMC) establishes regulations and standards regarding the generation of noise. Ambient base noise level standards for various zones in the City are set forth in **Table 4, Land Use Compatibility for Community Noise Environments**.

Section 7-12.11 of the CMC prohibits the use or operation of any machinery, equipment, pump, fan, air condition apparatus or other similar mechanical devices from exceeding the ambient noise level at the property line of any property by more than 5 dBA.

Under Section 7-12.22 of the CMC, construction activities (including operation of any tools, equipment, impact devices, derricks or hoists used in construction, drilling, repair, alteration, demolition or earthwork) may only occur between the hours of 7:00 A.M. and 8:00 P.M. on weekdays and Saturday. No construction activities are permitted outside of these hours except with express written permission from a City Building Official.

Table 4
Land Use Compatibility for Community Noise Environments

Land Use Category	Community Noise Exposure (dB, Ldn or CNEL)						
		55	60	65	70	75	80
Residential - Single-Family, Duplex, Multiple-family	Clearly Compatible	Clearly Compatible	Normally Compatible	Normally Compatible	Conditionally Acceptable	Normally Incompatible	Normally Incompatible
Residential – Mobile Homes, Mixed-use	Clearly Compatible	Clearly Compatible	Normally Compatible	Conditionally Acceptable	Conditionally Acceptable	Normally Incompatible	Normally Incompatible
Commercial – Hotel, Motel, Other Lodging	Clearly Compatible	Clearly Compatible	Normally Compatible	Normally Compatible	Conditionally Acceptable	Conditionally Acceptable	Normally Incompatible
Commercial – General Commercial, Retail	Clearly Compatible	Clearly Compatible	Clearly Compatible	Clearly Compatible	Normally Compatible	Normally Compatible	Conditionally Acceptable
Commercial - Office	Clearly Compatible	Clearly Compatible	Clearly Compatible	Normally Compatible	Normally Compatible	Conditionally Acceptable	Normally Incompatible
Industrial – Business Park, Research & Development	Clearly Compatible	Clearly Compatible	Clearly Compatible	Normally Compatible	Normally Compatible	Conditionally Acceptable	Normally Incompatible
Industrial – Manufacturing, Warehousing	Clearly Compatible	Clearly Compatible	Clearly Compatible	Clearly Compatible	Normally Compatible	Normally Compatible	Normally Compatible
Institutional – Hospitals, Schools, Libraries	Clearly Compatible	Clearly Compatible	Normally Compatible	Conditionally Acceptable	Conditionally Acceptable	Normally Incompatible	Normally Incompatible
Institutional – Churches, Civic Uses	Clearly Compatible	Clearly Compatible	Clearly Compatible	Clearly Compatible	Normally Compatible	Conditionally Acceptable	Conditionally Acceptable
Recreation and Open Space – Public Parks	Clearly Compatible	Clearly Compatible	Clearly Compatible	Normally Compatible	Conditionally Acceptable	Normally Incompatible	Normally Incompatible
Recreation and Open Space – Golf Course, Natural Habitat, Commercial Recreation	Clearly Compatible	Clearly Compatible	Clearly Compatible	Normally Compatible	Normally Compatible	Conditionally Acceptable	Conditionally Acceptable

Clearly Compatible - Ambient noise levels are not significant enough to require special construction and/or noise mitigation.

Normally Compatible - Most land uses will not be affected by ambient noise. Some form of design measures and/or mitigation may be required for noise sensitive land uses.

Conditionally Acceptable - Noise sensitive land uses should not be located in these areas unless mitigation is employed to reduce interior noise levels.

Normally Incompatible - Noise sensitive land uses should not be located in these areas due to excessive and continuous high ambient noise.

**Please note that these guidelines are general and may not apply to specific sites.*
Source: California General Plan Guidelines. City of Compton General Plan Noise Element.

4.0 NOISE ANALYSIS

4.1 Thresholds of Significance

The impacts of the proposed project related to noise would be considered significant if they would exceed any of the following Standards of Significance, in accordance with Appendix G of the *California Environmental Quality Act (CEQA) Guidelines*:

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

4.2 Methodology

Noise levels associated with on-site construction activities were modeled pursuant to the ISO 9613-2 (1996) methodology using the SoundPLAN Essential model (version 5.1). This software package considers reference equipment noise levels, noise management techniques, distance to receptors, and any attenuating features to predict noise levels from sources like construction equipment. The distance from construction equipment noise sources (e.g., engines and tailpipes) assume that vehicles would not be capable of operating directly where the project's property line abuts adjacent structures. These vehicles would retain some setback to preserve maneuverability, in addition to operating at reduced power and intensity to maintain precision at these locations.

The project's off-site construction noise impact from haul trucks was analyzed by considering the project's estimated haul truck usage with existing traffic and roadway noise levels along the project's anticipated haul route. Because it takes a doubling of traffic volumes on a roadway to generate the increased sound energy it takes to elevate ambient noise levels by 3 dBA,[9] the analysis focused on whether truck traffic would double traffic volumes on key roadways to be used for hauling soils to and/or from the project site during construction activities. Because haul trucks generate more noise than traditional passenger vehicles, a 19.1 passenger car equivalency (PCE) was used to convert haul truck trips to a reference level conversion to an equivalent number of passenger vehicles.[10] It should be noted that because an official haul route has not been approved as of the preparation of this analysis, assumptions were made about logical routes that would minimize haul truck traffic on local streets in favor of major arterials that can access regional-serving freeways.

Similarly, off-site noise impacts from vendors and employees that access the construction site were also analyzed. The analysis focused on whether truck traffic would double traffic volumes on key roadways to be used for hauling soils during construction activities.

For operational noise impacts, the City's noise ordinance generally limits the generation of noise that exceeds the actual measured existing ambient noise level by 5 dB(A) at neighboring properties. Therefore, increases in 5dB(A) above ambient noise levels are considered significant, unless mitigated.

Traffic noise in the project area was estimated using average daily traffic volumes obtained in the traffic study done for the project. Traffic noise was compared to the existing traffic volumes to get a percentage of increase due to the project.

Construction vibration damage criteria are assessed based on structural category (e.g. reinforced-concrete, steel, or timber). FTA guidelines consider 0.2 inch/sec PPV to be the significant impact level for non-engineered timber and masonry buildings. Structures or buildings constructed of reinforced concrete, steel, or timber have a vibration damage criterion of 0.5 inch/sec PPV pursuant to FTA guidelines.[11] The FTA Guidelines include a table showing the vibration damage criteria based on structural category and is presented below in **Table 5, Construction Vibration Damage Criteria.**

Table 5
Construction Vibration Damage Criteria

Building/Structural 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: Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual. September 2018.

4.3 Project Impacts and Mitigation Measures

Impact 1 **Would the proposed project result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project site in**

excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies? ***(Less than Significant with Mitigation).***

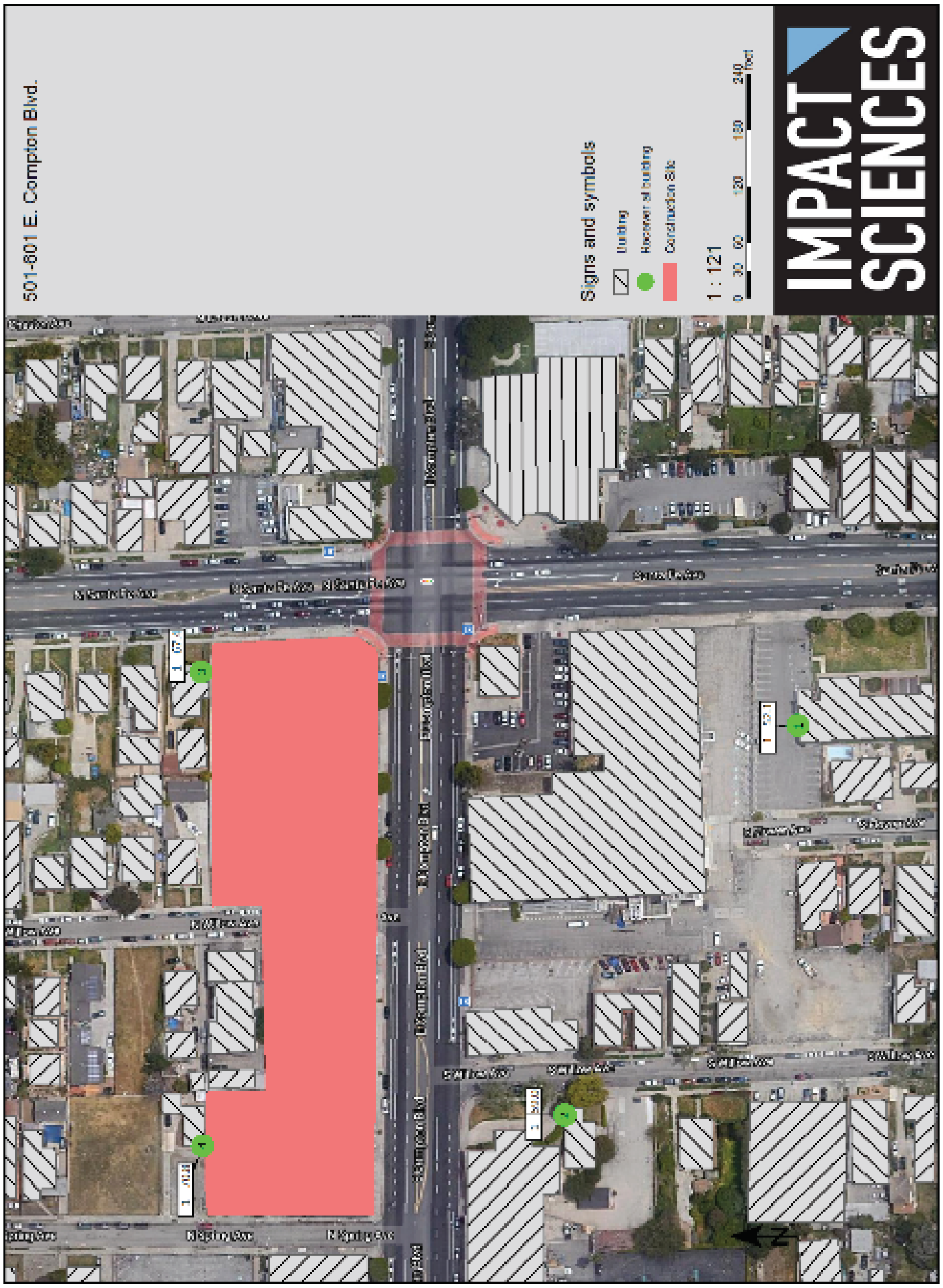
Construction Impacts

Temporary On-Site Construction Activity Noise

Noise levels would generally peak during demolition and grading phases, when diesel-fueled heavy-duty equipment like excavators and dozers are needed to move large amounts of debris or dirt. This equipment is mobile in nature and does not always operate at in a steady-state mode full load, but rather powers up and down depending on the duty cycle needed to conduct work. As such, equipment is occasionally idle during which time no noise is generated by that equipment. Equipment will often operate away from off-site receptors, as mobile equipment generally does not operate continuously in one place.

During other phases of construction (e.g., site preparation, paving, building construction), noise impacts are generally lesser than during demolition and grading because they are less reliant on using heavy equipment with internal combustion engines. Smaller equipment such as forklifts, generators, and various powered hand tools and pneumatic equipment would generally be utilized. Off-site secondary noises would be generated by construction worker vehicles, vendor deliveries, and haul trucks.

As shown on **Table 6, Construction Noise Impacts at Off-Site Sensitive Receptors (without Mitigation),** when considering ambient noise levels, the use of multiple pieces of powered equipment simultaneously could increase noise by up to approximately 12.7 dBA L_{eq} at the closest residences on Spring Avenue adjacent to the project site and an increase of up to approximately 5.4 dBA at the residences along Santa Fe Avenue. **Figure 2, Construction Noise Levels without Mitigation** and **Figure 3, Construction Noise Propagation without Mitigation** illustrate construction noise levels at sensitive receptors and how construction noise propagates from the project site prior to mitigation. These estimated construction noise levels would exceed the City's significance threshold of 5 dBA. However, **Mitigation Measure NOISE-1** requires the use of temporary sound barriers along the northern property lines during the project's construction phase and would reduce the project's construction noise levels to below the City's significance threshold. Therefore, with mitigation, the project's on-site construction noise impact would be less than significant.



SOURCE: Impact Sciences, 2020

FIGURE 2

Construction Noise Levels without Mitigation

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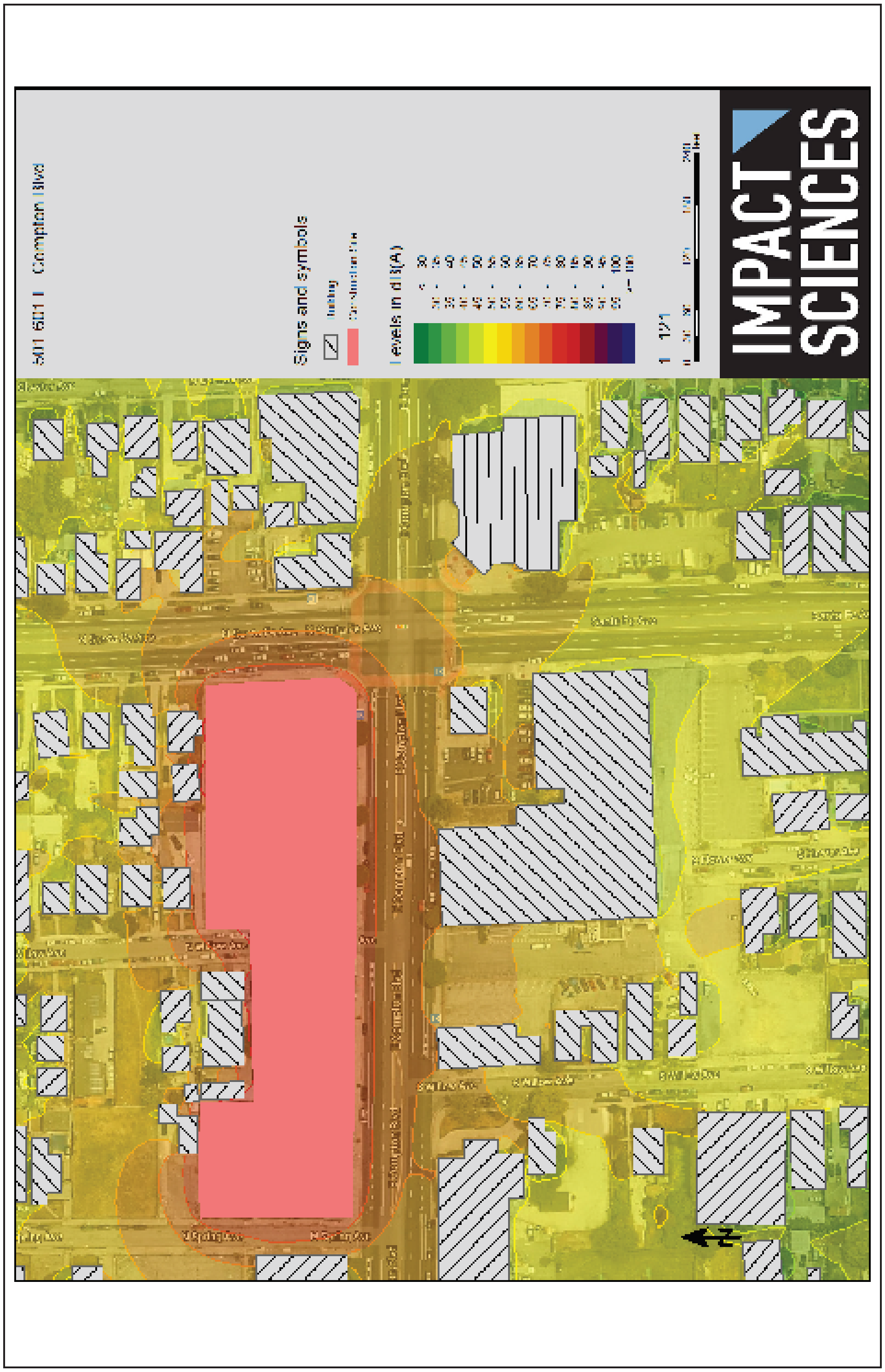

SOURCE: Impact Sciences, 2020

FIGURE 3

Construction Noise Propagation without Mitigation

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Table 6
Construction Noise Impacts at Off-Site Sensitive Receptors (without Mitigation)

Receptor	Maximum Construction Noise Level (dBA L_{eq})	Existing Ambient Noise Level (dBA L_{eq})	New Ambient Noise Level (dBA L_{eq})	Increase(dBA L_{eq})	Potentially Significant?
1. Residence – Spring Avenue	70.8	58.3	71.09	12.7	Yes
2. Residence – Santa Fe Avenue	67.4	63.5	68.9	5.4	Yes
3. Lifeline Education Charter School	52.1	66.8	66.9	0.1	No
4. Residence – Willow Avenue	59.0	56.7	61.0	4.3	No

Source: Impact Sciences, 2020.

Mitigation Measure:

MM-NOISE-1: During the construction of the proposed project, temporary noise barriers shall be installed along the northern perimeter of the project site. The barrier shall consist of K-rail with one-inch plywood fencing on top, at least 3 meters (9.8 feet in height) and not have any gaps or holes between the panels or at the bottom. The supporting structure shall be engineered and erected in order to comply with Compton Municipal Code noise requirements. This specification shall be included on the project construction documents.

As shown in **Table 7, Construction Impacts at Off-Site Sensitive Receptors (with Mitigation)**, implementation of Mitigation Measure NOISE-1 would reduce noise exposure of sensitive receptors below a 5 dBA Leq incremental increase. As a result, construction noise impacts would be considered less than significant with mitigation. **Figure 4, Construction Noise Levels with Mitigation** and **Figure 5, Construction Noise Propagation with Mitigation** illustrate construction noise levels at sensitive receptors and how construction noise propagates from the project site with mitigation.

Table 7
Construction Noise Impacts at Off-Site Sensitive Receptors (with Mitigation)

Receptor	Maximum Construction Noise Level (dBA L_{eq})	Existing Ambient Noise Level (dBA L_{eq})	New Ambient Noise Level (dBA L_{eq})	Increase(dBA L_{eq})	Potentially Significant?
1. Residence – Spring Avenue	61.3	58.3	63.1	4.8	No
2. Residence – Santa Fe Avenue	58.6	63.5	64.7	1.2	No
3. Lifeline Education Charter School	51.9	66.8	66.9	0.1	No
4. Residence – Willow Avenue	59.0	56.7	61.0	4.3	No

Source: Impact Sciences, 2020.

Temporary Off-Site Construction Activity Noise

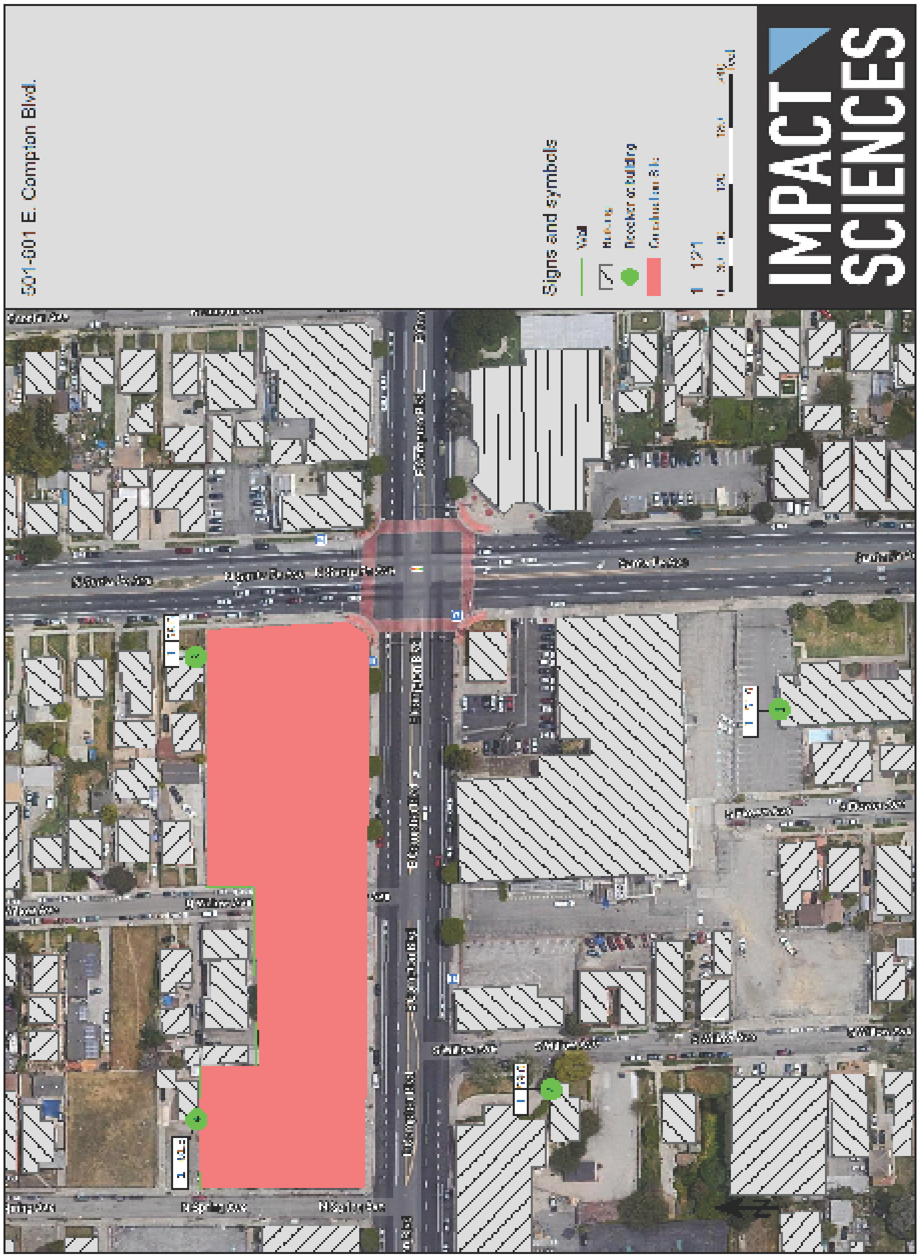
Construction haul trucks would generate noise off-site during site demolition. This would include removal of materials from the project site, base materials, and demolished materials. While this vehicle activity would increase ambient noise levels along the haul route, ambient noise levels would not be expected to significantly increase ambient noise levels by 3 dB(A) or greater at any noise sensitive land use. Studies have shown that a 3 dB(A) increase in sound level pressure is barely detectable by the human ear. A 3 dB(A) increase in roadway noise levels requires an approximate doubling of roadway traffic volume, assuming that travel speeds and fleet mix remain constant.[12] The Traffic Impact Analysis completed for the project shows that the segment on Compton Blvd between Alameda Ave (east) and Santa Fe Ave has a traffic volume of approximately 1,578 vehicles during the A.M. peak hour, and 1,682 vehicles during the P.M. peak hour.[13] The grading period is estimated to have a total of 2,301 hauling trips (including trips to and from the site) over a 185 day period, averaging about 13 trips per day. Because haul trucks generate more noise than traditional passenger vehicles, a 19.1 passenger car equivalency (PCE) was used to convert haul truck trips to a reference level conversion to an equivalent number of passenger vehicles.[14] The addition of 247 PCE trips to local roadways would account for 15.7 percent of the A.M. peak hour traffic volume or 14.7 percent of the P.M. peak hour traffic volume. Since it would take a doubling of roadway traffic volume to increase noise levels by 3 dB(A), the addition of haul trucks from the project would not increase traffic to levels capable of producing 3 dB(A) ambient noise increases and there would be no perceptible increase in noise due to the addition of haul trucks.

Operation Impacts

Operational Traffic Noise

As discussed above, a 3 dB(A) increase in roadway noise levels requires an approximate doubling of roadway traffic volume, assuming that travel speeds and fleet mix remain constant. A 3 dB(A) noise level increase is the minimum noise level increase required for a human to perceive a change in ambient noise.

Traffic volumes in the project area were obtained from the traffic impact analysis prepared for the proposed project. Trip generation information for the proposed project was added to peak hour traffic volumes to determine whether traffic increased enough to result in an audible noise level increase. The Traffic Impact



SOURCE: Impact Sciences, 2020

FIGURE 4

Construction Noise Levels with Mitigation

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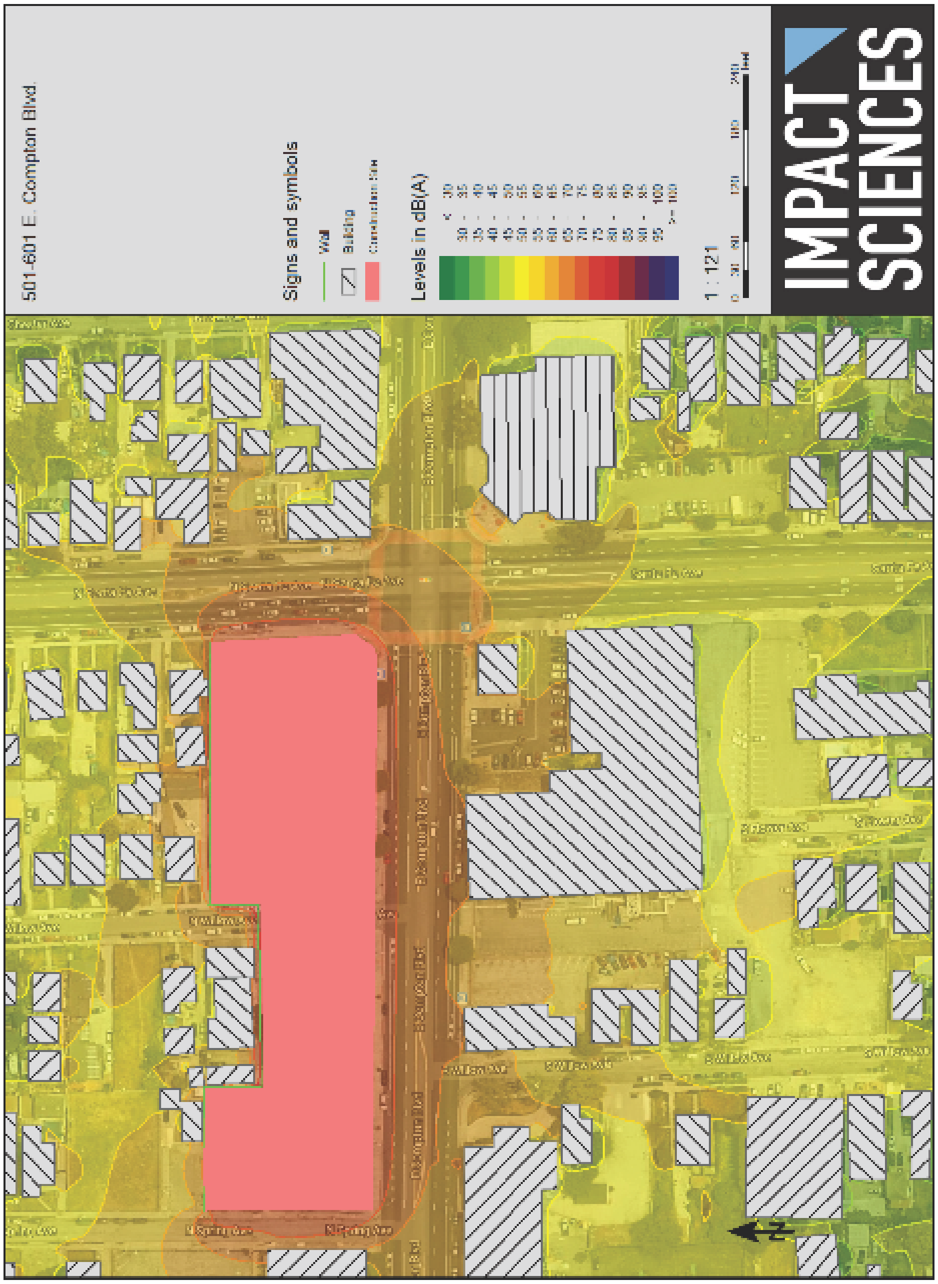

SOURCE: Impact Sciences, 2020

FIGURE 5

Construction Noise Propagation with Mitigation

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Analysis completed for the project shows that the segment on Compton Blvd between Alameda Ave (east) and Santa Fe Ave has a traffic volume of approximately 1,578 vehicles during the A.M. peak hour, and 1,682 vehicles during the P.M. peak hour. For this segment between Alameda Ave and Santa Fe Ave, the traffic study showed that the proposed project would add approximately 44 A.M. peak hour trips and 71 P.M. peak hour trips. The project's addition of approximately 44 A.M. peak hour trips and 71 P.M. peak hour trips would cause an increase of 2.79 percent for the A.M. peak hour and 4.22 percent for the P.M. peak hour traffic volumes. This increase in traffic volumes compared to current traffic counts and is not significant enough to cause an audible noise increase in traffic noise since it takes a doubling of traffic to increase noise levels to a perceptible degree.

Operation Stationary Noise

During project operation, the project would include stationary noises from sources associated with building operations, such as heating, ventilation, and air conditioning (HVAC) systems, as well as vehicle parking. Large ground-level HVAC systems typically generate noise levels between 50 and 65 dB(A) at 50 feet. Rooftop mounted equipment typically produces noise levels of up to approximately 56 dB(A) at 50 feet. The proposed project is anticipated to utilize rooftop mounted HVAC equipment. The nearest receptors would be located approximately 15 feet away. The elevation of this noise source and the presence of a roof edge create an effective noise barrier that reduces noise levels from rooftop HVAC units by 8 dB(A) or more.[15] Therefore noise from the HVAC system would cause a maximum noise level of 58.5 dB(A) Leq. Adding to an existing ambient noise level of 58.3 dB(A) would create a new ambient noise level of approximately 61.4 dB(A). This would result in a maximum noise level increase of approximately 3.1 dB(A) Leq. This is below the threshold of a 5 dB(A) increase in ambient noise levels and would not cause any nearby sensitive land use to exceed the normally acceptable level of noise identified in **Table 4**. Therefore, on-site HVAC noise would result in a less than significant impact.

Parking noise typically generates noise levels of approximately 60 dB(A) at 50 feet. Commercial parking for the proposed project would occur in a small above-grade garage on the first three levels of the building in the northern part of the 601 block of Compton Boulevard. This garage includes 111 parking spaces and is accessed from Santa Fe Avenue. The closest receptors would be residential uses to the north located approximately 20 feet away. Receptors located to the north would experience a noise level increase of approximately 1.6 dB(A) when vehicles enter the garage and are exposed to parking noise from the proposed project. This is below the threshold of a 5 dB(A) increase in ambient noise levels, and would not cause any nearby sensitive land use to exceed the normally acceptable level of noise identified in **Table 4**. Therefore, parking noise would result in a less than significant impact.

Residential parking would be located in a below-grade garage with and therefore would not be anticipated to cause noise impacts on any adjacent sensitive receptors.

Impact 2 **Would the proposed project result in the generation of excessive groundborne vibration or groundborne noise levels? *(Less than Significant)*.**

Construction Activity Vibration

The Federal Transit Administration provides ground-born vibration impact criteria with respect to building damage during construction activities. PPV, expressed in inches per second, is used to measure building vibration damage. Construction vibration damage criteria are assessed based on structural category (e.g. reinforced-concrete, steel, or timber). FTA guidelines consider 0.2 inch/sec PPV to be the significant impact level for non-engineered timber and masonry buildings. Structures or buildings constructed of reinforced concrete, steel, or timber have a vibration damage criterion of 0.5 inch/sec PPV pursuant to FTA guidelines.[16]

Groundborne vibration generated by construction activities associated with the proposed project would affect both on- and off-site sensitive uses located in close proximity to the project site. As shown in **Table 8, Vibration Source Levels for Construction Equipment**, vibration velocities could range from 0.003 to 0.089 inch/sec PPV at 25 feet from the source activity, with corresponding vibration levels (VdB) ranging from 58 VdB to 87 VdB at 25 feet from the source activity, depending on the type of construction equipment in use.

Table 8
Vibration Source Levels for Construction Equipment

	Approximate PPV (in/sec)					Approximate RMS (VdB)				
Equipment	**25 Feet**	**50 Feet**	**60 Feet**	**75 Feet**	**100 Feet**	**25 Feet**	**50 Feet**	**60 Feet**	**75 Feet**	**100 Feet**
Large Bulldozer	0.089	0.031	0.024	0.017	0.011	87	78	76	73	69
Caisson Drilling	0.089	0.031	0.024	0.017	0.011	87	78	76	73	69
Loaded Trucks	0.076	0.027	0.020	0.015	0.010	86	77	75	72	68
Jackhammer	0.035	0.012	0.009	0.007	0.004	79	70	68	65	61
Small Bulldozer	0.003	0.001	0.0008	0.0006	0.0004	58	49	47	44	40

Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual, 2018.

Table 9, Vibration Levels at Off-Site Sensitive Uses from Project Construction - Unmitigated, shows the vibration velocity and levels that would occur at these nearby buildings and structures during construction at the project site. It should be noted that none of these buildings are considered historic and are thus evaluated as non-engineered timber and masonry buildings.

Table 9
Vibration Levels at Off-Site Sensitive Uses from Project Construction - Unmitigated

Sensitive Uses Off-Site	Distance to Project Site (ft.)	Receptor Significance Threshold PPV (in./sec)	Estimated PPV (in/sec) [a]
1. Residence - Spring Ave	15	0.2	0.191
2. Residence – Santa Fe Ave	15	0.2	0.191
3. Lifeline Education Charter School	450	0.2	0.001
4. Residence – Willow Ave	205	0.2	0.003

Source: Impact Sciences, Inc. 2020

The vibration velocities predicted to occur at the nearest receptors located 15 feet from the nearest project site boundary would be 0.191 in/sec PPV. All receptors are considered to be a non-engineered timber or masonry building and would not experience a PPV groundborne vibration level that exceed the FTA 0.2 in/sec PPV threshold. Therefore, vibration impacts associated with building damage due to construction activities would result in a less than significant impact. No mitigation is required.

Impact 3 **For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise? *(Less than Significant).***

Permanent Operational Aircraft Noise

The project site is not in the vicinity of a private airstrip or airport land use plan. However, the project is located approximately 1.15 miles to the northeast of Compton/Woodley Airport. According to the County of Los Angeles Department of Public Works, which oversees Compton/Woodley Airport, in order to mitigate potential negative impacts from aircraft operations and enhance compatibility with the surrounding communities, the Department of Public Works maintains a proactive noise mitigation program with requested VFR flight paths, operational restrictions, and limited activities during certain hours of the day.[17] According to the LA County Department of Public Works, flight patterns north of the airport are prohibited, and therefore would not impact the project. As such, the project would not expose people residing or working in the project area to excessive airport-related noise levels. No impact would occur from the proposed project and no further analysis is required.

ATTACHMENT A

SoundPLAN Output Files

REFERENCES

California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Analysis Protocol*, 2013.

City of Moreno Valley, Moreno Valley WalMart Noise Impact Analysis, Table 901. February 10, 2015

Federal Highway Administration, *Highway Noise Fundamentals*, (1980) 97.

Federal Highway Administration, Highway Traffic Noise: Analysis and Abatement Guidance. December 2011.

Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual, September 2018.

Iteris, Inc. 2020. 501/601 E. Compton Blvd Specific Plan Focused Traffic Impact Analysis.

Wayne County Airport Authority. *Background information on noise & its measurement, 2009.*

World Health Organization. Guidelines for Community Noise, https://www.who.int/docstore/peh/noise /Comnoise-1.pdf, accessed October 15, 2020.

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1 California Department of Transportation, Technical Noise Supplement to the Traffic Noise Analysis Protocol, 2013.

2 Federal Highway Administration, *Highway Noise Fundamentals*, (1980) 97. Examples of "hard" or reflective sites include asphalt, concrete, and hard and sparsely vegetated soils. Examples of acoustically "soft" or absorptive sites include soft, sand, plowed farmland, grass, crops, heavy ground cover, etc.

3 Federal Highway Administration, *Highway Noise Mitigation*, (1980) 18.

4 California Department of Transportation, Technical Noise Supplement to the Traffic Noise Analysis Protocol, 2013.

5 Wayne County Airport Authority. Background information on noise & its measurement, 2009

6 World Health Organization. Guidelines for Community Noise, https://www.who.int/docstore/peh/noise /Comnoise-1.pdf, accessed October 15, 2020.

7 California Department of Transportation, Technical Noise Supplement to the Traffic Noise Analysis Protocol, 2013.

8 Measurements are based on Ldn or CNEL.

9 Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual, September 2018.

10 Caltrans, Technical Noise Supplement Table 3-3, 2013.

11 Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual. September 2018.

12 California Department of Transportation, *Technical Noise Supplement to the Traffic Noise Protocol.* September 2013.

13 Iteris, Inc. 2020. 501/601 E. Compton Blvd Specific Plan Focused Traffic Impact Analysis.

14 Caltrans, Technical Noise Supplement Table 3-3, 2013.

[15] City of Moreno Valley, Moreno Valley WalMart Noise Impact Analysis, Table 901. February 10, 2015

[16] Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual. September 2018.

[17] County of Los Angeles Department of Public Works, Aviation Division. Noise Abatement: Compton/Woodley Airport. Available at: https://dpw.lacounty.gov/avi/airports/ComptonWoodleyNoiseAbatement.aspx