

# 777 North Front Street Project 

> Noise Study
prepared for
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Burbank, California 91502
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## 1 Introduction and Project Summary

### 1.1 Introduction

This study is an analysis of the potential noise impacts of the proposed mixed-use Project (Project) located at 777 North Front Street, on the corner of North Front Street and West Burbank Boulevard in the City of Burbank, California. This report has been prepared by Rincon Consultants, Inc. (Rincon) under contract to the City of Burbank, in support of the environmental documentation being prepared pursuant to the California Environmental Quality Act (CEQA). This study includes noise reduction features from the Environmental Noise Evaluation \& Recommendations Report prepared by SSA Acoustics for the proposed Project on October 24, 2017. The purpose of this study is to expand upon previous findings made by SSA Acoustics and further analyze the Project's noise impacts related to both temporary construction activity and long-term operation of the Project.

### 1.2 Project Summary

## Project Location

The Project site encompasses approximately eight acres. The Project site is an irregularly-shaped parcel and is currently occupied predominately by concrete slabs and an abandoned section of old Front Street. The Project site currently contains mounds of soil and construction materials throughout as a result of its current use as a construction material storage site for the California Department of Transportation (Caltrans) during the Golden State Freeway (Interstate 5, or I-5) project. The Project site is generally bounded by Old Front Street and the l-5 freeway to the northeast, Magnolia Boulevard to the southeast, North Front Street to the southwest, and Burbank Boulevard to the northwest. The Project site is surrounded by primarily commercial and industrial uses to the west and southwest across North Front Street, including the United Water Services treatment facility located approximately 150 feet to the southwest. Commercial development, including Burbank Town Center, restaurants, and other retail uses, are located to the northeast across Burbank Boulevard, east across the l-5 freeway, and south across East Magnolia Boulevard. Existing site conditions are shown in Figure 1. As shown in Figure 1, the privately owned parcel makes up approximately 6.77 acres of the Project site and the City-owned parcel makes up approximately 1.22 acres.

## Project Description

The proposed Project would involve clearing and excavation of the Project site and construction of three multistory buildings: two residential buildings and one building for a hotel. A total of 1,454 onsite parking spaces would also be developed as part of the Project.

The residential component of the Project would include construction of one 279,162 square-foot, seven-story building containing 252 units and one 346,644 square-foot, eight-story building containing 321 units for a total of 573 residential units. In addition, a total of 1,206 parking spaces would be provided for tenants of both residential buildings (including 63 tandem parking spaces). The proposed Project would also include 106,400 square feet of open space, including courtyards, a
pool deck, publicly accessible ground floor plaza, and private balconies. Approximately 87,050 square feet would be common open space, a minimum of approximately 15 percent of which would be landscaped. Associated residential common areas and amenities constructed may include, but would not limited to a rooftop terrace, business center/internet café, coffee bar, demonstration kitchen, billiards room, resident lounge, fitness center with indoor exercise studio, resort-style pools with cabanas, Jacuzzis, public plaza and bike trail access, pet grooming station, pet park, concierge services, and bike storage. Residential courtyards and balconies would be located within the interior sides of the buildings.

The hotel component of the Project would include construction of one 212,250 square-foot, sevenstory building at the southeastern end of the Project site containing 307 hotel rooms and ancillary uses and 327 associated parking spaces (including 20 tandem parking spaces). Associated hotel amenities may include, but would not be limited to 1,800 square feet of restaurant space, café, bar, pool terrace, fitness center, meeting rooms, and lounge. The hotel's ancillary commercial uses would include accessory retail and restaurant uses on the ground floor. In addition, a 1,067-square foot retail gallery would be provided on Front Street near the intersection of Burbank Boulevard that would have 4 total parking spaces. Additional ancillary uses would include public and private recreational spaces consisting of courtyards, residential balconies, and sky terraces at both parking structure roof levels. The proposed Project would include an approximately 27,800 -square foot publicly accessible plaza area on the adjacent City-owned property located to the south of the project site.
The Project would include one subterranean level for parking at the southern half of the project site beneath a portion of the southern residential building and also beneath the hotel. One to two levels of parking would be between grade and the residential units in both residential buildings, as well as a seven-story parking structure between the residential buildings. There would also be a five-story parking structure adjacent to the hotel for hotel parking.
The Project would include bicycle parking spaces for both the residential, retail gallery and the hotel uses. The residential portion would provide 14 short term bicycle parking spaces near the main entrance and 43 long term spaces in the garage. The hotel and retail gallery portion would provide four short term bicycle parking spaces near the main entrance and 12 long term spaces in the garage. The total bicycle parking for the proposed Project would include 73 spaces.

The primary entries for the hotel, retail gallery, and apartments would be provided along Front Street. Loading for the residential units would be provided at two loading areas along the Project site's Front Street frontage lane, and loading for the hotel would be provided via a loading dock located at the northwest corner of the building with access along the fire truck access lane. The Project would include widening Front Street to include a turn lane and a bike lane.

See Figure 1 for the Project site boundary and configuration of the site and Figure 2 for the Project site plan.

Figure 1 Project Site Boundary


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Figure 2 Project Site Plan


## 2 Background and Setting

### 2.1 Fundamentals of Noise and Vibration

## Noise

Noise level (or volume) is generally measured in decibels (dB) using the A-weighted sound pressure level ( dBA ). The A-weighting scale is an adjustment to the actual sound pressure levels to be consistent with that of human hearing response, which is most sensitive to frequencies around 4,000 Hertz (about the highest note on a piano) and less sensitive to low frequencies (below 100 Hertz).

Sound pressure level is measured on a logarithmic scale with the 0 dBA level based on the lowest detectable sound pressure level that people can perceive (an audible sound that is not zero sound pressure level). Based on the logarithmic scale, a doubling of sound energy is equivalent to an increase of 3 dBA , and a sound that is 10 dBA less than the ambient sound level has no effect on ambient noise. Because of the nature of the human ear, a sound must be about 10 dBA greater than the ambient noise level to be judged as twice as loud. In general, a 3 dBA change in the ambient noise level is noticeable, while 1-2 dBA changes generally are not perceived. Quiet suburban areas typically have noise levels in the range of 40-50 dBA, while areas adjacent to arterial streets are typically in the 50-60+ dBA range. Normal conversational levels are usually in the 60-65 dBA range, and ambient noise levels greater than 65 dBA can interrupt conversations.

Noise levels from point sources, such as those from individual pieces of machinery, typically attenuate (or drop off) at a rate of 6 dBA per doubling of distance from the noise source. Noise levels from lightly traveled roads typically attenuate at a rate of about 4.5 dBA per doubling of distance. Noise levels from heavily traveled roads typically attenuate at about 3 dBA per doubling of distance. Noise levels may also be reduced by intervening structures; generally, a single row of buildings between the receptor and the noise source reduces noise levels by about 5 dBA , while a solid wall or berm reduces noise levels by 5 to 10 dBA (Federal Transit Administration [FTA] 2018). The manner in which homes in California are constructed generally provides a reduction of exterior-to-interior noise levels of approximately 20 to 25 dBA with closed windows (FTA 2018).

In addition to the instantaneous measurement of sound levels, the duration of sound is important since sounds that occur over a long period of time are more likely to be an annoyance or cause direct physical damage or environmental stress. One of the most frequently used noise metrics that considers both duration and sound power level is the equivalent noise level (Leq). The Leq is defined as the single steady A-weighted level that is equivalent to the same amount of energy as that contained in the actual fluctuating levels over a period of time (essentially, the average noise level). Typically, Leq is summed over a one-hour period. Lmax is the highest RMS (root mean squared) sound pressure level within the measurement period, and Lmin is the lowest RMS sound pressure level within the measurement period.

The time period in which noise occurs is also important since nighttime noise tends to disturb people more than daytime noise. Community noise is usually measured using Day-Night Average Level (Ldn) that is the 24-hour average noise level with a 10-dBA penalty for noise occurring during nighttime ( $10: 00$ PM to 7:00 AM) hours, or Community Noise Equivalent Level (CNEL) that is the 24-
hour average noise level with a 5 dBA penalty for noise occurring from 7:00 PM to 10:00 PM and a 10 dBA penalty for noise occurring from 10:00 PM to 7:00 AM. Noise levels described by Ldn and CNEL typically do not differ by more than 1 dBA . In practice, CNEL and Ldn are often used interchangeably.

## Vibration

Vibration refers to groundborne noise and perceptible motion. Vibration is a unique form of noise because its energy is carried through buildings, structures, and the ground, whereas noise is simply carried through the air. Thus, vibration is generally felt rather than heard. Some vibration effects can be caused by noise, such as the rattling of windows from passing trucks. This phenomenon is caused by the coupling of the acoustic energy at frequencies that are close to the resonant frequency of the material being vibrated. Typically, groundborne vibration generated by manmade activities attenuates rapidly as distance from the source of the vibration increases. The ground motion caused by vibration is measured as peak particle velocity (PPV) in inches per second and is also referenced as vibration decibels (VdB) in the U.S.

According to the FTA Transit Noise and Vibration Impact Assessment (2018), the background vibration velocity level in residential areas is usually around 50 VdB . The vibration velocity level threshold of perception for humans is approximately 65 VdB . A vibration velocity of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels for many people. Nonetheless, according to the FTA's criteria, buildings where people normally sleep would be impacted by frequent vibration events if vibration velocity levels exceed 72 VdB . In terms of ground-borne vibration impacts on structures, the FTA states that ground-borne vibration levels in excess of 100 VdB can damage fragile buildings, while levels in excess of 95 VdB can damage extremely fragile historic buildings (FTA 2018). Most perceptible indoor vibration is caused by sources within buildings such as operation of mechanical equipment, movement of people, or the slamming of doors. Typical outdoor sources of perceptible groundborne vibration are construction equipment, steel wheeled trains, and traffic on rough roads.

### 2.2 Sensitive Receptors

Noise exposure goals for various types of land uses reflect the varying noise sensitivities associated with those uses. According to the Burbank2035 General Plan Noise Element, residential areas, hospitals, convalescent and day care facilities, schools, and libraries are considered noise-sensitive uses (Burbank2035 2013). The Project site is surrounded by industrial and commercial uses. The nearest noise-sensitive uses to the Project site are single-family residences located approximately 875 feet northwest of the Project site across the I-5, Burbank High School located approximately 1,320 feet ( 0.25 mile) northeast of the Project site, and single-family residences approximately 1,740 ( 0.33 mile) west of the Project site along West Burbank Boulevard. In addition, the Project would include residences, open space areas, and a hotel that would be considered new noisesensitive receptors on the Project site.

### 2.3 Existing Project Area Noise Levels

The most common and primary existing sources of noise in the Project site vicinity are motor vehicles (i.e., automobiles, trucks, and buses) on North Front Street, West Burbank Boulevard, and the l-5. Motor vehicle noise is of concern because it is characterized by a high number of individual
events that often create a sustained noise level, and its proximity to noise sensitive uses. Additional sources of noise in the Project site vicinity include activities associated with the adjacent Metrolink station (Downtown Burbank Station) and railroad line (i.e., passing commuter trains and train horns), and aircraft noise from overhead flights associated with the Hollywood-Burbank Airport located approximately two miles northwest of the Project site.

Two on-site continuous 24 -hour noise measurements were conducted by SSA Acoustics on March 23 and March 24, 2017, as part of their Environmental Noise Evaluation \& Recommendations Report (2017) for the Project to determine the ambient daily noise exposure levels of future structures at the Project site. Based on measured noise levels, the ambient daily noise level at uses with direct exposure to Front Street and the l-5 would be 76 dBA Ldn and 81 dBA Ldn, respectively (SSA Acoustics 2017).

In order to determine existing peak hour noise levels on the Project site and at adjacent noisesensitive receptors, six additional peak hour weekday afternoon 10-minute noise measurements (Leq[10] dBA) were taken by Rincon using an ANSI Type II integrating sound level meter on January 30, 2018. Figure 3 shows the location of noise measurements in the Project area. Measurements 3, 4, and 5 were taken at the southeastern, center, and northwestern portions of the Project site, respectively. As shown in Table 1, the measured Leq[10] dBA levels on the Project site range from approximately 67 to 70 dBA Leq.

Table 1 Project Noise Monitoring Results - PM Peak Hour

| Measurement Number | Measurement Location | Sample <br> Times | Primary Noise Source, Distance to Centerline | $\begin{aligned} & \text { Leq[10] } \\ & (\mathrm{dBA})^{1} \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: |
| 1 | West Burbank Boulevard adjacent to single-family residences west of the Project site | $\begin{aligned} & \text { 4:13 PM - } \\ & \text { 4:23 PM } \end{aligned}$ | West Burbank Boulevard, 40 feet | 66.7 |
| 2 | $3^{\text {rd }}$ Street adjacent to Burbank High School northeast of the Project site | $\begin{aligned} & \text { 4:38 PM - } \\ & 4: 48 \text { PM } \end{aligned}$ | $3^{\text {rd }}$ Street, 35 feet | 66.2 |
| 3 | On-site at the southeastern portion of the Project site | $\begin{aligned} & \text { 5:03 PM - } \\ & \text { 5:13 PM } \end{aligned}$ | $\begin{aligned} & \text { I-5, } \\ & 165 \text { feet } \end{aligned}$ | 70.0 |
| 4 | On-site at the center portion of the Project site | $\begin{aligned} & \text { 5:28 PM - } \\ & \text { 5:38 PM } \end{aligned}$ | North Front Street, 50 feet | $69.5{ }^{2}$ |
| 5 | On-site at the northwestern portion of the Project site | $\begin{aligned} & \text { 5:43 PM - } \\ & \text { 5:53 PM } \end{aligned}$ | $\begin{aligned} & \text { I-5, } \\ & 275 \text { feet } \end{aligned}$ | 66.9 |
| 6 | Scott Road adjacent to single-family residences northwest of the Project site | $\begin{aligned} & \text { 6:09 PM - } \\ & \text { 6:19 PM } \end{aligned}$ | $\begin{aligned} & \mathrm{I}-5 \\ & 150 \text { feet } \end{aligned}$ | 70.0 |
| See Appendix A for noise monitoring data. See Figure 3 for a map of Noise Measurement Locations. |  |  |  |  |
| ${ }^{1}$ The equivalent noise level (Leq) is defined as the single steady A-weighted level that is equivalent to the same amount of energy as that contained in the actual fluctuating levels over a period of time (essentially, the average noise level). For this measurement, the Leq was over a 10-minute period (Leq[10]). |  |  |  |  |
| ${ }^{2}$ This noise measurement also captured a passing Metrolink commuter train departing from the Burbank Station at approximately 5:28 PM. |  |  |  |  |
| Source: Rincon Consultants, field measurements on January 30, 2018 field using ANSI Type II Integrating sound level meter |  |  |  |  |

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Figure 3 Noise Measurement and Sensitive Receptor Locations


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## Regulatory Setting

## Burbank 2035 General Plan Noise Element

The Noise Element of the Burbank2035 General Plan is intended to identify sources of noise and provide goals, objectives, and policies that ensure that noise from various sources, including transportation and stationary sources, does not create an unacceptable noise environment. As shown in Table 2, the City has adopted land use compatibility standards for use in assessing the compatibility of various land use types that are exposed to noise levels generated by transportation sources (e.g., traffic, railroad operations, and aircraft). According to the City's standards shown in Table 2, ambient noise up to 65 dBA CNEL/Ldn is normally acceptable for mixed-use multi-family residential development and transient lodging land uses, while ambient noise up to 70 dBA CNEL/Ldn is normally acceptable for neighborhood parks. These standards also establish maximum interior noise levels for new residential development, requiring that enough insulation be provided to reduce interior ambient noise levels to 45 dBA CNEL/Ldn (Burbank2035 2013).

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Table 2 Maximum Allowable Noise Exposure - Transportation Sources

| Land Use Category | Exterior Normally Acceptable ${ }^{1}$ <br> (dBA CNEL/Ldn) | Exterior Possibly Acceptable ${ }^{2}$ <br> (dBA CNEL/Ldn) | Exterior Normally Unacceptable ${ }^{3}$ (dBA CNEL/Ldn) | Interior <br> Acceptable ${ }^{4}$ <br> (dBA CNEL/Ldn <br> except where <br> noted) |
| :---: | :---: | :---: | :---: | :---: |
| Residential, single-family | Up to 60 | 61-70 | 71 and higher | 45 |
| Residential, multi-family | Up to 65 | 66-70 | 71 and higher | 45 |
| Residential, multi-family mixed-use | Up to 65 | 66-70 | 71 and higher | 45 |
| Transient lodging | Up to 65 | 66-70 | 71 and higher | 45 |
| Hospitals; nursing homes | Up to 60 | 61-70 | 71 and higher | 45 |
| Theaters; auditoriums; Music halls | Up to 60 | 61-70 | 71 and higher | 35 dBA Leq ${ }^{5}$ |
| Churches; meeting halls | Up to 60 | 61-70 | 71 and higher | 40 dBA Leq ${ }^{5}$ |
| Playgrounds; neighborhood parks | Up to 70 | 71-75 | 75 and higher | - |
| Schools; libraries; museums ${ }^{6}$ | - | - | - | 45 dBA Leq ${ }^{5}$ |
| Offices ${ }^{7}$ | - | - | - | 45 dBA Leq ${ }^{5}$ |
| Retail/commercial ${ }^{7}$ | - | - | - | - |
| Industrial | - | - | - | - |

${ }^{1}$ Normally acceptable means that land uses may be established in areas with the stated ambient noise level, absent any unique noise circumstances.
${ }^{2}$ Possibly acceptable means that land uses should be established in areas with the stated ambient noise level only when exterior areas are omitted from the Project or noise levels in exterior areas can be mitigated to the normally acceptable level.
${ }^{3}$ Normally unacceptable means that land uses should generally not be established in areas with the stated ambient noise level. If the benefits of the Project in addressing other Burbank2035 goals and policies outweigh concerns about noise, the use should be established only where exterior areas are omitted from the Project or where exterior areas are located and shielded from noise sources to mitigate noise to the maximum extent feasible.
${ }^{4}$ Interior acceptable means that the building must be constructed so that interior noise levels do not exceed the stated maximum, regardless of the exterior noise level. Stated maximums are as determined for a typical worst-case hour during periods of use.
${ }^{5}$ dBA Leq is as determine for a typical worst-case hour during periods of use.
${ }^{6}$ Within the Airport Influence Area, these uses are not acceptable above 65 dBA CNEL if subject to the City's discretionary review procedures.
${ }^{7}$ Within the Airport Influence Area, these uses may be acceptable up to 75 dBA CNEL following review for additional noise attenuation; in excess of 75 dBA CNEL these uses are not acceptable.
Source: Burbank2035 2013

When stationary noise is the primary noise source, the City applies a second set of hourly daytime and nighttime performance standards (expressed in Leq) that are designed to protect noise-sensitive land uses adjacent to stationary sources from excessive noise (Burbank2035 2013). Table 3 summarizes stationary-source noise standards for various land use types that represent acceptable noise levels at exterior spaces of the sensitive receptor.

## Table 3 Maximum Allowable Noise Exposure - Stationary Sources

| Noise Source | Noise Level <br> Descriptor | Exterior Spaces ${ }^{1}$ - <br> Daytime <br> (7 AM to 10 PM) | Exterior Spaces ${ }^{1}$ - <br> Nighttime <br> (10 PM to 7 AM) |
| :--- | :--- | :---: | :---: |
| Typical | Hourly dBA Leq | $55^{2}$ | $45^{2}$ |
| Tonal, impulsive, repetitive, or <br> consisting primarily of speech or music | Hourly dBA Leq | $50^{2}$ | $40^{2}$ |
| Any | dBA Lmax | 75 | 65 |

${ }^{1}$ Where the location of exterior spaces (i.e., outdoor activity areas) is unknown, the exterior noise level standard shall be applied to the property line of the receiving land use. Where it is not practical to mitigate exterior noise levels at patio or balconies of apartment complexes, a common area such as a pool or recreation area may be designated as the exterior space.
${ }^{2}$ The City may impose noise level standards that are more or less restrictive than those specified above based upon determination of existing low or high ambient noise levels.
Source: Burbank2035 2013

Furthermore, the following goals, objectives, and policies from the City's General Plan Noise Element are applicable to the Project (Burbank2035 2013):

## Goal 1: Noise Compatible Land Uses

Burbank's diverse land use pattern is compatible with current and future noise levels.
Policy 1.1: Ensure the noise compatibility of land uses when making land use planning decisions.
Policy 1.2: Provide spatial buffers in new development projects to separate excessive noise generating uses from noise-sensitive uses.

Policy 1.3: Incorporate design and construction features into residential and mixed-use projects that shield residents from excessive noise.

Policy 1.4: Maintain acceptable noise levels at existing noise-sensitive land uses.
Policy 1.5: Reduce noise from activity centers located near residential areas, in cases where noise standards are exceeded.

Policy 1.6: Consult with movie studios and residences that experience noise from filming activities to maintain a livable environment.

## Goal 2: Noise in Mixed-Use Development

Noise from commercial activity is reduced in residential portions of mixed-use projects.
Policy 2.1: Require the design and construction of buildings to minimize commercial noise within indoor areas of residential components of mixed-use projects.

Policy 2.2: Locate the residential portion of new mixed-use projects away from noise generating sources such as mechanical equipment, gathering places, loading bays, parking lots, driveways, and trash enclosures.

## Goal 3: Vehicular Traffic Noise

Burbank's vehicular transportation network reduces noise levels affecting sensitive land uses.
Policy 3.1: Support noise-compatible land uses along existing and future roadways, highways, and freeways.

Policy 3.2: Encourage coordinated site planning and traffic management that minimizes traffic noise affecting noise-sensitive land uses.

Policy 3.3: Advocate the use of alternative transportation modes such as walking, bicycling, mass transit, and non-motorized vehicles to minimize traffic noise.

Policy 3.4: Install, maintain, and renovate freeway and highway right-of-way buffers and sound walls through continued work with the California Department of Transportation (Caltrans) and Los Angeles County Metropolitan Transportation Authority (MTA).

Policy 3.5: Monitor noise levels in residential neighborhoods and reduce traffic noise exposure through implementation of the neighborhood protection plans.

Policy 3.6: Prohibit heavy trucks from driving through residential neighborhoods.
Policy 3.7: Where feasible, employ noise-cancelling technologies such as rubberized asphalt, fronting homes to the roadway, or sound walls to reduce the effects of roadway noise on sensitive receptors.

Policy 3.8: Within the Airport Influence Area, seek to inform residential property owners of airport generated noise and any land use restrictions associated with high noise exposure. Mixed-use development contributes to a thriving community, but can place sensitive receptors adjacent to noisy businesses.

## Goal 4: Train Noise

Burbank's train service network reduces noise levels affecting residential areas and noise-sensitive land uses.

Policy 4.1: Support noise-compatible land uses along rail corridors.
Policy 4.2: Require noise-reducing design features as part of transit-oriented, mixed-use development located near rail corridors.

Policy 4.3: Promote the use of design features, such as directional warning horns or strobe lights, at railroad crossings that reduce noise from train warnings.

## Goal 5: Aircraft Noise

Burbank achieves compatibility between airport-generated noise and adjacent land uses and reduces aircraft noise effects on residential areas and noise-sensitive land uses.

Policy 5.1: Prohibit incompatible land uses within the airport noise impact area.
Policy 5.2: Work with regional, state, and federal agencies, including officials at Bob Hope Airport, to implement noise reduction measures and to monitor and reduce noise associated with aircraft.

Policy 5.3: Coordinate with the Federal Aviation Administration and Caltrans Division of Aeronautics regarding the siting and operation of heliports and helistops to minimize excessive helicopter noise.

Policy 5.4: Within the Airport Influence Area, seek to inform residential property owners of airport generated noise and any land use restrictions associated with high noise exposure.

## Goal 6: Industrial Noise

Noise generated by industrial activities is reduced in residential areas and at noise-sensitive land uses.

Policy 6.1: Minimize excessive noise from industrial land uses through incorporation of site and building design features.

Policy 6.2: Require industrial land uses to locate vehicular traffic and operations away from adjacent residential areas.

## Goal 7: Construction, Maintenance, and Nuisance Noise

Construction, maintenance, and nuisance noise is reduced in residential areas and at noise-sensitive land uses.

Policy 7.1: Avoid scheduling city maintenance and construction projects during evening, nighttime, and early morning hours.
Policy 7.2: Require project applicants and contractors to minimize noise in construction activities and maintenance operations.
Policy 7.3: Limit the allowable hours of construction activities and maintenance operations located adjacent to noise-sensitive land uses.
Policy 7.4: Limit the allowable hours of operation for and deliveries to commercial, mixed-use, and industrial uses located adjacent to residential areas.

## Burbank Municipal Code

The City's noise standards, found in the City of Burbank Municipal Code (BMC), set forth hours of operation for certain activities and standards for determining when noise is deemed to be a disturbance.

Chapter 9-3-208 of the BMC prohibits the operation of any machinery, equipment, pump, fan, air conditioning apparatus, or similar mechanical device in such a manner as to cause the ambient noise level at an adjacent noise-sensitive property to be exceeded by more than five (5) dBA.

According to Chapter 9-3-213 of the BMC, no person shall use or operate any radio receiving set, musical instrument, phonograph, television set or other machine or device for the producing or reproducing of sound in such manner as to cause disturbance and cause the ambient noise level at an adjacent noise-sensitive property to be exceeded by more than five (5) dBA.

Similarly, according to Chapter 9-3-213.5 of the BMC, no person in a park (including public parking lots) or on a right of way adjacent to a park shall use or operate any radio receiving set, musical instrument, phonograph, television set or other machine or device for the producing or reproducing of sound or other sound amplification systems in such manner as to disturb the peace, quiet, and
comfort of neighboring residents or any reasonable person of normal sensitiveness residing in the area.

The BMC also designates hours of construction applicable to all construction, alteration, movement, enlargement, replacement, repair, equipment, maintenance, removal and demolition work. Chapter 9-1-1-105.8 of the BMC prohibits construction activity between 7:00 PM and 7:00 AM Monday through Friday, between 5:00 PM and 8:00 AM on Saturdays, and at any time on Sundays or national holidays.

## 3 Impact Analysis

### 3.1 Methodology and Significance Thresholds

The following analysis of noise impacts considers the effects of both temporary construction-related activities and long-term operation of the Project, including increased vehicle trips. The analysis includes noise reduction features from the Environmental Noise Evaluation \& Recommendations (2017) Report prepared by SSA Acoustics for the proposed Project.

## Construction Noise

Temporary construction activity would expose adjacent noise-sensitive receptors to construction noise generated by the use of on-site construction equipment. Construction noise was estimated using the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM). The RCNM uses baseline noise levels, distances to receptors, shielding information, and construction equipment utilized to calculate the construction noise level from each piece of construction equipment and overall construction noise at each receptor. To calculate noise generated by each piece of equipment, the model uses equipment noise levels from a study done by the Environmental Protection Agency (EPA) and acoustical usage factors for equipment (i.e., the fraction of time each equipment is operating at full power) from the Empire State Electric Energy Research Corp. Guide (FHWA 2006).

Project construction noise levels were estimated using RCNM at nearby noise-sensitive receptors, including single-family residences located approximately 875 feet northwest of the Project site across the I-5, Burbank High School located approximately 1,320 feet ( 0.25 mile) northeast of the Project site, and single-family residences approximately 1,740 feet ( 0.33 mile) west of the site along West Burbank Boulevard. However, construction activity would not operate exclusively along the Project boundary of the site. Rather, stationary construction activity would occur at various locations on the Project site and mobile construction equipment would operate throughout the site. To provide an overall estimate of the average hourly construction noise levels, the construction noise analysis assumes that on-site construction activity would occur, on average, 50 feet from the Project site boundaries. Therefore, the modeled distances between construction activity and nearby noise-sensitive receptors are 925 feet for single-family residences across the I-5, 1,370 feet for Burbank High School, and 1,790 feet for single-family residences along West Burbank Boulevard.

The modeled construction equipment for each construction phase was based on the California Emissions Estimator Model (CalEEMod) Version 2016.3.2 equipment defaults for construction of the proposed mixed-use Project as analyzed in the Air Quality and Greenhouse Gas Study prepared by Rincon in September 2018 for the Project. CalEEMod uses project characteristics, such as land use, building sizes, and lot acreage, to estimate a project's emissions and uses default equipment lists in its modeling based on empirical data. The RCNM results and equipment list from CalEEMod are included in Appendix B. As discussed in Section 2.4, Regulatory Setting, Chapter 9-1-1-105.8 of the BMC or prohibits construction activity between 7:00 PM and 7:00 AM Monday through Friday, between 5:00 PM and 8:00 AM on Saturdays, and at any time on Sundays or national holidays. In addition, Chapter 9-3-208 of the BMC prohibits the operation of any machinery, equipment, pump, or similar mechanical device in such a manner as to cause the ambient noise level at an adjacent
noise-sensitive property to be exceeded by more than 5 dBA . Therefore, noise generated by construction activity would be significant if it occurs outside the construction hours specified in the BMC and if it increases ambient noise levels at the property line of nearby sensitive receptors by more than 5 dBA . For the purpose of this analysis, the ambient noise levels for adjacent noisesensitive receptors are the measured noise levels shown in Table 1. Based on noise measurements in Table 1, the ambient noise at single-family residences across $1-5$ is 70 dBA Leq, the ambient noise level at Burbank High School is 66.2 dBA Leq, and the ambient noise level at single-family residences along West Burbank Boulevard is 66.7 dBA Leq. Therefore, the proposed Project would generate a significant impact if construction noise levels exceed 75 dBA Leq at single-family residences across I5, approximately 71 dBA Leq at Burbank High School, and approximately 72 dBA Leq at single-family residences along West Burbank Boulevard.

## Groundborne Vibration

The primary sources of vibration associated with operation of the Project would include vehicle circulation on the Project site that would be similar to the existing vibration levels on surrounding roadways and the I-5. Therefore, Project operations would not substantially increase the existing vibration levels in the immediate vicinity of the Project site. Construction activities also have the potential to generate ground-borne vibration near sensitive receptors, especially from grading and excavation of the Project site. Therefore, this analysis focuses on vibration impacts from Project construction that were evaluated by identifying the highest potential vibration sources from construction equipment, estimating the vibration levels at the potentially affected receptors, and comparing vibration levels with applicable significance thresholds.

Construction vibration estimates are based upon vibration levels reported by the FTA in the Transit Noise and Vibration Impact Assessment (2018) with an assumed standard attenuation rate of 6 VdB per doubling of distance. Similar to the methodology for estimating construction noise levels at nearby sensitive receptors, vibration levels were estimated under the assumption that construction activities would occur on average 50 feet within the Project boundary. Therefore, the modeled distances between construction activity and nearby noise-sensitive receptors are 925 feet for singlefamily residences across the I-5, 1,370 feet for Burbank High School, and 1,790 feet for single-family residences along West Burbank Boulevard. However, this analysis also models vibration levels at the nearest off-site building to the Project site to determine the worst-case level of vibration impact regardless of noise-sensitivity. Based on the location of the Project site and surrounding uses, the nearest non-residential off-site building is located approximately 175 feet southwest of the site across North Front Street. Vibration calculations are included in Appendix C. Based on impact criteria described in the FTA Transit Noise and Vibration Impact Assessment (2018), residences and buildings where people normally sleep would be impacted by frequent vibration events if vibration velocity levels exceed 72 VdB . In addition, Project-generated vibration would result in a significant impact if it would exceed 100 VdB (i.e., the threshold for damage to fragile buildings), or 95 VdB (i.e., the threshold for damage to extremely fragile historic buildings).

## On-site Operational Noise

On-site operational noise associated with the Project would include noise from delivery trucks; trash hauling trucks; heating, ventilation and air conditioning (HVAC) equipment; and public and private recreational spaces consisting of courtyards, residential balconies, sky terraces at both parking structure roof levels, and the transit plaza area. As discussed in Section 2.2, Sensitive Receptors, noise-sensitive receptors in the area include single-family residences located approximately 875 feet
northwest of the Project site across the I-5, Burbank High School located approximately 1,320 feet northeast of the Project site, and single-family residences approximately 1,740 feet west of the site along West Burbank Boulevard.

According to Chapter 9-3-208 and Chapter 9-3-213 of the BMC, the City prohibits the operation of any on-site machinery, mechanical devices, or sound-producing devices in a manner that causes the ambient noise level at an adjacent noise-sensitive property to be exceeded by more than 5 dBA . Although the 5 dBA noise standard outlined in the BMC is specific to the use of on-site mechanical equipment and sound-producing devices, this standard was applied to noise associated with use of on-site public and private recreational to determine impacts associated with all sources of on-site operational noise. Therefore, noise generated by operation of the Project would be significant if it increases ambient noise levels at the property line of nearby sensitive receptors by more than 5 dBA. Similar to the methodology for determining construction noise impacts at nearby sensitive receptors, the Project would generate a significant impact if on-site operational noise levels exceed approximately 72 dBA Leq at single-family residences along West Burbank Boulevard, approximately 71 dBA Leq at Burbank High School, and 75 dBA Leq at single-family residences across I-5. Operational noise level estimates do not account for the presence of intervening structures, topography, and the existing noise environment, which would reduce or mask operational noise levels at receptor locations. Therefore, the noise levels presented herein represent a worst-case estimate of actual operational noise.

## Off-site Roadway Noise

Operation of the Project would also generate off-site vehicle trips, thereby increasing traffic on area roadways. Noise levels associated with existing and future traffic along area roadways were estimated using the U.S. Department of Transportation Federal Highway Administration's (FHWA) Traffic Noise Model 2.5 (TNM2.5) (FHWA 2004) (traffic noise model data is provided in Appendix D). TNM 2.5 was used to estimate noise levels generated by traffic on area roadways under existing and future conditions, with and without Project-added traffic. The analysis of anticipated noise levels from traffic generated by the Project utilizes traffic volume data for area roadways from the Traffic Impact Analysis prepared for the Project by Fehr \& Peers (F\&P) in March 2019 (F\&P 2019).
According to the Transportation Impact Analysis, the average daily trips (ADT) generated by the Project would be 5,261; including 314 AM peak hour trips and 398 PM peak hour trips. Due to the Project area's proximity to the I-5, freeway noise was also incorporated into the model. Existing peak hour volumes for this segment of the I-5 were based on the latest traffic year peak hour volume data from the California Department of Transportation (Caltrans) Traffic Census Program (Caltrans 2016).

The results of the TNM analysis for existing traffic in the Project area were compared to measured noise levels to ensure the accuracy of the model in the Project vicinity, shown in Table 4. According to the Caltrans Technical Noise Supplement to the Traffic Noise Analysis Protocol, TNM 2.5 for Project involving existing roadways should always be validated for accuracy by comparing measured sound levels to modeled sound levels. If modeled sound levels do not match measured sound levels within 3 dBA , the model parameters should be reviewed and adjusted to ensure that they accurately represent actual site conditions (Caltrans 2013).

Table 4 Comparison of Measured and Modeled Noise Levels

|  |  | Existing Noise Level (dBA, Leq) |  |  |
| :--- | :--- | :---: | :---: | :---: |
| Measurement <br> Number | Measurement Location | Measured Ambient <br> Noise (1) | Modeled Traffic <br> Noise (2) | Difference in Noise <br> Level (2 minus 1) |
| 1 | West Burbank Boulevard <br> adjacent to single-family <br> residences west of the <br> Project site | 66.7 | 68.9 | +2.2 |
| 2 | $3^{\text {rd }}$ Street adjacent to <br> Burbank High School <br> northeast of the Project site | 66.2 | 69.2 |  |

See Appendix A for noise measurement data sheets and Appendix D for model results.
Source: Rincon Consultants, field measurements on January 30, 2018 field using ANSI Type II Integrating sound level meter; TNM2.5, FHWA 2004.

As shown in Table 4, modeled noise is within 3 dBA of the measurement noise levels. According to Caltrans guidance for validating the TNM 2.5 model results, no adjustments are necessary since the modeled results are within 3 dBA of measured traffic noise. Therefore, the model is an appropriate tool for determining existing ambient traffic noise levels and future noise levels caused by Project-generated traffic.

The nearest noise-sensitive receptors were included in the model that consist of Burbank High School located approximately 0.25 mile northeast of the Project site along 3rd Street, and singlefamily residences approximately 1,740 ( 0.33 mile) west of the site along West Burbank Boulevard. The single-family residences located approximately 875 feet northwest of the Project site were not included because these residences are located across the I-5 (see Figure 3). Therefore, Projectgenerated trips would not be directly distributed at roadways within this residential neighborhood.

The City of Burbank has not adopted specific thresholds to assess off-site Project-related traffic noise impacts. Therefore, this analysis uses thresholds contained in the FTA Transit Noise and Vibration Impact Assessment (2018) as guidance to determine whether or not a change in traffic would result in a significant permanent increase in roadway noise. Using the FTA criteria, the significance threshold is based on the existing ambient noise level. Roadways with lower ambient noise levels have a higher noise level increase threshold, while roadways with a higher ambient noise level have a lower noise level increase threshold. Traffic-related noise increases would result in a significant impact if roadway noise would increase by more than the levels indicated in Table 5.

Table 5 Significance of Changes in Operational Roadway Noise Exposure

| Existing Noise Exposure <br> (Ldn or Leq in dBA) | Significant Noise Exposure Increase <br> (Ldn or Leq in dBA) |
| :--- | :---: |
| $45-50$ | 7 |
| $50-55$ | 5 |
| $55-60$ | 3 |
| $60-65$ | 2 |
| $65-75$ | 1 |
| $75+$ | 0 |
| Source: FTA 2018 |  |

## Exposure of New Sensitive Receptors to Ambient Noise

Although CEQA does not require analysis of potential impacts of the environment on the Project, the following impact analysis of the ambient noise environment on the Project is provided for informational purposes and for disclosure of existing noise conditions in the vicinity of the Project site.

At buildout, the Project would be a noise-sensitive receptor due to its outdoor recreational spaces, residential units, and hotel rooms. The Project would be exposed to motor vehicles noise from area roadways and the I-5, train operational noise from the adjacent Metrolink station and railroad line, and aircraft noise from overhead flights associated with the Hollywood Burbank Airport. However, according to the Burbank2035 General Plan Noise Element, the Project site is located outside of the airport influence area and 65 dBA CNEL noise contour (Burbank2035 2013). Therefore, the Project would not be exposed to significant noise from overhead flights associated with daily airport operations. 4444 parks. These standards also establish maximum interior noise levels for new residential development, requiring that sufficient insulation be provided to reduce interior ambient noise levels to 45 dBA CNEL (Burbank2035 2013). Therefore, the Project would be exposed to significant noise if on-site noise levels exceed land use compatibility standards shown in Table 2.

### 3.2 Project Impacts and Recommended Measures

## Construction Noise

Construction of the Project would generate temporary noise that would exceed existing ambient noise levels on the Project site. Construction noise levels during all phases of construction (i.e., site preparation, grading, building construction, paving, and architectural coating) were modeled using the FHWA RCNM and CalEEMod construction equipment defaults to estimate construction noise levels at the nearest noise-sensitive receptors. Assuming that on-site construction activity would occur, on average, 50 feet from the Project site boundaries, the modeled distances between construction activity and nearby noise-sensitive receptors are 925 feet for single-family residences across the $\mathrm{I}-5,1,370$ feet for Burbank High School, and 1,790 feet for single-family residences along West Burbank Boulevard. Table 6 shows the average expected noise levels (Leq) at the nearest sensitive receptors based on the combined construction equipment anticipated to be used concurrently during each phase of construction as modeled in RCNM.

Table 6 Construction Noise Levels by Phase

| Construction Phase | Construction Equipment | Construction Noise Level (dBA, Leq) at Noise-Sensitive Receptors |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  |  | 925 Feet ${ }^{1}$ | 1,370 Feet ${ }^{\text {² }}$ | 1,790 Feet ${ }^{3}$ |
| Site Preparation | Tractors (2), Loader, Backhoe, Dozers (3) | 61 | 58 | 55 |
| Grading | Excavator, Dozer, Grader, Tractor, Loader, Backhoe | 61 | 57 | 55 |
| Building Construction | Crane, Forklifts (3), Generator Set, Tractor, Loader, Backhoe, Welder | 63 | 60 | 58 |
| Paving | Pavers (2), Rollers (2), Paving Equipment (2) | 61 | 58 | 55 |
| Architectural Coating | Air Compressor | 48 | 45 | 43 |
| Threshold ${ }^{4}$ |  | 75 | 71 | 72 |
| Threshold Exceeded? |  | No | No | No |

See Appendix B for RCNM results and CalEEMod equipment list.
${ }^{1}$ Modeled distance for single-family residences northwest of the Project site across the I-5.
${ }^{2}$ Modeled distance for Burbank High School located northeast of the Project site along $3^{\text {rd }}$ Street.
${ }^{3}$ Modeled distance for single-family residences west of the Project site along West Burbank Boulevard.
${ }^{4}$ According to Chapter 9-3-208 of the BMC, noise generated by construction activity would be significant if it increases ambient noise levels at the property line of nearby sensitive receptors by more than 5 dBA .
Source: FTA 2018
As shown in Table 6, operation of equipment during various phases of construction could generate noise levels up to 63 dBA Leq at single-family residences northwest of the Project site across the l-5, 60 dBA Leq at Burbank High School northeast of the Project site, and 58 dBA Leq at single-family residences west of the Project site. Construction noise level estimates do not account for the presence of intervening structures or topography that could reduce noise levels at receptor locations. Therefore, the noise levels presented herein represent a worst-case estimate of actual construction noise.

According to Chapter 9-1-1-105.8 of the BMC, construction activity is prohibited in the City between the hours of 7:00 PM and 7:00 AM Monday through Friday, between the hours of 5:00 PM and 8:00 AM on Saturdays, and at any time on Sundays or national holidays. Compliance with the City's defined hours of construction would ensure that adjacent noise-sensitive residential receptors are not disturbed during nighttime sleep hours. As discussed in Section 3.1, Methodology and Significance Thresholds, the Project would generate a significant impact if construction noise levels exceed 75 dBA Leq at single-family residences across $1-5$, approximately 71 dBA Leq at Burbank High School, and approximately 72 dBA Leq at single-family residences along West Burbank Boulevard. As shown in Table 6, Project-generated construction noise levels would be lower than the identified construction noise thresholds based on Chapter 9-3-208 of the BMC. Therefore, temporary construction noise impacts would be less than significant.

## Groundborne Vibration

Temporary construction activity associated with the Project would also create ground-borne vibration. Buildings in the vicinity of a construction site respond to vibration to varying degrees ranging from imperceptible effects at the lowest levels, to low rumbling sounds and perceptible vibrations at moderate levels, and up to minor damage at the highest vibrations levels. Similar to the construction noise analysis, the modeled distances between construction activity and nearby
noise-sensitive receptors are 925 feet for single-family residences across the I-5, 1,370 feet for Burbank High School, and 1,790 feet for single-family residences along West Burbank Boulevard. As discussed under Methodology and Significance Thresholds, this analysis also models vibration levels at the nearest non-residential off-site building to the Project site to determine the worst-case level of vibration impact regardless of noise-sensitivity. Based on the location of the Project site and surrounding uses, the nearest off-site building is located approximately 175 feet southwest of the site across North Front Street.

To determine vibration impacts during Project construction, vibration levels were calculated at the nearest receptors using the PPV of the highest impact pieces of equipment that would be used during Project construction (see Appendix C for vibration calculations), which would be loading trucks, dozers, and rollers. Table 7 shows the estimated groundborne vibration levels from these pieces of equipment at various distances associated with the nearby receptors.

Table 7 Groundborne Vibration Levels by Equipment

|  |  | Vibration Level (VdB) at Noise-Sensitive Receptors |  |  |
| :--- | :---: | :---: | :---: | :---: |
| Equipment | $\mathbf{1 7 5 ~ F e e t ~}^{\mathbf{1}}$ | $\mathbf{9 2 5 ~ F e e t ~}^{\mathbf{2}}$ | $\mathbf{1 , 3 7 0}$ Feet $^{\mathbf{3}}$ | $\mathbf{1 , 7 9 0}^{\text {Feet }}{ }^{\mathbf{4}}$ |
| Loading Truck | 60 | 39 | 33 | 30 |
| Dozer | 62 | 40 | 35 | 31 |
| Roller | 69 | 47 | 42 | 39 |

See Appendix C for vibration calculations.
${ }^{1}$ Modeled distance for industrial building southwest of the Project site across North Front Street.
${ }^{2}$ Modeled distance for single-family residences northwest of the Project site across the I-5.
${ }^{3}$ Modeled distance for Burbank High School located northeast of the Project site along $3{ }^{\text {rd }}$ Street.
${ }^{4}$ Modeled distance for single-family residences west of the Project site along West Burbank Boulevard.
Source: FTA 2018

Operation of a loaded truck, dozer, and roller would generate peak vibration levels up to 47 VdB at the nearest noise-sensitive receptor. As discussed in the construction noise analysis, compliance with the City's permitted hours of construction outlined in Chapter 9-1-1-105.8 of the BMC would ensure that adjacent noise-sensitive residential receptors are not disturbed by construction vibration during nighttime sleep hours. Furthermore, vibration levels would not exceed the FTA's vibration impact criterion of 72 VdB for residences or buildings where people normally sleep. In addition, construction vibration would not reach 100 VdB (i.e., the threshold for damage to fragile buildings) or 95 VdB (i.e., the threshold for damage to extremely fragile historic buildings) (FTA 2018). Therefore, construction vibration impacts would be temporary and less than significant.

## On-site Operational Noise

The Project would introduce a new residential/retail mixed-use development with an open space plaza area. On-site operational noise associated with the Project would include noise from delivery trucks; trash hauling trucks; heating, ventilation and air conditioning (HVAC) equipment; and public and private recreational spaces consisting of courtyards, residential balconies, sky terraces at both parking structure roof levels, and the publically accessible plaza area. Because the parking activities would be enclosed within parking structures and subterranean parking, noise from on-site vehicle circulation and parking activities (i.e., tire squeals, alarms, and engine start-ups) would not be a significant source of on-site operational noise that would be audible to off-site receivers.

Due to the distances between the Project and the nearest noise-sensitive receptors as well as the existing noise environment (i.e., vehicles along North Front Street, West Burbank Boulevard, and I5), it is not anticipated that adjacent noise-sensitive receptors would be subject to substantial or perceptible noise associated with operation of the Project. Nonetheless, each source of on-site operational noise is analyzed at the nearest noise-sensitive receptor for a conservative estimate of the Project's operational noise impacts. As discussed in Section 3.1, Methodology and Significance Thresholds, the Project would generate a significant impact if on-site operational noise levels exceed approximately 72 dBA Leq at single-family residences along West Burbank Boulevard, approximately 71 dBA Leq at Burbank High School, and 75 dBA Leq at single-family residences across I-5.

## Delivery and Trash Trucks

The Project would require periodic delivery and trash hauling services that would use available areas for loading and unloading activities, generating noise throughout the Project site. Based on the site plan shown in Figure 2, delivery and trash trucks would access the Project site through North Front Street. The average noise level for a single idling truck is generally 70 dBA at a distance of 25 feet (Salter 2017). At the nearest distance to noise-sensitive receptors, delivery and trash trucks would be operating approximately 875 feet from single-family residences northwest of the Project site. At this distance, and based on an attenuation rate of 6 dBA per doubling of distance, truck noise would be approximately 39 dBA at the nearest noise-sensitive receptor. Operational truck noise would not generate noise levels in excess of the applicable threshold of 75 dBA at single-family residences to the northwest. In addition, the Project site is located in a developed urban area and is surrounded by industrial and commercial uses. Therefore, delivery and trash trucks are already a common occurrence in the vicinity of the Project site. Operational noise impacts associated delivery and trash trucks would be less than significant.

## Commercial HVAC Equipment

Operation of mechanical equipment at the Project site would include HVAC equipment associated with the proposed mixed-use development. Commercial ventilation and air conditioning equipment typically has noise shielding cabinets, is placed on the roof or within mechanical equipment rooms, and is not usually a significant source of noise. Noise from rooftop-mounted HVAC equipment at commercial centers ranges from 60 to 70 dBA Leq at 15 feet from the source (Illingworth \& Rodkin 2009). Based on the Project site plan (see Figure 2), the majority of the Project site would be developed with occupiable buildings that would likely include rooftop-mounted HVAC equipment. Therefore, at the nearest distance to noise-sensitive receptors, HVAC equipment would be operating approximately 875 feet from single-family residences northwest of the Project site. At this distance, and based on an attenuation rate of 6 dBA per doubling of distance, on-site HVAC equipment would generate noise levels up to 35 dBA Leq at the nearest noise-sensitive receptor. Operational HVAC equipment noise would not generate noise levels in excess of 75 dBA at singlefamily residences to the northwest. Because the Project site is located in a developed urban area and is surrounded by industrial and commercial uses, HVAC equipment is an existing noise source in the Project area. Operational noise impacts associated with HVAC equipment would be less than significant.

## On-site Recreational Spaces

Other on-site operational noise would involve use of outdoor recreational spaces, particularly courtyards, residential balconies, sky terraces at both parking structure roof levels, and the open
space plaza area. Because the proposed residential balconies would only have the capacity for a few people at a time, noise from on-site balconies (i.e., human conversation) would not be a significant source of on-site operational noise. For the purpose of this analysis, noise associated with the operation of on-site courtyards, sky terraces, and the transit plaza area was analyzed using a reference noise level for a park. According to a noise measurement taken by Rincon on April 9, 2017 near gathering areas at a local park, recreation noise was measured at 58.6 dBA Leq at 25 feet from the source (Rincon 2017). Based on the Project site plan (see Figure 2), the proposed sky terrace at the roof of the center parking structure would be located approximately 1,350 feet ( 0.25 mile) from Burbank High School that is located northeast of the Project site. At this distance, use of on-site recreational spaces would not generate noise levels in excess of 71 dBA at Burbank High School to the northeast. Operational noise impacts associated with on-site recreational spaces would be less than significant.

## Off-site Roadway Noise

The Project would generate new vehicle trips and increase off-site traffic volumes on area roadways. Traffic generated by the Project was estimated by the Transportation Impact Analysis prepared for the Project by the F\&P. Table 8 compares measured and modeled noise levels at the nearest off-site noise sensitive receptors that would be exposed to an increase in traffic volumes associated with the Project.

Project-generated vehicle traffic would result in a significant increase roadway noise levels if the noise increase would exceed the roadway noise increase thresholds shown in Table 5. Table 8 shows the increase in sound levels due to the Project-generated traffic under the existing and existing plus project scenario.

Table 8 Comparison of Existing and Plus Project Traffic Noise Levels on Local Roadways

| Noise-Sensitive Receptor, <br> Location | Existing Noise Level <br> (dBA, Leq) | Existing Plus Project <br> Noise Level (dBA, Leq) | Project <br> Change | Significance <br> Threshold | Significant? |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |

See Appendix D for noise model results.
Source: TNM2.5, FHWA 2004.

As shown in Table 8, the greatest estimated traffic noise increase caused by Project-generated traffic would be 0.5 dBA along $3^{\text {rd }}$ Street. Other roadways in the vicinity of the Project would also experience an increase in traffic; however, the increase would not exceed the applicable significance thresholds for any of the evaluated roadways. Therefore, Project-generated traffic noise would not have a significant impact on noise-sensitive receptors in the vicinity of the Project site under the existing and existing plus project scenario.

Table 9 shows the Project's contribution to a cumulative increase in existing traffic noise levels for the year 2022. The Project would increase future traffic-related noise by up to 0.1 dBA at noisesensitive residential receptors along West Burbank Boulevard that would not exceed applicable thresholds. Therefore, the Project would not have a significant contribution to cumulative traffic noise impacts.

Table 9 Comparison of Future and Plus Project Traffic Noise on Local Roadways

| Noise Level (dBA CNEL) |  |  |  | Cumulative Change in Noise Level$[3]-[1]$ | Project <br> Change $[3]-[2]$ | Significance <br> Threshold ${ }^{1}$ |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Noise-Sensitive Receptor, Location | Existing <br> [1] | Future [2] | Future Plus Project [3] |  |  |  | Significant? |
| Single-Family <br> Residences, <br> West Burbank <br> Boulevard | 68.9 | 69.4 | 69.5 | +0.6 | +0.1 | 1 | No |
| Burbank High School (Classroom building), <br> 3rd Street | 69.2 | 69.9 | 69.9 | +0.7 | +0.0 | 1 | No |
| Burbank High School (Recreational uses), <br> 3rd Street | 68.7 | 69.3 | 69.3 | +0.6 | +0.0 | 1 | No |
| See Appendix D for Source: TNM2.5, FH | oise model <br> A 2004 |  |  |  |  |  |  |

## Exposure of New Sensitive Receptors to Ambient Noise

As discussed in Section 3.1, Methodology and Significance Thresholds, CEQA does not require analysis of potential impacts of the environment on the Project. Therefore, the following impact analysis of the ambient noise environment on the project is provided for informational purposes and for disclosure of existing noise conditions in the vicinity of the Project site.

The Project would include residences, open space areas, and a hotel that would be considered new noise-sensitive receptors on the Project site. Based on two 24-hour noise measurements conducted by SSA Acoustics at the Project site, the ambient daily noise level at future uses with direct exposure to Front Street and the l-5 would be 76 dBA Ldn and 81 dBA Ldn, respectively (SSA Acoustics 2017). According to the City's standards shown in Table 2, ambient noise up to 65 dBA Ldn is normally acceptable for mixed-use multi-family residential development and transient lodging land uses, while ambient noise up to 70 dBA Ldn is normally acceptable for neighborhood parks. Based on a noise exposure level up to 81 dBA Ldn, the Project would be exposed to normally unacceptable noise levels, except where exterior areas are located and shielded from noise sources to mitigate nose to the maximum extent feasible. Furthermore, as discussed in Section 2.1, the manner in which homes in California are constructed generally provides a reduction of exterior-to-interior noise levels of approximately 20 to 25 dBA with closed windows (FTA 2018). Therefore, based on an
exterior noise exposure level up to 81 dBA Ldn, interior noise levels at residential units and hotel rooms would be up to 61 dBA Ldn, which would exceed the City's standard of 45 dBA Ldn for interior noise. Therefore, the Project would require implementation of noise-reducing measures to reduce ambient noise at outdoor recreational spaces (i.e., residential and hotel balconies, open space public plaza) and exterior noise at interior spaces to acceptable levels per the City's standards.

### 3.3 Project Recommendations and Conclusions

As concluded in Section 3.2, Impact Analysis, the Project would not generate temporary construction noise and vibration impacts associated with Project construction, or long-term operational impacts associated with on-site noise sources or Project-generated traffic. However, based on the noise exposure levels at the Project site, the Project would be exposed to exterior and interior noise levels in excess of the City's standards. Therefore, Project design measures were recommended by SSA Acoustics in their Environmental Noise Evaluation \& Recommendations Report (2017) to reduce exterior noise at proposed outdoor residential uses (i.e., balconies) to 65 dBA CNEL, to reduce exterior noise at the proposed transit plaza to 70 dBA CNEL, and reduce interior noise in habitable rooms to an acceptable level of 45 dBA CNEL. The following recommended measures were incorporated from SSA Acoustics' Environmental Noise Evaluation \& Recommendations Report (2017) and expanded upon to ensure that noise levels at the Project site are reduced to levels consistent with the City's standards.

## Recommended Measures

## Cooling and Ventilation

- A cooling and ventilation system with an outdoor condensing unit and an interior ceilinginstalled or wall-mounted fan coil unit shall be incorporated into the Project to allow tenants the option of climate control without opening windows.
- Sound barriers at least six feet high shall be placed around the outdoor condensing unit on the rooftop terrace.


## Walls, Windows, and Balcony Doors

The following building materials shall be incorporated into the Project:

- Walls: 6 -inch wood stud wall with two layers of $5 / 8^{\prime \prime}$ gypsum wallboard (GWB) in the interior, $1 / 2^{\prime \prime}$ plywood and $5 / 8^{\prime \prime}$ GWB on exterior and 6 -inch glass fiber insulation in the cavity
- Windows and Sliding Glass Doors: $1 / 4$ "-glass $-1 / 2^{\prime \prime}$ airspaces $-1 / 4$ glass (STC 35 ); windows and sliding glass doors shall be mounted in low air infiltration rated frames.
- Exterior Door: solid core door with $1 / 2$ " glass insert with perimeter weather stripping and threshold seals.


## Outside Air Vents

The following design features shall be incorporated into the Project's exterior air vents:

- Ducted outside air path from rooftop or façade, to provide outside air to residential units without creating a direct entry path for ambient sound
- Minimum of 7 feet of ducting with 1 -inch thick duct liner
- Minimum of 1 elbow between outside inlet and interior vent
- All roof and attic vents shall be boxed or provided with baffling.


## Sound Wall

- The developer shall construct a Sound Wall located on either California Department of Transportation (Caltrans) right-of-way or on the Project site and City right-of-way adjacent to southbound Interstate 5. The northern limits of the Sound Wall shall be a point where the onramp to the southbound Interstate 5 is ten (10) feet above the finished grade of the mainline of Interstate 5, and the southern limit shall be a point where the Magnolia Boulevard Bridge intersects with the Caltrans right-of-way boundary.
- The Sound Wall shall be built consistent with the California Department of Transportation's "Sound Wall 1584" specifications and shall be a minimum of overall height of not less than ten (10) feet. The final design and construction of the Sound Wall is subject to review and approval by Caltrans (if located on State right right-of-way). If Caltrans does not approve the proposed Sound Wall to be placed on State right-of-way, then the developer shall construct the sound wall on private property and the adjacent City owned property with the final design of the Sound Wall being reviewed and approved by Community Development Department.


## Deck Level Plexiglass Barriers

- The three outdoor decks which face the I-5 to the north shall include plexiglass noise barriers to deflect freeway noise. Specifically, the two lower decks shall include $8^{\prime}$ plexiglass barriers and the upper deck shall include a $6^{\prime}$ plexiglass barrier to maintain outdoor air flow and views while minimizing freeway noise. Figure 4 shows a rendering of the proposed plexiglass barrier on the outdoor deck.

Figure 4 Deck Level Plexiglass Barrier


## Acoustic-Designed Public Plaza

- Acoustical shaping shall be incorporated into the design of the public plaza to deflect or absorb freeway noise thereby creating an artificially quiet community area directly adjacent to the freeway. The plaza shall be set at a lower elevation from the freeway, reducing the amount of
sound that initially reaches the plaza in conjunction with the Sound Wall recommendation above. Figure 5 shows an example of an acoustic-designed open space area.

Figure 5 Acoustic-Designed Open Space Area


## Hours of Operation and Maintenance

- Hours of operation for the commercial tenant spaces shall be limited to between 6:00 a.m. and 12:00 a.m. (midnight). Late night businesses and/or operations (including deliveries) shall be prohibited, unless otherwise approved in accordance with the BMC. The owner/operator of the Project shall be responsible for providing a written notice to all residents that they are located in a mixed-use development adjacent to retail and commercial land uses, and the residents could be affected by noise from adjacent uses.
- No exterior maintenance of the premises, including but not limited to lot sweeping and cleaning, landscaping and gardening, or washing of sidewalks shall be conducted on the premises before 7:00 a.m. or after 10:00 p.m. Monday through Saturday or before 9:00 a.m. or after 8:00 p.m. on Sunday.
- Any noise resulting from the operation of the business or conduct of the patrons, including the playing of musical instruments, whether live or mechanical, singing or other vocal sounds shall be kept at a level so as not to cause any disturbances or nuisances which would be detrimental to other properties in the area or to the welfare of the occupants thereof.


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## Appendix A

Noise Measurement Data


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| 434 | 2018/01/30 19:10:36 | 72 |
| 435 | 2018/01/30 19:10:37 | 71 |
| 436 | 2018/01/30 19:10:38 | 70 |
| 437 | 2018/01/30 19:10:39 | 71 |
| 438 | 2018/01/30 19:10:40 | 70 |
| 439 | 2018/01/30 19:10:41 | 70. |
| 440 | 2018/01/30 19:10:42 | 72. |
| 441 | 2018/01/30 19:10:43 | 72. |
| 442 | 2018/01/30 19:10:44 | 73. |
| 443 | 2018/01/30 19:10:45 | 73. |
| 444 | 2018/01/30 19:10:46 | 73. |
| 445 | 2018/01/30 19:10:47 | 72 |
| 446 | 2018/01/30 19:10:48 | 72 |
| 447 | 2018/01/30 19:10:49 | 73 |
| 448 | 2018/01/30 19:10:50 | 74 |
| 449 | 2018/01/30 19:10:51 | 73 |
| 450 | 2018/01/30 19:10:52 | 74 |
| 451 | 2018/01/30 19:10:53 | 72 |
| 452 | 2018/01/30 19:10:54 | 71. |
| 453 | 2018/01/30 19:10:55 | 71 |
| 454 | 2018/01/30 19:10:56 | 71 |
| 455 | 2018/01/3019:10:57 | 71. |
| 456 | 2018/01/30 19:10:58 | 70. |
| 457 | 2018/01/30 19:10:59 | 71 |
| 458 | 2018/01/30 19:11:00 | 72 |
| 459 | 2018/01/30 19:11:01 | 73 |
| 460 | 2018/01/30 19:11:02 | 73 |
| 461 | 2018/01/30 19:11:03 | 73 |
| 462 | 2018/01/3019:11:04 | 73. |
| 463 | 2018/01/30 19:11:05 | 75. |
| 464 | 2018/01/30 19:11:06 | 75. |
| 465 | 2018/01/3019:11:07 | 76. |
| 466 | 2018/01/30 19:11:08 | 75. |
| 467 | 2018/01/30 19:11:09 | 73 |
| 468 | 2018/01/30 19:11:10 | 72 |
| 469 | 2018/01/30 19:11:11 | 72 |
| 470 | 2018/01/30 19:11:12 | 71 |
| 471 | 2018/01/30 19:11:13 | 72. |
| 472 | 2018/01/30 19:11:14 | 72. |
| 473 | 2018/01/30 19:11:15 | 74. |
| 474 | 2018/01/30 19:11:16 | 72. |
| 475 | 2018/01/30 19:11:17 | 72. |
| 476 | 2018/01/30 19:11:18 | 71 |
| 477 | 2018/01/30 19:11:19 | 71 |
| 478 | 2018/01/30 19:11:20 | 71 |
| 479 | 2018/01/30 19:11:21 | 71 |
| 480 | 2018/01/30 19:11:22 | 71 |
| 481 | 2018/01/30 19:11:23 | 71. |


| 482 | 2018/01/30 19:11:24 | 71. |
| :---: | :---: | :---: |
| 483 | 2018/01/30 19:11:25 | 71 |
| 484 | 2018/01/30 19:11:26 | 70 |
| 485 | 2018/01/30 19:11:27 | 72 |
| 486 | 2018/01/30 19:11:28 | 71 |
| 487 | 2018/01/30 19:11:29 | 72 |
| 488 | 2018/01/30 19:11:30 | 73 |
| 489 | 2018/01/30 19:11:31 | 71 |
| 490 | 2018/01/30 19:11:32 | 71 |
| 491 | 2018/01/30 19:11:33 | 70 |
| 492 | 2018/01/30 19:11:34 | 69 |
| 493 | 2018/01/30 19:11:35 | 70 |
| 494 | 2018/01/30 19:11:36 | 72 |
| 495 | 2018/01/30 19:11:37 | 73 |
| 496 | 2018/01/30 19:11:38 | 72 |
| 497 | 2018/01/30 19:11:39 | 71 |
| 498 | 2018/01/30 19:11:40 | 70 |
| 499 | 2018/01/30 19:11:41 | 69 |
| 500 | 2018/01/30 19:11:42 | 71 |
| 501 | 2018/01/30 19:11:43 | 71 |
| 502 | 2018/01/30 19:11:44 | 72 |
| 503 | 2018/01/30 19:11:45 | 71 |
| 504 | 2018/01/30 19:11:46 | 71 |
| 505 | 2018/01/30 19:11:47 | 70 |
| 506 | 2018/01/30 19:11:48 | 71 |
| 507 | 2018/01/30 19:11:49 | 72 |
| 508 | 2018/01/30 19:11:50 | 73 |
| 509 | 2018/01/30 19:11:51 | 75 |
| 510 | 2018/01/30 19:11:52 | 74 |
| 511 | 2018/01/30 19:11:53 | 75 |
| 512 | 2018/01/30 19:11:54 | 74 |
| 513 | 2018/01/30 19:11:55 | 73 |
| 514 | 2018/01/3019:11:56 | 73 |
| 515 | 2018/01/30 19:11:57 | 73 |
| 516 | 2018/01/30 19:11:58 | 73 |
| 517 | 2018/01/30 19:11:59 | 70 |
| 518 | 2018/01/30 19:12:00 | 71 |
| 519 | 2018/01/30 19:12:01 | 72 |
| 520 | 2018/01/30 19:12:02 | 71 |
| 521 | 2018/01/30 19:12:03 | 71 |
| 522 | 2018/01/30 19:12:04 | 70 |
| 523 | 2018/01/30 19:12:05 | 70 |
| 524 | 2018/01/30 19:12:06 | 71 |
| 525 | 2018/01/30 19:12:07 | 71 |
| 526 | 2018/01/30 19:12:08 | 71 |
| 527 | 2018/01/30 19:12:09 | 72 |
| 528 | 2018/01/30 19:12:10 | 71 |
| 529 | 2018/01/30 19:12:11 | 71 |
| 530 | 2018/01/30 19:12:12 | 71 |
| 531 | 2018/01/30 19:12:13 | 70 |
| 532 | 2018/01/30 19:12:14 | 72 |
| 533 | 2018/01/30 19:12:15 | 73 |
| 534 | 2018/01/30 19:12:16 | 72 |
| 535 | 2018/01/30 19:12:17 | 71 |
| 536 | 2018/01/30 19:12:18 | 71 |
| 537 | 2018/01/30 19:12:19 | 72 |
| 538 | 2018/01/30 19:12:20 | 71 |
| 539 | 2018/01/30 19:12:21 | 70 |
| 540 | 2018/01/30 19:12:22 | 70 |
| 541 | 2018/01/30 19:12:23 | 69 |
| 542 | 2018/01/30 19:12:24 | 68 |
| 543 | 2018/01/30 19:12:25 | 68 |
| 544 | 2018/01/30 19:12:26 | 69 |
| 545 | 2018/01/30 19:12:27 | 70 |
| 546 | 2018/01/30 19:12:28 | 70 |
| 547 | 2018/01/30 19:12:29 | 71 |
| 548 | 2018/01/30 19:12:30 | 71 |
| 549 | 2018/01/30 19:12:31 | 70 |
| 550 | 2018/01/3019:12:32 | 70 |
| 551 | 2018/01/30 19:12:33 | 71 |
| 552 | 2018/01/30 19:12:34 | 70 |
| 553 | 2018/01/30 19:12:35 | 70 |
| 554 | 2018/01/30 19:12:36 | 70 |
| 555 | 2018/01/30 19:12:37 | 70 |
| 556 | 2018/01/30 19:12:38 | 71 |
| 557 | 2018/01/30 19:12:39 | 71 |
| 558 | 2018/01/30 19:12:40 | 70 |
| 559 | 2018/01/30 19:12:41 | 70 |
| 560 | 2018/01/30 19:12:42 | 70 |
| 561 | 2018/01/30 19:12:43 | 70 |
| 562 | 2018/01/30 19:12:44 | 70 |
| 563 | 2018/01/30 19:12:45 | 69 |
| 564 | 2018/01/30 19:12:46 | 70 |
| 565 | 2018/01/30 19:12:47 | 69 |
| 566 | 2018/01/30 19:12:48 | 71 |
| 567 | 2018/01/30 19:12:49 | 71 |
| 568 | 2018/01/30 19:12:50 | 71 |
| 569 | 2018/01/30 19:12:51 | 71 |
| 570 | 2018/01/30 19:12:52 | 71 |
| 571 | 2018/01/30 19:12:53 | 71 |
| 572 | 2018/01/30 19:12:54 | 72 |
| 573 | 2018/01/30 19:12:55 | 72. |
| 574 | 2018/01/30 19:12:56 | 72 |
| 575 | 2018/01/30 19:12:57 | 73. |
| 576 | 2018/01/30 19:12:58 | 73 |
| 577 | 2018/01/30 19:12:59 | 73 |
| 578 | 2018/01/30 19:13:00 | 74 |
| 579 | 2018/01/30 19:13:01 | 75 |
| 580 | 2018/01/30 19:13:02 | 74. |


| 582 | $2018 / 01 / 3019: 13: 04$ | 76.1 |
| :--- | :--- | :--- |
| 583 | $2018 / 01 / 3019: 13: 05$ | 76.3 |
| 584 | $2018 / 01 / 3019: 13: 06$ | 76.3 |
| 585 | $2018 / 01 / 3019: 13: 07$ | 76.7 |
| 586 | $2018 / 01 / 3019: 13: 08$ | 74.9 |
| 5877 | $2018 / 01 / 3019: 13: 09$ | 75.8 |
| 588 | $2018 / 01 / 3019: 13: 10$ | 75.9 |
| 589 | $2018 / 01 / 3019: 13: 11$ | 73.7 |
| 590 | $2018 / 01 / 3019: 13: 12$ | 73.1 |
| 591 | $2018 / 01 / 3019: 13: 13$ | 71.9 |
| 592 | $2018 / 01 / 3019: 13: 14$ | 71.8 |
| 593 | $2018 / 01 / 3019: 13: 15$ | 71.1 |
| 594 | $2018 / 01 / 3019: 13: 16$ | 71.8 |
| 595 | $2018 / 01 / 3019: 13: 17$ | 71.3 |
| 596 | $2018 / 01 / 3019: 13: 18$ | 70.2 |
| 597 | $2018 / 01 / 3019: 13: 19$ | 70.8 |
| 598 | $2018 / 01 / 3019: 13: 20$ | 71.7 |
| 599 | $2018 / 01 / 3019: 13: 21$ | 70.4 |
| 600 | $2018 / 01 / 3019: 13: 22$ | 70.9 |

## Appendix B

RCNM Construction Noise Modeling


Results
Noise Limits (dBA)
Noise Limit Exceedance (dBA)



## Results

Noise Limits (dBA)
Noise Limit Exceedance (dBA)

| Night |  | Day | culat | $\begin{array}{r} (\mathrm{dBA}) \\ \text { vening } \end{array}$ |  | Vight | Evening |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Equipment |  |  | $L$ max | Leq | $L$ max | Leq | L max | Leq | L max |
| Leq | L max | Leq | L max | Leq | L max | Leq |  |  |  |


| Tractor N/A | N/A | N/A | 55.2 N/ | 51. N/ | $N / A^{N / A}$ | $N / A^{N / A}$ | N/ A | N/ A | N/ A |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Tractor |  | N/ A | 55.2 | 51.3 | N/A | N/A | N/A | $N / A$ | N/ A |
| N/ A | N/ A | N/ A | N/ A | N/ A | N/ A | N/ A |  |  |  |
| Front End | Loader |  | 50.4 | 46.4 | N/A | N/A | N/ A | N/ A | N/ A |
| N/A | N/ A | N/ A | N/ A | N/ A | N/ A | N/ A |  |  |  |
| Backhoe |  |  | 48.8 | 44.8 | N/ A | N/ A | N/A | N/ A | N/ A |
| N/ A | N/ A | N/ A | N/ A | N/ A | N/ A | N/ A |  |  |  |
| Dozer |  |  | 52.9 | 48.9 | N/A | N/A | N/ A | N/ A | N/ A |
| N/A | N/ A | N/ A | N/A | N/A | N/A | N/ A |  |  |  |
| Dozer |  |  | 52.9 | 48.9 | N/A | N/A | N/ A | N/ A | N/ A |
| N/ A | N/ A | N/A | N/A | N/ A | N/ A | $\mathrm{N} / \mathrm{A}$ |  |  |  |
| Dozer |  |  | 52.9 | 48.9 | N/A | N/A | N/ A | N/ A | N/ A |
| N/ A | N/ A | N/A | N/ A | N/ A | N/ A | N/A |  |  |  |
|  | ${ }^{\text {T }}$ | al | 55. 2 | 57.6 | ${ }^{N / A}$ | $N / A$ | N/ A | N/ A | N/ A |

N/A N/A
N/A
N/A
N/A
N/A
**** Receptor \#3 ****

|  |  | Baselines (dBA) |  |  |
| :--- | :--- | ---: | :--- | ---: |
| Description | Land Use | Daytime | Evening | Night |
| Single-Family Residences | Residential | 55.0 | 55.0 | 55.0 |

Equipment

|  |  |  | Spec | Actual | Receptor | Estimated |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | I mpact | Usage | $L$ max | L max | Distance | Shielding |
| Description | Device | (\%) | ( d B A ) | ( dBA ) | (feet) | ( dBA) |

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G. tx t

Roadway Construction Noise Model (RCNM), Version 1.1
$\begin{array}{ll}\text { Report date: } & 02 / 26 / 2019 \\ \text { Case Description: } & \text { Grading }\end{array}$


|  |  |  | Equipment |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Spec | Actual | Receptor | Estimated |
|  | I mpact | Usage | $L$ max | L max | Distance | Shielding |
| Description | Device | ( \%) | ( d B A ) | ( dBA) | (feet) | ( dBA ) |
| Excavator | No | 40 |  | 80.7 | 1790.0 | 0.0 |
| Dozer | No | 40 |  | 81.7 | 1790.0 | 0.0 |
| Grader | No | 40 | 85.0 |  | 1790.0 | 0.0 |
| Tractor | No | 40 | 84.0 |  | 1790.0 | 0.0 |
| Front End Loader | No | 40 |  | 79.1 | 1790.0 | 0.0 |
| Backhoe | No | 40 |  | 77.6 | 1790.0 | 0.0 |

Results
Noise Limits (dBA)
Noise Limit Exceedance (dBA)


G. txt

Results

Noise Limit Exceedance (dBA)
Noise Limits (dBA)

| Night |  | Day | Calculated (dBA) |  | Day <br> Night |  | Evening |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Equipment |  |  | $L$ max | Leq | L max | Leq | L max | Leq | L max |
| Leq | L max | Leq | L max | Leq | L max | Leq |  |  |  |
| Excavator |  |  | 55.4 | 51.4 | N/A | N/A | N/ A | N/ A | $\mathrm{N} / \mathrm{A}$ |
| N/ A | N/A | N/ A | N/ A | N/ A | N/ A | N/ A |  |  |  |
| Dozer |  |  | 56.3 | 52.3 | N/A | N/A | N/A | N/ A | N/ A |
| N/ A | N/A | N/ A | N/A | N/A | N/ A | N/ A |  |  |  |
| Grader |  |  | 59.7 | 55.7 | N/ A | N/A | N/A | N/ A | N/A |
| N/ A | N/ A | N/ A | N/ A | N/ A | N/ A | N/ A |  |  |  |
| Tractor |  |  | 58.7 | 54.7 | N/A | N/A | N/A | N/ A | N/ A |
| N/ A | N/A | N/ A | N/A | N/A | N/ A | N/ A |  |  |  |
| Front End | Loader |  | 53.8 | 49.8 | N/A | N/A | N/A | N/ A | N/A |
| N/A | N/ A | N/ A | N/A | N/ A | N/ A | N/ A |  |  |  |
| Backhoe |  |  | 52.2 | 48.2 | N/ A | N/A | N/A | N/ A | N/A |
| N/ A | N/ A | N/A | N/A | N/ A | N/ A | N/ A |  |  |  |
|  |  |  | 59.7 | 60.5 | N/A | N/A | N/A | N/ A | N/A |
| N/A | N/ A | N/A | N/A | N/ A | N/ A | N/ A |  |  |  |



Results
Noise Limits (dBA)
Noise Limit Exceedance (dBA)



B. txt

| Crane |  |  | 51.8 | 43.8 | N/ A | N/ A | N/ A | N/ A |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| N/A N/A | N/ A | N/ A | N/ A | N/A | N/ A | N/ A |  |  |
| Al\| Other Equipme | 仡 > | HP | 56.2 | 53.2 | N/ A | N/ A | N/ A | N/ A |
| N/A N/A | N/ A | N/ A | N/ A | N/A | N/ A | N/ A |  |  |
| Al\| Other Equipme | nt > 5 | HP | 56.2 | 53.2 | N/ A | N/ A | N/ A | N/ A |
| N/A N/A | N/ A | N/ A | N/ A | N/A | N/A | N/A |  |  |
| Al\| Other Equipme | nt $>$ | HP | 56.2 | 53.2 | N/ A | N/ A | N/ A | N/ A |
| N/A N/A | N/ A | N/ A | N/ A | N/A | $N / A$ | $N / A$ |  |  |
| Generator |  |  | 51.9 | 48.9 | N/A | N/A | N/ A | N/ A |
| N/A N/A | N/ A | N/ A | N/ A | N/A | N/A | N/A |  |  |
| Tractor |  |  | 55.2 | 51.3 | N/ A | N/ A | N/ A | N/ A |
| N/A N/A | N/ A | N/ A | N/ A | N/A | N/A | N/A |  |  |
| Front End Loader |  |  | 50.4 | 46.4 | N/A | $N / A$ | N/ A | N/ A |
| N/A N/A | N/ A | N/ A | N/ A | N/A | N/A | N/A |  |  |
| Backhoe |  |  | 48.8 | 44.8 | N/A | N/A | N/ A | N/ A |
| N/A N/A | N/ A | N/ A | N/ A | N/A | N/ A | N/ A |  |  |
| Welder / Torch |  |  | 45.2 | 41.3 | N/A | $N / A$ | N/ A | N/ A |
| N/A N/A | N/ A | N/ A | N/ A | N/A | N/ A | N/A |  |  |
|  | Tota |  | 56.2 | 59.8 | N/ A | N/ A | N/ A | N/ A |
| N/A N/A | N/ A | N/ A | N/ A | N/ A | N/ A | N/ A |  |  |


|  |  | Baselines | ( d B A ) |  |
| :---: | :---: | :---: | :---: | :---: |
| Description | Land Use | Dayti me | Evening | Night |
| Single-Family Residences | Residential | 55.0 | 55.0 | 55.0 |


$(d B A)$

> Results

Noise Limits (dBA)
Noise Limit Exceedance (dBA)
Page 3



Results
Noise Limits (dBA)
Noise Limit Exceedance (dBA)


|  |  |  | P.t $x$ Equipme |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Spec | Actual | Receptor | Estimated |
|  | I mpact | Us age | L max | $L$ max | Distance | Shielding |
| Description | Device | ( \%) | $(\mathrm{dBA})$ | $(\mathrm{dBA})$ | (feet) | ( dBA) |
| Paver | No | 50 |  | 77.2 | 1370.0 | 0.0 |
| Paver | No | 50 |  | 77.2 | 1370.0 | 0.0 |
| Roller | No | 20 |  | 80.0 | 1370.0 | 0.0 |
| Roller | No | 20 |  | 80.0 | 1370.0 | 0.0 |
| Pavement Scarafier | No | 20 |  | 89.5 | 1370.0 | 0.0 |
| Pavement Scarafier | No | 20 |  | 89.5 | 1370.0 | 0.0 |

Results
Noise Limits (dBA)
Noise Limit Exceedance (dBA)


|  |  |  | uipme |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Spec | Actual | Receptor | Estimated |
|  | I mpact | Us age | L max | L max | Distance | Shielding |
| Description | Device | (\%) | ( dBA) | $(\mathrm{dBA})$ | (feet) | ( dBA) |
| Paver | No | 50 |  | 77.2 | 925.0 | 0.0 |
| Paver | No | 50 |  | 77.2 | 925.0 | 0.0 |
| Roller | No | 20 |  | 80.0 | 925.0 | 0.0 |
| Roller | No | 20 |  | 80.0 | 925.0 | 0.0 |
| Pavement Scarafier | No | 20 |  | 89.5 | 925.0 | 0.0 |
| Pavement Scarafier | No | 20 |  | 89.5 | 925.0 | 0.0 |

[^0]P.txt

## Results

Noise Limit Exceedance (dBA)
Noise Limits (dBA)

| Night |  | Day | Calcul ated (dBA) |  | $\begin{gathered} \text { Day } \\ \text { Night } \end{gathered}$ |  | Evening |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Equipment |  |  | L max | Leq | L max | Leq | L max | Leq | L max |
| Leq | L max | Leq | L max | Leq | L max | Leq |  |  |  |
| Paver |  |  | 51.9 | 48.9 | N/A | N/A | $\mathrm{N} / \mathrm{A}$ | N/ A | N/ A |
| N/ A | N/A | N/ A | N/ A | N/ A | N/ A | N/ A |  |  |  |
| Paver |  |  | 51.9 | 48.9 | N/A | N/ A | N/A | N/ A | N/ A |
| N/A | N/ A | N/ A | N/A | N/ A | N/ A | N/ A |  |  |  |
| Roller |  |  | 54.7 | 47.7 | N/ A | N/A | N/ A | N/ A | N/ A |
| N/A | N/A | N/A | N/A | N/A | N/ A | N/A |  |  |  |
| Roller |  |  | 54.7 | 47.7 | N/A | $\mathrm{N} / \mathrm{A}$ | N/A | N/ A | N/ A |
| N/A | N/A | N/A | N/ A | N/ A | N/ A | N/ A |  |  |  |
| Pavement | Scarafier |  | 64.2 | 57.2 | N/ A | N/ A | N/A | N/ A | N/ A |
| N/ A | N/ A | N/A | N/ A | N/A | N/ A | N/ A |  |  |  |
| Pavement | Scarafier |  | 64.2 | 57.2 | N/A | N/A | N/A | N/ A | N/ A |
| N/ A | N/ A | N/A | N/ A | N/ A | N/A | N/A |  |  |  |
|  | Tota |  | 64.2 | 61.2 | N/A | N/ A | N/A | N/ A | N/ A |
| N/A | N/A | N/A | N/ A | N/A | N/ A | N/ A |  |  |  |



AC. txt


## Results

Noise Limits (dBA)
Noise Limit Exceedance (dBA)

| Night |  | Day | Calculated ( ${ }_{\text {Eveni }}^{\text {d }}$ ( ${ }^{\text {a }}$ ( |  | Day <br> Night |  | Evening |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Equipment |  |  | $L$ max | Leq | L max | Leq | $L$ max | Leq | L max |
| Leq | L max | Leq | L max | Leq | L max | Leq |  |  |  |
| Compressor | ( air |  | 52.3 | 48.3 | N/ A | N/A | N/A | N/ A | N/ A |
| N/A | N/A | N/ A | N/A | N/A | N/ A | N/A |  |  |  |
|  |  |  | 52.3 | 48.3 | N/ A | N/A | N/A | N/ A | N/ A |
| N/ A | N/ A | N/ A | N/A | N/A | N/ A | N/A |  |  |  |

## Appendix C

Vibration Analysis

## Vibration Analysis - Burbank LaTerra Mixed Use

PPV (in/sec) $=$ PPV $\{$ ref $\}$ * $(25 / D)^{\wedge 1.5 ~}$
Where PPV = Peak Particle Velocity
$\{r e f\}=$ PPV at the reference distance of 25 feet
$\mathrm{D}=$ distance to the receptor

| Equipment | $=$ | Vibratory Roller |
| ---: | ---: | ---: |
| $P P V\{r e f\}$ | $=$ | $0.21 \mathrm{in} / \mathrm{sec}$ |
| D | $=$ | 175 feet |
| PPV at receptor | $=$ | $\mathbf{0 . 0 1 1} \mathbf{~ i n} / \mathbf{s e c}$ |


| PPV is $1.7 x$ to $6 x$ larger than RMS velocity Assume typical conversion factor of | 4 PPV:RMS |
| :---: | :---: |
| Therefore estimated RMS velocity = | $0.003 \mathrm{in} / \mathrm{sec}$ |
| Rec | 69 VdB |



| Equipment | $=$ | Loaded Trucks |
| ---: | ---: | ---: |
| PPV\{ref | $=$ | $0.076 \mathrm{in} / \mathrm{sec}$ |
| D | $=$ | 175 feet |
| PPV at receptor | $=$ | $0.004 \mathrm{in} / \mathbf{s e c}$ |

Source: Section 5 Transit Vibration

* RMS Velocity in decibels VdB with Vref of 1E-6 in/sec and PPV:RMS of $\sim 4$

Section 6 Vibration Impact Analysis
Section 7 Noise and Vibration during Construction
Transit Noise and Vibration Assessment, September 2018
John A. Volpe National Transportation Systems Center
Prepared For: USDOT Federal Transit Administration

Criterion

| Building Damage |  | Canmet, Bauer, and Calder, 1977 |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Type | VdB | Equipment | PPV Threshold, in/sec | Type of Damage |
| Extremely susceptible to vibration damage | 90 | Rigid Mercury Switches | 0.5 | Trip Out |
| Non-engineered timber and masonry buildings <br> Engineered concrete and | 94 | House | 2 | Cracked Plaster |
| masonry buildings Typical buildings | $\begin{gathered} 98 \\ 100 \end{gathered}$ | Concrete Block | 8 | Crack in Block |
| Reinforced concrete, steel, or timber buildings | 102 | Cased Drill Holes <br> Pumps, Compressors | $\begin{aligned} & 15 \\ & 40 \end{aligned}$ | Horizontol Offset Shaft Misalignment |


| Human Response Criteria |
| :--- |
| Level, Lv in VdB Equivalent Noise Level, dBA    <br>  Low Freq ( 30 Hz$)$ Mid Freq $(60 \mathrm{~Hz})$ Human Response  |
| 65 |
| 75 |


| Impact Criteria |  |  |  |
| :---: | :---: | :---: | :---: |
| Land Use | Lv in VdB |  |  |
|  | Frequent Events (70+/day) | $\begin{gathered} \text { Occasional } \\ \text { Events (30- } \\ 70 / \text { day }) \\ \hline \end{gathered}$ | Infrequent (<30 events/day) |
| Category 1: Vibration Sensitive | 65 | 65 | 65 |
| Concert Halls | 65 | 65 | 65 |
| TV Studios | 65 | 65 | 65 |
| Recording Studios | 65 | 65 | 65 |
| Category 2: Residences, hotels, sleeping areas | 72 | 75 | 80 |
| Auditoriums | 72 | 80 | 80 |
| Theaters | 72 | 80 | 80 |
| Category 3: Institutional with primarily daytime use only (i.e. schools and churches) | 75 | 78 | 83 |

Vibration Source Levels For Construction Equipment

| Equipment | PPV at 25 ft <br> (in/sec) | Approximate Lv <br> at 25 feet * |
| :--- | :---: | :---: |
| Impact Pile Driver - Upper Range | 1.518 | 112 |
| Impact Pile Driver - Typical | 0.644 | 104 |
| Sonic Pile Driver - Upper Range | 0.734 | 105 |
| Sonic Pile Driver - Typical | 0.17 | 93 |
| Clam Shovel Drop (slurry wall |  |  |
| construction) | 0.202 | 94 |
| Hydromill (slurry wall |  |  |
| construction) - in Soil | 0.008 | 66 |
| Hydromill (slurry wall |  |  |
| construction) - in Rock | 0.017 | 75 |
|  |  |  |
|  |  |  |
| Vibratory Roller | 0.21 | 94 |
| Hoe Ram | 0.089 | 87 |
| Bulldozer - Large | 0.089 | 87 |
| Bulldozer - Small | 0.003 | 58 |
| Caisson Drilling | 0.089 | 87 |
| Loaded Trucks | 0.076 | 86 |
| Jackhammer | 0.035 | 79 |

## Vibration Analysis - Burbank LaTerra Mixed Use

PPV (in/sec) $=$ PPV $\{$ ref $\}$ * $(25 / D)^{\wedge 1.5 ~}$
Where PPV = Peak Particle Velocity
$\{r e f\}=$ PPV at the reference distance of 25 feet
$\mathrm{D}=$ distance to the receptor


| Equipment $=$ Bulldozer - Large <br> $P P V\{r e f\}=$ $0.089 \mathrm{in} / \mathrm{sec}$ <br> D $=$ <br> 925 feet  <br> $P P V$ at receptor  |  |
| :---: | :---: |
| PPV is $1.7 x$ to $6 x$ larger than RMS velocity Assume typical conversion factor of | 4 PPV:RMS |
| Therefore estimated RMS velocity = | $0.000 \mathrm{in} / \mathrm{sec}$ |
| Receptor Lv = | 40 VdB |



Source: Section 5 Transit Vibration

* RMS Velocity in decibels VdB with Vref of 1E-6 in/sec and PPV:RMS of $\sim 4$

Section 6 Vibration Impact Analysis
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Criterion

| Building Damage |  | Canmet, Bauer, and Calder, 1977 |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Type | VdB | Equipment | PPV Threshold, in/sec | Type of Damage |
| Extremely susceptible to vibration damage | 90 | Rigid Mercury Switches | 0.5 | Trip Out |
| Non-engineered timber and masonry buildings | 94 | House | 2 | Cracked Plaster |
| Engineered concrete and masonry buildings Typical buildings | $\begin{gathered} 98 \\ 100 \end{gathered}$ | Concrete Block | 8 | Crack in Block |
| Reinforced concrete, steel, or timber buildings | 102 | Cased Drill Holes <br> Pumps, Compressors | $\begin{array}{r} 15 \\ 40 \\ \hline \end{array}$ | Horizontol Offset Shaft Misalignment |


| Human Response Criteria |
| :--- |
| Level, Lv in VdB 25 40 Equivalent Noise Level, dBA |
| 65 |
| 75 |


| Impact Criteria |  |  |  |
| :---: | :---: | :---: | :---: |
| Land Use | Lv in VdB |  |  |
|  | Frequent Events (70+/day) | $\begin{gathered} \text { Occasional } \\ \text { Events (30- } \\ 70 / \text { day }) \\ \hline \end{gathered}$ | Infrequent (<30 events/day) |
| Category 1: Vibration Sensitive | 65 | 65 | 65 |
| Concert Halls | 65 | 65 | 65 |
| TV Studios | 65 | 65 | 65 |
| Recording Studios | 65 | 65 | 65 |
| Category 2: Residences, hotels, sleeping areas | 72 | 75 | 80 |
| Auditoriums | 72 | 80 | 80 |
| Theaters | 72 | 80 | 80 |
| Category 3: Institutional with primarily daytime use only (i.e. schools and churches) | 75 | 78 | 83 |

Vibration Source Levels For Construction Equipment

| Equipment | PPV at 25 ft <br> (in/sec) | Approximate Lv <br> at 25 feet * |
| :--- | :---: | :---: |
| Impact Pile Driver - Upper Range | 1.518 | 112 |
| Impact Pile Driver - Typical | 0.644 | 104 |
| Sonic Pile Driver - Upper Range | 0.734 | 105 |
| Sonic Pile Driver - Typical | 0.17 | 93 |
| Clam Shovel Drop (slurry wall |  |  |
| construction) | 0.202 | 94 |
| Hydromill (slurry wall |  |  |
| construction) - in Soil | 0.008 | 66 |
| Hydromill (slurry wall |  |  |
| construction) - in Rock | 0.017 | 75 |
|  |  |  |
|  |  |  |
| Vibratory Roller | 0.21 | 94 |
| Hoe Ram | 0.089 | 87 |
| Bulldozer - Large | 0.089 | 87 |
| Bulldozer - Small | 0.003 | 58 |
| Caisson Drilling | 0.089 | 87 |
| Loaded Trucks | 0.076 | 86 |
| Jackhammer | 0.035 | 79 |

## Vibration Analysis - Burbank LaTerra Mixed Use

PPV (in/sec) $=$ PPV $\{$ ref $\}$ * $(25 / D)^{\wedge 1.5 ~}$
Where PPV = Peak Particle Velocity
$\{r e f\}=$ PPV at the reference distance of 25 feet
$\mathrm{D}=$ distance to the receptor

| Equipment | $=$ | Vibratory Roller |
| ---: | ---: | ---: |
| $\mathrm{PPV}\{\mathrm{ref}\}$ | $=$ | $0.21 \mathrm{in} / \mathrm{sec}$ |
| D | $=$ | 1370 feet |
| PPV at receptor | $=$ | $\mathbf{0 . 0 0 1} \mathbf{~ i n} / \mathbf{s e c}$ |


| PPV is $1.7 \times$ to $6 x$ larger than RMS velocity |  |
| :--- | ---: |
| Assume typical conversion factor of | $4 \mathrm{PPV}: \mathrm{RMS}$ |
|  |  |
| Therefore estimated RMS velocity = |  |

$\begin{array}{rr}\text { Therefore estimated RMS velocity }= & 0.000 \mathrm{in} / \mathrm{se} \\ \text { Receptor } L v= & 42 \mathrm{VdB}\end{array}$



Source: Section 5 Transit Vibration

* RMS Velocity in decibels VdB with Vref of 1E-6 in/sec and PPV:RMS of $\sim 4$

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Criterion

| Building Damage |  | Canmet, Bauer, and Calder, 1977 |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Type | VdB | Equipment | PPV Threshold, in/sec | Type of Damage |
| Extremely susceptible to vibration damage | 90 | Rigid Mercury Switches | 0.5 | Trip Out |
| Non-engineered timber and masonry buildings <br> Engineered concrete and | 94 | House | 2 | Cracked Plaster |
| masonry buildings Typical buildings | $\begin{gathered} 98 \\ 100 \end{gathered}$ | Concrete Block | 8 | Crack in Block |
| Reinforced concrete, steel, or timber buildings | 102 | Cased Drill Holes <br> Pumps, Compressors | $\begin{aligned} & 15 \\ & 40 \end{aligned}$ | Horizontol Offset Shaft Misalignment |


| Human Response Criteria |
| :--- |
| Level, Lv in VdB Equivalent Noise Level, dBA    <br>  Low Freq ( 30 Hz$)$ Mid Freq $(60 \mathrm{~Hz})$ Human Response  |
| 65 |
| 75 |


| Impact Criteria |  |  |  |
| :---: | :---: | :---: | :---: |
| Land Use | Lv in VdB |  |  |
|  | Frequent Events (70+/day) | $\begin{gathered} \text { Occasional } \\ \text { Events (30- } \\ 70 / \text { day }) \\ \hline \end{gathered}$ | Infrequent (<30 events/day) |
| Category 1: Vibration Sensitive | 65 | 65 | 65 |
| Concert Halls | 65 | 65 | 65 |
| TV Studios | 65 | 65 | 65 |
| Recording Studios | 65 | 65 | 65 |
| Category 2: Residences, hotels, sleeping areas | 72 | 75 | 80 |
| Auditoriums | 72 | 80 | 80 |
| Theaters | 72 | 80 | 80 |
| Category 3: Institutional with primarily daytime use only (i.e. schools and churches) | 75 | 78 | 83 |

Vibration Source Levels For Construction Equipment

| Equipment | PPV at 25 ft <br> (in/sec) | Approximate Lv <br> at 25 feet * |
| :--- | :---: | :---: |
| Impact Pile Driver - Upper Range | 1.518 | 112 |
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| Sonic Pile Driver - Typical | 0.17 | 93 |
| Clam Shovel Drop (slurry wall |  |  |
| construction) | 0.202 | 94 |
| Hydromill (slurry wall |  |  |
| construction) - in Soil | 0.008 | 66 |
| Hydromill (slurry wall |  |  |
| construction) - in Rock | 0.017 | 75 |
|  |  |  |
|  |  |  |
|  | 0.21 | 94 |
| Vibratory Roller | 0.089 | 87 |
| Hoe Ram | 0.089 | 87 |
| Bulldozer - Large | 0.003 | 58 |
| Bulldozer - Small | 0.089 | 87 |
| Caisson Drilling | 0.076 | 86 |
| Loaded Trucks | 0.035 | 79 |
| Jackhammer |  |  |

## Vibration Analysis - Burbank LaTerra Mixed Use

PPV (in/sec) $=$ PPV $\{$ ref $\}$ * $(25 / D)^{\wedge 1.5 ~}$
Where PPV = Peak Particle Velocity
$\{r e f\}=$ PPV at the reference distance of 25 feet
$\mathrm{D}=$ distance to the receptor

| Equipment | $=$ | Vibratory Roller |
| ---: | ---: | ---: |
| $P P V\{r e f\}$ | $=$ | $0.21 \mathrm{in} / \mathrm{sec}$ |
| D | $=$ | 1790 feet |
| PPV at receptor | $=$ | $\mathbf{0 . 0 0 0} \mathbf{~ i n} / \mathbf{s e c}$ |


| PPV is 1.7 x to 6 x larger than RMS velocity Assume typical conversion factor of | 4 PPV:RMS |
| :---: | :---: |
| Therefore estimated RMS velocity = | $0.000 \mathrm{in} / \mathrm{sec}$ |
| Receptor L |  |




Source: Section 5 Transit Vibration

* RMS Velocity in decibels VdB with Vref of 1E-6 in/sec and PPV:RMS of $\sim 4$

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| Human Response Criteria |
| :--- |
| Level, Lv in VdB Equivalent Noise Level, dBA    <br>  Low Freq ( 30 Hz$)$ Mid Freq $(60 \mathrm{~Hz})$ Human Response  |
| 65 |
| 75 |


| Impact Criteria |  |  |  |
| :---: | :---: | :---: | :---: |
| Land Use | Lv in VdB |  |  |
|  | Frequent Events (70+/day) | $\begin{gathered} \text { Occasional } \\ \text { Events (30- } \\ 70 / \text { day }) \\ \hline \end{gathered}$ | Infrequent (<30 events/day) |
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| Auditoriums | 72 | 80 | 80 |
| Theaters | 72 | 80 | 80 |
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| Sonic Pile Driver - Typical | 0.17 | 93 |
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| construction) | 0.202 | 94 |
| Hydromill (slurry wall |  |  |
| construction) - in Soil | 0.008 | 66 |
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| construction) - in Rock | 0.017 | 75 |
|  |  |  |
|  |  |  |
| Vibratory Roller | 0.21 | 94 |
| Hoe Ram | 0.089 | 87 |
| Bulldozer - Large | 0.089 | 87 |
| Bulldozer - Small | 0.003 | 58 |
| Caisson Drilling | 0.089 | 87 |
| Loaded Trucks | 0.076 | 86 |
| Jackhammer | 0.035 | 79 |

## Appendix D

TNM Roadway Noise Modeling






[^0]:    Page 2

