APPENDIX F

Environmental Noise Assessment

Prepared by:

SSA Acoustics, LLP

MONROVIA APARTMENTS
ENVIRONMENTAL NOISE ASSESSMENT REPORT
MONROVIA, CA

Submit To:

AvalonBay Communities, Inc.
Attn: Amil Gupta
Development Manager
11111 Santa Monica Blvd., Suite 850
Los Angeles, CA 90025
Cell: 805.279.3762
Office: 310.481.1286
amil_gupta@avalonbay.com

Prepared By:

SSA Acoustics, LLP.
222 Etruria Street, Suite 100
Seattle, WA 98109
206.839.0819
joel@ssaacoustics.com

March 16, 2018

DOCUMENT INFORMATION

FILE LOCATION: Y:\SSA Acoustics\Projects\Apt - Condo - Mixed Use\Apartments\18-6764 AvalonBay Monrovia Apartments

PROJECT #: 18-6764

PREPARED BY: Joel Esselstrom, Acoustical Consultant
SSA Acoustics, LLP

SIGNED: 

DATE: March 16, 2018

TABLE OF CONTENTS

I. INTRODUCTION

This report presents the environmental noise assessment for the new apartment project located at 825 S Myrtle Ave, Monrovia, California. The proposed project consists of a 5-story, 154 unit, wood-frame building consisting of 5 levels of apartment units as well as a retail space and a fitness space on the ground level. There will be a 5-story concrete parking structure on site serving the residents of the project, as well as space for public parking along S Mytle Ave. The product will require the demolition of three existing structures located on the site.

This noise assessment has been completed per the regulatory criteria as provided by the California Environmental Quality Act Guidelines (CEQA) and City of Monrovia General Plan, which has been summarized in section II of this report.

CEQA requires the following impact assessments be included in this report:

1. Noise and Land Use Compatibility
2. Project Generated Traffic Noise
3. Cumulative Traffic Noise
4. Operational Noise
5. Construction Noise
6. Construction Vibration

II. REGULATORY CRITERIA

The applicable regulatory criteria for this project includes the State CEQA guidelines, the Monrovia Municipal Code, and the City of Monrovia General Plan, which is summarized in this section.

State CEQA Guidelines

CEQA evaluates new site development based on the following criteria with regard to the significance of impact. For new projects, the following questions must be asked.

Would the project result in:

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

b) Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels?

c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

Municipal Code: Monrovia Code of Ordinances (Chapter 9.44)

<u>9.44.040 Allowable Noise Levels</u>

a) The noise standards imposed by this section shall apply to all properties in the city occupied for residential purposes, without regard to zoning classification. Except as otherwise allowed in this chapter, no person shall create or allow the creation of noise on any such residential property which causes the noise level to exceed the actual measured median ambient noise level, or the following presumed ambient noise level, whichever is greater:

Time	***Allowable Noise Level—dBA***
7:00 a.m. to 9:00 p.m.	55
9:00 p.m. to 7:00 a.m.	50

b) If the intruding noise source is continuous and cannot be reasonably discontinued for sufficient time in which the ambient noise level can be determined, the presumed ambient noise level shall be used.
(`83 Code, § 9.44.040) (Ord. 85-5 § 1 (part), 1985)

9.44.050 Noise Level Measurements
Utilizing the "A" weighting scale of the sound level meter-and the "slow" meter response ("fast" response for impulsive-type sounds), the noise level shall be measured at the street or any point on the property where the noise is received. In general, the microphone shall be located four feet above the ground and five feet from the nearest structure or wall. In those cases where another elevation is deemed appropriate, it shall be utilized.
(`83 Code, § 9.44.050) (Ord. 85-5 § 1 (part), 1985)

9.44.060 Permitted Increases in Noise Levels
Increases in noise levels prescribed in 9.44.040 are permitted in accordance with the following:

Permitted Increase dBA	***Duration of Increase Permitted (in minutes/per hour)***
5	15
10	5
15	1
20	less than one minute

9.44.070 Impulsive Sound
Noise standards set in this chapter shall be decreased by five dBA for any noise source which emits an impulsive sound.

9.44.080 Exemptions
The following activities shall be exempt from the provisions of this chapter:

a) The emission of sound for the purpose of alerting persons to the existence of an emergency or the emission of sound in the performance of emergency work;

b) Activities of the federal, state or local jurisdiction while performing governmental duties;

c) Activities conducted on public playgrounds and public or private school grounds, including but not limited to school athletic and school entertainment events;

d) The handling of boxes, crates, containers, garbage cans or other similar objects between the hours of 7:00 a.m. and 7:00 p.m.;

e) The operation of any mechanically powered saw, sander, drill, grinder, lawn or garden tool or similar tool between 7:00 a.m. and 7:00 p.m. on weekdays and the hours of 10:00 a.m. and 10:00 p.m. on weekends and holidays;

f) Construction or demolition work conducted between the hours of 7:00 a.m. and 7:00 p.m. on weekdays and the hours of 9:00 a.m. and 6:00 p.m. on weekends and holidays;

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

9.44.090 Radios, TVs,and Similar Devices**.**

a) It shall be unlawful for any person within any residential zone of the city to use or operate any radio receiving set, musical instrument, stereo system, entertainment system, television set, or other machine or device for the producing or reproducing of sound or any device by which voice, music, or any other sound is generated, between the hours of 10:00 p.m. and 7:00 a.m. of the following day, in such a manner as to disturb the peace, quiet, and comfort of neighboring residents or any reasonable person of normal sensitiveness residing in the area.

b) Any noise exceeding the ambient noise level at the property line of any property, or, if a condominium or apartment house, within any adjoining unit by more than five decibels shall be deemed to be prima facie evidence, although not the exclusive evidence, of a violation of the provisions of this section.

City of Monrovia General Plan

II. Evaluating Noise Impacts:

a) Defining Noise Exposure

Noise is often defined as unwanted sound. Sound is easily measured with instruments, but the human variability in subjective and physical responses to sound complicates the understanding of its impact on people. People judge the relative magnitude of sound by subjective terms such as “loudness” or “noisiness.”

Physically, sound-pressure magnitude is measured and quantified in terms of a logarithmic scale in decibels (dB). Research on human hearing sensitivity has shown that a 3 dB increase in the sound is barely noticeable and a 10 dB increase would be perceived as twice as loud. The table below presents the subjective effect of changes in sound pressure level. The human hearing system, however, is not equally sensitive to sound at all frequencies. Therefore, a frequency-dependent adjustment called “A-weighting” has been devised so that sound may be measured similar to the way the human hearing system responds. The A-weighted sound level is often abbreviated “dBA” or “dB(A).” Figure 1 provides typical A-weighted sound levels of various noise sources and the responses people usually have to such sound levels.

Change in	Change in Power		Change in
Sound Level (dB)	Decrease	Increase	Apparent Loudness
3	1/2	2	Just perceptible
5	1/3	3	Clearly noticeable
10	1/10	10	Half or twice as loud
20	1/100	100	Much quieter or louder

Source: Parsons Engineering Science

c) Land Use Criteria for Noise Exposure:
Guidelines for noise compatible land use, extracted from the State of California Guidelines for the Preparation and Content of the Noise Element of the General Plan, are presented in Figure 1. The guidelines provide land use compatibility with different ranges of CNEL or Ldn values, in terms of four categories of acceptability. The compatibility guidelines given in Figure 1 are based on consideration of the type of activity that would normally take place for a particular land use. These include the requirements of that activity for speech communication, the typical sound insulation characteristics of buildings that might be found in these areas, and additional requirements for freedom from noise intrusions that might be imposed on other activities, such as sleep. The noise exposure is such that the activities associated with the land use may be carried out with essentially no interference, e.g., for residential areas: both indoor and outdoor noise environments are pleasant.

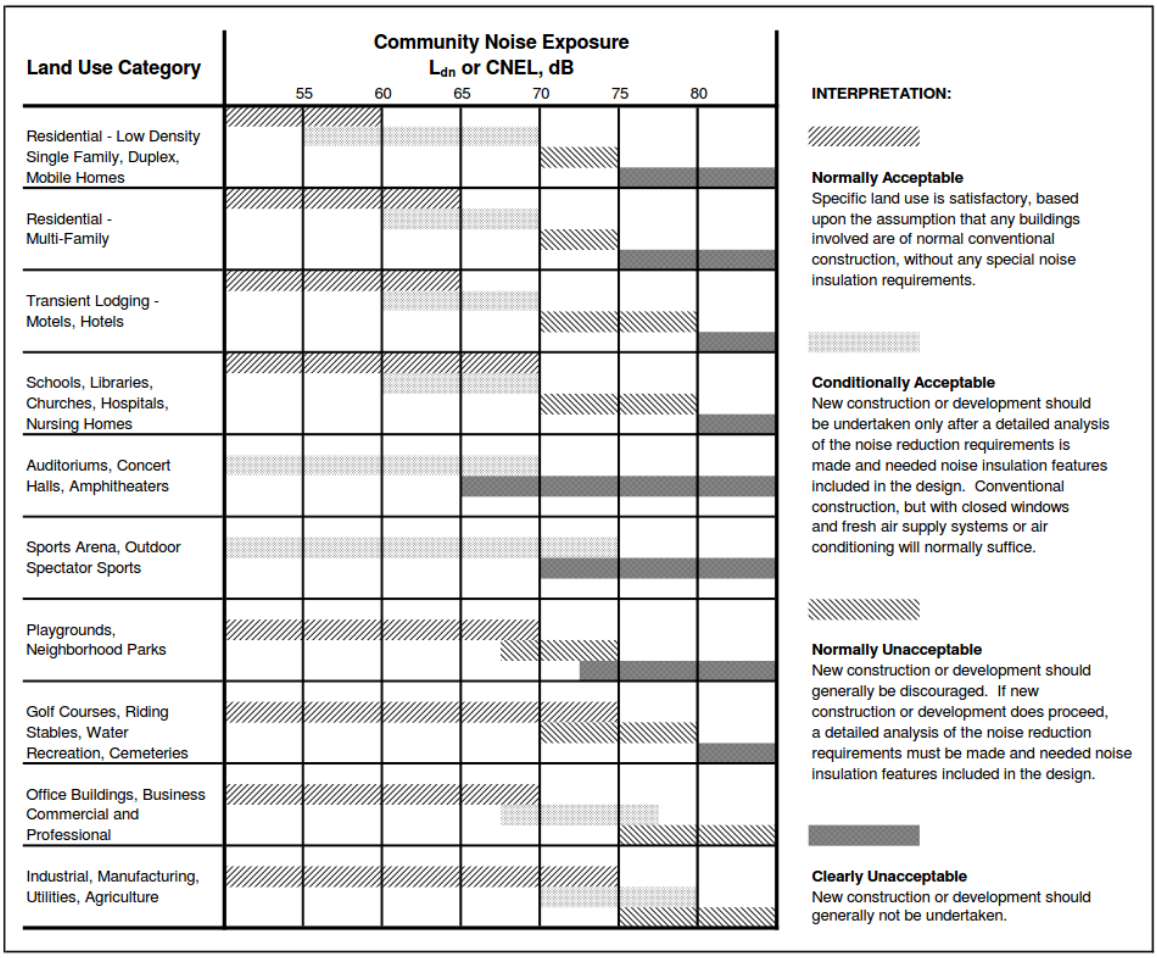
d) Acceptable Interior Noise Exposure
Section 1208A of the 1998 California Building Code (Title 24, Part 2, California Code of Regulations) establishes uniform minimum noise insulation performance standards to protect persons within new hotels, motels, dormitories, apartment houses and dwelling other than detached single-family dwellings from the effects of excessive noise. The regulations state that, “Interior noise levels attributable to exterior sources shall not exceed 45 dB in any habitable room. The noise metric shall be either … Ldn or … CNEL, consistent with the noise element of the general plan.” Additionally, it is stated that residential buildings or structures to be located where the Ldn or CNEL exceeds 60 dB shall require an acoustical analysis showing that the proposed building design will limit the intruding exterior noise to an interior CNEL (Ldn) of 45 dB.

III. Sources for Noise:

d) Neighborhood Noise Sources
Noise exposures allowable at a citizen's property line due to sources such as radio, television, recreational and social activities,air conditioning equipment, swimming pool pumps, animals, sound amplification systems, etc., vary in level, time of day, day of week, and duration. These noise intrusions, as well as intrusion from industrial or commercial zones, are regulated by the City of Monrovia’s current noise ordinance. Citizen understanding, participation and cooperation are essential for effectiveness.

e) Construction Activity
Short-term, temporary, and intermittent noise impacts associated with construction activities may be considered minimal during daytime hours. However, late evening and weekend disturbances related to construction activities experienced at nearby sensitive receptor locations may cause significant impacts.

Figure 1: Land Use Compatibility Guidelines



Source: *State of California General Plan Guidelines.* Governor's Office of Planning and Research, 1998.

III. EXISTING NOISE ENVIRONMENT

The primary source of noise exposure to the project site is from S Myrtle Ave, which runs north and south along the east side of the site. The site is also bordered by W Walnut Ave to the north and W Chestnut Ave to the south. These roads do not present a significant source of the noise to the site. Other sources include commercial and residential neighborhood activity, but were also observed not to be a significant source of noise

Long-term (LT) noise measurements were conducted at the site from Thursday, January 25, 2018 to Saturday, January 27, 2018. These measurements were used to calculate the Community Noise Exposure Level (CNEL), which is a descriptor used to calculate the average hourly noise levels over a 24-hour period, with a 5 dBA penalty between the evening hours of 7:00pm and 10:00pm and a 10 dBA penalty between the nighttime hours of 10:00pm and 7:00am. Hourly averages can be seen in the measurement charts located in Appendix II at the end of this report.

Long-Term Measurement Results

LT-1 was positioned along S Myrtle Ave, approximately 47 feet from the centerline and 17.5 feet to the first lane of traffic, in order to collect data representative of typical noise exposure along the east façade of the project. This location also provided a hidden and secure location for the sound level meter. LT-1 resulted in a CNEL 67.

LT-2 was positioned on the interior corner of the site approximately 182 feet from the centerline and 157 feet to the first lane of traffic on S Myrtle Ave, in order to represent typical noise exposure to the areas of the building façade oriented off of the road. LT-2 resulted in a CNEL 59.

Short-Term Measurement Results

Short-term (ST) measurements were taken to get more precise noise data near various areas of the façade where a long-term data was not taken. The measurements results are summarized in table 1 below:

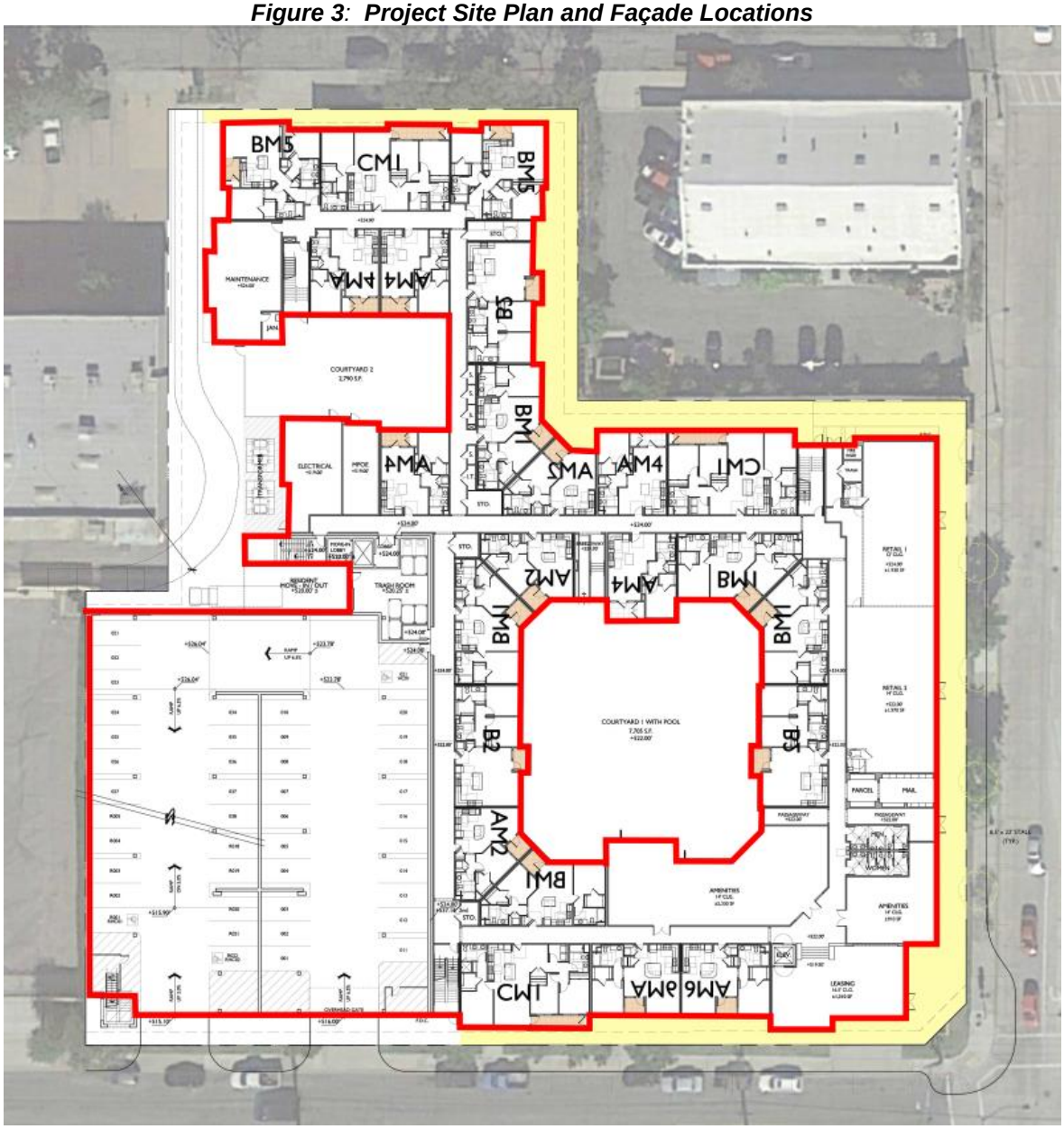
Table 1: Short Term Measurement Results

Location	dBA	Time	Duration	Measurement Description
ST-1	53.5	2:56 pm	5 min	6 cars passing at an average speed of 20 mph, at a distance of 15 feet from the first lane of traffic on W Walnut Ave.
ST-2	65.3	3:07 pm	5 min	69 cars passing and 5 medium sized trucks at an average speed of 25 mph, at a distance of 15 feet from the first lane of traffic on S Myrtle Ave.
ST-3	56.8	3:14 pm	5 min	12 cars passing and 1 medium sized truck at an average speed of 20 mph, at a distance of 15 feet from the first lane of traffic on W Chestnut Ave.

The project site location and noise sources are shown in Figure 2. Figure 3 shows the proposed building façade locations around the site.

Figure 2: Site Location and Noise Measurement Locations

Figure 3**: **Project Site Plan and Façade Locations



IV. NOISE IMPACT ASSESSMENT

Significance Criteria

The purpose of the noise impact assessment is to identify significant noise impact to or from the project site as defined by CEQA Guidelines. We have provided the following criteria of significance for this Noise Impact Assessment, which is based on the CEQA guidelines and the noise codes specific to the Monrovia General Plan and Monrovia Municipal Code. A significant noise impact would be identified if:

a. The project would expose persons utilizing the project to or cause noise levels that exceed the noise standards buildings per the General plan or Municipal code for new residential construction. Sites at or below a CNEL 65 are considered "Normally Acceptable" for residential use. Interior noise levels within a residential unit shall not exceed a CNEL 45 in any habitable room.

b. The construction of the project would expose persons to excessive vibration levels. The regulatory code does not define "excessive vibration"; however, this can generally be defined by a level of 0.3 in/sec PPV or more, or if the vibration levels have potential to cause damage to buildings adjacent to the site.

c. Permanent noise such as operational noise generated by the project has a significant impact to the sensitive receivers. Per the General Plan, a 3 dBA CNEL increase is noticeable increase, which is considered significant when you consider this increase from a single project. Furthermore, the municipal code states that noise to the residential receiving properties should not exceed 55 dBA during the day and 50 dBA during the night, or exceed the ambient noise environment, which ever is higher.

d. Permanent noise such as traffic noise increases due to the project has a significant impact to the sensitive receivers. Per the General Plan, a 3 dBA CNEL increase is noticeable increase, which is considered significant when you consider this increase from a single project.

e. Temporary or periodic noise generated by the project would have a significant impact to the sensitive receivers if it exceeds the ambient noise level by 5 dBA. The General Plan defines a 5 dBA increase as "clearly noticeable". This would generally apply to temporary noise during construction. Per the municipal code, construction noise is exempt from the noise regulations within the allowable construction hours.

1. NOISE AND LAND USE COMPATIBILITY

From the measurement results the maximum noise exposure to the site will be a CNEL 64, which falls within the "Normally Acceptable" and "Conditionally Acceptable" range for multi-family residential projects, based on the City of Monrovia General Plan.

This calculated CNEL noise level accounts for 3 dB of reduction given that our measurement of a CNEL 67 was taken at a distance of 17.5 feet from S Myrtle Ave, and

the actual building site is approximately 32 feet from S Myrtle Ave, when you factor in the new parallel parking strip along the road.

Additionally, it is stated in the general plan that residential buildings or structures to be located where the site noise exceeds a CNEL 60, an acoustical analysis is required showing that the proposed building design will limit the intruding exterior noise in to an interior CNEL 45 in any habitable room within the unit.

In order for the interior noise levels to achieve a CNEL 45, the building envelop must provide approximately 20 dB of noise reduction. This can be achieved with a standard wood-frame building envelope and STC 28 windows, which will provide 25 - 30 dB of reduction. 25-30 dB of reduction generally requires that a fresh air supply system allow that the windows to the units be closed, and that windows are STC rated. Additional notes have been provided to ensure proper sound isolation from a standard building envelope.

Additional Notes:

In order for an exterior wall assembly to achieve its intended performance, careful attention should be given to sound leaks. Sound leaks can reduce the performance of a wall of more than 10 STC points if not treated properly. The following notes should be implemented to further reduce interior noise on for all locations of the façade in this project:

a. It is recommended that the first layer of gypsum board on the unit side of exterior walls be sealed at the top and bottom with acoustical sealant per ASTM Standard C919: *Standard Practice for Use of Sealants in Acoustical Applications.* This includes outlet boxes and other penetrating elements within the wall.

b. Window rough-in seams shall be no greater than 1/4". The perimeter of window and door frames shall be sealed airtight to the exterior wall construction with a acoustical sealant.

c. Efforts to seal, caulk, gasket or weather-strip all joints and seams should be made to eliminate air leakage through these assemblies. This would include around window and doorframes; at penetrations through walls, and all other openings in the building envelop.

d. Select windows with offset trickle vents for air circulation through the window frame. Offset trickle vents drastically reduce sound leakage through the window assembly.

e. Select door seals for exterior unit doors such as Pemko S88 Silicone compression bulb seals and Pemko door bottoms. Do not use standard white seals with a foam core. These do not have sufficient mass needed to provide good noise reduction.

f. Once doors are installed, the strike and latch mechanisms must be tuned to make sure that the seals are fully compressed when the door is closed.

2. PROJECT GENERATED TRAFFIC NOISE

Traffic volume data for the project has been projected by LSA Associates, Inc. LSA estimates the following traffic volumes:

"The proposed project is estimated to generate 985 trips per day, including 58 trips in the a.m. peak hour (16 inbound and 42 outbound) and 83 trips in the p.m. peak hour (49 inbound and 34 outbound). The total net trip generation (total proposed project minus trips generated by existing land uses) will generate 721 trips per day, 27 trips in the a.m. peak hour (a reduction of 11 inbound trips and an addition of 38 outbound trips), and 52 trips in the p.m. peak hour (44 inbound and 8 outbound)."

LSA estimates that the existing land use will generate:

"264 trips per day, including 31 trips during the a.m. peak hour (27 inbound and 4 outbound) and 31 trips in the p.m. peak hour (5 inbound and 26 outbound)".

The intersection of S Myrtle Ave. and W Chestnut Ave, located on the southeast corner of the site, is estimated to have a traffic volume of 987 trips in the peak a.m. hours (7:00 a.m. – 9:00 a.m.) and 1,272 trips during peak p.m. hours (4:00 p.m. – 6:00 p.m.). The estimated addition of the 27 trips in the peak a.m. hours and 52 trips during peak p.m. hours, from the project generated traffic, is expected to have a very low impact on the overall amount of traffic in the vicinity of the site and near the NE sensitive land use receiver.

The sensitive land use receiver to the west of the site is located along W. Walnut Ave. Since there is no site access on this street, we expect that there will be very minimal impact to daily traffic volume numbers at this receiver.

In general, it takes a doubling of traffic volume to create a 3 dBA increase in noise levels, using the basic methods of summing noise sources. Traffic volumes are estimated to increase by only 3% during peak a.m. hours and 4% during peak p.m. hours. Therefore, traffic noise levels are estimated to increase by 0-1 dBA CNEL. Per the significance criteria, project generated traffic noise is considered a significant impact if it increases the site CNEL levels by 3 dBA, given that the site falls within the "normally acceptable" range for site noise. Therefore, the increase in noise due to project generated traffic is not considered a significant impact.

3. CUMULATIVE TRAFFIC NOISE

LSA Associates, Inc. provided "Cumulative Plus Project" traffic volume figures for 2020, which are considered to have a less than significant impact on the cumulative traffic volumes. LSA predicts a growth rate of 0.45 percent per year, for a total of 1.35 percent by year 2020. Traffic volumes are estimated to increase by less than 4.5% during peak a.m. hours and less than 5.5% during peak p.m. hours.

The project would be considered to have a significant impact if it raises the cumulative CNEL noise levels by 3 dBA or more, which would take a doubling of traffic volume. Based on the predicted increase in volume, the cumulative noise plus project generated noise is estimated to be a 0-1 dBA increase. Therefore, this is considered to have a less than significant impact.

4. OPERATIONAL NOISE

The predominant operational noise sources would be from the outdoor use areas such as the courtyard with the pool, from the fitness center and retail space, and also from the parking lot. Other sources would include outdoor HVAC equipment or ductwork exhausted to the exterior, serving the building.

Sensitive receivers include the apartment building to the northeast of the site, opposite S Myrtle Ave and the single-family residences to the west of the site along W Walnut Ave. Ambient noise from S Myrtle Ave is approximately 65 dBA during daytime hours and 55 dBA during nighttime hours, which will likely dominate any noise levels to sensitive receivers.

Courtyard 1 with Pool:

Courtyard 1 with the pool is enclosed on all sides by the layout of the building, which will reduce any substantial impact to the sensitive receivers. This area will likely have noise from children playing. Based on our experiences with measuring playgrounds and other similar sources for noise, children will produce noise levels between 65 and 75 dBA Leq when measured at an average distance of 25 feet from the play area. Noise from these sources will be mitigated to the sensitive receivers, given the location inside the courtyard. Furthermore, noise from children playing is generally limited to daytime hours and will not impact either of the sensitive receivers during nighttime hours.

Courtyard 2:

Courtyard 2 is located on the northwest portion of the project and is open to the east receiving properties. A typical courtyard without any play areas is not expected to generate loud noises and will not be a concern for noise at any sensitive receivers.

Amenities:

There are two amenity spaces located at ground level. One is on the east side of the site along S Myrtle Ave. The other is adjacent to the courtyard. Furthermore, noise from these spaces will mostly be confined within the interior of the building, and will also be masked by ambient noise from S Myrtle Ave.

Retail 1 and 2:

These spaces are located at ground level on the east side of the site along S Myrtle Ave. Given that noise sources from typical retail spaces will be much lower than traffic noise on S Myrtle Ave, these spaces are not expected to have a significant impact on the surrounding environment. Furthermore, noise from these spaces will mostly be confined within the interior of the building.

Parking Garage:

The parking garage is located on the SW corner of the site along W Chestnut Ave, with approximately 290 parking stalls per the current design. We estimate that most parking stalls will be in use and have at least one trip (leave and return) per day on average. SSA Acoustics has conducted noise surveys near parking lots with similar frequency of trips.

During peak parking lot activity, such as in the morning or the evening, noise levels were as high as 60 dBA Leq, when measured at a distance of 25 feet. Primary sources of noise were from door slams, vehicles starting up, and human activity. Car alarms are considered necessary for safety and anti-theft, are highly infrequent, and not generally a concern for noise.

Based on this data, parking garage noise is estimated to be as high as approximately 45 dBA Leq to the nearest residential receiving property to the northwest. Parking garage noise will be completely in audible to the residential receiver to the northeast, given the shielding from the proposed building. Given that the ambient noise levels at the northwest of the site are around 56 dBA Leq, the lot will increase the CNEL by less than 3 dBA CNEL at sensitive receivers, which is considered not to be a significant impact. Events such as door slams, and engine starts may be audible over the the ambient but will not be a significant impact.

HVAC Noise:

There will be HVAC equipment serving the building. Per the municipal code, this equipment will be limited to 55 dBA during the hours of 7:00 a.m. – 9:00 p.m. and 50 dBA during the hours of 9:00 p.m. – 7:00 a.m., or the average measured ambient noise level at the residential receivers, whichever is higher.

Given the distance of the residential receivers from the proposed building, standard HVAC equipment will produce noise levels that are within these limits. Typically, rooftop equipment for low-rise apartment projects does not exceed a sound power level of 90 dBA. Based on the distance of the sensitive residential properties, this level will be reduced to less than 50 dBA at these properties.

Ambient noise at the northeast residential receiver is 65 dBA during daytime hours and 55 dBA during nighttime hours, which will likely dominate any equipment noise. Ambient noise at the northwest residential receiver is 56 dBA during daytime hours and approximately 48 dBA during nighttime hours, which will not likely be increased by HVAC noise. Therefore, standard HVAC equipment noise will likely have a less than significant impact.

5. CONSTRUCTION NOISE

The construction schedule for this project is expected to last for 18 months. The major noise generating equipment is from excavation at the beginning of the project and from finishing at the end of the project. Cumulatively, these sources are expected to last no more than a year.

Construction noise is predicted based on the typical noise levels for various types of construction activity for domestic housing projects, as provided by the U.S. Environmental Protection Agency in Table 3.

Table 3: Typical Ranges of Noise Levels at 50 Feet from Construction Sites (dBA Leq)

	Domestic Housing		Office Building, Hotel, Hospital, School, Public Works		Industrial, Parking Garage, Religious Amusement & Recreations, Store, Service Station		Public Works Roads, & Highways, Sewers, and Trenches	
Type of Work	**I**	**II**	**I**	**II**	**I**	**II**	**I**	**II**
Ground Clearing	83	83	84	84	84	83	84	84
Excavation	88	75	89	79	89	71	88	78
Foundations	81	81	78	78	77	77	88	78
Erection	81	65	87	75	84	72	79	78
Finishing	88	72	89	75	89	74	84	84

I – All Pertinent equipment at site.
II – Minimum required equipment present at site.
Source: United States Environmental Protection Agency, 1973, Legal Compilation on Noise, Vol. 1 p. 2-104

Based on the data provided in Table 3, construction noise is expected to impact the ambient noise levels between 81 and 88 dBA on an hourly average during construction activity at a distance of 50 feet. The nearest sensitive receivers are residential buildings to the northeast and west of the site.

West Receiver:

The single-family residence to the west is approximately 290 feet from the center of the site, 165 feet from the nearest portion of the site, and 506 feet from the farthest portion of the site. These increased distances beyond 50 feet will provide approximately 10 to 20 dBA of reduction from the nearest point to the farthest point on the site, given that attenuation increases by 6 dB for every doubling of distance. Therefore, construction noise will range between 61 dBA and 78 dBA throughout the construction process depending on what equipment is being used and on what part of the site.

The ambient noise levels at this receiver are estimated to be 53 dBA during construction hours, based on our short-term noise measurements. Therefore, construction noise is predicted to exceed 60 dBA and the ambient by 5 dBA, at any portion of the site. This is considered a significant impact.

Northeast Receiver:

The multi-family residential building to the northeast is approximately 400 feet from the center of the site, 220 feet from the nearest portion of the site, and 570 feet from the farthest portion of the site. These increased distances beyond 50 feet will provide approximately 13 to 21 dBA of reduction from the nearest point to the farthest point on the site, given that attenuation increases by 6 dB for every doubling of distance. Therefore, construction noise will range between 60 dBA and 75 dBA throughout the construction process depending on what equipment is being used and on what part of the site.

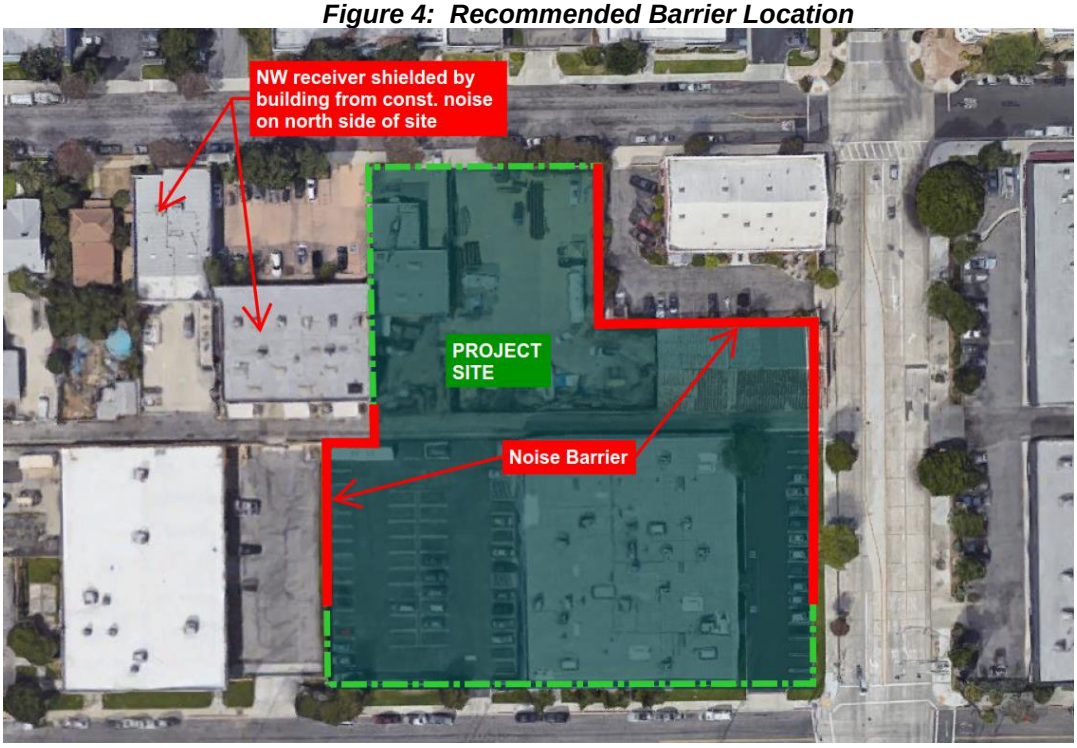
The ambient noise levels at this receiver are estimated to be 65 dBA during construction hours, based on our short-term noise measurements. Therefore, construction noise is

predicted to exceed 60 dBA and the ambient by 5 dBA, when construction noise is generated on the portions of the site nearest the NE receiver. This is considered a significant impact. We recommend the following mitigation:

Noise Mitigation:

1. Whenever possible, incorporate an 8' tall noise barrier into the site boundaries to reduce line-of-sight noise to the sensitive receivers. A barrier will provide as much as 5 dB of noise reduction where it blocks the line-of-site between the source and receiver. Noise attenuation from barrier varies drastically depending on the location of the source and receiver in relation to the barrier. The barrier will be most effective during demolition and initial site work. It will be less effective at reducing noise during framing of the upper floors of the building; however, it will reduce noise from ground level equipment throughout the duration of the project. See figure 4 for an approximate location of barrier.
    a. Construct a continuous barrier from 3/4" plywood, or a continuous mass having a weight of 2lb/sf or more.
    b. Seal all joints in barrier with acoustical sealant to create a continuous barrier without sound leaks. Also, vertical seams can be overlapped and screwed tight together to create a continuous barrier.
    c. Avoid large air gaps under the barrier. Soil can be mounded at the base to fill in larger spaces under the barrier.

Figure 4: Recommended Barrier Location



2. Locate loud stationary equipment such as generators, compressors, etc. along the south side of the site.

3. Locate large dumpsters, recycling containers, or demolition debris containers toward the south side of the site. These can be loud when materials are dropped into them during the demolition phase of construction.

4. Locate site entrance and exit on south side of site or near the corner of W. Chestnut Ave and S Myrtle Ave. This will locate heavy truck traffic away from sensitive receivers and also position activity near S Myrtle Ave, which has higher ambient noise levels to help mask the increase in noise.

5. Utilize exhaust and intake mufflers on machinery on machinery with combustion engines.

6. Limit construction activity between the hours of 7:00 a.m. and 7:00 p.m. on weekdays and between the hours of 9:00 a.m. and 6:00 p.m. on the weekends and holidays.

7. Devise a construction plan that we can review prior to start of construction so we can provide feedback for any potential issues not considered in this evaluation.

6. CONSTRUCTION VIBRATION

The State of California DOT recommends a vibration limit of no more than 0.5 in/sec PPV for modern and structurally sound buildings, 0.3 in/sec PPV for structurally sound buildings where damage may be a concern, and 0.08 in/sec PPV for ancient or structurally weakened buildings adjacent to the project site. Per the significance criteria, ground vibration levels exceeding 0.3 in/sec PPV would result in a significant impact.

Vibration levels from construction activity will occasionally be perceptible at neighboring properties during daytime hours. Construction activities will include demolition, excavation, site preparation, foundation work, concrete pouring, framing, and finishing. Table 4 below describes vibration levels from typical construction equipment.

Table 4: Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft	Approximate Lv* at 25 ft
Pile Driver (Impact)	upper range	1.518	112
	typical	0.644	104
Pile Driver (Sonic)	upper range	0.734	105
	typical	0.170	93
Clam shovel drop (slurry wall)		0.202	94
Hydromill (slurry wall)	in soil	0.008	66
	in rock	0.017	75
Vibratory roller		0.210	94
Hoe ram		0.089	87
Large bulldozer		0.089	87
Caisson drilling		0.089	87
Loaded trucks		0.076	86
Jackhammer		0.035	79
Small bulldozer		0.003	58

* RMS velocity in decibels (VdB) re 1 micro-inch/second
Source: Transit Noise and Vibration Impact Assessment, United States Department of Transportation, Office of Planning and Environment, Federal Transit Admin., May 2006

As shown in table 4, the most significant sources of vibration during construction are from pile driving equipment; however, this project will not be using this type of equipment. Most other equipment is around 0.2 in/sec PPV or less at a distance of 25 ft.

All adjacent building are at least 50 feet or more from the site, except for the building that directly borders the site on the NW side. Demolition of an existing structure on the project site that is attached to this building will be required. This may result in a perceptible vibration levels at this receiver for a short duration of time. The building that will be impacted is a modern building and should not be at risk for damage, with proper precautions taken.

Furthermore, there are no ancient buildings or buildings known to be structurally weakened adjacent to the site. There is an older building adjacent to the northeast corner of the site at 801 S Myrtle Ave, that was originally constructed in 1918 and significantly updated in 1940. Table 5 shows the recommended vibration limits for different types of structures. For buildings classified as “older” or “historical”, the limit for vibration is 0.25 in/sec PPV for continuous or frequent sources of vibration.

Table 5: Summary of Construction Equipment Vibration Levels and Effects on Humans and Buildings

Effects	Peak Particle Velocity (PPV in/sec)	
	Transient Sources or Isolated Event	**Continuous/Frequent Intermittent Sources**
Potentially Damaged Structure Type		
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5
Human Response		
Barely perceptible	0.04	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible	0.9	0.1
Severe	2.0	0.4

Source: Caltrans 2004

We expect that vibration levels will be less than 0.2 in/sec PPV at all receivers with standard construction equipment, which is considered a less than significant impact.

V. SUMMARY

This concludes our environmental noise assessment report of the Monrovia Apartments project. Most of the potential noise impacts are not significant. We have provided notes were necessary to reduce noise or vibration. The significance of impact for each portion of the evaluation can be summarized per the following:

1. Noise and Land Use Compatibility: Normally Acceptable. Notes provided to ensure that interior CNEL noise limits are not exceeded.

2. Project Generated Traffic Noise: Less than significant impact.

3. Cumulative Traffic Noise: Less than significant impact.

4. Operational Noise: Less than significant impact.

5. Construction Noise: Significant impact at sensitive receivers. Notes have been provided to mitigate noise.

6. Construction Vibration: No significant impact at sensitive receivers with standard construction equipment. Possibility of significant impact for short duration, at building to east of site with exterior wall attached to existing building on site to be demolished.

APPENDIX I: DESCRIPTORS

Sound Pressure Level (SPL)
Sound can be described by small vibrations traveling through the air that are sensed by the human ear. The ear perceives these vibrations as changes in pressure and as a result sound levels are often referred to as Sound Pressure Levels (SPL)

Decibel (dB)
Sound levels are expressed in units of decibels. The term decibel implies a logarithmic ratio of the measured pressure to a reference pressure. The reference pressure refers to the lower threshold of perceptibility by the human ear.

Frequency (Hz)
The number of complete pressure fluctuations per second above and below atmospheric pressure. This number dictates how "high" or "low" a sound is perceived by a listener. Typically, humans can perceive frequencies as low as 20 Hz and as high as 20,000 Hz.

A-Weighted Decibel (dBA)
The human ear responds differently to sounds at different frequencies. This is demonstrated by the fact that we hear higher pitched sounds more easily than lower ones of the same magnitude. To compensate for the different "loudness" as perceived by humans, a standard weighting curve is applied to measured sound levels. The weighting curve represents the frequency response of the human ear and is labeled as dBA ("A" weighted decibels).

Community Noise Exposure Level (CNEL)
CNEL is a descriptor used to calculate the average hourly noise levels over a 24-hour period, with a 5 dBA penalty between the evening hours of 7:00pm and 10:00pm and a 10 dBA penalty between the nighttime hours of 10:00pm and 7:00am. The value derived is used to describe noise exposure for both the exterior and interior spaces in a multi-family residential building from sources such as vehicle traffic, aircraft, or railways.

Ambient Noise
This describes the noise levels from a cumulation of sources in a given setting. This is often used to describe the noise levels from traffic for both indoor and outdoor spaces.

Peak Particle Velocity (PPV)
PPV is used to quantify ground vibration, measured in terms of with units in in/sec. PPV refers to the maximum molecular movement within the ground and not surface on the surface. The displacement value in inches describes to the surface movement. The frequency range for ground vibration is typically between 1 Hz and 200 Hz.

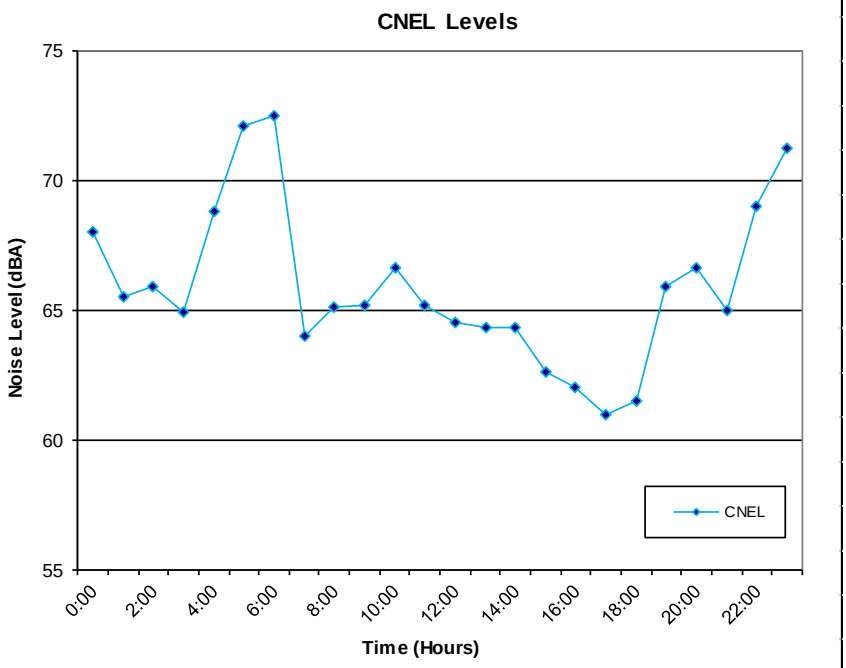
APPENDIX II: CNEL CALCULATIONS

Table 6: *CNEL Calculation for Measurement LT-1*

CNEL Calculation for Monrovia Apartments

LT-1 (Near S Myrtle Ave) **CNEL: 67**

Date / Time	Leq	CNEL
1/26/2018 0:00	58	68
1/26/2018 1:00	55.5	66
1/26/2018 2:00	55.9	66
1/26/2018 3:00	54.9	65
1/26/2018 4:00	58.8	69
1/26/2018 5:00	62.1	72
1/26/2018 6:00	62.5	73
1/26/2018 7:00	64	64
1/26/2018 8:00	65.1	65
1/26/2018 9:00	65.2	65
1/26/2018 10:00	66.6	67
1/26/2018 11:00	65.2	65
1/26/2018 12:00	64.5	65
1/26/2018 13:00	64.3	64
1/26/2018 14:00	64.3	64
1/26/2018 15:00	62.6	63
1/26/2018 16:00	62	62
1/26/2018 17:00	61	61
1/26/2018 18:00	61.5	62
1/26/2018 19:00	60.9	66
1/26/2018 20:00	61.6	67
1/26/2018 21:00	60	65
1/26/2018 22:00	59	69
1/26/2018 23:00	61.2	71



CNEL Definition: From Average Leq over 24-hour period with a 5 dBA penalty from 7:00pm to 10:00pm and a 10 dBA penalty 10:00pm to 7:00am. The Calc was derived from a single 24-hour period from the total duration.

Measurement: A Svantek 971 Sound Level Meter was placed on the north side of the site, approx. 17.5' from the first lane of traffic on S Myrtle Ave, at a height of approximatley 7 feet above grade.

Duration: The measurement began at 3:00pm on Thursday 1/25/18 and ended at 12:00pm on Saturday 1/27/18. A single 24-hour period was taken from Friday.

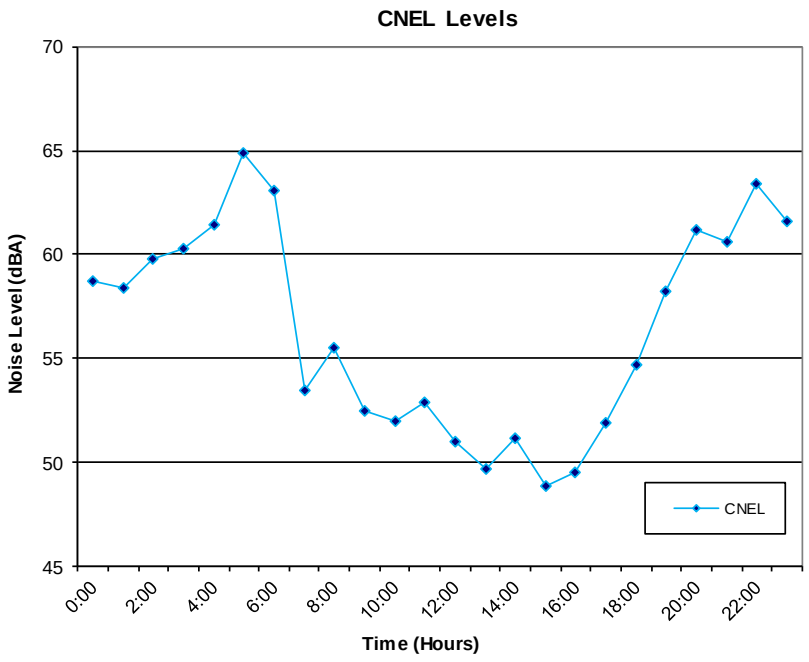
Observations: Major noise sources were from traffic moving at an approximate speed of 25 mph along S Myrtle Ave. Other side streets had very little traffic.

Table 7: *Ldn Calculation for Measurement LT-2*

CNEL Calculation for Monrovia Apartments

LT-2 (Near Interior of Site) **CNEL: 59**

Date / Time	Leq	CNEL
1/26/2018 0:00	48.7	59
1/26/2018 1:00	48.4	58
1/26/2018 2:00	49.8	60
1/26/2018 3:00	50.3	60
1/26/2018 4:00	51.4	61
1/26/2018 5:00	54.9	65
1/26/2018 6:00	53.1	63
1/26/2018 7:00	53.5	54
1/26/2018 8:00	55.5	56
1/26/2018 9:00	52.5	53
1/26/2018 10:00	52	52
1/26/2018 11:00	52.9	53
1/26/2018 12:00	51	51
1/26/2018 13:00	49.7	50
1/26/2018 14:00	51.2	51
1/26/2018 15:00	48.9	49
1/26/2018 16:00	49.5	50
1/26/2018 17:00	51.9	52
1/26/2018 18:00	54.7	55
1/26/2018 19:00	53.2	58
1/26/2018 20:00	56.2	61
1/26/2018 21:00	55.6	61
1/26/2018 22:00	53.4	63
1/26/2018 23:00	51.6	62



CNEL Definition: From Average Leq over 24-hour period with a 5 dBA penalty from 7:00pm to 10:00pm and a 10 dBA penalty 10:00pm to 7:00am. The Calc was derived from a single 24-hour period from the total duration.

Measurement: A Svantek 971 Sound Level Meter was placed near the middle of the site approx 157' from the first lane of traffic on S Myrtle Ave, at a height of 7 feet above grade.

Duration: The measurement began at 3:00pm on Thursday 1/25/18 and ended at 12:00pm on Saturday 1/27/18. A single 24-hour period was taken from Friday.

Observations: Major noise sources were from traffic moving at an approximate speed of 25 mph along S Myrtle Ave. Other side streets had very little traffic.