



**PRELIMINARY SITE NOISE ASSESSMENT FOR:**

**Harbor Bay Hotels**  
1051 Harbor Bay Blvd  
Alameda, CA  
RGD Project #: 18-002

**PREPARED FOR:**

SHS Development  
2834 El Camino Real  
Redwood City, CA 94061

**PREPARED BY:**

Harold Goldberg, P.E.  
Tsz "Anthony" Wong

**DATE:**

5 February 2018

## 1. Introduction

The proposed project is a development a new five-story hotel on an existing vacant lot located at 1051 Harbor Bay Boulevard. The project site is located at the western end of Oakland's International Airport. The proposed five-story hotel will have 211 guest rooms and at-grade parking. This study quantifies and assesses the noise environment with respect to the requirements of the State of California Building Code, California Green Building Code, and City of Alameda General Plan.

## 2. Environmental Noise Fundamentals

Noise can be defined as unwanted sound. It is commonly measured with an instrument called a sound level meter. The sound level meter captures the sound with a microphone and converts it into a number called a sound level. Sound levels are expressed in units of decibels. To correlate the microphone signal to a level that corresponds to the way humans perceive noise, the A-weighting filter is used. A-weighting de-emphasizes low-frequency and very high-frequency sound in a manner similar to human hearing. The use of A-weighting is required by most local General Plans as well as federal and state noise regulations (e.g. Caltrans, EPA, OSHA and HUD). The abbreviation dBA is sometimes used when the A-weighted sound level is reported.

Because of the time-varying nature of environmental sound, there are many descriptors that are used to quantify the sound level. Although one individual descriptor alone does not fully describe a particular noise environment, taken together, they can more accurately represent the noise environment. The maximum instantaneous noise level ( $L_{max}$ ) is often used to identify the loudness of a single event such as a car passby or airplane flyover. To express the average noise level the  $L_{eq}$  (equivalent noise level) is used. The  $L_{eq}$  can be measured over any length of time but is typically reported for periods of 15 minutes to 1 hour. The background noise level (or residual noise level) is the sound level during the quietest moments. It is usually generated by steady sources such as distant freeway traffic. It can be quantified with a descriptor called the  $L_{90}$  which is the sound level exceeded 90 percent of the time.

To quantify the noise level over a 24-hour period, the Day/Night Average Sound Level (DNL or  $L_{dn}$ ) or Community Noise Equivalent Level (CNEL) is used. These descriptors are averages like the  $L_{eq}$  except they include a 10 dB penalty during nighttime hours (and a 5 dB penalty during evening hours in the CNEL) to account for peoples increased sensitivity during these hours. The CNEL and  $L_{dn}$  are typically less that one decibel apart.

In environmental noise, a change in noise level of 3 dB is considered a just noticeable difference. A 5 dB change is clearly noticeable, but not dramatic. A 10 dB change is perceived as a halving or doubling in loudness.

### 3. Acoustical Criteria

#### 3.1. California Building Code

Section 1207.4 of the California Building Code has exterior noise transmission requirements for multi-family residential dwelling units and hotel sleeping units. The code states that allowable interior noise levels attributable to exterior sources shall not exceed a CNEL of 45 dB in any habitable room.

#### 3.2. CALGreen

Section 5.507 of the State of California Green Building Standards Code has exterior noise transmission requirements for new nonresidential buildings. If the building will be exposed to an hourly  $L_{eq}$  of 65 dB or more, the building envelope shall be constructed to achieve an interior hourly equivalent noise level ( $L_{eq}$ ) of 50 dBA in the occupied areas during any hour of operation. The aforementioned performance standard is an alternative to use of the prescriptive standard which tends to be much more restrictive for buildings exposed to normal exterior noise levels.

#### 3.3. Oakland International Airport Land Use Compatibility Plan (2010)

Chapter 3 of the Oakland International Airport Land Use Compatibility Plan (ALUCP) has noise compatibility policies in order to prevent the development of noise-sensitive land uses in portions of the airport environ that are exposed to significant levels of aircraft noise. The compatibility and acceptability of aircraft-related exterior noise exposure for different land uses are shown in Table 1 (ALUCP Table 3-1). Section 3.3.1.6 of the ALUCP defines that the maximum aircraft-related interior noise level considered acceptable for hotel development projects to be 45 dB CNEL.

**Table 1: Aircraft Noise Compatibility Criteria [OAK ALUCP Table 3-1]**

Land Use Category	Exterior Noise Exposure (dB CNEL)		
	60	65	70
<b>Agricultural, Recreational, and Animal-Related</b>			
Outdoor amphitheaters			
Zoos; animal shelters; neighborhood parks; playgrounds			
Regional parks; athletic fields; golf courses; outdoor spectator sports; water recreation facilities			
Nature preserves; wildlife preserves; livestock breeding or farming			
Agriculture (except residences and livestock); fishing			
<b>Residential, Lodging, and Care</b>			
Residential, (including single-family, multi-family, and mobile homes)*			
Residential hotels; retirement homes; hospitals; nursing homes; intermediate care facilities			
Hotels; motels; other transient lodging			
<b>Public</b>			
Schools; libraries			
Auditoriums; concert halls; indoor arenas; places of worship; cemeteries			
<b>Commercial and Industrial</b>			
Office buildings; office areas of industrial facilities; medical clinics; clinical laboratories; commercial - retail; shopping centers; restaurants; movie theaters			
Commercial - wholesale; research and development			
Industrial; manufacturing; utilities; public rights-of-way			

Land Use	Acceptability	Interpretation/Comments
	Compatible	<p><i>Indoor Uses:</i> Standard construction methods will sufficiently attenuate exterior noise to an acceptable indoor community noise equivalent level (CNEL).</p> <p><i>Outdoor Uses:</i> Activities associated with the land use may be carried out with essentially no interference from aircraft noise.</p> <p>* The maximum acceptable noise exposure for new residential development in the vicinity of OAK is anything below 60 CNEL (see Policy 3.3.1.2 (b).)</p>
	Conditional	<p><i>Indoor Uses:</i> Building structure must be capable of attenuating exterior noise to the indoor CNEL of 45 dB; standard construction methods will normally suffice.</p> <p><i>Outdoor Uses:</i> CNEL is acceptable for outdoor activities, although some noise interference may occur; caution should be exercised with regard to noise-sensitive uses.</p>
	Incompatible	<p><i>Indoor Uses:</i> Unacceptable noise interference if windows are open; at exposures above 65 dB CNEL, extensive mitigation techniques are required to make the indoor environment acceptable for performance of activities.</p> <p><i>Outdoor Uses:</i> Severe noise interference makes outdoor activities unacceptable.</p>

Source: ESA, 2007; *California Airport Land Use Compatibility Handbook* (Caltrans, 2002); PUC 21001 et seq., California State Aeronautics Act.

Note: The layout of this table was created using the framework developed in previous compatibility plans (Mead & Hunt, 2006).

### 3.4. City of Alameda

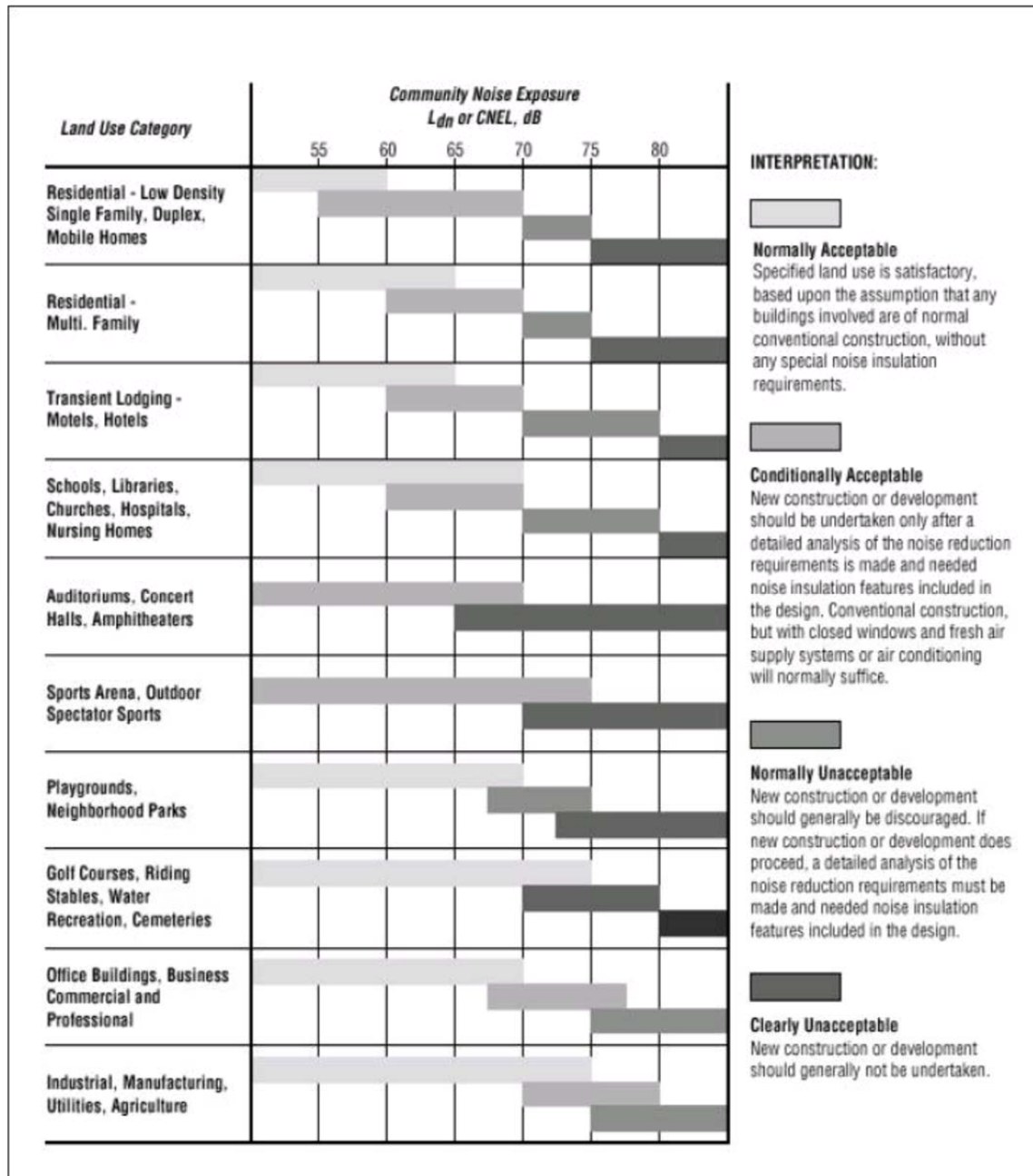
#### 3.4.1. General Plan (Effective January 1<sup>st</sup>, 2017)

The City of Alameda has objectives and policies related to noise in its Safety and Noise Element of its General Plan. Table 2 presents the California's Land Use Compatibility Guidelines referenced by the City's General Plan. The relevant implementation policy is also listed.

***Objective: Protect Alameda residents from the harmful effects of exposure to excessive noise from aircraft, buses, boats, trucks and automobiles, and adjacent land uses.***

- SN-53. Require compliance with the California Building Code requirements to ensure appropriate interior noise levels in new or replacement residential construction, hotels, motels, and schools. In new dwellings subject to an airport noise easement, the maximum interior noise level is not to exceed 45 dB CNEL. If this requirement is met by inoperable or closed windows, a mechanical ventilation system meeting California Building Code requirements must be provided. Require acoustical analyses as allowed by the California Building Code.

**Table 2: California Land Use Compatibility Guidelines [GP Table 8-1]**



### 3.4.2. Municipal Code

The City of Alameda's Municipal Code Chapter IV Article II contains noise regulations that specify noise level standards for noise generating land uses. Table 3 and Table 4 show the standards which are based on the type of receiving land use and the duration of the noise source. The noise level is to be measured at the receiving land use.

**Table 3: Noise Level Standards for Single or Multiple Family Residential, School, Hospital, or Public Library Properties (dBA)**

<i>Category</i>	<i>Cumulative Number of Minutes in Any One (1) Hour Time Period</i>	<i>Daytime (7:00 a.m. to 10:00 p.m.)</i>	<i>Nighttime (10:00 p.m. to 7:00 a.m.)</i>
1*	30	55	50
2	15	60	55
3	5	65	60
4	1	70	65
5	0	75	70

\* For example, this means the measured noise level may not exceed fifty-five (55) dB(A) for more than thirty (30) minutes out of any one (1) hour time period.

**Table 4: Noise Level Standards for Commercial Properties (dBA)**

<i>Category</i>	<i>Cumulative Number of Minutes in Any One (1) Hour Time Period</i>	<i>Daytime (7:00 a.m. to 10:00 p.m.)</i>	<i>Nighttime (10:00 p.m. to 7:00 a.m.)</i>
1	30	65	60
2	15	70	65
3	5	75	70
4	1	80	75
5	0	85	80

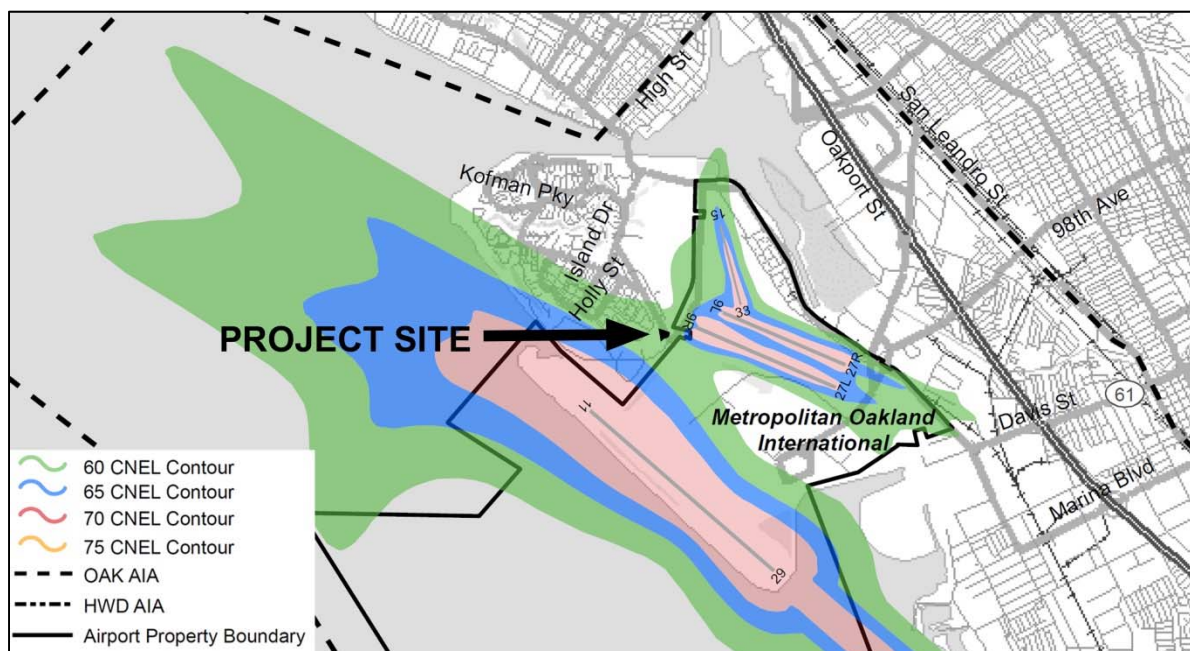
#### 4. Noise Environment

The project is located at the intersection of north/southbound Harbor Bay Parkway and east/westbound Harbor Bay Parkway in the City of Alameda. The Oakland International Airport aircraft runways are located to the approximately 1400 feet to the east and 3600 feet to the south. Additionally, the project site is bordered by a commercial RV and self-storage facility to the north and offices to the west. There is also the Oakland Raiders' athletic field to the south across Harbor Bay Parkway. The major noise sources affecting the project site are aircraft and vehicular traffic.

##### *Aircraft Noise Contours*

According to the airport noise contours presented in the Oakland International Airport Land Use Compatibility Plan (Alameda County ALUC, 2010, see Figure 1) the project site is within the CNEL 60 dBA contour, but outside of the CNEL 65 dBA. Therefore, the project is exposed to a CNEL of between 60 and 65 dBA due to aircraft noise.

**Figure 1: Airport Noise Contours**



Source: Oakland International Airport, Airport Land Use Compatibility Plan, Alameda County ALUC, Adopted December 15, 2010.

### Noise Measurements

To quantify the existing noise levels, one long-term, 2-day noise measurement (Location LT-1) and two short-term measurements (Location ST-1) were made at the project site. Figure 2 shows the noise measurement locations.

**Figure 2: Noise Measurement Locations**



Map data ©2018 Google

The long-term noise monitor at location LT-1 was attached to a tree approximately twelve feet above ground and 50 feet from the curb of Harbor Bay Parkway. The measured CNEL is 69 dBA with an hourly average noise levels ( $L_{eq}$ ) typically ranging between 60 to 68 dBA during daytime hours (7AM-10PM) and 56 to 67 dBA during nighttime hours (10PM-7AM).

Short-term measurements at location ST-1 were conducted on 22 and 24 January 2018. The microphone was located at the setback of the proposed hotel building fronting Harbor Bay Parkway at a height of 24 feet above ground to represent the noise exposure at the upper levels. The CNEL at this location is 69 dBA.

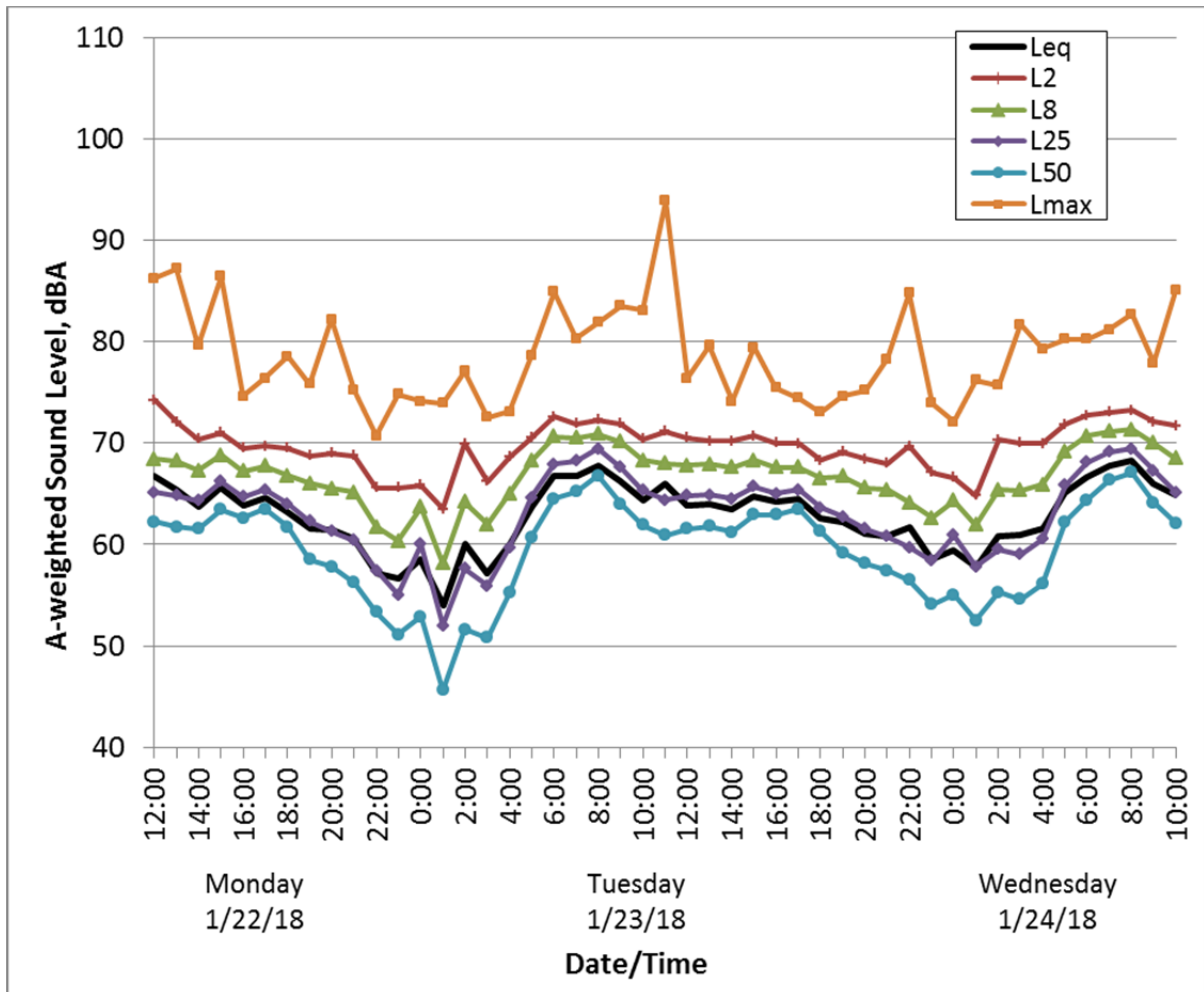
In general, aircraft take-offs typically generated a maximum noise level of 71 – 80 dBA. There were five aircraft takeoffs that generated maximum noise levels of 82 – 87 dBA. Aircrafts flying nearby (not taking off or landing at Oakland Airport)

generated lower maximum noise levels between 58 – 70 dBA. During the short-term measurement, aircrafts were observed as frequently as nine every fifteen minutes.

Maximum noise levels from traffic on Harbor Bay Parkway typically ranged between 63 – 67 dBA for cars and 64 – 74 dBA for medium and heavy trucks. There were six motorcycles that generated maximum noise levels between 80 to 87 dBA and one motorcycle that generated a maximum noise level of 94 dBA. Distant traffic also contributed significantly to the overall noise level and was the source of the background noise during the daytime and nighttime.

Figure 3 shows the long-term noise measurement results and Table 5 shows the short-term measurement results.

**Figure 3: Noise Measurement Results at Location LT- 1 (CNEL = 69 dBA)**



**Table 5: Short-Term Noise Measurement Results**

Location		Date/Time	A-weighted Sound Level, dBA						
			L <sub>eq</sub>	L <sub>max</sub>	L <sub>2</sub>	L <sub>8</sub>	L <sub>25</sub>	L <sub>50</sub>	CNEL*
ST-1	24 feet above ground	22 Jan 2018 12:01 – 12:17 PM	67	86	71	66	64	62	69
		24 Jan 2018 9:34 – 10:49 AM	64	84	70	67	65	62	

\*CNEL calculated based on correlation with simultaneous measurement at long-term location.

## 5. Analysis and Findings

Based on our measurements and the airport noise contours, the proposed project site is exposed to an exterior CNEL of up to 69 dBA due to a combination of aircraft and traffic noise and the contribution to the CNEL from aircraft is between 60 to 65 dBA. The noise exposure at various locations around the site from traffic will vary due to acoustical shielding provided by the neighboring offices and noise attenuation due to distance from the nearby roadways. We have included a 1 dBA increase in the CNEL to account for a 25% increase in future roadway traffic in the following analysis.

According to the Oakland Airport ALUCP Land Use Compatibility Table (Table 1), aircraft-related noise exposure acceptability is considered “conditional”. As defined in the ALUCP Land Use Compatibility table, the project building must be capable of attenuating exterior noise to the indoor CNEL of 45 dBA. The aircraft-related noise exposure for outdoor activities is considered acceptable by the ALUCP.

According to the City of Alameda’s Land Use Compatibility Guidelines table, the project site’s overall (aircraft and traffic) noise exposure of a CNEL of 70 dBA or less is considered “conditionally acceptable”. As defined in the City’s Land Use Compatibility Guidelines table, “conditionally acceptable” means that specified land use may be permitted only after detailed analysis of noise reduction requirements is made and needed noise insulation features are included in the design.

### 5.1. Indoor Noise Assessment - Residential Units

The City General Plan and the State of California Building Code require that interior noise levels be reduced to a CNEL of 45 dBA or less in guest rooms. Therefore, the building will need to provide noise reduction of up to 25 dBA to meet this requirement. Achieving this requirement would also achieve the ALUC requirement of reducing aircraft-related noise levels to an interior noise level of CNEL 45 dBA. This aircraft-related interior noise level requirement is consistent with noise section of the ALUC Administrative Review for the project dated 13 March 2017.

Based on our measurements and initial calculations, we conclude that the project can reasonably achieve the required noise reduction to meet State, City and ALUC interior noise standards through the use of sound rated windows.

Since the windows will need to be in the closed position to meet the interior noise level requirement, an alternate form of ventilation should be provided. This ventilation system must not compromise the sound insulation of the exterior façade.

Detailed recommendations for window and/or exterior wall STC ratings would be determined during the architectural design phase and are excluded from this report. The potential for sound intrusion from the fresh air ventilation system should be considered at this time, as well.

## 5.2. Indoor Noise Assessment - Non-Residential Units

The State of California Green Building Standards Code requires that non-residential areas (i.e. non-guest rooms) in the proposed building meet an interior hourly  $L_{eq}$  of 50 dBA. The areas that would need to meet this standard include the first floor proposed uses such as meeting rooms and the fitness room. The ground floor level of the proposed building would be exposed to an exterior hourly noise level  $L_{eq}$  up to 68 dBA and, therefore, the building will need to provide a noise reduction of between 18 dBA to meet the  $L_{eq}$  50 dBA standard.

A noise reduction of 18 dBA would likely be met with a typical commercial window glazing system with closed windows. The exact window type and corresponding STC rating requirements would be determined during the detailed design phase.

## 5.3. Mechanical Equipment Noise Assessment

The mechanical equipment will potentially be located on the building roof and ground level of the project site. The nearest residential property line is approximately 300 feet north of the project's property line. The nearest commercial spaces are adjacent to the project site (i.e. to the north and west).

The mechanical equipment noise sources associated with the project will need to meet the City of Alameda's Municipal Code Noise Standards. For example, at the nearest residences, continuously operating mechanical equipment will need to meet a noise standard of 50 dBA at night and 55 dBA during the daytime. At the nearby commercial land use, the steady noise limits are 60 dBA at night (65 dBA during the daytime) at the commercial spaces.

During the detailed design phase of the project a detailed analysis of mechanical equipment noise and, if necessary, noise reduction measures such as noise barriers or sound attenuating ductwork, should be determined.

\*

\*

\*