APPENDIX F

Noise and Vibration Assessment

Environmental Noise and Vibration Assessment

Topgolf

Burlingame, California

BAC Job # 2018-190

Prepared For:

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Introduction

The proposed Topgolf project (project) is located at 250 Anza Boulevard in the City of Burlingame, California. The Burlingame Golf Center currently operates at the project site. The site is approximately 13-acres and is located in the Bayfront area of Burlingame. The project involves the replacement of the existing driving range with a Topgolf commercial recreation and sports complex. The project area is presented as Figure 1. The proposed project site plan is presented as Figure 2.

Existing land uses in the project vicinity include hotels, playing fields, a park, a wastewater treatment facility, single-family and multi-family residential, and commercial uses. Due to the potential noise generation of the project relative to nearby noise-sensitive land uses, Bollard Acoustical Consultants, Inc. (BAC) was retained by David J. Powers & Associates, Inc. to prepare a noise analysis for the project.

The purposes of this analysis are to quantify existing ambient noise levels in the vicinity of the nearest sensitive receptors to the project site, to predict the noise generation of the various aspects of the project, and to compare project-generated noise levels against both the City of Burlingame noise standards as well as against the measured ambient noise environment.

It should be noted that, during BAC field inspections of the project site, no sources of local vibration were identified and ambient vibration levels were observed to be imperceptible. Daily operation at the project site would not include any appreciable sources of vibration. However, because project construction (e.g. pile driving) could potentially result in elevated vibration levels in the project vicinity, an analysis of vibration impacts was also conducted for the project.

Legend

- Project Border (Approximate)
- Long-Term Noise Level Measurement Location
- Short-Term Noise Level Measurement Location
- Existing Traffic Noise Barriers

N

Scale (feet)

0 250 500

Topgolf

Burlingame, California

Project Area and Ambient Noise Measurement Locations

Figure 1

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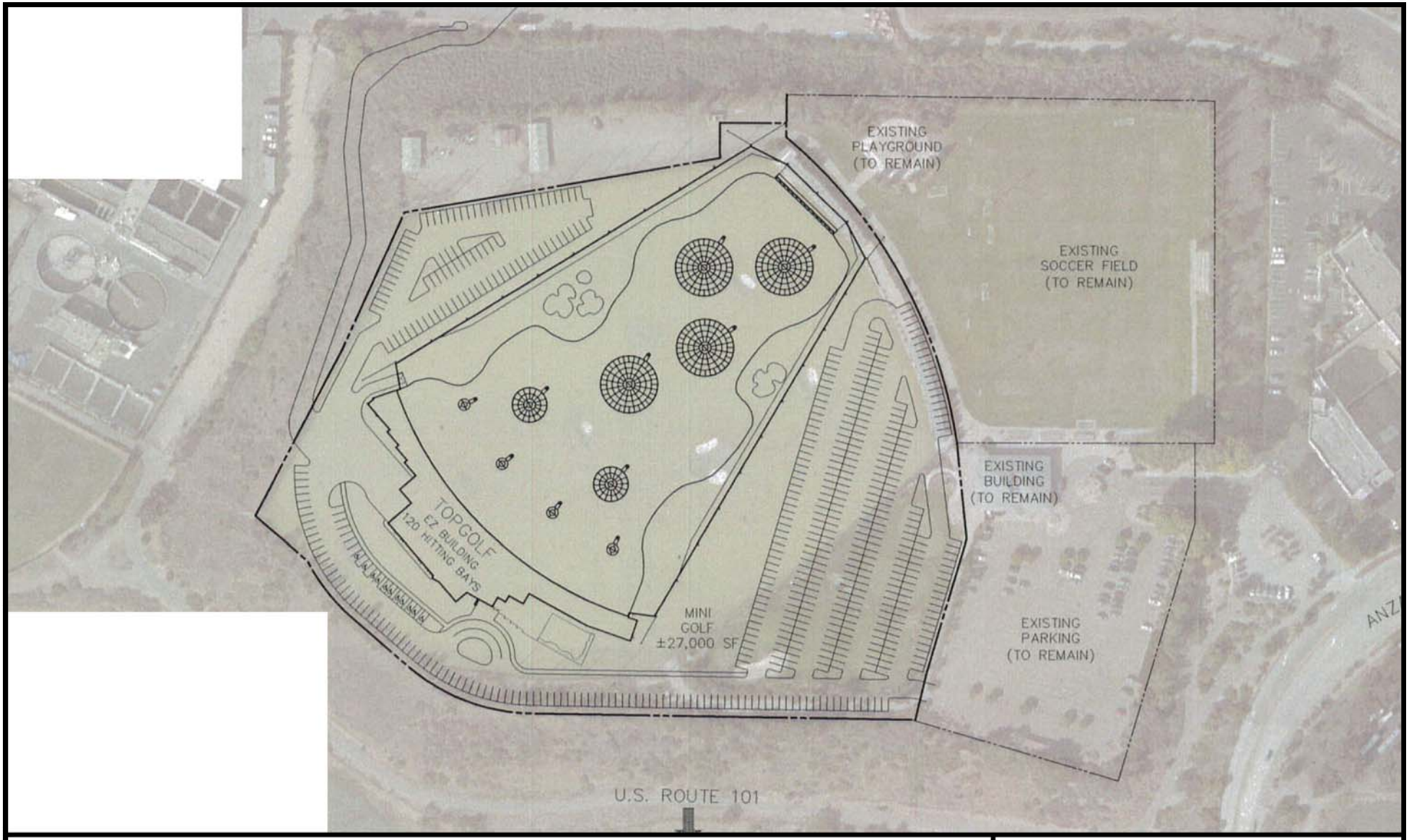

Topgolf

Burlingame, California

Project Site Plan

Figure 2

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Noise and Vibration Fundamentals

Noise

Noise is often described as unwanted sound. Sound is defined as any pressure variation in air that the human ear can detect. If the pressure variations occur frequently enough (at least 20 times per second), they can be heard and are designated as sound. The number of pressure variations per second is called the frequency of sound and is expressed as cycles per second, or Hertz (Hz). Definitions of acoustical terminology are provided in Appendix A. Figure 3 shows common noise levels associated with various sources.

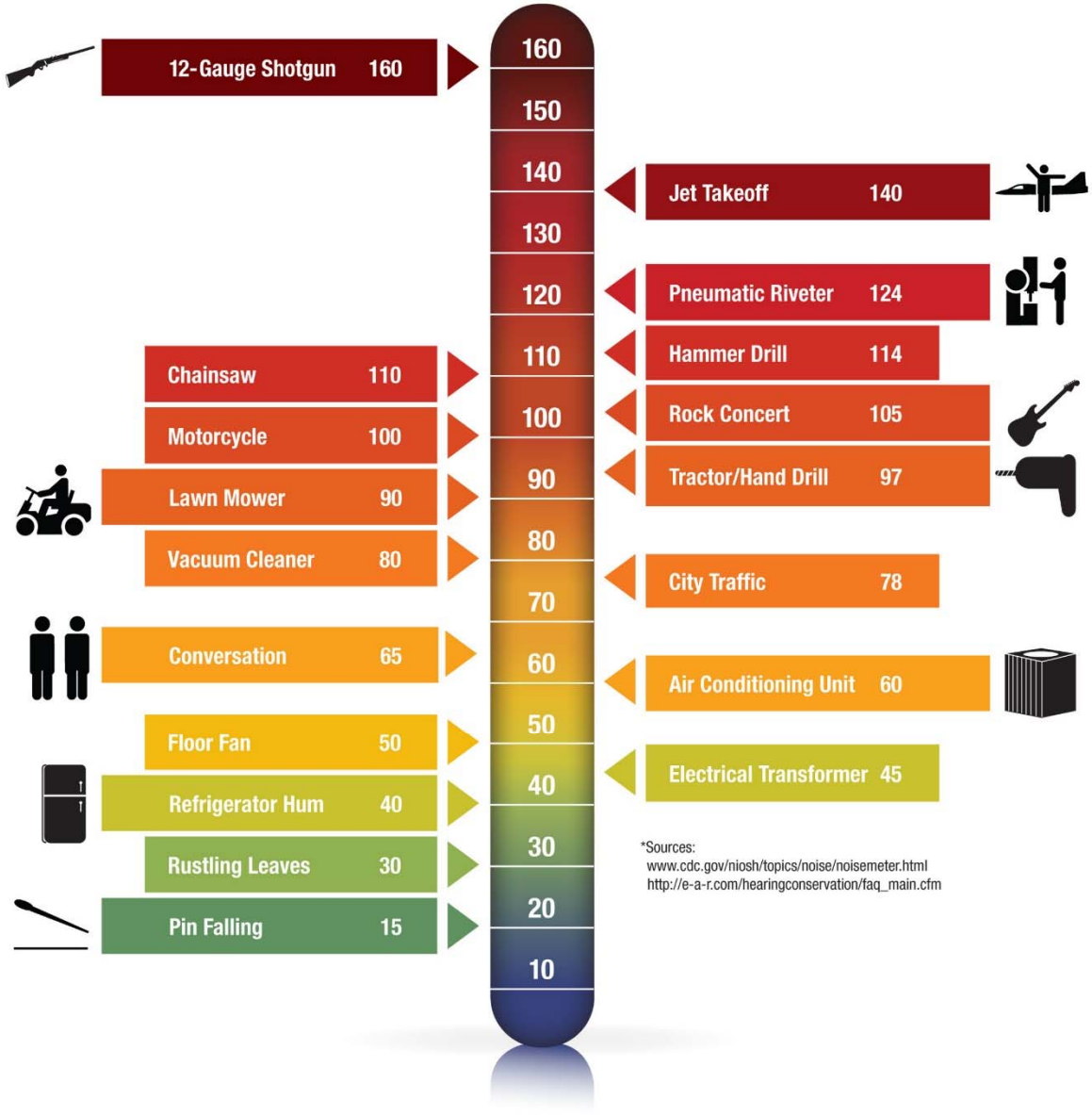
Measuring sound directly in terms of pressure would require a very large and awkward range of numbers. To avoid this, the decibel scale was devised. The decibel scale uses the hearing threshold (20 micropascals of pressure) as a point of reference, defined as 0 dB. Other sound pressures are then compared to the reference pressure, and the logarithm is taken to keep the numbers in a practical range. The decibel scale allows a million-fold increase in pressure to be expressed as 120 dB. Another useful aspect of the decibel scale is that changes in decibel levels correspond closely to human perception of relative loudness.

The perceived loudness of sounds is dependent upon many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise levels, perception of loudness is relatively predictable and can be approximated by filtering the frequency response of a sound level meter by means of the standardized A-weighting network. There is a strong correlation between A-weighted sound levels (expressed as dBA) and community response to noise. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment. All noise levels reported in this section are in terms of A-weighted levels.

Community noise is commonly described in terms of the ambient noise level, which is defined as the all-encompassing noise level associated with a given noise environment. A common statistical tool to measure the ambient noise level is the average, or equivalent, sound level (L_{eq}). The L_{eq} is the foundation of the day/night average noise descriptor, L_{dn}, and shows very good correlation with community response to noise. The day/night average sound level (L_{dn} or DNL) is based on the average noise level over a 24-hour day, with a +10 decibel weighting applied to noise occurring during nighttime (10:00 PM to 7:00 AM) hours. The nighttime penalty is based on the assumption that people react to nighttime noise exposures as though they were twice as loud as daytime exposures. Because L_{dn} represents a 24-hour average, it tends to disguise short-term variations in the noise environment.

The community noise equivalent level (CNEL) is similar to the day/night average sound level (L_{dn}). The CNEL is based on the average noise level over a 24-hour day, with a +10 decibel weighting applied to noise occurring during nighttime (10:00 PM to 7:00 AM) hours and a +5 dB decibel weighting applied to noise occurring during evening (7:00 PM to 10:00 PM) hours. In general, calculated L_{dn} and CNEL noise levels are within 1-2 dB.

Figure 3
Noise Levels Associated with Common Noise Sources



Vibration

Vibration is like noise in that it involves a source, a transmission path, and a receiver. While vibration is related to noise, it differs in that noise is generally considered to be pressure waves transmitted through air, while vibration is usually associated with transmission through the ground or structures. As with noise, vibration consists of an amplitude and frequency. A person's response to vibration will depend on their individual sensitivity as well as the amplitude and frequency of the vibration source.

Vibration can be described in terms of acceleration, velocity, or displacement. Common practices are to monitor vibration measures in terms of peak particle velocities (inches/second) or root-mean-square values in decibels (VdB, rms). Standards pertaining to perception as well as damage to structures have been developed for vibration in terms of peak particle velocities and VdB.

According to the Transportation and Construction Vibration Guidance Manual (Caltrans, September 2013), operation of construction equipment and construction techniques generate ground vibration. Traffic traveling on roadways can also be a source of such vibration. At high enough amplitudes, ground vibration has the potential to damage structures and/or cause cosmetic damage (e.g., crack plaster). Ground vibration can also be a source of annoyance to individuals who live or work close to vibration-generating activities. However, traffic, including heavy trucks traveling on a highway, rarely generates vibration amplitudes high enough to cause structural or cosmetic damage.

As vibrations travel outward from the source, they excite the particles of rock and soil through which they pass and cause them to oscillate. Differences in subsurface geologic conditions and distance from the source of vibration will result in different vibration levels characterized by different frequencies and intensities. In all cases, vibration amplitudes will decrease with increasing distance. The maximum rate or velocity of particle movement is the commonly accepted descriptor of the vibration "strength."

Human response to vibration is difficult to quantify. Vibration can be felt or heard well below the levels that produce any damage to structures. The duration of the event has an effect on human response, as does frequency. Generally, as the duration and vibration frequency increase, the potential for adverse human response increases.

Environmental Setting

Identification of Sensitive Receptors

Existing land uses in the project vicinity include hotels, playing fields, a park, a wastewater treatment facility, single-family and multi-family residential, and commercial. Of these uses, the greatest degree of sensitivity exists at the exterior and interior areas of the nearest residential uses located on the south side of Highway 101, and within the interior spaces of the two hotels located east and west of the project site. The wastewater treatment facility, playing fields and park are considered noise-generating uses, not noise-sensitive spaces. As a result, the focus of this analysis is the identification of potential noise impacts at the noise-sensitive interior and exterior spaces described above. Those sensitive areas are identified on Figure 1.

Existing Overall Ambient Noise Environment at Sensitive Receptors

The ambient noise environment in the project vicinity varies depending on proximity to project-area roadways (Highway 101, Airport Boulevard, Anza Boulevard) with Highway 101 being the dominant noise source in the project vicinity. The noise environment at the nearest sensitive receptors identified on Figure 1 is also affected by aircraft operations at San Francisco International Airport (SFO) and local sports playing field activities.

To generally quantify existing overall ambient noise levels from all sources at the nearest noise-sensitive receptors to the project site, continuous (72-hour) ambient noise surveys were conducted at three (3) locations on December 6-8, 2018. A short-term ambient noise survey was conducted at one (1) additional location on the afternoon of December 5, 2018. The monitoring locations are shown on Figure 1.

This analysis recognizes that there are more than four (4) noise-sensitive receptors in the project vicinity, particularly with respect to the considerable number of existing residences located on the south side of Highway 101. However, it is not necessary to monitor each sensitive receptor location to adequately quantify ambient conditions if the receptors have somewhat common exposure to the major local noise sources. As a result, this analysis focused on selecting representative sensitive-receptor locations for the ambient surveys, as described below.

Noise measurement site LT1 represents ambient conditions at the Crowne Plaza San Francisco Airport hotel located approximately 800 feet west of the project site (identified as Area 1 on Figure 1). Noise measurement site LT2 represents ambient conditions at the DoubleTree hotel located approximately 500 feet east of the project site (identified as Area 2 on Figure 1). Noise measurement site LT3 represents all of the single-family residences located south of Highway 101 along Rollins Road (identified as Area 3 on Figure 1). Lastly, noise measurement site ST1 represents the multi-family residences (apartments) located along Rollins Road (identified as Area 4 on Figure 1).

The ambient noise level monitoring results are summarized in Table 1, with graphs of the detailed hourly average (L_{eq}) and maximum (L_{max}) values shown in Figures 4 through 12. The ambient noise monitoring results are also tabulated in Appendix B.

Although long-term noise level measurements were not conducted for Area 4, it is reasonable to conclude that the measured community noise equivalent levels (CNEL) at Area 4 would have been a minimum of 5 dB higher than those conducted at Area 3 due to the presence of an existing 14-foot tall traffic noise barrier shielding Area 3 which is not present at the apartments represented by Area 4. Therefore, a conservative offset of +5 dB was assumed for CNEL values at ST1 relative to those measured at LT3.

Larson Davis Laboratories (LDL) Model 820 precision integrating sound level meters were used for the noise level measurement survey. The meters were calibrated before use with an LDL Model CA200 acoustical calibrator to ensure the accuracy of the measurements. The equipment used meets all specifications of the American National Standards Institute requirements for Type 1 sound level meters (ANSI S1.4).

Table 1
Ambient Noise Monitoring Results[1]
Nearest Sensitive Receptors to Proposed Topgolf Project – Burlingame, California

Site	Date	Day of Week	CNEL	Measured Hourly Noise Levels (dB)					
				Daytime (7 AM – 7 PM)		Evening (7 PM – 10 PM)		Nighttime (10 PM – 7 AM)	
				L_{eq}	L_{max}	L_{eq}	L_{max}	L_{eq}	L_{max}
LT1	12/6/18	Thu.	66	61	69-86	60	70-76	59	64-81
	12/7/18	Fri.	67	59	67-79	61	71-84	60	67-86
	12/8/18	Sat.	66	58	69-84	60	73-77	59	63-78
LT2	12/6/18	Thu.	68	60	64-83	62	73-82	61	62-78
	12/7/18	Fri.	69	64	69-81	62	75-77	61	70-79
	12/8/18	Sat.	68	60	66-76	62	74-77	61	67-80
LT3	12/6/18	Thu.	69	67	76-102	64	75-84	62	73-85
	12/7/18	Fri.	70	67	80-92	64	73-83	62	73-87
	12/8/18	Sat.	69	65	76-91	64	76	61	72-83
ST1[2]	12/5/18	Wed.	74	73	80	--	--	--	--

Notes:

1. Detailed results provided in Appendix B.
2. Short-term noise level measurements at site ST1 were conducted during the 1 PM hour of December 5, 2018. The L_{dn} value of 75 dB is estimated based on a comparison of measured noise levels of ST1 and LT3.

Source: Bollard Acoustical Consultants, Inc. (2018)

Figure 4
Hourly Noise Survey Results - Site LT1
Topgolf - Burlingame, California
Thursday, December 06, 2018

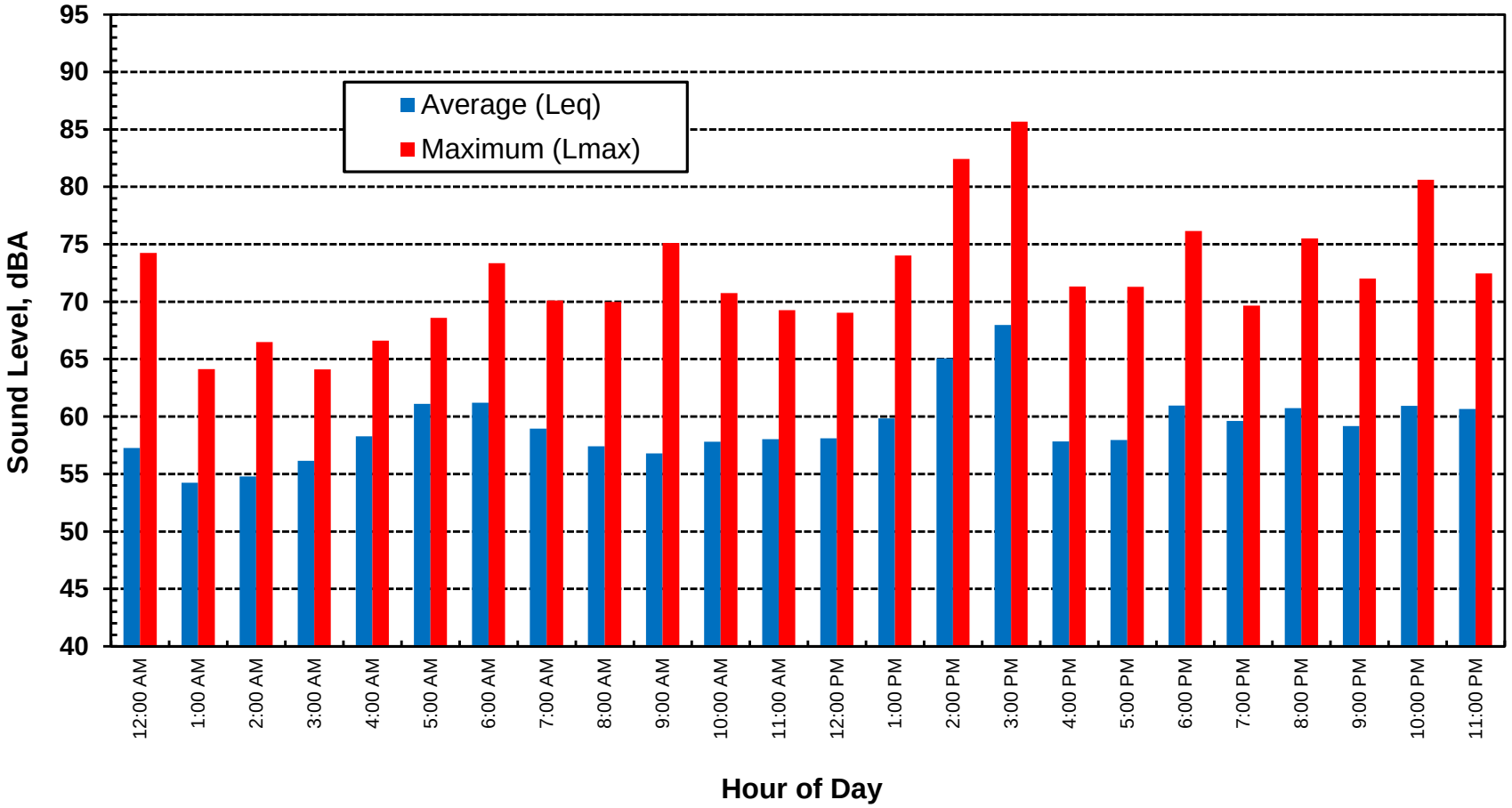


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Figure 5
Hourly Noise Survey Results - Site LT1
Topgolf - Burlingame, California
Friday, December 07, 2018

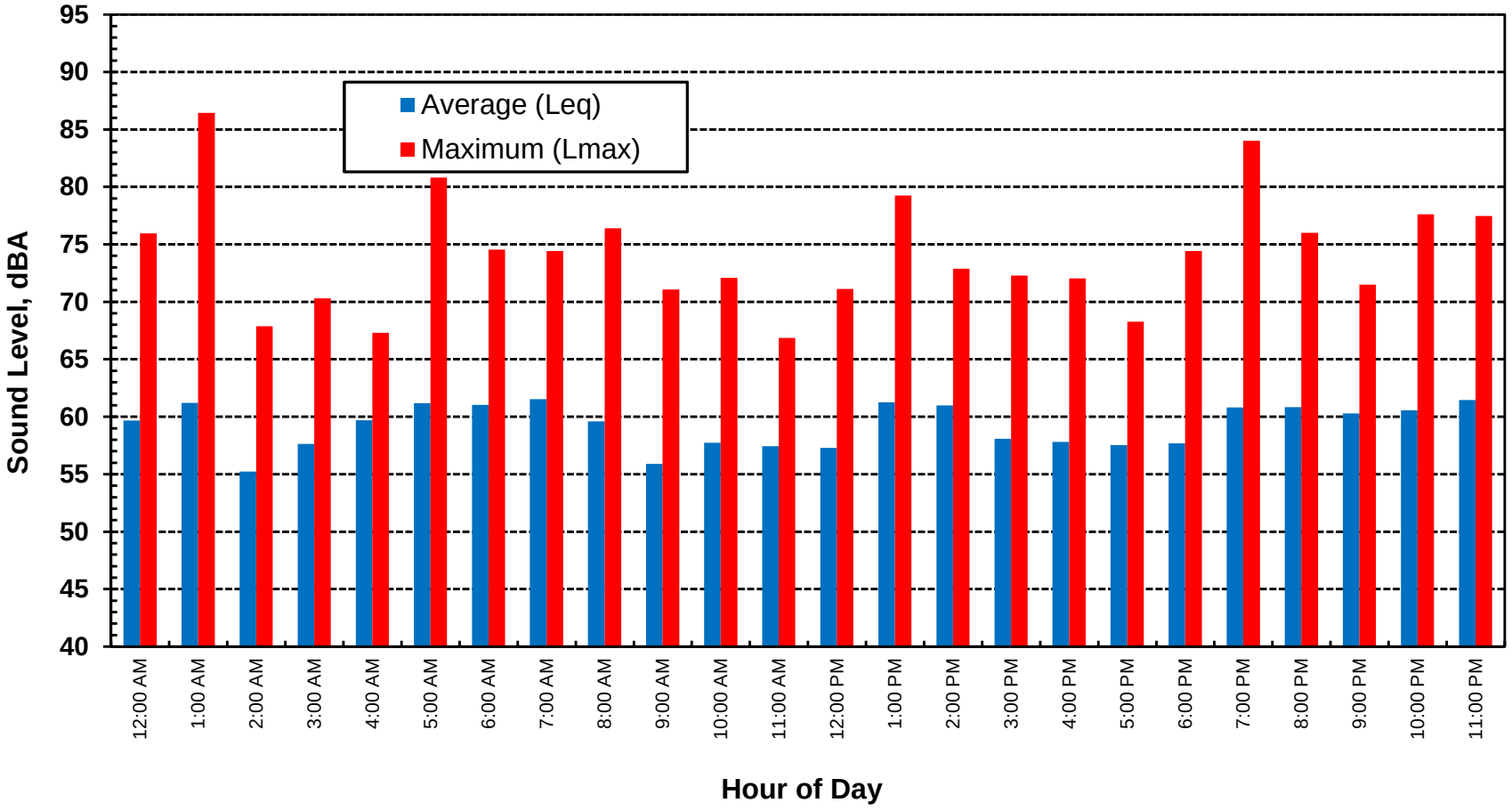

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Figure 6
Hourly Noise Survey Results - Site LT1
Topgolf - Burlingame, California
Saturday, December 08, 2018

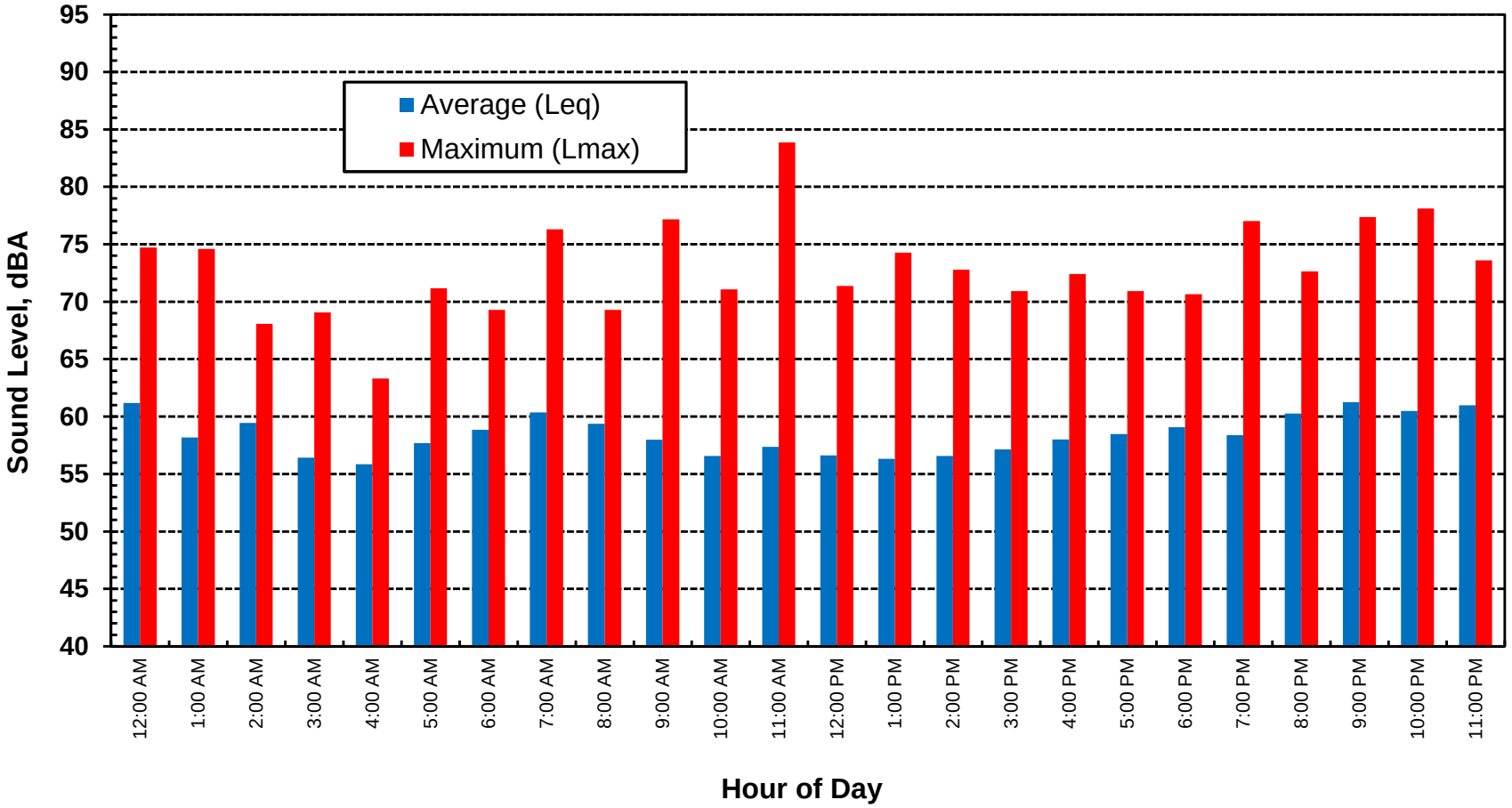

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Figure 7
Hourly Noise Survey Results - Site LT2
Topgolf - Burlingame, California
Thursday, December 06, 2018

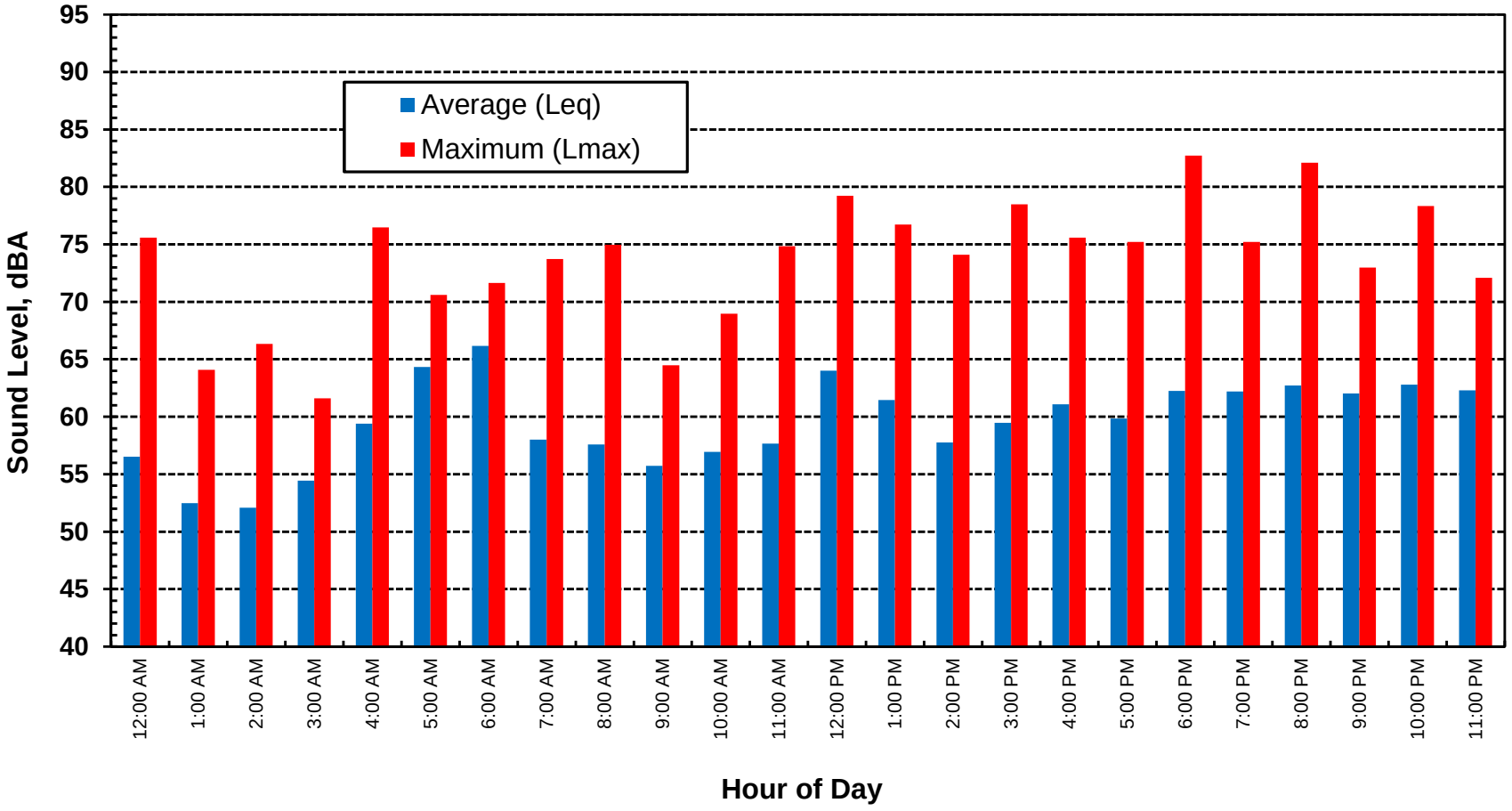

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Figure 8
Hourly Noise Survey Results - Site LT2
Topgolf - Burlingame, California
Friday, December 07, 2018

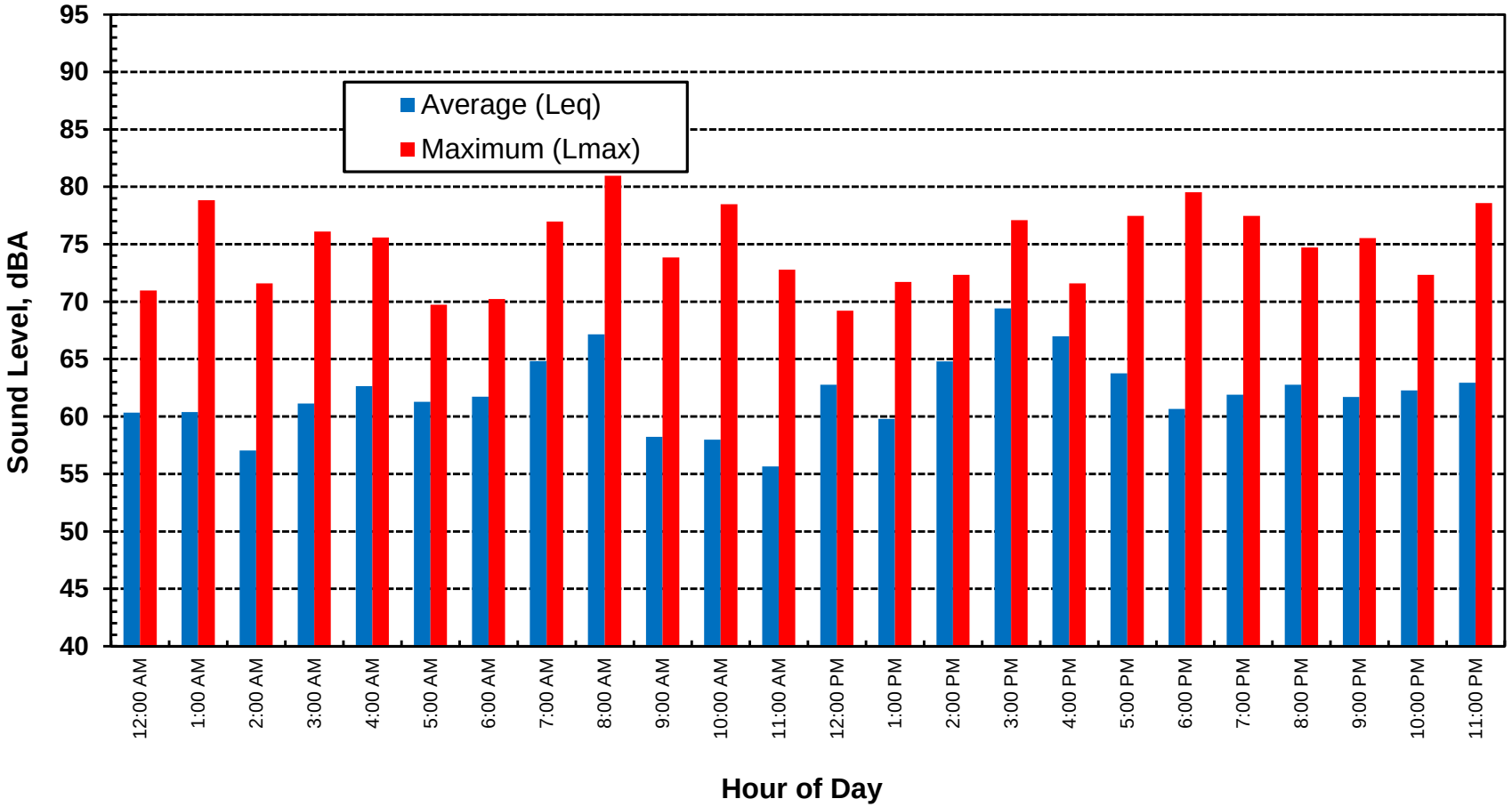

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Figure 9
Hourly Noise Survey Results - Site LT2
Topgolf - Burlingame, California
Saturday, December 08, 2018

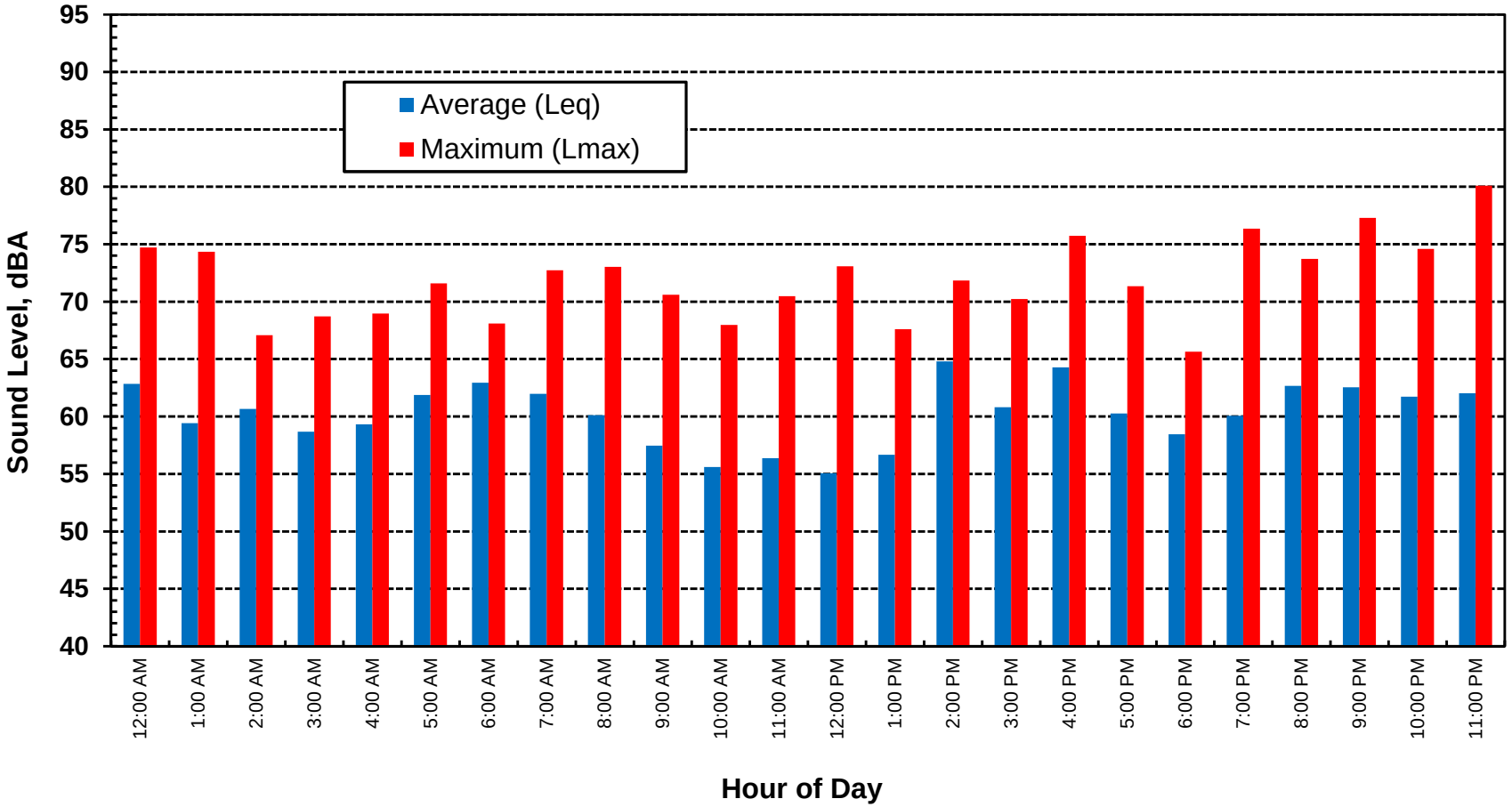

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Figure 10
Hourly Noise Survey Results - Site LT3
Topgolf - Burlingame, California
Thursday, December 06, 2018

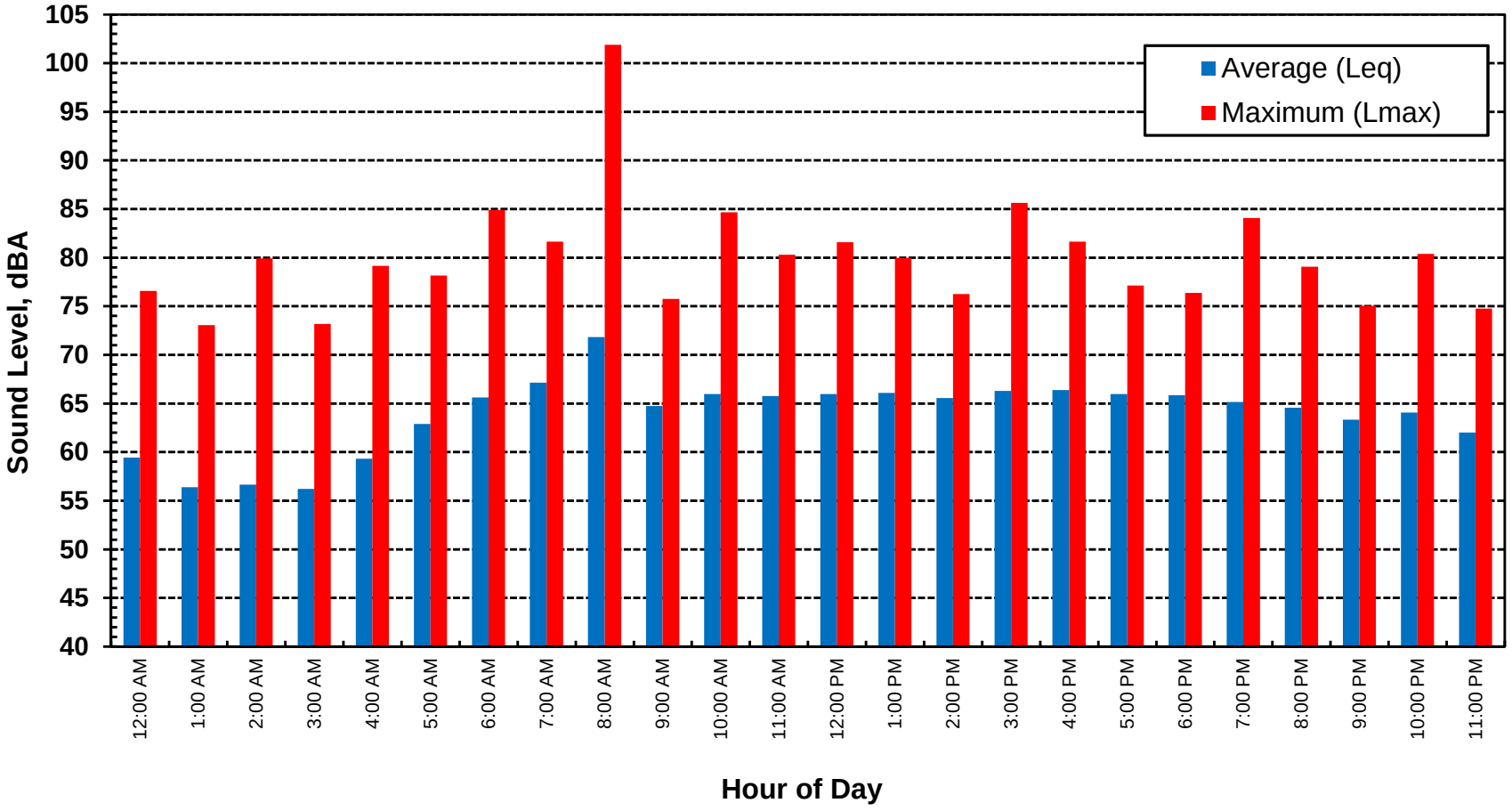

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Figure 11
Hourly Noise Survey Results - Site LT3
Topgolf - Burlingame, California
Friday, December 07, 2018

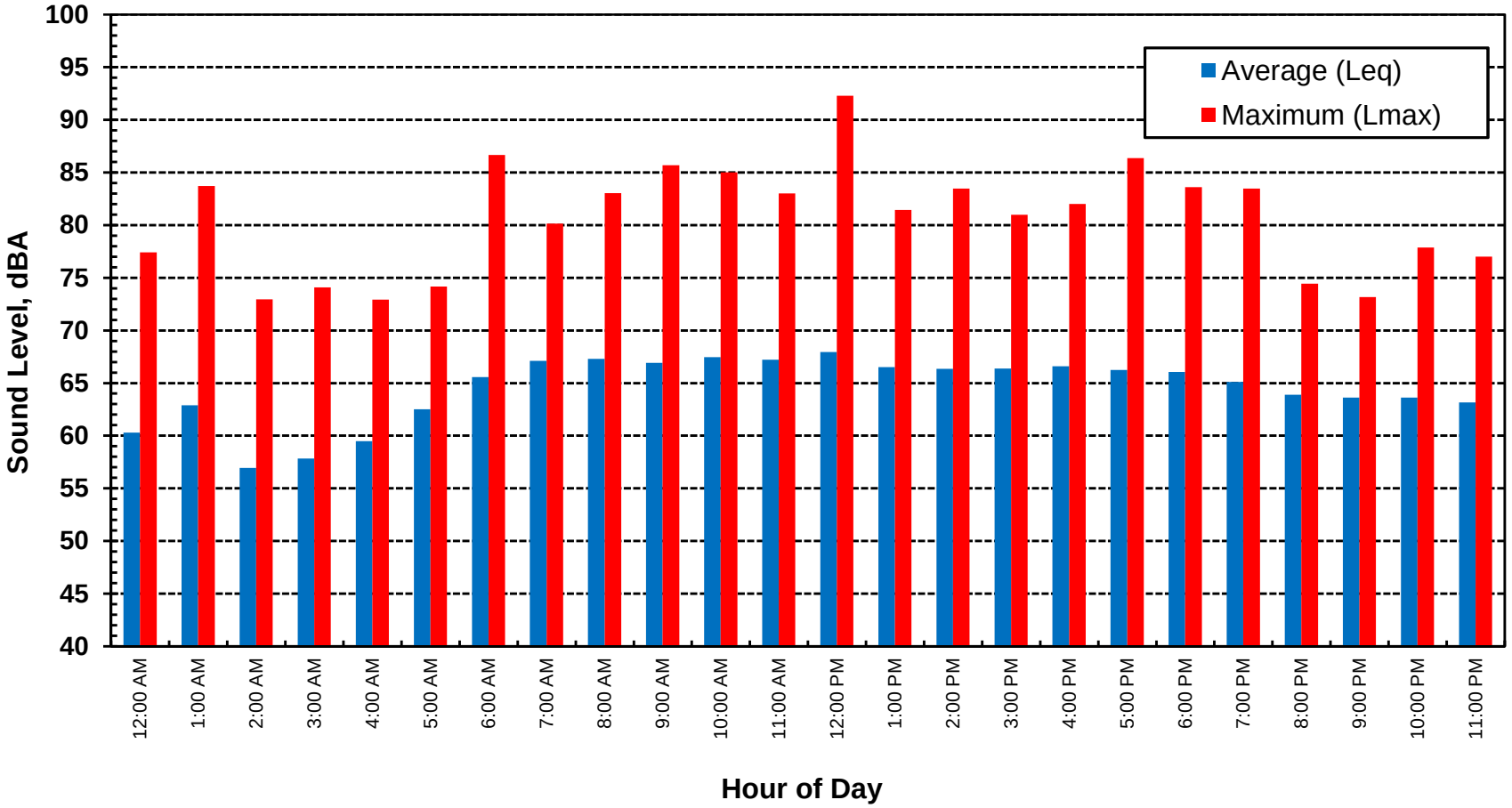

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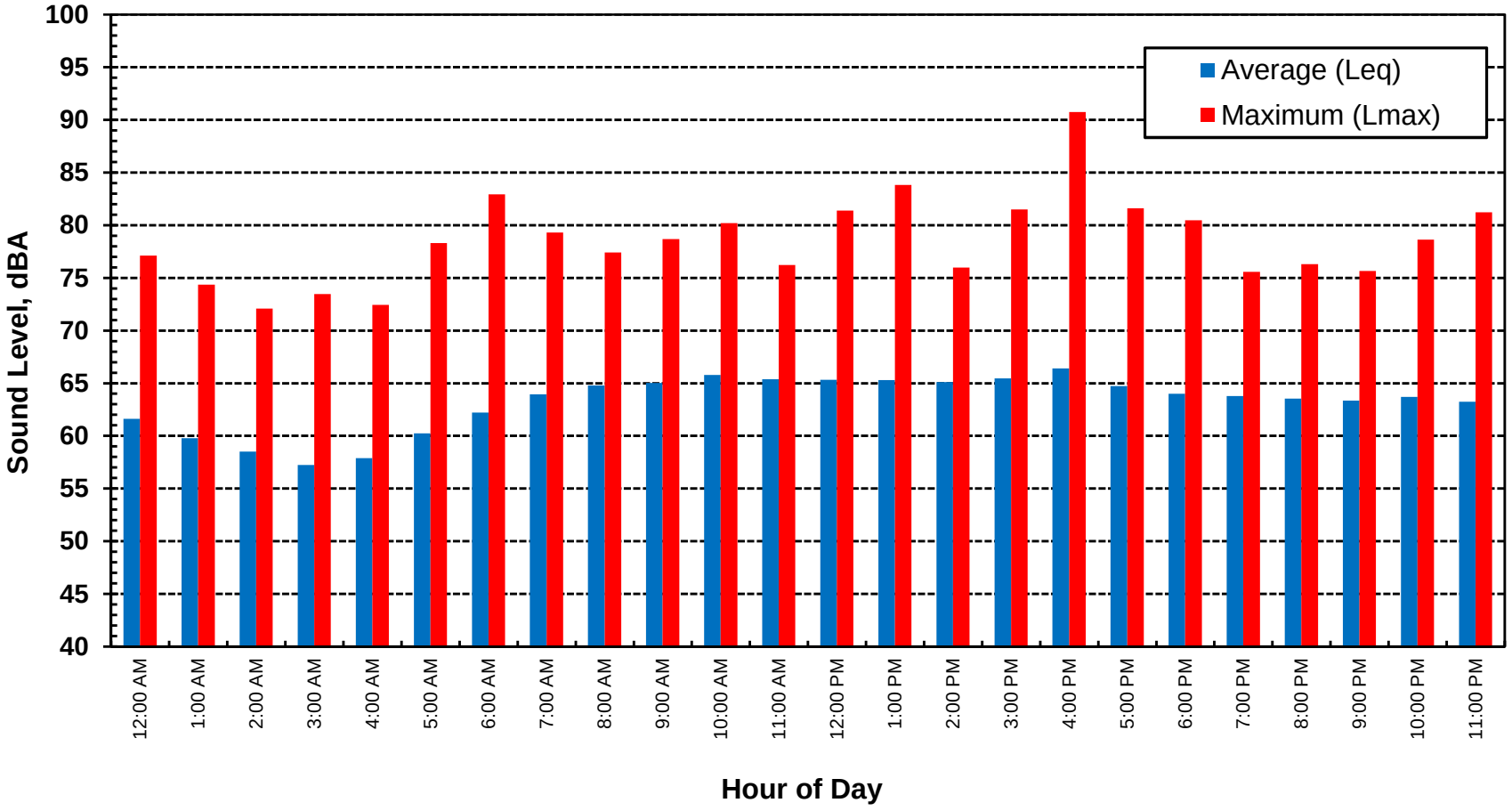
Figure 12
Hourly Noise Survey Results - Site LT3
Topgolf - Burlingame, California
Saturday, December 08, 2018



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The hourly noise measurement results presented in Figures 4-12 are important in that they establish baseline conditions at the nearest noise-sensitive areas against which noise generated by the project can be evaluated. The hour-by-hour data is presented because certain noise-generating aspects of the proposed project would occur during late night and/or early morning periods. For example, the Topgolf project is proposed to operate until 2 a.m. on weekends. Because ambient conditions decrease during these periods due to reduced traffic on local roadways, and because nighttime hours are more sensitive to noise in general, the identification of specific ambient conditions during these periods is essential to the subsequent evaluation of potential noise impacts due to the project.

As noted previously, measurement Site LT1 represents noise-sensitive Area 1 (see Figure 1), the Crowne Plaza San Francisco Airport, located to the west of the project site. According to Figures 4, 5, and 6, the lowest measured hourly average (L_{eq}) noise level during the hours of proposed activities at the project site was 54 dB L_{eq} measured during the 1 a.m. to 2 a.m. hour on Thursday, December 6, 2018. The lowest measured maximum (L_{max}) noise level during the hours of proposed activities at the project site was 64 dB L_{max} measured during the same hour. These data are used to establish baseline conditions for this sensitive receptor.

Measurement Site LT2 represents noise-sensitive Area 2 (see Figure 1), which includes DoubleTree and Red Roof hotels off of Anza Boulevard to the east of the project site. According to Figures 7, 8, and 9 the lowest measured hourly average (L_{eq}) noise level during the hours of proposed activities at the project site was 52 dB L_{eq} measured during the 1 a.m. to 2 a.m. hour on Thursday, December 6, 2018. The lowest measured maximum (L_{max}) noise level during the hours of proposed activities at the project site was 64 dB L_{max} measured during the same hour. These data are used to establish baseline conditions for this sensitive receptor.

Measurement Site LT3 represents noise-sensitive Area 3 (see Figure 1), which includes the existing residences located on the south side of Highway 101. Those residences are screened from view of Highway 101 by an existing sound wall. According to Figures 10, 11, and 12, the lowest measured hourly average (L_{eq}) noise level during the hours of proposed activities at the project site was 56 dB L_{eq} measured during the 1 a.m. to 2 a.m. hour on Thursday, December 6, 2018. The lowest measured maximum (L_{max}) noise level during the hours of proposed activities at the project site was 73 dB L_{max} measured during the same hour. These data are used to establish baseline conditions for this sensitive receptor.

Measurement Site ST1 represents noise-sensitive Area 4 (see Figure 1), which includes existing apartments located on the south side of Highway 101. Those residences have an unobstructed view of Highway 101. As discussed previously, the existing ambient noise exposure was assumed to be 5 dB higher at Area 4 relative to measurements conducted for Area 3. Therefore, the lowest hourly average (L_{eq}) noise levels assumed for Area 4 during the hours of proposed activities at the project site are 61 dB L_{eq} and 78 dB L_{max}.

Existing Traffic Noise Environment

Traffic Noise Prediction Methodology

The Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA-RD-77-108) was used with the Calveno vehicle noise emission curves to predict existing traffic noise levels along project-area roadways.

Predicted Existing Traffic Noise Levels

The FHWA Model was used with existing traffic data prepared by Fehr & Peers to predict existing traffic noise levels in the immediate project vicinity. Table 2 shows the predicted existing traffic noise levels at a reference distance of 100 feet from the roadway centerlines, as well as the distances to the unshielded L_{dn} contours. The FHWA Model Inputs for existing conditions are provided in Appendix C-1.

Table 2
Existing Traffic Noise Levels and Distances to Traffic Noise Contours
Topgolf – Burlingame, California

Segment	Intersection	Direction	L_{dn}[1]	L_{dn} Contour (feet) 75	70	65
1	US 101 Ramp/Bayshore Hwy	North	47	1	3	6
2		South	62	14	30	65
3		East	64	17	37	80
4		West	61	12	27	57
5	Airport Blvd/Broadway/Bayshore Hwy	North	59	9	20	43
6		South	64	18	39	84
7		East	46	1	3	5
8		West	64	17	37	80
9	Broadway/US 101 Ramps	North	64	18	38	83
10		South	66	23	50	108
11		East	61	11	23	51
12		West	61	12	26	57
13	Broadway/Rollins Rd	North	66	23	50	108
14		South	64	20	43	92
15		East	61	11	23	50
16		West	61	12	25	53
17	Broadway/Carolan Ave	North	64	20	43	92
18		South	64	18	39	84
19		East	58	8	17	36
20		West	31	0	0	1
21	Broadway/California Dr	North	64	18	39	84
22		South	60	10	21	45
23		East	63	15	32	68
24		West	63	15	32	69
25	Cadillac Way/Rollins Rd	North	n/a	n/a	n/a	n/a

Table 2
Existing Traffic Noise Levels and Distances to Traffic Noise Contours
Topgolf – Burlingame, California

Segment	Intersection	Direction	L_{dn}[1]	L_{dn} Contour (feet) 75	70	65
26		South	55	5	10	21
27		East	60	9	20	43
28		West	61	11	23	50
29	Anza Blvd/Airport Blvd	North	54	4	9	20
30		South	55	5	11	23
31		East	59	9	19	41
32		West	59	8	18	38
33	US 101 Off-Ramp/Airport Blvd	North	n/a	n/a	n/a	n/a
34		South	62	13	27	59
35		East	63	15	33	72
36		West	59	8	17	37
37	Peninsula Ave/Airport Blvd	North	55	5	10	22
38		South	63	16	34	73
39		East	n/a	n/a	n/a	n/a
40		West	63	15	33	72
41	Peninsula Ave/Bayshore Blvd	North	63	16	34	73
42		South	64	18	38	82
43		East	60	10	23	49
44		West	n/a	n/a	n/a	n/a
45	Peninsula Ave/Humboldt St	North	64	18	39	84
46		South	63	15	33	72
47		East	57	6	13	29
48		West	54	4	9	18
49	Poplar Ave/Humboldt St	North	59	8	18	38
50		South	58	7	15	32
51		East	56	5	11	23
52		West	57	6	14	29
53	US 101 Off-Ramp/Poplar Ave/Amphlet Blvd	North	63	16	35	76
54		South	59	8	18	38
55		East	58	8	16	36
56		West	52	3	7	14
57	Highway 101 (Broadway to Peninsula Ave)	Mainline	82	342	736	1587

Notes:
1. L_{dn} is computed at a distance of 100 feet from the roadway centerline.

Source: FHWA-RD-77-108 with inputs prepared by Fehr & Peers.

Existing Noise Environment due to SFO Operations

The project site is located just over a mile south of San Francisco International Airport (SFO). The ambient noise monitoring conducted at the nearest noise-sensitive receiver locations included contribution from various existing noise sources in the project vicinity (e.g. traffic on roadways, play field activities, parking lot activities, SFO operations, etc.). Noise exposure at the project site due solely to aircraft operations was quantified by referencing the San Francisco International Airport Noise Exposure Map Report (August 2015). According to that document, the project site is over 5000 feet south of the 65 dB CNEL contour. The 2019 Noise Exposure Map for SFO operations is provided as Appendix D. Based on the published noise contours, it was conservatively estimated that noise exposure at the project site due to SFO operations is no greater than 60 dB CNEL.

Regulatory Setting - Criteria for Acceptable Noise and Vibration Exposure

Federal

There are no federal noise or vibration criteria which would be directly applicable to this project.

State of California

California Environmental Quality Act (CEQA)

The State of California has established regulatory criteria that are applicable to this assessment. Specifically, Appendix G of the State of California Environmental Quality Act (CEQA) Guidelines are used to assess the potential significance of impacts pursuant to local General Plan policies, Municipal Code standards, or the applicable standards of other agencies. According to proposed CEQA Appendix G guidelines, a significant noise or vibration impact could occur if the project would result in:

A. Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or in other applicable local, state, or federal standards;

B. Generation of excessive groundborne vibration or groundborne noise levels;

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

CEQA does not define what noise level increase would be considered substantial. However, it is generally recognized that a 3 dB L_{dn}/CNEL or greater increase in noise levels due to a project would be considered significant where exterior noise levels would exceed 60 dB L_{dn} (for residential uses). Where pre-project ambient conditions are at or below 60 dB L_{dn}/CNEL, a 5 dB increase is applied as the standard of significance.

It should be noted that audibility is not a test of significance according to CEQA. If this were the case, any project which added any audible amount of noise to the environment would be considered unacceptable according to CEQA. Because every physical process creates noise, the use of audibility alone as significance criteria would be unworkable. CEQA requires a substantial increase in noise levels before noise impacts are identified, not simply an audible change.

California Department of Transportation (Caltrans)

The California Department of Transportation (Caltrans) criteria applicable to damage and annoyance potential from transient and continuous vibration that is usually associated with construction activity are presented in Tables 3 and 4. Equipment or activities typical of continuous vibration include: excavation equipment, static compaction equipment, tracked vehicles, traffic on a highway, vibratory pile drivers, pile-extraction equipment, and vibratory compaction equipment. Equipment or activities typical of single-impact (transient) or low-rate repeated impact vibration include: impact pile drivers, blasting, drop balls, "pogo stick" compactors, and crack-and-seat equipment (California Department of Transportation 2013).

Table 3
Guideline Vibration Damage Potential Threshold Criteria

	Maximum PPV (inches/second)	
Structure and Condition	**Transient Sources**	**Continuous/Frequent Intermittent Sources**
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

Source: California Department of Transportation, Transportation and Construction Vibration Guidance Manual (2013)
Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.
PPV = peak particle velocity.

Table 4
Guideline Vibration Annoyance Potential Criteria

Human Response	Maximum PPV (inches/second)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Barely perceptible	0.04	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible	0.9	0.10
Severe	2.0	0.4

Source: California Department of Transportation, Transportation and Construction Vibration Guidance Manual (2013)
Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.
PPV = peak particle velocity.

Local

City of Burlingame General Plan

The City of Burlingame General Plan Noise Element provides a set of suggested outdoor noise levels suitable to various land use categories. Those criteria are provided in Table 5. In addition to those exterior noise level criteria, the City also establishes an interior noise level standard of 45 dB CNEL applicable to any habitable room, including residential and transient lodging uses.

Table 5
Outdoor Noise Level Planning Criteria
Maximum Outdoor Noise Levels
City of Burlingame General Plan Noise Element

Land Use Categories	CNEL (dBA)
Public, Quasi-Public and Residential: Schools, Hospitals, Libraries, Auditoriums, Intensively Used Parks and Playgrounds, Public Buildings, Single Family Home, Multiple Family Apartments and Condominiums, Mobile Home Parks	60
Passively-Used Open Space: Wilderness-Type Parks, Nature or Contemplation Areas of Public Parks	45
Commercial Shopping Centers, Self-Generative Business, Commercial Districts, Offices, Banks, Clinics, Hotels and Motels	65
Industrial Non-Manufacturing Industry, Transportation, Communication, Utilities, Manufacturing	75

These criteria may be invoked for the following purposes:
a. To determine the suitability of development on lands considered as receptors to which the standards apply; and
b. To determine the suitability of building types and proposed construction materials to be applied on the site.

In addition to the exterior and interior noise level criteria in terms of CNEL, the General Plan also includes the following provision:

> *No person shall be allowed to cause any noise to be emitted past his/her property line in any manner so as to create any noise which would cause the ambient noise level to be increased by more than 5 dBA.*

City of Burlingame Municipal Code

The City of Burlingame Municipal Code provides general noise regulations and specific performance standards for entertainment businesses. Section 10.40.035 pertaining to general noise regulations and Section 6.16.150 pertaining to performance standards for entertainment business are provided below.

10.40.035 General noise regulations

Notwithstanding any other provisions of this code, and in addition thereto, it is unlawful for any person willfully to make or continue, or cause to be made or continued, any loud, unnecessary or unusual noise which disturbs the peace and quiet of any neighborhood or which causes discomfort or annoyance to any reasonable person of normal sensitiveness residing in the area. The standards which shall be considered in determining when a violation of the provisions of this section exists shall include, but not be limited to, the following:

(a) The level of the noise;
(b) The intensity of the noise;
(c) Whether the nature of the noise is usual or unusual;
(d) Whether the origin of the noise is natural or unnatural;
(e) The level and intensity of the background noise, if any;
(f) The proximity of the noise to residential sleeping facilities;
(g) The nature and zoning of the area within which the noise emanates;
(h) The density of the inhabitation of the area within which the noise emanates;
(i) The time of the day or night the noise occurs;
(j) The duration of the noise;
(k) Whether the noise is recurrent, intermittent or constant; and
(l) Whether the noise is produced by a commercial or noncommercial activity. (Ord. 1060 § 1, (1976))

6.16.150 Performance standards for entertainment businesses

The following performance standards shall apply to all entertainment businesses except amusement arcades, and shall be deemed conditions of all entertainment permits. Failure to comply with each such requirement, unless expressly provided otherwise in the specific entertainment permit, shall be grounds for suspension or revocation of a permit issued pursuant to this chapter:

(a) Maximum occupancy load, fire exits, aisles and fire equipment shall be regulated, designed, and provided in accordance with the fire and building regulations and standards of the city. A manager shall be on the premises at all times during which entertainment is being offered.

(b) The premises within which the entertainment business is located shall provide sufficient sound-absorbing insulation so that noise generated inside the premises shall not be audible anywhere on any adjacent property or public right-of-way or within any other building or other separate unit within the same building and comply with all applicable city noise regulations. The establishment shall measure the current twenty-four (24) hour ambient noise levels (L_{10}) at the exterior of the property along the public right-of-way using a methodology approved by the director of community development before opening for business. Upon request by the city, the establishment shall conduct noise measurements to determine whether the noise from the establishment is exceeding the five (5) dBA standard for increases in noise from the baseline as provided in the Burlingame General Plan, and shall report the measurements to the city, and the establishment shall ensure that the five (5) dBA standard is not exceeded.

(c) No entertainment shall be permitted between the hours of 1:30 a.m. and 9:00 a.m.

In addition to the above Municipal Code provisions which pertain to noise, the City also recently updated their Municipal Code to limit construction hours to 8 am to 7 pm weekdays and 9 am to 6 pm on Saturdays with no construction allowed on Sunday.

Noise Standards Applied to this Project

As noted previously, existing noise-sensitive land uses in the project vicinity include residential to the south on the opposite side of Highway 101, and hotels to the east and west. Land uses adjacent to the project site consist of a wastewater treatment facility, playing fields and a park. The land uses adjacent to the project site (playing fields, parking areas, and the wastewater treatment plant) are considered noise-generating uses, not noise-sensitive uses. As a result, the focus of this analysis is the identification of potential noise impacts at the noise-sensitive residential and hotel interiors and residential interior and exterior spaces (e.g. backyards, common outdoor activity areas).

The City of Burlingame General Plan exterior noise level standards presented in Table 5 were applied to the project. Specifically, at the property lines of the nearest hotels to the east and west of the project site, project noise-generation was assessed relative to the 65 dB CNEL threshold for hotel land uses. At the property lines of the nearest residential land uses to the south, project noise-generation was assessed relative to the 60 dB CNEL threshold for residential land uses. An interior noise level standard of 45 dB CNEL was applied to both residential and hotel uses.

The City of Burlingame General Plan noise level standards are in terms of the 24-hour average noise metric, community noise equivalent level (CNEL). Noise level standards which represent a 24-hour average such as the day/night average level (L_{dn}) or CNEL tend to disguise short-term variations in the noise environment. As a result, the use of an hourly average noise level performance standard (Hourly L_{eq}) for proposed on-site noise-generating activities would provide a more conservative approach in the assessment of project noise impacts at the nearest sensitive receptors.

The project proposes hours of operation that extend until 2 a.m. on weekends. Because ambient conditions decrease during these periods due to less traffic on local roadways, and because nighttime hours are more sensitive to noise in general, the ambient conditions described in the setting section of this report were used to establish baseline conditions against which project noise impacts are evaluated. Specifically, impacts were identified if the project noise-generation was predicted to increase the hourly average ambient conditions identified in the Setting Section by 3 dB L_{eq}.

For the assessment of impacts related to project-related increases in off-site traffic noise, a 3 dB L_{dn}/CNEL or greater increase in noise levels due to the project would be considered significant where exterior noise levels would exceed 60 dB L_{dn} (for residential uses). Where pre-project ambient conditions are at or below 60 dB L_{dn}/CNEL, a 5 dB increase was applied as the standard of significance.

Impacts and Mitigation Measures

As noted previously, the project proposes an outdoor entertainment use. The major noise-producing components and associated impacts of the proposed Topgolf project are as follows:

- Traffic noise impacts at existing sensitive land uses located in the general project vicinity caused by increased traffic noise resulting from increased project-generated traffic on the local roadway network.

- Noise impacts at the existing hotels and residences located near the project site resulting from noise generated by on-site activities associated with the project. Specific on-site noise sources evaluated in this assessment include parking lot movements (vehicles arriving and departing, doors opening and closing, etc.), mechanical equipment (HVAC) operation, operation of the proposed Topgolf entertainment facility (amplified music and patron/crowd noises), and project construction.

Traffic Noise Impacts Due to the Project

With development of the project site, traffic volumes on the local roadway network will increase. Those increases in daily traffic volumes will result in a corresponding increase in traffic noise levels at existing uses located along those roadways. The FHWA Model was used with traffic data provided by the client to predict existing, existing plus project, background, and background plus project traffic noise levels. Cumulative traffic conditions are discussed later in this report.

The Traffic Impact Analysis (TIA) conducted for the project by Fehr & Peers (January 2019) concluded that the proposed project would increase traffic on Highway 101 by less than 1% during the AM and PM peak hours. The TIA concluded that the project would not have impacts at the identified freeway study segments and no further study or mitigation measures were proposed. From a noise standpoint, a doubling (100% increase) in traffic volumes along a given roadway segment would be required to result in a noise level increase of 3 dB. Because the TIA determined that the project-related increase in Highway 101 traffic would be less than 1%, the increase in Highway 101 traffic noise would be approximately 0.04 dB or less. Therefore, a more detailed project-related traffic noise impact analysis was not warranted for Highway 101.

Impact 1: Increases in Existing Traffic Noise Levels due to the Project

Existing versus existing-plus-project traffic noise levels on the local roadway network are shown in Table 6. The following section includes an assessment of predicted noise levels relative to the noise criteria discussed in the Regulatory Section of the report.

Table 6
Existing vs. Existing Plus Project Traffic Noise Levels[1]
Topgolf – Burlingame, California

Segment	Intersection	Direction	E	E+P	Change	Substantial Increase?
1	US 101 Ramp/Bayshore Hwy	North	46.5	46.5	0.0	No
2		South	62.2	62.2	0.0	No
3		East	63.6	63.6	0.0	No
4		West	61.4	61.4	0.0	No
5	Airport Blvd/Broadway/Bayshore Hwy	North	59.5	59.6	0.1	No
6		South	63.8	63.9	0.1	No
7		East	46.0	46.0	0.0	No
8		West	63.6	63.6	0.0	No
9	Broadway/US 101 Ramps	North	63.8	63.9	0.1	No
10		South	65.5	65.5	0.0	No
11		East	60.6	60.6	0.0	No
12		West	61.3	61.4	0.1	No
13	Broadway/Rollins Rd	North	65.5	65.5	0.0	No
14		South	64.5	64.5	0.0	No
15		East	60.5	60.5	0.0	No
16		West	60.9	60.9	0.0	No
17	Broadway/Carolan Ave	North	64.5	64.5	0.0	No
18		South	63.9	63.9	0.0	No
19		East	58.3	58.3	0.0	No
20		West	31.3	31.3	0.0	No
21	Broadway/California Dr	North	63.9	63.9	0.0	No
22		South	59.7	59.8	0.1	No
23		East	62.5	62.5	0.0	No
24		West	62.6	62.6	0.0	No
25	Cadillac Way/Rollins Rd	North	n/a	n/a	n/a	n/a
26		South	54.8	54.8	0.0	No
27		East	59.5	59.5	0.0	No
28		West	60.5	60.5	0.0	No
29	Anza Blvd/Airport Blvd	North	54.4	54.4	0.0	No
30		South	55.5	56.0	0.5	No
31		East	59.2	59.5	0.3	No
32		West	58.6	58.7	0.1	No
33	US 101 Off-Ramp/Airport Blvd	North	n/a	n/a	n/a	n/a
34		South	61.6	61.6	0.0	No
35		East	62.8	63.0	0.2	No
36		West	58.5	58.8	0.3	No
37	Peninsula Ave/Airport Blvd	North	55.2	55.2	0.0	No
38		South	63.0	63.1	0.1	No
39		East	n/a	n/a	n/a	No
40		West	62.8	63.0	0.2	No
41	Peninsula Ave/Bayshore Blvd	North	63.0	63.1	0.1	No

Table 6
Existing vs. Existing Plus Project Traffic Noise Levels[1]
Topgolf – Burlingame, California

Segment	Intersection	Direction	E	E+P	Change	Substantial Increase?
42		South	63.7	63.7	0.0	No
43		East	60.3	60.5	0.2	No
44		West	n/a	n/a	n/a	n/a
45	Peninsula Ave/Humboldt St	North	63.9	63.9	0.0	No
46		South	62.8	62.8	0.0	No
47		East	56.8	56.9	0.1	No
48		West	54.0	54.0	0.0	No
49	Poplar Ave/Humboldt St	North	58.6	58.6	0.0	No
50		South	57.5	57.6	0.1	No
51		East	55.6	55.6	0.0	No
52		West	57.0	57.0	0.0	No
53	US 101 Off-Ramp/Poplar Ave/Amphlet Blvd	North	63.2	63.2	0.0	No
54		South	58.7	58.7	0.0	No
55		East	58.3	58.3	0.0	No
56		West	52.3	52.3	0.0	No

Notes:
1. L_{dn} is computed at a distance of 100 feet from the roadway centerline.

Source: FHWA-RD-77-108 with inputs prepared by Fehr & Peers.

Assessment Relative to Significant Increase Criteria

Given a baseline exposure between 31.3 and 65.5 dB L_{dn}, the applicable significance threshold criteria would range from 3 to 5 dB. According to Table 6, the largest project-related increase in traffic noise levels relative to existing no-project conditions would be 0.3 dB, which is well below the most-restrictive 3 dB significance threshold. Because the predicted increases in traffic noise levels are below the significance criteria for each roadway segment, this noise impact is considered ***less than significant.***

Assessment Relative to General Plan Interior Criteria - Hotels

As indicated in Table 6, existing plus project exterior noise levels at the analyzed roadway segment (segment #6, Broadway south of Bayshore Highway) nearest to the Crowne Plaza San Francisco Airport hotel were calculated to be 64 L_{dn}. However, the predicted roadway noise level of 64 dB L_{dn} was calculated a setback distance of 100 feet from the centerline of Broadway. The hotel is setback approximately 480 feet from the centerline of Broadway. At that distance, predicted existing plus project exterior traffic noise levels were calculated to be 54 dB L_{dn} at the hotel façade.

Existing plus project exterior noise levels at the analyzed roadway segment (segment #32, Anza Boulevard west of Airport Boulevard) nearest to the DoubleTree hotel were calculated to be 59 L_{dn}. However, the predicted roadway noise level of 59 dB L_{dn} was calculated a setback distance

of 100 feet from the centerline of Anza Boulevard. The hotel is setback approximately 130 feet from the centerline of Anza Boulevard. At that distance, predicted existing plus project exterior traffic noise levels were calculated to be 57 dB L_{dn} at the hotel façade.

Given exterior traffic noise levels of 54-57 dB L_{dn}, a building facade noise reduction of at least 12 dB would be required to satisfy the City's 45 dB L_{dn} interior noise level standard for hotel land uses. Standard hotel construction results in an exterior to interior noise reduction of at least 25 dB with windows closed and approximately 15 dB with windows open. After taking into consideration the noise reduction achieved from standard construction, the range of existing plus project traffic noise levels within interior spaces would be 29-32 dB L_{dn}. Resulting interior traffic noise levels in terms of the CNEL noise level descriptor would be within 1-2 dB of predicted day/night noise levels (L_{dn}). Because existing plus project traffic noise levels satisfy the City of Burlingame General Plan interior noise level standard of 45 dB CNEL for hotel land uses, this noise impact is considered ***less than significant***.

Impact 2: Increases in Background Traffic Noise Levels due to the Project

Using the same methodology described above, traffic noise levels were predicted for background and background plus project conditions. Table 7 shows the results of the background traffic analysis.

Table 7
Background vs. Background Plus Project Traffic Noise Levels[1]
Topgolf – Burlingame, California

Segment	Intersection	Direction	B	B+P	Change	Substantial Increase?
1	US 101 Ramp/Bayshore Hwy	North	46.7	46.7	0.0	No
2		South	62.3	62.3	0.0	No
3		East	63.7	63.7	0.0	No
4		West	61.5	61.5	0.0	No
5	Airport Blvd/Broadway/Bayshore Hwy	North	59.3	59.6	0.3	No
6		South	64.3	64.4	0.1	No
7		East	52.7	52.7	0.0	No
8		West	63.8	63.9	0.1	No
9	Broadway/US 101 Ramps	North	64.3	64.4	0.1	No
10		South	65.9	65.9	0.0	No
11		East	60.6	60.6	0.0	No
12		West	61.7	61.8	0.1	No
13	Broadway/Rollins Rd	North	65.9	65.9	0.0	No
14		South	64.8	64.9	0.1	No
15		East	60.8	60.8	0.0	No
16		West	60.9	60.9	0.0	No
17	Broadway/Carolan Ave	North	64.8	64.9	0.0	No
18		South	64.2	64.3	0.1	No
19		East	58.8	58.8	0.0	No
20		West	31.3	31.3	0.0	No

Table 7
Background vs. Background Plus Project Traffic Noise Levels[1]
Topgolf – Burlingame, California

Segment	Intersection	Direction	B	B+P	Change	Substantial Increase?
21	Broadway/California Dr	North	64.2	64.3	0.1	No
22		South	60.2	60.3	0.1	No
23		East	62.7	62.7	0.0	No
24		West	62.6	62.6	0.0	No
25	Cadillac Way/Rollins Rd	North	n/a	n/a	n/a	n/a
26		South	54.8	54.8	0.0	No
27		East	59.8	59.8	0.0	No
28		West	60.8	60.8	0.0	No
29	Anza Blvd/Airport Blvd	North	54.4	54.4	0.0	No
30		South	59.2	59.5	0.3	No
31		East	62.0	62.2	0.2	No
32		West	60.0	60.1	0.1	No
33	US 101 Off-Ramp/Airport Blvd	North	n/a	n/a	n/a	n/a
34		South	61.6	61.6	0.0	No
35		East	63.7	63.8	0.1	No
36		West	60.5	60.7	0.2	No
37	Peninsula Ave/Airport Blvd	North	55.2	55.2	0.0	No
38		South	63.8	63.9	0.1	No
39		East	n/a	n/a	n/a	n/a
40		West	63.7	63.8	0.1	No
41	Peninsula Ave/Bayshore Blvd	North	63.8	63.9	0.1	No
42		South	63.9	63.9	0.0	No
43		East	61.6	61.7	0.1	No
44		West	n/a	n/a	n/a	n/a
45	Peninsula Ave/Humboldt St	North	64.1	64.1	0.0	No
46		South	63.0	63.0	0.0	No
47		East	57.0	57.0	0.0	No
48		West	54.1	54.1	0.0	No
49	Poplar Ave/Humboldt St	North	58.8	58.8	0.0	No
50		South	57.8	57.8	0.0	No
51		East	55.6	55.6	0.0	No
52		West	57.1	57.2	0.1	No
53	US 101 Off-Ramp/Poplar Ave/Amphlet Blvd	North	63.2	63.2	0.0	No
54		South	58.8	58.8	0.0	No
55		East	58.3	58.3	0.0	No
56		West	52.3	52.3	0.0	No

Notes:
1. L_{dn} is computed at a distance of 100 feet from the roadway centerline.

Source: FHWA-RD-77-108 with inputs prepared by Fehr & Peers.

Assessment Relative to Significant Increase Criteria

Given a baseline exposure between 31.3 and 65.9 dB L_{dn}, the applicable significance threshold criteria would range from 3 to 5 dB. According to Table 7, the proposed project would not result in any substantial increases in off-site traffic noise impacts relative to background traffic conditions present without the project. Because the predicted increases in traffic noise levels are below the significance criteria for each roadway segment, this noise impact is considered ***less than significant.***

Assessment Relative to General Plan Interior Criteria - Hotels

As indicated in Table 7, baseline plus project exterior noise levels at the analyzed roadway segment (segment #6, Broadway south of Bayshore Highway) nearest to the Crowne Plaza San Francisco Airport hotel were calculated to be 64 L_{dn}. However, the predicted roadway noise level of 64 dB L_{dn} was calculated a setback distance of 100 feet from the centerline of Broadway. The hotel is setback approximately 480 feet from the centerline of Broadway. At that distance, predicted background plus project exterior traffic noise levels were calculated to be 54 dB L_{dn} at the hotel façade.

Background plus project exterior noise levels at the analyzed roadway segment (segment #32, Anza Boulevard west of Airport Boulevard) nearest to the DoubleTree hotel were calculated to be 60 L_{dn}. However, the predicted roadway noise level of 60 dB L_{dn} was calculated a setback distance of 100 feet from the centerline of Anza Boulevard. The hotel is setback approximately 130 feet from the centerline of Anza Boulevard. At that distance, predicted background plus project exterior traffic noise levels were calculated to be 58 dB L_{dn} at the hotel façade.

Given exterior traffic noise levels of 54-58 dB L_{dn}, a building facade noise reduction of at least 13 dB would be required to satisfy the City's 45 dB L_{dn} interior noise level standard for hotel land uses. Standard hotel construction results in an exterior to interior noise reduction of at least 25 dB with windows closed and approximately 15 dB with windows open. After taking into consideration the noise reduction achieved from standard construction, the range of background plus project traffic noise levels within interior spaces would be 29-33 dB L_{dn}. Resulting interior traffic noise levels in terms of the CNEL noise level descriptor would be within 1-2 dB of predicted day/night noise levels (L_{dn}). Because background plus project traffic noise levels satisfy the City of Burlingame General Plan interior noise level standard of 45 dB CNEL for hotel land uses, this noise impact is considered ***less than significant***.

Noise Impacts Resulting from On-Site Activities within the Project Site

Impact 3: Parking Lot Activity Noise

The project proposes parking areas on the west, south and east of the Topgolf facility as indicated in Figure 2. As a means of predicting the noise generation due to parking lot activities, BAC utilized noise level data collected at various parking lots over the years. That data indicate that a typical maximum noise level associated with parking lot activity did not exceed 65 dB L_{max} at a reference distance of 50 feet. Average (L_{eq}) noise levels were predicted to be 5 dB lower than maximum noise levels. Given the proposed hours of operation, parking lot CNEL values computed

to 4 dB higher than L_{eq} values, assuming equal level of activity for 9 daytime, 3 evening hours, and 4 nighttime hours. Because it is known that parking lot activity will be lighter during non-peak hours, this assumption is conservative.

The distance between the nearest proposed parking spaces and the closest hotel building façade to the west (Area 1 on Figure 1), is approximately 900 feet. At that distance, noise levels generated by the nearest parking lot activities are predicted to be approximately 35 dB L_{eq} and 39 dB CNEL. Appendix E-1 contains the computations of parking lot noise levels at the nearest sensitive receptors. The predicted exterior CNEL is considered satisfactory relative to the City's General Plan exterior noise level standard of 65 dB CNEL for hotels. Parking lot noise levels within the hotel guest rooms would be 25 dB lower due to noise attenuation provided by the building façade and would satisfy the City's General Plan interior noise level standard of 45 dB CNEL by a wide margin.

The distance between the nearest proposed parking spaces and the closest hotel building façade to the east (Area 2 on Figure 1), is approximately 500 feet. At that distance, noise levels generated by the nearest parking lot activities are predicted to be approximately 40 dB L_{eq} and 44 dB CNEL. The predicted exterior CNEL is considered satisfactory relative to the City's General Plan exterior noise level standard of 65 dB CNEL. Parking lot noise levels within the hotel guest rooms would be 25 dB lower due to noise attenuation provided by the building façade and would satisfy the City's General Plan interior noise level standard of 45 dB CNEL by a wide margin.

The residences to the south, on the opposite side of the Highway 101 (Area 3 on Figure 1), are located approximately 875 feet from the nearest proposed parking spaces at the project site. Despite the elevated project site, these residences would be shielded from view of the proposed parking areas by the existing Highway 101 traffic noise barrier. A conservative offset of 5 dB was applied to the predicted noise levels to account for the shielding provided by the barrier. Noise levels generated by the nearest parking lot activities are predicted to be approximately 30 dB L_{eq} and 34 dB CNEL. The predicted exterior CNEL is considered satisfactory relative to the City's General Plan exterior noise level standard of 60 dB CNEL for residential land uses. Parking lot noise levels within the residences would be 25 dB lower due to noise attenuation provided by the building façades and would satisfy the City's General Plan interior noise level standard of 45 dB CNEL by a wide margin.

The apartments to the south, on the opposite side of the Highway 101 (Area 4 on Figure 1), are located approximately 1,000 feet from the nearest proposed parking spaces at the project site. At that distance, noise levels generated by the nearest parking lot activities are predicted to be approximately 34 dB L_{eq} and 38 dB CNEL. The predicted exterior CNEL is considered satisfactory relative to the City's General Plan exterior noise level standard of 60 dB CNEL. Parking lot noise levels within the residences would be 25 dB lower due to noise attenuation provided by the building façade and would satisfy the City's General Plan interior noise level standard of 45 dB CNEL by a wide margin.

In addition to parking lot noise levels satisfying the City of Burlingame General Plan exterior and interior noise level standards at all of the nearest noise-sensitive areas to the project site, Figures 4-12 indicate the predicted hourly average noise levels level are well below the measured existing

hourly average noise levels at the nearest noise-sensitive areas. As a result, this impact is considered ***less than significant.***

Impact 4: Mechanical Equipment Noise

The heating, ventilation, and air conditioning (HVAC) systems for maintaining comfortable temperatures within the proposed Topgolf facility will be located within a mechanical equipment enclosure. Because mechanical equipment operation typically generates sustained, steady-state, noise levels, impacts of HVAC system usage are assessed in this study relative to the City's General Plan 65/60 CNEL exterior and 45 CNEL interior noise level standards.

Noise from rooftop HVAC units has been measured by BAC to be approximately 50 dB at a reference distance of 100 feet from the building façades of similar uses. HVAC systems located within dedicated mechanical equipment rooms typically result in even lower noise levels.

The nearest noise-sensitive land uses are located a minimum of 900+ feet from any project-related HVAC equipment. At that distance, average HVAC exterior noise levels are predicted to be approximately 31 dB L_{eq}/L_{max} and 34 dB CNEL, conservatively assuming the mechanical equipment were to operate 9 daytime, 3 evening, and 4 nighttime hours per day. Based on more typical operating conditions, predicted HVAC system levels are predicted to be even lower at the nearest noise-sensitive land uses to the project site. Appendix E-2 contains the computations of HVAC noise levels at the nearest noise-sensitive land uses.

Within the nearest hotels or residences, HVAC noise levels would be approximately 15 dB lower with windows open, and 25 dB lower with windows closed. Resulting interior noise levels would range from approximately 10-20 dB CNEL within the nearest noise-sensitive buildings.

Predicted HVAC system noise levels at the nearest noise-sensitive land uses would be satisfactory relative to the City's exterior noise level standards of 60 dB CNEL, 65 dB CNEL, and 45 dB CNEL interior noise level standard. In addition, predicted HVAC system noise levels would be well below measured ambient conditions at all of the nearest noise-sensitive land uses to the project site. As a result, noise impacts resulting from daytime and/or nighttime HVAC system usage within the project area is considered ***less than significant.***

Impact 5: Topgolf Outdoor Entertainment Facility Noise

Topgolf Facility Overview

Topgolf is a proposed golf entertainment complex as identified on Figure 2. The facility would include a three-story driving range facility with 125 climate-controlled hitting bays, with an outdoor outfield enclosed by netting. The Topgolf facility includes a full-service restaurant, bar, lounges and corporate/event meeting spaces, and family entertainment area with games. Players play in individual hitting bays. Each hitting bay can accommodate up to six players at a time but it's not unusual to have one or two players in some bays. Hitting bays include seating, television screens to monitor sporting events and track Topgolf scoring, and include overhead speakers providing amplified music. Topgolf facilities include the following specific activities:

- **Lower Level**. The lower level features approximately 40 hitting bays including bays designated for golf instruction and team practice. The lower level features a family lounge area. This level is at grade on the tee line.

- **Main Level.** The entrance to the building is on the main level. The main level features approximately 40 hitting bays, a full-service bar/restaurant, a 2,900-square foot corporate and event meeting space and lobby area.

- **Upper Level.** The upper level features approximately 40 hitting bays and an open-air rooftop terrace. The rooftop terrace will be furnished with tables, couches and fire pits. Restaurant food service is available on the roof top terrace. The terrace can accommodate live music for events.

- **Operations.** Proposed operating hours are 9 a.m. to 2 a.m., seven days a week. The project proposes live and DJ-generated music on the outdoor terrace on the third level. On weekdays, the music would start at 6 p.m. and end at midnight. On weekends, the music would start at noon and end at 1 a.m. Security will be provided with on-site indoor and outdoor cameras and on-site staff security during operating hours.

Topgolf Music and Patron Activity Noise Generation

The design of the Topgolf facilities is such that music is played above the individual drive bays, as well as on the third level terrace. In addition to this music, sound is also generated at the Topgolf facilities by patrons conversing, sometimes in raised voices.

To evaluate the noise generation of the proposed facility, BAC staff utilized data from an extensive sound level survey at the Topgolf facility in Gilbert, Arizona. BAC staff conducted surveys from 5 p.m. Friday September 25 to Noon on Sunday, September 27, 2015. The surveys consisted of both short and long-term sound level measurements at 17 locations in and around the Topgolf facility. An aerial image with noise measurement locations at the Gilbert facility is shown in Figure 13. Long-term sound level measurements were conducted at sites A and B shown on Figure 13. Measured sound levels resulting from typical weekend Topgolf activities at the Gilbert facility were plotted and are displayed on Figure 14. The Figure 14 “heat map” highlights the range of noise levels which can be expected throughout the site. According to Topgolf representatives, the noise generation of the proposed Topgolf Burlingame facility would be comparable to that of the Gilbert facility where the sound level surveys were conducted.

Predicted Topgolf Noise Levels at the Nearest Residences to the Burlingame Facility

The noise exposure data shown in Figure 14 were projected from the proposed facility to the nearest noise-sensitive receptors assuming a six (6) dB decrease per doubling of distance from the noise source, consistent with accepted sound propagation algorithms.

The Gilbert Topgolf facility measurement sites shown in Figure 13 which are most pertinent to this analysis of potential impacts at the proposed Burlingame facility are Sites I, A, K, and J, as they represent noise exposure in the direction of noise-sensitive receptor locations 1, 2, 3, and 4,

respectively. See Figure 1 for locations of nearest potentially affected receptor locations. The noise level data collected at those locations were projected to the nearest receptors assuming standard spherical spreading of sound (-6 dB per doubling of distance from the source). The results of the noise assessment at those locations are shown in Table 8.

Table 8 indicates the predicted average (L_{eq}), maximum (L_{max}), and community equivalent noise levels (CNEL), at each of the nearest noise-sensitive areas to the project site would be satisfactory relative to the project standards of significance. In addition, predicted exterior noise levels are at, or below, measured existing ambient conditions at those nearest sensitive areas. As a result, the project-related increase in CNEL at the nearest sensitive receptors is 0 dB, which is also below the thresholds for significance. As a result, noise impacts associated with on-site Topgolf activities, including amplified music and sound generated by facility patrons, is considered ***less than significant.***

Figure 13

Project Area and Noise Measurement Locations
Topgolf Gilbert - Gilbert, Arizona

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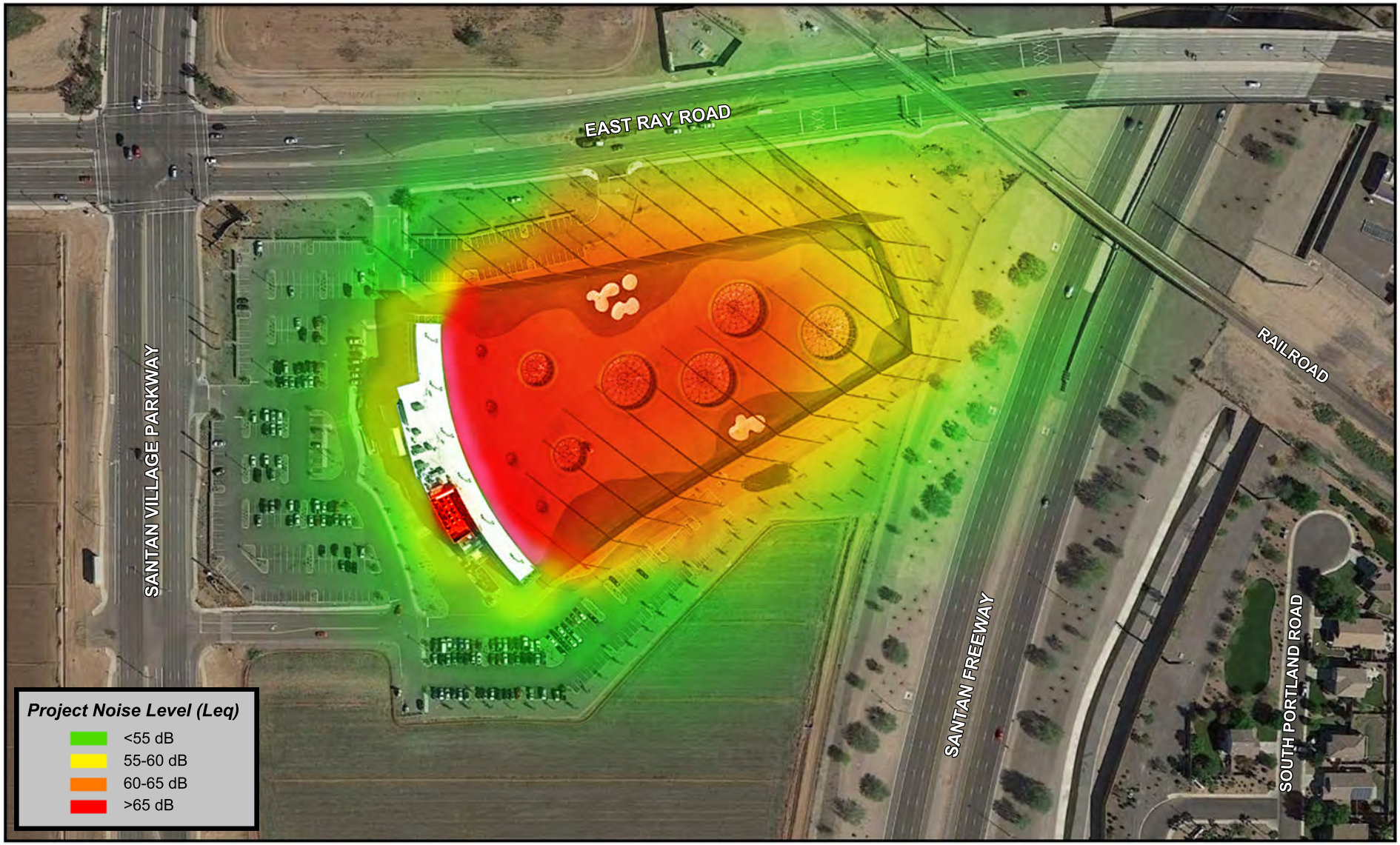
Scale (feet)
0 120 240

Figure 14

Project Noise Generation Heat Map

Topgolf Gilbert - Gilbert, Arizona



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Scale (feet)

0 120 240

Table 8
Predicted Topgolf Facility Noise Levels at Nearest Noise-Sensitive Uses
Topgolf Development Project – Burlingame, California

Site	Description	Distance from Topgolf Facility (ft)	Predicted Topgolf Noise Levels, dB[1]			Baseline CNEL, dB[5]	Baseline + Project CNEL, dB	Project Related Increase in CNEL, dB
			L_{eq}	L_{max}	CNEL[2]			
Area 1	Hotel to the west (interior)[3]	970	17	25	21	41	41	0
Area 2	Hotel to the east (interior)[3]	920	28	35	32	43	43	0
Area 3	Nearest Residences to South[4]	900	43	51	47	69	69	0
Area 4	Nearest Residences to Southwest	1,100	41	45	44	74	74	0

Notes:

1. Predicted levels are based on reference levels from BAC file data, and 6 dB per doubling of distance attenuation rate.
2. CNEL calculations conservatively assume continuous Topgolf noise generation between 9 am and 2 am.
3. Interior spaces of hotels were conservatively estimated to be 25 dB lower than exterior noise levels due to noise reduction provided by the hotel building facades.
4. Because the project site topography is significantly elevated, no additional offset was applied to the residences represented by Area 3 to account for the shielding provided by the existing Highway 101 noise barrier.
5. Baseline noise levels are identified in Table 1. Baseline noise levels at Areas 1 and 2 were adjusted by -25 dB to account for the noise reduction provided by the hotel building facades.
6. Please see Appendix E-3 for computations of Topgolf facility noise levels at the nearest noise-sensitive receptors.

Source: Bollard Acoustical Consultants, Inc. (2015, 2019)

Impact 6: Project Construction Noise Generation

During the construction phases of the proposed project, noise from construction activities would add to the noise environment in the immediate project vicinity. Activities involved in typical construction would generate maximum noise levels, as indicated in Table 9, ranging from 70 to 90 dB at a distance of 50 feet.

According to project representatives project construction activities would include pile driving. A total of 360 piles will be used and it is estimated that a 95-foot pile length will be needed for the project site. The duration of pile driving activities are anticipated to take approximately 60 days. According to Table 9 below, pile driving activities generate maximum noise levels of 95 dB at a distance of 50 feet.

Table 9
Typical Construction Equipment Noise

Equipment Description	Maximum Noise Level at 50 feet, dBA
Auger drill rig	85
Backhoe	80
Bar bender	80
Boring jack power unit	80
Chain saw	85
Compactor (ground)	80
Compressor (air)	80
Concrete batch plant	83
Concrete mixer truck	85
Concrete pump truck	82
Concrete saw	90
Crane (mobile or stationary)	85
Dozer	85
Dump truck	84
Excavator	85
Flatbed truck	84
Front end loader	80
Generator (25 kilovolt-amperes [kVA] or less)	70
Generator (more than 25 kVA)	82
Grader	85
Impact pile driver	95
Jackhammer	85
Paver	85
Pickup truck	55
Pneumatic tools	85
Pumps	77
Rock drill	85
Scraper	85
Soil mix drill rig	80
Tractor	84
Vacuum street sweeper	80
Vibratory concrete mixer	80
Vibratory pile driver	95

Source: Federal Highway Administration 2006.

The nearest existing noise-sensitive land uses are located between 500 and 1,000 feet to the required construction areas within the project site. At this range of distances, maximum noise levels for general construction activities would range from approximately 50 to 70 dB L_{max} at the nearest sensitive receptor (Area 2). Maximum noise levels due to pile driving would be approximately 75 dB L_{max} at the nearest sensitive receptor. Figures 7-9 indicate that daytime maximum noise levels frequently exceeded 70 dB L_{max} at the nearest sensitive receptor location (Area 2 – monitoring site LT2). Therefore, the predicted range of construction-related noise levels would not likely represent a substantial short-term increase over ambient maximum noise levels, particularly if construction activities are limited to daytime hours. However, due to the potential for substantial short-term exceedances of ambient noise levels at nearby sensitive areas during project construction, this impact is considered ***potentially significant***.

Mitigation for Impact 6:

MM 6: Implement measures to prevent exposure of sensitive receptors to excessive construction noise

To reduce impacts associated with noise generated during project-related construction activities, the project applicant(s) and their primary contractors for engineering design and construction of all project phases shall ensure that the following requirements are implemented at each work site in any year of project construction to avoid and minimize construction noise effects on sensitive receptors. The project applicant(s) and primary construction contractor(s) shall employ noise-reducing construction practices. Measures that shall be used to limit noise shall include the measures listed below:

- Noise-generating construction operations shall be limited to the hours between 8 a.m. and 7 p.m. Monday through Friday, and between 9 a.m. and 6 p.m. on Saturdays. No construction activity shall occur on Sundays or holidays.

- All construction equipment and equipment staging areas shall be located as far as possible from nearby noise-sensitive land uses.

- All construction equipment shall be properly maintained and equipped with noise-reduction intake and exhaust mufflers and engine shrouds, in accordance with manufacturers' recommendations. Equipment engine shrouds shall be closed during equipment operation.

- All motorized construction equipment shall be shut down when not in use to prevent idling.

- The primary contractor shall prepare and implement a construction noise management plan. This plan shall identify specific measures to ensure compliance with the noise control measures specified above. The noise control plan shall be submitted to the City of Burlingame before any noise-generating construction activity begins.

Significance after mitigation: ***Less than Significant***

Impact 7: Project Construction Vibration Generation

Vibration amplitude attenuates over distance and is a complex function of how energy is imparted into the ground and the soil or rock conditions through which the vibration is traveling. The following equation is used to estimate the vibration level at a given distance for typical soil conditions (Federal Transit Administration 2018). PPV_{ref} is the reference PPV at 25 feet.

$PPV = PPV_{ref} \times (25/Distance)^{1.5}$

Table 10 summarizes typical vibration levels generated by construction equipment (Federal Transit Administration 2018) at the reference distance of 25 feet and other distances as determined using the attenuation equation above. Table 11 summarizes predicted vibration levels generated by pile driving at the buildings nearest to the project site.

Table 10
Vibration Source Levels for Construction Equipment

	Maximum PPV (inches/second)				
Equipment	**PPV at 25 feet**	**PPV at 50 feet**	**PPV at 75 feet**	**PPV at 100 feet**	**PPV at 175 feet**
Pile driver (impact) – upper range	1.518	0.537	0.292	0.190	0.082
Pile driver (impact) – typical	0.644	0.228	0.124	0.081	0.035
Pile driver (sonic) – upper range	0.734	0.260	0.141	0.092	0.040
Pile driver (sonic) – typical	0.170	0.060	0.033	0.021	0.009
Vibratory roller	0.210	0.074	0.040	0.026	0.011
Large bulldozer	0.089	0.032	0.017	0.011	0.005
Caisson drilling	0.089	0.03	0.017	0.011	0.005
Loaded trucks	0.076	0.027	0.015	0.010	0.004
Jackhammer	0.035	0.012	0.007	0.004	0.002
Small bulldozer	0.003	0.001	0.001	0.000	0.000

Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual (2018)
PPV = peak particle velocity.

Table 11
Pile Driving Vibration Levels at Nearest Sensitive Buildings[1]
Topgolf – Burlingame, California

Site	Description	Distance (feet)	Maximum PPV (inches/second) [2,3]
Area 1	Hotel to the west	800	0.008
Area 2	Hotel to the east	500	0.017

Notes:
1. Based on vibration propagation equation PPV = PPV_{ref} x $(25/Distance)^{1.5}$
2. Upper range of impact pile driving used as worst-case assessment (1.518 PPV at 25 feet)
3. PPV = peak particle velocity.

The vibration data shown in Table 11 indicate that construction equipment-generated vibration levels are below the Caltrans thresholds for damage to structures of 0.5 in/sec PPV at the nearest off-site buildings. Furthermore, the Table 11 vibration levels are below the Caltrans thresholds for annoyance. Because no damage to structures are anticipated due to the project and because of the temporary nature of construction activities, construction/demolition-related vibration impacts for this project are considered ***less than significant.***

Impact 8: SFO Noise Generation at Project Site

The project site is located just over a mile south of San Francisco International Airport (SFO). Noise exposure at the project site due to aircraft operations was quantified by referencing the San Francisco International Airport Noise Exposure Map Report (August 2015). According to that document, the project site is over 5000 feet south of the 65 dB CNEL contour. The 2019 Noise Exposure Map for SFO operations is provided as Appendix D. Based on the published noise contours, it was conservatively estimated that noise exposure at the project site due to SFO operations is no greater than 60 dB CNEL. According to Table 5, the City of Burlingame applies a 60 dB CNEL for intensively used parks and playgrounds. Because SFO operational noise exposure is below the 60 dB CNEL threshold, this noise impact is considered ***less than significant.***

Cumulative Setting, Impacts and Mitigation Measures

The future (cumulative) noise environment at the project site will continue to be dominated by traffic on the local roadway network, particularly Highway 101, and to lesser extent by SFO aircraft operations. A detailed analysis of cumulative traffic noise levels, both with and without the project, is provided in Table 12. The FHWA Model input data used to derive the cumulative data contained in Table 12 is provided in Appendix C.

Cumulative Traffic Noise Impacts

Impact 9: Increase in Cumulative Traffic Noise Levels

Cumulative versus cumulative plus project traffic noise levels on the local roadway network are shown in Table 12. The following section includes an assessment of predicted noise levels relative to the noise criteria discussed in the Regulatory Section of the report.

Table 12
Cumulative vs. Cumulative Plus Project Traffic Noise Levels[1]
Topgolf – Burlingame, California

Segment	Intersection	Direction	C	C+P	Change	Substantial Increase?
1	US 101 Ramp/Bayshore Hwy	North	47.1	47.1	0.0	No
2		South	63.0	63.0	0.0	No
3		East	64.7	64.7	0.0	No
4		West	63.1	63.1	0.0	No
5	Airport Blvd/Broadway/Bayshore Hwy	North	60.0	60.2	0.2	No
6		South	65.2	65.3	0.1	No
7		East	52.8	52.8	0.0	No
8		West	64.9	64.9	0.0	No
9	Broadway/US 101 Ramps	North	65.2	65.3	0.1	No
10		South	66.5	66.6	0.1	No
11		East	61.4	61.4	0.0	No
12		West	62.3	62.4	0.1	No
13	Broadway/Rollins Rd	North	66.5	66.6	0.1	No
14		South	65.5	65.6	0.1	No
15		East	61.3	61.3	0.0	No
16		West	61.4	61.4	0.0	No
17	Broadway/Carolan Ave	North	65.5	65.6	0.1	No
18		South	64.9	64.9	0.0	No
19		East	59.5	59.5	0.0	No
20		West	31.3	31.3	0.0	No
21	Broadway/California Dr	North	64.9	64.9	0.0	No
22		South	60.8	60.8	0.1	No
23		East	63.4	63.4	0.0	No
24		West	63.1	63.1	0.0	No
25	Cadillac Way/Rollins Rd	North	n/a	n/a	n/a	n/a
26		South	55.2	55.2	0.0	No
27		East	60.2	60.2	0.0	No
28		West	61.2	61.2	0.0	No
29	Anza Blvd/Airport Blvd	North	54.9	54.9	0.0	No
30		South	59.4	59.6	0.2	No
31		East	62.4	62.5	0.1	No
32		West	60.5	60.6	0.1	No
33	US 101 Off-Ramp/Airport Blvd	North	n/a	n/a	n/a	n/a

Table 12
Cumulative vs. Cumulative Plus Project Traffic Noise Levels[1]
Topgolf – Burlingame, California

Segment	Intersection	Direction	C	C+P	Change	Substantial Increase?
34		South	62.1	62.1	0.0	No
35		East	64.1	64.2	0.1	No
36		West	60.8	61.0	0.2	No
37	Peninsula Ave/Airport Blvd	North	55.7	55.7	0.0	No
38		South	64.2	64.3	0.1	No
39		East	n/a	n/a	n/a	n/a
40		West	64.1	64.2	0.1	No
41	Peninsula Ave/Bayshore Blvd	North	64.2	64.3	0.1	No
42		South	64.4	64.4	0.0	No
43		East	62.1	62.2	0.1	No
44		West	n/a	n/a	n/a	n/a
45	Peninsula Ave/Humboldt St	North	64.6	64.6	0.0	No
46		South	63.5	63.5	0.0	No
47		East	57.4	57.4	0.0	No
48		West	54.5	54.5	0.0	No
49	Poplar Ave/Humboldt St	North	59.4	59.4	0.0	No
50		South	58.4	58.4	0.0	No
51		East	56.0	56.1	0.1	No
52		West	57.6	57.6	0.0	No
53	US 101 Off-Ramp/Poplar Ave/Amphlet Blvd	North	63.7	63.7	0.0	No
54		South	59.3	59.3	0.0	No
55		East	58.7	58.7	0.0	No
56		West	52.7	52.7	0.0	No

Notes:
2. L_{dn} is computed at a distance of 100 feet from the roadway centerline.
Source: FHWA-RD-77-108 with inputs prepared by Fehr & Peers.

Given a baseline exposure between 31.3 and 66.6 dB L_{dn}, the applicable significance threshold criteria would range from 3 to 5 dB. According to Table 12, the proposed project would not result in any substantial increases in off-site traffic noise impacts relative to cumulative traffic conditions present without the project. Because the predicted increases in traffic noise levels are below the significance criteria for each roadway segment, this noise impact is considered ***less than significant.***

Assessment Relative to General Plan Interior Criteria - Hotels

As indicated in Table 12, cumulative plus project exterior noise levels at the analyzed roadway segment (segment #6, Broadway south of Bayshore Highway) nearest to the Crowne Plaza San Francisco Airport hotel were calculated to be 65 L_{dn}. However, the predicted roadway noise level of 65 dB L_{dn} was calculated a setback distance of 100 feet from the centerline of Broadway. The hotel is setback approximately 480 feet from the centerline of Broadway. At that distance,

predicted existing plus project exterior traffic noise levels were calculated to be 55 dB L_{dn} at the hotel façade.

Cumulative plus project exterior noise levels at the analyzed roadway segment (segment #32, Anza Boulevard west of Airport Boulevard) nearest to the DoubleTree hotel were calculated to be 61 L_{dn}. However, the predicted roadway noise level of 61 dB L_{dn} was calculated a setback distance of 100 feet from the centerline of Anza Boulevard. The hotel is setback approximately 130 feet from the centerline of Anza Boulevard. At that distance, predicted cumulative plus project exterior traffic noise levels were calculated to be 59 dB L_{dn} at the hotel façade.

Given exterior traffic noise levels of 55-59 dB L_{dn}, a building facade noise reduction of at least 14 dB would be required to satisfy the City's 45 dB L_{dn} interior noise level standard for hotel land uses. Standard hotel construction results in an exterior to interior noise reduction of at least 25 dB with windows closed and approximately 15 dB with windows open. After taking into consideration the noise reduction achieved from standard construction, the range of cumulative plus project traffic noise levels within interior spaces would be 30-34 dB L_{dn}. Resulting interior traffic noise levels in terms of the CNEL noise level descriptor would be within 1-2 dB of predicted day/night noise levels (L_{dn}). Because cumulative plus project traffic noise levels satisfy the City of Burlingame General Plan interior noise level standard of 45 dB CNEL for hotel land uses, this noise impact is considered ***less than significant***.

Impact 10: Combined Noise from all On-Site Project Noise Sources

Combined noise levels for each on-site noise source operating concurrently are shown below in Table 13. It should be noted that project construction noise would not occur simultaneously with operational noise. Because the cumulative noise generation of all on-site sources would satisfy the City of Burlingame exterior noise criteria applied at the nearest noise-sensitive land uses, and because the increase in CNEL values at those nearest sensitive receptors would be 0 dB as a result of the project, this impact is considered **less than significant.**

Table 13
Predicted Noise Levels at Nearest Receptors from All On-Site Noise Sources Combined
Topgolf – Burlingame, California

Site	Description	Predicted Project Noise Levels, dB[1]			Baseline CNEL, dB[4]	Baseline + Project CNEL, dB	Project Related Increase in CNEL, dB
		L_{eq}	L_{max}	CNEL[2]			
Area 1	Hotel to the west (interior)[3]	18	25	22	41	41	0
Area 2	Hotel to the east (interior)[3]	28	35	32	43	43	0
Area 3	Nearest Residences to South[4]	43	51	47	69	69	0
Area 4	Nearest Residences to Southwest	42	46	46	74	74	0

Notes:
1. Predicted levels are based on the decibel addition of data reported in previous sections of this report.
2. CNEL calculations conservatively assume continuous Topgolf noise generation between 9 am and 2 am.
3. Interior spaces of the hotels were conservatively estimated to be 25 dB lower than exterior noise levels due to noise reduction provided by the hotel building facades.
4. Baseline noise levels are identified in Table 1.

Source: Bollard Acoustical Consultants, Inc. (2015, 2016)

Conclusions and Recommendations

There are considerable setbacks between the existing noise-sensitive land uses in the area and the proposed Topgolf development. In addition, existing Highway 101 and local roadway network traffic noise levels will provide masking of project noise generation at those nearest noise-sensitive land uses. As a result, with the exception of potential impacts during project construction, noise impacts are not identified for this project.

These conclusions are based on the project site plans shown on Figure 2, and on the data and assumptions cited herein. Any substantive revisions to the project site plans or proposed operations could cause actual noise levels to vary relative to those predicted herein. BAC is not responsible for such revisions.

This concludes BAC's environmental noise analysis for the proposed Topgolf Development Project. Please contact Paul Bollard at (916) 663-0500 or PaulB@bacnoise.com with any questions regarding this assessment.

Appendix A

Acoustical Terminology

Acoustics The science of sound.

Ambient Noise The distinctive acoustical characteristics of a given space consisting of all noise sources audible at that location. In many cases, the term ambient is used to describe an existing or pre-project condition such as the setting in an environmental noise study.

Attenuation The reduction of an acoustic signal.

A-Weighting A frequency-response adjustment of a sound level meter that conditions the output signal to approximate human response.

Decibel or dB Fundamental unit of sound, A Bell is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A Decibel is one-tenth of a Bell.

CNEL Community Noise Equivalent Level. Defined as the 24-hour average noise level with noise occurring during evening hours (7 - 10 p.m.) weighted by a factor of three and nighttime hours weighted by a factor of 10 prior to averaging.

Frequency The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or hertz.

Ldn Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.

Leq Equivalent or energy-averaged sound level.

Lmax The highest root-mean-square (RMS) sound level measured over a given period of time.

Loudness A subjective term for the sensation of the magnitude of sound.

Masking The amount (or the process) by which the threshold of audibility is for one sound is raised by the presence of another (masking) sound.

Noise Unwanted sound.

Peak Noise The level corresponding to the highest (not RMS) sound pressure measured over a given period of time. This term is often confused with the Maximum level, which is the highest RMS level.

RT_{60} The time it takes reverberant sound to decay by 60 dB once the source has been removed.

Sabin The unit of sound absorption. One square foot of material absorbing 100% of incident sound has an absorption of 1 sabin.

SEL A rating, in decibels, of a discrete event, such as an aircraft flyover or train passby, that compresses the total sound energy of the event into a 1-s time period.

Threshold of Hearing The lowest sound that can be perceived by the human auditory system, generally considered to be 0 dB for persons with perfect hearing.

Threshold of Pain Approximately 120 dB above the threshold of hearing.

Appendix B-1
Ambient Noise Monitoring Results - LT1
Topgolf - Burlingame, California
Thursday, December 06, 2018

Hour	Leq	Lmax	L50	L90
0:00	57	74	55	52
1:00	54	64	53	51
2:00	55	66	54	51
3:00	56	64	56	53
4:00	58	67	58	56
5:00	61	69	61	59
6:00	61	73	61	59
7:00	59	70	59	57
8:00	57	70	57	54
9:00	57	75	56	55
10:00	58	71	57	55
11:00	58	69	58	56
12:00	58	69	57	56
13:00	60	74	57	56
14:00	65	82	58	56
15:00	68	86	57	53
16:00	58	71	56	54
17:00	58	71	57	55
18:00	61	76	59	58
19:00	60	70	59	58
20:00	61	76	59	58
21:00	59	72	58	57
22:00	61	81	59	57
23:00	61	72	60	58

Statistical Summary									
	Daytime (7 a.m. - 7 p.m.)			Evening (7 p.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average	High	Low	Average
Leq (Average)	68	57	61	61	59	60	61	54	59
Lmax (Maximum)	86	69	74	76	70	72	81	64	70
L50 (Median)	59	56	57	59	58	59	61	53	57
L90 (Background)	58	53	55	58	57	58	59	51	55

Computed CNEL, dB	66
% Daytime Energy	62%
% Evening Energy	11%
% Nighttime Energy	27%

GPS Coordinates	37°35'24.02"N
	122°21'31.72"W

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Appendix B-2
Ambient Noise Monitoring Results - LT1
Topgolf - Burlingame, California
Friday, December 07, 2018

Hour	Leq	Lmax	L50	L90
0:00	60	76	58	56
1:00	61	86	56	53
2:00	55	68	54	52
3:00	58	70	57	54
4:00	60	67	59	57
5:00	61	81	60	59
6:00	61	75	61	59
7:00	62	74	60	59
8:00	60	76	59	56
9:00	56	71	56	54
10:00	58	72	57	55
11:00	57	67	57	55
12:00	57	71	57	55
13:00	61	79	57	55
14:00	61	73	57	55
15:00	58	72	57	54
16:00	58	72	57	56
17:00	58	68	57	55
18:00	58	74	56	55
19:00	61	84	58	56
20:00	61	76	59	58
21:00	60	71	59	58
22:00	61	78	60	58
23:00	61	77	59	57

Statistical Summary									
	Daytime (7 a.m. - 7 p.m.)			Evening (7 p.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average	High	Low	Average
Leq (Average)	62	56	59	61	60	61	61	55	60
Lmax (Maximum)	79	67	73	84	71	77	86	67	75
L50 (Median)	60	56	57	59	58	59	61	54	58
L90 (Background)	59	54	55	58	56	57	59	52	56

Computed CNEL, dB	67
% Daytime Energy	43%
% Evening Energy	16%
% Nighttime Energy	42%

GPS Coordinates	37°35'24.02"N
	122°21'31.72"W

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Appendix B-3
Ambient Noise Monitoring Results - LT1
Topgolf - Burlingame, California
Saturday, December 08, 2018

Hour	Leq	Lmax	L50	L90
0:00	61	75	58	56
1:00	58	75	56	55
2:00	59	68	57	55
3:00	56	69	56	54
4:00	56	63	55	53
5:00	58	71	57	55
6:00	59	69	58	56
7:00	60	76	60	58
8:00	59	69	59	57
9:00	58	77	57	56
10:00	57	71	56	55
11:00	57	84	56	55
12:00	57	71	56	55
13:00	56	74	56	54
14:00	57	73	56	53
15:00	57	71	56	55
16:00	58	72	57	55
17:00	58	71	57	56
18:00	59	71	59	57
19:00	58	77	58	57
20:00	60	73	59	58
21:00	61	77	59	58
22:00	60	78	59	58
23:00	61	74	59	58

Statistical Summary									
	Daytime (7 a.m. - 7 p.m.)			Evening (7 p.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average	High	Low	Average
Leq (Average)	60	56	58	61	58	60	61	56	59
Lmax (Maximum)	84	69	73	77	73	76	78	63	71
L50 (Median)	60	56	57	59	58	59	59	55	57
L90 (Background)	58	53	56	58	57	57	58	53	56

Computed CNEL, dB	66
% Daytime Energy	42%
% Evening Energy	17%
% Nighttime Energy	41%

GPS Coordinates	37°35'24.02"N
	122°21'31.72"W

BOLLARD
Acoustical Consultants

Appendix B-4
Ambient Noise Monitoring Results - LT2
Topgolf - Burlingame, California
Thursday, December 06, 2018

Hour	Leq	Lmax	L50	L90
0:00	57	76	54	51
1:00	52	64	52	49
2:00	52	66	51	47
3:00	54	62	54	52
4:00	59	76	58	55
5:00	64	71	63	60
6:00	66	72	67	60
7:00	58	74	57	55
8:00	58	75	56	53
9:00	56	64	55	53
10:00	57	69	56	54
11:00	58	75	57	54
12:00	64	79	57	54
13:00	61	77	57	54
14:00	58	74	56	53
15:00	59	78	56	53
16:00	61	76	59	56
17:00	60	75	58	55
18:00	62	83	60	59
19:00	62	75	61	59
20:00	63	82	62	60
21:00	62	73	61	60
22:00	63	78	61	59
23:00	62	72	62	60

Statistical Summary									
	Daytime (7 a.m. - 7 p.m.)			Evening (7 p.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average	High	Low	Average
Leq (Average)	64	56	60	63	62	62	66	52	61
Lmax (Maximum)	83	64	75	82	73	77	78	62	71
L50 (Median)	60	55	57	62	61	61	67	51	58
L90 (Background)	59	53	54	60	59	60	60	47	55

Computed CNEL, dB	68
% Daytime Energy	41%
% Evening Energy	17%
% Nighttime Energy	42%

GPS Coordinates	37°35'25.13"N
	122°21'7.04"W

BOLLARD
Acoustical Consultants

Appendix B-5
Ambient Noise Monitoring Results - LT2
Topgolf - Burlingame, California
Friday, December 07, 2018

Hour	Leq	Lmax	L50	L90
0:00	60	71	60	56
1:00	60	79	57	54
2:00	57	72	56	53
3:00	61	76	60	56
4:00	63	76	62	61
5:00	61	70	61	59
6:00	62	70	61	60
7:00	65	77	63	61
8:00	67	81	62	58
9:00	58	74	56	53
10:00	58	78	55	53
11:00	56	73	54	52
12:00	63	69	63	61
13:00	60	72	56	53
14:00	65	72	57	54
15:00	69	77	69	68
16:00	67	72	67	65
17:00	64	77	59	56
18:00	61	80	59	57
19:00	62	77	61	58
20:00	63	75	61	59
21:00	62	76	60	59
22:00	62	72	61	59
23:00	63	79	60	59

Statistical Summary									
	Daytime (7 a.m. - 7 p.m.)			Evening (7 p.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average	High	Low	Average
Leq (Average)	69	56	64	63	62	62	63	57	61
Lmax (Maximum)	81	69	75	77	75	76	79	70	74
L50 (Median)	69	54	60	61	60	61	62	56	60
L90 (Background)	68	52	58	59	58	59	61	53	57

Computed CNEL, dB	69
% Daytime Energy	66%
% Evening Energy	10%
% Nighttime Energy	24%

GPS Coordinates	37°35'25.13"N
	122°21'7.04"W

BOLLARD
Acoustical Consultants

Appendix B-6
Ambient Noise Monitoring Results - LT2
Topgolf - Burlingame, California
Saturday, December 08, 2018

Hour	Leq	Lmax	L50	L90
0:00	63	75	61	58
1:00	59	74	58	56
2:00	61	67	60	57
3:00	59	69	58	56
4:00	59	69	59	56
5:00	62	72	62	57
6:00	63	68	63	59
7:00	62	73	62	60
8:00	60	73	59	57
9:00	57	71	57	55
10:00	56	68	55	53
11:00	56	70	55	53
12:00	55	73	54	53
13:00	57	68	55	52
14:00	65	72	65	61
15:00	61	70	57	55
16:00	64	76	64	55
17:00	60	71	59	57
18:00	58	66	58	57
19:00	60	76	60	58
20:00	63	74	61	60
21:00	63	77	61	59
22:00	62	75	61	59
23:00	62	80	61	59

Statistical Summary									
	Daytime (7 a.m. - 7 p.m.)			Evening (7 p.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average	High	Low	Average
Leq (Average)	65	55	60	63	60	62	63	59	61
Lmax (Maximum)	76	66	71	77	74	76	80	67	72
L50 (Median)	65	54	58	61	60	61	63	58	60
L90 (Background)	61	52	56	60	58	59	59	56	58

Computed CNEL, dB	68
% Daytime Energy	44%
% Evening Energy	15%
% Nighttime Energy	40%

GPS Coordinates	37°35'25.13"N
	122°21'7.04"W

BOLLARD
Acoustical Consultants

Appendix B-7
Ambient Noise Monitoring Results - LT2
Topgolf - Burlingame, California
Thursday, December 06, 2018

Hour	Leq	Lmax	L50	L90
0:00	59	77	57	54
1:00	56	73	54	50
2:00	57	80	53	49
3:00	56	73	54	50
4:00	59	79	58	54
5:00	63	78	61	59
6:00	66	85	64	62
7:00	67	82	66	63
8:00	72	102	65	58
9:00	65	76	63	59
10:00	66	85	64	62
11:00	66	80	64	62
12:00	66	82	64	62
13:00	66	80	64	62
14:00	66	76	64	62
15:00	66	86	64	60
16:00	66	82	65	62
17:00	66	77	65	61
18:00	66	76	65	61
19:00	65	84	63	61
20:00	65	79	63	61
21:00	63	75	62	60
22:00	64	80	62	60
23:00	62	75	61	58

Statistical Summary									
	Daytime (7 a.m. - 7 p.m.)			Evening (7 p.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average	High	Low	Average
Leq (Average)	72	65	67	65	63	64	66	56	62
Lmax (Maximum)	102	76	82	84	75	79	85	73	78
L50 (Median)	66	63	64	63	62	62	64	53	58
L90 (Background)	63	58	61	61	60	60	62	49	55

Computed CNEL, dB	69
% Daytime Energy	74%
% Evening Energy	10%
% Nighttime Energy	16%

GPS Coordinates	37°35'12.85"N
	122°21'12.26"W

BOLLARD
Acoustical Consultants

Appendix B-8
Ambient Noise Monitoring Results - LT2
Topgolf - Burlingame, California
Friday, December 07, 2018

Hour	Leq	Lmax	L50	L90
0:00	60	77	58	56
1:00	63	84	56	53
2:00	57	73	55	53
3:00	58	74	56	53
4:00	59	73	59	56
5:00	63	74	61	59
6:00	66	87	64	61
7:00	67	80	66	63
8:00	67	83	66	61
9:00	67	86	65	61
10:00	67	85	64	62
11:00	67	83	65	62
12:00	68	92	65	62
13:00	66	81	64	62
14:00	66	83	65	61
15:00	66	81	65	60
16:00	67	82	65	61
17:00	66	86	65	60
18:00	66	84	64	60
19:00	65	83	63	60
20:00	64	74	62	60
21:00	64	73	62	60
22:00	64	78	62	60
23:00	63	77	61	59

Statistical Summary									
	Daytime (7 a.m. - 7 p.m.)			Evening (7 p.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average	High	Low	Average
Leq (Average)	68	66	67	65	64	64	66	57	62
Lmax (Maximum)	92	80	84	83	73	77	87	73	77
L50 (Median)	66	64	65	63	62	62	64	55	59
L90 (Background)	63	60	61	60	60	60	61	53	57

Computed CNEL, dB	70
% Daytime Energy	72%
% Evening Energy	10%
% Nighttime Energy	18%

GPS Coordinates	37°35'12.85"N
	122°21'12.26"W

BOLLARD
Acoustical Consultants

Appendix B-9
Ambient Noise Monitoring Results - LT3
Topgolf - Burlingame, California
Saturday, December 08, 2018

Hour	Leq	Lmax	L50	L90
0:00	62	77	60	58
1:00	60	74	58	56
2:00	59	72	57	55
3:00	57	73	55	53
4:00	58	72	56	53
5:00	60	78	58	56
6:00	62	83	60	58
7:00	64	79	62	60
8:00	65	77	63	60
9:00	65	79	63	61
10:00	66	80	64	61
11:00	65	76	64	61
12:00	65	81	64	61
13:00	65	84	64	61
14:00	65	76	63	61
15:00	65	81	63	61
16:00	66	91	63	61
17:00	65	82	63	60
18:00	64	80	62	60
19:00	64	76	62	60
20:00	64	76	62	60
21:00	63	76	62	60
22:00	64	79	62	60
23:00	63	81	61	59

Statistical Summary									
	Daytime (7 a.m. - 7 p.m.)			Evening (7 p.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average	High	Low	Average
Leq (Average)	66	64	65	64	63	64	64	57	61
Lmax (Maximum)	91	76	81	76	76	76	83	72	77
L50 (Median)	64	62	63	62	62	62	62	55	59
L90 (Background)	61	60	61	60	60	60	60	53	56

Computed CNEL, dB	69
% Daytime Energy	68%
% Evening Energy	12%
% Nighttime Energy	20%

GPS Coordinates	37°35'12.85"N
	122°21'12.26"W

BOLLARD
Acoustical Consultants

Appendix C-1
FHWA Highway Traffic Noise Prediction Model Data Inputs
Topgolf Burlingame
File Name: 2018-190 01 Existing.xlsx
Model Run Date: 3/14/2019

Segment	Intersection	Direction	ADT	Day %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance
1	US 101 Ramp/Bayshore Hwy	North	670	80	20	2	1	25	100
2		South	13,470	80	20	2	1	35	100
3		East	18,480	80	20	2	1	35	100
4		West	11,200	80	20	2	1	35	100
5	Airport Blvd/Broadway/Bayshore Hwy	North	7,250	80	20	2	1	35	100
6		South	19,770	80	20	2	1	35	100
7		East	600	80	20	2	1	25	100
8		West	18,480	80	20	2	1	35	100
9	Broadway/US 101 Ramps	North	19,450	80	20	2	1	35	100
10		South	28,970	80	20	2	1	35	100
11		East	9,260	80	20	2	1	35	100
12		West	10,960	80	20	2	1	35	100
13	Broadway/Rollins Rd	North	28,970	80	20	2	1	35	100
14		South	22,830	80	20	2	1	35	100
15		East	9,210	80	20	2	1	35	100
16		West	10,090	80	20	2	1	35	100
17	Broadway/Carolan Ave	North	22,830	80	20	2	1	35	100
18		South	19,970	80	20	2	1	35	100
19		East	5,560	80	20	2	1	35	100
20		West	20	80	20	2	1	25	100
21	Broadway/California Dr	North	19,980	80	20	2	1	35	100
22		South	7,690	80	20	2	1	35	100
23		East	14,520	80	20	2	1	35	100
24		West	14,730	80	20	2	1	35	100
25	Cadillac Way/Rollins Rd	North							
26		South	2,470	80	20	2	1	35	100
27		East	7,280	80	20	2	1	35	100
28		West	9,210	80	20	2	1	35	100
29	Anza Blvd/Airport Blvd	North	2,260	80	20	2	1	35	100
30		South	2,880	80	20	2	1	35	100
31		East	6,830	80	20	2	1	35	100
32		West	5,970	80	20	2	1	35	100
33	US 101 Off-Ramp/Airport Blvd	North							
34		South	11,680	80	20	2	1	35	100

Appendix C-1
FHWA Highway Traffic Noise Prediction Model Data Inputs
Topgolf Burlingame
File Name: 2018-190 01 Existing.xlsx
Model Run Date: 3/14/2019

Segment	Intersection	Direction	ADT	Day %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance
35	US 101 Off-Ramp/Airport Blvd	East	15,710	80	20	2	1	35	100
36		West	5,790	80	20	2	1	35	100
37	Peninsula Ave/Airport Blvd	North	2,730	80	20	2	1	35	100
38		South	16,180	80	20	2	1	35	100
39		East							
40		West	15,710	80	20	2	1	35	100
41	Peninsula Ave/Bayshore Blvd	North	16,180	80	20	2	1	35	100
42		South	18,980	80	20	2	1	35	100
43		East	8,740	80	20	2	1	35	100
44		West							
45	Peninsula Ave/Humboldt St	North	19,980	80	20	2	1	35	100
46		South	15,660	80	20	2	1	35	100
47		East	7,230	80	20	2	1	25	100
48		West	3,730	80	20	2	1	25	100
49	Poplar Ave/Humboldt St	North	10,970	80	20	2	1	25	100
50		South	8,500	80	20	2	1	25	100
51		East	5,380	80	20	2	1	25	100
52		West	7,510	80	20	2	1	25	100
53	US 101 Off-Ramp/Poplar Ave/Amphlet Blvd	North	16,960	80	20	2	1	35	100
54		South	11,160	80	20	2	1	25	100
55		East	6,980	80	20	2	1	30	100
56		West	1,760	80	20	2	1	30	100
57	Highway 101 (Broadway to Peninsula Ave)	Mainline	262,500	80	20	1	3	70	100

Notes: Blank cells represent roadways which either would not exist under the indicated scenario or for which no traffic data was provided.

Appendix C-2
FHWA Highway Traffic Noise Prediction Model Data Inputs
Topgolf Burlingame
File Name: 2018-190 02 Existing Plus Project.xlsx
Model Run Date: 3/13/2019

Segment	Intersection	Direction	ADT	Day %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance
1	US 101 Ramp/Bayshore Hwy	North	670	80	20	2	1	25	100
2		South	13,490	80	20	2	1	35	100
3		East	18,570	80	20	2	1	35	100
4		West	11,270	80	20	2	1	35	100
5	Airport Blvd/Broadway/Bayshore Hwy	North	7,460	80	20	2	1	35	100
6		South	19,880	80	20	2	1	35	100
7		East	600	80	20	2	1	25	100
8		West	18,580	80	20	2	1	35	100
9	Broadway/US 101 Ramps	North	19,880	80	20	2	1	35	100
10		South	29,180	80	20	2	1	35	100
11		East	9,270	80	20	2	1	35	100
12		West	11,170	80	20	2	1	35	100
13	Broadway/Rollins Rd	North	29,180	80	20	2	1	35	100
14		South	23,030	80	20	2	1	35	100
15		East	9,220	80	20	2	1	35	100
16		West	10,090	80	20	2	1	35	100
17	Broadway/Carolan Ave	North	23,030	80	20	2	1	35	100
18		South	20,170	80	20	2	1	35	100
19		East	5,560	80	20	2	1	35	100
20		West	20	80	20	2	1	25	100
21	Broadway/California Dr	North	20,180	80	20	2	1	35	100
22		South	7,810	80	20	2	1	35	100
23		East	14,580	80	20	2	1	35	100
24		West	14,750	80	20	2	1	35	100
25	Cadillac Way/Rollins Rd	North							
26		South	2,470	80	20	2	1	35	100
27		East	7,290	80	20	2	1	35	100
28		West	9,220	80	20	2	1	35	100
29	Anza Blvd/Airport Blvd	North	2,260	80	20	2	1	35	100
30		South	3,240	80	20	2	1	35	100
31		East	7,290	80	20	2	1	35	100
32		West	6,070	80	20	2	1	35	100
33	US 101 Off-Ramp/Airport Blvd	North							
34		South	11,710	80	20	2	1	35	100

Appendix C-2
FHWA Highway Traffic Noise Prediction Model Data Inputs
Topgolf Burlingame
File Name: 2018-190 02 Existing Plus Project.xlsx
Model Run Date: 3/13/2019

Segment	Intersection	Direction	ADT	Day %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance
35	US 101 Off-Ramp/Airport Blvd	East	16,140	80	20	2	1	35	100
36		West	6,250	80	20	2	1	35	100
37	Peninsula Ave/Airport Blvd	North	2,730	80	20	2	1	35	100
38		South	16,610	80	20	2	1	35	100
39		East							
40		West	16,140	80	20	2	1	35	100
41	Peninsula Ave/Bayshore Blvd	North	16,610	80	20	2	1	35	100
42		South	19,090	80	20	2	1	35	100
43		East	9,060	80	20	2	1	35	100
44		West							
45	Peninsula Ave/Humboldt St	North	20,090	80	20	2	1	35	100
46		South	15,690	80	20	2	1	35	100
47		East	7,290	80	20	2	1	25	100
48		West	3,750	80	20	2	1	25	100
49	Poplar Ave/Humboldt St	North	10,970	80	20	2	1	25	100
50		South	8,530	80	20	2	1	25	100
51		East	5,410	80	20	2	1	25	100
52		West	7,570	80	20	2	1	25	100
53	US 101 Off-Ramp/Poplar Ave/Amphlet Blvd	North	16,960	80	20	2	1	35	100
54		South	11,160	80	20	2	1	25	100
55		East	6,980	80	20	2	1	30	100
56		West	1,760	80	20	2	1	30	100

Notes: Blank cells represent roadways which either would not exist under the indicated scenario or for which no traffic data was provided.

Appendix C-3
FHWA Highway Traffic Noise Prediction Model Data Inputs
Topgolf Burlingame
File Name: 2018-190 03 Background.xlsx
Model Run Date: 3/13/2019

Segment	Intersection	Direction	ADT	Day %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance
1	US 101 Ramp/Bayshore Hwy	North	700	80	20	2	1	25	100
2		South	13,800	80	20	2	1	35	100
3		East	19,070	80	20	2	1	35	100
4		West	11,490	80	20	2	1	35	100
5	Airport Blvd/Broadway/Bayshore Hwy	North	6,960	80	20	2	1	35	100
6		South	22,170	80	20	2	1	35	100
7		East	2,790	80	20	2	1	25	100
8		West	19,760	80	20	2	1	35	100
9	Broadway/US 101 Ramps	North	22,170	80	20	2	1	35	100
10		South	31,450	80	20	2	1	35	100
11		East	9,370	80	20	2	1	35	100
12		West	12,070	80	20	2	1	35	100
13	Broadway/Rollins Rd	North	31,440	80	20	2	1	35	100
14		South	24,810	80	20	2	1	35	100
15		East	9,730	80	20	2	1	35	100
16		West	10,120	80	20	2	1	35	100
17	Broadway/Carolan Ave	North	24,810	80	20	2	1	35	100
18		South	21,620	80	20	2	1	35	100
19		East	6,190	80	20	2	1	35	100
20		West	20	80	20	2	1	25	100
21	Broadway/California Dr	North	21,620	80	20	2	1	35	100
22		South	8,600	80	20	2	1	35	100
23		East	15,210	80	20	2	1	35	100
24		West	14,890	80	20	2	1	35	100
25	Cadillac Way/Rollins Rd	North							
26		South	2,470	80	20	2	1	35	100
27		East	7,800	80	20	2	1	35	100
28		West	9,730	80	20	2	1	35	100
29	Anza Blvd/Airport Blvd	North	2,260	80	20	2	1	35	100
30		South	6,860	80	20	2	1	35	100
31		East	13,000	80	20	2	1	35	100
32		West	8,160	80	20	2	1	35	100
33	US 101 Off-Ramp/Airport Blvd	North							
34		South	11,810	80	20	2	1	35	100

Appendix C-3
FHWA Highway Traffic Noise Prediction Model Data Inputs
Topgolf Burlingame
File Name: 2018-190 03 Background.xlsx
Model Run Date: 3/13/2019

Segment	Intersection	Direction	ADT	Day %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance
35	US 101 Off-Ramp/Airport Blvd	East	19,100	80	20	2	1	35	100
36		West	9,210	80	20	2	1	35	100
37	Peninsula Ave/Airport Blvd	North	2,730	80	20	2	1	35	100
38		South	19,570	80	20	2	1	35	100
39		East							
40		West	19,100	80	20	2	1	35	100
41	Peninsula Ave/Bayshore Blvd	North	19,570	80	20	2	1	35	100
42		South	19,920	80	20	2	1	35	100
43		East	11,830	80	20	2	1	35	100
44		West							
45	Peninsula Ave/Humboldt St	North	20,920	80	20	2	1	35	100
46		South	16,280	80	20	2	1	35	100
47		East	7,450	80	20	2	1	25	100
48		West	3,830	80	20	2	1	25	100
49	Poplar Ave/Humboldt St	North	11,320	80	20	2	1	25	100
50		South	9,000	80	20	2	1	25	100
51		East	5,450	80	20	2	1	25	100
52		West	7,730	80	20	2	1	25	100
53	US 101 Off-Ramp/Poplar Ave/Amphlet Blvd	North	17,050	80	20	2	1	35	100
54		South	11,250	80	20	2	1	25	100
55		East	6,980	80	20	2	1	30	100
56		West	1,760	80	20	2	1	30	100

Notes: Blank cells represent roadways which either would not exist under the indicated scenario or for which no traffic data was provided.

Appendix C-4
FHWA Highway Traffic Noise Prediction Model Data Inputs
Topgolf Burlingame
File Name: 2018-190 04 Background Plus Project.xlsx
Model Run Date: 3/13/2019

Segment	Intersection	Direction	ADT	Day %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance
1	US 101 Ramp/Bayshore Hwy	North	700	80	20	2	1	25	100
2		South	13,820	80	20	2	1	35	100
3		East	19,160	80	20	2	1	35	100
4		West	11,560	80	20	2	1	35	100
5	Airport Blvd/Broadway/Bayshore Hwy	North	7,490	80	20	2	1	35	100
6		South	22,600	80	20	2	1	35	100
7		East	2,790	80	20	2	1	25	100
8		West	19,860	80	20	2	1	35	100
9	Broadway/US 101 Ramps	North	22,600	80	20	2	1	35	100
10		South	31,660	80	20	2	1	35	100
11		East	9,380	80	20	2	1	35	100
12		West	12,280	80	20	2	1	35	100
13	Broadway/Rollins Rd	North	31,650	80	20	2	1	35	100
14		South	25,010	80	20	2	1	35	100
15		East	9,740	80	20	2	1	35	100
16		West	10,120	80	20	2	1	35	100
17	Broadway/Carolan Ave	North	25,010	80	20	2	1	35	100
18		South	21,820	80	20	2	1	35	100
19		East	6,190	80	20	2	1	35	100
20		West	20	80	20	2	1	25	100
21	Broadway/California Dr	North	21,820	80	20	2	1	35	100
22		South	8,720	80	20	2	1	35	100
23		East	15,270	80	20	2	1	35	100
24		West	14,910	80	20	2	1	35	100
25	Cadillac Way/Rollins Rd	North							
26		South	2,470	80	20	2	1	35	100
27		East	7,810	80	20	2	1	35	100
28		West	9,740	80	20	2	1	35	100
29	Anza Blvd/Airport Blvd	North	2,260	80	20	2	1	35	100
30		South	7,220	80	20	2	1	35	100
31		East	13,460	80	20	2	1	35	100
32		West	8,260	80	20	2	1	35	100
33	US 101 Off-Ramp/Airport Blvd	North							
34		South	11,840	80	20	2	1	35	100

Appendix C-4
FHWA Highway Traffic Noise Prediction Model Data Inputs
Topgolf Burlingame
File Name: 2018-190 04 Background Plus Project.xlsx
Model Run Date: 3/13/2019

Segment	Intersection	Direction	ADT	Day %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance
35	US 101 Off-Ramp/Airport Blvd	East	19,530	80	20	2	1	35	100
36		West	9,670	80	20	2	1	35	100
37	Peninsula Ave/Airport Blvd	North	2,730	80	20	2	1	35	100
38		South	20,000	80	20	2	1	35	100
39		East							
40		West	19,530	80	20	2	1	35	100
41	Peninsula Ave/Bayshore Blvd	North	20,000	80	20	2	1	35	100
42		South	20,030	80	20	2	1	35	100
43		East	12,150	80	20	2	1	35	100
44		West							
45	Peninsula Ave/Humboldt St	North	21,030	80	20	2	1	35	100
46		South	16,310	80	20	2	1	35	100
47		East	7,510	80	20	2	1	25	100
48		West	3,850	80	20	2	1	25	100
49	Poplar Ave/Humboldt St	North	11,320	80	20	2	1	25	100
50		South	9,030	80	20	2	1	25	100
51		East	5,480	80	20	2	1	25	100
52		West	7,790	80	20	2	1	25	100
53	US 101 Off-Ramp/Poplar Ave/Amphlet Blvd	North	17,050	80	20	2	1	35	100
54		South	11,250	80	20	2	1	25	100
55		East	6,980	80	20	2	1	30	100
56		West	1,760	80	20	2	1	30	100

Notes: Blank cells represent roadways which either would not exist under the indicated scenario or for which no traffic data was provided.

Appendix C-5
FHWA Highway Traffic Noise Prediction Model Data Inputs
Topgolf Burlingame
File Name: 2018-190 05 Cumulative.xlsx
Model Run Date: 3/13/2019

Segment	Intersection	Direction	ADT	Day %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance
1	US 101 Ramp/Bayshore Hwy	North	770	80	20	2	1	25	100
2		South	16,270	80	20	2	1	35	100
3		East	23,810	80	20	2	1	35	100
4		West	16,510	80	20	2	1	35	100
5	Airport Blvd/Broadway/Bayshore Hwy	North	8,100	80	20	2	1	35	100
6		South	27,030	80	20	2	1	35	100
7		East	2,850	80	20	2	1	25	100
8		West	24,940	80	20	2	1	35	100
9	Broadway/US 101 Ramps	North	27,030	80	20	2	1	35	100
10		South	36,720	80	20	2	1	35	100
11		East	11,310	80	20	2	1	35	100
12		West	13,820	80	20	2	1	35	100
13	Broadway/Rollins Rd	North	36,730	80	20	2	1	35	100
14		South	29,100	80	20	2	1	35	100
15		East	10,910	80	20	2	1	35	100
16		West	11,300	80	20	2	1	35	100
17	Broadway/Carolan Ave	North	29,100	80	20	2	1	35	100
18		South	25,110	80	20	2	1	35	100
19		East	7,350	80	20	2	1	35	100
20		West	20	80	20	2	1	25	100
21	Broadway/California Dr	North	25,120	80	20	2	1	35	100
22		South	9,740	80	20	2	1	35	100
23		East	17,650	80	20	2	1	35	100
24		West	16,670	80	20	2	1	35	100
25	Cadillac Way/Rollins Rd	North							
26		South	2,730	80	20	2	1	35	100
27		East	8,560	80	20	2	1	35	100
28		West	10,690	80	20	2	1	35	100
29	Anza Blvd/Airport Blvd	North	2,500	80	20	2	1	35	100
30		South	7,160	80	20	2	1	35	100
31		East	14,110	80	20	2	1	35	100
32		West	9,190	80	20	2	1	35	100
33	US 101 Off-Ramp/Airport Blvd	North							
34		South	13,100	80	20	2	1	35	100

Appendix C-5
FHWA Highway Traffic Noise Prediction Model Data Inputs
Topgolf Burlingame
File Name: 2018-190 05 Cumulative.xlsx
Model Run Date: 3/13/2019

Segment	Intersection	Direction	ADT	Day %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance
35	US 101 Off-Ramp/Airport Blvd	East	20,810	80	20	2	1	35	100
36		West	9,810	80	20	2	1	35	100
37	Peninsula Ave/Airport Blvd	North	3,020	80	20	2	1	35	100
38		South	21,330	80	20	2	1	35	100
39		East							
40		West	20,810	80	20	2	1	35	100
41	Peninsula Ave/Bayshore Blvd	North	21,330	80	20	2	1	35	100
42		South	22,340	80	20	2	1	35	100
43		East	13,110	80	20	2	1	35	100
44		West							
45	Peninsula Ave/Humboldt St	North	23,440	80	20	2	1	35	100
46		South	18,340	80	20	2	1	35	100
47		East	8,200	80	20	2	1	25	100
48		West	4,220	80	20	2	1	25	100
49	Poplar Ave/Humboldt St	North	12,900	80	20	2	1	25	100
50		South	10,320	80	20	2	1	25	100
51		East	6,020	80	20	2	1	25	100
52		West	8,520	80	20	2	1	25	100
53	US 101 Off-Ramp/Poplar Ave/Amphlet Blvd	North	19,060	80	20	2	1	35	100
54		South	12,660	80	20	2	1	25	100
55		East	7,710	80	20	2	1	30	100
56		West	1,950	80	20	2	1	30	100

Notes: Blank cells represent roadways which either would not exist under the indicated scenario or for which no traffic data was provided.

Appendix C-6
FHWA Highway Traffic Noise Prediction Model Data Inputs
Topgolf Burlingame
File Name: 2018-190 06 Cumulative Plus Project.xlsx
Model Run Date: 3/13/2019

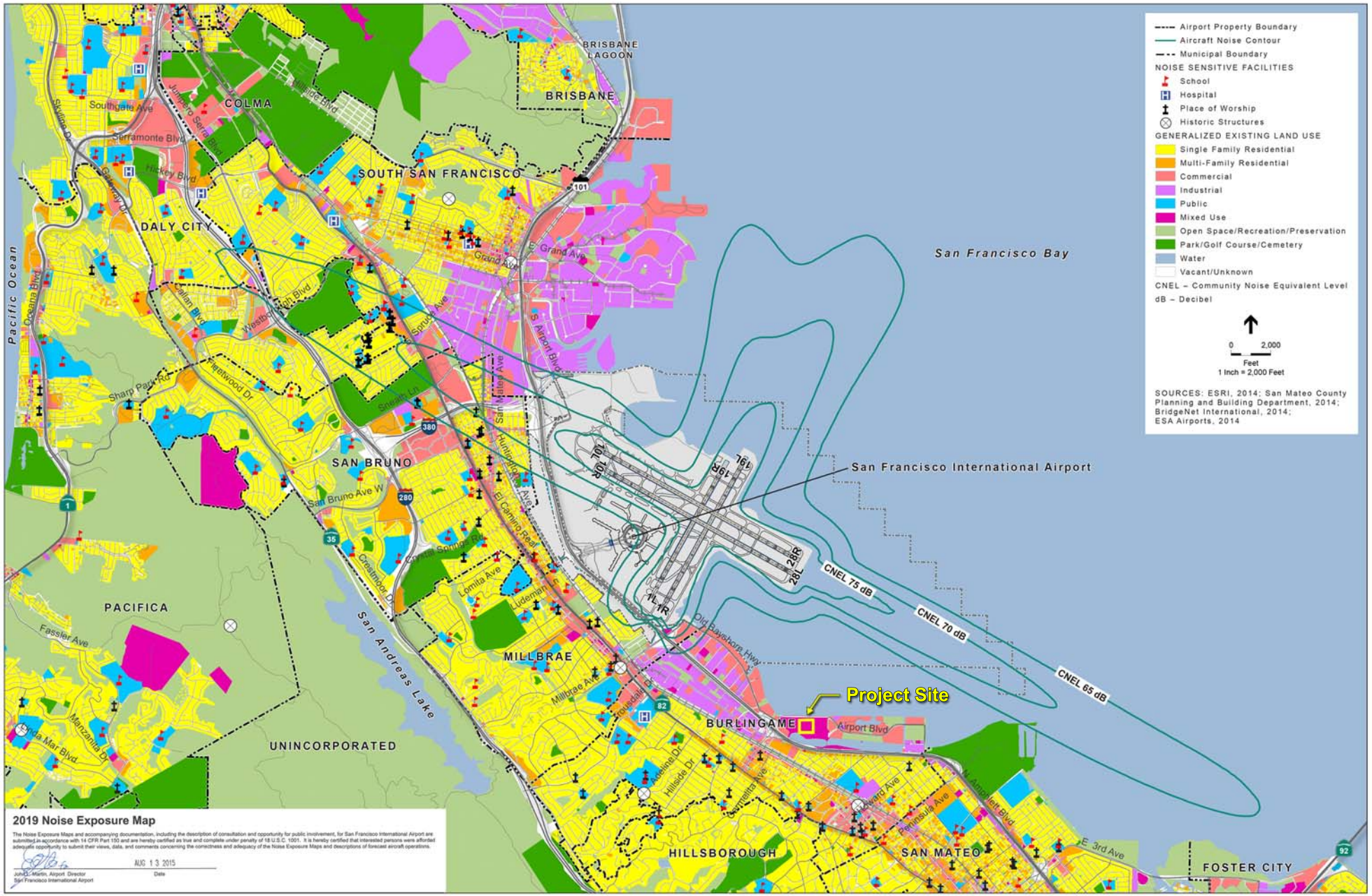
Segment	Intersection	Direction	ADT	Day %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance
1	US 101 Ramp/Bayshore Hwy	North	770	80	20	2	1	25	100
2		South	16,290	80	20	2	1	35	100
3		East	23,900	80	20	2	1	35	100
4		West	16,580	80	20	2	1	35	100
5	Airport Blvd/Broadway/Bayshore Hwy	North	8,630	80	20	2	1	35	100
6		South	27,460	80	20	2	1	35	100
7		East	2,850	80	20	2	1	25	100
8		West	25,040	80	20	2	1	35	100
9	Broadway/US 101 Ramps	North	27,460	80	20	2	1	35	100
10		South	36,930	80	20	2	1	35	100
11		East	11,320	80	20	2	1	35	100
12		West	14,030	80	20	2	1	35	100
13	Broadway/Rollins Rd	North	36,940	80	20	2	1	35	100
14		South	29,300	80	20	2	1	35	100
15		East	10,920	80	20	2	1	35	100
16		West	11,300	80	20	2	1	35	100
17	Broadway/Carolan Ave	North	29,300	80	20	2	1	35	100
18		South	25,310	80	20	2	1	35	100
19		East	7,350	80	20	2	1	35	100
20		West	20	80	20	2	1	25	100
21	Broadway/California Dr	North	25,320	80	20	2	1	35	100
22		South	9,860	80	20	2	1	35	100
23		East	17,710	80	20	2	1	35	100
24		West	16,690	80	20	2	1	35	100
25	Cadillac Way/Rollins Rd	North							
26		South	2,730	80	20	2	1	35	100
27		East	8,570	80	20	2	1	35	100
28		West	10,700	80	20	2	1	35	100
29	Anza Blvd/Airport Blvd	North	2,500	80	20	2	1	35	100
30		South	7,520	80	20	2	1	35	100
31		East	14,570	80	20	2	1	35	100
32		West	9,290	80	20	2	1	35	100
33	US 101 Off-Ramp/Airport Blvd	North							
34		South	13,130	80	20	2	1	35	100

Appendix C-6
FHWA Highway Traffic Noise Prediction Model Data Inputs
Topgolf Burlingame
File Name: 2018-190 06 Cumulative Plus Project.xlsx
Model Run Date: 3/13/2019

Segment	Intersection	Direction	ADT	Day %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance
35	US 101 Off-Ramp/Airport Blvd	East	21,240	80	20	2	1	35	100
36		West	10,270	80	20	2	1	35	100
37	Peninsula Ave/Airport Blvd	North	3,020	80	20	2	1	35	100
38		South	21,760	80	20	2	1	35	100
39		East							
40		West	21,240	80	20	2	1	35	100
41	Peninsula Ave/Bayshore Blvd	North	21,760	80	20	2	1	35	100
42		South	22,450	80	20	2	1	35	100
43		East	13,430	80	20	2	1	35	100
44		West							
45	Peninsula Ave/Humboldt St	North	23,550	80	20	2	1	35	100
46		South	18,370	80	20	2	1	35	100
47		East	8,260	80	20	2	1	25	100
48		West	4,240	80	20	2	1	25	100
49	Poplar Ave/Humboldt St	North	12,900	80	20	2	1	25	100
50		South	10,350	80	20	2	1	25	100
51		East	6,050	80	20	2	1	25	100
52		West	8,580	80	20	2	1	25	100
53	US 101 Off-Ramp/Poplar Ave/Amphlet Blvd	North	19,060	80	20	2	1	35	100
54		South	12,660	80	20	2	1	25	100
55		East	7,710	80	20	2	1	30	100
56		West	1,950	80	20	2	1	30	100

Notes: Blank cells represent roadways which either would not exist under the indicated scenario or for which no traffic data was provided.

Appendix D


Airport Property Boundary
Aircraft Noise Contour
Municipal Boundary
NOISE SENSITIVE FACILITIES
School
Hospital
Place of Worship
Historic Structures
GENERALIZED EXISTING LAND USE
Single Family Residential
Multi-Family Residential
Commercial
Industrial
Public
Mixed Use
Open Space/Recreation/Preservation
Park/Golf Course/Cemetery
Water
Vacant/Unknown
CNEL – Community Noise Equivalent Level
dB – Decibel
0 2,000
Feet
1 Inch = 2,000 Feet
SOURCES: ESRI, 2014; San Mateo County Planning and Building Department, 2014; BridgeNet International, 2014; ESA Airports, 2014
Pacific Ocean
BRISBANE LAGOON
BRISBANE
COLMA
SOUTH SAN FRANCISCO
DALY CITY
San Francisco Bay
San Francisco International Airport
CNEL 75 dB
CNEL 70 dB
CNEL 65 dB
SAN BRUNO
PACIFICA
MILLBRAE
BURLINGAME
Project Site
UNINCORPORATED
HILLSBOROUGH
SAN MATEO
FOSTER CITY
San Andreas Lake
Airport Blvd
El Camino Real
Millbrae Ave
Peninsula Ave
E 3rd Ave
2019 Noise Exposure Map
The Noise Exposure Maps and accompanying documentation, including the description of consultation and opportunity for public involvement, for San Francisco International Airport are submitted in accordance with 14 CFR Part 150 and are hereby certified as true and complete under penalty of 18 U.S.C. 1001. It is hereby certified that interested persons were afforded adequate opportunity to submit their views, data, and comments concerning the correctness and adequacy of the Noise Exposure Maps and descriptions of forecast aircraft operations.
AUG 13 2015
John C. Martin, Airport Director
San Francisco International Airport
Date

Appendix E-1
Noise Level Calculations - Impact 3: Parking Lot Noise
Topgolf Burlingame

Reference Noise Level Data for Parking Lots		
Source Reference	**Reference Noise Level (dBA Leq)**	**Reference Distance (feet)**
Parking Lot	60	50

Predicted Noise Levels at the Nearest Noise-Sensitive Receivers				
Nearest Parking Lot to Receiver	**Distance to Source (feet)**	**Distance Attenuation (dBA)**	**Offset due to Façade/Barrier (dBA)**	**Resulting Noise Level (dBA Leq)**
South Parking to Area 1*	900	-25	-25	10
East Parking to Area 2*	500	-20	-25	15
South Parking to Area 3**	875	-25	-5	30
South Parking to Area 4	1000	-26	0	34
Sample Calculation South Parking to Area 3	875	-20*LOG(875/50)=-25	-5	60+(-25)+(-5)=30

Notes

* Interior spaces of hotels were conservatively estimated to be 25 dB lower than exterior noise levels due to noise reduction provided by the hotel building facades (additional -25 dB offset applied).

** Additional offset of 5 dB was applied at Area 3 due to the shielding provided by the existing noise barrier along Highway 101.

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Appendix E-2
Noise Level Calculations - Impact 4: Mechanical Equipment Noise (HVAC)
Topgolf Burlingame

Reference Noise Level Data for HVAC		
Source Reference	Reference Noise Level (dBA Leq/Lmax)	Reference Distance (feet)
HVAC	50	100

Predicted Noise Levels at the Nearest Noise-Sensitive Receivers						
Nearest Receiver	Distance to Lease Area (feet)	Distance Attenuation (dBA)	Offset due to Façade/Barrier (dBA)	Resulting Noise Level (dBA Leq/Lmax)	Hours of Operation	Resulting Noise Level (dBA CNEL)
Area 1*	970	-20	-25	5	16	9
Area 2*	920	-19	-25	6	16	10
Area 3	900	-19	0	31	16	35
Area 4	1100	-21	0	29	16	33
Sample Calc (Area 3)	900	-20*LOG(900/100)=-19	0	50+(-19)+(0)=31	16	10*LOG((9*(10^(31/10)) +3*(10^((31+5)/10)) +4*(10^((31+10)/10)))/24) =35

Notes

* Interior spaces of hotels were conservatively estimated to be 25 dB lower than exterior noise levels due to noise reduction provided by the hotel building facades (additional -25 dB offset applied).

** Given the elevated project topography, no additional offset was applied at Area 3 due to the existing noise barrier along Highway 101.

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Appendix E-3
Noise Level Calculations - Impact 5: Topgolf Outdoor Entertainment Facility Noise
Topgolf Burlingame

Reference Noise Level Data for a Topgolf Facility				
Nearest Receiver	Reference Topgolf Gilbert Monitoring Location	Topgolf Gilbert Noise Level (dBA Leq)	Topgolf Gilbert Noise Level (dBA Lmax)	Reference Distance (feet)
Area 1	I	56	64	190
Area 2	A	61	68	370
Area 3	K	56	64	200
Area 4	J	55	59	210

Predicted Noise Levels at the Nearest Noise-Sensitive Receiver							
Nearest Area	Distance to proposed Topgolf (feet)	Distance Attentuation (dBA)	Offset due to Façade/Barrier (dBA)	Resulting Noise Level (dBA Leq)	Resulting Noise Level (dBA Lmax)	Hours of Operation (9AM - 2AM)	Resulting Noise Level (dBA CNEL)
1*	970	-14	-25	17	25	16	21
2*	920	-8	-25	28	35	16	32
3	900	-13	0	43	51	16	47
4	1100	-14	0	41	45	16	44
Sample Calculation (Area 3)		-20*LOG(900/200) =-13	0	56+(-13)+(0) =43	64+(-13)+(0) =51		10*LOG((9*(10^(43/10)) +3*(10^((43+5)/10)) +4*(10^((43+10)/10)))/24) =47

Notes

* Interior spaces of hotels were conservatively estimated to be 25 dB lower than exterior noise levels due to noise reduction provided by the hotel building facades (additional -25 dB offset applied).

** Given the elevated project topography, no additional offset was applied at Area 3 due to the existing noise barrier along Highway 101.

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Appendix E-4
Noise Level Calculations - Impact 10: Combined Noise Sources
Topgolf Burlingame

Predicted Noise Levels at the Nearest Noise-Sensitive Receivers												
Nearest Receiver	**Parking Lot Activities**			**HVAC Equipment[1]**			**Topgolf Facility**			**Combined**		
	Leq	**Lmax**	**CNEL**	**Leq**	**Lmax**	**CNEL**	**Leq**	**Lmax**	**CNEL**	**Leq**	**Lmax**	**CNEL**
Area 1	10	15	14	5	5	9	17	25	21	18	25	22
Area 2	15	20	19	6	6	10	28	35	32	28	35	32
Area 3	30	35	34	31	31	35	43	51	47	43	51	47
Area 4	34	39	38	29	29	33	41	45	44	42	46	46

	Combined Leq	**Combined Lmax**	**Combined CNEL**
Sample Calculation (Area 1)	10*LOG(10^(10/10) +10^(5/10)+10^(17/10)) =18	10*LOG(10^(15/10) +10^(5/10)+10^(25/10)) =25	10*LOG(10^(14/10) +10^(9/10)+10^(21/10)) =22

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