Environmental Noise Assessment

Parcel 49 Project

Roseville, CA

BAC Job # 2014-297

Prepared For:

Bayside Church

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Introduction

The Parcel 49 Project (project) is located at Highway 65 and Washington Boulevard in the City of Roseville, California. The project site vicinity is shown on Figure 1. The project proposes the following specific uses:

- Three restaurant buildings
- Five office buildings
- Seven Retail Buildings
- One hotel building
- One outdoor recreation facility (Top Golf)
- Three church buildings (Bayside)

In addition to these uses, the project includes 2,789 parking spaces. Figure 2 shows the project site plan. The site is bordered by two substantial noise sources along the northeastern boundary (Highway 65) and northwestern boundary (Washington Boulevard). It is bordered to the southeast by open space, beyond which is a large commercial use (Walmart). As a result, the site is bordered by noise-insensitive land uses on three sides. Along the fourth site boundary, however, the project site is bordered by an existing residential neighborhood, including a park.

Due to the potential noise generation of the project relative to the adjacent residential land uses, a noise analysis was required by the City of Roseville. In response to that requirement, Bollard Acoustical Consultants, Inc. (BAC) was retained by the project applicant to prepare this noise analysis. The purposes of this analysis are to quantify existing ambient noise levels at the boundary of the project site and existing residential community, to predict the noise generation of the various aspects of the project, and to compare project-generated noise levels against both the City of Roseville noise standards as well as against the measured ambient noise environment.

An independent analysis of the potential noise impacts associated with the proposed Topgolf component of the Parcel 49 development project was recently prepared by BAC (*Environmental Noise Assessment, Topgolf Project*, BAC Job# 2014-195, December 8, 2014). That analysis is incorporated into this Parcel 49 report by reference, and the noise mitigation measures identified as being necessary for the Topgolf project have been restated in this report.

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. Because the project proposes an interface of 300 feet designated for parking between the existing residences and nearest proposed structures, and because the project does not propose any appreciable sources of vibration, vibration impacts associated with this project are not anticipated and no further analysis of vibration impacts was considered to be warranted.

Figure 1

Parcel 49 Project - Roseville, California

Project Vicinity

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Scale (feet)

0 1,000 2,000

Figure 2

Parcel 49 Project - Roseville, California

Project Site Plan and Noise Monitoring Locations

Acoustical Terminology

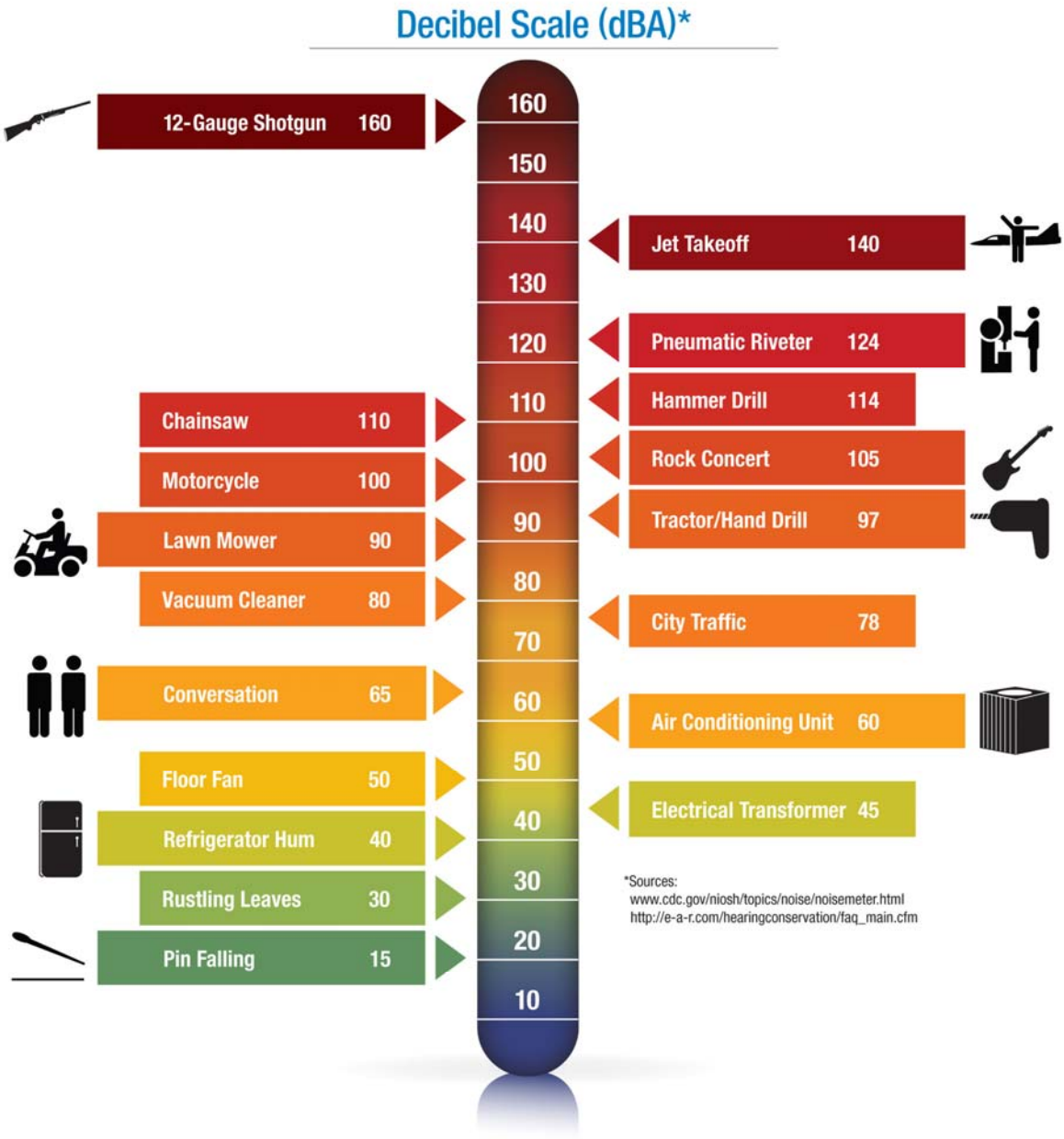
Noise is often described as unwanted sound. Sound is defined as any pressure variation in air that the human ear can detect. If the pressure variations occur frequently enough (at least 20 times per second), they can be heard and are designated as sound. The number of pressure variations per second is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

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 (Leq). The Leq is the foundation of the day/night average noise descriptor, Ldn, and shows very good correlation with community response to noise. The day/night average sound level (Ldn) 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 Ldn represents a 24-hour average, it tends to disguise short-term variations in the noise environment. For this reason, the City of Roseville utilizes performance standards for non-transportation noise sources. Specifically, performance standards in terms of instantaneous maximum levels (Lmax) and hourly average levels (L_{eq}), are used to assess noise generated on the project site.

Figure 3
Noise Levels Associated with Common Noise Sources



Existing Ambient Noise Environment

The ambient noise environment in the immediate project vicinity is defined primarily by noise from Highway 65 traffic. To generally quantify existing ambient noise levels in the project vicinity, three continuous (24-hour) ambient noise surveys were conducted on December 9-10, 2010, at the three locations shown in Figure 2. The noise measurement sites were selected to represent the nearest potentially affected residential land uses to the project site.

Although the ambient noise level measurements were conducted in 2010, a review of Caltrans traffic count information for Highway 65 indicates that changes in traffic volumes between 2010 and the latest published count date (2013) were 4%. A 4% change in traffic volume equates to a 0.2 dB increase, which is imperceptible. As a result, the data collected at the project site in 2010 is considered to be representative of ambient conditions today.

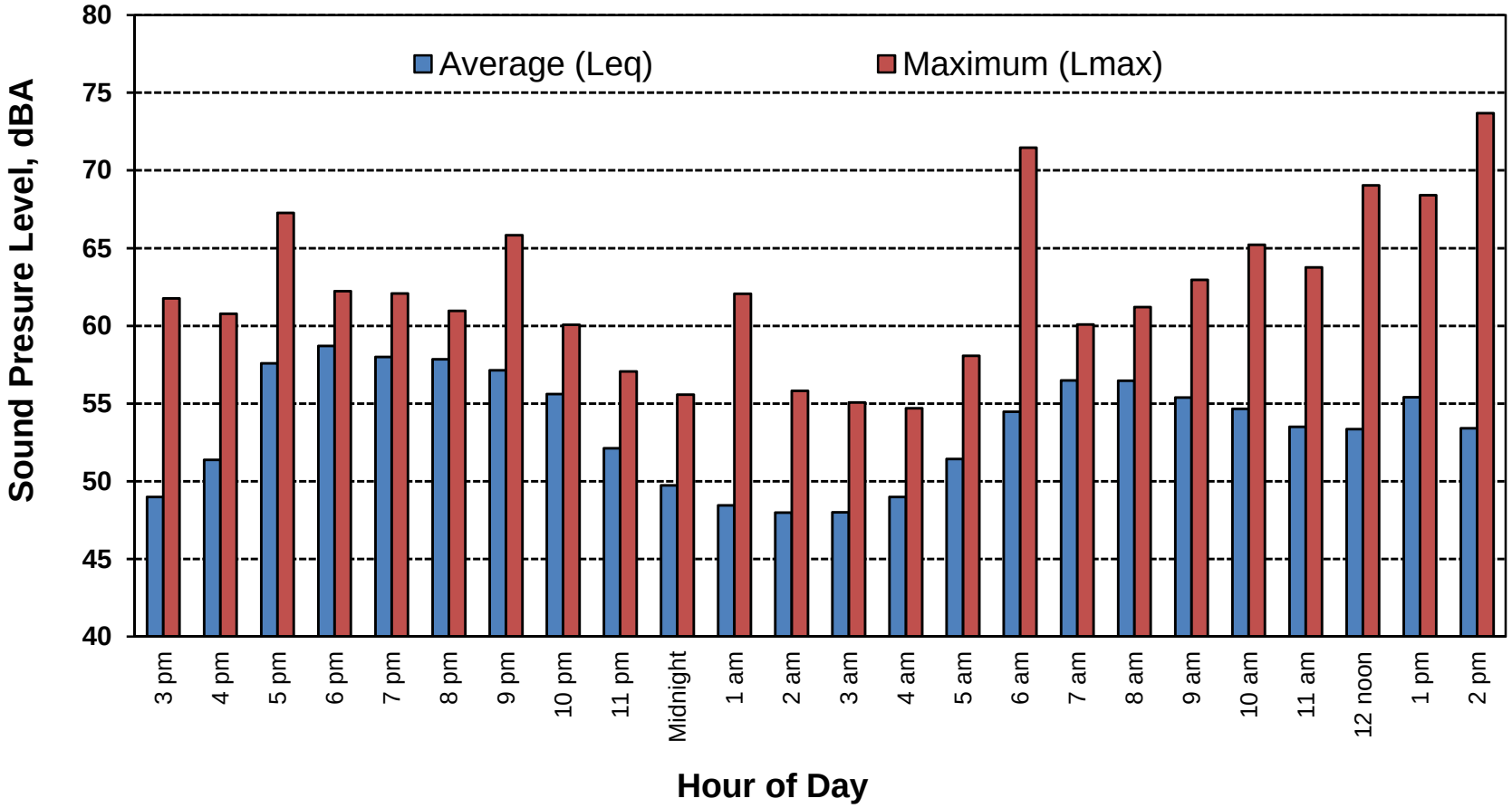
Larson Davis Laboratories (LDL) Model 820 precision integrating sound level meters were used for the noise level measurement survey. The meters were calibrated before use with an LDL Model CA200 acoustical calibrator to ensure the accuracy of the measurements. The equipment used meets all specifications of the American National Standards Institute requirements for Type 1 sound level meters (ANSI S1.4). The results of the continuous measurements are provided in Table 1, and displayed graphically on Figures 4-6.

Table 1
Ambient Noise Monitoring Results – December 9–10, 2010

Site	Description	L_{dn}	Average Measured Hourly Noise Levels, dB			
			Daytime (7 AM-10 PM)		Nighttime (10 PM-7 AM)	
			L_{eq}	L_{max}	L_{eq}	L_{max}
1	Southwest corner of project site	59	56	60–74	52	55–72
2	Near center of southern border	60	59	56–73	51	53–63
3	Southeast corner of project site	60	57	59–74	52	57–62

Source: Bollard Acoustical Consultants, Inc., December 2010

Figure 4
Hourly Noise Survey Results at Nearest Residences to Parcel 49 Project - Site 1
December 9-10, 2010



Ldn: 59 dB

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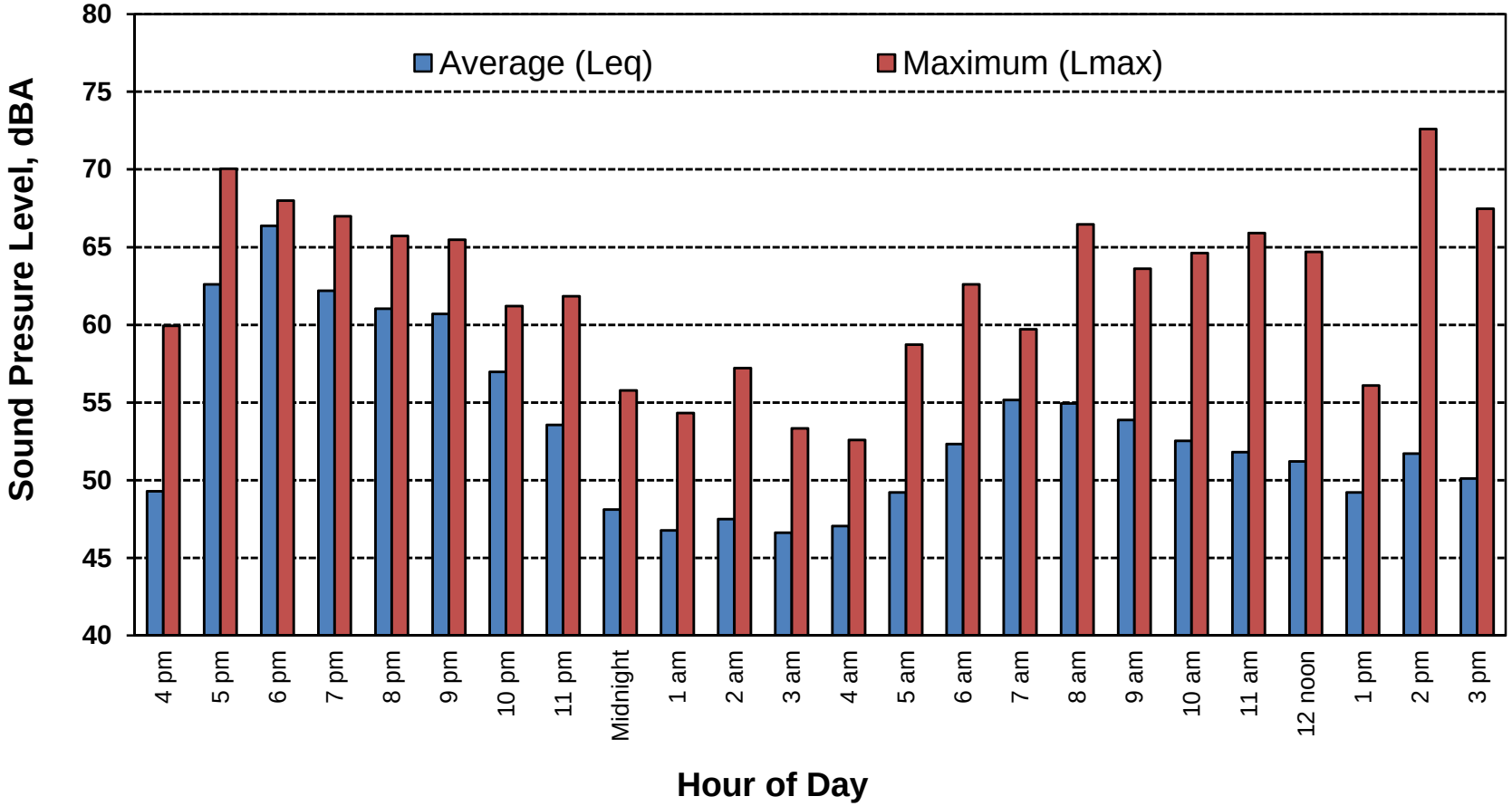
Figure 5
Hourly Noise Survey Results at Nearest Residences to Parcel 49 Project - Site 2
December 9-10, 2010



Ldn: 60 dB

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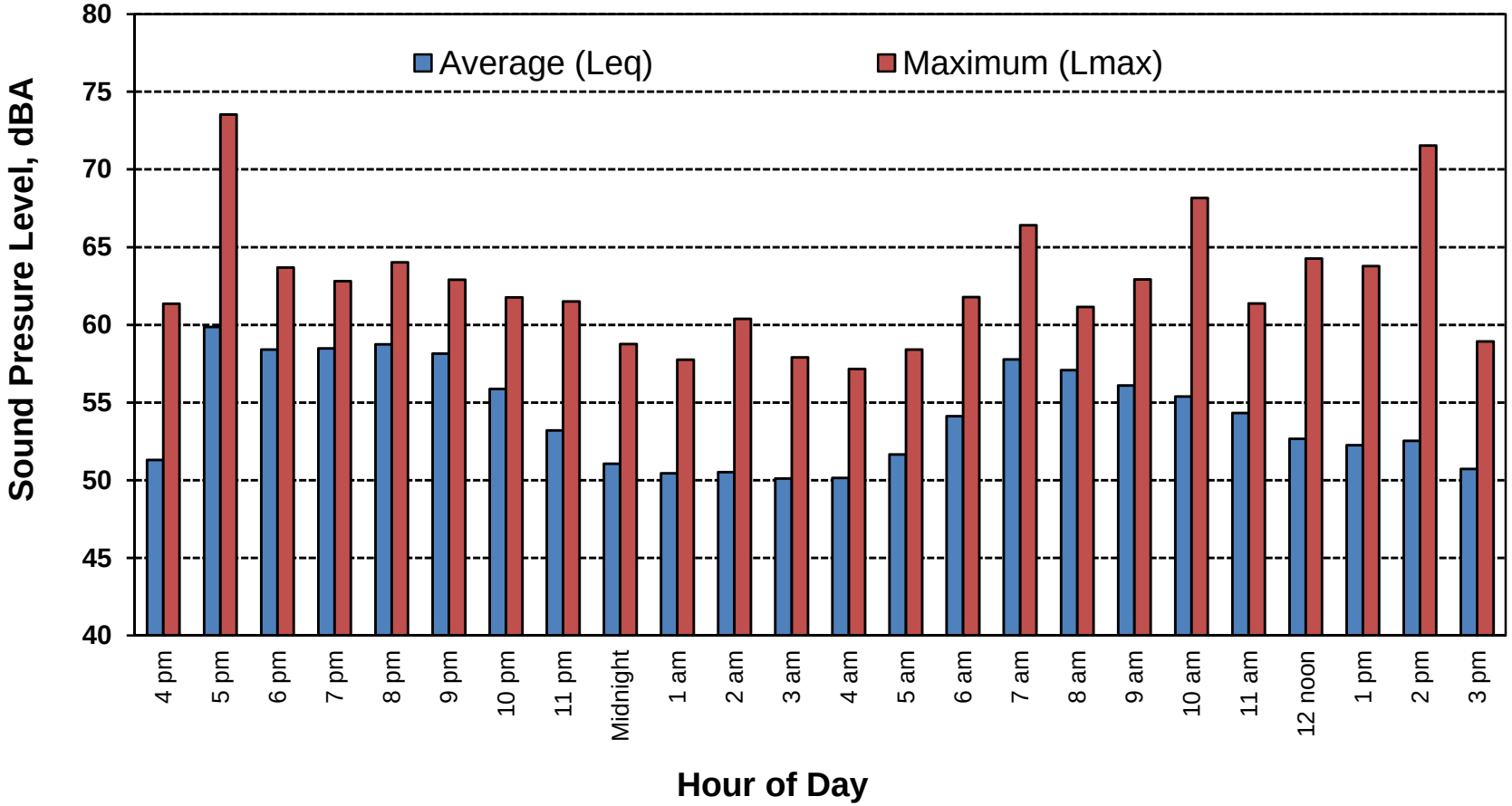
Figure 6
Hourly Noise Survey Results at Nearest Residences to Parcel 49 Project - Site 3
December 9-10, 2010



Ldn: 60 dB

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Criteria for Acceptable Noise Exposure

Roseville General Plan Noise Element

The City of Roseville General Plan Noise Element establishes acceptable noise level criteria for non-transportation noise sources, which would include all sources of noise occurring within the project site, such as parking lot movements, Topgolf operations, truck deliveries, mechanical equipment, etc. The City's hourly performance criteria are provided below in Table 2.

Table 2
City of Roseville General Plan Noise Level Performance Standards
New Projects Affected by or Including Non-Transportation Projects

Noise Level Descriptor	Daytime (7 AM to 10 PM)	Nighttime (10 PM to 7 AM)
Hourly Average Level – L_{eq}, dB	50	45
Maximum Level – L_{max}, dB	70	65

Source: City of Roseville
Note: Each of the noise levels specified above shall be lowered by 5 dB for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises. Noise level standards are as measured at the property line of lands designated for noise-sensitive uses.

The Noise Element also establishes acceptable noise level criteria for transportation noise sources. Those standards are reproduced below in Table 3.

For this project, impacts upon the residences to the west resulting from project-related, on-site, activities are evaluated relative to the City's performance standards contained in Table 2. To assess the potential impacts of existing and projected future traffic noise levels on the uses proposed within the project site, the noise standards of Table 3 are applied.

The hour-by-hour results of the ambient noise surveys shown in Figures 4-6 illustrate that, during most hours, existing traffic on Highway 65 and Washington Boulevard generated ambient noise levels in excess of the City's 50 dB Leq daytime and 45 dB Leq noise level standards shown in Table 2. Although the Table 2 standards are not applicable to traffic noise, existing traffic noise levels would provide some masking of project-generated noise levels at the nearest existing residences to the west.

The City of Roseville Planning Department staff recognizes that the ambient noise environment at the nearest residences is elevated due to Highway 65 traffic. As a result, the City has directed this analysis to address an exterior noise level standard equal to measured existing ambient noise levels along the property lines of the nearest residences to the west. Based on this direction, and the ambient noise level data summary shown in Table 2, the L_{eq} noise standards shown in Table 2 have conservatively been increased by 5 dB for the assessment of project noise impacts.

For the Topgolf component of the project, the actual hour by hour measured noise levels were used to establish performance standards for this project, rather than daytime and nighttime averages, to provide additional protection of the nearest residences during late night Topgolf operations. Please refer to that project noise study for the specific noise standards applied to that component of the project.

Table 3
Maximum Allowable Noise Exposure
Transportation Noise Sources

Land Use	Outdoor Activity Areas[1]	Interior Spaces	
	L_{dn}/CNEL, dB	L_{dn}/CNEL, dB	L_{eq}, dB[2]
Residential	60[3]	45	--
Transient lodging	60[3]	45	--
Hospitals, nursing homes	60[3]	45	--
Theaters, auditoriums, music halls	--	--	35
Churches, meeting halls	60[3]	--	40
Office buildings	65	--	45
Schools, libraries, museums	--	--	45
Playgrounds, neighborhood parks	70	--	--

[1] Outdoor activity areas for residential developments are considered to be the back yard patios or decks of single family dwelling, and the patios or common areas where people generally congregate for multi-family development.
Outdoor activity areas for non-residential developments are considered to be those common areas where people generally congregate, including pedestrian plazas, seating areas and outside lunch facilities.
Where the location of outdoor activity areas is unknown, the exterior noise level standard shall be applied to the property line of the receiving land use.
[2] As determined for a typical worst case hour during periods of use.
[3] Where it is not possible to reduce noise in outdoor activity areas to 60 dB Ldn/CNEL or less using a practical application of the best-available noise reduction measures, an exterior noise level of up to 75 dB Ldn/CNEL may be allowed provided that available exterior noise level reduction measures have been implemented and interior noise levels are in compliance with this table.
Note: Where a proposed use is not specifically listed on this table, the use shall comply with the noise exposure standards for the nearest similar use as determined by the Planning Department. Commercial and industrial uses have not been listed because such uses are not considered to be particularly sensitive to noise exposure.
Source: City of Roseville General Plan

Roseville Noise Ordinance

Chapter 9.24 of the City of Roseville Municipal Code contains the City's Noise Ordinance. The numerical noise standards contained in the City's Noise Ordinance (9.24.100, Table 1) are identical to the City's Noise Element standards shown in Table 2. As a result, compliance with the City's Noise Element standards shown in Table 2 would ensure compliance with the City's Noise Ordinance standards as well.

Criteria for Assessing Significance of Project-Generated Traffic Noise Increases

The City of Roseville does not have a specific policy for assessing noise impacts associated with project-related traffic increases on the local roadway network. It is generally recognized that an increase of at least 3 dB for similar noise sources is usually required before most people will perceive a change in noise levels, and an increase of 6 dB is required before the change will be clearly noticeable (Egan, Architectural Acoustics, page 21, 2007, McGraw Hill).

The Federal Interagency Commission on Noise (FICON) has developed a graduated scale for use in the assessment of project-related noise level increases. Table 4 was developed by FICON as a means of developing thresholds for impact identification for project-related noise level increases. The FICON standards have been used extensively in recent years by the authors of this section in the preparation of the noise sections of Environmental Impact Reports that have been certified in many California Cities and Counties.

The use of the FICON standards are considered conservative relative to thresholds used by other agencies in the State of California. For example, the California Department of Transportation (Caltrans) requires a project-related traffic noise level increase of 12 dB for a finding of significance, and the California Energy Commission (CEC) considers project-related noise level increases between 5-10 dB significant, depending on local factors. Therefore, the use of the FICON standards, which set the threshold for finding of significant noise impacts as low as 1.5 dB, provides a very conservative approach to impact assessment for this project.

Table 4
Significance of Changes in Cumulative Noise Exposure

Ambient Noise Level Without Project, L_{dn}	Increase Required for Significant Impact
<60 dB	+5.0 dB or more
60-65 dB	+3.0 dB or more
>65 dB	+1.5 dB or more

Source: Federal Interagency Committee on Noise (FICON)

Based on the FICON research, as shown in Table 4, a 5 dB increase in noise levels due to a project is required for a finding of significant noise impact where ambient noise levels without the project are less than 60 dB L_{dn}. Where pre-project ambient conditions are between 60 and 65 dB L_{dn}, a 3 dB increase is applied as the standard of significance. Finally, in areas already exposed to higher noise levels, specifically pre-project noise levels in excess of 65 dB L_{dn}, a 1.5 dB increase is considered by FICON as the threshold of significance.

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, whether by the addition of a single vehicle on a roadway, or a tractor in an agricultural field, 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.

Impact Evaluation Methodology

Overview of Impacts Evaluated

As noted previously, the project proposes a combination of church, retail, office, restaurant, hotel and outdoor entertainment uses. There are three types of noise impacts associated with this project. Those impacts are as follows:

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

2. Traffic noise impacts upon the noise-sensitive components of the proposed Parcel 49 development (church, restaurant, office, and hotel interior spaces), resulting from elevated Highway 65 traffic noise levels.

3. Noise impacts at the existing residences located immediately west of the project site resulting from noise generated by on-site activities associated with the project construction and operations.

As noted previously, potential impacts associated with the proposed Topgolf outdoor entertainment facility were addressed in a separate analysis. Major noise-producing components associated with the other proposed uses to be developed within the Parcel 49 project site consist of truck deliveries, parking lot activities (vehicles arriving and departing, doors opening and closing, etc.), mechanical equipment (HVAC) operation, off-site traffic increases, and project construction.

On-Site Truck Circulation and Unloading Noise

According to the project site plans, none of the proposed buildings uses will include a truck unloading dock, as most of the deliveries to the various uses proposed within the development will be made by medium-duty truck and side-step vans. As a result, on-site heavy truck circulation and unloading is not expected to be frequent occurrence within the project site. In addition, truck passbys on the project site are expected to be relatively brief, and would likely occur primarily during normal business (daytime) hours. Due to the power-line setback along the southwestern site boundary, the nearest project-related building to the existing residences to the southwest is over 250 feet away.

Because truck passbys and unloading activities are typically fairly brief, impacts of such activities are assessed in this study relative to the City's maximum noise level standards shown in Table 2. It follows that if brief periods of noise generated by truck passbys and deliveries can satisfy the City's maximum noise level standards, then the averaging of that noise over a 1-hour period would result in average noise levels which would similarly satisfy the City's average (L_{eq}) noise level standards shown in Table 2.

BAC file data indicate that on-site heavy truck passbys and unloading will produce a maximum noise level of approximately 75 dB L_{max} at a reference distance of 50 feet, with medium duty trucks (including side step vans), producing an L_{max} of approximately 70 dB L_{max} at 50 feet. At the nearest residences to the site, the substantial distance between the truck passby and unloading areas and the existing residences will reduce delivery truck maximum noise levels to approximately 55-60 dB L_{max} at those residences. These predicted levels would be well below the City of Roseville exterior noise level standards shown in Table 2 for both daytime and nighttime hours, as well as below measured existing maximum noise levels shown in Figures 4-6. As a result, maximum noise levels generated during onsite delivery truck circulation and unloading is considered less than significant at the nearest existing residences to the site.

It should be noted that the noise levels predicted above do not include any attenuation resulting from shielding of truck delivery noise by intervening structures. In addition, onsite truck circulation and deliveries at the more distant uses proposed on the project site (restaurants, hotel, etc.) would be further attenuated by shielding provided by intervening office buildings which will ultimately be constructed on the site.

Mechanical Equipment Noise

The heating, ventilation, and air conditioning (HVAC) systems for maintaining comfortable temperatures within the proposed hotel, church, restaurants, retail, and office uses will likely consist of packaged rooftop air conditioning systems. The units will likely be relatively evenly distributed across the roofs of the buildings. These types of HVAC units, which typically stand about 4 to 5 feet tall, will be shielded from view of existing nearby residences to the west by the building parapets.

Due to the power-line setback along the southwestern site boundary, the nearest project-related building to the existing residences to the southwest is approximately 250 feet. As a result, the minimum distance between project-related HVAC equipment and those existing residences would exceed 250 feet.

Because mechanical equipment operation typically generates sustained, steady-state, noise levels (rather than brief periods of elevated noise levels in the case of truck passbys and deliveries), impacts of HVAC system usage are assessed in this study relative to the City's average (Leq) noise level standards shown in Table 2.

Noise from rooftop HVAC units has been measured by BAC to be 45-50 dB at a reference distance of 100 feet from the building façades of similar uses, including shielding by the building parapet. HVAC systems located within dedicated mechanical equipment rooms typically result in even lower noise levels.

At the nearest residences to the site, located 250+ feet from any project-related HVAC equipment, average HVAC noise levels will be reduced to approximately 37-42 dB Leq. These predicted levels would be well below the City of Roseville exterior noise level standards shown in Table 2 for both daytime and nighttime hours, and well below measured existing average noise levels reported in Table 4. As a result, average noise levels generated by HVAC system usage is considered less than significant at the nearest existing residences to the site.

Parking Lot Activity Noise

As a means of determining the noise levels due to parking lot activities, BAC utilized noise level data collected at various parking lots in the Sacramento region over the years. That data indicate that a typical Sound Exposure Level (SEL) due to automobile arrivals/departures, including car doors slamming and people conversing is approximately 72 dB, at a distance of 50 feet. The maximum noise level associated with parking lot activity typically did not exceed 65 dB Lmax at the same reference distance.

Because individual cars entering and leaving the proposed parking areas will result in brief periods of noise generation, impacts associated with parking lot movements are assessed relative to the City's maximum noise level standards shown in Table 2. In addition, because of the large number of parking spaces proposed in the area adjacent to the existing residences is fairly large, the potential for ongoing parking lot noise generation will be present. As a result, noise impacts associated with parking lot usage are also assessed in this study relative to the City's average noise level standards shown in Table 2.

Due to the proposed drainage easement along the western site boundary, the distance between the nearest proposed parking spaces and the existing residences to the southwest is approximately 100 feet. At that distance, maximum noise levels generated by the nearest parking lot activities would be approximately 60 dB L_{max} at those residences. This range of levels would satisfy the City of Roseville noise standards shown in Table 2 for both daytime and nighttime hours.

To compute hourly average noise levels generated by parking lot activities, the approximate number of hourly operations in any given area and distance to the effective noise center of those activities is required. The buildings proposed nearest the residences consist of the two large church buildings in the central portion of the site, smaller retail buildings in the northern portion of the site, and the Topgolf facility in the southern portion of the site.

The Bayside Church buildings will likely generate the highest degree of parking lot activity in the 250-foot parking buffer located beneath the power lines, and that parking lot activity would occur primarily during daytime hours. Parking for the retail uses to the north is provided on the opposite side of those retail buildings, and would be substantially shielded from view of the nearest residences to the west by the retail buildings themselves. And parking at the Topgolf facility will likely occur primarily in the spaces provided between that facility and church Building S, as that area represents the shortest walk to the Topgolf facility.

The hourly average noise level generated by parking lot movements is computed using the following formula:

$$Hourly\ Leq = 70 + 10log\ (N) - 35.6$$

Where 70 is the mean Sound Exposure Level (SEL) for an automobile parking lot arrival or departure, N is the number of parking lot operations in a given hour, and 35.6 is 10 times the logarithm of the number of seconds in an hour.

Although there are nearly 2,800 parking spaces proposed for the Parcel 49 development, from a practical standpoint, only a small fraction of the overall parking lot noise will contribute to the noise environment at the nearest residences. This is because rows of parked cars essentially represent a noise barrier, providing shielding of further parking lot movements at the nearest residences. From a practical and mathematical standpoint, only about the closest 200 parking spaces would appreciably contribute to average noise levels received at an existing residence to the west. This is because of the aforementioned shielding provided by the nearest cars and the fact that sound decays with distance. Assuming that 200 parking lot movements could occur within an average distance of 150 feet of an existing residence during at busy hour of the day, the computed L_{eq} using the formula provided above is 50 dB L_{eq} at the nearest residences. This is considered a conservative estimate of noise exposure.

The predicted hourly average noise level of 50 dB L_{eq} would satisfy both the daytime 55 dB Leq and nighttime 50 dB Leq noise standards applicable to this project (Table 2 standards adjusted upward by 5 dB to account for elevated ambient conditions). However, this level of parking lot activity during nighttime hours is highly unlikely as substantial numbers of nighttime parking lot movements in the parking areas beneath the power lines are not anticipated. As a result, parking lot movements are not predicted to result in adverse noise impacts at the nearest residences and no additional noise mitigation measures would be warranted for proposed parking lot movements.

Topgolf Facility Noise Generation

The Topgolf facility will be a 64,232 square foot three-story facility with 102 climate-controlled hitting bays, an outdoor outfield enclosed by netting, full-service restaurant, bar, lounges and corporate/event meeting space and family entertainment area with games. The facility has been identified as a primary noise source associated with the Parcel 49 project. Noise mitigation for Topgolf has been addressed in a previous study (BAC job number 2014-195) and is predicted to be in compliance with City of Roseville noise standards after mitigation.

Off-Site Traffic Noise Increases

In addition to residences near the project site being affected by parking lot noise, increased traffic on nearby roadways due to the project could affect residences not immediately adjacent to the site. Traffic increases and resulting noise impacts at nearby roadways were evaluated and a significant increase in noise on the segment of Washington Boulevard directly south of the site was identified. The results are displayed in Table 5 for weekday traffic conditions, and Table 6 for weekend conditions. A complete listing of FHWA Model inputs is provided in Appendix B. Fewer traffic noise segments were evaluated for weekend conditions in the project traffic analysis, which accounts for the differences in number of roadway segments analyzed in Tables 5 and 6.

Table 5
Off-Site Roadway Noise – Weekday Conditions

Segment	Roadway	Description	L_{dn} 100 feet from roadway			Substantial Increase?[1]
			Baseline	Base + Project	Change	
1	Blue Oaks Blvd	East of Foothills Blvd	73.1	73.2	0.1	No
2	Blue Oaks Blvd	West of Foothills Blvd	72.6	72.2	-0.4	No
3	Blue Oaks Blvd	East of Washington Blvd	70.8	71.4	0.6	No
4	Blue Oaks Blvd	West of Washington Blvd	74.1	74.3	0.1	No
5	Foothills Blvd	North of Blue Oaks Blvd	69.0	65.9	-3.1	No
6	Foothills Blvd	South of Blue Oaks Blvd	70.2	68.8	-1.3	No
7	Harris & Bruno Dr	West of Washington Blvd	55.4	55.4	0.0	No
8	Hwy-65 SB Ramp	North of Blue Oaks Blvd	71.2	71.5	0.3	No
9	Hwy-65 SB Ramp	North of Pleasant Grove Blvd	67.8	67.9	0.1	No
10	Hwy-65 SB Ramp	South of Pleasant Grove Blvd	63.7	63.7	0.0	No
11	Pleasant Grove Blvd	East of Hwy-65 SB Ramp	73.0	73.0	0.0	No
12	Pleasant Grove Blvd	West of Hwy-65 SB Ramp	73.3	73.3	0.0	No
13	Pleasant Grove Blvd	East of Roseville Pkwy	73.0	73.0	0.0	No
14	Pleasant Grove Blvd	West of Roseville Pkwy	73.1	73.1	0.0	No
15	Roseville Pkwy	East of Washington Blvd	67.1	67.8	0.7	No
16	Roseville Pkwy	North of Pleasant Grove Blvd	68.1	68.5	0.4	No
17	Roseville Pkwy	South of Pleasant Grove Blvd	73.0	73.1	0.1	No
18	Washington Blvd	South of Blue Oaks Blvd	68.6	70.2	1.6	Yes
19	Washington Blvd	North of Roseville Pkwy	71.3	72.0	0.6	No
20	Washington Blvd	South of Roseville Pkwy	69.9	70.4	0.5	No
21	Washington Blvd	North of Project Entrance	69.0	69.9	1.0	No
22	Washington Blvd	South of Project Entrance	68.9	69.5	0.6	No

1. A substantial increase is based on the Table 5 criteria, and depends on the baseline noise level and the change in noise levels due to the project.

Table 6
Off-Site Roadway Noise – Weekend Conditions

Segment	Roadway	Description	L_{dn} 100 feet from roadway			Substantial Increase?[1]
			Baseline	Base + Project	Change	
1	Blue Oaks Blvd	East of Foothills Blvd	70.9	71.4	0.5	No
2	Blue Oaks Blvd	West of Foothills Blvd	71.1	71.5	0.4	No
3	Blue Oaks Blvd	East of Washington Blvd	69.6	70.7	1.1	No
4	Blue Oaks Blvd	West of Washington Blvd	72.1	72.6	0.5	No
5	Foothills Blvd	North of Blue Oaks Blvd	65.0	65.2	0.2	No
6	Foothills Blvd	South of Blue Oaks Blvd	61.4	62.2	0.8	No
7	Hwy-65 SB Ramp	North of Blue Oaks Blvd	69.1	70.1	1.0	No
8	Washington Blvd	South of Blue Oaks Blvd	66.0	70.0	4.0	Yes
9	Washington Blvd	North of Project Entrance	67.7	71.5	3.9	Yes
10	Washington Blvd	South of Project Entrance	67.7	70.3	2.6	Yes

1. A substantial increase is based on the Table 5 criteria, and depends on the baseline noise level and the change in noise levels due to the project.

The Table 5 data indicate that the proposed project would result in a substantial increase in ***weekday*** traffic noise levels, as defined by the FICON criteria shown in Table 4, on one (1) roadway segment. That segment is Washington Boulevard south of Blue Oaks (Between Blue Oaks and the project site entrance). Because there are no noise-sensitive land uses located adjacent to this roadway segment, no noise impact would result from the project-related weekday traffic noise increase on this roadway segment. Along all other roadway segments, the increase is predicted to be less than significant relative to the Table 4 criteria.

The Table 6 data indicate that the proposed project would result in a substantial increase in ***weekend*** traffic noise levels, as defined by the FICON criteria shown in Table 4, on three (3) roadway segments. Two of the three segments are located on Washington Boulevard between the project site access and Blue Oaks Boulevard, where there are no noise-sensitive receptors. As a result, no noise impact would result from the project-related weekend traffic noise increase on those two roadway segments.

The third roadway segment identified in Table 6 as having a substantial increase in ***weekend*** traffic noise levels is Washington Boulevard south of the project site access. There are existing residential land uses located adjacent to this roadway segment and the 2.6 dB increase in noise levels due to the project is considered substantial relative to the 1.5 dB threshold identified in the Table 4 criteria given that the baseline no-project noise level is above 65 dB L_{dn}. However, there is an existing masonry noise barrier along this roadway segment which provides a minimum Washington Boulevard traffic noise reduction of 5 dB. As a result of this shielding, actual baseline traffic noise exposure at those residences would be approximately 63 dB Ldn, not 68 dB L_{dn} (67.7 dB) as shown in Table 6. Given a baseline exposure between 60 and 65 dB

L_{dn}, Table 4 indicates that the applicable significance criteria would be 3 dB. Because the predicted weekend increase in traffic noise levels of 2.6 dB for that roadway segment is below the 3 significance dB criteria, this noise impact is considered less than significant.

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 7, ranging from 85 to 90 dB at a distance of 50 feet.

Table 7
Typical Construction Equipment Noise

Equipment Description	Maximum Noise Level at 50 feet, dBA
Auger drill rig	85
Backhoe	80
Bar bender	80
Blasting	94
Boring jack power unit	80
Chain saw	85
Clam shovel	93
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
Hydra break ram	90
Impact pile driver (diesel or drop)	95
Jackhammer	85
Mounted impact hammer (hoe ram)	90
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 residences to proposed buildings within the project site are located over 250 feet away from the nearest proposed buildings in the Parcel 49 development. At this distance, maximum noise levels would be expected to be approximately 70 to 75 dB L_{max}. Noise levels in this range would not represent a substantial short-term increase over ambient maximum noise levels shown in Table 1. During site grading and paving heavy equipment will be in closer proximity to the existing residences, thereby resulting in higher noise levels than would be expected during building construction. However, site grading and paving activities will be temporary and are anticipated to occur during normal daytime hours. As a result, no adverse noise impacts are anticipated from project site grading and paving, or construction of buildings on the site.

Conclusions and Recommendations

There are considerable setbacks between the existing residences to the west and proposed buildings within the Parcel 49 development. In addition, existing Highway 65 traffic noise levels will provide masking of project noise generation at those nearest residences. As a result, with the exception of the proposed Topgolf facility, potentially significant noise impacts are not identified for this project.

In a separate analysis of potential noise impacts associated with the Topgolf operations, potentially significant noise impacts were identified and noise mitigation measures were developed which will be included in the design and operation of that project. Those mitigation measures are reproduced below:

Topgolf Noise Mitigation Measures:

- Reorienting drive-bay speaker's 45-degrees inward rather than straight down.
- Restricting live and DJ-generated music generated on the terrace to pre-10 pm.
- Gradually reducing house sound system output after 10 pm.
- Filter low-frequency sound.
- Installation of extensive sound absorbing materials in and around the drive bays (50% treatment of wall, column, and ceiling areas with NRC 0.8 materials).
- Install sound absorbing turf around the hitting mats from the front edge of the drive bay to the support columns.
- Increasing terrace wall height using glass barriers.
- Orientation of terrace live entertainment stage to face east toward Highway 65.
- Requirement that live bands utilize electric drum kits so sound output can be regulated.
- Installation of sound absorbing materials within the terrace area.

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 Parcel 49 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

FHWA-RD-77-108 Highway Traffic Noise Prediction Model

Data Input Sheet

Project #: 2014-297 Parcel 49 Project
Description: Traffic Report 10-27-14: Weekday Baseline
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	Blue Oaks Blvd	East of Foothills Blvd	36,970	80		20	2	6	55	100	
2	Blue Oaks Blvd	West of Foothills Blvd	33,295	80		20	2	6	55	100	
3	Blue Oaks Blvd	East of Washington Blvd	21,785	80		20	2	6	55	100	
4	Blue Oaks Blvd	West of Washington Blvd	32,430	80		20	2	13	55	100	
5	Foothills Blvd	North of Blue Oaks Blvd	14,330	80		20	2	6	55	100	
6	Foothills Blvd	South of Blue Oaks Blvd	18,945	80		20	2	6	55	100	
7	Harris & Bruno Dr	West of Washington Blvd	435	80		20	2	13	55	100	
8	Hwy-65 SB Ramp	North of Blue Oaks Blvd	24,155	80		20	2	6	55	100	
9	Hwy-65 SB Ramp	North of Pleasant Grove Blvd	7,575	80		20	2	13	55	100	
10	Hwy-65 SB Ramp	South of Pleasant Grove Blvd	4,295	80		20	2	6	55	100	
11	Pleasant Grove Blvd	East of Hwy-65 SB Ramp	36,025	80		20	2	6	55	100	
12	Pleasant Grove Blvd	West of Hwy-65 SB Ramp	38,865	80		20	2	6	55	100	
13	Pleasant Grove Blvd	East of Roseville Pkwy	36,325	80		20	2	6	55	100	
14	Pleasant Grove Blvd	West of Roseville Pkwy	37,170	80		20	2	6	55	100	
15	Roseville Pkwy	East of Washington Blvd	6,375	80		20	2	13	55	100	
16	Roseville Pkwy	North of Pleasant Grove Blvd	11,820	80		20	2	6	55	100	
17	Roseville Pkwy	South of Pleasant Grove Blvd	36,445	80		20	2	6	55	100	
18	Washington Blvd	South of Blue Oaks Blvd	13,310	80		20	2	6	55	100	
19	Washington Blvd	North of Roseville Pkwy	16,940	80		20	2	13	55	100	
20	Washington Blvd	South of Roseville Pkwy	12,220	80		20	2	13	55	100	
21	Washington Blvd	North of Project Entrance	14,310	80		20	2	6	55	100	
22	Washington Blvd	South of Project Entrance	14,150	80		20	2	6	55	100	

Appendix B-2

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Data Input Sheet

Project #: 2014-297 Parcel 49 Project
Description: Traffic Report 10-27-14: Weekday Baseline + Project (Phase 1+2+3)
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	Blue Oaks Blvd	East of Foothills Blvd	37,750	80		20	2	6	55	100	
2	Blue Oaks Blvd	West of Foothills Blvd	30,040	80		20	2	6	55	100	
3	Blue Oaks Blvd	East of Washington Blvd	24,840	80		20	2	6	55	100	
4	Blue Oaks Blvd	West of Washington Blvd	33,565	80		20	2	13	55	100	
5	Foothills Blvd	North of Blue Oaks Blvd	7,005	80		20	2	6	55	100	
6	Foothills Blvd	South of Blue Oaks Blvd	13,885	80		20	2	6	55	100	
7	Harris & Bruno Dr	West of Washington Blvd	435	80		20	2	13	55	100	
8	Hwy-65 SB Ramp	North of Blue Oaks Blvd	25,695	80		20	2	6	55	100	
9	Hwy-65 SB Ramp	North of Pleasant Grove Blvd	7,760	80		20	2	13	55	100	
10	Hwy-65 SB Ramp	South of Pleasant Grove Blvd	4,295	80		20	2	6	55	100	
11	Pleasant Grove Blvd	East of Hwy-65 SB Ramp	36,350	80		20	2	6	55	100	
12	Pleasant Grove Blvd	West of Hwy-65 SB Ramp	39,005	80		20	2	6	55	100	
13	Pleasant Grove Blvd	East of Roseville Pkwy	36,465	80		20	2	6	55	100	
14	Pleasant Grove Blvd	West of Roseville Pkwy	37,170	80		20	2	6	55	100	
15	Roseville Pkwy	East of Washington Blvd	7,535	80		20	2	13	55	100	
16	Roseville Pkwy	North of Pleasant Grove Blvd	12,965	80		20	2	6	55	100	
17	Roseville Pkwy	South of Pleasant Grove Blvd	37,450	80		20	2	6	55	100	
18	Washington Blvd	South of Blue Oaks Blvd	19,050	80		20	2	6	55	100	
19	Washington Blvd	North of Roseville Pkwy	19,640	80		20	2	13	55	100	
20	Washington Blvd	South of Roseville Pkwy	13,760	80		20	2	13	55	100	
21	Washington Blvd	North of Project Entrance	17,825	80		20	2	6	55	100	
22	Washington Blvd	South of Project Entrance	16,410	80		20	2	6	55	100	

Appendix B-3

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Data Input Sheet

Project #: 2014-297 Parcel 49 Project
Description: Traffic Report 10-27-14: Weekend Baseline
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	Blue Oaks Blvd	East of Foothills Blvd	22,470	80		20	2	6	55	100	
2	Blue Oaks Blvd	West of Foothills Blvd	23,670	80		20	2	6	55	100	
3	Blue Oaks Blvd	East of Washington Blvd	16,690	80		20	2	6	55	100	
4	Blue Oaks Blvd	West of Washington Blvd	20,345	80		20	2	13	55	100	
5	Foothills Blvd	North of Blue Oaks Blvd	5,805	80		20	2	6	55	100	
6	Foothills Blvd	South of Blue Oaks Blvd	2,535	80		20	2	6	55	100	
7	Hwy-65 SB Ramp	North of Blue Oaks Blvd	14,745	80		20	2	6	55	100	
8	Washington Blvd	South of Blue Oaks Blvd	7,290	80		20	2	6	55	100	
9	Washington Blvd	North of Road A	7,290	80		20	2	13	55	100	
10	Washington Blvd	South of Road A	7,340	80		20	2	13	55	100	

Appendix B-4

FHWA-RD-77-108 Highway Traffic Noise Prediction Model
Data Input Sheet

Project #: 2014-297 Parcel 49 Project
Description: Traffic Report 10-27-14: Weekend Baseline + Phase 1, 2, 3
Ldn/CNEL: Ldn
Hard/Soft: Soft

Segment	Roadway Name	Segment Description	ADT	Day %	Eve %	Night %	% Med. Trucks	% Hvy. Trucks	Speed	Distance	Offset (dB)
1	Blue Oaks Blvd	East of Foothills Blvd	25,315	80		20	2	6	55	100	
2	Blue Oaks Blvd	West of Foothills Blvd	25,755	80		20	2	6	55	100	
3	Blue Oaks Blvd	East of Washington Blvd	21,535	80		20	2	6	55	100	
4	Blue Oaks Blvd	West of Washington Blvd	22,600	80		20	2	13	55	100	
5	Foothills Blvd	North of Blue Oaks Blvd	6,055	80		20	2	6	55	100	
6	Foothills Blvd	South of Blue Oaks Blvd	3,055	80		20	2	6	55	100	
7	Hwy-65 SB Ramp	North of Blue Oaks Blvd	18,660	80		20	2	6	55	100	
8	Washington Blvd	South of Blue Oaks Blvd	18,275	80		20	2	6	55	100	
9	Washington Blvd	North of Road A	17,775	80		20	2	13	55	100	
10	Washington Blvd	South of Road A	13,505	80		20	2	13	55	100	