Environmental Noise Assessment

76 Gas Station and Car Wash

Sacramento County, California

BAC Job # 2020-125

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Introduction

The proposed project consists of the construction of a new 76 gas station/convenience store and car wash tunnel located at 7599 Stockton Boulevard in Sacramento County, California (APN: 051-0180-021). Existing land uses in the project vicinity include commercial to the south and west, and multi-family residential to the north/east. The project area with aerial imagery is shown on Figure 1. The project site plan is presented as Figure 2.

Due to the proximity of the proposed project to existing residential uses, Bollard Acoustical Consultants, Inc. (BAC) was retained to prepare an assessment of potential noise impacts associated with the project. Specifically, the purposes of this assessment are to quantify noise levels associated with the proposed project operations, to assess the state of compliance of those noise levels with applicable Sacramento County noise standards, and if necessary, to recommend measures to reduce those noise levels to acceptable limits at the nearest noise sensitive uses.

Noise Fundamentals and 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 thus are called sound. 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 allows a million-fold increase in pressure to be expressed as 120 dB. Another useful aspect of the decibel scale is that changes in levels (dB) correspond closely to human perception of relative loudness. Appendix A contains definitions of Acoustical Terminology. Figure 3 shows common noise levels associated with various sources.

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 weighing the frequency response of a sound level meter by means of the standardized A-weighing 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 in decibels.

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}) over a given time period (usually one hour). The L_{eq} is the foundation of the Day-Night Average Level noise descriptor, DNL or L_{dn}, and shows very good correlation with community response to noise.

Legend

- Project Boundary (Approximate)
- Short-Term Noise Measurement Site
- Long-Term Noise Measurement Site

N

Scale (Feet)

0 25 50

76 Gas Station & Car Wash
Sacramento County, California

Project Area

Figure 1

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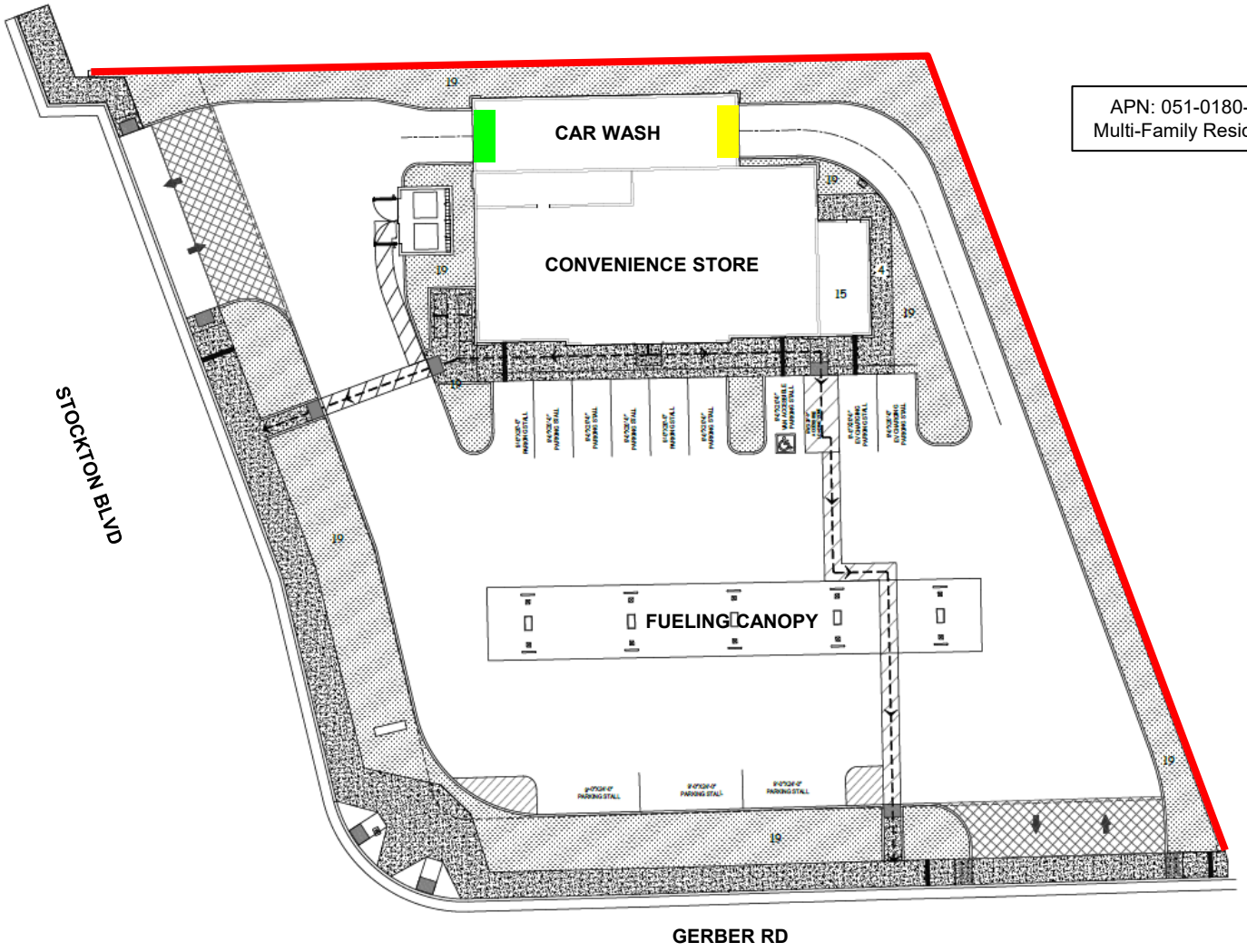

Legend

- Proposed 8' Sound Wall
- Car Wash Tunnel Entrance
- Car Wash Tunnel Exit

N

Scale (Feet)

0 25 50

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Site Plan

Figure 2

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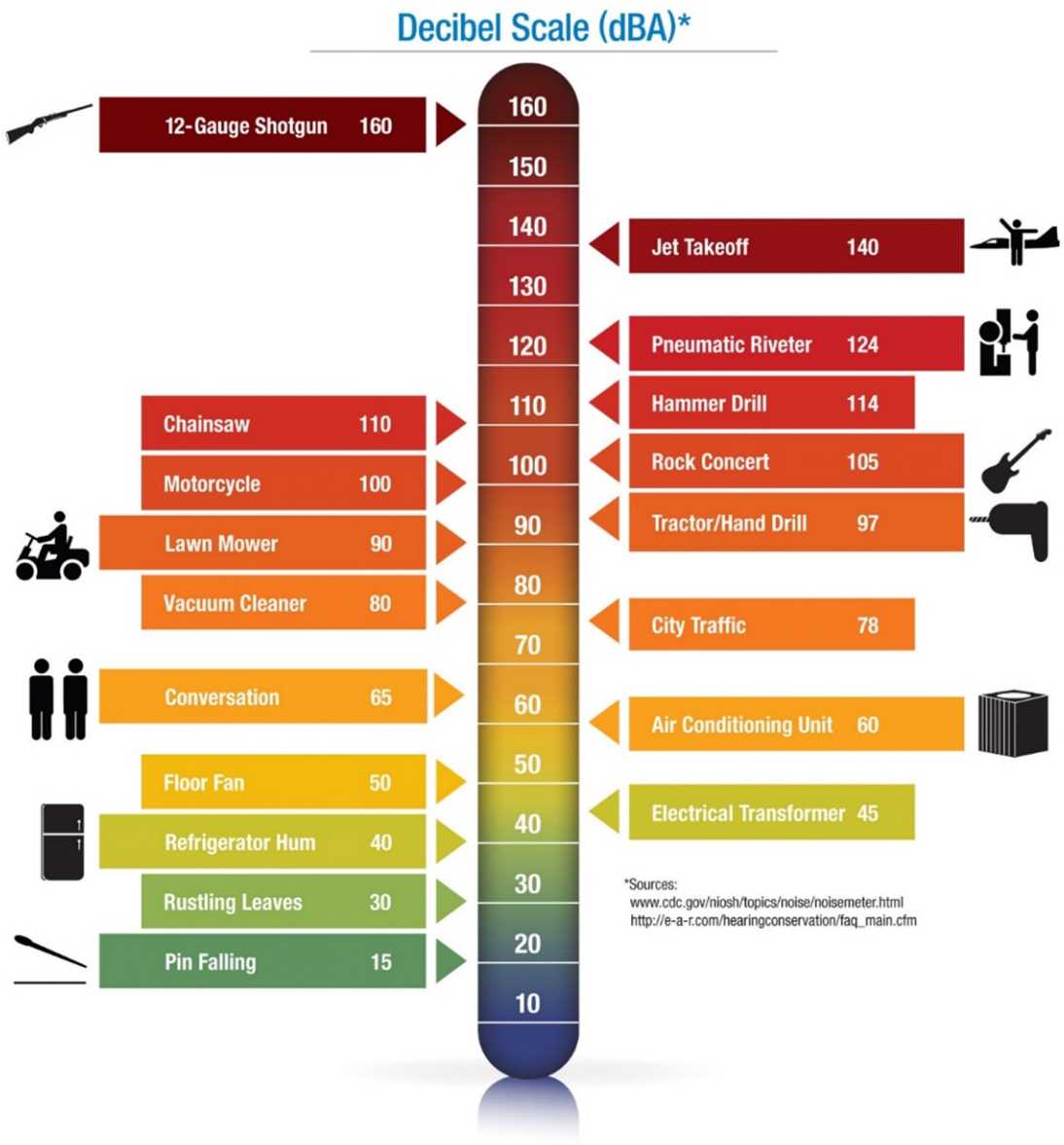
Figure 3
Typical A-Weighted Sound Levels of Common Noise Sources



The Day-Night Average Level (DNL or L_{dn}) is based upon the average noise level over a 24-hour day, with a +10-decibel weighting applied to noise occurring during nighttime (10:00 p.m. to 7:00 a.m.) hours. The nighttime penalty is based upon the assumption that people react to nighttime noise exposures as though they were twice as loud as daytime exposures. Because DNL represents a 24-hour average, it tends to disguise short-term variations in the noise environment. DNL-based noise standards are commonly used to assess noise impacts associated with traffic, railroad, and aircraft noise sources.

Existing Ambient Noise Environment

The existing ambient noise environment in the immediate project vicinity is defined primarily by traffic on Stockton Boulevard and Gerber Road. To generally quantify the existing ambient noise environment within the project vicinity, BAC conducted long-term (48-hour) noise level measurements from July 29-30, 2020. In addition, a short-term (30-minute) noise level survey was also conducted on July 28, 2020. The noise survey locations are shown on Figure 1, identified as sites LT-1 and ST-1. Photographs of the noise level survey locations are provided in Appendix B.

Larson-Davis Laboratories (LDL) Model 820 precision integrating sound level meters were used to complete the noise level surveys. The meters were calibrated immediately before and after use with an LDL Model CAL200 acoustical calibrator to ensure the accuracy off the measurements. The equipment used meets all pertinent specifications of the American National Standards Institute for Type 1 sound level meters (ANSI S1.4).

The results of the long-term ambient noise survey at site LT-1 are shown numerically and graphically in Appendices C and D (respectively) and are summarized below in Table 1. The results from the short-term noise level survey at site ST-1 are also provided in Table 1.

Table 1
Summary of Ambient Noise Level Measurement Results[1]

			Average Measured Noise Levels (dB)			
			Daytime[3]		Nighttime[4]	
Site Description[2]	Date	DNL (dB)	L_{50}	L_{max}	L_{50}	L_{max}
LT-1: Southeast project boundary	7/29/20	73	66	88	59	83
	7/30/20	72	66	90	59	81
ST-1 Northern end of project site	7/28/20	--	57	72	--	--

[1] Detailed summaries of the long-term noise monitoring results are provided in Appendices C and D.
[2] Ambient noise monitoring locations are identified on Figure 1.
[3] Daytime: 7:00 a.m. to 10:00 p.m.
[4] Nighttime: 10:00 p.m. to 7:00 a.m.
Source: Bollard Acoustical Consultants, Inc. (2020)

As indicated in Table 1, average measured hourly noise levels at site LT-1 were consistent throughout the monitoring period. The Table 1 data also indicate that average measured median (L_{50}) and maximum (L_{max}) noise levels were the highest at site LT-1. This was likely due to the proximity of the site relative to Gerber Road.

Criteria for Acceptable Noise Exposure

Sacramento County General Plan Noise Element

The Sacramento County General Plan serves as the overall guiding policy document for land use, development, and environmental quality for the County. Sacramento County Noise

Element of the General Plan contains noise standards for transportation as well as non-transportation or "stationary" noise sources. The non-transportation criteria, shown in Table 2, would apply to this project.

Table 2
Non-Transportation Noise Standards
Median (L_{50}) / Maximum (L_{max})[1]

	Outdoor Area[2]		Interior[3]	
Receiving Land Use	**Daytime (7 a.m. – 10 p.m.)**	**Nighttime (10 p.m. – 7 a.m.)**	**Day & Night**	**Notes**
All Residential	55 / 75	50 / 70	35 / 55	
Transient Lodging	55 / 75	--	35 / 55	4
Hospitals & Nursing Homes	55 / 75	--	35 / 55	5,6
Theaters & Auditoriums	--	--	30 / 50	6
Churches, Meeting Halls Schools, Libraries, etc.	55 / 75	--	35 / 60	6
Office Buildings	60 / 75	--	45 / 65	6
Commercial Buildings	--	--	45 / 65	6
Playgrounds, Parks, etc.	65 / 75	--	--	6
Industry	60 / 80	--	50 / 70	6

Notes:

1 The Table 2 standards shall be reduced by 5 dB for sounds consisting primarily of speech or music, and for recurring impulsive sounds. If the existing ambient noise level exceeds the standards of Table 2, then the noise level standards shall be increased at 5 dB increments to encompass the ambient.

2 Sensitive areas are defined in the acoustic terminology section.

3 Interior noise level standards are applied within noise-sensitive areas of the various land uses, with windows and doors in the closed positions.

4 Outdoor activity areas of transient lodging facilities are not commonly used during nighttime hours.

5 Hospitals are often noise-generating uses. The exterior noise level standards for hospitals are applicable only at clearly identified areas designated for outdoor relaxation by either hospital staff or patients.

6 The outdoor activity areas of these uses (if any) are not typically utilized during nighttime hours.

7 Where median (L50) noise level data is not available for a particular noise source, average (Leq) values may be substituted for the standards of this table provided the noise source in question operates for at least 30 minutes of an hour. If the source in question operates less than 30 minutes per hour, then the maximum noise level standards shown would apply.

Source: Sacramento County General Plan Noise Element (Amended 2017)

Sacramento County Noise Ordinance

Section 6.68 of the Sacramento County Code (noise control) establishes standards for acceptable noise exposure at residential uses. Because the County's Noise Ordinance standards are consistent with the County's General Plan Noise Element standards, compliance with the Table 2 standards would ensure satisfaction of both the noise element and noise ordinance standards.

Noise Standards Applied to the Project

According to the Sacramento County Assessor Parcel Viewer, the project parcel is bordered to the north and east by one parcel (APN: 051-0180-026), zoned multi-family residential (RD-20).

The Sacramento County General Plan Noise Element states that the County's noise level limits are to be applied at the outdoor areas of a receiving land use. Pursuant to the Noise Element, common outdoor recreation areas of multi-family residential uses (e.g., pools, tot-lots, tennis courts, etc.) are considered to be sensitive outdoor areas. The Noise Element further states that individual patios and balconies of multi-family developments are not considered to be sensitive outdoor areas. The common outdoor area of the adjacent multi-family residential development to the north/east has been identified as a pool area located north of the project.

The Sacramento County General Plan noise level standards applicable to the project depend on what time of day the noise-generating components of the project occur, and the duration of operation each given noise source during a given hour. The project site plans indicate that the gas station and convenience store will have 24-hour operations, while car wash operations will be limited to daytime hours (8:00 a.m. to 8:00 p.m.). Based on this information, noise exposure associated with project gas station and convenience store operations would be subject to the County's daytime and nighttime noise level standards shown in Table 2. However, project car wash operations would be subject to the County's daytime noise level standards only.

Finally, because all of the project's on-site operations noise sources could potentially exceed 30 minutes of operation during a given busy hour, the County's median (L_{50}) noise level standards shown in Table 2 would be applicable to this noise assessment.

Evaluation of Project-Related Noise Levels

The project proposes a gas station that would contain a convenience store, car wash tunnel, and associated parking stalls. Noise generated by project-related activities were quantified through a combination of reference noise level measurements and application of accepted noise modeling techniques.

The primary noise source associated with the car wash component of the project has been identified as the car wash drying assembly, used for drying the vehicles at the end of the wash cycle. It is our understanding that the project does not propose to have an exterior vacuum system. The most significant noise sources associated with the proposed gas station/convenience store component of the project include on-site delivery truck circulation (i.e., medium and heavy truck passbys) and on-site vehicle circulation. Predicted noise levels resulting from each of these sources are evaluated in the following sections.

Car Wash Drying Assembly

Based on the experience of Bollard Acoustical Consultants, noise levels generated by car washes are primarily due to the drying portion of the operation. The project proposes to utilize the Premier Touchless Drying Systems dual 30-Horsepower Dryers (four 15-HP dryers)

configuration. The manufacturer's specifications, provided in Appendix E, indicate that the reference sound level at a distance of 50 feet from the drying assembly with the carwash doors open is 78 dBA.

The noise level generation of car wash drying assemblies vary depending on the orientation of the measurement position relative to the tunnel opening. Worst-case drying assembly noise levels occur at a position directly facing the car wash exit, considered to be 0 degrees off-axis. For car wash tunnels that are in excess of 100 feet in length, drying assembly noise levels at the car wash entrance are approximately 10 dB lower than those at the exit. At off-axis positions, the building facade provides varying degrees of noise level reduction. At positions 45 degrees off-axis relative to the facade of the car wash exit and entrance, drying assembly noise levels are approximately 5 dB lower. At 90 degrees off-axis, drying assembly noise levels are approximately 10 dB lower.

It is the understanding of BAC that the interior walls of the car wash tunnel near the drying assembly (exit) will have sound absorptive material. Based on the experience of BAC in similar car wash projects in recent years, the installation of sound absorptive material having a Noise Reduction Coefficient (NRC) rating of 1.0 on a minimum of 80 percent of available wall space within the last 25 feet of the tunnel (i.e., closest to dryers and exit) provides approximately 3 dB of drying assembly noise attenuation. For the purposes of this analysis, it was assumed that the tunnel would have the sound absorptive material treatment described above.

Car wash drying assembly noise level exposure at the common outdoor space of the adjacent multi-family residential development (pool area) was calculated based on the orientation to tunnel entrance/exit, as discussed above. Noise attenuation due to distance was calculated based on standard spherical spreading loss from a point source (-6 dB per doubling of distance). Car wash drying assembly noise exposure was calculated at the common outdoor area of the adjacent multi-family residential development and the results of those calculations are presented in Table 3.

The results presented in Table 3 include consideration of attenuation that would be provided by the proposed construction of an 8-foot-tall CMU sound wall at the location illustrated on Figure 2. A barrier insertion loss calculation worksheet is provided as Appendix F-1.

Table 3
Predicted Car Wash Drying Assembly Noise Levels at Adjacent Residential Use

Location (APN)	Distance from Tunnel Exit (ft)[1]	Predicted Noise Level, L_{50} (dB)		County Daytime Noise Level Standard, L_{50} (dB)
		No Wall	With 8' Wall[2]	
051-0180-026 (Pool Area)	100	59	54	55

[1] Distance scaled from car wash tunnel exit to the pool area on APN: 051-0180-026 using the provided site plans (dated 2/15/22) and the Sacramento County Assessor Parcel Viewer measurement tool.

[2] Predicted noise level includes consideration of the attenuation that would be provided by the proposed construction of an 8-foot-tall CMU sound wall at the location illustrated on Figure 2. A barrier insertion loss calculation worksheet is provided as Appendix F-1.

Source: Bollard Acoustical Consultants, Inc. (2022)

Because project car wash operations are proposed during daytime hours only (8:00 a.m. to 8:00 p.m.), noise levels associated with car wash operations would be subject to the County's daytime noise level standards only.

As indicated in Table 3, car wash drying assembly noise level exposure at the common outdoor area of the adjacent multi-family residential use is predicted to satisfy the applicable Sacramento County daytime median (L_{50}) noise level standard, including attenuation that would be provided by the proposed 8-foot-tall property line noise barrier. As a result, provided that the project design includes the construction of an 8-foot-tall solid masonry wall at the location illustrated on Figure 2 (as proposed), no further consideration of car wash drying assembly noise mitigation measures would be warranted for the project.

On-Site Delivery Truck Circulation

It is the experience of BAC that deliveries of product to convenience stores such as the one proposed by the project occur at the front of the store with medium-duty vendor trucks/vans. However, the project will also receive deliveries from heavy fueling trucks for the purposes of refiling the underground fuel storage tanks.

On-site truck passbys are expected to be relatively brief and will occur at low speeds. To quantify noise levels generated by on-site truck circulation, BAC utilized file data obtained from measurements conducted by BAC of heavy and medium duty truck passbys. According to BAC file data, single-event heavy and medium truck passbys have SEL's (Sound Exposure Levels) of approximately 83 and 76 dB (respectively) at a distance of 50 feet.

For the purposes of this analysis, it was assumed that 1 heavy fueling truck and 2 medium duty trucks could have store deliveries during the same worst-case hour. Based on a conservative 1 heavy fueling truck and 2 medium duty truck and trips per hour, and SEL's of 83 and 76 dB SEL per passby, the combined hourly average noise level generated by project delivery truck circulation computes to 49 dB L_{eq} at a reference distance of 50 feet from the passby route during the worst-case hour of deliveries. The median (L_{50}) delivery truck passby noise level would be approximately 5 dB less than hourly average noise level (44 dB L_{50}). Assuming standard spherical spreading loss (-6 dB per doubling of distance), on-site delivery truck circulation noise exposure at the common outdoor space of the adjacent multi-family residential development (pool area) was calculated and the results of those calculations are presented in Table 4.

The results presented in Table 4 include consideration of attenuation that would be provided by the proposed construction of an 8-foot-tall CMU sound wall at the location illustrated on Figure 2. A barrier insertion loss calculation worksheet is provided as Appendix F-2.

Table 4
Predicted On-Site Delivery Truck Noise Levels at Adjacent Residential Use

Location (APN)	Distance from Truck Route (ft)[1]	Predicted Noise Level, L_{50} (dB)		County Noise Level Standards, L_{50} (dB)	
		No Wall	With 8' Wall[2]	Daytime	Nighttime
051-0180-026 (Pool Area)	140	35	30	55	50

[1] Distance scaled from nearest on-site truck circulation route to the pool area on APN: 051-0180-026 using the provided site plans (dated 2/15/22) and the Sacramento County Assessor Parcel Viewer measurement tool.
[2] Predicted noise level includes consideration of attenuation that would be provided by the proposed construction of an 8-foot-tall CMU sound wall at the location illustrated on Figure 2. A barrier insertion loss calculation worksheet is provided as Appendix F-2.
Source: Bollard Acoustical Consultants, Inc. (2022)

Because the gas station and convenience store are proposed to have 24-hour operations, and because it is possible that truck deliveries could occur during both daytime and nighttime hours, noise levels associated with on-site truck circulation would be subject to the County's daytime and nighttime noise level standards.

The Table 4 data indicate that on-site delivery truck circulation noise level exposure at the common outdoor area of the adjacent multi-family residential use is predicted to satisfy the applicable Sacramento County daytime and nighttime median (L_{50}) noise level standards, including attenuation that would be provided by the proposed 8-foot-tall property line noise barrier. As a result, no further consideration of on-site delivery truck circulation noise mitigation measures would be warranted for the project.

On-Site Passenger Vehicle Circulation

The FHWA Traffic Noise Prediction Model (FHWA-RD-77-108) was utilized to quantify on-site traffic circulation noise generated at the project site. The project site plan indicates that vehicles can access the project site via Stockton Boulevard on the west end, or from Gerber Road on the south end. The drive aisle proposed nearest to the common outdoor area of the adjacent multi-family residential development is located on the west end of the project site parallel to Stockton Boulevard.

According to the site plan shown in Figure 2, the project proposes 10 fuel dispensers (5 fueling islands) and 12 parking spaces. Assuming each vehicle spends five minutes in each parking stall or fuel dispenser, this would result in a total of approximately 265 vehicle trips to and from the site per hour at maximum capacity (considered to be worst-case). Conservatively assuming that 50% of the vehicles would use the drive aisle accessed off Stockton Boulevard, a total of 133 passbys would occur. For the purposes of this analysis, it was conservatively assumed that a total of 150 vehicle passbys could occur in the drive aisle nearest to the common outdoor area of the adjacent residential use (off Stockton Boulevard) during a worst-case busy hour.

Based on the assumptions above, and assuming a drive aisle vehicle speed of less than 25 mph, project on-site traffic circulation noise exposure at the common outdoor space of the

adjacent multi-family residential development (pool area) was calculated and the results of those calculations are presented in Table 5.

The results presented in Table 5 include consideration of attenuation that would be provided by the proposed construction of an 8-foot-tall CMU sound wall at the location illustrated on Figure 2. A barrier insertion loss calculation worksheet is provided as Appendix F-3.

Table 5
Predicted

Predicted Worst-Case On-Site Vehicle Circulation Noise Levels at Adjacent Residential Use

Location (APN)	Distance from Nearest Drive Aisle (ft)[1]	Predicted Noise Level, L_{50} (dB)		County Noise Level Standards, L_{50} (dB)	
		No Wall	With 8' Wall[2]	Daytime	Nighttime
051-0180-026 (Pool Area)	140	42	35	55	50

[1] Distance scaled from nearest on-site drive aisle to the pool area on APN: 051-0180-026 using the provided site plans (dated 2/15/22) and the Sacramento County Assessor Parcel Viewer measurement tool.

[2] Predicted noise level includes consideration of attenuation that would be provided by the proposed construction of an 8-foot-tall CMU sound wall at the location illustrated on Figure 2. A barrier insertion loss calculation worksheet is provided as Appendix F-3.

Source: Bollard Acoustical Consultants, Inc. (2022)

Because the gas station and convenience store are proposed to have 24-hour operations, noise levels associated with on-site vehicle circulation would be subject to the County's daytime and nighttime noise level standards.

As indicated in Table 5, worst-case on-site passenger vehicle circulation noise level exposure at the common outdoor area of the adjacent multi-family residential use is predicted to satisfy the applicable Sacramento County daytime and nighttime median noise level standards, including shielding that would be provided by the proposed construction of an 8-foot-tall property line noise barrier. It should be noted that project on-site vehicle circulation during nighttime hours is expected to be significantly lower than that occurring during daytime hours. Nonetheless, based on the results from the analysis provided above, no further consideration of on-site vehicle circulation noise mitigation measures would be warranted for the project.

Conclusions

Noise levels generated by operations at the proposed 76 gas station/convenience store and car wash are predicted to comply with the applicable Sacramento County daytime and nighttime noise level standards at the nearest residential use. The predicted compliance includes consideration of attenuation that would be provided by the proposed construction of an 8-foot-tall CMU sound wall (property line noise barrier), as indicated in the site plan (Figure 2). Provided that the project design includes the construction of the 8-foot-tall noise barrier as proposed, no further consideration of noise mitigation measures would be warranted for this project.

These conclusions are based on the site plan shown in Figure 2, equipment manufacturer's reference noise level data, project operations assumptions, and on BAC reference noise level measurements. Deviations from the resources cited herein could cause actual noise levels to differ from those predicted in this assessment.

This concludes BAC's noise assessment for the proposed 76 Gas Station and Car Wash project in Sacramento County, California. Please contact us at (530) 537-2328 or info@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.

IIC Impact Insulation Class (IIC): A single-number representation of a floor/ceiling partition's impact generated noise insulation performance. The field-measured version of this number is the FIIC.

L_{dn} Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.

L_{eq} Equivalent or energy-averaged sound level.

L_{max} 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.

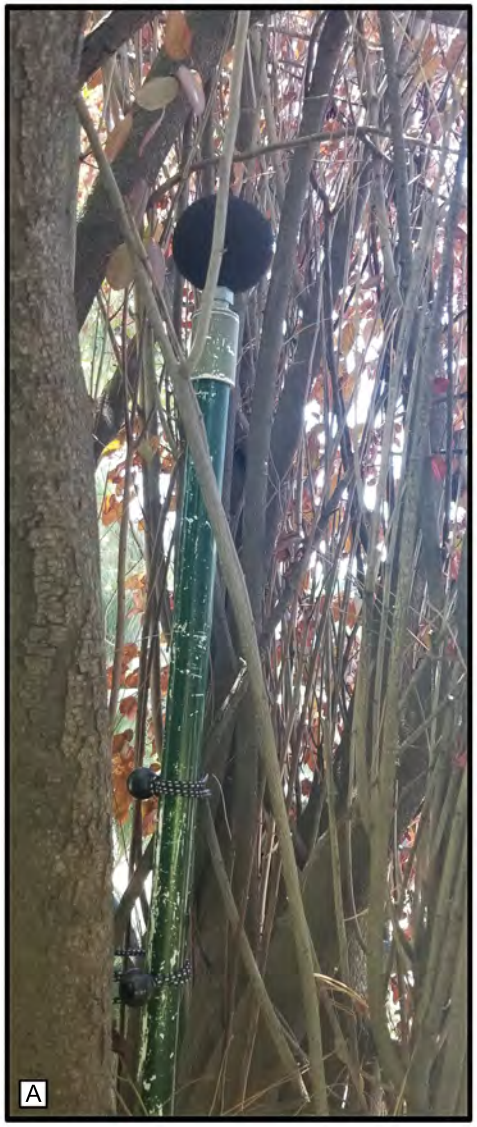
Masking The amount (or the process) by which the threshold of audibility is for one sound is raised by the presence of another (masking) sound.

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.

STC Sound Transmission Class (STC): A single-number representation of a partition's noise insulation performance. This number is based on laboratory-measured, 16-band (1/3-octave) transmission loss (TL) data of the subject partition. The field-measured version of this number is the FSTC.



Legend

- A LT-1: Southeast of project site
- B ST-1: North of project site
- C Facing southeast towards site LT-1 & Gerber Rd
- D Facing north towards site ST-1

76 Gas Station & Car Wash
Sacramento County, California

Photographs of Noise Survey Locations

Appendix B

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Appendix C-1
Ambient Noise Monitoring Results - Site LT-1
76 Gas Station & Car Wash - Sacramento County, California
Wednesday, July 29, 2020

Hour	Leq	Lmax	L50	L90
12:00 AM	62	84	56	49
1:00 AM	61	77	55	48
2:00 AM	62	82	54	47
3:00 AM	64	85	57	49
4:00 AM	66	86	60	53
5:00 AM	67	79	64	57
6:00 AM	70	92	65	59
7:00 AM	68	85	66	60
8:00 AM	69	85	67	61
9:00 AM	69	85	67	60
10:00 AM	71	93	67	60
11:00 AM	69	84	67	61
12:00 PM	69	86	66	60
1:00 PM	69	89	67	61
2:00 PM	70	85	67	62
3:00 PM	70	95	66	61
4:00 PM	69	89	66	61
5:00 PM	69	88	67	61
6:00 PM	69	85	66	61
7:00 PM	68	91	66	61
8:00 PM	69	93	65	58
9:00 PM	70	96	63	57
10:00 PM	68	90	62	55
11:00 PM	64	77	60	53

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	71	68	69	70	61	66
Lmax (Maximum)	96	84	88	92	77	83
L50 (Median)	67	63	66	65	54	59
L90 (Background)	62	57	60	59	47	52

Computed DNL, dB	73
% Daytime Energy	80%
% Nighttime Energy	20%

GPS Coordinates	38°28'54.52" N
	121°25'17.42" W

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Appendix C-2
Ambient Noise Monitoring Results - Site LT-1
76 Gas Station & Car Wash - Sacramento County, California
Thursday, July 30, 2020

Hour	Leq	Lmax	L50	L90
12:00 AM	62	78	57	50
1:00 AM	61	80	54	49
2:00 AM	61	79	53	48
3:00 AM	63	80	57	50
4:00 AM	65	79	60	52
5:00 AM	67	83	64	56
6:00 AM	68	82	65	59
7:00 AM	69	87	67	60
8:00 AM	68	84	66	60
9:00 AM	68	86	66	60
10:00 AM	69	88	66	60
11:00 AM	68	85	66	60
12:00 PM	71	95	66	61
1:00 PM	70	90	67	62
2:00 PM	70	92	66	61
3:00 PM	73	104	67	62
4:00 PM	69	88	67	61
5:00 PM	70	92	67	62
6:00 PM	70	93	66	61
7:00 PM	69	93	66	60
8:00 PM	68	91	64	58
9:00 PM	66	82	63	57
10:00 PM	66	87	62	56
11:00 PM	64	80	60	53

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	73	66	70	68	61	65
Lmax (Maximum)	104	82	90	87	78	81
L50 (Median)	67	63	66	65	53	59
L90 (Background)	62	57	60	59	48	53

Computed DNL, dB	72
% Daytime Energy	84%
% Nighttime Energy	16%

GPS Coordinates	38°28'54.52" N
	121°25'17.42" W

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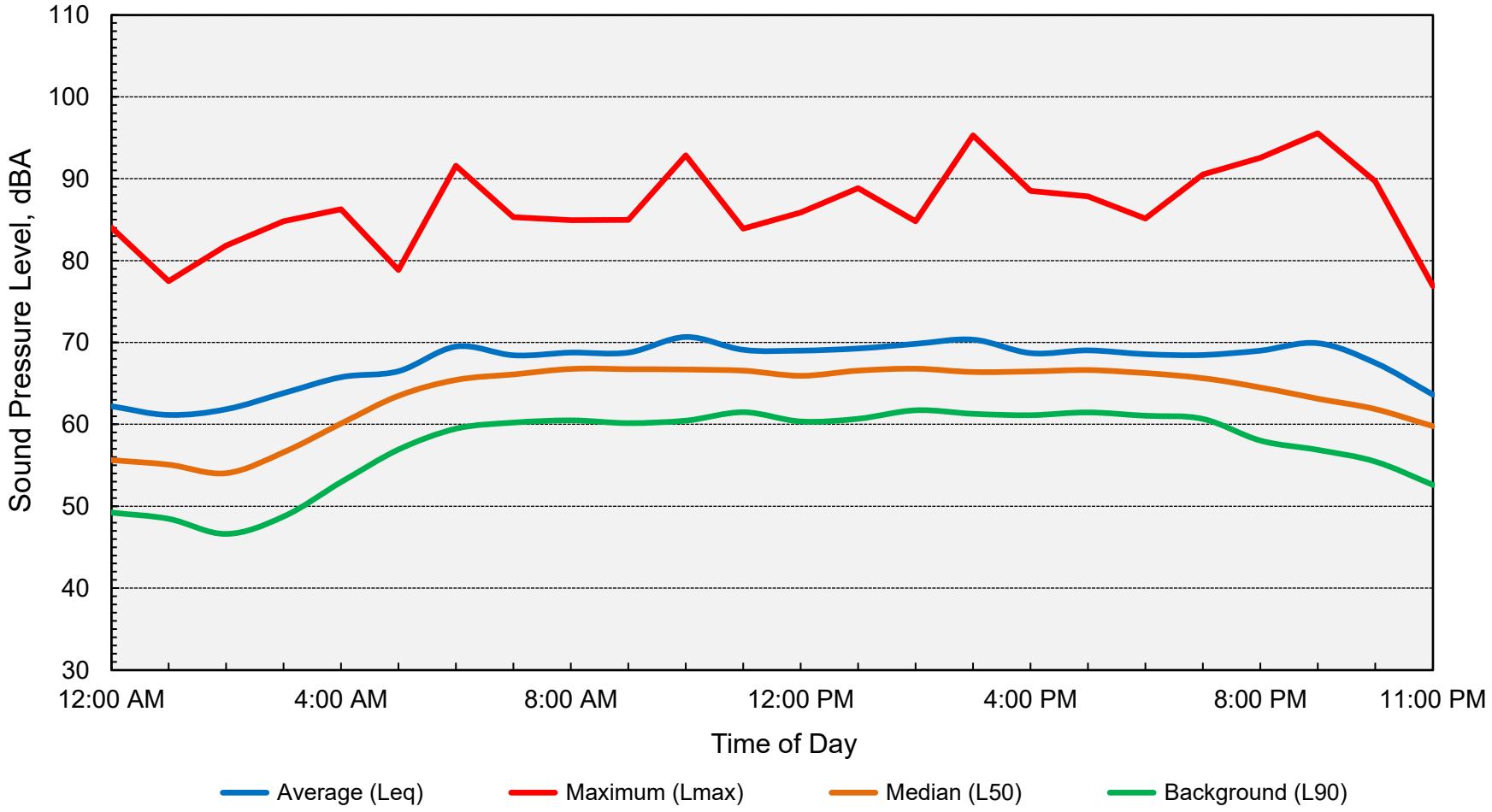
Appendix D-1
Ambient Noise Monitoring Results - Site LT-1
76 Gas Station & Car Wash - Sacramento County, California
Wednesday, July 29, 2020



Computed DNL = 73 dB

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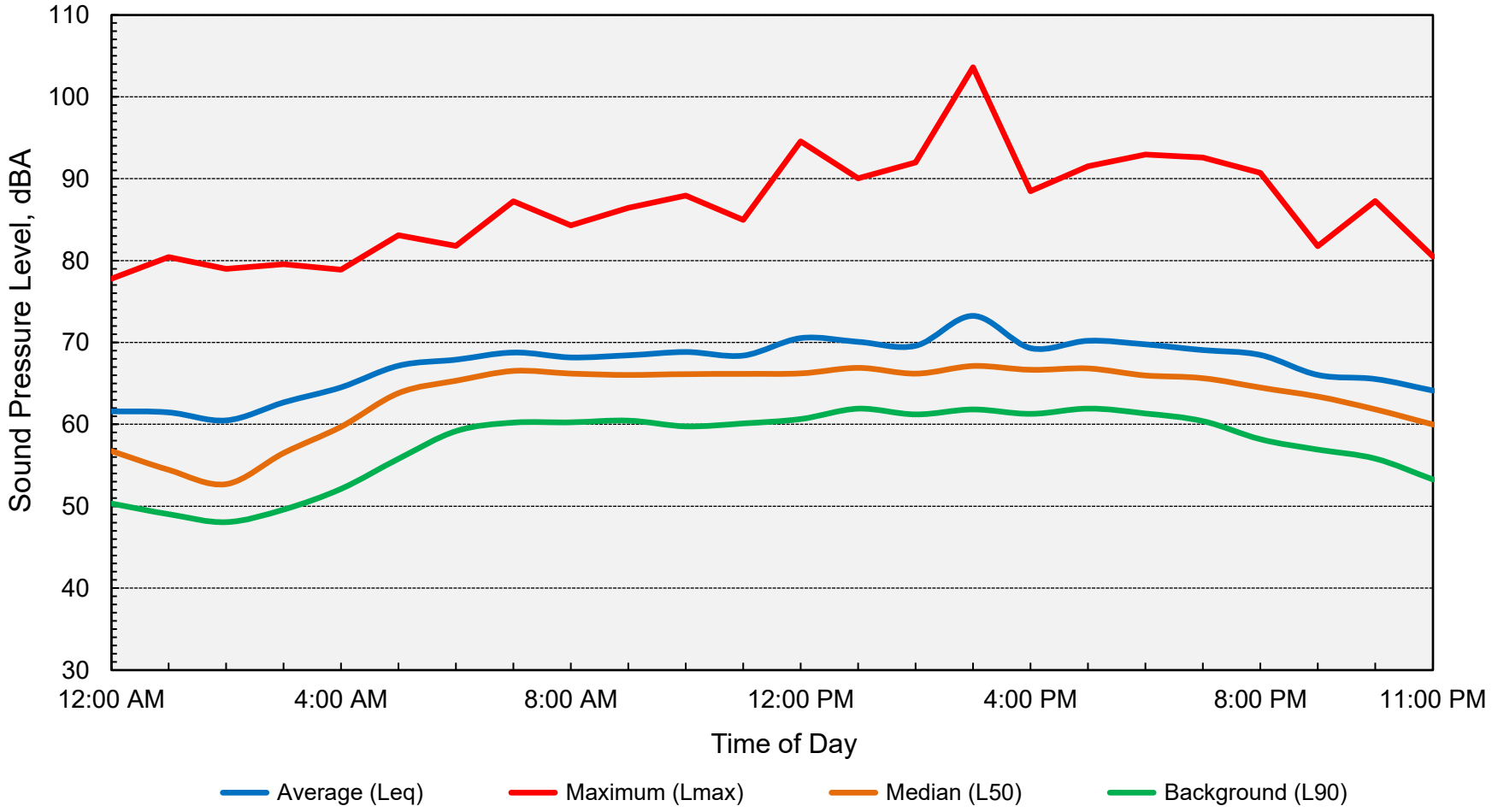
Appendix D-2
Ambient Noise Monitoring Results - Site LT-1
76 Gas Station & Car Wash - Sacramento County, California
Thursday, July 30, 2020



Computed DNL = 72 dB

BOLLARD
Acoustical Consultants

Appendix E

premier
Touchless Drying System

DECIBEL READINGS / LEVELS: ALL READINGS MAY VARY WITH BAY TYPES, SURROUNDINGS AND VARIABLE TYPES OF CONSTRUCTIONS.

DISTANCE FROM BAY:	30HP EXIT DOOR CLOSED	30HP EXIT DOOR OPEN	60 HP (4-15HP, 2-TRUNKS)
10FT.	76	89	95
20FT.	72	87	89
30FT.	70	82	84
40FT.	66	78	79
50FT.	66	78	78
60FT.	64	75	76

*DECIBEL LEVELS MAY DROP 4 TO 5 DBA'S OR MORE WITH FULL COVER SURROUNDS OR SILENCER CONES. READINGS MAY VARY.

*THESE READINGS WERE CONCLUDED WITH PREMIER PLASTIC HOUSINGS. ALUMINUM HOUSINGS ARE ON THE AVERAGE OF 6 TO 8 DECIBELS LOUDER.

Appendix F-1
Barrier Insertion Loss Calculation

Project Information:

Job Number: 2020-125
Project Name: 76 Gas Station and Car Wash
Location: Sacramento County, CA

Noise Level Data:

Source Description: Car Wash Dryers
Source Noise Level, L50 (dBA): 59
Source Frequency (Hz): 500
Source Height (ft): 8

Site Geometry:

Receiver Description: APN: 051-0180-026 - Pool Area
Source to Barrier Distance (C_1): 25
Barrier to Receiver Distance (C_2): 75

Pad/Ground Elevation at Receiver: 0
Receiver Elevation: 5
Base of Barrier Elevation: 0
Starting Barrier Height 8

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
8	8	-5.1	53.9	Yes
9	9	-5.7	53.3	Yes
10	10	-6.6	52.4	Yes
11	11	-7.6	51.4	Yes
12	12	-8.6	50.4	Yes
13	13	-9.6	49.4	Yes
14	14	-10.3	48.7	Yes
15	15	-11.1	47.9	Yes
16	16	-11.7	47.3	Yes
17	17	-12.6	46.4	Yes
18	18	-13.2	45.8	Yes

Notes: 1. Standard receiver elevation is five (5) feet above grade/pad elevations at the receiver location(s).

Appendix F-2
Barrier Insertion Loss Calculation

Project Information:

Job Number: 2020-125
Project Name: 76 Gas Station and Car Wash
Location: Sacramento County, CA

Noise Level Data:

Source Description: On-Site Truck Circulation
Source Noise Level, L50 (dBA): 35
Source Frequency (Hz): 500
Source Height (ft): 8

Site Geometry:

Receiver Description: APN: 051-0180-026 - Pool Area
Source to Barrier Distance (C_1): 50
Barrier to Receiver Distance (C_2): 90

Pad/Ground Elevation at Receiver: 0
Receiver Elevation: 5
Base of Barrier Elevation: 0
Starting Barrier Height 8

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
8	8	-5.1	29.9	Yes
9	9	-5.5	29.5	Yes
10	10	-6.2	28.8	Yes
11	11	-6.9	28.1	Yes
12	12	-7.7	27.3	Yes
13	13	-8.5	26.5	Yes
14	14	-9.2	25.8	Yes
15	15	-9.9	25.1	Yes
16	16	-10.5	24.5	Yes
17	17	-10.9	24.1	Yes
18	18	-11.5	23.5	Yes

Notes: 1. Standard receiver elevation is five (5) feet above grade/pad elevations at the receiver location(s).

Appendix F-3
Barrier Insertion Loss Calculation

Project Information:

Job Number: 2020-125
Project Name: 76 Gas Station and Car Wash
Location: Sacramento County, CA

Noise Level Data:

Source Description: On-Site Passenger Vehicle Circulation
Source Noise Level, L50 (dBA): 42
Source Frequency (Hz): 500
Source Height (ft): 5

Site Geometry:

Receiver Description: APN: 051-0180-026 - Pool Area
Source to Barrier Distance (C_1): 50
Barrier to Receiver Distance (C_2): 90

Pad/Ground Elevation at Receiver: 0
Receiver Elevation: 5
Base of Barrier Elevation: 0
Starting Barrier Height 8

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
8	8	-6.2	35.3	Yes
9	9	-6.9	34.6	Yes
10	10	-7.7	33.8	Yes
11	11	-8.4	33.1	Yes
12	12	-9.2	32.3	Yes
13	13	-9.9	31.6	Yes
14	14	-10.5	31.0	Yes
15	15	-10.9	30.6	Yes
16	16	-11.5	30.0	Yes
17	17	-12.1	29.4	Yes
18	18	-12.8	28.7	Yes

Notes: 1. Standard receiver elevation is five (5) feet above grade/pad elevations at the receiver location(s).