

**ACOUSTICAL ANALYSIS
QUICK N CLEAN CAR WASH
VAN BUREN BOULEVARD AND JURUPA AVENUE
RIVERSIDE, CALIFORNIA**

WJVA Project No. 17-029

PREPARED FOR

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**AUGUST 17, 2017
(revised March 18, 2019)**

INTRODUCTION

The project is a proposed car wash facility to be located along the northwest corner of Van Buren Boulevard and Jurupa Avenue, in Riverside, California. A water treatment facility is located northeast of the project site, existing office space land uses are located east and southeast of the project site. Existing residential land uses are located west and southwest of the project site.

This report is based upon the project site plan dated January 13, 2017, noise measurements obtained by WJV Acoustics, Inc. (WJVA) at the project site, reference noise measurements obtained at existing car wash facilities and information provided to WJVA by the project applicant concerning the proposed equipment and hours of operation of the car wash. Revisions to the site plan or other project-related information available to WJVA at the time the analysis was prepared may require a reevaluation of the findings and/or recommendations of the report. The Project Site Plan is provided as Figure 1.

Appendix A provides definitions of the acoustical terminology used in this report. Unless otherwise stated, all sound levels reported in this analysis are A-weighted sound pressure levels in decibels (dB). A-weighting de-emphasizes the very low and very high frequencies of sound in a manner similar to the human ear. Most community noise standards utilize A-weighted sound levels, as they correlate well with public reaction to noise. Appendix B provides examples of typical sound levels.

CRITERIA FOR ACCEPTABLE NOISE EXPOSURE

Objective N-1 of The City of Riverside Noise Element of the General Plan (noise element) seeks to *“minimize noise levels from point sources throughout the community and, wherever possible, mitigate the effects of noise to provide a safe and healthful environment.”*

Policy N-1.2 of the noise element states *“Require the inclusion of noise-reducing design features in development consistent with standards in Figure N-10 (Noise/Land Use Compatibility Criteria), Title 24 California Code of Regulations and Title 7 of the Municipal Code.”*

Title 7 (Noise Control) of the City of Riverside Municipal Code (hereafter referred to as Noise Ordinance) addresses the statistical distribution of noise over time and allows for progressively shorter periods of exposure to levels of increasing loudness. Table I summarizes the exterior noise level standards of the ordinance for residential land uses, for non-transportation (point source) noise sources. The City’s exterior noise level standards for Office/Commercial land uses is increased by 10 dB for each statistical category described in Table I. The ordinance is to be applied during any one-hour time period of the day or night and the standards are 10 dB more restrictive during the nighttime hours of 10:00 p.m. to 7:00 a.m.

The standards of the noise ordinance may be adjusted upward (made less restrictive) if existing ambient noise levels without the source of concern already exceed the noise ordinance standards. The ordinance states *“If the measured ambient noise level exceeds that permissible within any of the first four noise limit categories, the allowable noise exposure standard shall be increased in five decibel increments in each category as appropriate to encompass the ambient noise level.”*

<p style="text-align: center;">TABLE I</p> <p style="text-align: center;">RESIDENTIAL LAND USES</p> <p style="text-align: center;">EXTERIOR NOISE LEVEL STANDARDS, DBA</p> <p style="text-align: center;">CITY OF RIVERSIDE NOISE ORDINANCE</p>			
Category	Cumulative # Min/Hr. (L_n)¹	Daytime (7 am-10 pm)	Nighttime (10 pm-7 am)
1	30 (L ₅₀)	55	45
2	15 (L ₂₅)	60	50
3	5 (L _{8.3})	65	55
4	1 (L _{1.7})	70	60
<p>¹In layman’s terms, the noise level standards shown may not be exceeded for more than the specified number of minutes within any one-hour time period. The L_n value shown in parenthesis indicates the percent of the time during an hour that a particular noise level may not be exceeded. For example, the L₅₀ represents 50% of the hour, or 30 minutes.</p> <p>Source: City of Riverside Municipal Ordinance Code</p>			

EXISTING NOISE ENVIRONMENT

The project site is currently an undeveloped lot, located along the northwest corner of Van Buren Boulevard and Jurupa Avenue, in Riverside, California. A water treatment facility is located northeast of the project site, existing office space land uses are located east and southeast of the project site. Existing residential land uses are located west and southwest of the project site. Existing noise levels within the project vicinity are dominated by vehicle traffic noise associated with roadways adjacent to the project site.

WJVA staff conducted background (ambient) noise level measurements at three (3) locations within the project vicinity on August 15, 2017 using an automated sound level meter. Two of the ambient noise monitoring sites were located at the exterior of the closest residential land uses (single-family residences) located approximately 700 feet west of the project site and a third ambient noise monitoring site was located near the northwest corner of the intersection of Van Buren Boulevard and Jurupa Avenue, within the project site. The locations of the ambient noise monitoring sites are provided on Figure 2.

Ambient noise monitoring equipment consisted of a Larson-Davis Laboratories Model LDL 820 sound level analyzer equipped with a Bruel & Kjaer (B&K) Type 4176 ½" microphone. The monitor was calibrated with a B&K Type 4230 acoustical calibrator to ensure the accuracy of the measurements. The equipment complies with applicable specifications of the American National Standards Institute (ANSI) for Type 1 (precision) sound level meters.

The noise measurement data included energy average (L_{eq}) maximum (L_{max}) as well as five individual statistical parameters. Observations were made of the dominant noise sources affecting the measurements. The statistical parameters describe the percent of time a noise level was exceeded during the measurement period (and reflect the City of Riverside noise level standards described in Table I). For instance, the L_{90} describes the noise level exceeded 90 percent of the time during the measurement period, and is generally considered to represent the residual (or background) noise level in the absence of identifiable single noise events from traffic, aircraft and other local noise sources. Two (2) individual measurements were taken at each of the three measurement sites to quantify ambient noise levels in the morning and afternoon hours. Table II summarizes noise measurement results.

<p style="text-align: center;">TABLE II</p> <p style="text-align: center;">SUMMARY OF SHORT-TERM NOISE MEASUREMENT DATA</p> <p style="text-align: center;">VAN BUREN BLVD AND JURUPA AVE, RIVERSIDE</p> <p style="text-align: center;">AUGUST 15, 2017</p>									
Site	Time	A-Weighted Decibels, dBA							Sources
		L _{eq}	L _{max}	L ₂	L ₈	L ₂₅	L ₅₀	L ₉₀	
Site 1	9:17 a.m.	65.5	82.5	76.6	67.6	62.8	57.0	47.8	TR, V
Site 1	3:12 p.m.	66.7	84.1	75.2	68.0	63.7	58.3	48.2	TR, V, D
Site 2	9:40 a.m.	52.9	68.4	59.9	55.0	52.5	51.2	49.1	TR, L
Site 2	3:38 p.m.	56.8	82.1	64.9	59.7	56.0	53.5	51.0	TR, V
Site 3	10:04 a.m.	70.1	89.4	77.0	72.3	69.2	67.2	62.1	TR,
Site 3	4:17 p.m.	72.1	87.1	78.4	75.7	71.6	68.8	64.0	TR, AC
TR: Traffic AC: Aircraft V: Voices L: Landscaping Activities D: Dogs Barking, Source: WJV Acoustics, Inc.									

The dominant source of noise at all three measurement sites was traffic related to vehicles on Van Buren Boulevard and Jurupa Avenue. Reference to Table II indicates that existing ambient noise levels at all three measurements sites exceeded the City standards in nearly every statistical category during each of the six individual measurements.

PROJECT-RELATED NOISE LEVELS

In order to obtain representative noise level data for the car wash project, WJVA measured noise levels at an existing similar car wash facility located at 68279 East Palm Canyon Drive, in Cathedral City, California, on May 17, 2017. According to the project applicant the equipment used at the Cathedral City Facility is the same that will be utilized at the proposed Riverside location. The equipment consists of a Peco Wash and Dryer System. While car wash noise levels are audible from both sides of the tunnel, the loudest noise levels are associated with the dryer blower activities at the tunnel exit. For this analysis it was assumed that hours of operation would be 7:00 a.m. to 10:00 p.m.

Reference noise measurements were obtained at a distance of approximately 40 feet from the car wash tunnel exit, at the above-described Cathedral City Facility location. At a distance of 40 feet from the exit tunnel noise levels were observed to be in the range of 79-82 dBA, while the blowers were in full operation. Additionally, car wash noise levels at the tunnel entrance were observed to be in the range of 71-74 dB at a distance of 40 feet from the tunnel entrance. Noise levels in this range would only occur on the project site, at the distances described above. These noise levels were used to calculate project-related noise levels at off-site noise-sensitive receiver locations.

The project will also include a self-vacuum kiosk utilizing a central vacuum system. The make and model of the central vacuum system was not known at the time this analysis was prepared. However, WJVA staff has previously conducted noise level measurements at numerous car wash facilities utilizing central vacuum systems, and have measured vacuum associated noise levels to be in the range of 45-57 dBA at a distance of 25 feet from the vacuum system(s).

During peak hours of operation, the blowers do not cycle off, and remain in use for ongoing periods of time. Additionally, the central vacuum system utilized at the car wash facility remains on during all hours of operation. Noise levels generated by the blowers would be constant during peak hours of operation. Therefore, noise levels described above would correlate to the applicable L_{50} (30 minutes per hour) noise level standards established in the City's Noise Ordinance.

There are existing single-family residential land uses located to the west of the project site, approximately 800 feet from the proposed tunnel entrance and approximately 900 feet from the proposed tunnel exit, the loudest noise levels associated with the proposed car wash facility. However, the tunnel is oriented in a northwest/southeast direction, with the tunnel exit facing toward the southeast and the tunnel entrance facing toward the northwest. This alignment of the tunnel will result in acoustical shielding (provided by the tunnel walls) at the nearby residential land uses.

The above described measured reference noise levels and acoustical shielding provided by the tunnel were used to calculate project-related noise levels at the closest residential land uses. Additionally, project-related noise levels were calculated for the office land uses located to the

east. For the calculations, it was assumed that sound is attenuated with increasing distance at the normal rate for a “point” noise source (6 dB/doubling of distance).

During hours of peak operation, the closest residential land uses west of the proposed car wash tunnel would be exposed to noise levels of approximately 40-45 dB L₅₀ while Office land uses located east of the project would be exposed to noise levels of approximately 50-55 dB L₅₀. Such levels are below the applicable City of Riverside noise level standards. Additionally, these noise levels are below existing ambient noise levels at would likely not be audible above existing ambient noise levels at all nearby existing receiver locations. For the calculations, it was assumed that sound is attenuated with increasing distance at the normal rate for a “point” noise source (6 dB/doubling of distance).

It should be noted, the residential land uses located west of the project site are elevated approximately 20 feet above project site elevation. This topographic change would provide additional acoustic shielding and noise attenuation to the residences. This topographic shielding was not accounted for in the above-described noise level calculations, as such, noise levels described above should be considered a worst-case assessment of project-related noise levels at nearby receiver locations.

PROJECT COMPLIANCE

Exterior Noise Levels:

The City of Riverside Noise Ordinance has established an hourly L₅₀ standard of 55 dB, during the hours of 7:00 a.m. to 10:00 p.m. The project would not exceed these noise level standards, nor would it result in any increase of noise levels over existing (without project) ambient noise levels at nearby receiver locations. Additionally, noise levels associated with the vacuum kiosk would not be audible over existing ambient noise levels at the closest existing residential land uses. Further mitigation is not required.

CONCLUSIONS

The proposed Quick N Clean Car Wash to be located at the northwest corner of Van Buren Boulevard and Jurupa Avenue will comply with all applicable City of Riverside exterior and interior noise level requirements without the need for additional mitigation measures. It should be noted, while this analysis assumed hours of operation to be between 7:00 a.m. and 10:00 p.m., project related noise levels would not be expected to exceed any City of Riverside noise level standards if the project were to operate 24-hours per day.

The conclusions and recommendations of this acoustical analysis are based upon the best information known to WJV Acoustics Inc. (WJVA) at the time the analysis was prepared concerning the proposed site plan, project equipment and proposed hours of operation. Any significant changes in these factors will require a reevaluation of the findings of this report. Additionally, any significant future changes in car wash equipment, noise regulations or other factors beyond WJVA's control may result in long-term noise results different from those described by this analysis.

Respectfully submitted,

A handwritten signature in blue ink, appearing to read 'Walter J. Van Groningen', with a stylized flourish at the end.

Walter J. Van Groningen
President

WJV:wjv

FIGURE 1: PROJECT SITE PLAN

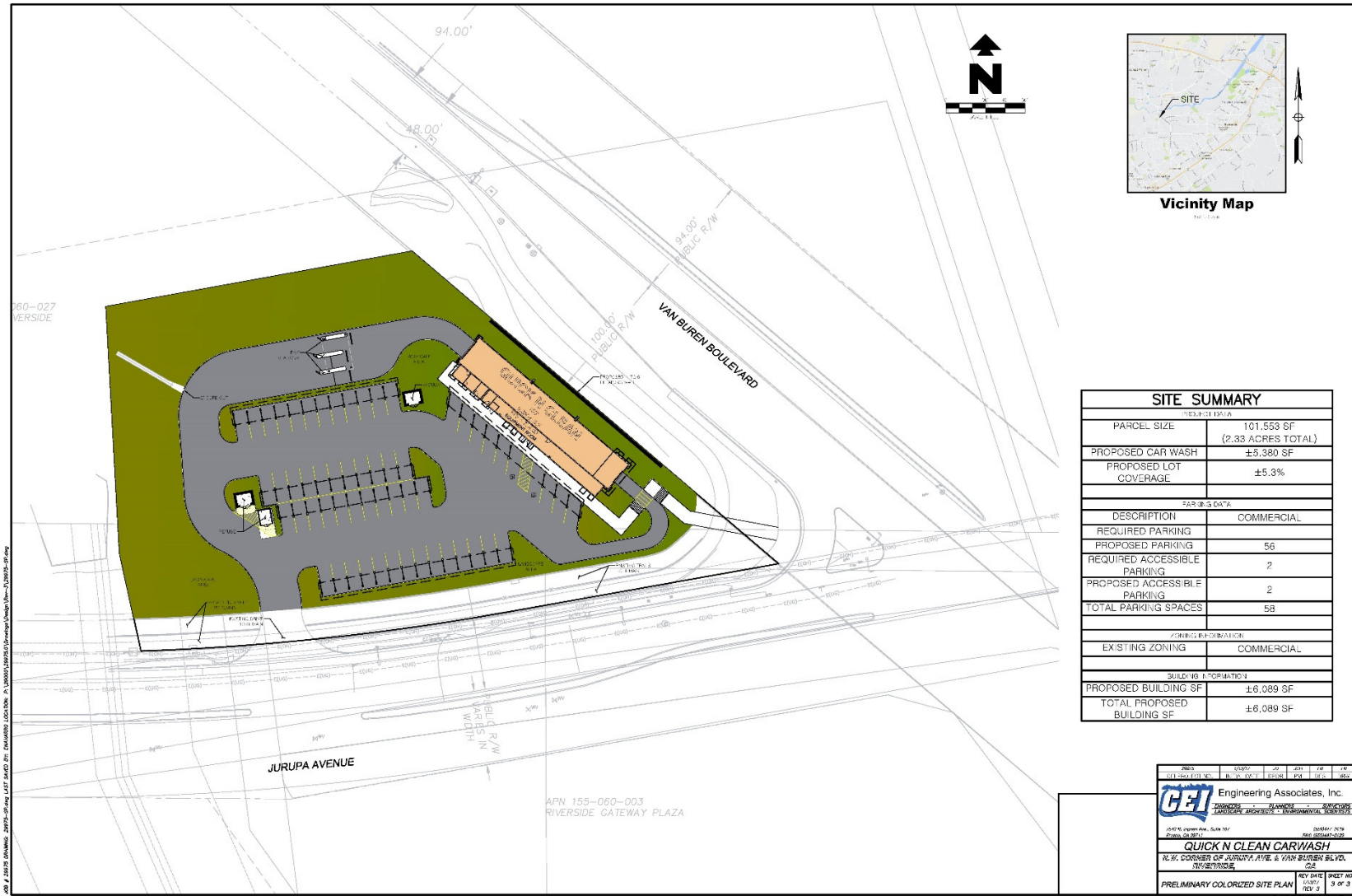


FIGURE 2: PROJECT VICINITY AND AMBIENT NOISE MONITORING LOCATIONS



APPENDIX A

ACOUSTICAL TERMINOLOGY

AMBIENT NOISE LEVEL:	The composite of noise from all sources near and far. In this context, the ambient noise level constitutes the normal or existing level of environmental noise at a given location.
CNEL:	Community Noise Equivalent Level. The average equivalent sound level during a 24-hour day, obtained after addition of approximately five decibels to sound levels in the evening from 7:00 p.m. to 10:00 p.m. and ten decibels to sound levels in the night before 7:00 a.m. and after 10:00 p.m.
DECIBEL, dB:	A unit for describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
LDN/L_{dn}:	Day/Night Average Sound Level. The average equivalent sound level during a 24-hour day, obtained after addition of ten decibels to sound levels in the night after 10:00 p.m. and before 7:00 a.m.
L_{eq}:	Equivalent Sound Level. The sound level containing the same total energy as a time varying signal over a given sample period. L_{eq} is typically computed over 1, 8 and 24-hour sample periods.
NOTE:	The CNEL and LDN represent daily levels of noise exposure averaged on an annual basis, while L_{eq} represents the average noise exposure for a shorter time period, typically one hour.
L_{max}:	The maximum noise level recorded during a noise event.
L_n:	The sound level exceeded "n" percent of the time during a sample interval (L_{90} , L_{50} , L_{10} , etc.). For example, L_{10} equals the level exceeded 10 percent of the time.

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ACOUSTICAL TERMINOLOGY

NOISE EXPOSURE CONTOURS:

Lines drawn about a noise source indicating constant levels of noise exposure. CNEL and LDN contours are frequently utilized to describe community exposure to noise.

NOISE LEVEL REDUCTION (NLR):

The noise reduction between indoor and outdoor environments or between two rooms that is the numerical difference, in decibels, of the average sound pressure levels in those areas or rooms. A measurement of “noise level reduction” combines the effect of the transmission loss performance of the structure plus the effect of acoustic absorption present in the receiving room.

SEL or SENEL:

Sound Exposure Level or Single Event Noise Exposure Level. The level of noise accumulated during a single noise event, such as an aircraft overflight, with reference to a duration of one second. More specifically, it is the time-integrated A-weighted squared sound pressure for a stated time interval or event, based on a reference pressure of 20 micropascals and a reference duration of one second.

SOUND LEVEL:

The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the response of the human ear and gives good correlation with subjective reactions to noise.

SOUND TRANSMISSION CLASS (STC):

The single-number rating of sound transmission loss for a construction element (window, door, etc.) over a frequency range where speech intelligibility largely occurs.

APPENDIX B EXAMPLES OF SOUND LEVELS

