



August 10, 2018

Mr. Mike Peters
Tahoe Donner Association
11509 Northwoods Blvd.
Truckee, CA 96161

Transmitted via email: Mpeters@tahoedonner.com

**Subject: Noise evaluation for events with amplified speech or music held within the Pavilion Tent at the Tahoe Donner Lodge in Truckee, California.
BAC Project #2018-128**

Dear Mr. Peters:

Pursuant to your request, Bollard Acoustical Consultants, Inc. (BAC) has conducted a site inspection and noise level measurements during an event simulation at the Tahoe Donner Association Pavilion tent located behind the Tahoe Donor Lodge. The purposes of BAC’s evaluation were to determine if amplified music sound levels generated during events held on the property were satisfactory relative to Town of Truckee noise standards at the nearby Tahoe Donner condominiums, to evaluate noise reduction measures which have already been implemented at this location, and if necessary, to develop noise attenuation strategies to further reduce event-generated sound levels at those nearby residences. This letter contains the results of our evaluation.

Town of Truckee Noise Standards

The Truckee Municipal Code provides performance standards for stationary noise sources, such as those proposed by the project. Section 18.44.040 of the Truckee Municipal Code is summarized below in Table 1:

Table 1				
Summary of Truckee Municipal Code Noise Level Criteria				
Exterior Noise Standards – Applied at Residential Uses				
Duration of Hour Sound Level Present (minutes)	Statistical Descriptor	Noise Level Standard (dBA)		
		Daytime (7 a.m.-10 p.m.)	Nighttime (10 p.m.-7 a.m.)	
30	L ₅₀	55	50	
15	L ₂₅	60	55	
5	L ₈	65	60	
1	L ₂	70	65	
0	L _{max}	75	70	

Source: Truckee Municipal Code: Title 18 – Development Code, Chapter 18.44, Noise, Table 3-7.
Each of the noise level standards specified above shall be reduced by five dB(A) for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises.

The Table 1 criteria which would be most applicable to this project would be the L_{max} and L_{50} standards. Because sound generated during events held at the Tahoe Donner Pavilion tent consist of amplified speech and music, the Table 1 standards are reduced by 5 dB. Because events held at this location reportedly conclude prior to 10 pm, only the daytime noise level standards would apply. In summary, the noise standards which would be most applicable at the nearest residences (condominiums) to this venue are as follows:

- L_{max} : 70 dBA
- L_{50} : 50 dBA

Attachment A contains definitions of acoustical terminology used in this report.

Noise Reduction Measures Recently Implemented at the Tahoe Donner Pavilion

According to Mr. Mike Peters, Tahoe Donner Association food and beverage director, since receiving concerns regarding sound levels generated during events at this location, several noise reduction measures have been implemented into this design and operation of this venue. Those measures include the following:

1. Replacement of the original pavilion tent with a new, heavier tent.
2. Reorienting the speakers during all events to the west, away from the nearest residences to the southeast (previously speakers were often oriented to the east, towards those residences).
3. Closing the flap on the south side of the pavilion tent once amplified music starts.
4. Monitoring of sound levels during events and requiring music levels to be maintained at reasonable levels.
5. Ensuring that all amplified music is concluded by 10 pm.

Event Simulation

To quantify the noise levels generated during typical events at the project site, BAC conducted short-term noise level measurements on Wednesday, July 25, 2018 during a wedding reception event simulation. The simulation consisted of playing digital recordings of typical music which of the type commonly played during a wedding reception using the Tahoe Donner Associations Pavilion Bose sound system. The sound system speakers were positioned where the event DJ would be positioned at events, with the speakers facing west. Attachment B shows the noise measurement locations. Attachment C shows photographs of the event simulation and noise measurement locations.

The sound system was set to produce sound levels slightly higher than what would typically be produced by amplified music playing at a typical wedding reception held at this location. The slightly higher amplification setting was used to provide a conservative assessment of sound propagation in the area during events. Specifically, the simulation utilized a reference music level of approximately 90 dBA L_{max} and 84 dB L_{50} at a distance of 40 feet directly in front of the speakers.

While the music was being played, short-term noise level measurements were conducted at 9 locations in the immediate vicinity of the pavilion tent, including 2 locations inside the tent (Sites 1 and 2).

A Larson Davis Laboratories Model 831 precision integrating sound level meter was used for the measurements. The meter was calibrated before use and placed on a tripod 5 feet above ground. Weather conditions were typical for the season, with no anomalous atmospheric conditions present which would have adversely affected the propagation of sound from the pavilion tent to the noise measurement locations.

Table 2 summarizes the noise level measurement results.

Table 2 Summary of Event Simulation Noise Measurement Results Tahoe Donner Pavilion – Town of Truckee, California				
Site	Description	L_{max}	L₅₀	Observations
1	In tent – 40 ft. in front of Speakers.	90	84	Reference position. Music levels high.
2	In tent – 40 ft. to side of speakers	79	76	Appreciable decrease in sound to the side of the speakers
3	50 ft. Southeast	61	58	South tent flap open
3	50 ft. Southeast	57	54	South tent flap closed
4	90 ft. Southeast – Nearest Condominium	52	50	Tent flap closed. Levels clearly audible but not loud.
5	140 ft. Southeast	48	45	Music still audible but low
6	75 ft. East	53	50	Music audible but below levels generated by nearby mechanical equipment
7	250 ft. Northeast	56	48	Music almost completely inaudible, traffic noise dominant.
8	200 ft. West – on golf course	57	54	Music plainly audible as speakers are facing the noise measurement site.
9	300 ft. Southwest – on golf course	56	52	Music plainly audible as speakers are facing the noise measurement site.
Notes:				
¹ Site measurement locations are shown on Attachment B.				
Source: Bollard Acoustical Consultants, Inc. (2016)				

Analysis and Conclusions

The results of the event simulation shown in Table 2 indicate that, even with reference levels slightly higher than typically occur during pavilion events, the measured sound levels at the nearest condominium registered 52 dB L_{max} and 50 dB L_{50} . These levels are considered satisfactory relative to the Town's 70 dB L_{max} and 50 dB L_{50} noise standards.

Based on the event simulation and BAC staff observations, this analysis concludes that the measures already implemented by the Tahoe Donner Association to reduce sound levels during pavilion events have resulted in a substantial decrease in sound levels at the nearest condominiums during those events. Provided event sound levels are maintained at approximately 85 dBA at a reference position directly in front of the speakers, sound levels at those nearest condominiums are expected to be satisfactory relative to Town of Truckee noise requirements. If, during events, Tahoe Donner Association staff observe that sound levels at those nearest condominiums appear to be higher than normal, sound levels should be decreased until median sound levels at those residences are reduced to at least 50 dBA.

This concludes BAC's assessment of sound generated during events held at the Tahoe Donner Association Pavilion tent in the Town of Truckee, California. Please contact Paul Bollard at (916) 663-0500 or paulb@bacnoise.com with any questions or requests for additional information.

Sincerely,

Bollard Acoustical Consultants, Inc.



Paul Bollard
President

Attachment 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.
RT₆₀	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.
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.

Attachment B
Noise Measurement Locations
Tahoe Donner Pavilion Event Simulation



Attachment C
Noise Measurement Location Photographs
Tahoe Donner Pavilion Event Simulation

