Appendix J

Bristol Curve Traffic Noise Study

ACOUSTICAL ANALYSIS

STEVENSON DRIVE REROUTING PROJECT
MONTEREY COUNTY, CALIFORNIA

PREPARED FOR

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INTRODUCTION

The Pebble Beach Company proposes to reroute Stevenson Drive to connect with Forest Lake Road. The project would eliminate the existing Bristol Curve roadway and establish a new roadway alignment to the south of Bristol Curve. The Bristol Curve alternative to the project would route traffic from Stevenson Drive to Forest Lake Road using the existing Bristol Curve alignment. It is the purpose of this analysis to assess potential project-related changes in traffic noise exposure at existing homes along the roadways of concern, and to determine if noise mitigation may be appropriate.

CRITERIA FOR NOISE IMPACT ASSESSMENT

The Monterey County Noise Element establishes an exterior noise level standard of 60 dB L_{dn} or below for residential areas. With regard to *changes* in noise levels due to a specific project, there are no clear guidelines from state or local agencies that may be applied. However, the following thresholds of significance have been previously applied to the assessment of potential noise impacts for projects within the Del Monte Forest, and have been accepted by Monterey County as being appropriate. A significant change in noise level is presumed to occur if:

a. The project will cause overall noise levels (including contributions from the project) at a noise-sensitive receiver to exceed 60 dB L_{dn}; or

b. The project will cause existing noise levels at a noise-sensitive receiver that are *less than 60 dB L_{dn}* to increase by 5 dB or more, <u>or</u> existing noise levels that are *greater than 60 dB L_{dn} but less than 65 dB L_{dn}* to increase by 3 dB or more, <u>or</u> existing noise levels that are *greater than 65 dB L_{dn}* to increase by 1.5 dB or more.

Appendix A provides a description of the acoustical terminology used in this report. Unless otherwise stated, all sound levels reported are in A-weighted 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-weighting, as it provides a high degree of correlation with human annoyance and health effects.

PROJECT SITE NOISE EXPOSURE

Noise levels from traffic on the existing and proposed Stevenson Drive alignments were calculated for existing conditions (existing alignment only) and for cumulative conditions with and without the project or the Bristol Curve alternative. Noise levels were calculated using the Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (FHWA-RD-77-108), traffic data obtained from the Pebble Beach Company's traffic consultant (Fehr & Peers Associates, Inc.) and the results of on-site traffic noise measurements.

The FHWA Model is the standard analytical method accepted by most state and local agencies, including Caltrans, for roadway traffic noise prediction. The FHWA Model is based upon reference energy emission levels for automobiles, medium trucks (2 axles)and heavy trucks (3 or more axles), with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site. The FHWA Model was developed to predict hourly L_{eq} values for free-flowing traffic condition, and is generally considered to be accurate within ±1.5 dB. The FHWA Model assumes a clear view of traffic with no shielding at the receiver location. To predict L_{dn} values, it is necessary to determine the hourly distribution of traffic for a typical day and adjust the traffic volume input data to yield an equivalent hourly traffic volume. The Calveno traffic noise emission curves have been employed in this analysis as recommended by Caltrans for the calculation of noise levels generated by California traffic.

Traffic noise level measurements and concurrent traffic counts were conducted on March 24, 2004 at the two locations shown in Figure 1. The measurement locations represent traffic noise exposure along the existing Stevenson Drive and Bristol Curve alignments in the project area. The measurement sites were located 50 feet from the center of the existing roadways and represent the approximate setback of existing homes closest to the roadways. The Stevenson Drive measurement site was located approximately 100 feet north of the intersection with Bristol Curve. The Bristol Curve site was located approximately 100 feet east of Silver Court.

The primary purpose of the traffic noise measurements was to check the accuracy of the FHWA Model in predicting traffic noise exposure for the conditions observed at the time of the measurements, taking into account site-specific conditions. It is assumed that if the FHWA Model accurately predicts traffic noise levels for observed traffic conditions, then the model may be relied upon to reasonably predict *annual average* traffic noise levels for projected future conditions and to provide a valid basis for comparing traffic noise levels with and without the project.

A secondary purpose of the noise measurements was to document existing background (or ambient) noise levels in the absence of vehicle passbys on Stevenson Drive or Bristol Curve. The measurements indicated that typical background noise levels were variable, and range from approximately 35 to 55 dBA. Background noise levels at the time of the study were caused by chirping birds, distant aircraft operations, landscape maintenance activities and occasional voices.

Table I compares measured L_{eq} values to those predicted by the FHWA Model for observed traffic conditions. Traffic speeds adjacent to the noise monitoring sites were observed to be approximately 35 mph on Stevenson Drive and approximately 25 mph on Bristol Curve. It is apparent from Table I that the FHWA Model provided an accurate assessment of existing traffic noise levels along Stevenson Drive. The number of vehicles observed during the sample period on Bristol Curve was too small to allow for a valid comparison of measured and predicted results. However, based upon the conditions observed, it may be assumed that the FHWA Model will provide a realistic assessment of noise exposure with and without the project along Bristol Curve.

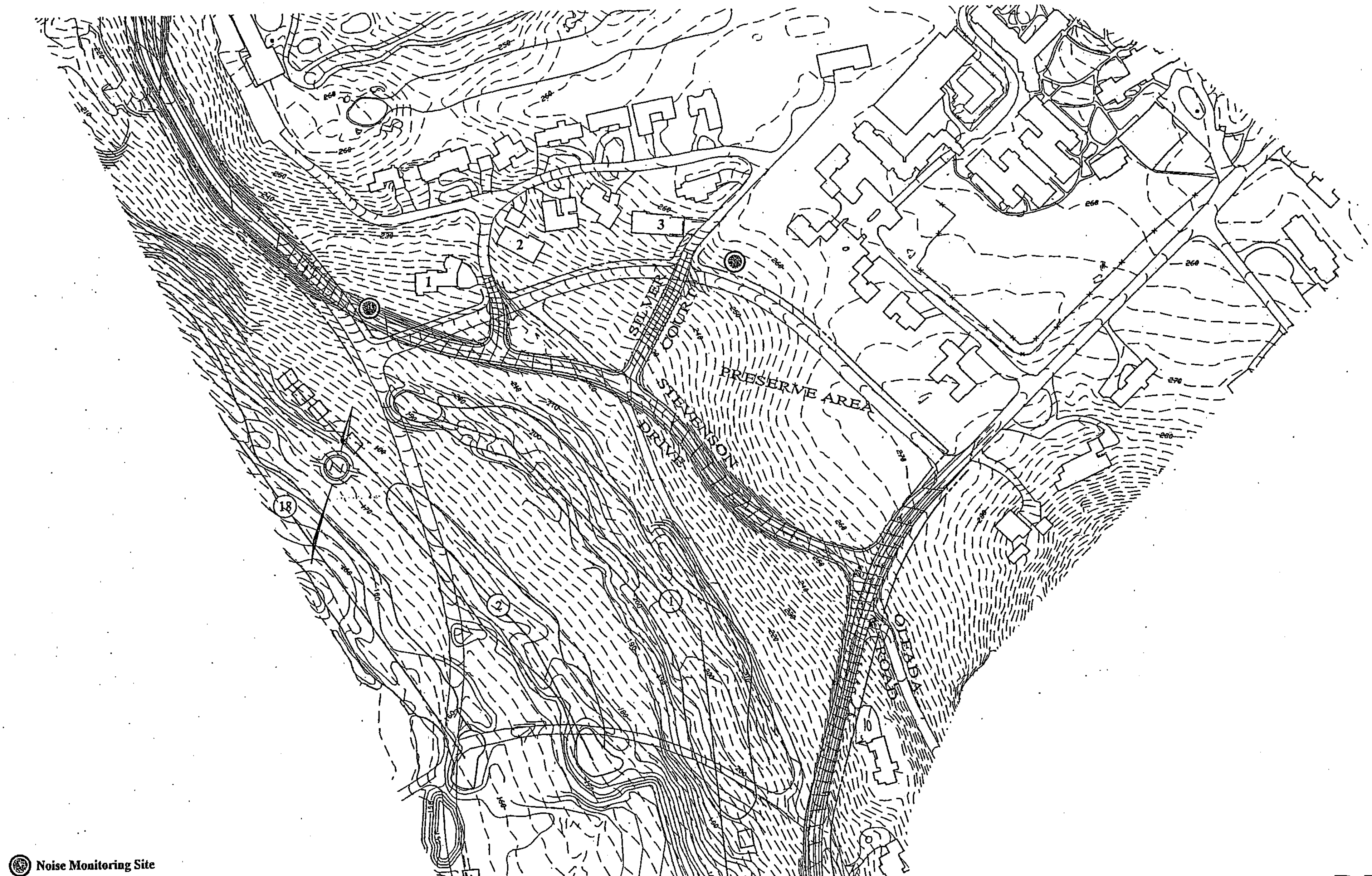

Figure 1: Project Area and Noise Monitoring Sites

TABLE I

COMPARISON OF MEASURED AND PREDICTED TRAFFIC NOISE LEVELS
MARCH 23, 2004

	Stevenson Drive	**Bristol Curve**
Time	3:00-4:00 p.m.	3:00-4:00 p.m.
Observed # Autos/Hr.	146	24
Observed # Medium Trucks/Hr.	9	0
Observed # Heavy Trucks/Hr.	2	1
Estimated Speed (mph)	35	25
Distance (from center of roadway)	50 ft.	50 ft.
L_{eq} (Measured)	57.7 dBA	51.8 dBA
L_{eq} (Predicted)[1]	57.7 dBA	49.2 dBA

[1]Predicted by the FHWA Model assuming an acoustically "soft" site.

Source: Brown-Buntin Associates, Inc.

Estimates of peak hour traffic volumes, truck mix and the day/night distribution of traffic were obtained for existing conditions and for cumulative conditions with and without the project from Fehr & Peers Associates, Inc. It was assumed for noise exposure calculation purposes that peak hour traffic volumes are equal to 10% of the annual average daily traffic (AADT). Table II summarizes traffic data used for traffic noise exposure calculations. Shown by the last three rows of Table II are the calculated L_{dn} values at 50 and 100 feet from the center of the roadway and the distance to the L_{dn} 60 dB contour. Noise exposure data are shown for conditions with and without the project or the Bristol Curve alternative.

TABLE II

TRAFFIC DATA AND CALCULATED NOISE EXPOSURE

	Stevenson Drive			**Bristol Curve**	
	Existing	**With Project**[1]	**Bristol Curve Alt.**[1]	**Existing**	**With Project**
Annual Average Daily Traffic (AADT)	2,840	2,700	2,700	360	---
Day/Night Split (%)	89/11	89/11	89/11	89/11	---
Assumed Vehicle Speed (mph)	35	35	35	25	---
Medium Trucks (% AADT)	0.89	0.89	0.89	0.89	---
Heavy Trucks (% AADT)	0.45	0.45	0.45	0.45	---
L_{dn} @ 50' from roadway center	57.6dB	57.4 dB	57.4 dB	45.0 dB	---
L_{dn} @ 100' from roadway center	53.1 dB	52.9 dB	52.9 dB	40.5 dB	---
Distance to L_{dn} 60 dB contour	35'	34'	34'	5'	---

[1]Cumulative traffic, including project traffic.

Sources: Fehr & Peers
Brown-Buntin Associates, Inc.

NOISE IMPACT ANALYSIS

The proposed project would result in rerouting Stevenson Drive so that it follows a new alignment to the south of existing residences along Bristol Curve. The existing Bristol Curve roadway would be eliminated. The Bristol Curve alternative would route traffic from Stevenson Drive to the current Bristol Curve roadway alignment.

The potential noise impacts of the project or the Bristol Curve alternative were analyzed by comparing traffic noise levels with and without the project or the Bristol Curve alternative at typical existing residential receiver locations. The residential locations analyzed are noted as locations 1-3 on Figure 1. Table III summarizes the findings of the analysis by comparing the calculated noise levels with the project or the Bristol Curve Alternative to existing noise exposure.

TABLE III

PROJECT-RELATED NOISE IMPACTS @ REPRESENTATIVE LOCATIONS

	L_{dn} (dB) From Stevenson Drive Traffic				
	Existing	**With Project**[1]	**Δ^2**	**Bristol Curve Alt.**[1]	**Δ^2**
House #1	50.0	53.9	+3.9	53.9	+3.9
House #2	44.5	48.0	+3.5	55.2	+10.7
House #3	41.1	45.1	+4.0	55.2	+14.1

[1]Cumulative traffic, including project traffic.
[2]Relative to existing traffic conditions on Stevenson Drive.

Source: Brown-Buntin Associates, Inc.

Table III indicates that traffic noise exposure would increase by 3.5 to 4.0 dB at typical existing home locations along Bristol Curve if the project is constructed. This is not considered a significant increase over existing conditions because it does not exceed 5.0 dB at locations where the existing traffic noise exposure is less than 60 dB L_{dn}. The resulting traffic noise exposure with the project would also not exceed the Monterey County exterior noise level standard of 60 dB L_{dn} at existing homes.

With the Bristol Curve alternative, traffic noise exposure would increase by 3.9 to 14.1 dB at the same locations. An increase in noise exposure of 5.0 dB or greater is considered a significant increase at locations where the existing traffic noise exposure is less than 60 dB L_{dn}. As with the project, the Bristol Curve alternative would not result in calculated traffic noise levels at the closest homes that exceed the Monterey County exterior noise level standard of 60 dB L_{dn}.

CONCLUSIONS

The proposed rerouting of Stevenson Drive will not cause traffic noise exposure as defined by the L_{dn} to exceed the Monterey County exterior noise level standard of 60 dB L_{dn} at existing homes. Additionally, the project would not cause a significant increase in traffic noise exposure at existing homes. Noise mitigation is therefore not required as a part of the project.

The Bristol Curve alternative would cause a significant increase in traffic noise exposure at most existing homes. However, the resulting traffic noise exposure would not exceed the County's 60 dB L_{dn} exterior noise level standard.

The conclusions of this acoustical analysis are based upon the best information available to BBA at the time the analysis was prepared concerning the location of existing homes, traffic volumes, vehicle speeds, truck mix and future roadway configuration. Any significant changes in these factors, or in motor vehicle technology, noise regulations or other factors beyond BBA's control, may result in long-range noise effects that are different from those described by this analysis.

Respectfully submitted,

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President

REB:dm

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).

DNL/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 DNL 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.

ACOUSTICAL TERMINOLOGY

NOISE EXPOSURE CONTOURS: Lines drawn about a noise source indicating constant levels of noise exposure. CNEL and DNL 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.