Environmental Noise Assessment

Oakmont Village Pickleball Courts

Santa Rosa, California

BAC Job # 2025-042

Prepared For:

Oakmont Village Association

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Introduction

The proposed Oakmont Village Pickleball Courts Project (project) is located at the East Rec Center within the Oakmont Community in the City of Santa Rosa, California. There are currently six pickleball courts at the East Rec Center and two tennis courts. The project proposes the conversion of the two tennis courts into six pickleball courts. The project area with aerial imagery is shown in Figure 1.

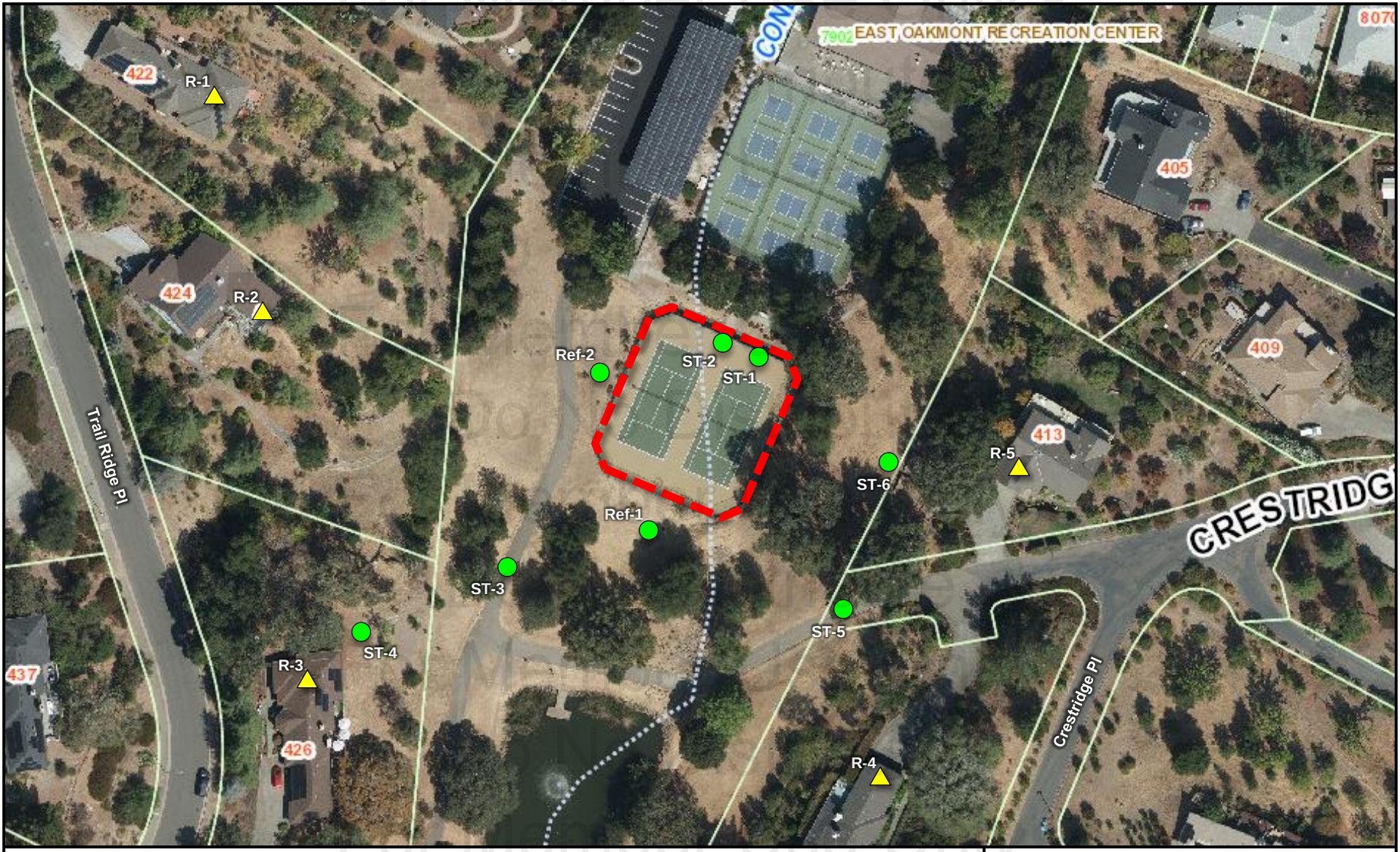
Due to concerns expressed by residents of the Oakmont Community regarding the noise associated with pickleball activities, Bollard Acoustical Consultants, Inc. (BAC) was retained by Oakmont Village Association to prepare an analysis of the potential noise impacts associated with converting the existing tennis courts to pickleball courts. The purposes of this assessment are to quantify the existing tennis/pickleball noise environment within the project area, to predict future pickleball activity noise levels at the nearest noise-sensitive uses (e.g., residences), and compare those predicted levels against the applicable City of Santa Rosa noise standards for acceptable noise exposure. This report contains BAC's evaluation.

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 2 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, L_{dn} or DNL, and shows very good correlation with community response to noise.



Legend

- Existing Tennis Courts to be Converted to Pickleball Courts Boundary
- Short-Term Noise Level Survey Locations
- Residential Receivers

N

Scale (Feet)

0 45 90

Oakmont Village Pickleball Courts

Santa Rosa, California

Project Area

Figure 1

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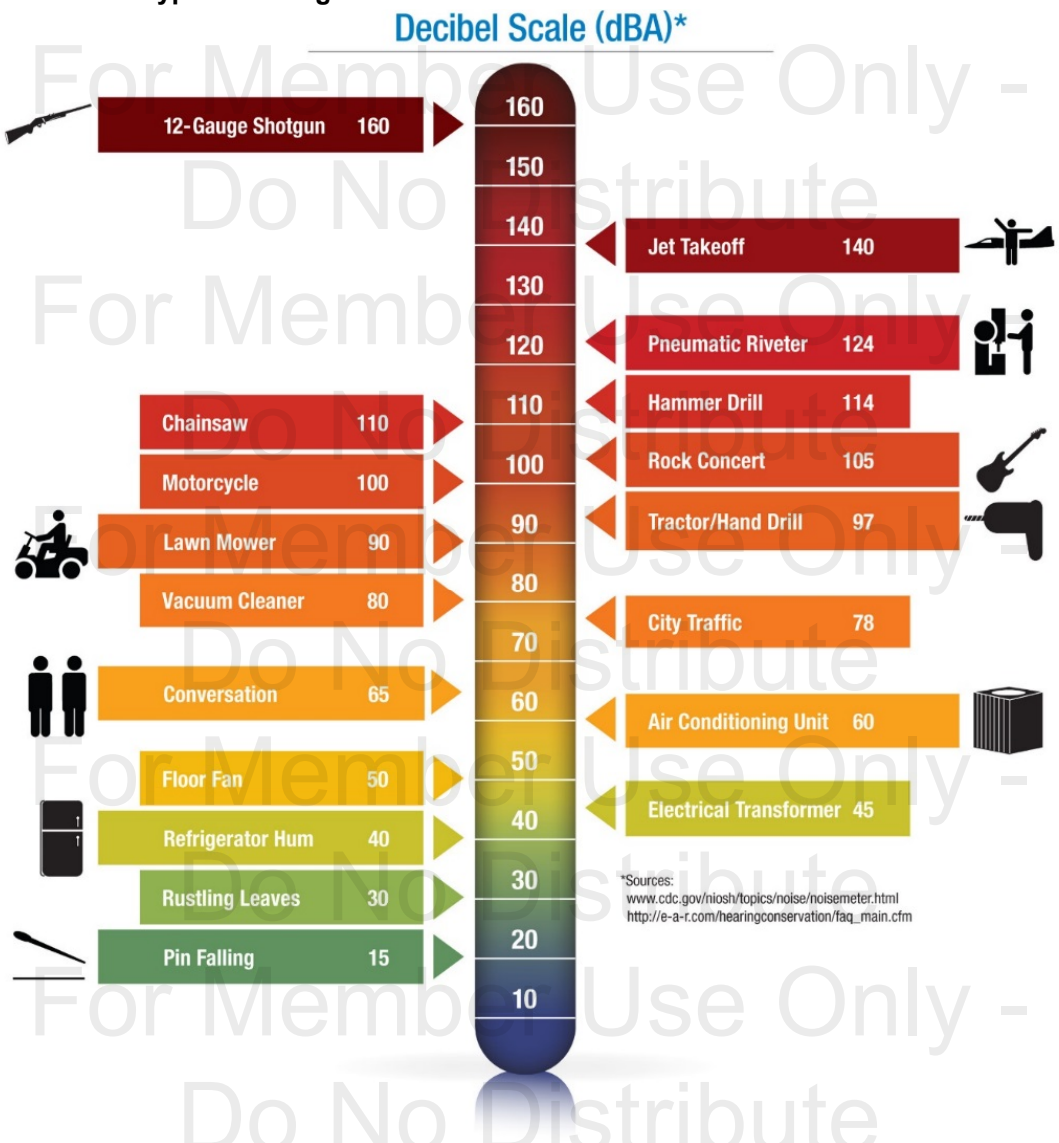
Figure 2
Typical A-Weighted Sound Levels of Common Noise Sources



The Day-Night Average Level (DNL) 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.

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Criteria for Acceptable Noise Exposure

Santa Rosa Municipal Code

The Santa Rosa Municipal Code (Section 17-16.030) provides ambient base exterior noise level criteria that vary depending on the zoning of the receiving land use and the time of day. The code section is reproduced below.

17-16.030 Ambient Base Noise Level Criteria

The following criteria will be used as a base (ambient noise level) from which noise levels can be compared:

Table 1
Ambient Base Noise Level Criteria – Receiving Land Uses

Zone	Time	Sound Level A (dB) Community Environment Classification
R1 & R2	10 p.m. to 7 a.m.	45
R1 & R2	7 p.m. to 10 p.m.	50
R1 & R2	7 a.m. to 7 p.m.	55
Multi-Family	10 p.m. to 7 a.m.	50
Multi-Family	7 a.m. to 7 p.m.	55
Office & Commercial	10 p.m. to 7 a.m.	55
Office & Commercial	7 a.m. to 10 p.m.	60
Intensive Commercial	10 p.m. to 7 a.m.	55
Intensive Commercial	7 a.m. to 10 p.m.	65
Industrial	Anytime	70

Source: Santa Rosa Municipal Code, Section 17-16.030, Figure

Noise Level Criteria Applied to this Project

Noise sensitive land uses in the project vicinity include single-family residential uses to the immediate east, west and south of the existing tennis courts. For residential land uses, the code section states that the base ambient noise level is considered to be 45 dB during nighttime hours (10 p.m. to 7 a.m.), 50 dB during evening hours (7 p.m. to 10 p.m.), and 55 dB during daytime hours (7 a.m. to 7 p.m.). The posted hours for the existing tennis and pickleball courts are 8:00 a.m. to 7:00 p.m., and the project does not propose extending the hours of use. Therefore, the daytime ambient base noise level of 55 dB was applied to the project. Although the municipal code does not explicitly provide a noise metric (e.g., average, median, maximum) for the ambient base noise levels, it was reasonably assumed that the noise level standards are intended to be evaluated as hourly averages (hourly L_{eq}), which would be consistent with many noise ordinances and noise elements throughout the State of California. The daytime 55 dB noise standard was conservatively applied at the nearest residential property lines to the east, west and south of the proposed pickleball courts.

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Existing Ambient Noise Environment within the Project Vicinity

The existing ambient noise environment within the project vicinity is primarily defined by activities at the East Rec Center (e.g., tennis and pickleball noise, parking lot movements, etc.) and secondarily by sounds of nature (e.g., birds, insects, wind, water features, etc.).

Evaluation of Pickleball Generated Noise

The proposed pickleball courts area is shown on Figure 1 at the location where the existing tennis courts are located. Figure 1 also illustrates the existing single-family residences located nearest the proposed pickleball courts.

To quantify noise generated by pickleball activities, noise level measurements of pickleball play at the project site were conducted on Wednesday, April 23rd, 2025. During the measurement period, the western court had a combination of pickleball and tennis play, and the eastern court had only pickleball play. There are six existing pickleball courts to the north of the existing tennis courts, all of which were being utilized for pickleball play during the survey period. Two sound level meters, Ref-1 and Ref-2, were placed approximately 95 feet south and approximately 70 feet west of the center point of the two tennis courts, respectively. Sound levels were monitored continuously at those two reference locations during the noise measurement period. A series short-term noise level measurements were also conducted at critical points surrounding the existing tennis courts. Two of these short-term noise level measurements included pickleball play using soft paddles, and five of the short-term noise level measurements included pickleball play using hard paddles. The locations of the reference meters and short-term measurement locations are illustrated on Figure 1. Photographs of the noise measurement locations are provided in Appendix B.

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

A summary of the results of the short-term noise level measurements is provided in Table 2.

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Table 2
Summary of Short-Term Pickleball Noise Level Measurements

Receiver Location[1]	Paddle Type	Distance (ft)[2]	Measured Average Sound Level, L_{eq} (dB)	Measured Maximum Sound Level, L_{max} (dB)
ST-1	Soft	60	59	71
ST-1	Soft	60	59	65
ST-2	Hard	60	58	68
ST-3	Hard	170	50	66
ST-4	Hard	290	51	55
ST-5	Hard	185	55	57
ST-6	Hard	150	53	59

[1] Receiver locations are shown on Figure 1.
[2] Distances from receiver location were scaled using aerial imagery to the center point of the two existing tennis courts.

Source: Bollard Acoustical Consultants, Inc. (2025)

The Table 2 data indicates that measured pickleball generated noise levels ranged from 50 to 59 dB L_{eq} at the short-term noise measurement locations. Additionally, the data indicates that there wasn't a discernable difference in noise levels between the soft and hard paddles. This could have been due to multiple factors (i.e., aggressiveness of play, shouting/cheering during play, influence from other noise sources, etc.), but based on the data the noise levels generated by pickleball play is not expected to vary significantly based upon paddle type used during play.

To enable consistent comparison, all measurements were projected to a standardized distance of 100 feet. These projected levels were then averaged to establish a representative baseline for pickleball generated noise. The resulting average noise levels at 100 feet were 55 dB L_{eq} and 60 dB L_{max}.

As noted previously, there were two pickleball games being played on the two tennis courts courts during the noise survey. Additionally, the six pickleball courts to the north of the tennis courts were all in use. All of the courts were playing doubles (i.e., two players on each side of the net), and therefore a total capacity of 32 players. The project proposes to develop six pickleball courts, which would have a maximum capacity of 24 players. In order to account for the increase in courts/capacity, an offset of +3 dB was applied to the baseline average 55 dB L_{eq} noise level. This offset factors the increase in noise exposure from the addition of the four new courts, as well as the distance to the existing six pickleball courts. No offset was applied to the predicted L_{max} value, as the maximum recorded noise level of a pickleball hitting a paddle would not increase with an increase in number of courts.

The baseline average pickleball noise levels were projected to the nearest representative residential receptors (Figure 1) assuming standard spherical spreading of sound (i.e., 6 dBA decrease per doubling of distance from the source). The results of the projections are included in Table 3.

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Table 3
Predicted Pickleball Courts Noise Levels at the Nearest Receivers

Receiver Location[1]	Distance (ft)[2]	Predicted Sound Level, L_{eq} (dB)[3]	Predicted Sound Level, L_{max} (dB)[3]
R-1	175	53	55
R-2	175	53	55
R-3	210	51	54
R-4	175	53	55
R-5	145	55	57

[1] Receiver locations are shown on Figure 1.

[2] Distances to the property line of nearby residential receivers were scaled from the center of the two existing tennis courts.

[3] Predicted pickleball noise levels based on reference noise level of 60 dB L_{eq} and 60 dB L_{max} at 100', which includes a +3 dB increase to account for the increase in number of pickleball courts from 2 courts to 6 courts.

Source: Bollard Acoustical Consultants, Inc. (2025)

The data in Table 2 indicates that the predicted pickleball generated noise levels are calculated to range from 51 dB to 55 dB L_{eq} at the nearest residences. As defined in Table 1, the Santa Rosa General Plan's daytime average noise level standard applicable to residential uses is 55 dB L_{eq}, and therefore the predicted pickleball noise levels are expected to comply at all of the nearest residential receivers.

However, to increase the factor of safety, and to reduce the potential for adverse reaction at the nearest residences, it is recommended that acoustical curtains (e.g., AcoustiFence or Pickleblok) be attached to the chain link fence on the east side of the tennis courts as identified in Figure 3. For reference, Figure 4 illustrates a similar installation on a different set of pickleball courts.

Figure 4
Example of AcoustiFence Installation

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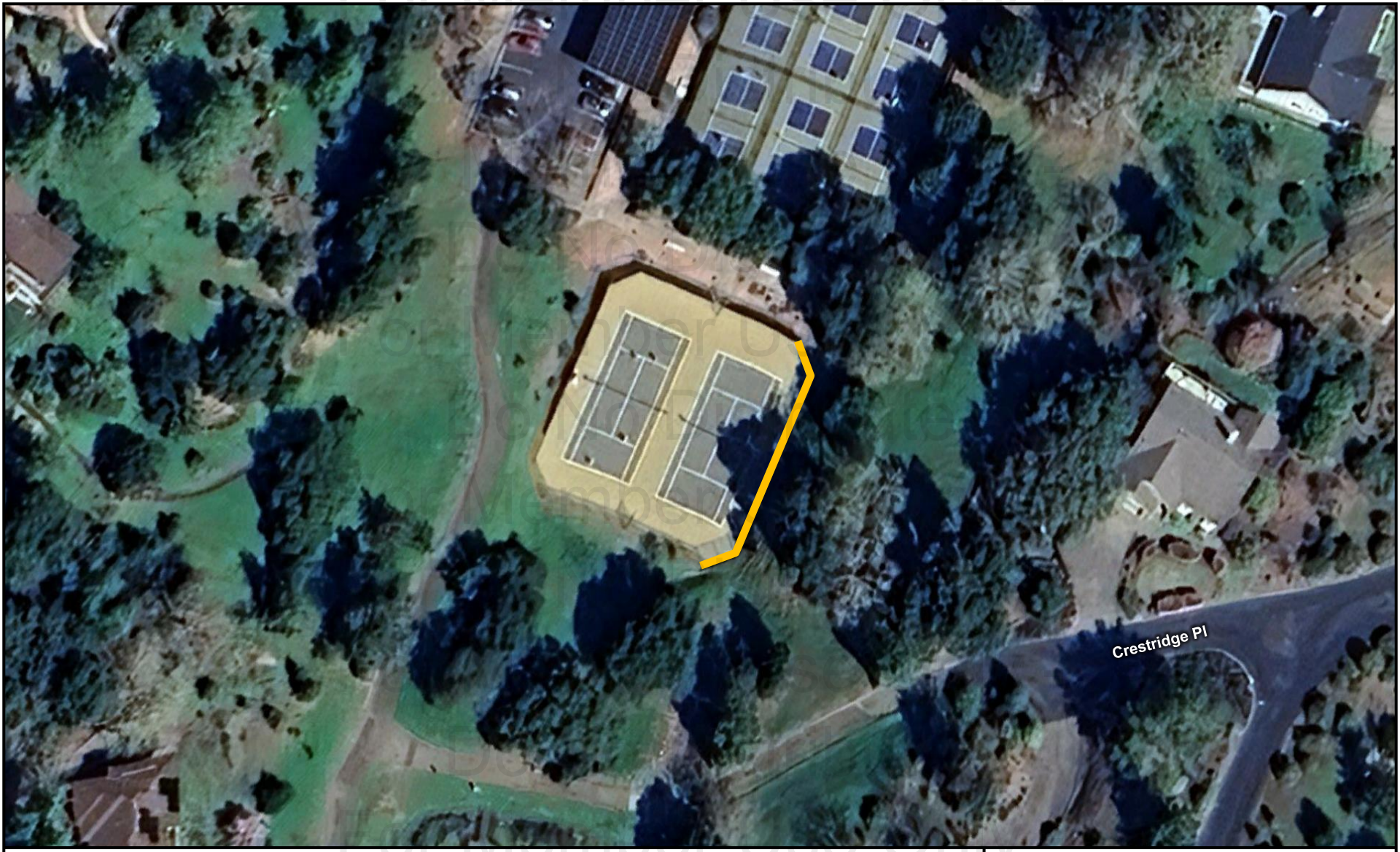

Legend

Optional AcoustiFence (or equivalent) Acoustical Curtains

N

Scale (Feet)

0 30 60

Oakmont Village Pickleball Courts

Santa Rosa, California

Noise Mitigation Measures

Figure 3

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Conclusions and Recommendations

Future pickleball court noise levels are predicted to comply with the Santa Rosa General Plan's 55 dB L_{eq} daytime exterior noise level standard for residential uses at all analyzed residences adjacent to the proposed courts. Additionally, the paddle type does not significantly impact the noise level produced by pickleball play. However, to increase the factor of safety, and to reduce the potential for adverse reaction at the nearest residences, the following noise mitigation measures may be followed:

1. Acoustic curtains, such as AcoustiFence, Pickleblok, or an equivalent alternative, could be installed at the locations identified in Figure 3.

These conclusions are based on the short-term noise level data collected by BAC on April 23rd, 2025, project aerial imagery, and information provided by the project applicant. Deviations from the above-mentioned resources could cause future noise levels to differ from those predicted in this assessment.

This concludes BAC's noise evaluation for the Oakmont Village Pickleball Courts Project in Santa Rosa, California. Please contact BAC at (530) 537-2328 or donb@bacnoise.com with any questions regarding this assessment.

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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.

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Legend

- A Noise Measurement Site Ref-1
- B Noise Measurement Site Ref-2
- C Noise Measurement Site ST-1
- D Noise Measurement Site ST-2

Oakmont Village Pickleball Courts

Santa Rosa, California

Noise Survey Photographs

Appendix B-1

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Legend

- A Noise Measurement Site ST-3
- B Noise Measurement Site ST-4
- C Noise Measurement Site ST-5
- D Noise Measurement Site ST-6

Oakmont Village Pickleball Courts
Santa Rosa, California

Noise Survey Photographs

Appendix B-2

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