# Sound Baffling Performance Analysis

**Location:** Sweeney Park, Manchester by the Sea

**Analysis Date:** 07/23/2024 – 07/25/2024

**Performed by:** Eliot C. Arnold

# Contents

# Executive Summary

In response to concerns about noise from the pickleball courts at Sweeney Park, SLN/CR conducted a sound baffling performance analysis using commercial off-the-shelf recording and sound level measurement technology. This initial study aimed to establish product effectiveness while also providing a benchmark an process for ongoing noise measurement.

Our analysis employed both spectral and RMS methodologies to provide a thorough understanding of the noise environment before and after the installation of our noise reduction system. The results revealed a noticeable reduction in overall sound pressure levels and the elimination of specific nuisance tonal ranges, which significantly contribute to the disturbance.

While we used readily available commercial technology for this initial assessment, the findings provide a credible baseline indicating that our noise reduction solutions are effective. For future studies, we recommend enhancing measurement equipment and conducting more extensive recordings to better segment sound pressure levels, particularly addressing significant traffic noise. This approach will ensure a comprehensive and accurate understanding of the soundscape, aligning with best practices recommended by the Institute of Noise Control Engineering (INCE USA).

We are committed to ongoing monitoring and improvements to ensure the acoustic environment at Sweeney Park meets the community's expectations and addresses noise concerns comprehensively.

# Data Collection Location:

The location is subject to significant ambient noise due to its proximity to Massachusetts Route 127, a major route with medium to high traffic rates. Traffic noise contributes to a baseline sound level of 55-60 dBA Leq over a 24-hour period. The area is also influenced by noise from the MBTA Newburyport/Rockport commuter rail line, which passes nearby multiple times a day, adding to the ambient noise levels. Previous studies by Pickleball Sound Mitigation LLC and USA Pickleball have shown that pickleball noise levels can be significant, with measurements indicating levels of 72 dB LAFmax at the property line of nearby residences without mitigation.

We captured data at the same physical location each day. The location was on State land as marked on the Google Earth file below.

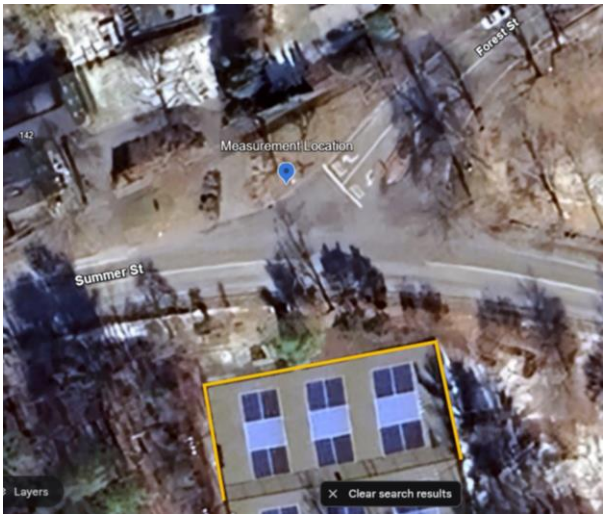



*Figure 1: Google Earth Project Link - https://earth.google.com/earth/d/12n4dAIfQo0hs87Lwce9x6_USE6i4z8ot?usp=sharing*

# Data Collection Equipment and Methodology

Apple iPhone 15 running DB Meter software along with an Tadeto Digital Sound Meter were used for analysis. The iPhone was used for data capture. Sound meter was used to calibrate and compare to readings on iPhone. No discrepancy was documented between sound meter and iPhone readings.

Recordings commenced at approximately 9AM EST on Tuesday July 23 then again at the same time on Thursday July 25. Recordings were taken on those dates to capture noise levels from the pickleball courts before baffling was erected then again after baffling was erected. Scope of recordings were limited to approximately 20 continuous minutes of recording. The devices were held by hand in the direction of sound. The devices were held at approximately three (3') above ground level. Samples were collected using a slow (500ms) response time. Decibel measurements were dB(a) weighted.

| Equipment Used: | |
|---|---|
| iPhone 15 + dB sound level meter<br>dB Meter is full of features sound level meter with exclusive accuracy of measurements plus Hearing test, Noise dosimeter, Spectrum Analyzer with RTA, FFT & Spectrogram. | Decibel Meter, Tadeto Digital Sound Level Meter |
|  |  |

# Analysis

Frequency spectral analysis and a Root Mean Square (RMS) analysis were conducted on the audio samples. RMS values represent the effective level of the audio signal, providing a measure of its loudness.

Spectral analysis is a technique used to analyze the frequency components of a signal. It involves transforming a time-domain signal into the frequency domain to reveal the amplitude and phase information of its sinusoidal components. The most common tool for spectral analysis is the Fourier Transform, which converts a signal from its original time domain into a representation in the frequency domain.

Loudness Measurement**:** RMS values offer a way to quantify the average power or energy of an audio signal. It reflects the perceived loudness, as our ears respond to the power of sound rather than its instantaneous amplitude.

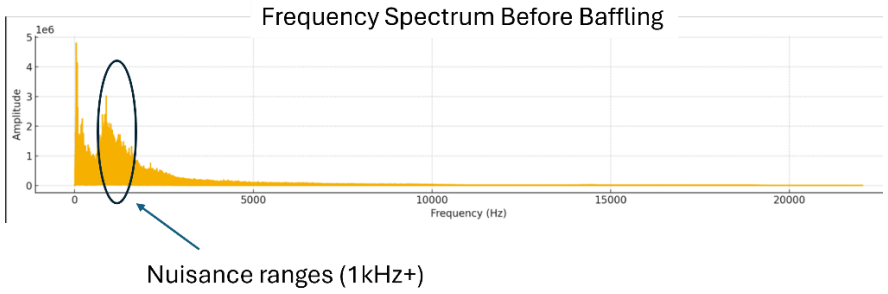
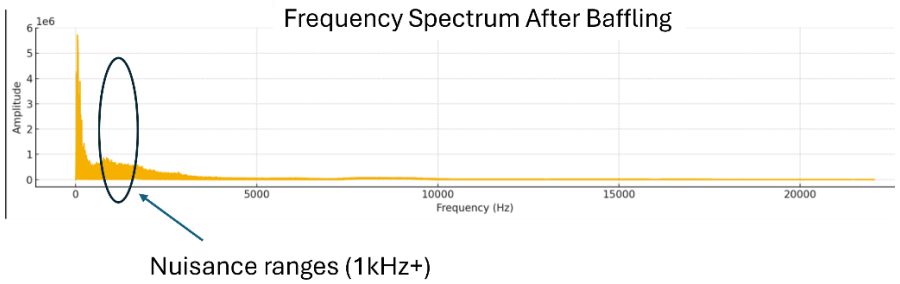
Calculation**:** The RMS value is calculated by taking the square root of the average of the squares of the signal's amplitudes over a specified period. This process smooths out the variations in the signal, providing a single value that represents its overall level.

## Profile of Recordings

The table below illustrates the details of the digital recordings.

| | |
|---|---|
| **Recording 1: Before Baffling** | Duration: 19:58<br>dB(a) Max: 90<br>dB(a) Min: 61 |
| **Recording 2: After Baffling** | Duration: 19:54<br>dB(a) Max: 86<br>dB(a) Min: 45 |

## Spectral Analysis

| | |
|---|---|
| **Recording 1: Before Baffling**<br><br>*Prevalence of nuisance tones* |  |
| **Recording 2: After Baffling**<br><br>*Significant attenuation of nuisance tones* |  |

## RMS Analysis

| | |
|---|---|
| **Recording 1: Before Baffling** | RMS Analysis: Recording has an RMS value of 106.09, indicating a higher average loudness |
| **Recording 2: After Baffling** | RMS value of 99.24, suggesting it has a lower average loudness. |

# Conclusions

The installation of SLN/CR system at Sweeney Park has yielded promising results. Our initial analysis, conducted using commercial off-the-shelf recording and sound level measurement technology, demonstrated a reduction in noise levels and the removal of nuisance tonal ranges from the pickleball courts. This improvement in the acoustic environment suggests that the noise reduction system is effectively mitigating the primary sources of disturbance.

These findings provide a solid foundation for continued efforts to enhance the quality of life for park users and neighboring residents. The successful reduction in noise levels supports the decision to implement these noise abatement measures and sets a positive precedent for future projects aimed at addressing community concerns.

This preliminary study, while not conducted with the most expensive industry-standard equipment, offers a credible baseline indicating the efficacy of our noise reduction solutions. Further analysis with enhanced measurement equipment and more extensive recordings is recommended to provide an even more detailed understanding of the soundscape. This approach will ensure that any remaining issues are thoroughly addressed and that the noise levels are kept within acceptable limits.

The goal is to create a peaceful and enjoyable environment for all park users and neighbors, and ongoing improvements and refinements to noise mitigation strategies will continue to be a priority.

# Recommendations for Further Analysis

According to published research from the Institute of Noise Control Engineering (INCE USA) accurate and effective sound analysis requires a minimum of thirty (30) days of continuous measurement to accurately and consistently understand the sound profile of any environment. Continuous monitoring will allow for a longitudinal analysis of the soundscape. Recommend using an autonomous monitoring device such as Sonitus Monitoring device to perform detailed spectral and sound pressure analysis. Spectral analysis will be critical as significant ongoing sound pressure from traffic noise is a consideration. If further analysis is required, we recommend retaining an acoustics engineering firm such as MD Acoustics or PSM, LLC. to conduct thorough on-site recordings and analysis.

# Disclaimer

SLN/CR Panels, LLC ("The Company") has conducted this sound baffling performance analysis using commercially available recording and sound level measurement technology to establish a preliminary benchmark and process for ongoing noise measurement and monitoring. While the Company has employed engineers to perform testing and analysis, it does not represent itself as an accredited acoustics engineering firm. The results presented herein are based on the specific methodologies and equipment used and may not fully align with results obtained using industry-standard, professional-grade equipment.

The Company makes no guarantees regarding the absolute accuracy or completeness of the data and findings in this report. This analysis is intended to provide an initial understanding of the noise reduction effects of our products and is not intended to serve as a definitive or exhaustive study. As such, the Company shall not be held liable for any discrepancies or differing results that may arise from subsequent studies conducted by third parties using different methodologies or equipment.

By using this report, the reader acknowledges and agrees that the Company is not responsible for any actions taken based on the information contained herein, and any reliance on the data and conclusions of this report is at the reader's own risk. For a more comprehensive and detailed analysis, the Company recommends consulting with an accredited acoustics engineering firm.