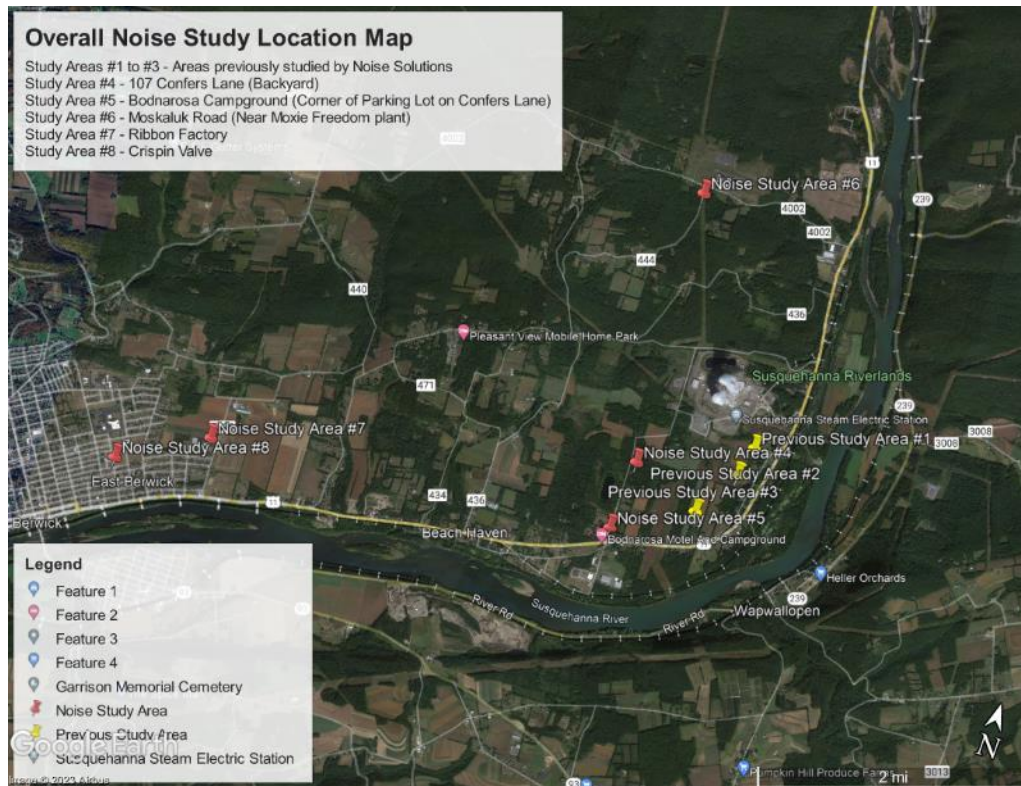


Noise Ordinance – Salem Township, PA

EXTERIOR SOUND SURVEY REPORT

February 9, 2024



PREPARED FOR
Brian Rhone, BCO
Zoning/Code Enforcement Officer
Salem Township

PREPARED BY
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President & CEO
Metropolitan Acoustics

February 9, 2024

Brian Rhone, BCO
Zoning/Code Enforcement Officer
Salem Township
38 Bomboy Lane
Berwick, PA 18603

Re: Noise Ordinance – Salem Township, PA
Exterior Sound Survey Report

Dear Mr. Rhone:

Metropolitan Acoustics has completed an exterior sound survey in Salem Township Luzerne County, PA, which was conducted between January 30 through February 1, 2024. The project entails measuring ambient sound levels in eight (8) representative areas of the Township to aid in the development of language for an updated township noise ordinance. This report addresses the survey procedures and results of the measurements; the noise ordinance language will be provided in a forthcoming report.

Please let us know if you have any questions regarding this information.

Best regards,

metroacoustics, llc



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ACOUSTICAL TERMINOLOGY

Sound Level

Sound pressure levels (SPL) are commonly expressed on a logarithmic scale in decibels (dB). The human ear is most sensitive to mid-frequency sound, such as speech, and less sensitive to high- and low-frequency sound at typical listening levels. To account for this, sound pressure can be expressed in units of A-weighted decibels (dBA).

For dBA ratings, a higher number corresponds to louder sound levels. For reference, a 3 dB difference in ratings represents a just-noticeable difference, a change of 5-6 dB is clearly noticeable, and a sound level that is 10 dB higher is perceived to be twice as loud.

Ambient Sound

Ambient sound is the all-encompassing sound associated with a given environment at a specified time, and is usually composed of sound from many sources and directions, including the specific sound sources of interest.

Statistical Sound Level Metrics

Sound levels can be measured using various statistical averaging techniques. Some of the more useful metrics for exterior sound levels include L_{EQ} , L_{10} , and L_{90} .

The L_{EQ} is the continuous-equivalent sound pressure level, which is the sound level that contains the same amount of sound energy as the fluctuating level over the course of the measurement period and is commonly accepted as the average.

Exceedance levels indicate the sound pressure level exceeded for a certain percentage of the measurement period. The L_N is the sound level exceeded for N% of the measurement period. Some common exceedance levels include:

- The L_{10} is the sound pressure level that was exceeded for 10% of the measurement time. It is typically representative of intermittent transient sound levels above the background.
- The L_{90} is the sound pressure level that was exceeded for 90% of the measurement time. It is generally accepted as the background level of the measurement period.

All metrics can be reported in A-weighted decibels, transitioning the nomenclature to L_{AN} .

ENVIRONMENTAL SOUND SURVEY

SURVEY LOCATIONS

The eight locations at which sound levels were measured were specified by Salem Township. Sound levels were previously measured at Locations 1-3 by Noise Solutions in 2021, which was done prior to the construction of a building housing a cryptocurrency mining operation. The maps of the locations are shown in Figure 1 through Figure 4 with the approximate location of the building housing the mining operation shown in blue in Figure 2.

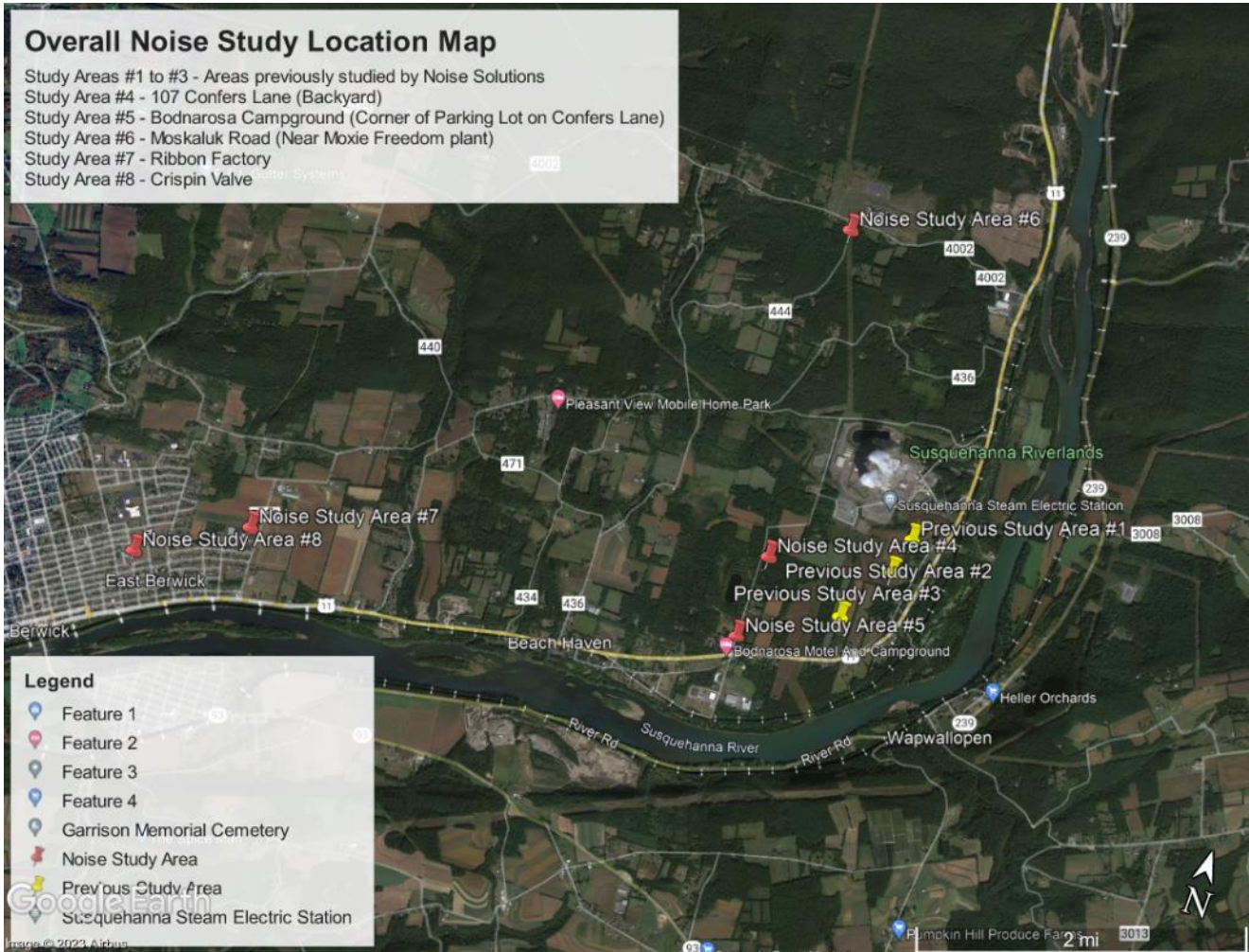


Figure 1. Survey Locations - Overall

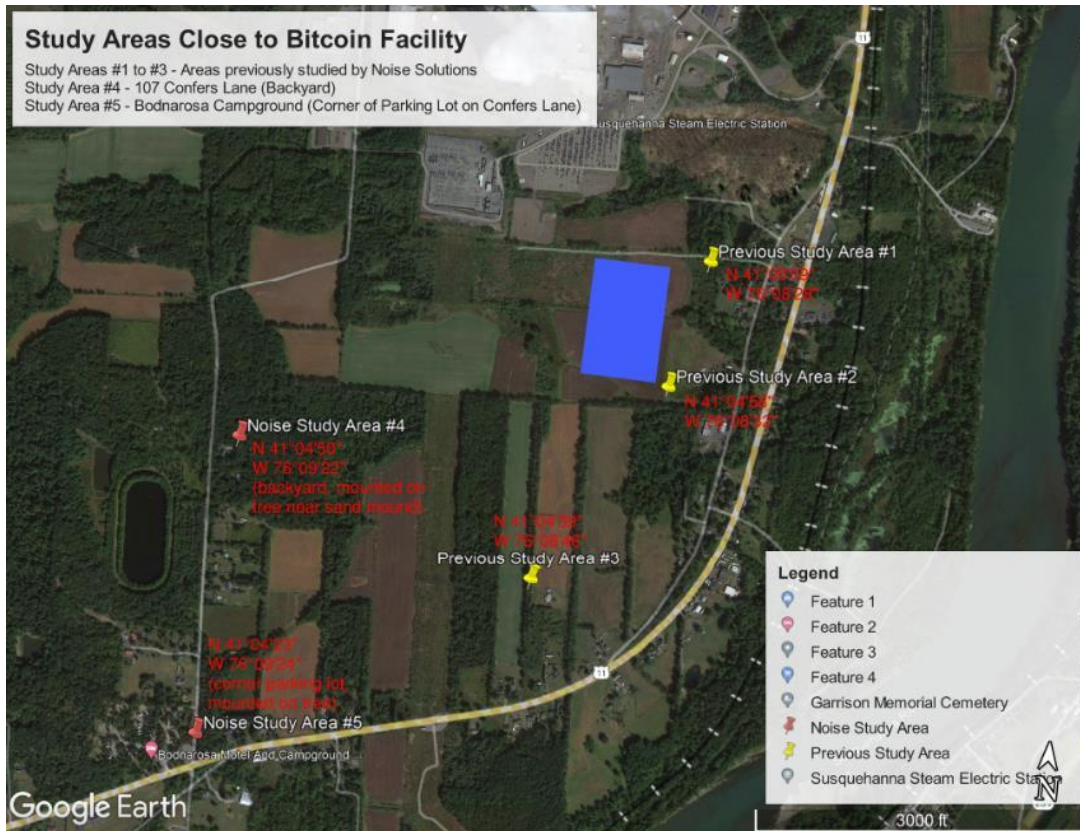


Figure 2. Survey Locations – Enlarged Locations 1-5

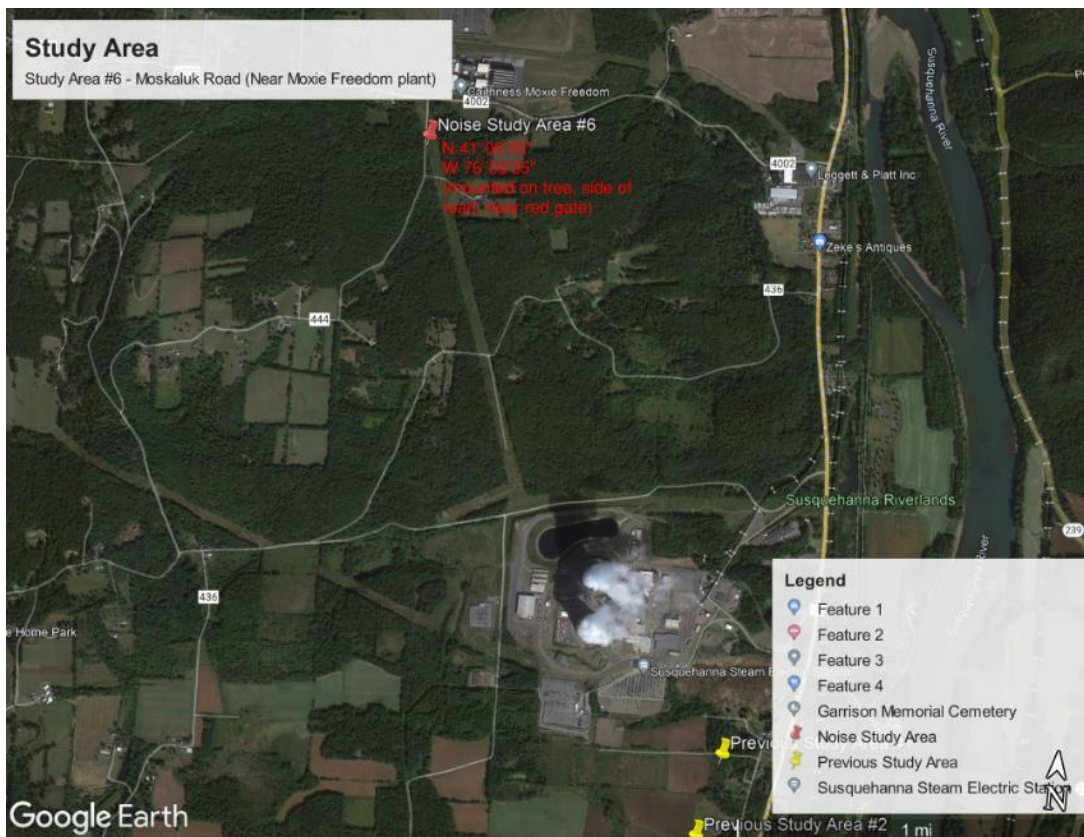


Figure 3. Survey Locations – Enlarged Location 6



Figure 4. Survey Locations – Enlarged Locations 7 & 8

SURVEY PROCEDURES

24-hour measurements were taken between January 30-31, 2024 for Locations 1 through 4 and between January 31-February 1, 2024 for Locations 5-8. The intent was to capture sound levels during daytime and nighttime periods as well as discrete sound events.

Sound pressure levels were measured at the specified locations with two Larson Davis Integrating Sound Level Analyzers, model 831C, and two NTi model XL2 Audio Analyzers, all of which meet the ANSI S1.4 criteria for Type 1 sound level meters. Prior to testing calibration was performed on site, and windscreens were used. The meters were set to measure sound in both one-minute and one-hour increments, store those measurements, then reset and measure the next time period. Numerous acoustical quantities were recorded, including the LA_{EQ}, LA₁₀, and LA₉₀, as well as audio of discrete events. The meters were either mounted on tripods approximately 6' off the ground or hung in a tree approximately 10' off the ground. The locations of the meters are shown in Figure 5 through Figure 12.



Figure 5. Location 1 – Previous Study Area



Figure 6. Location 2 – Previous Study Area



Figure 7. Location 3 – Previous Study Area



Figure 8. Location 4 – 107 Confers Ln (Backyard)



Figure 9. Location 5 – Bodnarosa Campground



Figure 10. Location 6 – Moskaluk Rd



Figure 11. Location 7 – Ribbon Factory



Figure 12. Location 8 – Crispin Valve

The weather conditions at the time of the survey were as follows (source www.wunderground.com):

<i>Date</i>	<i>Low Temp</i>	<i>High Temp</i>	<i>Precip.</i>	<i>Winds</i>
1/30/24	29°F	33°F	0.00"	0-7 mph
1/31/24	30°F	39°F	0.00"	0-8 mph
2/1/24	30°F	41°F	0.00"	0-8 mph

SURVEY RESULTS

Table 2 through Table 9 show the hourly measured sound pressure levels at each of the locations in LA_{EQ}, LA₁₀ and LA₉₀. Figure 13 through Figure 20 show the same metrics graphically in 15-minute increments. After listening to the recorded audio, the peaks seen in Figure 13 through Figure 16 at approximately 12:45 AM is believed to be a train passing. Other peaks are mostly attributable to traffic, birds, or people.

<i>Date</i>	<i>Start Time</i>	<i>LA_{EQ} (dB)</i>	<i>LA₁₀ (dB)</i>	<i>LA₉₀ (dB)</i>
1/30/24	2:00 PM	63	64	43
	3:00 PM	58	56	43
	4:00 PM	45	48	42
	5:00 PM	44	46	41
	6:00 PM	44	46	40
	7:00 PM	41	43	39
	8:00 PM	44	45	42
	9:00 PM	42	43	40
	10:00 PM	40	42	38
	11:00 PM	42	45	39
1/31/24	12:00 AM	43	44	40
	1:00 AM	46	47	42
	2:00 AM	45	47	44
	3:00 AM	44	46	42
	4:00 AM	43	44	41
	5:00 AM	43	45	42
	6:00 AM	45	47	44
	7:00 AM	56	50	43
	8:00 AM	46	46	42
	9:00 AM	47	48	43
	10:00 AM	47	48	45
	11:00 AM	49	51	46
12:00 PM	48	50	46	

Table 3. Hourly Measured Sound Pressure Levels – Location 2 Noise Ordinance – Salem Township, PA				
<i>Date</i>	<i>Start Time</i>	<i>LA_{EQ} (dB)</i>	<i>LA₁₀ (dB)</i>	<i>LA₉₀ (dB)</i>
1/30/24	1:00 PM	47	50	40
	2:00 PM	48	48	39
	3:00 PM	48	51	42
	4:00 PM	46	49	41
	5:00 PM	45	48	40
	6:00 PM	43	46	36
	7:00 PM	41	43	35
	8:00 PM	40	42	36
	9:00 PM	38	41	34
	10:00 PM	39	42	35
	11:00 PM	39	42	35
1/31/24	12:00 AM	43	43	36
	1:00 AM	42	42	38
	2:00 AM	41	42	40
	3:00 AM	39	41	35
	4:00 AM	40	44	35
	5:00 AM	45	48	40
	6:00 AM	45	48	41
	7:00 AM	45	48	40
	8:00 AM	44	46	39
	9:00 AM	43	46	40
	10:00 AM	43	45	39
11:00 AM	43	46	40	

Table 4. Hourly Measured Sound Pressure Levels – Location 3 Noise Ordinance – Salem Township, PA				
<i>Date</i>	<i>Time</i>	<i>LA_{EQ} (dB)</i>	<i>LA₁₀ (dB)</i>	<i>LA₉₀ (dB)</i>
1/30/24	12:00 PM	57	49	39
	1:00 PM	44	47	38
	2:00 PM	47	47	38
	3:00 PM	46	49	39
	4:00 PM	45	48	39
	5:00 PM	44	47	39
	6:00 PM	43	46	34
	7:00 PM	39	42	32
	8:00 PM	38	42	32
	9:00 PM	36	39	31
	10:00 PM	38	41	32
	11:00 PM	38	40	34
1/31/24	12:00 AM	42	42	33
	1:00 AM	37	38	34
	2:00 AM	36	37	34
	3:00 AM	37	39	31
	4:00 AM	36	39	32
	5:00 AM	40	43	37
	6:00 AM	41	43	38
	7:00 AM	42	44	38
	8:00 AM	43	46	39
	9:00 AM	44	47	39
	10:00 AM	47	50	40
	11:00 AM	43	44	39

Table 5. Hourly Measured Sound Pressure Levels – Location 4 Noise Ordinance – Salem Township, PA				
<i>Date</i>	<i>Time</i>	<i>LA_{EQ} (dB)</i>	<i>LA₁₀ (dB)</i>	<i>LA₉₀ (dB)</i>
1/30/24	1:00 PM	46	46	44
	2:00 PM	46	47	44
	3:00 PM	45	46	44
	4:00 PM	45	46	44
	5:00 PM	44	45	43
	6:00 PM	44	45	43
	7:00 PM	43	43	42
	8:00 PM	44	44	43
	9:00 PM	45	46	44
	10:00 PM	45	46	44
	11:00 PM	46	46	44
1/31/24	12:00 AM	45	46	44
	1:00 AM	45	45	44
	2:00 AM	47	47	46
	3:00 AM	47	48	47
	4:00 AM	48	48	47
	5:00 AM	48	49	47
	6:00 AM	47	48	45
	7:00 AM	45	46	43
	8:00 AM	44	44	42
	9:00 AM	43	44	42
	10:00 AM	44	45	43
	11:00 AM	43	44	42
	12:00 PM	46	46	44
	1:00 PM	46	46	42

Table 6. Hourly Measured Sound Pressure Levels – Location 5 Noise Ordinance – Salem Township, PA				
<i>Date</i>	<i>Time</i>	<i>LA_{EQ} (dB)</i>	<i>LA₁₀ (dB)</i>	<i>LA₉₀ (dB)</i>
1/31/24	3:00 PM	59	63	47
	4:00 PM	59	63	47
	5:00 PM	58	61	46
	6:00 PM	55	59	45
	7:00 PM	54	58	45
	8:00 PM	54	58	46
	9:00 PM	52	56	46
	10:00 PM	50	54	46
	11:00 PM	50	54	46
2/1/24	12:00 AM	50	53	46
	1:00 AM	48	47	46
	2:00 AM	49	47	45
	3:00 AM	51	49	45
	4:00 AM	53	56	45
	5:00 AM	57	61	47
	6:00 AM	58	61	47
	7:00 AM	58	61	47
	8:00 AM	58	62	47
	9:00 AM	58	62	46
	10:00 AM	58	62	46
	11:00 AM	58	61	46
	12:00 PM	57	61	47
	1:00 PM	58	61	46
2:00 PM	58	62	46	

Table 7. Hourly Measured Sound Pressure Levels – Location 6 Noise Ordinance – Salem Township, PA				
<i>Date</i>	<i>Time</i>	<i>LA_{EQ} (dB)</i>	<i>LA₁₀ (dB)</i>	<i>LA₉₀ (dB)</i>
1/31/24	3:00 PM	50	51	49
	4:00 PM	51	52	50
	5:00 PM	51	51	50
	6:00 PM	50	51	50
	7:00 PM	50	51	50
	8:00 PM	51	52	50
	9:00 PM	53	54	52
	10:00 PM	53	54	51
	11:00 PM	52	52	51
2/1/24	12:00 AM	52	53	51
	1:00 AM	51	52	50
	2:00 AM	52	52	50
	3:00 AM	51	51	51
	4:00 AM	50	51	50
	5:00 AM	50	51	50
	6:00 AM	50	51	50
	7:00 AM	51	51	50
	8:00 AM	50	51	49
	9:00 AM	52	51	49
	10:00 AM	50	51	49
	11:00 AM	50	51	49
	12:00 PM	51	51	49
	1:00 PM	50	51	49
2:00 PM	50	51	49	

Table 8. Hourly Measured Sound Pressure Levels – Location 7 Noise Ordinance – Salem Township, PA				
<i>Date</i>	<i>Time</i>	<i>LA_{EQ} (dB)</i>	<i>LA₁₀ (dB)</i>	<i>LA₉₀ (dB)</i>
1/31/24	4:00 PM	53	53	48
	5:00 PM	54	54	50
	6:00 PM	51	52	49
	7:00 PM	49	51	48
	8:00 PM	48	49	48
	9:00 PM	50	50	48
	10:00 PM	49	50	48
	11:00 PM	49	50	48
2/1/24	12:00 AM	49	49	48
	1:00 AM	48	48	47
	2:00 AM	48	48	47
	3:00 AM	48	48	47
	4:00 AM	49	49	48
	5:00 AM	52	50	48
	6:00 AM	56	53	49
	7:00 AM	59	54	50
	8:00 AM	67	70	51
	9:00 AM	68	71	59
	10:00 AM	61	60	51
	11:00 AM	58	56	52
	12:00 PM	54	55	51
	1:00 PM	53	53	50
	2:00 PM	57	54	50
3:00 PM	55	54	49	

Table 9. Hourly Measured Sound Pressure Levels – Location 8
Noise Ordinance – Salem Township, PA

<i>Date</i>	<i>Time</i>	<i>LA_{EQ} (dB)</i>	<i>LA₁₀ (dB)</i>	<i>LA₉₀ (dB)</i>
1/31/24	4:00 PM	51	48	40
	5:00 PM	50	51	40
	6:00 PM	46	47	39
	7:00 PM	45	44	39
	8:00 PM	44	45	39
	9:00 PM	43	44	41
	10:00 PM	41	42	39
	11:00 PM	41	42	38
2/1/24	12:00 AM	41	43	38
	1:00 AM	40	41	38
	2:00 AM	38	40	36
	3:00 AM	40	40	37
	4:00 AM	38	39	36
	5:00 AM	43	42	39
	6:00 AM	50	48	39
	7:00 AM	52	52	43
	8:00 AM	52	51	47
	9:00 AM	49	50	44
	10:00 AM	49	50	47
	11:00 AM	51	51	48
	12:00 PM	58	51	48
	1:00 PM	73	76	48
	2:00 PM	49	49	44
	3:00 PM	50	49	43

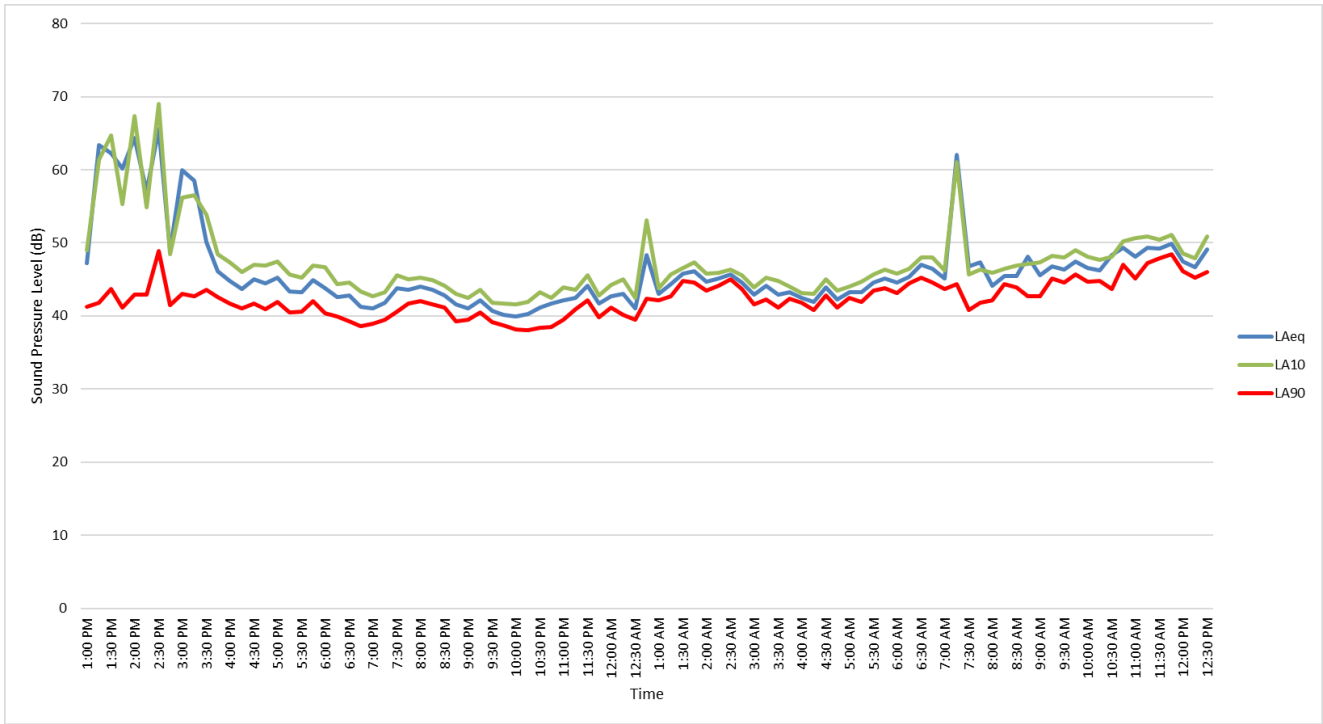


Figure 13. 15-Minute Sound Pressure Levels, Location 1: 1/30/24-1/31/24

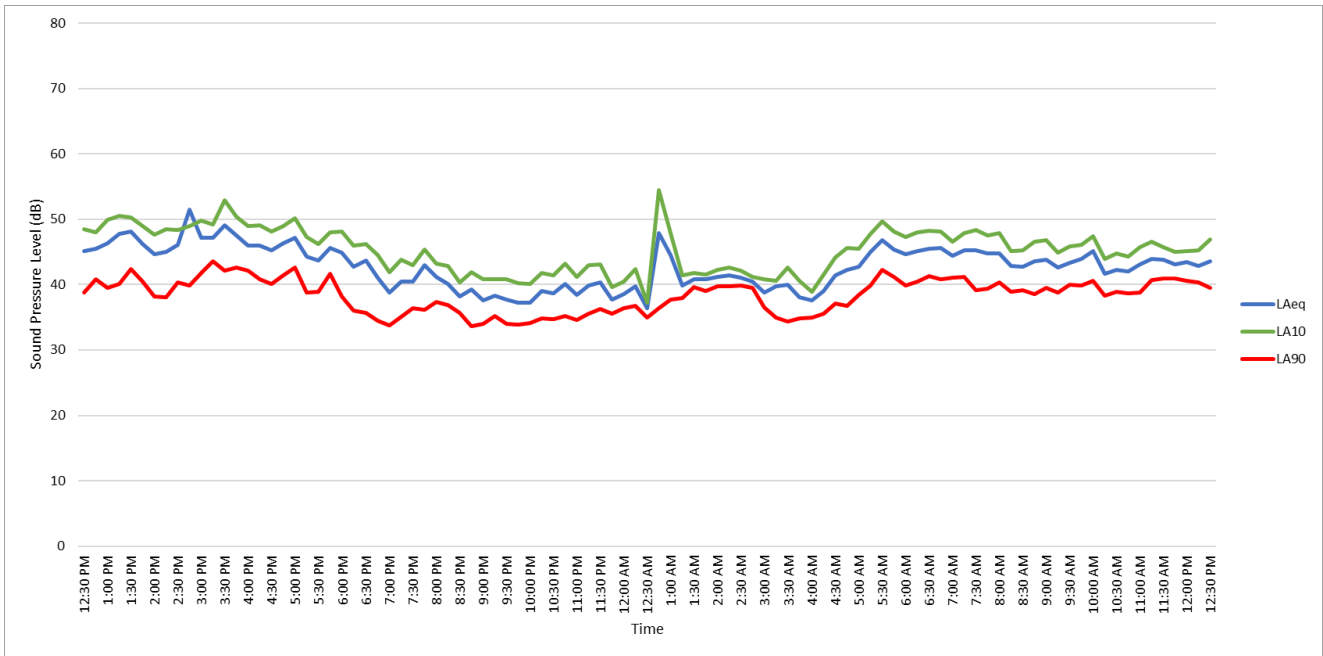


Figure 14. 15-Minute Sound Pressure Levels, Location 2: 1/30/24-1/31/24

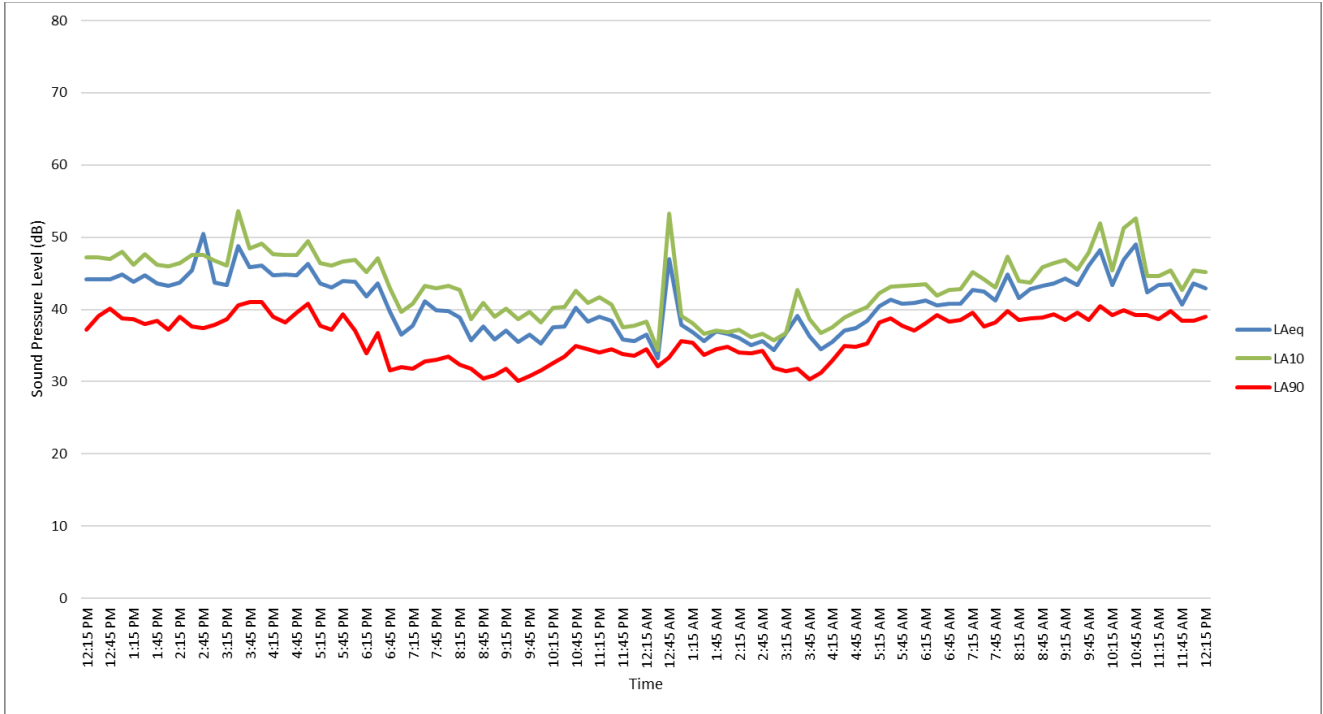


Figure 15. 15-Minute Sound Pressure Levels, Location 3: 1/30/24-1/31/24

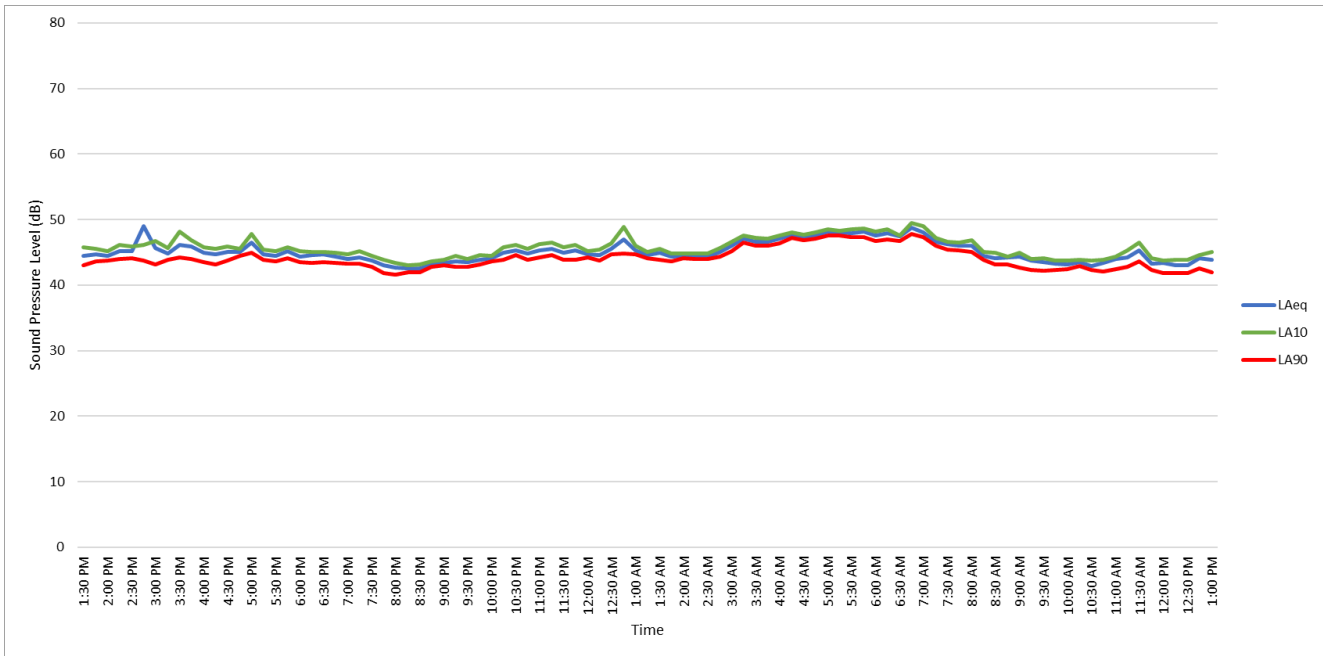


Figure 16. 15-Minute Sound Pressure Levels, Location 4: 1/30/24-1/31/24

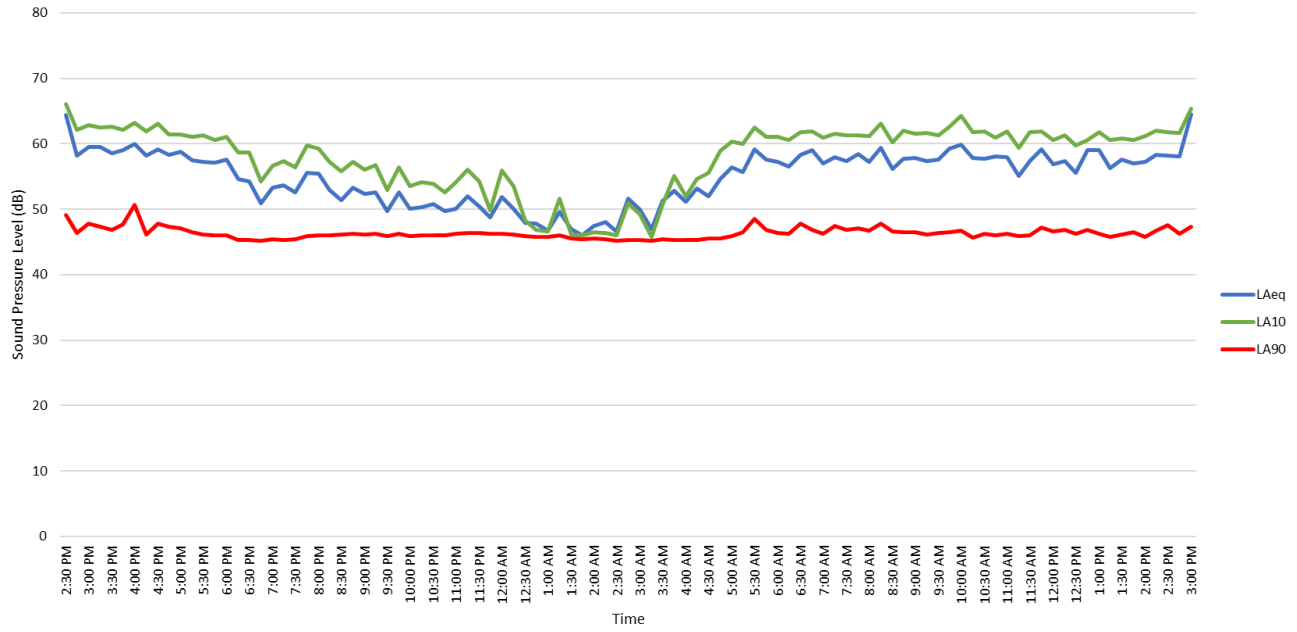


Figure 17. 15-Minute Sound Pressure Levels, Location 5: 1/31/24-2/1/24

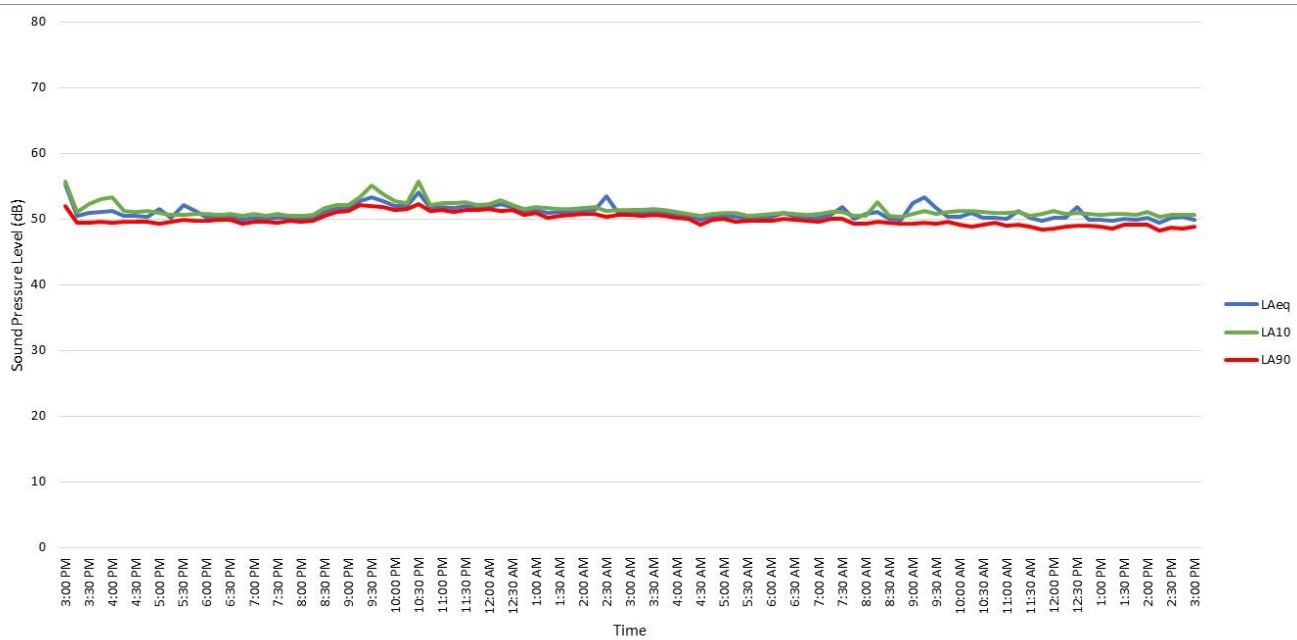


Figure 18. 15-Minute Sound Pressure Levels, Location 6: 1/31/24-2/1/24

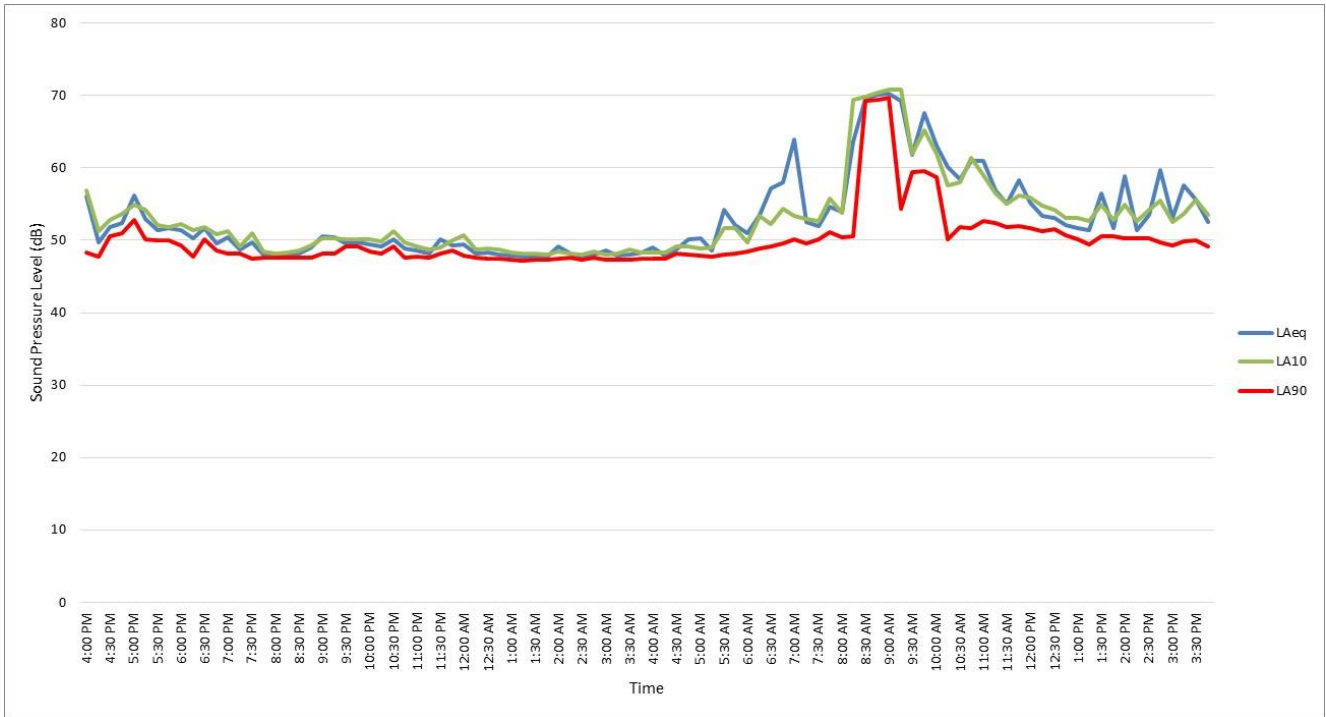


Figure 19. 15-Minute Sound Pressure Levels, Location 7: 1/31/24-2/1/24

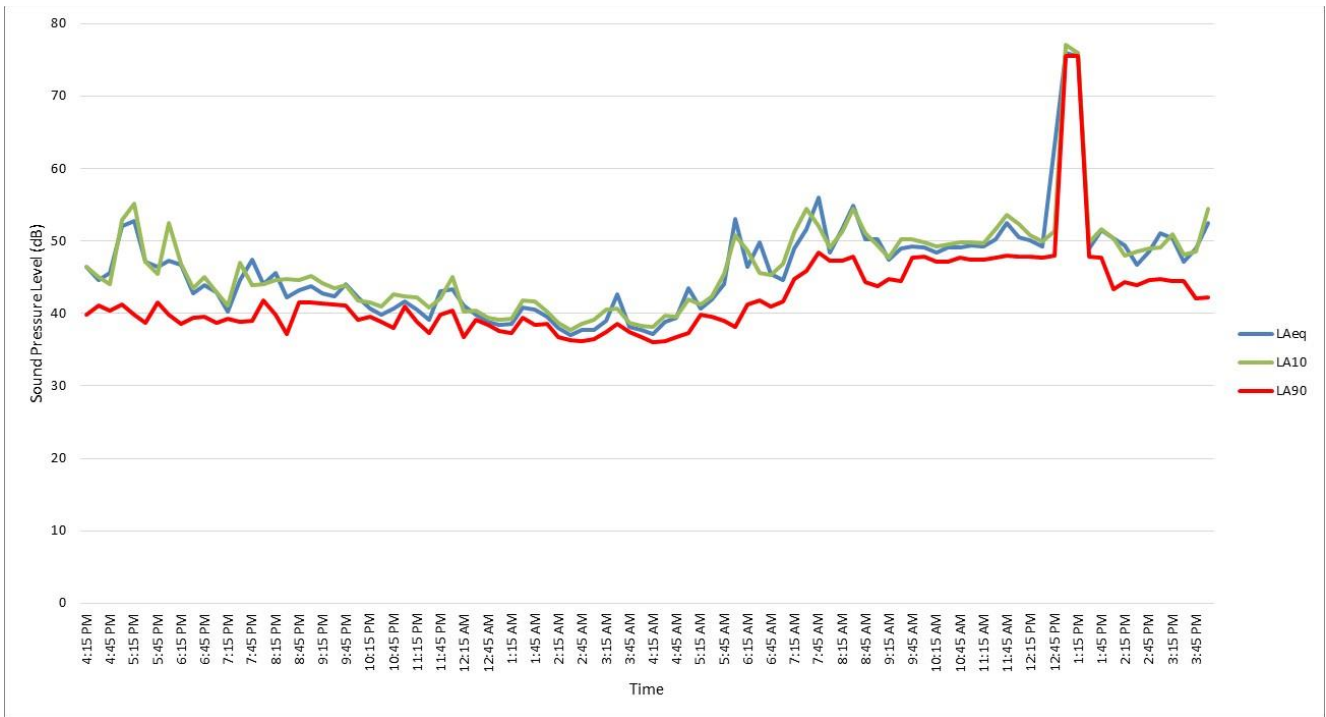


Figure 20. 15-Minute Sound Pressure Levels, Location 8: 1/31/24-2/1/24