Criterion Acoustics

Architectural Acoustics & Systems Design

Date: September 29, 2024

To: Gavin Crescenzo – Keyah Group

From: David Kotch, Andy Swerdlow – Criterion Acoustics

Re: 1515 Washington Avenue – Treehouse Hotel – Environmental Noise Impact Study

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1) Overview

Keyah Group has hired Criterion Acoustics (CA) to perform an Environmental Noise Impact Study for the proposed Treehouse Hotel project located at 1509 - 1515 Washington Avenue and 1500 Collins Avenue, Miami Beach, FL 33139.

2) Areas of Study

Audio systems for music playback are being planned for certain areas of the project. The areas that will be analyzed in this study and their associated programming intention are as follows:

A. Level 1 Pool Deck, Pool Bar, and Outdoor Lounge
- Food and Beverage service in certain areas
- Outdoor speakers for ambient background music playback

B. Level 1 Haddon Hall Ballroom
- Indoor entertainment for events, potentially with DJ music playback

C. Level 3 Rooftop Garden (Wellness Club)
- No Food and Beverage
- Outdoor speakers for ambient background music/sound playback

D. Level 7 Rooftop Lounge
- Food and Beverage service
- Outdoor speakers for ambient background music playback

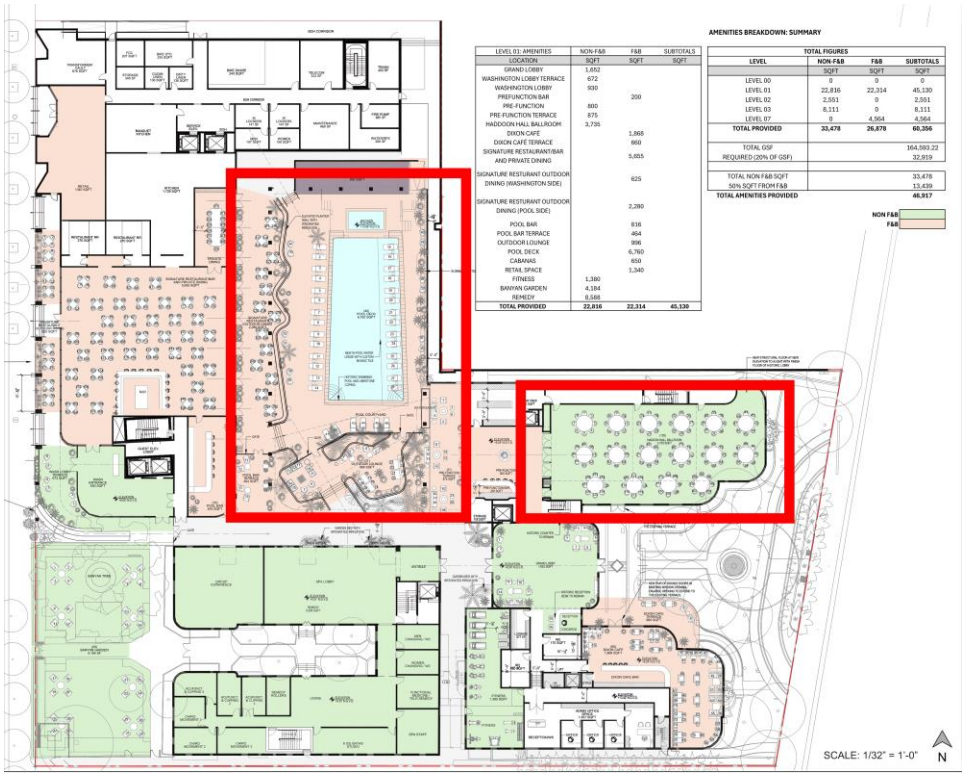

Figure 1 - Level 1 areas of study: Pool Deck (left) and Haddon Hall Ballroom (right)

Figure 2 - Level 3 area of study: Rooftop Garden

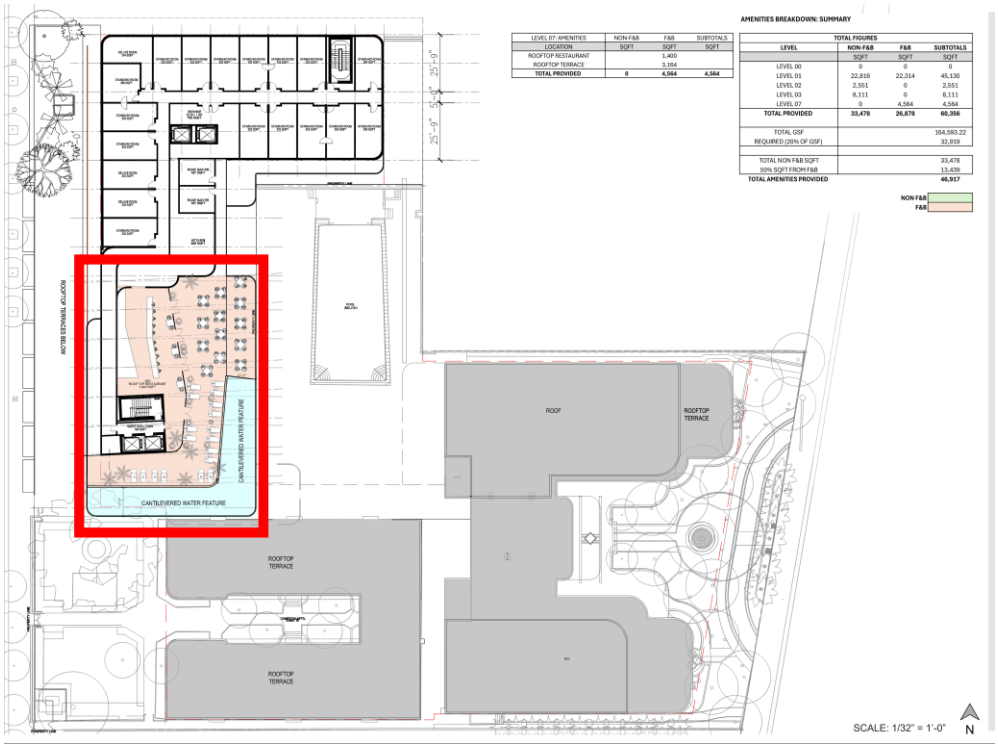

Figure 3 - Level 7 area of study: Rooftop Lounge

3) Environmental Noise Impact: Recommendations Summary

The project will meet or exceed the provisions in the Miami Noise Code if the conditions in this report are met.

The key points for the project's areas of study (identified in section 2) are as follows:

A. <u>Level 1 Pool Deck, Pool Bar, and Outdoor Lounge</u>

Design Advantages:

The Pool Deck is surrounded by buildings, shielding neighbors from the sound of activities on the pool deck.

Design Challenges:

The back of the 1506 and 1510 Collins Avenue buildings face the Pool Deck. Consideration will be taken during design of any installed sound reinforcement system to direct sound away from guests or tenants.

CA Recommendations:

a. **Loudspeakers for audio playback shall use 6" bass drivers or smaller,** be distributed to keep loudspeakers close to patrons and individual loudspeaker levels as low as possible to achieve the desired atmosphere.

b. **Subwoofers are not recommended** to be used on the Pool Deck.
c. Careful design and evaluation of the loudspeaker plans is recommended. Loudspeakers on the east side of the pool (or 20' from 1506 and 1510 Collins) should be on a separate control to reduce the level.
d. Commissioning after installation is recommended to set limiter and gain structure levels.
e. CA predicts that music playback of 70 dBA distributed sound level will be acceptable during the daytime under most conditions.

B. Level 1 Haddon Hall Ballroom

Design Advantages:

a. The Ballroom is fully enclosed; music playback will impact the guests in the rooms above the ballroom more than the environment.
b. The sound egress path to 1506 Collins (neighbor to the north) is interrupted by storage rooms and the alley between the buildings. This is good and direct sound egress should not be a problem during operation.

Design Challenges:

The 1437 Collins Avenue hotel is directly across the street. Sound egress is limited because the Ballroom is fully enclosed; when the door facing the courtyard is opened, more sound will impact the surroundings.

CA Recommendations:

a. Loudspeakers for audio playback should be permanently installed. Outside sound systems should not be allowed (special occasions or permits excepted). The system should be suitable for the planned programming so that renters do not need to bring their own gear.
b. Careful design and evaluation of the sound system plans is recommended. The sound system should be limited and password protected; master system settings controlled only by management. Operation during events will be controlled separately by staff on site.
c. CA cannot yet recommend a sound level limitation this early in the design because there are too many variables (e.g., a distributed sound system will likely not be appropriate for the intended use). CA estimates that 95-100 dBA event sound will be allowable under most conditions.
d. Outdoor egress doors should be heavy glass, be fitted with weather seals and automatic closure mechanisms if allowable by fire code.
e. As the project continues, CA will consult on the sound reinforcement system design and recommend a ceiling construction with multiple functions (reduce sound transfer to the guest rooms upstairs and reduce reflected sound within the Ballroom). Absorbing reflected sound within the ballroom will allow quieter operation by improving clarity and intelligibility of speech and sound.

C. Level 3 Rooftop Garden (Wellness Club)

Design Advantages:

a. The Rooftop Garden is intended to be operated as part of a wellness club—from what has been described to CA, the anticipated activities will be quieter than a restaurant or lounge.
b. The surrounding buildings are commercial; there is no clear risk for sound egress. The closest residences are across Washington Ave. and are lower height (this is good).

Design Challenges:

The roof deck is relatively unobstructed for sound to travel to neighboring properties.

CA Recommendations:

a. **Loudspeakers for audio playback shall use 6" bass drivers or smaller,** be distributed to keep loudspeakers close to patrons and individual loudspeaker levels as low as possible to achieve the desired atmosphere.
b. **Subwoofers are not recommended** to be used.
c. Should fitness or other classes be held, instructors should not be permitted to bring their own audio equipment.
d. Commissioning after installation is recommended to set limiter and gain structure levels.
e. CA estimates that at least 70 dBA music playback will be allowable.

D. Level 7 Rooftop Lounge

CA Recommendations:

a. **Loudspeakers for audio playback shall use 6" bass drivers or smaller,** be distributed to keep loudspeakers close to patrons and individual loudspeaker levels as low as possible to achieve the desired atmosphere.
b. **Subwoofers are not recommended** to be used.
c. Commissioning after installation is recommended to set limiter and gain structure levels.
d. CA estimates that at least 70 dBA music playback will be allowable.
e. Higher sound levels
f. **A digital tamper-resistant sound level input limiter will be installed and configured after on-site sound level calibration** to ensure that the calibrated level is never exceeded. This limiter and output gain settings will only be accessible by corporate management and will have no local operational access.

4) Project Images

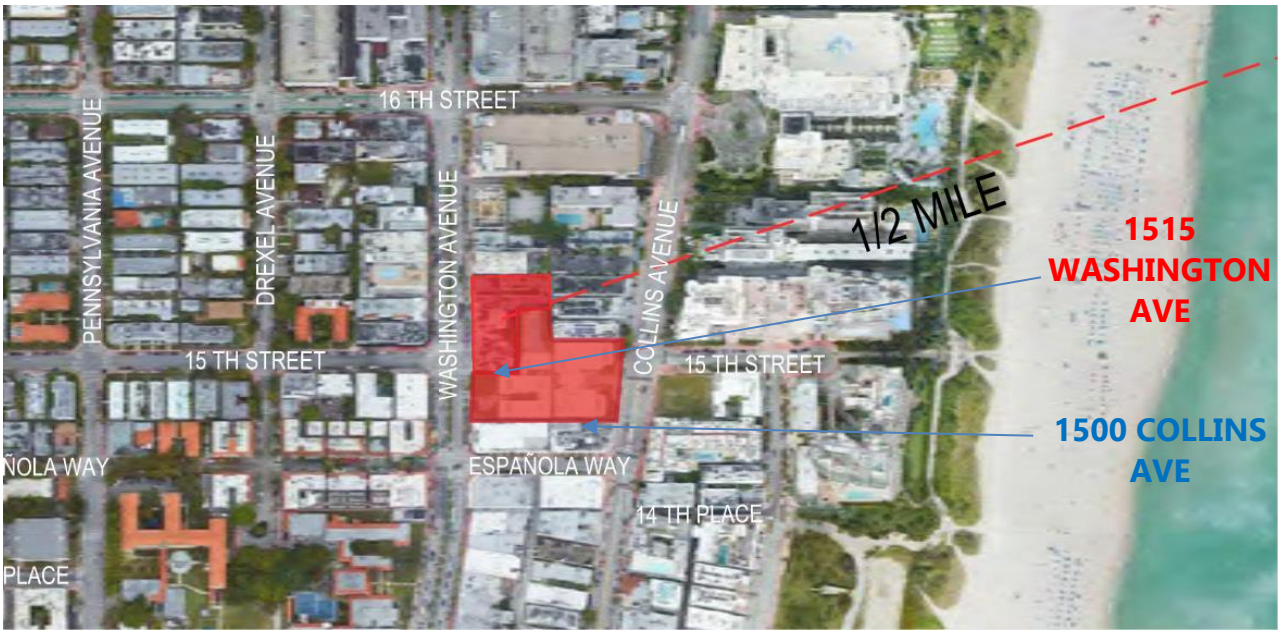

Figure 4 - Key Plan of 1509-1515 Washington Ave. and 1500 Collins Ave. (NR Architect)

VIEW 01

VIEW 03

Figure 5 - Street View of 1509-1515 existing buildings

5) Modeling Methodology and Measurement Results

1. Methodology

a. A B&K 2270 handheld analyzer was used for on-site acoustical measurements. The analyzer has the following software packages installed:
- BZ-7223 - Frequency analyzer software
- BZ-7224 - Logging software
- BZ-7225 - Enhanced logging software
- BZ-7226 - Sound recording option

The meter was calibrated by B&K in the past year, in addition to daily calibration with a B&K 4231 ½" microphone calibrator. A windscreen was used during the measurement.
All measured acoustical data was processed using the L90 calculation, removing the loudest 90% of recorded data.

b. Predicted rooftop sound from loudspeakers and talking patrons was modeled using Noisetools dBMap software.
- Patron sound sources were simulated using line sources with 68 dBA sound power per meter using the spectrum in Table ii, derived from ANSI 3.5 "normal" vocal effort. The spectrum was increased by 3dB to allow for two talkers per meter.
- Loudspeaker sound sources were modeled as omnidirectional (accurate for bass sounds), and placed 2m above the surface of the roof. The assumed sound power is listed below in Table iii; and is a typical value for a small outdoor speaker. They are placed in a distributed fashion throughout the outdoor patron areas. The proposed roof audio system has not yet been specified; CA has used this to show an average, typical and unsophisticated loudspeaker deployment.

Table ii – Sound power level for "normal" vocal effort

	31.5 [Hz]	63 [Hz]	125 [Hz]	250 [Hz]	500 [Hz]	1000 [Hz]	2000 [Hz]	4000 [Hz]	8000 [Hz]	Overall [dBA]	Overall [dBC]
Sound Level	-	45	55	65	69	63	56	50	45	68	-

Table iii – Modeled sound power level for a single loudspeaker

	31.5 [Hz]	63 [Hz]	125 [Hz]	250 [Hz]	500 [Hz]	1000 [Hz]	2000 [Hz]	4000 [Hz]	8000 [Hz]	Overall [dBA]	Overall [dBC]
Sound Level	-	80	80	80	80	80	77	74	71	84	88

2. On-Site, Ambient Sound Level Measurement Results

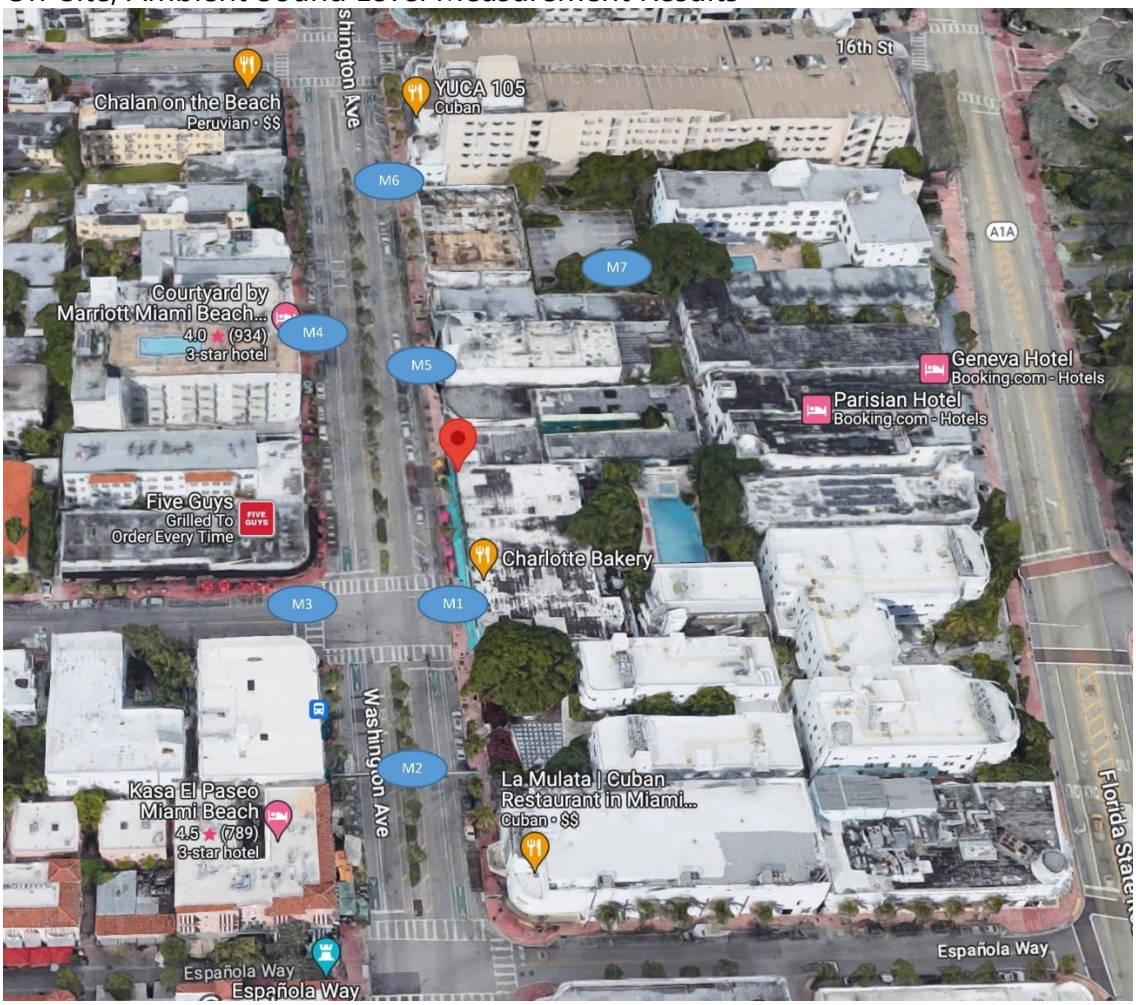

Figure 6 - Map of Ambient Noise Measurement Locations

Table iv – Measurement results for environmental noise testing		
Measurement	**Location**	**Measured Sound Level [dBA, LAF90]**
M1	East intersection of Washington and 15th	59
M2	Washington Ave between Espanola and 15th	59
M3	West intersection of Washington and 15th	63
M4	1530 Washington Ave.	59
M5	1527 Washington Ave.	58
M6	1555 Washinton Ave.	59
M7	Parking lot behind 1543 Washington Ave.	54

Ambient Noise Measurement Notes:

a. Measurements were captured between 9:30 PM and 11:30 PM on August 31, 2023 by David Molho of WSDG.
b. Normal activities such as light traffic and music from nearby establishments occurred during the measurements.
c. Measurement 7 is the quietest of the group; 54 dBA. CA was not able to access the pool adjacent to 1515 Washington, so the parking lot environmental noise value is assumed to be representative of the pool.

3. Environmental Noise Impact Model Results

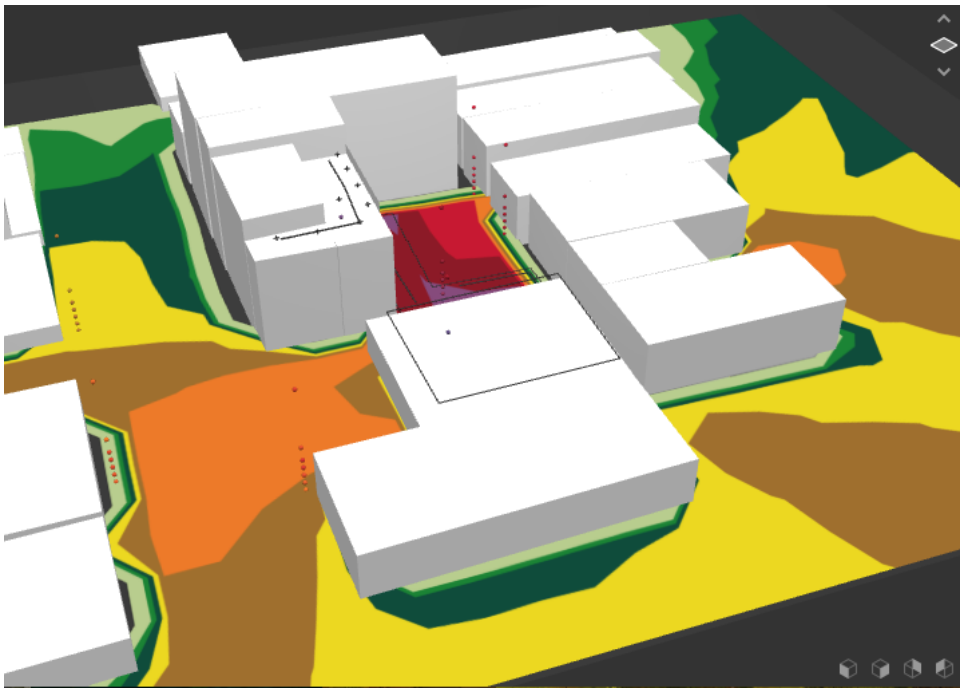

Figure 7 - dBMap 3D View

Speaker sources are indicated with a cross, human speaking sources are indicated with a line (2 people speaking per meter), and distributed loudspeaker sources are indicated with a box. Red is a deactivated source, black means it is on. All of the sources in figure 8 are on, while singular sources are shown on the following pages.

Modeled people (voices): Roof Lounge=50; Pool Deck=100

6) Modeling Results

A. Level 1 Pool Deck, Pool Bar, and Outdoor Lounge

Receiver results are in dBA. This map is representative of sound heard when standing on the ground. **The red arrow points to the sound source.**

The sound level in the lounge and on the pool deck is 71 dBA, and the sound at the property line of the hotels is 60-62 dBA.

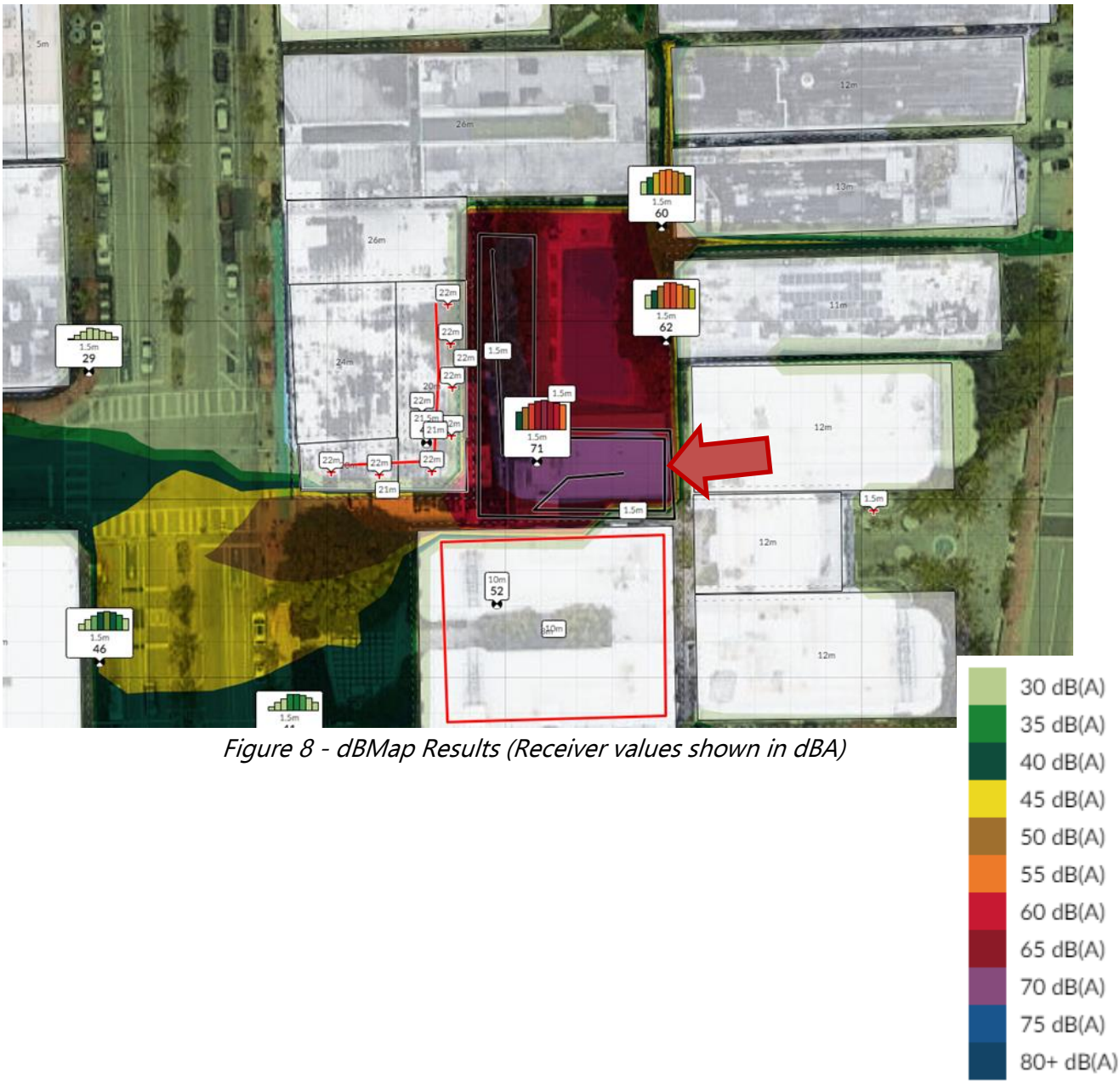

Figure 8 - dBMap Results (Receiver values shown in dBA)

B. Level 1 Haddon Hall Ballroom

Receiver results are in dBA. This map is representative of sound heard when standing on the ground. **The red arrow points to the sound source.**

The assumed sound level in the Ballroom is 100 dBA.
The sound just outside of the door is 94 dBA.
The sound received across Washington is 61 dBA. This sound will be momentarily audioble while the door is open.

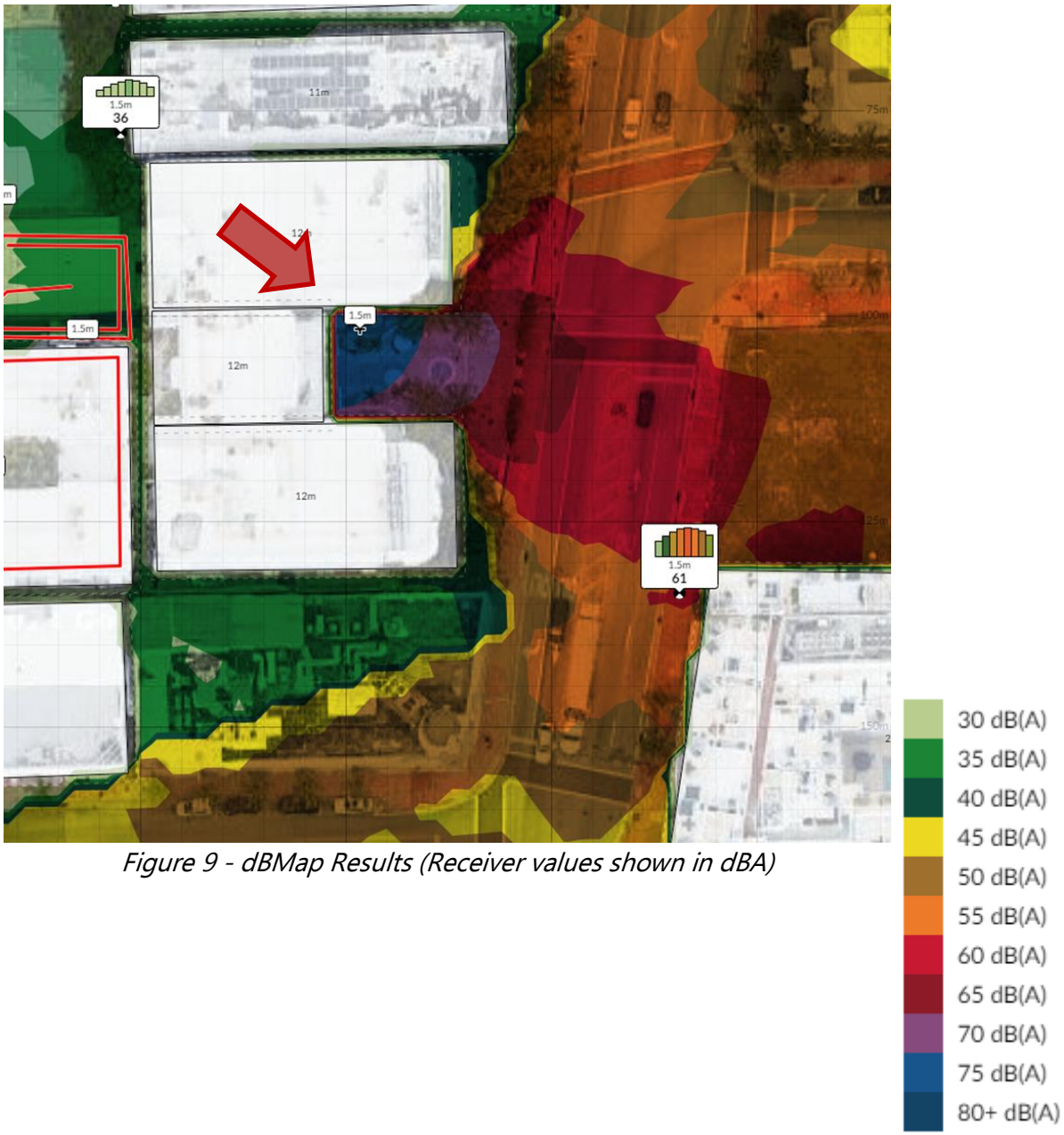

Figure 9 - dBMap Results (Receiver values shown in dBA)

C. Level 3 Rooftop Garden (Wellness Club)

Receiver results are in dBA. This map is representative of sound heard when standing on the ground. **The red arrow points to the sound source.**

The sound level on the Wellness Club Roof is 71 dBA, and the sound level across Collins is 54 dBA. This sound level will be barely audible.

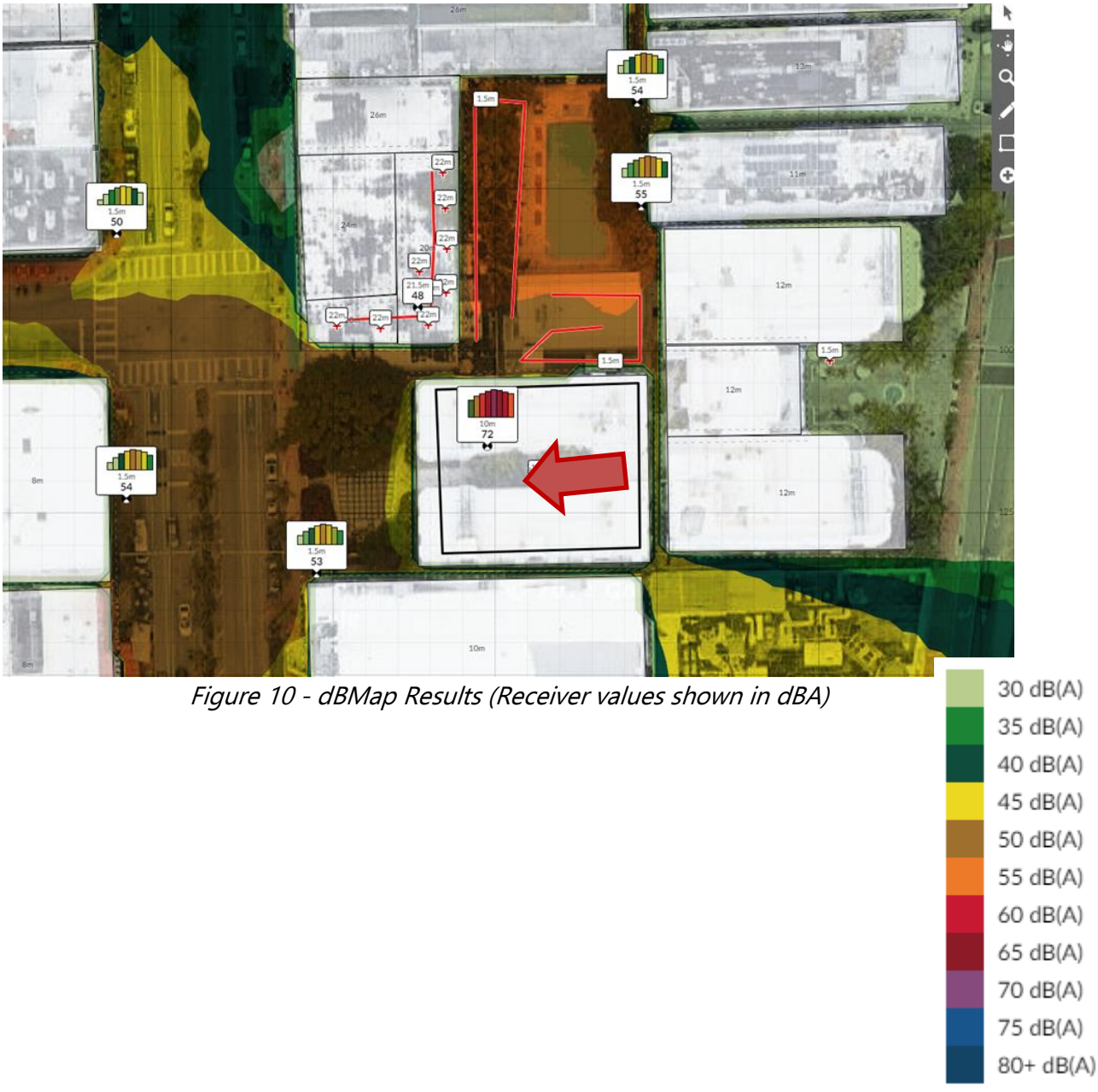

Figure 10 - dBMap Results (Receiver values shown in dBA)

D. Level 7 Rooftop Lounge

Receiver results are in dBA. This map is representative of sound heard one story above ground. **The red arrow points to the sound source.**

The sound level in the Rooftop Lounge is 70 dBA.

With a solid glass barrier 3 ft. high at the edge of the water feature, sound level at the neighboring hotels property line is 54 dBA.

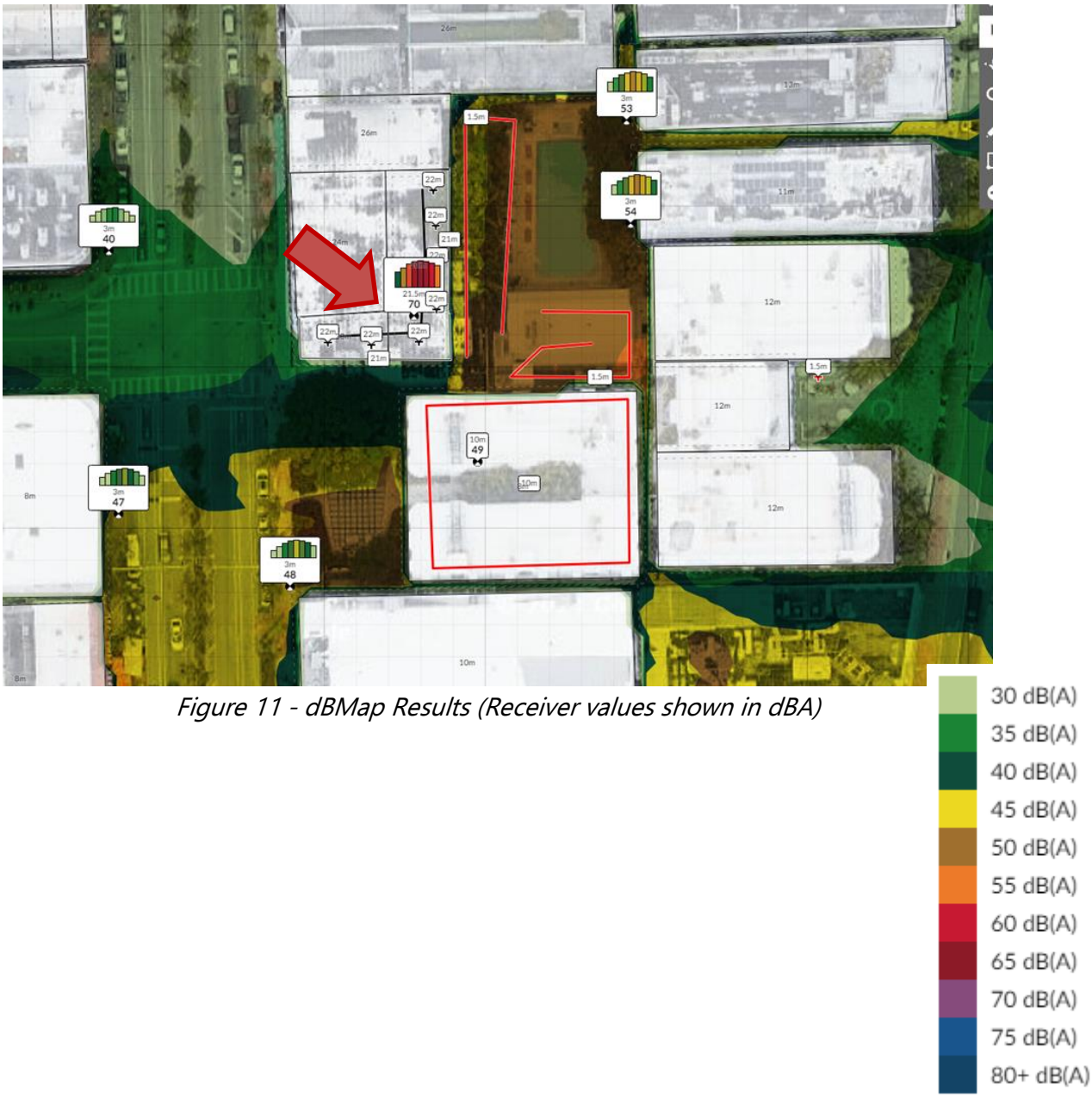

Figure 11 - dBMap Results (Receiver values shown in dBA)

7) Noise Code

The applicable section of the Miami Beach noise code is excerpted below in italics.

Sec. 46-152. - Noises; unnecessary and excessive prohibited.

It shall be unlawful for any person to make, continue or cause to be made or continued any unreasonably loud, excessive, unnecessary or unusual noise. The following acts, among others, are declared to be unreasonably loud, excessive, unnecessary or unusual noises in violation of this section, but this enumeration shall not be deemed to be exclusive, namely:

(b) Radios, televisions, phonographs, etc. The using, operating, or permitting to be played, used or operated any radio receiving set, television set, musical instrument, phonograph, or other machine or device for the producing or reproducing of sound in such manner as to disturb the peace, quiet and comfort of the neighboring inhabitants, or at any time with louder volume than is necessary for convenient hearing for the person or persons who are in the room, vehicle or chamber in which such machine or device is operated and who are voluntary listeners thereto. The operation of any such set, instrument, phonograph, machine or device between the hours of 11:00 p.m. and 7:00 a.m. in such manner as to be plainly audible at a distance of 100 feet from the building, structure or vehicle in which it is located shall be prima facie evidence of a violation of this section.

Please call to further discuss.

Sincerely,

David Kotch.

APPENDIX OF ACOUSTIC TERMS AND DEFINITIONS

Ambient:

Ambient noise includes all sounds present in an environment. The ambient noise level may be measured at any moment, but it will vary widely with time, e.g., with the coming and going of trucks, cars, aircraft, sirens, etc.

Decibel (dB):

A unit of the intensity of sound. The decibel (abbreviated dB) is a relational measure, expressing the relative intensity of the described sound to a reference sound. The decibel is a logarithmic measure, specifically 10 times the logarithm of the ratio of two voltages, currents, or sound pressures. Decibels are a logarithmic scale, so every 3dB increase is a doubling of sound pressure and subjectively it requires 10dB for a perceived doubling of loudness. See Figure A for a chart illustrating comparative dB & SPL values.

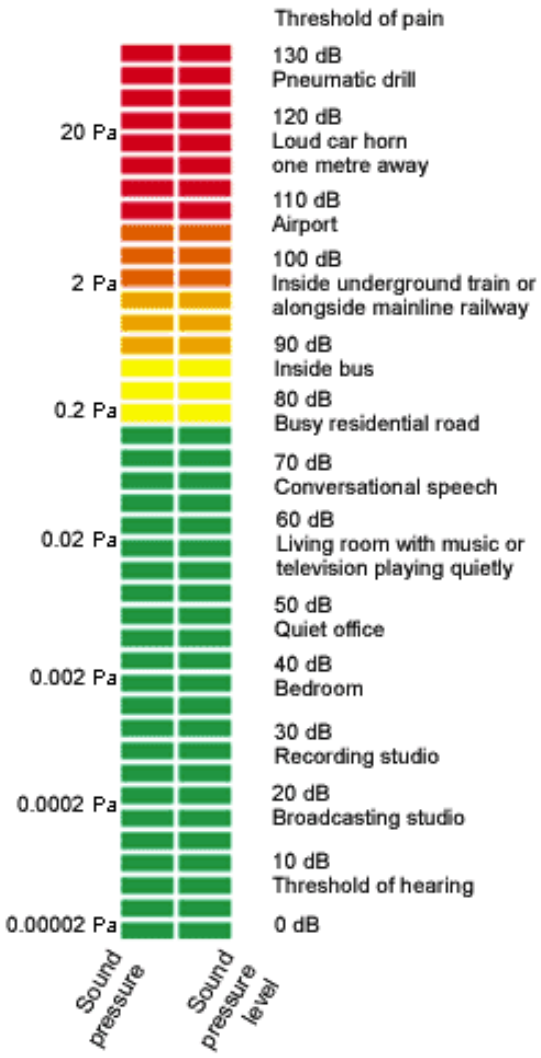

Figure A – Chart illustrating comparative dB & SPL values.

A-Weighting:

The A-contour filters out a significant amount of the bass in order to approximate the way humans hear at the 40 phon level. It is useful for eliminating inaudible low frequencies and is commonly used at SPLs below 70 dB. Sound pressure level values obtained using this weighting are referred to as A-weighted sound pressure levels and are signified by the identifier dBA. See Figure B for a visual comparison of weighting curves.

C-Weighting:

The C-contour is nearly flat, with only a slight reduction at the high and low frequencies. It approximates the way humans hear at very high sound levels and is commonly used for SPLs above 70 dB. Sound pressure level values obtained using this weighting are referred to as C-weighted sound pressure levels and are signified by the identifier dBC. See Figure B for a visual comparison of weighting curves.

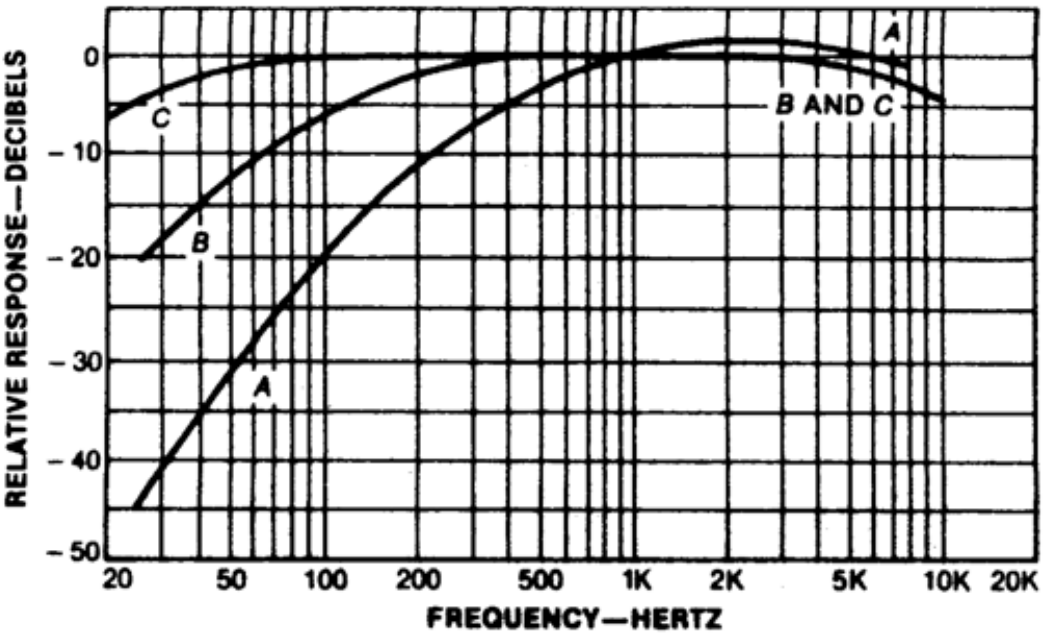

Figure B – A visual comparison of weighting curves.

L_{EQ}:

Equivalent continuous sound level. The steady level which would produce the same sound energy over the test period as the specified time-varying sound. This figure is useful for studying long-term trends in environmental noise.

L_{MAX}:

Highest, or loudest, Sound Pressure Level (in dBA, dBC, or dBZ) measured during the test period.

L_{MIN}:

Lowest, or quietest, Sound Pressure Level (in dBA, dBC, or dBZ) measured during the test period.

L_n:

L_n values are statistical noise levels (sometimes called percentiles) used to assess noise levels (sound pressure levels) from fluctuating noise sources over time. Any statistical value between 0.01% and 99.99% may be calculated where 'n' is the percent exceeded noise level over a timed measurement period (T).

$L_{5.0}$:

$L_{5.0}$ is the level exceeded for 5% of the time. For 5% of the time, the sound or noise has a sound pressure level above $L_{5.0}$. For the rest of the time, the sound or noise has a sound pressure level at or below $L_{5.0}$. These higher sound pressure levels are due to sporadic or intermittent events. $L_{5.0}$ is often used when assessing environmental noise and in planning applications.

L_{95}:

L_{95} is the level exceeded 95% of the time. For 95% of the time, the noise level is above this level. It is generally considered to be representing the background or ambient level of an environment. L_{95} is often used to quantify the background noise levels in assessments of noise pollution and nuisance noise from industrial sources.

Perception of Sound:

The threshold of perception of the human ear is approximately three decibels and a five-decibel change is considered to be clearly noticeable to the ear. This is primarily due to the logarithmic measuring metric typically associated with decibels. See Chart 1 for perceived change in decibel levels.

Perceived Change in Decibel Levels	
Change in sound level	**Perceived change to the human ear**
± 1dB	Not perceptible
± 3dB	Threshold of perception
± 5dB	Clearly noticeable
±10dB	Twice (or half) as Loud
± 20dB	Fourfold (4x) change

Chart 1 - Perceived change in decibel levels.

Subtracting Sound Levels:

Sometimes it is necessary to subtract the background noise from the total SPL. The correction for background noise can be done by subtracting background noise from the total noise level using logarithmic subtraction.

If change is less than 3 dB(A), the background noise is too high for an accurate measurement and the correct noise level cannot be found until the background noise has been reduced. If the difference is more than 10 dB(A), the background noise can be ignored.