TESTIMONY
of
Chris Pollock, PE
Arup,
before the
D.C City Council Committee of the Whole
July 2, 2018
John A. Wilson Building, Room 412

1. Background and Acoustic Info

I am Chris Pollock, an acoustical consultant with Arup with 20 years of experience measuring noise and designing buildings and spaces for suitable acoustics and noise conditions. I have a degree in Mechanical Engineering, I am a Licensed Professional Engineer in the Commonwealth of Virginia, have been published in articles in the field of acoustics and interviewed by various media outlets regarding acoustics and noise

Arup was asked to perform acoustical measurements and provide technical acoustical input and support for the testing and review of a group of leaf blowers.

2. Gas Leaf Blowers and Battery Leaf Blowers

The questions we were asked to help answer were:

a. What is the difference in characteristics of the sound produced by commonly used commercial gas leaf blowers compared with commercial grade battery blowers?
b. What are the implications for the communities in which those machines operate ?

We are not investigating the noise level at the operator ears relative to exposure, but rather the impact on people and the community surrounding the leaf blowers as they are being used.

3. Testing and Noise Measurements

We designed a set of tests that in our experience would allow us to capture side by side noise levels for various leaf blower types. It was arranged for 7 commercial blowers to be used, Blowers were selected for comparable flow rates and deciBel ratings.

The leaf blowers selected, and their corresponding labels on the graphs below are as follows:
The battery powered blowers labelled in blue are:

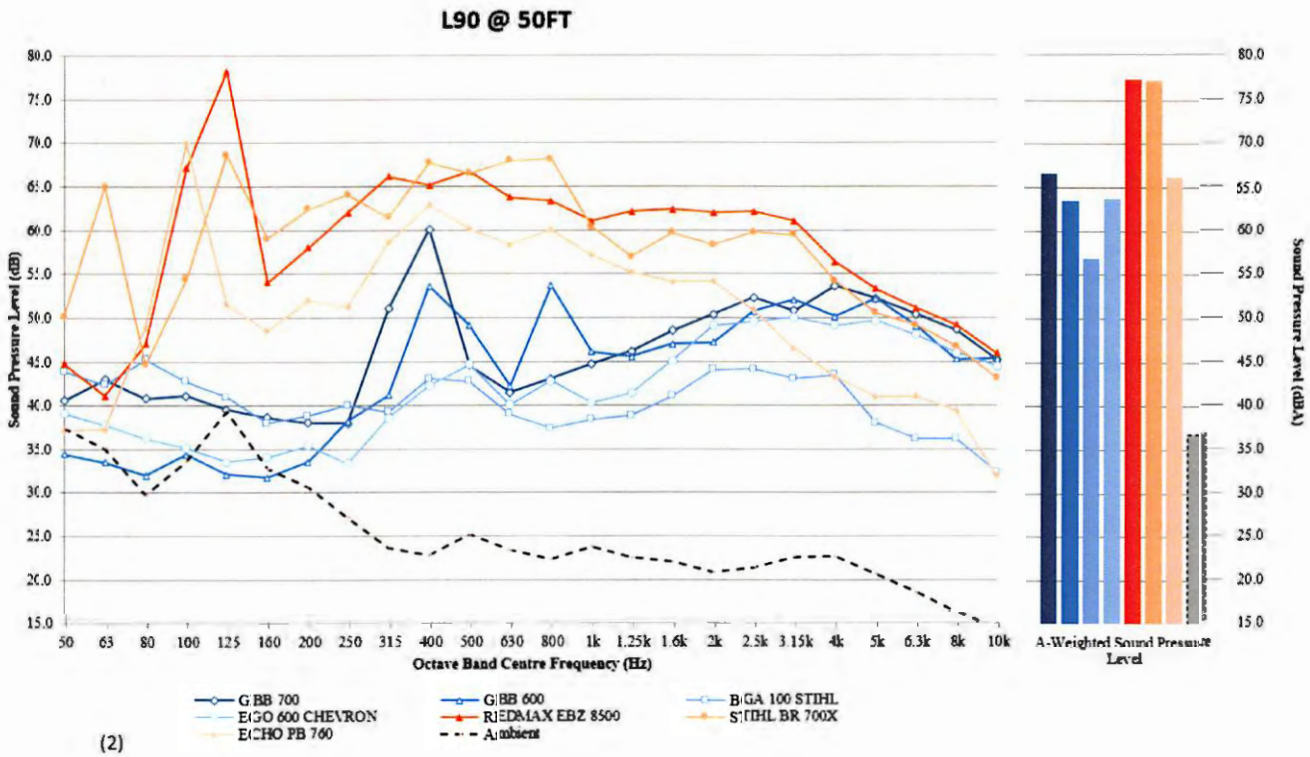
- Greenworks GBB 700
- Greenworks GBB 600
- Chevron EGO 600
- Stihl BGA 100

The gas powered blowers are labelled in orange:

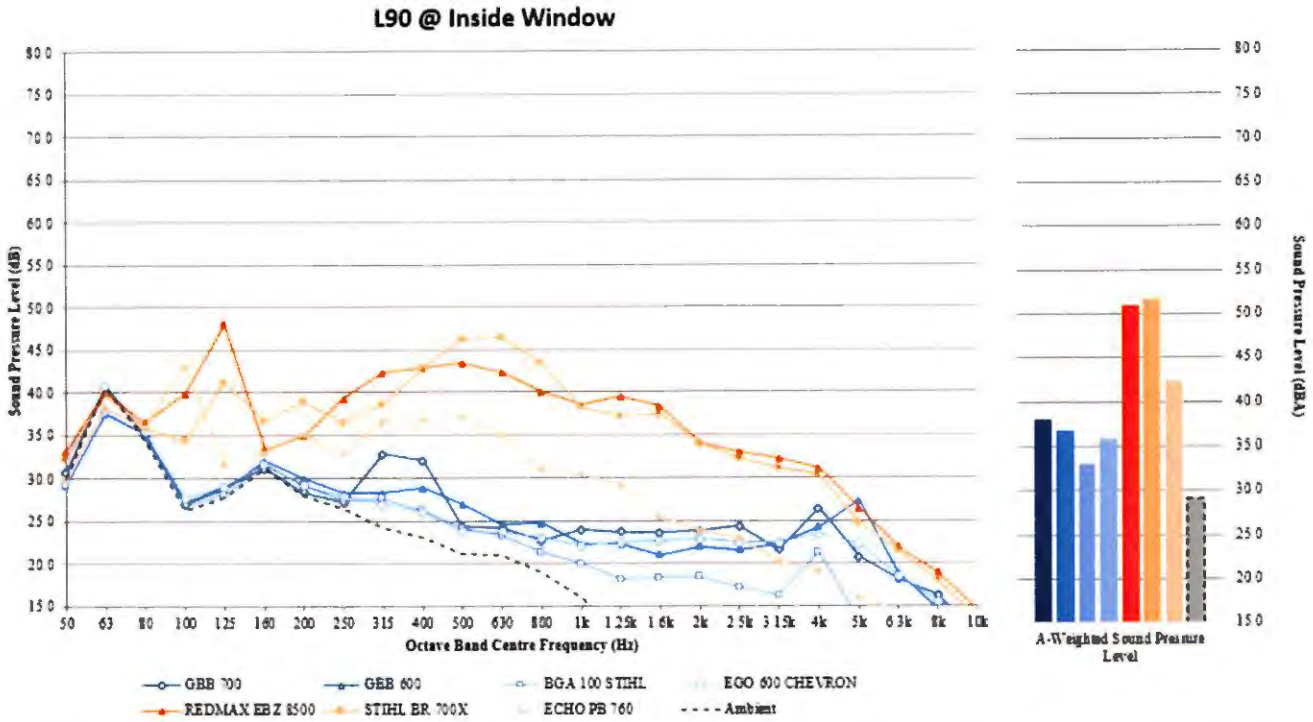
- Redmax EBZ 8500
- Stihl BR 700x
- Echo PB 760

The full details of the testing sequence, equipment and protocol will be outlined in my written report to follow.

Some of the summary results from our testing are outlined below:



(2)



The horizontal axis of the chart shows frequency, with the left side being very low frequency 'rumble' sounds, and the right side being high frequency 'hissing' sounds. The vertical axis shows increasing sound pressure level as you go up the chart.

The interesting points to note and where there are significant differences

4. Key Results
    a. From the data above, we observed clearly that the group of gas leaf blowers all exhibit a much higher level of sound energy in the low frequency bands. In a number of cases, this engine noise is a peak at 100 to 125 Hz. This energy is quite distinctly different for the gas leaf blowers than the battery powered leaf blowers. This is highlighted by the two blowers, the Echo PB 760 and the Greenworks GBB 700, both 66.5 dBA at 50 feet, but with dramatically different acoustic qualities and audibly different at 5feet, 50 feet and greater distances.

    b. Audibility over larger distances: Based on the experience of measuring sound, I witnessed that the three gas powered leaf blowers at an 800 foot distance were audible, two being clearly audible (Redmax EBZ 8500 and the Stihl BR 700x) and the third (Echo PB 760) being

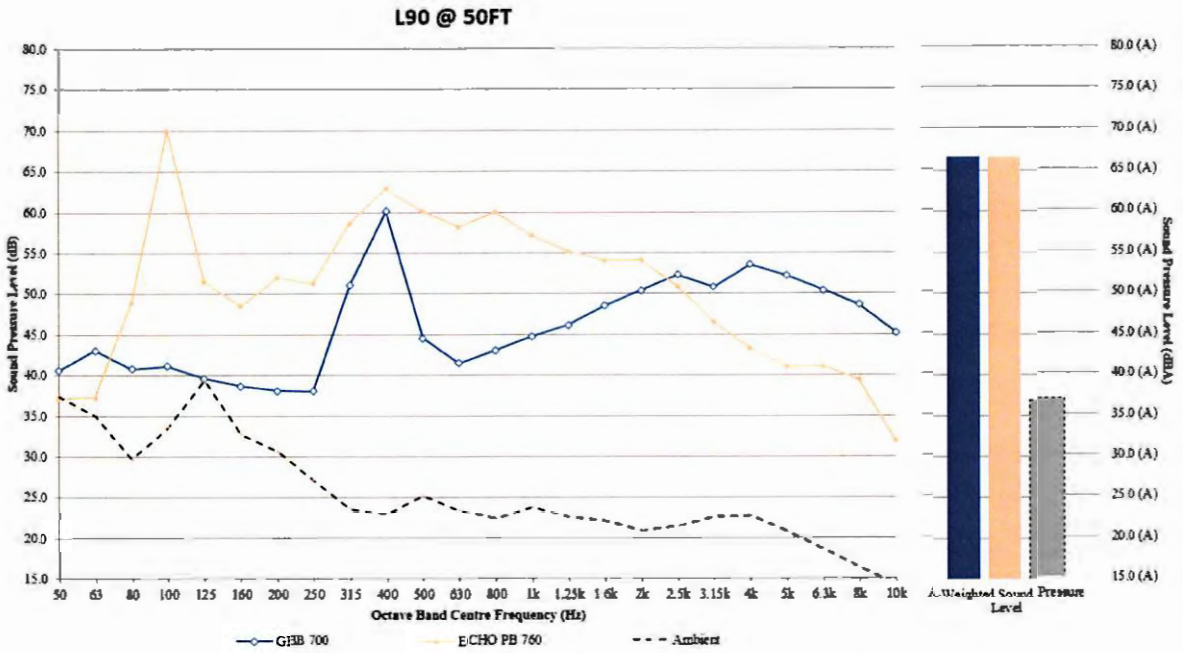
noticeable, while all of the battery powered leaf blowers were not distinguishable above the very quiet ambient community sound levels at that distance.

c. Audibility within Houses: One of the challenges with low frequency noise is that it requires heavy construction or materials to stop the sound transmitting from the outside into the building. With leaf blowers, the low frequency components of the gas leaf blowers are what is most easily transmitted, and this is clearly seen in the testing results at 100-125 Hz. These sound levels of gas powered leaf blowers as measured inside the house, are significantly above those of the battery powered leaf blowers, even when both the gas and battery blowers are rated at the same level and measured at the same sound level at 50 feet.

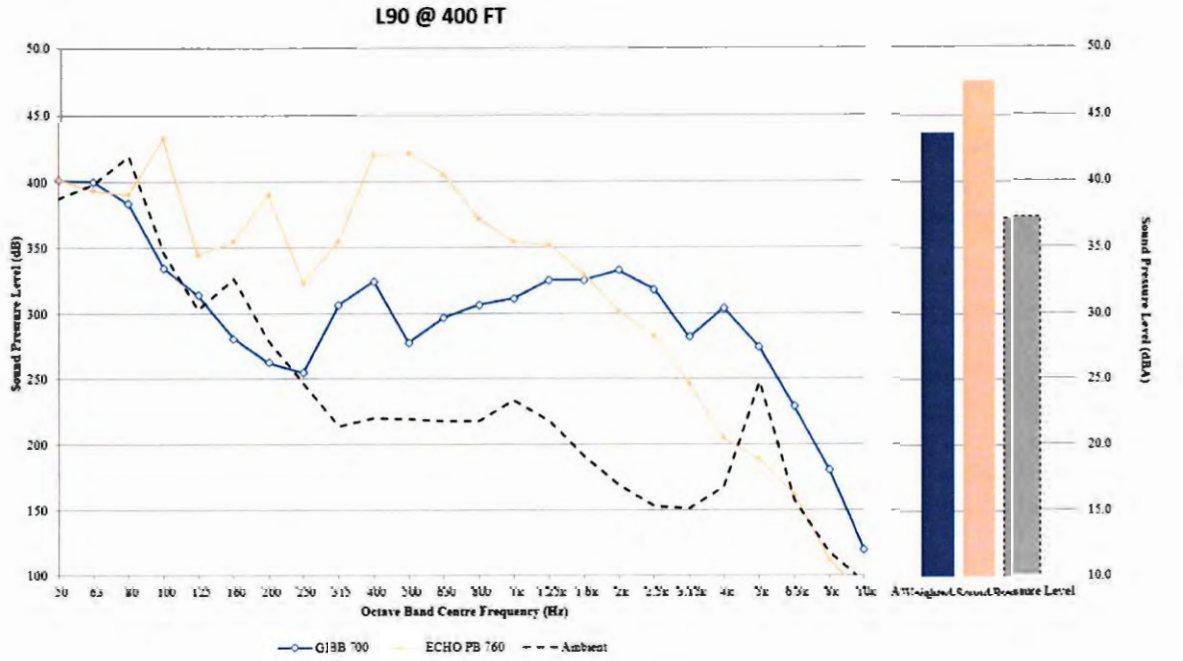
d. How they Sound –: We will demonstrate for you now the sounds of some leaf blowers as captured during our testing so you can experience the sound levels in a community with gas and battery leaf blowers. These samples are calibrated to represent the measured sound levels accurately, so your experience is as close as possible to the real measured conditions.

   The first sample is a comparison of a gas and a battery blower with the same dB(A) from the manufacturers standardized testing. The important comparison is that while the overall loudness may be the same, the acoustic qualities of each and the character of the sound are totally different

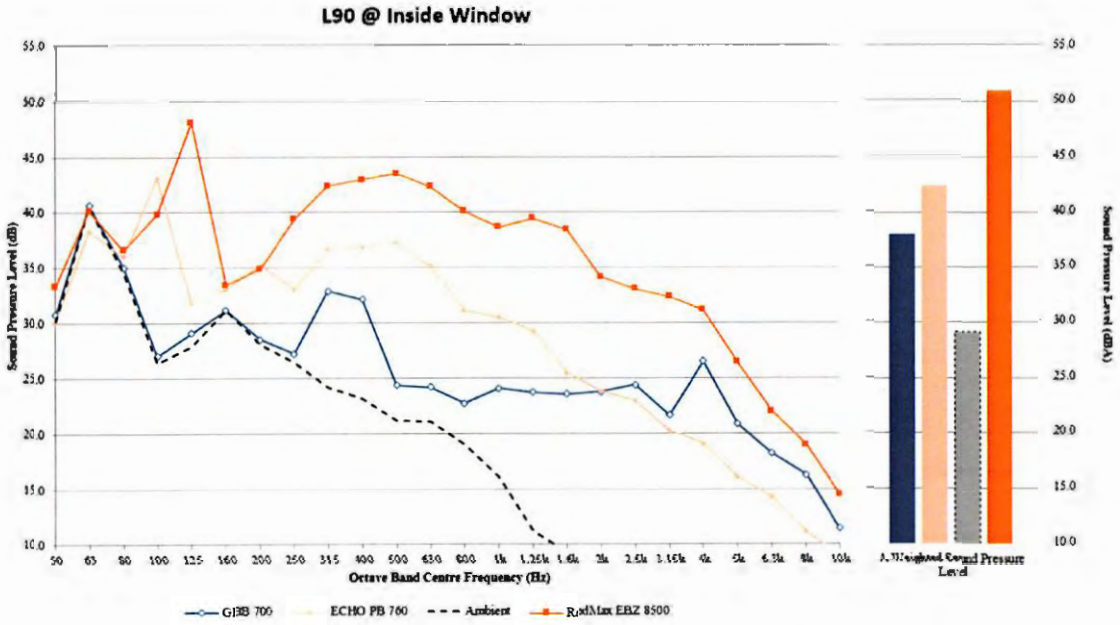
experiences. <Calibrated Audio Demonstration>.



Relative to impact on a community or specific individuals, it may help set the scene to imagine yourself in your own yard, doing your own thing – be it reading a book, relaxing on the deck or porch or sitting talking to your neighbor. This sample is the same two leaf blowers measured at 400 feet. <Calibrated Audio Demonstration>.



Our final demonstration is three leaf blowers as measured inside an adjacent house (Greenworks GBB 700, Echo PB 760 and the Redmax EBZ 8500), with the leaf blowers operating at 50 feet from the windows, behind a typical insulated glass window. <Calibrated Audio Demonstration>.



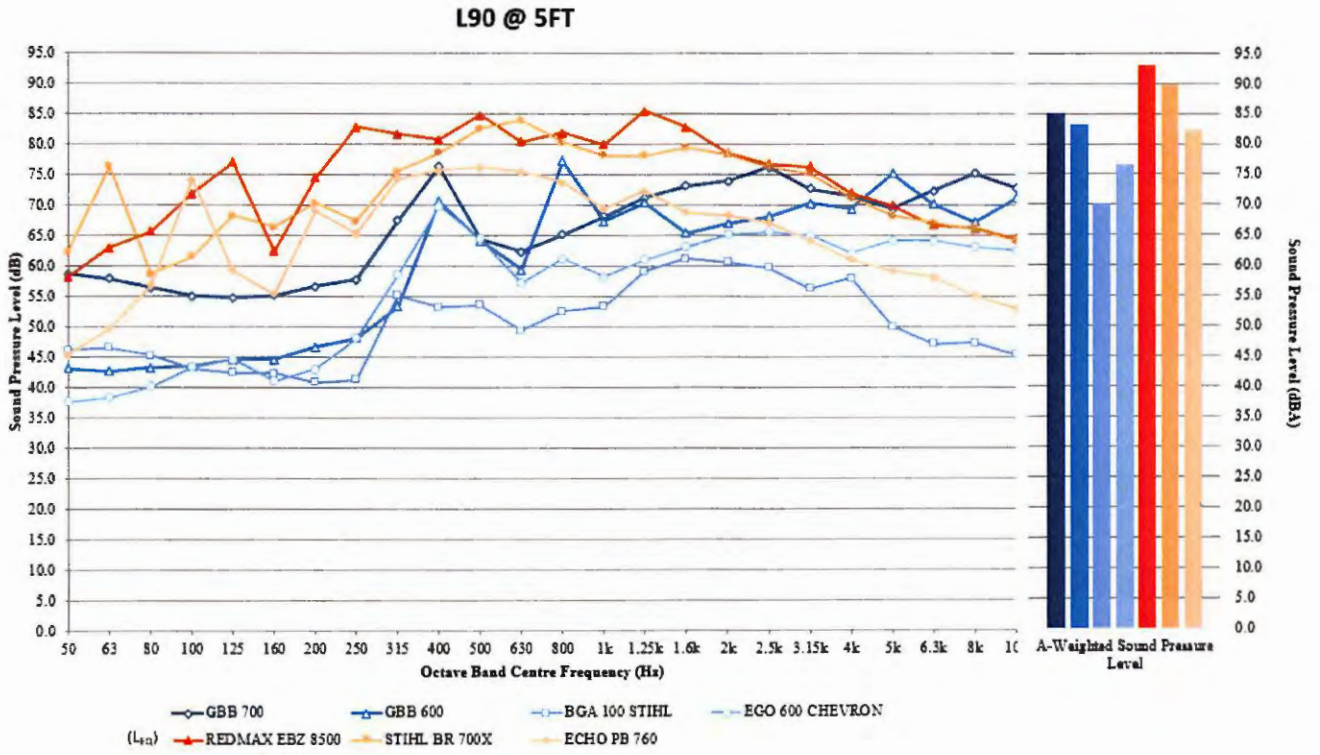
5. In summary, our measurements indicate that the sound of the gas leaf blowers measured have a significantly greater low frequency component. This low frequency sound creates a different acoustic quality to the sound of gas leaf blowers vs. battery leaf blowers. Because low frequency sound travels further, is audible over greater distances, transmits most easily through the windows and glass doors of homes and is more audible inside the home. The measured Gas leaf blowers have a greater noise impact on the community than the measured battery powered blowers.

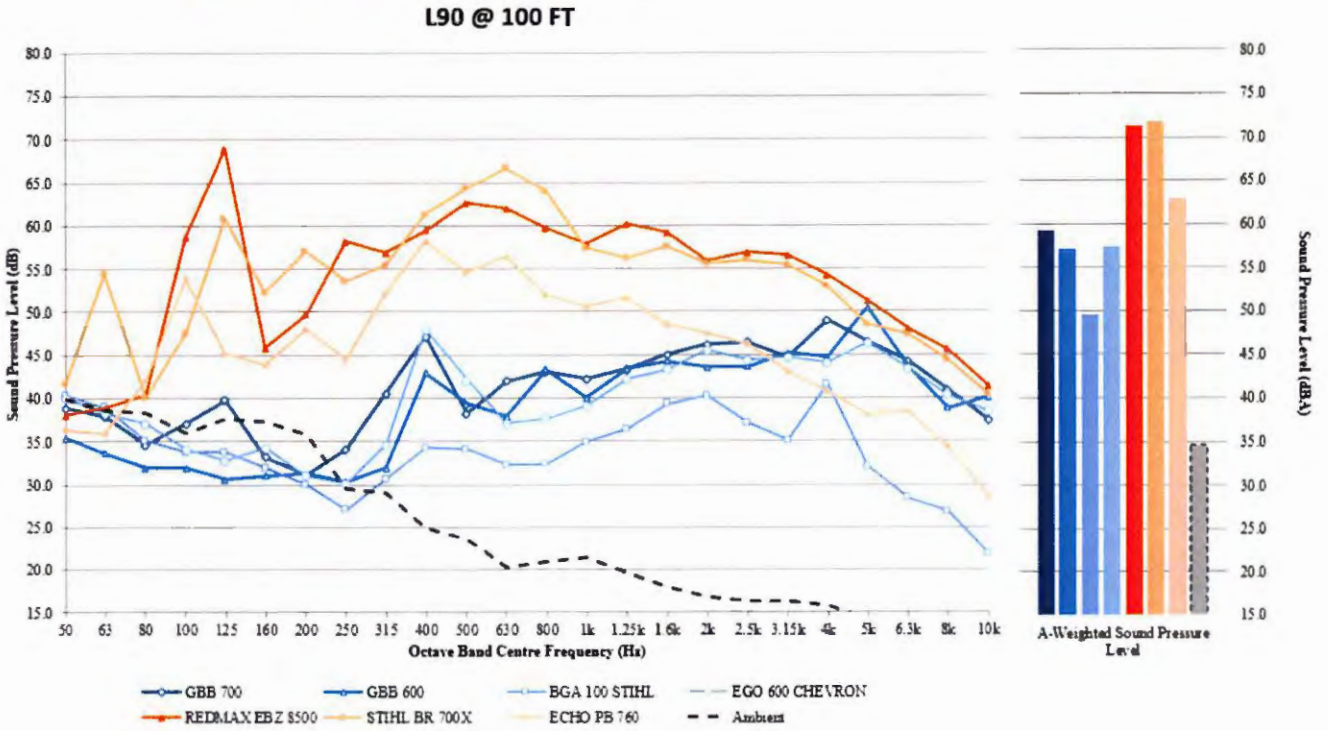
Notes and References:.

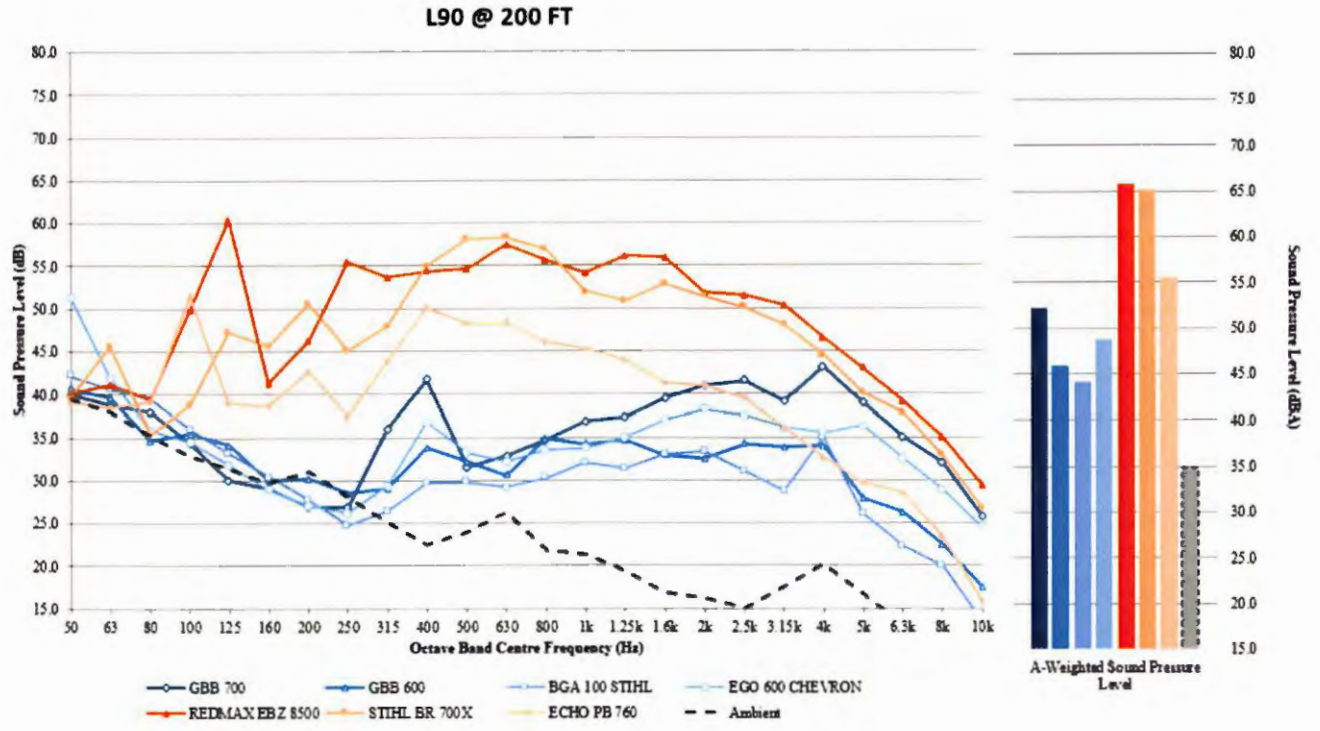
(1) ISO standard on sound propagation ISO 9613-2 outlines the higher rate of sound mitigation over distance for high frequency sound vs. low frequency sound.

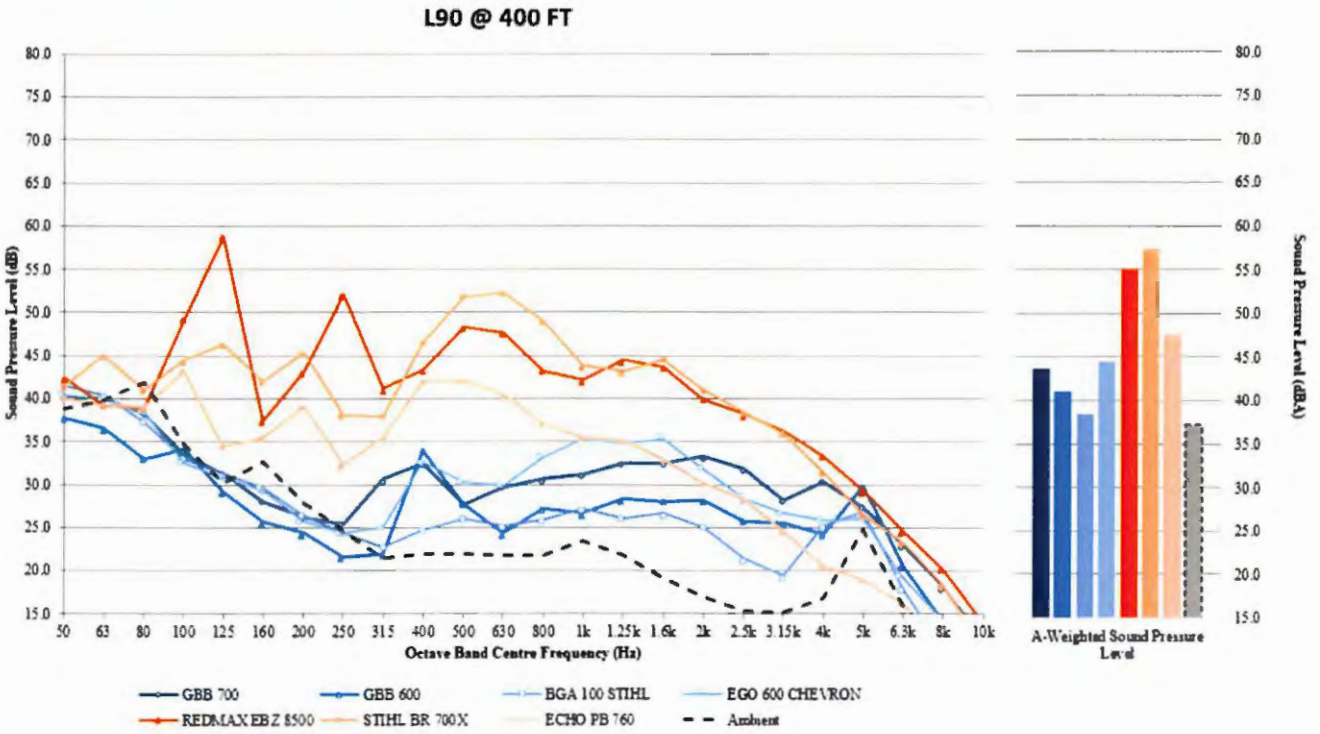
(2) L_{EQ} readings used for this single measurement due to an elongated measurement period with the blower idling which influenced the L_{90} result.

Appendix:


L90 @ 5FT
Sound Pressure Level (dB)
Octave Band Centre Frequency (Hz)
A-Weighted Sound Pressure Level
Sound Pressure Level (dBA)
GBB 700
GBB 600
BGA 100 STIHL
EGO 600 CHEVRON
REDMAX EBZ 8500
STIHL BR 700X
ECHO PB 760


L90 @ 100 FT
Sound Pressure Level (dB)
Octave Band Centre Frequency (Hz)
A-Weighted Sound Pressure Level
Sound Pressure Level (dBA)
GBB 700
GBB 600
BGA 100 STIHL
EGO 600 CHEVRON
REDMAX EBZ 8500
STIHL BR 700X
ECHO PB 760
Ambient


L90 @ 200 FT
Sound Pressure Level (dB)
Octave Band Centre Frequency (Hz)
50 63 80 100 125 160 200 250 315 400 500 630 800 1k 1.25k 1.6k 2k 2.5k 3.15k 4k 5k 6.3k 8k 10k
A-Weighted Sound Pressure Level
Sound Pressure Level (dBA)
GBB 700
GBB 600
BGA 100 STIHL
EGO 600 CHEVRON
REDMAX EBZ 8500
STIHL BR 700X
ECHO PB 760
Ambient


L90 @ 400 FT
Sound Pressure Level (dB)
Octave Band Centre Frequency (Hz)
50 63 80 100 125 160 200 250 315 400 500 630 800 1k 1.25k 1.6k 2k 2.5k 3.15k 4k 5k 6.3k 8k 10k
A-Weighted Sound Pressure Level
Sound Pressure Level (dBA)
GBB 700
GBB 600
BGA 100 STIHL
EGO 600 CHEVRON
REDMAX EBZ 8500
STIHL BR 700X
ECHO PB 760
Ambient