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22 August 2023

Chairman Kevin Giordano & Fellow Board Members
Mendham Township Planning Board
P. O. Box 520
Brookside, NJ, 07926

Re: Mendham Golf & Tennis Club
Proposed Pickleball Courts Sound

Dear Chairman & Board:

Russell Acoustics LLC was retained by Mendham Golf & Tennis Club ("Club") to assess neighborhood sound from their proposed pickleball courts. Figure 1 shows the Club's site plan; I highlighted with red the two proposed court locations.

The Club is, in my opinion, covered by the State Noise Regulation, N.J.A.C. 7:29, which limits impulsive sounds (sounds with a duration of less than a second, i.e., the impact of a paddle on the ball) to 80 dBA using a "fast" or "impulse setting on the sound level meter.

The A-weighted sound pressure level is a measurement method that is modeled after the frequency response of the human ear. Measurements of sound using this frequency weighting correlate very well with how "loud" sounds are. It is probably the single most commonly used method for measuring sound on a world-wide basis. Within the U.S. five major Federal agencies - FAA, DOT, DOL (OSHA), HUD and DOD - use it. The State of New Jersey noise regulation (N.J.A.C. 7:29) uses dBA measurements.

The instrument I used for my measurements is a Larson-Davis Laboratories model 831 digital precision sound level meter equipped with a ½-inch instrumentation microphone and wind screen. This instrument meets ANSI requirements for a Type 1 ("Precision") sound level meter. The system was calibrated on-site with a Bruel & Kjaer 4230 sound level calibrator, which is calibrated annually traceable to NIST. All our measurements reported here are in A-weighted decibels ("dBA") re 20 uPa, the preferred ANSI reference pressure.

The measurements at the Club specifically addressed complying with the Noise Regulation. We measured singles and doubles playing, at two different distances, using both the "fast" and "impulse" settings on the instrument. The first of three was made over slightly more than six minutes the second was over three minutes, while the third was stopped at just under two minutes because of off-site landscaping activity interference.

Figure 2 shows the test setup. One couple, then two, volleyed on the existing court; see the green rectangle on Figure 2. Meanwhile, the tripod-mounted sound level meter measured the sounds at

the two locations shown with the green stars on Figure 2, at 110 and 160 feet from the court edge. Our measurements tried to minimize sounds from other activities, e.g., landscapers both at the Club and neighbors. These measurement locations gave us straight, unobstructed line-of-sight to the Pickleball play, with no meaningful obstructions, hence no distortion of the sound.

The three sets of measurements are shown on Figures 3 through 5. As you can see, even at these distances, which are less than the distances to the neighbors' closest property lines, the measured "impulsive sound" is well under the 80 dBA limit. The distances from the closest proposed pickleball courts to the neighbors' properties are more, so the sound levels we measured will be slightly lower at the neighbors' closest property lines; i.e., under the impulsive limit.

One thing I noticed while at the Club was the sound from tennis balls and rackets (they were playing to the rear of the courts where we were testing the racket ball sounds) were comparable to the sounds from the pickle balls. They sounded different, but the sound levels were comparable. Moreover, other sounds in the area – cars in and out of the gravel parking lots, people walking on the gravel, tennis play, neighbor's landscaping, and aircraft – made as much or more sound than the pickleball play.

We are often asked "How loud is …?" or "What does X decibels sound like?" Figure 6 is a collection of various common sound sources and corresponding sound levels.

Our measurements of actual pickleball play, and using the proposed court locations and distances, show the proposed use should be well under the maximum limit at the neighbors' closest property lines.

Yours truly,

Norman R. Dotti, PE, PP, INCE
Principal

NRD/me

enclosures

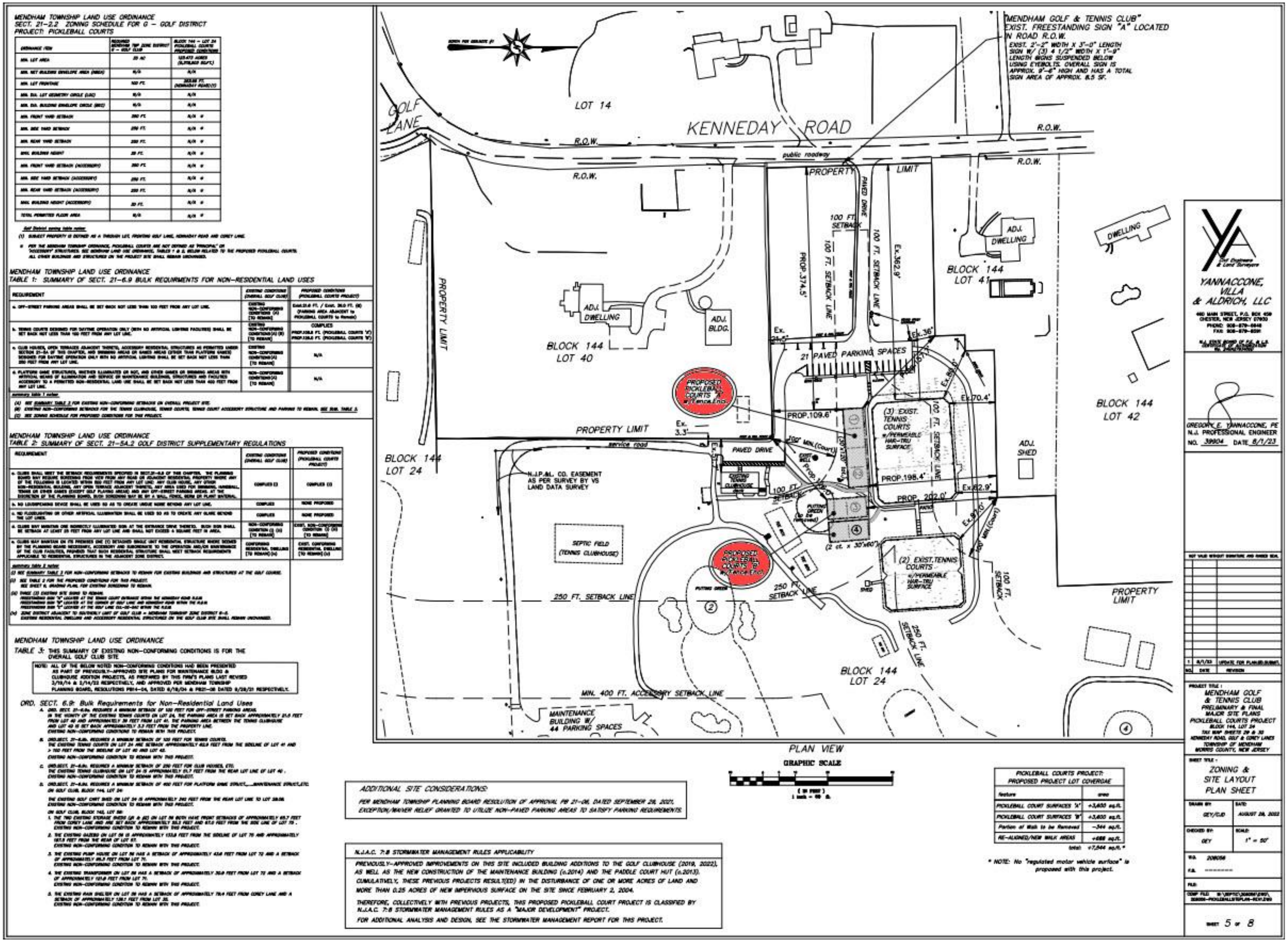


Figure 1 – Site Plan with Proposed Courts

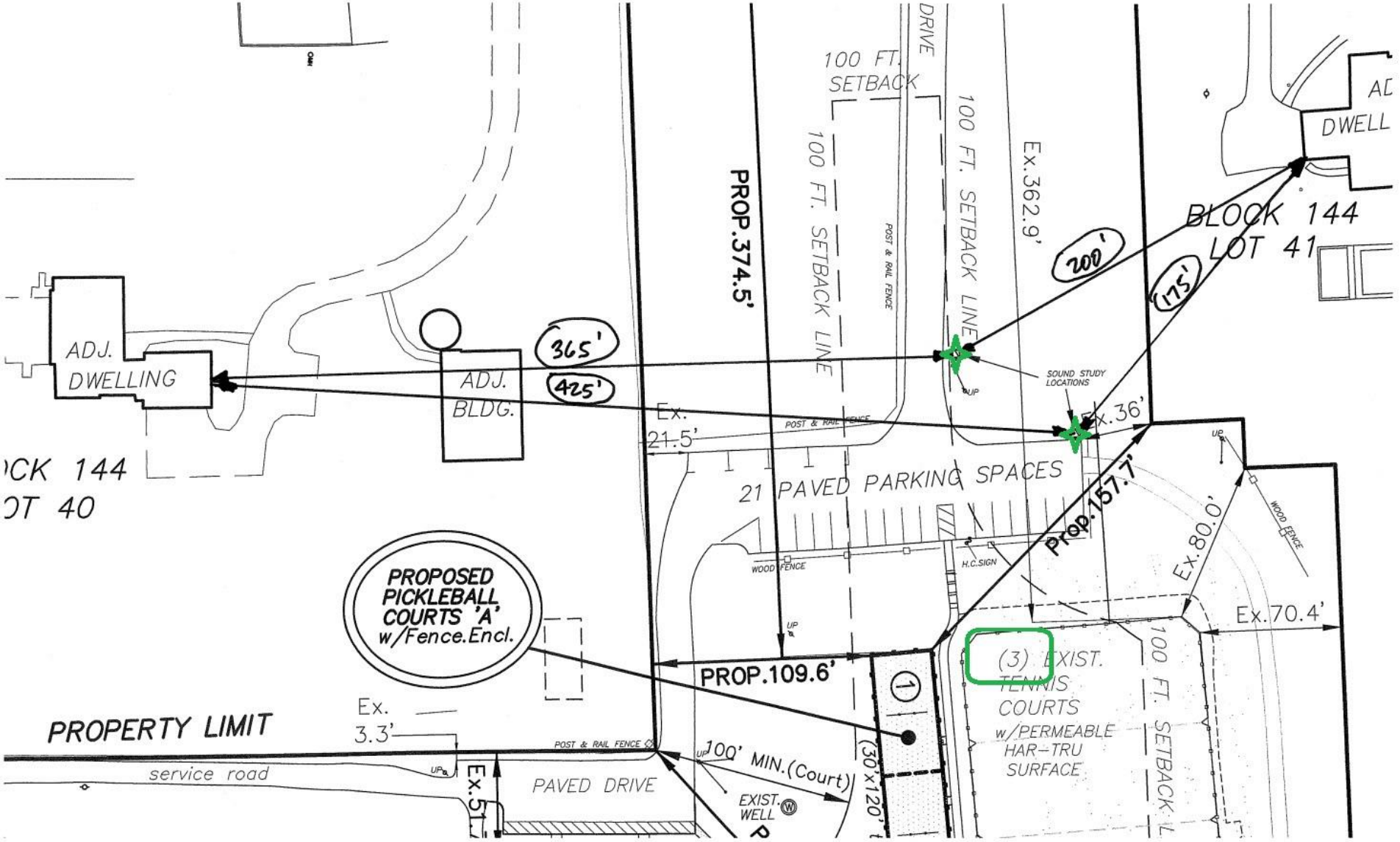


Figure 2 – Sound Tests at Club

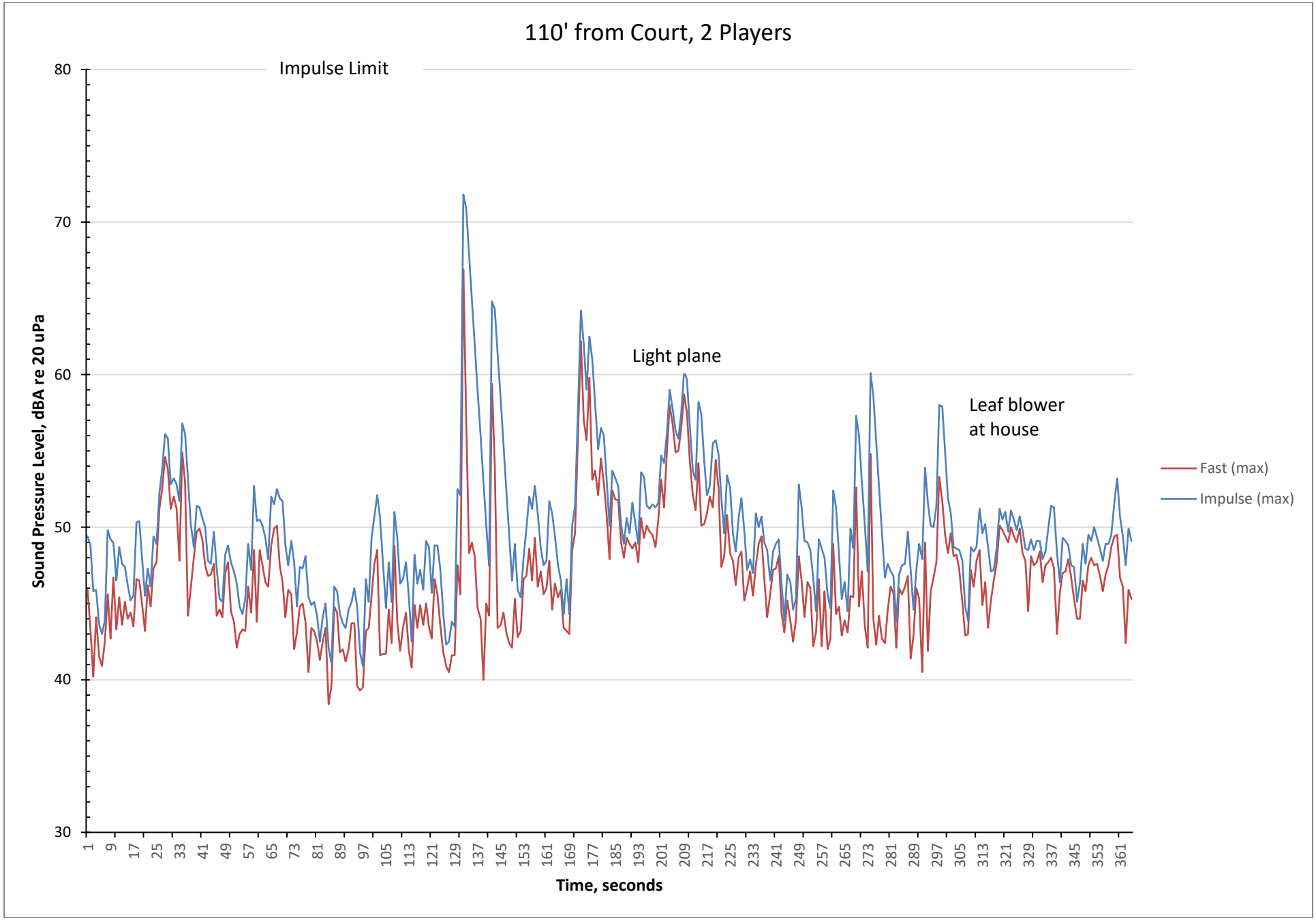

110' from Court, 2 Players
Impulse Limit
Light plane
Leaf blower
at house
Sound Pressure Level, dBA re 20 uPa
Time, seconds
Fast (max)
Impulse (max)
80
70
60
50
40
30
1
9
17
25
33
41
49
57
65
73
81
89
97
105
113
121
129
137
145
153
161
169
177
185
193
201
209
217
225
233
241
249
257
265
273
281
289
297
305
313
321
329
337
345
353
361

Figure 3

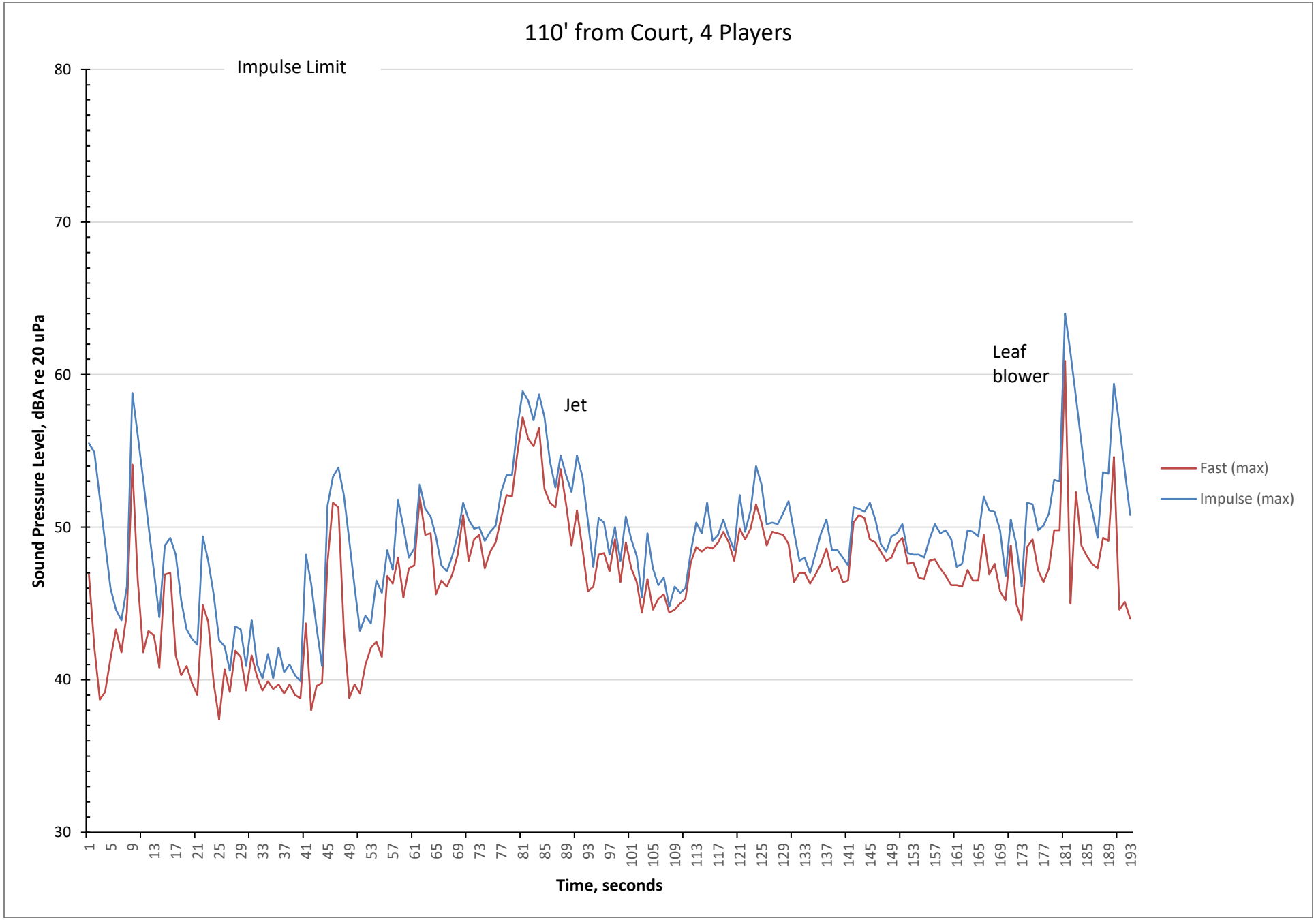

110' from Court, 4 Players
Impulse Limit
Leaf blower
Jet
Sound Pressure Level, dBA re 20 uPa
Time, seconds
Fast (max)
Impulse (max)
80
70
60
50
40
30
1
5
9
13
17
21
25
29
33
37
41
45
49
53
57
61
65
69
73
77
81
85
89
93
97
101
105
109
113
117
121
125
129
133
137
141
145
149
153
157
161
165
169
173
177
181
185
189
193

Figure 4

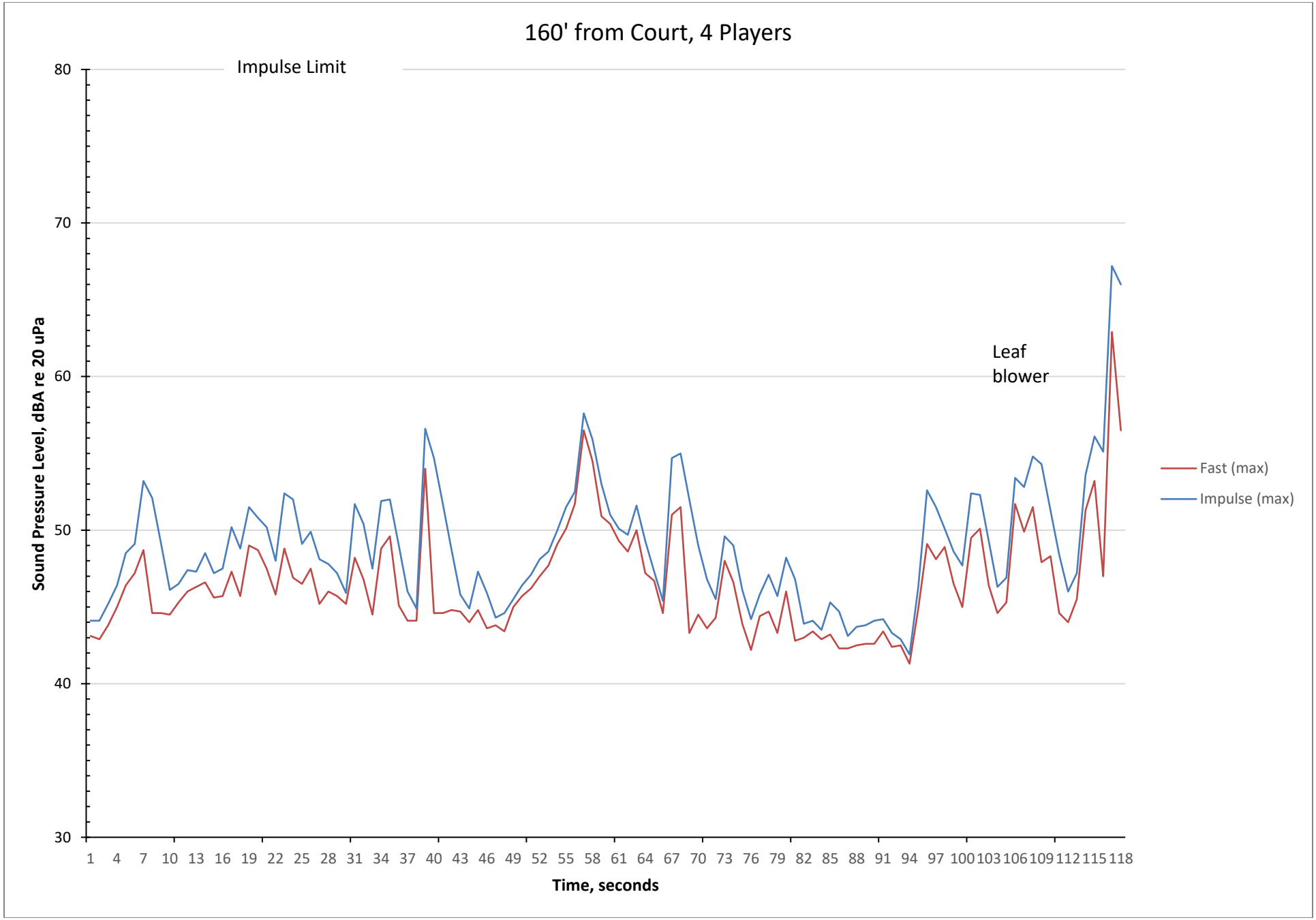
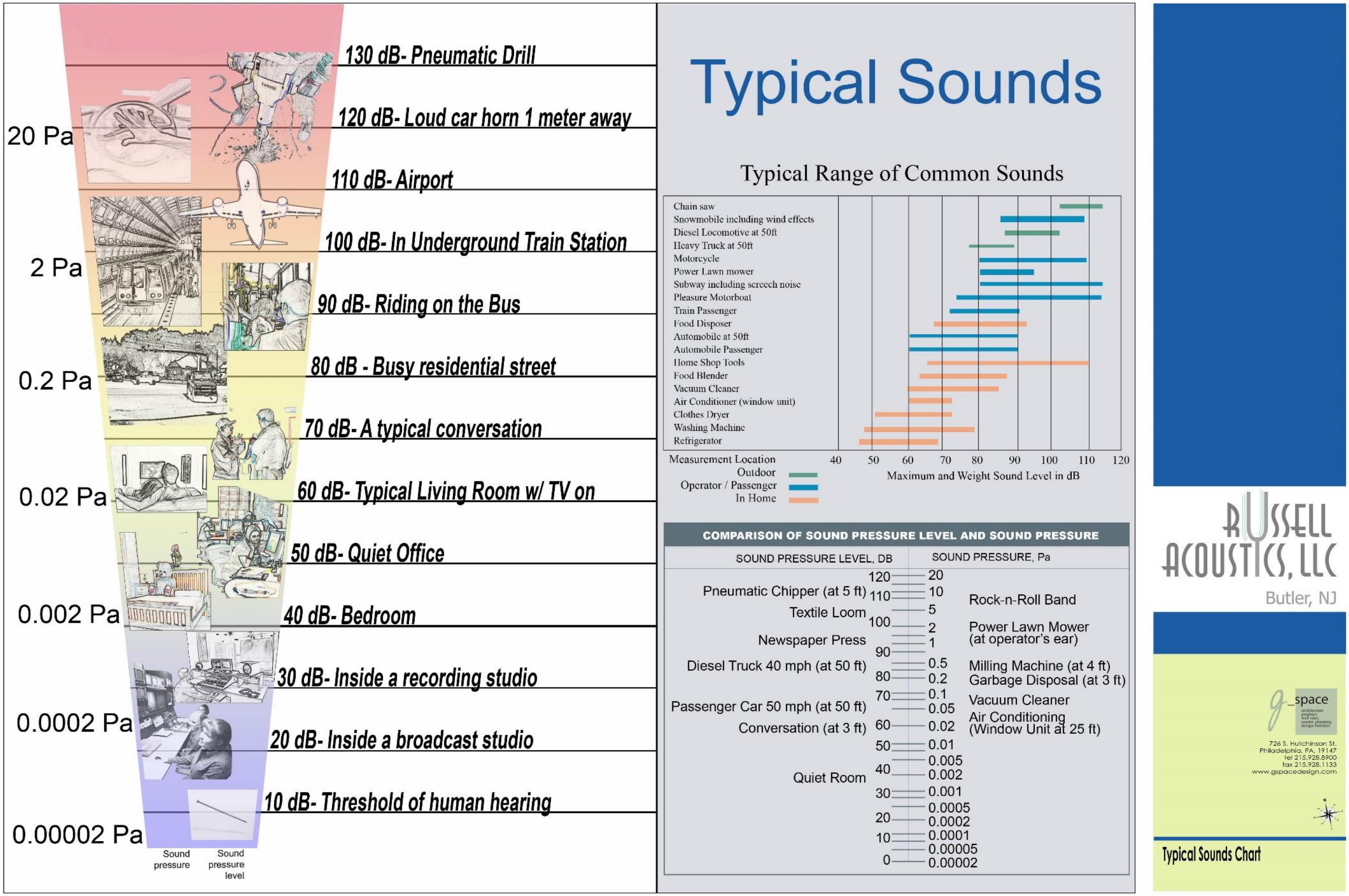

160' from Court, 4 Players
Impulse Limit
Leaf blower
Sound Pressure Level, dBA re 20 uPa
Time, seconds
Fast (max)
Impulse (max)
80
70
60
50
40
30
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85 88 91 94 97 100 103 106 109 112 115 118

Figure 5



20 Pa
2 Pa
0.2 Pa
0.02 Pa
0.002 Pa
0.0002 Pa
0.00002 Pa
Sound pressure
Sound pressure level
130 dB- Pneumatic Drill
120 dB- Loud car horn 1 meter away
110 dB- Airport
100 dB- In Underground Train Station
90 dB- Riding on the Bus
80 dB - Busy residential street
70 dB- A typical conversation
60 dB- Typical Living Room w/ TV on
50 dB- Quiet Office
40 dB- Bedroom
30 dB- Inside a recording studio
20 dB- Inside a broadcast studio
10 dB- Threshold of human hearing
Typical Sounds
Typical Range of Common Sounds
Chain saw
Snowmobile including wind effects
Diesel Locomotive at 50ft
Heavy Truck at 50ft
Motorcycle
Power Lawn mower
Subway including screech noise
Pleasure Motorboat
Train Passenger
Food Disposer
Automobile at 50ft
Automobile Passenger
Home Shop Tools
Food Blender
Vacuum Cleaner
Air Conditioner (window unit)
Clothes Dryer
Washing Machine
Refrigerator
Measurement Location
Outdoor
Operator / Passenger
In Home
40 50 60 70 80 90 100 110 120
Maximum and Weight Sound Level in dB
COMPARISON OF SOUND PRESSURE LEVEL AND SOUND PRESSURE
SOUND PRESSURE LEVEL, DB
SOUND PRESSURE, Pa
Pneumatic Chipper (at 5 ft)
Textile Loom
Newspaper Press
Diesel Truck 40 mph (at 50 ft)
Passenger Car 50 mph (at 50 ft)
Conversation (at 3 ft)
Quiet Room
120 110 100 90 80 70 60 50 40 30 20 10 0
20 10 5 2 1 0.5 0.2 0.1 0.05 0.02 0.01 0.005 0.002 0.001 0.0005 0.0002 0.0001 0.00005 0.00002
Rock-n-Roll Band
Power Lawn Mower (at operator's ear)
Milling Machine (at 4 ft)
Garbage Disposal (at 3 ft)
Vacuum Cleaner
Air Conditioning (Window Unit at 25 ft)
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Typical Sounds Chart

Figure 6