

Appendix F  
**Noise–Amphitheater Sound System**

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# Music Performance Community Noise Level Estimation and Assessment

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This report

- A. Establishes average ambient community sound pressure levels (SPLs) with measurements obtained from two representative locations near the venue, under average environmental conditions.
- B. Models maximum SPLs expected within and at the perimeter of the proposed West Harbor LA Amphitheater (hereafter “the Venue”), due to music performance events.
- C. Models maximum SPLs anticipated to reach the community due to music performance events at the Venue, and their expected dissipation with distance from the source.
- D. Assesses modeled noise levels against average ambient community noise measurements.

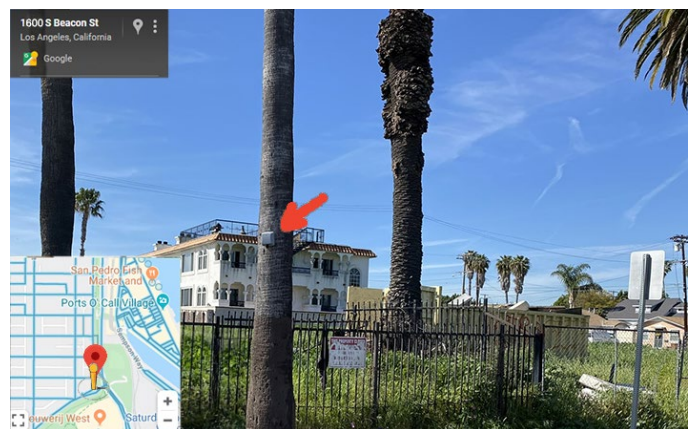
## A. Ambient SPL Measurements

Data was collected using Piccolo II Professional Class 2 Sound Level Meters by Soft dB<sup>1</sup> over a five-day period (2/26/2020, 2:00 p.m. – 3/2/2020, 12:00 p.m.) from two measurement locations, chosen for their: a) relative placement between the Venue and residences and b) representative traffic noise conditions.

*Location 1* (low-to-medium traffic<sup>2</sup>) - 33°43'44.93"N 118°16'50.08"W -

<https://maps.app.goo.gl/k8wrWcJ7bB7BGpcN6>

~1600 S Beacon St, San Pedro, CA 90731 (~1,450 ft E/SE of the stage; tree, E side of the street)



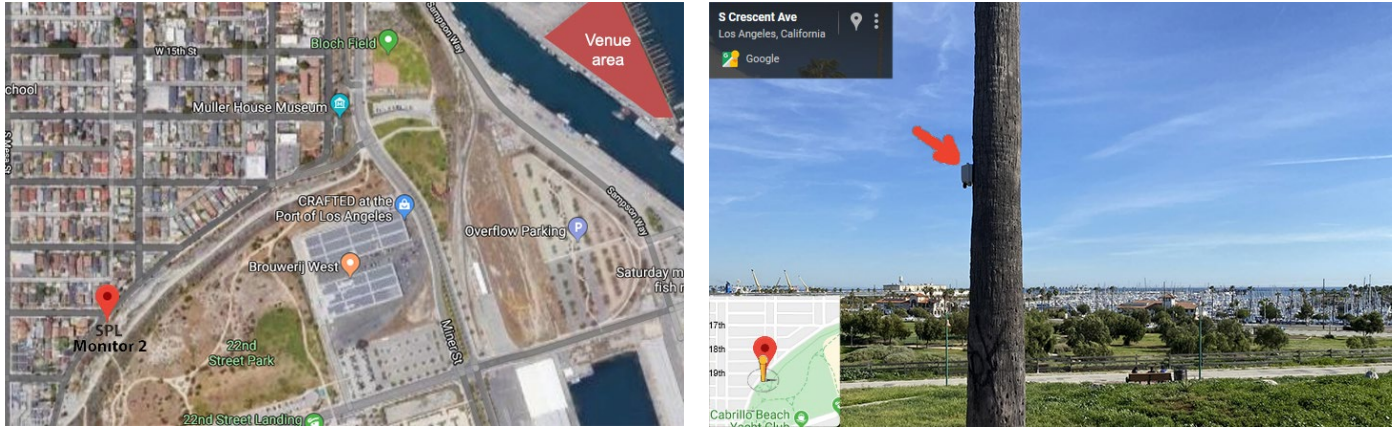
<sup>1</sup> <https://www.softdb.com/products/piccolo2>

<sup>2</sup> Traffic movement was assessed qualitatively. Descriptors (e.g. low; medium) reflect qualitative comparisons relative to the general area and are not based on quantitative analysis of measured vehicle flow, speed, and density.

Location 2 (medium traffic) - 33°43'36.59"N 118°17'2.97"W -

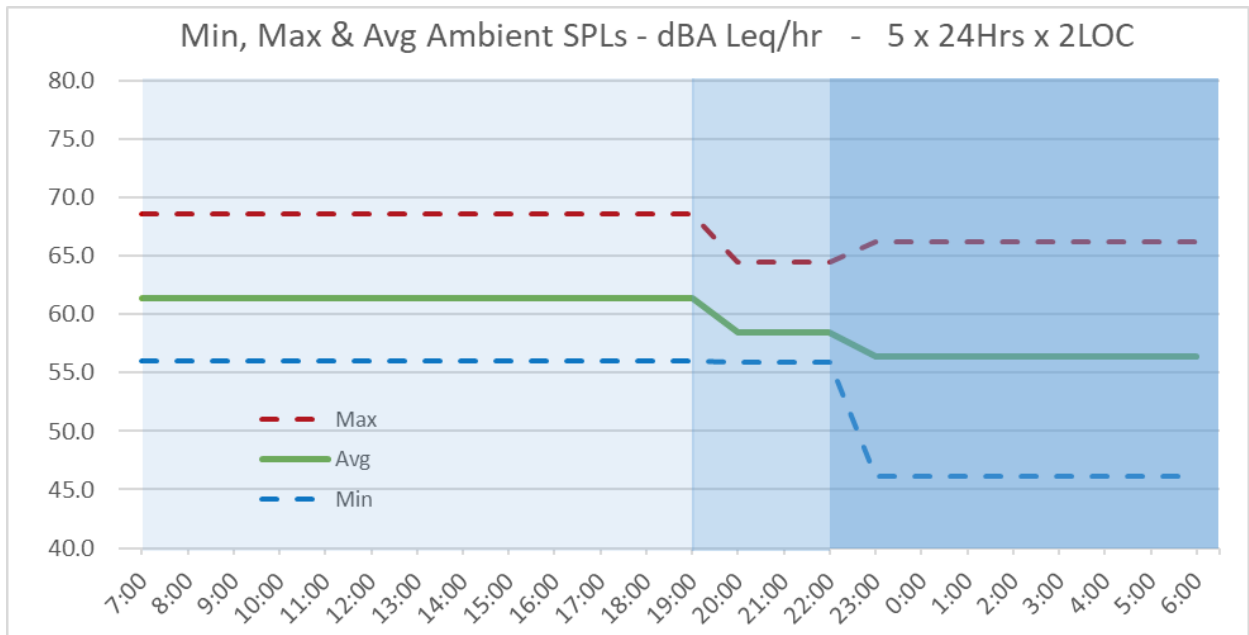
<https://maps.app.goo.gl/7cJqgCpNPmaa1mT28>

~1905 S Crescent Ave, San Pedro, CA 90731 (~3,150,ft SE of the stage, tree, W side of the street)



Minimum and maximum hourly dBA Leq<sup>3</sup> data is reported per location, along with average dBA Leq values, over three periods: Day: 7:00 A.M.-7:00 P.M.; Evening: 7:00 P.M.- 10:00 P.M.; Night: 10:00 P.M.-7:00 A.M.

dBA Leq Time Period	Minimum			Average			Maximum		
	Loc 1	Loc 2	Avg	Loc 1	Loc 2	Avg	Loc 1	Loc 2	Avg
Day	54.7	57	56	59.3	62.7	61.3	65.5	70.3	68.5
Evening	54.1	57.1	55.9	58.1	58.8	58.5	66.3	61	64.4
Night	44.8	47.2	46.2	54.1	57.9	56.4	63.7	67.8	66.2



<sup>3</sup> dBA Leq: time-averaged A-weighted SPLs of continuous signals matching in total energy the measured time-variant signals, over a given period of time. All measured SPL values are subject to ~ +1dB uncertainty level, standard for Class 1 measurement instruments.



## B. Music Performance SPLs Modeled at the Venue

SPLs within the Venue's perimeter were obtained via sound propagation modeling that

- a) assumed the maximum music performance SPL target values provided by the Venue's developer team:
  - i) ~106dBA SPL 5minLeq<sup>4</sup>: audience area nearest to the stage
  - ii) ~110dBA SPL 5minLeq: mixing, or "front of house" position (hereafter "FOH") ~95ft from the stage
  - iii) ~103dBA SPL 5minLeq: furthest audience locations at the Venue's perimeter
- b) incorporated loudspeaker system design and software processing with sound focusing capabilities that aims at the developer-defined SPL limits within the Venue while reducing the amount of sonic energy spillage outside the venue.

Levels at the Venue were modeled using *d&b audiotechnik* products, compatible with the far-field SPL modeling software<sup>5</sup> used to estimate community noise levels. Several manufacturers<sup>6</sup> offer hardware, software, and expertise capable of addressing the project's requirements through permanent or removable installations, with *L-Acoustics* having historically led the way in sound wave propagation management.

*d&b audiotechnik* system used for sound source & SPL distribution modeling<sup>7</sup>

- L-R Flown Arrays: 12 x GSL8<sup>8</sup> & 4 x GSL12<sup>9</sup> per side
- L-R Flown Subs: 6 x SL-SUB<sup>10</sup> per side
- SUB Arc / Ground Subs: 8 x SL-SUB
- Front Fills 6 x Y10P<sup>11</sup> (@90°)

Two sets of system tuning parameters were defined, aimed at reducing community SPLs at different environmental conditions,<sup>12</sup> within the prescribed onsite SPLs. Both involve extensive software processing that introduces spectral artifacts.

System Tuning 1: appropriate to favorable weather conditions, where refraction would direct sonic energy aiming outside the Venue upwards, and wind-flow would direct it towards the ocean. This permits the aiming of sonic energy outside the venue, helping increase SPL dissipation with distance through wave interference. A 40m-wide area was defined, surrounding the Venue, 30m off its perimeter. The system was tuned for reduced SPLs reaching that area.

System Tuning 2: appropriate to unfavorable weather conditions, where refraction would redirect any sonic energy exiting the Venue downwards, and wind flow would redirect it towards the community. The system was tuned for reduced SPLs exiting the venue, within the prescribed onsite SPLs.

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<sup>4</sup> i.e. A-weighted energy-equivalent SPLs, averaged over 5 minutes.

<sup>5</sup> : NoizCalc <https://www.dbaudio.com/global/en/products/software/noizcalc>. Created with SoundPLAN <https://www.soundplan.eu/en>, a specialist software developer for environmental noise prediction.

<sup>6</sup> L-Acoustics: <https://www.l-acoustics.com> - d&b Audiotechnik: <https://www.dbaudio.com/global/en> - Meyer Sound: <https://meyersound.com>

<sup>7</sup> Onsite SPLs were modeled with d&b audiotechnik's ArrayCalc <https://www.dbaudio.com/global/en/products/software/arraycalc>

<sup>8</sup> <https://www.dbaudio.com/global/en/products/series/sl-series/gsl8>

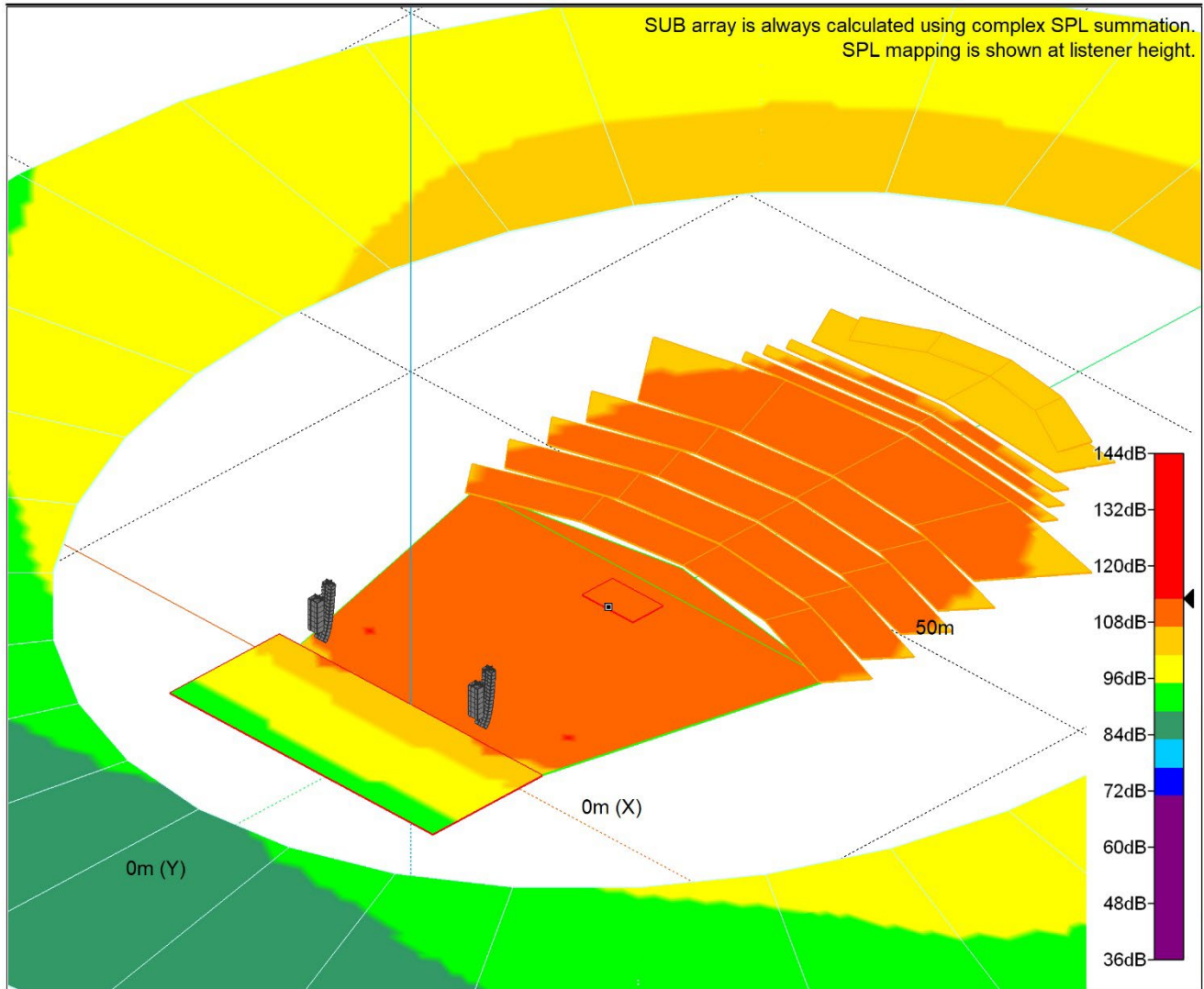
<sup>9</sup> <https://www.dbaudio.com/global/en/products/series/sl-series/gsl12>

<sup>10</sup> <https://www.dbaudio.com/global/en/products/series/sl-series/sl-sub>

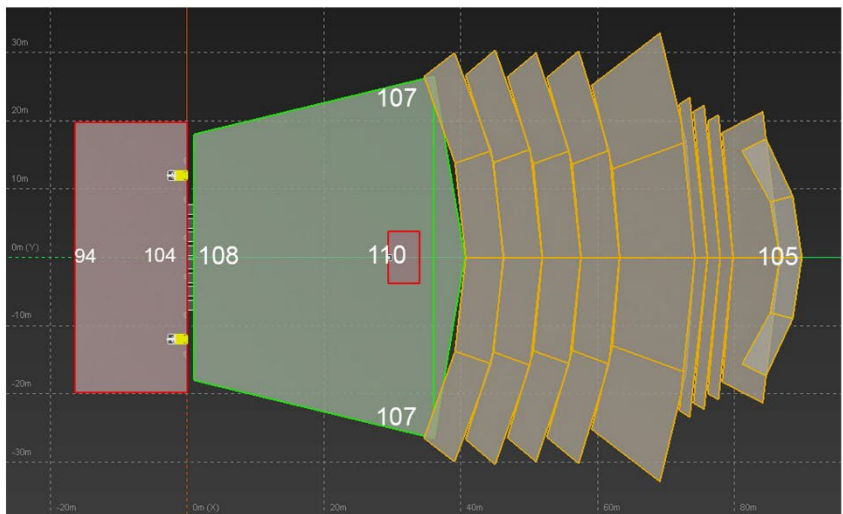
<sup>11</sup> <https://www.dbaudio.com/global/en/products/series/y-series/y10p>

<sup>12</sup> See the next section.

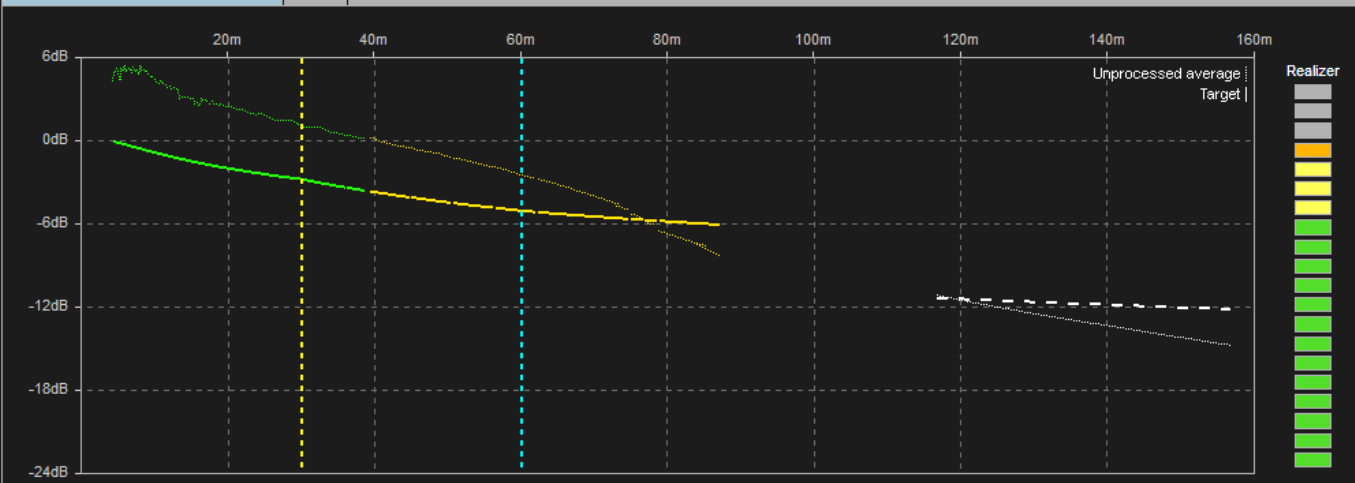
## System Tuning 1 (for favorable weather conditions)



SPL calculation	
Resolution:	Mid (2m)
Highest SPL:	113.1 dB
Simulated signal	
Level:	3.4 dBu
Signal:	BB pink (A)
Show interferences:	Off
Air absorption	
On/Off:	On
Temperature:	22 °C
Humidity:	65.0 %
NoizCalc reference point	
x:	29.6 m
y:	0.0 m
z:	2.0 m
SPL:	110.0 dB



Direct sound level vs. distance / dB Result



Front Central Rear

Level drop: -1.5 dB/dd 30.0 m Level drop: -2.4 dB/dd 60.0 m Level drop: -1.9 dB/dd

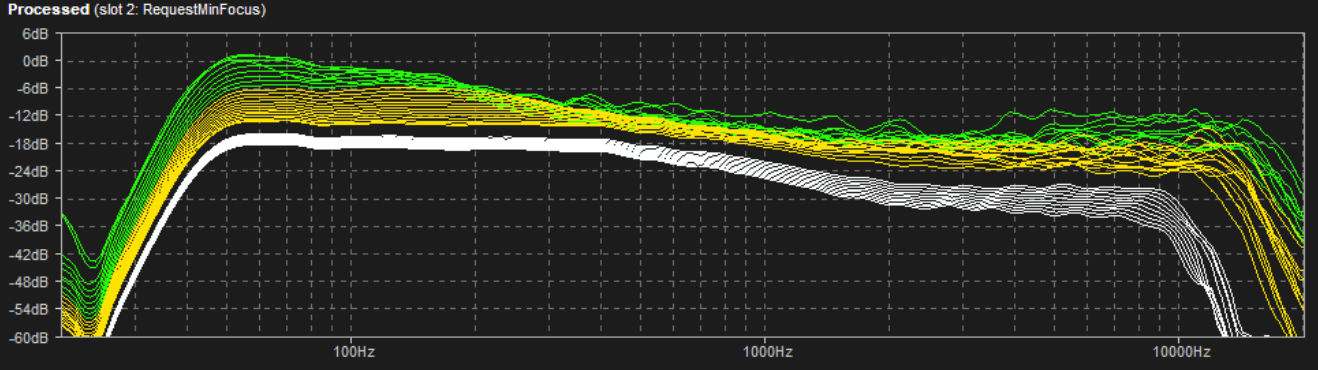
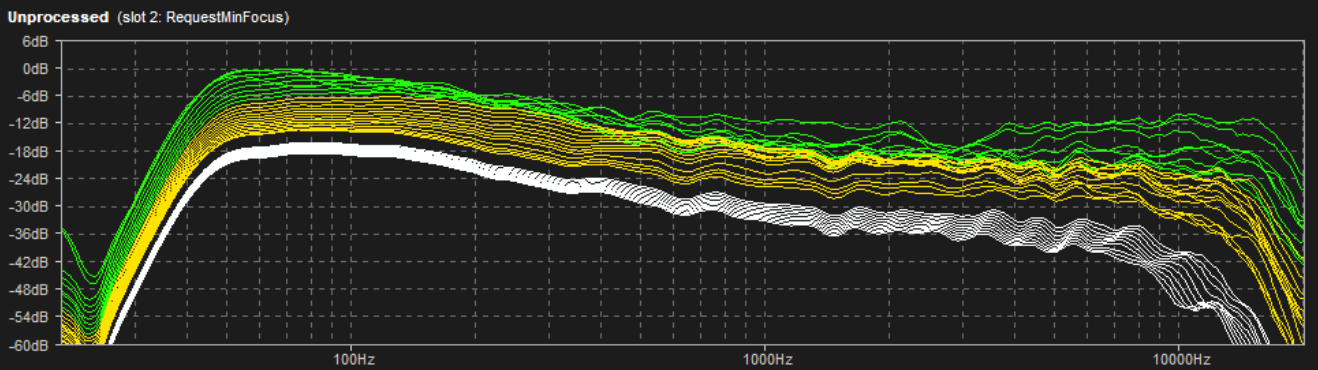
Plane settings: Plane: Monitoring Plane Air absorption: Temperature: 22 °C Processing emphasis: Power 11 5 0 5 11 Glory Calculate and save: Recalculate

Plane type: Reflecting Humidity: 65.0 %

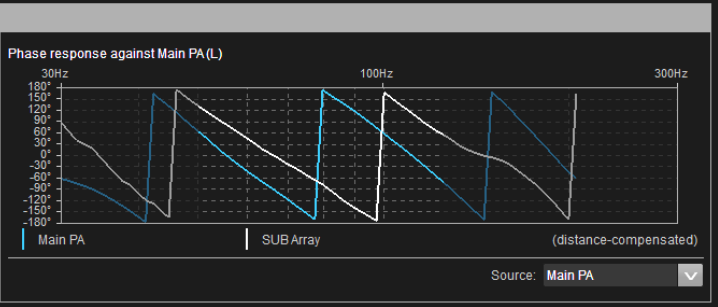
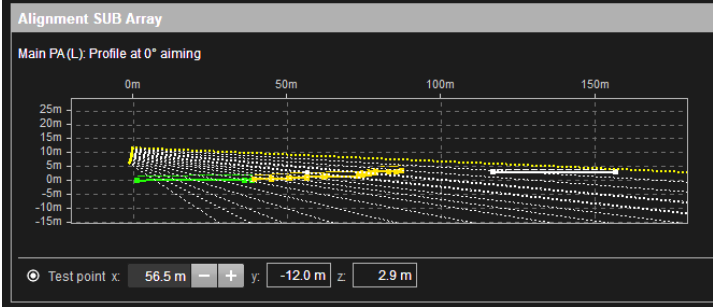
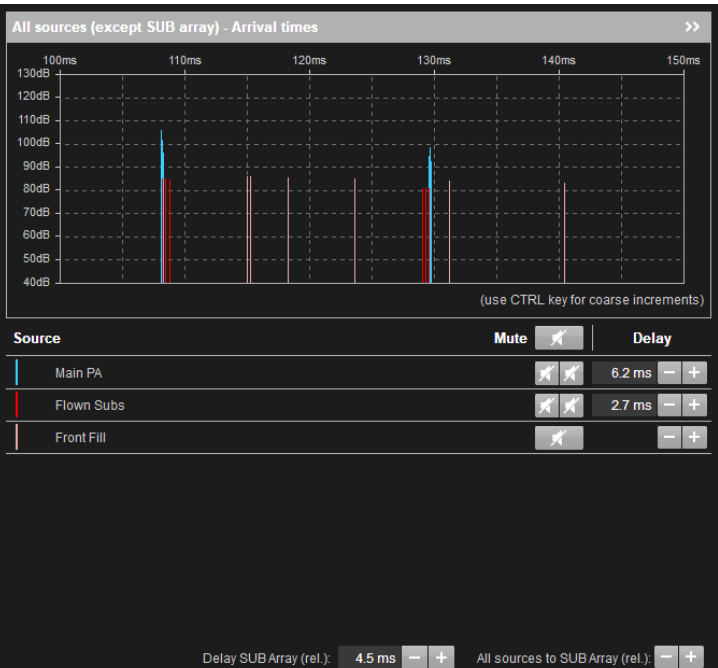
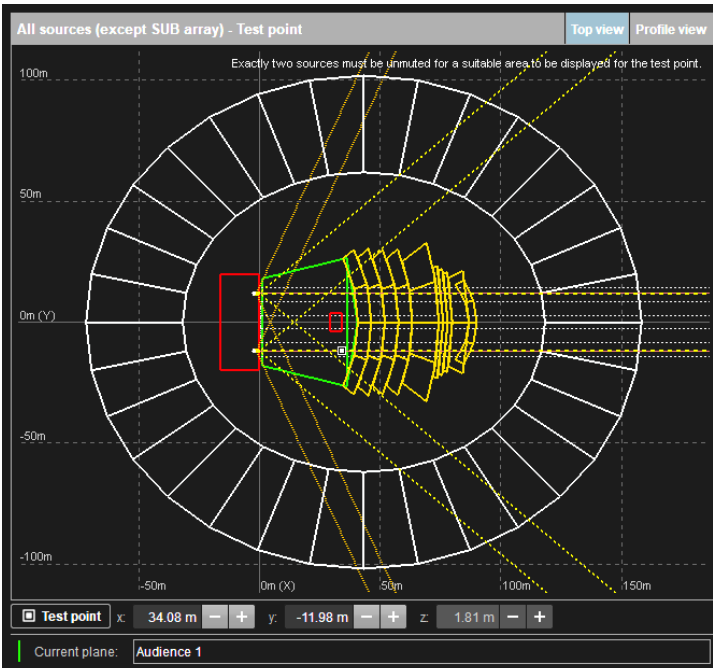
Plane offset: - +

Initialized Close

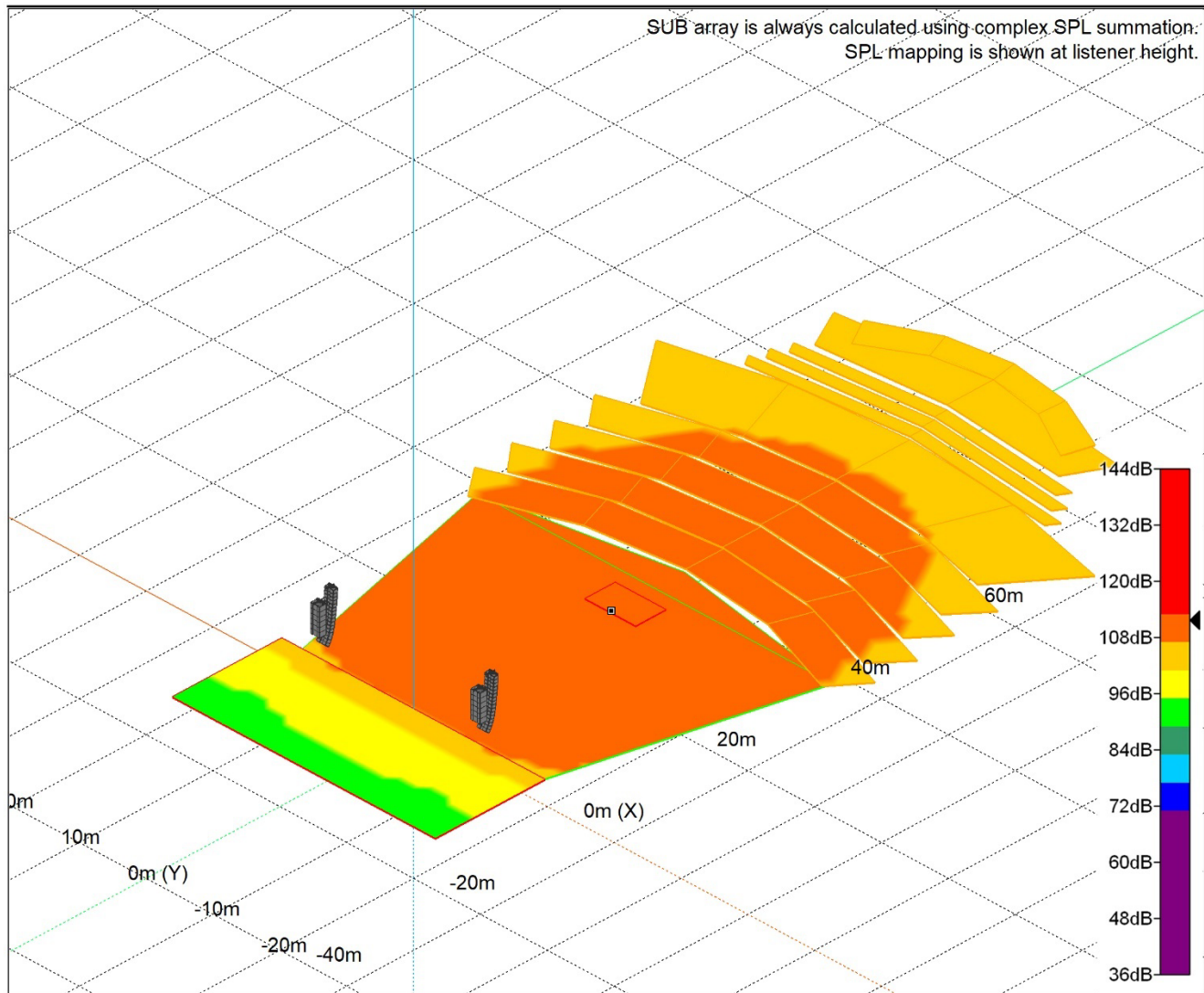
Direct sound level vs. distance / dB Result



Initialized Close



## System Tuning 2 (for unfavorable weather conditions)



### SPL calculation

Resolution:	Mid (2m)
Highest SPL:	111.7 dB

### Simulated signal

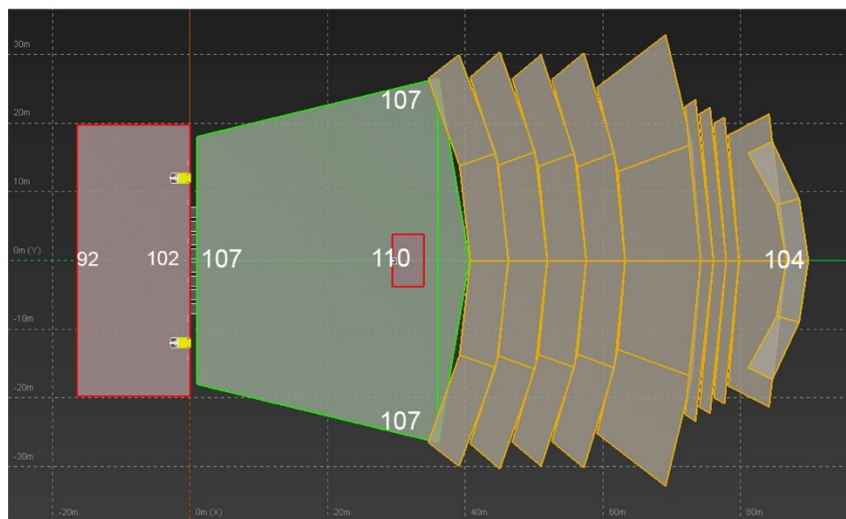
Level:	1.9 dBu
Signal:	BB pink (A)
Show interferences:	Off

### Air absorption

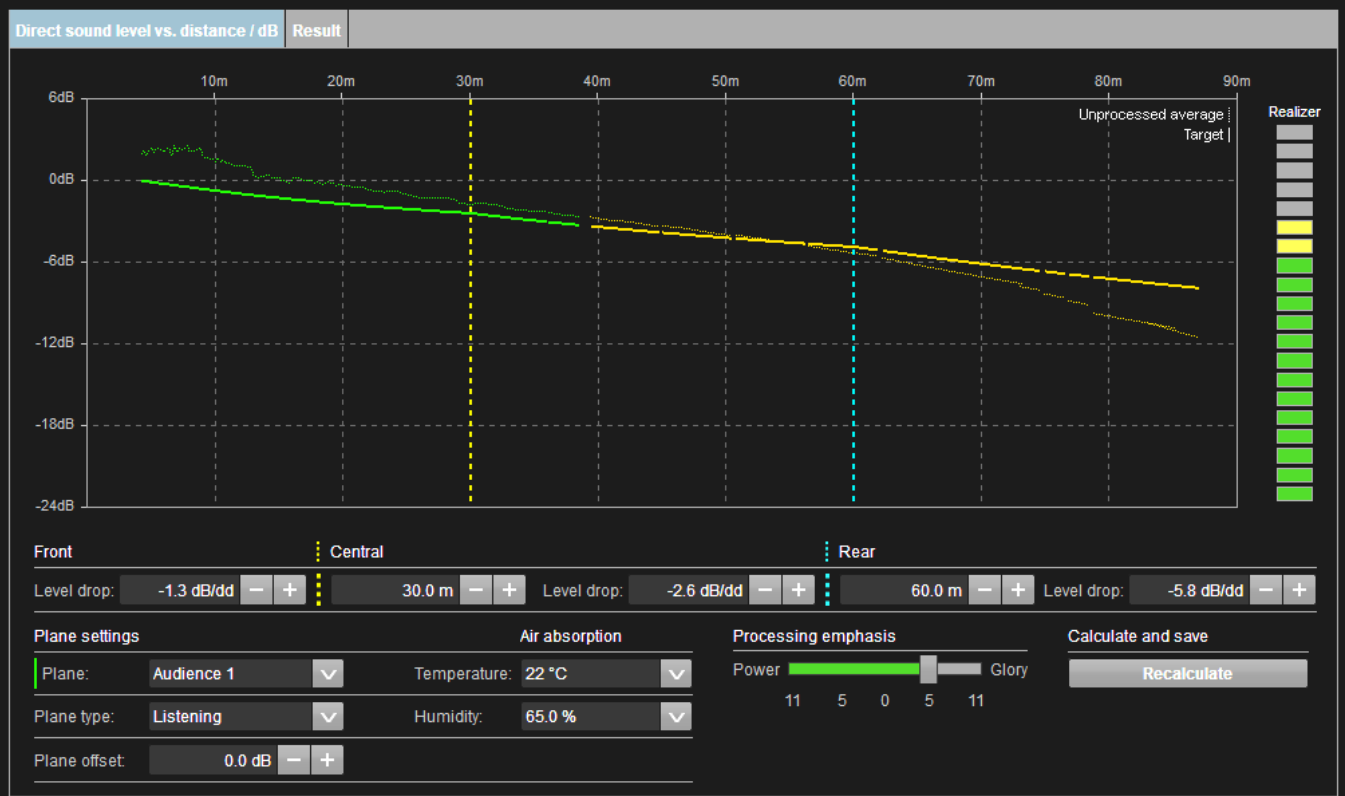
On/Off:	On
Temperature:	22 °C
Humidity:	65.0 %

### NoizCalc reference point

x:	29.6 m
y:	0.0 m
z:	2.0 m
SPL:	110.0 dB

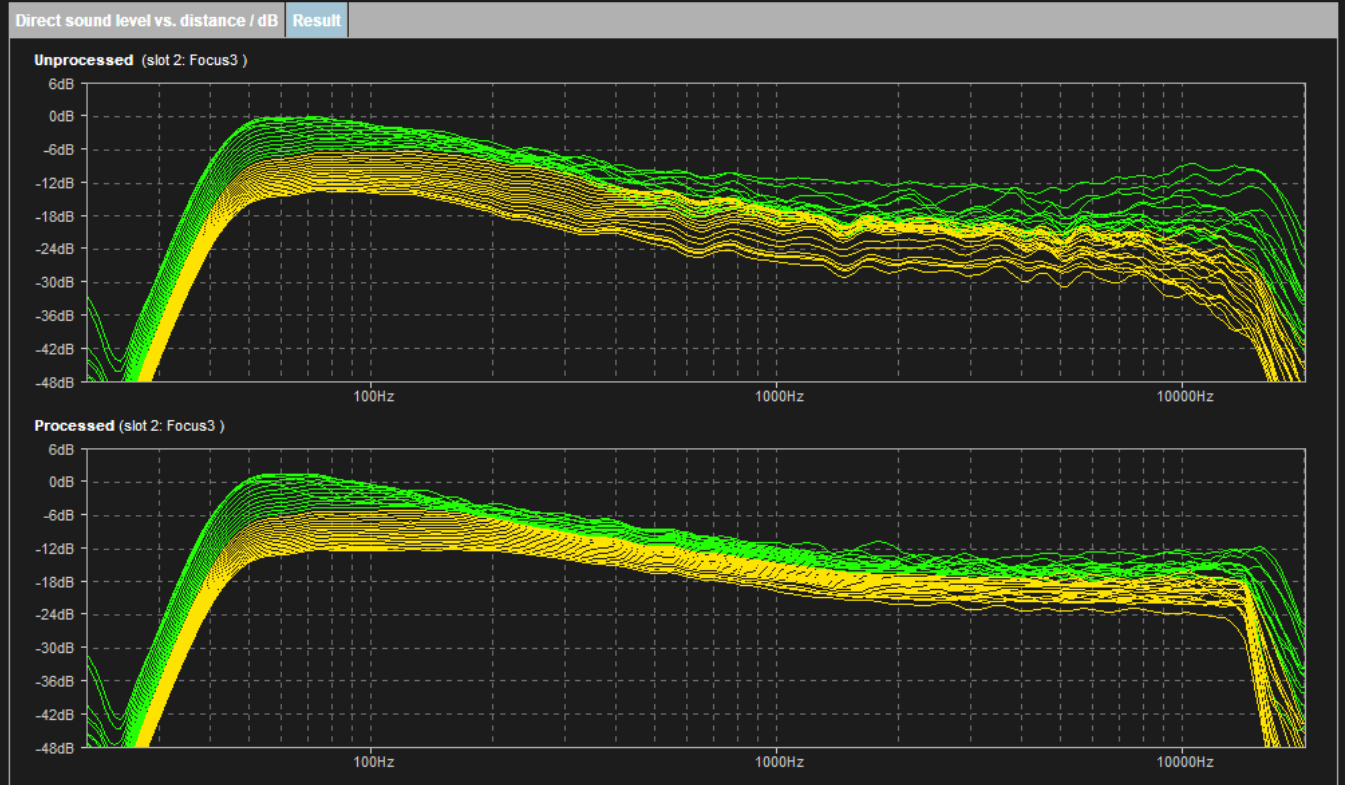






Initialized

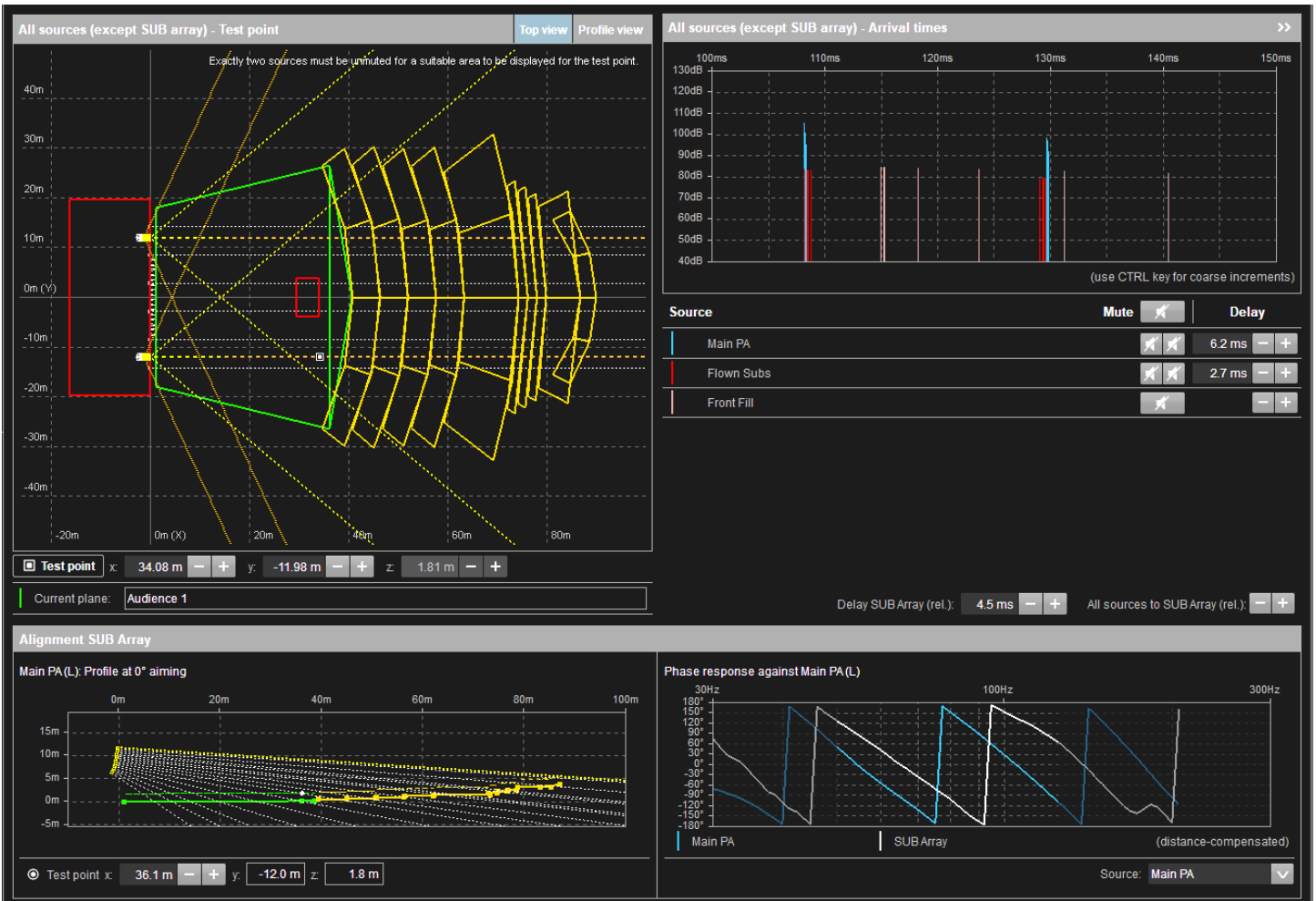
Close



Initialized

Close





SPL at the Source & Weather	Key SPL Values @ the Venue					
	Audience				Stage	
	Front	FOH	Back	Left / Right	Front	Back
Requested Favorable Weather	108	<b>110</b>	105	107	104	94
Requested Unfavorable Weather	107	<b>110</b>	104	107	102	92

### C. Music Performance SPLs Modeled at the Community

Four noise maps are included, based on the sound source design and SPL levels described above, modeling the spread of A-Weighted SPLs<sup>13</sup> away from the venue in 20m (~66ft) increments, under:

#### 2 x Environmental Conditions<sup>14</sup>

1) Favorable Weather

Wind direction: 285° (from W-N/W) - *away from residences*;

Temperature gradient: -0.09K/m - *temperature dropping with elevation, directing upward-bound sonic energy away from the ground (common daytime condition)*

2) Unfavorable Weather

Wind direction: 85° (from E-N/E) - *towards residences*;

Temperature gradient: +0.09K/m - *temperature rising with elevation, directing upward-bound sonic energy back towards the ground (ground temperature inversion<sup>15</sup>)*

#### System Tuning Profiles (each performing best under different conditions)

1) System tuning appropriate under Favorable Weather conditions: refraction will direct sonic energy that aims outside the Venue upwards and wind-flow will direct it towards the ocean.

2) System tuning appropriate under Unfavorable Weather conditions: refraction will direct sonic energy exiting the Venue downwards (temperature inversion condition), and wind flow will direct it towards the community.

#### 2 x Measurement Heights

1) 5.5ft (1.70m) (i.e. street level)

2) 16ft (4.9m) (i.e. building level)

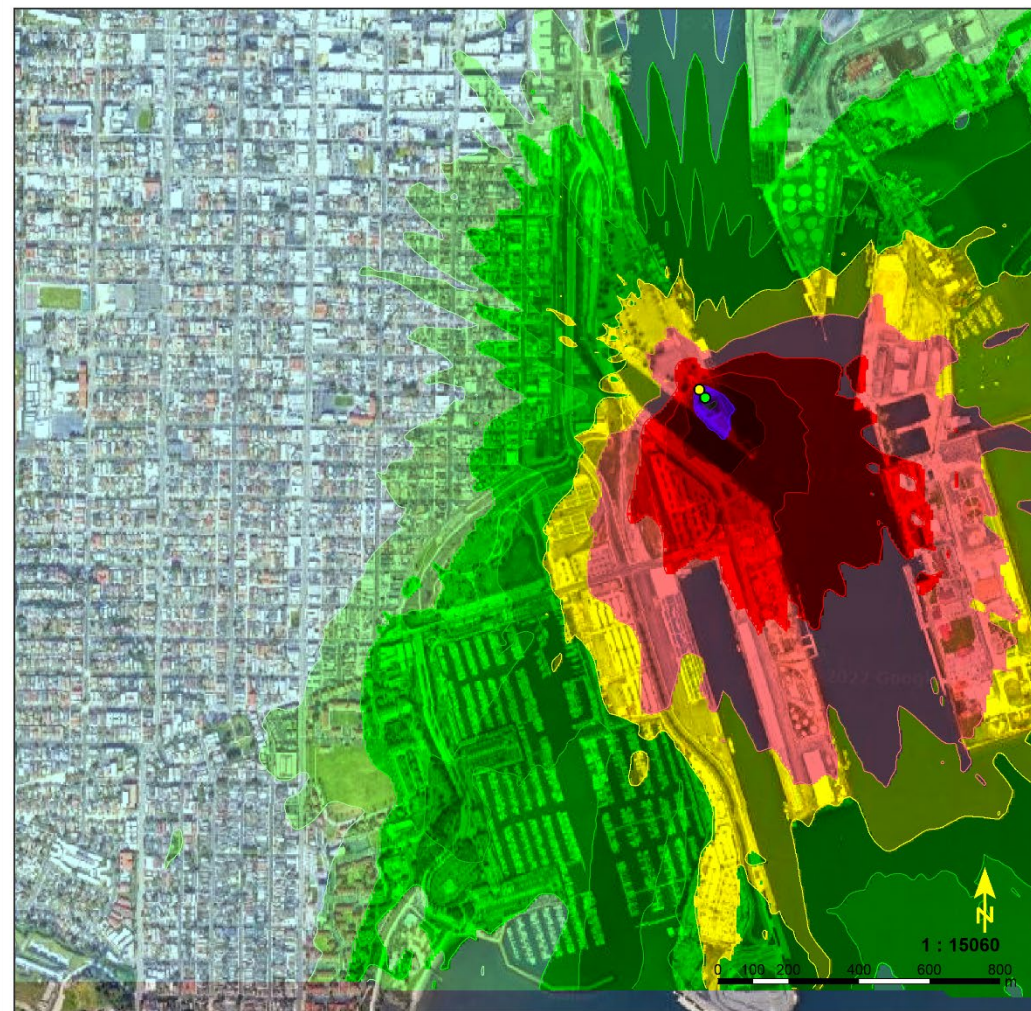
The summary table, below, compares average ambient SPL's to average maximum SPLs predicted by the sound source and sound propagation models to reach the residence blocks nearest to the venue, extending North-to-South between S. Beacon St. @ W. 8<sup>th</sup> St. (USPS) and Quartermaster Rd. @ Meyler Rd. (Fort MacArthur Inn).

Ambient Vs Noise dBA SPL		System Tuning 1 (best for favorable weather conditions)				System Tuning 2 (best for unfavorable weather conditions)			
		5.5ft. Elev.		16ft Elev.		5.5ft. Elev.		16ft Elev.	
Time Period	Ambient	Noise	Overage	Noise	Overage	Noise	Overage	Noise	Overage
Day	61.3	69	>7	69	>7	70	>8	69	>7
Evening	58.5	69	>10	69	>10	70	>11	69	>10
Night	56.4	69	>12	69	>12	70	>13	69	>12

<sup>13</sup> Noise maps model A-Weighted SPLs (measured in dBA). They bias middle frequencies, are representative of hearing response at moderate SPLs, and are consistent with standard noise level measurement and assessment.

<sup>14</sup> Both conditions assume 22°C; 65% RH; 1014mbar P; gentle breeze 4.3m/s - based on April/September historical data from <https://www.timeanddate.com/weather>

<sup>15</sup> Temperature inversion occurs more frequently after sundown and its effects are enhanced under more humid, overcast conditions.

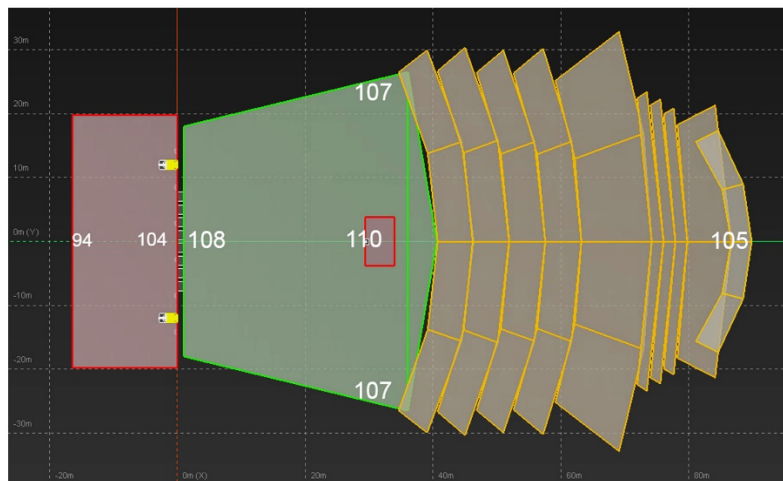


**San Pedro Amphitheater**  
 Spectrum: All Live bands  
 SPL at reference point: 110.0 dB(A)

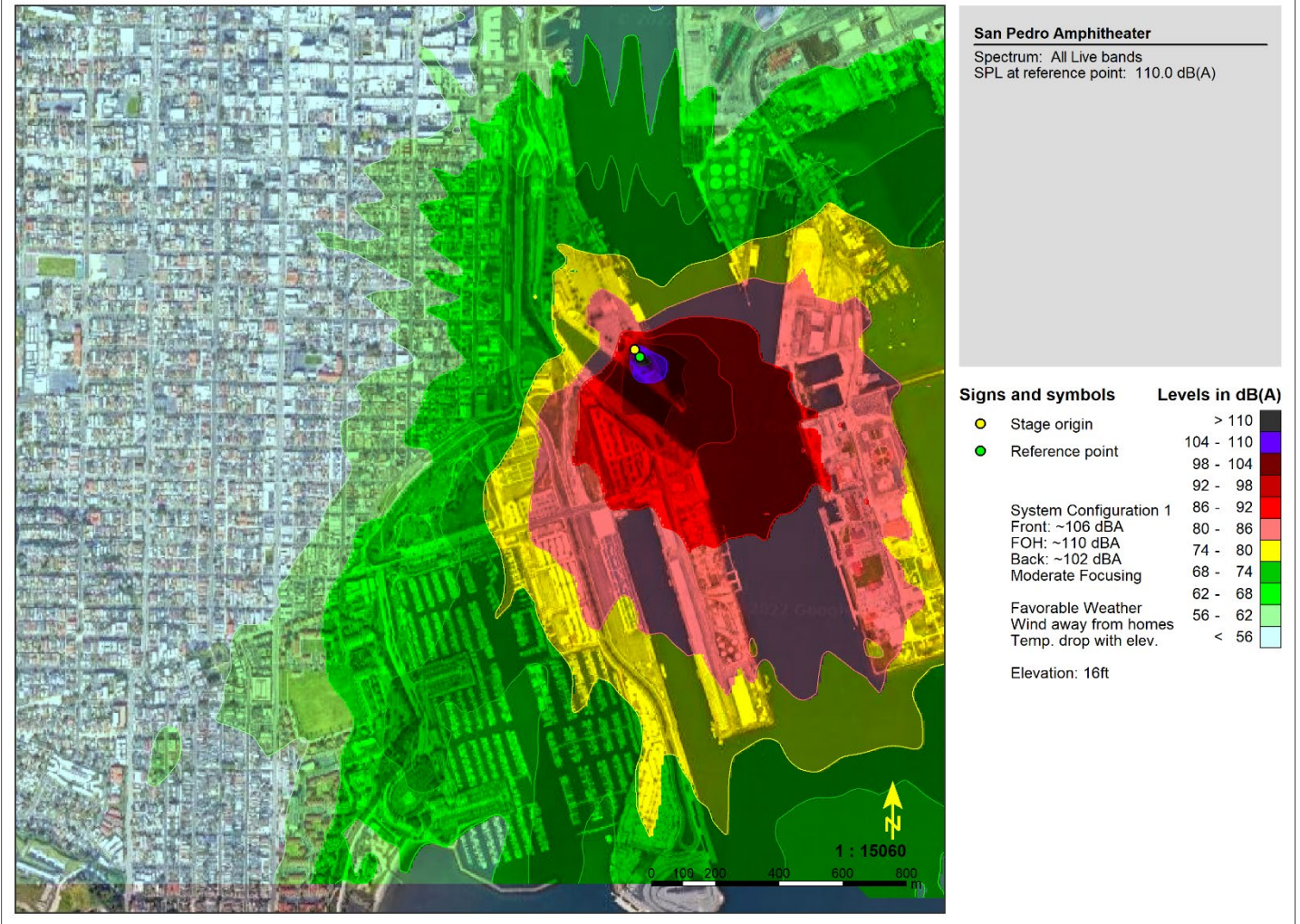
Signs and symbols	Levels in dB(A)
● Stage origin	> 110
● Reference point	104 - 110
	98 - 104
	92 - 98
System Configuration 1	86 - 92
Front: ~106 dBA	80 - 86
FOH: ~110 dBA	74 - 80
Back: ~102 dBA	68 - 74
Moderate Focusing	62 - 68
Favorable Weather	56 - 62
Wind away from homes	< 56
Temp. drop with elev.	
Elevation: 5.5ft	

**SPL calculation**

Resolution:	Mid (2m)
Highest SPL:	113.1 dB
<b>Simulated signal</b>	
Level:	3.4 dBU
Signal:	BB pink (A)
Show interferences:	Off
<b>Air absorption</b>	
On/Off:	On
Temperature:	22 °C
Humidity:	65.0 %
<b>NoizCalc reference point</b>	
x:	29.6 m
y:	0.0 m
z:	2.0 m
SPL:	110.0 dB







**SPL calculation**

Resolution:	Mid (2m)
Highest SPL:	113.1 dB

**Simulated signal**

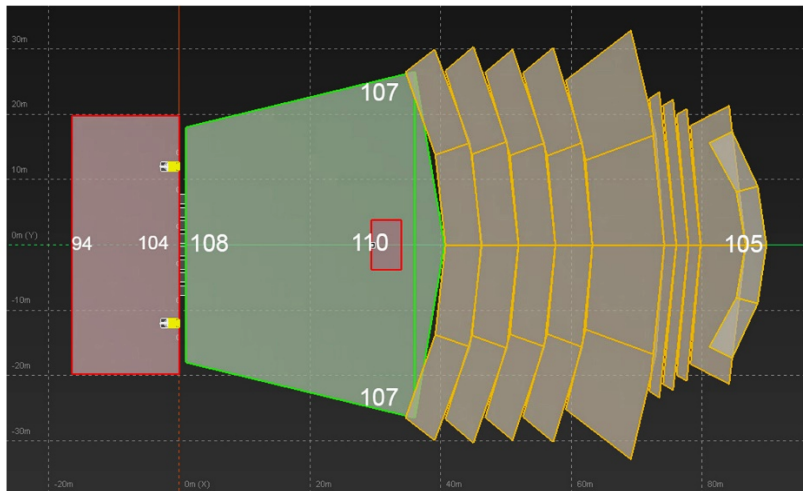
Level:	3.4 dBu
Signal:	BB pink (A)
Show interferences:	Off

**Air absorption**

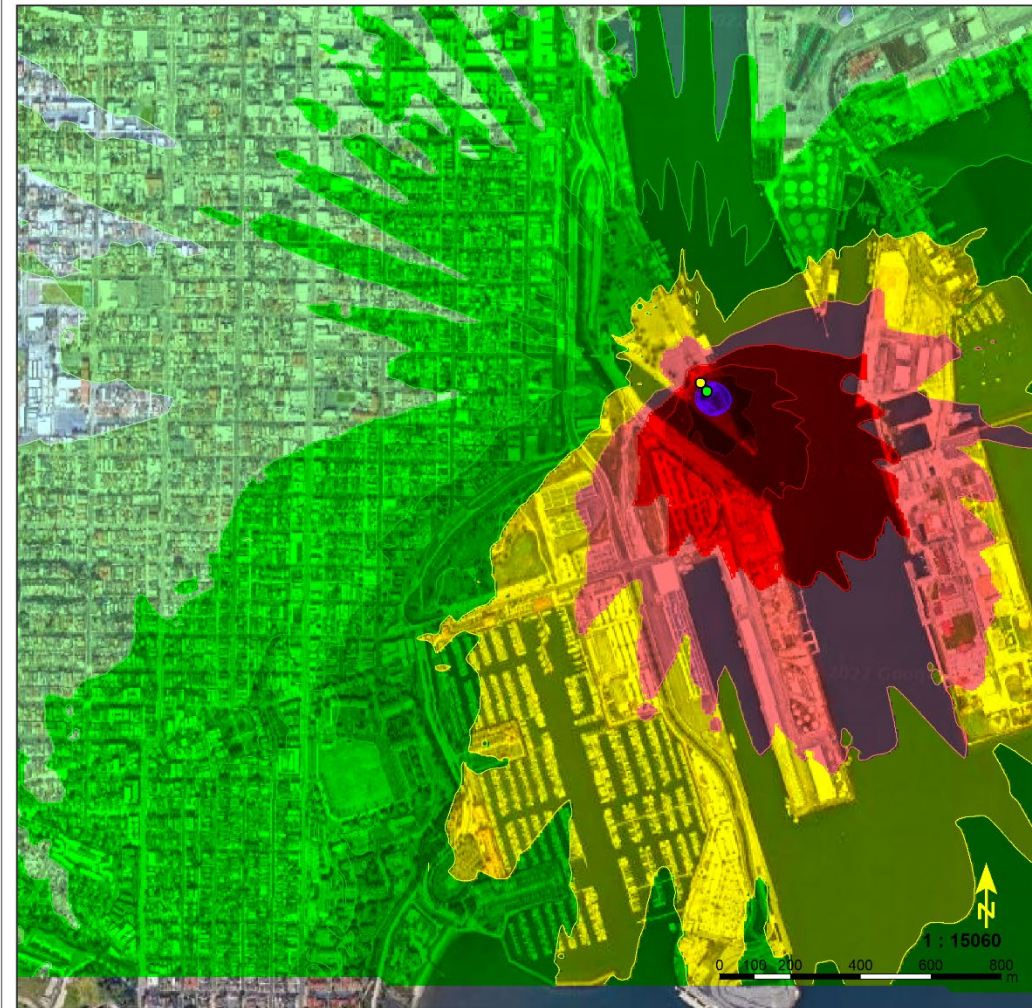
On/Off:	On
Temperature:	22 °C
Humidity:	65.0 %

**NoizCalc reference point**

x:	29.6 m
y:	0.0 m
z:	2.0 m
SPL:	110.0 dB







**San Pedro Amphitheater**  
 Spectrum: Live bands  
 SPL at reference point: 110.0 dB(A)

Signs and symbols	Levels in dB(A)
● Stage origin	> 110
● Reference point	104 - 110
	98 - 104
	92 - 98
	86 - 92
System Configuration 2	80 - 86
Front: ~106 dBA	74 - 80
FOH: ~110 dBA	68 - 74
Back: ~102 dBA	62 - 68
Array Tilt	56 - 62
Moderate Processing	< 56
Unfavorable Weather	
Wind towards homes	
Temp. rise with elev.	
Elevation: 5.5ft	

**SPL calculation**

Resolution:	Mid (2m)
Highest SPL:	111.7 dB

**Simulated signal**

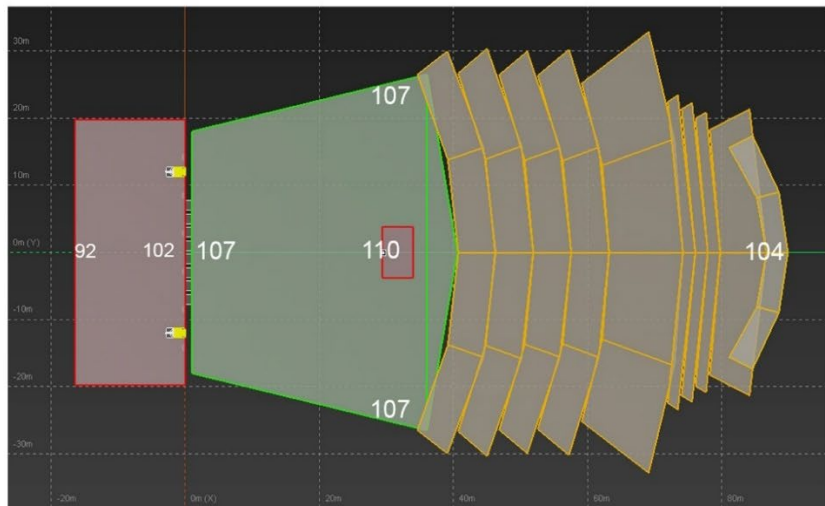
Level:	1.9 dBu
Signal:	BB pink (A)
Show interferences:	Off

**Air absorption**

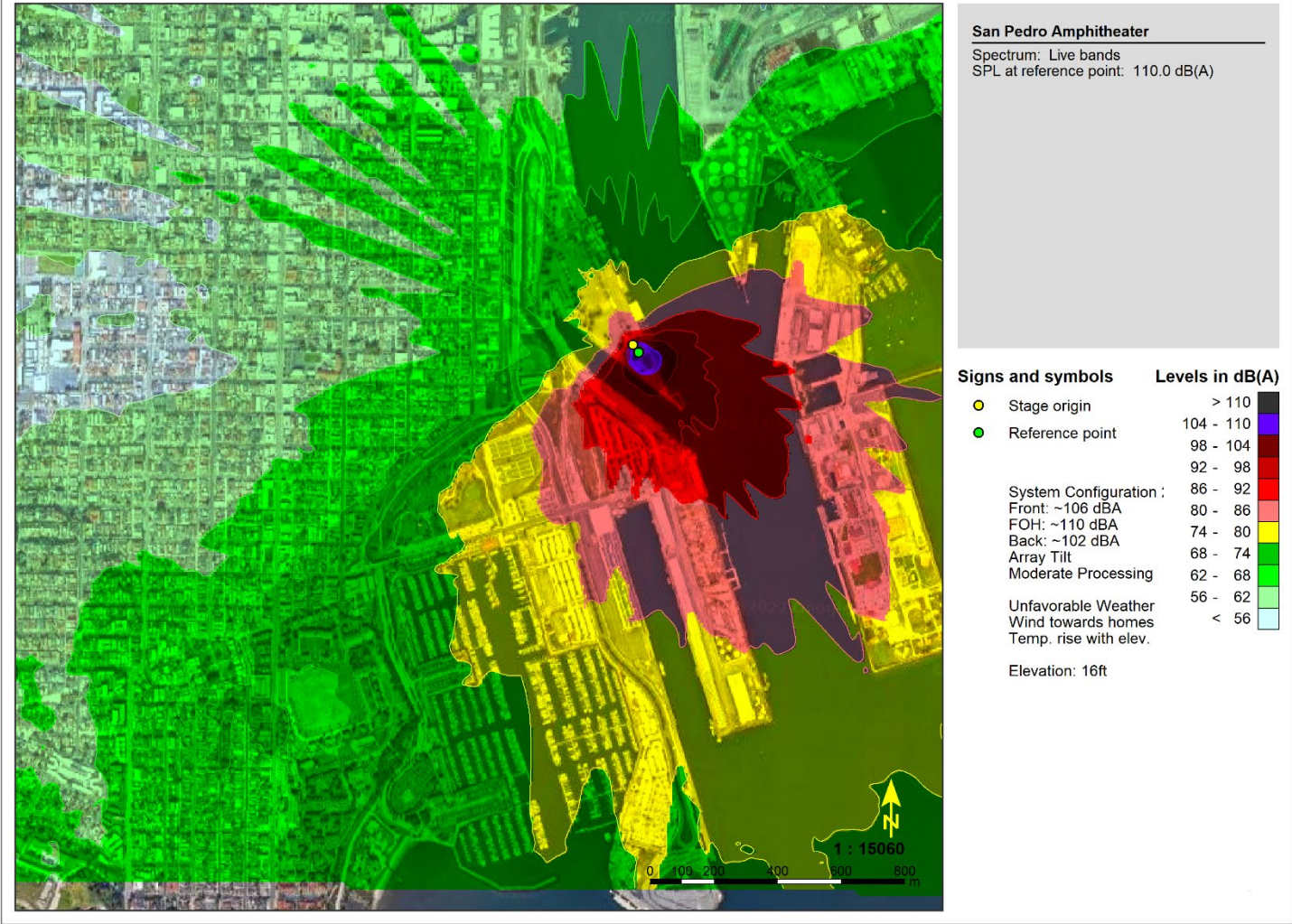
On/Off:	On
Temperature:	22 °C
Humidity:	65.0 %

**NoizCalc reference point**

x:	29.6 m
y:	0.0 m
z:	2.0 m
SPL:	110.0 dB







**SPL calculation**

Resolution:	Mid (2m)
Highest SPL:	111.7 dB

**Simulated signal**

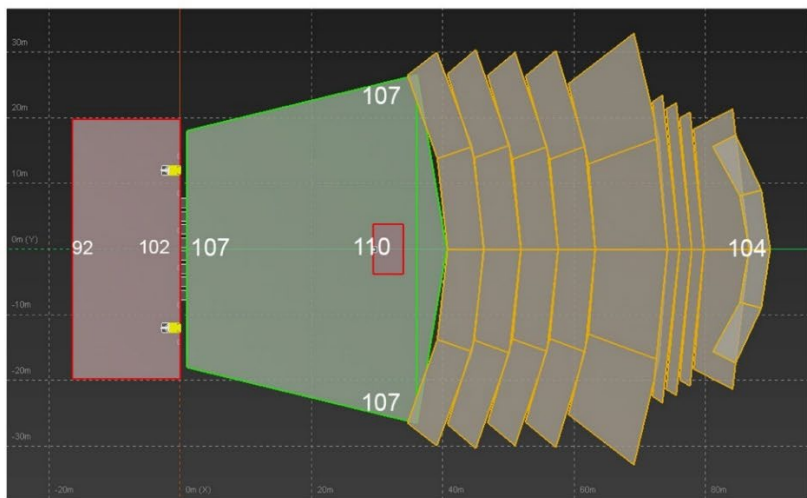
Level:	1.9 dBu
Signal:	BB pink (A)
Show interferences:	Off

**Air absorption**

On/Off:	On
Temperature:	22 °C
Humidity:	65.0 %

**NoizCalc reference point**

x:	29.6 m
y:	0.0 m
z:	2.0 m
SPL:	110.0 dB





## D. Modeled Noise Level Assessment & Suggestions

### Assessment

Based on the sound system design and noise modeling presented, the max SPLs expected at the Venue would generate community noise levels that are projected to exceed evening average ambient noise levels by >9dBA, under favorable weather conditions, and >10dBA, under unfavorable weather conditions.

**+3dB: Noticeable.** 3dB increase corresponds to ~2-fold increase in power.

**+5dB: Increasingly Noticeable.** 5dB increase corresponds to ~3-fold increase in power.

**+10dB Likely Complaints.** 10dB increase corresponds to ~10-fold increase in power and ~2-fold increase in perceived loudness.<sup>16</sup>

Community noise salience and associated annoyance/complaint potential increase with:

- signal time-variance (*i.e.* music versus steady noise signals)<sup>17</sup> and
- low frequency content (low frequencies cut through ambient noise easier than high frequencies)<sup>18</sup>

At the same time, the max SPLs expected onsite would likely inhibit the intended effect of sustained, intense loudness at the Venue. 110dBA can trigger the audience's automatic hearing protection mechanism within 6 minutes of exposure, reducing the apparent loudness by the equivalent of ~6dB and up to ~10dB, as exposure continues, in an effect that outlasts most music events. This short-term decrease in hearing sensitivity (temporary threshold shift or TTS)<sup>19,20</sup> degrades loudness, timbre, and sonic clarity perception,<sup>21</sup> and is likely to initiate upward sound level and downward loudness spirals.

### Suggestion

An effective and efficient way to reduce the sonic impact of onsite events to the community, while also significantly improving the audience experience at the Venue is to drop the max SPL at FOH to ~100dBA 5minLeq. The sound at the Venue will appear to the audience louder, fuller, and clearer for longer, while the associated ~10dB drop relative to average peak values modeled at the Venue will be barely noticeable onsite but clearly noticeable in the far field,<sup>22</sup> bringing the Venue's contributions to community noise levels down to +2dBA from or even under average ambient noise levels, depending on environmental conditions.

Note that time variant, patterned signals (such as music signals) are perceptible at levels as low as 10dB below steady, broadband background noise.

The following Appendix provides an example of the impact a 100dBA max limit at FOH would have on SPLs at the community.

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<sup>16</sup> Belcham, A. (2014). Manual of Environmental Management. p.258. Reference criteria need adjustment at very low/high starting levels.

<sup>17</sup> In Guignard, J.C. (1973). A Basis for Limiting Noise Exposure for Hearing Conservation. EPA. p. A 9-5.

<https://nepis.epa.gov/Exe/ZyPDF.cgi/9101XEFB.PDF?Dockey=9101XEFB.PDF>

<sup>18</sup> Small, A.M. and Gales, R.S. (1998). Hearing Characteristics. In C.M. Harris, Handbook of Acoustical Measurements and Noise Control. ASA, Chapt. 17.

<sup>19</sup> World Health Organization. Reports on recreational exposure to sound: [2015](#) - [2017](#)

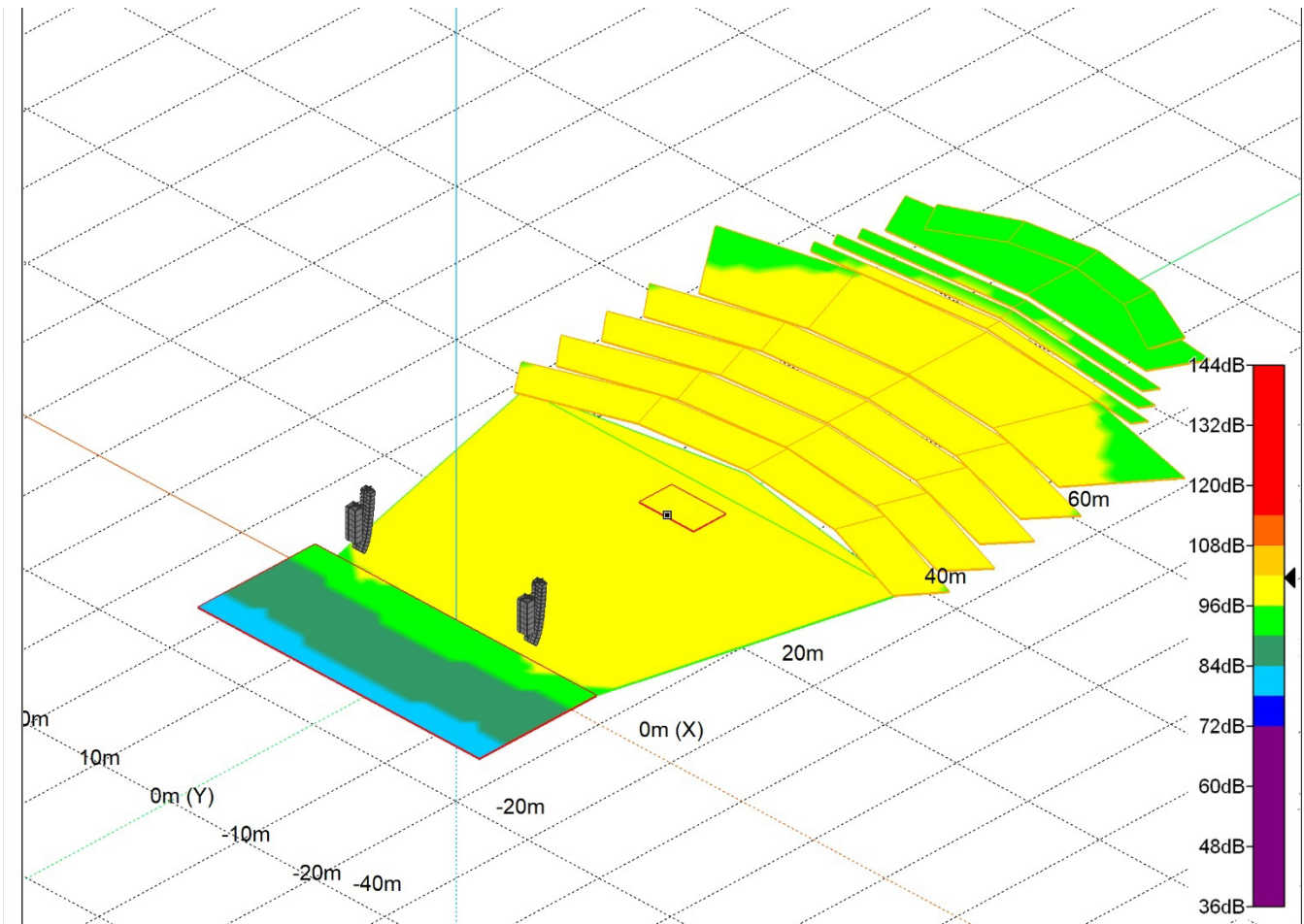
<sup>20</sup> In Guignard, J.C. (1973). EPA. A 12-6 – A 12-7.

<sup>21</sup> The TTS-induced reduction in loudness is unevenly distributed across frequencies (impacts more the 1-6kHz region), altering the intended spectral and timbral balance.

<sup>22</sup> As broadband signals exceed 96-100dBA, our hearing mechanism's ability to tell frequencies and levels apart becomes progressively coarser, reducing sonic clarity and rendering sonic nuances effected by musicians and sound engineers imperceptible.

# APPENDIX

## System Tuning 3 (@100dBA FOH)



### SPL calculation

Resolution:	Mid (2m)
Highest SPL:	101.6 dB

### Simulated signal

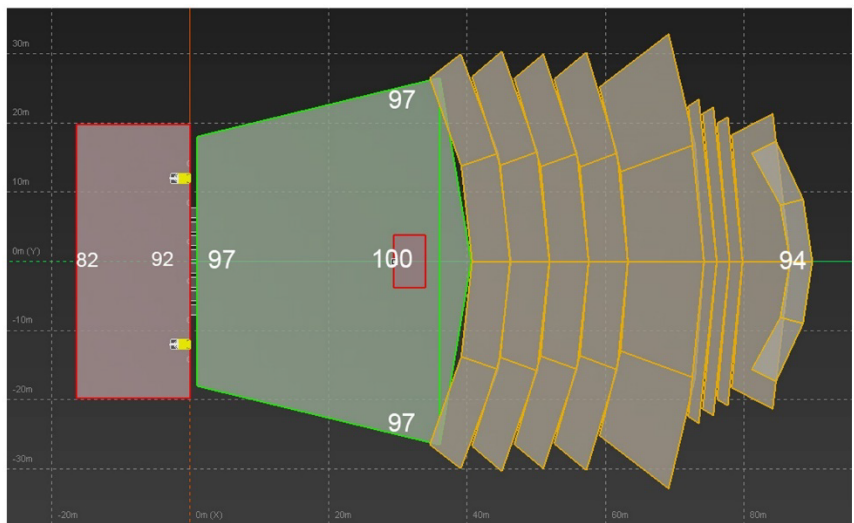
Level:	-8.0 dBu
Signal:	BB pink (A)
Show interferences:	Off

### Air absorption

On/Off:	On
Temperature:	22 °C
Humidity:	65.0 %

### NoizCalc reference point

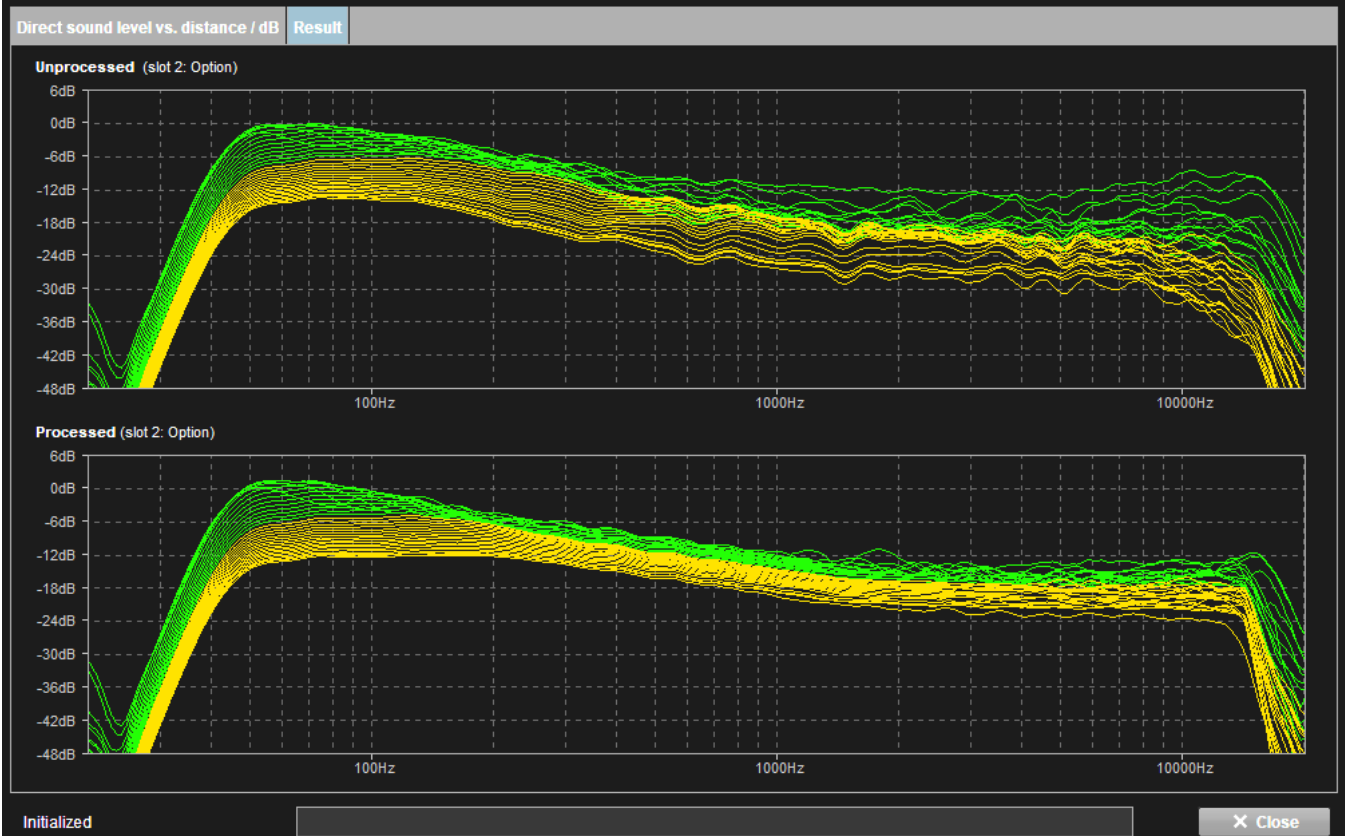
x:	29.6 m
y:	0.0 m
z:	2.0 m
SPL:	100.0 dB

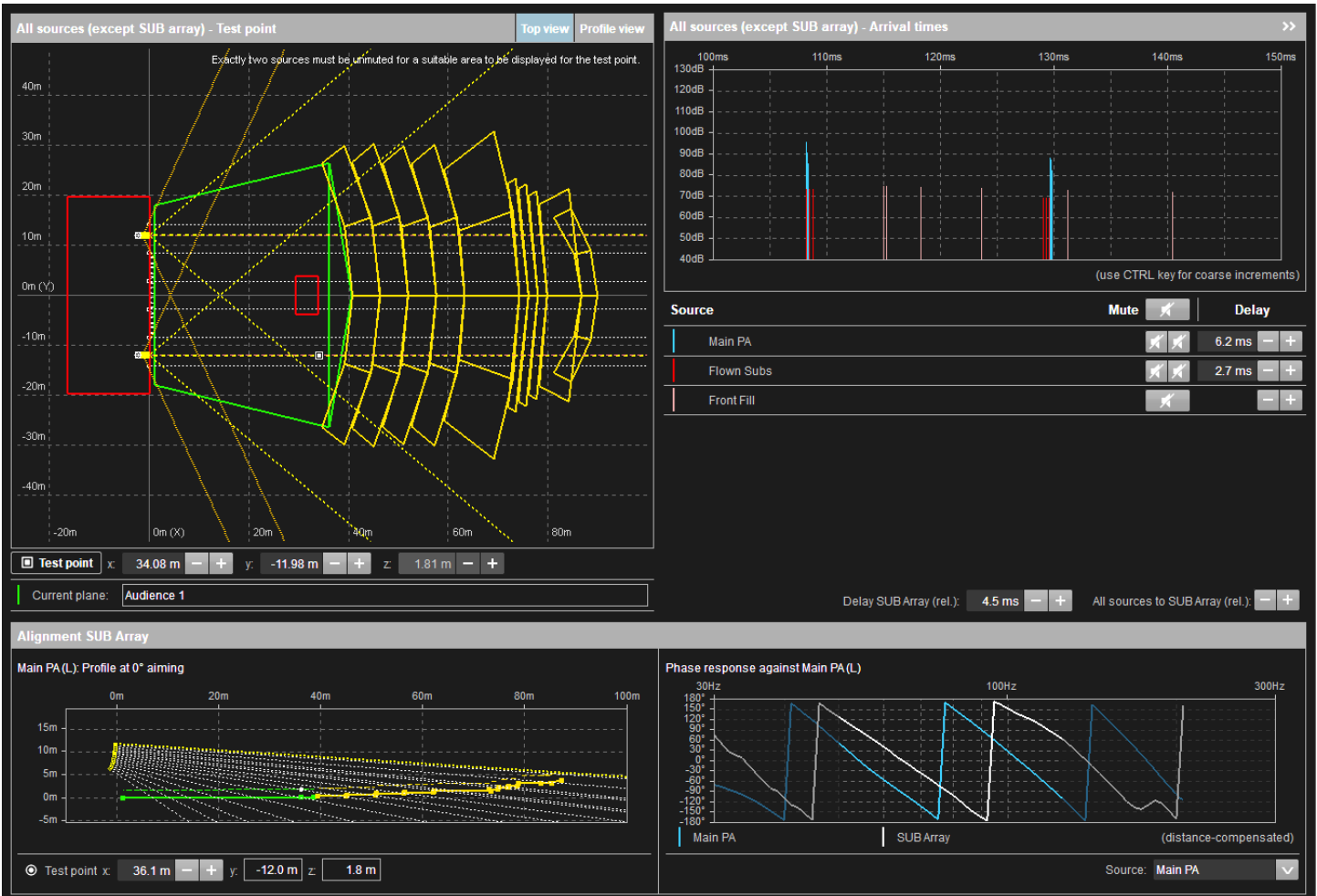




Initialized

Close



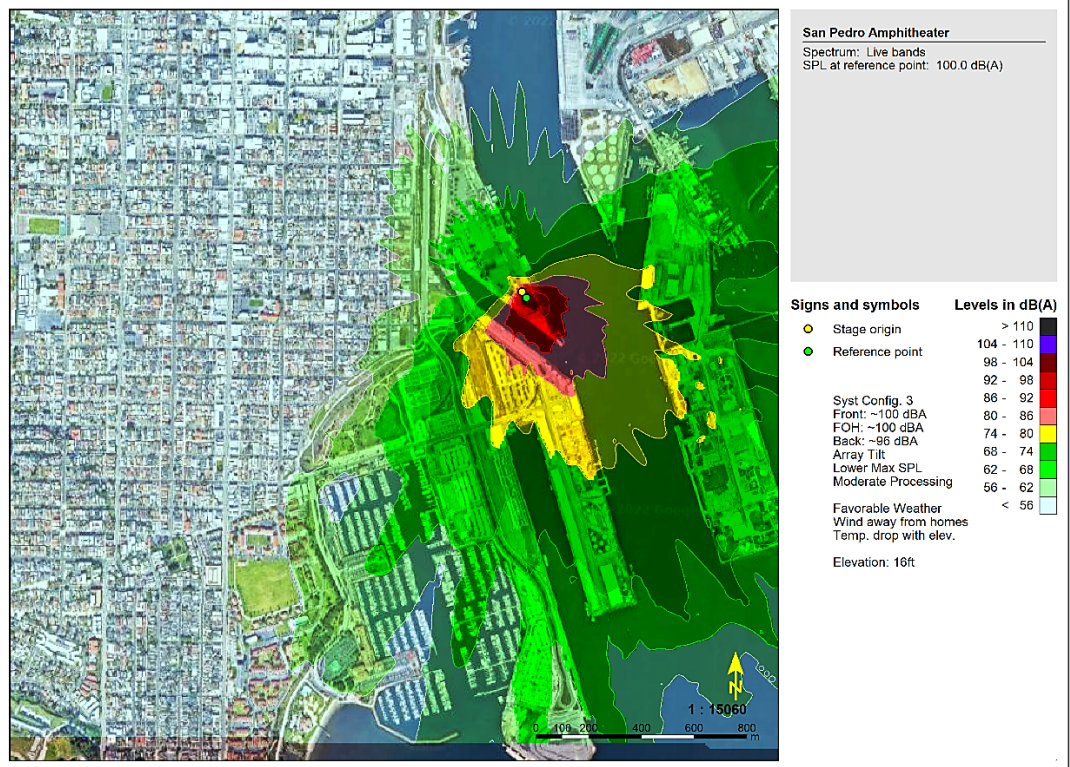
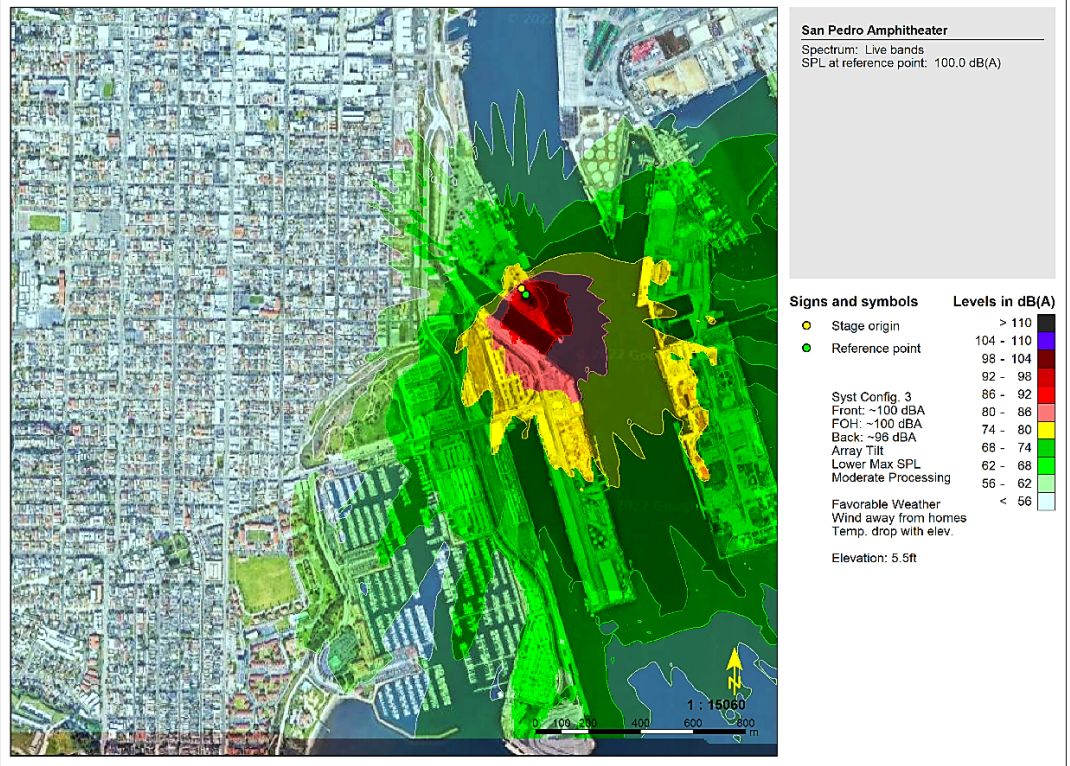


### Community Noise SPLs for System Tuning 3 (100dBA @ FOH)

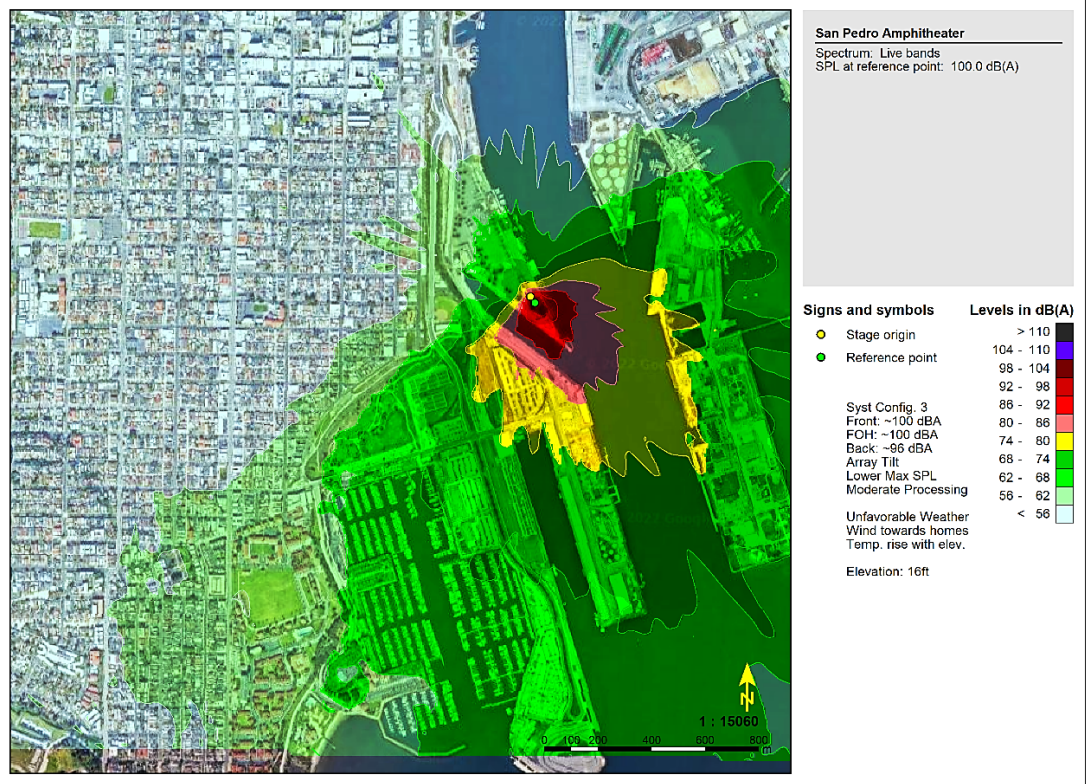
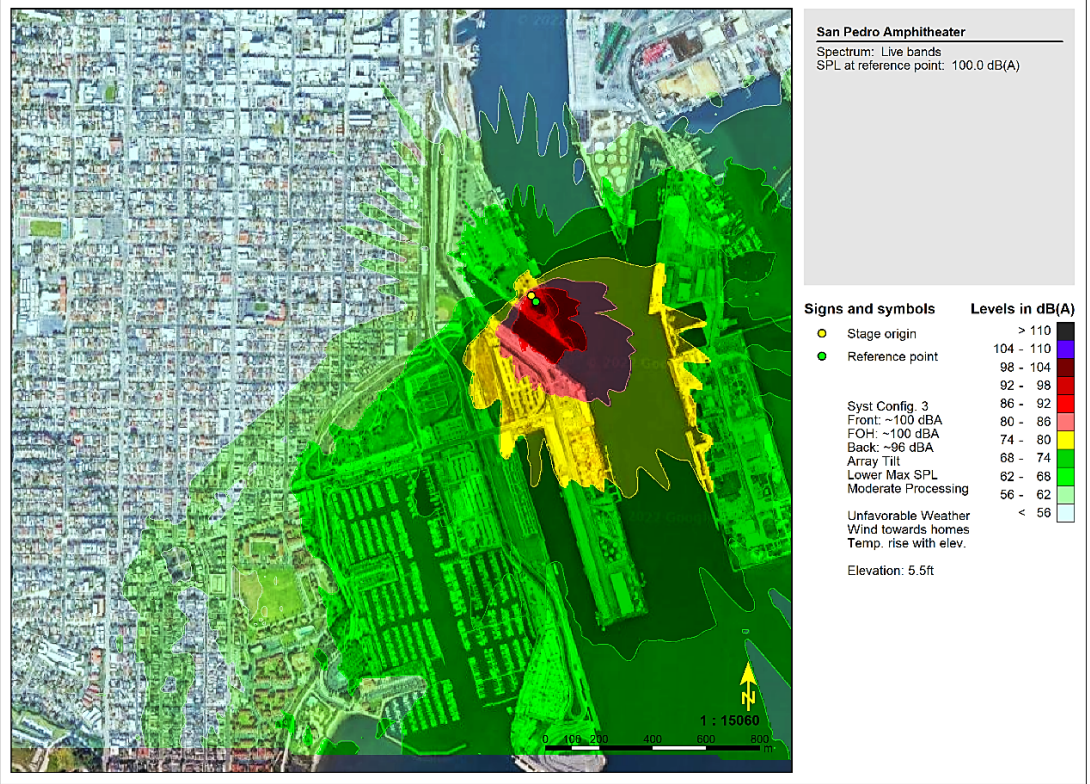
Comparison of average ambient SPL's to average maximum SPL's predicted to reach the residence blocks nearest to the venue.

Ambient Vs Noise dBA SPL (100 dBA @ FOH)		Favorable Weather Conditions				Unfavorable Weather Conditions			
		5.5ft. Elev.		16ft Elev.		5.5ft. Elev.		16ft Elev.	
Time Period	Ambient	Noise	Overage	Noise	Overage	Noise	Overage	Noise	Overage
Day	<u>61.3</u>	59	< -2	59	< -2	60	< -1	59	< -2
Evening	<u>58.5</u>	59	< 1	59	< 1	60	> 1	59	< 1
Night	<u>56.4</u>	59	> 2	59	> 2	60	> 3	59	> 2

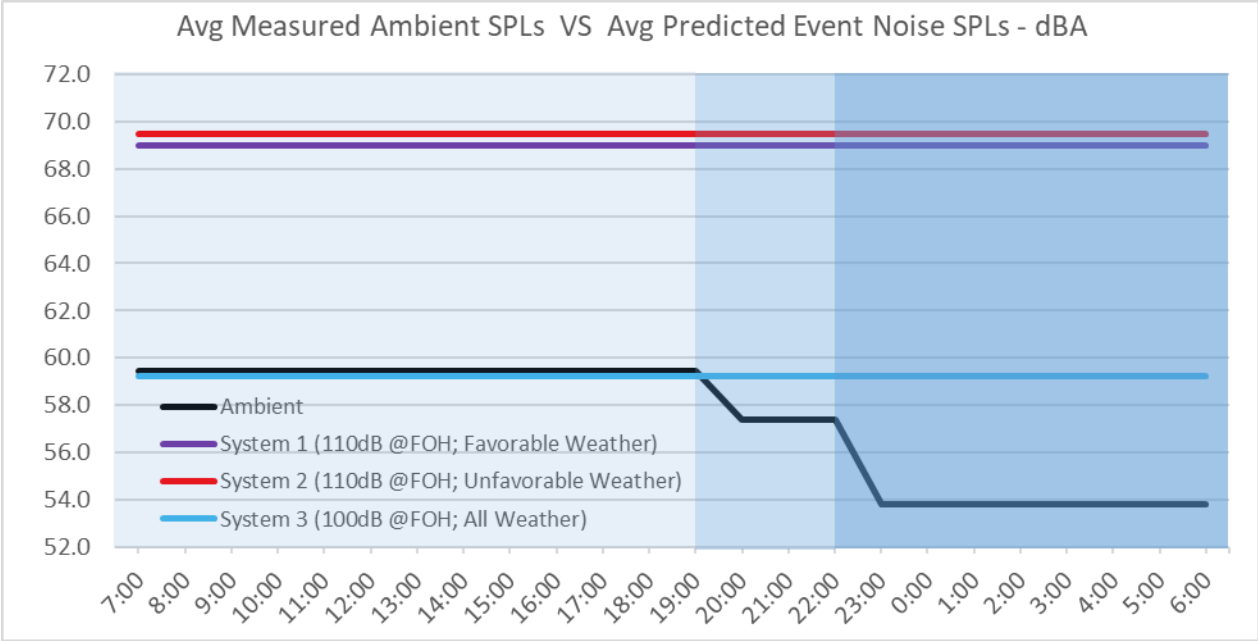












## Fireworks Noise Model Calculations

All noise levels in dBA

**Table 1. Sample Data from San Diego Bay and Imperial Beach Oceanfront Fireworks Display Events Project EIR**

Show Name	Totals Per Show		Values for Each Individual Launch Location				
	Pounds of Fireworks	No. of Launch Locations	Pounds of Fireworks/ Launch Location	Show Duration, Minutes	Pounds of Fireworks/ Minute/ Location	Leq @ 50' Over Show Duration, dBA	Leq @ 50' Normalized to 1 Hour, dBA
Big Bay Boom	5342	4	1336	19	70.3	116.9	111.9
Fireworks Over Glorietta Bay Show	397	1	397	20	19.9	111.7	106.9
Fourth of July Imperial Beach Fireworks Show	456	1	456	18	25.3	112.5	107.2
San Diego Symphony Summer Pops Fireworks	95	1	95	10	9.5	Not Measured	Not Measured

San Diego Symphony Summer Pops Fireworks are most similar to the proposed West Harbor Fireworks displays

**Table 2. San Diego Symphony Summer Pops Noise Levels. Estimated from Other Shows by Adjusting for Pounds of Fireworks/Minute**

San Diego Symphony Summer Pops Estimate Based On...	Reference Data	Calculations for San Diego Symphony Summer Pops	
	Leq @ 50' Over Show Duration, dBA	Adjustment for Pounds per Minute, dBA	Leq @ 50' Over Show Duration, dBA
Big Bay Boom	116.9	-8.7	108.2
Fireworks Over Glorietta Bay Show	111.7	-3.2	108.5
Fourth of July Imperial Beach Fireworks Show	112.5	-4.3	108.2

Results are very consistent, use the value derived from Glorietta Bay because it is the most conservative

**Table 3. Estimated Average Sound Levels from West Harbor Fireworks at Various Distances for Various Event Durations, Leq dBA**

	Distance from Launch Barge, Feet							
	50	100	500	1,000	2,000	3,000	4,000	5,000
	Leq Over Display Duration, dBA							
	108.5	102.5	88.5	82.5	76.5	72.9	70.4	68.5
Duration, Minutes	1-Hour Leq Adjusted for Display Duration, dBA							
5	97.7	91.7	77.7	71.7	65.7	62.1	59.6	57.7
10	100.7	94.7	80.7	74.7	68.7	65.2	62.7	60.7
15	102.5	96.5	82.5	76.5	70.4	66.9	64.4	62.5
20	103.7	97.7	83.7	77.7	71.7	68.2	65.7	63.7

Excludes atmospheric attenuation

**Table 4. Estimated Average Sound Levels from West Harbor Fireworks at the Surrounding Community for Various Event Durations, Leq dBA**

	Distance from Launch Barge, Feet				
	San Pedro Residences West of the Project	Al Larson Marina	Reservation Point	Cabrillo Marina	Fort MacArthur Housing
	6,600	6,800	3,500	2,400	4,700
Duration, Minutes	Leq Over Display Duration, dBA				
	1-Hour Leq Adjusted for Display Duration, dBA				
5	55.3	55.0	60.8	64.1	58.2
10	58.3	58.0	63.8	67.1	61.3
15	60.1	59.8	65.6	68.9	63.0
20	61.3	61.1	66.8	70.1	64.3

Excludes atmospheric attenuation

**Table 5. Community Noise Levels and Noise Increases from West Harbor Fireworks, Leq dBA**

Receiver/Location	Time of Day	Ambient	Fireworks Noise 1-hour Leq, dBA		Overage, dBA	
			10-Minute Display	20-Minute Display	10-Minute Display	30-Minute Display
San Pedro Residences West of the Project	Evening	59	58	61	-1	2
	Nighttime	56	58	61	2	5
Al Larson Marina	Evening	54	58	61	4	7
	Nighttime	50	58	61	8	11
Reservation Point	Evening	52	64	67	12	15
	Nighttime	49	64	67	15	18
Cabrillo Marina	Evening	50	67	70	17	20
	Nighttime	41	67	70	26	29
Fort MacArthur Housing	Evening	59	61	64	2	5
	Nighttime	56	61	64	5	8

**Red Values** signify overages greater than 5 dBA

**Table 6. Estimated Average Sound Levels from West Harbor Fireworks at Biological Resources for Various Event Durations, Leq dBA**

Note: These values are used in the marine mammal noise assessment for the Biological Resources section of the EIR

Duration, Minutes	Distance from Launch Barge, Feet							
	1. PoLA Main Channel (north)	2. Fish Harbor	3. Cabrillo Marina (north)	4. PoLA Main Channel (south)	5. Cabrillo Marina (south)	6. Firework Barge	7. Bait Barge	8. Cabrillo Beach
	10,000	6,800	3,700	2,800	2,700	650	550	3,650
	Over Display Duration							
	62.5	65.8	71.1	73.5	73.9	86.2	87.7	71.2
1-Hour Leq Adjusted for Display Duration								
10	54.7	58.0	63.3	65.8	66.1	78.4	79.9	63.5
15	56.5	59.8	65.1	67.5	67.8	80.2	81.7	65.2
20	57.7	61.1	66.3	68.8	69.1	81.4	82.9	66.5
25	58.7	62.0	67.3	69.7	70.0	82.4	83.9	67.4

Excludes atmospheric attenuation

## Noise Calculations for Marine Mammals

These calculations and tables are used in the analysis of noise impacts in the Biological Resources section of the EIR

**Table 7. A-Weighted Noise Levels from Amphitheater and Fireworks at Potential Biological Receiver Locations, dBA**

Biological Receiver Point	Amphitheater Noise Level (estimated from noise contour maps), Leq dBA		Estimated Fireworks Noise Levels, dBA (from Table 6)					Estimated Combined Noise Levels			
			Distance from Fireworks Barge, feet	Leq During Fireworks, dBA	Lmax During Fireworks, dBA	Hourly Fireworks Leq Depending on Display Duration, dBA		Combined Levels with Favorable Weather		Combined Levels with Unfavorable Weather	
	Favorable Weather	Unfavorable Weather				10-Minute Display	20-Minute Display	10-Minute Display	20-Minute Display	10-Minute Display	20-Minute Display
1. PoLA Main Channel (north)	59	64	10,000	62	78	55	58	60	62	65	65
2. Fish Harbor	77	74	6,800	66	82	58	61	77	77	74	74
3. Cabrillo Marina (north)	68	77	3,700	71	87	63	66	69	70	77	77
4. PoLA Main Channel (south)	80	80	2,800	74	90	66	69	80	80	80	80
5. Cabrillo Marina (south)	65	74	2,700	74	90	66	69	69	70	75	75
6. Firework Barge	74	74	650	86	102	78	81	79	82	79	82
7. Bait Barge	74	74	550	88	104	80	83	81	84	81	84
8. Cabrillo Beach	62	74	3,650	71	87	63	66	66	67	74	75

Based on the modeled sound spectrum for live music, dBZ sound levels (i.e., "flat" or "unweighted" sound levels) are 15 dB greater than dBA sound levels.

Based on reported frequency spectra for fireworks, dBZ sound levels (i.e., "flat" or "unweighted" sound levels) are 4 dB greater than dBA sound levels.

Noise levels adjusted from dBA to dBZ are provided in Table 8.

**Table 8. Unweighted ("Flat") Noise Levels from Amphitheater and Fireworks at Potential Biological Receiver Locations, dBZ**

Biological Receiver Point	Estimated Amphitheater Noise Levels, Leq dBZ		Estimated Fireworks Noise Levels					Estimated Combined Noise Levels			
			Distance from Fireworks Barge, feet	Leq During Fireworks, dBZ	Lmax During Fireworks, dBZ	Hourly Fireworks Leq Depending on Display Duration, dBZ		Combined Levels with Favorable Weather		Combined Levels with Unfavorable Weather	
	Favorable Weather	Unfavorable Weather				10-Minute Display	20-Minute Display	10-Minute Display	20-Minute Display	10-Minute Display	20-Minute Display
1. PoLA Main Channel (north)	74	79	10,000	66	82	59	62	74	74	79	79
2. Fish Harbor	92	89	6,800	70	86	62	65	92	92	89	89
3. Cabrillo Marina (north)	83	92	3,700	75	91	67	70	83	83	92	92
4. PoLA Main Channel (south)	95	95	2,800	78	94	70	73	95	95	95	95
5. Cabrillo Marina (south)	80	89	2,700	78	94	70	73	80	81	89	89
6. Firework Barge	89	89	650	90	106	82	85	90	90	90	90
7. Bait Barge	89	89	550	92	108	84	87	90	91	90	91
8. Cabrillo Beach	77	89	3,650	75	91	67	70	77	78	89	89

Yellow Values signify exceedance of in-air Level B harassment acoustic thresholds for harbor seal (90 dBZ)

Orange Values signify exceedance of in-air Level B harassment acoustic thresholds for harbor seal (90 dBZ) and all other pinnipeds (100 dBZ)

**Table 9. Mitigated Unweighted ("Flat") Noise Levels at Potential Biological Receiver Locations, Assuming 10 dB Noise Reduction for Amphitheater Noise**

Biological Receiver Point	Estimated Amphitheater Noise Levels, Leq dBZ		Estimated Fireworks Noise Levels					Estimated Combined Noise Levels			
			Distance from Fireworks Barge, feet	Leq During Fireworks, dBZ	Lmax During Fireworks, dBZ	Hourly Fireworks Leq Depending on Display Duration, dBZ		Combined Levels with Favorable Weather		Combined Levels with Unfavorable Weather	
	Favorable Weather	Unfavorable Weather				10-Minute Display	20-Minute Display	10-Minute Display	20-Minute Display	10-Minute Display	20-Minute Display
1. PoLA Main Channel (north)	64	69	10,000	66	82	59	62	65	66	69	70
2. Fish Harbor	82	79	6,800	70	86	62	65	82	82	79	79
3. Cabrillo Marina (north)	73	82	3,700	75	91	67	70	74	75	82	82
4. PoLA Main Channel (south)	85	85	2,800	78	94	70	73	85	85	85	85
5. Cabrillo Marina (south)	70	79	2,700	78	94	70	73	73	75	80	80
6. Firework Barge	79	79	650	90	106	82	85	84	86	84	86
7. Bait Barge	79	79	550	92	108	84	87	85	88	85	88
8. Cabrillo Beach	67	79	3,650	75	91	67	70	70	72	79	80

**Yellow Values** signify exceedance of in-air Level B harassment acoustic thresholds for harbor seal (90 dBZ)

**Orange Values** signify exceedance of in-air Level B harassment acoustic thresholds for harbor seal (90 dBZ) and all other pinnipeds (100 dBZ)