Brooks Acoustics Corporation
35 Talcottville Road, Suite 31 Vernon, Connecticut 06066 860-896-1081

Mr. Bradford H. Wainman
UW Vintage Lane II, LLC
P. O. Box 504
South Glastonbury, CT 06073

23 November 2021

Subject: Talbot Lane Development – Warehouse truck sound evaluation

Dear Mr. Wainman:

As requested, Brooks Acoustics Corporation (BAC) has conducted a sound evaluation study for the proposed Talbot Lane Development warehouse project in South Windsor, Connecticut.

As part of this study an evaluation will be made of the potential sound generated by a truck at the proposed Talbot Lane warehouse development in South Windsor, CT. This evaluation focused on the sound level at the nearest residential property line to the south. Those results were compared to provisions of the Town of South Windsor noise ordinance and the State of Connecticut noise regulations.

This study was based on project design information supplied on the project which are part of the Planning and Zoning application for the *Talbot Lane Development*.

Calculations of truck generated sound at the southernmost loading dock position were made for the nearest residential property line, at 124 Edgewood Drive. This analysis also included the beneficial effects of sound control design features which are included in the facility design. The calculations included a 12 foot sound barrier wall next to the loading dock area, and a 6 foot earthen berm and about 90 feet of vegetation and landscape plantings along the facility southern property line.

The maximum estimated sound level at the south residential property line from the truck activity is 43 dBA.

Significantly, this estimated sound level is *below* the regulatory limits for the Town of South Windsor and the State of Connecticut. Therefore, the truck is expected to be in compliance with regulatory requirements.

The study findings are summarized herein.

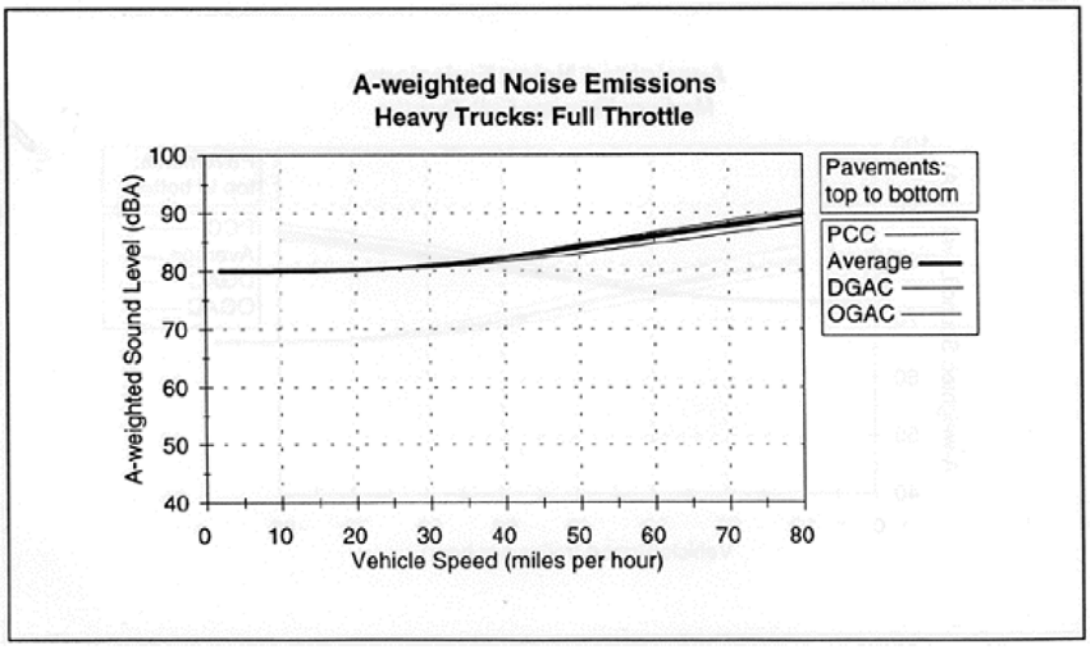
Estimates of sound level at the property line and neighbor residence

Acoustical calculations were made to estimate the sound level from truck activity at the proposed warehouse.

The **sound source** under consideration is a truck at the southernmost loading dock bay in the proposed Talbot Lane warehouse development. The source sound levels used for this analysis are based on sound test data provided by the US Federal Highway Administration (FHWA).

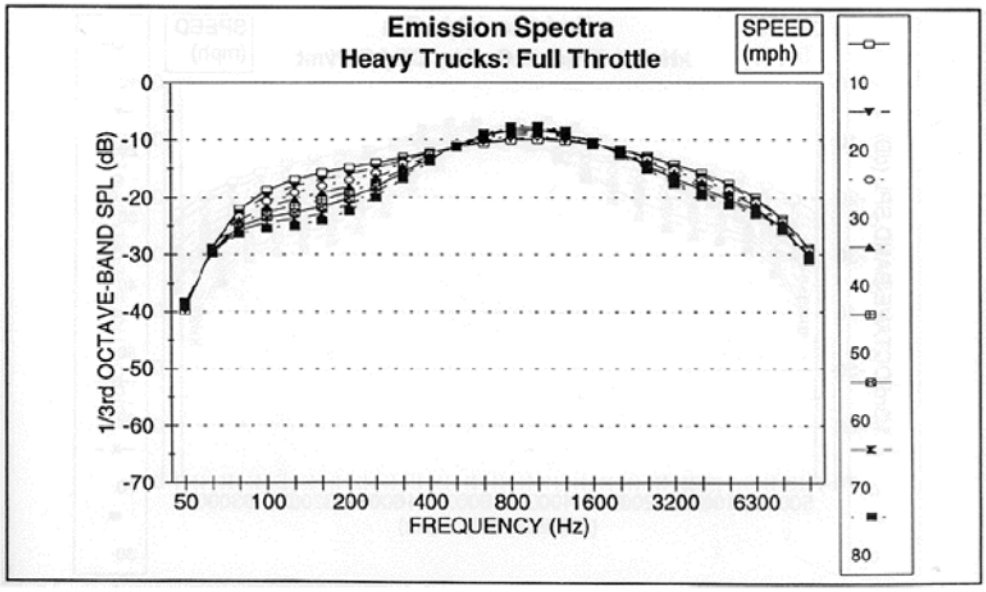
The sound level generated by a heavy truck in full throttle mode will depend on the speed of the truck. These sound levels are described in the US Federal Highway Administration, Traffic Noise Modeler (TNM) Technical Manual, as shown in the graph below for a distance of 50 feet, for various pavement types.

TNM is the sound modeler mandated to evaluate vehicle generated noise for all federal highway and many state highway projects.



The range of sound levels used by TNM goes from 80 dBA at under 10 MPH to about 90 dBA at 80 MPH. Note that CT State law (CGS 14-80a) prohibits noise emissions above 88 dBA at 50 feet for heavy trucks traveling at less than 35 MPH, so the TNM data are consistent with CT (and federal) law.

The TNM heavy truck sound spectrum shape at 10 MPH was used for this calculation, as shown below.



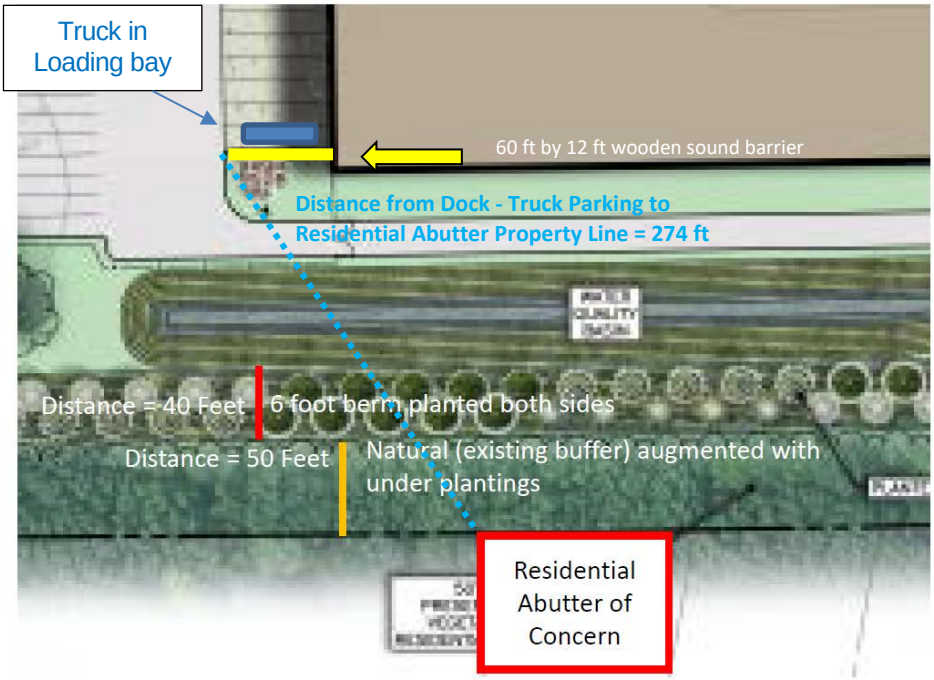
The truck activity was evaluated for potential impact on the neighborhood. The receiver location evaluated was the nearest residential property line to the south of the proposed development, at 124 Edgewood Drive.

A graphic showing the source to receiver conditions, including sound control features, is given below.

Existing & Proposed Buffer Area

Existing buffer of 50 ft mature trees located along the southern property boundary with the residential abutter to remain and be augmented by under plantings

Proposed additional buffer of 40 ft consisting of a 6 ft berm planted on both sides with evergreens



The calculations included a 60 foot long and 12 foot high sound barrier wall next to the loading dock area, a 40 foot wide and 6 foot high earthen berm planted on both sides, and 50 feet of natural vegetation and landscape plantings along the facility southern property line.

The source sound and location data were used as input to a computer modeling procedure which calculated the propagation of that sound through the atmosphere to the receptor position. The sound propagation calculation procedure accounts for the effects of the sources, barriers, vegetation and also distance and atmospheric conditions, in accordance with International Standard on the attenuation of sound during propagation outdoors, ISO 9613-1.

The site plan of the facility is shown on the Site Plan Application for 25 Talbot Lane, drawing set Revision 6, dated November 17, 2021, prepared by Design Professionals, Inc. of South Windsor, CT.

The source sound data are shown on the calculation Source Sheet, attached. The path and receiver calculations sheets which indicate the calculation results are also attached. Conservatively estimated sound barrier effects for the facility and the barrier walls are shown in the attached Barrier Attenuation Calculation sheets for the sound barrier wall and for the earthen berm, respectively.

The receiver sheets show the contribution for the truck sound source, and also show the total received sound level at the receiver location.

The calculation results are summarized below:

Sound Source	Distance	Sound level
Truck in southernmost loading bay	50 feet	80 dBA

Maximum Truck Sound Level (With Sound Control Features)	Distance	Sound level
124 Edgewood Drive property line	274 feet	43 dBA

Significantly, the estimated truck sound level at the north property line of 43 dBA is in compliance with both the Town of South Windsor Noise Ordinance (Article III, Section 50-65 Performance standards) and the Regulations of Connecticut State Agencies (RCSA 22a-69 Control of Noise). For both the Town of South Windsor and the State of CT the sound level limit for industrial sources at a residential receiver property line is 61 dBA during daytime hours (7 am to 10 pm) and 51 dBA during nighttime hours (10 pm to 7 am).

The study shows that the truck sound will meet the required limit of 51 dBA during the nighttime hours (10 pm to 7 am). So, the truck sound is expected to be *in compliance* with all regulatory requirements.

Discussion

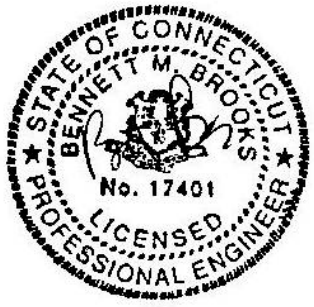
The proposed sound mitigation features are expected to provide significant reductions in sound levels from the truck loading dock to the south residential property line. It is important to note that the truck sound level will *drop substantially* for houses at greater distances.

Please contact me if you have any questions concerning these findings.

Very truly yours,
BROOKS ACOUSTICS CORPORATION

Bennett M. Brooks, PE, FASA, INCE
President

Attachments



APPENDIX

1- **Sound Projection Data**
Sound source sheet
Sound path and receiver sheets
Barrier calculations

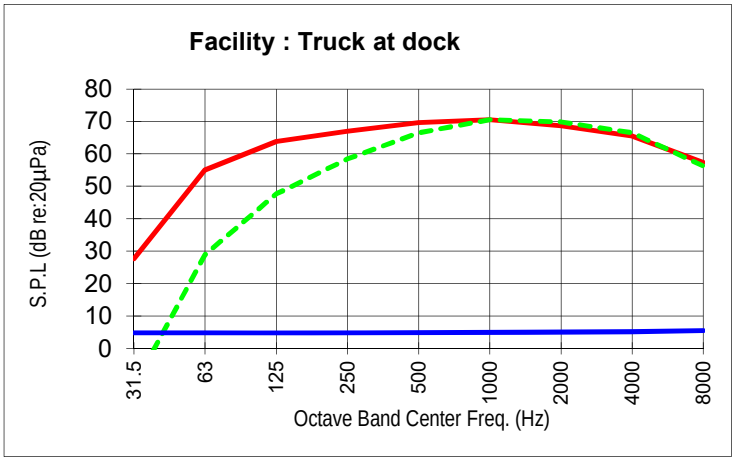
Source Sheet

Source Group: Facility
Source Name: Truck at dock

Source Data: US FWHA A-wt
Source Level: 75 dB(A)
record distance: 50

Source Type: point

	East	North	Elev.
Coordinates:	0	0	8



Frequency	Data	Atten Berm	Signature	A-weighted Signature	A-weighting Curve	freq.
31.5 Hz	32.5	5	**28**	-12	-39.4	31.5
63.0 Hz	59.9	5	**55**	29	-26.2	63
125.0 Hz	68.6	5	**64**	48	-16.1	125
250.0 Hz	71.8	5	**67**	58	-8.6	250
500.0 Hz	74.5	5	**70**	66	-3.2	500
1000.0 Hz	75.5	5	**71**	71	0.0	1000
2000.0 Hz	73.6	5	**69**	70	1.2	2000
4000.0 Hz	70.6	5	**66**	67	1.0	4000
8000.0 Hz	62.8	6	**57**	56	-1.1	8000

US FWHA
TNM
Data

Truck
@ 10 MPH
max SPL
80 dBA @ 50 ft

6 ft earth berm
BAC calc
Atten ~5 dBA

Talbot Lane Development

Based on FWHA sound data and proposed site plan

Property Line Sound Study

South Residential Property Line

Sound Projection: Truck at loading dock

Facility layout with sound control

PROJECTED FROM: Loading dock

PROJECTED TO: South residential property line

Coordinates:

East	North	Elevation
137.0	-237.3	5.0

RELATIVE HUMIDITY: 50%

TEMPERATURE: 72 deg. F

ATMOS. PRESS: 760 mm Hg

Criteria Level 45 dBA

Total Sound Level **43 dBA**

Compliance?

YES

FREQ.	AWT SPL
31.5 Hz	-36.5
63 Hz	3.1
125 Hz	25.3
250 Hz	35.5
500 Hz	39.1
1000 Hz	36.5
2000 Hz	31.8
4000 Hz	25.0
8000 Hz	7.5
RMS:	42.6

#	SOURCE	CONTRIBUTIONS AWT SPL
1	Facility Truck at dock	42.6 dBA
2	reserved --	-42.5 dBA
3	reserved --	-42.5 dBA
4	reserved --	-42.5 dBA
5	reserved --	-42.5 dBA
6	reserved --	-42.5 dBA
7	reserved --	-42.5 dBA
8	reserved --	-42.5 dBA
9	reserved --	-42.5 dBA
10	reserved --	-42.5 dBA
11	reserved --	-42.5 dBA
12	reserved --	-42.5 dBA

Atmospheric attenuation:	yes
Excess gound attenuation:	yes
Source region hard, soft, mixed (h,s,m%):	h
Receiver region hard, soft, mixed (h,s,m%):	s
Middle region hard, soft, mixed (h,s,m%):	s
Barrier shadowing:	yes
Vegetation	yes

PATH SHEET

		COORDINATES		
SOURCE 1:	Facility	East 0.0		Record Distance
	Truck at dock	North 0.0		50.0
TYPE:	point	Elevation 8.0		Projection Dist.
				274.0

Freq.	Source	Vegetation	Shadowing	Ground Atten	Net Barrier Atten	Atmospheric	Distance Atten	Contribution	Awt Contrib.
31.5 Hz	27.7	0.7	6.2	-3.0	9.2	0.0	14.8	2.9	-36.5
63 Hz	55.1	0.7	7.2	-3.0	10.2	0.0	14.8	29.3	3.1
125 Hz	63.8	1.1	8.8	2.3	6.5	0.0	14.8	41.4	25.3
250 Hz	67.0	1.5	10.8	4.2	6.6	0.1	14.8	44.1	35.5
500 Hz	69.7	1.5	13.3	2.4	10.9	0.2	14.8	42.3	39.1
1000 Hz	70.6	1.8	16.0	-1.0	17.0	0.4	14.8	36.5	36.5
2000 Hz	68.6	2.2	18.8	-1.5	20.3	0.8	14.8	30.6	31.8
4000 Hz	65.5	2.9	20.0	-1.5	21.5	2.3	14.8	24.0	25.0
8000 Hz	57.3	4.4	20.0	-1.5	21.5	8.0	14.8	8.6	7.5
								48.0	42.6

PATH SHEET

		COORDINATES		
SOURCE 2:	reserved	East 0.0		Record Distance
	--	North 0.0		1.0
TYPE:	point	Elevation 1.0		Projection Dist.
				274.0

Freq.	Source	Vegetation	Shadowing	Ground Atten	Net Barrier Atten	Atmospheric	Distance Atten	Contribution	Awt Contrib.
31.5 Hz	0.0	0.0	0.0	-2.0	-2.0	0.0	48.8	-46.8	-86.2
63 Hz	0.0	0.0	0.0	-2.0	-2.0	0.0	48.8	-46.8	-73.0
125 Hz	0.0	0.0	0.0	2.3	2.3	0.0	48.8	-51.1	-67.2
250 Hz	0.0	0.0	0.0	4.2	4.2	0.1	48.8	-53.0	-61.6
500 Hz	0.0	0.0	0.0	2.4	2.4	0.2	48.8	-51.4	-54.6
1000 Hz	0.0	0.0	0.0	-1.0	-1.0	0.4	48.8	-48.2	-48.2
2000 Hz	0.0	0.0	0.0	-1.5	-1.5	0.8	48.8	-48.1	-46.9
4000 Hz	0.0	0.0	0.0	-1.5	-1.5	2.3	48.8	-49.6	-48.6
8000 Hz	0.0	0.0	0.0	-1.5	-1.5	8.0	48.8	-55.3	-56.4
								-39.7	-42.5

Talbot Lane Development

Property Line Sound Study

Truck at loading dock

Sound Source Contribution Plot

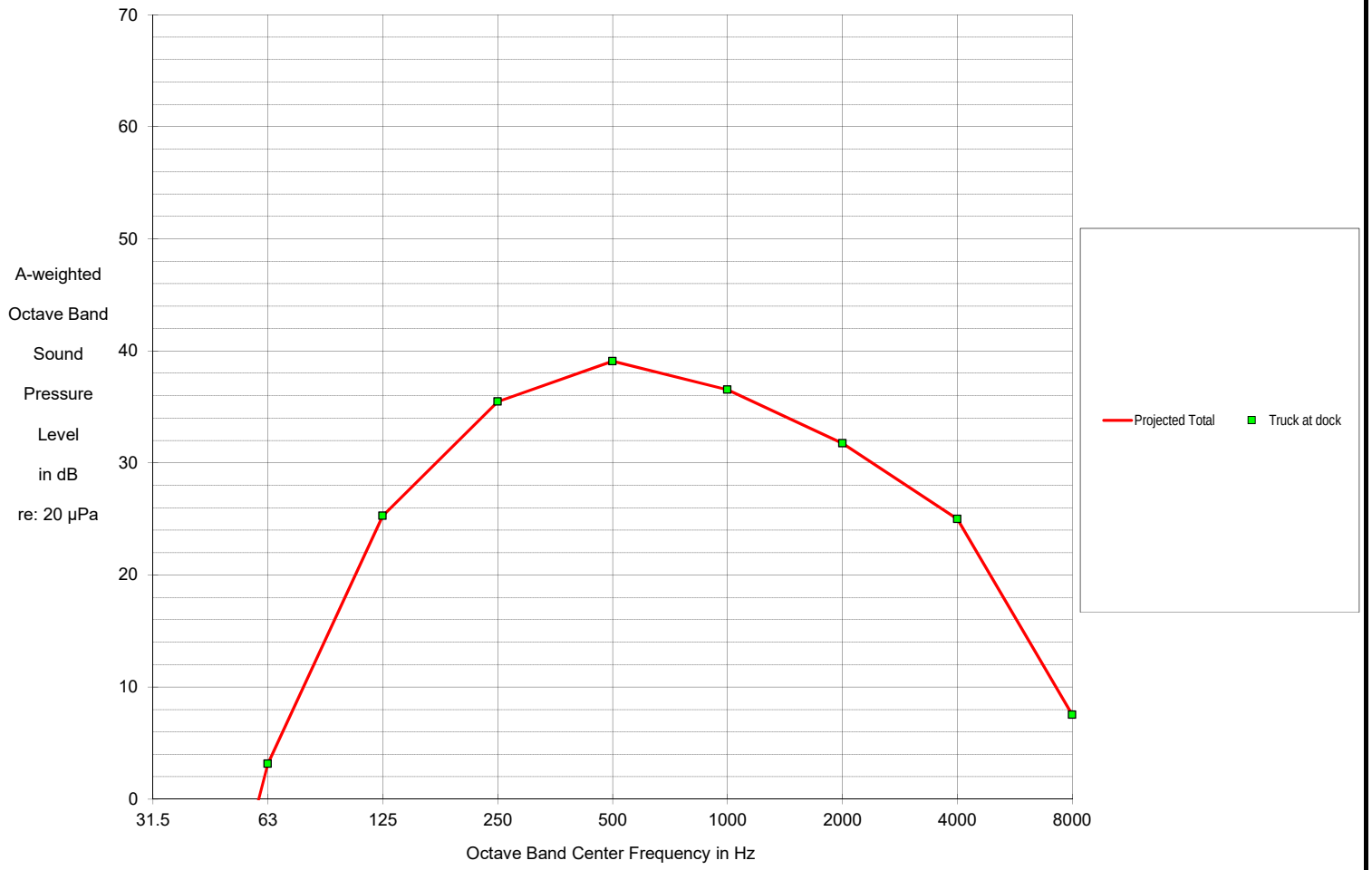
South residential property line

Based on FWHA sound data and proposed site plan

South Residential Property Line

Facility layout with sound control

RMS: 43 dBA



BAC Sound Projection Design Calculation 1

BAC Project Letter PJ2021-1376-L01

BAC Sound Projection Design Calculation 1

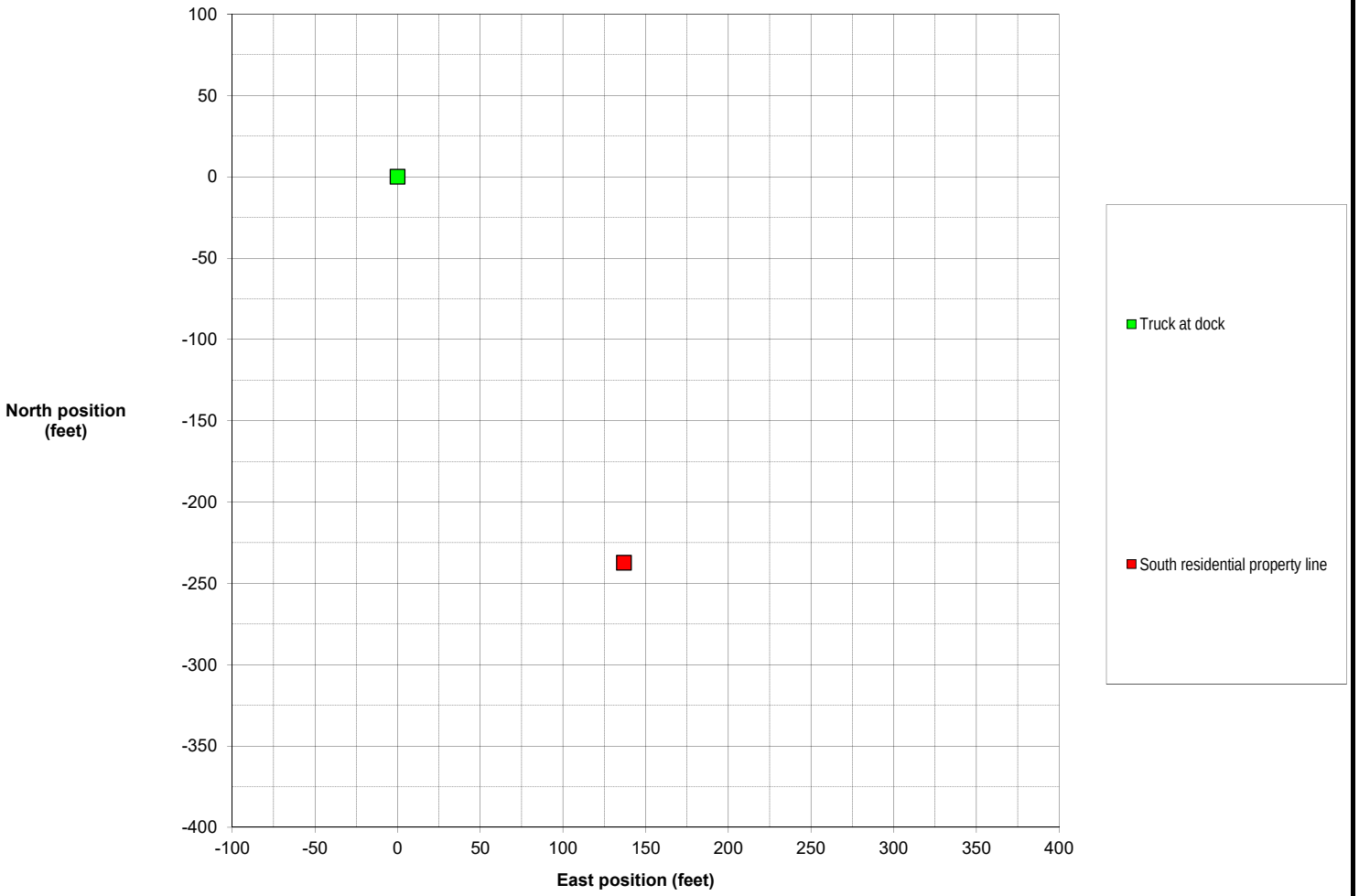
Talbot Lane Development
Property Line Sound Study
Truck at loading dock

Sound Source - Receiver Location Plot

Sound Source Contribution Plot

South residential property line

RMS: 42.6 dBA



BAC Sound Projection Graph Design Calculation 1

BARRIER ATTENUATION CALCULATION
Talbot Lane Development
Source: Truck -- Receiver: Planted berm -- Barrier: 12 foot sound barrier wall
(* Indicates values to be input in feet -- baseline elev. 76 ft)

$h_b := 12$ *Height of barrier

$h_s := 8$ *Height of source

$h_r := 6$ *Height of Receiver

$d_{sb} := 3$ *Distance from source to barrier

$d_{br} := 160$ *Distance from barrier to receiver

$c := 344$ Speed of sound (m/s)

$n := 0..8$

$f_n := 31.25 \cdot 2^n$ Frequency of peak (Hz)

$\lambda_n := \frac{c}{f_n}$ Wavelength of peak (meters)

$D_{br} := d_{br} \cdot .3048$ $D_{br} = 48.768$

$D_{sb} := d_{sb} \cdot .3048$ $D_{sb} = 0.914$

$H_{sb} := (h_b - h_s) \cdot .3048$ $H_{sb} = 1.219$

$H_{br} := (h_b - h_r) \cdot .3048$ $H_{br} = 1.829$

The path distances specific to the geometry of the installation -- in meters

$R_{sb} := \sqrt{(D_{sb})^2 + (H_{sb})^2}$ $R_{sb} = 1.524$

$R_{br} := \sqrt{D_{br}^2 + H_{br}^2}$ $R_{br} = 48.802$

Fresnel Number

$N_n := \frac{2 \cdot [(R_{sb} + R_{br}) - (D_{sb} + D_{br})]}{\lambda_n}$

$C := 10$

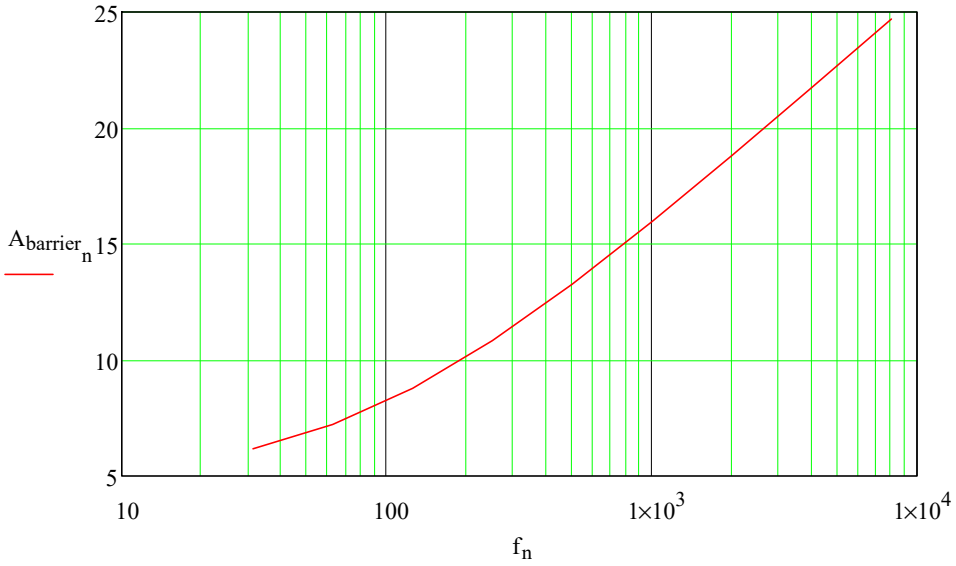
C=10 for receiver over reflecting plane (close to ground)

$A_{barrier_n} := 10 \cdot \log\left[3 + C \cdot N_n \cdot \exp\left[-\frac{1}{2000} \cdot \sqrt{\frac{R_{sb} \cdot R_{br} \cdot (D_{sb} + D_{br})}{2 \cdot [(R_{sb} + R_{br}) - (D_{sb} + D_{br})]}}\right]\right]$ Barrier Attenuation

$$A_{barrier} = \begin{pmatrix} 6.2 \\ 7.2 \\ 8.8 \\ 10.8 \\ 13.3 \\ 16 \\ 18.8 \\ 21.7 \\ 24.7 \end{pmatrix}$$

31.5
63
125
250
500
1000
2000
4000
8000

Note: Practical limit for barrier attenuation is 20 dB


25
20
15
10
5
$A_{barrier_n}$
10
100
1×10^3
1×10^4
f_n

BARRIER ATTENUATION CALCULATION
Talbot Lane Development
Source: Planted Berm -- Receiver: South residential property line -- Barrier: Planted Berm

(* Indicates values to be input in feet -- baseline elev. 76 ft)

$h_b := 6$ *Height of barrier

$h_s := 6$ *Height of source

$h_r := 5$ *Height of Receiver

$d_{sb} := 1$ *Distance from source to barrier

$d_{br} := 115$ *Distance from barrier to receiver

$c := 344$ Speed of sound (m/s)

$n := 0..8$

$f_n := 31.25 \cdot 2^n$ Frequency of peak (Hz)

$\lambda_n := \frac{c}{f_n}$ Wavelength of peak (meters)

$D_{br} := d_{br} \cdot .3048$ $D_{br} = 35.052$

$D_{sb} := d_{sb} \cdot .3048$ $D_{sb} = 0.305$

$H_{sb} := (h_b - h_s) \cdot .3048$ $H_{sb} = 0$

$H_{br} := (h_b - h_r) \cdot .3048$ $H_{br} = 0.305$

The path distances specific to the geometry of the installation -- in meters

$R_{sb} := \sqrt{(D_{sb})^2 + (H_{sb})^2}$ $R_{sb} = 0.305$

$R_{br} := \sqrt{D_{br}^2 + H_{br}^2}$ $R_{br} = 35.053$

Fresnel Number

$N_n := \frac{2 \cdot [(R_{sb} + R_{br}) - (D_{sb} + D_{br})]}{\lambda_n}$

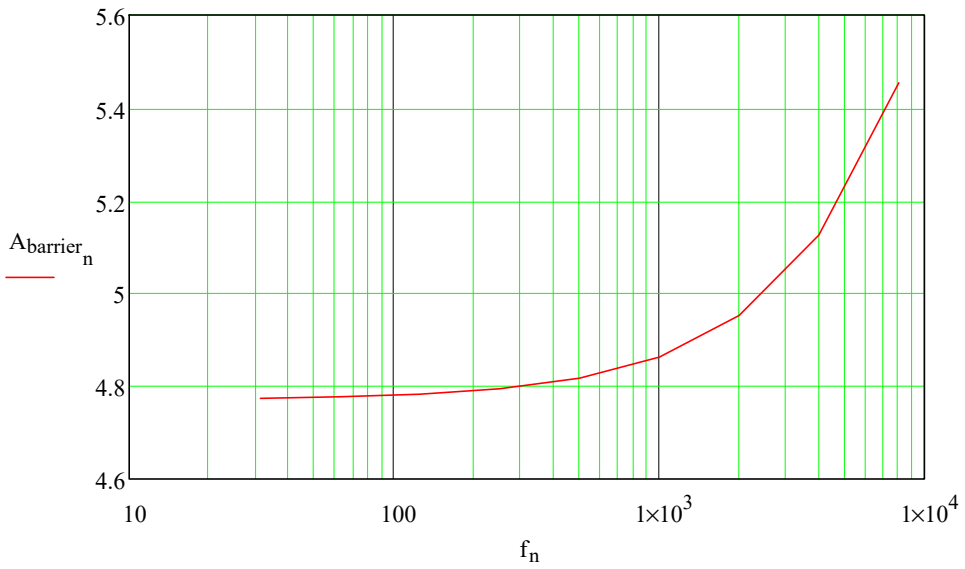
$C := 10$

C=10 for receiver over reflecting plane (close to ground)

$A_{barrier_n} := 10 \cdot \log\left[3 + C \cdot N_n \cdot \exp\left[-\frac{1}{2000} \cdot \sqrt{\frac{R_{sb} \cdot R_{br} \cdot (D_{sb} + D_{br})}{2 \cdot [(R_{sb} + R_{br}) - (D_{sb} + D_{br})]}}\right]\right]$ Barrier Attenuation

$$A_{barrier} = \begin{pmatrix} 4.8 \\ 4.8 \\ 4.8 \\ 4.8 \\ 4.8 \\ 4.9 \\ 5 \\ 5.1 \\ 5.5 \end{pmatrix} \quad \begin{matrix} 31.5 \\ 63 \\ 125 \\ 250 \\ 500 \\ 1000 \\ 2000 \\ 4000 \\ 8000 \end{matrix}$$

Note: Practical limit for barrier attenuation is 20 dB


5.6
5.4
5.2
5
4.8
4.6
$A_{barrier_n}$
10
100
1×10^3
1×10^4
f_n