SRW
Environmental Consulting, LLC

Noise Assessment
Re-issued 9/2025

Date: September 16, 2025

Subject Property: Sherburne School Property Redevelopment, Sherburne Road, Portsmouth< NH

Background: This document represents an update to the original noise study to account for the potential noise impacts at the proposed development given the current construction of a noise barrier on the opposite side of Interstate-95 from the subject property.

Proposed Development: The proposed project at the Sherburne School property includes three distinct areas of development, including the construction of a new 4-story 90 unit affordable housing apartment building on the eastern end of the property, demolition of a portion of the existing school building and redevelopment with 8 units of housing, and the construction of a new 3-story building with 30 units of affordable housing between the existing school and proposed 4 story building. The project is expected to use funding from the US Department of Housing and Urban Development (HUD) among other sources. SRW Environmental Consulting, LLC will be completing the HUD Part 58 Environmental Review.

Regulatory Requirements: The property is located on the southeast side of Interstate 95, and within the Portsmouth Highway Noise Overlay District. Standards used by Portsmouth include an interior noise level of 45 decibels for dwellings, and a 65 decibel requirement for outdoor activities, measured at the edge of the active use area closest to the highway. Portsmouth's noise requirements match those of HUD when considered during the completion of an Environmental Review. Note that while HUD requires indoor noise levels of 45 decibels, the HUD's Sound Transmission Classification Assessment Tool (STraCAT) module also includes a 3 decibel buffer when *assessing* for future for interior noise levels, so that calculated indoor noise levels using on HUD Exchange, is based on a 42 decibel "compliance level". However, the during this assessment, highway noise, the major contributor to site noise levels, has been computed using a 10 percent increase in vehicle traffic, and therefore the regulatory standard of 45 decibel indoor noise level is the mitigation goal. Aside from indoor and outdoor noise level requirements, HUD also has Site Acceptability Standard which includes the zones listed on page 2. Please note that residential development is allowable in all three Site Acceptability Standard zones, though each requires certain mitigation measures depending on the zone, and certain levels of Environmental Review required by HUD, also depending on the zone.

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HUD Site Acceptability Standard Zones:

1. Acceptable**:** Unmitigated site noise levels not exceeding 65 decibels. No special approvals or requirements are necessary.

2. Normally Unacceptable: Unmitigated noise levels between 65 decibels and 75 decibels. The EA level of Environmental Review is required and attenuation is required for new construction and strongly recommended for major rehabilitation.

3. Unacceptable: Unmitigated noise levels above 75 decibels. The requirements in this zone include one of the following: 1) completion of an Environmental Impact Statement (EIS) level of Environmental Review*, *or* 2) completion of an EIS waiver and an EA level Environmental Review. Attenuation is required for new construction.

* Note that an EIS Environmental Review is reserved for those projects that pose a high risk of significant impact to the environment. To put this in perspective, nationwide, the Environmental Review for only two HUD funded projects have been completed at the EIS level since 2020. According to HUD, the following types of projects are the type that HUD would normally require an EIS:

- Construction of hospitals or nursing homes containing a total of 2,500 or more beds
- A project that would remove, demolish, convert or substantially rehabilitate 2,500 or more existing housing units, or construction of 2,500 or more housing units.

HUD's EIS waiver process was specifically created to allow small projects with elevated, unmitigated noise levels, to proceed at the EA level of Environmental Review without needing to go through the EIS process. The type of proposed development (new construction) already requires an Environmental Review at the Environmental Assessment (EA) level. The project as planned meets the conditions to obtain an EIS waiver.

Portsmouth building regulations require a noise analysis by a registered engineer or qualified analysis, and HUD requires noise analysis using their DNL calculator and documented traffic data. In fact, HUD prefers calculations over an actual sound measurement assessment. Regarding it's calculator, HUD makes the following statement:

> *The Office of Environmental and Energy (OEE) has developed an electronic assessment tool that calculates the Day/Night Noise Level (DNL) site exposure. This is a web-based application of the existing Noise Assessment Guidelines (NAG). It is the basic noise assessment tool; most assessments start here. The DNL Calculator calculates noise from road and railway activity levels. It then combines the noise with airport projections and incorporates the effects of loud, impulsive sound for a site exposure at any Noise Assessment Location. The user-friendly DNL Calculator can document compliance or aid in site planning.*

SRW has assessed noise at hundreds of locations funded via HUD, and in fact, performed the noise analysis at a property in Bellows Falls, Vermont, that HUD uses for training purposes. This HUD Noise Assessment is considered to be a qualified analysis.

Selection of Noise Assessment Locations (NALs):

The topography at the southwestern side of the property where the current building exists includes a berm which blocks the direct line of sight of the highway from a 5 foot tall observer, and acts as a natural noise buffer. The northeastern side of the property, where the 4 story building is proposed is more level and the highway can be seen by a 6 foot tall observer. Note that HUD uses a 5 foot tall observer as the standard, and SRW has used the more conservative 6 foot tall observed. SRW has selected the western wall of the proposed 4 story building as NAL #1 as it is the closest to Interstate I-95 and is not blocked by local topography. NAL #2 is the proposed location of the outdoor activity area (playground).

Noise Sources:

Four major noise sources are considered in the typical HUD Noise Assessment including rail traffic, airport noise, road traffic and loud impulsive sounds. Only road traffic is a major noise source at the subject property, as described below.

Rail traffic is assessed if the active railway is located within 3,000 feet of the subject property. The CSX railway tracks are located approximately 3,000 feet from the eastern edge of the subject property and include only a single daily train. The property is not within the train whistle zone, and there are many natural and manmade buffers to any rail noise between the tracks and subject property. A USDOT Crossing Inventory report for the rail line, which shows the average daily train counts, rail speed, etc., is attached.

Airport noise is assessed based on the noise contours of civil airports. The nearest end of the Pease International Tradeport is runway is located approximately 3,400 feet to the northwest of the subject property. The subject property is located well outside the 60 decibel contour. A conservative estimated noise contour at the subject property, by extrapolation, would be 55 decibels. SRW has used 55 decibels as a noise level in the HUD noise assessment.

Road noise is assessed based on recorded annual average daily traffic AADT, defined as the mean traffic volume across all days for a year for a given location along a roadway. The most current AADT for Interstate Highway close to the subject property has been computed by the NH Department of Transportation (NHDOT) to be 103,079 in 2024. For the purposes of this assessment, the AADT has been increased by 10% to estimate future noise levels. The 2024 data does not include classification counts which are needed for the HUD DNL calculator. When vehicle classifications are not available, general functional class averages are used to determine the percentage of cars, medium truck and heavy trucks. For the purposes of this assessment 2022 Functional Class Averages were used to determine vehicle classifications for an interstate highway. This data, and the data from the airport, was fed into HUD's DNL Calculator to determine the estimated DNL at both NALs. Note that nighttime traffic is estimated to be 15%, which is HUD's default value. The road grade is estimated to be "0" (using the USGS National Map the average grade of I95 adjacent to the subject property is 0.2-0.3 percent).

Reflected road noise. This re-issued report now includes analysis of the contribution of noise reflected from the noise barrier being constructed on the opposite side of Interstate 95. The Federal Highway Administration has studied noise levels from noise barriers located on the opposite side of highways from a project, and has made the following findings (summary attached):

> *If all the noise striking a noise barrier were reflected back to the other side of a highway, the increase would be theoretically limited to 3 db. In practice, not all of the acoustical energy is reflected back to the other side. Some of the energy goes over the barrier, some is reflected to points other than the homes on the opposite side, some is scattered by ground coverings (for example, grass and shrubs), and some is blocked by the vehicles on the highway. Additionally, some of the reflected energy is lost due to the longer path that it must travel. Measurements made to quantify this reflective increase have never shown an increase of greater than 1-2 dB, an increase that is not perceptible to the average human ear.*

The noise barrier on the opposite side of Interstate I-95 from the proposed development is located on top of what will be a vegetated slope. The slope itself will deflect much of the sound upward, as will the barrier, given its elevated height in respect to the noise source. For these reasons, this analysis will consider the noise barrier to contribute 1 decibel to the noise levels at the subject property. This decibel will be added to the calculated noise levels using HUD's DNL Calculator when assessing mitigated outdoor and indoor noise levels.

Results of the DNL calculation are as follows:

NAL #1, Proposed New Building: The computed DNL is 75 decibels from traffic, 33 decibels from rail and 55 decibels from airport noise, and a 1 decibel contribution from the noise barrier, for a combined DNL of 76 decibels. A portion of the proposed building locations is within HUD's Unacceptable Zone, and the administrative process of an EIS waiver will be completed. The results indicate that the building must achieve a noise reduction of 31 decibels to meet HUD's indoor noise regulation and Portsmouth's Highway Noise Overley District indoor noise requirements.

NAL #2, Proposed Outdoor Activity Area (Playground): The computed DNL is 73 decibels from traffic, 33 decibels from rail and 55 decibels from airport noise, and a 1 decibel contribution from the noise barrier for a combined DNL of 74 decibels. The outdoor activity area is within HUD's Normally Unacceptable Zone. The results indicate that the site's natural and man-made barriers (new buildings) must achieve a noise reduction of 9 decibels to meet Portsmouth's Highway Noise Overley District and HUD's noise requirements.

SRW notes that noise levels at similar frequencies and decibel levels when combined, amplify noise levels to the receiver much more so than the same noises at much different decibel levels. HUD's DNL calculator considers the individual decibel levels in their calculations and automatically adds corrections when needed.

Loud impulse sounds when assessed in accordance with 24 CFR Part 51.103 require that "On an interim basis, when loud impulsive sounds, <u>such as explosions or sonic booms</u>, are experienced at a site, the day-night average sound level produced by the loud impulsive sounds alone shall have 8 decibels added to it in assessing the acceptability of the site.” The subject is not subject to loud impulsive sounds.

Copies of the HUD DNL calculations are attached.

Anticipated Indoor Noise Levels :

The worst case noise level at the building exterior has been calculated to be 76 decibels, and this data was used in HUD’s STraCAT module which is used to document sound attenuation performance of wall systems. Based on wall, window and door Sound Transmission Classification (STC values, the STraCAT generates a composite STC value for the wall assembly as a whole). Variables for our STraCAT analysis include the lowest STC values for standard construction materials to be ultra conservative, but actual building materials may have higher, sometimes significantly higher, STC values. Thus, the results of the STraCAT analysis is considered to be the minimal requirements to meet Portsmouth and HUD regulations. For the proposed 4-story building, construction materials considered include a standard 2 x 6 wood studs with 16 inch center construction with fiberglass insulation for exterior walls (STC of 38), and fifty-six (56) 4’ x 3’ windows facing the noise source (using an STC of 27). Results of the STraCAT analysis indicates an attenuation of approximately 33.1 decibels, which would result in an interior noise level of approximately 42.9 decibels. Any materials or construction methods with higher STC ratings will increase the total STC of the wall unit. The following examples are how additional noise attenuation can easily be achieved.

- Increase wood stud spacing from 16 to 24 inches on center increases STC by up to 2 db.
- The use of 2 x 4 metal studs at 24 inches on center increases STC by 8 to 10 db.
- Replacing fiberglass bats with dense cellulose may increase the STC by 5 db.
- Using sound mitigating sheetrock instead of standard sheetrock on the interior wall can increase the wall unit STC by 4 db.
- Many standard windows have STCs of 30 – 35 db. Noise reducing windows have even more.

Note that the STCs of the wall unit components are estimated using information from the National Gypsum Acoustical Assembly Guide. STCs of window and door units were provided by one vendor (Marvin Industries), which are representative STC ratings throughout the window and door industry.

The purpose of the STraCAT analysis is to show what sound reduction is possible using readily available materials, and that interior noise levels of 45 decibels is easily achievable. It does not represent what materials are actually being considered for the project. Additional noise mitigation is possible if choosing higher noise reducing materials. Given the easily achievable interior noise level of 45 decibels, the project will meet the indoor noise requirements of the City of Portsmouth and HUD.

A copy of HUD's STraCAT analysis is attached.

Anticipated Outdoor Activity Area Noise Levels:

Since calculated outdoor noise levels at the outdoor activity area is expected to be as high as 74 decibels without mitigation, the HUD barrier design module was completed. This module provides a measure on the barrier's effectiveness on noise reduction. The purpose of the noise barrier is to provide mitigation to the noise observer, which in this case is considered a 5 foot person standing at the edge of the outdoor activity area closest to Interstate 95. The barrier module was completing using a 4-story building and the second building, which is 3 stories but at a higher base elevation, and includes the gap in buildings which will be exposed to highway noise. Given these variables, the noise exposure at the outdoor activity area is calculated to be approximately 62 decibels.

Prior to the second building being constructed, the gap between 4-story building and the existing building is larger than when the second building is constructed, and the noise exposure at the outdoor activity area is calculated to be approximately 65 decibels.

Note that neither of the above calculations take into account the natural berm that exists between Interstate I-95 and the outdoor activity area, which will provide additional outdoor noise attenuation. Using the height of the natural berm, and assuming that barrier created by the new 4-story building is also 20 feet tall (for ease of calculations), the exterior noise level at the outdoor activity area is calculated to be 65 decibels. Iin reality, the additional noise attenuation resulting from the taller building will reduce outdoor noise levels in the outdoor activity area to below 65 decibels.

Copies of the barrier module calculations are attached.

Summary: The proposed project is within the Portsmouth Highway Noise Overlay District and portions of the proposed buildings are withing HUD's unacceptable zone for noise when unmitigated, but the proposed playground is located within HUD's normally unacceptable zone. However, it has been shown that interior noise levels will meet the 45 decibel standard, and that Outdoor Activities Areas of will meet the 65 decibel standards of both the City of Portsmouth and HUD upon completion*. Because parts of the property are within HUD's unacceptable zone when unmitigated, the upcoming HUD Assessment Levels Environmental Review will include a standard HUD waiver which will allow the project to proceed. SRW's review of the proposed project shows that it meets all of the requirements to be eligible for the waiver.

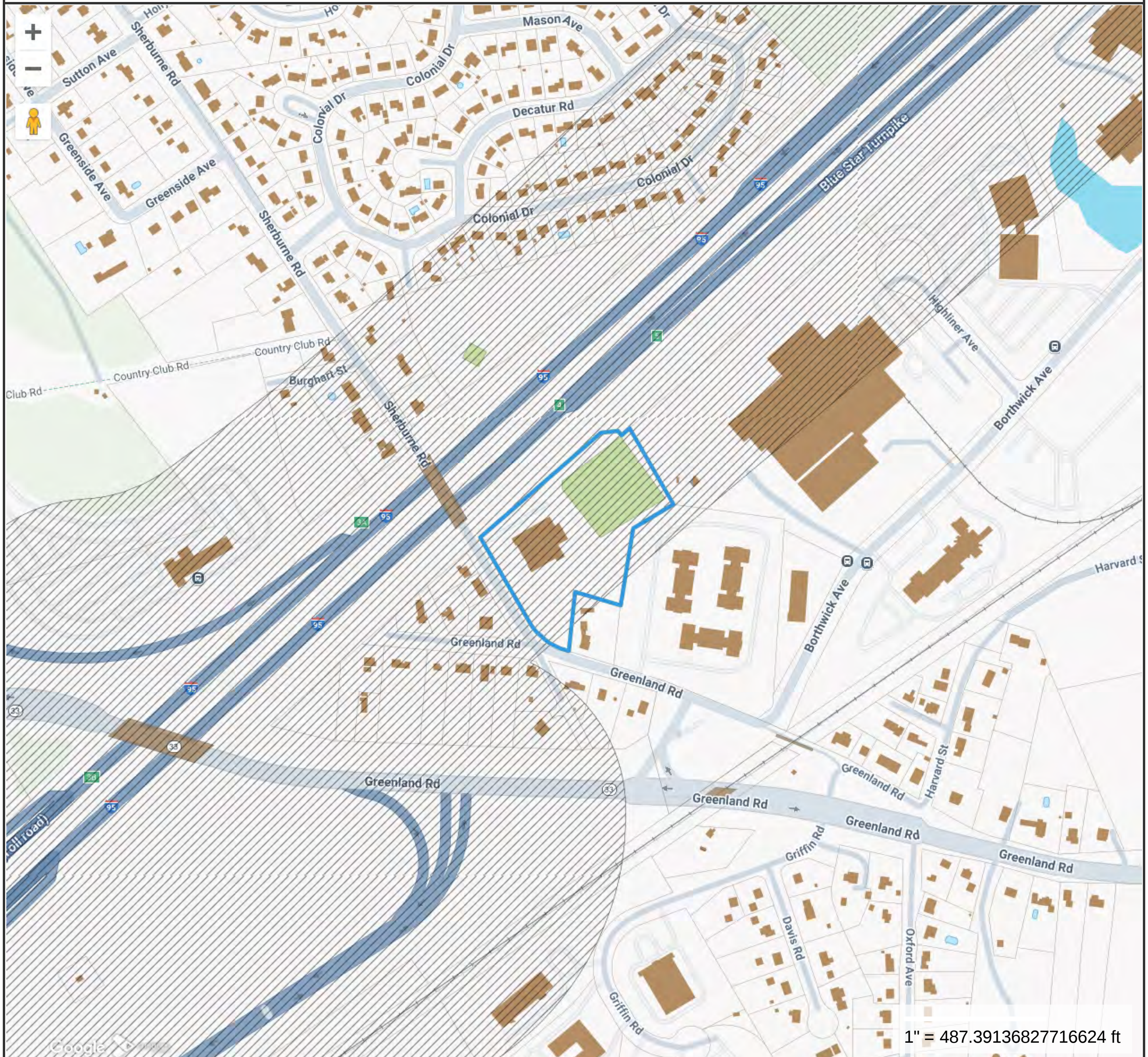
* For the project to achieve the indoor and outdoor noise levels calculated in this assessment, the actual construction design must meet the minimum STC ratings of the materials used in this assessment.

SRW Environmental Consulting, LLC

Todd Scheffer, P.G.
Principal

Property Location within Highway Noise District Overlay

Highway Noise Overlay



Property Information

Property ID	0259-0010-0000
Location	35 SHERBURNE RD
Owner	CITY OF PORTSMOUTH

MAP FOR REFERENCE ONLY
NOT A LEGAL DOCUMENT

Geometry updated 09/26/2024

Print map scale is approximate. Critical layout or measurement activities should not be done using this resource.

Portsmouth and HUD Noise Requirements

Standards

Structures and Uses	Loudest Traffic Hour Sound Level
Interior of dwelling, institutional residence or care facility, hospital or lodging establishment	45 dBA
Interior of other noise sensitive use	55 dBA
Uses with outdoor activities, measured at edge of the active use area closest to the highway	65 dBA

Requirements

- Conditional use permit required for all noise sensitive uses
  - Exceptions: addition to or expansion of a single-family or two-family dwelling that does not increase the footprint by more than 25% (similar to existing exception for conditional uses in wetland buffers)
- Noise analysis by registered engineer or qualified analysis
- Mitigation where necessary to achieve noise level standards

Noise Abatement and Control

Introduction

HUD's noise standards may be found in 24 CFR Part 51, Subpart B. For proposed new construction in high noise areas, the project must incorporate noise mitigation features. Consideration of noise applies to the acquisition of undeveloped land and existing development as well.

All sites whose environmental or community noise exposure exceeds the day night average sound level (DNL) of 65 decibels (dB) are considered noise-impacted areas. For new construction that is proposed in high noise areas, grantees shall incorporate noise attenuation features to the extent required by HUD environmental criteria and standards contained in Subpart B (Noise Abatement and Control) of 24 CFR Part 51. The interior standard is 45dB.

The "Normally Unacceptable" noise zone includes community noise levels from above 65 decibels to 75 decibels. Approvals in this noise zone require a minimum of 5 dB additional sound attenuation for buildings having noise-sensitive uses if the day-night average sound level is greater than 65 dB but does not exceed 70 dB, or a minimum of 10 decibels of additional sound attenuation if the day-night average sound level is greater than 70 dB but does not exceed 75 dB.

Locations with day-night average noise levels above 75 dB have "Unacceptable" noise exposure. For new construction, noise attenuation measures in these locations require the approval of the Assistant Secretary for Community Planning and Development (for projects reviewed under Part 50) or the Responsible Entity's Certifying Officer (for projects reviewed under Part 58). The acceptance of such locations normally requires an environmental impact statement.

In "Unacceptable" noise zones, HUD strongly encourages conversion of noise-exposed sites to land uses compatible with the high noise levels.

HUD Guidance

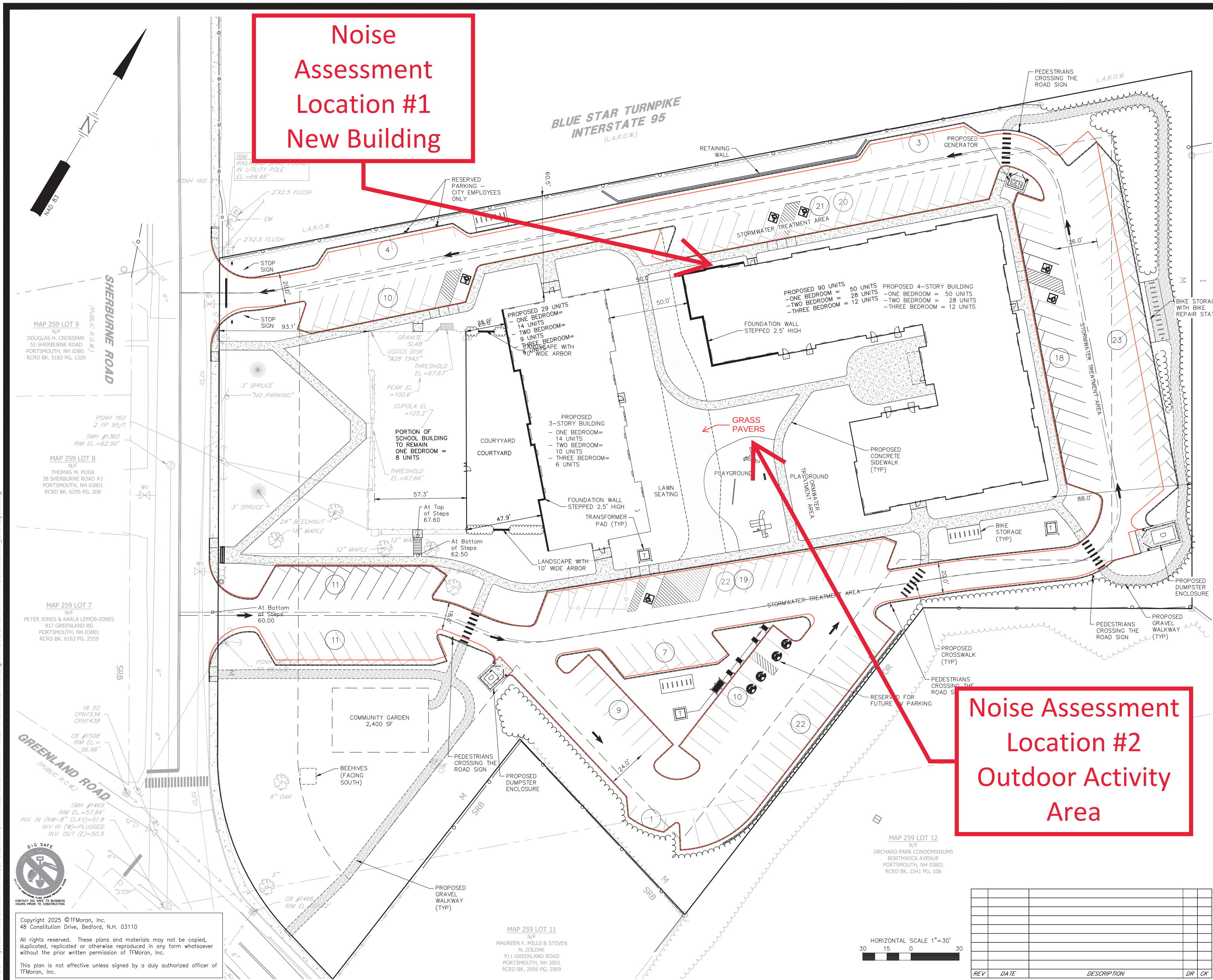
Are there potential noise generators in the vicinity of the project? Review general location maps and/or conduct a field review to screen for major roadways (within 1,000 feet), railroads (within 3,000 feet), and military or FAA-regulated airfields (with 15 miles) in the vicinity of the project.

If a noise assessment was performed, was the noise found to be Acceptable, Normally Unacceptable, or Unacceptable?

Site Acceptability Standards

Noise Zone	Day-Night Average Sound Level (in Decibels)	Special Approvals and Requirements
Acceptable	Not exceeding 65 dB	None
Normally Unacceptable	Above 65 dB but not exceeding 75 dB	• Environmental assessment and attenuation required for new construction • Attenuation strongly encouraged for major rehabilitation Note: An environmental impact statement is required if the project site is largely undeveloped or will encourage incompatible development.
Unacceptable	Above 75 dB	• Environmental impact statement required • Attenuation required for new construction with approval by the Assistant Secretary of CPD or Certifying Officer

Noise Assessment Location Map



SITE DATA

OWNER OF RECORD OF MAP 259 LOT 10: CITY OF PORTSMOUTH SCHOOLS, PO BOX 628, PORTSMOUTH, NH 03802
DEED REFERENCE TO PARCEL IS BK 2389 PG 1272
AREA OF PARCEL = 232,175± SF OR 5.33± ACRES

ZONED: MUNICIPAL
EXISTING USE: SCHOOL
PROPOSED USE: MIXED USE

THE PURPOSE OF THIS PLAN IS TO CONSTRUCT WORK FORCE HOUSING. ASSOCIATED IMPROVEMENTS INCLUDE AND ARE NOT LIMITED TO ACCESS, GRADING, STORMWATER MANAGEMENT SYSTEMS, UTILITIES, LIGHTING, AND LANDSCAPING.

DIMENSIONAL REQUIREMENTS (CURRENT ZONING)

	REQUIRED:	PROVIDED:
MINIMUM LOT DIMENSIONS:		
LOT AREA	XXX,XXX SF (X.XXX± AC)	232,175± SF (5.33± AC)
LOT FRONTAGE	XXX FT	471.79 FT
DEPTH	XXX FT	606 FT
MINIMUM YARD DIMENSIONS:		
FRONT	NA	XXX FT
SIDE	NA	XXX FT
REAR	NA	XXX FT
MAXIMUM STRUCTURE DIMENSIONS:		
STRUCTURE HEIGHT	NA	38.8 FEET
STRUCTURE STORIES	NA	4 STORIES
ROOF APPURTENANCE HEIGHT	NA	44.1 FT
LOT COVERAGE	NA	54%
MINIMUM SETBACKS/BUFFER:		
BUILDING FRONT	XXX FT	93.1 FT
BUILDING SIDE	XXX FT	48.8 FT
BUILDING REAR	XXX FT	89.5 FT
MINIMUM OPEN SPACE	XXX%	XXX%

PARKING REQUIREMENTS

RESIDENTIAL		
PARKING SPACES (SEE CALCULATION)	170 SPACES	170 RESIDENTIASPACES
OFFICE		
OFFICE	1 SPACES	1 SPACES
MUNICIPAL		
FOR CITY EMPLOYEES	NA	2 SPACE
TOTAL		173 SPACES
ACCESSIBLE SPACES (REQ'D BY ADA)	6 SPACES	6 SPACES
PARKING SPACE SIZE	8.5 FT X 19 FT	8.5 FT X 19 FT
AISLE WIDTH	18–24 FT	18–24 FT

PARKING CALCULATIONS

REQUIRED PARKING RATIO:
RESIDENTIAL: 1.3 SPACES PER UNIT > 750 SF
1 SPACE PER UNIT 600–750 SF
1 VISITOR SPACE PER 5 UNITS OR PORTION THEREOF
OFFICE:
1 SPACES PER UNIT > 350 SF
TOTAL REQUIRED = 59 UNITS * 1.3 SPACES/UNIT = 69.0 SPACES
69 UNITS * 1 SPACE = 53.3 SPACES
128 UNITS * 1 SPACE/5 UNITS = 26.0 SPACES
1 OFFICE * 1 SPACE/OFFICE = 1.0 SPACES

TOTAL = 171.3 SPACES

NOTES

1. SEE NOTES ON SHEET C–02.
2. ALL DIMENSIONS ARE TO THE FACE OF CURB UNLESS NOTED OTHERWISE.
3. LIGHTING, SIGNAGE, LANDSCAPING, AND SCREENING SHALL MEET THE REQUIREMENTS OF THE PORTSMOUTH, NH ZONING ORDINANCE AND SITE PLAN REVIEW REGULATIONS.
4. SNOW SHALL NOT BE STOCKPILED IN STORMWATER BMP'S, WETLAND BUFFERS, OR WETLANDS. SEE SNOW STORAGE LOCATIONS. IN THE EVENT THAT THE SNOW STORAGE AREAS PROVIDED ON THE SITE ARE COMPLETELY UTILIZED, EXCESS SNOW SHALL BE TRANSPORTED OFF SITE FOR DISPOSAL IN ACCORDANCE WITH NHDES REGULATION. IF SNOW IS STORED WITHIN PARKING AREA, KEEP CATCH BASINS CLEAR.

CITY OF PORTMOUTH PLANNING BOARD

CHAIRPERSON DATE

SITE DEVELOPMENT PLANS

TAX MAP 259 LOT 10
SITE LAYOUT PLAN
PROPOSED HOUSING DEVELOPMENT
35 SHERBURNE ROAD
PORTSMOUTH, NEW HAMPSHIRE
OWNED BY
CITY OF PORTSMOUTH SCHOOLS
PREPARED FOR
PORTSMOUTH HOUSING AUTHORITY
1"=60' (11"X17")
SCALE: 1"=30' (22"X34") JANUARY 29, 2025

TFM
Civil Engineers
Structural Engineers
Traffic Engineers
Land Surveyors
Landscape Architects
Scientists
48 Constitution Drive
Bedford, NH 03110
Phone (603) 472-4488
Fax (603) 472-9747
www.tfmoran.com

REV	DATE	DESCRIPTION	DR	CK

FILE 47528.00 DR JKC FB CK JJM CADFILE 47528-00_SITE LAYOUT C–03

SITE LAYOUT PLAN

HUD DNL Calculator Results

Noise Assessment Location #1 New Building

Site ID	Sherburne School
Record Date	04/14/2025
User's Name	TAS

Road # 1 Name:	**Interstate I95**

Road #1

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	216	216	216
Distance to Stop Sign			
Average Speed	55	55	55
Average Daily Trips (ADT)	96560	8312	7790
Night Fraction of ADT	15	15	15
Road Gradient (%)			0
Vehicle DNL	68	67	73
Calculate Road #1 DNL	75	Reset	

Railroad #1 Track Identifier:	**CSX Transportation**

Rail # 1

Train Type	**Electric** ☐	**Diesel** ☑

Effective Distance		3000
Average Train Speed		10
Engines per Train		2
Railway cars per Train		50
Average Train Operations (ATO)		1
Night Fraction of ATO		0
Railway whistles or horns?	Yes: ☐ No: ☐	Yes: ☐ No: ☑
Bolted Tracks?	Yes: ☐ No: ☐	Yes: ☑ No: ☐
Train DNL	0	33
Calculate Rail #1 DNL	33	Reset

Add Road Source | Add Rail Source

Airport Noise Level	55
Loud Impulse Sounds?	○ **Yes** ◉ **No**

Combined DNL for all Road and Rail sources	**75**
Combined DNL including Airport	**75**
Site DNL with Loud Impulse Sound	

Calculate | Reset

Noise Assessment Location #2 Playground

Site ID	Sherburne School
Record Date	04/14/2025
User's Name	TAS

Road # 1 Name:	**Interstate I95**

Road #1

Vehicle Type	**Cars** ☑	**Medium Trucks** ☑	**Heavy Trucks** ☑
Effective Distance	316	316	316
Distance to Stop Sign			
Average Speed	55	55	55
Average Daily Trips (ADT)	96560	8312	7790
Night Fraction of ADT	15	15	15
Road Gradient (%)			0
Vehicle DNL	66	65	71
Calculate Road #1 DNL	73	Reset	

Railroad #1 Track Identifier:	**CSX Transportation**

Rail # 1

Train Type	**Electric** ☐	**Diesel** ☑

Effective Distance		3000
Average Train Speed		10
Engines per Train		2
Railway cars per Train		50
Average Train Operations (ATO)		1
Night Fraction of ATO		0
Railway whistles or horns?	Yes: ☐ No: ☐	Yes: ☐ No: ☑
Bolted Tracks?	Yes: ☐ No: ☐	Yes: ☑ No: ☐
Train DNL	0	33
Calculate Rail #1 DNL	33	Reset

Add Road Source Add Rail Source

Airport Noise Level	55
Loud Impulse Sounds?	○ **Yes** ◉ **No**

Combined DNL for all Road and Rail sources	**73**
Combined DNL including Airport	**73**
Site DNL with Loud Impulse Sound	

Calculate Reset

USDOT Railroad Crossing Inventory

U. S. DOT CROSSING INVENTORY FORM

DEPARTMENT OF TRANSPORTATION

FEDERAL RAILROAD ADMINISTRATION

OMB No. 2130-0017

Instructions for the initial reporting of the following types of new or previously unreported crossings: For public highway-rail grade crossings, complete the entire inventory Form. For private highway-rail grade crossings, complete the Header, Parts I and II, and the Submission Information section. For public pathway grade crossings (including pedestrian station grade crossings), complete the Header, Parts I and II, and the Submission Information section. For Private pathway grade crossings, complete the Header, Parts I and II, and the Submission Information section. For grade-separated highway-rail or pathway crossings (including pedestrian station crossings), complete the Header, Part I, and the Submission Information section. For changes to existing data, complete the Header, Part I Items 1-3, and the Submission Information section, in addition to the updated data fields. Note: For private crossings only, Part I Item 20 and Part III Item 2.K. are required unless otherwise noted. An asterisk * denotes an optional field.

A. Revision Date *(MM/DD/YYYY)*: 10 / 24 / 2023

B. Reporting Agency: ☒ Railroad ☐ Transit ☐ State ☐ Other

C. Reason for Update *(Select only one)*: ☒ Change in Data ☐ New Crossing ☐ Closed ☐ No Train Traffic ☐ Quiet Zone Update ☐ Re-Open ☐ Date Change Only ☐ Change in Primary Operating RR ☐ Admin. Correction

D. DOT Crossing Inventory Number: 054410Y

Part I: Location and Classification Information

1. Primary Operating Railroad: CSX Transportation [CSX]

2. State: NEW HAMPSHIRE

3. County: ROCKINGHAM

4. City / Municipality: ☒ In ☐ Near PORTSMOUTH

5. Street/Road Name & Block Number: BARBERRY LN *(Street/Road Name)* | *(Block Number)* *

6. Highway Type & No.: LS-258

7. Do Other Railroads Operate a Separate Track at Crossing? ☐ Yes ☒ No
If Yes, Specify RR ____, ____, ____, ____

8. Do Other Railroads Operate Over Your Track at Crossing? ☐ Yes ☒ No
If Yes, Specify RR ____, ____, ____, ____

9. Railroad Division or Region: ☐ None NEW ENGLAND

10. Railroad Subdivision or District: ☐ None PORTLAND

11. Branch or Line Name: ☐ None PORTSMOUTH BR

12. RR Milepost: PMT *(prefix)* | 0004.923 *(nnnn.nnn)* | *(suffix)*

13. Line Segment *

14. Nearest RR Timetable Station *: EMERY

15. Parent RR *(if applicable)*: ☒ N/A

16. Crossing Owner *(if applicable)*: ☒ N/A

17. Crossing Type: ☒ Public ☐ Private

18. Crossing Purpose: ☒ Highway ☐ Pathway, Ped. ☐ Station, Ped.

19. Crossing Position: ☒ At Grade ☐ RR Under ☐ RR Over

20. Public Access *(if Private Crossing)*: ☐ Yes ☐ No

21. Type of Train: ☒ Freight ☐ Transit ☐ Intercity Passenger ☐ Shared Use Transit ☐ Commuter ☐ Tourist/Other

22. Average Passenger Train Count Per Day: ☐ Less Than One Per Day ☐ Number Per Day 0

23. Type of Land Use: ☐ Open Space ☐ Farm ☒ Residential ☐ Commercial ☐ Industrial ☐ Institutional ☐ Recreational ☐ RR Yard

24. Is there an Adjacent Crossing with a Separate Number? ☐ Yes ☒ No If Yes, Provide Crossing Number ____

25. Quiet Zone *(FRA provided)*: ☒ No ☐ 24 Hr ☐ Partial ☐ Chicago Excused Date Established ____

26. HSR Corridor ID: ☒ N/A

27. Latitude in decimal degrees *(WGS84 std: nn.nnnnnnn)*: 43.0657219

28. Longitude in decimal degrees *(WGS84 std: -nnn.nnnnnnn)*: -70.7793485

29. Lat/Long Source: ☒ Actual ☐ Estimated

30.A. Railroad Use *

31.A. State Use *: AADT ESTIMATED

30.B. Railroad Use *

31.B. State Use *

30.C. Railroad Use *

31.C. State Use *

30.D. Railroad Use *: Original MP: P 9.0766

31.D. State Use *

32.A. Narrative *(Railroad Use)* *

32.B. Narrative *(State Use)* *: VERIFIED

33. Emergency Notification Telephone No. *(posted)*: 800-232-0144

34. Railroad Contact *(Telephone No.)*: 904-366-3051

35. State Contact *(Telephone No.)*: 603-271-2468

Part II: Railroad Information

1. Estimated Number of Daily Train Movements

1.A. Total Day Thru Trains (6 AM to 6 PM)	1.B. Total Night Thru Trains (6 PM to 6 AM)	1.C. Total Switching Trains	1.D. Total Transit Trains	1.E. Check if Less Than One Movement Per Day ☐ How many trains per week?
1	0	0	0	

2. Year of Train Count Data *(YYYY)*: 2023

3. Speed of Train at Crossing
3.A. Maximum Timetable Speed *(mph)* 10
3.B. Typical Speed Range Over Crossing *(mph)* From 10 to 10

4. Type and Count of Tracks
Main 1 Siding 0 Yard 0 Transit 0 Industry 0

5. Train Detection *(Main Track only)*
☐ Constant Warning Time ☐ Motion Detection ☐ AFO ☐ PTC ☐ DC ☐ Other ☒ None

6. Is Track Signaled? ☐ Yes ☒ No

7.A. Event Recorder ☐ Yes ☒ No

7.B. Remote Health Monitoring ☐ Yes ☒ No

U. S. DOT CROSSING INVENTORY FORM

A. Revision Date *(MM/DD/YYYY)* 10/24/2023	PAGE 2	D. Crossing Inventory Number *(7 char.)* 054410Y

Part III: Highway or Pathway Traffic Control Device Information

1. Are there Signs or Signals? ☒ Yes ☐ No

2. Types of Passive Traffic Control Devices associated with the Crossing

2.A. Crossbuck Assemblies *(count)* 2

2.B. STOP Signs *(R1-1)* *(count)* 2

2.C. YIELD Signs *(R1-2)* *(count)* 0

2.D. Advance Warning Signs *(Check all that apply; include count)* ☒ None
☐ W10-1 ________ ☐ W10-3 ________ ☐ W10-11 ________
☐ W10-2 ________ ☐ W10-4 ________ ☐ W10-12 ________

2.E. Low Ground Clearance Sign *(W10-5)* ☐ Yes *(count_______)* ☒ No

2.F. Pavement Markings ☐ Stop Lines ☐ Dynamic Envelope ☐ RR Xing Symbols ☒ None

2.G. Channelization Devices/Medians ☐ All Approaches ☐ Median ☐ One Approach ☒ None

2.H. EXEMPT Sign *(R15-3)* ☐ Yes ☒ No

2.I. ENS Sign *(I-13)* Displayed ☒ Yes ☐ No

2.J. Other MUTCD Signs ☐ Yes ☒ No
Specify Type ______________ Count __________
Specify Type ______________ Count __________
Specify Type ______________ Count __________

2.K. Private Crossing Signs *(if private)* ☐ Yes ☐ No

2.L. LED Enhanced Signs *(List types)*

3. Types of Train Activated Warning Devices at the Grade Crossing *(specify count of each device for all that apply)*

3.A. Gate Arms *(count)* Roadway 0 Pedestrian 0

3.B. Gate Configuration ☐ 2 Quad ☐ 3 Quad ☐ 4 Quad ☐ Full *(Barrier)* Resistance ☐ Median Gates

3.C. Cantilevered *(or Bridged)* Flashing Light Structures *(count)* Over Traffic Lane 0 ☐ Incandescent Not Over Traffic Lane 0 ☐ LED

3.D. Mast Mounted Flashing Lights *(count of masts)* 0 ☐ Incandescent ☐ LED ☐ Back Lights Included ☐ Side Lights Included

3.E. Total Count of Flashing Light Pairs 0

3.F. Installation Date of Current Active Warning Devices: *(MM/YYYY)* ______/__________ ☒ Not Required

3.G. Wayside Horn ☐ Yes Installed on *(MM/YYYY)* ______/__________ ☒ No

3.H. Highway Traffic Signals Controlling Crossing ☐ Yes ☒ No

3.I. Bells *(count)* 0

3.J. Non-Train Active Warning ☐ Flagging/Flagman ☐ Manually Operated Signals ☐ Watchman ☐ Floodlighting ☒ None

3.K. Other Flashing Lights or Warning Devices Count 0 Specify type __________________

4.A. Does nearby Hwy Intersection have Traffic Signals? ☐ Yes ☒ No

4.B. Hwy Traffic Signal Interconnection ☒ Not Interconnected ☐ For Traffic Signals ☐ For Warning Signs

4.C. Hwy Traffic Signal Preemption ☐ Simultaneous ☐ Advance

5. Highway Traffic Pre-Signals ☐ Yes ☒ No Storage Distance * ___________ Stop Line Distance * ___________

6. Highway Monitoring Devices *(Check all that apply)* ☐ Yes - Photo/Video Recording ☐ Yes – Vehicle Presence Detection ☒ None

Part IV: Physical Characteristics

1. Traffic Lanes Crossing Railroad ☐ One-way Traffic ☒ Two-way Traffic ☐ Divided Traffic Number of Lanes 1

2. Is Roadway/Pathway Paved? ☒ Yes ☐ No

3. Does Track Run Down a Street? ☐ Yes ☒ No

4. Is Crossing Illuminated? *(Street lights within approx. 50 feet from nearest rail)* ☐ Yes ☒ No

5. Crossing Surface *(on Main Track, multiple types allowed)* Installation Date * *(MM/YYYY)* _______/_________ Width * ____________ Length * ____________
☐ 1 Timber ☒ 2 Asphalt ☐ 3 Asphalt and Timber ☐ 4 Concrete ☐ 5 Concrete and Rubber ☐ 6 Rubber ☐ 7 Metal
☐ 8 Unconsolidated ☐ 9 Composite ☐ 10 Other *(specify)* ______________________________

6. Intersecting Roadway within 500 feet? ☐ Yes ☒ No If Yes, Approximate Distance *(feet)* ______________

7. Smallest Crossing Angle ☐ 0° – 29° ☒ 30° – 59° ☐ 60° - 90°

8. Is Commercial Power Available? * ☒ Yes ☐ No

Part V: Public Highway Information

1. Highway System
☐ (01) Interstate Highway System
☐ (02) Other Nat Hwy System (NHS)
☐ (03) Federal AID, Not NHS
☒ (08) Non-Federal Aid

2. Functional Classification of Road at Crossing ☐ (0) Rural ☒ (1) Urban
☐ (1) Interstate ☐ (5) Major Collector
☐ (2) Other Freeways and Expressways
☐ (3) Other Principal Arterial ☐ (6) Minor Collector
☐ (4) Minor Arterial ☒ (7) Local

3. Is Crossing on State Highway System? ☐ Yes ☒ No

4. Highway Speed Limit 30 MPH ☒ Posted ☐ Statutory

5. Linear Referencing System *(LRS Route ID)* *

6. LRS Milepost *

7. Annual Average Daily Traffic *(AADT)* Year 2009 AADT 000560

8. Estimated Percent Trucks 00 %

9. Regularly Used by School Buses? ☐ Yes ☒ No Average Number per Day __________

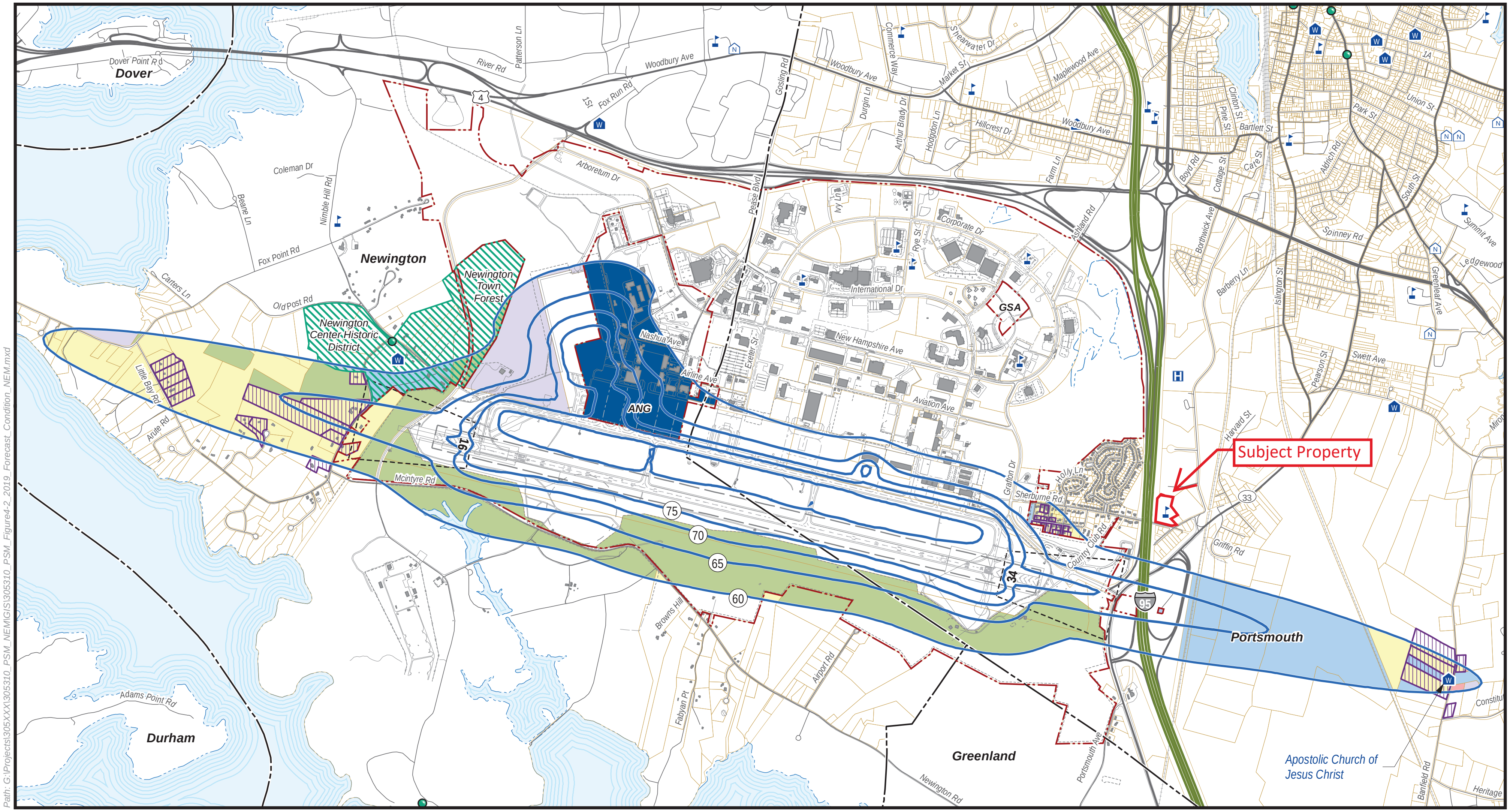
10. Emergency Services Route ☐ Yes ☐ No

Submission Information - *This information is used for administrative purposes and is not available on the public website.*

Submitted by ______________________ Organization ______________________ Phone ____________ Date ____________

Public reporting burden for this information collection is estimated to average 30 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed and completing and reviewing the collection of information. According to the Paperwork Reduction Act of 1995, a federal agency may not conduct or sponsor, and a person is not required to, nor shall a person be subject to a penalty for failure to comply with, a collection of information unless it displays a currently valid OMB control number. The valid OMB control number for information collection is 2130-0017. Send comments regarding this burden estimate or any other aspect of this collection, including for reducing this burden to: Information Collection Officer, Federal Railroad Administration, 1200 New Jersey Ave. SE, MS-25 Washington, DC 20590.

DNL Map Pease International Tradeport



2019 DNL Contour
Airport Boundary (Approximate)
Municipal Boundary
Water

Highway
Major Roads
Local Roads
Railroad
School
Place of Worship
Hospital
Nursing Home/Assisted Living

Residential Use
Public Use
Commercial Use
Manufacturing and Production
Recreational / Open Space
Air National Guard
Sound Insulated
Parcel Boundary

National Register Historic Place
National Register Historic District

Note: Land uses within the 65 dB DNL contour marked as "Sound Insulated" are compatible.

0 2,000 4,000 Feet

PORTSMOUTH INTERNATIONAL AIRPORT

Portsmouth, New Hampshire

2019 Five-Year Forecast Conditions Noise Exposure Map

Figure 4-2

HARRIS MILLER MILLER & HANSON INC.

Data for Road Noise Calculations
NHDOT AADT Data, 2022 Vehicle Classification Averages
Road Grade (USGS National Map)

Traffic Count (TCDS)

Home | Locate | Locate All | Email This | Auto-Locate:

List View | All DIRs

Record 1 of 1 Goto Record go

Fnct'l Class	Interstate	Milepost	
Located On	Interstate 95 S		
Loc On Alias	I-95 BETWEEN EXITS 3-4 (SB-NB) (81379062-81379061)		

More Detail

STATION DATA

Directions: 2-WAY NB SB

AADT

	Year	AADT	DHV-30	K %	D %	PA	BC	Src
	2024	53,441[3]				49,487 (93%)	3,954 (7%)	Grown from 2023
	2023	52,393[3]				48,673 (93%)	3,720 (7%)	Grown from 2022
	2022	51,215[3]				47,989 (94%)	3,226 (6%)	Grown from 2021
	2021	50,260[3]						Grown from 2020
	2020	45,320[3]						Grown from 2019

|<< < > >>| 1-5 of 13

VOLUME COUNT

	Date	Int	Total
	Wed 6/2/1993	60	34,334
	Tue 6/1/1993	60	41,589
	Mon 5/31/1993	60	61,980
	Sun 5/30/1993	60	38,984
	Sat 5/29/1993	60	31,537
	Fri 5/28/1993	60	37,629
	Thu 5/27/1993	60	35,951
	Wed 5/26/1993	60	34,946
	Tue 5/25/1993	60	33,443
-	Mon 5/24/1993	-	

|<< < > >>| 1-10 of 12

mm / dd / yyyy To Date

VOLUME TREND

Year	Annual Growth
2024	2%
2023	2%
2022	2%
2021	11%
2020	-16%
2019	1%
2018	2%
2017	2%
2016	2%
2015	0%

|<< < > >>| 1-10 of 12

SPEED

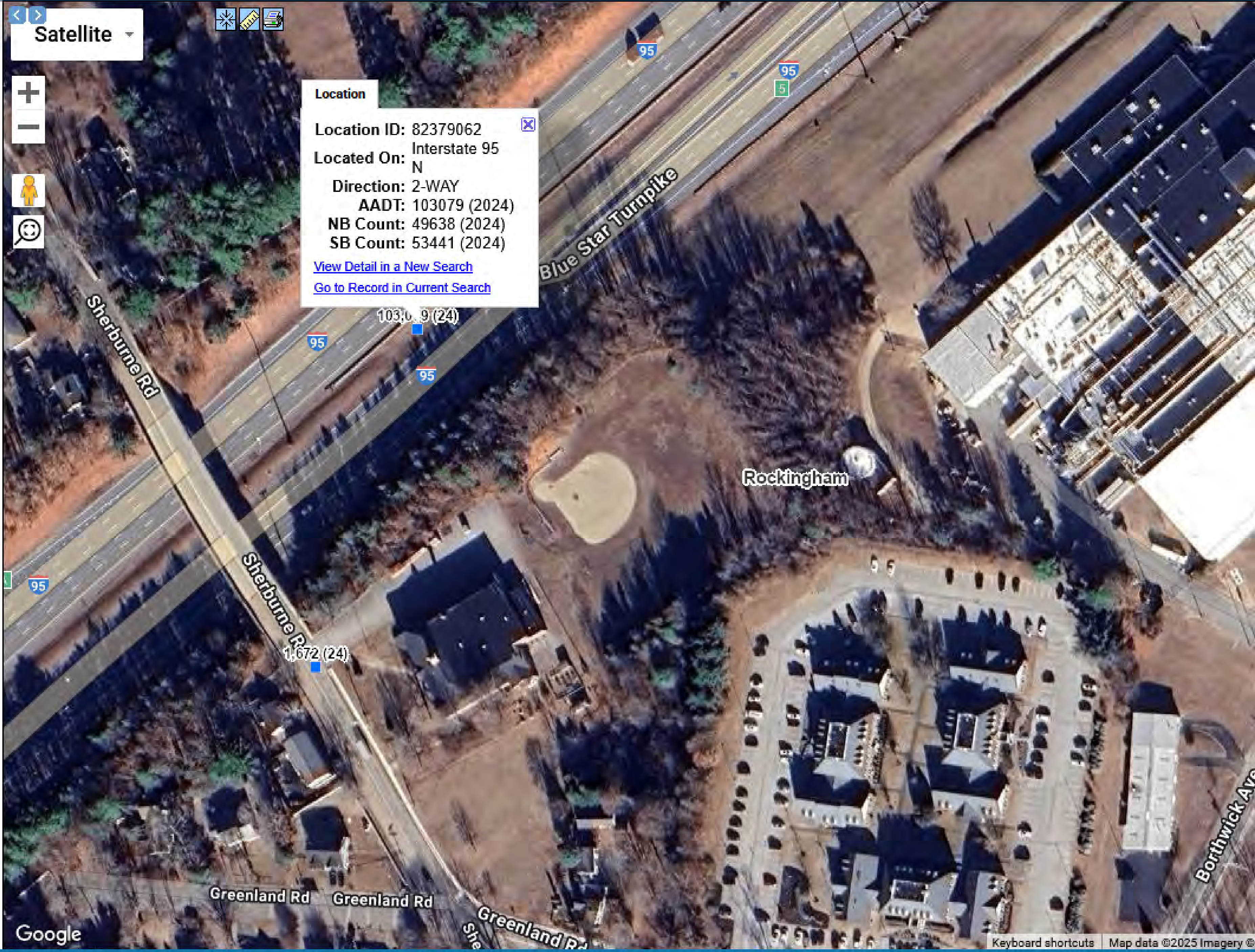
Date	Int	Pace	85th	Total
No Data				

CLASSIFICATION

Date	Int	Total
No Data		

WEIGH IN MOTION

PER VEHICLE



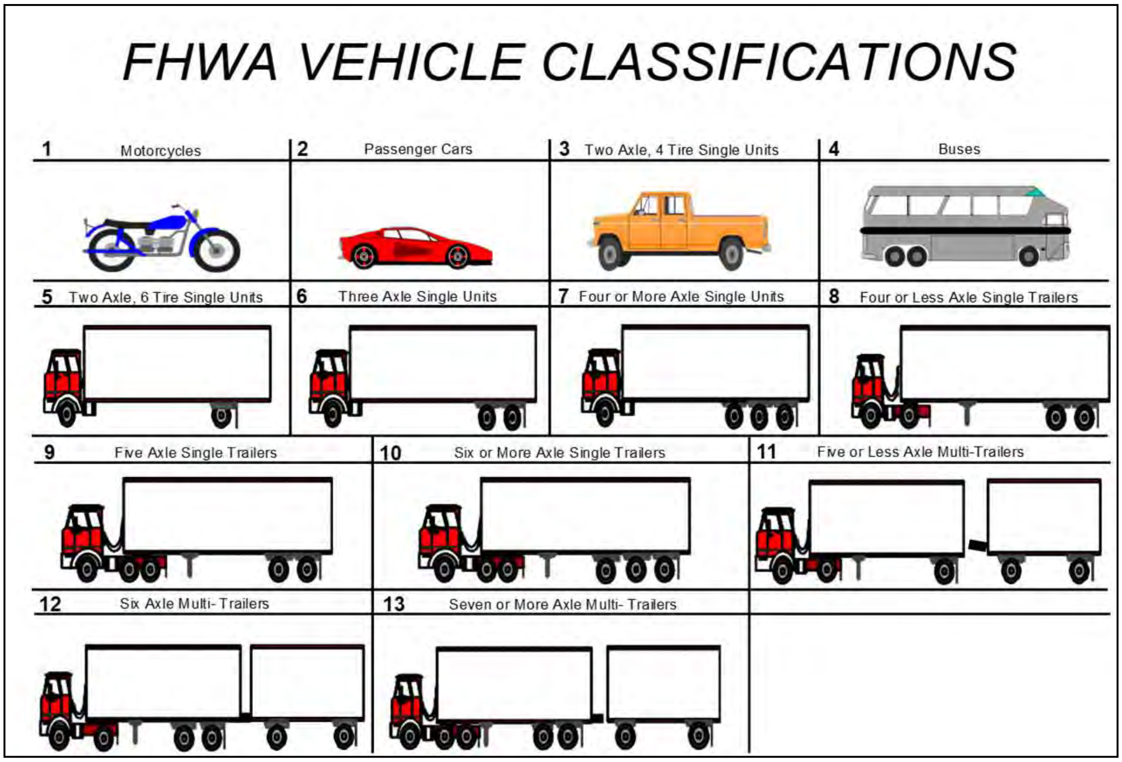
Definitions

Location: Automatic Traffic Recorder Station ID assigned by VTrans
FC: Functional Classification (designates road use characteristics)
1 = Interstate
2 = Principal Arterial - Other Freeways & Expressways
3 = Principal Arterial - Other
4 = Minor Arterial
5 = Major Collector
6 = Minor Collector
7 = Local
MM: Mile Marker
R/U: U (urban) designates a location within the Federal Aid Urban Area Boundary
R (rural) designates a location outside the Federal Aid Urban Area Boundary
AADT: Annual Average Daily Traffic for the Year shown

FHWA Vehicle Classes

Class	Heading	Description
1	MC	Motorcycle
2	Car	Passenger car
3	Pickup	Pickup truck/sports utility
4	Bus	Full size school and transit busses
5	2A SU	2 axle six tire, delivery type van or heavy duty pick up
6	3A SU	3 axle single unit, short haul delivery truck, dump truck
7	>3A SU	4 axle single unit, short haul delivery truck, concrete truck
8	<5A 2U	<5 axle tractor/single trailer, medium haul delivery
9	5A 2U	5 axle tractor/single trailer, "18 Wheeler"
10	>5A 2U	> 5 axle tractor/single trailer, tanker truck, logging truck
11	<6A >2U	<6 axle multi trailer truck
12	6A >2U	6 axle multi trailer truck
13	>6A >2U	>6 axle multi trailer truck

TRUCK: FHWA Vehicle Class 4-13
MED: Single Unit truck (FHWA Vehicle Class 4-7)
HEAVY: Tractor-trailer truck (FHWA Vehicle Class 8-13)


FHWA VEHICLE CLASSIFICATIONS
1 Motorcycles
2 Passenger Cars
3 Two Axle, 4 Tire Single Units
4 Buses
5 Two Axle, 6 Tire Single Units
6 Three Axle Single Units
7 Four or More Axle Single Units
8 Four or Less Axle Single Trailers
9 Five Axle Single Trailers
10 Six or More Axle Single Trailers
11 Five or Less Axle Multi-Trailers
12 Six Axle Multi- Trailers
13 Seven or More Axle Multi- Trailers

Total Cars

Cars

Trucks

2022 FUNCTIONAL CLASS AVERAGES

DAILY

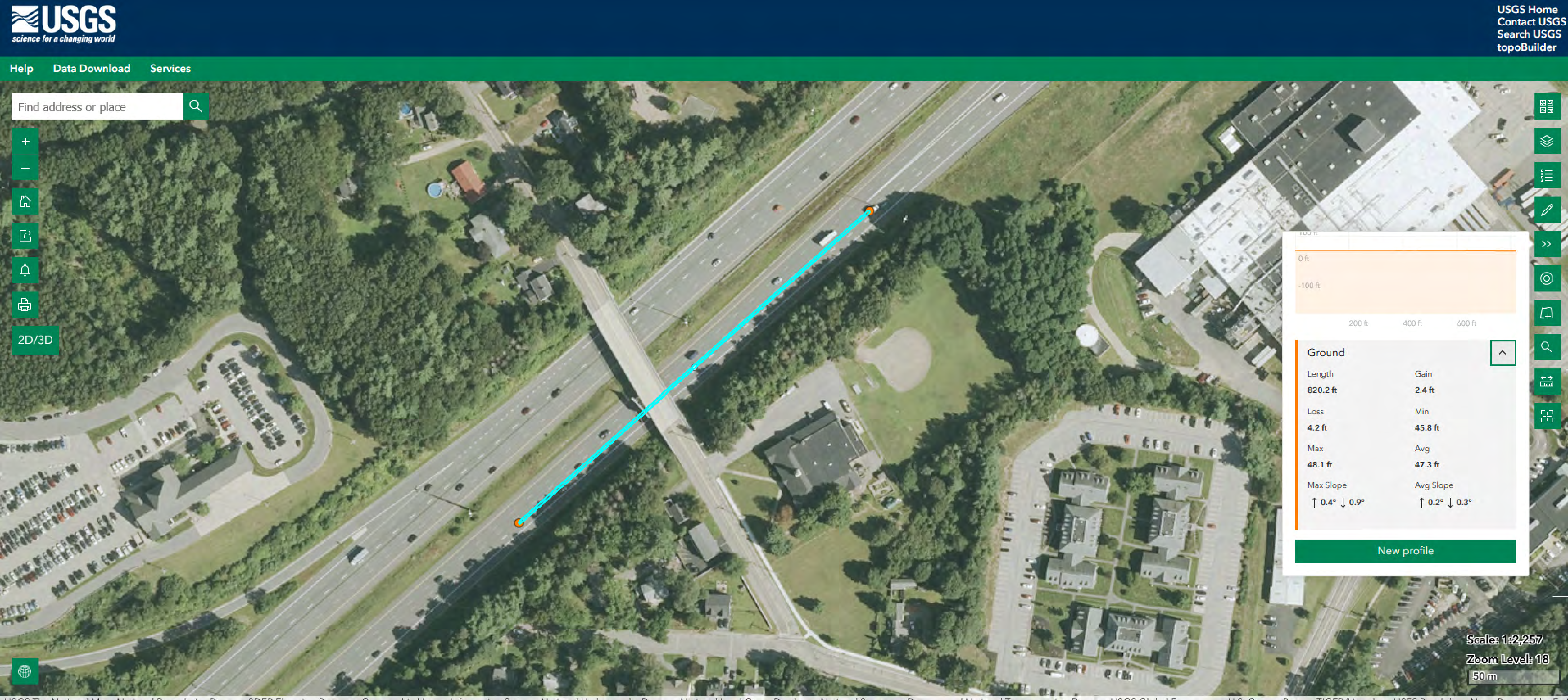
Total Cars	RURAL	Class 1 MC	Class 2 Car	Class 3 Pickup	Class 4 Bus	Class 5 2A SU	Class 6 3A SU	Class 7 >3A SU	Class 8 <5A 2U	Class 9 5A 2U	Class 10 >5A 2U	Class 11 <6A >2U	Class 12 6A >2U	Class 13 >6A >2U	TOTAL	TRUCKS MED	HEAVY
1	FC1 AVG	0.64%	67.54%	17.62%	1.46%	4.09%	1.23%	0.55%	1.72%	3.44%	1.54%	0.05%	0.01%	0.12%	14.20%	7.33%	6.87%
	FC2 AVG																
	FC3 AVG	1.55%	70.53%	19.21%	0.99%	3.56%	0.80%	0.16%	1.15%	1.56%	0.46%	0.01%	0.00%	0.01%	8.71%	5.51%	3.20%
	FC4 AVG	2.45%	68.70%	21.32%	0.79%	3.53%	0.84%	0.12%	1.06%	0.81%	0.37%	0.00%	0.00%	0.01%	7.53%	5.28%	2.25%
	FC5 AVG	2.45%	68.24%	22.49%	0.68%	3.69%	0.76%	0.11%	0.85%	0.46%	0.27%	0.00%	0.00%	0.01%	6.82%	5.23%	1.59%
	FC6 AVG	1.63%	67.39%	24.40%	0.26%	3.85%	1.44%	0.20%	0.57%	0.19%	0.07%	0.00%	0.00%	0.00%	6.58%	5.76%	0.83%
	FC7 AVG	1.11%	69.03%	23.96%	0.51%	4.18%	0.61%	0.04%	0.43%	0.08%	0.04%	0.00%	0.00%	0.00%	5.89%	5.33%	0.56%

URBAN	Class 1 MC	Class 2 Car	Class 3 Pickup	Class 4 Bus	Class 5 2A SU	Class 6 3A SU	Class 7 >3A SU	Class 8 <5A 2U	Class 9 5A 2U	Class 10 >5A 2U	Class 11 <6A >2U	Class 12 6A >2U	Class 13 >6A >2U	TOTAL	TRUCKS MED	HEAVY
FC1 AVG	0.68%	73.61%	17.09%	0.91%	3.64%	0.67%	0.19%	1.24%	1.55%	0.31%	0.06%	0.03%	0.04%	8.62%	5.40%	3.22%
FC2 AVG																
FC3 AVG	1.40%	73.63%	18.27%	0.77%	3.72%	0.48%	0.07%	0.82%	0.67%	0.16%	0.00%	0.00%	0.01%	6.70%	5.03%	1.67%
FC4 AVG	1.42%	73.14%	19.49%	0.61%	3.16%	0.79%	0.15%	0.49%	0.48%	0.26%	0.00%	0.00%	0.00%	5.94%	4.71%	1.24%
FC5 AVG	1.22%	72.91%	19.66%	0.62%	3.66%	0.88%	0.11%	0.38%	0.37%	0.20%	0.00%	0.00%	0.01%	6.22%	5.27%	0.95%
FC6 AVG	1.60%	70.18%	23.30%	0.18%	3.06%	0.57%	0.17%	0.91%	0.05%	0.00%	0.00%	0.00%	0.00%	4.92%	3.97%	0.95%
FC7 AVG	0.81%	70.66%	24.53%	0.39%	2.98%	0.29%	0.05%	0.24%	0.04%	0.00%	0.00%	0.00%	0.01%	4.00%	3.70%	0.29%

PEAK HOUR

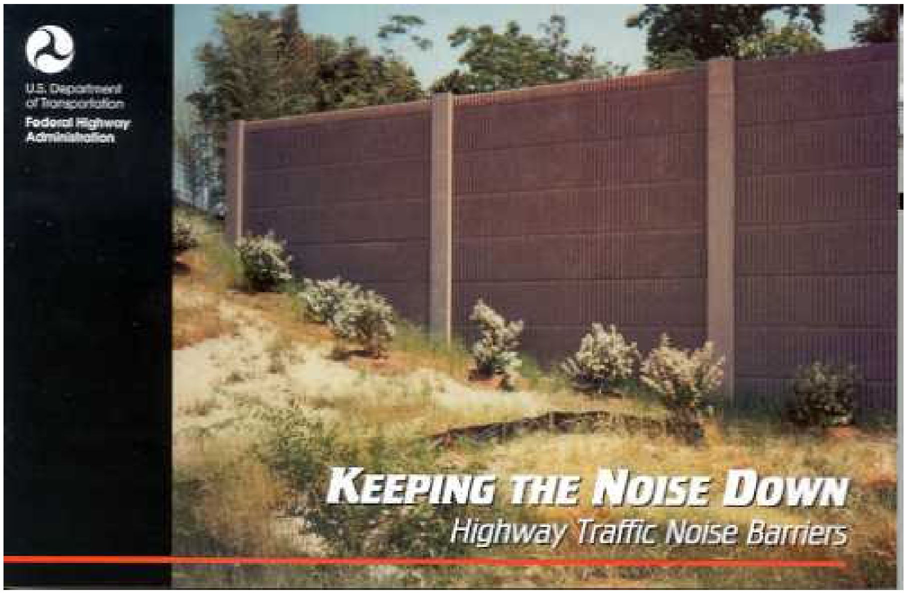
RURAL	Class 1 MC	Class 2 Car	Class 3 Pickup	Class 4 Bus	Class 5 2A SU	Class 6 3A SU	Class 7 >3A SU	Class 8 <5A 2U	Class 9 5A 2U	Class 10 >5A 2U	Class 11 <6A >2U	Class 12 6A >2U	Class 13 >6A >2U	TRUCKS TOTAL	MED	HEAVY
FC1 AVG	0.17%	70.87%	15.64%	1.93%	3.33%	0.69%	0.12%	1.69%	4.19%	1.30%	0.06%	0.00%	0.02%	13.32%	6.06%	7.26%
FC2 AVG																
FC3 AVG	1.11%	68.33%	22.06%	0.93%	3.99%	0.63%	0.09%	1.20%	1.24%	0.34%	0.01%	0.01%	0.06%	8.51%	5.65%	2.86%
FC4 AVG	2.28%	65.81%	23.15%	0.80%	4.64%	0.96%	0.08%	1.32%	0.70%	0.24%	0.02%	0.00%	0.01%	8.77%	6.48%	2.29%
FC5 AVG	2.22%	67.32%	22.76%	0.87%	4.87%	0.63%	0.03%	0.79%	0.37%	0.15%	0.00%	0.00%	0.00%	7.71%	6.40%	1.30%
FC6 AVG	0.74%	69.82%	24.00%	0.29%	4.32%	0.51%	0.00%	0.30%	0.01%	0.00%	0.00%	0.00%	0.01%	5.44%	5.11%	0.33%
FC7 AVG	1.39%	68.43%	24.34%	0.53%	4.05%	0.33%	0.16%	0.55%	0.14%	0.07%	0.00%	0.00%	0.00%	5.84%	5.08%	0.76%

URBAN	Class 1 MC	Class 2 Car	Class 3 Pickup	Class 4 Bus	Class 5 2A SU	Class 6 3A SU	Class 7 >3A SU	Class 8 <5A 2U	Class 9 5A 2U	Class 10 >5A 2U	Class 11 <6A >2U	Class 12 6A >2U	Class 13 >6A >2U	TRUCKS TOTAL	MED	HEAVY
FC1 AVG	2.85%	72.84%	16.91%	0.72%	3.16%	0.49%	0.19%	1.43%	1.06%	0.29%	0.02%	0.01%	0.04%	7.40%	4.56%	2.84%
FC2 AVG																
FC3 AVG	1.13%	74.37%	17.91%	1.23%	3.67%	0.44%	0.06%	0.71%	0.34%	0.13%	0.00%	0.00%	0.01%	6.60%	5.40%	1.19%
FC4 AVG	1.47%	72.39%	18.72%	0.99%	4.68%	0.52%	0.07%	0.54%	0.56%	0.06%	0.00%	0.00%	0.00%	7.42%	6.26%	1.16%
FC5 AVG	1.36%	72.69%	18.81%	0.38%	4.97%	0.58%	0.11%	0.63%	0.25%	0.21%	0.00%	0.00%	0.00%	7.14%	6.05%	1.09%
FC6 AVG	2.04%	69.82%	24.45%	0.06%	2.41%	0.24%	0.00%	0.98%	0.00%	0.00%	0.00%	0.00%	0.00%	3.69%	2.71%	0.98%
FC7 AVG	1.04%	69.26%	25.15%	0.05%	3.88%	0.05%	0.05%	0.52%	0.01%	0.00%	0.00%	0.00%	0.00%	4.55%	4.01%	0.53%


USGS
science for a changing world
USGS Home
Contact USGS
Search USGS
topoBuilder
Help
Data Download
Services
Find address or place
2D/3D
0 ft
-100 ft
200 ft
400 ft
600 ft
Ground
Length
820.2 ft
Gain
2.4 ft
Loss
4.2 ft
Min
45.8 ft
Max
48.1 ft
Avg
47.3 ft
Max Slope
↑ 0.4° ↓ 0.9°
Avg Slope
↑ 0.2° ↓ 0.3°
New profile
Scale: 1:2,257
Zoom Level: 18
50 m

Federal Highway Administration
Highway Traffic Noise Barriers at a Glance

Highway Traffic Noise Barriers at a Glance



Highway traffic noise barriers:

- can reduce the loudness of traffic noise by as much as half;
- do not completely block all traffic noise;
- can be effective, regardless of the material used;
- must be tall and long with no openings;
- are most effective within 61 meters (200 feet) of a highway (usually the first row of homes);
- must be designed to be visually appealing;
- must be designed to preserve aesthetic values and scenic vistas;
- do not increase noise levels perceptibly on the opposite side of a highway; and
- substantially reduce noise levels for people living next to highways.

Keeping the Noise Down

A sound occurs when an ear senses pressure variations or vibrations in the air. Noise is unwanted sound. The brain relates a subjective element to a sound, and an individual reaction is formed. Numerous studies have indicated that the most pervasive sources of noise in our environment today are those associated with transportation. Highway traffic noise tends to be a dominant noise source in our urban, as well as rural, environment.

What are Noise Barriers?

Noise barriers are solid obstructions built between the highway and the homes along a highway. They do not *completely* block all noise they only reduce overall noise levels. Effective noise barriers typically reduce noise levels by 5 to 10 decibels (dB), cutting the loudness of traffic noise by as much as one half. For example, a barrier which achieves a 10-dB reduction can reduce the sound level of a typical tractor trailer pass-by to that of an automobile.

Barriers can be formed from earth mounds or "berms" along the road, from high, vertical walls, or from a combination of earth berms and walls. Earth berms have a very natural appearance and are usually attractive. They also reduce noise by approximately 3 dB more than vertical walls of the same height. However, earth berms can require a lot of land to construct, especially if they are very tall. Walls require less space, but they are usually limited to eight meters (25 feet) in height for structural and aesthetic reasons.

When Are Noise Barriers Required?

Noise barriers are not always required at locations where an absolute threshold is met. There is no "number standard" which requires the construction of a noise barrier. Federal requirements for noise barriers may be found in Title 23 of the U.S. Code of Federal Regulations, Part 772, "Procedures for Abatement of Highway Traffic Noise and Construction Noise."

The Federal Highway Administration noise regulations apply only to projects where a State transportation department has requested Federal funding for participation in the improvements. The State transportation department must determine if there will be traffic noise impacts, when a project is proposed for (1) the construction of a highway on new location or (2) the reconstruction of an existing highway to either significantly change the horizontal or vertical alignment or increase the number of through-traffic lanes. If the State transportation department identifies potential impacts, it must implement abatement measures, possibly including the construction of noise barriers, where reasonable and feasible.

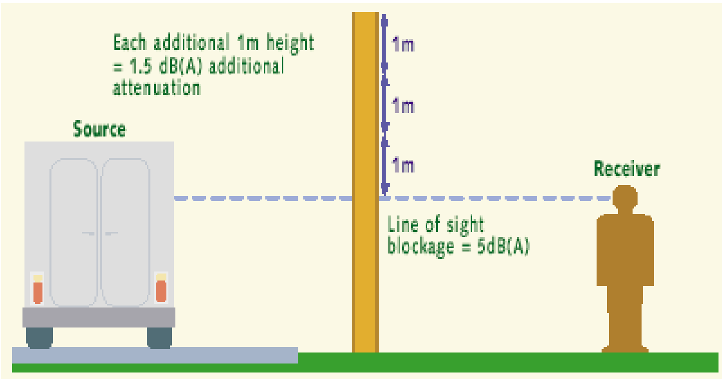
Federal law and Federal Highway Administration regulations do not require State transportation departments to build noise barriers along existing highways where no other highway improvements are planned. They may voluntarily do so, but they are solely responsible for making this decision.

How Is a Noise Barrier Funded?

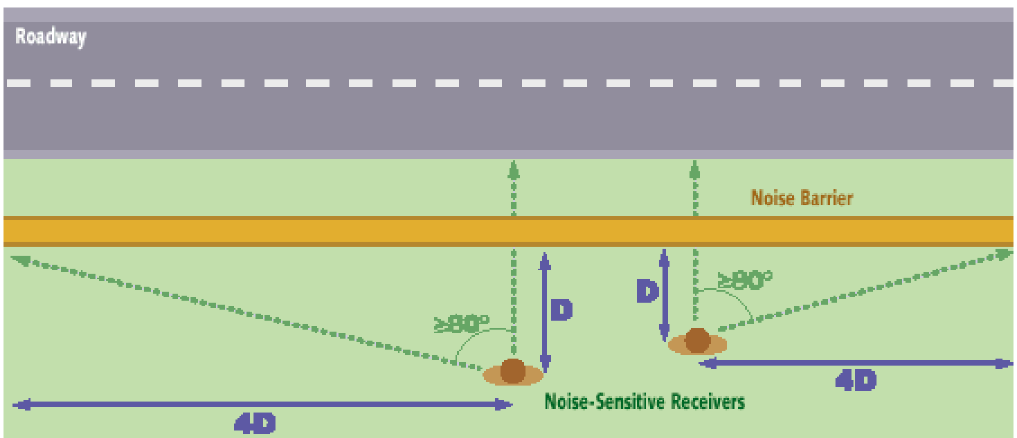
There are no special or separate Federal funds for highway traffic noise abatement. State transportation departments include the costs of noise barriers in their proposed Federal-aid highway projects. The Federal share is the same as that for the highway system on which the project is located. Noise barriers are sometimes constructed without using Federal funds - for example, using only State, local, or private funds. The costs of noise barriers are sometimes shared by governmental agencies and individual homeowners.

How Does a Noise Barrier Work?

Noise barriers reduce the sound which enters a community from a busy highway by either absorbing the sound, transmitting it, reflecting it back across the highway, or forcing it to take a longer path over and around the barrier. A noise barrier must be tall enough and long enough to block the view of a highway from the area that is to be protected, the "receiver." Noise barriers provide very little benefit for homes on a hillside overlooking a highway or for buildings which rise above the barrier. A noise barrier can achieve a 5 dB noise level reduction, when it is tall enough to break the line-of-sight from the highway to the home or receiver. After it breaks the line-of-sight, it can achieve approximately 1.5dB of additional noise level reduction for each meter of barrier height.



To effectively reduce the noise coming around its ends, a barrier should be at least eight times as long as the distance from the home or receiver to the barrier.



Openings in noise barriers for driveway connections or intersecting streets destroy their effectiveness. In some areas, homes are scattered too far apart to permit noise barriers to be built at a reasonable cost. Noise barriers are normally most effective in reducing noise for areas that are within approximately 61meters (200 feet) of a highway (usually the first row of homes).

What Type of Material Is Best for a Noise Barrier?

Noise barriers can be constructed from earth, concrete, masonry, wood, metal, and other materials. To effectively reduce sound transmission through the barrier, the material chosen must be rigid and sufficiently dense (at least 20 kilograms/square meter). All noise barrier material types are equally effective, acoustically, if they have this density.

There are no Federal requirements specifying the materials to be used in the construction of highway traffic noise barriers. Individual State departments of transportation select the materials when building these barriers. The selection is normally made based on factors, such as aesthetics, durability, maintenance, cost, and the desires of the public.

How Do People React to Noise Barriers?

Overall, public reaction to highway noise barriers appears to be positive. However, specific reactions vary widely. Residents adjacent to barriers say that conversations in households are easier, sleeping conditions are better, the environment is more relaxing, windows are opened more often, and yards are used more in the summer. Residents also perceive indirect benefits, such as increased privacy, cleaner air, improved views and a sense of ruralness, and healthier lawns and shrubs.

Negative reactions from residents have included a restriction of view, a feeling of confinement, a loss of air circulation, a loss of sunlight and lighting, and poor maintenance of the barrier. Motorists have sometimes complained of a loss of view or scenic vistas and a feeling of being "walled in" when traveling adjacent to barriers.

Are Residents' Views Considered?

A major consideration in the design of a noise barrier is its visual impact on the surrounding area. A tall barrier near a one-story, single family, detached residential area can have a negative visual effect. One solution to addressing the size relationship in visual quality is to provide staggered horizontal elements to a noise barrier to reduce the visual impact by planting landscaping in the foreground. Native plantings are preferable.

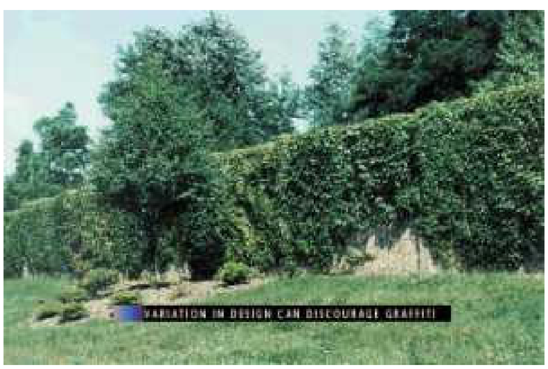
The visual character of noise barriers in relationship to their environmental setting should be carefully considered. In general, it is desirable to locate a noise barrier approximately four times its height from residences and to provide landscaping near the barrier to avoid visual dominance.

Noise barriers should reflect the character of their surroundings as much as possible. It is always desirable to preserve aesthetic views and scenic vistas, to the extent possible.

Are Motorists' Views Considered?

The psychological effect of noise barriers on the passing motorist should be a part of barrier design and construction. Noise barriers in dense, urban settings should be designed differently than barriers in more open suburban or rural areas, and they should be designed to avoid monotony for the motorist. At normal roadway speeds, motorists tend to notice noise barriers overall form, color, and surface texture. A primary objective of noise barrier design should be to avoid a tunnel effect for the motorist. This can be accomplished by varying the forms, materials, and surface treatments.

Graffiti on noise barriers can be a potential problem. One solution is to use materials that can be readily washed or repainted. Landscaping and plantings near barriers can also be used to discourage graffiti, as well as to add visual quality.



Does Construction of a Noise Barrier Increase Noise Levels on the Opposite Side of the Highway?

Residents adjacent to a highway sometimes feel that their noise levels have increased substantially, because of the construction of a noise barrier on the opposite side of the highway. However, field studies have shown that this is not true. If all the noise striking a noise barrier were reflected back to the other side of a highway, the increase would be theoretically limited to 3 dB. In practice, not all of the acoustical energy is reflected back to the other side. Some of the energy goes over the barrier, some is reflected to points other than the homes on the opposite side, some is scattered by ground coverings (for example, grass and shrubs), and some is blocked by the vehicles on the highway. Additionally, some of the reflected energy is lost due to the longer path that it must travel. Measurements made to quantify this reflective increase have never shown an increase of greater than 1-2 dB an increase that is not perceptible to the average human ear.

Does Construction of Noise Barriers on "Both" Sides of a Highway

Increase Noise Levels?

Multiple reflections of noise between two parallel plane surfaces, such as noise barriers or retaining walls on both sides of a highway, can theoretically reduce the effectiveness of individual barriers. However, studies of this issue have found no problems associated with this type of reflective noise. Any measured increases in noise levels have been less than can be perceived by normal human hearing, that is, less than 3 dB. Studies have suggested that to avoid a reduction in the performance of parallel reflective noise barriers, the width-to-height ratio of the roadway section to the barriers should be at least 10:1. The width is the distance between the barriers, and the height is the average height of the barriers above the roadway. This means that two parallel barriers 3 meters (10 feet) tall should be at least 30 meters (100 feet) apart to avoid any reduction in effectiveness. These studies have also shown that any reduction in performance can be eliminated through the use of sound absorptive noise barriers.

Can Trees Be Planted to Act as Noise Barriers?

Vegetation, if it is high enough, wide enough, and dense enough that it cannot be seen over or through, can decrease highway traffic noise. A wide strip of trees with very thick undergrowth can lower noise levels. 30 meters of dense vegetation can reduce noise by five decibels. However, it is not feasible to plant enough trees and other vegetation along a highway to achieve such a reduction. Trees and other vegetation can be planted for psychological relief but not to physically lessen noise levels.

In Summary

Most residents near a barrier seem to feel that highway noise barriers effectively reduce traffic noise and that the benefits of barriers far outweigh the disadvantages of barriers. While noise barriers do not eliminate all highway traffic noise, they do reduce it substantially and improve the quality of life for people who live adjacent to busy highways.

For More Information...

For more information on Keeping the Noise Down: Highway Traffic Noise Barriers, write to us at our e-mail address: environment@fhwa.dot.gov.

Or send your questions to our mailing address:

Federal Highway Administration (HEPN)
400 Seventh St., SW
Washington, DC 20590

Indoor Noise Level Calculations
HUD Sound Transmission Classification Assessment Tool
Calculations and General STC Ratings from
"The Sound Book" and Marvin INdustries

(STraCAT)

Overview

The Sound Transmission Classification Assessment Tool (STraCAT) is an electronic version of Figures 17 and 19 in The HUD Noise Guidebook. The purpose of this tool is to document sound attenuation performance of wall systems. Based on wall, window, and door Sound Transmission Classification (STC) values, the STraCAT generates a composite STC value for the wall assembly as a whole. Users can enter the calculated noise level related to a specific Noise Assessment Location in front of a building façade and STraCAT will generate a target required attenuation value for the wall assembly in STC. Based on wall materials, the tool will state whether the composite wall assembly STC meets the required attenuation value.

How to Use This Tool

Location, Noise Level and Wall Configuration to Be Analyzed

STraCAT is designed to calculate the attenuation provided by the wall assembly for one wall of one unit. If unit exterior square footage and window/door configuration is identical around the structure, a single STraCAT may be sufficient. If units vary, at least one STraCAT should be completed for each different exterior unit wall configuration to document that all will achieve the required attenuation. Additionally, if attenuation is not based on a single worst-case NAL, but there are multiple NALs which require different levels of attenuation around the structure, a STraCAT should be completed for each differing exterior wall configuration associated with each NAL.

Exterior wall configurations associated with an NAL include those with parallel (facing) or near-parallel exposure as well as those with perpendicular exposure. When a façade has parallel or perpendicular exposure to two or more NALs, you should base the required attenuation on the NAL with the highest calculated noise level. For corner units where the unit interior receives exterior noise through two facades, the STraCAT calculation should incorporate the area of wall, window and door materials pertaining to the corner unit's total exterior wall area (i.e., from both walls).

Information to Be Entered

Users first enter basic project information and the NAL noise level that will be used as the basis for required attenuation. This noise level must be entered in whole numbers. STraCAT users then enter information on wall, window and door component type and area. Again, as noted above, the wall, window and door entries are based on one unit, and one wall (except for corner units as discussed above). The tool sums total wall square footage based on the combined area of walls, doors and windows for the façade being evaluated.

Users may input STC values for materials in one of two ways. The tool includes a dropdown menu of common construction materials with STC values prefilled. If selected construction materials are not included in this dropdown menu, the user may also enter the STC for a given component manually. Verification of the component STC must be included in the ERR. Documentation includes the architect or construction manager's project plans showing wall material specifications. For new construction or for components that will be newly installed in an existing wall, documentation also includes the manufacturer's product specification sheet (cut sheet) documenting the STC rating of selected doors and windows.

Required STC Rating and Determination of Compliance

Finally, based on project information entered the tool will indicate the required STC rating for the wall assembly being evaluated and whether or not the materials specified will produce a combined rating that meets this requirement. Note that for noise levels above 75 dB DNL, either HUD (for 24 CFR Part 50 reviews) or the Responsible Entity (for 24 CFR Part 58 reviews) must approve the level and type of attenuation, among other processing requirements. Required attenuation values generated by STraCAT for NALs above 75 dB DNL should therefore be considered tentative pending approval by HUD or the RE.

Part I - Description

Project
Sherburne School

Sponsor/Developer
Portsmouth Housing Auth

Location
Sherburne Street

Prepared by
Todd Scheffer

Noise Level
76

Date
9/16/2025

Primary Source(s)
Interstate 95

Part II - Wall Components

Wall Construction Detail	Area	STC
2 x 6 Wood Studs with Fiberglass	4050	38

Add new wall

4,050 Sq. Feet **38**

Window Construction Detail	Quantity	Sq Ft/Unit	STC
4 x 3 two pane double hung (Marvin)	56	12	27

Add new window

Door Construction Detail	Quantity	Sq Ft/Unit	STC
owest Rated French Doors	8	21	31

Add new door

Part III - Results

Wall Statistics	
Stat	**Value**
Area:	4050 ft^2
Wall STC:	38

Aperture Statistics			
Aperture	**Count**	**Area**	**% of wall**
Windows:	56	**672 ft^2**	**16.59%**
Doors:	8	**168 ft^2**	**4.15%**

Evaluation Criteria	
Criteria	**Value**
Noise source sound level (dB):	**76**
Combined STC for wall assembly:	**33.1**
Required STC rating: (for 42 db interior level, not 45 db)	**34**

The SoundBook™

Acoustical Assembly Guide

National Gypsum®

Acoustical Terms and Concepts

Transmission of Airborne Sound

Airborne sound is acoustical energy generated by a source and transmitted by vibration through the air. The vibrations create sound pressure fluctuations that are detected by a receiver. Sound is characterized by its frequency, which determines the pitch of the sound, and by the intensity of the pressure fluctuations, which determines how loud the sound is perceived to be.

Sound Transmission				
Energy Generated by a Source	►	Transmitted Through a Medium	►	Detected by a Receiver
Drumstick strikes drumhead creating vibrations	►	Vibrations transmitted through the air as pressure fluctuations	►	Ear receives pressure fluctuations and perceives them as sound

The frequency of sound refers to the number of sound pressure fluctuations or cycles that occur at a fixed point in one second. The unit of measure for frequency is the hertz (Hz), which is one cycle per second. The human auditory system is capable of detecting sound frequencies between 20 Hz and 20,000 Hz, but humans are typically most sensitive to sounds within the range of 500 Hz and 4,000 Hz. Sound frequency is perceived by humans as pitch. The lowest note on a piano has a frequency of 27.5 Hz, while the highest note on the piano is 4,186 Hz.

The intensity of sound, or loudness, is measured in decibels (dB). A quiet whisper might register at 20 dB, compared to about 60 dB for normal conversation, and 75 dB for loud singing. The decibel scale is logarithmic, not linear. A sound level change of 1 to 2 dB will be difficult to perceive while a change of 5 dB will be clearly noticeable. Sound is perceived to double in intensity for every 10 dB increase and quadruple for every 20 dB increase.

Human Sensitivity to Changes in Sound Intensity Levels	
1 dB	Generally not perceptible
3 dB	Just perceptible
5 dB	Clearly noticeable
10 dB	Twice as loud
20 dB	Four times as loud

Rating	Activity	Sound Level (dB)
Painful	Jet Engine	120+
Very Loud	Industrial Machinery	100
Loud	Stock Trading Floor	80
Moderate	Normal Speech	65
Quiet	Suburban Home	45
Very Quiet	Barely Audible	25

Sound Transmission Class

The Sound Transmission Class (STC) is a single number rating of the effectiveness of a material or construction assembly to retard the transmission of airborne sound. The STC provides an indication of how loud transmitted sound is perceived to be by the listener. Partitions with higher STC values are more effective at reducing sound transmission.

STC values are derived by conducting a test in accordance with ASTM E90, *Standard Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions*. The test data collected is analyzed using ASTM E413, *Classification for Rating Sound Insulation,* and results in a single-number acoustical rating. The rating assesses the airborne sound transmission performance at a range of frequencies from 125 Hz to 4000 Hz, which is consistent with the frequency range of the human ear. An STC rating of 50 has been designated as the minimum allowable design rating for unit-to-unit multifamily construction in the International Building Code.

Design Considerations for Acoustical Partitions

The goal of a high STC rated partition is to decrease the amount of sound transmission through the partition. The following five variables can have an impact on the ability of the partition to retard the sound transmission.

Mass
Increasing the mass of a partition increases the amount of material airborne sound waves must penetrate to reach the adjoining room and can be accomplished by installing multiple layers of gypsum board.

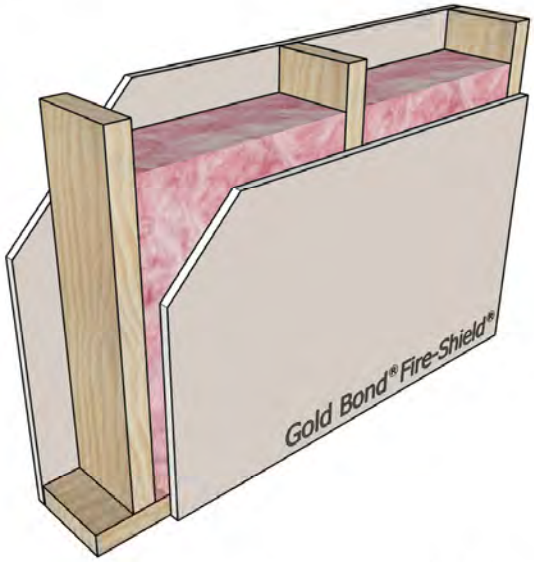
Stiffness
Decreasing the stiffness of a partition will increase the amount of sound transmission loss. For this reason metal studs outperform wood studs, and framing that is 24" o.c. outperforms framing that is 16" o.c.

Damping
Damping, or the ability to dissipate the vibrational energy produced by sound waves, reduces the amount of energy to pass through the partition.

Cavity Depth
Increasing the depth of the cavity of the partition can increase the amount of sound transmission loss, especially when the cavity is filled with acoustical insulation.

Cavity Absorption
Increasing the thickness of sound-absorbing material such as fiberglass or mineral fiber insulation in the cavity of a partition will increase the amount of sound transmission loss. The thickness of the insulation has a greater effect on sound transmission loss than the density.

Figure 114

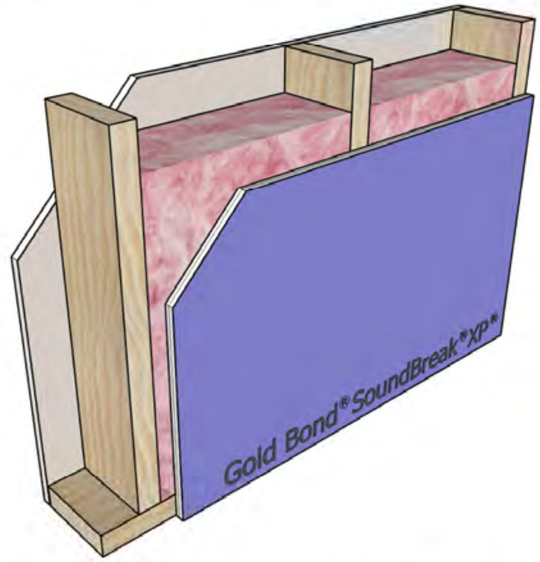


STC-38 **NGC 2008032**

Framing:	2x6 wood studs, 16" o.c.
Insulation:	5-1/2" glass fiber
Side 1:	5/8" Fire-Shield Gypsum Board
Side 2:	5/8" Fire-Shield Gypsum Board

UL Design: U305 - 1 hour

Figure 115

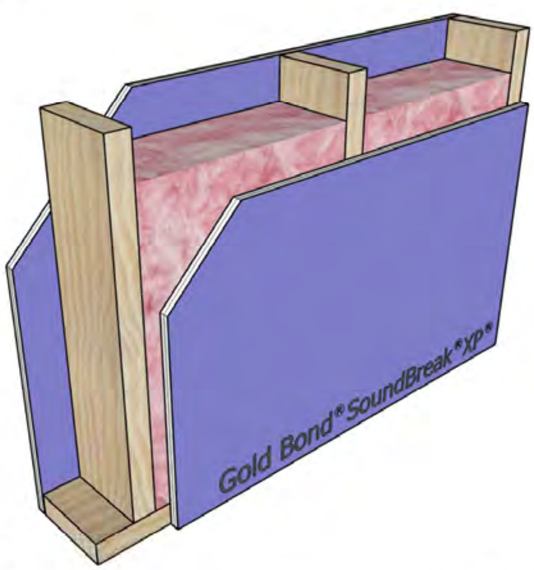


STC-42 **NGC 2009008**

Framing:	2x6 wood studs, 16" o.c.
Insulation:	5-1/2" glass fiber
Side 1:	5/8" Fire-Shield Gypsum Board
Side 2:	5/8" SoundBreak XP Gypsum Board

UL Design: U305 - 1 hour

Figure 116

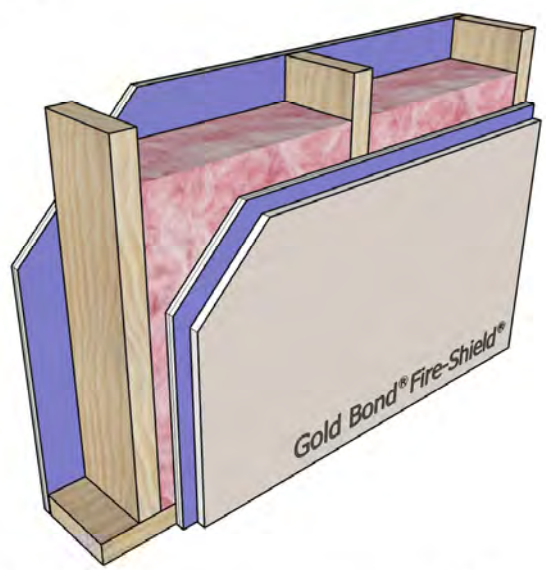


STC-44 **NGC 2009012**

Framing:	2x6 wood studs, 16" o.c.
Insulation:	5-1/2" glass fiber
Side 1:	5/8" SoundBreak XP Gypsum Board
Side 2:	5/8" SoundBreak XP Gypsum Board

UL Design: U305 - 1 hour

Figure 117



STC-46 **NGC 2009010**

Framing:	2x6 wood studs, 16" o.c.
Insulation:	5-1/2" glass fiber
Side 1:	5/8" SoundBreak XP Gypsum Board
Side 2:	5/8" Fire-Shield Gypsum Board on 5/8" SoundBreak XP Gypsum Board

UL Design: U305 - 1 hour

STC and OITC Class Values

Marvin Sound Transmission Class and Outdoor - Indoor Transmission Class Values							
Product Type	Exterior Glazing	Airspace	Interior Glazing	STC	OITC	Additional Information	STC Report #
Clad Ultimate Double Hung - NG							
CUDH-NG (47 3/16 x 59 1/8)	1/8" (3.1) Annealed	5/8" (16.0)	1/8" (3.1) Annealed	27	23		ESP018375P-2
CUDH-NG (47 3/16 x 59 1/8)	1/8" (3.1) Annealed	1/4" (6.5)	1/8" (3.1) Annealed	28	24	Tri-pane: two 1/4" air spaces with 1/8" center pane	ESP016170P-2
CUDH-NG (47 3/16 x 59 1/8)	1/8" (3.1) Annealed	19/32" (14.5)	3/16" (4.7) Annealed	30	26		ESP020753P-2
CUDH-NG (47 3/16 x 59 1/8)	1/4" (5.7) Annealed	3/8" (9.8)	1/4" (6.0) Lami	30	27		ESP016170P-4
CUDH-NG (47 3/16 x 59 1/8)	1/4" (6.0) Lami	3/8" (9.8)	1/4" (6.0) Lami	31	27		ESP016170P-5
CUDH-NG (47 3/16 x 59 1/8)	1/8" (3.1) Annealed	7/16" (11.5)	5/16" (7.8) Lami	31	26	CE	ESP020753P-1
CUDH-NG (47 3/16 x 59 1/8)	9/32" (7.0) Lami	5/16" (8.0)	9/32" (7.0) Lami	31	27	CE	ESP016170P-7
CUDH-NG (47 3/16 x 59 1/8)	1/8" (3.1) Annealed	7/16" (11.5)	11/32" (8.6) Lami	31	27	IZ3	ESP018375P-5
CUDH-NG (47 3/16 x 59 1/8)	3/16" (4.7) Annealed	7/16" (11.5)	1/4" (6.0) Lami	31	28		ESP018375P-3
CUDH-NG (47 3/16 x 59 1/8)	1/4" (5.9) Annealed	5/16" (8.0)	5/16" (7.8) Lami	31	29	CE	ESP016170P-6
CUDH-NG (47 3/16 x 59 1/8)	3/16" (4.7) Annealed	5/16" (8.0)	11/32" (8.6) Lami	32	29	IZ3	ESP018375P-7
CUDH-NG (47 3/16 x 59 1/8)	1/8" (3.1) Annealed	5/8" (16.0)	1/8" (3.1) Annealed	35	28	1/8" Clad Storm Combination	ESP016170P-14
CUDH-NG (47 3/16 x 59 1/8)	1/8" (3.1) Annealed	1/4" (6.5)	1/8" (3.1) Annealed	36	30	Tri-pane: two 1/4" air spaces w/ 1/8" center pane, 1/8" Clad Storm Comb	ESP016170P-15
CUDH-NG (47 3/16 x 59 1/8)	1/4" (5.7) Annealed	3/8" (9.8)	1/4" (6.0) Lami	39	32	1/8" Clad Storm Combination	ESP016170P-19
CUDH-NG (47 3/16 x 59 1/8)	1/4" (6.0) Lami	3/8" (9.8)	1/4" (6.0) Lami	40	33	1/8" Clad Storm Combination	ESP016170P-17
CUDH-NG (47 3/16 x 59 1/8)	3/16" (4.7) Annealed	7/16" (11.5)	1/4" (6.0) Lami	40	33	1/8" Clad Storm Combination	ESP016170P-18
CUDH-NG (47 3/16 x 59 1/8)	9/32" (7.0) Lami	5/16" (8.0)	9/32" (7.0) Lami	40	33	1/8" Clad Storm Combination CE	ESP016170P-12
CUDH-NG (47 3/16 x 59 1/8)	1/4" (5.9) Annealed	5/16" (8.0)	5/16" (7.8) Lami	41	35	1/8" Clad Storm Combination CE	ESP016170P-16
CUDHP-NG (47 3/16 x 59 1/8)	1/8" (3.1) Annealed	5/8" (16.0)	1/8" (3.1) Annealed	29	23		ESP016170P-21
CUDHP-NG (47 3/16 x 59 1/8)	1/8" (3.1) Annealed	1/4" (6.5)	1/8" (3.1) Annealed	30	25	Tri-pane: two 1/4" air spaces with 1/8" center pane	ESP016170P-24
CUDHP-NG (47 3/16 x 59 1/8)	1/4" (5.7) Annealed	3/8" (9.8)	1/4" (6.0) Lami	34	29		ESP016170P-26
CUDHP-NG (47 3/16 x 59 1/8)	1/4" (6.0) Lami	3/8" (9.8)	1/4" (6.0) Lami	35	30		ESP016170P-25
CUDHP-NG (47 3/16 x 59 1/8)	3/16" (4.7) Annealed	7/16" (11.5)	1/4" (6.0) Lami	35	29		ESP016170P-23
CUDHP-NG (47 3/16 x 59 1/8)	1/4" (5.9) Annealed	5/16" (8.0)	5/16" (7.8) Lami	35	31	CE	ESP016170P-22
CUDHP-NG (47 3/16 x 59 1/8)	9/32" (7.0) Lami	5/16" (8.0)	9/32" (7.0) Lami	35	30	CE	ESP016170P-27
CUDHP-NG (47 3/16 x 59 1/8)	1/8" (3.1) Annealed	1/4" (6.5)	9/16" (13.6) Lami	35	31		ESP016170P-29
Ultimate Double Hung							
WUDH 3026	1/8″ (3.1) Annealed	7/16″ (11.5)	1/8″ (3.1) Annealed	35	26	3/32″ (2) Wood Storm Comb	66263-4
WUDH 3026	3/16″ (4.7) Annealed	3/8″ (9.8)	1/8″ (3.1) Annealed	36	27	3/32″ (2) Wood Storm Comb	66263-5
WUDH 3026	5/32″ (3.9) Annealed	3/8″ (9.8)	1/4″ (6) Lami	37	28	3/32″ (2) Wood Storm Comb	66263-6
WUDHP 6878	1/4″ (5.7) Annealed	9/16″ (14.5)	1/4″ (6) Lami	34	27	2″ (51) Sash	66263-7
Ultimate Double Hung Magnum							
CUDHM FS 48″(1219) X 60″(1524) (7/8)	1/4″ (6) LAMI	3/8″ (9.8)	1/4″ (6) LAMI	33	28		ESP-015798P-3
CUDHM FS 48″(1219) X 60″(1524) (7/8)	1/4″ (6) LAMI	5/16″ (8)	5/16″ (8.6) LAMI	34	29		ESP-015798P-2
CUDHM FS 48″(1219) X 60″(1524) (7/8)	1/8″ (3.1) Annealed	1/4″ (6.5)	1/8″ (3.1) Annealed	28	24	Tri-pane: two 1/4" air spaces with 1/8" center pane	ESP-015798P-1
CUDHM FS 47 7/8 X 88 (11/16)	1/8″ (3.1) Annealed	7/16″ (11.5)	1/8″ (3.1) Annealed	27	22		76430
CUDHM FS 47 7/8 X 88 (11/16)	3/16″ (4.7) Annealed	3/8″ (9.8)	1/8″ (3.1) Annealed	30	25		
CUDHM FS 47 7/8 X 88 (11/16)	1/4″ (5.7) Annealed	5/16″ (8)	5/32" (3.9) Annealed	31	26		
CUDHM FS 47 7/8 X 88 (11/16)	1/4″ (6) LAMI	9/32″ (7)	3/16″ (4.7) Annealed	31	26		
WUDHM FS 48″ (1219) X 60″(1524)	1/4″ (6) LAMI	3/8″ (9.8)	1/4″ (6) LAMI	33	27		ESP-015798P-6
WUDHM FS 48″ (1219) X 60″(1524)	1/4″ (6) LAMI	5/16″ (8)	5/16″ (8.6) LAMI	34	29		ESP-015798P-5
WUDHM FS 48″ (1219) X 60″(1524)	1/8″ (3.1) Annealed	1/4″ (6.5)	1/8″ (3.1) Annealed	28	24	Tri-pane: two 1/4" air spaces with 1/8" center pane	ESP-015798P-4

STC and OITC Class Values

Marvin Sound Transmission Class and Outdoor - Indoor Transmission Class Values							
Product Type	Exterior Glazing	Airspace	Interior Glazing	STC	OITC	Additional Information	STC Report #
Ultimate Casement							
Values for wood and clad product UCA, UCART, UPCA, UCAP, UCARTP, UPCAP							
UCA 2460 3/4″ (19)	1/8″ (3.1) Annealed	1/2″ (13)	1/8″ (3.1) Annealed	29	23		TCT005872P-1
UCA 2460 3/4″ (19)	1/4″ (5.7) Annealed	5/16″ (8)	1/4″ (6) LAMI	34	29		ESP016574P-2
UCA 2460 3/4″ (19)	1/4″ (6) LAMI	9/32″ (7)	1/4″ (6) LAMI	35	30		ESP016574P-3
UCA 2460 3/4″ (19)	1/8″ (3.1) Annealed	5/16″ (8)	11/32" (8.6) PVB	35	31	IZ3	ESP017287P-4
UCA 2460 3/4″ (19)	3/16″ (4.7) Annealed	5/16″ (8)	1/4″ (6) LAMI	35	30		ESP016574P-4
UCA 2460 3/4″ (19)	3/16″ (4.7) Annealed	1/4″ (6.5)	11/32" (8.6) PVB	37	31	IZ3	ESP017287P-1
UCA 2460 3/4″ (19)	1/8″ (3.1) Annealed	1/2″ (13)	1/8″ (3.1) Annealed	46	34	interior sash 1/8″ glass, 4 1/4″ airspace	TCT005872P-1
UCA 2460 1″ (25)	1/8″ (3.1) Annealed	5/16″ (8)	1/8″ (3.1) Annealed	30	25	Tri-pane: two 5/16 air spaces, with 1/8" center	ESP016574P-5
UCA 2460 1″ (25)	1/4" (5.7) Annealed	1/2″ (13)	1/4″ (6) LAMI	34	28		ESP016574P-10
UCA 2460 1″ (25)	3/16″ (4.7) Annealed	9/16″ (14.5)	1/4″ (5.7) Annealed	34	27		TCT005872P-1
UCA 2460 1″ (25)	1/4″ (6) LAMI	1/2″ (13)	1/4″ (6) LAMI	35	28		ESP016574P-11
UCA 2460 1″ (25)	9/32" (7) Lami	7/16″ (11.5)	9/32" (7) Lami	35	29	CE	ESP016574P-13
UCA 2460 1″ (25)	1/4" (5.9) Annealed	7/16″ (11.5)	5/16" (7.8) Lami	37	32	CE	ESP017287P-3
UCA 2460 1″ (25)	3/16″ (4.7) Annealed	9/32″ (7)	17/32" (13.6) Lami	37	34		ESP016574P-9
UCA 2460 1″ (25)	3/16″ (4.7) Annealed	9/16″ (14.5)	1/4″ (6) LAMI	37	30		ESP016574P-12
UCA 2460 1″ (25)	3/16″ (4.7) Annealed	7/16″ (11.5)	11/32" (8.6) PVB	37	31	IZ3	ESP017287P-2
UCA 2460 1″ (25)	3/16″ (4.7) Annealed	3/8" (9.8)	13/32" (10.1) PVB	38	33	IZ3	ESP017287P-6
UCA 2460 1″ (25)	3/16″ (4.7) Annealed	9/16″ (14.5)	1/4″ (5.7) Annealed	47	36	interior sash 1/8″ glass, 4 1/4″ airspace	TCT005872P-1
UCAP 4860 1″ (25)	3/16″ (4.7) Annealed	9/16″ (14.5)	1/4″ (6) LAMI	36	30		ESP016574P-15
UCAP 4860 1″ (25)	1/4″ (5.7) Annealed	1/2″ (13.0)	1/4″ (6) LAMI	34	29		ESP016574P-16
UCAP 4860 1″ (25)	1/4″ (6) LAMI	1/2″ (13.0)	1/4″ (6) LAMI	35	29		ESP016574P-17
UCAP 4860 1″ (25)	3/16″ (4.7) Annealed	9/32″ (7)	17/32" (13.6) Lami	36	33		ESP016574P-18
UCAP 4860 1″ (25)	1/8″ (3.1) Annealed	5/16″ (8)	1/8″ (3.1) Annealed	29	24	Tri-pane: two 5/16" air spaces, with 1/8" center	ESP016574P-19
UCAP 4860 1″ (25)	9/32" (7) Lami	7/16″ (11.5)	9/32" (7) Lami	36	32	CE	ESP016574P-23
UCAP 4860 1″ (25)	1/4" (5.9) Annealed	7/16″ (11.5)	5/16" (7.8) Lami	36	30	CE	ESP016574P-22
UCAP 4860 1″ (25)	3/16″ (4.7) Annealed	5/8″ (16)	3/16″ (4.7) Annealed	31	25		TCT005872P-2
UCAP 4860 1″ (25)	3/16″ (4.7) Annealed	9/16″ (14)	1/4″ (5.7) Annealed	34	28		
CUGL 5040	1/8″ (3.1) Annealed	7/16″ (11.5)	1/8″ (3.1) Annealed	27	22		TCT006299P-CUGL
CUGL 5040	1/8″ (3.1) Annealed	3/8″ (10)	3/16″ (4.7) Annealed	32	26		
CUGL 5040	1/8″ (3.1) Annealed	7/16″ (11.5)	1/8″ (3.1) Annealed	33	25	1/8″ Combination to the exterior	
CUGL 5040	1/8″ (3.1) Annealed	3/8″ (10)	3/16″ (4.7) Annealed	37	27	1/8″ Combination to the exterior	
CUGL 5040	3/16″ (4.7) Annealed	9/32" (7.0)	1/4" (6.0) Lami	32	29		ESP020754P-4rev1
CUGL 5040	5/32" (3.9)	9/32" (7.0)	9/32" (7.0) Lami	30	27	CE	ESP020754P-5
CUGL 5040	3/16″ (4.7) Annealed	9/32" (7.0)	1/4" (6.0) Lami	37	31	1/8″ Combination to the exterior	ESP020754P-2rev1
CUGL 5040	5/32" (3.9)	9/32" (7.0)	9/32" (7.0) Lami	37	30	CE 1/8″ Combination to the exterior	ESP020754P-3
CUGLP 4050	3/16″ (4.7) Annealed	5/16″ (8)	3/16″ (4.7) Annealed	31	26		TCT006299P-CUGLP
CUGLP 4050	1/8″ (3.1) Annealed	3/8″ (10)	3/16″ (4.7) Annealed	31	26		
CUGLP 4050	3/16″ (4.7) Annealed	9/32″ (7)	1/4" (6.0) Lami	34	30		ESP020754P-1
Direct Glaze							
CDG Rect FS 47 3/16″ x 59 3/32″	5/32″ (3.9) Annealed	7/16″ (11.5)	5/32″ (3.9) Annealed	28	24		ESP014020-2
CDG Rect FS 47 3/16″ x 59 3/32″	1/4″ (5.7) Annealed	7/16″ (11.5)	1/4″ (6.0) Lami	33	27		ESP014020-3
CDG Rect FS 47.2 x 59.1	1/8" (3.1) Annealed	7/16" (11.5)	1/8" (3.1) Annealed	27	23		ESP019269P-4
CDG Rect FS 47.2 x 59.1	3/16" (4.7) Annealed	7/16" (11.5)	3/16" (4.7) Annealed	29	26		ESP019269P-9
CDG Rect FS 47.2 x 59.1	1/4" (5.7) Annealed	7/16" (11.5)	1/4" (5.7) Annealed	30	26		ESP019269P-8
CDG Rect FS 47.2 x 59.1	5/32" (3.9)Annealed	7/16" (11.5)	3/16" (4.7) Annealed	32	28		ESP019269P-5
CDG Rect FS 47.2 x 59.1	3/16" (4.7) Annealed	7/16" (11.5)	1/4" (6.0) Lami	34	29		ESP019269P-2
CDG Rect FS 47.2 x 59.1	1/4" (6.0) Lami	7/16" (11.5)	1/4" (6.0) Lami	33	28		ESP019269P-11
CDG Rect FS 47.2 x 59.1	1/8" (3.1) Annealed	5/16" (8.0)	1/8" (3.1) Annealed	27	23	tripane- two 5/16" airspaces with 1/8" center	ESP019269P-7
CDG Rect FS 47.2 x 59.1	1/8" (3.1) Annealed	5/16" (8.0)	1/4" (6.0) Lami	33	27	tripane- two 5/16" airspaces with 1/8" center	ESP019269P-6
CDG Rect FS 47.2 x 59.1	3/16" (4.7) Annealed	3/8" (9.8)	13/32" (10.1) SGP	34	30	IZ3	ESP019269P-3
CDG Rect FS 47.2 x 59.1	9/32" (7.0) Lami	7/16" (11.5)	9/32" (7.0) Lami	36	30	CE	ESP019269P-1
CDG Rect FS 47.2 x 59.1	15/64" (5.9) Annealed	7/16" (11.5)	5/16" (7.8) Lami	36	31	CE	ESP019269P-10
Magnum Tilt Turn							
CMTT FS 48″ (1219) x 72″ (1829)	1/8″ (3) Annealed	5/8″ (16)	1/8″ (3) Annealed	31	25		66263-24
CMTT FS 48″ (1219) x 72″ (1829)	3/16″ (5) Annealed	15/32″ (12)	1/4″ (6) Lami	36	29		66263-25

STC and OITC Class Values

Marvin Sound Transmission Class and Outdoor - Indoor Transmission Class Values							
Product Type	Exterior Glazing	Airspace	Interior Glazing	STC	OITC	Additional Information	STC Report #
Sliding Patio Door							
CSPD 6068	1/8″ (3.1) Tempered	1/2" (12.7)	1/8″ (3.1) Tempered	29	24		ESP023470P-12
CSPD 6068	1/8″ (3.1) Tempered	7/16" (11.0)	3/16" (4.7) Tempered	31	26		ESP023470P-20
CSPD 6068	1/8″ (3.1) Tempered	3/8″ (9.3)	1/4″ (5.7) Tempered	31	27		ESP023470P-14
CSPD 6068	5/32" (3.9) Tempered	7/16" (11.0)	5/32" (3.9) Tempered	30	25		ESP023470P-18
CSPD 6068	1/4″ (5.7) Tempered	5/16″ (8.1)	1/4″ (5.7) Tempered	31	28		ESP023470P-19
CSPD 6068	1/8″ (3.1) Tempered	3/8″ (9.8)	1/4″ (6) Lami	31	27		ESP023470P-15
CSPD 6068	3/16″ (4.7) Tempered	5/16″ (8.0)	1/4″ (6) Lami	31	28		ESP023470P-17
CSPD 6068	1/4″ (5.7) Tempered	5/16″ (8.0)	1/4″ (6) Lami	31	28		ESP023470P-13
CSPD 6068	1/4″ (6) Lami	9/32″ (7.0)	1/4″ (6) Lami	32	29		ESP023470P-16
CSPD 6068	1/8″ (3.1) Tempered	5/16″ (8.0)	5/16″ (7.8) Lami	31	28	CE	ESP023470P-22
CSPD 6068	5/32" (3.9) Tempered	5/16″ (8.0)	5/16″ (7.8) Lami	31	28	CE	ESP023470P-21
Ultimate Sliding French Door							
WSFD 6068	1/4″ (6) Lami	3/8″ (10)	1/8″ (3.1)″ Tempered	32	28		66263-9
CUSFD 6068	1/8″ (3.1) Tempered	1/2" (12.7)	1/8″ (3.1) Tempered	30	26		ESP023470P-1
CUSFD 6068	1/8″ (3.1) Tempered	7/16" (11.0)	3/16" (4.7) Tempered	31	27		ESP023470P-10
CUSFD 6068	1/8″ (3.1) Tempered	3/8″ (9.3)	1/4″ (5.7) Tempered	31	28		ESP023470P-5
CUSFD 6068	5/32" (3.9) Tempered	7/16" (11.0)	5/32" (3.9) Tempered	30	27		ESP023470P-7
CUSFD 6068	1/4″ (5.7) Tempered	5/16″ (8.1)	1/4″ (5.7) Tempered	31	28		ESP023470P-11
CUSFD 6068	1/8″ (3.1) Tempered	3/8″ (9.8)	1/4″ (6) Lami	32	28		ESP023470P-3
CUSFD 6068	3/16″ (4.7) Tempered	5/16″ (8.0)	1/4″ (6) Lami	32	29		ESP023470P-8
CUSFD 6068	1/4″ (5.7) Tempered	5/16″ (8.0)	1/4″ (6) Lami	32	29		ESP023470P-9
CUSFD 6068	1/4″ (6) Lami	9/32″ (7.0)	1/4″ (6) Lami	31	29		ESP023470P-2
CUSFD 6068	1/8″ (3.1) Tempered	5/16″ (8.0)	5/16″ (7.8) Lami	32	29	CE	ESP023470P-4
CUSFD 6068	5/32" (3.9) Tempered	5/16″ (8.0)	5/16″ (7.8) Lami	32	29	CE	ESP023470P-6
Clad Ultimate Sliding French Door IZ3							
CUSFD 6068	5/32" (3.9) Tempered	5/16″ (8.0)	9/32″ (6.9) SGP LAMI	32	29	IZ	ESP023470P-23
CUSFD 6068	3/16" (4.7) Tempered	9/32″ (7.0)	9/32″ (6.9) SGP LAMI	32	29	IZ	ESP023470P-24
Clad Ultimate Inswing French Door IZ3							
CUIFD 6068 IZ3	1/8″ (3.1) Tempered	9/32″ (7)	11/32" (8.6) SGP	33	30		ESP018204P-1
CUIFD 6068 IZ3	3/16″ (4.7) Tempered	1/4" (6.5)	11/32" (8.6) SGP	34	31		ESP018204P-2
Clad Ultimate Inswing French Door							
CUIFD 6068	1/8″ (3.1) Tempered	1/2" (13)	1/8″ (3.1) Tempered	31	26		ESP018204P-6
CUIFD 6068	1/8″ (3.1) Tempered	7/16" (11.5)	5/32" (3.9) Tempered	33	28		ESP018204P-8
CUIFD 6068	1/8″ (3.1) Tempered	3/8″ (9.8)	1/4″ (5.7) Tempered	34	30		ESP018204P-10
CUIFD 6068	1/4″ (5.7) Tempered	5/16″ (8)	1/4″ (5.7) Tempered	34	29		ESP018204P-12
CUIFD 6068	1/8″ (3.1) Tempered	3/8″ (9.8)	1/4″ (6) Lami	35	30		ESP018204P-14
CUIFD 6068	3/16″ (4.7) Tempered	5/16″ (8)	1/4″ (6) Lami	35	30		ESP018204P-18
CUIFD 6068	1/4″ (5.7) Tempered	5/16″ (8)	1/4″ (6) Lami	35	30		ESP018204P-16
CUIFD 6068	1/4″ (6) Lami	9/32″ (7)	1/4″ (6) Lami	35	30		ESP018634P-1
CUIFD 6068 3/4 lite stmpd rsd pnls	1/8″ (3.1) Tempered	1/2" (13)	1/8″ (3.1) Tempered	32	26	3/4 lite stamped raised panels	ESP018204P-22
CUIFD 6068 3/4 lite stmpd rsd pnls	3/16″ (4.7) Tempered	5/16″ (8)	1/4″ (6) Lami	34	30	3/4 lite stamped raised panels	ESP018204P-24
CUIFD 6068	1/8″ (3.1) Tempered	1/2" (13)	1/8″ (3.1) Tempered	40	30	1/8" storm combination on exterior	ESP018204P-7
CUIFD 6068	1/8″ (3.1) Tempered	7/16" (11.5)	5/32" (3.9) Tempered	42	32	1/8" storm combination on exterior	ESP018204P-9
CUIFD 6068	1/8″ (3.1) Tempered	3/8″ (9.8)	1/4″ (5.7) Tempered	43	33	1/8" storm combination on exterior	ESP018204P-11
CUIFD 6068	1/4″ (5.7) Tempered	5/16″ (8)	1/4″ (5.7) Tempered	42	34	1/8" storm combination on exterior	ESP018204P-13
CUIFD 6068	1/8″ (3.1) Tempered	3/8″ (9.8)	1/4″ (6) Lami	44	33	1/8" storm combination on exterior	ESP018204P-15
CUIFD 6068	3/16″ (4.7) Tempered	5/16″ (8)	1/4″ (6) Lami	43	34	1/8" storm combination on exterior	ESP018204P-19
CUIFD 6068	1/4″ (5.7) Tempered	5/16″ (8)	1/4″ (6) Lami	43	35	1/8" storm combination on exterior	ESP018204P-17
CUIFD 6068	1/4″ (6) Lami	9/32″ (7)	1/4″ (6) Lami	44	33	1/8" storm combination on exterior	ESP018634P-2
CUIFD 6068 3/4 lite stmpd rsd pnls	1/8″ (3.1) Tempered	1/2" (13)	1/8″ (3.1) Tempered	41	31	1/8" storm combination on exterior	ESP018204P-23
CUIFD 6068 3/4 lite stmpd rsd pnls	3/16″ (4.7) Tempered	5/16″ (8)	1/4″ (6) Lami	43	34	1/8" storm combination on exterior	ESP018204P-25

STC and OITC Class Values

Marvin Sound Transmission Class and Outdoor - Indoor Transmission Class Values							
Product Type	Exterior Glazing	Airspace	Interior Glazing	STC	OITC	Additional Information	STC Report #
Clad Ultimate Outswing French Door							
CUOFD 6068	1/8″ (3.1) Tempered	1/2" (13)	1/8″ (3.1) Tempered	31	26		ESP018204P-26
CUOFD 6068	1/8″ (3.1) Tempered	7/16" (11.5)	5/32" (3.9) Tempered	33	28		ESP018204P-27
CUOFD 6068	1/8″ (3.1) Tempered	3/8″ (9.8)	1/4″ (5.7) Tempered	35	30		ESP018204P-28
CUOFD 6068	1/4″ (5.7) Tempered	5/16″ (8)	1/4″ (5.7) Tempered	34	29		ESP018204P-29
CUOFD 6068	1/8″ (3.1) Tempered	3/8″ (9.8)	1/4″ (6) Lami	36	30		ESP018204P-30
CUOFD 6068	3/16″ (4.7) Tempered	5/16″ (8)	1/4″ (6) Lami	36	30		ESP018204P-32
CUOFD 6068	1/4″ (5.7) Tempered	5/16″ (8)	1/4″ (6) Lami	35	30		ESP018204P-33
CUOFD 6068	1/4″ (6) Lami	9/32″ (7)	1/4″ (6) Lami	36	31		ESP018204P-31
Clad Ultimate Outswing French Door IZ3							
COFD 6068 IZ3	1/8″ (3.1) Tempered	9/32″ (7)	11/32" (8.6) SGP	33	29	IZ3	ESP018204P-3
COFD 6068 IZ3	3/16″ (4.7) Tempered	1/4" (6.5)	11/32" (8.6) SGP	34	31	IZ3	ESP018204P-4
Clad Ultimate Marvin Multi Slide Door / Stacked							
Multi Panel Sliding Door CN6070 OX	3/16" (4.7) Tempered	9/16" (14.5)	3/16″ (4.7) Tempered	30	27		ESP021984P-1
Multi Panel Sliding Door CN6070 OX	3/16" (4.7) Tempered	1/2" (13.0)	1/4″ (5.7) Tempered	32	29		ESP021984P-3
Multi Panel Sliding Door CN6070 OX	1/4" (5.7) Tempered	7/16" (11.5)	1/4″ (5.7) Tempered	31	28		ESP021984P-4
Multi Panel Sliding Door CN6070 OX	3/16" (4.7) Tempered	1/2" (13.0)	1/4″ (6.0) Lami	33	30		ESP021984P-5
Multi Panel Sliding Door CN6070 OX	1/4″ (6.0) Lami	9/32″ (7)	1/4″ (6.0) Lami	33	30		ESP021984P-2
Multi Panel Sliding Door CN6070 OX	3/16" (4.7) Tempered	1/4" (11.5)	11/32" (8.6) SGP	31	29	IZ3	ESP021984P-7
Multi Panel Sliding Door CN6070 OX	1/4" (5.7) Tempered	1/2" (13.0)	15/32" (11.7) SGP	32	30	IZ3	ESP021984P-6
Clad Simulated Double Hung Hopper							
CSDHHOP (1") FS 40 X 59.1"	3/16″ (4.7) Annealed	5/8" (16)	3/16″ (4.7) Annealed	33	28		ESP017948P-1
CSDHHOP (1") FS 40 X 59.1"	1/8″ (3.1) Annealed	5/16" (8)	1/8″ (3.1) Annealed	32	28	Tri-pane: two 5/16" air space with 1/8" center	ESP017948P-3
CSDHHOP (1") FS 40 X 59.1"	3/16″ (4.7) Annealed	9/16" (14.5)	1/4″ (6) LAMI	36	32		ESP017948P-7
CSDHHOP (1") FS 40 X 59.1"	1/4" (5.7) Annealed	1/2" (13)	1/4″ (6) LAMI	36	32		ESP017948P-5
CSDHHOP (1") FS 40 X 59.1"	1/4″ (6) LAMI	1/2" (13)	1/4″ (6) LAMI	37	32		ESP017948P-17

Outdoor Areas of Activity Noise Level Calculations
HUD Barrier Performance Module
and Elevation Data from USGS National Map

Assuming Buildings Only

Barrier Performance Module (BPM) Calculator

This module provides to the user a measure on the barrier's effectiveness on noise reduction. A list of the input/output variables and their definitions, as well as illustrations of different scenarios are provided.

Calculator

View Day/Night Noise Level Calculator (/programs/environmental-review/dnl-calculator/)

View Descriptions of the Input/Output variables.

Note: Tool tips, containing field specific information, have been added in this tool and may be accessed by hovering over the Input and Output variables with the mouse.

WARNING: If there is direct line-of-sight between the Source and the Observer, the module will report erroneous attenuation. "Direct line-of-sight" means if the 5' tall Observer can see the noise Source (cars, trucks, trains, etc.) over the Barrier (wall, hill/excavation, building, etc.), the current version of Barrier Performance Module will not accurately calculate the attenuation provided. In this instance, there is unlikely to be any appreciable attenuation.

Note: Barrier height must block the line of sight

Input Data

H	35	**R**[1]	126
S	7 Average vehicle height	**D**[1]	100
O	15	**α**	165

Calculate Output

Output Data

h	24	**R**	127
D	99	**FS**	11.7579

Reduction From Barrier (dB):

-11.7579

Note: If you have separate Road and Rail DNL values, please enter the values below to calculate the new combined Road/Rail DNL :

Road DNL:

74

Rail DNL:

Calculate

Combined Road/Rail DNL with Barrier Reduction:

62.2421

Input/Output Variables

Input Variables

The following variables and definitions from the barrier being assessed are the input required for the web-based barrier performance module:

- H = Barrier Height
- S = Noise Source Height
- O = Observer Height (known as the receiver)
- R^1 = Distance from Noise Source to Barrier
- D^1 = Distance from the Observer to the Barrier
- α = Line of sight angle between the Observer and the Noise Source, subtended by the barrier at observer's location

Output Variables

Definitions of the output variables from the mitigation module of the Day/Night Noise Level Assessment Tools as part of the Assessment Tools for Environmental Compliance:

- h = The shortest distance from the barrier top to the line of sight from the Noise source to the Observer.
- R = Slant distance along the line of sight from the Barrier to the Noise Source
- D = Slant distance along the line of sight from the Barrier to the Observer

The “actual barrier performance for barriers of finite length” is noted on the worksheets(in the Guidebook) as **FS**.

Assuming existing berm and only 20 feet of attenuation from the new building.

Barrier Performance Module (BPM) Calculator

This module provides to the user a measure on the barrier's effectiveness on noise reduction. A list of the input/output variables and their definitions, as well as illustrations of different scenarios are provided.

Calculator

View Day/Night Noise Level Calculator (/programs/environmental-review/dnl-calculator/)

View Descriptions of the Input/Output variables.

Note: Tool tips, containing field specific information, have been added in this tool and may be accessed by hovering over the Input and Output variables with the mouse.

WARNING: If there is direct line-of-sight between the Source and the Observer, the module will report erroneous attenuation. "Direct line-of-sight" means if the 5' tall Observer can see the noise Source (cars, trucks, trains, etc.) over the Barrier (wall, hill/excavation, building, etc.), the current version of Barrier Performance Module will not accurately calculate the attenuation provided. In this instance, there is unlikely to be any appreciable attenuation.

Note: Barrier height must block the line of sight

Input Data

H	20	**R[1]**	126
S	7 Average vehicle height	**D[1]**	100
O	15	**α**	180

Calculate Output

Output Data

h	9	**R**	126
D	100	**FS**	11.2492

Reduction From Barrier (dB):

-11.2492

Note: If you have separate Road and Rail DNL values, please enter the values below to calculate the new combined Road/Rail DNL :

Road DNL:

74

Rail DNL:

Calculate

Combined Road/Rail DNL with Barrier Reduction:

62.7508

Input/Output Variables

Input Variables

The following variables and definitions from the barrier being assessed are the input required for the web-based barrier performance module:

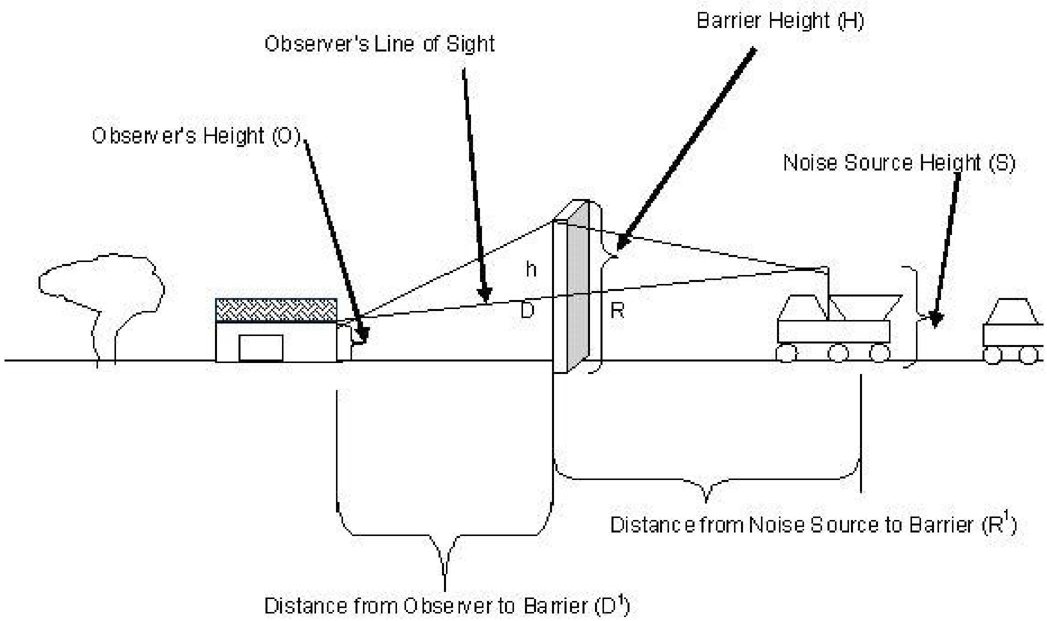
- H = Barrier Height
- S = Noise Source Height
- O = Observer Height (known as the receiver)
- R^1 = Distance from Noise Source to Barrier
- D^1 = Distance from the Observer to the Barrier
- α = Line of sight angle between the Observer and the Noise Source, subtended by the barrier at observer's location

Output Variables

Definitions of the output variables from the mitigation module of the Day/Night Noise Level Assessment Tools as part of the Assessment Tools for Environmental Compliance:

- h = The shortest distance from the barrier top to the line of sight from the Noise source to the Observer.
- R = Slant distance along the line of sight from the Barrier to the Noise Source
- D = Slant distance along the line of sight from the Barrier to the Observer

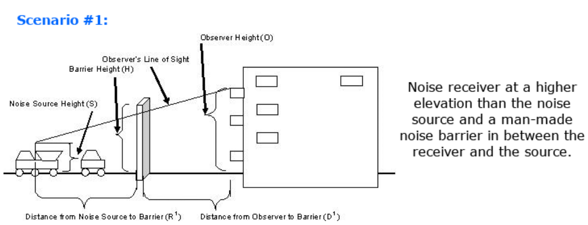
The “actual barrier performance for barriers of finite length” is noted on the worksheets(in the Guidebook) as **FS**.



Barrier Implementation Scenarios

Locate the cursor on the following thumbnails to enlarge the respective scenario as implementation examples of the barrier performance module.

Scenario #1:

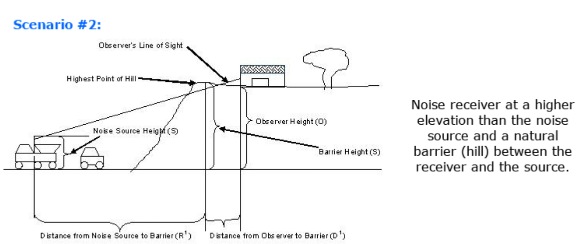


(https://www.hudexchange.info/resources/documents/Barrier-Performance-Module-Barrier-Implementation-Scenario-1.gif)

view larger version of image (/resource/3841/barrier-performance-module-bpm-barrier-implementation-scenarios/)

Noise receiver at a higher elevation than the noise source and a man-made noise barrier in between the receiver and the source.

Scenario #2:



Noise receiver at a higher elevation than the noise source and a natural barrier (hill) between the receiver and the source.

documents/Barrier-Performance-Module-Barrier-Implementation-Scenario-2.gif)

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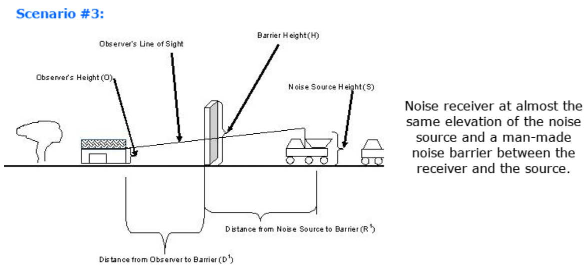
Scenario #3:



(https://files.hudexchange.info/resources/documents/Barrier-Performance-Module-Barrier-Implementation-Scenario-3.gif)

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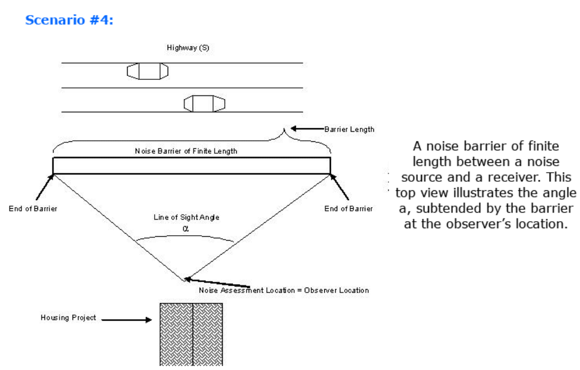
Noise receiver at almost the same elevation of the noise source and a man-made noise barrier between the receiver and the source.

Scenario #4:



(https://files.hudexchange.info/resources/documents/Barrier-Performance-Module-Barrier-Implementation-Scenario-4.gif)

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A noise barrier of finite length between a noise source and a receiver. This top view illustrates the angle α, subtended by the barrier at the observer's location.

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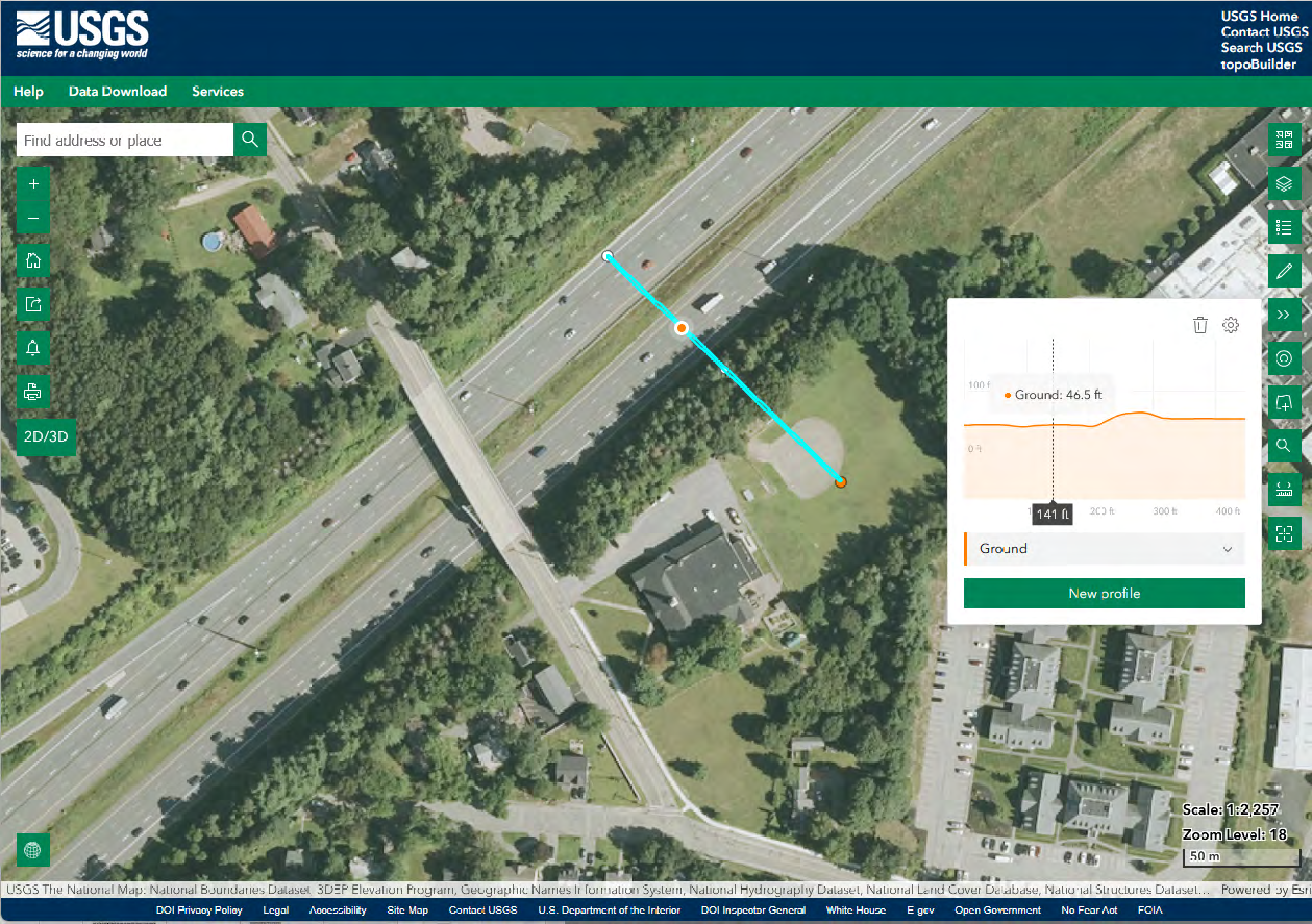
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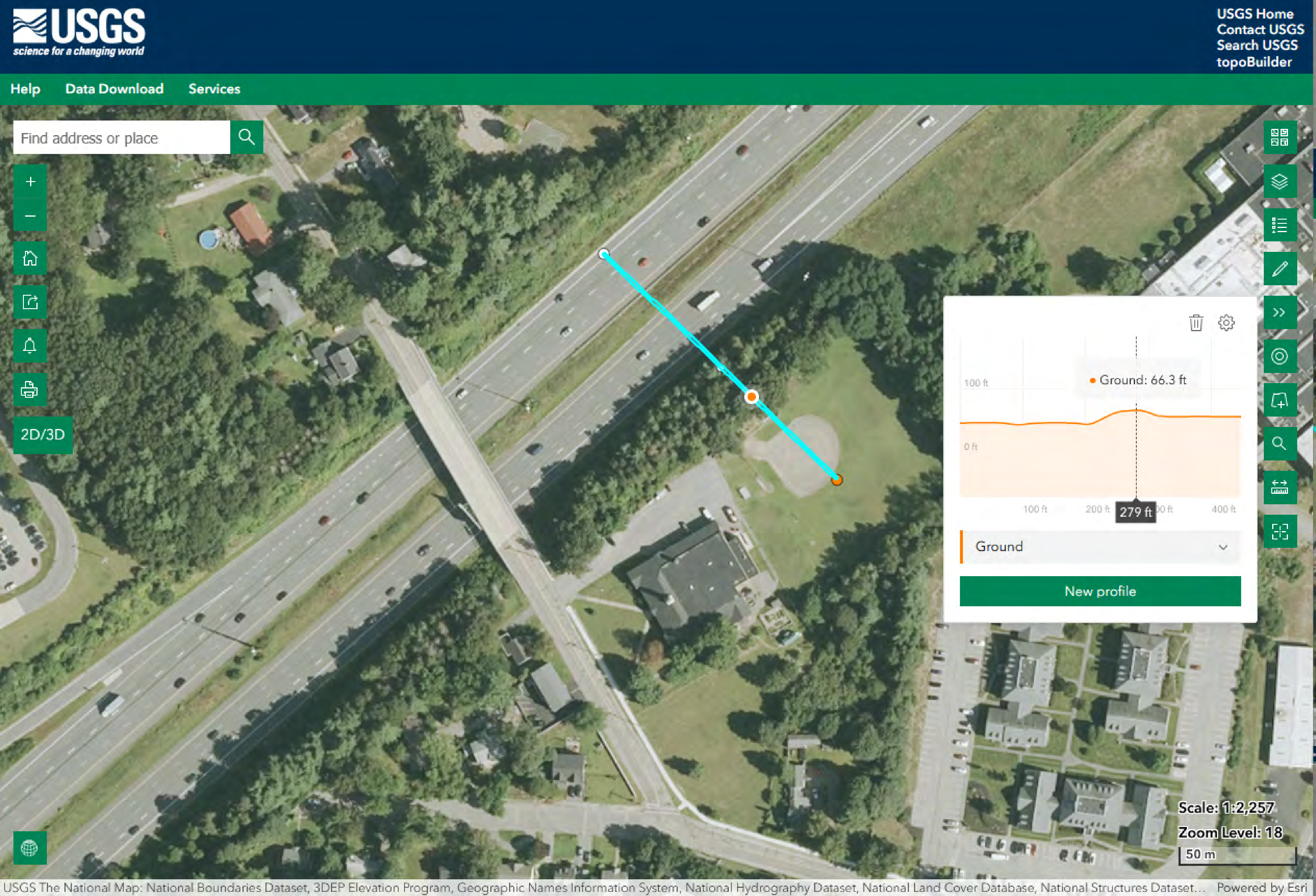

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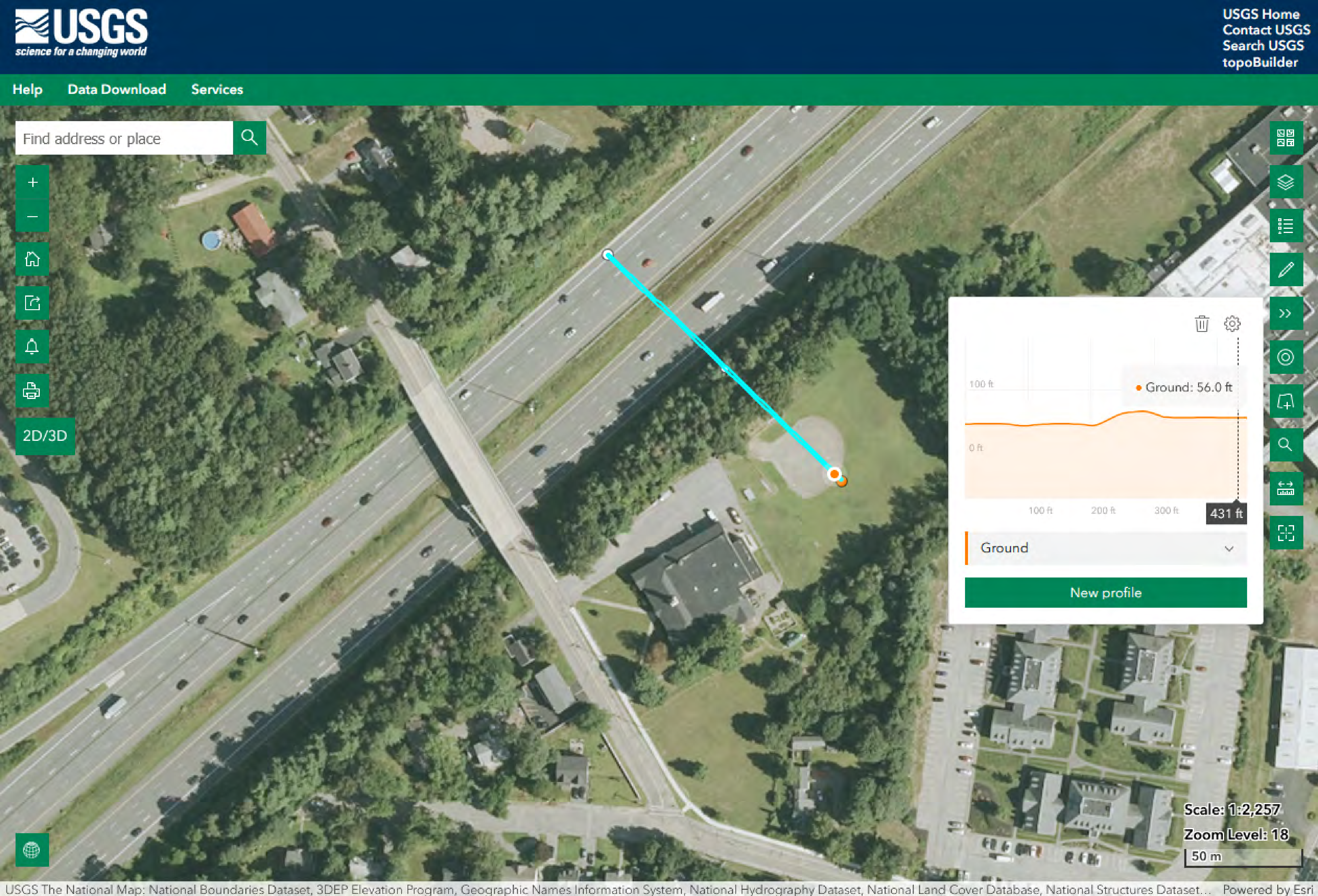
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