US 301 (SR 35) PD&E Study

CR 470 E to State Road 44 in Sumter County, FL

Noise Study Report

FDOT Office
District Five

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The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by the Florida Department of Transportation (FDOT) pursuant to 23 U.S.C. §327 and a Memorandum of Understanding dated December 14, 2016 and executed by the Federal Highway Administration and FDOT.

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Executive Summary

FDOT is conducting a Project Development and Environment (PD&E) study for an approximately 8-mile portion of US 301 between CR 470 East and SR 44 in Sumter County, as illustrated in this Noise Study Report as Figure 1-1. The traffic noise impact analysis conducted for this project is consistent with Title 23, Code of Federal Regulations (C.F.R.), § 772: *Procedures for Abatement of Highway Traffic Noise and Construction Noise* (July 13, 2010), Part II, Chapter 18 of the FDOT *Project Development and Environment Manual* (Effective June 14, 2017) and Chapter 335.17, *Florida Statutes*. This assessment also adheres to current Federal Highway Administration (FHWA) traffic noise analysis guidelines contained in FHWA-HEP-10-025: *Highway Traffic Noise: Analysis and Abatement Guidance* (December 2011). The FHWA Traffic Noise Model (TNM) - version 2.5 was used to predict traffic noise levels for this project following guidelines set forth in the *Traffic Noise Modeling and Analysis Practitioners Handbook*, FDOT, January 2016.

Impact Analysis

Table 3-4 of this report summarizes the TNM analysis in which 35 of the 78 analyzed receptor sites are predicted to have traffic noise impacts under the 2014 Existing conditions with 40 sites impacted under the No-Build Alternative. In comparison, the proposed project is expected to impact a total of 50 sites. Predicted project noise levels (averaged) along the study corridor will increase 5.5 dB(A) when compared to existing conditions. All 50 impacted noise receptor sites require abatement consideration and are discussed at length in Section 4.0 of this Noise Study Report.

Abatement Consideration

Due to limited right of way, the only abatement measure analyzed for this project is the construction of noise barriers. Seven (7) barriers were analyzed behind the proposed sidewalk and 5-feet inside the FDOT access rights of way to facilitate construction and future maintenance. The barrier analysis concluded that none of the seven analyzed barriers were reasonable and feasible.

Statement of Likelihood

Based on the noise analysis performed to date, there are no feasible solutions available to mitigate the noise impacts at the 50 impacted receptor locations. The receptors have been divided into the following FHWA Activity Categories:

- Activity Category B - 45 sites
- Activity Category C – 5 sites

Definitions

The following are the definitions of terms used in this Noise Study Report. These terms are also contained in the guiding publication put forth by the FDOT: *Project Development and Environment Manual*, Part 2, Chapter 18, Effective June 14, 2017.

- **Approach Criteria.** Approaching the criteria means within one decibel (dB) of the appropriate Federal Highway Administration (FHWA) Noise Abatement Criteria provided in Table 2-1.

- **Benefited Receptor.** The recipient of an abatement measure that receives a noise reduction at or above the minimum threshold of 5.0 dB(A).

- **Common Noise Environment**. A group of receptors within the same activity category (refer to Table 2-1) that are exposed to similar noise sources and levels; traffic volumes, traffic mix, and speed, and topographic features. Generally, common noise environments occur between two secondary noise sources, such as interchanges, intersections, and/or crossroads. A common noise environment involves a group of impacted receptors that would benefit from the same noise barrier or noise barrier system (i.e. overlapping/continuous noise barriers).

- **Date of Public Knowledge**. The approval date of the Categorical Exclusion (CE), the Finding of No Significant Impact (FONSI), the Record of Decision (ROD), State Environmental Impact Report (SEIR) or Non-Major State Action (NMSA).

- **Decibel.** A logarithmic expression of a sound level. For traffic noise purposes, and as specified by 23 CFR Part 772, the A-weighted scale, which closely approximates the range of frequencies a human ear can hear, is used. The A-weighted decibel is abbreviated dB(A).

- **Design Year.** The future year used to estimate the forecast traffic volume for which a roadway is designed. For this project, Design Year is 2042.

- **Existing Noise Levels.** The noise levels that occur during the worst noise hour resulting from the combination of natural and mechanical sources and human activity usually present in a particular area.

- **Feasibility.** A combination of acoustical and engineering factors considered in the evaluation of a noise abatement measure.

- **Impacted Receptor.** A receptor with a future design year, build alternative traffic noise level that is predicted to approach, meet, or exceed the Noise Abatement Criterion (NAC) for its respective activity category, or will experience an increase in noise levels of 15 dB(A) or more in the design year over the existing noise levels.

- **Insertion Loss**. The reduction in traffic noise levels as a direct result of a specific type of abatement measure.

- **Leq.** The equivalent steady-state sound level that, in a stated period of time, contains the same acoustic energy as the time-varying sound level during the same time period, with Leq(h) being the hourly value of Leq.

- **Multifamily Dwelling.** A residential structure containing more than one residence.

- **Noise Abatement Criteria (NAC).** The noise level, depending on activity category, at which FDOT must consider noise abatement for an impacted receptor. The NAC is referenced in Table 2-1 of this report.

- **Noise Barrier.** A physical obstruction that is constructed between the highway noise source and the noise sensitive receptor(s) for the purpose of lowering the noise level, including stand-alone barrier structures, berms (earth or other materials), and combination berm/barrier structure systems.

- **Noise Reduction Design Goal.** The optimum desired dB(A) noise reduction (insertion loss) determined by calculating the difference between future build noise levels with abatement to future build noise levels without abatement. The FDOT has selected 7 dB(A) as the noise reduction design goal for one (1) or more benefited receptors.

- **Permitted**. Development will be deemed to be permitted if the local agency with jurisdiction has granted a building permit for a specific structure associated with a noise sensitive land use, such as residential, school, place of worship, medical facility, institutional, prior to the project's Date of Public Knowledge.

- **Predicted Existing Traffic Noise Level.** The traffic noise level that is determined using the Traffic Noise Model for existing roadway conditions.

- **Predicted Future Traffic Noise Level.** The traffic noise level that is determined using the Traffic Noise Model for the future design year traffic and roadway geometry, including build and no-build alternatives.

- **Property Owner.** An individual or group of individuals that hold a title, deed, or other form of legal documentation showing ownership of a commercial or residential property.

- **Reasonableness.** The combination of social, economic, and environmental factors considered in the evaluation of a noise abatement measure.

- **Receptor.** A discrete or representative location of a noise sensitive area(s) for any of the land use categories listed in Table 2-1.

- **Residence.** A dwelling unit. Either a single family (SF) residence or an individual dwelling unit in a multifamily (MF) dwelling.

1.0 Project Description

FDOT is conducting a Project Development and Environment (PD&E) study for an approximately 8.0-mile portion of US 301 between CR 470 East and SR 44 in Sumter County. Within these limits, US 301 travels through the cities of Coleman and Wildwood and overlaps State Road 35. While mostly a north-south route, US 301 travels in an east-west direction through the City of Coleman where it has the local road name Warm Springs Avenue. Florida's Turnpike (SR 91) crosses US 301 with an interchange to the south of the northern project limit, and I-75 runs parallel to the study corridor on the west of US 301 through Sumter County.

The purpose of this project is to increase the capacity of US 301, to respond to future travel demand from the intersection of CR 470 East, north through the City of Coleman to SR 44 in the City of Wildwood. The project will also improve safety and provide multi-modal facilities for pedestrian and bicyclists, and evaluate improvements to the US 301 interchange with the Florida's Turnpike.

1.1 Proposed Improvements

Within the project limits, US 301 begins as a two-lane undivided roadway at CR 470 East with turn lanes at some intersections; makes a sharp 90° turn through the City of Coleman (Warm Springs Avenue) and then curves to the north at CR 468. It then continues north as an undivided roadway until it reaches the Florida's Turnpike interchange where a median is added. North of the interchange, the roadway is a four-lane divided, rural typical section facility. It has a short urban curb and gutter section approaching SR 44. Illustrations of the typical sections are provided in Appendix A.

The PD&E study evaluated all viable alternatives to widen US 301 to a four-lane divided roadway on the existing project corridor. Additionally, a realignment for US 301 from near CR 525 to CR 468 is proposed to minimize potential environmental impacts to the City of Coleman. This realignment is referred to as the truck route and is shown on the following page in Figure 1-1.

1.2 No-Build Alternative

Consistent with FHWA guidelines, this analysis also considers an alternative that assesses what would happen to the environment in the future if this proposed improvement were not built. This alternative, called the No-Build Alternative, consists not only of the existing roadways within the study area and the routine maintenance improvements to these facilities, but also the ongoing widening of CR 468. While the No-Build Alternative does not meet project needs, it provides a baseline condition to compare and measure the effects of the proposed project.

Figure 1-1 Project Location Map

2.0 Methodology

The traffic noise impact analysis conducted for this project is consistent with Title 23, Code of Federal Regulations (C.F.R.), § 772: *Procedures for Abatement of Highway Traffic Noise and Construction Noise* (July 13, 2010), Part II, Chapter 18 of the FDOT *Project Development and Environment Manual* (Effective June 14, 2017) and Chapter 335.17, *Florida Statutes*. This assessment also adheres to current Federal Highway Administration (FHWA) traffic noise analysis guidelines contained in FHWA-HEP-10-025: *Highway Traffic Noise: Analysis and Abatement Guidance* (December 2011).

The FHWA Traffic Noise Model (TNM) - version 2.5 was used to predict traffic noise levels for this project following guidelines set forth in the *Traffic Noise Modeling and Analysis Practitioners Handbook*, FDOT, January 2016. This program estimates the traffic noise level from a series of roadway segments (the source) at a noise sensitive site (the receptor). The TNM program requires certain data to be entered. These data are noise-influencing variables that include the volume and types of vehicles traveling the roadway, vehicular speed and roadway geometry, and the presence of existing barriers between the road and receptor such as berms and building rows.

2.1 Noise Metrics

Noise is typically defined as unwanted sound. Traffic noise is a combination of noises produced by the engine, exhaust, and tires and is never constant. As such, the noise metric used to describe this combination of noise is referred to as "L_{eq}". This metric allows for the fluctuations of daily traffic noise to be analyzed in terms of steady noise levels with the same acoustic energy, and thus, is the level of constant sound. Constant sound is quantified by a meter that measures units called decibels (dB). For highway traffic noise, an adjustment or weighting of the high and low-pitched sounds is applied to approximate the way an average person hears. These adjusted sounds are called "A-weighted decibels" and are expressed as "dB(A)".

2.2 Traffic Data

To predict project noise levels, traffic characteristics that represent the highest traffic noise impact for the design year were used in the impact modeling. Worst-case noise conditions occur with the maximum amount of traffic traveling at posted speed. In accordance with Chapter 18 of the PD&E Manual, the project's Demand Peak Hour Directional Traffic volumes were utilized for the Existing condition, for Florida's Turnpike interchange ramps, CR 470 and CR 468 under all scenarios, and for the segment of US 301 south of CR 468 under the Build Alternative. Where Demand Traffic was not used as noted, a Level of Service (LOS) "C" operating condition would produce the greatest noise impact. All traffic data used in this noise analysis are included in this report as Appendix B.

2.3 Noise Abatement Criteria

Land use plays an important role in traffic noise analyses. To determine which land uses are "noise-sensitive", this noise impact analysis used the FHWA Noise Abatement Criteria (NAC). Shown on the following page in Table 2-1, these criteria are divided into individual land use activity categories. For each of these categories, the FDOT has established noise levels at which noise abatement must be considered.

Table 2-1 Noise Abatement Criteria (Hourly A-Weighted Sound Level-decibels (dB(A))				
Activity Category	Activity Leq(h) [1]		Evaluation Location	Description of Activity Category
	FHWA	FDOT		
A	57.0	56.0	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need; and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[2]	67.0	66.0	Exterior	Residential.
C[2]	67.0	66.0	Exterior	Active sports areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, golf courses, places of worship, playgrounds, public meeting rooms, public/nonprofit institutional structures, radio studios, recording studios, recreational areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52.0	51.0	Interior	Auditoriums, daycare centers, hospitals libraries, medical facilities, places of worship, public meeting rooms, public/nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E[2]	72.0	71.0	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	-	-	-	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical) and warehousing.
G	-	-	-	Undeveloped lands that are not permitted.

(Based in Table 1 of 23 CFR Part 772)

[1] The Leq(h) Activity Criteria values are for impact determination only and are not design standards for noise abatement measures.
[2] Includes undeveloped lands permitted for this activity category.

Note: FDOT defines a substantial noise increase as occurring when the existing noise level is predicted to be exceeded by 15 decibels or more because of the transportation improvement project. When this occurs, the requirement for abatement consideration will be followed.

2.4 Identification of Noise Sensitive Sites

Land use within the study corridor is predominantly agriculture (Category F) and undeveloped lands (Category G). Scattered along US 301 are single-family residences (Activity Category B), commercial establishments (Category E), and Activity Category C properties such as a golf course, churches, daycare centers, and a park. There are no land uses in the study corridor that warrant an Activity Category A analysis. Analysis of interior (Category D) noise

levels was not required for this project. A records search for active building permits did not identify any active permits for buildings that would be considered noise sensitive.

3.0 Traffic Noise Analysis

3.1 Model Validation Process

Before TNM can be used to predict traffic noise, field measurements are required to validate the model. Following 23 CFR § 772, field measurements were taken within the study corridor using an Extech Instruments Model 407780 Type 2 Integrating Sound Level Meter. The sound level meter, calibrated at 114.0 dB(A) with an Extech Instruments Model 407766 calibrator, was adjusted to the A-weighted frequency scale which makes it respond more like a human ear. During each of the 10-minute measurement sessions, traffic data was collected and included the number of cars, medium trucks (delivery-type trucks/two axles, six wheels), buses, motorcycles, and heavy trucks (tractor-trailers, concrete trucks/more than two axles) traversing the validation site. The data collection effort also recorded the travel speed for each type of vehicle using a Bushnell Speedster hand-held radar gun.

The first measurement location, shown in Figure 3-1, is a picnic area at Shady Brook Park. This site was selected because it offered a clear view of US 301 and is representative of most noise-sensitive sites south of downtown Coleman. The weather during the May 2, 2017 monitoring sessions was 81° under partly cloudy skies with a 6-mph southerly breeze. No unusual noise events occurred. The predominant noise source at this location is US 301.

Figure 3-1 Field Measurement Location 1

The second measurement location is on CR 523 and is illustrated in Figure 3-2. This site was selected because it represents the houses adjacent to the proposed realignment (truck route). The weather during the monitoring sessions averaged 84° under partly cloudy skies with a slight southwesterly breeze. Background noise in this area is primarily attributed to neighboring livestock. At times, traffic noise from US 301 can be heard in the distance, but no traffic data was collected at this rural location.

Figure 3-2 Field Measurement Location 2

Site #2 is located away from existing, measurable traffic. Thus, this site cannot be used in the validation exercise. Since all noise levels in this analysis are based on a one-hour period, each of the 10-minute field-recorded traffic volumes at Site #1 was adjusted upward by a factor of "6" to reflect hourly traffic flow, as shown on the following page in Table 3-1.

Once adjusted, these volumes were input into TNM. Validation of TNM occurs when the model-predicted noise levels are within three decibels of the field-measured levels. Table 3-2 reflects that the model predicted noise levels within the 3.0-decibel acceptance range for each 10-minute session at Site #1. The model is considered validated and acceptable for predicting noise levels for this noise analysis.

Table 3-1 Field Measurement Data

General Information					Cars *2		Medium Trucks *2		Heavy Trucks *2		Buses *2		Motorcycles *2	
Location	Site #	Meter Placement (ft)	Begin Time	End Time	Vehicles per Hour	Speed (mph)	Vehicles per Hour	Speed (mph)	Vehicles per Hour	Speed (mph)	Vehicles per Hour	Speed (mph)	Vehicles per Hour	Speed (mph)
Shady Brook Park	1	70' from US 301 EOP *1	12:18 PM	12:28 PM	252	51	12	54	114	39	0	0	0	0
			12:30 PM	12:40 PM	312	51	18	46	108	40	0	0	0	0
			12:42 PM	12:52 PM	342	52	30	50	78	39	0	0	0	0
CR 523 Area near proposed new alignment	2	8' from CR 523 EOP / 314' from proposed US 301 EOP	10:45 AM	10:55 AM	N/A - Narrow residential road near proposed new alignment. No traffic.									
			1:06 PM	1:16 PM										
			3:35 PM	3:45 PM										

1* = EOP refers to edge of roadway pavement

2* = Field counted volumes adjusted by a factor of 6 to reflect hourly volumes need for TNM modeling.

Table 3-2 TNM Validation Results

General Information					Measured Leq(h) dB(A)	TNM Predicted Leq(h) dB(A)	TNM Difference Leq(h) dB(A)	Is Model Within +/-3 dB(A) of Measured Leq(h)?
Location	Site #	Meter Placement (ft)	Begin Time	End Time				
Shady Brook Park	1	70' from US 301 EOP *1	12:18 PM	12:28 PM	64.4	65.7	1.3	Yes
			12:30 PM	12:40 PM	64.5	65.9	1.4	Yes
			12:42 PM	12:52 PM	64.2	65.5	1.3	Yes
CR 523 Area near proposed new alignment	2	8' from CR 523 EOP / 314' from proposed US 301 EOP	10:45 AM	10:55 AM	44.5	N/A		
			1:06 PM	1:16 PM	43.9			
			3:35 PM	3:45 PM	44.3			

A total of 78 noise sensitive sites were analyzed for noise impacts. Breaking these receptor sites into activity categories, 68 are Category B residential receptors, 8 are Category C institutional/recreation sites, and 2 are office/hotel Category E properties with areas of exterior use. The reporting of project noise levels was simplified by using representative receptors within each Noise Sensitive Area (NSA). Within an NSA, there can be several common noise environments, which are defined by FDOT as a group of receptors within the same Activity Category that are exposed to similar noise sources and levels; traffic volumes, traffic mix, and speed; and topographic features. A set of project aerials illustrating the analyzed receptors is included as Appendix C.

An illustration of typical exterior and interior noises and their associated decibel levels are presented in Table 3-3. This table provides the reader a better understanding of the noise levels discussed herein. Noise levels that reach 66.0 dB(A) at Category B and C land uses require noise abatement consideration. It requires a 71.0 dB(A) noise level for a Category E land use to be impacted by traffic noise. When discussing noise level increases, the general rule that applies to perception is:

- A 3 dB(A) increase is barely perceptible to most people.
- A 5 dB(A) increase is noticeable to most people.
- A 10 dB(A) increase is perceived as twice as loud and is considered a doubling of noise.
- A 15 dB(A) increase is considered to be substantial; requiring abatement consideration regardless of the predicted noise level.

Table 3-3 Comparative Noise Levels

Outside Activity	dB(A)	Inside Activity
	110	Rock Band
Jet Flyover at 1,000 ft.		
	100	
Gas Lawn Mower at 3 ft.		
	90	
Diesel Truck at 50 mph (at 50 ft.)		Food Blender at 3 ft.
	80	Garbage Disposal at 3 ft.
Busy Urban Area Daytime		
NAC "E" Threshold	**71**	
Gas Mower at 100 ft.	70	Vacuum Cleaner at 10 ft.
NAC "B & C" Threshold	**66**	
		Busy Restaurant
Heavy Traffic at 300 ft.	60	Normal Speech at 3 ft.
NAC "A" Threshold	**56**	Large Business Office
	51	**NAC "D" Threshold**
Quiet Urban Daytime	50	
Quiet Urban Nighttime	40	Large Conference Room
Quiet Suburban Nighttime		
	30	Library
Quiet Rural Nighttime		Bedroom at Night
	10	
Threshold of Human Hearing	0	Threshold of Human Hearing

Sources: California Dept. of Transportation Technical Noise Supplement, Oct. 1998, Aviation Noise Effects Report No. FAA-EE-85-2

3.2 Predicted Noise Levels

Summarized on the following page in Table 3-4, TNM predicted noise impacts for the Existing condition, the 2042 No-Build Alternative, and the 2042 Build Alternative. Existing traffic noise impacts were calculated using 2014 traffic counts, resulting in predicted noise impacts at 35 receptor sites throughout the study corridor. The No-Build Alternative includes the completion of the CR 468 widening. Combined with the use of LOS C traffic volumes for the impact analysis, total noise impacts are predicted to increase to 40 receptors by 2042. By comparison, the proposed project is expected to impact a total of 50 sites, an increase of 70 percent over existing conditions. Each of these 50 impacted sites requires abatement consideration, discussed in depth in Section 4.0 of this Noise Study Report. A discussion of each Noise Sensitive Area and the predicted project impacts is provided after Table 3-4.

Table 3-4 Noise Impact Summary

Noise Sensitive Area (NSA)				Predicted Noise Levels (dB(A)) (Peak Direction)						
				2014 Existing Condition		2042 No-Build Alt. Predicted Noise Level	2042 Build Alternative			
Representative Receptor ID (=Impacted by Project)	# Sites Represented	Activity Category	NAC Impact Criterion (dB(A))	Distance to Existing US 301 EOP* (ft)	Predicted Noise Level		Distance to US 301 Build EOP* (ft)	Predicted Noise Level	Build Change from Existing	Consider Abatement
NSA 1: Shady Brook Golf and RV Resort- Illustrated on Sheet 1 in Appendix C										
1a	1	C	66.0	228	59.5	60.8	228	62.4	2.9	
1b	1	C	66.0	128	66.1	67.5	99	69.1	3.0	Yes
1c	1	C	66.0	292	57.5	58.7	263	60.7	3.2	
1d	1	C	66.0	145	64.6	66.0	116	68.6	4.0	Yes
1e	1	C	66.0	136	65.0	66.4	107	68.7	3.7	Yes
Summary	5				62.5	63.9		65.9	3.4	**3**
NSA 2: E. of US 301 from CR 470 East to CR 525 East - Illustrated on Sheets 1-5 in Appendix C										
2	1	B	66.0	368	55.6	56.7	290	60.6	5.0	
3	2	B	66.0	220	60.8	62.1	155	66.6	5.8	Yes
4	1	E	71.0	70	68.4	69.8	48	70.9	2.5	
5	1	B	66.0	60	69.9	71.3	37	72.6	2.7	Yes
6	1	C	66.0	104	67.2	68.7	87	70.2	3.0	Yes
9	3	B	66.0	224	60.5	61.7	202	63.8	3.3	
10	3	B	66.0	202	61.8	63.1	174	65.0	3.2	
11	1	C	66.0	207	61.3	62.6	185	64.6	3.3	
12	1	B	66.0	113	66.8	68.2	91	70.2	3.4	Yes
14	2	B	66.0	204	61.7	63.0	182	64.6	2.9	
16	4	B	66.0	53	70.6	72.0	31	73.1	2.5	Yes
Summary	20				64.1	65.4		67.5	3.4	9
NSA 3: W. of US 301 from CR 470 East to CR 525 East - Illustrated on Sheets 2-5 in Appendix C										
7	2	B	66.0	46	66.4	67.8	123	72.0	5.6	Yes
8	2	B	66.0	55	65.8	67.2	135	71.4	5.6	Yes
13	4	B	66.0	117	66.5	67.9	42	71.9	5.4	Yes

Table 3-4 Noise Impact Summary										
Noise Sensitive Area (NSA)				Predicted Noise Levels (dB(A)) (Peak Direction)						
Representative Receptor ID (=Impacted by Project)	# Sites Represented	Activity Category	NAC Impact Criterion (dB(A))	2014 Existing Condition		2042 No-Build Alt. Predicted Noise Level	2042 Build Alternative			
				Distance to Existing US 301 EOP* (ft)	Predicted Noise Level		Distance to US 301 Build EOP* (ft)	Predicted Noise Level	Build Change from Existing	Consider Abatement
15	2	B	66.0	336	56.4	57.6	239	62.1	5.7	
Summary	10				63.8	65.1		69.4	5.6	8
NSA 4: E. of New Alignment/S. of CR 468- Illustrated on Sheet 7 in Appendix C										
17	1	B	66.0	N/A	44.6	46.3	274	61.0	16.4	Yes
18	2	B	66.0	N/A	47.4	48.6	590	56.5	9.1	
Summary	3				46.0	47.5		58.8	12.8	1
NSA 5: W. of New Alignment/S. of CR 468- Illustrated on Sheet 7 in Appendix C										
19	1	B	66.0	N/A	42.5	45.0	600	56.5	14.0	
Summary	1				42.5	45.0		56.5	14.0	0
NSA 6: W. of US 301 between CR 468 and CR 512- Illustrated on Sheet 8 in Appendix C										
20	1	B	66.0	218	61.4	63.0	118	60.5	-0.9	
21	1	B	66.0	551	53.0	55.6	441	57.4	4.4	
22	1	B	66.0	130	67.7	68.2	130	67.9	0.2	Yes
23	2	B	66.0	238	61.5	62.1	238	63.8	2.3	
Summary	5				60.9	62.2		62.4	1.5	1
NSA 7: E. of US 301 between CR 468 and CR 512- Illustrated on Sheet 8 in Appendix C										
24	1	B	66.0	178	65.5	66.0	70	71.1	5.6	Yes
Summary	1				65.5	66.0		71.1	5.6	1
NSA 8: E. of US 301 between CR 512 and Florida's Turnpike - Illustrated on Sheets 9-10 in Appendix C										
25	1	B	66.0	316	58.4	58.9	233	63.6	5.2	
26	1	B	66.0	282	59.6	60.1	204	64.4	4.8	
27	11	B	66.0	99	68.8	69.3	26	73.9	5.1	Yes
28	1	B	66.0	148	66.4	66.8	74	71.1	4.7	Yes

Table 3-4 Noise Impact Summary

Noise Sensitive Area (NSA)				Predicted Noise Levels (dB(A)) (Peak Direction)						
				2014 Existing Condition		2042 No-Build Alt. Predicted Noise Level	2042 Build Alternative			
Representative Receptor ID (=Impacted by Project)	# Sites Represented	Activity Category	NAC Impact Criterion (dB(A))	Distance to Existing US 301 EOP* (ft)	Predicted Noise Level		Distance to US 301 Build EOP* (ft)	Predicted Noise Level	Build Change from Existing	Consider Abatement
Summary	14				63.3	63.8		68.3	5.0	12
NSA 9: E. of US 301 between Florida's Turnpike and SR 44 - Illustrated on Sheets 11-12 in Appendix C										
29	1	E	71.0	318	65.7	66.1	288	66.5	0.8	
30	1	B	66.0	318	62.9	63.0	288	64.7	1.8	
32	2	B	66.0	366	58.7	58.5	340	60.8	2.1	
33	1	C	66.0	118	65.4	64.5	93	69.3	3.9	Yes
Summary	5				63.2	63.0		65.3	3.0	1
NSA 10: W. of US 301 between Florida's Turnpike and SR 44 - Illustrated on Sheet 11 in Appendix C										
31a	2	B	66.0	255	69.7	70.1	228	70.6	0.9	Yes
31b	6	B	66.0	239	66.5	66.8	220	67.9	1.4	Yes
31c	2	B	66.0	201	64.3	64.3	178	66.3	2.0	Yes
31d	4	B	66.0	133	65.2	65.0	111	68.4	2.9	Yes
Summary	14				66.4	66.6		68.3	1.9	14

** = EOP represents edge of nearest travel lane pavement*

3.2.1 Noise Sensitive Area 1

Noise Sensitive Area (NSA) 1 is the Shady Brook Golf and RV Resort west of US 301 near CR 470 East. While the residential areas lie outside the project limits, a portion of the golf course is adjacent to the proposed US 301 widening. Despite the widening occurring on the east side of US 301, traffic noise levels are predicted to increase by an average of 3.4 dB(A) in this NSA.

As shown in Table 3-4, only the Hole 8 tee box (#1b) is currently impacted by traffic noise. With the proposed project, the green for Hole 6 (#1e), the tee box for Hole 7 (#1d), and the Hole 8 tee box (#1b) are predicted to have noise levels that exceed the 66.0 dB(A) Noise Impact Criterion (NAC) for Activity Category C land uses. An illustration of this NSA is provided in Appendix C on Sheet 1.

3.2.2 Noise Sensitive Area 2

East of US 301 from CR 470 East to CR 525 East is NSA 2. Through this area, the proposed project will widen US 301 on either side of the existing centerline, increasing the noise level an average of 3.4 dB(A) in this NSA. The 20 analyzed receptors within this NSA include 17 scattered residences, Category C receptors Shady Brook Park (#6) and Shady Brook Baptist Church (#11), and the Shady Oaks Gather All Nursery (#4), a Category E receptor with an area of exterior use. Of these analyzed receptors, 7 are currently experiencing traffic noise impacts; the same 7 are predicted to have impacts under the No-Build Alternative, and 9 are predicted to be impacted by the proposed project.

As shown in Table 3-4, 8 Category B receptors are impacted by project noise represented by Receptors 3, 5, 12, and 16. Also impacted is the Shady Brook Park (#6). An illustration of this NSA is provided in Appendix C on Sheets 1 through 5.

3.2.3 Noise Sensitive Area 3

To the west of US 301 from CR 470 East to CR 525 East is NSA 3 with 10 houses in proximity to the roadway which will be widened on either side of the existing centerline, increasing the noise level an average of 5.6 dB(A) in this NSA. As shown in Table 3-4, of these 10 houses, 6 are currently experiencing traffic noise impacts; 8 are predicted to have impacts under the No-Build Alternative and the proposed project. These eight impacted houses are represented by Receptors #7, #8 and #13. An illustration of this NSA is provided in Appendix C on Sheets 2-5.

3.2.4 Noise Sensitive Areas 4 and 5

NSA 4 and NSA 5 are the areas northwest and southeast of the proposed realignment of US 301, also referred to as the truck route. This rural area is predominantly agricultural land with a few houses. Four of these houses are in proximity to the realignment and are represented in Table 3-4 by Receptors 17-19. The predicted project noise levels will remain below the 66.0 dB(A) NAC, however, the increase over existing conditions is considered substantial for one house. Receptor 17 is predicted to have increased noise levels of 16.4 dB(A). An illustration of this NSA is provided in Appendix C on Sheet 7.

3.2.5 Noise Sensitive Area 6

From CR 468 north to CR 512 and west of US 301 is NSA 6. Through this area, US 301 will be shifted east as it intersects with a realigned CR 468. As shown in Table 3-4, of the five analyzed houses located in this NSA, only one is currently experiencing noise levels that exceed the 66.0 dB(A) NAC. This same house, represented by Receptor 22, will continue to be impacted by traffic noise with either the No-Build Alternative or the Build Alternative. Despite the negligible 0.2 dB(A) noise increase at this receptor, abatement consideration is required. This NSA is illustrated on Sheet 8 in Appendix C.

3.2.6 Noise Sensitive Area 7

NSA 7 is located east of US 301 adjacent to NSA 6. One house, Receptor 24, is in NSA 7. With the proposed project bringing a wider US 301 closer, traffic noise is predicted to increase by 5.6 dB(A). As shown in Table 3-4, this house is predicted to have noise levels exceeding the 66.0 dB(A) NAC under both the No-Build and Build Alternatives. This NSA is illustrated on Sheet 8 in Appendix C.

3.2.7 Noise Sensitive Area 8

East of US 301 between CR 512 and Florida's Turnpike is NSA 8. Through this area, the proposed project will widen US 301 to the east of the existing centerline, increasing the noise level an average of 5.0 dB(A) over existing conditions. Scattered throughout this NSA are 14 houses of which 12 are currently experiencing noise impacts from US 301. These same 12 houses, represented in Table 3-4 by Receptors 27 and 28, are also predicted to have noise levels exceeding the 66.0 dB(A) NAC for both the No-Build and Build Alternatives. An illustration of this NSA is provided in Appendix C on Sheets 9 and 10.

3.2.8 Noise Sensitive Area 9

Between Florida's Turnpike and SR 44, and east of US 301 is NSA 9. Through this area, the project's proposed typical section begins to tie into existing US 301; hence the predicted noise levels increase by an average of 3.0 dB(A) over existing conditions. As summarized in Table 3-4, despite this minimal increase, traffic noise impacts are predicted at the Uptown Family Childcare Center playground (Receptor 33).

The remaining 4 noise sensitive sites will not be impacted by traffic noise. These sites are the Sleep Inn pool (#29) and two houses represented by Receptors 30 and 32. An illustration of this NSA is provided in Appendix C on Sheets 11 and 12.

3.2.9 Noise Sensitive Area 10

Between Florida's Turnpike and SR 44, and west of US 301 is the last noise sensitive area in the project corridor. As summarized in Table 3-4, the predicted noise levels in NSA 10 increase by an average of 1.9 dB(A) over existing conditions. Despite this negligible increase, traffic noise impacts are predicted at 14 mobile homes in the Village RV Park (Receptor 31). These 14 mobile homes have been identified as long-term residences by comparing historical aerial mapping, on which each home site is shown to be occupied by the same structure.

The eight mobile homes closest to Florida's Turnpike (Receptors 31a and 31b) currently experience traffic noise impacts and will continue to be impacted with the No-Build Alternative. Under the proposed Build Alternative, all 14 mobile homes are impacted by traffic noise. An illustration of this NSA is provided in Appendix C on Sheet 11.

3.2.10 Impact Summary

Out of the 78-analyzed noise-sensitive receptor sites, 50 are predicted to exceed the Noise Abatement Criteria presented earlier in Table 3-4. The feasibility and reasonableness of noise barriers were considered for these 45 impacted Activity Category B receptors and 5 Category C receptors.

4.0 Noise Abatement Consideration

The most common type of noise abatement measure is the construction of a noise barrier. Due to the limited right of way and proposed typical sections, noise barriers are the only measure being considered for this project. The following discussion details where noise abatement was considered for the 50 impacted sites. When considering noise barriers for abatement, the following feasibility and reasonableness factors identified in FDOT's PD&E Manual, Chapter 18 must be evaluated.

4.1 Feasibility Factors

Feasibility factors focus on engineering considerations including the ability to construct a noise barrier using standard construction methods and techniques. Below is a discussion of these factors.

1. Safety is a critical factor. If a conflict between a noise barrier and safety exists, primary consideration must be given to safety. An example of such a conflict would be the loss of a safe sight distance (line of sight) at an intersection or driveway as a result of the placement of a noise barrier.
2. Accessibility to adjacent properties on non-limited access roadways must be given consideration since the placement of a noise barrier may block ingress and egress to these properties. Other access issues to be considered include access to a local sidewalk or normal routes of travel.
3. Right of way needs, including access rights, easements for construction and/or maintenance, and additional land must be considered as part of the feasibility of noise barrier construction.
4. Maintenance of a noise barrier must be considered to ensure that the barrier can be maintained using standard practices. Maintenance crews must have reasonable access on both sides of the barrier for both personnel and equipment.
5. Drainage is an important element that must be considered in the location and design of a noise barrier. Directing stormwater along, under, or away from a noise barrier can cause construction and maintenance problems and therefore, must be given adequate consideration.
6. Utility issues, including the impact of noise barriers on utilities and the reverse, must be assessed early in the process.
7. In addition, for a noise barrier to be considered acoustically feasible, at least two impacted receptor sites must achieve a 5.0 dB(A) reduction or greater. Consequently, noise barriers will not be evaluated for isolated impacted receptors.

4.2 Reasonableness Factors

Once a noise abatement measure is determined to be feasible, the reasonableness of noise abatement will then be determined. The following reasonableness factors must collectively be achieved for the noise abatement measure to be deemed reasonable:

1. Consideration of the viewpoints of the benefited property owners and residents. During a PD&E Study, the view of benefited receptors regarding noise abatement is gathered during workshops and at the Public Hearing if one is held. During the Final Design phase of the project, a more detailed process is implemented including noise abatement workshops and/or public survey to determine the wishes of the benefited receptor sites. Each benefited receptor, including both the owner and resident, is given the opportunity to provide input regarding their desires to have the proposed noise abatement measure constructed. The goal of this process is to obtain a response for or against the noise barrier from a majority (greater than 50 percent) of benefited receptors (owners and renters) that respond to the survey. If not supported by a majority of the benefited receptor sites, a noise barrier or abatement measure will not be deemed reasonable.
2. Cost effectiveness of the highway traffic noise abatement measure. Using the current unit cost of $30.00 per square foot, a reasonable cost of $42,000 per benefited receptor is looked upon as the upper limit. Only benefited receptors will be included in the calculation used to determine if a proposed noise abatement measure has a reasonable cost.
3. Achievement of the FDOT noise reduction design goal. As stated in 23 CFR § 772.13(d)(2)(iv) for an abatement measure to be considered reasonable, it must attain the FDOT noise reduction design goal. To ensure the provision of reasonable traffic noise abatement consideration at the greatest number of impacted locations, FDOT has selected a 7.0 dB(A) noise level reduction for one (1) or more benefited receptors as the noise reduction design goal. Failure to achieve the noise reduction design goal will result in the noise abatement measure being deemed not reasonable.

4.3 Isolated Impacted Receptors

For a noise barrier to be considered acoustically feasible, at least two impacted receptor sites must achieve a 5.0 dB(A) reduction or greater. Consequently, noise barriers will not be evaluated for the four isolated impacted receptors shown on the following page in Table 4-1. Refer to Appendix C for an illustration of where these receptors are located within the study corridor.

Table 4-1 Isolated Impacted Receptors			
Noise Sensitive Area (NSA)	**Receptor ID**	**NAC Impact Criterion (dB(A))**	**Noise Level Without Barrier (dB(A))**
NSA 2: E. of US 301 from CR 470 East to CR 525 East	12	B	70.2
NSA 4: E. of New Alignment/S. of CR 468	17	B	61.0 *Substantial Increase*
NSA 7: E. of US 301 between CR 468 and CR 512	24	B	71.1
NSA 8: E. of US 301 between CR 512 and Florida's Turnpike	28	B	71.1

4.4 Impacted Receptors with Constraints

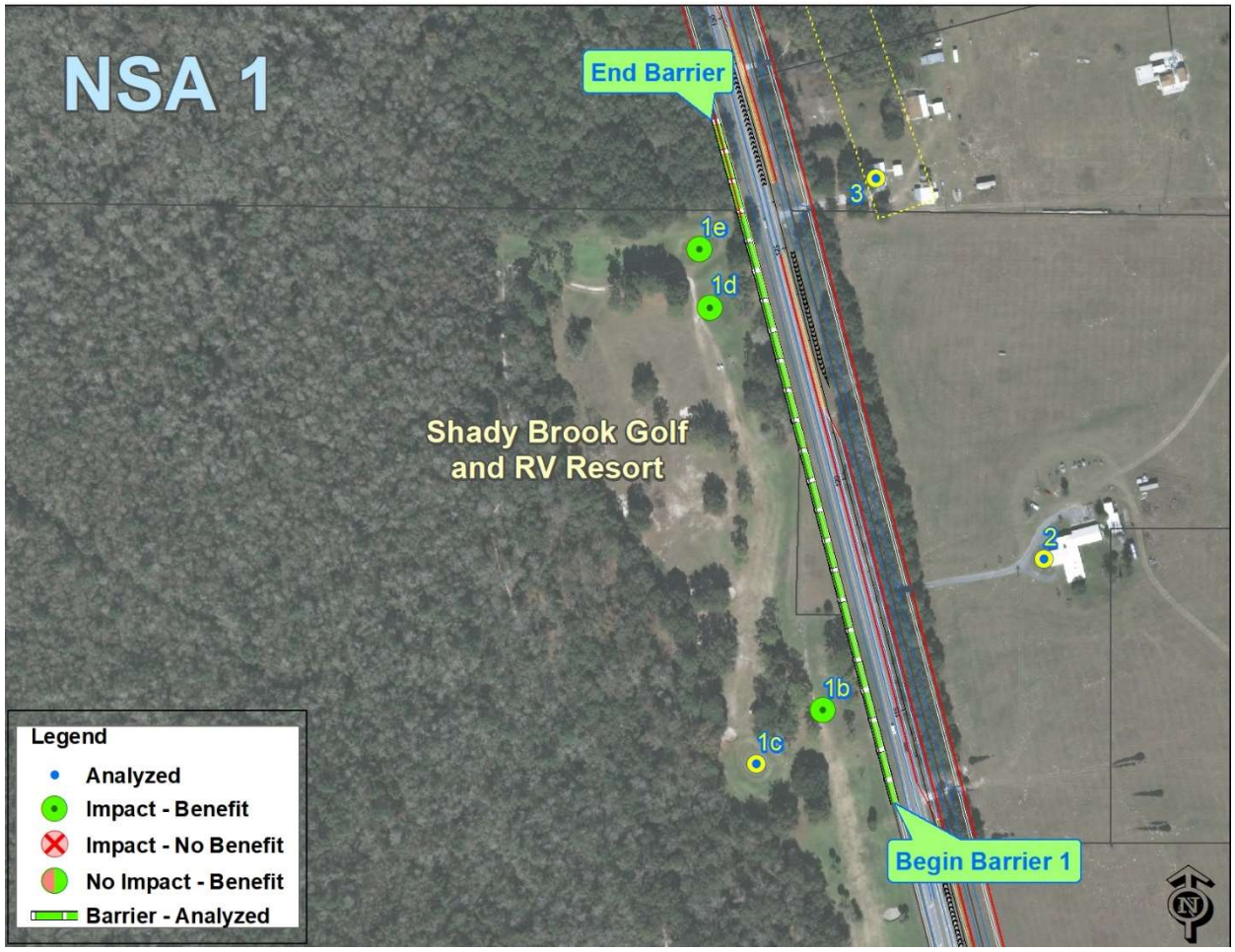
When determining feasibility, accessibility to adjacent properties on non-limited access roadways such as US 301 must be given consideration since the placement of a noise barrier may block ingress and egress to these properties (i.e. driveway connections or intersecting streets). Such openings in noise barriers destroy their insertion loss effectiveness. According to the American Association of State Highway Transportation Officials (AASHTO), "Noise barriers are ineffective in situations where there are numerous intersecting streets or where openings for access to driveways must be provided." Such is the case with 28 impacted sites identified below in Table 4-2. The driveway accesses for these 28 Category B receptors prohibit construction of a continuous noise barrier, or segmented barrier system, that can attain the minimum-required 5.0 dB(A) of noise reduction. Consequently, abatement is not considered feasible at these locations. Refer to Appendix C for an illustration of where these receptors are located within the study corridor.

Table 4-2 Impacted Receptors with Accessibility Constraints				
Noise Sensitive Area (NSA)	**Receptor ID**	**NAC Impact Criterion (dB(A))**	**Sites Represented**	**Noise Level Without Barrier (dB(A))**
NSA 2: E. of US 301 from CR 470 East to CR 525 East	3	B	2	66.6
	5	B	1	72.6
NSA 8: E. of US 301 between CR 512 and Florida's Turnpike	27	B	11	73.9
NSA 10: W. of US 301 between Florida's Turnpike and SR 44	31	B	14	66.3 - 70.6

4.5 Noise Barrier 1

To determine the feasibility of providing abatement in NSA 1 for the impacted areas at the Shady Brook Golf Course, a 1,487-foot long noise wall was analyzed behind the proposed sidewalk and five feet inside the FDOT right of way. An illustration of this analyzed barrier is included in Figure 4-1 on the following page.

Figure 4-1 Noise Barrier 1 Analysis



The feasibility analysis, summarized on the following page in Table 4-3, concluded that at heights above 10 feet, Barrier 1 achieves the 7.0 dB(A) noise reduction design goal. A barrier at this location is considered feasible for further evaluation to determine whether it is cost effective.

Table 4-3 Noise Barrier 1 -Shady Brook Golf Course (#1) Feasibility Analysis							
		Barrier Length (ft):	1487	**1487**	1487	1487	1487
		Barrier Height (ft):	8	**10**	14	16	18
Receptor ID	**Represents**	**Noise Level Without Barrier (dB(A))**	**Noise Reduction with Barrier (dB(A))**				
1b	Tee Box - 8	69.1	6.3	7.1	9.0	9.3	9.5
1c	Hole 7	60.7	<5.0	<5.0	<5.0	<5.0	<5.0
1d	Tee Box - 7	68.6	6.5	7.3	9.7	10.1	10.5
1e	Hole 6	68.7	6.5	7.2	8.8	9.1	9.3
		Avg. Noise Reduction (dB(A))	6.4	7.2	9.2	9.5	9.8
Feasible. Carry forward to Reasonableness Analysis							

Activity Category C receptors require the use of FDOT's Special Use Reasonableness Matrix to determine if the analyzed noise barrier is cost effective. The golf course operates seven days a week with tee times every 32 minutes beginning at 7:00 am to 4:32 pm. Assuming full capacity of 76 golfers per day spending approximately 15 minutes per impacted hole/tee equals 45 minutes of play time per golfer. The matrix calculated that at full capacity, the course operates below what is required to make the barrier cost effective. As such, abatement is not cost-reasonable and no further evaluation is required. This cost-reasonableness analysis is summarized on the next page in Table 4-4.

Table 4-4 Noise Barrier 1 Special Use Reasonableness Matrix (Category C Land Use)				
Item	**Criteria**	**Input**		**Description**
1	Enter length of proposed barrier	1487	feet	
2	Enter height of proposed barrier	10	feet	
3	Multiply Item1 by Item 2	14870	sq. feet	
4	Avg. amount of time person stays per visit	0.75	hours	See Assumptions
5	Avg. number people visit site per day	76	people	
6	Multiply Item 4 by Item 5	57	person-hr.	
7	Divide Item 3 by Item 6	260.877193	sq. ft/person-hr.	
8	Multiply $42,000 by Item 7	$10,956,842	$/sq. ft/person-hr.	
9	Does Item 8 exceed the "abatement cost factor" of $995,935/person-hr./ft2?	Yes		
10	If Item 9 is no, abatement is reasonable	-		
11	If Item 9 is yes, abatement is not reasonable	Not Reasonable		
Data (Per Owners): 1. Tee Times 7:00 am -4:32 pm; Groups every 32 mins = 19 rounds/day 18 hole. Assumption 1: 4 golfers/Tee time = 76 golfers/day Assumption 2: 15 minutes/hole x 3 impacted holes/Tee-Box = 45 mins (.75 hrs.)				76 0.75

4.6 Noise Barrier 2

Noise Barrier 2 is in NSA 2. To determine the feasibility of providing noise abatement for the impacted areas at Shady Brook Park (Receptor 6), the 5 picnic pavilions at the park were analyzed as separate receptors as illustrated on the following page in Figure 4-2. The two pavilions closest to US 301 (#6 and 6d) are the areas of the park impacted by traffic noise. The proposed design closes the access to the park via the dirt driveway but leaves open the current paved entrance. Because of this closure, the noise barrier was analyzed as a two-segment system, 627 feet in combined length, placed behind the proposed sidewalk and five feet inside the FDOT right of way. As shown on the following page in Table 4-5, at heights above 16 feet, the barrier provides the required 5.0 dB(A) minimum noise reduction for only one of the two impacted pavilions. However, the barrier also benefits non-impacted Pavilion 6c and meets the 7.0 dB(A) noise reduction design goal. A barrier at this location is considered feasible for further evaluation to determine whether it is cost effective.

Figure 4-2 Noise Barrier 2 Analysis

Table 4-5 Noise Barrier 2 - Shady Brook Park (#6) Feasibility Analysis					
		Barrier Length (ft):	**627**	**627**	**627**
		Barrier Height (ft):	**14**	**16**	**22**
Receptors	**Represents**	**Noise Level Without Barrier (dB(A))**	**Noise Reduction with Barrier (dB(A))**		
6	1 Pavilion	70.2	7.2	7.5	7.9
6a	1 Pavilion	62.0	<5.0	<5.0	<5.0
6b	1 Pavilion	61.9	<5.0	<5.0	<5.0
6c	1 Pavilion	65.9	<5.0	5.1	5.6
6d	1 Pavilion	67.3	<5.0	<5.0	<5.0
		Avg. Noise Reduction (dB(A))	7.2	6.3	6.8
Feasible. Carry forward to Reasonableness Analysis					

FDOT's Special Use Reasonableness Matrix was used to determine if the Noise Barrier 2 is cost effective. The park's posted operating hours are from sunrise to sunset. Summarized below in Table 4-6, conservative assumptions as to park usage were made. Assuming full capacity at the two benefited picnic pavilions, and assuming a 1.5-hour duration per stay, the matrix calculated that at full capacity, the usage at the two benefited pavilions operates below what is required to make the barrier cost effective. As such, abatement is not cost-reasonable and no further evaluation is required.

Table 4-6 Noise Barrier 2

Special Use Reasonableness Matrix (Category C Land Use)

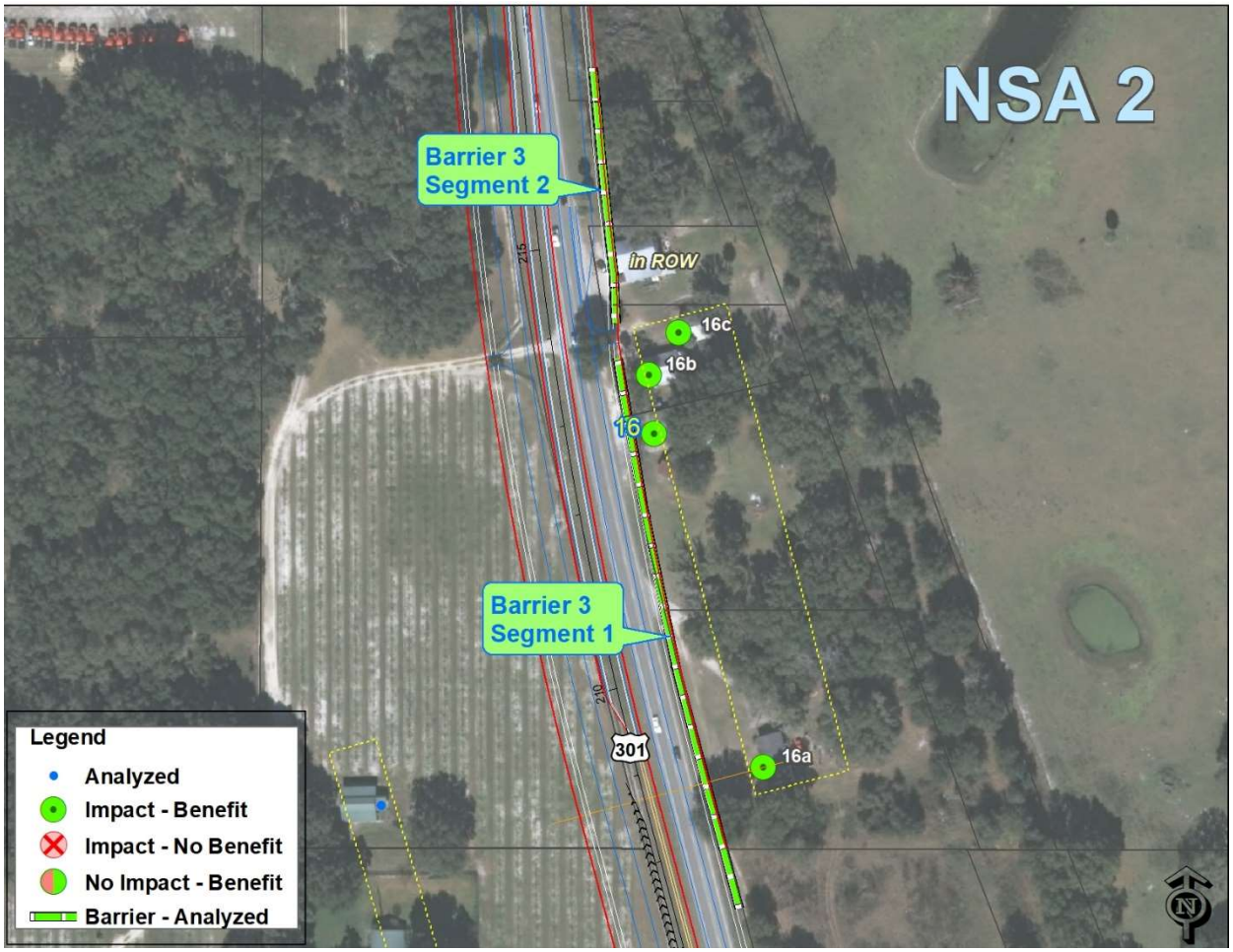
Item	Criteria	Input		Description
1	Enter length of proposed barrier	627	feet	
2	Enter height of proposed barrier	16	feet	
3	Multiply Item1 by Item 2	10032	sq. feet	
4	Avg. amount of time person stays per visit	1.5	hours	See Assumptions
5	Avg. number people visit site per day	197	people	
6	Multiply Item 4 by Item 5	295.5	person-hr.	
7	Divide Item 3 by Item 6	33.94923858	sq. ft/person-hr.	
8	Multiply $42,000 by Item 7	$1,425,868	$/sq. ft/person-hr.	
9	Does Item 8 exceed the "abatement cost factor" of $995,935/person-hr./ft2?	Yes		
10	If Item 9 is no, abatement is reasonable	-		
11	If Item 9 is yes, abatement is not reasonable	Not Reasonable		
ASSUMPTIONS				
Max. people per visit	Picnic tables seat 8; x 2 benefited tables =	16		
Posted Park Hours (Sunrise to Sunset)	Winter: 0722 - 1745	10.23	164	Max. people/day
	Spring: 0640 - 2000	13.55	217	Max. people/day
	Summer: 0645 - 2025	13.8	221	Max. people/day
	Fall: 0730 - 1900	11.7	187	Max. people/day
Time per visit	Ang time spent at a pavilion	1.5 hours	197	Avg. max people/day

4.7 Noise Barrier 3

Impacted Receptor 16 represents four houses east of US 301 in NSA 2. To facilitate the barrier analysis, each of these houses was given its own identifier (i.e., "16a"), as illustrated on the following page in Figure 4-3. These four houses utilize an unpaved easement that is parallel to US 301, to access the roadway via a shared driveway.

Because of this driveway, Barrier 3 is a two-segment system analyzed behind the proposed sidewalk and five feet inside the FDOT right of way.

Figure 4-3 Noise Barrier 3 Analysis



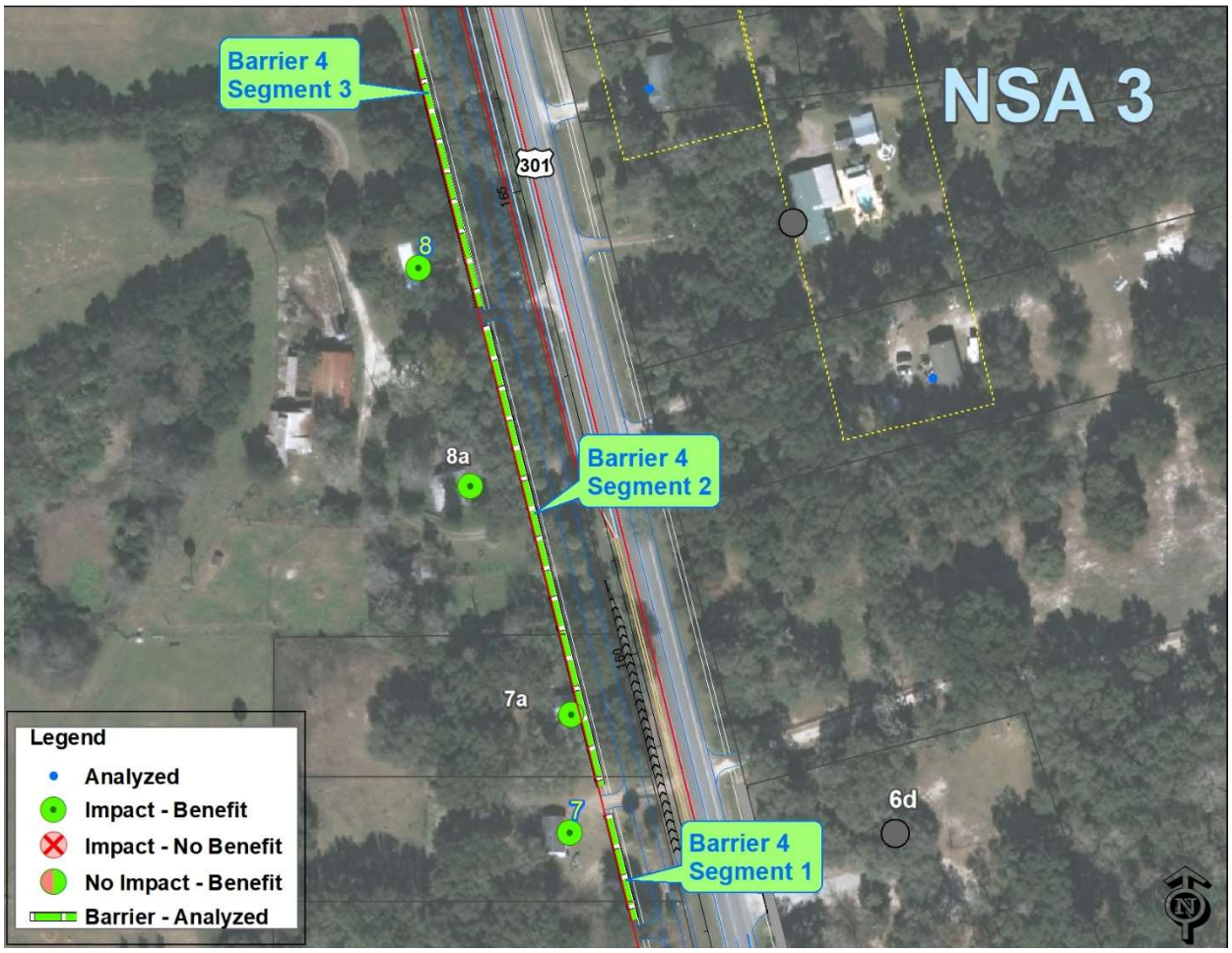
The analysis concluded that with a combined length of 923 feet and heights above 10 feet, the analyzed noise barrier achieves both the minimum-required noise reduction and the noise reduction design goal. With an average 7.3 dB(A) at the lowest effective height of 10 feet, all four impacted houses are benefited from the barrier. However, at all analyzed heights, the barrier exceeds the $42,000 upper limit for cost-reasonableness. Lowering the barrier's height to 8 feet reduces the length of the barrier, but with these lowered dimensions, the barrier exceeds the cost-reasonableness criterion. Consequently, it is not considered cost-reasonable and no further evaluation of abatement for these four impacted Category B receptors is warranted. Refer to Table 4-7 on the following page for a summary of the Barrier 3 analysis.

Table 4-7 Noise Barrier 3 - NSA 2 Residential Analysis					
		Barrier Length (ft):	690	**923**	923
		Barrier Height (ft):	8	**10**	12
Receptor	**Represents**	**Noise Level Without Barrier (dB(A))**	**Noise Level Reduction with Barrier (dB(A))**		
16	1	73.1	8.0	9.8	10.7
16a	1	70.7	6.2	7.5	8.1
16b	1	72.8	5.2	6.6	6.9
16c	1	70.4	<5.0	5.1	5.4
		Avg. Noise Reduction (dB(A))	6.5	7.3	7.8
		* Impacted/Not Benefited	1	0	0
		* Impacted/Benefited	3	4	4
		* Not Impacted/Benefited	0	0	0
		Total Benefited	3	4	4
		Total Cost	$165,600	$276,900	$332,280
		Cost/Benefited	$55,200	$69,225	$83,070
** = Minimum of 5.0 dB(A) required to be considered benefited by noise barrier.*					

4.8 Noise Barrier 4

West of US 301 in NSA 3 are four impacted houses represented by Receptors 7 and 8. To facilitate the barrier analysis, each of these houses was given its own identifier (i.e., "8a"), as illustrated on the following page in Figure 4-4. The two driveway access points for these houses are spaced approximately 510 feet apart which allows for the placement of a three-segment barrier. The Barrier 4 system was analyzed behind the proposed sidewalk and five feet inside the FDOT right of way.

Figure 4-4 Noise Barrier 4 Analysis



The analysis, summarized on the following page in Table 4-8, determined that with a combined length of 888 feet and heights at 14 feet and above, the analyzed noise barrier benefits all impacted receptors achieving both the minimum-required noise reduction and the noise reduction design goal. However, a barrier with these dimensions exceeds the upper cost-reasonableness criterion, thus, Barrier 4 is not considered reasonable and no further evaluation of abatement for these four impacted Category B receptors is warranted.

Table 4-8 Noise Barrier 4 - NSA 3 Residential Analysis					
		Barrier Length (ft):	888	**888**	888
		Barrier Height (ft):	12	**14**	22
Receptor	**Represents**	**Noise Level Without Barrier (dB(A))**	**Noise Level Reduction with Barrier (dB(A))**		
7	1	72.0	<5.0	5.0	5.2
7a	1	74.5	12.8	13.8	15.5
8	1	71.4	7.4	7.6	8.2
8a	1	71.6	10.3	11.0	12.3
		Avg. Noise Reduction (dB(A))	10.2	9.4	10.3
		* Impacted/Not Benefited	1	0	0
		* Impacted/Benefited	3	4	4
		* Not Impacted/Benefited	0	0	0
		Total Benefited	3	4	4
		Total Cost	$319,680	$372,960	$586,080
		Cost/Benefited	$106,560	$93,240	$146,520
** = Minimum of 5.0 dB(A) required to be considered benefited by noise barrier.*					

4.9 Noise Barrier 5

To abate for noise impacts to Receptor 13 in NSA 3, Barrier 5 was analyzed behind the proposed sidewalk and five feet inside the FDOT right of way along US 301. Because of the distance between the driveways, it may be possible to construct a four-segment feasible noise barrier. To facilitate the analysis, each of four impacted houses was given its own identifier (i.e., "13a"), as illustrated on the following page in Figure 4-5.

The analysis, summarized on Page 26 in Table 4-9, determined that with a combined length of 1,164 feet and at the maximum construction height of 22 feet, the analyzed noise barrier will only benefit two of the four impacted houses with an average noise reduction of 6.1 dB(A). Despite meeting the minimum-required noise reduction, Barrier 5 cannot achieve the noise reduction design goal, nor can it be constructed below the upper cost-reasonableness criterion. Consequently, Barrier 5 is not considered reasonable and no further evaluation of abatement for these four impacted Category B receptors is warranted.

Figure 4-5 Barrier 5 Analysis

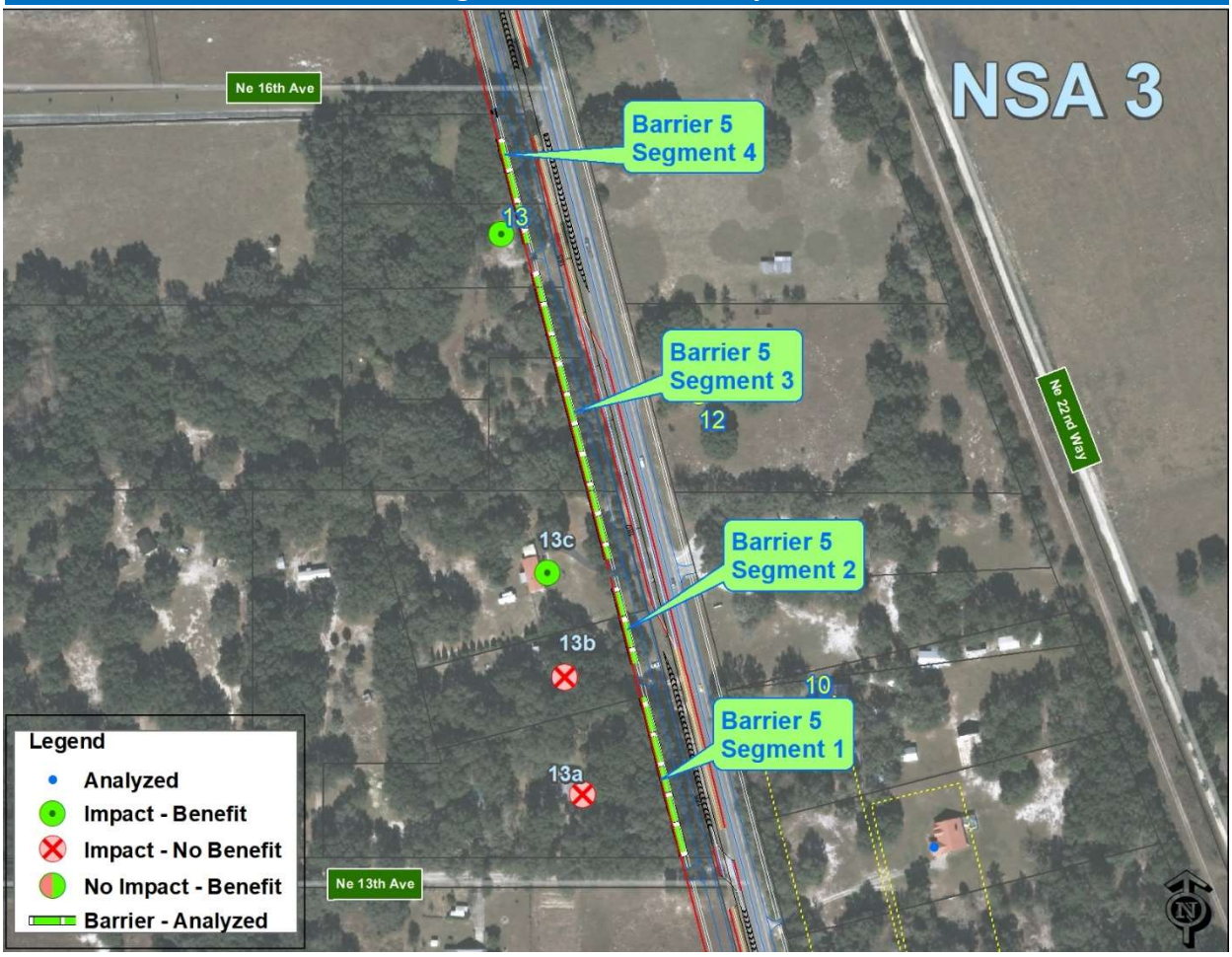


Table 4-9 Noise Barrier 5 - NSA 3 Residential			
		Barrier Length (ft):	**1164**
		Barrier Height (ft):	**22**
Receptor	**Represents**	**Noise Level Without Barrier (dB(A))**	**Noise Level Reduction with Barrier (dB(A))**
13	1	71.9	6.4
13a	1	66.1	<5.0
13b	1	67.5	<5.0
13c	1	68.7	5.7
		Avg. Noise Reduction (dB(A))	6.1
		* Impacted/Not Benefited	2
		* Impacted/Benefited	2
		* Not Impacted/Benefited	0
		Total Benefited	2
		Total Cost	$768,240
		Cost/Benefited	$384,120
** = Minimum of 5.0 dBA required to be considered benefited by noise barrier.*			

4.10 Noise Barrier 6

To abate for noise impacts in NSA 6, Barrier 6 was analyzed behind the proposed sidewalk and five feet inside the FDOT right of way along US 301 and the realigned segment of CR 468 west of the proposed intersection. To better determine the barrier's effectiveness, two additional houses were analyzed, each having its own identifier (i.e., "22a"), as illustrated on the following page in Figure 4-6. Receptor 23 was also subdivided into two individual receptors, 23 and 23a.

A continuous 652-foot barrier was evaluated to abate impacts to one house, R22. Both the minimum-required noise reduction and the noise reduction design goal are achieved at the lowest effective height of 16 feet. With an average 5.8 dB(A), the impacted house and two non-impacted houses are benefited from the barrier. However, a barrier with these dimensions exceeds the $42,000 upper limit for cost-reasonableness and no further evaluation is required. Refer to Table 4-10 on Page 28 for a summary of the analysis.

Figure 4-6 Noise Barrier 6 Analysis

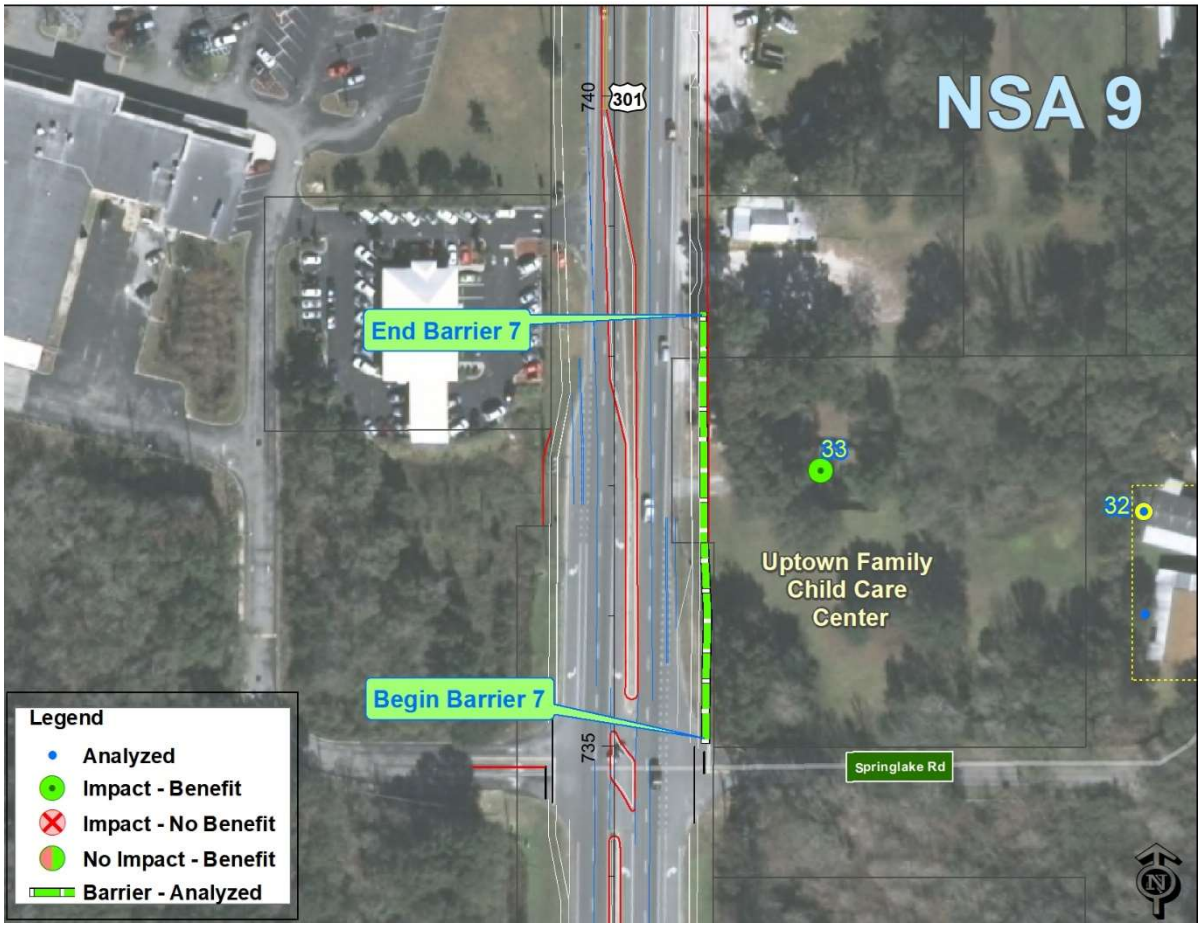
Table 4-10 Noise Barrier 6 - NSA 6 Residential Analysis					
		Barrier Length (ft):	**652**	652	652
		Barrier Height (ft):	**16**	18	22
Receptor	**Represents**	**Noise Level Without Barrier (dB(A))**	**Noise Level Reduction with Barrier (dB(A))**		
22	1	67.9	7.1	7.4	7.8
22a	1	63.3	5.2	5.6	6.1
22b	1	61.9	<5.0	<5.0	<5.0
22c	1	63.2	5.0	5.3	5.8
23a	1	62.4	<5.0	<5.0	<5.0
		Avg. Noise Reduction (dB(A))	5.8	6.1	6.6
		* Impacted/Not Benefited	0	0	0
		* Impacted/Benefited	1	1	1
		* Not Impacted/Benefited	2	2	2
		Total Benefited	3	3	3
		Total Cost	$312,960	$352,080	$430,320
		Cost/Benefited	$104,320	$117,360	$143,440
** = Minimum of 5.0 dB(A) required to be considered benefited by noise barrier.*					

4.11 Noise Barrier 7

Noise Barrier 7 was evaluated to provide abatement for the playground area at the Uptown Family Child Care Center in NSA 9, as shown on the following page in Figure 4-7. As part of the proposed project, two of the three existing driveways that access the child care center will be closed. The northernmost driveway will remain open to access the child care center and a neighboring business. Because of the driveway closures, a 332-foot long noise wall was analyzed behind the proposed sidewalk and five feet inside the FDOT right of way. The feasibility analysis, summarized below in Table 4-11, concluded that even at the maximum construction height of 22 feet, Barrier 7 cannot achieve the 7.0 dB(A) noise reduction design goal. Consequently, the barrier is not considered reasonable and no further evaluation is required.

Table 4-11: Noise Barrier 7 -(#33) Feasibility Analysis					
		Barrier Length (ft):	**332**	**332**	**332**
		Barrier Height (ft):	**16**	**18**	**22**
Receptors	**Represents**	**Noise Level Without Barrier**	**Noise Reduction with Barrier (dB(A))**		
33	Playground	69.3	<5.0	5.0	5.0
		Avg. Noise Reduction (dB(A))	<5.0	5.0	5.0
Does not meet FDOT Noise Abatement Design Goal of 7.0 dB(A)					

Figure 4-7 Noise Barrier 7



4.12 Conclusion

Design year (2042) traffic noise levels for the Build Alternative will approach or exceed the NAC at 50 impacted noise receptor sites. In accordance with FDOT's traffic noise study requirements, noise barriers were considered for all noise sensitive receptor sites where traffic noise levels were predicted to equal or exceed the NAC as a result of the proposed transportation improvement project.

Four of the impacted sites are isolated receptors that inherently cannot meet the minimum noise requirement of 5.0 dB(A) at *two* impacted receptors. Twenty-eight (28) impacted sites have accessibility constraints (i.e., numerous driveways) that negate the effectiveness of a noise barrier.

Seven (7) noise barriers were evaluated to abate for the remaining 18 impacted receptors. None of these barriers are considered reasonable and feasible. The results of the noise barrier analyses are summarized on the following page in Table 4-12.

Table 4-12 Noise Barrier Evaluation Summary									
Noise Sensitive Area	**Analyzed Barrier ID *1**	**Activity Category**	**No. Impacted Sites/Type**	**No. Benefited Sites**	**Avg. Noise Reduction dB(A)**	**Feasible Barrier Length (ft)**	**Feasible Barrier Height (ft)**	**Estimated Barrier Cost**	**Cost per Benefited Receptor Site**
NSA 1: Shady Brook Golf and RV Resort	1	C	3 holes - Shady Brook Golf Course	3	7.2	1487	10	$446,100	Exceeds Special Use
NSA 2: E. of US 301 from CR 470 East to CR 525 East	2	C	1 - Park	2	6.3	627	16	$300,960	Exceeds Special Use
	3	B	4 - residences	4	7.3	923	10	$276,900	$ 69,225
NSA 3: W. of US 301 from CR 470 East to CR 525 East	4	B	4 - residences	4	9.4	888	14	$372,960	$ 93,240
	5	B	4 - residences	2	6.1	1164	22	$768,240	$ 384,120
NSA 6: W. of US301 between CR-468 and CR 512	6	B	1 - residence	3	5.8	652	16	$312,960	$ 104,320
NSA 9: E. of US301 between Florida's Turnpike-and SR 44	7	C	1 - Daycare	1	5.0	332	22	$219,120	Exceeds Special Use

4.12.1 Statement of Likelihood

Based on the noise analysis performed to date, there are no feasible solutions available to mitigate the noise impacts at the locations identified in Table 4-12.

5.0 Construction Noise and Vibration Impacts

Based on the existing land use within the limits of this project, construction of the proposed roadway improvements is not anticipated to have any noise or vibration impact. There are no construction noise and/or vibration impacts that have been identified and for which abatement measures appear to be feasible and reasonable. If noise-sensitive land uses develop adjacent to the roadway prior to construction, additional impacts could result. It is anticipated that the application of the FDOT Standard Specifications for Road and Bridge Construction will minimize or eliminate most of the potential construction noise and vibration impacts. However, should unanticipated noise or vibration issues arise during the construction process, the Project Manager, in concert with the District Noise Specialist and the Contractor, will investigate additional methods of controlling these impacts.

6.0 Community Coordination

6.1 Noise Impact Contours

To aid in promoting land use compatibility, a copy of this report, which provides information that can be used to protect future land development from becoming incompatible with anticipated traffic noise levels, will be provided to Sumter County and local officials. In addition, generalized future noise impact contours for the properties in the immediate vicinity of the project have been developed for NAC B/C and E (i.e., residential, other sensitive land uses, and sensitive commercial land uses, respectively). These contours represent the approximate distance from the edge of the nearest proposed travel lane of US 301 to the limits of the area predicted to approach [i.e., within 1 dB(A)] or exceed the NAC in the Design Year 2042. The contours do not consider any shielding of noise provided by structures between the receptor site and the proposed travel lanes. Within the project corridor, the distance between the proposed edge of the outside travel lane and the noise contour line at various locations is presented in Figures 6-1 through 6-4 beginning on the following page. To minimize the potential for incompatible land use, noise sensitive land uses should be located beyond these distances.

6.2 Public Meetings

The Florida Department of Transportation is committed to working with local governments, developers, and residents by providing them access to this Noise Study Report. A draft was made available 21 days prior to and at the Public Hearing conducted on December 3, 2018. Comments were accepted up until 14 days after the Hearing.

Figure 6-1 Noise Impact Contour CR 470E to CR 525

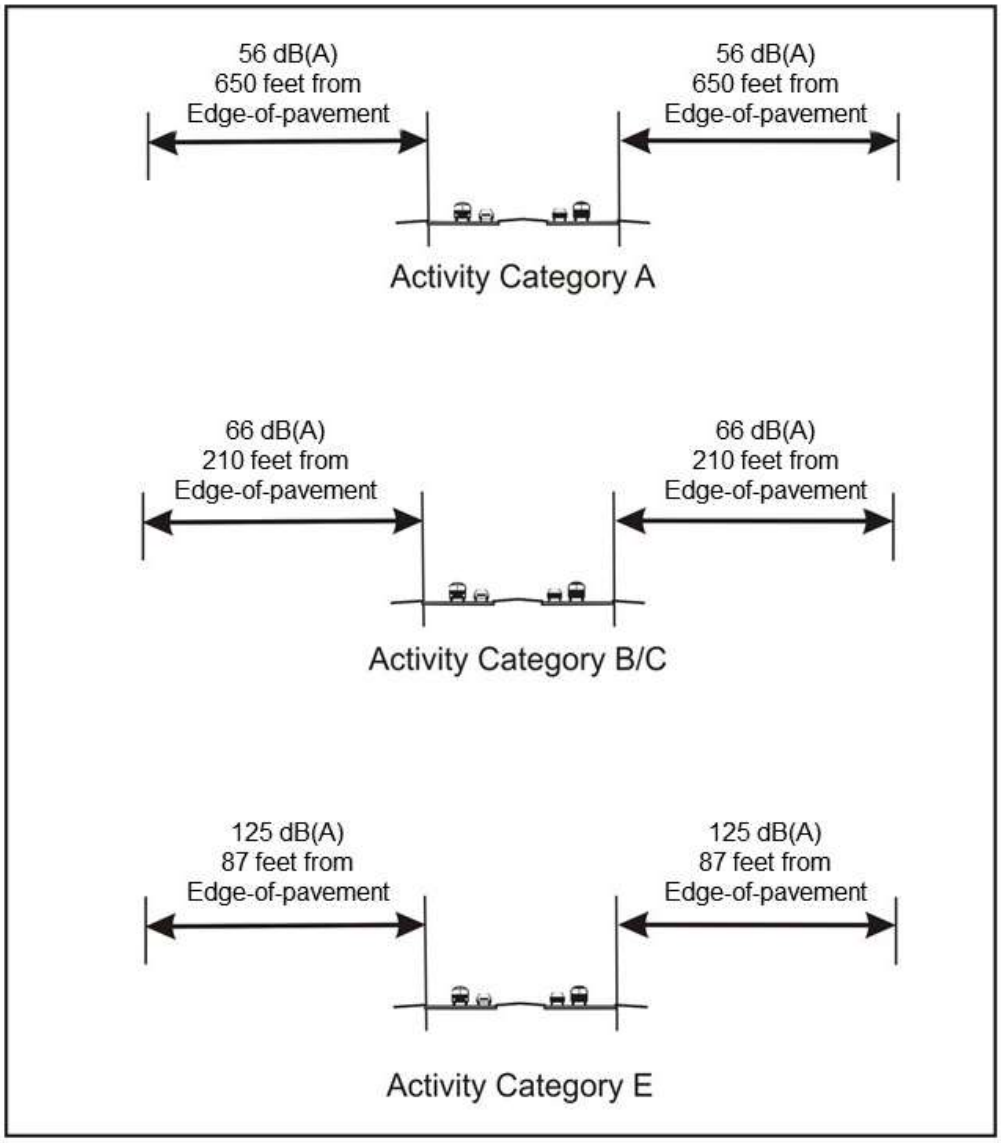


Figure 6-2 Noise Impact Contour - CR 525 to CR 468

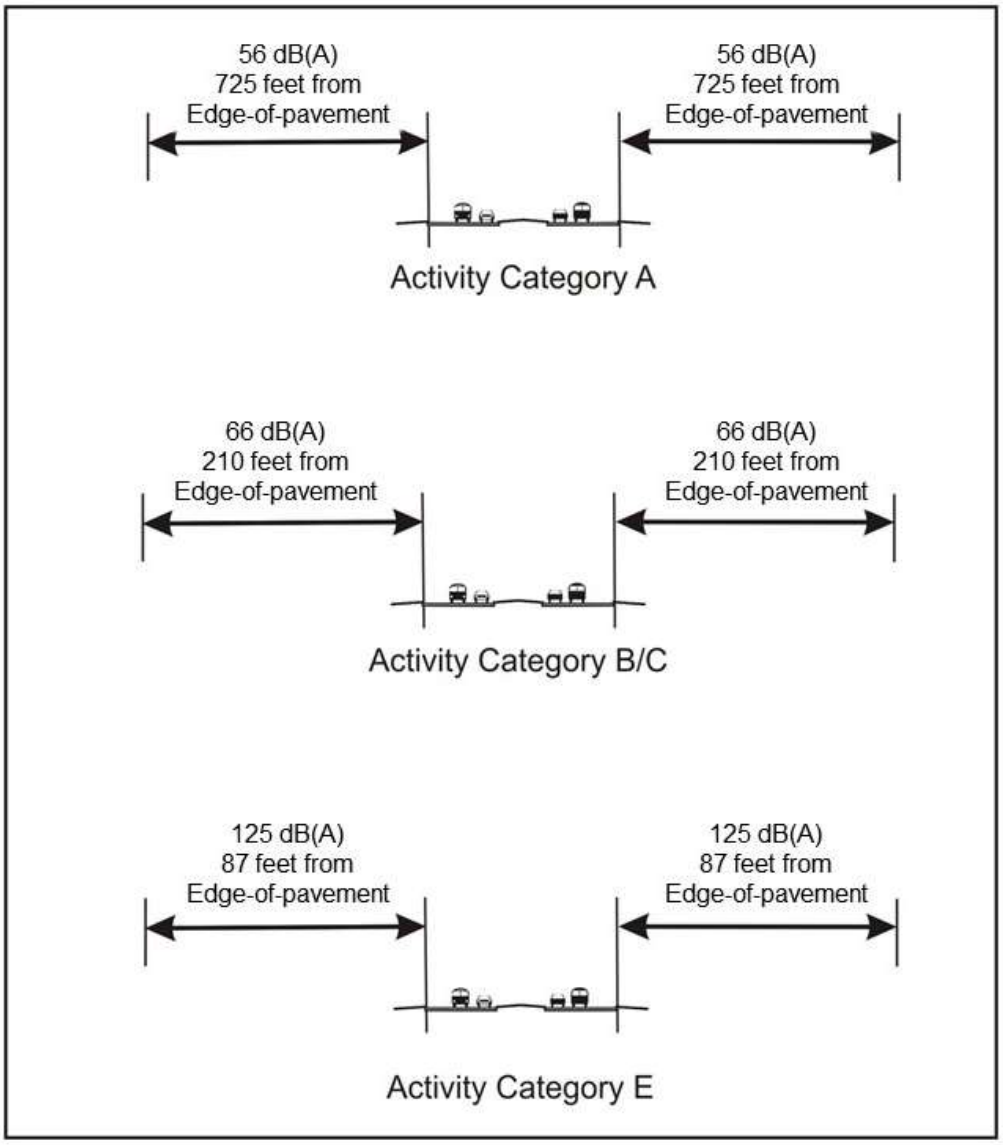


Figure 6-3 Noise Impact Contour - CR 468 to Florida's Turnpike

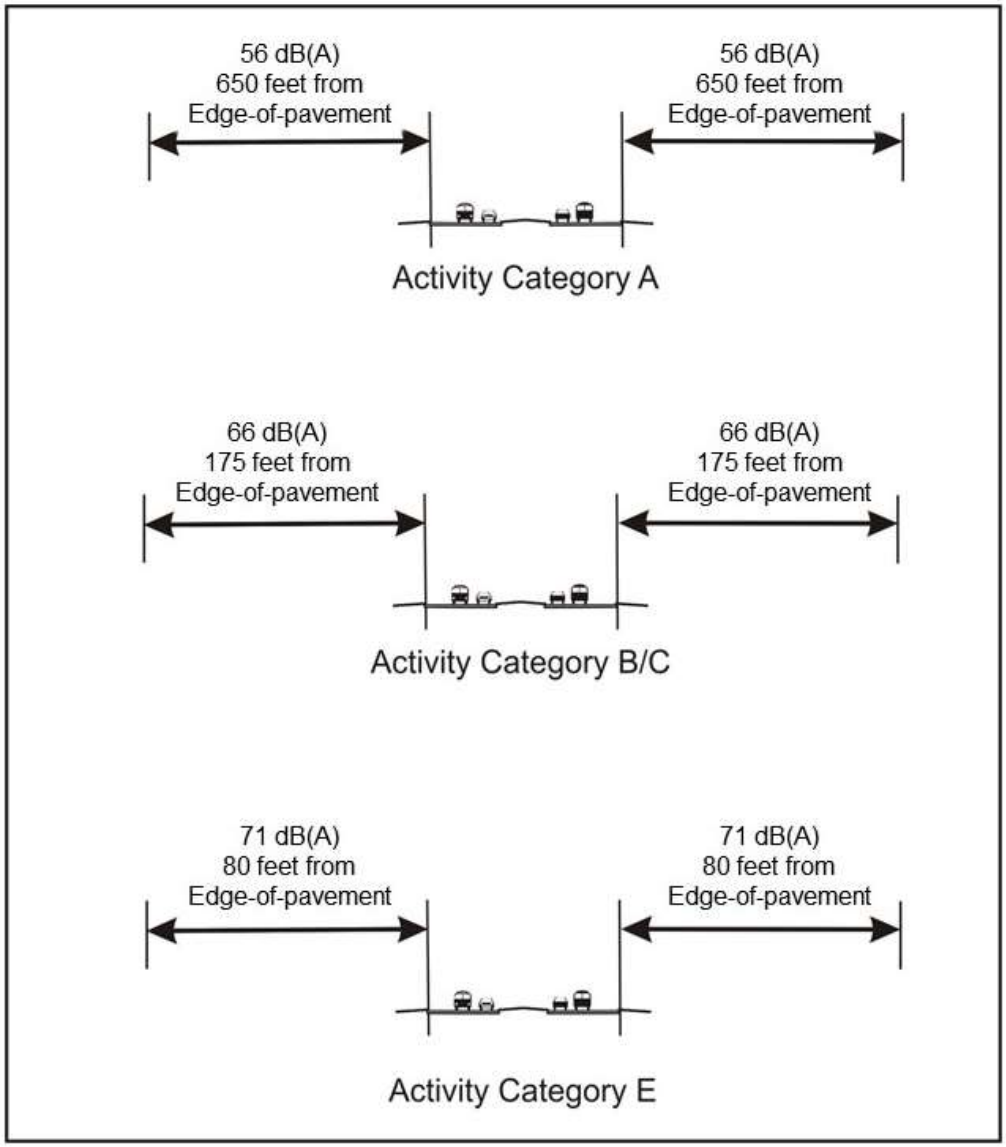
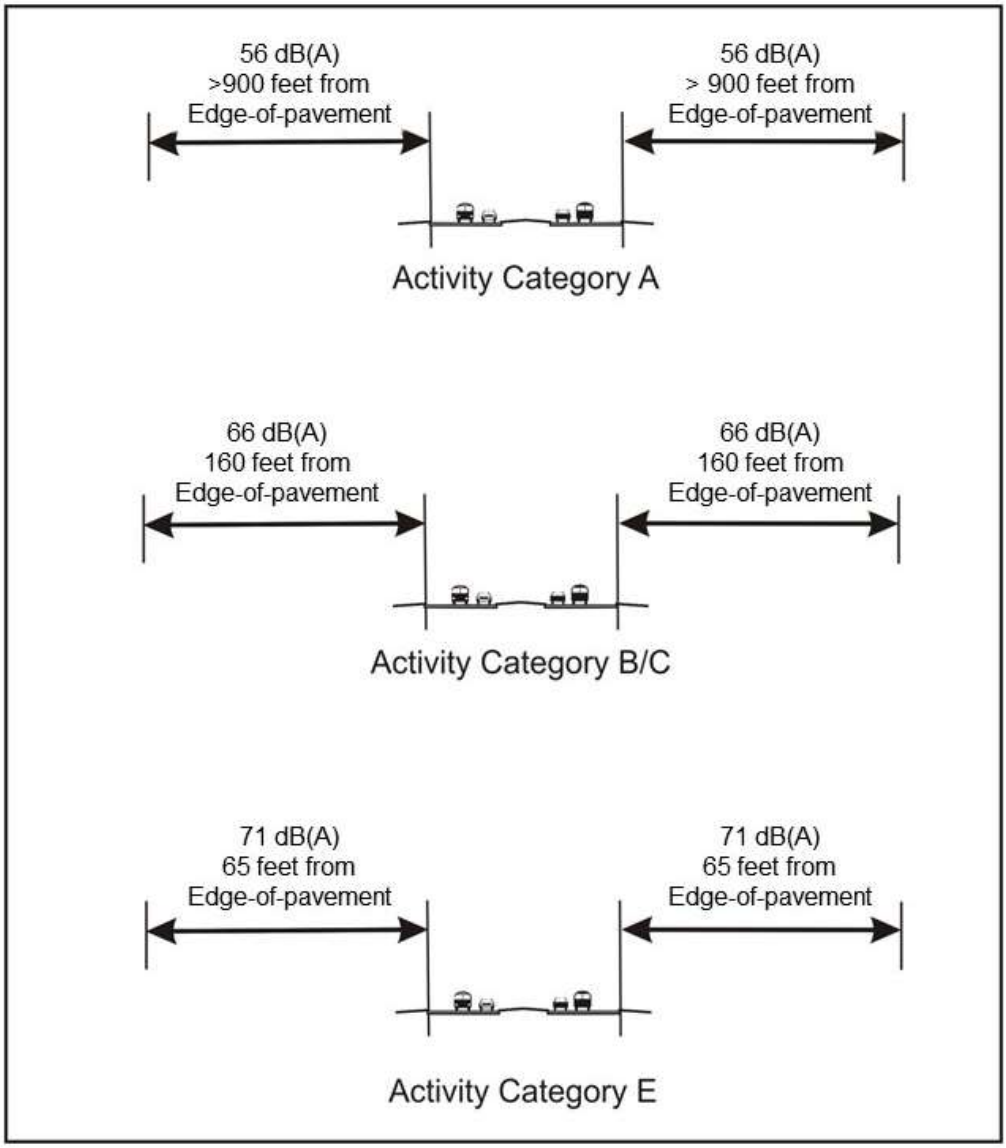


Figure 6-4 Noise Impact Contour - Florida's Turnpike to SR 44



7.0 Bibliography

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