Draft Noise Study Report

for the

Prepared for:

Seminole County Contract No.: PS-5738-10/JVP
Financial Project ID: 240216-4-28-01
Federal Aid Project No.: TCSP-045-U
ETDM No.: 4972

January 2014

NOISE STUDY REPORT

State Road 46

from East of SR 415 to CR 426
Seminole County, Florida

Project Development and Environment (PD&E) Study

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Prepared For:
Seminole County
Florida Department of Transportation, District Five

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January 2014

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EXECUTIVE SUMMARY

Seminole County, in consultation with the Florida Department of Transportation (FDOT), is conducting a Project Development and Environment (PD&E) study to evaluate possible alternative improvements to widen State Road 46 (SR 46).

In accordance with *Title 23 Code of Federal Regulations Part 772 (23 CFR Part 772)*, "Procedures for Abatement of Highway Traffic Noise and Construction Noise", and the procedures outlined in the Florida Department of Transportation (FDOT) Project Development and Environment (PD&E) Manual (Part 2, Chapter 17), a noise impact study was conducted for the SR 46 PD&E Study.

Sixty-seven (67) receptor areas were chosen to represent 74 potential noise sensitive sites along the project corridor. Predicted noise levels for these receptor sites for the Existing Year (2013 and the Design Year (2035) No Build and Build Alternatives were determined using the Federal Highway Administration (FHWA) Traffic Noise Model (TNM).

Noise levels at 20 noise sensitive receptor sites are predicted to approach or exceed the NAC for the Design Year 2035 Build Alternative. Compared to existing conditions, no noise sensitive receptor sites are expected to experience a substantial increase in traffic noise as a result of this project. Based on impacts to the noise sensitive sites that approached or exceeded NAC, noise abatement measures were evaluated within the project corridor. For this evaluation of noise abatement measures, impacted sites were grouped into three noise sensitive areas (NSAs) based on their proximity, similar characteristics and geography. Although feasible, traffic management, alternative alignments, and property acquisitions were determined to be unreasonable methods of reducing predicted traffic noise impacts to the affected receptors.

Based on predicted noise levels exceeding the NAC, noise barrier evaluations were performed as potential abatement for noise sensitive sites contained in NSA 1, NSA 2, and NSA 3. The results of these barrier evaluations indicate that the construction of noise barriers does not appear to be a feasible or cost reasonable method of reducing traffic noise impacts for the proposed improvements to SR 46. Therefore, based on the noise analyses performed to date, there appears to be no apparent solutions available to mitigate the noise impacts at the 20 noise sensitive receptor sites predicted to approach or exceed the NAC for the Design Year 2035 Build Alternative.

1.0 INTRODUCTION

Seminole County, in consultation with the Florida Department of Transportation (FDOT), is conducting a Project Development and Environment (PD&E) study to evaluate possible alternative improvements to widen State Road 46 (SR 46). SR 46 is an east-west arterial highway that extends from US 441 in Mount Dora (Lake County) to US 1 in Mims (Brevard County). The limits of this PD&E Study are from east of SR 415 in unincorporated Seminole County to CR 426 in Geneva, FL, an unincorporated census-designated place (see Figure 1). The project length is approximately 7.4 miles.

Figure 1: Project Location Map

An objective of the PD&E study is to gain approval from Federal Highway Administration (FHWA) for a Type II Categorical Exclusion (CE) for the widening of SR 46 and approval of the Location and Design Concept (LDCA) for the preferred alternative.

As part of the SR 46 Widening PD&E Study, a traffic noise study has been conducted. The primary objectives of this noise study are to: 1) describe the existing site conditions including noise sensitive land uses within the project study area, 2) document the methodology used to conduct the noise assessment, 3) assess the significance of traffic noise levels on noise sensitive sites for both the No Build and Build Alternatives, and 4) evaluate abatement measures for those

noise sensitive sites that approach or exceed FDOT's and FHWA's Noise Abatement Criteria (NAC) with the Build Alternative. The methods and results of the noise study performed for the SR 46 widening project are summarized in this report. The information within this report is also intended to provide the technical support for the findings presented in the Project Development Summary Report.

1.1 Purpose and Need for Improvement

The SR 46 widening project will serve as an improvement to a major hurricane evacuation route for northern Brevard and southern Volusia Counties. This evacuation route is imperative for those counties since the nearest east-west evacuation routes are located approximately 8 miles to the south (State Road 50) and approximately 25 miles to the north (State Road 44). State Road 50, the nearest alternative route, is anticipated to be over capacity by year 2035.

The overall project will alleviate traffic congestion and correct safety and roadway deficiencies. The specific transportation needs include to:

- Provide a higher capacity east-west travel facility in Seminole County.
- Improve safety to reduce vehicle crash fatalities and injuries on SR 46.
- Develop a transportation facility that minimizes impacts to the area's resources.

The widening of the SR 46 corridor between SR 415 and CR 426 as a four-lane section is included as a planned improvement in the MetroPlan Orlando 2030 Long Range Transportation Plan (LRTP). The project is also in the Seminole County Comprehensive Plan and is number 11 on the MetroPlan Orlando Prioritized Project List.

1.2 Project Description

SR 46 is an integral component of Central Florida's transportation and evacuation system that traverses Lake, Seminole, and Brevard Counties with interchanges at I-4 and I-95. SR 46 is currently a two-lane rural roadway extending between SR 415 and CR 426 in eastern Seminole County. The project length is approximately 7.4 miles. The western terminus connects to SR 415, which is under construction to a four-lane divided facility. Lake Mary Boulevard, which was recently extended to SR 415, provides a direct connection to the Orlando-Sanford International Airport and the Seminole Expressway (SR 417). The eastern terminus of the project occurs at CR 426 (Geneva), which provides a direct connection to the city of Oviedo. Within the project limits, SR 46 is a two-lane rural principal arterial comprised of 12-foot lanes in each direction with six-foot shoulders (four-foot paved). Figure 2 depicts the existing typical section.

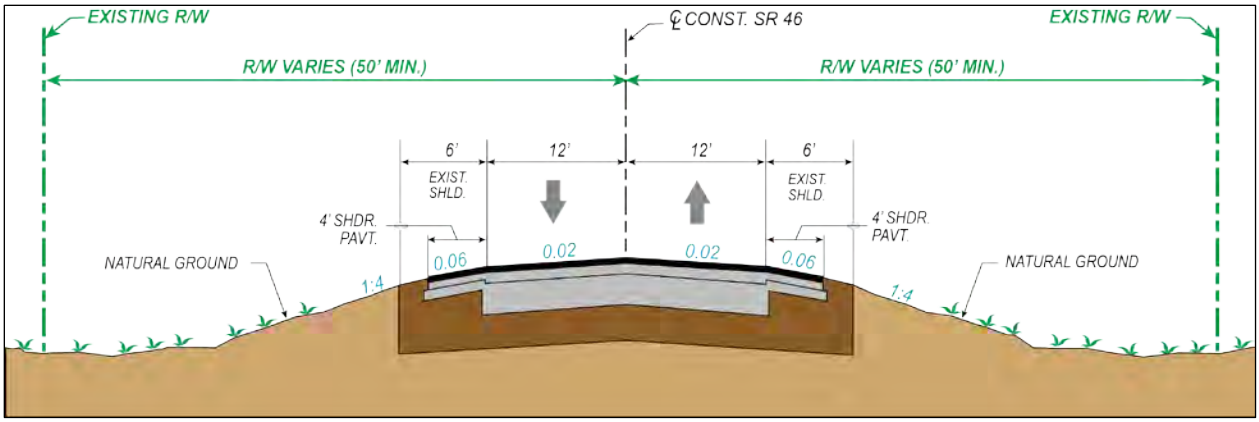


Figure 2: Existing Typical Section

1.3 Project Alternatives

For the purpose of this PD&E study, the SR 46 widening project was subdivided into four (4) segments.

- Segment 1 consists of the expansion of the existing two-lane rural roadway to a four-lane suburban roadway section from SR 415 to the west end of the Lake Jesup Bridge.
- Segment 2 consists of an additional two-lane bridge over Lake Jesup. The proposed four-laning would result in the construction of a new bridge over Lake Jesup, of parallel structure and of the same length, north of the newly constructed Lake Jesup Bridge.
- Segment 3 consists of the expansion of a two-lane rural roadway to a four-lane suburban roadway segment from the east end of the Lake Jesup Bridge to Hart Road.
- Segment 4 consists of the expansion of a two-lane rural roadway to a four-lane urban roadway segment from Hart Road to CR 426.

In addition, drainage, stormwater management facilities, and access management are included as part of this project.

There were five alternatives analyzed as part of the PD&E study, one No-Build Alternative and four Build Alternatives. Special considerations in the development of the alternatives included providing bicycle facilities and improvements to major intersections. The PD&E study addresses engineering solutions and their potential impacts to the human, natural, and physical environment. The alternatives include:

Build Alternative 1

- SR 415 to Lake Jesup (Suburban North Typical Section)
- Lake Jesup to Hart Road (Suburban Best Fit Typical Section)
- Hart Road to CR 426 (Urban Typical Section)

Build Alternative 2

- SR 415 to Lake Jesup (Suburban South Typical Section)
- Lake Jesup to Hart Road (Suburban Best Fit Typical Section)
- Hart Road to CR 426 (Urban Typical Section)

Build Alternative 3

- SR 415 to Lake Jesup (Suburban North Typical Section)
- Lake Jesup to Hart Road (Rural Best Fit Typical Section)
- Hart Road to CR 426 (Urban Typical Section)

Build Alternative 4

- SR 415 to Lake Jesup (Suburban South Typical Section)
- Lake Jesup to Hart Road (Rural Best Fit Typical Section)
- Hart Road to CR 426 (Urban Typical Section)

No-Build Alternative 5

- SR 46 remains a 2-lane arterial

Once the typical sections were identified, typical section alternatives were selected by segment.

Segment 1 - In order to minimize impacts to existing conservation easements both north and south of SR 46 within this segment, only the suburban typical sections will be considered for Segment 1. Alternative A uses the Suburban Widen North typical section and Alternative B uses the Suburban Widen South typical section.

Segment 2 - Segment 2 is the bridge typical section and is dependent on the typical section selected for Segment 3 as indicated above. The Bridge with Shared Use Path typical section is compatible with the suburban typical section and the Bridge without Shared Use Path is compatible with the rural typical section.

Segment 3 - Both the rural and suburban typical sections are appropriate for use within Segment 3. Both typical sections will be evaluated and vary between north and south widening in order to minimize impacts to both the natural, physical and social environments. These combinations of north and south widenings are known as the Rural Best Fit and Suburban Best Fit alternatives.

Segment 4 - Only the urban typical section is being analyzed for Segment 4 in order to minimize right-of-way acquisition to commercial land uses in the downtown Geneva area.

Build Alternatives were developed from the alternatives listed for each segment. The bridge with the shared use path is compatible with the Suburban Best Fit Alternative and the bridge without the shared use path is compatible with the Rural Best Fit Alternative. The Segment 1 typical section alternatives are interchangeable and the Segment 4 typical section alternative woks with either the Suburban or Rural Best Fit alternatives. Table 1.1 lists the potential Build Alternatives for the widening of SR 46.

Table 1.1 Build Alternatives

Build Alternative	Segment 1	Segment 2	Segment 3	Segment 4
1	Suburban North	Bridge with Path	Suburban Best Fit	Urban
2	Suburban South	Bridge with Path	Suburban Best Fit	Urban
3	Suburban North	Bridge without Path	Rural Best Fit	Urban
4	Suburban South	Bridge Without Path	Rural Best Fit	Urban

The No-Build Alternative provides no improvements to SR 46 within the project limits. Other planned and programmed roadway projects identified in MetroPlan Orlando's LRTP are assumed to be implemented. The absence of construction-related and short-term operational impacts associated with the Build Alternative is a benefit of the No-Build Alternative. Long-term benefits accrued from serving future traffic demands would not be realized with this alternative. Continued traffic growth on SR 46 will result in traffic volumes in excess of capacity, thereby increasing congestion. The No-Build Alternative does not fulfill the purpose and need of the project. Distinct advantages and limitations associated with the No-Build Alternative are as follows:

Advantages

- No impedance to traffic flow during construction.
- No disruption to existing land uses because of construction activities.
- No right-of-way acquisition or relocations.
- No expenditure of funds for engineering design or construction.
- No impacts to the adjacent natural, physical, human, and social environments.

Limitations

- Increase in traffic congestion and user cost associated with increased travel time due to excessive delay.
- Increase in carbon monoxide and other pollutants due to increased traffic congestion.
- Increase in maintenance costs due to roadway and structure deterioration.
- Increase in emergency vehicle response time.
- Increase in evacuation time during weather emergencies as a result of heavy congestion.
- Increase in crash potential because of increased congestion.
- Not compatible with the area's long range plans.
- No opportunity for potential additional mitigation to Lake Jesup/St. Johns River.

The No-Build Alternative will remain a viable alternative through the Public Hearing.

The recommended alternative was selected to not only avoid and minimize impacts to natural resources but also to minimize cost and maximize safety. The evaluation focused on minimizing impacts to public conservation lands, conservation easements, wetlands, and potential habitat for threatened and endangered (T&E) species.

Figures 3 through 6 depict the typical sections that are proposed for the recommended alternative.

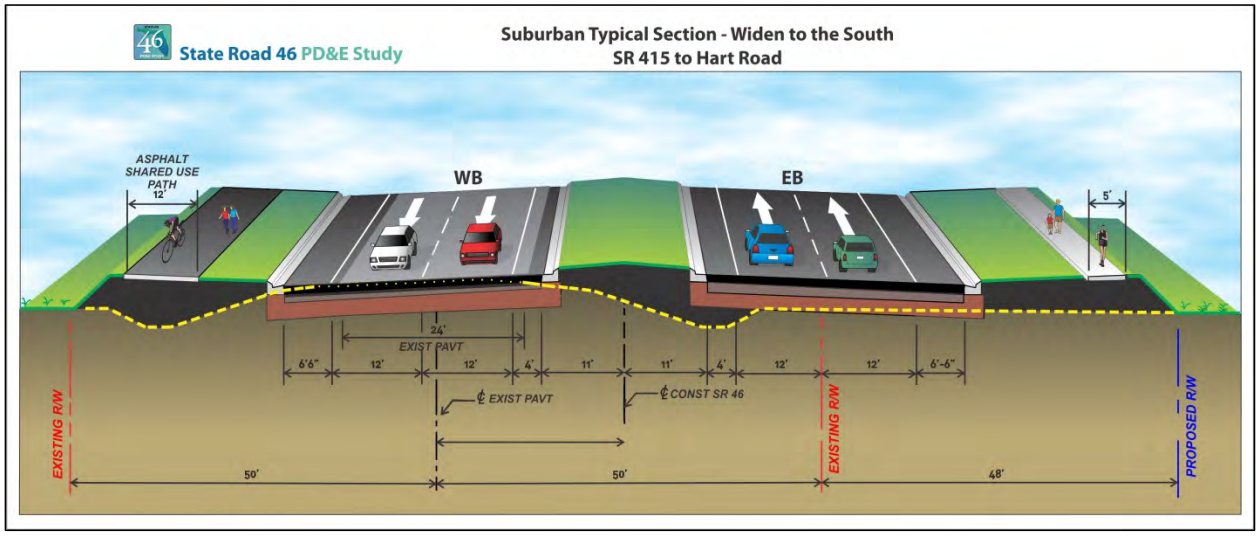


Figure 3: Proposed Typical Section (Segment 1)

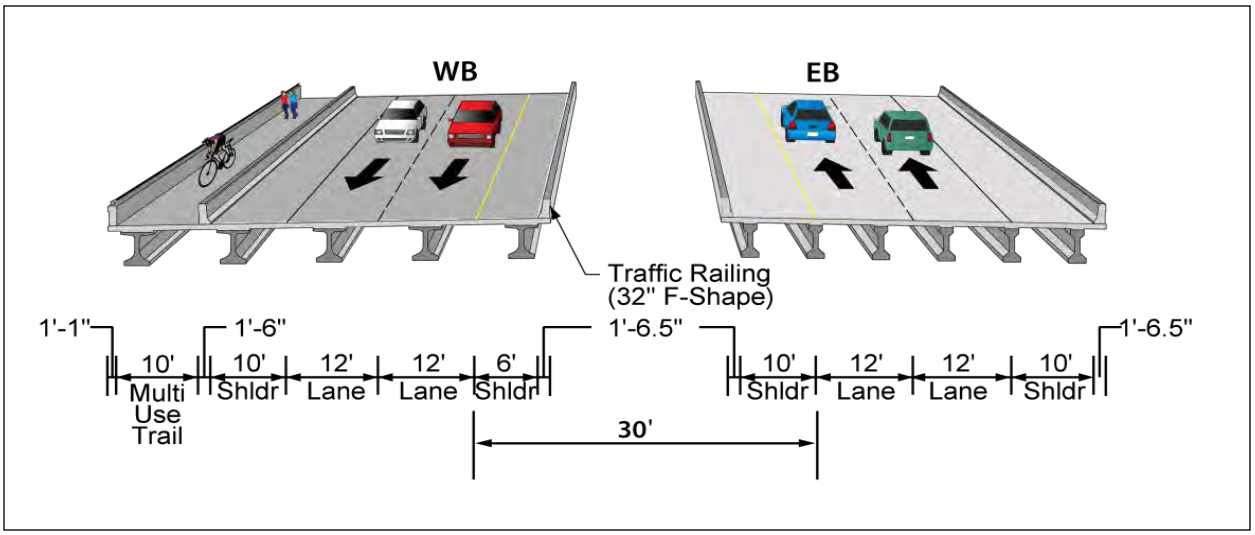


Figure 4: Proposed Typical Section (Segment 2)

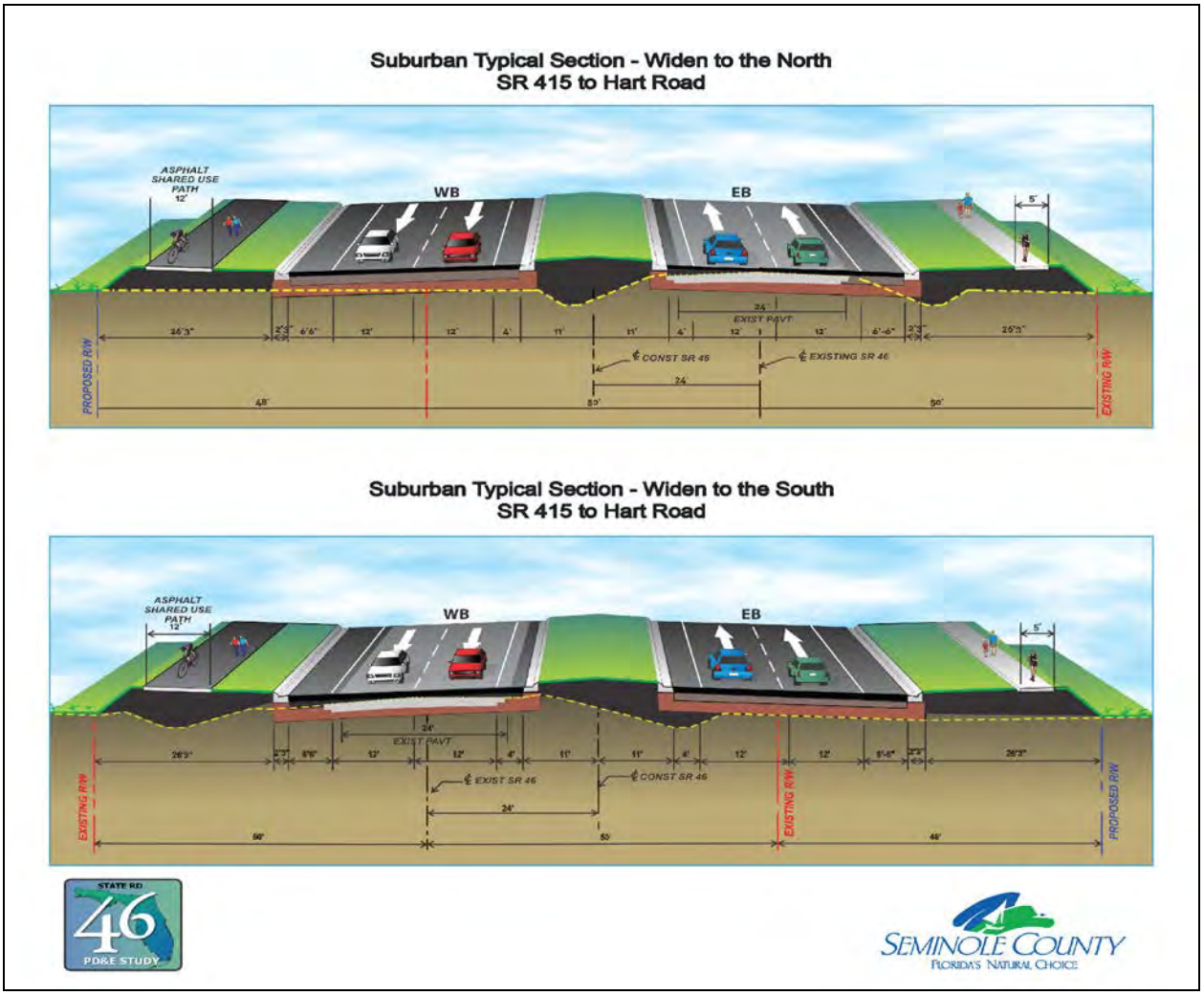


Figure 5: Proposed Typical Section (Segment 3)

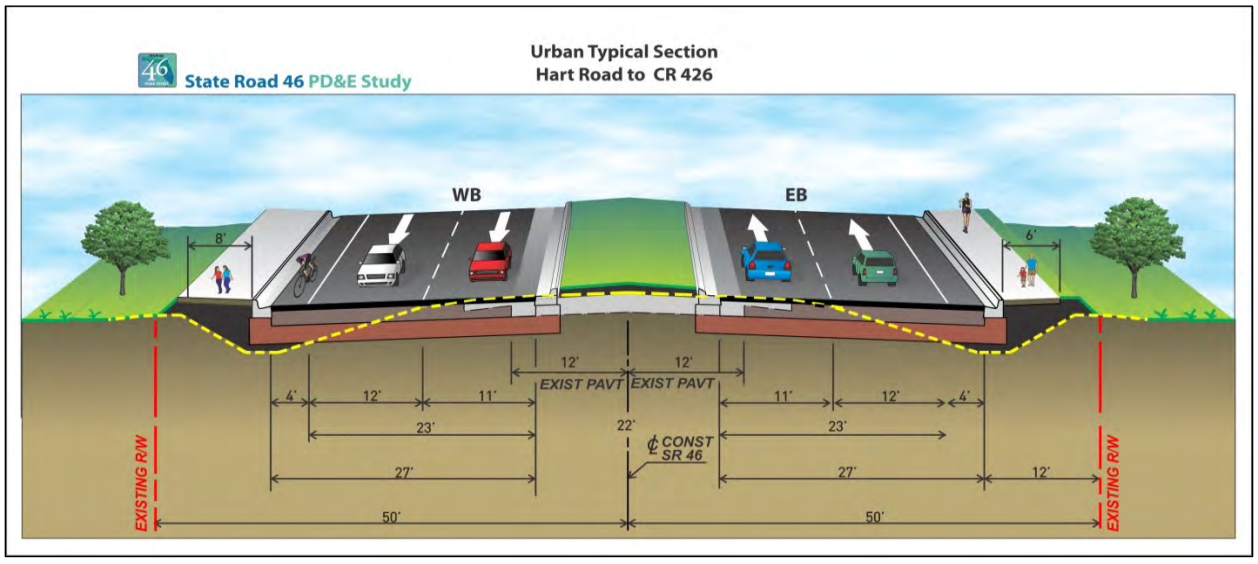


Figure 6: Proposed Typical Section (Segment 4)

2.0 METHODOLOGY

The traffic noise study was performed on the preferred Build Alternative in accordance with Code of Federal Regulations Title 23 Part 772 (23 CFR 772), *Procedures for Abatement of Highway Traffic Noise and Construction Noise*[1] using methodology established by the FDOT in the *Project Development and Environment Manual*[2], Part 2, Chapter 17 (FDOT, May 24, 2011). The methods and results of this traffic noise analysis are summarized within Sections 2 and 3.

2.1 Model and Noise Metrics

Predicted noise levels are produced using the FHWA Traffic Noise Model (TNM), Version 2.5 (2004). This model estimates the acoustic intensity at a noise sensitive receptor site from a series of roadway segments (the source). Model-predicted noise levels are influenced by several factors, such as vehicle speed and distribution of vehicle types. Noise levels are also affected by characteristics of the source-to-receptor site path, including the effects of intervening barriers, structures (houses, trees, etc.), ground surface type (hard or soft), and topography.

Noise levels in the analysis are reported in decibels on the "A" scale [dB(A)]. This scale most closely approximates the response characteristics of the human ear. Noise levels in this analysis are reported as an hourly equivalent sound level [$L_{eq(h)}$] consistent with the noise metric established by FHWA in 23 CFR 772. $L_{eq(h)}$ is an averaged measurement. The $L_{eq(h)}$ is the equivalent steady state, A-weighted sound level which in an hour would contain the same acoustic energy as the time-varying, A-weighted sound level during the same period. Sound levels of typical noise sources and environments are provided in Table 2.1.

Table 2.1 Sound Levels of Typical Noise Sources and Environments

COMMON OUTDOOR ACTIVITIES	NOISE LEVEL dB(A)	COMMON INDOOR ACTIVITIES
	---110---	Rock Band
Jet Fly-over at 1000 ft		
	---100---	
Gas Lawn Mower at 3 ft		
	---90---	
Diesel Truck at 50 ft		Food Blender at 1 m (3 ft)
	---80---	Garage Disposal at 1 m (3 ft)
Noise Urban Area (Daytime)		
Gas Law Mower at 100 ft	**---70---**	Vacuum Cleaner at 10 ft
Commercial Area		Normal Speech at 3 ft
Heavy Traffic at 300 ft	**---60---**	
		Large Business Office
Quiet Urban Daytime	**---50---**	Dishwasher Next Room
Quiet Urban Nighttime	**---40---**	Theater, Large Conference Room
Quiet Suburban Nighttime		(Background)
	---30---	Library
Quiet Rural Nighttime		Bedroom at Night, Concert Hall (Background)
	---20---	
	---10---	
Lowest Threshold of Human Hearing	**---0---**	Lowest Threshold of Human Hearing

Source: California Dept. of Transportation Technical Noise Supplement, Oct. 1998, Page 18.

2.2 Traffic Data

The traffic data used in the noise analysis was primarily obtained from the *Draft SR 46 Design Traffic Technical Memorandum* prepared by GMB Engineers & Planners (February 2012)[3]. Supplemental traffic data was obtained from GMB Engineers in November 2013. The amount of noise generated by traffic is dependent on vehicle speed. LOS C traffic conditions generally represent the maximum traffic volumes that will allow vehicles to travel at the speed limit, which results in the noisiest condition. The traffic volumes used to predict noise levels included the least of either: 1) the traffic capacity of the roadway at LOS C or 2) the projected traffic demand of the roadway. These traffic volumes can be expected to produce the noisiest traffic conditions likely to occur during the design year. For the SR 46 widening project, the total truck percentage is 8.5% for SR 46 for existing (2013) and future year (2035) conditions. Traffic volumes used in the analysis and factors used to split the traffic volumes into vehicle classifications are provided in Appendix A. Roadway and receptor elevation data were obtained from the as-built plans for the existing Lake Jesup bridge and from the U.S. Geological Survey quadrangle maps.

3.0 TRAFFIC NOISE ANALYSIS

3.1 Noise Sensitive Areas

The FHWA has established Noise Abatement Criteria (NAC) for seven land use activity categories. These criteria determine when an impact occurs and when consideration of noise abatement analysis is required. Criteria noise levels have been established for five of these activity categories. The NAC levels are presented in Table 3.1. Noise abatement measures must be considered when predicted noise levels approach or exceed the NAC levels or when a substantial noise increase occurs. A substantial noise increase occurs when the existing noise level is predicted to be exceeded by 15 dB(A) or more as a result of the transportation improvement project. Because SR 46 is an existing facility, a substantial increase in traffic noise is not expected to occur at any location along the project corridor. The FDOT defines "approach" as within 1 dB(A) of the FHWA criteria.

Table 3.1 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	56	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	66	Exterior	Residential
C[2]	67	66	Exterior	Active sports areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreational areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	51	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E[2]	72	71	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 on Table 1 of 23 CFR Part 772)

[1] The Leq(h) Activity Criteria values are for impact determination only, and are not a design standard for noise abatement measures.

[2] Includes undeveloped lands permitted for this activity category.

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

Noise sensitive receptor sites represent any property where frequent exterior human use occurs. This includes residential units (Noise Abatement Activity Category B), other noise sensitive areas including parks and recreational areas, medical facilities, schools, and places of worship (Category C), and commercial properties with exterior areas of use (Category E). Noise sensitive sites also include interior use areas where no exterior activities occur for facilities such as auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, recording studios, schools, and television studios (Category D).

Existing land uses within the project corridor include the following noise sensitive sites:

- Residences *(Activity Category B)*,
- Cameron Wight Park *(Activity Category B)*,
- Sanford Aero Modelers Flying Field *(Activity Category E)*,
- Church facilities *(Activity Category C-exterior & D-interior)*,
- Commercial with outdoor use *(Activity Category E)*,
- Seminole County Fire Department with outdoor use *(Activity Category C)*, and
- Geneva Community Center & Museum of Geneva *(Activity Category C)*.

The Seminole County Fire Department was analyzed since there appeared to be outdoor use at this location. This land use was determined to be an Activity Category C since the fire station is a public structure.

Noise sensitive sites were identified for the project as described in Table 3.2 and were evaluated to determine impacts by traffic noise associated with the proposed improvements to SR 46. Receptors representing noise sensitive sites along the project corridor were grouped into noise sensitive areas (NSAs) based on their geographic location. Noise sensitive sites have been identified on Figures 7A-7I and are described below.

Table 3.2 Noise Sensitive Receptor Site Descriptions and Locations

Noise Receptor [1]	Map (Fig. #)	Noise Sensitive Receptor Name/Type	Location (Station #)	Distance[2] (ft)	Activity Category	Number of Residences
Noise Sensitive Area 1 (SR 415 to Lake Jesup Bridge)						
R1	7A	Residential	22+50	250	B	1
R1A	7A	Residential	27+00	450	B	1
R2	7A	Residential	28+50	150	B	1
R3	7A	Residential	30+00	80	B	2
R4	7C	Cameron Wight Park (outdoor use)	103+00	170	C	n/a

Noise Receptor [1]	Map (Fig. #)	Noise Sensitive Receptor Name/Type	Location (Station #)	Distance [2] (ft)	Activity Category	Number of Residences
R5	7C	Residential	102+50	370	B	1
R6	7C	Residential	100+50	450	B	2
Noise Sensitive Area 2 (Lake Jesup Bridge to Mockingbird Lane)						
R7	7D	Residential	150+50	150	B	2
R8	7D	Residential	150+50	210	B	1
R9	7D	Residential	151+50	430	B	3
R10	7D	Residential	156+00	210	B	2
R11	7D	Residential	158+50	120	B	1
R12	7D	Residential	164+50	330	B	1
R13	7D	Residential	166-00	390	B	1
R14	7D	Residential	161+00	350	B	1
R15	7D	Residential	182+00	420	B	1
R16	7D	Residential	187+00	310	B	1
R17	7E	Residential	198+50	390	B	1
R18	7E	Residential	201+00	400	B	1
R19	7E	Residential	206+00	340	B	1
R20	7E	Residential	209+00	440	B	1
R21	7E	Sanford Aero Modelers Flying Field (outdoor use)	215+50	110	E	n/a
R22	7E	Residential (abandon)	224+50	90	B	1
R23	7E	Residential	229+50	360	B	1
R24	7F	Residential	240+00	140	B	1
R25	7F	Residential	244+00	270	B	1
R26	7F	Residential	250+00	140	B	1
R27	7F	Residential	253+50	350	B	1
R28	7F	Residential	256+00	130	B	1
R29	7F	Residential	259+00	440	B	1
Noise Sensitive Area 3 (Mockingbird Lane to CR 426)						
R30	7F	Residential	279+00	190	B	4
R31	7F	Residential	280+50	390	B	1
R32	7F	Residential	285+00	320	B	1
R33	7F	Residential	287+50	220	B	1
R34	7G	Residential	307+00	400	B	1
R35	7G	Residential	332+00	430	B	1
R36	7H	Residential	338+50	410	B	2
R37	7H	Residential	338+50	190	B	1
R38	7H	Community Church of God (outdoor use)	345+00	110	C	n/a
R39	7H	Residential	339+00	390	B	1
R40	7H	Residential	352+00	250	B	1
R41	7H	Residential	354+00	100	B	1

Noise Receptor [1]	Map (Fig. #)	Noise Sensitive Receptor Name/Type	Location (Station #)	Distance[2] (ft)	Activity Category	Number of Residences
R42	7H	Residential	367+50	340	B	1
R43	7H	Residential	371+50	220	B	1
R44	7H	Residential	372+50	370	B	1
R45	7H	Residential	372+50	110	B	1
R46	7H	Residential	374+50	190	B	2
R47	7H	Geneva Church of the Nazarene (no outdoor use)	380+00	180	D	n/a
R48	7H	Commercial/Nursery/house (outdoor use)	382+50	360	E	n/a
R49	7I	Commercial (outdoor use)	387+00	70	E	n/a
R50	7H	Seminole County Fire Station (outdoor use)	365+50	200	C	n/a
R51	7H	Residential	367+00	400	B	1
R52	7H	Residential	367+50	330	B	1
R53	7H	Residential	368+50	260	B	1
R54	7H	Residential	368+50	450	B	1
R55	7H	Residential	369+00	380	B	1
R56	7H	Residential	370+00	290	B	1
R57	7H	Residential	370+50	220	B	1
R58	7H	Residential	371+50	170	B	1
R59	7H	Residential	373+00	400	B	1
R60	7H	Residential	373+50	310	B	2
R61	7H	Residential	374+00	250	B	2
R62	7H	Residential	375+00	170	B	3
R63	7H	Residential	375+00	60	B	1
R64	7H	Residential	382+50	430	B	1
R65	7H	Residential	384+00	310	B	1
R66	7H	Geneva Community Center & Museum of Geneva (outdoor use)	386+00	330	C	n/a
R67	7H	Commercial (outdoor use)	386+00	60	E	n/a
TOTAL						74

[1] Refer to Figure 7 - project aerials showing the locations of the noise sensitive receptor sites.
[2] Approximate distance to the near travel lane with existing year 2013 roadway conditions.

LEGEND

- Preferred Alternative Right-of-Way: Source - URS
- Existing Right-of-Way: Source - URS
- Noise Receptor Location
- Noise Monitoring Site

STATE RD 46 PD&E STUDY

Noise Analysis Map
Noise Sensitive Area 1

SR 46 PD&E Study
SR 46 from SR 415 to CR 426

Sections 34 and 35, Township 19S, Range 31E, Sections 1, 2 and 3, Township 20S, Range 31E, and Sections 6, 7, 8, 16, 17, 21 and 22, Township 20S, Range 32 E, Seminole County, Florida

FIGURE: 7A

SCALE: 1" = 500'

JOB NO.: 10.20

DATE: 12/9/13

LEGEND

- Preferred Alternative Right-of-Way: Source - URS
- Existing Right-of-Way: Source - URS
- Noise Receptor Location
- Noise Monitoring Site

STATE RD 46 PD&E STUDY

Noise Analysis Map
Noise Sensitive Area 1

SR 46 PD&E Study
SR 46 from SR 415 to CR 426

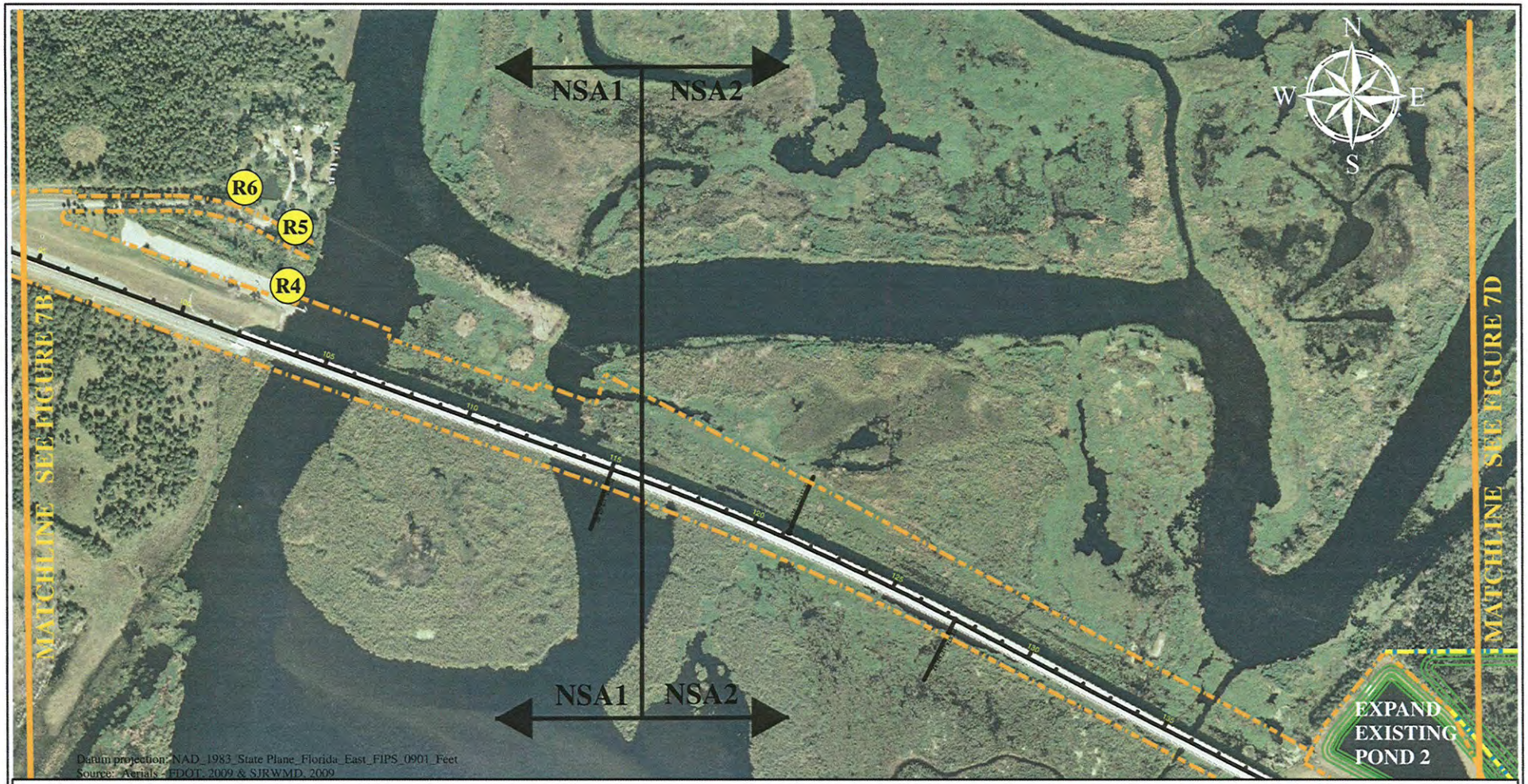
Sections 34 and 35, Township 19S, Range 31E, Sections 1, 2 and 3, Township 20S, Range 31E, and Sections 6, 7, 8, 16, 17, 21 and 22, Township 20S, Range 32 E, Seminole County, Florida

FIGURE: 7B

SCALE: 1" = 500'

JOB NO.: 10.20

DATE: 12/9/13



LEGEND

- Preferred Alternative Right-of-Way: Source - URS
- Existing Right-of-Way: Source - URS
- Noise Receptor Location
- Noise Monitoring Site

STATE RD 46 PD&E STUDY

Noise Analysis Map
Noise Sensitive Areas 1 & 2

SR 46 PD&E Study
SR 46 from SR 415 to CR 426

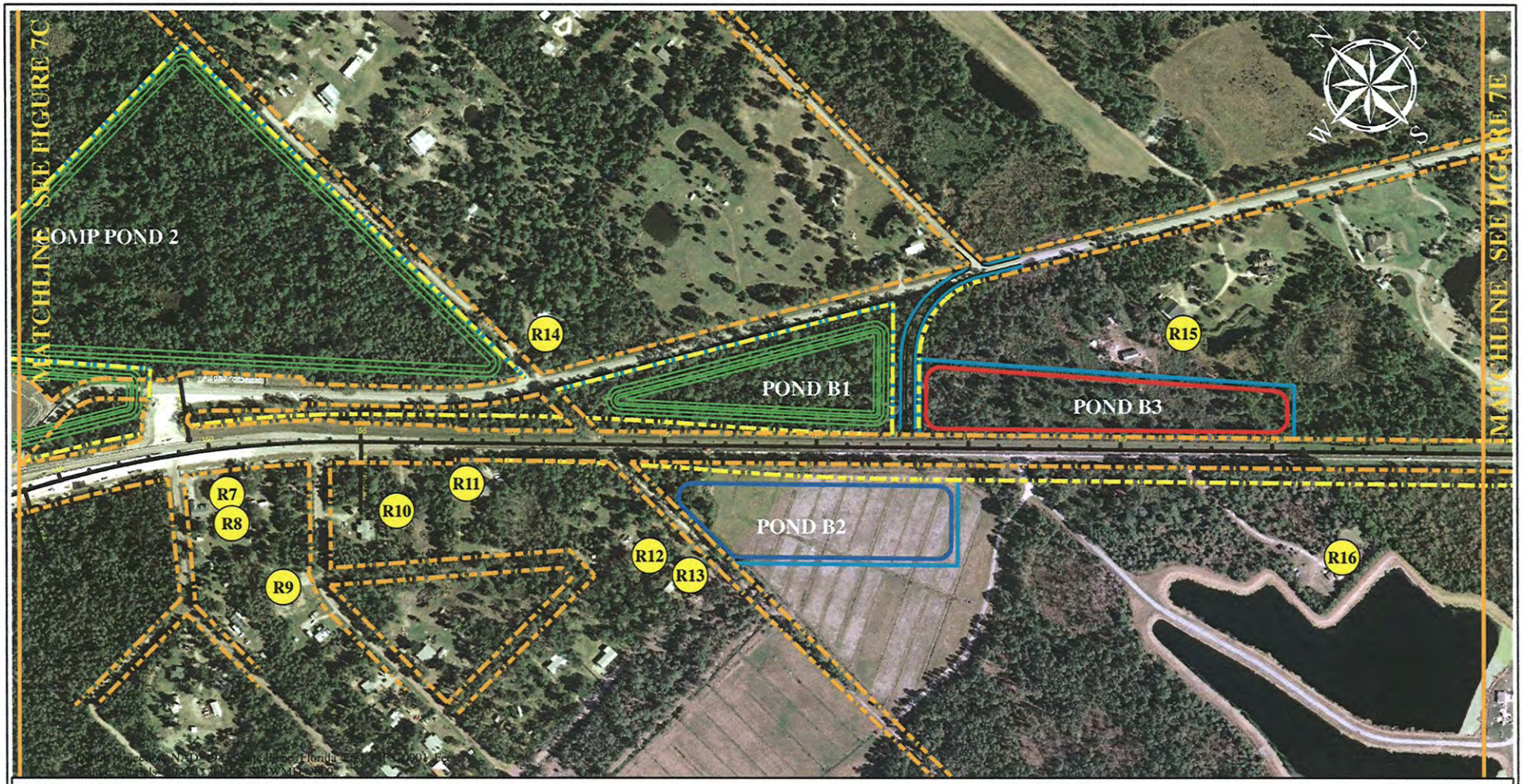
Sections 34 and 35, Township 19S, Range 31E, Sections 1, 2 and 3, Township 20S, Range 31E, and Sections 6, 7, 8, 16, 17, 21 and 22, Township 20S, Range 32 E, Seminole County, Florida

FIGURE: 7C

SCALE: 1" = 500'

JOB NO.: 10.20

DATE: 12/9/13



LEGEND

- Preferred Alternative Right-of-Way: Source - URS
- Existing Right-of-Way: Source - URS
- Noise Receptor Location
- Noise Monitoring Site

STATE RD 46 PD&E STUDY

Noise Analysis Map
Noise Sensitive Area 2

SR 46 PD&E Study
SR 46 from SR 415 to CR 426

Sections 34 and 35, Township 19S, Range 31E, Sections 1, 2 and 3, Township 20S, Range 31E, and Sections 6, 7, 8, 16, 17, 21 and 22, Township 20S, Range 32 E, Seminole County, Florida

FIGURE: 7D

SCALE: 1" = 500'

JOB NO.: 10.20

DATE: 12/9/13

LEGEND

- Preferred Alternative Right-of-Way: Source - URS
- Existing Right-of-Way: Source - URS
- Noise Receptor Location
- Noise Monitoring Site

STATE RD 46 PD&E STUDY

Noise Analysis Map
Noise Sensitive Area 2

SR 46 PD&E Study
SR 46 from SR 415 to CR 426

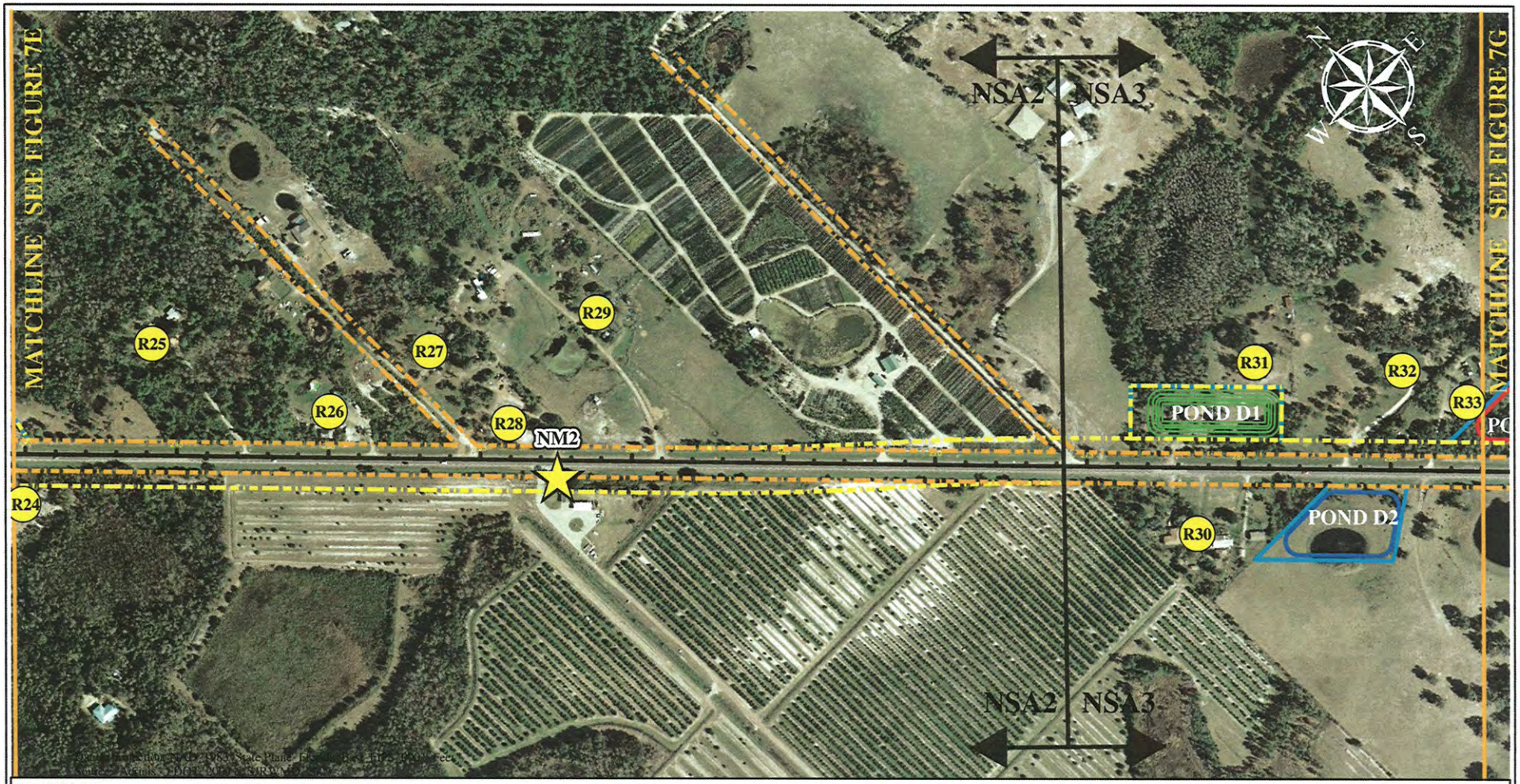
Sections 34 and 35, Township 19S, Range 31E, Sections 1, 2 and 3, Township 20S, Range 31E, and Sections 6, 7, 8, 16, 17, 21 and 22, Township 20S, Range 32 E, Seminole County, Florida

FIGURE: 7E

SCALE: 1" = 500'

JOB NO.: 10.20

DATE: 12/9/13



LEGEND

- Preferred Alternative Right-of-Way: Source - URS
- Existing Right-of-Way: Source - URS
- Noise Receptor Location
- Noise Monitoring Site

STATE RD 46 PD&E STUDY

Noise Analysis Map
Noise Sensitive Areas 2 & 3

SR 46 PD&E Study
SR 46 from SR 415 to CR 426

Sections 34 and 35, Township 19S, Range 31E, Sections 1, 2 and 3, Township 20S, Range 31E, and Sections 6, 7, 8, 16, 17, 21 and 22, Township 20S, Range 32 E, Seminole County, Florida

FIGURE: 7F

SCALE: 1" = 500'

JOB NO.: 10.20

DATE: 12/9/13

LEGEND

- Preferred Alternative Right-of-Way: Source - URS
- Existing Right-of-Way: Source - URS
- Noise Receptor Location
- Noise Monitoring Site

STATE RD 46 PD&E STUDY

Noise Analysis Map
Noise Sensitive Area 3

SR 46 PD&E Study
SR 46 from SR 415 to CR 426

Sections 34 and 35, Township 19S, Range 31E, Sections 1, 2 and 3, Township 20S, Range 31E, and Sections 6, 7, 8, 16, 17, 21 and 22, Township 20S, Range 32 E, Seminole County, Florida

FIGURE: 7G

SCALE: 1" = 500'

JOB NO.: 10.20

DATE: 12/9/13

LEGEND

- Preferred Alternative Right-of-Way: Source - URS
- Existing Right-of-Way: Source - URS
- Noise Receptor Location
- Noise Monitoring Site

STATE RD 46 PD&E STUDY

Noise Analysis Map
Noise Sensitive Area 3

SR 46 PD&E Study
SR 46 from SR 415 to CR 426

Sections 34 and 35, Township 19S, Range 31E, Sections 1, 2 and 3, Township 20S, Range 31E, and Sections 6, 7, 8, 16, 17, 21 and 22, Township 20S, Range 32 E, Seminole County, Florida

FIGURE: 7H

SCALE: 1" = 500'

JOB NO.: 10.20

DATE: 12/9/13

LEGEND

- Preferred Alternative Right-of-Way: Source - URS
- Existing Right-of-Way: Source - URS
- Noise Receptor Location
- Noise Monitoring Site

STATE RD 46 PD&E STUDY

Noise Analysis Map
Noise Sensitive Area 3

SR 46 PD&E Study
SR 46 from SR 415 to CR 426

Sections 34 and 35, Township 19S, Range 31E, Sections 1, 2 and 3, Township 20S, Range 31E, and Sections 6, 7, 8, 16, 17, 21 and 22, Township 20S, Range 32 E, Seminole County, Florida

FIGURE: 7I

SCALE: 1" = 500'

JOB NO.: 10.20

DATE: 12/9/13

Representative receptor sites were chosen based on noise sensitivity, roadway proximity, anticipated impacts from the proposed project, and homogeneity (i.e., representative of similar areas in the project study area). Receptor points representing the noise sensitive sites were located in accordance with the FDOT's *Project Development and Environment Manual*[2], Part 2, Chapter 17. For residential areas, traffic noise levels are predicted at the edge of the dwelling closest to the travel lane. For other noise sensitive sites with outdoor use, noise levels are predicted where the exterior activity occurs. For future permitted noise sensitive sites, noise levels are predicted at locations that may contain an outdoor use. For the prediction of interior noise levels, receptor sites are placed 10 feet inside the building at the edge closest to roadway. Building noise reduction factors identified in Table 17.2 of Chapter 17 of the PD&E manual and window conditions are used to estimate the noise reduction due to the exterior of the structure.

NSA 1 is contained within Segment 1 of the project and is located from SR 415 (Station 10+00) to the Lake Jesup bridge (Station 117+00). A total of nine noise sensitive sites representing eight residences and Cameron Wight Park were analyzed.

NSA 2 is contained within Segment 3 and is located from the Lake Jesup bridge (Station 130+00) to Mockingbird Lane (Station 274+00). A total of 27 noise sensitive sites representing 26 residences and the Sanford Aero Modelers Flying Field were analyzed.

NSA 3 is contained within Segments 3 and 4 and is located from Mockingbird Lane (Station 274+00) to CR 426 (Station 389+50. A total of 47 noise sensitive sites representing 40 residences, two churches, Seminole County Fire Department, Geneva Community Center & Museum, and three commercial buildings with outdoor use.

3.2 Measured Noise Levels

To verify that traffic noise is the main source of noise and to validate the noise model used (TNM), field measurements were taken within the project area following procedures documented in FHWA's *Measurement of Highway-Related Noise*.[4] Noise levels were measured using a Casella sound level analyzer (CEL-573 series) on February 22, 2012 at three sites as depicted on Figure 7: NM 1 is located approximately 450 feet east of Richmond Avenue (Station 26+00), NM 2 is located at the Lake Jesup Groves Reclaimed Water entrance road (Station 257+50), and NM 3 is located approximately 500 feet west of Hart Road (Station 362+50). The A-weighted frequency scale was used and the sound meter was calibrated to 114 dB(A) using a CEL-284/2 sound-level calibrator. Monitoring was conducted for three-ten minute intervals with the microphone approximately five feet above the land surface. Community noises and traffic information, such as number of vehicles and average speeds, were also collected at the time of noise monitoring. A Stalker Radar Gun was used to obtain average operating speeds for cars, medium trucks, heavy trucks, buses, and motorcycles. Since all noise levels in this report are based on a one-hour period, the field-recorded traffic volumes were adjusted upward to reflect hourly volumes. The data collected was then used as input to TNM. The dates, times, traffic data, and the measured and TNM-predicted noise levels are provided on a CD in Appendix B.
The TNM model was verified by comparing measured noise levels to levels calculated by the model for the same traffic and site conditions. Measured and modeled noise levels at all three monitoring sites (NM1, NM1, and NM3) were within the acceptable 3 decibel range which verifies the model used in this noise study. The measured and modeled L_{eq} noise levels are presented in Table 3.3.

Table 3.3 Noise Monitoring Data and TNM Validation Results

Site	Run 1 - Noise Level [$L_{eq(h)}$ dB(A)]		Run 2 - Noise Level [$L_{eq(h)}$ dB(A)]		Run 3 - Noise Level [$L_{eq(h)}$ dB(A)]	
	Measured	Modeled	Measured	Modeled	Measured	Modeled
NM 1	63.3	66.1	63.3	65.7	62.5	65.0
NM 2	62.9	64.5	64.9	67.7	62.7	65.7
NM 3	68.9	67.1	69.0	69.0	67.3	68.4

3.3 Predicted Noise Levels

TNM was used to predict traffic noise levels at representative receptor sites along the project corridor. Within the project limits, noise sensitive land uses adjacent to SR 46 include: residences, Cameron Wight Park, Sanford Aero Modelers Flying Field, church facilities, commercial with outdoor use, Seminole County Fire Department with outdoor use, and Geneva Community Center & Museum of Geneva.

All of the noise sensitive sites are classified as Activity Categories B, C, D, E, or F as listed on Table 3.1. Traffic noise levels were predicted for existing conditions (2013) and the future Design Year (2035) conditions for the No Build and recommended Build Alternatives. The traffic data used in these predictions are presented in Section 2.2 and the predicted noise levels at these sites are presented in Section 3.4. All TNM input and output datasheets are included on the CD attached to this report as Appendix C.

3.4 Noise Impact Analysis

Noise levels were predicted at 67 receptor points representing 74 residences, two church facilities, a public recreational facility (pavilion and boat ramp), an aero modeler's flying field, a fire station, a community center with museum, and three commercial buildings with exterior seating areas. Predicted noise levels for these sites are provided within Table 3.4. The locations of the receptor sites identified on Table 3.4 are depicted on the aerials found in Figure 7. The alphanumeric identification for each receptor point associated with a noise sensitive site generally increases in the eastbound direction.

For the Design Year 2035 No Build condition, noise levels are predicted to approach or exceed the NAC at one noise sensitive receptor site. For the Design Year 2035 Build condition, noise levels are predicted to approach or exceed the NAC at 20 noise sensitive receptor sites. Of the 20 sites, three sites are commercial (including the Sanford Aero Modelers Flying Field), one site is a home that appears to be abandoned, one site is a park, one site is a church with outdoor use, and 14 are residences.

3.5 Noise Abatement Measures

Abatement is evaluated for all noise sensitive sites predicted to approach/exceed the NAC. Amount of noise reduction that could be provided, cost of abatement, right-of-way availability, safety criteria, construction, and maintenance issues are considered when evaluating abatement measures. Land use controls are identified as a potentially effective abatement measure in any redeveloped or currently undeveloped areas. However, land use controls must be implemented by

Table 3.4 Predicted Noise Levels for Noise Sensitive Receptor Sites

Noise Sensitive Area[1]	Noise Receptor	Noise Sensitive Receptor Name/Type	Noise Receptor Sites				TNM Predicted Noise Levels dB(A)			Difference Existing to Build dB(A)	Exceeds Criteria
			Location (Station #)[2]	Number of Residences	Activity Category	Noise Abatement Criteria dB(A)	Existing Year[3]	Design Year[4] No Build	Design Year[4] Build		
Segment 1											
NSA 1	R1	Residential	22+50	1	B	66	54.9	54.9	62.9	8.0	no
	R1A	Residential	27+00	1	B	66	49.1	49.1	57.5	8.4	no
	R2	Residential	28+50	1	B	66	59.0	59.0	68.0	9.0	yes
	R3	Residential	30+00	2	B	66	60.1	60.1	69.0	8.9	yes
	R4	Cameron Wight Park (outdoor use)	103+00	n/a	C	66	60.7	60.7	66.9	6.2	yes
	R5	Residential	102+50	1	B	66	56.6	56.6	63.3	6.7	no
	R6	Residential	100+50	2	B	66	53.3	53.3	60.4	7.1	no
Segment 3											
NSA 2	R7	Residential	150+50	2	B	66	58.4	58.4	66.8	8.4	yes
	R8	Residential	150+50	1	B	66	55.6	55.8	63.8	8.2	no
	R9	Residential	151+50	3	B	66	50.9	51.1	58.8	7.9	no
	R10	Residential	156+00	2	B	66	56.5	56.6	63.8	7.3	no
	R11	Residential	158+50	1	B	66	61.4	61.5	68.3	6.9	yes
	R12	Residential	164+50	1	B	66	52.6	52.7	60.5	7.9	no
	R13	Residential	166-00	1	B	66	51.5	51.6	59.7	8.2	no
	R14	Residential	161+00	1	B	66	54.3	55.0	61.2	6.9	no
	R15	Residential	182+00	1	B	66	52.5	52.7	59.4	6.9	no
	R16	Residential	187+00	1	B	66	52.5	52.5	61.7	9.2	no
	R17	Residential	198+50	1	B	66	51.4	51.5	59.5	8.1	no
	R18	Residential	201+00	1	B	66	51.2	51.2	59.5	8.3	no
	R19	Residential	206+00	1	B	66	51.5	51.5	60.2	8.7	no
	R20	Residential	209+00	1	B	66	50.2	50.2	59.1	8.9	no
	R21	Sanford Aero Modelers Flying Field (outdoor use)	215+50	n/a	C	66	61.9	61.9	68.8	6.9	yes
	R22	Residential (abandon)	224+50	1	B	66	60.3	60.3	69.3	9.0	yes
	R23	Residential	229+50	1	B	66	52.2	52.2	60.5	8.3	no
	R24	Residential	240+00	1	B	66	60.5	60.5	69.5	9.0	yes
	R25	Residential	244+00	1	B	66	50.9	50.9	59.0	8.1	no
	R26	Residential	250+00	1	B	66	58.4	58.4	66.5	8.1	yes
	R27	Residential	253+50	1	B	66	51.5	51.5	60.2	8.7	no
	R28	Residential	256+00	1	B	66	60.8	60.8	68.7	7.9	yes
	R29	Residential	259+00	1	B	66	49.6	49.6	58.6	9.0	no
NSA 3	R30	Residential	279+00	4	B	66	58.7	58.7	65.5	6.8	no
	R31	Residential	280+50	1	B	66	53.6	53.6	60.7	7.1	no
	R32	Residential	285+00	1	B	66	54.1	54.1	61.3	7.2	no
	R33	Residential	287+50	1	B	66	58.8	58.8	65.4	6.6	no
	R34	Residential	307+00	1	B	66	52.1	52.1	59.2	7.1	no
	R35	Residential	332+00	1	B	66	51.6	51.6	59.2	7.6	no
	R36	Residential	338+50	2	B	66	52.0	52.1	60.5	8.5	no
	R37	Residential	338+50	1	B	66	60.2	60.2	67.4	7.2	yes
	R38	Community Church of God (outdoor use)	345+00	n/a	C	66	59.6	59.6	69.1	9.5	yes
	R39	Residential	339+00	1	B	66	54.3	54.3	61.0	6.7	no
	R40	Residential	352+00	1	B	66	53.5	53.5	61.8	8.3	no
	R41	Residential	354+00	1	B	66	61.7	61.7	69.0	7.3	yes
	R42	Residential	367+50	1	B	66	51.9	51.9	60.9	9.0	no
	R50	Seminole County Fire Station (outdoor use)	365+50	na/	C	--	54.4	54.4	64.8	10.4	no
Segment 4											
NSA 3	R43	Residential	371+50	1	B	66	54.8	54.8	63.6	8.8	no
	R44	Residential	372+50	1	B	66	50.4	50.5	60.0	9.6	no
	R45	Residential	372+50	1	B	66	62.6	62.6	70.0	7.4	yes
	R46	Residential	374+50	2	B	66	56.5	56.5	65.2	8.7	no
	R47	Geneva Church of the Nazarene (no outdoor use)	380+00	n/a	D	51 (interior)	56.0	56.0	65.1	9.1	no

Table 3.4 Predicted Noise Levels for Noise Sensitive Receptor Sites

Noise Sensitive Area[1]	Noise Receptor	Noise Sensitive Receptor Name/Type	Noise Receptor Sites				TNM Predicted Noise Levels dB(A)			Difference Existing to Build dB(A)	Exceeds Criteria
			Location (Station #)[2]	Number of Residences	Activity Category	Noise Abatement Criteria dB(A)	Existing Year[3]	Design Year[4] No Build	Design Year[4] Build		
NSA 3	R48	Commercial/Nursery/house (outdoor use)	382+50	n/a	E	71	50.8	50.8	60.4	9.6	no
	R49	Commercial (outdoor use)	387+00	n/a	E	71	63.1	63.1	71.2	8.1	yes
	R51	Residential	367+00	1	B	66	50.6	50.6	60.9	10.3	no
	R52	Residential	367+50	1	B	66	52.4	52.4	62.8	10.4	no
	R53	Residential	368+50	1	B	66	54.2	54.2	64.5	10.3	no
	R54	Residential	368+50	1	B	66	49.4	49.4	59.7	10.3	no
	R55	Residential	369+00	1	B	66	51.1	51.1	61.3	10.2	no
	R56	Residential	370+00	1	B	66	53.6	53.6	63.7	10.1	no
	R57	Residential	370+50	1	B	66	57.0	57.0	66.4	9.4	yes
NSA 3	R58	Residential	371+50	1	B	66	60.5	60.5	69.3	8.8	yes
	R59	Residential	373+00	1	B	66	51.3	51.3	61.2	9.9	no
	R60	Residential	373+50	2	B	66	52.9	52.9	62.5	9.6	no
	R61	Residential	374+00	2	B	66	55.0	55.0	64.2	9.2	no
	R62	Residential	375+00	3	B	66	60.3	60.3	68.7	8.4	yes
	R63	Residential	375+00	1	B	66	68.6	68.6	77.2	8.6	yes
	R64	Residential	382+50	1	B	66	51.9	52.1	60.3	8.4	no
	R65	Residential	384+00	1	B	66	54.7	54.9	62.1	7.4	no
	R66	Geneva Community Center & Museum of Geneva (outdoor use)	386+00	n/a	C	66	55.7	56.1	61.9	6.2	no
	R67	Commercial (outdoor use)	386+00	n/a	E	71	63.3	63.4	70.8	7.5	yes
TOTAL	--	--	--	74	--	--	--	--	--	--	--

local planning agencies (i.e., FDOT has no direct control over designating land use in areas adjacent to the highway ROW).

The most common and effective noise abatement measure is the construction of a noise barrier. Barriers reduce noise levels by blocking the sound path between a highway and noise sensitive site. To effectively reduce traffic noise, a barrier must be relatively long, continuous (with no intermittent openings), and of sufficient height. In accordance with 23 CFR Part 772, when traffic noise associated with a proposed project is predicted to approach or exceed the NAC at a noise sensitive site, noise abatement in the form of a noise barrier must be considered and evaluated for feasibility and reasonableness.

For a noise barrier to be considered feasible and cost reasonable, the following minimum conditions should be met:

- A noise barrier must provide a noise reduction of at least 7 dB(A) for one or more benefitted receptors.
- The number of impacted receptors required to achieve a 5 dB(A) reduction or greater in order for a noise barrier to be considered feasible must be two or greater.
- The cost of the noise barriers should not exceed $42,000 per benefited noise sensitive site. This is the upper cost limit established by FDOT. A benefited noise sensitive site is defined as a site that would experience at least a 5 dB(A) reduction as a result of providing a noise barrier.

In addition to evaluating the cost reasonableness of noise barriers, certain feasibility factors were also considered including accessibility, sight distance, etc. Accessibility refers to the ingress and egress to properties that would be effected by the construction of a noise barrier. Sight distance is a safety issue that refers to the ability of drivers to see far enough in each direction to safely enter the roadway. Sight distance requirements for driveways further reduce the length of noise barriers which reduces the benefits to noise sensitive receptors.

As described in Section 3.4, predicted design year traffic noise levels for the Preferred Build Alternative will approach or exceed the NAC at 14 noise sensitive receptor sites (i.e., residences) along the project corridor and at three commercial sites, one abandon home site, one park, and one church with outdoor use.

As part of this PD&E phase noise study, the feasibility and reasonableness of noise barriers were considered for those 20 noise sensitive sites impacted by traffic noise. The analysis of each site is discussed below:

NSA 1 (SR 415 to Lake Jesup Bridge) Segment 1 – Receptor Sites R1-R6

Noise levels at the noise receptor sites (R1, R1A, R5, and R6) are not predicted to approach or exceed the NAC for the Design Year 2035 Build Alternative. Compared to existing conditions, no noise sensitive receptor sites are expected to experience a substantial increase in traffic noise as a result of this project. Since the Build Alternative does not involve noise impacts, noise abatement for these sites was not warranted or recommended.

R2 & R3 – There are two single family residences that have access onto SR 46. Site conditions in these areas prevent the use of a noise barrier to reduce traffic noise levels. Access driveways

are either located directly in front of or immediately adjacent to these sites. Therefore, construction of an effective noise barrier would restrict property access. In addition, existing right-of-way is limited within this residential area and does not contain enough right-of-way for a barrier structure unless the proposed 5' sidewalk is removed from consideration. Additional right-of-way may be required for the construction of a barrier. For these reasons, a noise barrier was not considered a reasonable or feasible noise abatement measure at these locations and further barrier analysis was not considered warranted.

R2 & R3 Barrier Analysis

Height/Length (ft)	Number of Sites with Insertion Loss of (dB(A))					Number of Benefited Sites	Barrier Cost	Cost/ Benefited Site	Cost Reasonable (Yes/No)
	5+	6+	7+	8+	9+				
12/390	0	0	0	0	0	0	$140,400	N/A	no
14/390	0	0	0	0	0	0	$163,800	N/A	no
16/390	1	0	0	0	0	1	$187,200	$187,200	no
18/390	1	0	0	0	0	1	$210,600	$210,600	no
20/390	1	0	0	0	0	1	$234,000	$234,000	no
22/390	1	0	0	0	0	1	$257,500	$257,500	no

R4 – There are three special land use areas along the project corridor where three noise sensitive receptor sites (R4, R21, & R38) are located. R4 is the Cameron Wight Park which has an open pavilion and a boat ramp. This site was evaluated individually using the FDOT publication *A Method to Determine Reasonableness and Feasibility of Noise Abatement at Special Use Locations*[5] (Updated July 22, 2009). Special land uses do not include dwelling residences or Activity Category C as defined by 23 CFR Part 772. Some examples of special land uses are churches, schools, parks, and amphitheaters.

The outdoor land uses are predicted to experience noise levels exceeding 66 dB(A) in the Build condition. A special abatement analysis was conducted to determine the reasonableness and feasibility of a noise barrier at this location. Barriers were evaluated for heights ranging from 8 to 22 feet. This site is located adjacent to the Lake Jesup Bridge. The barrier evaluated for the bridge segment was restricted to eight feet. Even with a 22-foot barrier height for the other barrier segments, the minimum 5 dB(A) insertion loss could not be achieved; therefore, a barrier does not meet the feasibility criterion.

R4 Barrier Analysis (Special Use Location)

Item	Criteria	Input	Units
1	Barrier Length	450+681	ft
2	Barrier Height	22 & 8 (bridge)	ft
3	Multiply 1 x 2	14,338	ft^2
4	Avg time person stays at site per visit	1	hr
5	Avg no. of people that use site per day that will receive 5 dB	0	person
6	Multiply 4 x 5	0	person-hr
7	Divide 3 by 6	0	ft^2/person-hr
8	Multiply 7 by $42,000	N/A	$/person-hr/$ft^2$
9	Does 8 exceed $711,382?	N/A	--
10	If item 9 is no, abatement is reasonable	--	--
11	If item 9 is yes, abatement in not reasonable	not reasonable	--

NSA 2 (Lake Jesup Bridge to Mockingbird Lane) Segment 3 – Receptor Sites R7-R29
Only sites R7, R11, R21, R22, R24, R26 and R28 are predicted to approach or exceed the NAC for the Design Year 2035 Build Alternative. Therefore, since the remaining sites do not involve noise impacts, noise abatement for these sites was not warranted or recommended.

R7 – This site represents two single family residences. The predicted noise level at this site exceeds the NAC for the Design Year 2035. Therefore, a barrier analysis was performed for the site. A noise wall was evaluated inside the proposed right-of-way between the back of sidewalk and the proposed SR 46 right-of-way line. The barrier heights analyzed ranged from 12 feet to 22 feet. Only the 22-foot height provided a 3.4 dB(A) noise reduction which does not meet the 7 dB(A) reduction goal. Therefore, noise abatement was not warranted or recommended.

R7 Barrier Analysis

Height/Length (ft)	Number of Sites with Insertion Loss of (dB(A))					Number of Benefited Sites	Barrier Cost	Cost/ Benefited Site	Cost Reasonable (Yes/No)
	5+	6+	7+	8+	9+				
12/310	0	0	0	0	0	0	$111,796	N/A	no
14/310	0	0	0	0	0	0	$130,429	N/A	no
16/310	0	0	0	0	0	0	$149,061	N/A	no
18/310	0	0	0	0	0	0	$167,694	N/A	no
20/310	0	0	0	0	0	0	$186,327	N/A	no
22/310	0	0	0	0	0	0	$204,959	N/A	no

R11 – This site represents one single family residence. The predicted noise level at this site exceeds the NAC for the Design Year 2035. Therefore, a barrier analysis was performed for the site. A noise wall was evaluated inside the proposed right-of-way between the back of sidewalk and the proposed SR 46 right-of-way line. The barrier heights analyzed ranged from 12 feet to 22 feet. Only the 22-foot height provided a 5.0 dB(A) noise reduction which does not meet the 7 dB(A) reduction goal. Therefore, noise abatement was not warranted or recommended.

R11 Barrier Analysis

Height/Length (ft)	Number of Sites with Insertion Loss of (dB(A))					Number of Benefited Sites	Barrier Cost	Cost/ Benefited Site	Cost Reasonable (Yes/No)
	5+	6+	7+	8+	9+				
12/310	0	0	0	0	0	0	$153,172	N/A	no
14/310	0	0	0	0	0	0	$178,700	N/A	no
16/310	0	0	0	0	0	0	$204,229	N/A	no
18/310	0	0	0	0	0	0	$229,757	N/A	no
20/310	0	0	0	0	0	0	$255,286	N/A	no
22/310	1	0	0	0	0	1	$280,814	$280,814	no

R21 – The second of three sites that are considered special land use areas along the project corridor is R21. R21 is where the Sanford Aero Modelers (SAM) fly their radio control model airplanes. The not-for-profit organization has leased the property from the City of Sanford and Seminole County. The site has a maintained grassy field, pavilions, and seating areas. This site was evaluated individually using the FDOT publication *A Method to Determine Reasonableness and Feasibility of Noise Abatement at Special Use Locations*[5] (Updated July 22, 2009). Special

land uses do not include dwelling residences or Activity Category C as defined by 23 CFR Part 772. Some examples of special land uses are churches, schools, parks, and amphitheaters.

The outdoor land use on this site is predicted to experience noise levels exceeding 66 dB(A) in the Build condition. A special abatement analysis was conducted to determine the reasonableness and feasibility of a noise barrier at this location. Barriers were evaluated for heights ranging from 12 to 22 feet. A barrier height of 12 feet provides the minimum 5 dB(A) insertion loss. However, the cost of this barrier exceeds the abatement cost factor; therefore, a barrier does not meet the feasibility criterion.

R21 Barrier Analysis (Special Use Location)

Item	Criteria	Input	Units
1	Barrier Length	875	ft
2	Barrier Height	12	ft
3	Multiply 1 x 2	10,500	ft^2
4	Avg time person stays at site per visit	4	hr
5	Avg no. of people that use site per day that will receive 5 dB	100	person
6	Multiply 4 x 5	400	person-hr
7	Divide 3 by 6	26	ft^2/person-hr
8	Multiply 7 by $42,000	1,102,500	$/person-hr/$ft^2$
9	Does 8 exceed $711,382	yes	--
10	If item 9 is no, abatement is reasonable	--	--
11	If item 9 is yes, abatement in not reasonable	not reasonable	--

R22, R24, R26, & R28 – These sites are single family residences that have access onto SR 46 and are located over 600 feet apart. R22 is located on the north side of SR 46 at Mullet Lake Park Road, R24 is on the south side of SR 46 approximately 1,500 feet from R22, R26 is on the north side of SR 46 just west of Torren Point, and R28 is on the north side of SR 46 just east of Torren Point. Site conditions in these areas prevent the use of noise barriers to reduce traffic noise levels. Access driveways are either located directly in front of or immediately adjacent to these sites. Therefore, construction of effective noise barriers would restrict property access. In addition, existing right-of-way is limited within these residential areas and does not contain enough right-of-way for a barrier structure unless the proposed 5' sidewalk is removed from consideration. Additional right-of-way may be required for the construction of a barrier. Based on the number of impacted residences (i.e. one each location), a noise barrier at these separate locations does not meet the minimum number of impacted receptor sites to be considered acoustically feasible. For a noise barrier to be considered acoustically feasible, a noise barrier must provide a noise reduction of at least 7 dB(A) and provide at least 5 dB(A) noise reduction to at least two impacted noise receptor sites. For these reasons, noise barriers were not considered a reasonable or feasible noise abatement measure at these locations and further barrier analysis was not considered warranted.

R22 Barrier Analysis

Height/Length (ft)	Number of Sites with Insertion Loss of (dB(A))					Number of Benefited Sites	Barrier Cost	Cost/ Benefited Site	Cost Reasonable (Yes/No)
	5+	6+	7+	8+	9+				
12/304	0	0	0	0	0	0	$109,490	N/A	no
14/304	0	0	0	0	0	0	$127,738	N/A	no
16/304	0	0	0	0	0	0	$145,986	N/A	no

18/304	0	0	0	0	0	0	$164,235	N/A	no
20/304	0	0	0	0	0	0	$182,483	N/A	no
22/304	0	0	0	0	0	0	$200,731	N/A	no

R24 Barrier Analysis

Height/Length (ft)	Number of Sites with Insertion Loss of (dB(A))					Number of Benefited Sites	Barrier Cost	Cost/ Benefited Site	Cost Reasonable (Yes/No)
	5+	6+	7+	8+	9+				
12/201	1	0	0	0	0	1	$72,295	$72,295	no
12/301	0	1	0	0	0	1	$108,442	$108,442	no
14/301	0	1	0	0	0	1	$126,516	$126,516	no
16/301	0	1	0	0	0	1	$144,589	$144,589	no
18/301	0	1	0	0	0	1	$162,663	$162,663	no
20/301	0	1	0	0	0	1	$180,736	$180,736	no
22/301	0	1	0	0	0	1	$198,810	$198,810	no

R26 Barrier Analysis

Height/Length (ft)	Number of Sites with Insertion Loss of (dB(A))					Number of Benefited Sites	Barrier Cost	Cost/ Benefited Site	Cost Reasonable (Yes/No)
	5+	6+	7+	8+	9+				
12/375	0	0	0	0	0	0	$134,929	N/A	no
14/375	0	0	0	0	0	0	$157,418	N/A	no
16/375	0	0	0	0	0	0	$179,906	N/A	no
18/375	0	0	0	0	0	0	$202,394	N/A	no
20/375	0	0	0	0	0	0	$224,882	N/A	no
22/375	0	0	0	0	0	0	$247,371	N/A	no

R28 Barrier Analysis

Height/Length (ft)	Number of Sites with Insertion Loss of (dB(A))					Number of Benefited Sites	Barrier Cost	Cost/ Benefited Site	Cost Reasonable (Yes/No)
	5+	6+	7+	8+	9+				
12/326	0	0	0	0	0	0	$117,419	N/A	no
14/326	1	0	0	0	0	1	$136,989	$136,989	no
16/326	1	0	0	0	0	1	$156,559	$156,559	no
18/326	1	0	0	0	0	1	$176,128	$176,128	no
20/326	1	0	0	0	0	1	$195,698	$195,698	no
22/326	1	0	0	0	0	1	$215,268	$215,268	no

NSA 3 (Mockingbird Lane to CR 426) Segment 3 – Receptor Sites R30-R42 & R50

Only sites R37, R38, and R41 are predicted to approach or exceed the NAC for the Design Year 2035 Build Alternative. Since the remaining receptor sites do not involve noise impacts, noise abatement for these sites was not warranted or recommended.

R37 – There is one single family residence that has access onto Cochran Road at the intersection of SR 46. Site conditions in this area prevent the use of a noise barrier to reduce traffic noise levels. The access driveway is located directly in front of this site. Therefore, construction of an effective noise barrier would restrict property access. In addition, existing right-of-way is limited within this residential area and does not contain enough right-of-way for a barrier structure unless the proposed 5' sidewalk is removed from consideration. Additional right-of-

way may be required for the construction of a barrier. Based on the number of impacted residences (i.e. one), a noise barrier at this location does not meet the minimum number of impacted receptor sites to be considered acoustically feasible. For a noise barrier to be considered acoustically feasible, a noise barrier must provide at least 5 dB(A) noise reduction to at least two impacted noise receptor sites. For these reasons, a noise barrier was not considered a reasonable or feasible noise abatement measure at this location and further barrier analysis was not considered warranted.

R37 Barrier Analysis

Height/Length (ft)	Number of Sites with Insertion Loss of (dB(A))					Number of Benefited Sites	Barrier Cost	Cost/ Benefited Site	Cost Reasonable (Yes/No)
	5+	6+	7+	8+	9+				
12/438	0	0	0	0	0	0	$157,826	N/A	no
14/438	0	0	0	0	0	0	$184,131	N/A	no
16/438	0	0	0	0	0	0	$210,435	N/A	no
18/438	0	0	0	0	0	0	$236,739	N/A	no
20/438	0	0	0	0	0	0	$263,044	N/A	no
22/438	0	0	0	0	0	0	$289,348	N/A	no

R38 – The second of three sites that are considered special land use areas along the project corridor is R38. R38 is the Community Church of God which appears to have outdoor usage. This site was evaluated individually using the FDOT publication *A Method to Determine Reasonableness and Feasibility of Noise Abatement at Special Use Locations*[5] (Updated July 22, 2009). Special land uses do not include dwelling residences or Activity Category C as defined by 23 CFR Part 772. Some examples of special land uses are churches, schools, parks, and amphitheaters.

The outdoor land uses are predicted to experience noise levels exceeding 66 dB(A) in the Build condition. A special abatement analysis was conducted to determine the reasonableness and feasibility of a noise barrier at this location. Barriers were evaluated for heights ranging from 12 to 22 feet. A barrier height of 12 feet provides the minimum 5 dB(A) insertion loss. However, the cost of this barrier exceeds the abatement cost factor; therefore, a barrier does not meet the feasibility criterion.

R38 Barrier Analysis (Special Use Location)

Item	Criteria	Input	Units
1	Barrier Length	304	ft
2	Barrier Height	12	ft
3	Multiply 1 x 2	3,648	ft^2
4	Avg time person stays at site per visit	1	hr
5	Avg no. of people that use site per day that will receive 5 dB	100	person
6	Multiply 4 x 5	100	person-hr
7	Divide 3 by 6	36	ft^2/person-hr
8	Multiply 7 by $42,000	1,532,160	$/person-hr/$ft^2$
9	Does 8 exceed $711,382?	yes	--
10	If item 9 is no, abatement is reasonable	--	--
11	If item 9 is yes, abatement in not reasonable	not reasonable	--

R41 – There is one single family residence that has access onto SR 46. Site conditions in this area prevent the use of a noise barrier to reduce traffic noise levels. The access driveway is located directly in front of this site. Therefore, construction of an effective noise barrier would restrict property access. In addition, existing right-of-way is limited within this residential area and does not contain enough right-of-way for a barrier structure unless the proposed 5' sidewalk is removed from consideration. Additional right-of-way may be required for the construction of a barrier. Based on the number of impacted residences (i.e. one), a noise barrier at this location does not meet the minimum number of impacted receptor sites to be considered acoustically feasible. For a noise barrier to be considered acoustically feasible, a noise barrier must provide at least 5 dB(A) noise reduction to at least two impacted noise receptor sites. For these reasons, a noise barrier was not considered a reasonable or feasible noise abatement measure at this location and further barrier analysis was not considered warranted.

R41 Barrier Analysis

Height/Length (ft)	Number of Sites with Insertion Loss of (dB(A))					Number of Benefited Sites	Barrier Cost	Cost/ Benefited Site	Cost Reasonable (Yes/No)
	5+	6+	7+	8+	9+				
12/266	0	0	0	0	0	0	$95,816	N/A	no
14/266	0	0	0	0	0	0	$111,786	N/A	no
16/266	0	0	0	0	0	0	$127,755	N/A	no
18/266	0	0	0	0	0	0	$143,724	N/A	no
20/266	0	0	0	0	0	0	$159,694	N/A	no
22/266	0	0	0	0	0	0	$175,663	N/A	no

NSA 3 (Mockingbird Lane to CR 426) Segment 4 – Receptor Sites R43-R49 and R51-R67

Only sites R45, R49, R57, R58, R62, R63, and R67 are predicted to approach or exceed the NAC for the Design Year 2035 Build Alternative. Therefore, since the remaining sites do not involve noise impacts, noise abatement for these sites was not warranted or recommended.

R45 – There is one single family residence that has access onto SR 46. Site conditions in this area prevent the use of a noise barrier to reduce traffic noise levels. The access driveway is located directly in front of this site. Therefore, construction of an effective noise barrier would restrict property access. In addition, existing right-of-way is very limited within this residential area and does not contain enough right-of-way for a barrier structure. Additional right-of-way (resulting in relocations) would be required for the construction of a barrier. Based on the number of impacted residences (i.e. one), a noise barrier at this location does not meet the minimum number of impacted receptor sites to be considered acoustically feasible. For a noise barrier to be considered acoustically feasible, a noise barrier must provide at least 5 dB(A) noise reduction to at least two impacted noise receptor sites. For these reasons, a noise barrier was not considered a reasonable or feasible noise abatement measure at this location and further barrier analysis was not considered warranted.

R45 Barrier Analysis

Height/Length (ft)	Number of Sites with Insertion Loss of (dB(A))					Number of Benefited Sites	Barrier Cost	Cost/ Benefited Site	Cost Reasonable (Yes/No)
	5+	6+	7+	8+	9+				
12/323	1	0	0	0	0	1	$116,453	$116,453	no

14/323	1	0	0	0	0	1	$135,862	$135,862	no
16/323	1	0	0	0	0	1	$155,271	$155,271	no
18/323	1	0	0	0	0	1	$174,680	$174,680	no
20/323	1	0	0	0	0	1	$194,089	$194,089	no
22/323	1	0	0	0	0	1	$213,498	$213,498	no

R49 – This site is a commercial facility that has an exterior public-use area. It is located at the busy intersection of SR 46 and CR 426. Site conditions in this area prevent the use of a noise barrier to reduce traffic noise levels. Access driveways are either located directly in front of or immediately adjacent to these sites. Therefore, construction of an effective noise barrier would restrict property access. In addition, existing right-of-way is very limited within this commercial area and does not contain enough right-of-way for a barrier structure. Additional right-of-way (resulting in relocations) would be required for the construction of a barrier. For these reasons, a noise barrier was not considered a reasonable or feasible noise abatement measure at this location and further barrier analysis was not considered warranted.

R57 & R58 – These sites represent two single family residences. The predicted noise levels at these sites exceed the NAC for the Design Year 2035. Therefore, a barrier analysis was performed for the sites. A noise wall was evaluated inside the proposed right-of-way between the back of sidewalk and the proposed SR 46 right-of-way line. The barrier heights analyzed ranged from 12 feet to 22 feet. Only the 22-foot height provided a 7.0 dB(A) noise reduction at one residence which meets the 7 dB(A) reduction goal. However, only one impacted receptor was provided at least 5 dB(A) reduction or greater which does not meet the minimum threshold of two or greater. Therefore, noise abatement was not warranted or recommended.

R57 & R58 Barrier Analysis

Height/Length (ft)	Number of Sites with Insertion Loss of (dB(A))					Number of Benefited Sites	Barrier Cost	Cost/ Benefited Site	Cost Reasonable (Yes/No)
	5+	6+	7+	8+	9+				
12/529	1	0	0	0	0	1	$190,233	$190,233	no
14/529	0	1	0	0	0	1	$221,939	$221,939	no
16/529	0	1	0	0	0	1	$253,644	$253,644	no
18/529	0	1	0	0	0	1	$285,350	$285,350	no
20/529	0	1	0	0	0	1	$317,055	$317,055	no
22/529	0	0	1	0	0	1	$348,761	$348,761	no

R62 & R63 – There are two single family residences that have access onto SR 46. Site conditions in these areas prevent the use of a noise barrier to reduce traffic noise levels. Access driveways are either located directly in front of or immediately adjacent to these sites. Therefore, construction of an effective noise barrier would restrict property access. In addition, existing right-of-way is very limited within this residential area and does not contain enough right-of-way for a barrier structure. Additional right-of-way (resulting in relocations) would be required for the construction of a barrier. For these reasons, a noise barrier was not considered a reasonable or feasible noise abatement measure at these locations and further barrier analysis was not considered warranted.

R62 & R63 Barrier Analysis

Height/Length (ft)	Number of Sites with Insertion Loss of (dB(A))					Number of Benefited Sites	Barrier Cost	Cost/ Benefited Site	Cost Reasonable (Yes/No)
	5+	6+	7+	8+	9+				
12/260	0	0	0	0	1	1	$93,583	$93,583	no
14/260	0	0	0	0	1	1	$109,180	$109,180	no
16/260	0	0	0	0	1	1	$124,778	$124,778	no
18/260	0	0	0	0	1	1	$140,375	$140,375	no
20/260	0	0	0	0	1	1	$155,972	$155,972	no
22/260	0	0	0	0	1	1	$171,569	$155,972	no

R67 – This site is a commercial facility that has an exterior public-use area. It is located at the busy intersection of SR 46 and CR 426. Site conditions in this area prevent the use of a noise barrier to reduce traffic noise levels. Access driveways are either located directly in front of or immediately adjacent to these sites. Therefore, construction of an effective noise barrier would restrict property access. In addition, existing right-of-way is very limited within this commercial area and does not contain enough right-of-way for a barrier structure. Additional right-of-way (resulting in relocations) would be required for the construction of a barrier. For these reasons, a noise barrier was not considered a reasonable or feasible noise abatement measure at this location and further barrier analysis was not considered warranted.

For the reasons listed above, noise barriers were not considered a reasonable or feasible noise abatement measure at Receptor Sites R2, R3, R4, R7, R11, R21, R22, R24, R26, R28, R37, R38, R41, R45, R49, R57, R58, R62, R63, and R67. Therefore, further barrier analysis was not considered warranted.

4.0 CONCLUSIONS

Noise levels at 20 noise sensitive receptor sites are predicted to approach or exceed the NAC for the Design Year 2035 Build Alternative. Compared to existing conditions, no noise sensitive receptor sites are expected to experience a substantial increase in traffic noise as a result of this project.

Based on impacts to the noise sensitive sites that approached or exceeded NAC, noise abatement measures were evaluated within the project corridor. For this evaluation of noise abatement measures, impacted sites were grouped into three noise sensitive areas (NSAs) based on their proximity, similar characteristics and geography. Although feasible, traffic management, alternative alignments, and property acquisitions were determined to be unreasonable methods of reducing predicted traffic noise impacts to the affected receptors.

Based on predicted noise levels exceeding the NAC, noise barrier evaluations were performed as potential abatement for noise sensitive sites contained in NSA 1, NSA 2, and NSA 3. The results of these barrier evaluations indicate that the construction of noise barriers does not appear to be a feasible or cost reasonable method of reducing traffic noise impacts for the proposed improvements to SR 46.

Therefore, based on the noise analyses performed to date, there appears to be no apparent solutions available to mitigate the noise impacts at the locations identified in Table 3.4.

5.0 CONSTRUCTION NOISE AND VIBRATION

Land uses adjacent to SR 46 are identified on the FDOT listing of noise- and vibration-sensitive sites (e.g., residences, churches). Construction of the proposed roadway improvements is not expected to have any substantial noise or vibration impact. If additional sensitive land uses develop adjacent to the roadway prior to construction, increased potential for noise or vibration impacts could result. It is anticipated that the application of the ***FDOT Standard Specifications for Road and Bridge Construction*** will minimize or eliminate potential construction noise and vibration impacts. However, should unanticipated noise or vibration issues arise during the construction process, the Project Engineer, in coordination with the District Noise Specialist and the Contractor, will investigate additional methods of controlling these impacts.

6.0 PUBLIC COORDINATION

Coordination with local agencies, officials and the general public is ongoing. The public will have the opportunity to comment on the proposed project at public meetings. Local officials can promote compatibility between land development and highways. This report provides information that can be used by local communities to identify locations where particular types of future land development would be incompatible with anticipated traffic noise levels.

To aid in promoting land use compatibility, a copy of the Noise Study 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 Seminole County. In addition, generalized future noise impact contours for the properties in the immediate vicinity of the project have been developed for Noise Abatement Categories A, B/C, and E (highly sensitive land uses, residential, sensitive institutional/commercial, and other sensitive land uses, respectively). These contours represent the approximate distance from the edge of the nearest proposed travel lane of SR 46 to the limits of the area predicted to approach (i.e., within 1 dB(A) or exceed the NAC in the Design Year 2035. The estimated contours do not account for the effects of elevation, topographic features, shielding of noise by man-made structures, or noise from other roads (i.e., intersecting streets), all of which can cause a variation in the distance to the contour. Within the project corridor the distance between the proposed edge of the outside travel lane and the contours at various locations are presented in Figure 8. To minimize the potential for incompatible land use, noise sensitive land uses should be located beyond the distance provided for the applicable Activity Category.

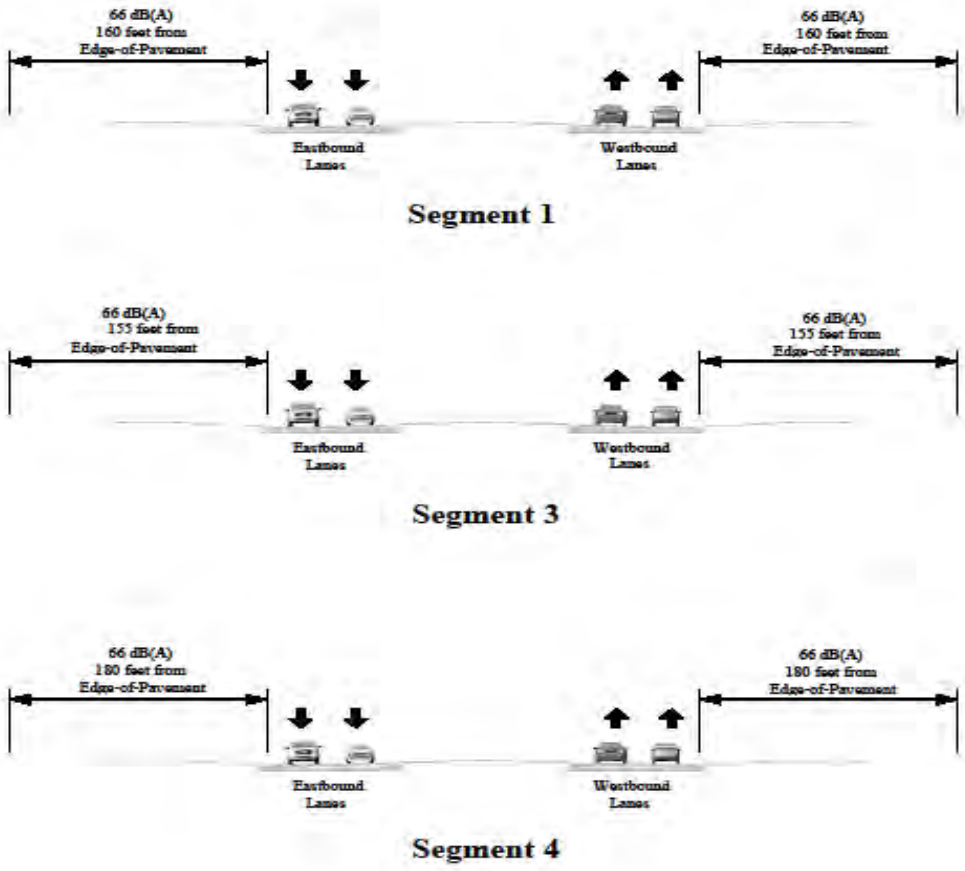


Figure 8: Project Noise Contours
(SR 46 from SR 415 to CR 426)

7.0 REFERENCES

1. *Procedures for Abatement of Highway Traffic Noise and Construction Noise*, 23 CFR Part 772. Federal Highway Administration. July 13, 2010.
2. *Project Development and Environment Manual*, Part 2, Chapter 17 Noise. Florida Department of Transportation. May 24, 2011.
3. *Draft SR 46 Design Traffic Technical Memorandum.* Prepared for Seminole County. Prepared by GMB Engineers & Planners, Inc. February 2012 and updated November 2013.
4. *Measurement of Highway-Related Noise.* Federal Highway Administration. May 1996.
5. *A Method to Determine Reasonableness and Feasibility of Noise Abatement at Special Use Locations*, FL-ER-65-97 (Updated July 22, 2009).

APPENDICES

Appendix A: Traffic Data for SR 46 Noise Study
Appendix B: Noise Monitoring and Validation Data (CD)
Appendix C: TNM Model Inputs/Outputs (CD)

APPENDIX A

Traffic Data for SR 46 Noise Study

Traffic Data for SR 46 Noise Study

Existing (2013) Conditions

Mainline Segment	Two-way Number of Lanes	Two-way AADT		Peak Hour Peak Direction			Design Hr % T	Design Hr % MT	Design Hr % HT	Design Hr % Buses	Design Hr % Motorcycles	K-factor	D-factor	Posted Speed (mph)
		Demand	LOS C MSV	PM Peak Direction	Demand	LOS C MSV								
SR 46 West of SR 415	2	10,500	15,400	EB	644	820	8.50%	5.00%	3.50%	1.00%	0.80%	9.00%	53.00%	50
SR 46 Between SR 415 and W. Osceola Road	2	10,500	8,100	EB	548	430	8.50%	5.00%	3.50%	1.00%	0.80%	9.00%	53.00%	55
SR 46 Between W. Osceola Road and Cochran Road	2	8,500	8,100	EB	445	430	8.50%	5.00%	3.50%	1.00%	0.80%	9.00%	53.00%	55
SR 46 Between Cochran Road and CR 426	2	8,700	8,100	EB	438	430	8.50%	5.00%	3.50%	1.00%	0.80%	9.00%	53.00%	45
SR 46 East of CR 426	2	6,100	8,100	EB	294	430	8.50%	5.00%	3.50%	1.00%	0.80%	9.00%	53.00%	55
SR 415 South of SR 46	4	9,300 (1)	35,500	NB	753 (2)	1,890	4.40%	2.59%	1.81%	0.52%	0.41%	9.00%	67.10%	45
SR 415 North of SR 46	2	15,500 (1)	15,400	NB	1,129 (2)	820	1.00%	0.59%	0.41%	0.12%	0.09%	9.00%	67.10%	45
W. Osceola Road North SR 46	2	2,100	4,700	EB	137	260	10.00%	5.88%	4.12%	1.18%	0.94%	9.00%	62.10%	35
Cochran Road South of SR 46	2	750 (1)	4,700	SB	37 (2)	260	1.00%	0.59%	0.41%	0.12%	0.09%	9.00%	69.00%	35
Cochran Road North of SR 46	2	60 (1)	4,700	NB	5 (2)	260	1.00%	0.59%	0.41%	0.12%	0.09%	9.00%	69.00%	35
CR 426 South of SR 46	2	8,600	8,100	NB	530	430	1.00%	0.59%	0.41%	0.12%	0.09%	9.00%	60.80%	45
CR 426 North of SR 46	2	3,600	4,700	NB	219	260	1.00%	0.59%	0.41%	0.12%	0.09%	9.00%	60.80%	30

Note:

1. Reflects Year 2011 Annual Average Daily Traffic Voulmes

2. Reflects Year 2011 Peak Hour Peak Directional Volumes

No Build (2035) Conditions

Mainline Segment	Two-way Number of Lanes	Two-way AADT		Peak Hour Peak Direction			Design Hr % T	Design Hr % MT	Design Hr % HT	Design Hr % Buses	Design Hr % Motorcycles	K-factor	D-factor	Posted Speed (mph)
		Demand	LOS C MSV	PM Peak Direction	Demand	LOS C MSV								
SR 46 West of SR 415	2	31,000	15,400	EB	1,500	820	8.50%	5.00%	3.50%	1.00%	0.80%	9.0%	53.0%	50
SR 46 Between SR 415 and W. Osceola Road	2	31,000	8,100	EB	1,500	430	8.50%	5.00%	3.50%	1.00%	0.80%	9.0%	53.0%	55
SR 46 Between W. Osceola Road and Cochran Road	2	26,500	8,100	EB	1,300	430	8.50%	5.00%	3.50%	1.00%	0.80%	9.0%	53.0%	55
SR 46 Between Cochran Road and CR 426	2	25,500	8,100	EB	1,200	430	8.50%	5.00%	3.50%	1.00%	0.80%	9.0%	53.0%	45
SR 46 East of CR 426	2	17,000	8,100	EB	800	430	8.50%	5.00%	3.50%	1.00%	0.80%	9.0%	53.0%	55
SR 415 South of SR 46	4	24,500	35,500	NB	1,500	1,890	4.40%	2.59%	1.81%	0.52%	0.41%	9.0%	67.1%	45
SR 415 North of SR 46	4	34,500	35,500	NB	2,100	1,890	1.00%	0.59%	0.41%	0.12%	0.09%	9.0%	67.1%	45
W. Osceola Road North SR 46	2	3,300	4,700	EB	200	260	10.00%	5.88%	4.12%	1.18%	0.94%	9.0%	62.1%	35
Cochran Road South of SR 46	2	1,100	4,700	SB	70	260	1.00%	0.59%	0.41%	0.12%	0.09%	9.0%	69.0%	35
Cochran Road North of SR 46	2	90	4,700	NB	10	260	1.00%	0.59%	0.41%	0.12%	0.09%	9.0%	69.0%	35
CR 426 South of SR 46	2	19,000	8,100	NB	1,000	430	1.00%	0.59%	0.41%	0.12%	0.09%	9.0%	60.8%	45
CR 426 North of SR 46	2	5,600	4,700	NB	300	260	1.00%	0.59%	0.41%	0.12%	0.09%	9.0%	60.8%	30

Build (2035) Conditions

Mainline Segment	Two-way Number of Lanes	Two-way AADT		Peak Hour Peak Direction			Design Hr % T	Design Hr % MT	Design Hr % HT	Design Hr % Buses	Design Hr % Motorcycles	K-factor	D-factor	Posted Speed (mph)
		Demand	LOS C MSV	PM Peak Direction	Demand	LOS C MSV								
SR 46 West of SR 415	4	36,500	35,500	EB	1,700	1,890	8.50%	5.00%	3.50%	1.00%	0.80%	9.0%	53.0%	50
SR 46 Between SR 415 and W. Osceola Road	4	36,500	41,100	EB	1,700	2,210	8.50%	5.00%	3.50%	1.00%	0.80%	9.0%	53.0%	55
SR 46 Between W. Osceola Road and Cochran Road	4	31,000	41,100	EB	1,500	2,210	8.50%	5.00%	3.50%	1.00%	0.80%	9.0%	53.0%	55
SR 46 Between Cochran Road and CR 426	4	30,000	41,100	EB	1,400	2,210	8.50%	5.00%	3.50%	1.00%	0.80%	9.0%	53.0%	45
SR 46 East of CR 426	4	20,000	41,100	EB	950	2,210	8.50%	5.00%	3.50%	1.00%	0.80%	9.0%	53.0%	55
SR 415 South of SR 46	4	24,500	35,500	NB	1,500	1,890	4.40%	2.59%	1.81%	0.52%	0.41%	9.0%	67.1%	45
SR 415 North of SR 46	4	34,500	35,500	NB	2,100	1,890	1.00%	0.59%	0.41%	0.12%	0.09%	9.0%	67.1%	45
W. Osceola Road North SR 46	2	3,300	4,700	EB	200	260	10.00%	5.88%	4.12%	1.18%	0.94%	9.0%	62.1%	35
Cochran Road South of SR 46	2	1,100	4,700	SB	70	260	1.00%	0.59%	0.41%	0.12%	0.09%	9.0%	69.0%	35
Cochran Road North of SR 46	2	90	4,700	NB	10	260	1.00%	0.59%	0.41%	0.12%	0.09%	9.0%	69.0%	35
CR 426 South of SR 46	2	19,000	8,100	NB	1,000	430	1.00%	0.59%	0.41%	0.12%	0.09%	9.0%	60.8%	45
CR 426 North of SR 46	2	5,600	4,700	NB	300	260	1.00%	0.59%	0.41%	0.12%	0.09%	9.0%	60.8%	30

Source: *Draft SR 46 Design Traffic Technical Memorandum*. Prepared for Seminole County. Prepared by GMB Engineers & Planners, Inc. February 2012 and updated November 2013.

APPENDIX B

Noise Monitoring and Validation Data (CD)

NM1 Noise Monitoring Data Sheet and TNM Files for:
Validation Site 1 (NM1)
Validation Site 2 (NM2)
Validation Site 3 (NM3)

APPENDIX C

TNM Model Inputs/Outputs
(CD)

TNM Files for:
Noise Study Area 1 (existing, no-build, and build)
Noise Study Area 2 (existing, no-build, and build)
Noise Study Area 3 (existing, no-build, and build)