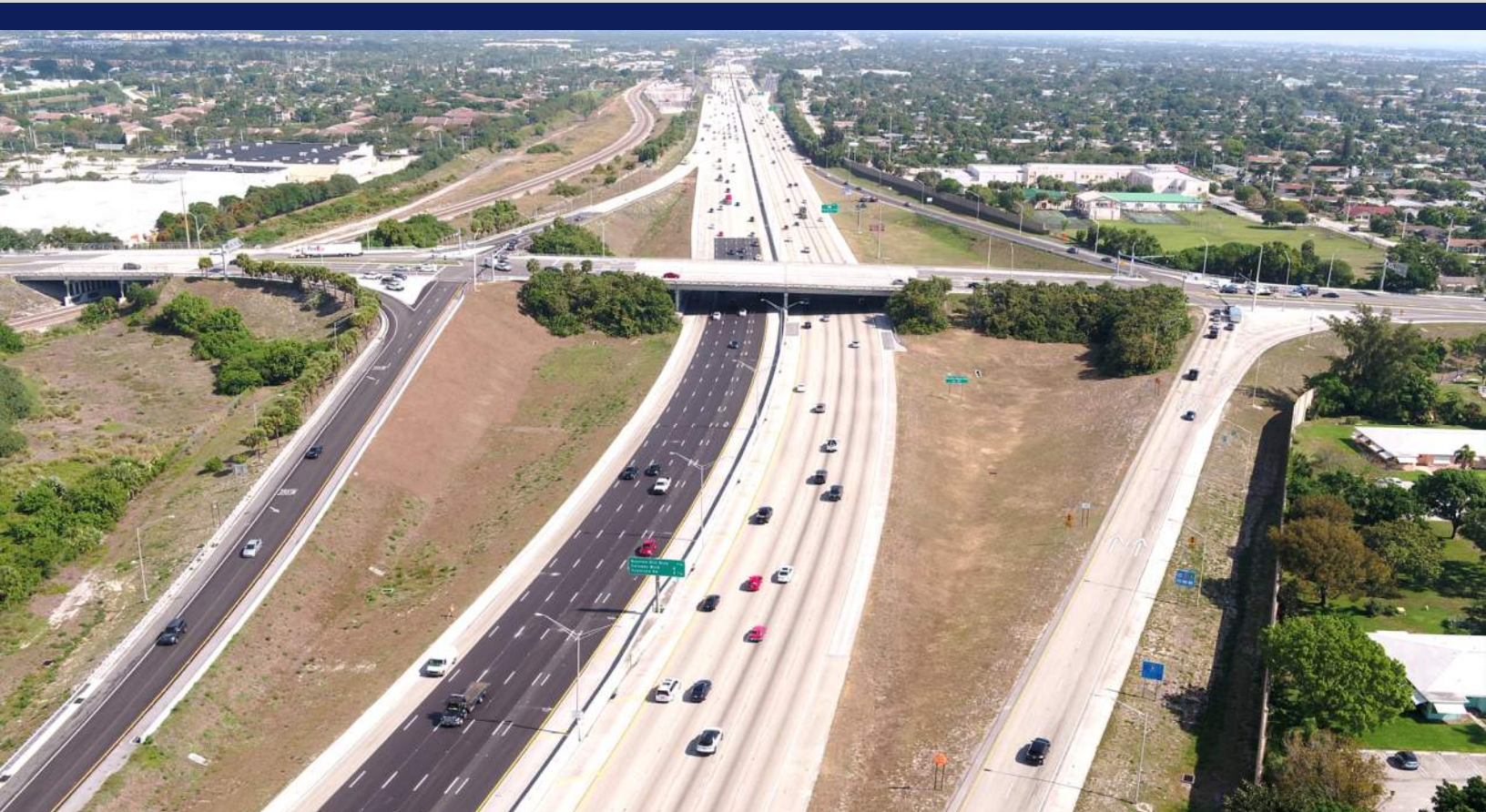




**SR 9/I-95 Project Development and Environment (PD&E) Study
from S. of Woolbright Road to N. of Woolbright Road
Palm Beach County, Florida**

FPID No.: 437279-1-22-02 | ETDM No.: 14341



NOISE STUDY REPORT

December 2020

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

NOISE STUDY REPORT

SR 9/I-95 Project Development and Environment Study
From South of Woolbright Road to North of Woolbright Road
Boynton Beach, Palm Beach County, Florida
(From Mile Post 13.560 to Mile Post 13.995)

FPID: 437279-1-22-02
ETDM #: 14341

Prepared for:



Florida Department of Transportation
District Four
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December 2020

Table of Contents

Table of Contents	i
EXECUTIVE SUMMARY	2
1. SUMMARY OF PROJECT	3
1.1 Project Description	3
1.2 Background	6
1.3 Purpose and Need	6
2. Proposed Alternatives	9
3. Traffic Noise Analysis	14
3.1 Noise Sensitive Receptor Sites	15
3.1.2 Woolbright Road	16
3.1.2 I-95	16
3.2 Field Measured Noise Levels	18
3.2.1 Field Measurement Sites	19
3.3 Computer Noise Model Validation	20
3.4 Noise Model Development	20
3.5 Predicted Traffic Noise Levels	21
3.5.1 Woolbright Road	21
3.5.2 I-95	23
3.6 Noise Impact Analysis	23
4. Noise Barrier Analysis	25
4.1 Isolated Residence – Woolbright Road West of SW 3 rd Street	26
4.2 Noise Barrier LPP – Learning Place Playground	28
4.3 Noise Barrier WM – East of SW 3 rd Street to East of SW 2 nd Street	30
5. Summary and Conclusions	32
6. Construction Noise and Vibration	34
7. Coordination with Local Officials	35
8. References	36

List of Figures

Figure 1-1 Project Study Area	4
Figure 2-1 Alternative 1: TDI	11
Figure 2-2 Alternative 2: DDI.....	12
Figure 2-3 Alternative 3: SPUI	13
Figure 3-1 Noise Analysis Map	17
Figure 4-1 Noise Barrier Recommendations	27

List of Tables

Table 3-1 Noise Abatement Criteria.....	15
Table 3-2 Field Measurement Data.....	18
Table 3-3 Modeled Noise Receptor Locations and Noise Analysis Results.....	22
Table 4-1 Noise Barrier Analysis for the Learning Place Preschool Playground	29
Table 4-2 Special Use Site Noise Barrier Analysis for the Learning Place Preschool Playground	30
Table 7-1 Design Year (2045) Noise Impact Contour Distances.....	35

Appendices

Appendix A – TNM Traffic Data

EXECUTIVE SUMMARY

A traffic noise analysis was conducted in accordance with Title 23 CFR 772, *Procedures for Abatement of Highway Traffic Noise and Construction Noise* (July 13, 2010) and Part 2, Chapter 18 – *Highway Traffic Noise* from the FDOT PD&E Manual. Traffic noise levels were predicted for noise sensitive locations along the project corridor for the existing conditions and the design year (2045) No-Build and recommended Build Alternatives. Approximately 57 residences and six noise sensitive non-residential/special-use locations with the potential to be impacted by the proposed improvements were identified along Woolbright Road and I-95 within the project study area. Under the existing conditions, the primary source of noise at the nearby noise sensitive sites is traffic on the subject roadways (Woolbright Road and I-95).

Build Alternative traffic noise levels are expected to range from approximately 57.0 to 70.7 dB(A) during the project's design year, no more than 1.8 dB(A) greater than existing traffic noise levels. Design Year, Build Alternative traffic noise levels are predicted to approach or exceed the FHWA NAC - 67 dB(A) at six residences and a preschool playground along the north side of Woolbright Road as a result of the planned improvements. Based on the FHWA and FDOT methodologies used to evaluate traffic noise levels in this study, modifications proposed with this project were determined to generate noise impacts at noise sensitive sites within the project study area and consideration of noise abatement is required to mitigate these impacts. An analysis of noise abatement measures considered for the sites that approach or exceed the NAC is presented in **Chapter 4**. Although a number of sites approach or exceed the NAC, the proposed improvements do not result in any substantial noise increases [i.e., greater than 15 dB(A) over existing levels]. The locations where noise barriers were evaluated are depicted on **Figure 4-1** and are described below:

- **Isolated Residence – Woolbright Road West of SW 3rd Street.** One (1) impacted single-family home along the north side of Woolbright Road at SW 3rd Street. This site does not meet the FDOT's noise reduction feasibility criterion requiring that a noise barrier must provide a 5.0 dB(A) reduction for at least two impacted receptors to be considered feasible.
- **Woolbright Road – The Learning Place Preschool.** One (1) impacted school playground. According to the results of the special land use noise barrier reasonableness analysis for this site, the cost to provide noise abatement for this playground exceeded the FDOT's abatement cost factor criteria for special use sites (\$995,935/person-hours/square-foot).
- **Woolbright Road East of SW 3rd Street to East of SW 2nd Street.** Five (5) impacted single-family homes. There is no available ROW behind the sidewalk for construction of a noise barrier. In addition, numerous openings for driveways and a side street would be required. Therefore, it is not possible to construct an effective noise barrier for these homes.

None of the noise barrier design concepts for these areas met FDOT's reasonableness and/or feasibility criteria, therefore, noise barriers are not recommended with this project.

1. SUMMARY OF PROJECT

This report contains information regarding the SR 9/I-95 (I-95) from South of Woolbright Road to North of Woolbright Road Project Development and Environment (PD&E) Study (Mile Post 13.560 to Mile Post 13.995) for a total length of 0.83 miles along I-95 and 0.85 miles along Woolbright Road. This project has been developed in compliance with Title VI of the Civil Rights Act of 1964 and other related federal and state nondiscrimination authorities. Neither the Florida Department of Transportation (FDOT) nor this project will deny the benefits of, exclude from participation in, or subject to discrimination anyone on the basis of race, color, national origin, age, sex, disability, or family status.

1.1 Project Description

The FDOT, District Four is conducting a PD&E Study to identify long-term needs of I-95 and develop design concepts to address traffic spillback onto I-95, reduce congestion at the I-95 and Woolbright Road interchange, improve interchange operations, and improve safety at the study interchange through the 2045 design year horizon. This study will also consider Strategic Intermodal System (SIS) connector improvements needed within the project area and is consistent with plans for the I-95 mainline, including the potential extension of I-95 Managed Lanes through Palm Beach County. This study is investigating alternatives, including the no-build alternative, to improve the overall operating conditions and enhance safety within the interchange.

The improvements to the I-95 Interchange at Woolbright Road will provide additional capacity for vehicles travelling east-west as well as operational improvements north-south through the interchange. Local and network connectivity for the City of Boynton Beach will be improved.

The I-95 Interchange of at Woolbright Road is located in Palm Beach County in the City of Boynton Beach. The project limits along I-95 extend from just south of Woolbright Road at SW 23rd Avenue to just north of Woolbright Road about 2,000 feet north of the interchange. The project limits along Woolbright Road extend from the SW 18th Street on the west to just east of I-95 at SW 2nd Street. The project area includes the signalized intersections at SW 8th Street, and the I-95 southbound and northbound ramps (**Figure 1-1. Project Location Map**). The South Florida Rail Corridor (SFRC)/CSX Railroad is adjacent to the project corridor and runs parallel along the west side of I-95. Tri-Rail operates along this rail corridor, with the nearest station; Boynton Beach Tri-Rail Station located 2.68 miles to the north of Woolbright Road, just north of the Gateway Boulevard interchange.

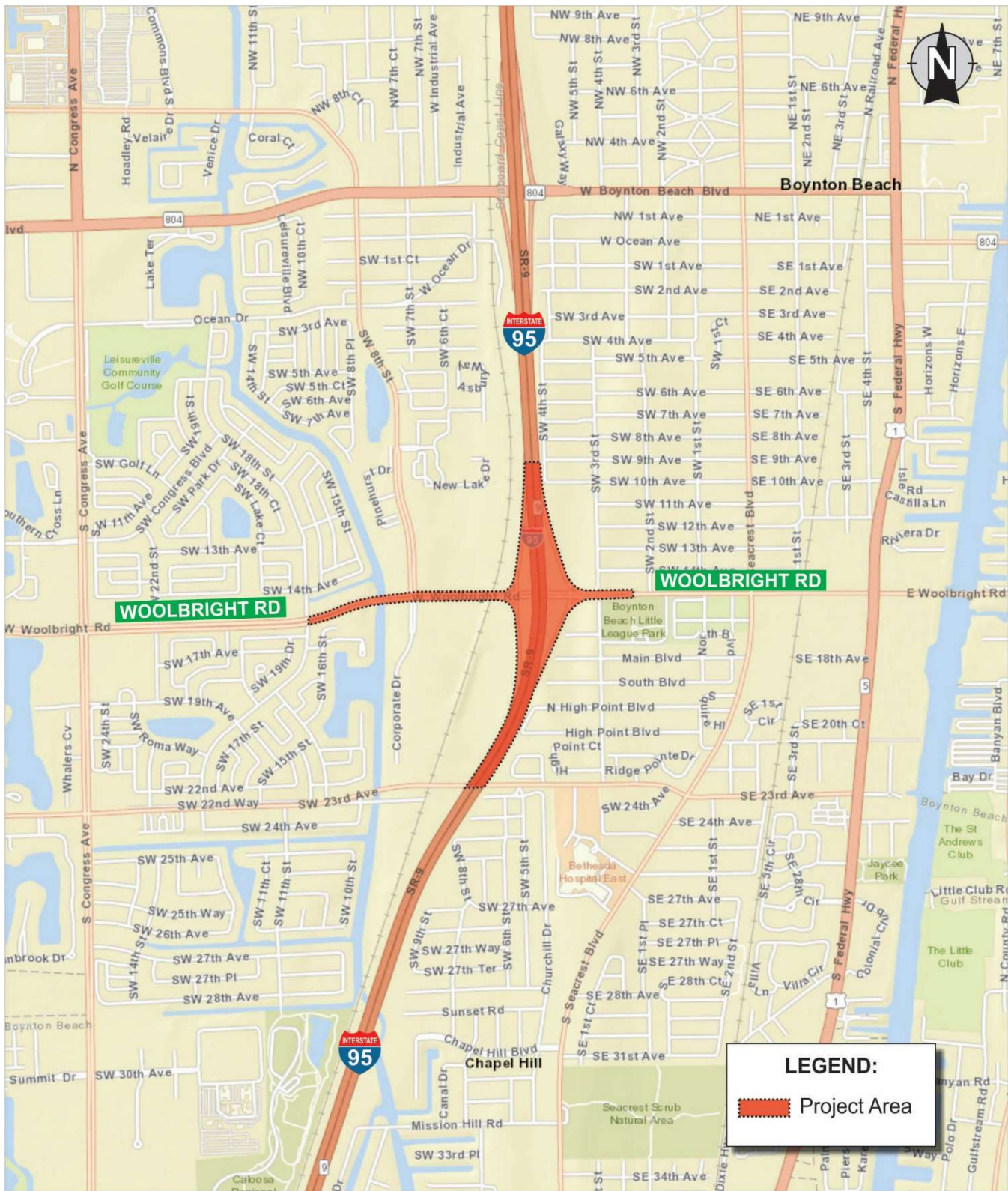


Figure 1-1 Project Study Area

Within the project limits, I-95 is a ten-lane divided interstate freeway providing four general purpose lanes and one high occupancy vehicle (HOV) lane in each direction. The project will be designed to complement the I-95 interim interchange design-build project recently completed, which constructed one additional left-turn lane onto I-95 in both the eastbound and westbound directions; a free-flow right-turn lane from the southbound off-ramp; and designated bicycle lanes along Woolbright Road within the limits of the interchange.

Woolbright Road is currently a six-lane urban divided minor arterial to the west of I-95 and a four-lane urban divided minor arterial to the east of I-95. There is a raised median from SW 18th Street west of I-95 to just west of SW 2nd Street east of I-95. At SW 2nd Street, Woolbright Road transitions to a five-lane roadway section with a two-way left-turn lane in the middle. There are sidewalks on both sides of Woolbright Road throughout the project area and designated bicycle lanes within the limits of the interchange.

The land use adjacent to the interchange is zoned as Public Usage, Single Family, Duplex, Neighborhood Commercial, and Light Industrial. The area southeast of the interchange is zoned Recreation, Multi Family, Public Usage, and Planned Unit Development. Zoning northwest of the interchange consists of Planned Commercial Development, Planned Unit Development, Light Industrial, Office Professional, Neighborhood Commercial, and Single Family, and southwest of the interchange is zoned Community Commercial, Office Professional, Planned Industrial Development, and Single Family.

Improvement to the I-95 interchange at Woolbright Boulevard is consistent with the Cost Feasible Plan of the Palm Beach County Metropolitan Planning Organization (MPO)'s 2045 Long Range Transportation Plan (LRTP). "The purpose is to improve interchange operations and reduce congestion, reduce potential for traffic spillback onto I-95, and increase safety. The improvements are needed to ensure that the I-95 interchange will meet FDOT Level-of-Service standards through year 2045."

This project has been screened through the Efficient Transportation Decision Making (ETDM) process. The Advance Notification (AN) was distributed during the programing screening event, which occurred on October 23, 2017. The Programming Screen Summary Report was re-published on May 3, 2018 and can be viewed under the ETDM # 14341.

1.2 Background

The FDOT made improvements to the I-95 mainline in Palm Beach County in the 1990s and 2000s, adding High Occupancy Vehicle (HOV) lanes and auxiliary lanes from south of Linton Boulevard to north of PGA Boulevard. Minor interchange improvements were also made to eight of the existing 18 interchanges along this section of the corridor. At the time of the project, FDOT committed to re-examine the need for long-term improvements at those interchanges that were not improved during the I-95 mainline project. FDOT District Four also identified the need to re-examine the 2003 I-95 Master Plan Study for Palm Beach County to develop new improvements to interchanges based on changes in traffic volumes and updated design standards since the Master Plan was developed.

A Concept Development Report (CDR) was prepared by the FDOT District Four Office of Planning and Environmental Management in August of 2014. The following are the recommendations identified for short-term improvements that have been recently completed as part of the Design-Build project:

- One additional left-turn lane onto I-95 in both the eastbound and westbound directions;
- A free-flow right-turn lane from the southbound off-ramp; and
- Designated bicycle lanes along Woolbright Road within the limits of the interchange.

1.3 Purpose and Need

The purpose of this study is to identify long-term needs of I-95 and develop concepts to address traffic spillback onto I-95, reduce congestion on I-95 and Woolbright Road, improve interchange operations, and improve safety at the I-95 and Woolbright Road interchange through the 2045 design year horizon. This project will also consider SIS connector improvements needed within the project area and will be consistent with plans for the I-95 mainline, including the potential extension of I-95 Express lanes through Palm Beach County.

Additional considerations for the purpose and need for this project are further described in the following sections that include System Linkage, Capacity, Transportation Demand, Social Demands/Economic Development, Modal Interrelationships, and Safety.

System Linkage: I-95 is a part of the SIS and National Highway System (NHS). A need exists to ensure that I-95 continues to meet the minimum requirements as a component of those two systems. The project is not proposing to change system linkage; however, the interchange modifications would improve movements within the existing systems. The proposed project at I-95 and Woolbright Road will help improve connectivity and

capacity within the roadway network by addressing traffic spillback onto I-95 and improving interchange connections.

Capacity: Using field review data collected in 2018, A.M. and P.M. peak conditions were observed at all intersections in the study area. At the Corporate Drive/SW 8th Street intersection, during the P.M. peak hour, all approaches experienced minimal queues, except for the westbound and eastbound directions. The westbound left-turn queue experienced spillback into the through lanes and the eastbound direction experienced long queues. During the P.M. peak hour on the I-95 southbound ramp intersection, the eastbound approach experienced long queues, but all queues cleared the intersection during each signal cycle. The southbound approach experienced significant queues, with the queue not clearing during one signal cycle. During the P.M. peak hour at the I-95 northbound ramps intersection, the eastbound approach experienced minimal queue buildup and the northbound and westbound approaches experienced long queues; however, all queues cleared the intersection in one signal cycle for all approaches.

Transportation Demand: Interchange improvements to I-95 at Woolbright Road is included in the Palm Beach County Transportation Planning Agency's 2045 LRTP under projects funded with SIS revenues, which includes federal funds. The project is consistent with the plans for the I-95 mainline, including the extension of express lanes into Palm Beach County.

Social Demands/Economic Development: Social and economic demands on the I-95 corridor will continue to increase as population and employment increase. The Palm Beach County TPA 2040 LRTP states that the population would grow 27 percent from 1.32 million in 2010 to 1.68 million in 2040. The employment forecasted to grow from 571,000 to 820,000 employees in the same 30 year period for an increase of nearly 44 percent. The predicted increase in population and employment will increase congestion in the study area.

Modal Interrelationships: Currently, sidewalks and crosswalks are provided on both sides of Woolbright Road. Palm Tran Route 70 services Seacrest Boulevard both north and south of Woolbright Road east of the interchange, as well as the Boynton Beach Tri-Rail station 2.68 miles north of Woolbright Road. The project proposes to provide undesignated bicycle lanes on both sides of Woolbright Road. Capacity improvements at the interchange will enhance the mobility of people and goods by alleviating current and future congestion at the interchange and the surrounding freight and transit networks. Reduced congestion will serve to maintain and improve viable access to the major transportation facilities and businesses in the area.

Safety: The crash data for the latest available five-year period (2012 to 2016) along Woolbright Road (93220000) from SW 8 Street to S. Seacrest Boulevard was retrieved from FDOT's Crash Analysis Reporting System (CARS) on-line database and from Signal 4 Analytics database. The study corridor encompasses the I-95 Interchange. The crash data from both databases were summarized separately for the entire corridor and for the I-95 interchange.

Overall, there was a total of 680 crashes during the 5-year period. Based on crash severity, of the 680 crashes reported, 240 (35.5%) were injury type crashes, 437 (64.3%) were property damage only crashes, and three fatal crashes were reported. Two of the fatal crashes occurred in 2012 and were classified as overturn and collision with parked vehicle type and the third fatal crash occurred in 2016 and it was classified as angle collision. There were 150 wet pavement crashes (22.1%) reported. The frequency of wet pavement crashes was constant through the 5-year analysis period. This may indicate a crash pattern of wet pavement crashes. There were 171 nighttime/dusk/dawn/dark crashes (25.1%) reported. The leading crash type was rear-end with a total of 338 crashes (49.7%) followed by sideswipe with a total of 94 crashes (13.8%). Careless driving or negligent manner was the most predominate contributing causes of these crashes. Most of the crashes (178) occurred during the morning hours (6 AM to 9 AM), which correspond to the typical morning rush period.

2. Proposed Alternatives

The following describes the alternatives considered for this project.

No Build Alternative

- This alternative would keep the existing interchange roadway network into the future without improvements.
- The No Build Alternative has a number of positive aspects, since it would not require expenditure of public funds for design, right-of-way acquisition, construction, or utility relocation. Traffic would not be disrupted due to construction, therefore, avoiding inconveniences to local residents and businesses. Also, there would be no direct or secondary impacts to the environment, the socio-economic characteristics, or community cohesion of the area.
- The No Build Alternative fails to fulfill the purpose and need of the project. Operational and safety conditions within the interchange area will become progressively worse as traffic volumes continue to increase, thereby increasing the number of crashes and deteriorating access of this interchange.

Alternative 1 – Tight Diamond Interchange (TDI) – Recommended Alternative

- Modify the existing Diamond Interchange by widening the existing Woolbright Road bridge over I-95 and the bridge over the South Florida Rail Corridor to accommodate one additional through lane in each direction through the interchange
- Add one additional left-turn lane (triple lefts) at the northbound and southbound I-95 off-ramp intersections
- Add one additional westbound through lane at the Corporate Drive/SW 8th Street intersection
- Add one additional left-turn lane in the eastbound and westbound direction at the Corporate Drive/SW 8th Street intersection
- Widen the existing bridge over the E-4 Canal to accommodate the additional westbound through lane and bicycle lanes
- Extend the bicycle lanes from the interchange to SW 18th Street
- Refer to [Figure2-1](#).

Alternative 2 – Diverging Diamond Interchange (DDI)

- Reconstruct the existing Diamond Interchange to a Diverging Diamond Interchange (DDI) configuration, which provides three continuous through lanes through the interchange with two free flow left-turn lanes into the I-95 on-ramps
- Add one additional westbound through lane at the Corporate Drive/SW 8th Street intersection
- Add one additional left-turn lane in the eastbound and westbound direction at the Corporate Drive/SW 8th Street intersection

- Widen the existing bridge over the E-4 Canal to accommodate the additional westbound through lane and bicycle lanes
- Extend the bicycle lanes from the interchange to SW 18th Street
- Refer to [Figure 2-2](#).

Alternative 3 – Single Point Urban Interchange (SPUI)

- Reconstruct the existing Diamond Interchange to a Single Point Urban Interchange (SPUI) configuration, which provides two continuous through lanes through the interchange
- Add one additional left-turn lane (triple lefts) at the southbound I-95 off-ramp intersection
- Add one additional westbound through lane at the Corporate Drive/SW 8th Street intersection
- Add one additional left-turn lane in the eastbound and westbound direction at the Corporate Drive/SW 8th Street intersection
- Widen the existing bridge over the E-4 Canal to accommodate the additional westbound through lane and bicycle lanes
- Extend the bicycle lanes from the interchange to SW 18th Street
- Refer to [Figure 2-3](#).

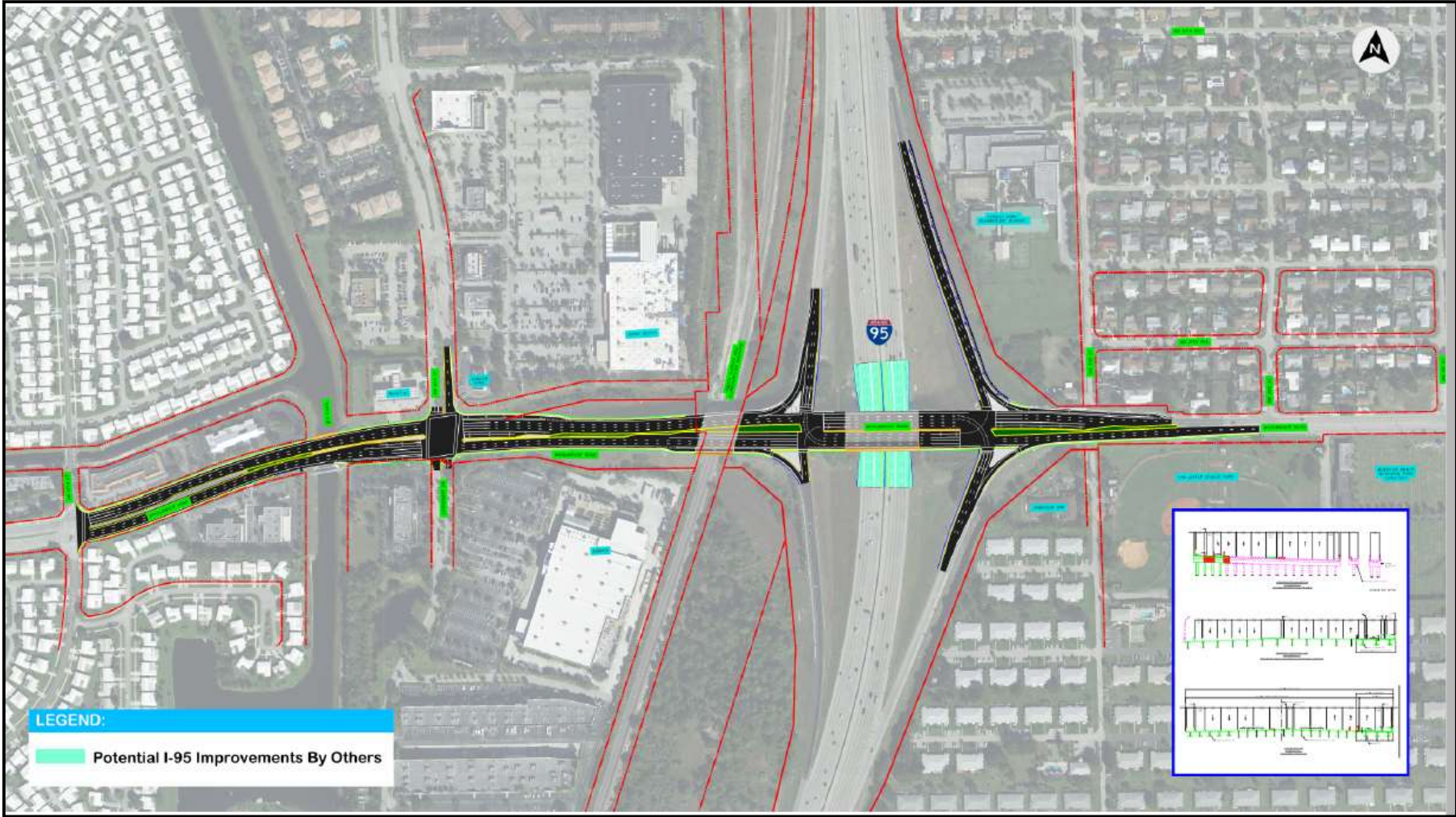


Figure 2-1 Alternative 1: TDI

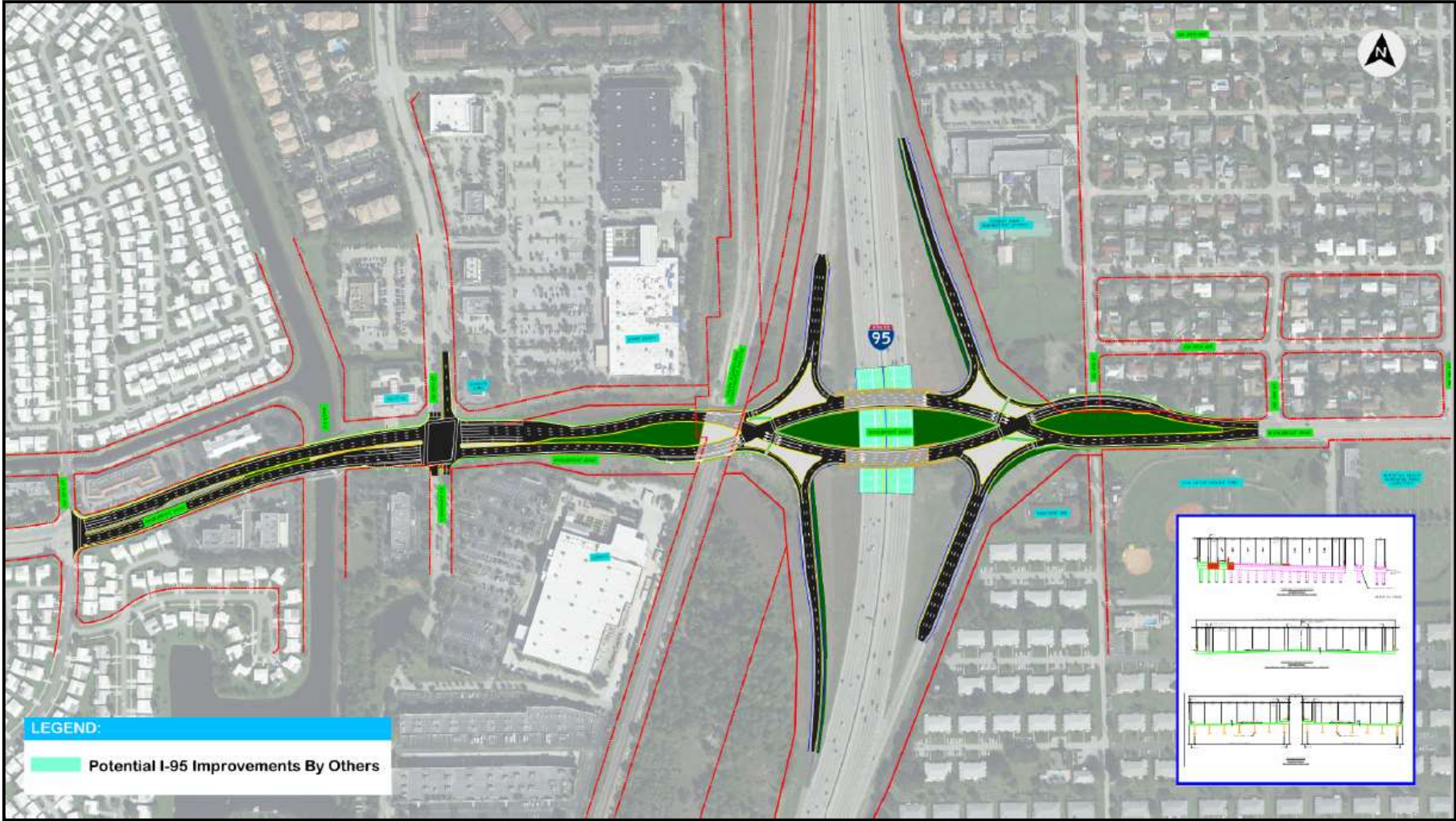


Figure 2-2 Alternative 2: DDI

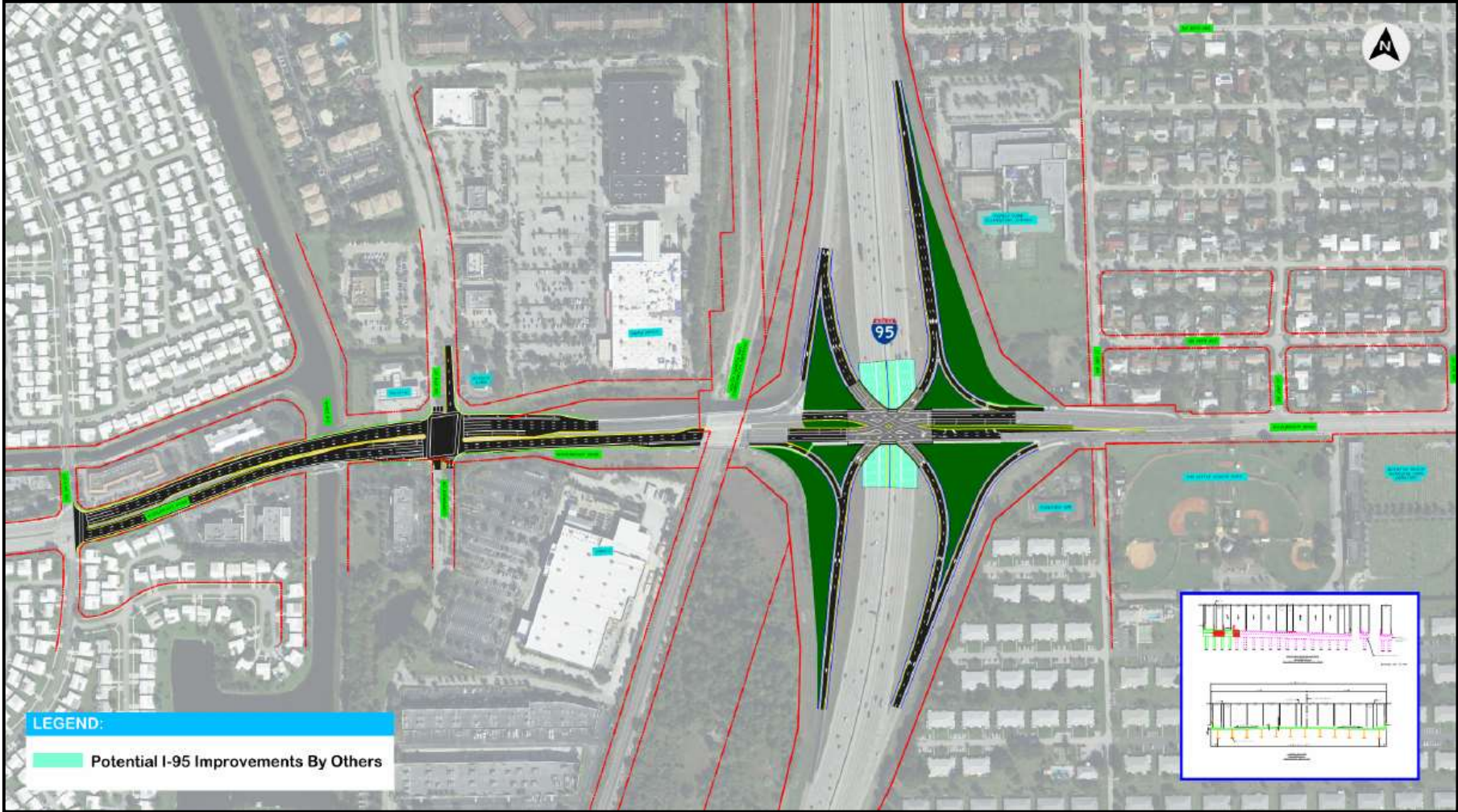


Figure 2-3 Alternative 3: SPUI

3. Traffic Noise Analysis

Prior to conducting a detailed noise analysis, a desk-top review of the project was performed to determine if noise levels will likely increase as a result of the proposed improvements, if noise sensitive receptor sites are located within the project area and/or if noise impacts are likely to occur. This desk-top review indicated that the proposed improvements associated with the project may cause design year (2045) traffic noise levels to approach or exceed the Federal Highway Administration (FHWA) Noise Abatement Criteria (NAC) at noise sensitive sites within the project limits. Therefore, in accordance with Part 2, Chapter 18 – *Highway Traffic Noise* of the FDOT PD&E Manual, a more detailed noise analysis was performed. The methods and results of this traffic noise analysis are summarized within this section and involved the following procedures:

- Identification of noise sensitive receptor sites;
- Field measurement of noise levels and noise model validation;
- Prediction of existing and future noise levels;
- Assessment of traffic noise impacts; and,
- Evaluation of the feasibility and reasonableness of noise abatement.

The recommended build alternative for the project, herein referred to as the “Build Alternative”, is *Alternative 1-Tight Diamond Interchange*.

The FHWA *Traffic Noise Model* (TNM) Version 2.5 (February 2004) was used to predict traffic noise levels and to analyze the effectiveness of noise barriers. This model estimates the acoustic intensity at a noise sensitive site (the receptor) 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, obstructions (houses, trees, etc.), ground surface type (hard or soft) and topography. Elevation data for the existing travel lanes and the limited-access ROW lines were obtained from existing roadway plans where available.

Noise levels presented in this report represent the hourly equivalent sound level [Leq(h)]. The Leq(h) is the steady-state sound level, which contains the same amount of acoustic energy as the actual time-varying sound level over a one-hour period. The Leq(h) is measured in A-weighted decibels [abbreviated as dB(A)], which closely approximate the range of frequencies a human ear can hear.

3.1 Noise Sensitive Receptor Sites

The FHWA has established NAC for seven land use activity categories. These criteria determine when an impact occurs and when consideration of noise abatement is required. Maximum noise level thresholds have been established for five of these activity categories. These maximum thresholds, or criteria levels, represent acceptable traffic noise level conditions. 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. The FDOT defines “approach” as within one dB(A) of the FHWA criteria. A substantial noise increase is defined as when the existing noise level is predicted to be exceeded by 15 dB(A) or more as a result of the transportation improvement project.

Table 3-1 Noise Abatement Criteria

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, amphitheatres, 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.

The developed lands along the project corridor were evaluated to identify the noise sensitive receptor sites that may be impacted by traffic noise associated with the proposed improvements. Noise sensitive receptor sites represent any property where frequent exterior human use occurs and where a lowered noise level would be of benefit. This includes residential units (FHWA Noise Abatement Activity Category B), other noise sensitive areas including parks, playgrounds and schools (Category C) and certain commercial properties (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. Noise sensitive sites along the project are shown on **Figure 3-1**.

3.1.2 Woolbright Road

The improvements planned with this project are focused along Woolbright Road. Capacity improvements along Woolbright Road are only planned east of SW 8th Street; the roadway remains in its current six-lane configuration west of SW 8th Street. Alignment modifications are also primarily occurring east of SW 8th Street; although minor realignment of the westbound lanes over the canal just west of SW 8th Street is planned to accommodate a new eastbound left-turn lane onto northbound SW 8th Street. The noise sensitive sites closest to this alignment shift are homes that are located over 300 feet to the north, and the realignment will only bring the roadway less than approximately 20 feet closer. Thus, noise sensitive sites adjacent to Woolbright Road with the potential to be impacted due to the planned improvements are only found east of I-95. These noise sensitive sites include approximately 18 single-family homes in the first two rows of homes and a playground north of this segment of Woolbright Road. Baseball fields at the City of Boynton Beach Little League Park are found to the south of this segment of Woolbright Road. This corridor also includes commercial properties and offices that are not considered noise sensitive (i.e., Activity Category F).

3.1.2 I-95

As the improvements planned with this project are focused along Woolbright Road, only minor ramp improvements are planned along I-95. Within approximately 500 feet of the planned improvements on the ramps, a mixture of approximately 39 single-family and multi-family residences are found along I-95. These include 32 residences in the High Point multi-family home community, three homes in the Woodcrest Manor single-family home neighborhood and four homes in the Bellamy Heights single-family home neighborhood. A patio at the Parkside Inn Assisted Living Facility, and sports fields and a playground at the Forest Park Elementary School are also found within approximately 500 feet of the planned improvements along I-95. This segment of the project also includes commercial properties that are not considered noise sensitive (i.e., Activity Category F).

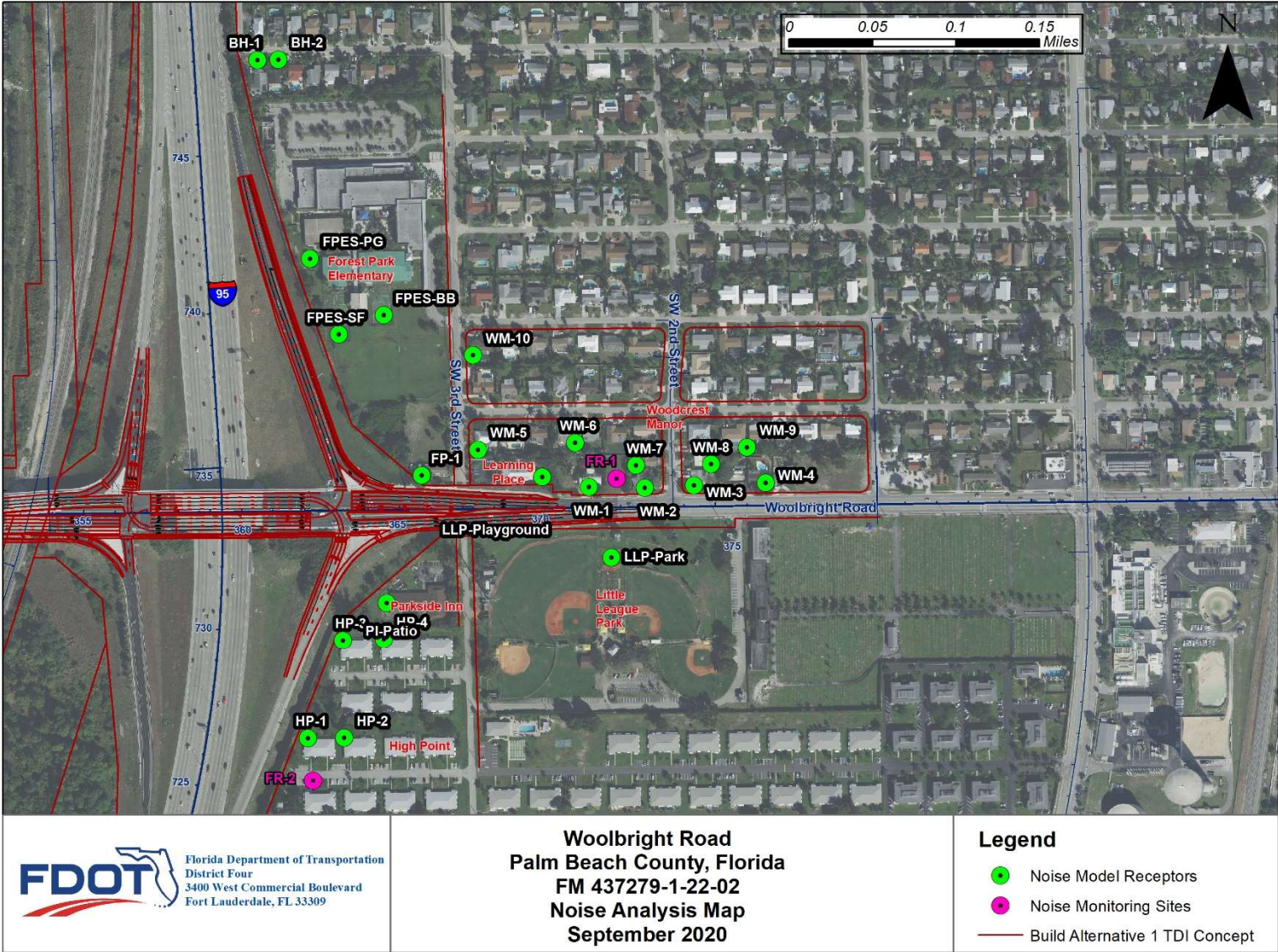


Figure 3-1 Noise Analysis Map

Two (2) existing noise barriers are found along the east side of I-95 within the limits of this project, one north and one south of Woolbright Road. These noise barriers are as follows:

- **1042** - Eastern limited-access ROW line, SW 23rd Avenue to Woolbright Road, 2,264 feet long, 20 to 22 feet tall.
- **1043** – Eastern limited-access ROW line, Woolbright Road to SR 804/West Boynton Beach Boulevard, 4,380 feet long, 13 to 14 feet tall.

3.2 Field Measured Noise Levels

Measurements of sample existing noise levels along the project corridor were performed using procedures defined in the FHWA report Measurement of Highway-Related Noise (FHWA-PD-96-046). Field measurements of existing noise levels were conducted on September 24, 2020 at two locations within the project study area. The locations of the field measurement sites are depicted on **Figure 3-1** and described in **Table 3-2**.

Table 3-2 Field Measurement Data								
Field Receptor	Location	Sample Run	Time/Date	Measured 10-Minute Traffic Volume (Auto/MT/HT/B/Mcy)	Distance From Roadway (Feet)	Measured Traffic Noise Level [dB(A)]	Modeled Traffic Noise Level [dB(A)]	Difference (Measured - Modeled) [dB(A)]
FR-1	North side of Woolbright Road in a vacant parcel between 315 W Woolbright Road and 1515 SW 2 nd Street.	A	11:35 AM 9-24-20	EB: 135/6/0/0/0 WB: 182/2/3/0/1	35	67.7	69.1	-1.4
					110	59.6	59.3	0.3
		B	11:45 AM 9-24-20	EB: 162/1/1/0/0 WB: 151/2/1/0/1	35	67.5	69.2	-1.7
					110	58.9	59.5	-0.6
		C	11:55 AM 9-24-20	EB: 210/2/2/0/1 WB: 145/3/4/0/1	35	68.2	70.3	-2.1
					110	59.8	60.6	-0.8
FR-2	East side of I-95, adjacent to 350 Main Boulevard.	A	10:04 AM 9-24-20	EB: 631/30/43/0/1 WB: 625/23/64/0/2	235*	57.3	58.5	-1.2
					350*	54.3	55.2	-0.9
		B	10:14 AM 9-24-20	EB: 522/41/47/0/1 WB: 706/11/68/0/3	235*	57.3	58.6	-1.3
					350*	56.2	55.4	0.8
		C	10:24 AM 9-24-20	EB: 654/41/70/0/0 WB: 721/32/83/1/1	235*	57.9	59.3	-1.4
					350*	55.1	56.1	-1.0

Note: * = Distance from near edge of the northbound mainline lanes.

Three repetitions of 10-minute readings were measured at each site to ensure reasonable results. Where possible, readings were taken at the first and second rows of homes in the residential communities described below. Unusual noises were documented to facilitate identification of any atypical noise sources along the alignment. Cesva SC310 Type-II integrating sound level meters were used to collect noise level data. Foam wind

screens and adjustable tripods were also used. The sound level meters were calibrated to 94 dB at 1000 Hertz using a Rion Model NC-74 acoustical calibrator.

Traffic data was collected by the project team during each measurement period. Traffic speeds were measured using Bushnell Model 101911 radar speed measuring equipment. Traffic volumes, speed data and noise levels were collected during six 10-minute sampling periods. The ambient temperature during the measurement periods was approximately 85 to 90 degrees Fahrenheit, and the wind generally from the east/southeast; and the average wind speed generally remained less than approximately 10 miles per hour (MPH) from the east throughout the measurement periods. The relative humidity was approximately 68 to 73 percent and the cloud cover varied between 50 to 75 percent throughout the measurement periods. All roadway surfaces remained clean and dry during the measurements. The data collected were then used as inputs to the TNM. The dates, times, traffic data and the measured and TNM-predicted noise levels are presented in **Table 3-2**.

3.2.1 Field Measurement Sites

3.2.1.1 Site FR-1

This measurement site is located along the north side of Woolbright Road in a vacant lot between 315 W Woolbright Road and 1515 SW 2nd Street in the Woodcrest Manor neighborhood (See **Figure 3-1**). This site is representative of noise sensitive sites along Woolbright Road east of I-95. Traffic noise levels at this site were measured approximately 35 and 110 feet from the near edge of the westbound lanes in order to be representative of nearby first and second row residences. Noise level readings were taken between 11:35 and 12:15 AM. Existing traffic noise levels were found to range from 67.5 to 68.2 dB(A) at the near location and 58.9 to 59.8 dB(A) at the far location.

3.2.1.2 Site FR-2

This measurement site is located along the east side of I-95 and south of Woolbright Road adjacent to 350 Main Boulevard in the High Point community (See **Figure 3-1**). This site is representative of noise sensitive residences located east of I-95. Traffic noise levels at this site were measured approximately 235 and 350 feet from the near edge of the outside northbound I-95 mainline travel lane in order to be representative of nearby first and second row residences. Noise level readings were taken between 10:04 and 10:34 AM. Existing traffic noise levels were found to range from 57.3 to 57.9 dB(A) at the near location and 54.3 to 56.2 dB(A) at the far location.

3.2.1.3 Field Measurement Summary

Existing noise levels were measured at two sites along the project corridor during six 10-minute long sampling periods. Traffic noise levels were found to range from 58.9 to 68.2 dB(A) at the site along Woolbright Road (FR-1) and from 54.3 to 57.9 dB(A) at the site along I-95 (FR-2). In all cases, traffic noise from either Woolbright Road or I-95 was the predominant source of noise at the nearby noise sensitive sites.

3.3 Computer Noise Model Validation

Site conditions and traffic data gathered during the field measurements were used to develop inputs to the FHWA's TNM 2.5 for computer models representative of the existing conditions. Additional geometric information necessary for these models was developed from aerial photographs and/or MicroStation files of the existing conditions in the project study area. The TNM results were then compared to the noise level data collected for each field measurement sample. The results of this analysis are shown in **Table 3-2**. The model inputs for the field conditions are deemed to be within an acceptable level of accuracy if the predicted noise levels are within ± 3.0 dB(A) of the measured noise levels. These model inputs are then used as a basis for additional model runs used to predict existing and future noise levels at representative nearby noise sensitive locations. The difference for each of the field measurements falls within the ± 3.0 dB(A) verification limit in accordance with Chapter 18 of the FDOT PD&E Manual. Thus, further use of TNM on this project is supported.

3.4 Noise Model Development

After verification of the prediction methodology, computer models were developed for the existing year (2019) conditions, and the design year (2045) No-Build Alternative and recommended Build Alternative. The TNM models for all Alternatives were developed using geometric information from the project's master plans. Traffic data used in the TNM models were derived from traffic data provided by the FDOT traffic consultant for the project and from data contained in the 2020 FDOT Quality/Level of Service Handbook tables. These data may be found in **Appendix A**. According to Chapter 18 of the PD&E Manual, "Maximum peak-hourly traffic representing Level of Service (LOS) "C", or demand LOS of "A", "B", or "C" will be used (unless analysis shows that other conditions create a "worst-case" level)". In cases where traffic volumes on project roadways were predicted to operate at worse than LOS C, the LOS C project data were used. In overcapacity situations, this represents the highest traffic volume traveling at the highest average speed, which typically generates the highest noise levels at a given site during a normal day. The posted speed limit for Woolbright Road (40 MPH) and I-95 (65 MPH) was used. Truck factors ranged from 1.7 percent on Woolbright Road west of I-95 to 3.7 percent on I-95 north of Woolbright Road.

Representative receptor sites were used in the TNM model inputs to estimate noise levels associated with existing and future conditions within the project study area. These sites were chosen based on noise sensitivity, roadway proximity, anticipated impacts from the proposed project, and homogeneity (i.e., the site is representative of other nearby sites). For single-family homes, traffic noise levels were predicted at the edge of the dwelling unit closest to the nearest primary roadway. For other noise sensitive sites that may be impacted, traffic noise levels were predicted where the exterior activity occurs. All receptor sites were modeled five feet above the local ground elevation. Twenty-three (23) model receptors representative of approximately 57 residential noise sensitive sites and six non-residential noise sensitive locations described in **Section 3.1** of this report were input into the TNM model. These locations are described in **Table 3-3**.

3.5 Predicted Traffic Noise Levels

The TNM results for the worst-case traffic conditions for the existing (2019) conditions and the Design Year (2045) No Build and Build alternatives are summarized in the following sections. Predicted noise levels for individual model receptors are presented in **Table 3-3**.

3.5.1 Woolbright Road

Existing traffic noise levels at the residences along Woolbright Road are predicted by TNM to range from 57.5 to 70.4 dB(A) during peak periods. Design year worst-case traffic noise levels with the No-Build Alternative are predicted to range from 57.9 to 70.7 dB(A) and to be no more than 1.9 dB(A) greater than existing levels at these residences. Design year worst-case traffic noise levels at the residences are predicted to range from 57.9 to 70.7 dB(A) with the recommended Build Alternative. These predicted levels are no more than 1.8 dB(A) greater than the existing levels and 0.2 dB(A) greater than those of the No-Build Alternative. Existing traffic noise levels at the non-residential noise sensitive sites along Woolbright Road are predicted to range from 62.7 dB(A) at Little League Park to 66.1 dB(A) at the Learning Place Preschool playground during peak periods. Design year worst-case traffic noise levels at these two sites with the No-Build Alternative are predicted to range from 63.7 to 67.7 dB(A), no more than 1.6 dB(A) greater than existing levels at these sites. Design year worst-case traffic noise levels at these sites with the recommended Build Alternative are predicted to range from 64.5 to 67.7dB(A); no more than 1.8 dB(A) greater than the existing levels and 0.8 dB(A) greater than those of the No-Build Alternative.

Table 3-3 Modeled Noise Receptor Locations and Noise Analysis Results										
Representative Model Receptor	Location (Nearest Cross Street)	Type	Description (Noise Abatement Activity Category)	FDOT Noise Abatement Approach Criteria [dB(A)]	Location (Station)	Number Of Noise Sensitive Sites	Distance To Nearest Traffic Lane* [Existing/No-Build/Build] (Feet)	Predicted Traffic Noise Levels [LAeq1h, dB(A)]		
								Existing (2017)	Design Year (2045)	
									No-Build	Build
I-95										
Southern Project Terminus to Woolbright Road										
East Side										
HP-1	High Point – Main Boulevard	MFH	B	66	727+00	12	120/120/120	56.8	57.5	57.5
HP-2	High Point – Main Boulevard	MFH	B	66	727+00	12	215/215/215	56.2	56.9	57.0
HP-3	High Point – North Boulevard	MFH	B	66	730+00	4	95/95/95	57.3	58.1	57.8
HP-4	High Point – North Boulevard	MFH	B	66	730+00	4	210/210/210	57.2	58.1	57.9
PI-Patio	Parkside Inn Assisted Living Facility – 1613 SW 3 rd Street	Medical Facility Patio	C	66	731+00	SLU	165/165/165	59.4	60.3	59.7
Number of Residences =						32	Minimum =	56.2	56.9	57.0
Number of Special Land Use Sites =						1	Maximum =	59.4	60.3	59.7
Woolbright Road										
South Side										
LLP-Park	Little League Park – Woolbright Road	Baseball Field	C	66	371+80	SLU	120/120/120	62.7	63.7	64.5
North Side										
FP-1	Forest Park – Woolbright Road/SW 3 rd Street	SFH	B	66	365+80	1	45/45/45	68.1	70.0	69.9
LPP-Playground	The Learning Place Preschool – 1400 SW 3 rd Street	Preschool Playground	C	66	369+60	SLU	65/65/65	66.1	67.7	67.7
WM-1	Woodcrest Manor – Woolbright Road/SW 2 nd Street	SFH	B	66	371+00	1	35/35/35	69.5	70.2	70.4
WM-2	Woodcrest Manor – Woolbright Road/SW 2 nd Street	SFH	B	66	372+80	1	35/35/35	70.1	70.4	70.5
WM-3	Woodcrest Manor – Woolbright Road/SW 2 nd Street	SFH	B	66	374+40	1	35/35/35	70.4	70.7	70.7
WM-4	Woodcrest Manor – Woolbright Road/SW 1 st Street	SFH	B	66	376+80	2	40/40/40	69.8	70.1	70.1
WM-5	Woodcrest Manor –SW 3 rd Street	SFH	B	66	367+60	1	135/135/135	62.2	63.3	63.1
WM-6	Woodcrest Manor –SW 14 th Avenue	SFH	B	66	370+80	5	180/180/180	57.9	59.0	59.2
WM-7	Woodcrest Manor –SW 2 nd Street	SFH	B	66	372+60	1	105/105/105	58.8	59.5	59.7
WM-8	Woodcrest Manor –SW 2 nd Street	SFH	B	66	375+00	1	105/105/105	61.4	61.7	61.7
WM-9	Woodcrest Manor –SW 14 th Avenue	SFH	B	66	376+20	4	155/155/155	57.5	57.9	57.9
Number of Residences =						18	Minimum =	57.5	57.9	57.9
Number of Special Land Use Sites =						2	Maximum =	70.4	70.7	70.7
I-95										
Woolbright Road to Northern Project Terminus										
East Side										
WM-10	Woodcrest Manor –SW 13 th Avenue	MFH	B	66	738+60	3	520/520/500	59.9	60.3	60.6
FPES-SF	Forest Park Elementary School – 1201 SW 3 rd Street	School Sports Field	C	66	739+40	SLU	140/140/120	61.6	62.2	62.5
FPES-BB		School Basketball Court	C	66	740+00	SLU	295/295/275	59.0	59.6	59.9
FPES-PG		School Playground	C	66	741+80	SLU	130/130/110	60.0	60.7	60.8
BH-1	Bellamy Heights – SW 10 th Avenue	SFH	B	66	749+40	2	105/105/105	64.2	64.9	64.9
BH-2	Bellamy Heights – SW 10 th Avenue	SFH	B	66	749+40	2	175/175/175	58.1	58.7	58.8
Number of Residences =						7	Minimum =	58.1	58.7	58.8
Number of Special Land Use Sites =						3	Maximum =	64.2	64.9	64.9

Notes: SFH = Single-Family Home, MFH = Multi-Family Home (i.e., quadriplex), SLU = Special Land Use site.
 RED numbers indicate Build Alternative noise levels equal or exceeding the FDOT Noise Abatement Criteria

3.5.2 I-95

Existing traffic noise levels at the residences along I-95 are predicted by TNM to range from 56.2 to 64.2 dB(A) during peak periods. Design year worst-case traffic noise levels with the No-Build Alternative are predicted to range from 56.9 to 64.9 dB(A) and to be no more than 0.9 dB(A) greater than existing levels at these residences. Design year worst-case traffic noise levels at the residences are predicted to range from 57.0 to 64.9 dB(A) with the recommended Build Alternative. These predicted levels are no more than 0.8 dB(A) greater than the existing levels and 0.3 dB(A) greater than those of the No-Build Alternative. Existing traffic noise levels at the non-residential noise sensitive sites along I-95 are predicted to range from 59.0 dB(A) at the Forest Park Elementary School basketball courts to 61.6 dB(A) at the school's sports fields during peak periods. Design year worst-case traffic noise levels with the No-Build Alternative are predicted to range from 59.6 to 62.2 dB(A) at the same locations, no more than 0.9 dB(A) greater than existing levels at these sites. Design year worst-case traffic noise levels with the recommended Build Alternative are predicted to range from 59.7 dB(A) at the Parkside Inn patio to 62.5 dB(A) at the elementary school's sports field. The Build Alternative noise levels at the non-residential noise sensitive sites are no more than 0.9 dB(A) greater than the existing levels and 0.3 dB(A) greater than those of the No-Build Alternative.

3.6 Noise Impact Analysis

Approximately 57 residences with the potential to be impacted by the proposed improvements were identified along Woolbright Road and I-95 within the project study area. These residences include single-family homes and multi-family residences. Also, six noise sensitive non-residential/special-use locations were identified in the project study area. These include playgrounds, sports fields and a common use patio at an assisted living facility. Under the existing conditions, the primary source of noise at the nearby noise sensitive sites is traffic on the subject roadways (Woolbright Road and I-95).

During the design year, the primary source of noise in the area is expected to remain traffic on the nearby roadways listed above. The planned improvements will widen the existing Woolbright Road bridges over I-95 the South Florida Rail Corridor and over the E-4 Canal to accommodate additional through lane(s); add one additional left-turn lane at the I-95 off-ramp intersections and at the Corporate Drive/SW 8th Street intersection and improve the bicycle facilities. Predicted design year traffic noise levels for the Build Alternative were compared to the NAC and to noise levels predicted for the existing conditions, to assess potential noise impacts associated with the proposed project (see **Table 3-3**).

Build Alternative traffic noise levels at the residences are expected to range from approximately 57.0 to 70.7 dB(A) during the project's design year. Build Alternative traffic noise levels at the non-residential/special-use sites are expected to range from approximately 59.7 dB(A) at the Parkside Inn patio to 67.7 dB(A) at the Learning Place Preschool playground. The worst-case design year traffic noise levels with the Build Alternative are predicted to be no more than 1.8 dB(A) greater than existing levels and no more than 0.8 dB(A) greater than the design year No Build noise levels. Build Alternative traffic noise levels are predicted to approach or exceed the FHWA NAC - 67 dB(A) at a total of six residences along the north side of Woolbright Road as a result of the planned improvements. For the non-residential noise sensitive sites, Build Alternative traffic noise levels are predicted to approach or exceed the correlating FHWA NAC [NAC = 67 dB(A)] at only the Learning Place playground. Therefore, based on the FHWA and FDOT methodologies used to evaluate traffic noise levels in this study, modifications proposed with this project were determined to generate noise impacts at noise sensitive sites within the project study area and consideration of noise abatement is required to mitigate these impacts. An analysis of noise abatement measures considered for the sites that approach or exceed the NAC is presented in **Chapter 4**. Although a number of sites approach or exceed the NAC, the proposed improvements do not result in any substantial noise increases [i.e., greater than 15 dB(A) over existing levels].

4. Noise Barrier Analysis

As described above in **Section 3.6**, predicted design year traffic noise levels with the Build Alternative will approach or exceed the NAC at six residences and a preschool playground. In accordance with the FDOT requirements that the reasonableness and feasibility of noise abatement be considered when the NAC is approached or exceeded, noise abatement was considered for these residences and for the preschool playground. The most common and effective noise abatement measure for projects such as this is construction of a noise barrier as close as possible to the impacted sites. Noise barriers reduce noise by blocking the sound path between a roadway and a noise sensitive area. To be effective, noise barriers must be long, continuous, and have sufficient height to block the path between the noise source and the receptor site.

A wide range of factors are used to evaluate the feasibility and reasonableness of noise abatement measures. Feasibility primarily concerns the ability to reduce noise levels by at least five dB(A) at the impacted receptor sites using standard construction methods and techniques. Engineering considerations typically assessed during the feasibility analysis include access, drainage, utilities, safety and maintenance. FDOT structural standards require that noise barriers located within the roadway clear recovery zone (e.g., at the edge-of-pavement) meet crash test requirements stipulated by National Cooperative Highway Research Program (NCHRP) 350 Test Level 4 criteria. They must either be constructed of a crash-approved noise barrier design or be protected by a supplemental traffic barrier or guardrail meeting Level 4 criteria offset a minimum of five feet from the front face of the noise barrier. Crash-approved noise barrier designs currently permitted by FDOT are limited to a maximum height of eight feet on structures and 14 feet on fill. Ground-mounted noise barriers not located within the roadway clear recovery zone are limited by FDOT to a maximum height of 22 feet.

Reasonableness implies that common sense and good judgment were applied in a decision related to noise abatement. A reasonableness analysis includes consideration of the cost of abatement, the amount of noise abatement benefit, and the consideration of the viewpoints of the impacted and benefited property owners and residents. The FDOT's current Statewide average noise barrier unit cost is \$30 per square-foot. To be deemed reasonable, a noise barrier must, at a minimum, meet two important FDOT criteria:

- The estimated construction cost cannot exceed the FDOT's reasonable cost criteria of \$42,000 per benefited receptor site; and,
- According to the FDOT's noise reduction reasonableness criteria, the noise barrier must reduce noise levels by at least seven dB(A) at one or more impacted receptor sites.

The noise barrier considered for the impacted playground was assessed using FDOT's "A Method to Determine Reasonableness and Feasibility of Noise Abatement at Special Use Locations" (July 22, 2009). The cost reasonableness of this method is based on the number of people (i.e., person-hours per day) benefited by a noise barrier under consideration. Using this methodology, to be considered cost reasonable, the cost of the noise barrier must have an Abatement Cost Factor less than \$995,935 per person-hour per square foot. The Abatement Cost Factor represents the upper limit of the cost per person-hour per square foot of noise barrier and does not represent any direct relation to real noise barrier construction costs such as dollar per square foot of a noise barrier. The derivation of the Abatement Cost Factor is based on the FDOT's reasonable cost criteria of equal to or less than \$42,000 per benefited receptor site.

As part of the reasonableness cost analysis, conceptual noise barrier designs were considered for the impacted area to determine the most effective location, length and height that will achieve the desired noise level reduction at reasonable cost. In addition, the primary method for determining the cost of noise abatement involves a review of the cost per benefited receptor site for the construction of a noise barrier benefiting a single location or common noise environment (e.g., a subdivision or contiguous impact area).

The locations of the noise barriers that were considered are shown in **Figure 4-1**. The following discussion provides the details of the feasibility and reasonableness analysis for noise barriers considered for each of the impacted sites.

4.1 Isolated Residence – Woolbright Road West of SW 3rd Street

A single-family residence located along the north side of Woolbright Road west of SW 3rd Street (model receptor FP-1) is expected to experience a design year noise level with the proposed improvements of 69.9 dB(A), which exceeds the residential NAC [67.0 dB(A)]. This traffic noise level is approximately the same as the No Build noise levels [0.1 dB(A) lower] and 1.8 dB(A) greater than the existing noise levels. Therefore, the traffic noise level at this residence is not expected to substantially increase above the existing conditions. The other impacted residences along the north side of Woolbright Road are located east of the Learning Place Preschool playground and are addressed in **Section 4.3**. Since this site is an isolated impacted residence, it does not meet the FDOT's noise reduction feasibility criterion requiring that a noise barrier must provide a 5.0 dB(A) reduction for at least two impacted receptors to be considered feasible. Therefore, a noise barrier is not proposed for this location.

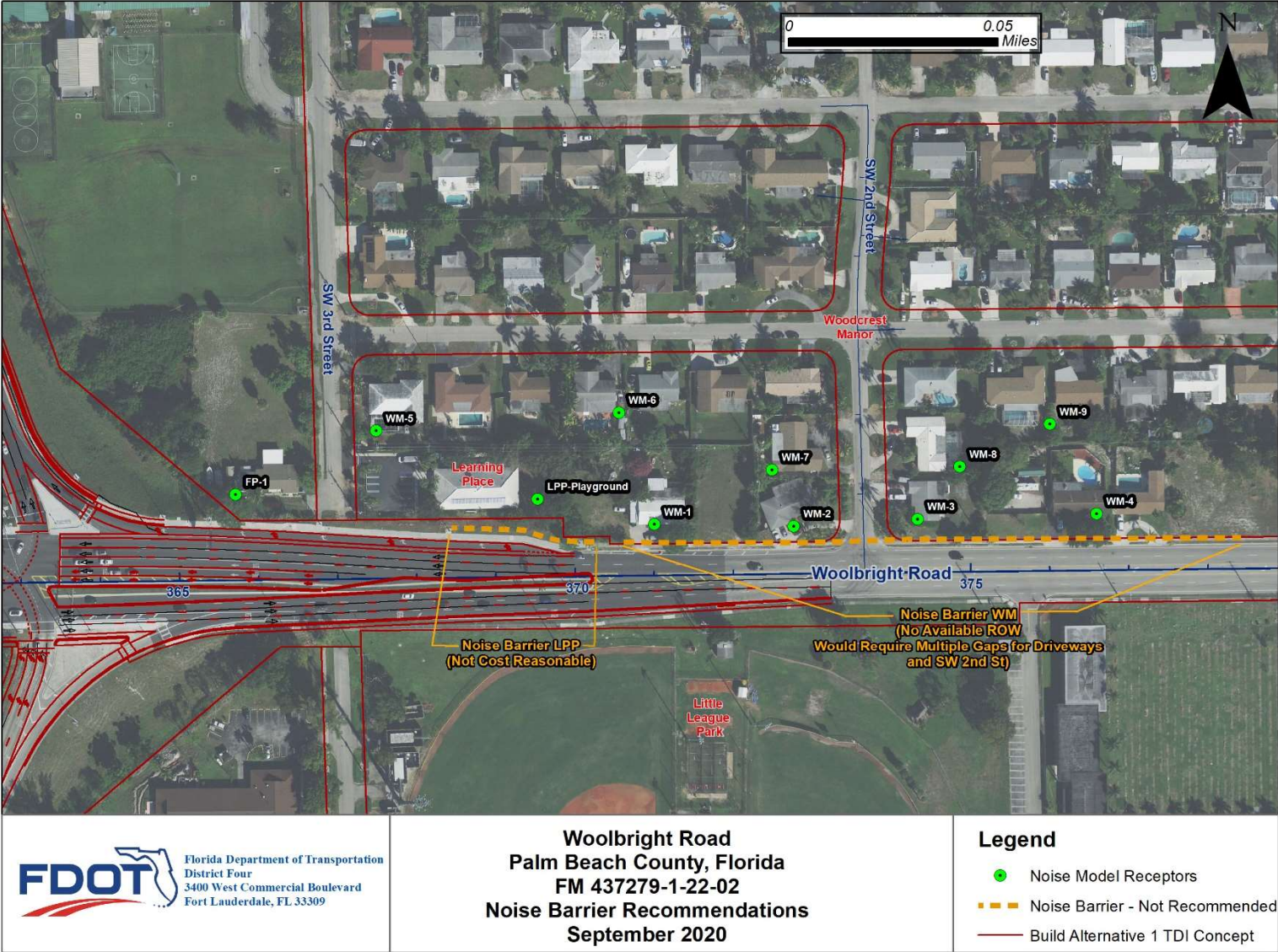


Figure 4-1 Noise Barrier Recommendations

4.2 Noise Barrier LPP – Learning Place Playground

The results of the noise barrier analysis for a playground on the east side of the Learning Place Preschool located along the north side of Woolbright Road, east of SW 3rd Street are summarized in **Table 4-1**. This preschool is represented by model receptor *LPP-Playground* and is shown on **Figure 4-1**. The design year Build Alternative noise level at the area of this playground closest to the road is predicted to be 67.7 dB(A), slightly above the FHWA NAC for playgrounds [67.0 dB(A)]. This noise level is the same as predicted with the No Build alternative and 1.6 dB(A) greater than the predicted existing level.

The primary improvements near this preschool include addition of one through lane in each direction (both of which end just east of the preschool) and minor ramp improvements. With the Build Alternative improvements, the nearest westbound lane will remain at its current location approximately 65 feet from the near edge of the playground. The most feasible location for a noise barrier for this preschool would be along the back of the sidewalk along the westbound lanes. Overhead utilities cross Woolbright Road from north to south near Station 367+40 on the west side of the preschool and overhead lighting is located along the back of the sidewalk. In addition, a noise barrier at this location would at a minimum partially obscure the preschool's commercial signage. The alignment of the noise barrier design concept for this site is shown on **Figure 4-1**.

A 12-foot tall, 130-foot long ground mounted noise barrier located along the north ROW line between Sta. 368+90 and 370+20 was considered to be the most feasible and effective noise abatement alternative for the impacted areas of the playground. This noise barrier design concept is referred to as LPP-CD3 in **Table 4-1**. This concept would reduce noise levels by an average of 5.9 dB(A) and a maximum of 7.2 dB(A), and would benefit all of the eastside playground area. The estimated overall cost of this noise barrier is \$46,800.

The FDOT's special land use methodology was used to determine if the cost of this noise barrier would be reasonable based on the level of activity in the playground. An array of model receptors representing all of the east side playground were used to evaluate noise barrier cost reasonableness. The results of this analysis are shown in **Table 4-2**. According to the facility's website, the hours of operation for this location are from 6:45AM to 6:00PM. According to the Florida Department of Children and Families (DCF) inspections during 2019, the number of children present at the Learning Place Preschool ranged from 39 to 57, including infants. For the purposes of this analysis, each child was assumed to spend approximately one hour per day on the playground.

Table 4-1 Noise Barrier Analysis for the Learning Place Preschool Playground

Common Noise Environment	Conceptual Noise Barrier Design Number	Noise Barrier Type	Height (feet)	Length (feet)	Begin Station Number	End Station Number	Number of Impacted Receptor Sites	Average (Maximum) Noise Reduction for Impacted Receptor Sites dB(A)	Percentage of Impacted Areas of the Playground that are Benefited	Percentage of Non-Impacted Areas of the Playground that are Benefited	Average (Maximum) Noise Reduction for all Benefited Receptor Sites dB(A)	Cost (\$30 per square foot)	Average Cost/Site Benefited	Comments
LLP-Playground The Learning Place Preschool Playground North side of Woolbright Road at 1400 SW 3 rd Street	LPP-CD1	Ground-Mounted	8	340	367+00	370+40	1 SLU	5.6 (5.8)	100%	0%	5.6 (5.8)	\$81,600	See Table 4-2	Not Recommended – Does not achieve 7.0 dB(A).
	LPP-CD2	Ground-Mounted	10	160	368+80	370+40	1 SLU	6.4 (7.0)	100%	100%	5.8 (7.0)	\$48,000		Not Recommended – Based on expected usage, the abatement cost factor for this playground exceeds the FDOT’s “abatement cost factor” criteria.
	LPP-CD3	Ground-Mounted	12	130	368+90	370+20	1 SLU	6.5 (7.2)	100%	100%	5.9 (7.2)	\$46,800		Not Recommended – Based on expected usage, the abatement cost factor for this playground exceeds the FDOT’s “abatement cost factor” criteria.
	LPP-CD4	Ground-Mounted	14	120	368+90	370+10	1 SLU	6.3 (7.1)	100%	100%	5.7 (7.1)	\$50,400		Not Recommended – Based on expected usage, the abatement cost factor for this playground exceeds the FDOT’s “abatement cost factor” criteria.

The cost reasonableness of providing noise abatement for this playground was evaluated for the three noise barrier design concepts shown in **Table 4-1** that provide a noise level reduction of at least 7.0 dB(A). Based on a maximum usage of 57 children per day using the playground, with each child spending one hour per day, it was determined that the abatement cost factor for this playground exceeded the FDOT’s “abatement cost factor” criteria shown in **Table 4-2**. Therefore, noise abatement is not recommended for further consideration and public input for the Learning Place playground due to insufficient usage.

Table 4-2 Special Use Site Noise Barrier Analysis for the Learning Place Preschool Playground					
Item	Criteria	Input			Units
		LPP-CD2	LPP-CD3	LPP-CD4	
1	Enter Length of Proposed Barrier	160	130	120	feet
2	Enter Height of Proposed Barrier	10	12	14	feet
3	Multiply item 1 by item 2	1,600	1,560	1,680	feet ²
4	Enter the average amount of time that a person stays at the site per visit	1	1	1	hours
5	Enter the average number of people that use this site per day that will receive at least 5 dB(A) benefit from abatement at the site	57	57	57	persons
6	Multiply item 4 by item 5	57	57	57	person-hours
7	Divide item 3 by item 6	28.07	27.37	29.47	feet ² /person-hours
8	Multiply item 7 by \$42,000	\$1,178,947	\$1,149,474	\$1,237,895	\$/person-hours/ft ²
9	Does item 8 exceed the "abatement cost factor" of: \$995,935/person-hour/ft ² ?	Yes	Yes	Yes	Yes/No
10	If item 9 is no, abatement is reasonable.	Not Reasonable	Not Reasonable	Not Reasonable	
11	If item 9 is yes, abatement is not reasonable.	N/A	N/A	N/A	

4.3 Noise Barrier WM – East of SW 3rd Street to East of SW 2nd Street

Noise barriers was considered for five single-family residences in the Woodcrest Manor community located along the north side of Woolbright Road from east of SW 3rd Street at Station 370+80 to the eastern project terminus east of SW 2nd Street. These homes are represented by model receptors WM-1 through WM-4, as shown on **Figure 4-1**. The design year traffic noise levels at these homes are predicted to range from 70.1 to 70.7 dB(A) with the planned improvements, which exceed the FHWA’s residential NAC [67.0 dB(A)]. However, these predicted noise levels are expected to be no more than 0.2 dB(A) greater than the No Build noise levels

and no more than 0.9 dB(A) greater than the existing noise levels. Therefore, the traffic noise level at these residences are not expected to substantially increase above the existing conditions.

The only possible location for constructing a noise barrier for these homes would be behind the sidewalk along the westbound lanes. However, there is no available FDOT ROW behind the sidewalk and overhead lighting is also located in this space. Also, along the approximately 660-foot-long segment north of Woolbright Road adjacent to these impacted sites (between Station 370+80 and 377+40) there are five driveway openings and one opening for SW 2nd Street. In order to provide adequate safety for vehicles entering Woolbright Road from these driveways and from SW 2nd Street, each gap in the noise barrier would be required to be wide enough to provide adequate sight-distance onto Woolbright Road. Given the unavailability of ROW and the numerous openings required, it is not possible to construct an effective noise barrier for these homes. Therefore, based on this analysis, a noise barrier is not recommended for further consideration and public input for these impacted sites.

5. Summary and Conclusions

In summary, traffic noise levels were predicted for noise sensitive locations along the project corridor for the existing conditions and the design year (2045) No-Build and recommended Build Alternatives. Build Alternative traffic noise levels at the residences are expected to range from approximately 57.0 to 70.7 dB(A) during the project's design year. Build Alternative traffic noise levels at the non-residential/special-use sites are expected to range from approximately 59.7 dB(A) at the Parkside Inn patio to 67.7 dB(A) at the Learning Place Preschool playground. The worst-case design year traffic noise levels with the Build Alternative are predicted to be no more than 1.8 dB(A) greater than existing levels and no more than 0.8 dB(A) greater than the design year No Build noise levels.

Design year traffic noise levels with the planned improvements are predicted to approach or exceed the FHWA NAC for residential use [67 dB(A)] at six residences along the north side of Woolbright Road as a result of the planned improvements. For the non-residential noise sensitive sites, Build Alternative traffic noise levels are predicted to approach or exceed the correlating FHWA NAC [NAC = 67 dB(A)] at only the Learning Place playground. Therefore, based on the FHWA and FDOT methodologies used to evaluate traffic noise levels in this study, modifications proposed with this project were determined to generate noise impacts at noise sensitive sites within the project study area and consideration of noise abatement is required to mitigate these impacts. An analysis of noise abatement measures considered for the sites that approach or exceed the NAC is presented in **Chapter 4**. Although a number of sites approach or exceed the NAC, the proposed improvements do not result in any substantial noise increases [i.e., greater than 15 dB(A) over existing levels]. The locations where noise barriers were evaluated are depicted on **Figure 4-1**. None of the noise barrier design concepts met FDOT's reasonableness and/or feasibility criteria:

- **Woolbright Road – I-95 to West of SW 3rd Street.** One (1) impacted single-family home along the north side of Woolbright Road at SW 3rd Street represented by model receptor *FP-1*. This site is an isolated impacted residence. As such, it does not meet the FDOT's noise reduction feasibility criterion requiring that a noise barrier must provide a 5.0 dB(A) reduction for at least two impacted receptors to be considered feasible.
- **Woolbright Road – The Learning Place Preschool.** Woolbright Road – The Learning Place Preschool. One (1) impacted playground represented by model receptor LPP-Playground. Construction of a noise barrier along the back of the sidewalk adjacent to the school was considered. According to the results of the special land use noise barrier reasonableness analysis for this site, the cost to provide noise abatement for this playground exceeded the FDOT's abatement cost factor criteria for special use sites (\$995,935/person-hours/square-foot).

- **Woolbright Road East of SW 3rd Street to East of SW 2nd Street.** Five (5) impacted single-family homes represented by model receptors *WM-1* through *WM-4*. There is no available FDOT ROW behind the sidewalk and overhead lighting is also located in this space. Also, six openings for driveways and for SW 2nd Street would be required. Given the unavailability of ROW and the numerous openings required, it is not possible to construct an effective noise barrier for these homes.

6. Construction Noise and Vibration

During construction of the project, there is the potential for noise impacts to be substantially greater than those resulting from normal traffic operations due to the heavy equipment typically used to build roadways. In addition, construction activities may result in vibration impacts. Therefore, early identification of potential noise/vibration sensitive sites along the project corridor is important in minimizing noise and vibration impacts. The project area does include residences, private schools and medical offices that may be affected by noise and vibration associated with construction activities. Construction noise and vibration impacts to these sites will be minimized by adherence to the controls listed in the latest edition of the FDOT's *Standard Specifications for Road and Bridge Construction*. A reassessment of the project corridor for additional sites particularly sensitive to construction noise and/or vibration will be performed during design to ensure that impacts to such sites are minimized. The contractor will be instructed to coordinate with the project engineer and the District Noise Specialist should unanticipated noise or vibration issues arise during project construction.

7. Coordination with Local Officials

Agency coordination to obtain noise-related information for this project occurred through the Efficient Transportation Decision Making (ETDM) Planning and Programming Screens (ETDM #14341). The Advance Notification (AN) was distributed during the programing screening event, which occurred on October 23, 2017. The Programming Screen Summary Report was re-published on May 3, 2018. No comments were received on noise-related issues.

To aid in promoting land use compatibility, a copy of the NSR, which provides information that can be used to protect future land development from becoming incompatible with anticipated traffic noise levels, will be provided to Palm Beach County. In addition, generalized future noise impact contours for properties in the immediate vicinity of the project have been developed for Noise Abatement Activity Categories B/C and E (i.e., residential/other sensitive land uses and sensitive commercial, respectively). These contours represent the approximate distance from the edge of the nearest proposed travel lane of a roadway to the limits of the area predicted to approach [i.e., within 1 dB(A)] or exceed the NAC in the Design Year (2045). These contours do not consider any shielding of noise provided by structures between the receiver and the proposed travel lanes. Contours were generally developed for portions of the project that are located away from significant ground features such as existing noise barriers. Within the project corridor, the distance between the proposed edge of the outside travel lane and the contour at various locations are presented in **Table 7-1**. To minimize the potential for incompatible land use, noise sensitive land uses should be located beyond this distance.

Table 7-1 Design Year (2045) Noise Impact Contour Distances		
Location	Distance from Proposed Nearest Travel Lane to Noise Contour Line (Feet)	
	51/71 dB(A) – Activity Category D/E	66 dB(A) – Activity Category B/C
Woolbright Road East of I-95, South Side Sta. 374+00	35	90
I-95 South of Woolbright Road, West Side Sta. 721+00	220	405
I-95 South of Woolbright Road, East Side Sta. 721+20	70*	70*

Note: * = Impact level occurs at the adjacent noise barrier.

8. References

Florida Department of Transportation, "*Project Development and Environment Manual, Part 2, Chapter 18-Highway Traffic Noise*", July 01, 2020.

23 CFR Part 772, "*Procedures for Abatement of Highway Traffic Noise and Construction Noise*", Federal Register, Vol. 75, No. 133, Tuesday, July 13, 2010; pages 39834-39839.

Federal Highway Administration Report FHWA-HEP-10-025, "*Highway Traffic Noise: Analysis and Abatement Guidance*", June 2010 (revised December 2010); 76 pages.

Florida Statute 335.17, "*State highway construction; means of noise abatement*". 1989; 1 page.

Florida Department of Transportation Policy, "*Noise Abatement*". Topic 000-360-005-f; Effective September 20, 2007; 1 page.

Florida Department of Transportation, "*A Method to Determine Reasonableness and Feasibility of Noise Abatement at Special Use Locations*" (July 22, 2009)

Federal Highway Administration Report Number FHWA-PD-96-046, "*Measurement of Highway-Related Noise*". Cynthia S.Y. Lee and Gregg Fleming; May 1996; 206 pages.

Florida Department of Transportation, "*Standard Specifications for Road and Bridge Construction*". 2010; 996 pages.

Federal Highway Administration Report FHWA-HEP-06-015, "*FHWA Highway Construction Noise Handbook: Final Report*". August 2006; 185 pages.

Appendix A – TNM Traffic Data

Traffic Data Used in TNM Model†

Roadway Segment	Existing (2017)				Design Year (2045) No-Build				Design Year (2045) Build			
	Number of Lanes	Peak-Hour	LOS C	TNM Data	Number of Lanes	Peak-Hour	LOS C	TNM Data	Number of Lanes	Peak-Hour	LOS C	TNM Data
I-95												
I-95 Mainline (HOV/Express Lanes are Separate) Northbound Southern Project Terminus to Woolbright Road Off-Ramp	5	8,744	6,933	6,933	5	11,891	6,933	6,933	5	11,891	6,933	6,933
I-95 Mainline (HOV/Express Lanes are Separate) Northbound Northbound Woolbright Road Off-Ramp to Woolbright Road On-Ramp	4	7,830	6,200	6,200	4	10,738	6,200	6,200	4	10,738	6,200	6,200
I-95 Mainline (HOV/Express Lanes are Separate) Northbound Woolbright Road On-Ramp to Northern Project Terminus	5	9,263	6,933	6,933	6	12,417	7,666	7,666	6	12,417	7,666	7,666
I-95 Mainline (HOV/Express Lanes are Separate) Southbound Northern Project Terminus to Woolbright Road Off-Ramp	6	6,454	7,666	6,454	6	8,279	7,666	7,666	6	8,279	7,666	7,666
I-95 Mainline (HOV/Express Lanes are Separate) Southbound Woolbright Road Off-Ramp to Woolbright Road On-Ramp	4	5,276	6,200	5,276	4	6,806	6,200	6,200	4	6,806	6,200	6,200
I-95 Mainline (HOV/Express Lanes are Separate) Southbound Woolbright Road On-Ramp to Southern Project Terminus	5	5,878	6,933	5,878	5	7,509	6,933	6,933	5	7,509	6,933	6,933
I-95 HOV/Express Lanes												
I-95 HOV/Express Lanes Northbound Southern Project Terminus to Woolbright Road Off-Ramp	1	1,178	1,560	1,178	2	1,610	3,320	1,610	2	1,610	3,320	1,610
I-95 HOV/Express Lanes Northbound Northbound Woolbright Road Off-Ramp to Woolbright Road On-Ramp	1	1,055	1,560	1,055	2	1,454	3,320	1,454	2	1,454	3,320	1,454
I-95 HOV/Express Lanes Northbound Woolbright Road On-Ramp to Northern Project Terminus	1	1,251	1,560	1,251	2	1,693	3,320	1,693	2	1,693	3,320	1,693
I-95 HOV/Express Lanes Southbound Northern Project Terminus to Woolbright Road Off-Ramp	1	731	1,560	731	2	928	3,320	928	2	928	3,320	928
I-95 HOV/Express Lanes Southbound Woolbright Road Off-Ramp to Woolbright Road On-Ramp	1	598	1,560	598	2	763	3,320	763	2	763	3,320	763
I-95 HOV/Express Lanes Southbound Woolbright Road On-Ramp to Southern Project Terminus	1	715	1,560	715	2	924	3,320	924	2	924	3,320	924
Woolbright Road												
Woolbright Road Eastbound SW 18th Court to SW 8th Street	3	1,443	2,940	1,443	3	1,826	2,940	1,826	3	1,826	2,940	1,826
Woolbright Road Eastbound SW 8th Street to SB I-95 Off-Ramp	2	1,407	2,940	1,407	2	1,801	2,940	1,801	3	1,801	2,940	1,801
Woolbright Road Eastbound SB I-95 Off-Ramp to Eastern Project Terminus	2	1,638	1,910	1,638	2	2,083	1,910	1,910	3	2,083	2,940	2,083
Woolbright Road Westbound Eastern Project Terminus to NB I-95 On-Ramp	2	1,797	1,910	1,797	2	2,490	1,910	1,910	2	2,490	1,910	1,910
Woolbright Road Westbound NB I-95 Off-Ramp to SB I-95 Off-Ramp	2	1,581	1,910	1,581	2	2,254	1,910	1,910	3	2,254	2,940	2,254
Woolbright Road Westbound SB I-95 Off-Ramp to SW 8th Street	2	1,268	1,910	1,268	2	1,840	1,910	1,840	3	1,840	2,940	1,840
Woolbright Road Westbound SW 8th Street to SW 18th Court	3	1,715	2,940	1,715	3	2,362	2,940	2,362	3	2,362	2,940	2,362

Traffic Data Used in TNM Model [†]													
Roadway Segment	Existing (2017)				Design Year (2045) No-Build				Design Year (2045) Build				
	Number of Lanes	Peak-Hour	LOS C	TNM Data	Number of Lanes	Peak-Hour	LOS C	TNM Data	Number of Lanes	Peak-Hour	LOS C	TNM Data	
SW 18th Court													
SW 18th Court Southbound North of Woolbright Road	1	0	333	333	1	0	333	333	1	0	333	333	
SW 18th Court Northbound North of Woolbright Road	1	0	333	333	1	0	333	333	1	0	333	333	
SW 18th Court Southbound South of Woolbright Road	1	0	333	333	1	0	333	333	1	0	333	333	
SW 18th Court Northbound South of Woolbright Road	1	0	333	333	1	0	333	333	1	0	333	333	
SW 8th Street/Corporate Drive													
SW 8th Street Southbound North of Woolbright Road	1	495	333	333	1	758	333	333	1	758	333	333	
SW 8th Street Northbound North of Woolbright Road	1	752	333	333	1	1,065	333	333	1	1,065	333	333	
Corporate Drive Southbound South of Woolbright Road	1	180	333	180	1	348	333	333	1	348	333	333	
Corporate Drive Northbound South of Woolbright Road	1	550	333	333	1	619	333	333	1	619	333	333	
Ramps													
Northbound I-95 Off-Ramp to Westbound Woolbright Road NB to WB Off-Ramp	2	578	N/A	578	2	786	N/A	786	3	786	N/A	786	
Northbound I-95 Off-Ramp to Eastbound Woolbright Road NB to EB Off-Ramp	1	459	N/A	459	1	523	N/A	523	1	523	N/A	523	
Westbound Woolbright Road On-Ramp to Northbound I-95 WB to NB On-Ramp	1	794	N/A	794	1	1,022	N/A	1,022	1	1,022	N/A	1,022	
Eastbound Woolbright Road On-Ramp to Northbound I-95 EB to NB On-Ramp	2	835	N/A	835	2	896	N/A	896	2	896	N/A	896	
Southbound I-95 Off-Ramp to Eastbound Woolbright Road SB to EB Off-Ramp	2	607	N/A	607	2	655	N/A	655	3	655	N/A	655	
Southbound I-95 Off-Ramp to Westbound Woolbright Road SB to WB Off-Ramp	1	704	N/A	704	1	983	N/A	983	1	983	N/A	983	
Westbound Woolbright Road On-Ramp to Southbound I-95 EB to SB On-Ramp	1	406	N/A	406	1	450	N/A	450	1	450	N/A	450	
Eastbound Woolbright Road On-Ramp to Southbound I-95 WB to SB On-Ramp	2	313	N/A	313	2	414	N/A	414	2	414	N/A	414	

Notes:
[†] = Peak-Hour Demand traffic data taken from the project's draft Interchange Modification Report dated October, 2019
* = LOS C values based on the FDOT's Generalized Level of Service C Tables dated December, 2012
TNM By-Lane Data is either PM Peak-Hour Volume or Level of Service C Capacity, whichever is less.
PHD = Peak-Hour Demand
LOS C = Level-of-Service C
N/A = Not applicable