Noise Study Report

Florida Department of Transportation

District 1

SR 789 (John Ringling Causeway)

Limits of Project: Bird Key Drive to Sarasota Harbour West

Sarasota, Florida

Financial Management Number: 436680-1-22-01 & 436680-1-32-01

ETDM Number: 14384

Date: October 2023

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by the Florida Department of Transportation (FDOT) pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated May 26, 2022 and executed by the Federal Highway Administration and FDOT.

Executive Summary

The Florida Department of Transportation, District 1 (FDOT) is conducting a Project Development & Environment (PD&E) study to consider the potential reconstruction and/or rehabilitation of the SR 789 (Ringling) bridges [Structure Numbers 170022 and 170951]. The limits of the improvements are from Bird Key Drive to Sarasota Harbour West in the City of Sarasota, in Sarasota County (see **Figure 1-1)**. The purpose of the study is to address structural integrity and operational deficiencies. SR 789 is classified as an Urban, Minor Arterial and consists of a four-lane, divided typical section between Bird Key Drive and Sarasota Harbour West, a distance of 0.741 miles. SR 789 serves as the only connection from downtown Sarasota to St. Armands Key and Lido Key. Although SR 789 is designated as a north-south route, within the project limits SR 789 runs in a generally east-west direction.

This PD&E study *Noise Study Report* (NSR) documents the project summary, project purpose and need, methodology, analysis, and conclusions of the traffic noise analysis conducted for the State Road (SR) 789 (John Ringling Causeway) project (Financial Project ID: 436680-1-22-01 & 436680-1-32-01). The purpose of this NSR is to identify land uses adjacent to the project corridor for which there are Noise Abatement Criteria (NAC), to evaluate future traffic noise levels at the properties with and without the proposed improvements, and to evaluate the need for, and effectiveness of, noise abatement measures. Additional objectives include the consideration of potential construction noise impacts and the identification of noise impact "contours" adjacent to the corridor.

This document has been prepared in accordance with the Florida Department of Transportation's (FDOT) *Project Development and Environment Manual Part 2: Analysis and Documentation, Highway Traffic Noise*; the FDOT's *Traffic Noise Modeling and Analysis Practitioners Handbook*; the Federal Highway Administration (FHWA) *Procedures for Abatement of Highway Traffic Noise and Construction Noise* (FHWA 23 CFR 772); the FHWA *Highway Traffic Noise: Analysis and Abatement Guidance (FHWA-HEP-10-025)*; and in consultation with FDOT District 1.

This project was analyzed for the 2045 design year, based on Demand and Level of Service (LOS) C traffic volumes, where appropriate.

- The determination of traffic noise impacts is based on the relationship between noise levels: the predicted loudest-hour traffic noise levels, and the noise abatement criteria (NAC) dictated by land use in the project area. The study area was divided into 10 distinct noise sensitive common noise environments (CNEs).
- In addition to two field measurement sites, 162 receptor locations are modeled within these 10 CNEs.
- Two CNEs were predicted to be impacted, but noise mitigation was deemed not acoustically reasonable.

The Florida Department of Transportation is committed to the construction of feasible and reasonable noise abatement measures where recommended. Within the two impacted CNEs, the potential barriers would not meet the reasonable cost effectiveness criteria. Therefore, potential noise barriers are not recommended for further consideration for this project.

Construction of the proposed roadway improvements of SR 789 may cause temporary noise and/or vibration impacts to nearby developed land uses. Should anticipated noise or vibration issues arise during the construction process, the Project Manager, in coordination with the District Noise Specialist and the Contractor, will investigate additional methods of controlling these impacts.

Upon approval of the project's environmental document, a copy of the final NSR will be provided to the Sarasota County Office of Housing and Community Development (OHCD), Sarasota/Manatee Metropolitan Planning Organization (MPO) and the City of Sarasota for their use associated with planning for development after the date of public knowledge (i.e., when the Type 2 CE is approved). Noise contours are provided to assist planning and zoning with a best estimate on distances from the proposed edge-of-pavement at which traffic noise levels would meet or exceed the FDOT's NAC for activity categories A through E.

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1 INTRODUCTION

1.1 Project Description

This project involves the potential reconstruction of the SR 789 (John Ringling Causeway) bridges [Structure Numbers 170022 and 170951]. The limits of the improvements are from Bird Key Drive to Sarasota Harbour West in the City of Sarasota, in Sarasota County (see **Figure 1-1**). The purpose of the study is to address structural integrity and operational deficiencies. SR 789 is classified as an Urban, Minor Arterial and consists of a four-lane, divided typical section between Bird Key Drive and Sarasota Harbour West, a distance of 0.741 miles. SR 789 serves as the only connection from downtown Sarasota to St. Armands Key and Lido Key. Although SR 789 is designated as a north-south route, within the project limits SR 789 runs in a generally east-west direction.

The existing twin bridges cross the Coon Key Waterway, a navigable waterway without a defined channel. Per the FDOT Design Manual (FDM), a minimum six-foot vertical clearance is required. The existing concrete multi-beam bridges were constructed in 1958. The bridges are spaced 100 feet apart and each bridge is approximately 1,006 feet, 10 inches long (21 spans of 48 feet each). Each bridge has two twelve-foot travel lanes and a five-foot wide sidewalk on both sides. There are currently no shoulders or designated bicycle facilities across the bridges.

Figure 1-1 Project Location Map

1.2 Purpose and Need

The purpose of the project is to address structural integrity and operational deficiencies of the SR 789 (Ringling) bridge [Structure Numbers 170022 and 170951]. The ultimate goal of the project is to identify the optimal solution for a bridge structure in need of repair due to deteriorating conditions and to accommodate greater multimodal transportation access. The project will evaluate twin bridge and single bridge alternatives for the reconstruction/rehabilitation, with consideration of bicycle/pedestrian and transit facilities, of approximately 0.741 miles of roadway that provides a connection between nearby neighborhoods and recreational facilities (West Causeway Park, Bird Key Park and the Sarasota Yacht Club). The need for the project is based on the following criteria:

BRIDGE DEFICIENCIES: Address Structural Integrity and Operational Deficiencies

The current concrete multi-beam bridge is the second bridge that has existed at this location, with the original bridge replaced in 1958. Several sections of the deck were replaced on the northbound bridge in 2016 along with other repair-type work throughout the years. The SR 789 bridges, located between downtown Sarasota and St. Armands Key and Lido Key, are more than fifty-years old, the typical expected design life for transportation infrastructure, and are operationally deficient, particularly for transit. SR 789, including the bridges, is identified as a constrained roadway by the Sarasota / Manatee Metropolitan Planning Organization (MPO), meaning it does not preclude any type of improvement in the future, but it identifies that the corridor has physical, or policy challenges associated with a widening/capacity project.

Based on a January 2023 FDOT bridge inspection report, the northbound SR 789 bridge received a sufficiency rating of 76.9 and health index rating of 68.0, while the southbound bridge received a sufficiency rating of 77.7 and health index rating of 71.17, as measured on scales of 0-100. “Sufficiency rating” is essentially an overall rating of a bridge's fitness to remain in service and whether it should be repaired or replaced. A bridge with a sufficiency rating of 80 or less is generally eligible for bridge rehabilitation funding. The "health index" is a tool that measures the overall condition of a bridge and typically includes about 10 to 12 different elements that are evaluated by the department. A health index below 85 generally indicates that some repairs are needed, although it doesn't mean the bridge is unsafe. Both bridges do not meet current road design and safety standards. The bridge conditions are as follows:

<u>Northbound (170022)</u>

- Overall Condition: Fair
- Deck: Fair
- Superstructure: Satisfactory
- Substructure: Satisfactory
- Deck Geometry Appraisal: Substandard typical section elements
- Countermeasures have been installed to mitigate an existing problem with scour.

Southbound (170951)

- Overall Condition: Good
- Deck: Satisfactory
- Superstructure: Good
- Substructure: Satisfactory
- Deck Geometry Appraisal: Substandard typical section elements
- Countermeasures have been installed to mitigate an existing problem with scour.

MODAL INTERRELATIONSHIPS: Improve Multimodal Transportation Options

SR 789 serves as the primary connection between downtown Sarasota and St. Armands Key and Lido Key and is frequently used by bicyclists and pedestrians due to the adjacent parks and recreational facilities [Bird Key Park, West Multi-Use Recreational Trail (MURT) Bird Key / Coon Key Phase I, John Ringling Trail and Longboat Key Trail Corridor]. While there are five-foot-wide sidewalks on both sides of the bridges, there are currently no shoulders or designated bicycle facilities across the bridges. Due to the minimal sidewalk width, there are often conflicts between pedestrians and bicyclists. Overall, the proposed project intends to enhance mobility by evaluating alternatives for reconstruction/rehabilitation with consideration of bicycle/pedestrian and transit facilities on approximately 0.741 miles of roadway on SR 789.

SAFETY: Improve Emergency Evaluation and Response Times

Serving as part of the emergency evacuation route network designated by the Florida Division of Emergency Management and City of Sarasota, SR 789 plays a critical role in facilitating traffic during emergency evacuation periods as the primary connection between downtown Sarasota and St. Armands Key and Lido Key. The entire project corridor is located in the City of Sarasota's Hurricane Storm Surge Category "A."

The City of Sarasota Climate Adaptation Plan (December 4, 2017) studied and evaluated climate threats to public infrastructure to understand how sea level rise, storm surge, extreme precipitation, and extreme heat might impact the City of Sarasota's transportation network; stormwater management, water supply, and wastewater systems; public lands; and critical buildings. Thirty-four transportation assets were evaluated of which 15 were deemed most vulnerable, including SR 789 [Project ID T15, pg. 31]. When prioritizing transportation vulnerabilities, the SR 789 bridge received a risk score of 64.4 (on a scale of 0-100). The potential reconstruction and/or rehabilitation of SR 789 bridge would make it more resilient to climate vulnerabilities.

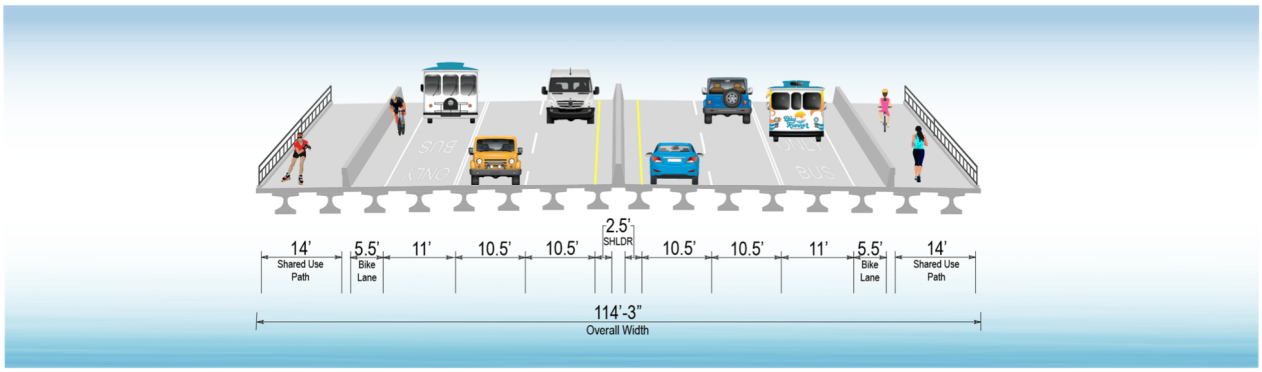
1.3 Proposed Improvements

Preferred Alternative

The preferred alternative replaces the existing twin bridges with a single bridge. The single bridge

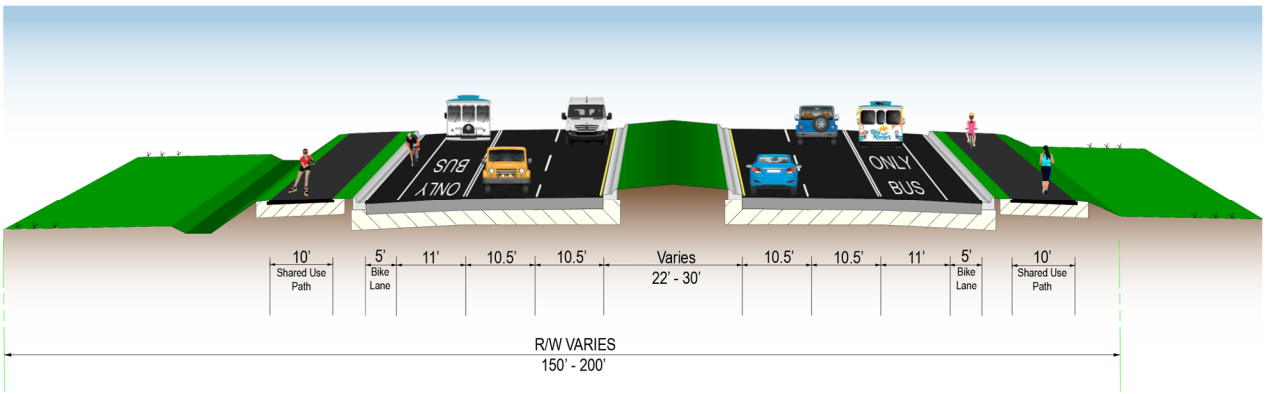
typical section includes two 10.5-ft wide travel lanes, a dedicated 11-ft transit lane, 2.5-ft inside shoulder, 5.5-ft bike lane, and 14-ft shared use path in each direction. The total width of the bridge is 114 ft 3-in, shown on **Figure 1-2.**

Figure 1-2 SR 789 Preferred Single Bridge Typical Section



The new bridge will transition to a curb and gutter roadway typical section that includes two 10.5-ft wide travel lanes, a dedicated 11-ft transit lane, and 5-ft bike lane in each direction, separated by a median with Type E curb and gutter. This section of roadway also includes a 10-ft shared-use path on both sides of the roadway that connects to the bridge, shown on **Figure 1-3**. The design speed is 40 mph with a posted and target speed of 35 mph. The proposed bridge will be approximately 27.55 ft above the Coon Key Waterway, an increase of 15.73 ft from the existing bridges.

Figure 1-3 SR 789 Preferred Roadway Typical Section



2 METHODOLOGY

This traffic noise analysis was conducted in accordance with the FDOT's *Project Development and Environment Manual Part 2: Analysis and Documentation, Highway Traffic Noise*; the FDOT *Traffic Noise Modeling and Analysis Practitioners Handbook;* the FHWA *Procedures for Abatement of Highway Traffic Noise and Construction Noise* (FHWA 23 CFR 772), required in the noise impact assessment process, regardless of funding, in accordance with Chapter 335.17, Florida Statute; and FHWA's *Highway Traffic Noise: Analysis and Abatement Guidance (FHWA-HEP-10-025)*.

As defined in FHWA 23 CFR 772, and adopted by FDOT's PD&E Manual, this project will result in changes in the horizontal roadway geometry and is expected to meet FHWA and FDOT's definition of a "Type I" project for which traffic noise impacts and abatement measures will be evaluated.

The procedures by which this NSR was conducted are as follows:

- *Initial project scoping:* Obtain project preliminary design; prepare field maps; review project mapping, GIS data, aerial photography, traffic data, and other available pertinent information.
- *Noise monitoring / traffic collection / fieldwork:* Identify all land uses, addresses, and locations of all noise sensitive receptors within the project corridor; obtain noise monitoring data; obtain weather data for noise monitoring sessions; collect traffic data during noise monitoring, create field data logs and site sketches; photograph noise monitoring locations and other relevant visual data; process noise monitoring data.
- *Traffic Evaluation:* Process both existing traffic collected from field and proposed traffic data into 5 TNM-designated vehicle classifications. For all modeled scenarios, determine if Level of Service (LOS) C or Demand volumes will be used in TNM.
- *Baseline TNM modeling:* Create a comprehensive but efficient representation of the existing condition project corridor utilizing receptors, roadways, terrain lines, ground zones, and barriers to represent structures within TNM.
- *TNM Model Validation Analyses:* Validate the baseline model in TNM to confirm the accuracy of the baseline models to predict traffic noise levels within acceptable tolerances of the traffic noise levels obtained at noise monitoring locations for which traffic noise was dominant.
- *Impact Assessment:* Input existing and 2045 design year no-build condition TNM traffic volumes and speeds into the validated baseline TNM models to evaluate existing and design-year no-build condition traffic noise levels. Update the validated baseline models with the preliminary project design and design year build-condition traffic volumes and speeds to evaluate design year build-condition traffic noise levels. Determine if future noise levels approach or exceed the Noise Abatement Criteria (NAC) and/or if substantial increase occurs.
- *Noise Abatement Evaluation:* If traffic noise impacts are identified above, noise abatement shall be considered and evaluated for feasibility and reasonableness. Model traffic noise barriers; calculate TNM-predicted with-barrier traffic noise levels; evaluate with-barrier noise level reductions; and optimize potentially feasible and reasonable barriers.
- *Noise Study Report:* The results of the noise analysis are documented in the NSR.

2.1 Noise Metrics

All noise levels were assessed as the hourly equivalent sound level, Leq(h), in terms of A-weighted decibels, dB(A). The hourly equivalent sound level, Leq(h), is the equivalent steady-state sound level which in a period of one hour contains the same acoustic energy as the time-varying sound level during that hour. The A-weighted decibel filtering scale applies numerical adjustments to sound frequencies to emphasize the frequencies at which human hearing is sensitive, and to minimize the frequencies to which human hearing is not as sensitive.

Several examples of A-weighted noise levels expressed in dB(A) listed in **Table 2-1**. Human hearing has a non-linear sensitivity to sound pressure exposure and can perceive sounds of greatly varying pressure levels. For example, doubling the sound pressure results in a three decibel change in the noise level; however, variations of three decibels (3 dB(A)) or less are commonly considered “barely perceptible” to normal human hearing. A five decibel (5 dB(A)) change is more readily noticeable. A ten-fold increase in the sound pressure level correlates to a 10 decibel (10 dB(A)) noise level increase; however, it is judged by most people as only a doubling of the loudness – sounding “twice as loud”.

In March 1998, the FHWA, Office of Natural and Human Environment, released the FHWA Traffic Noise Model, Version 1.0, a state-of-the-art computer model for highway traffic noise prediction and analysis. TNM 2.5 (TNM) is the latest approved version of the Traffic Noise Model program. Within TNM, roadway elements, terrain lines, barriers building rows, and ground zones are used to represent the existing and build-condition topography of the project and noise study areas. With the exception of ground zones, each of these elements defines the horizontal (x, y) and vertical (z) coordinates for the model. The discrete point locations at which TNM calculates traffic noise levels are modeled as receptors. The horizontal and vertical coordinates define a point for each modeled receptor; however, TNM does not interpolate ground elevations between receptors as it does between terrain lines, roads, barriers, and building rows.

Table 2-1: Common Indoor and Outdoor Noise Levels

Common Outdoor Noise Levels	Noise Level (dB(A))	Common Indoor Noise Levels
	110	Rock Band
Jet Flyover at 1,000 feet	100	Inside Subway Train (NY)
Gas Lawn Mower at 3 feet		
Diesel Truck at 50 feet	90	Food Blender at 3 feet
Noisy Urban Daytime	80	Garbage Disposal at 3 feet
Gas Lawn Mower at 100 feet	70	Vacuum Cleaner at 10 feet
Commercial Area		Normal Speech at 3 feet
	60	
		Large Business Office
Quiet Urban Daytime	50	Dishwasher Next Room
Quiet Urban Nighttime	40	Small Theater, Large Conference Room (Background)
Quiet Suburban Nighttime		Library
	30	
Quiet Rural Nighttime		Bedroom at Night, Concert Hall (Background)
	20	
		Broadcast and Recording Studio
	10	
	0	Threshold of Hearing

Adapted from Guide on Evaluation and Attenuation of Traffic Noise, American Association of State Highway and Transportation Officials (AASHTO). 1974 (revised 1993).

2.2 Traffic Evaluation

The FHWA standard vehicle classification scheme defines 13 different vehicle types to identify vehicles by use, weight, axles, wheels, and other distinguishing characteristics. The TNM algorithm combines the 13 types of vehicles into 5 classifications: automobiles, medium trucks, heavy trucks, buses, and motorcycles (see **Table 2-2**).

Table 2-2: FHWA Traffic Noise Model (TNM) Vehicle Types

TNM Vehicle Type	Description	FHWA Vehicle Classification
Autos	All vehicles with two axles and four tires, including passenger cars and light trucks, weighing 10,000 pounds or less[1]	2, 3
Medium Trucks	All vehicles having two axles and six tires, weighing between 10,000 and 26,000 pounds[1]	5
Heavy Trucks	All vehicles having three or more axles, weighing more than 26,000 pounds[1]	6 – 13
Buses	All vehicles designed to carry more than nine passengers	4
Motorcycles	All vehicles with two or three tires and an open-air driver / passenger compartment	1
Since the January 1998 publication of the *FHWA Traffic Noise Model User's Guide*, the FHWA GVWR have been restored from metric to the English weights cited above. As noted in the *Guide* preface, the English values for the metric weights cited for Automobiles, Medium Trucks, and Heavy Trucks were "generally" <9,900 lb., 9,900 lb. – 26,400 lb., and >26,400 lb., respectively.		

In predicting traffic noise levels and assessing impacts, traffic characteristics that would yield the highest traffic noise impact for the 2045 design year shall be used. It is known that the highest traffic volume (also taking into consideration truck percentages) and the highest average speed usually create the noisiest conditions. Maximum peak-hourly traffic representing Level of Service (LOS) "C" will be used unless traffic analysis shows that LOS C will not be reached. If LOS C will not be reached, demand volumes shall be used.

The traffic volumes used for this study were specifically obtained from the SR 789 *Project Traffic Analysis Report* completed in May 2023. The traffic volumes generated by the FDOT *Traffic Volumes for Noise Analysis Spreadsheet* indicate the number of each TNM vehicle type (automobiles, medium trucks, heavy trucks, buses, and motorcycles) on each project segment for each direction of travel, and whether peak-hour demand or LOS "C" volumes should be used for TNM input on each project roadway segment. In accordance with FHWA TNM modeling guidance, each roadway travel lane was modeled as a separate TNM roadway element and TNM roadway element widths were established to ensure that roadways overlap. In order to represent vehicle traffic on all modeled travel lanes, the traffic volumes generated by the FDOT *Traffic Volumes for Noise Analysis Spreadsheet* for each direction of travel were divided by two or three for each direction of the 4-lane and 6-lane project roadway segments, respectively (refer to **Appendix A**).

2.3 Noise Abatement Criteria

The FHWA has developed Noise Abatement Criteria (NAC) and procedures to be used in the planning and design of highways. A traffic noise impact can occur in two ways; one of which is when the modeled future highway traffic noise levels for the worst-case noise condition approach or exceed the NAC. FDOT has determined that the NAC is approached when it is within 1 dB(A) of the appropriate NAC. A summary of the NAC for various land uses is presented in **Table 2-3**.

Table 2-3: Noise Abatement Criteria

Hourly Equivalent A-Weighted Sound Level (decibels (dB(A))				
Activity Category	Activity Leq(h)[1]		Evaluation Location	Activity Description
	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 sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section4(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
[1] The $L_{eq(h)}$ Activity Criteria values are for impact determination only and are not design standards for noise abatement measures. [2] Includes undeveloped lands permitted for this activity category.				
Source: Table 1 of 23 CFR Part 772				

In determining traffic noise impacts for properties with Activity Category A, B, C or E, areas of frequent exterior human use should be identified. For those properties with Activity Category D, interior areas of frequent human use should be identified. Unless the area of exterior frequent human use is identified elsewhere, residential receptor sites are be placed at the edge of the dwelling unit closest to the major traffic noise source.

When more than one unit is clustered together, a single receptor can be analyzed as representative of a group of noise sensitive sites. Each residence in a multifamily dwelling is counted as one receptor when determining impacted and benefited receptors. Noise sensitive receptors may also consist of parks, schools, hospitals, and other sites where quiet is important for normal activities. The location of the receptor in these cases will be dictated by the location of the noise source and the exterior activity that may be impacted, if any.

2.4 Noise Abatement Measures

The NAC, as shown in **Table 2-3**, is used to determine whether a highway traffic noise impact occurs. A traffic noise impact occurs when one of two criteria are met:

1. When the modeled future highway traffic noise levels for the worst-case noise condition approaches or exceeds the NAC.
2. When modeled future highway traffic noise levels substantially exceed the existing highway traffic noise level, even though the modeled levels may not exceed the NAC.

FDOT determines that the NAC is approached when noise levels are within 1 dB(A) of the appropriate NAC; a substantial increase occurs when the increase over existing conditions (measured or predicted) is 15 dB(A) or greater. To assess the highway traffic noise impact of a project, FDOT must evaluate both criteria (approach and substantial increase).

Design year traffic noise impacts are based on the modeled future build noise levels, or the difference between the future build and existing measured or predicted traffic noise levels. If one or more noise sensitive receptors are impacted by project related traffic noise levels, which approach or exceed the NAC, or substantially increase when compared to existing (measured or predicted) noise levels, then abatement measures must be considered. If the abatement criteria are not approached or exceeded, or if projected traffic noise levels do not substantially exceed existing noise levels, abatement measures will not be considered.

Per FHWA procedures, when traffic noise impacts are identified, noise abatement shall be considered and evaluated for feasibility and reasonableness. In abating traffic noise impacts, FDOT shall give primary consideration to exterior areas where frequent human use occurs. Traffic noise abatement is considered only if the predicted future build traffic noise level approach or exceed abatement levels in the NAC, or if build traffic noise levels substantially increase from existing noise levels (either measured or predicted). When considering noise barriers for noise abatement, the feasibility and reasonableness factors must be evaluated for each viable alternative under detailed analysis. The most common type of traffic noise abatement measure, and the only viable abatement measure at the PD&E stage, is the construction of a noise barrier.

Feasibility Criteria

- At least a 5-dB(A) highway traffic noise reduction at a minimum of two (2) impacted receptors; and
- The determination that it is possible to design and construct the noise abatement measure. The factors related to the design and construction include safety, access, barrier height, topography, drainage, utilities, maintenance of the abatement measure, maintenance access to adjacent properties, right of way, and general access to adjacent properties (i.e., arterial widening projects).

A determination of noise barrier reasonableness includes the consideration of the parameters listed below. All the reasonableness factors must collectively be achieved in order for a noise abatement measure to be deemed reasonable.

Reasonableness Criteria

- Noise Reduction Design Goals. FDOT's design goal is 7 dB(A) for at least one (1) benefited receptor.
- Cost-effectiveness. FDOT's noise barrier cost effectiveness value is based on an approximately 1,400 SF of noise barrier per benefited receptor. Using a current unit cost of $30/SF, a reasonable cost of $42,000 per benefited receptor is looked upon as the upper limit.
- Viewpoints of the benefited receptors. FDOT shall solicit the viewpoints of all benefited receptors. It is the desire of the FDOT to obtain a response for or against the noise barrier from a numerical majority (greater than 50%) of the respondents. If, after multiple attempts to gather the input from the benefited receptors, a minimum response rate of 50% is not achieved, the FDOT will determine the abatement measure to be not reasonable. If a numerical majority of the benefited residents and property owners that provide a response to the survey do not favor construction of a noise barrier, FDOT will not provide the noise barrier.
- For special land uses, the cost of the barrier should not be more than $995,935 per person-hour per square foot (dollars / person-ft^2).

The Florida Department of Transportation is committed to the construction of feasible and reasonable noise abatement measures contingent upon the following conditions:

1. Final recommendations on the construction of abatement measures is determined during the project's final design and through the public involvement process;
2. Detailed noise analyses during the final design process support the need, feasibility and reasonableness of providing abatement;
3. Cost analysis indicates that the cost of the noise barrier(s) will not exceed the cost reasonable criteria;
4. Community input supporting types, heights, and locations of the noise barrier(s) is provided to the District Office; and
5. Safety and engineering aspects as related to the roadway user and the adjacent property owner have been reviewed and any conflicts or issues resolved.

The FDOT's PD&E Manual and FHWA 23 CFR 772.17 regulation require that to minimize future traffic noise impacts on currently undeveloped lands for Type I projects, highway agencies shall inform local officials within whose jurisdiction the highway project is located of noise compatible planning concepts, and the best estimation of the future design year noise levels at various distances (traffic noise level contours) from the edge of the nearest travel lane of the highway improvement where the future noise levels meet the highway agency's definition of "approach" for undeveloped lands or properties within the project limits.

3 TRAFFIC NOISE ANALYSIS

The noise impacts and abatement assessments summarized in this NSR were completed in accordance with the FDOT's *Project Development and Environment Manual Part 2: Analysis and Documentation, Highway Traffic Noise*; the FDOT's *Traffic Noise Modeling and Analysis Practitioners Handbook*; and the FHWA's *Procedures for Abatement of Highway Traffic Noise and Construction Noise* (FHWA 23 CFR 772).

For the purposes of this traffic noise analysis, the project study area acoustic environment evaluation was based upon noise from highway traffic, assessed using FHWA's TNM, representations of the project study area, for which predicted traffic noise levels were validated to within acceptable tolerances of monitored traffic noise levels generated by classified traffic volumes.

3.1 Land Uses

The study area was divided into ten (10) distinct areas of similar land use called a common noise environment (CNE), in accordance with FDOT and FHWA policies and guidance. A common noise environment is a group of receptors within the same NAC that are exposed to similar noise sources and levels, traffic volumes, traffic mix, speed and topographic features. Generally, common noise environments occur between two secondary noise sources, such as interchanges, intersections and/or cross-roads.

Within the project area, of the 10 CNEs, four are categorized as NAC B, five are NAC C, and one is NAC E. A map of these CNEs can be found in **Appendix E**.

CNE 01: This CNE is located on the south side of SR 789 (John Ringling Causeway), just north-east of St Armands Key, and represents the Continuing Care Retirement Community (CCRC) of Plymouth Harbor on Sarasota Bay. The facility includes care management, home health services, assisted living and memory care facilities, rehabilitation services, and clinic services. As the CNE contains no areas of frequent outdoor use and would be considered a Medical Facility, it is evaluated as NAC D.

CNE 02: This CNE is located on the south side of SR 789 (John Ringling Causeway), just north-east of St Armands Key, and represents the Dog Park at the north-west corner of the Garden Building at the Continuing Care Retirement Community (CCRC) of Plymouth Harbor on Sarasota Bay. It is evaluated as NAC C.

CNE 03: This CNE is located on the south side of SR 789 (John Ringling Causeway), just south-west of Coons Key Waterway, and represents the Sarasota Yacht Club. Based on coordination with the dock master, it was verified that there are no overnight berths within the yacht club. It is evaluated as NAC E.

CNE 04: This CNE is located on the south side of SR 789 (John Ringling Causeway), just south-west of Coons Key Waterway, and represents a swimming pool at the front of the Sarasota Yacht Club. It is evaluated as NAC C.

CNE 05: This CNE is located on the south side of SR 789 (John Ringling Causeway), north-east of Coons Key Waterway, and represents the single-family residences of the Bird Key Subdivision. It is evaluated as NAC B.

CNE 06: This CNE is located on the north side of SR 789 (John Ringling Causeway), north-east of Coons Key Waterway, and represents Ringling Bridge Causeway Park and Bird Key Park. It is evaluated as NAC C.

CNE 07: This CNE is located on the north side of SR 789 (John Ringling Causeway), south-west of Coons Key Waterway, and represents the residential multi-family homes of Sarasota Harbour East. It is evaluated as NAC B.

CNE 08: This CNE is located on the north side of SR 789 (John Ringling Causeway), south-west of Coons Key Waterway, and represents the swimming pool of Sarasota Harbour East. It is evaluated as NAC C.

CNE 09: This CNE is located on the north side of SR 789 (John Ringling Causeway), south-west of Coons Key Waterway, and represents the residential multi-family homes of Sarasota Harbour West. It is evaluated as NAC B.

CNE 10: This CNE is located on the north side of SR 789 (John Ringling Causeway), south-west of Coons Key Waterway, and represents the swimming pool of Sarasota Harbour West. It is evaluated as NAC C.

3.2 Existing Noise Levels

The primary purpose of field work is to ensure that traffic noise is the primary source of noise, and for validating TNM accuracy.

3.2.1 Noise Monitoring

Short-term noise monitoring data was acquired at two (2) receptor locations within influence of highway traffic noise from SR 789 on Tuesday, March 29, 2022. These locations were determined based on common noise environments - a group of receptors within the same activity category that are exposed to similar noise sources and levels, traffic volumes, traffic mix, speed and topographic features.

Classified vehicle traffic counts from SR 789 were acquired concurrently with each of the short-term noise monitoring sessions. During the field measurements, speeds were obtained through radar. Measurements were taken for three ten-minute intervals. The noise monitoring data sheets can be seen in **Appendix B**.

Since wind, temperature inversions, and precipitation have varying effects upon sound propagation, fair-weather is desirable for ambient noise monitoring. As indicated in **Table 3-1**, the weather conditions for the short-term noise monitoring session were favorable for obtaining noise level data.

Table 3-1: Traffic Noise Monitoring Weather Data

TMS	Temperature (°F)	Dew Point (°F)	Pressure (in)	Wind Direction	Wind Speed (mph)	Relative Humidity	Precip. (in)
1	76°	63°	30.14”	SW	9 mph	64%	0
2	77°	63°	30.13”	WSW	9 mph	62%	0
Source: Weather Underground®							

TMS #1: Sarasota Yacht Club (CNE 03)
Short-term ambient noise level data and concurrent classified SR 789 traffic counts were obtained adjacent to SR 789 EB at the Sarasota Yacht Club between 10:18 a.m. - 11:02 a.m. on Tuesday, March 29, 2022. SR 789 traffic was the dominant source of ambient noise at monitoring location M-01 during the short-term monitoring session.

TMS #2: Ringling Bridge Causeway Park (CNE 06)
Short-term ambient noise level data and concurrent classified SR 789 traffic counts were obtained adjacent to SR 789 EB at Ringling Bridge Causeway Park between 11:20 a.m. - 12:00 p.m. on Tuesday, March 29, 2022. SR 789 traffic was the dominant source of ambient noise at monitoring location M-02 during the short-term monitoring session.

3.3 TNM Validation

To ensure modeling consistency for the assessment of all predicted traffic noise levels, a single comprehensive but efficient TNM representation of the existing condition project corridor utilizing receptors, roadways, terrain lines, ground zones, and barriers to represent structures was created for the entire project limits.

TNM validation is the process by which the precision of the modeled relationship between traffic and equivalent noise levels is refined and/or confirmed. If the model is well-constituted, it should generate predicted traffic noise levels that are similar to the noise levels obtained in the field. A model is considered validated if the TNM-predicted noise levels are within ±3.0 dB(A) at all monitoring locations for which traffic was the dominant noise source.

The SR 789 models for the areas in which noise monitoring and traffic count data were acquired validated predicted traffic noise levels to within acceptable tolerance levels for both monitoring locations for which traffic noise was the dominant source, as seen in **Table 3-2**. A copy of these models can be found in the project file (**Appendix E)**.

Table 3-2: TNM Validation Table

Receptor	CNE	Land Use NAC[1]	Date Start – Stop Time	Distance to Existing Edge of Road (feet)	TNM-Predicted $L_{eq(h)}$ dB(A)[2]	Measured $L_{eq(h)}$ dB(A)[2]	Validation Delta (Pred. – Meas.)[2]	Validate?
M-01	03	E	03/29/2022 10:18 - 10:28 a.m.	16 feet	72.8	69.9	2.9	Yes
			03/29/2022 10:38 - 10:48 a.m.		73.2	70.4	2.8	
			03/29/2022 10:52 - 11:02 a.m.		73.6	71.3	2.3	
M-02	06	C	03/29/2022 11:20 - 11:30 a.m.	33 feet	68.8	68.7	0.1	Yes
			03/29/2022 11:35 - 11:45 a.m.		69.2	69.1	0.1	
			03/29/2022 11:50 - 12:00 p.m.		68.6	68.8	-0.2	

1. Land uses in this table are identified only for the exact noise monitoring locations. Noise monitoring locations were selected to represent the overall noise environment and for optimal TNM model validation throughout each Common Noise Environment (CNE), regardless of land use.
2. Hourly equivalent noise levels, Leq(h), are expressed to the nearest one-tenth decibels to ensure that TNM-predicted noise levels validate to within ±3.0 dB(A) of measured noise levels without the benefits of rounding.

3.4 Predicted Noise Levels and Abatement Analysis

FHWA 23 CFR 772.9 requires that traffic noise analyses use the FHWA TNM. To maximize efficiency and ensure optimal compliance with FHWA 23 CFR 772.9, predicted 2021 existing, 2045 design year no-build, and 2045 design year build condition traffic noise levels were calculated using validated models for each of the 162 discrete noise-sensitive land use receptors throughout the project corridor (refer to **Appendix C**).

For the purposes of this traffic noise analysis, the project study area acoustic environment evaluation was based upon highway traffic noise. Highway traffic noise was assessed using FHWA's TNM representations of the project study area, for which predicted traffic noise levels were validated to within acceptable tolerances of monitored traffic noise levels generated by classified traffic volumes and traffic noise level data acquired during ambient noise monitoring.

3.4.1 Traffic Analysis

In predicting traffic noise levels and assessing impacts, traffic characteristics that would yield the highest traffic noise impact for the 2045 design year shall be used. The traffic volumes generated by the FDOT *Traffic Volumes for Noise Analysis Spreadsheet* indicate the number of each TNM vehicle type (automobiles, medium trucks, heavy trucks, buses, and motorcycles) on each project segment for each direction of travel, and whether peak-hour demand or LOS "C" volumes should be used for TNM input on each project roadway segment. According to available information, the Bay Runner would operate 2-4 times an hour. To account for transit throughout this project, the trolley traffic was added to TNM as a 'bus' vehicle type.

The tables for all Demand versus LOS C traffic can be found in **Appendix A**.

3.4.2 Predicted Noise Level Results

The FHWA has developed NAC and procedures to be used in the planning and design of highways. A traffic noise impact can occur in two ways; one of which is when the modeled future highway traffic noise levels for the worst-case noise condition approach or exceed the NAC. FDOT has determined that the NAC is approached when it is within 1 dB(A) of the appropriate NAC. The second is a substantial noise increase – when modeled future highway traffic noise levels substantially exceed the existing highway traffic noise level, even though the modeled levels may not exceed the NAC. FDOT has determined that a substantial increase occurs when the increase over existing conditions (measured or predicted) is 15 dB(A) or greater. To assess the highway traffic noise impact of a project, FDOT must evaluate both criteria (approach and substantial increase).

Predicted 2021 existing noise levels were compared to 2045 design-year no-build and build noise levels. The interior noise levels for the medical facility in Activity Category D property at CNE 01 were estimated by applying a typical 25 dB reduction for building attenuation. This assumption is based on standard masonry construction and single glazed windows per FDOT and FHWA guidelines.

There are no predicted substantial noise increase impacts directly associated with the SR 789 project. Of the 162 receptors modeled, four receptors were predicted to be impacted by the project. Two CNEs are predicted to be impacted by the project, as shown in **Table 3-3**. Noise levels for all receptors are compiled in **Appendix C**.

Table 3-3: Noise Level Impacts by CNE

CNE	NAC	Receptors	Total Receptors in CNE	Impacted CNE? Y/N	Warrant Abatement Analysis?[1] Y/N	Includes Special Land Use?[2] Y/N
01	B	01-01 (A/B/C/D)[3]	4	No	No	N
02	**C**	**02-01 through 02-02**	**2**	**Yes**	**Yes**	**Y**
03	E	03-01 through 03-09	9	No	No	Y
04	C	04-01	1	No	No	Y
05	B	05-01 through 05-29	29	No	No	N
06	**C**	**06-01 through 06-07**	**7**	**Yes**	**Yes**	**Y**
07	B	07-01 (A/B/C) through 07-28 (A/B/C)[3]	84	No	No	N
08	C	08-01	1	No	No	Y
09	B	09-01 (A/B/C) through 09-09 (A/B/C)[3]	24	No	No	N
10	C	10-01	1	No	No	Y
		TOTAL	**162**	**2**	**2**	**6**

[1] An impacted CNE may not warrant abatement analysis due to many reasons, including isolated receptors, design/construction, safety, access, right-of-way, maintenance, drainage, and utility limitations.

[2] Special land use (SLU) analysis for outdoor activity areas at facilities such as parks, churches and schools occurs only when mitigation is warranted, and factors such as frequency and duration are needed to determine activity level and abatement reasonableness.

[3] Multi-story receptors are named with suffixes A, B, C, and D (i.e., 01-01A, 01-01B, 01-01C, and 01-01D) to represent first, second, third, and fourth stories, respectively.

[4] Impacted receptors shown in bold.

3.4.3 Evaluation of Abatement Measures

Two of the CNEs (CNE 02 and CNE 06) were impacted and found to warrant mitigation analysis; however, FDOT's special use reasonableness requirements determined noise abatement was not reasonable for either location.

CNE 02

CNE 02 is located on the south side of SR 789 (John Ringling Causeway), just north-east of St Armands Key, and represents the Dog Park at the north-west corner of the Garden Building at the Continuing Care Retirement Community (CCRC) of Plymouth Harbor on Sarasota Bay. This area will be analyzed as NAC C. Design year 2045 future no-build and build-condition hourly equivalent sound levels were predicted at two noise-sensitive receptors (refer to **Table 3-3**). Future build-condition noise levels approach or exceed the applicable NAC at both modeled receptor sites. No receptors are impacted by a substantial increase.

A potential noise barrier was considered, however, preliminary findings determined that usage would be below the special use cost effective reasonableness criteria and utilities would impact the feasibility.

The potential barrier information is shown in **Figure 4-1** and **Appendix F.**

Barrier CNE 02 was evaluated approximately 11' within the proposed right of way. It would provide at least a 5 dB(A) reduction benefit to both impacted receptors and a 7 dB(A) reduction and would meet most of the reasonableness criteria.

Since the impacted area in this property represents a special land use (i.e., non-residential), the noise abatement measures were also assessed in accordance with the special land use reasonableness methodology.

Using a noise barrier 272 feet long and 12 feet tall, it would require at least 138 people per day (each spending an hour in the park) to meet FDOT's special use reasonableness requirements. **Table 3-4** shows the calculation of these results.

Table 3-4: Special Land Use Reasonableness Matrix CNE 02

Item	Criteria	Minimum Usage to Achieve Threshold	Units
1	Length of proposed barrier	272	feet
2	Height of Proposed barrier	12	feet
3	Multiply item 1 by item 2	3,264	$feet^2$
4	Enter the average amount of time that a person stays at the site per visit	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	138	person
6	Multiply time 4 by item 5	138	person-hour
7	Divide item 3 by item 6	23.7	$feet^2$/person-hours
8	Multiply item 7 by $42,000	$993,391	$/person-hours/$ft^2$
9	Does item 8 exceed the abatement cost factor of $995,935/person-hr/$ft^2$?	No	n/a
10	If item 9 is no, abatement is reasonable	Yes	n/a
11	If item 9 is yes, abatement is not reasonable	n/a	n/a

Per an email from Chief Operating Officer George McGonagill of Plymouth Harbor on June 19, 2023, the dog park is used around 8 to 10 times a day.

Therefore, a consistent usage of 138 people per day is very unlikely and the location would be below the special land use cost reasonableness requirements.

FDOT maintenance requirements call for at least 5 to 7 feet of buffer at either side of a noise barrier. The barrier for CNE 02 would need to be located between the sidewalk and the dog park and therefore would overlap with the two transformers on site.

Due to the space not meeting the special needs cost reasonableness requirements and potentially having a conflict with utilities, a noise barrier is not recommended for further consideration at this location.

CNE 06

CNE 06 is located on the north side of SR 789 (John Ringling Causeway), north-east of Coons Key Waterway, and represents Ringling Bridge Causeway Park and Bird Key Park. It is evaluated as NAC C. Design year 2045 future no-build and build-condition hourly equivalent sound levels were predicted at seven noise-sensitive receptors (refer to **Table 3-3**). Future build-condition noise levels approach or exceed the applicable NAC at two modeled receptor sites. The two impacted receiver locations represent a picnic table and a bench at the park. No receptors are impacted by a substantial increase.

A potential noise barrier was considered, however, preliminary findings determined that the usage would be below the special use cost effective reasonableness criteria.

The potential barrier information is shown in **Figure 4-2** and **Appendix F**.

Barrier CNE 06, placed approximately 3' within the proposed right of way, would provide at least a 5 dB(A) reduction benefit to both impacted receptors a 7 dB(A) reduction and therefore would meet most of the reasonableness criteria. Since the impacted area in this property represents a special land use (i.e., non-residential), the noise abatement measures were assessed in accordance with the special land use reasonableness methodology.

Using a noise barrier 192 feet long and 7 feet tall, at least 57 people per day (each spending a minimum of an hour on the property) would be necessary to meet FDOT's special use reasonableness requirements.

An average of 57 people a day would require the bench and picnic table to have 8 total people (presumably 2 on bench and 6 at table) occupying the spaces for around 7 hours a day. This level of occupancy may be possible on occasion, but not consistently throughout the week or year. **Table 3-5** shows the calculation of these results.

Table 3-5: Special Land Use Reasonableness Matrix CNE 06

Item	Criteria	Minimum Usage to Achieve Threshold	Units
1	Length of proposed barrier	192	feet
2	Height of Proposed barrier	7	feet
3	Multiply item 1 by item 2	1,344	$feet^2$
4	Enter the average amount of time that a person stays at the site per visit	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	person
6	Multiply time 4 by item 5	57	person-hour
7	Divide item 3 by item 6	23.6	$feet^2$/person-hours
8	Multiply item 7 by $42,000	$990,316	$/person-hours/$ft^2$
9	Does item 8 exceed the abatement cost factor of $995,935/person-hr/$ft^2$?	No	n/a
10	If item 9 is no, abatement is reasonable	Yes	n/a
11	If item 9 is yes, abatement is not reasonable	n/a	n/a

The above data represents the minimum usage needed for the barrier to be reasonable. As the minimum usage being met regularly is unlikely, usage of this property would be below the special land use reasonableness. Therefore, a noise barrier is not recommended for further consideration at this location.

4 CONCLUSIONS

This noise study has been completed as part of a PD&E study to consider the proposed improvements to a portion of SR 789 from Bird Key Drive to Sarasota Harbour West.

This traffic noise analysis was conducted in accordance with the FDOT *Project Development and Environment Manual Part 2: Analysis and Documentation, Highway Traffic Noise*; the FDOT *Traffic Noise Modeling and Analysis Practitioners Handbook*; the FHWA *Procedures for Abatement of Highway Traffic Noise and Construction Noise* (FHWA 23 CFR 772); *Highway Traffic Noise: Analysis and Abatement Guidance (FHWA-HEP-10-025)*; and in consultation with FDOT District 1.

The conclusions of this traffic noise analysis are as follows:

- Predicted noise levels will create 4 Noise Abatement Criteria (NAC) impacts to noise-sensitive receptors in the vicinity of the proposed project.
- Due to existing traffic and non-traffic noise sources, the proposed project will not create any substantial noise impacts over existing noise levels.
- Traffic noise abatement was considered for all predicted noise impacts; however, those locations did not meet the special use reasonableness requirements.

The Florida Department of Transportation is committed to the construction of feasible and reasonable noise abatement measures where recommended. Of the 10 project CNEs, 2 CNEs are predicted to have noise impacts. Within the modeled 162 receptors, 4 receptors were predicted to be impacted by the project. The impacted CNEs warranted abatement analysis; however, it was determined that noise abatement does not meet reasonableness criteria for these areas.

4.1 Statement of Likelihood

The Florida Department of Transportation is committed to the construction of feasible and reasonable noise abatement measures where recommended. Within the two CNEs for which noise barriers were further evaluated, the potential barriers in CNE 02 and 06 would not meet the reasonable cost effectiveness criteria. Therefore, potential noise barriers are not recommended for further consideration for this project. Locations of these potential noise barriers can be seen in **Figures 4-1** and **4-2.**

Figure 4-1 CNE 02 Noise Barrier Location

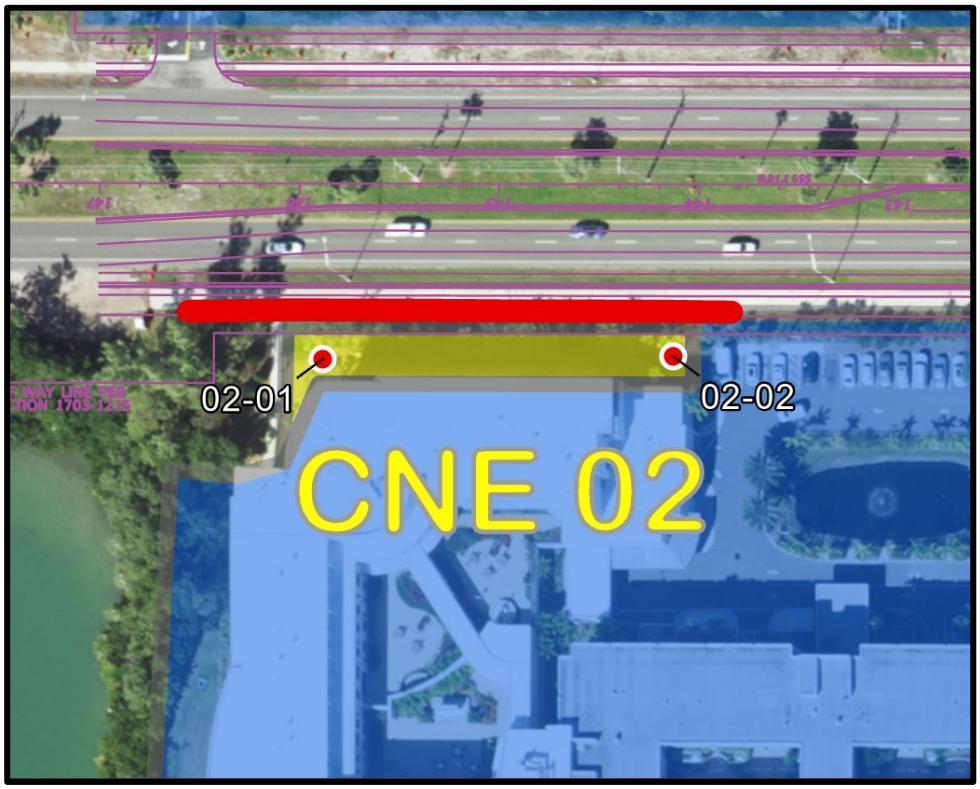
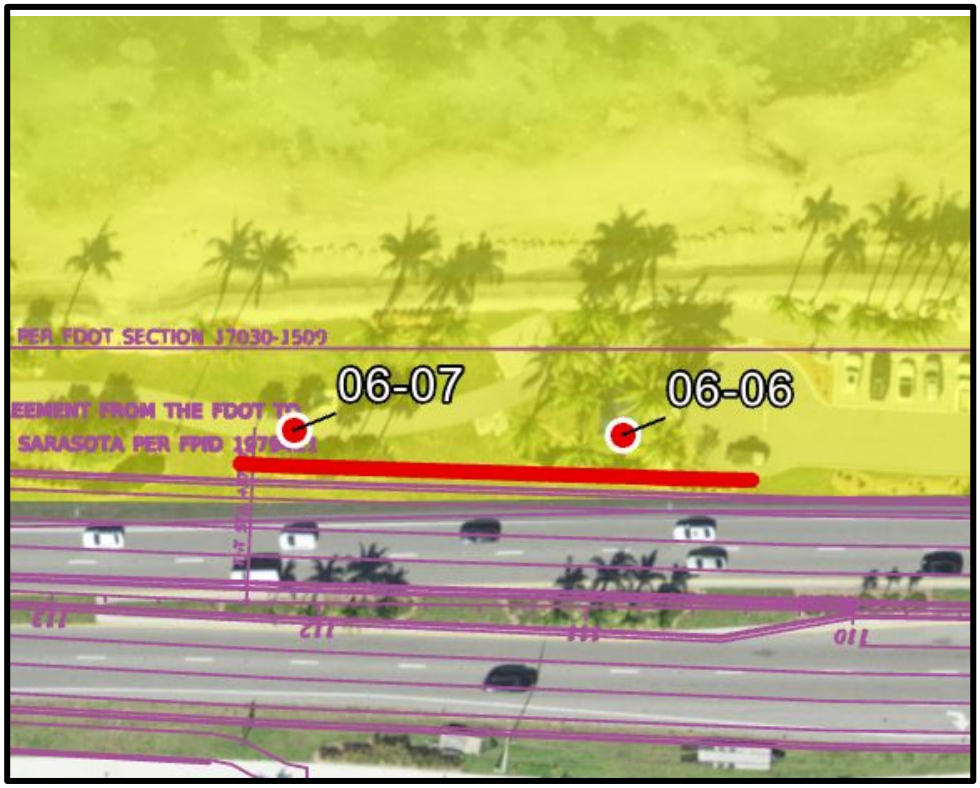


Figure 4-2 CNE 06 Noise Barrier Location



5 CONSTRUCTION NOISE AND VIBRATION

Based on the existing land use within the limits of this project, construction of the proposed SR 789 roadway improvements may cause temporary noise and/or vibration impacts. If additional land uses are developed in the vicinity of the proposed project prior to construction, then additional construction noise and vibration impacts could occur. It is anticipated that 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 project construction, the Project Manager, in concert with the District Noise Specialist and the Contractor, will investigate additional methods of controlling these impacts.

The following table are noise and vibration sensitive sites found within this project area.

Table 5-1: Construction Noise and Vibration Sensitive Sites

Noise	Vibration
Medical Centers Residences Educational Centers Motels/Hotels Lodges/ Union Halls Parks	Medical Centers Residences
Note: This list is not meant to be all inclusive or exclusive, but rather an indication of the type of sites likely to be sensitive to construction noise and/or vibration.	
Adapted from: FDOT Noise and Vibration Task Team; August 17, 1999.	

6 COMMUNITY COORDINATION

Coordination with local agencies and officials will be accomplished in conjunction with the project development process. Local and community officials will have the opportunity to comment on the proposed project at public meetings. Upon approval of the project's environmental document, a copy of the final NSR will be provided to the Sarasota County Office of Housing and Community Development (OHCD), Sarasota/Manatee Metropolitan Planning Organization (MPO) and the City of Sarasota for their use associated with planning for development after the date of public knowledge (i.e., when the Type 2 CE is approved).

Traffic noise level contours represent the approximate distances for each project segment from the edge of the nearest proposed travel lane of SR 789, respectively, to the limits of the area predicted to approach within 1 decibel (1 dB(A)) the design-year build-condition NAC. The contour distances do not include consideration for shielding by intervening structures or forestation within the source-to-receptor traffic noise propagation paths. In accordance with the FDOT definition of "approach" to be within 1 decibel (1 dB(A)) of the FHWA NAC, the 56 dB(A) contour distances, provided in **Table 6-1** and in **Figure 6-1**, correlate to NAC "A" land uses, the 66 dB(A) contour distances correlate to NAC "B" and NAC "C" land uses, and the 71 dB(A) contour distances correlate to NAC "E" land uses.

The 56 dB(A), 66 dB(A), and 71 dB(A) noise level contour information provided should assist local authorities in exercising land use control over the remaining undeveloped lands, so as to avoid development of lands for use by incompatible activities adjacent to the roadways within the local jurisdictions.

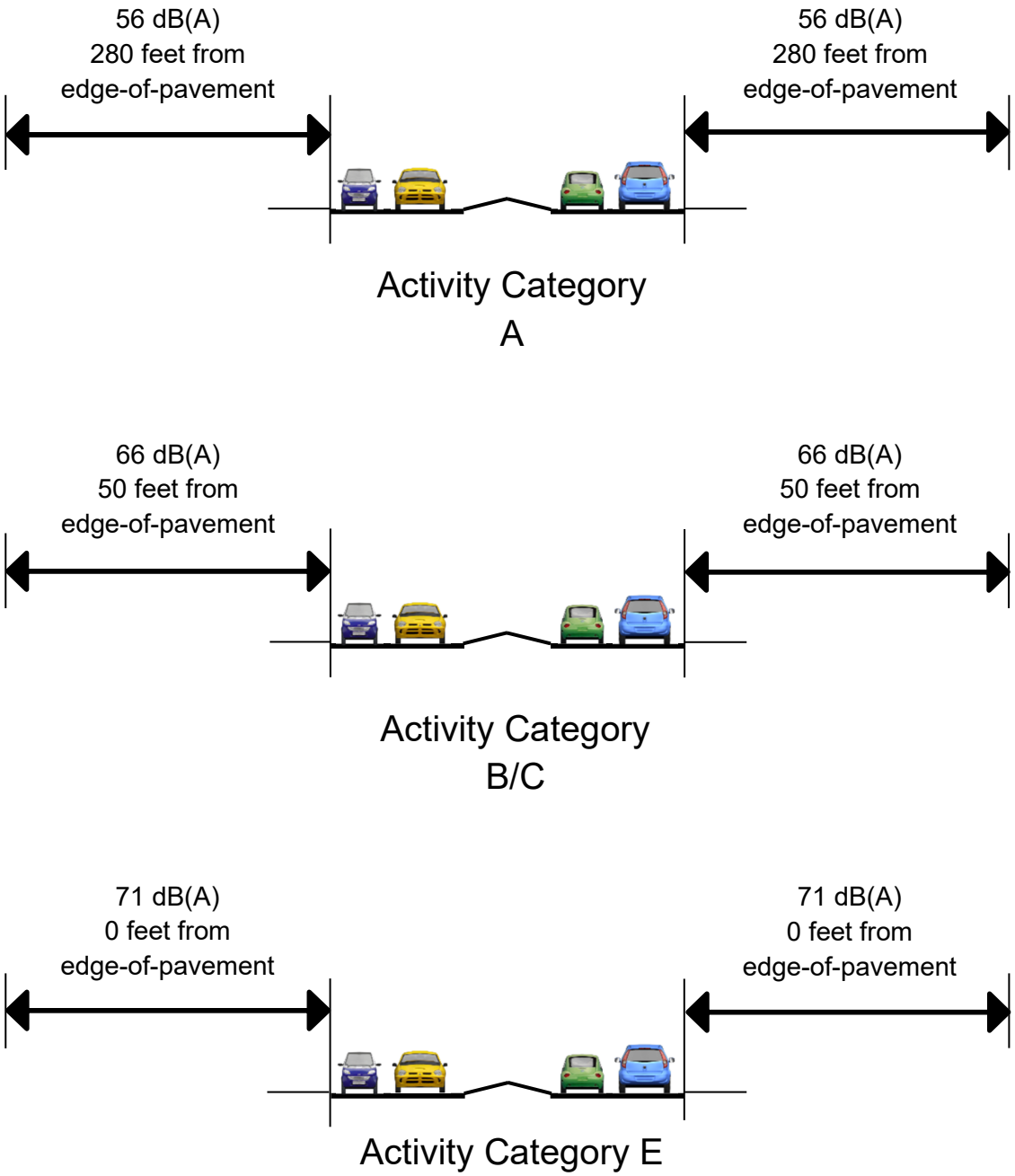
Table 6-1: Design Year Build-Condition Noise Abatement Criteria Contours

Locations	Distance from Proposed Nearest Travel Lane to Noise Contour (Feet)		
	56 dB(A) NAC A	66 dB(A) NAC B & C	71 dB(A) NAC E
North Side of SR 789	280	50	n/a
South Side of SR 789	280	50	n/a

A graphic of the 56 dB(A), 66 dB(A), and 71 dB(A) noise level contour information, separated by roadway segments, are shown on **Figure 6-1** to assist planning and zoning with a best estimate on distances from the proposed edge-of-pavement at which traffic noise levels would meet or exceed the FDOT's NAC for activity categories A through E.

Figure 6-1 Noise Contours for Local Officials

SR 789 (John Ringling Causeway)



7 REFERENCES

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Florida Department of Transportation. *Standard Specifications for Road and Bridge Construction*. fy-2023-24-ebookfinalcompressed-signed-sealed.pdf (windows.net)

APPENDICES

Appendix A – Traffic Data

Appendix B – Noise Measurement Data Sheets

Appendix C – Predicted Noise Levels

Appendix D – Traffic Noise Analysis Receptor Maps

Appendix E – TNM Modeling Files and PDF of the NSR
(in Project Folder, including “Read Me” file)

Appendix F – Abatement Analysis

APPENDIX A

Traffic Data

TRAFFIC DATA FOR NOISE STUDIES - SUMMARY OUTPUT
FDOT DISTRICT 1

Federal Aid Number(s):	0
FPID Number(s):	436680-1-22-01, -1-32-01
State/Federal Route No.:	SR 789
Road Name:	John Ringling Causeway
Project Description:	SR 789 PD&E Study from Bird Key Drive to Sarasota Harbour West
Segment Description:	East (South) of Bird Key Drive
Section Number:	17030000
Mile Post To/From:	1.206

Existing Facility:		D =	**60.00%**	%
		T24 =	**3.60%**	% of 24 Hour Volume
Year:	**2021**	Tpeak =	**1.80%**	% of Design Hour Volume
		MT =	**1.15%**	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	**1700**	HT =	**0.65%**	% of Design Hour Volume
Demand Peak Hour Volume:	**2122**	B =	**0.05%**	% of Design Hour Volume
Posted Speed:	**35**	MC =	**0.69%**	% of Design Hour Volume

No Build Alternative (Design Year):		D =	**60.00%**	%
		T24 =	**3.60%**	% of 24 Hour Volume
Year:	**2045**	Tpeak =	**1.80%**	% of Design Hour Volume
		MT =	**1.15%**	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	**1700**	HT =	**0.65%**	% of Design Hour Volume
Demand Peak Hour Volume:	**2365**	B =	**0.05%**	% of Design Hour Volume
Posted Speed:	**35**	MC =	**0.69%**	% of Design Hour Volume

Build Alternative (Design Year):		D =	**60.00%**	%
		T24 =	**3.60%**	% of 24 Hour Volume
Year:	**2045**	Tpeak =	**1.80%**	% of Design Hour Volume
		MT =	**1.15%**	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	**1700**	HT =	**0.65%**	% of Design Hour Volume
Demand Peak Hour Volume:	**2365**	B =	**0.05%**	% of Design Hour Volume
Posted Speed:	**35**	MC =	**0.69%**	% of Design Hour Volume

I certify that the above information is accurate and appropriate for use with the traffic noise analysis.

Prepared By: Stuart Samberg (Print Name)  (Signature) Date: 4/25/2023

I have reviewed and concur that the above information is appropriate for use with the traffic noise analysis.

FDOT Reviewer: Brittany Nichols (Print Name) DocuSigned by: Brittany Nichols 3491A225DF874FE... (Signature) Date: 05/04/2023 | 2:34 PM EDT

FDOT TRAFFIC DATA FOR NOISE STUDIES - DETAILED OUTPUT

Prepared By: Stuart Samberg **Date:** 4/25/2023 **Approved for Use By:** _____ **Date:** _____

Federal Aid Number(s): 0 **Section Number:** 17030000

FPID Number(s): 436680-1-22-01, -1-32-01 **Mile Post To/From:** 1.206

State/Federal Route No.: SR 789

Road Name: John Ringling Causeway

Project Description: SR 789 PD&E Study from Bird Key Drive to Sarasota Harbour West

Segment Description: East (South) of Bird Key Drive

Note: Data sheets are to be completed for each segment having a change in traffic parameters (i.e., volume posted speed, typical section)

Demand Peak Hour/LOS C	Peak or Off-Peak Direction	Vehicle Type	Existing Year: 2021 Posted Speed: 35 Number of Travel Lanes: 4	No Build (Design Year) Year: 2045 Posted Speed: 35 Number of Travel Lanes: 4	Build (Design Year) Year: 2045 Posted Speed: 35 Number of Travel Lanes: 4
			Number of Vehicles	Number of Vehicles	Number of Vehicles
See Columns to Right > for Which Volumes To Use (Demand or LOS C)			Use LOS C	Use LOS C	Use LOS C
Demand Peak Hour	Peak Direction	Autos	2068	2306	2306
		Med Trucks	24	27	27
		Heavy Trucks	14	15	15
		Buses	1	1	1
		Motorcycles	15	16	16
		Total	2122	2365	2365
	Off-Peak Direction	Autos	1379	1537	1537
		Med Trucks	16	18	18
		Heavy Trucks	9	10	10
		Buses	1	1	1
		Motorcycles	10	11	11
		Total	1415	1577	1577
LOS C	Peak Direction	Autos	1656	1656	1656
		Med Trucks	20	20	20
		Heavy Trucks	11	11	11
		Buses	1	1	1
		Motorcycles	12	12	12
		Total	1700	1700	1700
	Off-Peak Direction	Autos	1656	1656	1656
		Med Trucks	20	20	20
		Heavy Trucks	11	11	11
		Buses	1	1	1
		Motorcycles	12	12	12
		Total	1700	1700	1700

TRAFFIC DATA FOR NOISE STUDIES - SUMMARY OUTPUT
FDOT DISTRICT 1

Federal Aid Number(s):	0
FPID Number(s):	436680-1-22-01, -1-32-01
State/Federal Route No.:	SR 789
Road Name:	John Ringling Causeway
Project Description:	SR 789 PD&E Study from Bird Key Drive to Sarasota Harbour West
Segment Description:	Bird Key Drive to Sarasota Harbour East
Section Number:	17030000
Mile Post To/From:	1.206 / 1.702

Existing Facility:		D =	**60.00%**	%
		T24 =	**3.60%**	% of 24 Hour Volume
Year:	**2021**	Tpeak =	**1.80%**	% of Design Hour Volume
		MT =	**1.15%**	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	**1700**	HT =	**0.65%**	% of Design Hour Volume
Demand Peak Hour Volume:	**2101**	B =	**0.05%**	% of Design Hour Volume
Posted Speed:	**35**	MC =	**0.69%**	% of Design Hour Volume

No Build Alternative (Design Year):		D =	**60.00%**	%
		T24 =	**3.60%**	% of 24 Hour Volume
Year:	**2045**	Tpeak =	**1.80%**	% of Design Hour Volume
		MT =	**1.15%**	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	**1700**	HT =	**0.65%**	% of Design Hour Volume
Demand Peak Hour Volume:	**2344**	B =	**0.05%**	% of Design Hour Volume
Posted Speed:	**35**	MC =	**0.69%**	% of Design Hour Volume

Build Alternative (Design Year):		D =	**60.00%**	%
		T24 =	**3.60%**	% of 24 Hour Volume
Year:	**2045**	Tpeak =	**1.80%**	% of Design Hour Volume
		MT =	**1.15%**	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	**1700**	HT =	**0.65%**	% of Design Hour Volume
Demand Peak Hour Volume:	**2344**	B =	**0.05%**	% of Design Hour Volume
Posted Speed:	**35**	MC =	**0.69%**	% of Design Hour Volume

I certify that the above information is accurate and appropriate for use with the traffic noise analysis.

Prepared By: Stuart Samberg (Print Name)  (Signature) Date: 4/25/2023

I have reviewed and concur that the above information is appropriate for use with the traffic noise analysis.

FDOT Reviewer: Brittany Nichols (Print Name) DocuSigned by: Brittany Nichols 3491A225DF874FE... (Signature) Date: 05/04/2023 | 2:34 PM EDT

FDOT TRAFFIC DATA FOR NOISE STUDIES - DETAILED OUTPUT

Prepared By: Stuart Samberg **Date:** 4/25/2023 **Approved for Use By:** _____ **Date:** _____

Federal Aid Number(s): 0 **Section Number:** 17030000

FPID Number(s): 436680-1-22-01, -1-32-01 **Mile Post To/From:** 1.206 / 1.702

State/Federal Route No.: SR 789

Road Name: John Ringling Causeway

Project Description: SR 789 PD&E Study from Bird Key Drive to Sarasota Harbour West

Segment Description: Bird Key Drive to Sarasota Harbour East

Note: Data sheets are to be completed for each segment having a change in traffic parameters (i.e., volume posted speed, typical section)

Demand Peak Hour/LOS C	Peak or Off-Peak Direction	Vehicle Type	Existing Year: 2021 Posted Speed: 35 Number of Travel Lanes: 4	No Build (Design Year) Year: 2045 Posted Speed: 35 Number of Travel Lanes: 4	Build (Design Year) Year: 2045 Posted Speed: 35 Number of Travel Lanes: 4
			Number of Vehicles	Number of Vehicles	Number of Vehicles
See Columns to Right > for Which Volumes To Use (Demand or LOS C)			Use LOS C	Use LOS C	Use LOS C
Demand Peak Hour	Peak Direction	Autos	2048	2285	2285
		Med Trucks	24	27	27
		Heavy Trucks	14	15	15
		Buses	1	1	1
		Motorcycles	14	16	16
		Total	2101	2344	2344
	Off-Peak Direction	Autos	1364	1522	1522
		Med Trucks	16	18	18
		Heavy Trucks	9	10	10
		Buses	1	1	1
		Motorcycles	10	11	11
		Total	1400	1562	1562
LOS C	Peak Direction	Autos	1656	1656	1656
		Med Trucks	20	20	20
		Heavy Trucks	11	11	11
		Buses	1	1	1
		Motorcycles	12	12	12
		Total	1700	1700	1700
	Off-Peak Direction	Autos	1656	1656	1656
		Med Trucks	20	20	20
		Heavy Trucks	11	11	11
		Buses	1	1	1
		Motorcycles	12	12	12
		Total	1700	1700	1700

TRAFFIC DATA FOR NOISE STUDIES - SUMMARY OUTPUT
FDOT DISTRICT 1

Federal Aid Number(s):	0
FPID Number(s):	436680-1-22-01, -1-32-01
State/Federal Route No.:	SR 789
Road Name:	John Ringling Causeway
Project Description:	SR 789 PD&E Study from Bird Key Drive to Sarasota Harbour West
Segment Description:	Sarasota Harbour East to Sarasota Harbour / Plymouth Harbor
Section Number:	17030000
Mile Post To/From:	1.702 / 1.828

Existing Facility:		D =	**60.00%**	%
		T24 =	**3.60%**	% of 24 Hour Volume
Year:	**2021**	Tpeak =	**1.80%**	% of Design Hour Volume
		MT =	**1.15%**	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	**1700**	HT =	**0.65%**	% of Design Hour Volume
Demand Peak Hour Volume:	**2084**	B =	**0.05%**	% of Design Hour Volume
Posted Speed:	**35**	MC =	**0.69%**	% of Design Hour Volume

No Build Alternative (Design Year):		D =	**60.00%**	%
		T24 =	**3.60%**	% of 24 Hour Volume
Year:	**2045**	Tpeak =	**1.80%**	% of Design Hour Volume
		MT =	**1.15%**	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	**1700**	HT =	**0.65%**	% of Design Hour Volume
Demand Peak Hour Volume:	**2327**	B =	**0.05%**	% of Design Hour Volume
Posted Speed:	**35**	MC =	**0.69%**	% of Design Hour Volume

Build Alternative (Design Year):		D =	**60.00%**	%
		T24 =	**3.60%**	% of 24 Hour Volume
Year:	**2045**	Tpeak =	**1.80%**	% of Design Hour Volume
		MT =	**1.15%**	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	**1700**	HT =	**0.65%**	% of Design Hour Volume
Demand Peak Hour Volume:	**2327**	B =	**0.05%**	% of Design Hour Volume
Posted Speed:	**35**	MC =	**0.69%**	% of Design Hour Volume

I certify that the above information is accurate and appropriate for use with the traffic noise analysis.

Prepared By: Stuart Samberg (Print Name)  (Signature) Date: 4/25/2023

I have reviewed and concur that the above information is appropriate for use with the traffic noise analysis.

FDOT Reviewer: Brittany Nichols (Print Name) DocuSigned by: Brittany Nichols 3491A225DF874FE... (Signature) Date: 05/04/2023 | 2:34 PM EDT

FDOT TRAFFIC DATA FOR NOISE STUDIES - DETAILED OUTPUT

Prepared By: Stuart Samberg **Date:** 4/25/2023 **Approved for Use By:** _____ **Date:** _____

Federal Aid Number(s): 0 **Section Number:** 17030000

FPID Number(s): 436680-1-22-01, -1-32-01 **Mile Post To/From:** 1.702 / 1.828

State/Federal Route No.: SR 789

Road Name: John Ringling Causeway

Project Description: SR 789 PD&E Study from Bird Key Drive to Sarasota Harbour West

Segment Description: Sarasota Harbour East to Sarasota Harbour / Plymouth Harbor

Note: Data sheets are to be completed for each segment having a change in traffic parameters (i.e., volume posted speed, typical section)

Demand Peak Hour/LOS C	Peak or Off-Peak Direction	Vehicle Type	Existing Year: 2021 Posted Speed: 35 Number of Travel Lanes: 4	No Build (Design Year) Year: 2045 Posted Speed: 35 Number of Travel Lanes: 4	Build (Design Year) Year: 2045 Posted Speed: 35 Number of Travel Lanes: 4
			Number of Vehicles	Number of Vehicles	Number of Vehicles
See Columns to Right > for Which Volumes To Use (Demand or LOS C)			Use LOS C	Use LOS C	Use LOS C
Demand Peak Hour	Peak Direction	Autos	2031	2268	2268
		Med Trucks	24	27	27
		Heavy Trucks	14	15	15
		Buses	1	1	1
		Motorcycles	14	16	16
		Total	2084	2327	2327
	Off-Peak Direction	Autos	1354	1512	1512
		Med Trucks	16	18	18
		Heavy Trucks	9	10	10
		Buses	1	1	1
		Motorcycles	10	11	11
		Total	1390	1552	1552
LOS C	Peak Direction	Autos	1656	1656	1656
		Med Trucks	20	20	20
		Heavy Trucks	11	11	11
		Buses	1	1	1
		Motorcycles	12	12	12
		Total	1700	1700	1700
	Off-Peak Direction	Autos	1656	1656	1656
		Med Trucks	20	20	20
		Heavy Trucks	11	11	11
		Buses	1	1	1
		Motorcycles	12	12	12
		Total	1700	1700	1700

TRAFFIC DATA FOR NOISE STUDIES - SUMMARY OUTPUT
FDOT DISTRICT 1

Federal Aid Number(s):	0
FPID Number(s):	436680-1-22-01, -1-32-01
State/Federal Route No.:	SR 789
Road Name:	John Ringling Causeway
Project Description:	SR 789 PD&E Study from Bird Key Drive to Sarasota Harbour West
Segment Description:	Sarasota Harbour / Plymouth Harbor to Sarasota Harbour West
Section Number:	17030000
Mile Post To/From:	1.828 / 1.947

Existing Facility:		D =	**60.00%**	%
		T24 =	**3.60%**	% of 24 Hour Volume
Year:	**2021**	Tpeak =	**1.80%**	% of Design Hour Volume
		MT =	**1.15%**	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	**1700**	HT =	**0.65%**	% of Design Hour Volume
Demand Peak Hour Volume:	**2079**	B =	**0.05%**	% of Design Hour Volume
Posted Speed:	**35**	MC =	**0.69%**	% of Design Hour Volume

No Build Alternative (Design Year):		D =	**60.00%**	%
		T24 =	**3.60%**	% of 24 Hour Volume
Year:	**2045**	Tpeak =	**1.80%**	% of Design Hour Volume
		MT =	**1.15%**	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	**1700**	HT =	**0.65%**	% of Design Hour Volume
Demand Peak Hour Volume:	**2322**	B =	**0.05%**	% of Design Hour Volume
Posted Speed:	**35**	MC =	**0.69%**	% of Design Hour Volume

Build Alternative (Design Year):		D =	**60.00%**	%
		T24 =	**3.60%**	% of 24 Hour Volume
Year:	**2045**	Tpeak =	**1.80%**	% of Design Hour Volume
		MT =	**1.15%**	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	**1700**	HT =	**0.65%**	% of Design Hour Volume
Demand Peak Hour Volume:	**2322**	B =	**0.05%**	% of Design Hour Volume
Posted Speed:	**35**	MC =	**0.69%**	% of Design Hour Volume

I certify that the above information is accurate and appropriate for use with the traffic noise analysis.

Prepared By: Stuart Samberg (Print Name)  (Signature) Date: 4/25/2023

I have reviewed and concur that the above information is appropriate for use with the traffic noise analysis.

FDOT Reviewer: Brittany Nichols (Print Name) DocuSigned by: Brittany Nichols 3491A225DF874FE... (Signature) Date: 05/04/2023 | 2:34 PM EDT

FDOT TRAFFIC DATA FOR NOISE STUDIES - DETAILED OUTPUT

Prepared By: Stuart Samberg **Date:** 4/25/2023 **Approved for Use By:** _____ **Date:** _____

Federal Aid Number(s): 0 **Section Number:** 17030000

FPID Number(s): 436680-1-22-01, -1-32-01 **Mile Post To/From:** 1.828 / 1.947

State/Federal Route No.: SR 789

Road Name: John Ringling Causeway

Project Description: SR 789 PD&E Study from Bird Key Drive to Sarasota Harbour West

Segment Description: Sarasota Harbour / Plymouth Harbor to Sarasota Harbour West

Note: Data sheets are to be completed for each segment having a change in traffic parameters (i.e., volume posted speed, typical section)

Demand Peak Hour/LOS C	Peak or Off-Peak Direction	Vehicle Type	Existing Year: 2021 Posted Speed: 35 Number of Travel Lanes: 4	No Build (Design Year) Year: 2045 Posted Speed: 35 Number of Travel Lanes: 4	Build (Design Year) Year: 2045 Posted Speed: 35 Number of Travel Lanes: 4
			Number of Vehicles	Number of Vehicles	Number of Vehicles
See Columns to Right > for Which Volumes To Use (Demand or LOS C)			Use LOS C	Use LOS C	Use LOS C
Demand Peak Hour	Peak Direction	Autos	2026	2263	2263
		Med Trucks	24	27	27
		Heavy Trucks	14	15	15
		Buses	1	1	1
		Motorcycles	14	16	16
		Total	2079	2322	2322
	Off-Peak Direction	Autos	1350	1508	1508
		Med Trucks	16	18	18
		Heavy Trucks	9	10	10
		Buses	1	1	1
		Motorcycles	10	11	11
		Total	1386	1548	1548
LOS C	Peak Direction	Autos	1656	1656	1656
		Med Trucks	20	20	20
		Heavy Trucks	11	11	11
		Buses	1	1	1
		Motorcycles	12	12	12
		Total	1700	1700	1700
	Off-Peak Direction	Autos	1656	1656	1656
		Med Trucks	20	20	20
		Heavy Trucks	11	11	11
		Buses	1	1	1
		Motorcycles	12	12	12
		Total	1700	1700	1700

APPENDIX B

Noise Measurement Data Sheets

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Site/Run #: 1-1

Noise Measurement Data Sheet

Date: 3/29/2022

Measurement Taken By: Bogner, Berube

Project: Little Ringling

Site ID: M1

10:18am - 10:28am

Weather Conditions: Clear: Partly Cloudy: Cloudy: Other: Foggy

Temperature: Start: 73.9 End: (°F)

Wind Direction: Start: West End:

Wind Speed (Start): Min: Max: Average: 2.9 mph (mph)

Wind Speed (End): Min: Max: Average: (mph)

Humidity: Start: 64.5 End: (%)

Equipment Data

Sound Level Meter: Rion NL-42 Serial Number: 560089

Date of Last Traceable Calibration: September 18, 2020

Calibration: Start: End: Difference:

Battery: Start: End:

Weighting Scale: A Response: Slow

Calibrator: Serial Number:

Results: Leq: 72.8
in dB(A)

Major Noise Sources: SR789

Background Noise Sources:

Other Notes/Observations:

Observed Traffic Data Site Sketch on Reverse Side

Observed Traffic Data Site #: 1-1 Run #:

Vehicle Types	Westbound		Eastbound			
	Volume	Speed	Volume	Speed	Volume	Speed
Auto	257	35	163	35		
Medium Truck	10	35	10	35		
Heavy Truck	1	35				
Bus			1	35		
Motorcycle						

Site Sketch

Sound Level Meter 16 feet from nearest travel lane.

Site/Run #: **1-2**

Noise Measurement Data Sheet

Date: 3/29/2022

Measurement Taken By: Bogner, Berube

Project: Little Ringling

Site ID: M1

10:38am - 10:48am

Weather Conditions: Clear: Partly Cloudy: Cloudy: Other: Foggy

Temperature: Start: 73.9 End: (°F)

Wind Direction: Start: West End:

Wind Speed (Start): Min: Max: Average: 3.1 mph (mph)

Wind Speed (End): Min: Max: Average: (mph)

Humidity: Start: 66.8 End: (%)

Equipment Data

Sound Level Meter: Rion NL-42 Serial Number: 560089

Date of Last Traceable Calibration: September 18, 2020

Calibration: Start: End: Difference:

Battery: Start: End:

Weighting Scale: A Response: Slow

Calibrator: Serial Number:

Results: Leq: 73.2
in dB(A)

Major Noise Sources: SR789

Background Noise Sources:

Other Notes/Observations:

Observed Traffic Data Site Sketch on Reverse Side

Observed Traffic Data Site #: 1-2 Run #:

Vehicle Types	Westbound		Eastbound			
	Volume	Speed	Volume	Speed	Volume	Speed
Auto	289	35	189	35		
Medium Truck	7	35	8	35		
Heavy Truck	3	35	1	35		
Bus			1	35		
Motorcycle						

Site Sketch

Sound Level Meter 16 feet from nearest travel lane.

Site/Run #: **1-3**

Noise Measurement Data Sheet

Date: 3/29/2022

Measurement Taken By: Bogner, Berube

Project: Little Ringling

Site ID: M1 10:52am - 11:02am

Weather Conditions: Clear: X Partly Cloudy: Cloudy: Other:

Temperature: Start: 73.8 End: (°F)

Wind Direction: Start: West End:

Wind Speed (Start): Min: Max: Average: 0.6 mph (mph)

Wind Speed (End): Min: Max: Average: (mph)

Humidity: Start: 72.6 End: (%)

Equipment Data

Sound Level Meter: Rion NL-42 Serial Number: 560089

Date of Last Traceable Calibration: September 18, 2020

Calibration: Start: End: Difference:

Battery: Start: End:

Weighting Scale: A Response: Slow

Calibrator: Serial Number:

Results: Leq: 73.6
in dB(A)

Major Noise Sources: SR789

Background Noise Sources:

Other Notes/Observations:

Observed Traffic Data Site Sketch on Reverse Side

Observed Traffic Data Site #: 1-3 Run #:

Vehicle Types	Westbound		Eastbound			
	Volume	Speed	Volume	Speed	Volume	Speed
Auto	280	35	200	35		
Medium Truck	18	35	11	35		
Heavy Truck			3	35		
Bus	1	35	1	35		
Motorcycle	2	35	1	35		

Site Sketch

Sound Level Meter 16 feet from nearest travel lane.

Site/Run #: **2-1**

Noise Measurement Data Sheet

Date: 3/29/2022

Measurement Taken By: Bogner, Berube

Project: Little Ringling

Site ID: M2

11:20am - 11:30am

Weather Conditions: Clear: X Partly Cloudy: Cloudy: Other:

Temperature: Start: 90.2 End: (°F)

Wind Direction: Start: West End:

Wind Speed (Start): Min: Max: Average: 0.9 mph (mph)

Wind Speed (End): Min: Max: Average: (mph)

Humidity: Start: 41.5 End: (%)

Equipment Data

Sound Level Meter: Rion NL-42 Serial Number: 560089

Date of Last Traceable Calibration: September 18, 2020

Calibration: Start: End: Difference:

Battery: Start: End:

Weighting Scale: A Response: Slow

Calibrator: Serial Number:

Results: Leq: 68.8
in dB(A)

Major Noise Sources: SR789

Background Noise Sources:

Other Notes/Observations:

Observed Traffic Data Site Sketch on Reverse Side

Observed Traffic Data Site #: 2-1 Run #:

Vehicle Types	Westbound		Eastbound			
	Volume	Speed	Volume	Speed	Volume	Speed
Auto	258	37	203	37		
Medium Truck	6	37	8	37		
Heavy Truck	3	37				
Bus						
Motorcycle	5					

Site Sketch

Sound Level Meter 33 feet from nearest travel lane.

Site/Run #: **2-2**

Noise Measurement Data Sheet

Date: 3/29/2022

Measurement Taken By: Bogner, Berube

Project: Little Ringling

Site ID: M2 11:35am - 11:45am

Weather Conditions: Clear: X Partly Cloudy: Cloudy: Other:

Temperature: Start: 92.9 End: (°F)

Wind Direction: Start: West End:

Wind Speed (Start): Min: Max: Average: 0.8 mph (mph)

Wind Speed (End): Min: Max: Average: (mph)

Humidity: Start: 45.6 End: (%)

Equipment Data

Sound Level Meter: Rion NL-42 Serial Number: 560089

Date of Last Traceable Calibration: September 18, 2020

Calibration: Start: End: Difference:

Battery: Start: End:

Weighting Scale: A Response: Slow

Calibrator: Serial Number:

Results: Leq: 69.2
in dB(A)

Major Noise Sources: SR789

Background Noise Sources:

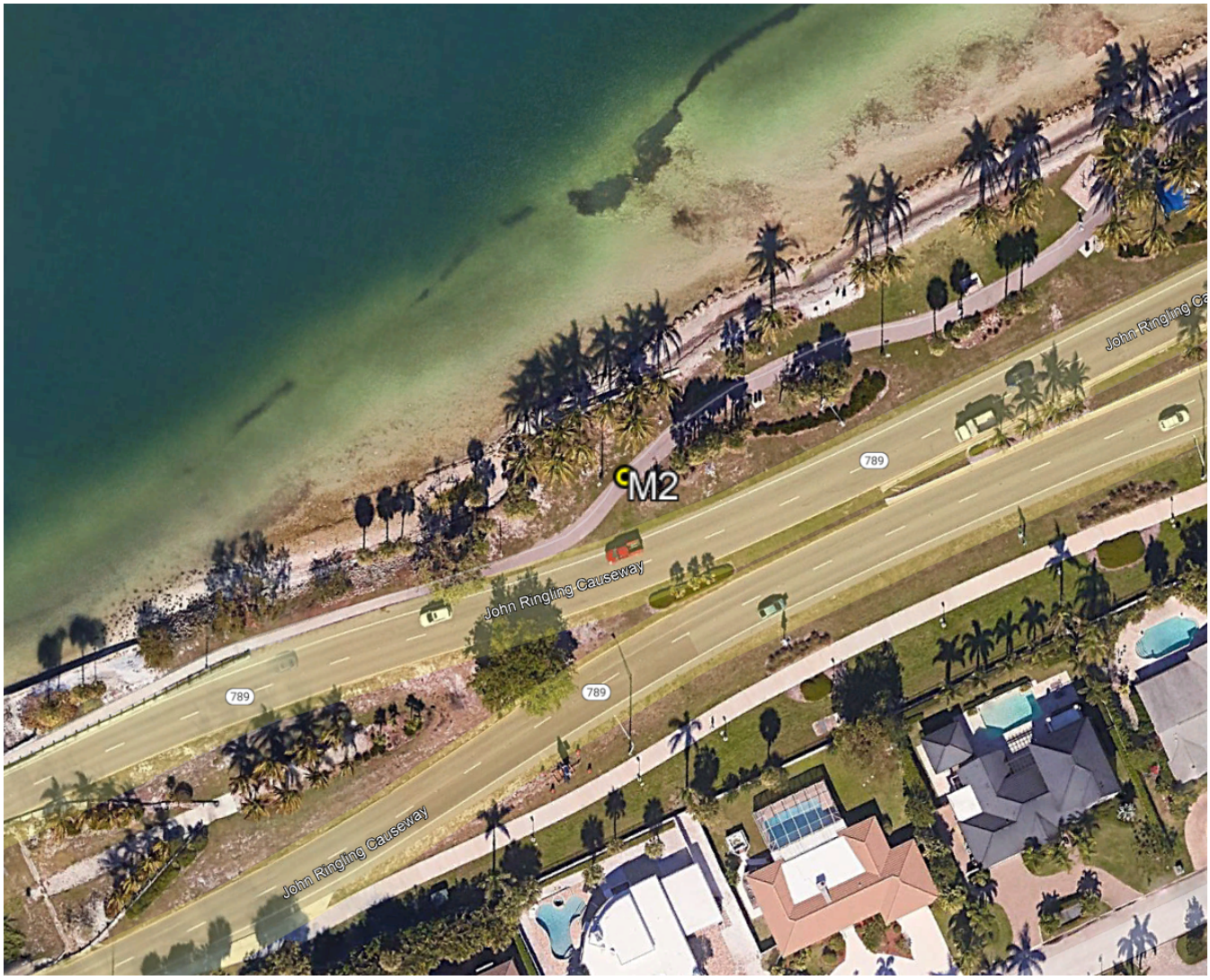
Other Notes/Observations:

Observed Traffic Data Site Sketch on Reverse Side

Observed Traffic Data Site #: 2-2 Run #:

Vehicle Types	Westbound		Eastbound			
	Volume	Speed	Volume	Speed	Volume	Speed
Auto	307	37	182	37		
Medium Truck	10	37	8	37		
Heavy Truck	3	37	1	37		
Bus			2	37		
Motorcycle	1	37				

Site Sketch



Sound Level Meter 33 feet from nearest travel lane.

Site/Run #: **2-3**

Noise Measurement Data Sheet

Date: 3/29/2022

Measurement Taken By: Bogner, Berube

Project: Little Ringling

Site ID: M2

11:50am - 12:00pm

Weather Conditions: Clear: X Partly Cloudy: Cloudy: Other:

Temperature: Start: 96.2 End: (°F)

Wind Direction: Start: West End:

Wind Speed (Start): Min: Max: Average: 1.1 mph (mph)

Wind Speed (End): Min: Max: Average: (mph)

Humidity: Start: 46.8 End: (%)

Equipment Data

Sound Level Meter: Rion NL-42 Serial Number: 560089

Date of Last Traceable Calibration: September 18, 2020

Calibration: Start: End: Difference:

Battery: Start: End:

Weighting Scale: A Response: Slow

Calibrator: Serial Number:

Results: Leq: 68.6
in dB(A)

Major Noise Sources: SR789

Background Noise Sources:

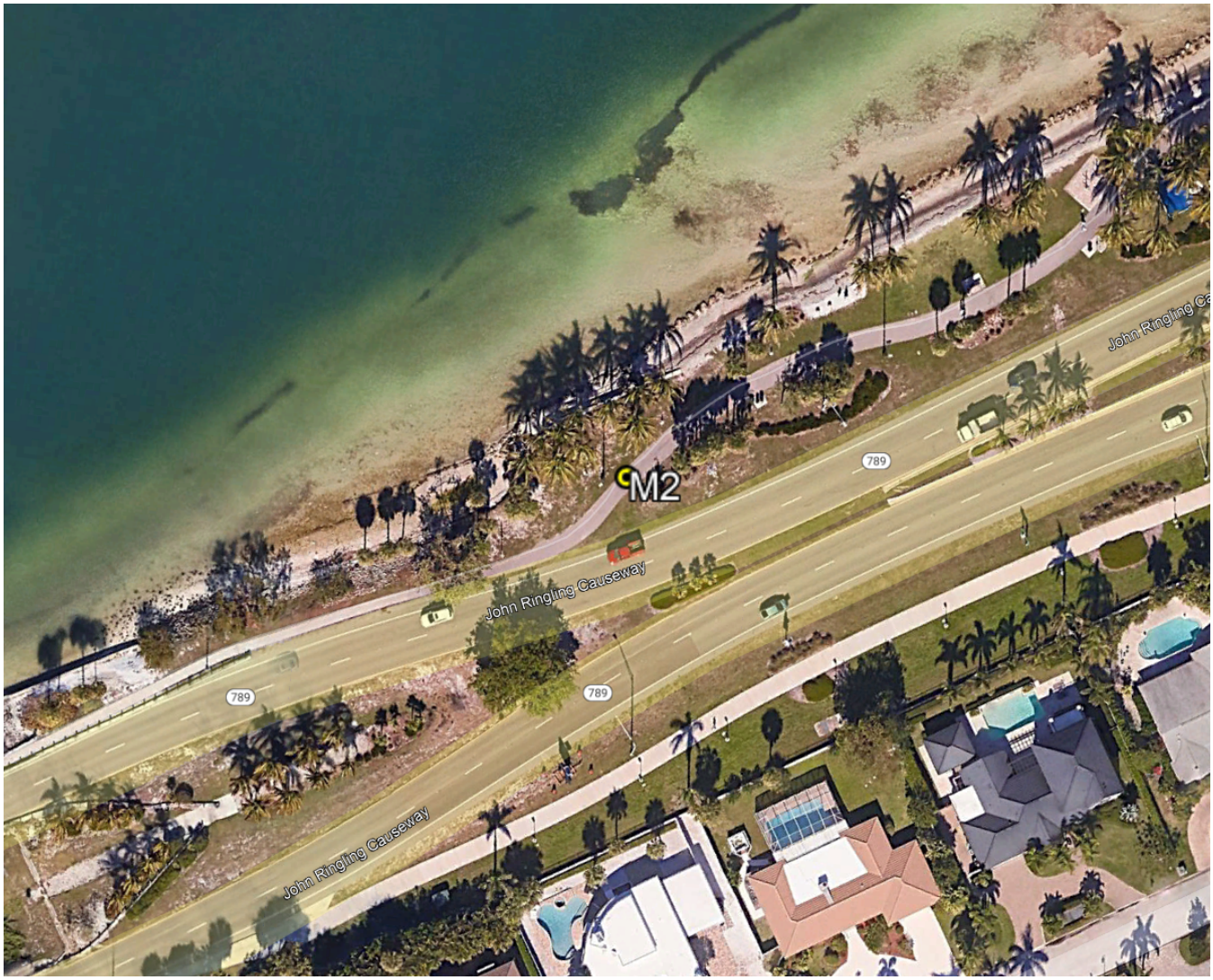
Other Notes/Observations:

Observed Traffic Data Site Sketch on Reverse Side

Observed Traffic Data Site #: 2-3 Run #:

Vehicle Types	Westbound		Eastbound			
	Volume	Speed	Volume	Speed	Volume	Speed
Auto	274	37	207	37		
Medium Truck	7	37	8	37		
Heavy Truck	2	37	2	37		
Bus			1	37		
Motorcycle	2	37				

Site Sketch



Sound Level Meter 33 feet from nearest travel lane.

APPENDIX C

Predicted Noise Levels

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Table C-1: Noise Levels

Noise-Sensitive Receptors				Predicted Noise Levels (dB(A))			
Receptor[2]	Use	NAC	Address	2021 Existing	2045 No-Build	2045 Build	Δ[1]
01-01A	Medical Facility	D[3]	700 John Ringling Blvd	41.0	41.0	40.8	-0.2
01-01B	Medical Facility	D[3]	700 John Ringling Blvd	42.2	42.2	42.0	-0.2
01-01C	Medical Facility	D[3]	700 John Ringling Blvd	42.0	42.0	41.8	-0.2
01-01D	Medical Facility	D[3]	700 John Ringling Blvd	41.7	41.7	41.6	-0.1
02-01	Dog Park	C	700 John Ringling Blvd	66.0	66.0	66.0	0.0
02-02	Dog Park	C	701 John Ringling Blvd	66.4	66.4	66.3	-0.1
03-01	Dock	E	1100 John Ringling Blvd	59.2	59.2	57.9	-1.3
03-02	Dock	E	1100 John Ringling Blvd	58.6	58.6	58.0	-0.6
03-03	Dock	E	1100 John Ringling Blvd	58.1	58.1	57.6	-0.5
03-04	Dock	E	1100 John Ringling Blvd	58.1	58.1	57.5	-0.6
03-05	Dock	E	1100 John Ringling Blvd	57.6	57.6	57.0	-0.6
03-06	Dock	E	1100 John Ringling Blvd	57.1	57.1	56.6	-0.5
03-07	Dock	E	1100 John Ringling Blvd	56.6	56.6	56.4	-0.2
03-08	Dock	E	1100 John Ringling Blvd	55.9	55.9	55.7	-0.2
03-09	Dock	E	1100 John Ringling Blvd	55.7	55.7	55.5	-0.2
04-01	Pool	C	1100 John Ringling Blvd	53.4	53.4	51.8	-1.6
05-01	Single Family	B	101 Seagull Lane	63.7	63.7	61.4	-2.3
05-02	Single Family	B	105 Seagull Lane	64.9	64.9	63.2	-1.7
05-03	Single Family	B	109 Seagull Lane	63.9	63.9	63.1	-0.8
05-04	Single Family	B	113 Seagull Lane	63.9	63.9	63.4	-0.5
05-05	Single Family	B	117 Seagull Lane	64.5	64.5	64.0	-0.5
05-06	Single Family	B	121 Seagull Lane	64.0	64.0	63.7	-0.3
05-07	Single Family	B	125 Seagull Lane	63.3	63.3	63.2	-0.1

Noise-Sensitive Receptors				Predicted Noise Levels (dB(A))			
Receptor[2]	Use	NAC	Address	2021 Existing	2045 No-Build	2045 Build	Δ[1]
05-08	Single Family	B	129 Seagull Lane	64.1	64.1	64.2	0.1
05-09	Single Family	B	201 Seagull Lane	63.5	63.5	63.5	0.0
05-10	Single Family	B	211 Seagull Lane	62.6	62.6	62.6	0.0
05-11	Single Family	B	215 Seagull Lane	63.1	63.1	63.1	0.0
05-12	Single Family	B	217 Seagull Lane	59.8	59.8	59.9	0.1
05-13	Single Family	B	223 Seagull Lane	58.6	58.6	59.0	0.4
05-14	Single Family	B	227 Seagull Lane	56.9	56.9	59.0	2.1
05-15	Single Family	B	231 Seagull Lane	56.3	56.3	58.6	2.3
05-16	Single Family	B	233 Seagull Lane	55.7	55.7	58.5	2.8
05-17	Single Family	B	102 Seagull Lane	55.8	55.8	55.1	-0.7
05-18	Single Family	B	106 Seagull Lane	53.7	53.7	53.6	-0.1
05-19	Single Family	B	110 Seagull Lane	53.0	53.0	52.9	-0.1
05-20	Single Family	B	114 Seagull Lane	53.0	53.0	53.0	0.0
05-21	Single Family	B	118 Seagull Lane	53.1	53.1	53.1	0.0
05-22	Single Family	B	122 Seagull Lane	53.4	53.4	53.4	0.0
05-23	Single Family	B	201 Bird Key Drive	53.5	53.5	53.9	0.4
05-24	Single Family	B	200 Robin Drive	53.6	53.6	53.6	0.0
05-25	Single Family	B	203 Robin Drive	52.8	52.8	53.1	0.3
05-26	Single Family	B	220 Seagull Lane	52.1	52.1	52.8	0.7
05-27	Single Family	B	224 Seagull Lane	51.7	51.7	52.4	0.7
05-28	Single Family	B	228 Seagull Lane	50.8	50.8	51.7	0.9
05-29	Single Family	B	232 Seagull Lane	51.9	51.9	53.8	1.9
06-01	Park	C	200 John Ringling Causeway	63.6	63.6	63.7	0.1
06-02	Park	C	200 John Ringling Causeway	62.3	62.3	62.4	0.1

Noise-Sensitive Receptors				Predicted Noise Levels (dB(A))			
Receptor[2]	Use	NAC	Address	2021 Existing	2045 No-Build	2045 Build	Δ[1]
06-03	Park	C	200 John Ringling Causeway	63.4	63.4	63.4	0.0
06-04	Park	C	200 John Ringling Causeway	61.8	61.8	61.9	0.1
06-05	Park	C	200 John Ringling Causeway	63.5	63.5	62.9	-0.6
06-06	Park	C	200 John Ringling Causeway	68.3	68.3	67.5	-0.8
06-07	Park	C	200 John Ringling Causeway	68.4	68.4	68.4	0.0
07-01A	Condominium	B	777 John Ringling Blvd	59.9	59.9	60.2	0.3
07-01B	Condominium	B	777 John Ringling Blvd	61.2	61.2	61.7	0.5
07-01C	Condominium	B	777 John Ringling Blvd	61.9	61.9	62.3	0.4
07-02A	Condominium	B	777 John Ringling Blvd	57.9	57.9	58.2	0.3
07-02B	Condominium	B	777 John Ringling Blvd	59.1	59.1	59.6	0.5
07-02C	Condominium	B	777 John Ringling Blvd	59.8	59.8	60.3	0.5
07-03A	Condominium	B	777 John Ringling Blvd	56.5	56.5	56.9	0.4
07-03B	Condominium	B	777 John Ringling Blvd	57.5	57.5	58.2	0.7
07-03C	Condominium	B	777 John Ringling Blvd	58.5	58.5	59.0	0.5
07-04A	Condominium	B	777 John Ringling Blvd	55.2	55.2	55.4	0.2
07-04B	Condominium	B	777 John Ringling Blvd	56.1	56.1	56.7	0.6
07-04C	Condominium	B	777 John Ringling Blvd	57.0	57.0	57.7	0.7
07-05A	Condominium	B	777 John Ringling Blvd	54.4	54.4	54.7	0.3
07-05B	Condominium	B	777 John Ringling Blvd	55.2	55.2	55.9	0.7
07-05C	Condominium	B	777 John Ringling Blvd	56.1	56.1	56.9	0.8
07-06A	Condominium	B	777 John Ringling Blvd	53.5	53.5	54.0	0.5
07-06B	Condominium	B	777 John Ringling Blvd	54.3	54.3	55.0	0.7
07-06C	Condominium	B	777 John Ringling Blvd	55.2	55.2	56.1	0.9
07-07A	Condominium	B	775 John Ringling Blvd	45.7	45.7	47.2	1.5

Noise-Sensitive Receptors				Predicted Noise Levels (dB(A))			
Receptor[2]	Use	NAC	Address	2021 Existing	2045 No-Build	2045 Build	Δ[1]
07-07B	Condominium	B	775 John Ringling Blvd	46.9	46.9	48.1	1.2
07-07C	Condominium	B	775 John Ringling Blvd	48.6	48.6	49.5	0.9
07-08A	Condominium	B	775 John Ringling Blvd	41.2	41.2	41.5	0.3
07-08B	Condominium	B	775 John Ringling Blvd	41.3	41.3	41.8	0.5
07-08C	Condominium	B	775 John Ringling Blvd	44.2	44.2	44.6	0.4
07-09A	Condominium	B	775 John Ringling Blvd	40.7	40.7	41.1	0.4
07-09B	Condominium	B	775 John Ringling Blvd	40.9	40.9	41.4	0.5
07-09C	Condominium	B	775 John Ringling Blvd	44.1	44.1	44.4	0.3
07-10A	Condominium	B	775 John Ringling Blvd	40.5	40.5	41.0	0.5
07-10B	Condominium	B	775 John Ringling Blvd	40.8	40.8	41.2	0.4
07-10C	Condominium	B	775 John Ringling Blvd	44.0	44.0	44.3	0.3
07-11A	Condominium	B	775 John Ringling Blvd	40.5	40.5	40.9	0.4
07-11B	Condominium	B	775 John Ringling Blvd	40.8	40.8	41.2	0.4
07-11C	Condominium	B	775 John Ringling Blvd	44.0	44.0	44.3	0.3
07-12A	Condominium	B	775 John Ringling Blvd	40.0	40.0	40.5	0.5
07-12B	Condominium	B	775 John Ringling Blvd	40.8	40.8	41.2	0.4
07-12C	Condominium	B	775 John Ringling Blvd	43.8	43.8	44.2	0.4
07-13A	Condominium	B	775 John Ringling Blvd	40.6	40.6	41.0	0.4
07-13B	Condominium	B	775 John Ringling Blvd	41.3	41.3	41.6	0.3
07-13C	Condominium	B	775 John Ringling Blvd	44.1	44.1	44.4	0.3
07-14A	Condominium	B	775 John Ringling Blvd	42.4	42.4	42.7	0.3
07-14B	Condominium	B	775 John Ringling Blvd	43.6	43.6	43.8	0.2
07-14C	Condominium	B	775 John Ringling Blvd	46.4	46.4	46.8	0.4
07-15A	Condominium	B	771 John Ringling Blvd	59.7	59.7	59.7	0.0

Noise-Sensitive Receptors				Predicted Noise Levels (dB(A))			
Receptor[2]	Use	NAC	Address	2021 Existing	2045 No-Build	2045 Build	Δ[1]
07-15B	Condominium	B	771 John Ringling Blvd	61.4	61.4	61.3	-0.1
07-15C	Condominium	B	771 John Ringling Blvd	62.1	62.1	62.0	-0.1
07-16A	Condominium	B	771 John Ringling Blvd	57.1	57.1	57.1	0.0
07-16B	Condominium	B	771 John Ringling Blvd	58.9	58.9	58.9	0.0
07-16C	Condominium	B	771 John Ringling Blvd	59.7	59.7	59.7	0.0
07-17A	Condominium	B	771 John Ringling Blvd	55.2	55.2	55.0	-0.2
07-17B	Condominium	B	771 John Ringling Blvd	57.1	57.1	57.2	0.1
07-17C	Condominium	B	771 John Ringling Blvd	58.0	58.0	58.0	0.0
07-18A	Condominium	B	771 John Ringling Blvd	53.1	53.1	53.0	-0.1
07-18B	Condominium	B	771 John Ringling Blvd	55.2	55.2	55.3	0.1
07-18C	Condominium	B	771 John Ringling Blvd	56.5	56.5	56.5	0.0
07-19A	Condominium	B	771 John Ringling Blvd	51.7	51.7	51.8	0.1
07-19B	Condominium	B	771 John Ringling Blvd	53.8	53.8	54.1	0.3
07-19C	Condominium	B	771 John Ringling Blvd	55.6	55.6	55.6	0.0
07-20A	Condominium	B	771 John Ringling Blvd	50.6	50.6	51.0	0.4
07-20B	Condominium	B	771 John Ringling Blvd	52.5	52.5	52.9	0.4
07-20C	Condominium	B	771 John Ringling Blvd	54.6	54.6	54.6	0.0
07-21A	Condominium	B	771 John Ringling Blvd	49.6	49.6	50.4	0.8
07-21B	Condominium	B	771 John Ringling Blvd	51.5	51.5	52.0	0.5
07-21C	Condominium	B	771 John Ringling Blvd	53.6	53.6	53.7	0.1
07-22A	Condominium	B	769 John Ringling Blvd	46.9	46.9	47.6	0.7
07-22B	Condominium	B	769 John Ringling Blvd	48.1	48.1	48.4	0.3
07-22C	Condominium	B	769 John Ringling Blvd	49.7	49.7	49.8	0.1
07-23A	Condominium	B	769 John Ringling Blvd	47.9	47.9	48.4	0.5
07-23B	Condominium	B	769 John Ringling Blvd	49.2	49.2	49.5	0.3

Noise-Sensitive Receptors				Predicted Noise Levels (dB(A))			
Receptor[2]	Use	NAC	Address	2021 Existing	2045 No-Build	2045 Build	Δ[1]
07-23C	Condominium	B	769 John Ringling Blvd	50.9	50.9	51.0	0.1
07-24A	Condominium	B	769 John Ringling Blvd	49.0	49.0	49.2	0.2
07-24B	Condominium	B	769 John Ringling Blvd	50.6	50.6	50.8	0.2
07-24C	Condominium	B	769 John Ringling Blvd	52.1	52.1	52.2	0.1
07-25A	Condominium	B	769 John Ringling Blvd	50.4	50.4	50.4	0.0
07-25B	Condominium	B	769 John Ringling Blvd	52.0	52.0	52.3	0.3
07-25C	Condominium	B	769 John Ringling Blvd	53.3	53.3	53.3	0.0
07-26A	Condominium	B	769 John Ringling Blvd	52.6	52.6	52.5	-0.1
07-26B	Condominium	B	769 John Ringling Blvd	54.2	54.2	54.4	0.2
07-26C	Condominium	B	769 John Ringling Blvd	55.2	55.2	55.2	0.0
07-27A	Condominium	B	769 John Ringling Blvd	54.7	54.7	55.0	0.3
07-27B	Condominium	B	769 John Ringling Blvd	56.7	56.7	56.7	0.0
07-27C	Condominium	B	769 John Ringling Blvd	57.6	57.6	57.5	-0.1
07-28A	Condominium	B	769 John Ringling Blvd	58.2	58.2	58.5	0.3
07-28B	Condominium	B	769 John Ringling Blvd	60.2	60.2	60.2	0.0
07-28C	Condominium	B	769 John Ringling Blvd	61.0	61.0	61.0	0.0
08-01	Residential Common Area / Pool	C	773 John Ringling Blvd	52.5	52.5	52.9	0.4
09-01A	Condominium	B	767 John Ringling Blvd	60.5	60.5	60.7	0.2
09-01B	Condominium	B	767 John Ringling Blvd	62.2	62.2	62.2	0.0
09-01C	Condominium	B	767 John Ringling Blvd	62.9	62.9	62.9	0.0
09-02A	Condominium	B	767 John Ringling Blvd	46.7	46.7	47.4	0.7
09-02B	Condominium	B	767 John Ringling Blvd	48.2	48.2	48.4	0.2
09-02C	Condominium	B	767 John Ringling Blvd	49.8	49.8	49.9	0.1
09-03A	Condominium	B	765 John Ringling Blvd	60.9	60.9	61.0	0.1

Noise-Sensitive Receptors				Predicted Noise Levels (dB(A))			
Receptor[2]	Use	NAC	Address	2021 Existing	2045 No-Build	2045 Build	Δ[1]
09-03B	Condominium	B	765 John Ringling Blvd	62.4	62.4	62.2	-0.2
09-03C	Condominium	B	765 John Ringling Blvd	63.0	63.0	62.9	-0.1
09-04A	Condominium	B	765 John Ringling Blvd	49.5	49.5	50.0	0.5
09-04B	Condominium	B	765 John Ringling Blvd	51.1	51.1	51.2	0.1
09-04C	Condominium	B	765 John Ringling Blvd	52.8	52.8	52.8	0.0
09-05A	Condominium	B	763 John Ringling Blvd	48.6	48.6	48.2	-0.4
09-05B	Condominium	B	763 John Ringling Blvd	50.1	50.1	49.8	-0.3
09-05C	Condominium	B	763 John Ringling Blvd	51.5	51.5	51.1	-0.4
09-06A	Condominium	B	763 John Ringling Blvd	49.5	49.5	49.7	0.2
09-06B	Condominium	B	763 John Ringling Blvd	51.4	51.4	51.6	0.2
09-06C	Condominium	B	763 John Ringling Blvd	54.3	54.3	54.4	0.1
09-07A	Condominium	B	761 John Ringling Blvd	50.6	50.6	50.6	0.0
09-07B	Condominium	B	761 John Ringling Blvd	52.6	52.6	52.7	0.1
09-07C	Condominium	B	761 John Ringling Blvd	56.9	56.9	57.0	0.1
09-09A	Condominium	B	761 John Ringling Blvd	60.4	60.4	60.5	0.1
09-09B	Condominium	B	761 John Ringling Blvd	62.4	62.4	62.4	0.0
09-09C	Condominium	B	761 John Ringling Blvd	64.0	64.0	64.0	0.0
10-01	Residential Common Area / Pool	C	773 John Ringling Blvd	51.8	51.8	51.7	-0.1

[1] Δ is the difference between the 2045 Build condition and the 2021 Existing Worst Case condition.

[2] Receptors with suffixes A, B and C represent multi-story receptors with first, second and third stories, respectively.

[3] NAC D levels were calculated by taking exterior impact and applying a 25 dB reduction (masonry, single glazed windows), per FDOT and FHWA.

APPENDIX D

Noise CNE & Measurement Map

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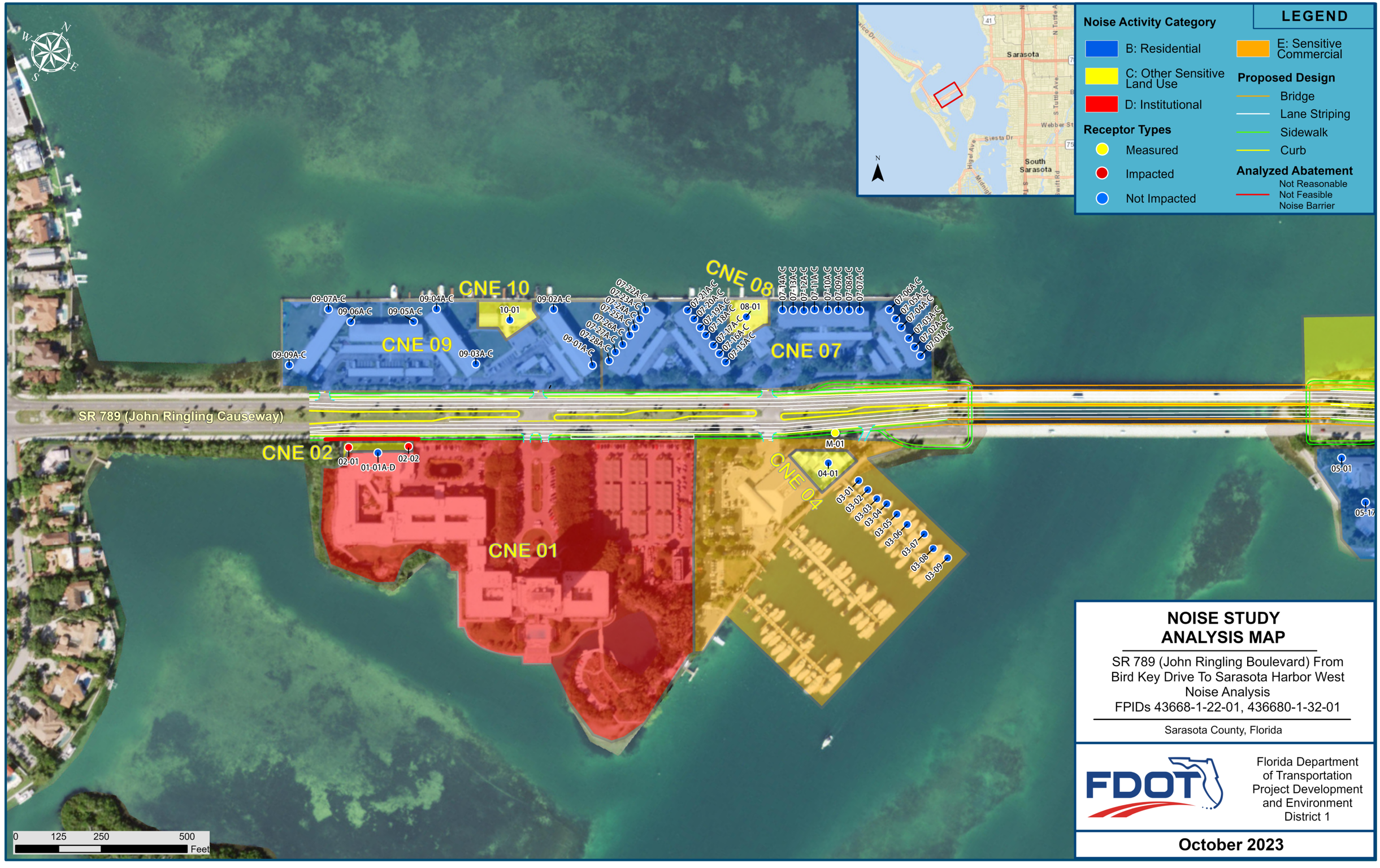


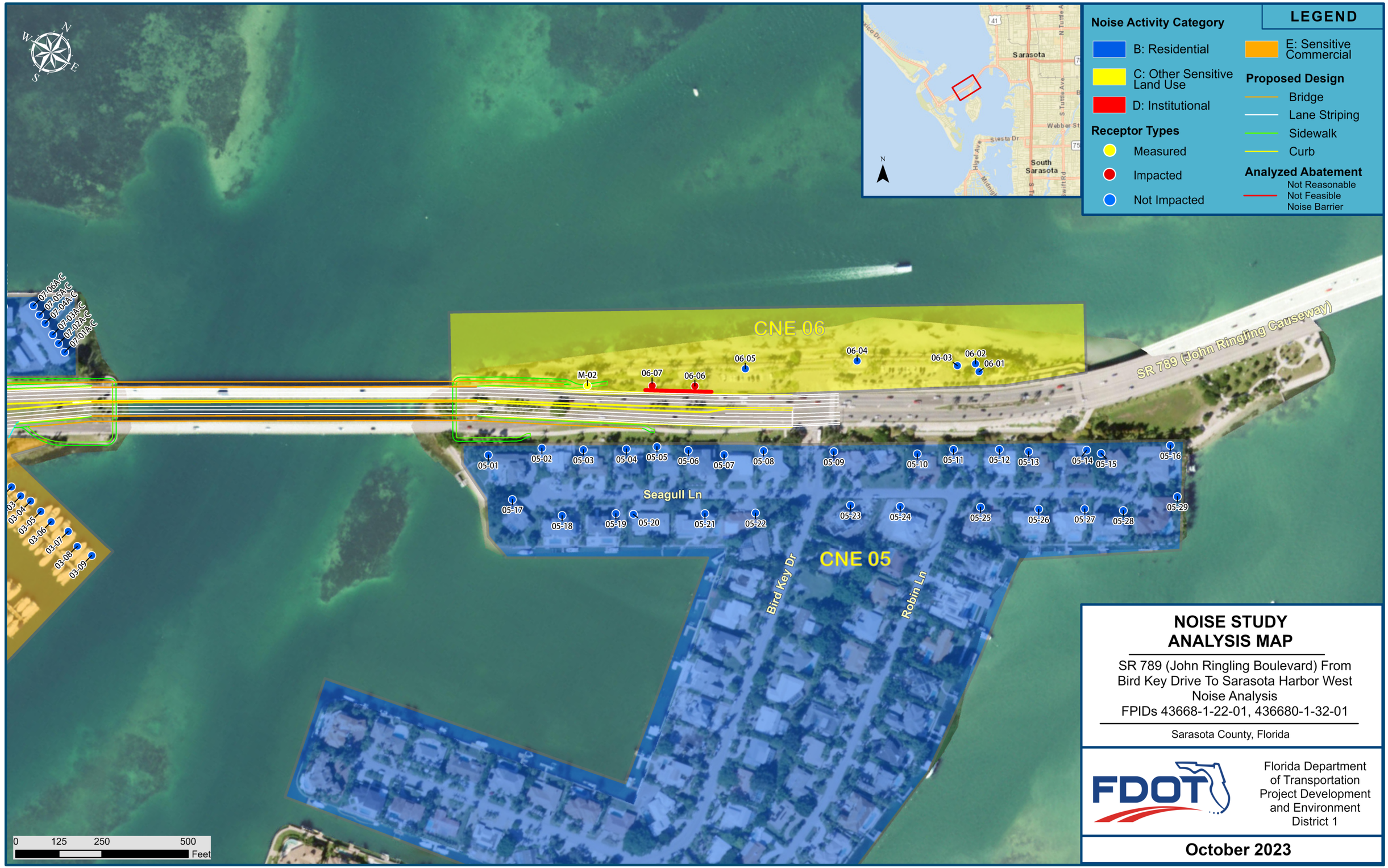
NOISE STUDY ANALYSIS MAP

SR 789 (John Ringling Boulevard) From Bird Key Drive To Sarasota Harbor West
Noise Analysis
FPIDs 43668-1-22-01, 436680-1-32-01

Sarasota County, Florida

Florida Department of Transportation
Project Development and Environment
District 1

October 2023



NOISE STUDY ANALYSIS MAP

SR 789 (John Ringling Boulevard) From Bird Key Drive To Sarasota Harbor West
Noise Analysis
FPIDs 43668-1-22-01, 436680-1-32-01

Sarasota County, Florida

Florida Department of Transportation
Project Development and Environment
District 1

October 2023

APPENDIX E

TNM Modeling Files and PDF of the NSR
(in Project File, including “Read Me” file)

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APPENDIX F

Abatement Analysis

Table F-1: CNE 02 Abatement Analysis

Impacted Noise-Sensitive Receptors – CNE 02					Abatement Analysis			
Rec. No.	**Use**	**NAC**	**Address**	**2045 Predicted Build-Condition Noise Levels (dB(A))[1]**	**With-Barrier (dB(A))**	**IL**	**Benefit[2]**	**Abatement Feasible & Reasonable**
02-01	Dog Park	C	700 John Ringling Blvd	66.0	N/A[3]	N/A[3]	NO	NO[3]
02-01	Dog Park	C	700 John Ringling Blvd	66.3	N/A[3]	N/A[3]	NO	NO[3]

[1] Receptors with a predicted noise level that approach or exceed the NAC are highlighted in red.
[2] IL = "Insertion Loss" = the difference between the Predicted Build-condition noise level and the With-Barrier noise level. "Benefit" = a receptor that receives at least a 5 dB(A) IL.
[3] Utilization of the special land use at this property is below the level sufficient to meet cost criterion necessary for the construction of the noise barrier.

Table F-2: CNE 06 Abatement Analysis

Impacted Noise-Sensitive Receptors – CNE 06					Abatement Analysis			
Rec. No.	**Use**	**NAC**	**Address**	**2045 Predicted Build-Condition Noise Levels (dB(A))[1]**	**With-Barrier (dB(A))**	**IL**	**Benefit[2]**	**Abatement Feasible & Reasonable**
06-01	Park	C	200 John Ringling Causeway	63.7	N/A[3]	N/A[3]	NO	NO[3]
06-02	Park	C	200 John Ringling Causeway	62.4	N/A[3]	N/A[3]	NO	NO[3]
06-03	Park	C	200 John Ringling Causeway	63.4	N/A[3]	N/A[3]	NO	NO[3]
06-04	Park	C	200 John Ringling Causeway	61.9	N/A[3]	N/A[3]	NO	NO[3]
06-05	Park	C	200 John Ringling Causeway	62.9	N/A[3]	N/A[3]	NO	NO[3]
06-06	Park	C	200 John Ringling Causeway	67.5	N/A[3]	N/A[3]	NO	NO[3]
06-07	Park	C	200 John Ringling Causeway	68.4	N/A[3]	N/A[3]	NO	NO[3]

[1] Receptors with a predicted noise level that approach or exceed the NAC are highlighted in red.
[2] IL = "Insertion Loss" = the difference between the Predicted Build-condition noise level and the With-Barrier noise level. "Benefit" = a receptor that receives at least a 5 dB(A) IL.
[3] Utilization of the special land use at this property is below the level sufficient to meet cost criterion necessary for the construction of the noise barrier.