# NOISE STUDY REPORT

## S.R. 401 Bridge Replacement PD&E Study

Brevard County, Florida

Financial Project Identification (FPID) Number: 444787-1-22-01
ETDM Number: 14397

*Prepared For:*

**Florida Department of Transportation**
**District Five**

The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being, or have been, carried out by FDOT pursuant to 23 U.S.C. & 327 and Memorandum of Understanding dated 12/14/2016 and executed by FHWA and FDOT.

**July 2022**

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Prepared by:
**Bernard Kinney Associates, Inc.**

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# EXECUTIVE SUMMARY

The Florida Department of Transportation (FDOT) District 5 has conducted this Project Development and Environment (PD&E) Study to determine the engineering and environmental effects of the proposed S.R.401 Bridge Replacement in Brevard County. This PD&E Study documents the need for capacity and multimodal improvements, and presents the procedures utilized to develop and evaluate a preferred alternative. The PD&E Study satisfies the requirements of FDOT and follows the process for a Categorical Exclusion (CE) Type 2. The PD&E Study process was developed in compliance with the National Environmental Policy Act (NEPA), and other applicable federal and state regulations.

This study utilized the Traffic Noise Model (TNM) version 2.5 which is the most current model available for the prediction of highway traffic noise levels. Traffic noise impacts were evaluated for potential noise sensitive sites developed prior to the project's Date of Public Knowledge (DPK). Based upon the DPK, Activity Category B and C land uses were evaluated for potential noise impacts. The noise study was developed based upon the current regulatory criteria contained in Part 2, Chapter 18 Noise (July 1, 2020) of the PD&E Manual and the Traffic Noise Modeling and Analysis Practitioners Handbook dated January 1, 2016.

The noise sensitive areas evaluated are representative of twelve (12) noise sensitive receptor locations. The computer modeled noise receptor locations are as follows: the Rodney S. Ketcham Park/Boat Ramp Special Use Location (SUL) and a local marina with some liveaboard tenants.

The traffic noise levels predicted at the twelve (12) noise sensitive receptor locations under evaluation approached or exceeded the applicable NAC; at one (1) single receptor location (NSA 1, R1E), however, potential noise abatement measures were not feasible based on the Department's Feasibility Factor (Noise Reduction Factor). Activity Category B and C locations require potential noise abatement measures for computer predicted sound levels which approach or exceed 66 dB(A).

The remaining noise sensitive areas adjacent to the S.R. 401 Bridge did not approach or exceed the applicable NAC for the Activity Categories evaluated; therefore, potential noise abatement measures were not considered.

The feasibility factor associated with a barrier's noise reduction is the Noise Reduction Factor. FDOT's Noise Reduction Factor requires that two (2) or more impacted receptors achieve a 5 dB(A) reduction or greater in order to be considered feasible. There was only one (1) single impact receptor location; therefore, the Feasibility Factor could not be achieved and potential noise abatement measures were not considered.

The proposed Bridge Replacement (Preferred Alternative) is expected to have a perceivable noise level increase on the adjacent noise sensitive receptor locations. The predicted noise level increase over the existing condition for the Preferred Alternative is approximately 5.6 to 5.9 dB(A).

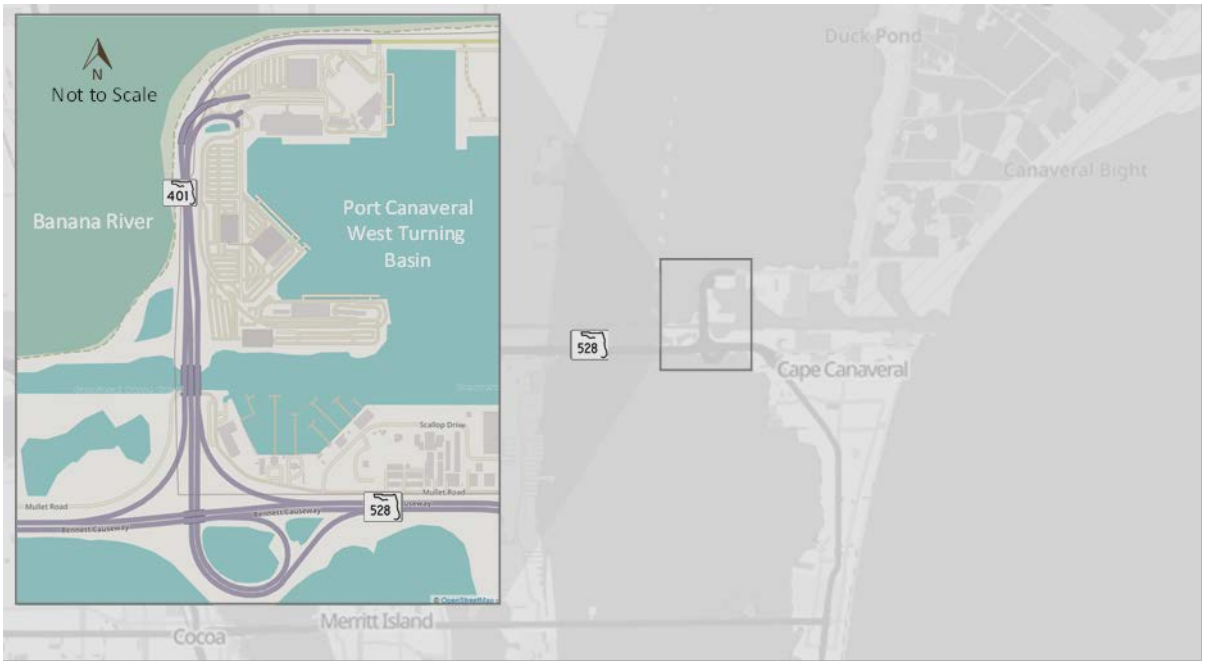
# 1.0 INTRODUCTION

The Florida Department of Transportation (FDOT), District Five, is conducting a Project Development and Environment (PD&E) study to evaluate replacement alternatives for the three existing bascule bridges with either a new medium-level movable bridge or a new high-level fixed span bridge over the Canaveral Barge Canal, in Brevard County, Florida (see **Figure 1**). A No Build Alternative will also be considered. The bridges provide a vital connection to Port Canaveral's operations including major cruise and cargo terminals. The bridges also serve as the primary access to Cape Canaveral Air Force Station, Naval Ordinance Test Unit, facilities for the U.S. Coast Guard, and access to Space Florida operations. The existing 354-foot single-leaf bascule bridges consists of three separate structures accommodating southbound and northbound traffic - Bridge No. 700030 (SB) (1963), Bridge No. 700031 (SB) (1963) and Bridge No. 700117 (NB) (1972). The existing bridges provides a 90-foot-wide navigational horizontal clearance and a 25-foot navigational vertical clearance above mean water level when the bridges are in the closed position. The current bridges provide two 12-foot-wide travel lanes in each direction with 2-foot-wide shoulders. There are no existing sidewalks or bicycle lanes on the existing causeway and bridge.

The existing bridges have been classified as functionally obsolete. Bridge improvements will provide additional capacity to address future traffic growth resulting from strategic expansion plans for Port Canaveral and military stakeholders in the immediate area. The PD&E study will assess navigational needs from the surrounding community to assist in determining the appropriate replacement structure for the bridge.

Traffic noise impacts were evaluated for potential noise sensitive locations identified in this study. Based upon the existing land uses, Activity Category B and C noise sensitive locations were evaluated. Two (2) Noise Sensitive Areas (NSA) were identified adjacent to the study corridor. The noise sensitive areas evaluated are representative of twelve (12) noise sensitive receptor locations. The computer modeled noise receptor locations are as follows: the Rodney S. Ketcham Park/Boat Ramp Special Use Location (SUL) and a local marina with some liveaboard tenants. The noise study was developed based upon the current regulatory criteria contained in Part 2, Chapter 18 Noise (July 1, 2020), of the Project Development & Environment Manual, and the Traffic Noise Modeling and Analysis Practitioners Handbook dated January 1, 2016. Additionally, the current regulatory criteria contained in the New Final Rule (23 CFR Part 772) dated July 13, 2010 is in compliance with the Department's Noise Policy. A summary of the noise study may be found in the Categorical Exclusion (CE) Type 2 document for the project available under separate cover.

**Figure 1: Project Location Map**




# 2.0 PROJECT DESCRIPTION

## 2. 1 Purpose and Need

The purpose of the PD&E study is to evaluate replacement alternatives for the existing bascules bridges over the Canaveral Barge Canal. The two southbound bridges (700030 and 700031) were constructed in 1963 and the northbound bridge (700117) was constructed in 1972 and are considered structurally deficient by FDOT. This project will determine whether to replace the existing bridges with either a new medium-level movable bridge or a new high-level fixed span bridge option. A No Build Alternative will also be considered.

The primary need for the project is based on improving system linkage, modal interrelationships, traffic and safety enhancements to accommodate future growth.

### 2.1.1 System Linkage

S.R. 401 is designated a SIS connector, providing access to Cape Canaveral, a SIS Seaport. Port Canaveral's operations include major cruise terminals, cargo terminals, and substantial tanker truck traffic. Additionally, SR 401 is classified as a part of the State Strategic Highway Network (the STRAHNET) connector by the Military Surface Deployment and Distribution Command as a connection to an ocean terminal to deploy and sustain U.S. forces on a global basis. The two southbound bridges (70030 and

700031) were constructed in 1963 and the northbound bridge (700117) was constructed in 1972. The bridges are the primary access to Cape Canaveral Air Force Station and Space Florida operations, Naval Ordinance Test Unit, facilities for the U.S. Coast Guard, and access to Space Florida operations. The maximum weight limits of the existing bridges restrict heavy loads. The 2011 Spaceport Area Transportation Infrastructure Assessment by the Space Coast TPO identified the weight limit as an impediment to expanding port freight operations and maximizing military uses.

### 2.1.2 Modal Interrelationships

The 2019-2020 Port Directory shows the port handled approximately 4.5 million passengers and approximately 6,400,000 tons of cargo in 2018, in addition to outdoor recreation such as fishing and boating. The S.R. 401 bridges provide access to/from Port Canaveral, but do not have pedestrian or bicycle facilities. As the second largest cruise port in the world today, the Vision Plan identifies the Port's successful growth as rooted in the link between Central Florida theme parks and the cruise industry. The surface transportation at this point is via the S.R. 401 bridges.

The 2017 S.R. 401 Bridge Alternatives Analysis Study showed 14,900 AADT with 13% truck traffic. The truck traffic includes fuel transport, which accounts for about 40% of the supply for Central Florida. While the Port Canaveral 30 Year Vison Plan notes that petroleum cargo may level off as the US switches to more renewable energy sources, cargo is expected to grow to more than 3 times the current tonnage by 2048. Today the primary transportation options to distribute cargo is currently via truck or barge. Minimizing delays for the road and vessel usage will better position Port Canaveral to provide economic growth. The bridges opening to marine vessels create traffic delays to the port and cruise terminal. Similarly, water vessels are delayed based on operation restrictions. Traffic evaluations and a vessel survey will be conducted during the PD&E study to determine factors to reduce delays. Finally, the Port's Vision Plan considers the sector north of the S.R. 401 bridges as having more demand for growth than land available, which further adds to the importance of this distribution connectivity.

# 3.0 PROJECT ALTERNATIVES

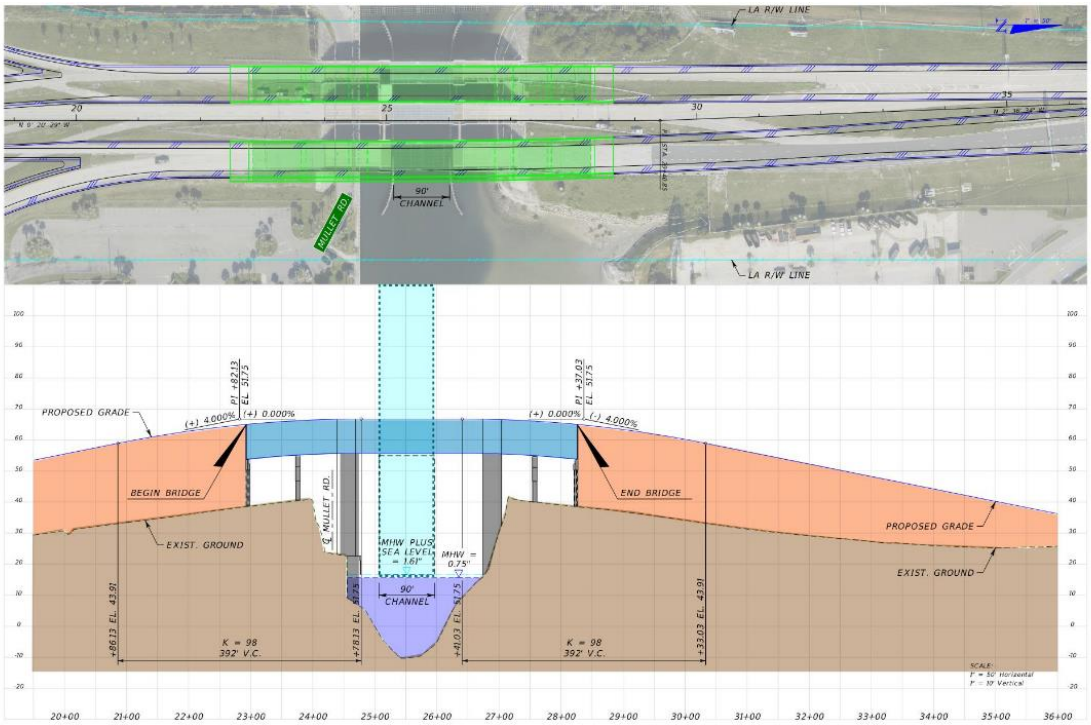
The following are descriptions of the alternatives being analyzed for the S.R. 401 Bridge Replacement PD&E Study.

### No Build Alternative

The No Build Alternative consists of leaving the existing bascule bridges in place. The existing bridges will continue to provide a 25-foot vertical clearance (MHW) in the closed position and a horizontal clearance of 90 feet at the main navigational channel. Bridge inspection reports prepared by the Florida Department of Transportation (FDOT) have classified the S.R. 401 bascule bridges at Port Canaveral as functionally obsolete due to not meeting current FDOT bridge design standards. The bridges were constructed in 1963 and are due for an update. A 2011 Spaceport Area infrastructure assessment study identified the S.R. 401 bridge as critically important and that the current bridge “weight limits and insufficient capacity can inhibit economic growth” of the region.

## Mid-Level Movable Bascule Bridge Alternative

This Alternative considers replacing the existing three bascule bridges with two separate 3-lane bascule bridges, in the northbound/southbound directions, located along the existing bridge alignment. This alternative would provide a **mid-level** profile allowing for a 40-foot vertical clearance in the closed position and an unlimited open clearance in the open position. The existing horizontal clearance is a 90-foot main navigational channel. The total bridge length is 1,120 feet, and the maximum grade is 4%. The existing bascule bridges are classified as functionally obsolete, and this alternative would address that issue. The number of bridge openings will be reduced from 1,296 (current) to 312 per year (2025), and the traffic delays will be reduced from ~ 138 hours (current) to ~ 33 hours (2025).

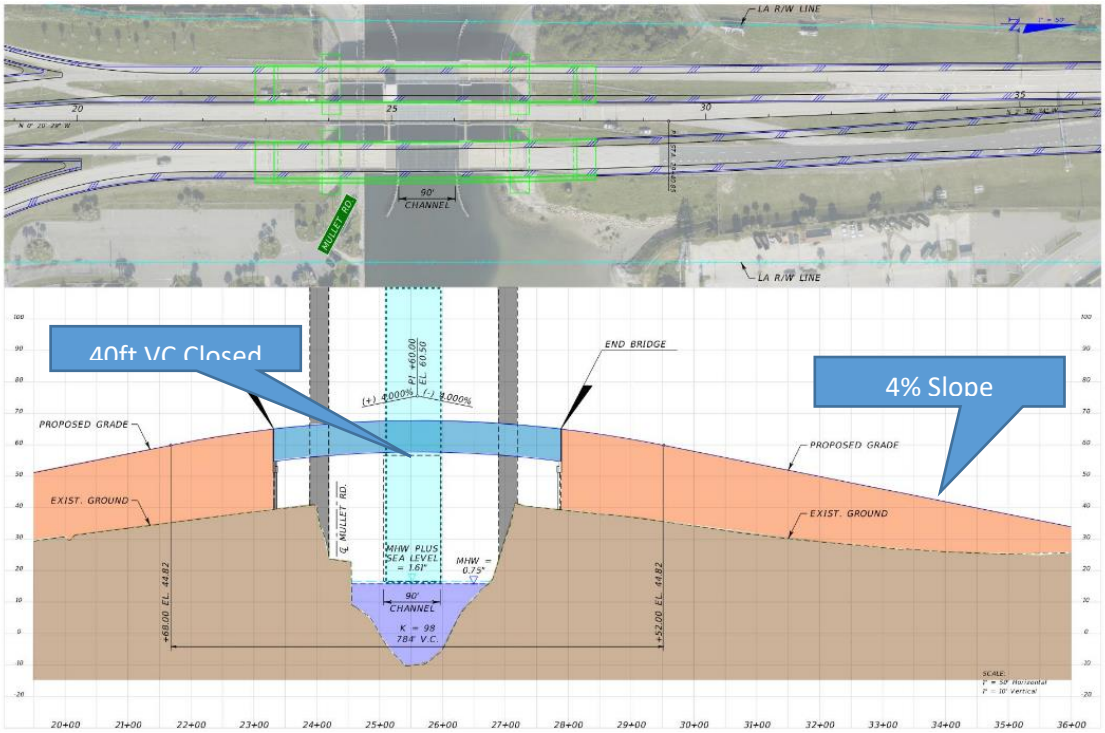



## Mid-Level Movable Lift Bridge Alternative

This Alternative considers replacing the existing three bascule bridges with two separate 3-lane lift bridges, in the northbound/southbound directions, located on the existing bridge alignment. A vertical lift bridge span, which can open/close faster than a bascule bridge, rises vertically while remaining parallel with the deck, whereas a bascule bridge operates with a counterweight that continuously balances a span, throughout its upward swing.

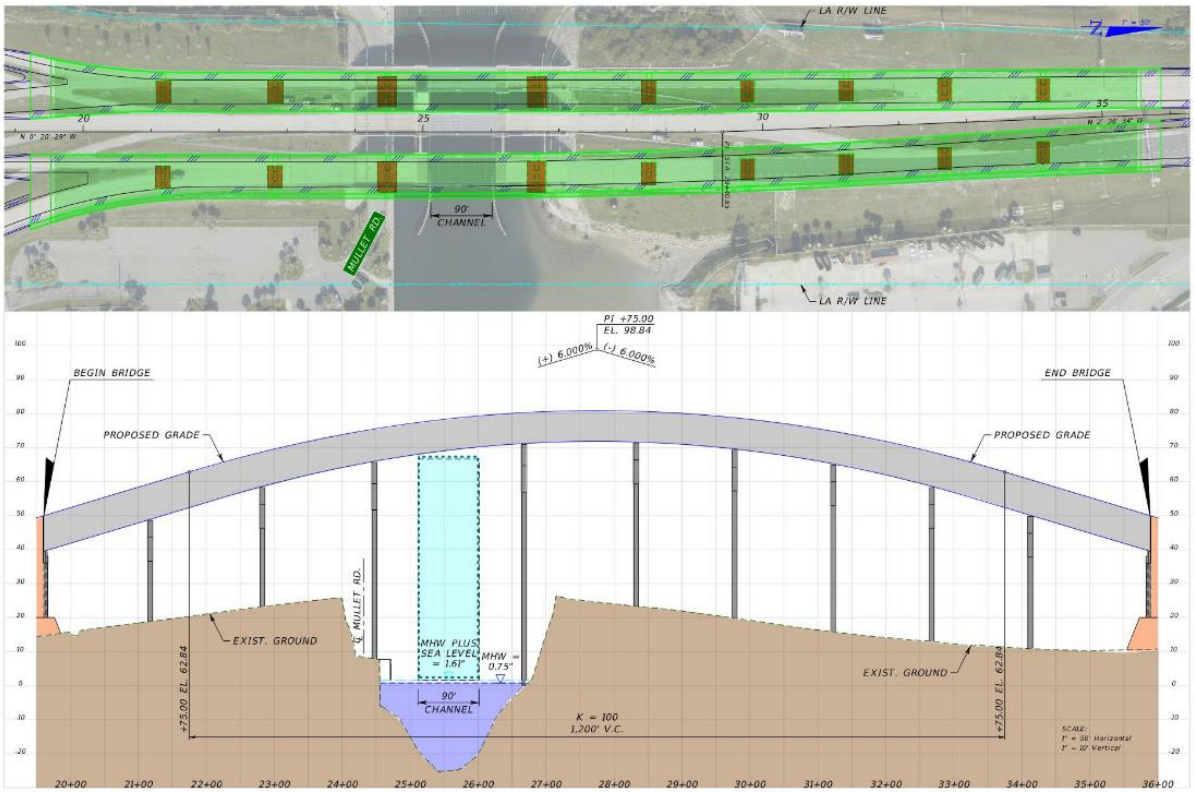
This alternative would provide a **mid-level** profile allowing for a 40-foot vertical clearance in the closed position and an 85+-foot clearance in the open position due to the existing FP&L lines to the west. The existing horizontal clearance is a 90-foot main navigational channel. The total bridge length is 964 feet, and the maximum grade is 4%.

The existing bascule bridges are classified as functionally obsolete, and this alternative would address that issue. The number of bridge openings will be reduced from 1,296 (current) to 312 per year (2025), and the traffic delays will be reduced from ~ 138 hours (current) to ~ 33 hours (2025).




## High-Level Fixed Bridge Alignment – Preferred Alternative

This Alternative considers replacing the existing three bascule bridges with two separate 3-lane **high-level**, fixed span concrete bridges located on the existing bridge alignment, in the northbound/southbound directions. This improvement would provide a maximum 65-foot vertical clearance above mean high water and a 90-foot horizontal clearance at the main navigational channel. The total bridge length is 3,210 feet, and the maximum grade is 6%. The existing bascule bridges are classified as functionally obsolete, and this alternative would address that issue. As a result of the alternatives evaluation process, the High-Level Fixed Bridge was determined to be the preferred alternative. The typical section and rendering of this alternative is provided in **Appendix A.**




# 4.0 LAND USES

## 4. 1 Existing Land Uses

The existing land uses adjacent to the project corridor are representative of the Rodney S. Ketcham Park/Boat Ramp (recreational area) and a local marina with some live aboard tenants. The Port Canaveral Inlet, the Avocet lagoon, and the Merritt Island National Wildlife Refuge are also located adjacent to the study corridor. The recreational and marina liveaboard areas are located on the east side of the S.R. 401 Bridge. The study corridor has little opportunity for future development.

## 4.2 Future Land Uses

Future land use adjacent to the study area is expected to remain consistent with the existing land use characteristics. The study corridor is fully developed which would limit any future development. Should any noise sensitive development occur, the contents of this report should be considered before approving any potential noise sensitive land uses directly adjacent to the S.R.401 Bridge Replacement corridor.

FDOT is not responsible for future noise abatement measures for parcels or locations with building permits approved after the project's Date of Public Knowledge (DPK).

Active / Granted building permits for potential noise sensitive areas within the study corridor limits were requested on February 1, 2022. A response from Canaveral Port Authority was received on February 1, 2022. Based on the response that there were no active permits or near future permits, a second request / follow-up was not made. There were no additional noise sensitive sites identified based on the building permit information received by Canaveral Port Authority. There were no additional noise sensitive areas identified with the exception of the park/marina area.

# 5.0 METHODOLOGY

The noise study was developed based upon the current regulatory criteria contained in Part 2, Chapter 18 Noise (July 1, 2020) of the PD&E Manual and the Traffic Noise Modeling and Analysis Practitioners Handbook dated January 1, 2016.

Additionally, the current regulatory criteria contained in the New Final Rule (23 CFR Part 772) dated July 13, 2010 is reflected in the Department's Noise Policy. The technical criteria are provided in the Federal Regulations Title 23, Part 772 (23 CFR Part 772) entitled "Procedures for Abatement of Highway Traffic Noise and Construction Noise"[1]. Chapter 335.17 of the Florida Statute requires the use of 23 CFR Part 772 in the noise impact assessment process regardless of funding, and the FDOT PD&E Manual, Part 2, Chapter 18 Noise (July 1, 2020)[2]. Additionally, technical guidance is provided in the Traffic Noise Modeling and Analysis Practitioners Handbook, January 1, 2016[3].

Computer predicted noise levels were produced using the Federal Highway Administration (FHWA) Traffic Noise Model (TNM) version 2.5. The project alternatives evaluated in the noise study consist of the Existing Year 2019 Condition and the Design Year 2050 No-Build and Build Alternative Condition (Preferred Alternative). The traffic noise levels were predicted for each of these conditions. No other alternatives were evaluated.

No consideration was given to potential noise sensitive land uses established after the DPK. Both the interior (where applicable) and exterior areas of potential noise sensitive locations were evaluated for potential noise impacts.

FDOT is not responsible for future noise abatement measures for parcels or locations with building permits approved after the DPK. The DPK is the approval date of the Categorical Exclusion (CE) Type 2.

The Noise Abatement Criteria (NAC) activity categories for the noise sensitive areas evaluated include Activity Category B and C locations. The Activity Category B locations represent the local marina with some liveaboard tenants and the Activity Category C locations represent a SUL (park/boat ramp). No other activity categories were identified as of the date of this report.

## 5.1 Noise Metrics

The noise level descriptor used by FDOT will be level equivalent (LEQ). LEQ is the equivalent steady-state sound level which in a stated period of time contains the same

acoustic energy as the time-varying sound level during the same time period, with LEQ (h) being the hourly value of LEQ.

Title 23 CFR Part 772 specifies that either the LEQ(h) or L10(h) metric, but not both, may be used on a project. Consistent with this requirement, the FDOT elects to use the LEQ(h) metric.

The noise levels developed for this analysis are expressed in decibels (dB) using an "A"-scale [dB(A)] weighting. This scale most closely approximates the response characteristics of the human ear.

## 5.2 Traffic Data

Predicted traffic noise levels are primarily dependent on traffic volumes, vehicle mix, and vehicle speeds. The project traffic data developed for this study was prepared as part of the PD&E Study and the Traffic Data Forms for Noise Studies. The project traffic data was developed for S.R.401 Bridge Replacement for the following conditions: Existing Year 2019 Condition and the Design Year 2050 No-Build and Build Alternative Condition (Preferred Alternative). Traffic volumes representative of Level of Service (LOS) C or demand (whichever is less) was used as input data for the noise study and is consistent with the Traffic Noise Modeling and Analysis Practitioners Handbook dated January 1, 2016. This represents the highest traffic volume traveling at the highest average speed for this project. Such conditions typically generate the highest noise levels at a given site during a normal day. A review of the traffic data for this study determined that the project traffic data (demand) would be used for input into TNM version 2.5. The project traffic data developed for this study is presented in **Appendix B.**

## 5.3 Noise Abatement Criteria

Noise sensitive sites are defined in the PD&E Manual as any property (owner occupied, rented or leased) where frequent exterior human use occurs and where a lowered noise level would be of benefit. Consistent with the guidance provided in the PD&E Manual, unless the area of exterior frequent use is identified elsewhere, residential receptor sites were placed at the edge of the dwelling unit closest to the major traffic noise source as dictated by professional judgment. Examples of common outdoor and indoor activities and their associated noise levels are presented in **Figure 2**.

The FHWA has established specific noise levels for both exterior and interior locations where frequent human activity could occur. These noise levels vary by activity category and are presented in **Table 1**.

## Figure 2: Typical Noise Levels

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

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

**Table 1**
**NOISE ABATEMENT CRITERIA (NAC)**
**[Hourly A-Weighted Sound Level-decibels (dB(A))]**

| Activity Category | Activity Leq(h)[1] | | Evaluation Location | Description of Activity Category |
|---|---|---|---|---|
| | FHWA | FDOT | | |
| A | 57 | 56 | Exterior | Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose. |
| B[2] | 67 | 66 | Exterior | Residential |
| C[2] | 67 | 66 | Exterior | Active sports areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreational areas, Section 4(f) sites, schools, television studios, trails, and trail crossings. |
| D | 52 | 51 | Interior | Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios. |
| E[2] | 72 | 71 | Exterior | Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F. |
| F | – | – | – | Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing. |
| G | – | – | – | Undeveloped lands that are not permitted. |

*(Based on Table 1 of 23 CFR Part 772)*

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

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

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

The FDOT has also established an approach criterion based upon these activity categories. The FDOT approach criteria are one (1) decibel below the FHWA criteria.

Potential noise abatement measures must be considered for all activity categories (except Activity Category F and G) which either meet or exceed the FDOT NAC for a specific category or experience a substantial noise increase as a direct result of a transportation improvement project.

The FDOT defines a substantial increase as 15 dB(A) or more over the existing conditions. A substantial increase in traffic-related noise usually occurs for new alignment transportation projects. This study has identified that Activity Category B and C locations were present as of the date of this report.

## 5.4 NOISE ABATEMENT MEASURES

The traffic noise levels predicted at the twelve (12) noise sensitive receptor locations under evaluation approached or exceeded the applicable FDOT NAC at one (1) single receptor location (NSA 1, R1E); however, potential noise abatement measures were not feasible based on the Department's Feasibility Factor (Noise Reduction Factor). The impacted location was identified as NSA 1, Receptor R1E, which is an outside pavilion seating area. The remaining adjacent pavilions were not impacted. A summary of the potential noise abatement measures considered by the Department are presented below.

### 5.4.1 Traffic Management

Traffic management techniques are considered an acceptable noise abatement measure by the FHWA; however, such measures may be difficult to implement. A review of the project traffic data does not support this technique as a viable choice.

### 5.4.2 Alignment Modifications

Alignment modifications are considered an effective noise abatement measure by the FHWA. Given the right-of-way limitations associated with the study corridor, this technique is not a viable choice. The preferred alternative (High Level Fixed Bridge) reduced potential noise impacts at the park / boat ramp area and the marina with some liveaboard tenants.

### 5.4.3 Buffer Zones

Buffer zones are considered an effective noise abatement measure by the FHWA. Given the right-of-way limitations associated with the study corridor, this technique is not a viable choice. The noise contours developed for the noise study will assist local planning agencies in minimizing future traffic noise impacts adjacent to the study corridor by restricting future development in areas where future traffic noise impacts have been identified.

### 5.4.4 Noise Barrier Placement

Potential noise barrier placement is the most effective noise abatement measure utilized by the Department. The Department has established feasibility factors which are used to determine the viability of potential noise barrier placement. Potential noise abatement measures were not evaluated at NSA 1, Receptor R1E, based on the Department's Feasibility Factor (Noise Reduction Factor) for single receptor impact locations. Receptor R1E will experience a noise level of 66 dB(A) in the build alternative year 2050. No other noise impacts were identified.

The feasibility factor associated with a barriers noise reduction is the Noise Reduction Factor. FDOT's Noise Reduction Factor requires that two (2) or more impacted receptors achieve a 5 dB(A) reduction or greater in order to be considered feasible. There was only one (1) single impact receptor location; therefore, the Feasibility Factor could not be achieved and potential noise abatement measures were not considered.

The remaining noise sensitive areas adjacent to the S.R. 401 Bridge did not approach or exceed the applicable NAC for the Activity Categories evaluated; therefore, potential noise abatement measures were not considered.

# 6.0 TRAFFIC NOISE ANALYSIS

The noise study identified two (2) Noise Sensitive Areas (NSA) which were evaluated for potential noise impacts for the following conditions: Existing Year 2019 Condition and the Design Year 2050 No-Build and Build Alternative Condition (Preferred Alternative).

The noise sensitive areas evaluated are representative of twelve (12) noise sensitive receptor locations. The computer modeled noise receptor locations are as follows: the Rodney S. Ketcham Park/Boat Ramp (SUL) and a local marina with some liveaboard tenants. The noise receptor location and description summary are presented in **Table 2**.

The potential noise sensitive locations identified in this report are representative of Activity Category B and C as shown in **Table 1**. There are no other noise sensitive areas located within the project corridor as of the date of this report and was verified through an active building permit request. There are no other noise sources located adjacent to the study corridor which could interfere with the existing ambient highway traffic noise levels.

First and second floor receptors were assumed to be placed 5 feet and 15 feet above ground, respectively. Consistent with these guidelines, residential receptors were placed at the edge of the dwelling unit closest to the major traffic noise source at a height of 5 feet and 15 feet.

## 6.1 Model Validation

Field measurements were documented to evaluate the current noise conditions and to determine if TNM version 2.5 could accurately predict the noise levels for the study corridor under evaluation. Measurements of the ambient noise levels for the project corridor were documented using procedures defined in the FHWA report Measurement of Highway-Related Noise (FHWA-PD-96-046)[4].

Noise level measurements, meteorological conditions, and traffic data were recorded at two (2) representative locations adjacent to the S.R. 401 Bridge. The study corridor limits extend south and north of the existing bridge. The field measurement locations are identified as ML1 and ML2 and are described below. The locations are also presented in the Noise Analysis Map presented in **Appendix C**.

- **ML1** – Monitoring Location 1 (ML1/R3E) is located within the Rodney S. Ketcham Park at 998 Mullet Drive. (Park Pavilion-SUL). The measurement location is situated approximately 330-410 feet from the nearest edge of pavement.
- **ML2** – Monitoring Location 2 (ML2/R5E) is located within the Rodney S. Ketcham Park at 998 Mullet Drive. (Park Pavilion-SUL). The measurement location is situated approximately 390-470 feet from the nearest edge of pavement.

**Table 2**
**Noise Receptor Location and Description Summary**
**Build Alternative (Preferred Alternative)**

| Noise Receptor Number | Noise Receptor Station Number | Noise Receptor Description | FDOT NAC | Distance from Centerline of Outside Travel Lane (Ft.) S.R.401 Bridge | Distance from Centerline of Outside Travel Lane (Ft.) S.R. 401 Bridge | Distance Variance (Ft.) |
|---|---|---|---|---|---|---|
| | | | | **Existing Alignment** | **Build Alternative / Preferred** | |
| R1E | 24+41.44 | Ketcham Park/Boat Ramp | 66 | 170.515 | 164.52 | 5.99 |
| R2E | 24+16.09 | Ketcham Park/Boat Ramp | 66 | 218.843 | 212.84 | 6.00 |
| R3E | 23+43.07 | Ketcham Park/Boat Ramp | 66 | 322.917 | 316.92 | 5.99 |
| R4E | 22+69.27 | Ketcham Park/Boat Ramp | 66 | 329.485 | 323.50 | 5.98 |
| R5E | 22+13.57 | Ketcham Park/Boat Ramp | 66 | 379.895 | 374.24 | 5.65 |
| R6E | 22+70.70 | Ketcham Park/Boat Ramp | 66 | 201.010 | 195.01 | 5.00 |
| R7E | 24+11.33 | Marina liveaboard[1] | 66 | 447.785 | 441.78 | 6.00 |
| R8E | 23+45.60 | Marina liveaboard[1] | 66 | 475.278 | 469.28 | 5.99 |
| R9E | 22+03.71 | Marina liveaboard[1] | 66 | 504.509 | 498.51 | 5.99 |
| R10E | 23+63.04 | Marina liveaboard[1] | 66 | 731.611 | 725.61 | 6.00 |
| R11E | 22+96.38 | Marina liveaboard[1] | 66 | 734.991 | 728.99 | 6.00 |
| R12E | 22+13.63 | Marina liveaboard[1] | 66 | 735.259 | 732.30 | 2.95 |

[1]19 Marina liveaboard tenants were documented on 12/16/2021

### 6.1.1 Methodology

A series of three (3) continuous 10-minute measurement periods were acquired at the designated field measurement locations (ML1 and ML2). Noise levels were measured using the Larson Davis 831 Type I Real Time Sound Level Analyzer (SN 4153 and SN 3557) for the purposes of field verification of the existing measured noise levels. The Larson Davis 831 instrumentation adheres to the following Acoustical Specifications IEC 61672-2013 (Class 1), IEC 60651-2001 (Type 1), IEC 60804-2000 (Type 1), IEC 61260-2001 (Class 1), IEC 61252-2002, ANSI S1.4-2014 Class 1, ANSI S1.11-2004, 1/1 & 1/3 Octave Band Class 1, and ANSI S1.25-1991 (R2007).

The Larson Davis Model CAL 200 Calibrator (SN 8533) with two selectable calibration levels of 94.00 dB and 114.00 dB at 1 KHz was utilized in the measurement analysis and was the manufacturer's specified calibrator. The Larson Davis Model CAL 200 Calibrator (SN 8533) adheres to the following Acoustical Specifications IEC 6LR61, NEDA 1604A, IEC 60942-2003 CLASS 1, and ANSI S1.40-2006.

The entire acoustical system was calibrated before and after each series of (10) minute measurement periods and received an annual factory calibration / certification by the manufacturer's representative.

The sound level analyzer was calibrated at 114.00 dB at 1 KHz and was verified to be within the calibration tolerance. The acoustical and meteorological instrumentation is presented in **Table 3**.

The sound level meter was properly mounted on an instrument tripod approximately five (5) feet above the ground surface at each designated noise measurement location. The manufacturer's specified wind screen was properly mounted on the sound level meter microphone during the field measurement period. Prior to each measurement period, the sound level meter's battery level was verified to be within the manufacturer's recommended tolerance. Vehicle speeds were measured with a Stalker Basic Radar Gun (SN KE5356) and a Decatur Scout Radar Gun (SN SHD-04728) which was calibrated before and after each measurement period.

### 6.1.2 Meteorological Conditions

During each field noise measurement period, meteorological components, such as cloud cover, ambient temperature, wind speed, wind direction, and humidity, were documented. The corresponding meteorological condition associated with each measurement period was recorded with a Kestrel hand held Pocket Weather Tracker. The Kestrel Model 4500NV (SN 678342) was utilized to record all field meteorological conditions associated with this study.

**Table 3**
**Acoustical and Meteorological Instrumentation**

| Instrument Type & Model No. | Manufacturer | Serial No. | Annual Calibration | Calibration Laboratory |
|---|---|---|---|---|
| Larson Davis Model 831 Type I SLM | Larson Davis | 04153 | 07/12/2021 | Larson Davis |
| Larson Davis PRM 831 Preamplifier | Larson Davis | 012499 | 07/12/2021 | Larson Davis |
| Larson Davis 377B02 Microphone | Larson Davis | 113988 | 07/12/2021 | Larson Davis |
| Larson Davis Model 831 Type I SLM | Larson Davis | 03557 | 07/12/2021 | Larson Davis |
| Larson Davis PRM 831 Preamplifier | Larson Davis | 016882 | 07/12/2021 | Larson Davis |
| Larson Davis 377B02 Microphone | Larson Davis | 305224 | 07/12/2021 | Larson Davis |
| Larson Davis Cal 200 Calibrator | Larson Davis | 8533 | 06/25/2021 | Larson Davis |
| Kestrel 4500 NV Pocket Weather Tracker | Kestrel | 678342 | N/A | N/A |
| GPS HOLUX MN M-215+ | HOLUX | SN 215+ L70700105 | N/A | N/A |
| GPS HOLUX MN GR-213 | HOLUX | SN 213U-91802451 | N/A | N/A |
| Stalker Basic Radar Gun | Stalker | SN KE5356 | N/A | N/A |
| Decatur Scout Radar Gun | Decatur | SHD-04728 | N/A | N/A |

### 6.1.3 Field Measurement Data

Field noise measurements, meteorological conditions, and vehicle speeds were documented at two (2) representative locations (ML1 and ML2) adjacent to the S.R. 401 Bridge Replacement area. ML1 and ML2 represents the Park Pavilion (SUL) of the Rodney S. Ketcham Park.

The noise measurement data sheets are presented in **Appendix D.** The field measured noise levels and corresponding vehicle classification information are depicted in the TNM 2.5 model validation results presented in **Table 4**. The noise levels are reported to the 1/10th of a decibel using the LEQ(h) noise descriptor.

### 6.1.4 Model Validation Results

In accordance with Part 2, Chapter 18 Noise (July 1, 2020), of the PD&E Manual, the acceptable range of error between the field noise level measurements and the predicted noise levels is +/- 3 dB(A). If this acceptable range of error can be achieved, TNM version 2.5 inputs can be relied upon for the purposes of predicting the noise levels for the project conditions. The difference between the field measured noise levels and the predicted noise levels was within +/- 3 dB(A). Therefore, the model inputs were determined to be valid for further use with this study. The TNM 2.5 model validation results are presented in **Table 4**. The measurement periods associated with ML1 and ML2 were within the acceptable range of error for validation purposes.

**Table 4**
**TNM 2.5 Model Validation Results**

| Monitoring Site Identification Number | Monitoring Site Location | Begin Time | End Time | Travel Lanes | Distance From Nearest Edge of Travel Lane (Feet) | Cars | | Medium Trucks | | Heavy Trucks | | Buses | | Motorcycles | | Field Measured Noise Level dB(A) | TNM / Computer Predicted Noise Level dB(A) | Difference (Measured-Predicted) dB(A) | Model Validation (+/-) 3 dB(A) Yes / No |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Vehicles Per Hour | Speed (MPH) | Vehicles Per Hour | Speed (MPH) | Vehicles Per Hour | Speed (MPH) | Vehicles Per Hour | Speed (MPH) | Vehicles Per Hour | Speed (MPH) | | | | |
| **Field Validation Site: S.R. 401 Bridge Replacement from SR 528 to Port Canaveral – December 16, 2021** | | | | | | | | | | | | | | | | | | | |
| ML1 (R3E) | Rodney S. Kethcam Park 998 Mullet Dr. Park / Boat Ramp | 11:33:00 | 11:43:00 | SR 401 Bridge NB | 330 | 318 | 32 | 48 | 34 | 78 | 32 | -- | -- | -- | -- | 57.2 | 57.4 | 0.2 | YES |
| | | | | SR 401 Bridge SB | 410 | 174 | 28 | 12 | 26 | 72 | 25 | -- | -- | -- | -- | | | | |
| | | 11:43:00 | 11:53:00 | SR 401 Bridge NB | 330 | 366 | 32 | 12 | 32 | 42 | 34 | -- | -- | -- | -- | 56.8 | 55.3 | -1.5 | YES Helicopter Fly Over |
| | | | | SR 401 Bridge SB | 410 | 186 | 33 | 12 | 33 | 48 | 32 | -- | -- | -- | -- | | | | |
| | | 11:53:00 | 12:03:00 | SR 401 Bridge NB | 330 | 306 | 32 | 18 | 32 | 78 | 31 | 06 | 54 | -- | -- | 56.2 | 56.9 | 0.7 | YES |
| | | | | SR 401 Bridge SB | 410 | 156 | 29 | 12 | 32 | 48 | 26 | -- | -- | -- | -- | | | | |
| | | | | | | | | | | | | | | | | | | | **Average 0.8** |
| ML2 (R5E) | Rodney S. Kethcam Park 998 Mullet Dr. Park / Marina Live Aboard | 11:33:31 | 11:43:31 | SR 401 Bridge NB | 390 | 318 | 32 | 48 | 34 | 78 | 32 | -- | -- | -- | -- | 57.0 | 56.4 | -0.6 | YES |
| | | | | SR 401 Bridge SB | 470 | 174 | 28 | 12 | 26 | 72 | 25 | -- | -- | -- | -- | | | | |
| | | 11:43:31 | 11:53:31 | SR 401 Bridge NB | 390 | 366 | 32 | 12 | 32 | 42 | 34 | -- | -- | -- | -- | 56.7 | 54.3 | -2.4 | YES Helicopter Fly Over |
| | | | | SR 401 Bridge SB | 470 | 186 | 33 | 12 | 33 | 48 | 32 | -- | -- | -- | -- | | | | |
| | | 11:53:31 | 12:03:31 | SR 401 Bridge NB | 390 | 306 | 32 | 18 | 32 | 78 | 31 | 06 | 54 | -- | -- | 57.1 | 55.9 | -1.2 | YES |
| | | | | SR 401 Bridge SB | 470 | 156 | 29 | 12 | 32 | 48 | 26 | -- | -- | -- | -- | | | | |
| | | | | | | | | | | | | | | | | | | | **Average 1.4** |
| Note: All vehicle volumes represent the hourly volume (10-minute volumes multiplied by 6) | | | | | | | | | | | | | | | | | | | **Overall Average 1.1** |

## 6.2 PREDICTED NOISE LEVELS AND ABATEMENT ANALYSIS

The predicted noise levels and applicable abatement analysis measures were developed based upon the modeling criteria described in Part 2, Chapter 18 Noise (July 1, 2020), of the PD&E Manual and the Traffic Noise Modeling and Analysis Practitioners Handbook dated January 1, 2016. Specific input data for TNM version 2.5 is required to generate computer predicted noise levels associated with the project area under evaluation. Twelve (12) noise sensitive receptor locations representative of the Rodney S. Ketcham Park/Boat Ramp (SUL) and a local marina with some marina liveaboard tenants was evaluated. The noise sensitive locations are depicted in the Noise Analysis Map presented in **Appendix C**.

### 6.2.1 Data Sources

The data input sources that TNM version 2.5 relied upon for the purposes of predicting noise levels for this study are as follows: roadways, receptors, barriers, ground zones, and terrain line data (state plane coordinates), project traffic data (i.e., vehicle volumes, vehicle mix, and vehicle speeds), distance(s) from the center of each roadway to the receptor, the widths of the roadway and lanes, the height of the receptor, barrier and buffer information including embankments, areas of water (e.g., Canaveral Inlet), paved surfaces, building rows or other structures, the type of propagation paths (hard vs. soft), variations in terrain between the receptors and the roadway, and any changes in grade. Each of these factors can influence the predicted noise levels. The coordinate geometry for this study was developed with the State Plane Coordinate System. Elevation data was provided in the project survey file (TIN File) and LIDAR data provided by the Survey Sub Consultant.

### 6.2.2 Predicted Noise Levels

The TNM 2.5 predicted noise levels for the project area are presented in **Table 5**. The noise study evaluated the following conditions: Existing Year 2019 Condition and the Design Year 2050 No-Build and Build Alternative Condition (Preferred Alternative). The predicted noise levels were evaluated at two (2) Noise Sensitive Areas which represent twelve (12) noise sensitive receptor locations.

### 6.2.3 Noise Sensitive Area 1

Noise Sensitive Area 1 represents the Rodney S. Ketcham Park/Boat Ramp (Special Use Location) on the east side of the S.R. 401 Bridge. This area is representative of recreational areas and represents 6 noise sensitive receptor locations which will experience the following computer predicted sound levels: R1E-R6E**:**

- Existing Year (2019) Condition: 55.3 dB(A) to 60.2 dB(A).
- No-Build Alternative Year (2050) Condition: 62.3 dB(A) to 67.3 dB(A).
- Build Alternative Year (2050) Condition: 61.2 dB(A) to 66.0 dB(A).

### 6.2.4 Noise Sensitive Area 2

Noise Sensitive Area 2 represents a local marina with some liveaboard tenants on the east side of the S.R. 401 Bridge. This area is representative of a local marina and represents 6 noise sensitive receptor locations which will experience the following computer predicted sound levels: R7E-R12E

- Existing Year (2019) Condition: 50.7 dB(A) to 55.2 dB(A).
- No-Build Alternative Year (2050) Condition: 57.2 dB(A) to 61.8 dB(A).
- Build Alternative Year (2050) Condition: 56.4 dB(A) to 61.0 dB(A).

**Table 5**
**TNM 2.5 Predicted Noise Levels**
**dB(A)**
**Build Alternative (Preferred Alternative)**

| Noise Receptor Number | Number of Noise Sensitive Sites Represented | Activity Category | FDOT NAC | (2019) Existing Year dB(A) | (2050) No-Build Alternative dB(A) | (2050) Build Year Alternative dB(A) | Difference Between Build and Existing dB(A) | Approach or Exceed FDOT NAC | Consider Abatement |
|---|---|---|---|---|---|---|---|---|---|
| R1E | 1 | C | 66 | 60.2 | 67.3 | 66.0 | 5.8 | Y | N[1] |
| R2E | 1 | C | 66 | 59.1 | 66.1 | 64.8 | 5.7 | N | N |
| R3E | 1 | C | 66 | 57.0 | 64.0 | 62.7 | 5.7 | N | N |
| R4E | 1 | C | 66 | 56.6 | 63.7 | 62.3 | 5.7 | N | N |
| R5E | 1 | C | 66 | 55.3 | 62.3 | 61.2 | 5.9 | N | N |
| R6E | 1 | C | 66 | 59.5 | 66.6 | 65.2 | 5.7 | N | N |
| R7E | 1 | B | 66 | 55.2 | 61.8 | 61.0 | 5.8 | N | N |
| R8E | 1 | B | 66 | 54.5 | 61.2 | 60.3 | 5.8 | N | N |
| R9E | 1 | B | 66 | 53.6 | 60.4 | 59.4 | 5.8 | N | N |
| R10E | 1 | B | 66 | 51.8 | 58.2 | 57.4 | 5.6 | N | N |
| R11E | 1 | B | 66 | 51.4 | 57.8 | 57.0 | 5.6 | N | N |
| R12E | 1 | B | 66 | 50.7 | 57.2 | 56.4 | 5.7 | N | N |

**N[1] Single impacted receptor locations do not meet the Noise Reduction Factor (Feasibility Factor)**

## 6.3 NOISE IMPACT ANALYSIS

The traffic noise levels predicted at the twelve (12) noise sensitive receptor locations under evaluation approached or exceeded the applicable FDOT NAC at one (1) single receptor location (NSA 1, R1E); however, potential noise abatement measures were not feasible based on the Department's Feasibility Factor (Noise Reduction Factor). The impacted location was identified as NSA 1, Receptor R1E, which is an outside pavilion seating area (Special Use Location - Rodney S. Ketcham Park/Boat Ramp) The remaining adjacent pavilions were not impacted.

Potential noise barrier placement is the most effective noise abatement measure utilized by the Department. The Department has established feasibility factors which are used to determine the viability of potential noise barrier placement. Potential noise abatement measures were not evaluated at NSA 1, Receptor R1E, based on the Department's Feasibility Factor (Noise Reduction Factor) for single receptor impact locations. Receptor R1E will experience a noise level of 66 dB(A) in the Build Alternative year 2050. No other noise impacts were identified.

The feasibility factor associated with a barriers noise reduction is the Noise Reduction Factor. FDOT's Noise Reduction Factor requires that two (2) or more impacted receptors achieve a 5 dB(A) reduction or greater in order to be considered feasible. There was only one (1) single impact receptor location; therefore, the Feasibility Factor could not be achieved and potential noise abatement measures were not considered.

The remaining noise sensitive areas adjacent to the S.R. 401 Bridge did not approach or exceed the applicable NAC for the Activity Categories evaluated; therefore, potential noise abatement measures were not considered.

# CONCLUSIONS

The Florida Department of Transportation (FDOT) District 5 has conducted this Project Development and Environment (PD&E) Study to determine the engineering and environmental effects of the proposed S.R.401 Bridge Replacement in Brevard County. This PD&E Study documents the need for capacity and multimodal improvements, and presents the procedures utilized to develop and evaluate a preferred alternative. The PD&E Study satisfies the requirements of FDOT and follows the process for a Categorical Exclusion (CE) Type 2 document. The PD&E Study process was developed in compliance with the National Environmental Policy Act (NEPA), and other applicable federal and state regulations.

The noise study identified two (2) Noise Sensitive Areas (NSA) which were evaluated for potential noise impacts for the following conditions: Existing Year 2019 Condition and the Design Year 2050 No-Build and Build Alternative Condition (Preferred Alternative).

The noise sensitive areas evaluated are representative of twelve (12) noise sensitive receptor locations. The computer modeled noise receptor locations are as follows: the Rodney S. Ketcham Park/Boat Ramp (SUL) and a local marina with some liveaboard tenants.

The traffic noise levels predicted at the twelve (12) noise sensitive receptor locations under evaluation approached or exceeded the applicable FDOT NAC at one (1) single receptor location (NSA 1, R1E); however, potential noise abatement measures were not feasible based on the Department's Feasibility Factor (Noise Reduction Factor). The impacted location was identified as NSA 1, Receptor R1E, which is an outside pavilion seating area (Special Use Location - Rodney S. Ketcham Park/Boat Ramp) The remaining adjacent pavilions were not impacted.

Potential noise abatement measures were not evaluated at NSA 1, Receptor R1E, based on the Department's Feasibility Factor (Noise Reduction Factor) for single receptor impact locations. Receptor R1E will experience a noise level of 66 dB(A) in the Build Alternative year 2050.

The remaining noise sensitive areas did not approach or exceed the appropriate NAC for the Activity Categories evaluated; therefore, potential noise abatement measures were not considered.

There are no other noise sensitive areas located within the project corridor as of the date of this report and was verified through one (1) active building permit request. There are no other noise sources located adjacent to the study corridor which could interfere with the existing ambient highway traffic noise levels.

The proposed Bridge Replacement (Preferred Alternative) is expected to have a perceivable noise level increase on the adjacent noise sensitive receptor locations. The predicted noise level increase over the existing condition for the Preferred Alternative is approximately 5.6 to 5.9 dB(A).

Statement of Likelihood

The Florida Department of Transportation is committed to the construction of feasible and reasonable noise abatement measures at the noise-impacted locations identified in Table 5 and Appendix C (Noise Analysis Map) 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 analysis during the final design process support the need, feasibility and reasonableness of providing abatement;
3. Cost analysis indicates the cost of the noise barrier(s) will not exceed the cost reasonable criterion;
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.

# 8.0 CONSTRUCTION NOISE AND VIBRATION

The study corridor is situated adjacent to a park/boat ramp and a local marina with some liveaboard tenants. The noise sensitive locations are comprised of a Special Use Location (park/boat ramp) and a local marina. The S.R.401 corridor limits extend from the south-north terminus of the existing bridge.

Generally, there does not appear to be any locations which may require special noise and vibration control consideration during the construction process. Special consideration as it relates to ground borne vibration impacts should be evaluated again, prior to the construction improvements.

The noise sensitive locations are depicted in the Noise Analysis Map presented in **Appendix C**. Noise and vibration impacts may occur due to movement and operation of heavy equipment and construction activities.

Noise control measures will include those contained in FDOT Standard Specifications for Road and Bridge Construction[5]. Special consideration may be required to minimize noise and vibration impacts resulting from the expected bridge construction process.

These considerations could include any of the following: limitations on the construction activities, temporary noise abatement structures around noisy equipment, and methods to measure and reduce ground borne vibration impacts.

A list of typical construction noise and vibration sensitive sites can be found on page 18-47 of Chapter 18 (Topic No. 650-000-001, July 1, 2020). A summary of potential noise and vibration sensitive sites has been provided in **Appendix E**.

An assessment of these sites should take place prior to construction to mitigate potential impacts. Section 335.02, Florida Statutes, in 2003, exempts FDOT from compliance with local ordinances. However, FDOT policy is to follow the requirement of local ordinances to the extent that it is reasonable. If unanticipated noise and / or vibration issues arise during the construction process, the Project Engineer, in concert with the District Noise Specialist and the Contractor, may investigate additional methods of controlling these impacts on a case-by- case basis.

# 9.0 COMMUNITY COORDINATION

A copy of the Noise Study Report will be provided to the appropriate local planning and zoning officials in Brevard County for their use in land development compatibility and to identify noise sensitive sites that are proposed in incompatible areas where future noise impacts are expected to occur. To assist local planning officials, the distances to the 66 dB(A) noise contours were estimated by evaluating the results of the computer modeled receptor location(s) identified in this analysis. The 66 dB(A) noise contour delineates the distance from the edge of the nearest proposed travel lane that an approach of the NAC for Activity Category B and Category C is expected to occur for the 2050 design year traffic condition.

This study has identified that Activity Category B and C locations (Marina liveaboard and marina park/boat ramp) were present under the existing study corridor conditions. For the Build Alternative (Preferred Alternative), the approximate distance from the edge of the nearest proposed travel lane to the 66 dB(A) noise contour is approximately 159 Ft. on the east side of S.R.401 at the boat ramp / park and marina liveaboard. Future noise sensitive development should only occur beyond the distances where noise impacts have been identified.

The set-back distances referenced above account only for the traffic noise associated with the S.R. 401 and do not take into consideration the noise levels associated with other noise sources. The noise contours are depicted on the Noise Analysis Map presented in **Appendix C.** The noise contour table is presented in **Appendix F**.

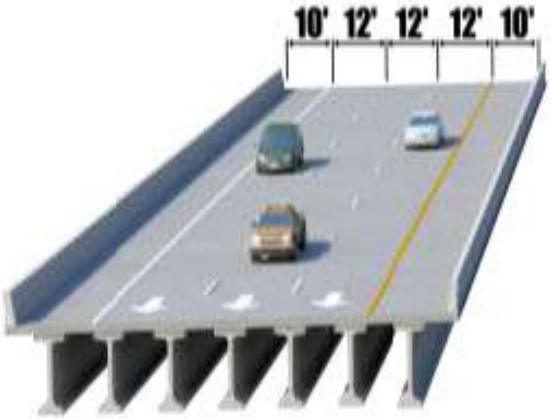
Further, the distances to the 66 dB(A) noise contours do not consider the effects of shielding from adjacent buildings, significant changes in roadway elevation, unusual topographic features, abnormal atmospheric conditions, or local traffic volumes from adjacent roadways.

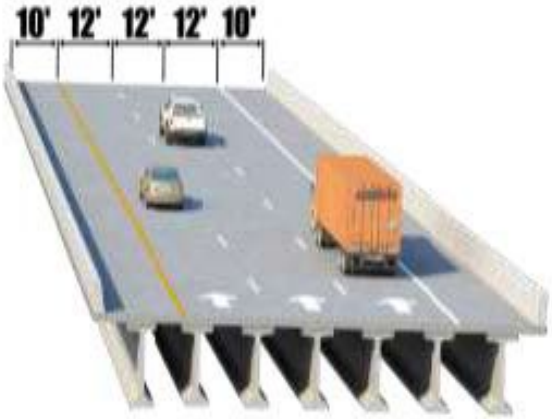
Each of these factors could either increase or decrease the estimated distance to the 66 dB(A) noise contours**.** Therefore, the setback distances shown in **Appendix F** are approximate values and should be considered as general guidance information.

# 10.0 REFERENCES

1. Procedures for Abatement of Highway Traffic Noise and Construction Noise; FHWA; April 2001.
2. FDOT PD&E Manual, Part 2, Chapter 18 (Noise Policy); FDOT; Tallahassee, Florida; July 1, 2020.
3. The Traffic Noise Modeling and Analysis Practitioners Handbook; FDOT; Tallahassee, Florida; January 1, 2016.
4. Measurement of Highway-Related Noise (FHWA-PD-96-046); FHWA; May 1996.
5. Standard Specifications for Road and Bridge Construction; FDOT; Tallahassee, Florida; 2013.

# Appendix A | Typical Section – Preferred Alternative


10' 12' 12' 12' 10'


10' 12' 12' 12' 10'

# Appendix B | Traffic Data for Noise Study

**TRAFFIC DATA FOR NOISE STUDIES - SUMMARY OUTPUT**
**FDOT DISTRICT 5**

| | |
|---|---|
| **Federal Aid Number(s):** | 0 |
| **FPID Number(s):** | 444787-1-22-01 |
| **State/Federal Route No.:** | 0 |
| **Road Name:** | SR 401 |
| **Project Description:** | SR 401 Bridge Replacement Project |
| **Segment Description:** | SR 401 North of SR 528 |
| **Section Number:** | 0 |
| **Mile Post To/From:** | 0 |

| | | | | |
|---|---|---|---|---|
| **Existing Facility:** | | D = | **66.67%** | % |
| | | T24 = | **11.00%** | % of 24 Hour Volume |
| **Year:** | **2019** | Tpeak = | **13.00%** | % of Design Hour Volume |
| | | MT = | **4.07%** | % of Design Hour Volume |
| **LOS C Peak Hour Directional Volume:** | **2940** | HT = | **13.56%** | % of Design Hour Volume |
| **Demand Peak Hour Volume:** | **450** | B = | **0.53%** | % of Design Hour Volume |
| **Posted Speed:** | **45** | MC = | **0.20%** | % of Design Hour Volume |

| | | | | |
|---|---|---|---|---|
| **No Build Alternative (Design Year):** | | D = | **66.67%** | % |
| | | T24 = | **19.00%** | % of 24 Hour Volume |
| **Year:** | **2050** | Tpeak = | **10.00%** | % of Design Hour Volume |
| | | MT = | **4.07%** | % of Design Hour Volume |
| **LOS C Peak Hour Directional Volume:** | **2940** | HT = | **13.56%** | % of Design Hour Volume |
| **Demand Peak Hour Volume:** | **2600** | B = | **0.53%** | % of Design Hour Volume |
| **Posted Speed:** | **45** | MC = | **0.20%** | % of Design Hour Volume |

| | | | | |
|---|---|---|---|---|
| **Build Alternative (Design Year):** | | D = | **66.67%** | % |
| | | T24 = | **19.00%** | % of 24 Hour Volume |
| **Year:** | **2050** | Tpeak = | **10.00%** | % of Design Hour Volume |
| | | MT = | **4.07%** | % of Design Hour Volume |
| **LOS C Peak Hour Directional Volume:** | **2940** | HT = | **13.56%** | % of Design Hour Volume |
| **Demand Peak Hour Volume:** | **2600** | B = | **0.53%** | % of Design Hour Volume |
| **Posted Speed:** | **45** | MC = | **0.20%** | % of Design Hour Volume |

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

Prepared By: Akram Hussein (Print Name) Akram Hussein (Signature) Date: 6/20/2022

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

FDOT Reviewer: ason Learned (Print Name) Jason Learned (Signature) Date: 6/24/2022

**TRAFFIC DATA FOR NOISE STUDIES - SUMMARY OUTPUT**
**FDOT DISTRICT 5**

| | |
|---|---|
| **Federal Aid Number(s):** | 0 |
| **FPID Number(s):** | 444787-1-22-01 |
| **State/Federal Route No.:** | 0 |
| **Road Name:** | SR 401 |
| **Project Description:** | SR 401 Bridge Replacement Project |
| **Segment Description:** | SR 401 North of Charles Rowland Dr |
| **Section Number:** | 0 |
| **Mile Post To/From:** | 0 |

| | | | | |
|---|---|---|---|---|
| **Existing Facility:** | | D = | **71.56%** | % |
| | | T24 = | **13.00%** | % of 24 Hour Volume |
| **Year:** | **2019** | Tpeak = | **5.00%** | % of Design Hour Volume |
| | | MT = | **4.07%** | % of Design Hour Volume |
| **LOS C Peak Hour Directional Volume:** | **1910** | HT = | **13.56%** | % of Design Hour Volume |
| **Demand Peak Hour Volume:** | **940** | B = | **0.53%** | % of Design Hour Volume |
| **Posted Speed:** | **45** | MC = | **0.20%** | % of Design Hour Volume |

| | | | | |
|---|---|---|---|---|
| **No Build Alternative (Design Year):** | | D = | **71.56%** | % |
| | | T24 = | **19.00%** | % of 24 Hour Volume |
| **Year:** | **2050** | Tpeak = | **11.00%** | % of Design Hour Volume |
| | | MT = | **4.07%** | % of Design Hour Volume |
| **LOS C Peak Hour Directional Volume:** | **1910** | HT = | **13.56%** | % of Design Hour Volume |
| **Demand Peak Hour Volume:** | **1510** | B = | **0.53%** | % of Design Hour Volume |
| **Posted Speed:** | **45** | MC = | **0.20%** | % of Design Hour Volume |

| | | | | |
|---|---|---|---|---|
| **Build Alternative (Design Year):** | | D = | **71.56%** | % |
| | | T24 = | **19.00%** | % of 24 Hour Volume |
| **Year:** | **2050** | Tpeak = | **11.00%** | % of Design Hour Volume |
| | | MT = | **4.07%** | % of Design Hour Volume |
| **LOS C Peak Hour Directional Volume:** | **1910** | HT = | **13.56%** | % of Design Hour Volume |
| **Demand Peak Hour Volume:** | **1510** | B = | **0.53%** | % of Design Hour Volume |
| **Posted Speed:** | **45** | MC = | **0.20%** | % of Design Hour Volume |

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

Prepared By: Akram Hussein (Print Name) Akram Hussein (Signature) Date: 6/20/2022

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

FDOT Reviewer: Jason Learned (Print Name) Jason Learned (Signature) Date: 6/24/2022

**TRAFFIC DATA FOR NOISE STUDIES - SUMMARY OUTPUT**
**FDOT DISTRICT 5**

| | |
|---|---|
| **Federal Aid Number(s):** | 0 |
| **FPID Number(s):** | 444787-1-22-01 |
| **State/Federal Route No.:** | 0 |
| **Road Name:** | SR 401 |
| **Project Description:** | SR 401 Bridge Replacement Project |
| **Segment Description:** | Ramp from SR 401 SB to SR 528 WB |
| **Section Number:** | 0 |
| **Mile Post To/From:** | 0 |

| | | | | |
|---|---|---|---|---|
| **Existing Facility:** | | D = | **0.00%** | % |
| | | T24 = | **16.00%** | % of 24 Hour Volume |
| **Year:** | **2019** | Tpeak = | **30.00%** | % of Design Hour Volume |
| | | MT = | **1.66%** | % of Design Hour Volume |
| **LOS C Peak Hour Directional Volume:** | **444** | HT = | **15.32%** | % of Design Hour Volume |
| **Demand Peak Hour Volume:** | **200** | B = | **0.46%** | % of Design Hour Volume |
| **Posted Speed:** | **35** | MC = | **0.32%** | % of Design Hour Volume |

| | | | | |
|---|---|---|---|---|
| **No Build Alternative (Design Year):** | | D = | **0.00%** | % |
| | | T24 = | **26.00%** | % of 24 Hour Volume |
| **Year:** | **2050** | Tpeak = | **33.00%** | % of Design Hour Volume |
| | | MT = | **1.66%** | % of Design Hour Volume |
| **LOS C Peak Hour Directional Volume:** | **444** | HT = | **15.32%** | % of Design Hour Volume |
| **Demand Peak Hour Volume:** | **750** | B = | **0.46%** | % of Design Hour Volume |
| **Posted Speed:** | **35** | MC = | **0.32%** | % of Design Hour Volume |

| | | | | |
|---|---|---|---|---|
| **Build Alternative (Design Year):** | | D = | **0.00%** | % |
| | | T24 = | **26.00%** | % of 24 Hour Volume |
| **Year:** | **2050** | Tpeak = | **33.00%** | % of Design Hour Volume |
| | | MT = | **1.66%** | % of Design Hour Volume |
| **LOS C Peak Hour Directional Volume:** | **444** | HT = | **15.32%** | % of Design Hour Volume |
| **Demand Peak Hour Volume:** | **750** | B = | **0.46%** | % of Design Hour Volume |
| **Posted Speed:** | **35** | MC = | **0.32%** | % of Design Hour Volume |

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

Prepared By: Akram Hussein (Print Name) Akram Hussein (Signature) Date: 6/20/2022

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

FDOT Reviewer: Jason Learned (Print Name) Jason Learned (Signature) Date: 6/24/2022

**TRAFFIC DATA FOR NOISE STUDIES - SUMMARY OUTPUT**
**FDOT DISTRICT 5**

| | |
|---|---|
| **Federal Aid Number(s):** | 0 |
| **FPID Number(s):** | 444787-1-22-01 |
| **State/Federal Route No.:** | 0 |
| **Road Name:** | SR 401 |
| **Project Description:** | SR 401 Bridge Replacement Project |
| **Segment Description:** | Ramp from SR 528 WB to SR 401 NB |
| **Section Number:** | 0 |
| **Mile Post To/From:** | 0 |

| | | | | |
|---|---|---|---|---|
| **Existing Facility:** | | D = | **0.00%** | % |
| | | T24 = | **8.00%** | % of 24 Hour Volume |
| **Year:** | **2019** | Tpeak = | **6.00%** | % of Design Hour Volume |
| | | MT = | **2.80%** | % of Design Hour Volume |
| **LOS C Peak Hour Directional Volume:** | **876** | HT = | **4.13%** | % of Design Hour Volume |
| **Demand Peak Hour Volume:** | **350** | B = | **0.32%** | % of Design Hour Volume |
| **Posted Speed:** | **35** | MC = | **0.09%** | % of Design Hour Volume |

| | | | | |
|---|---|---|---|---|
| **No Build Alternative (Design Year):** | | D = | **0.00%** | % |
| | | T24 = | **12.00%** | % of 24 Hour Volume |
| **Year:** | **2050** | Tpeak = | **5.00%** | % of Design Hour Volume |
| | | MT = | **2.80%** | % of Design Hour Volume |
| **LOS C Peak Hour Directional Volume:** | **876** | HT = | **4.13%** | % of Design Hour Volume |
| **Demand Peak Hour Volume:** | **1100** | B = | **0.32%** | % of Design Hour Volume |
| **Posted Speed:** | **35** | MC = | **0.09%** | % of Design Hour Volume |

| | | | | |
|---|---|---|---|---|
| **Build Alternative (Design Year):** | | D = | **0.00%** | % |
| | | T24 = | **12.00%** | % of 24 Hour Volume |
| **Year:** | **2050** | Tpeak = | **5.00%** | % of Design Hour Volume |
| | | MT = | **2.80%** | % of Design Hour Volume |
| **LOS C Peak Hour Directional Volume:** | **876** | HT = | **4.13%** | % of Design Hour Volume |
| **Demand Peak Hour Volume:** | **1100** | B = | **0.32%** | % of Design Hour Volume |
| **Posted Speed:** | **35** | MC = | **0.09%** | % of Design Hour Volume |

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

Prepared By: Akram Hussein (Print Name) Akram Hussein (Signature) Date: 6/20/2022

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

FDOT Reviewer: Jason Learned (Print Name) Jason Learned (Signature) Date: 6/24/2022

| TNM 2.5 Traffic Volume Input | | | | |
|---|---|---|---|---|
| Year / Roadway Segment / SR-401 Bridge Replacement | LOS C Peak Hour Directional Volume[1] | Demand Peak Hour Volume[2] | Posted Speed | Traffic Volume for TNM 2.5 |
| **Existing (2019)** | | | | |
| SR 401 North of SR 528 | 2,940 | **450** | 45 | **450** |
| **No Build (2050)** | | | | |
| SR 401 North of SR 528 | 2,940 | **2,600** | 45 | **2,600** |
| **Build (2050)** | | | | |
| SR 401 North of SR 528 | 2,940 | **2,600** | 45 | **2,600** |
| | | | | |
| **Existing (2019)** | | | | |
| SR 401 North of Charles Rowland Dr. | 1,910 | **940** | 45 | **940** |
| **No Build (2050)** | | | | |
| SR 401 North of Charles Rowland Dr. | 1,910 | **1,510** | 45 | **1,510** |
| **Build (2050)** | | | | |
| SR 401 North of Charles Rowland Dr. | 1,910 | **1,510** | 45 | **1,510** |
| | | | | |
| **Existing (2019)** | | | | |
| Ramp from SR 401 SB to SR 528 WB | N/A | **200** | 35 | **200** |
| **No Build (2050)** | | | | |
| Ramp from SR 401 SB to SR 528 WB | N/A | **750** | 35 | **750** |
| **Build (2050)** | | | | |
| Ramp from SR 401 SB to SR 528 WB | N/A | **750** | 35 | **750** |
| | | | | |
| **Existing (2019)** | | | | |
| Ramp from SR 528 WB to SR 401 NB | N/A | **350** | 35 | **350** |
| **No Build (2050)** | | | | |
| Ramp from SR 528 WB to SR 401 NB | N/A | **1,100** | 35 | **1,100** |
| **Build (2050)** | | | | |
| Ramp from SR 528 WB to SR 401 NB | N/A | **1,100** | 35 | **1,100** |

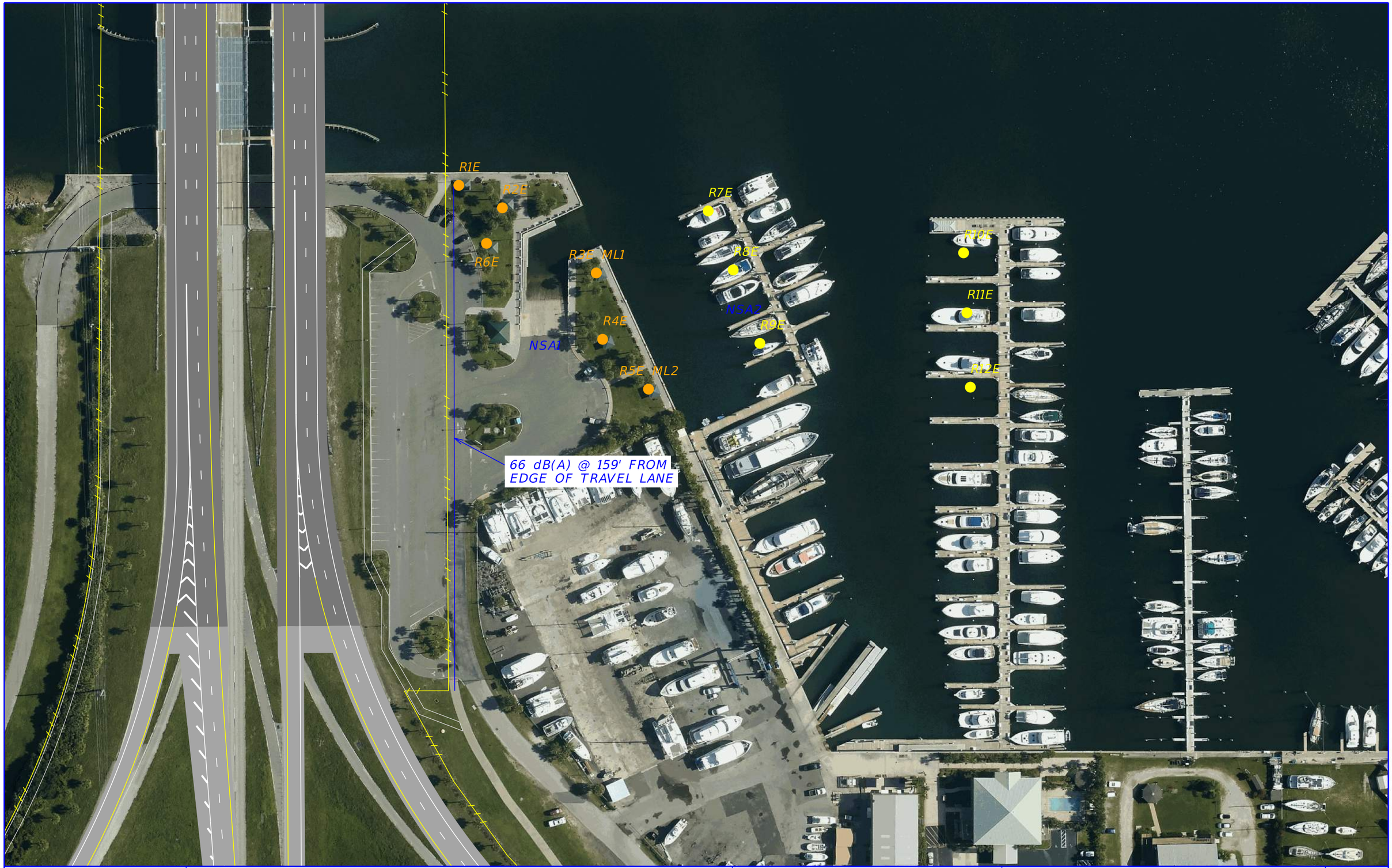
[1] LOS C traffic volume applied to each roadway direction. Ramps are Demand Only.

[2] Demand traffic volume applied to each roadway direction based on D Factor.

# SR 401/Bridge Replacement Peak Hour Traffic Volumes For TNM 2.5 Model

| | Existing Year 2019 Condition | | | | No Build Alternative 2050 Condition | | | Build Alternative 2050 Condition | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SR 401 N. of SR 528 | **450 VPH** | **Cars** | 244.0000 | 123.0000 | **2,600 VPH** | 1415.0000 | 707.0000 | **2,600 VPH** | 1415.0000 | 707.0000 |
| | **Demand** | **MT** | 12.0000 | 6.0000 | **Demand** | 71.0000 | 35.0000 | **Demand** | 71.0000 | 35.0000 |
| | D=66.67% | **HT** | 41.0000 | 20.0000 | D=66.67% | 235.0000 | 118.0000 | D=66.67% | 235.0000 | 118.0000 |
| | | **Bus** | 2.0000 | 1.0000 | | 9.0000 | 5.0000 | | 9.0000 | 5.0000 |
| | | **MC** | 1.0000 | 0.0000 | | 3.0000 | 2.0000 | | 3.0000 | 2.0000 |
| | | **45 MPH** | 300.0000 | 150.0000 | | 1733.0000 | 867.0000 | | 1733.0000 | 867.0000 |
| | **Existing Year 2019 Condition** | | | | **No Build Alternative 2050 Condition** | | | **Build Alternative 2050 Condition** | | |
| SR 401 N. of Charles Rowland Dr. | **940 VPH** | **Cars** | 550.0000 | 219.0000 | **1,510 VPH** | 882.0000 | 352.0000 | **1,510 VPH** | 882.0000 | 352.0000 |
| | **Demand** | **MT** | 27.0000 | 11.0000 | **Demand** | 44.0000 | 17.0000 | **Demand** | 44.0000 | 17.0000 |
| | D=71.56% | **HT** | 91.0000 | 36.0000 | D=71.56% | 147.0000 | 58.0000 | D=71.56% | 147.0000 | 58.0000 |
| | | **Bus** | 4.0000 | 1.0000 | | 6.0000 | 2.0000 | | 6.0000 | 2.0000 |
| | | **MC** | 1.0000 | 0.0000 | | 2.0000 | 0.0000 | | 2.0000 | 0.0000 |
| | | **45 MPH** | 673.0000 | 267.0000 | | 1081.0000 | 429.0000 | | 1081.0000 | 429.0000 |
| | **Existing Year 2019 Condition** | | | | **No Build Alternative 2050 Condition** | | | **Build Alternative 2050 Condition** | | |
| Ramp from SR 401 SB to SR 528 WB | **200 VPH** | **Cars** | 165.0000 | | **750 VPH** | 618.0000 | | **750 VPH** | 618.0000 | |
| | **Demand** | **MT** | 3.0000 | | **Demand** | 12.0000 | | **Demand** | 12.0000 | |
| | D=0.00% | **HT** | 31.0000 | | D=0.00% | 115.0000 | | D=0.00% | 115.0000 | |
| | RAMP | **Bus** | 1.0000 | | RAMP | 3.0000 | | RAMP | 3.0000 | |
| | | **MC** | 0.0000 | | | 2.0000 | | | 2.0000 | |
| | | **35 MPH** | 200.0000 | | | 750.0000 | | | 750.0000 | |
| | **Existing Year 2019 Condition** | | | | **No Build Alternative 2050 Condition** | | | **Build Alternative 2050 Condition** | | |
| Ramp from SR 528 WB to SR 401 NB | **350 VPH** | **Cars** | 325.0000 | | **1,100 VPH** | 1019.0000 | | **1,100 VPH** | 1019.0000 | |
| | **Demand** | **MT** | 10.0000 | | **Demand** | 31.0000 | | **Demand** | 31.0000 | |
| | D=0.00% | **HT** | 14.0000 | | D=0.00% | 45.0000 | | D=0.00% | 45.0000 | |
| | RAMP | **Bus** | 1.0000 | | RAMP | 4.0000 | | RAMP | 4.0000 | |
| | | **MC** | 0.0000 | | | 1.0000 | | | 1.0000 | |
| | | **35 MPH** | 350.0000 | | | 1100.0000 | | | 1100.0000 | |
| | | | Peak NB | Off Peak SB | | Peak NB | Off Peak SB | | Peak NB | Off Peak SB |

# Appendix C | Noise Analysis Map




FDOT

FLORIDA DEPARTMENT
OF TRANSPORTATION
DISTRICT FIVE

LEGEND

- B - MARINA LIVE-A-BOARD 66.0 dB(A)
- C - OTHER SENTIVE LAND USES 66.0 dB(A)
- NOISE CONTOUR LINE 66.0 dB(A)

ML# - MONITORING LOCATION
NSA# - NOISE SENITIVE AREA

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

| ROAD NO. | COUNTY | FINANCIAL PROJECT ID |
|---|---|---|
| SR 401 | BREVARD | 444787-1 |

# NOISE ANALYSIS MAP
# PREFERRED ALTERNATIVE

SHEET NO.

# Appendix D | Noise Measurement Data Sheets

Site/Run #: ML1
LD 001

# Noise Measurement Data Sheet

**Date:** 12/16/2021

**Measurement Taken By:** Bernard Kinney Jr., INCE

11:33:00-12:03:00

**Project:** SR-401 Bridge Replacement FPID No. 444787-1-22-01 FDOT 5/ Parsons

**Site ID:** ML1 Park / Boat Ramp

**Weather Conditions:** Clear: x Partly Cloudy: Cloudy: Other:

Temperature: Start: 83.6 End: 83.5 (°F)

Wind Direction: Start: NW 314 End: NNW334

Wind Speed (Start): Min: 0.0 Max: 1.7 Average: 1.4 (mph)

Wind Speed (End): Min: 0.0 Max: 3.2 Average: 2.7 (mph)

Humidity: Start: 63.3 End: 63.0 (%)

**Equipment Data**

Sound Level Meter: Larson Davis 831-Type 1 Serial Number: 0003557

Date of Last Traceable Calibration: SLM /PRM/MIC 07/12/2021 CAL 06/25/2021

Calibration: Start: 114.00 End: 114.00 Difference: 0.21 dB

Battery: Start: 5.7V 95.7 % End: 5.9 V 98.4 %

Weighting Scale: A Response: Slow

Calibrator: Larson Davis CAL 200 Serial Number: 8533

**Results:** Leq: 57.2/56.8/56.2
in dB(A)

Major Noise Sources: SR 401 Bridge to Port Canaveral

Background Noise Sources:

Other Notes/Observations:

SR 401 PD&E Noise Study From S.R. 528 to north of Canaveral Barge Canal

MN PRM831 SN 016882 MN 377B02 SN 305224 GPS HOLUX MN GR-213 SN 213U-91802451

Observed Traffic Data Site Sketch on Reverse Side

**Observed Traffic Data** Site #: ML1 Run #: 1

See Table 4

| Vehicle Types | NB Direction | | SB Direction | | | |
|---|---|---|---|---|---|---|
| | Volume | Speed | Volume | Speed | Volume | Speed |
| Auto | | | | | | |
| Medium Truck | | | | | | |
| Heavy Truck | | | | | | |
| Bus | | | | | | |
| Motorcycle | | | | | | |

**Site Sketch**

## General Information

| | | |
|---|---|---|
| Serial Number | 03557 | |
| Model | Model 831 | |
| Firmware Version | 2.403 | |
| Filename | 831_Data.001 | |
| User | Bernard Kinney Jr., INCE | |
| Job Description | Model Validation Measurements | |
| Location | SR-401 Bridge Replacement / Port Canaveral | |
| | | |
| Measurement Description | Parsons / SR401 Validation FPID 444787-1 | |
| Latitude | 28° 24.514' | |
| Longitude | -80° 37.853' | |
| Altitude | -3.0 | ft |
| Start Time | Thursday, 2021 December 16 11:33:00 | |
| Stop Time | Thursday, 2021 December 16 12:03:00 | |
| Duration | 00:30:00.0 | |
| Run Time | 00:30:00.0 | |
| Pause | 00:00:00.0 | |
| Pre Calibration | Thursday, 2021 December 16 11:15:52 | |
| Post Calibration | Thursday, 2021 December 16 12:18:13 | |
| Calibration Deviation | 0.21 dB | |

## Note

ML1 / R3E Park- Boat Ramp

## Overall Data

| | | | |
|---|---|---|---|
| LAeq | | 56.8 | dB |
| LASmax | 2021 Dec 16 11:48:49 | 67.6 | dB |
| LApeak (max) | 2021 Dec 16 11:48:48 | 87.7 | dB |
| LASmin | 2021 Dec 16 11:43:25 | 50.9 | dB |
| LCeq | | 70.5 | dB |
| LAeq | | 56.8 | dB |
| LCeq - LAeq | | 13.8 | dB |
| LAIeq | | 58.7 | dB |
| LAeq | | 56.8 | dB |
| LAIeq - LAeq | | 2.0 | dB |
| Ldn | | 56.8 | dB |
| LDay 07:00-22:00 | | 56.8 | dB |
| LNight 22:00-07:00 | | --- | dB |
| Lden | | 56.8 | dB |
| LDay 07:00-19:00 | | 56.8 | dB |
| LEvening 19:00-22:00 | | --- | dB |
| LNight 22:00-07:00 | | --- | dB |
| LAE | | 89.3 | dB |
| EA | | 94.67 | µPa²h |
| EA8 | | 1.515 | mPa²h |
| EA40 | | 7.574 | mPa²h |
| # Overloads | | 0 | |
| Overload Duration | | 0.0 | s |
| # OBA Overloads | | 0 | |
| OBA Overload Duration | | 0.0 | s |

## Statistics

| | | |
|---|---|---|
| LAS1.00 | 64.4 | dBA |
| LAS5.00 | 60.5 | dBA |
| LAS10.00 | 59.1 | dBA |
| LAS50.00 | 55.5 | dBA |
| LAS90.00 | 53.1 | dBA |
| LAS99.00 | 51.5 | dBA |
| | | |
| LAS > 50.0 dB (Exceedence Counts / Duration) | 3 / 1799.7 | s |
| LAS > 60.0 dB (Exceedence Counts / Duration) | 33 / 193.8 | s |
| LApeak > 135.0 dB (Exceedence Counts / Duration) | 0 / 0.0 | s |
| LApeak > 137.0 dB (Exceedence Counts / Duration) | 0 / 0.0 | s |
| LApeak > 140.0 dB (Exceedence Counts / Duration) | 0 / 0.0 | s |

## Dose

| | | |
|---|---|---|
| Name | OSHA-1 | |
| Dose | --- | % |
| Projected Dose | --- | % |
| TWA (Projected) | --- | dBA |
| TWA (t) | --- | dBA |
| Lep (t) | 44.7 | dBA |

## Settings

| | | |
|---|---|---|
| Exchange Rate | 5 | dB |
| Threshold | 90.0 | dBA |
| Criterion Level | 90.0 | dBA |
| Criterion Duration | 8.0 | h |
| RMS Weight | A Weighting | |
| Peak Weight | A Weighting | |
| Detector | Slow | |
| Preamp | PRM831 | |
| Microphone Correction | Off | |
| Integration Method | Linear | |
| OBA Range | Normal | |
| OBA Bandwidth | 1/1 and 1/3 | |
| OBA Freq. Weighting | Z Weighting | |
| OBA Max Spectrum | At Lmax | |
| Gain | +0 | dB |
| Under Range Limit | 26.8 | dB |
| Under Range Peak | 77.4 | dB |
| Noise Floor | 17.7 | dB |
| Overload | 144.9 | dB |

## 1/1 Spectra

| Freq. (Hz): | 8.0 | 16.0 | 31.5 | 63.0 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | 16k |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LZeq | 74.4 | 70.0 | 67.8 | 67.0 | 61.6 | 55.1 | 53.8 | 52.7 | 47.1 | 44.1 | 42.4 | 45.2 |
| LZSmax | 64.8 | 73.1 | 71.5 | 66.3 | 66.2 | 64.1 | 65.8 | 64.3 | 56.9 | 47.7 | 42.4 | 45.2 |
| LZSmin | 55.2 | 55.6 | 59.1 | 58.3 | 53.2 | 45.6 | 45.7 | 46.4 | 41.3 | 39.4 | 41.7 | 45.0 |

## 1/3 Spectra

| Freq. (Hz): | 6.3 | 8.0 | 10.0 | 12.5 | 16.0 | 20.0 | 25.0 | 31.5 | 40.0 | 50.0 | 63.0 | 80.0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LZeq | 71.3 | 69.2 | 67.7 | 66.0 | 65.6 | 63.8 | 62.5 | 63.7 | 62.9 | 62.6 | 63.8 | 59.5 |
| LZSmax | 64.2 | 60.5 | 60.8 | 73.7 | 62.9 | 59.0 | 69.1 | 60.4 | 66.8 | 63.0 | 60.9 | 60.0 |
| LZSmin | 44.9 | 47.8 | 49.4 | 46.1 | 50.3 | 50.4 | 50.7 | 54.3 | 52.3 | 50.5 | 53.8 | 50.8 |

| Freq. (Hz): | 100 | 125 | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1k | 1.25k |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LZeq | 57.8 | 57.2 | 54.9 | 50.5 | 51.1 | 49.2 | 48.9 | 49.1 | 49.2 | 49.3 | 47.8 | 46.2 |
| LZSmax | 56.0 | 64.5 | 59.5 | 59.5 | 59.0 | 62.4 | 58.2 | 61.9 | 62.6 | 62.3 | 57.3 | 55.6 |
| LZSmin | 50.0 | 47.4 | 44.1 | 41.0 | 40.3 | 39.7 | 39.1 | 40.0 | 41.3 | 41.8 | 41.1 | 39.4 |

| Freq. (Hz): | 1.6k | 2k | 2.5k | 3.15k | 4k | 5k | 6.3k | 8k | 10k | 12.5k | 16k | 20k |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LZeq | 43.8 | 41.3 | 41.2 | 40.8 | 39.2 | 37.4 | 37.1 | 37.5 | 38.2 | 39.1 | 40.0 | 41.8 |
| LZSmax | 54.8 | 51.0 | 48.2 | 45.1 | 42.2 | 39.2 | 37.4 | 37.3 | 38.2 | 39.1 | 40.1 | 41.9 |
| LZSmin | 37.5 | 35.7 | 35.2 | 34.5 | 34.4 | 34.9 | 35.7 | 36.7 | 37.8 | 38.8 | 39.8 | 41.6 |

## Calibration History

| Preamp | Date | dB re. 1V/Pa |
|---|---|---|
| PRM831 | 16 Dec 2021 12:18:11 | -27.4 |
| PRM831 | 16 Dec 2021 11:15:52 | -27.6 |
| PRM831 | 16 Dec 2021 11:15:38 | -27.6 |
| PRM831 | 16 Dec 2021 11:15:24 | -27.6 |
| PRM831 | 13 Dec 2021 14:06:54 | -27.4 |
| PRM831 | 13 Dec 2021 14:06:40 | -27.4 |
| PRM831 | 13 Dec 2021 14:06:06 | -27.4 |
| PRM831 | 13 Dec 2021 14:05:52 | -27.4 |
| PRM831 | 13 Dec 2021 14:05:38 | -27.4 |
| PRM831 | 13 Dec 2021 14:05:19 | -27.4 |
| PRM831 | 13 Dec 2021 14:05:05 | -27.4 |

General Information

| | |
|---|---|
| Serial Number | 03557 |
| Model | Model 831 |
| Firmware Version | 2.403 |
| Filename | 831_Data.001 |
| Measurement Records: | 3 |

NOTE: Only five metrics can be displayed on screen.
To view spectra and other metrics use the export feature.

| Record # | Date | Time | Duration | LAeq | LAE | LASmax | LASmin | LApeak (max) |
|---|---|---|---|---|---|---|---|---|
| 1 | 21/12/16 | 11:33:00 | 00:10:00.0 | 57.2 | 85.0 | 67.4 | 50.9 | 82.2 |
| 2 | 21/12/16 | 11:43:00 | 00:10:00.0 | 56.8 | 84.6 | 67.6 | 50.9 | 87.7 |
| 3 | 21/12/16 | 11:53:00 | 00:10:00.0 | 56.2 | 83.9 | 63.7 | 51.2 | 84.0 |

# SR 401 Bridge Replacement

ML1 / R1E Park-Boat Ramp

**Legend**

28° 24.514' -80° 37.853'

ML1

28° 24.514' -80° 37.853'

Cruise Terminal #8 Parking

Disney Cruise Line

West Basin

Uber Driver Waiting Area

Norwegian Cruise Lines Port Canaveral

Charles W Rowland Dr

Rodney S. Ketcham Boat Ramp

Canaveral Lock

Avocet Lagoon

Mullet Rd

A1A

Scallop Dr

Cape Marina

Ocean Club at Port canaveral

Sunshine Welding

Chum It Up Live Bait and Tackle

Google Earth

Image Landsat / Copernicus

N

1000 ft

Site/Run #: ML2
LD 001

# Noise Measurement Data Sheet

**Date:** 12/16/2021
11:33:31-12:03:31

**Measurement Taken By:** Bernard Kinney Jr., INCE

**Project:** SR-401 Bridge Replacement FPID No. 444787-1-22-01 FDOT 5/ Parsons

**Site ID:** ML2 Park/Marina Live Aboards

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

Temperature: Start: 83.6 End: 83.5 (°F)

Wind Direction: Start: NW 314 End: NNW 334

Wind Speed (Start): Min: 0.0 Max: 1.7 Average: 1.4 (mph)

Wind Speed (End): Min: 0.0 Max: 3.2 Average: 2.7 (mph)

Humidity: Start: 63.3 End: 63.0 (%)

**Equipment Data**

Sound Level Meter: Larson Davis 831-Type 1 Serial Number: 0004153

Date of Last Traceable Calibration: SLM /PRM/MIC 07/12/2021 CAL 06/25/2021

Calibration: Start: 114.00 End: 114.00 Difference: 0.02 dB

Battery: Start: 5.8V 95.8 % End: 5.5 V 89.6 %

Weighting Scale: A Response: Slow

Calibrator: Larson Davis CAL 200 Serial Number: 8533

**Results:** Leq: 57.0/56.7/57.1
in dB(A)

Major Noise Sources: SR 401 Bridge to Port Canaveral

Background Noise Sources:

Other Notes/Observations:

SR 401 PD&E Noise Study From S.R. 528 to north of Canaveral Barge Canal

MN PRM831 SN 012499 MN 377B02 SN 113988 GPS HOLUX MN M-215+ SN 215+ L70700105

Observed Traffic Data Site Sketch on Reverse Side

**Observed Traffic Data** Site #: ML2 Run #: 1

See Table 4

| Vehicle Types | NB Direction | | SB Direction | | | |
|---|---|---|---|---|---|---|
| | Volume | Speed | Volume | Speed | Volume | Speed |
| Auto | | | | | | |
| Medium Truck | | | | | | |
| Heavy Truck | | | | | | |
| Bus | | | | | | |
| Motorcycle | | | | | | |

**Site Sketch**

## General Information

| | | |
|---|---|---|
| Serial Number | 04153 | |
| Model | Model 831 | |
| Firmware Version | 2.403 | |
| Filename | 831_Data.001 | |
| User | Bernard Kinney Jr., INCE | |
| Job Description | Model Validation Measurements | |
| Location | SR-401 Bridge Replacement / Port Canaveral | |
| | | |
| Measurement Description | Parsons / SR401 Validation FPID 444787-1 | |
| Latitude | 28° 24.502' | |
| Longitude | -80° 37.848' | |
| Altitude | 25.3 | ft |
| Start Time | Thursday, 2021 December 16 11:33:31 | |
| Stop Time | Thursday, 2021 December 16 12:03:31 | |
| Duration | 00:30:00.0 | |
| Run Time | 00:30:00.0 | |
| Pause | 00:00:00.0 | |
| Pre Calibration | Thursday, 2021 December 16 11:14:13 | |
| Post Calibration | Thursday, 2021 December 16 12:19:19 | |
| Calibration Deviation | 0.02 dB | |

## Note

ML2 / R5E Park-Marina Live Aboards

## Overall Data

| | | | |
|---|---|---|---|
| LAeq | | 56.9 | dB |
| LASmax | 2021 Dec 16 11:50:23 | 69.7 | dB |
| LApeak (max) | 2021 Dec 16 11:40:00 | 86.0 | dB |
| LASmin | 2021 Dec 16 11:51:39 | 50.0 | dB |
| LCeq | | 70.0 | dB |
| LAeq | | 56.9 | dB |
| LCeq - LAeq | | 13.1 | dB |
| LAIeq | | 59.8 | dB |
| LAeq | | 56.9 | dB |
| LAIeq - LAeq | | 2.9 | dB |
| Ldn | | 56.9 | dB |
| LDay 07:00-22:00 | | 56.9 | dB |
| LNight 22:00-07:00 | | --- | dB |
| Lden | | 56.9 | dB |
| LDay 07:00-19:00 | | 56.9 | dB |
| LEvening 19:00-22:00 | | --- | dB |
| LNight 22:00-07:00 | | --- | dB |
| LAE | | 89.5 | dB |
| EA | | 98.57 | µPa²h |
| EA8 | | 1.577 | mPa²h |
| EA40 | | 7.886 | mPa²h |
| # Overloads | | 0 | |
| Overload Duration | | 0.0 | s |
| # OBA Overloads | | 0 | |
| OBA Overload Duration | | 0.0 | s |

## Statistics

| | | |
|---|---|---|
| LAS1.00 | 64.9 | dBA |
| LAS5.00 | 61.1 | dBA |
| LAS10.00 | 59.5 | dBA |
| LAS50.00 | 55.2 | dBA |
| LAS90.00 | 52.8 | dBA |
| LAS99.00 | 51.1 | dBA |
| | | |
| LAS > 50.0 dB (Exceedence Counts / Duration) | 3 / 1799.7 | s |
| LAS > 60.0 dB (Exceedence Counts / Duration) | 38 / 235.6 | s |
| LApeak > 135.0 dB (Exceedence Counts / Duration) | 0 / 0.0 | s |
| LApeak > 137.0 dB (Exceedence Counts / Duration) | 0 / 0.0 | s |
| LApeak > 140.0 dB (Exceedence Counts / Duration) | 0 / 0.0 | s |

## Dose

| | | |
|---|---|---|
| Name | OSHA-1 | |
| Dose | --- | % |
| Projected Dose | --- | % |
| TWA (Projected) | --- | dBA |
| TWA (t) | --- | dBA |
| Lep (t) | 44.9 | dBA |

## Settings

| | | |
|---|---|---|
| Exchange Rate | 5 | dB |
| Threshold | 90.0 | dBA |
| Criterion Level | 90.0 | dBA |
| Criterion Duration | 8.0 | h |
| RMS Weight | A Weighting | |
| Peak Weight | A Weighting | |
| Detector | Slow | |
| Preamp | PRM831 | |
| Microphone Correction | Off | |
| Integration Method | Linear | |
| OBA Range | Normal | |
| OBA Bandwidth | 1/1 and 1/3 | |
| OBA Freq. Weighting | Z Weighting | |
| OBA Max Spectrum | At Lmax | |
| Gain | +0 | dB |
| Under Range Limit | 26.7 | dB |
| Under Range Peak | 77.1 | dB |
| Noise Floor | 17.5 | dB |
| Overload | 144.6 | dB |

## 1/1 Spectra

| Freq. (Hz): | 8.0 | 16.0 | 31.5 | 63.0 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | 16k |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LZeq | 71.1 | 68.6 | 66.7 | 67.1 | 61.5 | 56.0 | 53.0 | 51.9 | 48.5 | 46.6 | 42.8 | 44.5 |
| LZSmax | 71.6 | 69.2 | 66.0 | 66.6 | 62.4 | 53.9 | 54.2 | 52.4 | 62.3 | 67.0 | 62.0 | 45.9 |
| LZSmin | 50.0 | 54.0 | 58.0 | 57.3 | 52.2 | 45.3 | 45.5 | 45.7 | 41.3 | 39.3 | 41.0 | 44.3 |

## 1/3 Spectra

| Freq. (Hz): | 6.3 | 8.0 | 10.0 | 12.5 | 16.0 | 20.0 | 25.0 | 31.5 | 40.0 | 50.0 | 63.0 | 80.0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LZeq | 67.3 | 66.2 | 65.2 | 63.9 | 64.4 | 63.1 | 61.4 | 62.5 | 61.9 | 62.2 | 64.4 | 59.3 |
| LZSmax | 66.2 | 62.1 | 64.7 | 62.1 | 68.0 | 66.9 | 61.1 | 61.2 | 62.6 | 64.2 | 58.3 | 63.9 |
| LZSmin | 41.1 | 41.8 | 45.7 | 45.0 | 50.8 | 48.1 | 49.5 | 53.2 | 50.7 | 50.6 | 53.2 | 50.4 |

| Freq. (Hz): | 100 | 125 | 160 | 200 | 250 | 315 | 400 | 500 | 630 | 800 | 1k | 1.25k |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LZeq | 57.7 | 57.4 | 54.4 | 50.8 | 52.0 | 50.7 | 48.0 | 48.6 | 48.0 | 48.1 | 46.9 | 46.4 |
| LZSmax | 60.6 | 58.1 | 54.5 | 50.7 | 49.3 | 46.3 | 50.0 | 48.4 | 51.2 | 49.4 | 47.8 | 43.9 |
| LZSmin | 49.5 | 46.3 | 41.8 | 40.5 | 40.5 | 39.7 | 39.7 | 39.9 | 40.2 | 41.8 | 41.2 | 38.6 |

| Freq. (Hz): | 1.6k | 2k | 2.5k | 3.15k | 4k | 5k | 6.3k | 8k | 10k | 12.5k | 16k | 20k |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LZeq | 43.2 | 41.4 | 45.5 | 44.5 | 40.9 | 37.3 | 38.2 | 38.1 | 37.7 | 38.5 | 39.5 | 40.9 |
| LZSmax | 41.8 | 43.5 | 62.0 | 64.9 | 62.9 | 46.2 | 59.9 | 57.5 | 46.6 | 41.4 | 40.8 | 41.1 |
| LZSmin | 37.2 | 35.8 | 35.3 | 34.6 | 34.2 | 34.4 | 35.1 | 36.0 | 37.1 | 38.1 | 39.3 | 40.7 |

## Calibration History

| Preamp | Date | dB re. 1V/Pa |
|---|---|---|
| PRM831 | 16 Dec 2021 12:19:17 | -27.1 |
| PRM831 | 16 Dec 2021 11:14:13 | -27.1 |
| PRM831 | 16 Dec 2021 11:13:59 | -27.1 |
| PRM831 | 16 Dec 2021 11:13:44 | -27.1 |
| PRM831 | 16 Dec 2021 11:13:28 | -27.1 |
| PRM831 | 16 Dec 2021 11:13:14 | -27.1 |
| PRM831 | 16 Dec 2021 11:13:00 | -27.1 |
| PRM831 | 16 Dec 2021 11:12:45 | -27.2 |
| PRM831 | 13 Dec 2021 14:03:19 | -27.1 |
| PRM831 | 13 Dec 2021 14:03:06 | -27.1 |
| PRM831 | 13 Dec 2021 14:02:52 | -27.1 |

## General Information

| | |
|---|---|
| Serial Number | 04153 |
| Model | Model 831 |
| Firmware Version | 2.403 |
| Filename | 831_Data.001 |
| Measurement Records: | 3 |

NOTE: Only five metrics can be displayed on screen.
To view spectra and other metrics use the export feature.

| Record # | Date | Time | Duration | LAeq | LAE | LASmax | LASmin | LApeak (max) |
|---|---|---|---|---|---|---|---|---|
| 1 | 21/12/16 | 11:33:31 | 00:10:00.0 | 57.0 | 84.8 | 68.7 | 51.1 | 86.0 |
| 2 | 21/12/16 | 11:43:31 | 00:10:00.0 | 56.7 | 84.5 | 69.7 | 50.0 | 85.9 |
| 3 | 21/12/16 | 11:53:31 | 00:10:00.0 | 57.1 | 84.9 | 67.8 | 50.8 | 83.9 |

# SR 401 Bridge Replacement

ML2 / R4E Park-Marina Live Aboards

**Legend**

28° 24.502' -80° 37.848'

Uber Driver Waiting Area

Norwegian Cruise Lines Port Canaveral

Charles M Rowland Dr

401

Rodney S. Ketcham Boat Ramp

ML2 28° 24.502' -80° 37.848'

Mullet Rd

Cape Marina

Scallop Dr

Scorpion Marine / Port Canaveral Marine

Port Canaveral Yacht Club

Avocet Lagoon

Mullet Rd

A1A

Google Earth

Image Landsat / Copernicus

N

800 ft

# Appendix E | Noise and Vibration Sensitive Sites

## Construction Noise and Vibration Sensitive Sites
## (a partial listing of potential sites)

| Noise | Vibration |
|---|---|
| Eye Centers/Clinics | Eye Centers/Clinics |
| Medical Centers | Medical Centers |
| Hospitals | Hospitals |
| Geriatric Centers | Geriatric Centers |
| Sound Recording Studios | Sound Recording Studios |
| TV/Radio Stations | TV/Radio Stations |
| Residences | Residences |
| Technical Laboratories | Technical Laboratories |
| Hearing Testing Centers | Antiques Shops |
| Theaters | Museums |
| Schools | Historic Buildings |
| Motels/Hotels | |
| Funeral Homes | |
| Libraries | |
| Meditation Centers | |
| Churches/Shrines | |
| Parks | |
| Day Care Centers | |
| Outdoor Theaters | |
| 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. | |
| Source: FDOT Noise and Vibration Task Team; August 17, 1999. | |

# Appendix F | Noise Contour Table

| Appendix F<br>Noise Contour Table<br>S.R. 401 Bridge Replacement<br>Port Canaveral / Brevard County<br>Build Alternative (Preferred Alternative) High Level Fixed Bridge | | | | |
|---|---|---|---|---|
| **Roadway Segment:**<br>**S.R. 401 / Bridge Replacement** | **Activity Category** | **FDOT NAC**<br>**dB(A)** | **Number of Travel Lanes New Bridge** | **Distance from Closest Edge of Travel Lane**<br>**Bridge Replacement – Preferred Alternative** |
| S.R. 401 Bridge – Park / Boat Ramp / Marina - NB | B, C | 66 | 6 | 159 Ft. |