



**Florida Department of Transportation**  
**23 CFR Part 667**

Periodic Evaluation of Facilities Repeatedly  
Requiring Repair and Reconstruction Due to Emergency Events



**March 1, 2024**

Cover Images:

Hurricane Ian, Category 4 Storm, Southwest Florida, Lee County, Source: CIRA/NOAA

Sanibel Causeway between Ft. Myers and Sanibel Island, damaged by Hurricane Ian, Source: AP Photo/Steve Helber

A1A in Flagler Beach, Florida, damaged by Hurricane Nicole storm surge, Source: Flagler Beach Police Department

## CHANGE LOG

Date Revised	Description	Page Number
11/23/2018	Original publication date for NHS facilities only.	
02/28/2020	Revised District 6 Project 1 location information to reflect actual begin/end point of damage on the roadway instead of using mile markers (MM) and updated the alternatives discussion.	A-17
11/20/2020	Added District 3 Project 1: SR-30/US-98.	A-5
	Added other damage locations to District 6 Project 1: SR-5/US-1.	A-17
	Added District 7 Project 1: I-275 and I-275 at SR-694 (Gandy Blvd).	A-23
12/31/2021	No analysis required.	
03/11/2022	No analysis required. Project approach updated.	1 and 5
5/01/2023	Revised District 3 Project 1 to show information for SR-30/US-98 only. Added damage information for Hurricane Sally.	A-5
	Added separate project for SR-8/I-10 from information previously included with District 3 Project 1.	A-7
	Added District 3 Project 3: SR-10/US-90.	A-10
	Added District 3 Project 4: SR-83/US-331.	A-11
2/26/2024	Added District 1 Project 1: SR-93/I-75	A-2
	Added District 5 Project 1: SR-A1A/US-1	A-13



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## Introduction

Title 23, Code of Federal Regulations (CFR) Part 667 requires the Florida Department of Transportation (Department) to identify and conduct statewide evaluations to determine if there are reasonable alternatives to National Highway System (NHS) roads, highways, and bridges that have required repair and reconstruction activities on two or more occasions due to emergency events.

In addition, beginning on November 23, 2020, the Department must also prepare an evaluation that conforms to Part 667 for all other roads, highways, and bridges (non-NHS) in the state prior to including any project affecting the facility in the Statewide Transportation Improvement Program (STIP). As explained in the regulations, the “evaluations for other roads, highways and bridges are required only when there is some reasonable likelihood work will be performed on those facilities.”

An emergency event is defined as *“a natural disaster or catastrophic failure resulting in an emergency declared by the Governor of the State, or an emergency or disaster declared by the President of the United States.”* Repair and reconstruction refer to *“permanent repairs”* that restore roads, highways, and bridges to their pre-disaster conditions.

The evaluation of the roads, highways, and bridges is an analysis that includes:

- Identification and consideration of any alternative that will mitigate, or partially or fully resolve, the root cause of the recurring damage.
- The costs of achieving the solution.
- The duration of the solution.
- Consideration of recurring damage and cost of future repair under current and future environmental conditions.

All evaluations in this report cover the period January 1, 1997 through December 31 of the previous year. The evaluations exclude tribally owned and federally owned roads, highways, and bridges.

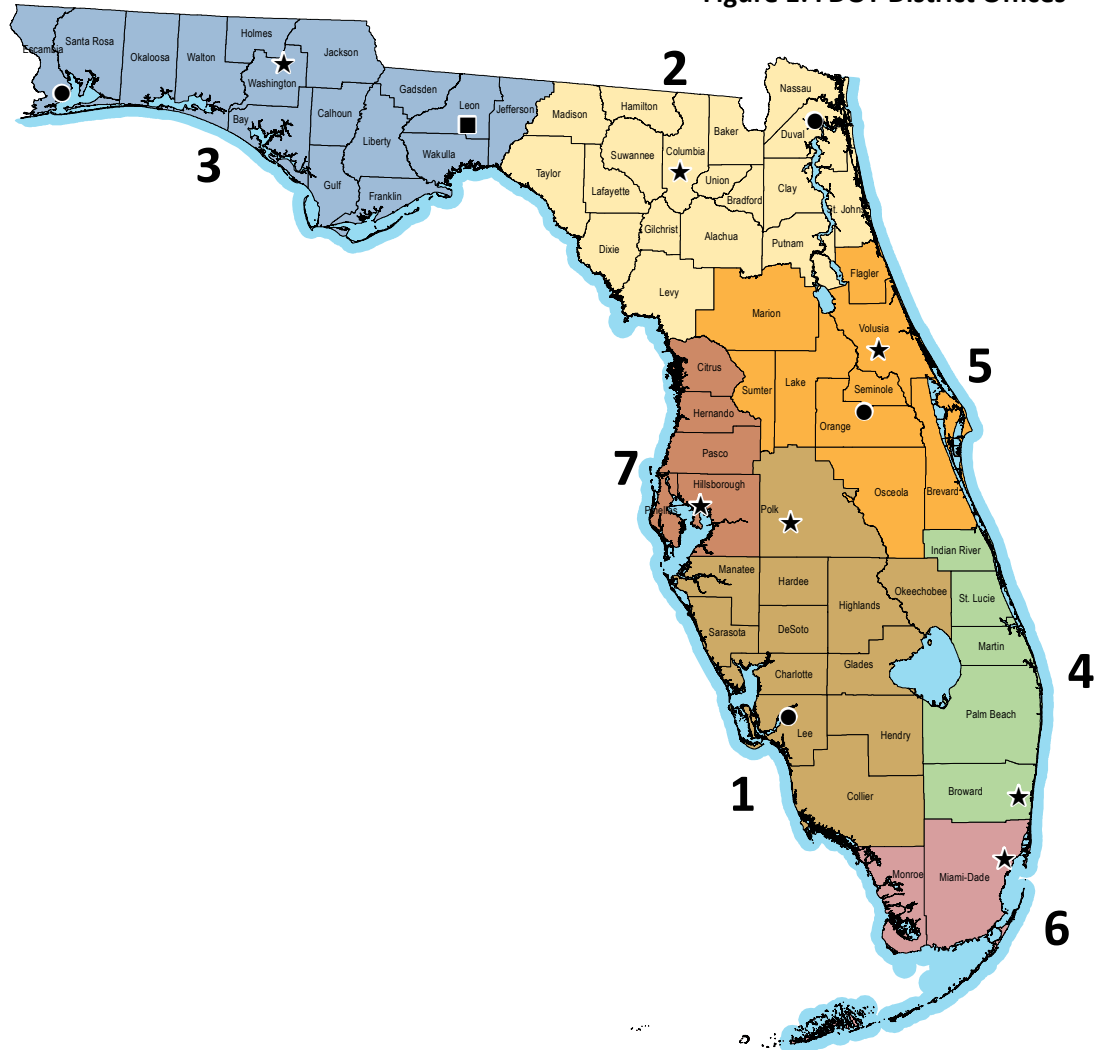
## Approach and Project Analysis

The first step in this process was to identify all state and national emergency declaration events for the period January 1, 1997 through December 31 of the previous year. All executive orders for the gubernatorially declared disasters and Florida’s federally declared disasters which include major disaster declarations; emergency declarations; fire management assistance declarations; and fire suppression authorizations were compiled.

Next, was project identification. Within the Department, the Office of Work Program and Budget (OWPB) is responsible for the development and management of the Adopted Work Program. All projects, including projects due to emergency events, are stored in the Financial Management (FM) Database. Using filters, all emergency projects that received federal funds for the period January 1, 1997, through December 31 of the previous year are extracted and used in combination with other roadway information (such as functional classification) to build geographic information system (GIS) line and point data.

This allows the impacted locations to be shown electronically on a map, providing a visual context to assist the Design and Structures Maintenance Engineers in the districts with analysis of projects with permanent repairs.

Figure 1: FDOT District Offices



DEPARTMENT OFFICES		
Central Office	District Headquarters	District Urban Area Offices
<p>■ Tallahassee</p>	<p>★ District 1 – Bartow                      District 2 – Lake City                      District 3 – Chipley                      District 4 – Ft. Lauderdale                      District 5 – Deland                      District 6 – Miami                      District 7 – Tampa</p>	<p>● District 1 – Ft. Myers                      District 2 – Jacksonville                      District 3 – Pensacola                      District 5 – Winter Park</p>
<p>Turnpike District: Ocoee – Administrative Office, Pompano – Operations Office</p>		

In accordance with the Federal Highway Administration (FHWA) Emergency Relief Manual, permanent repairs usually occur after emergency repairs have been completed. Emergency repairs are *“those repairs including temporary traffic operations undertaken during or immediately following the disaster occurrence for the purpose of 1) minimizing the extent of the damage, 2) protecting remaining facilities, or 3) restoring essential traffic.”*

Examples of emergency repairs are:

- Erection and removal of barricades and detour signs.
- Flagging and pilot cars during the emergency period.
- Construction of temporary roadway connections (detours).
- Erection of temporary detour bridges.
- Temporary substitute highway traffic service, including ferry or transit service.
- Removal of debris.
- Removal of slides.
- Removal of drift piling up on bridges.
- Placing riprap around piers and bridge abutments to relieve severe on-going scour action.
- Placing riprap on the downstream slopes of approach fills to prevent scour from overtopping.
- Replacement of washed-out embankments and approach fills.
- Regrading of roadway surfaces, roadway fills, and embankments.
- Restoring final roadway surfaces when needed to restore essential traffic.

Permanent repairs typically require the development of plans, specifications, and estimates. Permanent repairs also include *“...restoring pavement surfaces, reconstructing damaged bridges and culverts, and replacing highway appurtenances.”*

When an event causes the failure of a highway appurtenance, it is the policy of the Department to investigate the failure. If the failed appurtenance was not built according to current Department standards, the appurtenance is replaced with a highway appurtenance that meets current Department standards. On the other hand, if the failed appurtenance was built according to Department standards, then the standards are evaluated to determine if they need to be improved. This results in a better performance of the highway infrastructure.

Listed below are the Department’s policies and procedures for various highway appurtenances.

- Overhead Sign Structures - The Department has developed design standards for these structures, these standards are periodically reviewed and updated as appropriate. Currently Overhead Sign Structures are designed for a 700-year recurrence interval. In the event of a failure the structure is evaluated to determine if it was built to earlier standards, the structure will be replaced with a structure that meets current standards. If the failed structure was built according to current design standards, then the current design standards will be evaluated to determine if it is appropriate to update the current design standards.

- High Mast Light Poles – The Department has developed design standards for these structures, these standards are periodically reviewed and updated as appropriate. Currently High Mast Light Poles are designed for a seven hundred–year recurrence interval. In the event of a failure the structure is evaluated to determine if it was built to earlier standards, the structure will be replaced with a structure that meets current standards. If the failed structure was built according to current design standards, then the current design standards will be evaluated to determine if it is appropriate to update the current design standards.
- Standard Light Poles - The Department has developed design standards for these structures, these standards are periodically reviewed and updated as appropriate. Currently standard Light Poles are designed for a 300-year recurrence interval. In the event of a failure the structure is evaluated to determine if it was built to earlier standards, the structure will be replaced with a structure that meets current standards. If the failed structure was built according to current design standards, then the current design standards will be evaluated to determine if it is appropriate to update the current design standards.
- Traffic Signal Mast Arms - The Department has developed design standards for these structures, these standards are periodically reviewed and updated as appropriate. Currently Traffic Signal Mast Arms are designed for a 700-year recurrence interval. Traffic Signal Mast Arms are required in the area near the coast. This area is defined in Traffic Operations Mast Arm Limit Boundary Map. In the event of a failure the structure is evaluated to determine if it was built to earlier standards, the structure will be replaced with a structure that meets current standards. If the failed structure was built according to current design standards, then the current design standards will be evaluated to determine if it is appropriate to update the current design standards.
- Span Wire Mounted Traffic Signals – These structures are used in areas away from the coast that experience lower wind speeds in storm events. The Department believes this is a prudent use of limited resources. If the Department experiences increased failures of these structures in high wind events, the Department will revisit this and determine if it is justified to expand the areas where Traffic Signal Mast Arms are required.
- Ground Mounted Signs – The Department bases its design standards on the AASHTO design standards. AASHTO requires Ground Mounted Signs to be designed for a 10-year recurrence interval. This results in a ninety mile per hour wind loading. However, the Department requires Ground Mounted Signs to be designed for a 110 mile per hour wind loading. This is reasonable since the service life of the sign panels averages 8 to 10 years. If the Department should experience an increase in the number of Ground Mounted Signs that are damaged in Emergency Events, then the Department will revisit its design standards.

Using project files, detailed damage inspection reports (DDIRs), bridge records and by consulting with team members, the Design and Structures Maintenance Engineers can cross-check the projects to identify the roads, highways, and bridges with permanent repairs. The results of the reviews are provided in Appendix A.

## Next Steps

As required by 23 CFR 515.9(d)(6) the results of the evaluations will be incorporated into the Department's Transportation Asset Management Plan (TAMP). The evaluations will also be made available to FHWA upon request.

Additionally, the evaluations will be used by the Department to review the Transportation Improvement Plans (TIPs) developed by the state's Metropolitan Planning Organizations (MPOs). As required by Florida statutes and federal law, each MPO in the state publishes a TIP which is a listing of all projects financed with either state and/or federal funds. The Office of Policy Planning (OPP) coordinates planning activities and provides support with development of the TIPs through the Department's MPO Liaisons. As part of the coordination efforts, the Department reviews the draft TIPs for consistency with the Work Program, LRTP priorities, goals and objectives and federal and state laws and regulations.

This report will be used during review of the draft TIPs to determine if evaluations for other roads, highways and bridges are required before each MPOs TIP is included in the STIP. If an evaluation is required, the liaisons will work with the MPO to ensure the evaluation(s) in this report are considered in the respective MPOs TIP.

The Department will also update the evaluations after every emergency event, as well as on a regular 4-year cycle (23 CFR 667.7(a)). As explained in the regulations, updates after an emergency event are for the purpose of adding newly qualifying roads, highways, or bridges or modifying information on facilities already in the evaluation.

If no emergency event (as defined in the rule) occurs during the evaluation period, the Department's evaluation will simply indicate that fact.

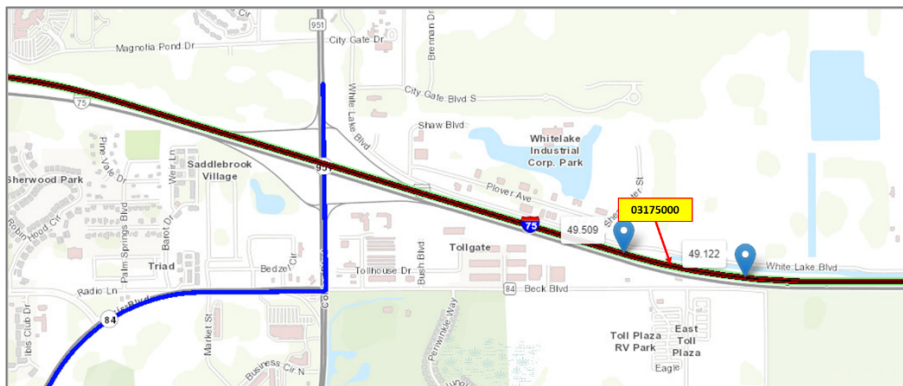
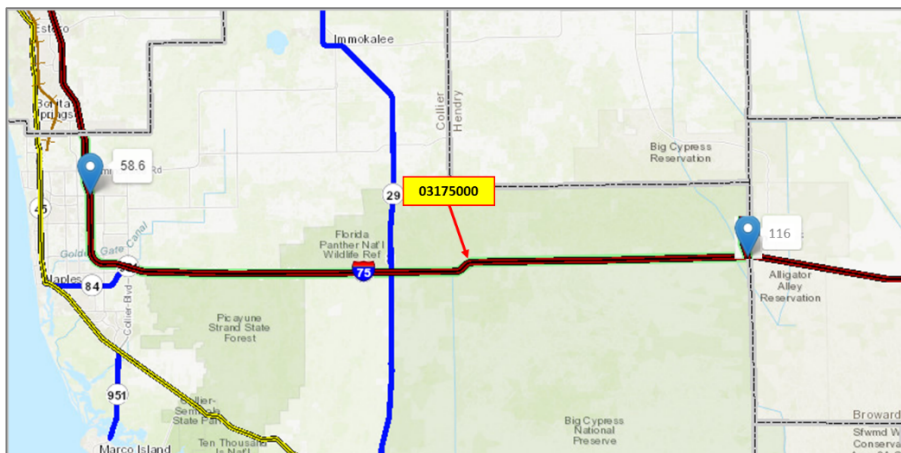
## **Appendix A : Project Evaluations for Roads, Highways and Bridges**

# District 1

## Project 1: SR-93/I-75

County	Event	Landfall Date	Item No.	Route ID	Route Type	Location	Damage Description
Collier	Hurricane Irma	09/09/2017	442788-1	03175000	NHS	Beg Pt 58.6 to End Pt 116	Fence damage
	Hurricane Ian	09/28/2022	452524-1			Beg Pt 49.122 to End Pt 49.509	Lighting

### Project Location Maps





**Alternatives Discussion****Collier County:**

For Hurricane Irma, the repairs involved replacement of the Type B barbwire and chain link fence at the limits of the limited access right-of-way along a 50-mile stretch of I-75 (Alligator Alley) due to flooding, wind damage, and isolated tree damage. The total cost was \$250,000, which was eligible for federal reimbursement. Due to the low-lying elevation of I-75 along Alligator Alley, proximity to the adjacent canals, and physical location of the limited access fencing adjacent to the right-of-way line, mitigative action is not practical. A chain link fence is the most cost-effective way to secure limited access right-of-way. Restoration of the chain link fence damaged by Hurricane Irma cost \$5,000 per mile – a relatively inexpensive repair. Additionally, many of the trees that impacted the fence are located outside the right-of-way. In order to remove them, additional right-of-way would need to be acquired.

For Hurricane Ian, we are repairing a total of seven (7) light poles at a cost of \$8,000. The repairs involve replacement of seven (7) luminaire and bracket arms and leveling of one (1) of the light pole foundations. These repairs were ineligible for federal reimbursement due to the small number of poles affected, minor nature of the repairs, and the sporadic distance between them over this 0.4-miles section of I-75. Due to the low cost associated with these FHWA-ineligible repairs relative to complete replacement of the lighting system in this area to meet current design standards and wind loading requirements, mitigative action is unwarranted at this time.

## District 2

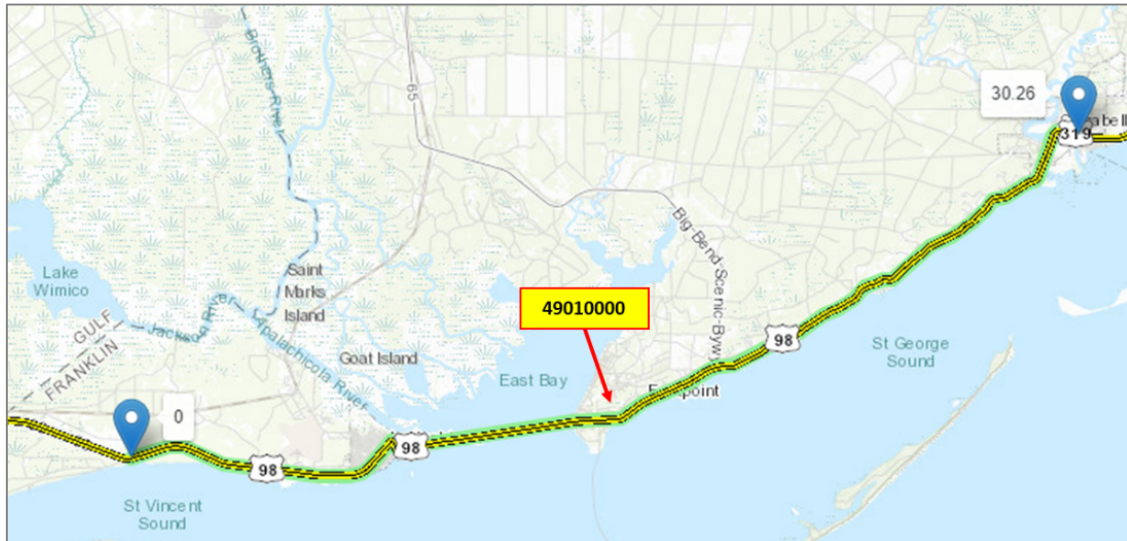
None currently.

## District 3

### Project 1: SR-30/US-98

County	Event	Landfall Date	Item No.	Route ID	Route Type	Location	Damage Description
Franklin	Hurricane Dennis	07/09/2005	419487-2	49010000	NHS	Beg Pt 14.700 to End Pt 29.272	Roadway washouts
	Hurricane Hermine	08/31/2016	440284-1			Beg Pt 14.700 to End Pt 29.272	Shoulder erosion
	Hurricane Michael	10/10/2018	445016-1			Beg Pt 13.984 to End Pt 30.260	Roadway washouts
			445016-2			Beg Pt 13.984 to End Pt 17.099	
			445382-1			Beg Pt 29.262 to End Pt 29.606	
	Hurricane Sally	9/16/2020	448311-1			Beg Pt 25.510 to End Pt 25.630	Shoulder washouts
			448312-1			Beg Pt 20.380 to End Pt 20.53	Embankment washouts
			448318-1			Beg Pt 24.160 to End Pt 24.390	Embankment washouts
			448319-1			Beg Pt 18.070 to End Pt 18.300	Embankment washouts
			448324-1			Beg Pt 15.190 to End Pt 17.210	Embankment erosion
			448498-1			Beg Pt 21.460 to End Pt 21.670	Embankment washouts

Project Location Map



## **Alternatives Discussion**

### **Franklin County:**

SR-30/US-98 in Franklin County runs adjacent to the Gulf of Mexico. This corridor is primarily undeveloped and is positioned only slightly above sea level; thus, causing the roadway to be highly susceptible to extensive damage during tropical events.

In efforts to break the continuous repair cycle, the Department constructed articulating blocks along sections of SR-30/US-98 in Franklin County that experienced roadway washout caused by Hurricane Dennis in 2005. The articulating block consisted of a layer of filter fabric, 18" of bedding stone and a layer of articulating concrete block covered with soil and sod and an armored toe. The cost of construction was approximately \$35.5M. During Hurricane Hermine in 2016, the articulating block experienced some washouts in locations where the articulating block contacted cross drain headwalls. The repair cost approximately \$294,400.

In 2018 Hurricane Michael produced catastrophic damage as a Category 5 Hurricane with record high storm surge for the panhandle. Amidst the catastrophic damage, the articulating block in Franklin County performed outstandingly well as a whole. There were isolated locations in which the areas that had previously been prone to washing out were still intact. However, there were also some areas located at the interface of existing headwalls and articulating blocks that washed out. Therefore, during the recent repairs, the articulating block was designed to be more resilient in these locations with better tie-ins to the head wall. Isolated locations with roadway washouts not having existing articulating blocks were reconstructed with articulating blocks. Articulating block became the standard in which the Department repaired nearly all locations on coastal roadways with roadway damage due to Hurricane Michael. Additional improvements could include overlapping and strengthening the articulating block at locations where the articulating block terminates at existing cross drains. This would yield an estimated construction cost of approximately \$8.6M.

The Carrabelle River Bridge also received damage from Hurricane Michael. The damage from the hurricane included the fender system, clearance gauge, and navigation lights. This permanent repair project is scheduled to be let in FY 2020. The estimated Construction Cost to repair the damage is \$35K. The existing system does not meet the current FDOT Standard Plan 471-030. Bringing this location up to current standards would include the use of composite lumber, 2" x 6" railing, 2" x 12" decking, and all new materials. The district recognizes that bringing the existing fender system, clearance gauge, and navigational lights up to current standards would help with resiliency, however, due to the low repair cost, the cost benefit does not warrant replacement prior to the end of its useful life.

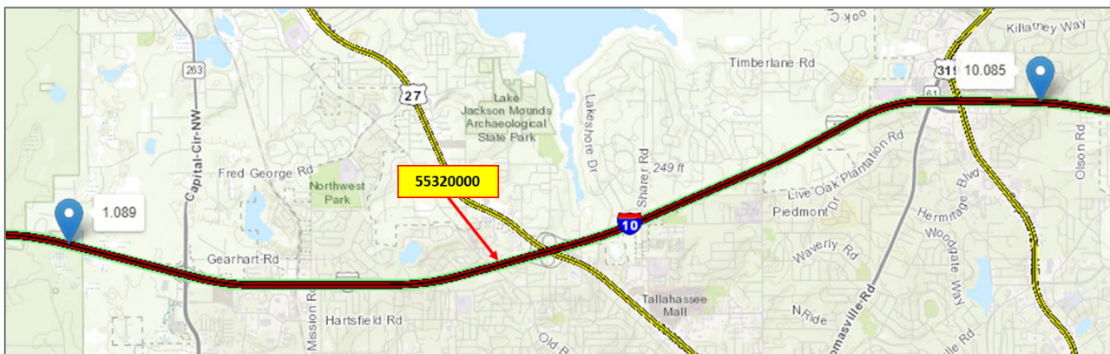
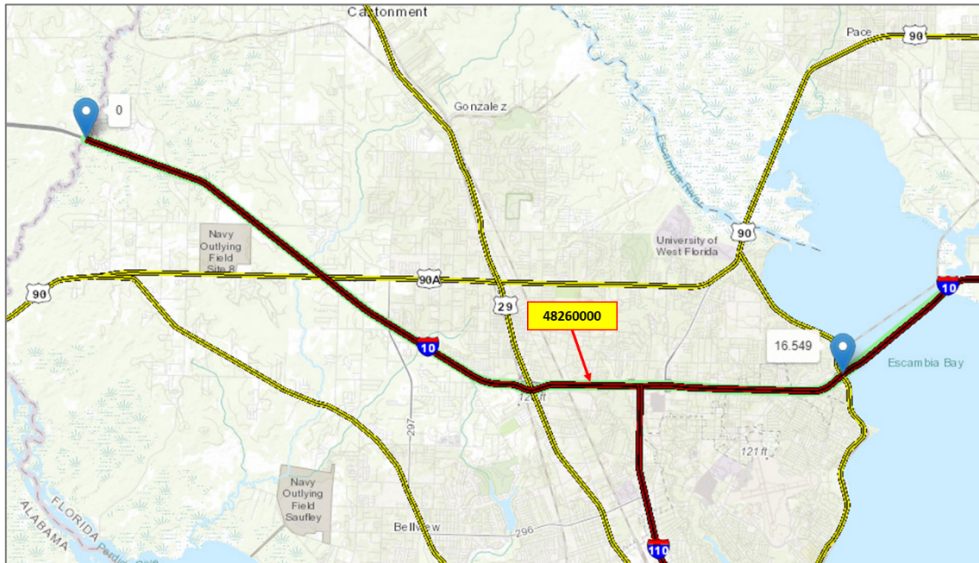
In 2020, Hurricane Sally caused embankment erosion along the same roadway which is adjacent to the Gulf of Mexico. This makes the road susceptible to strong winds, storm surge and wave action. Several different types of shoreline hardening projects throughout the years have been implemented including the installation of articulating block, the use of PROTECT funds to install articulating block and upgrade cross drains, as well as other maintenance projects to install sheetpile walls and concrete walls to protect the roadway. The most recent permanent repairs totaled approximately \$852,000.

The department is in the process of compiling all the hardening projects on this corridor to get a better idea of where all the improvements have been made to identify areas more clearly along the corridor that still need mitigation for shoreline hardening.

**Project 2: SR-8/I-10**

County	Event	Landfall Date	Item No.	Route ID	Route Type	Location	Damage Description
Escambia	Hurricane Ivan	09/16/2004	417537-1	48260000	NHS	Beg Pt 0.000 to End Pt 16.549	Signs
Leon	Tropical Storm Fay	08/18/2008	222589-4	55320000	NHS	Beg Pt 4.580 to End Pt 7.000	Slope erosion
			222589-5			Beg Pt 5.110 to End Pt 5.720	
Escambia	Spring Floods	04/28/2014	436117-1	48260000	NHS	Beg Pt 2.753 to End Pt 2.773	Ditch erosion
Leon	Hurricane Michael	10/10/2018	445120-1	55320000	NHS	Beg Pt 1.089 to End Pt 10.085	Signs
			445249-2				Damaged fencing

Project Location Maps



## **Alternatives Discussion**

### **Escambia County:**

In 2004 Hurricane Ivan damaged roadway signage along I-10. For the design of highway sign structures, the department uses the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals (LTS). In that specification, the design service life for roadside sign structures (single and multi-post) is 10 years. For all other highway sign structures, the design service life is 50 years. The lower the design service life, the lower the design wind speed.

After Hurricane Ivan, the department updated Index 11200 (multi-column ground signs) and Index 11860 (single column ground signs) of the FDOT Design Standards to include the AASHTO LTS-4 specifications. Some of those changes included deleting the aluminum column option for the multi-post signs structures and adding new post and foundation tables for the single column ground signs. These changes were effective with the July 2007 letting. The total cost was approximately \$844K. These standards have since been updated to meet the AASHTO LRFDLTS-1 specifications. Those changes were effective with the July 2017 letting.

In April 2014 Escambia County experienced a flood that was estimated to be between a 200-year and 500-year event for one-hour rainfall. Some parts of Escambia County received an estimated 26 inches of rain within a 24-hour period.

The I-10 Weigh in Motion Station is located approximately 1.5 miles east of the Beulah Road overpass. Stormwater collected along I-10 is conveyed via linear ditches and discharged into a Stormwater Management Facility (SMF) for treatment. The outfall structure within the SMF discharges into a larger rubble lined outfall ditch. As a result of the excessive rain fall in conjunction with high water velocities due to slope, the outfall experienced scour and damage. Emergency repair efforts included replacing the mitered end section as well as placement of additional rubble within the outfall.

A permanent solution could include constructing a concrete emergency spillway to allow water to over-top in a controlled location. The estimated construction cost for this improvement is \$8,000. Additional improvements could include lining the outfall structure with gabion mats to better armor the outfall. The approximate construction cost for this improvement is \$200,000.

However, it should be noted that this location falls within the limits of an ongoing PD&E and Design project for FPID 433113-1. This project includes constructing a new interchange on SR 8 (I-10) at CR 99 (Beulah Rd). This design will likely impact the outfall. Right of Way and Construction for the new interchange are not funded at this time.

Hurricane Ivan and the Spring Floods also caused damage along Gulf Beach Highway (CR-292A) in Pensacola. This roadway is located close to Big Lagoon Bay making it susceptible to damage during tropical and storm events.

During both instances, the roadway suffered damage to the drainage system resulting from the inundation of water. The projects included installation of pipe and reconstruction of swales with a total cost of approximately \$148K. Due to the location and geography of the roadway, no additional improvements are recommended at this time.

**Leon County:**

In 2008, during the Construction phase of a major reconstruction project on I-10 in Leon County, Tropical Storm Fay inundated the project with heavy rains. Isolated areas of the construction project sustained severe erosion damage. Supplemental Agreement Change Order #40 was issued to provide emergency and permanent repairs (FPID 222589-4) as well as a betterment (222589-5).

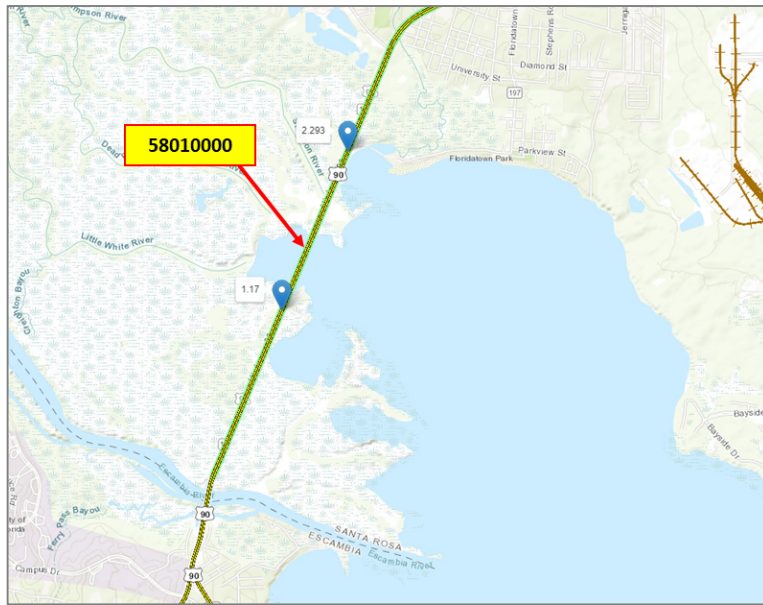
The permanent restoration included removing existing concrete, excavation borrow, miscellaneous asphalt, 3" concrete ditch pavement, guardrail, and fencing. The betterment activities included adding asphalt, Type S gutter inlets, 18" pipe culvert, U-endwall with baffles, shoulder gutter, slope concrete pavement, riprap rubble ditch lining, guardrail, and sod. The total cost of the repairs and betterment was approximately \$367K. The construction of the betterment has stabilized the area and routine maintenance repairs have not been necessary. No additional improvements are proposed at this time.

In 2018 Hurricane Michael devastated the panhandle with rain and treacherous wind speeds. Several signs and fencing were damaged during the hurricane event due to winds and debris. Over time, the standards for design and placement of roadway signs have become better, however, a certain level of damage can be expected during severe weather events that cannot be designed for in a cost-efficient manner. The total cost for the fence and sign repair was approximately \$750K. No improvements to corridor sign design are proposed at this time.

**Project 3: SR-10/US-90**

County	Event	Landfall Date	Item No.	Route ID	Route Type	Location	Damage Description
Santa Rosa	Hurricane Ivan	9/16/2004	417486-2	58010000	STBG	Beg Pt 1.171 to End Pt 2.293	Roadway washouts
	Hurricane Sally	9/16/2020	448258-1			Beg Pt 1.680 to End Pt 2.010	

Project Location Map



**Alternatives Discussion**

**Santa Rosa County:**

This portion of SR-10/US-90 in Santa Rosa County is located near and crosses Escambia Bay. There are also other rivers (Simpson, Bannahasse, and Little White rivers) that terminate within the bay in this area.

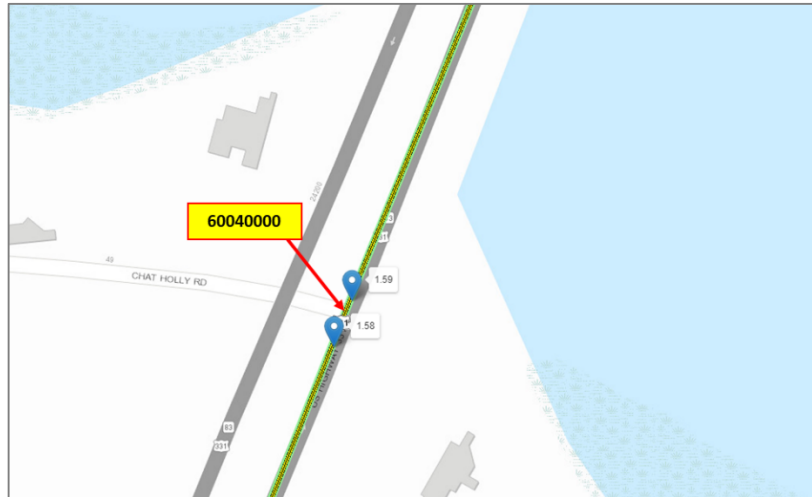
In 2004 and 2020, both Hurricane Ivan and Hurricane Sally caused damage to the roadway and approach slabs. The damage types were similar and were caused by the storm surge and wave action. A permanent solution for this issue would be to provide a cut off sheet pile wall with a concrete cap to prevent the reoccurring damage. This would be a major project but would be the most effective mitigation strategy to the reoccurring issue. The estimated construction cost of the permanent repair is approximately \$9.2M (\$1.2M for design and \$8M for construction).



**Project 4: SR-83/US-331**

County	Event	Landfall Date	Item No.	Route ID	Route Type	Location	Damage Description
Walton	Hurricane Michael	10/10/2018	445358-1	60040000	NHS	Beg Pt 1.580 to End Pt 4.760	Erosion
	Hurricane Sally	9/16/2020	448347-1			Beg Pt 1.580 to End Pt 1.590	Ditch berm washout

Project Location Map



**Alternatives Discussion**

**Walton County:**

This portion of SR-83/US-331 in Walton County is the causeway south of the Clyde B Wells Bridge that crosses over the Choctawhatchee Bay.

In 2018 and 2020, both Hurricane Michael and Hurricane Sally caused damage due to storm surge and wave action. Following Hurricane Michael, a permanent repair project was designed and constructed to address the washed-out areas. As a mitigation strategy, Coastal Shore Riprap was installed in the damaged areas. To further harden this causeway to natural disasters, it is recommended that Coastal Shore Riprap be installed on the entire causeway or extending the bridge over the causeway. The construction cost for the permanent repair is approximately \$37.1M.

## **District 4**

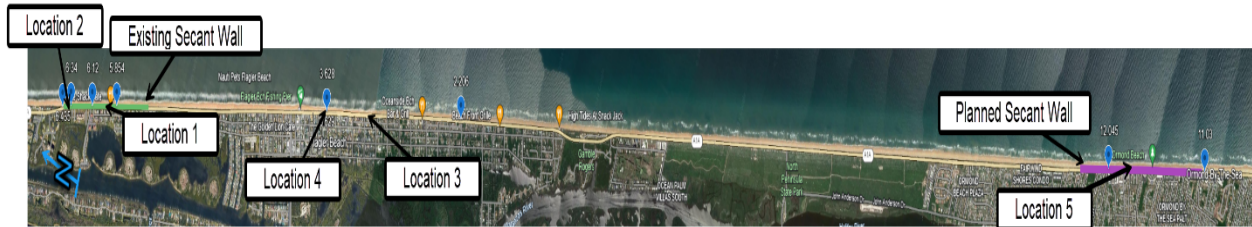
None currently.

## District 5

### Project 1: SR-A1A/US-1

County	Event	Landfall Date	Item No.	Route ID	Route Type	Location	Damage Description
Flagler	Hurricane Matthew	10/06/2016	440557	73030000	NHS	Beg Pt 2.206 to End Pt 3.628	Road/slope protection
Volusia				79080000		Beg Pt 11.030 to End Pt 12.045	
Flagler	Hurricane Nicole	11/10/2022	452443	73030000	Beg Pt 2.206 to End Pt 3.628		
					Beg Pt 3.629 to End Pt 3.629		
					Beg Pt 5.854 to End Pt 6.12		
					Beg Pt 6.34 to End Pt 6.435		
Volusia				79080000	Beg Pt 11.030 to End Pt 12.045		

### Project Location Map



### Alternatives Discussion

There has been damage from several hurricanes on these sections of roadway throughout the past. This section of SR A1A is adjacent to the Atlantic Ocean which makes it susceptible to strong winds, storm surge, and wave action. The exact locations of the washouts vary from storm to storm, but these sections of roadway are often impacted when we have hurricanes.

FDOT has funded several different types of shore-line hardening projects through several different contracting methods.

**Flagler County:**

Location 1 and 2, MP 5.854 to MP 6.2 and MP 6.34 to 6.435:



FDOT completed a hardening project, T5641/440557-1-52-01, secant wall, on this corridor. The final construction cost for this project was \$22,800,570.85. The duration of this project was 362 days with a 50-year design life. During previous storm events, location 1 & 2 has experienced the loss of sand in front of the existing secant wall. The cost of the replacement sand is approximately \$350,000.

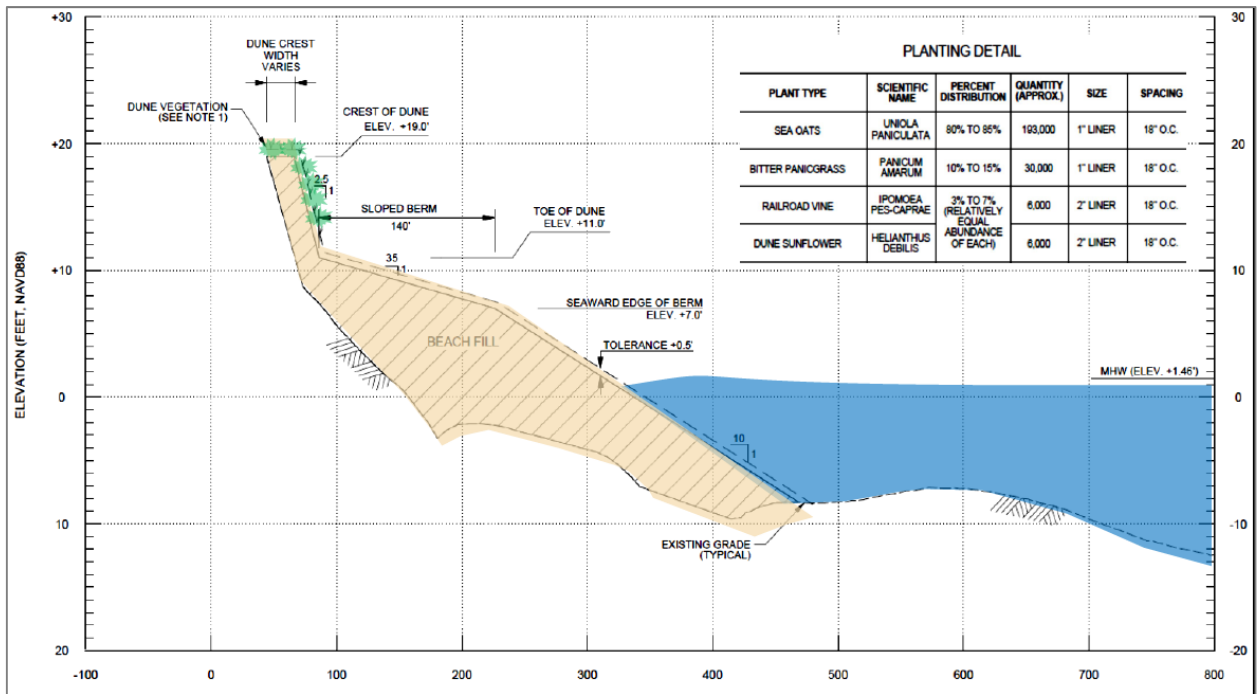
FDOT is developing a maintenance contract to periodically replenish sand on the seaward side of the wall. The contract will be work document driven (as-needed basis) and will include the new secant wall locations, location 5, as well.

Location 3 and 4, MP 2.206 to MP 3.628 and MP 3.629 to MP 3.629



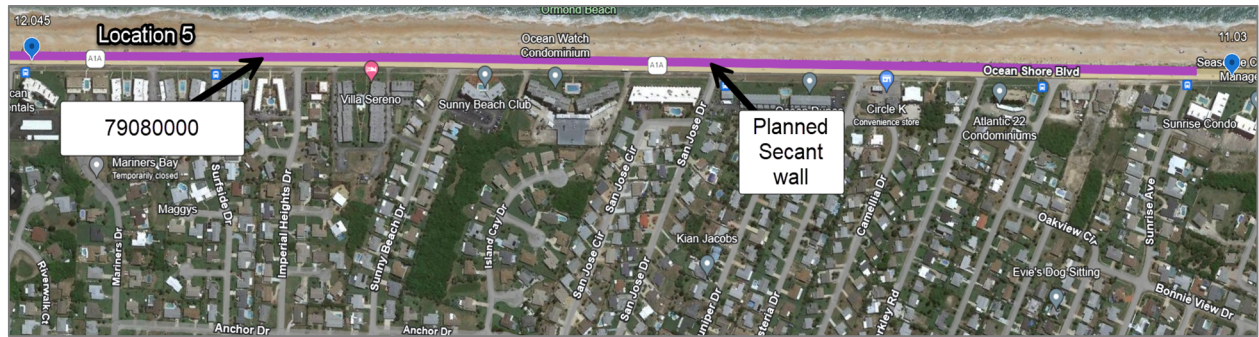
This portion of the roadway is now part of the Flagler County Coastal Storm Risk Management Project/USACOE. The anticipated cost for this Army Core project is \$17,494,000 with a duration of 365 days and has a 50-year design life. This project will require 4 periodic renourishments within locations 3 & 4. Funding has yet to be determined.

Figure 2: Beach Fill Typical Profile





Location 5, MP 11.03 to MP 12.045



This portion of the roadway is incorporated within the limits of a new hardening project, H5461 452443-1-52-01 Phase design build secant wall. Total anticipated construction cost for H5461 specifically at location 5 is \$50,000,000 with a construction duration of 1,096 days and has a 50-year design life. During previous storm events, location 5 has experienced damage requiring the replacement of sand, coquina revetment, asphalt roadway, and vegetation. Previous storm events have caused approximately \$3.8 million worth of damage.

We are developing a maintenance contract to periodically replenish sand on the seaward side of the wall. The contract will be work document driven (as-needed basis) and will include the existing secant wall locations, location 1&2, as well.

## District 6

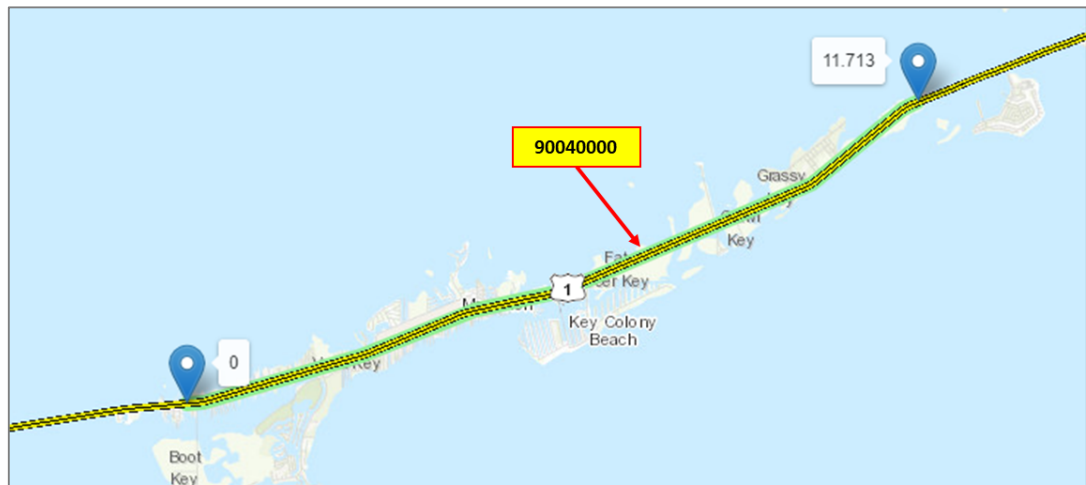
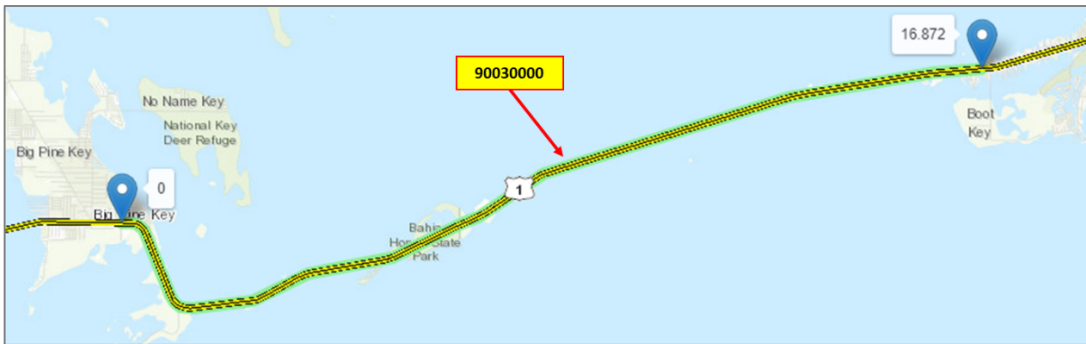
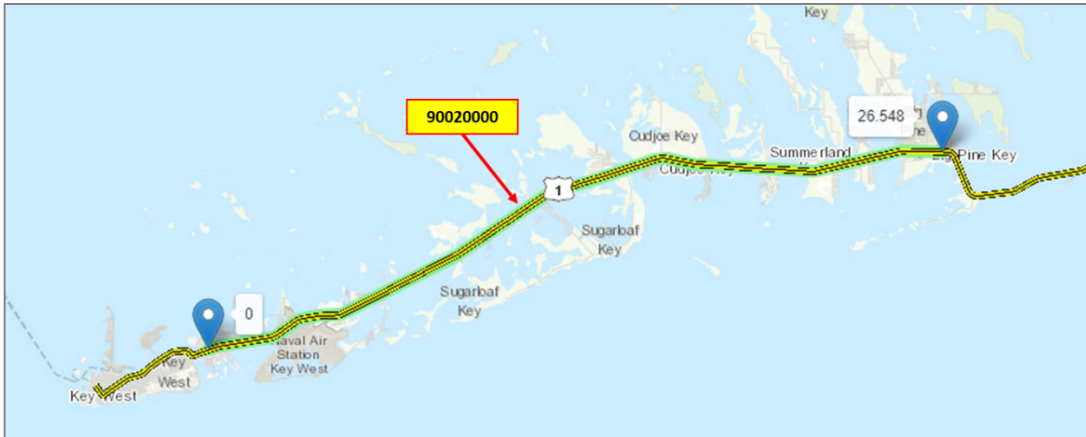
### Project 1: SR-5/US-1

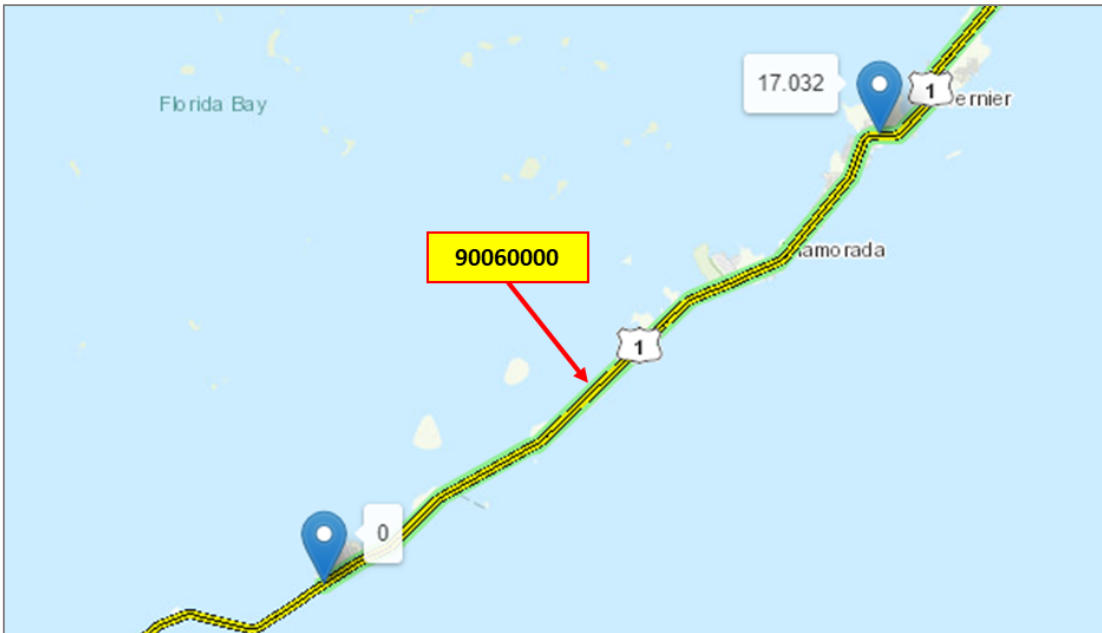
County	Event	Landfall Date	Item No.	Route ID	Route Type	Location	Damage Description
Monroe	Hurricane Wilma	10/24/2005	421240-1	90020000	NHS	Beg Pt 0.760 to End Pt 26.548	Washouts on roadside
				90030000	NHS	Beg Pt 0.000 to End Pt 16.872	
				90040000	NHS	Beg Pt 0.000 to End Pt 11.713	
				90050000	NHS	Beg Pt 0.000 to End Pt 14.126	
				90060000	NHS	Beg Pt 0.000 to End Pt 17.032	
	Hurricane Irma	09/09/2017	442869-1	90020000	NHS	Beg Pt 19.557 to End Pt 19.728	Slope erosions and washouts
			442967-1			Beg Pt 24.880 to End Pt 25.021	Washouts on roadside
			442972-1			Beg Pt 0.216 to End Pt 1.468	Lighting
			443138-1			Beg Pt 24.260 to End Pt 124.355	Slope washout
			443203-1			Beg Pt 4.043 to End Pt 22.868	Signs
			443209-1			Beg Pt 3.740 to End Pt 3.859	Embankment erosion
			443212-1			Beg Pt 24.355 to End Pt 24.891	Slope erosion
			443213-1			Beg Pt 1.468 to End Pt 26.548	Lighting
			442813-1	90030000	NHS	Beg Pt 4.193 to End Pt 5.468	Embankment erosion
			442816-1			Beg Pt 3.626 to End Pt 4.126	Roadway washouts
			442817-1			Beg Pt 3.364 to End Pt 3.615	Embankment washouts
			442819-1			Beg Pt 0.620 to End Pt 1.470	Damaged fencing
			442828-1			Beg Pt 8.613 to End Pt 8.696	Embankment erosion/washouts
			442829-1			Beg Pt 0.650 to End Pt 1.552	Embankment erosion/washouts
			442830-1			Beg Pt 8.125 to End Pt 8.392	Embankment erosion
			442847-1			Beg Pt 0.000 to End Pt 2.895	Signs
			442956-1			Beg Pt 3.820 to End Pt 4.056	Slope washouts
			442961-1			Beg Pt 3.477 to End Pt 3.724	Embankment washouts
			442964-2			Beg Pt 2.795 to End Pt 2.851	Embankment washouts
			442968-1			Beg Pt 8.369 to End Pt 8.540	Bridge embankment washout, rip rap
	442977-1	Beg Pt 6.339 to End Pt 7.098	Embankment washouts, fencing				
	442999-1	Beg Pt 5.875 to End Pt 5.983	Embankment washouts				
443204-1	Beg Pt 1.419 to End Pt 1.919	Signs					

County	Event	Landfall Date	Item No.	Route ID	Route Type	Location	Damage Description		
Monroe	Hurricane Irma (continued)	09/09/2017	443213-1			Beg Pt 0.000 to End Pt 16.872	Lighting		
			443275-1	90030000	NHS	Beg Pt 0.650 to End Pt 1.048	Embankment erosion		
			443279-1			Beg Pt 7.629 to End Pt 7.813	Embankment erosion		
			443205-1	90040000	NHS	Beg Pt 0.046 to End Pt 9.446	Signs		
			443206-1			Beg Pt 8.582 to End Pt 10.245	Signs		
			443213-1			Beg Pt 0.000 to End Pt 5.046	Lighting		
			442844-1	90050000	NHS	Beg Pt 6.432 to End Pt 6.792	Embankment erosion/washouts		
			442845-1			Beg Pt 0.045 to End Pt 0.345	Embankment erosion/washouts		
			442846-1			Beg Pt 12.195 to End Pt 12.824	Embankment slope washouts		
			442877-1			Beg Pt 10.789 to End Pt 10.957	Embankment erosion/washouts		
			442957-1			Beg Pt 10.579 to End Pt 10.789	Slope washout		
			442963-1			Beg Pt 10.279 to End Pt 10.492	Embankment/slope erosion		
			442981-1			Beg Pt 2.660 to End Pt 3.008	Embankment washout		
			443107-1			Beg Pt 9.779 to End Pt 10.279	Embankment washout		
			443113-1			Beg Pt 13.368 to End Pt 13.568	Embankment washout		
			443114-1			Beg Pt 3.198 to End Pt 3.318	Embankment erosion/washouts		
			443234-1			Beg Pt 3.168 to End Pt 3.435	Embankment washout		
			443570-1			Beg Pt 11.071 to End Pt 12.004	Bridge embankment, rip rap		
			442969-1			90060000	NHS	Beg Pt 3.733 to End Pt 3.904	Bridge embankment washout, rip rap
			442970-1					Beg Pt 4.167 to End Pt 4.553	Barrier
			442971-1					Beg Pt 5.908 to End Pt 5.962	Bridge embankment washout, rip rap
			442980-1	Beg Pt 0.735 to End Pt 0.795	Sinkhole, shoulder repair				
			443110-1	Beg Pt 9.969 to End Pt 10.069	Embankment washout				
			443111-1	Beg Pt 10.994 to End Pt 11.194	Embankment washout				
			443197-1	Beg Pt 11.771 to End Pt 11.932	Bridge embankment washout, rip rap				
			443202-1	Beg Pt 5.532 to End Pt 5.948	Embankment washout				
			443207-1	Beg Pt 10.255 to End Pt 17.105	Signs				
			443208-1	Beg Pt 3.931 to End Pt 4.093	Embankment washout				
			443210-1	Beg Pt 4.547 to End Pt 5.361	Embankment washout				
			443307-1	Beg Pt 0.570 to End Pt 1.350	Embankment erosion				



Project Location Maps





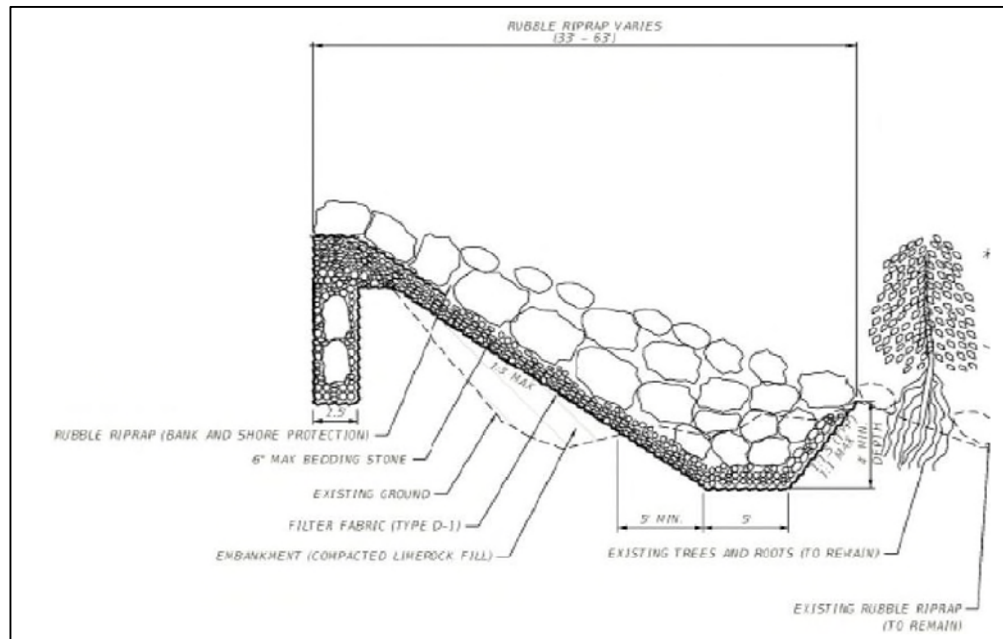
**Alternatives Discussion**

SR-5/US-1 (Overseas Highway) in the Florida Keys is susceptible to storm damage. There is also a high-water clearance issue for this state road throughout the Florida Keys (high-water fluctuates with the ocean tides) which is a contributing factor to the recurring damage. As a consequence, the District has conducted a roadway base clearance screening analysis that identified the stretch of roadways most critical for hurricane damage and confirmed that there is a high-water clearance issue for this state road throughout the Florida Keys (high-water fluctuates with the ocean tides).

The majority of the damage caused by recent hurricane storms consists of roadside slope/embankment erosion/washout that primarily affected the roadside. However, in specific situations it also impacted the shoulder and/or mainline. With the exception of the Sea Oats Beach limits located within the Village of Islamorada (MM 74.2 to MM 75.2), geotechnical studies recommended for the reconstruction of these impacted locations to include rubble riprap trench anchors (vertical trenches at the bottom and top of the slope) that provide extra protection against undermining from future storms. The recommended rubble riprap design (Figure 2) would have an estimated construction cost of approximately \$1.8M/mile.

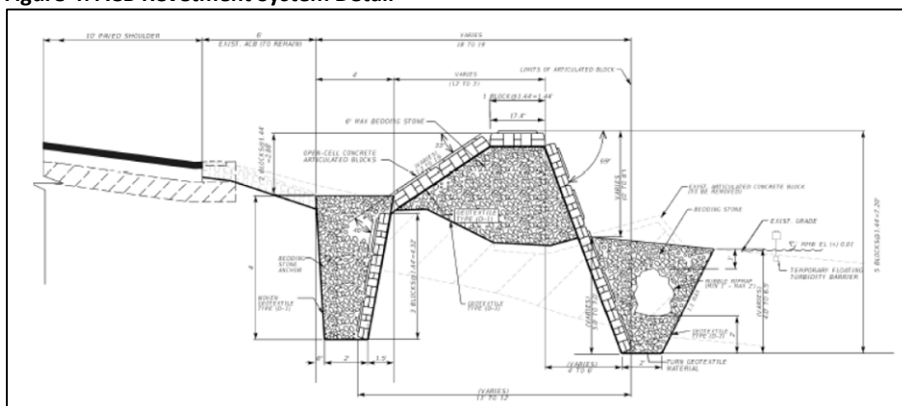
Figure 3: Rubble Riprap Restoration Repair Detail

The Sea Oats Beach limits repairs will include an Articulating Concrete Block (ACB) revetment system (Figure 3). The system was requested by the Village of Isla Morada for this specific site conditions that includes but is not limited to environmental consideration for sea turtles.



The ACB revetment system is not adequate for other corridor locations that entail embankment erosion/washout repairs. The recommended ACB design would have an estimated construction cost of approximately \$1.3M/mile.

Figure 4: ACB Revetment System Detail



The District has programmed several projects (FM: 443212-1, 443233-1, 443112-1, 442846-1, and 443307-1) to restore and reinforce the roadside/embankment along SR 5/Overseas Highway from MM 8.270 to MM 79.749. Most of the projects have completed construction in 2019 and the remaining ones have an anticipated construction completion date of Spring 2021.

Ultimately, the District recognizes the permanent way to address substandard base clearance and mitigate hurricane damage to the pavement is to raise Overseas Highway. The District has programmed three projects (FM: 443893-1, 443920-1, 443898-1) which include a combination of a pavement design with a geotechnical component along with the raising of the roadway. A conservative pavement design restricted to asphalt base only (B-12.5) and addition of geogrid is proposed to help mitigate the design high water issue, increasing the clearance between the base and the water table, with facilitation of maintenance of traffic and constructability as secondary benefits. These projects are scheduled to let in December 2021 and January 2022 and have a cost of \$2.2M/mile.

**Additional Considerations:**

FDOT designs structural supports for highway signs, luminaires, and traffic signals in accordance with AASHTO LRFD specifications. All impacted sign assemblies are being replaced with new sign assemblies that will meet latest design criteria. There were existing light poles that were impacted throughout the corridor. If the light pole impact entailed damage only to the luminaire or bracket, these parts were replaced in kind using the existing pole and foundation. However, if the pole or foundation were compromised, then a new complete light pole will be proposed. New light pole assemblies will meet latest design criteria.

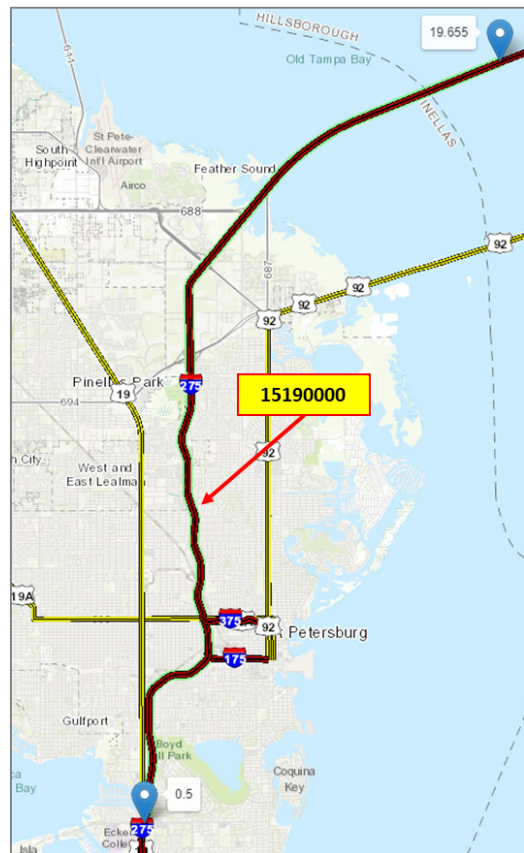
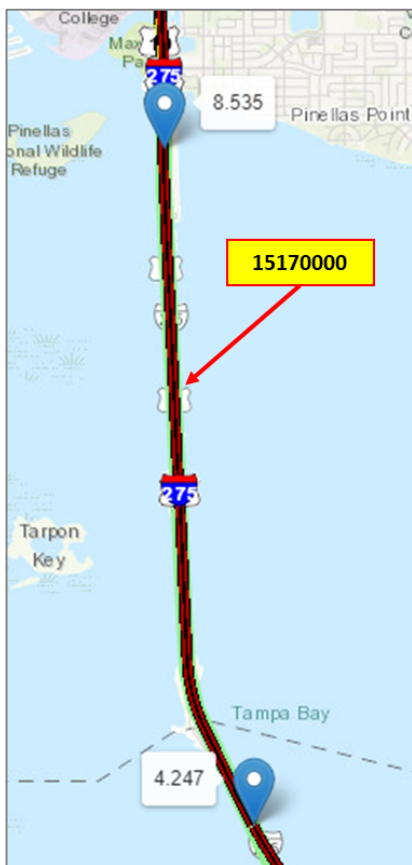
One (1) mast arm was impacted at the intersection of SR 5/Overseas Highway and Emerald Drive in Big Coppit Key. A new mast arm assembly will be proposed, and it will meet the latest design criteria. The District believes that these elements, although important, are not critical to preserving the functionality of the roadway for the residents of the Florida Keys. Bridge repairs will be typically restoring impacted areas to pre-storm conditions and were limited to restoring the slope protection. The slope protection worked as intended and designed, avoiding impact to the structures, and minimizing repair costs and/or bridge replacement.

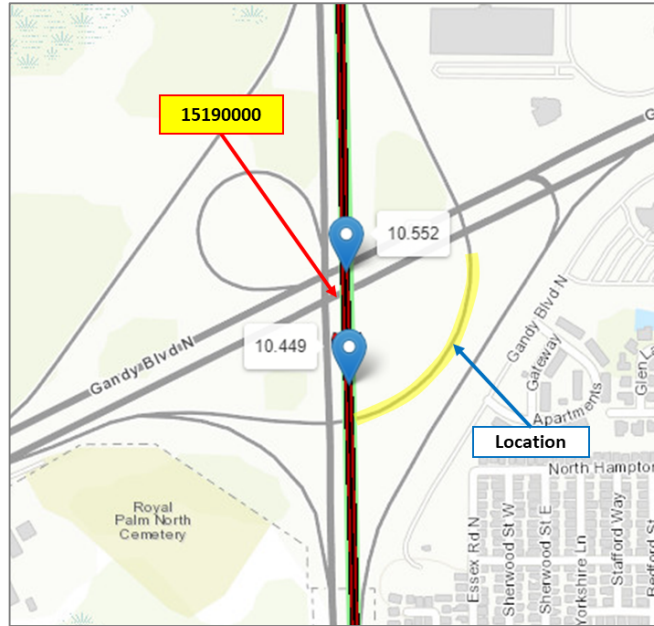
## District 7

### Project 1: I-275 and I-275 at SR-694 (Gandy Blvd)

County	Event	Landfall Date	Item No.	Route ID	Route Type	Location	Damage Description
Pinellas	Hurricane Francis	09/05/2004	418409-1	15170000	NHS	Beg Pt 4.247 to End Pt 8.535	Light poles
				15190000		Beg Pt 0.500 to End Pt 19.655	
	Tropical Storm Debby	6/25/2012	432719-1	15190000		Beg Pt 10.429 to End Pt 10.552	Slope erosion
	Hurricane Irma	09/09/2017	442752-1	15170000		Beg Pt 7.690 to End Pt 7.691	Light Poles
				15190000		Beg Pt 16.057 to End Pt 16.058	
						Beg Pt 18.172 to End Pt 18.173	

### Project Location Maps





## **Alternatives Discussion**

### **Light Pole Damages:**

Light poles being an above ground roadway asset and designed to break away in the event of a crash can sometimes be particularly susceptible to damage from excessively high winds during storm events.

At various locations along Interstate 275 in Pinellas County from just north of the Sunshine Skyway Bridge to the Howard Frankland Bridge in Hillsborough County, light poles were damaged by Hurricane Frances and repaired in 2004 under FPID 418409-1-52-01. An attempt was made to retrieve and review records for this repair project however the contract file was destroyed per policy of retention for Contract H7074. The damage was likely caused by high winds, but the exact locations of the affected light poles is unknown other than they were located somewhere along this 23.453-mile stretch of I-275. The total construction cost for this repair was \$180,324 which when using an average cost of \$7,000 per light pole replacement, it is estimated that approximately twenty-seven light poles were replaced.

The second occurrence of light poles being impacted and requiring permanent repair was in 2018. Three light poles were replaced at the following locations along I-275 under FPID 442752-1-52-01 after suffering wind damage during Hurricane Irma: Two (2) poles were replaced on roadway ID 15190000 at mile post 16.057 and milepost 18.172 just prior to and on the Howard Frankland Bridge, respectively. One (1) pole was replaced on roadway ID 15170000 at milepost 7.690 which located just north of the Sunshine Skyway Bridge.

It should be noted that because there are no records available to determine the locations of the estimated twenty-seven light poles damaged in the first storm event it is not possible to reach the conclusion that permanent repairs to the same assets were made more than once.

A permanent solution, however, could include the total replacement of all roadway lighting for this 23.453-mile span of I-275. The light poles that were damaged in the 2004 storm were designed to a wind speed criterion of 100 mph in Pinellas County. In 2017 the FDOT Structures Design Guidelines increased the wind loading criteria for all counties in District Seven including Pinellas to 150 mph. Any new roadway lighting designed and installed to this current criterion should result in a roadway lighting asset that is capable of handling increased wind speeds our District may experience.

The estimated total cost for complete lighting replacement for this entire 23.453-mile segment of I-275 is estimated to be \$12,854,465. Because of the high degree of cost involved and the fact that only an estimated thirty light poles out of approximately one thousand were damaged during these two storm events along with no confirmation that the same asset was damaged twice, the district does not believe it is prudent to initiate a project to only include replacement of light poles solely to address wind speed criteria concerns.

The district plans to include the replacement of roadway lighting during our current and planned reconstruction projects where lighting is impacted or needs to be adjusted and future resurfacing projects throughout this segment of I-275 where it is determined that the existing light poles are reaching the end of their useful life. Partial lighting replacement along I-275 is currently under construction under FPID 433880-1-52-01 Gateway Expressway project which is estimated to be completed in 2023. The roadway lighting across the entire length of the Howard Frankland Bridge will be replaced under FPID 422904-2-52-01 which also includes the construction of the new bridge. Construction for this project began in 2020 and is expected to be completed in 2025.

**Slope Erosion – I-275 at SR-694 (Gandy Blvd):**

The eastbound Gandy Blvd to northbound I-275 on-ramp has required multiple repairs due to side slope erosion damage from declared emergency events and non-emergency events. The existing slopes are composed of 1:2 fill sections which average 40 ft. in height. A 10 ft. level maintenance berm is provided 20 ft. below the edge of the shoulder. This section was constructed in 1972.

A repair in 2012 used a 6" cellular confinement system for soil stabilization. FDOT Maintenance reported that this area had been repaired before and after the 2012 repair mentioned above.

A permanent solution could include constructing 1:4 side slopes. The west side of the ramp could utilize 1:4 side slopes which tie to the existing ground. The east side of the ramp could use 1:4 side slopes with a retaining wall to prevent impacting the adjacent northbound I-275 to eastbound Gandy Blvd off-ramp. Concrete slope pavement at the existing bridges would be replaced. Wetland mitigation may be required for this operation.

The estimated cost for the permanent solution is approximately \$4,771,551.

The permanent solution is expected to prevent future erosion at this location with standard routine maintenance. The likely duration of the solution should exceed the design life of the facility.