# RDE the WAVE TO RESILIENCY

## **Transportation Resiliency Master Plan**

**Data Collection and Analysis Technical Memorandum** 

**JUNE 2021** 

Prepared For: Space Coast Transportation Planning Organization 2725 Judge Fran Jamieson Way, Building B, Room 105 Melbourne, FL 32940 321.690.6890

> Prepared By: Kittelson & Associates, Inc. 225 E Robinson Street, Suite 355 Orlando, FL 32801 407.540.0555

> > June 2021

# CONTENTS

1.0	Introduction	1
2.0	Evaluating Current Conditions	1
3.0	Verifying Sea Level Rise Datasets	14
4.0	Relevant Best Practices and Programs	19
5.0	Key Takeaways from Relevant Case Studies	22
6.0	Identifying Vulnerable Communities	25
7.0	Next Steps	29
8.0	Appendix	30

# **FIGURES**

Figure 1: Environmentally Endangered Lands (EEL) and Florida Forever Conservation Lands	4
Figure 2: Wetlands and Florida Conservation Lands	5
Figure 3: Major Water Bodies	6
Figure 4: Major Destinations	7
Figure 5: Task Force Agencies	9
Figure 6: Environmental Stakeholders	10
Figure 7: Economic Stakeholders	12
Figure 8: Major Destinations and 2040 NOAA High Sea Level Rise (SLR) Inundation	16
Figure 9: Major Destinations and 2070 NOAA High Sea Level Rise (SLR) Inundation	17
Figure 10: Major Destinations and 2100 NOAA High Sea Level Rise (SLR) Inundation	18
Figure 11: Impact Zones for Earthquake Scenario	24
Figure 12: Recovery Targets	24
Figure 13: Transportation Disadvantaged (TD) Population Areas	28

# TABLES

Table 1: Summary of Most Relevant Agency Plans	19
APPENDIX	

Appendix A: Data Collection Appendix B: Outreach and Education Appendix C: Best Practices and Plans

# ACRONYMS AND DEFINITIONS

ACS	American Community Survey	LRTP	2045 Long Range Transportation Plan
ARP	Alternative Restoration Plan	N5	NOAA 2017 High Hydro- connectivity model
BMAP	Basin Management Action Plan	NAACP	National Association for the Advancement of Colored People
BPMP	Space Coast TPO Bicycle and Pedestrian Master Plan	NIRL	North Indian River Lagoon
BPMP	Bicycle/Pedestrian Master Plan	NOAA	National Oceanic and Atmospheric Administration
BRL	Banana River Lagoon	NPDES	National Pollutant Discharge Elimination System
ССМР	Comprehensive Conservation and Management Plan	ORP	Oregon Resilience Plan
CIRL	Central Indian River Lagoon	OSTDS	On Site Treatment and Disposal Systems
CoC	Communities of Color	PIVOT	Progress, Innovation and Vision for Our Tomorrow
DEM	Digital Elevation Model	RAP	Reasonable Assurance Plan
ECFPRC	East Central Florida Regional Planning Council	RCI	Roadway Characteristics Inventory
EEL	Environmentally Endangered Lands	RRAP	Regional Resiliency Action Plan
EPA	Environmental Protection Agency	SIS	Strategic Intermodal System
FAST Act	Fixing America's Surface Transportation (FAST) Act	SJRWMD	St. Johns River Water Management District
FDEM	Florida Division of Emergency Management	SLR	Sea Level Rise
FDEP	Florida Department of Environmental Protection	SMP	Strategic Monitoring Plans
FDOT	Florida Department of Transportation	SOS	State of the System
FEGN	Florida Ecological Greenways Network	Space Coast TPO	Space Coast Transportation Planning Organization
FF	Florida Forever	SWIM	Surface Water Improvement and Management Plans
FHWA	Federal Highway Administration	SWSC	Surface Water Storage and Conveyance Infrastructure

FIT	Florida Institute of Technology	TD	Transportation Disadvtanged
FNAI	Florida Natural Areas Inventory	TMDL	Total Maximum Daily Load
F-TRAC	Florida Forever Tool for Efficient Resource Acquisition and Conservation	TN	Total Nitrogen
GIS	Geographic Information System	TP	Total Phosphorus
HIFLD	Homeland Infrastructure Foundation-Level Data	Transportation RMP	Transportation Resiliency Master Plan
HUD	U.S. Department of Housing and Urban Development	UF	University of Florida
IRL	Indian River Lagoon	USACE	United States Army Corp of Engineers
IRLNEP	Indian River Lagoon National Estuary Program	VA	Space Coast TPO Vulnerability Assessment
ITS	Intelligent Transportation System	WWTP	Wastewater Treatment Plants
LMS	Local Mitigation Strategy		

# **1.0 INTRODUCTION**

With Brevard County being a coastal community, the population is subject to environmental, social, and economic vulnerabilities. Metropolitan/Transportation Planning Organizations are federally required to consider and strive for resiliency of the transportation system through their planning activities and implementation of projects. The requirements are outlined through the Fixing America's Surface Transportation (FAST) Act and the Federal Highway Administration (FHWA) planning factors. Building on previous resiliency work, the Space Coast Transportation Planning Organization (Space Coast TPO) is developing a Transportation Resiliency Master Plan (Transportation RMP). The focus of the Transportation RMP is to develop a plan for transportation resiliency, defined as the ability of the transportation system to recover and regain functionality after a major disruption or disaster.

The Transportation RMP will build on past work to define potential transportation-specific stressors, identify vulnerable corridors in Brevard County, and recommend strategies to improve the adaptability/recoverability of the system. Resiliency focuses on the ability to bounce back from events and forces that negatively impact natural and man-made resources. For purposes of the Transportation RMP, these impacts are known as shocks and stressors. Shocks are single, sometime sudden, events that threaten a community, and stressors are continuous or re-occurring issues or events that impact or weaken the fabric of a community on a day to day or cyclical basis. For every community, understanding it's infrastructure and socioeconomic vulnerabilities is critical to building resilience.

The purpose of this Data Collection and Analysis Technical Memorandum (Memo) is to document the insights gather from the following efforts:

- Summarizing and reporting trends gathered from evaluating current conditions;
- Reviewing relevant agency plans and summarizing case studies;
- Identifying valuable assets and infrastructure; and
- Analyzing socioeconomic conditions across communities in Brevard County.

# 2.0 EVALUATING CURRENT CONDITIONS

Relevant data was collected, assessed, and mapped to understand the interconnected roadway, infrastructure, natural areas, and built environment areas that make Brevard County unique. Meetings and work sessions with Task Force members and Stakeholders supplemented data collection efforts to identify and confirm the important assets and areas in Brevard County. More information about those engagement efforts is detailed in **2.2 Initial Outreach and** Education.



The goal of data collection efforts is to set the stage for understanding what is at risk of being impacted by potential shocks and stressors in Brevard County, and to begin understanding the relationship and influence between the County's natural areas and built environment.

#### **2.1 Existing and Potential Future Conditions**

For the Transportation RMP, analyzing existing transportation elements, infrastructure, and natural areas is complemented with data for planned future transportation assets based on efforts completed by the Space Coast TPO, such as the State of the System (SOS), 2045 Long Range Transportation Plan (LRTP), and Bicycle and Pedestrian Master Plan (BPMP). Existing and potential future conditions form the basis for the shocks and stressors scenarios/projections analyses to be completed in the next phase of the Transportation RMP. **Appendix A: Data Collection** lists the data collected and sources. Data was collected from readily-available public from past Space Coast TPO efforts and GIS portals.

The following figures illustrate the key natural environments, infrastructure, and assets in Brevard County that make up the areas of interest for determining the impacts of shocks and stressors in the next phase of the Transportation RMP. Each figure is described in the following list:

- **Figure 1** illustrates the Environmentally Endangered Lands (EEL), Florida Forever (FF), and Conservation lands in Brevard County. Some natural systems in Brevard County span beyond the County limits and are interlinked with natural environments in other counties and municipalities. This is an important distinction as the impacts that a natural system faces up/down stream or in an area outside Brevard County may affects areas within the County boundaries.
- Conservation and wetlands shown in Figure 2 provide natural buffers and other ecosystem services to naturally protects communities and other assets from storm and other events.
- One of the most treasured natural assets in Brevard County is the Indian River Lagoon (IRL), shown in Figure 3. In addition to its natural beauty, the IRL provides economic benefit through recreational use value based on the billions of dollars spent on recreational activities<sup>1.</sup>
- In additional to the natural systems, major destinations in the built environment shown in Figure 4 serve as economic drivers that make Brevard County unique and competitive.

<sup>&</sup>lt;sup>1</sup> Indian River Lagoon Basin: Central Indian River Lagoon, Basin Management Action Plan, 2013



Future meetings with the Task Force and Focus Groups will identify and confirm the relevancy of additional datasets. In addition, as part of defining and developing scenarios/projections for specific shocks and stressors, further datasets may be collected and analyzed; these may include the following:

- Utilities;
- Stormwater system/drainage;
- Sewage system and septic tanks;
- Sources of drinking water/aquifers;
- Development trends;
- Bridge conditions; and
- Rail connections (e.g., Brightline).







June 2021

R

Ε S

ΤO

LIENCY

**Wetlands and Florida Conservation Lands** 

Figure 2





### **2.2 Initial Outreach and Education**

Throughout the Transportation RMP, meetings and work sessions with the Task Force members, Stakeholders, Space Coast TPO Governing Board and Committees, Focus Groups, transportation disadvantaged (TD) communities, and the general public will keep each group updated on progress and milestones achieved and sustain an open channel of communication to receive and share data and information. A detailed Outreach and Education Framework outlines each groups' roles, identifies specific collaborators to engage during the Transportation RMP development, points in the project schedule to engage with them, relevant information to obtain to progress the Transportation RMP, and the materials/concepts to disseminate with each group. The effectiveness of these strategies will be evaluated regularly and inform the evolution of future strategies used throughout the Transportation RMP. Initial meetings with the Task Force members and Stakeholders served to confirm datasets obtained and identify relevant and valuable information for upcoming Transportation RMP tasks. The full notes from the Task Force meetings and Stakeholder work sessions through March 2021 are included in **Appendix B: Outreach and Education**.

#### 2.2.1 January 2021 Task Force Meeting

The role of the Task Force is to provide technical, detailed feedback during data collection and analysis, defining shocks/stressors, and the development of actional strategies and tailored implementation guides. The first Task Force Meeting was held virtually on Tuesday, January 26, 2021, with the attendees listed in **Figure 5**. The purpose of this meeting was to introduce the Task Force to the Transportation RMP, their role in the project, and collect additional data to inform current conditions and planned resiliency-related efforts. Key takeaways from the first Task Force meeting are listed below.

- Task Force members are working on other relevant plans and/or programs in their organization/municipality (documented and summarized in Appendix C: Best Practices and Plans);
- Organizations/municipalities are at various stages of resiliency planning, ranging from early stages of planning to implementing projects and programs in the next year or two;
- Some Task Force members provided additional information about relevant case studies and datasets, including the Brevard County Emergency Management Local Mitigation Strategies Hazard Summary (documented and summarized in Appendix C: Best Practices and Plans);
- Additional Task Force members for future meetings and potential Stakeholders were identified; and



 The Brevard Housing Authority, National Association for the Advancement of Colored People (NAACP), and Aging Matters Brevard were identified as contacts to help identify and engage Transportation Disadvtanged (TD) communities.



FIGURE 5: TASK FORCE AGENCIES



#### 2.2.2 March 2021 Stakeholder Work Sessions

The specific roles and expectations of the Stakeholders are as follows:

- Provide background information on current conditions and share topic-specific information throughout the Transportation RMP's phases;
- Act as a sounding board for strategies that are developed; and
- Serve as partners in implementing the strategies that are developed as part of this Transportation RMP.

Two virtual Stakeholder Work Sessions were held with the aim of introducing the Transportation RMP, defining the Stakeholders' role in the project, identifying assets and infrastructure critical to their organizations, and beginning to discuss shocks/stressors. The first work session was held with Environmental Stakeholders on March 1, 2021, with the organizations shown in **Figure 6**.



FIGURE 6: ENVIRONMENTAL STAKEHOLDERS

Key takeaways from the Environmental Stakeholders Work Session as relevant to evaluating current conditions and preparing for developing shocks/stressors scenarios/projections are listed below.

- US 1, SR A1A, and other road corridors closest to surface waters convey pollutants into water bodies.
- US 1 has a direct impact on the IRL.
- DeSoto Parkway is an example of a corridor with stormwater issues.



- I-95 functions as a berm dividing the St. Johns River from the IRL watershed.
- Rising temperatures and water quality issues based on compartmentalizing water through transportation infrastructure is negatively impacting marine life.
- There is a need to coordinate locations of widened and new roadways with areas that are within expanding sewer system service areas.
- Some prominent shocks and stressors include heavy rainfall events and droughts between these events, increased frequency and intensity of storm events and hurricanes, and sea level rise.
- Stormwater storage and infrastructure design must consider future sea levels to ensure that these systems can function for their intended design life.
- For causeways, consider water circulation improvements and raising the levels above the future/rising sea levels.
- Living shorelines need landscape design that can facilitate the inward migration of the shoreline species as sea levels rise.
- NOAA 2017 Sea Level Rise Report and calculator from the US Army Corps of Engineers provides indication of sea levels in the future that can be used to plan infrastructure development. It was recommended that the highest curve be used for future planning.
- West of I-95, rainfall going into the St. Johns River will expand the shorelines and wetlands as more water enters the basin.
- More frequent and intense precipitation and changing rainfall patterns are filling basins.
- Rising temperatures impact the structural integrity of infrastructure and natural systems with increased acidification.
- Wildfires based on changing patterns of rainfalls and droughts are expected to be an elevated risk in the future.
- Urbanizing shorelines, rising temperatures, and seasonal pattern shifts are leading to algal blooms.
- Funding is always a concern and the Transportation RMP may look at connections between roadway infrastructure construction and the natural environment to better allocate funds for resiliency.
- As habitats become fragmented and water pools in areas that were previously dry, mosquito control problems arise in communities.

The second work session was held with Economic Stakeholders on March 26, 2021, with representatives of the Brevard County economic organizations shown in **Figure 7**.





FIGURE 7: ECONOMIC STAKEHOLDERS

Key takeaways from the Economic Stakeholders Work Session as relevant to evaluating current conditions and preparing for developing shocks/stressors scenarios and projections are listed below.

- Brightline rail connection from Brevard County to Miami could positively impact Brevard's technology industry as investors have the ease of connection between the two locations.
- Cruise ships out of operation during COVID have had a tremendous impact; cruises bring in about 20-25% of business (in terms of overnight stays) to Brevard County.
- Airports are critical and adding more domestic and international service will bring in more passengers.
- A transportation challenge stakeholders face in bringing in new potential employers are pedestrian safety, specifically on SR A1A.
- Connectivity between mainland and the beaches is important.
- North Brevard County is different from the central and south parts of the County because of the amount of protected land and its transportation connectivity to Orlando on corridors like SR 46 and SR 50.



- Shoreline development is not viewed as at risk in north Brevard County because of wildlife refuges and barrier islands, but is a growing concern based on growing investments in these developments.
- Generally, the north Brevard trail network is not as connected to residential communities. Neighborhood developments are planning to monetize connectivity to recreational facilities as quality of life assets.
- For Melbourne, a valuable asset is the airport because of the travel and the corporate activity on the property.
- I-95 and US 1 are bottlenecks now and potentially into the future as employers relocate to Brevard County and more jobs are created.
- North and central Brevard have corporate airport network that includes Titusville Cocoa Airport Authority, Merritt Island Airport, Space Coast Regional Airport, and Dunn Airpark.
- SR 528 and SR 520 identified as bottlenecks now and likely will be into the future as population and development growth rises.
- Public transport is needed to support economic growth.
- Causeways are heavily traveled by people wanting to see launch activities.
- Housing, accessibility, recreation, safety, and entertainment are the elements businesses and employees are looking for when thinking about residing in Brevard County.
- Potential shocks are catastrophic failures related to aerospace activities.
- Other potential shocks included safety, congestion, sea level rise, hurricanes, dated infrastructure, water infrastructure, and fire.
- Evacuation from south Brevard seems more challenging than north and central Brevard because of limited east-west connection.
- Water infrastructure is critical in the conversation about how development should grow into the future.
- Future initiatives include integrating the Economic Development Commission, economic development organizations, and chambers of commerce as partially responsible for getting to message residents/businesses during emergency events.
- Drought conditions are worsening in Brevard County and should be considered a shock/stressor because of lightning, rainfall changes, and undeveloped area that would allow wildfire to spark and burn longer without notice as fire moves through vegetation root systems.
- Commodity access (high speed internet, water, electricity) drive where businesses choose to locate.

Stakeholders will be engaged again toward the end of the Transportation RMP development in Spring 2022. At that time, Stakeholders will discuss the potential to implement strategies identified in the Transportation RMP and will identify processes/systems to implement strategies.



# 3.0 VERIFYING SEA LEVEL RISE DATASETS

The 2018 Space Coast TPO Vulnerability Assessment utilized the latest (at the time) University of Florida (UF) GeoPlan and Florida Department of Transportation (FDOT) data to assess transportation and public service facilities that are at risk of SLR inundation in 2040, 2070, and 2100. The UF GeoPlan data used was the modified bathtub model which applies a hydrologic connectivity filter to remove isolated inundated areas not connected to a major waterway. The specific projected SLR scenarios used in the VA report are the United States Army Corp of Engineers (USACE) low, intermediate, and high curves.

The publicly-available UF GeoPlan Sea Level Rise Models and Affected Transportation Geographic Information System (GIS) data was updated in December 2020 by county and decade. The inundation models are derived from multiple sources, including:

- USACE Sea-Level Change Curve Calculator (2019.21);
- National Oceanic and Atmospheric Administration (NOAA) SLR projections (2017);
- USACE SLR projections (2013);
- NOAA tidal surfaces; and
- A 5-meter horizontal resolution Digital Elevation Model (DEM).

The potential model output to be used for the Transportation RMP is the modified bathtub model that applies a hydrologic connectivity filter to remove isolated inundated areas not connected to a major waterway. Unlike the models used in past plans, the recently updated datasets replace the NOAA 2012 projections with the 2017 projections, were rerun with latest Lidar information, and remapped the USACE projections to account for updated Lidar data. The USACE SLR projections are from the USACE Calculator 2019.21 using 2013 data for low, intermediate, and high. The NOAA 2017 data uses six projections: low, intermediate-low, intermediate, high, high, and extreme. There are twelve tidal gauge stations in Florida for which the SLR data is projected. The tidal gauge station used in Brevard County is in Daytona Beach Shores. The proposed SLR projection to be used in the Transportation RMP is the NOAA 2017 High ("N5") Hydroconnectivity model ("Modified Bathtub"). The extent of sea level inundation using the NOAA 2017 High Modified Bathtub model for 2040, 2070, and 2100 are shown in the following figures. With the SLR Focus Group's input, the official projection for the Transportation RMP will be determined. The 2040 NOAA High Sea Level Rise (SLR) Inundation is shown in Figure 8 is primarily concentrated in Merritt Island and the low-lying, unincorporated natural areas of the barrier islands south of Melbourne Beach. The 2070 inundation extent shows increased affected areas on the western side of Merritt Island and in the mainland north of Titusville, as shown in



**Figure 9.** The projected inundation in 2100 nearly covers all of Merritt Island and the Barrier Islands, portions of US 1 throughout Brevard County, coastal areas north of Titusville and the natural areas between SR 50 and SR 46 in western Brevard County, as shown in **Figure 10**.

Also unique to the latest UF GeoPlan are the Affected Transportation infrastructure Current and Future Flood Exposure datasets. Broken out by county and decade, the dataset indicates transportation facilities exposed to current and future flooding under the different SLR scenarios: roadways, rails, freight terminals, seaports, airports, and spaceports. The modified bathtub SLR inundation model (used for this Transportation RMP) was intersected with transportation data to indicate the amount and percentage that each infrastructure facility is potentially affected under the different SLR scenarios (2040, 2070, 2100 in this case). The UF GeoPlan transportation-specific data used in the analysis includes the following:

- Roadway Characteristics Inventory (RCI) Roads On-system (maintained by FDOT) and off-system roads (owned by city/county);
- TIGER Roads Local roadways that are not included in FDOT RCI data based on 2018 U.S. Census Bureau datasets;
- Rails From the FDOT Strategic Intermodal System (SIS) and FDOT Transportation Statistics Office based on combining railways data from 2019 SIS and 2014 TRANSTAT; and
- Facilities Includes airports, freight terminals, seaports, and spaceports from the 2019 SIS and UF GeoPlan Center.

Linear facilities show in feet and percentage of each segments how much infrastructure is affected, while areal facilities (polygons) show acres and percentage of area affected. The potential SLR projection used to determine Transportation Infrastructure Affected for the Transportation RMP is the NOAA 2017 High ("N5") Hydro-connectivity model ("Modified Bathtub"). The final projection to be used for the Transportation RMP will be determined as part of the SLR Focus Group meetings aimed at defining and developing scenarios/projections for shocks and stressors.









# 4.0 RELEVANT BEST PRACTICES AND PROGRAMS

#### 4.1 Summary of Relevant Agency Plans

Federal, regional, and local agencies have been researching and developing plans that address many different aspects of the natural and built environment. Many of these plans include information related to resource management within Brevard County; these were reviewed to identify existing considerations and management practices. Existing resource management plans are predominantly focused on land acquisition, reduction in pollutant loading to water resources, and restoration of natural water systems. A summary of the reviewed plans is presented in **Table 1** and is described below, organized by agency.

This summary is intended to be a working document; as additional relevant plans are identified through cooperation with Stakeholders and local agencies, these will be reviewed, summarized, and added to the summary of plans initially reviewed. A detailed review of each plan listed in **Table 1** is documented in **Appendix C: Best Practices and Plans.** 

Agency	Plan Name	Key Relevant Points
Brevard County	Save Our Lagoon Plan	<ul> <li>Identified and monetized specific actions to reduce nitrogen and phosphorus loading in the IRL</li> <li>Developed a dedicated funding source</li> </ul>
	Local Mitigation Strategy	<ul> <li>Identify hazards and potential effects to Brevard County</li> <li>Identify critical facilities</li> </ul>
	Environmentally Endangered Lands (EEL) Program	<ul> <li>Identified key lands for acquisition</li> <li>Developed regional natural resource management strategy</li> </ul>
East Central Florida Regional Planning	Regional Resiliency Action Plan	<ul> <li>Established uniform projections of sea level rise for analysis</li> <li>Develop model for resiliency plans to be followed by local agencies</li> </ul>
Council (ECFRPC)	Space Coast Transportation Planning Organization Sea Level Rise Vulnerability Assessment	<ul> <li>Identification of transportation assets inundated by sea level rise</li> <li>Identification of next steps</li> </ul>

TABLE 1: SUMMARY OF MOST RELEVANT AGENCY PLANS



Agency	Plan Name	Key Relevant Points
	Satellite Beach Sea Level Rise Vulnerability Analysis	<ul> <li>Highly detailed (parcel and roadway) analysis of sea level rise, storm surge, flooding, and coastal erosion caused inundation</li> </ul>
	Community Resiliency in the City of Satellite Beach	<ul> <li>Received community feedback and prioritization for resiliency actions</li> </ul>
	Resilient Titusville	<ul> <li>Highly detailed (parcel and roadway) analysis of sea level rise, storm surge, and flooding caused inundation</li> </ul>
	Green Infrastructure Adaptation Plan for the Town of Melbourne Beach	<ul> <li>Concept development for site specific green infrastructure treatments</li> <li>Summary of best practices for green infrastructure</li> </ul>
	Indian River Lagoon Outfall and Sea Level Rise Vulnerability Analysis	<ul> <li>Consideration of impact of sea level rise on stormwater outfalls</li> </ul>
	Indian River Lagoon Storm Water Outfall Best Maintenance Report	<ul> <li>Comparison of cost effectiveness of stormwater best management practices</li> <li>Identification of priority streets within Brevard County for street sweeping</li> </ul>
Florida Department of Environmental Protection (FDEP)	Basin Management Action Plan (BMAP) & Alternative Restoration Plan (ARP)	<ul> <li>Legally enforceable actions to reduce nitrogen and phosphorus loading</li> </ul>
Indian River Lagoon National	Comprehensive Conservation and Management Plan (CCMP)	<ul> <li>Developed framework for assessing IRL</li> </ul>
Estuary Program (IRLNEP)	Climate Ready Estuary Technical Report	<ul> <li>Prioritized 9 adaptation actions to reduce risks of climate changes</li> </ul>
St. Johns River Water Management	Surface Water Improvement and Management (SWIM) Plans	<ul> <li>Identify actions to increase water quality</li> </ul>
District (SJRWMD)	Levee System Summaries and Emergency Plan	<ul> <li>Identification of inundation areas</li> </ul>
	Land Management Plans	<ul> <li>Property specific management strategies including fire, exotic species, habitat creation, and water management</li> </ul>



Agency	Plan Name	Key Relevant Points
FDOT	FDOT Mitigation Plan	<ul> <li>Drainage basin based identification of mitigation efforts</li> <li>Planned mitigation projects</li> </ul>
Florida Division of Emergency Management	Florida Natural Hazards Interagency Workgroup	<ul> <li>Summary of ongoing cross-agency work</li> </ul>
Environmental Protection Agency (EPA)	Being Prepared for Climate Change	<ul> <li>Guidebook for identification of climate change risks and development of actions to reduce risk</li> </ul>



# 5.0 KEY TAKEAWAYS FROM RELEVANT CASE STUDIES

In addition to the summary in **Relevant Best Practices and Programs**, case studies from other parts of the country were reviewed to gather information about novel methodological approaches outside of those used in existing local plans. These case studies contain aspects relevant to developing a resilient transportation system which can be adapted as part of the Transportation RMP development.

### 5.1 Texas Gulf Coast

The Texas Coastal Resiliency Master Plan is a statewide plan to protect and promote a vibrant and resilient Texas coast that supports and sustains a strong economy and healthy environment for all who live, work play or otherwise benefit from the natural resources and infrastructure along the Texas Coast. The Texas Gulf Coast Plan lists recommended specific projects that mitigate, collectively and individually, the issues of concern. One aspect of this case study that may have applicability to the Transportation RMP is the calculation of population served and associated property values and wages associated with the area that would benefit from the recommended projects. For example, in one area along the Texas Coast, the cost of the recommended resiliency projects was approximately \$4.5 billion. The property values within this area totals \$646 billion and the total wages associated with this area was \$156 billion.

#### 5.2 Resilient 305 Strategy – Miami Area

The Resilient 305 Strategy is a living document created to address resilience challenges through intergovernmental and community collaboration. This plan was developed through a unique partnership of Miami-Dade County, the City of Miami, and the City of Miami Beach. This Plan identified 50 actions that spanned three (3) overarching goal areas – Places, People, and Pathways (strategic course). This Plan focused on opportunities where the partnership was best positioned to move the needle and separated them from those where other entities are already advancing work. One aspect of this case study that this Transportation RMP can consider is how to successfully foster champions for the topic of resiliency. Resilient 305 created a PIVOT team (Progress, Innovation and Vision for Our Tomorrow), comprised of Mayors from the cities and county and community partners, to oversee the implementation of the Strategy. Similar to the Transportation RMP, Resilient 305 Strategy built upon analyses performed by the Regional Climate Compact.



#### 5.3 Oregon Resilience Plan

The Oregon Resilience Plan (ORP) was developed to anticipate effects to the state's infrastructure should a large earthquake occur. Additionally, the ORP proposed the level of infrastructure reliability that a resilient state should provide. This plan's recommendations identify ways to close the gap between anticipated and desired performance of state infrastructure. Considered infrastructure elements included the transportation network, critical facilities, energy transmission, communication systems, and water systems. The ORP is primarily focused on how to return to normal operating conditions as quickly as possible following a severe shock. The ORP provides an example of a methodological approach to determining influence area, differing effects of a shock throughout the state, and defining the acceptable restoration of infrastructure.

The Oregon Resilience Plan classified the transportation network on several dimensions:

- Impact Zone: The state was divided into four impact zones, as shown in Figure 11, each with a different expected level of impact.
- Route Tier: Routes were divided into three tiers, based on the criticality of the route, with Tier 1 facilities providing a bare backbone system and the restoration of Tier 1, Tier 2, and Tier 3 providing a more complete transportation network.
- Expected Service: Expected level of service of the network, with minimal restoration being needed for emergency responders and operational restoration being needed for 90 percent of capacity.

Timelines for recovery were set for each Expected Service target, on each roadway, based upon the above dimensions, as shown in **Figure 12**. Identification of targets of expected operation can be used to prioritize recommendations and specific projects to increase resiliency.





FIGURE 11: IMPACT ZONES FOR EARTHQUAKE SCENARIO



FIGURE 12: RECOVERY TARGETS



# 6.0 IDENTIFYING VULNERABLE COMMUNITIES

Vulnerable communities encompass the communities that may be impacted by shocks and stressors, including communities that are transportation disadvantaged (TD). The Transportation RMP is building on past work to identify these communities in Brevard County in terms of resiliency to shocks and stressors. As part of the initial efforts to prepare for meetings with TD communities, an analysis was completed to identify TD communities in Brevard County. The upcoming meetings with TD communities in the early phases of the Transportation RMP are aimed at to describe the project, share educational materials, and gather input related to how various shocks/stressors may impact TD communities in Brevard County. For the next phase of the Transportation RMP, the vulnerable communities will be further filtered by the impacts of each top shocks/stressors identified, and by the varying levels of intensities by which they are impacted.

#### 6.1 Transportation Disadvtanged Populations

An analysis was completed to create a TD population index representing populations most likely to rely on walking, biking, and transit as primary modes of transportation. The population groups in the TD index included:

- Overburdened renters, or people that pay 40% or more of their household income on rent;
- Population under age 18 in a single-parent household;
- Population with a disability;
- Population under age 10;
- Population over age 75;
- Workers without vehicle access;
- Population with limited English proficiency;
- Low-income population, or residents whose income is less than 200% of the Federal Poverty Guidelines<sup>2</sup>; and
- Communities of Color<sup>3</sup> (CoC) (all races and ethnicities other than White, non-Hispanic).

<sup>&</sup>lt;sup>3</sup> While some jurisdictions use the abbreviation "CoC" for "Communities of Concern", this analysis uses the abbreviation for "Communities of Color", or people of all races and ethnicities other than White, non-Hispanic. These are Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian or other Pacific Islander, Hispanic or Latino, other races, and two or more races.



<sup>&</sup>lt;sup>2</sup> Federal poverty guidelines are based on the number of people in a household or family. For example, \$12,760 is the federal poverty guideline for a single individual, while \$26,200 is the federal poverty guideline for a family of four. The U.S. Department of Housing and Urban Development (HUD) defines low-income as 80% of median family income, which in Florida ranges from 163% of the federal poverty guideline to 299% of the federal poverty guideline based on family/household size, averaging at 211%. Therefore, 200% of the federal poverty guideline was used to identify low-income populations.

This analysis used Census Bureau American Community Survey (ACS) data at the census tract level. To calculate the TD index, the family- or household-level variables were converted to person-units using the average family or household size for each census tract. The nine population values were summed and divided by the total population of the census tract to generate the preliminary index value. An individual can meet more than one of the qualifying attributes (e.g., a person could be living in poverty and be in a single-parent household), and for this reason the index intentionally counts individuals multiple times to generate an index that evaluates the relative equity disadvantage of the census tract. Thus, the highest theoretical score for an index census tract would be 8 if every person and household met every possible criterion (elderly and youth are mutually exclusive and thus these two variables cannot be met at the same time).

Brevard County-specific results are illustrated in **Figure 13** and key findings are summarized in the bullets below.

- The census tracts with 30% or more low-income population are along I-95;
- Generally, CoC are concentrated in places with the greatest population density: Cocoa, Rockledge, Melbourne, and Palm Bay; and
- Census tracts with the highest index scores are in the densest areas of Brevard County, including Cocoa, Rockledge, Melbourne, and Palm Bay and in Satellite Beach.

# 6.1.1 May 2021 Transportation Disadvantaged Community Conversation

The TD index serves as a basis to being identifying those populations that may be disproportionately impacted by shocks/stressors. As part of determining an equitable set of strategies in this Transportation RMP, it is critical to identify the communities with relatively fewer reliable transportation options in light of future catastrophic events. The first Community Conversation was held on May 12, 2021. Key takeaways from the first Community Conversation are listed below and detailed notes can be reviewed in **Appendix B: Outreach and Education**.

- Transportation Deserts: Some areas in Brevard County have few or no travel options for people walking, biking or taking transit. These areas/communities are not served by public transit and have roadways that are not accessible or safe for people walking and biking. Large employers that are not served by public transit due to being located on barrier islands or behind gates, should also be considered.
- In some areas of Cocoa, for example walking under I-95, children are walking or biking without access to safe facilities.



- Accessible transit is important to maintaining employment and independent living for some community members with disabilities. There are also some barriers to transit servicing areas in adjacent counties.
- Seniors and people with disabilities are sometimes affected similarly by natural disasters if they need to shelter in place. If evacuations are required, they may be more complex and have unique needs at shelters.
- Some key TD communities that have been identified include Cocoa, Downtown Titusville and Melbourne.
- During the meeting, several corridors and areas of importance were specifically noted.
- Transportation barrier may make it difficult for companies to hire employees in a tight labor market.
- There is currently no mechanism or occasion when the organizations that provide services to TD populations meet or coordinate routinely.





# 7.0 NEXT STEPS

The information gathered and research conducted in this first phase of the Transportation RMP will inform the selection of the top shocks/stressors to analyze in the next phase. The next phase will focus on identifying the specific infrastructure and assets critical to transportation in Brevard County. The scenarios/projections of each top shock/stressor will be developed to understand the levels of impact to transportation infrastructure. The Task Force, Focus Groups, and the community will be engaged in this next phase of the Transportation RMP, and the work completed, and insights gathered will be summarized in a technical memorandum.



# 8.0 APPENDIX

# CONTENTS

Appendix A: Data Collection Appendix B: Outreach and Education Appendix C: Best Practices and Plans




#### APPENDIX A: DATA COLLECTION

Data Category	Data Type	Data Source
	Functionally Classified Roadways	2019 SOS
	SOS Network	2019 SOS
	Hurricane Evacuation Routes	2018 SOS
	Hurricane Evacuation Zones	Florida Division of Emergency Management (FDEM)
	Existing and Proposed Bike Facilities	Space Coast TPO Bicycle and Pedestrian Master Plan (BPMP)
	LRTP Projects	Space Coast TPO LRTP
	Existing and Proposed Sidewalks	Space Coast TPO BPMP
Deedwey and	Trails Data	Space Coast TPO BPMP
Roadway and	Major Destinations	Space Coast TPO BPMP
minastructure	Existing/Proposed Fiber	Intelligent Transportation System (ITS) Master Plan
	Proposed Redundancy Fiber	ITS Master Plan
	Proposed Wireless Network	ITS Master Plan
	Rails	UF GeoPlan Center
	Transit Routes, Stops, and Ridership Data	2018/19 SOS
	Bridges	FDOT
	Sea Level Rise (SLR) Affected Transportation	UF GeoPlan Center
	Solid Waste Landfill Facilities	Homeland Infrastructure Foundation-Level Data (HIFLD)
	Wetlands	Space Coast TPO LRTP
	Alternative Restoration Plans	FDEP
	Florida Basin Areas	FDEP
	Florida National Hydrography	FDEP
Natural and Built Environment	Florida Total Maximum Daily Loads	FDEP
	Statewide Basin Management Action Plan	FDEP
	Surface Water Class Boundaries Areas	FDEP





Data Category		Data Type
	Verified List Impaired Waterbodies	FDEP
	Waters Not Attaining Standards	FDEP
	FEMA Floodplains/Brevard County Flood Maps	Space Coast TPO LRTP
	Sea Level Rise Coverage and	
	Depth	UF GeoPlan Center
	Florida Conservation Lands	Florida Natural Areas Inventory (FNAI)
Notural and	Florida Forever Board of	FNAI
	Trustees Projects	
Environment	Florida Forever Acquisitions	FNAI
Continued	EEL Program	Space Coast TPO LRTP
Continued	Florida Forever	FDEP
	Future Land Use	ECFPRC
	Food Access Research Atlas	Economic Research Service, U.S. Department of Agriculture
	Environmental Health Index	US Department of Housing and Urban Development
	Nursing Home/Assisted Care	HIFLD
	Public Housing Buildings	US Department of Housing and Urban Development





APPENDIX B: OUTREACH AND EDUCATION





TASK FORCE MEETING 1 AGENDA AND NOTES







#### Task Force Meeting #1

Date: Tuesday, January 26, 2021

Time: 9:00 AM - 11:00 AM

**Location:** Virtual via GoToMeeting

- Georganna Gillette (Space Coast Transportation Planning Organization (SCTPO))
- Sarah Kraum (SCTPO)
- Laura Carter (SCTPO)
- Chelsea Forgenie (SCTPO)
- Abby Hemenway (SCTPO)
- Travis Hills (Kittelson & Associates, Inc. (KAI))
- Mary Raulerson (KAI)
- Sigal Carmenate (KAI)
- Task Force invitees and attendees list attached

#### Introduction:

The purpose of this meeting was to introduce the Task Force to the Transportation Resiliency Master Plan (RMP) and their role in the project. The meeting agenda included introductions, discussions about the project scope and schedule, relevant best practices and programs, data collection efforts, key Stakeholders and Underserved Communities, and next steps.

#### **Meeting Notes:**

The meeting discussion was guided by a PowerPoint presentation, and feedback was collected using Mentimeter interactive polling and open discussion throughout the meeting. Highlights from the meeting are listed below.

- Some Task Force members are working on other relevant plans and/or programs in their organization/municipality, such as the following:
  - Municipal sustainability action plans;
  - Municipal resiliency plans;

- Brevard Local Mitigation Strategy;
- Audubon Florida and East Central Florida Regional Resiliency Collaborative (R2C) Climate Cohort Program;
- o United States Army Corps of Engineers (USACE) Southeast Study; and
- Stormwater master plans.
- Organizations/municipalities are at various stages of resiliency planning.
  - A Mentimeter poll of 27 respondents showed that most organizations/municipalities are in the early stages of planning for and implementing resiliency projects and programs, with plans to begin work in the next year or two.
- Some Task Force members provided additional information about relevant case studies and datasets, including the following:
  - o East Central Florida Regional Planning Council sea-level rise and surge data;
  - o East Central Florida Road Condition Assessments; and
  - Brevard County Emergency Management Local Mitigation Strategies Hazard Summaries.
- The following potential Task Force members were identified:
  - Lori Cox from East Central Florida Regional Planning Council; and
  - Ashleigh Fountain and Kipp Weber from the USACE.
- The following potential Stakeholders were identified:
  - The Marine Resources Council;
  - The Indian River Lagoon Council;
  - The Indian River Lagoon National Estuary Program;
  - Airport Authorities;
  - National Weather Service Melbourne Office; and
  - Florida Power & Light Company (FPL).
- KAI and the SCTPO will brainstorm how to effectively engage Underserved Communities while respecting social distancing practices and guidelines.
- The following contacts were discussed to help identify and engage Underserved Communities:
  - Brevard Housing Authority;
  - National Association for the Advancement of Colored People (NAACP); and
  - Aging Matters Brevard.
- The SCTPO will be launching a resiliency education campaign aimed to educate elected officials and the general public.
- One suggestion offered for the next Task Force Meeting was to have follow-up questions to the Mentimeter polls.
- The second Task Force Meeting will be held in Spring 2021.

The agenda, presentation, Mentimeter poll responses, and the invitees/attendees lists are attached.



#### Task Force Meeting #1 Agenda Transportation Resiliency Master Plan

January 26, 2021

Virtual via GoToMeeting

9:00 AM - 11:00 AM

- 1. Introductions
- 2. Project Scope, Schedule, and Overall Approach
  - a. Defining Transportation Resiliency
  - b. Roles and expectations of Task Force members
- 3. Relevant Best Practices and Programs
- 4. Input from Task Force on Data Collection
- 5. Key Stakeholders & Underserved Communities to Engage
- 6. Next Steps
  - a. Task 3 Data Collection and Analysis Activities
  - b. Stakeholder and Underserved Communities meetings
  - c. Next Task Force Meeting in May 2021
    - i. Review Draft Influence Areas and Current Conditions
    - ii. Vulnerable Communities Identification
    - iii. Determine Shortlist of Shocks/Stressors





TASK FORCE MEETING #1

JANUARY 26, 2021

VIRTUAL VIA GOTOMEETING

9:00 AM – 11:00 AM

## **GOTOMEETING LOGISTICS**



Today's meeting is being recorded.

Presentation and recording will be posted to the website.





In order to reduce background noises, please keep yourself muted unless you are speaking.

## INTRODUCTIONS



Enter your message
Send to

°

X Chat

— & ×

:

63

\$

へ 🧟 👄 🗐 🗘 🐉 👫 8:47 AM 1/26/2021 😽

Send

## TELL US ABOUT YOURSELF IN THE CHAT

- Full name
- Agency/Organization
- Length of occupation





## **MENTIMETER QUESTIONS**

Mentimeter will be utilized as a component of audience participation.

Go to Menti.com using a computer, tablet, or cellular device and enter code:

11 62 11 4



### AGENDA

- Introductions
- Project Scope, Schedule, and Overall Approach
- Relevant Best Practices and Programs
- Input on Data Collection
- Key Stakeholders and Underserved Communities to Engage
- Next Steps



What is your favorite place in Brevard? (Park, city, resturant, etc)

## brevard zoo cocoa village beach

## PROJECT SCOPE, SCHEDULE, AND OVERALL APPROACH





## WHAT IS RESILIENCE?

East Central Florida Regional Resiliency Action Plan (ECFRRAP) Definition:

The capacity of individuals, communities, institutions, businesses and systems within a region to plan, sustain, adapt, recover, improve and grow collaboratively – regardless what kind of chronic stresses and acute shocks they experience





## **BUILDING ON PREVIOUS** WORK – STATEWIDE EFFORTS

## FDEP Basin Management Action Plans (BMAP) – statewide watershed management

- North IRL (January 2013) reductions needed in subbasins (Turnbull Creek to NASA Causeway and NASA Causeway to Melbourne Causeway (U.S. Highway 192)
- Central IRL (January 2013) no additional reductions needed
- Banana River Lagoon (January 2013) reduction needed in area south of the SR 528 Causeway

IRLNEP Comprehensive Conservation and Management Plans (CCMPs)

SJWMD Surface Water Improvement and Management (SWIM) Plans

FDOT Florida Transportation Plan (FTP) Resiliency Subcommittee Source: fit.edu/indian-river-lagoon/





## BUILDING ON PREVIOUS WORK – REGIONAL EFFORTS

#### **ECF Regional Resilience Collaborative**

- ECFRPC resolution recommitting to regionalism to support:
  - □ Health (people) + Equity
  - Build Infrastructure + Natural Environment (places)
  - Economic Resilience (prosperity)
- Stakeholders across the region to develop a structure and framework for a regional resilience
  - □ Steering Committee/Council Sub-Committee
  - Technical Advisory Committee





## BUILDING ON PREVIOUS WORK – REGIONAL EFFORTS

#### **ECFRPC Regional Resiliency Action Plan**

- Focused on Sea Level Rise and Climate Adaptation
- Broad Perspective with Focus Areas:
  - □ Leadership and Strategy
  - Economic and Society
  - Infrastructure and Environment
  - □ Health and Wellbeing
  - Developed Goals, Objectives and Actions to be taken by different agencies over 5-year period

#### **Resilient Brevard – Brevard County and ECFRPC**

• Take a short survey by 1/27: www.perilofflood.net/resilient-brevard





## BUILDING ON PREVIOUS WORK – REGIONAL EFFORTS

**SCTPO Sea Level Rise Vulnerability Assessment** 

- Sea Level Scenario Sketch Planning Tool
- Documents inundation risks to transportation assets

#### 2019-22 SCTPO Governing Board Strategic Plan

Sustainability & Resiliency Emphasis Area

#### **SCTPO Project Prioritization Methodology**

 Sustainability & Resiliency Pre-Screening Criteria

#### SCTPO 2045 LRTP

• A primary goal is to provide a resilient transportation system





## **BUILDING ON PREVIOUS** WORK – LOCAL EFFORTS

- Vulnerability Assessments
- Resiliency Recommendations and Adaptation Action Area Recommendations
  - Community Resiliency Plans after ECFRPC RAP
- Projects and actions to achieve pollutant reductions as part of BMAPs



- Sustainability/Resiliency Elements in Comprehensive Plans (12/17 municipalities)
  - Cape CanaveralCocoa
  - Cocoa Beach
    Grant Valkaria
    Indialantic
  - Indian Harbour Beach
  - Melbourne
  - Melbourne Beach
  - Palm Shores
  - Rockledge
  - Satellite Beach
  - Titusville



## **MENTIMETER QUESTIONS**

What other relevant plans/programs does your organization/municipality have or are working on?

# **Mentimeter**



## WHAT IS TRANSPORTATION RESILIENCY?

.....the ability of the transportation system to recover and regain functionality after a major disruption or disaster. Source: visitspacecoast.com/





## WHAT ARE SHOCKS AND STRESSORS?

- Acute Shocks = Single, sharp events that threaten a community
- Chronic Stressors = Continuous or re-occurring issues or events that impact or weaken the fabric of a community on a day to day or cyclical basis





Source: Bill Klein

## **MENTIMETER QUESTIONS**

Where is your organization/municipality at regarding Transportation resiliency?

# **Mentimeter**







## **TRANSPORTATION FOCUS**

- Must answer:
  - What puts people and infrastructure at risk?
  - Which infrastructure are most important to protect?
- Key areas in Brevard County identified through *Influence Areas* 
  - Buffer areas around natural systems and where they potentially influence/interact with transportation infrastructure and the built environment









## WE NEED YOU TO SHARE INFORMATION WITH LOCALS & TO SHARE LOCAL INFORMATION WITH US



## **ROLES AND EXPECTATIONS OF THE TASK FORCE**





#### Task 3: Data Collection and Analysis

#### What are our current conditions?

- Feedback on engagement strategy/help engage others
- Information/data on current conditions
- Continuity from best existing programs/work
- Information/data on future conditions
- Input on definitions of shocks/stressors

#### Task 4: Define Shocks and Stressors

What future events potentially put our people/infrastructure at risk?

What infrastructure are more important to protect?

- Define goals/objectives to address shocks/stressors
- Feedback on scenarios/projections runs and critical areas/corridors/infrastructure
- Feedback/buy-in on vulnerable corridors

• Advise on identifying the top six shocks/stressors

#### Task 5: Transportation Resiliency Master Plan Development

What actions should we take to protect our high-priority infrastructure?

- Implementing strategies
- Identify barriers to implementation



## **TASK FORCE MEMBERS INVITED**

Agency/Organization	Name	Agency/Organization	Name
Brevard County - Emergency Management	John Scott	Grant-Valkaria	Jason Mahaney
Brevard County - Natural Resources	Darcie Mcgee	Indialantic	Michael Casey
Brevard County - Planning	Jane Hart	Indian Harbour Beach	Mark Ryan
Brevard County - Planning	leffery Ball	Indian River Lagoon Council	Duane De Freese
Brevard County - Public Works	Corrina Gumm	Malabar	Lisa Morrell
Broward County - Habit Works	Edward Fontanin	Melbourne	David Wilkison
Brevard County - Otinties		Melbourne	Todd Corwin
Cape Canaveral	Brenda Suprenant	Melbourne Beach	Elizabeth Mascaro
Cape Canaveral	Zac Eichholz	Melbourne Tillman WCD	Mike McCabe
Cocoa - Planning	Alix Bernard	Palm Bay	Suzanne Sherman
Cocoa - Public Works	Bryant Smith	Port Canaveral	Bob Musser
Cocoa Beach	Jared Francis	Rockledge	John Cooper
ECFRPC	Tara McCue	Satellite Beach	Courtney Barker
EPA	Roshanna White	Satellite Beach	Alexis Miller
FDOT	Casey Lyon	SJRWMD	Abby Johnson
FDOT	Steve Shams	SJRWMD	Tom Frick
Florida DEP	Leo Angelero	Titusville	Eddy Galindo
Florida Sea Grant/UF/IFAS Extension	Holly Abeels	West Melbourne	Daniel Martoma



## RELEVANT BEST PRACTICES AND PROGRAMS





## RELEVANT PLANS REVIEWED TO-DATE

- Florida
  - □ Southeast Florida Regional Climate Compact Regional Climate Action Plan (RCAP)
  - Through the Lens of Resilience
  - Resilient 305
- National
  - Brookline Urban Forest Climate Resiliency Master Plan
  - Mariposa County Recreation and Resiliency Master Plan
  - □ Metro Climate Action and Adaptation Plan
  - □ New Hampshire Ten Year Plan
  - Oregon Resilience Plan
  - Plan Bay Area 2050
  - Texas Coastal Resiliency Master Plan
  - Urban Transportation System Flood Vulnerability Assessment with Special Reference to Low Income and Minority Neighborhoods
  - Uulnerability and Resiliency Framework for the Atlanta Region

## RESILIENT 305 – MIAMI AND GREATER BEACHES

- Places
- People
- Pathways
- PIVOT Team "Progress, Innovation, and Vision for Our Tomorrow"
- Southeast Florida Regional Climate Change Compact – 2009


## TEXAS COASTAL RESILIENCY MASTER PLAN



- Statewide Plan a strategic pathway to restore, enhance and protect the coast
  - Protect and promote a vibrant and resilient Texas coast
  - Support and sustain a strong economy and healthy environment
  - For all who live, work, play or otherwise benefit from the natural resources and infrastructure along the Texas coast
- Identified 8 Priority Issues of Concern (existing and future conditions)
- Project-centric
- Uses population, property values and wages to offset/compare project costs

## **MENTIMETER QUESTIONS**

Are there other case studies that you're familiar with relevant to what the Transportation RMP is trying to achieve?

## **Mentimeter**



## INPUT ON DATA COLLECTION



## **DATA COLLECTION**



- Existing facilities and characteristics •
- Hurricane evacuation routes/maps
- LRTP and ITS Plans data
- Bridges and causeways
- Rails, airports, freight terminals, seaports, and spaceports

- Shores/beaches
- Water bodies
- Floodplains
- Agri-rural lands
- Conservation and preservation areas
- Stormwater system
- Habitat areas •

## WHAT OTHER DATA SETS CAN YOU PROVIDE TO COMPLETE THE PUZZLE?



## **MENTIMETER QUESTIONS**

What other relevant data sets can you provide?

## **Mentimeter**



## KEY STAKEHOLDERS & UNDERSERVED COMMUNITIES TO ENGAGE



### **DIFFERENT ROLES FOR THE SAME GOAL**



## A RESILIENT BREVARD



Group	Role	Schedule
Board	<ul> <li>Provide feedback</li> <li>Adopt the Transportation RMP</li> <li>Educate their community/constituency on the Transportation RMP</li> </ul>	<ul> <li>End of Task 3: Data Collection and Analysis</li> <li>End of Task 4: Define Shocks and Stressors</li> <li>End of Task 5: Transportation Resiliency Master Plan Development</li> </ul>
Committees	<ul> <li>Provide feedback</li> <li>Educate their community on the Transportation RMP</li> </ul>	<ul> <li>End of Task 3</li> <li>End of Task 4</li> <li>End of Task 5</li> </ul>
Focus Group	<ul> <li>Provide technical/detailed feedback</li> <li>Input needed about specific shocks/stressors</li> </ul>	Task 4
Key Stakeholders	<ul> <li>Provide specific background information on conditions</li> <li>Act as a Sounding board for strategies</li> <li>Potentially responsible for some strategies</li> </ul>	Targeted input during Task 3 and Task 5
Underserved Communities	<ul> <li>Education/information exchange with project team</li> <li>Identify missing socioeconomic elements in data collection and analysis</li> </ul>	Targeted input during Task 3 and Task 4
General Public/Special Interest Groups	<ul> <li>Educate about resiliency</li> <li>Feedback to inform Task Force and SCTPO Boards/Committees</li> <li>Share Information on other platforms/events to disseminate information/educate about the Transportation RMP</li> </ul>	High-level, targeted information/education dissemination in Tasks 3 and 4/5

### ENGAGING STAKEHOLDERS AND UNDERSERVED COMMUNITIES



- Act as a Sounding board for strategies
- Potentially responsible for some strategies
- Education/information exchange with project team
- Identify missing socioeconomic elements in data collection and analysis





## WORKING LIST OF STAKEHOLDERS



## **IDENTIFYING UNDERSERVED COMMUNITIES**

- Focus of the outreach is to target Transportation Disadvantaged populations
- Transportation Disadvantaged populations meeting one or more criteria:
  - Overburdened renters
  - Population under age 18 in a single-parent household
  - Population with a disability
  - Population under age 10
  - Population over age 75
  - □ Workers without vehicle access
  - Population with limited English proficiency
  - □ Low-income population
  - Communities of Color (All other races and ethnicities Non-White Non-Hispanic)





ransportation Disadvantaged Population (TDP) Index AetroPlan Orlando and Space Coast TPO

RIDE the WAVE

## **NEXT STEPS**



## **NEXT STEPS**

- Data Collection and Analysis Activities
- Stakeholder and Underserved Communities meetings
- Next Task Force Meeting: May 2021
  - Review Draft Influence Areas and Current Conditions
  - □Vulnerable Communities Identification
  - Discuss long list of Shocks/Stressors and identify short list for this Plan







## Thank you!

Sarah Kraum, Senior Transportation Planner (321) 350-9263 sarah.kraum@brevardfl.gov http://sctpo.com/

## What is your favorite place in Brevard? (Park, city, resturant, etc)

restaurant mangetsu lori wilson park third culture kitchen riverfront park playa linda state park the kennedy space center turkey creek sanctuary downtown melbourne micco scrub sanctuary canaveral natl seashore the cove port canaveral home viera wetlands beach brevard zoo oco my backyard indian river lagoon indian river sand point park cocoa village enchanted forest field of dreams orleans restaurant titusv malabar trails eel properties fox lake park spessard holland beach river road 0 rockledge turkey creek

satellite beach Z00 palm bay

O

the lagoo

any natural land or trail merrit island national ss

playalinda brix project sun shoppe cafe wickham park summer st beach

chain of lakes

irl - sebastian inlet west melbourne



# What other relevant plans/programs does your organization/municipality have or are working on?

USACE southeast study	IRLC Lagoon resil
Brevard Local Mitigation Strategy	Municipal Sustain
Following up on our own 2019 vulnerability assessment, we are preparing Cape Canaveral's first resiliency action plan.	City of Cocoa Res

ilience plan

city-specific Sustainability Action Plans

nability Action Plan

Resilient Titusville (complete)

esiliency Plan

R2C Climate Cohort program



# What other relevant plans/programs does your organization/municipality have or are working on?

City-specific resiliency plans	The City of Melbo developing a Coo
Town of Malabar-Stormwater Master Plan	stormwater mast
Assessing potential road threats.	Peril of Flood

ourne is currently astal Resilency Plan. IRLNEP Climate Ready Estuary Report will be adopted by IRL Council BOD in February 2021

er plan

purposeful comprehensive plan updates for zoning and height restrictions



# Where is your organization/municipality at regarding Transportation resiliency?

5



Early stages, plan to begin work in the next year or two getting to implementation Implementing resiliency related projects and programs

7



# Are there other case studies that you're familiar with relevant to what the Transportation RMP is trying to achieve?

Norfolk VAq	Road Conditio
EM Evacuation routes	EM Evacuation

on Assessment

n routes

local codes that support mitigation in LMS

Codes that support mitigation in LMS from all Jurisdictions in Brevard



# What other relevant data sets can you provide?



maybe: sustainability assessment

Land value map

Road Condition Assessment



Invitees				
Name	Agency/Organization	Attended		
Abby Johnson	SJRWMD	Y		
Alexis Miller	Satellite Beach	Y		
Alix Bernard	Cocoa - Planning	Y		
Bob Musser	Port Canaveral	Y		
Brenda Suprenant	Cape Canaveral	Y		
Bryant Smith	Cocoa - Public Works	Y		
Casey Lyon	FDOT	Y		
Corrina Gumm	Brevard County - Public Works	Y		
Courtney Barker	Satellite Beach	Y		
Daniel Martoma	West Melbourne	Y		
Darcie Mcgee	Brevard County - Natural Resources	Y		
David Wilkison	Melbourne	Y		
Duane De Freese	Indian River Lagoon Council	Y		
Eddy Galindo	Titusville	Y		
Edward Fontanin	Brevard County - Utilities	Y		
Elizabeth Mascaro	Melbourne Beach	N		
Holly Abeels	Florida Sea Grant/UF/IFAS Extension	Y		
Jane Hart	Brevard County - Planning	Y		
Jared Francis	Cocoa Beach	N		
Jason Mahaney	Grant-Valkaria	Y		
Jeffery Ball	Brevard County - Planning	Y		
John Cooper	Rockledge	Y		
John Scott	Brevard County - Emergency Management	N		
Leo Angelero	Florida DEP	Y		
Lisa Morrell	Malabar	Y		
Mark Ryan	Indian Harbour Beach	Y		
Michael Casey	Indialantic	N		
Michael McCabe	Melbourne Tillman WCD	Y		
Roshanna White	EPA	Y		
Steve Shams	FDOT	Y		
Suzanne Sherman	Palm Bay	Y		
Tara McCue	ECFRPC	Y		
Todd Corwin	Melbourne	Y		
Tom Frick	SJRWMD	Y		
Zac Eichholz	Cape Canaveral	Y		
	Other Attendees			
Name	Agency/Organization	Attended		
Debbie Coles	Brevard County - Emergency Management	Υ		
Don Kean	Brevard County - Utilities	Y		
Abigal Morgan	Cocoa - Assistant City Engineer	Υ		

ENVIRONMENTAL STAKEHOLDERS WORK SESSION AGENDA AND NOTES







#### **Environmental Stakeholder Work Session Agenda**

#### **Transportation Resiliency Master Plan**

March 1, 2021

Virtual via Microsoft Teams

9:30 AM – 11:00 AM

- 1. Introductions
- 2. Meeting Purpose
  - a. Introduce the Master Plan
  - b. Identify Critical Assets and Infrastructure
  - c. Begin Discussing Relevant Shocks/Stressors
- 3. Project Scope, Schedule, and Overall Approach
  - a. Defining Transportation Resiliency
  - b. Roles and Expectations of Stakeholders
- 4. Critical Assets/Infrastructure and Important Considerations
  - a. What are the most important assets influencing the health of the Indian River Lagoon?
  - b. What other major natural systems are critical to your agency/organization?
  - c. What transportation infrastructure is critical to meeting the goals of your agency/organization?
  - d. What partners do you rely on/collaborate with to meet your agency's/organization's mission?

- 5. Historic Shocks/Stressors and Future Threats
  - a. What natural or man-made events have historically required a moderate or intense recovery process?
  - b. What current natural or man-made events negatively impact the ability to meet your agency's/organization's goals or mission?
  - c. What has been your role in the Brevard County Local Mitigation Strategy and Hazards List development?
  - d. What other involvement have you had in resiliency-related efforts in the county and region?
  - e. Does your agency/organization have future initiatives/coalitions/campaigns planned?
- 6. Next Steps
  - a. Stakeholder Discussions Follow-ups
  - b. Continue Outreach and Education activities
  - c. Evaluate Current Conditions
  - d. Identify Vulnerable Communities
  - e. Define short list of Key Shocks/Stressors



#### **Environmental Stakeholders Work Session**

Date: Monday, March 1, 2021

Time: 9:30 AM - 11:00 AM

Location: Virtual via Microsoft Teams

- Georganna Gillette (Space Coast Transportation Planning Organization (SCTPO))
- Sarah Kraum (SCTPO)
- Laura Carter (SCTPO)
- Virginia Barker (Brevard County Director of Natural Resources)
- Darcie McGee (Brevard County Natural Resources Management Department Assistant Director)
- Michael Knight (Brevard County Environmentally Endangered Lands (EEL) Program Manager)
- Keith Winsten (Brevard County Zoo Executive Director)
- Amy Reaume (Brevard County Zoo Conservation Coordinator)
- Dr. Duane De Freese (Indian River Lagoon Council Executive Director)
- Dr. Randall Parkinson (Coastal Geologist and President of RWParkinson Consulting, Inc.)
- Dr. Leesa Souto (Marine Resources Council (MRC) Executive Director)
- Mary Raulerson (Kittelson & Associates, Inc. (KAI))
- Sigal Carmenate (KAI)

#### Introduction:

The purpose of this meeting was to introduce the Environmental Stakeholders to the Transportation Resiliency Master Plan (RMP), define the stakeholder role in the project, identify assets and infrastructure critical to their organizations, and begin discussing shocks/stressors.

#### **Meeting Notes:**

The meeting discussion was guided by a PowerPoint presentation and PDF maps of natural resources in Brevard County. Feedback was collected as comments on the PDF maps and through a recording of the Microsoft Teams meeting. Highlights from the meeting are listed below:

- Roadway projects have historically focused on flood control instead of where water is discharging.
  - Road systems are functioning like pollution conveyance systems for stormwater runoff.

- US 1, SR A1A, and other road corridors closest to surface waters convey pollutants into water bodies.
  - US 1 has a direct impact on the Indian River Lagoon (IRL).
- In Merritt Island and the barrier islands, water flows through communities picking up pollutants and discharging into nearby lakes and tributaries.
  - DeSoto Parkway is an example of a corridor with stormwater issues.
- I-95 functions as a berm dividing the St. Johns River from the IRL watershed.
  - Funds used to put culverts under the interstate to redirect flows west of the St. Johns River drain excess freshwater into the IRL.
  - Recommended to look at maps of historical ridge locations as proxy for the drainage divides.
- The volume of water that roads are carrying and discharging into water bodies like the IRL change salinity which negatively affect marine life like oysters and clams.
- Rising temperatures and water quality issues based on compartmentalizing water through transportation infrastructure is negatively impacting marine life.
- There is a need to coordinate locations of widened and new roadways with areas that are within expanding sewer system service areas.
- Brevard County Natural Resources has completed digital modeling for every septic tank that drains into the IRL.
- Some prominent shocks and stressors include heavy rainfall events and droughts between these events, increased frequency and intensity of storm events and hurricanes, and sea level rise.
- Stormwater storage and infrastructure design must consider future sea levels to ensure that these systems can function for their intended design life. They need to be designed so that the outfall levels accommodate for future sea levels.
- For causeways, consider water circulation improvements and raising the levels above the future/rising sea levels.
- Living shorelines need landscape design that can facilitate the inward migration of the shoreline species as sea levels rise.
- NOAA 2017 Sea Level Rise Report and calculator from the US Army Corps of Engineers provides indication of sea levels in the future that can be used to plan infrastructure development. It was recommended that the highest curve be used for future planning.
- As currently designed, stormwater systems that have outfalls below sea level (and future sea levels) can lead to neighborhood flooding.
- Buffering lands like uplands, wetlands, floodplains, and tributaries are critical natural systems that are key to coastal protection; many are being overdeveloped.
- As sea level rises, groundwater also rises and fills ditches so there is little room for additional water capacity, leading to flooding.
- Coastal wetland and marshes are fragmented because of infrastructure; this impedes natural water flow and inhibits natural wildlife migration which can lead to a loss in species diversity and health.

- It would be helpful to understand which habitats and connections are most important to preserve/protect.
- Consider transportation improvements without negative unintended consequences on natural environments.
- Regulation has not kept up with the changing needs in terms of water quantity or water quality. This is exemplified by permitting septic systems which are not the most environmentally-friendly option available.
- The Clean Waterways Act focuses on updating stormwater permitting, and the Florida Department of Environmental Protection (DEP) Technical Advisory Committee is meeting to update the state's stormwater rules.
- Low impact development standards are not applied comprehensively throughout the Brevard County.
- West of I-95, rainfall going into the St. Johns River will expand the shorelines and wetlands as more water enters the basin.
- More frequent and intense precipitation and changing rainfall patterns are filling basins.
- Rising temperatures impact the structural integrity of infrastructure and natural systems with increased acidification.
- Wildfires based on changing patterns of rainfalls and droughts are expected to be an elevated risk in the future.
- Urbanizing shorelines, rising temperatures, and seasonal pattern shifts are leading to algal blooms.
- It is important to look at how infrastructure is managed in addition to how it is built. For example, the City of Sebastian held a moratorium on chemical spraying to decrease chemicals into the water systems; this had a negative impact from increased vegetation which compromised water flows in ditches and drainage systems.
- Funding is always a concern and the Transportation RMP may look at connections between roadway infrastructure construction and the natural environment to better allocate funds for resiliency.
- Erosion is an issue as shorelines recede and poses problems for shoreline residents, US 1, and other roads on the coast.
- Policy does not currently address buffering wave and wind energy, and seawalls cannot suffice for structural integrity at shorelines.
- Translocating Florida Scrub Jays and other species during road construction is a challenge, as roads are built through protected species habitats.
- As habitats become fragmented and water pools in areas that were previously dry, mosquito control problems arise in communities.
- Other stakeholders to provide more targeted information include the United States Fish and Wildlife Services, Florida Fish and Wildlife Conservation Commission, and Mosquito Control.
- Data to map to facilitate discussion includes future land use and development growth.

The agenda and presentation are attached.





ENVIRONMENTAL STAKEHOLDERS WORK SESSIONS

MARCH 1, 2021

VIRTUAL VIA MICROSOFT TEAMS

9:30 AM - 11:00 AM

## AGENDA

- Introductions
- Meeting Purpose
- Project Scope, Schedule, and Overall Approach
- Critical Assets and Important Considerations
- Historic Shocks/Stressors and Future Threats
- Next Steps





## **TELL US ABOUT YOURSELF**

- Name
- Agency/Organization
- Length of occupation & role
- Favorite place in Brevard County





## **MEETING PURPOSE**

- Introduce the Master Plan
- Identify Critical Assets and Infrastructure
- Begin Discussing Relevant Shocks/Stressors





## WHAT IS RESILIENCE?

East Central Florida Regional Resiliency Action Plan (ECFRRAP) Definition:

The capacity of individuals, communities, institutions, businesses and systems within a region to plan, sustain, adapt, recover, improve and grow collaboratively – regardless what kind of chronic stresses and acute shocks they experience









## **TRANSPORTATION FOCUS**

- Must answer:
  - What puts people and infrastructure at risk?
  - Which infrastructure are most important to protect?
- Key areas in Brevard County identified through *Influence Areas* 
  - Buffer areas around natural systems and where they potentially influence/interact with transportation infrastructure and the built environment




## **ROLES AND EXPECTATIONS OF STAKEHOLDERS**





#### **DIFFERENT ROLES FOR THE SAME GOAL**



# A RESILIENT BREVARD



## **SPECIAL AND VALUABLE PLACES IN BREVARD**

- Built Environment
  Natural Resources
  - Playhouses/Center • for the Arts
  - Historic and other • Downtown areas
  - Tourism, waterfront • property values, and commercial fisheries

From 2009-2019, 55% growth in Construction jobs and 40% in Leisure and Hospitality jobs Space Coast EDC, 2019



Melbourne named #1 place to live near the beach in the U.S. U.S. News & World *Report, 2019* 

- - Indian River Lagoon most biologically diverse estuary in North America
  - St. Johns River
  - 72 miles of beaches
  - Living Shorelines salt marshes, oyster reefs, mangroves
  - Coastal dunes
  - Scrub ecosystems
  - **Conservation areas**
  - Endangered • lands/species





## WHAT MAKES BREVARD COUNTY UNIQUE?

- Space Kennedy Space Center and Cape Canaveral Air Force Station, SpaceX
- Air Orlando Melbourne International Airport (MLB) and Orlando International Airport (MCO), Space Coast Regional Airport (TIX)
- Road causeways, bridges, critical eastwest and regional corridors/connections

- **Rail** Florida East pe Railway
  - **Sea** Port Canaveral, Army, Navy, and Air Force facilities, including Surface Deployment and Distribution

#1 Most concentrated high-tech economy in FL, and #10 in U.S. Milken Institute, 2019







## STAKEHOLDER WORK SESSION/DISCUSSION: POINTED QUESTIONS

#### PLEASE LET US KNOW...

#### **Critical Assets/Infrastructure and Important Considerations**

- What are the most important assets influencing the health of the Indian River Lagoon?
- What other major natural systems are critical to your agency/organization?
- What transportation infrastructure is critical to meeting the goals of your agency/organization?
- What partners do you rely on/collaborate with to meet your agency's/organization's mission?



## STAKEHOLDER WORK SESSION/DISCUSSION: POINTED QUESTIONS

#### PLEASE LET US KNOW...

#### **Historic Shocks/Stressors and Future Threats**

- What natural or man-made events have historically required a moderate or intense recovery process?
- What current natural or man-made events negatively impact the ability to meet your agency's/organization's goals or mission?
- What has been your role in the Brevard County Local Mitigation Strategy and Hazards List development?
- What other involvement have you had in resiliency-related efforts in the county and region?
- Does your agency/organization have future initiatives/coalitions/campaigns planned?



## **NEXT STEPS**

- Stakeholder Discussions Follow-ups
- Continue Outreach and Education activities
- Evaluate Current Conditions
- Identify Vulnerable Communities
- Define short list of Key Shocks/Stressors







# Thank you!

Sarah Kraum, Senior Transportation Planner (321) 350-9263 sarah.kraum@brevardfl.gov http://sctpo.com/ ECONOMIC STAKEHOLDERS WORK SESSION AGENDA AND NOTES







#### Economic Stakeholder Work Session Agenda

#### **Transportation Resiliency Master Plan**

March 26, 2021

#### Virtual via Microsoft Teams

10:30 AM - 12:00 PM

- 1. Introductions
- 2. Meeting Purpose
  - a. Introduce the Master Plan
  - b. Identify Critical Assets and Infrastructure
  - c. Begin Discussing Relevant Shocks/Stressors
- 3. Key Terms/Common Language
- 4. Project Scope, Schedule, and Overall Approach
  - a. Defining Resiliency in Terms of Past Efforts
  - b. Transportation Resiliency for this Master Plan
- 5. Critical Assets/Infrastructure and Important Considerations
  - a. What are the most important/valuable assets for your agency/organization?
  - b. What transportation infrastructure is critical to the success of your agency/organization?
  - c. What partners do you rely on/collaborate with to meet your agency's/organization's mission?
- 6. Historic Shocks/Stressors and Future Threats
  - a. What events have historically required a moderate or intense recovery process?

- b. What current events negatively impact the ability to meet your agency's/organization's goals or mission?
- c. What resources do you have for communities/businesses as part of the recovery process from a shock/stressor?
- d. What has been your role in the Brevard County Local Mitigation Strategy and Hazards List development?
- e. What involvement have you had in resiliency-related efforts in the county and region?

#### 7. Next Steps

- a. Stakeholder Discussions Follow-ups
- b. Continue Outreach and Education Activities
- c. Evaluate Current Conditions
- d. Identify Vulnerable Communities
- e. Define Short List of Key Shocks/Stressors



#### **Economic Stakeholders Work Session**

Date: Friday, March 26, 2021

Time: 10:30 AM - 12:00 PM

Location: Virtual via Microsoft Teams

- Georganna Gillette (Space Coast Transportation Planning Organization (SCTPO))
- Laura Carter (SCTPO)
- Sarah Kraum (SCTPO)
- Brian Blanchard (Deputy Director, Space Coast Office of Tourism)
- Peter Cranis (Executive Director, Space Coast Office of Tourism)
- Kathryn Rudloff (Executive Director, weVENTURE Women's Center at Florida Tech's Bisk College of Business)
- Marcia Gaedcke (President, Titusville Chamber of Commerce)
- Michael Ayers (President and CEO, Melbourne Regional Chamber)
- Jennifer Sugarman (President & CEO, Cocoa Beach Regional Chamber of Commerce)
- Marcus Smith (Consultant, Florida Small Business Development Center (SBDC))
- Mary Raulerson (Kittelson & Associates, Inc. (KAI))
- Sigal Carmenate (KAI)

#### Introduction:

The purpose of this meeting was to introduce the Economic Stakeholders to the Transportation Resiliency Master Plan (RMP), define the stakeholders' role in the project, identify assets and infrastructure critical to their organizations, and begin discussing shocks/stressors.

#### **Meeting Notes:**

The meeting discussion was guided by a PowerPoint presentation and starter questions listed on the meeting agenda sent to stakeholders beforehand. Feedback was collected as typed notes during the meeting and through a recording of the Microsoft Teams meeting. Highlights from the meeting are listed below:

- Office of Tourism's goal is to have people visit Brevard County, and transportation options are critical to meeting that goal.
  - Would like to see opportunities for Brightline or other services where people can visit by rail; rail connection from Brevard County to Miami could positively impact Brevard's technology industry as investors have the ease of connection between the two locations.
  - Cruise ships out of operation during COVID have had a tremendous impact; cruises bring in about 20-25% of business (in terms of overnight stays) to Brevard County.
  - Airports are critical and adding more domestic and international service will bring in more passengers; Melbourne airport is beginning international service to the United Kingdom soon.
- A transportation challenge stakeholders face in bringing in new potential employers are pedestrian safety, specifically on SR A1A.
  - Pedestrian deaths become news around the country and show Brevard County as a dangerous place to walk, which negatively impacts tourism.
- Connectivity between mainland and the beaches is important; hotel workers live in Cocoa, Rockledge, Titusville, and face transportation challenges traveling to/from work.
  - Current rehiring issues have to do with lack of transportation connectivity, especially between mainland Brevard County and the beaches.
- Port Canaveral is known as being easy to access.
- Ellis Road, when constructed, will make provide additional access to get in/out of Brevard County as development and population growth increase.
- North Brevard County is different from the central and south parts of the county because of the amount of protected land and its transportation connectivity to Orlando on corridors like SR 46 and SR 50; there is a need to grow sustainably.
  - Traffic from the northern part of Brevard County is going to Sanford and Orlando airports because they are more convenient to get to.
  - The economy in north Brevard County is east-west oriented and linked to the Orlando Metro Area.
  - Shoreline development is not viewed as at risk in north Brevard County because of wildlife refuges and barrier islands, but is a growing concern based on growing investments in these developments.
  - In the northern part of Brevard County there is limited in the amount of land for development and little opportunity for sprawl because of natural lands and water bodies.
    - The infrastructure must support the growth in population and development while balancing the preservation of natural lands.
  - Generally, the north Brevard trail network is not as connected to residential communities. Neighborhood developments are planning to monetize connectivity to recreational facilities as quality of life assets.
- Connectivity in terms of all modes of transportation, including trails, is critical for the safety of residents/visitors and as a desirable amenity.
  - Housing prices increase with connection to recreation activities and facilities.

- Reducing congestion is an element of enhancing quality of life.
- For Melbourne, a valuable asset is the airport because of the travel and the corporate activity on the property.
  - During the day, the airport grows to be one of the largest "cities" in Brevard County based on the number of employees.
- I-95 and US 1 are bottlenecks now and potentially into the future as employers relocate to Brevard County and more jobs are created.
- North and central Brevard have corporate airport network that includes Titusville Cocoa Airport Authority, Merritt Island Airport, Space Coast Regional Airport, and Dunn Airpark.
  - These are economic drivers that support Kennedy Space Center and aerospace contractors.
- SR 528 and SR 520 identified as bottlenecks now and likely will be into the future as population and development growth rises.
- The need to advance Ellis road was raised by several people.
- Public transport is needed to support economic growth.
  - Titusville has partnered with Beachwave, a transportation service being provided for shift workers to get to jobs at the beach.
- Causeways are heavily traveled by people wanting to see launch activities; as we think about hardening this infrastructure, we should be mindful of this important aspect of this need.
- Question asked about the SCTPO's efforts to work with municipalities to plan for future development and population growth
  - The SCTPO regular works with the different municipalities in Brevard County through groups like the Technical Advisory Committee and Governing Board
  - Municipalities are also engaged through the Task Force specific to the Transportation Resiliency Master Plan
- Housing, accessibility, recreation, safety, and entertainment are the elements businesses and employees are looking for when thinking about residing in Brevard County.
  - Walkable, bikeable, and golf cart access are modes the business community gets feedback on from clients as attractors to locate in Brevard County.
- Potential shocks are catastrophic failures related to aerospace activities.
  - Has to be at the forefront of development moving forward, especially with the potential increase in launches.
- Other potential shocks included safety, congestion, sea level rise, hurricanes, dated infrastructure, water infrastructure, and fire.
- Evacuation from south Brevard seems more challenging than north and central Brevard because of limited east-west connection.
- Water infrastructure is critical in the conversation about how development should grow into the future.
  - Transportation systems are being used to deliver water, internet, electricity; roads serve utility functions.

- Hurricanes impact roadways that are tied to infrastructure that delivers fresh, potable water to residents.
- During the pandemic, the local chambers of commerce, Emergency Management Office, and other organizations formed a coalition as the Brevard Business Community COVID-19 team.
  - They share consistent information to residents and business owners during the pandemic, and during other events like hurricanes.
- Office of Tourism staffs the business support desk at the Emergency Operations Center.
  - The business community is part of the support network for communication from the support desk.
  - Future initiatives include integrating the Economic Development Commission, economic development organizations, and chambers of commerce as partially responsible for getting to message residents/businesses during emergency events.
- Drought conditions are worsening in Brevard County and should be considered a shock/stressor because of lightning, rainfall changes, and undeveloped area that would allow wildfire to spark and burn longer without notice as fire moves through vegetation root systems.
- Climate change not generally discussed as a priority for most of the business community in Brevard County.
  - Some municipalities having a stronger emphasis on sustainability, like Satellite Beach.
- Commodity access (high speed internet, water, electricity) drive where businesses choose to locate.

The agenda and presentation are attached.





ECONOMIC STAKEHOLDERS WORK SESSIONS

MARCH 26, 2021

VIRTUAL VIA MICROSOFT TEAMS

10:30 AM – 12:00 PM

## LET'S GET TO KNOW ONE ANOTHER!

- Name
- Agency/Organization
- Length of occupation & role
- How would you answer: "Why should I live, work, and/or start my business in Brevard County?"





## **ABOUT THE TPO**

- Mission and Goals
- Why Resiliency Matters
  - FAST Act





### AGENDA

- Meeting Purpose
- Key Terms
- Overview of Project Scope, Schedule, and Approach
- Open Discussion
  - Critical Assets and Important Considerations
  - Historic Shocks/Stressors and Future Threats
- Next Steps



## **MEETING PURPOSE**

- Introduce the Transportation Resiliency Master Plan
- Identify Critical Assets and Infrastructure
- Begin Discussing Relevant Shocks/Stressors





## **KEYTERMS/COMMON LANGUAGE**

- **Shocks** Single, sometime sudden, events that threaten a community
- Stressors Continuous or re-occurring issues or events that impact or weaken the fabric of a community on a day to day or cyclical basis
- Sustainability Can be separated into environmental, social/cultural, and economic sustainability; development that meets the needs of the present without compromising the ability of future generations to meet their own needs
- Resiliency The ability to bounce back from events and forces that negatively impact natural and built environment resources; these impacts are also known as shocks and stressors
- Infrastructure The built environment that makes up the physical systems people and communities interact with in their daily lives, such as roadways and bridges
- Assets The specific resources that provide value to a group of people or wildlife; value can be derived in a monetary sense (economic drivers) or from an ecological sense (biodiversity)



## WHAT IS RESILIENCE IN TERMS OF PAST EFFORTS?

East Central Florida Regional Resiliency Action Plan (ECFRRAP) Definition:

The capacity of individuals, communities, institutions, businesses and systems within a region to plan, sustain, adapt, recover, improve and grow collaboratively – regardless what kind of chronic stresses and acute shocks they experience







## **TRANSPORTATION FOCUS**

- Must answer:
  - What puts people and infrastructure at risk?
  - Which infrastructure are most important to protect?
- Key areas in Brevard County identified through *Influence Areas* 
  - Buffer areas around natural systems and where they potentially influence/interact with transportation infrastructure and the built environment





#### **DIFFERENT ROLES FOR THE SAME GOAL**



# A RESILIENT BREVARD



## **SPECIAL AND VALUABLE PLACES IN BREVARD**

#### Built Environment Natural Resources

- Playhouses/Center • for the Arts
- Historic and other • **Downtown areas**
- Tourism, waterfront • property values, and commercial fisheries

**Melbourne** named #1 place to live near the beach in the U.S. U.S. News & World *Report, 2019* 

- Indian River Lagoon most biologically diverse estuary in North America
- St. Johns River
- 72 miles of beaches
- Living Shorelines salt marshes, oyster reefs, mangroves
- Coastal dunes
- Scrub ecosystems
- **Conservation areas** •
- Endangered lands/species







## WHAT MAKES BREVARD COUNTY UNIQUE?

- Space Kennedy Space
  Center and Cape
  Canaveral Air Force
  Station, SpaceX
- Air Orlando Melbourne International Airport (MLB) and Orlando International Airport (MCO), Space Coast Regional Airport (TIX)
- Road causeways, bridges, critical eastwest and regional corridors/connections



- e• **Rail** Florida East Railway
  - **Sea** Port Canaveral, Army, Navy, and Air Force facilities, including Surface Deployment and Distribution

Palm Bay Ranks #2 in the 2021 Milken Institute Best-Performing Cities Index





## **OPEN DISCUSSION: WE WANT TO HEAR FROM YOU!**

- Goals for this Discussion:
  - Understand your agency's/organization's main goals
  - Confirm and Identify valuable infrastructure and assets
  - Understand historic and expected future events and risks that impact valuable infrastructure and assets
  - Share current and upcoming resiliency-related efforts



## **NEXT STEPS**

- Stakeholder Discussions Follow-ups
- Continue Outreach and Education Activities
- Evaluate Current Conditions
- Identify Vulnerable Communities
- Define Short List of Key Shocks/Stressors







# Thank you!

Sarah Kraum, Senior Transportation Planner (321) 350-9263 sarah.kraum@brevardfl.gov http://sctpo.com/ TRANSPORTATION DISADVANTAGED COMMUNITY CONVERSATION AGENDA AND NOTES







#### Transportation Disadvantaged Community Conversation Agenda

#### **Transportation Resiliency Master Plan**

May 12, 2021

Virtual via Microsoft Teams

2:30 PM - 4:00 PM

- 1. Introductions
- 2. Purpose of the Community Conversations
  - a. Understand the impacts/shocks/stressors and transportation barriers Transportation Disadvantaged (TD) populations experience
  - b. Identify key community services currently available
  - c. Identify other community leaders to engage in specific areas
- 3. Overview of Master Plan
- 4. Role of the Community and Community Engagement
- 5. Open Discussion
  - a. What are the most important/key community services and assets in Brevard County?
  - b. What transportation infrastructure is critical to meeting the goals of the people served by your organization?
  - c. What impacts/shocks/stressors have negatively impacted the people your organization serves?
  - d. Are there specific shocks/stressors that impact certain populations uniquely?
- 6. Next Steps
- 7. New Initiatives



#### Transportation Disadvantaged (TD) Community Conversation

Date: Wednesday, May 12, 2021

Time: 2:30 PM - 4:00 PM

Location: Virtual via Microsoft Teams

#### Attendees:

- Sarah Kraum [Space Coast Transportation Planning Organization (SCTPO)]
- Laura Carter (SCTPO)
- Abby Hemenway (SCTPO)
- Alan Woolwich (Brevard County)
- Amanda Wilhelm (United Way of Brevard)
- Carmen Baez [Space Coast Area Transit (SCAT)]
- Jennifer Keyser (Aging Matters Brevard)
- Josh Jensen (Aging Matters Brevard)
- Keith Heinly (United Way of Brevard)
- Sandra Simmons (Brevard Schools)
- Sean Odle (Brevard Alzheimer's Foundation)
- Susan McGrath [Brevard Achievement Center (BAC)]
- Mary Raulerson [Kittelson & Associates, Inc. (KAI)]
- Chris Bame (KAI)

#### Introduction:

The purpose of this meeting was to understand the impacts of shocks/stressors to TD communities, identify currently offered community services, and identify other community leaders to engage. The meeting agenda included introductions, discussions about the purpose of community conversations, an overview of the Transportation Resilience Master Plan (Transportation RMP), an open discussion, and next steps. A list of the meeting invitees and attendees is attached to this meeting summary.

#### Meeting Highlights:

The meeting discussion was guided by a PowerPoint presentation and feedback was collected through an open discussion throughout the meeting. Key discussion points from the meeting were:

- Specific concerns related to TD communities.
  - Transportation Deserts: Some areas in Brevard County have few or no travel options for people walking, biking or taking transit. These areas/communities are not served by public transit and have roadways that are not accessible or safe for people walking and biking. Large employers that are not served by public transit due to being located on barrier islands or behind gates, should also be considered. Identifying these transportation deserts may inform challenges facing TD communities.
  - Bicycle and Pedestrian Safety: In some areas of Cocoa, for example walking under I-95, children are walking or biking without access to safe facilities. Safe facilities should be provided on both sides of the road.
  - Transit Access: Accessible transit is important to maintaining employment and independent living for some community members with disabilities. Extending transit service to cover all of Brevard County is a difficult task due to the size of the county and the level of funds available to operate transit. There are also some barriers to transit servicing areas in adjacent counties. (It was shared that the Senior Resource Alliance/Community Coach is providing transit service into Indian River County.)
- How might shocks/stressors affect TD communities differently than other communities in Brevard County?
  - Seniors and people with disabilities are sometimes affected similarly by natural disasters if they need to shelter in place. If evacuations are required, they may be more complex and have unique needs at shelters.
  - Several of the organizations represented in the meeting coordinate with SCAT to arrange/coordinate evacuating community members to shelters.
  - The effect of natural disasters on communities and organizations is dependent on which shelters are open, which is decided on a storm-by-storm basis. Organizations that provide food to shelters need to maintain access to the shelter throughout the duration of the shock.
- Other ongoing work related to TD communities includes:
  - A research group at the Florida Institute of Technology (FIT) is investigating the transportation needs of disabled populations. The group is currently looking for research grants.
- The Transportation RMP Team plans to engage directly with communities. Some key TD communities that have been identified include Cocoa, Downtown Titusville and Melbourne.
- The meeting included a discussion of possible contacts and connections to TD communities in Brevard County.
  - Kim Agee (Downtown Melbourne)

- Marcia Gaedcke (Titusville Chamber)
- Law Enforcement Police Community Organizations
- o Abby Hemenway may know a contact at City of Cocoa
- o Amanda or Keith may know community leaders in Cocoa through their census work
- Susan will follow-up with additional contacts for organizations serving people with a disability
- Alan Woolwich will follow-up with contacts for several neighborhoods in Brevard County
- During the meeting, several corridors and areas of importance were specifically noted.
  - o US 1
  - Causeways/Bridges
  - o Space Center
  - o **I-95**
  - Viera north/south corridors
  - During evacuations or natural disasters shelters are opened on a case-by-case basis.
    Depending on which shelters are open, different routes may be critical based on this.
  - Barefoot Bay
  - o Mims
  - Cape Canaveral
- Transportation barrier may make it difficult for companies to hire employees in a tight labor market.
- SCTPO is developing a continuing coordination program to engage TD populations/communities and requested information/advice on who, how and when to engage
  - Several suggestions of who to engage were identified above and several attendees noted that they could provide additional information after the meeting
  - There is currently no mechanism or occasion when the organizations that provide services to TD populations meet or coordinate routinely
  - Transportation is a common thread across the services needed by TD populations and/or provided by various community support organizations

The agenda, presentation, and list of the invitees/attendees are attached.

Invitees		
Name	Agency/Organization	Attended
Abby Hemenway	SCTPO	Yes
Georganna Gillette	SCTPO	No
Laura Carter	SCTPO	Yes
Sarah Kraum	SCTPO	Yes
Josh Jensen	Aging Matters Brevard	Yes
Marty Mercado	Aging Matters Brevard	No
Amar Patel	Brevard Achievement Center (BAC)	No
Susan McGrath	BAC	Yes
Tim Timmermann	Brevard Alzheimer's Foundation	No
Alan Woolwich	Brevard County	Yes
Sandra Simmons	Brevard Schools	Yes
Melissa Wilbrandt	Bridges BTC	No
Jana Bauer	Career Source Brevard	No
Mike Hoenick	Family Promise of Brevard	No
Terry Jordan	Space Coast Area Transit (SCAT)	No
Patricia Knapp	Students at Risk	No
Amanda Wilhelm	United Way of Brevard	Yes
Caron Partridge	United Way of Brevard	No
Keith Heinly	United Way of Brevard	Yes
Christopher Bame	Kittelson & Associates (KAI)	Yes
Mary Raulerson	KAI	Yes
Other Attendees		
Name	Agency/Organization	Attended
Carmen Baez	SCAT	Yes
Jennifer Keyser	Aging Matters Brevard	Yes
Sean Odle	Brevard Alzheimer's Foundation	Yes




TRANSPORTATION DISADVANTAGED COMMUNITY CONVERSATION MAY 12, 2021 VIRTUAL VIA MICROSOFT TEAMS 2:30 PM – 4:00 PM

# INTRODUCTIONS



## LET'S GET TO KNOW ONE ANOTHER!

- Name
- Key focus of your organization





## **ABOUT THE TPO**

- Mission and Goals
- Why Resiliency Matters
  - FAST Act





## **MULTI-FACETED ENGAGEMENT APPROACH**



# A RESILIENT BREVARD





- Purpose of the Community Conversations
- Overview of Master Plan
- Role of the Community and Community Engagement
- Open Discussion
- Next Steps
- New Initiatives



## PURPOSE OF THE COMMUNITY CONVERSATIONS



## **MEETING PURPOSE**

- Understand the impacts/shocks/stressors and transportation barriers Transportation Disadvantaged (TD) populations experience
- Identify key community services to access and protect
- Identify other community leaders to engage in specific areas





# OVERVIEW OF TRANSPORTATION RESILIENCY MASTER PLAN



## **KEYTERMS/COMMON LANGUAGE**

- **Shocks** Single, sometime sudden, events that threaten a community
- Stressors Continuous or re-occurring issues or events that impact or weaken the fabric of a community on a day to day or cyclical basis
- Sustainability Can be separated into environmental, social/cultural, and economic sustainability; development that meets the needs of the present without compromising the ability of future generations to meet their own needs
- Resiliency The ability to bounce back from events and forces that negatively impact natural and built environment resources; these impacts are also known as shocks and stressors
- Infrastructure The built environment that makes up the physical systems people and communities interact with in their daily lives, such as roadways and bridges
- Assets The specific resources that provide value to a group of people or wildlife; value can be derived in a monetary sense (economic drivers) or from an ecological sense (biodiversity)



## WHAT WE'VE DONE AND WHERE WE'RE GOING



## LONG LIST OF SHOCKS/STRESSORS

- Aging Infrastructure
- Flooding
- Funding
- Sea Level Rise
- Community Connections/Affordability
- Hurricane/Storm Surge
- Public Events/Congestion
- Catastrophic Events
- Shoreline Erosion



- Extreme Heat/Drought
- Security (e.g., cyber-attacks)
- Connected and Autonomous Vehicles (CAV)/Electric Vehicles (EV)/Intelligent Transportation System (ITS)
- Pandemic
- Safety
- Bike/Pedestrian/Transit
- Daily Congestion



What impacts/shocks/stressors most concern you?

Is anything missing from this long list?



# ROLE OF THE COMMUNITY AND COMMUNITY ENGAGEMENT



## **TRANSPORTATION FOCUS**

- The people and infrastructure at risk
- The infrastructure that serves critical links for communities

Critical Infrastructure/ Underserved Populations



## DATA USED TO IDENTIFY TRANSPORTATION DISADVANTAGED COMMUNITIES

- Criteria considered:
  - Overburdened renters
  - □ Population under age 18 in a single-parent household
  - Population with a disability
  - Population under age 10
  - □ Population over age 75
  - □ Workers without vehicle access
  - Population with limited English proficiency
  - □ Low-income population
  - Communities of Color (All races and ethnicities beside White Non-Hispanic)
- What other populations should be considered beyond those we've looked at?
- Who are the community leaders to engage with in Downtown Titusville, Cocoa, and Downtown Melbourne?



## **OPEN DISCUSSION: WE WANT TO HEAR FROM YOU!**

- What are the most important/key community services and assets in Brevard County?
- What transportation infrastructure is critical to meeting the goals of the people served by your organization?
- What impacts/shocks/stressors have negatively impacted the people your organization serves?
- Are there specific shocks/stressors that impact populations uniquely?



## **NEXT STEPS**

- Follow-up with community leaders/other groups
- Task Force Meeting #2
  - Define shortlist of shocks/stressors for focus in this Plan
- Focus Group Discussions
  - Brainstorm scenarios/projections for top shocks/stressors
- Continue educational campaign





## **NEW INITIATIVES**

- Development of SCTPO and Transportation Disadvantaged populations continuing coordination program
- Who should we coordinate with?
- How often should we coordinate?
- What methods?







# Thank you!

Sarah Kraum, Senior Transportation Planner (321) 350-9263 sarah.kraum@brevardfl.gov http://sctpo.com/ APPENDIX C: BEST PRACTICES AND PLANS





# RIDE the WAVE TO RESILIENCY

### **Transportation Resiliency Master Plan**

Data Collection and Analysis Technical Memorandum

**Appendix: Best Practices and Plans** 



Prepared For: Space Coast Transportation Planning Organization 2725 Judge Fran Jamieson Way, Building B, Room 105 Melbourne, FL 32940 321.690.6890

> Prepared By: Kittelson & Associates, Inc. 225 E Robinson Street, Suite 355 Orlando, FL 32801 407.540.0555

> > June 2021

## CONTENTS

1.1	Brevard County								
	1.1.1	Save our Lagoon Plan	6						
	1.1.2	2020 Local Mitigation Strategy (LMS)	7						
	1.1.3	Environmentally Endangered Lands (EEL) Program	9						
1.2	East Central Florida Regional Planning Council (ECFRPC)								
	1.2.1	Regional Resiliency Action Plan	9						
	1.2.2	Space Coast Transportation Planning Organization Sea Level Rise Vulnerab Assessment	<i>ility</i> 10						
	1.2.3	Satellite Beach Sea Level Rise Vulnerability Analysis	11						
	1.2.4	Community Resiliency in the City of Satellite Beach	12						
	1.2.5	Resilient Titusville	13						
	1.2.6	Green Infrastructure Adaptation Plan for the Town of Melbourne Beach	14						
	1.2.7	Indian River Lagoon Outfall and Sea Level Rise Vulnerability Analysis	15						
	1.2.8	Indian River Lagoon Storm Water Outfall Best Maintenance Report	15						
1.3	Florida Department of Environmental Protection (FDEP)								
	1.3.1	Basin Management Action Plans (BMAP) and Alternative Restoration Plans	16						
	1.3.2	2020 Florida Forever 5 Year Plan	20						
1.4	Indian River Lagoon National Estuary Program (IRLNEP)								
	1.4.1	Comprehensive Conservation and Management Plan (CCMP)	21						
	1.4.2	Indian River Lagoon: Climate Ready Estuary Technical Report	22						
1.5	St. Joh	ns Water Management District (SJRWMD)	23						
	1.5.1	Surface Water Improvement and Management (SWIM)	23						
	1.5.2	Levee System Summaries and Emergency Action Plans	25						
	1.5.3	Land Management Plans	26						
1.6	Florida	Department of Transportation (FDOT)	27						
	1.6.1	2021 FDOT Mitigation Plan	27						
1.7	Florida Division of Emergency Management								
	1.7.1	Florida Natural Hazards Interagency Work Group 2019 Annual Report	28						
1.8	Environmental Protection Agency (EPA)								

	1.8.1	Being Prepared for Climate Change: A Workbook for Developing Risk-Based Adaptation Plans	29				
1.9	Research and Literature						
	1.9.1	Indian River Lagoon Flushing Research Project	30				
	1.9.2	Adaptation Actions to Reduce Impairment of IRL Water Quality Caused by Climate Change	31				

## **FIGURES**

Figure 1: Percent of Funding Allocation for Reduce, Remove, Restore, and Respond Projects	6
Figure 2: Locations of Sub-Lagoons	6
Figure 3: Recommended Bounds for Sea Level Rise	10
Figure 4: Inundation of Evacuation Routes Due to Sea Level Rise	11
Figure 5: Satellite Beach Exposure to Storm Surge	12
Figure 6: Community Survey Response to Strategies	12
Figure 7: Critical Facilities Exposed to Inundation in Titusville	13
Figure 8: Sites for Green Infrastructure Opportunities	14
Figure 9: Priority Areas for Street Sweeping	16
Figure 10: Cost Comparison of Best Practices	16
Figure 11: Brevard County BMAP and ARP Study Areas	18
Figure 12: Project Map for Indian River Lagoon Blueway in Northern Brevard County	20
Figure 13: Prioritized Ecological Greenways	20
Figure 14: IRLNEP Vital Signs and Vital Sign Categories	21
Figure 15: Example of Indicators for Vital Signs	22
Figure 16: Shared Management Issues	23
Figure 17: Upper St. Johns River Basin	24
Figure 18: Levees System Inundation Map	25
Figure 19: Micco Water Management Area	26
Figure 20: New Projects Included in the FDOT 2021 Mitigation Plan in Regulatory Basin 21	27
Figure 21: Example of Agency Summary of Mitigation Efforts	28
Figure 22: Roadmap for Vulnerability Assessment and Action Plan	29

## TABLES

Table 1: Hazards to Brevard County	7
Table 2: Adaptation Actions	22
Table 3: Key Stressors from Climate Change to IRL	31

#### **1.1 Brevard County**

#### 1.1.1 Save our Lagoon Plan

The Brevard County Save Our Lagoon Plan identifies specific projects with expected costs and effect on nitrogen and phosphorus loading in the Lagoon. Projects are primarily prioritized by the cost per pound of nitrogen or phosphorus removed. The Save Our Lagoon Plan estimates that the present value of restoring the Lagoon is \$6 Billion compared to the cost of \$300 Million. The Save Our Lagoon Plan is funded through a Brevard County 0.5 cent sales tax, which provides about \$50 Million of funding annually. Since the 2017 original plan, funding has been reallocated to diversify the approaches and projects being considered, from being primarily focused on muck removal to also considering educational campaigns, wastewater upgrades, and stormwater treatment.



Projects are categorized as reducing pollutants, removing the

accumulation of muck, **restoring** water filtering oysters and lagoon ecosystem services, and **responding** to change. The funding allocated to each of these project categories is shown in **Figure 1**. The Save Our Lagoon Plan considers sources, solutions, and effects for each sub-lagoon. The division of the Indian River Lagoon into sub-lagoons is shown in **Figure 2**.

The Save Our Lagoon Plan identifies the key areas of economic value at risk as:

- Tourism and Recreation due to reduced ecotourism;
- Property Value due to reduced waterfront property value related to fish kills and algal blooms;
- Commercial Fishing due to decreasing healthy fish populations; and
- Healthy Residents and Tourists due to pathogens migrating from septic systems into waterways.





FIGURE 2: LOCATIONS OF SUB-LAGOONS



#### 1.1.2 2020 Local Mitigation Strategy (LMS)

The Brevard County Local Mitigation Strategy is intended to provide a framework to identify potential hazards and decrease the vulnerability of the community to future disasters. The LMS includes a summary of potential hazards, an assessment of potential hazards, and the identification of critical facilities. The hazards presented in this memo that may have an impact to the transportation system are summarized in **Table 1**. Projects are identified to reduce identified vulnerabilities. Critical facilities are primarily focused on specific structures or tools, for example fire stations or sewer lift stations. While impacts to the transportation system were not directly stated in the report, the following table relates the hazards to potential impacts to transportation as inferred by the project team.



Hazard	Key Effects	Potential Impact to Transportation System
Hurricane/Storm Effects	<ul> <li>Flooding</li> <li>Greatest threats are storm surge along the barrier islands, wind damage, and inland flooding</li> <li>Evacuation of large parts of the east side of the county</li> <li>Disruption of power and telecommunications</li> </ul>	<ul> <li>Blocked roads from debris</li> <li>Flooded roads, especially in low lying areas</li> <li>Disruption of ITS/Signals</li> <li>High traffic volumes due to evacuation</li> </ul>
Sea Level Rise	<ul> <li>Storm surge</li> <li>Coastal flooding</li> <li>Inland flooding due to increased rainfall periods</li> <li>Wildfire exacerbated by vegetative fuel growth in periods of higher rainfall and burn risk in drier periods</li> <li>Saltwater intrusion</li> <li>Coastal erosion</li> <li>Greatest impact to the west side of the barrier islands along the canals and the low-lying parts of Merritt Island</li> </ul>	<ul> <li>Flooded roads, especially in low lying areas</li> <li>Disruption of ITS/Signals with underground infrastructure</li> </ul>

#### TABLE 1: HAZARDS TO BREVARD COUNTY



Hazard	Key Effects	Potential Impact to Transportation System
Drought	<ul> <li>Wildfire exacerbated by vegetative fuel growth in periods of higher rainfall and burn risk in drier periods</li> </ul>	Road closures due to smoke/wildfire
Severe Winter Storms	<ul> <li>Unlikely damage to electric power distribution</li> <li>Icy road conditions</li> <li>Agricultural impact</li> </ul>	<ul><li>Disruption of ITS/Signals</li><li>Icy road conditions</li></ul>
Wildfire	<ul> <li>Greatest risk are areas where development has occurred or is occurring at the edge of previously undeveloped vegetated areas, prevalent between I-95 and US 1</li> <li>Spring 2011, Iron Horse Fire forced the closure of I-95, SR 442, and SR 46</li> </ul>	• Road closures due to smoke/wildfire
Tsunami	<ul> <li>Jurisdictions within danger zone include: Cape Canaveral, Cocoa Beach, Satellite Beach, Melbourne Beach, Indian Harbour Beach, Indialantic, and Unincorporated Brevard.</li> <li>High risk to tourism economy, businesses, and housing within Tsunami range</li> </ul>	<ul> <li>Blocked roads from debris</li> <li>Flooded roads, especially in low lying areas</li> <li>High traffic volumes due to evacuation</li> <li>Disruption of ITS/Signals</li> </ul>
Space Weather/ Geomagnetic Storms	• Damage to satellites, other high tech systems, radio blackouts, GPS interruptions	Disruption of ITS/Signals
Dam/Levee Failure	<ul> <li>127 miles of levees in the upper basin, of which 92 miles are federal flood protection levees and 35 miles are District levees. Approximately 30 miles of levees lie within Brevard County</li> </ul>	<ul> <li>Flooded roads, especially in low lying areas near dam failure</li> </ul>
Communications Systems Failure	Communications systems failure	Disruption of ITS/Signals
Prolonged Utility Failure	<ul> <li>Electricity generation shortfalls compared to demand</li> <li>"Transportation disruption"</li> <li>Electrical power outage</li> </ul>	• Disruption of ITS/Signals
Terrorism	<ul><li>Unknown</li><li>Facility specific impact</li></ul>	• Unknown
Transportation Accidents	<ul><li> Property damage</li><li> Traffic, delay</li></ul>	• Traffic, delay



#### 1.1.3 Environmentally Endangered Lands (EEL) Program

The Brevard County EEL Program partners with federal, state, and local agencies to protect natural resources through the management of EEL sanctuaries.

The EEL Program Land Acquisition Manual outlines the identification, feasibility, and acquisition processes used in the EEL Program. The EEL Program first determines high priority sites based on environmental criteria. These sites are reviewed to determine management requirements and expected cost for management. Subsequently the feasibility of acquisition is considered.

The EEL Program developed the Sanctuary Management Manual to guide management decisions for individual sanctuary sites managed by the EEL Program and other agencies. The Sanctuary Management Manual establishes the primary goal of the program as conservation, with public access and passive recreation available where possible.



Each sanctuary is assigned an expected level of use, ranging from education centers to no public access. The EEL Program is focused on ecosystem management and considering big picture needs, specific conservation principles for the EEL Program are identified.

#### 1.2East Central Florida Regional Planning Council (ECFRPC)

#### 1.2.1 Regional Resiliency Action Plan

The goal of the Regional Resiliency Action Plan (RRAP) was to increase the ability of local and regional stakeholders to implement resiliency and climate adaptation strategies. The framework for the RRAP is based on the 100 Resilient Cities program. The plan considers a variety of resiliency aspects and extends to a variety of sectors, including infrastructure, using a shock and stressor approach. The plan identifies action items that can be taken at various agencies, organizations, and between partners.

The plan focuses on sea level rise as the primary stressor affecting Brevard County, specifically considering resulting inundation. The



plan considers the social vulnerability of counties within Brevard County, which considers the resilience of a community confronted by external stressors.

The RRAP recommends considering a range of projected rates of sea level rise, including a lower range of 5.15 feet by 2100, defined by the 2013 USACE High model, and an upper range of 8.48 feet by 2100, defined by the 2017 NOAA High model. The RRAP recommends short term projects to consider sea level rise impacts



9

to 2040, medium term projects to consider impacts in 2070, and long term projects to consider impacts to 2100. The sea level rise projection range is shown graphically in **Figure 3**.



FIGURE 3: RECOMMENDED BOUNDS FOR SEA LEVEL RISE

#### 1.2.2 Space Coast Transportation Planning Organization Sea Level Rise Vulnerability Assessment

The Sea Level Rise Vulnerability Assessment considers assets that contribute to transportation functionality within Brevard County. The Vulnerability Assessment considers inundation of transportation facilities. **Figure 4** shows the hurricane evacuation routes within Brevard County that will be inundated by sea level rise. Impacts to Port Canaveral, Cape Canaveral Air Force Station, Patrick Air Force Base, and NASA are anticipated to result in large scale economic hardship for the community. Stormwater management is identified as a problem that will be exasperated by rising sea levels. A series of next steps are identified for SCTPO to undertake, including turning SR A1A into a "Green Street".







#### FIGURE 4: INUNDATION OF EVACUATION ROUTES DUE TO SEA LEVEL RISE

#### 1.2.3 Satellite Beach Sea Level Rise Vulnerability Analysis

ECFRPC completed the Sea Level Rise Vulnerability Analysis for Satellite Beach to analyze the impacts of storm surge, flooding, coastal erosion, and sea level rise. Exposure from each of these natural hazards was considered from the perspectives of financial value, parcels by build year, land use, critical facility, and ecological value. An example of this method of categorization is shown in **Figure 5** by the financial perspective on storm surge hazard. The impact of each hazard is primarily constrained to the threat of inundation.





#### TABLE 1: 2014 Satellite Beach Parcel Exposure to Storm Surge Zones

Hazard Zone)						
Hazard Zone	Parcels in Zone	Built Parcels*	Land Value	Building Value	Assessed Value	Taxable Value
Category 1	323 7.2%	283 87.6% built	\$72, 739,510	\$54,239,780	\$181,378,740	\$131,356,490
Category 2	1,904 42.5%	1,636 85.9% built	\$168,511,090	\$172,305,380	\$561,803,770	\$351,630,330
Category 3	4,455 99.4%	4,007 89.9% built	\$324,793,540	\$379,398,120	\$993,705,020	\$634,952,640
Category 4	4,480 100.0%	4,026 89.9% built	\$327,668,670	\$382,240,860	\$999,306,190	\$639,261,090
Category 5	4,480 100.0%	4,026 89.9% built	\$327,668,670	\$382,240,860	\$999,306,190	\$639,261,090

**Financial Exposure to Hazard Zones** – *Cumulative* Financial Values within Zones (\*Built % of Built Parcels in Specific Hazard Zone)

FIGURE 5: SATELLITE BEACH EXPOSURE TO STORM SURGE

#### 1.2.4 Community Resiliency in the City of Satellite Beach

ECFRPC and Satellite Beach conducted the Satellite Beach Resilient Community Survey to prioritize best practices to consider in resiliency planning. Recommended policies for the City of Satellite Beach to implement are identified. In addition to providing a comprehensive list of feedback from community members, a clip of which is shown in **Figure 6**, a few recommendations were emphasized including:

- Move pole-mounted utilities underground;
- Plant native coastal vegetation to reduce coastal erosion;
- Direct development away from high-risk areas; and
- Manage stormwater.

Vulnerability	Strategy	Number of 1 Star Rankings	Number of 2 Star Rankings	Number of 3 Star Rankings	Number of 4 Star Rankings	Number of 5 Star Rankings	% of Total Survey Respondents Who Support Strategy (rated with 4-5 Stars)	% of Total Survey Respondents Who Oppose Strategy (rated with 1-2 Stars)	% of Total Survey Respondents who were Neutral (rated with 3 stars)	Total % of Total Respondents who Ranked Strategy	Rank of Strategy within Specific Vulnerability based on #pos/#neg	Total Weighted Sum	Weighted Rank Across all Strategies
Loss of Utilities/ Power	Work with utility companies to determine the feasibility of moving pole-mounted utilities underground.	7	4	32	49	179	48%	2%	7%	57%	1	1202	1
Coastal Erosion	Plant native coastal vegetation such as sea oats	3	4	15	45	176	46%	1%	3%	51%	1	1116	2
Flooding	Install larger drainage pipes and structures as the system undergoes maintenance and repair.	4	6	31	83	123	43%	2%	6%	52%	1	1056	3
Storm Surge	Increase construction setbacks from the shoreline	13	29	42	58	111	36%	9%	9%	53%	1	984	4

FIGURE 6: COMMUNITY SURVEY RESPONSE TO STRATEGIES



#### 1.2.5 Resilient Titusville

ECFRPC completed Resiliency Plans with the City of Titusville. The Resiliency Plan seeks to identify specific coastal vulnerabilities due to sea level rise and potential mitigating actions. The Resiliency Plan primarily focused on the inundation of properties, critical facilities, and roadways under different hazards including sea level rise, storm surge from a hurricane, and flooding. A map of the impacts to the transportation network in Titusville from a 100-year and 500-year flood is shown in **Figure 7**. A Draft Resiliency Plan was developed for Titusville, based on the ECFRPC Regional Resiliency Action Plan, to identify specific action items for Titusville.



100-Year and 500-Year Flood Zones - Impact to Transportation Network



FIGURE 7: CRITICAL FACILITIES EXPOSED TO INUNDATION IN TITUSVILLE



#### 1.2.6 Green Infrastructure Adaptation Plan for the Town of Melbourne Beach

The Town of Melbourne Beach was awarded a grant to conduct a case study in how to improve stormwater management, improve water quality, and provide recreational/aesthetic amenities. Through this grant the Town developed the Green Infrastructure Adaptation Plan, which identifies potential projects. Lessons learned from other case studies are summarized in the plan, including:

- Use of pervious pavement for roads and sidewalks;
- Buyout program to convert structures with repetitive flood claims into passive public spaces;
- Development of a Master Plan to outline incremental small green infrastructure projects; and
- Use of town-owned properties to demonstrate green infrastructure.



Green infrastructure and low impact development may be applied to

retrofitting existing developments. These strategies may address issues related to water quality, stormwater management, and recreational amenities. Concepts for green infrastructure are developed for specific sites in the town, as shown in **Figure 8**.



FIGURE 8: SITES FOR GREEN INFRASTRUCTURE OPPORTUNITIES



#### 1.2.7 Indian River Lagoon Outfall and Sea Level Rise Vulnerability Analysis

The Outfall and Sea Level Vulnerability Analysis considers the effects of sea level rise on the outfalls within the lagoon system, some of which are within Brevard County. Considering the USACE High Model, 11% of outfalls in Brevard County are expected to be inundated by 2040. Areas around Cape Canaveral, Cocoa Beach, and Grant Valkaria are expected to be especially impacted.

#### 1.2.8 Indian River Lagoon Storm Water Outfall Best Maintenance Report

This report is intended to provide a stormwater outfall best maintenance plan for the Indian River Lagoon (IRL). Street sweeping was identified as the most cost effective approach for mitigating nutrient enrichment in the IRL, with priority areas identified in **Figure 9**.

Eutrophic conditions (excess of nutrients) reduce the availability of light to aquatic vegetation like seagrass, which reduces the health of seagrass. Seagrass provides habitat, settles sediments, oxygenates water, and absorbs dissolved nutrients. Eutrophic conditions can deprive the water of oxygen and result in fish kills.

Several best management practices were reviewed, summarized in **Figure 10**, including:

- Baffle boxes Poor performance of reducing suspended solids, phosphorus, and fecal coliform. Additionally, require frequent maintenance.
- Street sweeping Roads should be prioritized based on land use and seasonal rain events.
- Catch basin Effective, however maintenance is needed to clean based on stormwater inflow volume.








FIGURE 9: PRIORITY AREAS FOR STREET SWEEPING

ВМР	Mean (\$/lb.)	TN Mean (\$/lb.)	ТР
Desoto Baffle Boxes: Brevard Count (Satellite Beach 2015)	<b>y</b> 13,944	120,364	
Catch Basin (FSAEF)	1,016	1,656	
Street Sweeping(Satellite Beach 2015)	79	175	

FIGURE 10: COST COMPARISON OF BEST PRACTICES

## 1.3Florida Department of Environmental Protection (FDEP)

### 1.3.1 Basin Management Action Plans (BMAP) and Alternative Restoration Plans

In general, the following process is followed by FDEP to evaluate waterbodies for impairments related to water quality.

- 1. **Review:** Waterbodies are reviewed every 5 years to identify if they are impaired. A waterbody is impaired if it does not meet the water quality standards required for its designated use.
  - a. **Comprehensive Study List:** If additional study is needed to confirm the attainment of water quality standards, a waterbody is added to the Comprehensive Study List. These waterbodies



are considered to not be attaining water quality standards, however they are not included on the Verified List or prioritized for TMDL development.

- 2. **Verified List:** If the waterbody is impaired, it is added to the Verified List of Impaired Waters. Waterbodies on the Verified List get prioritized and scheduled for Total Maximum Daily Load (TMDL) development.
- 3. **Develop TMDL:** The TMDL is the maximum amount of pollutant loading that can be discharged to a waterbody and have its designated uses met. The designated use is delineated by the Waterbody Class, which ranges from Class 1 to Class 5, with Class 1 affording the most protection. TMDLs are developed for 28 unique waterbodies in Brevard County. TMDLs are most often established for a parameter of Nutrients or Dissolved Oxygen and Nutrients, and a pollutant of Total Nitrogen (TN) or Total Phosphorus (TP).
  - a. Prior to the implementation of a BMAP, Strategic Monitoring Plans (SMPs) collect data in preparation of establishing TMDLs and implementing BMAPs. The SMPs also verify the impairment of waterbodies.
- 4. **Implement TMDL:** The TMDL is implemented through a BMAP, Alternative Restoration Plan, or another program.

Basin Management Action Plans (BMAPs) are part of FDEP's effort to go beyond the required USACE's National Pollutant Discharge Elimination System (NPDES) process and follow a statewide watershed management approach to restore and protect Florida's water quality. The BMAP provides an enforceable framework to define an appropriate Total Maximum Daily Load (TMDL) for specific pollutants and identify specific actions to restore water quality.

Early implementation of restoration activities is more cost effective and may allow the FDEP to forgo the regulatory steps of establishing TMDL and BMAPs. 4b and 4e restoration plans are the two types of Alternative Restoration Plans (ARPs). An example of an Alternative Restoration Plan is the Reasonable Assurance Plan completed for Mosquito Lagoon. Waterbodies may be considered for a 4b or 4e restoration plan if they have control programs in place for restoring water quality or have ongoing/recently completed restoration activities.

BMAPs and ARPs identify specific best management practices (BMPs) and systemic solutions for stakeholders to complete to increase water quality. Three BMAPs and one ARP have been developed in Brevard County. The considered areas are shown in **Figure 11**, followed by the details of the plans.







Central Indian River Lagoon BMAP





Banana River Lagoon BMAP

FIGURE 11: BREVARD COUNTY BMAP AND ARP STUDY AREAS



#### 1.3.1.1 Mosquito Lagoon RAP

The Mosquito Lagoon Reasonable Assurance Plan (RAP), which overlaps with Cape Canaveral in Brevard County, was adopted in September 2019 to restore water quality in the Mosquito Lagoon within 15 years. The RAP specifically seeks to protect seagrasses by addressing impairments from chlorophyll a, Total Nitrogen, and Total Phosphorus. A majority of the planned projects are stormwater or base flow retrofit projects. Metrics will be assessed every 5 years to determine if additional corrective actions need to be taken.

#### 1.3.1.2 North Indian River Lagoon (NIRL) BMAP

The BRL BMAP, which includes Merritt Island and the northern portion of Brevard County, was adopted in February 2013 to implement the total nitrogen and total

phosphorous Total Maximum Daily Loads (TMDLs). Elevated levels of nitrogen and phosphorus can cause algal blooms and reduce the growth of seagrass in the lagoon. A variety of potential actions were identified including stormwater retention and street sweeping.

#### 1.3.1.3 Central Indian River Lagoon (CIRL) BMAP

The CIRL BMAP, which includes portions of southern Brevard County, was adopted in February 2013 to implement the total nitrogen and total phosphorous Total Maximum Daily Loads (TMDLs). Elevated levels of nitrogen and phosphorus can cause algal blooms and reduce the growth of seagrass in the lagoon. Through December 31, 2019 262 projects were completed, with an additional 56 projects planned or underway. The BMAP identified a second phase to the Canal 1 (C-1) Rediversion project, which sought to redirect stormwater from the IRL to the St. Johns River. Completion of the C-1 project was expected to contribute greatly to reaching the TMDLs.

#### 1.3.1.4 Banana River Lagoon (BRL) BMAP

The BRL BMAP, which includes Merritt Island and the barrier island in Brevard County, was adopted in February 2013 to implement the total nitrogen and total phosphorous Total Maximum Daily Loads (TMDLs). Elevated levels of nitrogen and phosphorus can cause algal blooms and reduce the growth of seagrass in the lagoon. A variety of potential actions were identified including stopping or reducing fertilization, stormwater retention, and educational campaigns.







## 1.3.2 2020 Florida Forever 5 Year Plan

The Florida Forever Five-Year Plan is updated annually to add new projects or modify boundaries of previously identified projects. Five (5) Florida Forever Land Acquisition Projects are located within Brevard County. Further details for each site, including planned acquisition area, description, and purpose are included in the Florida Forever 5 Year Plan. An example of a map identifying properties remaining to be acquired for the Indian River Lagoon Blueway is shown in **Figure 12**. The five land acquisition projects located within Brevard County are:

- Partnerships and Regional Incentives Projects Priority 4 (High): Indian River Lagoon Blueway;
- Partnerships and Regional Incentives Projects Priority 6 (High): Brevard Coastal Scrub Ecosystem;
- Climate Change Lands Projects Priority 8 (Low): Archie Carr Sea Turtle Refuge;
- Less-than-Fee Projects Priority 16 (Low): Ranch Reserve; and
- Less-than-Fee Projects Priority 24 (Low): Maytown Flatwoods.



Lands are identified for inclusion in the Florida Forever Plan through a process of analysis and review. Florida Natural Areas Inventory (FNAI) conducts a review and makes a recommendation as part of the annual Florida Forever proposal cycle. To evaluate projects and lands, FNAI developed a Conservation Needs Assessment for each natural resource in Florida and the Florida Forever Tool for Efficient Resource Acquisition and Conservation (F-TRAC). One of the data points referenced by the Conservation Needs Assessment is the Florida Ecological Greenways Network (FEGN) developed by FDEP and the University of Florida to identify opportunities to protect large, intact landscapes, important for conserving Florida's biodiversity and ecosystem. The prioritized Florida Ecological Greenways near Brevard County are shown in **Figure 13**.



FIGURE 12: PROJECT MAP FOR INDIAN RIVER LAGOON BLUEWAY IN NORTHERN BREVARD COUNTY



FIGURE 13: PRIORITIZED ECOLOGICAL GREENWAYS



## 1.4Indian River Lagoon National Estuary Program (IRLNEP)

### 1.4.1 Comprehensive Conservation and Management Plan (CCMP)

The Indian River Lagoon (IRL) provides a habitat to about 4,000 documented species and provides an estimated \$10 Billion in annual economic output. The 2019 CCMP shifts emphasis to focus on active water quality and habitat restoration. Additionally, connected waterways and watersheds are more explicitly considered in the 2019 CCMP.

The CCMP defines a series of Vital Signs and Indicators that can be used to measure the health of the Indian River Lagoon (IRL). The CCMP Vital Signs are shown in **Figure 14**. For each Vital Sign, indicators are defined, which **Figure 15** provides an example of how the indicators are measured. Targets are not specifically or quantitatively set within the CCMP. Considering each Vital Sign and Indicator and in alignment with the Brevard County Save Our Lagoon Plan, the CCMP identifies actions based upon the principles of "Remove, Reduce, Restore, and Respond". Actions are assigned to lead agencies and organizations. Two key actions include 1) implementing BMAPs and RAPs and 2) implementing stormwater best management practice (BMP) principles including



reducing or delaying volume, reducing maximum flow rate, improving water quality, and following sustainable maintenance practices.



FIGURE 14: IRLNEP VITAL SIGNS AND VITAL SIGN CATEGORIES



IRLNEP Mission	Vital Sign Category	Vital Signs	Indicators: The Measures	Targets
		Seagrasses	Coverage (acres), density, and species diversity; coverage (acres), density, and species diversity of other benthic habitats	Recovery to scientifically defensible reference target; TMDL targets for seagrass Recourse to acientifically defensible
		Filter Feeders	species in conservation and/or commercial production	reference target
ONE	Habitat	Living Shorelines	Expansion of functional living shoreline habitats based on quantitative shoreline restoration coupled with evaluation of natural habitat quality and functionality; miles of living shoreline, miles of buffer zone	Miles of eroded or hardened shoreline planted, miles of buffer zones around waterbodies
LAGOON	Quality	Wetlands and Impounded and Altered Marshes	Acres in conservation and management	Acres acquired and conserved, natural wetland functions restored and managed
		Spoil Islands	Islands in conservation, management, and public use	Islands restored, enhanced, and managed
		Land Conservation	Acres in conservation, management, and public use	Acres restored and managed for ecosystem integrity
		Connected Waters and Watersheds	Regional watershed planning and project integration	Volume or area of unimpeded circulation in the IRL, restored flows to St. Johns River, volume retained to groundwater

FIGURE 15: EXAMPLE OF INDICATORS FOR VITAL SIGNS

### 1.4.2 Indian River Lagoon: Climate Ready Estuary Technical Report

The Indian River Lagoon (IRL) Climate Ready Estuary technical report was developed in alignment with USEPA guidance for being prepared for climate change. The IRL Climate Ready Estuary report focuses on actions that can be taken over the next decade to protect IRL water quality and reduce future climate-related water quality impairments. The primary climate change stressors affecting the IRL across all Vital Signs are temperature, precipitation, storminess, acidity, and sea level rise. Temperature and acidity are considered second tier risks, due to the larger scale and longer time frame at which they occur. The assessment found that climate change risks could be most effectively mitigated by decreasing nutrient and pollutant loads at the source (wastewater treatment plants, septic systems, surface water storage, and conveyance infrastructure). The nine identified adaptation actions are to reduce pollutant loadings from each identified source due to the



nine adaptation actions may reduce the risks associated with climate change by 50%.

Stressor	Adaptation Action		
Precipitation	Reduce pollutant loadings from WWTP during high rainfall events		
Precipitation	Reduce pollutant loadings from OSTDS during high rainfall events		
Provinitation	Reduce pollutant loadings from surface water storage and conveyance infrastructure		
Precipitation	during high rainfall events		
Storms	Reduce pollutant loadings from WWTP due to more frequent and intense storms		
Storms	Reduce pollutant loadings from OSTDS due to more frequent and intense storms		
Storms	Reduce pollutant loadings from surface water storage and conveyance infrastructure		
	due to more frequent and intense storms		
Son Lovel Dice	Reduce pollutant loadings from WWTP caused by rising water table and sea level		
Sea Level Rise	(inundation, erosion)		
Con Long Dise	Reduce pollutant loadings from OSTDS caused by rising water table and sea level		
Sea Level Kise	(inundation, erosion)		
Son Lovel Dice	Reduce pollutant loadings from surface water storage and conveyance infrastructure		
Sea Level Rise	caused by rising water table and sea level (inundation, erosion)		

#### **TABLE 2: ADAPTATION ACTIONS**



## 1.5St. Johns Water Management District (SJRWMD)

### 1.5.1 Surface Water Improvement and Management (SWIM)

The SWIM program focuses on water quality and natural systems restoration projects for priority waterbodies. A SWIM Plan must be approved before State SWIM funds can be applied to a waterbody. The SWIM plans in Brevard County include Indian River Lagoon SWIM Plan Update (2002) and Upper St. Johns River Basin SWIM Plan (2007).

### 1.5.1.1 Indian River Lagoon

The Indian River Lagoon SWIM Plan was first adopted in 1989 and has been updated twice, most recently in 2002. The goals of the IRL SWIM Plan are to: 1) Attain and maintain water quality to support the ecosystem. 2) Attain and maintain a macrophyte-based (water plantbased, in this case seagrass) ecosystem which supports species and fisheries. 3) Heighten public awareness and coordinate interagency management. The most immediate improvement has been the reconnection of impounded wetlands, which increases fisheries utilization of wetlands and increases the diversity of the supported plant and animal communities.

The IRL SWIM Plan identifies management issues, shown in **Figure 16**, shared between various federal and local agencies, including protection of seagrasses through water quality and pollutant sources and the rehabilitation and management of coastal wetlands.





FIGURE 16: SHARED MANAGEMENT ISSUES



#### 1.5.1.2 Upper St. Johns River

Historically, a significant portion of the Upper St. Johns River Basin (USJRB) flood plain was drained for farming and flood control. However, these efforts also prevented the land from functioning in its role as a natural provider for flood control and water quality. The USJRB SWIM Plan is focused on restoring acquired land in the basin. The US Army Corps of Engineers (USACE) and SJRWMD have been completing an ongoing USJRB project, seeking to balance flood control and environmental health. The USJRB and associated levees and conserved lands are shown in Figure 17. Water that used to drain to the St. Johns was diverted to IRL, but recently projects have been undertaken to re-divert the water to the St. Johns River. These rediversion projects are included in the IRL plans and are also recommended for the St. Johns River ecology. A series of Action Steps are identified to improve water quality and habitat, with a 5 year timeline. Although a BMAP is identified as an Action Step, it has not been completed to date.





FIGURE 17: UPPER ST. JOHNS RIVER BASIN



## 1.5.2 Levee System Summaries and Emergency Action Plans

SJRWMD provides Levees System Summary which includes the inundation areas, as shown in **Figure 18**, expected, risk, and emergency management plan for the Jane Green Detention Levee System and the Upper St. Johns River Basin Levee System, both of which overlap with Brevard County. Each levee has a low risk rating. Areas that could be inundated during a levee failure are identified in the summary documents.



FIGURE 18: LEVEES SYSTEM INUNDATION MAP



### 1.5.3 Land Management Plans

SJRWMD prepares a land management plan for district-owned land. An example map showing the Micco Water Management Area in relationship to other conservation lands is shown in **Figure 19**. Land management plans consider a range of actions addressing resource management issues including water resources, fire management, forest management, wildlife, exotic species, and cultural and historical resources. In addition to resource management, land management plans also identify public access, security, and recreational use of the property.

SJRWMD conducts prescribed burns at regular intervals as part of the land management plan for each property, dependent on the ecological system. Prescribed burns seek to restore fire to ecosystems requiring fire, while protecting homes and communities. The Southern Wildfire Risk Assessment ranks Florida as a high risk of wildfire.



FIGURE 19: MICCO WATER MANAGEMENT AREA



# **1.6Florida Department of Transportation (FDOT)**

### 1.6.1 2021 FDOT Mitigation Plan

FDOT updates a mitigation plan annually to provide wetland mitigation for planned projects in the FDOT Work Program. Before developing mitigation projects through the Mitigation Plan, FDOT considers using credits from permitted mitigation banks. The goal of funding mitigation banks is to mitigate environmental costs more effectively through regional long-term planning, rather than considering mitigation on a project by project basis. If permitted mitigation banks cannot provide the required mitigation, a project can be identified for inclusion in the Mitigation Plan. Projects in the Mitigation Plan must focus on land acquisition, restoration or enhancement, or SWIM projects. Projects are organized by regulatory mitigation basin, and impacts are typically offset within the same basin.

The 2021 FDOT Mitigation Plan includes one new project and one modified project, both within Regulatory Basin 21, which overlaps Cape



Canaveral and the Indian River Lagoon in Brevard County. The projects are shown in **Figure 20**. Although mitigation banks service Regulatory Basin 21, the type of mitigation required by these projects is not available in the existing mitigation banks. Therefore, the FDOT Mitigation Plan includes proposed projects for mitigating both of these planned roadway projects.



FIGURE 20: NEW PROJECTS INCLUDED IN THE FDOT 2021 MITIGATION PLAN IN REGULATORY BASIN 21



## **1.7Florida Division of Emergency Management**

### 1.7.1 Florida Natural Hazards Interagency Work Group 2019 Annual Report

The Florida Natural Hazards Interagency Work Group produces an annual progress report on the implementation of Florida's hazard mitigation plan. This report includes potential impacts to each agency, agency efforts to address the impacts of natural hazards, and a prioritization of efforts to address the impacts of natural hazards. An example of a summary of agency mitigation efforts is provided in **Figure 21**.



#### Johns River Water Management District Dave Dickens and Brian Emanu The mission of St. Johns River Water Management District (SJRWMD) is to protect natural resources and Agency Summary support Florida's growth by ensuring sustainable use of Florida's water for the benefit of the people of the District and the State. To meet that mission statement, the District's work is focused on four core missions vater quality, water supply, flood protection, and natural systems protection. The SJRWMD Division of Regulatory Services works to protect and manage water resources by permitting in a manner that will prevent adverse flooding, manage surface water, and protect water quality, wetlands, and other surface waters. SJRWMD partners with FDOT and communities to develop annual FDOT Mitigation Plans, pursuant to section 373.4137(4), Florida Statute, for wetland impacts associated with FDOT roadway projects. The Office of Real Estate Services acquires lands for flood control, water quality protection, and natural resource conservation. Similarly, the Bureau of Land Management provides oversight for many district lands for water resource protection. Important activities include hydrologic restoration of altered drainage, protection of floodplains, and the use of prescribed fire for restoration and wildfire prevention. The Division of Projects has oversight for district-led and partnership projects that help to meet the con-The Unison of Projects has oversign to or districtive and partnership projects that help to meet the cole missions. For example, the Division is responsible for operating and maintaining more than 100 major and minor water control structures, including eleven spillways, three navigational locks, approximately 300 miles of levees, and thirty pump stations. The Division is also responsible for the construction of projects aimed at protecting water supplies, improving water quality, and restoring natural systems, as well as providing flood protection through practices such as improved stormwater drainage or storage. 2019 Update SIR WMD implemented the followin Land Management: Mitigation of wildfire risk through 51 prescribed burns totaling 28,979 acres on 22 conservation areas. Flood Protection Partnerships: SJRWMD has utilized our cost share program to partner with many local governments to ensure the completion of shovel ready stormwater/flood protection projects local governments of ensuite the comparison of shower ready submittee (r) loog protection projects designed to reduce floading risks and improve water quality. Our government partners over the past year with fload protection projects include St. Augustine, Flagler County, Palm Coast, New Smyrna, and Volusia County. These cost share projects have allowed for the retrofitting stormwater outfalls with tidal backflow prevention valves, reconstruction of weirs, construction of watershed management collection and stormwater treatment systems, and stormwater management system expansion and reconstruction. Levee improvements: Improved a combined total of 11.4 miles of levees at the Lake Apopka North Shore, Taylor Creek, and C231. Provided additional protection to levees via gopher tortoise Flood Control Structure improvements: Rehabilitated S96B, culvert maintenance, installation of new generators at five major structures, and upgraded remote operations hardware at all major structures. The SJRWMD completes several mitigation projects each year and is therefore relevant to state mitigation Projects include stormwater retrofits, watershed restoration, floodplain mapping, and land conservation. Relevance Level The level of mitigation efforts of SJRWMD is high because almost every project includes mitigation, usually to reduce flood risk. Significance The mitigation efforts of the SJRWMD are significant because floodplain management must be coordin not only locally, but also regionally, based on basins and watersheds, to be successful. The agency also completes many infrastructure mitigation projects to reduce flood risk.

FIGURE 21: EXAMPLE OF AGENCY SUMMARY OF MITIGATION EFFORTS



## **1.8Environmental Protection Agency (EPA)**

### 1.8.1 Being Prepared for Climate Change: A Workbook for Developing Risk-Based Adaptation Plans

The EPA Workbook presents a methodology for climate change adaptation planning. A two part process is presented to, 1) conduct a vulnerability assessment and 2) develop an action plan. The key steps within each of these parts are shown in **Figure 22**. The risk management process is intended to help identify risks that may have been overlooked, highlight strategies that may be effective at reducing multiple risks, and aid organizations in making better decisions. A vulnerability assessment is defined as "an evaluated set of risks that describes how climate change stressors would affect goals." The vulnerability assessment may be treated as a standalone product; however, it is not an end to itself. Rather, an action plan should be developed to identify actions to decrease the prioritized risks.





FIGURE 22: ROADMAP FOR VULNERABILITY ASSESSMENT AND ACTION PLAN

The workbook describes the process of developing a vulnerability assessment through risk management strategy based on organizations' mission and goals. The Action Plan is based on the risks that pose the greatest threat to the mission and goals of an organization and includes steps to set up the process for tacking the status of risks and parties to lead the mitigation strategies.



## **1.9Research and Literature**

### 1.9.1 Indian River Lagoon Flushing Research Project<sup>1</sup>

In a research project conducted by Gary Zarillo at Florida Institute of Technology (FIT) for the Indian River Lagoon National Estuary Program (IRLNEP) and Canaveral Port Authority, a numerical model was used to assess the effect of modifications to the SR 528 and SR 520 bridge structures and causeways on flushing rates in the Indian River Lagoon (IRL). The analysis considered the existing conditions and a series of different hypothetical bridge spans. The model found that to achieve significant improvement in flushing, bridge spans would be required on both SR 520 and SR 528. Considering long bridge spans for both SR 528 and SR 520, flushing of the IRL increases by about 10%. Further modelling is required to understand how bridge modifications would affect the salinity, water quality, and water levels of the IRL.



<sup>&</sup>lt;sup>1</sup> Gary A. Zarillo (2018). Numerical Model Flushing Experiments. The Indian River Lagoon National Estuary Program and Canaveral Port Authority.



## 1.9.2 Adaptation Actions to Reduce Impairment of IRL Water Quality Caused by Climate Change<sup>2</sup>

The article identifies nine (9) adaptation actions that may reduce risks to water quality in the IRL as a result of climate change. Risks were prioritized based on severity of consequence, likelihood of occurrence, extent of impact, and time horizon. Climate change induces several stresses on the IRL with the effects summarized in **Table 3**. Risks were found to be primarily induced by changes in precipitation, increasing storminess, and sea-level rise. Adaptation actions are focused on reducing pollutant loadings from wastewater treatment plants (WWTP), on site treatment and disposal systems (OSTDS), and surface water storage and conveyance infrastructure (SWSC). Conveyance infrastructure includes the transportation system. Action Plans for each adaptation action were developed.

Key Stressors	Induced Problems
Warmer temperatures	<ul> <li>Increased evaporation</li> <li>Reduced solubility of oxygen</li> <li>Increased phytoplankton production</li> </ul>
Changes in precipitation	<ul> <li>Increased concentration of discharged pollutants</li> <li>Temporal and spatial salinity patterns</li> </ul>
Increasing storminess	<ul> <li>Fluxes of freshwater</li> <li>Erosion</li> <li>Flooding</li> <li>Destruction conditions</li> </ul>
Acidification	<ul> <li>Kill juvenile fish</li> <li>Increase difficulty for shell animals to maintain shell</li> </ul>
Sea-Level Rise	<ul> <li>Shoreline erosion</li> <li>Inundation</li> <li>Saltwater intrusion</li> <li>Storm surge flooding</li> </ul>

TABLE 3: KEY	<b>S</b> TRESSORS	FROM	CLIMATE	CHANGE	TO IRL
	01112000110		• =	010.001	

<sup>&</sup>lt;sup>2</sup> Randall W. Parkinson, Valerie Seidel, Clay Henderson & Duane De Freese (2021): Adaptation Actions to Reduce Impairment of Indian River Lagoon Water Quality Caused by Climate Change, Florida, USA, Coastal Management

