2020 Annual Climate Leadership Summit
Monroe County Roadway Vulnerability Analysis and Capital Plan

October 13, 2020

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Chief Resilience Officer
Challenge: Climate Change and Sea Level Rise in the Florida Keys (NOAA 2017 Intermediate-High SLR Projection)
King Tides – Higher and More Frequent

November 13, 2019

Roadway Asphalt Limits
Planning: A Proactive Approach

2013 - 2016 Monroe County sea level rise planning launched: GreenKeys

- Initial vulnerability analysis
- Improve roads elevation data
- Engineering level analysis of transportation impacts countywide
- Two Pilot Road Elevation projects

2017 Mobile Lidar Elevation data completed

2018 Two Demo Roads Elevation Projects designed

2019 Countywide roads adaptation study is launched

If you fail to plan, you are planning to fail.
— Benjamin Franklin
Roads are County’s Most Vulnerable Infrastructure: Roadway Vulnerability Analysis Underway

Monroe County Roads Vulnerability Analysis

Task 1: Data Collection
Task 2: Engineering Analysis
Task 3: Concept Development
Task 4: Policy Review & Regulations
Task 5: Stakeholder & Public Outreach
Task 6: Implementation Plan

5
311 Miles of County-Maintained Roads spread out over 1200 locations
Collected A Lot of Data!

All Critical Facilities throughout the County

Number of Residential Units along each roadway segment.

LiDAR Survey available along all 311 miles of roadway.
Developing Sea Level Rise and King Tide Inundation Maps along County Roadway limits

Digital set up and maps available for 2025, 2030, 2035, 2040, 2045, 2060, and 2100 Study Years.
Vulnerability Assessment

1. Groundwater Clearance
2. Surface Inundation Depth (SLR)
3. Storm Surge
4. Surface Wave Impact Potential
5. Roadway Existing Pavement Condition
6. Initial Assessment

45% of Monroe County roads are vulnerable to sea level rise by 2045.
Criticality Assessment

1. Vulnerability Score
2. Number of Residential Units
3. Roadways Associated with Critical Facilities
Criticality Assessment (Cont.)

4. Commercial Buildings

5. Threatened and Endangered and Focus Species

6. Wetlands/Natural Habitats

7. Roadway Functional Classification and Evacuation Route
Initial 25% of Road Segments
Based on Preliminary Scoring to proceed to Engineering Concept Evaluation

NOAA 2017
Intermediate-High SLR Projection + King Tide Prediction for 2045
Engineering Concept Evaluation
Different Solutions for Different Neighborhoods
Existing Private Property and Roadway Low Ground Elevation
Right-of-Way Constraints and Impacts
# Cost and Funding

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Neighborhood Example</th>
<th>Countywide Roadways for 2045</th>
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<tbody>
<tr>
<td></td>
<td>(Raising the road for 1.75' max with curb &amp; gutter and Pump/Injection Well System) (Approximately 1.8 Miles)</td>
<td>(Assumption has similar design approach as example noted above) (Approximately 152 Miles)</td>
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<tr>
<td>Initial Investment</td>
<td>$21 Million</td>
<td>$1.8 Billion</td>
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<tr>
<td>Annual O&amp;M Cost (Pump System)</td>
<td>$18,000</td>
<td>N/A - To be completed as part of Engineering Concept Evaluation</td>
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Note: Cost Estimates do not include design, right-of-way acquisition, harmonization/cost to cure, and legal fees. Cost Estimates are preliminary and subject to change.
Shoreline Strategies

Living Shorelines
- Vegetation
- Edging
- Sills
- Breakwater
- Revetment
- Bulkhead

Coastal Structures

Regulatory

Preliminary coordination with permitting agencies revealed that permits will be required if a drainage system is included and/or impervious surface of the road increases requiring analysis of:

- Water quality impacts (treatment required)
- Pre-project compared to post-project impacts from precipitation
- Impacts to offsite properties
Partnership with Residents for long term resiliency goals

Projected Sea Level Rise infiltrates through low elevation along vacant lots and property perimeter limits

2025
2035
2045
Temporary Flood Protection

Testing in Key Largo during the current Fall high tides

Example of a temporary dam being used in Detroit

Photo by U.S. Flood Control
Looking Back…

- FL Keys experiencing widespread effects of Climate Change in King Tide roads flooding
- Monroe County has been resilience planning and data gathering for a decade
- Monroe County preparing for implementation of resilience plans through Countywide Roads Analysis
- Countywide data gathering and modeling must be completed before decisions can be made on schedule of road adaptations, funding, level of service, etc.

Looking Forward…. 

Countywide Roads Analysis to be completed in 2021