Community Action Team and Public Meeting: March 3, 2022

Resilient Beaufort

An initiative to tackle coastal and climate hazards
Tech Tips

- Call-in option:
  - 301-715-8592 – Meeting ID: 831 8711 9500 Passcode: 985976

- Livestream option:
  - TOB Facebook: https://www.facebook.com/BeaufortTown/

- As a viewer, you are automatically muted and without video
Core Project Team

- **Town of Beaufort**
  - Sam Burdick
  - All departments play supportive role

- **Stewart Community Planning Group**
  - Jay McLeod
  - Andrea Radford
  - Allison Evans

- **Coastal Protection Engineering**
  - Ken Wilson

- **Community Action Team**
  - Diane Meelheim
  - Paula Gillikin
  - Ralph Merrill
  - Heather Poling
  - Henry Everett
  - Johnna Davis
  - Robert Harper
  - Guy Copes
  - Ex officio (non-voting)
    - Mackenzie Todd – NCDCM
    - Sarah Spiegler – NC Sea Grant
Agenda

Meeting Agenda:
- Project Recap
- Review Potential Projects
- Prioritize Projects
- Next Steps

Today’s Objective:
Review and Prioritize Projects
Project Recap
What is Resilience?

- The ability of a community or system to withstand or “bounce back” from an impact.
- Focusing on climate and coastal resilience, looking at risks to our community from flooding, storm events, erosion, and sea level rise.
- Using a triple-bottom-line approach that highlights the social, environmental, and economic impacts of these increasing hazards.
North Carolina Resilient Coastal Communities Program

- Main goal: provide local governments with funding and assistance to complete a resiliency planning initiative
  - Perform a data- and community-driven risk and vulnerability assessment
  - Develop a portfolio of well-planned and prioritized solutions to address risks
  - Create a platform for launching into Phases 3 and 4 (Design and Construction)
Resilience Strategy

Phase 1 Steps:
1. Develop a Community Action Team
2. Set Vision and Goals
3. Review Existing Plans & Efforts
4. Develop a Community Engagement Strategy
5. Map Critical Assets & Natural Infrastructure
6. Conduct Risk and Vulnerability Assessment
   - A. Identify and Map the Hazards
   - B. Assess Vulnerability
   - C. Estimate Risk

Phase 2 Steps:
1. Identify a Suite of Potential Solutions
2. Consolidate and Prioritize Projects

The Resilience Strategy will combine the outputs of each step into a planning document.
Hazards and Threats
Hazards

COASTAL FLOODING

RIVERINE FLOODING

COASTAL EROSION
Tidal Flooding

- As seas rise, nuisance flooding will be chronic
- Over 30 tidal flooding events per year by 2060
- Over 100 tidal flooding events per year by 2080

This graph shows the corresponding number of high tide flood days considering only RSL rise and present astronomical tides. High tide flood days for Beaufort are defined as reaching water levels 1.8 ft above present Mean Higher High Water (Sweet et al. 2018). This figure courtesy of W. Sweet.
Tidal Flooding

- RCCP requires minimum 30-year future projection
- Most structures have at least a 50-year lifespan
- Many major structures last 100 years or more, incl. bridges, WWTP, etc.

Figure 1: Graph shows relative sea level change scenarios for Beaufort, NC associated with the six different global sea level rise scenarios. The low and extreme scenarios represent the minimum and maximum of plausible future sea level rise. Data source: NOAA Technical Report NOS CO-OPS 083; Site: 2295.
Critical Infrastructure

Assets
Critical Infrastructure

- Wastewater Treatment Plant and sewer pump stations
- Public drinking water (wells, towers)
- Emergency response (police, fire, EMS)
- Gas stations
- Evacuation routes
- Grocery / markets
- Telecommunications
- Schools
- Recovery sites (churches, hardware)
- Employment (downtown, Pivers Island, etc.)
Recap of Interactive Web Map & Public Meeting #1

Input

Review the interactive online maps: https://tob-planning.maps.arcgis.com/apps/instant/basic/index.html?appid=52f755447ec14cd7b2355169f01fc2e

Visit the project website at: https://www.beaufortnc.org/planninginspections/page/resilient-beaufort
Public Comments (to-date)

- **Critical Assets**
  - Extended care facility
  - Parks
  - Public housing
  - Forests and specimen trees
  - NIZ

- **Erosion**
  - Front Street

- **SLR and Flooding**
  - Measuring erosion
  - Bird Shoal won’t drown
  - Other low-lying streets

- **Social Vulnerability**
  - Public housing
  - Liveaboards

- **Storm Sturge**
  - Trouble spots like Turner Ck and North River

- **Erosion**
  - Front Street

- **SLR and Flooding**
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- **Storm Sturge**
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Intervention and Mitigation

Structural and Non-structural Projects
Natural/Green, Hybrid, and Grey Infrastructure

**Living Shorelines**

- **Vegetation Only** - Provides a buffer to upland areas and breaks small waves. Suitable only for low.
- **Edging** - Added structure holds the toe of existing or vegetated slope in place.
- **Sills** - Parallel to existing or vegetated shoreline, reduces wave energy, and prevents erosion. Suitable for most.
- **Breakwater** (vegetation optional) - Offshore structures intended to break waves, reducing the force of wave action.

**Coastal Structures**

- **Revetment** - Lays over the slope of the shoreline and protects it from erosion and waves. Suitable for sites with pre-
- **Bulkhead** - Vertical wall parallel to the shoreline intended to hold soil in place. Suitable for areas highly vulnerable to storm.
Nature-Based Solutions/Natural Infrastructure

Living Shorelines
- Coastal Erosion
- Riverine Flooding
- Riverine Erosion
- Coastal Flooding
- Stormwater Flooding
- Tidal Flooding

Oyster Reefs
- Coastal Erosion
- Riverine Flooding
- Riverine Erosion
- Coastal Flooding
- Stormwater Flooding
- Tidal Flooding

Restoring Coastal Features
- Coastal Erosion
- Riverine Flooding
- Riverine Erosion
- Coastal Flooding
- Stormwater Flooding
- Tidal Flooding

Waterfront Parks
- Coastal Erosion
- Riverine Flooding
- Riverine Erosion
- Coastal Flooding
- Stormwater Flooding
- Tidal Flooding

Naturally Resilient Communities
The Benefits of Nature-Based Solutions

The Business Case: **Cost Savings**
Low-Impact Development

Urban Trees + Forests  Green Parking Lots  Green Streets

Bioswales  Rain Gardens  Green Roofs

Small-scale projects add up!

Naturally Resilient Communities
Non-Structural Policy and Planning Projects

Planning Approaches to Reduce Natural Hazards
- Coastal Erosion
- Riverine Flooding
- Tidal Flooding
- Coastal Flooding
- Stormwater Flooding

Regulatory and Policy Approaches to Address Hazards
- Coastal Erosion
- Riverine Flooding
- Tidal Flooding
- Stormwater Flooding

Open Space Preservation through Land Acquisition
- Coastal Erosion
- Riverine Flooding
- Tidal Flooding
- Stormwater Flooding

Naturally Resilient Communities
Planned or Ongoing Projects
Ongoing Plans

Beaufort Waterfront Master Plan

Visit website [here](#)

Rachel Carson Reserve Habitat Resilience Plan

Visit website [here](#)
Ongoing Projects

- Update Town Ordinances
  - Land Development Ordinance, Subdivision Ordinance, Flood Damage Prevention Ordinance, and Stormwater Ordinance

- NCDOT Cedar Street Project

- USDA Utilities Project
Projects

- Each project has a similar description.

<table>
<thead>
<tr>
<th>Project Name</th>
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<tbody>
<tr>
<td>Project Description</td>
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<tr>
<td>Hazard(s) Addressed</td>
</tr>
<tr>
<td>Type of Solution</td>
</tr>
<tr>
<td>Project Map</td>
</tr>
</tbody>
</table>
Potential Non-Structural Projects
## Community Rating System Program for Public Information

<table>
<thead>
<tr>
<th>Objective</th>
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<tbody>
<tr>
<td>The Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management practices that exceed the minimum requirements of the National Flood Insurance Program (NFIP). Certain actions, including public engagement activities, can help a community earn points, resulting in a lower CRS rating and higher flood insurance premium discounts. Having a Program for Public Information that covers other types of public information endeavors, such as a website and technical assistance, can result in a significant point increase.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Key Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRS Coordinator’s Manual, Developing a Program for Public Information for Credit under the Community Rating System of the National Flood Insurance Program, Louisiana-Mississippi Sea Grant Developing CRS Programs for Public Information, CRS and the Program for Public Information</td>
</tr>
</tbody>
</table>

## Floodplain Management Plan

<table>
<thead>
<tr>
<th>Objective</th>
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<tbody>
<tr>
<td>An additional activity under the Community Rating System, known as Activity 510, is the development of a Floodplain Management Plan or Program that comprehensively addresses flooding in the community. Extra credit is provided for plans that address the natural resources of floodplains and recommend ways to protect them. Given the limitations in the RCCP study, this plan should include an in-depth flood analysis to further assess flooding in Beaufort.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Key Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRS Coordinator’s Manual, Morehead City Floodplain Management Plan</td>
</tr>
</tbody>
</table>
### Open Space and Parks Master Plan

**Objective**
Open space provides the community with a wide range of benefits. In addition to enhancing resilience to flooding and providing critical habitat for threatened and endangered species, parks and open space enhance the community’s overall health and wellbeing. This project would involve writing an Open Space and Parks Master Plan to strategically plan how to increase the amount of open space and parks in Town.

**Key Resources**
- Beaufort Parks and Recreation Advisory Board 10-Year Plan
- 2018 Comprehensive Bicycle and Pedestrian Plan
- NC Outdoor Recreation Plan
- City of Edenton Greenway and Open Space Plan
- City of Wilmington Parks and Recreation Master Plan
- National Park Service Land and Water Conservation Fund

### Estuarine Shoreline Management Plan

**Objective**
This project would involve the development of an Estuarine Shoreline Management Plan to comprehensively address the management of the Town’s estuarine shoreline. This plan will assess erosion and balance land use, coastal and climate hazards, ecosystem health, public health, and recreational opportunities.

**Key Resources**
- Nags Head Estuarine Shoreline Management Plan

### Living Shoreline Homeowner Cost-Share Program

**Objective**
Work directly with North Carolina Coastal Federation to facilitate and expand access to their existing Living Shoreline Homeowner Cost-Share Program (currently not funded).

**Key Resources**
- NC Coastal Federation’s Living Shoreline Cost-Share for Homeowners
Potential Structural Projects
## Rachel Carson Reserve Bird Shoal Dune Stabilization

### Project Description
In addition to protecting critical infrastructure, homes, and businesses from coastal and climate hazards, the Reserve islands provide critical and pristine habitat for endangered species and economically important fish and shellfish. Carrot Island and Bird Shoal act nearly as barrier islands, protecting the Town’s south-facing waterfront, Downtown Commercial Waterfront, Historic District, and other critical infrastructure from the Atlantic Ocean and the widening of Beaufort Inlet. Maintaining, restoring, and stabilizing this key natural asset is necessary for sustaining the Town.

The project will include stabilization of a section of dunes on the Western end of Bird Shoal, which sometimes experiences wave overtopping during storm events. A final scope of this project will be determined in close partnership with the Rachel Carson Reserve.

### Hazard(s) Addressed
- Erosion

### Type of Solution
- Nature-based/green infrastructure, innovative technology; marsh restoration, dune stabilization, living shoreline
Front Street Green Infrastructure and Nature-Based Solutions

| Project Description | Front Street, located on the Town of Beaufort’s south-facing waterfront, is in major risk of being inundated with tidal floods, rainfall, and storm surge. Nature-based solutions, or “sustainable planning, design, environmental management, and engineering practices that weave natural features or processes into the built environment” (FEMA), would enhance the resilience of Front Street and nearby areas in the southernmost part of Beaufort. These can include things like engineered berms, living shorelines, and innovative stormwater retention features. This project would include 1) the evaluation of nature-based features to provide additional flood mitigation along Front Street and 2) implementation of preferred features in a phased approach based on prioritization. This project will need to be done in partnership with Front Street riparian landowners. |
| Hazard(s) Addressed | Tidal flooding, sea level rise |
| Type of Solution | Nature-based/green infrastructure |
Downtown Waterfront Shoreline Stabilization

<table>
<thead>
<tr>
<th>Project Description</th>
<th>The Town of Beaufort’s Downtown Waterfront is protected, in part, by two bulkhead structures. An assessment of these structures was completed, highlighting the need to update or replace the structures. During the ongoing development of the Town’s <a href="#">Waterfront Master Plan</a>, a conditions assessment determined that the Town’s bulkhead extending 950 feet of Front Street between Turner Street and Queen Street would benefit most from a total replacement. This would extend it's service life far beyond “band-aid” repairs. A 12-to-18 inch lip above the current height of the bulkhead would also provide additional flood protection to that area. The assessment also indicated that the bulkhead extending along 415 feet of Front Street between Queen St. and Pollock St. is in generally good condition, but some minor repairs are needed. In addition to the replacement and repair of these bulkheads, this project could include stormwater retrofits at the stormwater outfalls within each bulkhead, as well as nature-based features or green infrastructure on the edges of each bulkhead to prevent erosion and over-wash in those locations.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard(s) Addressed</td>
<td>Tidal flooding, sea level rise</td>
</tr>
<tr>
<td>Type of Solution</td>
<td>Grey infrastructure/stormwater retrofitting</td>
</tr>
</tbody>
</table>
### Project Description
Gallant's Point and adjacent areas along Gallant's Channel, including the Michael J. Smith Airport and the NC Maritime Museum’s property, are at risk of erosion, storm surge, tidal flooding, and sea level rise. This area would likely benefit from installing a living shoreline to provide enhanced protection.

A feasibility study to locate specific areas within this larger project area will be needed to further investigate the suitability of different types of living shorelines along this site. According to The Nature Conservancy's [Living Shoreline Explorer](https://www.nature.org/), the northern area would likely benefit from a hybrid living shoreline, such as a marsh-sill, due to a higher wave energy than nearby areas. The southern end would likely benefit from a traditional living shoreline with vegetation and oysters. This project would be done in close partnership with the NC Maritime Museum, Michael J. Smith Airport Authority, and the North Carolina Coastal Federation.

### Hazard(s) Addressed
- Erosion

### Type of Solution
- Nature-based/green infrastructure; living shoreline
### Cedar Street Waterfront Park

**Project Description**

Parks and open spaces are key for enhancing community resilience. Waterfront parks, especially, can serve as a buffer that provides storm protection and flood reduction to nearby properties, contribute to the holistic well-being of individuals in the community, promote community cohesion, and increase environmental public awareness.

Cedar Street Waterfront Park is a planned park on the property that used to serve as the base of the bridge at the Western end of Cedar Street. The project is described in the [2016 Small Area Plan](#) as follows: “The park’s current plan features a 21-space parking lot, a turnaround/drop-off area, bicycle parking, restrooms, picnic areas, weaving paths, an elevated site for water views, seat steps, a lawn area, bench swings, and a fishing beach area. The plan also includes a design for part of Cedar Street leading up to the park. It proposes a two-lane street with a 10-foot wide, multi-use path on its south side. Additional street lighting and planting areas are also included.”

The Cedar Street Waterfront Park should be designed to shift and transform during periods of extreme weather and flood. Cedar Street Waterfront Resilience Park could include a living shoreline on either side of the existing bulkhead, marsh restoration, low-impact development (LID) strategies to absorb stormwater, and additional public amenities that promote community cohesion. Such elements could include a kayak launch, dock, tree plantings, rain garden, permeable pavement, and floodproofing of bathroom facilities. Additionally, informational signage throughout the park will enhance community awareness and education.

### Hazard(s) Addressed

- **Erosion**

### Type of Solution

- Nature-based/green infrastructure; Low-Impact Development
**Stormwater Outfall Retrofits**

<table>
<thead>
<tr>
<th>Project Description</th>
<th>This project would include the installation of check valves at all 17 stormwater outfalls in Beaufort, aimed at preventing tidal water from backing up into the storm drain system.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard(s) Addressed</td>
<td>Tidal flooding, sea level rise</td>
</tr>
<tr>
<td>Type of Solution</td>
<td>Development of long-term phased plan and installation of check valves designed to prevent tidal waters from backing up into the storm drain system.</td>
</tr>
</tbody>
</table>

**Street Stormwater Retrofits**

<table>
<thead>
<tr>
<th>Project Description</th>
<th>This project would include phased stormwater retrofits throughout the Town of Beaufort based on priority hotspots that experience recurring flooding. These retrofits may be hard infrastructure but should incorporate Low-Impact Development and Stormwater Best Management Practices where possible.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard(s) Addressed</td>
<td>Stormwater flooding</td>
</tr>
<tr>
<td>Type of Solution</td>
<td>Nature-based and Low-Impact Development</td>
</tr>
</tbody>
</table>
## Wastewater System Maintenance and Flood Mitigation

### Project Description
Implement lift station and wastewater infrastructure projects identified in the Town’s 2021 Wastewater Asset Management Plan, with the addition of flood proofing facilities to account for increased future chance of inundation or flooding. This might include elevating structures or infrastructure such as stacks, ladders, or generator pads, or adding floodproofing and flood mitigation through nature-based features. Improvements should be undertaken according to an established schedule as it best suits the Town’s maintenance planning efforts.

### Hazard(s) Addressed
Tidal flooding, sea level rise, and floodplain expansion

### Type of Solution
Hard Infrastructure Retrofits

### Estimated Cost

<table>
<thead>
<tr>
<th>Project</th>
<th>Cost (FY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replacement of Lift Station #7</td>
<td>$756,300.00</td>
</tr>
<tr>
<td>(FY 2023/24)</td>
<td>Replacement of Lift Station #2 -</td>
</tr>
<tr>
<td>Rehabilitation Lift Station #6</td>
<td>$572,800.00</td>
</tr>
<tr>
<td>(FY 2024/25)</td>
<td>Replacement of Lift Station #3 -</td>
</tr>
<tr>
<td>Replacement of Lift Station #1</td>
<td>$1,070,800.00</td>
</tr>
<tr>
<td>(FY 2025/26)</td>
<td>Rehabilitation Lift Station #8 -</td>
</tr>
<tr>
<td>Replacement of Lift Station #5</td>
<td>$714,300.00</td>
</tr>
<tr>
<td>(FY 2026/27)</td>
<td>Sanitary Sewer Rehabilitation -</td>
</tr>
<tr>
<td></td>
<td>$3,178,400.69</td>
</tr>
</tbody>
</table>
## Project Description

Maintaining the integrity of the Town’s water system and accounting for future flood risk helps prevent potential interruptions in service. The drinking water infrastructure projects identified in the Town’s 2019 Water Asset Capital Improvement Plan would be enhanced with the addition of flood proofing and mitigation strategies. These might include elevating structures or infrastructure such as stacks, ladders, or generator pads, or adding floodproofing or flood mitigation through nature-based features. Improvements should be undertaken according to an established schedule as it best suits the Town’s maintenance planning efforts.

## Hazard(s) Addressed

Tidal flooding, sea level rise inundation, and floodplain expansion. Although not covered in the assessment of vulnerabilities, saltwater intrusion underground may also be a concern, but would need to be studied separately.

## Type of Solution

Hard Infrastructure Retrofits

<table>
<thead>
<tr>
<th>Project</th>
<th>Estimated Cost</th>
<th>Project</th>
<th>Estimated Cost</th>
</tr>
</thead>
</table>
| 1A - Crescent Drive  
1B - Campen Road | $203,300 | 6 - West Ann Street and Queen Street: | $2,648,085 |
| 2A - Live Oak St. - Chestnut Dr. - Circle Drive  
2B - Second St. - Legion Drive | $2,851,125 | 7 - Front Street - Broad Street  
(Marsh Street to Gordon Street) | $1,407,970 |
| 3 - Live Oak - Mulberry Street - Pine Street | $3,434,535 | 8 - Front Street - Broad Street  
(Gordon Street to Belle Air Street) | $2,492,850 |
| 4 - Cedar Street - Moore Street | $374,300 | 9 - Front Street - Ocean Street  
(Belle Air Street to Island View Drive) | $788,260 |
| 5 - Downtown | $4,934,085 | 10 - East Ann Street | $194,130 |
### Project Description

Reducing the amount of stormwater throughout the Town of Beaufort and enhancing the natural function of our watersheds is critical for building resilience to coastal and climate hazards. The Town’s [2017 Watershed Restoration Plan](#) contains a series of Low-Impact Development actions and projects to enhance the natural function of the Town Creek, Turner/Gibbs Creek, and Taylor Creek Watersheds in which the Town lies. These actions include, but are not limited to, permeable pavement, green streets/alleys, rain gardens, cisterns, permeable pavement, bioswales, green parking, green roofs, and stormwater retention cells.

This project will occur in three phases, with each phase focusing on one of the three watersheds in the Town. The list of Low-Impact Development action items in the Watershed Restoration Plan would be prioritized within each watershed, then implemented on a schedule. An additional component of this project, depending on funding sources, could include a property owner cost-share program for Low-Impact Development on private property.

### Hazard(s) Addressed

Stormwater flooding, watershed/stormwater system impediments

### Type of Solution

Nature-based/green infrastructure; Low-Impact Development; Watershed Restoration

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[Beaufort Watershed Boundaries Map](#)
## Historic Structure Elevation Program

<table>
<thead>
<tr>
<th>Project Description</th>
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<tbody>
<tr>
<td>The Town of Beaufort is the third oldest Town in North Carolina, established in 1709. With this rich history, there are many historically significant structures and properties within the Town’s Downtown Historic District. Many of these properties are at risk from flooding and sea level rise, threatening these important cultural assets. This project would include a program for elevation of historic properties, facilitating the process of raising their structures to better withstand future risks.</td>
<td></td>
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<table>
<thead>
<tr>
<th>Hazard(s) Addressed</th>
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</thead>
<tbody>
<tr>
<td>Stormwater flooding, tidal flooding, and sea level rise</td>
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</table>

<table>
<thead>
<tr>
<th>Type of Solution</th>
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<tbody>
<tr>
<td>Hazard Mitigation</td>
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**Duncan House**
Summary of Projects

Non-Structural Projects
1. Floodplain Management Plan
2. Community Rating System Public Information Plan
3. Open Space and Master Parks Plan
4. Estuarine Shoreline Management Plan
5. Living Shoreline Homeowner Cost-Share Program

Structural Projects
1. Rachel Carson Reserve Bird Shoal Dune Stabilization
2. Front St. Green Infrastructure and Nature-Based Solutions
3. Downtown Waterfront Bulkhead
4. Gallant’s Channel Living Shoreline
5. Cedar Street Waterfront Park
6. Stormwater Outfall Retrofits
7. Street Stormwater Retrofits
8. Wastewater System Maintenance and Flood Mitigation
9. Water System Maintenance and Flood Mitigation
10. Low Impact Development for Reduced Flooding and Enhanced Water Quality
11. Historic Structure Mitigation and Elevation
Community Input - Next Steps

- Beaufort Community
  - Review the projects in detail at https://www.beaufortnc.org/planninginspections/page/resilient-beaufort
  - Rank the projects via a short survey https://www.surveymonkey.com/r/ResilientBeaufort
  - Public comment collected until 03/13/22
  - Or provide comment to Town staff directly at s.burdick@beaufortnc.org

- Community Action Team
  - Final meeting: 3/15 @ 5pm
  - Then the plan will be presented to Town Council in April (tentative)

Thank You
Thank You

- Please visit the project website at: https://www.beaufortnc.org/planning inspections/page/resilient-beaufort
- Please contact Sam Burdick with any questions or feedback: s.burdick@beaufortnc.org