

RESILIENT RING'S ISLAND

FINAL DESIGN AND PERMITTING

WINTER 2021



What Does Climate Change Look Like in Salisbury?



The region is planning for 40" of sea level rise by 2070



Increased flooding will lead to increased erosion



Precipitation may increase in the winter and spring



Winter ice and snowstorms are expected to increase



The risk of drought will increase in the summer and fall



The average temperature could increase by 10°F by 2100

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DESIGN STRATEGY

PRELIMINARY DESIGN - FALL 2019

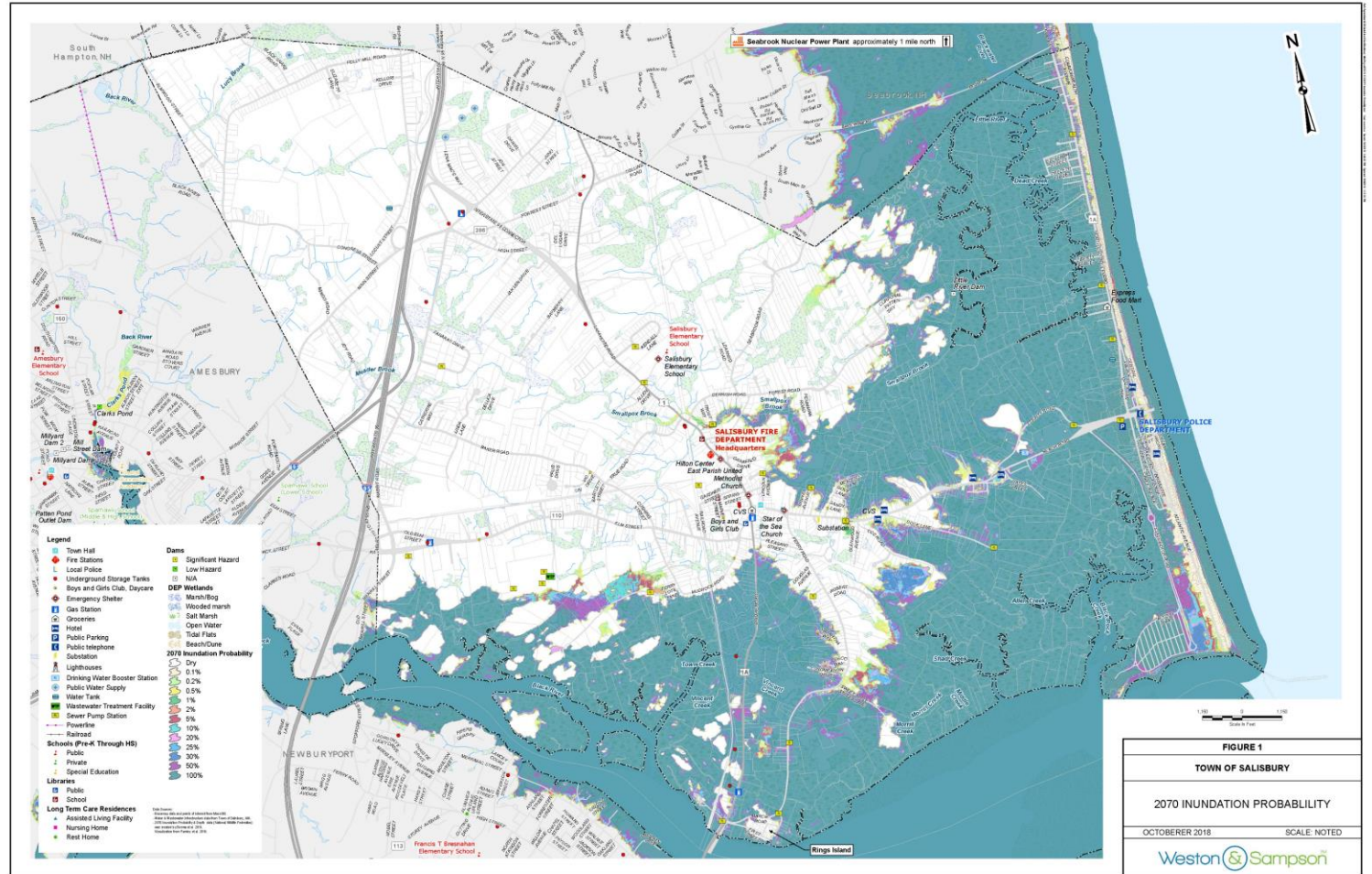
Project Proposal

Flooding occurs along the southwest evacuation route about 8-10 times per year

Northern evacuation route also floods during King Tides and significant storms

Flood conditions are expected to worsen under climate change

4-10 feet of sea level rise is expected by 2100



A map of inundation probability in Salisbury by 2070

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DESIGN STRATEGY

PRELIMINARY DESIGN - FALL 2019

Municipal Vulnerability Preparedness (MVP) Program

- Program under the MA Executive Office of Energy & Environmental Affairs
- Implementing the MVP Summary of Findings Report
- \$407,500 grant funding to improve the resilience of the Ring's Island neighborhood for both preliminary and final design

Overall Project Goal

The Resilient Ring's Island Project aims to decrease the impact of floods in the area and improve the coastal neighborhood's public safety by raising the access roads and increasing the tidal flushing through culvert replacements at 1st Street, March Road and Ferry Road.

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SURVEY RESULTS

PRELIMINARY DESIGN – FALL 2019

Summary of short-answer responses

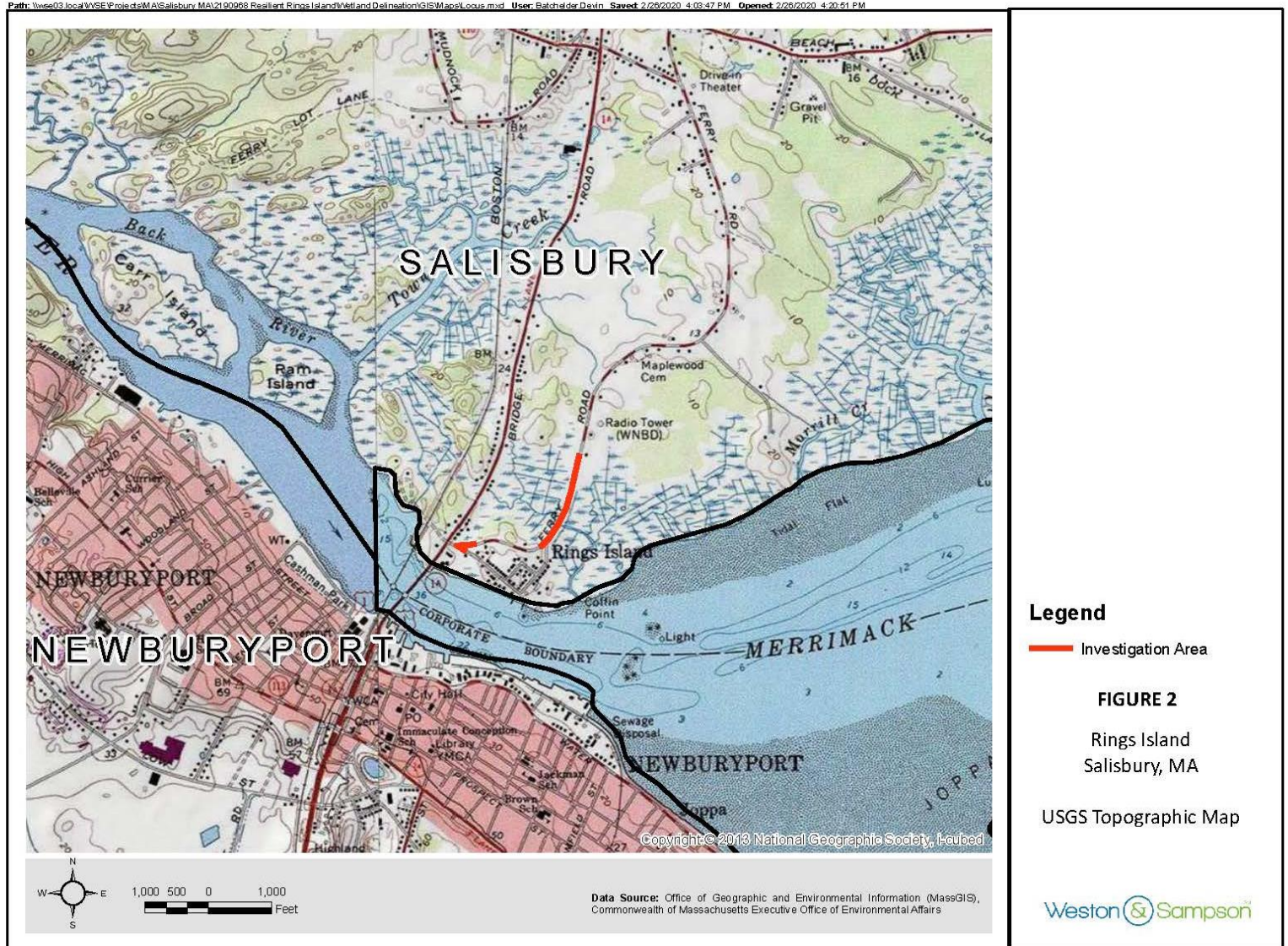
- **5 concerns** related to the potential impact of tide gates or related interventions on the neighborhood's natural beauty
- **4 concerns** related to the high speed of cars traveling in this area and the public safety impact for pedestrians if sidewalks are added.
- **2 comments** that the proposed design will not decrease flooding and may worsen flooding
- Respondents were found to be concerned about:
 - Fixing storm drains on 2nd street
 - The aesthetic impact of the proposed design

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Site Investigation

Site investigations for the analysis included:

- Wetland delineation and mapping
- Geotechnical subsurface investigations during preliminary and final design
- Topographic survey of the culverts, channel and marsh area
- Final topographic survey of full project area



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MODELLING RESULTS

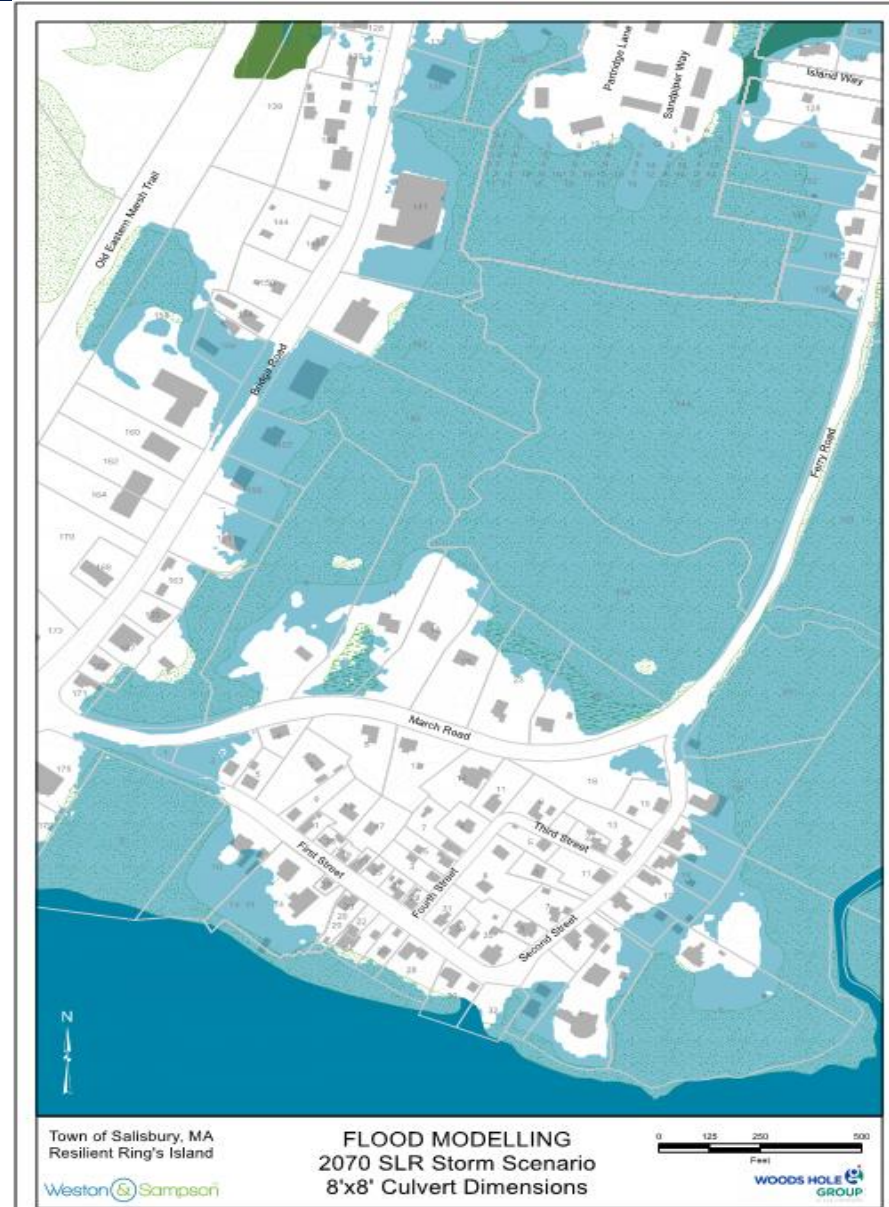
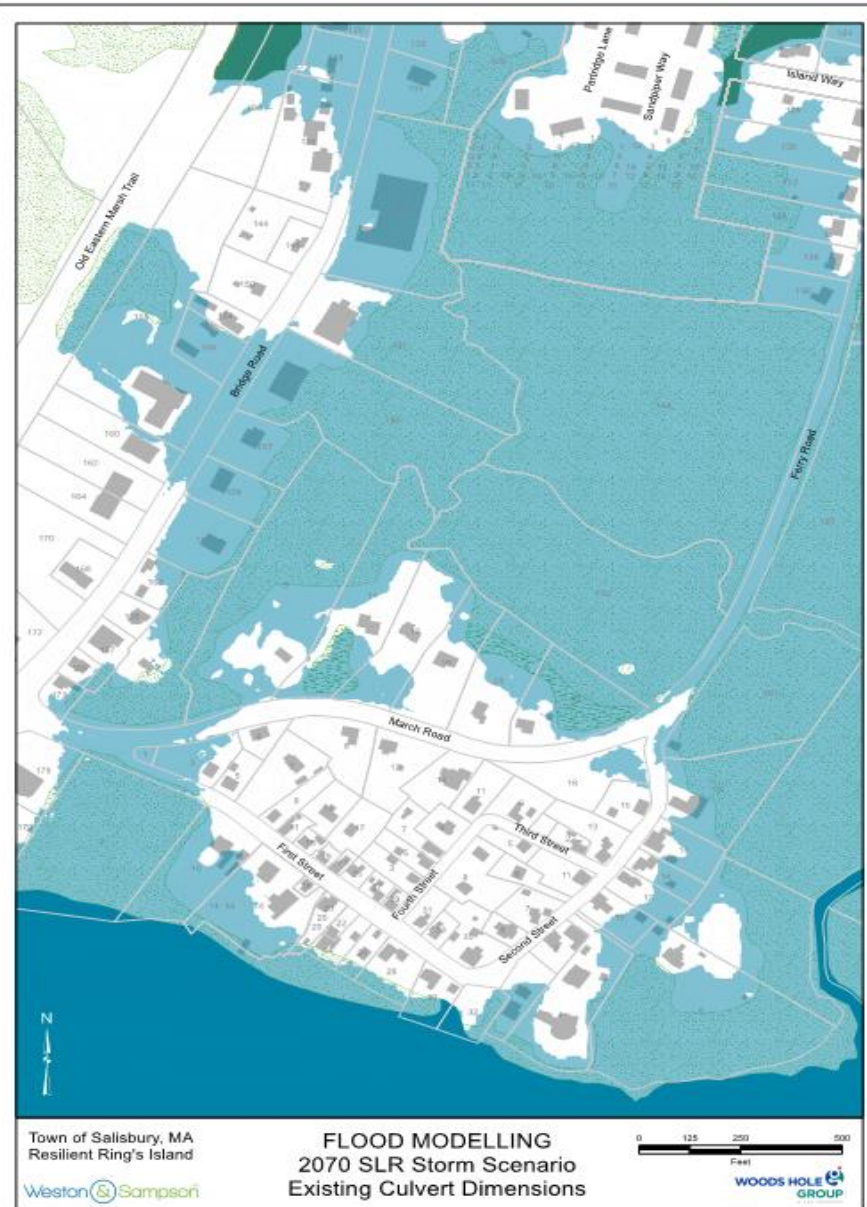
Model Development

- Dataloggers deployed at four stations to evaluate water surface elevation
- Hydraulics model developed using a sea level rise scenario in 2070 of 2.3 feet and a high astronomical tide of 6.5 feet
- Model run with three Ferry Road culvert design alternatives:
 - 5 feet x 5 feet box culvert
 - 5 feet x 8 feet box culvert
 - 8 feet x 8 feet box culvert

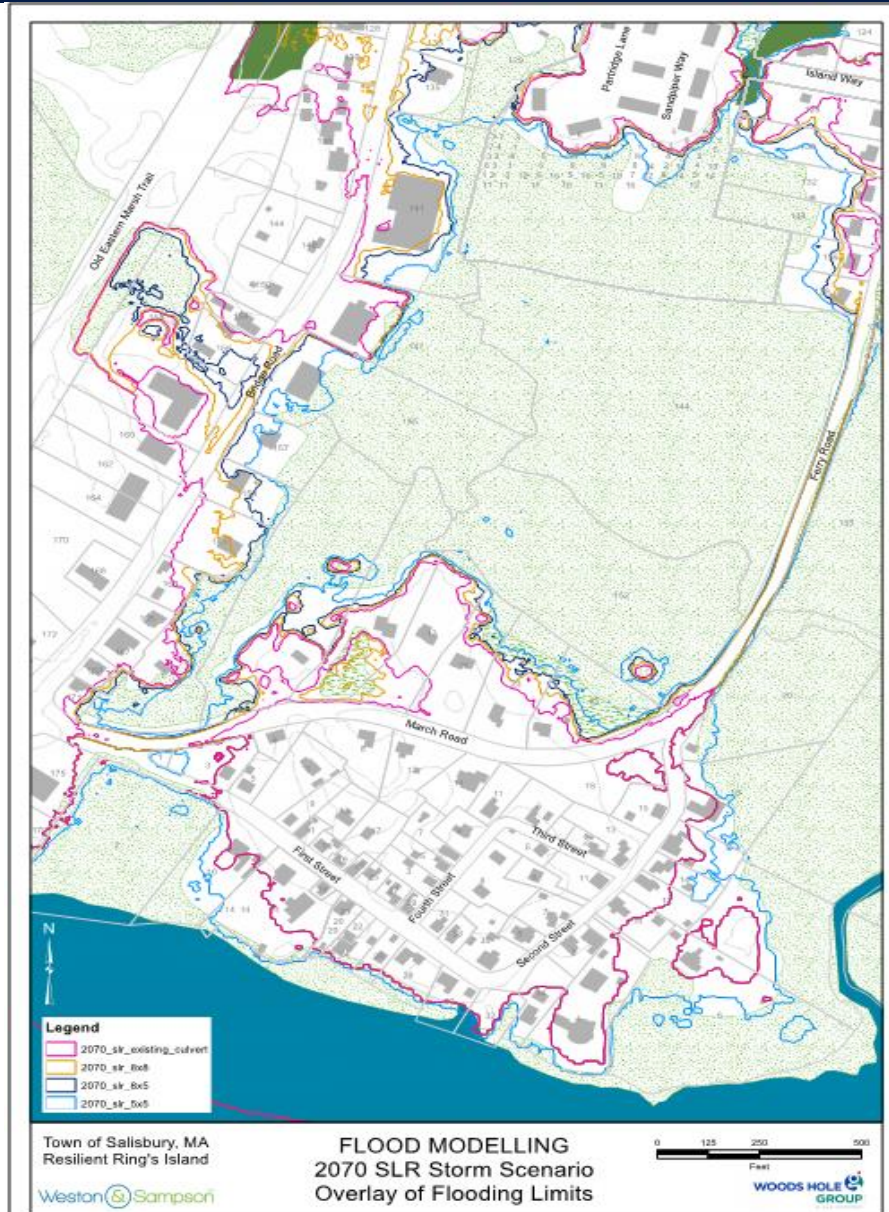
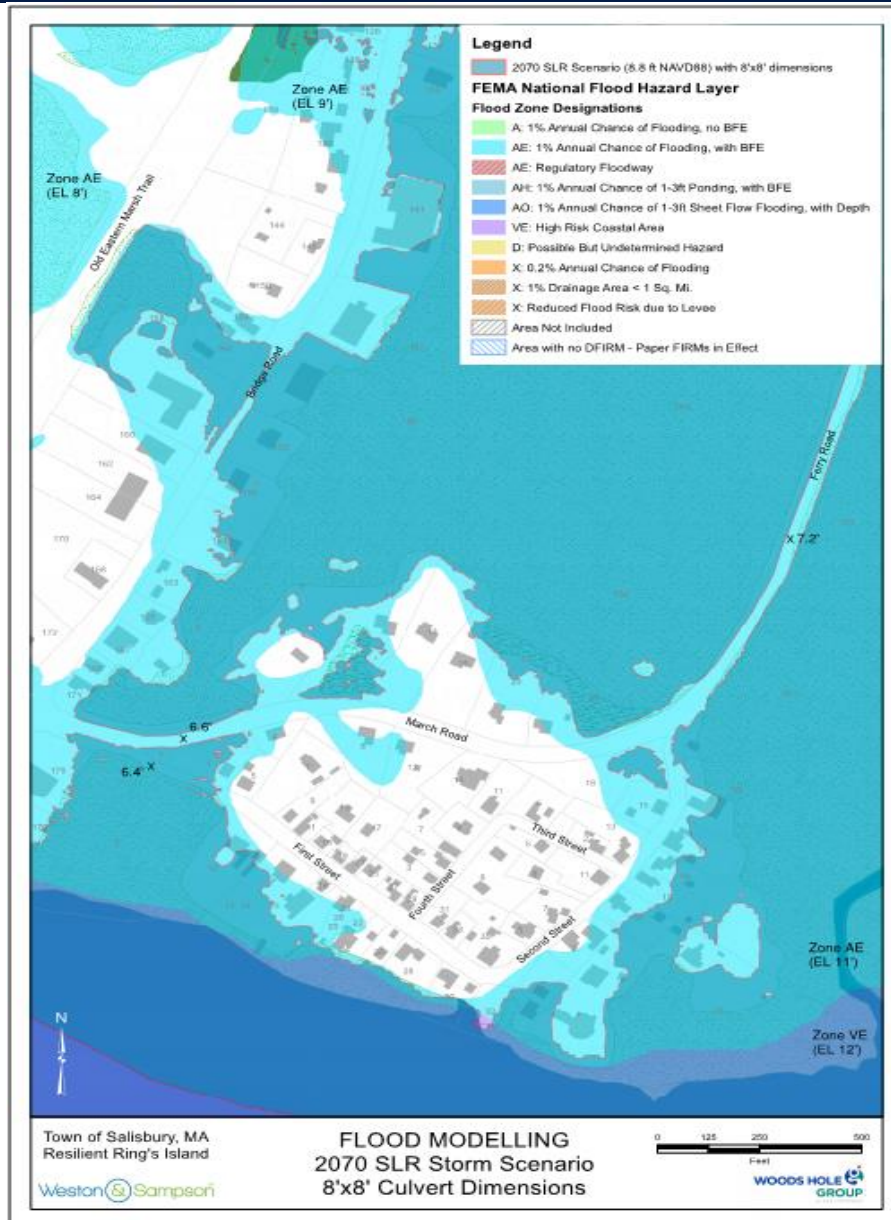
Model Results

- Recommended design parameters for Ferry Road
 - Roadway elevation at a minimum of ELEV. 9.0
 - Existing roadway ELEV. 7.0-8.0 Avg.
 - 8 feet x 8 feet box culvert
 - Maintain existing culvert floor invert elevation
- Recommended design parameters for March Road & First Street
 - Roadway elevation at a minimum of ELEV. 9.0
 - Existing roadway ELEV. 6.0 Avg.
 - Culvert hydraulic opening of 2.5' diameter pipe
 - Maintain existing culvert invert elevations

MODELLING



MODELLING



RESILIENT RING'S ISLAND

WINTER 2020

PRELIMINARY DESIGN

Redesign Options Considered for Ferry Road and March Road and 1st Street

Option 1: Raised Berm (Earthen Fill)

Option 2: Sheet Pile & Concrete Block Wall

Option 3: Elevated Road (Spanning Bridge)

Designed Flood Elevation = ELEV. 9.0

This is calculated using an astronomical high tide of 6.5 feet with 2.3 feet of sea level rise (2070 conditions). Woods Hole Group

Additionally, these redesigns incorporate retrofits of the existing, undersized culverts.



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WINTER 2021

FINAL DESIGN

Final Design for Ferry Road and March Road and 1st Street

Combination of -

Option 1: Raised Berm (Earthen Fill)

Option 2: Concrete Block Retaining Wall

Proposed Minimum Roadway Elevations

- ELEV. 9.0 feet edge of pavement
- ELEV. 9.3 feet centerline



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FINAL DESIGN CONSIDERATIONS

Ferry Road Box Culvert

- 8 feet x 8 feet, with tide gate for additional controls
 - Precast Concrete Structure
 - Wingwalls
 - Natural stream bottom

Roadway Realignment

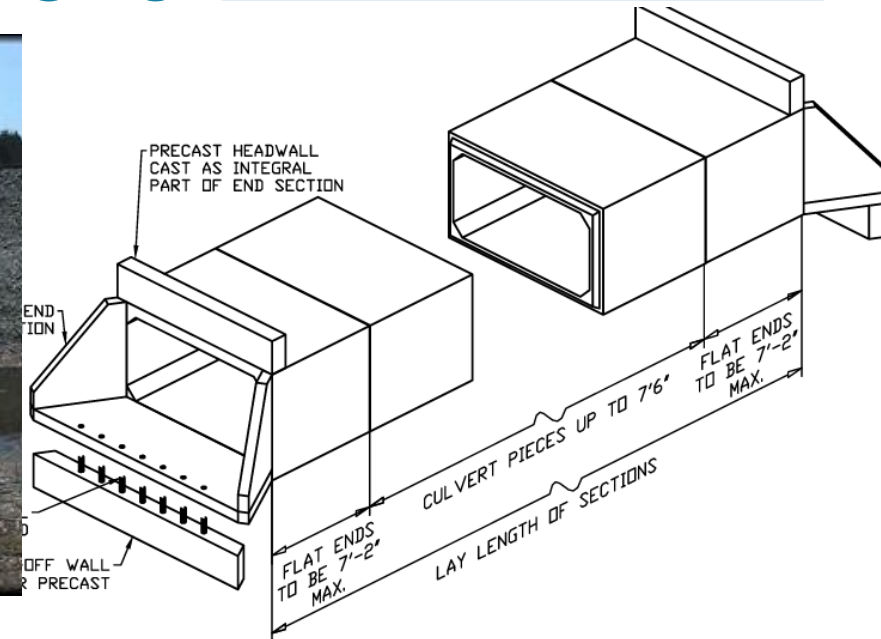
- Along the length of Ferry Road improvements
 - Avoid utility pole conflicts

Wetland Impacts

- Borders roadway throughout project area
 - Dependent on roadway section
 - Anticipating ¼ acre of Wetland Impacts
 - Saltmarsh Restoration

Geotechnical Investigations

- Lightweight fill
- Ground improvement





Newburyport

Rings Island

Merrimack River



Box Culvert

8'x8'

200 ft

1500 ft

Ferry Road

Existing Pump
Station

March Road

1st Street

Two Culverts 2.5ft

500 ft

US Route 1



Ferry Road towards Rings Island
Existing Conditions





Ferry Road towards Rings Island Embankment Fill

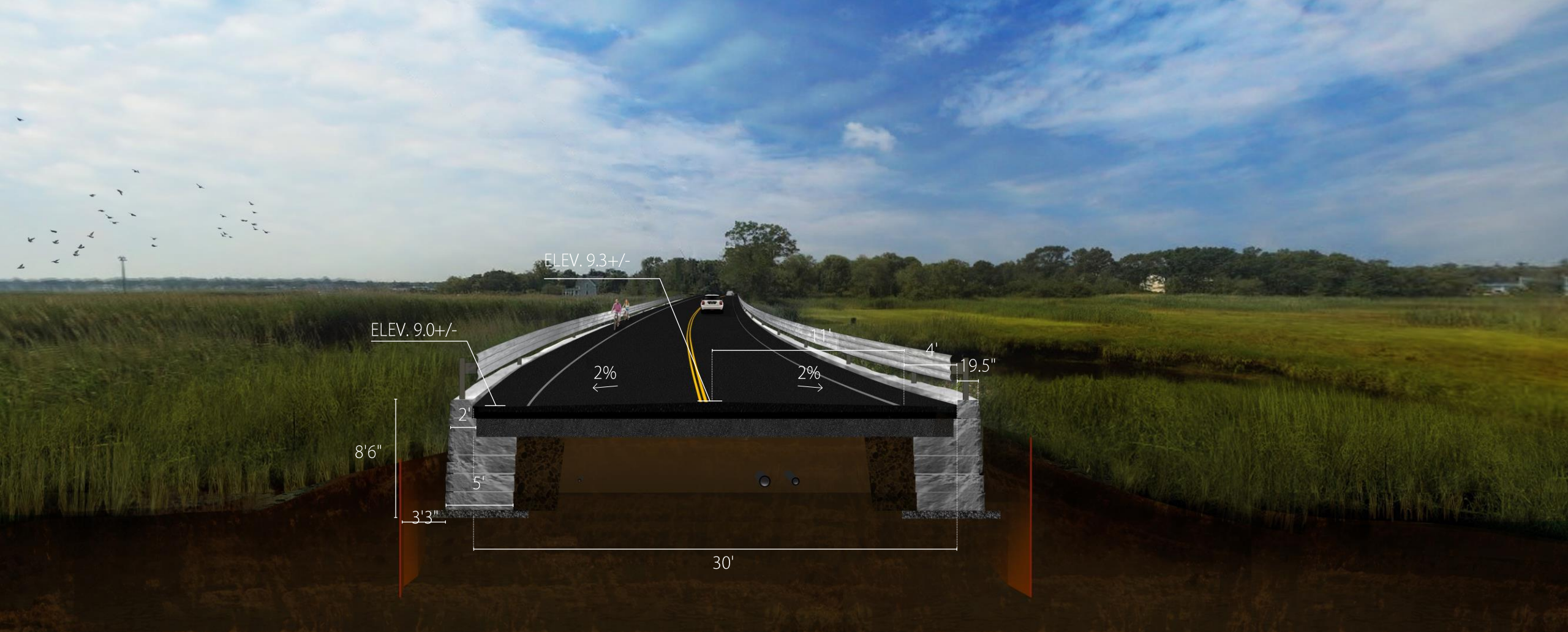
Pros:

- Easiest to construct
- Simpler relocation of exiting utilities if needed

Cons:

- Wide footprint extends into wetland and would require additional permitting
- Slope offset requires relocation of telephone poles or roadway realignment





Ferry Road towards Rings Island Retaining Wall

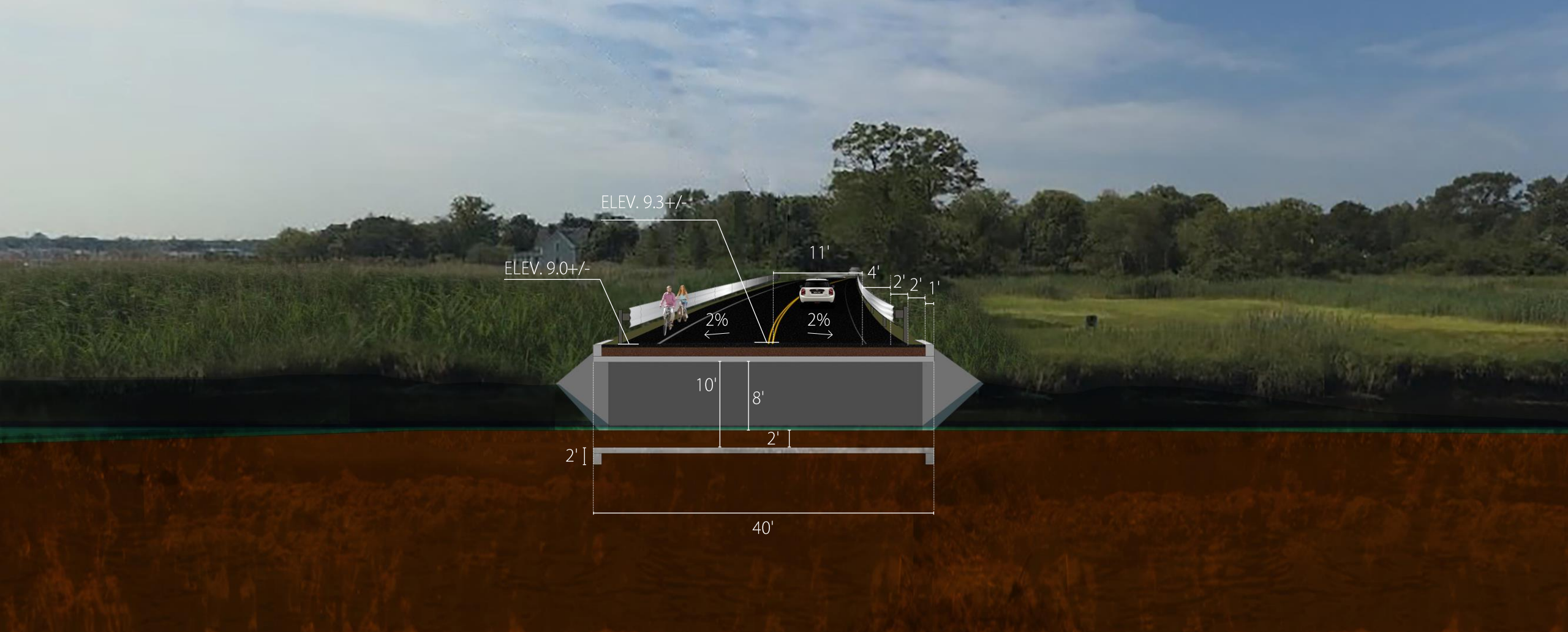
Pros:

- Requires smaller footprint than earthen fill
- Simpler relocation of exiting utilities if needed

Cons:

- May negatively impact tidal scouring and intensity along adjacent waterlines due to harder edge
- Negative impact to restoration of wetland
- Requires moving existing buried telephone conduit





Ferry Road towards Rings Island
Culvert Cross Section







March Road towards Rings Island
Existing Condition





March Road and 1st St towards Rings Island Embankment Fill

Pros:

- Easiest to construct
- Simpler relocation of exiting utilities if needed

Cons:

- Wide footprint extends into wetland and would require additional permitting
- Slope offset requires relocation of telephone poles
- Little impact on wetland restoration





March Road and 1st St towards Rings Island Retaining Wall

Pros:

- Requires smaller footprint than earthen fill
- Simpler relocation of exiting utilities if needed

Cons:

- May negatively impact tidal scouring and intensity along adjacent waterlines due to harder edge
- Negative impact to restoration of wetland
- Requires moving existing buried telephone conduit





RESILIENT RING'S ISLAND

PROJECT SCHEDULE

Project Schedule:

- Final Design and Permitting – Continue through Spring 2021
- Bidding – Early Summer 2021
- Construction – Fall 2021
- Project Completion – Spring 2023
- *Project Completion – Spring 2024 (if bid as separate projects)

PROJECT PERMITTING

• Possible Permits:

- MA Wetlands Protection Act Notice of Intent (NOI)
- MassDEP 401 Water Quality Certification (WQC)
- MassDEP Chapter 91 Submission
- MEPA Environmental Notification Form (ENF) OR Environmental Impact Report (EIR)
- US Army Corp of Engineers (ACOE) Individual Permit (IP)
- Massachusetts Coastal Zone Management (CZM) Federal Consistency Review
- Massachusetts Division of Marine Fisheries (DMF) Review
- Massachusetts Endangered Species Act (MESA) Project Review
- ACOE Individual Permit (IP) or Pre-Construction Notification (PCN)



Newburyport

Rings Island

Merrimack River



1500 ft

Ferry Road

Box Culvert
8'x8' 200 ft

Existing Pump
Station

March Road

500 ft

1st Street

Two Culverts 2.5ft

US Route 1

RESILIENT RING'S ISLAND

Questions



Brief Survey: <https://www.surveymonkey.com/r/XPCGJVQ>