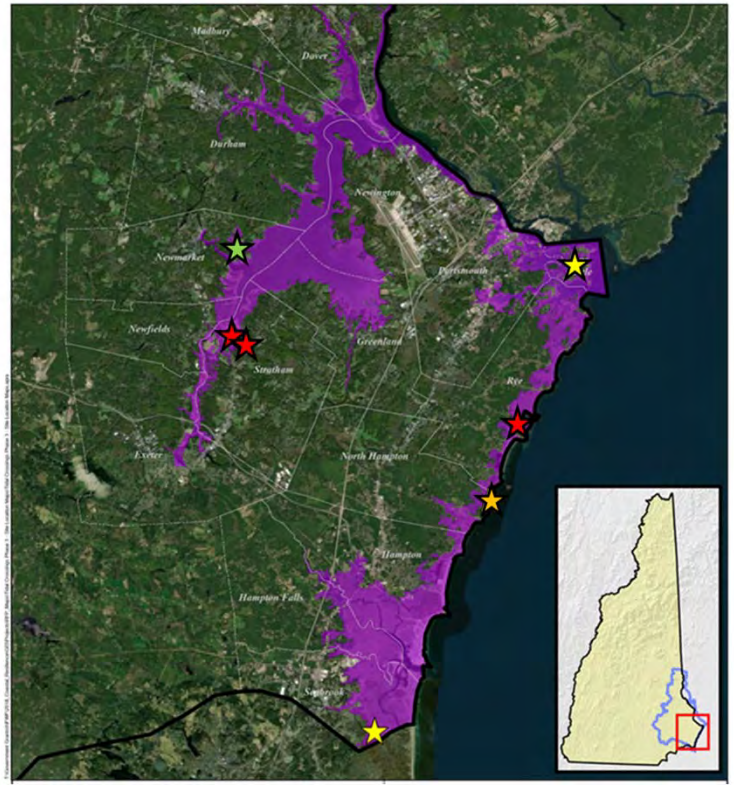
Alternative Analysis and Preliminary Designs for Priority Tidal Crossing Replacements

NH Resilient Tidal Crossings Project (Phase 3)



New Hampshire DOT

The Nature Conservancy
New Hampshire

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

NHCP

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

NATIONAL FISH AND WILDLIFE FOUNDATION
NFWF

CMA ENGINEERS
pursue excellence

Streamworks

Developing Tidal Crossing Assessment Protocol

NH Resilient Tidal Crossings Project (Phase I)
(2015-2017)

Local Advisory Committee

The Nature Conservancy New Hampshire
NH Coastal Program
NH Department of Environmental Services
New Hampshire DOT
Sea Grant New Hampshire
NOAA
University of New Hampshire
Wright-Pierce Engineering a Better Environment

Regional Coordination

MaineDOT
Casco Bay Estuary Partnership
Maine Coastal Program
Fisheries and Oceans Canada
Nova Scotia Canada
UMassAmherst
Gulf of Maine Council on the Marine Environment
North Atlantic LCC
CRMC
NROC

New Hampshire's Tidal Crossing Assessment Protocol

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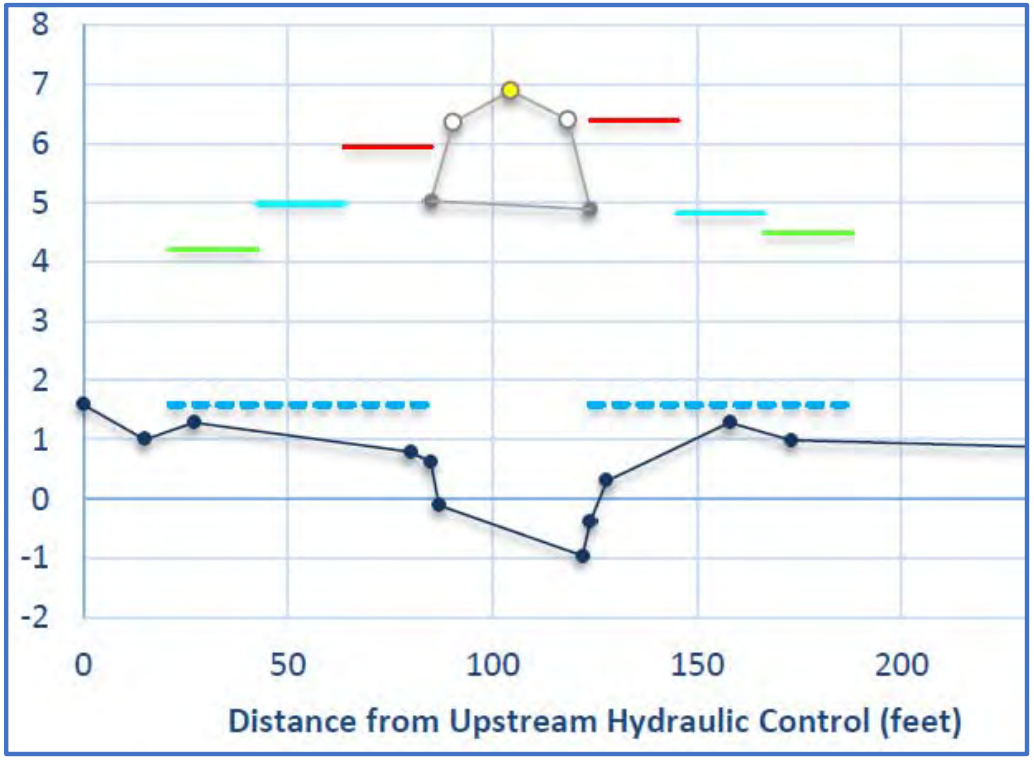
July 14, 2017

Assessing Tidal Stream Crossing Infrastructure

NH Resilient Tidal Crossings Project (Phase 2)
(2018-2019)

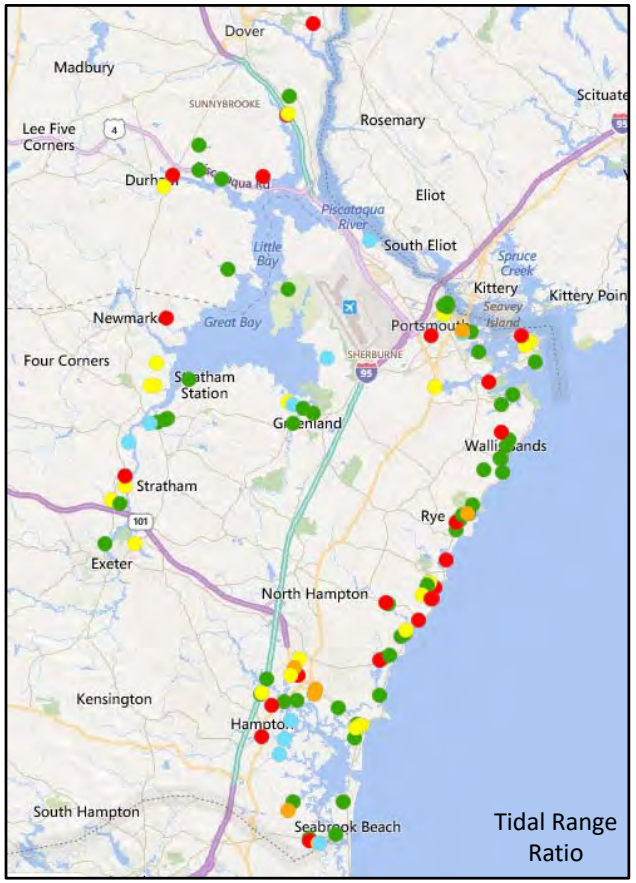


Prioritizing Tidal Stream Crossing Replacement

NH Resilient Tidal Crossings Project (Phase 2)
(2018-2019)

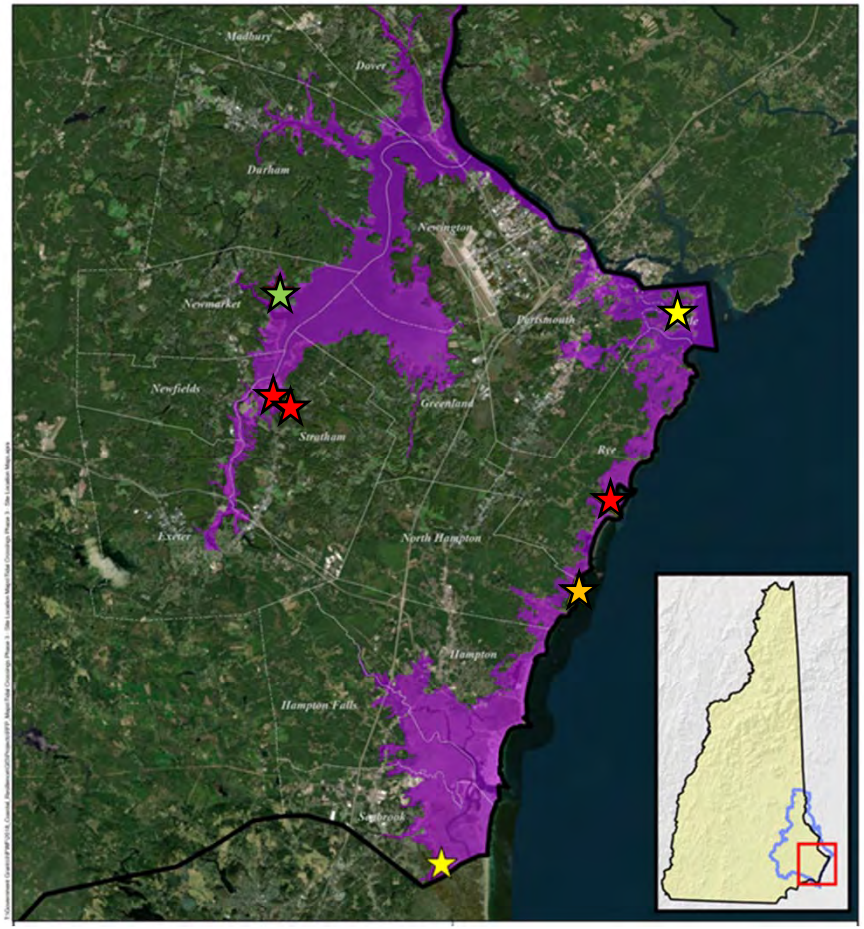
INFRASTRUCTURE	1. Structure Condition
	2. Inundation Risk To Roadway
	3. Inundation Risk To Crossing Structure
	4. Inundation Risk To Development
ECOLOGICAL	5. Tidal Range Ratio
	6. Crossing Ratio
	7. Erosion Classification
	9. Tidal Aquatic Organism Passage
	10. Salt Marsh Migration Potential
	11. Salt Marsh Migration Potential
	12. Vegetation Evaluation
COMBINED	13. Overall Infrastructure Score
	14. Overall Ecological Score
	15. Overall Combined Score

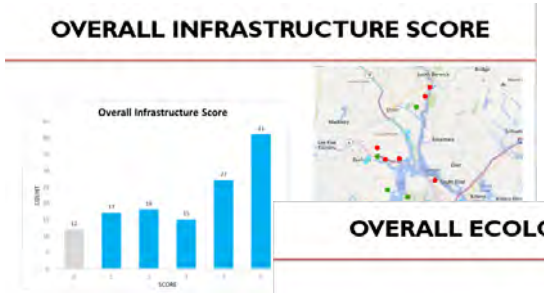
SCORE	SCORING CHARACTERIZATION	RECOMMENDED ACTION
1	- good structure condition - no tidal restriction - allows organism passage - low salt marsh migration potential - vegetation unaffected by crossing - low flood risk - many adverse impacts	Low Replacement Priority
2		
3		
4		
5	- poor structure condition - severe tidal restriction - reduced organism passage - high salt marsh migration potential - vegetation affected by crossing - high flood risk - few adverse impacts	High Replacement Priority

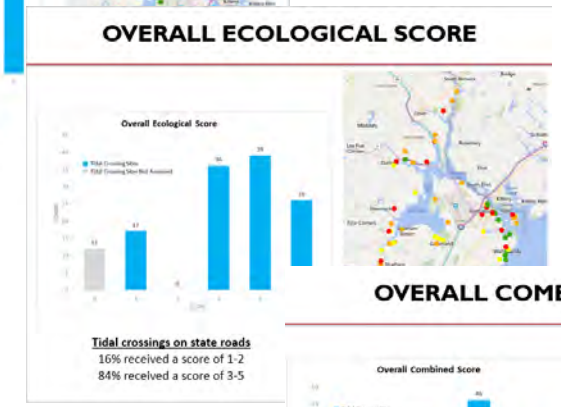


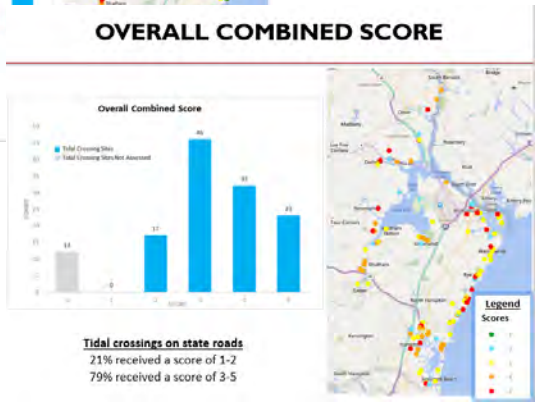
Advancing High Priority Tidal Stream Crossing Replacements

NH Resilient Tidal Crossings Project (Phase 3)
(2019- current)



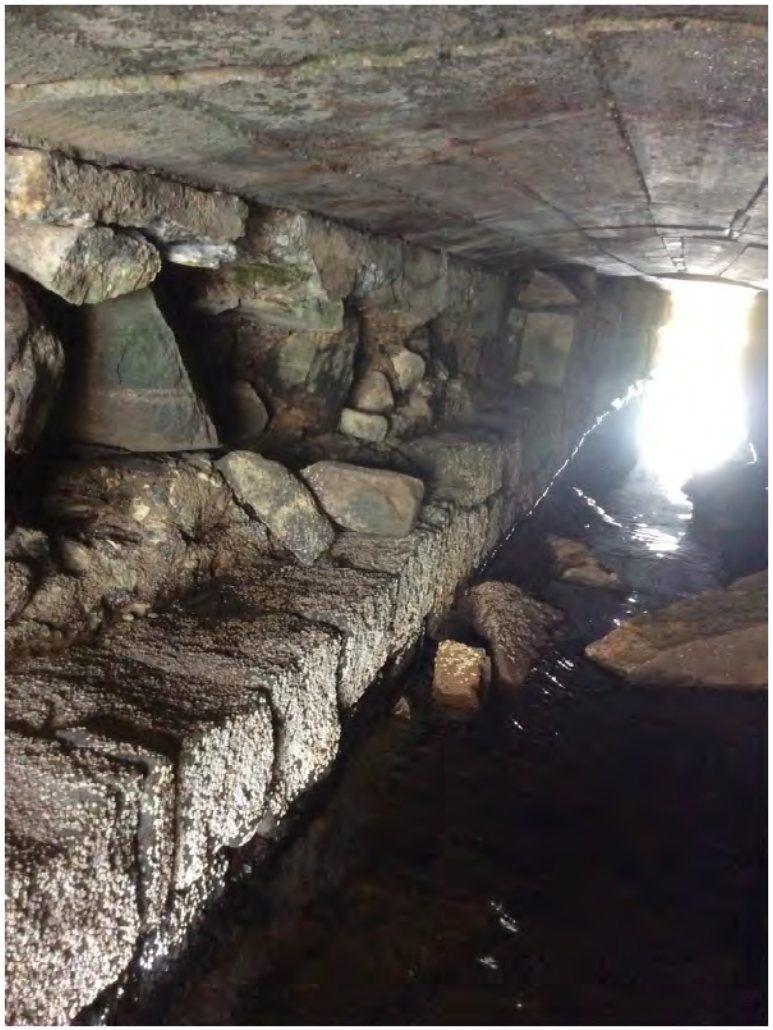






Route 1A at Rye Harbor / Awcomin Salt Marsh (#46)

Route 1A at Rye Harbor / Awcomin Salt Marsh (#46)



Squamscott Road, Stratham (#113 & 114)

Squamscott Road, Stratham (#114 &113)

NHDES Stream Crossing Policy

Structure type requirements are based upon contributing watershed area and waterbody type.

Tier 1	Tier 2	Tier 3	Tier 4
≤200 acres	>200 - <640 acres	greater than 640 acres	Tidal Watercourse




New tidal stream crossings rules (Tier 4) became effective on December 15, 2019

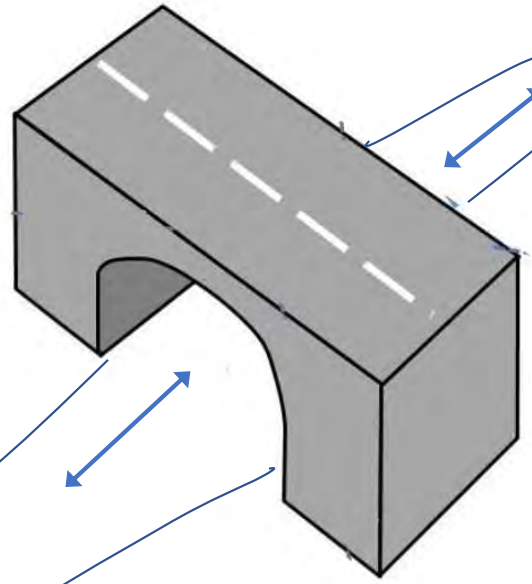
NHDES Tidal Stream Crossing Policy

ENV-WT 904.07 Tier 4 Stream Crossing Regulatory Design Criteria

Shall be a designed :

- Of sufficient size to accommodate the 100-Year 24-hour design storm.
- To prevent a restriction of tidal flows
- To account for channel morphology
- To consider sea level rise.

Tidal Crossing Design Considerations



UPLAND MODEL INPUTS

- Existing Rainfall
- Climate Change

OTHER INPUTS

- Topography
- Bathymetry
- Land Cover

OCEAN MODEL INPUTS

- Existing Tide Level
- Storm Surge
- Sea Level Rise

MODEL OUTPUTS

- Water Surface Elevation
- Water Velocities
- Duration

DECISION CRITERIA

- Fish Swim Speeds
- Channel Scour
- Tidal Restriction
- Flood Conveyance

TIER 4 REGULATORY DESIGN STANDARDS (ENV-WT 904.07)

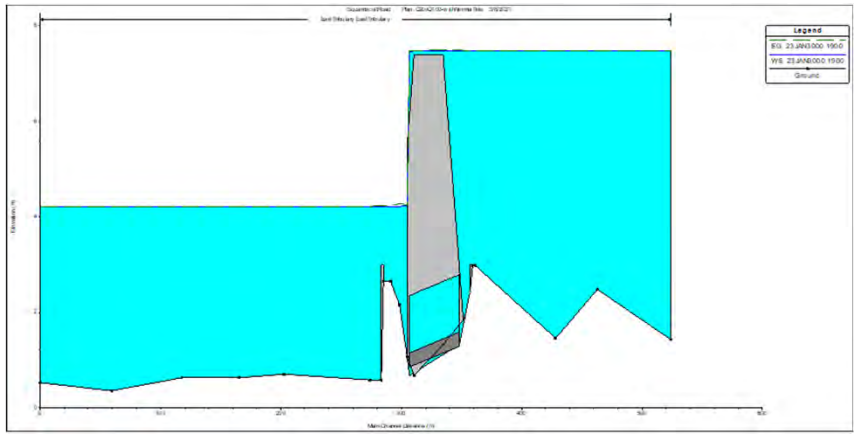
- 100 Y / 24 Hr Storm
- Prevent Tidal Restriction
- Geomorphically Compatible
- Aquatic Organism Passage
- Consider Sea Level Rise

ALTERNATIVE ANALYSIS

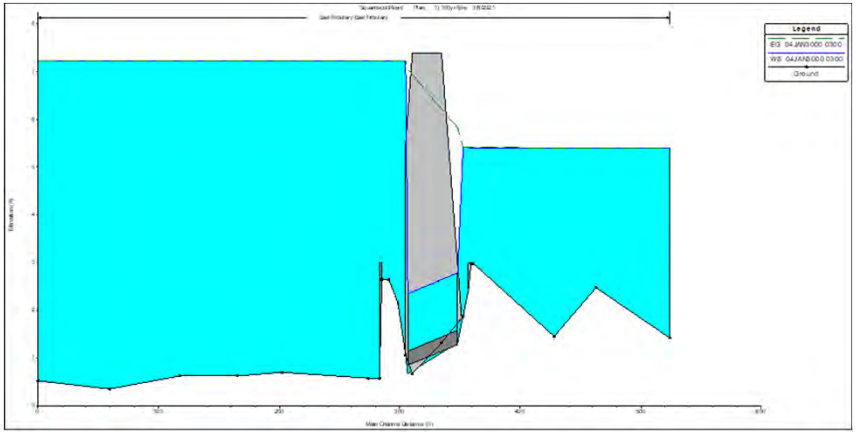
	ROUTE 1 A, RYE HARBOR		SQUAMSCOTT ROAD, STRATHAM	
RAINFALL	50 + 100 Year Peak Flow			
CLIMATE CHANGE RAINFALL	Add 15% to Peak Flow			
EXISTING TIDE LEVELS	Great Diurnal Tide Range (MHHW-MLLW)			
COASTAL STORMS	50 + 100 Year Storm Surge			
SEA LEVEL RISE SCENARIO	5.3 ft at 2100		3.8 ft at 2100	
FLOOD RISK TOLERENCE	Low Flood Risk Tolerance		Medium Flood Risk Tolerance	
HYDRAULIC MODEL TYPE	SRH-D2		1D HEC-RAS, v5.07	
EXISTING STRUCTURE	3.5’ wide x 7’ tall	Existing Structure	1.5’ round	Existing Structure
ALTERNATIVES ANALYZED	3.5’	In-kind Replacement	1.5’	In-kind Replacement
	9.0’	Upstream Structure	8’	1.2 x Bankfull Width
	15’	1.2 x Bankfull Width	14’	2.2 x Bankfull Width
	18’	2.2 x Bankfull Width	6’	With Log Removal

Squamscott Road, Stratham (#113): Existing Structure

2020

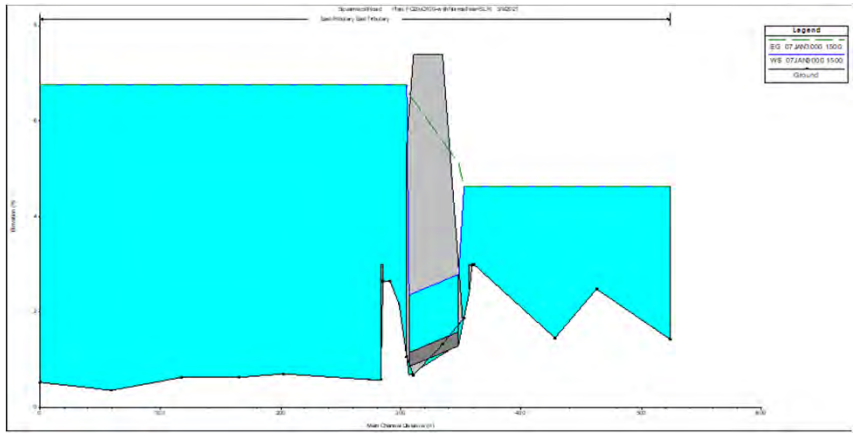


100 Y RAINFALL

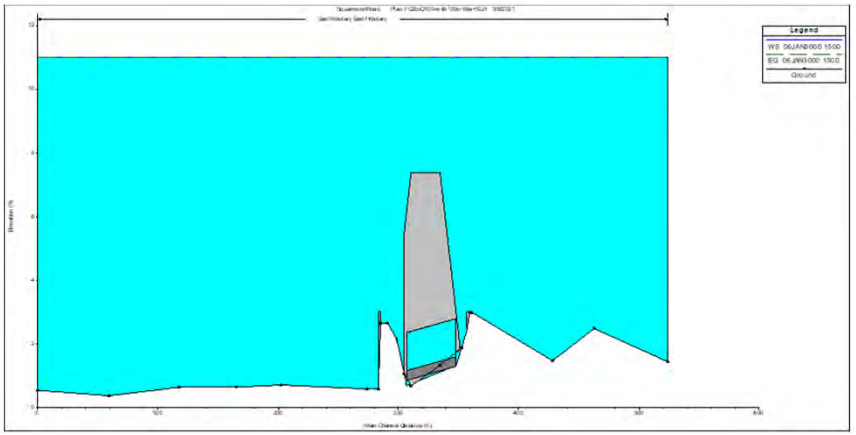


100 Y STORM SURGE

2100



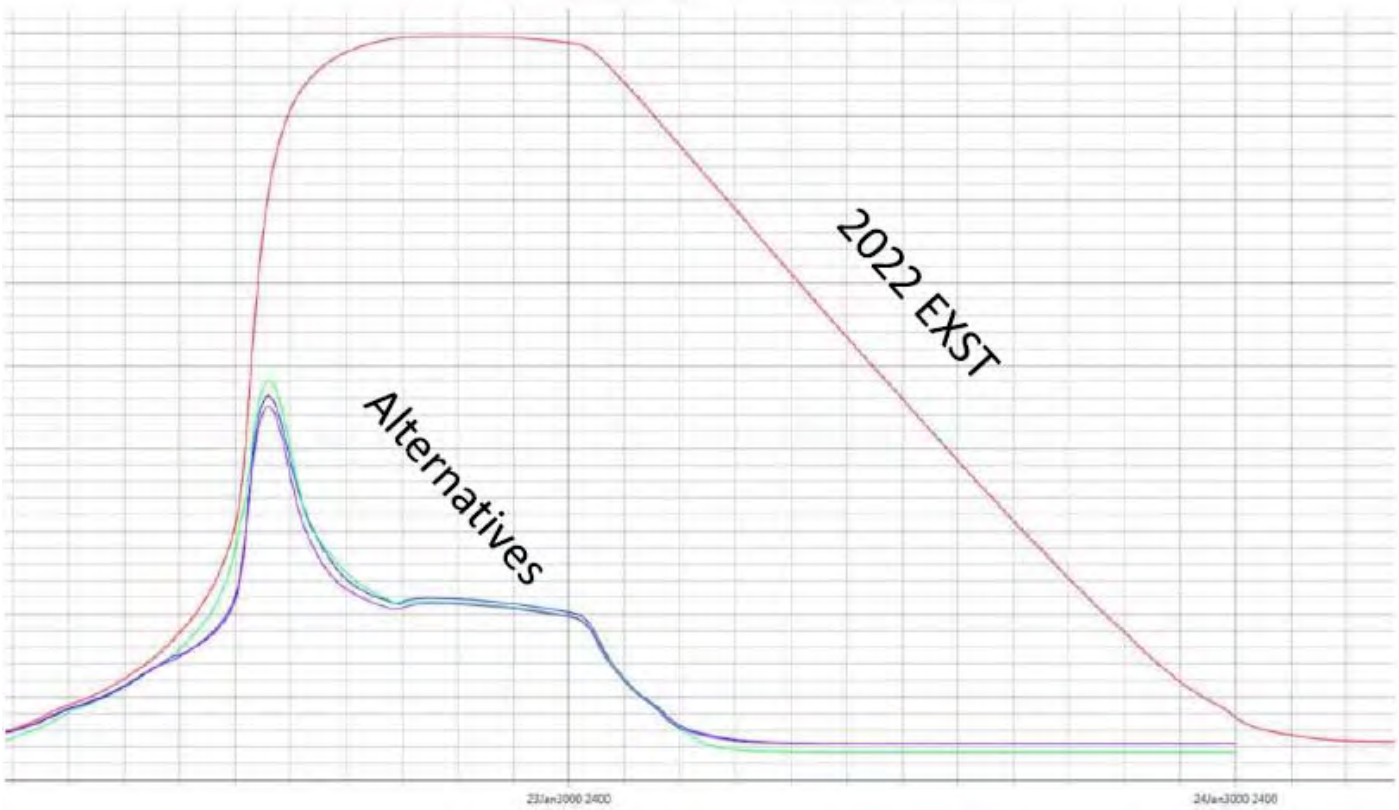
3.8 FT SEA LEVEL RISE



50 Y STORM SURGE + 3.8 SLR

Squamscott Road, Stratham (#113)

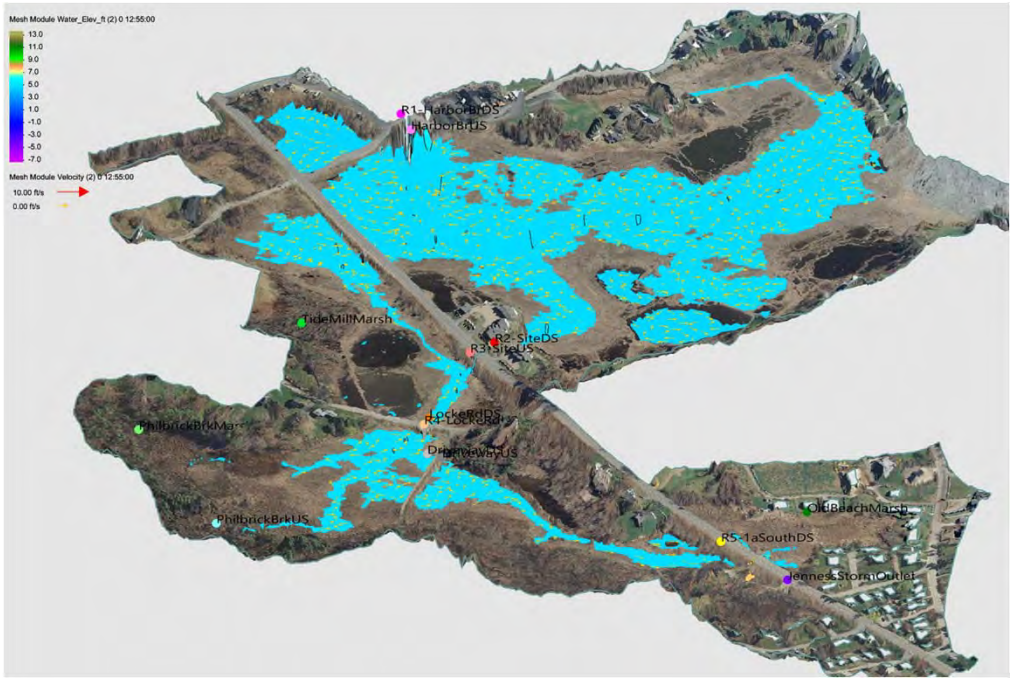
100 Y RAINFALL



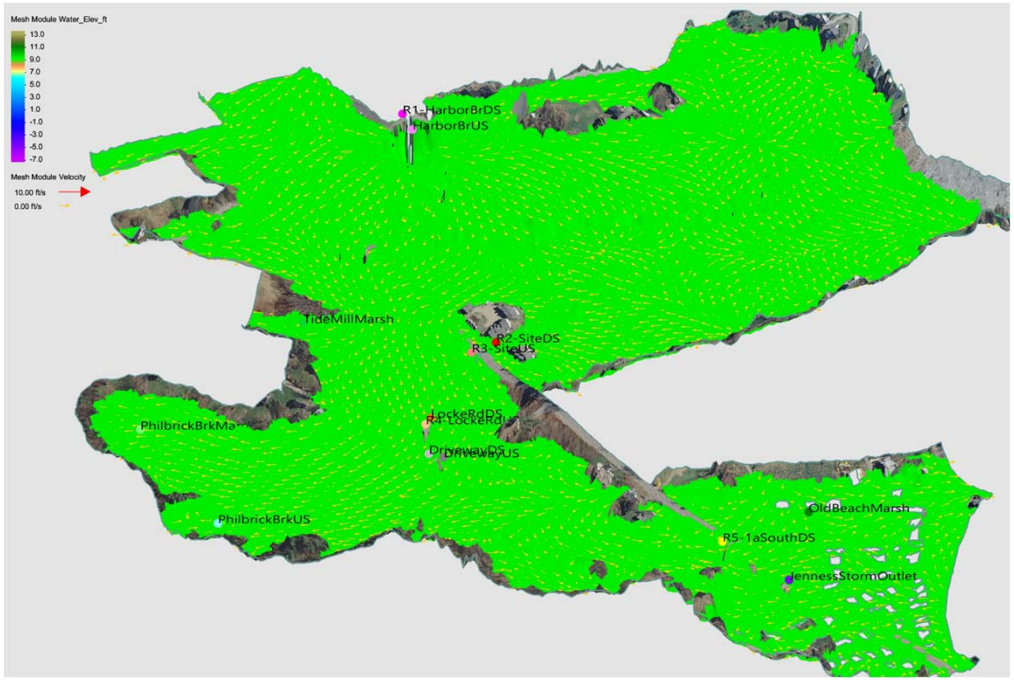
Headwater Recedes more quickly

Route 1A at Rye Harbor / Awcomin Salt Marsh (#46)

2020 Mean Higher High Water
Existing Conditions

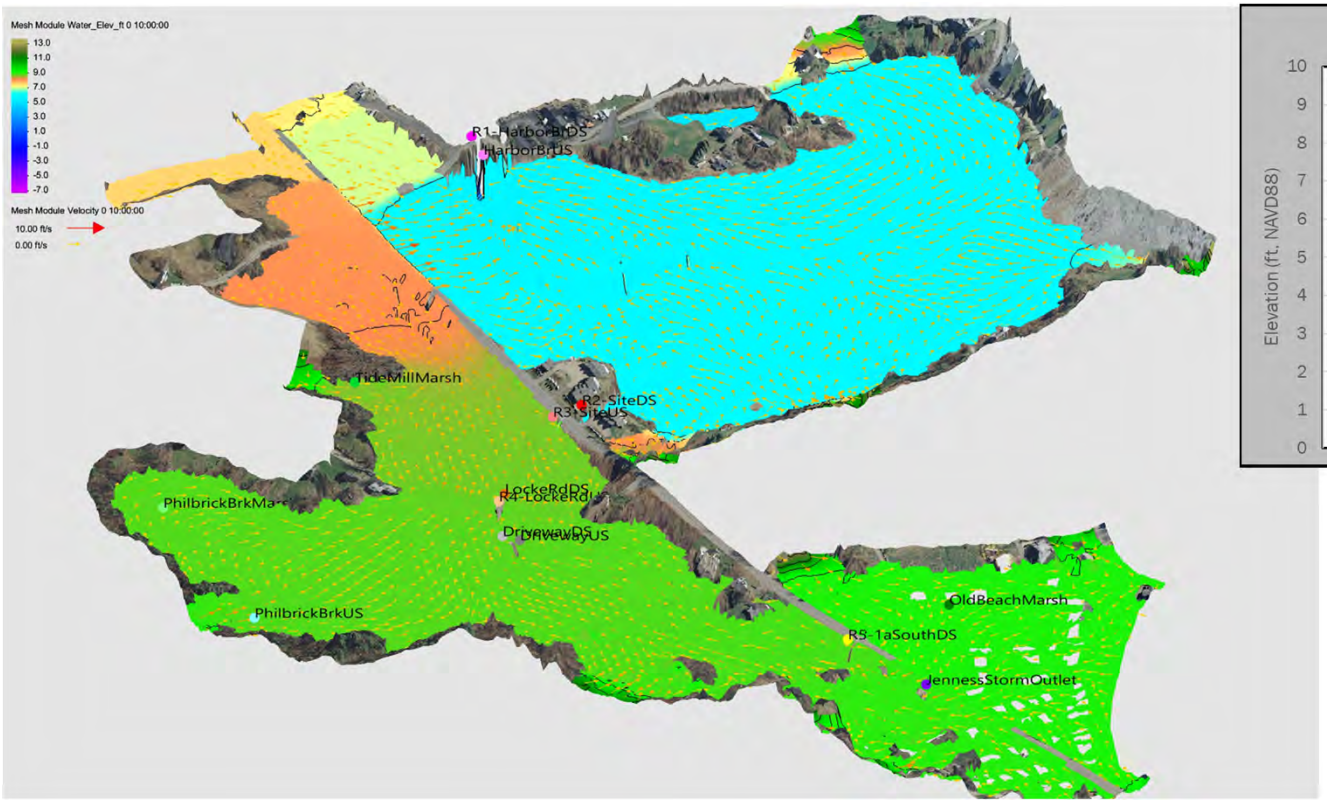


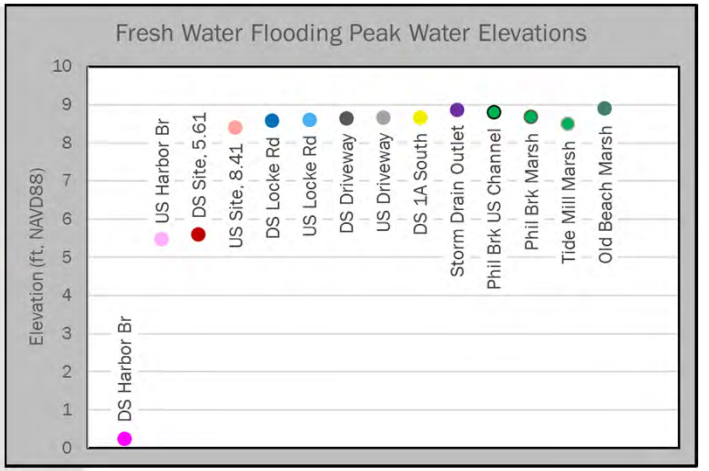
2100 Mean Higher High Water
5.3 ft Sea Level Rise



Route 1A at Rye Harbor / Awcomin Salt Marsh (#46)

2020 - 50 Year Rainfall Runoff

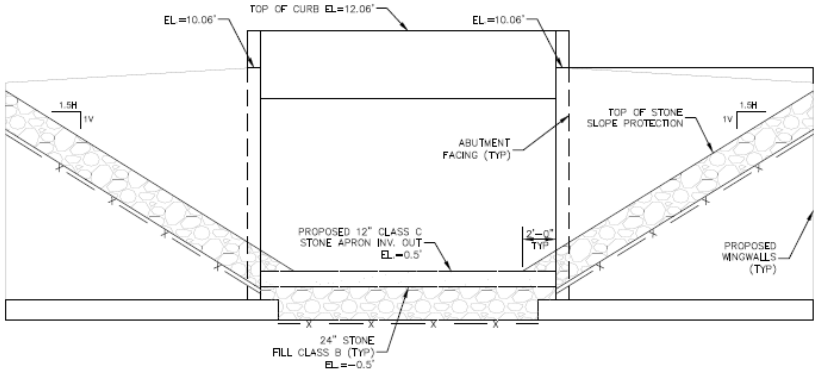


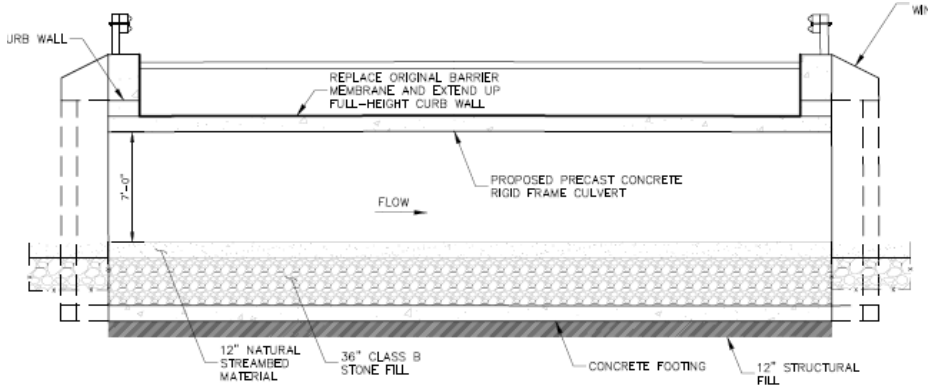


PREFERRED ALTERNATIVE

	ROUTE 1 A, RYE HARBOR		SQUAMSCOTT ROAD, STRATHAM	
	EXISTING	**PROPOSED**	**EXISTING**	**PROPOSED**
STRUCTURE TYPE	Granite Farmers Box	3 sided pre-cast box	Reinforced Concrete Pipes	4 sided pre-cast box
WIDTH	3.5’	15’	1.5’	8’
HEIGHT	7’	7’	1.5’	7’
OPENING HEIGHT	7	7	1.5’	4.5 – 5’
NATURAL STREAM CHANNEL DESIGN	▪ Culvert width equal to 1.2 x bankfull width ▪ Will simulate natural stream bed within culvert		▪ Culvert width equal to 1.2 x bankfull width ▪ Will simulate natural stream bed within culvert	
ROAD HEIGHT	▪ No proposed change to road height. ▪ New structure is designed to accommodate an additional 2 ft of road fill in the future		▪ No proposed changes to road height. ▪ Insufficient substrate (marine clay) to raise road ▪ With new culverts, roadway only overtops at 2100.	

NEXT STEPS





TIMELINE	
FINAL DESIGNS/PERMITS	2023 – 2024
CONSTRUCTION	2025 - 2026

ESTIMATED CONSTRUCTION COST	
RYE	$1,272,500
STRATHAM	$1,025,000
TOTAL	$2,297,500