

Weir Creek Tidal Restoration

April Wobst, Restoration Manager
Association to Preserve Cape Cod

Enter your Name and Email in
the Chatbox to Sign Up for
Future Project Meeting
Updates



Meeting Purpose and Overview

- Meeting Purpose: Updates, Comments & Qs
 - Project Overview (April Wobst, APCC)
 - Modeling (Arden Herrin, Woods Hole Group)
 - Design (Eric Ohanian, Tighe & Bond)
 - Question and Answers (20-30 minutes)
 - Wrap Up and Next Steps
- 

Legend

— Project Site Boundary

★ Tidal Restrictions

Wetland Type

— Estuarine and Marine Wetland

— Freshwater Forested/Shrub Wetland

Project Area



Tidal Restrictions





Benefits of Restoration

- Ecological Value
- Human Use Value
- Ecosystem Services

Salt marshes provide the nursery habitat for more than 75% of commercial fishery species!



Enhancing Community Resilience to Climate Change by Restoring Degraded Ecosystems



Weir Creek Project Summary

- Identified Priority by Town, APCC, Regional and Federal Partners (CCWRRP)
- APCC Applied for and was Awarded Two Grants for Planning and Design (2023-2024)
- Scope: Feasibility Study, Culvert Design Alternatives, Outreach and Community Engagement and 30/60% Design



Weir Creek Tidal Restoration Goals

Short-term Goals:

- Understand Current Condition and Flooding Impacts to Community
 - *Series of Stakeholder Engagement Meetings*
- Determine Feasibility of Tidal Restoration
 - *H&H Study and Alternatives Analysis*
- Develop 30/60% Design Plans with Cost Estimates for Next Phase

Long-term Goals:

- Restore Tidal Flow to the Salt Marsh
- Improve Health and Habitat within Weir Creek and Bass River Watersheds
- Increase Resilience of System and Community to Impacts of Climate Change

Project Team

Association to Preserve Cape Cod

Town of Dennis

Tighe & Bond with Woods Hole Group

USDA Natural Resources Conservation Service

Cape Cod Conservation District

Friends of Bass River

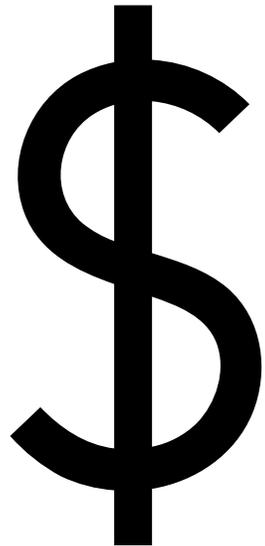
Dennis Conservation Land Trust

Cape Cod Mosquito Control

Cape Cod Commission

MA Division of Ecological Restoration

Project Funding



EPA SNEP and NFWF Grants: \$417,888 for Current Scope

In-Kind Contributions (Match): \$73,292 for Current Scope

NOAA Grant Applications (Pending): \$4-4.5 million for project completion over the next 3 years (2025-2027)

NFWF Grant Application (In Progress): permitting and final design

Cape Cod Water Resource Restoration Project (CCWRRP): NRCS and CCCD Funding

Project Scope and Timeline

Project Kick Off

- Project Planning and Development (Winter – Spring 2023)
- Public Meeting One – June 15, 2023

Tidal Evaluation, Modeling and Culvert Alternatives

- Field Data Collection (Summer 2023)
- Hydrodynamic Modeling and Culvert Alternatives Analysis (Fall/Winter 2023)
- **Public Meeting Two (March 2024)**

Culvert Design and Planning

- 30% Conceptual Designs (Spring 2024)
- 60% Permit-Ready Designs (Summer-Fall 2024)
 - Low-lying Infrastructure Survey
- Pre-Restoration Monitoring (Summer 2024)
- Public Meeting Three (Fall 2024)



LEGEND

- Woods Hole Group Loggers
- WQ Sampling Stations
- ▲ Salinity Loggers
- Vegetation Monitoring
 - Fresh/Brackish Upstream
 - Reference
 - Restricted

Proposed APCC 2024 Pre-Restoration Monitoring

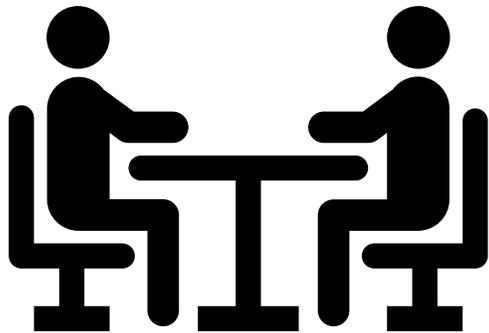
1. Vegetation
2. Water Quality

Funding for Monitoring:



Private Foundation Funding

Public Meeting Goals



- Share Plans for Project
- Understand What Community Values
- Inform Study and Data Collection
- **Listen to and Address Concerns and Questions**
- Gather Support for Project

What the
community
values



Community Concerns

A word cloud on a dark blue background. The words are in various shades of pink and red, with sizes corresponding to their frequency. The most prominent words are 'mosquitoes', 'flooding', and 'excess vegetation'. Other visible words include 'rising water levels', 'increased water velocity', 'inaccessibility', 'degraded freshwater system', 'stagnant water', 'odor', 'communication issues', 'property impacts', 'erosion', 'sedimentation', 'septic issues', 'restricted marsh', 'fishkill', 'project stalling', 'storm surge', 'flood zone', 'phragmites', 'pollution', 'mold', and 'coyotes'.

rising water levels
increased water velocity
inaccessibility
degraded freshwater system
mosquitoes
stagnant water odor communication issues
flooding
property impacts
erosion sedimentation
septic issues
excess vegetation
restricted marsh fishkill
project stalling
storm surge
flood zone
phragmites
pollution
mold
coyotes

Meeting Registration Feedback

Summary of Key Questions

1. Any proposed activity at South Main and Fisk Street? Or at the culvert that connects Weir Creek to Kelley's Pond?
2. How many sensors were used to monitor salinity? Was salinity monitored at Indian Pond? What do salinity models show for the upper reaches of the system?
3. How will the project change flooding on private properties? Lighthouse Inn Road?
4. Affect on local groundwater levels during high tides and storm events?

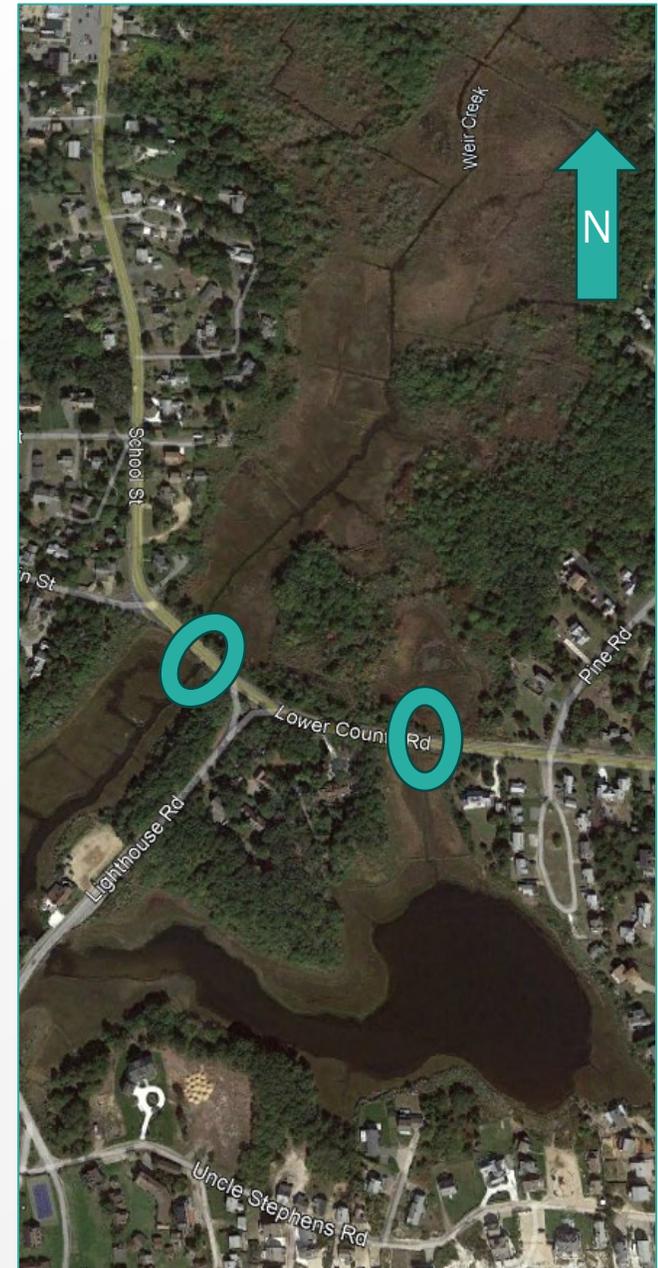
Summary of Key Public Concerns

1. Flooding of Lighthouse Inn Road
2. Need for dredging
3. Insufficient tidal flow upstream to maintain a healthy salt marsh ecosystem.
4. Preserving the natural marsh and wildlife
5. Water quality

Weir Creek Restoration

Lower County Road Culvert Optimization

Dennis, MA



Arden KT Herrin Woods Hole Group

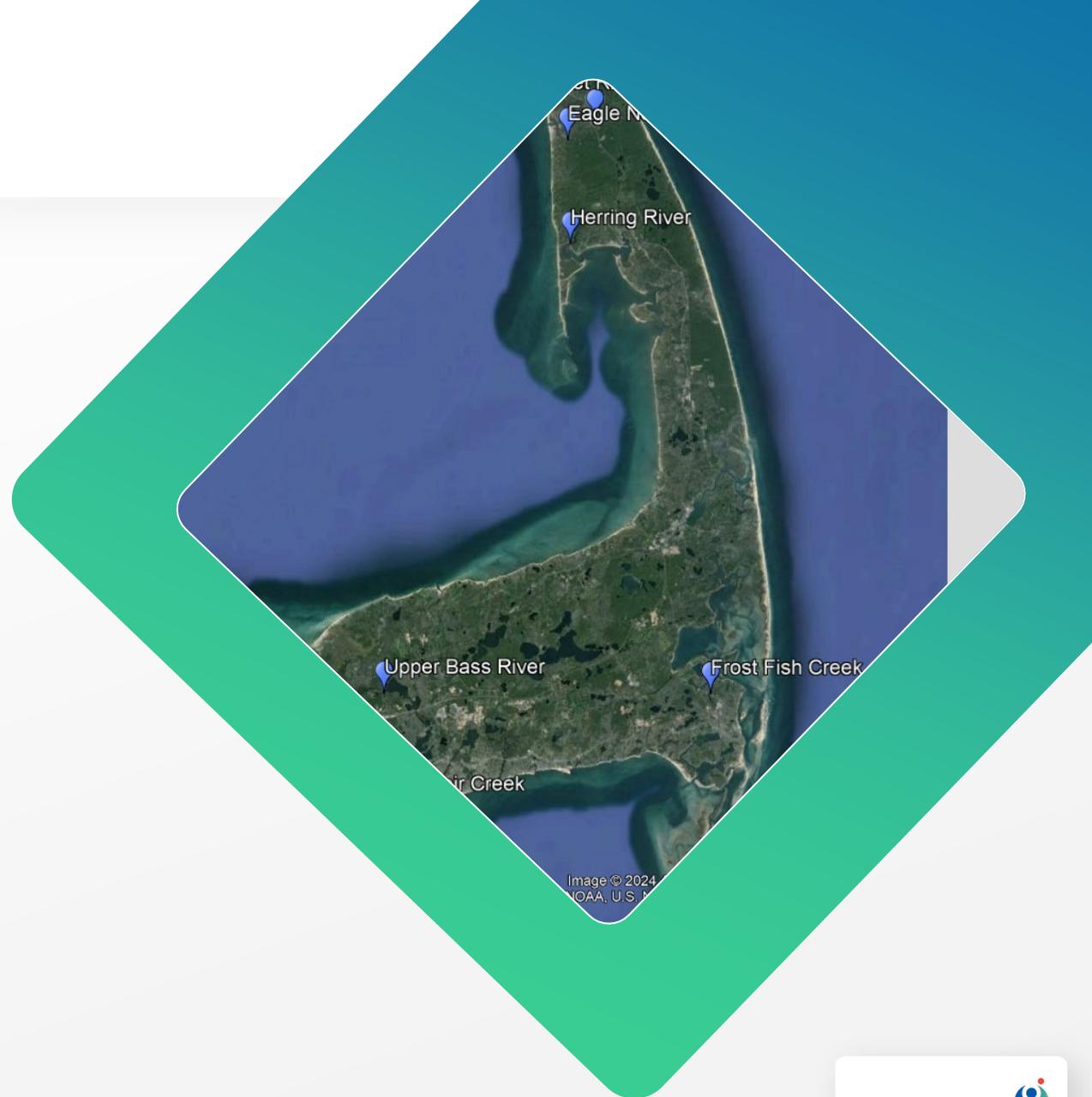
Herring River Restoration

Eagle Neck Creek Restoration

Pamet River Restoration

Upper Bass River Restoration

Frost Fish Creek Restoration



Project Timeline: Data Collection & Modeling



2023-0032-00

Weir Creek Restoration: Area of Study



GOALS

- Increased tidal exchange
- Restore habitat
- Mitigate/minimize flooding

Methods

- Water Data Collection
- Bathymetric/Topographic Survey
- Numerical Modeling

Weir Creek Area of Study



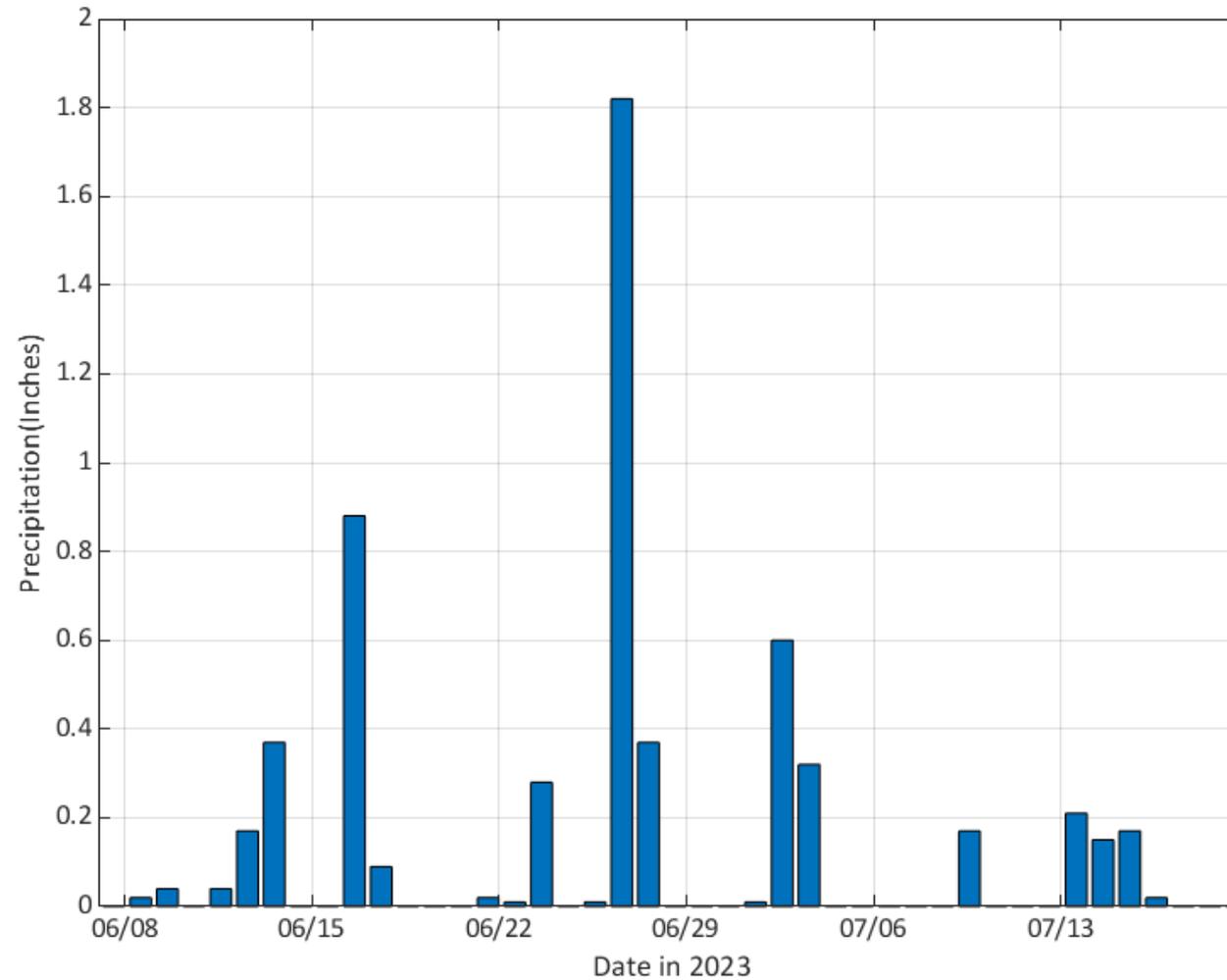
Water Column Measurements

- Ten (10) AT200 CTD measurement stations
- Stations WC1 & WC2 bracket Loring Avenue
- Stations WC8 & WC9 bracket Fisk Street
- Stations WC3 & WC7 bracket Lower County Road (East)
- Stations WC5 & WC6 bracket Lower County Road (West)
- Station WC4 upstream side of the Lighthouse Road bridge
- Station WC10 located upstream in upper Weir Creek (near Regan Road)
- 39 days of continuous measurements (06/8 & 06/09 through 07/18 & 07/19)



Precipitation Measurements During Deployment Period

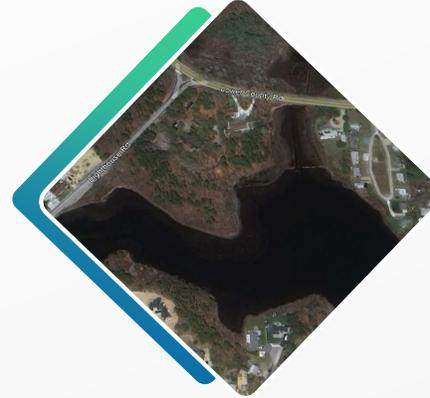
Rainfall at Hyannis Airport



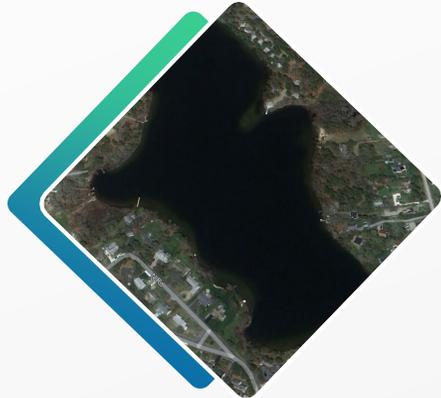
Four Subsystems for Discussion & Review



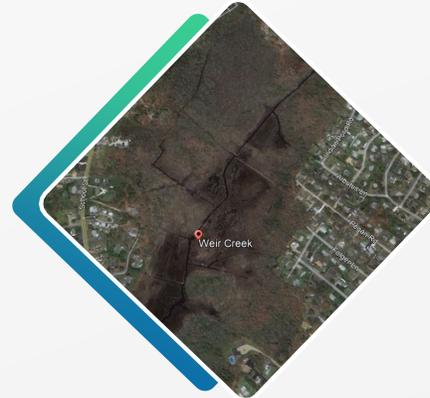
Lower Weir Creek: downstream of Lower County Road, Lighthouse Avenue, and Fisk Street



Uncle Stephen's Pond: East of Lighthouse Avenue & small marsh upstream of Lower County Road



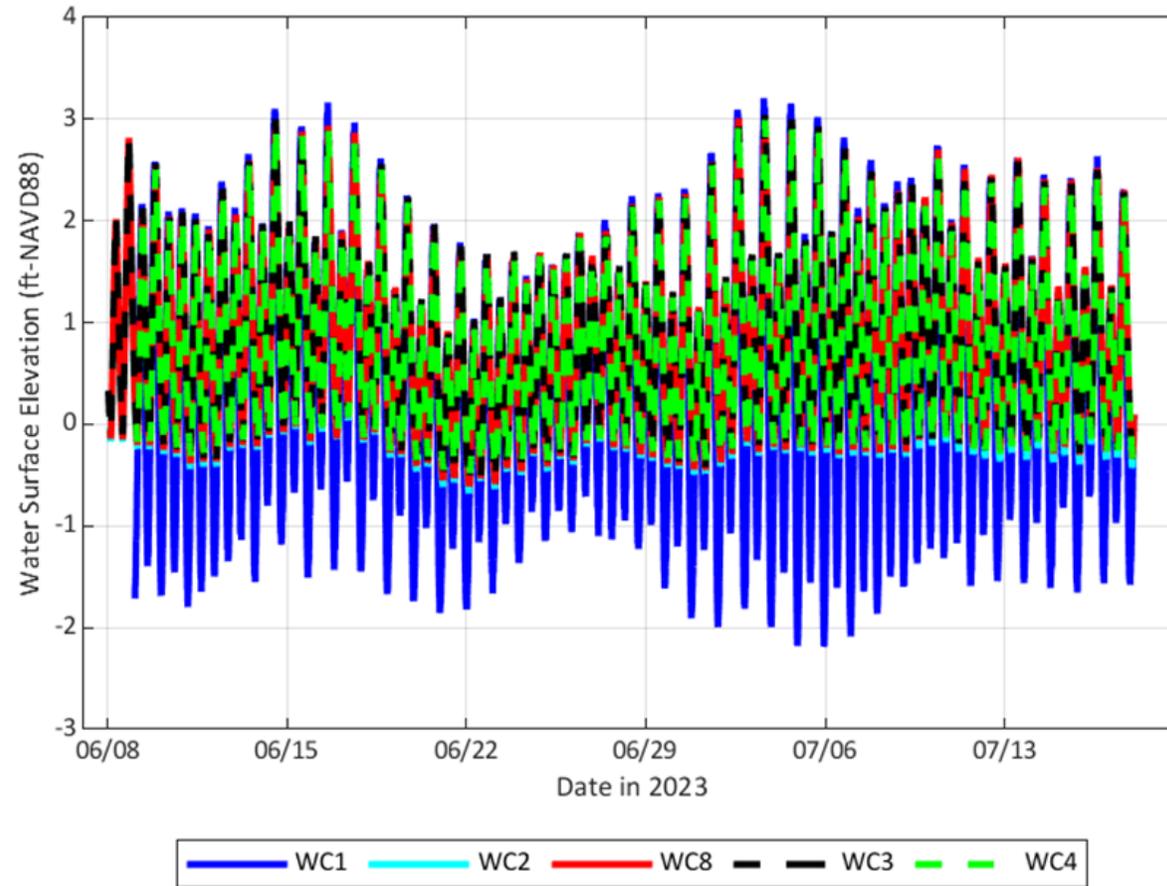
Kelley's Pond: Upstream of Fisk Street



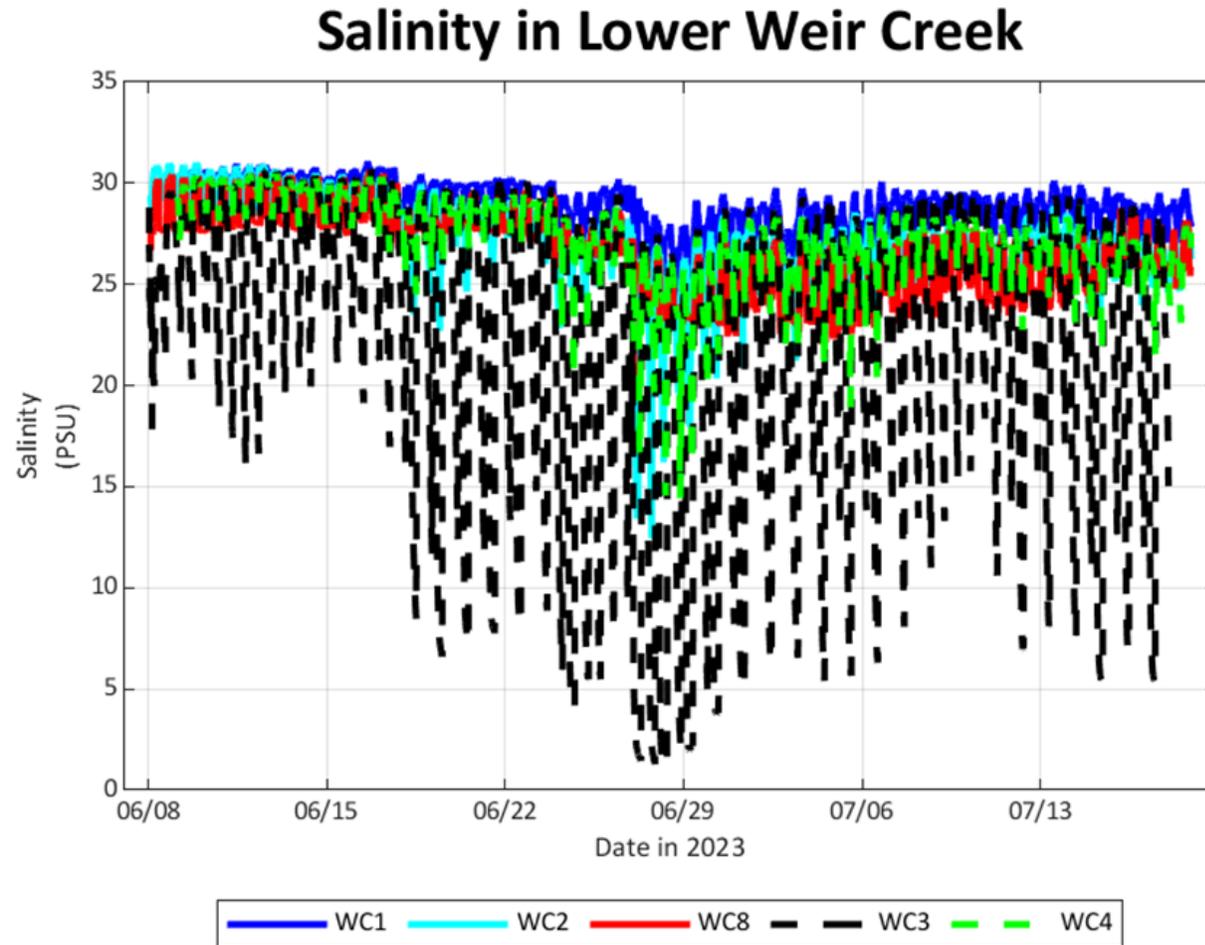
Upper Weir Creek: Large section of marsh upstream of the western Lower County Road crossing to unnamed pond in the North

Lower Weir Creek: Loring, Lighthouse, Fisk, & Lower County Road

Water Levels in Lower Weir Creek

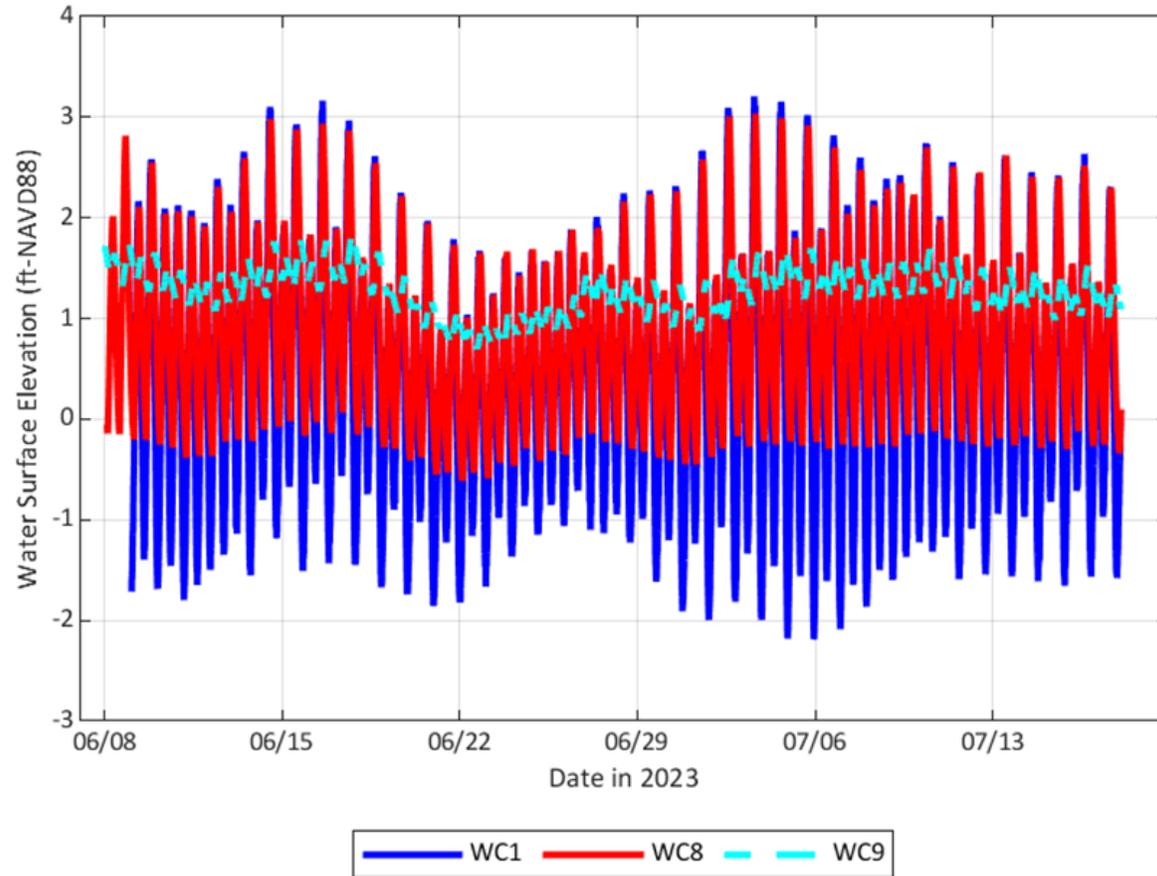


Lower Weir Creek: Loring, Lighthouse, Fisk, & Lower County Road

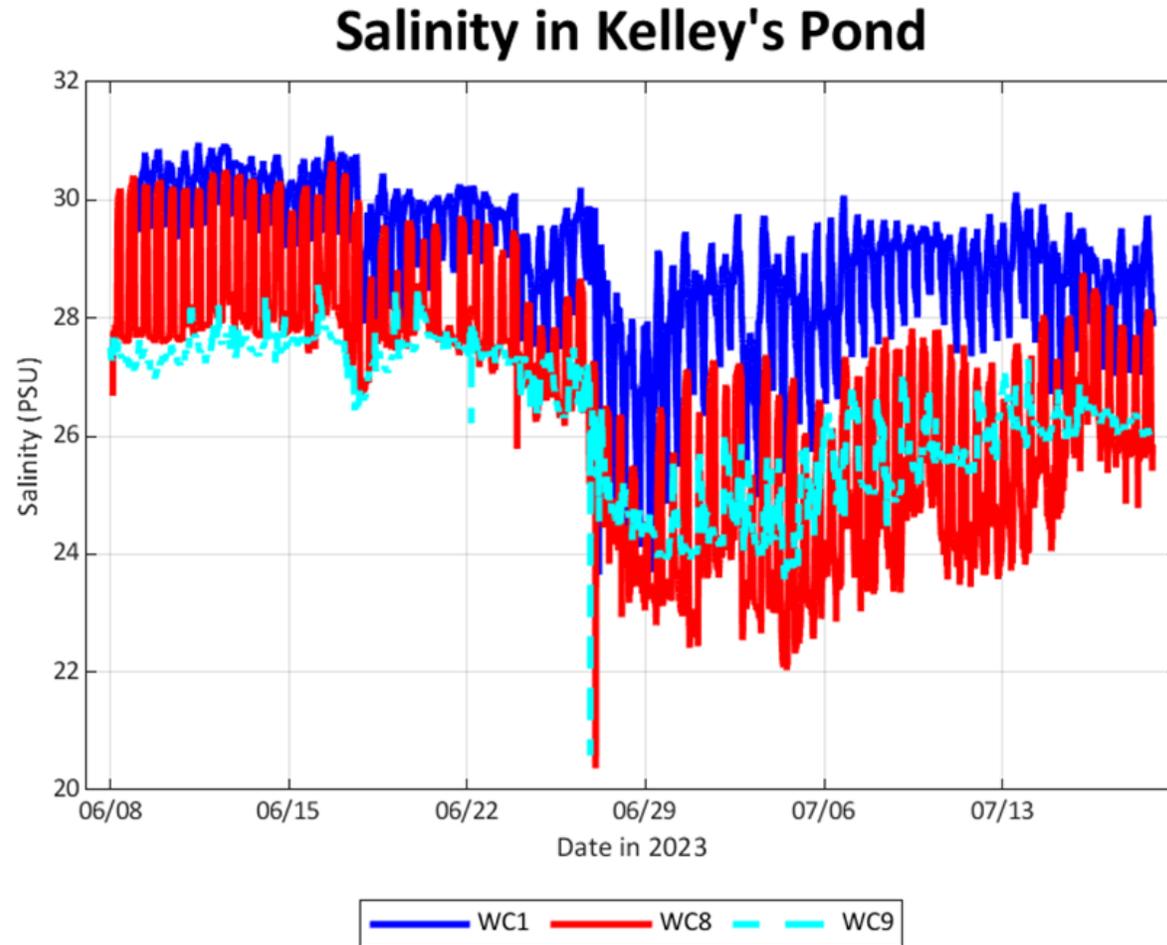


Kelley's Pond: Fisk Street Crossing

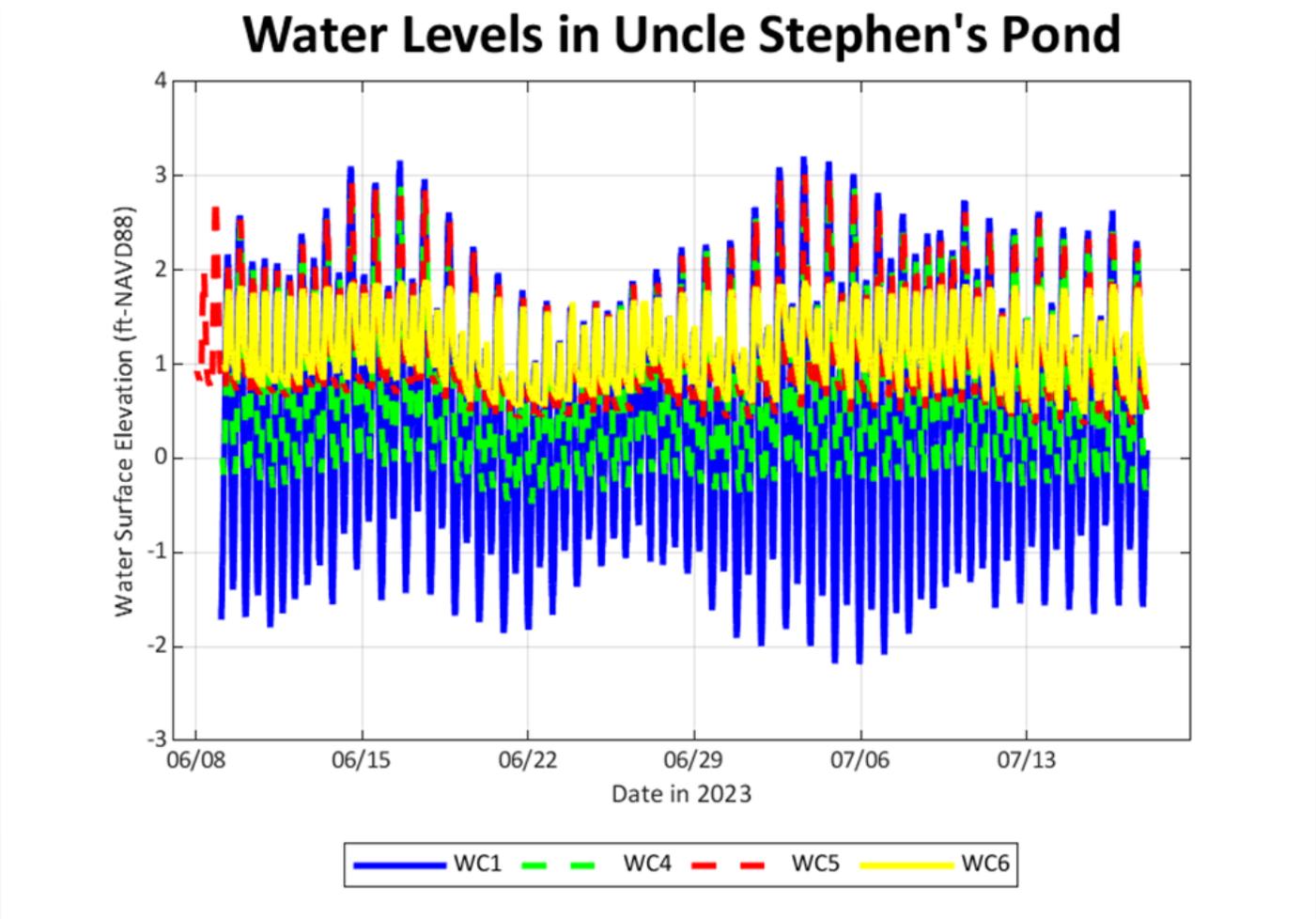
Water Levels in Kelley's Pond



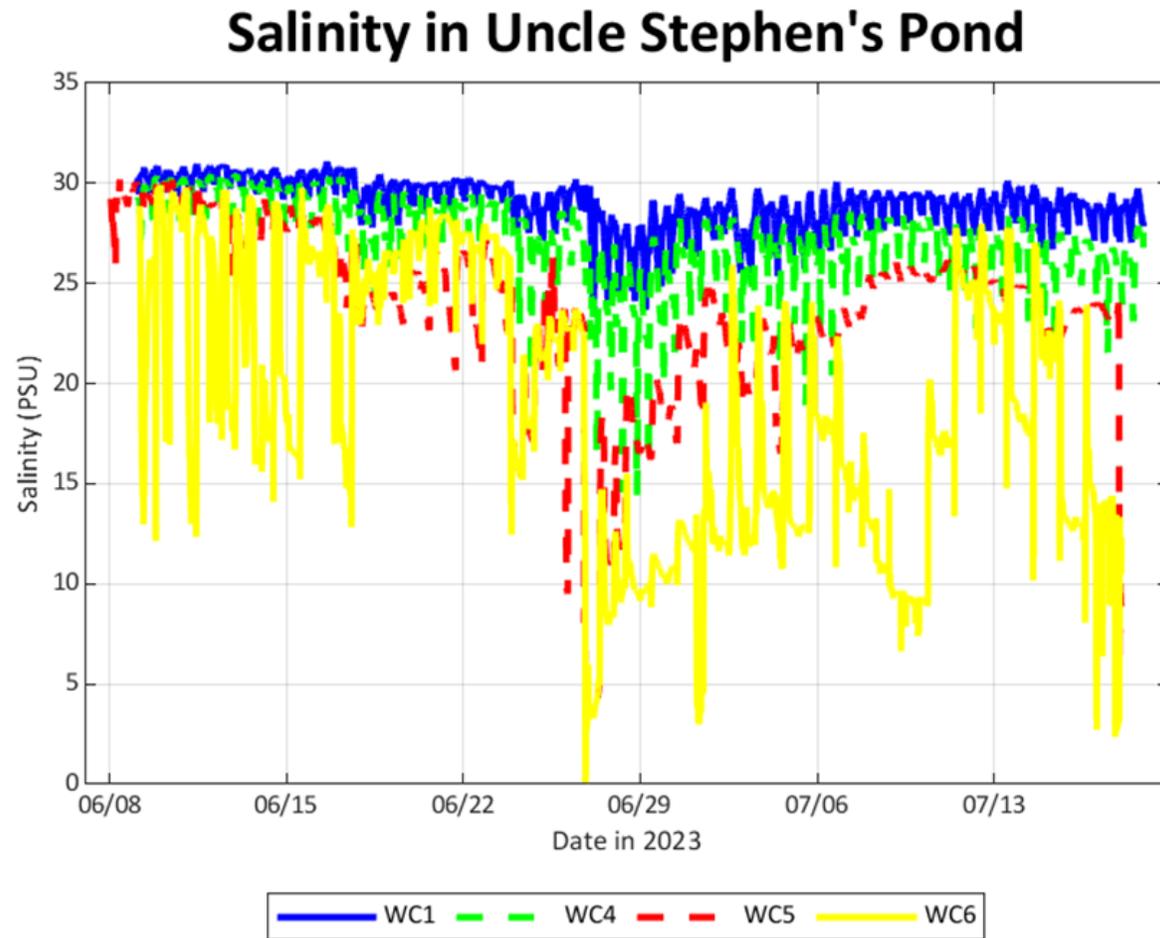
Kelley's Pond: Fisk Street Crossing



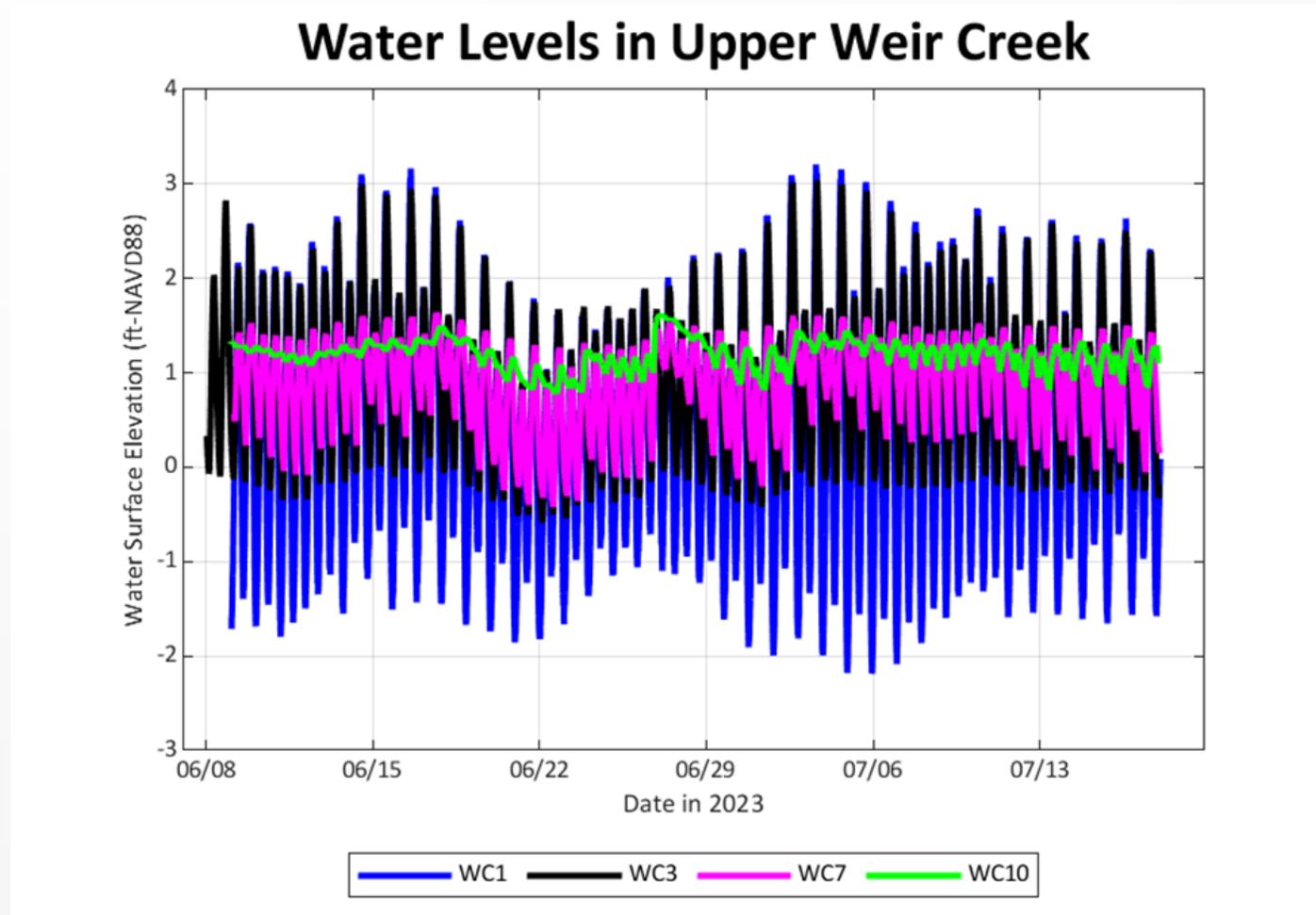
Uncle Stephen's Pond: Lighthouse Avenue & Lower County Road (East)



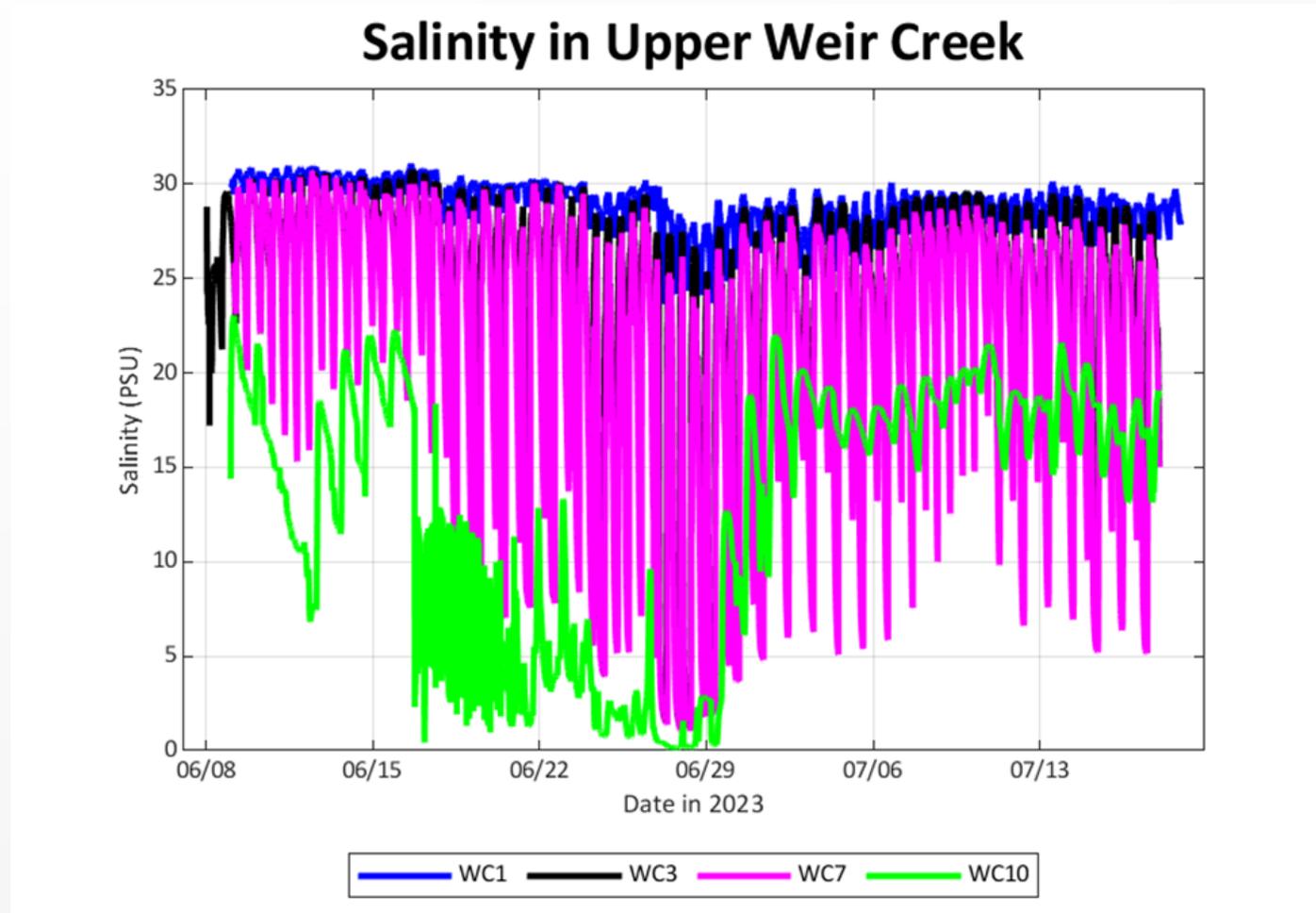
Uncle Stephen's Pond: Lighthouse Avenue & Lower County Road (East)



Upper Weir Creek: Lower County Road (west) to Unnamed Pond



Upper Weir Creek: Lower County Road (west) to Unnamed Pond



Tidal Benchmarks and Salinity Variability by Station

| | WC1 | WC2 | WC3 | WC4 | WC5 | WC6 | WC7 | WC8 | WC9 | WC10 |
|-----------|------|------|------|------|------|------|------|------|------|------|
| MHHW | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 1.8 | 1.5 | 2.4 | 1.5 | 1.3 |
| MHW | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 1.7 | 1.4 | 2.0 | 1.4 | 1.3 |
| TDL | 0.4 | 0.8 | 0.9 | 0.9 | 1.3 | 1.2 | 0.8 | 0.9 | 1.3 | 1.2 |
| MLW | -1.3 | -0.3 | -0.2 | -0.2 | 0.6 | 0.7 | 0.2 | -0.3 | 1.2 | 1.1 |
| MLLW | -1.6 | -0.4 | -0.3 | -0.3 | 0.5 | 0.7 | 0.1 | -0.3 | 1.1 | 1.1 |
| Range | 3.3 | 2.3 | 2.3 | 2.2 | 1.4 | 0.9 | 1.2 | 2.3 | 0.3 | 0.1 |
| Avg. Sal | 29.0 | 27.4 | 22.4 | 27.4 | 23.7 | 18.9 | 21.1 | 26.6 | 26.3 | 12.8 |
| Max Sal | 23.7 | 12.4 | 1.1 | 14.4 | 2.8 | 0.1 | 1.0 | 20.4 | 20.6 | 0.1 |
| Min Sal | 31.1 | 31.0 | 30.7 | 30.6 | 30.2 | 29.9 | 30.7 | 30.7 | 28.6 | 23.0 |
| Sal Range | 7.4 | 18.6 | 29.6 | 16.2 | 27.4 | 29.8 | 29.7 | 10.3 | 8.0 | 22.8 |

Topographic & Bathymetric Survey

Vessel Mounted Acoustic Sounder used for Kelley's Pond, Uncle Stephen's Pond, and portions of Weir Creek below Lower County Road

RTK GPS survey in Weir Creek upstream of Lower County Road, flood shoal upstream of Loring Avenue & channel upstream of Fisk Street

Vessel survey with RTK & GPS for western section of Weir Creek

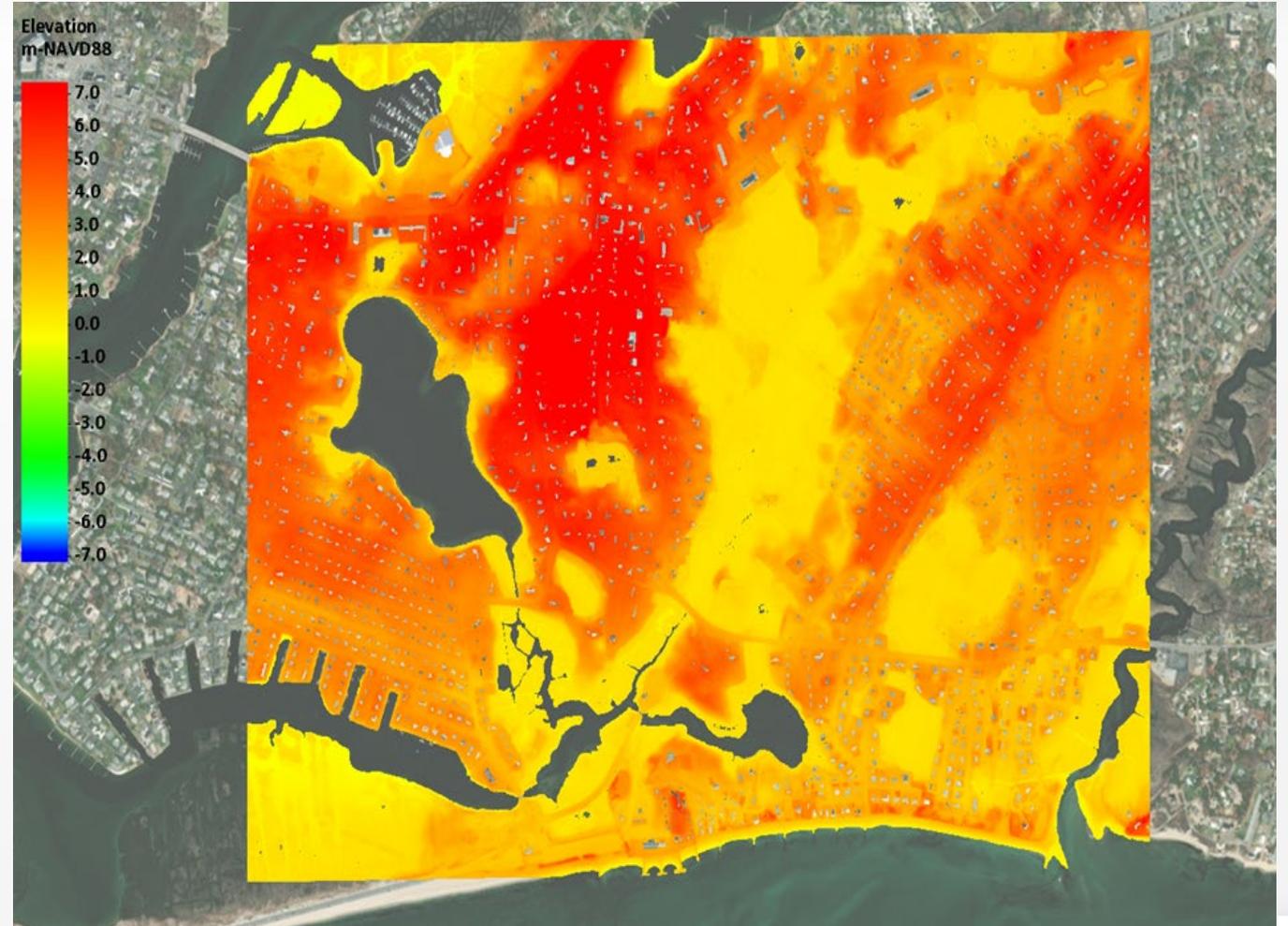


LiDAR Elevation Data

2021 USGS Elevation dataset

Uses light reflection & return time to measure elevation

Dense point coverage over land, but typically does not provide usable data for wetted areas.



EFDC Model Description & Domain

Environmental Fluid Dynamics Code (EFDC)

Developed at VIMS for application for 2D or 3D systems

Solves the equations of motion for variable density fluids

Capable of simulating water quality constituents & sediment transport



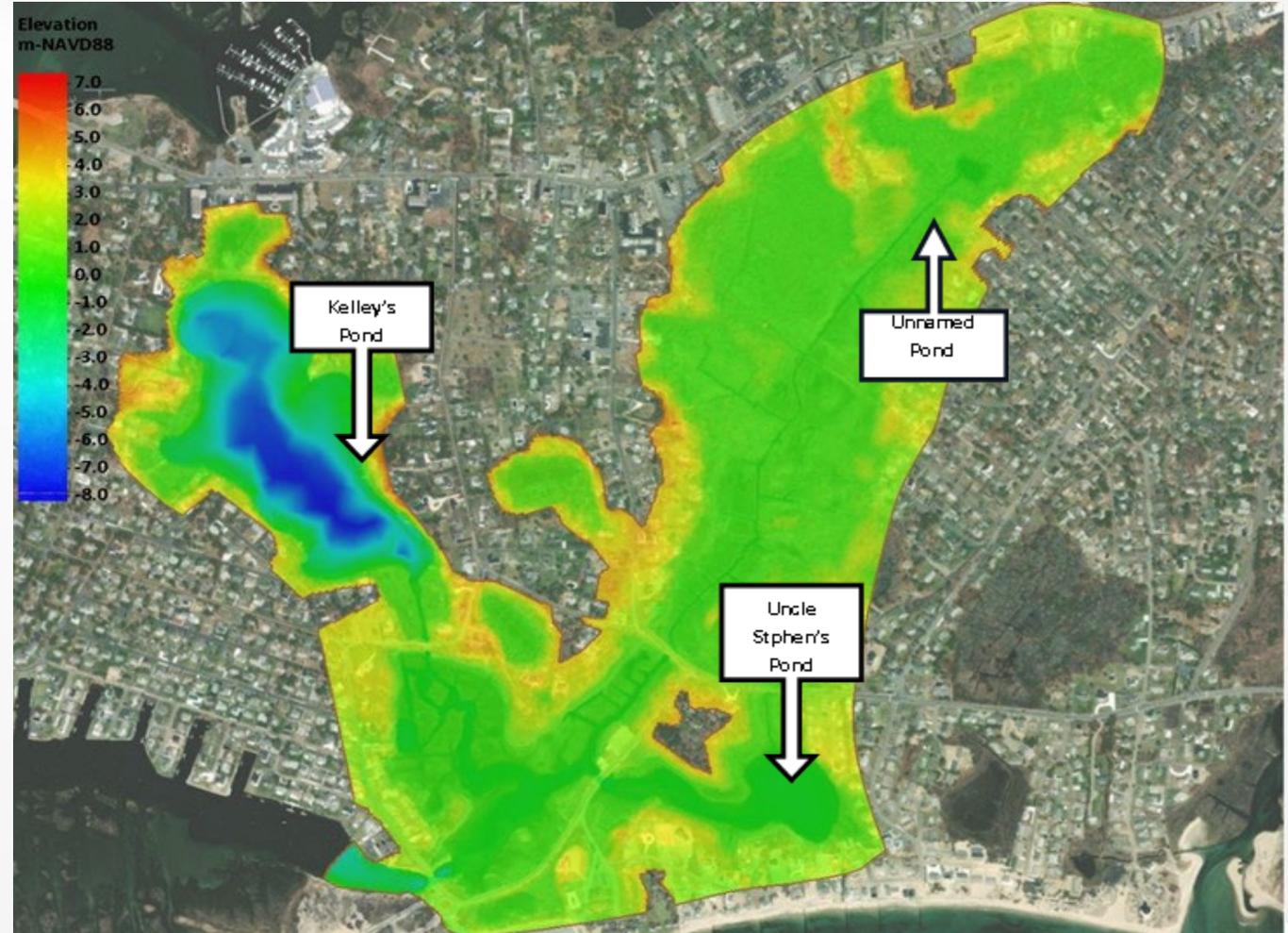
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Model Calibration:Tides

Model Grid

Existing topography from survey & LiDAR

Surface roughness varied by depth & increased in Upper Weir Creek

Model Boundaries

Tidal signal forcing from WC1 (Yacht Club)

Precipitation as measured at Hyannis Airport

Freshwater inflows at Kelley's Pond, Unnamed Pond, and marsh upstream of Uncle Stephen's Pond

Existing Culverts:Tide
2.0104 Days



Surface Elev. (ft-NAVD)



Potential Alternatives for Evaluation



Three Variations Investigated

1. Status quo or unchanged
2. Maximum Restoration: Dredging, bridges, channel widening
3. Culvert replacement: varying width of box culverts



Maximized Restoration

- Replaced all existing bridges with wider openings
- Dredged the flood shoal upstream of Loring Avenue
- Lowered the channel bottoms approaching both Lower County Road crossings
- Replaced both culverts with 20-ft single span bridges
- Channel widening and grading upstream of the western Lower County Road crossing

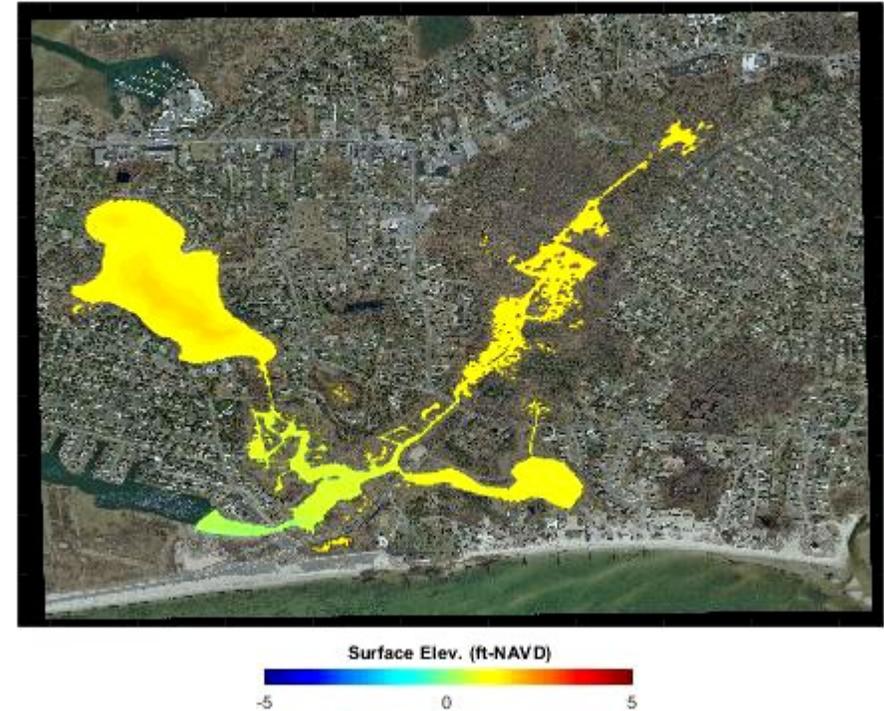
Tide Range

Increased from 0.2 ft to 1 ft (increased by 5X)

Salinity

Increased from an average salinity of 17 PSU to 27 PSU

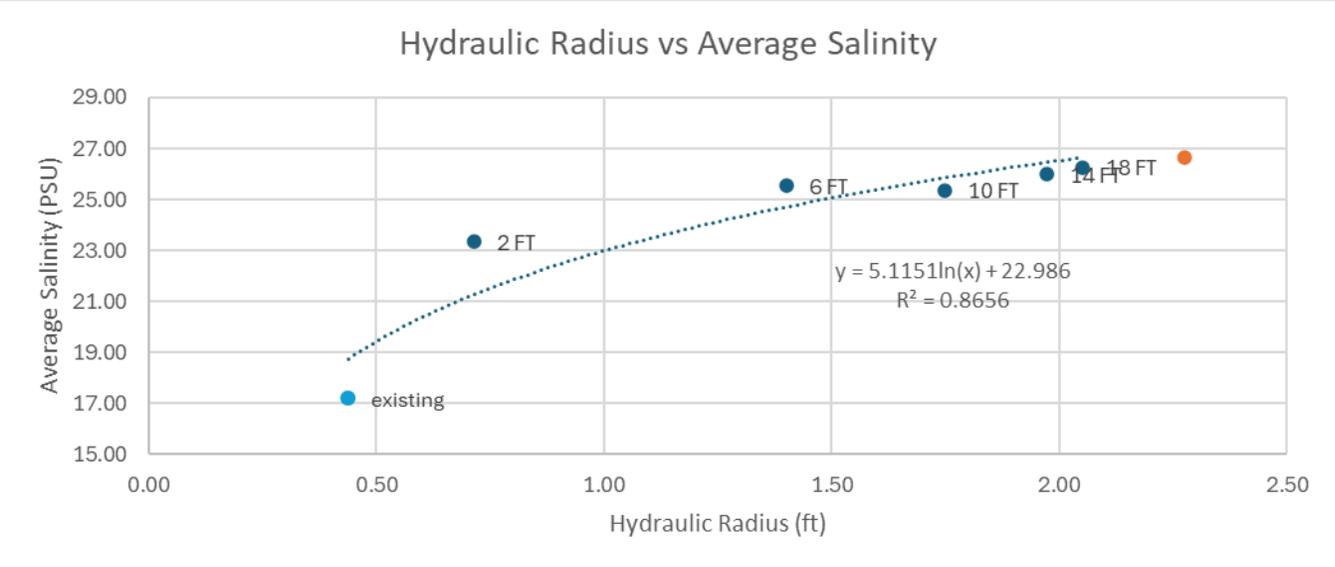
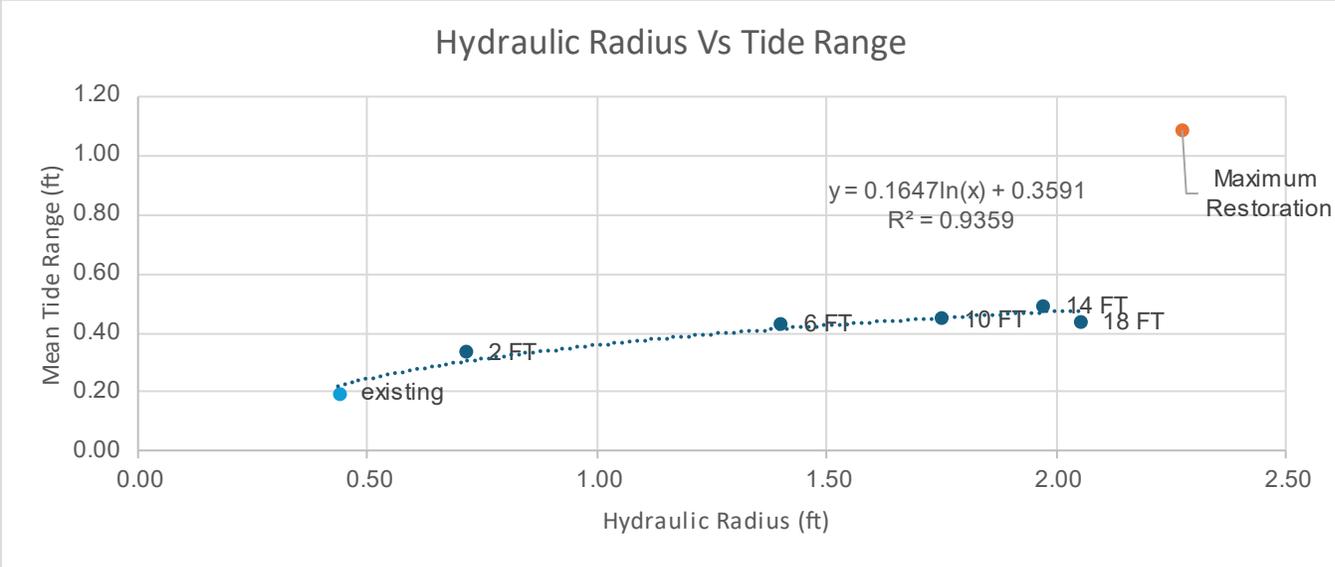
Maximized Restoration:Tide
2.0104 Days



Restoration Selection Metrics from Initial Screening

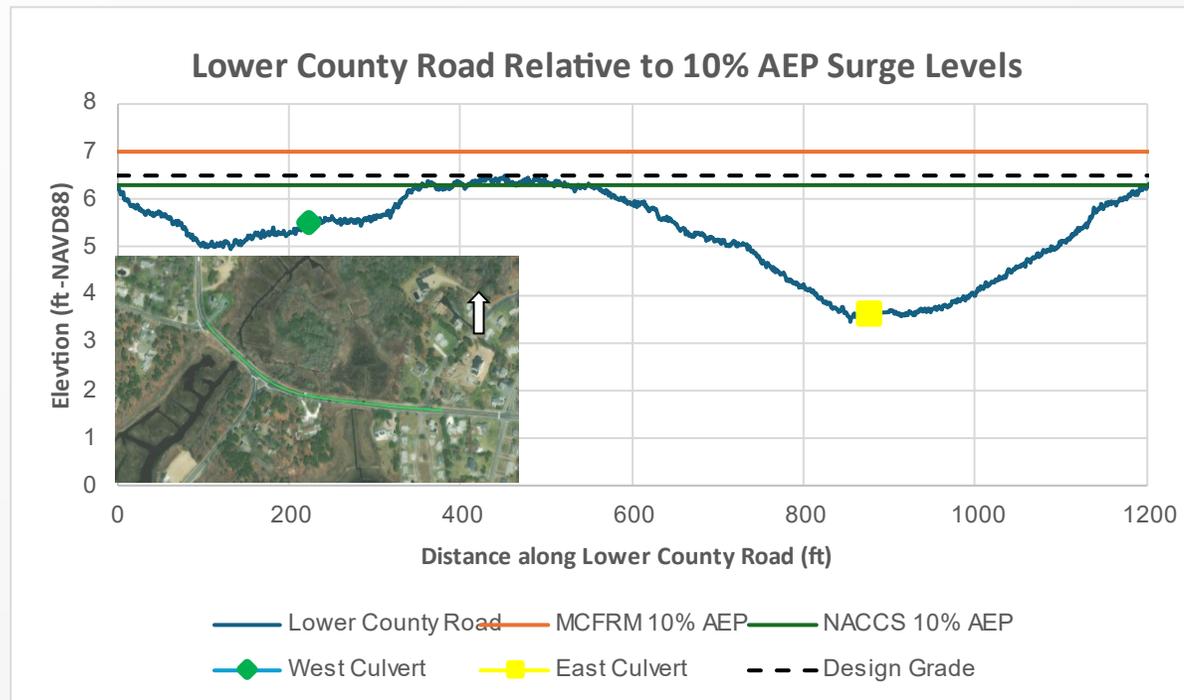
| Opening | R_H (ft) | MHW (ft- NAVD88) | MLW (ft- NAVD88) | MTR (ft) | S_{max} (PSU) | S_{min} (PSU) | S_{ave} (PSU) |
|----------|---------------|------------------------|------------------------|-------------|--------------------|--------------------|--------------------|
| Existing | 0.44 | 1.36 | 1.17 | 0.19 | 22.48 | 16.00 | 19.18 |
| 2 FT | 0.71 | 1.50 | 1.20 | 0.30 | 29.39 | 21.86 | 23.82 |
| 6 FT | 1.40 | 1.61 | 1.18 | 0.43 | 30.19 | 23.13 | 24.89 |
| 10 FT | 1.73 | 1.65 | 1.22 | 0.44 | 29.72 | 23.10 | 24.93 |
| 14 FT | 1.94 | 1.68 | 1.22 | 0.46 | 30.32 | 23.09 | 25.28 |
| 18 FT | 2.00 | 1.57 | 1.20 | 0.36 | 30.33 | 23.40 | 25.50 |
| Maximum | 2.23 | 1.87 | 0.89 | 0.99 | 30.43 | 16.36 | 25.69 |

Restoration Selection Metrics from Initial Screening



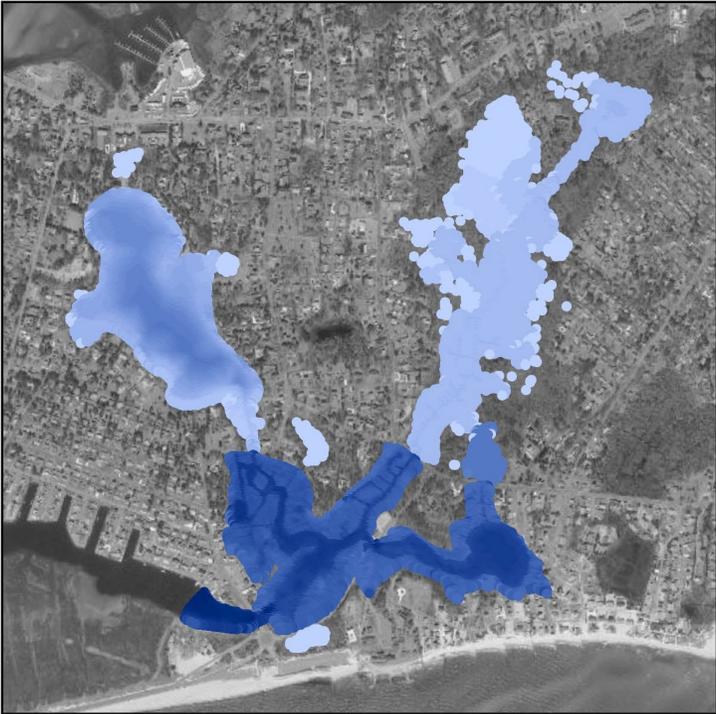
Preferred Design for Additional Analyses: Criteria

- Maximize Tidal Exchange to restore marsh to pre-development habitat
- Minimize or decrease potential flooding
 - Low frequency storm events (10% AEP, 2% AEP, 1%AEP)
 - Potential Sea Level Rise: 2070 high emissions scenario
- Minimize impacts to surrounding wetlands and infrastructure



Preferred Design: Increases in Water Levels

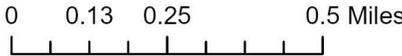
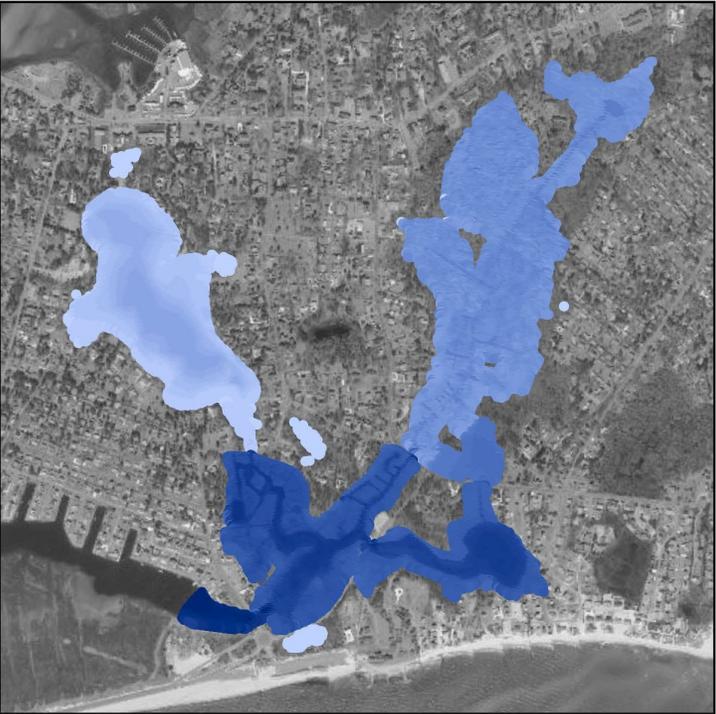
Existing Conditions



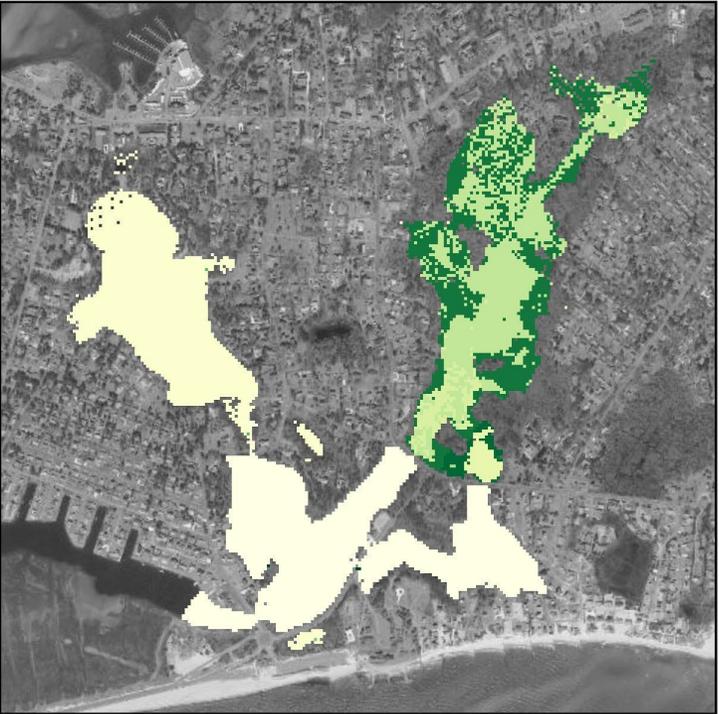
Maximum Tidal Water Surface Elevation (FT, NAVD88)



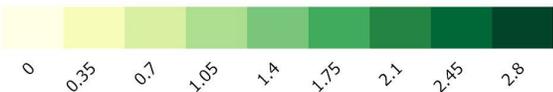
Design Conditions



Difference in Maximum Tidal WSE

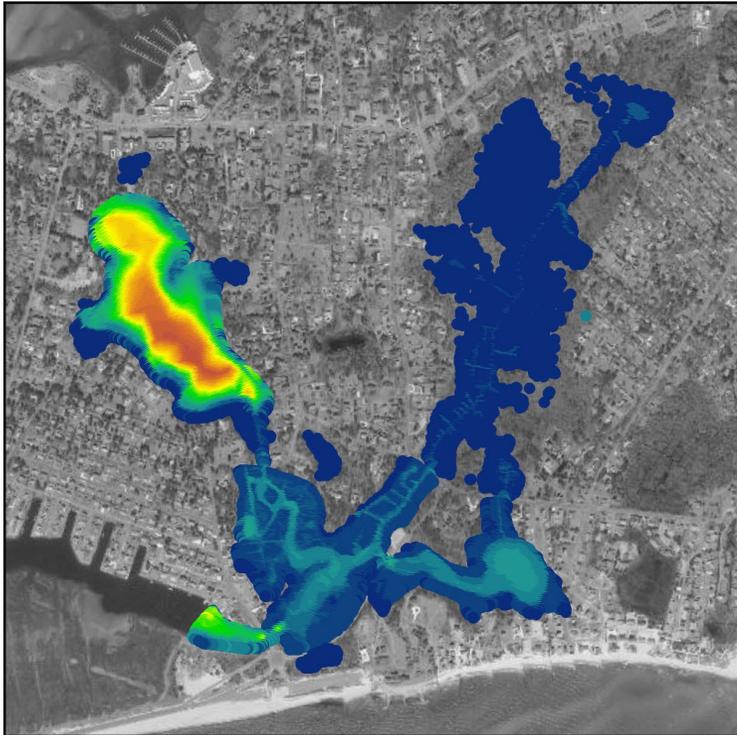


Maximum Tidal WSE Difference (FT, NAVD88)

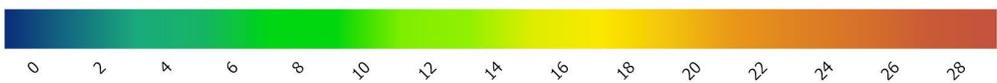


Preferred Design: Criteria increase in tidal exchange

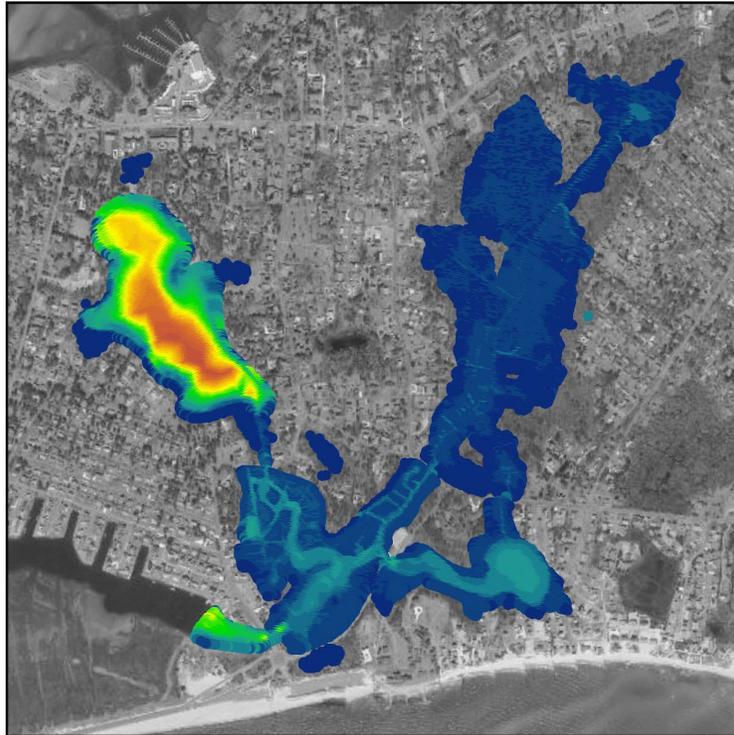
Existing Conditions



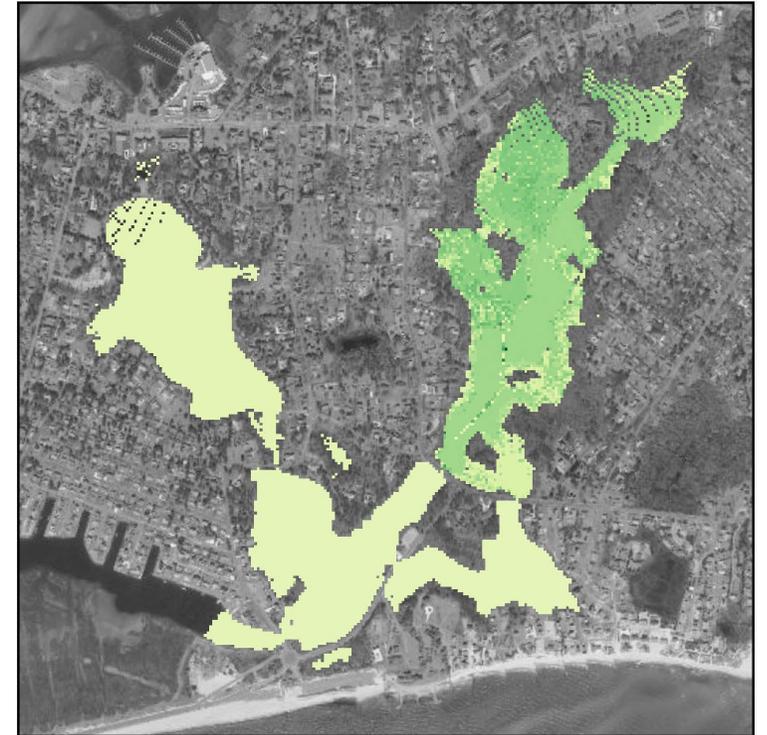
Maximum Depth (FT, NAVD88)



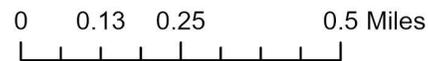
Design Conditions



Difference in Maximum Depth

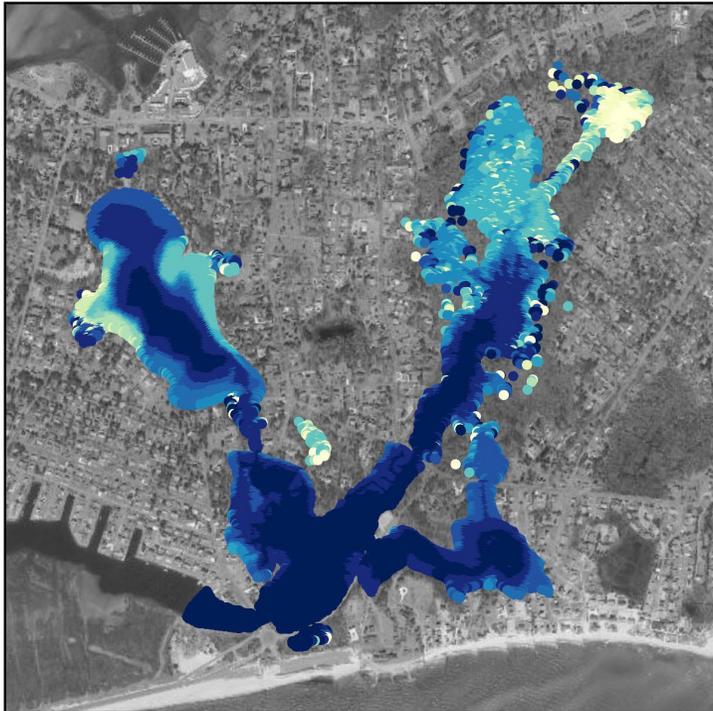


Design Depth - Existing Depth (FT NAVD88)



Preferred Design: Changes in Salinity

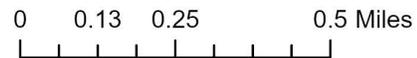
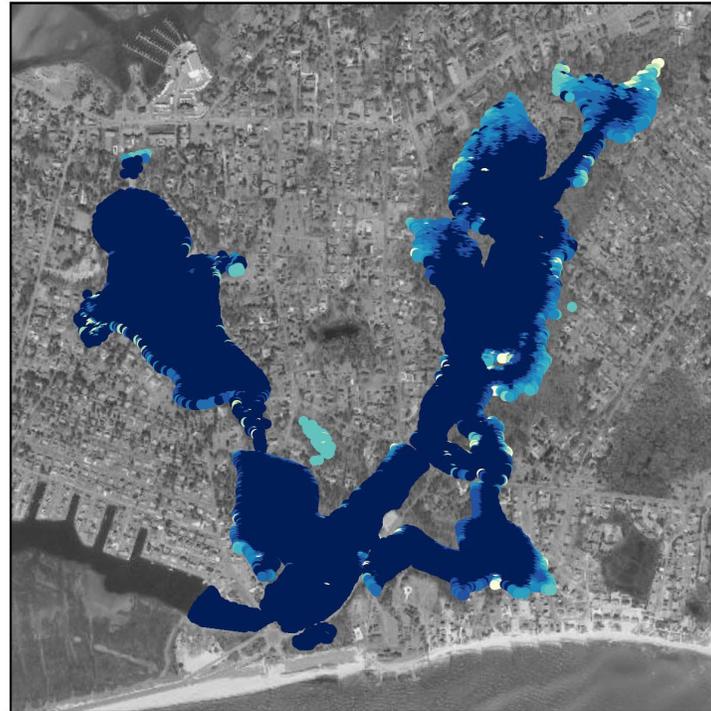
Existing Conditions



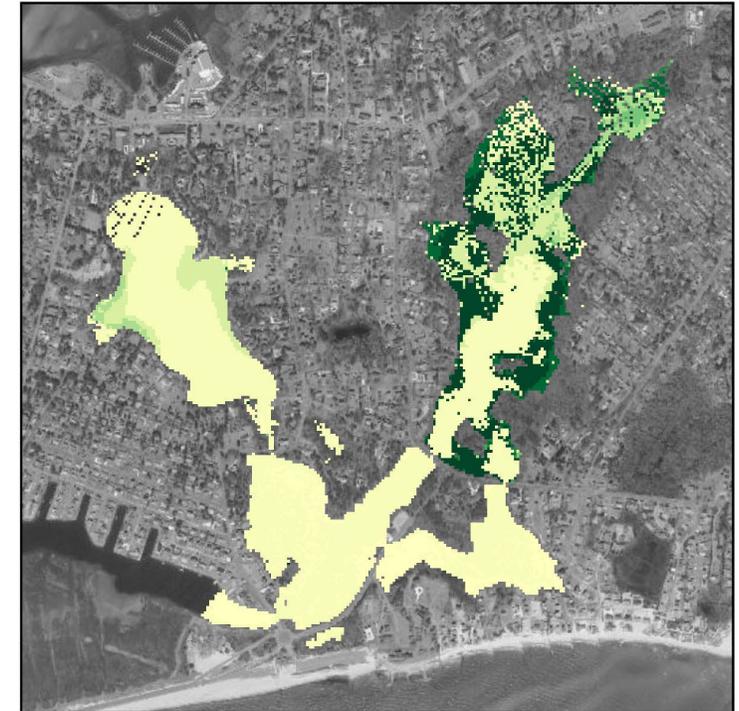
Maximum Salinity (PSU)



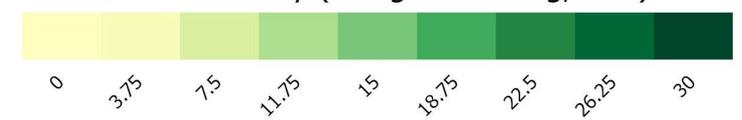
Design Conditions



Difference in Maximum Salinity

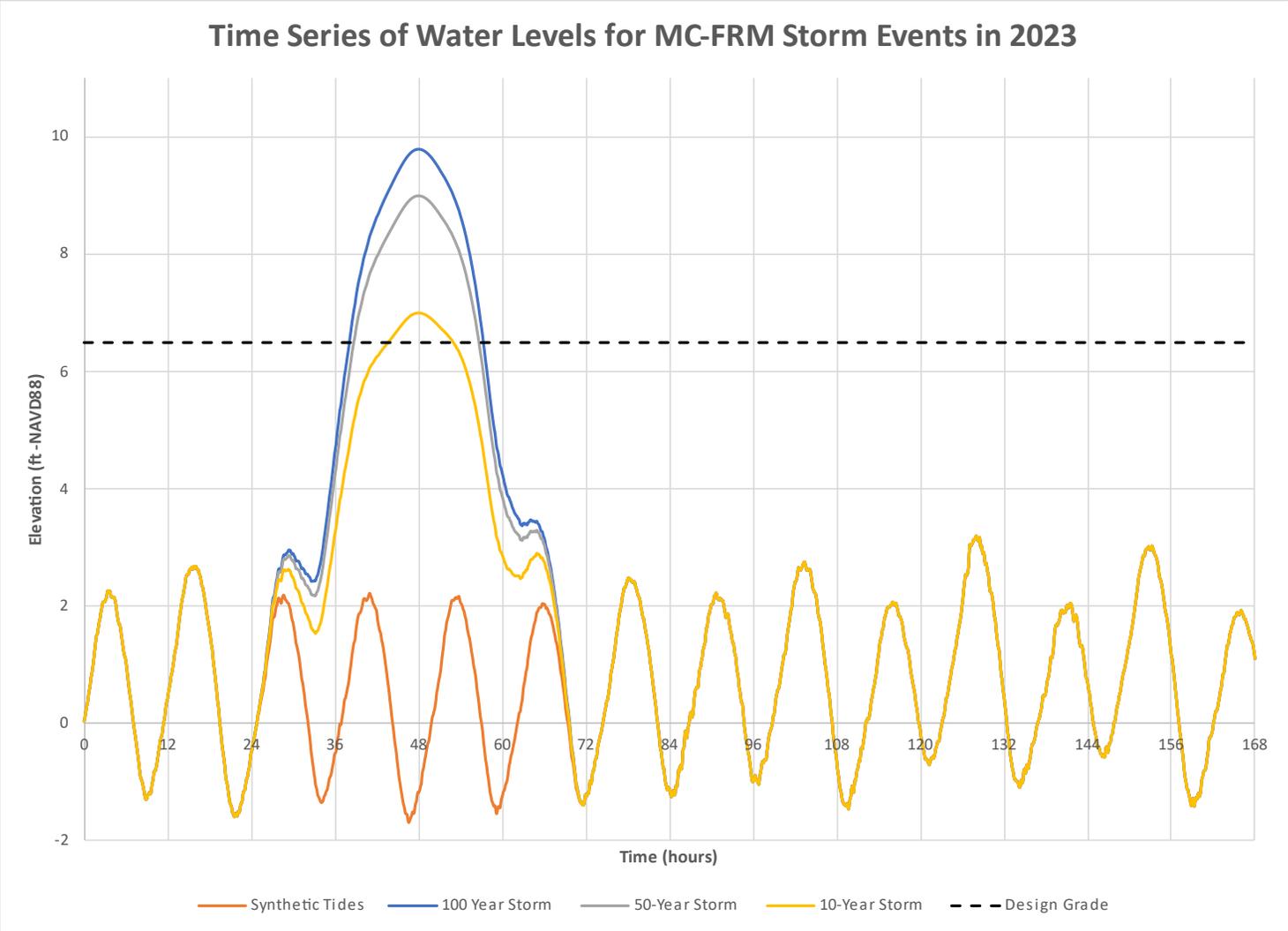


Difference in Salinity (Design - Existing, PSU)



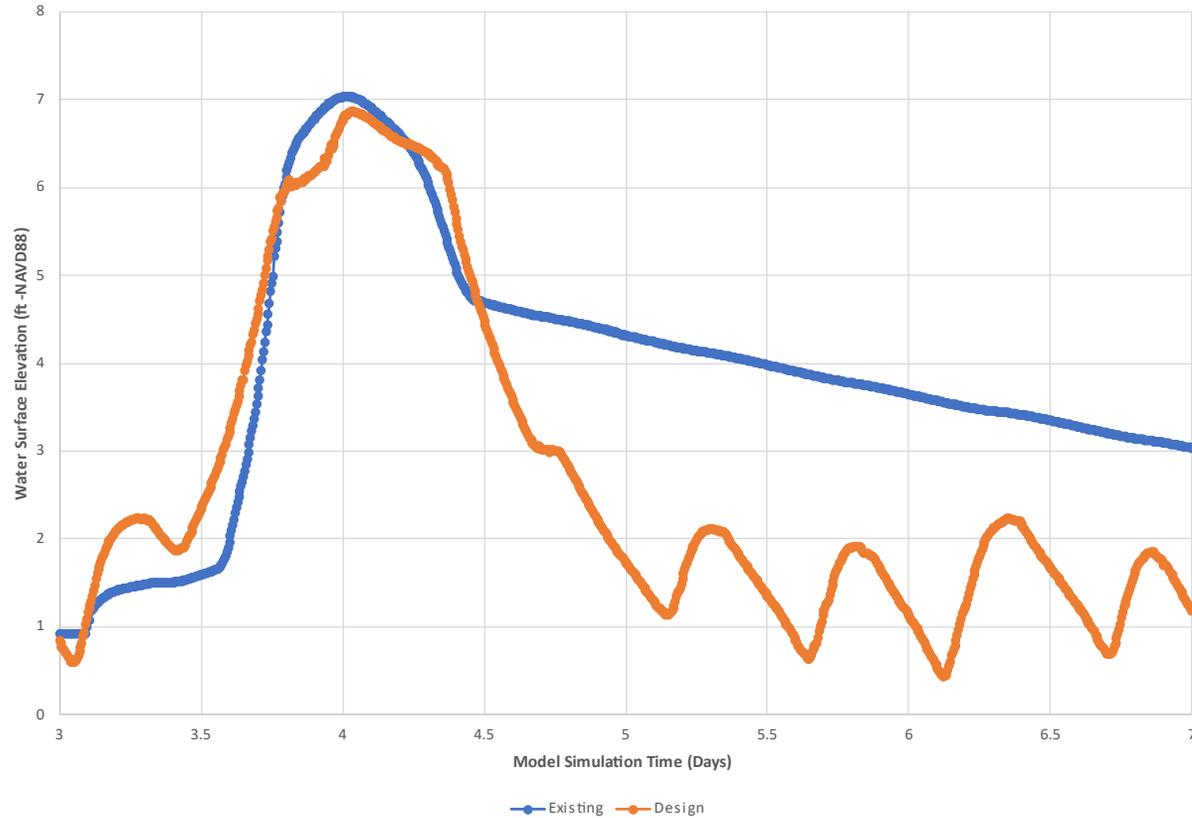
Low Frequency Storm Events

- 10 % AEP (10-Year) peak elevation=7.0 ft-NAVD88
- 2 % AEP (50Year) peak elevation=9.0 ft-NAVD88
- 1 % AEP (100-Year) peak elevation=9.8 ft-NAVD88

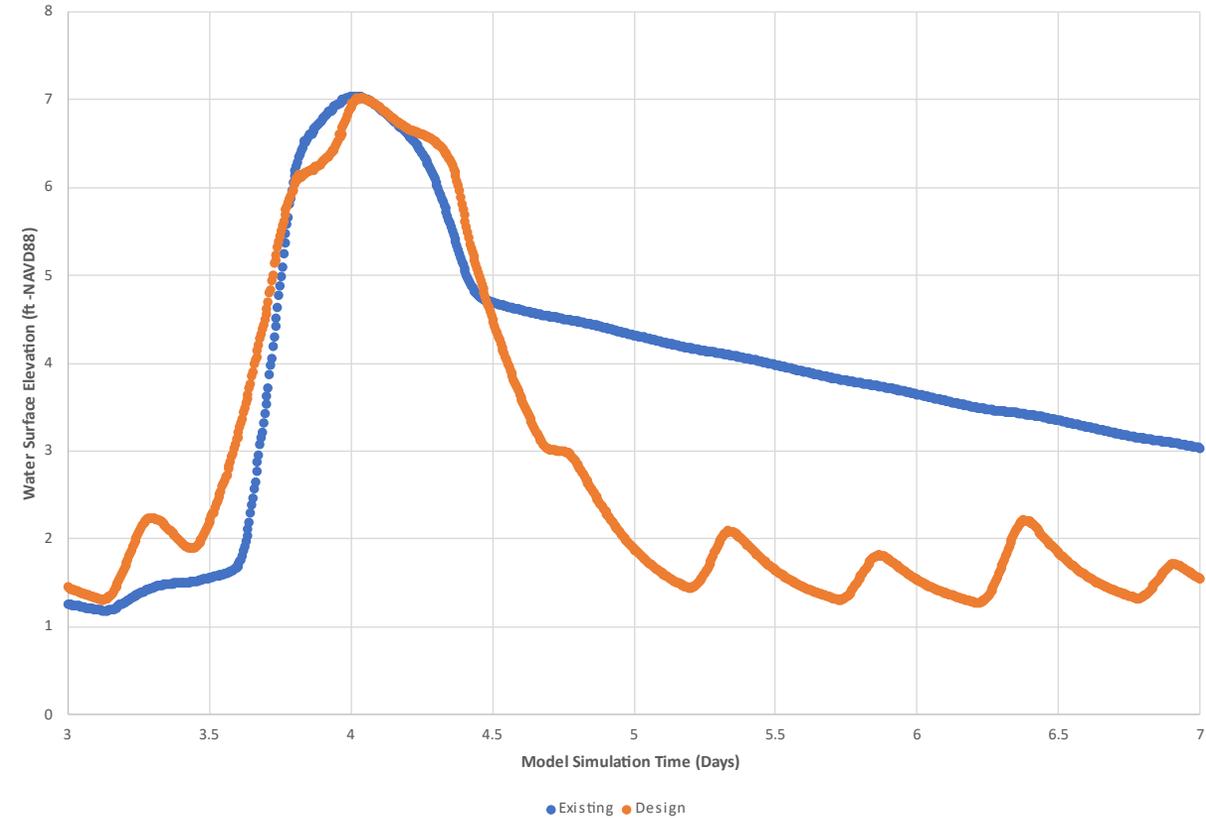


Low Frequency Storm Events: 10% AEP Storm

EFDC-WC Model Results at Station WC7



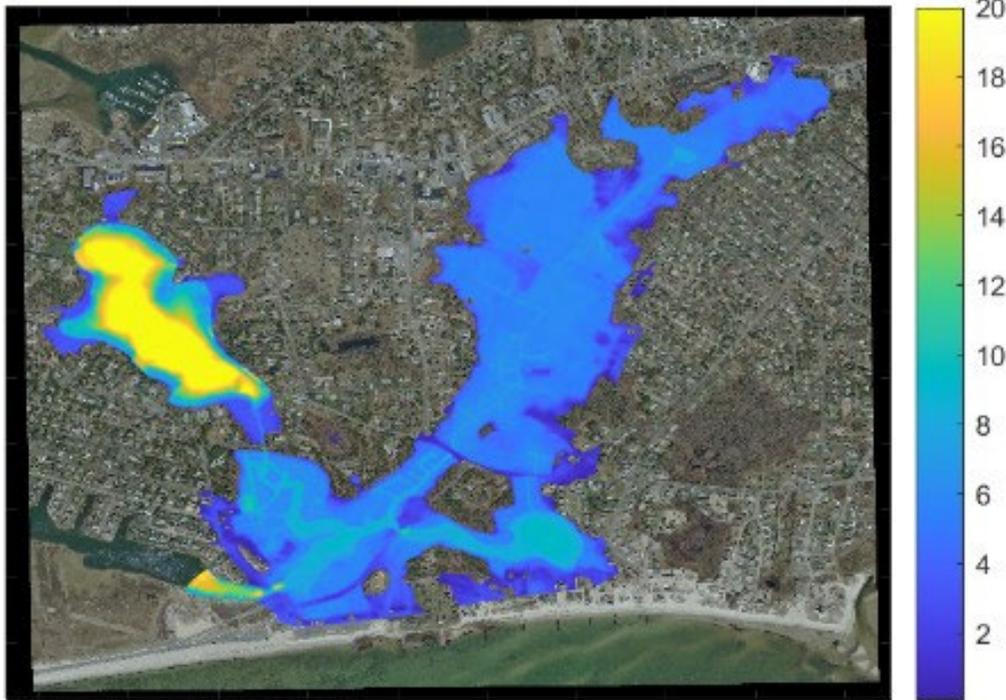
EFDC-WC Model Results at Station WC10



Low Frequency Storm Events: 10% AEP (10-year) Storm

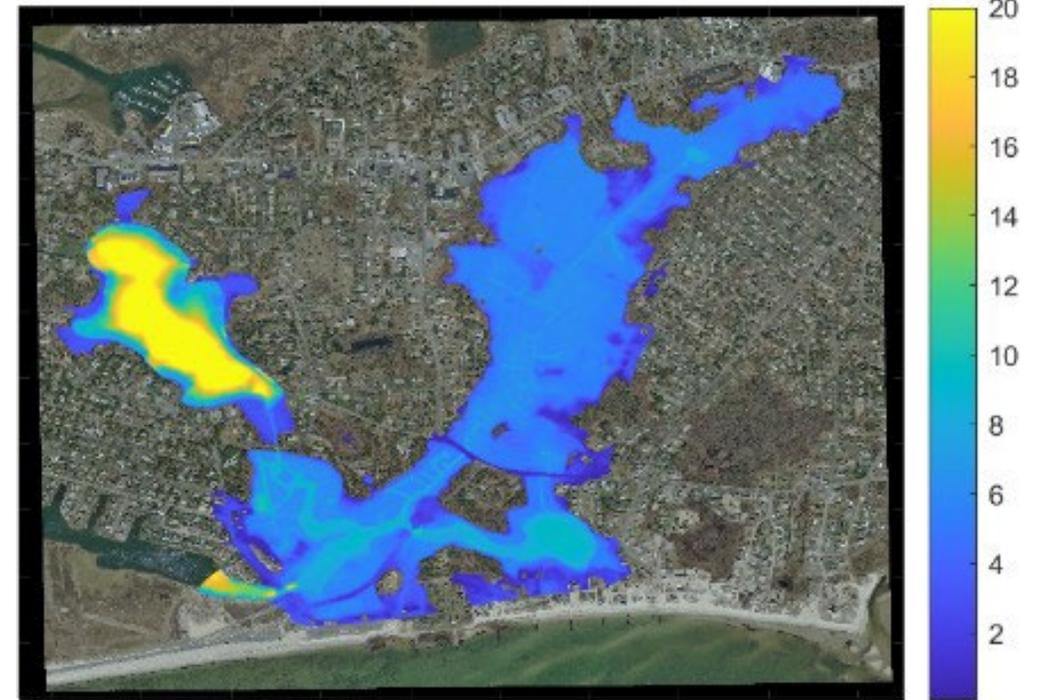
Maximum Depth (ft)

Existing Conditions: 10% AEP Storm



Maximum Depth (ft)

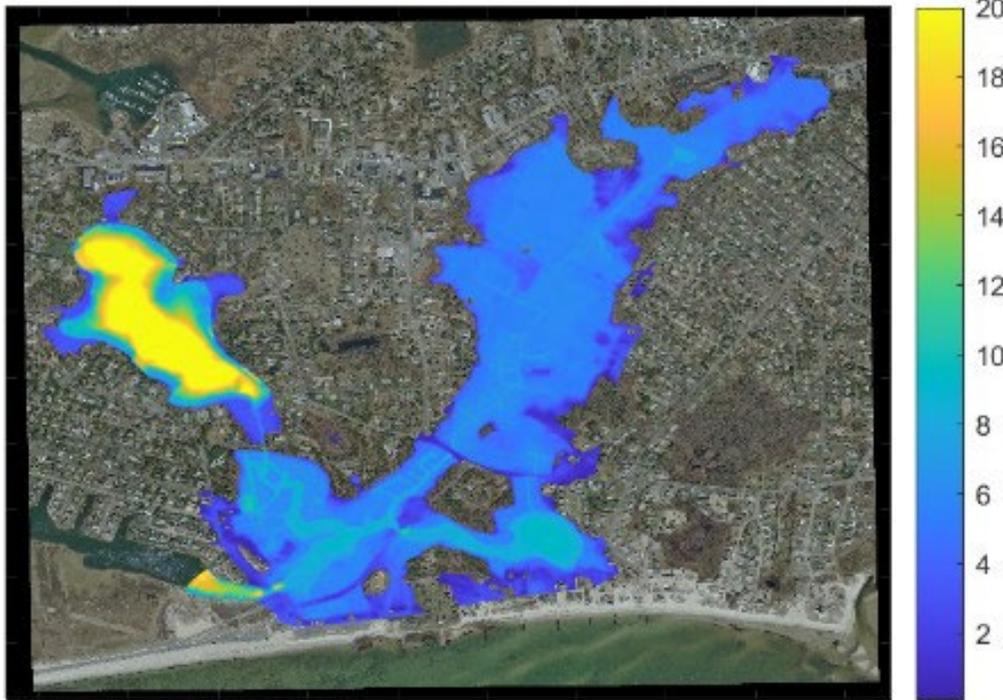
8ft x 6ft Box Culverts: 10% AEP Storm



Low Frequency Storm Events: 10% AEP (10-year) Storm

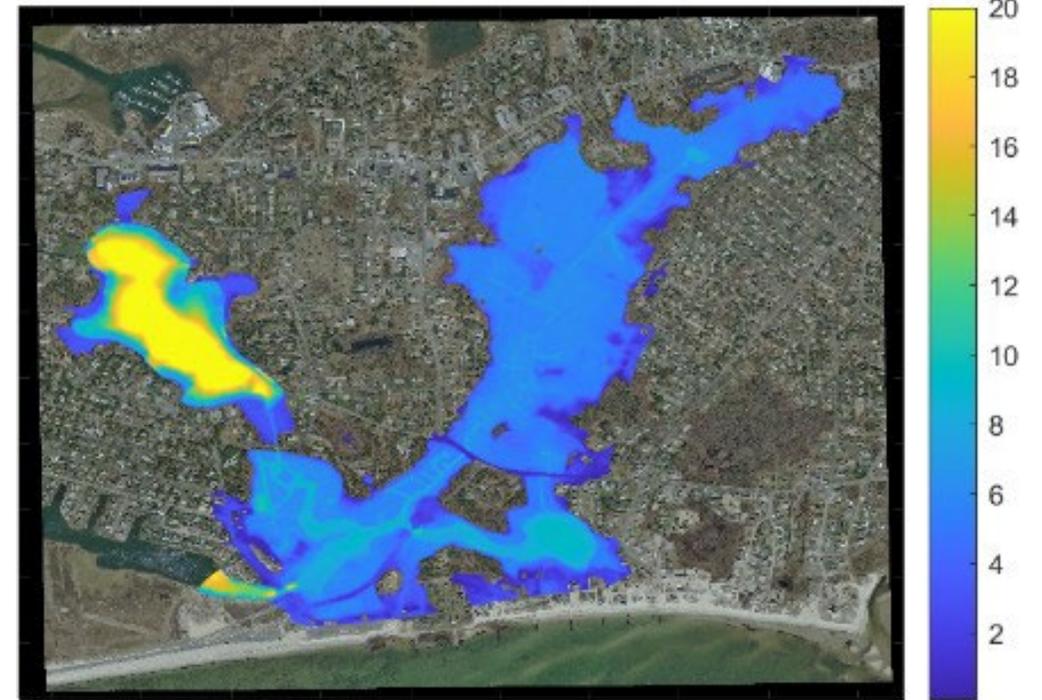
Maximum Depth (ft)

Existing Conditions: 10% AEP Storm



Maximum Depth (ft)

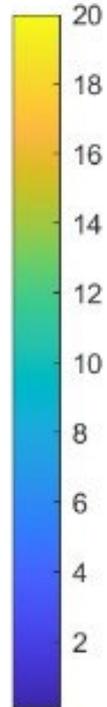
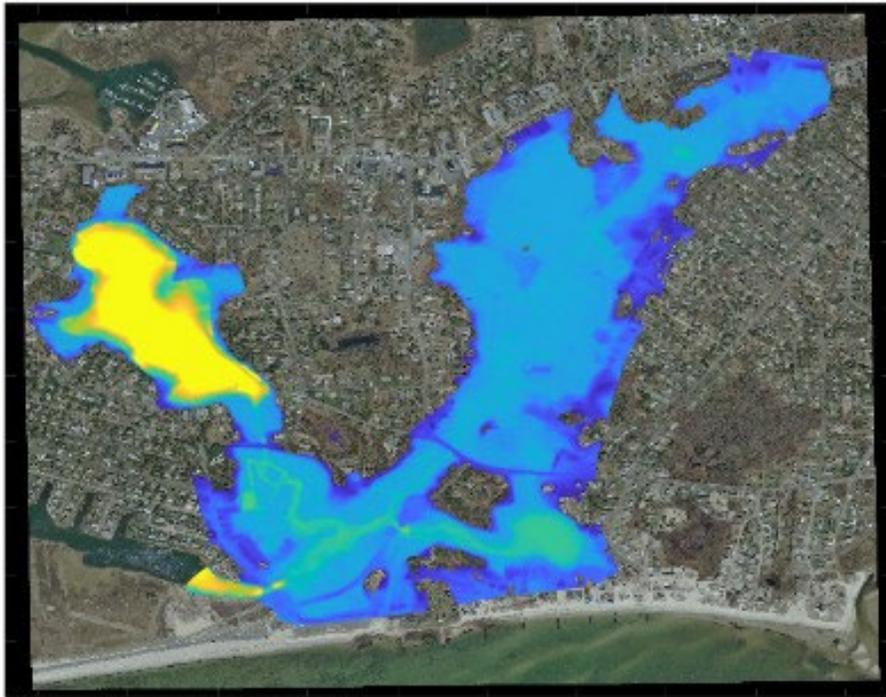
8ft x 6ft Box Culverts: 10% AEP Storm



Low Frequency Storm Events: 2% AEP (50-year) Storm

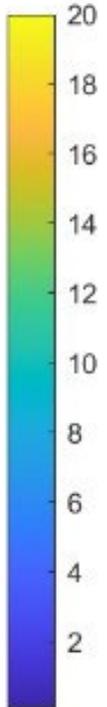
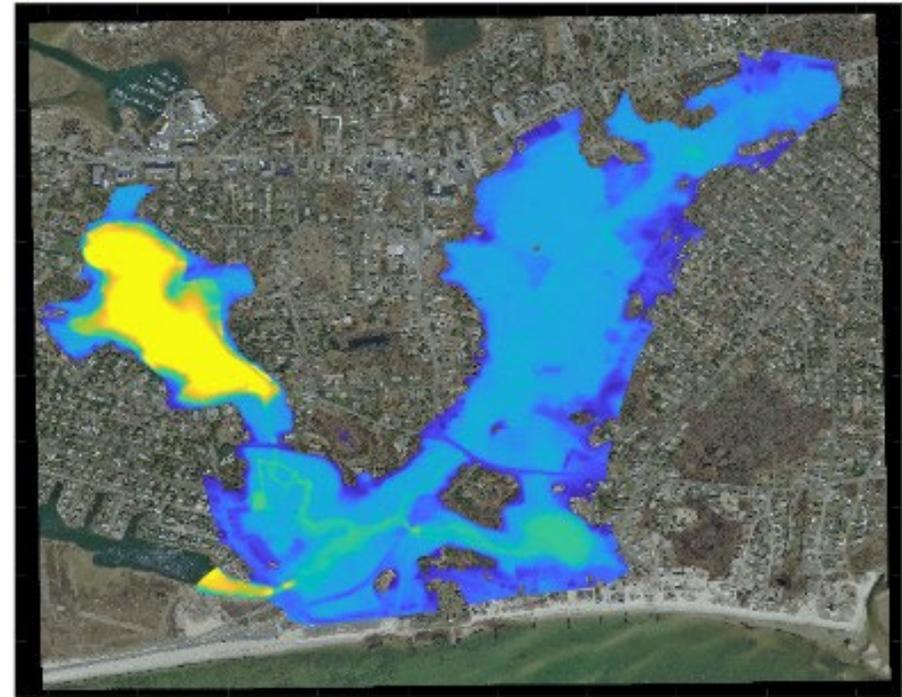
Maximum Depth (ft)

Existing Conditions: 2% AEP Storm



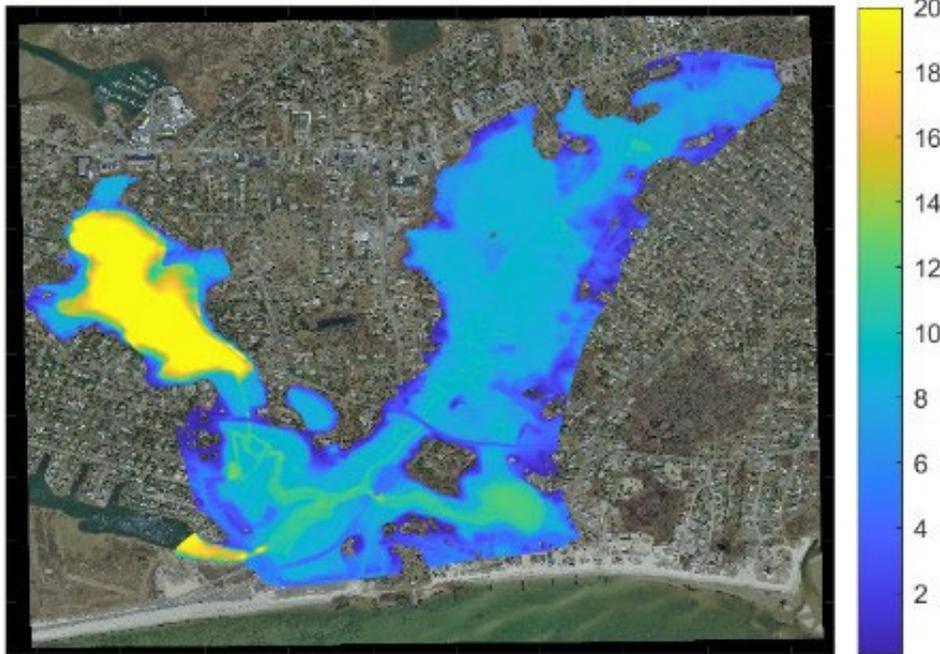
Maximum Depth (ft)

8ft x 6ft Box Culverts: 2% AEP Storm

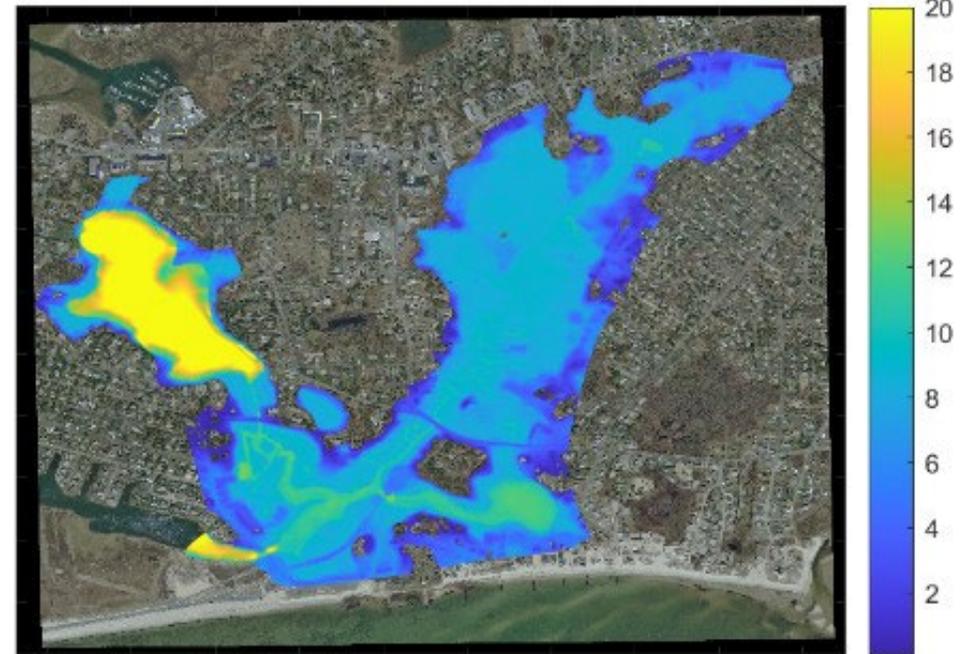


Low Frequency Storm Events: 1% AEP (100-year) Storm

Maximum Depth (ft)
Existing Conditions: 1% AEP Storm

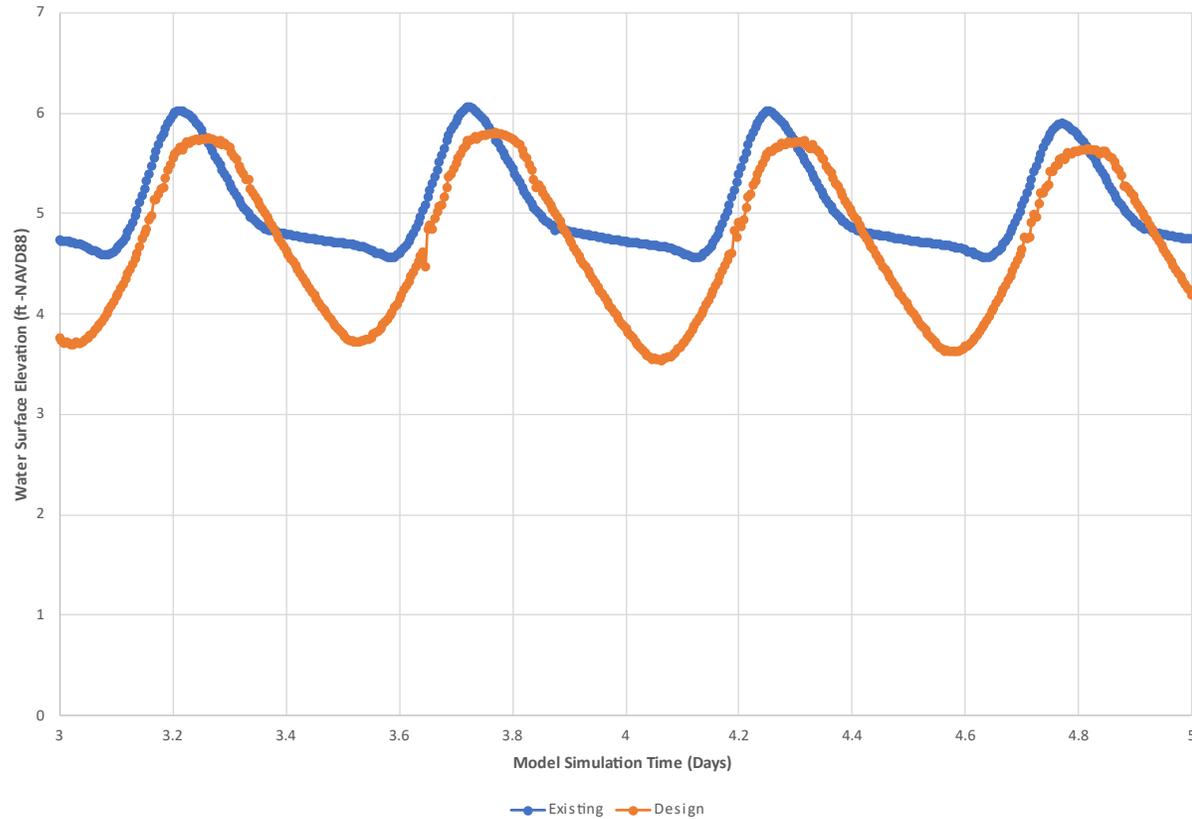


Maximum Depth (ft)
8ft x 6ft Box Culverts: 1% AEP Storm

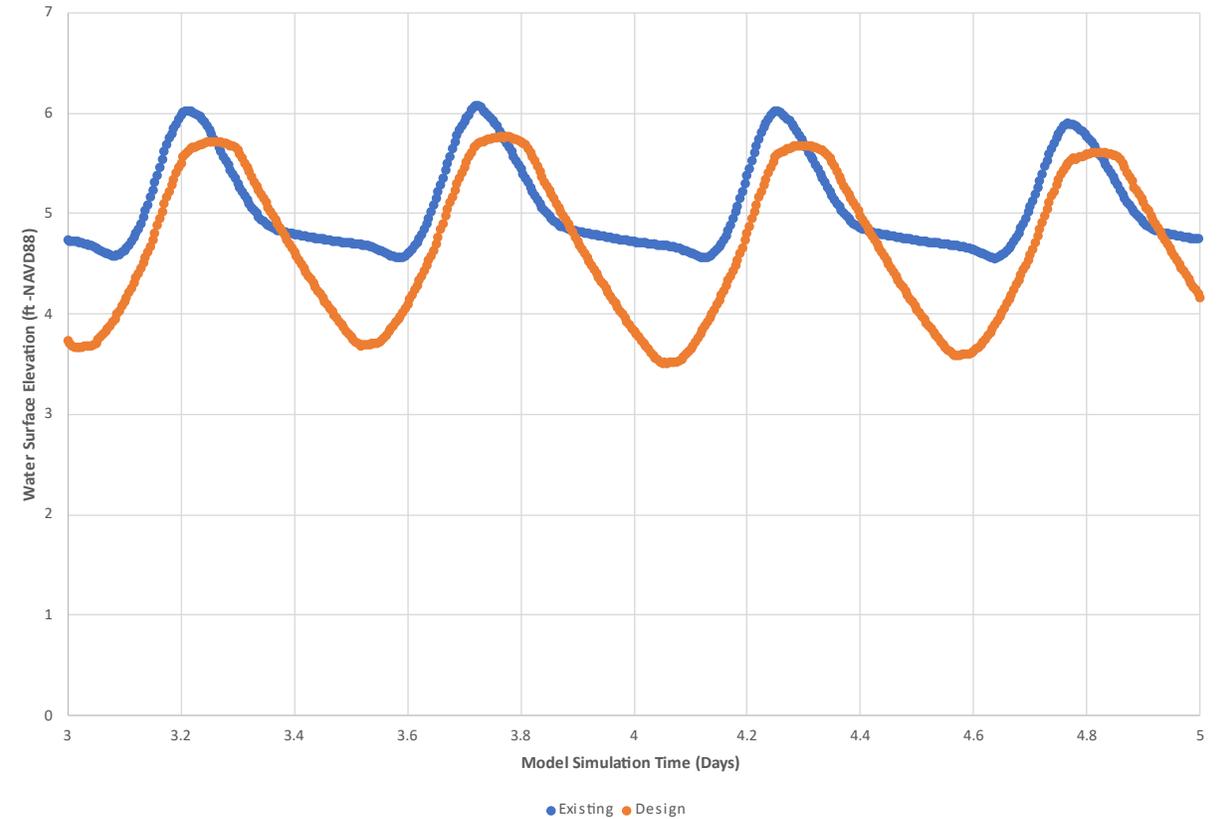


2070 Tides: 4.1 feet of Sea Level Rise

EFDC-WC Model Results at Station WC7



EFDC-WC Model Results at Station WC10



Conclusions & Recommendations

- The bridge crossing at Loring Avenue restricts flows during ebb tides as a result of the large flood shoal created by high velocity flows depositing sediments upstream of the bridge crossing. Dredging of the flood shoal will allow for greater tidal exchange.
- The low roadway elevations at Lower County Road allow for surge events to propagate over the roadway at approximately the 10% AEP (10-year) storm level, increasing to 6.5 ft-NAVD88 will help mitigate future flooding.
- Replacement of the existing pipe culverts at both the eastern and western crossings of Lower County Road will allow additional saltwater to enter the upper reaches of the system increasing the average salinity thereby encouraging salt marsh habitat and eliminating invasive vegetation.
- Following storm events, the larger 8'x6' culverts will provide additional drainage capacity allowing the system to return to pre-surge water levels more quickly than the undersized culverts currently in place.



Tighe&Bond



WEIR CREEK TIDAL RESTORATION

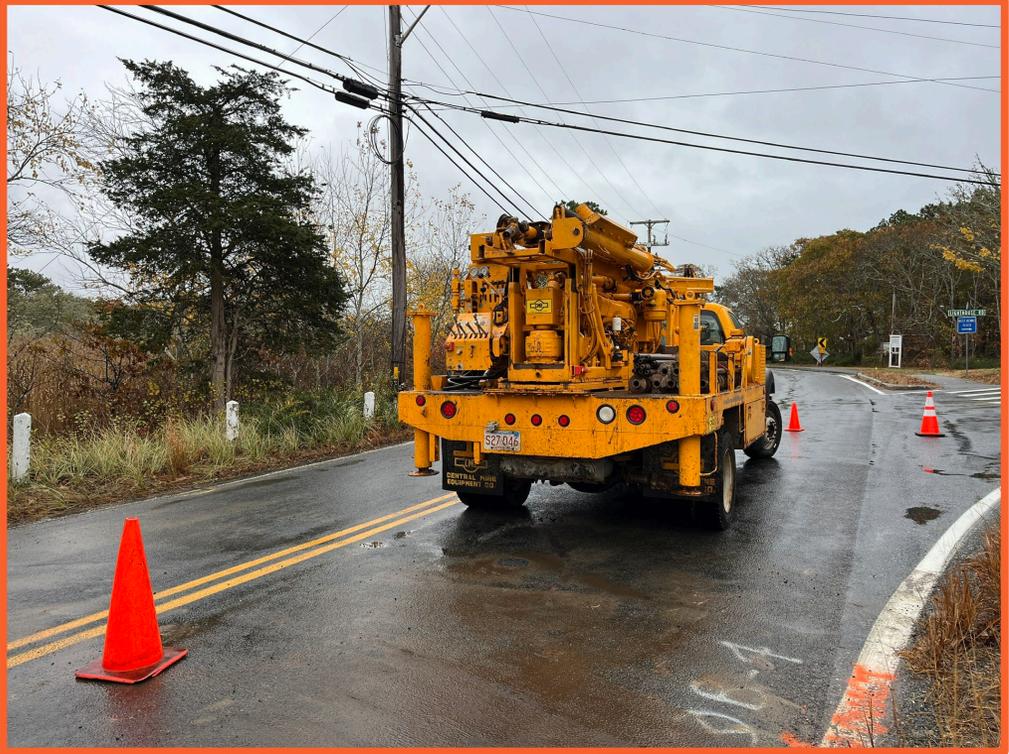
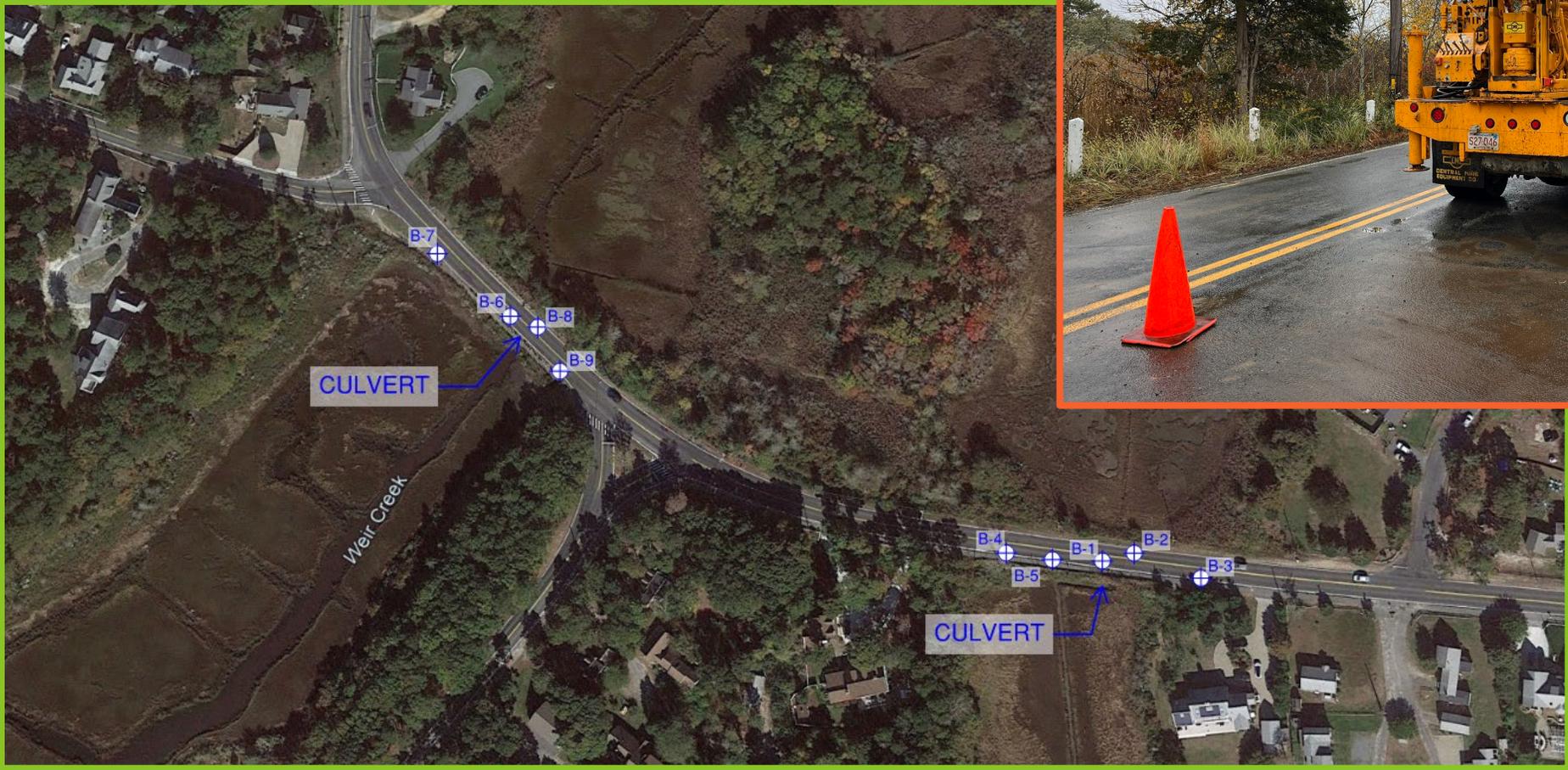
Tighe & Bond

Eric Ohanian, PE

SURVEY



GEOTECHNICAL BORINGS



GEOTECHNICAL BORINGS



Engineers | Environmental Specialists

Boring No. **B-1**

Page 1 of 1

File No. A-5102-001

Checked by: D. Gnatek

Project: Weir Creek Tidal Restoration

Location: Lower County Road, Dennis, MA

Client: Assoc. to Preserve Cape Cod (APCC)

Drilling Co. Desmond Well Drilling, Inc.

| Casing | | Sampler | | Groundwater Readings | | | |
|-----------------|-----|-------------|------|----------------------|-------|--------|-----------|
| Type | HSA | Split Spoon | Date | Time | Depth | Casing | Sta. Time |
| Refer to Note 1 | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

| Depth (ft.) | Casing No. Per Ft. | Sample No. Rec.(in) | Sample Depth (ft.) | Blows Per 6" | PID Reading (ppm) | Sample Description | General Stratigraphy | Notes | Well Construction | |
|-------------|--------------------|---------------------|--------------------|--------------|-------------------|--|----------------------|-------|-------------------|--|
| 5 | S-1 / 15 | 0-2 | 4-4 | - | - | Loose, brown/grey, fine to medium SAND, little Silt, trace Gravel, dry | 0.7' ASPHALT | 1 | No Well Installed | |
| | | | | | | | EXISTING FILL | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 10 | S-2 / 21 | 2-4 | 4-7 | - | - | Medium dense, brown/grey, fine to medium SAND, little Silt, trace Gravel, dry | 4.5' PEAT | 2 | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 15 | S-3 / 21 | 4-6 | 1-1 | - | - | 6" SAA, over 8" very soft, black, Fibrous PEAT, moist, over very loose, grey, fine to coarse SAND, trace Silt, trace Gravel, moist | 5.2' | 3 | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 20 | S-4 / 16 | 6-8 | 1-4 | - | - | Loose, brown, fine to medium SAND, trace Silt, trace Organics, wet | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 25 | S-5 / 11 | 8-10 | 1-3 | - | - | Loose, light brown, fine to medium SAND, trace Silt, wet | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 30 | S-6 / 12 | 10-12 | 1-3 | - | - | Loose, light brown, fine to coarse SAND, trace Silt, trace Gravel, wet | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 30 | S-7 / 13 | 13-15 | 1-2 | - | - | Loose, light brown, fine to coarse SAND, trace Silt, wet | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 30 | S-8 / 16 | 18-20 | 3-3 | - | - | Loose, red/brown, fine to coarse SAND, little Silt, wet | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 30 | S-9 / 18 | 23-25 | 1-1 | - | - | Loose, light brown, fine to coarse SAND, trace Gravel, trace Silt, wet | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 30 | S-10 / 10 | 28-30 | 1-1 | - | - | Loose, grey, fine to coarse SAND, trace Silt, wet | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

Notes:

- Groundwater estimated at 6' based on sample wetness.
- Drillers introduce water into augers below 6' to avoid blow-in.
- End of boring at 30'. Borehole backfilled with cuttings and sand upon completion. Pavement repaired with cold patch asphalt.

| Proportions Used | Density/Consistency |
|------------------------|---------------------------------|
| TRACE (TR.) 0 - <10% | VERY LOOSE 0-4 VERY SOFT <2 |
| LITTLE (LI.) 10 - <20% | LOOSE 4-10 SOFT 2-4 |
| SOME (SO.) 20 - <35% | MEDIUM DENSE 10-30 MEDIUM 4-8 |
| AND 35 - <50% | DENSE 30-50 STIFF 8-15 |
| | VERY DENSE >50 VERY STIFF 15-30 |
| | HARD >30 |



Engineers | Environmental Specialists

Boring No. **B-2**

Page 1 of 1

File No. A-5102-001

Checked by: D. Gnatek

Project: Weir Creek Tidal Restoration

Location: Lower County Road, Dennis, MA

Client: Assoc. to Preserve Cape Cod (APCC)

Drilling Co. Desmond Well Drilling, Inc.

| Casing | | Sampler | | Groundwater Readings | | | |
|-----------------|-----|-------------|------|----------------------|-------|--------|-----------|
| Type | HSA | Split Spoon | Date | Time | Depth | Casing | Sta. Time |
| Refer to Note 1 | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

| Depth (ft.) | Casing No. Per Ft. | Sample No. Rec.(in) | Sample Depth (ft.) | Blows Per 6" | PID Reading (ppm) | Sample Description | General Stratigraphy | Notes | Well Construction | |
|-------------|----------------------|---------------------|--------------------|--------------|-------------------|--|----------------------|-------|-------------------|--|
| 5 | S-1 / 6 | 0-2 | 2-1 | - | - | Loose, brown, fine to medium SAND, little Silt, trace Gravel, moist | 0.7' ASPHALT | 1 | No Well Installed | |
| | | | | | | | EXISTING FILL | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 10 | S-2 / 23 | 2-4 | 1-1 | - | - | 17" Very loose, brown, fine to coarse SAND, little Silt, moist, over Soft, black/brown, Fibrous PEAT, moist | 3.4' PEAT | 2 | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 15 | S-3 / 12 | 4-6 | 2-1 | - | - | 6" Soft, black, Fibrous PEAT, little fine to coarse Sand, trace Silt, wet, over very loose, grey, fine to coarse SAND, trace Organics, wet | 4.4' PEAT | 3 | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 20 | S-4 / 14 | 6-8 | 1-1 | - | - | Loose, brown, fine to medium SAND, trace Silt, wet | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 25 | S-5 / 13 | 8-10 | 1-3 | - | - | Loose, light brown, fine to coarse SAND, trace Silt, wet | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 30 | S-6 / 13 | 10-12 | 1-2 | - | - | Loose, light brown, fine to coarse SAND, trace Gravel, trace Silt, wet | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 30 | End of Boring at 12' | | | | | | | | | |

Notes:

- Groundwater estimated at 4' based on sample wetness.
- Drillers introduce water into augers below 4' to avoid blow-in.
- Borehole backfilled with cuttings and sand upon completion. Pavement repaired with cold patch asphalt.

| Proportions Used | Density/Consistency |
|------------------------|---------------------------------|
| TRACE (TR.) 0 - <10% | VERY LOOSE 0-4 VERY SOFT <2 |
| LITTLE (LI.) 10 - <20% | LOOSE 4-10 SOFT 2-4 |
| SOME (SO.) 20 - <35% | MEDIUM DENSE 10-30 MEDIUM 4-8 |
| AND 35 - <50% | DENSE 30-50 STIFF 8-15 |
| | VERY DENSE >50 VERY STIFF 15-30 |
| | HARD >30 |

WETLAND DELINEATION

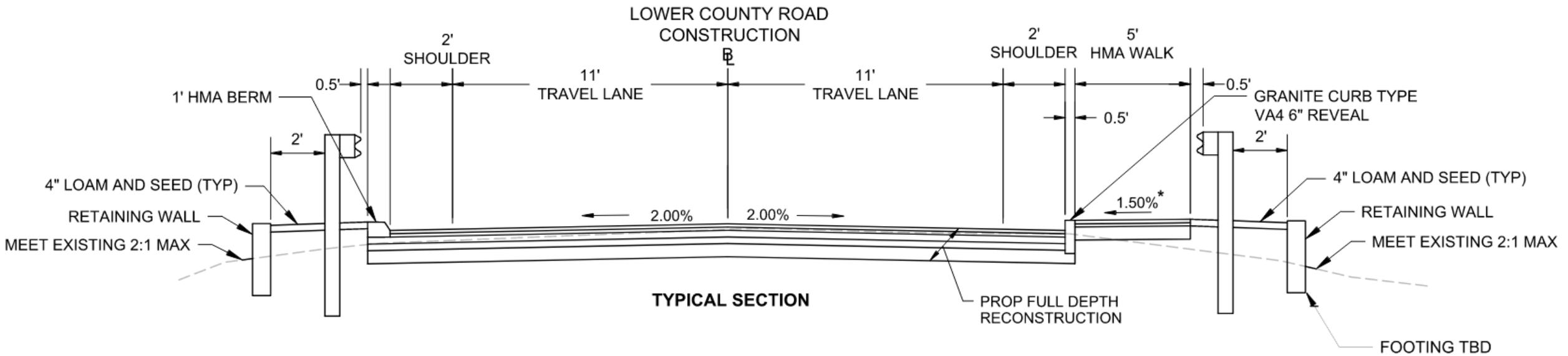
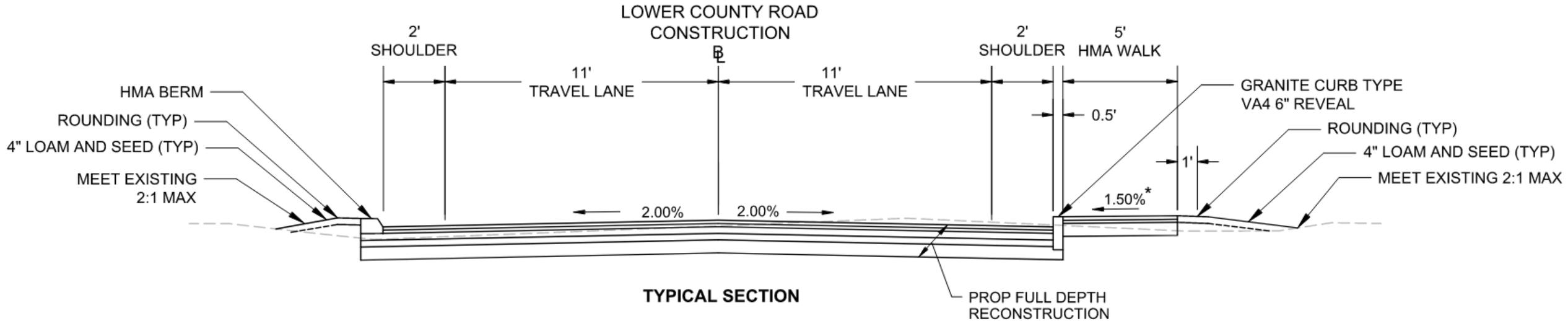


CONCEPTUAL DESIGN

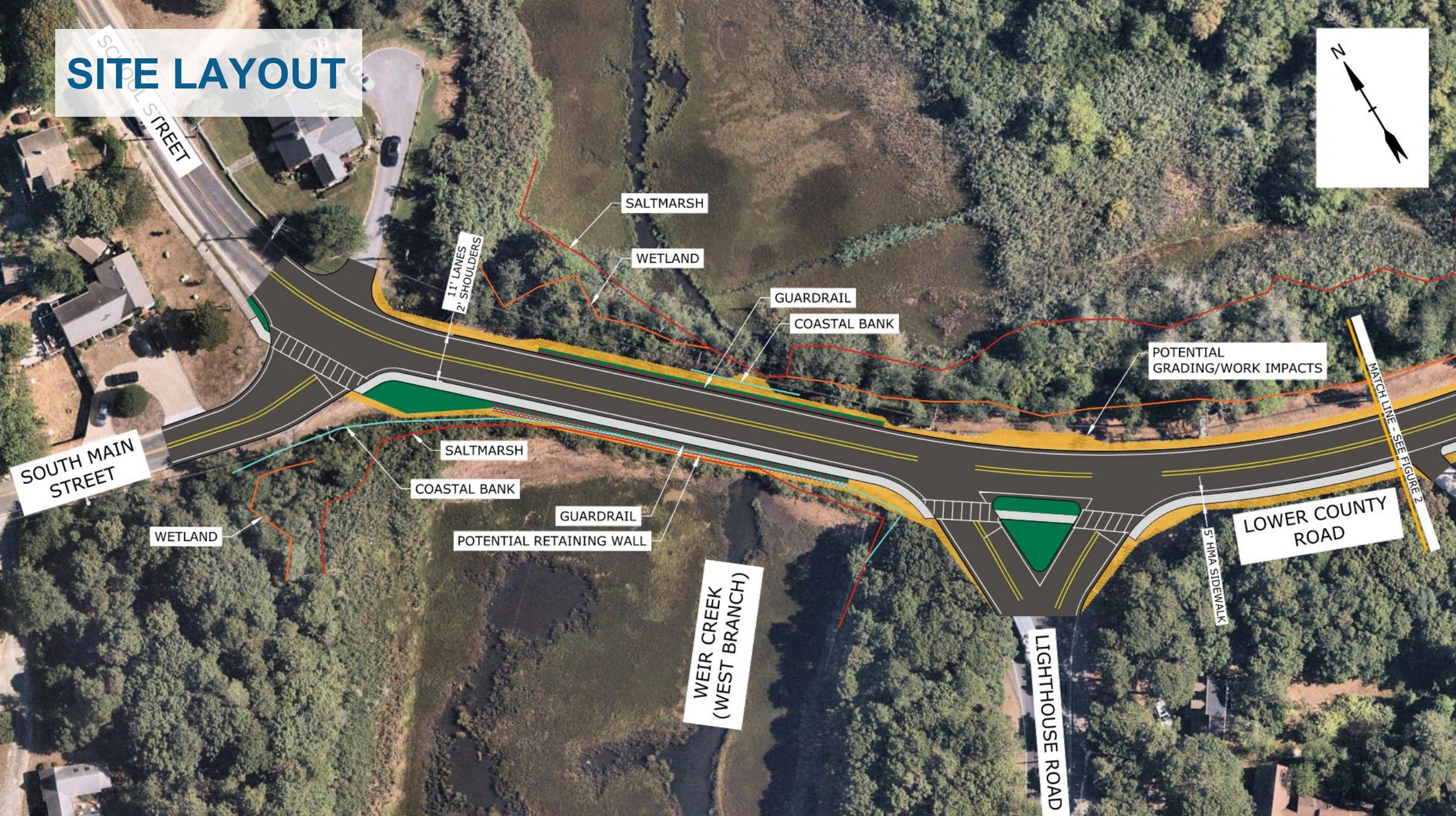
- **Replacement of 2 culverts**
 - Upsizing to 8-ft box culverts
- **Raised roadway elevation**
- **Improved guardrail protection**
- **Maintain sidewalks**
- **Increase roadway shoulder width**



CROSS SECTIONS



SITE LAYOUT



SALTMARSH

WETLAND

GUARDRAIL

COASTAL BANK

POTENTIAL GRADING/WORK IMPACTS

MATCHLINE - SEE FIGURE 2

SALTMARSH

COASTAL BANK

GUARDRAIL

POTENTIAL RETAINING WALL

WEIR CREEK (WEST BRANCH)

5' HMA SIDEWALK

LOWER COUNTY ROAD

LIGHTHOUSE ROAD

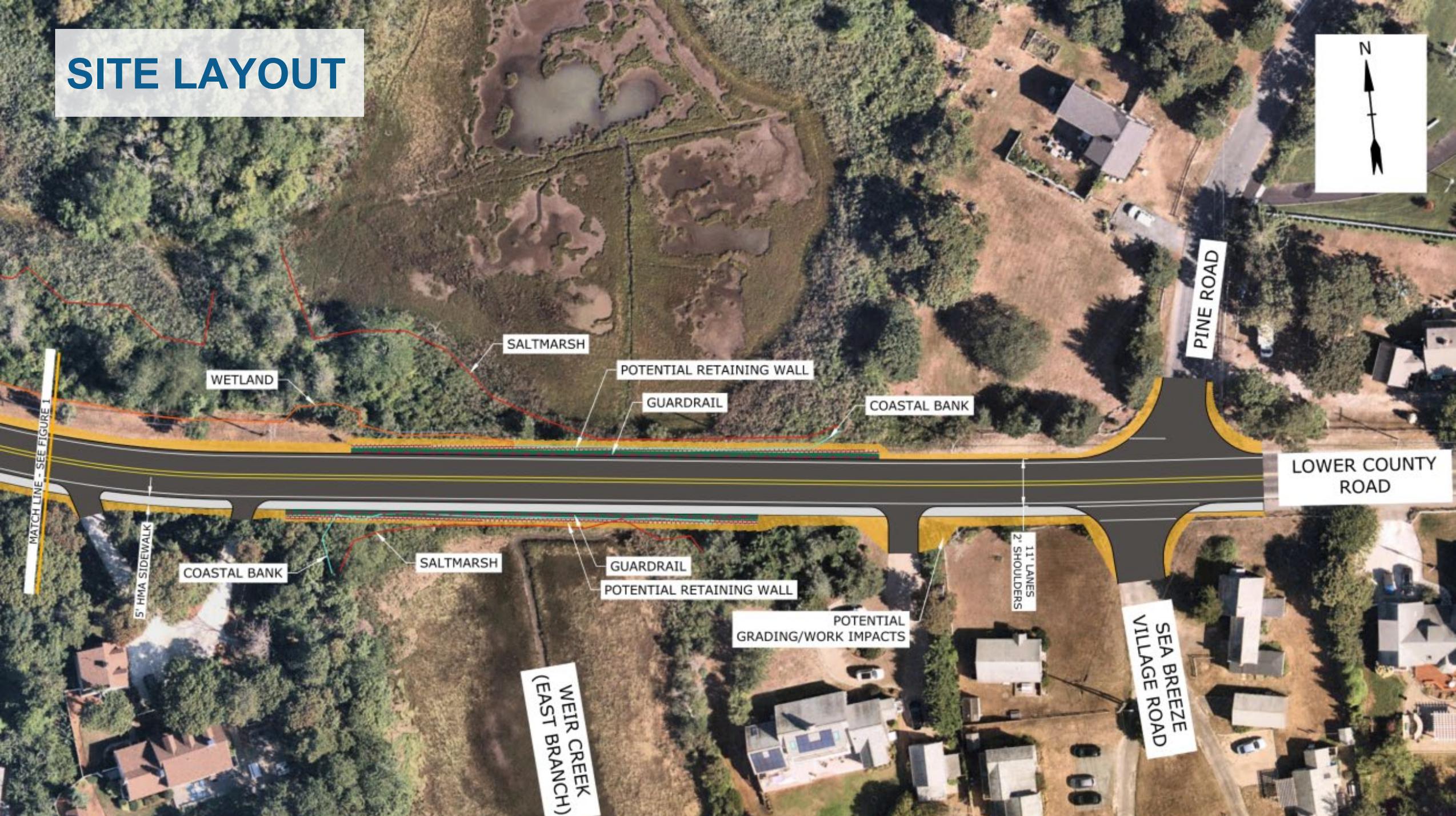
SOUTH MAIN STREET

SCHOOL STREET

WETLAND

11' LANES
2' SHOULDERS

SITE LAYOUT



Questions



Meeting Registration Feedback

Summary of Key Questions

1. Any proposed activity at South Main and Fisk Street? Or at the culvert that connects Weir Creek to Kelley's Pond?
2. How many sensors were used to monitor salinity? Was salinity monitored at Indian Pond? What do salinity models show for the upper reaches of the system?
3. How will the project change flooding on private properties? Lighthouse Inn Road?
4. Affect on local groundwater levels during high tides and storm events?

Summary of Key Public Concerns

1. Flooding of Lighthouse Inn Road
2. Need for dredging
3. Insufficient tidal flow upstream to maintain a healthy salt marsh ecosystem.
4. Preserving the natural marsh and wildlife
5. Water quality

Next Steps

- Write Up and Consolidate Comments and Questions from this Meeting
- Planning and Design (April-Oct)
- Monitoring of Vegetation and Water Quality (Summer)
- **Public Meeting 3 – Fall 2024**



Thank You for Coming

Sign In – Name and Email

For More Information and
Project Updates Go To:

www.apcc.org/weir-creek

