DEPARTMENT OF PLANNING AND NATURAL RESOURCES &
TYSAM TECH LLC

# GREAT POND RESTORATION DESIGN WORKSHOP

**MARCH 21ST**
**3:30 PM TO 8:30 PM**

**OR**

**MARCH 22ND**
**10:00 AM TO 3:00 PM**

**UNIVERSITY OF THE VIRGIN ISLANDS**
UVI MEDICAL SIMULATION CENTER - DINING ROOM

Please join us to review and discuss various restoration design scenarios!

Share your questions, comments and concerns on multiple design sketches.

ALL ARE WELCOMED!LIGHT REFRESHMENTS WILL BE SERVED!

*Together we can protect and enhance our Virgin Islands.*

Tysam Tech, LLC

# GREAT POND CHARRETTE

## FEBRUARY
*KICK-OFF MEETING*

Public kick-off meeting
@ UVI Great Hall
-February 28, 2024

## FEB-MAR
*PLANNING*

Incorporation of public comments and concerns into a design approach.

Completion of technical review and field surveys to feed into design approach.

## MARCH
*CHARRETTE*

Interviews with stakeholders
Great Pond Restoration and Design Charrette
@ UVI Medical Simulation Center - Dining Hall
March 21, 2024 3:30pm - 8:30pm
March 22, 2024 10:00am - 3:00pm

## APRIL
*SOCIAL EVENT*

Documentation of interviews and testimonials for Social Event
@ DPNR-EEMP/Great Pond
-April 12, 2024 4:30pm - 7:00pm

## APRIL
*RESTORATION ACTION PLAN*

Incorporate all tech surveys, documents, and stakeholder input to choose engineering design options for creation of Restoration Action Plan (RAP).

## APRIL-MAY
*ENGINEERING*

Engineering Team finalizes design of proposed solutions. Preparation of design drawings to show project scope & prepare for permits.

# MEET THE TEAM - DPNR

## Marlon Hibbert

Director, Division of Coastal Zone Management, DPNR

## Hilary Lohmann

Coastal Resilience Coordinator, Coastal Zone Management, DPNR

## Kelcie Troutman

East End Marine Park Coordinator, Coastal Zone Management, DPNR

# MEET THE TEAM – TYSAM TECH

Tysam Tech, LLC

## Trinity Austrie

Director of Environmental Services

## Shamoy Bideau

Marine Biologist

Project Coordinator

## Benjamin Keularts

Environmental Engineer

Project Manager

## Henry Tonnemacher

Marine Biologist

## The GreenPiece

Engineering and Surveying

## Montrose Environmental

Engineering and Hydraulic & Hydrologic Modeling

# AUDIENCE INTRODUCTIONS

- What is your motivation for being present here today?

# OBJECTIVES FOR TODAY

This **Restoration Design Charrette** (RDC) includes objectives to: (1) review drafted technical restoration designs and consider the benefits and challenges for each design scenario, (2) evaluate an approach to each scenario to guide the development of a **Restoration Action Plan** (RAP), and (3) evaluate the efficacy of each scenario to restore or improve Great Pond's potential as a reef fish nursery habitat.

1

Gather local data and knowledge

- Literature review
- Site assessments
- Kick-off meeting

2

Develop a greater understanding of Great Pond site conditions

- Stakeholder interviews
- Design Charrette
- Overview report

3

Select design options based on charrette and site modeling

- Restore tidal flushing
- Low & Med. designs to improve Great Pond function
- Do nothing

4

Design of options

- Restoration Action Plan
- Provide design drawings for project implementation and permitting

# GREAT POND OVERVIEW

# IMPORTANCE OF GREAT POND

- Designated Area of Particular Concern (APC) in 1979
- Functions as a fish nursery to commercially important species and other aquatic species
- Exists as part of the natural infrastructure of St. Croix
- Serves as a sediment sink for runoff
- Provides a flood buffer for nearby communities

# Great Pond, 1954

1954 USGS Satellite Imagery

Great Pond, 1972

# Great Pond, 1992

USGS Satellite Imagery


# Great Pond, 1999

Photo: USGS Satellite Imagery

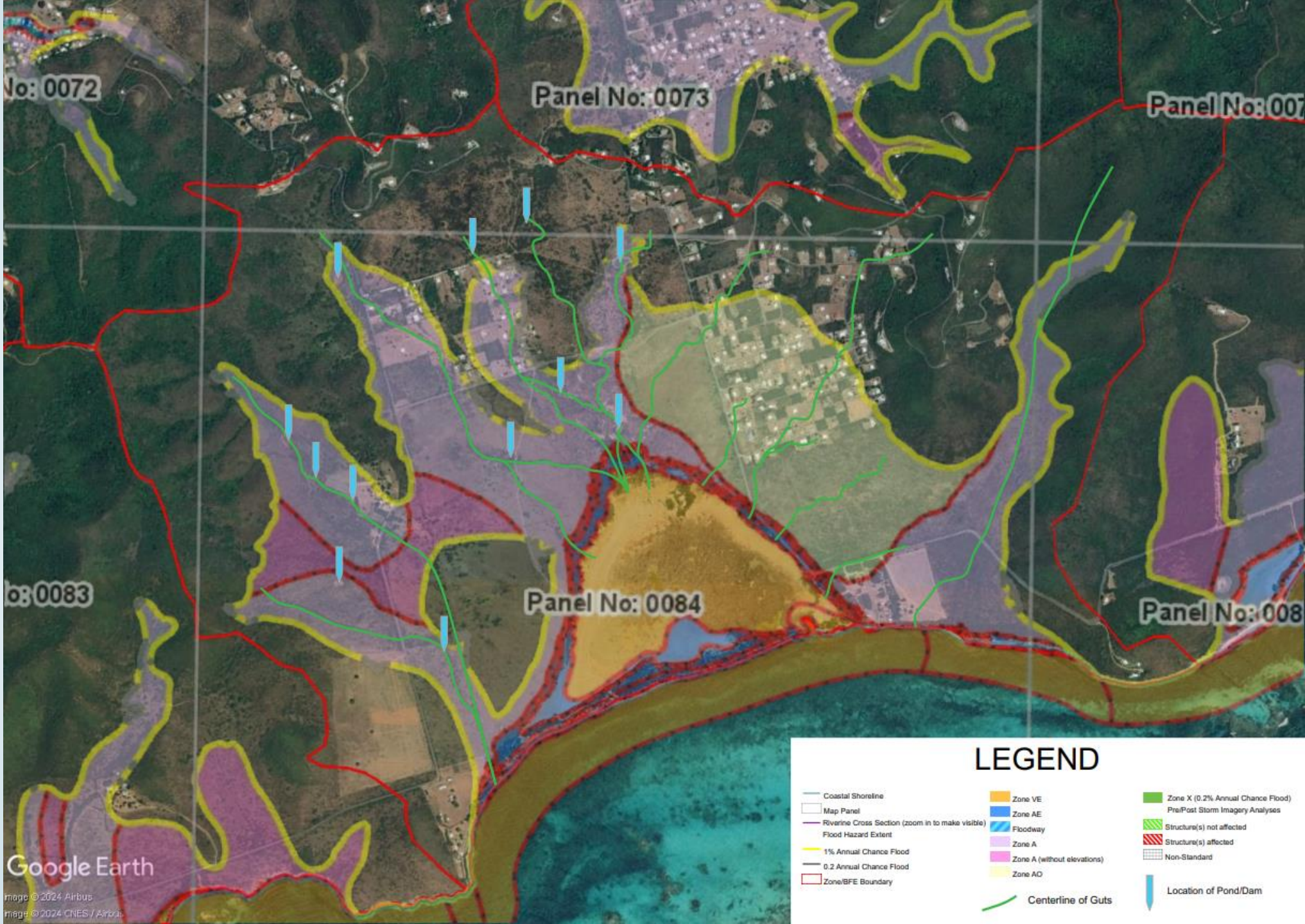
# EFFECTS OF MAJOR WEATHER EVENTS

Post-Hurricane Maria, 2017

Runoff from Union and Mount Washington

# Flood map of Great Pond Watershed

(including Guts and Ponds)



# Pond adjacent to Lowry Hill road, March 2024

# Pond in Estate Marienhoj, March 2024

# Pond in Estate Sight, March 2024

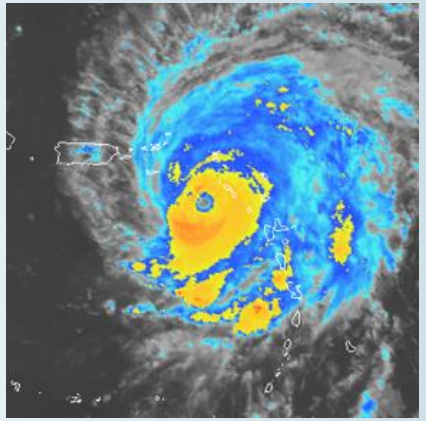
# Pond in Estate Hartman, March 2024 – (1 of 2)

# Pond in Estate Hartman, March 2024 – (2 of 2)

# IMPACTS TO GREAT POND TODAY

## Land Development
Changes to land cover/land use

## Solid Waste Disposal
Illegal dumping

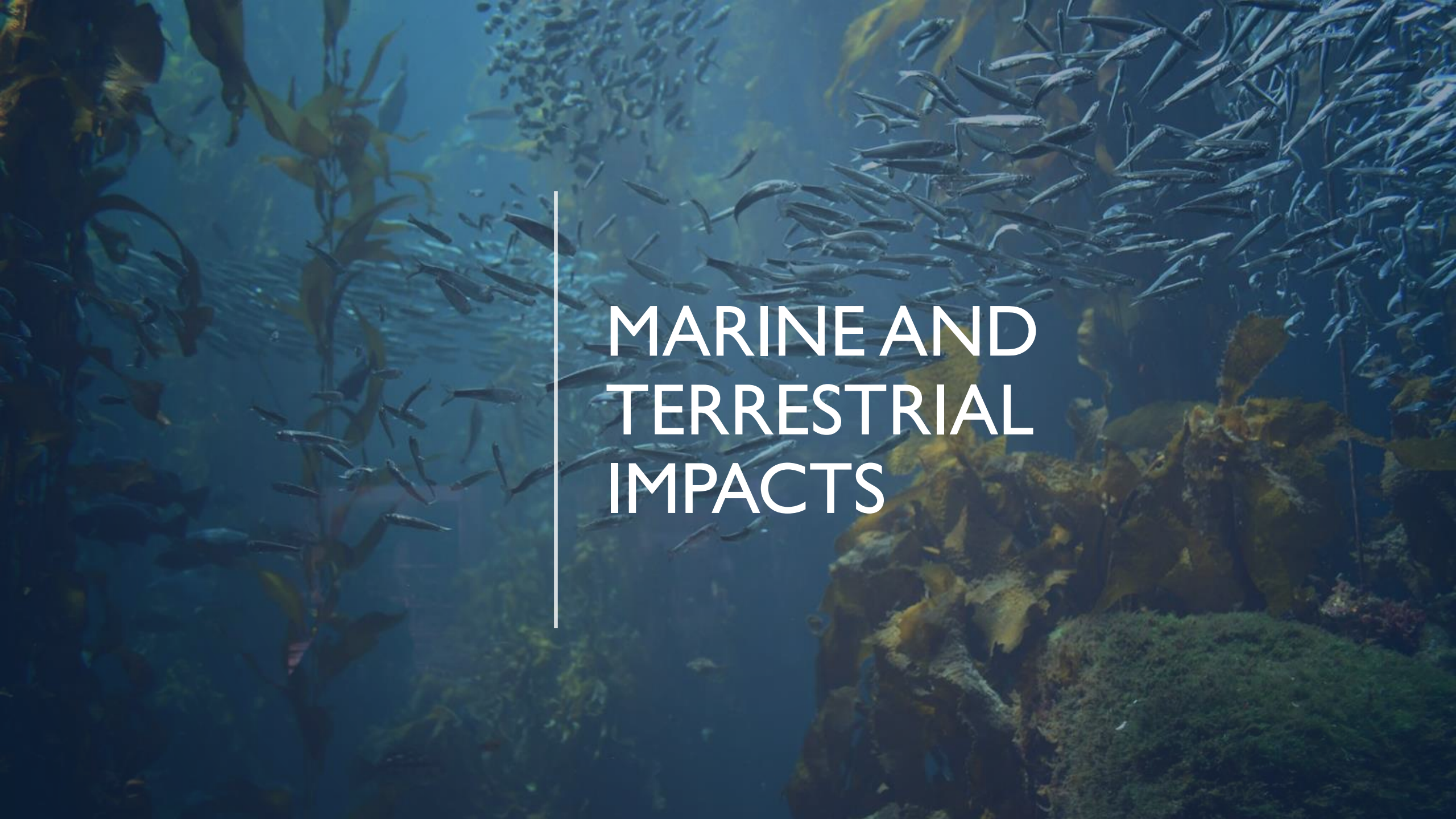


## Major Storm Events
Short, high intensity changes

## Commercial Development
Pollution, runoff & increased volume

## Sargassum
Reduced water quality, mouth blockage


## Climate Change
Drought, sea level rise, shore erosion



# MARINE AND TERRESTRIAL IMPACTS

# RELATIONSHIP BETWEEN FISH SPECIES AND RED MANGROVES

Protection from predators by way of mangrove prop roots

Provision of critical food sources such as crustaceans and algae

Active breeding grounds for commercially important fish species

Sources: (Laegdsgaard & Johnson, 2001), (Fry and Ewel, 2003;Layman, 2007), (Tobias et al., 2001;Tobias et al., 1996)

# IMPORTANT FISH SPECIES

Great Barracuda

Grunt species

Mangrove Snapper

White Mullet

**Other fish species and aquatic organisms:**

- Common snook
- Yellowfin mojarra
- Damselfishes
- Wrasses
- Ballyhoo
- Shrimp
- Lobsters
- Blue crabs
- Upside down Jellies

# COMPOUNDING STRESSORS TO GREAT POND'S FISH HABITAT

**Mangrove presence**

Appeared after Hurricane Hugo

Creates reduced temperature variability at sites with tree canopies

Decaying plant material causes decreased dissolved oxygen (DO)

**Invasive species expansion**

Tilapia introduced as part of an initiative to establish commercial and recreational fish populations (mid-1960's)

Outcompete native species for food and habitat resources

**Salinity variation**

Increases with reduced water flow through channel and decreased depth

Exasperated by droughts in 2015 and 2018

# DESIGN CONSIDERATIONS

# DESIGN OPTION 1: LARGE-SCALE SCENARIO
# RESTORE TIDAL FLUSHING

Tidal flushing is the repeated movement of water in and out of a shoreline connected body of water. It helps to remove pollutants, excess nutrients, and stagnant water, maintaining water quality and supporting biodiversity. Great Pond has historically been an open or partially open lagoon. Restoring tidal flush could involve:

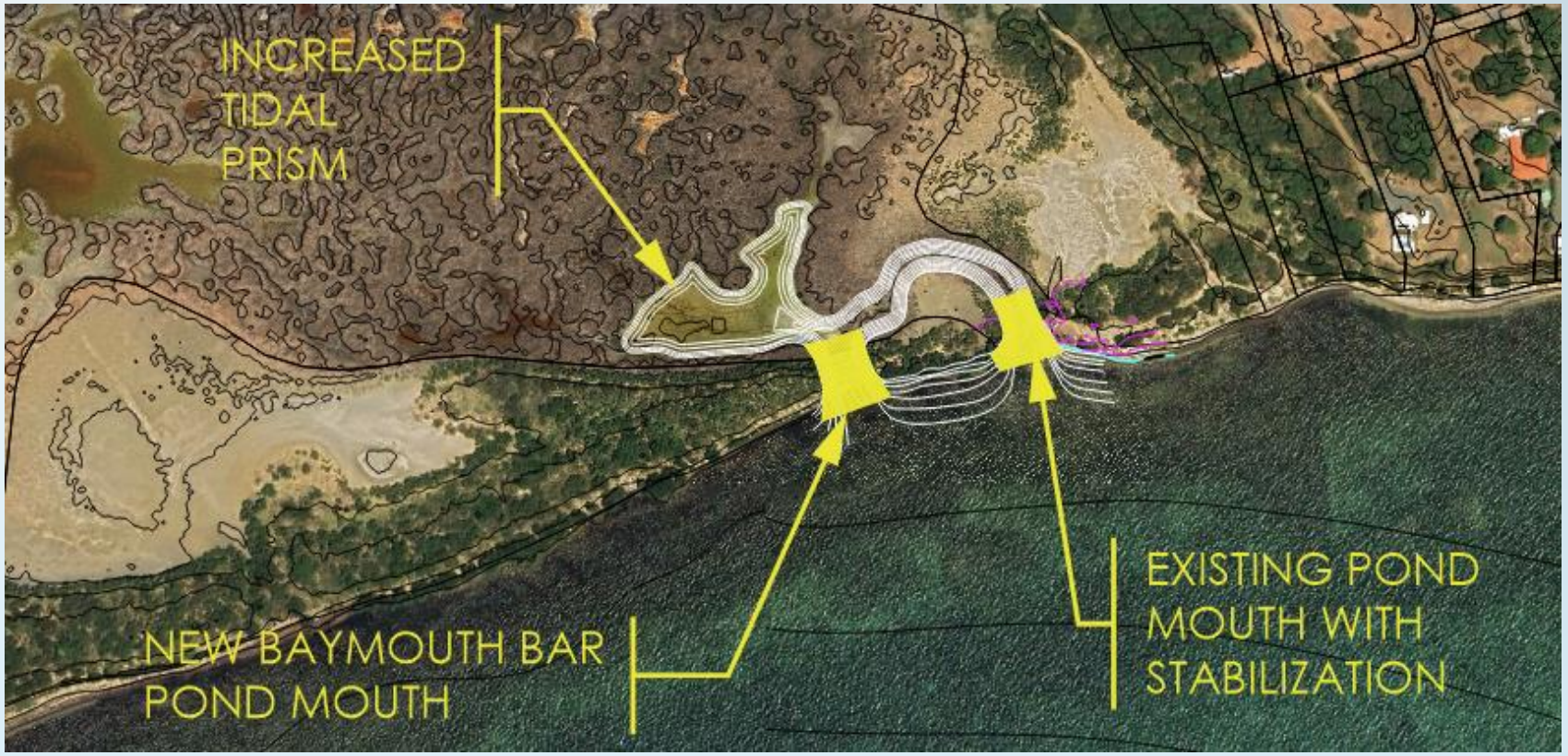
1. Clearing the mouth of the pond by removal of dead tree material, etc.
2. Evaluating sediment transport routes through Great Pond Bay
3. Reinforcing the mouth of the pond with a rock spillway such as a gabion reno mattress to maintain a stable spillway elevation over time.

# DESIGN OPTION 1: LARGE-SCALE SCENARIO
# RESTORE TIDAL FLUSHING

The primary option for restoring tidal flush to the Great Pond is through a dredging and widening of the mouth and increasing the tidal prism.

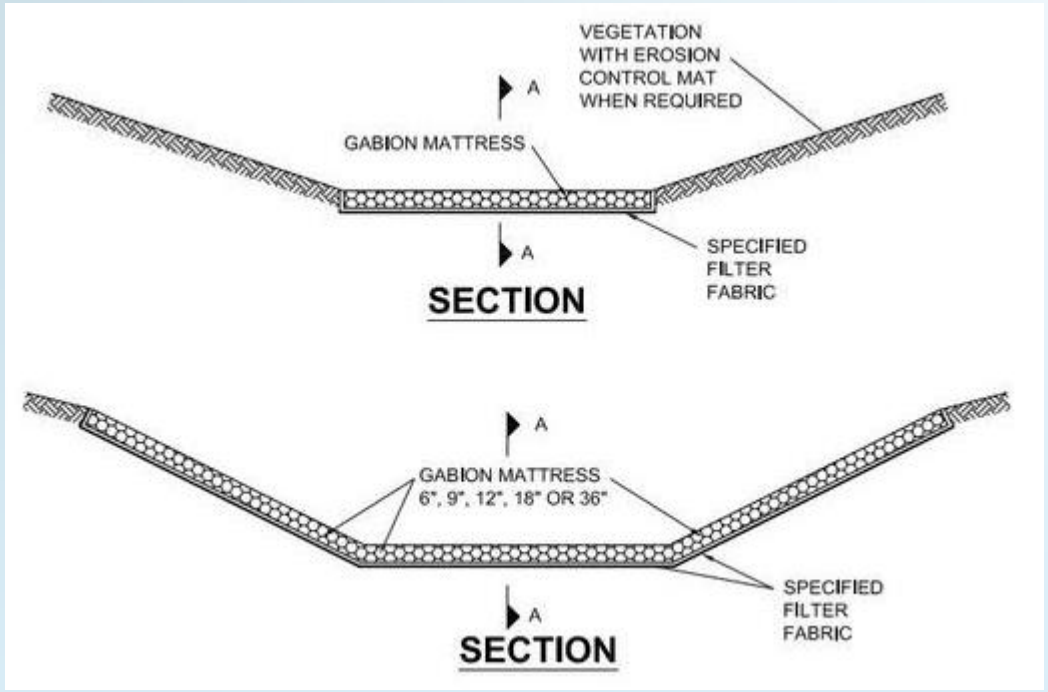
This will be accomplished by both the traditional route via the current mouth pathway, as well as dredging the baymouth bar at its most direct route.

The spillway elevation would be set at an elevation that would introduce the appropriate amount of sea water to Great Pond.



# DESIGN OPTION 1: LARGE-SCALE SCENARIO
# RESTORE TIDAL FLUSHING

Based on final hydraulic estimates, a mouth profile can be designed, along with stabilization. The solid structure spillway would be set at an elevation that would introduce an amount of sea water to Great Pond that would sustain conditions for fish nursery habitat.

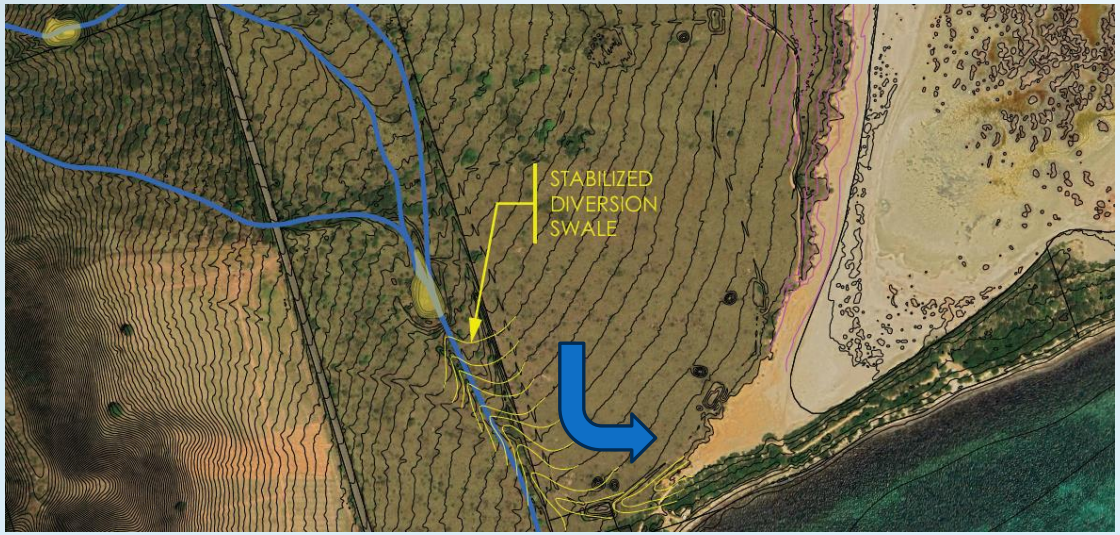



# DESIGN OPTION 2: MEDIUM-SCALE SCENARIOS
# GUT RE-ROUTING

Several medium-scale design scenarios have been evaluated for Great Pond. Taking into account the project size, cost, and complexity, there are 3 viable candidates as a potential medium-scale project.

## 1. Re-route the gut on west of great pond to great pond

Western portion of watershed drains via drainage swale directly to coast. A re-routing of this drainage swale into the Great Pond will allow for increased input of fresh water, providing better flushing and combatting hypersaline conditions.



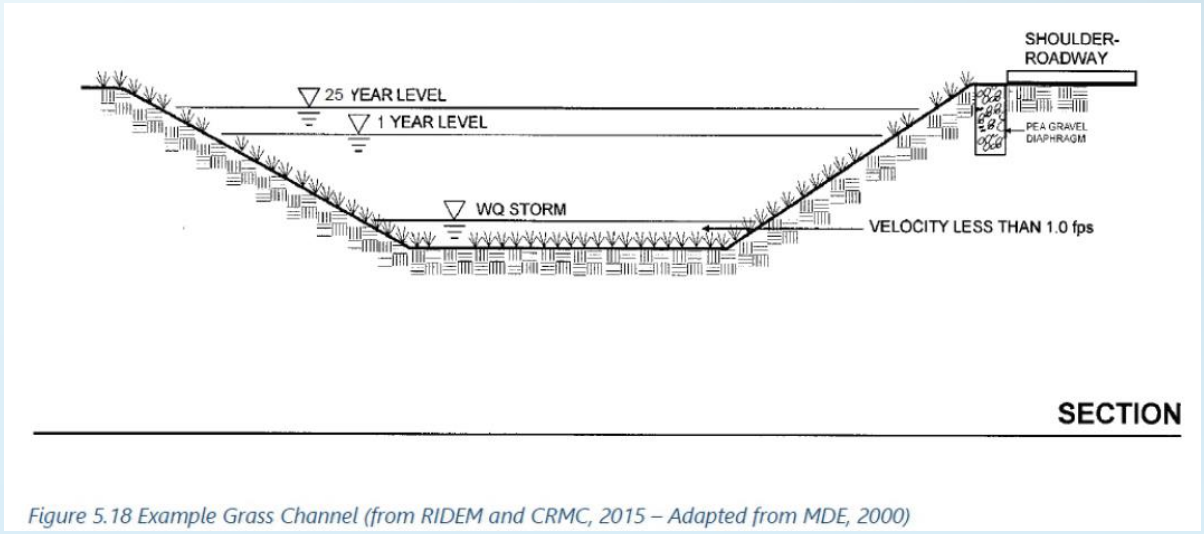




*Figure 5.18 Example Grass Channel (from RIDEM and CRMC, 2015 – Adapted from MDE, 2000)*

# DESIGN OPTION 2: MEDIUM-SCALE SCENARIOS
# VEGETATED SEDIMENT FOREBAY

2. Install a sediment forebay on the north side of Great Pond with option to plant mangroves/mangrove associates along the pond border to help with sediment trapping before entering the pond.

- Capture of both water and sediment from the primary guts traveling from the center of the watershed.
- Design allows for both capture of sediment from a large portion of the watershed and design for easier maintenance and sediment removal.

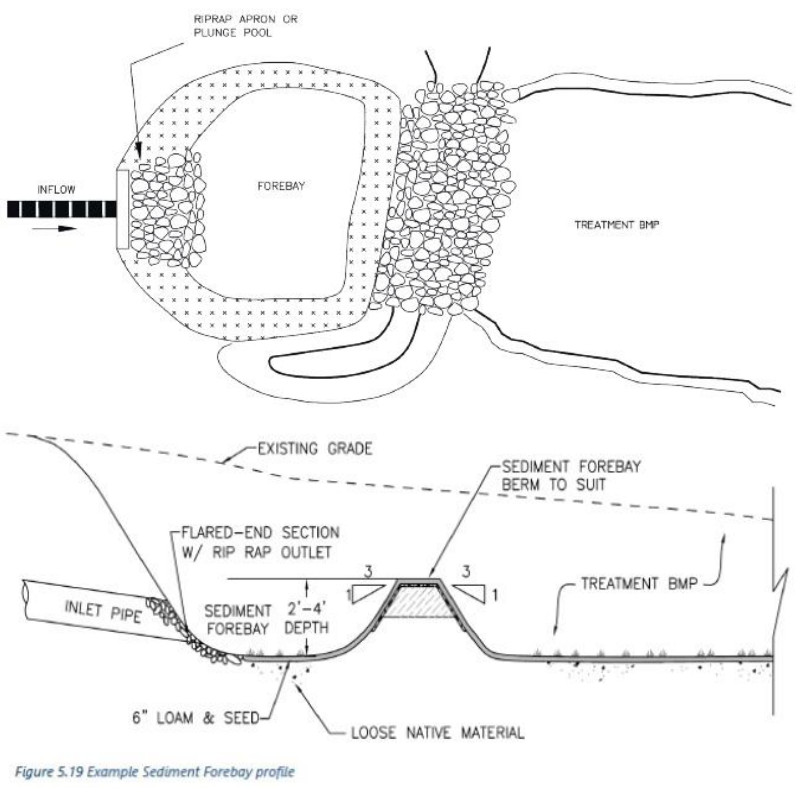
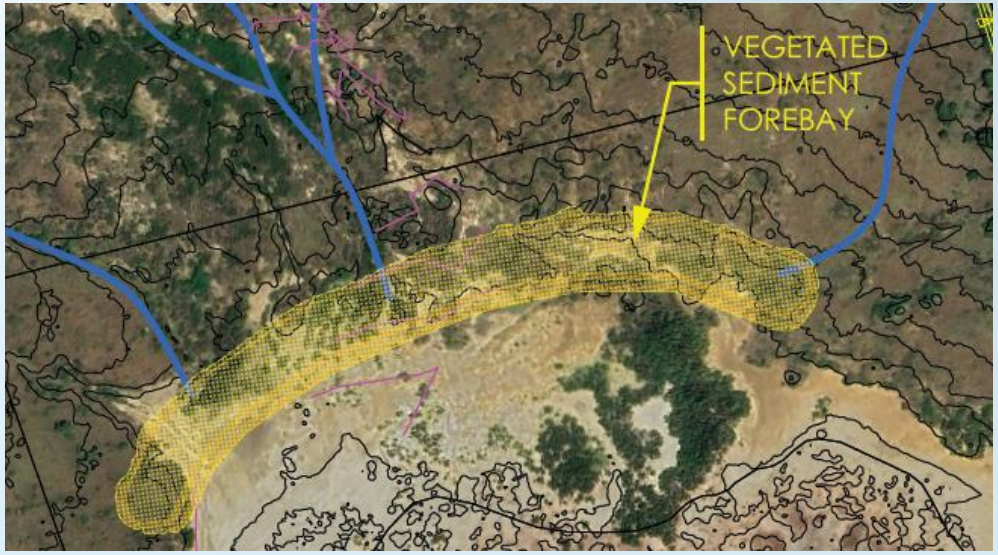


Figure 5.19 Example Sediment Forebay profile



# DESIGN OPTION 2: MEDIUM-SCALE SCENARIOS
# EASTERN SEDIMENT POND

## 3. Install a sediment pond/forebay on the East side of Great Pond to capture Union & Mt. Washington sediment runoff and water, with controlled release.

- Capture of both water and sediment from the heavily developed areas of the watershed.
- Design allows for capture of this sediment loading increase, controlled release of water, and easier maintenance.

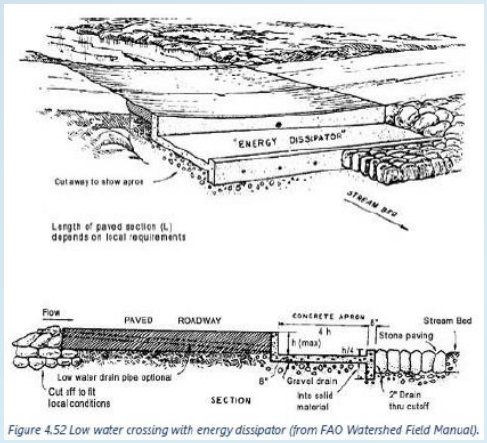
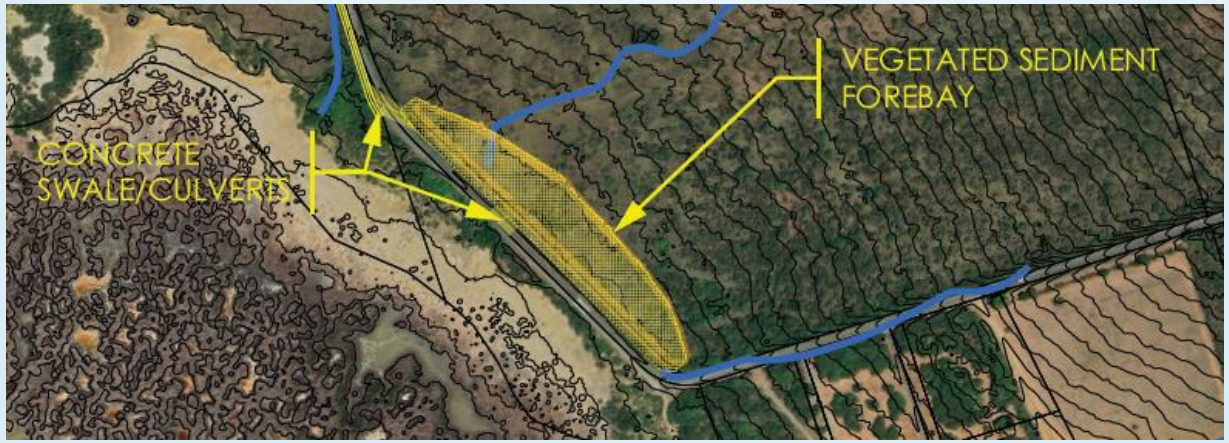


Figure 4.52 Low water crossing with energy dissipator (from FAO Watershed Field Manual).



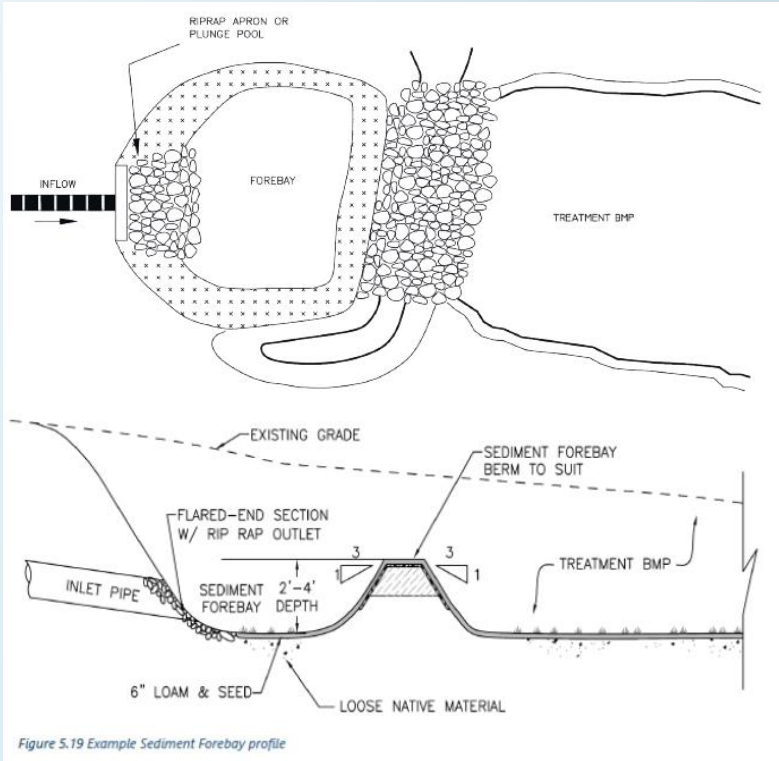



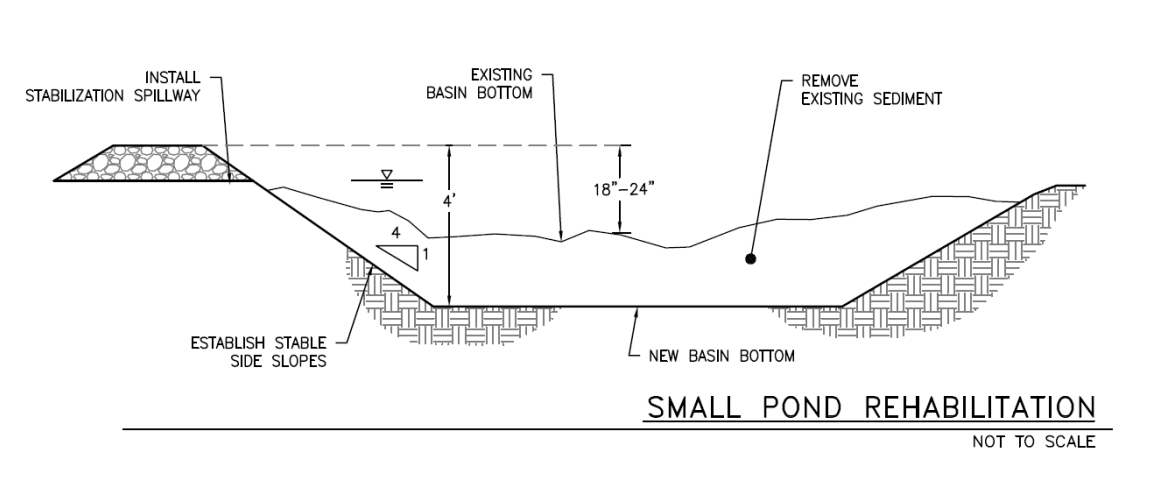
Figure 5.19 Example Sediment Forebay profile

# DESIGN OPTION 3: SMALL-SCALE SCENARIOS
# EXISTING POND REHABILITATION

There are two potential small-scale design scenarios that can provide mitigation against negative impact to Great Pond on a lower level. Low level scenarios may be easy to implement, have lower cost, or minimal concerns for greater environmental impact.

1. Rehabilitation of existing sediment retention ponds (deepen, add stabilizing rocks and riprap).

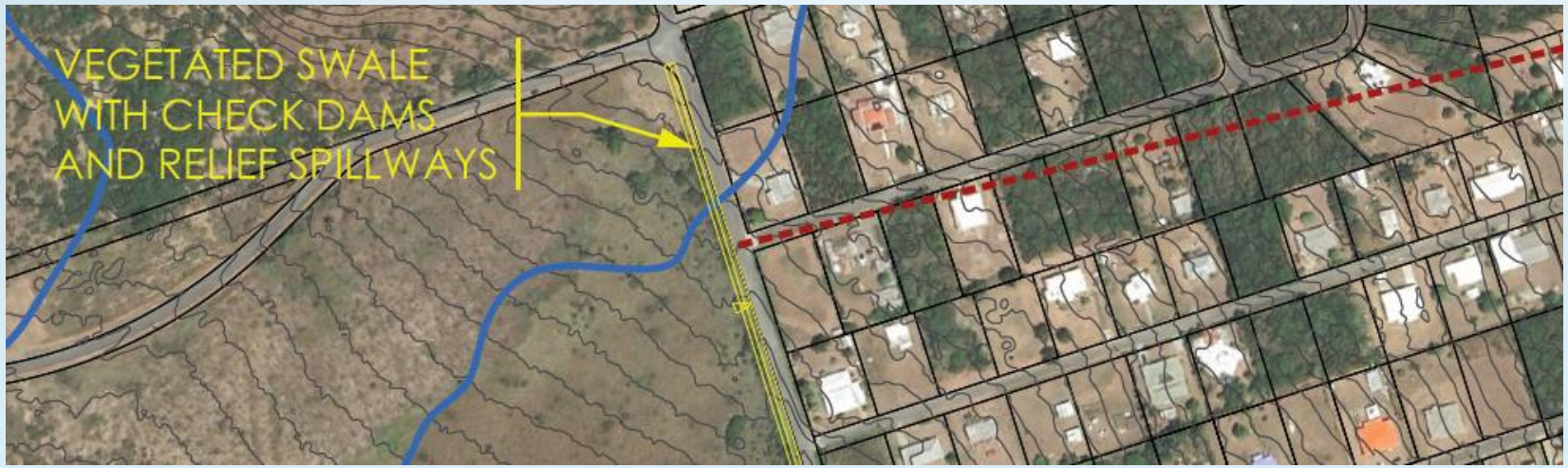
- Allows for restoration of existing management structures, with minimal changes to existing land contours.
- Some ponds may need only dredging, some could benefit from additional stabilization to improve future maintenance.

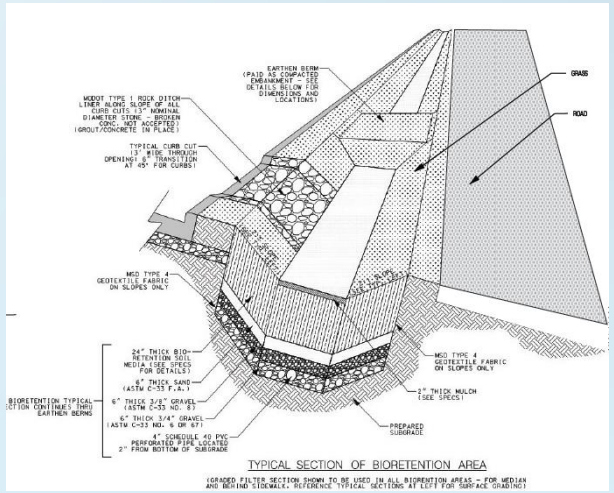



# DESIGN OPTION 3: SMALL-SCALE SCENARIOS
# ROAD DRAINAGE SWALES

## 2. Installation of drainage swale on road shoulder to direct, slow and control discharge of water to pond.

- Swales, to include check dams and routing points, will allow for slower moving water to prevent sediment transport, and improve sediment capture.
- Can be use in conjunction with previously mentioned Eastern pond/forebay to control and capture water for increased sediment retention.



# DESIGN OPTION 4: DO NOTHING SCENARIO

A final considered scenario where no design action is implemented

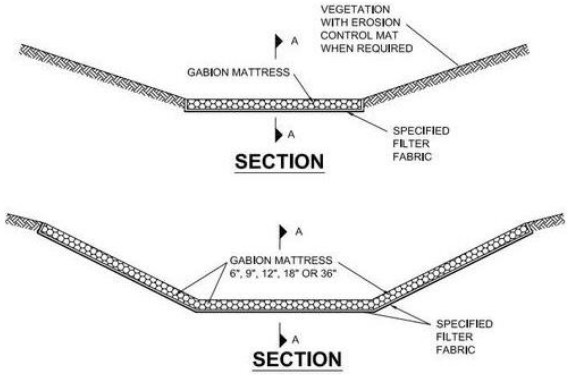
- Do nothing considers risk and challenges that come with the other design scenarios
- Weight of benefits vs. risks/challenges
- Consideration of potential future trends
- Determine if no action should be taken now, but consideration for future action, after some triggering milestone is reached
- Consideration if Great Pond has capacity to improve on its own

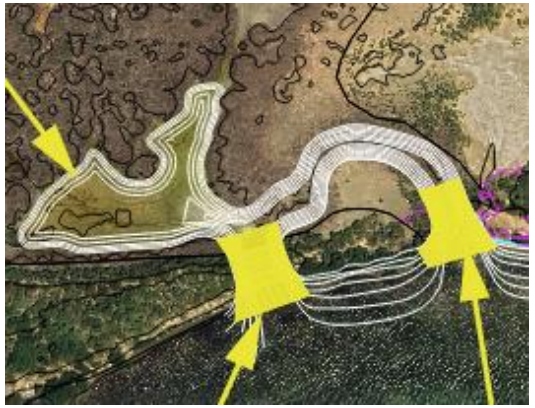
Currently opened mouth of pond after Feb. 2024 rain event

# DESIGN SCENARIOS RECAP

## 1:Large Scale

- Introduction of dredged and stabilized spillway(s) to promote tidal flushing

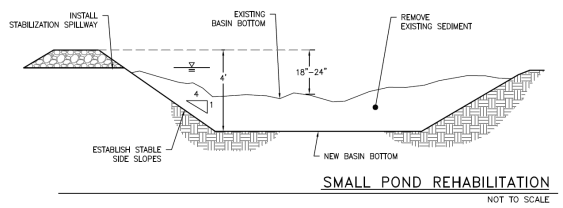


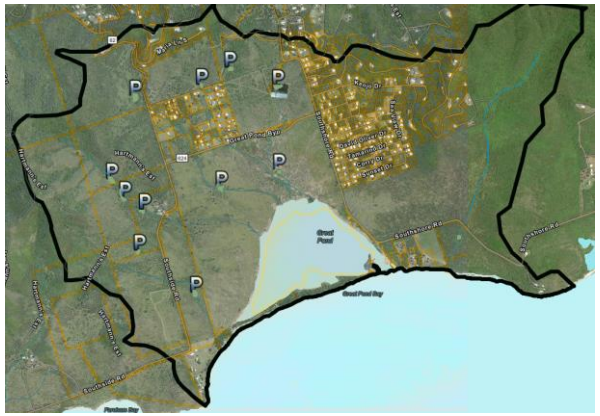



## 2: Medium Scale

- Re-route the gut on west of great pond to great pond
- Add new pond(s) to ease runoff from Union and Mount Washington, leading to sediment retention, controlled waterflow, and increased fresh water to Great Pond
- Install a sediment basin on the north side of Great Pond and plant mangroves / mangrove associates along the pond border to help with sediment trapping before entering the pond

## 3: Small Scale



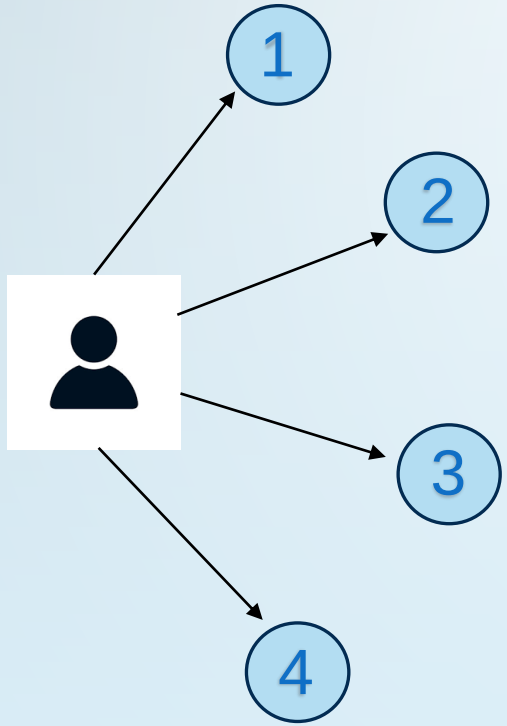
- Rehabilitation of existing sediment retention ponds (deepen, add stabilizing rocks and riprap)
- Add drainage swales/dip cuts along roads to allow water to correctly route into the pond

## 4: Do Nothing

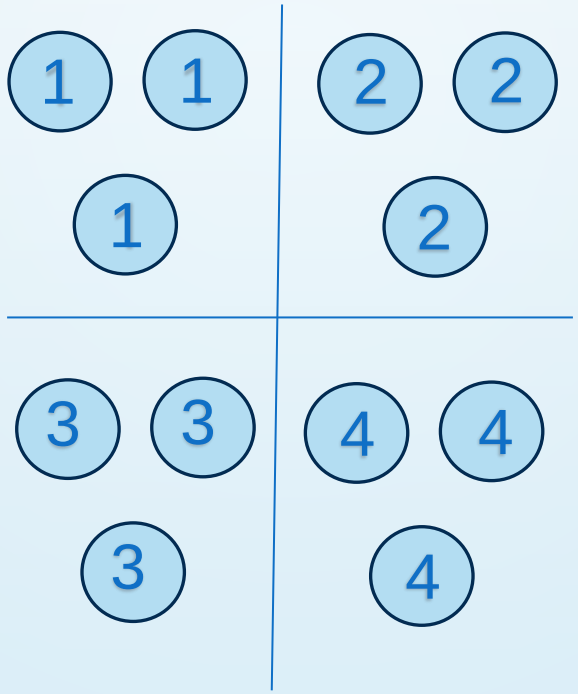
- No intervening actions to be taken
- Leave Great Pond in its current adapted ecological state

# BREAK OUT GROUP ACTIVITY INSTRUCTIONS

Count Off: Each person will get a number assignment.




Each person will divide into 4 groups based on the assigned numbers.




Activity Collaboration

# BREAK OUT GROUP ACTIVITY INSTRUCTIONS CONT'D

**Introduction:**

- Introduce yourselves/background.
- Designate a note-taker and presenter (speaker) for your group.
- Recap objectives.

**Feasibility Assessment:**

- Assess the technical, regulatory, and financial feasibility of each design concept.
- Identify potential challenges and opportunities for implementation.

**Functionality Assessment:**

- Evaluate how well each design concept meets the functional requirements of the project.
- Consider the effectiveness of proposed flow regulation infrastructure in achieving these objectives.

**Aesthetics Assessment:**

- Discuss the visual impact of each design concept on the pond and its surrounding landscape.
- Consider how the proposed solutions integrate with the natural environment and enhance the site's aesthetic appeal.
- Explore opportunities to incorporate elements of beauty and harmony into the design.

# ACTIVITY WORKSHEET EXAMPLE

## OPTION 1 ASSESSMENT

Large Scale Scenario: Restore Tidal Flushing

| FEASIBILITY: CAN THIS WORK? | FUNCTIONALITY: WHAT KEEPS THIS WORKING? | AESTHETICS: HOW SHOULD THIS LOOK? |
|---|---|---|
| 1) Technical Considerations | 1) Water Exchange | |
| 2) Regulatory Considerations | 2) Ecological Balance | |
| 3) Cost Considerations | 3) Resiliency Assurance | |
| 4) Easement Considerations | | |

Tysam Tech, LLC

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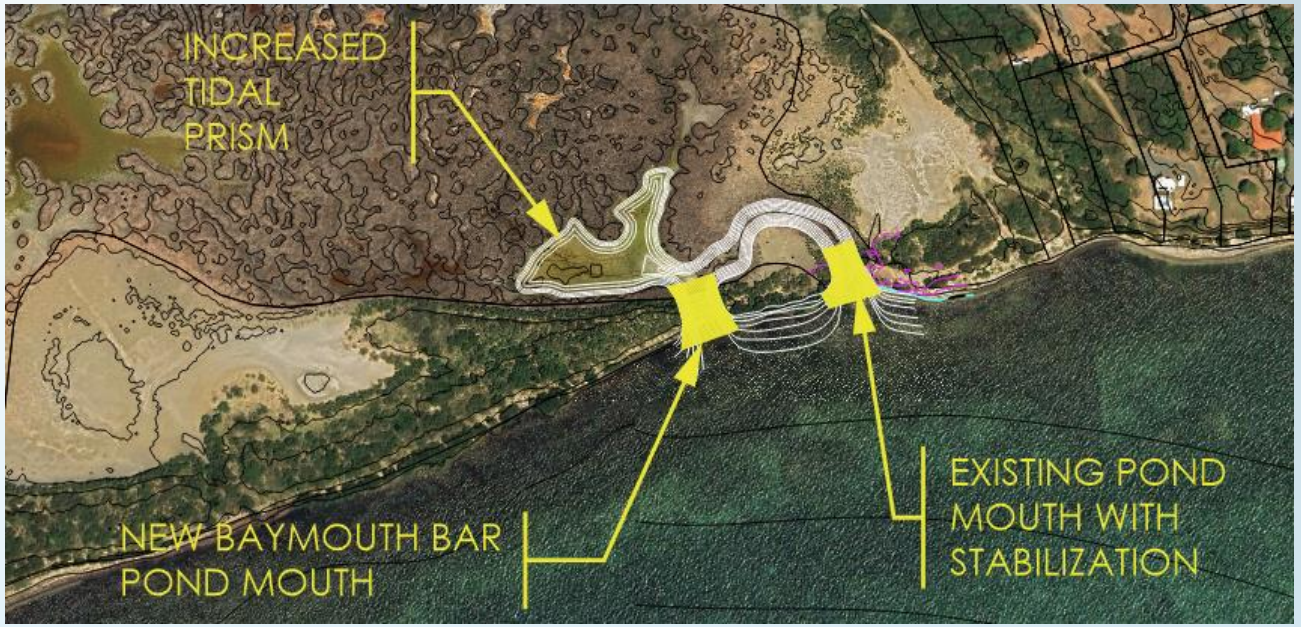


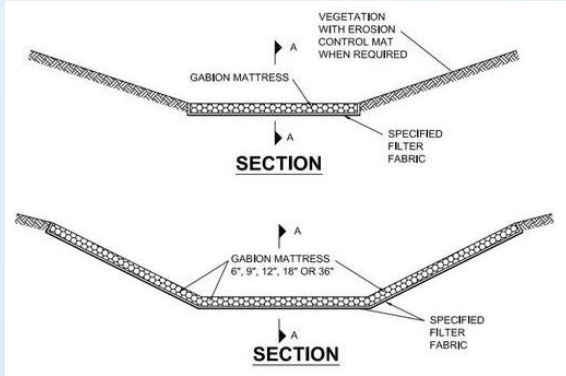


# DESIGN OPTION 2: MEDIUM-SCALE SCENARIOS
# 3 CANDIDATES

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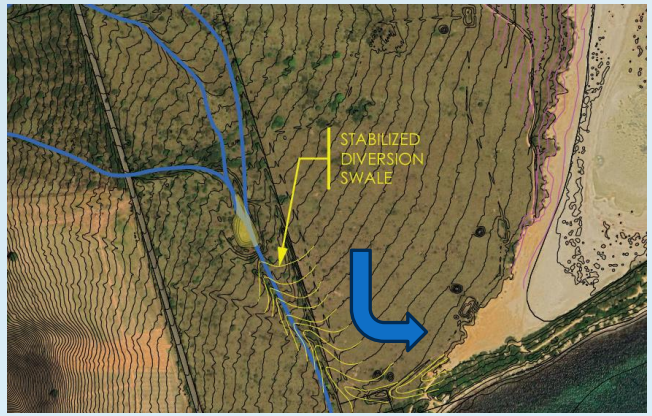


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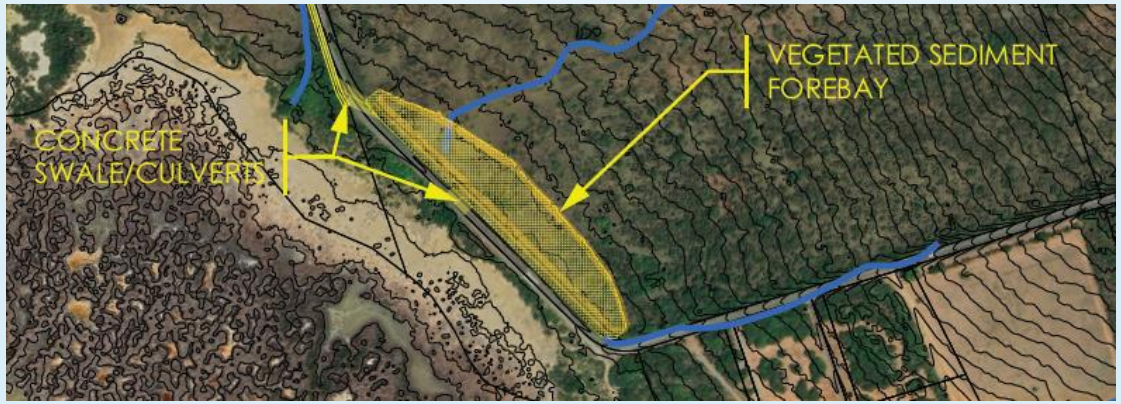


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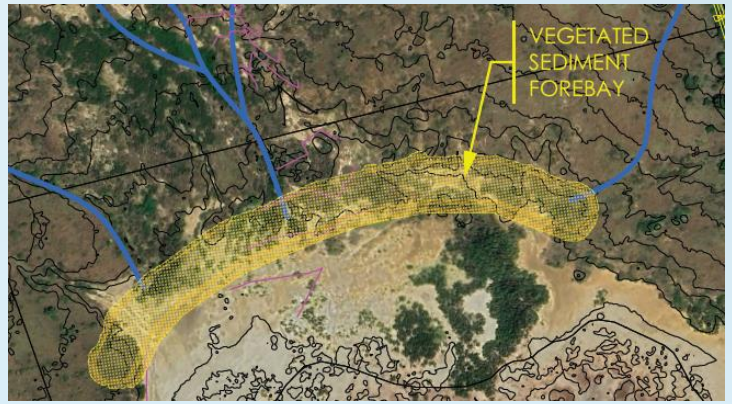

# DESIGN OPTION 3: SMALL-SCALE SCENARIOS
# 2 CANDIDATES

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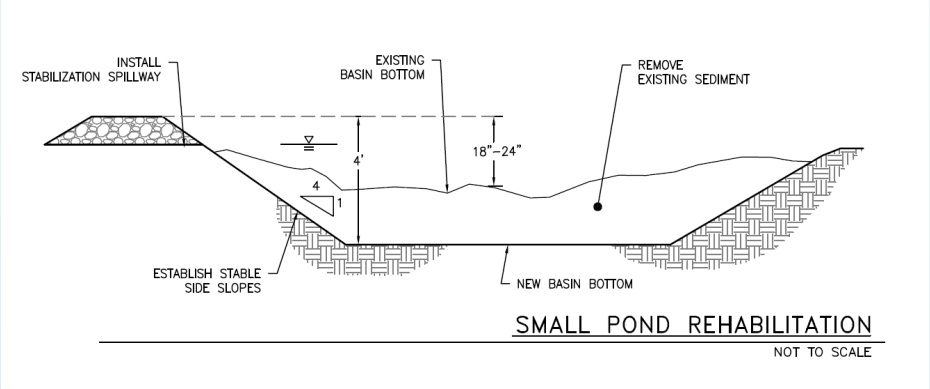


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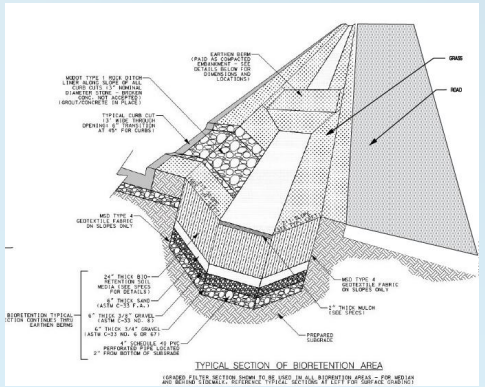

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# AGENDA: DAY 2
## March 22, 2024

| Timing | Topic |
|---|---|
| 10:00 – 10:15 am | Welcome, Introductions and Agenda |
| 10:15 – 10:45 am | Objectives, Project Overview and Engineering Design Summary |
| 10:45 – 11:15 am | Food Break |
| 11:15 – 12:00 pm | Group Discussion 1: "Large-scale Scenario" |
| 12:00 – 12:30pm | Group Discussion 2: "Medium-scale Scenario" |
| 12:30 – 12:40 pm | Break |
| 12:40 – 1:10 pm | Group Discussion 3: "Small-scale Scenario" |
| 1:10 – 1:40 pm | Group Discussion 4: "Do Nothing Scenario" |
| 1:40 – 1:50 pm | Break |
| 1:50 to 2:50 pm | Group Presentation Prep, Presentation and Voting |
| 3:25 – 3:30 pm | Closeout, Final Statements, and Charette Evaluation |

# BREAK OUT GROUP PRESENTATION INSTRUCTIONS

**Presentation Prep:**

- Review activity sheets.
- Confirm all group members' thoughts are considered.

**Final Presentation:**

- Each group will present on the design option correlating to their group number to the larger group.
- The other groups will provide input and feedback not captured by the presenting group.

# GROUP VOTING (BY SHOW OF HANDS)

# GREAT POND CHARRETTE

## FEBRUARY
*KICK-OFF MEETING*

Public kick-off meeting
@ UVI Great Hall
-February 28, 2024

## FEB-MAR
*PLANNING*

Incorporation of public comments and concerns into a design approach.

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@ UVI Medical Simulation Center - Dining Hall
March 21, 2024 3:30pm - 8:30pm
March 22, 2024 10:00am - 3:00pm

## APRIL
*SOCIAL EVENT*

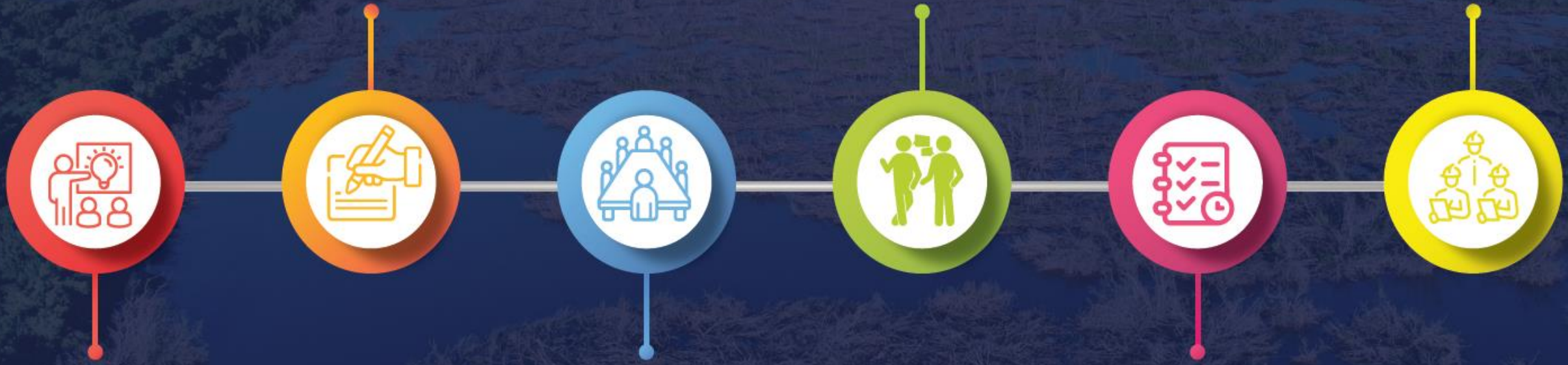
Documentation of interviews and testimonials for Social Event
@ DPNR-EEMP/Great Pond
-April 12, 2024 4:30pm - 7:00pm

## APRIL
*RESTORATION ACTION PLAN*

Incorporate all tech surveys, documents, and stakeholder input to choose engineering design options for creation of Restoration Action Plan (RAP).

## APRIL-MAY
*ENGINEERING*

Engineering Team finalizes design of proposed solutions. Preparation of design drawings to show project scope & prepare for permits.



Thank you for your time.

We welcome your feedback.
Please fill out an evaluation form.