

An aerial photograph of a fjord, showing a narrow body of water between steep, forested hills. A road runs along the shoreline, and a small island is visible in the distance. The image is overlaid with a dark teal color.

# SHORELINE TRAIL CONCEPT DESIGN

## HUDSON HIGHLANDS FJORD TRAIL

March 11, 2024



# TEAM

The ARUP logo consists of the word "ARUP" in a bold, red, serif typeface.

**Matt Carter**, PE PEng CEng  
Principal in charge  
Bridges

**Sherazad Mehta**, PE  
Project Manager  
Associate Principal | Civil

**Chi Chi Truong**, PE, LEED Green Assoc.  
Deputy Project Manager  
Senior Engineer | Civil

**Eric Brunning**, PE  
Lead Engineer | Structure

**Robert Acker**, PE  
Lead Engineer | Coastal

**Dominic Medel**, PE  
Lead Engineer | Geotech

**Sonja Hartmann**, PE  
Lead Engineer | Civil

The SCAPE logo features the word "SCAPE" in a bold, teal, sans-serif font.

**Kate Orff**, RLA, FASLA  
Principal  
Landscape Architecture

**Gena Wirth**, RLA  
Principal in charge  
Landscape Architecture

**Brad Howe**, RLA  
Design Director  
Landscape Architecture

The SLR logo includes a stylized green asterisk icon to the left of the letters "SLR" in a bold, green, sans-serif font.

**Mark Carabetta**, PWS, CFM  
Principal Environmental Scientist  
Ecologist



BREAKNECK RIDGE

SUGAR LOAF MOUNTAIN

HUDSON HIGHLANDS STATE PARK

COLD SPRING

MT. TAURUS QUARRY

P

BREAKNECK POINT

BREAKNECK RIDGE TRAIL

P

CORNISH ESTATE TRAIL

WASHBURN TRAIL

LITTLE STONY POINT

DOCKSIDE PARK

~2 miles of main trail

HUDSON RIVER

STORM KING MOUNTAIN

MN

# NORTH OF LITTLE STONY POINT

BREAKNECK RIDGE

LOWER OVERLOOK



# DOCKSIDE (SOUTH OF LITTLE STONY POINT)

DOCKSIDE PARK

CAUSEWAY



**TRAIL MUST BE MIN 25' AWAY FROM  
CENTERLINE OF SOUTHBOUND TRACK**

APPROX. LOW TIDE

APPROX. HIGH TIDE

**TOP OF RIVERBANK**



# LOOKING SOUTH TOWARD LITTLE STONY POINT

TRAIL MUST BE MIN 25' AWAY FROM CENTERLINE OF SOUTHBOUND TRACK

SAVE MATURE TREES WHERE POSSIBLE

TOP OF RIVERBANK

AREA OF AT GRADE TRAIL





An aerial photograph of a river valley, showing a winding road along the riverbank and forested hills in the background. The image is overlaid with a dark teal color and white text.

**TRAIL FIRST APPROACH (ACCESSIBLE, RESILIENT, COST-EFFECTIVE DESIGN)**

**AVOID ECOLOGICAL IMPACTS, CREATE NEW ECOLOGICAL OPPORTUNITIES**

**PROVIDE NEW WATER ACCESS POINTS & RIVER-BASED EXPERIENCES**

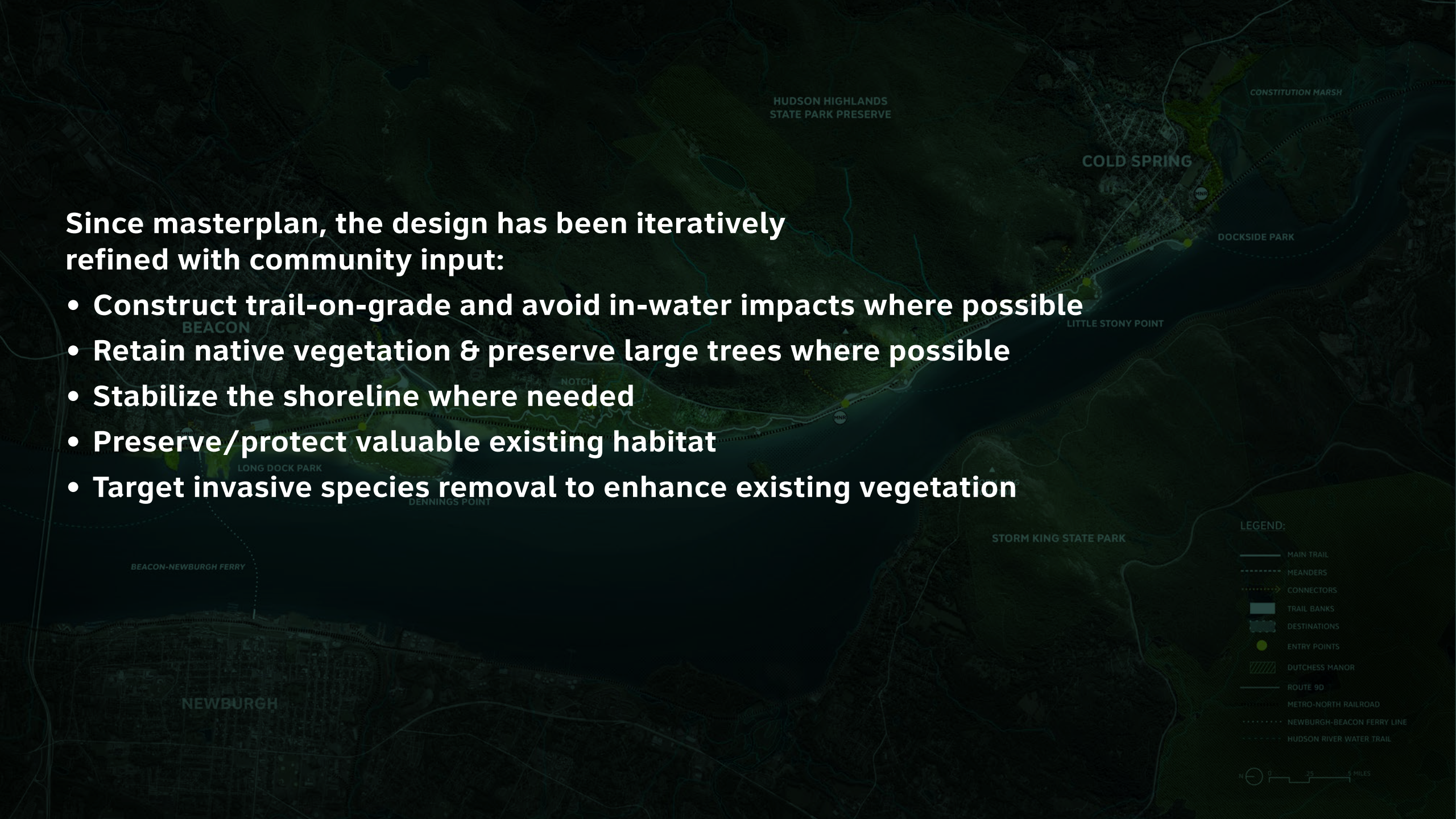
**CREATE MOMENTS OF REST TO APPRECIATE THE LANDSCAPE**

**USE CONSISTENT, SIMPLE, AND DURABLE MATERIALS (IN-LINE WITH THE MASTER PLAN VISION)**

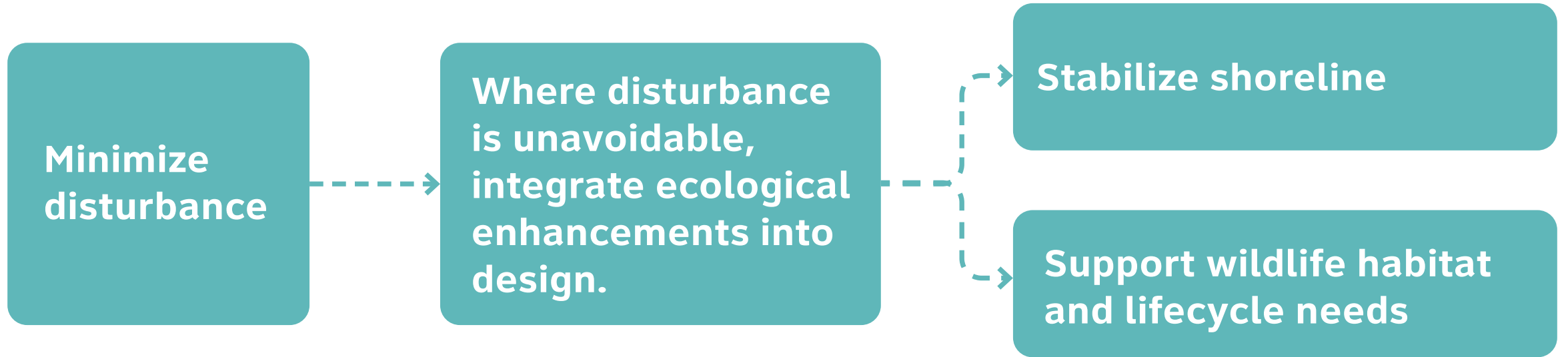


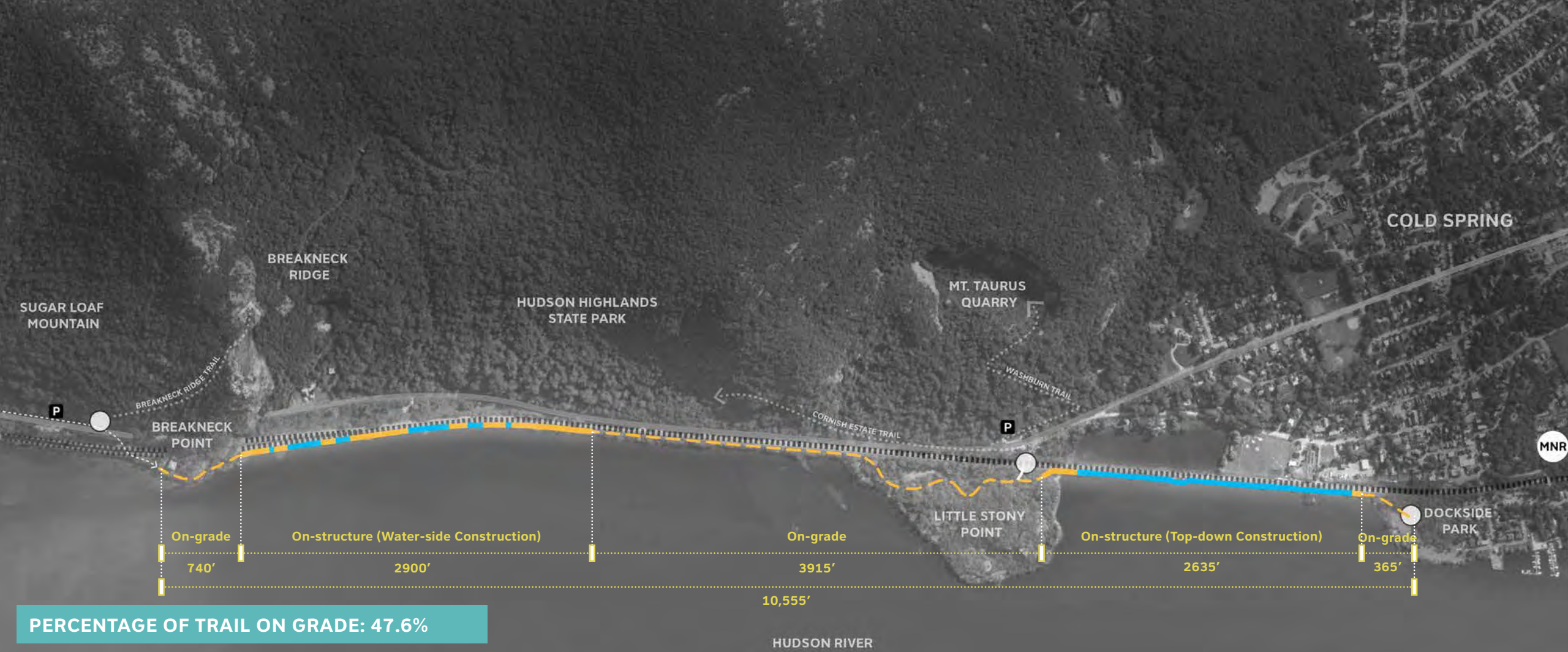
Since masterplan, the design has been iteratively refined with community input:

- Construct trail-on-grade and avoid in-water impacts where possible
- Retain native vegetation & preserve large trees where possible
- Stabilize the shoreline where needed
- Preserve/protect valuable existing habitat
- Target invasive species removal to enhance existing vegetation



# ECOLOGICAL PRINCIPLES





**LEGEND**

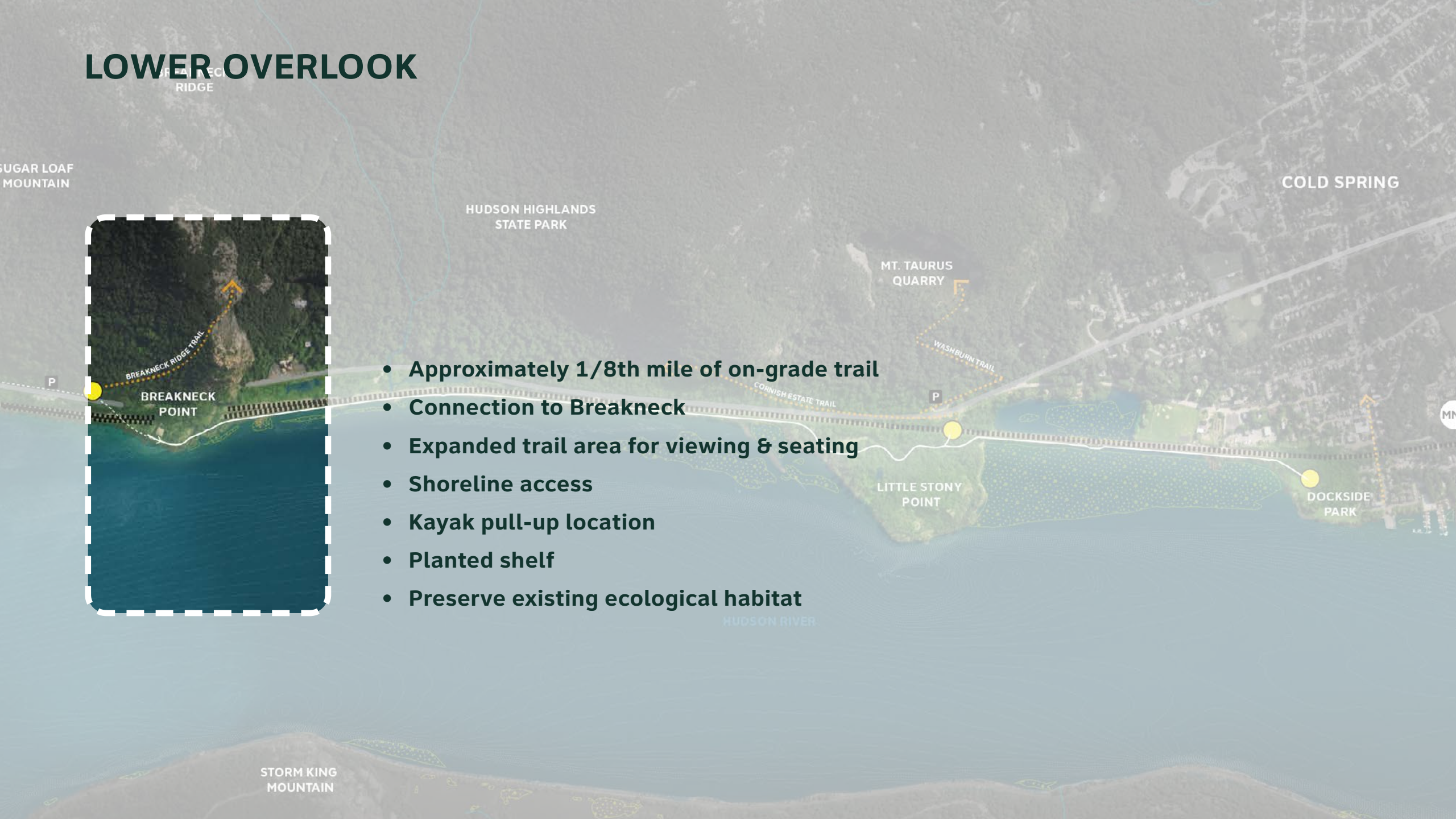
- SHORELINE TRAIL
- - - BREAKNECK CONNECTOR
- · · · · CONNECTOR TRAILS
- ACCESS POINTS
- ▬ ROUTE 9D
- ▬ METRO - NORTH RAIL
- - - ON GRADE
- ▬ ON STRUCTURE
- ▬ ON STRUCTURE WITH PILES BELOW MHHW



# LOWER OVERLOOK



- **Approximately 1/8th mile of on-grade trail**
- **Connection to Breakneck**
- **Expanded trail area for viewing & seating**
- **Shoreline access**
- **Kayak pull-up location**
- **Planted shelf**
- **Preserve existing ecological habitat**



PLANTED SHELF

SEATING

APPROX. HIGH TIDE

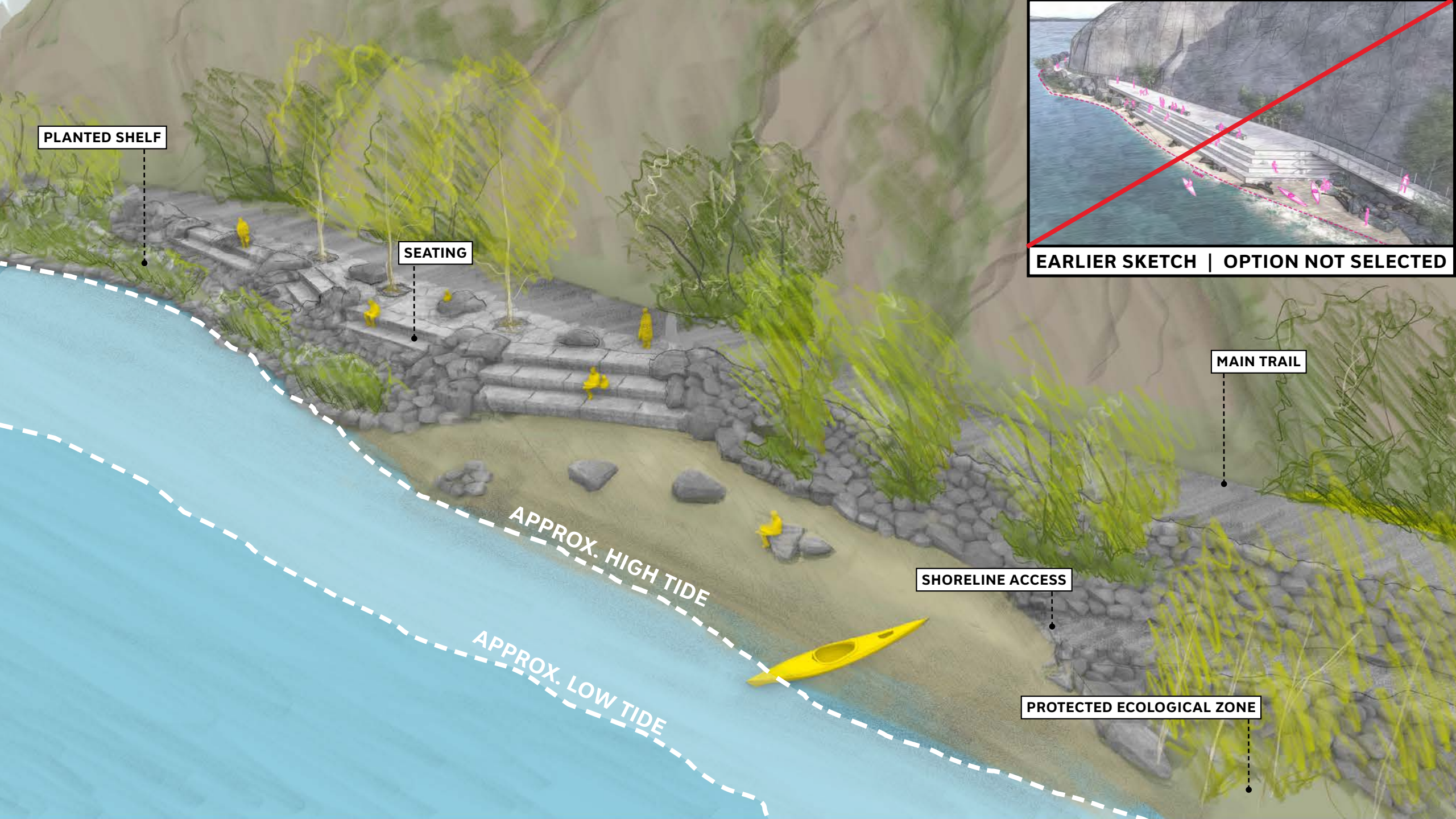
APPROX. LOW TIDE

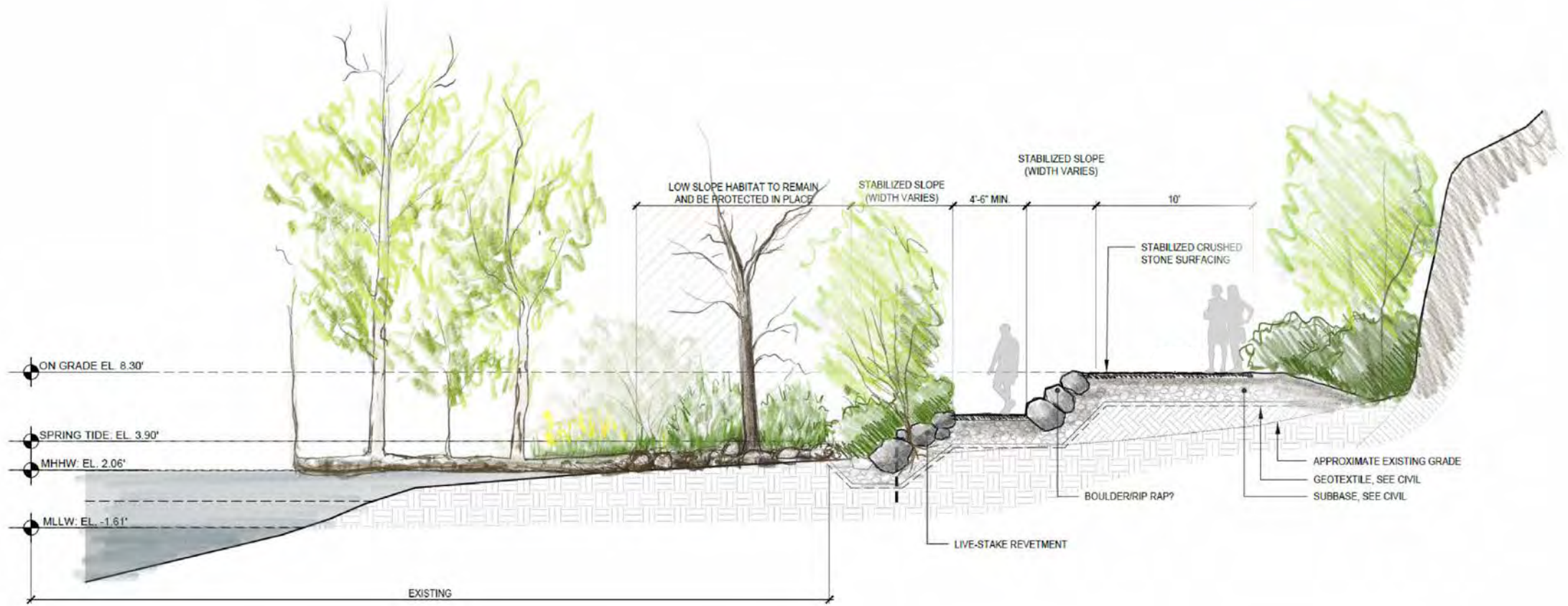
SHORELINE ACCESS

PROTECTED ECOLOGICAL ZONE

MAIN TRAIL

EARLIER SKETCH | OPTION NOT SELECTED







# ON-STRUCTURE TRAIL - NORTH



- Approximately 0.5 mile of trail on mono-pile structure
- Water-side Construction, 70 spans, ~50' span length
- Approximately 5' above MNR tracks
- 45% of piles are in the intertidal zone
- Overlook Trail bank at existing widened shoreline



# ON-STRUCTURE

PRE-CAST CONCRETE PLANK OPTION SHOWN W/ RAILING & FENCE



# PRE-CAST CONCRETE PLANKS vs. GLULAM TIMBER DECK



## PRECAST CONCRETE PLANKS

*Selected during Master Plan design process*

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- Higher upfront costs

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- Less maintenance over time

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- Aligns with Master Plan material palettes

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- 50+ year lifespan, panels are not easily replaceable due to weight

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- Resilient to flood events and can withstand sustained floodwaters

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- Meets accessibility standards

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- May not actually have higher embodied carbon than glulam - study ongoing



## GLULAM TIMBER DECK

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- Less upfront costs

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- Likely to require more maintenance over time

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- Same material as Breakneck Bridge and elevated trail

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- Approx. 25 year lifespan, panels easier to replace

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- Resilient to flood events but cannot withstand long periods of sustained flooding

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- Meets accessibility standards

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- May have similar embodied carbon (in the lifespan of the project) as concrete - study ongoing

# ON-STRUCTURE FENCE

STEEL CABLE MESH



**STEEL CABLE MESH FENCE**



**CHAIN LINK FENCE**

# ON-STRUCTURE OVERLOOK



# BEFORE TRANSITION



**AFTER**  
TRANSITION

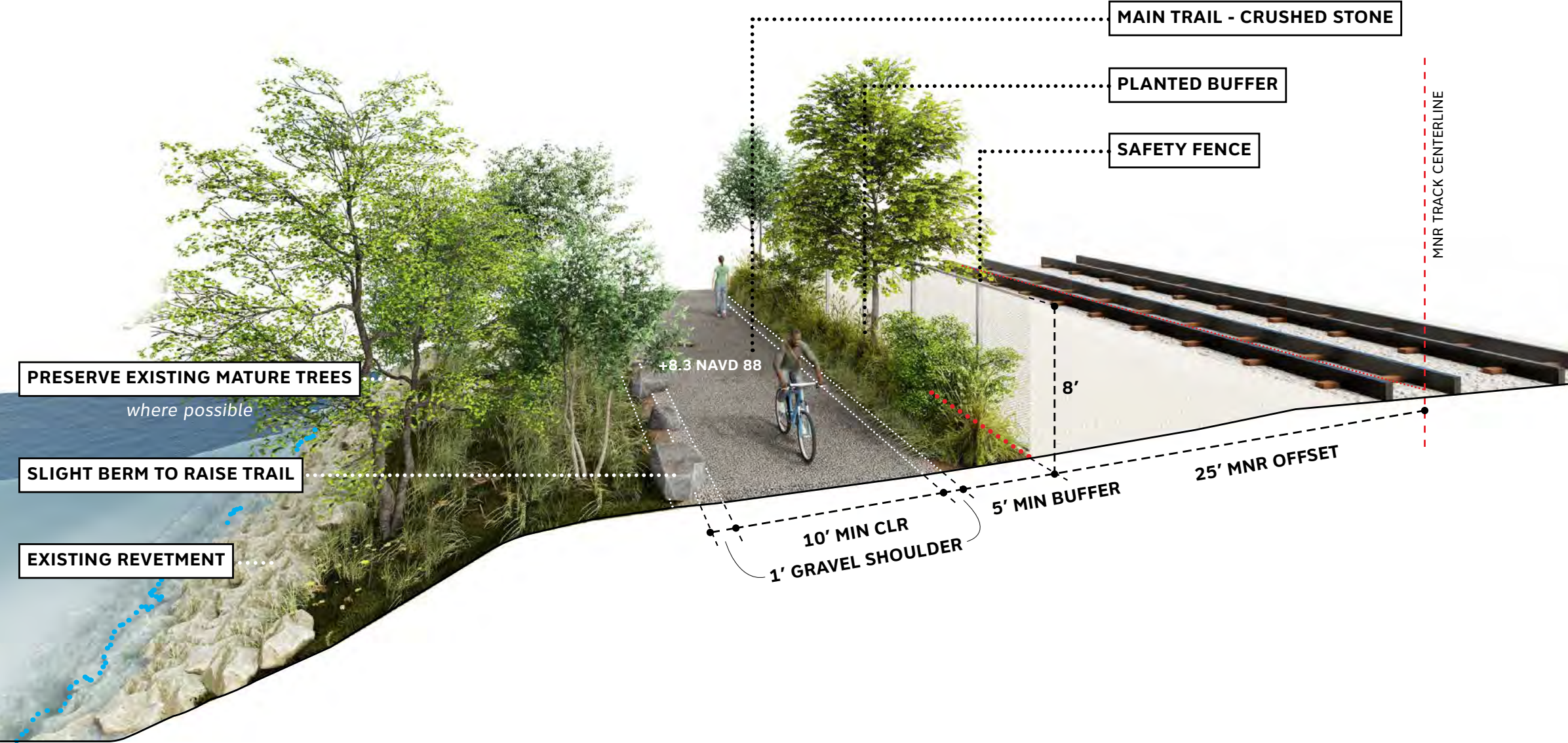


# ON-GRADE TRAIL



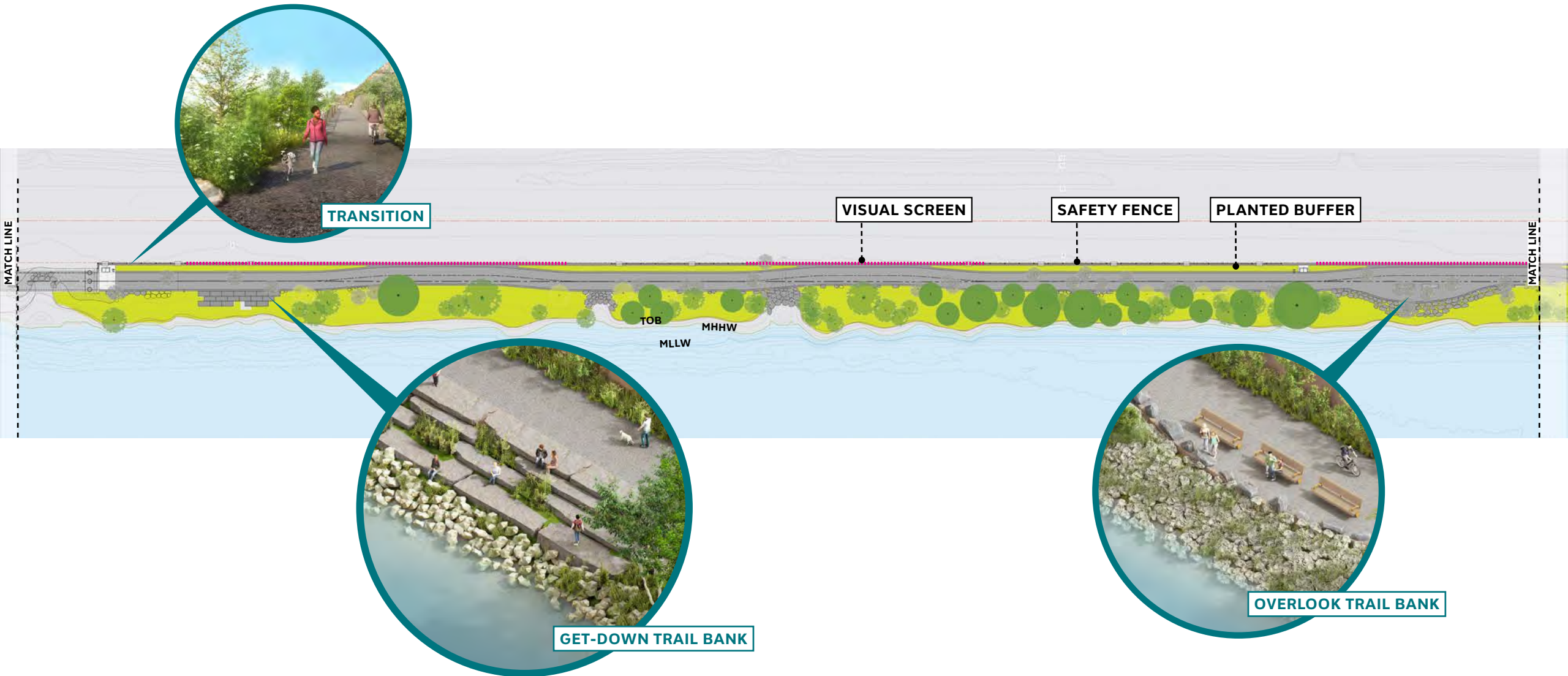
- Approx. 3/4 mile of on-grade trail
- 10' wide
- (3) Trail banks provide moments of rest and opportunities to be close to water
- Accessible pathway through Little Stony Point

# ON-GRADE TRAIL













# ON-GRADE TRAIL



## LEGEND

-  MAIN TRAIL
-  PLANTED BUFFER
-  MNR SECURITY FENCE
-  TREE TO BE REMOVED
-  TREE TO REMAIN
-  TREE WITHIN 6' OF PATH EDGE
-  SPECIALTY FENCE / COMFORT SCREENING
-  AVOIDED TREE REMOVALS

**TOB:** Top of River Bank  
**MHHW:** Mean Higher High Water  
**MLLW:** Mean Lower Low Water

# ON-GRADE CONDITIONS



# ON-GRADE | ALTERNATE OPTION - NO VISUAL SCREENING FENCE



# BEFORE

BREAKNECK RIDGE .....●

METRO-NORTH RAILROAD

ROUTE 9D

LITTLE STONY POINT .....●



# AFTER

LOWER OVERLOOK .....●  
BREAKNECK RIDGE

GET-DOWN .....●

VIEW OVERLOOK .....●

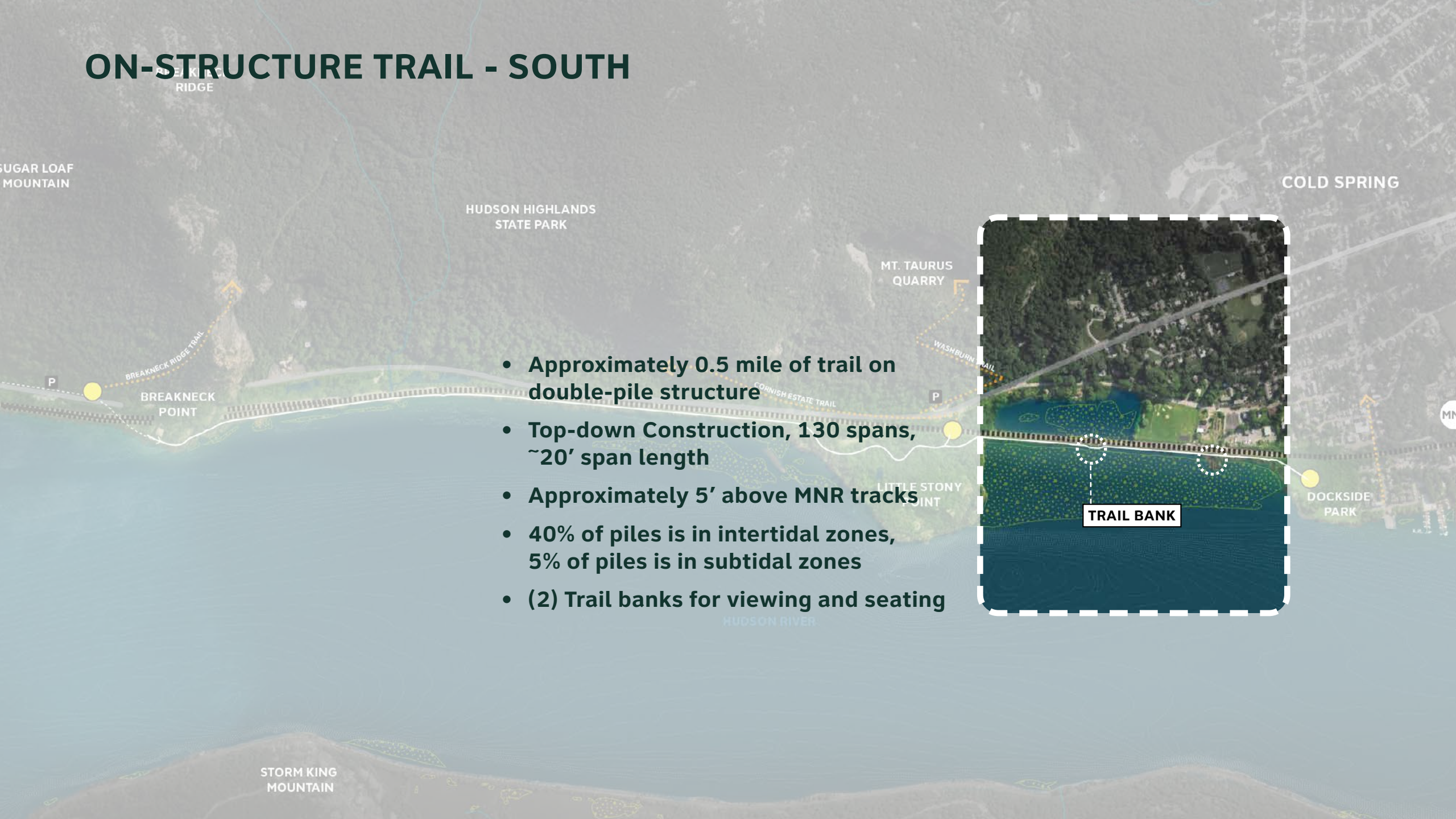
GET-DOWN .....●

LITTLE STONY POINT .....●

METRO-NORTH RAILROAD

ROUTE 9D

# ON-STRUCTURE TRAIL - SOUTH



- **Approximately 0.5 mile of trail on double-pile structure**
- **Top-down Construction, 130 spans, ~20' span length**
- **Approximately 5' above MNR tracks**
- **40% of piles is in intertidal zones, 5% of piles is in subtidal zones**
- **(2) Trail banks for viewing and seating**



# SOUTHERN ON-STRUCTURE TRAIL

- Top down construction
- Small scale construction equipment working incrementally
- Double pile structure to provide stability for equipment
- Smaller piles



# CAUSEWAY TRAIL BANK

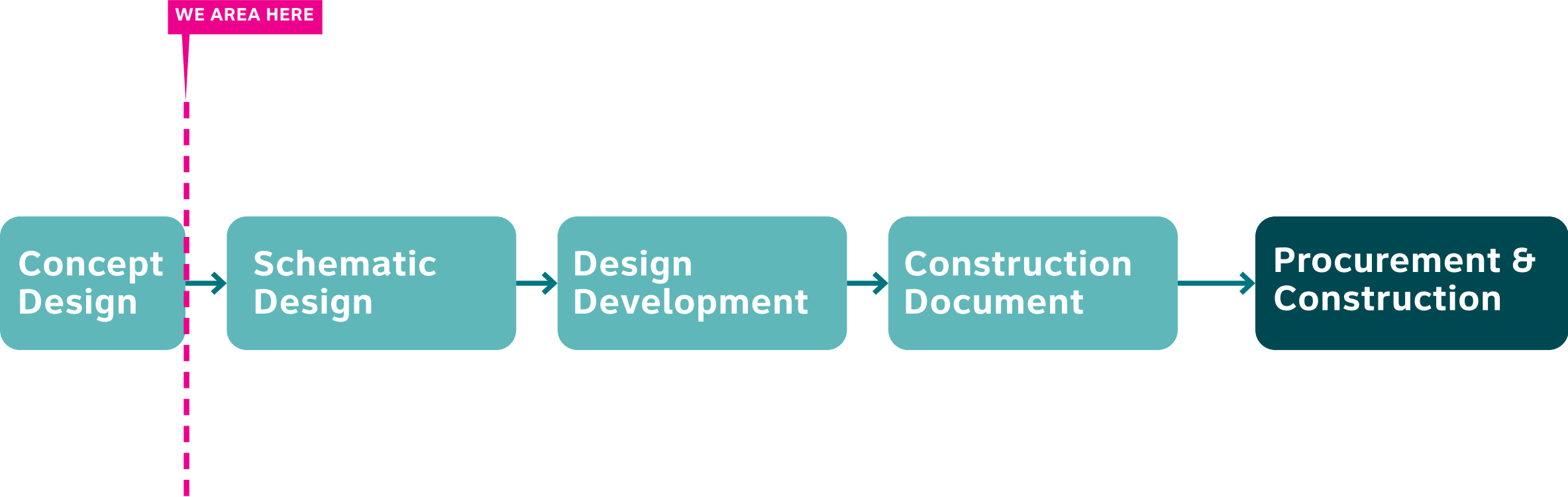




# DOCKSIDE LAND SPIT



# NEXT STEPS

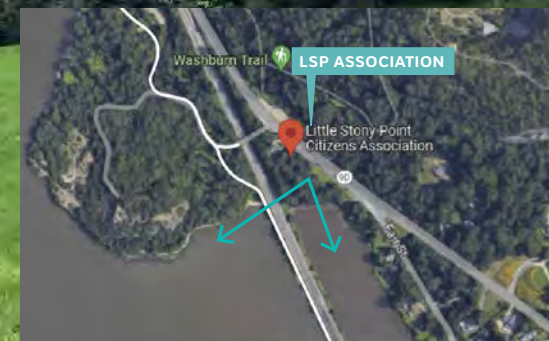




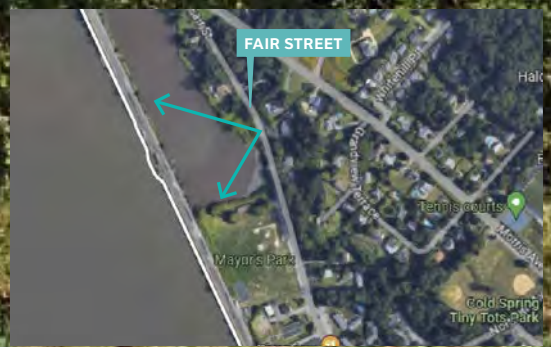
# QUESTIONS & ANSWERS

**What will the Shoreline trail  
look like from the Village?**

# VIEW FROM LITTLE STONY POINT LAWN



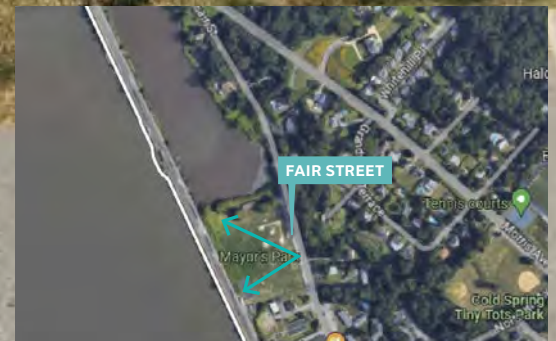
# VIEW FROM FAIR STREET



# VIEW FROM FAIR STREET AT MAYOR'S PARK



# VIEW FROM FAIR STREET AT MAYOR'S PARK





## **How much of the Shoreline trail is in the river?**

### **North Shoreline**

**55% of piles are placed above the water line**

**45% of piles are in the intertidal zone**

### **South Shoreline**

**55% of piles are placed above the water line**

**40% of piles are in the intertidal zone**

**5% of all piles are consistently submerged (subtidal)**

**How high off the ground is the Shoreline trail when it is on-structure?**

**The on-structure trail is approximately 5' above the Metro North Rail track**

**How long will construction take  
and will it be constant?**



BREAKNECK RIDGE

SUGAR LOAF MOUNTAIN

HUDSON HIGHLANDS STATE PARK

COLD SPRING

MT. TAURUS QUARRY

BREAKNECK RIDGE TRAIL

P

BREAKNECK POINT

P

CORNISH ESTATE TRAIL

WASHBURN TRAIL

LITTLE STONY POINT

DOCKSIDE PARK

SHORELINE NORTH | WATERSIDE CONSTRUCTION

(5 seasons)

SHORELINE SOUTH | TOP-DOWN CONSTRUCTION

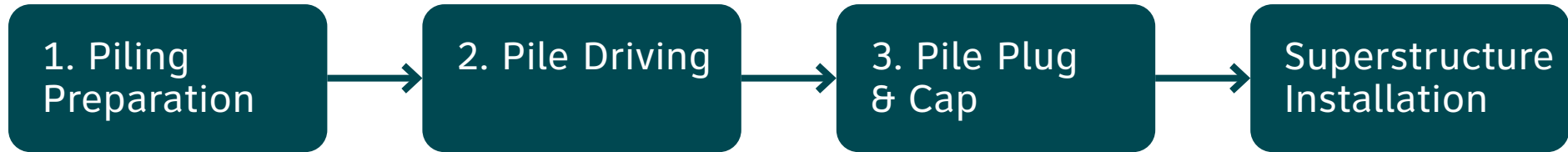
(6 seasons)

HUDSON RIVER

STORM KING MOUNTAIN

# CONSTRUCTION LOGISTICS

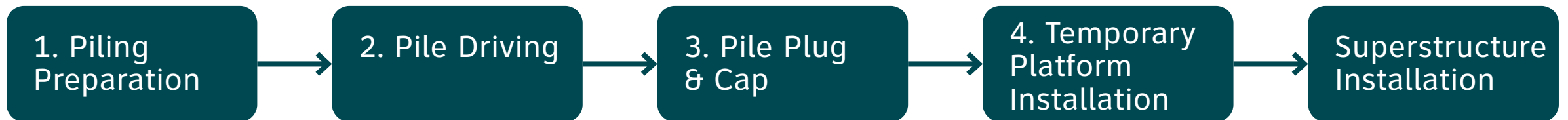
## SHORELINE NORTH - WATERSIDE CONSTRUCTION (5 seasons)



### CONSTRAINTS:

- Tidal working windows
- Submerged aquatic vegetation
- Seasonal working windows for in water work

## SHORELINE SOUTH - TOP-DOWN CONSTRUCTION (6 seasons)



### CONSTRAINTS:

- Low water depths
- Seasonal working windows for in-water work
- Slow, sequential nature of top-down construction



**THANK YOU!**

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# Q & A

Please send your cards to  
the side of the aisle

# Gathering feedback on the Shoreline Trail Concept Design

We are using mentimeter so we can hear from the many people who are here tonight.

**Use the QR code or**

- **go to:**  
**[www.menti.com](http://www.menti.com)**
- **enter code: 8479 9609**

**Wifi: HHFTP@55word**





# Wrap-up and Next Steps

# Next steps

- Please join us on April 3 for our second information session
- Join us at our monthly Sunday Chats 2-4pm at Hubbard Lodge
  - March 24
  - April 28
  - May 19
- Participate in the public comment period for GEIS - public hearing, opportunities to submit letters

Thank you!

Visit [hhft.org](http://hhft.org) for more info

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# PUBLIC INFORMATION SESSIONS

## **SESSION 1: MARCH 11, 2024**

- **Alternative Route Analysis**
- **Shoreline Trail Concept Design**

## **SESSION 2: APRIL 3, 2024**

- **Managing visitors and visitation projections**