



Conceptual Resilience Plan

LITTLE CREEK, DELAWARE

August 3, 2020
Community Presentation





The **Coastal Resilience Design Studio (CRDS)** is an interdisciplinary team of student designers, researchers and engineers exploring creative and thoughtful solutions to the many challenges facing Delaware's coastal communities.

The **CRDS** aims to equip communities with tools, designs, and adaptation strategies aimed at mitigating disruptions from short-term hazardous events and long-term environmental changes.



Our Team

Emma Ruggiero Senior Designer, UD LA 2018

Mark Switliski Senior Designer, UD CE 2020

Josh Gainey Senior Designer, UD LA

Olivia Boon UD LA

DJ Bromley UD LA

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Leigh Muldrow UD LA

Community Aspirations

1. Residents wish to preserve the **small-town character** by balancing any new development with preservation of agricultural lands and open space. Annexation and new residential developments are generally not desired and are not a priority;
2. Residents desire to **re-establish public access** to Little River for commercial fishing and for recreational boating and fishing; thereby restoring their working waterfront and maritime heritage; and
3. Residents recognize that sea level rise is happening and they generally support action to **adapt and become a resilient community**.

An aerial photograph of a suburban street, likely in Delaware, showing a mix of residential houses, trees, and a clear road. The image is used as a background for the text overlays.

Place Branding

Stormwater Strategy

Traffic & Connection

Commercial Opportunity



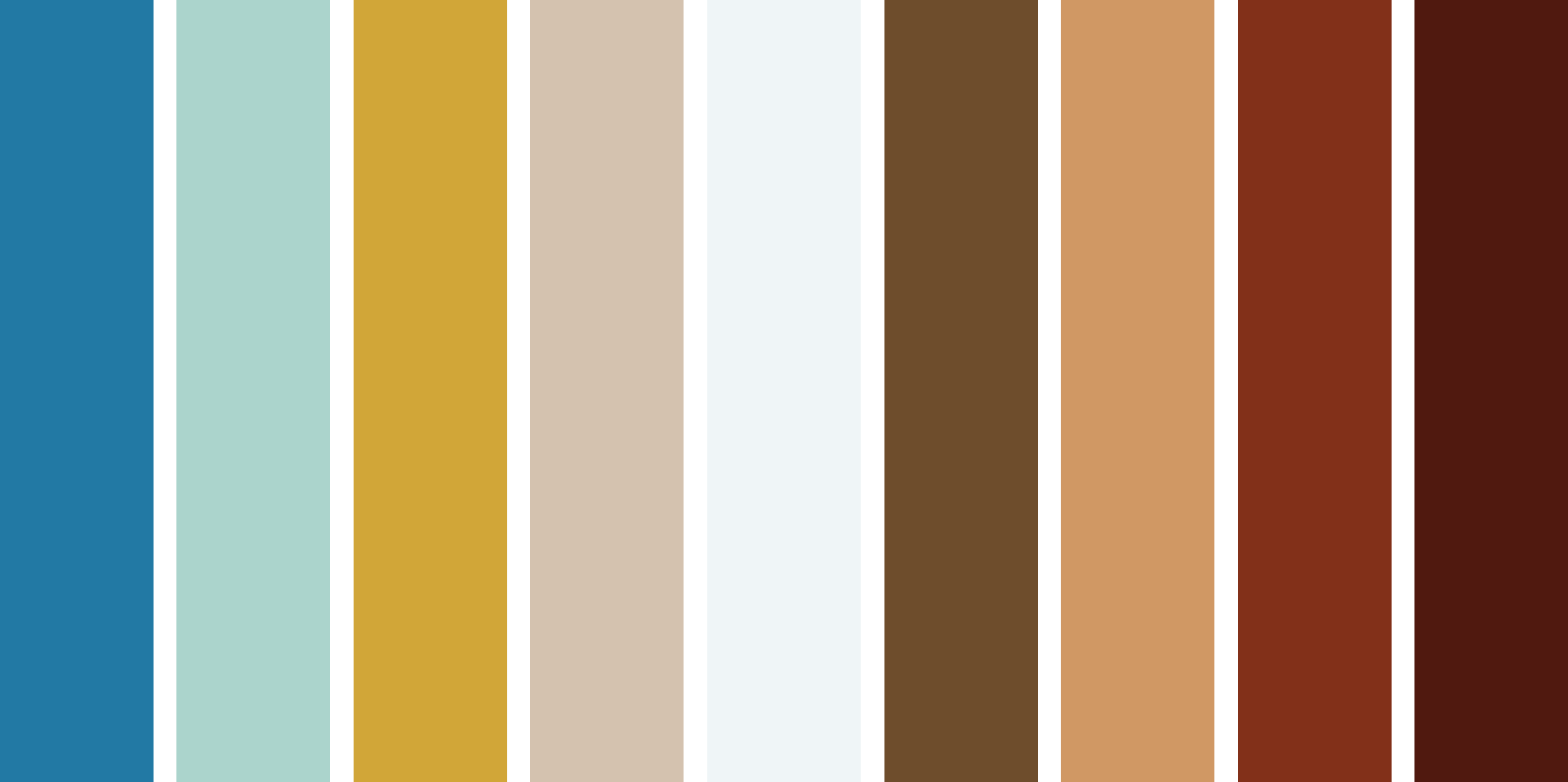
Place Branding

LITTLE CREEK, DELAWARE

Branding Toolbox

Colors
Typeface
Graphics
Message





The Colors

I am your Primary Typeface

I am your Secondary Typeface

I am your Accent Typeface

The Fonts



Graphics



SHORPY



Nestled on the shore of the Little River is a small coastal community with a rich maritime history and a strong agricultural heritage. As a jewel along the Bayshore Byway in the tidal marshes of Kent County, our 187 full time residents cherish authentic small town life and from the halls of our Fire Company to our old Stone Tavern, our history and dedication to our neighbors is evident.

We are proud of the place we call home,
a place where being small is in our nature.





Little Creek

D E L A W A R E

= est. 1899 =

Slow Down. Live A Little.



Wayfinding



Street Banners





An aerial photograph of a residential area with a river or stream, overlaid with a blue gradient. The word "Stormwater" is written in white serif font across the middle of the image.

Stormwater

LITTLE CREEK, DELAWARE



Image: Glenn Gauvry



Image: Glenn Gauvry



Image: Glenn Gauvry



Image: Glenn Gauvry



Image: Glenn Gauvry



DOVER
↑
LEIPSIC
↑
PORT MAHON →

ONE-WAY
↑





CRDS
COASTAL RESILIENCE
DESIGN STUDIO

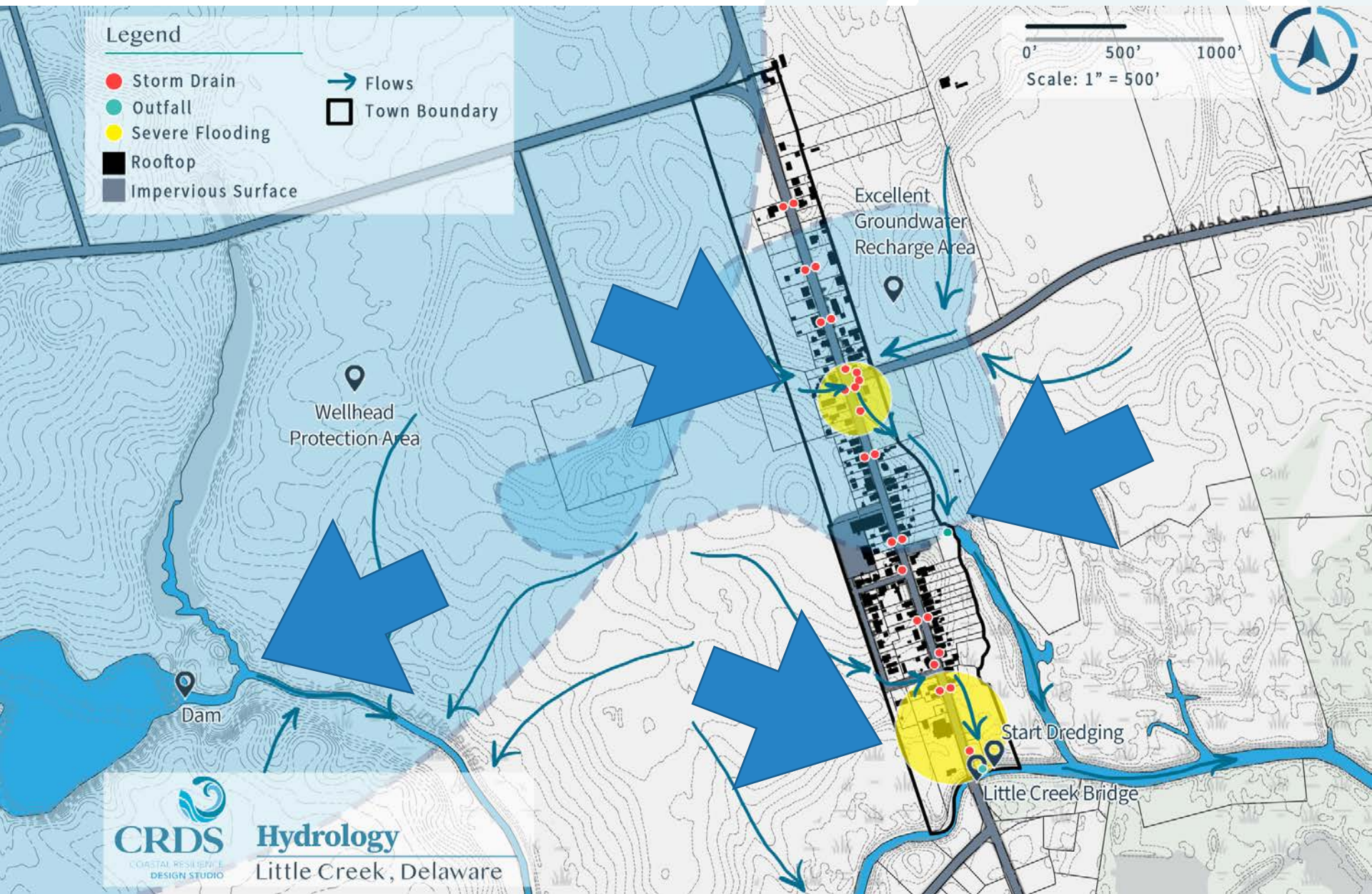
Existing Stormwater Flooded Areas

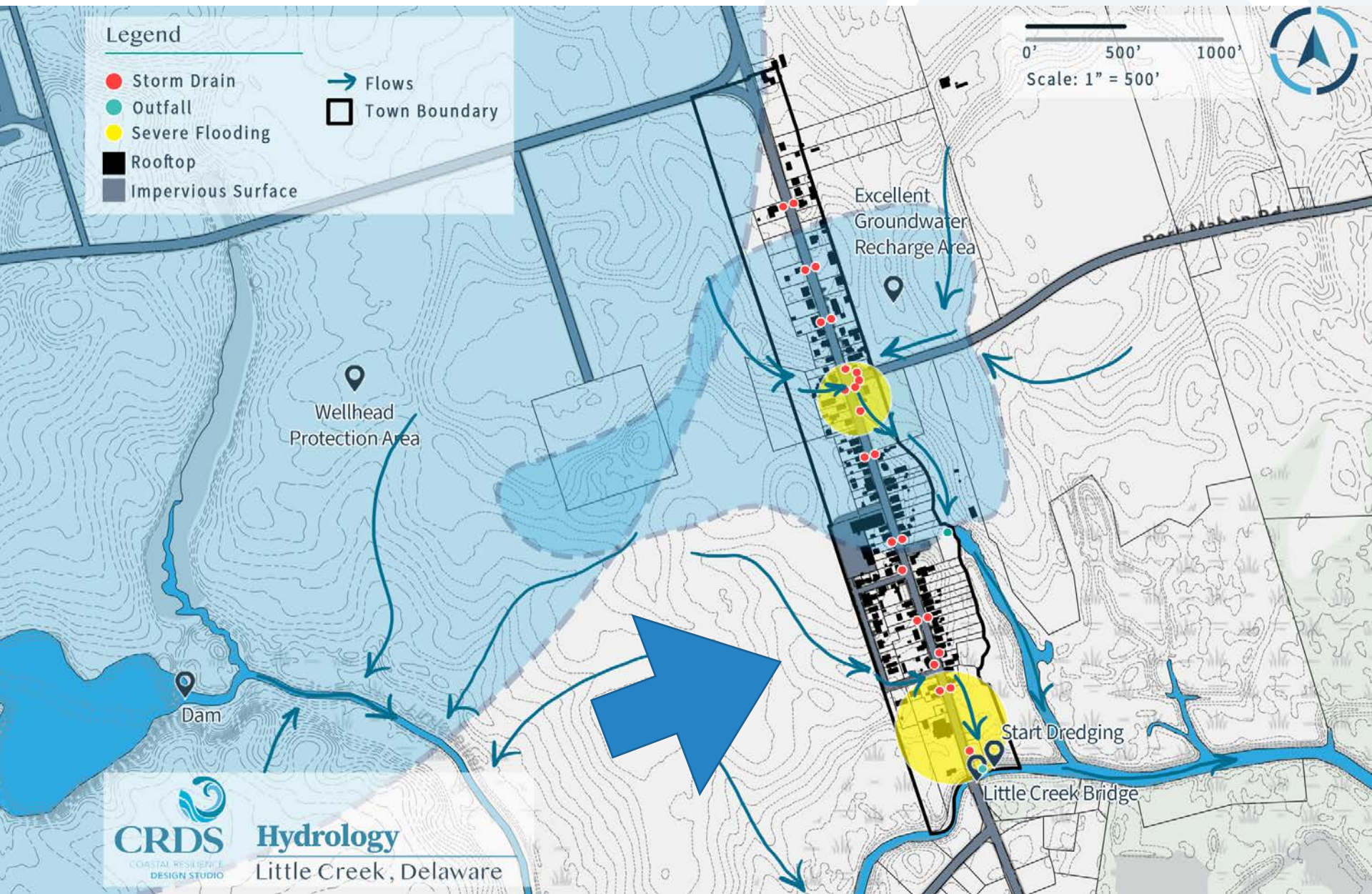
Little Creek, Delaware

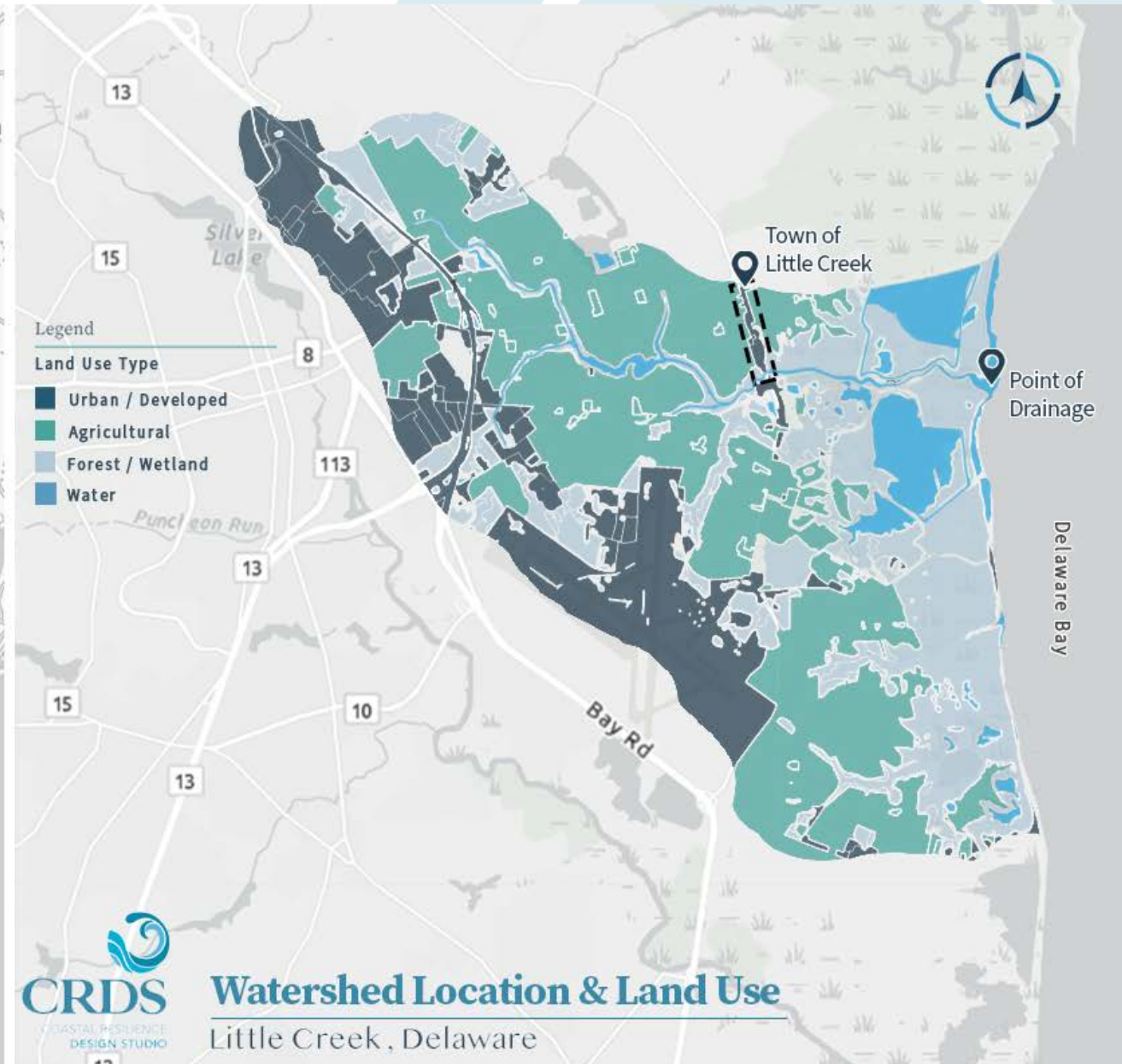


0 480 960
Scale: 1" = 480'









Depth to Water Table

Little Creek, Delaware

Legend

Delaware Municipalities

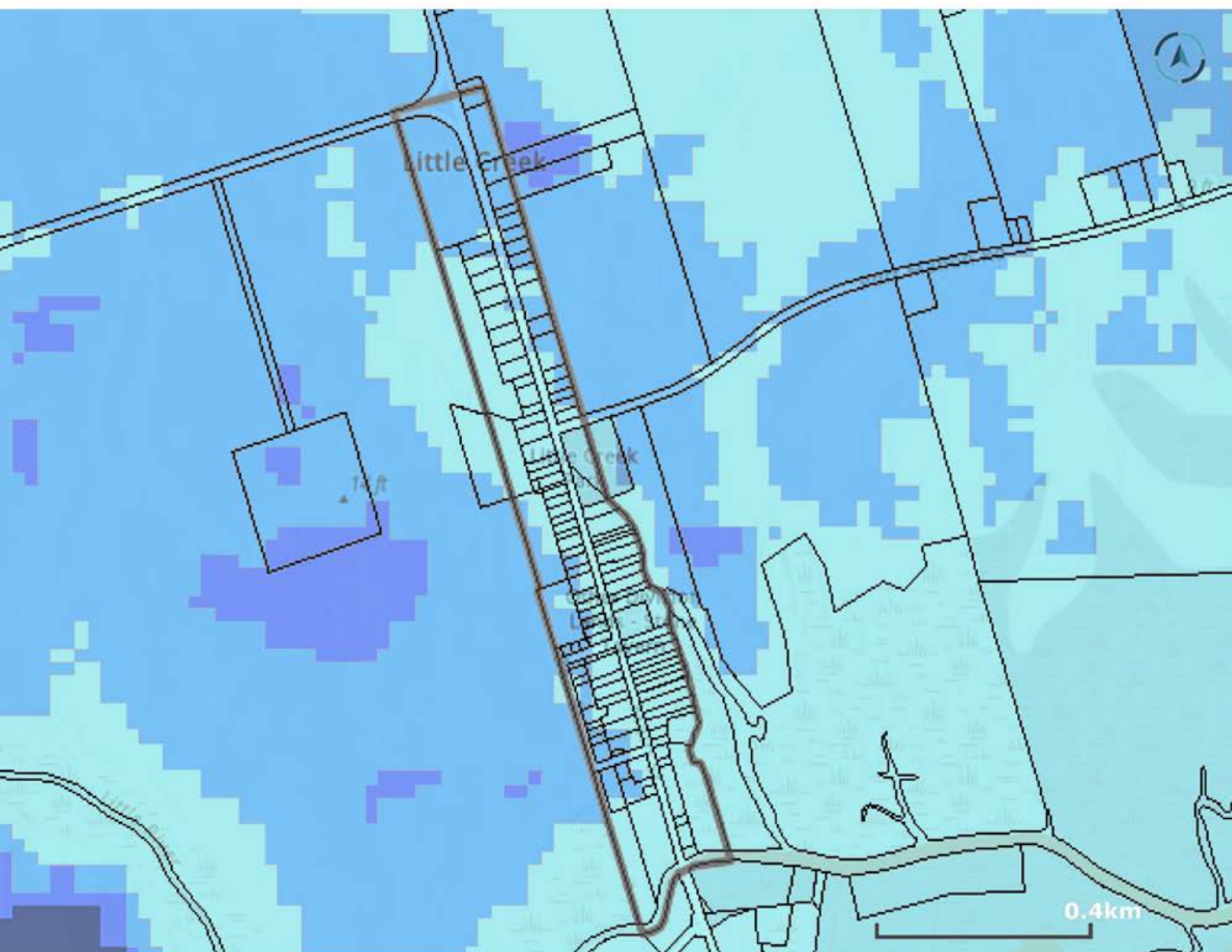


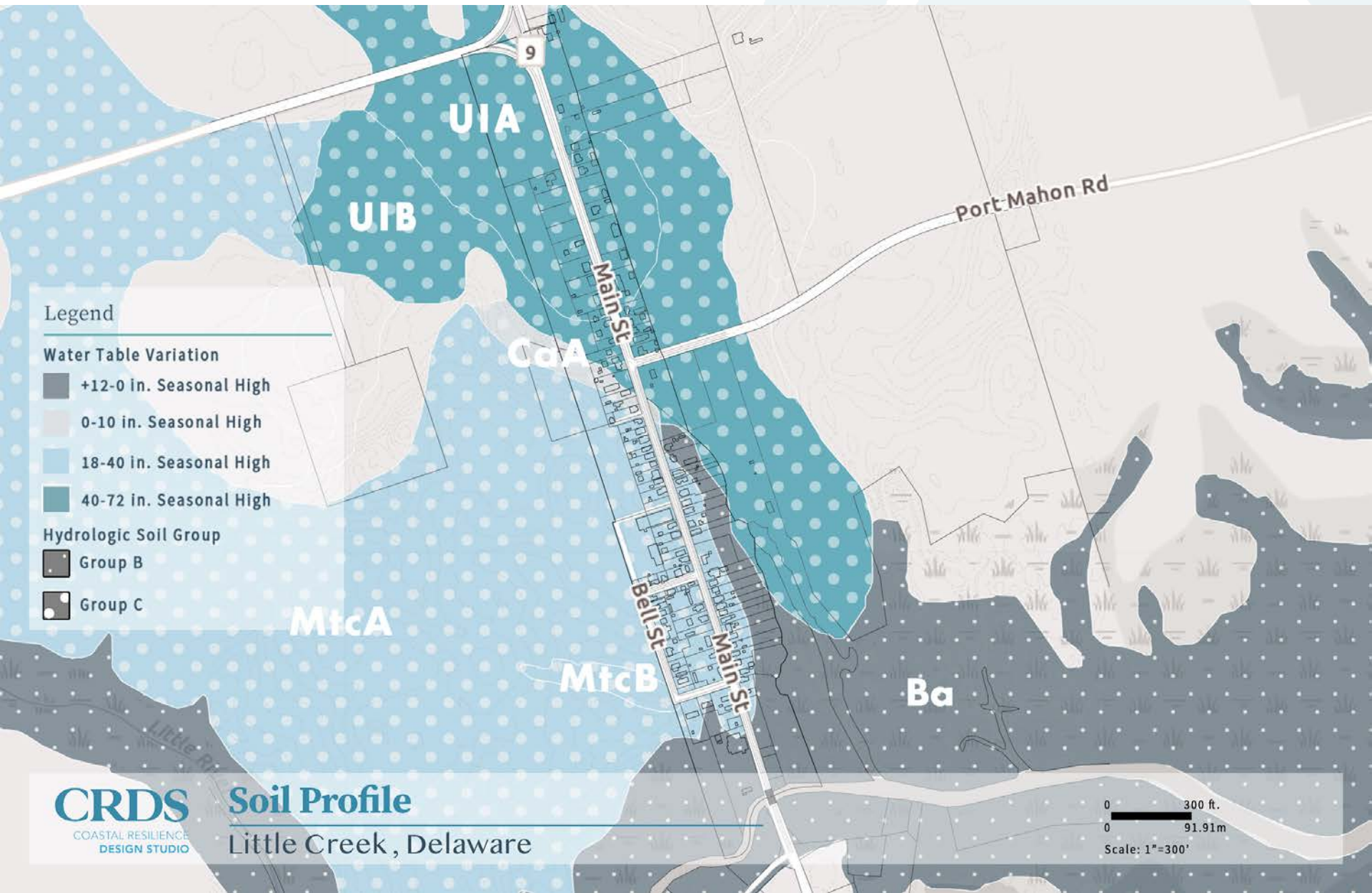
Delaware Kent County
Parcels



Delaware DGS Depth To
Water - NORMAL

- 0 - 3 ft
- 3 - 6 ft
- 6 - 9 ft
- 9 - 16 ft
- 16 - 20 ft
- > 20 ft





Stormwater Objectives

- Provide an opportunity for Little Creek to **independently manage stormwater**
- Address storm event flooding with green infrastructure treatments that **convey water slowly where infiltration is not possible**
- Increase residence time of water in areas where **water can safely and effectively infiltrate** to improve water quality and quantity

Three Stormwater Hotspots

1. Agricultural Buffer & Swales
2. Little Creek Park
3. Restored Wetland

Agricultural Buffer & Swales





LEGEND

- Bioswale
- Enhanced Riparian Buffer
- Enhanced Swale/Ditch



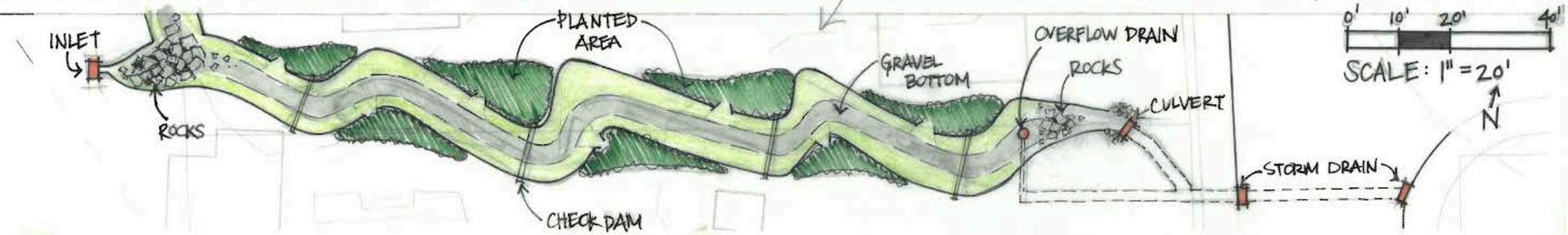
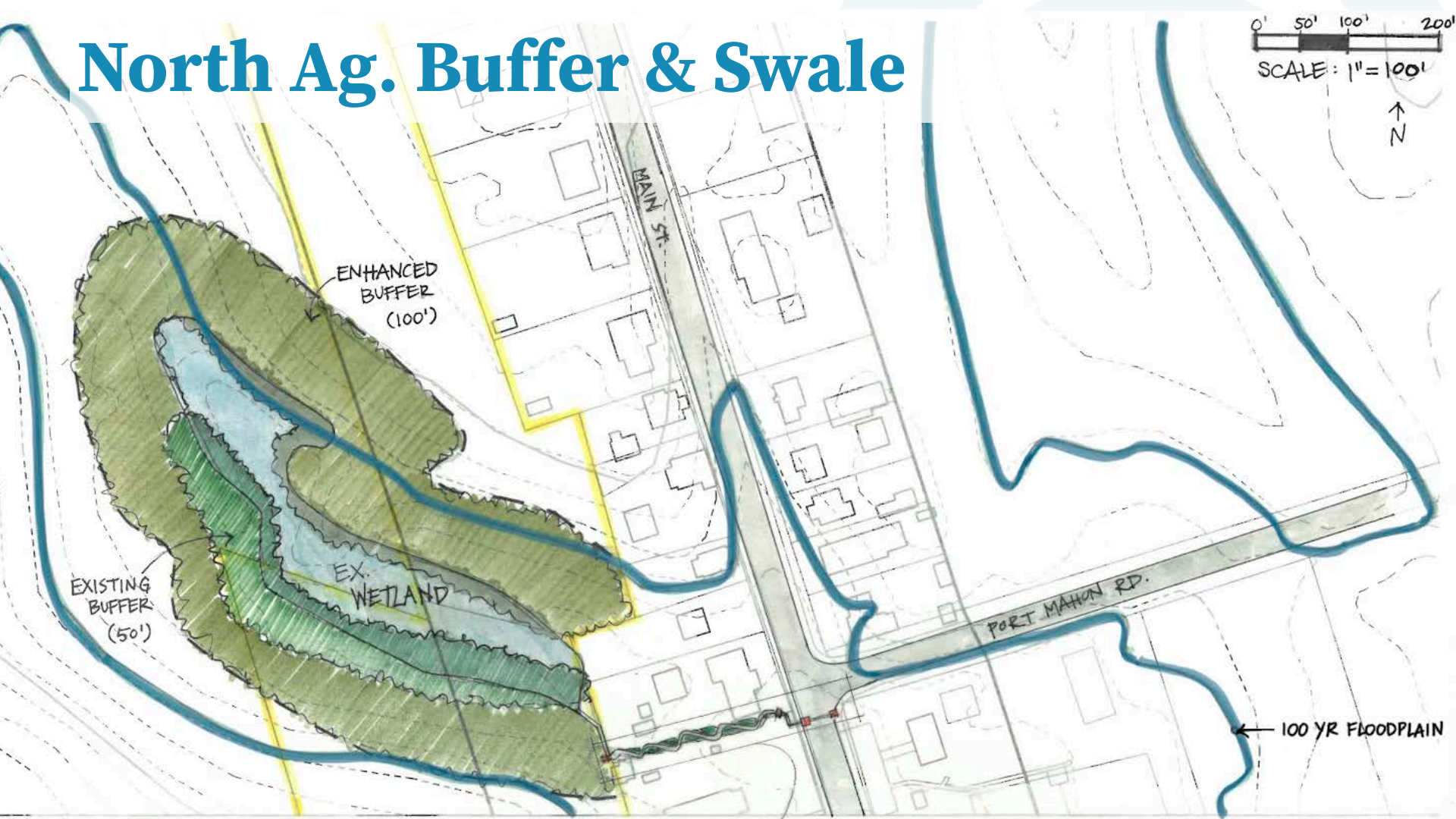




Agricultural Buffer Program:

- **Increase riparian buffer** to surround wetland from 50' → 100' increasing habitat at a DNREC designated wetland area
 - ~146,000 sq. ft. or 3.35 acres of farmland converted to shrub/forest buffer
 - Potential incentives to farmers via CREP program
- **Create a bioswale** with meanders, native planted areas for overflow during storm events and check dams to slow and infiltrate water
 - Dissipate water energy with rocky inlets and outfalls
 - Increase infiltration capacity with an engineered soil matrix
 - Include an overflow drain that leads to stormwater system
- **Enlarge size of culvert** draining the ditch

North Ag. Buffer & Swale





LEGEND

- Ditch Rework
- Swale Extension



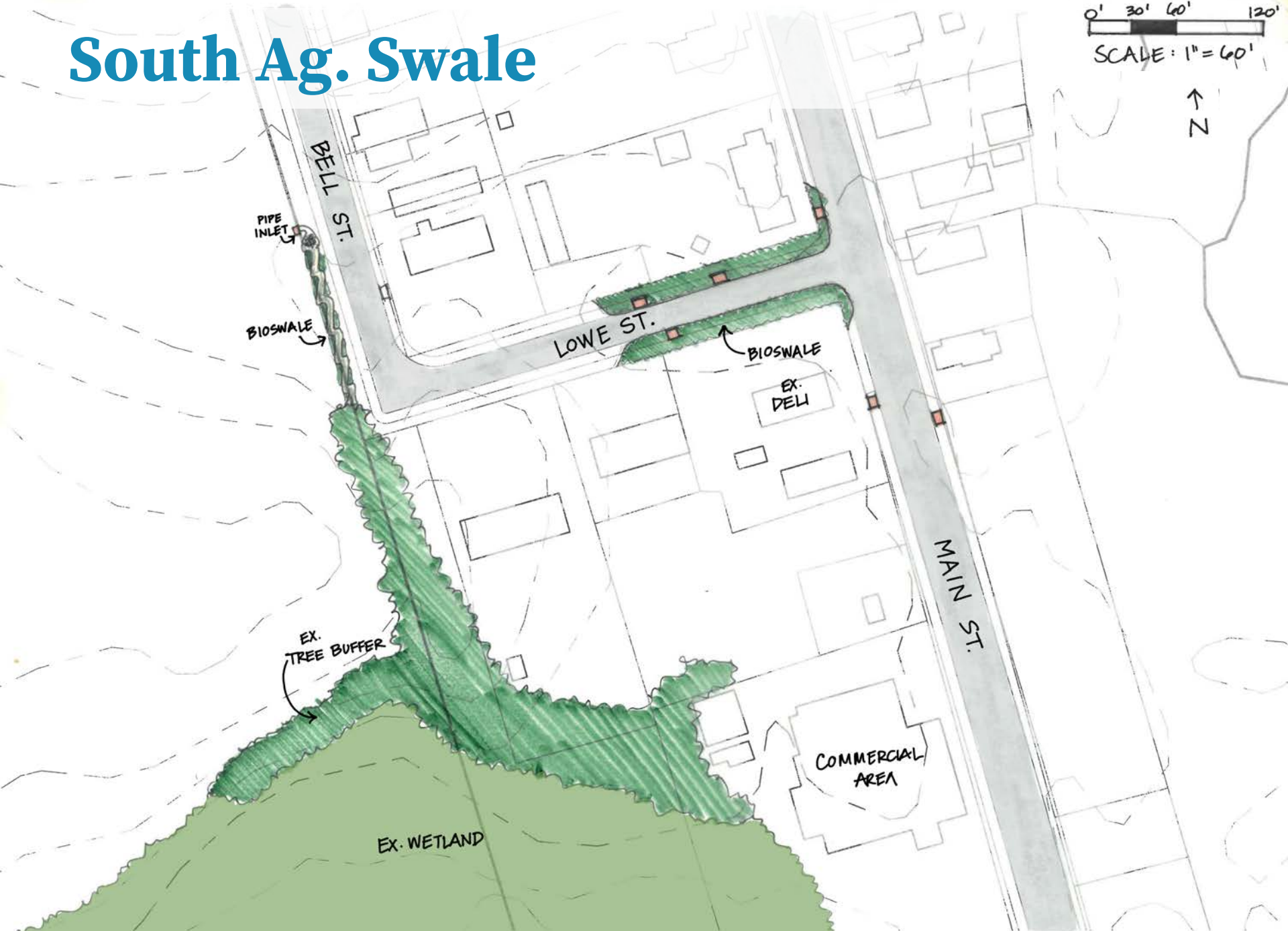


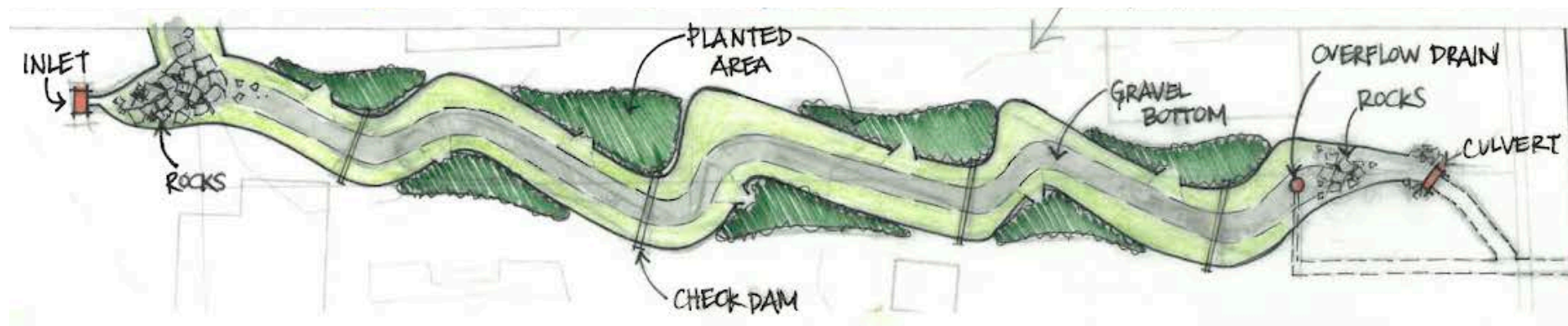
LEGEND

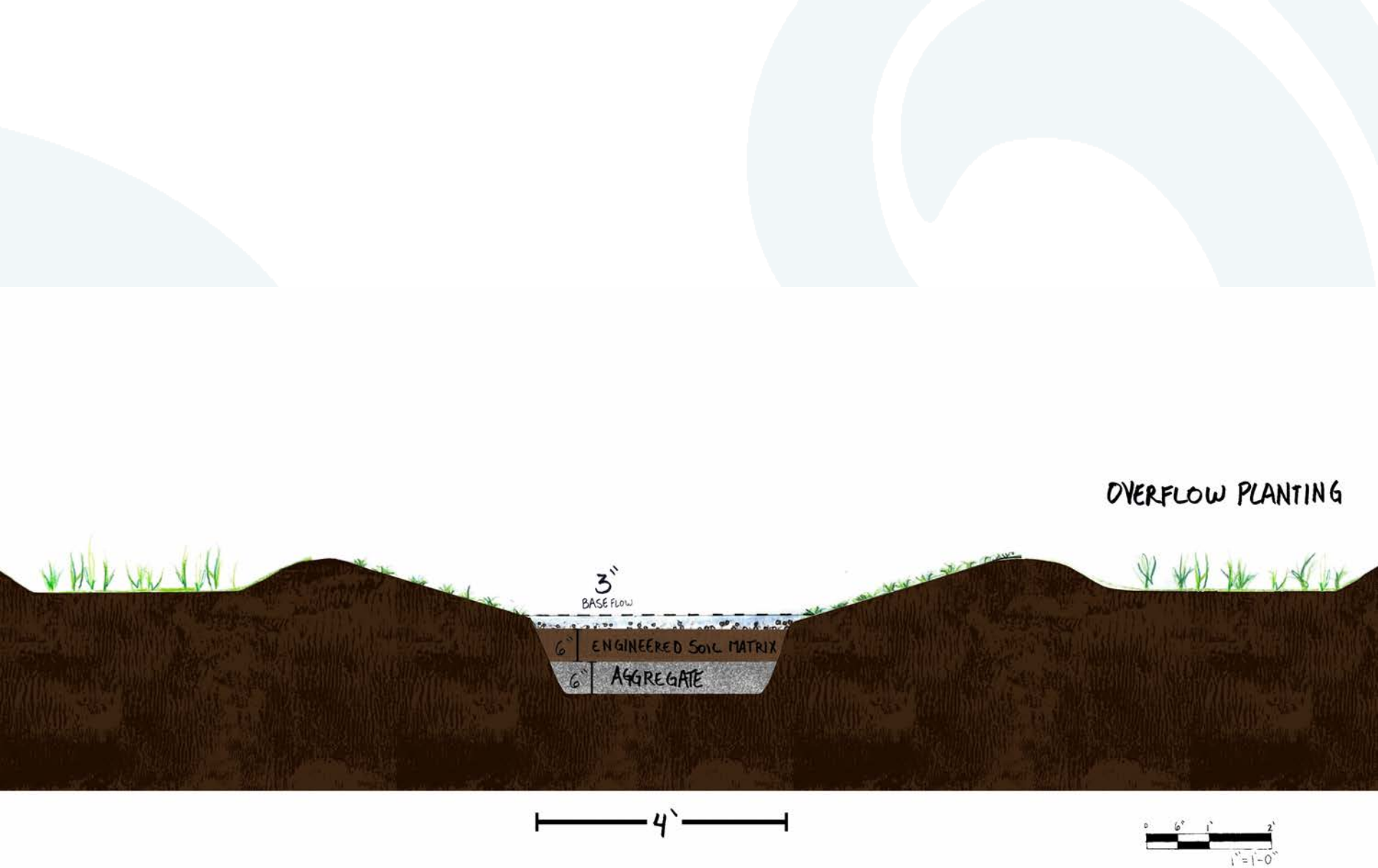
Bioswale



South Ag. Swale







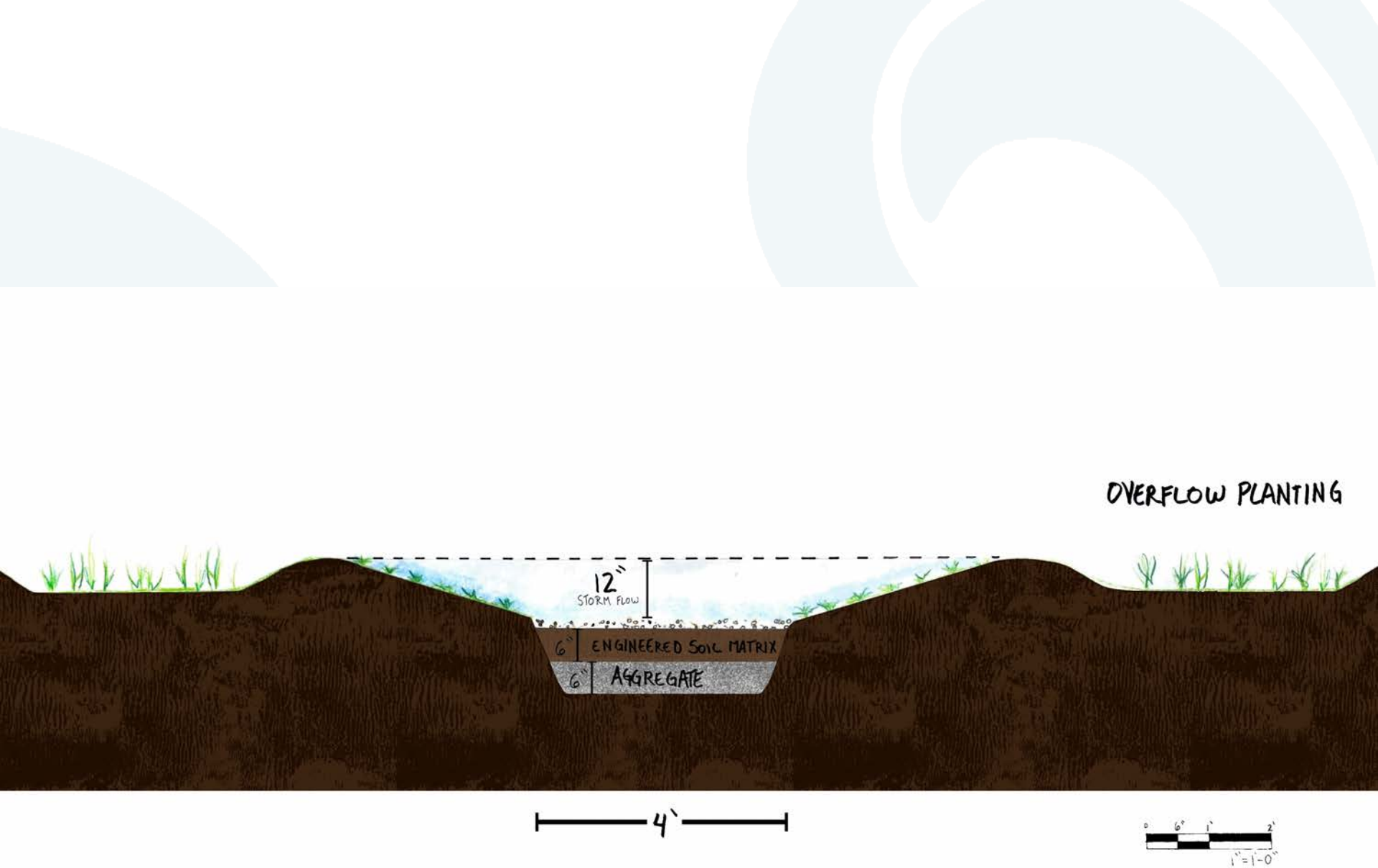




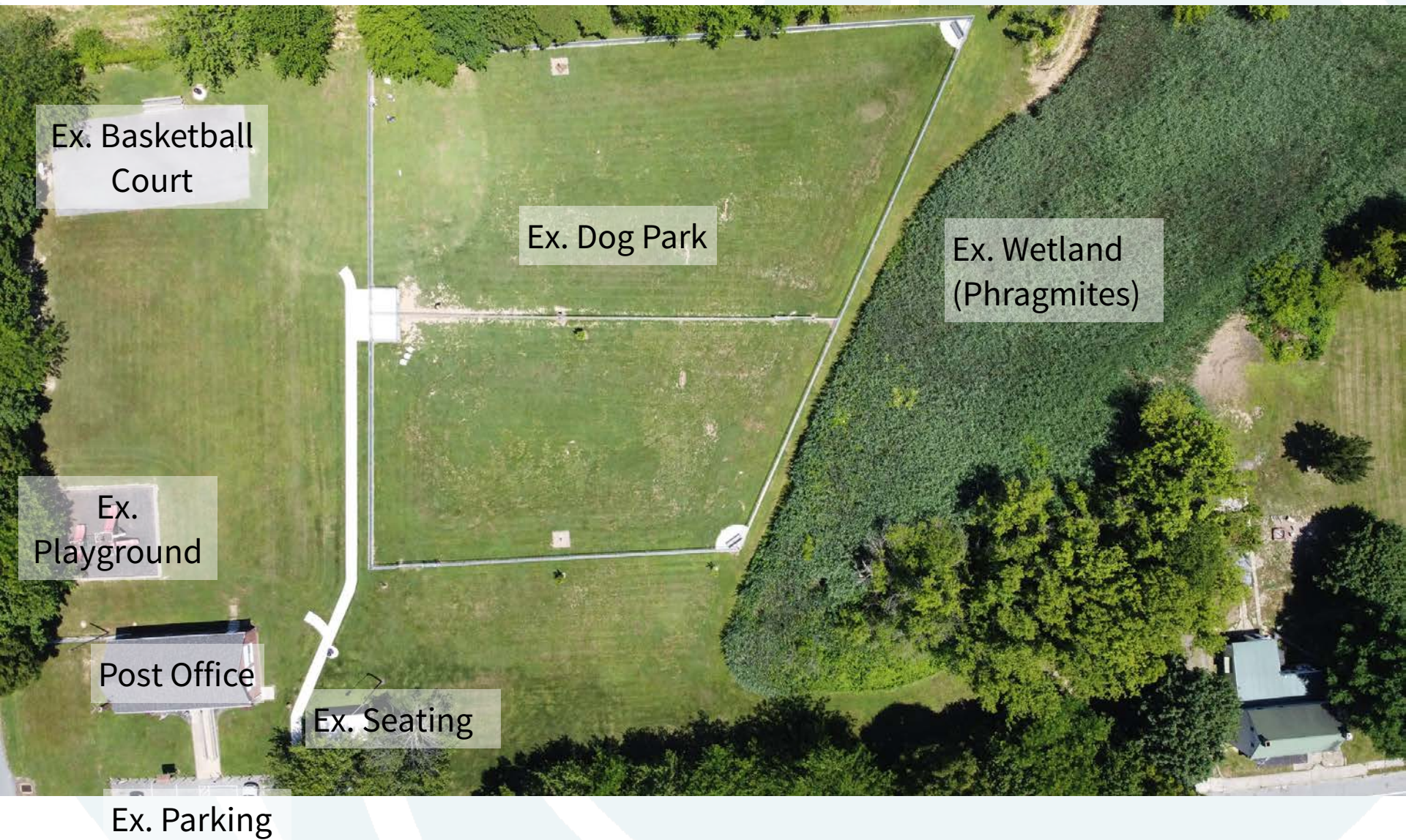


Image: Mitt Watershed Council

Little Creek Park







Ex. Basketball
Court

Ex. Dog Park

Ex. Wetland
(Phragmites)

Ex.
Playground

Post Office

Ex. Seating

Ex. Parking

drainage ditch



Main St.

Post Office

Little Creek Park Program:

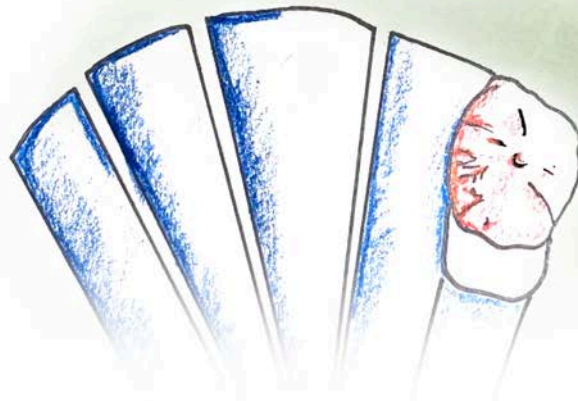
- Convey all stormwater from inlets to a forebay that drains to a **restored wetland**
- Create a **native plant / pollinator garden** with an underdrain leading water to forebay
- Create **bioswales** in bump outs along Main Street and Port Mahon Road with curb cuts leading water to forebay
- Replace post office parking lot with **pervious pavement** and an underdrain that flows to the forebay
- Update park amenities to include a fuller breadth as noted from the LC Comprehensive Plan: **multi-use trail with lookouts; bench seating; community garden; stage with moveable seating; picnic area; sports field; educational signage**



Little Creek PARK

0' 25' 50' 100'
SCALE: 1" = 50'





Park Stage



Restored Wetland



LEGEND

- Culvert Adjustment/Bridge
- Phragmites Removal
- Trail-Park Connection









Restored Wetland Program:

- **Remove stand of phragmites** in wetland and create a plan for invasives control
- Restore health to degraded wetland by creating a forebay for stormwater pollutants to settle, deep pools, low marsh and high marsh areas
 - Planting design conveys beautification as a park amenity and stormwater management
- **Remove culvert to allow for a natural flow** or replace culvert with a larger one at the pinch-point

FOREBAY

COLLECTION FOR A MAJORITY OF STORMWATER; ALLOWS SEDIMENT TO SETTLE.

INLET PIPE

EX. WETLAND BOUNDARY

HIGH MARSH

OFTEN BUT NOT CONSISTENTLY SATURATED ZONE.

DEEP POOL

STORES WATER + DISSIPATES ENERGY.

REMOVE EX. INLET

UPLAND ISLAND

LOW MARSH

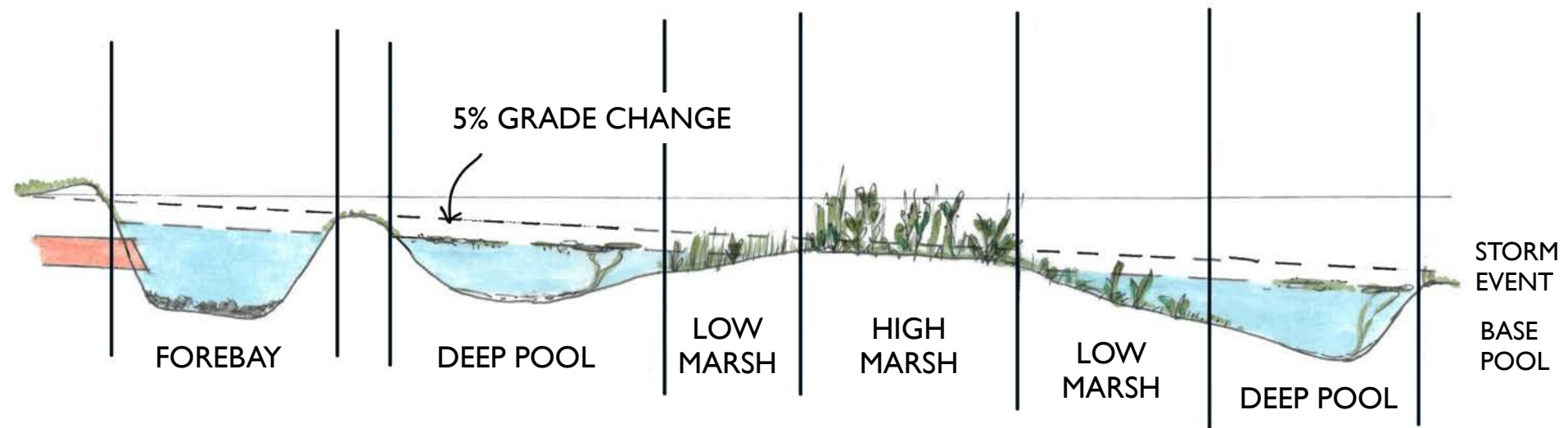
CONSISTENTLY SATURATED WETLAND ZONE.

DEEP POOL

FINAL SETTLING OF SEDIMENT; COLLECTION BEFORE DISCHARGE.

REMOVE EX. CULVERT

EX. WETLAND



Wetland Storage Capacity



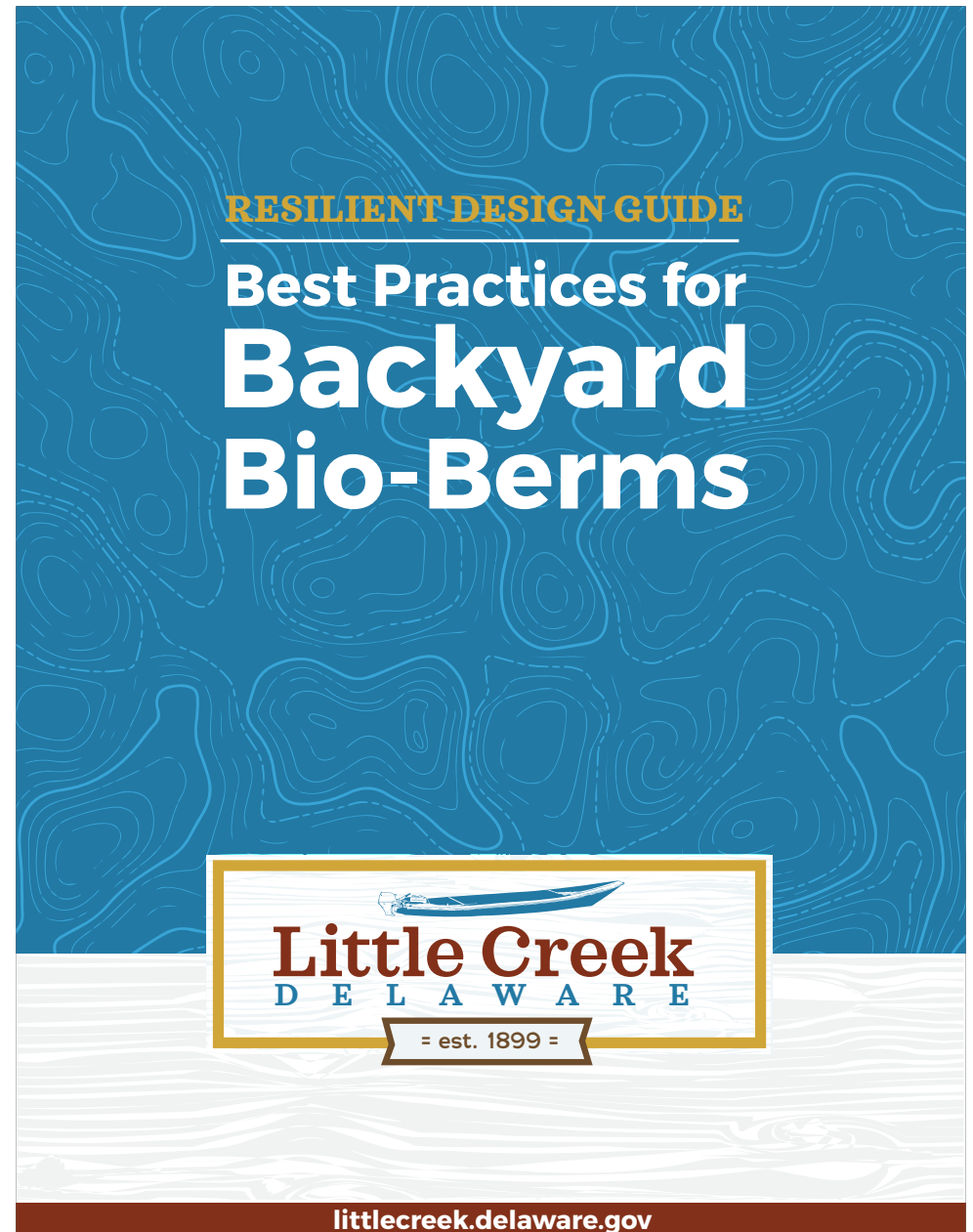


Image: GES



Image: LB Littles

Develop a Community & Homeowner Education Program





Traffic & Connection

LITTLE CREEK, DELAWARE

Objectives

- Address **flooding issues** along Main Street
- Provide **traffic calming** through town using the Complete Streets model
- Reconnect the **community** with the **Little River**
- Provide a **walking trail** and **observation tower**
- Improve **bike access** and **safety**
- Maintain the **small town feel**
- **Resiliency** should be a common thread in all design recommendations



COASTAL RESILIENCE
DESIGN STUDIO

TOWN OF LITTLE CREEK MONTHLY TRAFFIC DATA

PRE COVID-19 SHUTDOWN			Total cars	25-29 Mph	30-34 Mph	35-39 Mph	40-44 Mph	45-49 Mph	50 Mph and Over	Total > 29 Mph
	February 2020 35 Days	Totals % of Total Avg per day	24,187 691	7,782 32.17%	7,541 31.18%	3,831 15.84%	3,059 12.65%	1,554 6.42%	420 1.74%	16,405 67.83%
COVID-19 SHUTDOWN	March 2020 35 Days	Totals % of Total Avg per day	19,485 557	6,958 35.71%	6,195 31.79%	2,967 15.23%	2,150 11.03%	1,040 5.34%	175 0.90%	12,527 64.29%
	April 2020 28 Days	Totals % of Total Avg per day	16,523 590	6,029 36.49%	5,381 32.57%	2,485 15.04%	1,625 9.83%	795 4.81%	208 1.26%	10,494 63.51%
	May 2020 27 Days	Totals % of Total Avg per day	17,833 660	7,116 39.90%	5,794 32.49%	2,570 14.41%	1,495 8.38%	689 3.86%	169 0.95%	10,717 60.10%



1 in 3 drivers speed a little
The rest speed a lot

WHAT IS A COMPLETE STREET?



ACTIVE SIDEWALKS

Sidewalks should be smooth, wide, feel safe, and have appropriate transitions to the street, making them easy to walk or use a wheelchair on



DEDICATED BIKE LANES

Simple pavement markings creating a dedicated bike lane make both motorist and bicycle movement more predictable, and therefore safer for both. They may increase the likelihood of casual riders using bicycles for transportation



ACTIVE ROADWAY

One lane of car traffic going in each direction with a two-way-left-turn-lane (TWLTL) in the center would reduce the amount of car crashes on Government Street by providing turning vehicles a refuge from through traffic, while keeping through traffic moving more efficiently



SAFE CROSSWALKS

Clearly marked crosswalks allow pedestrians and wheelchair users to cross streets safely, while making sure cars know where to expect them



PLANTING STRIP

Street trees and landscaping slow speeding traffic, improve the aesthetics of the roadway, provide shade, and create a buffer between cars and people, making a more inviting environment for pedestrians



GREEN SPACES

Parks and public green spaces create a destination, encouraging community interaction and providing a rest from the surrounding urban environment

Why Complete Streets in Little Creek?

Enhance Little Creek as a **destination** on the **Bayshore Byway**

Increase **pedestrian access and safety** with crosswalks

Enhance the community and visitor **experience** in the community

Provide **traffic calming** and facilitate foot traffic

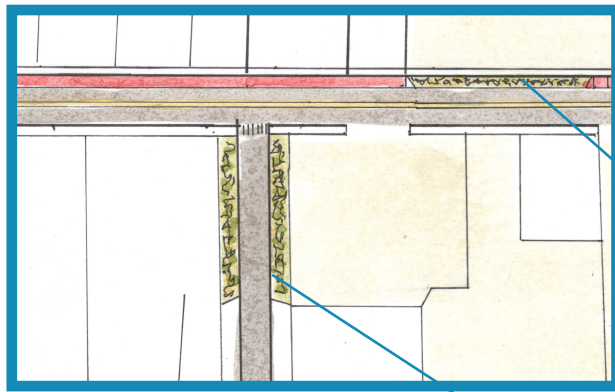
Provide an opportunity for added **stormwater mitigation**

Incorporate native species of plants and trees to improve stormwater absorption, enhance habitat for native wildlife, and provide **locally driven beautification** for the community



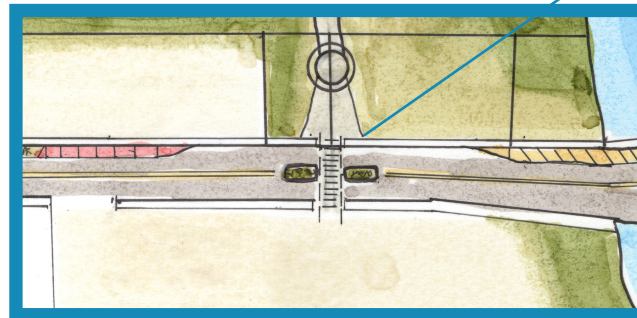
Why are people speeding?

Southern Gateway entrance to Little Creek



Right-of-Way Bioswales

Located strategically to address surface stormwater and provide traffic calming



0' 10' 40' 100' 200'
SCALE: 1" = 60'-0"

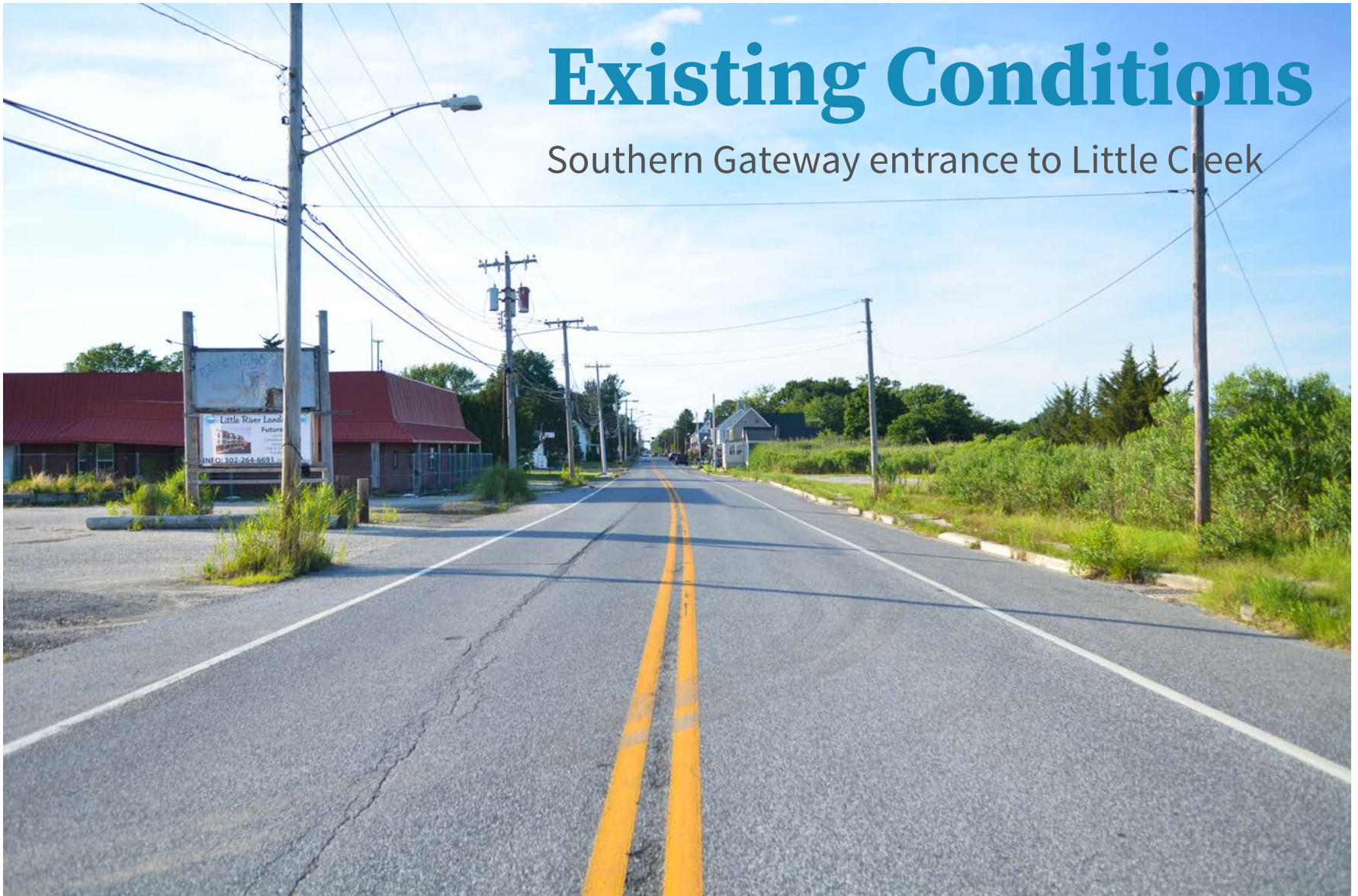
Gateway Entry
Planted medians
and crosswalks

Traffic Calming

Medians & Bioswales

Existing Conditions

Southern Gateway entrance to Little Creek



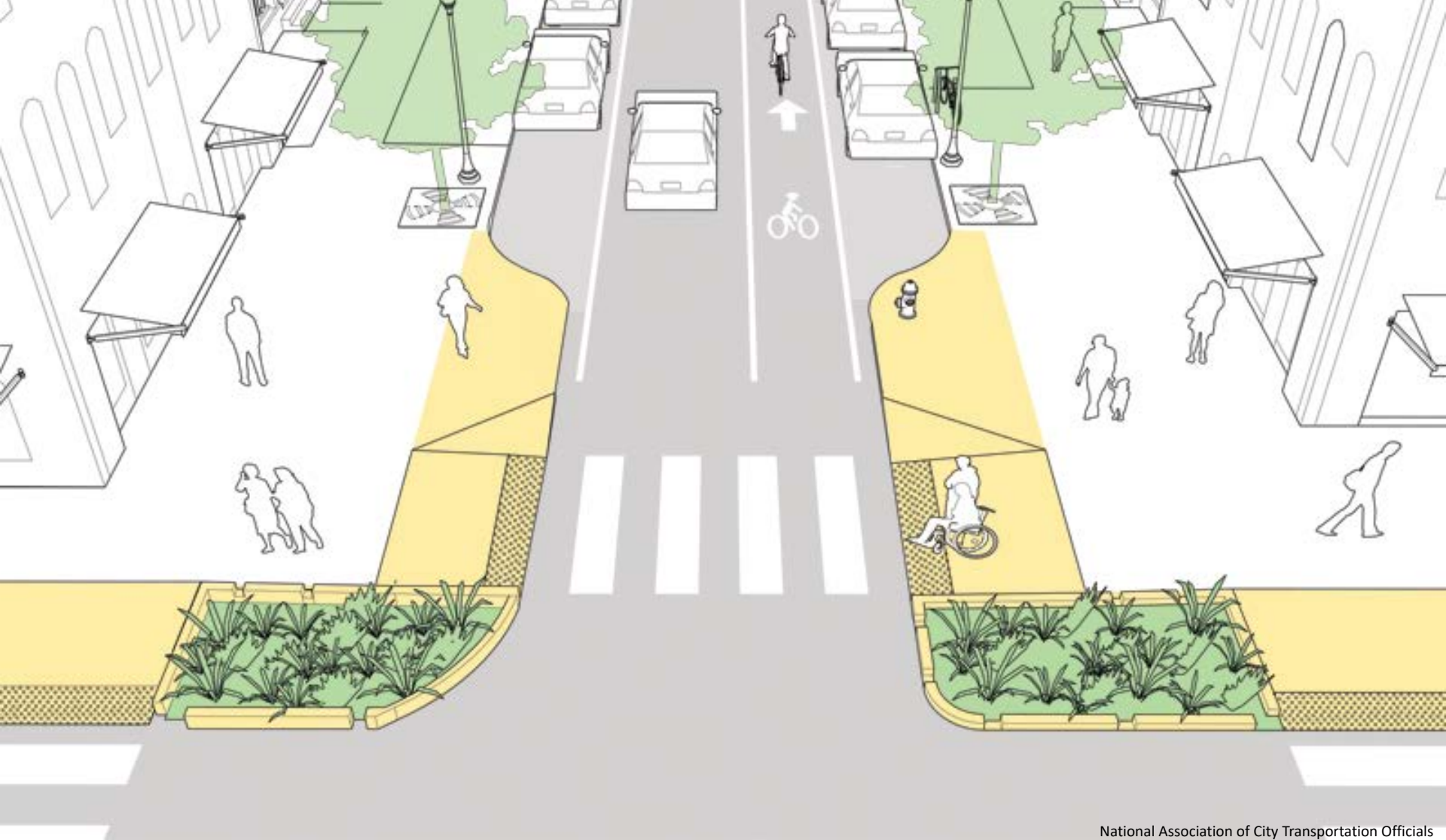


Banners









National Association of City Transportation Officials

Bump-Outs vs. Bioswales

Both calm traffic by narrowing the roadway

Why Bioswales

- When placed in the right-of-way, a **bioswale** performs the **traffic calming** function of a bump-out but also works for stormwater control
- **Poor soils + high water table** constrain the design options for green infrastructure
- **Slow, retain, and clean water** for short periods of time before it moves into the Little River through the **established stormwater system**
- **Low maintenance**, native plantings reinforce the local aesthetic and create **micro habitats**

2. Bioswale

A bioswale is an elongated, linear bioretention facility often found on roadsides within the right-of-way. They can be outfitted with small dams to retain water on steeper slopes.

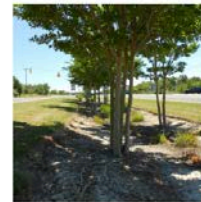


Figure 4: Route 1 Bioswales
The Center for Inland Bays (CIB) worked with the Town of South Bethany to install bioswales in the medians along Coastal Highway (Route 1).



Figure 5: Route 1 Bioswales
CIB and South Bethany identified sixteen locations that would assist in filtering stormwater run-off from the highway.

Feasibility

The following table lists the feasibility requirements for bioswales.

Soils	No restrictions
Water Table	The bottom of the channel should be above the seasonally high water table
Drainage Area	10 acres maximum
Slope Restriction	The longitudinal slope should be less than 4%
Hot Spot Runoff	No restrictions
100-yr Floodplain	Restricted

Maintenance

Monthly

- Regularly inspect the site
- Remove debris and blockages
- Remove weeds and invasive plants
- Alert the appropriate governing body if erosion is seen in or around the facility
- Check the facility after a storm to make sure that any standing water draws down after 2 days.

As Needed

- Mow the vegetated perimeter of the bioretention facility but not within the facility
- Repair broken components and outlet structure.
- Remove sediment in facility
- Water plants every 3 days for the first 18 months after establishment and during droughts (when there has been no rain for more than 10 days)

What to Avoid

- Keep animal waste out of the facility
- Do not shovel snow onto the facility

Facility	Property Type	Relative Cost	Benefit	Level of Maintenance
Bioswale	CII	\$\$	Water Quality, Runoff Rate Reduction, Storm Conveyance	Low

Precedent Study

Bioswale design
median installation

Bethany Beach, Delaware

2.1.5 Inlet Retrofits

Within N4 (South Bethany) there were many inlets located in small depression areas. Examples are provided in Figure 9. One potential retrofit to improve stormwater quality before entering the inlet is to remove the pavement and rip-rap surrounding these inlets. Grass and native vegetation can then be planted around the inlets to serve as pretreatment.



Figure 9. Inlets surrounded by rip-rap and concrete in N4 (South Bethany) that can be modified to remove the impervious cover and include grass/native vegetation pretreatment.

B4



B5



LEGEND

- Median
- Crosswalk
- Bioswale
- Trailhead



Bioswales

Connectivity & Traffic Calming Context Map

LITTLE CREEK, DELAWARE



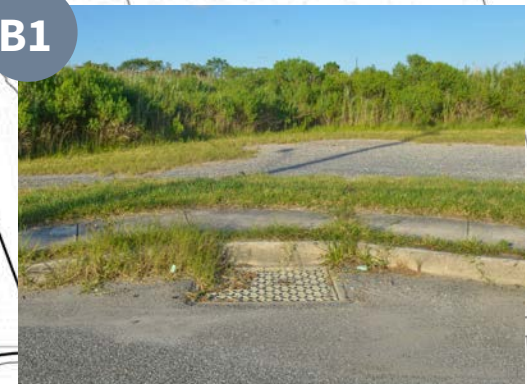
B3



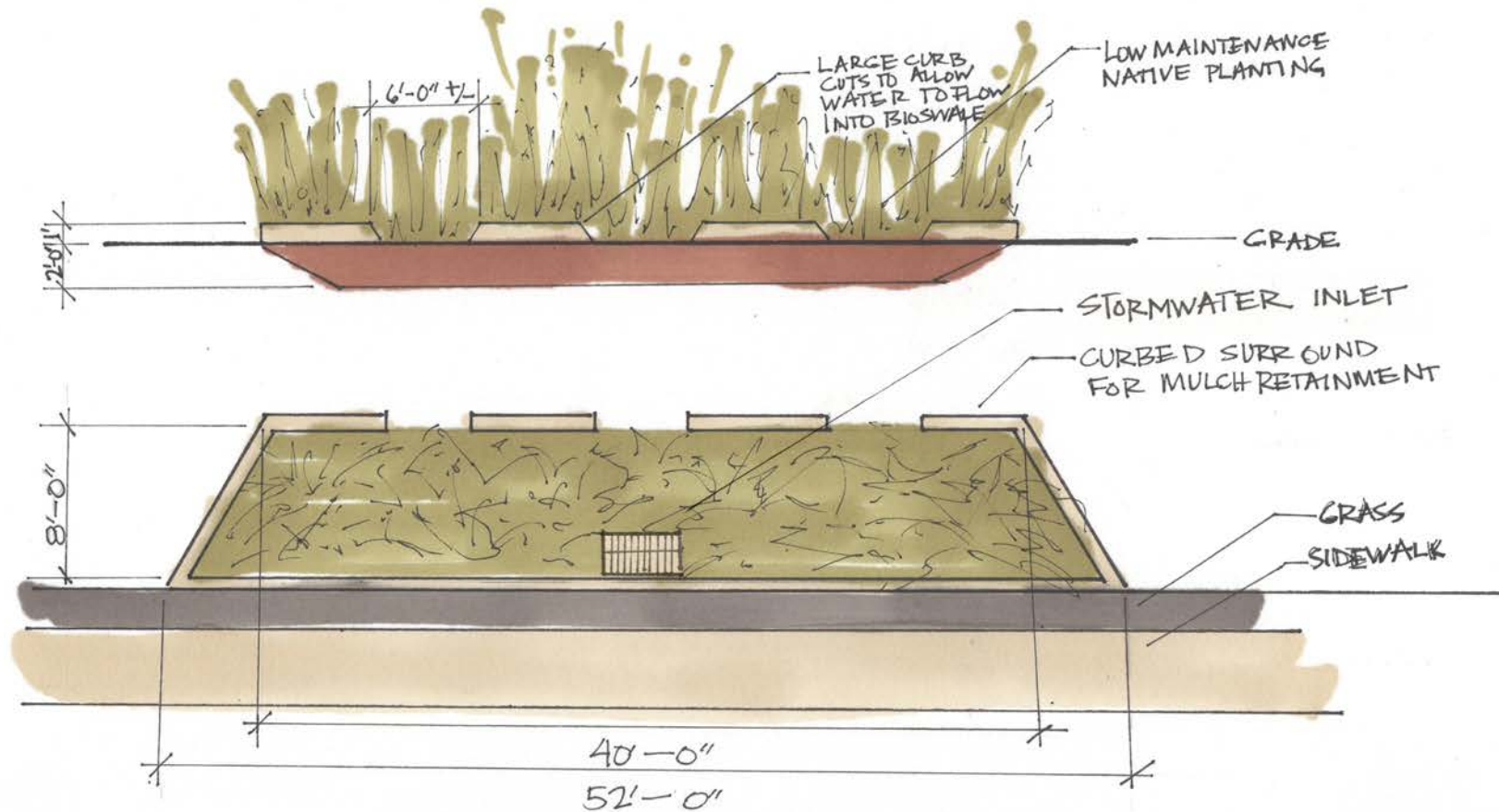
B2



B1



SAMPLE RETROFIT BIOSWALE





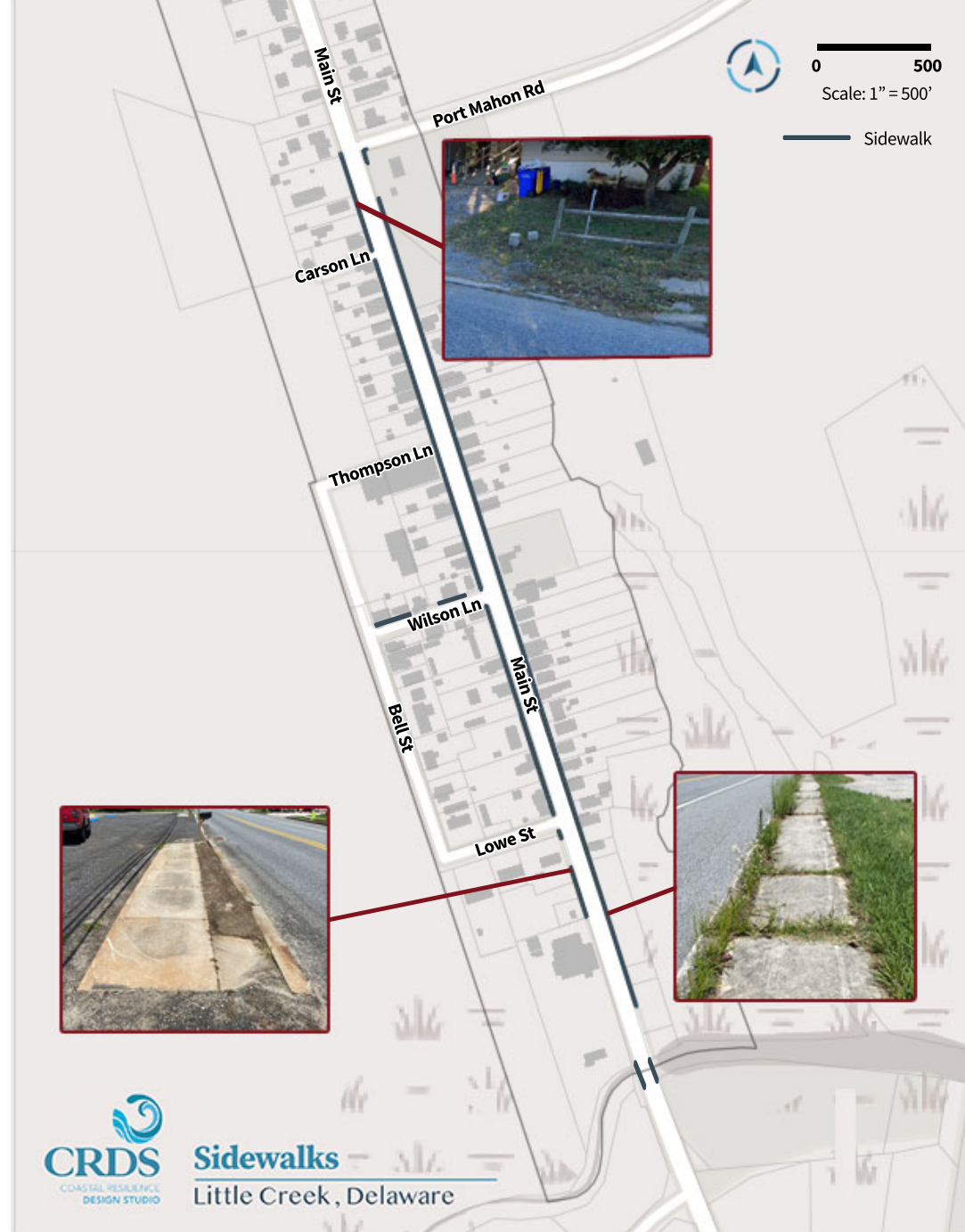
Bioswales have many benefits, including a reduction in strain on a city's municipal sewer system. Less water in sewers generally leads to cleaner rivers and waterways. Click through the gallery for more about Portland's bioswales.





Sidewalk Inventory

Existing Conditions &
Recommendations

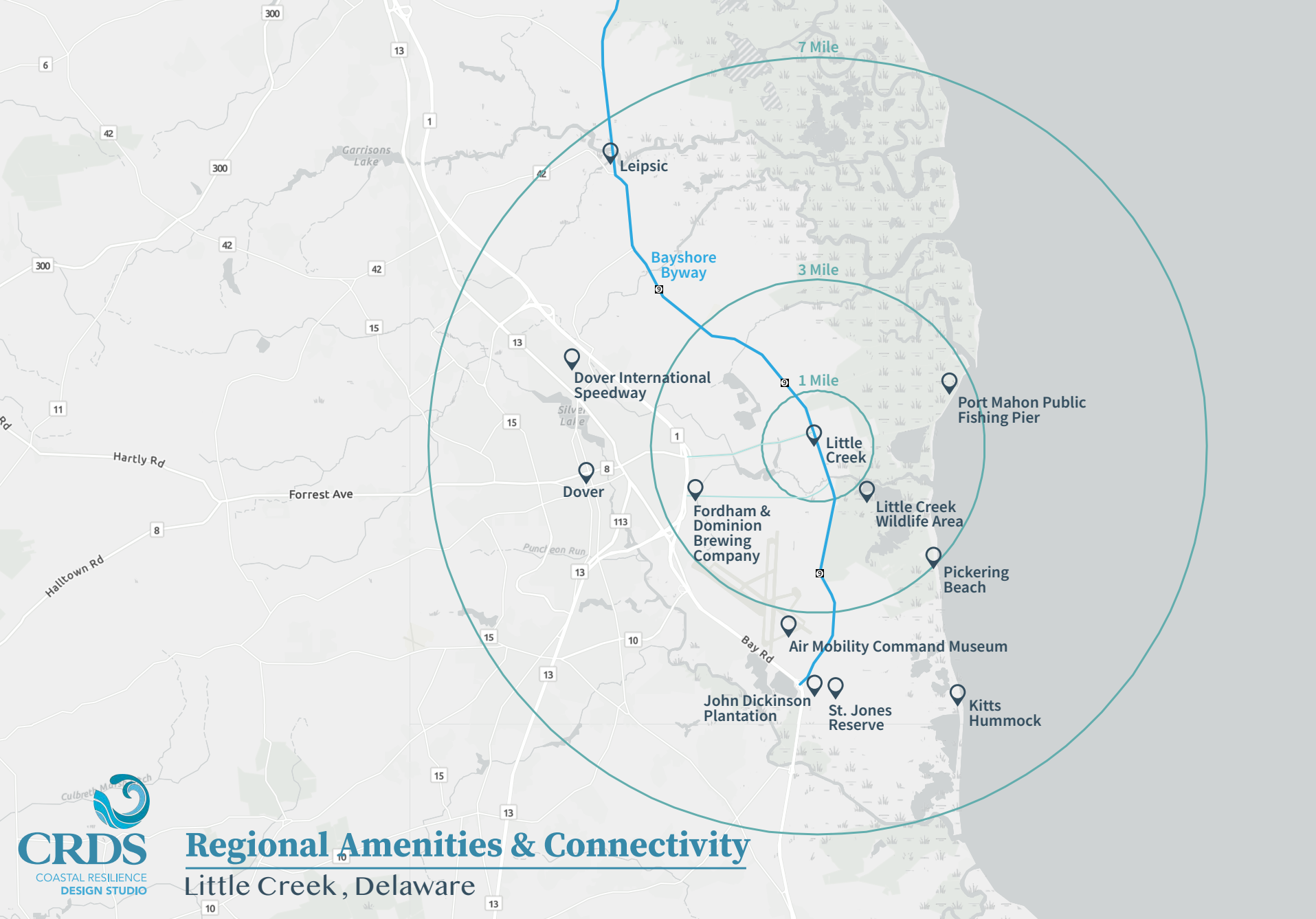


Connection



CRDS

COASTAL RESILIENCE
DESIGN STUDIO





BAYSHORE

== B Y W A Y ==



BAYSHORE

== B Y W A Y ==

New Castle | Delaware City | Port Penn | Leipsic



BAYSHORE

River Towns

Little Creek | Frederica | Milford | Milton

Augustine | Woodland | Pickering | Kitts Hummock | Bowers



BAYSHORE

Beaches

South Bowers | Slaughter | Prime Hook | Broadkill | Lewes





12^{ft}

10^{ft}

8^{ft}



BAYSHORE

Bikeway

Elevated Boardwalk

Proposed Bikeway Trail Types



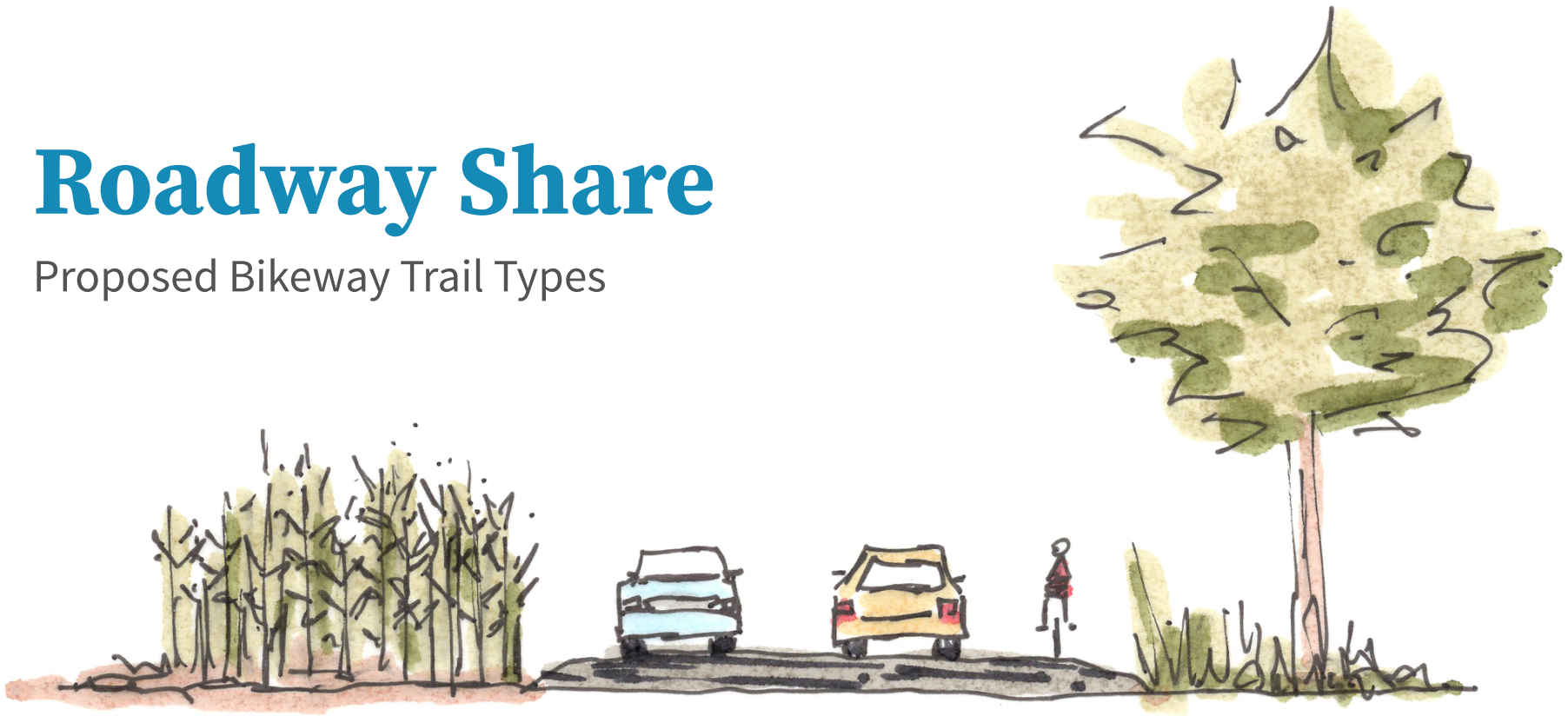
Grade Level Trail

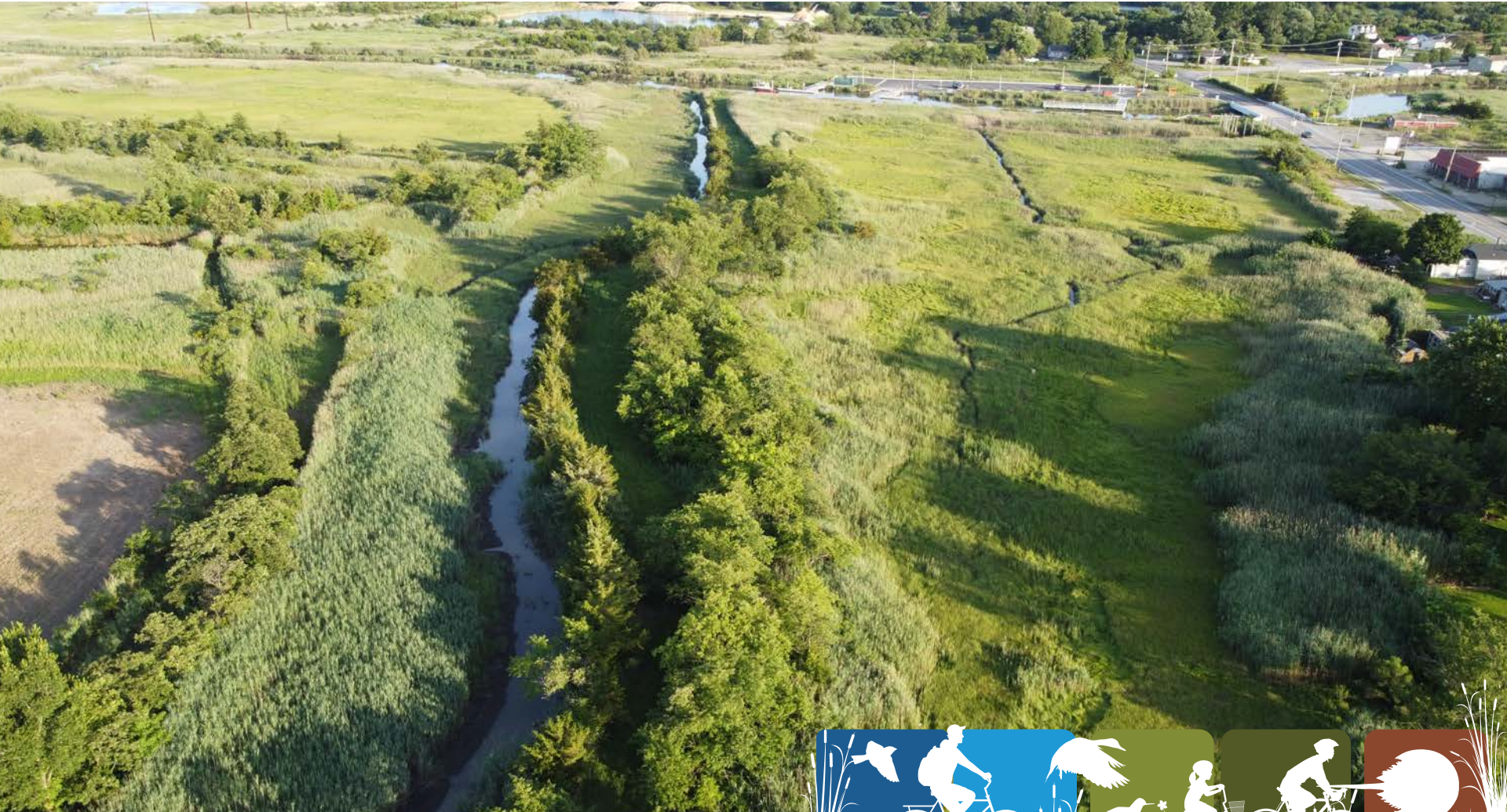
Proposed Bikeway Trail Types



Roadway Share

Proposed Bikeway Trail Types





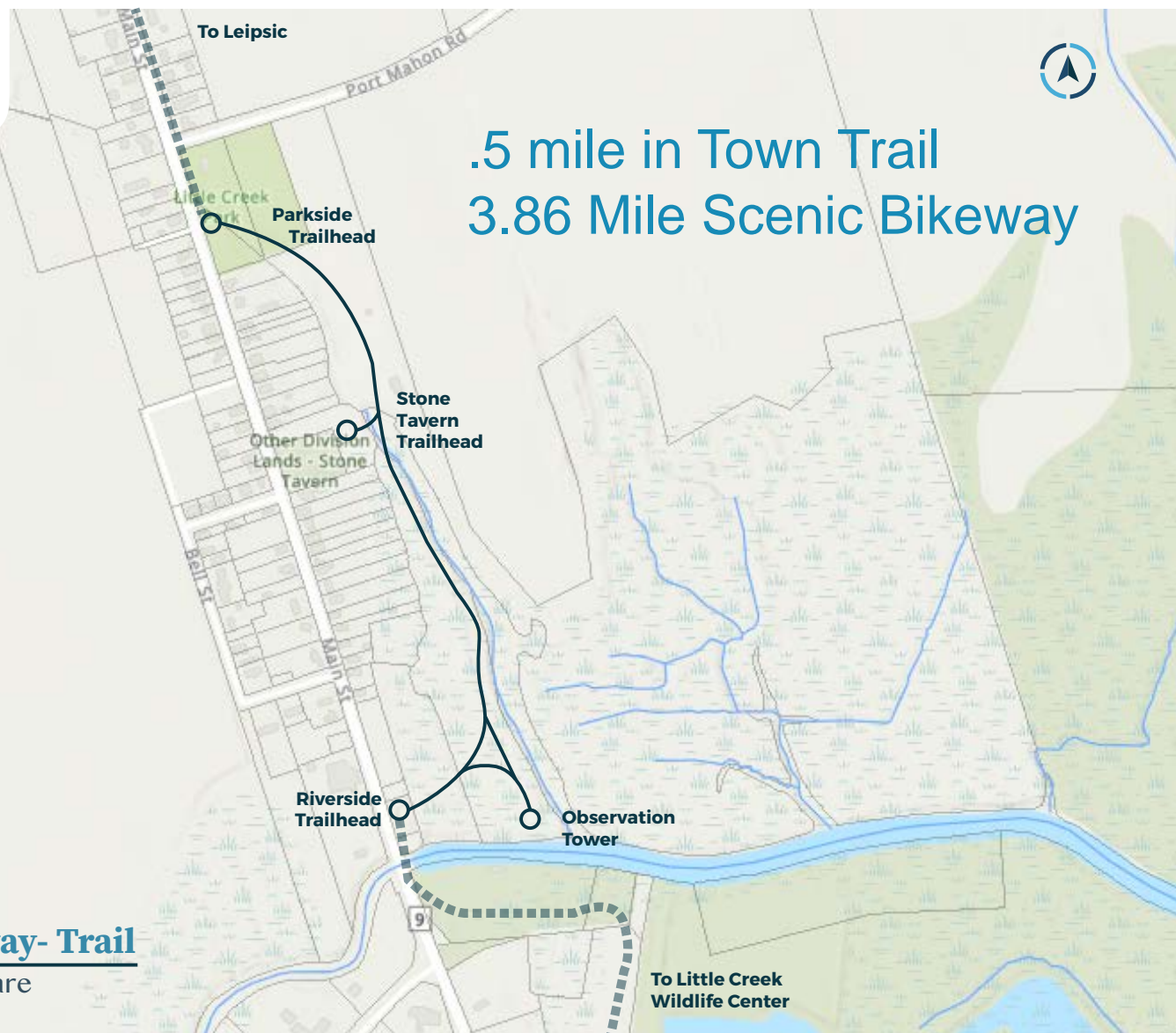
Existing Conditions

Proposed Bikeway





BAYSHORE *Bikeway*



Bayshore Bikeway- Trail
Little Creek , Delaware



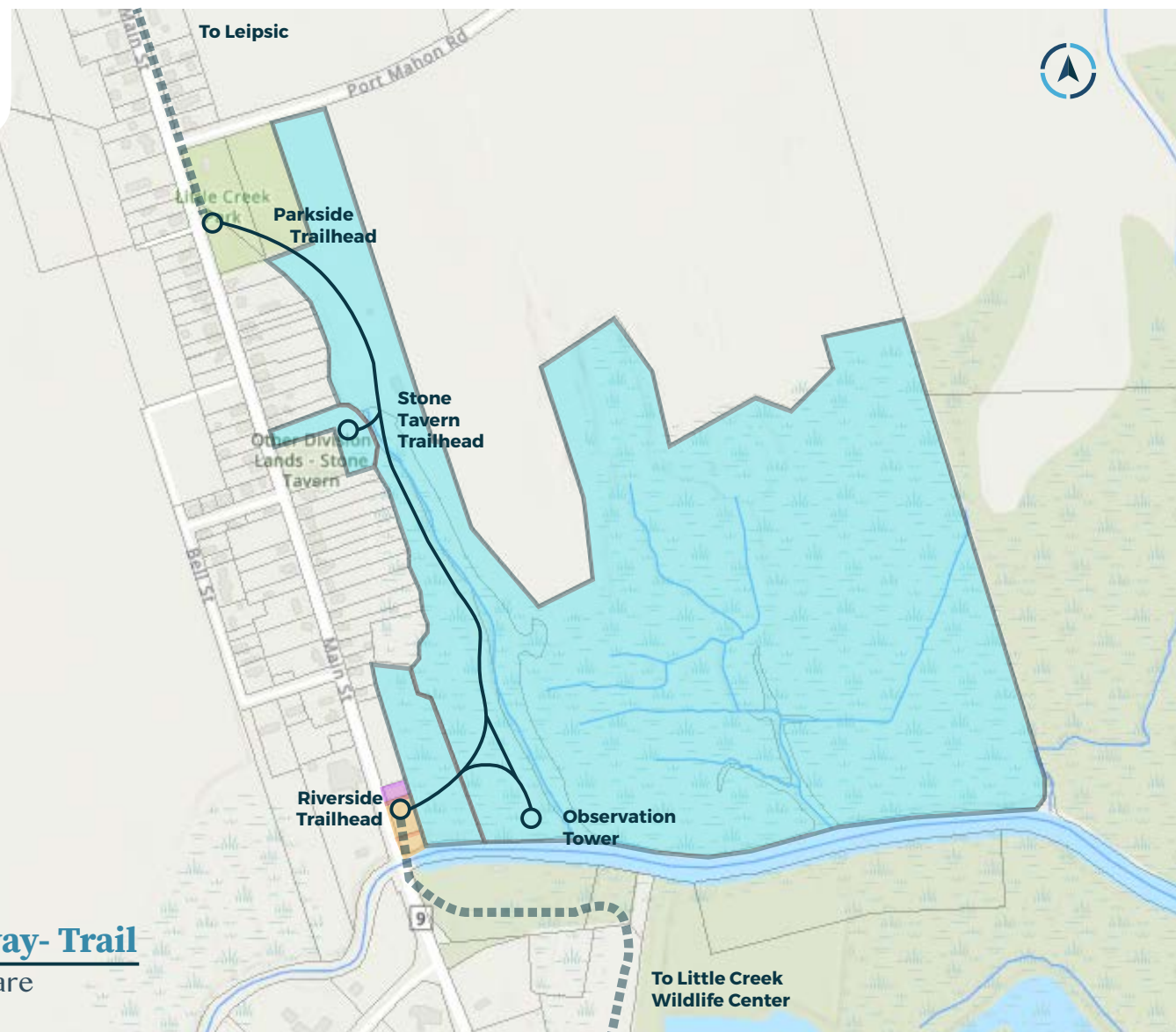
BAYSHORE *Bikeway*

- Owner 1- Felton, DE
- Owner 2- Dover, DE
- Owner 3- Black Mountain, NC



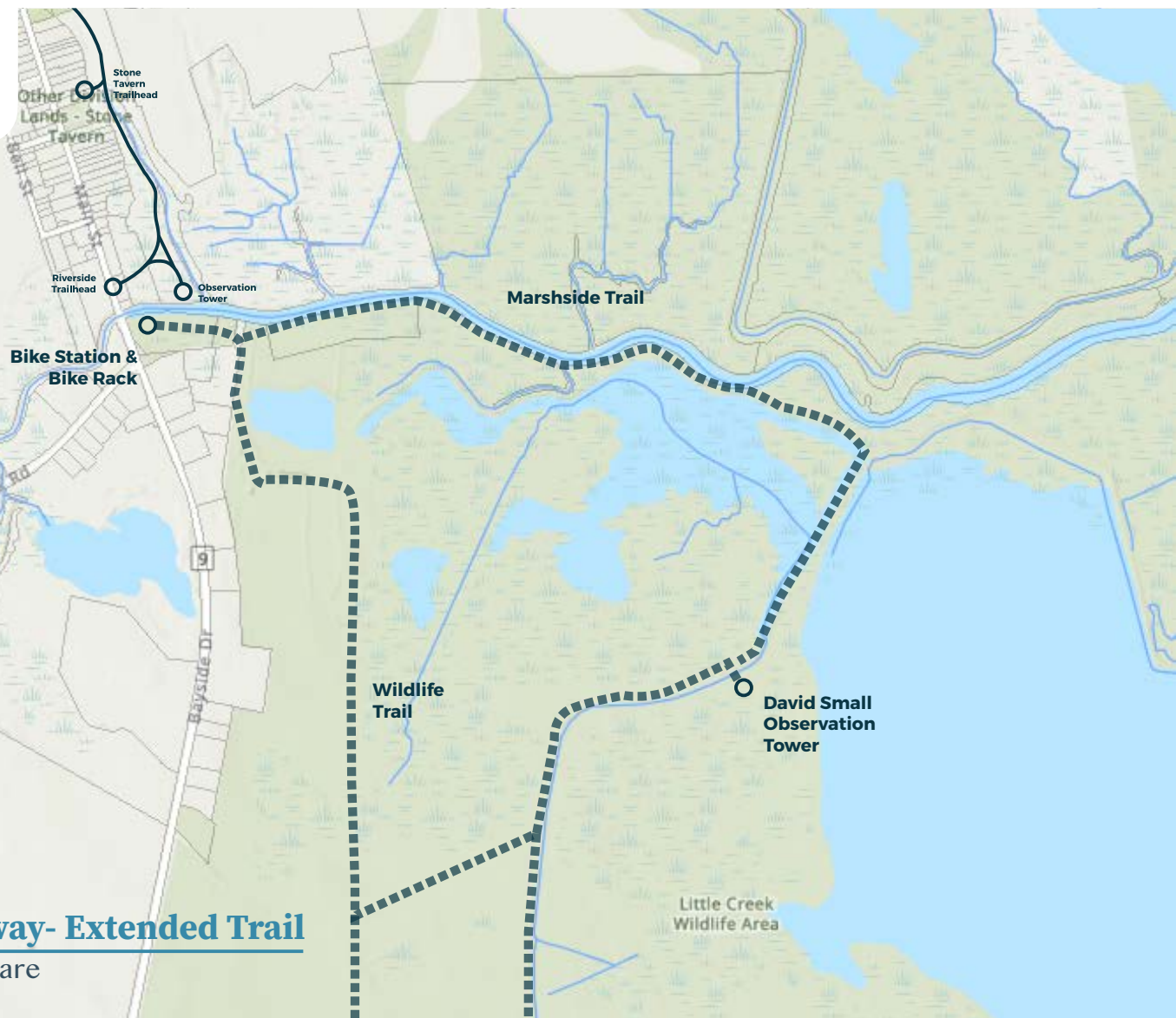
Bayshore Bikeway- Trail

Little Creek, Delaware





BAYSHORE *Bikeway*



Bayshore Bikeway- Extended Trail

Little Creek , Delaware



BAYSHORE
Bikeway



Bayshore Bikeway-Extended Trail
Little Creek, Delaware

BIKE TRAIL MILES



New Castle County

27 miles



Sussex County

32 miles



Kent County

3.5 miles

T3

Parkside



Trailheads

Connectivity & Traffic Calming Context Map

LITTLE CREEK, DELAWARE



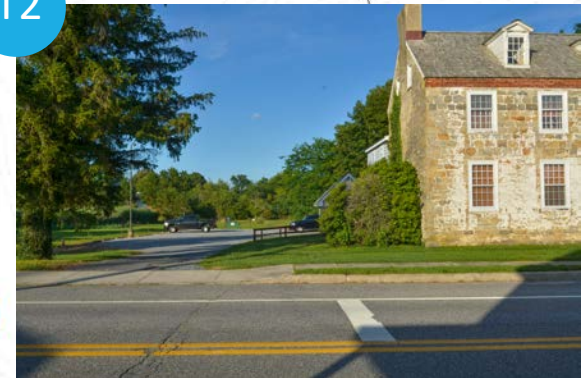
T1

Riverside



T2

Stone Tavern



T3

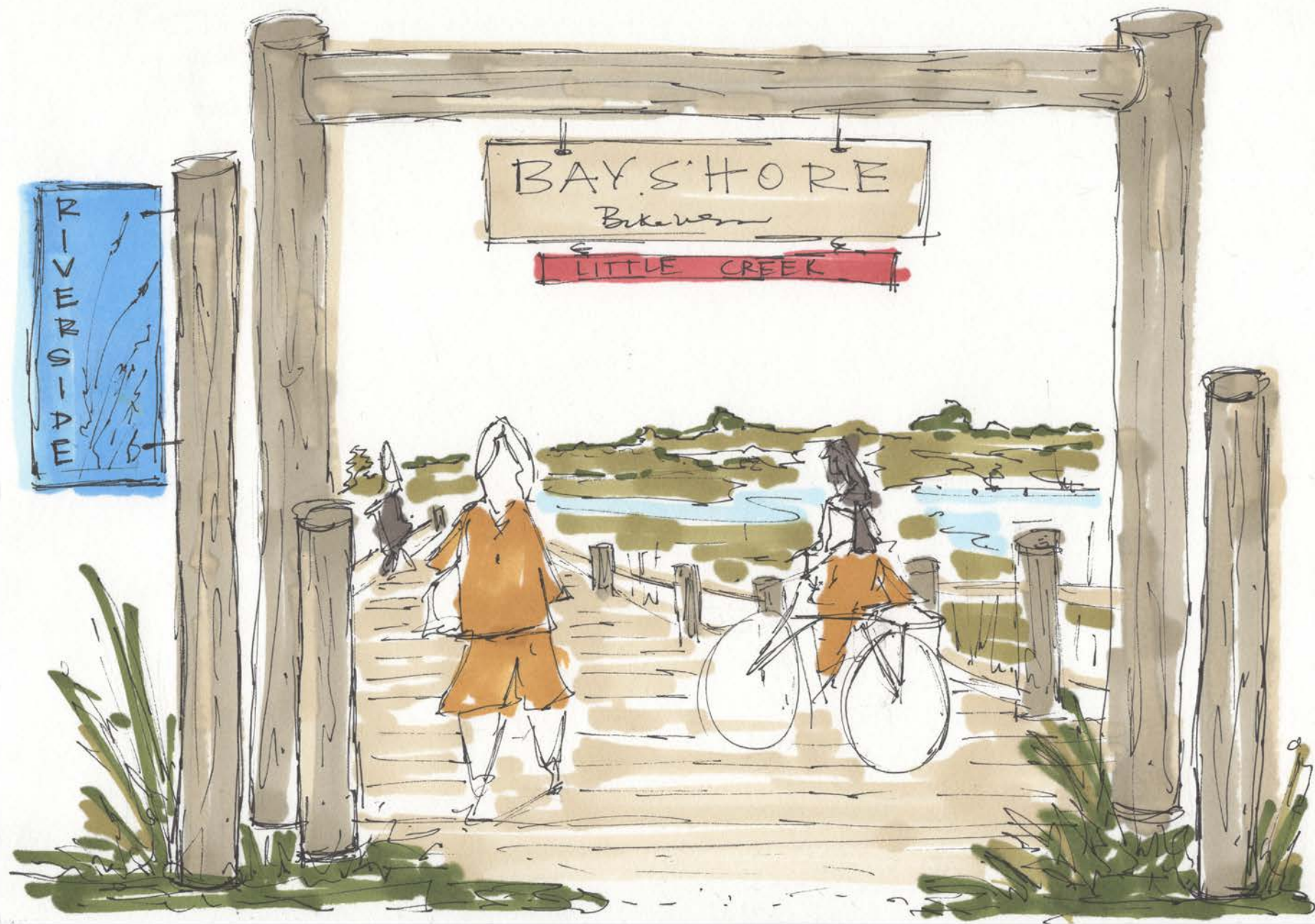
T2

T1

LEGEND

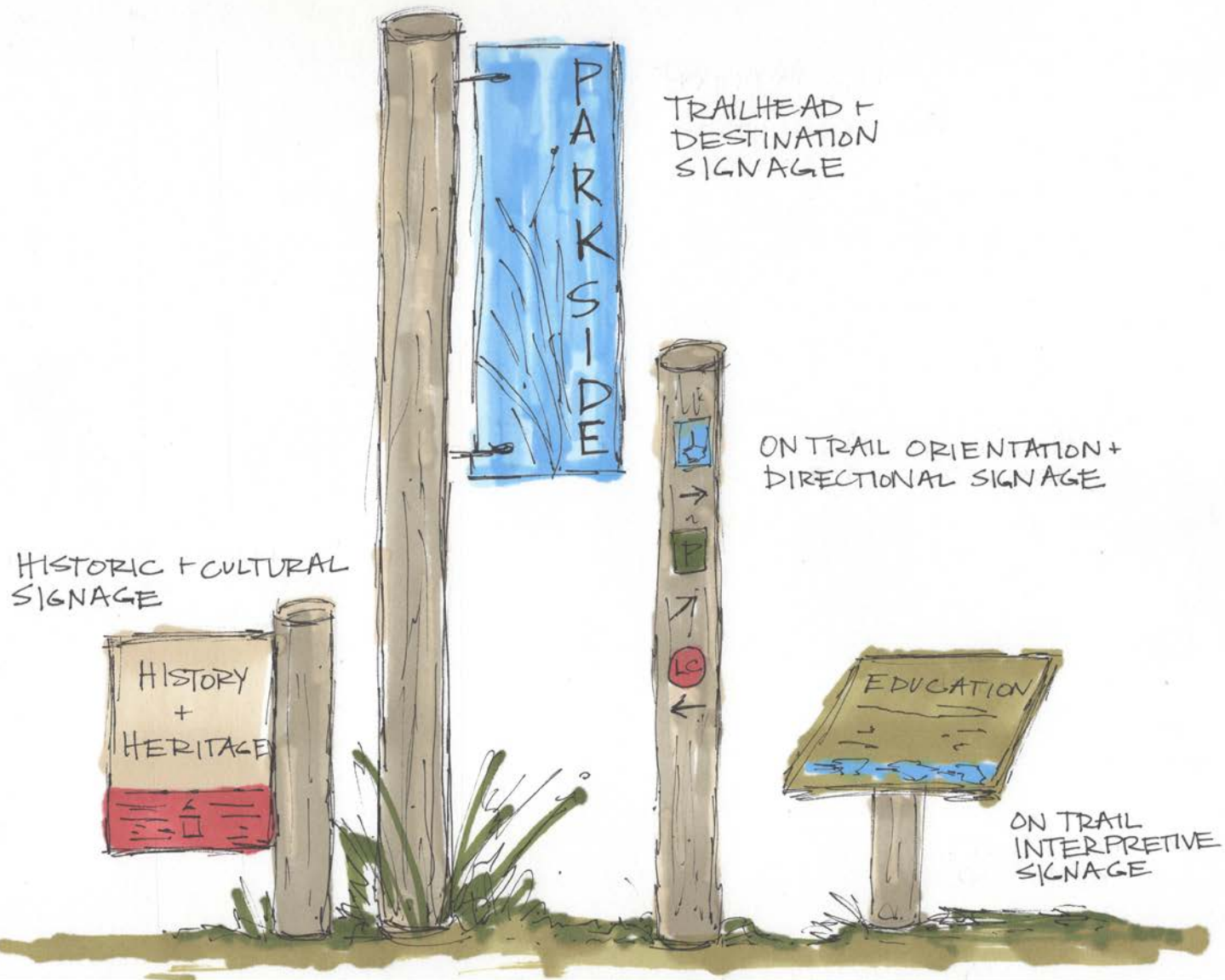
- Median
- Crosswalk
- Bioswale
- Trailhead







YSHORE
Bikeway



HISTORY + CULTURAL
SIGNAGE

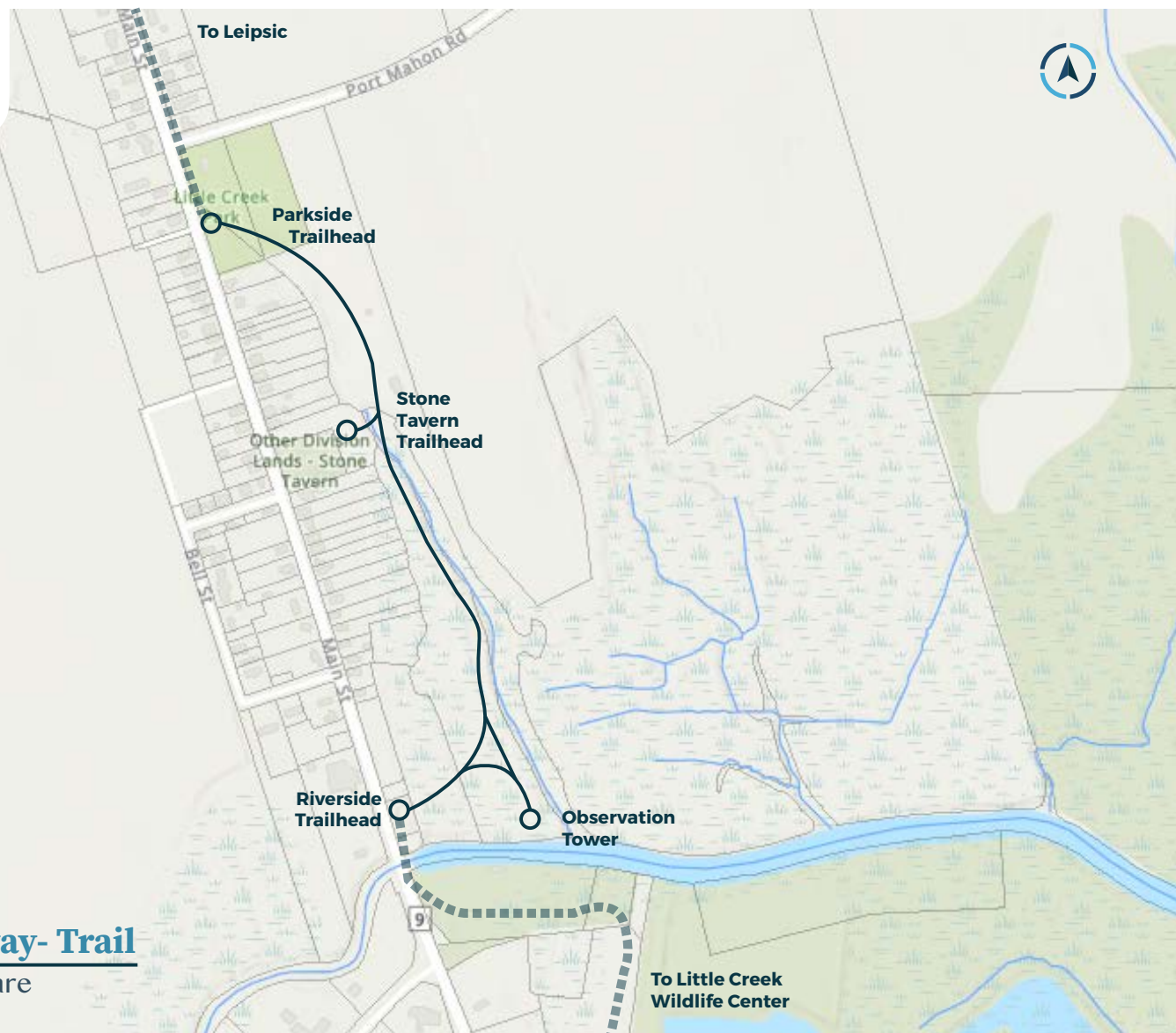
TRAILHEAD +
DESTINATION
SIGNAGE

ON TRAIL ORIENTATION +
DIRECTIONAL SIGNAGE

ON TRAIL
INTERPRETIVE
SIGNAGE

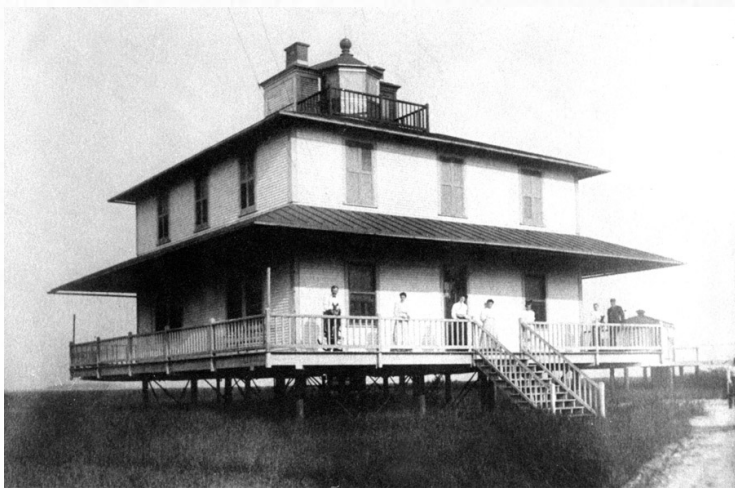


BAYSHORE *Bikeway*



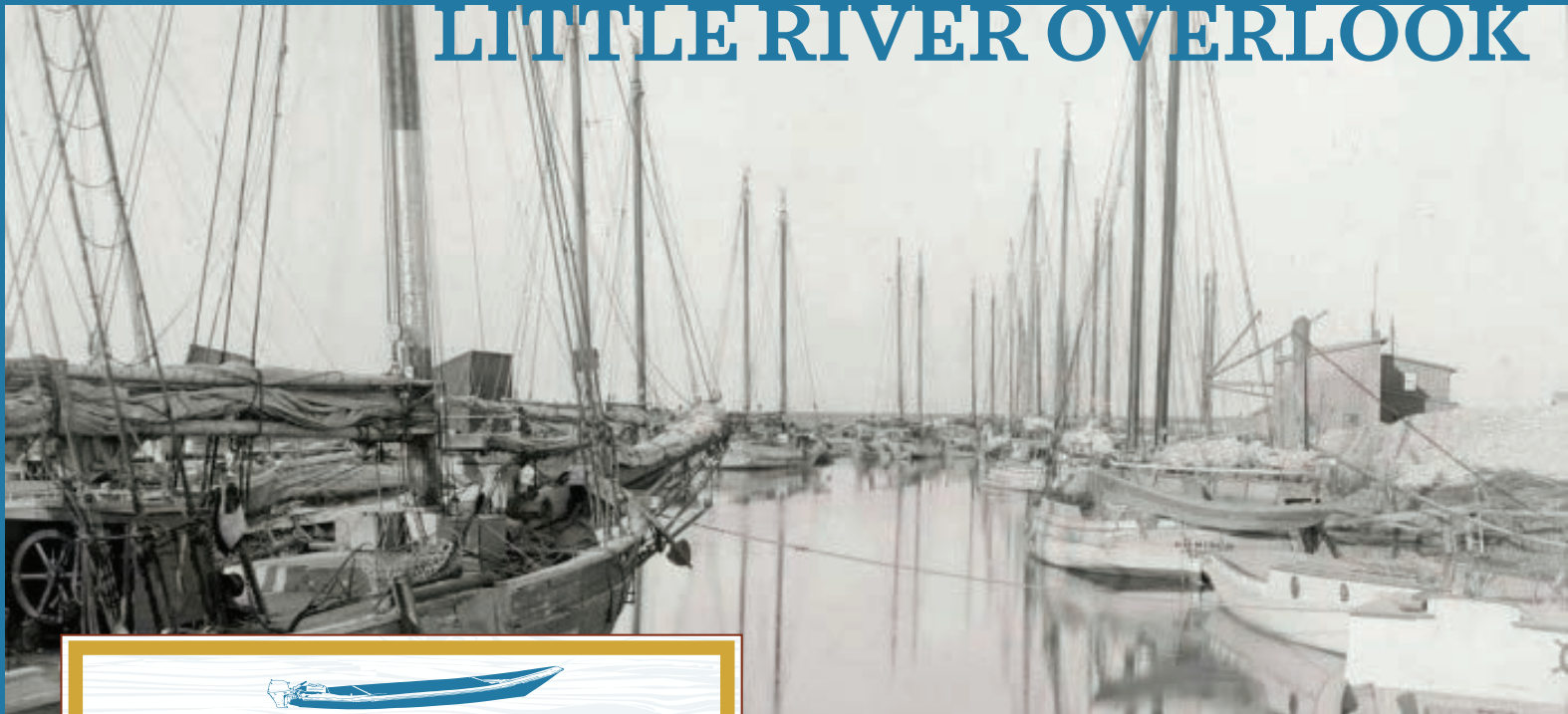
Bayshore Bikeway- Trail


Little Creek , Delaware



JARMAN LOOKOUT
OBSERVATION TOWER

LITTLE RIVER OVERLOOK




Little Creek
D E L A W A R E

= est. 1899 =

Slow Down. Live A Little.

The Town of Little Creek is a charming Bayshore town with an interesting history while offering the potential for traveler services. The Town of Little Creek, settled in the early 1800's, allegedly was first inhabited by pirates. Originally called Little Landing, the town was most prosperous in the late 1800's when a thriving oyster industry emerged. Nearby Port Mahon grew into a stopover for large ships and commercial boats that led to businesses, such as bait shops, restaurants and a cannery in town. The Old Stone Tavern, actually never a tavern, was built in 1829 with the stone from the ballast of old sailing ships. Today, few boats are found in the Town's waters. Now, part of the Little Creek Wildlife Area, Port Mahon was previously lined with fishing shacks and oyster-shucking houses."





BAYSHORE BYWAY

Bloodthirsty

LITTLE CREEK, DE

5k

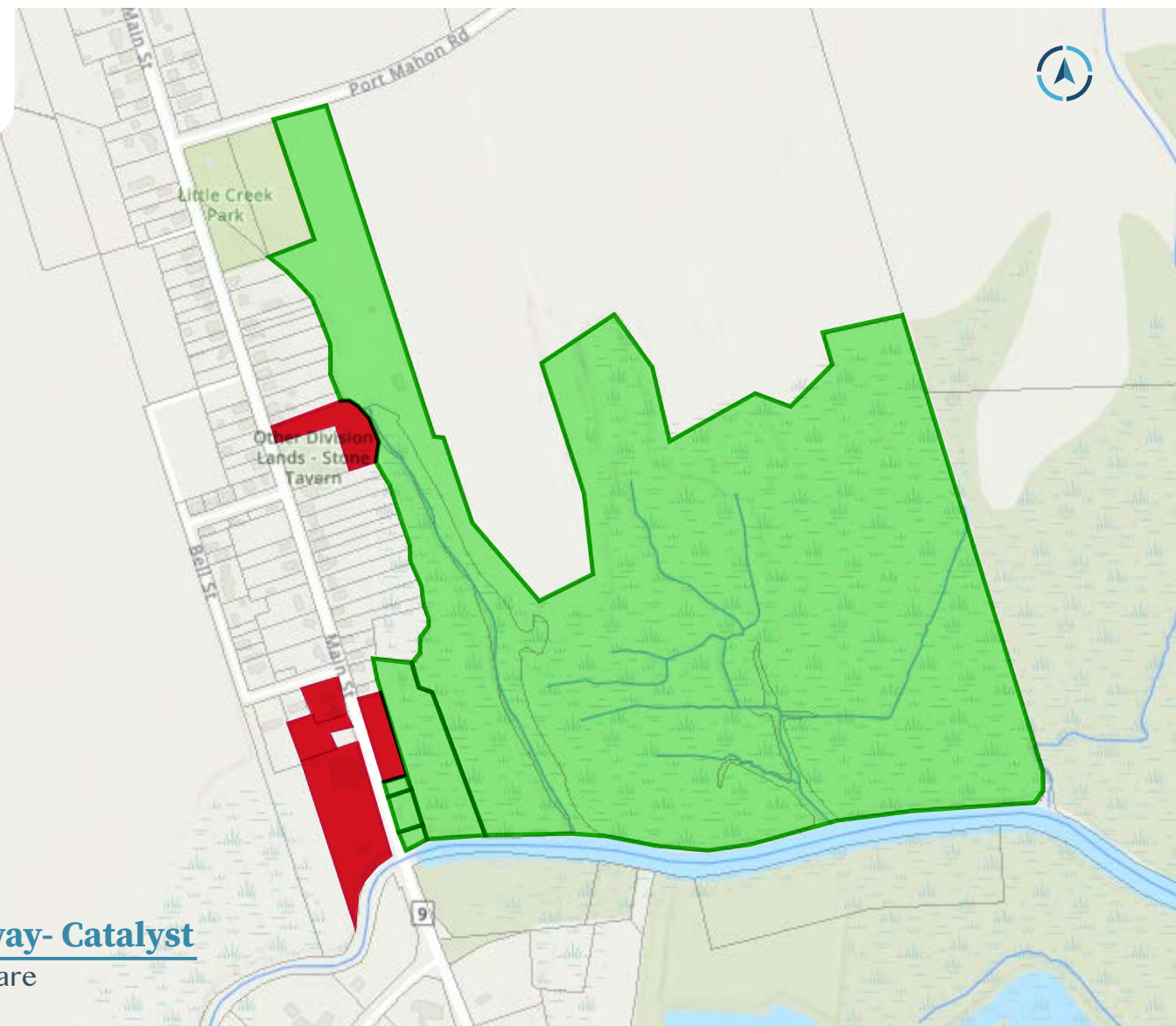
Bikeway Extension

- Phased goals aimed at connecting the bikeway south to the Little Creek Wildlife Center and north to Leipsic through a **buffered shared path** along Route 9, eventually converting to a marked sharrow lane.
- Bayshore Byway communities have an opportunity to offer **unique biking and walking experiences** in their community.
- The ultimate goal is to continue the bikeway north through **all the Bayshore Byway towns** to Delaware City.



BAYSHORE

Bikeway



Bayshore Bikeway- Catalyst

Little Creek , Delaware



Commercial Opportunity

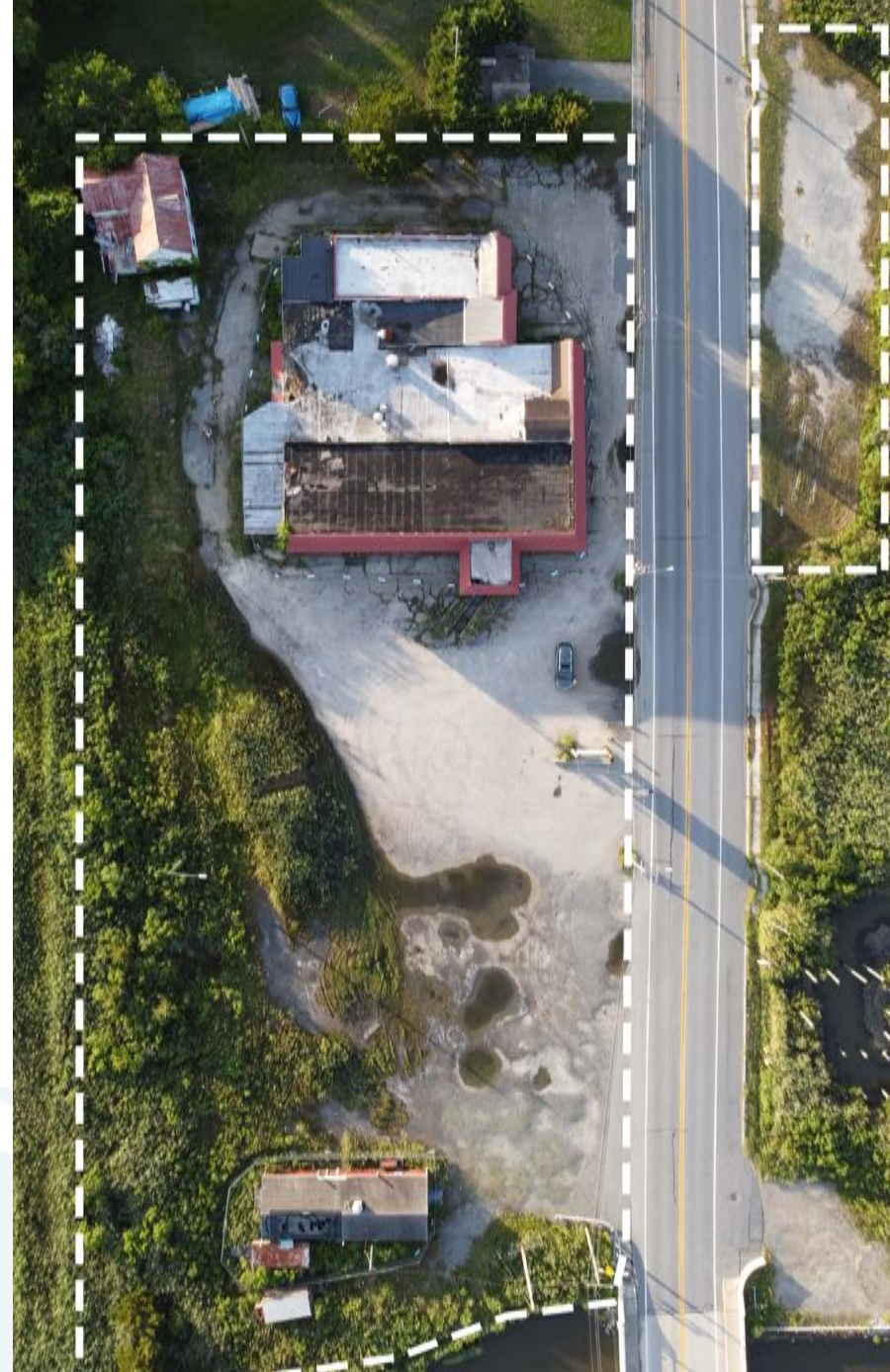
LITTLE CREEK, DELAWARE

Commercial Redevelopment Opportunity



Commercial Redevelopment

Property Boundaries

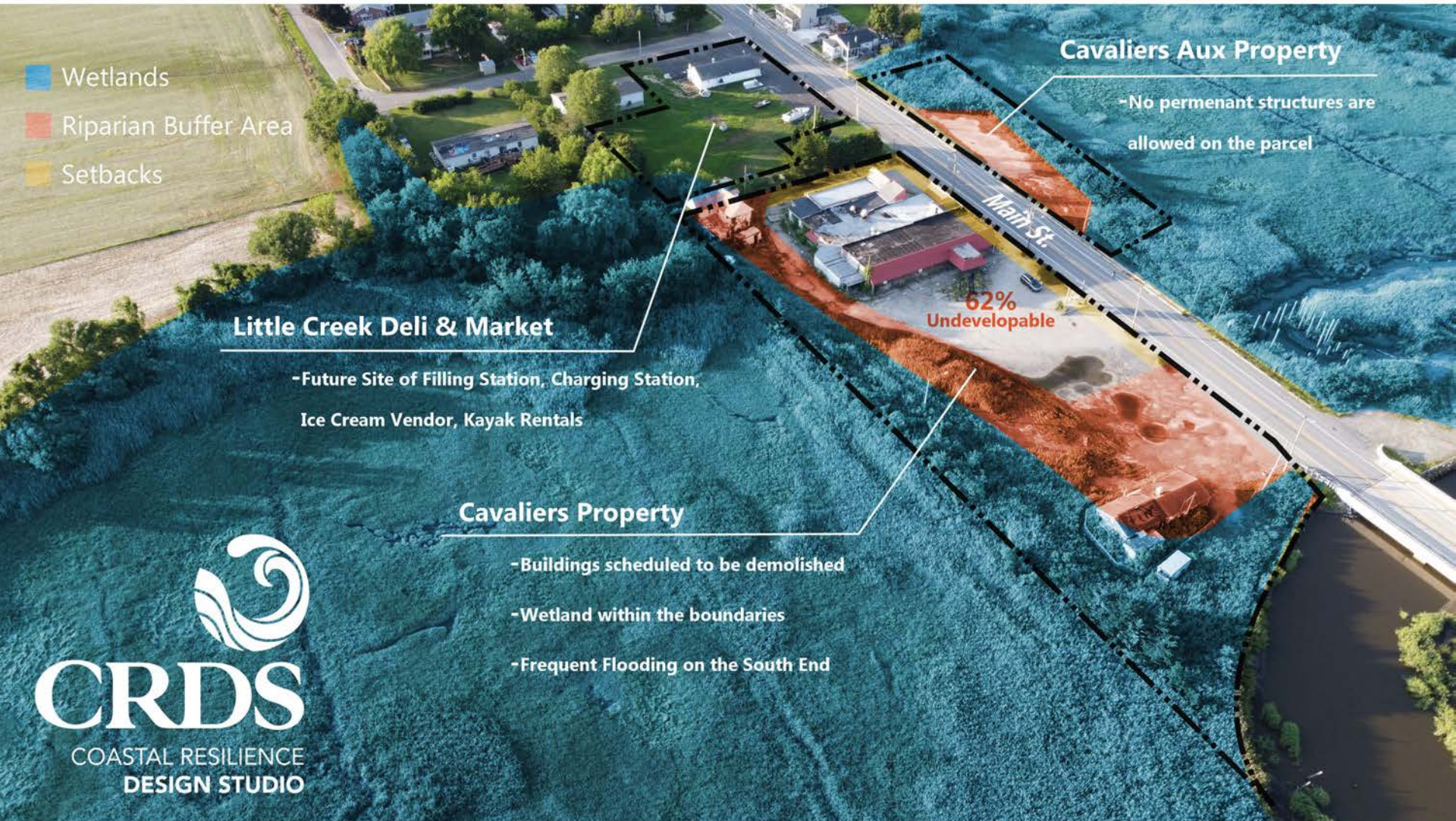






Commercial Redevelopment Site

Existing Conditions & Design Constraints



Legend

Projected Sea Level Rise 2040

- 0.5m (1.6 ft, Low)
- 1.0m (3.28 ft, Middle)
- 1.5m (4.92 ft, Middle)

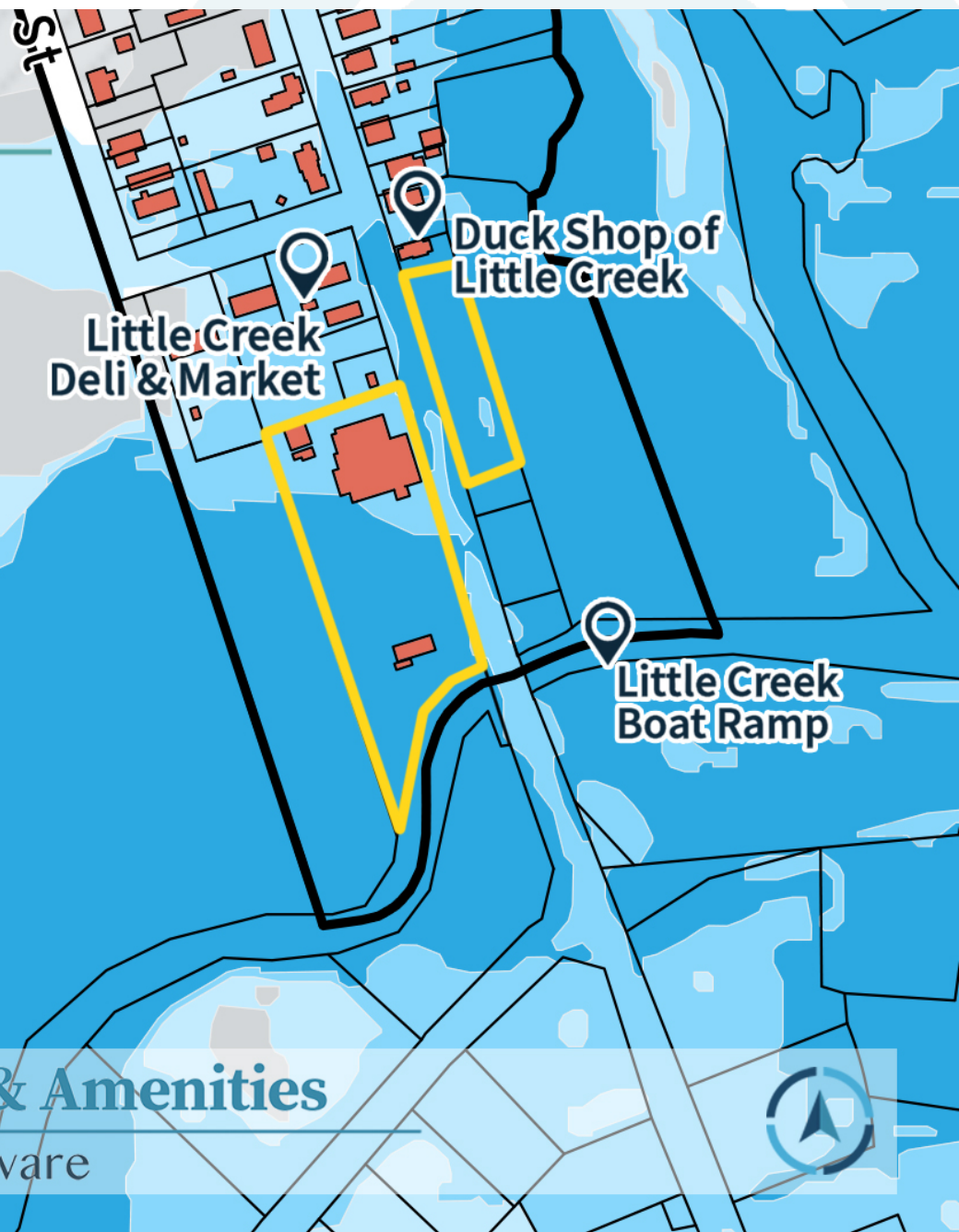
At-Risk Buildings

FEMA Flood Hazard Zones

- AE- 100 Year Floodplain
- X- 500 Year Floodplain

CRDS
COASTAL RESILIENCE
DESIGN STUDIO

Sea Level Rise & Amenities
Little Creek, Delaware



Commercial Objectives

- Incentivize private investment in Little Creek
- Create an inviting commercial district
- Establish a connection to the Little River
- Honor maritime history and small-town character
- Mitigate current and future flooding on site
- Increase wetland habitat
- Increase the riparian buffers
- Create elevated views of the Little River

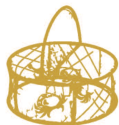
Waterman's Village

Plan View

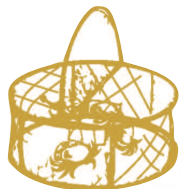


Waterman's Village

Plan View



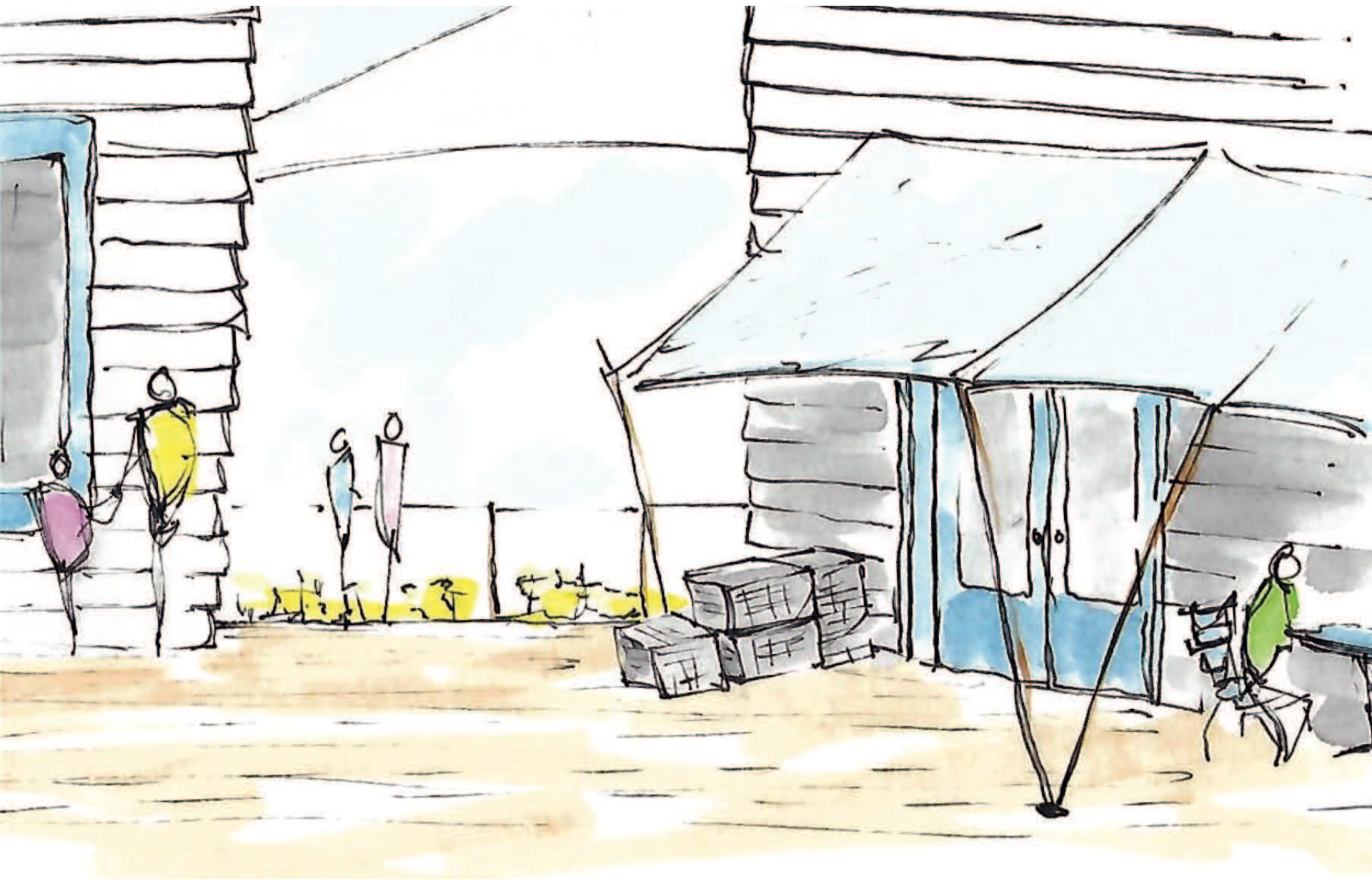
WATERMANS
=Village=



WATERMANS

=Village=

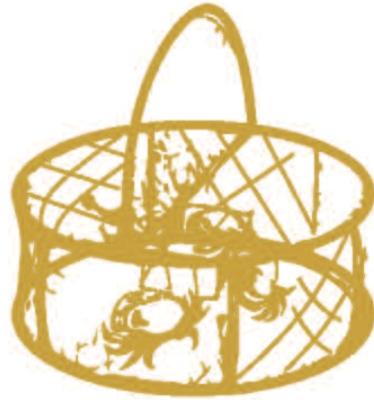




Waterman's Village

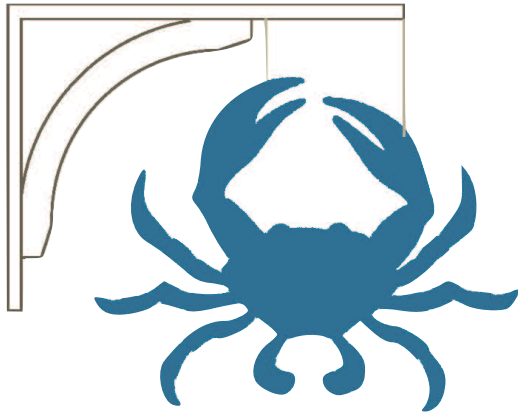
Section View





WATERMANS

=Village=



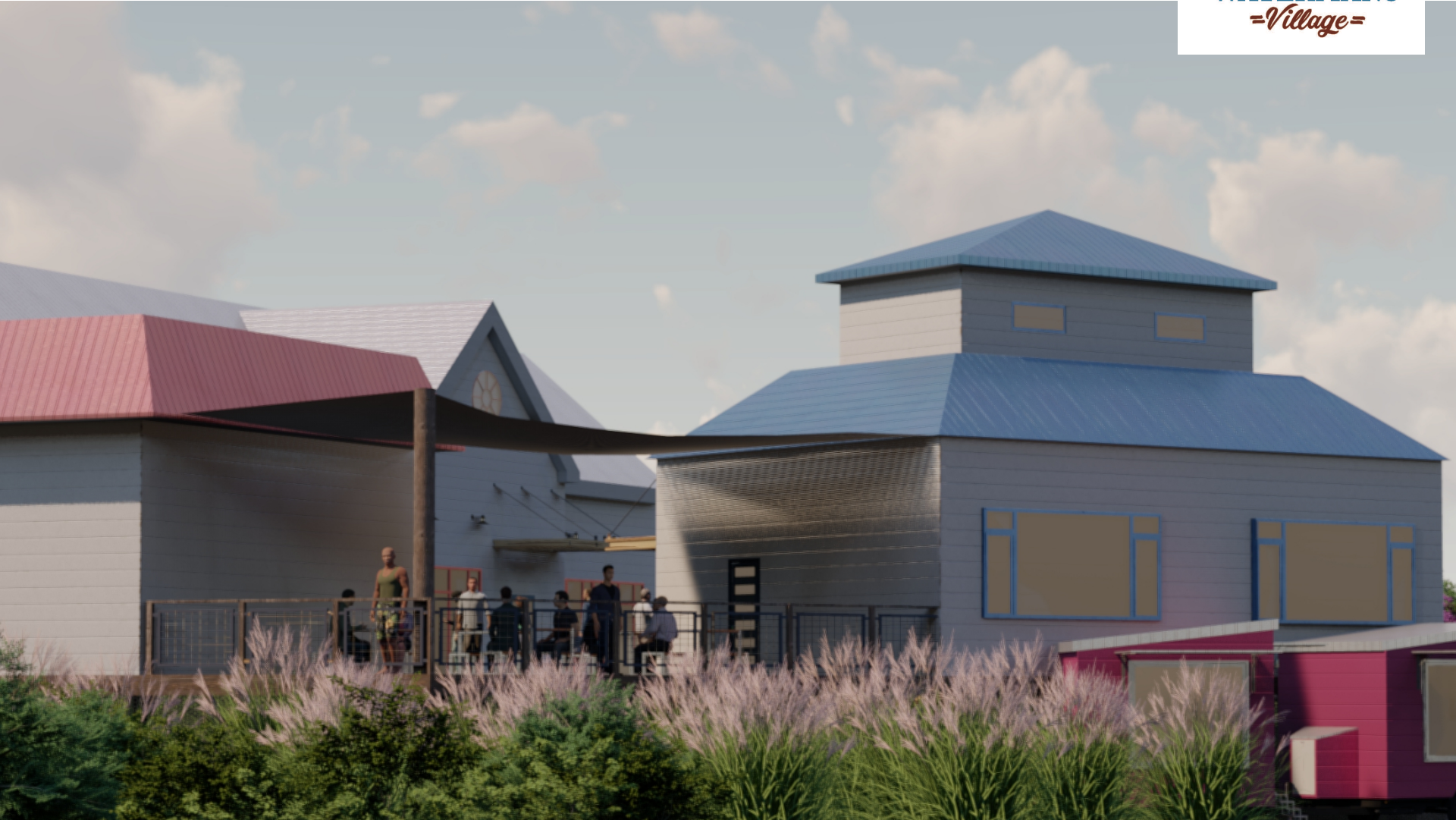


Tony's Seafood Restaurant, Marshall, CA

Waterman's Village



Waterman's Village



Waterman's Village



Waterman's Village



Waterman's Village



Waterman's Village



Micro Retail

What is it and why here?

Small business incubators
w/ little upfront investment

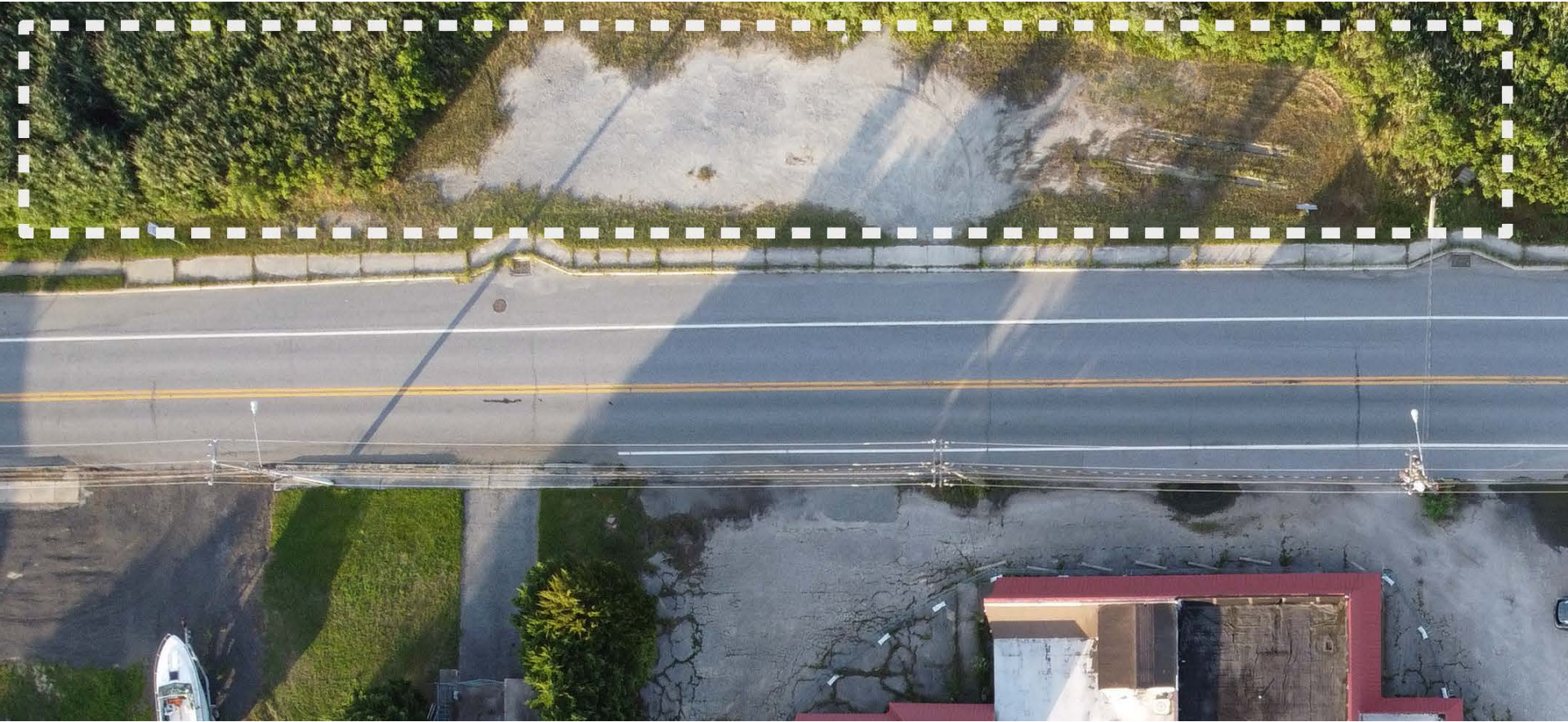
Roadworthy shops

- Allowable in the floodplain
- Built on wheels
- Less than 200 sqft
- Mobile in case of flood



The Pilings at Waterman's Village

Existing Conditions



The Pilings at Waterman's Village

Microretail Proposed Plan View



The Pilings at Waterman's Village

Existing Street View



The Pilings at Waterman's Village

Microretail Proposed Street View



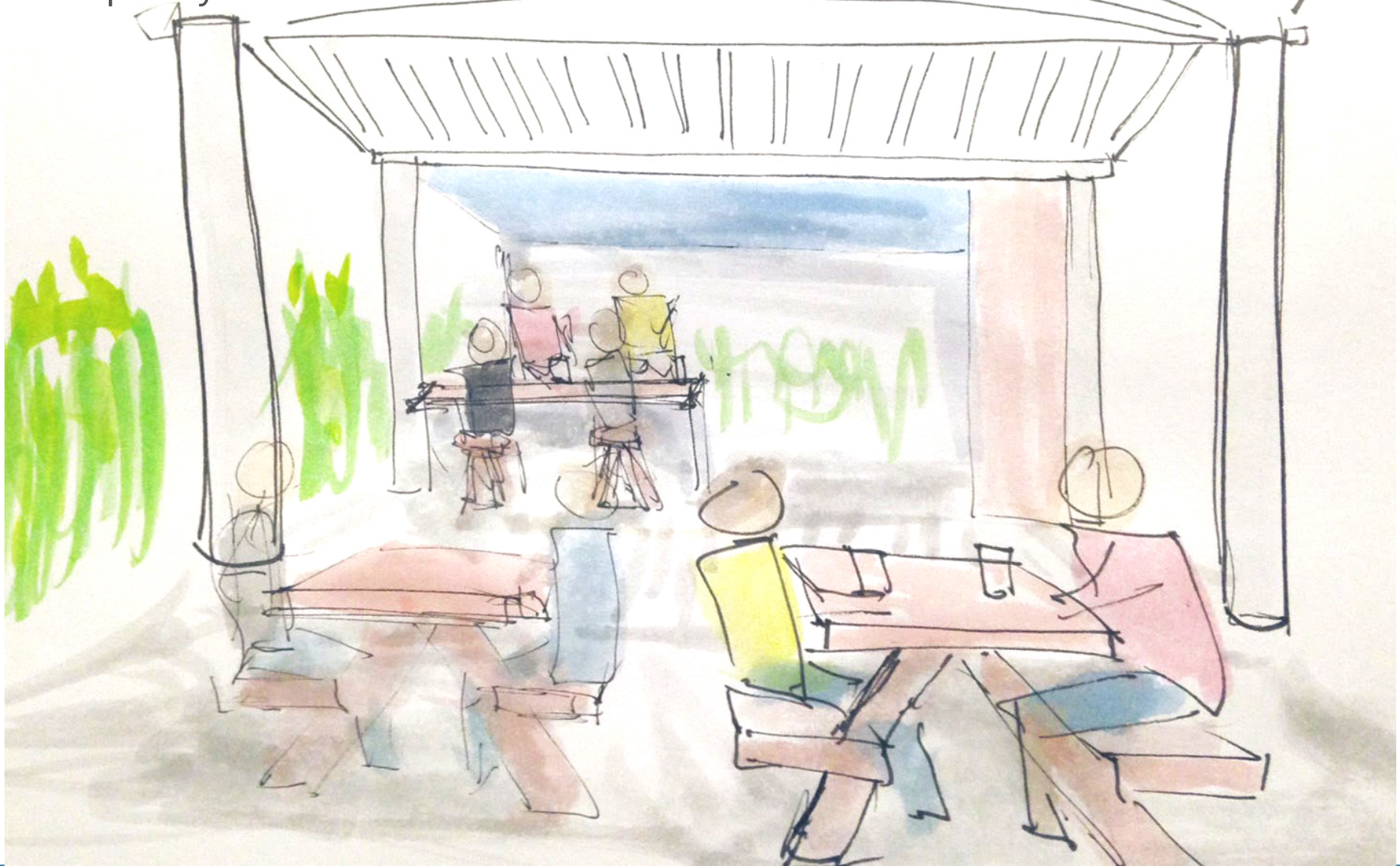
The Pilings at Waterman's Village

Microretail Proposed Elevation



Pop-ups at Waterman's Village

Temporary Commercial Area





Sail Shades, Superior Awning





Implementation Strategy

LITTLE CREEK, DELAWARE



A plan for resilience is a plan worth pursuing.

Working with **CRDS** means Little Creek continues to receive instrumental help in developing innovative and feasible solutions to source and fund the implementation of the proposed plan. We are here to help.

Conceptual Plan Benefits

- Increased surface level stormwater capacity and control
- Increased ability for stormwater to maintain its natural flow
- Enhanced park experience with a shared path over a restored wetland, providing educational and recreational opportunities, as well as functioning as a stormwater relief measure for the community
- Enhanced walkability
- Safer, slower streets
- Addition of approximately 4 miles protected bike and shared use pathways in Little Creek, enhancing the visitor experience and connection to the Little River
- Opportunity to leverage existing investment in the Little Creek Wildlife Area and newly installed DE Fish & Wildlife Boat Ramp facility
- Opportunity to have public sector investment catalyze private sector development
- Net gain of approximately 6 on-street parking spaces along the commercial district by re-striping and painting the parking lane while preserving residential parking amenities
- Opportunity to add approximately:
 - 5,000 sf of commercial space in 5 buildings
 - 900 sf micro retail space
 - 3,000 sf of outdoor seating and recreation
 - 28 parking spaces on the commercial lot
 - 10,000 sf new wetland habitat, enhancing the stormwater buffer and the community's commitment toward sustainable sea level rise mitigation
- Resilient infrastructure and community pride have been shown to raise property values

First Steps to Implementation

- **Adopt branding package**
- **Coordinate with DelDOT on a maintenance check of the North and Central portions of existing stormwater infrastructure.**
- **Strategize removal or increase capacity of poorly functioning culverts**
- **Coordinate with DNREC on grant opportunities for engineer feasibility studies and construction drawings**
- **CRDS will strategize to address silted stormwater outlet near the park**
- **Coordinate with Delmarva Power to approve a street banner design & size**
- **Partner with the Living Lab grant & DelDOT to set up a traffic calming pop-up to collect data before, during, and after installing temporary medians, crosswalks, and bump-outs**
- **CRDS will coordinate with DE Fish & Wildlife to discuss the feasibility of the Bayshore Bikeway, with a focus on Little Creek as the pilot community and to address invasive Phragmites**
- **CRDS currently has a proposal from IPA to interview stakeholders, review current codes, make recommendations and provide wording to reflect the desires of the community, in order to codify portions of the recommended plan**
- **Develop a community education program**

Thank You!

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Coordinator - Sustainable Coastal Communities

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Associates

Michael Hahn, DelDOT Planner

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Architecture

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Designer

Andrew Hayes, Professional Engineer / Landscape
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