

Introducing Green  
Infrastructure for  
Coastal Resilience

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Giovanni Zinn, PE  
City Engineer

Dawn Henning, PE  
Project Manager

City of New Haven, CT

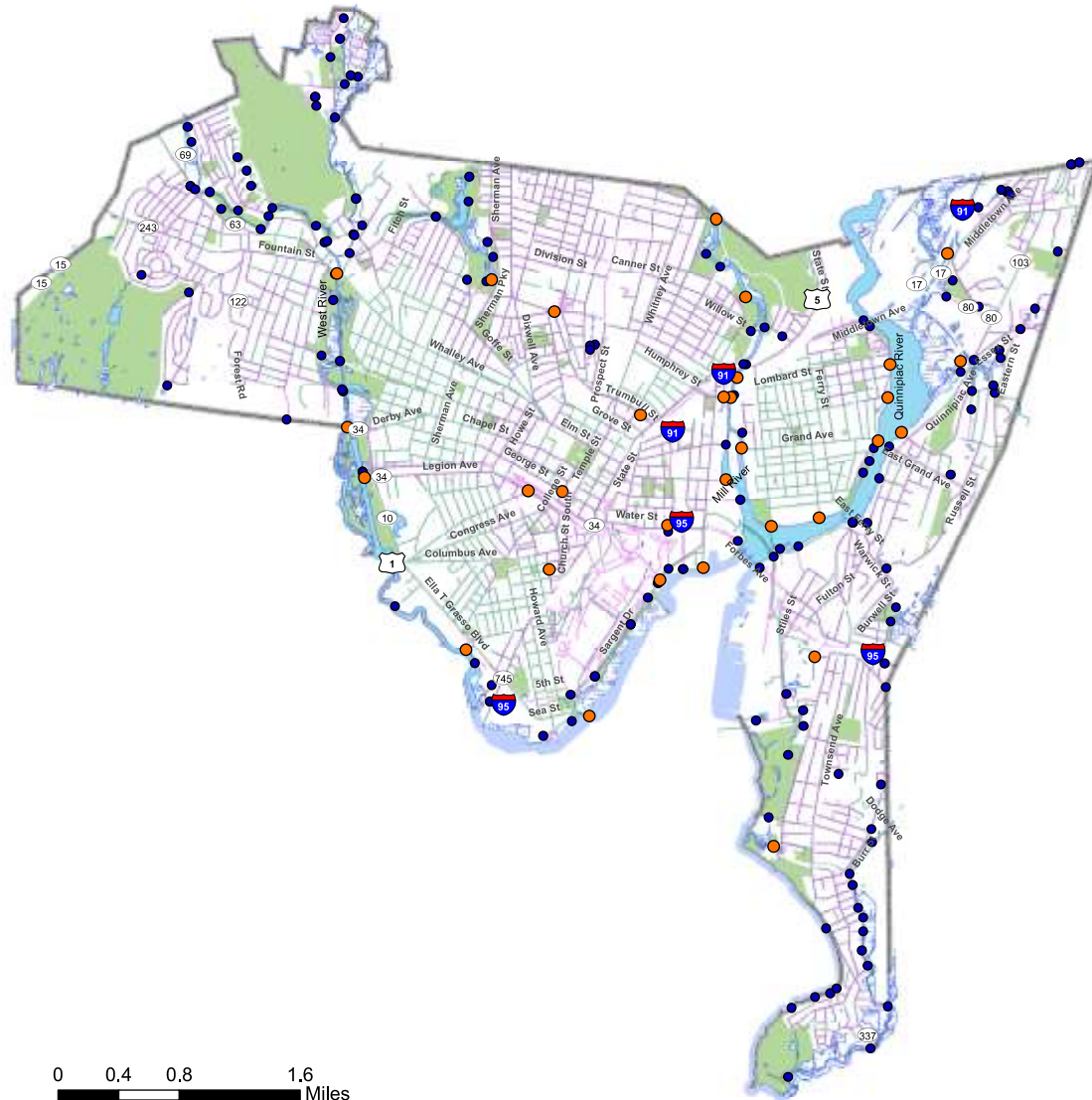
# Designing for the Future by going back to Nature



City of New Haven  
Toni N. Harp, Mayor

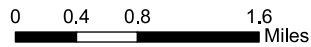


# New Haven's Stormwater System



## Legend

- Stormwater Pipe
- Combined Sewer Pipe
- Stormwater Outfall
- Combined Sewer Outfall

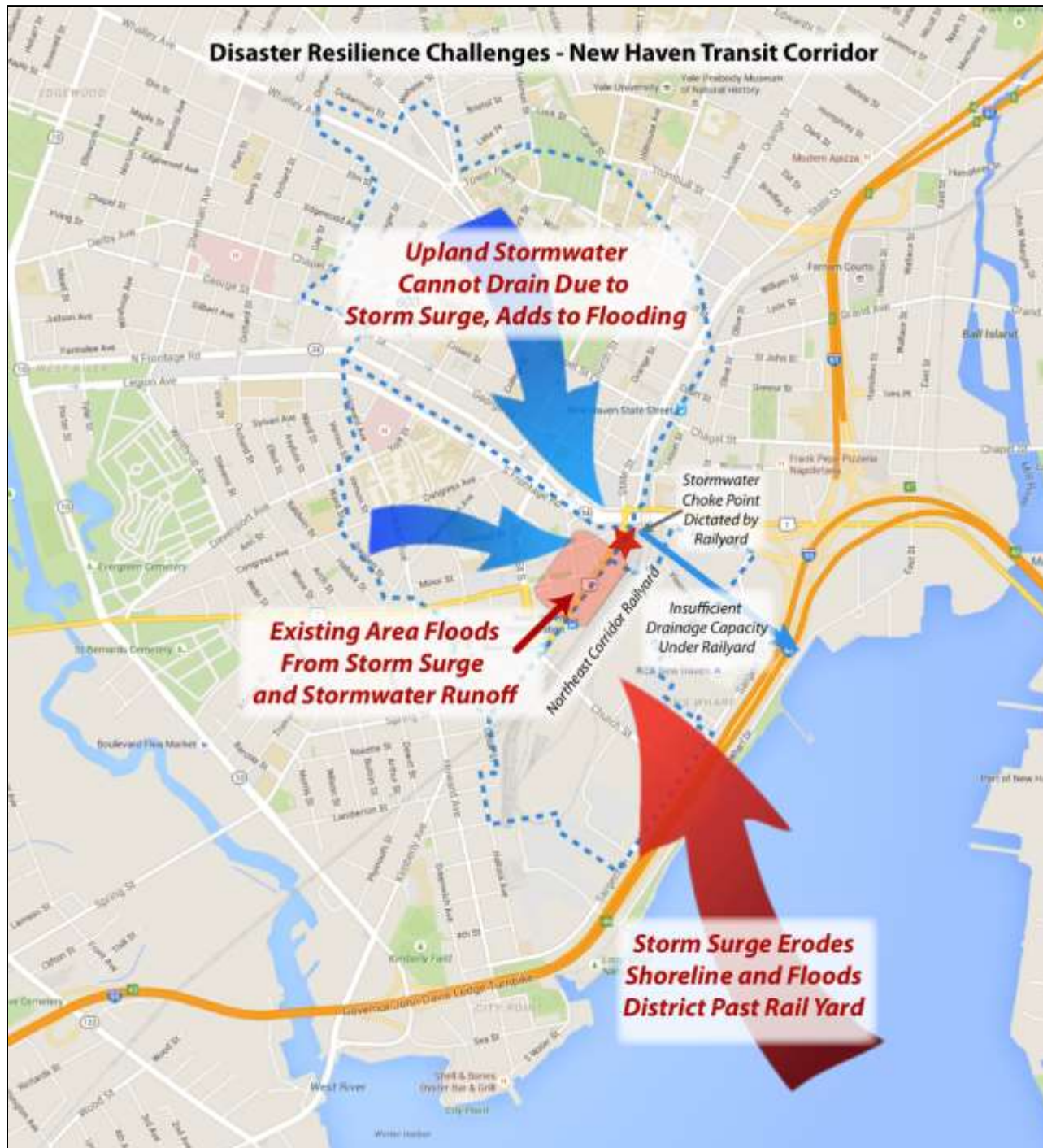


Date	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	1-day	2-day	3-day
Aug 10, 2012	0.6	1.1	1.4	2.1	2.2	2.4	2.4	2.4	2.4	2.9	3.6	3.6
Sep 18, 2012	0.3	0.6	0.8	1.1	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Sep 26, 2012	0.4	0.6	0.8	1.3	2.0	2.5	3.0	3.2	3.3	3.4	3.4	3.5
June 7, 2013	0.2	0.3	0.3	0.5	0.7	1.1	1.4	2.3	3.8	4.8	5.0	5.0
July 11, 2013	0.4	0.6	0.9	1.0	1.0	1.0	1.0	1.2	1.2	1.4	1.5	1.6
July 23, 2013	0.4	0.6	0.7	0.8	0.9	1.0	1.1	1.1	1.1	2.0	2.0	2.1
Mar 28, 2014	0.1	0.2	0.2	0.3	0.6	1.0	1.3	2.1	3.0	3.4	4.2	4.3
April 29, 2014	0.1	0.2	0.3	0.5	0.8	1.2	1.4	2.1	2.8	3.6	3.9	3.9
May 15, 2014	0.3	0.4	0.6	0.8	1.1	1.3	1.4	1.6	1.6	1.6	1.7	1.7
May 27, 2014	0.3	0.5	0.7	1.0	1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.4
June 13, 2014	0.4	0.6	0.8	1.2	1.6	1.6	1.7	1.7	2.1	2.1	2.1	2.1
July 14, 2014	0.4	0.7	1.0	1.5	1.8	1.9	2.4	2.4	2.4	2.5	2.8	2.8
July 1, 2015	0.5	0.7	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9

1-year
2-year
5-year
10-year

**Are we getting more rain?**

## Disaster Resilience Challenges - New Haven Transit Corridor



**Downtown  
Hill  
Long Wharf  
~  
Problems**









**Downtown Hill  
Long Wharf**

~

**Solutions**

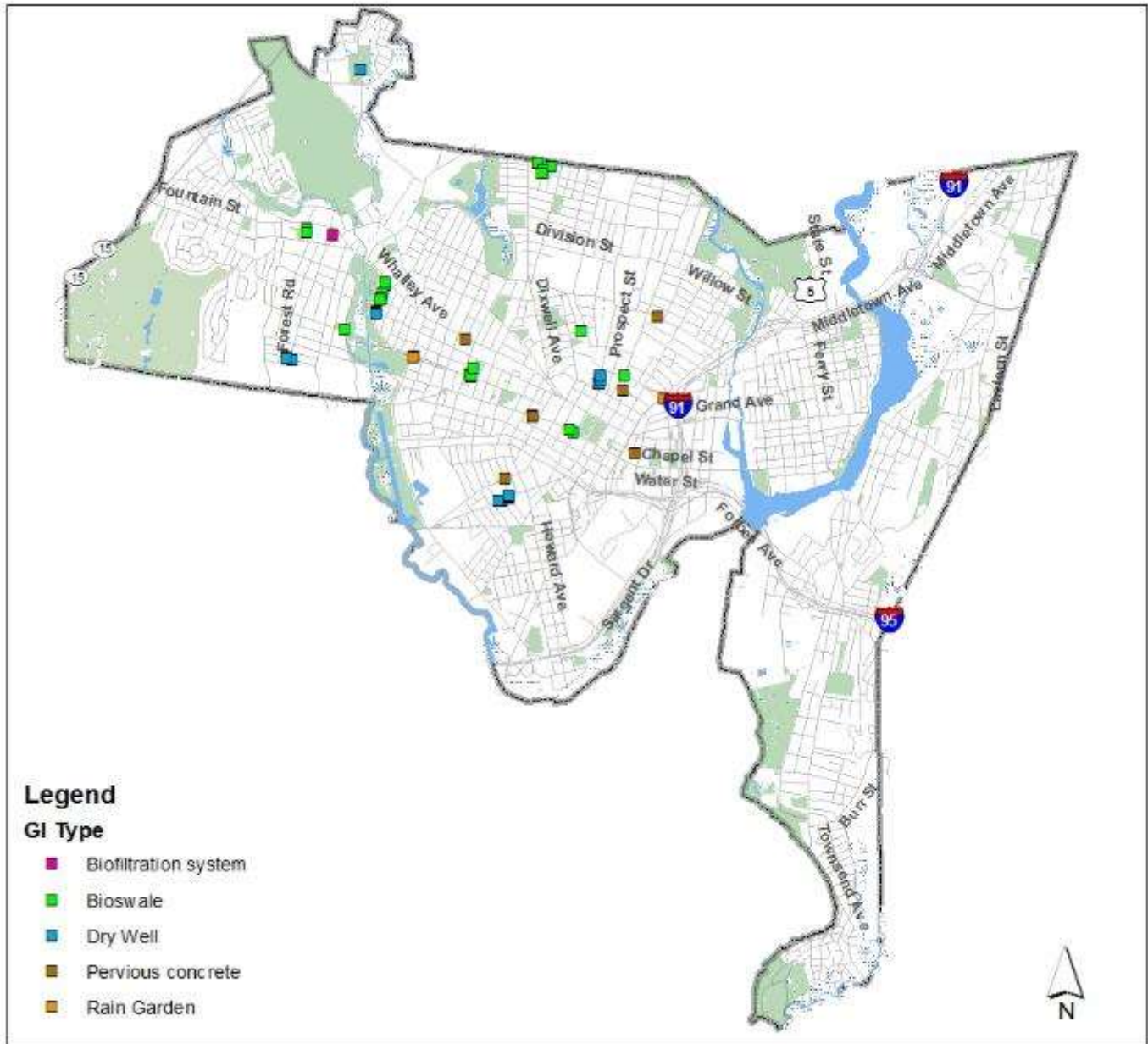
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**Green Infrastructure  
Living Shorelines**



# Existing GI Installations

- 26 bioswales
- 19 dry wells
- 7 pervious concrete installations
- 3 rain gardens



# Bioswales

- Green infrastructure in the public right of way
- Standard size: 15 feet by 5 feet
- Infiltration vs Conveyance
- Visible infrastructure



# Bioswale Design



# Bioswale Design



- Removal of the overflow curb cut
- Removal of concrete header to use of precast concrete footings
- Location of gabion
- Peastone cover
- Low maintenance plantings

# Partnerships

- Urban Resources Initiative
- EMERGE
- CFE/Save the Sound
- Work with Re-entry population
- Provide job skills training



**SLOW**  
CHILDREN  
AT PLAY

**No  
Standing  
Anytime**

**Eye**  
Watch for people  
with impaired  
vision. Yield  
to them. Do not  
drink. Do not  
drive. Do not  
operate heavy  
machinery.

**BEWARE  
of DOG**

**EMERGE**  
**CREW  
MEMBER**

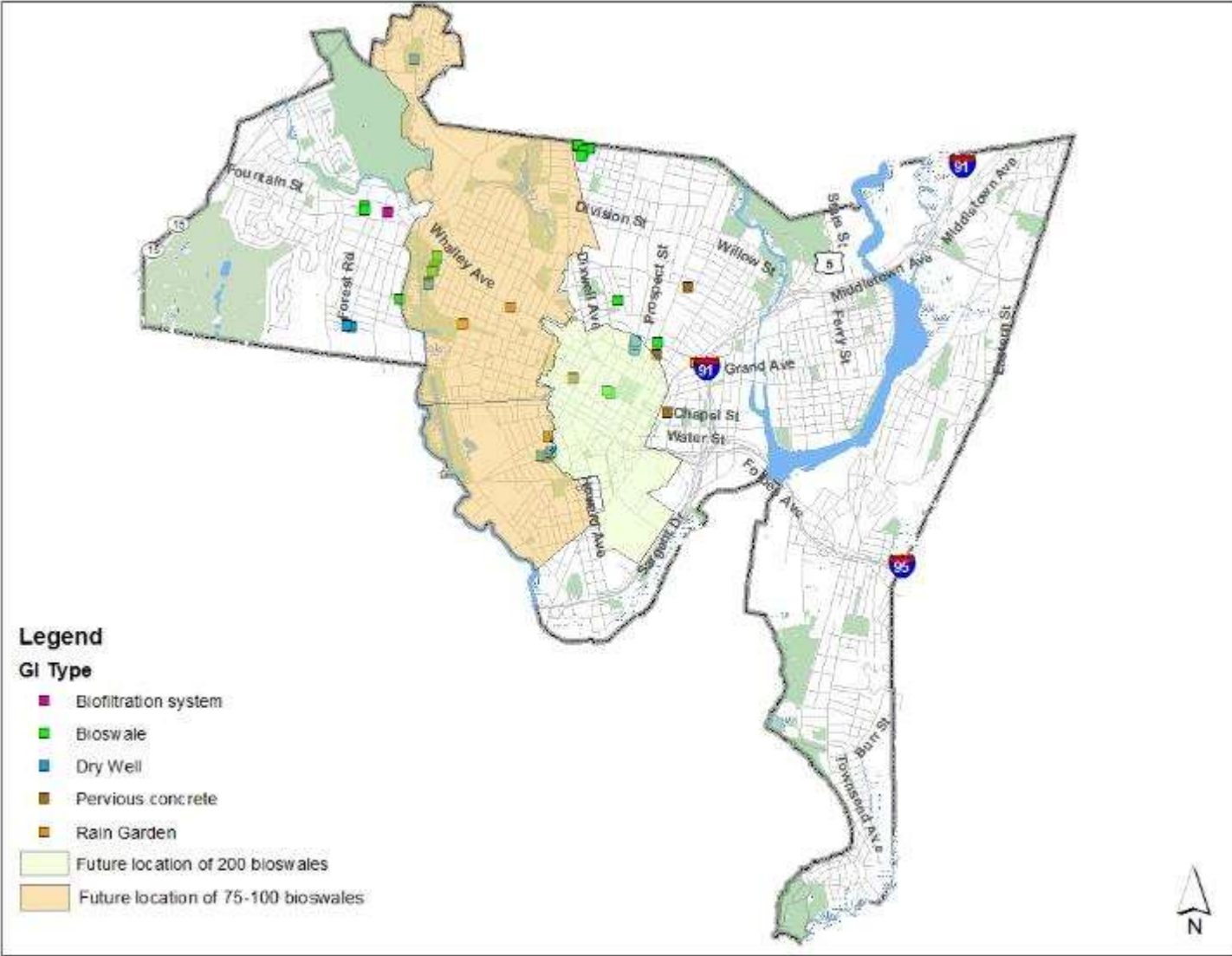
**EMERGE**  
**CREW  
MEMBER**





# Planned Bioswale Projects

- Flood prevention- approx. 200 bioswales- City project- grant funded (CDBG-DR)
- CSO prevention- approx. 75-100 bioswales- GNHWPCA project- grant funded (Clean Water Funds)

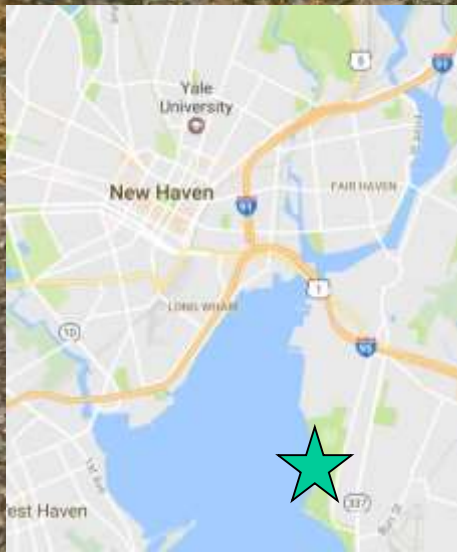






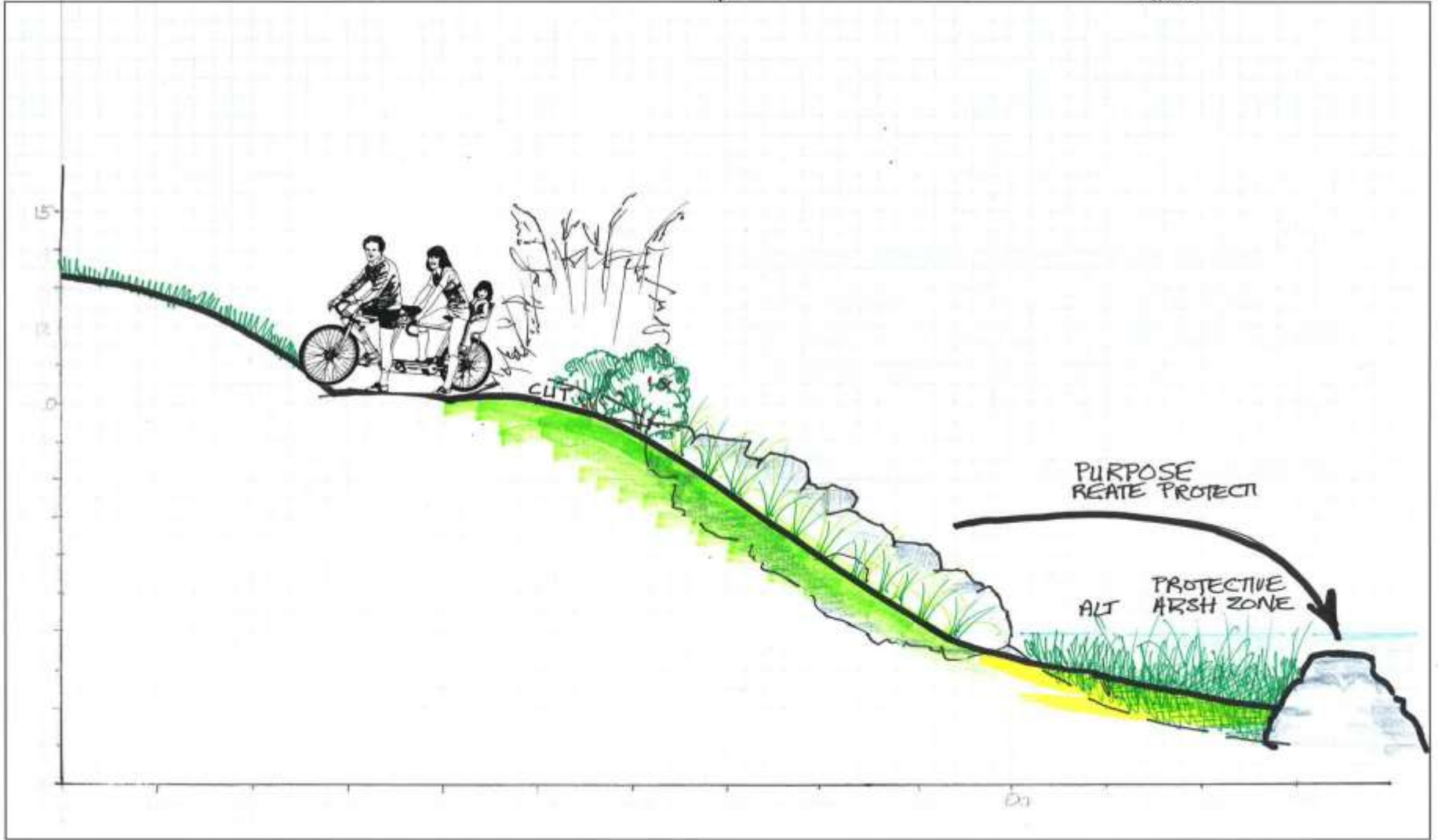
## Shoreline Protection – Layered Approach





SE  
EAST SHORE PARK - REGRADE & REVEGETATE, A

Approved





## Lessons Learned

- Go with Green-first philosophy
- Find the co-benefits
- Don't hedge your bet on GI
- Adaptive design process
- Engage the community
- See what works elsewhere
- Embrace your sandy soils

# Thank You!

## Questions?

**Giovanni Zinn**

[gzinn@newhavenct.gov](mailto:gzinn@newhavenct.gov)

**@NewHavenEng**

**Dawn Henning**

[dhenning@newhavenct.gov](mailto:dhenning@newhavenct.gov)

