August 22, 2023

Upper Little Patuxent Restoration

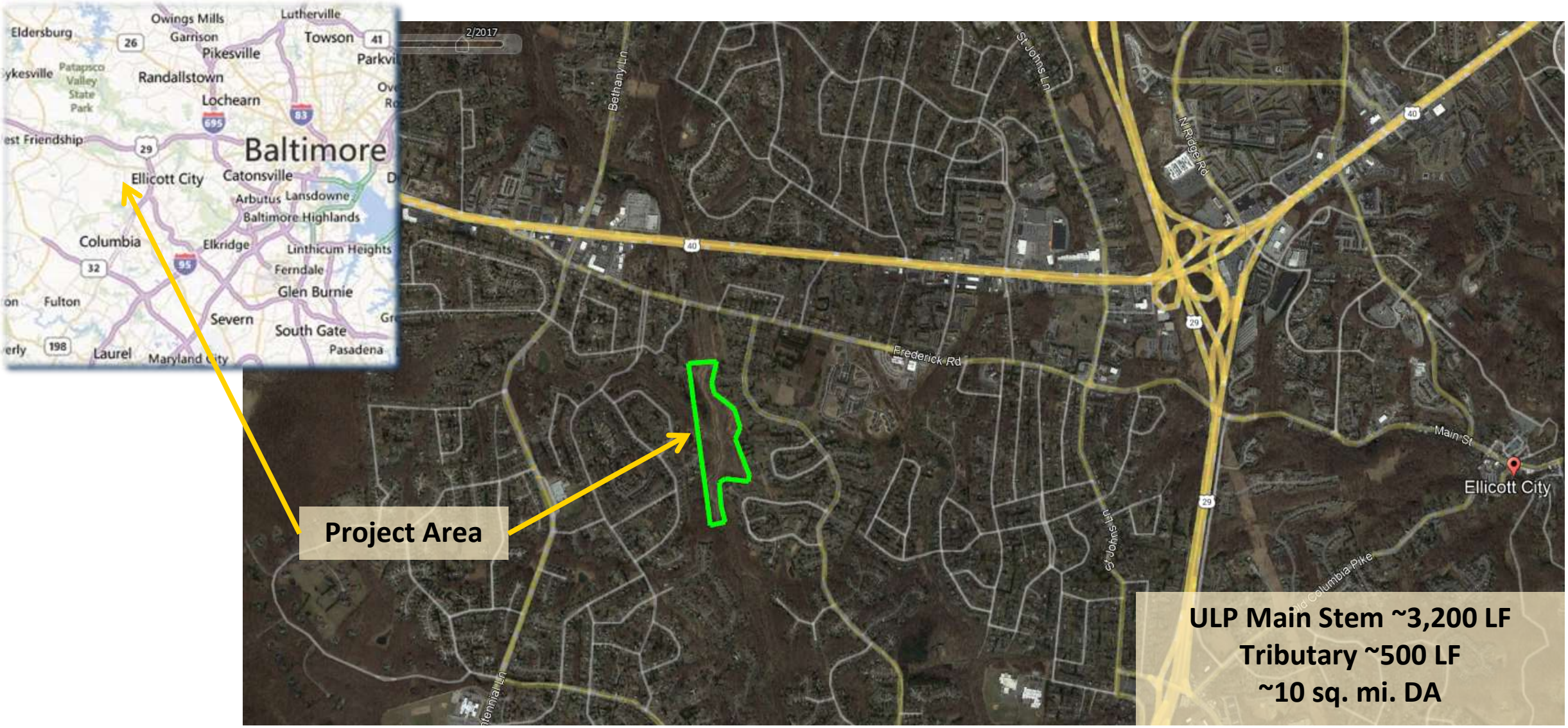
10 Years of Lessons Learned

Presented to: 2023 National Stream Restoration Conference

Agenda

1. Project Background
2. Project Constraints
3. Post Construction Monitoring
4. Lessons Learned

1 Project Background – Where?



1 Project Background – Why?

Goals & Objectives

- Nutrient and Sediment Reduction / Chesapeake Bay TMDL
  - Improved Channel Stability
  - Increased & Stable Floodplain Connection
  - Ecological Uplift

1 Project Background – When?

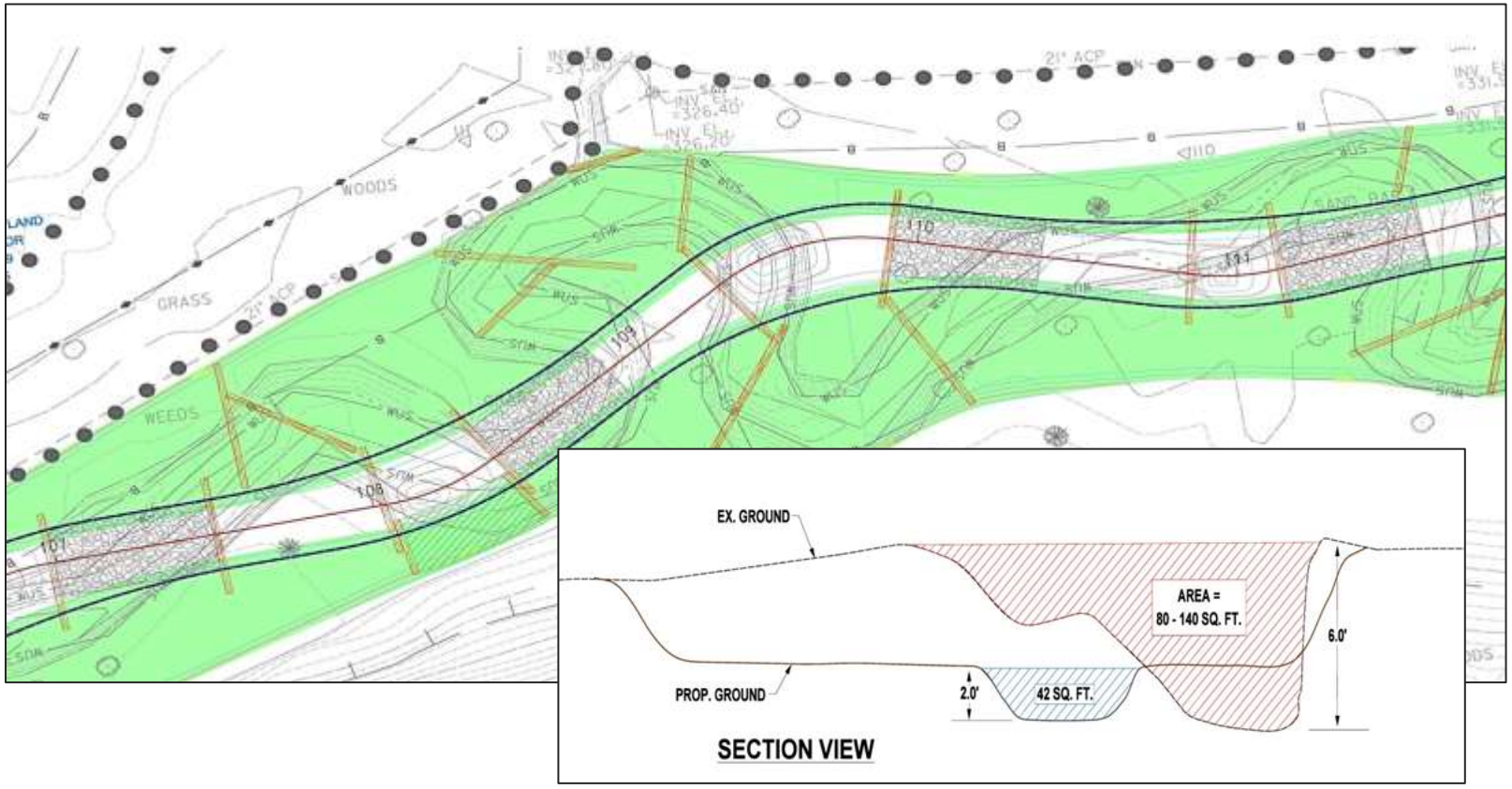
Project Timeline

- Design – 2013/2014
- Construction – 2014/2015
- Monitoring – 2016-2020

1 Project Background – How?

Design Build Approach

- Inset Floodplain - Priority 2 Restoration
- Plan, Profile and Section Modifications
- Habitat Elements
- Early Contractor Involvement and Review

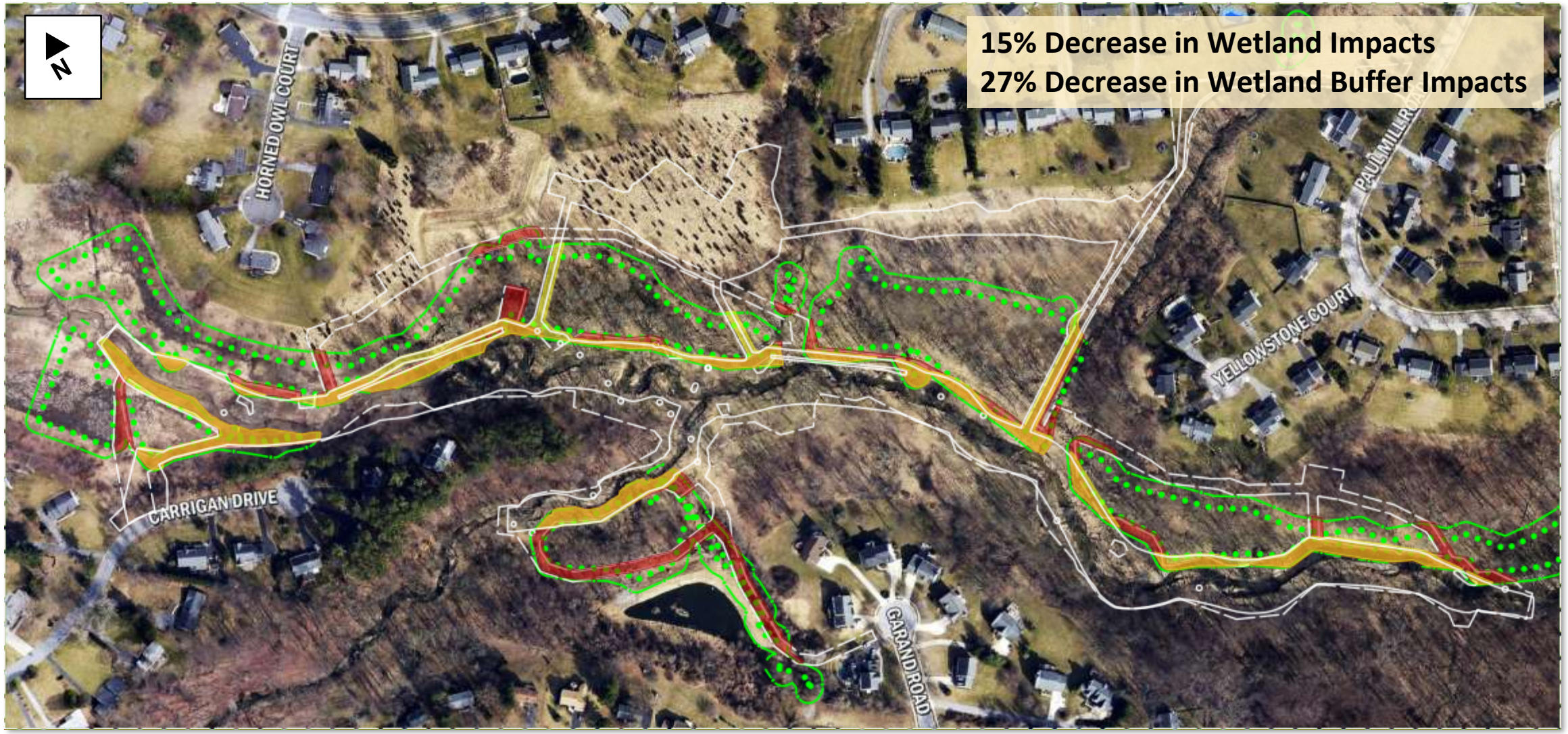


2 Project Constraints

Design Considerations

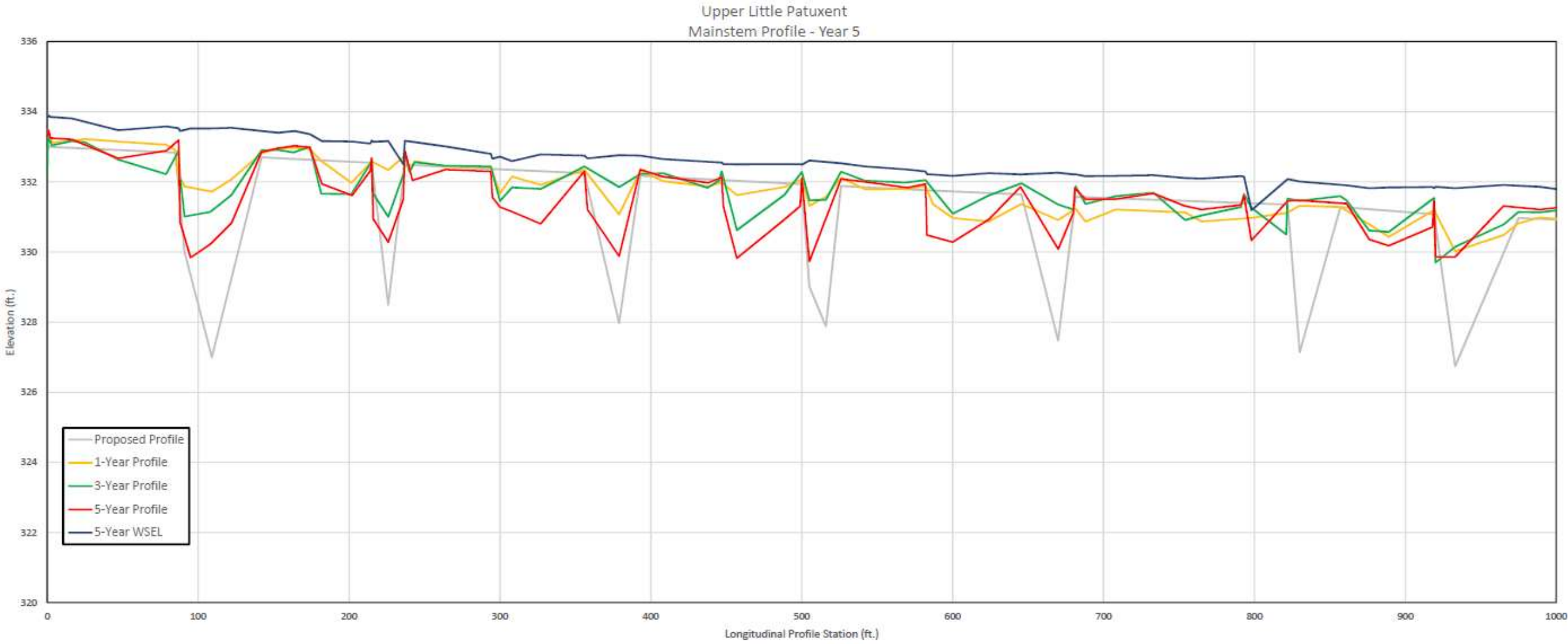
- $1.7M Maximum Bid Price
- Adjacent Forest
- Adjacent Wetlands
- High Sediment Supply (silt, sand, gravel)
- Sewer Infrastructure – ACP

2 Project Constraints – Wetlands

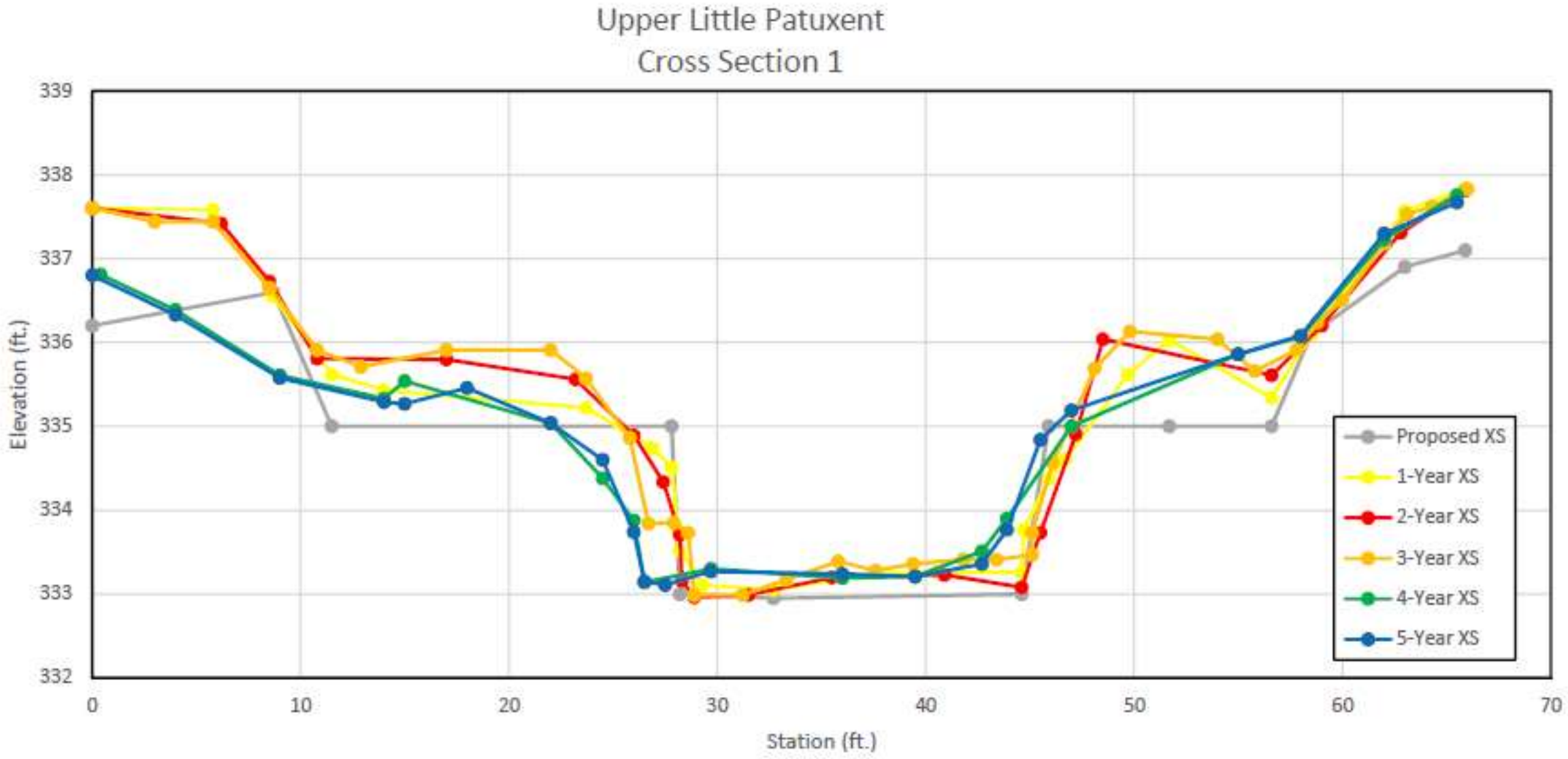


2 Project Constraints – Forest

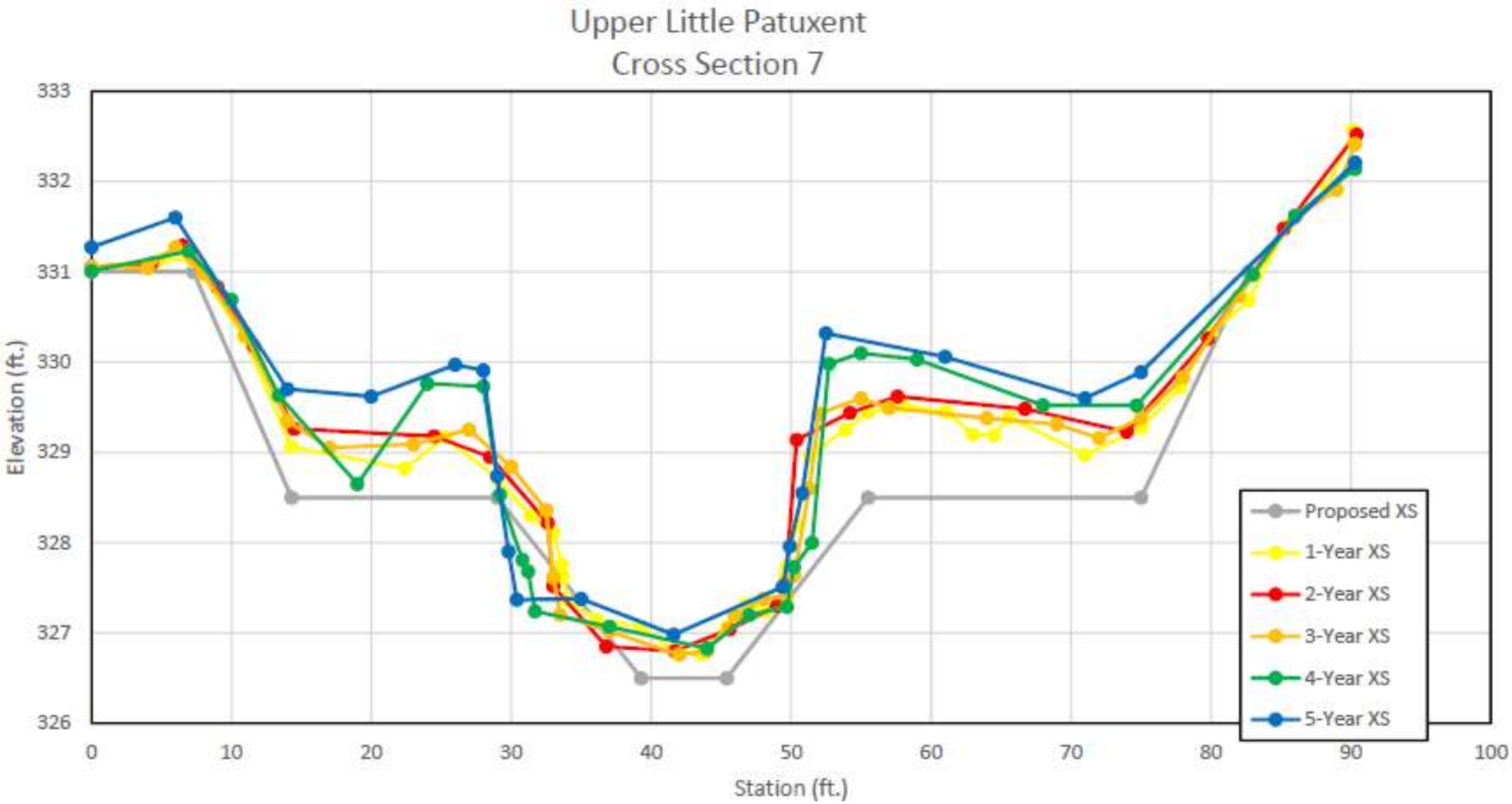
3 Post Construction Monitoring - Profile



3 Post Construction Monitoring - Section



3 Post Construction Monitoring - Section



3 Post Construction Monitoring – Flood Performance

Floods of Record

- June 30, 2016 – 6 in / 2 hours
- May 27, 2018 – 9.7 in / 2 hours

PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.344** (0.313-0.379)	**0.412** (0.374-0.454)	**0.489** (0.443-0.539)	**0.546** (0.493-0.601)	**0.617** (0.553-0.679)	**0.669** (0.598-0.738)	**0.721** (0.641-0.797)	**0.770** (0.681-0.855)	**0.833** (0.729-0.930)	**0.881** (0.766-0.988)
10-min	**0.550** (0.499-0.606)	**0.659** (0.598-0.726)	**0.784** (0.710-0.864)	**0.873** (0.789-0.962)	**0.983** (0.882-1.08)	**1.07** (0.952-1.18)	**1.15** (1.02-1.27)	**1.22** (1.08-1.36)	**1.32** (1.15-1.47)	**1.39** (1.21-1.56)
15-min	**0.687** (0.624-0.758)	**0.828** (0.751-0.912)	**0.991** (0.898-1.09)	**1.10** (0.998-1.22)	**1.25** (1.12-1.37)	**1.35** (1.21-1.49)	**1.45** (1.29-1.60)	**1.54** (1.36-1.71)	**1.66** (1.45-1.85)	**1.74** (1.51-1.95)
30-min	**0.942** (0.856-1.04)	**1.14** (1.04-1.26)	**1.41** (1.28-1.55)	**1.60** (1.45-1.76)	**1.84** (1.66-2.03)	**2.03** (1.82-2.24)	**2.22** (1.97-2.45)	**2.40** (2.12-2.66)	**2.64** (2.31-2.94)	**2.82** (2.45-3.16)
60-min	**1.18** (1.07-1.30)	**1.44** (1.30-1.58)	**1.81** (1.64-1.99)	**2.08** (1.88-2.30)	**2.46** (2.20-2.71)	**2.75** (2.46-3.04)	**3.06** (2.72-3.38)	**3.36** (2.98-3.73)	**3.79** (3.31-4.22)	**4.12** (3.58-4.62)
2-hr	**1.41** (1.27-1.55)	**1.71** (1.56-1.89)	**2.17** (1.96-2.39)	**2.52** (2.27-2.78)	**3.02** (2.71-3.32)	**3.42** (3.06-3.77)	**3.85** (3.41-4.26)	**4.30** (3.78-4.77)	**4.95** (4.30-5.52)	**5.48** (4.71-6.15)

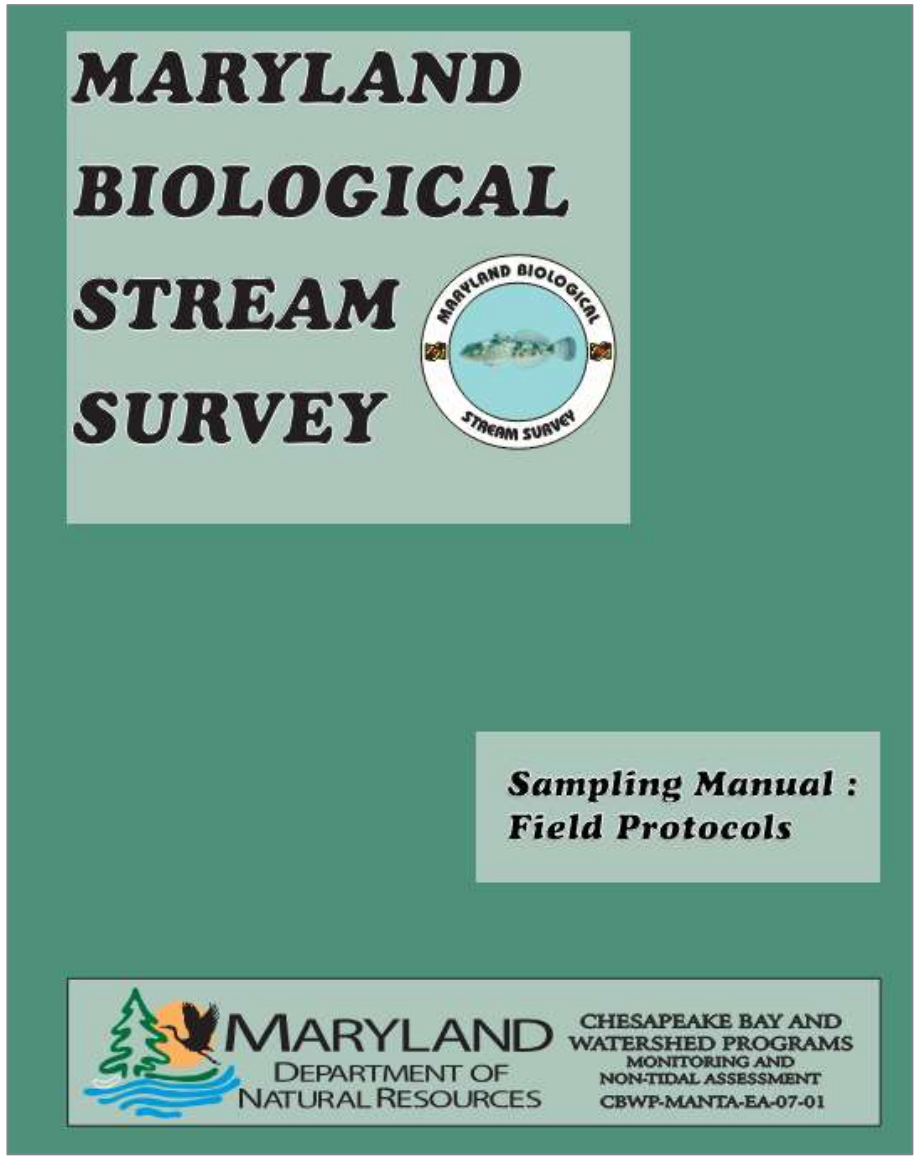
3 Post Construction Monitoring – Flood Performance, 2016

3 Post Construction Monitoring – Flood Performance, 2018

3 Post Construction Monitoring – Aquatic Biology / Chemistry

Pre-Construction Samples

- MBSS Methodology
  (https://dnr.maryland.gov/streams/pages/mbss.aspx)
- Four Total Locations & Two Sampling Periods (Nov. 2012 & Mar. 2013)
  - Middle Site - BIBI 2.0 (poor)
  - Lower Site - BIBI 2.0 (poor)
  - Two Upstream Control - BIBI 2.7 (poor)
  - Mar 2013 Samples BIBI 1.0-1.7 (very poor)
- Water Quality
  - TN, TP, TSS, Specific Conductance (high = salts)



3 Post Construction Monitoring – Aquatic Biology

Table 5: Year 5 Benthic Index of Biotic Integrity (BIBI) Summary

	Pre-Restoration Spring 2013		Post Restoration Spring 2020				
	UMD Lower		ULP-1		ULP-2		Improvement Y/N/NSC*
Parameter	Raw	BIBI	Raw	BIBI	Raw	BIBI	
Taxa Richness	13	1	26	5	23	3	Y
Number of EPT Taxa	1	1	5	3	5	3	Y
Number of Epheroptera taxa	0	1	1	1	1	1	NSC
% Intolerant Urban	2	1	3	1	1	1	NSC
% Chironomidae	66	1	69	1	84	1	NSC
% Clingers	15	1	38	3	25	1	Y
BIBI Score		1		2.33		1.67	Y
BIBI Rating		Very poor		Poor		Very poor	

* No Significant Change

4 Lessons Learned – Goals / Objectives Met?

Goals & Objectives

- Nutrient and Sediment Reduction / Chesapeake Bay TMDL
  - Improved Channel Stability
    - Significantly reduced bed/bank erosion and mass wasting
    - Stable plan, profile and section for 2 storms of record
    - Some pool filling and lateral migration
  - Increased & Stable Floodplain Connection
    - Removed 15,000 CY of highly erodible sediment
    - Fine sediment deposition on inset floodplain
    - Stable floodplain for 2 storms of record
  - Ecological Uplift
    - Increased and improved riffle habitat
    - Inset floodplain wetland restoration
    - Some macroinvertebrate improvement

4 Lessons Learned

Missed Opportunities/Other Considerations

- Coordinated Watershed Restoration Approach
- Additional Floodplain Creation / Connection
- Smaller / Less Imported Riffle Material
- Additional Habitat Structures
  - Toewood
  - Vanes rather than Sills at Pool Locations
- Additional / More Robust Woody Vegetation
- MBSS Fish Sampling & IBI Scores
- Review the Site and Monitoring Reports (whether you get compensated for this or not!)

4 Lessons Learned – Put Into Practice

Howard County, MD ULP Font Hill Tributary Restoration

Session H at 2:10 PM