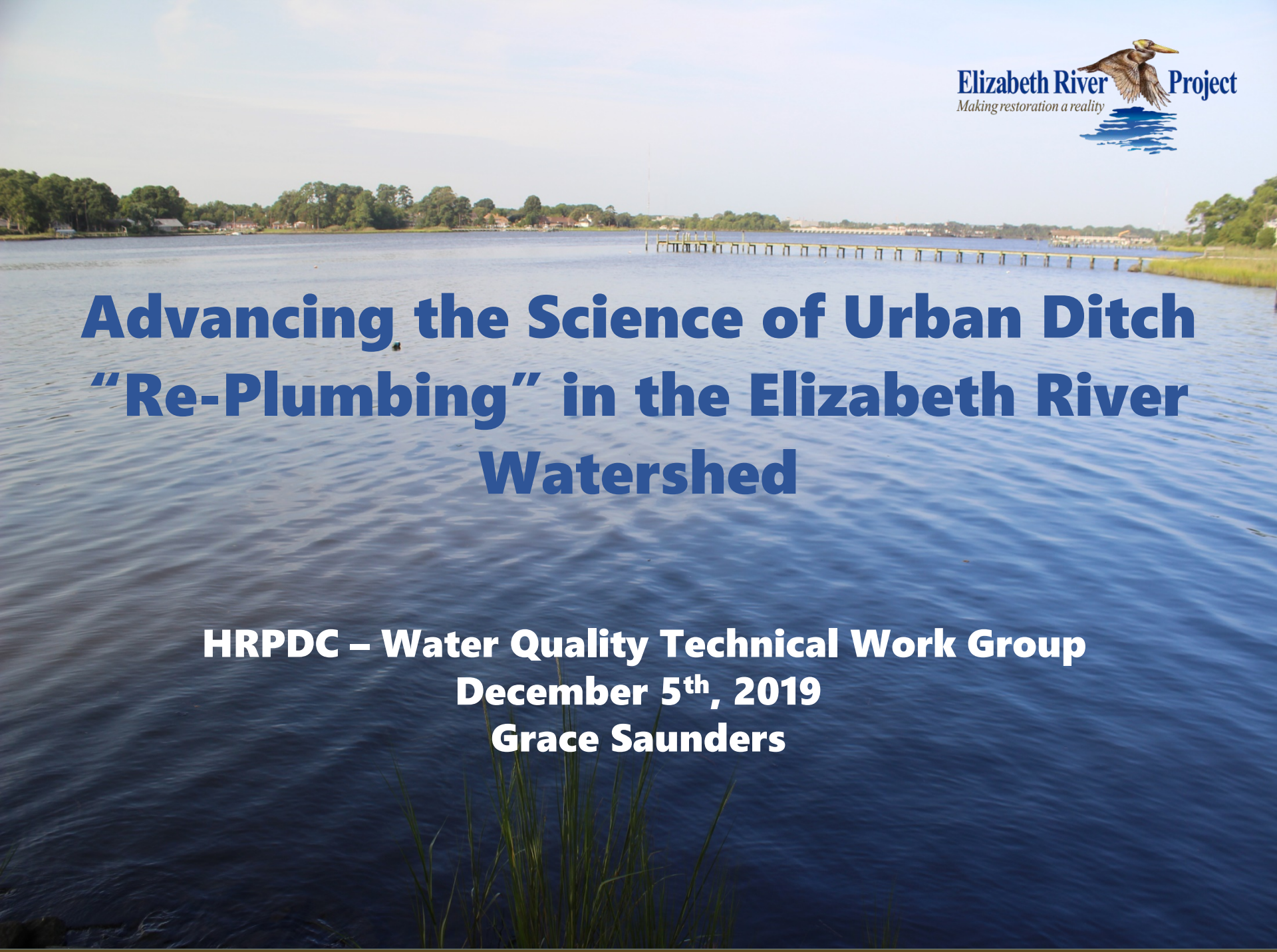

Advancing the Science of Urban Ditch "Re-Plumbing" in the Elizabeth River Watershed

HRPDC – Water Quality Technical Work Group
December 5th, 2019
Grace Saunders

The Elizabeth River Project

Mission: Restore the Elizabeth River to the highest practical level of environmental quality through governmental, business, & community partnerships.

- Working on restoring the river for 27 years
- 134 River Star facilities
- Over 5,400 River Star Homes
- Government projects with US Navy, NOAA, US EPA, VA DEQ, VA DCR, Norfolk, Chesapeake, Virginia Beach, and Portsmouth

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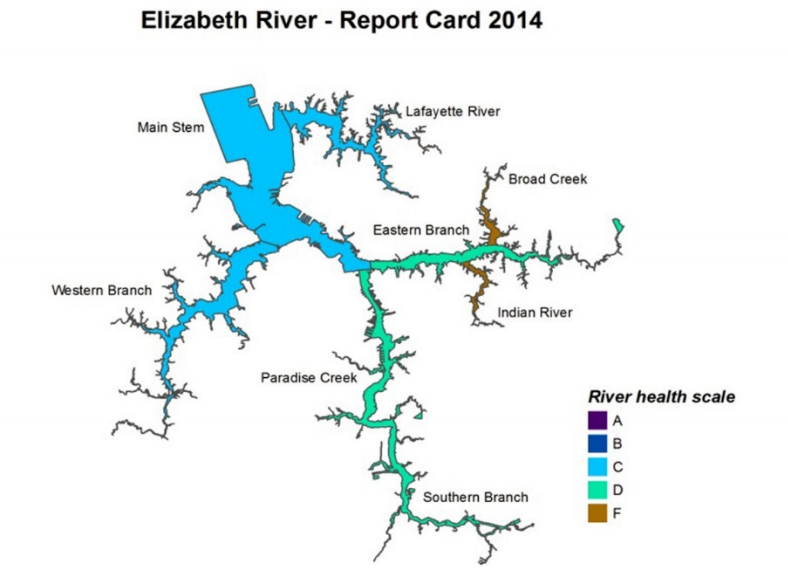
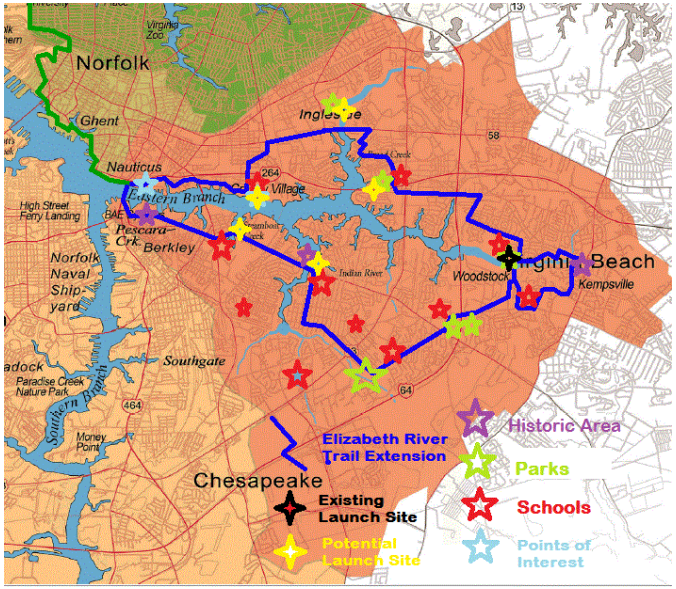
The Health of the Eastern Branch of the Elizabeth River





Goal: Improve the Indian River and Broad Creek tributaries of the Eastern Branch of the Elizabeth River from F to at least D for *Enterococcus* bacteria. Improve the overall water quality score for the Eastern Branch from D to C.

(Eastern Branch Environmental Restoration Strategy, Elizabeth River Project with stakeholder guidance and federal grant with the National Fish & Wildlife Foundation)

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Scorecard Overview

Scorecard Measures	Broad Creek	Indian River
Bacteria (human contact criteria)	F	F
Dissolved Oxygen	F	B
Nutrients - Nitrogen	D	F
Nutrients - Phosphorous	D	F
Phytoplankton/ Chlorophyll	D	D
OVERALL	**F**	**F**

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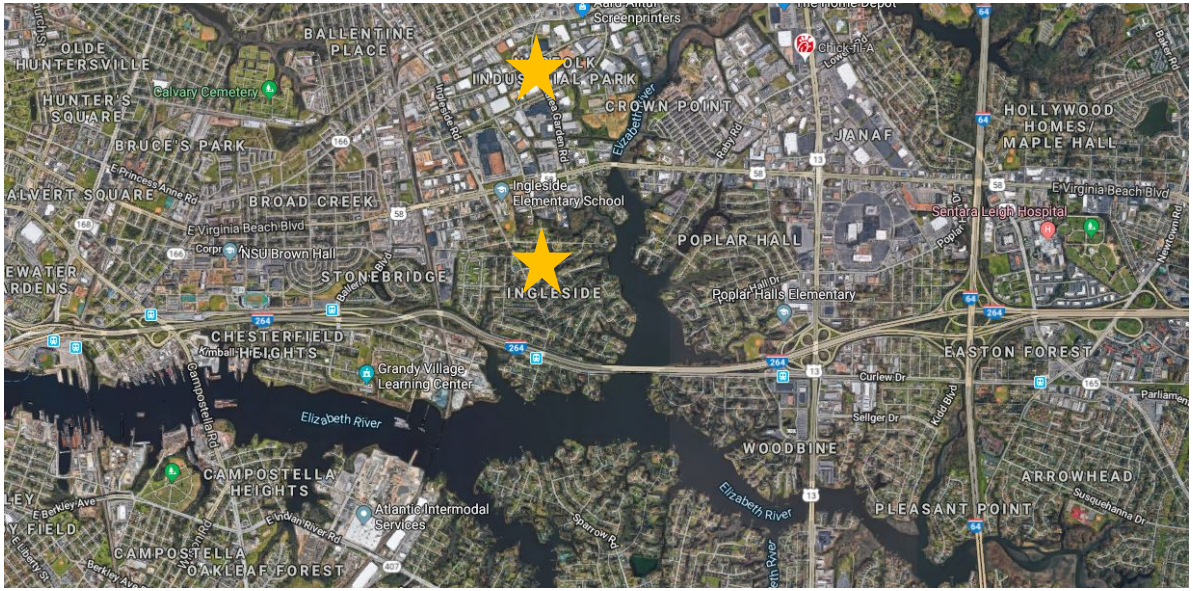
Restoring the "Lost Branch" of the Elizabeth River



- "Restoring Broad Creek While Advancing the Science of Urban Ditch 'Re-Plumbing'"

- "The project will integrate green infrastructures, including but not limited to the urban ditch retrofit, into storm water management approaches along the lower bay, while also improving water quality in Broad Creek."

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Why Ditch Retrofits?

- Innovative Stormwater Treatment
  - Improved N and P reductions
  - Option for high water tables
- TMDL Credit Available for Ditch Treatments and Ditch Retrofits
- Replicability across Hampton Roads
  - Feasible solution when space is limited
  - 148 miles of ditches in Norfolk alone, more in adjacent cities

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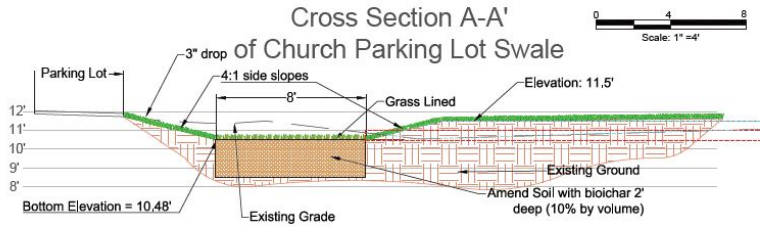
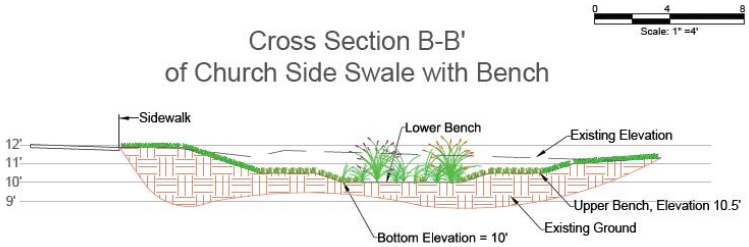
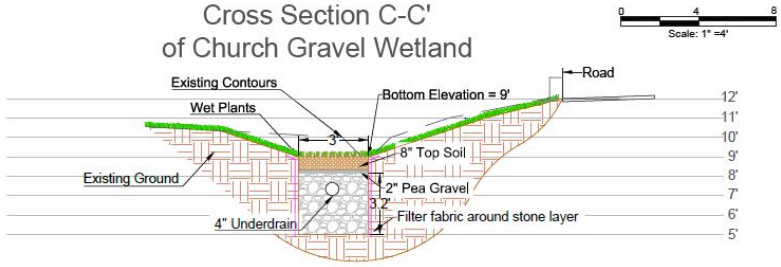
Ingleside Church – Part 1







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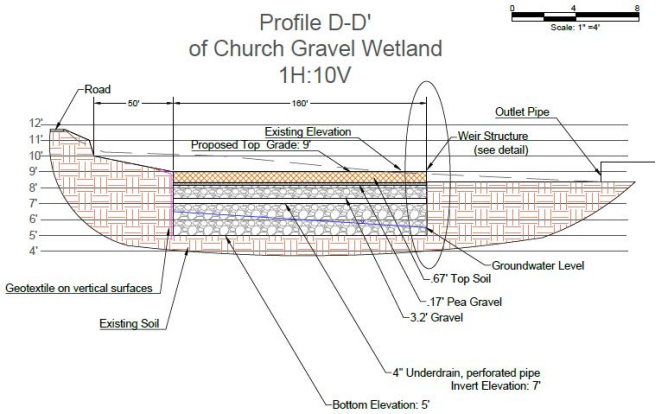
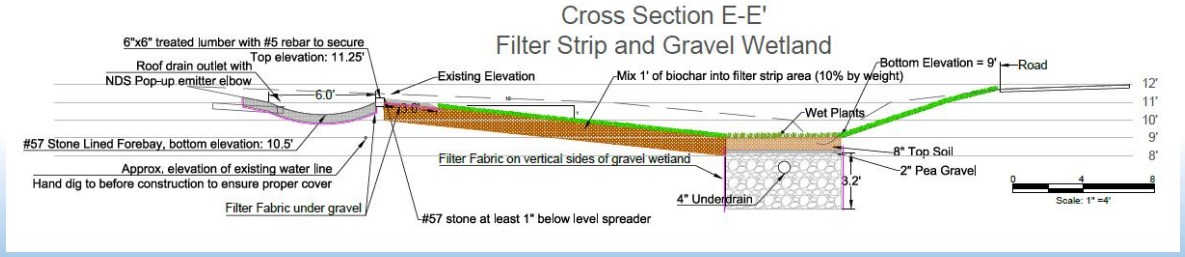
Ingleside Church – Part 2





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Preconstruction Conditions – Ingleside Church

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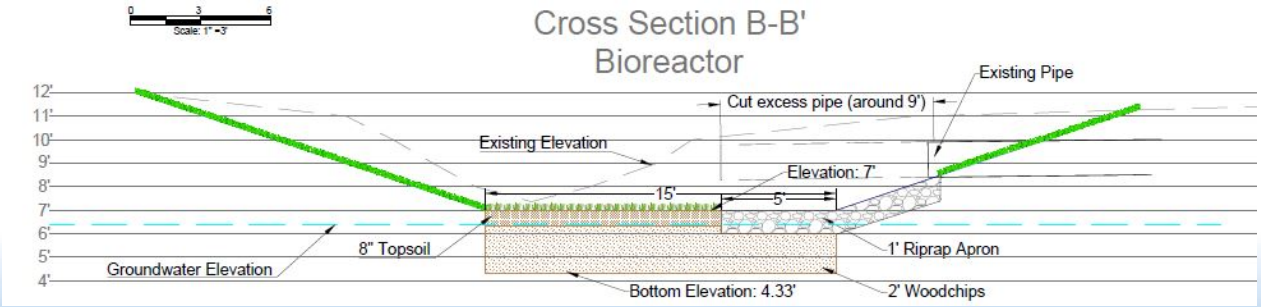
During Construction – Ingleside Church

East Princess Anne Road

Princess Anne – East



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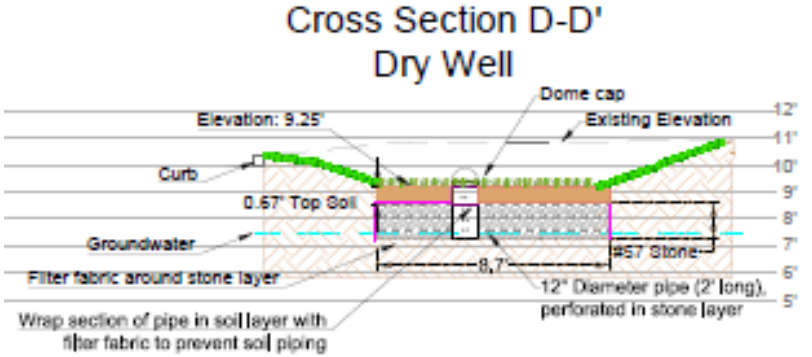
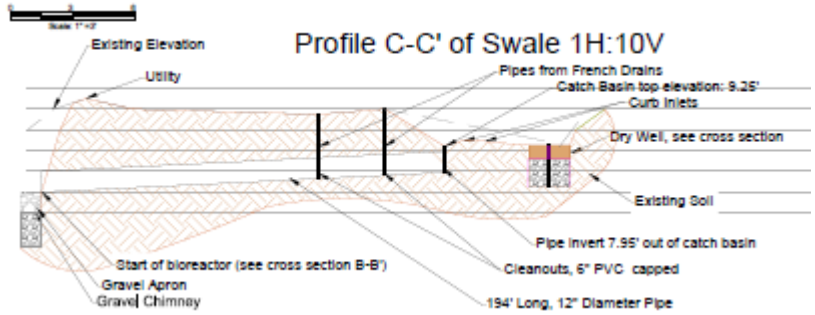
Princess Anne – South





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Preconstruction Conditions – Princess Anne

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During Construction – Princess Anne

N and P Reduction Overview

Site	Location	BMP	P Reduction	N Reduction
Church	Parking Lot Ditch	Grass Channel (Biochar)	15%	20%
	Side Swale	2-Stage Ditch/Rain Garden	N/A	N/A
	Roadside Ditch	Gravel Wetland	32-88% (literature)	90% (literature)
	Front of Church	Filter Strip/Rooftop Disconnect (Biochar)	50%	50%
Industrial – West	In Ditch	Bioreactor	N/A	N/A
	In Grass Area	Bioretention Level 2	50%	60%
Industrial – East	In Ditch	Bioreactor	N/A	N/A
	In Grass Area	Bioretention Level 2	50%	60%
Industrial – South	In Ditch	Piping to West & East	N/A	N/A

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Lessons Learned

- Ditch retrofits are expensive - original bid was over $800,000, rebid reduced the project to $310,000
- Limited number of engineers and contractors who have experience with ditch designs – experienced firms were not the low-bidders
- Issues with inaccurate design data can cause significant impacts to the project
- Bay program yet to approve TMDL credits for two-staged ditches, bioreactors, and phosphorus absorbing substrates
- Maintenance of surrounding ditch elevations is needed for project to be effective
- With increased rainfall intensity, ditch retrofit designs will need to be modified
- Utilities in the urban arena make these projects difficult
- Hire an experienced and trustworthy contactor - we hired EQR and they have been great to work with

Thank you! Questions?

Thank you to our funders, NFWF and the Chesapeake Bay Program!

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