



# River Sediment Remediation

September 9, 2022



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ATTORNEYS AND COUNSELLORS AT LAW

# What We Will Cover Today

- Legal framework for remediating contaminated sediments (Jim)
- How waterways became contaminated (Joe)
- Cleanup methodologies (Joe)
- Results (Joe)

# Biggest Problem: Legacy Contamination

- 200 miles of the Hudson River is a Superfund site
  - GE discharged 1.3M pounds PCBs from capacitor manufacturing plants
- Locally
  - Atlantic Wood Industries (50 acres on So. Branch Elizabeth River, Portsmouth)
    - Creosote
  - Peck Iron & Metal (33 acres on Paradise Creek, Portsmouth)
    - Inactive scrapyards: PCB, metals, radioactive material
  - Money Point (2 creosote plants on So. Branch Elizabeth River, Portsmouth)
    - First large-scale sediment remediation project by non-profit
  - Paradise Creek (connects to So. Branch Elizabeth River, Portsmouth)
    - PCB contamination from upstream neighbors

# Atlantic Wood

The Atlantic Wood Industries (AWI) Site is approximately 50 acres of land on the industrialized waterfront of Portsmouth, Virginia, and over 30 acres of contaminated sediments in the Southern Branch of the Elizabeth River. From 1926 to 1992, a wood-treating facility operated at the site using both creosote and pentachlorophenol (PCP). The Site was contaminated from the treatment operation, storage of treated wood and disposal of wastes.

At one time, the Navy leased part of the property from AWI and disposed of waste on Site, including used abrasive blast media from the sand blasting of naval equipment resulting in contamination with heavy metals such as copper, lead, zinc and arsenic. The Navy also disposed of sludge from the production of acetylene in a wetland on the border of the Southgate Annex of the Shipyard and the AWI Site.

Sediments in the Elizabeth River contain heavy metals and visible creosote. The groundwater and soil at the site are also contaminated with creosote and heavy metals.

# Environmental Compliance is a (Relatively) New Concept



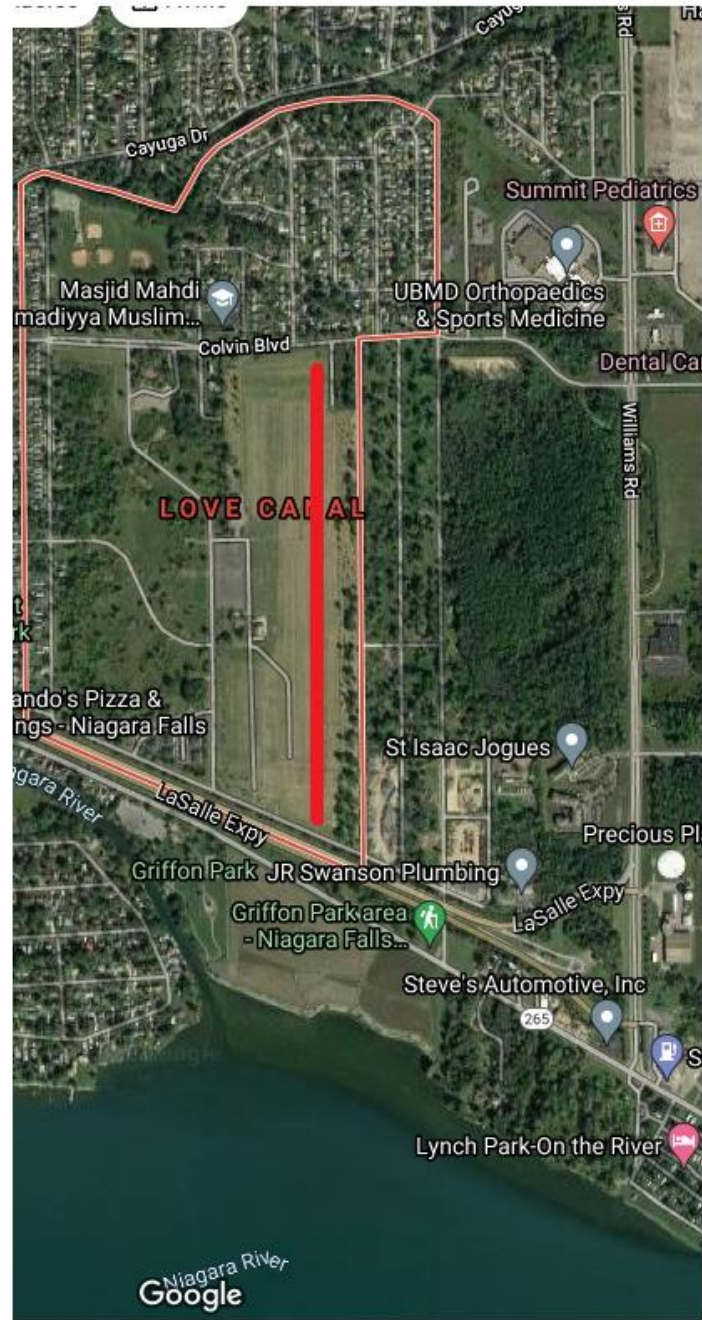
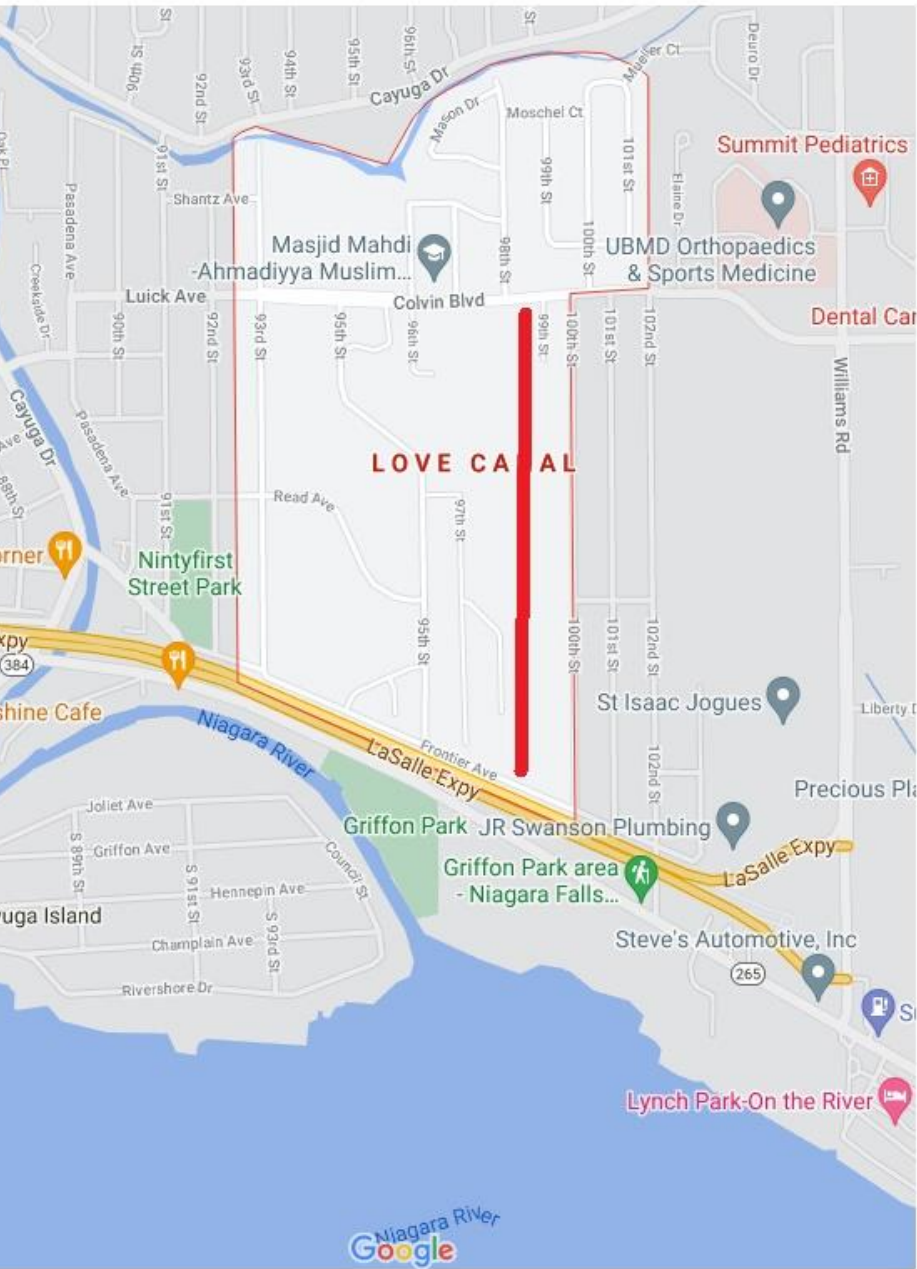
# Love Canal

In 1890's William T. Love wanted to build a canal connecting the upper and lower Niagara Rivers so that power could be generated cheaply to fuel the industry and homes of his planned model city. The state assisted the project through use of condemnation to acquire land. Love started his canal but could not finish it: 1 mile, 15 feet wide, 10 feet deep.

1927 Photograph showing Canal



[http://ublib.buffalo.edu/libraries/projects/lovecanal/aerial\\_photos/aerial\\_1927.html](http://ublib.buffalo.edu/libraries/projects/lovecanal/aerial_photos/aerial_1927.html)



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# Love Canal

In 1942 Hooker Chemical and Plastics Corporation purchased the trench. Seizing on the industrial boom around World War II, Hooker manufactured plastics, chlorine, pesticides, caustic soda and fertilizers. During its 11 years of ownership Hooker disposed of 21,000 tons of hazardous chemicals at Love Canal.





# 1953

- Waste from Hooker, the US Army, and the City of Niagara Falls has filled the canal
- Backfill the canal and cover it with 4 feet of clay
- Niagara Falls Board of Education wants to buy the property from Hooker

# 1953 -- continued

- Hooker says “no” it’s not suitable for a school
- Hooker took school officials to the site, bored holes to show what was under the ground
- School officials threatened to acquire the property via condemnation
- Hooker sold for \$1 and full written disclosure of what lay underneath the ground

# Site Development After Hooker Sells the Property

- The Niagara Falls Board of Education builds “The 99<sup>th</sup> Street School” on the site
- Over time: 800 homes, 240 low income apartments, 3 schools in neighborhood
- Record rainfall in 1978
  - Contaminants seeped into the homes and schools
  - Puddles of toxic chemicals on the ground
  - Air had a faint choking smell
  - Children returned from play with burns on their hands and faces

# NY Times August 5, 1978

- NY Times August 5, 1978: **“Time Bomb in Love Canal”**
- August 7, 1978:
  - NY Governor Hugh Carey announces that the state will purchase homes affected by chemicals
  - President Carter approves emergency financial aid (first time emergency funds were used for something other than a “natural” disaster)
  - U.S. Senate adopts a “sense of Congress” resolution saying federal aid should be provided
- 98 families evacuated by end of August
- 1980 fed/state government buy 500 homes

# Comprehensive Environmental Response, Compensation and Liability Act

- “CERCLA” or “The Superfund Law”
- 42 USC §§9601 to 9675
- Enacted in 1980 to clean up leaking hazardous waste disposal sites
- “Who” pays for the clean up – 42 USC §9607
  - Joint and several liability
  - Retroactive

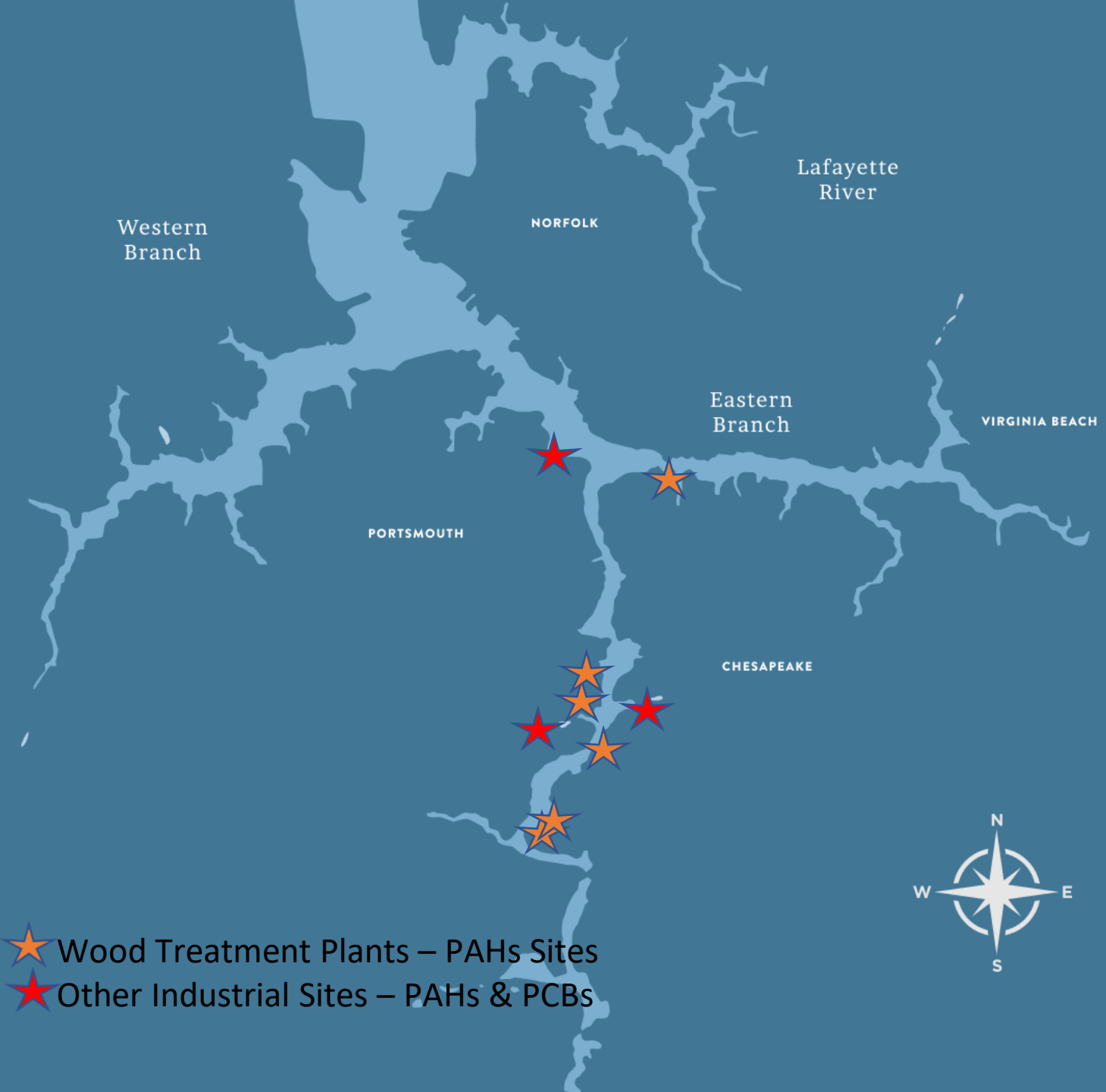
# CERCLA Liability

- 42 USC §9607(a)
- Current owner and operator of Love Canal
- Person who owned or operated Love Canal at the time when the disposal occurred
  - 1983 Hooker pays \$20M (homeowners)
  - 1989 Hooker accepts responsibility to clean up
  - 1994 Hooker pays \$98M (state govt)
  - 1995 Hooker pays \$129M (fed govt)
- Person who “generated” the waste disposed at Love Canal
- Person who “arranged” for the waste to be disposed at Love Canal

# Superfund Cleanup

- Lots of litigation
- Lots of studies
- Not fast
- Not inexpensive
- Is there an alternative???

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



- ★ Wood Treatment Plants – PAHs Sites
- ★ Other Industrial Sites – PAHs & PCBs





# Elizabeth River Project Watershed Action Plan 2022



Mike Unger, Virginia Institute of Marine Science, tests "the goo."

**ACTION 5: The goo must go!** Clean up contamination in the river bottom while also reducing PCBs (highly toxic polychlorinated hydrocarbons) in fish.

- “The goo must go!” was the top focus of prior versions of this plan but drops down in priority this time because of so much progress. While Elizabeth’s bottom still harbors hotspots with some of the highest levels of sediment contamination in the Chesapeake Bay, scientists estimate as many as half of the river’s hotspots have now been addressed.
- The bottom of rivers forms the foundation of the food chain, and cleaning up remaining legacy contamination sites is still very important. Remaining legacy contaminants include PCBs and polycyclic aromatic hydrocarbons (PAH), both toxic to marine life and also posing human health risks.

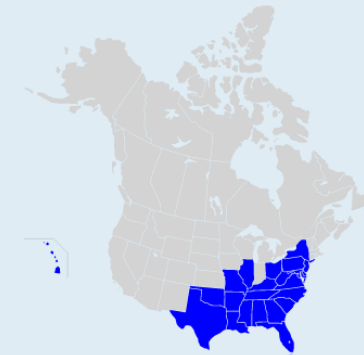
**10-YEAR GOAL:** Reduce cancer in the indicator fish, the mummichog, to background levels in known hotspots by reducing polycyclic aromatic hydrocarbon (PAH) in river sediment to below 45 parts per million (a level at which adverse effects are seen in marine life).

**5-YEAR GOALS:**

- Achieve sediment cleanup goals for Paradise Creek and Atlantic Creosote in addition to cleanups already achieved.
- Improve data collection and dissemination.

# History of Contamination in the Elizabeth River

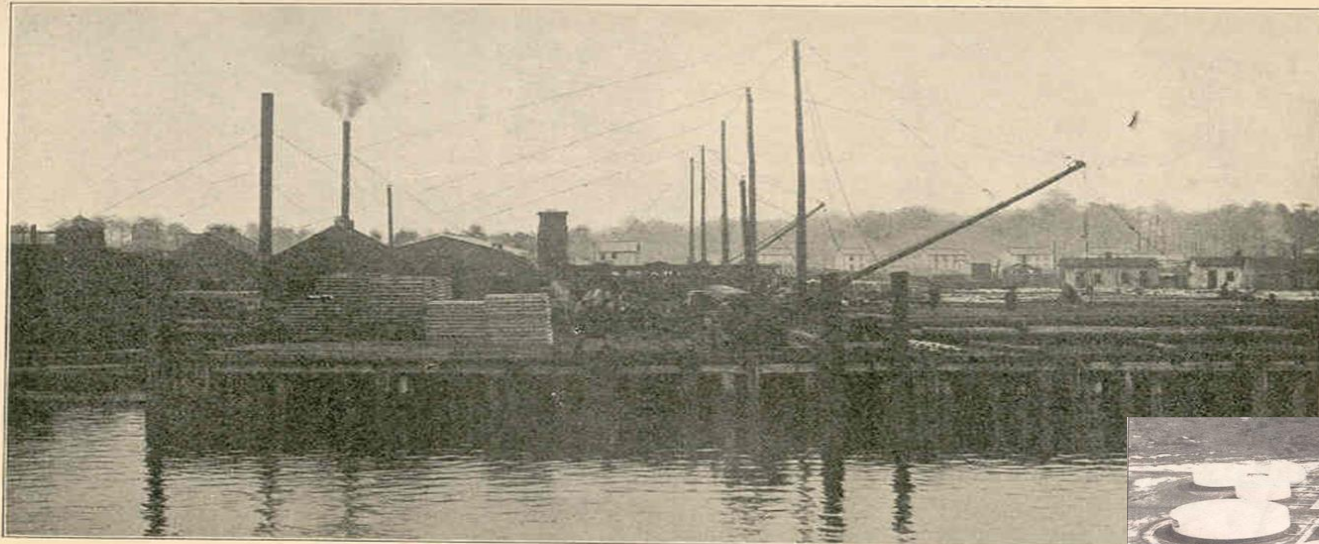
- Creosoting became one of the predominate industries on the Elizabeth River because of the river's strategic location in southeastern Virginia.
  - Location to Yellow Pine Belt, ice-free harbor, deep water access, and location to military and other water dependent companies.
- Trees are placed in a large cylinder, air is withdrawn, and creosote is place into the cylinder at a high temperature.
- Creosote is an insecticide used to reduce damage to wood from marine boring organisms.
- Before the Clean Water Act waste creosote from inside the cylinder was discharged to river and there were many fires and releases to the environment.
- Location of docks were also a contributor to contamination.



Distribution of Yellow Pine Belt



# Eppinger & Russell—Former Creosote Plant



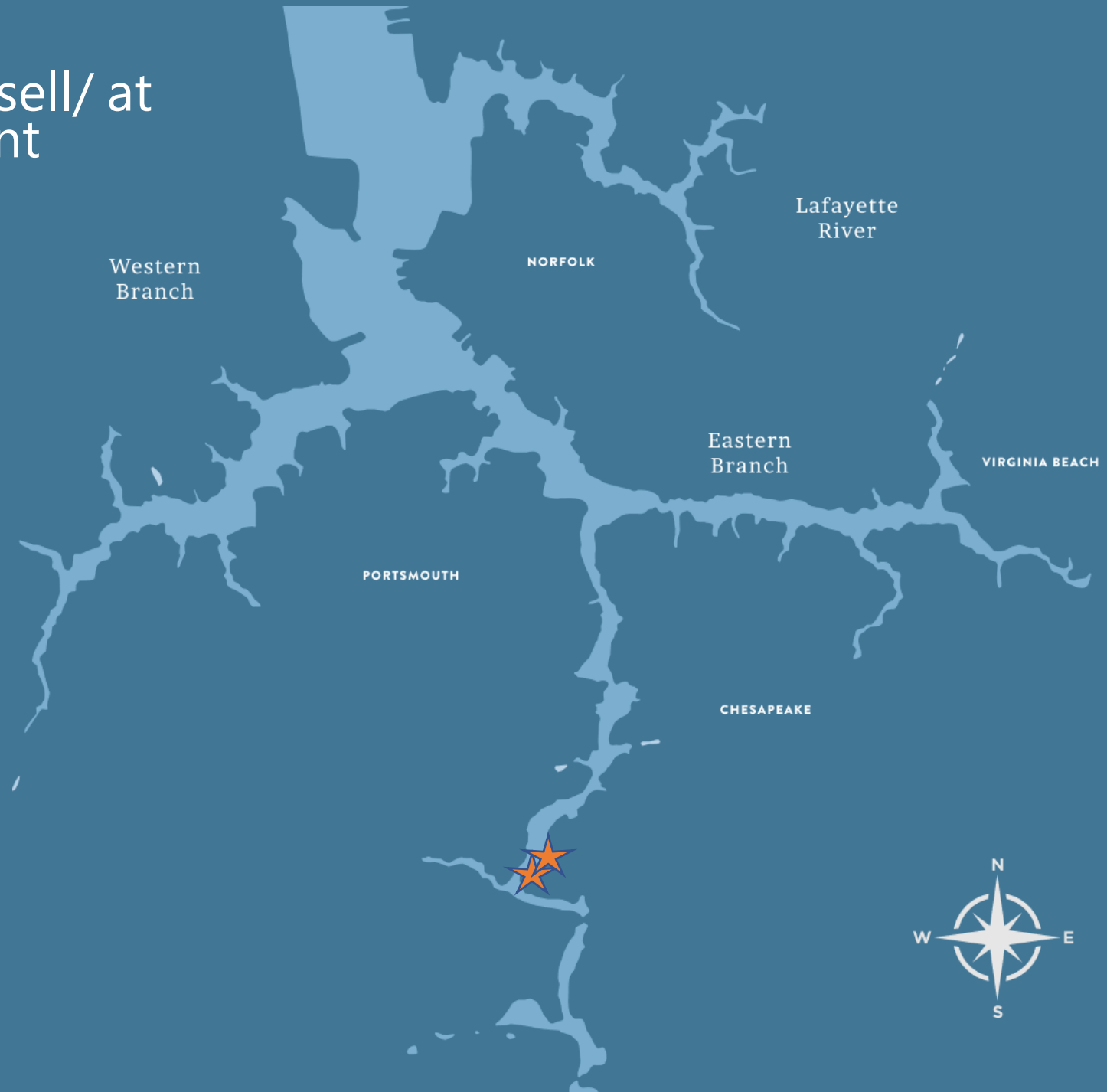
NORFOLK CREOSOTING COMPANY'S SHIPPING DOCK,  
Norfolk, Va.



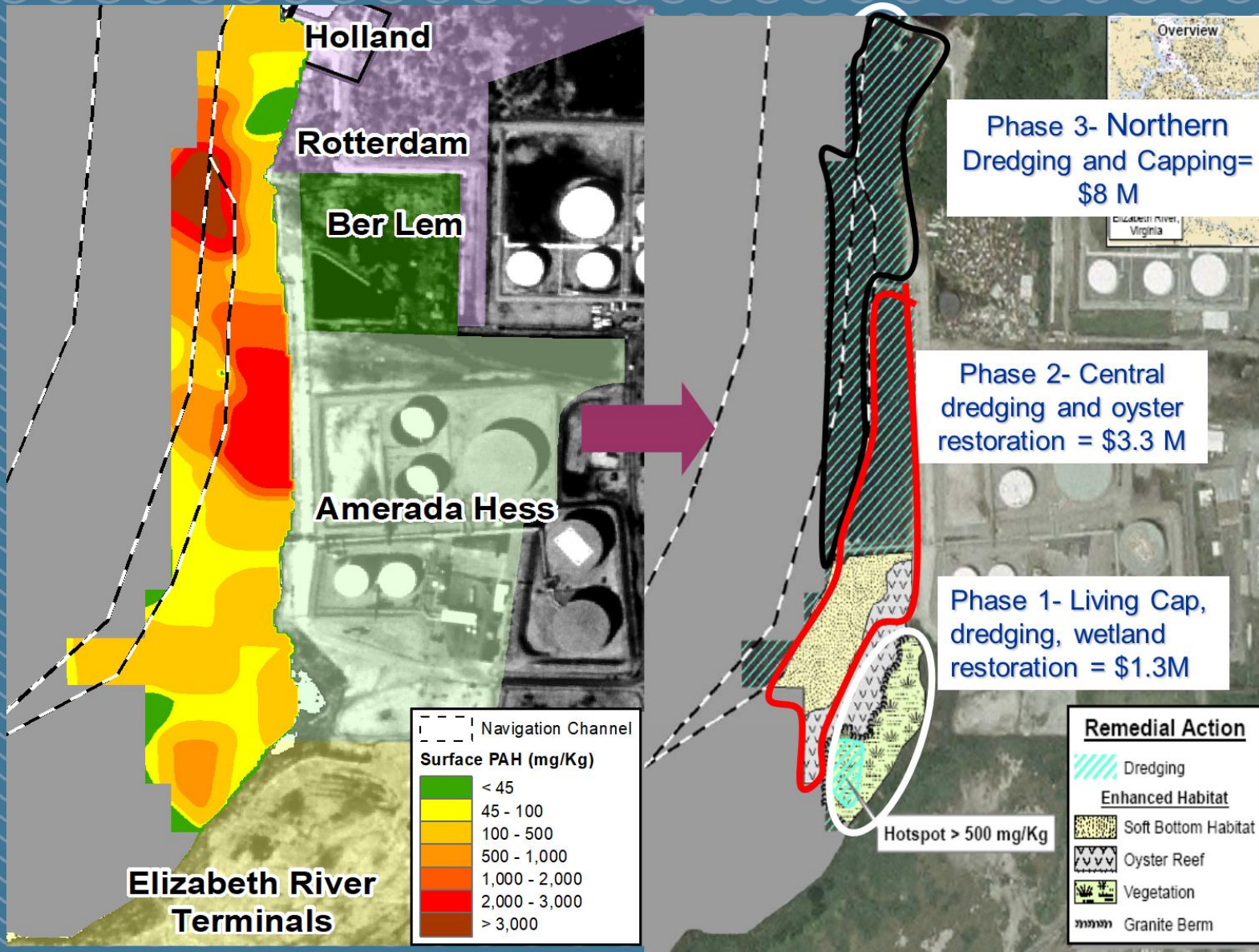
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# Eppinger & Russell/ at Money Point



# Clean up at Money Point





**First sediment remediation site in VA**



**First use of environmental bucket in VA**



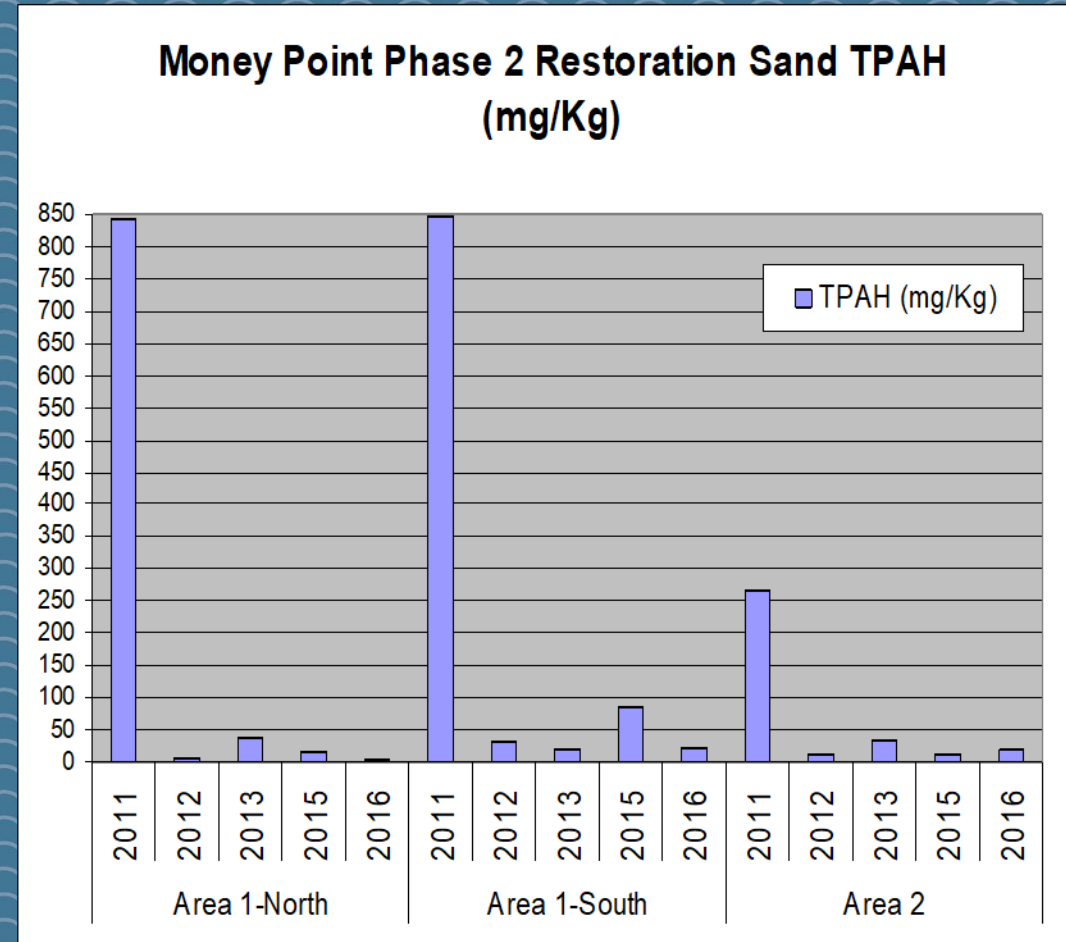
**First intertidal marsh cap in US**



**First subaqueous sand cap in VA**

# Sediment Results From Money Point

Restoration Sand Area	Sample Date	Average tPAH Conc.
Area 1-North	2011	845
	2012	4.9
	2013	36.2
	2015	14.2
	2016	4.4
Area 1-South	2011	847
	2012	31.7
	2013	17.9
	2015	85.8
	2016	22.1
Area 2	2011	266
	2012	11.4
	2013	35.3
	2015	12.4
	2016	19.6
Numeric Averages	2011	652
	2012	16
	2013	29.8
	2015	37.5
	2016	15.3



# Fish Monitoring at Money Point





# Fish Monitoring Results from Money Point 26 Species Caught



# Clean up at Atlantic Wood Industries

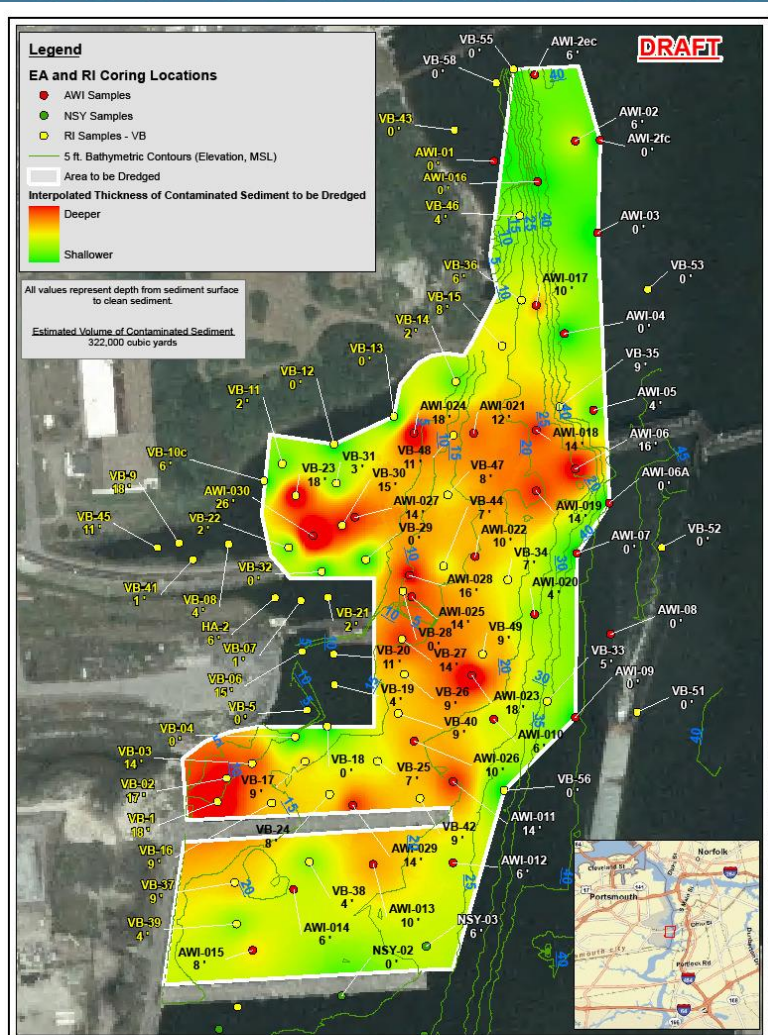


Figure 8 - Interpolated Thickness of Contaminated Sediment to be Dredged

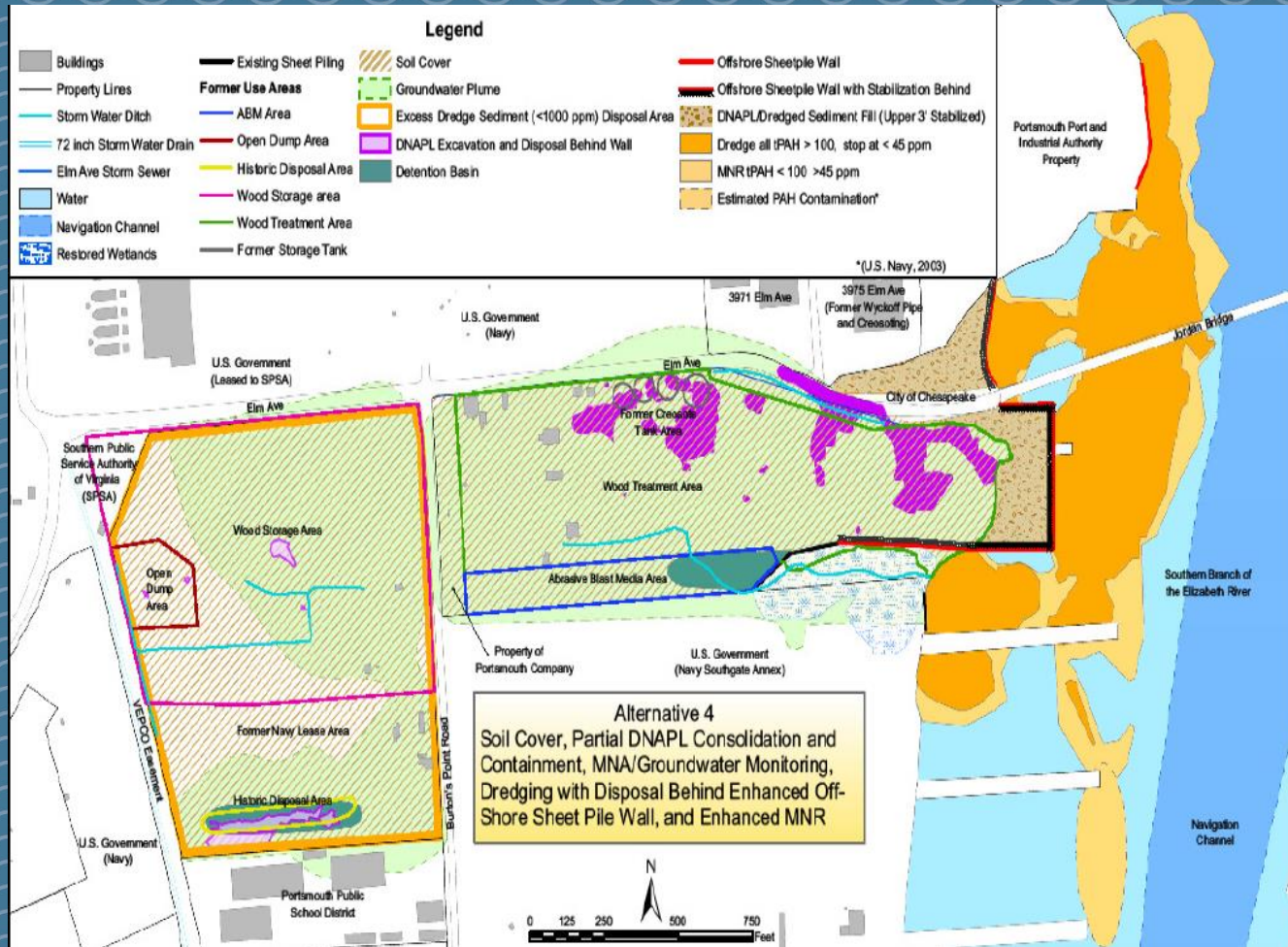
0 100 200 400 Feet



Atlantic Wood Industries Superfund Site

Technical Memorandum No. 5  
Determination of the Area to be Dredged

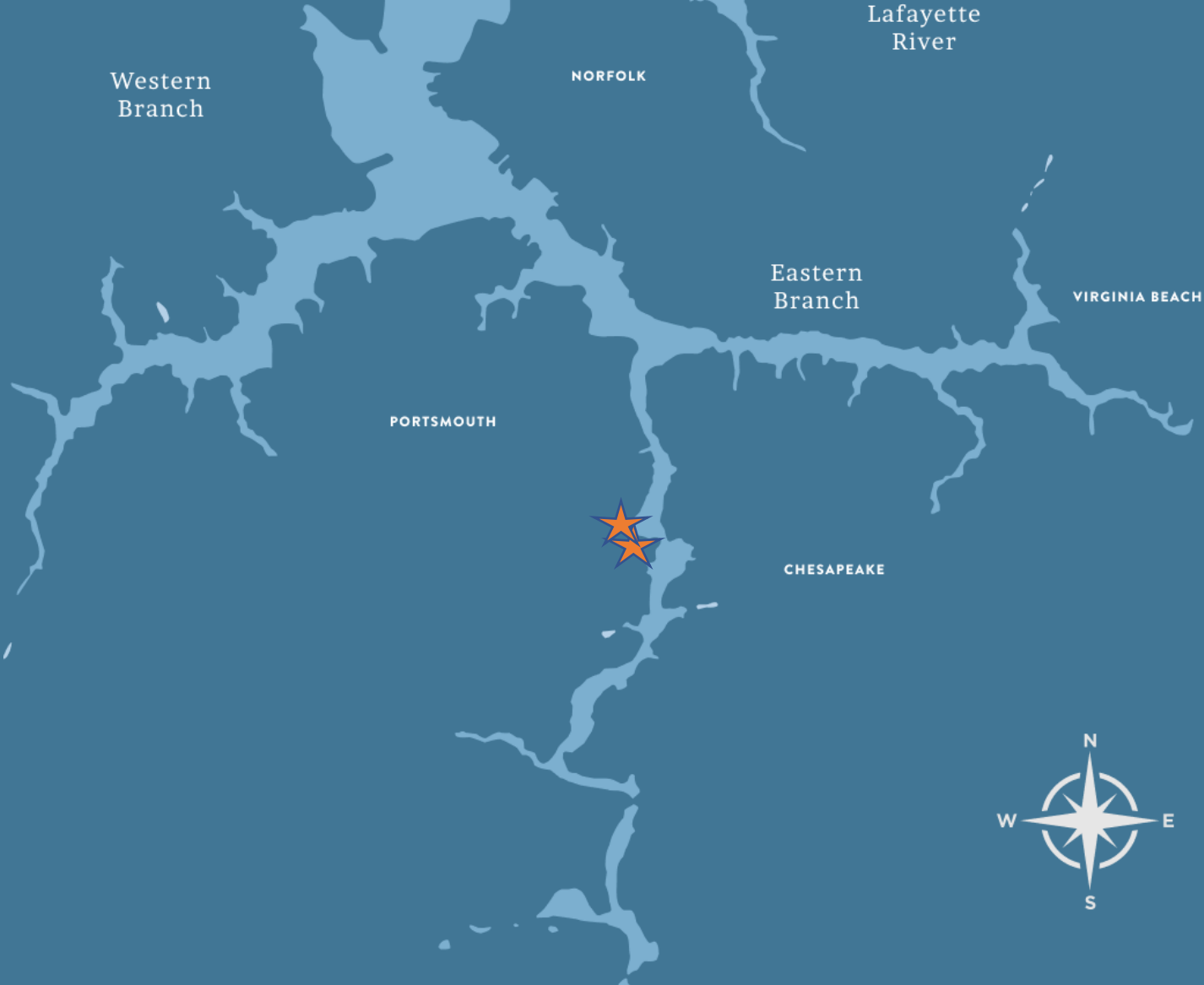
EA Project No. 1453011 8.3.7



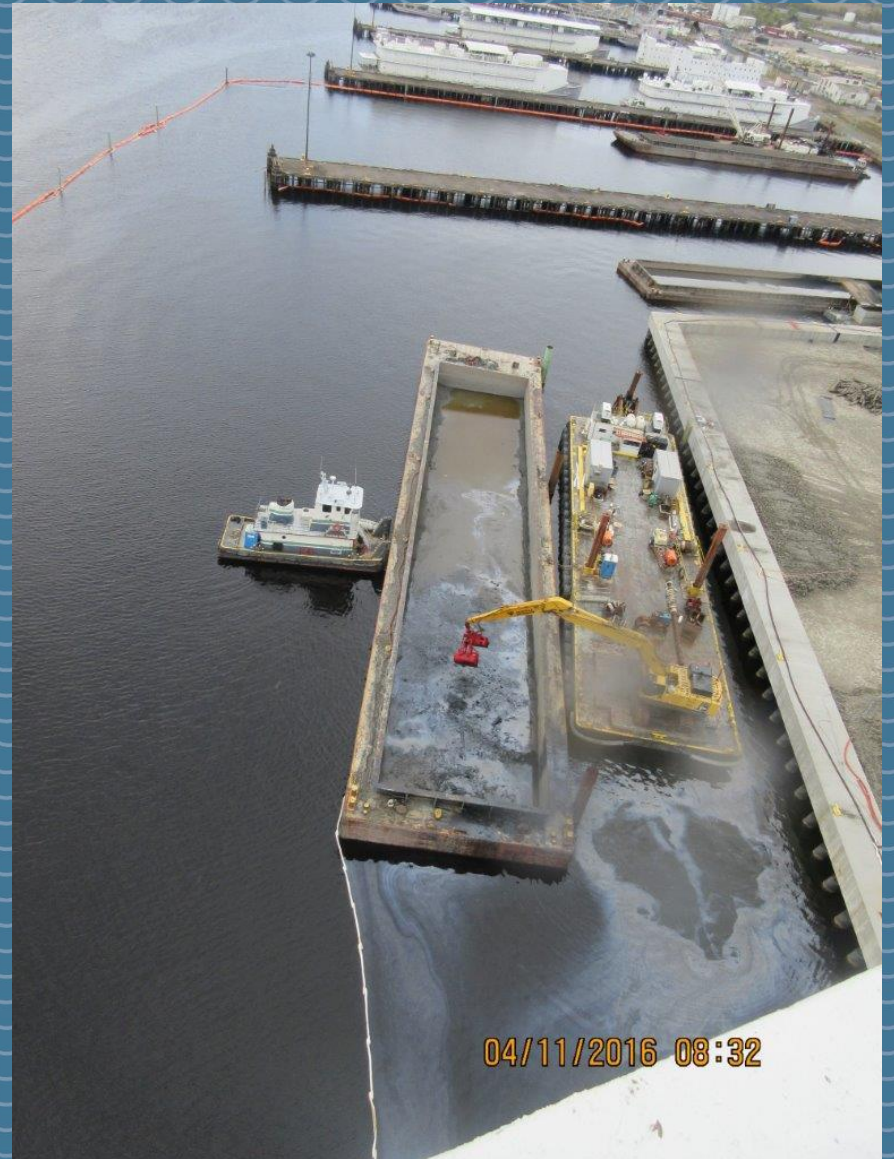
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# Atlantic Wood Industries and Wycoff Superfund Site



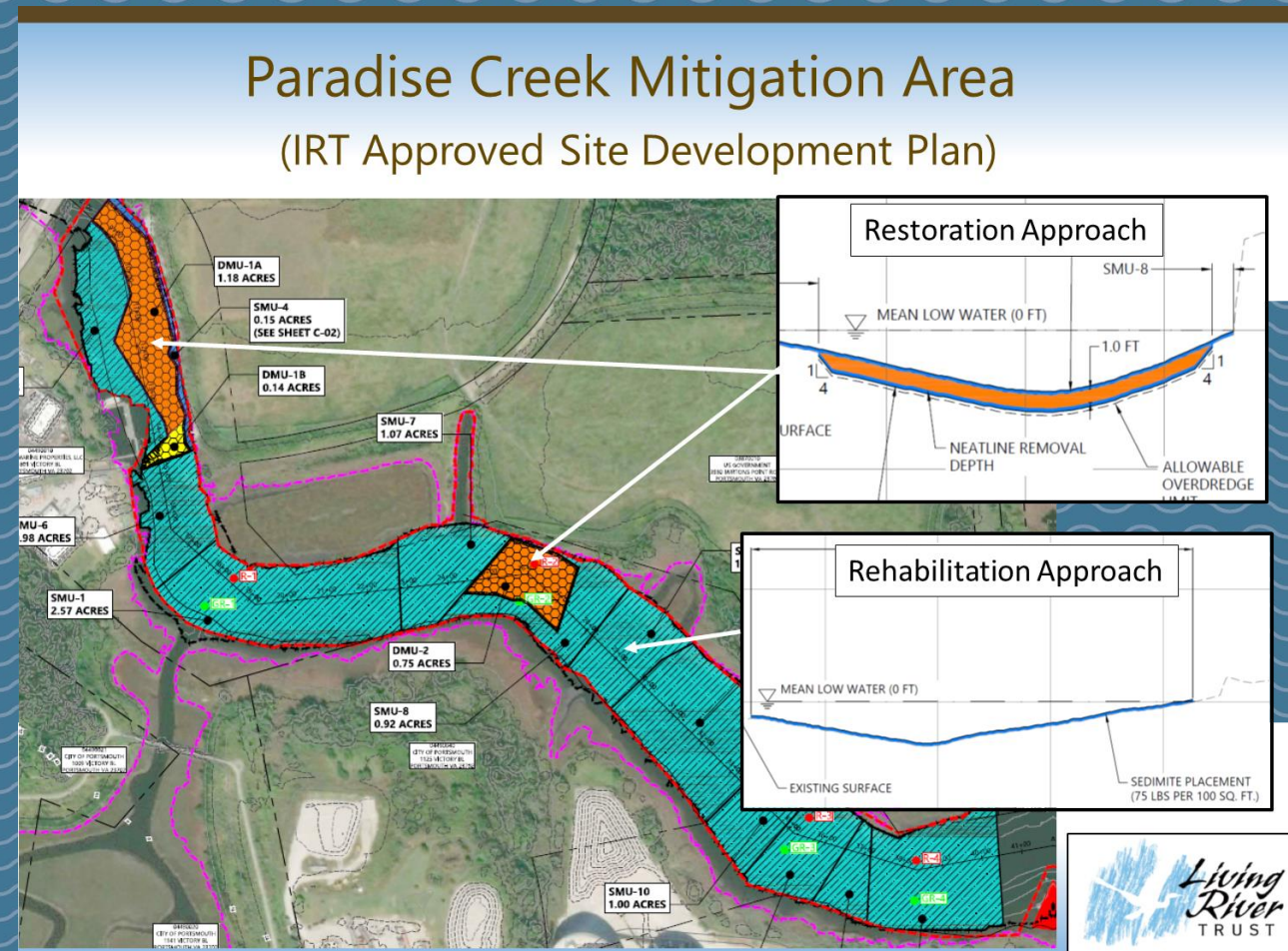
# Clean up at Atlantic Wood Industries



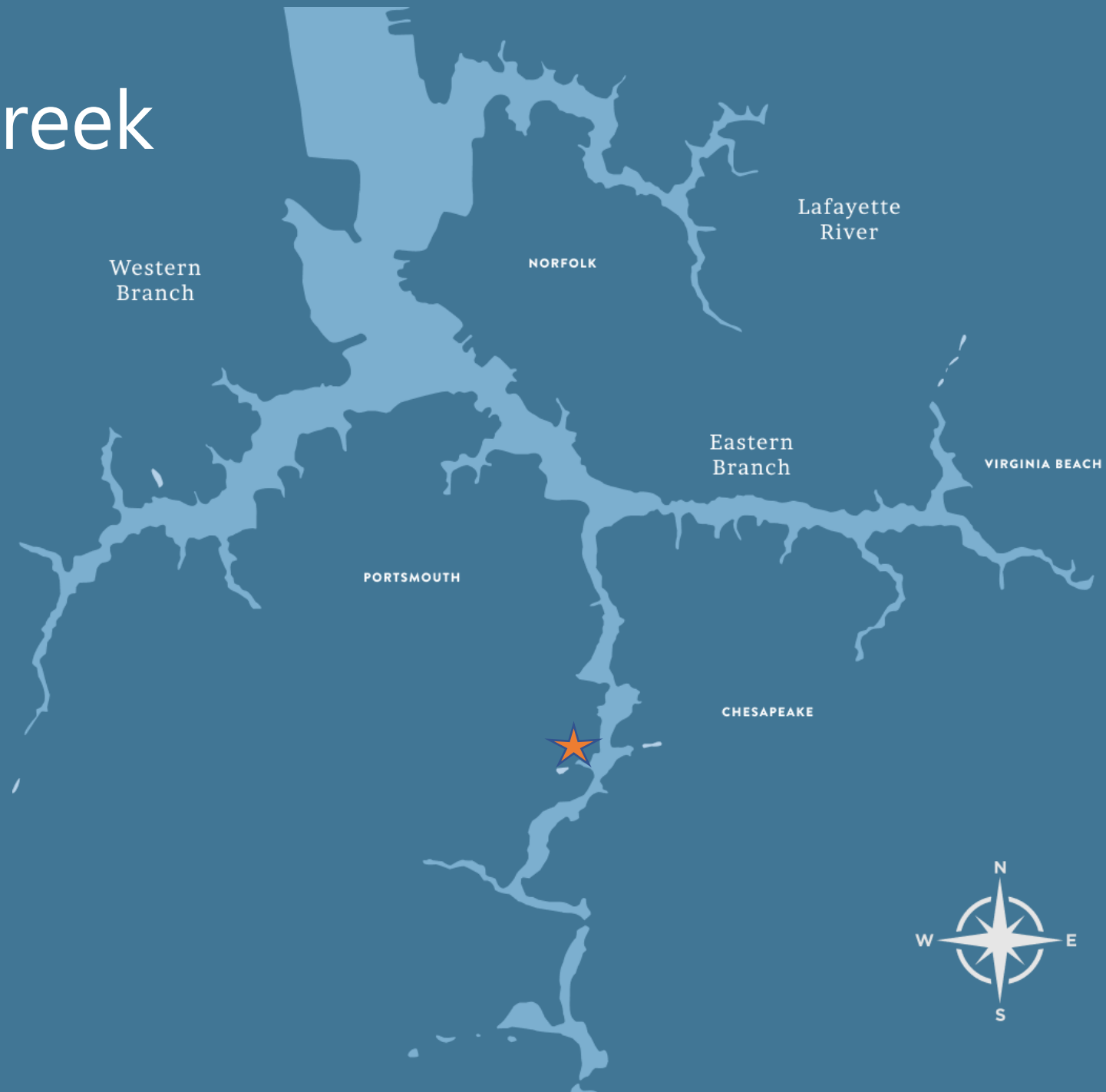
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# Clean up at Paradise Creek



# Paradise Creek



# Clean up at Paradise Creek



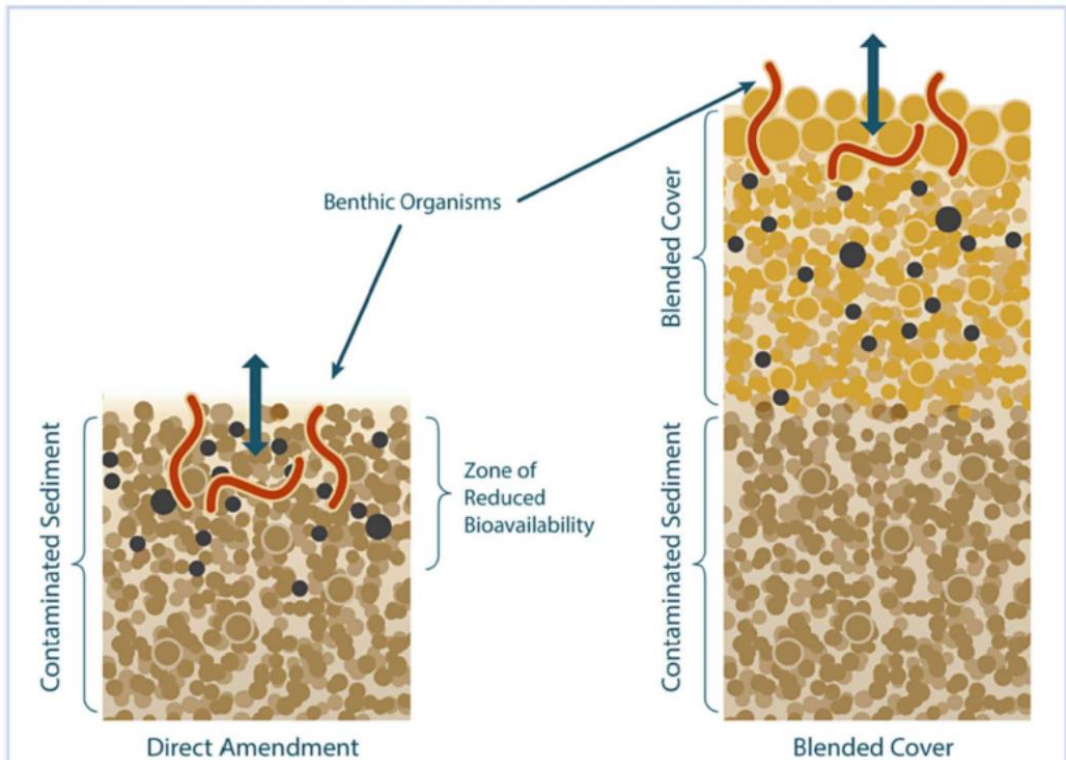
# Activate Carbon Application on Paradise Creek





# How Does Activated Carbon Work?

## TWO BASIC ENGINEERING APPROACHES



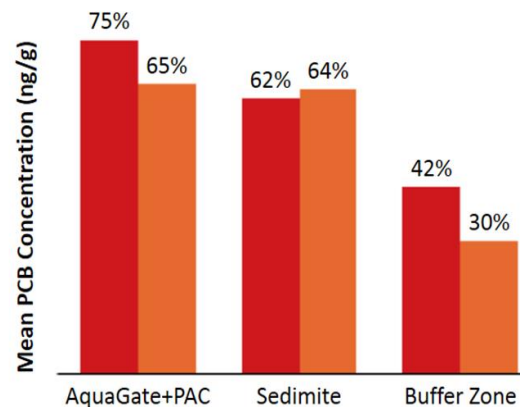
Sediment amendment involves integration of a sorbent like AC into the surficial bioactive zone of sediments (shown on the left) while blended cover involves placement of a new layer of cover materials (typically a relatively thin layer of clean sand or sediment) that includes a sorbent like AC either dispersed within (shown in right) or placed as a discrete layer as part of a multi-layer cover. Although these approaches have several differences, the ultimate goal of both approaches is to reduce exposure of benthic organisms to HOCs in sediments and also to reduce HOC flux from sediment into water.

From Patmont et al. IEAM 2015

## Activated carbon reduced pore water and tissue concentrations of target contaminants

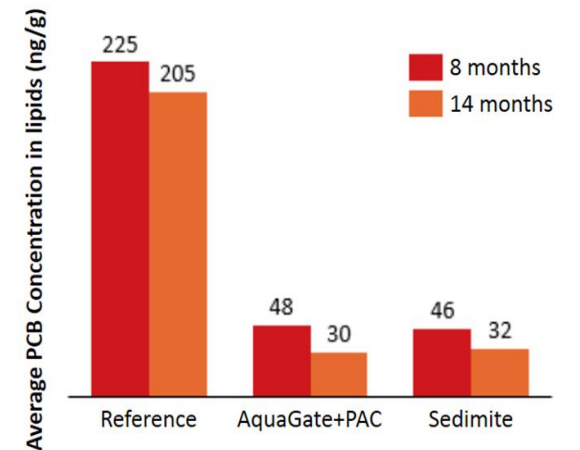
U.S. Navy Site  
San Francisco, CA

Pore Water PCB Reduction % relative to reference (top 16 cm)



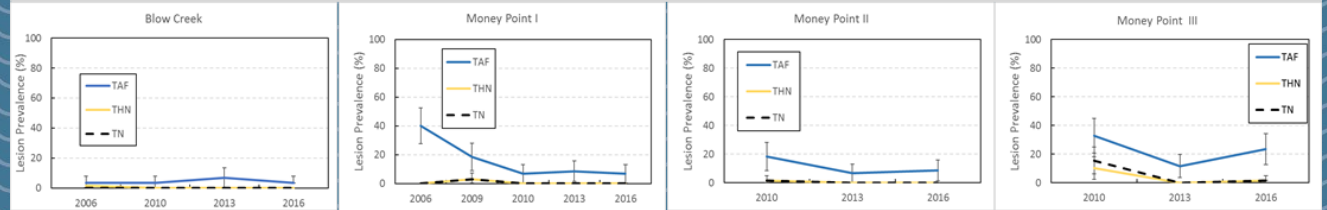
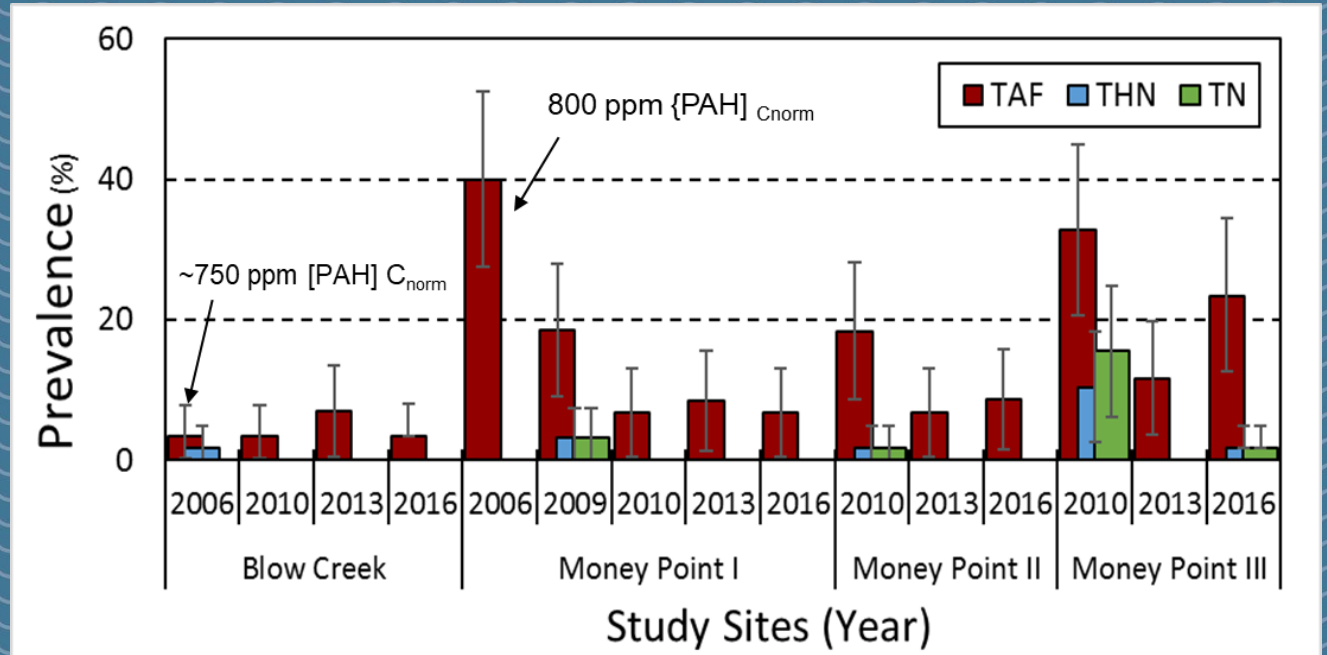
Time	Total PCBs
Baseline	2.26 +/- 0.2 ng/l
8 months	0.30 – 0.42 ng/l
14 months	0.10 – 0.12 ng/l

PCB Concentrations in bent nose clams



Time	% PCB Reduction
AquaGate+PAC	82%
Sedimite	85%

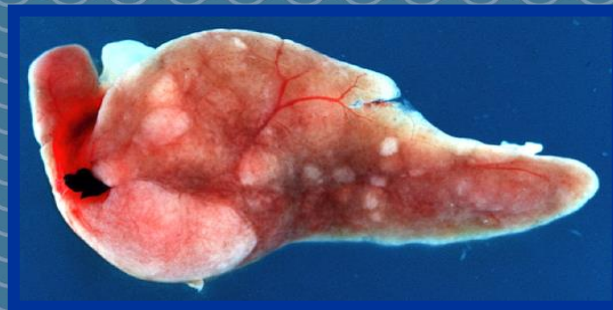
# Results From Money Point



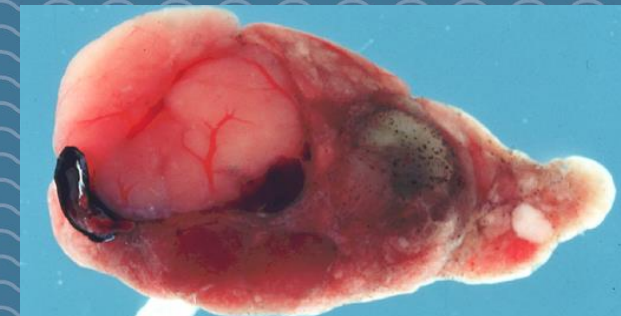
Healthy Mummichog Liver



Pre-Cancerous Mummichog Liver



Cancerous Mummichog Liver



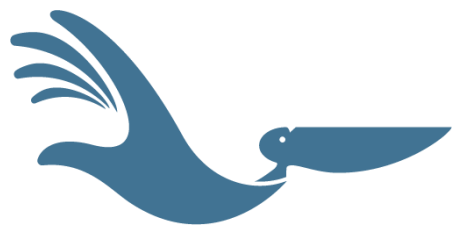
# Thank You & Questions

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