Mid Atlantic Region Environmental Professionals

MAREP

Today's Webinar

Sediment to Solutions: Innovative Reuse and Beneficial Use of Dredged Material

Presenter: Kristen Keene, Innovative Reuse Program Manager, Port of Baltimore

Dredged materials are often viewed as a waste product and referred to as "dredge spoil." Today, with extensive physical, chemical and geotechnical testing, and in conjunction with new guidance from the Maryland Department of the Environment, dredged material is being recognized as a valuable resource. The Maryland Department of Transportation Maryland Port Administration (MDOT MPA) is leading the way on innovative reuse of dredged material through demonstration projects and research studies. MDOT MPA has also demonstrated how dredged sediments can be beneficially used to restore lost island habitat.

MAREP

MAREP benefits environmental professionals from a range of disciplines and industries by providing networking and educational opportunities.

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SEDIMENT TO SOLUTIONS

CHANNELING INNOVATION

MDOT Maryland Port Administration

Innovative Reuse and Beneficial Program

January 21, 2021

Presentation Overview

- Port of Baltimore 101
- Maryland's Dredged Material Management Program
- Innovative Reuse and Beneficial Use
- Dredged Material Characteristics
- Regulatory Guidance
- IR Demonstration & Research Projects
- Beneficial Use Projects
- Recent Developments

Port of Baltimore 101

MDOT MPA Mission

SEDIMENT TO SOLUTIONS:
CHANNELING INNOVATION

"To increase the flow of waterborne commerce through the State of Maryland in a manner that provides a benefit to the citizens of the State."

The Port of Baltimore

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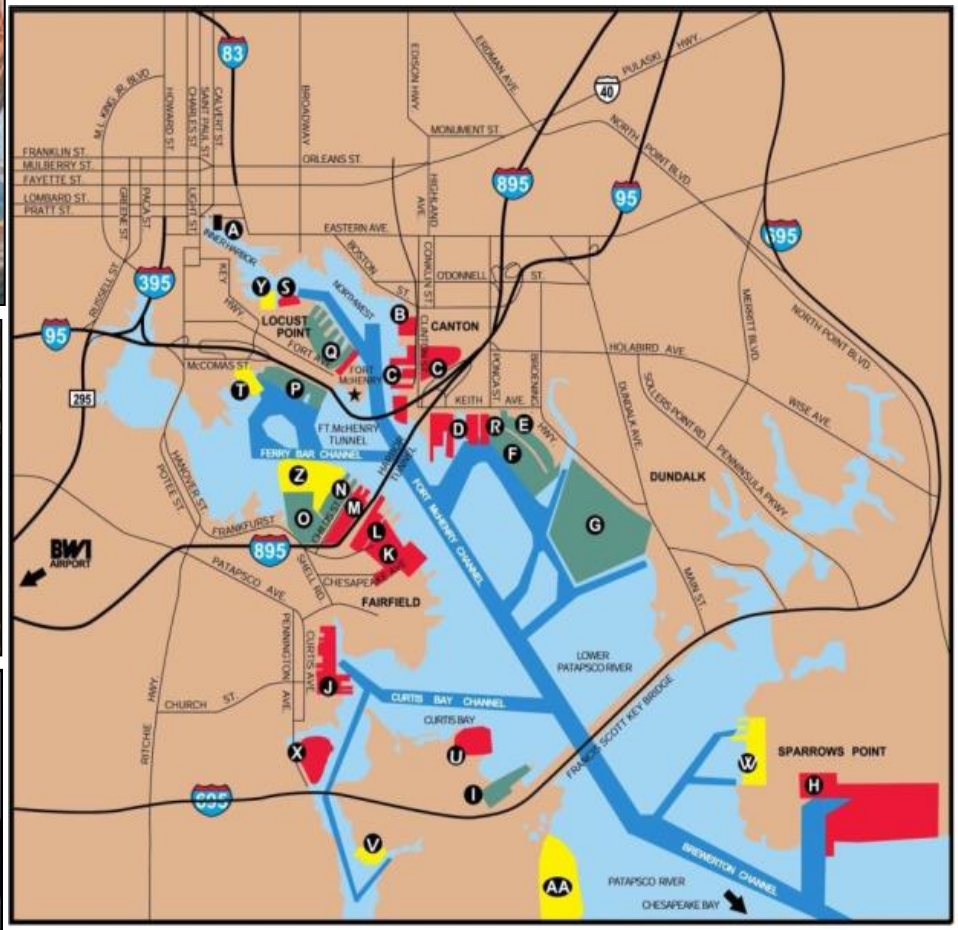

MARYLAND DEPARTMENT OF TRANSPORTATION
MARYLAND PORT ADMINISTRATION

GreenPort of Baltimore

Port of Baltimore Statistics

SEDIMENT TO SOLUTIONS:
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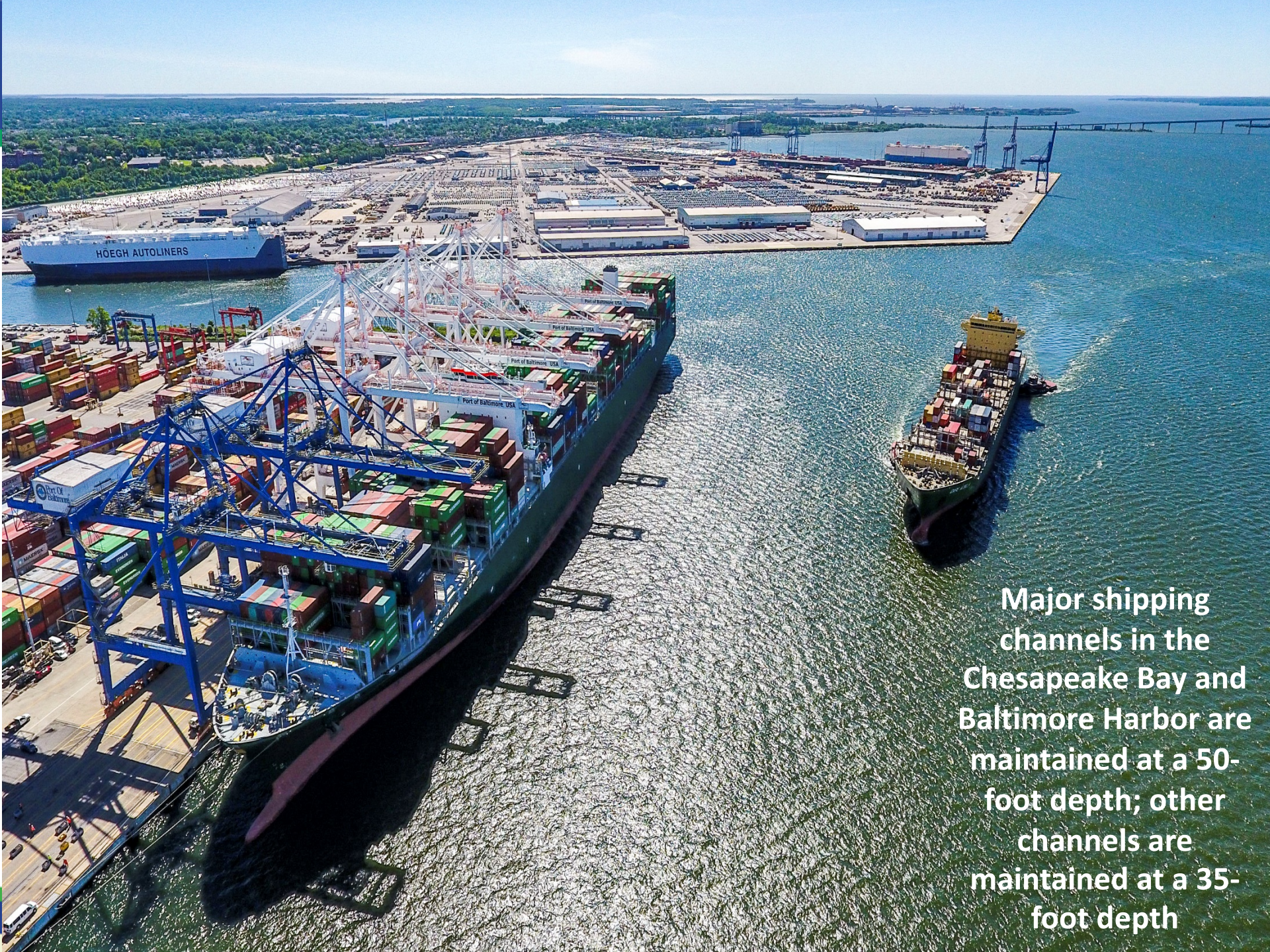
- Ranks #1 in Autos and Light Trucks.
- Ranks #1 in Roll-on Roll-off Heavy Equipment.
- Ranks #1 in imported Sugar and Gypsum.
- Ranks #2 in exported Coal.
- 9th in Overall Foreign Cargo Value ($59.7 billion)
- 11th in Overall Foreign Cargo Tonnage (43.0 million tons)

Maryland's Dredged Material Management Program



Major shipping channels in the Chesapeake Bay and Baltimore Harbor are maintained at a 50-foot depth; other channels are maintained at a 35-foot depth

Dredging Shipping Channels

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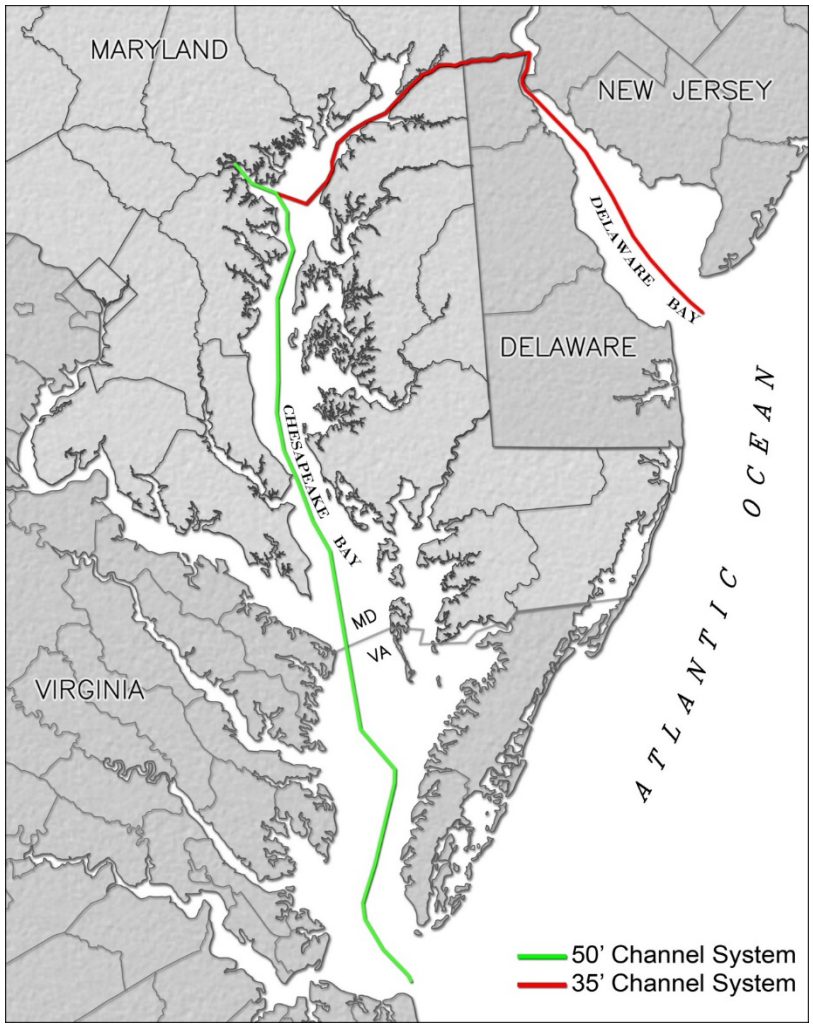

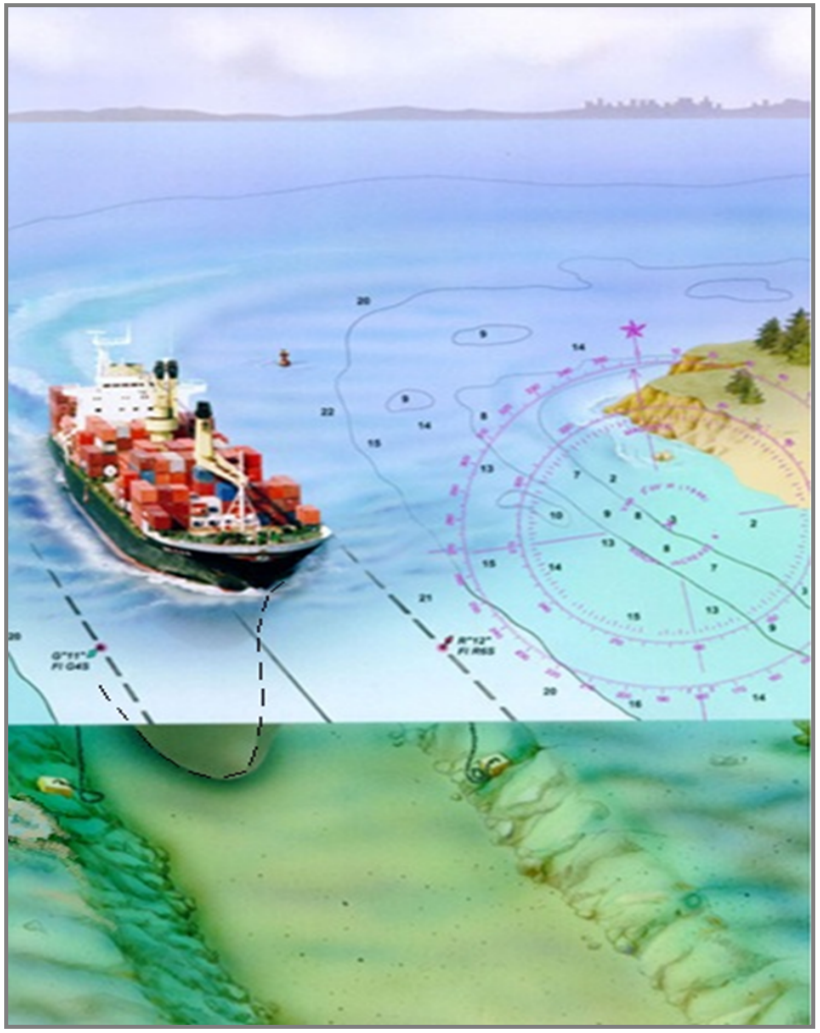

Port of Baltimore Dredging Volumes

- Port of Baltimore's shipping channel
  - Maintaining a 50' depth keeps channels safe and open and the Port competitive.
- Annual maintenance of the State's marine highway
  - 136 miles of dredged channels/yr
- 4.7mcy of material is dredged annually
  - Harbor channel material: 1mcy/yr
  - Bay channel material
  - C&D Canal approach channel material

Dredged Material in Maryland: The Early Years

- **1975**: SB 28, Ch. 22, Acts of 1975: *Chesapeake Bay – Dumping Spoil from Dredging Operations within the Baltimore Harbor.*
  - *Legislative Declaration: The General Assembly declares that the Chesapeake Bay and its tributaries (within the tidewater portions thereof) are a great natural asset and resource to the state and its counties. Portions of these areas are* ***threatened with inundation by the unconfined dumping of vast quantities of spoil from dredging operations within Baltimore Harbor.*** *This inundation and unconfined dumping will pollute and despoil valuable portions of the bottomland in the Chesapeake Bay and its tidewater tributaries and be* ***grossly harmful to fish and marine life in these and adjacent waters,*** *to use for recreation, and to the economic and social life of the people of this state.*

- **1975**: SB 28, Ch. 22, Acts of 1975: *Chesapeake Bay – Dumping Spoil from Dredging Operations within the Baltimore Harbor.*
  - *Defined Baltimore Harbor*: Baltimore Harbor: consists of the tidal portions of the Patapsco River and its tributaries lying westward of a line extending from Rock Point in Anne Arundel County to North Point in Baltimore County.
  - ***Dumping Prohibited***: A person may not redeposit in an unconfined manner dredged material from Baltimore Harbor into or onto any portion of the water or bottomland of the Chesapeake Bay or of the tidewater portions of any of the Chesapeake Bay's tributaries outside of Baltimore Harbor. However, the dredged material may be redeposited in contained areas approved by the Department.

- Md. ENVIRONMENT Code Ann. § 5-1102

Maryland's Dredged Material Management Program (DMMP)

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Guiding Legislation: The Dredged Material Management Act of 2001

Prioritized placement options in the following hierarchy:

1. ***Innovative Reuse and Beneficial Use***
2. Upland Sites and Other Environmentally Sound Confined Capacity
3. Expansion of Existing Facilities
4. Other Options to Meet Long-Term Placement Needs (excluding re-deposition in an unconfined manner)

DMMP Committee Structure

This is how Maryland engages stakeholders in dredged material management – from challenge identification through site operation and end use.

Governor of Maryland

Executive Committee

Management Committee

Citizens Advisory Committee

Harbor Team

Innovative Reuse Committee

Hart-Miller Island Citizens Oversight Committee

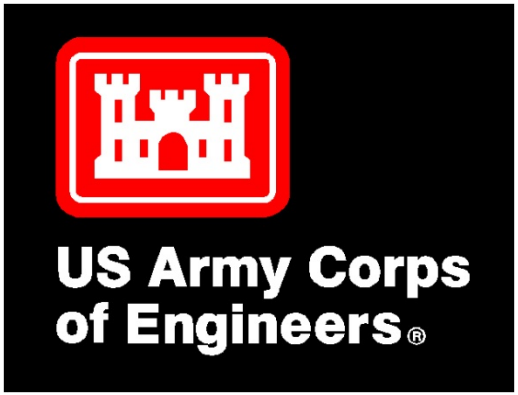
Cox Creek Citizens Oversight Committee

Masonville Citizens Advisory Committee

Pearce Creek Implementation Committee

Bay Enhancement Working Group (BEWG) and Scientific and Technical Advisors

Partners in Dredging



CITIZENS

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CENTER FOR ENVIRONMENTAL SCIENCE

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Harbor Channel Placement Options

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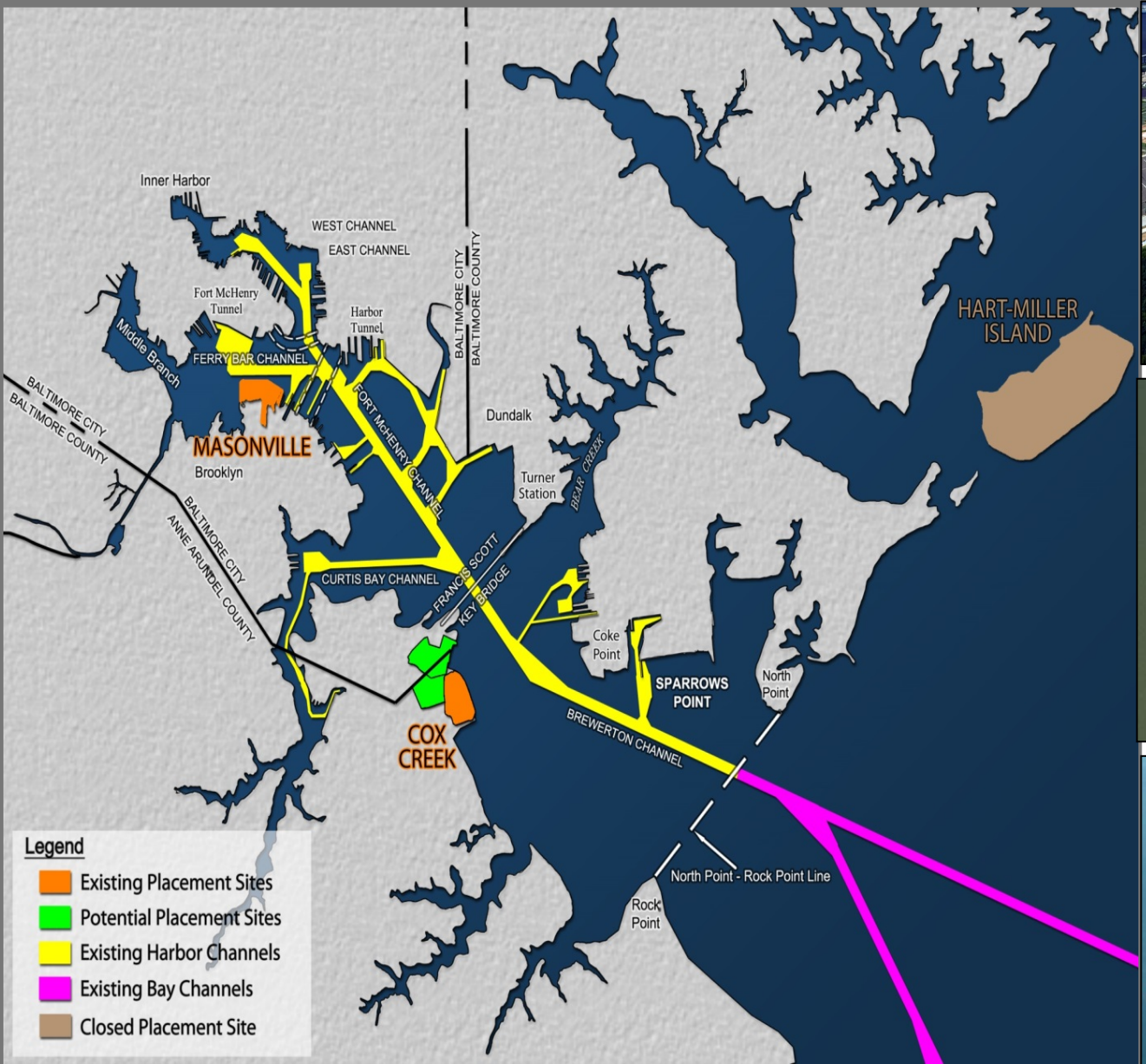
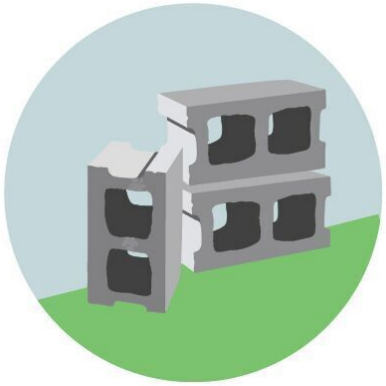


Innovative Reuse and Beneficial Use

New Solutions Needed

SEDIMENT TO SOLUTIONS: CHANNELING INNOVATION

Innovative Reuse and Beneficial Use



Building Materials

Habitat Restoration

Manufactured Topsoil

Site Reclamation

MPA Innovative Reuse & Beneficial Use Goal:

To make long-term, sustainable reuse of dredged material a widely used tool for managing dredged sediments to promote capacity recovery in upland containment facilitates and support the continued viability of the Port of Baltimore.

IR and BU

Statutory Definitions:

Innovative Reuse:
"includes the use of dredged material in the development or manufacturing of commercial, industrial, horticultural, agricultural or other products."

Beneficial Use:
"Means any of the following uses of dredged material from the Chesapeake Bay and its tributary waters placed into waters or onto bottomland of the Chesapeake Bay or its tidal tributaries, **including Baltimore Harbor**:

(i) The restoration of underwater grasses;
(ii) The restoration of islands;
(iii) The stabilization of eroding shorelines;
(iv) The creation or restoration of wetlands; and
(v) The creation, restoration, or enhancement of fish or shellfish habitats."

2020 Innovative Reuse & Beneficial Use Strategy

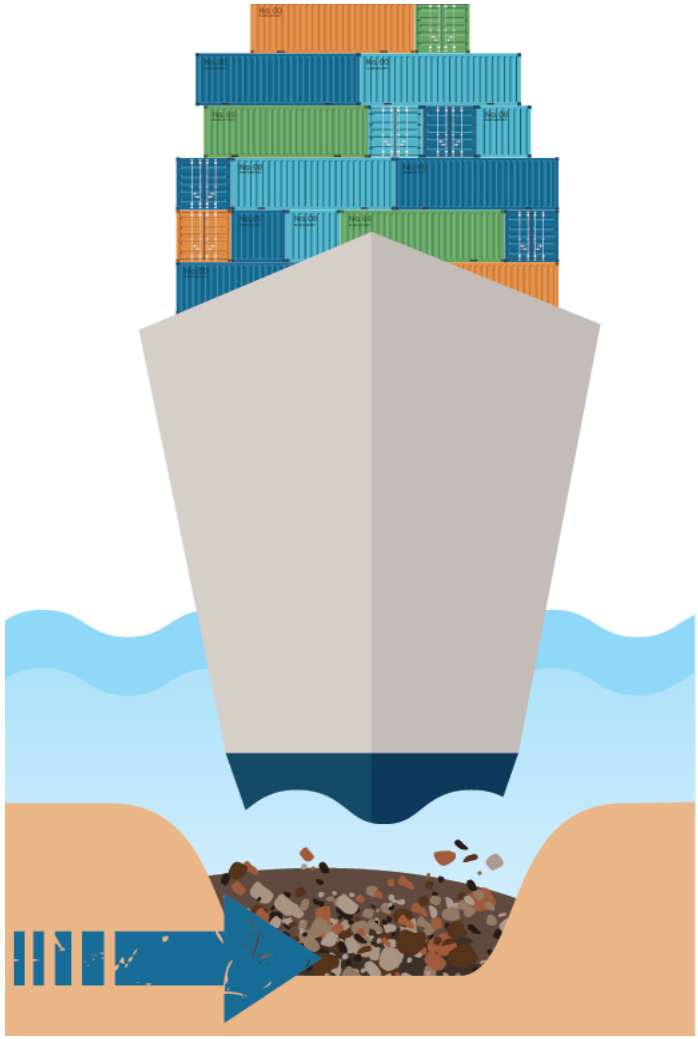
- Policy/Regulatory
- Technical
- Education and Stakeholder Engagement
- Program Implementation

For more information: https://maryland-dmmp.com

Dredged Material Characteristics

Dredged Material

- What's in it?
  - Consists of clays, silts and some sand
  - 70% - 80% water by weight, initially
- Where does it come from?
  - Sedimentation
    - Natural process
    - Washes off the land
    - Tidal flow in the Bay



Chemical Properties

Dredged material generally qualifies as CAT 2 material. The main elevated concentrations in dredged material include:

METALS

Arsenic - is usually one of the drivers for material falling into Category 2 with risk assessment due to human health risk (assigned a cancer risk)

Hex Chromium – usually falls into CAT 2 when speciated out from Total Chromium numbers

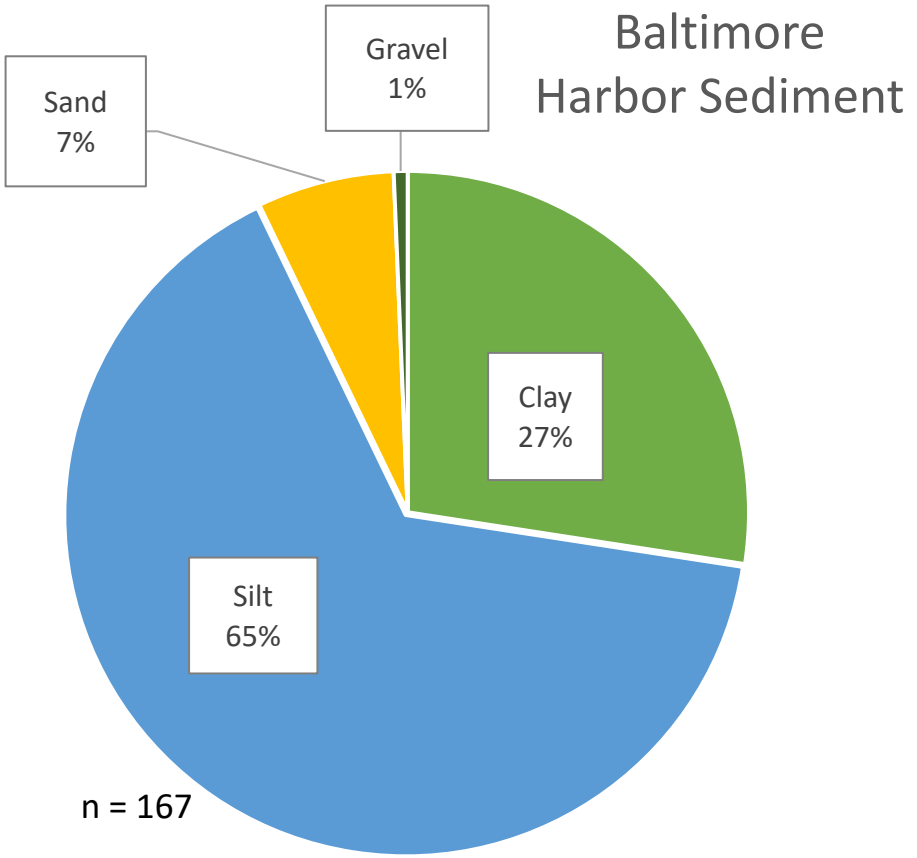
Non-cancer risks that are usually Category 2, but not a high risk:
Iron, manganese, nickel and thallium

Semi-VOCs

Benzo(a)pyrene – usually falls into Category 2

Physical Properties

- Baltimore Harbor dredged material is mostly silt and clay with a medium to high plasticity.
- In general, soils exhibit a low organic content with high levels of fine fractions.



Summary of Dredged Material Challenges

- **Salinity**
  - Soluble salts 3x higher than SHA topsoil spec
- **Heavy Metals**
  - Arsenic is present, although often comparable to background levels
- **Particle Size**
  - Composed of mostly silts and clays
- **Moisture Content**
  - 70-80% water by weight
- **Sulfides**
  - Upon exposure to oxygen, sulfides can produce acidic conditions

Regulatory Guidance

Dredged Material Reuse Potential

The MDE Guidance Document guides prospective end users of dredged material through the various steps, permits or approvals necessary based on the proposed project. It covers the sampling requirements, environmental and public health standards and long-term management needs.

Establishes **4 categories** for management (including dredged material) of engineered fill or soil, including as a soil amendment:

- Category 1 – Residential, Unrestricted
- Category 2 – Non-Residential, Restricted Use
- Category 3 – Restricted Use, Cap Required
- Category 4 – Ineligible for Reuse

Confirmation of Suitability Forms

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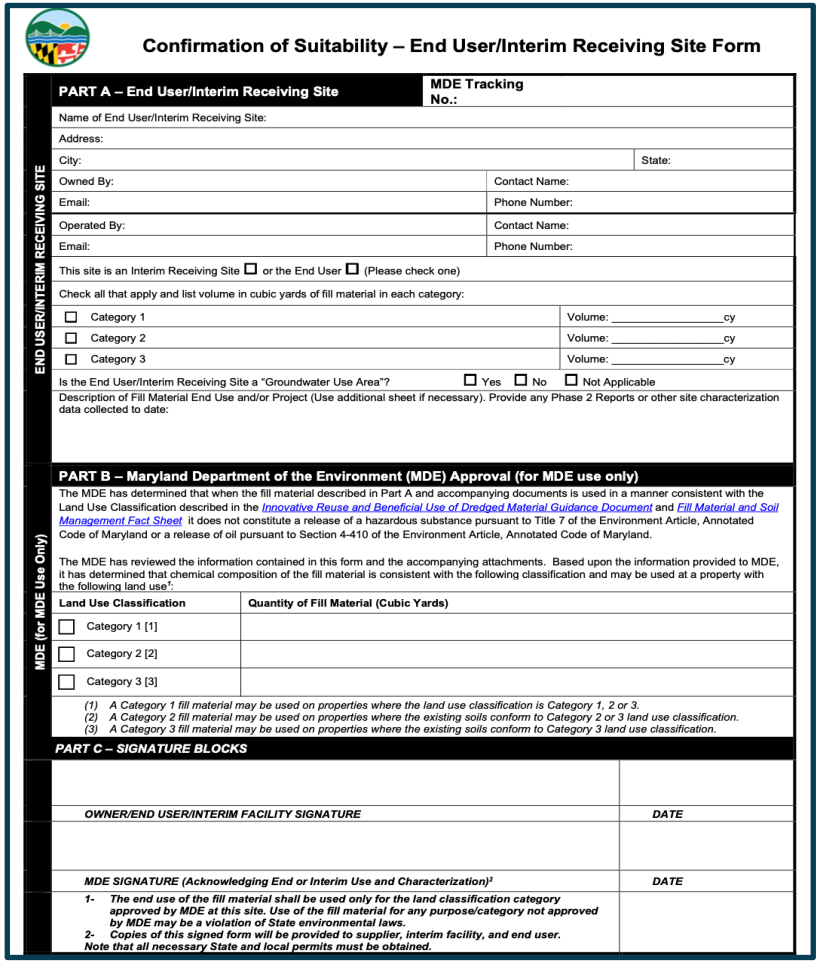
MDE developed **"Confirmation of Suitability Forms"** to further streamline regulatory tracking and approval for dredged material reuse.

- Supplier Form
- End User/Interim Receiving Site Form



Confirmation of Suitability – End User/Interim Receiving Site Form

END USER/INTERIM RECEIVING SITE

PART A – End User/Interim Receiving Site | **MDE Tracking No.:**

Name of End User/Interim Receiving Site:

Address:

City: | State:

Owned By: | Contact Name:

Email: | Phone Number:

Operated By: | Contact Name:

Email: | Phone Number:

This site is an Interim Receiving Site ☐ or the End User ☐ (Please check one)

Check all that apply and list volume in cubic yards of fill material in each category:

☐ Category 1 | Volume: _____cy

☐ Category 2 | Volume: _____cy

☐ Category 3 | Volume: _____cy

Is the End User/Interim Receiving Site a "Groundwater Use Area"? ☐ Yes ☐ No ☐ Not Applicable

Description of Fill Material End Use and/or Project (Use additional sheet if necessary). Provide any Phase 2 Reports or other site characterization data collected to date:

MDE (for MDE Use Only)

PART B – Maryland Department of the Environment (MDE) Approval (for MDE use only)

The MDE has determined that when the fill material described in Part A and accompanying documents is used in a manner consistent with the Land Use Classification described in the *Innovative Reuse and Beneficial Use of Dredged Material Guidance Document* and *Fill Material and Soil Management Fact Sheet* it does not constitute a release of a hazardous substance pursuant to Title 7 of the Environment Article, Annotated Code of Maryland or a release of oil pursuant to Section 4-410 of the Environment Article, Annotated Code of Maryland.

The MDE has reviewed the information contained in this form and the accompanying attachments. Based upon the information provided to MDE, it has determined that chemical composition of the fill material is consistent with the following classification and may be used at a property with the following land use[1]:

Land Use Classification	Quantity of Fill Material (Cubic Yards)
☐ Category 1 [1]	
☐ Category 2 [2]	
☐ Category 3 [3]	

(1) A Category 1 fill material may be used on properties where the land use classification is Category 1, 2 or 3.
(2) A Category 2 fill material may be used on properties where the existing soils conform to Category 2 or 3 land use classification.
(3) A Category 3 fill material may be used on properties where the existing soils conform to Category 3 land use classification.

PART C – SIGNATURE BLOCKS

OWNER/END USER/INTERIM FACILITY SIGNATURE | *DATE*

MDE SIGNATURE (Acknowledging End or Interim Use and Characterization)[2] | *DATE*

1- The end use of the fill material shall be used only for the land classification category approved by MDE at this site. Use of the fill material for any purpose/category not approved by MDE may be a violation of State environmental laws.
2- Copies of this signed form will be provided to supplier, interim facility, and end user.
Note that all necessary State and local permits must be obtained.

Instructional webinar coming soon!!

Dredged Material Category Calculator

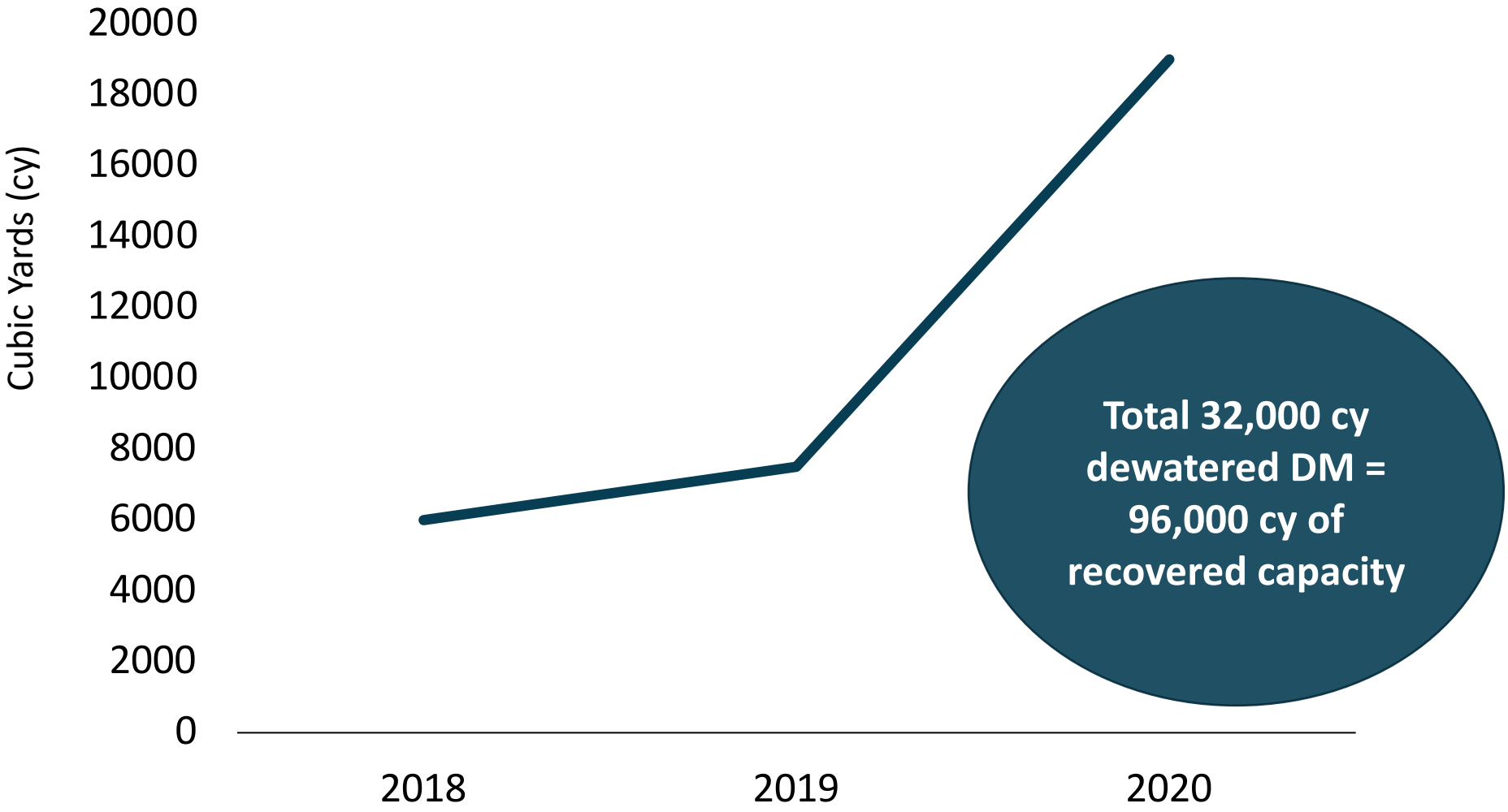
MDE developed a **Category Calculator Tool** to:

1. Assist environmental professionals in evaluating the nature and probability of adverse human health effects from the exposure of contamination in soil
2. Assist environmental professionals to categorize soil for use as fill material

	INPUT VALUES IN THIS COLUMN	Category 1		Category 2 - Population 1 - Child		Category 2 - Population 2 - Construction		Category 2 - Population 3 - Composite Adult	
Analyte	Sample Concentration (mg/kg)	Cancer	Non-cancer	Cancer	Non-cancer	Cancer	Non-cancer	Cancer	Non-cancer
Arsenic		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Cadmium		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Chromium (III)		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Chromium (VI)		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Total Chromium[1]		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Copper		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Lead[2]		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Mercuric chloride		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Mercury (elemental)		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Methyl Mercury		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Molybdenum		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Nickel		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Selenium		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Zinc		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Aroclor 1016		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Aroclor 1221		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Aroclor 1232		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Aroclor 1242		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Aroclor 1248		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Aroclor 1254		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Aroclor 1260		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Acenaphthene		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Acenaphthylene		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Anthracene		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Benz[a]anthracene		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Benzo[a]pyrene		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Benzo[b]fluoranthene		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Benzo[g,h,i]perylene		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Benzo[k]fluoranthene		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Chrysene		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Dibenz[a,h]anthracene		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Fluoranthene		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00
Fluorene		0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00	0.00E+00	0.00

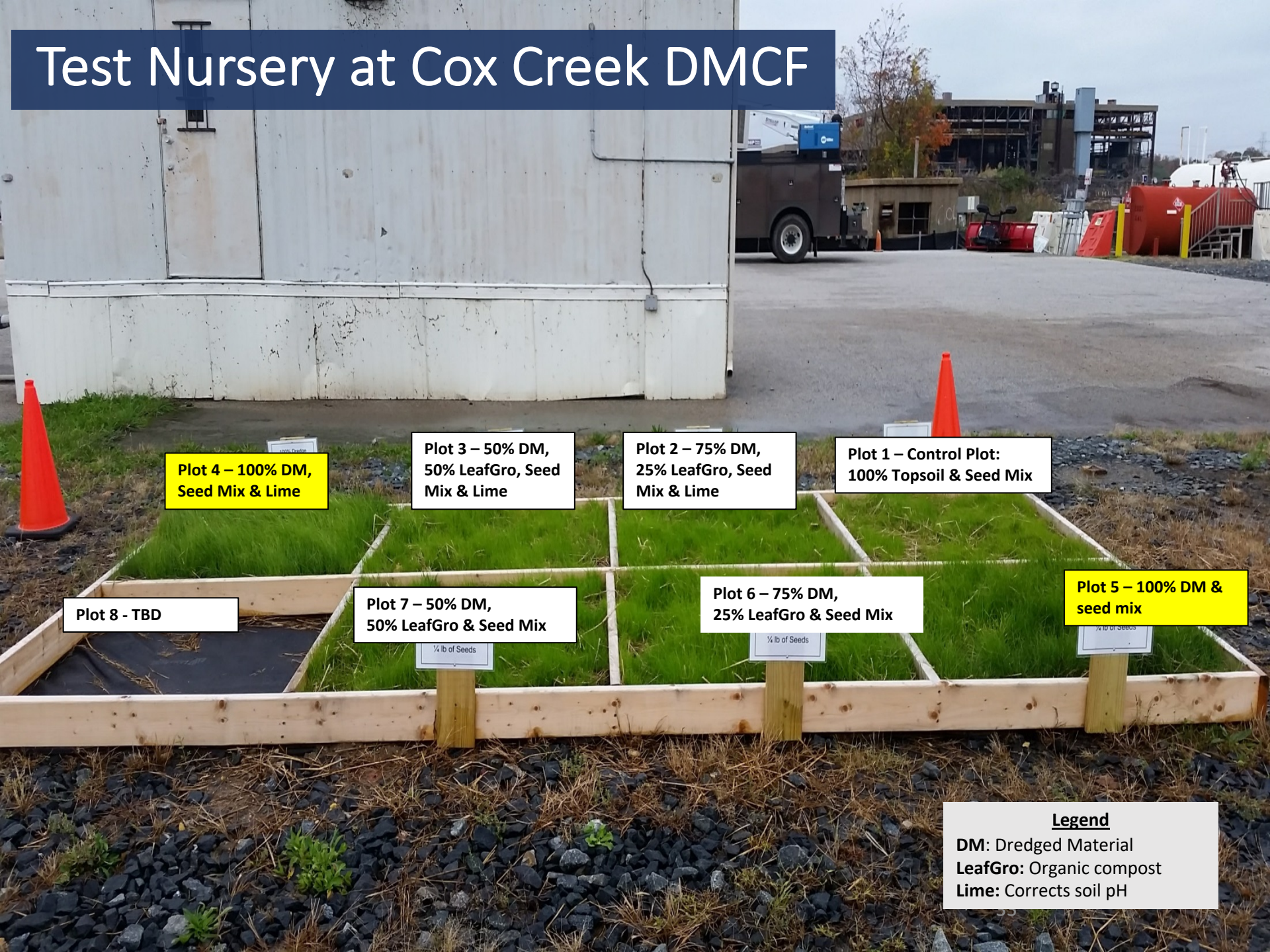
IR Demonstration & Research Projects

Dredged Material Recovered from Cox Creek DMCF



DREDGED MATERIAL ENGINEERED FILL

Test Nursery at Cox Creek DMCF



Alternative Daily Cover at Quarantine Road Landfill: 6,000 cy

Ridgely's Cove Remedial Capping

Research Projects - *Completed*

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University of Maryland College Park

Study #1 – Develop dredged material blend to meet MDOT SHA topsoil specification

- Results indicated that DM met all topsoil specs with exception of soluble salts

Study #2 – Explore use of dredged material as potential highway embankment fill

- Results showed that compaction + sheer strength of DM improved upon blending with quarry by-products
- All metals released during batch leach tests were below MD Surface Water Quality limits and risk of groundwater contamination very low

Research Projects - *Underway*

SEDIMENT TO SOLUTIONS:
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University of Maryland Center for Environmental Science (UMCES):

Study #3 – Conduct economic evaluations to better understand value of reclaimed capacity in DM storage facilities

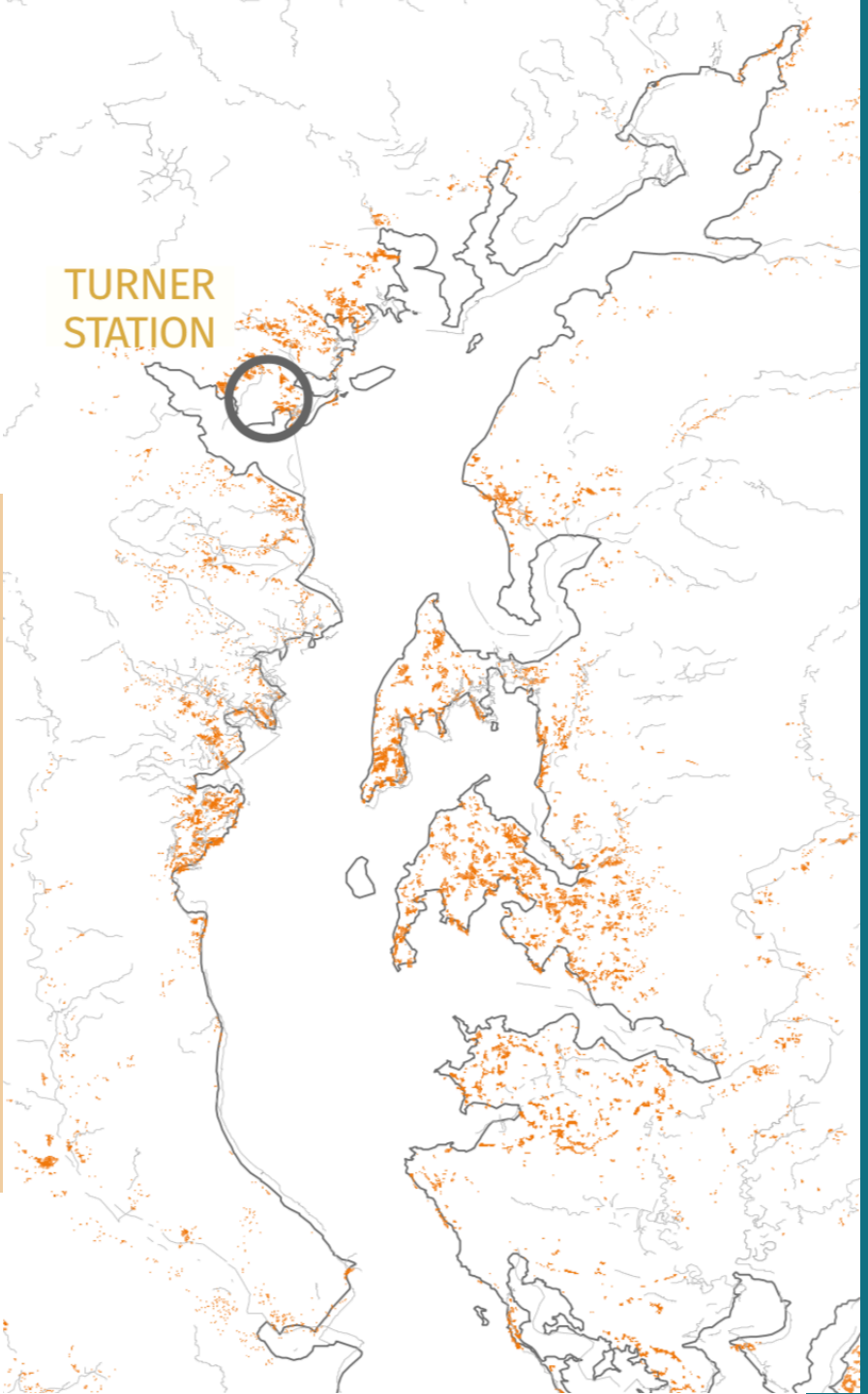
University of Maryland Baltimore County (UMBC):

Study #4 – Explore bioavailability of DM contaminants in marine environment + identify amendments to reduce pollutant risk and enable sustainable reuse

UMCES + Morgan State University:

Study #5 – Develop DM blend suitable for in-water shoreline restoration activities that incorporates other local "waste" streams

Beneficial Use Projects



MDOT MPA Secretary's Grant

Fleming Park Restoration Project

A multi-partner effort to develop a community-based co-benefits project at Fleming Park in Baltimore County. The design for the project proposes to create a new hybrid landscape that combines the innovative reuse and beneficial use of navigation channel/maintenance dredged material with waterfront recreational amenities and resilient infrastructure.

Grant awarded to Turner Station Conservation Teams

Total award = $500,000

FLEMING PARK RESTORATION PROJECT PHASES

Phase I – Community Outreach, Pre-Design Investigation, 30% Design & Engineering, and Permitting & Regulatory Review

Phase II – Design Development, Final Design, and Engineering

Phase III – Construction Planning, Construction, and Construction Management

Phase IV – Monitoring, Adaptive Management, and Reporting

Large-Scale Beneficial Use

Poplar Island:

- 40 mcy capacity
- 1,140 acres total

Poplar Expanded:

- 28 mcy additional capacity
- 575 acres total
  - 206 acres of wetlands
  - 259 acres of uplands
  - 110-acre open water embayment

Mid-Chesapeake Bay Islands Project

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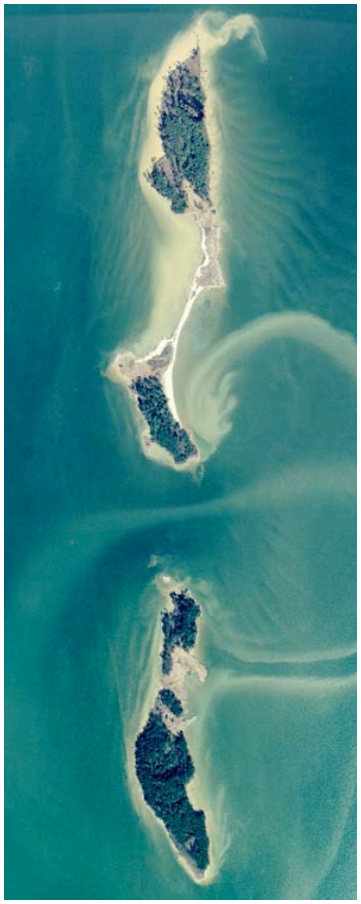
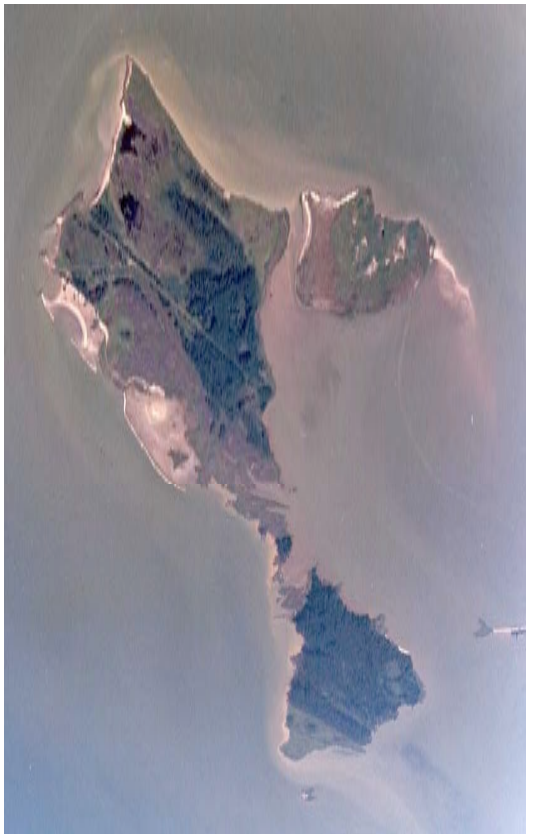


James Island: 2072 acres
55% wetland, 45% upland habitat

- ✓ Provides ***90-95 million cubic yards*** of dredged material placement capacity.
- ✓ Beneficial use of sediment dredged from the Port of Baltimore's 50' deep open Bay channels in Maryland.
- ✓ Restores important, scarce remote island habitat at James and Barren Islands.
- ✓ Provides shoreline protection and resiliency for Dorchester County and its property owners.



Barren Island 72 acres
Sub-Aquatic Vegetation
restoration/protection

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Recent Developments

Innovative Reuse and Beneficial Use

Request for Proposals

- RFP was advertised on e-Maryland Marketplace Advantage in November 2019
- RFP for research and development for novel dredged material end-use applications
- Intent is to award multiple proposals - each proposal is not to exceed $300,000
- Maximum volume of dredged material to be allocated under this RFP is 5,000 cy per proposal

Status of RFP Proposals

Total of 10 proposals received to-date

- 2 proposals rejected
- 3 proposals in review stages
- 2 contracts going to BPW on 1/27
- 3 contracts awarded

Private Sector Ingenuity

- Manufactured building products
- Stormwater management solutions
- Coastal restoration/resiliency products
- Agricultural applications

RFP Contract Awards

#1 Belden-Eco Products

Purpose: Conduct industrial-scale testing using Cox Creek dredged material for commercial production of ceramic bricks and permeable pavers.

#2 Northgate Environmental Management

Purpose: Study the use of Cox Creek dredged sediment for manufacturing concrete traffic barriers for local transportation projects and structures to protect shorelines.

#3 FasTrak Express

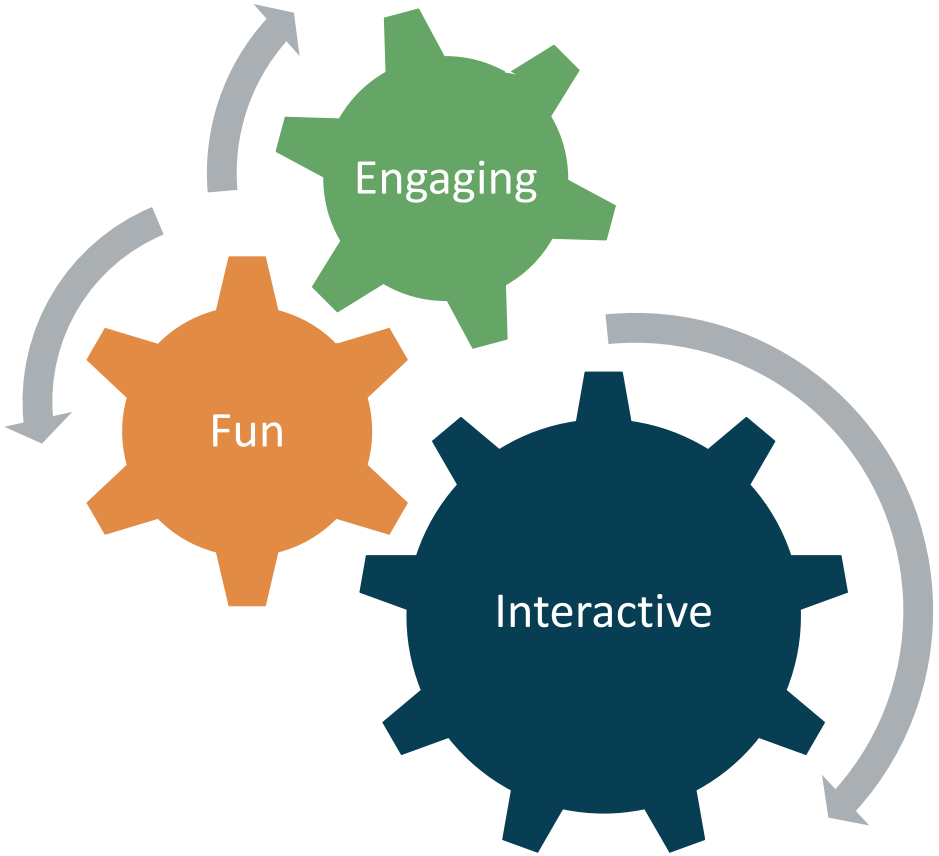
Purpose: Study the use of Cox Creek dredged material in the the development of re-engineered soil for growing sod.

2021 IRC Workshop Series

SEDIMENT TO SOLUTIONS:
CHANNELING INNOVATION

- Implementation of the IRBU Strategy will require all hands on deck!

- Workshop series will cover a variety of topics such as:
  - Marketing & promotion of dredged material
  - IR technology tools
  - Coastal resiliency



February 16 | May 25 | August 24 | November 23

https://maryland-dmmp.com

SEE IT FIRST HAND!

Thank you!

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