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# Primer: Coastal Resiliency Database

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Sea Level Rise

WETLANDS WATCH

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## ACKNOWLEDGMENTS

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Virginia Coastal Zone
MANAGEMENT PROGRAM

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

Thank you to the CZM Coastal Policy Team, the Virginia Institute of Marine Sciences, and all of stakeholders who provided feedback and resources during the development of this project. Special thanks to Shep Moon, Laura McKay, and Wetlands Watch staff.

## ABOUT WETLANDS WATCH

Wetlands Watch, an environmental non-profit located in Norfolk, Virginia, operates statewide to conserve and protect wetlands through education and advocacy. Sea level rise is the biggest threat to our tidal wetlands; we work with local governments to encourage nature based adaptation solutions to sea level rise adaptation.



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www.wetlandswatch.org

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Sea Level Rise

*In an effort to broaden public engagement in sea level rise adaptation, Wetlands Watch developed an app to track flooding. The logo above is from the “Sea Level Rise” app, downloadable on all app stores.*

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# INTRODUCTION

## What is the Coastal Resiliency Database?

The Coastal Resiliency Database is an effort to compile proposed projects, plans, studies, and funding sources for flood resiliency projects in Virginia's Coastal Zone. The goal is to create a user-friendly, online resource that stakeholders can use for planning purposes, while providing a repository for the litany of coastal resources that exist among the regions that make up the eight coastal planning district commissions (PDCs).

## What does the Database consist of?

The Database consists of three tables.

**Table 1: Project Inventory**- contains proposed projects that have been identified as a need within the coastal zone. These records include data on location, estimated cost, the PDC and locality where the project would be undertaken, the project type, and the planning document/narrative associated for the project. Additionally, an interactive map is provided for projects with spatial coordinates. A description pop-up also provides additional information and a visual guide for using the Database.

**Table 2: Plans & Studies-** contains local, regional, and statewide plans and studies that provide resources and guidance for resiliency actions. Incorporated plans include local documents, such as green infrastructure plans and local resiliency plans, as well as regional documents like Hazard Mitigation Plans, and statewide plans including the Chesapeake Bay Comprehensive Water Resources and Restoration Plan. Plans can be sorted and filtered based on location, planning region, and document type.

**Table 3: Funding Database-** The final table consists of a funding database. This includes private, state, and federal sources to finance resiliency projects. Information listed includes the funding source, types of projects funded, the source's RFP or grant narrative, funding maximums, deadlines, and contact information for the funder. Additionally, a grant calendar has been created that displays pre-proposal and proposal deadlines for each grant. This information can be viewed within the Database, or downloaded into a user's personal calendar.

In addition to these three tables, there are several other tables included within the Database. There are three back up tables, which are automatically saved and archived to ensure data is not lost. Finally, there is an additional table that incorporates projects that have been submitted through a populated form. This information is added to a private table to be verified prior to inclusion in the public Database.

## How do I access the Database?

The Database, and its associated forms, can be accessed directly through the URLs attached below. Note that at the time of submittal, this link is only accessible by password. This password will be removed when the 8 coastal PDCs confirm there is no information present that should not be available to the public. The links below will remain unchanged.

| | |
|---|---|
| Coastal Resiliency Database | https://bit.ly/VACoastalDatabase |
| Form: Submit a Project | https://bit.ly/SubmitProjectVA |
| Form: Submit a Plan or Study | https://bit.ly/SubmitPlanVA |
| Form: Submit a Funding Source | https://bit.ly/SubmitFundVA |

In addition to these direct links, the Database will be available on the Wetlands Watch website, and Adapt Virginia. AdaptVA is an information gateway on climate change adaptation for individuals, local programs, and agencies. The Database will be available on the Resilience Resources section of the website (adaptva.com/info/resilience.html).

Finally, as a cloud-based resource, the Database can be linked on a variety of websites and resources. The Database can also be directly embedded on websites that enable Iframes. Note: Contact Ross Weaver for details about direct embedding. Specific views can be created for different users. For example, a "view" could be created that allowed a viewer to only see projects and plans from the Hampton Roads planning region. To this point, the Funding Database has been directly linked in several regional resources. As the funding information was the only relevant data for these resources, this specific "View" only shows grants and funding opportunities, not plans or potential projects.

## Project Hosting: Why use Airtable over ArcGIS?

There were several factors that were considered when choosing to host the Database on Airtable, as opposed to ArcGIS. Airtable is a cloud-based service that acts as a spreadsheet-database hybrid. That allows for each record within the Database to have the benefits of a database, while still organized as a spreadsheet.

## Benefits

- Each project record can hold multiple files, which can be displayed within their record or directly downloaded. Each of the three tables within the Database can hold 20gb of data, or approximately 2,000 documents[1]. This is helpful as it prevents "link rot", as the files are embedded directly within the Base.
- New records can be uploaded in bulk (by the administrator of the Database or any authorized collaborator), or inputted directly through an auto populating form.
  Note: Records submitted via form automatically populate in a QA/QC database. The Database administrator is notified via email when a record is submitted by form, and verifies it prior to inclusion.
- ArcGIS has limits as an information viewer. Records can be filtered and sorted by a number of factors, including project type, planning document, locality, PDC, or implementation phase, and further grouped by the same factors. Records in the Database can be expanded, tables and maps can be resized, and there is also a search function.
- Data can be directly downloaded from the Database, and specific records can be filtered or identified before downloading as opposed to downloading the comprehensive file set. Unique views can be created for different groups- for example a specific view could enable a user to only see projects and plans from only the Accomack-Northampton PDC. This allows for easier information sharing with public groups.
- The Database automatically periodically backs up data, and provides two years of revision history.
- In the Project Inventory, the total estimated cost of the projects currently displayed will automatically update, as will the map showing project locations.
- Airtable is a low-cost option, costing just $144 per year.

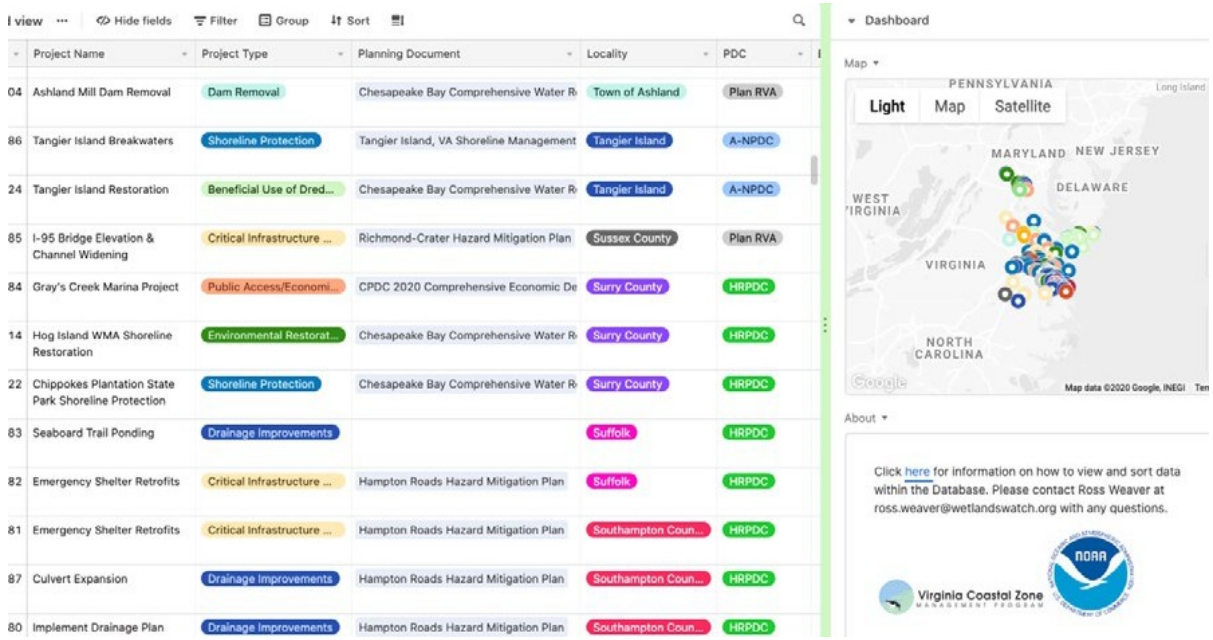
1 Assuming a size of 10mb per document

Records in all three tables (Projects, Plans & Studies, Funding Sources) are linked together. For example, the Chesapeake Bay Comprehensive Water Resources and Restoration Plan (CBCP) identifies the Middle Peninsula State Park as a potential shoreline protection project that DCR is interested in pursuing with USACE. Expanding the record within the project database shows linked records in Plans & Studies, as well as potential funding sources (in this case, Section 510, Section 206 or the Section 103 Program).

### Drawbacks

A major limitation of Airtable when compared to ArcGIS is that there is no ability to conduct spatial analysis. For example, Maryland's tool to identify beneficial uses of dredged material (BUILD, or "Beneficial Use: Identifying Locations for Dredge") is an ArcGIS layer that uses a simple buffer analysis to create polygons around dredging projects (two and four mile radii) to identify potential restoration sites that are close enough to be economically feasible for beneficial use. This is not possible using the existing Database, although projects that have been identified as possible uses of dredged material have been classified as such.

## PROJECT DATABASE PRIMER




### Project Inventory

The following fields are included in the Project Inventory records

| | |
|---|---|
| **Object ID** | The object ID is the primary field for each record. These numbers cannot be altered, to ensure data remains organized |
| **Project Name** | Brief name of each proposed project |
| **Project Types** | Further discussion below |
| **Planning Document** | The planning document (or documents) that relate to the proposed project. Note that this is a linked field from the Plans & Studies table. |
| **Locality** | Location of the proposed project |

| | |
|---|---|
| **PDC** | The planning region of the proposed project |
| **Estimated Cost** | Estimated total cost of the project. When a range of cost estimates has been provided, the high estimate was used |
| **Implementation Phase** | Whether the proposed project is an identified need, in the planning/site assessment phase, design/permitting phase, or project implementation ("shovel-ready") phase |
| **Lat/Long** | Geographic coordinates when available. In the case of large restoration projects, a single data point is used (as opposed to a boundary shapefile) |
| **Additional Information** | Source of a project (when not identified in a Plan or Study), relevant notes |
| **Additional Documentation** | Additional documents, including site plans, presentations, or project narratives |
| **Potential Funding Sources** | Potential sources of funding for project implementation. Note that this is a linked field from the Funding Database |

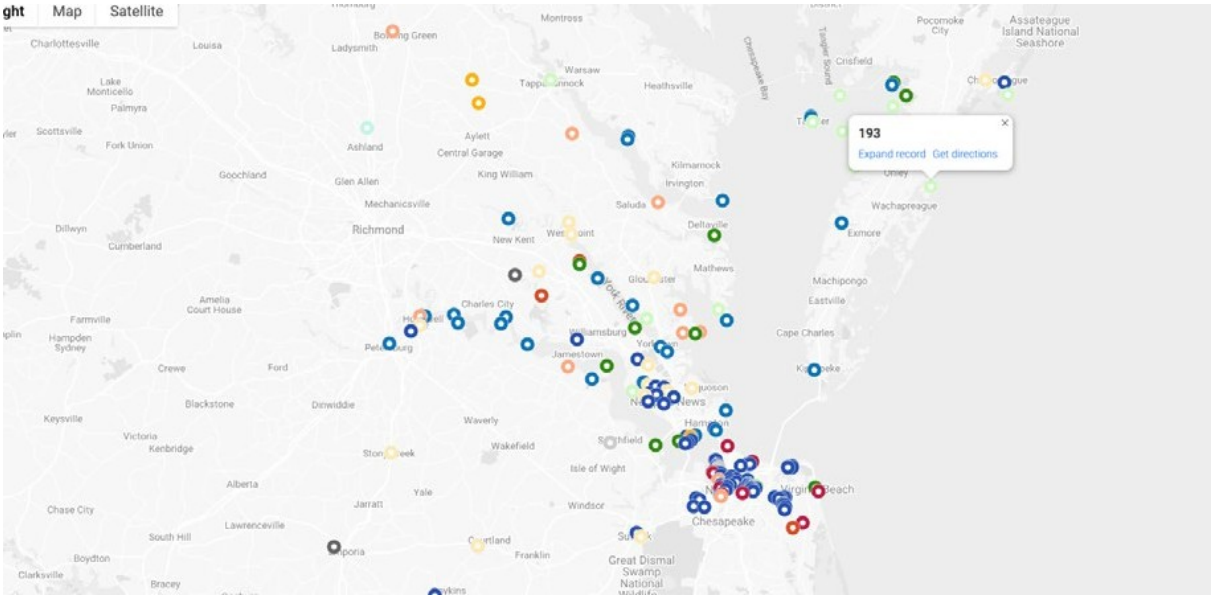
## Project Types

There are a number of challenges classifying the diverse range of projects included in the Database. While the initial scope of this repository was natural infrastructure, it became evident that resiliency means different things in different regions, and more project types needed to be incorporated, including stormwater management and gray infrastructure. Data needs, studies, critical infrastructure, and public access have also been incorporated. Finally, many large initiatives contain multiple components, making it challenging to classify a project in a single type. As such, the project types below are purposely broad.

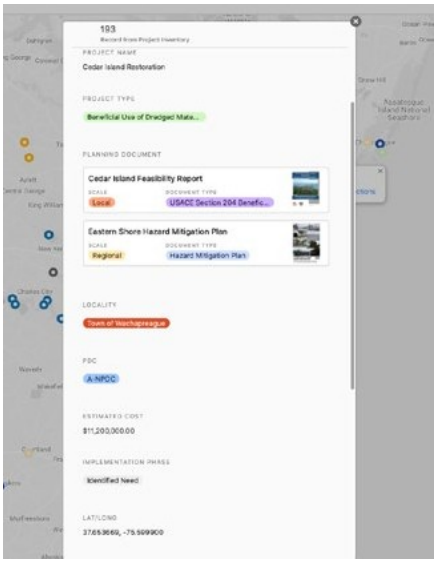
| Project Type | Definition | Example (Object ID) |
|---|---|---|
| Structural Flood Protection | Includes dams, levees, floodwalls that reduce the probability of flooding in a targeted area | Portsmouth Seawall Replacement (169) |
| Nonstructural Flood Risk Management | Alter the impact of flooding but not the characteristics of flooding, such as elevation or acquisition | Pretty Lake House Elevations, Floodproofing, and/or Buyout (53) |
| Infrastructure Elevation | Road elevation | Buxton Ave Road Elevation (144) |
| Critical Infrastructure Upgrades | Mitigation for critical infrastructure (emergency routes, fire stations, emergency shelters, etc) | Diascund Dam Strengthening (143) |
| Public Access/Economic Development | Resiliency actions that promote public access or economic development | Gray's Creek Marina Project (184) |
| Drainage Improvements | Stormwater management, channel modifications, etc. | Maddox Boulevard Stormwater Improvement (188) |
| Shoreline Protection | Primary focus on reducing erosion and reducing wave | Chippokes Plantation State Park Shoreline Protection |

| | | |
|---|---|---|
| | velocity | (222) |
| Environmental Restoration & Creation | Restoration activities (marsh, oyster, stream, forest) | Penniman Spit Restoration (205) |
| Water Quality | Primary focus on meeting TMDL goals and reducing nutrients | Lake Accotink Dredging and Forebay Construction (232) |
| Beneficial Use of Dredged Material | Identified opportunities for restoration projects using dredge material | Cedar Island Restoration (193) |
| Dam Removal | Habitat creation through dam removal | Ashland Mill Dam Removal |
| Studies/Data Needs | Identified needs for studies | First Floor Elevation Data (LIDAR(126) |
| Flood Monitoring | Stream/tidal gauges, flooding sensors | I-Flow Gauge Feasibility Study (140) |

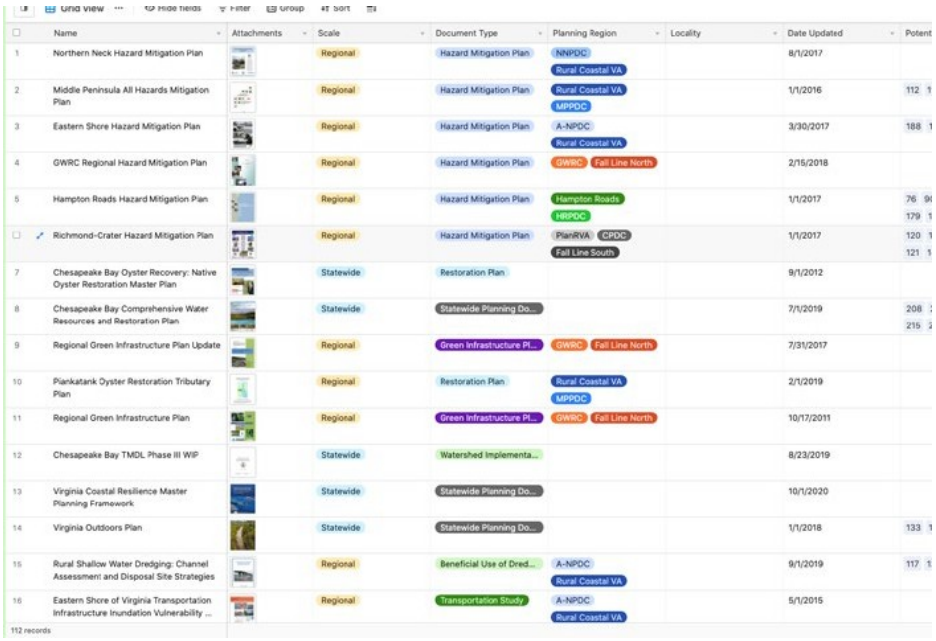
## Project Map




The project map displays projects that have been spatially identified. Color is based on project type. As projects are sorted and filtered in the Database, the map will automatically update. Selecting a project will allow a user to expand the record, seeing additional information and linkages to the Plans and Funding Sources tables.



# Plans & Studies Primer



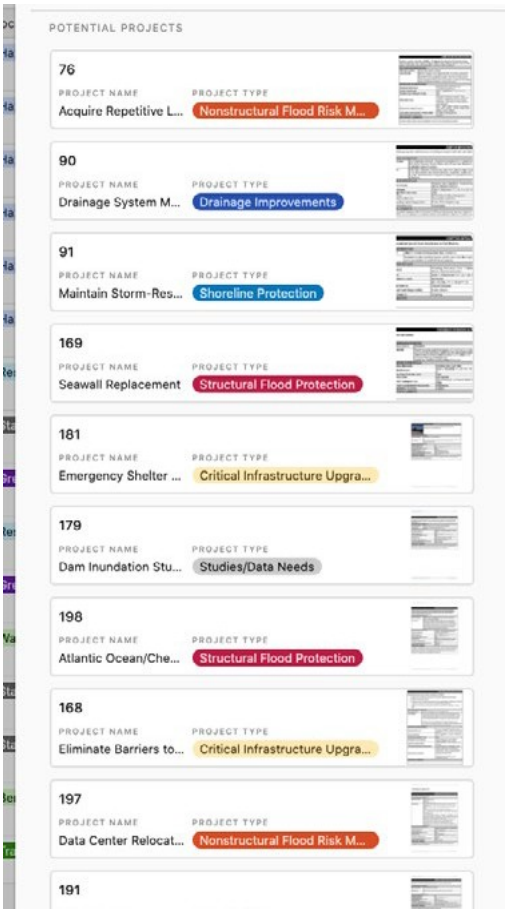
| | Name | Attachments | Scale | Document Type | Planning Region | Locality | Date Updated | Potent |
|---|---|---|---|---|---|---|---|---|
| 1 | Northern Neck Hazard Mitigation Plan | | Regional | Hazard Mitigation Plan | NNPDC, Rural Coastal VA | | 8/1/2017 | |
| 2 | Middle Peninsula All Hazards Mitigation Plan | | Regional | Hazard Mitigation Plan | Rural Coastal VA, MPPDC | | 1/1/2016 | 112 |
| 3 | Eastern Shore Hazard Mitigation Plan | | Regional | Hazard Mitigation Plan | A-NPDC, Rural Coastal VA | | 3/30/2017 | 188 |
| 4 | GWRC Regional Hazard Mitigation Plan | | Regional | Hazard Mitigation Plan | GWRC, Fall Line North | | 2/15/2018 | |
| 5 | Hampton Roads Hazard Mitigation Plan | | Regional | Hazard Mitigation Plan | Hampton Roads, HRPDC | | 1/1/2017 | 76, 179 |
| | Richmond-Crater Hazard Mitigation Plan | | Regional | Hazard Mitigation Plan | PlanRVA, CPDC, Fall Line South | | 1/1/2017 | 120, 121 |
| 7 | Chesapeake Bay Oyster Recovery: Native Oyster Restoration Master Plan | | Statewide | Restoration Plan | | | 9/1/2012 | |
| 8 | Chesapeake Bay Comprehensive Water Resources and Restoration Plan | | Statewide | Statewide Planning Do... | | | 7/1/2019 | 208, 215 |
| 9 | Regional Green Infrastructure Plan Update | | Regional | Green Infrastructure Pl... | GWRC, Fall Line North | | 7/31/2017 | |
| 10 | Piankatank Oyster Restoration Tributary Plan | | Regional | Restoration Plan | Rural Coastal VA, MPPDC | | 2/1/2019 | |
| 11 | Regional Green Infrastructure Plan | | Regional | Green Infrastructure Pl... | GWRC, Fall Line North | | 10/17/2011 | |
| 12 | Chesapeake Bay TMDL Phase III WIP | | Statewide | Watershed Implementa... | | | 8/23/2019 | |
| 13 | Virginia Coastal Resilience Master Planning Framework | | Statewide | Statewide Planning Do... | | | 10/1/2020 | |
| 14 | Virginia Outdoors Plan | | Statewide | Statewide Planning Do... | | | 1/1/2018 | 133 |
| 15 | Rural Shallow Water Dredging: Channel Assessment and Disposal Site Strategies | | Regional | Beneficial Use of Dred... | A-NPDC, Rural Coastal VA | | 9/1/2019 | 117 |
| 16 | Eastern Shore of Virginia Transportation Infrastructure Inundation Vulnerability ... | | Regional | Transportation Study | A-NPDC, Rural Coastal VA | | 5/1/2015 | |

112 records

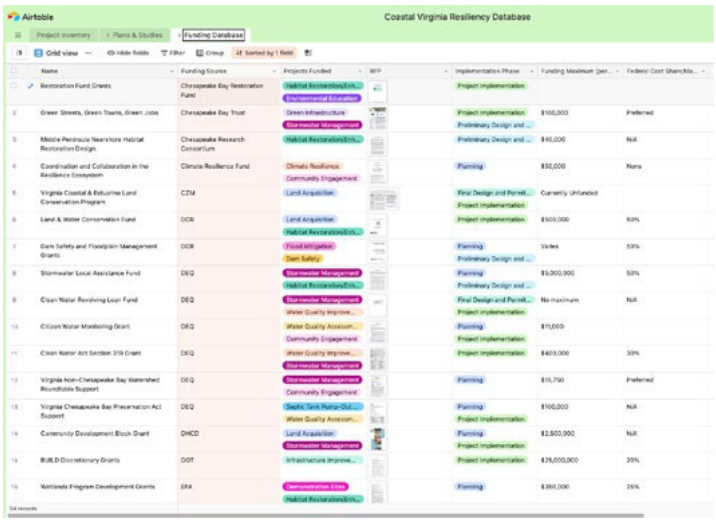
## Background

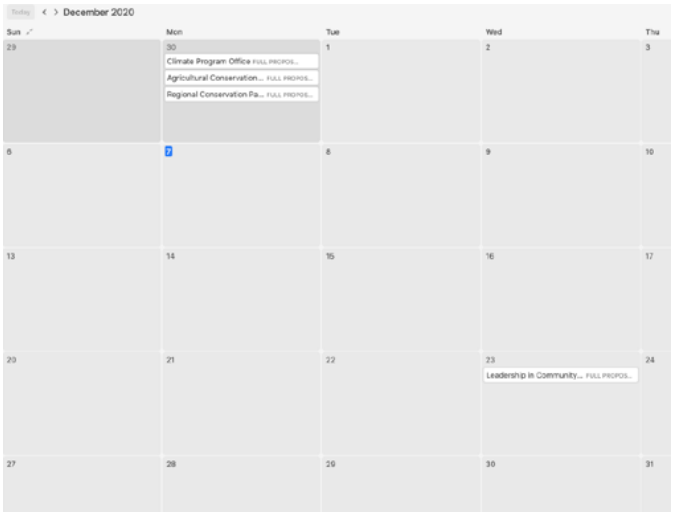
One of the initial goals of the Database was to identify projects that have been proposed in a formal planning document. This is a requirement that several recent grant opportunities have enacted. Additionally, there are a huge number of resources available to aid in resilience planning, but these resources are located in many different locations, with no way of quickly viewing the existing plans and studies that have already been developed. Many of these documents identify potential projects, but these projects may not be "shovel-ready" or are actively being pursued. To increase utility of the Database, a Plans & Studies table was developed to capture this information.

Plans can be sorted by location or document type, and directly downloaded from the Database. Expanding a record within the Plans & Studies table also highlights records from the Projects table that have been identified within the specific plan.



# Funding Database Primer



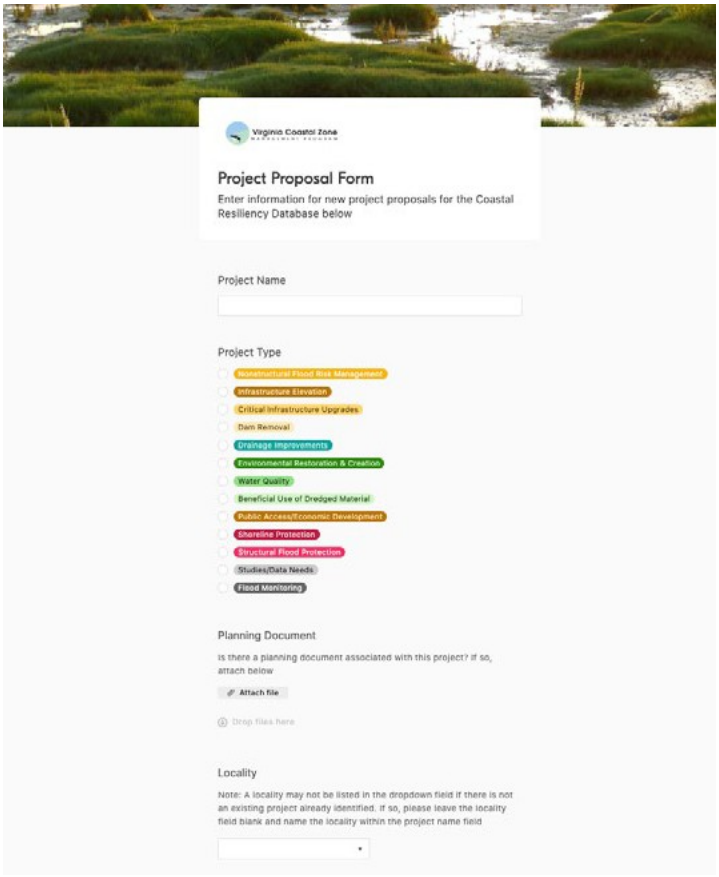

## Background

One of the challenges of the early development of the Database was to create enough value to incentivize localities to use the resource. To increase utility to local and regional staffers, a funding inventory was developed to connect to the Project table. By selecting “Grid View” in the top left corner and selecting “Calendar”, the table can also be viewed as a calendar to aid in identifying upcoming pre-proposal or proposal deadlines. This information can be uploaded into a user’s personal calendar. The fields in each Funding record include

- Name
- Funding Source
- Projects Funded
- RFP (Attachment)
- Implementation Phase Funded
- Funding Maximum
- Federal Cost Share
- Pre-Proposal Deadline
- Full Proposal Deadline
- Contact Email
- Funding Type (state or federal)
- Potential Projects (linked from Project Inventory

# Project Solicitation

As referenced above, there are multiple ways to input projects within the Database. In addition to bulk uploading (by the administrator), users can simply use a pre-populated form to fill information, attach narratives, and submit a record. When a form is submitted, the administrator recieves an email notification, and the record is sent to a QA/QC table held within the Database. Upon approval, this record is shared to the public-facing Database. Initial population of the database came from multiple sources, briefly detailed below.




OSNR Stimulus Package Funding Project Call (March 2020)

- Working alongside the Office of the Secretary of Natural Resources, projects were identified during March 2020 in advance of a potential federal stimulus package. Priority was given to projects that were close to "shovel-ready". 12 projects were identified with an estimated total cost of $58,293,000. Additionally, USACE identified four studies that could begin quickly, at a total cost of $12,000,000. More information about these projects is included in Appendix A.

CSO Stimulus Package Funding Project Call (April 2020)

- Shortly after the initial OSNR project call, the Coastal States Organization asked the Coastal Zone Management Program to develop a list of "shovel-ready" coastal projects for a federal stimulus package. In response, the MPPDC provided CZM a list of 133 projects totaling $777,290,000. The HRPDC provided a list of 131 projects totaling $1,510,565,103; while the NVRC provided a list of 54 projects totaling $222,002,000. While many of these projects have been identified through planning documents and are currently incorporated in the Database, projects that have not been linked to a public plan or study have yet to be added. These spreadsheets have been archived in the back-end of the Database, and can be included at the discretion of the Planning District Commissions.

HRPDC Resilience Project Dashboard

- HRPDC maintains a list of completed, current, and future projects that improve resilience to coastal hazards within the Hampton Roads region. This dataset is available on HRGEO (https://www.hrgeo.org/datasets/hampton-roads-resilience-projects). Following the most recent data revision on June 25, 2020, the dataset was downloaded for import into the CZM Database. Data was filtered to include only those projects that are listed as "Proposed".

Chesapeake Bay Comprehensive Water Resources and Restoration Plan

- USACE's Chesapeake Bay Comprehensive Plan (CBPC) identified opportunities for resiliency actions throughout the Chesapeake Bay Watershed. The final Restoration Roadmap dataset contained multiple projects for environmental restoration, shoreline protection, and opportunities for the beneficial use of dredged material.

George Washington Regional Commission's Environmental Services Strategic Plan

- GWRC recently adopted a strategic plan to identify regional environmental service needs and develop a plan for implementation. Appendix K of this document contains a list of proposed resilience and water quality projects. With permission of the GWRC, this dataset will be incorporated into the Database.

2019 Middle Peninsula Nearshore Restoration Workshop

- This workshop was co-hosted by the NOAA Chesapeake Bay Office and Chesapeake Bay National Estuarine Research Reserve (CBNERR) in September 2019, with the goal of advancing nearshore habitat restoration projects within the Middle Peninsula of Virginia. Four regional restoration projects were presented during the workshop. This workshop proved to be very successful in promoting project implementation, as several of these projects have advanced towards construction in the subsequent year.

Identifying Existing Project Priorities through Planning Documents

- There are a multitude of existing plans and programs that identify potential projects within the coastal zone. The 8 Regional Hazard Mitigation Plans in the coastal zone were reviewed, and provided a number of potential projects and priorities, including research and data needs. Capital Improvement Plans also provided a rich source of projects, as well as local flood protection studies, TMDL action plans, stormwater master plans, and Comprehensive Economic Development Strategies (CEDS). The region's Joint Land Use Studies (JLUS) were invaluable in identifying larger-scale flood protection priorities, as were USACE feasibility studies. Once the scope of the Database was broadened, there were a number of additional plans that provided insight into local and regional resilience priorities. These have included, but are not limited to, small area plans, transportation studies, dredging needs assessments, shoreline management plans, and watershed implementation plans. Appendices have been compiled for each coastal PDC, indicating plans and studies that have been researched and included in the Database, as well as projects not yet incorporated into the final product.

Nonprofit Solicitation of Projects

- On a smaller scale, several projects have been identified through conversations with local and regional nonprofits, including the James River Association, the Elizabeth River Project, the Nature Conservancy, and Lynnhaven River Now.

# Appendix A

Working alongside the Office of the Secretary of Natural Resources, these projects were identified during March 2020 in advance of a potential federal stimulus package. Priority was given to projects that were "shovel-ready".

**Total Shovel-Ready Proposed Projects Cost: $58,293,000**

| Project Name | Cost Estimate |
|---|---|
| Colonial NHP | $12,000,000.00 |
| Penniman Spit Restoration | $1,000,000 |
| Pamunkey Reservation Sills | $150,000 |
| Ware River Living Shoreline | $800,000 |
| Laskins Gateway Marsh & Oyster Restoration | $153,000 |
| Resilient Hampton: Big Bethel Blueway | $4,600,000 |
| Resilient Hampton: Newmarket Creek WaterWalk | $3,500,000 |
| Resilient Hampton: Armistead Ave Road Elevation | $4,900,000 |
| Resilient Hampton: Public Spaces for Water (Lake Hampton) | $4,400,000 |
| Money Point Phase II | $15,000,000 |
| Norfolk Flood Wall (Design Funds Only) | $2,500,000 |
| Virginia Beach Back Bay Restoration Project | $9,290,000 |
| **Sum** | $58,293,0004 |

Colonial National Historical Park - York River Shoreline Stabilization

Estimated Cost: $12,000,000
Contact: Dorothy Geyer, Colonial NHP

Funding for this project would carry design to completion and finish construction of 3 miles of natural shoreline stabilization on the York River along the Colonial Parkway. This project is critical to protect the Parkway and reduce marsh loss and erosion. The project incorporates sea level rise planning and will use living shorelines to protect and expand marshes, provide habitat for oyster reefs and aquatic wildlife, accommodate for recreational fishing in a sustainable manner, protect important pre-colonial and colonial period cultural resources, and keep the critical Colonial Parkway intact. The Parkway is a major commuter route for the region, and supports the over 3.2 million annual visitors to Colonial Park, who spent $331.5 million in the adjacent communities. This supported in excess of 5,000 jobs. The National Park Service is partnering with the Virginia Institute of Marine Science, the U.S. Army Corps of Engineers and the Naval Weapons Station Yorktown on this project.

Penniman Spit Restoration

Estimated Cost: >$1,000,000
Contact: Scott Hardaway, VIMS

This restoration project addresses the loss of ecologically important Penniman Spit, at the confluence of King Creek and the York River in York County. Since 1937, the spit has severely eroded and breached in several places, resulting in tremendous loss of nursery habitat for the Blue Crab, shrimp, oysters and other valuable marine life. The loss of the spit has resulted in increased wave energy and salinity in the creek and bay communities behind it, further accelerating shoreline erosion and habitat loss. This restoration project would restore this sanctuary habitat and protect the creek watershed from marsh and shoreline erosion under

high-energy conditions and sea level rise. Localized recovery of Blue Crabs, Oysters and several fish species would be an expected benefit of this project. This project, led by the Virginia Institute of Marine Science, includes the U.S. Army Corps of Engineers, National Oceanic and Atmospheric Administration, Department of Defense, and the Naval Weapons Station Yorktown and Colonial National Historical Park, both who would benefit from the reduction in erosion.

Pamunkey Indian Reservation Sills

Estimated Cost: $150,000
Contact: Scott Hardaway, VIMS

The Pamunkey Indian Reservation Shoreline Management Plan was completed by VIMS in November 2019. Appendix C of this document shows the conceptual plans for the next living shoreline project on the Reservation. The project facilitates the protection of Pamunkey Reservation lands, including critical natural heritage and cultural sites, traditional fish hatchery and fishing locations, and preserves and enhances living shoreline and water management for the Pamunkey Reservation and its tribal community. These designs have been permitted and approved by USACE. Construction of the stone sills needed for the shoreline is estimated to cost $150,000, per Scott Hardaway, Marine Scientist Supervisor at VIMS.

Ware River Living Shoreline

Estimated Cost: $900,000
Contact: Scott Hardaway, VIMS. Lewie Lawrence, MPPDC

The Ware River Living Shoreline project would improve 1,300 linear ft. of shoreline within the Middle Peninsula. The project is ready to undergo the permitting process. Lewie Lawrence, Executive Director of the Middle Peninsula Planning District Commission, has secured approximately $200,000 in loans and property owner contributions for the project, which has an estimated total cost of $900,000. This project is a partnership between the Middle Peninsula Planning District Commission, and the Virginia Institute of Marine Science and protects private property and adjacent public roads and rights of way.

Laskins Gateway Marsh and Oyster Restoration

Estimated Cost: $153,000
Contact: Karen Forget, Executive Director, Lynnhaven River Now

Lynnhaven River Now has proposed a tidal marsh and oyster restoration project on Little Neck Creek in Virginia Beach, Virginia. The proposed site is on city-owned property, adjacent to a newly developed traffic circle near the oceanfront resort area. A joint-permit application will be submitted once funding is secured, and the construction stage of the project is expected to take approximately 60-90 days. The proposal, which is estimated to cost $153,000, will create over 10,000 sq. feet of tidal wetlands, and stabilize 230 linear feet of shoreline in an area with wide recreational and public use. Additional information is attached as “Laskin Road Traffic Circle Project.docx”.

Resilient Hampton: 4 Projects

Terry Allard, Director of Communications, David Imburgia, Lead Planner, David Waggoner, Waggoner and Ball, Moffat and Nichol

Overview: These projects, part of Hampton's Resilient Hampton strategy, are considered a series of pilot projects built throughout the City of Hampton designed to be used as a template for similar water management solutions and needs across the City and beyond. In this way, Hampton plans to export their lessons learned at the local and regional level and perhaps farther. This is a purposeful test of the social input and impacts of such projects to build community acceptance and understanding for the future of living with water within the City. They are all of critical importance in developing solutions to manage, hold, disburse, and live with water from wind and storm driven coastal inundation, sea level rise, and increased rainfall. These projects are a partnership between the City of Hampton, USACE, Chesapeake Bay Foundation, and the engineering and design firms of Waggoner and Ball and Moffat and Nichol.

Resilient Hampton: Big Bethel Blueway

Estimated Cost: $4.6 M
Contact: City of Hampton

The Big Bethel Blueway is a ditch retrofit project designed to store and slow water to reduce flooding upstream, as well as downstream in Newmarket Creek, which spans upland, inland and coastal zones, and which is routinely susceptible to flooding. The Blueway will double as a recreational amenity, creating a linear park to Newmarket Creek over 1 mile long and providing a shared-use path for pedestrians. Adjacent to the ditch, a former public school site provides a pilot location for additional water storage. Residential areas currently served by small runnels will be replaced with French drains to infiltrate stormwater, while three weirs along the Blueway will impound water during storm events.

Resilient Hampton: Newmarket Creek WaterWalk

Estimated Cost: $3.5 M
Contact: City of Hampton

The Newmarket Creek Waterwalk will complete a section of the Newmarket Creek restoration between Mercury Boulevard and Armistead Avenue with a multi-use and in places, boardwalk trail, along the existing creek area. The walk will double as a space to absorb water overflow in flood conditions, and will also serve to improve water quality and water management in this publicly accessible area, while enhancing natural habitat, through the addition of native plant species, which will in turn draw in additional wild birds, mammals, and aquatic species. The restoration of this portion of wetlands and creek, which runs through both business, urban and suburban neighborhoods of the City, is critical to improve viability of an area subject to recurrent flooding episodes that impact adjacent roads and infrastructure.

Resilient Hampton: Armistead Ave Road Elevation

Estimated Cost: $4.9 M
Contact: City of Hampton

This project improves the resiliency of North Armistead Avenue, a critical infrastructure corridor that is vulnerable to flooding. North Armistead connects to key evacuation routes within the City of Hampton, and is a major connector to Joint Base Langley-Eustis, downtown Hampton, and the Coliseum Central district. Elevation of this corridor would alleviate flooding, while creating opportunities for green infrastructure along the avenue, including a bioswale along the existing right of way, along with the Birthplace of America shared use trail.

Resilient Hampton: Public Spaces for Water (Lake Hampton)

Estimated Cost: $4.4 M
Contact: City of Hampton

This project transforms a stormwater detention pond into a stormwater park that yields multiple benefits for the community, including excess stormwater management for Newmarket Creek, a full treatment train for ecosystem services, shoreline improvements, a multi-use path around the lake, and creates new habitat for native species of plants, birds, fish, and other wildlife. The area is adjacent to Armistead Avenue and the Coliseum Central District, and is in wide public use. This project transforms a former Borrow pit into a functional, usable public space with multiple cross community and City benefits. It is important in its ability to assist in controlling extensive recurrent Newmarket Creek flooding in an urban/suburban and highly populated area.

Money Point - Phase III

Estimated Cost: $15 M
Contact: Joe Rieger, Deputy Director of Restoration, Elizabeth River Project

The bottom of the Elizabeth River at Money Point, in Chesapeake Virginia, has some of the highest levels of the carcinogenic compound, polycyclic aromatic hydrocarbon (PAH), in the Chesapeake Bay. These levels have led to high rates of fish cancer and low biodiversity. Elizabeth River Project remediated two areas at Money Point in 2010 and monitoring data has shown the river has recovered, and cancer levels reduced to background levels. However, there still remain approximately 10 acres of river bottom remediation to be completed. These last 10 acres contain the highest level of contamination at the site and will result in the entire site's recovery. Phase III of the Money Point project is shovel-ready, with 100% of design work completed and permits awarded. Approximately $15M is needed to complete this final phase. Remediation will include over 50,000 cy of dredging to remove the contamination and the installation of three engineered underwater caps to isolate part of the contamination. Once this project is completed one of the most contaminated areas of the Chesapeake Bay will be cleaned up and restored. More information about the restoration process can be found within the Money Point Revitalization 10-Year Plan.

Norfolk Flood Wall (Design Funds Only)

Estimated Cost: $2.5 M
Contact: Susan Layton, USACE Norfolk District
CAPT Doug Beaver, USN (Ret), Chief Resilience Officer, City of Norfolk

The Norfolk Downtown Flood Wall was identified as part of the recommended plan from the Norfolk Coastal Storm Risk Management Study, managed by the U.S. Army Corps of Engineers. This funding would complete the design phase of a 1.3 mile segment of berm and extending from Harbor Park and terminating at the existing downtown floodwall that would provide flood risk reduction in the economic core of the city. Behind the floodwall system alignment lies important infrastructure such as the region's only Tier 1 trauma hospital, the region's children's hospital, emergency services, the region's only medical school, critical transportation corridors used for evacuation, city hall, the city institutional network, cultural assets, and adjacent historic districts as well as public housing. The U.S. Army Corps of Engineers Chief's Report for this Feasibility Study was signed and recommended for congressional authorization in 2019, and the project is currently in the Preconstruction, Engineering and Design (PED) phase.[1]

1 https://www.army.mil/article/223986/leaders_sign_norfolk_coastal_storm_risk_management_design_agreement

Virginia Beach - Back Bay National Wildlife Refuge Marsh Terracing

Estimated Cost: $9.29 M ($790,000 design, $8.5M in construction)

Contact: CJ Bodnar, City of Virginia Beach Lead Stormwater Planner
Greg Johnson, Stormwater Consultant, City of Virginia Beach
Brian Batten, Dewberry

This project involves a unique opportunity to explore an application of marsh terracing as a viable nature-based adaptation strategy for marsh restoration and flood risk reduction. The project will study, evaluate the effectiveness of, design, and eventually construct marsh terraces to restore lost habitat that has historically provided both environmental and flood reduction benefits. The project aims to achieve flood risk reduction objectives in flood prone neighborhoods in southern Virginia Beach and meet conservation goals in Back Bay NWR (e.g. reduce rate of marsh loss and promote growth of native submerged aquatic vegetation to improve water quality and increase habitat quality for freshwater fish populations). The project will be led by the City of Virginia Beach, Virginia in collaboration with the Back Bay National Wildlife Refuge (NWR), managed by the U.S. Fish and Wildlife Service (USFWS).

USACE Potential Projects and Studies (not included in total cost estimate)

Continuing Authorities Program (CAP)

- Indian Run Section 14 Emergency Streambank - $5 M
- Newport News Section 14 Emergency Streambank -$5M
- Newmarket Creek Section 205 Flood Risk Management - $5 M

Coastal Storm Risk Management Studies that could begin quickly ($12M in total)

- Virginia Peninsula Coastal Storm Risk Management
- Virginia Beach Regional Coastal Storm Risk Management
- Chincoteague Coastal Storm Risk Management
- Tangier Island Coastal Storm Risk Management

# Appendix B: Regional Plans and Potential Projects

## Accomack-Northampton

Regional Plans

- Chincoteague and Wallops Island National Wildlife Refuges Comprehensive Conservation Plan
- Eastern Shore Hazard Mitigation Plan
- Eastern Shore of Virginia Transportation Infrastructure Inundation Vulnerability Assessment
- Chincoteague and Wallops Island National Wildlife Refuges Comprehensive Conservation Plan

Shoreline Management Plans

- Town of Saxis
- Tangier Island
- Cape Charles
- Occohannock Creek Living Shoreline Options Report

Beneficial Reuse of Dredged Material

- CAP 204: Beneficial Uses of Dredged Material, Cedar Island VA
- Rural Shallow Water Dredging: Channel Assessment and Disposal Site Strategies
- Eastern Shore of VA Regional Dredging Needs Assessment

Local Organizations & Workgroups

- Eastern Shore Resource Conservation and Development Council
- Eastern Shore SWCD
- A-NPDC Regional Navigable Waterways Committee
- A-NPDC Climate Adaptation Working Group

Regional Adaptation Framework Tools (RAFT)

- Eastern Shore

Localities

**Accomack County**

- There are 38 repetitive loss properties and 3 severe repetitive loss structures in the County. There are over 70 owners who would like to receive assistance in raising their homes. (HMP)
- Potential Projects utilizing the Waterway Maintenance Fund (From Eastern Shore Regional Navigable Waterways Committee (7/19/2017)
  - Hunting Creek
  - Folly Creek to Metompkin Inlet
  - Wachapreague Channel
  - Quinby-Eastern End of Federal Channel to Quinby Inlet
  - Pungoteague Creek

**Cape Charles**

- Cape Charles Public Beach and Dune Management Plan
  - Additional breakwaters required on northern and central sections of coastline
- Chincoteague National Wildlife Refuge
  - Assateague Island Beneficial Reuse Project
    - Beneficial reuse of dredged material to restore the back-barrier wetlands inside Swans Cove. (ESRNWC 4/18/2019)

**Northampton County**

- Potential Projects utilizing the Waterway Maintenance Fund (From Eastern Shore Regional Navigable Waterways Committee (7/19/2017)
    - Great Machipongo Channel
    - Hungers Creek
    - Kings Creek
    - Red Bank Creek
    - Nassawadox Creek
    - Dredging of Willis Wharf- being evaluated, including beneficial use options for the material

**Onancock**

- Design Resilient Wharf Waterfront
    - Repair bulkhead/boat ramp, drainage improvements to parking lot. Repairs to waterfront for historic Hopkins Building (RAFT)

**Saxis**

- Drainage improvements
    - North End of Saxis Road
        - May be achievable through smaller retention/detention efforts (RAFT)
- Critical Infrastructure
    - Control flooding on Causeway
        - May be a long term- bigger infrastructure project (RAFT)

**Tangier**

- Retrofit undersized box culverts (HMP)
- Create shoreline protection on the eastern shore of the Island (HMP)
- Investigate the use of sediment from dredging operations to address marsh loss (HMP)

**Wachapreague**

- The Town is also entering into preliminary negotiation with several engineering firms to address the replacement/upgrade of what is considered to be the main storm drain located in the center of town, which runs from the west end of town, to the waterfront located on the east end of town. Issues to be addressed are a Preliminary Engineering Report, Environmental Report and Grant resources. (CAWG Annual Report)
- Upgrade and Improve Town Emergency Response and Communications (RAFT Scorecard)
- Replacement/upgrade of main storm drain (HMP)
- Projects to minimize storm damage by rebuilding east side of Wachapreague channel
- Replacement/upgrades to the main storm drain (HMP)
- Minimize storm damage by rebuilding east side of Wachapreague Channel (HMP)
- Beneficial use of dredged material, oyster reef construction, and marsh restoration in the vicinity of Cedar Island and Wachapreague (ESRNWC 4/18/2019)

## Crater PDC

Regional Priorities

- Richmond - Crater Hazard Mitigation Plan 2017
- Economic Development Project Priority List (2018-2019)

Dredging Needs

- Appomattox River (Petersburg)
  - Estimated cost: $17 million (CEDS Priority Project List)
    - Proposed Downtown Petersburg VA Revitalization Program

Non-Profit Organizations

- Friends of the Lower Appomattox River (FOLAR)
- Appomattox River Trail Plan (ART)
  - ART Appendices: Priority Matrix
- Middle James Watershed Roundtable
- Capital Region Land Conservancy

Localities

### Charles City

Shoreline Management Plan (Link)

- Berkeley Plantation Sill (Area of Interest)
  - The point of land at Berkeley Plantation where the shoreline direction of face changes from westerly to south, just upriver of Harrisons Landing, has an historic erosion rate of 1 to 2 ft/yr with fetch exposures to the west, southwest, and south of 5.0 miles, 1.4 miles, and 2.1 miles, respectively. The southerly fetches are relatively shallow. The SMM recommends a sill along this stretch of shore. In order to hold the point of land and stop erosion of the low, eroding agricultural land, about 400 feet of shoreline that has an existing intermittent tidal freshwater marsh fringe can be protected. The proposed sill will maintain and enhance the existing wetland fringe. The site has easy access by and existing road.
- Sturgeon Point Breakwaters (Area of Interest)
  - This site is located in Reach 3 just upriver of Sturgeon Point. The erosion rate is less the 0.5 ft/yr, but the site has a long fetch to the southwest of over 4 miles. This is a segment of residential coast where the SMM strongly recommends offshore breakwaters and beach fill along about 1,700 feet. About 800 feet of the shoreline does not have existing protective structures. For this 800 feet, four offshore breakwaters and sand fill are recommended to start upriver of the existing pier and continue upriver to the heavily wooded upland. This can be classed as a medium energy coast, and Hardaway and Byrne (1999) suggest breakwater lengths should be 60 feet to 150 feet long. At this site, breakwaters with lengths of 80 feet spaced about 120 feet apart are suggested. Beach fill will be placed along shore into pocket beach configuration. The existing cypress trees should be avoided or included as part of the plan.
- Shoreline between Sandy Point and Dancing Point (Headland Control)
  - The shoreline from Sandy Point to Dancing Point in Reach 4 occurs as a long curvilinear embayment and is mostly low eroding farmland with bank heights from 5 to 10 feet. Fetch exposures are to the southwest, south, and southeast at 1.2 miles, 1.4 miles and 3.5 miles respectively, placing the site in the medium energy category. Long-term erosion is low between 0.3 and 0.5 ft/yr. Sandy Point and Dancing Point are major headland features. The top of the bank is wooded with a narrow beach at low tide and scattered cypress trees along the coast. These cypress trees act as small headland features. This

section of coast could be protected with Headland Control since the SMM recommends breakwaters and beach fill. However, because it is such a long stretch of shoreline, closely-spaced shore attached breakwaters may be cost prohibitive. By strategically placing breakwaters in front of existing headland features (cypress trees), the shoreline will begin the process of long-term shoreline stabilization. The adjacent shoreline will continue to recede toward static equilibrium. Seven headland breakwaters are proposed for this site ranging from 60 ft to 80 ft. Construction access will be along the adjacent farm field and then laterally through the existing woods to each structure. Sand fill will be required to build the road and associated tombolos.

**Colonial Heights**

Local Planning Documents

- Colonial Heights Comprehensive Plan
  - North Bank of the Appomattox River (N37.2400589, W-77.3991762) – This is the only area of concern categorized as "active erosion." The bank of the shoreline is steep at over 10 feet in height, with trees leaning into the water. The vegetated bank is considered failing with swift water flow directed straight into the meandering river edge. The pedestrian trail is within 5-10 feet of the edge.

**Emporia**

- Halifax St. Bridge Replacement (HMP)

**Prince George**

Shoreline Management Plan (Link)

- City Park (Area of Interest)
  - The City Park shoreline occurs just south of City Point on the James River in the City of Hopewell. The project shoreline is about 500 feet long and lies between two existing stone revetments. The shoreline occurs as a very low eroding upland bank with a narrow beach. The nearshore is extremely narrow. The James River channel is close to shore and the depths drop down to 18 feet less than 100 feet of the shoreline. The SSM recommends a breakwater system but due to the very deep nearshore and very low bank, a sill with wide gaps is recommended. The wide gaps are to provide additional recreational access to the river.
- Breakwater (Area of Interest)
  - Approximately one mile upriver from Jordan Point is the second Area of Interest. The project shoreline is about 1,000 feet long and occurs in front of 3 houses located on a 130 foot bluff. The long bank slope has recently been cleared of vegetation and appears to be recommends a breakwater system. The conceptual plan is for six breakwater units and beach fill that transition on each end. A revetment occurs on the downriver end and the system can be tied into it. The beach fill will be planted in low marsh behind each unit and high marsh across the new backshore.
- Upper Brandon (Area of Interest)
  - Upper Brandon is a large farm/plantation complex on the James River. The project site is about 1,000 feet long in front of the house. The eroding upland bank is about 10 feet high on the upriver end and decreasing to less than 5 feet high on the downriver end. The SSM recommends a sill. The landowners clear cut the trees along the shoreline exposing a relatively stable, sloped bank with erosion along the base of the bank. 28 existing marsh headland separates the upriver and downriver sill systems.

## George Washington Regional Commission

Regional Plans

- GWRC Regional Hazard Mitigation Plan
- 2017 Regional Green Infrastructure Plan Update
- GWRC Environmental Services Strategic Plan
    - Appendix K from the Environmental Services Strategic Plan have not yet been incorporated
    - Sample Projects for inclusion
        - King George County Fairview Beach WWTP
        - King George County Community Center Parking Lot Retrofit
        - Stafford County Government Center BMP Retrofit
            - Port Royal Main Street Drainage

Shoreline Management Plans

- Targeted Living Shoreline Management Planning for VA State Parks in Chesapeake Bay
- Stafford County Shoreline Management Plan

Watershed Implementation Plans

- Fairview Beach Watershed Plan
- Mattaponi River Watershed Implementation Plan

Local Organizations & Workgroups

- Rappahannock River Basin Commission
- Healthy Watershed Forest Project

Soil & Water Conservation Districts

- Tri-County/City SWCD

## Hampton Roads Planning District Commission

Regional Plans

- 2017 Hampton Roads Hazard Mitigation Plan

Joint Land Use Studies

- Portsmouth and Chesapeake JLUS
- Norfolk and Virginia Beach JLUS (2019)
- Fort Eustis JLUS
- Hampton Langley JLUS (2010)
- Resilience Addendum
- Hampton Roads JLUS 2005
- JLUS Implementation Strategy

Soil and Water Conservation Districts

- Peanut SWCD
- Colonial SWCD
- Virginia Dare SWCD

Regional Adaptation Framework Tools (RAFT)

- Portsmouth

Shoreline Management Plans

- Hampton Beachfront and Storm Protection Management Plan
- James City County Shoreline Management Plan
- Suffolk Shoreline Management Plan
- Lynnhaven River Shoreline Management Plan
- York County Shoreline Management Plan
- Targeted Living Shoreline Management Planning for Virginia State Parks
- Colonial National Historical Park Shoreline Management Plan

Localities

**Chesapeake**

- Chesapeake Bay TMDL Action Plan
- Rediscover the Treasure: Money Point Revitalization Plan

**Hampton**

- Newmarket Creek Master Plan
- Master Plans
- Salt Ponds Inlet Management Plan
- Hampton Green Infrastructure Plan
- Resilient Hampton Phase I Report

**Newport News**

- Newport News Project List

**Norfolk**

- Flooding Studies
- Stormwater Master Plan for the Hague
- Combined Coastal & Precipitation Flooding Master Plan

- Norfolk Coastal Storm Risk Management Study
- Unfunded Capital Requests
- Norfolk Green Infrastructure Plan
- Norfolk City-Wide Drainage Master Plan

**Portsmouth**

- TMDL Action Plan

**Virginia Beach**

- Neighborhood-Scale Structural Strategies for Coastal Flood Risk Reduction (Dewberry 2020)
- City-wide Structural Alternatives for Coastal Flood Protection
- Virginia Beach Sea Level Wise Adaptation Strategy
- Virginia Beach FY21 Capital Improvement Program
- Nature-Based Coastal Flood Mitigation Strategies

## Middle Peninsula Planning District Commission

### Regional Organizations and Workgroups

- Middle Peninsula Planning District Commission
- Middle Peninsula Chesapeake Bay Public Access Authority
- Middle Peninsula Alliance
- York River & Small Coastal Basin Roundtable

### Regional Programs

- Fight the Flood Program
  - Provides private property owners access to loans, grants, & technical assistance

### Soil and Water Conservation Districts

- Tidewater SWCD
- Three Rivers SWCD

### Regional Plans

- 2016 Middle Peninsula All Hazards Mitigation Plan (HMP)
- Middle Peninsula Conservation Corridor Plan
- Special Area Management Plan: Dragon Run Watershed
- Middle Peninsula Public Access Master Plan
- Piankatank Oyster Restoration Tributary Plan
- Economic Development
  - 2020 Middle Peninsula Comprehensive Economic Development Strategy (CEDS)
  - 2016 Virginia Working Waterfront Master Plan (Working Waterfront)
- Stormwater Management/Drainage Improvements
  - 2013 MPPDC Roadside and Outfall Drainage Ditches Report (Morris, 2013)
- Dredging and Beneficial Use of Dredged Material
  - 2011 Shallow Draft Navigation and Sediment Management Plan (MPPDC, 2011)
  - Middle Peninsula Shallow Water Dredging Master Plan Framework
  - Chesapeake Bay Comprehensive Water Resources and Restoration Plan

### Shoreline Management Plans

- Captain Sinclairs Recreational Area Shoreline Management Plan
  - Werowocomoco Shoreline Management Plan
    - Regional featured project in VA Outdoors Plan
  - Matthew's County Shoreline Management Plan

### Identified Regional Needs

Dredging and Beneficial Use of Dredged Material

- Need for small channel dredging region-wide
  - "The silting in of several smaller channels has resulted in fewer commercial boats able to use these channels. The US Coast Guard has been removing channel markers in these instances. The safety and navigation problems have gotten worse." (CEDS)
- "The most probable average annual cost for maintaining (dredging) a shallow draft

navigation program on the Middle Peninsula is approximately $1,630,000 per year. The cost for dredging could range from $550,000 per year to $4,917,000 per year. In addition, approximately $111,000 per year would most probably be required in order to use available suitable material in a beneficial manner for placement along nearby shorelines. The cost for beneficial placement could range from $24,000 per year to $247,000 per year." (MPPDC, 2011)

| Name | Description | Phase | Estimated Cost | Source |
|---|---|---|---|---|
| Marsh Replenishment | Thin layer spreading from public dredging for marsh replenishment | Conceptual | $1,000,000 | (CSO) |

Monitoring

| Name | | Phase | | |
|---|---|---|---|---|
| Bay-Wide Tide Gauge Stations for New Coastal Insurance Products | | Currently Seeking Funding | | |

Stormwater Management

| Name | Description | Phase | Estimated Cost | Source |
|---|---|---|---|---|
| Storm Drainage Backflow Prevention | Install one-way structures to prevent tidal intrusion into storm drain system | Conceptual | $1,000,000 | (CSO) |

Emergency Management

| Name | Description | Phase | Estimated Cost | Source |
|---|---|---|---|---|
| Middle Peninsula Evacuation Route Flood Mitigation Projects | Improvements to flood-prone primary evacuation routes-<br>Essex/ Tappahannock: Rt. 17;<br>King William: Rt. 30;<br>Gloucester: Rt. 17N;<br>Matthews: Rt. 14, Rt. 198, Rt. 17;<br>West Point: Rt. 30, Rt. 33 | Conceptual | $75,000,000 | (CSO) |

Public Access

| Name | Description | Phase | Estimated Cost | Source |
|---|---|---|---|---|
| Shoreline Protection for public access sites | Shoreline protection for appx. 300 small (less than ½ ac) publicly owned access sites | Conceptual | $10,000,000 | (CSO) |

## Localities

**Essex**

Hazard Mitigation

- Dam Safety
  - 1/17 Dams designated as Significant Hazard (HMP)

Floodplain Management

- 32 Repetitive Loss Properties (HMP)
  - 2 Severe Repetitive Loss Properties (HMP)

Environmental Plan

- Browne Tract Management Plan
- June Parker Marina Business and Management Plan
  - Address flooding at Marina with Berm
  - Marina development is regional featured project in VA Outdoors Plan

**Gloucester**

Hazard Mitigation

- Dam Vulnerability
  - 1/11 Dams designated as High Hazard (Hazard Mitigation Plan)
  - 3/11 Dams designated as Significant Hazard (Hazard Mitigation Plan)
- Infrastructure Vulnerability
  - Two segments of Route 17 are located in a flood zone and potentially affected by storm surge (Hazard Mitigation Plan)
  - Pump Stations 11 & 13: Prone to flooding during a Category 3 storm surge (Hazard Mitigation Plan)
  - Pump Stations 15,17,20: Prone to inundation during a Category 1 storm surge (Water and Wastewater Master Plan)

Non-Structural Floodproofing

- 146 Repetitive Loss Properties (Hazard Mitigation Plan)
- 13 Severe Loss Properties (Hazard Mitigation Plan)

Environmental Plans

- Middle Peninsula State Park Master Plan
  - Regional featured project in VA Outdoors Plan
- Gloucester County Shoreline Management Plan
- Resilience Adaptation Framework Tool

Dredging/Beneficial Use of Dredged Materials

- Aberdeen Creek
  - Dredging necessary to retain commercial waterman who use the creek (2020 CEDS) (2015 VIMS) (2014 MPPDC)
  - Design & Build dredge material storage area in Aberdeen Creek/Timberneck Creek State Park ($1,000,000) (CSO)
  - Aberdeen Creek Harbor Master Plan
  - "It is recommended that Gloucester County and/or the Middle Peninsula Chesapeake Bay Public access authority collaborate and coordinate with other stakeholders to develop and implement a plan to maintain the channel on Aberdeen Creek"
    - Financing An Aberdeen Creek Dredging Project Using A Tax Increment Financing Approach

Economic Development

- 2011 Perrin River Commercial Seafood Harbor Master Plan
- Floodproofing Commercial Fishing Facilities (CSO)
  - $3,000,000
- Aberdeen Creek Wharf Flood Proofing (CSO)
  - $750,000
- Gloucester Point Fishing Pier (CSO)
  - $4,500,000

**King and Queen County**

Hazard Mitigation

- Dam Vulnerability
  - 6/22 Dams designated as Significant Hazard (Hazard Mitigation Plan)

**King William**

Dam Vulnerability

- 1/36 Dams designated as High Hazard (Hazard Mitigation Plan)
- 8/36 Dams designated as Significant Hazard (Hazard Mitigation Plan)
- Lake Anna Dam: Periodic major water released can impact water levels on Pamunkey River

**Mathews**

Critical Infrastructure

- Mitigation retrofit projects at Fire Stations at Bohannon, New Point, Gwynn's Island, Mathews Court House (Hazard Mitigation Plan)
  - $5,000,000 (CSO)

Hazard Mitigation

- Non Structural Floodproofing
  - 169 Repetitive Loss Properties
  - 11 Single Family Severe Repetitive Losses

Shoreline Protection

- New Point Comfort Lighthouse
  - Significant erosion, locality plans to armor the structure's foundation (Hazard Mitigation Plan)
  - New Point Comfort Lighthouse Mathews, Virginia Site Assessment Plan

Drainage Improvements

- Ditch Enhancement/Repair
  - Canoe Yard Trail (Draper Aden Associates, 2015)
  - Bethel Beach Road (Draper Aden Associates, 2015)
  - Gullwing Cove Road (Draper Aden Associates, 2015)
  - Peachie Lane (Draper Aden Associates, 2015)
  - South Bay Haven Road Bay (Draper Aden Associates, 2015)
  - Route 620 & Private Drive (Draper Aden Associates, 2015)
  - Route 620 & Old Auburn Road (Draper Aden Associates, 2015)

Economic Development

- East River Boatyard Property
  - "Pursue site planning and recommended improvements to the East River Boatyard property for public recreation and access. Consider grant funding for planning and construction"
  - Working Waterfront Master Plan

**Middlesex**

Hazard Mitigation

- Dam Vulnerability
  - 2/15 Dams designated as Middle Risk (Hazard Mitigation Plan)
- Repetitive and Severe Repetitive Loss Residences (Hazard Mitigation Plan)
  - 35 Repetitive Loss properties
  - 2 Severe Repetitive Loss properties

**Town of Tappahannock**

Hazard Mitigation

- 2 Repetitive Loss Properties (Hazard Mitigation Plan)

Critical Infrastructure

- Route 17
  - Main Evacuation Road needs elevation (Hazard Mitigation Plan)
- Newbill Drive Pump Station: Chronically flooded (Hazard Mitigation Plan)

Drainage Improvements

- Newbill Drive
  - SW Runoff from Tappahannock Business District & storm surge from Rappahannock River causes inundation/undermining (Hazard Mitigation Plan)
  - Drainage improvements and storm surge mitigation (CSO)
    - $1,000,000

Economic Development

- Create Park on Waterfront in Tappahannock
  - Proposed infrastructure improvement, potential extension of Main Street Project (CEDS)

**West Point**

Critical Infrastructure

- 2nd St. Pump Station: Chronically flooded (Hazard Mitigation Plan)
- Floodproof/elevate 1) Bagby St. & Mattaponi Ave. Pump Station, 2) Thompson Ave. Pump Station (Hazard Mitigation Plan)
- Chelsea Road (1 of 2 routes to West Point School Complex) floods during severe storms (Hazard Mitigation Plan)

Public Access

- Public boat landing (Glass Island Road on the northside of Lord Delaware Bridge) receives minor damage during severe storms (Hazard Mitigation Plan)

## Northern Neck Planning District Commission

Regional Organizations and Workgroups

- Northern Neck SWCD
- Northern Neck PDC
- Friends of the Rappahannock
- Potomac Watershed Roundtable
- Northern Neck Land Conservancy

Resilience Adaptation Feasibility Tool

- Northern Neck Communities

Shoreline Management Plans

- Westmoreland County
- Targeted Living Shoreline Management Planning for Virginia State Parks

Economic Development

- White Stone Business District Revitalization Plan
  - Goal: Construct drainage improvements to drain stormwater from commercial areas
- Colonial Beach Revitalization

Green Infrastructure

- Blue/Green Infrastructure Planning Protection Focal Area

Hazard Mitigation

- Northern Neck Hazard Mitigation Plan

## PlanRVA

Regional Organizations and Workgroups

- PlanRVA
- James River SWCD
- FOLAR
- James River Association
- Capital Region Land Conservancy
- Historic Virginia Land Conservancy

Regional Reports and Studies

- RVA Clean Water Plan
- Richmond Green Infrastructure Assessment
- Richmond Riverfront Plan
- Richmond Region Green Infrastructure Project
- Below the Falls of the James

Economic Development

- Leveraging Economic Benefits of the Natural Resources of the Lower Chickahominy
- Richmond Regional Comprehensive Economic Development Strategy

Shoreline Management Plans

- Charles City County Shoreline Management Plan
- Targeted Living Shoreline Management Planning for Virginia State Parks

Hazard Mitigation Planning

- 2017 Richmond-Crater Hazard Mitigation Plan

## Northern Virginia Regional Commission

Regional Organizations and Workgroups

- Northern Virginia Regional Commission
- Interstate Commission on the Potomac River Basin
- Loudoun SWCD
- Northern VA Soil and Water Conservation District
- Prince William Soil and Water Conservation District

Non-Profit Organizations

- Potomac Watershed Roundtable
- Friends of the Occoquan
- Prince William Conservation Alliance
- Friends of Accotink Creek

Regional Reports and Studies

- Sustainable Shorelines and Community Management in Northern Virginia Phase III
- Resilient Critical Infrastructure: A Roadmap for Northern Virginia
- Regional Collaboration to Build Community Resilience in Northern Virginia
- Conservation Corridor Planning
- Four Mile Run Master Plan
- Targeted Living Shoreline Management Planning for Virginia State Parks

Localities

**Arlington**

- Stormwater Master Plan
- High Priority Stormwater Projects
- Chesapeake Bay TMDL
- Donaldson Run Stream Restoration Tributary B
    - High priority in stormwater master plan, 100% of project designs completed. Estimated costs: $3,095,340

**Alexandria**

Plans

- Urban Forestry Master Plan
- Potomac River Waterfront Flood Mitigation Study
- Alexandria Waterfront Small Area Plan
- Phase 2 Chesapeake Bay TMDL
- Environmental Action Plan 2040
- Beauregard Small Area Plan

Projects

- Taylor Run Stream Restoration
    - Identified: Phase 2 Chesapeake Bay TMDL , Environmental Action Plan 2040
    - Total estimated cost: $4.5 million
- Strawberry Run Stream Restoration
    - Identified: Phase 2 Chesapeake Bay TMDL , Environmental Action Plan 2040
    - Design process ongoing
    - Estimated cost: $3 million
- Alexandria Waterfront Park Flood Mitigation Measures
- King, Strand, and Union Streets Flood Mitigation Project
    - Cost Estimate: $1,150,000

**Fairfax**

- Fairfax County Shoreline Management Plan
- Accotink Creek Restoration
  - Currently funded for design, construction costs estimated at $2 million
- Pohick Creek Watershed Management Plan
- WMA Restoration Strategies

**Leesburg**

- Town Branch Stream Restoration
  - Between Catoctin Circle and the W&OD Trail, alleviate flooding and restore stream channel (Future Potential Projects)
- Tuscarora Creek Stream Restoration
  - Mitigate erosion and stream degradation downstream of the Leesburg Bypass to near Lawson Road (Future Potential Projects)
- Tuscarora Creek Flood Mitigation
  - (Capital Improvements Program)