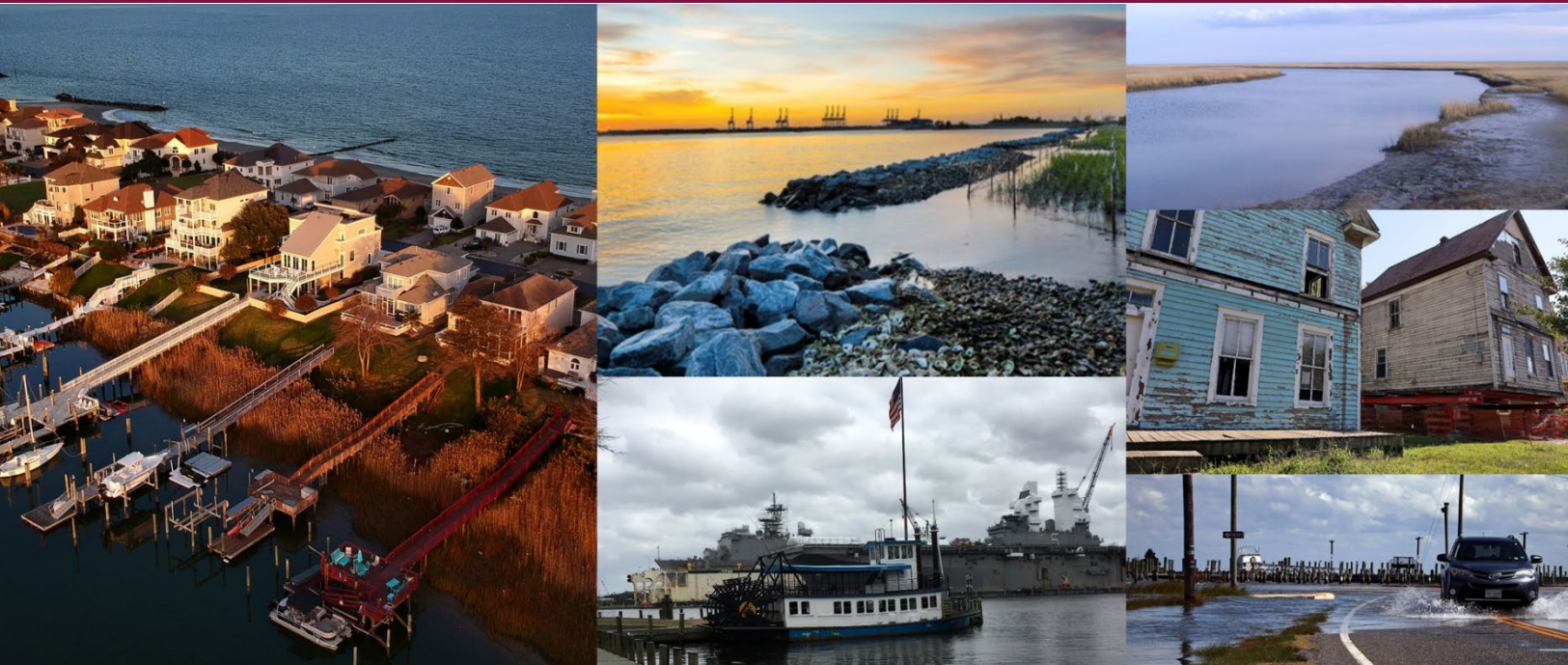


VIRGINIA COASTAL RESILIENCE MASTER PLAN

Task 5: Adaptation Strategies and Prioritization:
Project Evaluation and Prioritization Approach

NOVEMBER 1, 2021



FINAL REPORT

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1. INTRODUCTION

1.1. BACKGROUND

The Virginia Coastal Resilience Master Planning Framework (hereinafter referred to as the “CRMP Framework”) lays out the guiding principles of the Commonwealth’s approach to coastal adaptation and protection, and the process by which the Commonwealth will develop and begin implementing Virginia’s first Coastal Resilience Master Plan (CRMP) by the end of 2021. The development of a prioritization approach is a key step to drive towards the first goal in the CRMP Framework: “Identification of priority projects to increase the resilience of coastal communities, including both built and natural assets at risk due to sea level rise and flooding.” The document leverages lessons learned from the Louisiana and Texas Coastal Master plans to form the approach for a Virginia-specific project prioritization approach.

This Technical Report presents a vision and objectives for the Prioritization Approach and provides an overview of evaluation factors, criteria, and metrics to assign the relative priority of projects for funding and implementation across the State and by Master Planning Region. The Prioritization Approach will be refined in coordination with the Commonwealth leadership team; the Technical Advisory Committee (TAC); and the Dewberry Coastal Flood Hazard, Impact Assessment, and Project Identification Tasks to understand potential data sources for evaluation factors. Specifically, the relevant tasks and associated objectives, activities, and deliverables are summarized in Table 1.

Table 1: Overview of tasks and associated objectives, activities, and products.

Task, Objectives, and Outcomes	Activities
<p>Task Draft Prioritization Approach</p> <p>Objective Establish a prioritization approach based on the CRMP Framework, Commonwealth, and TAC input.</p> <p>Outcome Draft Technical Memorandum on Prioritization Approach</p>	<ul style="list-style-type: none"> • Review the CRMP Framework and identify how values expressed in the guiding principles and desired outcomes shape the prioritization approach. • Leverage lessons learned from the Louisiana and Texas Coastal Master Plans into a Virginia-specific framework to inform the approach. • Coordinate with Coastal Flood Hazard, Risk Assessment, and Project Inventory Tasks to understand potential data sources for evaluation factors. • Engage with the Commonwealth and TAC to gather perspectives on the approach.
<p>Task Final Prioritization Approach</p> <p>Objective</p>	<ul style="list-style-type: none"> • Review feedback from Commonwealth and TAC. • Discuss with Commonwealth and TAC to resolve outstanding issues. • Update approach based on feedback and understanding of available data.

Task, Objectives, and Outcomes	Activities
Finalize approach for the prioritization framework Outcome Final Prioritization Approach.	<ul style="list-style-type: none"> • Provide final draft for additional feedback, make final adjustments, and finalize approach.
Task Initial Prioritization Objective Provide an initial prioritized list of projects for the state and Master Planning Regions. Outcome Initial prioritized list of projects (with evaluation scores)	<ul style="list-style-type: none"> • Coordinate with the Commonwealth and TAC to acquire existing project databases. • Evaluate databases and CRMP Framework to establish schema¹ for project evaluation in consultation with Commonwealth and TAC. • Collect information from project owners to address key project attributes required for prioritization. • Organize projects in a database. • Test prioritization approach to provide an initial list of prioritized projects and review results with Commonwealth and TAC. Adjust approach, as needed, based on feedback from initial testing.
Task Final Prioritized Project List Objective Develop the final prioritized project list for the CRMP Outcome Final prioritized project list for the CRMP (with evaluation scores)	<ul style="list-style-type: none"> • Address outstanding data and process issues. • Apply final prioritization criteria to projects. • Provide draft final list for review and feedback to the Commonwealth and TAC. • Integrate feedback and produce the final project list for the CRMP.

This document reflects the Final Prioritization Approach that was implemented to produce the Final Prioritized Project List to present in the first iteration of the Master Plan.

1.2. PURPOSE

The purpose of the Prioritization Approach is to provide a mechanism to evaluate the relative importance of coastal resilience projects. The Prioritization Approach will enable the following actions:

- Identify and define overall prioritization objectives to be accomplished by implementation of the CRMP guiding principles. These shared goals will provide the foundation of the decision-making process and the scientific framework for metrics used in project evaluation.
- Screen the inventory of projects against baseline filters to identify those that

¹ A database schema indicates the tables that make up the database, the relations between the tables, as well as the fields in each table.

align with the CRMP Framework.

- Rank projects against a set of evaluation criteria, acknowledging that future CRMP versions could have updated evaluation processes.
- Provide a transparent, repeatable approach that can be leveraged by the Commonwealth's constituents to:
 - Advance projects that do not pass the initial baseline screening (e.g., defining additional planning and analysis needed to improve the characterization of these projects)
 - Formulate new project proposals that align with the CRMP goals and evaluation criteria.
- Engage the Commonwealth, regional coastal planning district commissions, and TAC subcommittees to tailor the Prioritization Approach with local, regional, and Commonwealth adaptation and flood risk mitigation priorities.

1.3. VISION AND GUIDING PRINCIPLES

The following Vision Statement forms the basis upon which the Prioritization Approach was developed to drive towards the desired outcomes of the CRMP.

Vision

Virginia's Coastal Resilience Master Plan (CRMP) will protect and preserve Virginia's way of life, its economy, natural environment, and communities in the face of a changing climate. It will enhance the resilience of its communities, regions and natural and built infrastructure to recurrent flooding and sea level rise. The CRMP will yield a resilient and thriving Virginia coast that is secure for current and future generations.

The CRMP Framework recognizes the need for the alignment of community, regional, and statewide principles and goals. Such alignment should be informed by community, regional and statewide planning, capacity building, and project implementation. The spatial, temporal, capacity, funding, and project typology challenges inherent in developing the Prioritization Approach, across its four planning horizons (current conditions, 2040, 2060, and 2080) and its four distinct planning regions, must be explicitly acknowledged and addressed. The CRMP must offer actionable solutions for current and future generations, using the best available science, while accepting the uncertainties related to the rate of sea-level rise and environmental change and the extent of economic and community development across the Commonwealth. The CRMP must address today's hazards, as well as long-term resilience needs. The CRMP must acknowledge and balance resource

constraints in funding, in natural system provisioning, in planning capacity, and across key regional and local priorities.

The Prioritization Approach was developed in alignment with CRMP Framework guiding principles. Under each guiding principle, prioritization objectives were established that represent achievable objectives within the first iteration of the CRMP, acknowledging there will be opportunities to refine or add additional objectives under future CRMP iterations. The Prioritization Approach will evaluate projects based on how well they achieve the following prioritization objectives:

- **Guiding Principle #1:** “Acknowledge climate change and its consequences, and base decision-making on the best available science.”
 - *Prioritization Objective 1a:* Prioritize projects that incorporate forward-looking and adaptive design principles, such as accommodating existing and future flood risks.
 - *Prioritization Objective 1b:* Prioritize projects that are needed to address both existing and future coastal flood risk.
 - *Prioritization Objective 1c:* Prioritize projects that address multiple types of flood hazards (tidal, storm surge, riverine, rainfall-runoff), as well as associated coastal hazards such as shoreline erosion and rising groundwater tables.
- **Guiding Principle #2:** “Identify and address socioeconomic inequities and work to enhance equity through coastal adaptation and protection efforts.”
 - *Prioritization Objective 2a:* Prioritize projects that consider social and economic equity, with attention to the most chronically underserved communities facing increased flood risks.
 - *Prioritization Objective 2b:* Prioritize projects that have the potential to add resilience to socially vulnerable communities.
- **Guiding Principle #3:** “Recognize the importance of protecting and enhancing green infrastructure like natural coastal barriers and fish and wildlife habitat by prioritizing nature-based solutions.”
 - *Prioritization Objective 3a:* Prioritize projects that incorporate nature-based design elements.
- **Guiding Principle #4:** “Utilize community- and regional-scale planning to the maximum extent possible, seeking region-specific approaches tailored to the needs of individual communities.”

- *Prioritization Objective 4a*: Prioritize projects that address regional adaptation priorities for community resources, critical sector assets, and natural infrastructure.
- **Guiding Principle #5**: “Understand fiscal realities and focus on the most cost-effective solutions for protection and adaptation of our communities, businesses, and critical infrastructure.”
 - *Prioritization Objective 5a*: Prioritize projects that maximize benefits and co-benefits.

These objectives shall be vetted and made actionable with public, community, stakeholder, and TAC engagement during CRMP development. The objectives should be refined and adapted as needed in successive future CRMP iterations based on best-available science and stakeholder and other technical expert input. Such consensus will ensure that the CRMP is a living document, relevant to Virginia and its changing coast and that it enables the Commonwealth and its communities to achieve Virginia’s coastal resilience. The following section provides details on the project identification and inventory process and the established prioritization approach, in alignment with the above objectives.

2. PROJECT IDENTIFICATION AND INVENTORY

Integral to the Prioritization Approach is the definition of a CRMP “project,” a mechanism for classifying projects for purposes of evaluation, and an inventory of projects across the Commonwealth. The following sections provide an overview of the project identification and inventory process that provides the basis for project prioritization.

2.1. DEFINITION OF “PROJECT”

The Virginia CRMP Leadership Team, in coordination with the Project Identification (PI) and Project Evaluation (PE) subcommittees and the Virginia CRMP consultant team, established the following definition for what constitutes a “project” for consideration and evaluation for the CRMP:

CRMP Projects

“Projects” involve activities that would lead to the implementation of on-the-ground treatments/installations or land use controls that reduce flood impacts and associated hazards in Virginia’s coastal communities. These projects can include conceptual or preliminary designs, continued and expanded stakeholder engagement efforts, detailed cost estimates, final design and permitting, and implementation.

“Coastal Communities” are defined as the counties, cities, towns, and tribal territories that are located within the eight coastal Planning District Commissions (PDCs) and regional Commissions (RCs) as defined in the CRMP Framework.

2.2. PROJECT CLASSIFICATION SCHEMA

A project classification schema was established to aid in the categorization and evaluation of projects. The classification schema has three levels of hierarchy: Project Class, Project Type, and Project Subtype. These levels are diagramed in Figure 1. Project Class is the highest level in the classification of projects.

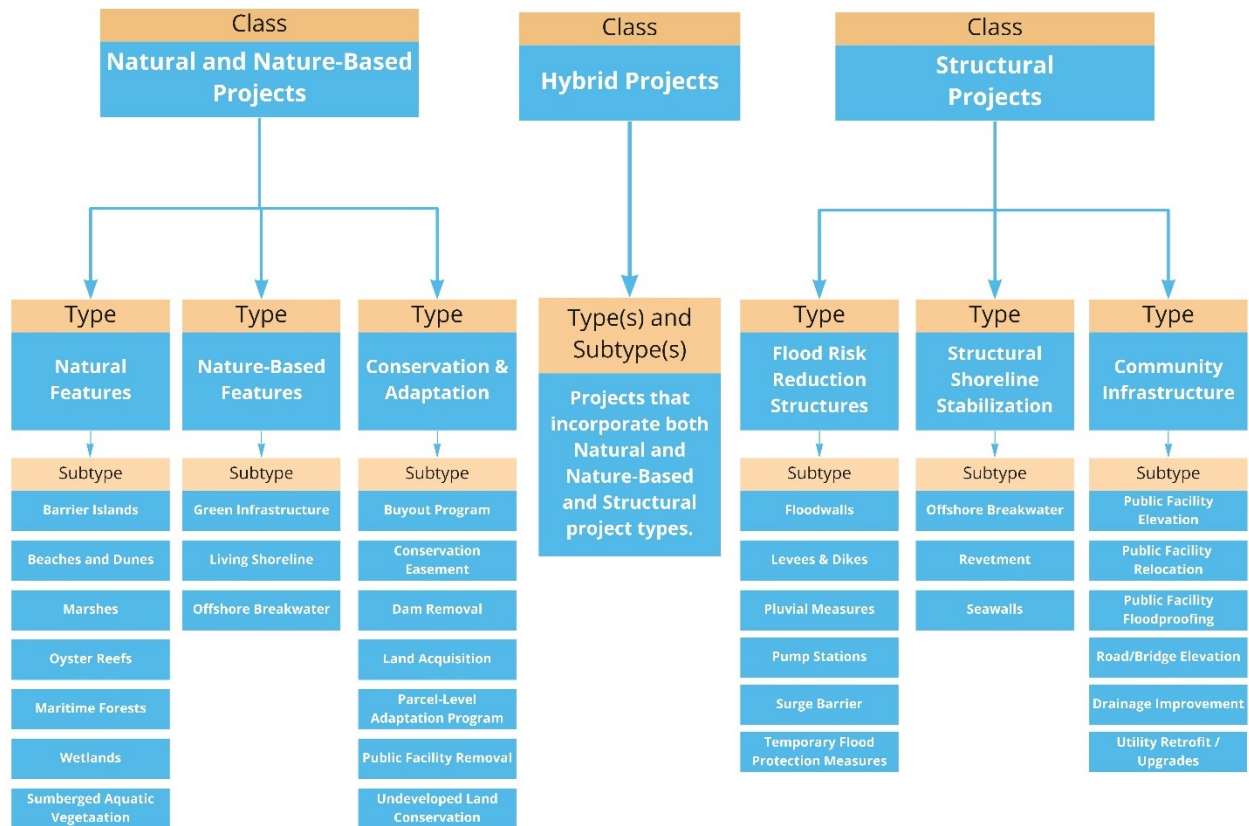


Figure 1: Project classification schema diagram.

The three main project classes were established in coordination with the 2021 Grant Manual for the Virginia Community Flood Preparedness (CFPF) Fund². They are defined as follows:

“Natural and Nature-Based Projects” reduce the impacts of flood and storm events using environmental processes and natural systems. A nature-based solution may provide additional benefits beyond flood control, including recreation opportunities and improved water quality. For the CRMP, nature-based projects include those that reduce flood impacts by restoring, creating, or emulating natural features, as well as projects that allow for the continuation of natural processes and allow inundation; strategic retreat of existing land uses from areas vulnerable to flooding; the conservation or enhancement of natural flood resilience resources; or acquisition of structures, provided the acquired property will be

² Commonwealth of Virginia 2021 Grant Manual for Virginia Community Flood Preparedness Fund (CFPF) - <https://www.dcr.virginia.gov/dam-safety-and-floodplains/document/2021-CFPF-Manual.pdf>. It should be noted that the list of project types presented within the 2021 CFPF does not encompass the full suite of project types within the CRMP project classification schema. These schemas could be aligned in the future for improved congruency between the two.

protected in perpetuity from further development. See Table 18 in Appendix A of this report for definitions of natural and nature-based project types and associated subtypes.

“Structural Projects” encompasses engineered flood risk reduction measures that can include the protection of individual assets or the blocking of flood pathways, preventing coastal or riverine flooding of inland areas. For the CRMP, structural projects include permanent or deployable flood defense systems like seawalls and levees, as well as retrofit or relocation strategies for built infrastructure for which protection is not practical. See Table 19 in Appendix A of this report for definitions of structural project types and associated subtypes.

“Hybrid Projects” are projects that incorporate project types and/or subtypes from both the Natural and Nature-Based and Structural project classes. The project class is intended to capture multi-faceted projects.

2.3. PROJECT DATABASE & ATTRIBUTES

The CRMP Project Database was designed in alignment with the project classification schema to capture and standardize the key attributes required for project prioritization. While several data collection efforts have captured some flood resilience projects, none included the full range of attributes necessary to understand and validate specific projects, and most still require verification by localities for accuracy. To address this data gap, a survey tool was developed using ESRI’s Survey123 software to build and populate the CRMP Project Database in alignment with the Prioritization Approach. The survey is organized into two sections:

- Required Fields - attributes that are essential to characterize projects and evaluate their effectiveness.
- Optional Fields - project attributes that are desirable and would help better assess the merits of a project, which could improve its chances of being funded.

The responses provided within the “Required” section of the survey will be used as part of the inputs into the Prioritization Approach. A copy of the survey is provided in Appendix B.

3. PRIORITIZATION APPROACH

The Prioritization Approach is illustrated in Figure 2, showing the processes, data inputs, and outputs required for prioritization. These elements are defined as below and further described in the following sections.

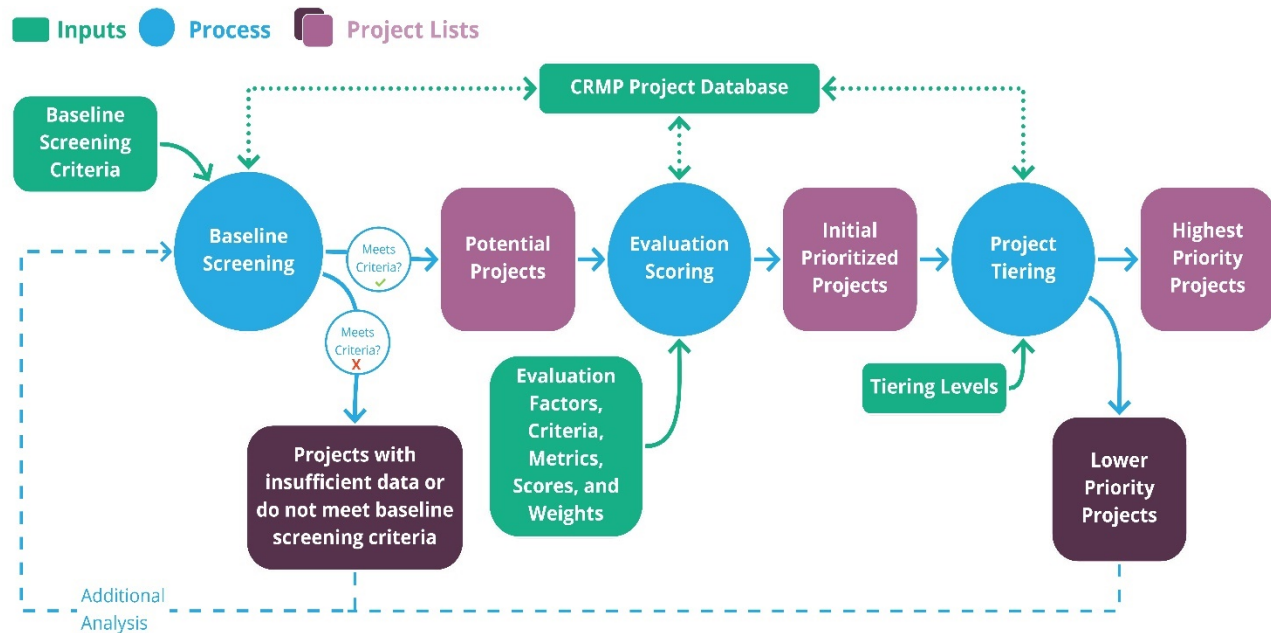


Figure 2: Overview of the Prioritization Approach.

- **Processes:** the overarching analytical steps (e.g. Baseline Screening, Evaluation Scoring, and Project Tiering) required for project prioritization. These are defined as:
 - **Baseline Screening (Section 3.1):** the process for screening projects for advancement to the evaluation scoring process. Projects will either meet or not meet the baseline screening criteria.
 - **Evaluation Scoring (Section 3.2):** the process for scoring projects that pass the baseline screening process against a set of factors, criteria, and metrics. Projects will receive both raw and weighted scores.
 - **Project Tiering (Section 3.3):** the process for sorting projects that receive evaluation scores into tiers that indicate three levels of priority.
- **Data Inputs:** the essential information required to apply the prioritization approach.

- **CRMP Project Database:** The catalog of all projects assembled into the CRMP Project Database, as previously described. The results of the Baseline Screening, Evaluation Scoring, and Project Tiering will be captured within the Project Database for tracking and documentation purposes.
- **Baseline Screening Criteria:** Binary (yes/no) filters intended to screen projects for advancement to the evaluation scoring process.
- **Evaluation Factors:** Categories that align CRMP guiding principles and desired outcomes, under which evaluation criteria are developed.
- **Evaluation Criteria:** A concise statement that summarizes what the project must achieve to be considered a priority.
- **Evaluation Metrics:** A qualitative statement or quantitative threshold to enable the scoring of projects.
- **Evaluation Scores:** A numerical point score associated with each metric.
- **Tiering Levels:** A means for grouping projects into relative levels of priority based on evaluation scoring results.
- **Project Lists:** the inventory of projects in the CRMP Project Database. Each phase of the prioritization process will advance the level of screening of each project.
 - **Potential Projects:** list of projects that meet the baseline screening criteria.
 - **Projects with insufficient data or that do not meet baseline screening criteria:** list of projects that either 1) do not have sufficient data to enable evaluation scoring, or 2) do not meet the baseline screening criteria.
 - **Initial Prioritized Projects:** the initial prioritized list of projects for the CRMP with raw and weighted scores.
 - **Highest Priority Projects:** the list of projects that are grouped into the highest level of tiering.
 - **Lower Priority Projects:** the list of projects that are grouped into the lower levels of tiering.

The following sections provide additional detail on each of the Baseline Screening, Evaluation Scoring, and Project Tiering processes.

3.1. BASELINE SCREENING

The Baseline Screening process begins is a review of the projects against the following filters:

1. **Primary Screening Filter:** Removes projects lacking critical information.
2. **Secondary Screening Filters:** Remove projects that do not fall within the CRMP scope or are already being implemented.

The results of the Baseline Screening will be captured in the Project Database. Projects that do not pass these filters will be archived for potential future reference or additional analysis, whereas projects that pass will be compiled into a Potential Project List, as shown in Figure 3.

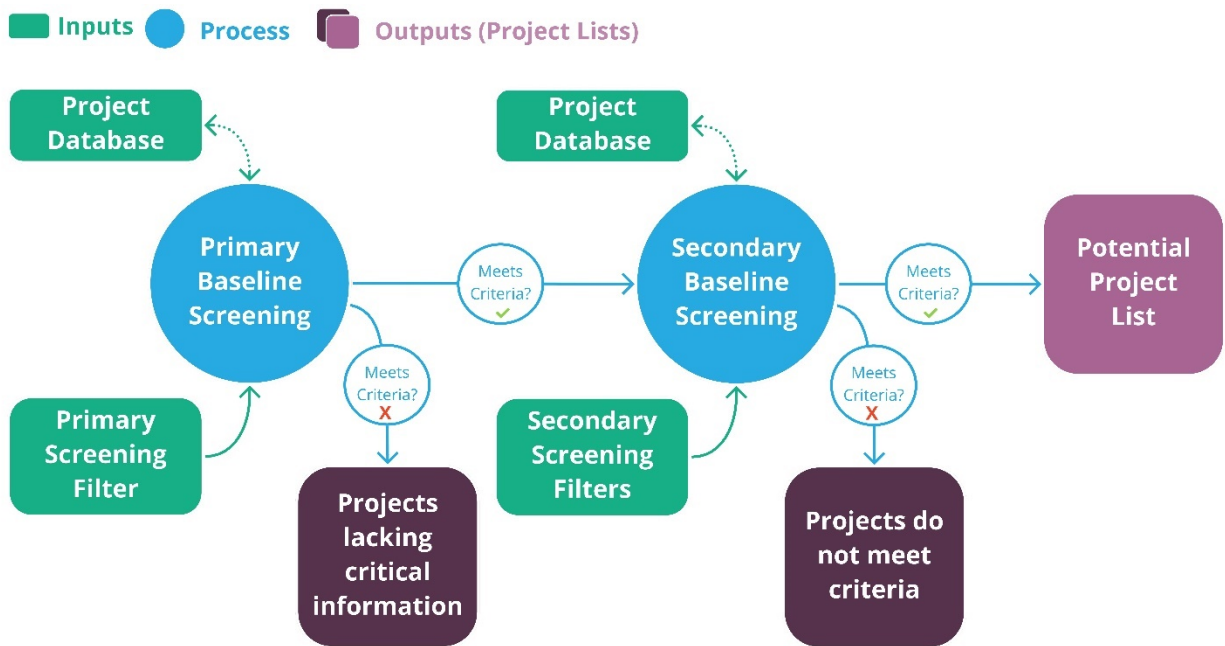


Figure 3: Baseline screening process.

3.1.1. PRIMARY SCREENING FILTER

This primary filter removes projects from consideration that do not have sufficient information to enable evaluation scoring. The project must pass this primary screening filter before being evaluated against the secondary screening filters.

Screening Criteria: Does the project have the minimum information required to enable prioritization? The project passes if all the following questions are answered:

1. **Project Name** - a short, descriptive name that will distinguish it from other project proposals and indicate the project purpose,
2. **Project Description** – a brief description of the project that states the scope and goals of the project and the expected outcome from the project and its relevance to the CRMP.
3. **Project Purpose and Need** – the types of flood hazards the project is intended to address, including tidal flooding, storm surge flooding, riverine flooding, rainfall-runoff flooding, and other associated hazards such as land degradation and groundwater impacts.
4. **Project Owner** – the locality, agency, entity, or person that will be responsible for implementing the project, regardless of land ownership.
5. **Project Subtypes** – the project subtypes that best characterize the project (see Appendix). Multiple subtypes can be selected, if appropriate.
6. **Project Footprint** – the approximate geographic footprint of the project. The footprint will depend on the type and scale of the project. A few examples include:
 - a. A project footprint for a structural or natural infrastructure project should represent the estimated extent of the project once it has been implemented.
 - b. A project footprint for a land conservation strategy (e.g., property acquisition or conservation easement) would represent the area of the land parcel.
 - c. A project footprint for a stormwater infrastructure or utility infrastructure would be the extent of the project area.
7. **Resilience Considerations** – the design standards used to account for future increases in coastal flooding due to sea level rise and future storms characteristics.
8. **Project Status** – the current (2021) status of the project, defined below:
 - a. *Proposed* - the project has been identified as a need through a formal planning process that addresses flood resilience (e.g. Resilience Plan, Comprehensive Plan, Hazard Mitigation Plan, etc.), but has not yet been formally initiated or budgeted.
 - b. *Programmed* – the project has been identified as a need through a formal planning process that addresses flood resilience (e.g. Resilience Plan, Comprehensive Plan, Hazard Mitigation Plan), and has been budgeted for near-term or future progression.

- c. *Under Site Assessment and Preliminary Design* - Projects in this phase involve activities required to lay the groundwork for successful implementation. These activities may include evaluation of potential project sites, assessing alternatives, assessing project benefits/adverse impacts, identifying and addressing barriers to moving to the final design and implementation phases, gathering baseline data, conducting cost-benefit analyses, and selecting the most appropriate solution for a site, and preparing preliminary project designs that allow a community to make a “go/no-go” decision on the project.
 - d. *Under Final Design and Permitting* - Projects in this phase involve advancing conceptual or preliminary designs into final designs and engineering plans, developing detailed cost estimates, engaging the community, preparing permit applications, and other related tasks to position projects for implementation.
 - e. *Under Construction or Implementation* - Projects in this phase involve active implementation.
 - f. *Completed* – Projects in this phase have completed construction and involve monitoring efforts to track project success.
9. **Scale of Benefits** – the estimated area predicted to benefit from an implemented project, provided by the project owner from the selection of the following choices:
- a. *Individual Lot*: the project is expected to only benefit an individual lot.
 - b. *Community to Sub-Watershed*: the project is expected to benefit an area that is larger than an individual lot but smaller than a Hydrologic Unit Code (HUC)12, for example.
 - c. *Watershed*: for example, the project is expected to benefits a similar area as a HUC10
 - d. *Multi-jurisdictional*: the project is expected to benefit an area greater than a HUC8, for example.

3.1.2. SECONDARY SCREENING FILTERS

The project must pass (i.e., answer “yes”) to all the secondary filters to advance to the Evaluation Scoring process.

3.1.2.1. Filter 1: Project Location within VA Coastal PDCs/RCs

This secondary screening filter removes projects from consideration that are not located within the boundaries of the CRMP region.

Screening Criteria (Yes/No): The project is located within the CRMP region, which includes the geographic area comprised by the following eight coastal Planning District Commissions (PDC) and Regional Commissions (RCs) boundaries:

1. Accomack-Northampton PDC (A-NPDC)
2. Crater PDC
3. George Washington Regional Commission (GWRC)
4. Hampton Roads PDC (HRPDC)
5. Middle Peninsula PDC (MPPDC)
6. Northern Neck PDC (NNPDC)
7. Northern Virginia Regional Commission (NVRC)
8. PlanRVA (formerly Richmond Regional Planning District)

3.1.2.2. Filter 2: Project Status

This secondary screening filter removes projects that are already complete.

Screening Criteria (Yes/No): Is the project complete?

3.1.2.3. Filter 3: Project Contribution to Coastal Resilience

In the Coastal Resilience Planning Framework, coastal resilience projects are defined as those that would “improve the Commonwealth’s resilience and ability to adapt to rising seas, increased nuisance flooding, and more frequent and intense storms that result from climate change and threaten our coastal communities.” This secondary screening filter removes projects that are not consistent with this definition.

Screening Criteria (Yes/No): Does the project address coastal flood hazards including tidal flooding, storm-surge flooding, or coastal shoreline erosion?

3.2. EVALUATION SCORING

In the Evaluation Scoring process, the Potential Project List will be appraised against a set of Evaluation Factors, Criteria, and Metrics, which are presented in Section 3.2.3. The outcome of the initial Evaluation Scoring process will be an Initial Prioritized Project List where each project has been assigned a raw numerical score. The raw scores are then multiplied by factor-based weights, which are further described in Section 3.2.5.

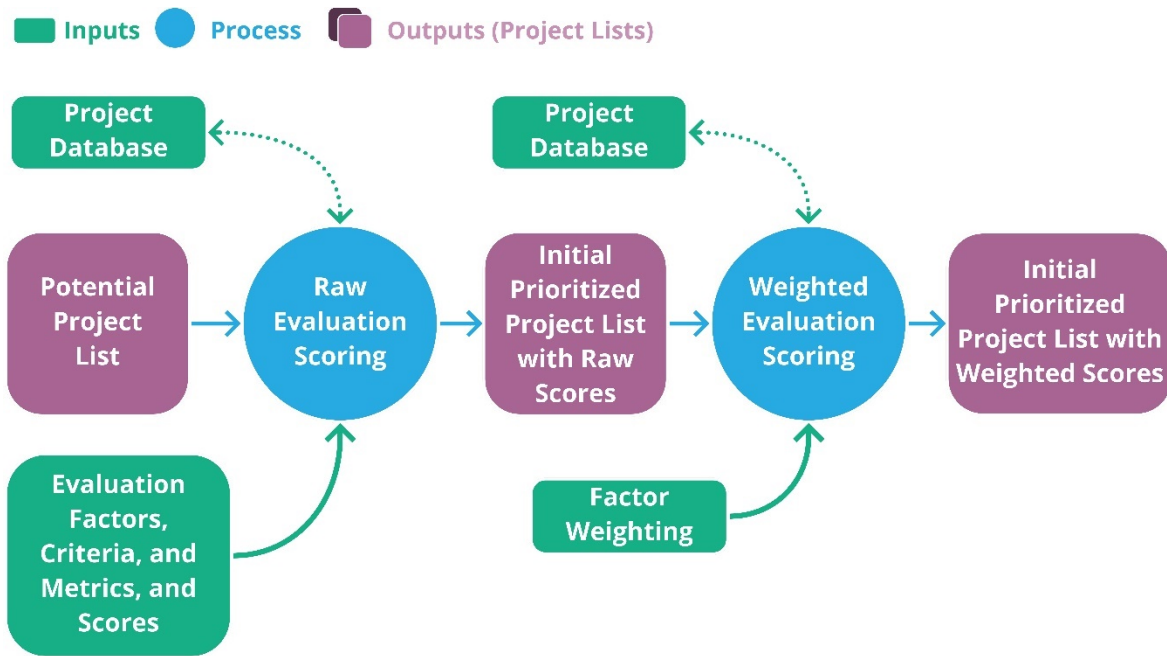


Figure 4: Evaluation scoring process.

3.2.1. SCORING RUBRIC

To enable ranking and comparison of projects, each metric is assigned a numerical score. For some criteria, the project will be assigned a single score (Table 2), whereas other criteria use an additive approach (Table 3), where projects can receive a cumulative score for that criterion.

Table 2: Single score rubric

Lowest Score	0	1	2	3	4	5	6	7	8	9	Highest Score
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Table 3: Additive score rubric

	Lowest Score			Highest Score	
	1	2	3	4	

3.2.2. EVALUATION SCORING APPROACHES

The scoring approach includes a combination of quantitative and qualitative analyses, participatory scoring, and expert evaluation defined as follows:

- **Project Owner Input:** Contribution from the project owner or a person who is the most familiar with the project, typically an employee of or agent for the project owner.
- **Qualitative Analysis:** Evaluation using non-numerical information about the proposed projects, such as the project type and description, purpose and need, overlaid on contextual community data.
- **Expert Evaluation:** Evaluation by the CRMP consultant team aided by local, regional, and Commonwealth subject matter experts.
- **Quantitative Analysis:** Evaluation that leverages the CRMP study data, including outputs of the Coastal Flood Hazard Assessment and Impact Assessment; for example, the monetary value of flood damage avoided.

The Prioritization Approach is designed to allow metrics and methods for evaluating projects to be refined as better data becomes available.

3.2.3. FACTORS, CRITERIA, METRICS & SCORES

Five core evaluation factors were established, in alignment with the CRMP Framework guiding principles and prioritization objectives outlined in Section 1.3. These evaluation factors and their associated criteria, metrics, and point scores are summarized in Figure 5 and further described in the following sections.

Factors	Evaluation Criteria
 <p>Factor 1: Resilience Planning and Design</p> <p><i>Relevant CRMP Framework Guiding Principle: #1</i></p>	<p>Criteria 1a: The project incorporates future conditions scenarios including sea level rise and precipitation.</p> <p>Criteria 1b: The project is needed to address both existing and future coastal flood exposure.</p> <p>Criteria 1c: The project addresses coastal hazards and compounding stressors that exacerbate coastal hazards.</p>
 <p>Factor 2: Equity Considerations</p> <p><i>Relevant CRMP Framework Guiding Principle: #2</i></p>	<p>Criteria 2a: The project provides benefits to communities with a lack of economic resources and capacity to address current and future increases in flooding.</p> <p>Criteria 2b: The project has the potential to add resilience to socially vulnerable communities.</p>
 <p>Factor 3: Natural-Based Approaches</p> <p><i>Relevant CRMP Framework Guiding Principle: #3</i></p>	<p>Criteria 3: The project recognizes the importance of protecting and enhancing green infrastructure like natural coastal barriers and fish and wildlife habitat by prioritizing nature-based solutions.</p>
 <p>Factor 4: Regional Adaptation Priorities</p> <p><i>Relevant CRMP Framework Guiding Principle: #4</i></p>	<p>Criteria 4: The project has potential to benefit regional priority areas for community resources, critical assets, or natural assets that are at risk of flooding.</p>
 <p>Factor 5: Project Benefits</p> <p><i>Relevant CRMP Framework Guiding Principle: #5</i></p>	<p>Criteria 5: The project maximizes the benefits it is intended to provide. Benefits depend on the project type:</p> <ul style="list-style-type: none"> • <u>Flood Risk Reduction Structures</u>: The project is expected to reduce existing and future coastal flood risk. • <u>Nature-Based Features and Structural Shoreline Stabilization</u>: The project is expected to reduce shoreline erosion. • <u>Natural Features; Nature-Based Features; Conservation and Adaptation</u>: The project is expected to protect and/or enhance natural systems critical for flood resilience, natural habitat and ecosystem diversity, agriculture and forestry preservation, and water quality improvements. • <u>Community Infrastructure</u>: The project is expected to provide community-scale benefits to the populated area surrounding the project.

Figure 5: Summary of Evaluation Factors, Metrics, and Criteria.

3.2.3.1. Factor 1: Resilience Planning & Design

This factor is intended to evaluate whether the project aligns with the CRMP Framework Guiding Principle #1: “Acknowledge climate change and its consequences, and base decision-making on the best available science.” This factor encompasses three evaluation criteria, as shown in Figure 6 and further described below.

1 2 3 4				ADDITIVE SCORES						
0 1 2 3 4 5 6 7 8 9 10				SINGLE SCORES						
Criteria				Metrics & Scores						
 <p>Criterion 1.A. Resilient Design Criteria: The project incorporates future conditions scenarios.</p>	9	Higher and more risk-averse than CRMP SLR scenario								
	7	Scenario aligns with CRMP SLR scenario								
	5	Lower and less risk-averse than CRMP SLR scenario								
	0	No considerations of future SLR scenarios								
	1	Considers increased heavy rainfall								
 <p>Criterion 1.B. Project Need: The project is needed to address both existing and future coastal flood exposure.</p>	1	Existing exposure (tidal flooding)								
	1	Existing exposure (10-year flood event)								
	1	Existing exposure (100-year flood event)								
	1	Near-term exposure (tidal flooding)								
	1	Near-term exposure (10-year flood event)								
	1	Near-term exposure (100-year flood event)								
	1	Mid-term exposure (tidal flooding)								
	1	Mid-term exposure (10-year flood event)								
	1	Mid-term exposure (100-year flood event)								
	1	Long-term exposure (tidal flooding)								
	1	Long-term exposure (10-year flood event)								
	1	Long-term exposure (100-year flood event)								
 <p>Criterion 1.C. Project Purpose: The project addresses coastal hazards and compounding stressors that exacerbate coastal hazards.</p>	2	Coastal Flooding								
	2	Riverine flooding								
	2	Rainfall flooding								
	1	Groundwater impacts								
	1	Land degradation								

Figure 6: Evaluation criteria, metrics, and scores for Factor 1: Resilience Planning & Design.

Criterion 1a: Resilient Design Criteria

Evaluation Criteria: Projects that incorporate the sea level rise (SLR) scenario in alignment with the CRMP (defined as the NOAA 2017 Intermediate-High sea level rise projection), or a more risk-averse (e.g. conservative) local standard, will rank highest against this criterion. The project can receive an extra point if planning and/or design efforts consider future projections of heavy rainfall.

Evaluation Metrics: The evaluation metrics for this criterion are presented in Table 4.

Table 4: Metrics and basis for ranking for Criterion 1a: Resilient Design Criteria.

Metric	Basis for Metric Ranking	Score (Single Choice)
Most Risk-Averse	The project incorporates a SLR scenario that is higher and more risk-averse than the CRMP SLR scenario.	9 Points
Risk Averse	The project incorporates a SLR Scenario that aligns with the CRMP SLR scenario.	7 Points
Less Risk Averse	The project incorporates a local SLR scenario that is lower than and less risk-averse than the CRMP SLR scenario.	5 Points
Not Risk Averse	The project does not consider future sea level rise.	0 Points
Metric	Basis for Metric Ranking	Score (Additive)
Increased Rainfall	The project incorporates future projections of increased heavy rainfall.	1 Point

Evaluation Approach: The basis for ranking will be determined by the project owner input. Where appropriate, expert evaluation by the CRMP consultant team will also be performed to review the responses provided by the project owner for this survey question in conjunction with supplementary information submitted by the project owner such as reports and engineering documents. This information will be reviewed to understand what specific projection source and time-horizon(s) the project is designed to and how the design accommodates the future condition projection.

Criterion 1b: Project Need

Evaluation Criteria: Projects that are needed to address both existing and future coastal flood exposure across a range of flood events (from tidal to storm surge) will rank highest against this criterion. This criterion is intended to capture the relative urgency of projects to address existing, near-term, mid-term, or long-term flood risks.

Evaluation Metrics: The evaluation metrics for this criterion are presented in Table 5. The scoring for this criterion is additive. Each affirmative answer accrues towards the total score.

Table 5: Metrics and basis for ranking for Criterion 1b: Project Need.

Metric	Basis for Metric Ranking	Score (Additive)
Existing Exposure (High Tide)	The project footprint is exposed to flooding during mean high water (MHW) (Existing Conditions).	1 Point
Existing Exposure (10-Yr)	The project footprint is exposed to flooding during the 10-percent annual chance coastal flood (Existing Conditions).	1 Point
Existing Exposure (100-Yr)	The project footprint is exposed to flooding during the 1-percent annual chance coastal flood (Existing Conditions).	1 Point
Near-Term Exposure (High Tide)	The project footprint is exposed to flooding during MHW in the near-term (2040).	1 Point
Near-Term Exposure (10-Yr)	The project footprint is exposed to flooding during the 10-percent annual chance coastal flood in the near-term (2040).	1 Point
Near-Term Exposure (100-Yr)	The project footprint is exposed to flooding during the 1-percent annual chance coastal flood in the near-term (2040).	1 Point
Mid-Term Exposure (High Tide)	The project footprint is exposed to flooding during MHW in the mid-term (2060).	1 Point
Mid-Term Exposure (10-Yr)	The project footprint is exposed to flooding during the 10-percent annual chance coastal flood in the mid-term (2060).	1 Point
Mid-Term Exposure (100-Yr)	The project footprint is exposed to flooding during the 1-percent annual chance coastal flood in the mid-term (2060).	1 Point
Long-Term Exposure (High Tide)	The project footprint is exposed to flooding during MHW in the long-term (2080).	1 Point
Long-Term Exposure (10-Yr)	The project footprint is exposed to flooding during the 10-percent annual chance coastal flood in the long-term (2080).	1 Point
Long-Term Exposure (100-Yr)	The project footprint is exposed to flooding during the 1-percent annual chance coastal flood in the long-term (2080).	1 Point

Evaluation Approach: The basis for ranking will be determined by quantitative analysis that involves intersecting the project footprint with the existing and future floodplains developed as part of the Coastal Flood Hazard Assessment. An example of how a single project could score against this criterion is shown in Table 6.

Table 6: Example of additive scoring for Criterion 1b.

	Existing Conditions	2040	2060	2080	Point Total
Project footprint exposed during high tide?	No	No	No	Yes	1×1 = 1
Project footprint exposed during 10-Yr Event?	No	Yes	Yes	Yes	1×3 = 3
Project footprint exposed during 100-Yr Event?	Yes	Yes	Yes	Yes	1×4 = 4
Total Score:					8

Criterion 1c: Project Purpose

Evaluation Criteria: Projects that address multiple coastal flood hazards and compounding stressors that exacerbate them, such as pluvial and fluvial flooding, shoreline erosion, and rising groundwater tables, will rank highest against this criterion.

Evaluation Metrics: The evaluation metrics for this criterion are presented in Table 7. These scores are additive. Each affirmative answer will accrue points toward the total score.

Table 7: Metrics and basis for ranking for Criterion 1c: Project Purpose.

Metric	Basis for Metric Ranking	Score (Additive)
Coastal Flooding	The project is intended to reduce flooding caused by tidal and storm surge flooding.	2 Points
Riverine Flooding	The project is intended to reduce flooding caused by overflowing rivers and streams	2 Points
Rainfall-Runoff Flooding	The project is intended to reduce flooding caused by inadequate drainage that result during heavy rainfall events	2 Points
Groundwater Impacts	The project is intended to reduce impacts associated with changes in the boundary between freshwater and saltwater or rising groundwater tables due to sea level rise	1 Point
Land Degradation	The project is intended to reduce loss or displacement of land, vegetation, or sediment along the coastline	1 Point

Evaluation Approach: The basis for ranking will be determined by project owner input. However, the CRMP consultant team will verify the tidal flooding and storm surge flood objectives to evaluate if the project has potential to address these hazards using the existing and future tidal and storm-surge flood extents produced as part of the Coastal Flood Hazard Assessment. Future iterations of the CRMP could provide opportunities to review the validity of other hazards through modeling.

3.2.3.1. Factor 2: Equity Considerations

This factor is intended to evaluate whether the project aligns with the CRMP Framework Guiding Principle #2: “Identify and address socioeconomic inequities and work to enhance equity through coastal adaptation and protection efforts.” This factor encompasses two evaluation criteria, as shown in Figure 7 and further described below.

For the CRMP, socioeconomic inequities are understood using the concept of “underserved communities,” which are defined as populations sharing a particular characteristic – either demographic or geographic – that has led to a systematic lack of social opportunity, civic life, and economic investment.³ The Commonwealth recognizes that these existing inequities of resources across communities necessitate a higher prioritization of projects and actions that serve these groups. Underserved communities can be defined using two main factors: **Community Resources & Capacity** (geographic/jurisdictional elements) and **Social Vulnerability** (demographic elements). The two main factors are presented as individual evaluation criteria as they are measuring different community characteristics.

³ Adapted from EO 13985. Available here: <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/20/executive-order-advancing-racial-equity-and-support-for-underserved-communities-through-the-federal-government/>



Criteria	Metrics & Scores
 <p>Criterion 2.A. Community Resources & Capacity The project provides communities with chronic fiscal stress—defined as communities facing lack of economic resources and capacity to address current and future increases in flooding.</p>	<ul style="list-style-type: none"> 10 Benefits a community with high fiscal stress 6 Benefits a community with above average fiscal stress 2 Benefits a community with below average fiscal stress 0 Does not benefit a community with fiscal stress
 <p>Criterion 2.B. Social Vulnerability: The project has the potential to add resilience to socially vulnerable communities.</p>	<ul style="list-style-type: none"> 10 Very high social vulnerability 8 High social vulnerability 6 Moderate social vulnerability 5 Low social vulnerability 0 Very low social vulnerability

Figure 7: Evaluation criteria, metrics, and scores for Factor 2: Equity Considerations.

In the context of challenges with coastal flooding, the CRMP Framework acknowledges that “challenges differ by region, locality, neighborhood, and individual, as does capacity to address them.” The equity criterion related to Community Resources and Capacity aims to capture discrepancies relating to financial resources across Virginia’s coastal jurisdictional areas (cities, counties, and tribes). To quantify this metric, the CRMP Impact Assessment uses the Fiscal Stress Index developed by the Virginia Department of Housing and Community Development’s (DHCD) Commission on Local Government (CLG). The fiscal stress is the aggregation of analyses on the comparative revenue capacity, revenue effort, and median household income for Virginia’s cities and counties and indicates a locality’s ability to generate additional local revenues from its current tax base relative to the rest of the Commonwealth.⁴ It is assumed that these cross-jurisdictional inequities are largely a result of historic and present disadvantages that reduce a community’s capacity for resilience planning and project implementation.

Social vulnerability measures the likelihood that a community or individual will experience harm during and after a flood by assessing demographic factors that indicate their ability to prepare, withstand and recover from a disaster. To quantify social

⁴ Virginia Commission on Local Government, Report on Comparative Revenue Capacity, Revenue Effort, and Fiscal Stress of Virginia’s Cities and Counties, FY 2018. Available here: <https://www.dhcd.virginia.gov/sites/default/files/Docx/clg/fiscal-stress/fiscal-stress-report.pdf>

vulnerability the CRMP Impact Assessment uses variables established in the Social Vulnerability Index (SVI) developed by the Centers for Disease Control and Prevention and the Agency for Toxic Substances and Disease Registry.⁵ This index uses census data on race and ethnicity, income, education, age, disability status, language ability, vehicle access, and housing type.

Criterion 2a: Community Resources & Capacity

Evaluation Criteria: Projects that have the potential to provide benefits to chronically fiscally stressed communities—defined as communities facing a lack of economic resources and capacity to address current and future increases in flooding—will rank highest against this criterion.

Evaluation Metrics: The evaluation metrics for this criterion are presented in Table 8.

Table 8: Metrics and basis for ranking for Criterion 2a: Community Resources & Capacity.

Metric	Basis for Metric Ranking	Score (Single)
High Fiscal Stress	The project provides benefits to localities that have a high measure of fiscal stress.	10 Points
Above Average Fiscal Stress	The project provides benefits to localities that have above average measure of fiscal stress.	6 points
Below Average Fiscal Stress	The project provides benefits to localities that have a below-average measure of fiscal stress.	2 points
Low Fiscal Stress	The project only provides benefits to communities designated as having low fiscal stress.	0 Points

Evaluation Approach: The basis for ranking will be determined by quantitative analysis that involves intersecting the project footprint with the Community Resources & Capacity layer produced as part of the Impact Assessment to determine whether the project is anticipated to benefit these communities. The tiered classification of high, above average, below average, and low is derived directly from the CLG’s report. Fiscal stress is calculated at the county level. Therefore, if a project impact area spans multiple counties, the highest value will be used to score the project.

Criterion 2b: Social Vulnerability

Evaluation Criteria: Projects that have the potential to add resilience to socially vulnerable communities will rank highest against this criterion.

⁵ CDC SVI 2010 Documentation, Updated 2020. Available here: <https://www.atsdr.cdc.gov/placeandhealth/svi/documentation/pdf/SVI2018Documentation-H.pdf>

Evaluation Metrics: The evaluation metrics for this criterion are presented in Table 9.

Table 9: Metrics and basis for ranking for Criterion 2b: Social Vulnerability.

Metric	Basis for Metric Ranking	Score (Single)
Very High Social Vulnerability	The project footprint has a 'Very High' social vulnerability score.	10 Points
High Social Vulnerability	The project footprint has a 'High' social vulnerability score.	8 Points
Moderate Social Vulnerability	The project footprint has a 'Moderate' social vulnerability score.	6 Points
Low Social Vulnerability	The project footprint has a 'Low' social vulnerability score.	2 Points
Very Low Social Vulnerability	The project footprint has a 'Very Low' social vulnerability score.	0 Points

Evaluation Approach: The basis for ranking will be determined by quantitative analysis that involves intersecting the project footprint with the Social Vulnerability layer produced as part of the Impact Assessment. The Impact Assessment aggregates social vulnerability scores across a mesh of 1,375 ft x 1,375 ft grid cells (with a total of 296,000 cells across the study area). Project footprints will be used to select appropriate grid cells. An average of the values of those cells will produce the social vulnerability score for each project.

3.2.3.2. Factor 3: Nature-Based Approaches

This factor is intended to evaluate whether the project aligns with the CRMP Framework Guiding Principle #3: "Recognize the importance of protecting and enhancing green infrastructure like natural coastal barriers and fish and wildlife habitat by prioritizing nature-based solutions." This factor encompasses a single evaluation criterion, as shown in Figure 8 and further described below.

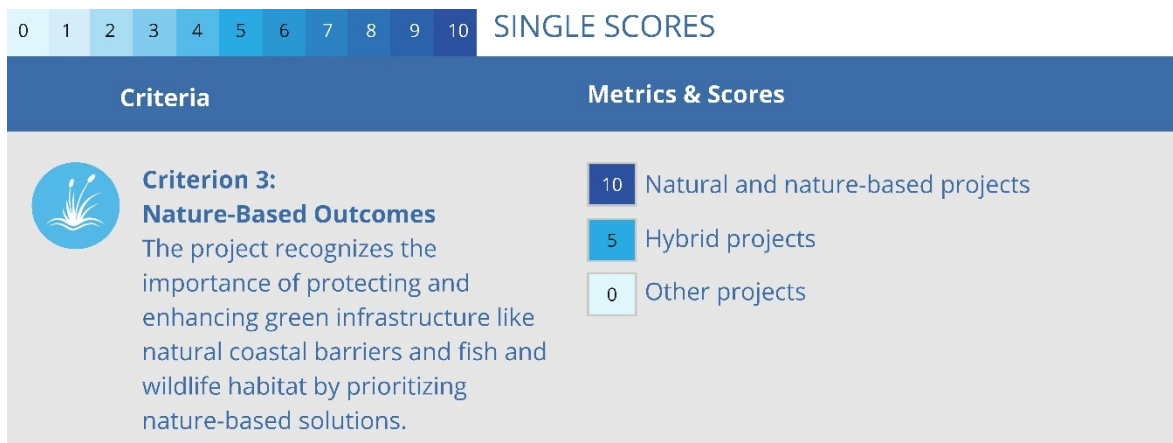


Figure 8: Evaluation criteria, metrics, and scores for Factor 3: Nature-Based Approaches.

Criterion 3: Nature-Based Outcomes

Evaluation Criteria: Projects that incorporate only natural and nature-based design elements will rank highest against this criterion.

Evaluation Metrics: The evaluation metrics for this criterion are presented in Table 10.

Table 10: Metrics and basis for ranking for Criterion 3: Nature-Based Outcomes.

Metric	Basis for Metric Ranking	Score (Single)
Natural and Nature-Based Projects	The project consists of only natural and nature-based features.	10 Points
Hybrid Projects	The project incorporates both natural and nature-based and structural approaches (e.g. "hybrid project")	5 Points
Other Projects	The project does not include natural and nature-based features.	0 Points

Evaluation Approach: The basis for ranking will be determined by qualitative analysis based on the project classification schema (see Appendix A). Specifically, any project that falls into the natural and nature-based approach category according to the project classification schema will automatically score "High." Projects classified as hybrid projects will score "Medium." All other projects will score "Low."

3.2.3.3. Factor 4: Regional Adaptation Priorities

This factor is intended to evaluate whether the project aligns with the CRMP Framework Guiding Principle #4: "Utilize community and regional scale planning to the maximum extent possible, seeking region-specific approaches tailored to the needs of individual communities." This factor encompasses a single evaluation criterion, as shown in Figure 9 and further described below.


1 2 3 4				ADDITIVE SCORES
Criteria		Metrics & Scores		
 <p>Criterion 4: Regional Adaptation Priorities The project addresses regional adaptation priorities for community resources, critical sector assets, and natural infrastructure.</p>	3	Highest Priority Community Resource Adaptation Area		
	3	Highest Priority Critical Sectors Adaptation Area		
	3	Highest Priority Natural Infrastructure Adaptation Area		
	2	High Priority Community Resource Adaptation Area		
	2	High Priority Critical Sectors Adaptation Area		
	2	High Priority Natural Infrastructure Adaptation Area		
	1	Medium Priority Community Resource Adaptation Area		
	1	Medium Priority Critical Sectors Adaptation Area		
	1	Medium Priority Natural Infrastructure Adaptation Area		

Figure 9: Evaluation criteria, metrics, and scores for Factor 4: Regional Adaptation Priorities.

Criterion 4: Regional Adaptation Priorities

Evaluation Criteria: The CRMP Impact Assessment categorizes impacts into three themes based on the types of assets affected. These themes focus on different elements of the Commonwealth’s unique coastal landscapes and what is at stake due to escalating flood hazards. Projects that address regional priorities across the three impact themes will rank highest against this criterion:

- **Community Resources Theme** includes impacts on physical assets that contribute to coastal Virginia’s unique economy and social environment. This theme examines impacts on residential populations, residential and non-residential buildings, tribal-owned lands, and agricultural lands.
- **Critical Sectors Theme** includes impacts on assets, systems, and networks that are vital to everyday functions, and if damaged or destroyed, would have debilitating effects on the economy, public health, safety, and/or security. This theme examines impacts on transportation; communications; commercial and critical manufacturing facilities; military installations; energy infrastructure; health and emergency services; government facilities; and waste, water and wastewater systems.
- **Natural Infrastructure Theme** includes impacts on natural coastal and aquatic environments that provide fish and wildlife habitat, water quality and flood reduction benefits, and numerous ecosystem services to the surrounding region.

This theme examines impacts on tidal habitat, aquatic habitat, upland habitat, and beaches and dunes.

The Impact Assessment produced aggregated impact scores across a mesh of 1,375 ft x 1,375 ft grid cells (with a total of 296,000 cells across the study area). Impact scores represent the cumulative impact values for each specific asset type under the theme. A statistically driven approach called K-means clustering was then used to delineate impact scores into three (3) sets of five (5) relative “impact levels” across time horizons (2020, 2040, 2060, and 2080). Impact levels ranged from 1 (lowest) to 5 (highest) and calculated separately relative to the entire coastal region, to each Planning District or Regional Commission, and to each locality. K-means clustering is a data classification method that sorts data into a set of natural classes based to minimize the variation within each cluster and maximize the variation across clusters.⁶ Grid cells with no measured impacts were excluded from any clusters. Workshops with representatives of each Planning District and Regional Commission were used to validate and inform this process and results, and ultimately confirmed this approach as adequately representing their understanding of on-the-ground conditions.

The Planning District and Regional Commission impact levels for the 2080 time horizon were then used to identify three (3) classifications of “regional priority areas” for use in project evaluation. Exact classification varies by impact theme, as described in the table below:

Table 11: Classification for impact levels used to designate regional priority areas by theme.

Impact Theme	Relative Impact Level				
	1 (lowest)	2	3	4	5 (highest)
Community Resources	Medium Priority	High Priority	High Priority	Highest Priority	Highest Priority
Critical Sectors	Medium Priority	High Priority	High Priority	Highest Priority	Highest Priority
Natural Infrastructure	Medium Priority	Medium Priority	High Priority	High Priority	Highest Priority

Maps and graphs showing the distribution of regional priority areas are presented in the figures below. For representation purposes, medium priority areas are shown as yellow, high priority areas are shown as orange, and highest priority areas are shown in red.

⁶ For further information, see *Univariate classification schemes* in [Geospatial Analysis—A Comprehensive Guide, 6th edition](#); 2007–2018; de Smith, Goodchild, Longley.

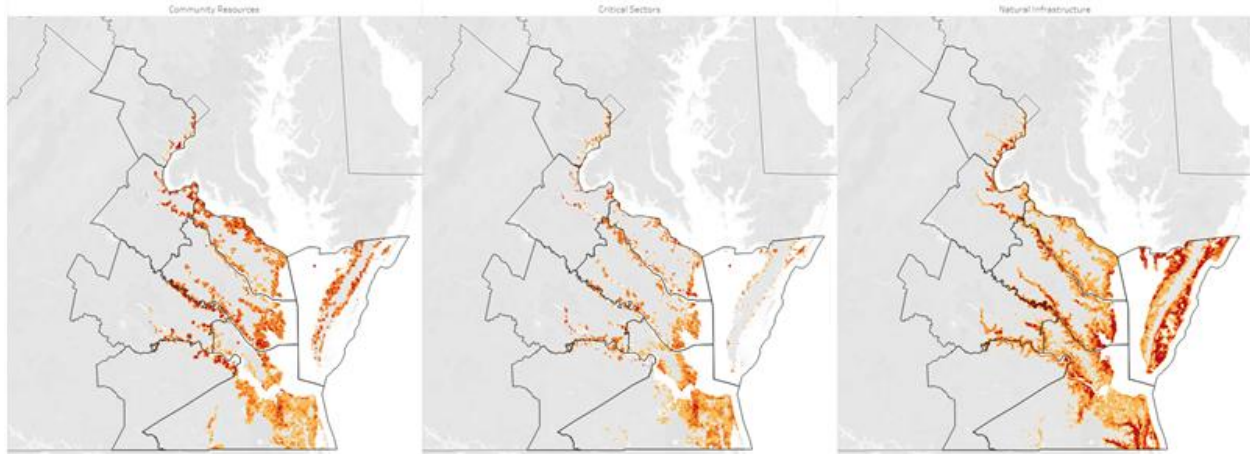


Figure 10: Maps showing the spatial distribution of medium (yellow), high (orange), and highest (red) regional priority areas across themes. Black borders indicate the eight Planning District and Regional Commissions. Community Resources theme is the farthest left.

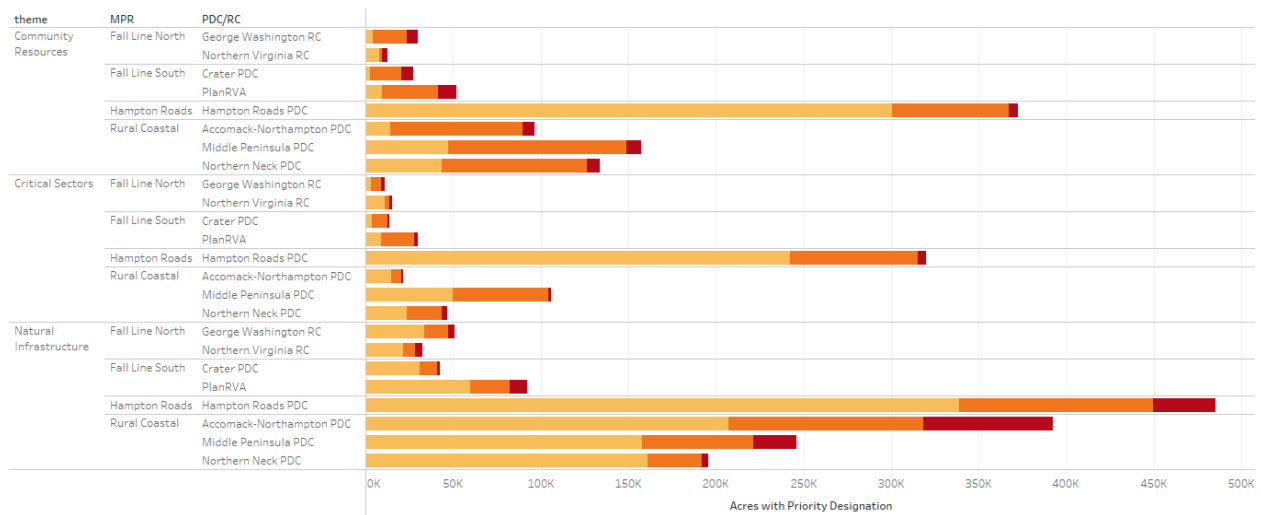


Figure 11: Graph showing the acreage of designated as medium (yellow), high (orange), and highest (red) regional priority areas across Planning District and Regional Commissions and impact themes.

Evaluation Metrics: The evaluation metrics for this criterion are presented in Table 12.

Table 12: Metrics and basis for ranking for Criterion 4: Regional Adaptation Priorities

Metric	Basis for Metric Ranking	Score (Additive)
Community Resource Priority Area (Highest)	The project footprint encompasses an area determined to be the highest regional priority for the protection or adaptation of community resources.	3 Points

Metric	Basis for Metric Ranking	Score (Additive)
Critical Sectors Priority Area (Highest)	The project footprint encompasses an area determined to be the highest regional priority for the protection or adaptation of critical sector assets.	3 Points
Natural Infrastructure Priority Area (Highest)	The project footprint encompasses an area determined to be the highest regional priority for the protection or adaptation of natural infrastructure assets.	3 Points
Community Resource Priority Area (High)	The project footprint encompasses an area determined to be a high regional priority for the protection or adaptation of community resources.	2 Points
Critical Sectors Priority Area (Highest)	The project footprint encompasses an area determined to be a high regional priority for the protection or adaptation of critical sector assets.	2 Points
Natural Infrastructure Priority Area (Highest)	The project footprint encompasses an area determined to be a high regional priority for the protection or adaptation of natural infrastructure assets.	2 Points
Community Resource Priority Area (Medium)	The project footprint encompasses an area determined to be a medium regional priority for the protection or adaptation of community resources.	1 Point
Critical Sectors Priority Area (Highest)	The project footprint encompasses an area determined to be a medium regional priority for the protection or adaptation of critical sector assets.	1 Point
Natural Infrastructure Priority Area (Medium)	The project footprint encompasses an area determined to be a medium regional priority for the protection or adaptation of natural infrastructure assets.	1 Point

Evaluation Approach: The basis for ranking will be determined by quantitative analysis that involves intersecting the project footprint with the regional adaptation priority areas. Only certain project classifications will be evaluated against certain priority areas, as follows:

- All projects will be evaluated for their potential to provide benefits to Community Resource priority areas;
- Structural or Hybrid Projects will be evaluated for their potential to provide benefits to Critical Sectors priority areas; and
- Natural and Nature-Based and Hybrid Projects will be evaluated for their potential to provide benefits to Natural Infrastructure priority areas.

3.2.3.4. Factor 5: Project Benefits

This factor is intended to evaluate whether the project aligns with the CRMP Framework Guiding Principle #5: “Understand fiscal realities and focus on the most cost-effective solutions for protection and adaptation of our communities, businesses, and critical infrastructure.” The extent of project benefits depends on the project type, as shown in Figure 12 and further described below. Multi-faceted projects that span several project types are evaluated against more than one of the relevant criteria.



Figure 12: Evaluation criteria, metrics, and scores for Factor 5: Project Benefits.

Criterion 5a: Project Benefits

Relevant Project Type: Flood Risk Reduction Structures

Evaluation Criteria: The main benefit of structural flood risk reduction structures is the reduction (or elimination) of the amount of flooding that protected areas would experience. Structural projects will be evaluated based on their potential to reduce coastal flood risks across the range of coastal hazard events (tidal to storm surge), focused on the immediate-term planning horizons (2020).

Evaluation Metrics: The evaluation metrics for flood risk reduction structures for this criterion are presented in Table 12.

Table 13: Metrics and basis for ranking for Criterion 5: Project Benefits (Flood Risk Reduction Structures).

Metric	Basis for Metric Ranking	Score (Single)
High Economic Risk	The project is expected to provide a 'High' level of economic flood risk reduction for existing conditions.	10 Points
Moderate Economic Risk	The project is expected to provide a 'Moderate' level of economic flood risk reduction for existing conditions.	7 Points
Low Economic Risk	The project is expected to provide a 'Low' level of economic flood risk reduction for existing conditions.	4 Points

Evaluation Approach: The basis for ranking will be based on quantitative analysis that involves intersecting the "project impact area" (described in the following paragraph) with flood loss results to estimate the monetary value of flood damage avoided by the project. The Average Annualized Loss (AAL) metric will be used since it represents the expected coastal flood loss to residential and non-residential structures across the range of events for any given year. The Impact Assessment produced AAL values across the mesh of 1,375 ft x 1,375 ft grid cells across the study area.

Relating projects to the AAL grid cell values requires an estimate of the area to be impacted by a project, once implemented – the "project impact area". The project impact area will be estimated using the project footprint in conjunction with an estimate of the extent of the benefits (i.e., individual lot, community/sub-watershed, watershed, and multi-jurisdictional). An example of this approach is shown in Figure 13. If the project spans multiple geographic boundaries, the project impact area would be assumed to span both geographies.

The project impact area is then used to select relevant grid cells and compute a total AAL that represents an estimate of flood damage that could be avoided by the project.

Thresholds to represent “low”, “moderate”, and “high” economic flood risk were established by delineating a quantile distribution across all project impact areas. These thresholds:

- *Low Economic Risk*: Less than \$32.9 Million
- *Moderate Economic Risk*: Between \$32.9 Million and \$78.5 Million
- *High Economic Risk*: Greater than \$78.5 Million

It should be noted that these thresholds are subject to change if more projects are added to the project database and change the quantile distribution of AALs in the project impact areas.

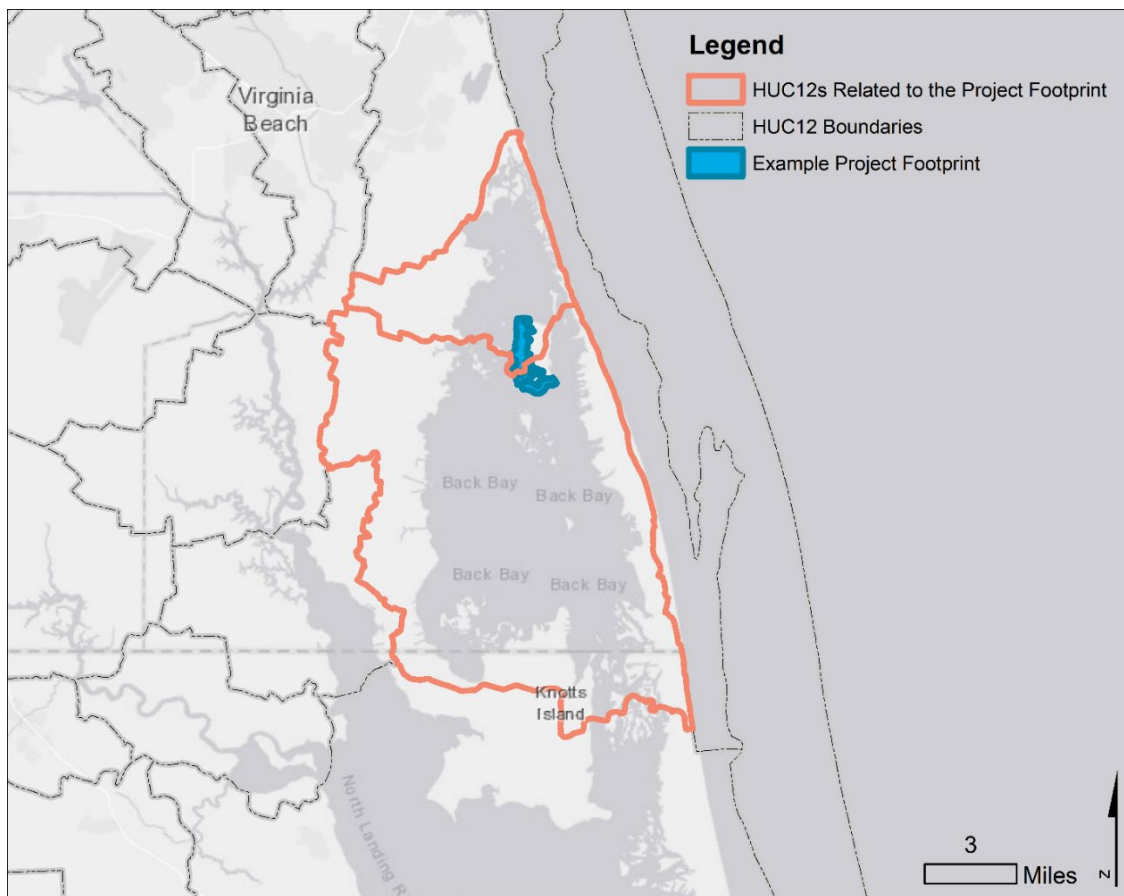


Figure 13: Example of relating the project footprint to the scale of benefits to generate a project impact area.

This approach provides a transparent, standard method for evaluating the extent of benefits across projects of the same project subtype. This approach could be modified during later iterations of the CRMP along with improved methods for benefit estimation. For example, this criterion could be enhanced using Benefit-Cost Analysis (BCA), which is used to evaluate if the benefits of a project outweigh its cost. The benefits are the avoided

losses associated with a proposed project. The costs are the initial and long-term investments associated with a proposed project, including mitigation costs associated with environmental impacts. Several key inputs would be required to perform this analysis including project design life, mitigation costs, and quantification of co-benefits.

Criterion 5a: Project Benefits

Relevant Project Types: Nature-Based; Structural Shoreline Stabilization

Evaluation Criteria: The main benefit of shoreline stabilization measures is the reduction in the amount of shoreline erosion occurring at the site.

Evaluation Metrics: The evaluation metrics for nature-based and structural shoreline stabilization projects for this criterion are presented in Table 14.

Table 14: Metrics and basis for ranking for Criterion 5: Project Benefits (Natural and Nature-Based Approaches).

Metric	Basis for Metric Ranking	Score (Single)
Highest Shoreline Stabilization Benefits	The project is anticipated to benefit a shoreline that is experiencing a high to very high erosion rate.	10 Points
Medium Shoreline Stabilization Benefits	The project is anticipated to benefit a shoreline that is experiencing a medium erosion rate.	7 Points
Lowest Shoreline Stabilization Benefits	The project is anticipated to benefit a shoreline that is experiencing a low erosion rate or is experiencing accretion.	4 Points

Evaluation Approach: The basis for ranking will be based on quantitative analysis that involves using the End Point Shoreline Change Rates computed by the Virginia Institute of Marine Sciences (VIMS) and the project footprint. The project footprint will be used to determine the average shoreline change rate along the reach of the shoreline. The VIMS shoreline erosion rates are defined as:

- *Very High Accretion:* > 10 (ft/yr)
- *High Accretion:* +10 to +5 (ft/yr)
- *Medium Accretion:* +5 to +2 (ft/yr)
- *Low Accretion:* +2 to +1 (ft/yr)
- *Very Low Accretion:* +1 to 0 (ft/yr)
- *Very Low Erosion:* – 0 to -1 (ft/yr)

- *Low Erosion*: -1 to -2 (ft/yr)
- *Medium Erosion*: -2 to -5 (ft/yr)
- *High Erosion*: -5 to -10 (ft/yr)
- *Very High Erosion*: > -10 (ft/yr)

Criterion 5a: Project Benefits

Relevant Project Types: Natural Features; Nature-Based Features; Conservation & Adaptation Projects

Evaluation Criteria: Natural and nature-based features and conservation and adaptation projects should be evaluated based on their provision of co-benefits. Projects that have the potential to protect and enhance natural systems identified by the Commonwealth as priorities for natural habitat and ecosystem diversity, flood and storm protection, scenic preservation, protected landscapes, and water quality improvements, will rank highest against this criterion.

The Virginia Department of Conservation and Recreation (DCR) conducted a data-driven process to help prioritize the most important targeted area for land and water conservation. The ConserveVirginia map is the synthesis of 21 mapped data inputs, which have been divided into seven categories representing overarching conservation values. This criterion will evaluate projects based on their ability to address the following conservation categories: Natural Habitat & Ecosystem Diversity, Floodplains and Flooding Resilience, Agriculture and Forestry Preservation, Protected Landscapes Resilience and Water Quality Improvement.

Evaluation Metrics: The evaluation metrics for this criterion are presented in Table 15.

Table 15: Metrics and basis for ranking for Criterion 5: Project Benefits (Natural Features; Nature-Based Features; Conservation & Adaptation Projects).

Metric	Basis for Metric Ranking	Score (Single)
2+ ConserveVA Layers	The project footprint intersects with areas identified by ConserveVirginia as conservation priorities for "Floodplains and Flooding Resilience"	10 Points
1 ConserveVA Layer	The project footprint intersects with areas identified by ConserveVirginia as conservation priorities for "Natural Habitat and Ecosystem Diversity"	7 Points
No ConserveVA Layers	The project footprint intersects with areas identified by ConserveVirginia as conservation priorities for "Agriculture and Forestry Preservation"	4 Points

Evaluation Approach: The basis for ranking will be determined by quantitative analysis that involves intersecting the project footprint with the relevant ConserveVirginia mapping layers to identify how many layers the project may benefit.

Criterion 5a: Project Benefits

Relevant Project Types: Community Infrastructure

Evaluation Criteria: Infrastructure projects that provide community-scale benefits will rank highest against this criterion. “Community-scale” in this context means that the project provides demonstrable benefits to a populated area.

Evaluation Metrics: The evaluation metrics for Community Infrastructure projects for this criterion are presented in Table 16.

Table 16: Metrics and basis for ranking for Criterion 5: Project Benefits (Community Infrastructure).

Metric	Basis for Metric Ranking	Score (Single Choice)
Large Benefit	The project is anticipated to provide large community-scale benefits.	10 Points
Medium Benefit	The project is anticipated to provide medium community-scale benefits.	7 Points
Small Benefit	The project is anticipated to provide small community-scale benefits.	4 Points

Evaluation Approach: Community infrastructure projects will be evaluated based on the approximate populated area the project is anticipated to benefit. The basis for ranking will be determined differently based on the project subtype. The method for each project subtype is described as follows:

- **Public Facility Elevation, Floodproofing, and Removal** – the estimated population that will benefit from these projects will be estimated based on aggregating the population count within the project impact area. Metric thresholds for population were established based on distribution of scores for public facility elevation, floodproofing, and removal projects, as follows:
 - *Small Benefit:* Population is less than 10,000
 - *Medium Benefit:* Population is between 10,000 and 50,000
 - *Large Benefit:* Population is greater than 50,000
- **Stormwater Drainage Improvements and Utility Retrofit / Upgrades** – the estimated population that will benefit from these projects will be estimated

based on aggregating the population count within the project footprint provided by the owner since it represents the service area the project is intended to cover. The distribution of population counts across projects was similar to the population thresholds above and therefore follow the same approach (e.g. small benefit: < 10,000; medium benefit: 10,000 – 50,000; large benefit: > 50,000).

- **Road/Bridge Elevation** – the estimated population that will benefit from the road/bridge elevation project will be estimated based on the average annual daily traffic (AADT) of the section of road covered by the project footprint. Metric thresholds for AADT were established based on distribution of scores for road/bridge elevation projects, as follows:
 - *Small Benefit*: AADT is less than 10,000
 - *Medium Benefit*: AADT is between 10,000 and 30,000
 - *Large Benefit*: AADT is greater than 30,000

It should be noted that these thresholds are subject to change if more projects are added to the project database and change the distribution of population or AADT values.

3.2.4. SCORING NORMALIZATION

Each project receives a total score that represents the sum of the individual scores for each criterion. The total possible minimum and maximum scores vary across the evaluation criteria. For example, some criteria have a maximum total score of 10 whereas others have a total maximum score of 40. To avoid artificial weighting of individual criteria, the total raw scores are normalized using a consistent scale of 0 (Lowest Score) to 10 (Highest Score).

The formula used for normalizing each raw score is:

normalized score = (raw score - min) / (max - min) * 10, with the min and max values varying for different criteria.

For example, Criteria 1B has a minimum possible value of 0 and a maximum possible value of 12. Therefore, if a project's Criteria 1B raw score is 3 the normalized score will equate to $10 * (3 - 0) / (12 - 0) = 2.5$. However, a raw score of 3 for Criteria 4A (where the min is 0 and the max is 9) would equate 3.33 for the normalized score. Normalizing the raw scores removes bias when summing the values for the total score.

3.2.5. FACTOR/CRITERIA WEIGHTING

The total raw scores can be multiplied by a numerical weight to adjust the relative importance of a factor or criteria. For this first iteration of the CRMP, factor weights were

established to even out the importance of each factor, given that some factors have multiple criteria and others have a single criterion. Factor1 has three (3) criteria, Factor2 has two (2) criteria, and Factor3, Factor4, and Factor5 each have one (1) criteria. To remove artificial weighting across factors, each factor is assigned an overall weight of ten (10), as shown in Table 17.

Table 17: Factor-based weights

Criteria	Weight
1a: Resilient Design Criteria	3.33
1b: Project Need	3.33
1c: Project Purpose	3.33
2a: Community Resources & Capacity	5.00
2b: Social Vulnerability	5.00
3: Nature-Based Outcomes	10.00
4: Regional Adaptation Priorities	10.00
5: Project Benefits	10.00

Future iterations of the CRMP could provide an opportunity for participatory refinement of the prioritization approach through an adjusted statewide or regional weighting schemas. For example, the relative importance of the evaluation factors and criteria may vary based on local, regional, and Commonwealth priorities. This variability can be addressed by capturing regional stakeholder input and special circumstances to refine weights and review outcomes.

3.3. PROJECT TIERING AND NEXT STEPS

All projects that pass the baseline screening process and receive weighted evaluation scores will be grouped into Tier 1, 2, or 3 classifications as illustrated in Figure 14. Tier 1 projects reflect the most resilient and actionable projects that most closely align with CRMP guiding principles. Tier 2 projects may effectively contribute to resiliency and share good alignment with CRMP guiding principles. Tier 3 projects are those that could benefit from improved alignment with CRMP guiding principles.

Projects that fall within the bottom 25th percentile of evaluation scores are not placed within tiers but will be retained within the project database for further research and development in future iterations of the CRMP, similar to the projects that did not meet the baseline screening criteria.

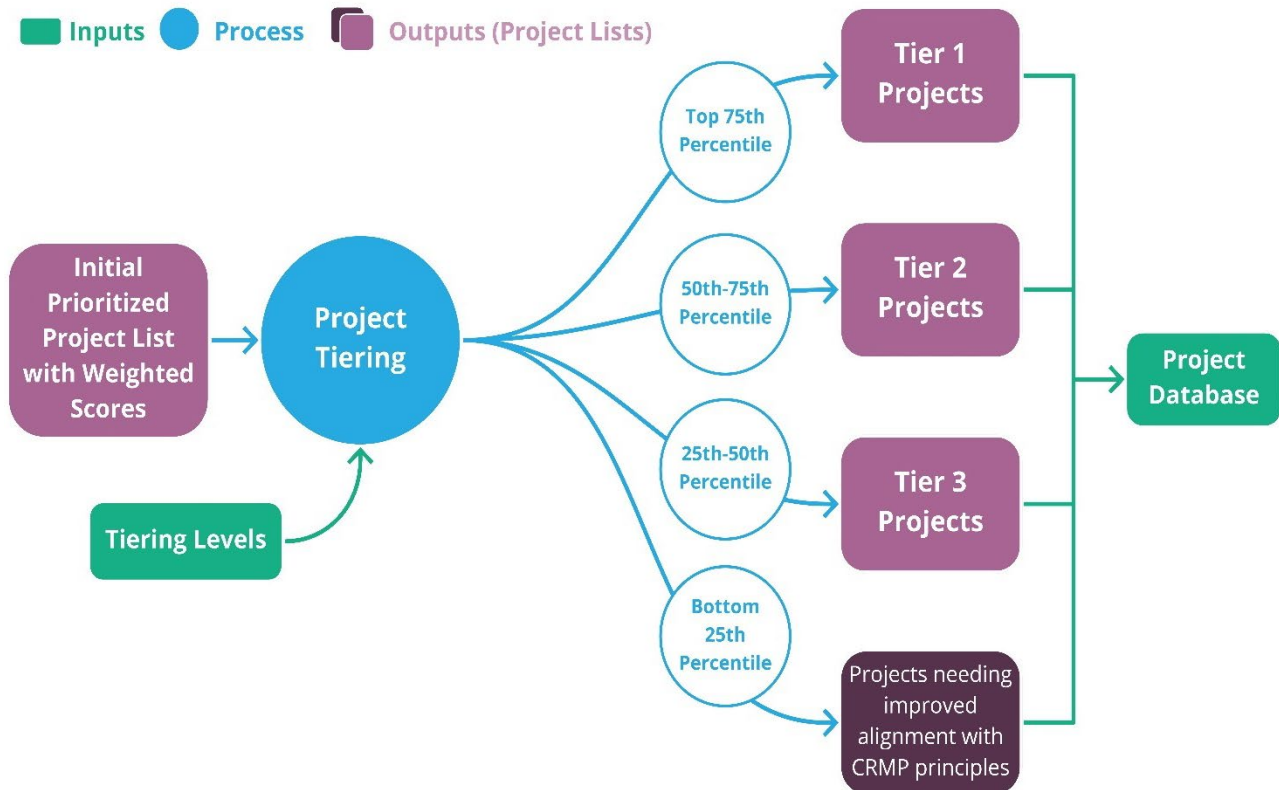


Figure 14: Project tiering process.

The Prioritization Approach provides a transparent, repeatable approach that can be leveraged by project owners to improve prioritization, funding potential, and implementation readiness. For projects that lack data, this process can be used by project owners to identify additional planning and analysis needed to improve the characterization of projects.

For projects that do not meet the baseline screening criteria, or score low in the evaluation scoring, project owners can use this process to better align projects with the CRMP guiding principles and evaluation criteria. For example, there may be an opportunity to develop “project packages” that represent complementary efforts that yield regional benefits rather than individual projects that may not rank high when evaluated in isolation. However, project packages that combine multiple, smaller-scale projects, must be re-evaluated through this process to assess potential upstream or downstream impacts that would reduce their collective impact.

This process can also be used to identify and formulate new projects that align with the CRMP goals and evaluation criteria. While the first iteration of the CRMP will present a list of projects sorted into tiers, this process is intended to such that localities will have access to the project database and continue to enter projects for consideration in future Master Plan iterations.

APPENDIX A – PROJECT CLASSIFICATION SCHEMA

Table 18: Project Class, Type, and Subtype for Nature-Based Projects

Class: Natural and Nature-Based Projects	
Project Type: Natural Features - evolved over time through processes operating in nature.	
Project Subtype	Subtype Definition
Barrier Island Restoration	A variety of restoration techniques, such as the placement of dredged material to increase island height and width, the placement of structures to protect the island from erosive forces, and the placement of sand-trapping fences, which are used in conjunction with vegetation plantings on barrier island beaches.
Dune Creation and Restoration with Beach Nourishment	Creation and restoration of dune systems that match the natural dune pattern in accordance with the natural processes that lead to dune establishment. Dune creation and restoration can be done in concert with beach nourishment, which involves the addition of sand onto or directly adjacent to an eroding beach to combat erosion and increase beach width to protect the dune system and upland coastal habitats.
Hydrologic Connectivity and Floodplain Restoration	Restoration or mimicking natural connections that have been disrupted by infrastructure such as roads and levees. These projects remove barriers to flow (e.g., old flood control structures) or install structures like culverts to enable water to flow under or around an existing barrier.
Maritime Forest Restoration	Manipulation of a degraded forest habitat to restore functions that attenuate and dissipate waves and reduce shoreline erosion. A maritime forest is a coastal wooded habitat found on higher ground than dune areas within the range of salt spray.
Oyster Reef Restoration	Projects to rebuild or restore oyster reefs. Techniques include reef construction using natural or nature-based materials, oyster gardening, and stock enhancement.
Submerged Aquatic Vegetation (SAV) Restoration	Underwater grass beds, known as Submerged Aquatic Vegetation (SAV), are comprised of rooted flowering plants that have colonized primarily soft sediment habitats in coastal, estuarine, or freshwater habitats like the Chesapeake Bay. SAV restoration involves improving conditions for SAV survival or active restoration such as seed dispersal and plantings.
Wetland Creation	Construction of a wetland on a site that never was a wetland. These projects are only feasible with site conditions that can produce and sustain a wetland.

Wetland Restoration	Manipulation of a former or degraded wetland's physical, chemical, or biological characteristics to return its natural functions. Restoration practices include re-establishment (the rebuilding of a former wetland) and rehabilitation (repairing the functions of a degraded wetland).
Project Type: Nature-Based Features - created by human design, engineering and construction for specific services such as coastal hazard risk reduction	
Project Subtype	Subtype Definition
Green Infrastructure	Stormwater control practices that minimize runoff and use engineered soils and vegetation to reduce runoff volumes and remove stormwater pollutants. Examples of green infrastructure include imperviousness minimization, conservation of existing vegetation, soil restoration and deployment of stormwater controls such as bioretention filters, permeable pavement, and vegetated swales.
Living Shoreline	Shoreline management practices, such as living shorelines, that control erosion; protect, restore, and enhance shoreline habitat; and maintain coastal and fluvial processes through strategic placement of plants, stone, sand fill, and organic structural materials.
Project Type: Conservation & Adaptation – Activities that remove flood-exposed infrastructure, conserve natural flood buffers, allow for flood inundation, or provide migration potential for natural systems.	
Project Subtype	Subtype Definition
Buyout Program	Acquisition of properties that have been damaged or are prone to damage caused by storms or storm-related flooding, or acquisition of land and property that may protect other lands or assets from damage.
Conservation Easements	A conservation easement is a voluntary, legal agreement that permanently limits the uses of the land to protect its conservation value and reduce flood damage.
Dam Removal	Dam removal is the process of demolishing a dam to restore natural flows in river and provide flood control and ecosystem benefits.
Land Acquisition	Acquisition of land for flood protection, prevention and conservation purposes, or public access.
Parcel-Level Adaptation Program	Community-scale flood mitigation actions such as structural elevations, floodproofing, or reconstruction to reduce flood damage. Parcel-scale programs that include projects on private property must show greater public benefit for health, safety, and community welfare beyond the benefits to individual property owners.
Public Facility Relocation	Relocation of a public building or other infrastructure puts it out of reach of floodwaters.
Undeveloped Land Conservation	Permanent conservation of undeveloped lands identified as having flood resilience value by ConserveVirginia's Floodplain and Flooding Resilience layer or similar data-driven analytics.

Table: Project Class, Type, and Subtype for Structural Projects.

Class: Structural Projects	
Project Type: Flood Risk Reduction	
Project Types	Project Type Definition
Floodwalls	An engineered, primarily vertical barrier that contains the floodwaters of a river or other waterway. Floodwalls are typically used where space constraints do not allow construction of levees or where there are conflicts with existing buildings or infrastructure.
Levees	Compacted earth structures designed to block floodwaters of a river or other waterway from moving into the protected area behind.
Pump Stations	Stormwater pump stations help protect areas by pumping away large volumes of rainwater, thereby preventing the occurrence of flooding.
Pluvial Measures	Pluvial flood protection measures include regrading slopes to reduce flow, collecting and/or diverting runoff from the face of a slope, conveying runoff from impermeable surfaces, and maintaining vegetation to filter and store water during extreme rainfall events.
Surge Barrier and Tide Gates	A surge barrier is a structural intervention designed to prevent a storm surge or high tide from flooding the protected area behind the barrier. Tide gates can be closed or open depending on tidal elevation and anticipated storm conditions.
Temporary Flood Protection Measures	Temporary flood barriers that can be raised in advance of flood risk and lowered to permit access when flood waters subside
Project Type: Structural Shoreline Stabilization	
Project Types	Project Type Definition
Offshore Breakwater	Large gapped structures offshore to maintain beaches and dunes
Revetment	A sloped structure constructed with large heavy stone, often in two layers, used to anchor the base of the upland bank. The size of a revetment is dictated by the energy of the shoreline environment where it is proposed.
Seawalls	An engineered barrier built parallel to the shore with a primary function to prevent erosion of the shoreline. Although their primary function is erosion control, they can protect against coastal flooding. associated with waves and storm surge.

Project Type: Community Infrastructure

Project Types	Project Type Definition
Public Facility Elevation	Elevating a public building or other infrastructure puts it out of reach of floodwaters.
Public Facility Floodproofing	Public buildings or other infrastructure can be protected from floodwaters through measures such as dry floodproofing, wet floodproofing, material replacement, deployable flood barriers, and facility ring dikes that enclose a facility.
Public Facility Relocation	Relocation of a public building or other infrastructure puts it out of reach of floodwaters.
Road/Bridge Elevation	Elevating roadways and bridges may be necessary to allow continuity of access and transportation during flooding events. In some situations, elevation is necessary to avoid pressure flow and scour impacts to structures. Strategies include pier additions, embankment reinforcement, low and high chords retrofits, and bridge replacement.
Stormwater Drainage Improvements	Drainage improvements are retrofits and upgrades necessary to improve the conveyance capacity of drainage infrastructure (e.g., manholes, catch basins, outfalls, conduits, and stormwater controls) to handle the combined occurrence rain and of coastal flooding, for example tailwater effects due to storm surge, waves, and tides.
Utility Retrofit/Upgrades	Above ground and subsurface utility retrofits to protect against the impacts of flooding. Measures include armoring, localized and corridor-wide measures, relocation, or improved installation.

APPENDIX B – PROJECT INFORMATION SURVEY

The Data Call Form for Flood Resilience Projects is provided on the following pages:

Virginia CRMP Data Call: Flood Resilience Projects

What is the purpose of this survey?

The Commonwealth of Virginia is preparing a Coastal Resilience Master Plan (CRMP) that will serve as a roadmap to flood resilience. The purpose of this survey is to gather details about projects that your locality or organization may have identified to address flooding problems.

The Virginia Coastal Resilience Master Plan Leadership Team, in coordination with the TAC and Project Identification (PI) and the Virginia Coastal Resilience Master Plan consultant team, have identified two main categories: Capacity Building and Planning and Flood Resilience Projects defined as follows:

1. "Capacity Building and Planning" includes engaging stakeholders through community outreach and education, improving the ability of local governments through training of existing staff, hiring personnel, contracting with consultants or advisors, and other related actions that identify and mitigate risk and flood impacts.
2. Flood Resilience Projects" involve activities that would lead to the implementation on-the-ground projects, acquisition of land, or implementation of land use controls that reduce flood risks and impact coastal communities. These projects can include conceptual or preliminary designs, continued and expanded stakeholder engagement efforts, detailed cost estimates, and final design and permitting.

This survey is for [Flood Resilience Projects](#). To submit a Community Capacity Building initiative, please use this survey: <https://arcg.is/0z4nL4>.

Isn't this information available already?

Yes! Some information is available but it is incomplete or outdated. Some information was provided by third or fourth parties rather than directly by contributors, and some did not contain key project attributes to enable project evaluation and prioritization.

The Commonwealth wants your projects represented correctly and equitably, and this can only happen if the information about them is accurate and current.

How will this information be used?

The submitted project information will be evaluated according to the CRMP guiding principles for possible inclusion in the CRMP.

What is the minimum information that I need to provide?

This survey is organized into two sections, Required and Optional.

- *Required Fields* - attributes that are essential to characterize your projects and evaluate their effectiveness. While some projects might not be fully ready to answer some of these questions, please provide your best guess.
- *Optional Fields* - project attributes that are desirable and would help better assess the merits of your project, which could improve its chances of being funded.

What projects should I focus on first?

Please submit all projects you want to be included as part of the CRMP evaluation process by **Friday, August 13**. This survey will remain open to collect projects past that date, but may not be evaluated if entered after that date.

Required Fields

Submitter Name*

Please provide the name of the person familiar with the project planning who can answer questions; typically, an employee of—or agent for—the project owner. The submitter should be the contact person providing the information for this data call.

Submitter contact Info*

Please provide the project contributor's email address, in case we need to reach them to clarify information about the project.

Project Owner*

Enter the locality, agency, entity, sponsor, or person that will be responsible for implementing the project, regardless of land ownership. If a locality will implement the project, the owner is the locality. If a government agency will implement the project, the owner is the government agency. If a private entity will implement the project, the owner is the sponsor of that private entity.

Project Name*

Please provide a short, descriptive name that will distinguish it from other project proposals

Please use underscores between each word in your Project Name, as shown below.

Enter_Project_Name_Here

Related Initiative?*

Is the project related to a capacity building and planning need that you submitted / will submit on the Capacity Building and Planning data call?

Please ensure the Project Name is the same on both forms.

Yes

No

Description*

Please provide a brief description of the project. This should be two sentences long in most cases. The first sentence should clearly state the scope and goals of the project. The second sentence should state the expected outcome from the project and its relevance to the CRMP.

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Project Footprint*

Use the map tool below to draw the approximate geographic footprint of the project.

Polygon - this is the term used for the shape of your project location. It is made up of multiple vertices (i.e. points).

Tips:

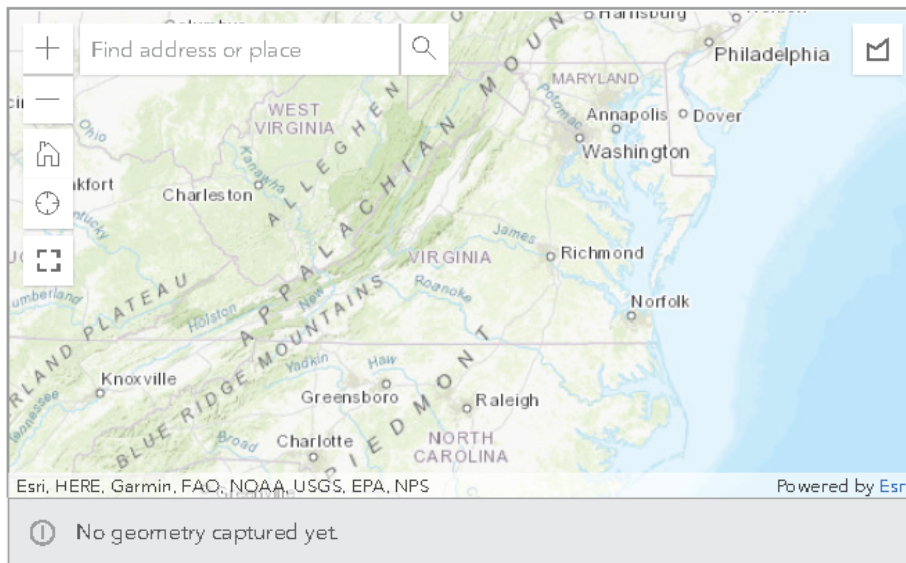
1. Expand the window to make it larger and easier to use.
2. Navigate to the location where you will be creating your polygon by using the Zoom In/Out feature or the 'Find address or place' search bar.
3. Click the Area widget, located at the top-right of the screen.
4. Move your mouse to the map. Click once to create the first vertex. Move your mouse to the next place you want to place another vertex. Continue placing vertices until you are

ready to close the polygon. To finish, double click.

5. You can use the Undo, Reset, Cancel, Delete and Edit tools to revise your polygon.
6. When you are finished, click the "X" button in the upper-righthand corner.

The footprint will depend on the type and scale of your project. A few examples include:

- A project footprint for a structural or natural infrastructure project should represent the estimated extent of the project, once it has been implemented.
- A project footprint for a land conservation strategy (e.g. acquisition or conservation easement) would represent the area of land (e.g. parcel)
- A project footprint for a stormwater infrastructure or utility infrastructure would be the service area the project is intended to cover.



Scale of Benefits*

Estimate the area predicted to benefit from the project, once implemented.

Use [this map](#) if you need assistance locating the HUC boundaries referenced in the choices below. Click 'content' to turn off and on the layers.

Purpose and Need*

What types of coastal hazards is the project intended to reduce? Select all that apply:

 Tidal Flooding - flooding caused by daily or extreme high tides

Storm Surge Flooding - flooding caused by coastal storms including nor'easters and hurricanes

Riverine/Fluvial Flooding - flooding caused by overflowing of rivers and streams

Stormwater/Pluvial Flooding - flooding caused by lack of drainage or overflowing drainage systems due to intense rainfall

Land Degradation - loss or displacement of land, vegetation, or sediment along the coastline

Groundwater Impacts - changes in the boundary between freshwater and saltwater or rising water tables in response to sea level rise

Other

Future Condition Considerations*

The design standards of the project to account for existing and future flood hazards. Select all that apply:

The project considers the SLR Scenario in alignment with the CRMP (defined as the NOAA 2017 Intermediate-High sea level rise projection)

Local Standards that are higher and more risk-averse than the CRMP SLR Scenario

Local Standards that are lower and less risk-averse than the CRMP SLR Scenario

The project considers increased rainfall

The project does not consider future sea level rise or rainfall conditions

Project Subtypes*

Please select the project subtype(s) that best characterize your project. Multiple subtypes can be selected, if appropriate.

Barrier Island Restoration - A variety of restoration techniques, such as the placement of dredged material to increase island height and width, the placement of structures to protect the island from erosive forces, and the placement of sand-trapping fences, which are used in conjunction with vegetation plantings on barrier island beaches.

Buyout Program - Acquisition of properties that have been damaged or are prone to damage caused by storms or storm-related flooding, or acquisition of land and property that may protect other lands or assets from damage.

Conservation Easements - A conservation easement is a voluntary, legal agreement that permanently limits the uses of the land in order to protect its conservation value related to flood protection and prevention.

Dune Creation and Restoration with Beach Nourishment - Creation and restoration of dune systems that match the natural dune pattern in accordance with the natural processes that lead to dune establishment. Dune creation and restoration can be done in concert with beach nourishment, which involves the addition of sand onto or directly adjacent to an eroding beach to combat erosion and increase beach width to protect the dune system and upland coastal habitats.

Dam Removal

Flood Wall - Concrete structures designed around a city of major residential area that blocks floodwaters from reaching the area behind the structure.

Green Infrastructure - Green infrastructure is designed to move urban stormwater away from the built environment and treat stormwater at its source while delivering environmental, social, and economic benefits. Examples of green infrastructure approaches include maintaining green space, strategically installing vegetation to slow runoff and spread water to promote infiltration, and

installing rain gardens

Hydrologic Connectivity and Floodplain Restoration - Restoration or mimicking natural connections that have been disrupted by infrastructure such as roads and levees. These projects remove barriers to flow (e.g., old flood control structures) or install structures like culverts to enable water to flow under or around an existing barrier.

Land Acquisition - Acquisition of land for flood protection and prevention conservation purposes and/or public access.

Levees & Dikes - Compacted earthen structures designed to block water from moving into the protected area behind.

Living Shoreline - A living shoreline is a management practice that provides erosion control benefits; protects, restores, and enhances natural shoreline habitat; and maintains coastal/fluvial processes through strategic placement of plants, stone, sand fill, and other structural organic materials. Living shorelines typically include a low-profile stone structures (e.g. marsh or oyster sill) to maintain tidal marsh and attenuate waves.

Maritime Forest Restoration - Manipulation of a degraded forest habitat to restore functions that attenuate and dissipate waves and reduce shoreline erosion. A maritime forest is a coastal wooded habitat found on higher ground than dune areas within the range of salt spray.

Offshore Breakwaters - Large gapped structures offshore to maintain beaches and dunes

Oyster Reef Restoration - Projects to rebuild or restore oyster reefs. Techniques include reef construction using natural or nature-based materials, oyster gardening, and stock enhancement.

Parcel-Level Flood Adaptation Program - Community-scale flood mitigation actions such as structural elevations, floodproofing, or reconstruction to reduce

flood risks. Parcel-scale programs that include projects on private property must show greater public benefit for health, safety, and community welfare beyond the benefits to individual property owners.

Pluvial Measures - Pluvial flood protection measures include regrading slopes to reduce flow, collecting and/or diverting runoff from the face of a slope, conveying runoff from impermeable surfaces, and reservoirs or holding tanks to store extra water during extreme rainfall events.

Pump Stations - Stormwater pump stations help protect areas by pumping away large volumes of water, thereby preventing the occurrence of flooding.

Public Facility Elevation - Elevating a public building or other infrastructure puts it out of reach of floodwaters without alternating the frequency of inundation events.

Public Facility Removal or Relocation - Removal or relocation of a public building or other infrastructure puts it out of reach of floodwaters without alternating the frequency of inundation events.

Public Facility Floodproofing - Public buildings or other infrastructure can be protected from floodwaters through measures such as dry floodproofing, wet floodproofing, material replacement, deployable floodwalls, and facility ring dikes that enclose a facility and prevent that facility from flood damages even when adjacent portions of the property are inundated.

Roads/Bridge Elevation - Elevating roadways and bridges may be necessary to ensure continuity of access and transportation during flooding events due to multiple sources. In some situations, this will be necessary to avoid pressure flow and scour impacts to structures, which will challenge the long-term sustainability and performance of the structures and accessories associated with bridges. Strategies include pier additions, embankment reinforcement, low and high chords retrofits, and bridge replacement, if necessary.

Revetment - A sloped structure constructed with large heavy stone, often in two layers, used to anchor the base of the upland bank. The size of a revetment is

dictated by the energy of the shoreline environment where it is proposed.

- Seawall - An engineered barrier, typically constructed parallel to the shoreline and with a vertical face. The principal function of a seawall is preventing overtopping by waves and flooding, and erosion associated with waves and storm surges.
- Submerged Aquatic Vegetation (SAV) Restoration - SAV is defined as rooted plants found in shoal areas of Chesapeake Bay or other shallow habitats that provide important ecological roles, such as providing food, shelter, and oxygen as well as trap sediment and dissipate wave energy. SAV restoration involves improving conditions for SAV survival or active restoration such as seed dispersal and plantings.
- Surge Barrier - A structural intervention designed to prevent a storm surge or high tide from flooding the protected area behind the barrier. Tide gates can be closed or open depending on tidal elevation and anticipated storm conditions.
- Stormwater Drainage Improvements - Drainage improvements are defined as retrofits/upgrades necessary to address the peak flow and volume requirements of drainage infrastructure (manholes, catch basins, outfalls, conduits, and stormwater controls) due to the individual or combined occurrence of coastal flooding (tailwater effects due to storm surge, waves, and tides), and precipitation events.
- Temporary Flood Protection Measures - Temporary flood barriers can be raised in advance of flood risk but lowered to permit access when flood risk is absent
- Utility Retrofit/Upgrades - Above ground and subsurface utility infrastructure that need to be protected against the impacts of flooding. Measures include armoring, localized and corridor-wide measures, relocation, or improved installation.
- Undeveloped Land Conservation - permanent conservation of undeveloped lands identified as having flood resilience value by ConserveVirginia Floodplain and Flooding Resilience layer or similar data-driven analytic tool.

Wetland Creation - Construction of a wetland on a site that never was a wetland. These projects are only feasible with site conditions that can produce and sustain a wetland.

Wetland Restoration - Reestablishment of wetland characteristics and functions where they have ceased to exist, or exist in a substantially degraded state.

Other

Project Status*

What is the current (2021) status of the project?

-Please Select-

Total Implementation Cost*

Please enter the total estimate of all planning, engineering, permitting, mitigation, and construction costs. This cost represents the total financial commitment by the Project Owner to proceed from initial project conception to ribbon cutting. The total implementation cost does not include estimated annual operations and maintenance costs. Additional cost breakdowns may be provided as optional fields.

12³

Optional Fields

Project Identifier

Is there a unique identifier that your organization uses to track this project internally?

Owner Classification

Use the drop-down to select the most appropriate owner classification.

-Please Select-

Estimated Start Date

What is the estimated start date for spending on this project, including planning, engineering, and permitting lead time?

Estimated End Date

What is the estimated completion date for the project (when the project will be implemented or constructed and is fully functional)?

Information Link

Is there an Internet URL (webpage address) where interested parties can read more online about the project? This link could lead to a webpage, PDF report, ArcGIS online story map, or similar resource.

Design Life

What is the expected design/service life of the project?

Planning, Engineering, and Permitting Cost

Enter the estimated cost for planning, engineering, and permitting. This value typically will be a fraction of the Total Implementation Cost. The Planning, Engineering, and Permitting Cost plus the Construction Implementation Cost plus the Easement Land Cost should not exceed the Total Implementation Cost.

Construction Implementation Cost

Enter the estimated cost of construction or implementation. This value will typically be a

fraction of the Total Implementation Cost. The Planning, Engineering, and Permitting Cost plus the Construction Implementation Cost plus the Easement Land Cost should not exceed the Total Implementation Cost.

Average Annual Operations & Maintenance Cost

Enter the estimated average annual operations and maintenance cost for the project. This value is separate from the other cost information presented above. It is NOT a portion of the Total Implementation Cost.

Permitting Status

What is the current (2021) status of any required permitting?

Funding - Cost-Share Requirements

Identified projects will be assessed for potential sources of funding. Oftentimes, these funding programs require a cost-share/matching requirement. Does the submitting organization have the ability to raise or collect funding to pay for any cost-share requirements?

 Yes No

Funding - Application Costs

Does the submitting organization have the resources to complete funding applications (e.g. grant applications, etc.)?

 Yes No

Special Consideration Notes

Is there additional clarifying information or context about the extent of project benefits.? This additional information will help the team better evaluate benefits and/or match your project

with potential sources of funding. This field may be blank if there is no need for clarification. Examples of additional information or special considerations include:

- Has the community the project is located in had a major natural disaster, other than COVID-19, under Stafford Act in the last seven years?
- Are there neighborhoods/populations/communities within your project's impact area that you would consider particularly vulnerable to the impacts of climate change and coastal hazard?
- Does the project involve the beneficial use of dredged materials?
- Water quality benefits - does the proposed project include implementation of one or more best management practices with a nitrogen, phosphorus, or sediment reduction efficiency established by the Virginia Department of Environmental Quality or the Chesapeake Bay Program Partnership in support of the Chesapeake Bay TMDL Phase III Watershed Implementation Plan?
- Other benefits that this survey might have not captured?

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Submit

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