Climate Resilience Design Standards Tool
Resilient MA Action Team

One Size Fits All: A Tool for Climate Resilient Design Standards

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Weston & Sampson℠

March 28-30, 2023
Columbus, OH

AGENDA

WHY WAS THE TOOL DEVELOPED?

WHAT IS THE TOOL?

WHEN AND WHERE SHOULD THE TOOL BE USED?

Link to the Tool: https://resilientma.mass.gov/rmat_home/designstandards/

Climate Resilience Design Standards Tool

Resilient MA Action Team

Version 1.1 – updated April 25, 2022

2.5-Year History of Iterative Stakeholder Engagement

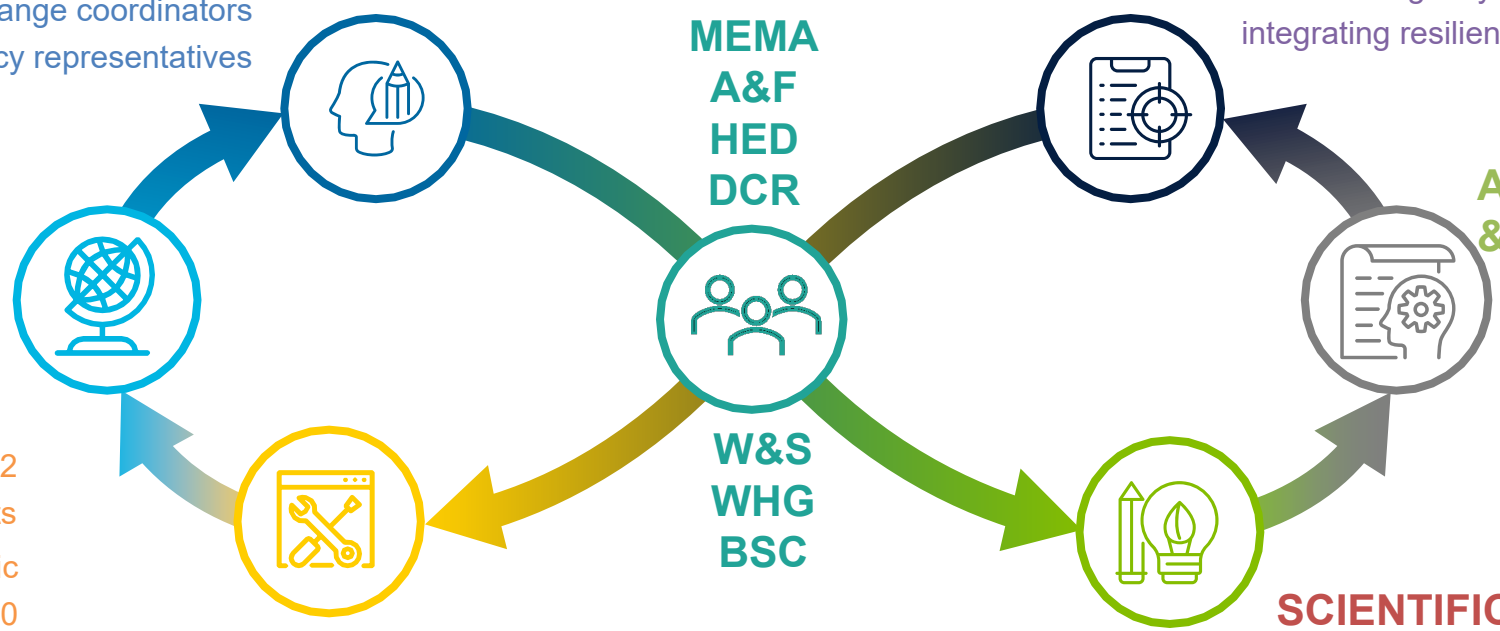
Resilient MA Action Team (RMAT)

Over 30 climate change coordinators and State Agency representatives

2020 PUBLIC COMMENT & 2021 BETA TOOL LAUNCH

Beta Tool Used for FY22 MVP and Massworks Grants

256 Responses to Public Feedback Survey and 20 Focus Groups



TECHNICAL ADVISORY GROUP

50+ consultants, academics, municipalities, regional planning organizations, non-profit agencies, and federal agencies

CAPITAL PLANNING WORKING GROUP

20+ State Agency and A&F representatives focused on integrating resilience into capital planning

ASSETS WORKING GROUPS & PILOT TESTING BETA TOOL

60+ State Agency representatives organized by buildings/facilities, infrastructure, and natural resources asset working groups

SCIENTIFIC WORKING GROUP

20+ leading climate academics, researchers, and others working on local, regional, and country-wide climate science studies

Climate Resilience Design Standards Tool

Resilient MA Action Team

WHY

Integration of climate resilience into capital planning is a 2018 SHMCAP Priority Action

RMAT's Climate Resilience Design Standards Tool (Tool) advances prioritized global (or cross-agency) actions from the SHMCAP.

The Tool supports efforts by Massachusetts agencies and municipalities to integrate best available statewide climate change projections into conceptual planning and design of projects with physical assets.

WHY

GOALS:

- Make preliminary climate resilience analysis **more broadly accessible**
- Provide recommendations based on **consistent use of state's climate data** hosted on **ResilientMa.org**
- Inform **"climate smart" capital planning** and procurement
- Provide a **unified planning and design support tool that state agencies and municipalities** can use for grant applications and evaluation of projects

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WHAT DO YOU NEED TO USE THE TOOL?

- Access to internet, a computer, and a valid email address
- A project with physical assets that has been identified through Capital Planning, HMP, MVP, or other plans and the following preliminary information:

- ❑ **Name** of the project
- ❑ Project **location** and approximate extent of project limits
- ❑ **General details**, including estimated capital costs and contact information
- ❑ Planned or possible **ecosystem service benefits** through the project, if any
- ❑ **Past climate exposure**, if any, for example history of flooding
- ❑ **Asset Information**
  - ❑ Infrastructure Assets
  - ❑ Buildings/Facilities
  - ❑ Natural Resource Assets

The Tool is not recommended for the following types of projects:

- Projects with no physical assets
- Ecological restoration (note: dam removal is a construction type for natural resource assets)
- Demolition projects
- Regular maintenance projects
- Projects without a physical location
- Projects with a location area greater than 3 sq. miles (will need to segment the project and create multiple projects in Tool).

WHAT DO YOU GET FROM THE TOOL?

The Tool is intended to **inform climate resilient planning and design** of infrastructure, buildings, and natural resource assets in Massachusetts.

The Tool's report may be submitted and/or downloaded for inclusion in grant applications and/or project documents.

PRIMARY TOOL OUTPUTS:

- Preliminary Climate **Exposure & Risk** Screening
- Recommended Climate Resilience **Design Standards**

Additional supporting best practices & forms:

- Site Suitability Considerations
- Regional Coordination Considerations
- Flexible Adaptive Pathways Considerations

Recommended to be used in **conjunction with traditional engineering assessments**, feasibility analyses, and cost-benefit analyses to advance planning and design with Project Outputs.

Project Outputs: Preliminary Climate Exposure and Risk Screening

OUTPUTS	PURPOSE
Evaluation of whether project within a mapped Environmental Justice population	Preliminary indication of **potential impact to climate vulnerable populations**, who may have lower adaptive capacity or higher sensitivity to climate hazards like flooding or heat stress due to factors such as access to transportation, income level, disability, racial inequity, health status, or age.
Ecosystem Service Benefits Score	Overall indication of the Ecosystem Service Benefits provided by a project, through **protection of natural resources** and implementation of nature-based solutions.
Preliminary Climate Exposure Score for Sea Level Rise/Storm Surge, Extreme Precipitation, and Extreme Heat	Provide a preliminary assessment of whether the **overall project site** and subsequent assets are **exposed** to impacts of natural hazard events and/or **future impacts of climate change**. This does not substitute a formal vulnerability assessment.
Preliminary Asset Climate Risk Ratings* for Sea Level Rise/Storm Surge, Extreme Precipitation, and Extreme Heat	Provide an initial screening to identify projects and assets with a “High Risk” designation, which may warrant additional review and/or design considerations. High Risk does not mean risky investment, and this does not substitute a formal risk assessment.

Project Outputs: Ecosystem Service Benefits Score

ECOSYSTEM SERVICES BENEFITS
Provides flood protection through nature-based solutions
Reduces storm damages
Recharges groundwater
Protects public water supply
Filters stormwater using green infrastructure
Improves water quality
Promotes decarbonization
Enables carbon sequestration
Provides oxygen production
Improves air quality
Prevents pollution
Remediates existing sources of pollution
Protects fisheries, wildlife, and plant habitat
Protects land containing shellfish
Provides pollinator habitat
Provides recreation
Provides cultural resources/education

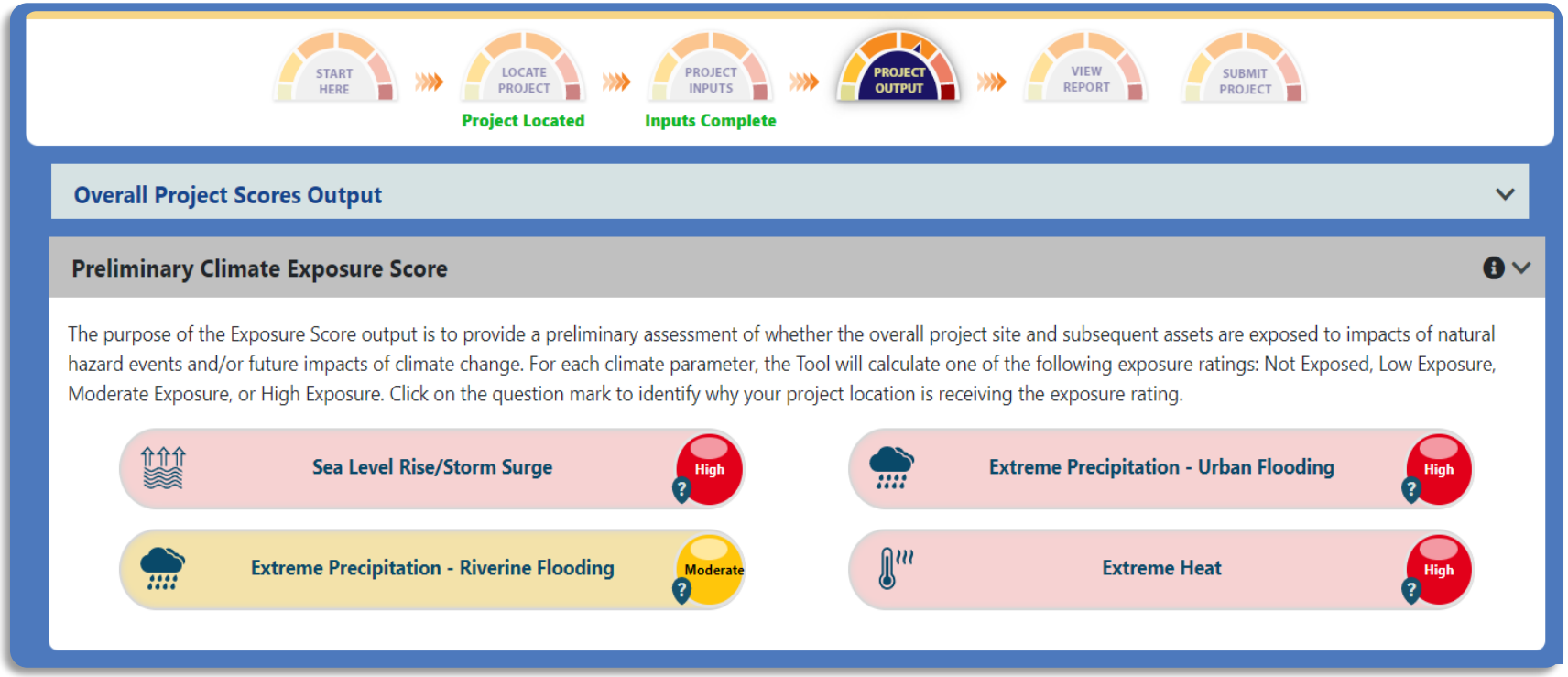
EJ Impacts and Ecosystem Benefits

WHAT

The Tool provides a preliminary indication **of potential impact to climate vulnerable populations** and of the **Ecosystem Service Benefits** provided by a project, through protection of natural resources and implementation of nature-based solutions.

Preliminary Climate Exposure Rating – Project Scale

WHAT



The Tool provides a **preliminary assessment** of whether the overall project site and subsequent assets are **exposed to impacts of natural hazard events and/or future impacts of climate change**.

This does not substitute a formal vulnerability assessment.

Preliminary Climate Risk Rating – Asset Scale

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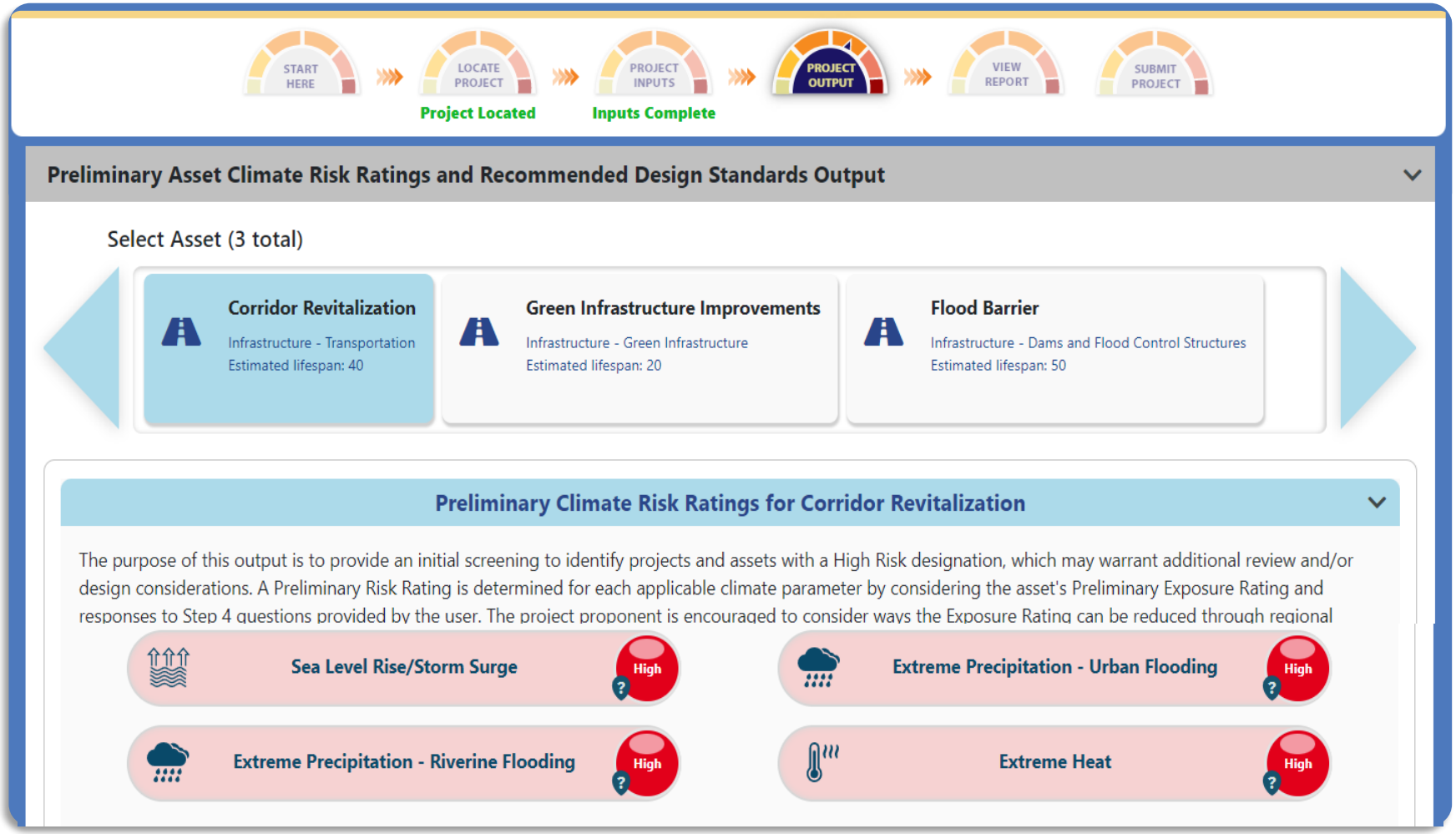

The Tool provides an **initial screening to identify projects and assets with a "High Risk" designation**, which may warrant additional review and/or design considerations.

This does not substitute a formal risk assessment.

Project Outputs: Recommended Climate Resilience Design Standards

The Standards provide a **basis-of-discussion for planning, early design, and evaluation** that is standardized across the Commonwealth based on **asset type, location, criticality, construction type, and useful life** of physical assets.

Each asset receives recommended Design Standards for sea level rise/storm surge, extreme precipitation, and extreme heat. These include recommended

- Intermediate and/or Target **planning horizons**
- **Return period*** or percentile
- Applicable **design criteria** with
  - Definitions
  - Projected values or methodologies for estimating projected values (using planning horizon and return period/percentile)
  - How projected values may inform planning, early design, and project evaluation
  - Limitations

*Note: Natural Resources assets will not receive a recommended return period, but projected values for specified return periods are provided where available to inform planning and early design

Recommended Climate Resilience Design Standards

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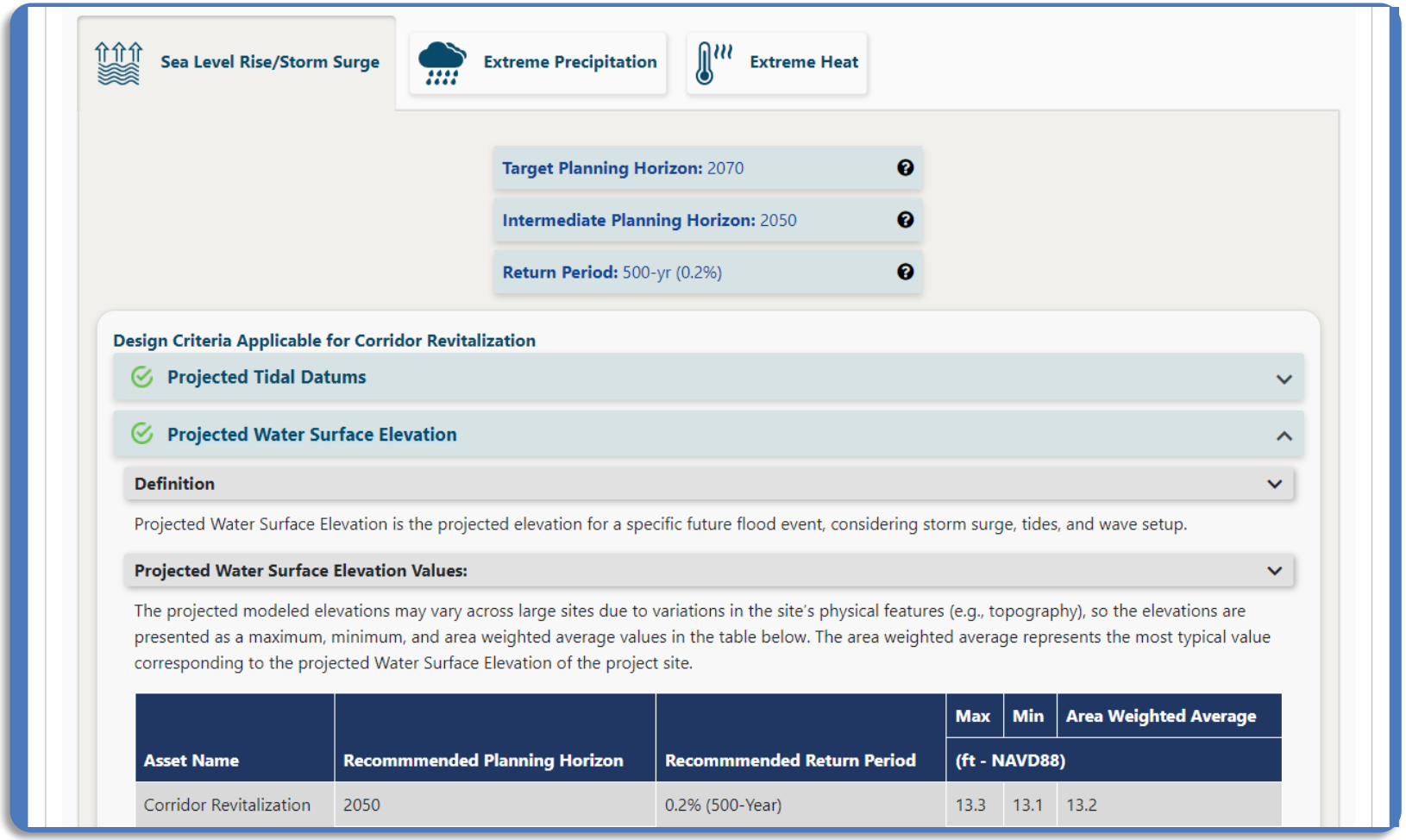


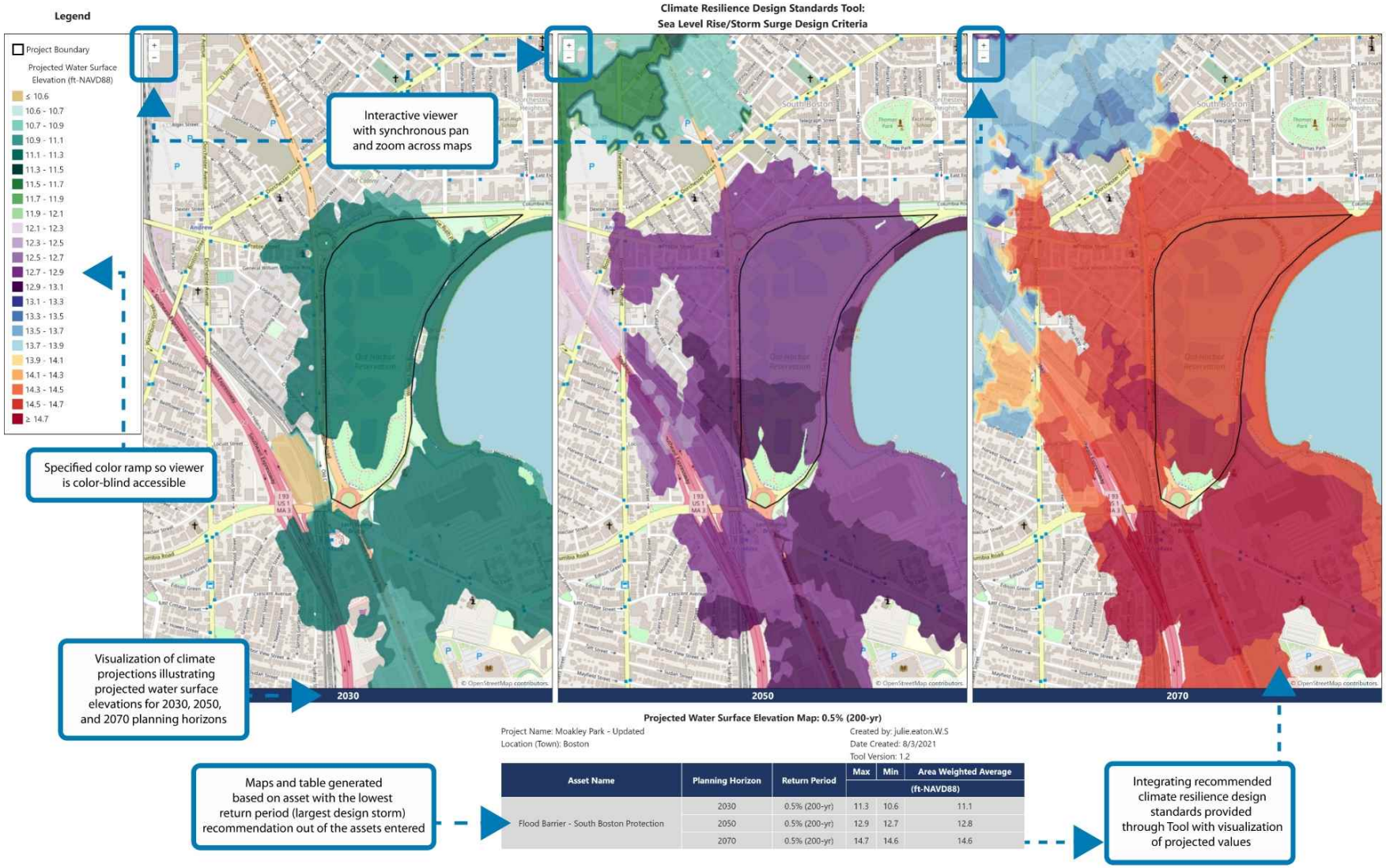
Asset Name	Recommmended Planning Horizon	Recommmended Return Period	Max (ft - NAVD88)	Min (ft - NAVD88)	Area Weighted Average (ft - NAVD88)
Corridor Revitalization	2050	0.2% (500-Year)	13.3	13.1	13.2

Sea Level Rise/Storm Surge Design Criteria:

- Projected Tidal Datums
- Projected Water Surface Elevation
- Projected Wave Action Water Elevation
- Projected Wave Heights
- Projected Duration of Flooding
- Projected Design Flood Velocity
- Projected Scour & Erosion

Recommended Climate Resilience Design Standards

WHAT



Interactive maps visualizing the projected water surface elevations for different planning horizons within 0.5 miles of the project location

Recommended Climate Resilience Design Standards

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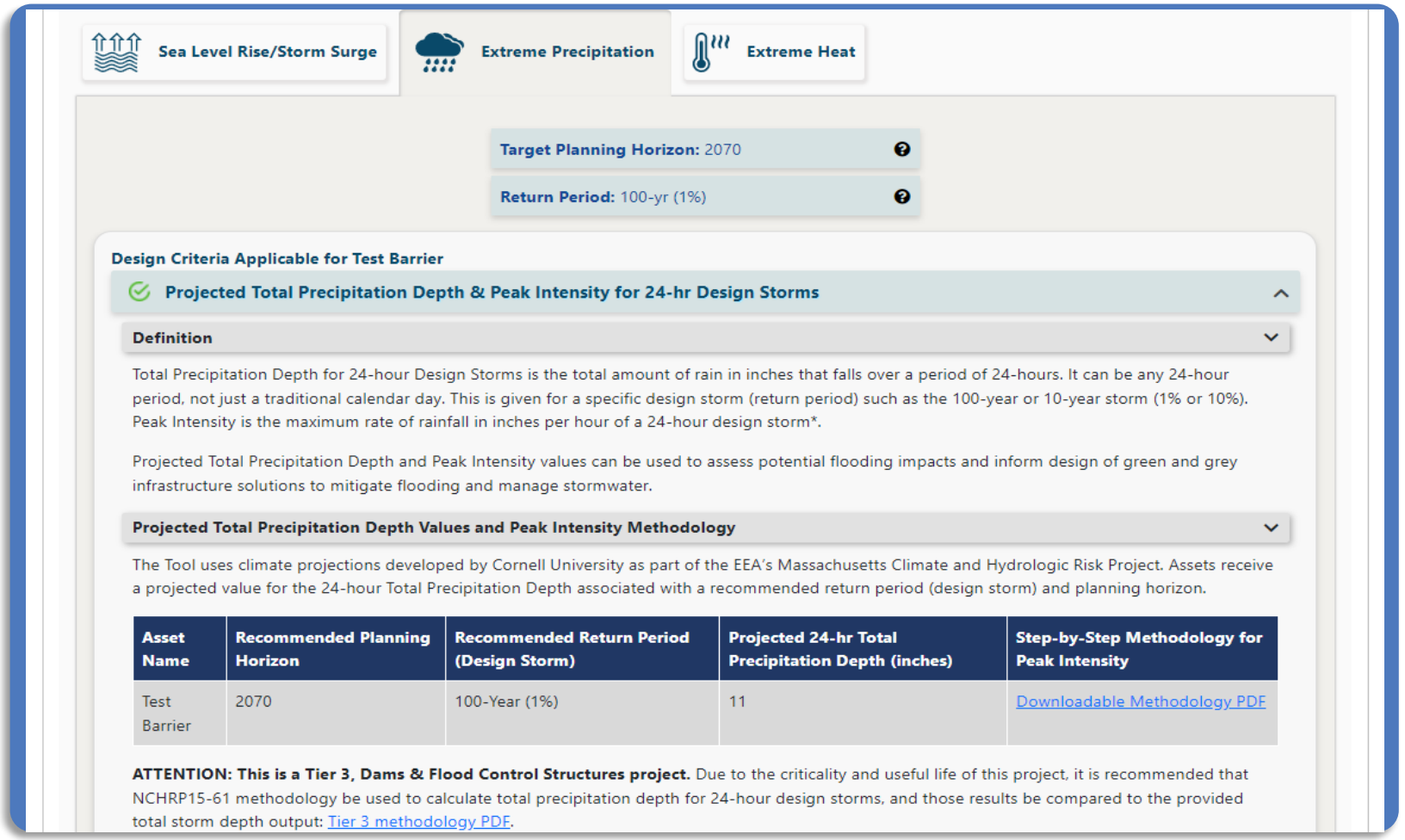
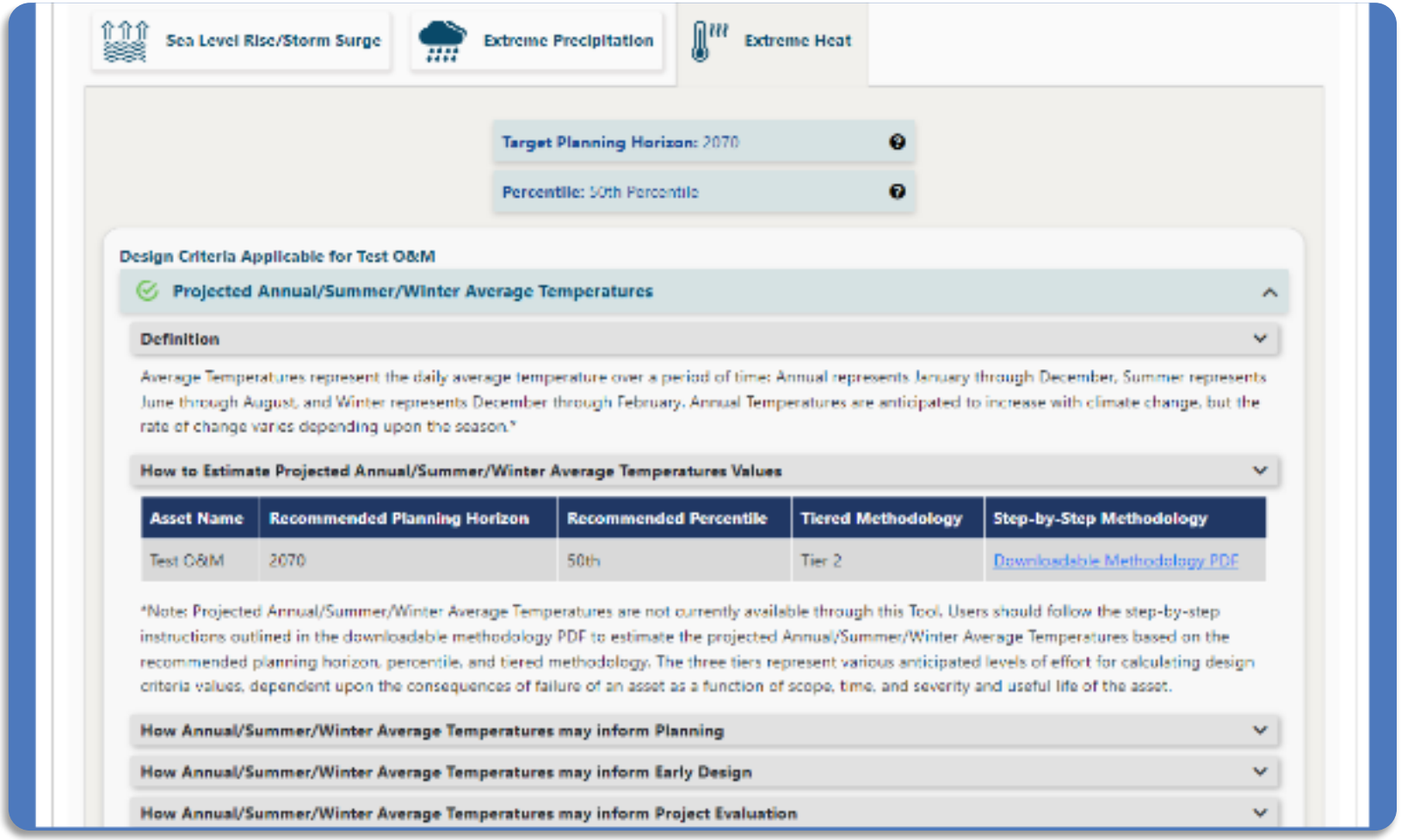


Extreme Precipitation Design Criteria:

- Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms
- Projected Riverine Peak Discharge & Peak Flood Elevation

Recommended Climate Resilience Design Standards

WHAT



Extreme Heat Design Criteria:

- Projected Average Temperatures
- Projected Heat Index
- Projected Days/Year with Max Temp >95, >90, <32F
- Projected Number of Heat Waves & Average Duration
- Projected CDD & HDD
- Projected Growing Degree Days

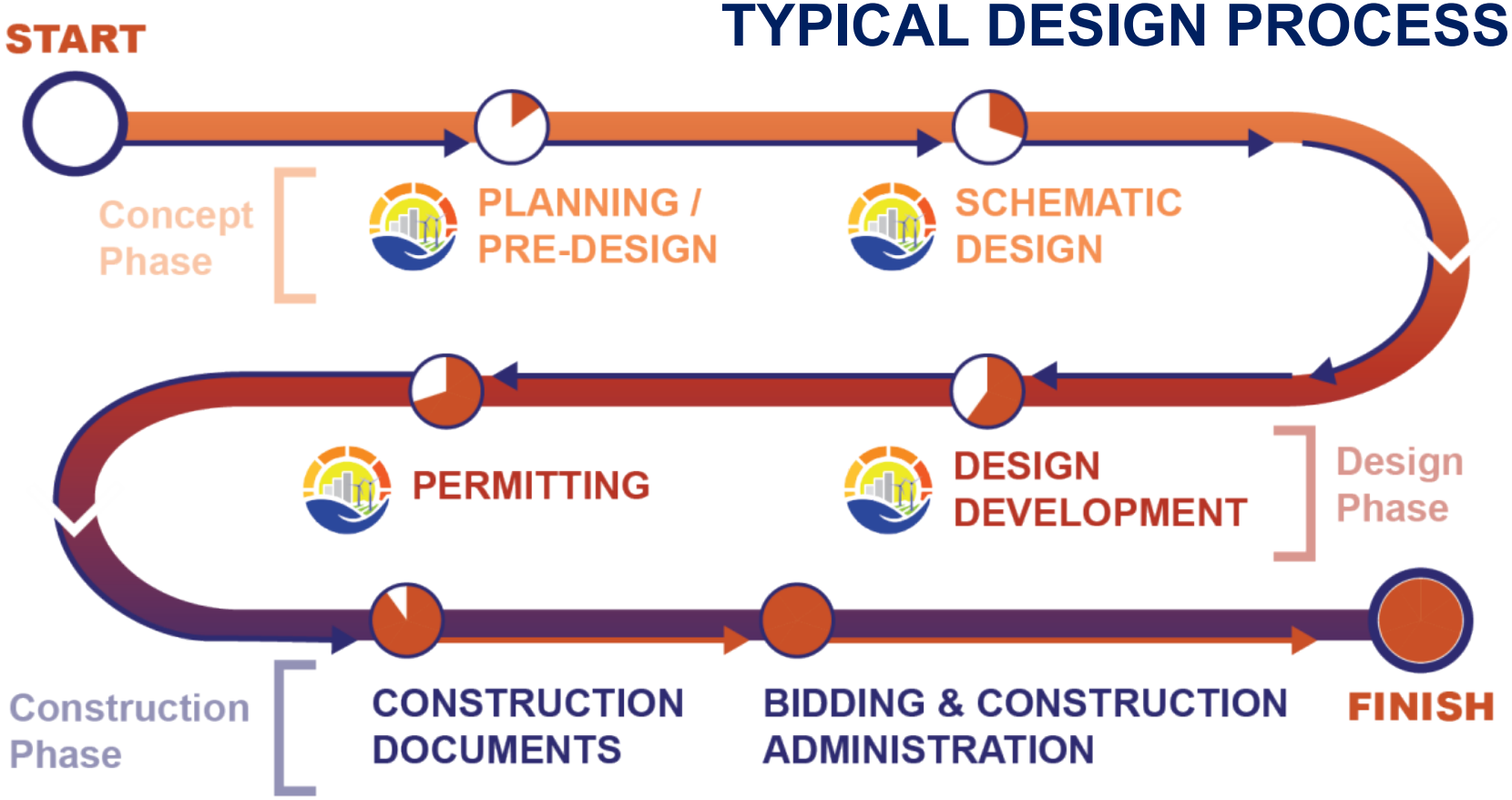
WHEN & WHERE

https://resilientma.org/rmat_home/designstandards/

Where the Tool is recommended for benefit to users. Concept Phase is where most beneficial.

NOTE: *The Tool can be used or updated any time during the design process. If projects are submitted through the Tool, users can create a clone of a submitted project to update as needed.*

TYPICAL DESIGN PROCESS



WHEN & WHERE

Where the Tool is recommended for benefit to users.
Concept Phase is where most beneficial.

Design Process: Concept Phase

START

- Project with physical assets identified through Capital Planning or other means (HMP/MVP)
- Identified need for State Funding

PLANNING/PRE-DESIGN

- General project scope outlined with assets and limit of work (location of project) identified
- Due Diligence for project location
- **Create Project in Tool with preliminary information & review guidance for planning**
- **Consider Site Suitability & Regional Coordination forms**

SCHEMATIC DESIGN

- Preliminary layout, design considerations and constraints identified
- Opinion of probable cost
- **Create/Update Project in Tool with planned design & review guidance for early design**
- **Consider Flexible Adaptive Pathways forms**

Design Process: Design Phase

DESIGN DEVELOPMENT

- Engineering analyses and assessments performed
- Design advanced based on concepts identified through schematic and resolving conflicts

Update Project in Tool (as-needed) and review guidance for project evaluation

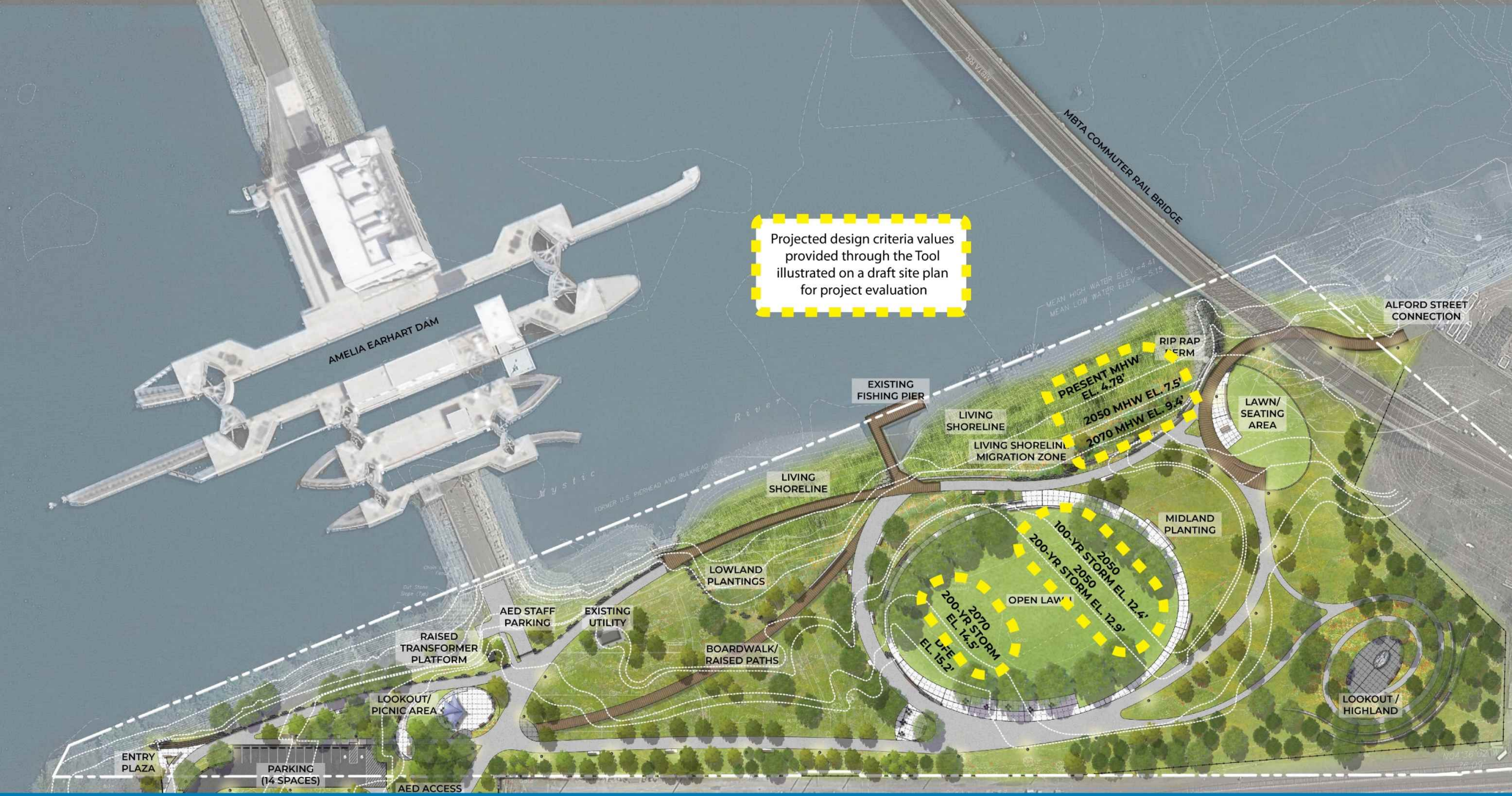
PERMITTING

- Regulatory compliance documents
- Secured approvals from applicable agencies

MEPA process requires Tool Report

Piloting and Implementation Examples

- **FY23 A&F Capital Planning**
  - "For any project that receives at least one "High" risk rating for any of the four climate hazards, your FY23-FY27 CIP submission must also include a **detailed description of how the project is proposing to mitigate any "High" risk climate exposures identified in the tool** through project planning and design."
- **Municipal Infrastructure Grant Programs**
  - MVP
    - **1 point** for utilization and report from the RMAT Climate Resilience Design Standards Tool
    - Up to **3 points** for the degree to which the most up-to-date climate science and data (including data found on resilientma.org, the RMAT Climate Resilience Design Standards Tool, and/or local-level studies) will be utilized, including specific reference to the climate data utilized.
      - **For Project Type 1:** Planning, Assessments, Capacity Building, and Regulatory Updates–how will the project utilize the preliminary climate risk rating and recommended design standards from the RMAT Climate Resilience Design Standards Tool at this assessment phase of the project?
      - **For Project Type 2:** Design and Permitting – How will the project utilize the preliminary climate risk rating and recommended design standards from the RMAT Climate Resilience Design Standards Tool in the design of the project's physical assets? What other climate data and standards will be used to inform the design process and how will they be utilized?
      - **For Project Type 3:** Construction and On-the-Ground Implementation – How does the proposed design meet or fail to meet the recommendations in the RMAT Climate Resilience Design Standards Tool output report? (e.g. planning horizon, return periods, design criteria, methodology). If the proposed design does not follow the recommended design standards, please explain how climate science, data, and projections were used to inform the design of the project. Please cite specific data sources. If a different type of implementation project (e.g., land acquisition) describe how climate data informed the project.
  - **Community One Stop for Growth**
    - Does the project's Climate Resilience Design Tool report provide a "High" preliminary exposure score for either Sea Level Rise/Storm Surge, Extreme Precipitation - Urban Flooding, or Extreme Precipitation - Riverine Flooding?
      - If yes, please specify the design storm (return period) that the applicant plans to use in the engineering of the public infrastructure project (e.g., the 25-year storm or 4% storm). Additionally, please describe any design strategies that the public infrastructure project will incorporate, and/or that the applicant plans to investigate as part of the project's design, to mitigate potential impacts of future flooding.
    - Will the public infrastructure project result in a net increase in impervious area?
      - If yes, please describe any design strategies that the public infrastructure project will incorporate, and/or that the applicant plans to investigate as part of the project's design, to mitigate a heat island effect.


Projected design criteria values provided through the Tool illustrated on a draft site plan for project evaluation
AMELIA EARHART DAM
MBTA COMMUTER RAIL BRIDGE
ALFORD STREET CONNECTION
EXISTING FISHING PIER
LIVING SHORELINE
PRESENT MHW EL. 4.78'
2050 MHW EL. 7.5'
2070 MHW EL. 9.4'
LIVING SHORELINE MIGRATION ZONE
LAWN/ SEATING AREA
MIDLAND PLANTING
100-YR STORM 2050 EL. 12.4'
200-YR STORM 2050 EL. 12.9'
2070 200-YR STORM EL. 14.5'
LFE EL. 15.2'
OPEN LAWN
LOWLAND PLANTINGS
AED STAFF PARKING
EXISTING UTILITY
RAISED TRANSFORMER PLATFORM
BOARDWALK/ RAISED PATHS
LOOKOUT/ PICNIC AREA
LOOKOUT / HIGHLAND
ENTRY PLAZA
PARKING (14 SPACES)
AED ACCESS

THANK YOU!

QUESTIONS?

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