RESILIENTMASS ACTION TEAM (RMAT)

CLIMATE RESILIENCE DESIGN STANDARDS & GUIDANCE

SECTION 2: PROJECT INPUTS

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TABLE OF CONTENTS

2. PROJECT INPUTS 1

2.1 LOCATE PROJECT 1
2.2 STEP 1: CORE PROJECT INFORMATION 2
2.2.1 ENTITY SUBMITTING PROJECT DROPDOWN OPTIONS 2
2.2.2 GRANT PROGRAM DROPDOWN OPTIONS 3
2.3 STEP 2: PROJECT CLIMATE HAZARD EXPOSURE 4
2.4 STEP 3: PROJECT ECOSYSTEM SERVICE BENEFITS 4
2.5 STEP 4: PROJECT ASSETS INFORMATION 7
2.5.1 ASSET CATEGORY 7
2.5.2 ASSET TYPE 7
2.5.3 ASSET SUB-TYPE 8
2.5.4 CONSTRUCTION TYPE 11
2.5.5 ESTIMATED YEAR CONSTRUCTION WILL START 11
2.5.6 ASSET USEFUL LIFE 11
2.5.7 CRITICALITY 13

SECTION 2 ATTACHMENTS 20

Attachment 2-A – Project Inputs Form 21
Attachment 2-B – Building Criticality Worksheet 46
Attachment 2-C – Infrastructure Criticality Worksheet 49

LIST OF TABLES AND FIGURES

Table 2.1. Project Information Provided By User 1
Table 2.2. Project Inputs Related to Project Details for the Tool 2
Table 2.3. Project Inputs Options Related to the Entity Submitting the Project, State Agencies 2
Table 2.4. Project Inputs Options Related to the Entity Submitting the Project, Regional Planning Agency 3
Table 2.5. Project Inputs Related to Grant Program Details for the Tool 3
Table 2.6. Project Inputs Related to Project Climate Hazard Exposure Questions for the Tool 4
Table 2.7. Project Inputs Related to Ecosystem Services Benefits Details for the Tool 6
Table 2.8. Asset Information Provided as Project Inputs for the Tool 7
Table 2.9. Project Inputs Related to Asset Category for the Tool 7

Table 2.10. Project Inputs Related to Asset Type for each Asset Category for the Tool..... 7
Table 2.11. Project Inputs Related to Asset Sub-Type for each Building/Facility Asset Type..... 8
Table 2.12. Project Inputs Related to Asset Sub-Type for each Infrastructure Asset Type 9
Table 2.13. Project Inputs Related to Asset Sub-Type for each Natural Resources Asset-Type.....10
Table 2.14. Project Inputs Related to Construction Type for each Asset Category for the Tool.....11
Table 2.15. Useful Life Recommendations by Asset Type 12
Table 2.16. Project Inputs Related to Time Questions for Building/Facility Criticality 14
Table 2.17. Project Inputs Related to Scope Questions for Building/Facility Criticality 14
Table 2.18. Project Inputs Related to Severity Questions for Building/Facility Criticality.....15
Table 2.19. Project Inputs Related to Time for Infrastructure Criticality 17
Table 2.20. Project Inputs Related to Scope Questions for Infrastructure Criticality 17
Table 2.21. Project Inputs Related to Severity Questions for Infrastructure Criticality.....18

2. PROJECT INPUTS

This section describes the type of information users will need to input into the Climate Resilience Design Standards Tool (the Tool) related to the overall project and proposed physical asset(s).

Users will need to provide information through a selection of pre-populated lists of responses for the project and assets, as well as select automated GIS-based spatial queries, to receive *Project Outputs* from the Tool (described in **Section 3** and **Section 4**). It is expected that users will spend approximately 15 to 30 minutes to *Locate Project* and complete *Project Inputs* depending on the number of physical assets in the project. Refer to **Section 2, Attachment 2-A** for the Project Form that captures the questions in the Tool in the event that the Tool is offline.

Table 2.1. Project Information Provided By User

PROJECT INFORMATION PROVIDED BY USER
Locate Project
Step 1. Core Project Information
Step 2. Project Climate Hazard Exposure
Step 3. Project Ecosystem Service Benefits
Step 4. Project Assets Information

2.1 LOCATE PROJECT

Users will need to draw a polygon that represents the proposed limit of work for the project on a map interface. The project polygon, in conjunction with answers to questions in *Project Inputs*, will be used to inform:

- Exposure and risk to climate hazards, including sea level rise/storm surge, extreme precipitation-stormwater flooding, extreme precipitation-riverine flooding, and extreme heat. Refer to **Section 3, Attachment 3-A – GIS Component Table for Version 1.4** for detailed information regarding the GIS layers queried through the Tool. Refer to **Section 3** for the GIS-spatial relationships informing the Preliminary Climate Hazard Exposure and Risk Screening.
- Recommended design criteria. Refer to **Section 4** for relationships informing the Climate Resilience Design Standards.

The polygon should encompass all physical assets proposed for the project and where the actual project work will take place, rather than the broader area it will impact. If the project location exceeds 3 square miles, or assets proposed are dispersed over a large area, users should break down the project area into multiple polygons, with each polygon submitted as a separate project entry in the Tool. For long/skinny assets (e.g., transportation or piped infrastructure), even if polygon meets the total 3 square mile threshold but spans a large geography (i.e., across municipalities), it is recommended to break up into separate projects.

2.2 STEP 1: CORE PROJECT INFORMATION

The Core Project Information is where the user will provide an overall snapshot of the project and inform the context of the project. Users will be prompted to provide the following basic project details, indicated in Table 2.2 below.

Table 2.2. Project Inputs Related to Project Details for the Tool

PROJECT DETAILS	**Project Name**
	Location of Project
	Estimated Project Capital Cost
	Entity Submitting Project*
	Is this project being submitted as part of a state grant application?**
	Which grant program?*
	What stage are you in your project lifecycle?
	Is climate resiliency a core objective of this project?**
	Is this project being submitted as part of the state capital planning process?**
	Is this project being submitted as part of a project review process or permitting?**
	Brief Project Description

*Inputs will be pre-populated dropdown options for users to select based on respective lists for state agency, funding mechanisms, and grant programs as shown in Tables 2.3, 2.4, and 2.5, respectively.
** Inputs will be pre-populated dropdown options for users to select based on either Yes/No.

2.2.1 *ENTITY SUBMITTING PROJECT DROPDOWN OPTIONS*

Users will be prompted to indicate first if a public or private entity is submitting the project. For public projects, the preliminary lists of state agencies and regional planning agencies included for project management are shown below, in Tables 2.3 and 2.4. This selection is in the form of 'parent agency' and 'child agency,' where the options below indicate the parent agency selections possible. Further options are available for the child agency submitting the project, not shown below. Additionally, users will have the option to select Cities/Towns, or Other, and must provide a Contact Name and Contact Email.

Table 2.3. Project Inputs Options Related to the Entity Submitting the Project, State Agencies

STATE AGENCY SUBMITTING PROJECT*	**Executive Office for Administration and Finance**
	Massachusetts Department of Transportation
	Executive Office of Education
	Executive Office of Energy and Environmental Affairs
	Executive Office of Health and Human Services

	Executive Office of Labor and Workforce Development
	Executive Office of Housing and Economic Development
	Executive Office of Public Safety and Security
	Executive Office of Technology Services and Security

If users select a State Agency for "Who is the submitting entity?", the follow-up question "Is this project identified as an agency priority project, such as in the State Hazard Mitigation and Climate Adaptation Plan (SHMCAP)?" will be asked. If users select a City/Town for "Who is the submitting entity?", the follow-up question "Is this project identified as a priority project in the Municipal Vulnerability Preparedness (MVP) plan or the local or regional Hazard Mitigation Plan (HMP)?" will be asked. If users reply "Yes" to the two questions stated above, they will then be prompted to indicate what planning document identified the project as a priority.

Table 2.4. Project Inputs Options Related to the Entity Submitting the Project, Regional Planning Agency

REGIONAL PLANNING AGENCY SUBMITTING PROJECT*	**Massachusetts Association of Regional Planning Agencies**
	Berkshire Regional Planning Commission
	Cape Cod Commission
	Franklin Regional Council of Governments
	Martha's Vineyard Commission
	Merrimack Valley Planning Commission
	Metropolitan Area Planning Council
	Montachusett Regional Planning Commission
	Nantucket Planning and Economic Development Commission
	Northern Middlesex Council of Governments
	Old Colony Planning Council
	Pioneer Valley Planning Commission
	Southeastern Regional Planning & Economic Development District

2.2.2 *GRANT PROGRAM DROPDOWN OPTIONS*

Projects may be funded by state-wide grant opportunities allowing users to indicate, if so. The grant programs available for selection are indicated in Table 2.5, below.

Table 2.5. Project Inputs Related to Grant Program Details for the Tool

GRANT PROGRA	**MA Office of Coastal Zone Management (CZM)**
	Massachusetts Preservation Projects Fund (MPPF)
	MassWildlife Habitat Management Grant Program (MHMGP)

	Community One Stop for Growth
	Municipal Vulnerability Preparedness (MVP) Program
	Office of Grants and Research (OGR)
	Parkland Acquisitions and Renovations for Communities (PARC) Grant Program

2.3 STEP 2: PROJECT CLIMATE HAZARD EXPOSURE

Project Climate Hazard Exposure is based on the location of the project, GIS-based analysis, and several user questions. In addition to drawing the physical location of the project site on a map, users will be asked several yes/no/unsure questions that will inform the Preliminary Climate Hazard Exposure Ratings as described in **Section 3**.

Table 2.6. Project Inputs Related to Project Climate Hazard Exposure Questions for the Tool

USER QUESTIONS FOR PROJECT CLIMATE HAZARD EXPOSURE	**Does the project site have a history of coastal flooding?**
	Does the project site have a history of riverine flooding?
	Does the project site have a history of flooding during extreme precipitation events?
	Does the project result in a net increase in impervious area of the site?
	Are existing trees being removed as part of the proposed project?

Additional guidance is provided in the Tool to help users assess the correct responses for project climate exposure questions. For example, if the project site has a history of flooding: "Projects that have evidence of flooding as indicated by State and/or local hazard mitigation plans, the NOAA Storm Events Database, or Town/ local historical records. This does not include flooding caused by utility infrastructure failure (e.g., sewer, water, etc.). Coastal flooding examples include inundation of roads, infrastructure or structures due to spring tides, King tides, nor'easters, tropical storms, etc."

2.4 STEP 3: PROJECT ECOSYSTEM SERVICE BENEFITS

Ecosystem Services are critical to mitigating and adapting to the effects of climate change and provide great economic value and social benefit, often untapped in non-resilient projects. As such all projects should consider possible indirect and direct benefits to or provided by ecosystems as part of planning and design. User responses to these questions are meant to provide an overall indication of the Ecosystem Service Benefits (ESB) provided by a project based on protection of natural resources and implementation of nature-based solutions. User responses should consider benefits provided by the project as a whole, as opposed to individual assets.

The questions are intended for projects that are going above and beyond existing regulatory requirements. If users are required to provide a benefit because of regulations (e.g., compensatory storage as a result of increasing fill in a floodplain), users should not answer yes unless it is going above that regulatory requirement. Similarly, if a benefit is generated from the replacement or upgrade of an existing asset to one that complies with current regulations (e.g., improvements to a drainage system that meet Massachusetts Stormwater Management Standards), users should not answer yes unless these improvements exceed the standard regulations

The first question askes users to consider "Is the primary purpose of this project ecological restoration?" This is for projects that restore rivers, streams, wetlands, and watersheds, improving habitat for wildlife, as described by the Division of Ecological Restoration (DER). If physical assets other than natural resources are proposed by the project, users should answer no. Answering "Yes" automatically sets the ESB Score to "High" as defined in **Section 3**.

The Tool guides users to answer questions as to whether the project provides any of the ESBs listed below in Table 2.7. Users will be able to select "Yes" if their project provides the benefit, "Maybe" if the benefit may be integrated into the project if possible, or "No" if the benefit will not be provided by the project. The potential ESBs possible for a project to provide are listed in Table 2.7, below. Responses to these questions will result in an Ecosystem Service Benefits (ESB) score in the Project Outputs. Scoring can be found in **Section 3.2.1**

Table 2.7. Project Inputs Related to Ecosystem Services Benefits Details for the Tool

ECOSYSTEM SERVICES BENEFITS	**Provides flood protection through nature-based solutions**	Project components that prevent or reduce inland or coastal flooding and flood damage to project assets (or other natural areas or infrastructure), through water infiltration, retention, redirection, or buffering of water flow using nature-based solutions. Nature-based solutions are adaptation measures focused on the protection, restoration, and/or management of ecological systems to safeguard public health, provide clean air and water, increase natural hazard resilience, and sequester carbon. Examples of nature-based solutions may include floodplain restoration through to reconnection of a floodplain to the waterway, restoration or protection of stream-side wetland systems, riparian zones and buffers.
	Reduces storm damage	Project components that take measures to mitigate the severity and consequence of storm conditions and impacts, including winds, precipitation, storm surge, waves, ice, water flow, erosion, and sediment movement on an asset. Nature-based solutions in the coastal zone may include living shorelines and the protection or restoration of tidal wetlands, dunes, or oyster reefs.
	Recharges groundwater	Project components that promote the infiltration of surface waters to the groundwater table such as through stormwater infiltration and retention using green infrastructure or nature-based solutions. Co-benefits of this practice include reduction in flooding, contributions to stream base flow and drought amelioration.
	Protects public water supply	Projects that reduce the risk of contamination, pollution, and/or runoff of surface and groundwater sources used for human consumption. Land protection strategies within wellhead protection zones along with other nature-based solutions or green infrastructure designed to reduce pollutant loads from stormwater are examples.
	Filters stormwater using green infrastructure	Project components that absorb and filter stormwater, such as through rain gardens, swales, or bio basins.
	Improves water quality	Projects that mitigate adverse impacts from increased temperature, nutrient, sediment, and pollutant inputs to waterbodies. Project examples may include restoration or protection of riparian zones, vegetation filter strips.
	Promotes decarbonization	Projects that reduce overall carbon emissions through strategies such as using heat pumps for heating and cooling of buildings, or renewable energy sources for electric supply. Projects proponents should refer to the DOER Leading by Example program for additional guidance on decarbonization strategies.
	Enables carbon sequestration	Project components that enable the uptake of carbon containing substances, in particular carbon dioxide, in terrestrial or marine reservoirs. Nature-based climate solutions which may serve as carbon sinks or reservoirs include restoration or protection of woodlands, peatlands and salt marshes along with improved agricultural practices to manage the use of synthetic fertilizers and planting cover crops on croplands.
	Provides oxygen production	Project components that generate oxygen through photosynthesis by plants, trees and other vegetation as part of nature-based solutions. Project examples may include green roofs and living walls in urban settings, restoration or protection of woodlands in terrestrial settings, or restoration of submerged aquatic vegetation (eel grass) in coastal areas.
	Improves air quality	Project components that mitigate adverse impacts from increased atmospheric greenhouse gas concentrations and other toxic air pollutants. For instance the restoration or protection of woodlands and urban tree planting can improve air quality through the uptake of ozone, ammonia and particulates.
	Prevents pollution	Projects that prevent the release of pollutants, including but not limited to contaminants (atmospheric, groundwater, or soil), wastewater (storm or sewage), or other hazardous waste. Project examples may include nature-based solutions that protect a landfill from coastal erosion.
	Remediates existing sources of pollution	Project components that remove existing pollutants or contaminants on-site. Project examples may include aquatic habitat restoration through the dredging of contaminated sediments or removal of contaminated soil as part of a brownfield redevelopment.
	Protects fisheries, wildlife, and plant habitat	Project components that preserve, enhance or restore habitats important for conservation of fish, wildlife, and plant abundance and diversity. Increasing habitat complexity within degraded systems typically leads toward greater production and higher levels of biodiversity. Incorporating or protecting critical habitat features for species of concern, managing invasive populations and providing connectivity to other habitat types are important considerations.
	Protects land containing shellfish	Project components that preserve, enhance or restore coastal habitats important for conservation of shellfish abundance and diversity. As an important component of coastal ecosystems, shellfish support both commercial and recreational fisheries, provide nutrient mitigation, reduce shoreline erosion, provide nursery habitat, and support recreation and cultural heritage values. Project examples may include living shorelines or breakwaters and oyster reef restoration.
	Provides pollinator habitat	Project components that provide feeding, nesting or stopover habitat for pollinators (i.e., hummingbirds, butterflies, moths, beetles, wasps, and most importantly bees). Pollinators are critical for agricultural productivity as well as the many co-benefits provided by a heathy ecosystem. Project examples may include rain gardens with native shrubs that feed bees.
	Provides recreation	Project components that provide active or passive recreational opportunities (such as swimming, paddling, bird watching, hiking or exercise activities) for the public through the use of outdoor spaces.
	Provides cultural resources/education	Project components that 1) provide opportunities for environmental education, scientific study or research or 2) protect important archaeological or historic sites, areas with unique biological communities, geologic or aesthetic features, or cultural heritage values.

2.5 STEP 4: PROJECT ASSETS INFORMATION

The Tool will then prompt users to answer a series of questions for each physical asset in the project based on what assets the user identifies. Users must provide the asset information listed in Table 2.8 for each asset.

Table 2.8. Asset Information Provided as Project Inputs for the Tool

ASSET INFORMATION	**ASSET CATEGORY**
	ASSET TYPE
	ASSET SUB-TYPE
	CONSTRUCTION TYPE
	ESTIMATED YEAR CONSTRUCTION WILL START
	ASSET USEFUL LIFE
	CRITICALITY

2.5.1 *ASSET CATEGORY*

There are three physical asset categories, indicated in Table 2.9, below. Each Asset Category has a different array of Asset Types, Asset Sub-Types, and Construction Types for Project Input options.

Table 2.9. Project Inputs Related to Asset Category for the Tool

ASSET CATEGORY	**BUILDING/FACILITY**
	INFRASTRUCTURE
	NATURAL RESOURCES

2.5.2 *ASSET TYPE*

The Asset Types available for each Asset Category are presented in Table 2.10.

Table 2.10. Project Inputs Related to Asset Type for each Asset Category for the Tool

ASSET CATEGORY	BUILDING/FACILITY	INFRASTRUCTURE	NATURAL RESOURCES
ASSET TYPE	Typically Occupied	Dams and Flood Control Structures	Agricultural Resources
	Typically Unoccupied	Green Infrastructure	Aquatic Ecosystems
		Solid and Hazardous Waste	Coastal Resource Area
		Transportation	Forested Ecosystems
		Utility Infrastructure	Open Space
			Wetland Resource Area - Inland

2.5.3 *ASSET SUB-TYPE*

The Asset Sub-Type inputs available for each Asset Category are presented in Tables 2.11, 2.12, and 2.13, respectively for Building/Facility, Infrastructure, and Natural Resources.

Table 2.11. Project Inputs Related to Asset Sub-Type for each Building/Facility Asset Type

ASSET CATEGORY	BUILDING/FACILITY	
ASSET TYPE	**Typically Occupied**	**Typically Unoccupied**
ASSET SUB-TYPE	Airport	Food distribution center
	Childcare facility	Fuel storage/station
	Community center	Generator
	Correctional facility	Hazardous waste storage
	Elderly housing	Industrial
	Emergency operations/response building (fire, police, etc.)	Maintenance facility
	Emergency shelter	Material storage
	Government building	Mechanical building/vent stack
	Group home	Morgue
	Higher-education facility	Parking facility
	Hospital and mental health facilities	Power transmission facility, substation, and/or generation station
	House/place of worship	Pump Station - Sanitary
	Laboratory	Pump Station - Stormwater
	Library	Rapid Transit/Rail station
	IT data center	Recreational facility
	Judicial center	Solid waste facility (recycling facilities, transfer stations, etc.)
	Military facility	Telecommunications facility/communication tower
	Mixed-use building	Ventilation building/fan plants
	Non-residential building (office, commercial, retail)	Wastewater treatment plant
	Residential building - Public Housing	Water storage tank or tower
	School (primary, secondary, high, vocational, etc.)	Water treatment plant (potable water)
	Other	Other

Table 2.12. Project Inputs Related to Asset Sub-Type for each Infrastructure Asset Type

ASSET CATEGORY	INFRASTRUCTURE				
ASSET TYPE	**Transportation**	**Dams and Flood Control Structures**	**Utility Infrastructure**	**Green Infrastructure**	**Solid and Hazardous waste**
ASSET SUB-TYPE	Pedestrian ways and bikeways	Dams	Energy (electric, gas, petroleum, renewable)	Bioswale	Landfill
	Bridge	Dikes and/or levees	Stormwater utility infrastructure	Green Roof	Solid Waste Facility/Transfer Station
	Bus (stops)	Multi-purpose flood storage	Telecommunications	Permeable Pavement	Other Solid and Hazardous Waste
	Culvert	Seawalls	Wastewater	Rain Garden	
	Ferry/water taxi	Other Flood Barrier	Water	Other Green Infrastructure	
	Ports		Other Utility		
	Railways (rail and rapid transit)				
	Roads (highway)				
	Roads (local)				
	Other Transportation				

Table 2.13. Project Inputs Related to Asset Sub-Type for each Natural Resources Asset-Type

ASSET CATEGORY	NATURAL RESOURCES					
ASSET TYPE	**Coastal Resource Area**	**Forested Ecosystems**	**Aquatic Ecosystems**	**Wetland Resource Area - Inland**	**Agricultural Resources**	**Open Space**
ASSET SUB-TYPE	Barrier beach	Forested swamps	Connecticut and Merrimack Mainstems	Banks	Cropland and/or arable land (annual replanting)	Conservation land
	Coastal bank	Lowland forest	Lakes and Ponds - Non water supply	Bogs	Permanent Cropland	Open recreation space
	Coastal beach	Riparian forest	Large- and mid-size rivers	Emergent wetlands	Permanent Pastures (grasslands, shrublands)	Reserves
	Coastal dune	Shrub swamps	Small streams	Land under Water Bodies or Waterways	Retired Cropland or Farmland	Trails
	Coastal plain ponds	Upland forest		Lower Floodplains		
	Coastal wetland	Woodlands		Marsh		
	Estuarine open water	Young forests and shrublands		Riverfront Area		
	Land subject to coastal 100-year storm flowage			Vernal Pool Habitat		
	Land subject to tidal action			Wet meadows		
	Land under a salt pond			Wooded deciduous swamps		
	Land under an estuary					
	Land under streams, rivers, lakes, or creeks within the coastal zone that are anadromous/catadromous fish runs					
	Land under the ocean					
	Rocky intertidal shores					
	Salt marsh					

2.5.4 *CONSTRUCTION TYPE*

The construction type refers to the proposed type of project related to asset construction. The Construction type inputs available for each Asset Category are presented in the Table 2.14.

Table 2.14. Project Inputs Related to Construction Type for each Asset Category for the Tool

ASSET CATEGORY	BUILDING/FACILITY	INFRASTRUCTURE	NATURAL RESOURCES
CONSTRUCTION TYPE	New Construction	New Construction	New Construction
	Major Repair/Retrofit	Major Repair/Retrofit	Restoration or enhancement
	Maintenance (critical repair)	Maintenance (critical repair)	Maintenance (environmental)
	Maintenance (environmental)	Maintenance (environmental)	Dam removal
	Renovation		

2.5.5 *ESTIMATED YEAR CONSTRUCTION WILL START*

Users will estimate and enter the expected year construction of the asset will start. This year will be used with the asset useful life (as explained below in **Section 2.5.6**), to determine the year through which the asset is expected to last (i.e., before a major reconstruction/renovation).

2.5.6 *ASSET USEFUL LIFE*

Users will estimate the asset's useful life. The useful life represents the estimated number of years before the asset will require significant reconstruction or renovation to continue performing its normal function(s). For example, for residential buildings, we generally expect a useful life of about 30 years before they are expected to undergo a major rehabilitation. For sewer infrastructure, we generally expect a longer useful life, of 50 to 100 years. Refer to Table 2.15 for useful life by asset category recommendations.

Natural resource assets will be asked to estimate the asset's monitoring frequency. Monitoring is the repeated observation and measurement of specific natural resources in order to better understand their condition. Monitoring allows us to detect change, identify any potential problems in the early stages, and measure success. Monitoring Frequency is typically determined based on the goals of the natural resource manager. The monitoring frequency varies based on the chosen variable being monitored and studied, and if often done regularly to evaluate the health of natural resources over time.

The Tool will add the estimated asset's useful life or monitoring frequency to the estimated year construction will start to calculate the year through which the asset is expected to last (i.e., before a major reconstruction/renovation). This calculated year will be used to determine the recommended planning horizon output. A table with this correlation can be found in **Section 4.7.3**.

Table 2.15. Useful Life Recommendations by Asset Type

Typical Useful Life	General Project Types	Typical Buildings / Facilities Elements	Typical Infrastructure Elements
Up to 20 years	Temporary assets or assets with rapidly replaced components	• Temporary building structures • Storage Facilities • Developing Technology components (e.g. telecommunications equipment, batteries, solar photovoltaics, fuel cells, etc.)	• Green infrastructure • Interim and Deployable Flood Barriers • Asphalt pavement, pavers, other right-of-way finishing • Street furniture and outdoor lighting • Developing Technology components (e.g. telecommunications equipment, fuel cells, etc.) • Septic systems • Landscaping
20 to 40 years	Facility improvements and assets with a regular replacement cycle	• Electrical, HVAC, and mechanical components • Most building retrofits (substantial improvements) • Outdoor recreational facilities (e.g. ballfields, courts, playgrounds) • At-site energy equipment (e.g. fuel tanks, conduits, emergency generators) • Infrastructural mechanical components (e.g. compressors, lifts, pumps)	• Concrete paving and public plazas • High voltage transformers • Infrastructural mechanical components (e.g. compressors, lifts, pumps) • Stormwater surface detention systems (e.g. detention pond systems) • Plastic culverts or storm drains • Roundabouts • Landfills
40 to 60 years	Long-lived buildings and infrastructure	• Most building new construction • On-site energy generation or co-generation plants • Water treatment facilities	• Bridges • Culverts (metal) • Seawalls/Bulkheads • Marinas/Ports • Transmission lines • Rail Tracks
60 to 80 years	Assets that are very unlikely to be relocated	• Major infrastructure facilities (e.g. wastewater treatment plants) • Most monumental building foundations	• Reservoirs and Dams • Drinking water distribution systems • Subgrade sewer systems • Subgrade stormwater systems (e.g. conveyance, outfalls, etc.) • Tunnels • Culverts (concrete, HDPE, PVC)

2.5.7 *CRITICALITY*

For building and infrastructure assets only, Project Inputs for each asset will appear as a pre-populated list of questions and options for responses to assess criticality. **These questions will not appear for natural resource assets.**

Criticality is defined as a function of scope, time, and severity for building and infrastructure assets:

- *Scope* is defined as the geographic area and population that would be affected by the loss or inoperability of that asset, such as localized or regional impacts or impacts to vulnerable populations.
- *Time* is the length of time an asset can be inoperable without consequences, for instance, does the asset need to remain operational at all times (such as a hospital) or could the asset be inoperable for a while without consequences (such as a gazebo).
- *Severity* refers to the consequences that are associated from the loss or inoperability of an asset (i.e., public health and safety impacts, economic impacts, environmental impacts).

The questions are used to generate a criticality score, which is used as an internal metric for informing the preliminary risk rating outputs and subsequent recommendation for design standards for building and infrastructure assets. Documents outlining the scoring and methodology informing criticality calculations are attached at the end of **Section 2**, **Attachments 2-B and 2-C**. Answer choices shown in green in Table 2.18 and Table 2.21 indicate override options, which produce a high criticality scoring upon selection. These override options were determined by EEA through feedback received from pilot testing of the Tool with state agencies. Further details on the scope, time, and severity questions and pre-populated answer choices for the buildings and infrastructure asset categories can be found in Tables 2.16 through 2.21.

Table 2.16. Project Inputs Related to Time Questions for Building/Facility Criticality

BUILDING/FACILITY CRITICALITY		
Criticality Component	**Questions**	**Answer Choices**
TIME	1. Identify the length of time the asset can be inaccessible/inoperable without significant consequences.	Building may be inaccessible/inoperable more than a week after natural hazard events without consequences
		Building may be inaccessible/inoperable for more than a day, but less than a week after natural hazard events without consequences
		Building may be inaccessible/inoperable during natural hazard events, but must be accessible/operable within one day after natural hazard events
		Building must be accessible/operable at all times, even during natural hazard events

Table 2.17. Project Inputs Related to Scope Questions for Building/Facility Criticality

BUILDING/FACILITY CRITICALITY		
Criticality Component	**Questions**	**Answer Choices**
SCOPE	2. Identify the geographic area directly affected by permanent loss or significant inoperability of the building/facility.	Impacts limited to site only
		Impacts would be limited to local area and/or municipality
		Impacts would be regional (more than one municipality and/or surrounding region)
		State-wide or greater impacts
	3. Identify the population directly served that would be affected by the permanent loss or significant inoperability of the building/facility.	Less than 100 people
		Less than 1,000 people
		Less than 10,000 people
		Greater than 10,000 people
	4. Identify if the building/facility provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.	The building/facility does not provide services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
		The building/facility provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.

Table 2.18. Project Inputs Related to Severity Questions for Building/Facility Criticality

BUILDING/FACILITY CRITICALITY		
Criticality Component	**Questions**	**Answer Choices**
SEVERITY	5. If the building/facility became inoperable for longer than acceptable in Question 1, how, if at all, would it be expected to impact people's health and safety?	Inoperability of the building/facility would not be expected to result in injuries
		Inoperability of the building/facility would be expected to result in minor impacts to people's health, including minor injuries or minor impacts to chronic illnesses
		Inoperability of the building/facility would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses
		Inoperability of the building/facility would be expected to result in possible loss of life
	6. If there are hazardous materials in your building/facility, what are the extent of impacts related to spills/releases of these materials?	There are no hazardous materials in the building/facility
		Spills and/or releases of hazardous materials would be relatively easy to clean up
		Spills and/or releases of hazardous materials would be moderately difficult to clean up
		Spills and/or releases of hazardous materials are expected with difficult remediation and pose a severe threat to public health or safety (e.g., wastewater treatment plant; biohazard laboratory)
	7. If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts on other facilities, assets, and/or infrastructure?	Minor – Inoperability will not likely affect other facilities, assets, or buildings
		Moderate – Inoperability may impact other facilities, assets, or buildings, but is not expected to affect their ability to operate
		Significant – Inoperability is likely to impact other facilities, assets, or buildings and will likely affect their ability to operate
		Debilitating – Inoperability will result in cascading impacts that will render other facilities, assets, or buildings inoperable and/or prevent the functionality of major regional or statewide facilities and/or delivery of critical services
	8. If this building/facility was damaged beyond repair, how much would it approximately cost to replace?	Less than $10 million
		Between $10 million and $30 million
		Between $30 million and $100 million
		Greater than or equal to $100 million

BUILDING/FACILITY CRITICALITY		
Criticality Component	**Questions**	**Answer Choices**
SEVERITY	9. Is this a recreational facility which can be vacated during a natural hazard event?	No
		Yes
	10. If the building/facility became inoperable for longer than acceptable in Question 1, what are the public and/or social services impacts?	Many alternative programs and/or services are available to support the community
		Some alternative programs and/or services are available to support the community
		Few alternative programs and/or services are available to support the community
		No alternative programs and/or services are available to support the community
	11. If the building/facility became inoperable for longer than acceptable in Question 1, what are the environmental impacts related to natural resources?	No impact on surrounding natural resources is expected
		Impact on natural resources can be mitigated naturally
		Impact on natural resources will require remediation/rehabilitation
		Impact on natural resources is irreversible/natural resource lost
	12. If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts to government services (i.e., the building is not able to serve or operate its intended users or function)?	Loss of building is not expected to reduce the ability to maintain government services
		Loss of building may reduce the ability to maintain some government services, while a majority of services will still exist
		Loss of building may reduce the ability to maintain most government services, while some services will still exist
		Government agency will no longer be able to maintain services
	13. If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts to loss of confidence in government (i.e., the building is not able to serve or operate its intended users or function)?	Reduced morale and public support
		Loss of confidence in government agency
		Loss of confidence in Commonwealth

Table 2.19. Project Inputs Related to Time for Infrastructure Criticality

INFRASTRUCTURE CRITICALITY		
Criticality Component	**Questions**	**Answer Choices**
TIME	1. Identify the length of time the asset can be inaccessible/inoperable without significant consequences.	Infrastructure may be inaccessible/inoperable more than a week after natural hazard events without consequences.
		Infrastructure may be inaccessible/inoperable for more than a day, but less than a week after natural hazard events without consequences.
		Infrastructure may be inaccessible/inoperable during natural hazard events, but must be accessible/operable within one day after natural hazard event.
		Infrastructure must be accessible/operable at all times, even during natural hazard events.

Table 2.20. Project Inputs Related to Scope Questions for Infrastructure Criticality

INFRASTRUCTURE CRITICALITY		
Criticality Component	**Questions**	**Answer Choices**
SCOPE	2. Identify the geographic area directly affected by permanent loss or significant inoperability of the infrastructure.	Impacts limited to location of infrastructure only
		Impacts would be limited to local area and/or municipality
		Impacts would be regional (more than one municipality and/or surrounding region)
		State-wide or greater impacts
	3. Identify the population directly served that would be affected by the permanent loss or significant inoperability of the infrastructure.	Less than 5,000 people
		Less than 10,000 people
		Less than 100,000 people
		Greater than 100,000 people
	4. Identify if the infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.	The infrastructure does not provide services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
		The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
	5. Will the infrastructure reduce the risk of flooding?	No
		Yes

Table 2.21. Project Inputs Related to Severity Questions for Infrastructure Criticality

INFRASTRUCTURE CRITICALITY		
Criticality Component	**Questions**	**Answer Choices**
SEVERITY	6. If the infrastructure became inoperable for longer than acceptable in Question 1, how, if at all, would it be expected to impact people's health and safety?	Inoperability of the infrastructure would not be expected to result in injuries
		Inoperability of the infrastructure would be expected to result in minor impacts to people's health, including minor injuries or minor impacts to chronic illnesses
		Inoperability of the infrastructure would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses
		Inoperability of the infrastructure would be expected to result in possible loss of life
	7. If there are hazardous materials in your infrastructure, what are the extent of impacts related to spills/releases of these materials?	There are no hazardous materials in the infrastructure
		Spills and/or releases of hazardous materials are expected with relatively easy cleanup
		Spills and/or releases of hazardous materials are expected with moderately difficult cleanup
		Spills and/or releases of hazardous materials are expected with difficult remediation and pose a severe threat to public health or safety (e.g., wastewater treatment plant; biohazard laboratory)
	8. If the infrastructure became inoperable for longer than acceptable in Question 1, what are the impacts on other facilities, assets, and/or infrastructure?	Minor – Inoperability will not likely affect other facilities, assets, or buildings
		Moderate – Inoperability may impact other facilities, assets, or buildings, but cascading impacts do not affect ability of other facilities, assets, or buildings to operate
		Significant – Inoperability is likely to impact other facilities, assets, or buildings and result in cascading impacts that will likely affect their ability to operate
		Debilitating – Inoperability will result in cascading impacts that will render other assets inoperable and/or prevent the functionality of major regional or statewide infrastructure or delivery of critical services

INFRASTRUCTURE CRITICALITY		
Criticality Component	**Questions**	**Answer Choices**
SEVERITY	9. If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?	Less than $10 million
		Between $10 million and $30 million
		Between $30 million and $100 million
		Greater than or equal to $100 million
	10. Does the infrastructure function as an evacuation route during emergencies? This question only applies to roadway projects.	No
		Yes
	11. If the infrastructure became inoperable for longer than acceptable in Question 1, what are the environmental impacts related to natural resources?	No impact on surrounding natural resources is expected
		Impact on natural resources can be mitigated naturally
		Impact on natural resources will require remediation/rehabilitation
		Impact on natural resources is irreversible/natural resource lost
	12. If the infrastructure became inoperable for longer than acceptable in Question 1, what are the impacts to government services (i.e., the infrastructure is not able to serve or operate its intended users or function)?	Loss of infrastructure is not expected to reduce the ability to maintain government services
		Loss of infrastructure may reduce the ability to maintain some government services, while a majority of services will still exist
		Loss of infrastructure may reduce the ability to maintain most government services, while some services will still exist
		Government agency will no longer be able to maintain services
	13. What are the impacts to loss of confidence in government resulting from loss of infrastructure functionality (i.e., the infrastructure asset is not able to serve or operate its intended users or function)?	Reduced morale and public support
		Loss of confidence in government agency
		Loss of confidence in Commonwealth

Section 2 Attachments

Attachment 2-A – Project Inputs Form (for use if Tool is offline)

Attachment 2-B – Building Criticality Worksheet

Attachment 2-C – Infrastructure Criticality Worksheet

Attachment 2-A – Project Inputs Form

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Climate Resilience Design Standards Tool

Project Form

The Climate Resilience Design Standards Tool can be found at https://resilient.mass.gov/rmat_home/designstandards/. If, for any reason, the web-tool is inaccessible, please complete this "Project Form" in lieu of the web-tool. The "Project Form" captures the majority of questions found in the web-tool, with the exception of questions requiring geospatial input, and should be attached to grant or other applications in place of the web-tool's "Project Report".

A. Context

The Climate Resilience Design Standards and Guidance project includes:

- **Climate Resilience Design Standards Tool**: a web-tool for agencies that provides a preliminary climate risk screening and recommended climate resilience design standards for State projects with physical assets
- **Climate Resilience Design Guidance:** guidance, best practices, and forms for State agencies to support implementation of recommended climate resilience design standards

The **Project Form accompanies the Climate Resilience Design Standards Tool and is meant to be completed and submitted in lieu of the "Project Report" if the web-tool is inaccessible for any reason.** The Site Suitability, Regional Coordination, and Flexible Adaptation Pathways Forms are **additional, optional forms** that serve to document project information and design considerations.

The forms are structured as follows:

Form Name	Abbreviation	Complete For…	Submission Process
Project Form	*N/A*	Project Questions: Overall Project	**Only submit** this form if the web-tool is inaccessible. Please follow instructions of your grant and other application process.
		Asset Questions: Each Asset	

Form Name	Abbreviation	Complete For…	Submission Process
Site Suitability Form	Form-SS	[Optional] Overall Project	Submit these **optional** forms as a complete package to supplement your grant application or other process.
Regional Coordination Form	Form-RC	[Optional] Overall Project	
Flexible Adaptation Pathways Form	Form-AP	[Optional] Overall Project	

B. Instructions

The Tool prompts users to input details related to the project and physical asset(s). This Project Form contains project-specific questions as well as asset-specific questions, which are further categorized by project asset categories (below) as identified in the web-tool.

- **All projects** should complete the "Project Questions" in Section C of this form.
- Projects with **building/facility assets** should complete the corresponding "Asset Questions" in Section D.
- Projects with **infrastructure assets** should complete the corresponding "Asset Questions" in Section E.
- Projects with **natural resource assets** should complete the corresponding "Asset Questions" in Section F.

C. Project Questions (All projects)

Provide the responses to related to the **overall project.**

Step 1: Core Project Information

The Core Project questions pertain to the proposed project in its entirety and are intended to provide a high-level snapshot of the project. The information provided in Step 1 does not directly influence recommendations or outputs of the Tool and are features that can be used to search for projects. If you aren't sure how to answer a question, click on the question mark icon. Questions related to specific physical assets are asked in Step 4.

Core Project Information	Answer
Project Name:	Click or tap here to enter text.
Location of Project: Please select the Massachusetts municipality and/or municipalities where the proposed project is located.	Click or tap here to enter text.
Estimated Capital Cost: This refers to the estimated total project cost through completion or construction. This number should reflect the dollar value estimated for capital planning and budgetary purposes. When associated with a grant, this number should match the total project cost given in the grant application. This number is not meant to reflect ratings or recommendations provided through the Tool.	Click or tap here to enter text.
Entity Submitting Project: Please select the State Agency, Municipality, Regional Planning Authority, or Other responsible for the planning, design, and/or construction of the project. Publicly owned assets and privately owned assets should be submitted as separate projects in this Tool. Public: defined as projects led by a public entity and focused on an asset owned by a municipality or state or federal agency. Private: defined as projects led by a private entity and focused on an asset owned by a private entity. If a project entails a combination of public and private ownership, you should submit the publicly owned assets and the privately owned assets as separate projects.	☐ Public ☐ Private Organization Name: Click or tap here to enter text. Contact Name: Click or tap here to enter text. Contact Email: Click or tap here to enter text.
Is this project being submitted as part of a state grant application? Examples of state grant applications include the Municipal Vulnerability Preparedness (MVP) Program. In contrast, the Chapter 90 Program and State Revolving Fund (SRF) Loan Program are state funding programs but are not state grants.	☐Yes ☐ No
What stage are you in your project lifecycle? Pre-Planning: These projects are very early on in the planning process with an overall project concept, but specific project details are mostly unknown. Planning: These projects are in the process of conducting assessments and evaluating alternatives to inform the scope of future design, permitting, and construction work. Design or Permitting: These projects are in the process of engineering assets (infrastructure, buildings, and/or natural resources) and/or are in the process of completing permitting or regulatory reviews. Construction: These projects have permit-approved construction documents and/or are in the process of construction.	☐ Pre-Planning ☐ Planning ☐ Design ☐ Permitting ☐ Construction ☐ No physical assets planned for this project

Is climate resiliency a core objective of this project? Resilience is the ability to withstand and recover from an extreme event. Ideally, resilient systems "bounce forward" to create healthier, greener, and more equitable systems and spaces. Projects that incorporate climate resilience as a core objective adapt assets to changing climate conditions, and prioritize designing above and beyond regulatory requirements by leveraging available resources such as the RMAT's Climate Resilience Design Guidance and Standards.	☐ Yes ☐ No
Is this project being submitted as part of the state capital planning process? The State Capital Planning Process identifies the budget and financing needed to support the State's assets, which can include infrastructure and natural resources. In Massachusetts, capital planning is led by the State's Executive Office for Administration and Finance (A&F). The state capital planning process does not include municipal grant applications.	☐ Yes ☐ No
Is this project being submitted as part of a regulatory review process or permitting? For example, an applicable regulatory review process could include MEPA environmental review. Please note that the RMAT's tool assumes that projects submitted already meet baseline regulatory requirements, for example the Massachusetts Stormwater Management Standards. The RMAT's guidance is intended to assist projects in incorporating climate resilient considerations that exceed baseline requirements.	☐ Yes ☐ No
Brief Project Description: Please summarize the project's main goals, anticipated tasks, and contribution towards advancing climate resilience and adaptation in the Commonwealth (500 character limit). Please indicate what permits the project will require (if any).	Click or tap here to enter text.

Step 2: Project Ecosystem Benefit

Ecosystem Services are critical to mitigating and adapting to the effects of climate change. As such all projects should consider possible indirect and direct benefits to or provided by ecosystems as part of planning and design. Your responses to these questions should consider benefits provided by the project as a whole, as opposed to individual assets.

Please indicate if the project provides a benefit (select YES), if the benefit may be integrated into the project if possible (select MAYBE), or if the benefit will not be provided in the project (select NO).

The questions are intended for projects that are going above and beyond existing regulatory requirements. If you are required to provide a benefit because of regulations, for example, compensatory storage as a result of increasing fill in a floodplain, you should not answer yes unless it is going above that regulatory requirement. Refer to the information icons for additional guidance, including definitions and subsequent examples of each ESB.

Ecosystem Services Benefits	YES	NO	MAYBE
Is the primary purpose of this project ecological restoration?	☐	☐	☐
Provides flood protection through green infrastructure or nature-based solutions Project components that prevent or reduce inland or coastal flooding and flood damage to project assets (or other natural areas or infrastructure), through water infiltration, retention, redirection, or buffering of water flow using nature-based solutions. Nature-based solutions are adaptation measures focused on the protection, restoration, and/or management of ecological systems to safeguard public health, provide clean air and water, increase natural hazard resilience, and sequester carbon. Examples of nature-based solutions may include floodplain restoration through to reconnection of a floodplain to the waterway, restoration or protection of stream-side wetland systems, riparian zones and buffers.	☐	☐	☐
Reduces storm damage Project components that take measures to mitigate the severity and consequence of storm conditions and impacts, including winds, precipitation, storm surge, waves, ice, water flow, erosion, and sediment movement on an asset. Nature-based solutions in the coastal zone may include living shorelines and the protection or restoration of tidal wetlands, dunes, or oyster reefs.	☐	☐	☐
Recharges groundwater Project components that promote the infiltration of surface waters to the groundwater table such as through stormwater infiltration and retention using green infrastructure or nature-based solutions. Co-benefits of this practice include reduction in flooding, contributions to stream base flow and drought amelioration.	☐	☐	☐
Protects public water supply Projects that reduce the risk of contamination, pollution, and/or runoff of surface and groundwater sources used for human consumption. Land protection strategies within wellhead protection zones along with other nature-based solutions or green infrastructure designed to reduce pollutant loads from stormwater are examples.	☐	☐	☐
Filters stormwater using green infrastructure Project components that absorb and filter stormwater, such as through rain gardens, swales, or bio basins.	☐	☐	☐
Improves water quality Projects that mitigate adverse impacts from increased temperature, nutrient, sediment, and pollutant inputs to waterbodies. Project examples may include restoration or protection of riparian zones, vegetation filter strips.	☐	☐	☐
Promotes decarbonization Projects that reduce overall carbon emissions through strategies such as using heat pumps for heating and cooling of buildings, or renewable energy sources for electric supply. Projects proponents should refer to the DOER Leading by Example program for additional guidance on decarbonization strategies.	☐	☐	☐
Enables carbon sequestration Project components that enable the uptake of carbon containing substances, in particular carbon dioxide, in terrestrial or marine reservoirs. Nature-based climate solutions which may serve as carbon sinks or reservoirs include restoration or protection of woodlands, peatlands and salt marshes along with improved agricultural practices to manage the use of synthetic fertilizers and planting cover crops on croplands.	☐	☐	☐
Provides oxygen production Project components that generate oxygen through photosynthesis by plants, trees and other vegetation as part of nature-based solutions. Project examples may include green roofs and living walls in urban settings, restoration or protection of woodlands in terrestrial settings, or restoration of submerged aquatic vegetation (eel grass) in coastal areas.	☐	☐	☐

Improves air quality Project components that generate oxygen through photosynthesis by plants, trees and other vegetation as part of nature-based solutions. Project examples may include green roofs and living walls in urban settings, restoration or protection of woodlands in terrestrial settings, or restoration of submerged aquatic vegetation (eel grass) in coastal areas.	☐	☐	☐
Prevents pollution Projects that prevent the release of pollutants, including but not limited to contaminants (atmospheric, groundwater, or soil), wastewater (storm or sewage), or other hazardous waste. Project examples may include nature-based solutions that protect a landfill from coastal erosion.	☐	☐	☐
Remediates existing sources of pollution Project components that remove existing pollutants or contaminants on-site. Project examples may include aquatic habitat restoration through the dredging of contaminated sediments or removal of contaminated soil as part of a brownfield redevelopment.	☐	☐	☐
Protects fisheries, wildlife, and plant habitat Project components that preserve, enhance or restore habitats important for conservation of fish, wildlife, and plant abundance and diversity. Increasing habitat complexity within degraded systems typically leads toward greater production and higher levels of biodiversity. Incorporating or protecting critical habitat features for species of concern, managing invasive populations and providing connectivity to other habitat types are important considerations.	☐	☐	☐
Protects land containing shellfish Project components that preserve, enhance or restore coastal habitats important for conservation of shellfish abundance and diversity. As an important component of coastal ecosystems, shellfish support both commercial and recreational fisheries, provide nutrient mitigation, reduce shoreline erosion, provide nursery habitat, and support recreation and cultural heritage values. Project examples may include living shorelines or breakwaters and oyster reef restoration.	☐	☐	☐
Provides pollinator habitat Project components that provide feeding, nesting or stopover habitat for pollinators (i.e., hummingbirds, butterflies, moths, beetles, wasps, and most importantly bees). Pollinators are critical for agricultural productivity as well as the many co-benefits provided by a heathy ecosystem. Project examples may include rain gardens with native shrubs that feed bees.	☐	☐	☐
Provides recreation Project components that provide active or passive recreational opportunities (such as swimming, paddling, bird watching, hiking or exercise activities) for the public through the use of outdoor spaces.	☐	☐	☐
Provides cultural resources/education Project components that 1) provide opportunities for environmental education, scientific study or research or 2) protect important archaeological or historic sites, areas with unique biological communities, geologic or aesthetic features, or cultural heritage values.	☐	☐	☐

Step 3: Project Climate Hazard Exposure

Projects should indicate if the project location has experienced flooding in the past or if proposed site improvements include increasing the net impervious area on the site or removing trees. This information will be used in conjunction with the polygon drawn for the project to establish a Preliminary Climate Hazard Exposure and Risk Ratings.

Core Project Information	YES	NO	UNSURE
Does the project site have a history of coastal flooding? Projects that have evidence of flooding since 1990, as indicated by State and/or local hazard mitigation plans, the NOAA Storm Events Database, or Town/ local historical records. This does not include flooding caused by utility infrastructure failure (e.g., sewer, water, etc.). Coastal flooding examples include inundation of roads, infrastructure or structures due to spring tides, King tides, nor'easters, tropical storms, etc.	☐	☐	☐
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)? Projects that have evidence of flooding since 1990, as indicated by State and/or local hazard mitigation plans, the NOAA Storm Events Database, or Town/ local historical records. This does not include flooding caused by utility infrastructure failure (e.g., sewer, water main breaks, etc.), but does include flooding from overwhelmed sewer or drainage infrastructure, excessive stormwater runoff, inundation of built structures, etc.	☐	☐	☐
Does the project site have a history of riverine flooding? Projects that have evidence of flooding since 1990, as indicated by State and/or local hazard mitigation plans, the NOAA Storm Events Database, or Town/ local historical records. This does not include flooding caused by utility infrastructure failure (e.g., sewer, water main breaks, etc.). Riverine flooding examples include inundation of roads, infrastructure or structures due to overbank flooding, flash flooding, etc.	☐	☐	☐
Does the project result in a net increase in impervious area of the site? Projects that increase the area on-site with paved or hard surfaces which decrease infiltration of stormwater.	☐	☐	☐
Are existing trees being removed as part of the proposed project? Projects that are removing trees, even if the project is proposing a net increase in trees following construction, should answer yes.	☐	☐	☐

SECTION D: BUILDING/FACILITY ASSET

Complete this section if your Project includes Building/Facility Assets

D. Asset Questions: Building/Facility

Physical assets are defined as assets that make up the major physical components of a project and organized into three main Asset Categories; buildings/facilities, infrastructure, and natural resources. Please provide responses to the following questions for **each building/facility asset** in the project. If a project has multiple building/facility assets, please copy this Section and complete a copy for each asset.

1. For this building/facility asset, please select ONE of the following Asset Types and ONE corresponding Asset Sub-Type.

ASSET CATEGORY	BUILDING/FACILITY ASSET – **LIST HERE**	
ASSET TYPE	TYPICALLY OCCUPIED	TYPICALLY UNOCCUPIED
	If Typically Occupied, select ONE of the following, below.	*If Typically Unoccupied, select ONE of the following, below.*
ASSET SUB-TYPE	☐ Airport	☐ Food distribution center
	☐ Childcare facility	☐ Fuel storage/station
	☐ Community center	☐ Generator
	☐ Correctional facility	☐ Hazardous waste storage
	☐ Elderly housing	☐ Industrial
	☐ Emergency operations/response building (fire, police, etc.)	☐ Maintenance facility
	☐ Emergency shelter	☐ Material storage
	☐ Government building	☐ Mechanical building/vent stack
	☐ Group home	☐ Morgue
	☐ Higher-education facility	☐ Parking facility
	☐ Hospital and mental health facilities	☐ Power transmission facility, substation, and/or generation station
	☐ House/place of worship	☐ Pump Station - Sanitary
	☐ Laboratory	☐ Pump Station - Stormwater
	☐ Library	☐ Rapid Transit/Rail station
	☐ IT data center	☐ Recreational facility
	☐ Judicial center	☐ Solid waste facility (recycling facilities, transfer stations, etc.)
	☐ Military facility	☐ Telecommunications facility/communication tower
	☐ Mixed-use building	☐ Ventilation building/fan plants
	☐ Non-residential building (office, commercial, retail)	☐ Wastewater treatment plant
	☐ Residential building - Public Housing	☐ Water storage tank or tower
	☐ School (primary, secondary, high, vocational, etc.)	☐ Water treatment plant (potable water)
	☐ Other	☐ Other

2. For the building/facility asset, check one Asset Construction Type.

ASSET CATEGORY	BUILDING/FACILITY ASSET – **LIST HERE**	
ASSET CONSTRUCTION TYPE	New Construction	☐
	Major Repair/Retrofit	☐
	Maintenance (critical repair)	☐
	Maintenance (environmental)	☐
	Renovation	☐

3. Construction Start Year: Click or tap here to enter text.
4. Asset Useful Life: Click or tap here to enter text.

   Useful Life refers to the estimated number of years before the project will require significant reconstruction or renovation to continue performing its normal function(s). This differs from the design life, which is typically shorter. The environmental surroundings and/or lack of maintenance can reduce typical useful life of assets. Climate change may accelerate deterioration of assets and expose assets to new or more frequent environmental impacts. Regular maintenance and inspections are essential to infrastructure and building performance.

5. Summarize the above selections here.

Tool Input	**LIST ASSET HERE**
Asset Category	Click or tap here to enter text.
Asset Type	Click or tap here to enter text.
Asset Sub-Type	Click or tap here to enter text.
Construction Type	Click or tap here to enter text.
Construction Start Year	Click or tap here to enter text.
Asset Useful Life	Click or tap here to enter text.

6. For ***each building/facility asset*** identified above, document the following information to the best of your knowledge, given your response to the first question in the table below, "Identify the length of time the asset can be inaccessible/inoperable without severe consequences."

   Only one answer choice may be selected per question.

BUILDING/FACILITY ASSET – **LIST ASSET HERE**			
Component	**Questions**	**Answer Choices**	**Selection**
TIME	1. Identify the length of time the asset can be inaccessible/inoperable without severe consequences.	Building may be inaccessible/inoperable more than a week after natural hazard events without consequences	☐
		Building may be inaccessible/inoperable for more than a day, but less than a week after natural hazard events without consequences	☐
		Building may be inaccessible/inoperable during natural hazard events, but must be accessible/operable within one day after natural hazard events	☐
		Building must be accessible/operable at all times, even during natural hazard events	☐
SCOPE	2. Identify the geographic area directly affected by permanent loss or significant inoperability of the building/facility.	Impacts limited to site only	☐
		Impacts would be limited to local area and/or municipality	☐
		Impacts would be regional (more than one municipality and/or surrounding region)	☐
		State-wide or greater impacts	☐
	3. Identify the population directly served that would be affected by the permanent loss or significant inoperability of the building/facility.	Less than 100 people	☐
		Less than 1,000 people	☐
		Less than 10,000 people	☐
		Greater than 10,000 people	☐
	4. Identify if the building/facility provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.	The building does not provide services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations	☐
		The building provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations	☐

BUILDING/FACILITY ASSET – **LIST ASSET HERE**			
Component	**Questions**	**Answer Choices**	**Selection**
SEVERITY	5. If the building/facility became inoperable for longer than acceptable in Question 1, how, if at all, would it be expected to impact people's health and safety?	Inoperability of the building/facility would not be expected to result in injuries	☐
		Inoperability of the building/facility would be expected to result in minor impacts to people's health, including minor injuries or minor impacts to chronic illnesses	☐
		Inoperability of the building/facility would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses	☐
		Inoperability of the building/facility would be expected to result in possible loss of life	☐
	6. If there are hazardous materials in your building/facility, what are the extent of impacts related to spills/releases of these materials?	There are no hazardous materials in the building/facility	☐
		Spills and/or releases of hazardous materials would be relatively easy to clean up	☐
		Spills and/or releases of hazardous materials would be moderately difficult to clean up	☐
		Spills and/or releases of hazardous materials are expected with difficult remediation and pose a severe threat to public health or safety (e.g., wastewater treatment plant; biohazard laboratory)	☐
	7. If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts on other facilities, assets, and/or infrastructure?	Minor – Inoperability will not likely affect other facilities, assets, or buildings	☐
		Moderate – Inoperability may impact other facilities, assets, or buildings, but is not expected to affect their ability to operate	☐
		Significant – Inoperability is likely to impact other facilities, assets, or buildings and will likely affect their ability to operate	☐
		Debilitating – Inoperability will result in cascading impacts that will render other facilities, assets, or buildings inoperable and/or prevent the functionality of major regional or statewide facilities and/or delivery of critical services	☐

BUILDING/FACILITY ASSET – **LIST ASSET HERE**			
Component	**Questions**	**Answer Choices**	**Selection**
SEVERITY	8. If this building/facility was damaged beyond repair, how much would it approximately cost to replace?	Less than $10 million	☐
		Between $10 million and $30 million	☐
		Between $30 million and $100 million	☐
		Greater than or equal to $100 million	☐
	9. Is this a recreational facility which can be vacated during a natural hazard event?	No	☐
		Yes	☐
	10. If the building/facility became inoperable for longer than acceptable in Question 1, what are the public and/or social services impacts?	Many alternative programs and/or services are available to support the community	☐
		Some alternative programs and/or services are available to support the community	☐
		Few alternative programs and/or services are available to support the community	☐
		No alternative programs and/or services are available to support the community	☐
	11. If the building/facility became inoperable for longer than acceptable in Question 1, what are the environmental impacts related to natural resources?	No impact on surrounding natural resources is expected	☐
		Impact on natural resources can be mitigated naturally	☐
		Impact on natural resources will require remediation/rehabilitation	☐
		Impact on natural resources is irreversible/natural resource lost	☐
	12. If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts to government services (i.e., the building is not able to serve or operate its intended users or function)?	Loss of building is not expected to reduce the ability to maintain government services.	☐
		Loss of building may reduce the ability to maintain some government services, while a majority of services will still exist.	☐
		Loss of building may reduce the ability to maintain most government services, while some services will still exist.	☐
		Government agency will no longer be able to maintain services	☐

BUILDING/FACILITY ASSET – **LIST ASSET HERE**			
Component	**Questions**	**Answer Choices**	**Selection**
SEVERITY	13. If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts to loss of confidence in government (i.e., the building is not able to serve or operate its intended users or function)?	No impact	☐
		Reduced morale and public support	☐
		Loss of confidence in government agency	☐
		Loss of confidence in Commonwealth	☐

SECTION E: INFRASTRUCTURE ASSET

Complete this section if the Project includes Infrastructure Assets

E. Asset Questions: Infrastructure

Physical assets are defined as assets that make up the major physical components of a project and organized into three main Asset Categories; buildings/facilities, infrastructure, and natural resources. Please provide responses to the following questions for **each infrastructure asset** in the project. If a project has multiple infrastructure assets, please copy this Section and complete a copy for each asset.

1. For this infrastructure asset, please select ONE of the following Asset Types and ONE corresponding Asset Sub-Type.

ASSET CATEGORY	**INFRASTRUCTURE ASSET – **LIST HERE****									
ASSET TYPE	**TRANSPORTATION**		**DAMS AND FLOOD CONTROL STRUCTURES**		**UTILITY INFRASTRUCTURE**		**GREEN INFRASTRUCTURE**		**SOLID AND HAZARDOUS WASTE**	
	If Transportation, select ONE of the following, below.		*If Dam and Flood Control Structure, select ONE of the following, below.*		*If Utility Infrastructure, select ONE of the following, below.*		*If Green Infrastructure, select ONE of the following, below.*		*If Solid and Hazardous Waste, select ONE of the following, below.*	
ASSET SUB-TYPE	☐	Pedestrian ways and bikeways	☐	Dams	☐	Energy (electric, gas, petroleum, renewable)	☐	Bioswale	☐	Landfill
	☐	Bridge	☐	Dikes and/or levees	☐	Stormwater utility infrastructure	☐	Green Roof	☐	Solid Waste Facility/Transfer Station
	☐	Bus (stops)	☐	Multi-purpose flood storage	☐	Telecommunications	☐	Permeable Pavement	☐	Other Solid and Hazardous Waste (e.g., salvage/junk yard)
	☐	Culvert	☐	Seawall	☐	Wastewater	☐	Rain Garden		
	☐	Ferry/water taxi	☐	Other Flood Barrier	☐	Water	☐	Other Green Infrastructure		
	☐	Ports			☐	Other Utility				
	☐	Railways (rail and rapid transit)								
	☐	Roads (highway)								
	☐	Roads (local)								
	☐	Other Transportation								

2. For the infrastructure asset, check one Asset Construction Type.

ASSET CATEGORY	INFRASTRUCTURE ASSET – **LIST HERE**	
ASSET CONSTRUCTION TYPE	New Construction	☐
	Major Repair/Retrofit	☐
	Maintenance (critical repair)	☐
	Maintenance (environmental)	☐

3. Construction Start Year: Click or tap here to enter text.
4. Asset Useful Life: Click or tap here to enter text.

   Useful Life refers to the estimated number of years before the project will require significant reconstruction or renovation to continue performing its normal function(s). This differs from the design life, which is typically shorter. The environmental surroundings and/or lack of maintenance can reduce typical useful life of assets. Climate change may accelerate deterioration of assets and expose assets to new or more frequent environmental impacts. Regular maintenance and inspections are essential to infrastructure and building performance.

5. Summarize the above selections here.

Tool Input	**LIST ASSET HERE**
Asset Category	Click or tap here to enter text.
Asset Type	Click or tap here to enter text.
Asset Sub-Type	Click or tap here to enter text.
Construction Type	Click or tap here to enter text.
Construction Start Year	Click or tap here to enter text.
Asset Useful Life	Click or tap here to enter text.

7. For ***each infrastructure asset*** identified above, document the following information to the best of your knowledge, given your response to the first question in the table below, "Identify the length of time the asset can be inaccessible/inoperable without severe consequences."

   Only one answer choice may be selected per question.

INFRASTRUCTURE ASSET – **LIST ASSET HERE**			
Component	**Questions**	**Answer Choices**	**Selection**
TIME	1. Identify the length of time the asset can be inaccessible/inoperable without significant consequences.	Infrastructure may be inaccessible/inoperable more than a week after natural hazard events without consequences.	☐
		Infrastructure may be inaccessible/inoperable for more than a day, but less than a week after natural hazard events without consequences.	☐
		Infrastructure may be inaccessible/inoperable during natural hazard events, but must be accessible/operable within one day after natural hazard event.	☐
		Infrastructure must be accessible/operable at all times, even during natural hazard events.	☐
SCOPE	2. Identify the geographic area directly affected by permanent loss or significant inoperability of the infrastructure.	Impacts limited to location of infrastructure only	☐
		Impacts would be limited to local area and/or municipality	☐
		Impacts would be regional (more than one municipality and/or surrounding region)	☐
		State-wide or greater impacts	☐
	3. Identify the population directly served that would be affected by the permanent loss or significant inoperability of the infrastructure.	Less than 5,000 people	☐
		Less than 10,000 people	☐
		Less than 100,000 people	☐
		Greater than 100,000 people	☐

INFRASTRUCTURE ASSET – **LIST ASSET HERE**			
Component	**Questions**	**Answer Choices**	**Selection**
	4. Identify if the infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.	The infrastructure does not provide services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations	☐
		The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations	☐
	5. Will the infrastructure reduce the risk of flooding?	No	☐
		Yes	☐
SEVERITY	6. If the infrastructure became inoperable for longer than acceptable in Question 1, how, if at all, would it be expected to impact people's health and safety?	Inoperability of the infrastructure would not be expected to result in injuries	☐
		Inoperability of the infrastructure would be expected to result in minor impacts to people's health, including minor injuries or minor impacts to chronic illnesses	☐
		Inoperability of the infrastructure would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses	☐
		Inoperability of the infrastructure would be expected to result in possible loss of life	☐
	7. If there are hazardous materials in your infrastructure, what are the extent of impacts related to spills/releases of these materials?	There are no hazardous materials in the infrastructure	☐
		Spills and/or releases of hazardous materials are expected with relatively easy cleanup	☐
		Spills and/or releases of hazardous materials are expected with moderately difficult cleanup	☐
		Spills and/or releases of hazardous materials are expected with difficult remediation and pose a severe threat to public health or safety (e.g., wastewater treatment plant; biohazard laboratory)	☐

INFRASTRUCTURE ASSET – **LIST ASSET HERE**			
Component	**Questions**	**Answer Choices**	**Selection**
SEVERITY	8. If the infrastructure became inoperable for longer than acceptable in Question 1, what are the impacts on other facilities, assets, and/or infrastructure?	Minor – Inoperability will not likely affect other facilities, assets, or buildings	☐
		Moderate – Inoperability may impact other facilities, assets, or buildings, but cascading impacts do not affect ability of other facilities, assets, or buildings to operate	☐
		Significant – Inoperability is likely to impact other facilities, assets, or buildings and result in cascading impacts that will likely affect their ability to operate	☐
		Debilitating – Inoperability will result in cascading impacts that will render other assets inoperable and/or prevent the functionality of major regional or statewide infrastructure or delivery of critical services	☐
	9. If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?	Less than $10 million	☐
		Between $10 million and $30 million	☐
		Between $30 million and $100 million	☐
		Greater than or equal to $100 million	☐
	10. Does the infrastructure function as an evacuation route during emergencies? This question only applies to roadway projects.	No	☐
		Yes	☐
	11. If the infrastructure became inoperable for longer than acceptable in Question 1, what are the environmental impacts related to natural resources?	No impact on surrounding natural resources is expected	☐
		Impact on natural resources can be mitigated naturally	☐
		Impact on natural resources will require remediation/rehabilitation	☐
		Impact on natural resources is irreversible or the natural resources are lost	☐

INFRASTRUCTURE ASSET – **LIST ASSET HERE**			
Component	**Questions**	**Answer Choices**	**Selection**
SEVERITY	12. If the infrastructure became inoperable for longer than acceptable in Question 1, what are the impacts to government services (i.e., the infrastructure is not able to serve or operate its intended users or function)?	Loss of infrastructure is not expected to reduce the ability to maintain government services	☐
		Loss of infrastructure may reduce the ability to maintain some government services, while a majority of services will still exist	☐
		Loss of infrastructure may reduce the ability to maintain most government services, while some services will still exist	☐
		Government agency will no longer be able to maintain services	☐
	13. What are the impacts to loss of confidence in government resulting from loss of infrastructure functionality (i.e. the infrastructure asset is not able to serve or operate its intended users or function)?	No impact	☐
		Reduced morale and public support	☐
		Loss of confidence in government agency	☐
		Loss of confidence in Commonwealth	☐

SECTION F: NATURAL RESOURCE ASSET

Complete this section if the Project includes Natural Resource Assets

F. Asset Questions: Natural Resources

Physical assets are defined as assets that make up the major physical components of a project and organized into three main Asset Categories; buildings/facilities, infrastructure, and natural resources. Please provide responses to the following questions for **each natural resource asset** in the project. If a project has multiple natural resource assets, please copy this Section and complete a copy for each asset.

1. For this natural resource asset, please select ONE of the following Asset Types and ONE corresponding Asset Sub-Type. *See table on following page.*

ASSET CATEGORY	NATURAL RESOURCES - **LIST ASSET HERE**					
ASSET TYPE	**COASTAL RESOURCE AREA**	**FORESTED ECOSYSTEMS**	**AQUATIC ECOSYSTEMS**	**WETLAND RESOURCE AREA - INLAND**	**AGRICULTURAL RESOURCES**	**OPEN SPACE**
	If Coastal Resource Area, select ONE of the following, below.	*If Forested Ecosystem, select ONE of the following, below.*	*If Aquatic Ecosystem, select ONE of the following, below.*	*If Wetland Resource Area, select ONE of the following, below.*	*If Agricultural Resources, select ONE of the following, below.*	*If Open Space, select ONE of the following, below.*
ASSET SUB-TYPE	☐ Barrier beach	☐ Forested swamps	☐ Connecticut and Merrimack Mainstems	☐ Banks	☐ Cropland and/or arable land (annual replanting)	☐ Conservation land
	☐ Coastal bank	☐ Lowland forest	☐ Lakes and Ponds - Non water supply	☐ Bogs	☐ Permanent Cropland	☐ Grassland
	☐ Coastal beach	☐ Riparian forest	☐ Large- and mid-size rivers	☐ Emergent wetlands	☐ Permanent Pastures (grasslands, shrublands)	☐ Open recreation space
	☐ Coastal dune	☐ Shrub swamps	☐ Small streams	☐ Land under Water Bodies or Waterways		☐ Parklands
	☐ Coastal plain ponds	☐ Upland forest		☐ Lower Floodplains		☐ Peatlands
	☐ Coastal wetland	☐ Woodlands		☐ Marsh		☐ Reserves
	☐ Estuarine open water	☐ Young forests and shrublands		☐ Riverfront Area		☐ Trails
	☐ Land subject to coastal 100-year storm flowage			☐ Vernal Pool Habitat		
	☐ Land subject to tidal action			☐ Wet meadows		
	☐ Land under a salt pond			☐ Wooded deciduous swamps		
	☐ Land under an estuary					
	☐ Land under streams, rivers, lakes, or creeks within the coastal zone that are anadromous/ catadromous fish runs					
	☐ Land under the ocean					
	☐ Rocky intertidal shores					
	☐ Salt marsh					

2. For the natural resource asset, check one Asset Construction Type.

ASSET CATEGORY	NATURAL RESOURCES ASSET – **LIST HERE**	
ASSET CONSTRUCTION TYPE	New Construction	☐
	Restoration or enhancement	☐
	Maintenance (environmental)	☐
	Dam removal	☐

3. Estimated year construction will start: Click or tap here to enter text.
4. Asset Monitoring Frequency: Click or tap here to enter text.

   Monitoring is the repeated observation and measurement of specific natural resources in order to better understand their condition. Monitoring allows us to detect change, identify any potential problems in the early stages, and measure success. Monitoring Frequency is typically determined based on the goals of the natural resource manager. The monitoring frequency varies based on the chosen variable being monitored and studied, and if often done regularly to evaluate the health of natural resources over time.

5. Summarize the above selections here.

Tool Input	****LIST ASSET HERE****
Asset Category	Click or tap here to enter text.
Asset Type	Click or tap here to enter text.
Asset Sub-Type	Click or tap here to enter text.
Construction Type	Click or tap here to enter text.
Estimated Year Construction Will Start	Click or tap here to enter text.
Asset Monitoring Frequency	Click or tap here to enter text.

Attachment 2-B – Building Criticality Worksheet

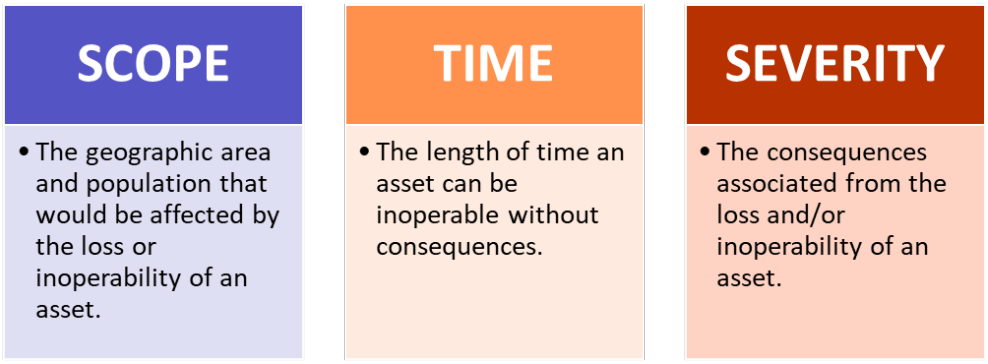
CRITICALITY WORKSHEET FOR BUILDINGS - INTRODUCTION

The primary goal of this worksheet is to illustrate the questions needed to evaluate criticality of Commonwealth-owned buildings for the application of Climate Resilience Design Standards. Separate criticality worksheets are provided for each asset category: Buildings, Infrastructure, and Natural Resources. The separate worksheets recognize that:

- the criticality of one asset category should not be compared to the criticality of another asset category
- the questions and answers should respond to the specific needs of that asset category

The intent of Criticality in the Climate Resilience Design Standards is not to rank one project versus another, rather to inform return periods/ confidence intervals, which tiered methodology to apply to determine design criteria values, and the Climate Risk Screening output.

Criticality is defined as a function of scope, time, and severity for building and infrastructure assets. Scope is defined as the geographic area and population that would be affected by the inoperability of that asset; time is the length of time an asset can be inoperable without consequences; and severity are the consequences that are associated from the inoperability of an asset – such as public health and safety impacts, economic impacts, environmental impacts, and cascading impacts.



Criticality Scoring - Internal Metric Only (NOT SHOWN TO USERS)

The scores are determined through a series of questions related to scope, time, and severity with pre-populated responses. Weighting as described below are based on feedback from stakeholders during working groups held in 2020.

Scope Score is the average score of the scope questions for population and geography affected.

Time Score is based on the length of time the building can be inoperable without consequences as described in the severity section.

Severity Score is based on eight (8) consequences that are assigned weights based on relative impact for buildings. Weights are indicated in parentheses in the questions for internal review purposes and will be removed in final tool. The most severe impacts are given the highest weights (3), and lowest impacts are given no weight (1). The composite severity score is a function based on the average of the weighted criteria as follows:

Composite Severity = $[3 \times \Sigma TOP + 2 \times \Sigma MID + 1 \times \Sigma LOW]/8$

The weighting is assigned to the consequences as follows:.

TOP: Public health and safety and Economic
MID: Public and/or social services, Interdependency, Environmental (Hazardous materials and Ecological)
LOW: Govermental and Psychological

Final Criticality Score
Composite criticality =AVERAGE [Scope,Time,Composite Severity]
The final score is the normalized value of the Composite Criticality score. The value is normalized on a scale of 10 (low) to 100 (high) due to inherent criticality of all sites.

An asset with final value greater than or equal to 60 is considered High Criticality and value less than or equal to 40 is considered Low Criticality. Assets with values in between are considered as Medium Criticality. Criticality results are shown for internal review purposes to illustrate the relationships between answers and output. In the web-based tool, users will answer criticality questions but not receive a criticality score.

BUILDING CRITICALITY	
Criticality (High, Medium, Low)	**LOW**
TIME QUESTIONS	
Question	**Select Answer**
1. Identify the length of time the asset can be inaccessible/inoperable without severe consequences.	Building may be inaccessible/inoperable more than a week after natural hazard event without consequences
SCOPE QUESTIONS	
Questions	**Select Answer**
2. Identify the geographic area directly affected by permanent loss or significant inoperability of the building/facility.	Impacts limited to site only
3. Identify the population directly served that would be affected by the permanent loss of use or inoperability of the building/facility.	Less than 100 people
4. Identify if the building/facility provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.	The building/facility does not provide services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
SEVERITY QUESTIONS	
Questions (weights)	**Select Answer**
5. If the building/facility became inoperable for longer than acceptable in Question 1, how, if at all, would it be expected to impact people's health and safety?	Inoperability of the building/facility would not be expected to result in injuries
6. What are the environmental impacts related to spills/releases of hazardous materials as a result of loss of the building/facility functionality?	There are no hazardous materials in the building/facility
7. What are the impacts on other facilities, assets, and/or infrastructure as a result of loss of the building/facility functionality?	Minor – Inoperability will not likely affect other facilities, assets, or buildings
8. What are the direct costs to replace the loss of the building/facility?	Less than $10M
9. Is this a recreational facility which can be vacated during a natural hazard event?	No
10. If the building/facility became inoperable for longer than acceptable in Question 1, what are the public and/or social services impacts?	Many alternative programs and/or services are available to support the community
11. If the building/facility became inoperable for longer than acceptable in Question 1, what are the environmental impacts related to natural resources?	No impact on surrounding natural resources is expected
12. What are the impacts to government services as a result of loss of building functionality (i.e. the building is not able to serve or operate its intended users or function)?	Loss of building is not expected to reduce the ability to maintain government services.
13. What are the impacts to loss of confidence in government resulting from loss of building functionality (i.e. the building asset is not able to serve or operate its intended users or function)?	Reduced morale and public support

CRITICALITY WORKSHEET FOR BUILDINGS - SCORING

Questions	Answer Choices	Assigned Scores	Weights	Selected Scores	Lowest Score	Highest Score (excluding the highest points for the override questions)
1. Identify the length of time the asset can be inaccessible/inoperable without severe consequences.	Building may be inaccessible/inoperable more than a week after natural hazard event without consequences	1	None	1	1	4
	Building may be inaccessible/inoperable for more	2		2		
	Building may be inaccessible/inoperable during natural hazard event, but must be accessible/operable within one day after natural hazard event	3		3		
	Building must be accessible/operable at all times, even during natural hazard event	4		4		
2. Identify the geographic area directly affected by permanent loss or significant inoperability of the building/facility.	Impacts limited to site only	1	None	1	1	4
	Impacts would be limited to local area and/or	2		2		
	Impacts would be regional (more than one	3		3		
	State-wide or greater impacts	4		4		
3. Identify the population directly served that would be affected by the permanent loss of use or inoperability of the building/facility.	Less than 100 people	1	None	1	1	4
	Less than 1,000 people	2		2		
	Less than 10,000 people	3		3		
	Greater than 10,000 people	4		4		
4. Identify if the building/facility provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.	The building/facility does not provide services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.	1	None	1	1	1
	The building/facility provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.	1		1		
5. If the building/facility became inoperable for longer than acceptable in Question 1, how, if at all, would it be expected to impact people's health and safety?	Inoperability of the building/facility would not be expected to result in injuries	1	3	3	3	9
	Inoperability of the building/facility would be expected to result in minor impacts to people's health, including minor injuries or minor impacts to chronic illnesses	2		6		
	Inoperability of the building/facility would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses	3		9		
	Inoperability of the building/facility would be expected to result in possible loss of life	10		30		
6. What are the environmental impacts related to spills/releases of hazardous materials as a result of loss of the building/facility functionality?	There are no hazardous materials in the building/facility	1	2	2	2	6
	Spills and/or releases of hazardous materials would be relatively easy to clean up	2		4		
	Spills and/or releases of hazardous materials would be moderately difficult to clean up	3		6		
	Spills and/or releases of hazardous materials are expected with difficult remediation and pose a	10		20		
7. What are the impacts on other facilities, assets, and/or infrastructure as a result of loss of the building/facility functionality?	Minor – Inoperability will not likely affect other facilities, assets, or buildings	1	2	2	2	6
	Moderate – Inoperability may impact other facilities, assets, or buildings, but is not expected to affect their ability to operate	2		4		
	Significant – Inoperability is likely to impact other facilities, assets, or buildings and will likely affect their ability to operate	3		6		
	Debilitating – Inoperability will result in cascading impacts that will render other facilities, assets, or buildings inoperable and/or prevent the functionality of major regional or statewide facilities and/or delivery of critical services	10		20		
8. What are the direct costs to replace the loss of the building/facility?	Less than $10M	1	3	3	3	9
	Between $10 million and $30 million	2		6		
	Between $30 million and $100 million	3		9		
	Greater than or equal to $100M	10		30		
9. Is this a recreational facility which can be vacated during a natural hazard	No	0	1	0	0	1
	Yes	1		1		
10. If the building/facility became inoperable for longer than acceptable in Question 1, what are the public and/or social services impacts?	Many alternative programs and/or services are available to support the community	1	2	2	2	8
	Some alternative programs and/or services are available to support the community	2		4		
	Few alternative programs and/or services are available to support the community	3		6		
	No alternative programs and/or services are available to support the community	4		8		
11. If the building/facility became inoperable for longer than acceptable in Question 1, what are the environmental impacts related to natural resources?	No impact on surrounding natural resources is expected	1	2	2	2	8
	Impact on natural resources can be mitigated naturally	2		4		
	Impact on natural resources will require remediation/rehabilitation	3		6		
	Impact on natural resources is irreversible/natural resource lost	4		8		
12. What are the impacts to government services as a result of loss of building functionality (i.e. the building is not able to serve or operate its intended users or function)?	Loss of building is not expected to reduce the ability to maintain government services.	1	1	1	1	4
	Loss of building may reduce the ability to maintain some government services, while a majority of services will still exist.	2		2		
	Loss of building may reduce the ability to maintain most government services, while some services will still exist.	3		3		
	Government agency will no longer be able to maintain services	4		4		
13. What are the impacts to loss of confidence in government resulting from loss of building functionality (i.e. the building asset is not able to serve or	Reduced morale and public support	1	1	1	1	3
	Loss of confidence in government agency	2		2		
	Loss of confidence in Commonwealth	3		3		

Q.#	SCORES	Lowest Score	Highest Score (excluding the highest points for the override questions)
1	1	1	4
Time score	1	1	4
2	1	1	4
3	1	1	4
4	1	1	1
Scope score	1	1	4
5	3	3	9
6	2	3	9
7	2	1	1
8	3	2	8
9	0	0	0
10	2	2	6
11	2	2	8
12	1	1	4
13	1	1	3
Composite Severity Score	1.8	1.7	5.3
Composite Criticality Score	**1.3**	**1.2**	**4.4**
Normalized Criticality Value (10-100)**	**11**	**10**	**100**
	LOW		
	LOW		
Criticality (High, Medium, Low)	**LOW**		

Attachment 2-C – Infrastructure Criticality Worksheet

CRITICALITY WORKSHEET FOR INFRASTRUCTURE - INTRODUCTION

The primary goal of this worksheet is to illustrate the questions needed to evaluate criticality of Commonwealth-owned infrastructure for the application of Climate Resilience Design Standards. Separate criticality worksheets are provided for each asset category: Buildings, Infrastructure, and Natural Resources. The separate worksheets recognize that:

- the criticality of one asset category should not be compared to the criticality of another asset category
- the questions and answers should respond to the specific needs of that asset category

The intent of Criticality in the Climate Resilience Design Standards is not to rank one project versus another, rather to inform return periods/ confidence intervals, which tiered methodology to apply to determine design criteria values, and the Climate Risk Screening output.

Criticality is defined as a function of scope, time, and severity for building and infrastructure assets. Scope is defined as the geographic area and population that would be affected by the loss or inoperability of that asset; time is the length of time an asset can be inoperable without consequences; and severity are the consequences that are associated from the loss or inoperability of an asset – such as public health and safety impacts, economic impacts, environmental impacts, and cascading impacts.

SCOPE	TIME	SEVERITY
• The geographic area and population that would be affected by the loss or inoperability of an asset.	• The length of time an asset can be inoperable without consequences.	• The consequences associated from the loss and/or inoperability of an asset.

Criticality Scoring - NOT SHOWN TO USERS

The scores are determined through a series of questions related to scope, time, and severity with pre-populated responses. Weighting as described below are based on feedback from stakeholders during working groups held in 2020.

Scope Score is the average score of the scope questions for population and geography affected. The scope score is doubled if the infrastructure serves or is proposed to function as flood protection.

Time Score is based on the length of time the infrastructure asset can be inoperable without consequences as described in the severity section.

Severity Score is based on eight (8) consequences that are assigned weights based on relative impact for infrastructure. Weights are indicated in parentheses in the questions for internal review purposes and will be removed in final tool. The most severe impacts are given the highest weights (3), and lowest impacts are given no weight (1). The composite severity score is a function based on the average of the weighted criteria as follows:

Composite Severity = $[3 \times \Sigma TOP + 2 \times \Sigma MID + 1 \times \Sigma LOW]/8$

The weighting is assigned to the consequences as follows:.

TOP: Public health and safety and Interdependency
MID: Economic, Environmental (Hazardous materials and Ecological), and Evacuation route (if asset type is Transportation)
LOW: Govermental and Psychological

Final Criticality Score (NOT SHOWN TO USERS)
Composite criticality =AVERAGE [Scope,Time,Composite Severity]
The final score is the normalized value of the Composite Criticality score. The value is normalized on a scale of 10 (low) to 100 (high) due to inherent criticality of all sites.

An asset with final value greater than or equal to 60 is considered High Criticality and value less than or equal to 40 is considered Low Criticality. Assets with values in between are considered as Medium Criticality. Criticality results are shown for internal review purposes to illustrate the relationships between answers and output. In the web-based tool, users will answer criticality questions and not receive a criticality score.

INFRASTRUCTURE CRITICALITY	
Criticality (High, Medium, Low)	**LOW**
TIME QUESTIONS	
Question	**Select Answer**
1. Identify the length of time the asset can be inaccessible/inoperable without severe consequences.	Infrastructure may be inaccessible/inoperable more than a week after natural hazard event without consequences.
SCOPE QUESTIONS	
Questions	**Select Answer**
2. Identify the geographic area directly affected by permanent loss or significant inoperability of the infrastructure.	Impacts limited to location of infrastructure only
3. Identify the population directly served that would be affected by the permanent loss or significant inoperability of the infrastructure.	Less than 5,000 people
4. Identify if the infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.	The infrastructure does not provide services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
5. Will the infrastructure reduce the risk of flooding?	No
SEVERITY QUESTIONS	
Questions (Weights)	**Select Answer**
6. If the infrastructure became inoperable for longer than acceptable in Question 1, how, if at all, would it be expected to impact people's health and safety?	Inoperability of the infrastructure would not be expected to result in injuries
7. If there are hazardous materials in your infrastructure, what are the extent of impacts related to spills/releases of these materials?	There are no hazardous materials in the infrastructure
8. If the infrastructure became inoperable for longer than acceptable in Question 1, what are the impacts on other facilities, assets, and/or infrastructure?	Minor – Inoperability will not likely affect other facilities, assets, or buildings
9. If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?	Less than $10 million
10. Does the infrastructure function as an evacuation route during emergencies? This question only applies to roadway projects.	No
11. If the infrastructure became inoperable for longer than acceptable in Question 1, what are the environmental impacts related to natural resources?	Impact on natural resources can be mitigated naturally
12. If the infrastructure became inoperable for longer than acceptable in Question 1, what are the impacts to government services (i.e. the infrastructure is not able to serve or operate its intended users or function)?	Loss of infrastructure is not expected to reduce the ability to maintain government services
13. What are the impacts to loss of confidence in government resulting from loss of infrastructure functionality (i.e. the infrastructure asset is not able to serve or operate its intended users or function)?	Reduced morale and public support

CRITICALITY WORKSHEET FOR INFRASTRUCTURE - SCORING

Questions	Answer Choices	Assigned Scores	Weights	Selected Scores	Lowest Score	Highest Score (excluding the highest points for the override questions)
1. Identify the length of time the asset can be inaccessible/inoperable without severe consequences.	Infrastructure may be inaccessible/inoperable more than a week after natural hazard event without consequences.	1	None	1	1	4
	Infrastructure may be inaccessible/inoperable for more than a day, but less than a week after natural hazard event without consequences.	2		2		
	Infrastructure may be inaccessible/inoperable during	3		3		
	Infrastructure must be accessible/operable at all times, even during natural hazard event.	4		4		
2. Identify the geographic area directly affected by permanent loss or significant inoperability of the infrastructure.	Impacts limited to location of infrastructure only	1	None	1	1	4
	Impacts would be limited to local area and/or municipality	2		2		
	Impacts would be regional (more than one municipality and/or surrounding region)	3		3		
	State-wide or greater impacts	4		4		
3. Identify the population directly served that would be affected by the permanent loss or significant inoperability of the infrastructure.	Less than 5,000 people	1	None	1	1	4
	Less than 10,000 people	2		2		
	Less than 100,000 people	3		3		
	Greater than 100,000 people	4		4		
4. Identify if the infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.	The infrastructure does not provide services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.	1	None	1	1	1
	The infrastructure provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.	1		1		
5. Will the infrastructure reduce the risk of flooding?	No	1	None	1	1	2
	Yes	2		2		
6. If the infrastructure became inoperable for longer than acceptable in Question 1, how, if at all, would it be expected to impact people's health and safety?	Inoperability of the infrastructure would not be expected to result in injuries	1	3	3	3	9
	Inoperability of the infrastructure would be expected to result in minor impacts to people's health, including minor injuries or minor impacts to chronic illnesses	2		6		
	Inoperability of the infrastructure would result in moderate or severe injuries or moderate or severe impacts to chronic illnesses	3		9		
	Inoperability of the infrastructure would be expected to result in possible loss of life	10		30		
7. If there are hazardous materials in your infrastructure, what are the extent of impacts related to spills/releases of these materials?	There are no hazardous materials in the infrastructure	1	2	2	2	6
	Spills and/or releases of hazardous materials are expected with relatively easy cleanup	2		4		
	Spills and/or releases of hazardous materials are expected with moderately difficult cleanup	3		6		
	Spills and/or releases of hazardous materials are expected with difficult remediation and pose a severe threat to public health or safety (E.g. wastewater treatment plant; biohazard laboratory)	10		20		
8. If the infrastructure became inoperable for longer than acceptable in Question 1, what are the impacts on other facilities, assets, and/or infrastructure?	Minor – Inoperability will not likely affect other facilities, assets, or buildings	1	3	3	3	9
	Moderate – Inoperability may impact other facilities, assets, or buildings, but cascading impacts do not affect ability of other facilities, assets, or buildings to operate	2		6		
	Significant – Inoperability is likely to impact other facilities, assets, or buildings and result in cascading impacts that will likely affect their ability to operate	3		9		
	Debilitating – Inoperability will result in cascading impacts that will render other assets inoperable and/or prevent the functionality of major regional or statewide infrastructure or delivery of critical services	10		30		
9. If the infrastructure was damaged beyond repair, how much would it approximately cost to replace?	Less than $10 million	1	2	2	2	6
	Between $10 million and $30 million	2		4		
	Between $30 million and $100 million	3		6		
	Greater than or equal to $100 million	10		20		
10. Does the infrastructure function as an evacuation route during emergencies? This question only applies to roadway projects.	No	1	2	2	2	2
	Yes	10		20		
11. If the infrastructure became inoperable for longer than acceptable in Question 1, what are the environmental impacts related to natural resources?	No impact on surrounding natural resources is expected	1	2	2	2	8
	Impact on natural resources can be mitigated naturally	2		4		
	Impact on natural resources will require remediation/rehabilitation	3		6		
	Impact on natural resources is irreversible/natural resource lost	4		8		
12. If the infrastructure became inoperable for longer than acceptable in Question 1, what are the impacts to government services (i.e. the infrastructure is not able to serve or operate its intended users or function)?	Loss of infrastructure is not expected to reduce the ability to maintain government services	1	1	1	1	4
	Loss of infrastructure may reduce the ability to maintain some government services, while a majority of services will still exist	2		2		
	Loss of infrastructure may reduce the ability to maintain most government services, while some services will still exist	3		3		
	Government agency will no longer be able to	4		4		
13. What are the impacts to loss of confidence in government resulting from loss of infrastructure functionality (i.e. the infrastructure asset is not able to serve or operate its intended users or function)?	Reduced morale and public support	1	1	1	1	3
	Loss of confidence in government agency	2		2		
	Loss of confidence in Commonwealth	3		3		

CRITICALITY WORKSHEET FOR INFRASTRUCTURE - SCORING

Q.#	SCORES	Lowest Score	Highest Score (excluding the highest points for the override questions)
1	1	1	4
Time score	1	1	4
2	1	1	4
3	1	1	4
4	1	1	1
5	1	1	2
Scope score	1	1	8
6	3	3	9
7	2	3	9
8	3	2	6
9	2	2	6
10	2	2	8
11	4	2	2
12	1	1	4
13	1	1	3
Composite Severity Score	2.3	2.0	5.9
Composite Criticality Score	1.4	1.3	6.0
Normalized** Criticality Value (10-100)	12	10	100
Criticality (High, Medium, Low)	LOW		

**Normalized Criticality Value – Due to inherent criticality of all sites, a scale of 10 to 100, where 10 represents the minimum risk