City of Salem

Collins Cove to Willows Resilience Study

Project Narrative

1. Project Description, Rationale, and Climate Data (13 points)

Climate Change Impacts/Vulnerabilities Addressed by Project

The proposed study will address vulnerability and risk due to sea level rise and storm surge as well as precipitation-based flooding in the Collins Cove to Willows area in Salem.

Project's Goals and Objectives

The proposed study's goal is to conduct a resilience study for the Collins Cove to Willows area of Salem, with an emphasis on assessing vulnerability and risk of the study area to coastal and inland flooding. The proposed study focuses on city-owned property including roadway/right-of-way infrastructure, linear parks/bike paths, Collins Cove Park, Collins Cove Beach, Memorial Park, Salem Willows Park, and Winter Island Park.

The objectives of the proposed study include:

- Review and apply coastal flooding projections;
- Examine overland flooding under current and future conditions (including development of a dynamic hydraulic/hydrologic model for the study area);
- Conduct a stakeholder engagement process to receive and collect feedback on current vulnerabilities and risks and identify recommended measures that the City can implement to increase the resilience of this area to climate change;
- Develop resilient options for the city parks and road networks in the study area;
- Develop an emergency response and evacuation plan for residents to use during flood events;
- Develop a resilient coastal parks toolkit; and
- Prepare a Collins Cove to Willows Resilience study report that summarizes the findings from the study and includes an implementation plan.

Why Project was Chosen

The Collins Cove to Willows area is a coastal community in the City of Salem (see attached study area locus map *Salem_Collins_Cove_Willows_Locus_Map_ENV23MVP02.pdf).* Portions of the study area are particularly vulnerable to sea level rise, storm surge, and extreme precipitation. As shown in the attached FEMA National Flood Hazard Map (*Salem_Collins_Cove_Willows_Figures_ENV23MVP02.pdf)*, much of the study area is located within mapped FEMA flood hazard areas including AE Flood Zone (1% annual chance of flooding), VE Flood Zone (High Risk Coastal Area), and X Flood Zone (0.2% annual chance of flooding). The majority of the study area is also identified as being within a hurricane surge inundation zone (see attached file named *Salem_Collins_Cove_Willows_Figures_ENV23MVP02.pdf*).

Portions of the study area currently experience coastal and overland flooding, as documented in the Historical Flooding attachment (*Salem_Collins_Cove_Willows_Historical_Flooding_ENV23MVP02.pdf*). This flooding is anticipated to worsen and affect a greater area in the future as a result of climate change. The Massachusetts Coast Flood Risk Model (MC-FRM) attachment (*Salem_Collins_Cove_Willows_MC-*

FRM_ENV23MVP02.pdf) shows the MC-FRM data for the study area with 1% inundation depth and flooding probability for projected years of 2030, 2050 and 2070, which indicate a substantial projected increase in sea level rise and storm surge in the study area.

The study area also includes Environmental Justice (EJ) populations and climate vulnerable population groups as described in Section 4 that are particularly at risk due to impacts associated with climate change (*Salem_Collins_Cove_Willows_Figures_ENV23MVP02*). The populations are particularly vulnerable due to their coastal location with limited evacuation routes that are surrounded by coastal hazards. The proposed project will create an emergency response plan that identifies an evacuation route and means for first responders to provide assistance during extreme weather during extreme weather events. Evacuation of individuals with limited mobility and limited access to transportation will be addressed in the emergency response and evacuation plan.

Additionally, the study area also includes critical facilities (e.g. South Essex Sewerage District and Salem Harbor Power Station/Footprint Power Salem Harbor Operations LLC) that serve the City of Salem as well as the region and need to be protected from coastal and inland flooding events.

The City's receipt of Municipal Vulnerability Preparedness (MVP) action grant funding would allow the City to proceed with a robust study that includes stakeholder engagement, assessment of current and future vulnerabilities and risks to coastal and inland flooding, identification and assessment of resilience options to reduce risks, and development of an implementation strategy for the prioritized action items.

How Project Reflects Municipal Priorities

The proposed study aligns with priority actions identified through the City of Salem's Community Resilience Building Workshop planning process as documented in the City's MVP Summary of Findings Report, including completion of a watershed analysis for inland and coastal hydrology and preparation of an inventory of stormwater infrastructure.

The proposed study would complement several completed and ongoing initiatives and projects in the study area. Some of these include a high flow stormwater biofiltration system at Winter Island Park; upgrades to a seawall on Columbus Avenue; improvements, including infiltrating parking bays and bioretention basins at the Salem Willows Park parking lot; and a living shoreline at Collins Cove Beach. Other resilient efforts include the addition of, and continued development of, a bike lane/shared use path along Fort Avenue.

- Winter Island Park Rain Garden – This project was completed in partnership with Salem Sound Coastwatch (SSCW), under an FY19 Coastal Pollution Remediation Grant from Massachusetts Office of Coastal Zone Management (CZM). The project addressed stormwater runoff from the parking lot at Winter Island Park that was ponding and running off untreated into Salem Harbor. The constructed high flow biofiltration rain garden treats the polluted runoff and slows the rate of the discharge into the harbor.
- Columbus Avenue Seawall – This project has received funding from the EEA's Dam and Seawall Repair or Removal grant program. The Columbus Avenue Seawall is located in the northwestern portion of Juniper Cove in the study area. The seawall is the forefront of protection against flood waters to the public roadway (Columbus Avenue), public walkway, utilities, and residential dwellings. The seawall needs reconstruction to address damage from nor'easters and the projected higher water levels of climate change to adequately protect the landside amenities and dwellings.

This project is ongoing, and the design promotes nature-based elements (living shoreline) to provide a more resilient solution against storm damage and flooding.

- Salem Willows Park Parking Lot and Surrounding Area Restoration (green infrastructure) – This project was completed using a FY20-21 MVP Action Grant. In order to reduce erosion and polluted runoff from reaching the ocean, the Salem Willows parking lot was reconstructed to increase infiltration and treat runoff. The parking bays in the parking lot were constructed of an interlocking gravel paving system and the runoff from the driving lanes in the parking lot was directed to bioretention basins. Additionally, an adjacent open space area was modified to eliminate erosion and compaction of the ground around tree roots.
- Collins Cove Beach Living Shoreline Construction and Maintenance – This project was completed with FY19 and FY21 Coastal Resiliency Grants from CZM. The project provided a living shoreline (a natural approach) for protection against coastal erosion. Through grants and working with the City, SSCW designed, permitted, constructed, and helps maintain a successful living shoreline at Collins Cove Beach.

A project currently being completed in the Point neighborhood of Salem has a similar scope to this proposed Collins Cove to Willows area study. The project in the Point neighborhood is being funded by a FY22 grant from CZM, includes extensive outreach, and relies on available sea level rise data as well as the development of a hydrologic/hydraulic model to inform the evaluation of alternatives to increase climate resiliency in the area.

Utilization and Report from RMAT Climate Resilience Design Standards Tool

☐ Project is focused on a specific site and includes physical asset/s -- e.g., building, infrastructure, natural resources-- at any project phase

- If box is checked you are required to follow Attachment E and upload your RMAT tool report with your application. There is a place on the online form to upload this report.

☒ Project is NOT focused on a specific site and/or does NOT include physical asset/s --e.g., building, infrastructure, natural resources-- at any project phase

- You are not required to submit a report and will receive this point.

Climate Data to be Used

The proposed study will utilize data from ResilientMA.org to explore climate change data, impacts, vulnerability, and adaptation options. This includes the Northeast Climate Adaption Science Center's predicted increases in precipitation for the North Coastal Basin, which will be evaluated as part of the hydrologic/hydraulic modeling that will be conducted as part of this project. The project team will coordinate with the Commonwealth to utilize available climate data from the Massachusetts Climate and Hydrologic Risk project as well as the ongoing Massachusetts Statewide Climate Assessment and 2023 State Hazard Mitigation and Climate Adaptation Plan. The proposed study will also utilize data from Massachusetts Coast Flood Risk Model (MC-FRM) to assess future storm surge and sea level rise effects on the project area for the following planning horizons: 2030, 2050, and 2070. Local studies will also be used for gathering relevant information and climate data for the proposed study.

MVP Yearly Progress Report

The City of Salem is in good standing in the MVP program and has a proven track record of delivering successful MVP Action Grants. The City's FY23 MVP Progress Report is attached to this application (*Salem_Collins_Cove_Willows_MVP_Progress_Report_ENV23MVP02.pdf*).

2. Timeline, Scope, and Budget (15 points)

Scope

The subject of this Municipal Vulnerability Preparedness (MVP) action grant application is to conduct a resilience study for the Collins Cove to Willows area of Salem. The study is comprised of five key tasks to engage the community in assessing current and future vulnerabilities and risks to flooding and prioritizing structural, non-structural, and nature-based solutions. The five main project tasks are described in more detail below.

Task 1: Project Kick-off, Management, and Reporting

The City and its consultants, AECOM and Salem Sound Coastwatch (SSCW), will conduct a kick-off meeting with the Executive Office of Energy and Environmental Affairs (EEA) to review the proposed project's scope, schedule, and budget. This task also includes the City's completion and submittal of monthly progress reports by the 30th of each month of the grant period to the Northeast Region MVP Coordinator and development of a final project case study.

Task 1 Deliverables: Kick-off meeting notes and sign-in, monthly progress reports, final project case study/PowerPoint slide/project photos.
Primary Assigned Project Team Members: City, City's Consultants.

Task 2: Public Involvement and Community Engagement

The City and its consultants will involve the community and key stakeholders throughout the resilience study. The City's overall public involvement and community engagement plan is detailed in Section 5 of this application. Through this engagement, the City will receive and collect feedback on current vulnerabilities and risks in the study area as well as feedback to aid in the identification of community-informed alternatives for making the study area more resilient to current and projected conditions. Stakeholders will include but not be limited to City officials, residents, neighborhood associations, business owners, South Essex Sewerage District, and Salem Harbor Power Station. An emphasis will be placed on engaging residents in the Environmental Justice (EJ) and climate vulnerable populations that are in the Collins Cove portion of the study area since this is considered an especially vulnerable population group (see the attached EJ populations figure; *Salem_Collins_Cove_Willows_Figures_ENV23MVP02.pdf*). It is important for these EJ populations to have a voice in the study, and the City and SSCW will coordinate with neighborhood associations and schools who represent the residents in this portion of the study area to help reach this community and encourage its involvement. Community leaders and liaisons will be recruited to be champions for this resilience study.

Online and print outreach material will be created and distributed through the schools, local businesses, and neighborhood associations. Multiple venues will be employed to gather local stories of past flooding to inform the vulnerability assessment and modeling. This will include personal interviews, small group walk and talks, neighborhood meetings, and community workshops. A publicinput.com website for this project will join Salem's other resiliency projects so that everyone in the community has an opportunity to follow and contribute to the study. Publicinput.com provides quick language translations, and one of the project's community partners, the Bentley Academy Innovation School, has a website that is in English, Spanish, and Portuguese.

Three workshops will be conducted as part of the project's public involvement and community engagement program. The first workshop will serve as a kickoff for the resilience study, where the City will inform the

participants about the objectives of the study and solicit input that will guide and inform the study. The second workshop will be focused on sharing the findings of *Task 3: Assess Current and Future Vulnerabilities and Risks to Coastal and Inland Flooding*, and to seek ideas for potential resilience alternatives as well as input on criteria used to assess the feasibility of resilience alternatives (i.e. part of *Task 4: Identification and Assessment of Resilience Options to Reduce Risks*). The third workshop will be used to present the draft coastal resilience study results and discuss actions that will be taken as part of the City's implementation plan.

Task 2 Deliverables: Workshop #1 presentation and comment summary; Workshop #2 presentation and comment summary; Workshop #3 presentation and comment summary; list of outreach materials with distribution dates and methods; summary of personal stories data collection with pertinent findings documented; project ESRI StoryMap.
Primary Assigned Project Team Members: City, City's Consultants.

Task 3: Assess Current and Future Vulnerabilities and Risks to Coastal and Inland Flooding

Task 3 includes reviewing available information and assessing current and future vulnerability and risks to coastal and inland flooding, building on the preliminary citywide assessment conducted as part of the City's MVP planning grant and other resilience planning efforts that are currently underway. As part of this task, the City and its consultants will review past studies and reports directly related to the study area such as the 2014 Climate Change Vulnerability Assessment and Adaptation Plan; 2015 Massachusetts Coastal Infrastructure Inventory and Assessment Report Update – North Shore; 2020 MVP Summary of Findings Report; 2020 Columbus Avenue Seawall Reconstruction Project; 2021 Beverly and Salem Resilient Together Climate Action and Resilience Plan; and the ongoing Climate Change Deep Dive Model, Alternatives Analysis, and Targeted Outreach and Engagement project for the Point/Palmer Cove community.

This task will also be used to confirm ownership for shoreline properties and to obtain and review existing surveys, critical facility and infrastructure mapping, navigational charts, and documented historical storm events with associated damages. An allowance has been included in the Task 3 budget to obtain additional spot survey elevations to supplement existing survey data if needed. Data from the Massachusetts Office of Coastal Zone Management's Shoreline Change Project and the Federal Emergency Management Agency (FEMA) Region I's Coastal Erosion Hazard Map will be utilized to identify the historic and projected rates of erosion and/or accretion. The findings and recommendations from the past studies and historic data collected will be summarized in a memo.

In order to assess future vulnerability conditions for coastal flooding, results from the Massachusetts Coast Flood Risk Model (MC-FRM) will be used to assess future storm surge and sea level rise effects on the project area for the following planning horizons: 2030, 2050, and 2070. Both Level 1 (i.e. annual coastal flood exceedance probability data and depth data) and Level 2 (i.e. water surface elevations, maximum wave heights, design flood elevations, tidal benchmarks) data will be utilized. The storm surge and sea level data will be used to identify areas of potential inundation and vulnerability to coastal flooding. The FEMA Region I Coastal Erosion Hazard mapping data will be used to assess vulnerability to erosion for current and future conditions. This data, combined with the wave height results from the MC-FRM, will be used as part of Task 4 to identify areas along the coast where living shorelines, oyster reefs, or other nature-based solutions could be sited versus areas with a higher wave climate that would necessitate an engineered structure to provide appropriate flood and erosion control along the shoreline.

A key component of the City's infrastructure that will be assessed for inland flooding vulnerability is the storm drainage system. This system can be affected by climate change in two basic ways that can be compounded. First, the pipes may not have the capacity to convey the more intense rain events that are

predicted to occur as a result of climate change. Second, increased tide elevation, due to projected higher sea level and storm surge, could result in the ocean water flowing backwards through the stormwater system to upstream areas and result in flooding. If this backwater effect (high tide/storm surge) occurs simultaneously with an intense rainfall event, the flooding would be exacerbated since the stormwater would not be able to enter and flow in pipes to discharge to the receiving water. Therefore, a drainage analysis is needed to assess this risk and identify potential alternatives.

A model of the stormwater system will be created from available Geographic Information System (GIS) data which will include the key storm drainage pipes in the study area. The model will include the drainage area for the entire service area. The hydrology will be developed using available GIS land use data such as impervious areas and soil data. The model will utilize the PCSWMM software and will be fully dynamic. PCSWMM is a graphical user interface for the USEPA Stormwater Management Model (SWMM) and is widely used for this type of analysis. PCSWMM has the ability to represent the above ground storage using a 2D mesh. The mesh will be developed based on LIDAR data and will include buildings as obstructions using available GIS coverages of building footprints. The model will utilize time varying rainfall and tide to identify flooding areas.

Time varying tidal water levels will be applied at the stormwater outfalls. The model will first be run for existing conditions to confirm it generally predicts current known problem areas. The model will then be run for the future conditions with higher rainfall and tide / storm surge levels. The Northeast Climate Adaption Science Center's predicted increases in precipitation for the North Coastal Basin will be evaluated as part of this effort. The model results can be used to assess potential alternatives as part of Task 4, such as the need for larger stormwater pipes, the height of required seawalls, and the benefit of installing tide gates on the storm drains. The model could also be applied in subsequent more detailed assessments to size pump stations necessary to pump stormwater over sea walls if that is determined to be a proposed adaptation measure.

Task 3 Deliverables: Draft and Final Vulnerability Assessment and Modeling Results Memo, Hydrologic/Hydraulic Model Files.
Primary Assigned Project Team Members: City's Consultants.

Task 4: Identification and Assessment of Resilience Options to Reduce Risks

Building on the findings of Task 3, a list of potential resilience options will be developed to address the key vulnerabilities and risks that were identified in the study area. It is anticipated that the list of options will include a mix of structural, non-structural, and nature-based adaptation measures. As part of this task, a multi-criteria decision matrix assessing feasibility of the identified resilience options will be developed. Important considerations included in the matrix will be relative cost and funding opportunities, ownership, community acceptance, conservation restriction requirements, permitting requirements, and identification of responsible parties. The ability of the resilience options to protect the study area from the projected future conditions as determined from review of the latest available climate science data and projections (conducted under Task 3) will also be considered. This matrix and results of applying it will be summarized in a memo. The resilience options will be based on engineering judgements. Coastal and additional hydrologic/hydraulic modeling to better understand the effectiveness and design considerations for the resilience options, which is outside the scope of this study, may need to be performed to better inform the conceptual options and subsequent design efforts.

Considering the presence of several coastal city parks in the study area, this task will include development of a toolkit of resilience options that can be implemented for coastal parks. This toolkit will act as a resource for

future climate resilience projects not only for the City of Salem, but also for other coastal municipalities in the Commonwealth. This toolkit will identify key design components of each concept and provide recommendations for appropriate implementation scenarios for each option. A graphic representation of each concept will be developed and included in the toolkit.

Also, an emergency response plan in the event of an extreme weather event will be developed as part of this task. This will include identification of an evacuation route for residents, businesses, and the Bentley School, as well as means for first responders to provide assistance to impacted residents.

Task 4 Deliverables: Draft and Final Resilience Options Memo (including an emergency response plan attachment), Draft and Final Resilient Coastal Parks Toolkit.
Primary Assigned Project Team Members: City's Consultant.

Task 5: Collins Cove to Willows Resilience Study Report

Findings from the preceding tasks will be summarized in a report. The report will include an implementation plan that identifies prioritized action items, responsibilities, and potential funding sources. Implementation challenges will also be identified.

Task 5 Deliverables: Draft and Final Collins Cove to Willows Resilience Study Report.
Primary Assigned Project Team Members: City's Consultant.

Budget

The project's detailed budget is provided in Attachment B (*Salem_Collins_Cove_Willows_Attachment_B_ENV23MVP02.xlsx*), which includes budget numbers for each task and subtask of the proposed scope of work included in this application. The "Optional Budget Data" tab has been competed to provide application reviewers with a greater level of detail for the proposed budget.

Timeline

The City of Salem is committed to executing the scope of work presented in this application within approximately ten months of receipt of a Notice to Proceed (NTP) and will partner with AECOM and SSCW who have sufficient staffing availability, technical expertise, and familiarity with the study area to allow this schedule to be met. The project timeline is provided in the table on the following page. The dates in the project timeline align with those used in the detailed budget in Attachment B (*Salem_Collins_Cove_Willows_Attachment_B_ENV23MVP02.xlsx*). The timeline included in this application assumes an NTP of September 1, 2022 for the consultants supporting the project.

Regulatory Project Components

The subject of this application is a resilience study, which qualifies as a "Project Type 1." Thus, completion of *Attachment C: Required Information for Design, Permitting, and Construction Projects* is not required. However, the study will include identification of permitting requirements for recommended resilience options. Also, relevant regulatory agencies will be invited to participate in the public involvement and community engagement activities and given the opportunity to review and comment on draft deliverables.

Proposed Schedule for Collins Cove to Willows Resilience Study (Assumes Notice to Proceed is Issued by September 1, 2022)

Task	September		October		November		December		January		February		March		April		May		June	
Task 1: Project Kick-off, Management, and Reporting																				
Sub-task 1.1 Kick-off Meeting with Town, EEA, and Consultant		■																		
Sub-task 1.2 Monthly Progress Reports FY23		■		■		■		■		■		■		■		■		■		■
Sub-task 1.3 Project Case Study																				■
Task 2: Public Involvement and Community Engagement																				
Sub-task 2.1 Workshop #1					■															
Sub-task 2.2 Workshop #2											■									
Sub-task 2.3 Workshop #3																	■			
Sub-task 2.4 Online and Print Outreach Material		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Sub-task 2.5 Personal Stories Data Gathering			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■			
Sub-task 2.6 Collins Cove to Willows Resilience Study Website and StoryMap		■	■	■		■						■				■	■	■	■	
Sub-task 2.7 Community Liaisons		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Task 3: Assess Current and Future Vulnerabilities and Risks to Coastal and Inland Flooding																				
Sub-task 3.1 Draft Vulnerability Assessment and Modeling Results Memo	■	■	■	■	■	■	■	■												
Sub-task 3.2 Final Vulnerability Assessment and Modeling Results Memo									■	■										
Task 4: Identification and Assessment of Resilience Options to Reduce Risks																				
Sub-task 4.1 Draft Resilience Options Memo											■	■	■	■						
Sub-task 4.2 Final Resilience Options Memo															■	■				
Sub-task 4.3 Resilient Coastal Parks Toolkit						■	■	■	■											
Sub-task 4.4 Resilient Coastal Parks Toolkit										■	■									
Task 5: Collins Cove to Willows Resilience Study Report																				
Sub-task 5.1 Draft Collins Cove to Willows Resilience Study Report																■	■	■		
Sub-task 5.2 Final Collins Cove to Willows Resilience Study Report																			■	■

3. Nature-Based Solutions and Environmental Co-Benefits (16 Points)

Incorporation of Nature-Based Solutions

The study will identify and evaluate the feasibility of nature-based solutions and strategies to increase resilience to sea level rise, storm surge, and extreme precipitation in the Collins Cove to Willows area. Nature-based solutions offer several benefits to communities that infrastructure-only projects cannot provide. These benefits include promoting biodiversity, restoring lost habitats, managing ecological systems, improving water quality and groundwater recharge, and providing climate mitigation.

The project team will reach out to the Municipal Vulnerability Preparedness (MVP) Regional Coordinator to identify relevant local, state, and federal groups as well as engage community members and environmental organizations to better understand the natural characteristics and climate hazards in the study area. The project team will also work with the community members who are impacted by the climate hazards to understand their risks and to develop solutions that would provide benefits to those who are most at risk. The study will explore suitability of the following nature-based solutions to protect the study area from flooding:

- Living Shorelines: Living shorelines use native plants (marsh grasses and seagrass), sand/soil, and the limited use of hard structures to reduce coastal erosion. Living shorelines preserve, create, or enhance coastal habitats and improve water quality and reduce erosion.
- Shore and Beach Nourishment and Rehabilitation: This involves spreading sand on eroded shores and maintaining beach widths to prevent overtopping of seawalls and shore erosion. This method also improves soil quality and stability, and erosion prevention.
- Dune Protection: Dune protection and management helps in protecting coastal shorelines against flooding and erosion. Measures such as grass planting, dune thatching and dune fencing help accumulate sand that would protect dunes. Some of the co-benefits of protecting dunes include improvement of soil quality and stability, erosion prevention, and promoting biodiversity.
- Coastal Wetlands Restoration: Coastal wetlands restoration reduces the risk of coastal flooding by decreasing the height of storm surges and reducing the impact of sea-level rise. Coastal wetlands can be restored by adding sediment to raise land above the water level, which enhances vegetation growth for wetland plants such as seagrass and salt marshes. Coastal wetlands restoration regulates water cycle, improves water quality, soil quality and stability, prevents erosion, promotes biodiversity, and achieves carbon sequestration.
- Sustainable Drainage Systems: This involves reducing the volume of surface water run-off during flooding by using natural features and processes. This method also helps in regulating water cycle, recharging groundwater, and improving air quality.

Identification of Environmental Co-Benefits

Co-Benefit		Description of how the project will produce this environmental co-benefit
Promotes Biodiversity (habitat restoration, creation, or enhancement)	☒	The study area is home to a variety of coastal habitats including saltmarsh, beaches, maritime shrub, and tidal flats. Stabilizing beaches through dune grass planting will provide and preserve habitat for birds, insects, and other species that rely on this natural community. This is particularly important in areas that receive a lot of foot traffic. Installation of living shorelines will help to protect salt marshes that are at risk to erosion caused by wave action and increased sea level rise. Marshes trap sediments from tidal waters and grow in elevation as sea level rises. Salt marsh vegetation provides critical habitat for fish, birds, insects, and invertebrates. By increasing vegetation and stabilizing living shorelines wherever possible along the project area coastline, the project can preserve natural coastal processes that will maintain coastal habitats as well as enhance critical feeding habitats for coastal and estuarine species. The toolkit will also identify areas that can accommodate salt marsh migration.
Restores/remediates Project Site	☒	Nature-based resilience strategies like beach nourishment and living shorelines protect and restore coastal areas that are at risk to flooding and storm surge. A key objective of restoring these areas is to not only prevent and mitigate erosion but to enhance the vegetative communities of these ecosystems. This in turn enhances habitat for a variety of birds, invertebrates, and aquatic species.
Promotes Environmentally-Sustainable Development / Reduces Development in Climate Vulnerable Areas	☒	Sustainable drainage systems use natural features and process to reduce the volume of surface water run-off during flooding. This method promotes environmentally sustainable development in the study area.
Improved Water Quality and/or Increased Groundwater Recharge	☒	Nature-based solutions such as living shorelines, coastal wetlands restoration, and sustainable drainage systems regulate water cycle, reduce erosion, improve water quality, and increase groundwater recharge. Stormwater best management practices such as bioretention and removal of impervious surfaces will also help in improving water quality by enhancing infiltration and reducing the amount of stormwater, nutrients, and contaminants.
Improved Air Quality	☒	The project promotes improved air quality by protecting green spaces and tree planting at Willows Park, Winter Island Park, and other community gathering spaces in the study area. The project will also work to increase the opportunities for existing trees to thrive
Climate Mitigation (carbon sequestration, site-scale improvements for cooling, reduced energy use)	☒	Living shorelines and coastal wetlands restoration will preserve and protect salt marshes, which sequester and store carbon. The project will also incorporate developments that promote zero-carbon footprint.
Other Environmental Co-Benefit:	☒	The project will engage community members in learning about nature-based solutions.

4. Environmental Justice and Public/Regional Benefits (14 points)

Environmental Justice Populations and Climate Vulnerable Populations

The study area is located within mapped Environmental Justice (EJ) populations identified through the Massachusetts EJ viewer. As shown in the attached EJ populations figure (see attached file named *Salem_Collins_Cove_Willows_Figures_ENV23MVP02.pdf*), the Collins Cove portion of the study area includes populations that meet the EJ criteria of "Minority" and "Minority and Income." *(Note: The 2020 EJ Populations layer is based on 2015-2019 American Community Survey (ACS) data).*

Two of the three block groups that the study area is located in are EJ communities. The study area is located in two Census Tracts: 2044 and 2045. Census Tract 2044 includes Block Group 4 with a population of 1,092 in 2019. Block Group 4 meets the EJ criteria of "Minority and Income" as it has a total minority (non-white) population of 25.7% and median household income of $53,510, which is below the 65% of the statewide median household income for Massachusetts ($85,843 in 2019). Census Tract 2045, Block Group 1 has a total population of 1,512. Block Group 1 also meets the criteria for a "Minority" EJ population with a total minority population of 24.9% and median household income of $101,583 (118.35% of the state median income), which is less than 150.5% of the state median household income.

Overall citywide, based on the 2019 ACS 5-year Estimates, 15 of the 33 block groups (45.5% of the block groups) in the City of Salem are considered EJ block groups, and a total of 45.6% of the City's population lives in the EJ block groups. The City of Salem's median household income in 2019 was $68,808.

According to the Massachusetts Department of Public Health's "Climate Change Vulnerability Map", the study area also consists of climate vulnerable populations in both Census Tracts. Census Tract 2044 includes 3.4% of populations under 5 years, 23.3% of populations over 65 years, and 13% of the populations over 65 years living alone. Census Tract 2045 includes 6.1% of populations under 5 years, 20.9% of populations over 65 years, and 9% of the populations over 65 years living alone. The study area's access to public transit is also very limited with only one transit route available along the western edge of the study area serving the residents along Bridge Street.

The Massachusetts State Hazard Mitigation and Climate Adaptation Plan (September 2018) states that "individuals who have less physical and socioeconomic resiliency due to factors such as age, mobility, access to transportation, income level, race, or health status are more vulnerable to the impacts of natural hazards and climate change." People living in poverty and communities of color are identified as vulnerable populations that may require extra time or outside assistance during evacuations or during events that cause power outages or isolation and are considered to be more likely to seek or require emergency services. They are also more likely to live in risk-prone areas with poor infrastructure. Therefore, it is critical that efforts to increase resiliency prioritize vulnerable communities and are inclusive of vulnerable populations.

How the Project will increase Climate Resiliency for EJ and Climate Vulnerable Populations

Portions of the study area are currently experiencing coastal and overland flooding. This includes the Bentley Academy Innovation School, residents of the Leefort Terrace (a State Public Housing development for elderly and disabled households), Bridge Street neighborhood (west Collins Cove), Collins Cove neighborhood (Webb Street and east Collins Cove), and Salem Willows. All these neighborhoods, except the Willows, are home to or service EJ and climate vulnerable populations who are even more vulnerable to flooding. With climate change, flooding is anticipated to worsen, particularly where there is insufficient drainage, and could lead to

upstream flooding and tidal backwater flooding. In addition to impairing the function of the stormwater system and damaging homes and property, this presents a significant health hazard to the community. Floodwater can contain a range of contaminants, downed power lines, physical objects, bacteria, and chemicals. Exposure can cause infections, gastrointestinal illness, tetanus, and other impacts to health. It also poses a drowning risk.

Flooding threatens the integrity of the community's infrastructure and causes road closures and impacts to access and travel. Anticipated future flooding may impact the viability of vegetation that is not tolerant to inundation or salt, resulting in reduced property value and impacts to valuable community assets.

The population is particularly vulnerable due to its geographic location on a peninsula surrounded by coastal hazards with limited evacuation routes. The proposed project will create an emergency response plan that identifies an evacuation route and means for first responders to provide assistance during extreme weather. Evacuation of individuals with limited mobility and limited access to transportation will be addressed in the emergency response plan.

The proposed project will identify and rank a suite of resilience options to improve drainage, infrastructure, and preparedness. This assessment is a needed step in identifying priority actions to address current hazards and adapt to future conditions. During the process of implementing this project, there will be several opportunities to engage and educate the community about flood hazards, adaptation strategies, and evacuation, which is an important component of building resilience.

The City and its consultants will involve the community and key stakeholders throughout the resilience study to increase climate resiliency for the EJ and climate vulnerable populations. Through public involvement and community engagement, the City will receive and collect feedback on current vulnerabilities and risks in the study area as well as feedback to aid in the identification of community-informed alternatives for making the study area more resilient to current and projected conditions. The City and its consultants will review available information and assess current and future vulnerability and risks to coastal and inland flooding, building on the preliminary citywide assessment conducted as part of the City's Municipal Vulnerability Preparedness planning grant and other resilience planning efforts that are currently underway. The City will develop a list of potential resilience options to address the key vulnerabilities and risks that were identified in the study area.

Support from and involvement of EJ and Climate Vulnerable Populations

The City of Salem's resilient study is supported by the EJ populations of the study area. Letters of support from residents and/or community groups representing the EJ populations are included in the Letters of Support attachment (*Salem_Collins_Cove_Willows_Letters_of_Support_ENV23MVP02.pdf*).

The study will engage residents in the EJ and climate vulnerable populations that are in the Collins Cove portion of the study area since this is considered an especially vulnerable population group. The City and Salem Sound Coastwatch will coordinate with the neighborhood associations that represent the residents in this portion of the study area to help reach this community and encourage its involvement. Using the Community Liaison Model, individuals who represent the local EJ and climate vulnerable communities will be reimbursed for time spent working with the outreach team to achieve better inclusiveness and equitable outcomes. Liaisons will be sought to represent the Leefort Terrace population (Salem Housing Authority), the City's Bentley Academy Innovation School, and people who have experienced flooding from living or working in this area. The City will compensate the community liaisons for their involvement during the study and has

allocated a budget of $1,000 for the community liaisons task as shown in the proposed budget (*Salem_Collins_Cove_Willows_Attachment_B_ENV23MVP02.xlsx*).

The project team will include various strategies to make the public involvement and engagement process more equitable to the EJ and climate vulnerable populations. Some of the equitable strategies will include but are not limited to selecting meeting hours and locations that are feasible for the EJ/climate vulnerable populations, implementing and coordinating actions through the community liaison, identifying and sharing content with alternative language online media outlets that service the residents of these populations, and providing childcare services during meetings. See Section 5 of this application for additional details on the public involvement and community engagement strategy for this project.

Salem is actively engaging the EJ and climate vulnerable populations across the city through all its departments and its Race Equity Task Force. Upon hiring its first Diversity, Equity and Inclusion Director who will work with the forthcoming Race Equity Commission, Mayor Driscoll commented, "The Director will advance racial equity in the City, amplify underrepresented voices, address systemic racism prevalent in government entities and strive to galvanize community support for DEI efforts."

Broad and Multiple Community Benefits

The study will most directly benefit approximately 3,173 residents (2020 Census) in 2,709 households (2020 ACS) located in the study area, including the EJ populations in the Collins Cove area, by creating a resilient infrastructure to protect the properties in the study area from the environmental and health hazards during coastal and inland flooding. The study area includes assessment of parks that are utilized by residents other than those within the physical limit of the study area; thereby expanding the benefits to EJ populations and residents in other parts of the City. The study will result in resilience recommendations and a toolkit for resources such as parks that are used by the City's entire population as well as neighboring communities, such as Winter Island Park, Salem Willows, Collins Cove Park, and beaches. Winter Island Park, located on the waterfront of Salem Harbor, is located within Federal Emergency Management Agency (FEMA) Zone VE and is therefore vulnerable to coastal hazards. Winter Island Park offers a range of recreational opportunities and is the one of the closest campgrounds to Boston on the North Shore. Another regional asset, Historic Salem Willows Park, provide 35 acres of oceanfront vistas, picnic grounds, fishing, and swimming, and is also vulnerable to coastal hazards.

The project will result in the identification of resilient measures that will benefit the study area's road network by protecting and maintaining emergency access to the coastal areas. This will also provide identification of safe evacuation routes for the communities, which would reduce the need for emergency response team to respond to the flooded areas. The project will provide co-benefits to the community by identifying resilience measures that will protect the residents from injuries, deaths, and mental stress by making them aware and informed of the current and future vulnerabilities and risks from the climate change and by protecting the infrastructures and personal assets from being damaged by extreme weather events. Other co-benefits of the project include identification of resilience measures that will improve aesthetics of the neighborhoods and potentially increase property values in the area.

Regional Benefits

The project will benefit the following critical facilities that are located within the study area serve the region: South Essex Sewerage District (SESD) Wastewater Treatment Facility and Salem Harbor Power Station/Footprint Power Salem Harbor Operations LLC (Footprint Power). SESD currently serves

approximately 185,000 residents and many businesses in Salem, Beverly, Marblehead, Peabody, and Danvers and a portion of the Towns of Middleton and Wenham. Footprint Power provides efficient, reliable, low-emission electrical power to New England. These critical facilities are located on the east side of Fort Avenue in the study area and are vulnerable to coastal flooding and inland flooding. Access to these critical facilities is also threatened under future conditions. Recommendations from this study will protect these facilities during coastal and inland flooding, which is important for the safety of public health and quality of water resources that serve the region's residents and businesses.

Additionally, the resilience study will develop a resilient coastal parks toolkit with strategies to mitigate climate change for coastal parks in the study area. The toolkit will include transferable strategies that can be used as a resource for future climate resilience projects not only for the City of Salem, but also for other coastal municipalities in the Commonwealth.

5. Public Involvement and Community Engagement (12 points)

Public Involvement and Community Engagement Plan Narrative

Salem Sound Coastwatch (SSCW) in coordination with the project team will develop and implement a public involvement and community engagement plan that incorporates a mix of print, digital, and in-person elements, along with equitable engagement methods to assure inclusion of Environmental Justice (EJ) and climate vulnerable populations in Salem's Collins Cove to Willows Resilience Study Area.

The following Equitable Engagement Modifiers will be included in each print, digital, and in-person strategy. The engagement goals are to build awareness of the project and obtain stakeholder feedback on current climate vulnerabilities and risks from individuals who live or work in the area. Community members' awareness of climate change and resilience will be an additional significant benefit. The plan will identify and engage a wide range of stakeholders to obtain their input through interviews, community meetings, and workshops. Their feedback will aid in the identification of community-informed resiliency alternatives.

Finally, the final project deliverables will be communicated back to stakeholders through social media, an ESRI StoryMap, the City of Salem's and SSCW's websites, newspapers, public meetings, and walking tours of the project area. Salem's vibrant neighborhood associations will also be involved to reach the different constituents. Using the Community Liaison Model, individuals who represent the local EJ and climate vulnerable communities will be reimbursed for time spent working with the outreach team to achieve better inclusiveness and equitable outcomes. Liaisons will be sought to represent the Leefort Terrace population (Salem Housing Authority property), the City's Bentley Academy Innovation School, and people who have experienced flooding from living or working in this area. Meeting times and locations will be matched to the diverse neighborhoods and populations that make up this area. Public involvement and community engagement will be conducted in a culturally competent and meaningful way by the entire project team.

Printed Engagement

1. Project information, materials, and meeting announcements will be distributed to residents, businesses, the two Ward Councilors representing the study area, and the City Councilors-at-Large.
2. Flyers informing the community of the project, workshops, and resiliency benefits will be posted.
3. "Backpack Mailer" will be sent home with middle school students.
4. Local newspapers will be given press releases and announcements.

Electronic/Digital Engagement

1. The City of Salem is successfully using the public engagement web platform, publicinput.com, for its climate resilience and sustainability work. A publicinput.com/CollinsCovetoWillows website will be created to post announcements, materials, and presentations and a way to post online comments.
2. Language translation is available through the publicinput.com platform.
3. SATV, Salem's Public Access TV, will be engaged to help distribute information.
4. An online ESRI StoryMap will be created to explain the project process and results, which will be accessed with links on the project webpages at salemma.gov, salemsound.org and publicinput.com/CollinsCovetoWillows.
5. Social media will be used to increase the project's reach.
6. Email lists will be generated that include community stakeholders.
7. Information on how to submit comments will be posted on multiple venues.

An additional Equitable Engagement Modifier will be to identify venues and share content with alternative language online media outlets that service residents of the EJ/climate vulnerable population.

In-Person Engagement

1. Three public community workshops will be held:
    a. First, the fall kickoff will introduce the project and its resiliency goals and objectives, which will begin the on-going process of soliciting community input to guide and inform the study.
    b. Second, a winter workshop will focus on sharing the findings of *Task 3: Assess Current and Future Vulnerabilities and Risks to Coastal and Inland Flooding* and to seek ideas for potential resilience alternatives as well as input on criteria used to assess the feasibility of resilience alternatives (i.e. part of *Task 4: Identification and Assessment of Resilience Options to Reduce Risks*).
    c. Finally, the spring workshop will present the draft coastal resilience study results and discuss actions that will be taken as part of the City's implementation plan.
2. Stakeholder data gathering interviews.
3. Walk and talks of the different areas of the project.

Assisting methods may include staffed "Pop-Up" events within project area.

An additional Equitable Engagement Modifier will include selecting meeting hours that correspond with hours that are feasible for stakeholders.

Public Involvement and Community Engagement Plan Table

Collins Cove to Willows Resilience Study Public Involvement and Community Engagement Plan Table Summary (summarized version of narrative)			
	Print	Digital	In-Person
Principal Strategies	1. Outreach material distributed to residents and businesses in the project area. 2. Materials provided to City Councilors and neighborhood associations. 3. "Backpack Mailer" 4. Local newspapers	1. SATV announcements 2. Online Patch 3. Project ESRI StoryMap	1. Three public workshops 2. Data-gathering interviews with area businesses and residents. 3. Walk and talks of project areas
Assisting Strategies	1. Flyers announcing community workshops and project's resiliency benefits	1. Project webpages: publicinput.com and salemsound.org for the ESRI StoryMap, project details and comment submittals. 2. Social media to increase the project's reach 3. Facebook for neighborhood associations 4. Stakeholder email lists	1. Staffed "Pop-Up" events within project area
Equitable Engagement Modifiers	1. Implementing and coordinating actions through the Community Liaison Model	1. Identify venues and share content with alternative language online media outlets that service the EJ/Climate Vulnerable Population	1. Selecting meeting hours that correspond with hours that are feasible for stakeholders
How community feedback will be incorporated into project and mechanism by which results will be shared: Stakeholders will be identified and engaged to obtain their input through individual interviews, multiple meetings, workshops, walking tours of the site, and social media. Their feedback will be incorporated into the project deliverables and communicated back to stakeholders through social media, webpages, newspapers, public meetings, and walking tours of the project.			

6. Project Transferability, Measurement of Success, and Maintenance (8 points)

Project Transferability

The study will develop a resilient coastal parks toolkit with strategies to mitigate climate change for coastal parks in the study area. This toolkit will include transferable strategies that can be used as a resource for future climate resilience projects not only for the City of Salem, but also for other coastal municipalities in the Commonwealth that are interested in identifying suitable resilience interventions for their vulnerable coastal parks. This toolkit will identify key design components of each concept and provide recommendations for appropriate implementation scenarios for each option. A graphic representation of each concept will be developed and included in the toolkit. The City plans to post the toolkit on its website to facilitate access to it and will also share the results of the study and toolkit via the Salem Sound Coastwatch's (SSCW's) website.

The emergency response and evacuation plan that will be developed as part of this project can be used as an example by other communities to help inform development of their own plans.

Measurement of Success

The City's local project manager will oversee execution of the proposed scope of work and will work closely with the consultants, AECOM and SSCW, to keep the project on schedule and within budget. The City views participation of stakeholders and public, including the EJ and climate vulnerable populations, as an important measure of success for the project and will invest staff time in advertising the study and workshop opportunities to aid in robust and equitable stakeholder engagement. The summary report will develop an implementation plan that identifies prioritized action items, responsibilities, and potential funding sources as well as implementation challenges. The project will result in recommendations that will support the following outcomes: reduction in flooding of the coastal parks and transportation network infrastructure and evacuation routes, reduction in loss of power and operation at critical facilities, improvement in drainage system, increase in stormwater storage capacity, and improved access to community parks and beaches.

Maintenance

The City will continue to work with the stakeholders and take steps to implement the study recommendations. The City and its partners will work together to seek funding to implement subsequent project phases including design, permitting, and construction of recommended resilience strategies. The City will conduct meetings with key stakeholders to track the study's progress and challenges. Progress made will be presented by the City in its MVP yearly progress report.

7. Need for Financial Assistance (6 points)

The Community Resilience Building (CRB) workshop summary, and the collaborative Resilient Together: Climate Action and Resilience Plan, demonstrate that Salem has a considerable list of priorities and needs related to its commitment of addressing the effects of climate change. Receiving funding through grants allows the City to be proactive, rather than reactive, in meeting the challenges that come from not only being a coastal community but also from having significant low-lying filled tidelands areas.

The Municipal Vulnerability Preparedness (MVP) grant program is the best programmatic fit because the proposed project aligns with the core principals of the MVP program. The proposed project intends to address multiple priority actions identified in Salem's CRB workshop while using climate change data from sources like ResilientMA.org and the Massachusetts Coast Flood Risk Model (MC-FRM). The focus on coastal parks prioritizes nature-based solution as well as opportunities for co-benefits such as ecological restoration, park improvements, and economic vitality. Additionally, a wastewater treatment facility, the South Essex Sewerage District (SESD), that serves a regional community is within the study area boundaries. The SESD provides a regional benefit whose essential services must be safeguarded.

Funding from MVP will help the City consider and implement adaptive solutions that are not the traditional hardscaped standard tools in the toolbox. Receipt of an MVP action grant will allow for opportunities to collaborate and innovate in ways that would not be possible without that support.

8. Project Feasibility, Support, and Management (6 points)

Technical, Financial, and Management Capacity

The City of Salem is moving toward completion of a resiliency study in the Point neighborhood that uses a similar approach to what is proposed in this application. Therefore, City staff have developed a knowledge base, as well as lessons learned, during that effort that can be applied directly to this project. The City's project manager for the Collins Cove to Willows Resiliency Study will be Deborah Duhamel, Assistant City Engineer. Ms. Duhamel has 28 years of civil consulting and municipal engineering experience (see attached file named *Salem_Collins_Cove_Willows_PM_Resume_ENV23MVP02.pdf* for Ms. Duhamel's resume). She was a significant contributor to the successful completion of the City's FY20 Municipal Vulnerability Preparedness (MVP) Action Grant for the Ocean Avenue Pump Station Evaluation and Preliminary Design, so she is familiar with the MVP grant program process. Additionally, she brings extensive experience in planning, design, and construction of stormwater management systems including hydrologic and hydraulic modeling. City staff support for this project will also include David Knowlton, City Engineer/DPS Director, and GIS Technician, Maria Josefson.

The City will be supported by following consultants: AECOM and Salem Sound Coastwatch (SSCW). AECOM has performed infrastructure work in the City of Salem for decades and has a strong existing relationship with the City's project manager and the Engineering department. AECOM brings extensive local and national experience conducting vulnerability assessments and climate resilience studies, including for coastal communities like Salem. AECOM will draw from its experience and best practices and will perform the technical work required for this project.

SSCW is an environmental non-profit working in Salem with municipalities, government agencies, businesses, other non-profit organizations, and residents. SSCW is a certified Massachusetts Municipal Vulnerability Preparedness Provider. It has been involved in Salem's 2014 Climate Assessment and Action Plan, its Community Resilience Building Workshop, and the FY22 MVP Resilient Together: The Point project. SSCW will bring its extensive community connections and knowledge to help build success for this MVP action grant project.

Letters of Support

The City has broad and diverse support for the proposed project as evidenced by letters of support from the following individuals and organizations that are included in the Letters of Support attachment in the order presented below (*Salem_Collins_Cove_Willows_Letters_of_Support_ENV23MVP02.pdf*).

- Joan B. Lovely, State Senator, Second Essex District
- Paul F. Tucker, State Representative, Seventh Essex District
- Caroline E. Watson-Felt, City Councilor for Ward 2, City of Salem
- Robert K. McCarthy, City Councilor for Ward 1, City of Salem
- Bentley Academy Innovation School, Salem Public Schools
- South Essex Sewerage District
- Beacon Communities LLC – Redevelopment of Leefort Terrace
- Bridge Street Neck Neighborhood Association

- Salem Sound Coastwatch

Good Standing in the Municipal Vulnerability Preparedness (MVP) Program

The City of Salem is in good standing in the MVP program and has a proven track record of delivering successful MVP Action Grants. The City's FY23 MVP Progress Report is attached to this application (*Salem_Collins_Cove_Willows_MVP_Progress_Report.pdf*).