

Adapting to Rising Tides Nine County Work Program

Regional Assessment and Adaptation Project

SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION
(MARCH 2015)



Adapting to Rising: Tides Nine County Assessment

Over the past four years, assessments of the region's vulnerability to current and future flooding have become more coordinated and are beginning to produce recommended actions to improve resilience. Some of the region's more comprehensive, guiding projects include the San Francisco Bay Conservation and Development Commission's Adapting to Rising Tides Program (ART), the Silicon Valley 2.0 project, and the City of San Francisco's Sea Level Guidance for Capital Planning. While these projects were conducted in different parts of the region and were led by different agencies, the sponsors coordinated to ensure similar methods were used to determine the areas at risk for current and future flooding, to assess vulnerabilities and developing strategies.

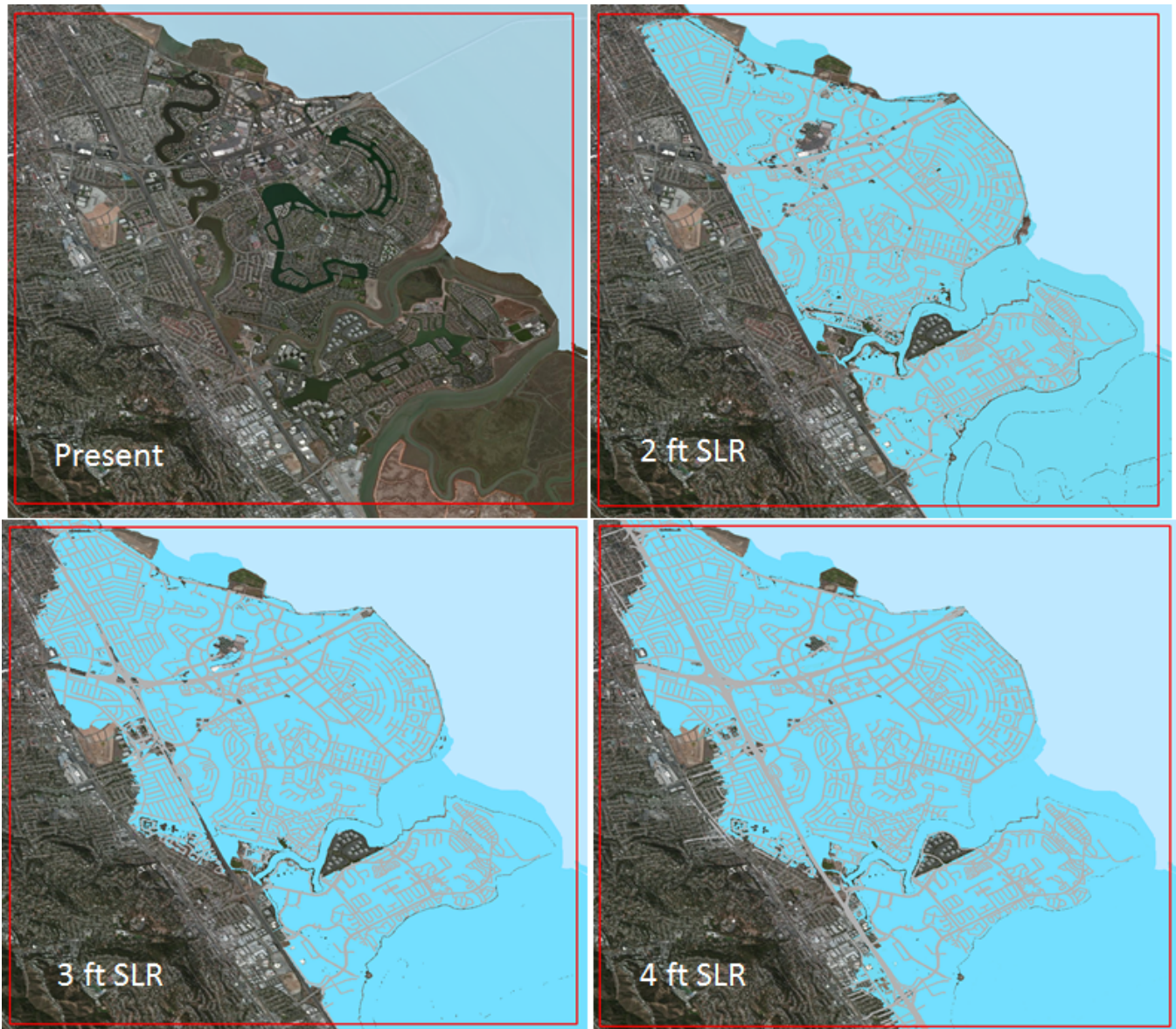
These and other efforts around the region clearly show that the most effective and efficient approach to assessing and responding to current and future flooding risks is to develop a uniform approach to exposure mapping, assessing risks, and developing actions across the region. A consistent approach will facilitate funding and action at local, regional, state and federal scales, providing the information and data necessary to pursue strategies ranging from legislative and regulatory changes to site specific strategies to address local vulnerabilities. As demonstrated by the ART program, conducting this work at the regional scale can also build capacity at the local level, and provide findings and actions at the regional, local, sector and component scales that can be used to jumpstart planning and action.

Why focus on understanding and addressing current and future flooding rise in the Bay Area?

While storm events and sea level rise will be an issue for all of California, the Bay Area faces some unique challenges as well as current opportunities that make it timely to advance a regional project with a focus on transportation assets and services. These include:

- The highest density development in the Bay Area was built along the shoreline on fill. This has resulted in numerous critical assets on or near the shoreline at a very low elevation with ad-hoc, or no shoreline protection.
- Based on findings from assessments to date, it is difficult to address this problem within a single agency or jurisdiction. Coordination among multiple jurisdiction and agencies is critical for successful adaptation. The Bay Area's nine-counties and the significant number of transportation and flood protection agencies makes this coordination challenging, and require work on these issues starts well before the region's people, infrastructure, economy and environment face these risks.
- A significant percentage of the Bay Area's critical transportation infrastructure is at risk from current and future flooding. This includes the majority of the region's interstates, rail lines serving passenger and cargo, two of the three international airports, several of the region's general aviation airports, and a number of the region's transit agency assets and services.

Figure 1. Foster City Transportation Infrastructure under SLR scenarios



	Exposure of transportation assets within area shown					
	2ft SLR		3FT SLR		4FT SLR	
	Miles	Acres	Miles	Acres	Miles	Acres
High Importance Roads	5.7	103.2	16.8	304.9	26.9	488.5
Local Connecting Roads	27.7	201.4	33.6	244.0	33.6	244.2
Local Roads / High Importance	33.5	203.0	50.4	305.3	51.5	312.2
Local Roads	60.1	364.1	79.7	482.9	79.9	484.4
Local Roads / Minor Importance	95.1	576.2	109.5	663.8	110.0	666.4

Current Opportunities

While the risks are significant, there is a great opportunity to build on the findings, recommendations and relationships that have been developed by work underway in the region. The current opportunities include:

- Using the findings and recommendations from the ART program and related efforts to jump-start work in other parts of the region.
- Strengthening the relationships that have been built through work across jurisdictions, agencies and sectors within efforts, such as ART. These cross-jurisdictional, multiple asset efforts not only allow for the development of actions that provide multiple benefits and protect multiple assets, they also allow different agencies, organizations, jurisdictions, interested parties, asset owners, community members and others to assess the potential risks and consequences together and, together, develop actions that work in the real world.

Why is it timely to address this issue now?

Communities throughout the region are undertaking adaptation planning at various scales and using differing approaches. The ART program and other efforts demonstrate that the region benefits greatly from coordination and consistency. With significant work already completed in Alameda and Santa Clara Counties and in the transportation and parks and recreation sectors, the region has a strong understanding of the issues and how to approach them to get to action. Ongoing and new projects getting underway need support. These include assessments in San Mateo County, Contra Costa County and Marin County, the Highway 37 Stewardship Study, the Regional Hazard Mitigation Plan update, and work on a resilience chapter for the region's Sustainable Communities Strategy. It is very timely to initiate an assessment and develop recommendations and support for the region to ensure consistency and efficiency for these efforts. In every ART effort, the participants consistently request this kind of action, and inquire what the region is doing on this issue. The Regional Assessment and Adaptation Project would fill this gap and ensure that the efforts around the region are well supported, consistent and resulting in outcome-oriented actions.

Why the Adapting to Rising Tides approach should be used to conduct the Regional Assessment and Adaptation Project.

The ART approach is a road-tested adaptation planning process that will ensure that assessment and adaption - from local, to county, to regional - are outcome-oriented with results that can be integrated across scales and sectors. ART has been developed, tested and refined based on experience doing the work and with valuable feedback from the agencies and organizations that participate in ART working groups. An important characteristic of the ART approach - which differentiates it from other adaptation planning processes - is the integration of sustainability into each step across all sectors and scales of the assessment and planning effort. Sustainability in ART includes society and equity, environment, economy and governance. Addressing governance challenges and opportunities is critical to achieving sustainable and successful adaptation; the issues at hand cannot be solved without the active engagement of community members, elected officials, the private sector, non-profits, and governments.

The core features of ART that will result in a successful Regional Assessment and Adaptation Project include:

- **Considers sustainability from start to finish**

A core aspect of ART is consideration of the relevance and implications of all aspects of sustainability in each step of the planning process, from who is included in the initial working group list to what evaluation criteria are selected to evaluate adaptation responses.

- **Convenes and engages a working group to build local capacity and ensure outcomes resonate locally**

ART convenes working groups with diverse perspectives and expertise that together develop a shared understanding of the issues, builds trust among stakeholders, and achieves buy-in for collaborative problem solving.

- **Can be applied to different geographies, sectors and hazards**

ART builds an understanding of the underlying causes and components of vulnerability and consequences at different scales - from individual assets, systems and sectors, to large and small project areas, to different hazards including flooding and earthquakes

- **Clear outcomes and communications materials**

ART develops summarized assessment findings that are concise and clearly communicate the planning issues in a manner approachable to a wide variety of audiences.

- **Results in a robust and transparent vulnerability assessment that makes the case for adaptation**

To build a strong and actionable case for adaptation, ART adheres to transparent decision-making throughout the planning process. ART guidance, tools and information help maintain transparency and support clear communication to stakeholders about the decisions and project outcomes, including resilience goals developed and agreed upon by the working group and evaluation criteria that clearly lay out priorities and objectives.

- **Establishes a clear roadmap for taking action**

ART establishes a clear road map for taking action on planning issues by collaboratively developing adaptation responses with one or more actions and options for making implementation real by clarifying roles and responsibilities, the timing and sequencing of actions, and the individual and collective next steps for getting started and possible funding sources and ways to include in existing plans, maintenance and practices.

Multi-Sector Planning

- Airport
- Community land use, facilities, services
- Contaminated lands
- Energy, pipelines and telecom
- Flood control
- Hazardous material sites
- **Transportation services**
- Parks and recreation
- Natural shorelines
- Residential land uses
- Seaport
- Stormwater
- Structural shorelines
- Wastewater



The Adapting to Rising Tides Approach

Figure 1: Adapting to Rising Tides Planning Process



The steps in the ART approach to adaptation planning include:

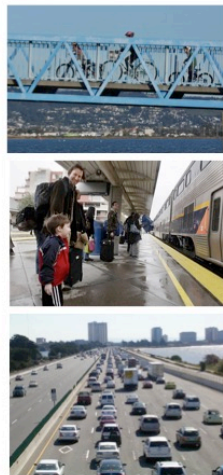
- I. **Scope & Organize:** Identify the scale of the project and the working group members. Determine the assets along the shoreline for the entire region that need to be protected. Develop resilience goals for the project with the working group to guide the work of the project.
- II. **Assess:** Conduct detailed sea level rise and storm event mapping for the shoreline areas not included in other studies and analyze the extent, depth, and pathways of inundation caused by overtopping of specific shoreline segments. Use ART assessment questions to develop information and data about the assets included in the project area.
- III. **Define:** Identify vulnerabilities and risks for assets and the consequences on the environment, economy, equity and governance.
- IV. **Plan:** Develop multi-objective adaptation strategies at various scales that address the vulnerabilities and risks from sea level rise and storm events. Further refine applicable adaptation strategies that were developed as part of other studies. Develop evaluation criteria to prioritize adaptation responses and weigh their effects on the environment, economy, equity and governance.
- V. **Implement and Monitor:** Develop and recommend adaptation responses that serve as a roadmap for taking action to address vulnerable assets / areas, and provide implementation plans.

Expected Outcomes of the Regional Assessment and Adaptation Project

- Uniform vulnerability assessments across the entire region
- Identification of early actions and priority actions for transportation assets and services.
- Assessments of multiple assets, e.g., at the sector/system, representative asset, asset and component scales and at multiple scales, including agencies at the local, regional, state and federal scales.
- Identification of governance, information, functional and physical vulnerabilities that lead directly to developing appropriate timing and sequencing of actions, identification of key actor(s) to be involved, and the scale and priority of issues.
- Identification of owners and responsible actors for the local, regional, state and federal assets and functions in the region.
- Consequences of the failure or disruption of the assets and systems assessed.
- County/subregional and a regional-scale working groups to ensure that findings and outcomes are being addressed at appropriate scales.
- Building capacity within federal, state and local agencies, organizations and jurisdictions that work within each county to ensure assessments translate into action.
- Adaptation responses that include: the vulnerability addressed by the response; specific adaptation actions for the vulnerability; the actors that need to be involved for implementing the actions; the type, order and scale of the actions; possible funding mechanisms; and level of priority.
- Priority actions at agency, local, regional, state and federal scales.
- Regional agreement on the tools, processes, models and data used in adaptation planning.

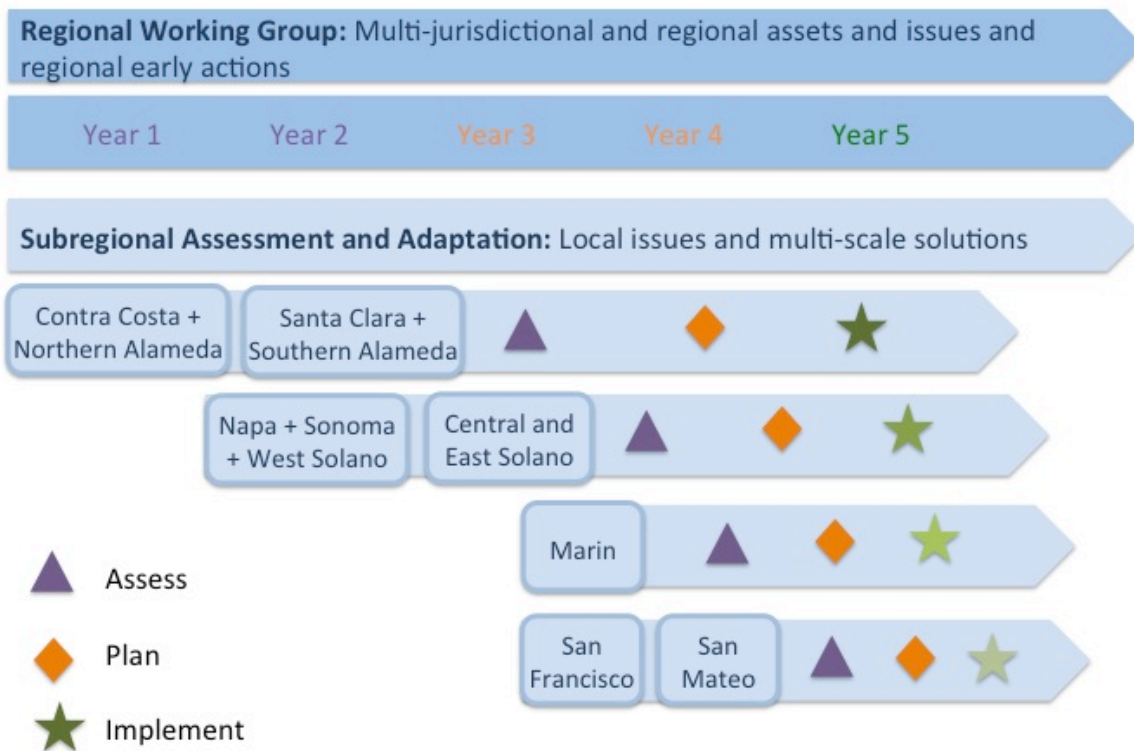
Transportation Assets and Services

- Interstates (I-80, I-880, I-580)
- State Routes (SR-37, SR-237)
- US Route 101
- Toll plazas and bridge approaches
- Bay Area Rapid Transit and Caltrain
- Cargo and passenger rail
- Local streets and roads
- San Francisco International Airport
- Oakland International Airport
- Ports of Oakland, SF, Richmond
- San Francisco Bay Trail
- Ferry service
- Local transit providers



Project Elements and Timeline

Regional Assessment and Adaptation Project Roll Out



I. Project Initiation

- First three months: Initiate project.
- Identify the resources already available, such as the existing ART Program website (ART Portfolio), ART findings and ART approach developed from previous projects, ART working group members and partners, ART team members, data and information regarding assets, systems, agencies and organizations, flooding scenarios and completed and on-going work of other agencies.
- Hire team members.
- Establish office space- location, hardware, software and other resources.
- Communicate the approach, project timeline, roles and responsibilities and outcomes with the appropriate regional and county Commissions and local agencies, organizations and jurisdictions through presentations, one and two page information sheets and possibly a regional or a set of subregional kick off meeting or meetings or a meeting in each county.

- Develop multi-year work plan for assessing all nine counties—including an identification of the phasing of the subregional work and the relationship between the vulnerability assessments and the development of the adaptation responses at the agency, local, subregional, regional, state and federal scales. Base the decision on phasing the subregional efforts on the outreach already conducted as part of the ART program, the communication initiated for this effort, regional and state priorities and existing information and data available for each subregion.
- Develop and issue requests for proposals for consultant assistance.

II. Subregional Assessments and Adaptation Development

The project will use the ART methodology developed in the ART Pilot project in Alameda County and refined in further ART efforts to conduct county scale assessments and develop adaptation responses for the region. The methodology will be refined in subregion to include existing reports, processes and local conditions as described in the county modules. Taken together, the work will result in outcomes and deliverables will result in a regional story of climate risk and response. Existing reports, plans, projects and studies conducted within each county or subregion will be evaluated at the initiation of each module so that relevant local and regional data and information can be leveraged. For example, where there is adequate data and information about a specific geography or sector, the scope of the county assessment will be adjusted to ensure an efficient use of staff, stakeholder, and partner resources.

	Pre-Roll Out	Year 1	Year 2	Year 3	Year 4	Year 5
Regional Integration Working Group		+ Δ ◆ ★	+ Δ ◆ ★	+ Δ ◆ ★	+ Δ ◆ ★	+ Δ ◆ ★
Alameda ART Project Area	+ Δ ◆	★	★	★	★	★
Contra Costa + Albany and Berkeley	+	Δ	◆	★	★	★
Santa Clara + Fremont and Newark		+ Δ	◆	★	★	★
Napa + Sonoma + Western Solano County			+	Δ ◆	★	★
Central and East Solano			+	Δ	◆	★
Marin			+	Δ	◆	★
San Francisco				+	Δ ◆	★
San Mateo				+	Δ ◆	★
+ = Working Group ◆ = Adaptation Responses Δ = Assessment ★ = Implementation						

III. Regional Integration

At the regional scale, a working group will be convened to enable the assessments and adaptation options developed at the county scale to consider the issues, assets and services that are regional in scale or cross county jurisdictional lines, and that there is an integration of the findings to support a regional understanding of the issues and the actions that are needed. The ART program has worked with a variety of agencies and organizations with local, regional, state-wide and federal interests, and would propose that these partnerships and collaborations continue, particularly with the Joint Policy Committee (JPC), the Federal Emergency Management Administration (FEMA), National Oceanic and Atmospheric Administration's Coastal Services Center (NOAA CSC), the Metropolitan Transportation Commission (MTC), the California Department of Transportation (CalTrans) and the Association of Bay Area Governments. The regional working group will be convened on an ongoing basis throughout the five-year project and will align work, data, resources, information, findings and processes from the subregional projects. The regional working group will also enable early action at the regional scale, including action on information and governance vulnerabilities, as well as building capacity to support county, local and sector specific efforts.

Next Steps – what happens beyond the 5 years?

How will this five-year project position the region to understand and respond to current and future flooding? Some of the on-going work that would be necessary to carry the region forward to implementing adaptation responses includes:

- Continue to use the ART program to bring on new information, data, resources, approaches and support to efforts at all scales.
- Identify early actions and priority actions for transportation assets and services.
- Support the implementation of early actions across jurisdictional and agency boundaries.
- Identifying and developing funding sources to implement adaptation actions.
- Construction, and monitoring adaptations to support adaptive management and to identify for thresholds for future actions.

Budget

Staffing (salary + benefits)

Position	Detail/Number	Expense
ART Program Director	1.0 FTE	\$750,000
ART Projects Manager	1.0 FTE	\$675,000
Program Logistics & Coordination	1.0 FTE	\$600,000
Project Lead	1.0 FTE	\$600,000
Project Lead	1.0 FTE	\$600,000
Project Lead	1.0 FTE	\$600,000
Project Lead	1.0 FTE	\$600,000
Project Associate	1.0 FTE	\$562,500
Project Associate	1.0 FTE	\$562,500
Project Associate	1.0 FTE	\$562,500
Subtotal:	10.0 FTE	\$6,418,125

Equipment (one time purchases)

Budget Item	Detail/Number	Expense
Hardware	Laptops, desktop GIS computer, plotter, color printer/copier, internet 3G cards, presentation easels	\$29,000
Software	ESRI ArcGIS, file sharing, project management	\$20,000
Subtotal:		\$49,000

Consultant Support

Budget Item	Detail/Number	Expense
Coastal engineering		\$1,500,000
Geospatial analysis and mapping		\$1,500,000
Planning and design: environmental, economic, land use		\$1,500,000
Graphic Design and print production		\$500,000
Website hosting and maintenance		\$100,000
Subtotal:		\$5,100,000

Logistics (materials and travel)

Budget Item	Detail/Number	Expense
Working Group Meetings	Name badges, refreshments, room rental fees	\$100,000
Regional Steering Committee Materials	Name badges, refreshments, room rental fees	\$100,000
Travel	Local travel to project and program meetings, in-state and out-of-state conferences and workshops	\$100,000
Subtotal:		\$300,000

Annual Budget – 5 year total

Subtotal (from above)		\$11,867,125
Program overhead (15%)		\$1,780,069
TOTAL		\$13,647,194

Appendix: County Assessment and Adaptation Modules

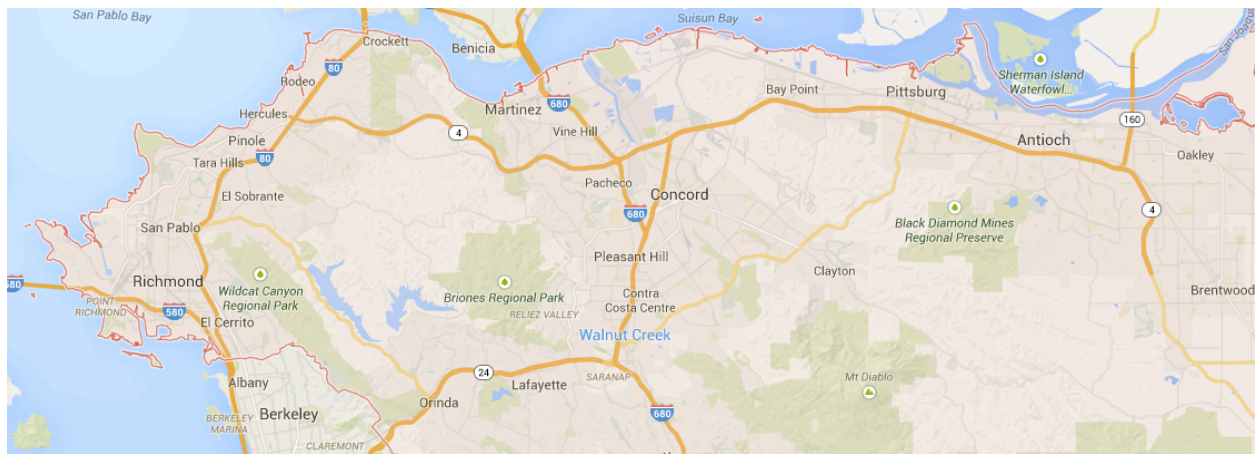
The project will use the ART methodology developed in the ART Pilot project in Alameda County and refined in further ART efforts to conduct county scale assessments and develop adaptation responses in all nine Bay Area counties. The methodology will be refined in each county to include existing reports, processes and local conditions as described in the county modules. Taken together, the work will result in outcomes and deliverables will result in a regional story of climate risk and response. Existing reports, plans, projects and studies conducted within each county will be evaluated at the initiation of each module so that relevant local and regional data and information can be leveraged. For example, where there is adequate data and information about a specific geography or sector, the scope of the county assessment will be adjusted to ensure an efficient use of staff, stakeholder, and partner resources.

The county-scale assessments will be multi-asset and will include locally and regionally significant transportation and transit assets and services such as:

- Interstates (I-80, I-880, I-580)
- State Routes (SR-37, SR-237)
- US Route 101
- Toll plazas and bridge approaches
- Bay Area Rapid Transit and Caltrain
- Cargo and passenger rail
- Local streets and roads
- San Francisco International Airport
- Oakland International Airport
- Ports of Oakland, SF, Richmond
- San Francisco Bay Trail
- Ferry service
- Local transit providers

Contra Costa + Northern Alameda County (Albany and Berkeley)

<i>Working Group</i>	<i>Vulnerability Assessment</i>	<i>Refined maps</i>	<i>Shoreline delineation</i>	<i>Overtopping analysis</i>
ART Project Working Group, first meeting March 2015	ART multi-sector assessment of west and central county initiated Dec 2014	No	Draft in review, April 2015	No



The Contra Costa County module will expand and build on the recently initiated ART multi-sector adaptation project in west and central Contra Costa County (from Richmond to Bay Point) to include the County’s eastern shoreline and Albany and Berkeley in Northern Alameda County. The Contra Costa ART project is convening a stakeholder working group to help assess shoreline communities and infrastructure, including regionally significant highway corridors 1-80, I-580 and I-680, the Benicia-Martinez Bridge, most of the region’s refineries, and the Union Pacific and Burlington Northern Santa Fe rail corridors.

The module will focus on developing a detailed understanding of regionally significant asset systems, such as the rail corridor, and focus areas within the county where local vulnerabilities could have regionally significant consequences. It will leverage the inter-agency ART Transportation Vulnerability Assessment and Adaptation Options projects (BCDC, MTC, Caltrans and BART). It will also leverage findings of ART focus area projects in Hayward and Oakland/Alameda, the Regional Housing and Community Risk project conducted by BCDC and ABAG, and ART working group member projects including Capitol Corridor’s intercity passenger rail hot spots assessment and BART’s Climate Adaptation Project.

Additionally, local studies of current and future flood hazard risk, such as the City of Berkeley’s recently completed Local Hazard Mitigation Plan, the County’s Northern Waterfront Economic Development Initiative, and the County’s Lower Walnut Creek Restoration Project will be reviewed and relevant information will help to enrich the assessment of vulnerabilities and consequences and the selection of adaptation responses.

A suite of refined inundation maps, and a detailed shoreline delineation and overtopping analysis developed by Alameda County Public Works is available to support the this module. Additional analyses will be necessary for much of Contra Costa County shoreline, including the eastern shoreline. In particular, refined inundation maps and an overtopping analysis will be needed. The San Francisco Estuary Institute (SFEI) has completed a draft shoreline delineation using the ART Alameda County methodology with technical support from AECOM. The draft delineation has been and reviewed by county staff, and the final shoreline delineation is expected in April 2015.

Santa Clara + Southern Alameda County (Fremont and Newark)

<i>Working Group</i>	<i>Vulnerability Assessment</i>	<i>Refined maps</i>	<i>Shoreline delineation</i>	<i>Overtopping analysis</i>
No	SV 2.0 county-wide and sector scale assessment of all climate impacts including sea level rise	No	Yes, 2014	No

The module will include Fremont and Newark in Southern Alameda County and the Santa Clara County shoreline. It will focus on developing a detailed understanding of regionally significant asset systems, such as the rail corridor, and focus areas within the county where local vulnerabilities could have regionally significant consequences. It will leverage the inter-agency ART Transportation Vulnerability Assessment and Adaptation Options projects (BCDC, MTC, Caltrans and BART), the Regional Housing and Community Risk project conducted by BCDC and ABAG, and ART working group member projects including Capitol Corridor’s intercity passenger rail hot spots assessment and BART’s Climate Adaptation Project.

It will also build on information developed for the Silicon Valley 2.0 (SV 2.0) project, a countywide, sector-scale project that used an approach similar to the ART Alameda County project. Findings from SV 2.0 should therefore provide a reasonable amount of information that can be used in the module to develop a refined understanding of specific shoreline locations, assets, or asset systems to support the development of adaptation responses. The SV 2.0 Decision-Support Tool and Climate Adaptation Strategic Guide expected to be publicly available by April 2015.



The module will also leverage the South San Francisco Bay Shoreline Study, which is a joint project of U.S. Army Corps of Engineers, the Santa Clara Valley Water District and the State Coastal Conservancy.

A suite of refined inundation maps and detailed shoreline delineation and overtopping analysis developed by Alameda County Public Works is available to support this module, however refined inundation maps and an overtopping analysis will be needed for Santa Clara County. The Santa Clara County shoreline has been delineated using the ART methodology developed in Alameda County by the SV 2.0 project. Current efforts of the Santa Clara Valley Water District to better understand the shoreline topographic features that provide flood protection features will be leveraged in this effort. Lastly, local studies of current and future flood hazard risk will be reviewed and all relevant information will be used to enrich the assessment findings.

Napa + Sonoma + Western Solano County

<i>Working Group</i>	<i>Vulnerability Assessment</i>	<i>Refined maps</i>	<i>Shoreline delineation</i>	<i>Overtopping analysis</i>
No	No	Limited and in progress, for Hwy 37 project	In progress, April 2015	No

The Napa + Sonoma + Western Solano County module will begin with a review of all relevant existing reports, plans, projects and studies conducted in the counties to determine how and if they can support the assessment to be conducted. A critical study that will be investigated is the Highway 37 Stewardship Study that is investigating strategies to improve current and future resilience of the Highway 37 corridor along the Solano, Napa and Sonoma County shoreline. This project is bringing together transportation and environmental agency partners and resources protection agencies to collaboratively finding a context-appropriate solution to the challenges that may come with sea level rise. The module will also leverage the inter-agency ART Transportation Vulnerability Assessment and Adaptation Options projects (BCDC, MTC, Caltrans and BART), the Regional Housing and Community Risk project conducted by BCDC and ABAG and the ART working group member Capitol Corridor’s intercity passenger rail hot spots assessment.



Additionally, local and county efforts to understand and address current and future flood hazard risks will be reviewed and all relevant information will be used to enrich the assessment findings. The Sonoma County Climate Action 2020 study, published in December 2014 by the Regional Climate Protection Authority and the North Bay Climate Adaptation Initiative, is a broad level adaptation analysis and vulnerability study that evaluated potential impacts current and future hazards may have on residents, built infrastructure, and natural and working lands. Sonoma County is also working to update the outer coast Local Coastal Plan to incorporate climate change including sea level rise.

A limited number of refined inundation maps are being developed for the Highway 37 Stewardship Study, and will be available to support the module as well as efforts to better understand the shoreline topographic features that provide flood protection features will be leveraged in this effort. The San Francisco Estuary Institute (SFEI) has completed a draft shoreline delineation using the ART Alameda County methodology with technical support from AECOM. The delineation is in progress and is expected to be complete in April 2015.

Central and East Solano County

<i>Working Group</i>	<i>Vulnerability Assessment</i>	<i>Refined maps</i>	<i>Shoreline delineation</i>	<i>Overtopping analysis</i>
No	Yes, City of Benicia only	Limited and in progress, for Hwy 37 project	In progress, April 2015	No

The Central and East Solano County module will begin with a review of all relevant existing reports, plans, projects and studies conducted in the county to determine how and if they can support the assessment to be conducted. A critical study that will be investigated is the Highway 37 Stewardship Study that is investigating strategies to improve current and future resilience of the Highway 37 corridor along the Solano, Napa and Sonoma County shoreline.



This project is bringing together transportation and environmental agency partners and resources protection agencies to collaboratively finding a context-appropriate solution to the challenges that may come with sea level rise.

The module will build from and leverage findings local studies such as the City of Benicia Vulnerability Assessment and Adaptation project, which begin in July 2014 and will conclude in July 2015. This local scale project applied the ART approach to engage local stakeholders, including members of the public, to assess the vulnerability of shoreline infrastructure and natural habitats. Based on the assessment findings climate strategies were developed, evaluated, and prioritize with input from community members, City staff, and various local, regional, and state agencies. The module will also leverage the inter-agency ART Transportation Vulnerability Assessment and Adaptation Options projects (BCDC, MTC, Caltrans and BART), the Regional Housing and Community Risk project conducted by BCDC and ABAG and the ART working group member Capitol Corridor’s intercity passenger rail hot spots assessment.

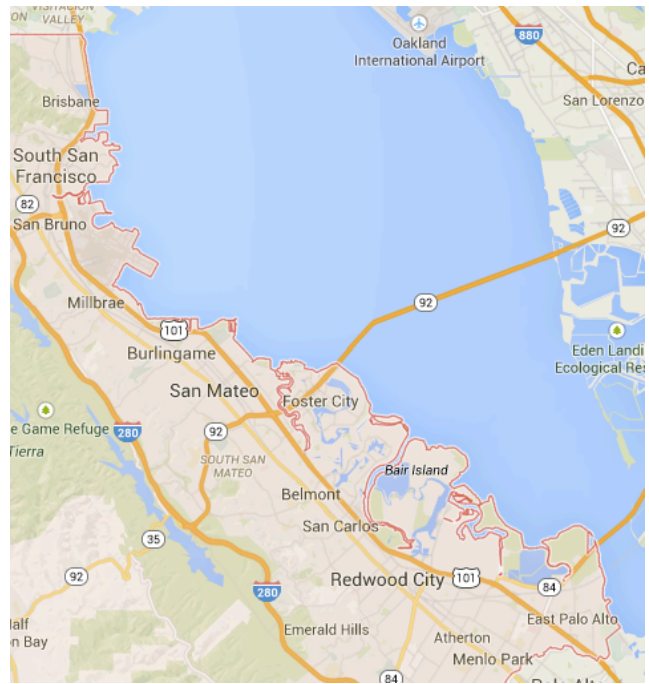
Additional shoreline analyses will be necessary for much of the Solano County shoreline, including the eastern shoreline. In particular, refined inundation maps and an overtopping analysis will be needed. The San Francisco Estuary Institute (SFEI) has completed a draft shoreline delineation using the ART Alameda County methodology with technical support from AECOM. The delineation is in progress and is expected to be complete in April 2015.

San Mateo

<i>Working Group</i>	<i>Vulnerability Assessment</i>	<i>Refined maps</i>	<i>Shoreline delineation</i>	<i>Overtopping analysis</i>
Maybe, SCC Funded Project	No	No	In progress, April 2015	No

The San Mateo County module will begin with a review of all relevant existing reports, plans, projects and studies conducted in the county to determine how and if they can support the assessment to be conducted. Critical studies to be investigated include a county-wide adaptation planning process for both the bayside and outer coasts that will be initiated in 2015, a local project in Mountain View that analyzed the vulnerability of the shoreline to 8 and 32 inches of sea level rise, and identified and prepared cost estimates for strategies to address the flood risk.

The module will leverage the inter-agency ART Transportation Vulnerability Assessment and Adaptation Options projects (BCDC, MTC, Caltrans and BART), the Regional Housing and Community Risk project conducted by BCDC and ABAG, and BART's Climate Adaptation Project.



Additional shoreline analyses will be necessary, including refined inundation maps and an overtopping analysis will be needed. The San Francisco Estuary Institute (SFEI) has completed a draft shoreline delineation using the ART Alameda County methodology with technical support from AECOM. The delineation is in progress and is expected to be complete in April 2015.

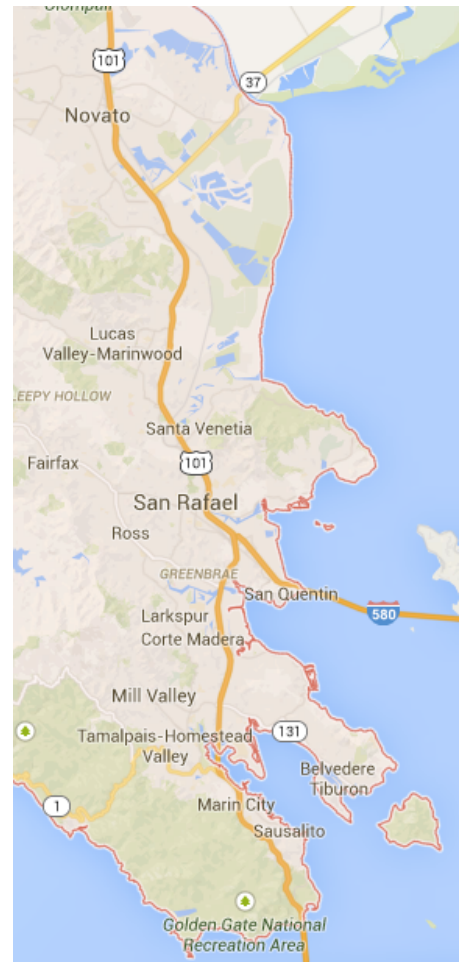
Marin County

<i>Working Group</i>	<i>Vulnerability Assessment</i>	<i>Refined maps</i>	<i>Shoreline delineation</i>	<i>Overtopping analysis</i>
No	No	No	Draft in review, April 2015	No

The Marin County module will begin with a review of all relevant existing reports, plans, projects and studies conducted in the county to determine how and if they can support the assessment to be conducted. Critical studies to be investigated include the Southern Marin Pilot Project, San Rafael’s Sea Level Rise White Paper, and the C-SMART project to update outer coast Local Coastal Plans to incorporate climate change including sea level rise.

The module will leverage the inter-agency ART Transportation Vulnerability Assessment and Adaptation Options projects (BCDC, MTC, Caltrans and BART, the Regional Housing and Community Risk project conducted by BCDC and ABAG, and BART’s Climate Adaptation Project.

Additional shoreline analyses will be necessary for Marin County, including refined inundation maps and an overtopping analysis. The San Francisco Estuary Institute (SFEI) has completed a draft shoreline delineation using the ART Alameda County methodology with technical support from AECOM. The delineation is in progress and is expected to be complete in April 2015.



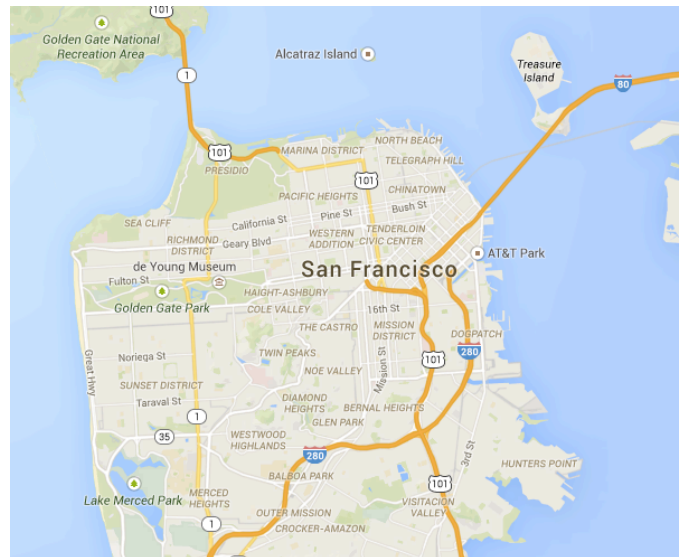
San Francisco

<i>Working Group</i>	<i>Vulnerability Assessment</i>	<i>Refined maps</i>	<i>Shoreline delineation</i>	<i>Overtopping analysis</i>
Maybe, SF Adapt	No	Yes, 2014	Yes, 2014	Yes, 2014

The San Francisco County module will begin with a review of all relevant existing reports, plans, projects and studies conducted in the county to determine how and if they can support the assessment to be conducted. Critical studies to be investigated include the San Francisco Public Utility Commission’s Bayside Urban Watershed Planning study and Sewer Service Improvement Program, a 20-year, multi-billion dollar citywide program to upgrade aging sewer infrastructure to ensure a reliable and seismically safe sewer system that is resilient to climate change. In addition, the Port of San Francisco’s Waterfront Seawall study to assess seismic vulnerability will be used to understand the impact of a failure of this critical flood and shoreline protection infrastructure. This module will also leverage efforts of the inter-agency San Francisco Climate Adaptation Working Group (SF Adapt). This group is focusing on understanding and addressing sea level rise along Ocean Beach and shores, flooding from storm surges and extreme rain events, an increased likelihood of extreme heat, and decreased fog that supports the region’s iconic redwoods and local ecosystems.

The module will leverage the inter-agency ART Transportation Vulnerability Assessment and Adaptation Options projects (BCDC, MTC, Caltrans and BART, the Regional Housing and Community Risk project conducted by BCDC and ABAG, and BART’s Climate Adaptation Project.

A full suite of refined inundation maps, a shoreline delineation and an overtopping analysis developed by the San Francisco Public Utility Commission’s Sewer Service Improvement Program using the ART methodology are available to support this module.



Current Assessment, Adaptation, Implementation Status

	Scope	Assess				Plan	Implement
		Working Group	Vulnerability Assessment	Refined sea level rise and storm maps	Shoreline delineation		
Alameda	Yes, ART Alameda County	Yes, ART for most of county	Yes, 2014	Yes, 2014	Yes, 2014	Yes, sector and asset scale	No
Contra Costa	Yes, ART Contra Costa County	Yes, ART initiated for west and central county	No	Draft in review	No	No	No
Marin	No	No	No	Draft in review	No	No	No
Napa	No	No	Limited and in progress, for Hwy 37 project	In progress	No	No	No
San Francisco	Maybe, SF Adapt	No	Yes, 2014	Yes, 2014	Yes, 2014	No	No
San Mateo	Maybe, SCC Funded Project	No	No	In progress	No	No	No
Santa Clara	No	Yes, SV 2.0	No	Complete	No	No	No
Solano	No	Yes, City of Benicia only	Limited and in progress, for Hwy 37 project	In progress	No	Yes, city only	No
Sonoma	No	Maybe	Limited and in progress, for Hwy 37 project	In progress	No	No	No

County Assessment and Adaptation Modules: Project Steps and Tasks

Step I. Scope and Organize

Define the area and assets to be considered, convene a stakeholder working group, identify and communicate the climate impacts, set project goals, and agree on communications practices.

Resources needs/time requirements:

Project Team (ART Project Manager, Project Lead, 1 or 2 Project Associates)

- Draft workplan and project scoping documents; prepare for /follow-up to first Working Group meeting.

Working Group:

- Attend one 3-hour meeting; follow-up with project team as needed, including participating in subcommittee meeting.

Program Communications:

- Set up project website; assist team with creating a library of communications content for project (e.g., photos, graphics, presentation template, etc)

Program Logistics & Coordination:

- Develop project contacts list; meeting coordination; posting to website.

Geospatial Analyst:

- Set-up project basemap/layers; prepare project area map.

Deliverables and outcomes:

- Project description, including project goals and objectives, work schedule.
- Project area.
- Working Group and subcommittees (if appropriate).
- Roles and responsibilities: Project Team, Working Group, Stakeholders.
- Communication practices and audiences for the outcomes.
- Asset categories/sectors.
- Project resilience goals.

Tasks:

1. Research and review reports, plans, projects and studies that can inform the project

2. Identify and reach out to key project partners and stakeholders

3. Prepare proposed project scope to share with key project partners:

- Proposed project boundary.
- Draft list of asset categories and sectors to be addressed, and proposed level of assessment.
- Draft list of working group members, stakeholders and project team members.
- Proposed roles and responsibilities, communications practices and audiences.

4. Hold project kick-off meeting to convene Working Group, and learn about and agree on:

- Expected project outcomes, communications practices and roles and responsibilities.
- Project area, a list of assets to be addressed.

5. Finalize project scope, including:

- Invite additional participants to join the working group if necessary.
- Finalize project area boundary and create map demonstrating the project boundary and key orienting features and select assets in GIS.
- Finalize asset categories and sectors to be included and level of analysis, follow up with individual working group members, issue experts and others as necessary.
- Meet with communications subcommittee (if appropriate) to finalize communications practices.
- Use working group input to draft project resilience goals and share with working group for their review and input.

Step II. Conduct the Assessment

Conduct an assessment of vulnerabilities and consequences in the project area, and determine when and if assets will be exposed to the selected climate impacts.

Resources needs/time requirements:

Project Team (Project Lead, 1 or 2 Project Associates):

- Conduct assessment including exposure analysis, gather and refine assessment answers, plan for / follow up after second working group meeting.

Working Group:

- Review and ground-truth assessment answers; provide additional information as needed; attend and/or host field visits; attend one 3-hour working group meeting; participate in subcommittee meeting as needed.

Program Logistics & Coordination:

- Meeting coordination; posting to website.
- Geospatial Analyst.
- Prepare asset exposure maps.

Deliverables and outcomes:

- Climate scenarios and impacts statements.
- Compiled assessment data and information for existing conditions, vulnerability, and consequences; confirmed by Working Group and other technical experts.
- Identified gaps in available information and data.
- High level analysis of climate impacts exposure.

Tasks:

1. Draft climate scenarios and impacts statement, review and summarize best available maps, models, and analyses available, and evaluate asset exposure to the selected climate impacts

2. Hold a working group meeting to introduce the assessment:

- Describe and obtain input on the assessment process/methods.
- Present and obtain input on the climate scenarios and impacts, available maps, models and analyses to help evaluate exposure.
- Obtain feedback on the asset scales to be included in the assessment.

3. Develop and compile assessment information and ground-truth with Working Group members and other relevant stakeholders:

- Develop preliminary assessment answers and share with working group members, asset managers, jurisdiction or owner, those with local knowledge, or those with topical expertise.
- Provide the maps and climate impacts analysis to technical subcommittee or working group members and ask them to review to ground truth them based on local knowledge of flood management infrastructure and experience during current and past flooding (this review may need to be done with a small group of technical advisors).

4. Identify information gaps

5. Incorporate working group input and finalize the assessment

Step III. Determine Assessment Outcomes

Summarize answers to the assessment questions as clear, outcome-oriented vulnerability and consequence statements.

Resources needs/time requirements:

Project Team (Project Lead, 1 or 2 Project Associates):

- Summarize assessment outcomes in draft profile sheets; plan for / follow up after third working group meeting.

Working Group:

- Three-hour meeting; two to three hours to review profile sheets and follow up with project team if needed.

Program Communications:

- Assist with layout of finalized profile sheets.

Program Logistics & Coordination:

- Meeting coordination; posting to website.

Deliverables and outcomes:

- Profile sheets that summarize issues, vulnerabilities and consequences for assets addressed in the project.
- An understanding of the unique, shared and overarching vulnerabilities, dependencies and relationships among assets.

Tasks:

- 1. Review compiled information from the assessment questions, and develop vulnerability and consequence statements for the assets, sectors, services, agencies or organizations evaluated**
- 2. Draft summary profile sheets to be shared with working group members for review and input**
- 3. Identify assets, sectors or services that have similar characteristics, conditions or challenges; have particular, or unique, issues, and/or are vulnerable because they are reliant or dependent on other vulnerable assets**
- 4. Hold a working group meeting to present and obtain input on the assessment outcomes:**
 - Present final findings of the climate impacts analysis.
 - Discuss observations and outcomes from the field visits (if conducted).
 - Present vulnerability and consequence findings for all or representative assets.
 - Provide draft summary profile sheets for review and feedback.
 - Obtain input on shared, unique, and overarching vulnerabilities, and confirm physical and organizational dependencies and relationships among assets, services and sectors.
- 5. Revise the profile sheets with feedback, and update the profile sheets with draft issue statements**
- 6. Finalize and share with working group summary profile sheets and high level findings about shared, unique, and overarching vulnerabilities**

Step IV. Define Key Planning Issues

Define and confirm key planning issues, refine project resilience goals.

Resources needs/time requirements:

Project Team (Project Lead, 1 or 2 Project Associates):

- Develop proposed key planning issues and draft adaptation responses; plan for / follow up after Working Group meeting.

Working Group:

- Attend one 3-hour meeting; follow-up with project team as needed, including participating in subcommittee meeting.

Program Logistics & Coordination:

- Meeting coordination; posting to website.

Deliverables and outcomes:

- Confirmed key planning issues to be addressed in the next step.
- Resilience goals that are relevant in light of assessment outcomes.
- Draft adaptation responses.

Tasks:

1. Develop draft proposed key planning issues for the project

2. Review project resilience goals, and based on the assessment outcomes, revise if necessary

3. Determine how the adaptation responses will be organized, the type of information to be included, and the level of specificity

4. Hold a Working Group meeting to:

- Review project resilience goals and discuss if they need to be refined based on the outcome of the assessment.
- Introduce the Plan step components and expected outcomes, including the organization of the adaptation responses and the type and specificity of information to be included.
- Discuss and get feedback on proposed key planning issues to be addressed in this next step.

5. Incorporate input:

- Finalize project resilience goals (if revised) based on working group input.
- Finalize the key planning issues, revisit assessment outcomes to make sure no important issues were left behind, and share with working group.
- Catalog any asset vulnerabilities or key issues that will not be carried forward for further working group consideration. Note if they should be taken up in the future, either in further collaborative efforts or individually by agencies, organizations or communities.

Step V. Developing Adaptation Responses

Develop adaptation responses for the key planning issues that lay a clear and transparent path towards implementation.

Resources needs/time requirements:

Project Team (Project Lead, 1 or 2 Project Associates):

- Develop draft adaptation responses; plan for / follow up after Working Group meeting.

Working Group:

- Attend one 3-hour meeting; follow-up with project team as needed, including participating in subcommittee meeting.

Program Communications:

- Assist with layout/preparation of engagement exercise materials.

Program Logistics & Coordination:

- Meeting coordination; posting to website.

Deliverables and outcomes:

- Adaptation responses for the project's key planning issues.

Tasks:

1. Develop draft adaptation responses:

- Conduct research on the adaptation responses, strategies, actions, and implementation options that have been developed by others for similar assets, sectors or services.
- Contact individual working group members, or local and national topical experts, and ask for their best professional judgment on the actions and implementation options that will be the most practical, feasible, and responsive to the issues identified.
- Develop adaptation actions and implementation options for the agreed-upon key planning issues.

2. Hold a Working Group meeting to present draft adaptation responses and obtain working group feedback

3. Review feedback from the working group and revise adaptation responses, and if necessary develop new adaptation responses

4. Prepare and provide to the working group revised summary profile sheets with example actions for review and input

Step VI. Evaluating and Selecting Adaptation Responses

Evaluate adaptation responses against project resilience goals and the four sustainability frames (society and equity, environment, economy and governance).

Resources needs/time requirements:

Project Team (Project Lead, 1 or 2 Project Associates):

- Develop draft evaluation criteria; plan for / follow up after Working Group meeting.

Working Group:

- Attend one 3-hour meeting; follow-up with project team as needed.

Program Logistics & Coordination:

- Meeting coordination; posting to website.

Deliverables and outcomes:

- A set of evaluation criteria to help the working group identify benefits and trade-offs of the different adaptation responses.
- Summarized outcomes of applying the evaluation criteria to the adaptation responses.

Tasks:

1. Develop draft evaluation criteria that will help the working group weigh benefits and trade-offs of each adaptation response against the project resilience goals and the four sustainability frames:

- Determine how to apply the evaluation criteria, e.g., qualitative criteria such as yes/no, or quantitative criteria such as ordinal ranking or numeric ranges, considering the quality of available data and information and how best to maintain transparency and clarity.
- Apply the draft criteria to a number of example adaptation responses to test out the approach and identify any hurdles or information gaps that will need to be overcome.

2. Hold a meeting to evaluate adaptation responses using selected criteria:

- Present proposed evaluation criteria and the approach to applying them
- As a group apply the evaluation criteria to a number of example adaptation responses and discuss how the criteria work and if they need to be adjusted.
- Discuss how and if to prioritize or narrow the adaptation responses to be evaluated based on expected project outcomes, resources available, the collective and individual needs of the working group, the type of vulnerability addressed or the timing and magnitude of the potential consequences.

3. Adjust evaluation criteria based on working group input:

- Evaluate adaptation responses (all or a sub-set) using selected criteria.
- Summarize outcomes of the evaluation and share with working group members.

Step VI. Opportunities for Implementation

Develop recommendations for advancing high priority adaptation responses and further collaborations.

Resources needs/time requirements:

Project Team (Project Lead, 1 or 2 Project Associates):

- Develop recommendations for high priority adaptation responses; plan for / follow up after Working Group meeting; follow-up meetings with Working Group members.

Working Group:

- Attend one 3-hour meeting; additional small-group, or one-on-one meetings with project team as needed.

Program Communications:

- Assist development of communications materials for project outcomes.
- Program Logistics & Coordination.
- Meeting coordination; posting to website.

Deliverables and outcomes:

- Outcomes are summarized and communicated to support the working group in implementing adaptation responses and making the case for continued participation in collaborative adaptation planning.
- A set of recommendations for advancing high priority adaptation responses that require shared, coordinated action.
- Working group members launch new efforts and collaborations that will have a “life of their own”.

Tasks:

- 1. Identify actions that are ready for implementation and those that are ready but lack funding**
- 2. Identify actions from the adaptation responses that need further refinement or feasibility assessments, changes in governance or regulations, or the addition of new partners and participants**

- 3. Craft a set of recommendations for advancing and funding actions that are ready to be implemented**
- 4. Review actions that are not ready for implementation, and identify those that are most in need of immediate further collaboration**
- 5. Hold one-on-one discussions with working group members and stakeholders to hear their ideas on what next steps are needed**
- 6. Hold a meeting(s) to present and obtain input on opportunities for implementation and further collaboration:**
 - Present recommendations for advancing and funding “ready to go” adaptation responses and actions.
 - Discuss if there are next steps that project participants can take either individually or collectively to initiate ready to go actions, including getting buy-in from decision makers, and what next steps need to be taken for those that need further consideration.
 - Confirm next steps, discuss who will lead them, and determine a schedule and roadmap for their initiation.
- 7. Finalize and share with working group members recommendations for advancing and funding “ready to go” adaptation responses, and for initiating additional assessments, feasibility studies, new efforts, or further collaborations**
- 8. Follow up with those identified to lead any next steps to support them in the initiation of these efforts, including facilitating further collaborations, setting up meetings, connecting stakeholders directly, etc.**