Adapting to Rising Tides

Working together to increase the resilience of Bay Area communities to sea level rise and storm events

San Francisco Bay Conservation and Development Commission

Contra Costa ART Working Group

Working Group Meeting #4 – December 8, 2015

Objectives

- Provide an update on assessment organization and work products
- Share findings for the 24 asset categories and 9 sectors investigated
- Introduce the Plan Step and the approach to developing adaptation responses for the project area

Agenda

9:00 am - Welcome, Meeting Objectives, and Announcements

9:15 am - Presentation: Assessment Organization and Work Products

9:45 am - Presentation and Discussion: Assessment Findings

10:30 am - Break

10:45 am - The Plan Step: Developing Adaptation Responses

11:30 am - Wrap Up and Next Steps

Project Timeline

ART Contra Costa Project

Project Initiation – Fall 2014

Project Scoping – Fall/Winter 2015

Conduct Assessment – Winter/Spring 2015

Determine Assessment Outcomes – Summer 2015

Transition to Adaptation – Fall 2015

Develop Adaptation Responses – Winter 2015

Evaluate and Select Adaptation Responses + Opportunities for Implementation – Spring 2016

Working Group Meeting

Individual or small group meetings

ART Planning Process

ART Contra Costa Project

Working Group Meeting #3

ART Planning Process

ART Contra Costa Project

Working Group Meeting #4

Focus of today's meeting

1. **Present Summarized Findings**

   We have develop **outcome-oriented issue statements** that summarize assessment findings each asset category and asset assessed

2. **Shift to Adaption**

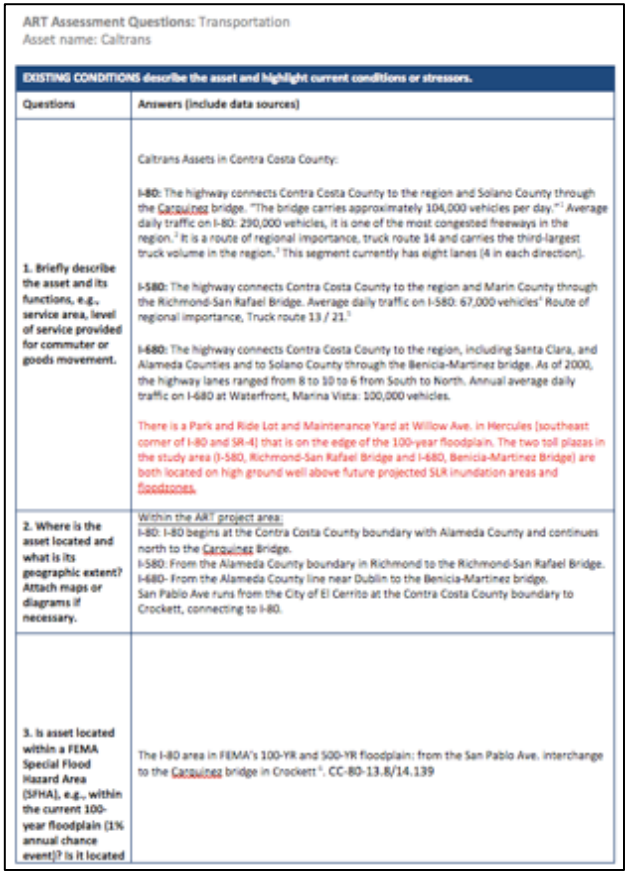
   We will present the Plan Step today, and work with you to determine how **key planning issues will be selected** for **adaptation response** development

The Assess Step

ART Contra Costa Project

Reminder, the Contra Costa ART assessments has included:

- Answers to assessment questions about existing conditions, types of vulnerabilities and potential consequences
- Review and validation of assessment outcomes by the working group, other stakeholders, asset managers, topical experts
- An exposure analysis that identified exposure to current and future flooding



ART Assessment Questions: Transportation
Asset name: Caltrans

EXISTING CONDITIONS describe the asset and highlight current conditions or stressors.	
Questions	**Answers (include data sources)**
1. Briefly describe the asset and its functions, e.g., service area, level of service provided for commuter or goods movement.	Caltrans Assets in Contra Costa County: **I-80:** The highway connects Contra Costa County to the region and Solano County through the Carquinez bridge. "The bridge carries approximately 104,000 vehicles per day."[1] Average daily traffic on I-80: 290,000 vehicles, it is one of the most congested freeways in the region.[2] It is a route of regional importance, truck route 14 and carries the third-largest truck volume in the region.[3] This segment currently has eight lanes (4 in each direction). **I-580:** The highway connects Contra Costa County to the region and Marin County through the Richmond-San Rafael Bridge. Average daily traffic on I-580: 67,000 vehicles[4] Route of regional importance, Truck route 13 / 21.[5] **I-680:** The highway connects Contra Costa County to the region, including Santa Clara, and Alameda Counties and to Solano County through the Benicia-Martinez bridge. As of 2000, the highway lanes ranged from 8 to 10 to 6 from South to North. Annual average daily traffic on I-680 at Waterfront, Marina Vista: 100,000 vehicles. There is a Park and Ride Lot and Maintenance Yard at Willow Ave. in Hercules (southeast corner of I-80 and SR-4) that is on the edge of the 100-year floodplain. The two toll plazas in the study area (I-580, Richmond-San Rafael Bridge and I-680, Benicia-Martinez Bridge) are both located on high ground well above future projected SLR inundation areas and floodzones.
2. Where is the asset located and what is its geographic extent? Attach maps or diagrams if necessary.	Within the ART project area: I-80: I-80 begins at the Contra Costa County boundary with Alameda County and continues north to the Carquinez Bridge. I-580: From the Alameda County boundary in Richmond to the Richmond-San Rafael Bridge. I-680- From the Alameda County line near Dublin to the Benicia-Martinez bridge. San Pablo Ave runs from the City of El Cerrito at the Contra Costa County boundary to Crockett, connecting to I-80.
3. Is asset located within a FEMA Special Flood Hazard Area (SFHA), e.g., within the current 100-year floodplain (1% annual chance event)? Is it located	The I-80 area in FEMA's 100-YR and 500-YR floodplain: from the San Pablo Ave. interchange to the Carquinez bridge in Crockett [6]. CC-80-13.8/14.139

Assessment answers vetted by working group members and topical experts

The Define Step

Reminder: What is the Define Step?

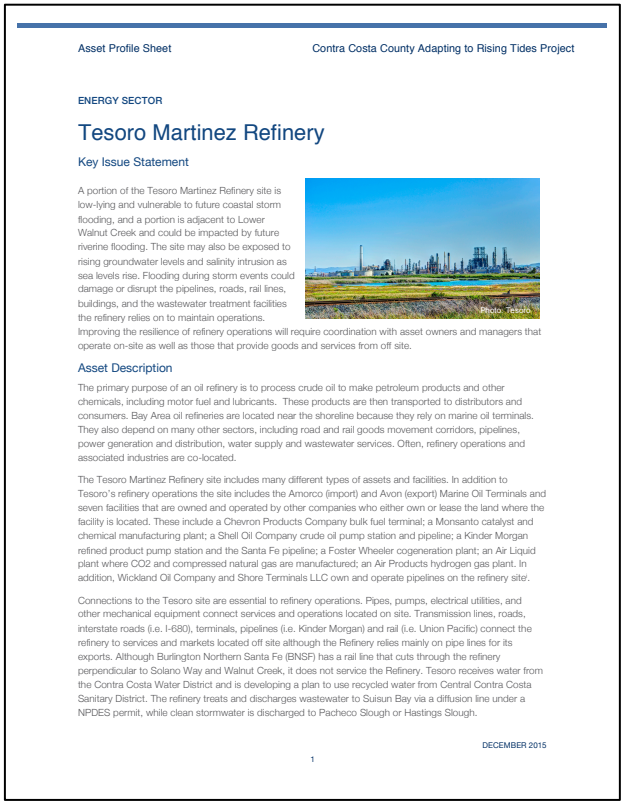
- Serves as the bridge between Assess and Plan
- Organizes and communicates the assessment findings to support adaptation response development
- Avoids the challenge of ranking, scoring or prioritizing, improving transparency
- Helps make sure important vulnerabilities are not left behind

The Define Step

ART Contra Costa Project

The Contra Costa ART Define step has included so far:

- An introduction at the last working group meeting in August
- Profile sheets that summarized and characterized the vulnerabilities and risks of assets and asset categories
- A World Café style table top exercise to share ideas for how to organize project area findings before launching into the Plan Step



Asset Profile Sheet

Contra Costa County Adapting to Rising Tides Project

ENERGY SECTOR

Tesoro Martinez Refinery

Key Issue Statement

A portion of the Tesoro Martinez Refinery site is low-lying and vulnerable to future coastal storm flooding, and a portion is adjacent to Lower Walnut Creek and could be impacted by future riverine flooding. The site may also be exposed to rising groundwater levels and salinity intrusion as sea levels rise. Flooding during storm events could damage or disrupt the pipelines, roads, rail lines, buildings, and the wastewater treatment facilities the refinery relies on to maintain operations. Improving the resilience of refinery operations will require coordination with asset owners and managers that operate on-site as well as those that provide goods and services from off site.

Photo: Tesoro

Asset Description

The primary purpose of an oil refinery is to process crude oil to make petroleum products and other chemicals, including motor fuel and lubricants. These products are then transported to distributors and consumers. Bay Area oil refineries are located near the shoreline because they rely on marine oil terminals. They also depend on many other sectors, including road and rail goods movement corridors, pipelines, power generation and distribution, water supply and wastewater services. Often, refinery operations and associated industries are co-located.

The Tesoro Martinez Refinery site includes many different types of assets and facilities. In addition to Tesoro's refinery operations the site includes the Amorco (import) and Avon (export) Marine Oil Terminals and seven facilities that are owned and operated by other companies who either own or lease the land where the facility is located. These include a Chevron Products Company bulk fuel terminal; a Monsanto catalyst and chemical manufacturing plant; a Shell Oil Company crude oil pump station and pipeline; a Kinder Morgan refined product pump station and the Santa Fe pipeline; a Foster Wheeler cogeneration plant; an Air Liquid plant where CO2 and compressed natural gas are manufactured; an Air Products hydrogen gas plant. In addition, Wickland Oil Company and Shore Terminals LLC own and operate pipelines on the refinery site.

Connections to the Tesoro site are essential to refinery operations. Pipes, pumps, electrical utilities, and other mechanical equipment connect services and operations located on site. Transmission lines, roads, interstate roads (i.e. I-680), terminals, pipelines (i.e. Kinder Morgan) and rail (i.e. Union Pacific) connect the refinery to services and markets located off site although the Refinery relies mainly on pipe lines for its exports. Although Burlington Northern Santa Fe (BNSF) has a rail line that cuts through the refinery perpendicular to Solano Way and Walnut Creek, it does not service the Refinery. Tesoro receives water from the Contra Costa Water District and is developing a plan to use recycled water from Central Contra Costa Sanitary District. The refinery treats and discharges wastewater to Suisun Bay via a diffusion line under a NPDES permit, while clean stormwater is discharged to Pacheco Slough or Hastings Slough.

DECEMBER 2015

1

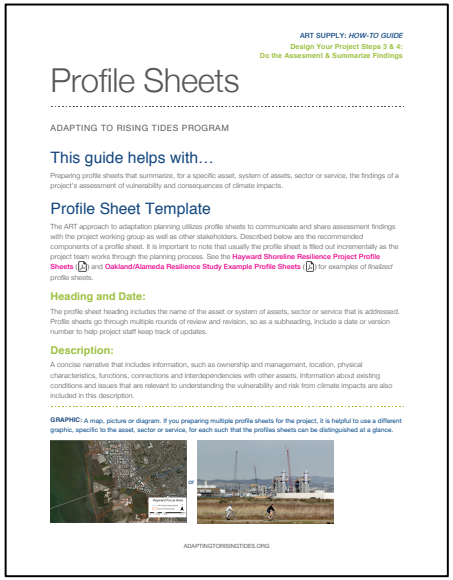
Summarized assessment findings shared with working group members as draft Profile Sheets (67 total)

Two Components of the Define Step

So, while last meeting we started into the Define Step, we didn't finish…

- ✓ **Summarize Findings**
  Develop outcome-oriented vulnerability and consequence statements that clearly and concisely summarize answers to the assessment questions for each asset or asset category assessed

- ✓ **Shift to Adaption**
  Determine the key planning issues that will be advanced for adaptation response development



ART SUPPLY: *HOW-TO GUIDE*
Design Your Project Steps 3 & 4:
Do the Assesment & Summarize Findings

Profile Sheets

ADAPTING TO RISING TIDES PROGRAM

This guide helps with…

Preparing profile sheets that summarize, for a specific asset, system of assets, sector or service, the findings of a project's assessment of vulnerability and consequences of climate impacts.

Profile Sheet Template

The ART approach to adaptation planning utilizes profile sheets to communicate and share assessment findings with the project working group as well as other stakeholders. Described below are the recommended components of a profile sheet. It is important to note that usually the profile sheet is filled out incrementally as the project team works through the planning process. See the **Hayward Shoreline Resilience Project Profile Sheets** and **Oakland/Alameda Resilience Study Example Profile Sheets** for examples of *finalized* profile sheets.

Heading and Date:

The profile sheet heading includes the name of the asset or system of assets, sector or service that is addressed. Profile sheets go through multiple rounds of review and revision, so as a subheading, include a date or version number to help project staff keep track of updates.

Description:

A concise narrative that includes information, such as ownership and management, location, physical characteristics, functions, connections and interdependencies with other assets. Information about existing conditions and issues that are relevant to understanding the vulnerability and risk from climate impacts are also included in this description.

GRAPHIC: A map, picture or diagram. If you preparing multiple profile sheets for the project, it is helpful to use a different graphic, specific to the asset, sector or service, for each such that the profiles sheets can be distinguished at a glance.

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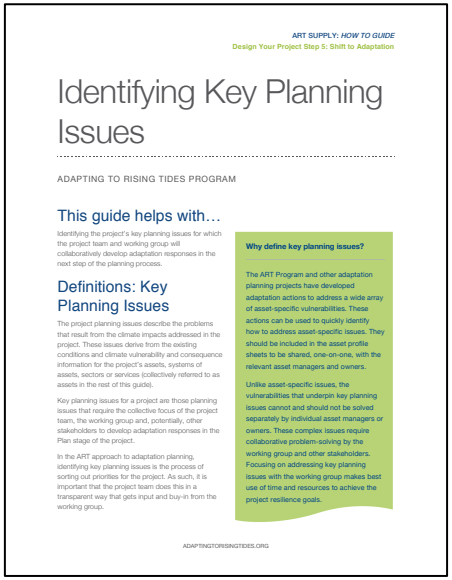

ART SUPPLY: *HOW TO GUIDE*
Design Your Project Step 5: Shift to Adaptation

Identifying Key Planning Issues

ADAPTING TO RISING TIDES PROGRAM

This guide helps with…

Identifying the project's key planning issues for which the project team and working group will collaboratively develop adaptation responses in the next step of the planning process.

Definitions: Key Planning Issues

The project planning issues describe the problems that result from the climate impacts addressed in the project. These issues derive from the existing conditions and climate vulnerability and consequence information for the project's assets, systems of assets, sectors or services (collectively referred to as assets in the rest of this guide).

Key planning issues for a project are those planning issues that require the collective focus of the project team, the working group and, potentially, other stakeholders to develop adaptation responses in the Plan stage of the project.

In the ART approach to adaptation planning, identifying key planning issues is the process of sorting out priorities for the project. As such, it is important that the project team does this in a transparent way that gets input and buy-in from the working group.

Why define key planning issues?

The ART Program and other adaptation planning projects have developed adaptation actions to address a wide array of asset-specific vulnerabilities. These actions can be used to quickly identify how to address asset-specific issues. They should be included in the asset profile sheets to be shared, one-on-one, with the relevant asset managers and owners.

Unlike asset-specific issues, the vulnerabilities that underpin key planning issues cannot and should not be solved separately by individual asset managers or owners. These complex issues require collaborative problem-solving by the working group and other stakeholders. Focusing on addressing key planning issues with the working group makes best use of time and resources to achieve the project resilience goals.

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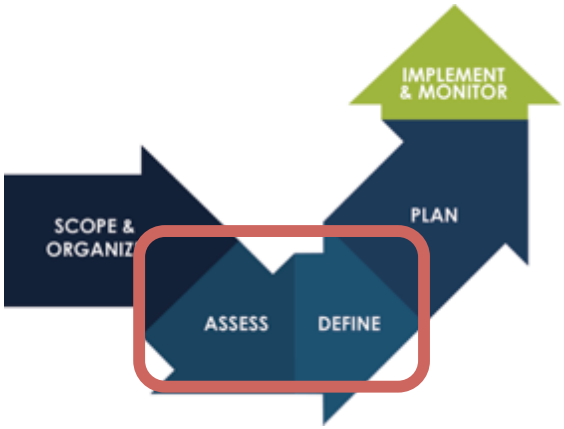
So, where have we been?

ART Contra Costa Project

Actually…..

Finishing the assessment and working through the Define Step!



- We started with 67 separate profile sheets that presented summarized findings for both individual assets or an entire asset category
- We heard from working group members that more specific information was needed for certain assets, and it needed to be communicated more clearly for others
- We finished the exposure analysis for all asset categories using existing regional mapping (NOAA SLR Viewer)
- AND – we are working with AECOM and you to complete locally refined draft inundation and shoreline mapping

Asset Category Chapters

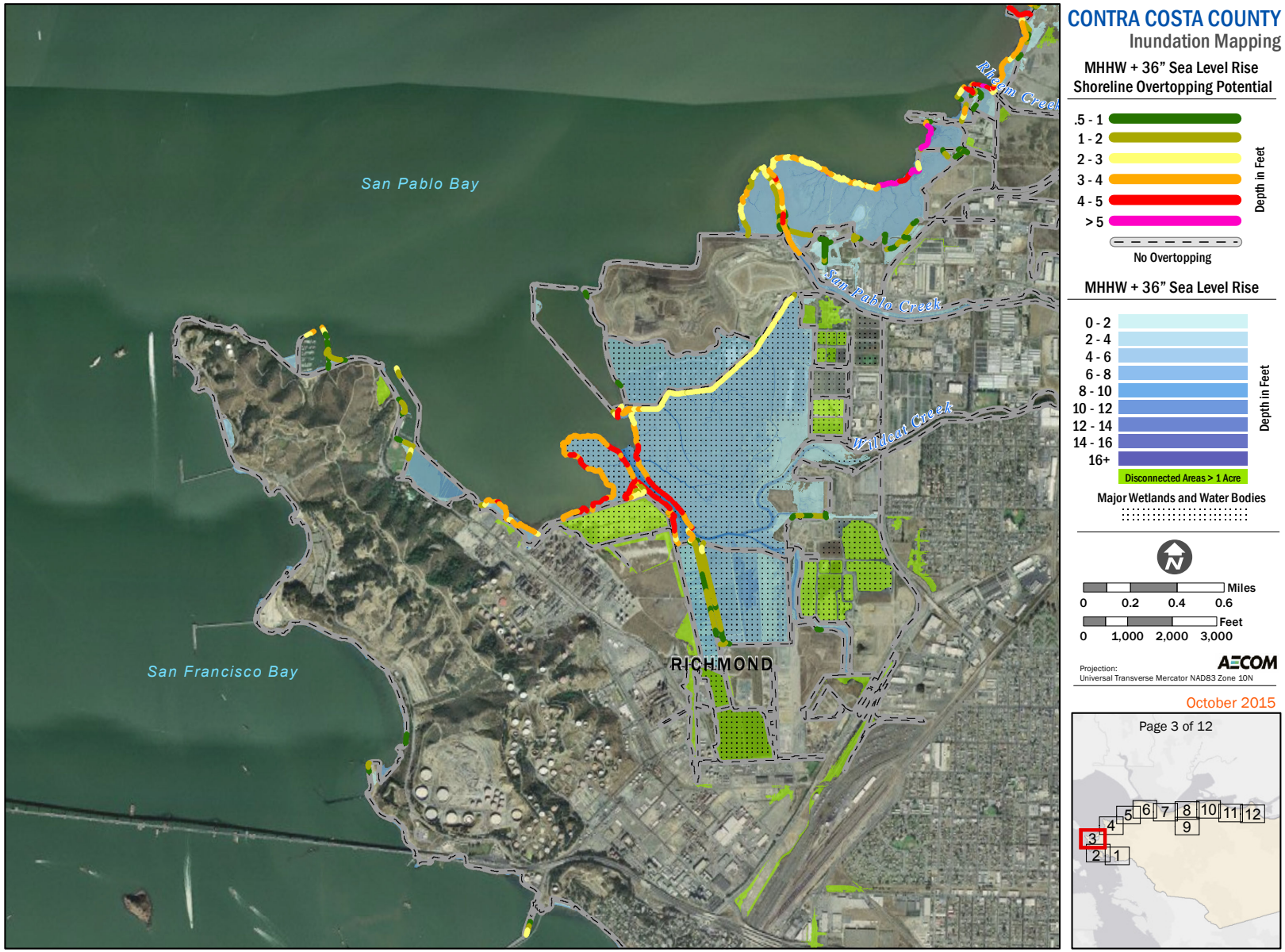
- **People** – project area, cities, neighborhoods
- **Business & Industry** – commercial, industrial, haz material sites
- **Contaminated Lands** – Brownfields and landfills
- **Energy** – refineries, pipelines, power generation and distribution
- **Housing** – single family, multi-family and mobile homes
- **Natural Areas** – tidal marshes
- **Parks, Recreation, Open Space** – parks, marinas, Bay Trail
- **Public Services** – health, police, fire, schools, waste collection
- **Seaport** – Port of Richmond and marine oil terminals
- **Transportation** – railways and roadways
- **Water Management** – water, wastewater, stormwater, flood control

Asset Specific Profiles

- City of Richmond Stormwater
- Contra Costa Water District
- EBMUD Pt. Isabel Wet Weather Facility
- EBMUD RARE
- Alhambra Creek
- Pinole Creek
- Rodeo Creek
- Rheem Creek
- Walnut Creek
- Wildcat and San Pablo Creek
- Plains Products Martinez Oil Terminal
- Tesoro Martinez Refinery
- West Contra Costa Sanitary Landfill
- West County Wastewater District WPCF

These assets were selected because the owner or manager shared specific information about the asset and its operations and provided critical review and feedback to ensure the profile was as accurate and reflective of existing conditions as possible

Inundation and Shoreline Mapping

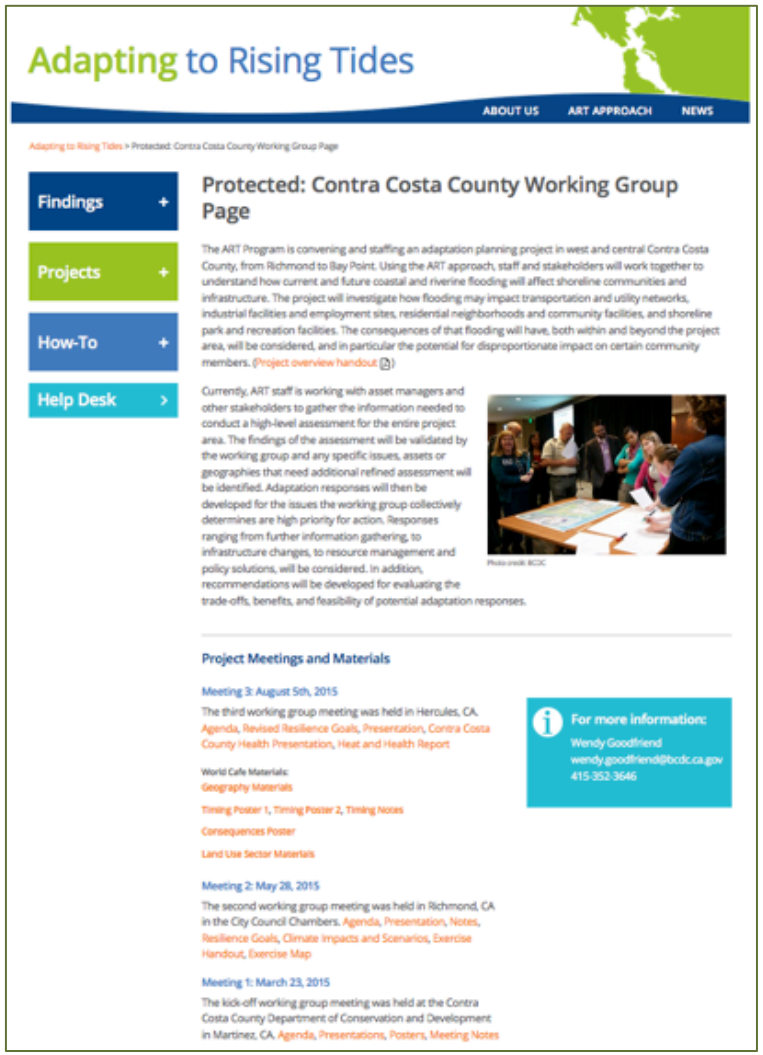


Where to find these products

Project website, password protected working group page:

http://www.adaptingtorisingtides.org/contra-costa-county-working-group-page

password: cccwg



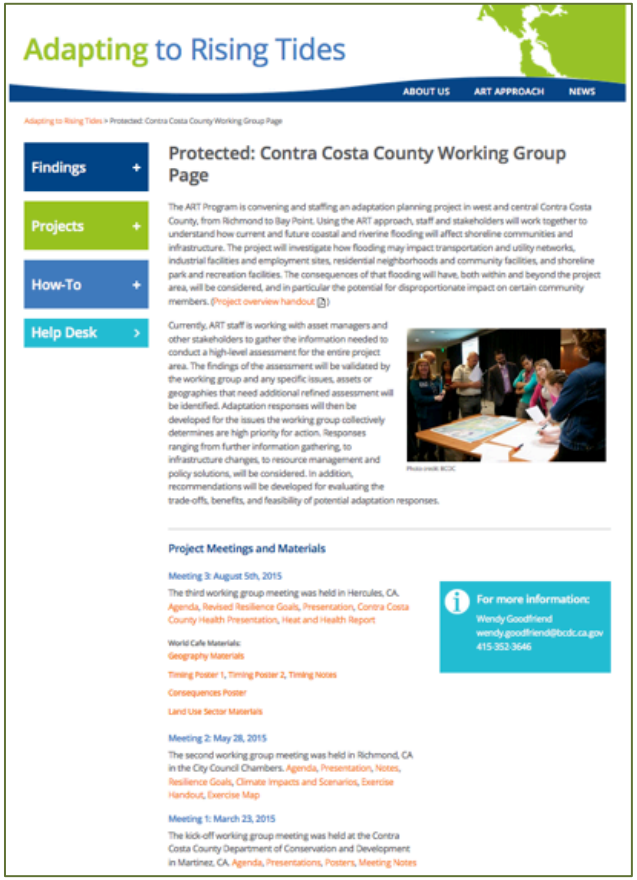
Available now:

- 14 asset-specific profile sheets
- 10 draft asset category chapters (images and maps to be added)
- Draft 12, 24, 36” SLR + overtopping maps

Coming soon:

- Two remaining asset category chapters
- Flood exposure chapter
- Final SLR and shoreline maps

Questions?



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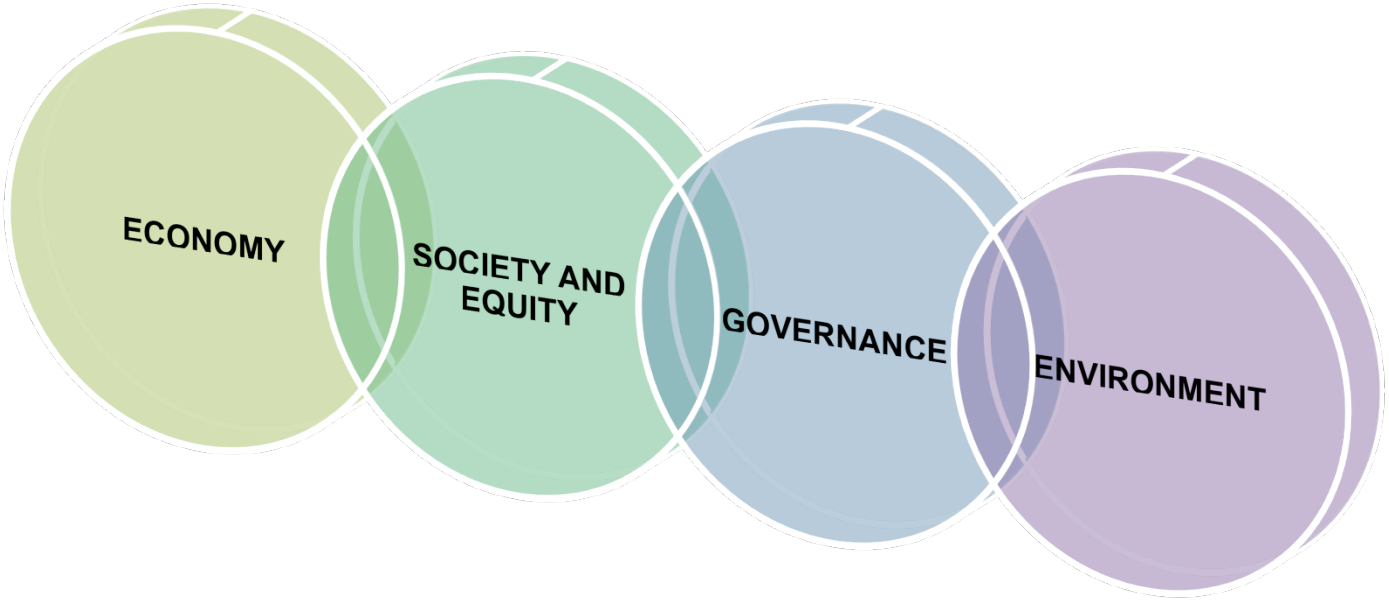
Assessment Findings

ART Contra Costa Project

Select findings presented through the lens of the project resilience goals



If we presented all of the findings you would:

a) never come to another meeting

b) not read the chapters and profile sheets!

Project Resilience Goals

ART Contra Costa Project

Society and Equity

Protect all communities and what they rely on including safe and healthy housing, jobs, and access to goods and services, with a focus on characteristics that could make them more vulnerable

Protect the health, safety and welfare of those who live, work and recreate in Contra Costa County

Housing: Single Family

ART Contra Costa Project

- 75% of housing county-wide is single family
- 507 single family parcels in the project area are within the 100-year floodplain
- Over half of these are at risk of more extensive or frequent flooding as sea levels rise
- 74 parcels not currently at risk of flooding could experience flooding as sea levels rise
- 392 parcels are in low-lying areas adjacent to areas that could flood with 6 feet of SLR

Key Issue:
Most single-family homes were not built with their first floor elevated above the current 100-year flood level, nor designed to withstand flooding, meaning that any exposure to flooding is likely to cause lasting damage. Ultimately, displaced residents will have difficulties finding other comparable housing due to the low housing-vacancy rate and limited availability of affordable housing in the county.

Housing: Multi-Family

ART Contra Costa Project

- 25% of housing county-wide is multi-family
- 506 multi-family units in the project area are within the 100-year floodplain
- 101 of these are at risk of more extensive or frequent flooding as sea levels rise
- 274 parcels not currently at risk of flooding could experience flooding as sea levels rise
- 196 parcels are in low-lying areas adjacent to areas that could flood with 6 feet of SLR

Key Issue:
Multi-family residential in Contra Costa County provides an affordable housing alternative to single-family homes, which is particularly important for lower-income residents. Renters living in multi-family housing have limited opportunity to improve the flood resilience of their residences; while improvements to housing in shared ownership, for example condominium or mutual homeowner associations, require cooperative decision-making.

Housing: Mobile Homes

ART Contra Costa Project

The two mobile home parks in the project area are at risk from flooding:

- Tara Hills Mobile Manor in Baywiew-Montalvin, a +55 community next to Garrity Creek and protected from the Bay by UP/BNSF rail lines
- Rodeo Mobile Home and RV Park which is within the 100-year floodplain of Rodeo Creek also has two of the larger parcels at risk from 6 feet of sea level rise

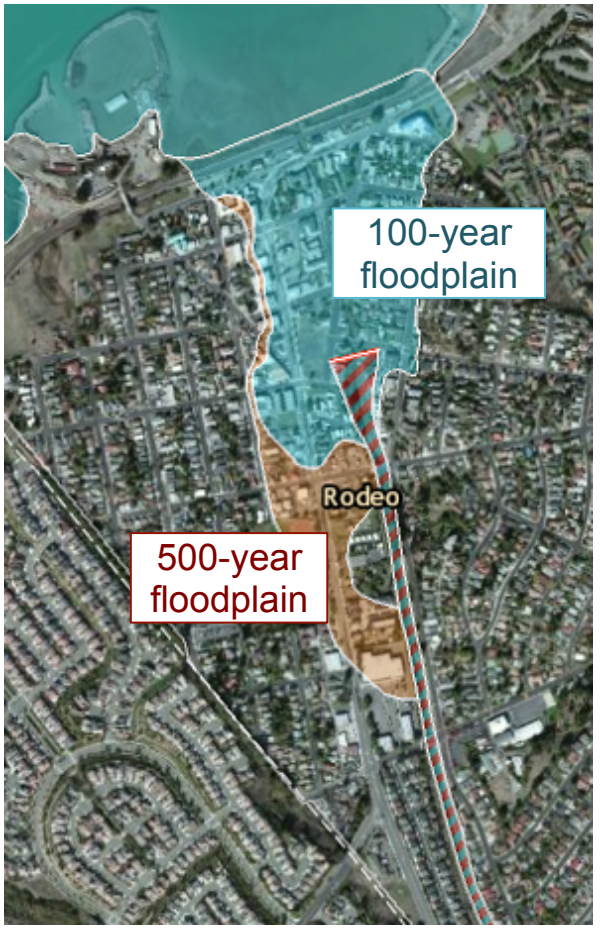
Key Issue:
Mobile homes are vulnerable both during and after flood events because of their design and the materials used to construct them. Mobile homes provide affordable housing options, however once damaged they are difficult to repair and typically need to be replaced. This can cause the permanent displacement of mobile home park residents to other more affordable areas, where they could become disconnected from jobs, schools, and other community ties.

Water Management: Flood Control

- Rodeo Creek conveys only the 15 to 20-year riverine flow, and the 2005 New Year's Eve storm almost caused overbank flooding
- County Flood Control receives only 5% of the funds necessary to maintain the channel due to Prop 13 and 218 restrictions
- Since desilting is both expensive and difficult to permit, the last sediment removal effort was in the mid-1990s

Key Issue:
Watershed-specific hydraulic modeling is needed to understand if higher Bay water levels will exacerbate existing flooding or cause areas beyond the existing 100-year floodplain to flood as sea levels rise. This is very important for Rodeo Creek where ongoing sedimentation in addition to rising sea levels will further reduce flood capacity.

Rodeo Current flood risk



Public Services

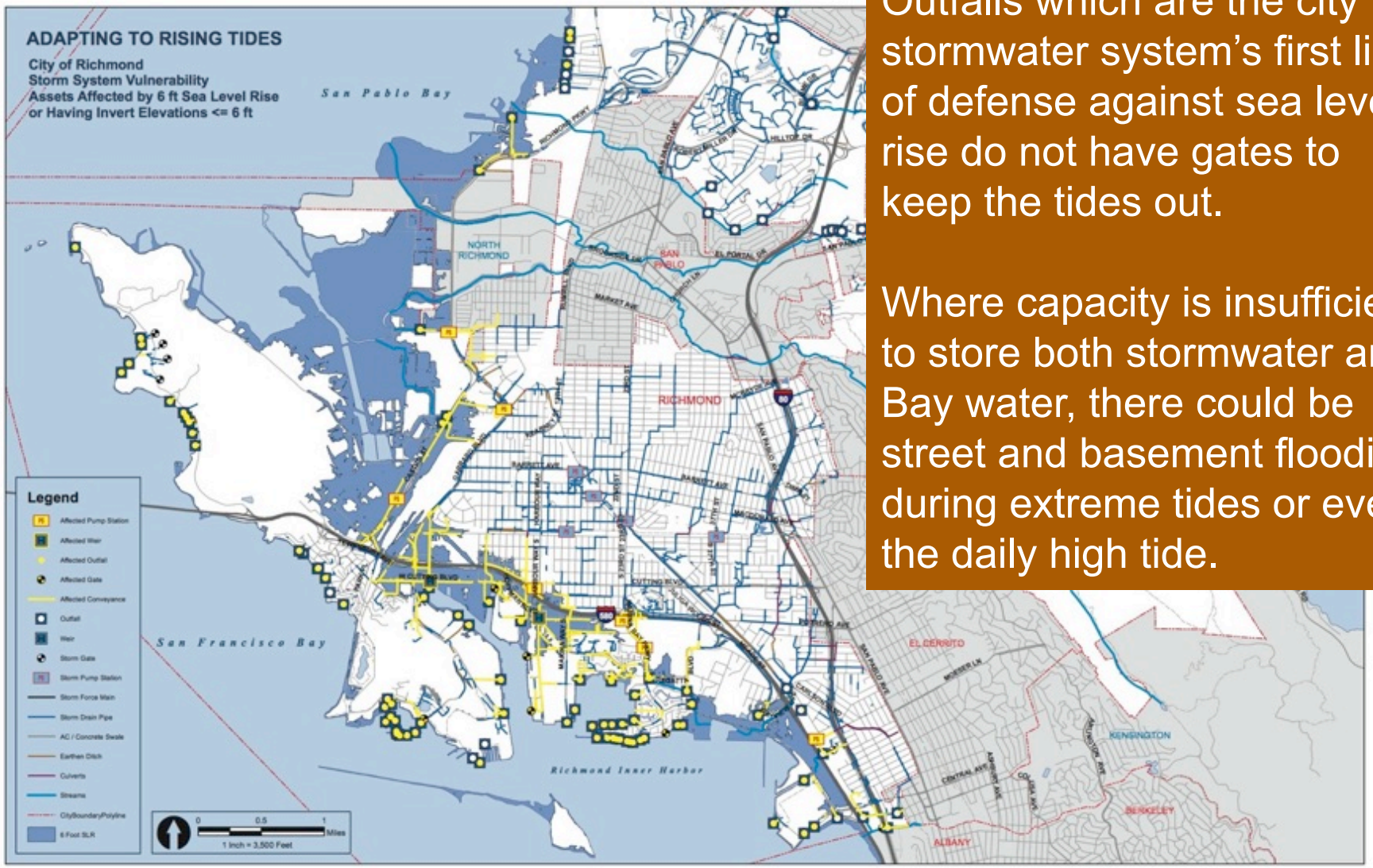
ART Contra Costa Project

- Public health facilities
- Fire stations
- Law enforcement (police and sheriff)
- Schools (K-12)
- Waste transfer stations
- Household Hazardous Waste Collection

Key Issues:
While most of the public services facilities in the project area are not directly at risk of flooding, their function is at vulnerable because they rely on roads and access routes that could flood, as well as uninterrupted power, communications, water and food, and wastewater services.

Public service facilities in the project area are fairly limited, and even a temporary closure could cause significant disruption for residents, both increasing the distance need to travel and expense of obtaining services.

Water Management: Stormwater



Outfalls which are the city stormwater system's first line of defense against sea level rise do not have gates to keep the tides out.

Where capacity is insufficient to store both stormwater and Bay water, there could be street and basement flooding during extreme tides or even the daily high tide.

Project Resilience Goals

ART Contra Costa Project

Economy

Maintain and improve local economic vitality and access to diverse employment opportunities by preserving the function of major employment centers, infrastructure and utilities

Recognizing Contra Costa County's regional role, ensure the energy and transportation sectors and the interconnected networks and systems they rely on are resilient

Business & Industry: Commercial

ART Contra Costa Project

- 229 commercial parcels in the project area are within the 100-year floodplain, and most of these are commercial stores
- 59 of these parcels are at risk of more extensive or frequent flooding as sea levels rise
- 36 parcels not currently at risk of flooding could experience flooding as sea levels rise, and most of these are office buildings
- Almost half of the commercial parcels at risk are located in Martinez and most of the remainder are in Richmond and Rodeo

Key Issues:

Most commercial buildings are not designed to withstand flooding, and even those not directly at risk will be vulnerable if roads that provide access are flooded, or if power, water or wastewater services are disrupted.

Even temporary closure of commercial uses can have significant social and economic impacts on neighborhoods and communities, including workers being unable to report to work, and necessary goods and services becoming unavailable to community members.

Business & Industry: Industrial

ART Contra Costa Project

- 128 industrial parcels in the project area are within the 100-year floodplain, about half are heavy and half are light industrial
- 83 of these parcels are at risk of more extensive or frequent flooding as sea level rises
- 137 parcels not currently at risk of flooding could experience flooding as sea levels rise, and most of these are light industrial

Key Issues:

While the four refineries in the project area comprise the majority of the acres at risk, light industrial comprises the majority of parcels at risk.

About half of the light industrial parcels at risk are not current in the 100-year floodplain and therefore property owners and site operators may not be prepared for, or aware of, the flood risk they may face in the future.

Energy: Refineries

ART Contra Costa Project

Three of the four refinery have at least a portion of their land area within the existing 100-year floodplain, and the shoreline of each is exposed to as little as one foot of sea level rise

Disruption of refinery operations could result in lost jobs at the refinery site and associated sectors, and potentially impact the regional economy, resulting in higher fuel prices and potentially shortages

Key Issues:

Temporary or permanent disruption of operations could occur due to on-site flooding or because access to the refinery is disrupted. Improving the resilience of refinery operations will require coordination with asset owners and managers that operate on-site as well as those that provide goods and services from off-site.

Because refineries are physically large sites, further analyses are needed to understand which if any vulnerable assets or facilities are located in areas that could be flooded due to shoreline overtopping or a failure of the stormwater system to drain adequately.

Energy: Pipelines

ART Contra Costa Project

Miles of Pipelines

- 276 in the project area
  55 in the 100-year floodplain
- 12 that carry natural gas
- 43 that carry hazardous liquids
- 51 potentially exposed to 6 ft SLR

Contra Costa is the epicenter of refining and heavy manufacturing in the Bay Area and pipelines, which span the County, are an essential component to the regional economy

Key Issues:

Buried pipelines are sensitive to higher groundwater and salinity intrusion. Exposure to salt water can corrode pipelines, and pipelines that are not weighted or anchored may float and become exposed, particularly during prolonged flooding and in marshy or sandy soils.

Damage to pipelines could result in significant regional disruptions to the energy and transportation sectors, and threaten public safety and the the environment if there is an explosion or release of hazardous contents.

Project Resilience Goals

ART Contra Costa Project

Environment

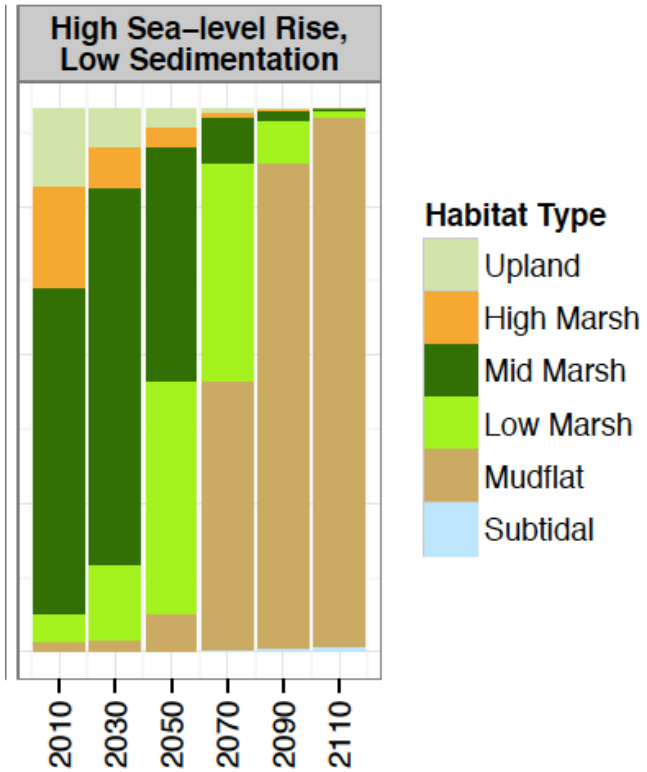
Protect and enhance the environmental value of Contra Costa County by preserving habitat, continuing to improve water quality, and air quality, cleaning up contaminated lands, and by using natural approaches wherever possible to improve community and economic resilience

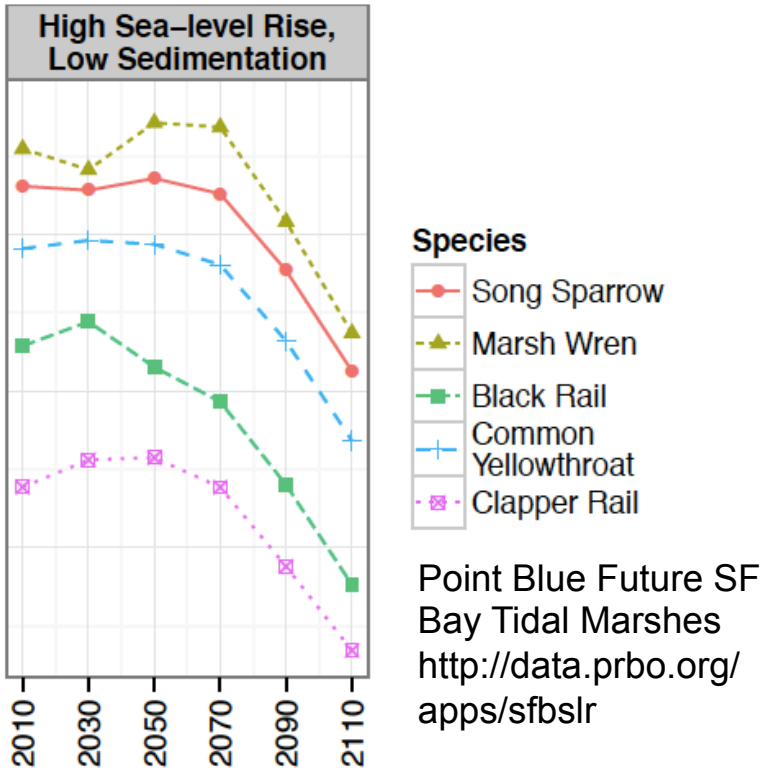
Natural Areas: Tidal Marshes

ART Contra Costa Project

Key Issues:

The fifteen tidal marshes in the project area may downshift as sea level rises to eventually become mudflat by the end-of-century, and marsh erosion will increase due to greater wind-wave action in deeper water, narrowing marshes such as Stege Marsh in the Central Bay





Point Blue Future SF Bay Tidal Marshes http://data.prbo.org/apps/sfbslr

Contaminated Lands: Brownfields

ART Contra Costa Project

Brownfields
- 63 in the project area, the majority of which are in Richmond
- 28 within the 100-year floodplain
- 22 of these are at risk of more extensive or frequent flooding with sea level rise
- 10 not currently at risk could experience flooding as sea levels rise

Brownfields that have not been fully cleaned up, were cleaned up to less stringent upland or reuse standards, or employ remediation or engineering control practices that may not continue to be effective as sea level rises may pose a risk to public and environmental health

Key Issues:
Upland sites that become aquatic as sea level rises will not have been remediated to a high enough standard, as allowable aquatic contaminant concentrations are greater than upland concentrations

Opportunities for further cleanup of brownfields to address changing flood or groundwater conditions will vary; remedies are site specific, and there may not be means to compel the further cleanup of certified sites

Water Management: Wastewater

ART Contra Costa Project

- Eight of the nine wastewater treatment plants in the project area are either completely or partially within the 100-year floodplain
- Six of these eight treatment plants may also experience more frequent or extensive flooding with sea level rise of 1 and 3 feet

Key Issue:
Wastewater treatment plants are highly vulnerable to flooding, however, the combination of existing infrastructure problems and limited funding may prevent some agencies from fully address the challenges of sea level rise.

If storm events or sea level rise overwhelm and compromise the treatment plants, toxic substances and excessive nutrients could overflow into the adjacent shoreline areas and Bay, degrading water quality and harming fish and other aquatic organisms.

Project Resilience Goals

ART Contra Costa Project

Governance:

Build resilience within Contra Costa County by improving capacity within and cooperation among agencies, organizations, and the community

Transportation: Rail Lines

ART Contra Costa Project

Miles of Rail

- 153.5 miles in the project area, including rail track, sidings, and minor yards
- 14 miles of rail is within or crosses over the current 100-year riverine and coastal floodplains
- 40 miles of rail is exposed to sea level rise, almost half at risk from 4 feet or less

Key Issues:

Given the interconnected nature of rail, and lack of redundancy, a disruption of any segment, either within or beyond the project area, could have significant impacts on moving agricultural, automotive, chemical, industrial, and other goods from the region's seaports to local and national markets.

Collaboration between private rail owners (Union Pacific and Burlington Northern Santa Fe (BNSF)), local agencies that own or manage adjacent lands, and those that rely on rail either for providing service or for flood protection, will be necessary to find and implement appropriate, multi-benefit solutions to address flood risks.

Transportation: Roadways

ART Contra Costa Project

Miles of Roadway

- 202 miles of roads in the project area
- 27.5 miles are within or cross over the current 100-year riverine and coastal floodplains, mostly major collectors
- 16.3 miles are exposed to sea level rise, most from 4 feet of sea level rise or less

Key Issues:

Agency coordination is required to maintain connections between interstates and local streets and roads. This will increases the complexity, time and cost of planning for and address future flooding impacts.

The lack of planning funds, capital improvement financing, regulatory mechanisms or incentives limits the ability of public agencies to assess or address the impacts of sea level rise, in particular where roadways will be impacted by diminished capacity of the stormwater system or where there will be increase riverine flood risks.

Contaminated Lands: Landfills

ART Contra Costa Project

Key Issues:
Increased flooding, higher groundwater levels, and increased tidal, wind and wave energy could have significant consequences on landfill waste containment systems.

Currently, the Regional Water Quality Control Board long-term flood protection requirements are one opportunity for landfills to identify and address increased flood risks due to sea level rise, however, this approach is geared towards site-specific actions, and may not suffice in locations where landscape-scale responses are warranted.


Photo: City Lab

Questions? Discussion? Break?

Waterfront Road – this year!

The Plan Step

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Outcomes of the Plan Step:

- Adaptation responses for individual assets, agencies, organizations
- Cross-cutting adaptation responses for the key planning issues
- Implementation options
- Evaluation criteria based on resilience goals

What is an Adaptation Response

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An **adaptation response** is an action or series of actions to address identified vulnerabilities (governance, information, physical, or functional) for individual or multiple assets

Adaptation responses include:

- The vulnerability being addressed, which provides a direct link to the outcomes of the assessment
- One or more actions, some that can be taken at the same time and others are sequential and incrementally build towards resilience
- Implementation options that serve as a guide for those that want to initiate action, including leads, partners, possible funding sources, and ways to mainstream into existing processes

Example Adaptation Response

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Overarching Adaptation Response | **Adapting to Rising Tides**

Information Vulnerability

Vulnerability O4: There is a limited understanding of how dynamic baylands habitats such as tidal marshes, intertidal mudflats, and subtidal areas will respond to accelerating sea level rise, or how these habitats will be affected by shoreline adaptation responses (e.g., structural solutions such as levees) that may change tide, wave or sediment conditions.

Vulnerability

Action Number	Action	Action Type	Process	Possible Actors	Action Characterization
O4.1	Establish and support a regional research agenda to advance the understanding of how baylands will respond to accelerating sea level rise in light of declining sediment supply and limited space to migrate inland	Evaluation, Coordination	New Initiative	EBRPD, HARD, ACFCWCD, SCC, DFW, BCDC, RWQCB, Port, USACE, USFWS, FEMA, City, County, CBOs, Private Sector, SFBRA	Unlocking, Regional, High Priority
O4.2	Research and test restoration and management actions that will improve baylands resilience	Evaluation	Project Planning and Design	EBRPD, HARD, ACFCWCD, SCC, DFW, BCDC, RWQCB, Port, USACE, USFWS, FEMA, City, County, CBOs, Private Sector, SFBRA	Unlocking, Regional, High Priority
O4.3	Develop and implement a Regional Sediment Management Plan for the Bay	Coordination, Policy Development	Long-range Planning, New Initiative	CSMW, BCDC, USEPA, USACE, RWQCB, LTMS stakeholders, USFWS, NOAA, City DPW, Flood Control Agencies, Private Sector	Unlocking, Multi-benefit, Regional, High Priority

Actions

Implementation Options

County-Scale Adaptation Responses

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- Will highlight key issues in the project area
- Will be adequate for certain vulnerabilities, such as systemic issues, information gathering needs, or policy development
- Will set the stage for more focused, landscape or asset scale, assessment and adaptation response development

ART Adaptation Scales

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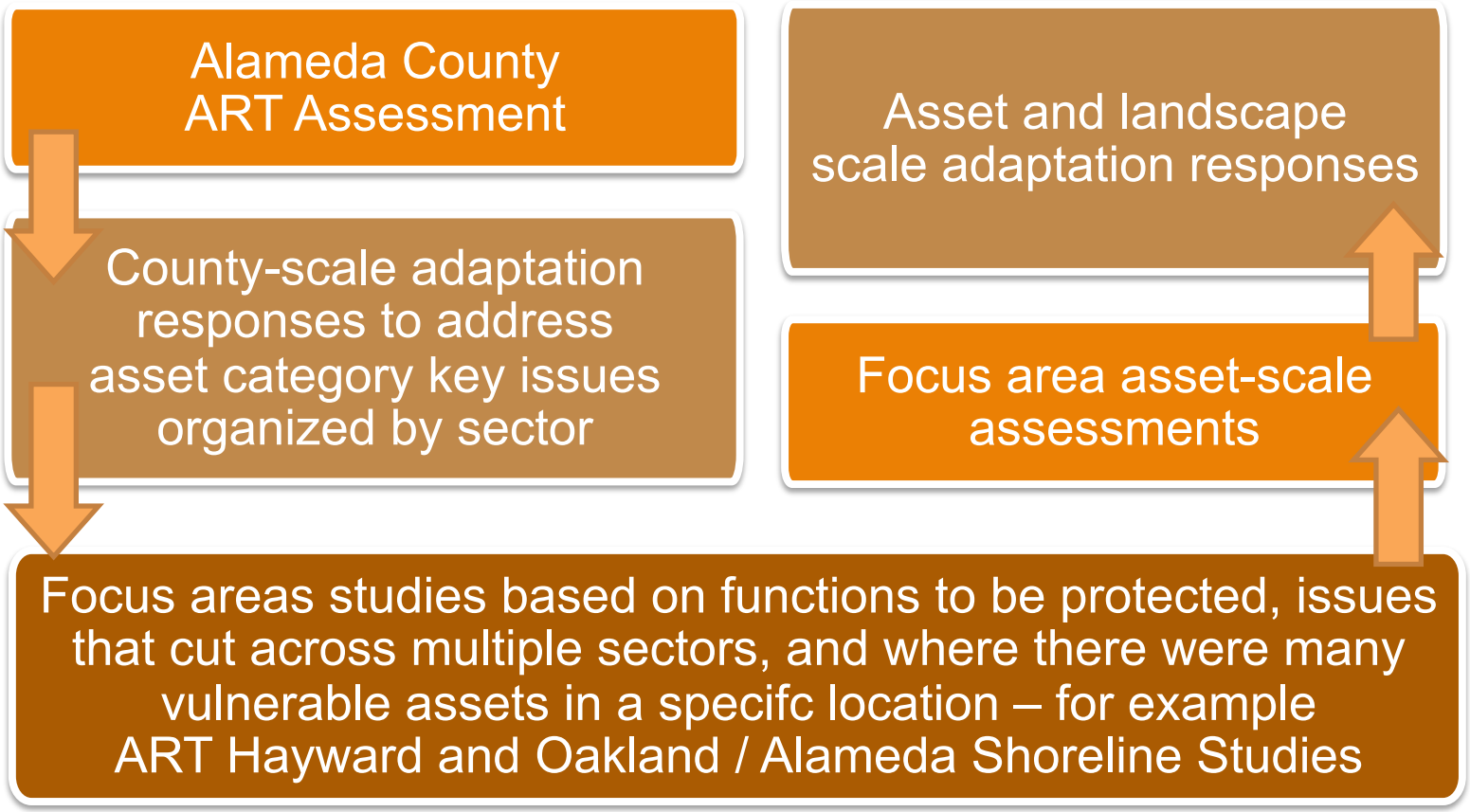

Asset Scale: Oakland / Alameda

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BART Coliseum Station

PHYS4: The A30 pedestrian tunnel is below-grade; there is a sump pump that helps keep the tunnel dry, however this pump system was not designed for major overland flooding events and may be taxed by consistently high groundwater

ACTION	Process	Partners
Install manual, remote control, or automatic **temporary barriers or waterproof closures** to protect at- or below-grade critical elements such as station entrances, tunnels, maintenance facilities, storage areas, and rail alignments	Capital Planning, Operations, Codes and Standards, Project Planning and Design	UP, Amtrak, Caltrans, CCJPA, Cities, Counties
Construct **permanent structures** to protect at- or below-grade critical elements such as station entrances, tunnels, maintenance facilities, and asset storage areas, and rail alignments	Capital Planning, Operations, Codes and Standards, Project Planning and Design	UP, Amtrak, Caltrans, CCJPA, Cities, Counties

Landscape Scale: Hayward

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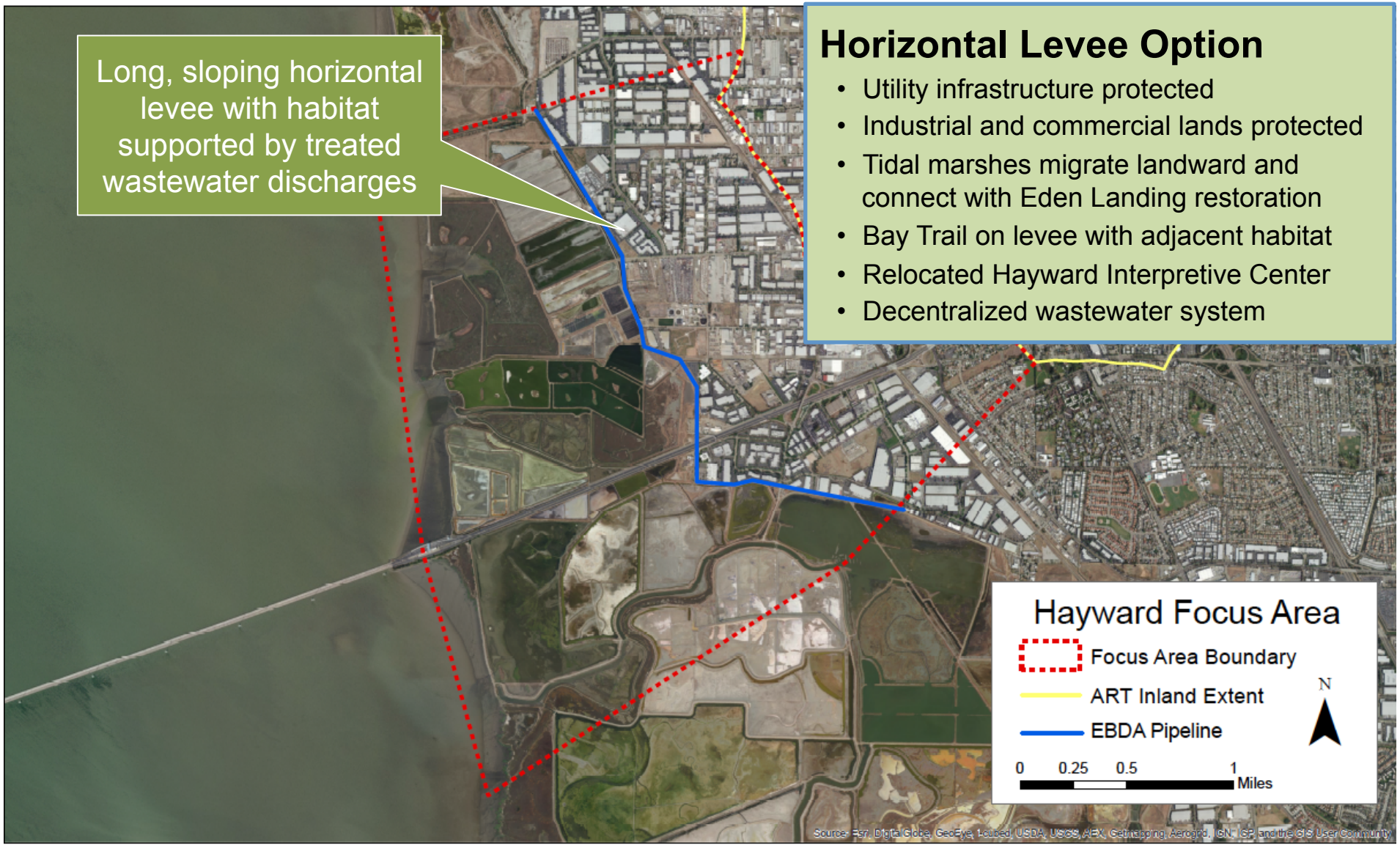

Horizontal Levee Option

- Utility infrastructure protected
- Industrial and commercial lands protected
- Tidal marshes migrate landward and connect with Eden Landing restoration
- Bay Trail on levee with adjacent habitat
- Relocated Hayward Interpretive Center
- Decentralized wastewater system

Contra Costa Example: Housing

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KEY ISSUE

Retaining housing is crucial to expediting and ensuring an effective disaster recovery

Limiting catastrophic housing damage and keeping residents in their homes not only helps people who may lack the resources to effectively recover from a disaster, but also keeps communities intact

Multi-family Housing Vulnerabilities

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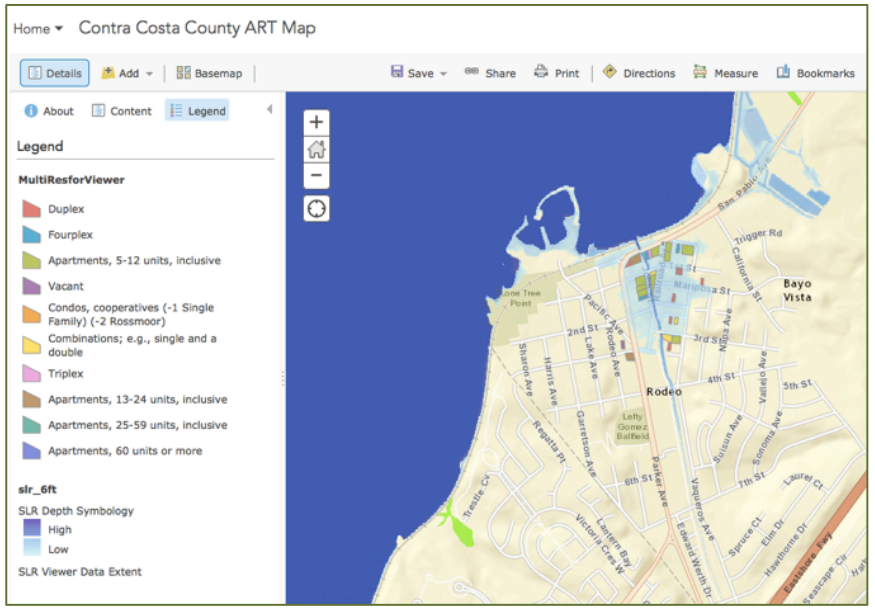
Multi-family residences are often rented, and renters often lack flood insurance, which could provide assistance with replacing damaged personal items or providing an alternative place to live if there was a flood event

In addition, flooding of multi-family housing with a large number of units could displace a sizable number of renters who would need to find alternative, affordable, housing



There are seven neighborhood-scale areas in the project area with multi-family residential housing at risk from either current or future flooding. These areas are within the Cities of Richmond, San Pablo, and Martinez and in the unincorporated communities of North Richmond and Rodeo.

Housing Responses

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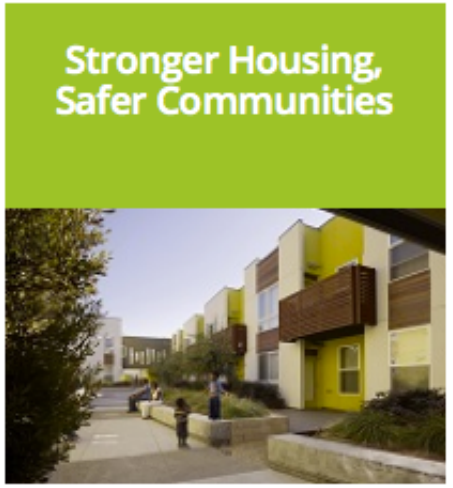
Community resilience-building actions:

- Require hazard disclosure for renters
- Advocate for changes to post-disaster federal and state multifamily housing rebuilding programs
- Create a community capacity inventory
- Disseminate best available hazard and climate risk information through community-based organizations and non-traditional partners



www.adaptingtorisingtides.org/project-location/regional/

Housing resilience-building actions:

- Increase standards in local floodplain management ordinances beyond the minimum requirements of FEMA's NFIP program
- Require flood-proof construction methods and techniques within and adjacent to special flood hazard zones
- Revise minimum building elevation standards and maximum building height-limits for new development

Adaptation Response

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Community Land Use, Facilities and Services Adaptation Response — Adapting to Rising Tides

Management Control Vulnerability

Vulnerability C4: Neighborhoods are informal networks whose function depends on the relationship among the individuals and services within them. These informal connections are easily severed during disasters and are often difficult to rebuild once disrupted. Neighborhoods without a strong social network, where residents do not know each other, or are not invested in the overall community good, are especially vulnerable to sea level rise and storm events.

Action Number	Action	Action Type	Process	Possible Actors	Action Characterization
C4.1	Provide expanded Community Emergency Response Team (CERT) trainings, refresher classes, and annual exercises that include flooding preparedness and response	Education/outreach	Emergency and Hazard Planning	ABAG, CalOES, FEMA, Cities, County, ACPHD, CBOs, NPOs	Multi-benefit, Local, Regional
C4.2	Coordinate with non-profit, community, and faith-based organizations to build strong social networks in neighborhoods, in particular those with certain characteristics such as less mobile or medically dependent residents	Coordination	Emergency and Hazard Planning, New Initiative	CalOES, FEMA, Cities, County, ACPHD, CBOs, NPOs, Private Sector	Multi-benefit, Local
C4.3	Provide technical assistance to neighborhoods to support the development and maintenance of disaster plans, including storm evacuation procedures and shelter-in-place guidelines	Education/outreach, Program/operation	Emergency and Hazard Planning	ABAG, CalOES, FEMA, Cities, County, ACPHD	Multi-benefit, Local

Project Adaptation Responses

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What issues will we be developing adaptation responses for in the Contra Costa project area?

Suggestions…issues that:

- Need to be addressed collectively
- Have broad or significant consequences
- Need to be addressed by actions that to implement will take a long time, or the time to accrue benefits will be long
- Affect multiple assets or sectors due to inter-dependencies
- Are focused in specific geographies

Your Thoughts?

Next Meeting

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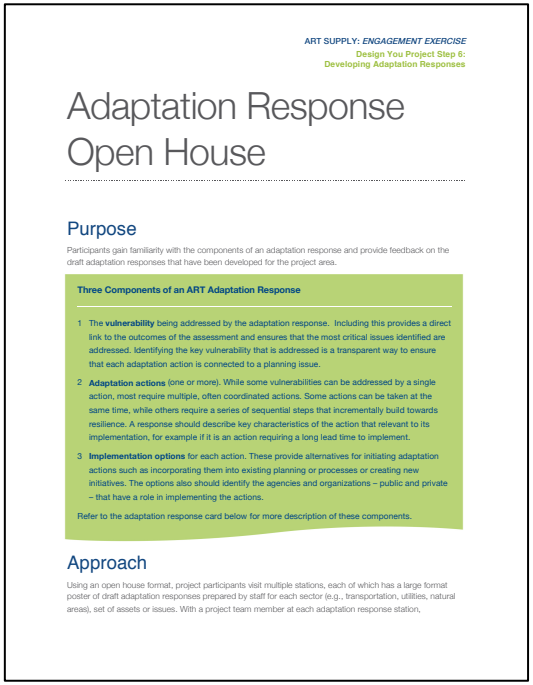
Adaptation Response “open house”

- A relatively rapid way for you to gain familiarity with content of the adaptation responses
- An interactive yet self-paced format where you will be able to spend time with the information you are most interested in
- The ART team will document your feedback and explore any of your questions or ideas in greater depth



ART SUPPLY: *ENGAGEMENT EXERCISE*

Design You Project Step 6:
Developing Adaptation Responses

Adaptation Response Open House

Purpose

Participants gain familiarity with the components of an adaptation response and provide feedback on the draft adaptation responses that have been developed for the project area.

Three Components of an ART Adaptation Response

1. The **vulnerability** being addressed by the adaptation response. Including this provides a direct link to the outcomes of the assessment and ensures that the most critical issues identified are addressed. Identifying the key vulnerability that is addressed is a transparent way to ensure that each adaptation action is connected to a planning issue.
2. **Adaptation actions** (one or more). While some vulnerabilities can be addressed by a single action, most require multiple, often coordinated actions. Some actions can be taken at the same time, while others require a series of sequential steps that incrementally build towards resilience. A response should describe key characteristics of the action that relevant to its implementation, for example if it is an action requiring a long lead time to implement.
3. **Implementation options** for each action. These provide alternatives for initiating adaptation actions such as incorporating them into existing planning or processes or creating new initiatives. The options also should identify the agencies and organizations – public and private – that have a role in implementing the actions.

Refer to the adaptation response card below for more description of these components.

Approach

Using an open house format, project participants visit multiple stations, each of which has a large format poster of draft adaptation responses prepared by staff for each sector (e.g., transportation, utilities, natural areas), set of assets or issues. With a project team member at each adaptation response station,

Next Steps

- Visit the password protected webpage to find and review assessment products
- Provide us feedback or comments before the next meeting
- Ask us to present assessment findings and products to your agency co-workers, decision makers or stakeholders
- Get ready and document upcoming King Tides (california.kingtides.net)

Project web page:
http://www.adaptingtorisingtides.org/project/contra-costa-county-adapting-to-rising-tides-project//

Working Group Password:
cccwg