

Adapting to Rising Tides

A regional program that uses findings, processes, tools and relationships built by ART and its partners to lead and support efforts that increase the resilience of Bay Area communities to sea level rise and storm events



San Francisco Bay Conservation
and Development Commission

www.adaptingtorisingtides.org

What is Adapting to Rising Tides?

A Bay Area Program that:

- Provides guidance and support for adaptation at all scales - local, regional, state and federal
- Develops, leverages and identifies best available data, information and research
- Builds and supports partnerships with agencies and organizations
- Identifies challenging issues or regional priorities that need further assessment
- Continues to refine adaptation practices to ensure outcomes support taking action



The screenshot shows the website for 'Adapting to Rising Tides'. The header includes the title and navigation links for 'ABOUT US', 'ART APPROACH', and 'NEWS'. Below the header is a large image of a coastal landscape with a text box for 'ART Workshop in Napa County'. A welcome message reads: 'Welcome to the ART Portfolio, a place to find planning guidance, tools and information that have been developed, tested and refined by the Adapting to Rising Tides Program to address the specific challenges of climate change.' The main content area features three columns: 'Findings' (ART Program outcomes summarized by sectors and adaptation planning issues), 'Projects' (Latest information about current and past projects of the ART Program), and 'How-To' (Background information, step-by-step guidance and "supplies" for leading an adaptation planning project). Each column has several links, such as 'Findings by Sector', 'Regional Scale Projects', 'The ART Approach', 'Findings by Issue', 'Local Scale Projects', 'Design Your Project', 'Sector Specific Projects', and 'ART Supplies'. A 'Help Desk' link is also present at the bottom, with a subtext: 'Find answers to frequently asked questions and connect with knowledgeable ART Program staff.'

The ART Approach

- Integrates equity, economy, environment and governance from start to finish
- Can be applied to different geographies, sectors and hazards
- Convenes and engages a working group to build local capacity and ensure outcomes resonate locally
- Results in a robust and transparent vulnerability assessment that makes the case for adaptation
- Establishes a clear roadmap for actors at all scales to take action



ART Program Projects

Local-scale projects

- Alameda County
- Contra Costa County
- Hayward Shoreline Resilience Study
- Oakland/Alameda Shoreline Resilience Study

Regional-scale projects

- Stronger Housing, Safer Communities
- Hazard Mitigation and Adaptation Plans
- Regional Sea Level Rise and Shoreline Overtopping Maps and Analysis

Sector-specific projects

- EBRPD Shoreline Parks
- Bay Area Transportation Climate Resilience
- CCJPA Intercity Rail Hot Spots Assessment
- Corte Madera Baylands
- Tidal Creeks and Flood Control Channels



ART Program in Contra Costa

ART Contra
Costa Project

The ART Program team used findings, tools and processes from previous ART-lead and supported projects to jumpstart the Contra Costa ART project

Previous work made every step more efficient and effective, including:

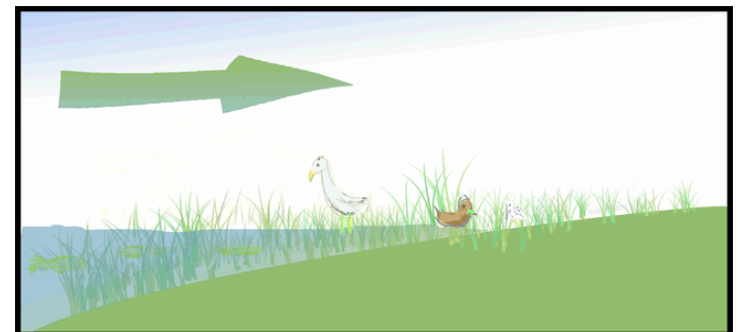
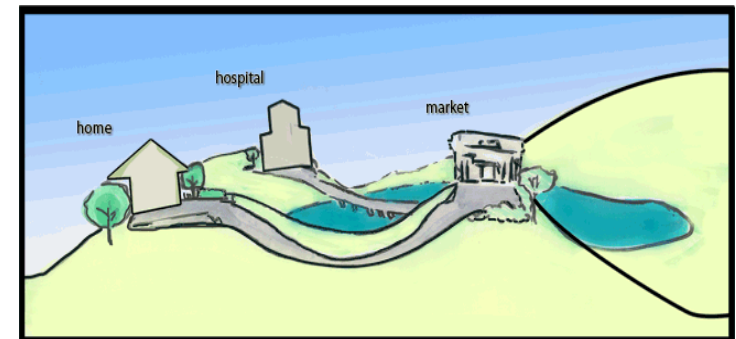
- Identification of current and future flooding
- Working group identification and participation
- Adaptation planning process
- Adaptation response development



Flooding Impacts and Scenarios

Impacts from coastal and/or riverine flood events including:

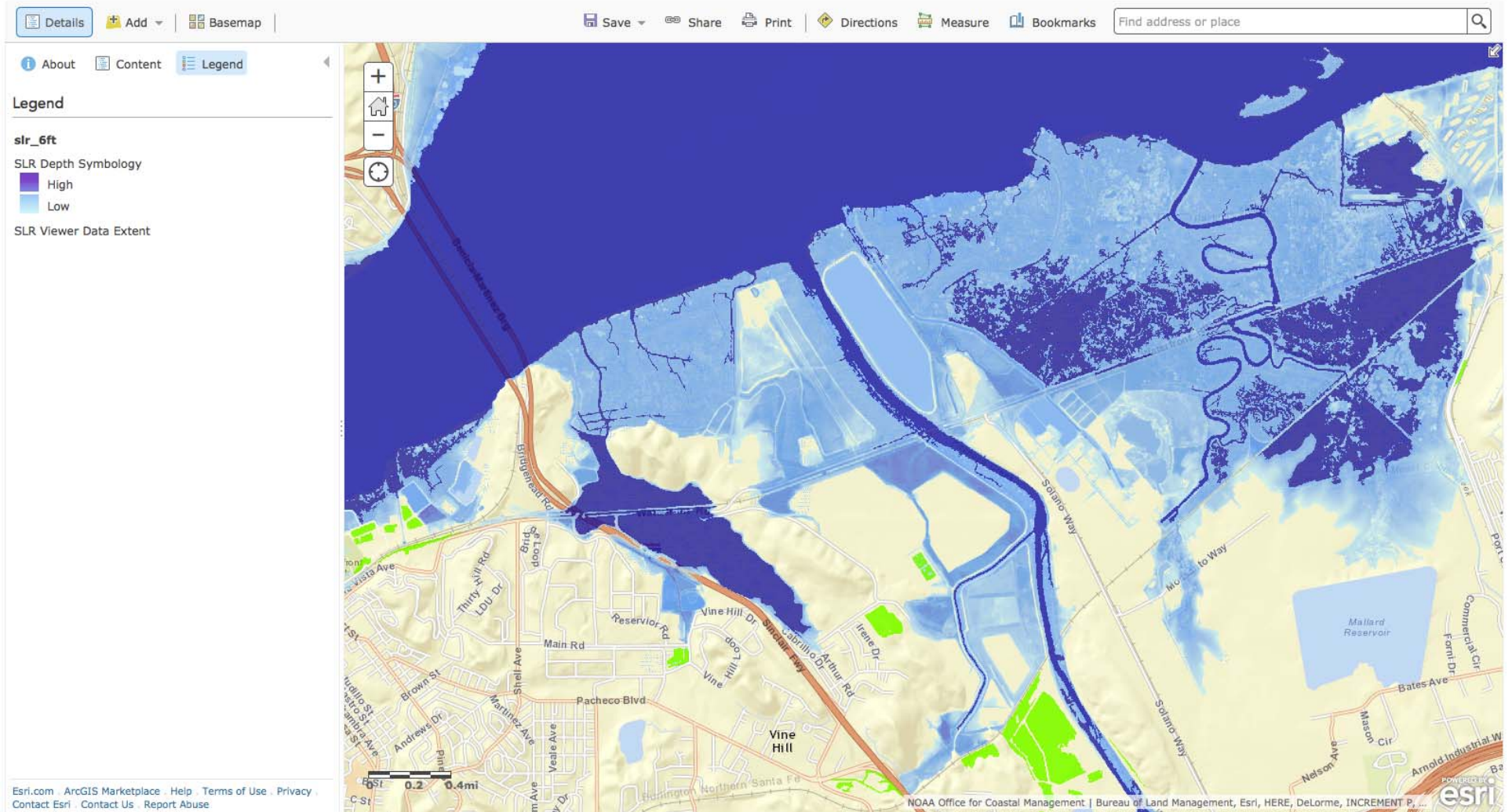
- More frequent flooding of existing flood-prone areas
- Flooding in areas that are not currently at risk
- Elevated groundwater and increased salinity intrusion
- Permanent inundation along the shoreline, in particular tidal wetland systems
- Shoreline erosion and overtopping



Coastal Flooding

Home ▾ Contra Costa County ART Map

New Map ▾ Edit Presentation BC ▾



Riverine Flooding

Home ▾ Contra Costa County ART Map

New Map ▾ Edit Presentation BC ▾

Details Add ▾ Basemap

Save ▾ Share Print Directions Measure Bookmarks Find address or place

About Content Legend

Legend

September FEMA Flood Zone Layer

- X
- AE
- A
- VE
- AO
- AH
- D
- OPEN WATER
- Other

NFHL

- Flood Hazard Boundaries
 - Limit Lines
 - SFHA / Flood Zone Boundary
 - Other Boundaries

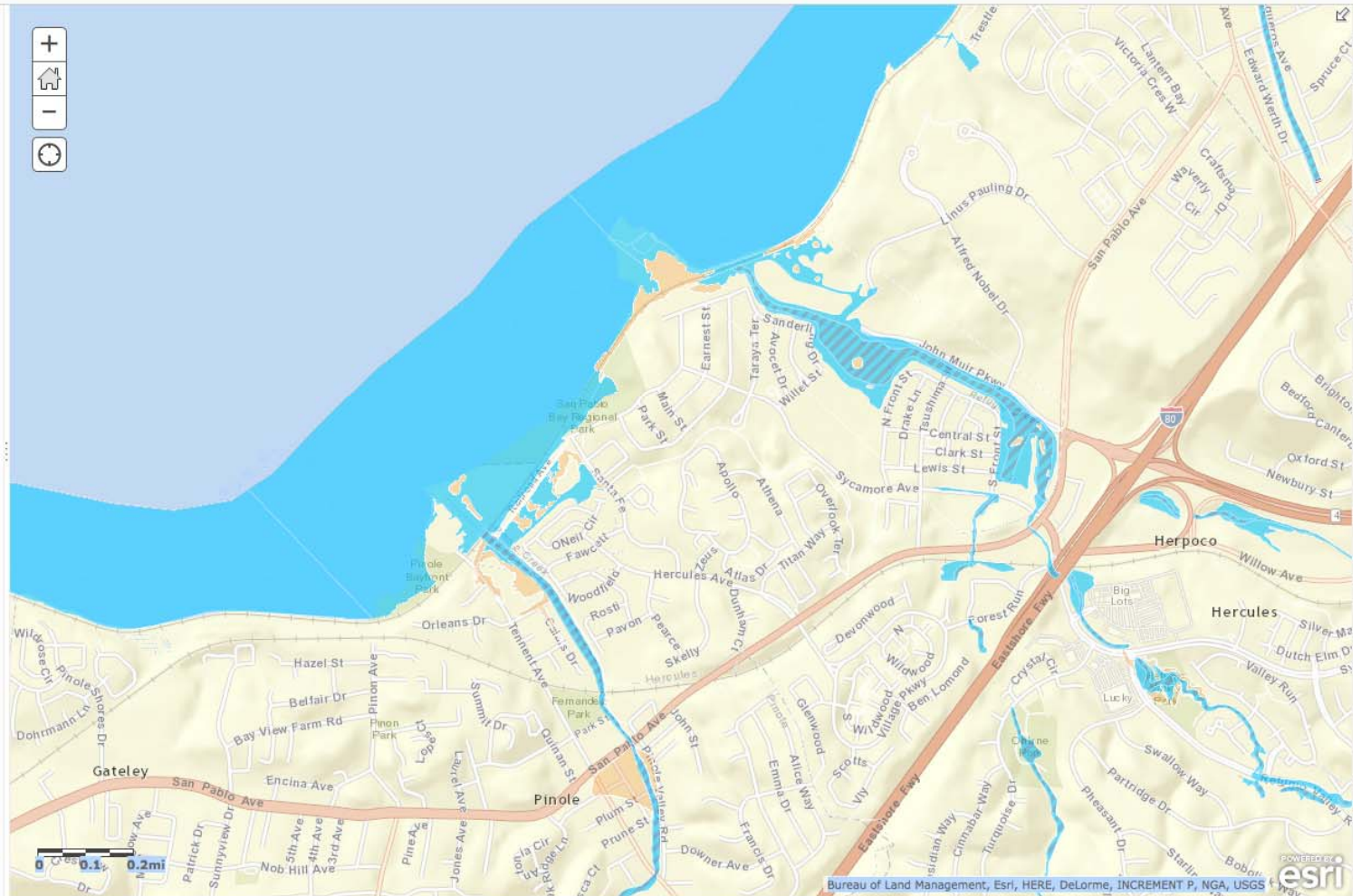
Flood Hazard Zones

- 1% Annual Chance Flood Hazard
- Regulatory Floodway
- Special Floodway
- Area of Undetermined Flood Hazard
- 0.2% Annual Chance Flood Hazard
- Future Conditions 1% Annual Chance Flood Hazard
- Area with Reduced Risk Due to Levee

Water Areas

-

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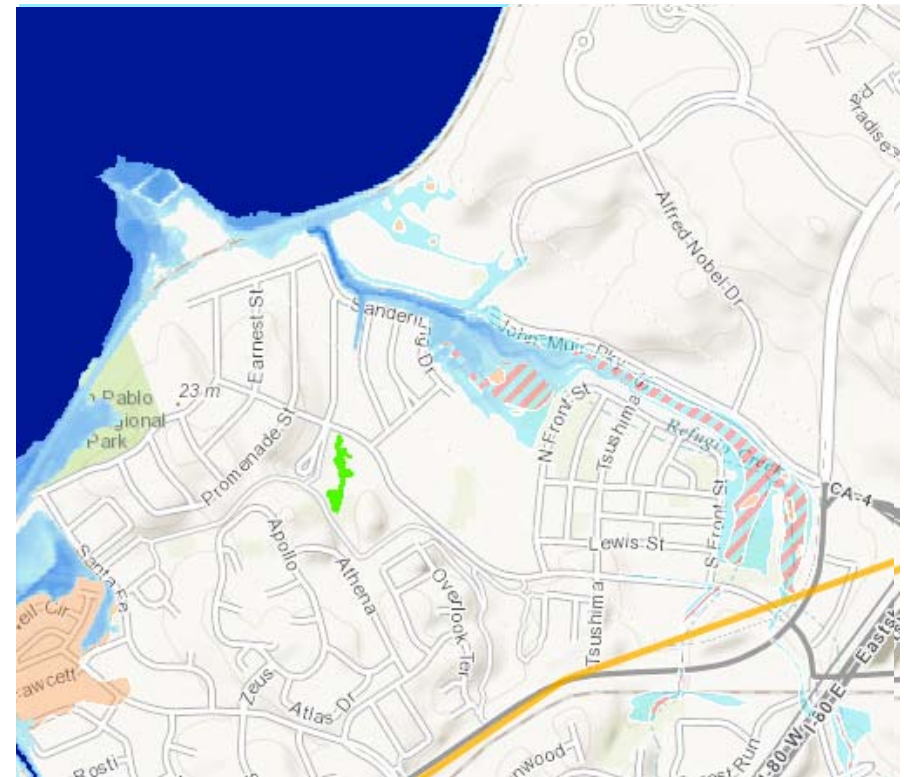
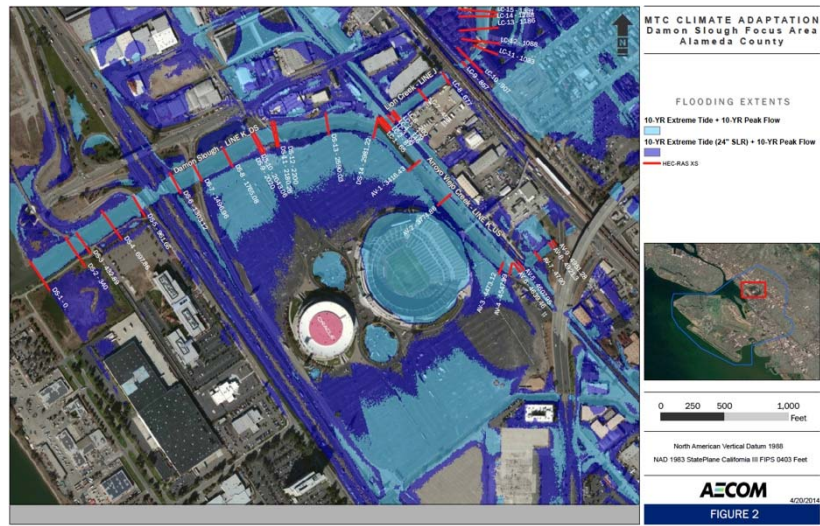
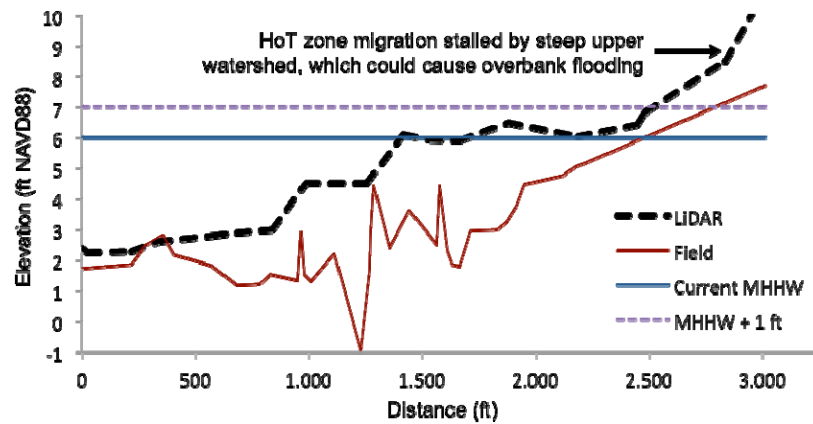


Bureau of Land Management, Esri, HERE, DeLorme, INCREMENT P, NGA, USGS, Imagery

Coastal + Riverine Flooding

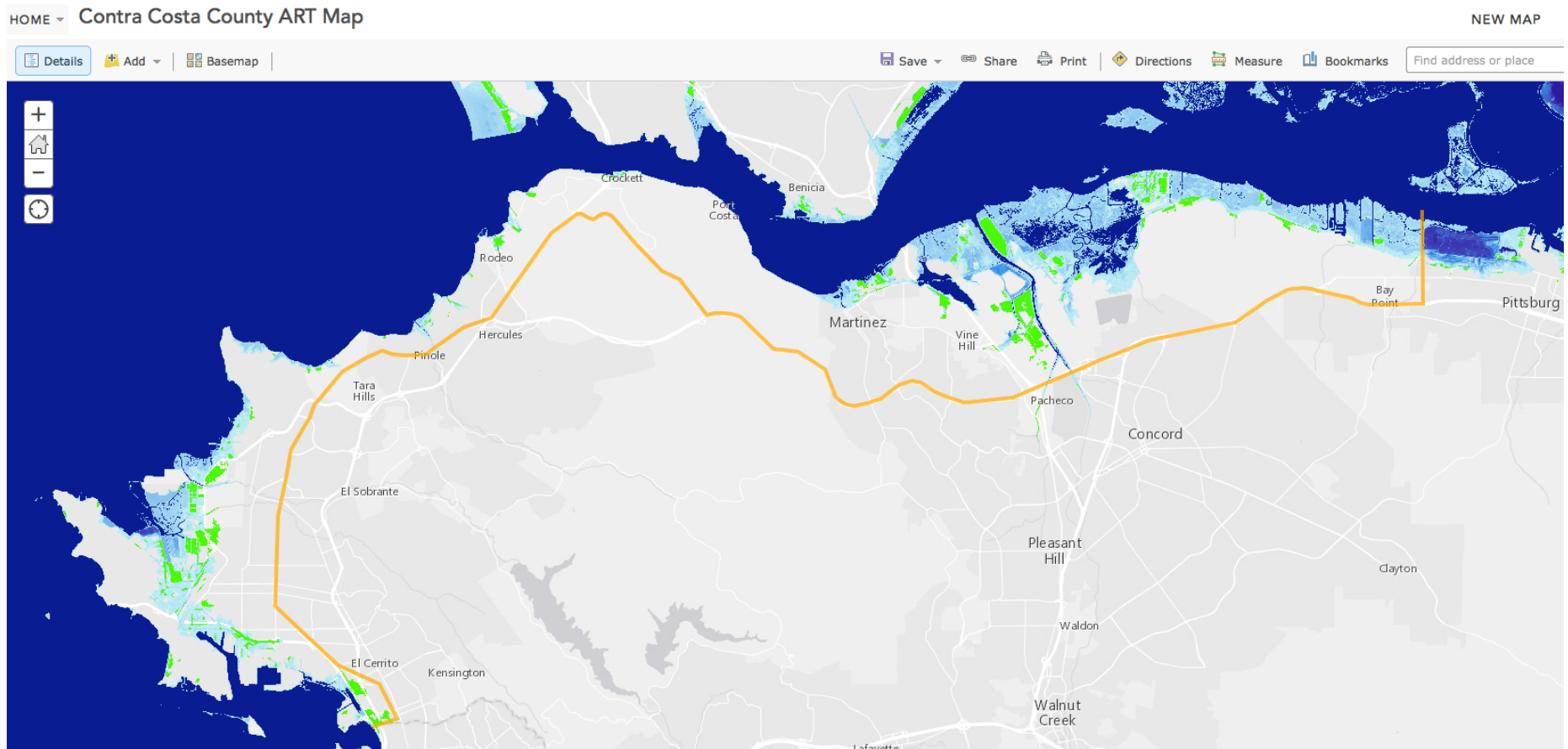
Studies where available, best professional judgment based on current mapping, or new investigations where feasible

Alhambra Creek



Project Area

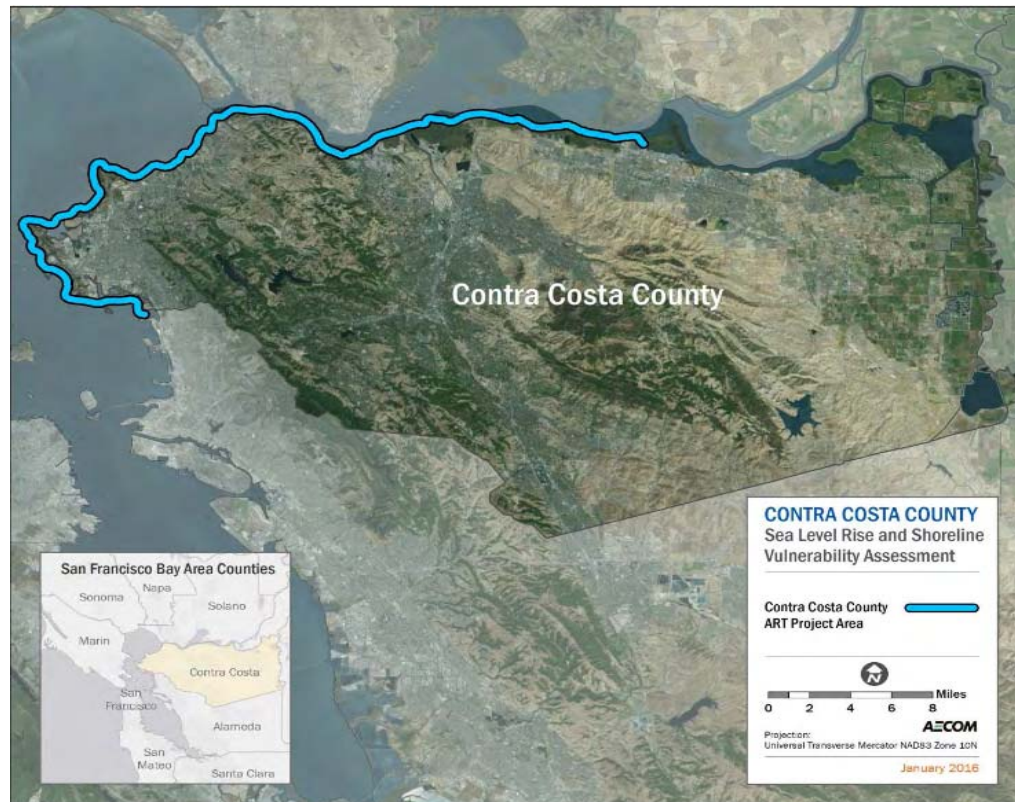
The shoreline from Richmond to Bay Point, including areas potentially exposed to current and future coastal and riverine flooding



Working Group and Resilience Goals

ART Contra
Costa Project

- A diverse and capable stakeholder working group
- Eight project resilience goals that touch on all four frames of sustainability



Stakeholder Working Group

ART Contra
Costa Project

- **County Agencies:** Conservation and Development, Flood Control, Public Works, Health Services, Mosquito and Vector Control, Office of Emergency Services
- **Cities:** Planning and Public Works
- **Special Districts:** Water, Wastewater, Parks
- **Regional, State and Federal Agencies:** ABAG, MTC, Congestion Management/Transportation, NOAA, FEMA
- **Private Entities and Non-Governmental Organizations:** Power, rail, refineries, industrial alliances and councils, community based organizations



Many Sectors and Assets

ART Contra
Costa Project

Community Characteristics

Individuals, households, neighborhoods

Residential Housing

Single-family, multi-family, mobile homes

Community Facilities and Services

Public health infrastructure

Emergency facilities and services

Waste collection and transfer stations

Business and Industrial Land Uses

Commercial land uses

Industrial land uses

Brownfields

Hazardous Materials Sites

Landfills (closed and open)

Parks and Recreation Facilities

Shoreline parks

Marinas

Water Management

Water supply

Wastewater

Flood management

Stormwater infrastructure

Natural Shorelines

Tidal wetlands

Transportation

Passenger and freight rail

Local, state, interstate roads

Bay trail

Seaport (Port of Richmond)

Marine oil terminals

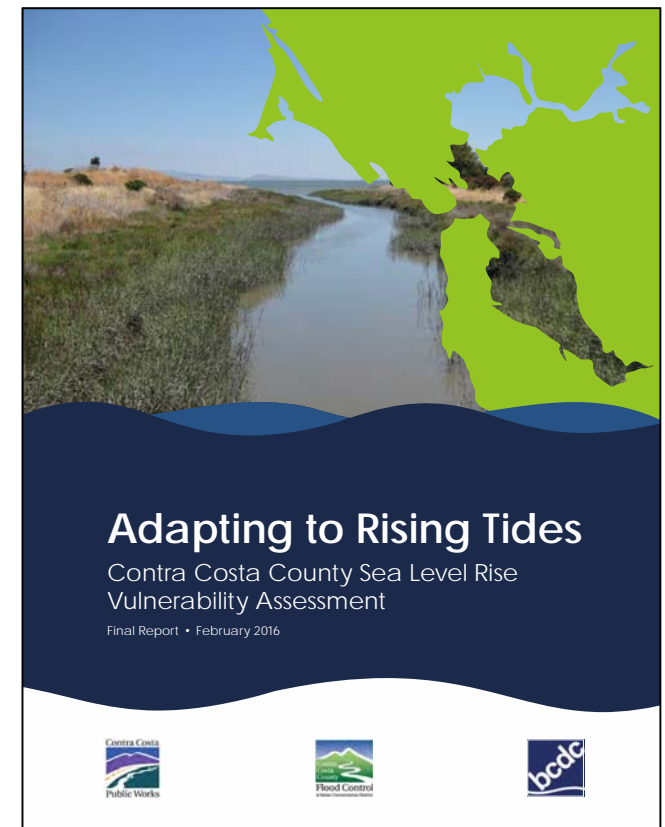
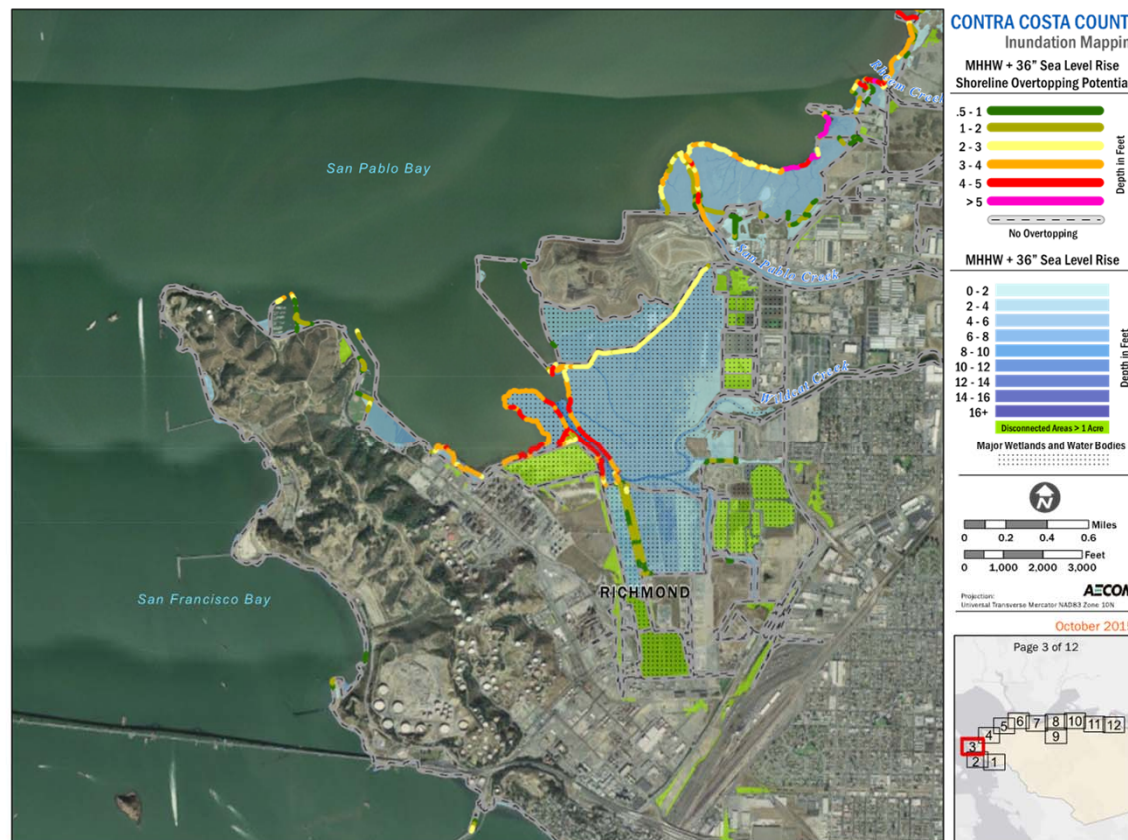
Energy and Fuel Supply

Pipelines

Refineries

Power generation & distribution

- o Locally refined ART sea level rise maps and shoreline overtopping analysis



Sea Level Rise Inundation Mapping

ART Contra Costa Project

Equivalent Water Levels

High tide with 77" SLR

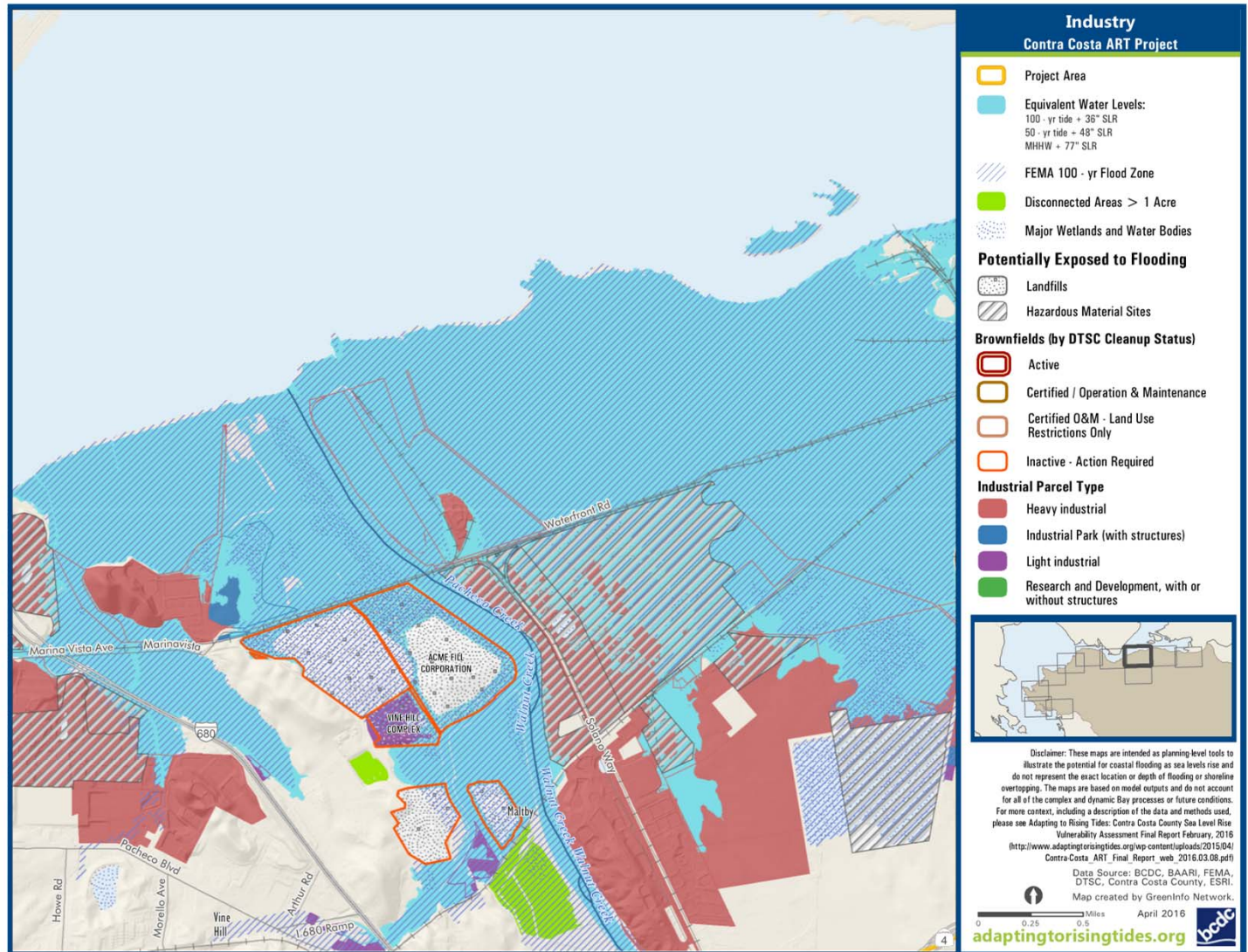
Permanent Inundation

or

100-year tide with 36" SLR

50-year tide with 48" SLR

Temporary Flooding

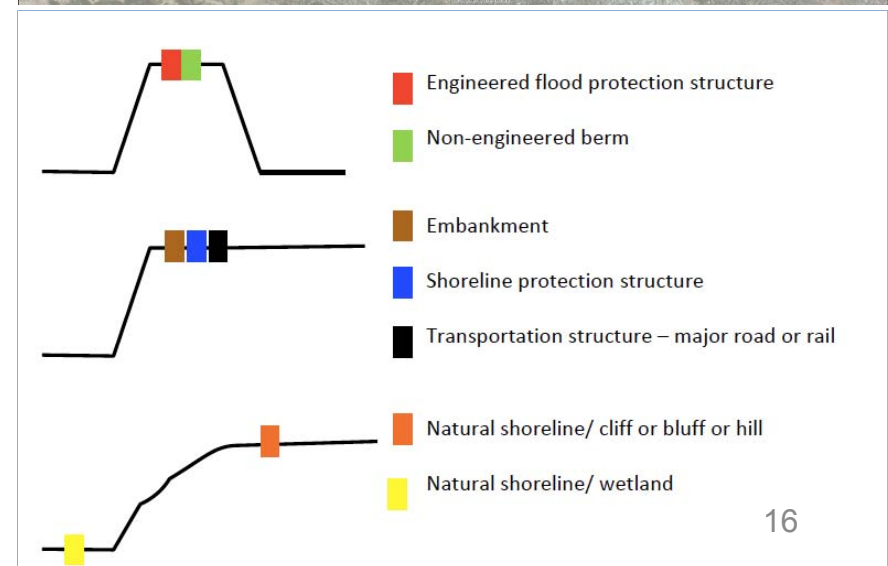
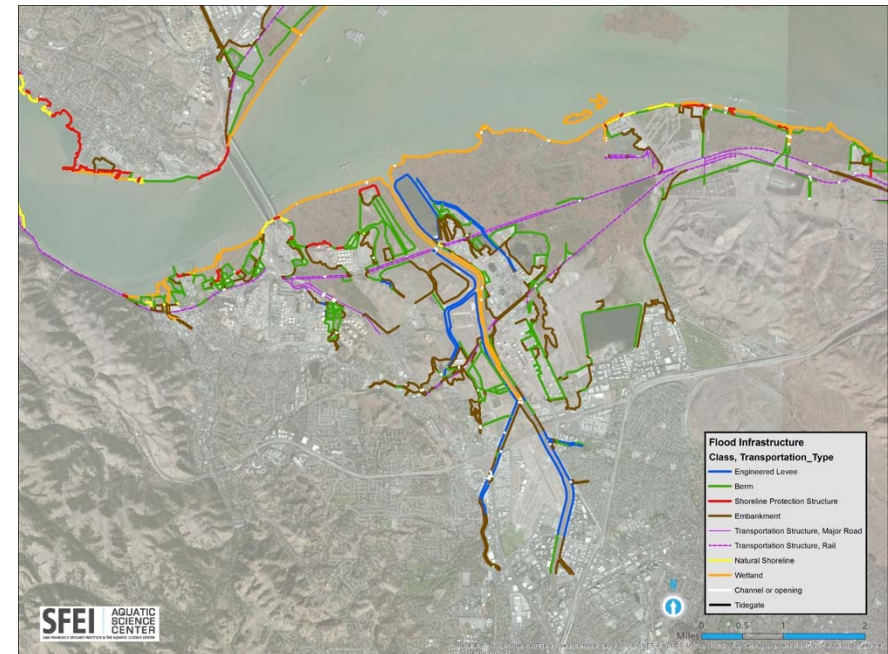


Shoreline Mapping

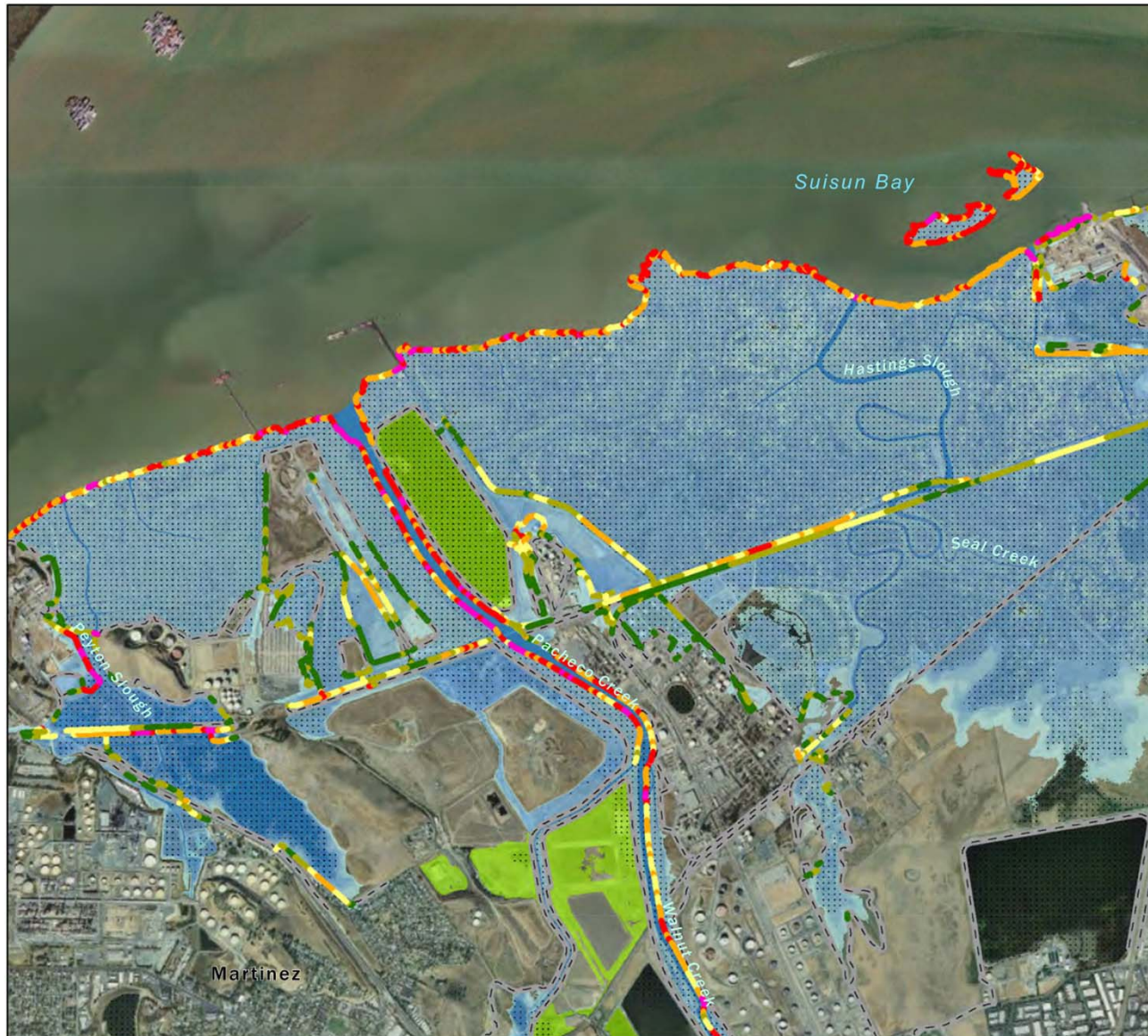
ART Contra
Costa Project

Location and elevation of **seven shoreline defense types** that can prevent inland flooding:

- Engineered Flood Protection
- Engineered Shoreline Protection
- Embankments
- Transportation Structures
- Non Engineered Berms
- Wetlands
- Natural Shoreline/Beach

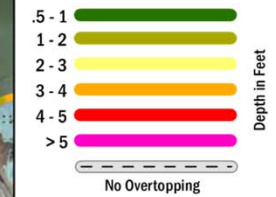


Shoreline Overtopping Analysis

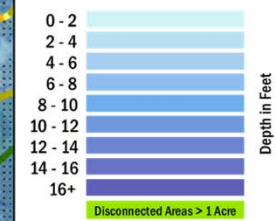


CONTRA COSTA COUNTY Inundation Mapping

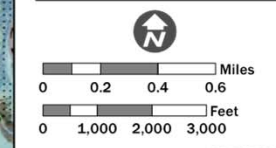
MHHW + 48" Sea Level Rise
Shoreline Overtopping Potential



MHHW + 48" Sea Level Rise



Major Wetlands and Water Bodies



Projection: Universal Transverse Mercator NAD83 Zone 10N
AECOM

January 2016



Analysis of Flood Management

The ART team worked with local flood managers to assess the tidal portion of eight flood control creeks:

- Alhambra
- Pinole
- Refugio
- Rheem
- Rodeo
- Wildcat
- San Pablo
- Lower Walnut Creek

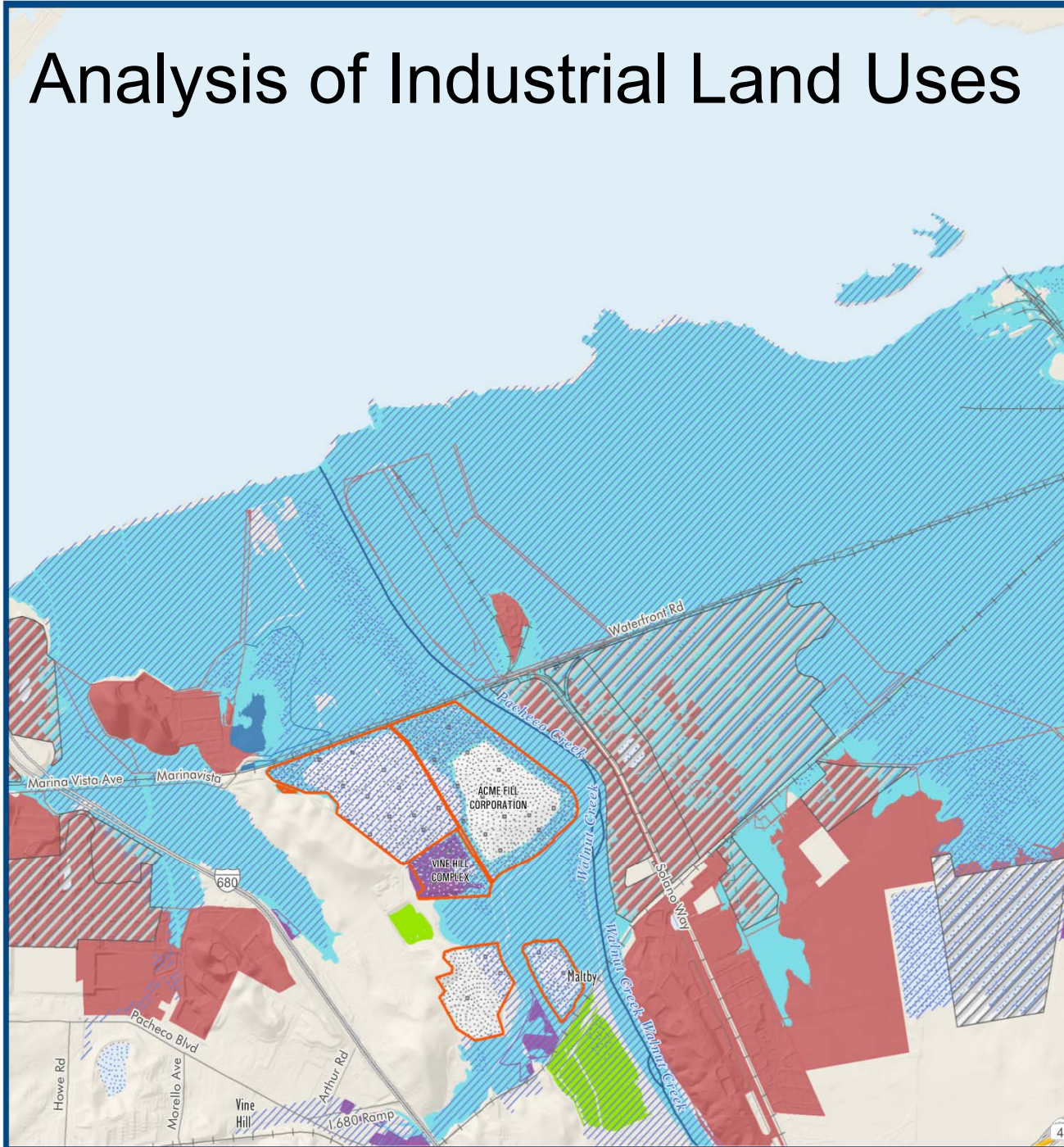
Rodeo Current flood risk



Rodeo Future flood risk



Analysis of Industrial Land Uses



Industry Contra Costa ART Project

- Project Area
- Equivalent Water Levels:
100 - yr tide + 36" SLR
50 - yr tide + 48" SLR
MHHW + 77" SLR
- FEMA 100 - yr Flood Zone
- Disconnected Areas > 1 Acre
- Major Wetlands and Water Bodies

Potentially Exposed to Flooding

- Landfills
- Hazardous Material Sites

Brownfields (by DTSC Cleanup Status)

- Active
- Certified / Operation & Maintenance
- Certified O&M - Land Use Restrictions Only
- Inactive - Action Required

Industrial Parcel Type

- Heavy industrial
- Industrial Park (with structures)
- Light industrial
- Research and Development, with or without structures

Disclaimer: These maps are intended as planning-level tools to illustrate the potential for coastal flooding as sea levels rise and do not represent the exact location or depth of flooding or shoreline overtopping. The maps are based on model outputs and do not account for all of the complex and dynamic Bay processes or future conditions. For more context, including a description of the data and methods used, please see Adapting to Rising Tides: Contra Costa County Sea Level Rise Vulnerability Assessment Final Report February, 2016 (http://www.adaptingtorisingtides.org/wp-content/uploads/2015/04/Contra-Costa_ART_Final_Report_web_2016.03.08.pdf)

Data Source: BCDC, BAARI, FEMA, DTSC, Contra Costa County, ESRI.
Map created by GreenInfo Network.

0 0.25 0.5 Miles April 2016

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Analysis of Industrial Land Uses

ART Contra
Costa Project

- 128 industrial parcels in the project area are in the 100-year floodplain:
 - $\frac{1}{2}$ are heavy and $\frac{1}{2}$ are light industrial
 - $\frac{2}{3}$ may experience more extensive or frequent flooding as sea level rises
- 137 parcels not in the current floodplain could experience flooding as sea levels rise – most of these are light industrial



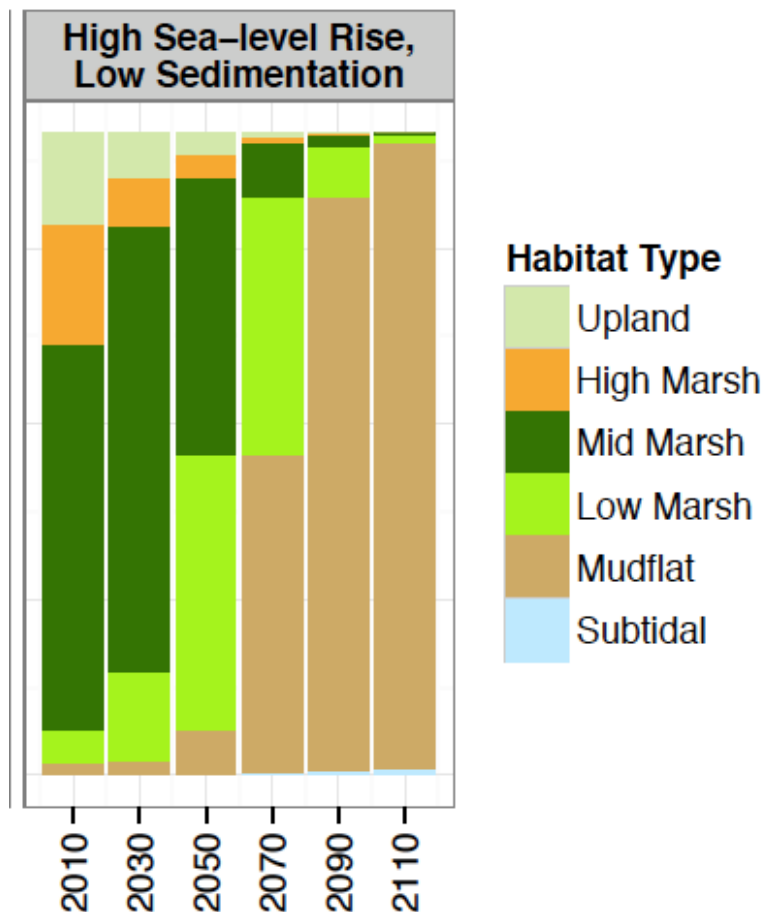
Key Issues:

While heavy industry comprises the majority of the acres at risk, light industrial comprises the majority of parcels at risk

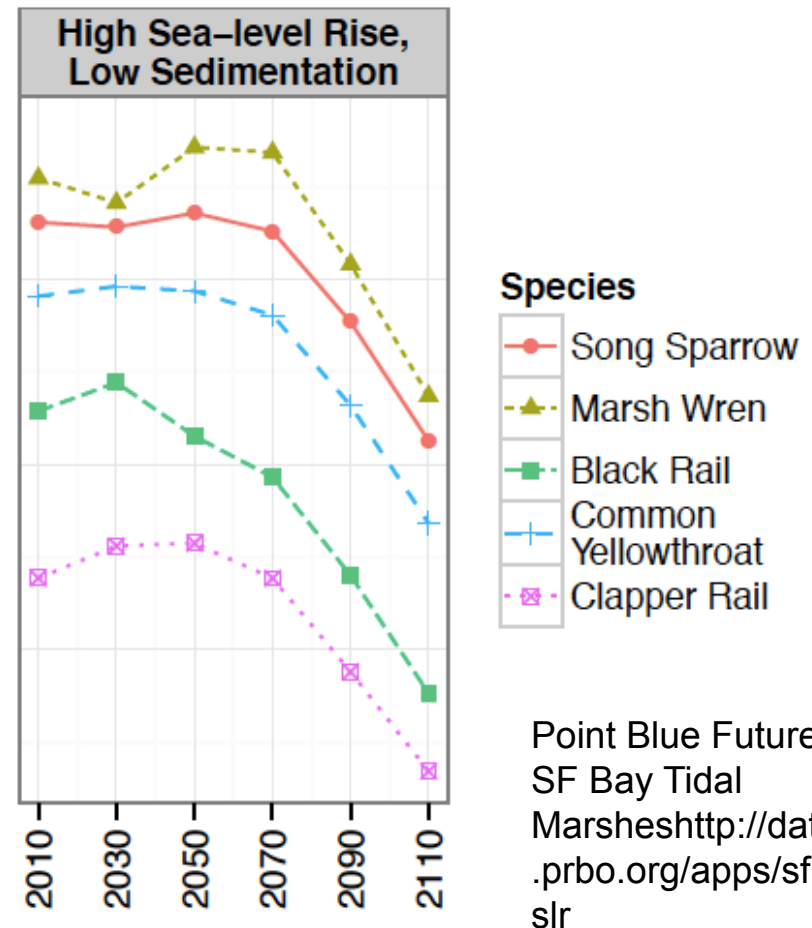
About half of the light industrial parcels at risk are not in the current 100-year floodplain and therefore property owners and site operators may not be prepared for, or aware of, the flood risk they may face in the future

Future Tidal Marshes Example: **Point Edith Marsh**

Marsh habitat
predicted to downshift

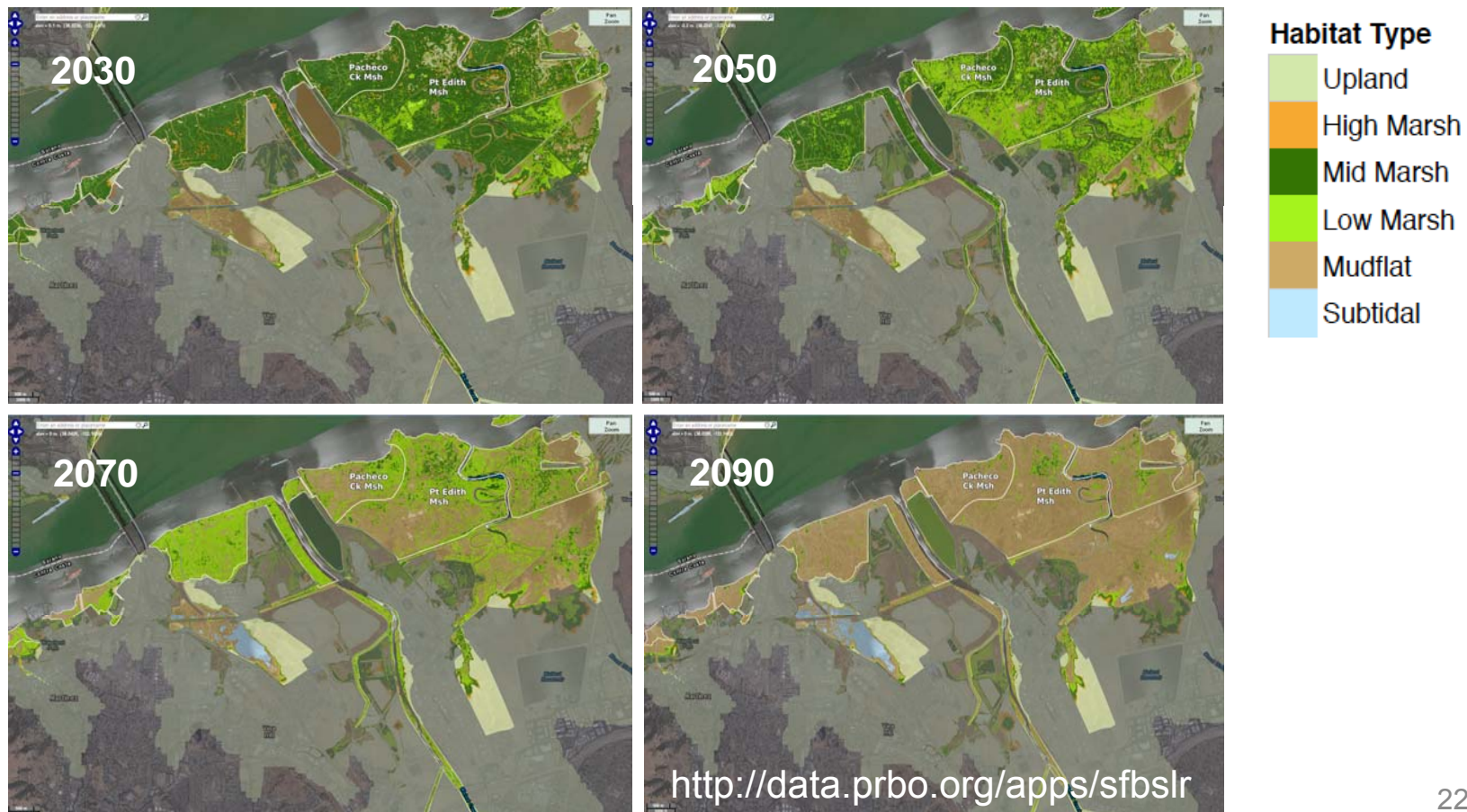


Bird populations
predicted to decline



Analysis of Natural Areas / Tidal Marshes

Fifteen tidal marshes were evaluated using Point Blue's Future SF Bay Marshes Tool (high sea level rise rate and low sediment supply scenarios)



Six key planning issues

- Water-dependent Industries
- Employment Sites
- Creek-side Communities
- Access to Services
- Ad-hoc Flood Protection
- Parks and Open Spaces



City of Richmond

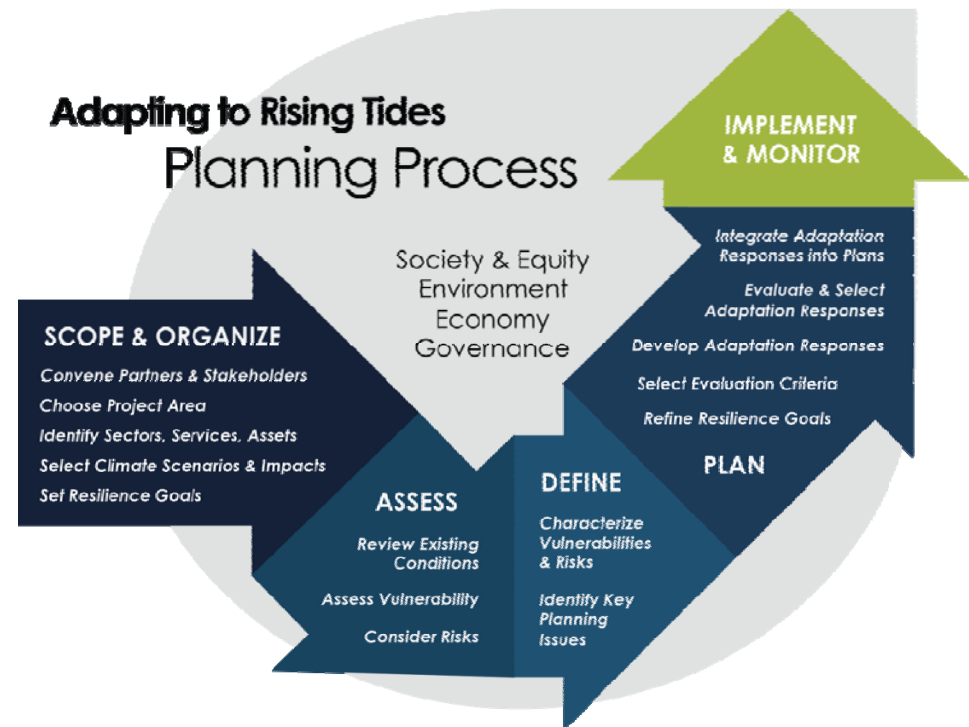
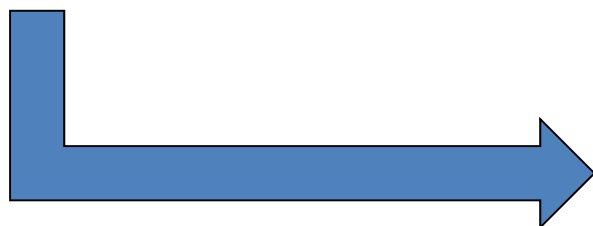
Climate Change Adaptation Study

Vulnerabilities

- Information
- Physical and Functional Qualities
- Governance
- Management Control

Consequences

- Economy
- Environment
- Governance
- People (Society and Equity)



90 Priority Actions

- Awareness and Education
- Mitigation and Risk Reduction
- Community Preparedness

Education and Outreach

- Educate facility owners, site operators, private business owners, and the general public about the risks of, and how to respond to, current and future flooding
- Encourage facilities that could be exposed to flooding to reduce the amount of hazardous materials stored on site



Contra Costa Watershed Actions

ART Contra
Costa Project

- Educate residents and property owners about the need to improve stormwater and flood management systems so they support bond initiatives and assessments
- Analyze watersheds at risk to identify opportunity sites where green infrastructure or nature-based solutions can improve system-wide capacity to accommodate sea level and groundwater rise
- Actively monitor tidal marshes to detect when intervention is necessary before thresholds of change are surpassed
- Collaborate on hydrologic, geomorphic, and ecological studies that will help to determine the feasibility of nature-based adaptation options



Possible Plan and Policy Actions

- Assist facilities with incorporating sea level rise, storm events, and elevated groundwater in emergency plans, facility operations plans, and capital improvement plans
- Prioritize the remediation of contaminated sites based on the timing of exposure, degree of vulnerability, and extent of the consequence
- Evaluate and recommend new standards and practices for facilities that are vulnerable to current and future flooding



Contra Costa Priority Actions

ART Contra
Costa Project

Action #1 - Develop and disseminate **guidance to business and industry** on the best practices for reducing the potential impacts of flooding and sea level rise on their facilities and the services and systems they rely on

Action #2 - Create a public-private **shoreline working group** tasked with developing a plan to fund and implement integrated shoreline solutions to reduce flood risk

Action #3 - Develop a **county-wide program** to monitor, maintain, and repair (as feasible) **at risk shorelines** most in need of intervention

Action #4 - Establish a **public-private partnership to better understand** the consequences of flooding on commercial and industrial supply chains, employee access to job sites and the **regional transportation networks** goods and commuters rely on

How can the ART Program help to advance action in Contra Costa County?

- Complete mapping and assessment for the entire county (Eastern portion)
- Work together to identify focus areas for strategy development
- Continue to present to a variety of audiences within the county
- Develop language and approaches for plan updates, capital planning, mainstreaming into organizations
- Prioritize action for critical assets and disadvantaged community members



Adapting to Rising Tides

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Thank you!

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www.adaptingtorisingtides.com