HUMBOLDT BAY

SEA LEVEL RISE ADAPTATION PLANNING PROJECT

Adaption Planning Working Group

Meeting

February 26, 2014

- Coastal Ecosystems Institute of Northern California
- Humboldt Bay Harbor, Recreation, and Conservation District
- Humboldt County Public Works Department
- Northern Hydrology and Engineering
- Trinity Associates

AGENDA

1. Introductions/Announcements: All [10]
2. Vulnerability Assessment update: Jeff [20]
3. Caltrans' District 1 Climate Change Pilot Study: Rob Holmlund [20]
4. City of Eureka Grant to Address SLR in its LCP Update: Lisa Shikany and Aldaron [15]
5. Climate Ready and LCP 2014 Grant Programs: Joel Gerwein , Bob Merrill, and All [10]
6. Update on Risk Assessment Case Study: Aldaron [15]
7. Adaptation Strategies Discussion: All [30]

Introductions and Agency Updates/Announcements

2014 Statewide Adaptation Forum

August 19 – 20, 2014
Sheraton Grand Sacramento Hotel
Sacramento, California

The Local Government Commission and the State of California are organizing the first California Adaptation Forum in the state capital for next summer. This two-day forum will build off a successful National Adaptation Forum held in Colorado in 2013. The attendance of many California leaders there underscored the need for a California-focused event, which will be held every other year to complement the biennial national conference.

Climate change is having, and will have, more widespread impacts on California's economy and environment. California's unique and valuable natural treasures – hundreds of miles of coastline, high-value forestry and agricultural resources, snowmelt-fed fresh water supply, vast snow and water-fueled recreational opportunities as well as other natural wonders – are especially at risk.

To respond to climate change, the State enacted the California Global Warming Solutions Act of 2006 (Assembly Bill 32 - Núñez). The Act caps California's greenhouse gas emissions at 1990 levels by 2020.

Adopting this ambitious goal put California at the forefront of global action. Achieving this goal will require significant collaboration and support from all public entities and private stakeholders representing all sectors of California's diverse economy.

In addition to reducing California's greenhouse gas emissions, there are steps that must be taken to protect against climate change impacts that are already occurring. Taking steps now to prepare for and adapt to climate change will protect public health and safety, our economy and our future.

Climate Adaptation Advocate

SONOMA COUNTY WATER AGENCY

"It's time for courage, it's time for creativity and it's time for boldness to tackle climate change."

– California Governor Edmund G. Brown

Sponsorship Opportunities

We are looking for **Conference Sponsors** – agencies, organizations, foundations and companies – that are leading the way supporting climate change adaptation efforts across the country. These high-profile sponsorship opportunities offer many ways to interact with conference participants and underscore your commitment to safeguarding the state from climate impacts and creating national models.

For more information about becoming a Conference Sponsor please download our **Sponsorship Brochure**.

Local Government Commission

Hosted by the Local Government Commission in partnership with the State of California

Update on Vulnerability Assessment: Inundation Modeling and Mapping Rising Groundwater

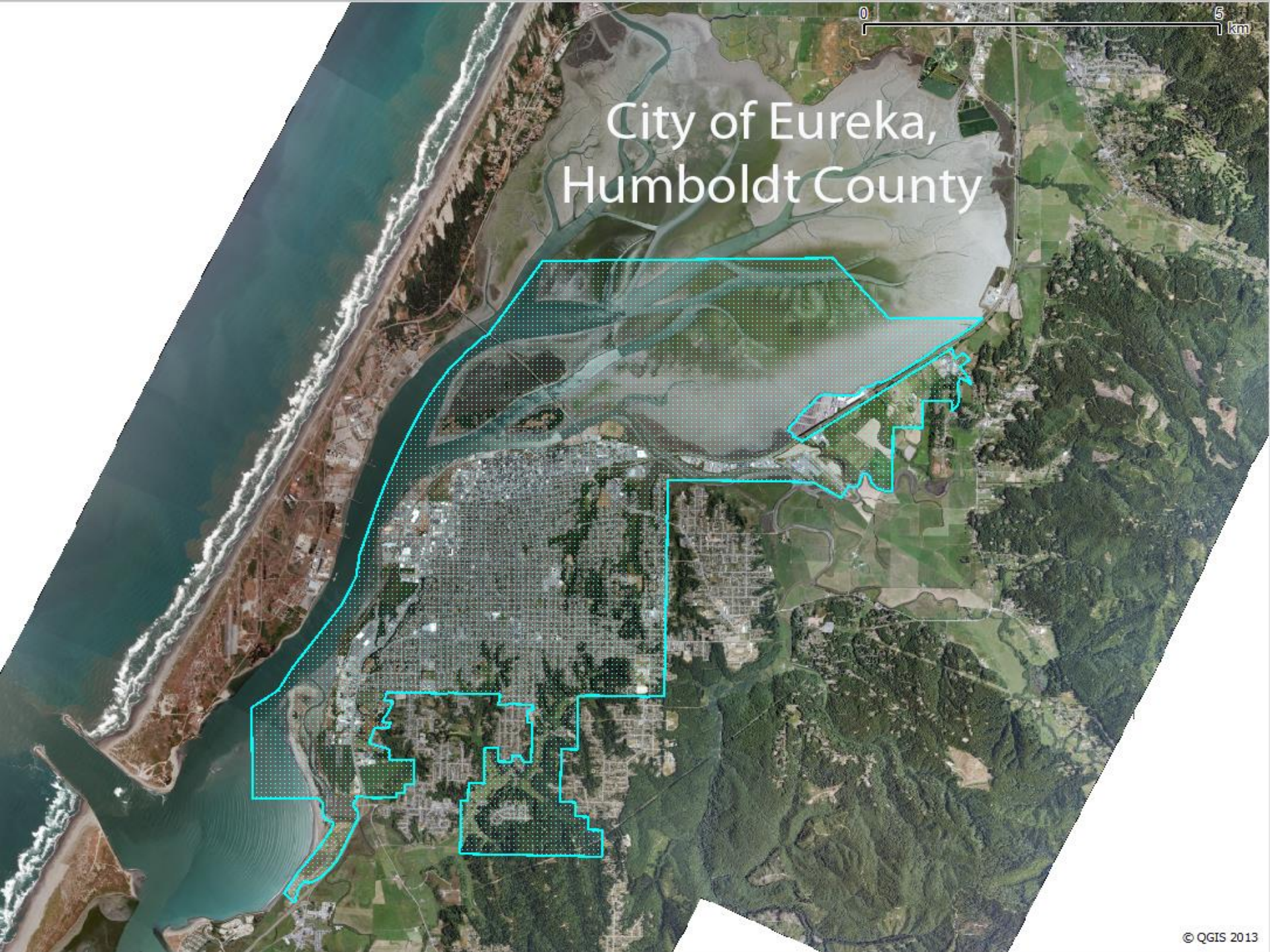
Jeff Anderson

Caltrans District 1
Climate Change Pilot Study

Rob Holmlund

City of Eureka
Addressing SLR in its LCP Update

Lisa Shikany and Aldaron Laird


City of Eureka,
Humboldt County
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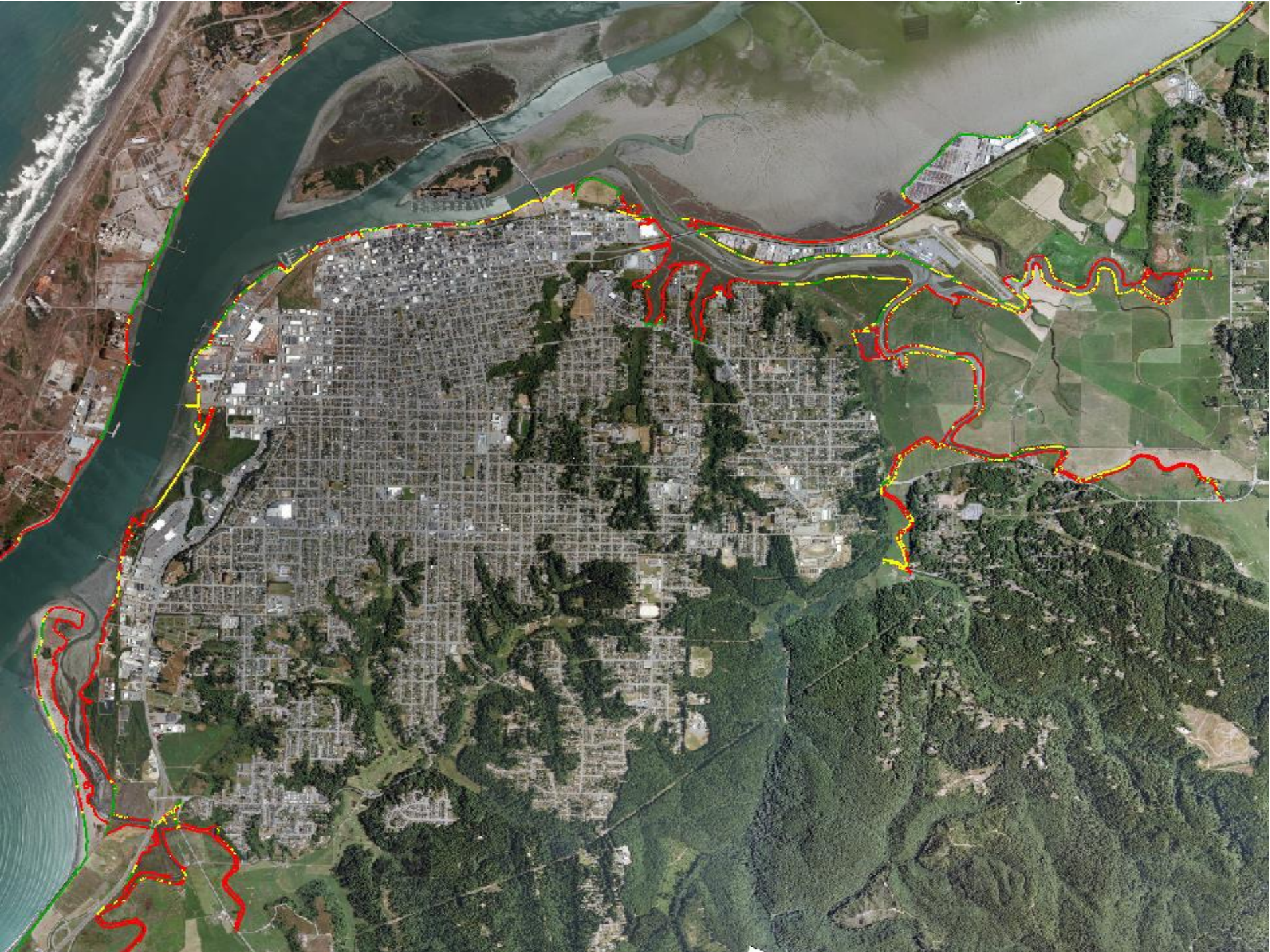
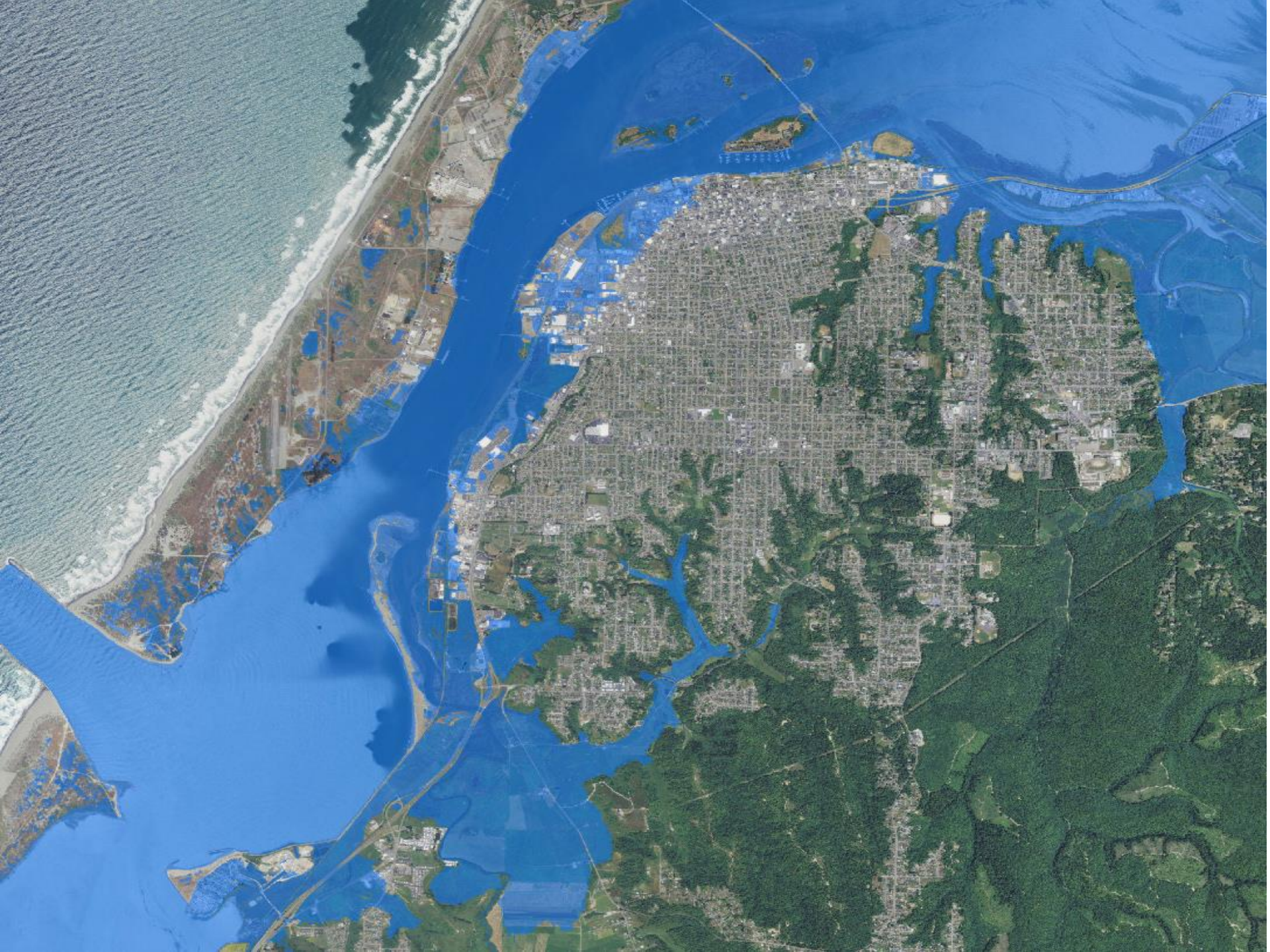
km
© QGIS 2013





Analyze Risk

a) Categorize, identify, and map physical assests potentially at risk
b) Coordinate with City of Eureka's Public Works, Engineering Departments, and GIS Division
c) Assess sea level rise exposure impacts to physical assets
d) Assess resiliency of assets
e) Public review and revision of the Risk Analysis Report and GIS Database
e) Submit Risk Analysis Report and GIS Database to City and CNRA

Evaluate Adaptive Capacity

a) Evaluate existing and proposed proposed LCP policies that address flooding
b) Coordinate with City of Eureka's Public Works, Engineering Departments, and GIS Division
c) Evaluate relevant local, state, and federal programs
d) Identify technical infrastructure protection measures
e) Identify natural systems protection measures
f) Public review and revision of the Adaptive Capacity Analysis Report
g) Submit Adaptation Capacity Analysis Report to City and CNRA

Develop Adaptation Strategies

a) Develop and prioritize identified adaptation strategies and measures
b) Coordinate with City of Eureka's Public Works, Engineering Departments, and GIS Division
c) Prioritize adaptation needs
d) Public review and revision of Adaptation Strategies, Priorities, and Measures Report
e) Submit Adaptation Strategies, Priorities, and Measures Report to City and CNRA

Draft Coastal Land Use Adaptation Policies

a) Develop proposed adaptation polices and integrate into the City's Draft LCP
b) Public review and revision of proposed Draft LCP Adaptation Policies
c) Submit Draft LCP Adaptation Policies to City and CNRA

2014
Climate Ready and LCP Grant Programs

Joel Gerwein and Bob Merrill

King Salmon
Sea Level Rise Assets At Risk
Case Study Summary

Aldaron Laird

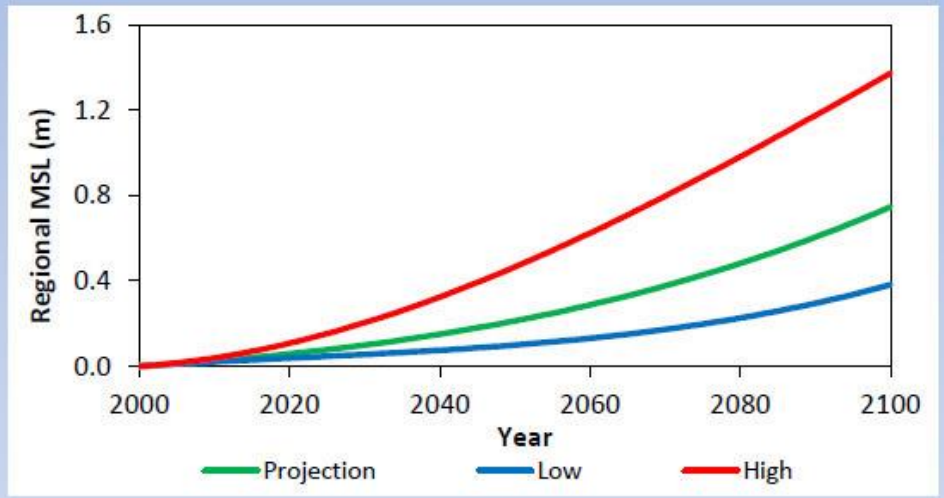
1) **Impacts:**
   - Shoreline Erosion
   - Flooding: Overtopping Shoreline, Breaching Dikes, and Rising Groundwater
   - Saltwater Intrusion

2) Assets at Risk:
   - HCPW: King Salmon Avenue – Single Ingress and Egress
   - HCSD: Municipal Water Wells and Water Transmission Lines
   - HCSD: Wastewater Transmission Lines, and Sewage Lift Station
   - HBLCP: Residential, Retail, Commercial Land Uses
   - PG&E: Power Plant, Industrial Well, Electrical Transmission Line, and Gas Pipelines
   - HBHRCD/HBLCP: Coastal Recreational Resources, Jetties, Sea Wall Trail, Dune Ecosystem, and Salt and Brackish Wetlands

Sea-Level Rise Projections Based on National Research Council (2012) Study

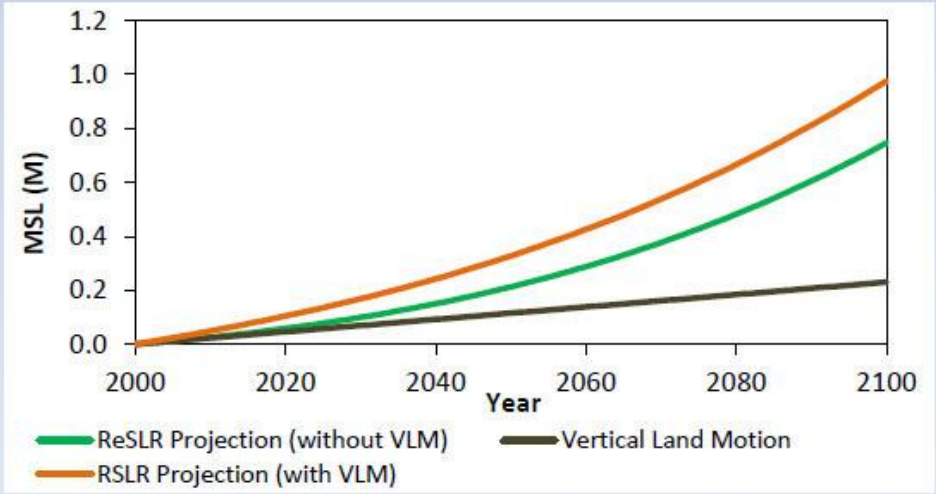
Regional mean sea-level rise (ReSLR) projections for different scenarios in Humboldt Bay Region without vertical land motion effect

	ReSLR Projections Relative to Year 2000 (cm (in))		
Year	Low	Projection	High
2030	3.9 (1.5)	9.9 (3.9)	21.3 (8.4)
2050	10.9 (4.3)	21.4 (8.4)	46.2 (18.2)
2100	38.6 (15.2)	75.1 (29.6)	137.9 (54.3)

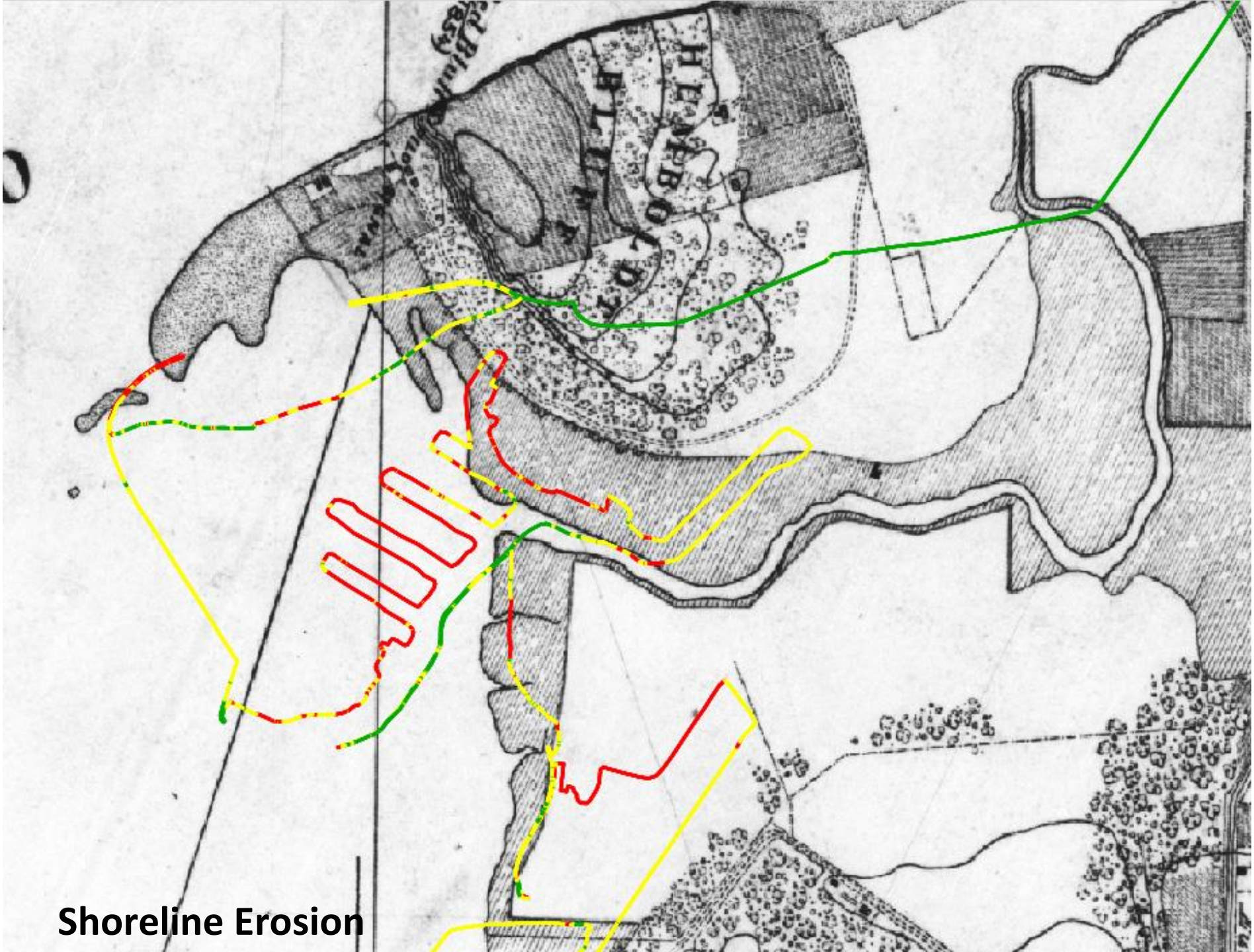


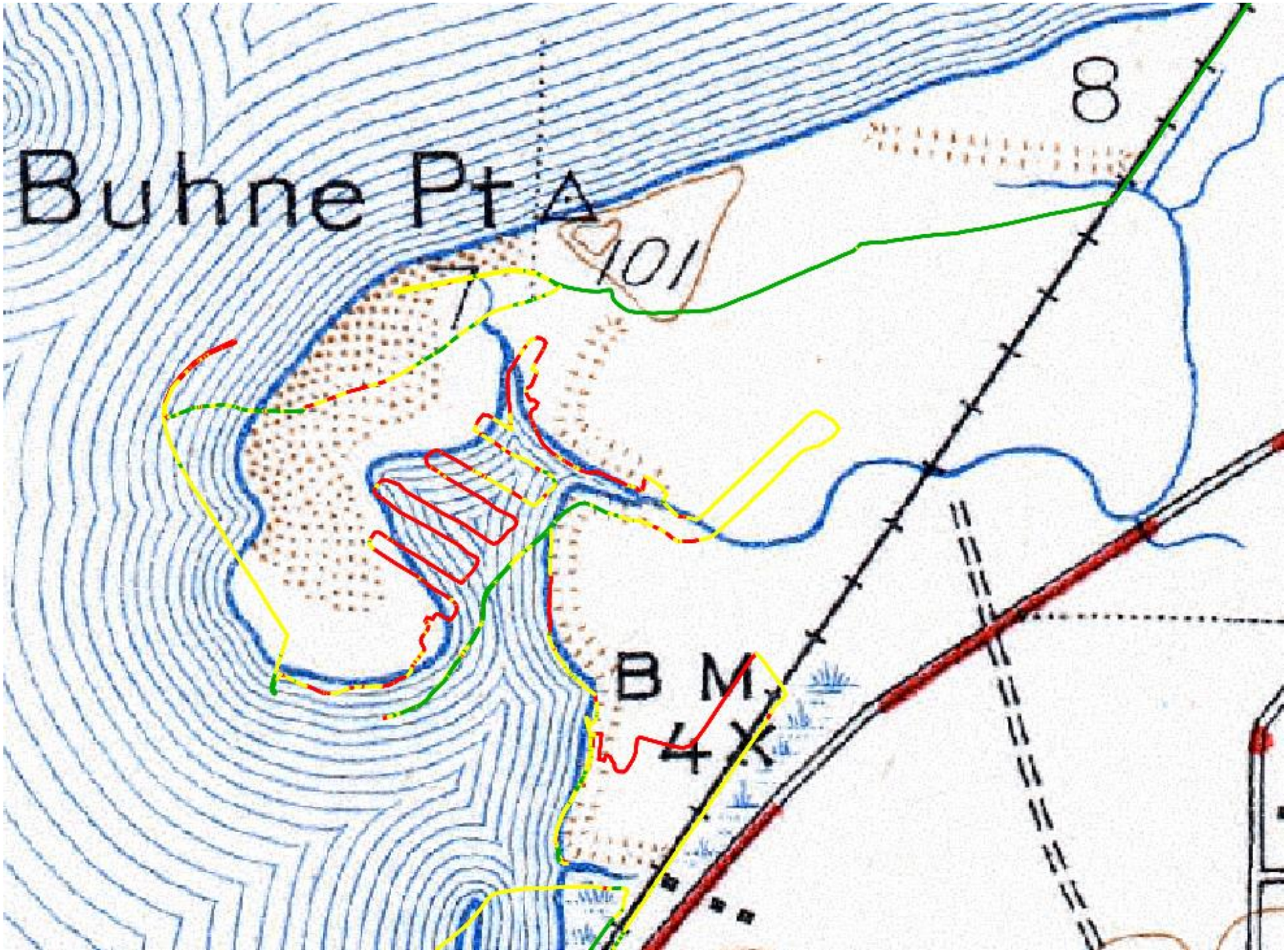
Relative mean sea level rise (RSLR) projections for different scenarios in Humboldt Bay with vertical land motion effect (VLM at North Spit gage = 2.3 mm yr^{-1})

	RSLR Projections Relative to Year 2000 (cm (in))		
Year	Low	Projection	High
2030	12.5 (4.9)	16.8 (6.6)	27.3 (10.7)
2050	21.4 (8.4)	32.8 (12.9)	58.1 (22.9)
2100	61.2 (24.1)	97.7 (38.5)	160.4 (63.2)



Jeff Anderson 2014


Shoreline Erosion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EASTMAN TOPOGRAPHIC SAFETY


Flooding


Sole St
Cod St
Crab St
Perch St
Halibut Ave
Buhne Dr
King Salmon Ave
643 ft
© 2013 Google
Google earth


Buhne Dr
Halibut Ave
Perch St
Crab St
Cod St
Sole St
Herring St
King Salmon Ave
626 ft
© 2013 Google
Google earth

KING SALMON


547 ft
Google earth


N
1142 ft
Google earth

King Salmon Assets at Risk Summary

Relative SLR Moderate Projections:
2030 ~ 7 inches => MMMH= 8.4 feet, King Tides ~ 9.4 feet
2050 ~ 13 inches => MMMH= 8.8 feet, King Tides ~ 9.9 feet
2070 ~ 23 inches => MMMH= 9.7 feet, King Tides ~ 10.7 feet

King Salmon Avenue: ranges from 7 to 12 feet-Dike 8-10 feet
Subdivision: ranges from 6 to 15 feet, ~ 10 feet
PG&E Power Plant: ranges from 11 to 48 feet
Coastal Resources: ranges 0 to 11 feet, and 11 to 40 feet

Discussion of Sea Level Rise Adaptation Strategies For Humboldt Bay

Protection, Relocation, Regulation and Education

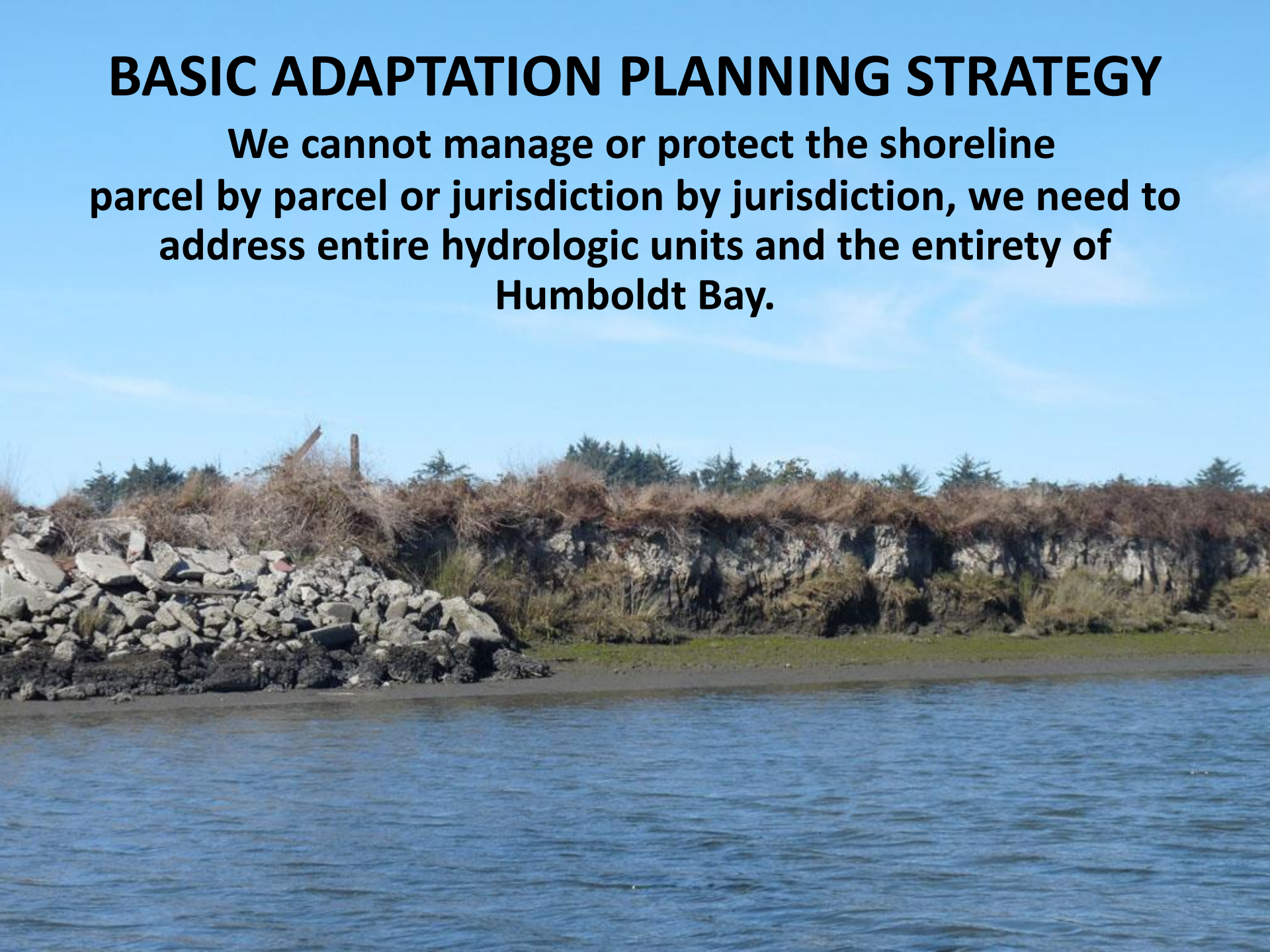
Humboldt Bay Sea Level Rise Adaptation Planning Project

Goal

The goal of the project is to support informed decision-making and encourage a unified, consistent regional adaptation strategy to address the hazards associated with sea level rise in the Humboldt Bay region.

BASIC ADAPTATION PLANNING STRATEGY

We cannot manage or protect the shoreline parcel by parcel or jurisdiction by jurisdiction, we need to address entire hydrologic units and the entirety of Humboldt Bay.

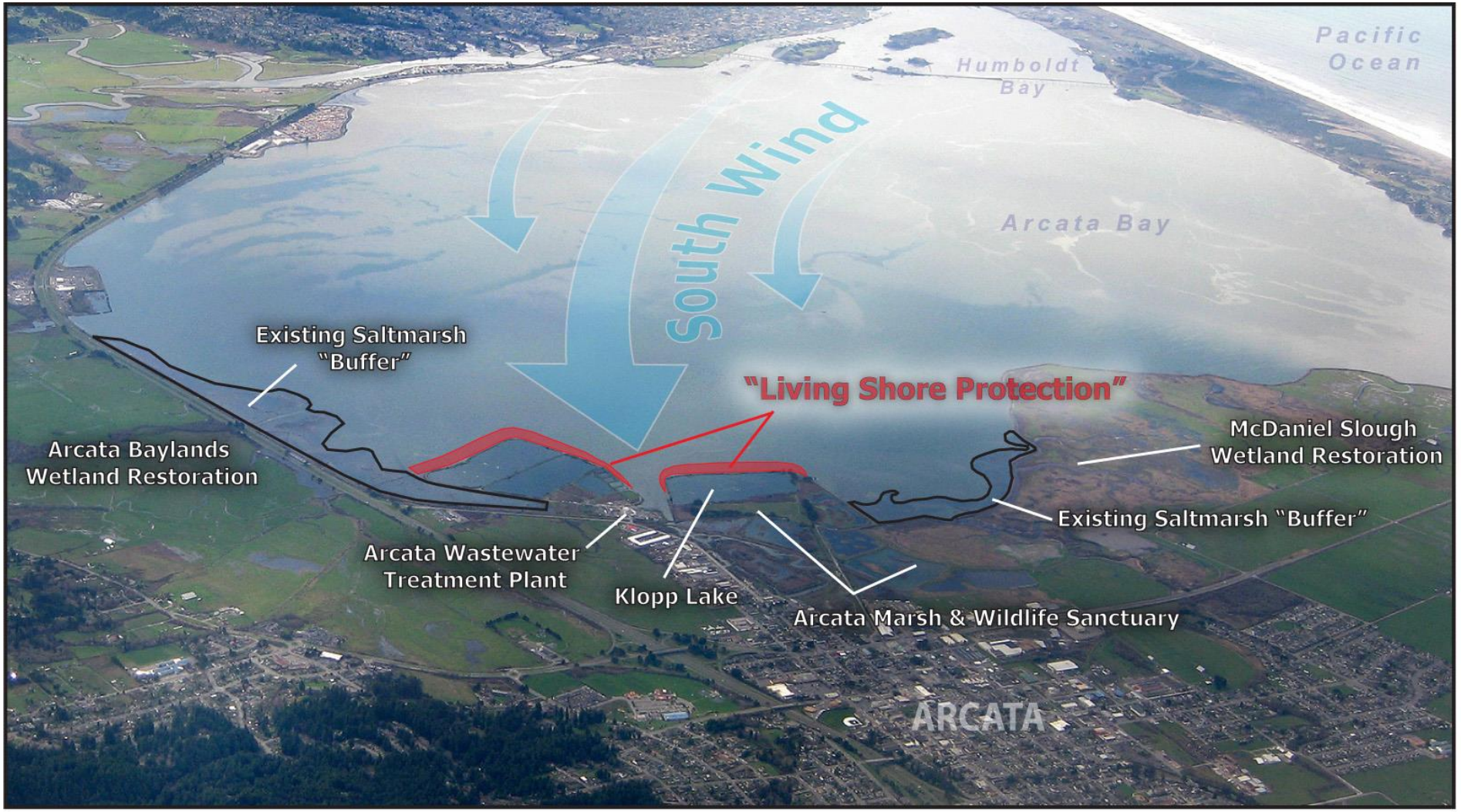


On Humboldt Bay the Areas Most Vulnerable to Flooding and Sea Level Rise are Diked Former Tide Lands

Assets Most at Risk Reside on Diked Former Tide Lands

Arcata Bay Adaptation Measures

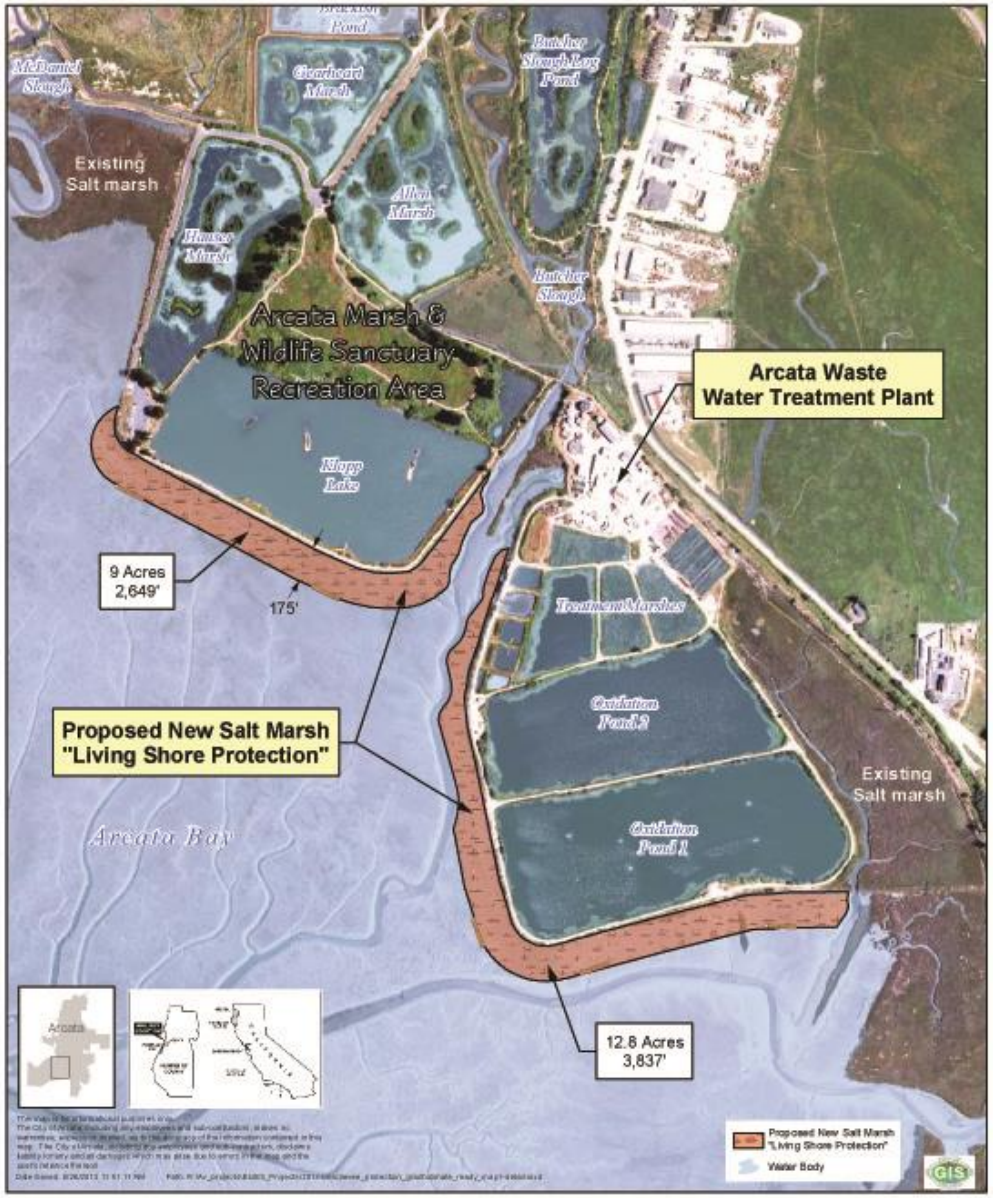
City of Arcata
Mark Andre



City of Arcata

State Coastal Conservancy Climate Ready Program 2013

Arcata Bay Adaptation Measures



City of Arcata
Environmental Services

City of Arcata

State Coastal Conservancy Climate Ready Program 2013

Arcata Bay Adaptation Measures

NORTH

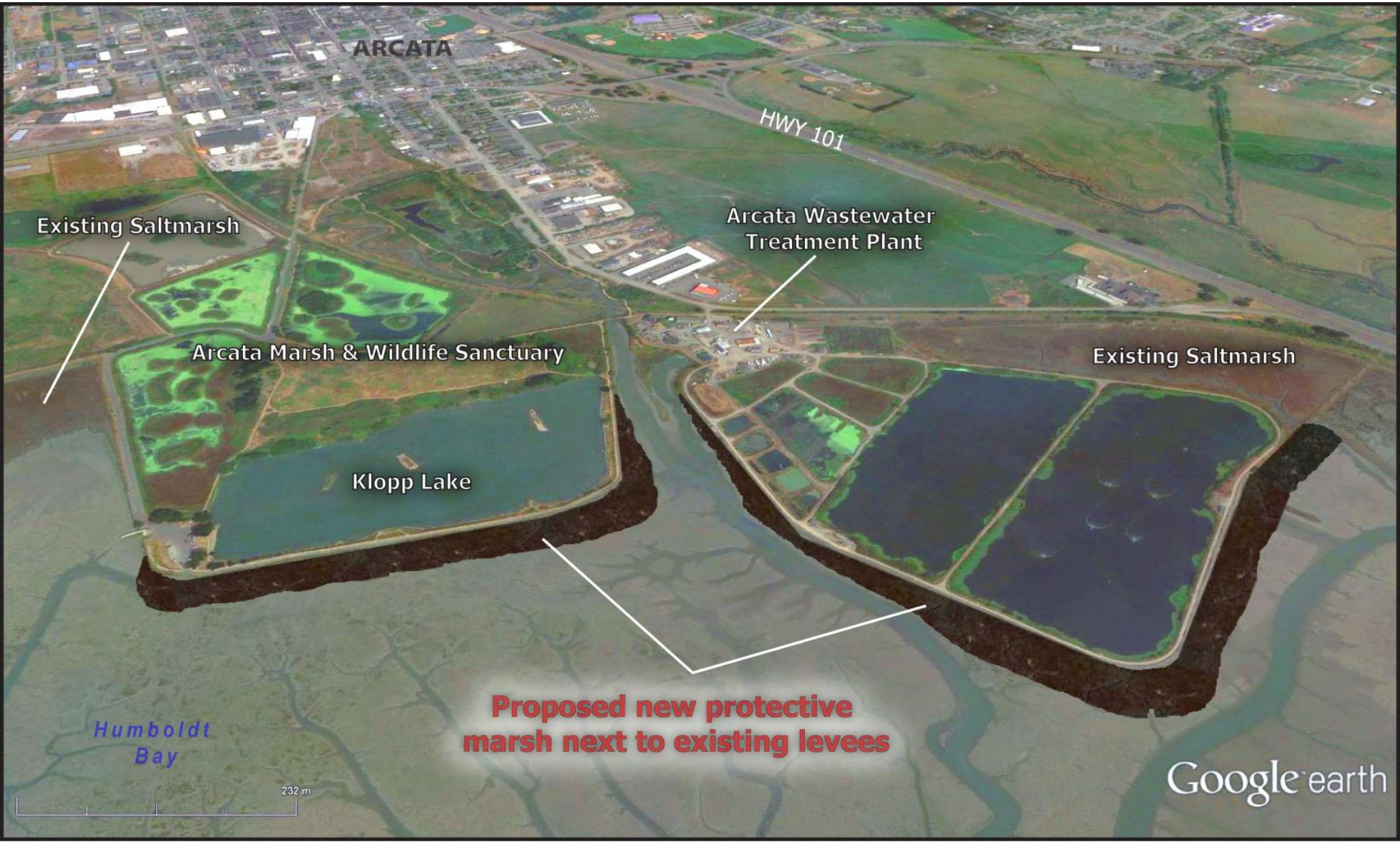
0 300 600 Feet

City of Arcata
Environmental Services

City of Arcata
State Coastal Conservancy Climate Ready Program 2013

Arcata Bay Adaptation Measures
Project Overview

NORTH
0 2,000 Feet



City of Arcata

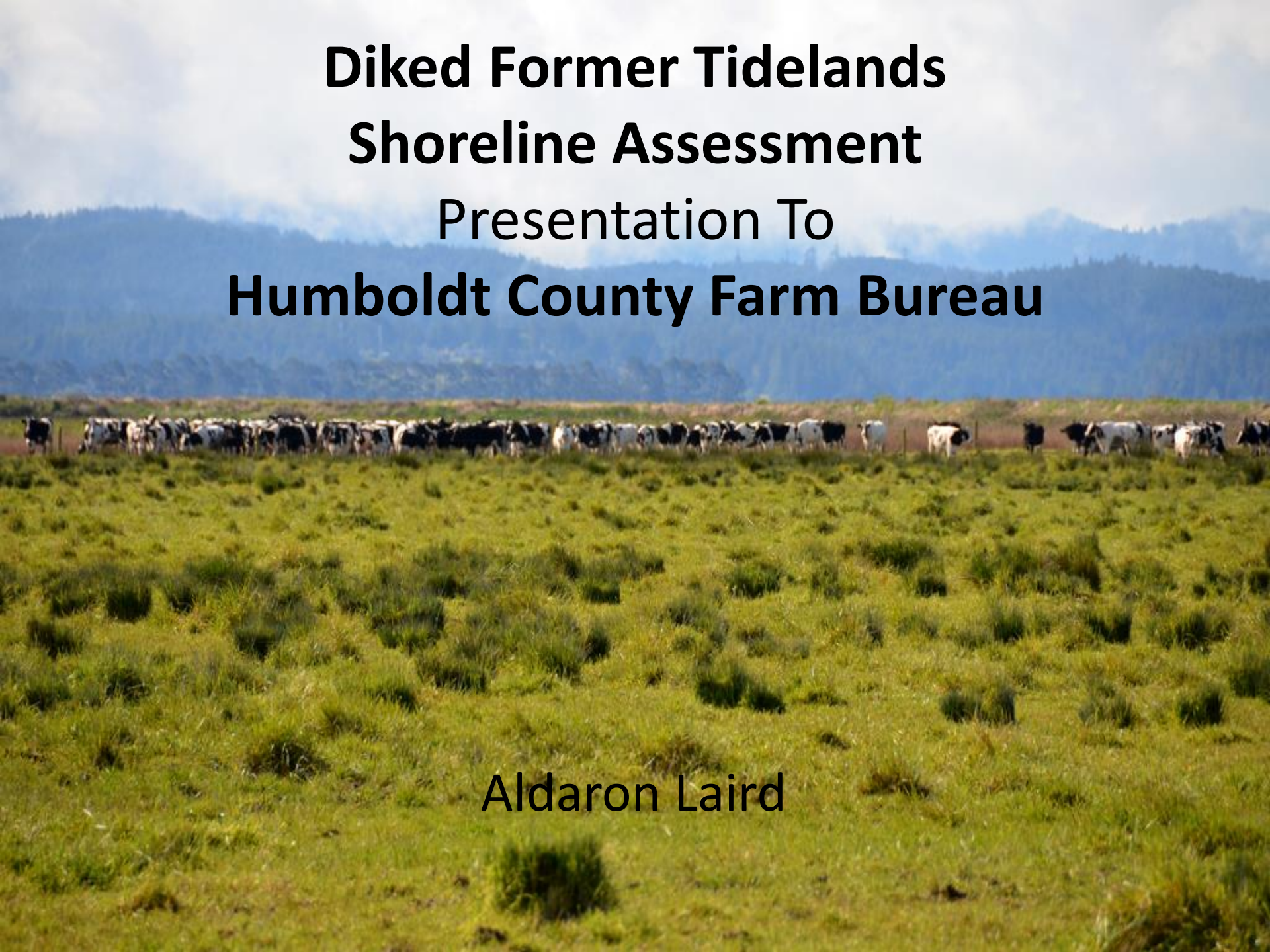
State Coastal Conservancy Climate Ready Program 2013

Arcata Bay Adaptation Measures

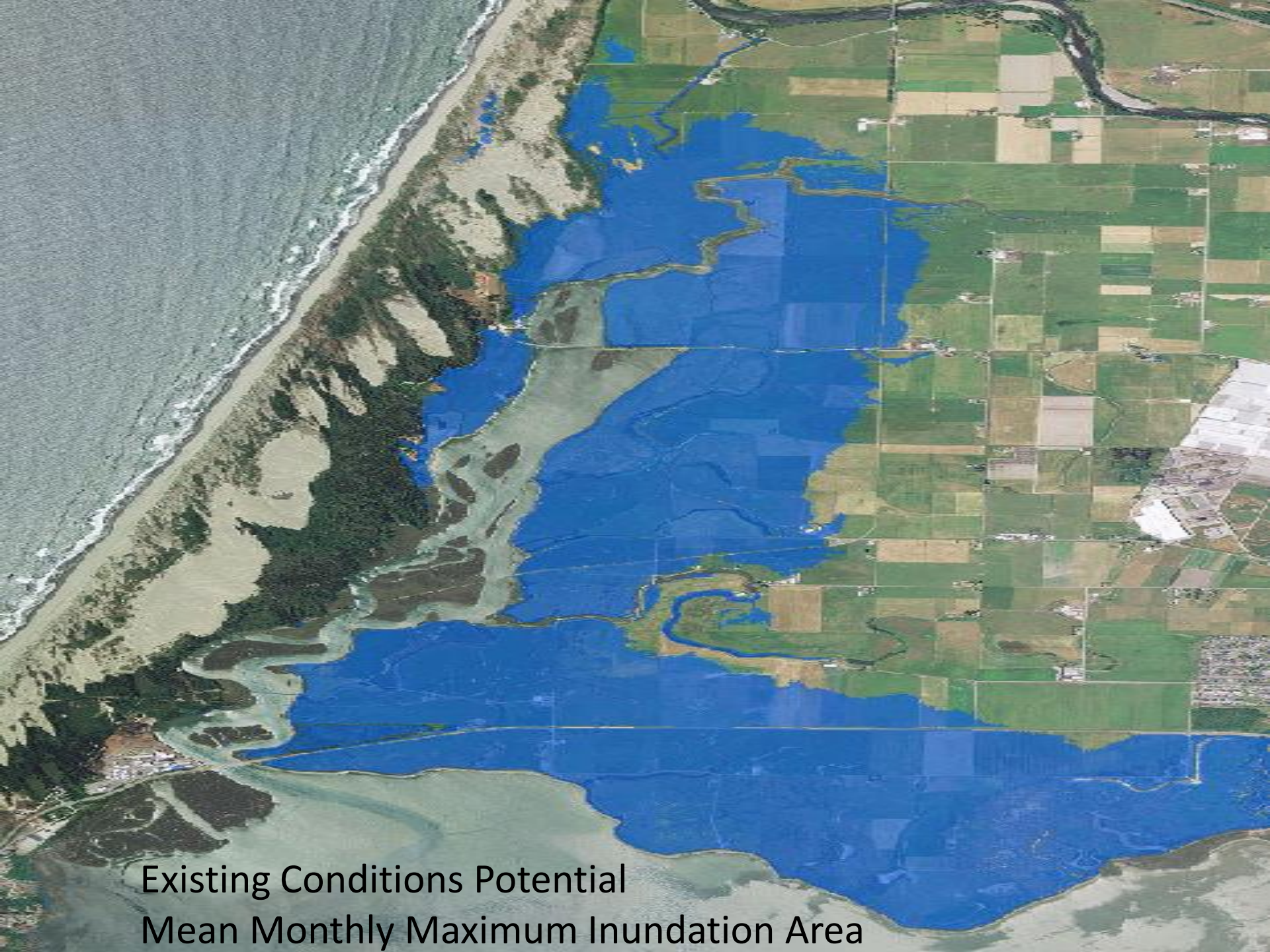
Diked Former Tidelands Shoreline Assessment

Presentation To

Humboldt County Farm Bureau



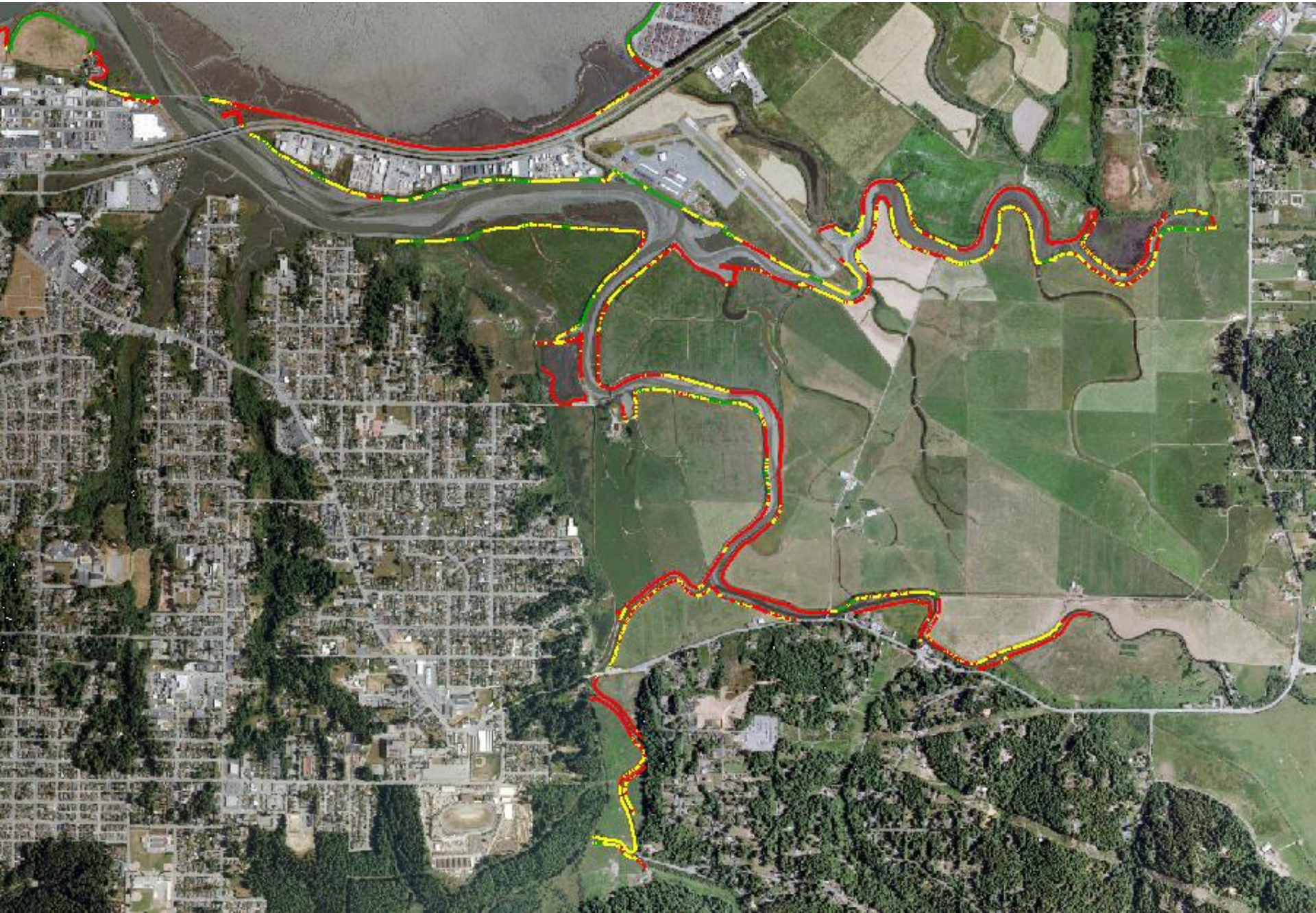
Aldaron Laird


Existing Conditions Potential
Mean Monthly Maximum Inundation Area


Existing Conditions Potential
Mean Monthly Maximum Inundation Area

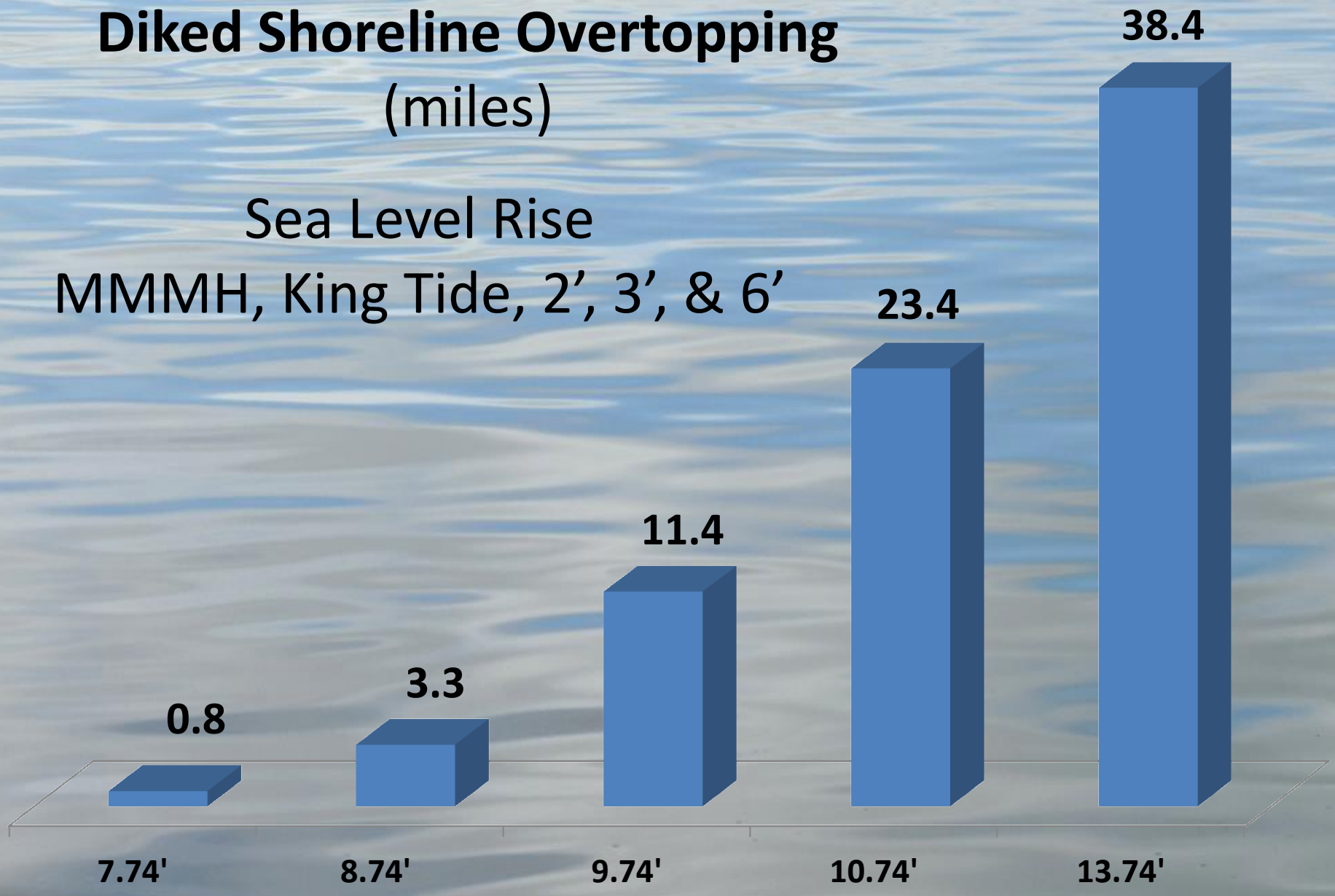

Existing Conditions Potential
Mean Monthly Maximum Inundation Area

7.2 miles Highly Vulnerable



Diked Shoreline Overtopping
(miles)

Sea Level Rise
MMMH, King Tide, 2’, 3’, & 6’



Sustainability of Agricultural Uses on Diked Former Tideland

Relative SLR Moderate Projections
and Miles of Dike Overtopped by King Tides

2030 ~ 7 inches => MMMH 8.4', King Tides ~ 9.4' > 7+ miles
2050 ~ 13 inches => MMMH 8.8', King Tides ~ 9.9' > 11+ miles
2070 ~ 23 inches => MMMH 9.7', King Tides ~ 10.7' > 23+ miles

Increasing dike elevations 2' could increase the adaptive capacity of agricultural uses on diked former tidelands for 5 or more decades, or until rising groundwater reduces agricultural productivity.

Discussion of Sea Level Rise Adaptation Strategies For Humboldt Bay

APWG Meeting Schedule: 2013-2014

2013	2014
~~2/27~~	2/26
~~4/24~~	4/30
~~(7/15)~~	6/25
~~8/28~~	8/27
~~10/30~~	10/29

Humboldt Bay Sea Level Rise Adaptation Planning Project

Sea Level Rise

The increase in global temperature has raised sea level by 7 to 8 inches over the past century. On Humboldt Bay, sea level rise is greater because we live in a seismically active area and the ground has been dropping in elevation. Consequently, sea level in the Bay may have increased by more than 18 inches over the past century. The National Research Council has projected that sea level may rise by as much as 55 to 65 inches in California by 2100. Communities around Humboldt Bay will need to prepare for the effects of sea-level rise, which could severely impact critical infrastructure such as our wastewater treatment plants, Highway 101 corridor, our port, and residential communities, businesses, and coastal agricultural lands.

King Tide 2010 Swain Slough