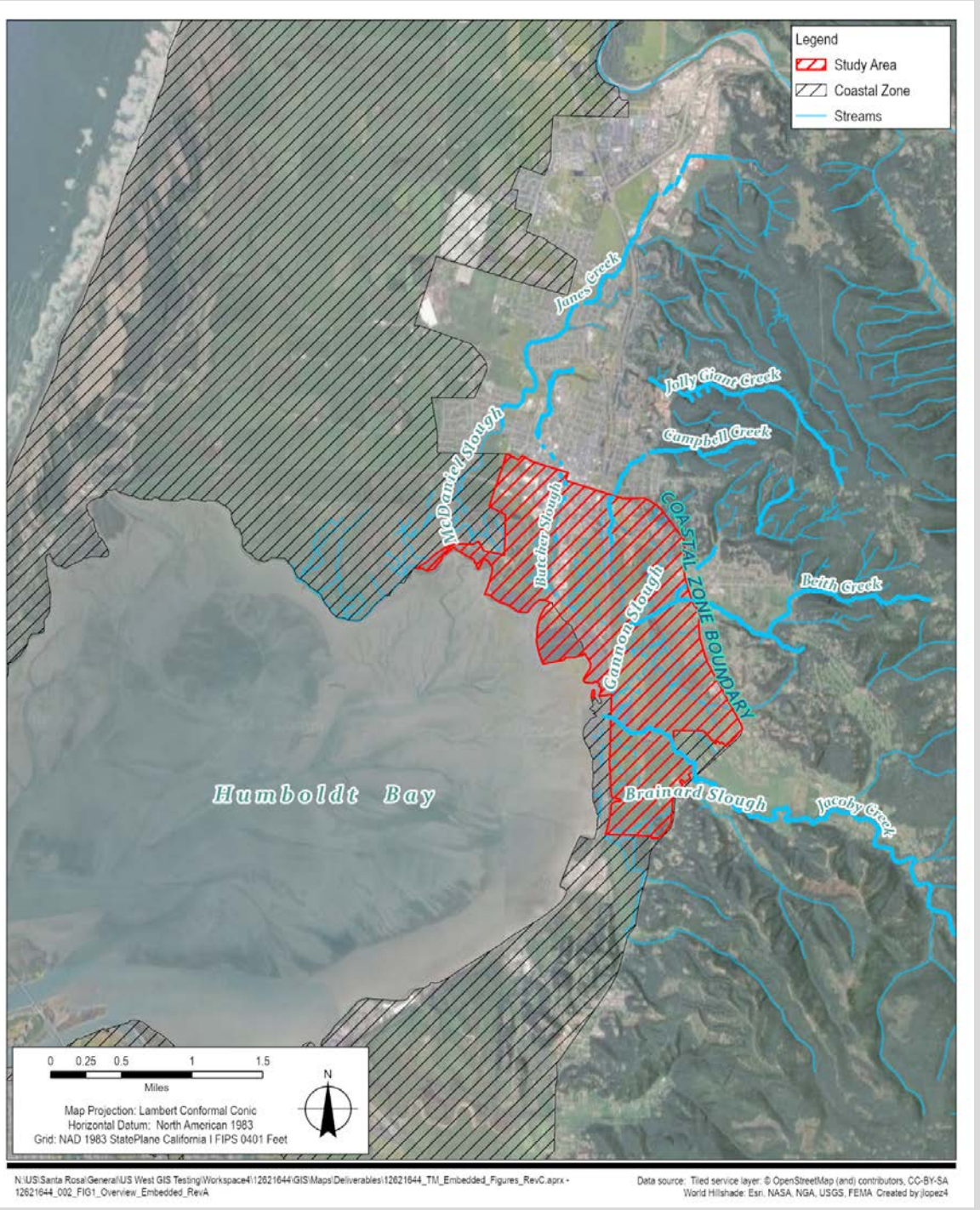
Arcata Sea Level Rise Vulnerability Assessment and Capital Improvement Project Adaptation Plan

- Purpose of the Plan
- Vulnerability Assessment
  - Flood Modeling Advancements
- Risk Assessment
- Next steps for Adaptation



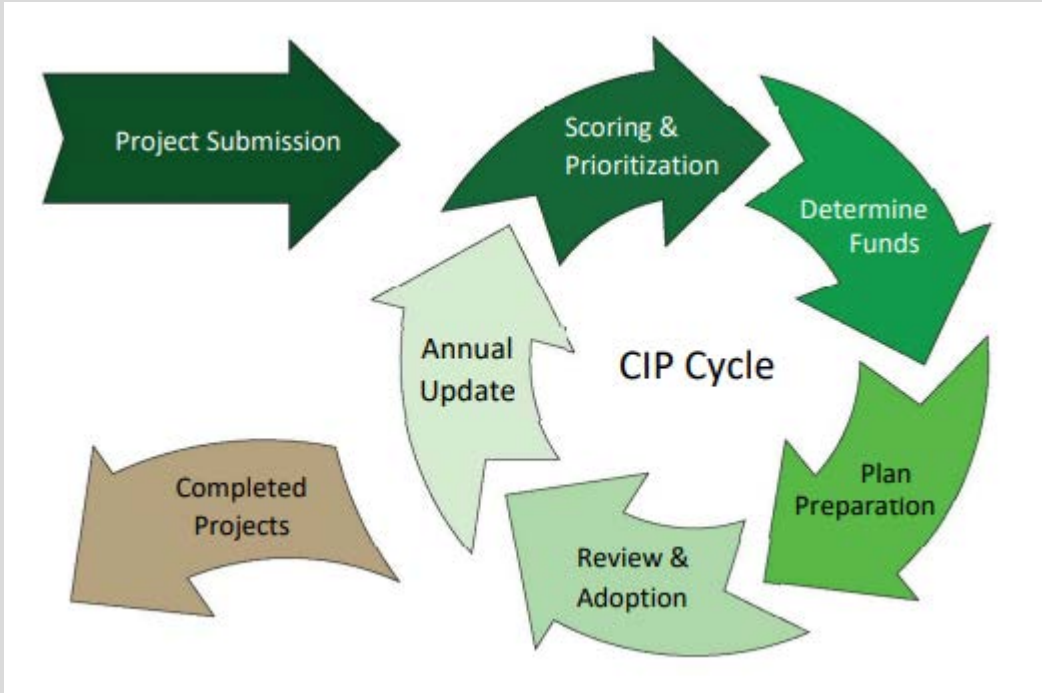
Purpose of the Plan

Capital Improvement Program (CIP)

- Long-term, multi-year planning tool
- Identify the construction, repair, and replacement of major city assets.

Local Coastal Program (LCP)

- Guide development
- Protect coastal resources



Purpose of Vulnerability and Risk Assessment

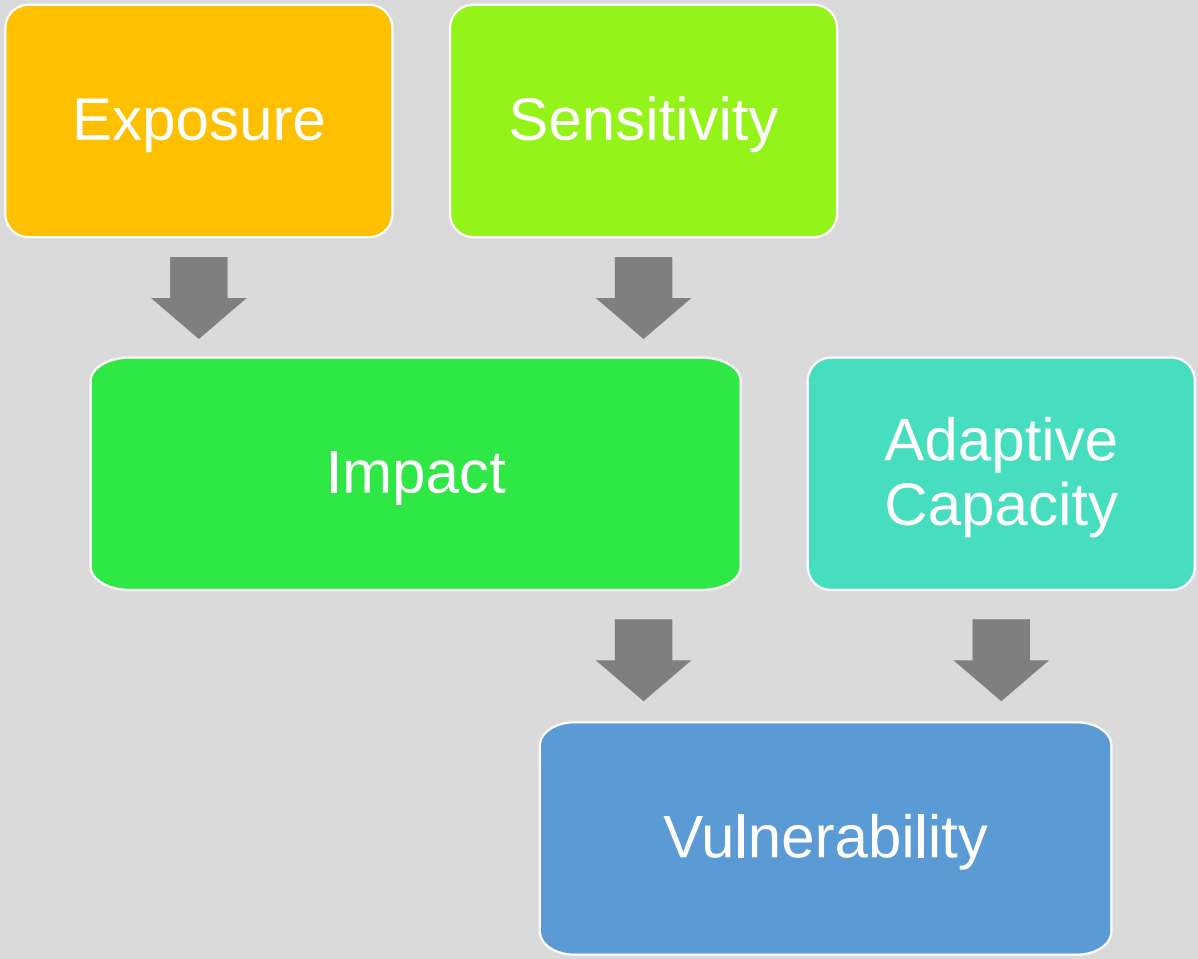
<u>By understanding current and future flood risk (consequence and likelihood) we can:</u>

- *Better understand what the future might look like*

- *Inform project design*
  - *Where? How High? Material?*

- *Identify where and when to implement new projects*

Purpose of Vulnerability Assessment



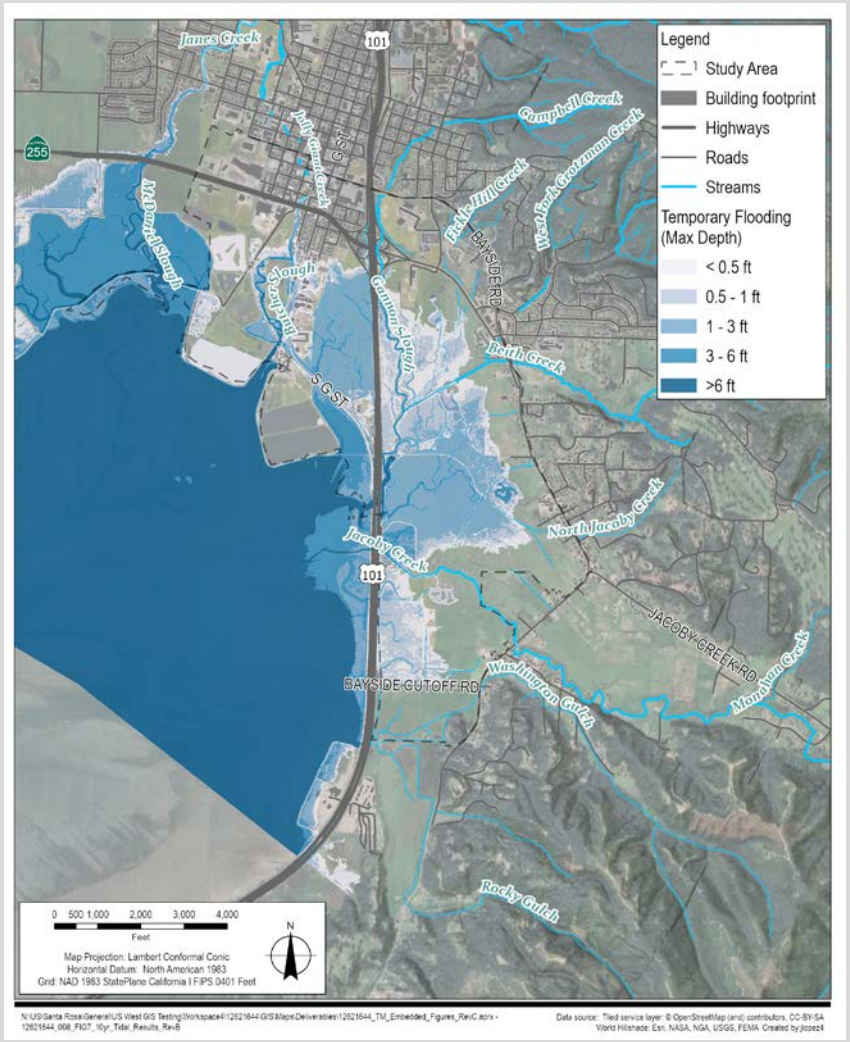
Exposure - Flooding Scenarios

Scenario	Fluvial Boundary Condition	Tidal Boundary Condition	Likelihood (% Chance per Year)*			
			2024	2055	2075	2105
1	1 cfs base flow	peak 9.5 feet	67%	1-6/year	>1/Month	Daily
2		peak 10.0 feet	15%	1-6/year	>1/Month	Daily
3		peak 10.7 feet	1%	32%	1-6/year	Daily
4		peak 11.1 feet	0%	10%	67%	>1/Month
5		peak 11.7 feet	<0.2%	0.8%	10%	>1/Month
6		peak 12.7 feet	<0.2%	<0.2%	<0.2%	1-6/year
7		peak 13.7 feet	<0.2%	<0.2%	<0.2%	10%
8	2-year	MMMW	50%	>50%	>50%	>50%
9	10-year		10%	-	-	50%
10	100-year		1%	0.1	-	-
11**	10-year	peak 9.5 feet	67%	1-6/year	>1/Month	Daily

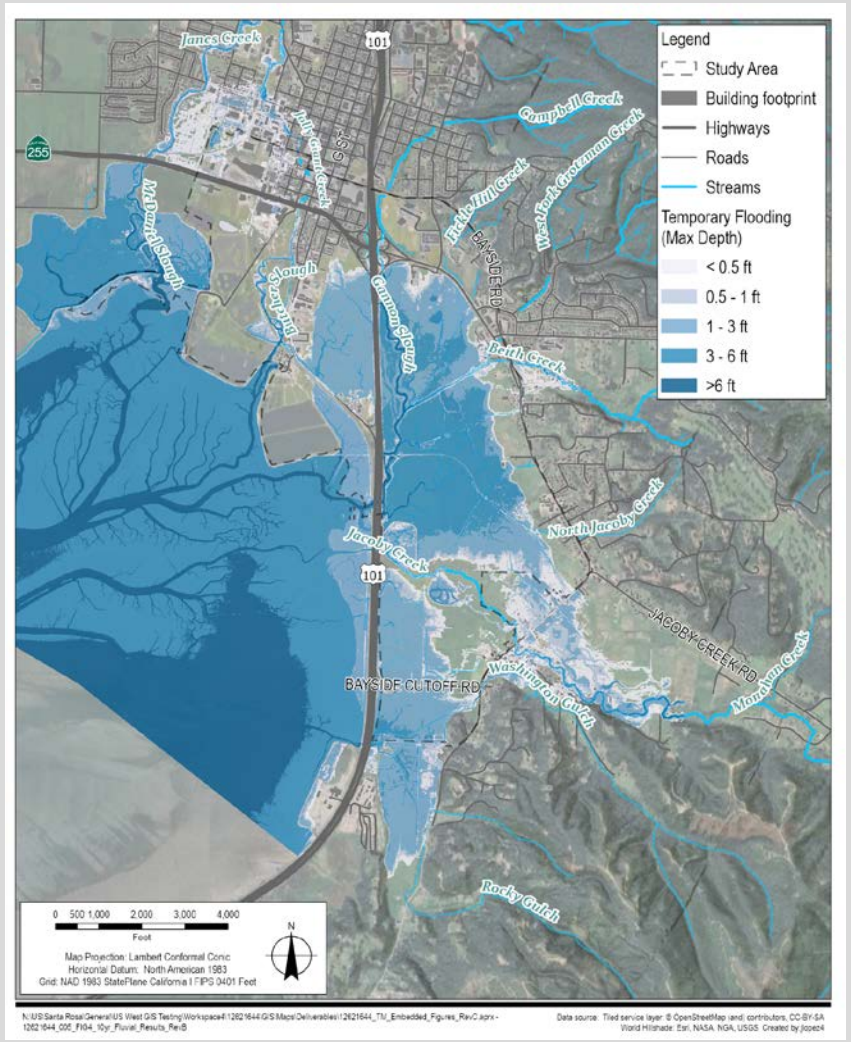
*Likelihood based on existing likelihood and OPC 2024 Intermediate SLR projection and Cal-Adapt Medium Emissions (RCP 4.5) Scenarios

**Compound frequency estimated based on product of fluvial and tidal likelihood

Exposure - Hydraulic Model
Tailored to Arcata's Coastal Zone (Shoreline and Inland)

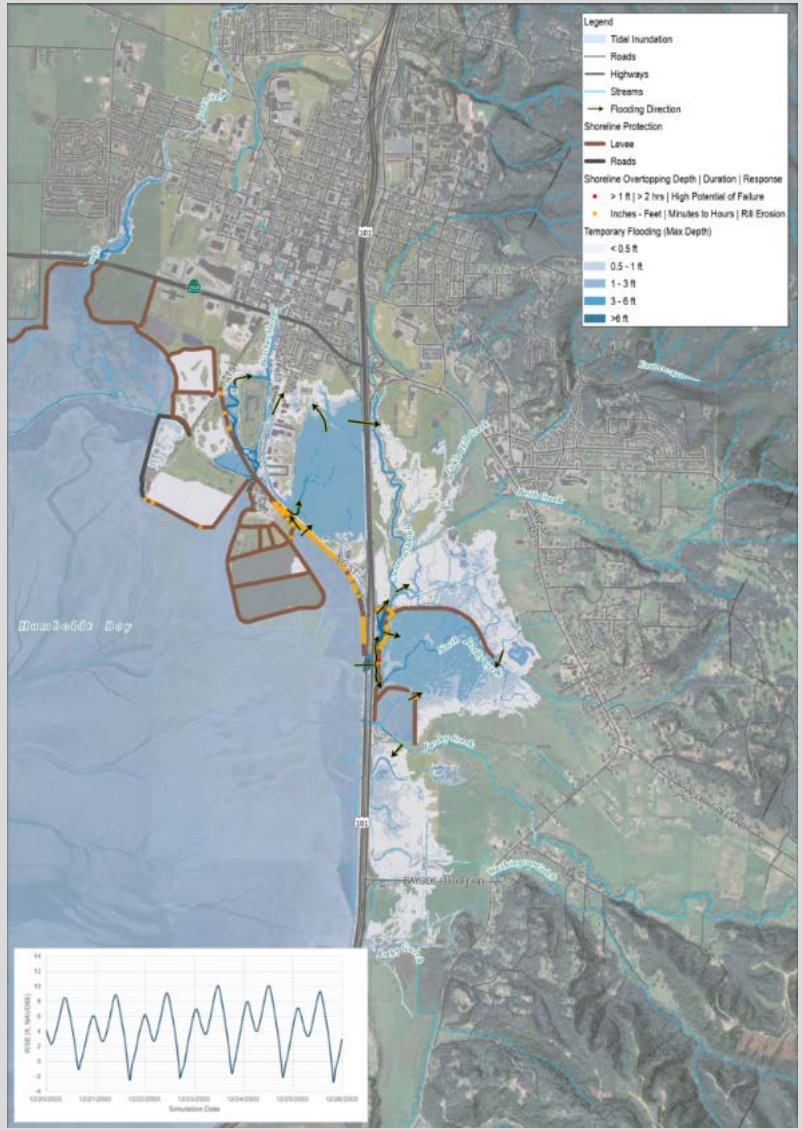


10% Chance Tidal Flooding

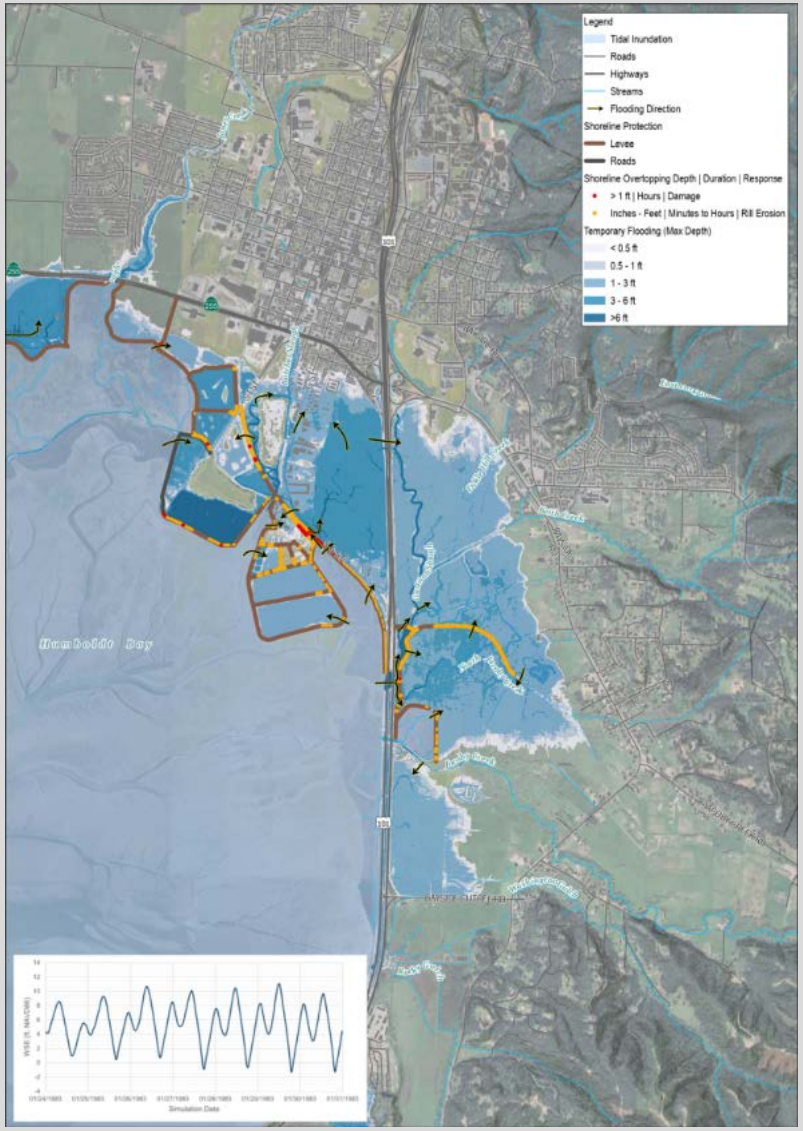


10% Chance Creek Flooding

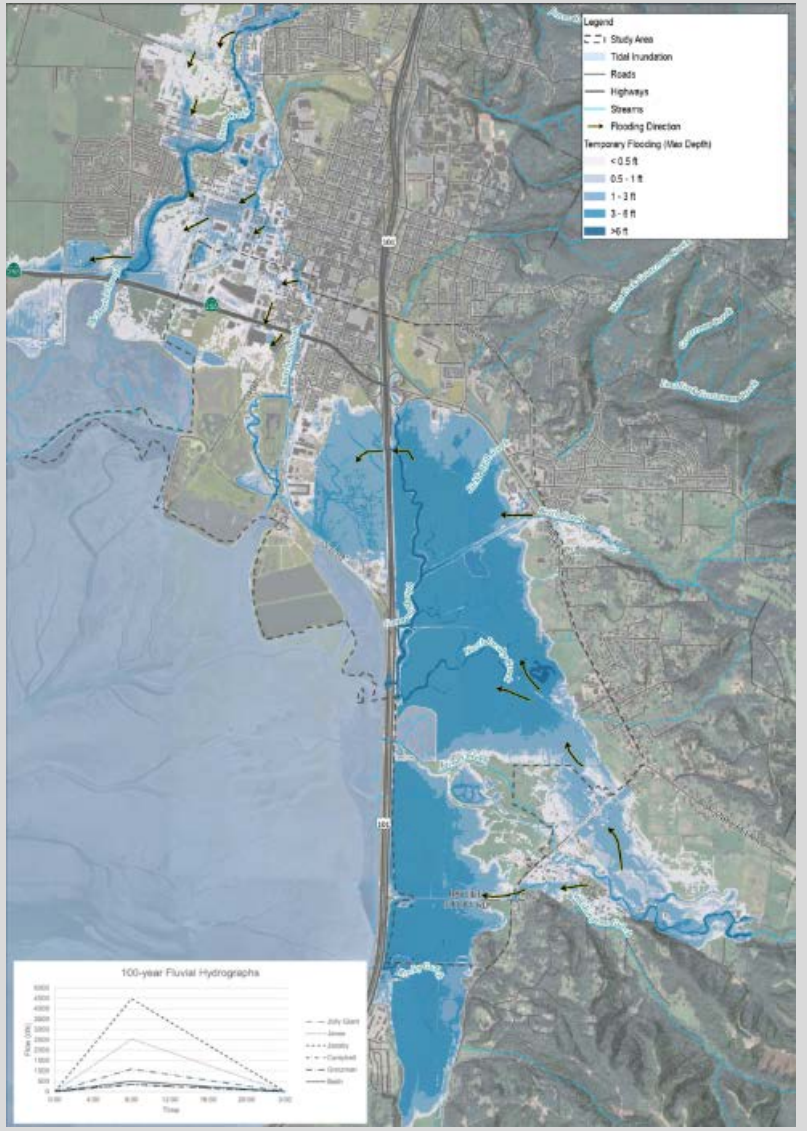
Exposure (flood pathways and thresholds)



Peak Tide 10 ft



Peak Tide 10.7 ft



1% Chance Rainfall

Sensitivity, Impacts and Adaptive Capacity

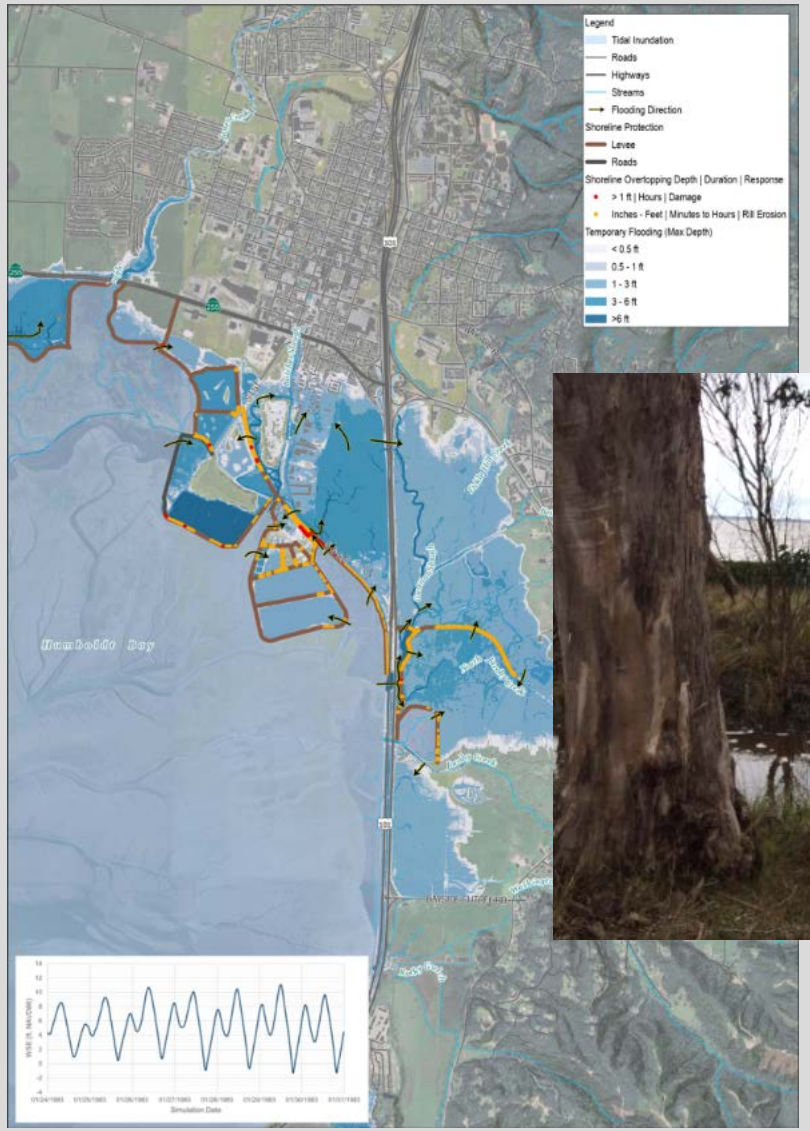
Asset	Physical Process	Asset Impacts		
		Wet Conditions	Maintenance/ Change to Typical Service or Operation	Damage/ Replacement/ Significant Disruption to Service
		→	→	→
Shoreline Structures [1]	Overtopping	No Overtopping, Water-side Erosion	>1ft for <2hrs, or <1ft for >0hrs Minor Erosion/Repairs	>1ft for >2hrs Breach/Reconstruction
Roads	Flood Depth/ Duration	No Flooding Typical Maintenance	Flooding of Centerline Road Closure/Reduced Access Signage, Clean-Up	>12 inch depth No Access, Clean-Up
Lift Stations, Pump Stations, Electrical Buildings, Generator Buildings, Office Building	Surface Flooding	Flooding near facility (roadways)	Flooding enters/interacts with structures	Flooding at elevation of electrical panel or generators

References: [1] (USACE, USBR, FERC, TVA, 2017)

Vulnerability

Shoreline Protection Overtopping (Erosion and Maintenance)	Threshold	Year			
		2024	2055	2075	2105
OPC Intermediate Scenario					
South G Street Agricultural Areas East of Hwy 101	9.5 ft Tide	67%	1-6/year	>1/Month	Daily
Arcata Marsh and Wildlife Sanctuary/ South I Street	10.1 ft Tide	10%	1-6/year	6/year	Daily
AWTF	10.7 ft Tide	1%	32%	1-6/year	Daily
(Potential Failure)					
South G Street Agricultural Areas East of Hwy 101 Arcata Marsh and Wildlife Sanctuary/ South I Street	11.1 ft Tide	0.2%	10%	67%	>1/Month
AWTF	11.7 ft Tide	<0.2%	1%	10%	>1/Month

Assess Risk – Scale and Severity of Impacts



Peak Tide 10.7 ft

Assess Risk - Likelihood

Likelihood Scale	Annual Chance
Almost Certain	Multiple times per year
Very Likely	50-99.9%
Likely	4-50%
Unlikely	2-4%
Very Unlikely	0.2-2%
Almost Unprecedented	0.2% or less

Assess Risk - Consequence of Impacts

Consequence Scale	Description	Examples
Insignificant	Easily manageable within typical operations and maintenance	No change to typical operations and maintenance Within typical budgeted costs
Minor	Minimal impact, easily manageable with some additional maintenance/staff time required	Small additional operations and maintenance Additional costs within typical annual contingency
Moderate	Manageable impact, some effort required to address.	Short (hours) delays in service Increased costs not typically budgeted Limited additional resources required
Major	Noticeable impact, requires significant effort to manage	Temporary (1+ days) delays to service Requires repair of facilities or parts Additional resource required
Severe	Significant impact, challenging to manage, requiring additional resources	Extended (multiple days to one week) service disruption. Significant financial cost not typically budgeted Requires replacement of limited facilities or parts Substantial outside resources required to address
Catastrophic	Severe impact, potentially unmanageable even with additional resources	Long term (multiple weeks) service disruption Massive financial loss, failure and replacement of assets required Requires extensive replacement, repair, and or reconstruction of facilities

Assess Risk – Scale and Severity of Impacts (Risk Rating)

Risk Matrix Evaluation							
		Consequence					
		Insignificant	**Minor**	**Moderate**	**Major**	**Severe**	**Catastrophic**
Likelihood	**Almost Certain**	Low	Low	Low	Medium	High	Very High
	Very Likely	Low	Low	Low	Medium	High	Very High
	Likely	Low	Low	Low	Medium	High	High
	Unlikely	Very Low	Low	Low	Medium	Medium	Medium
	Very Unlikely	Very Low	Low	Low	Low	Low	Low
	Almost Unprecedented	Very Low	Very Low	Very Low	Low	Low	Low

Assess Risk – Risk Rating

Roadway Flooding (OPC Intermediate SLR Scenario)						
Impact: 1 ft Flooding	**Threshold**	**Consequence**	**Year | Risk Rating**			
			2024	**2055**	**2075**	**2105**
Local Roads						
Front St | S F St | S G St	10.1 ft Tide	Major: No Access, requires significant effort to manage, Temporary (1+ days) delays to service, Additional resource required				
AWTF Site Access| S H St | S I St S G ST - South of AWTF	10.7 ft Tide					
5th St	100yr Fluvial 11.1 ft Tide					
H St	11.1 ft Tide					
2nd St | 6th St | 7th St | E St | I St | J St | S Union St	11.7 ft Tide					
3rd St	12.7 ft Tide					
4th St | Bayside Ct | Community Park Way | D St	13.7 ft Tide					

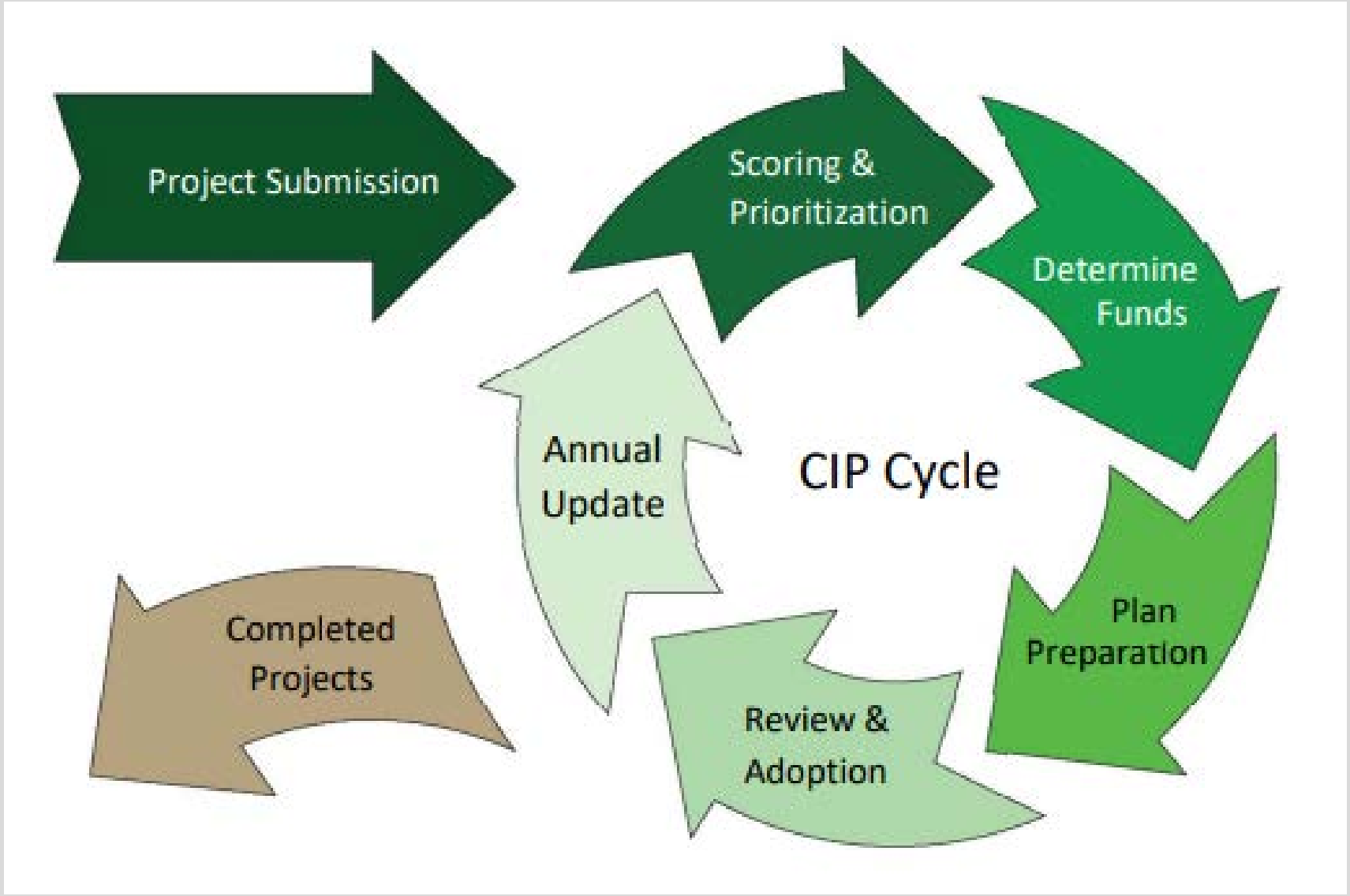
Risk Rating
Very High
High
Medium
Low
Very Low

Assess Risk – Risk Rating

Lift Station Flooding (OPC Intermediate SLR Scenario)						
Impact: Operations, Service	**Threshold**	**Consequence**	**Year | Risk Rating**			
			2024	**2055**	**2075**	**2105**
First St Lift Station						
Building Flooding	10.7 ft Tide	Minor: Flooding enters structure, cleanup required				
Generator (Backup Power)	11.7 ft Tide	Major: Flooding at elevation of generators, failure of backup power, replacement of generator required				
Electrical Equipment	13.3 ft Tide	Severe: Flooding at elevation of electrical panel, failure of Lift Station, replacement / reconstruction				

Risk Rating
Very High
High
Medium
Low
Very Low

Assess Risk – Inform CIP and LCP



Next Steps

Refine Vulnerability
and
Risk Assessment

Develop CIP Adaptation Projects & Inform LCP Update