November 17, 2016
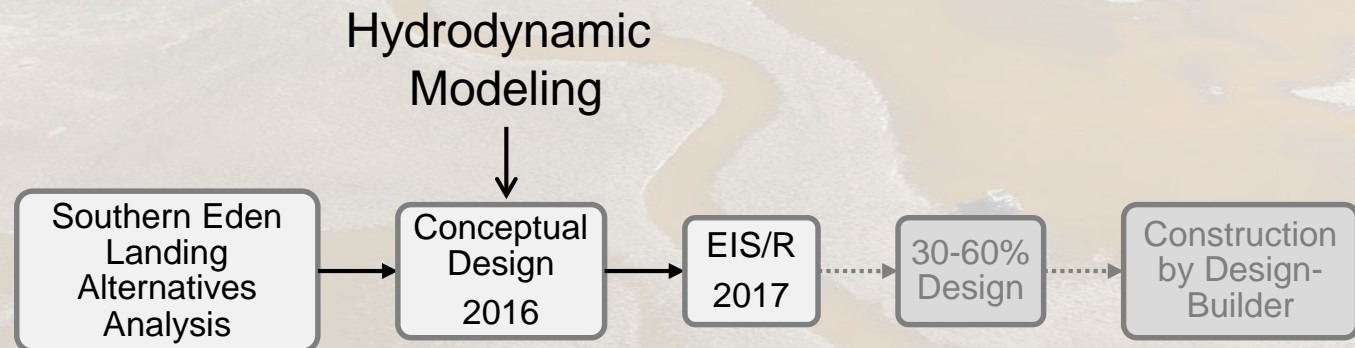
Southern Eden Landing
Hydrodynamic Modeling
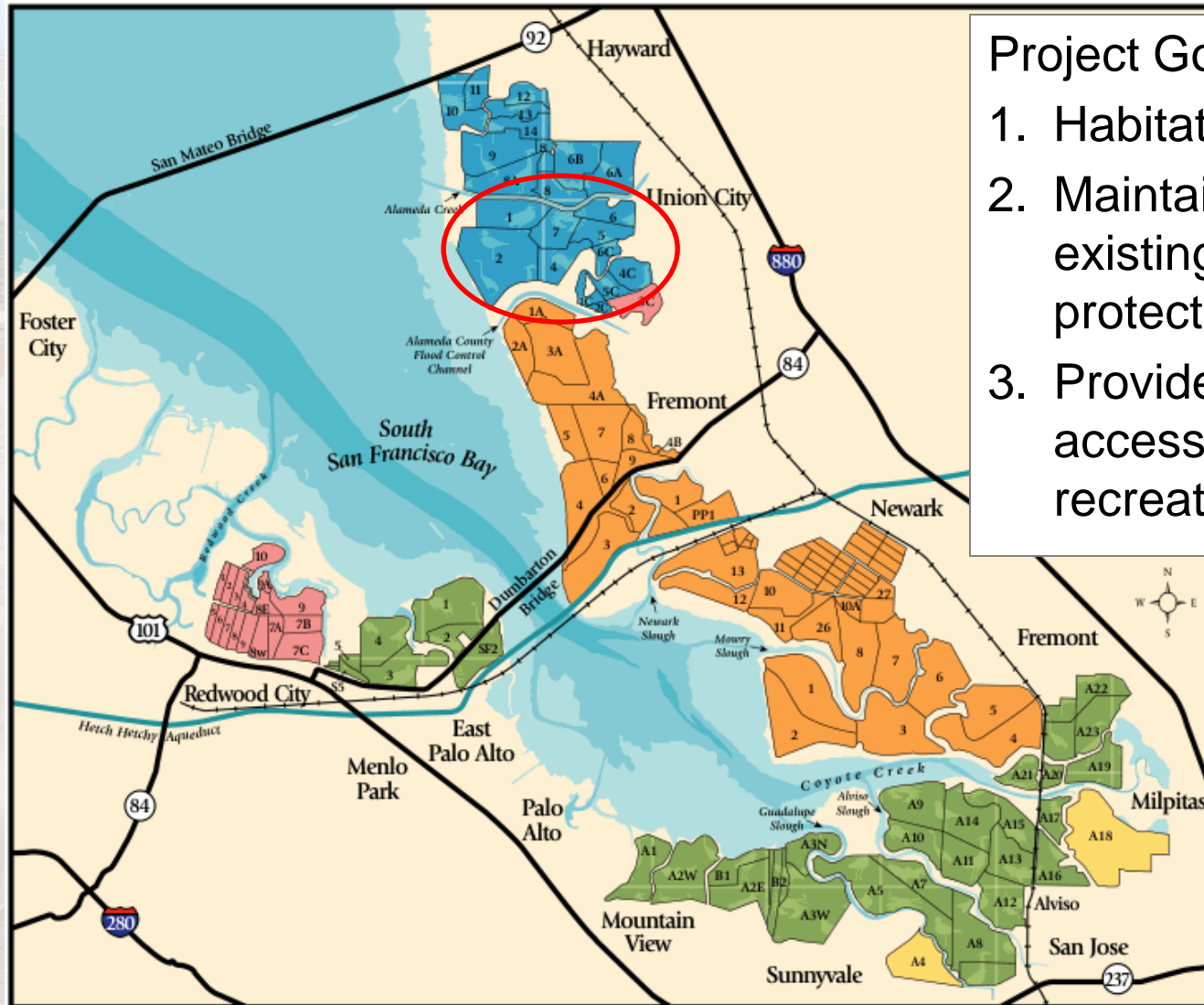
Agenda

1. Project Background
2. Modeling Overview
   a. Purpose
   b. Input Parameters
   c. Layout Configurations
3. Modeling Results
   a. Restoration
   b. Flood

Cris Benton

Hydrodynamic
Modeling

Southern Eden Landing Alternatives Analysis → Conceptual Design 2016 → EIS/R 2017 ┄┄> 30-60% Design ┄┄> Construction by Design-Builder
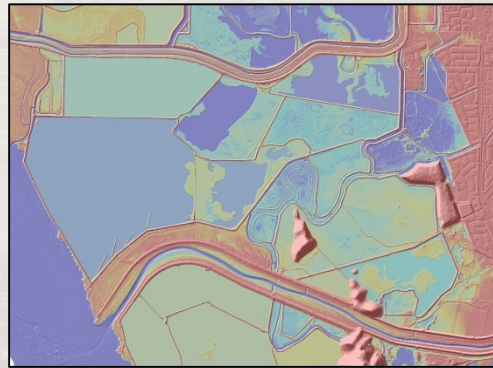
Project Background

Project Goals:

1. Habitat restoration

2. Maintain or improve existing flood protection

3. Provide public access and recreation

# Project Background

Modeling Overview

Modeling Overview
Purpose

Modeling Purpose:

- Determine levee improvement heights
- Size and locate:
  - Levee breaches
  - Channels
  - Water control structures
- From these, locate public trails

Pre-design Process:

- Historical slough network
- Breach sizes
  - Empirical geometries of SF Bay historic marshes
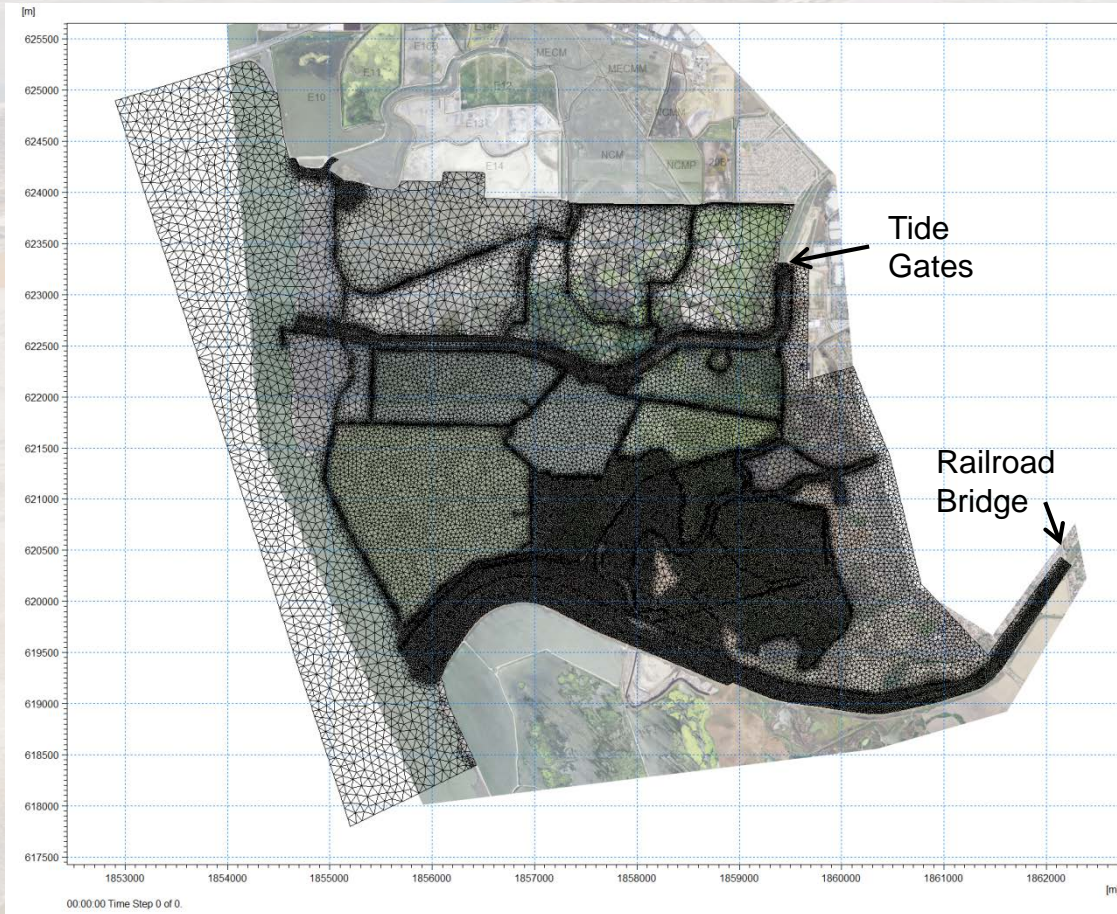 - Short-term & long-term tidal prisms
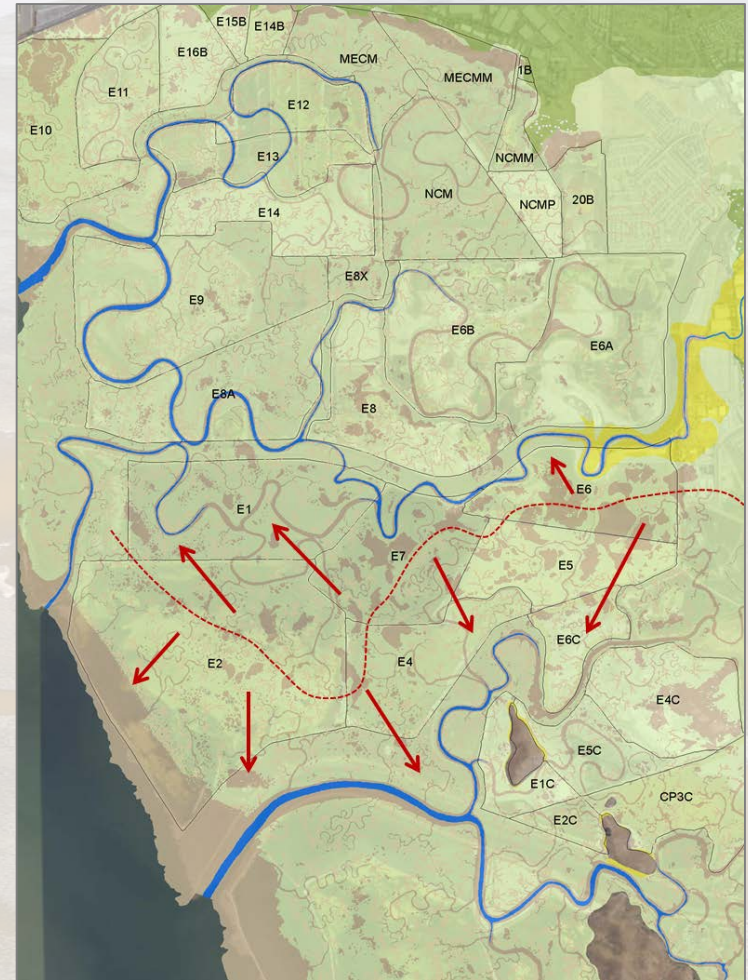
Historical Slough Network

Modeling Overview
Input Parameters

Model:
- MIKE21 Flexible Mesh

Combined LiDAR & Bathymetry
- Ponds between MSL & MHW

Triangular Mesh Elements:
- 10 m^2 - Narrow levee crests
- 200 m^2 - Southern ponds
- $1,250 \text{ m}^2$ - Large flat ponds
- $5,000 \text{ m}^2$ - Bay

Connected Element Paths:
- Levee crests and channels

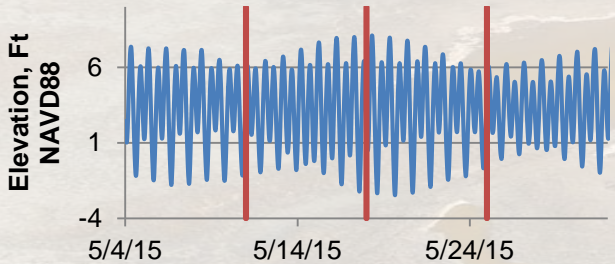**Variable Time Step:**
- Max: 60 sec
- Computed Avg.: 0.25 sec

Modeling Overview

Input Parameters

	Restoration	Flood Control
Objectives:	• Maximize tidal prism for habitat enhancement	• Maintain or minimize max. water surface elevations
Hydrologic Scenarios:	• Typical Tide (3-4 weeks)	• 100-year tide with 10-year riverine discharge • 10-year tide with 100-year riverine discharge
Layout Configurations:	• Existing Conditions (Alt. A) • Tidal Restoration (Alt. B) • Tidal Restoration & Managed Ponds (Alt. C)	

Modeling Overview
Layout Configurations

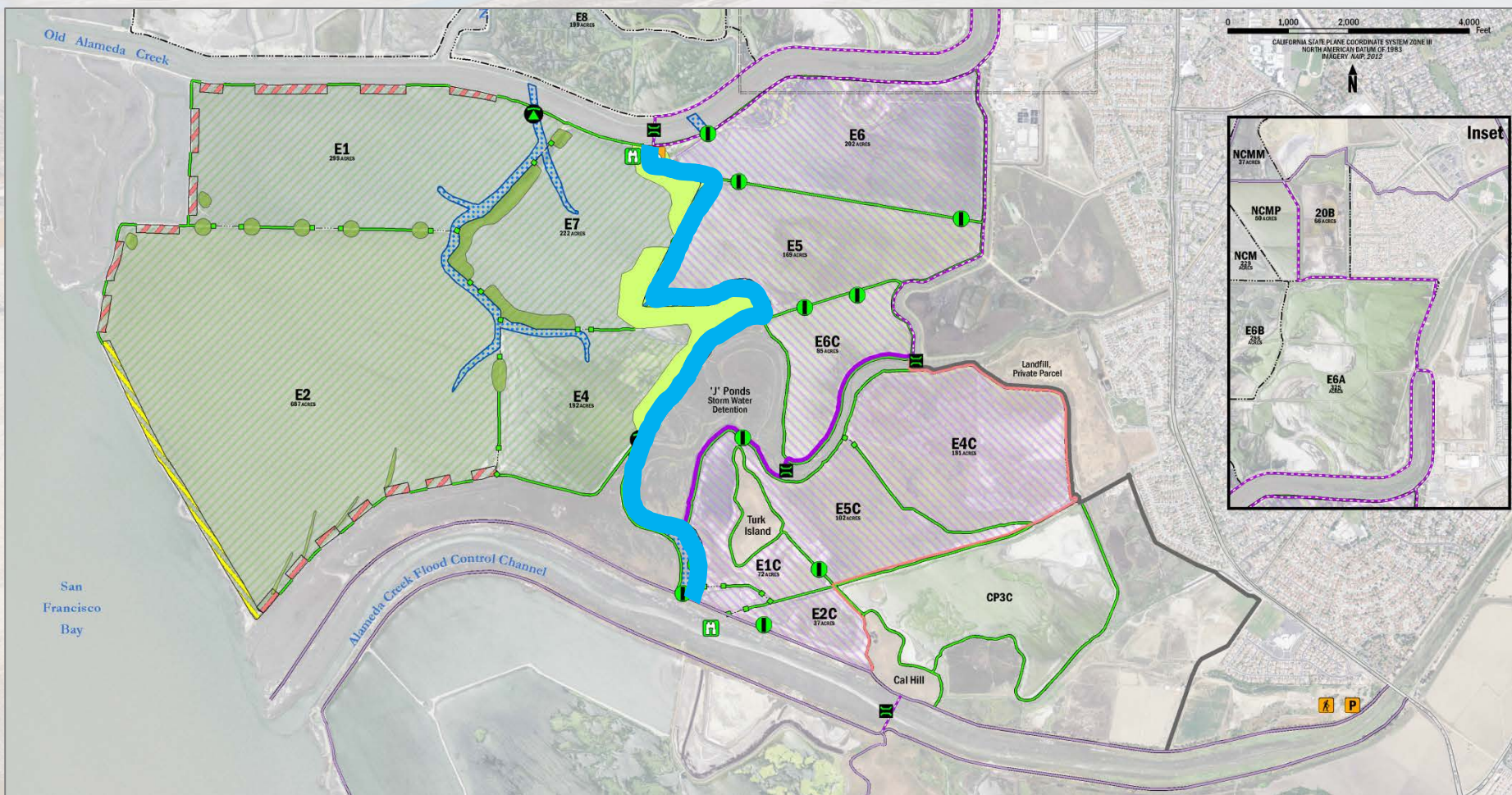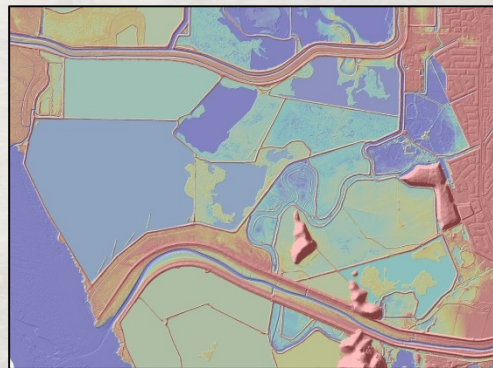**Tidal Restoration (Alt. B)**

Modeling Overview
Layout Configurations

Tidal Restoration & Managed Ponds (Alt. C)
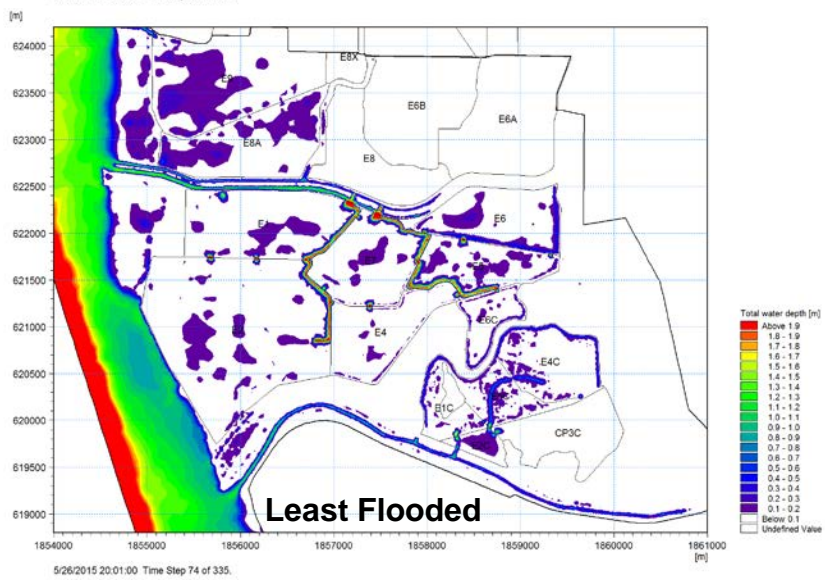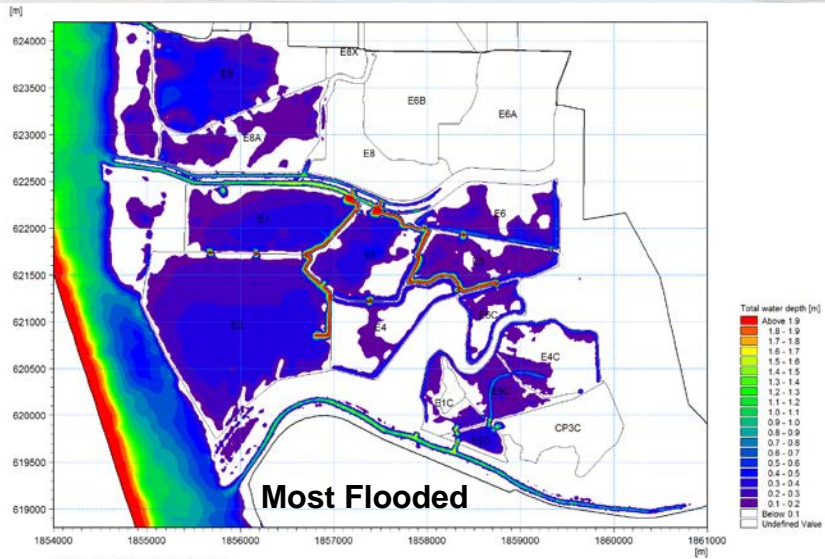
Restoration Results

Restoration Results
Tidal Restoration (Alt. B)

Objective:

- Maximize tidal prism for habitat enhancement

Tidal Propagation Results:

- Optimized breach & channel size
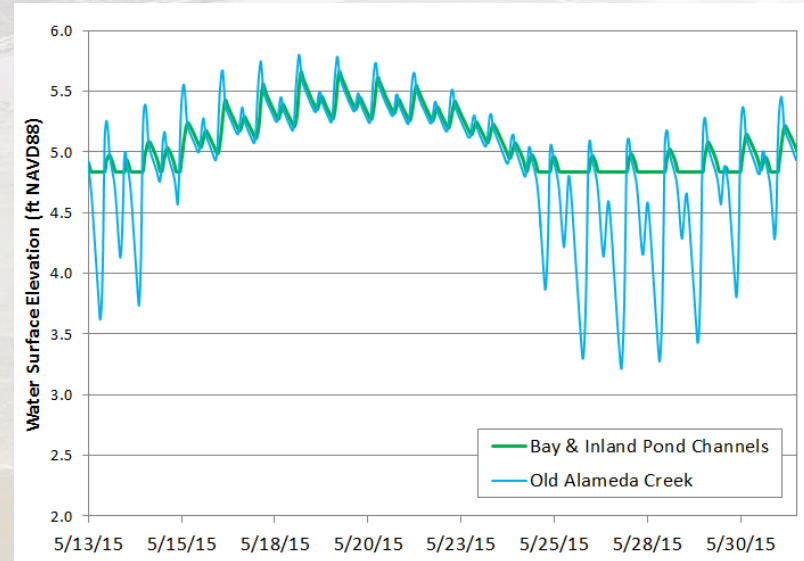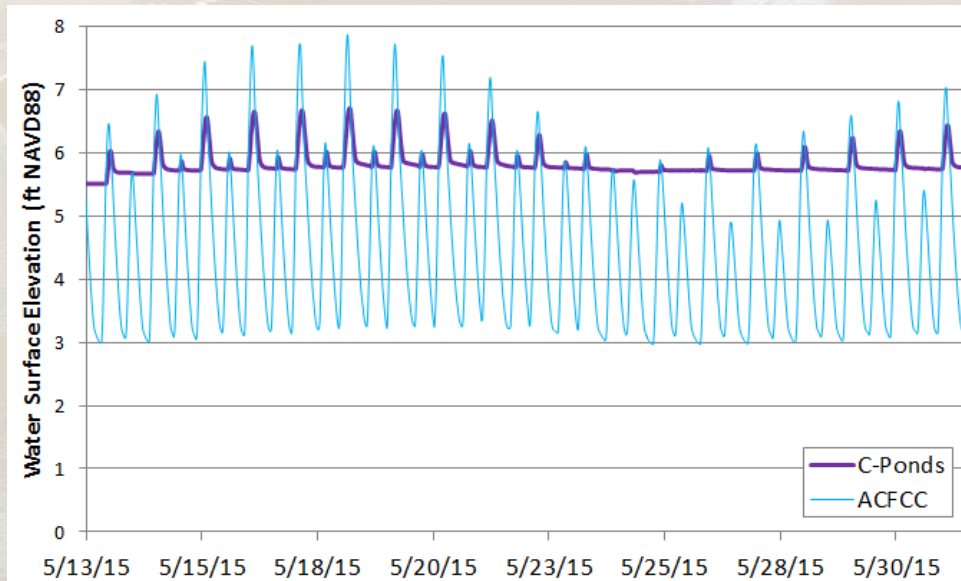- Tidal exchange sufficient with connections to Old Alameda Creek

Restoration Results

- Old Alameda Creek restricts flow; may erode in future

- C-Ponds will become less muted with additional water control structures
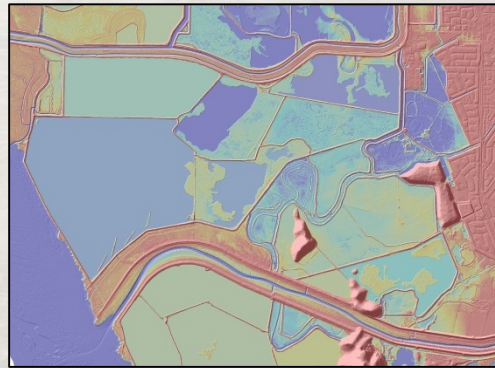
Bay & Inland Ponds
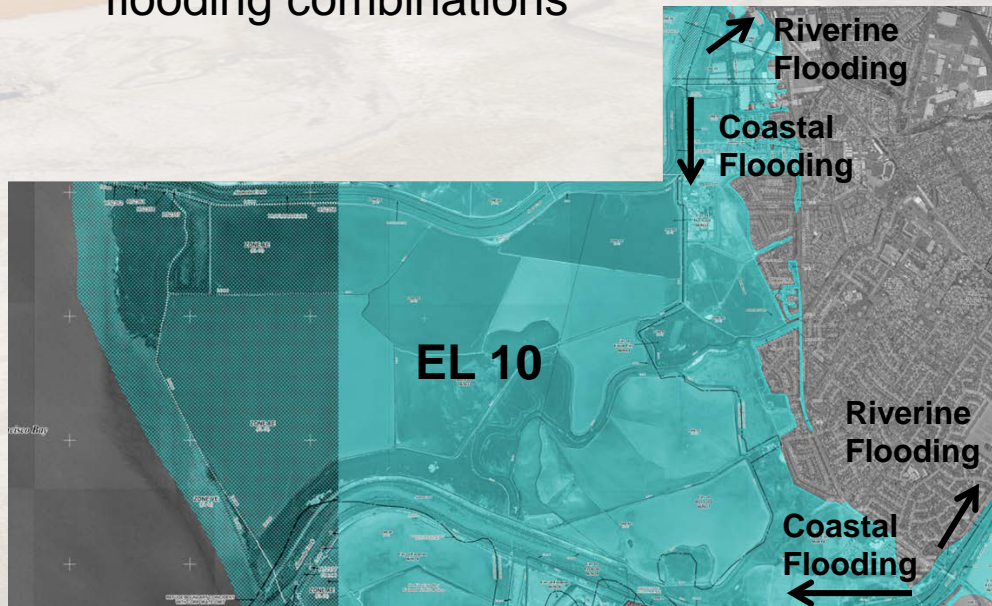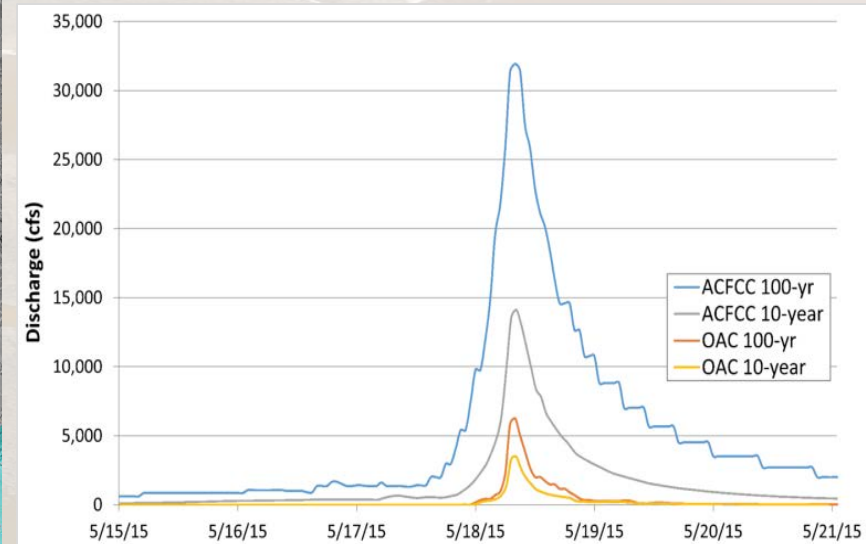

C-Ponds

Flood Results

Flood Results

FEMA FIRM:

- Project is within the coastal floodplain
- Unaccredited levees
- Modeled both Coastal and Riverine flooding combinations

Hydrologic Scenarios:

- 100-year tide with 10-year riverine discharge
- 10-year tide with 100-year riverine discharge

Effective 2009 (pending update)

ACFCC: Alameda Creek Flood Control Channel
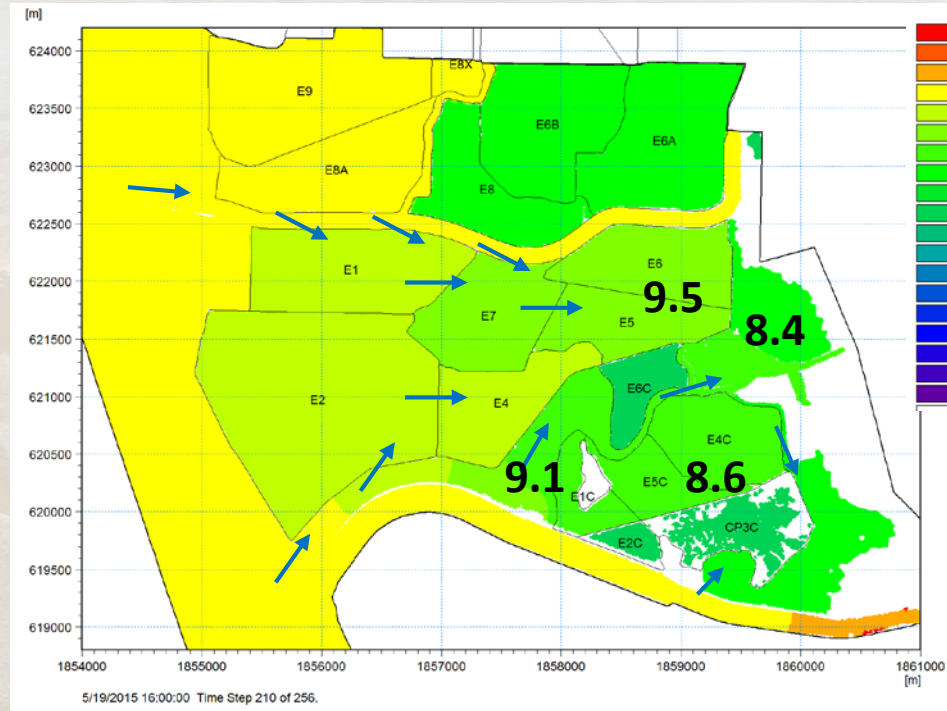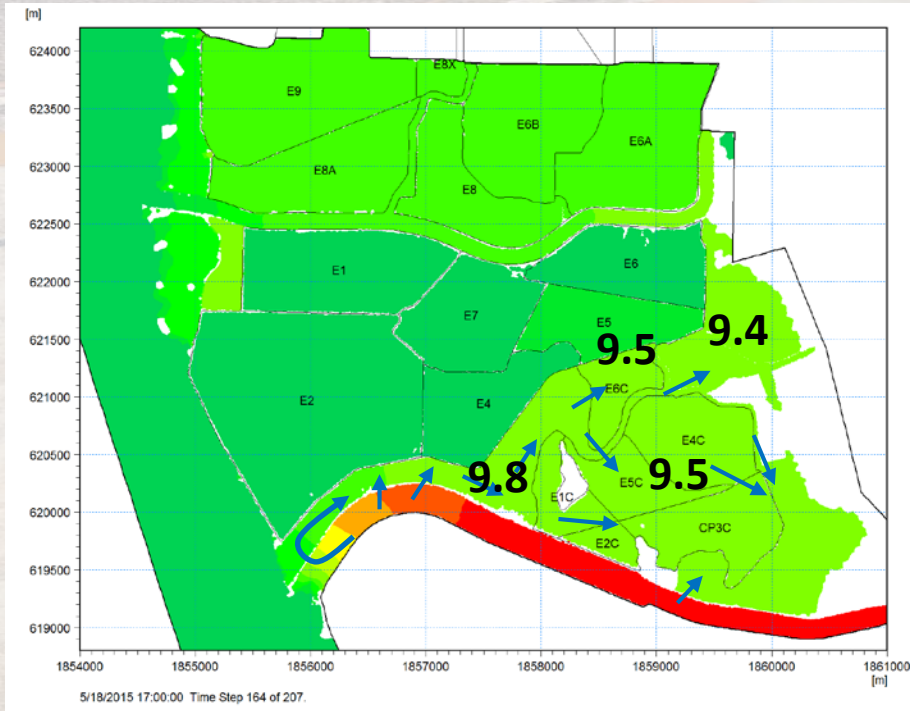OAC: Old Alameda Creek

Flood Results
Existing Conditions (Alt. A)

10-yr Tide & **100-yr Discharge**

100-yr Tide & 10-yr Discharge

Maximum Water Surface Elevation
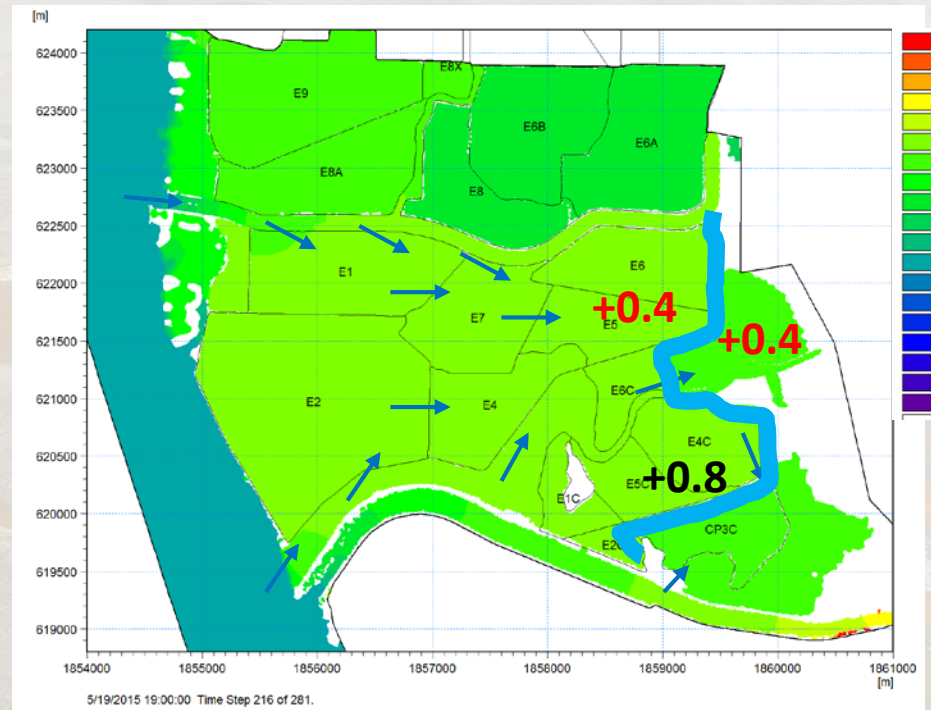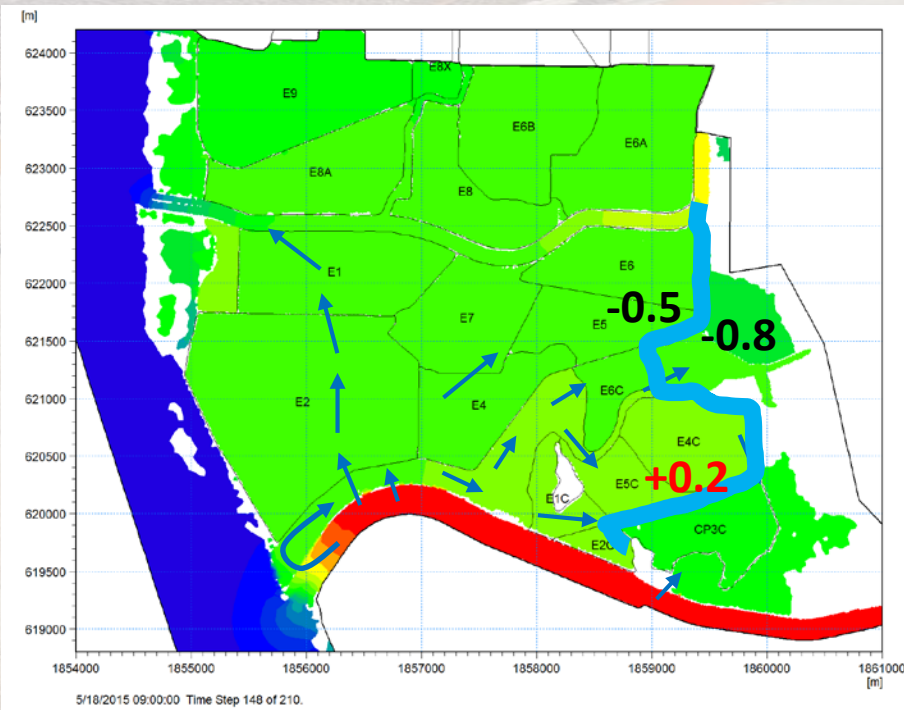Elevations in Feet, NAVD88

Flood Results
Tidal Restoration (Alt. B)

10-yr Tide & **100-yr Discharge**

100-yr Tide & 10-yr Discharge

Maximum Water Surface Elevation
Elevations in Feet, NAVD88

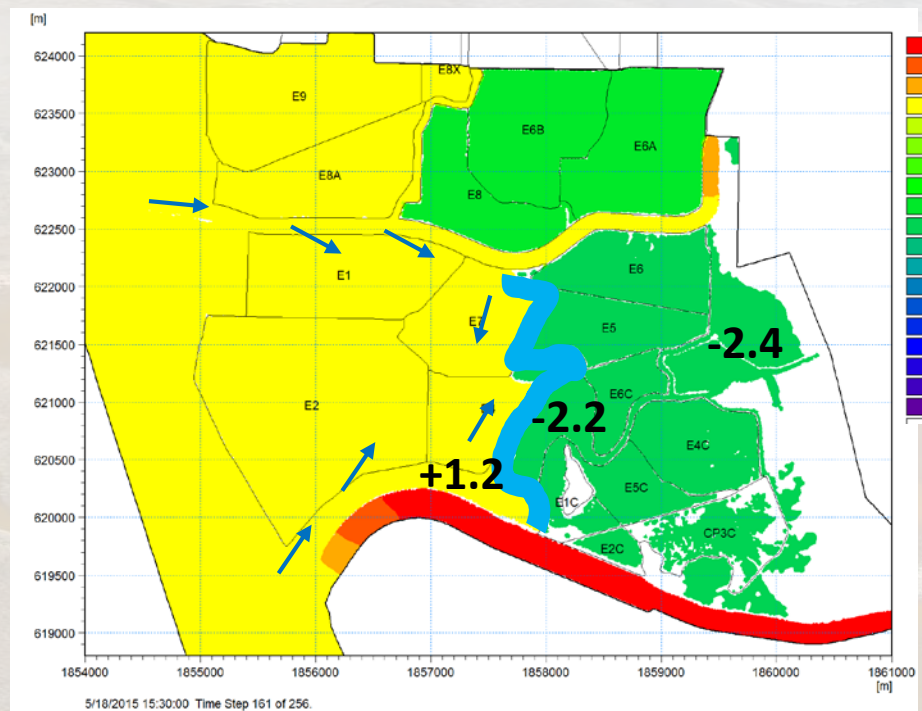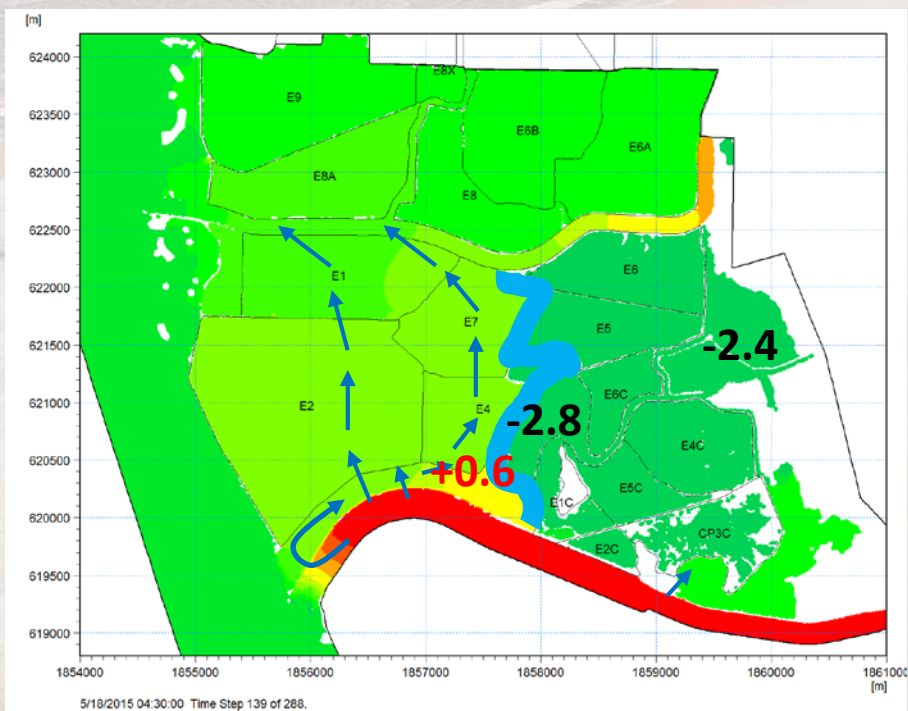Landside Levee Max. WSL : 9.9 feet NAVD88

Flood Results
Tidal Restoration & Managed Ponds (Alt. C)

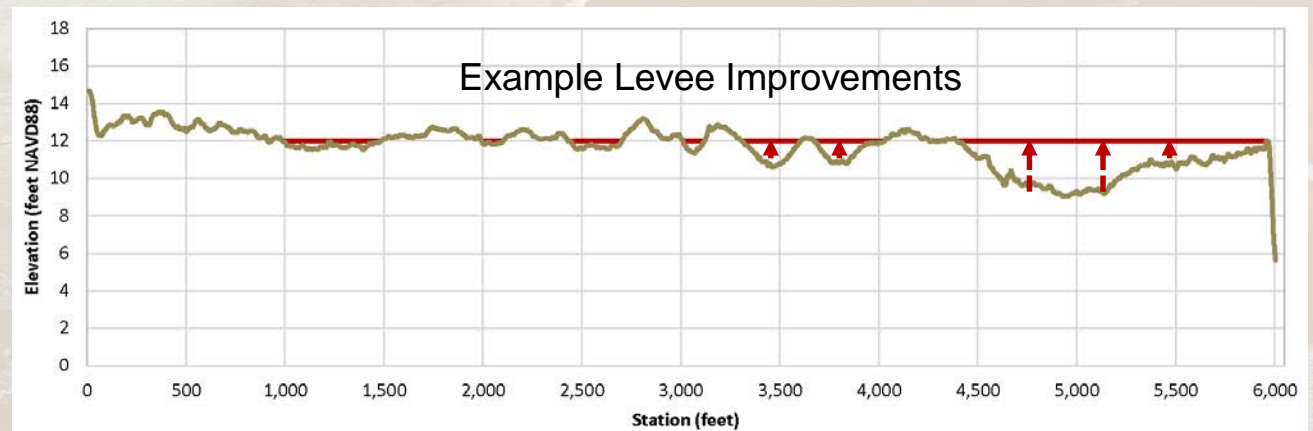10-yr Tide & **100-yr Discharge**   **100-yr Tide** & 10-yr Discharge

Maximum Water Surface Elevation
Elevations in Feet, NAVD88

Mid-complex Levee Max. WSL : 10.4 feet NAVD88

Flood Results

- Improve levees to 12 feet NAVD88, creating 1.5 to 2.5 feet of freeboard

- Upstream water surface elevations in Creeks maintained or improved

- Flood protection goals were balanced with restoration goals (and recreation)

Example Levee Improvements

Questions?