

CALIFORNIA WATERFIX INFRASTRUCTURE

MODERNIZING THE SYSTEM



Board of Directors
August 1, 2017

Topics

- ◆ SWP History
- ◆ Water Supply Reliability Issues
- ◆ Infrastructure Solutions

MODERNIZING THE SYSTEM:

California WaterFix
Infrastructure



A Robust Solution is Needed

- Provide water supply reliability
- Enhance ecosystem habitat throughout Delta
- Allow flexible operations in dynamic fishery environment
- Improve water quality
- Reduce seismic risks
- Reduce climate change risks

State Water Project



◆ History

- ◆ 1931 – State Water Plan
- ◆ 1933 – CVP Act
- ◆ 1971 – First delivery
- ◆ 1994 – Bay Delta Accord
- ◆ 2000 – CALFED
- ◆ 2017 – CA WaterFix

◆ Facilities

- ◆ 19 Dams & Reservoirs
- ◆ 20 Pumping Plants
- ◆ 10 Power Plants
- ◆ 662 Aqueduct Miles



Subsidence



Fishery Declines

Delta Risks

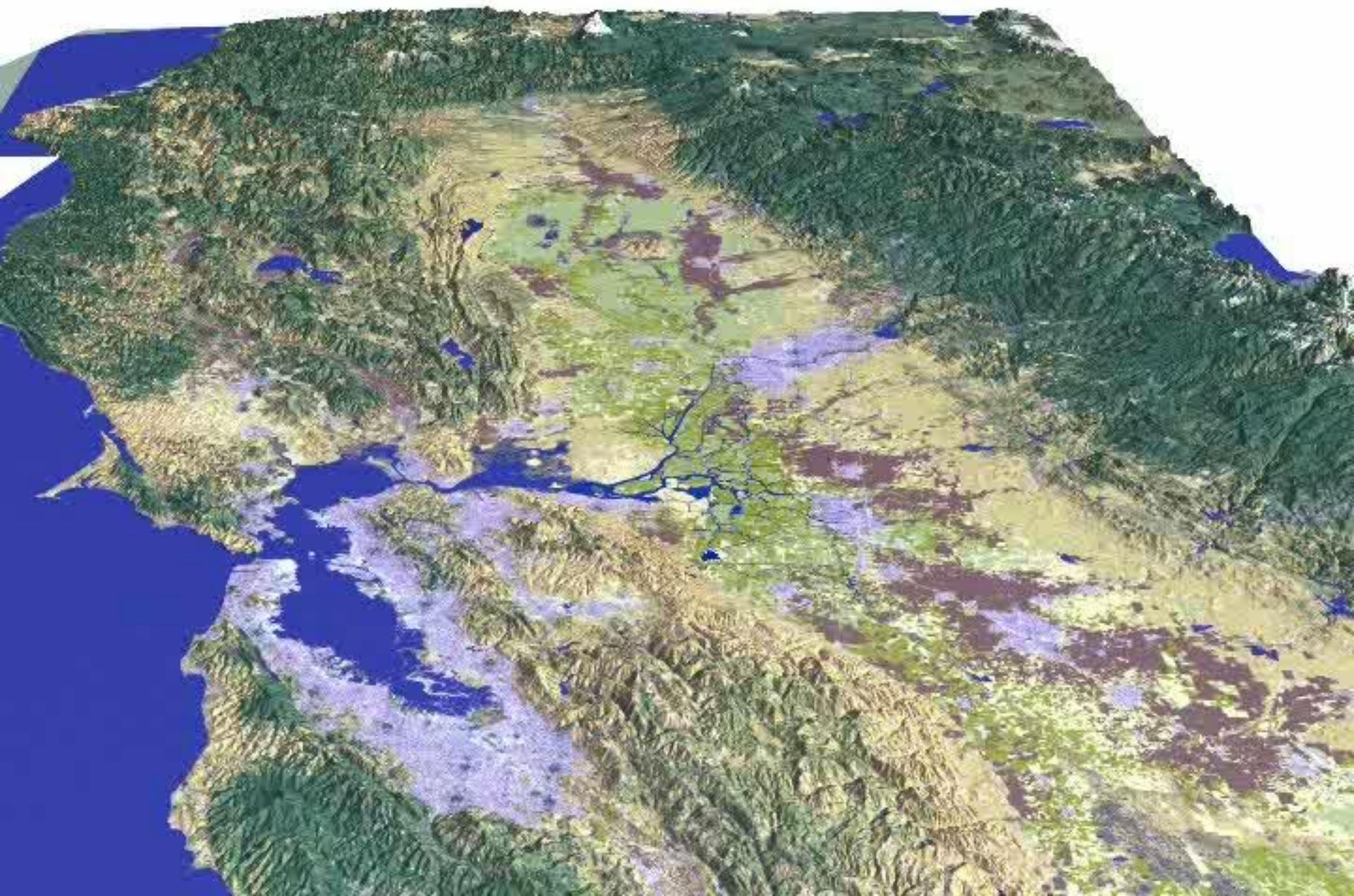


Seismic



Sea Level Rise

California's Delta



Delta Inflow

Sacramento River

~80% Inflow; good quality

East Side Rivers

~5% Inflow; good quality

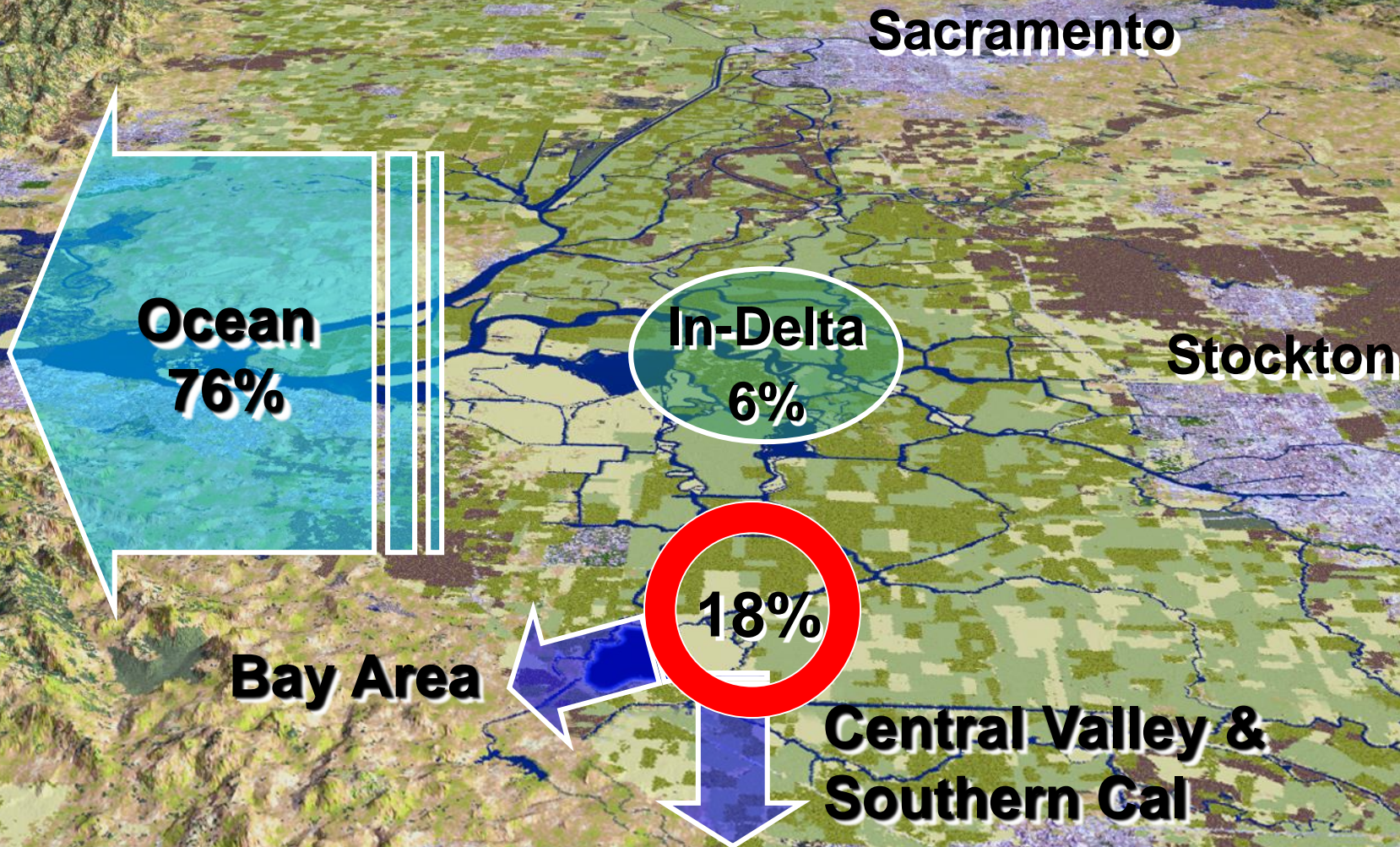
Ocean/Tidal
High salinity

San Joaquin River

~15% Inflow; poor quality

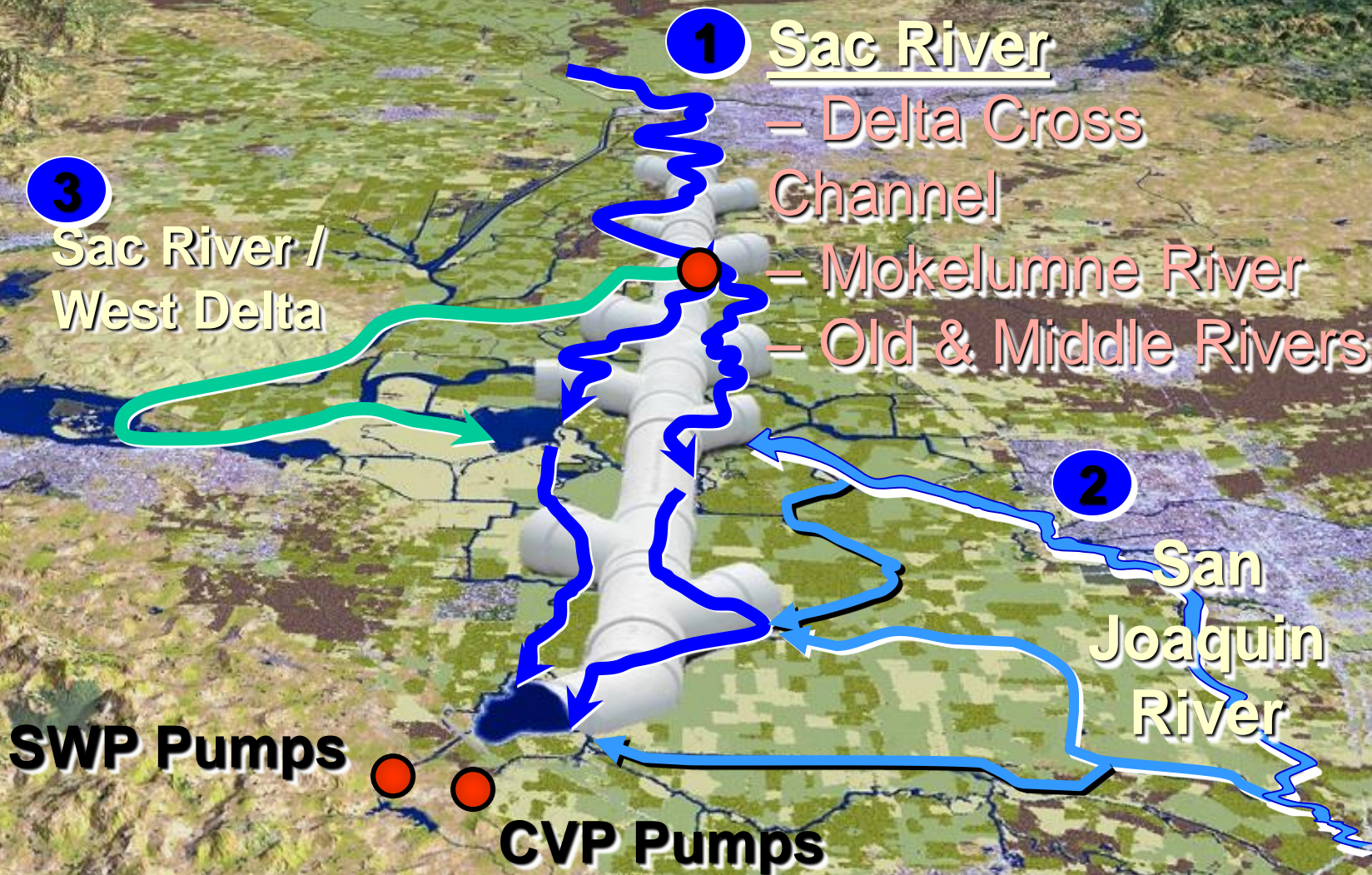


Delta Water Use





How Water Gets to Southern California

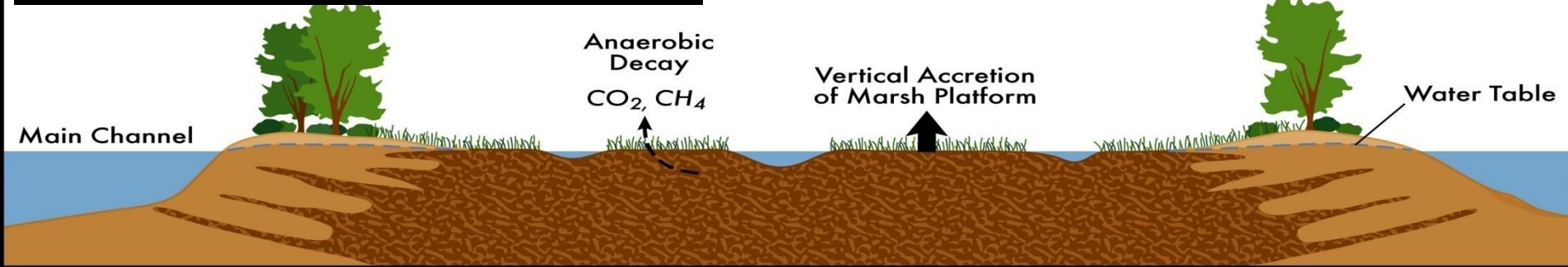


SWP Susceptibility

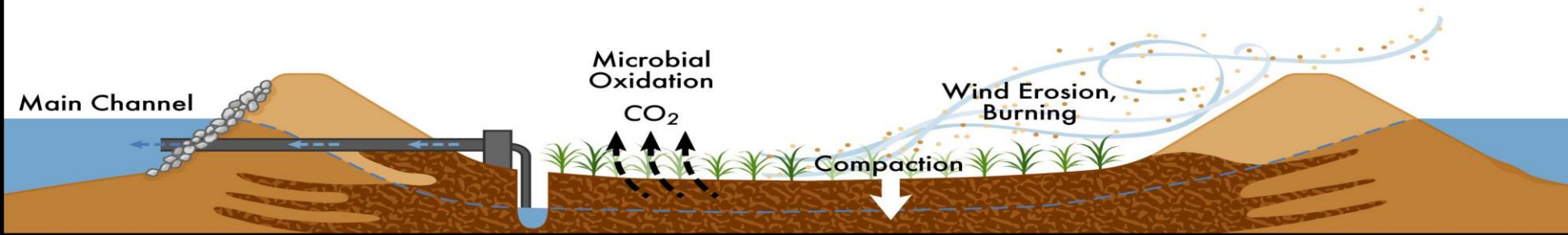
- ◆ Levee failures
- ◆ Fish entrainment
- ◆ Water quality/ salt water contamination

Bay-Delta Islands or Holes?

Pre-1880s



Present Time

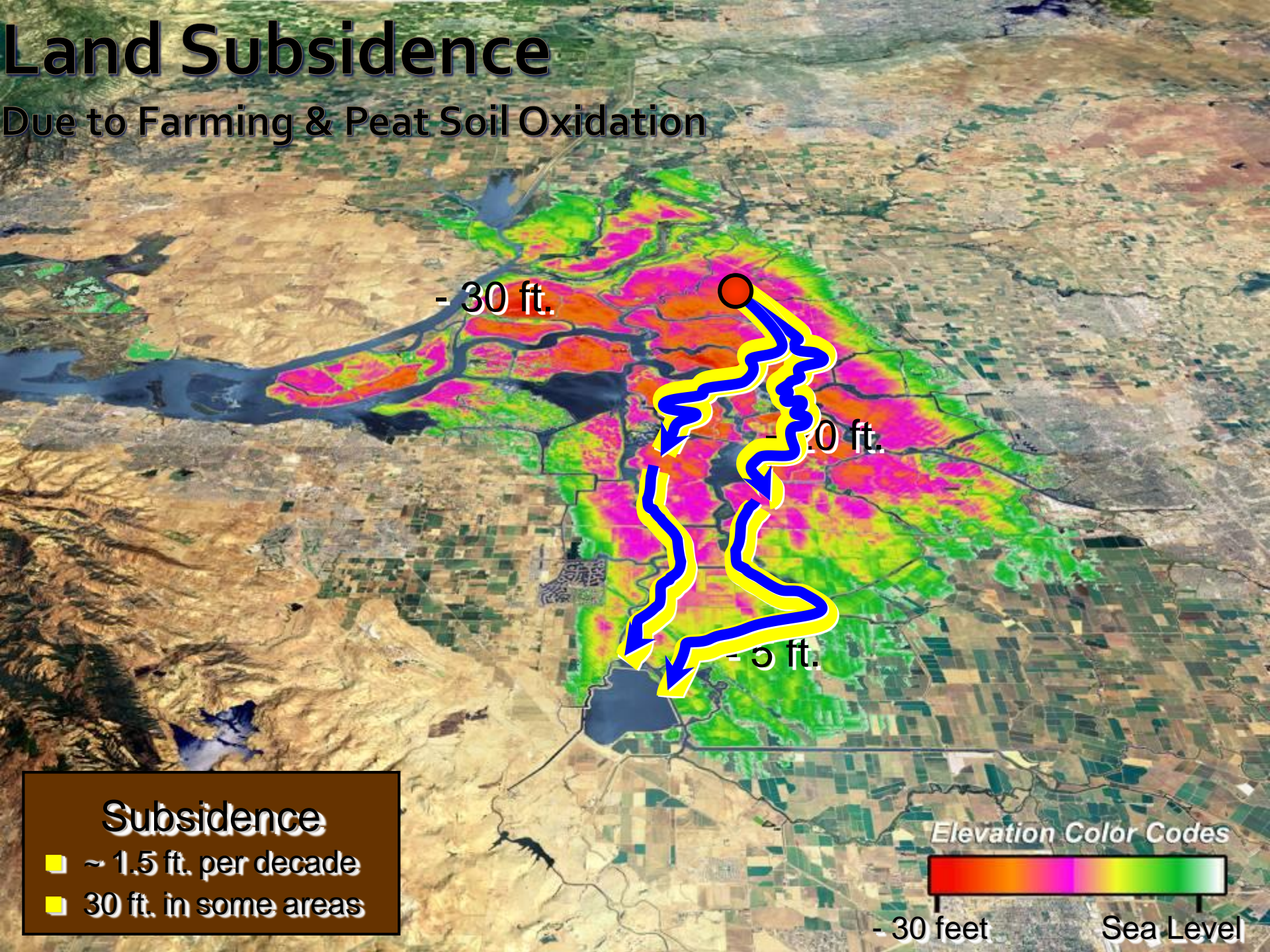


Levee Failure



Land Subsidence

Due to Farming & Peat Soil Oxidation



- 30 ft.

- 20 ft.

- 5 ft.

Elevation Color Codes



- 30 feet

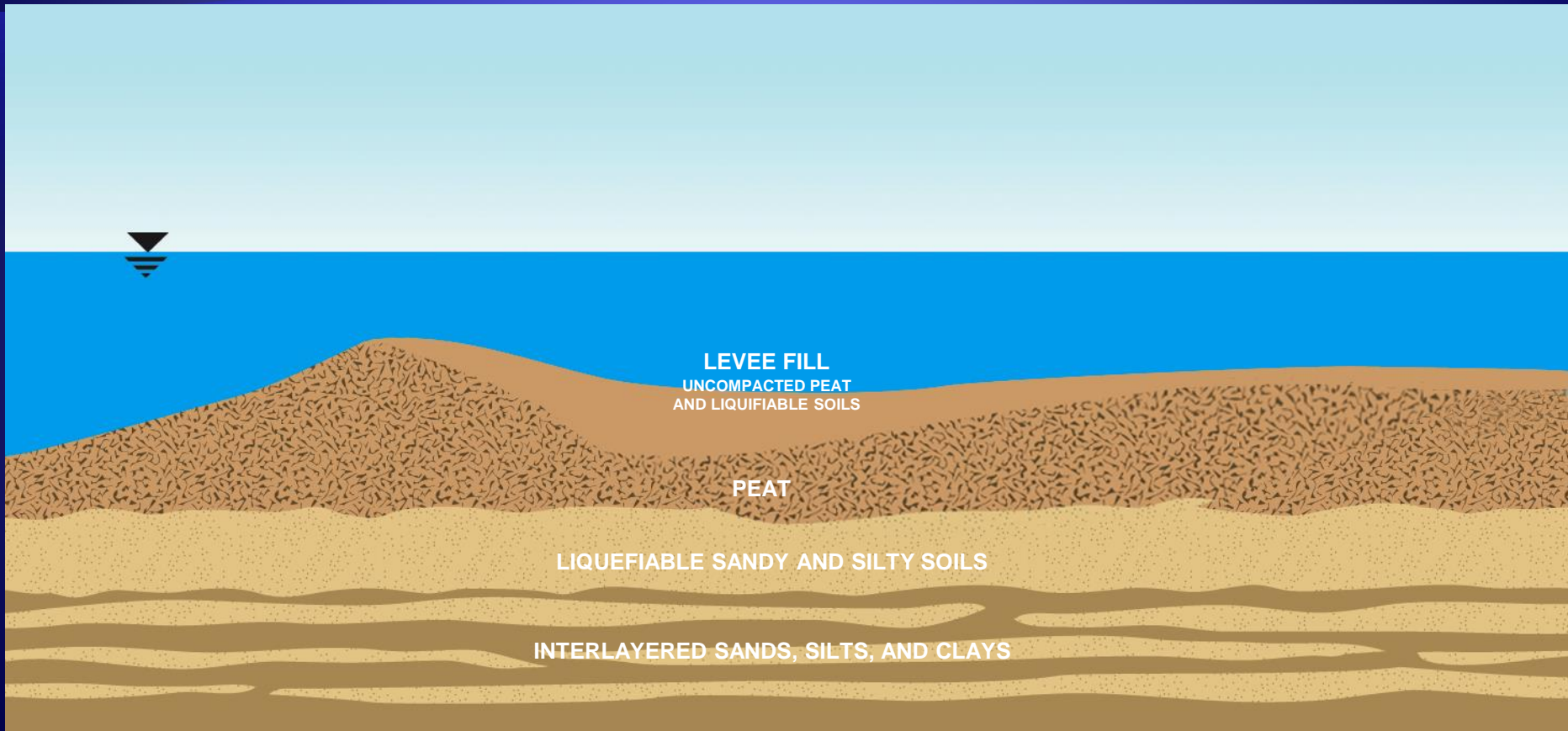
Sea Level

Subsidence

~ 1.5 ft. per decade

30 ft. in some areas

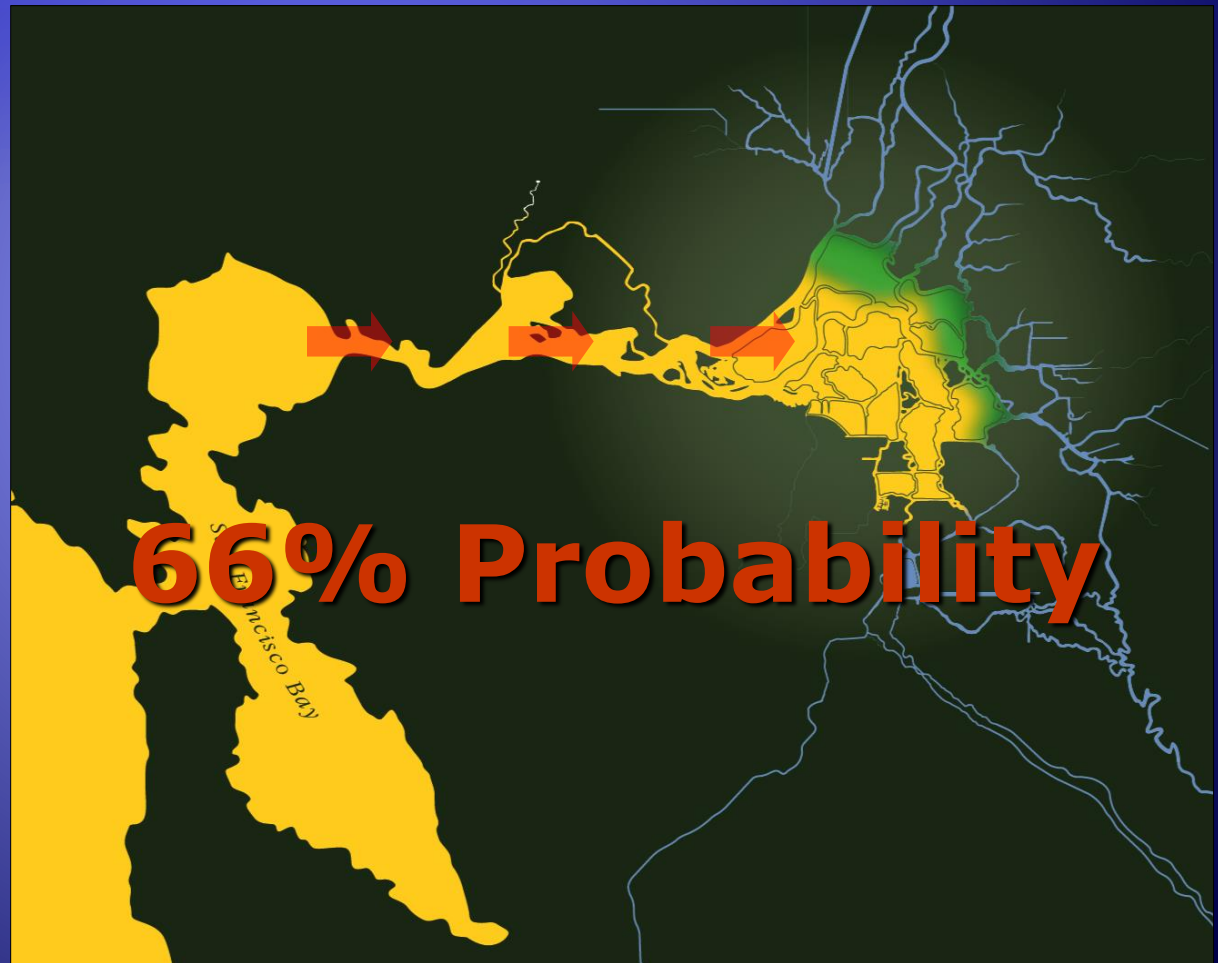
Earthquake Induced Levee Failure



When Delta Levees Fail: The “Big Gulp”

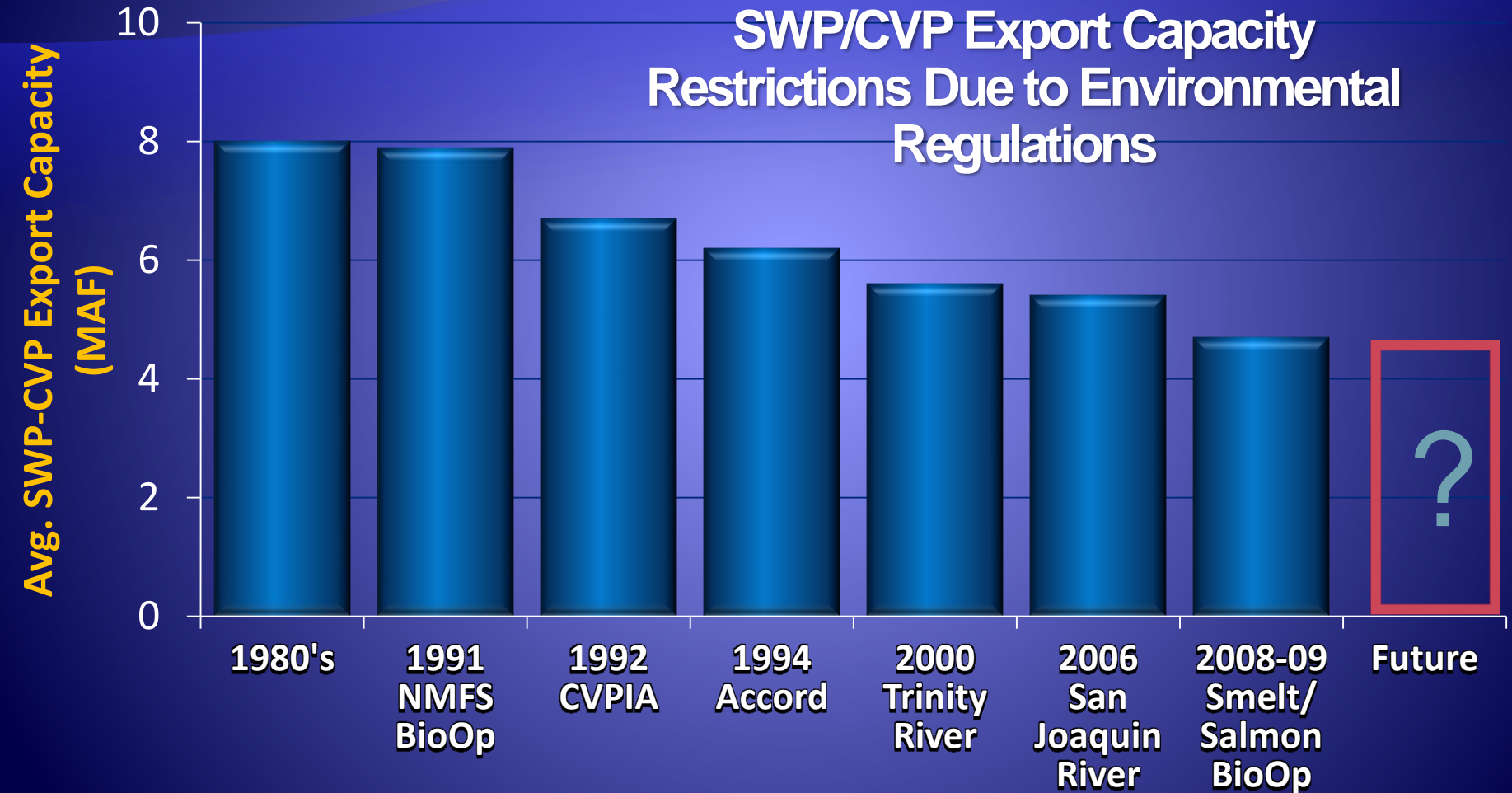
1 million af
of salt water flow
into the Delta in
first few days

Cost \$40 Billion



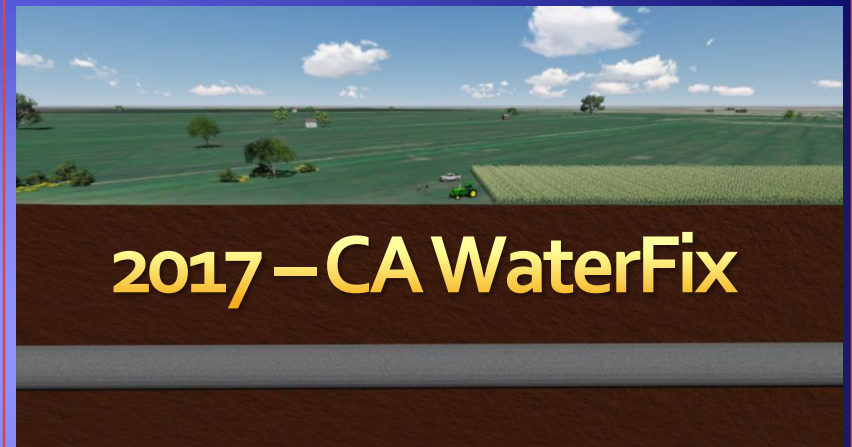
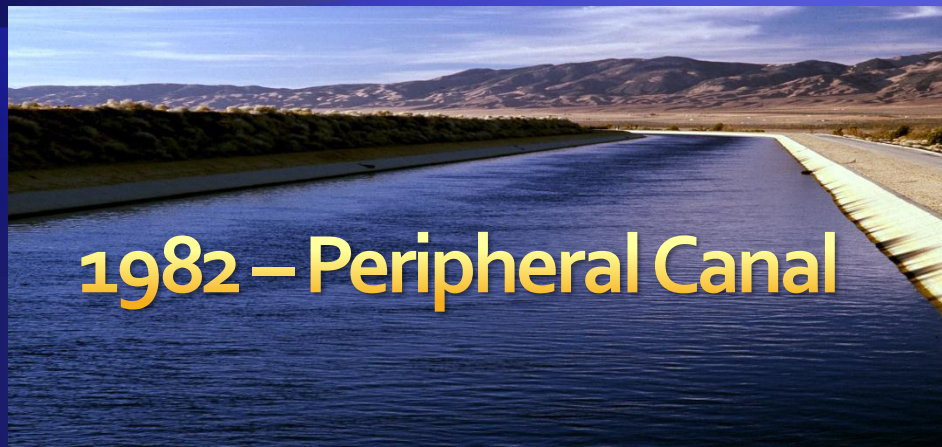
State & Federal Project Supplies

History of Regulatory Restrictions



Four Decades of Analysis

21st Century Approach



Above ground

21,800 cfs diversion

Mitigation only

Regulatory only approach

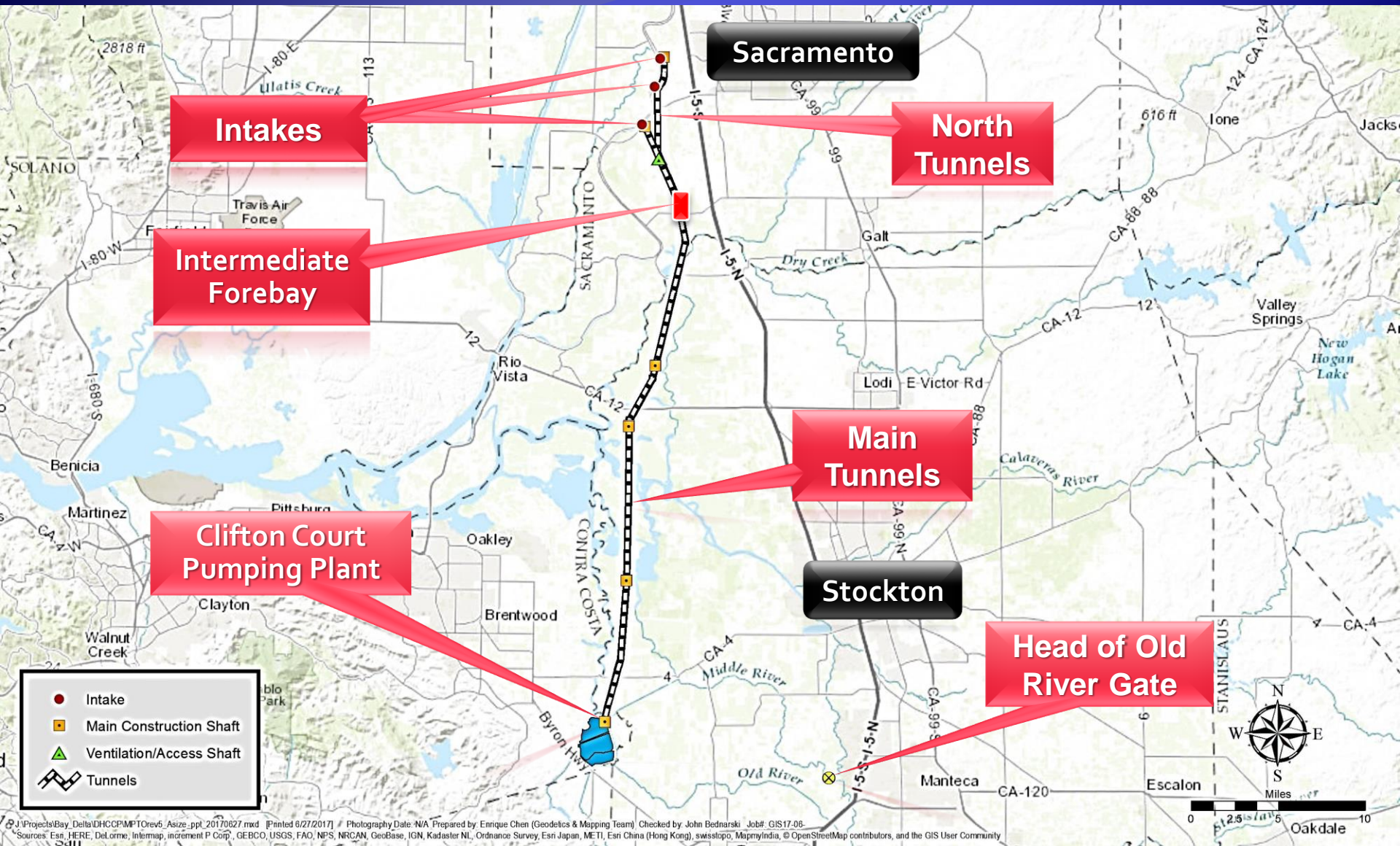
Below ground

9,000 cfs diversion

Mitigation plus
CA EcoRestore program

Science & adaptive
management

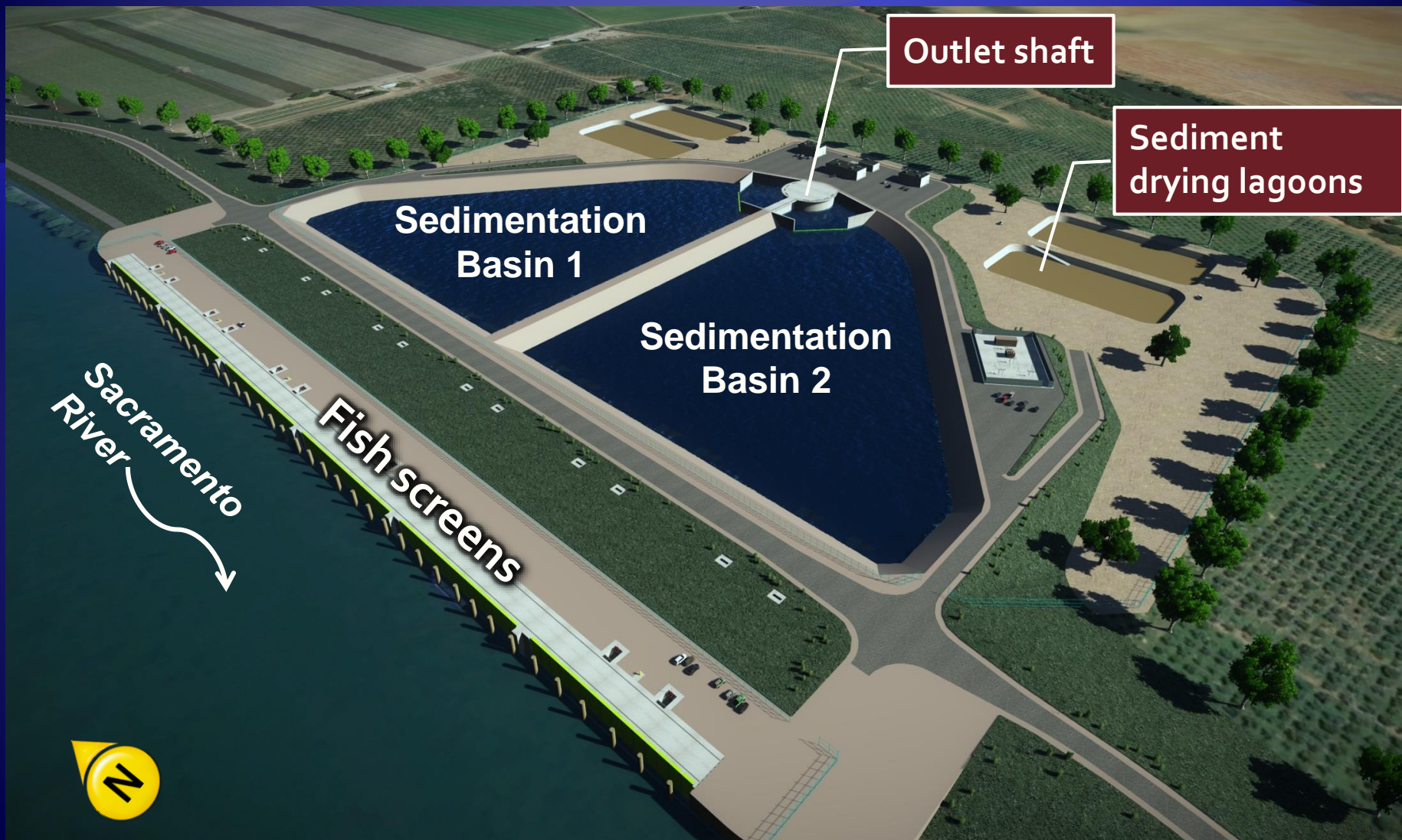
California WaterFix - Overall Program



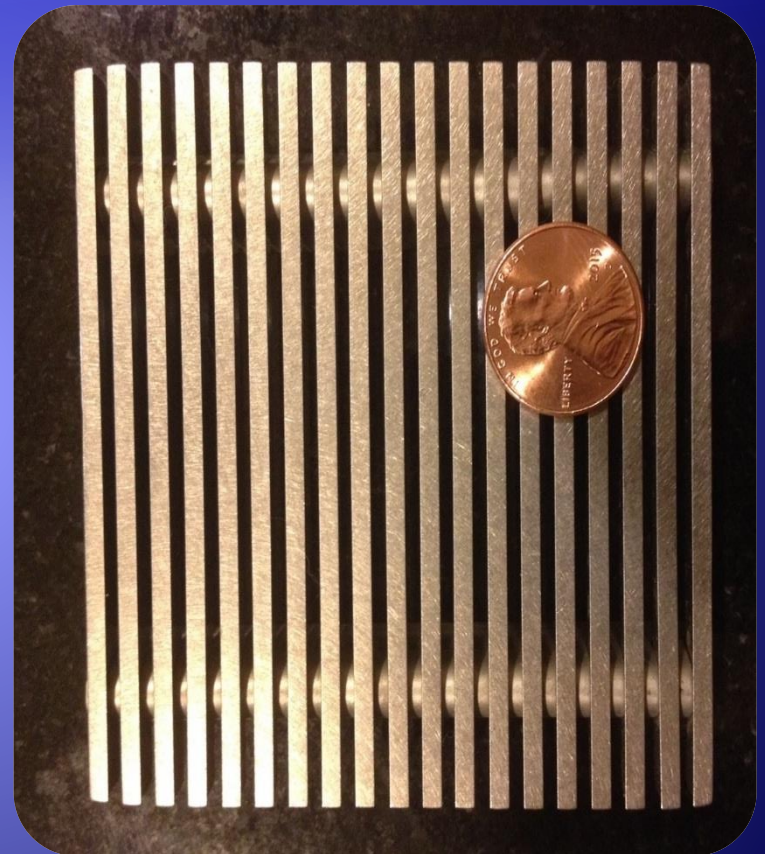
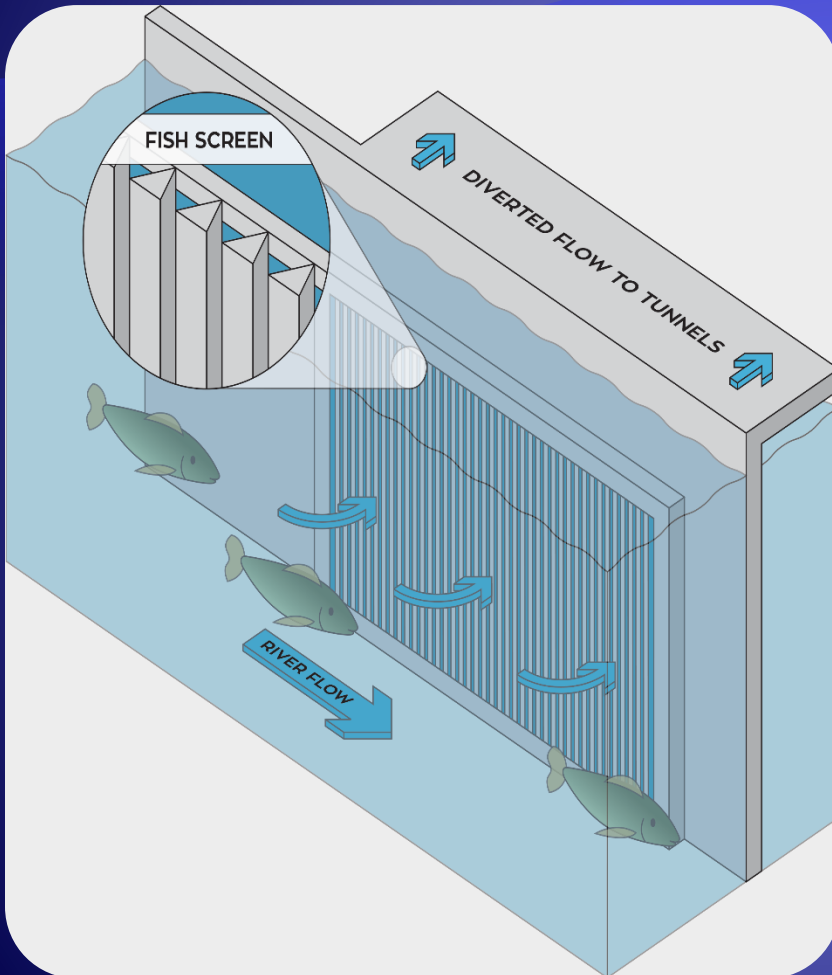
River Intake Locations



River Intakes

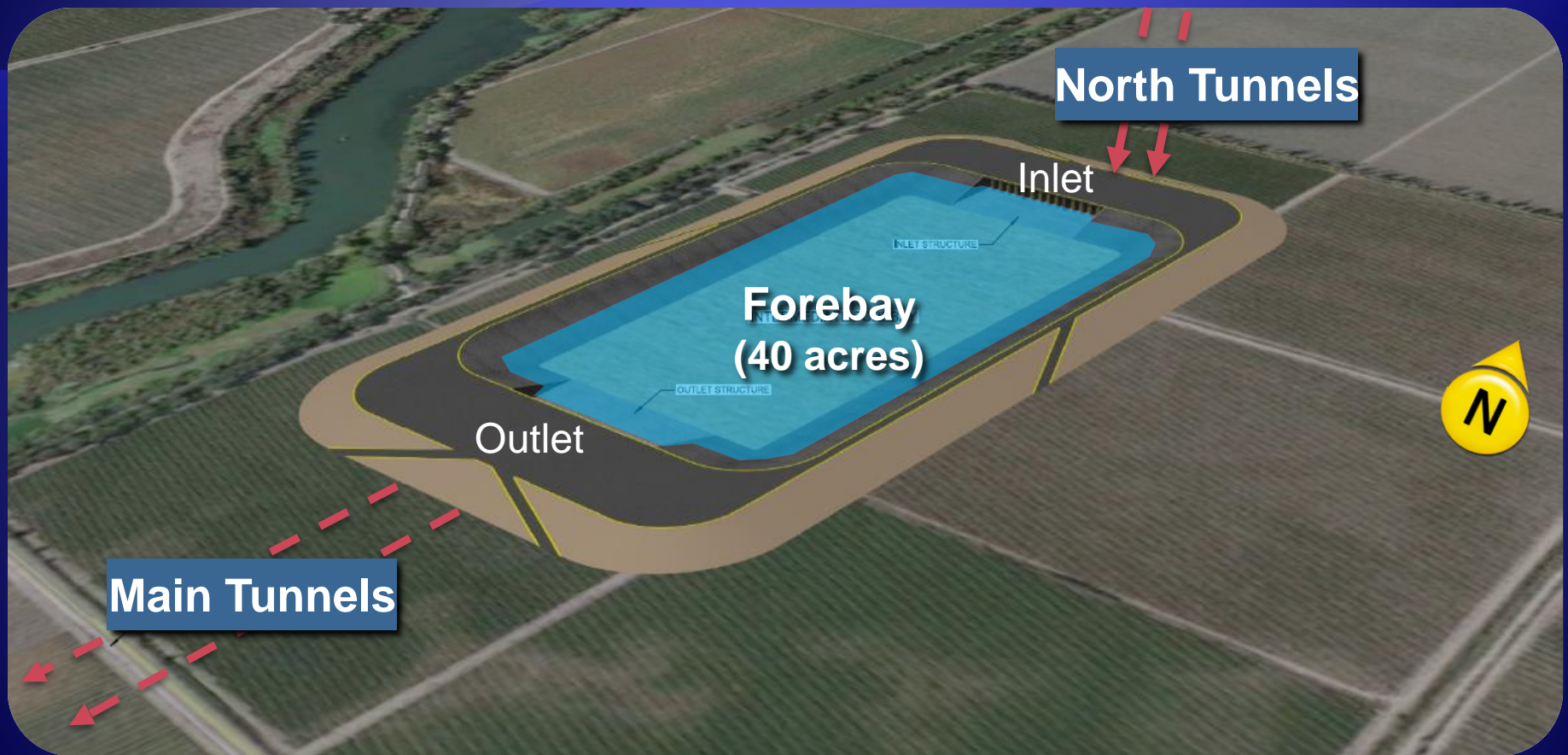


Designed to Protect Fish



Screen spacing – 1.75mm
Flow approach velocity = 0.2
ft/sec

Intermediate Forebay

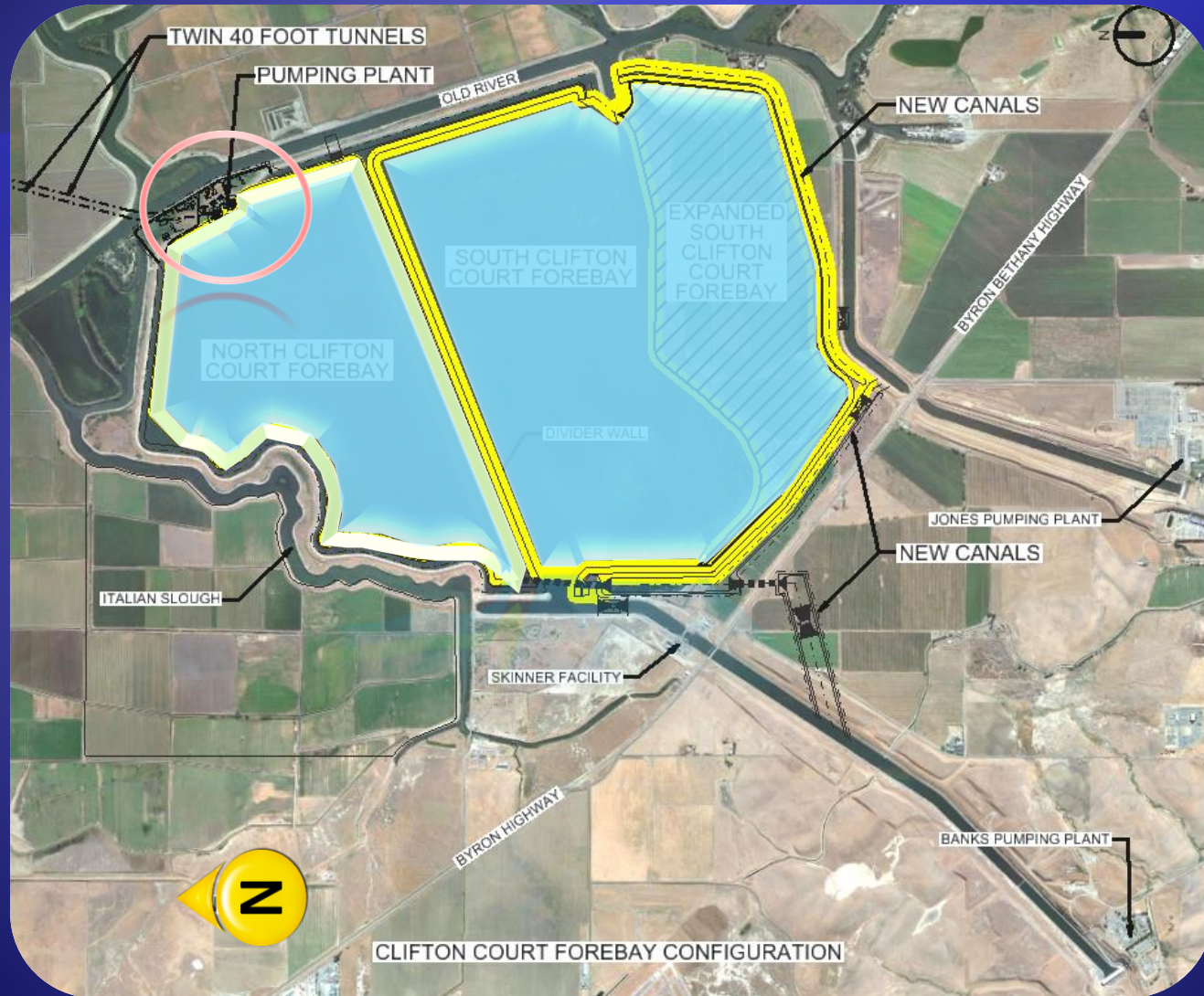


Main Tunnels

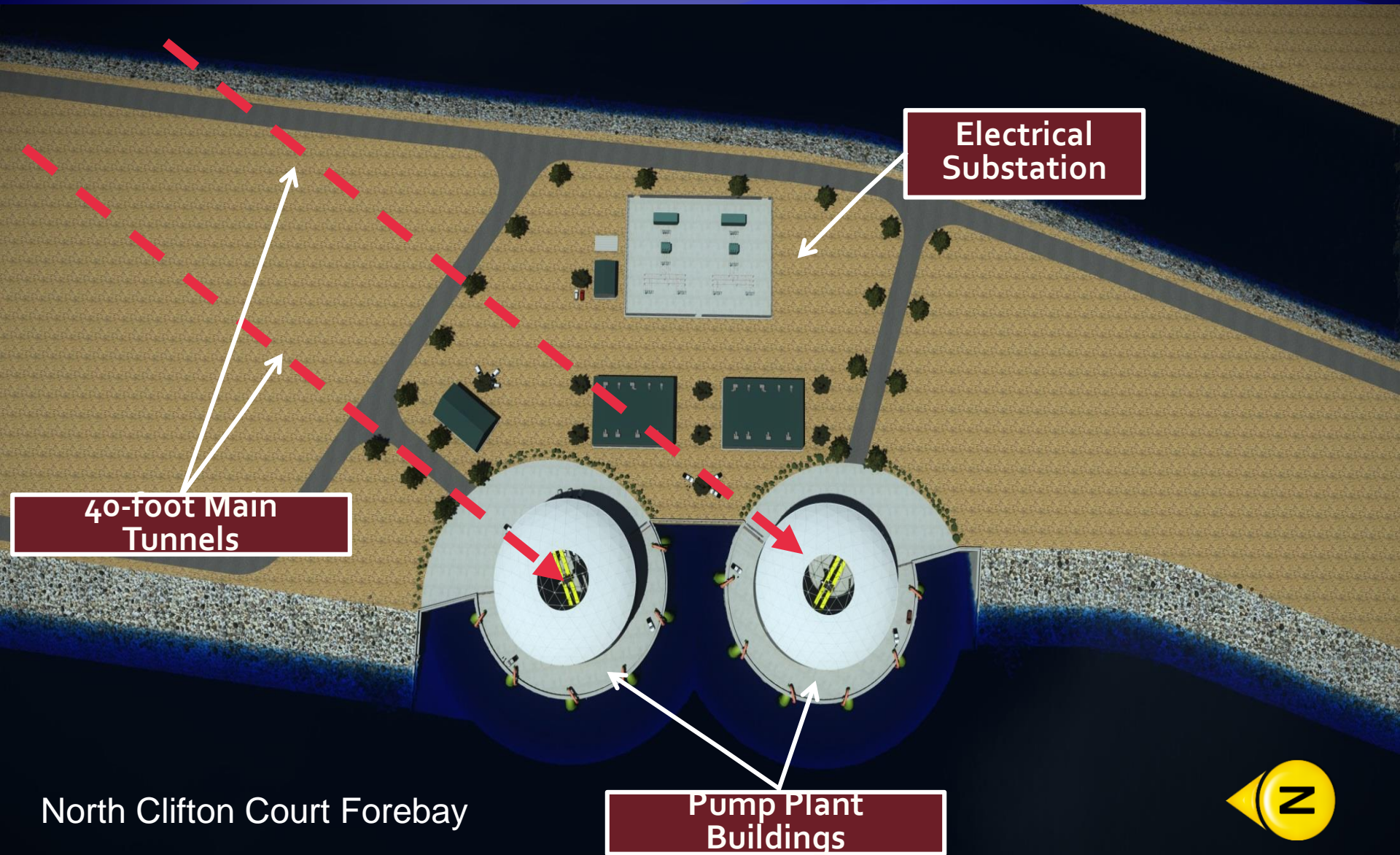


- ◆ Twin bore main tunnels
- ◆ 30 miles long each
- ◆ 150 ft below grade
- ◆ 2-foot thick concrete liner
- ◆ Pressurized face tunnel boring machine
- ◆ ± 45 -ft excavated diameter
- ◆ 40-ft internal diameter

Clifton Court Forebay – Expansion



Clifton Court Forebay – Pump Plants



North Clifton Court Forebay

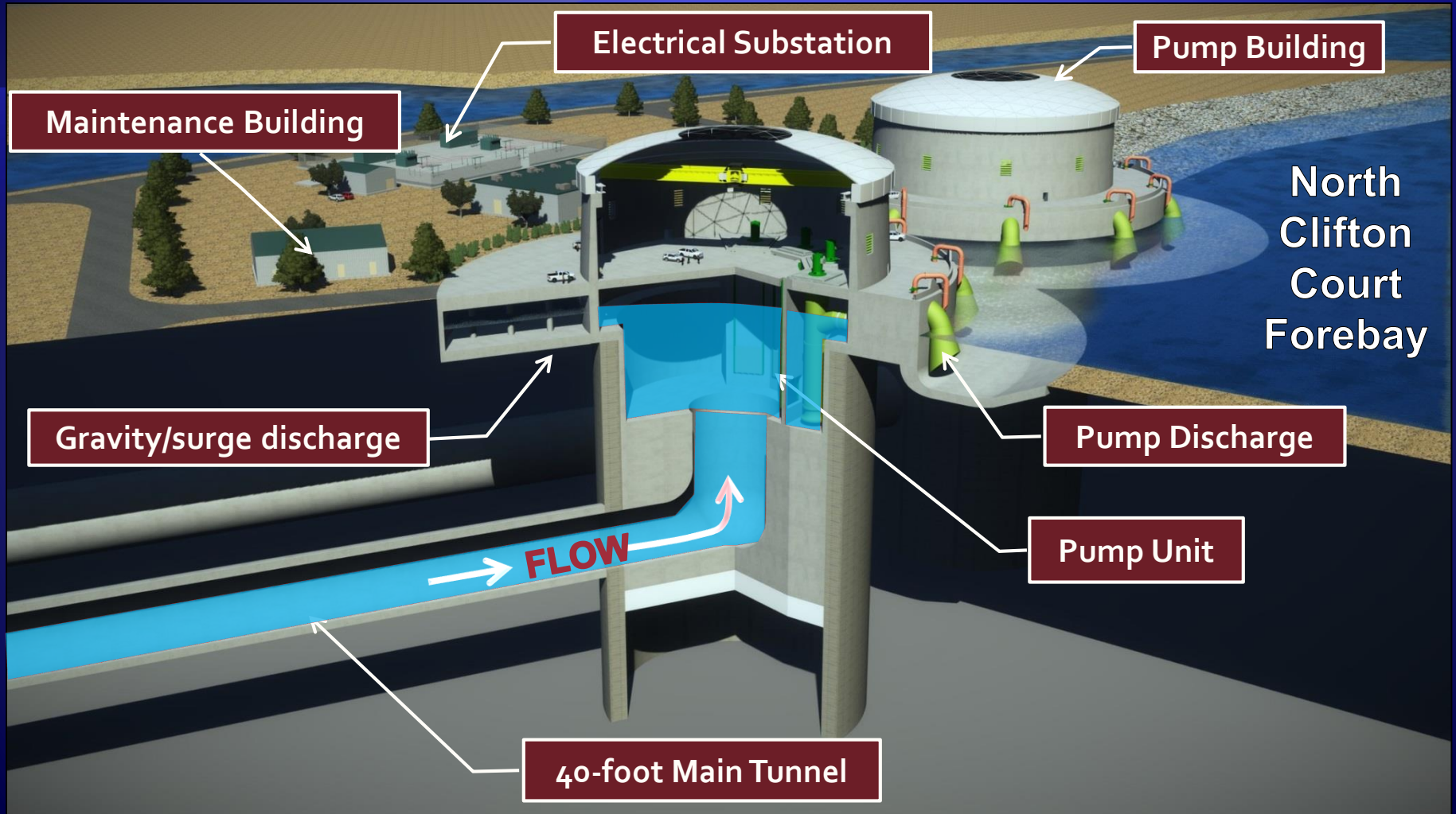
Pump Plant Buildings

Electrical Substation

40-foot Main Tunnels

N

Clifton Court Forebay – Pump Plants

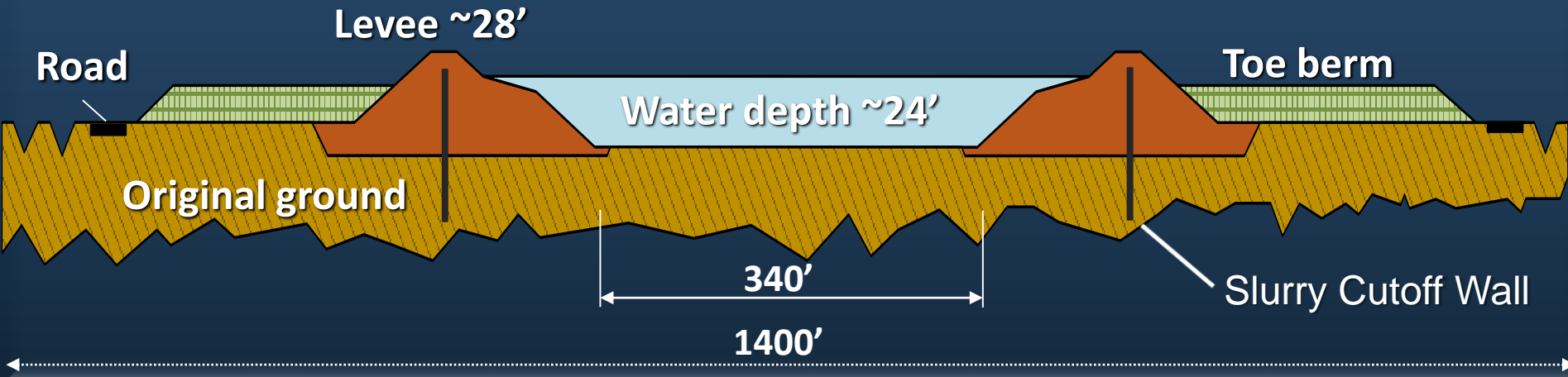


Project Modifications and Mitigation

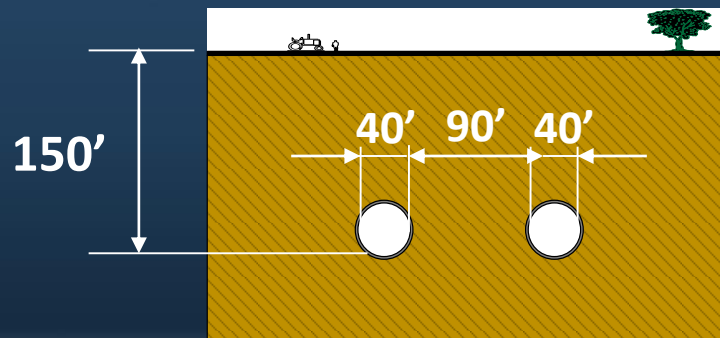
- ◆ Minimized environmental footprint
- ◆ Reduced impacts to Delta communities
- ◆ Maximized use of public lands
- ◆ Reduced overall size of program
- ◆ Provided for gravity flow of diversions

Reduced Footprint - Cross Sections

Original Proposal – Open Canal



Current Proposal – Underground Tunnels

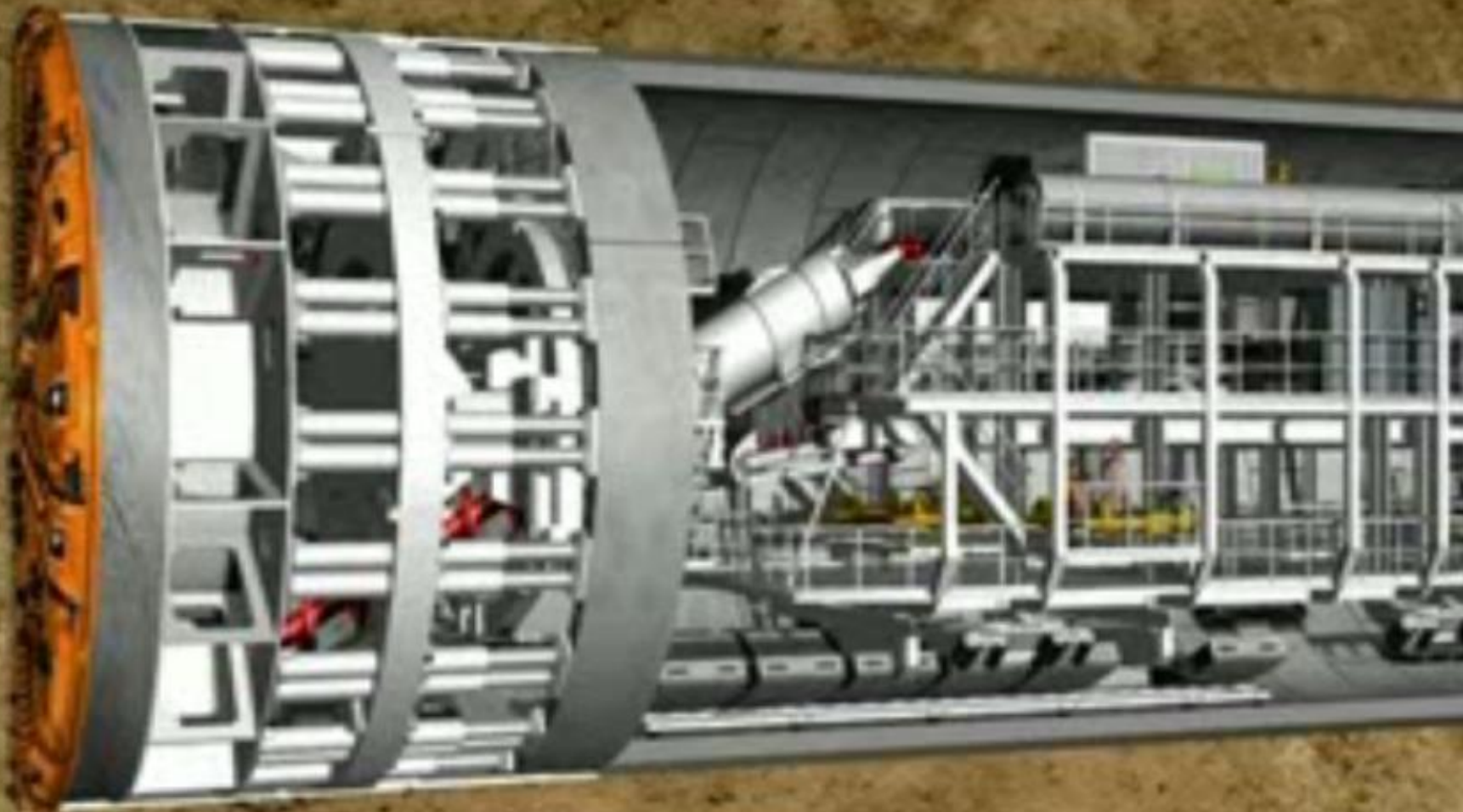


Review of Other Mega-Tunnel Projects

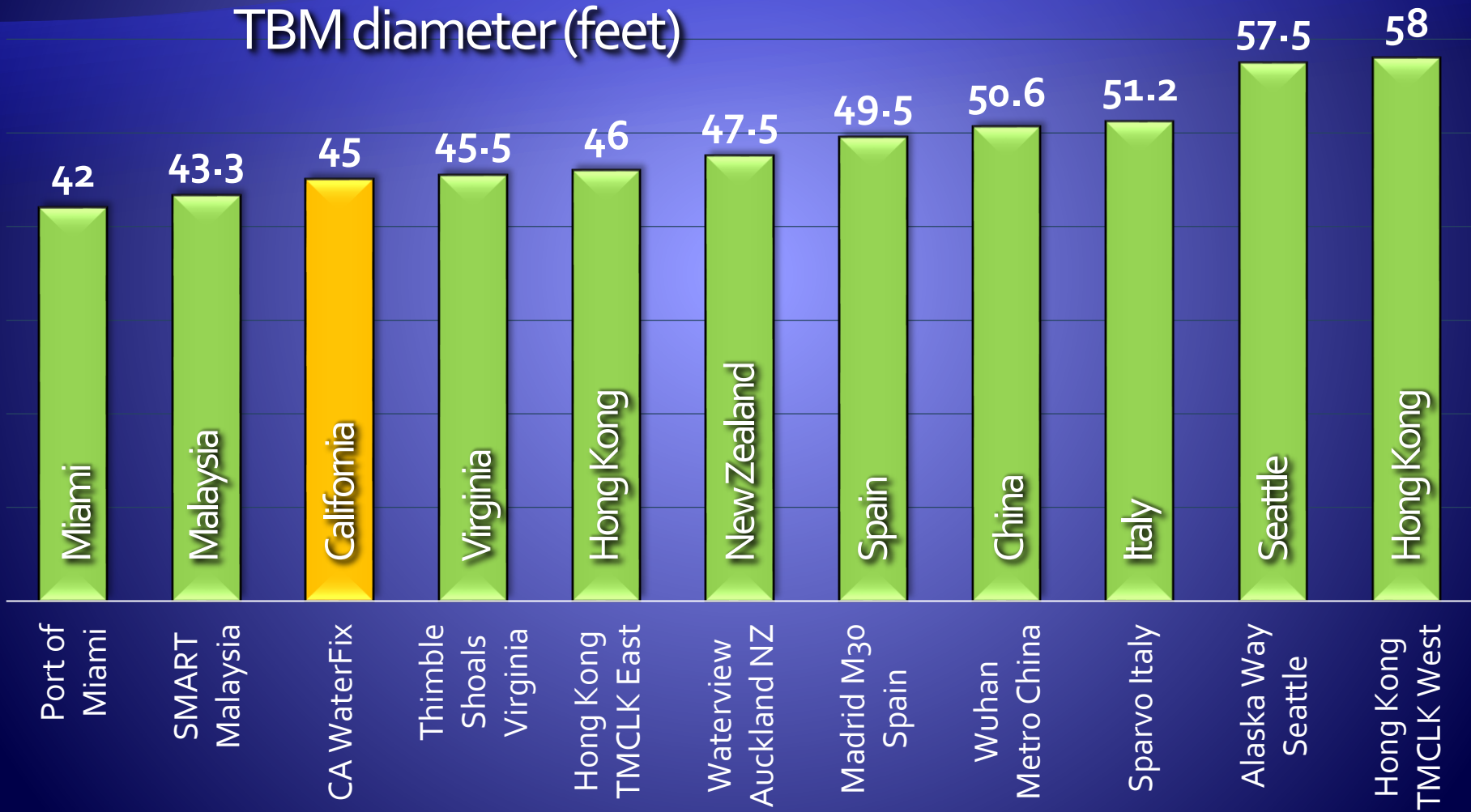
- ◆ The Eurasia Tunnel – Turkey
- ✓ Lee Tunnel – London
- ✓ Port of Miami Tunnel – Florida
- ✓ East Side Access – New York
- ✓ Blue Plains Tunnel Project – District of Columbia
- ✓ Bay Tunnel – San Francisco
- ✓ Willamette River Sewer Overflow Program – Portland
- ✓ Gotthard Base Tunnel – Swiss Alps
- ✓ SR-99 Alaskan Way Replacement – Seattle
- ✓ Tuen Mun-Chek Lap Kok Link – Hong Kong

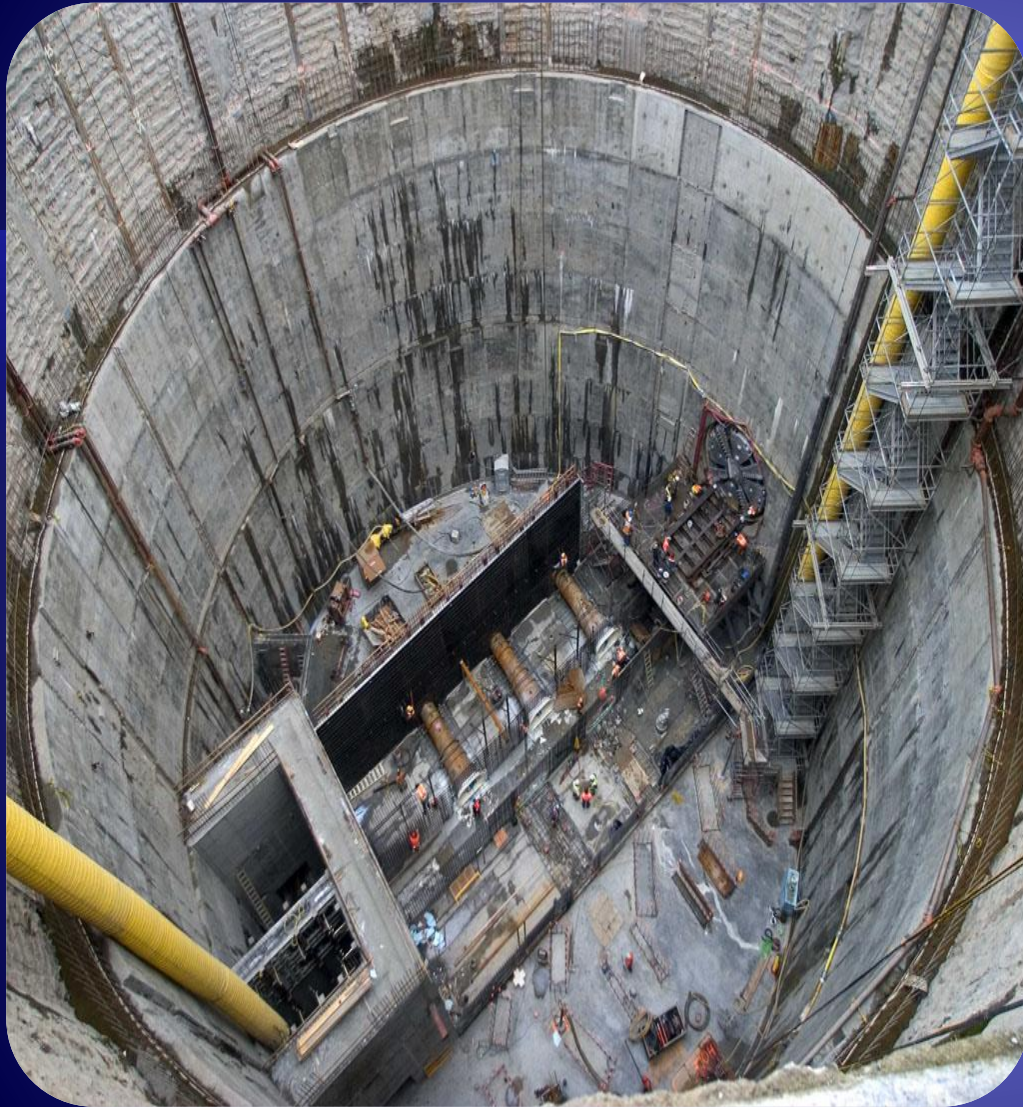
✓ = *Projects visited by program team*

Tunnel Boring Machine



Large Diameter Tunnel Boring Machine Projects





Tunnel Shafts

- Launch/retrieve tunnel boring machines
- Construction maintenance access
- Long-term operational access

Program Schedule



Cost Estimate Preparation

- ◆ Multiple estimates prepared
- ◆ Class 3 estimates based on Conceptual Engineering Report
- ◆ Bottoms up contractor's estimate
- ◆ 2014 dollars

Program Estimate

ITEM	AMOUNT (\$ billions)
Conveyance System	
• Program Management, construction management, and engineering	\$1.91
• Tunnel & shaft construction	\$6.82
• Remaining construction	\$2.68
• Contingency (~36% for tunnels, shafts, remaining construction)	\$3.38
• Land acquisition (includes 20% contingency)	\$0.15
Subtotal	\$14.94
Environmental Mitigation (includes 35% contingency)	\$0.80
OVERALL COST	\$15.74

Program Estimate in 2014 dollars

Cost Estimate Comparison

ITEM	<u>Estimate 1</u> 5RMK Inc. (Billions) ^{1,2}	<u>Estimate 2</u> Jacobs Engineering (Billions) ^{1,2}	<u>Estimate 3</u> Risk Adjusted with Mitigation at 75% Confidence Interval (Billions) ^{1,3}
Construction	\$9.50	\$8.86	\$10.66
Contingency	\$3.38	\$3.15	----
Subtotal	\$12.88	\$12.01	\$10.66
PM/CM/Eng	\$1.91	\$1.91	\$1.91
Land acquisition	\$0.15	\$0.15	\$0.15
Overall Total	\$14.94	\$14.07	\$12.72

1. Program estimates in 2014 dollars

2. ~36% contingency on construction for 5RMK and Jacob Engineering estimates

3. Based on risks known at time of assessment

Approach to Risk Management

1

AVOID

Revise tunnel alignment to avoid sensitive features

2

MITIGATE

Probe ahead and grout to mitigate risk from faults

3

ALLOCATE

Provide clear contractual baselines to allocate residual risk

Design and Construct Authority

- ◆ Single-purpose organization
- ◆ Under contract with State DWR
- ◆ Independent staffing
- ◆ World-class expertise and methods
- ◆ Sunsets at completion of project commissioning

Design and Construct Authority

State Department of Water
Resources

Joint Powers Authority
(Public Agency)

Program Director

Finance &
Accounting

Public
Education

Internal
Audit

Program
Manager

Legal
Counsel

Safety & Risk
Management

