Update on Bay-Delta Conservation Plan and Delta Conveyance

Special Committee on Bay-Delta

Item 4b; April 26, 2011

Status

- State administration
  - Formulated new BDCP governance approach to improve management & policy decision-making
  - Reviewed schedule to ensure milestones are being met
- Finalizing biological effects analysis

Upcoming Tasks

- Develop operations criteria
- Develop assurances including adaptive management range
- Negotiate cost-share & funding mechanisms
- Analysis of EIR/EIS

Bay-Delta Conservation Plan
Overview

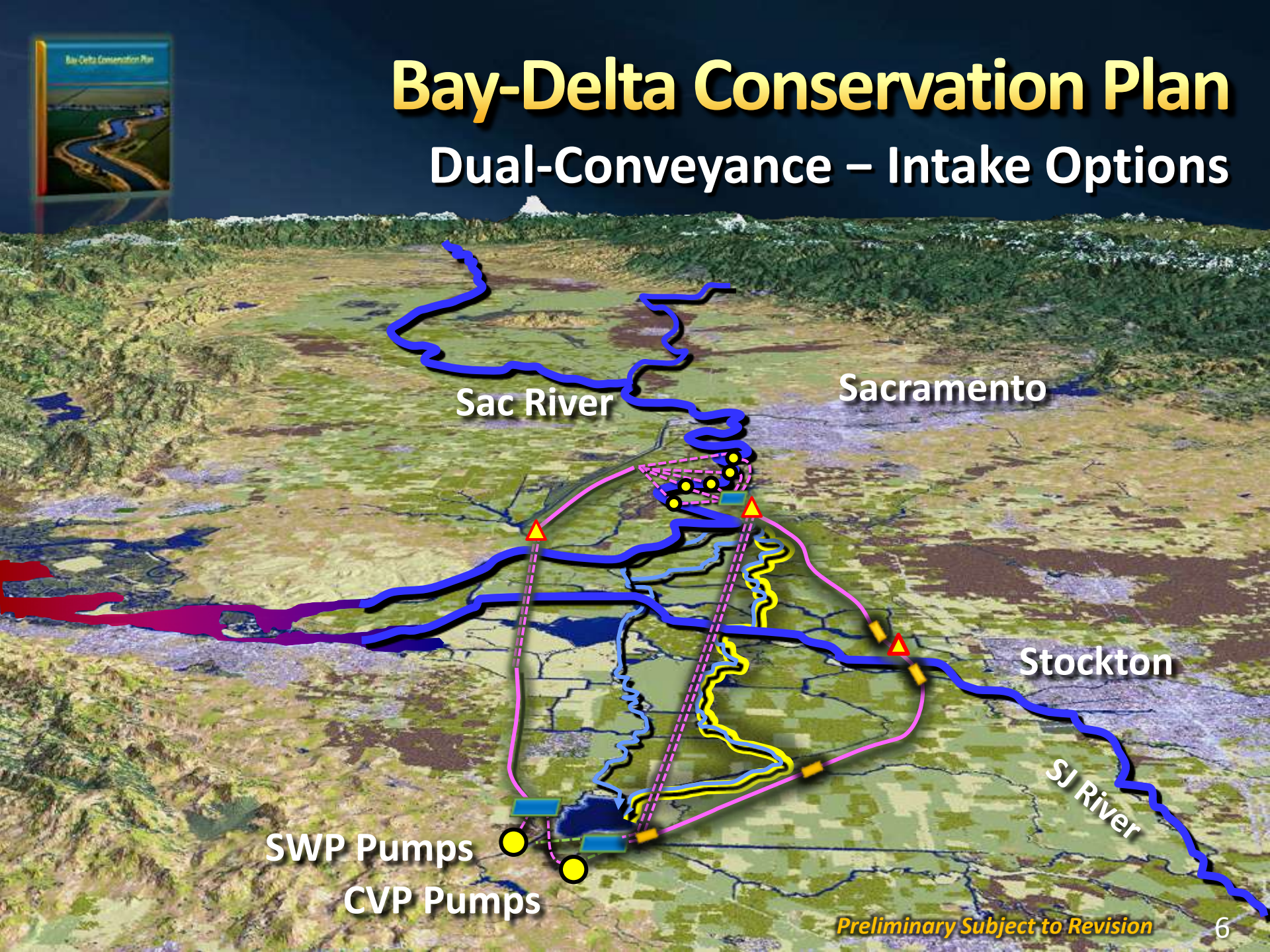
- Multi-species approach to endangered species protection
- Includes habitat conservation, conveyance improvements, and other stressors control
- Regulatory assurances
  - Long-term operations permit
  - Coverage for existing & future listed species
  - Future regulatory obligation defined upfront

Bay-Delta Conservation Plan
Conveyance Improvement Questions

- What will the project look like?
- What are the benefits & risks?
- What will it cost?

Bay-Delta Conservation Plan

Dual-Conveyance – Intake Options



Preliminary Subject to Revision

Bay-Delta Conservation Plan

Dual-Conveyance – Central Tunnel

- River Intakes (Five 3,000 cfs w-screens)
- Regulating Forebay (5,250 acre-ft capacity)
- Intermediate Pumping Plant
- Two Tunnels – 35 mi. (37 ft outside diameter)
- Byron Tract Forebay (4,300 acre-ft capacity)

Sac River

Sacramento

Stockton

SJ River

SWP Pumps

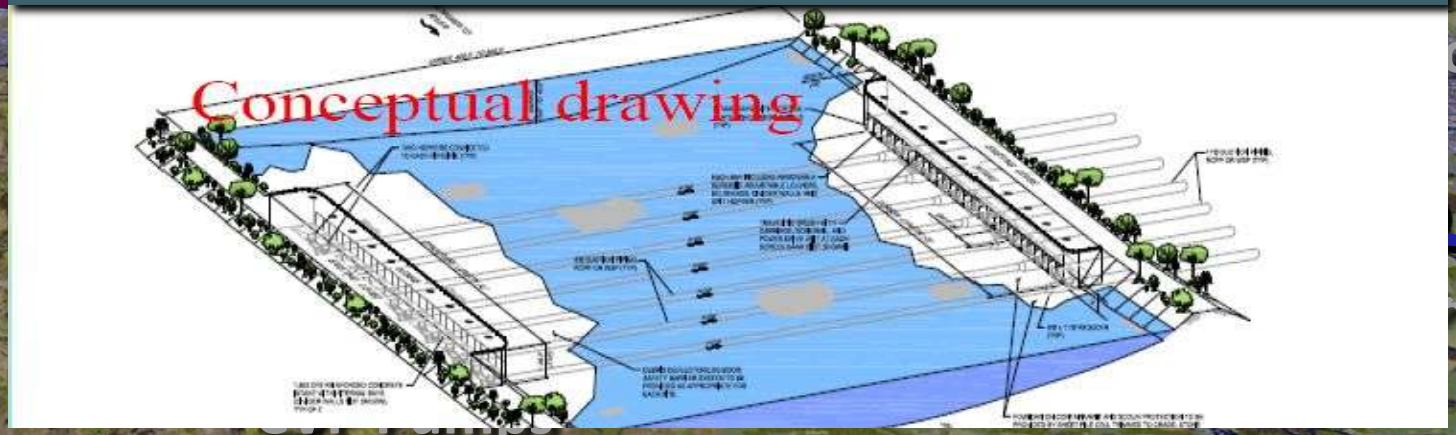
CVP Pumps

Preliminary Subject to Revision

Bay-Delta Conservation Plan

Dual-Conveyance – Intake Options

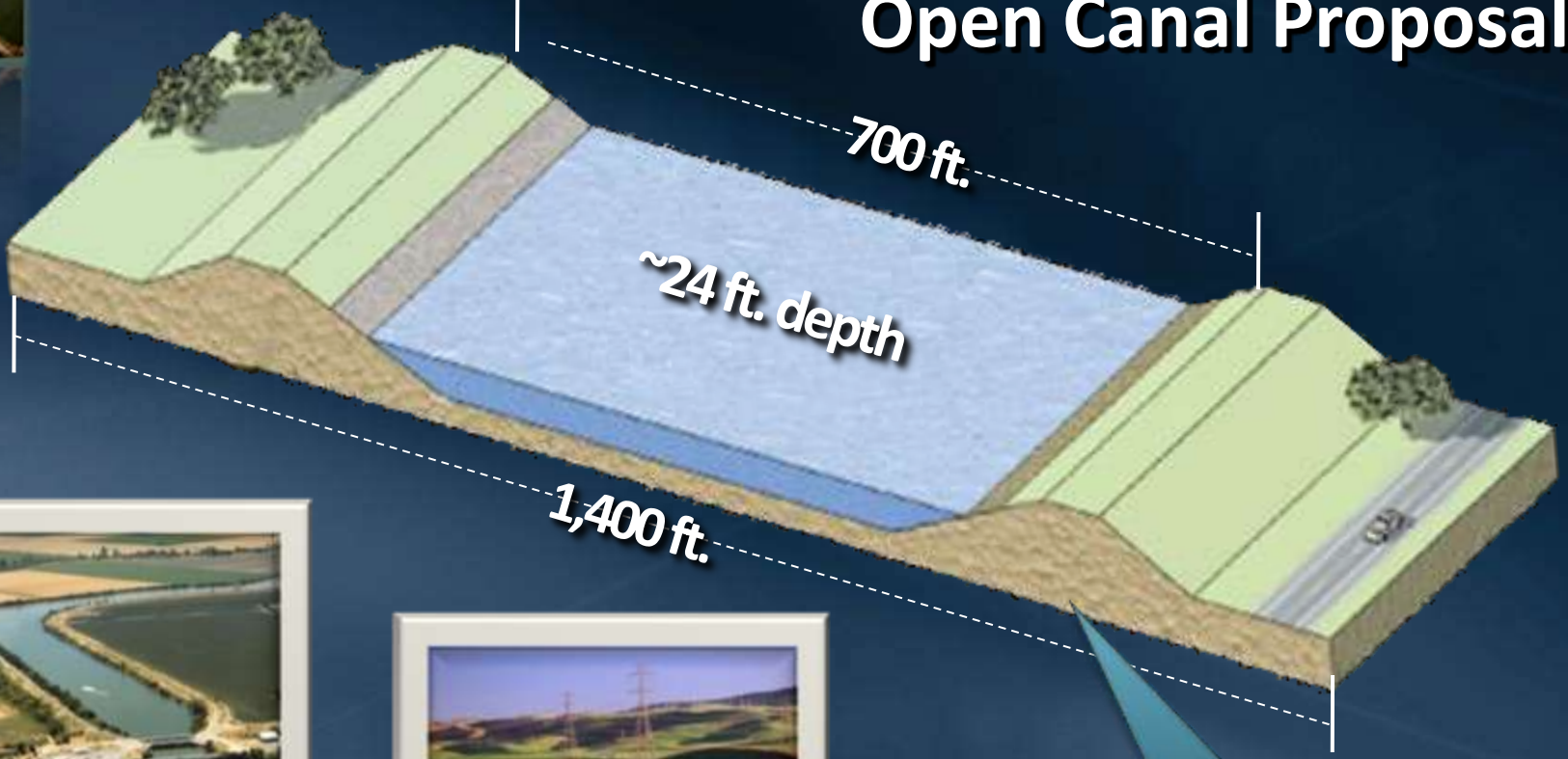
On-Bank Screen



Preliminary Subject to Revision

Bay-Delta Conservation Plan

Open Canal Proposal



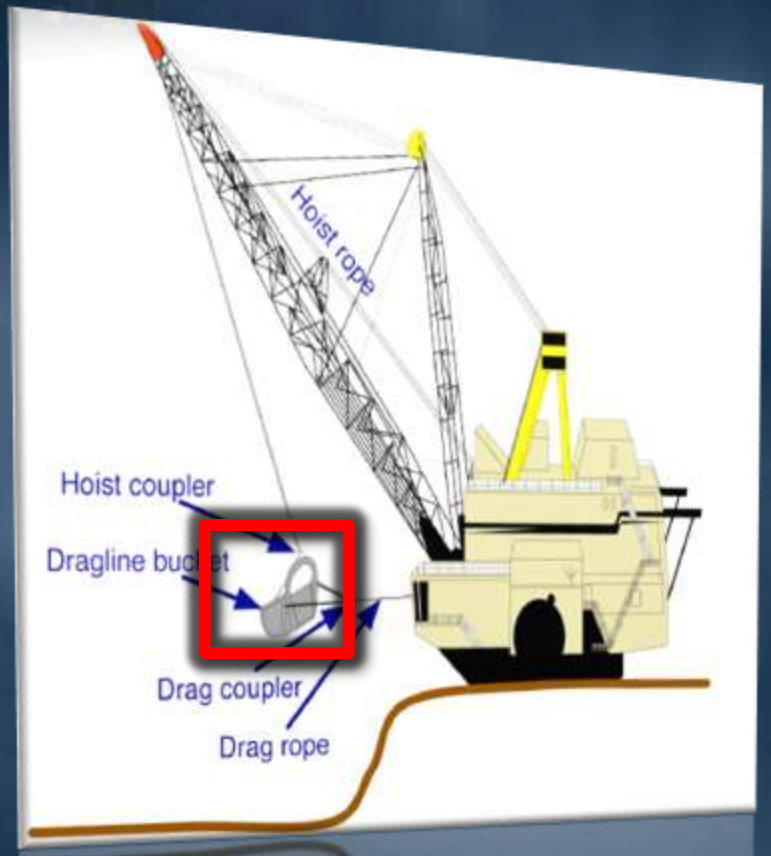
Delta Cross Channel
(500’ wide x 15’ deep)

California Aqueduct
(200’ wide x 30’ deep)

Levees
Up to 35 ft high

Bay-Delta Conservation Plan

Open Canal Proposal

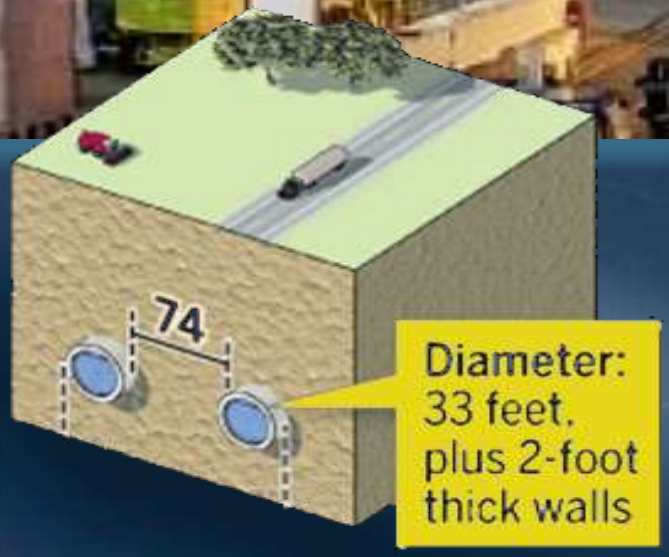


Canal Dredging

Walking Dragline

Tunnel Boring Machine

- **Inland Feeder Tunnel**
  - 12 ft diameter (19’ O.D.) = 1,000 cfs
- **Delta Tunnel**
  - 2 @ 33 ft. dia. (37’ O.D.) = 15,000 cfs



Preliminary Subject to Revision

Large Diameter Tunnels

- **51 ft. – Shanghai, China**
  Yangtze River highway tunnel; 2 bores
- **30 ft. – Chicago, USA**
  109 mile sewer overflow tunnel
  30 tunnel boring machines
- **24 to 45 ft. – Cleveland, USA**
  Sewer overflow tunnels
- **33 ft. – Nagarjuna Sagar NP, India**
  27 mile water supply tunnels
- **41 ft. – Jinping, China**
  40 mile hydroelectric tunnels
- **44 ft. – Kuala Lumpur, Malaysia**
  Dual-deck transportation/stormwater

Conveyance Improvements
Footprint

Land Acquisition	West Canal	Central Tunnel	East Canal
Footprint	18,643 ac.	6,525 ac.	18,065 ac.
Subsurface Easement	920 ac.	1,945 ac.	506 ac.
Land (Residential & Commercial	194 ac.	26 ac.	224 ac.
Utilities	300 conflicts	70 conflicts	150 conflicts
Transp. (Crossings)	20 Roads	0	18 Roads
Navigation (Siphons)	12 water courses	0	8 water courses

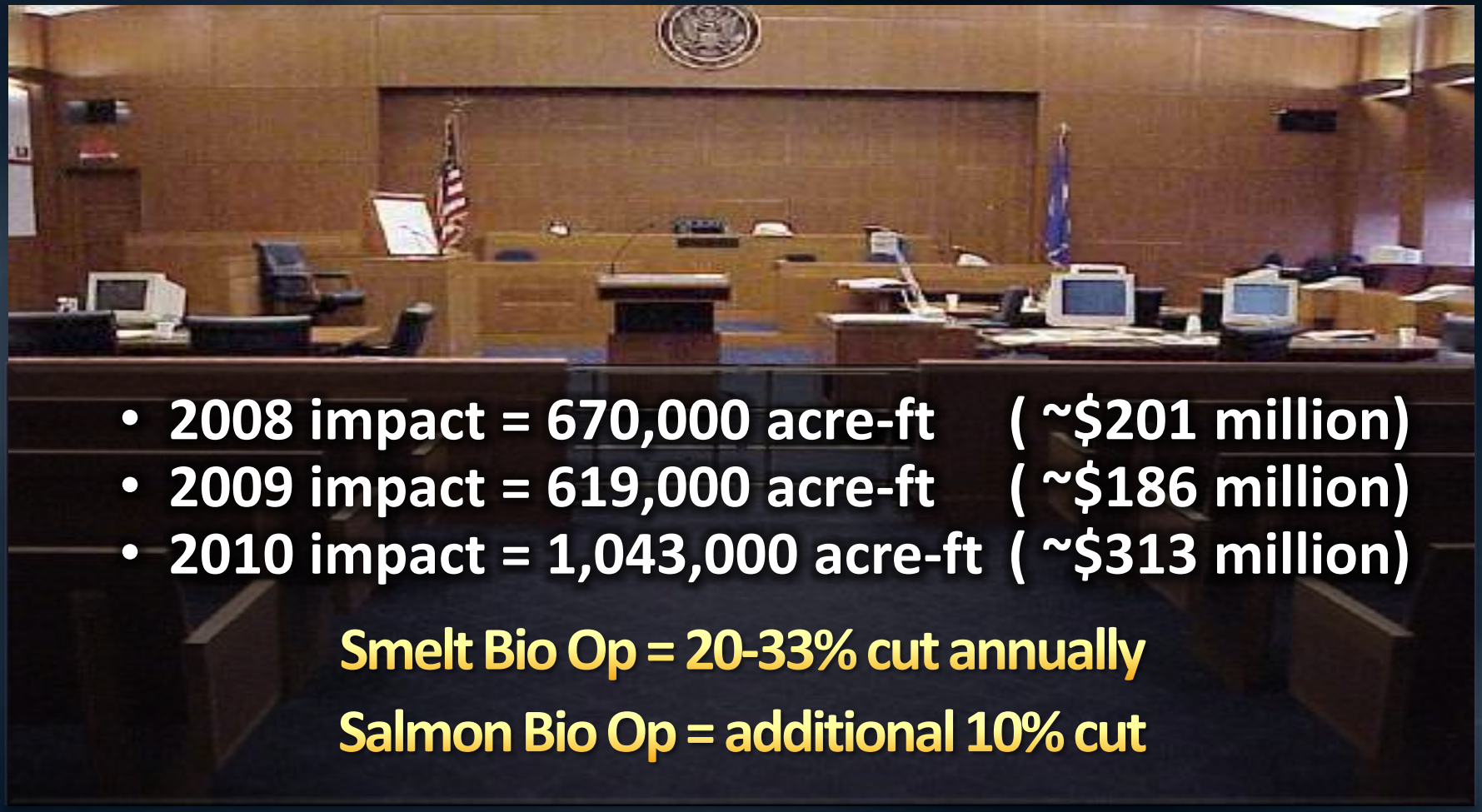
Temporary right-of-way for construction is included

Benefits

- What can be delivered without new conveyance?
- What can be delivered with new conveyance?
- What size should the project be?

Regulatory Water Costs *

2008-2010 Biological Opinion Impacts



- 2008 impact = 670,000 acre-ft (~$201 million)
- 2009 impact = 619,000 acre-ft (~$186 million)
- 2010 impact = 1,043,000 acre-ft (~$313 million)

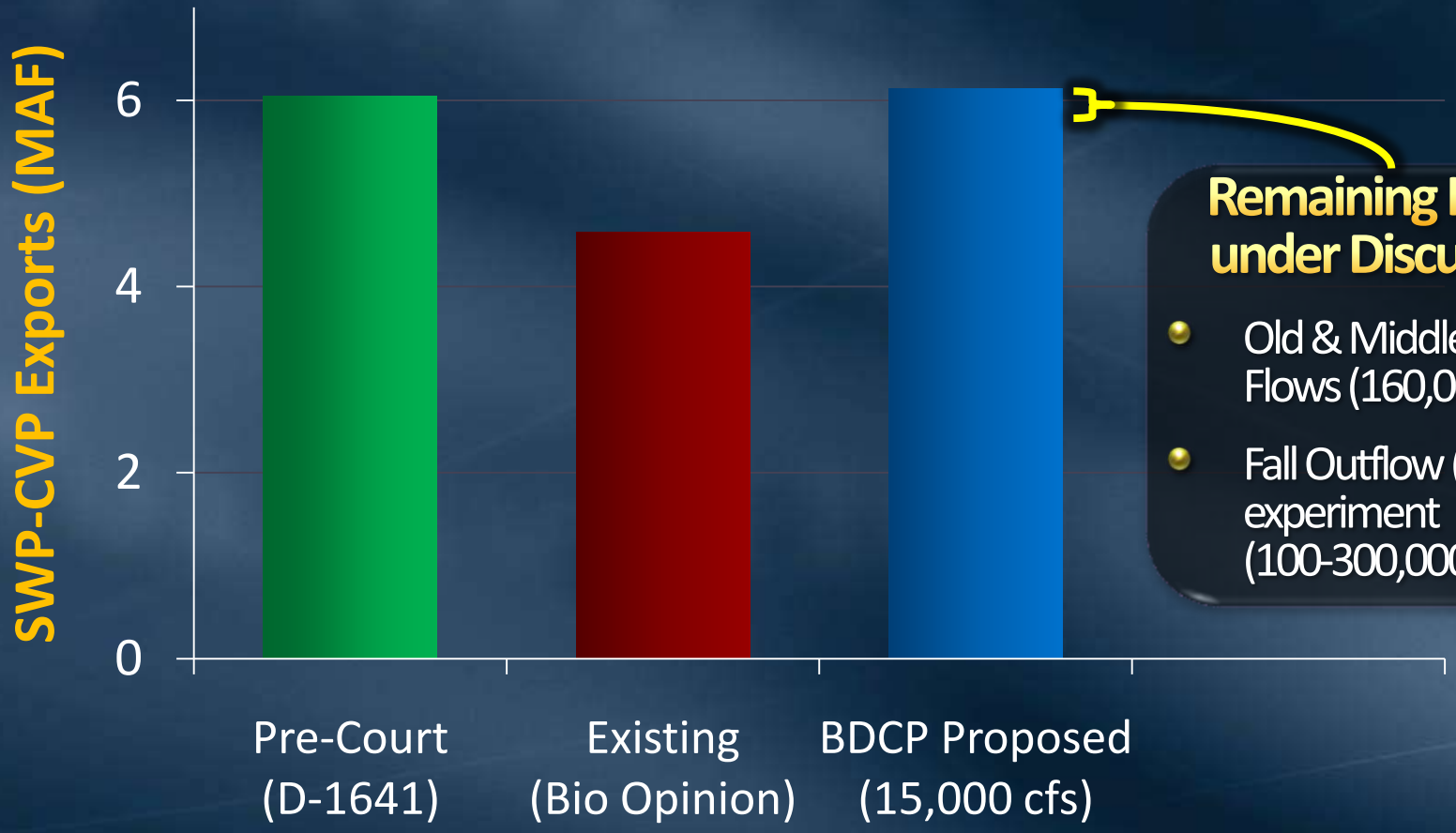
Smelt Bio Op = 20-33% cut annually

Salmon Bio Op = additional 10% cut

** State Water Project & Central Valley Project*

Delta Conveyance

Water Supply (SWP & CVP)



Remaining Issues under Discussion

- Old & Middle River Flows (160,000 AF)
- Fall Outflow (X2) experiment (100-300,000 AF)

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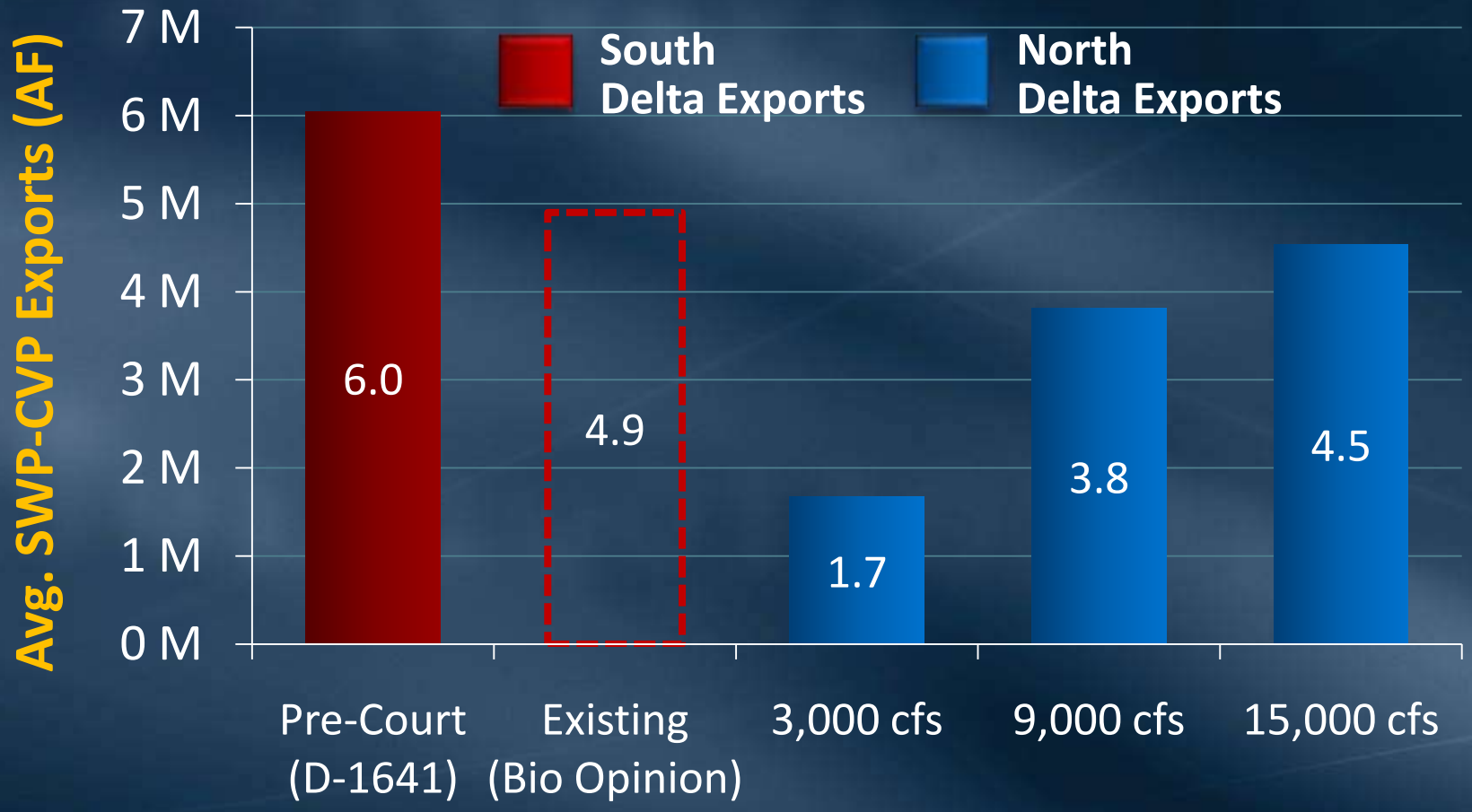
What Happens If There Are No South Delta Diversions?

(Due to sea-level rise, seismic/flood, ESA restrictions)



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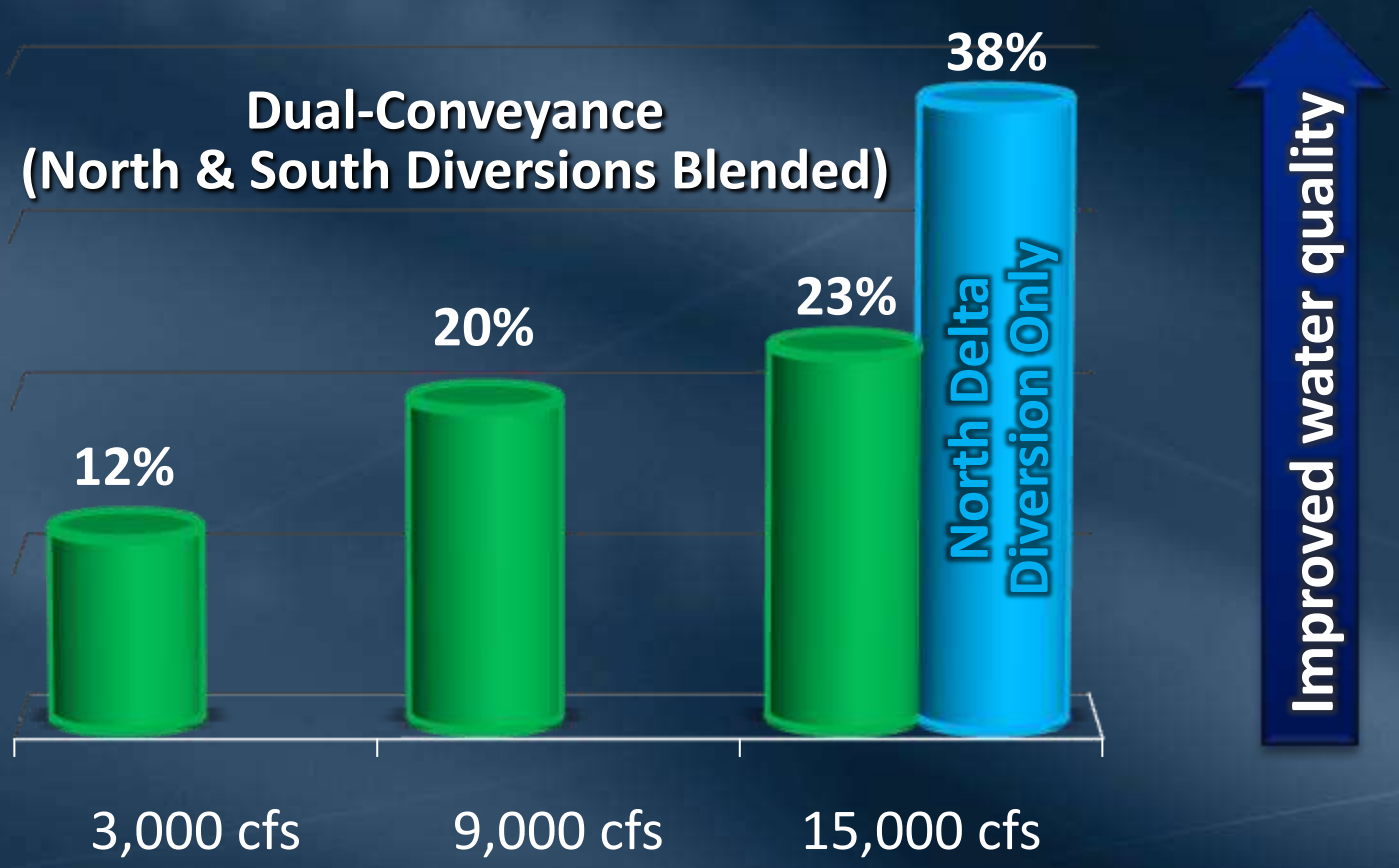
Delta Conveyance

Export Water Quality – Salinity Reduction



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Delta Conveyance
Export Water Quality – Salinity Reduction

- Reduced salinity allows for
  - Easier to meet MWD blending goals
  - Improved quality for groundwater replenishment
  - Lower salinity by 100mg/L = ~ $95M/yr regional savings

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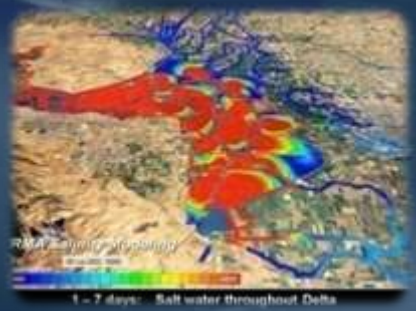
New Delta Conveyance
Other Benefits



- Water Quality
  - Reduced organic carbon, bromides
  - Reduced water treatment costs
- Improved Reliability
  - Avoids seismic risks of levee failure
  - Avoids potential future regulatory restrictions
  - Enhances ability to handle future climate change challenges

Preliminary Subject to Revision

Conveyance Sizing: Is Smaller Simpler?

How do the tunnels differ?

Conveyance Sizing – Is Smaller Simpler?

Options Under Review

- 3,000 cfs — Two 18-ft tunnels
- 6,000 cfs — Two 23-ft tunnels
- 9,000 cfs — Two 26-ft tunnels
- 12,000 cfs — Two 29-ft tunnels
- 15,000 cfs — Two 33-ft tunnels

Smaller is NOT Simpler …

Tunnel boring machine size necessary for 3,000 cfs Delta tunnels

Does Smaller Conveyance Solve Environmental Problems?

"The operation of an isolated conveyance will provide opportunities to manage the flow of water which will enable the operators to better emulate the natural flows, which were evident before all of man's changes to the system…"

John McCamman, Director
California Fish and Game

Chinook Salmon

Longfin smelt

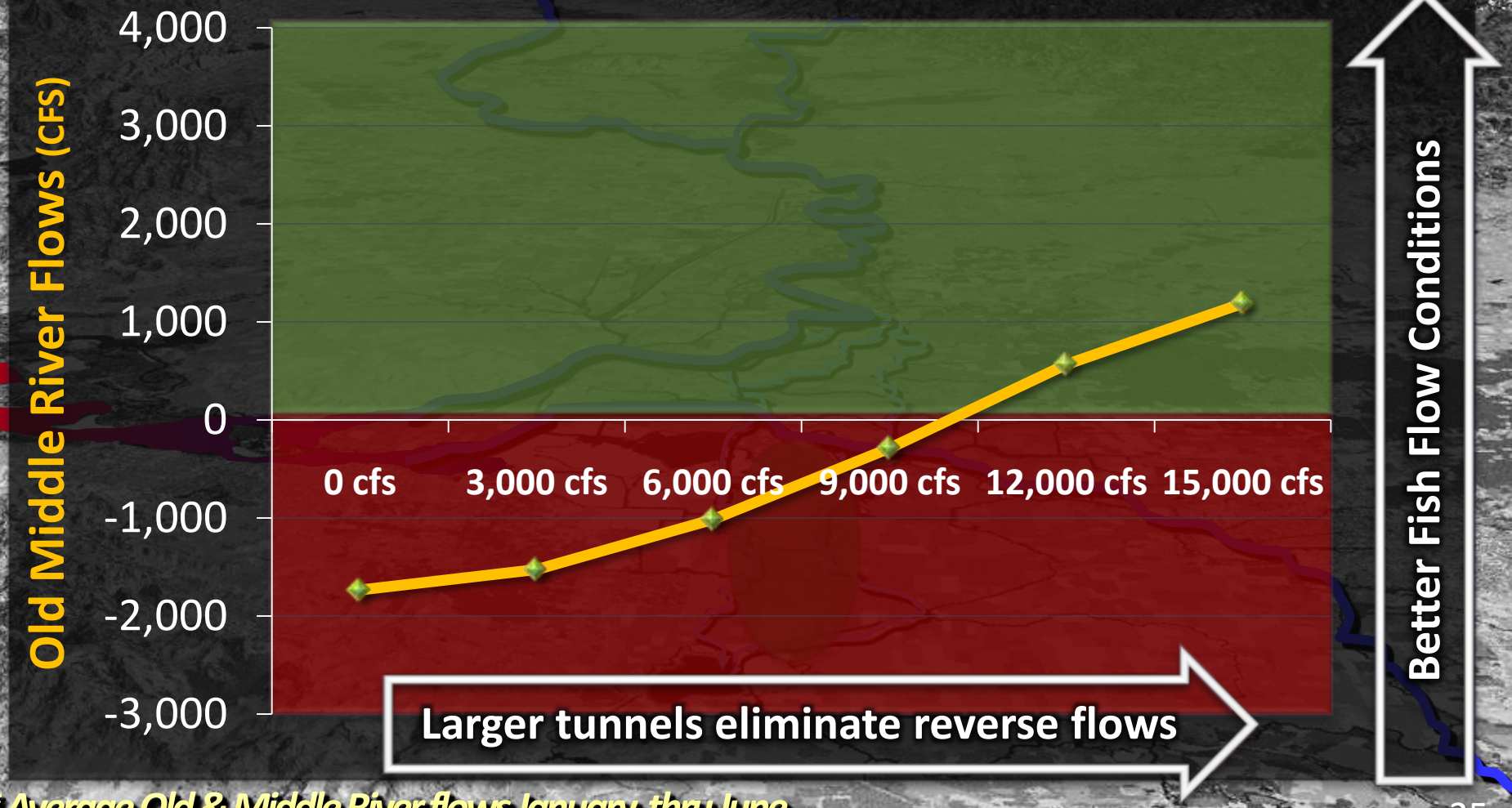
Steelhead

Green Sturgeon

Delta smelt

Goal – In-Delta Rivers Flowing Forward

Old & Middle River Flows*



* Average Old & Middle River flows January thru June

Delta Conveyance Options

Risk Analysis

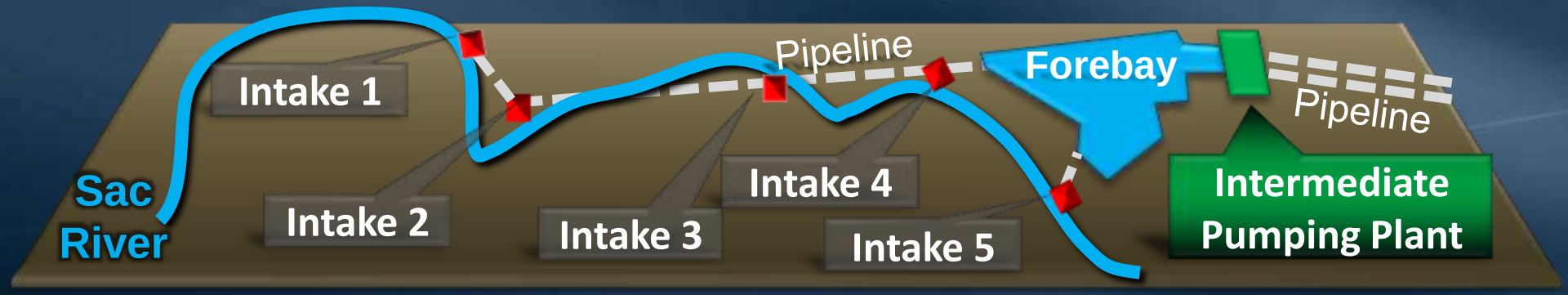
Delta Conveyance
Risk Assessment Results

- **Top Cost Risks**
  - Differing geotech conditions
  - Potential habitat mitigation (terrestrial)
  - Available tunnel contractor pool
  - Inability to adjust construction activities to avoid delay

Engineering Optimization

Tunnel Flow – Gravity vs. Pumped

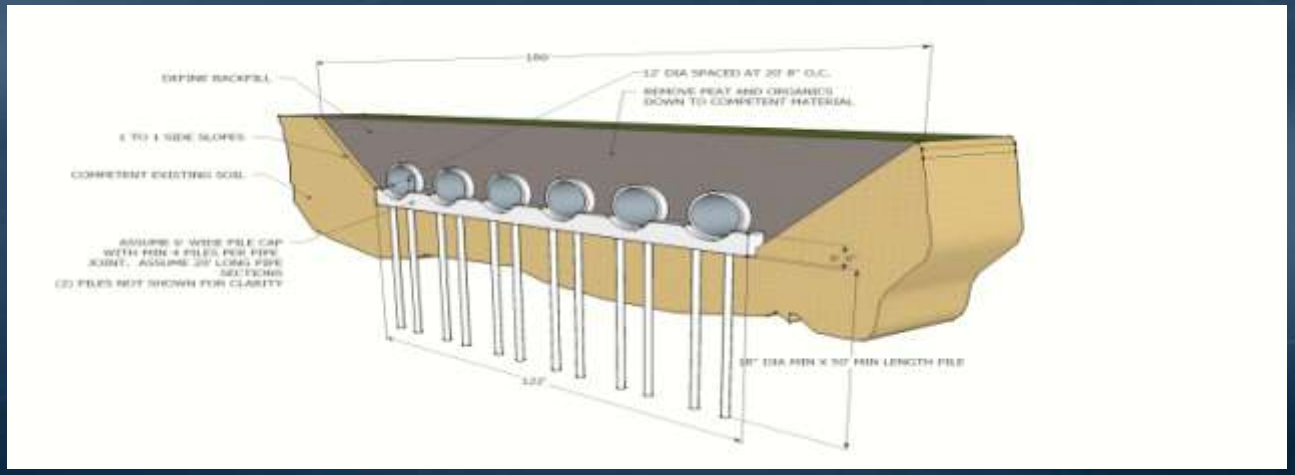
- Pumped Flow
  - Tunnel diameter = 37 ft
  - Higher internal pressures & stress
  - Higher annual costs (energy, maintenance, replacement)
- Gravity Flow
  - Tunnel diameter = 45 ft
  - Lower internal pressures & stress
  - Lower annual costs



Engineering Options Analyzed

3,000 cfs "Cut & Cover" Construction vs. Tunnel

Capacity	Capital Cost	Total Annual Costs (over 50-yr)	Pipe Sizes	Foundation Requirements
Tunnel	$ 7.4 B	$ 0.95 billion	2 @ 18 ft	None
Cut & Cover	$ 9.7 B	$ 0.95 billion	6 @ 12 ft	Piles and Concrete Caps



Engineering Optimization

Other Analyses

- Contracting methods & contractor availability
- Alignment optimization
- Tunnel lining reinforcements
- Schedule & sequencing of tunnel construction
- Tunnel profile – depth, slope changes

Delta Conveyance Options

Cost Analysis

Delta Conveyance
Cost Analysis

- East Canal ~ $8 billion *
- West Canal ~ $9 billion *
- Tunnel ~ $12.7 billion *

* *URS developed initial cost estimates; Second independent expert cost analysis from 5RMK Inc completed in Jan. 2010.*

* *Includes 35% construction contingency on tunnel (25% on non-tunnel) and 18% for engineering/project management.*

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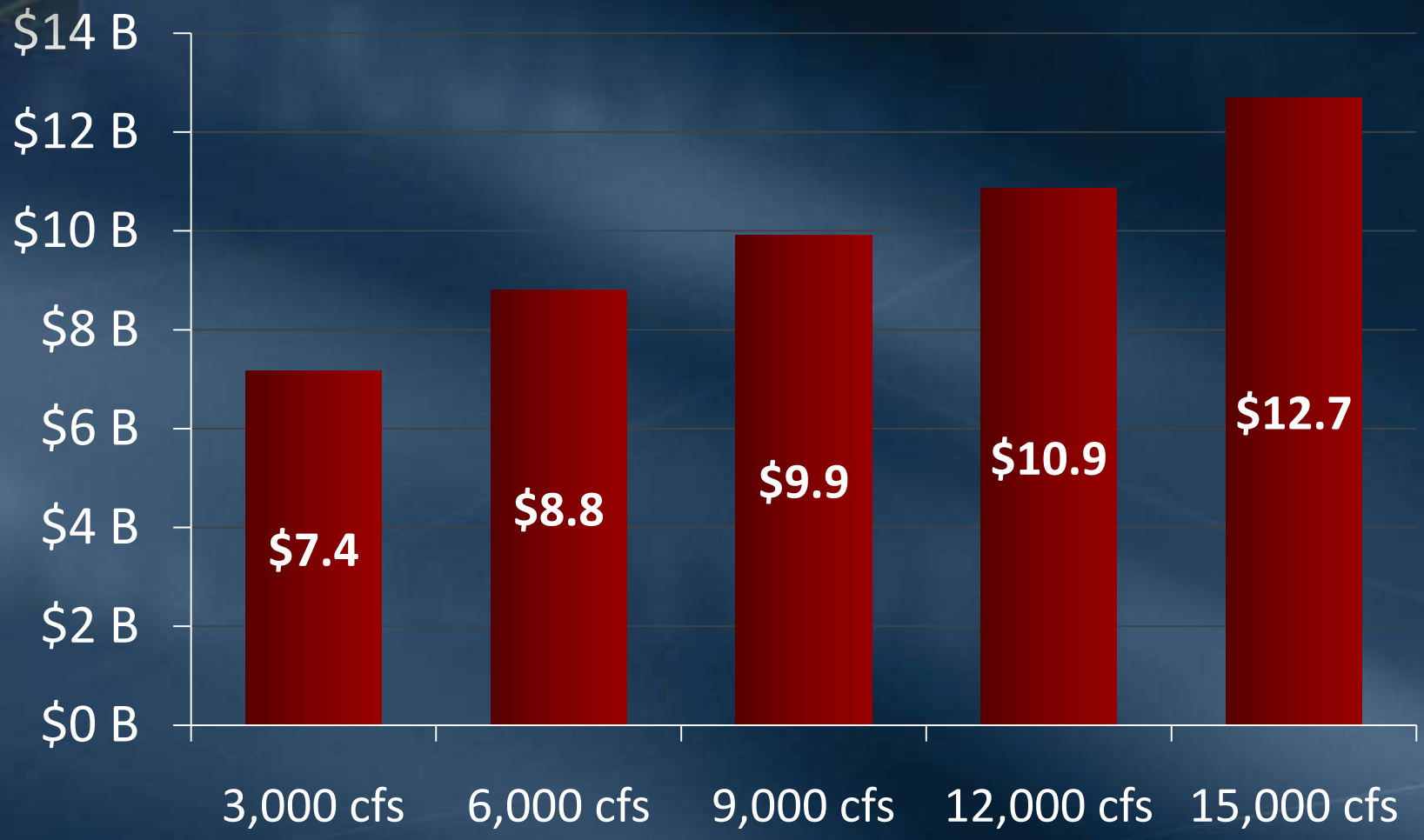
New Delta Conveyance

Tunnel – Estimated Capital Costs



Costs based on Dec 2010 DHCCP estimate (in billions)

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What Tunnel Per Unit of Capacity Is the Most Expensive to Build?

$ million per cfs capacity

Costs based on Dec 2010 DHCCP estimate (in millions)

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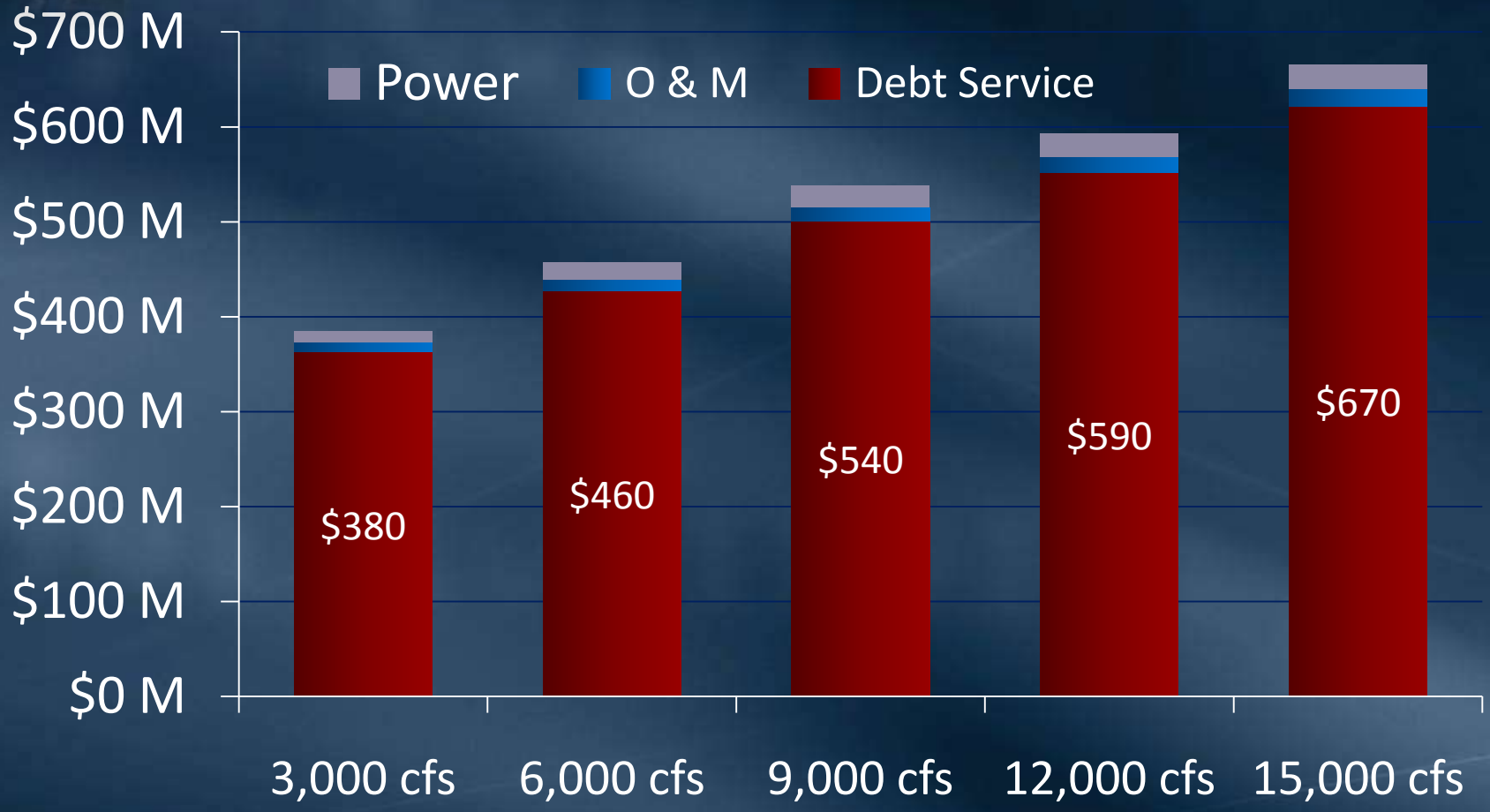
New Delta Conveyance

Total Annual Costs



Costs based on Dec 2010 DHCCP estimate (in millions)

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Delta Conveyance
Capital Cost per Acre-Feet

Alignment	Repayment Based On	
	Incremental New Supplies	Average SWP Deliveries
East (~ $8 B)	~ $326/AF	~ $68/AF
West (~ $9 B)	~ $367/AF	~ $77/AF
Tunnel (~ $12.7 B)	~ $518/AF	~ $109/AF

Central Valley transfers: ~$250-$300 per acre foot

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Long-Term Implementation
Estimated Costs

Conveyance	Obligations	
	Total Program	Metropolitan Share
Capital	~$8 - $13 billion	~$1.8 - $3.0 billion
O&M (annual)	~$14 - $18 million/yr	~$3 - $4 million/yr
Energy (annual)	~$16 - $55 million/yr	~$4 - $12 million/yr

Bay-Delta Conservation Plan
Preliminary Cost Analysis

Improvements	Costs *	Funding Source
Conveyance	$12.7 billion	Water Exporters
Eco-Restoration & Other Stressors	$3.6 billion	Fed/State/Water Exporters/Other

** Cost is based on midpoint estimates*

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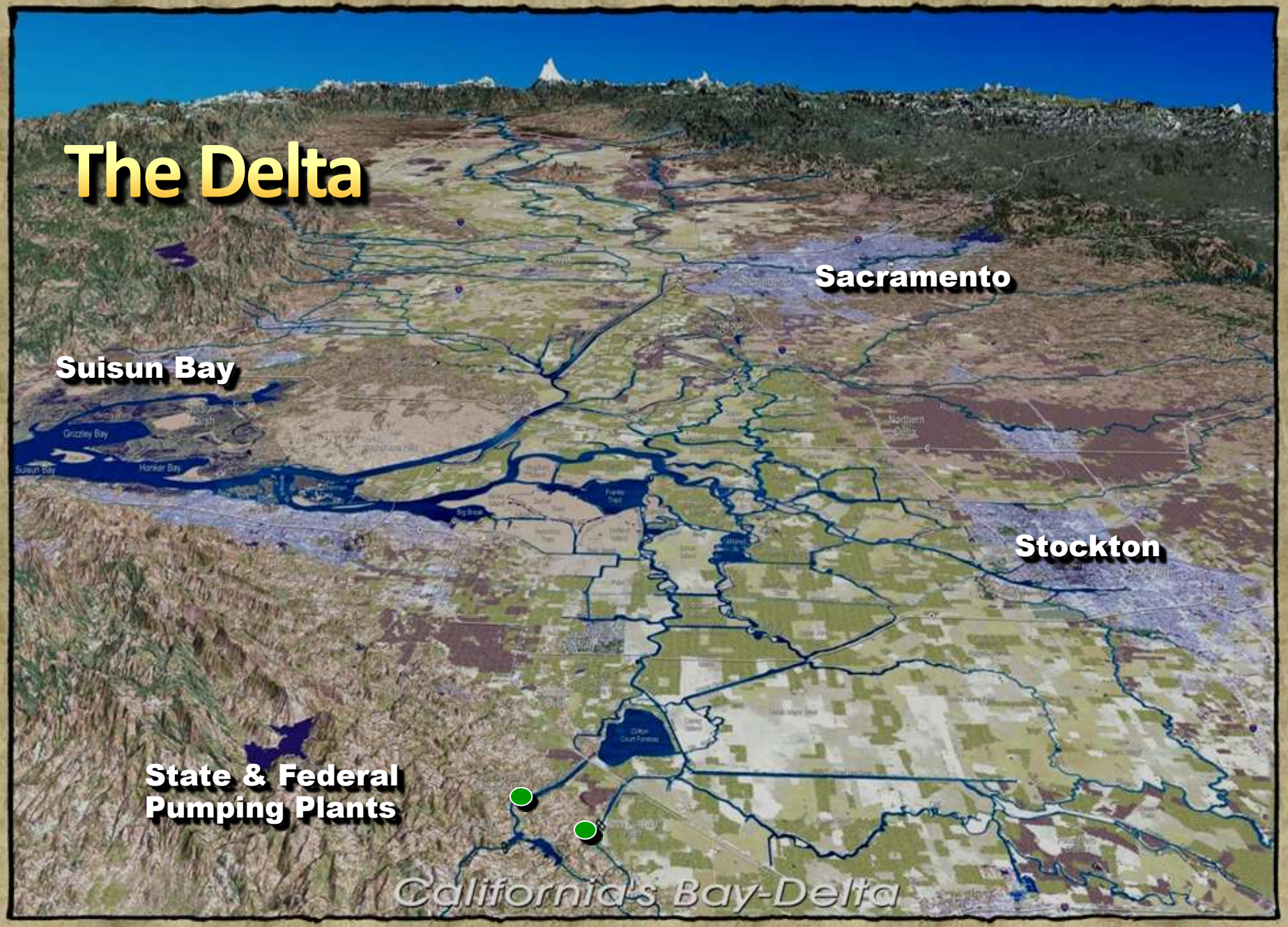
Upcoming Tasks

- Analyze other alternatives in EIR/EIS
- Refine project description as needed
- Continue engineering optimization
- Continue financial plan development
  - SWC Finance Workgroup in coordination with CVP contractors


The Delta
Sacramento
Suisun Bay
Stockton
State & Federal
Pumping Plants
California's Bay-Delta