City of Santa Cruz

Desalination Feasibility Update Review

Water Commission Presentation

November 6, 2017

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In Collaboration with Kennedy/Jenks Consultants

Presentation Overview

- Purpose of review & planning context
- Report overview and conclusions
- Next steps

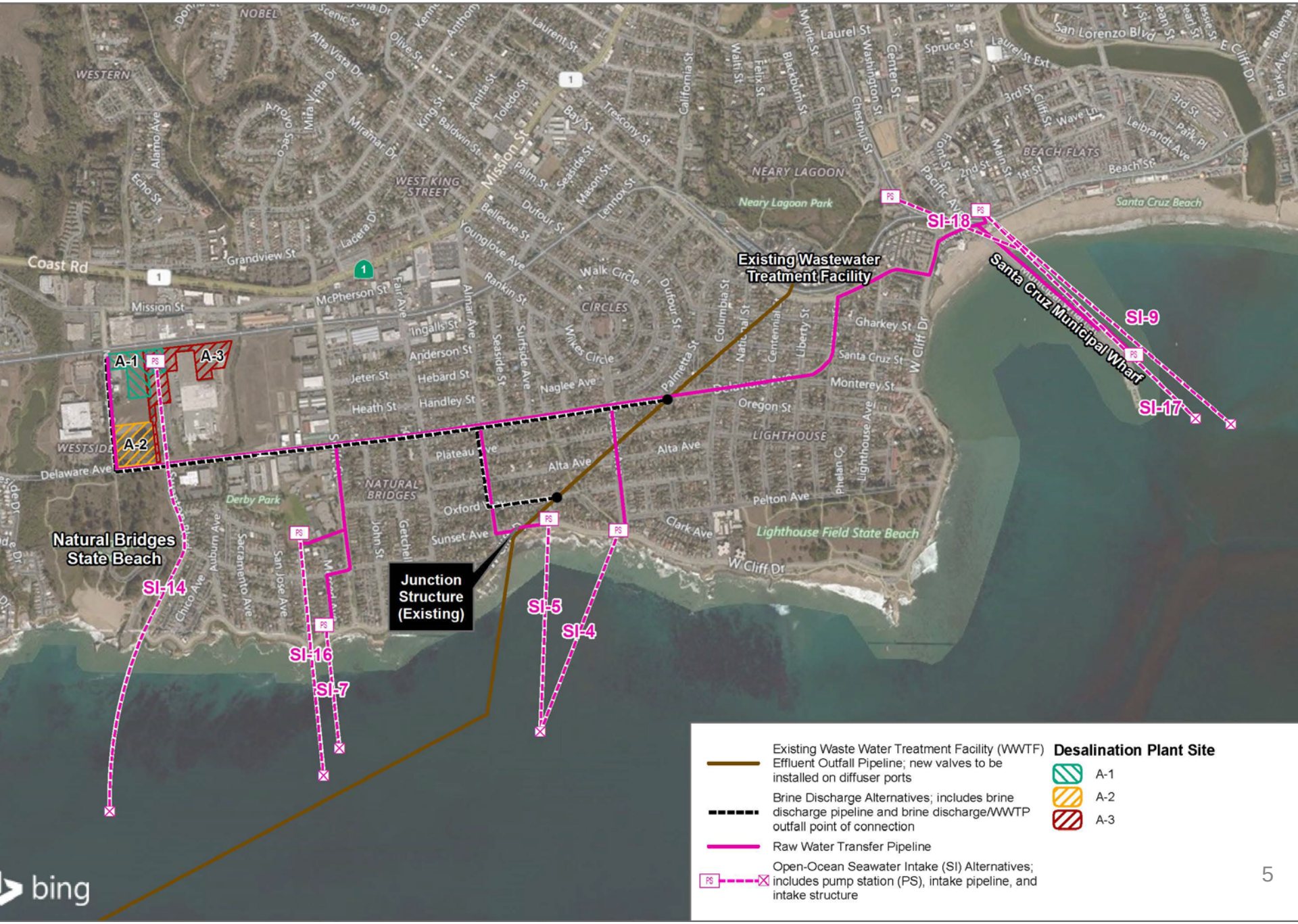
Purpose of Review & Planning Context

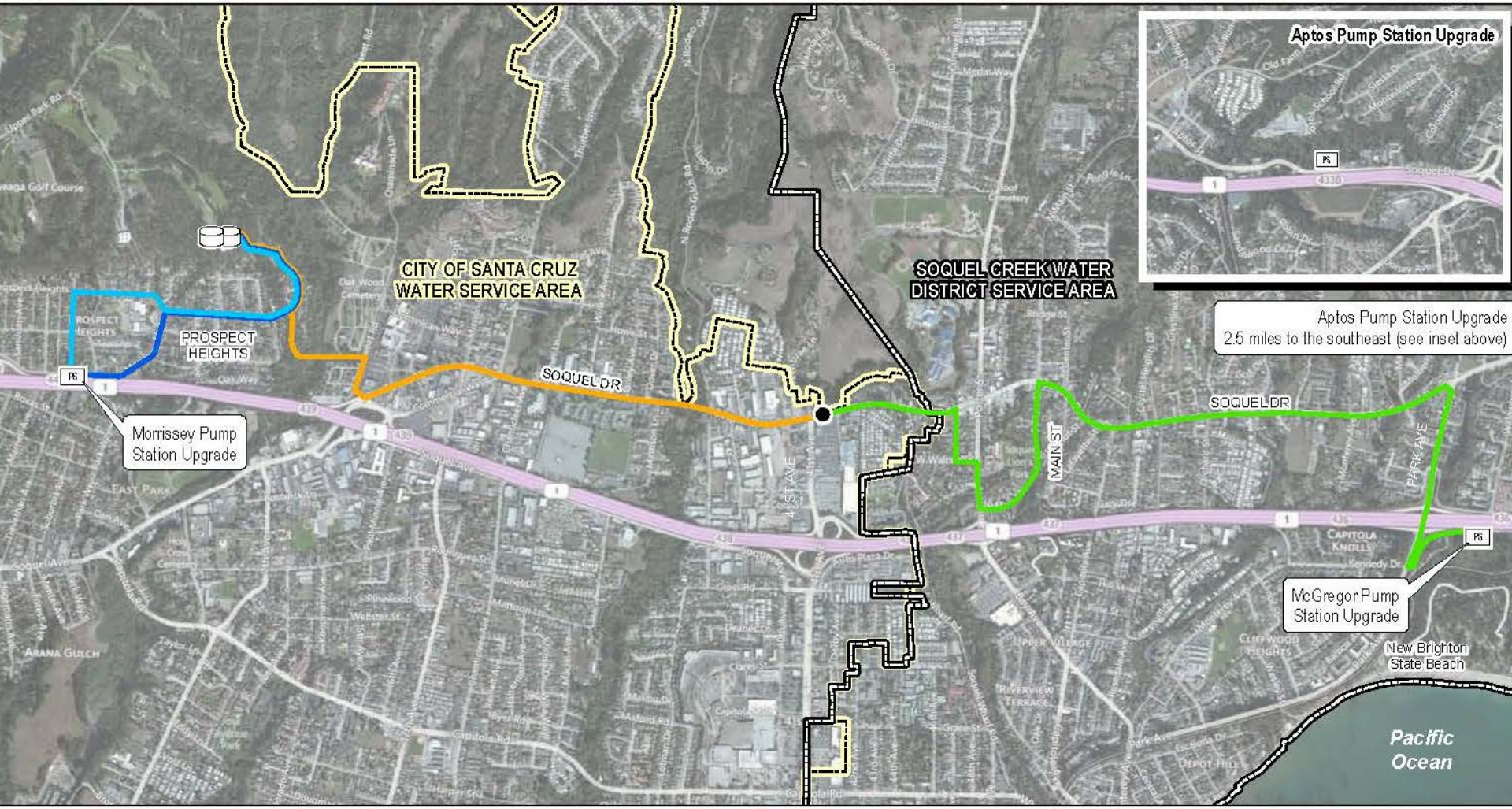
Water Supply Advisory Committee (WSAC)
Final Report on Agreements and Recommendations (Oct 2015)
(excerpt,Table 16)

Advanced Treated Recycled Water or Desalination (Element 3)		
3.1M ◇	Identify recycled water alternatives; increase understanding of recycled water (regulatory framework, feasibility, funding opportunities, public outreach and education)	c. 2016
3.2D △	Complete high level feasibility studies, as-needed demonstration testing, and conceptual level designs of alternatives; define CEQA processes; and continue public outreach and education. Select preferred Element 3.	c. 2017
3.3D △	Preliminary design, CEQA (including preparation of draft EIR), and apply for approvals and permits (except building permit).	c. 2020
3.4M ◇	Complete property acquisition, final design, complete CEQA and all permits.	c. 2022
3.5W ■	Construction completed: plant start-up, water production begins	c. 2024

Report Contents

1. Introduction
2. Assessment of Changed Conditions
3. City Seawater Desalination Project Characteristics
4. CEQA/NEPA Compliance Approach
5. Permitting Approach
6. Timeliness of Implementation
7. Opportunities for Regional Collaboration
8. Conclusions


Existing Wastewater Treatment Facility
Junction Structure (Existing)
Natural Bridges State Beach
Santa Cruz Municipal Wharf
Neary Lagoon Park
Santa Cruz Beach
Lighthouse Field State Beach
Derby Park
A-1
A-2
A-3
SI-14
SI-16
SI-7
SI-5
SI-4
SI-18
SI-9
SI-17
Existing Waste Water Treatment Facility (WWTF) Effluent Outfall Pipeline; new valves to be installed on diffuser ports
Brine Discharge Alternatives; includes brine discharge pipeline and brine discharge/WWTP outfall point of connection
Raw Water Transfer Pipeline
Open-Ocean Seawater Intake (SI) Alternatives; includes pump station (PS), intake pipeline, and intake structure
Desalination Plant Site
A-1
A-2
A-3



Potable Water Pipeline Alignments

- Morrissey PS to DeLaveaga Tanks - Morrissey Alignment Option
- Morrissey PS to DeLaveaga Tanks - Trevethan Alignment Option
- DeLaveaga Tanks to City-District Intertie
- City-District Intertie to McGregor PS

- DeLaveaga Tanks
- Pump Station (PS)
- Intertie location at Soquel Dr
- Soquel Creek Water District Service Area Boundary
- City of Santa Cruz Water Service Area Boundary

N

0 0.5 1

SCALE IN MILES

Base map source:
Microsoft Bing Maps

Changed Conditions that Affect Project

- Change in Project Objectives Affects Project Size
  - scwd^2 project - 2.5 mgd; joint project with SqCWD
  - City seawater desalination project - 3.3 mgd; City-only project
  - Same plant-site location
- Reduction in Intake Pump Station Locations
  - scwd^2 project - 8 intake alternative locations
  - City seawater desalination project - 3 intake alternative locations

Changed Conditions that Affect Project

- **2016 Ocean Plan Amendment (OPA)**
  - Substantial implications for seawater desalination projects
  - OPA is the basis for RWQCB Water Code Section 13142.5(b) determinations
  - Determination assesses best site, design, technology and mitigation alternatives to minimize mortality of all forms of marine life
  - Requires subsurface intake unless they are deemed infeasible
  - RWQCBs have not yet completed Water Code determination

Changed Conditions that Affect Project

- **OPA Affects Seawater Intake**
  - **scwd^2 project - open-ocean intake was selected approach**
  - **City seawater desalination project - considers both open-ocean intake and subsurface radial collector wells**
  - **Additional study likely required to assess feasibility of radial collector wells**
  - **Pursue early consultation with RWQCB to confirm and clarify additional study**
  - **Marine Life Mortality Report required to quantify construction and operational impacts**

Changed Conditions that Affect Project

- **OPA Affects Brine Discharge Analysis**
  - **scwd^2 project - dilution analysis showed brine dilution with City's WWTF would not prompt modification to existing NPDES permit**
  - **City seawater desalination project - update dilution analysis required:**
    - **Project is slightly bigger (3.3 vs 2.5 mgd)**
    - **Water reuse projects may reduce WWTF effluent for dilution**
  - **Modelling/analysis must be conducted to estimate the degradation of all forms of marine life related to brine discharge**


Existing Wastewater Treatment Facility
Santa Cruz Municipal Wharf
SI-1
SI-2
SI-3
A-1
A-2
A-3
Junction Structure (Existing)
Natural Bridges State Beach
Lighthouse Field State Beach
Neary Lagoon Park
Santa Cruz Beach
Coast Rd
Mission St
Delaware Ave
Alta Ave
Oregon St
Monterey St
Pelton Ave
W Cliff Dr
Existing Waste Water Treatment Facility (WWTF) Effluent Outfall Pipeline; new valves to be installed on diffuser ports
Brine Discharge Alternatives; includes brine discharge pipeline and brine discharge/WWTP outfall point of connection
Raw Water Transfer Pipeline Alternative
Open-Ocean Seawater Intake (SI) Alternatives; includes pump station (PS), intake pipeline, and intake structure
Radial Collector Wells
Desalination Plant Site Alternatives
A-1
A-2
A-3
For SI-2 and SI-3, a pump station and raw water pipeline on the Wharf could also be considered as a backup to the pump station at the SCCRTC property located south of Depot Park. However, an exact site is no longer known, given the planned improvements identified in the City's proposed Wharf Master Plan.

Desal Costs Updated for Changes, Capacity, and Inflation

Approach to Update City Seawater Desalination Costs

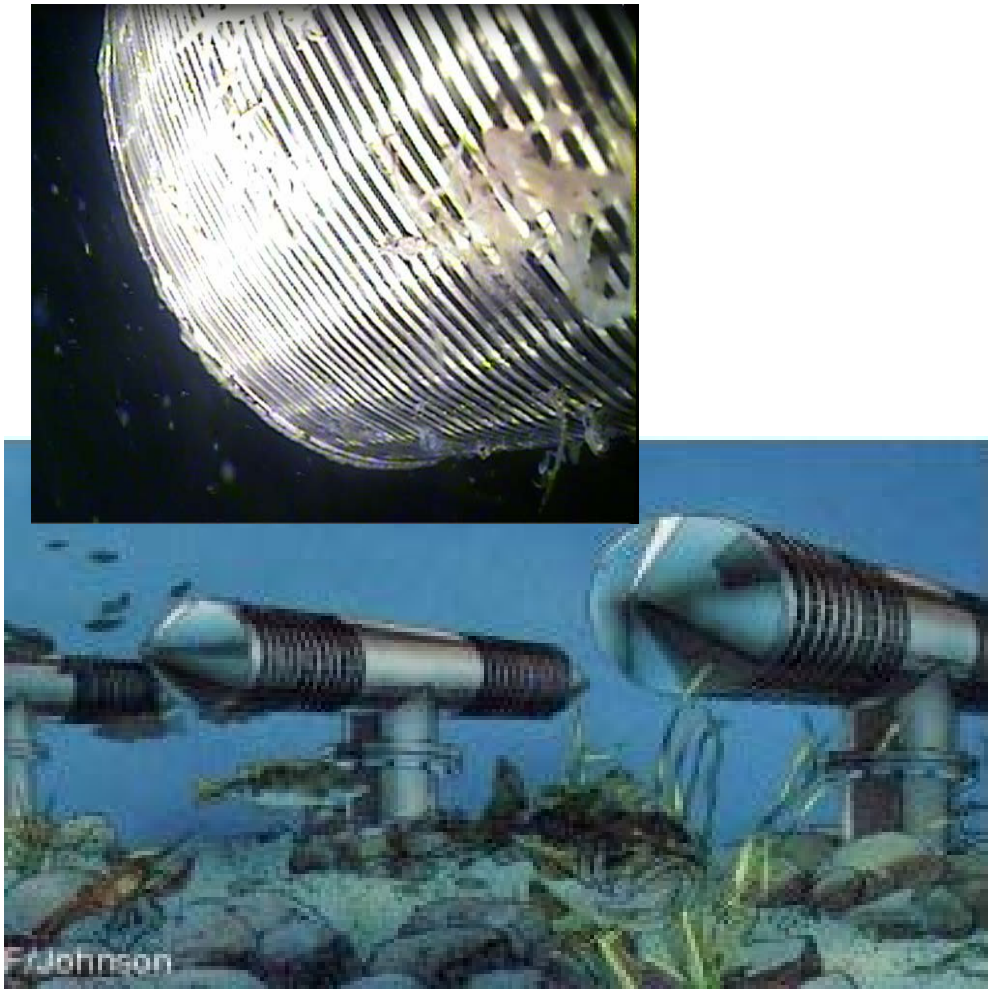
Source costs from scwd[2]

Adjust for changed elements

Adjust for increase to 3.3 mgd

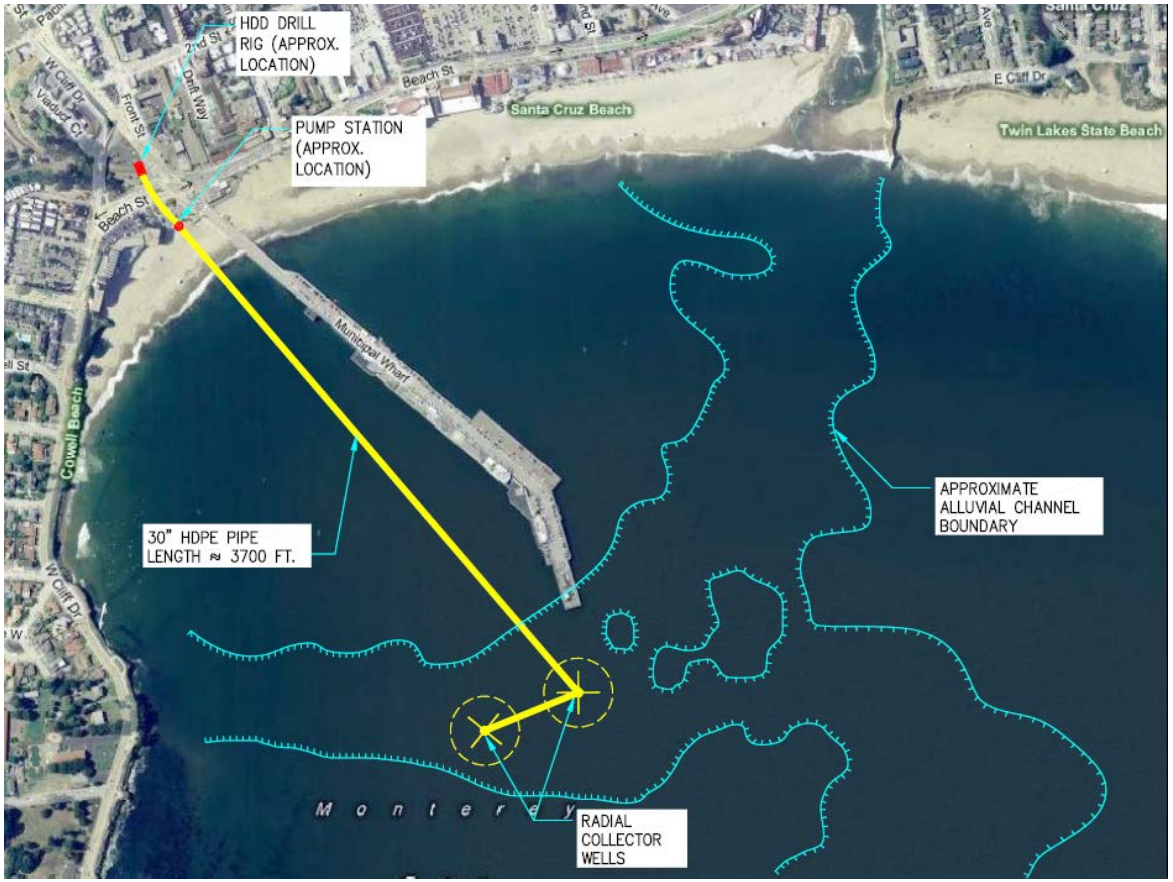
Inflation from 2012 to 2017

Screened Open Water Intake System Changes



- scwd^2 based on 2-mm Intake screens
- Coastal Commission now requires 1-mm intake screens
- Required screen area doubles
- Element cost doubles

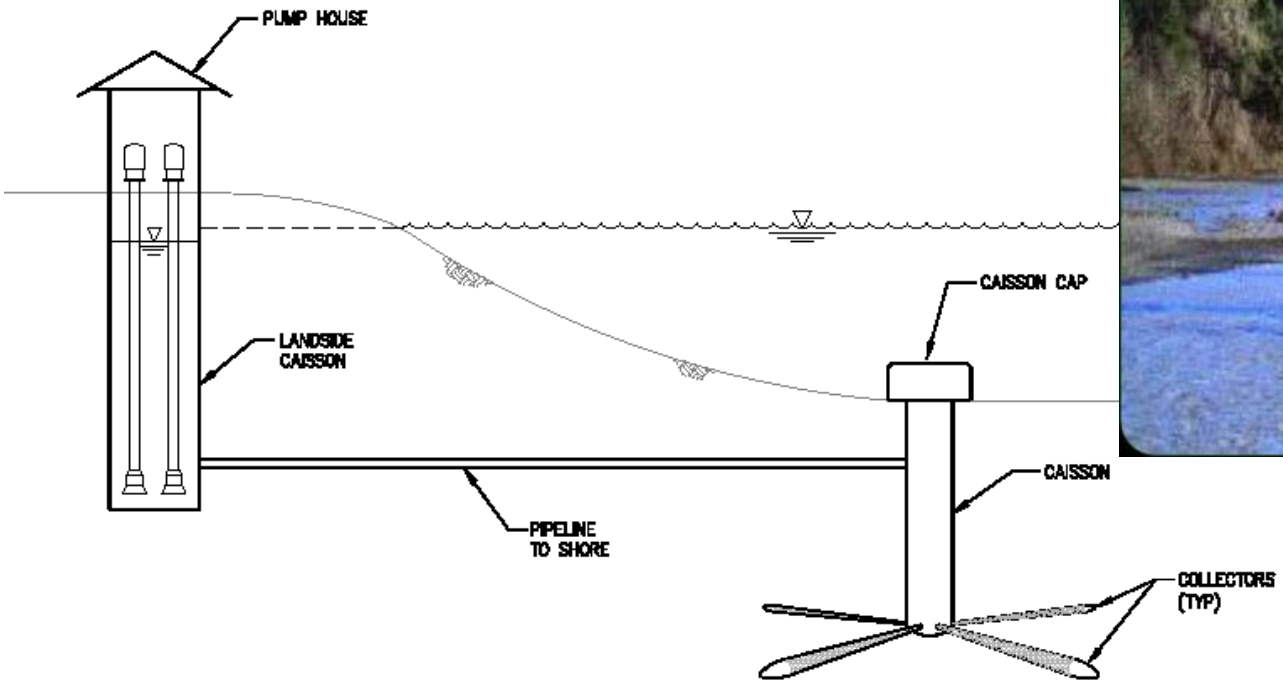
Potential Subsurface Intake System



- OPA and Coastal Commission require evaluation of subsurface intakes
- Subsurface intakes could provide a portion of the supply
- Subsurface intakes could have parallel screened open-ocean intake for portion of supply
- Radial Collector Wells evaluated for scwd[2]

Potential Subsurface Intake System

A radial collector well could potentially be built in offshore alluvial material



Is an Offshore Radial Collector Well Feasible?

Challenges for Radial Collector Well System

- Highly variable alluvial material
- New concept in marine environment
- Over twice the cost of screened open-ocean intake
- Extensive testing to determine production capacity

Changes due to Increased Capacity: 2.5 to 3.3 mgd

Site and buildings already sized for 4.5 mgd

Processing equipment sized for 2.5 mgd

Only adjusted cost for appropriate items

Costs increase ~18% for ~32% capacity increase

Comparison of Alternative 2 Costs from 2012 to 2017

SCWD Desal Project Element	2012 Source Document Costs	Adjusted for 3.3 mgd Capacity	Adjusted for Inflation to 2017
Desalination Facility Site and Buildings	$3.47 M	$3.47 M	$4.09 M
Desalination Facility Treatment Processes	$24.98 M	$29.98 M	$35.36 M
Screened Intake System	$20.90 M	$25.32 M	$29.85 M
Brine Disposal	$4.19 M	$4.63 M	$5.31 M
Electrical, Instrumentation, Misc. (25%)	$13.38 M	$15.85 M	$18.65 M
Mobilization, Taxes, Bonds, OH&P (28.75%)	$15.26 M	$18.07 M	$21.26 M
Contingency (35%)	$23.43	$27.74 M	$32.64 M
Opinion of Probable Construction Cost	**$105.6 M**	**$125.1 M**	**$147.2 M**

Probable Construction Costs for 3 Desal Alternatives

Project Components (3.3 MGD Facility)	Alternative 1 Screened Open-Ocean Intake (Westside)	Alternative 2 Screened Open-Ocean Intake (Wharf Area)	Alternative 3 Subsurface Intake System (Wharf Area)
Seawater Intake and Conveyance System			
Open Ocean Intake[1]	$60,100,000	$58,900,000	$52,800,000
Radial Well Collectors	n/a	n/a	$76,600,000
Seawater Desalination Plant	$77,800,000	$77,800,000	$77,800,000
Brine Storage, Disposal, and Conveyance System	$10,500,000	$10,500,000	$10,500,000
Potable Water Distribution System Improvements	*(Included in Desalination Plant costs)*		
Total Capital Cost ($)	$148,400,000	$147,200,000	$217,700,000
Estimated Capital Cost ($mil)	**$148.4**	**$147.2**	**$217.7**
Annualized Capital Cost ($mil/yr)	$7.8	$7.7	$11.9
Desalinated Water Produced (AFY)	3,696	3,696	3,696
Annual Unit Capital Cost ($/AF)	$2,100	$2,100	$3,200
Annual O&M Cost ($mil/yr)	$5.4	$5.6	$5.7
Annual O&M Cost ($/AF)	$1,470	$1,510	$1,530
Life Cycle Unit Cost ($/AF)	$3,570	$3,610	$4,730
($/MG)	$11,000	$11,100	$14,500
($/CCF)	$8.20	$8.30	$10.90

Source: Appendix A.

Notes: AF = acre feet; AFY = acre feet per year; CCF = 100 cubic feet; MG = million gallons; n/a = not applicable

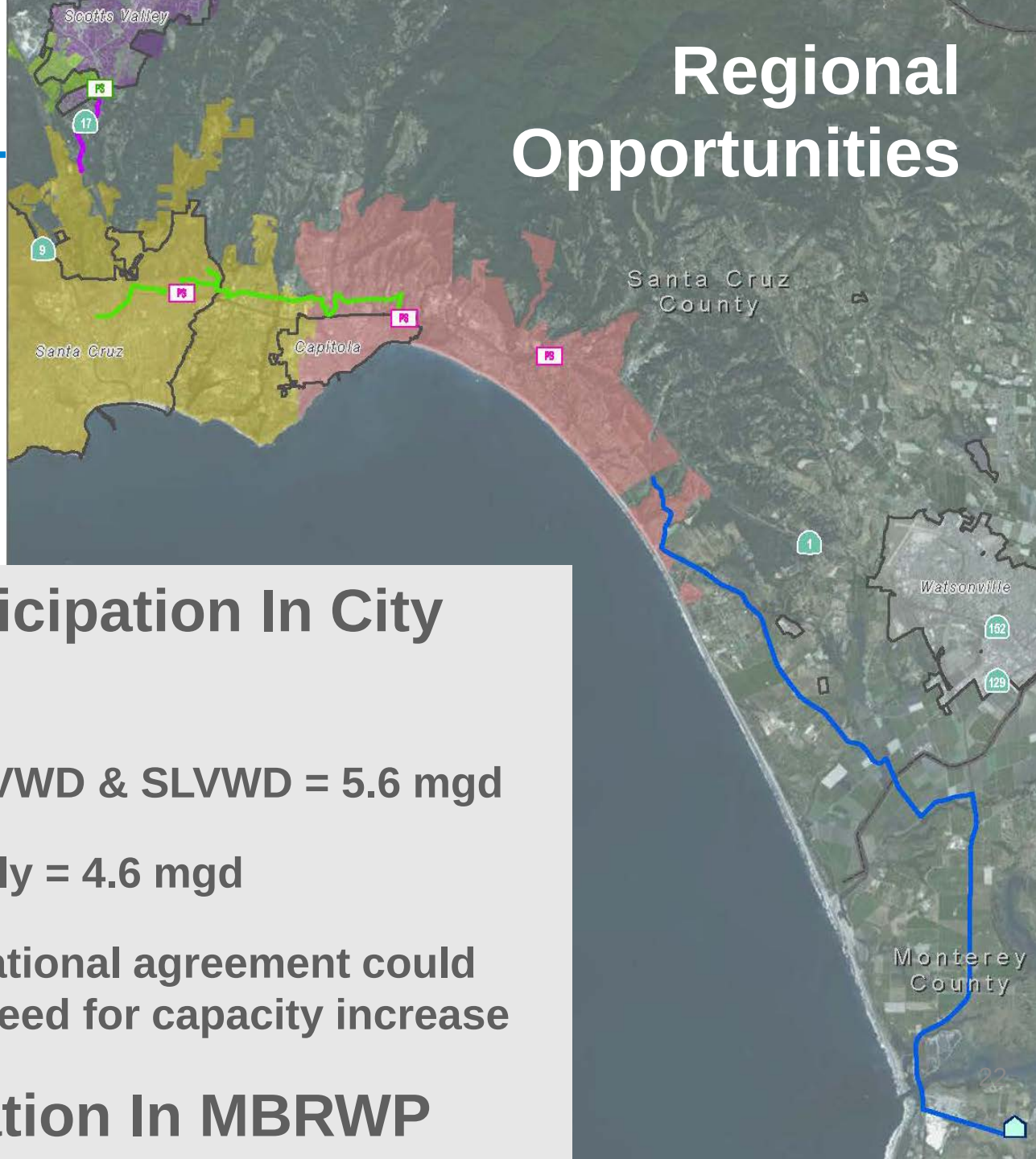
[1] Includes intake structure, screens, pipelines and pump station.

CEQA/NEPA Approach

- Lead Agencies
  - CEQA = City of Santa Cruz
  - NEPA = Monterey Bay National Marine Sanctuary
- CEQA/NEPA Approach
  - Stand alone EIR and EIS vs Joint EIR/EIS
  - Meet with regulatory agencies early to assess need for and scope of additional marine studies

Schedule

Regional Opportunities



- **Regional participation In City project**
  - ✓ **SqCWD, SVWD & SLVWD = 5.6 mgd**
  - ✓ **SqCWD only = 4.6 mgd**
  - ✓ **Joint operational agreement could minimize need for capacity increase**
- **City participation In MBRWP**

Conclusions

- City seawater desalination project can meet most WSAC objectives:
  - Fill identified supply-demand gap (1.2 bgy)
  - Meet the timeliness objective - operational by 2025
  - Support system robustness, redundancy and adaptive flexibility
  - Be configured as a regional project
- Not yet known whether the Project would meet the cost-effectiveness objective
- Subsequent analysis required to compare seawater desalination to other alternatives

Next Steps

Figure 12 Gantt Chart
Implementation Plan and Timeline

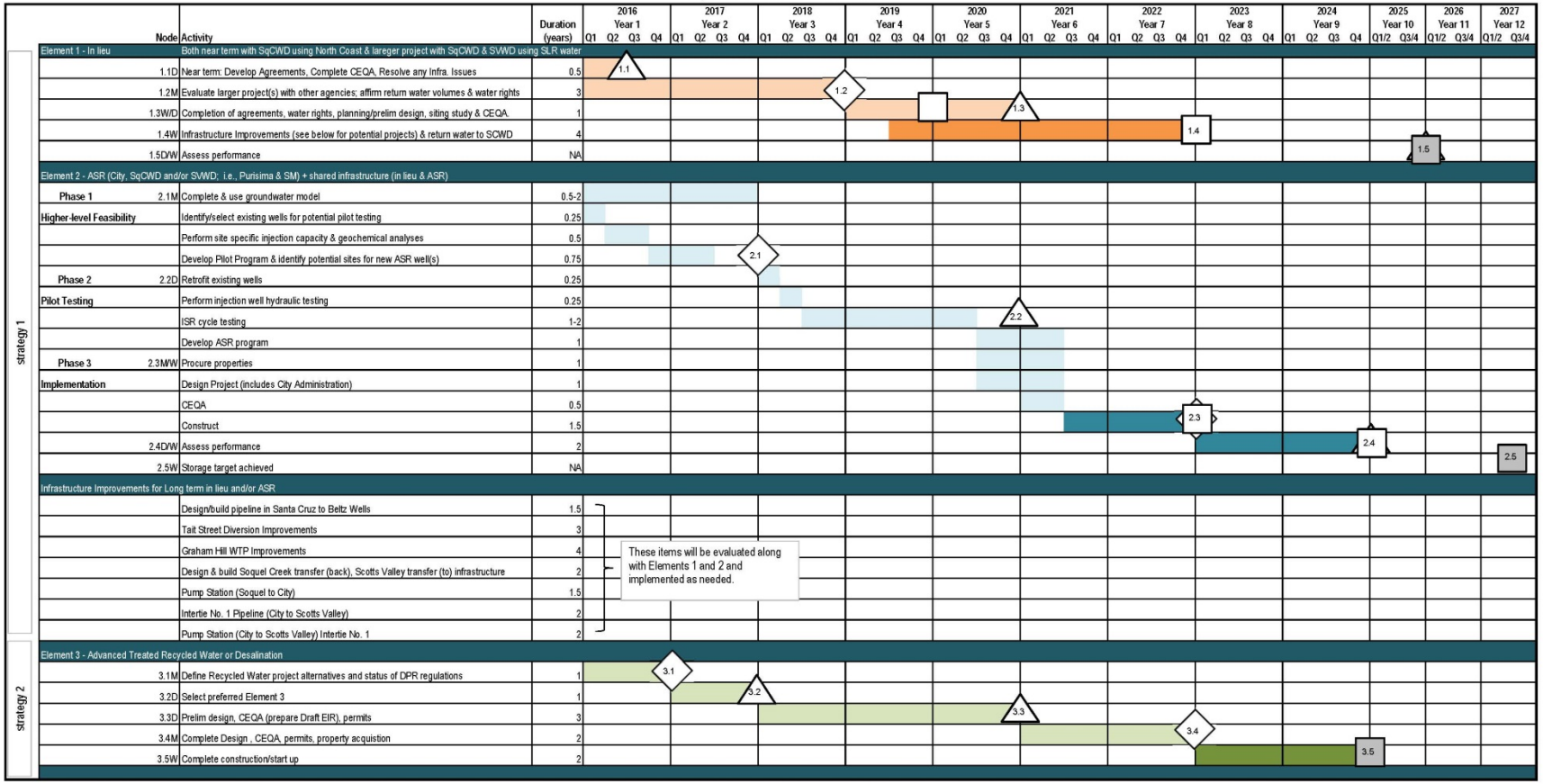


Table Notes & Select Assumptions

This table approximates activities, costs, durations and sequencing of each element, all of which are subject to change.
Elements are shown to start in Q1 - 2016. This may or may not occur depending upon agreements, contracts, etc.
Rehab/replacement of the Newell Creek Pipeline is part of the existing CIP and not shown here.
Some infrastructure improvements may not be required if other pursuits are successful. E.g., evaluation of Ranney collectors may substitute GHWTP Improvements.
CEQA is used generically; implies compliance with California Environmental Quality Act.
Pilot ASR work assumes major infrastructure not required. E.g., intertie to Scotts Valley or new well(s).
Element 2 includes 8 wells for in lieu plus 8 additional wells for ASR.

Legend

ASR = Aquifer Storage and Recovery
CEQA = California Environmental Quality Act
DDW = Division of Drinking Water
DPR = Direct Potable Reuse
EIR = Environmental Impact Report
GHWTP = Graham Hill Water Treatment Plant
IPR = Indirect Potable Reuse
ISR = Injection, Storage, Recovery
SCWD = Santa Cruz Water Department
SqCWD = Soquel Creek Water District
SVWD = Scotts Valley Water District

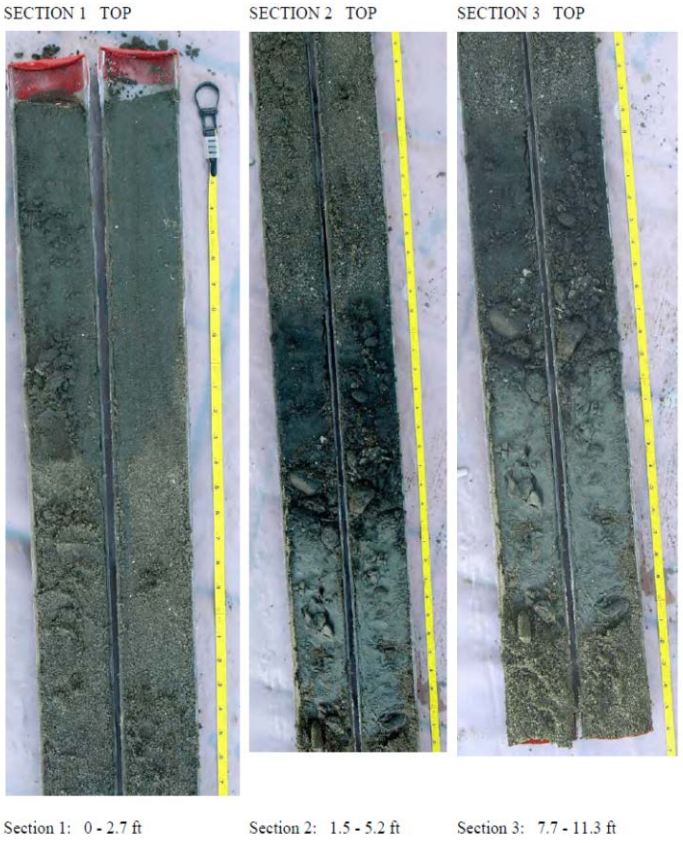
Decision Node
Milestone Node
Some amount of water returned to SCWD
Full required amount of water returned to SCWD

Questions.

Backup Slides follow

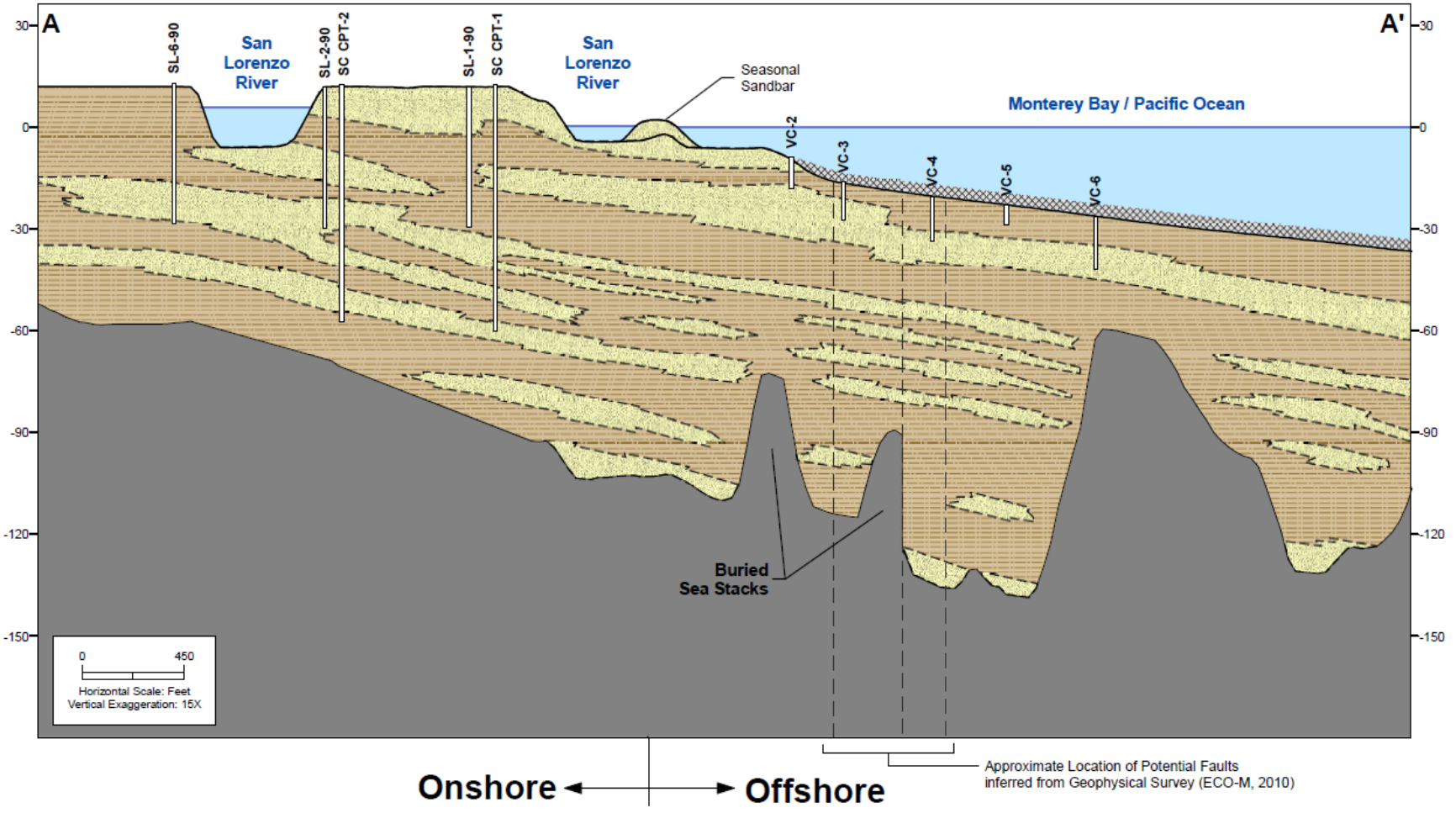
The information we know includes:

- Physical characteristics of onshore SLR alluvial channel
- Variability and characteristics of onshore sediments
- Physical characteristics of offshore SLR alluvial channel
- Variability and hydraulic conductivity of offshore sediments 8-15 feet below seafloor from vibracores
- Mobile fine sediment layer at the seafloor



Offshore VC-6: Silty sand and clay layer over medium sand

The offshore deeper sediments can be inferred from onshore data and local geologic conditions



New/Updated Studies

- New biological records searches & terrestrial surveys
- Need for additional marine surveys to be determined
- Marine Life Mortality Report
- New cultural resources records searches, surveys and NA consultations
- New ambient noise measurements
- Update air quality and GHG analyses
- Other updates