Optimization Study Groundwater Modeling Santa Cruz Mid-County Basin

MONTGOMERY & ASSOCIATES
Water Resource Consultants

Santa Cruz Mid-County Groundwater Agency Board of Directors

Agenda Item 6.1

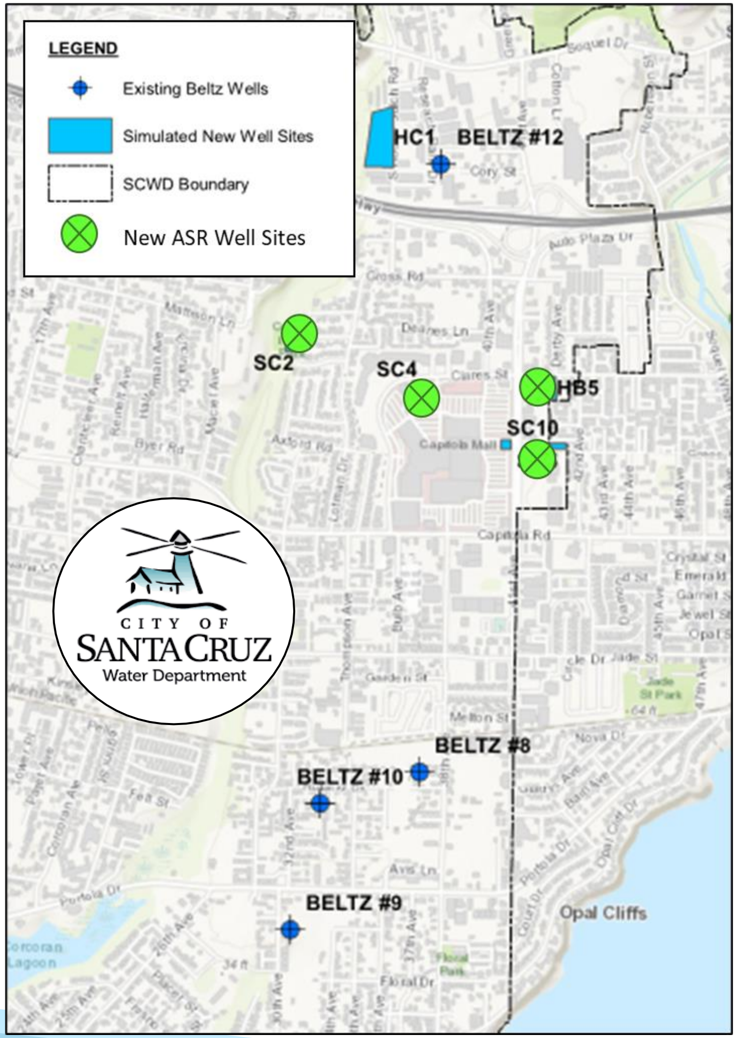
June 20, 2024

Outline

- Planned Projects in Groundwater Sustainability Plan (GSP)
- Groundwater Modeling Role for Optimization Study
- Alternative Tracks and Alternative to Include in GSP Periodic Evaluation
- Alternatives Selected for Further Evaluation
- Summarize Results of Selected Alternatives

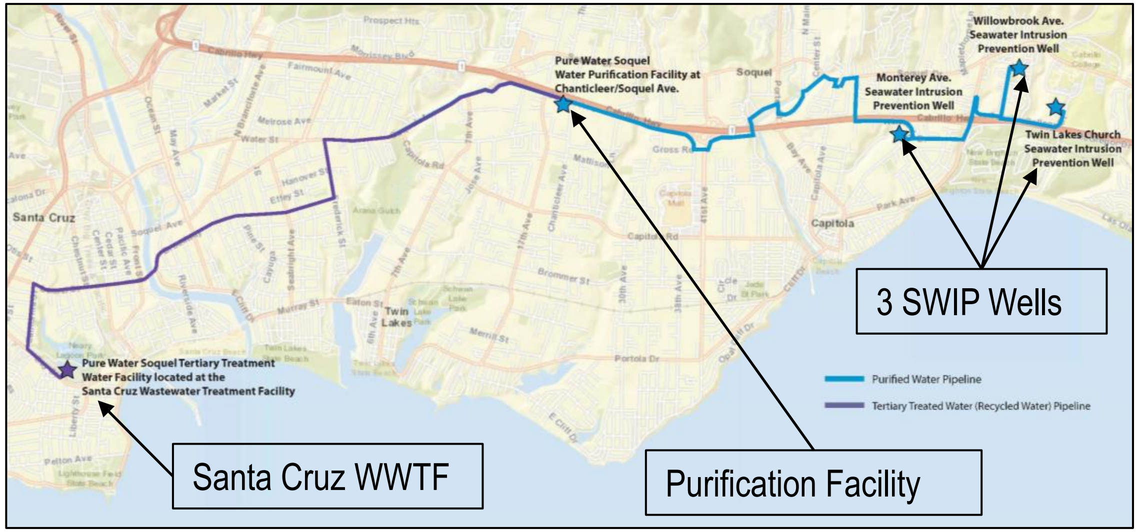
Planned Projects in GSP

Aquifer Storage and Recovery (ASR)

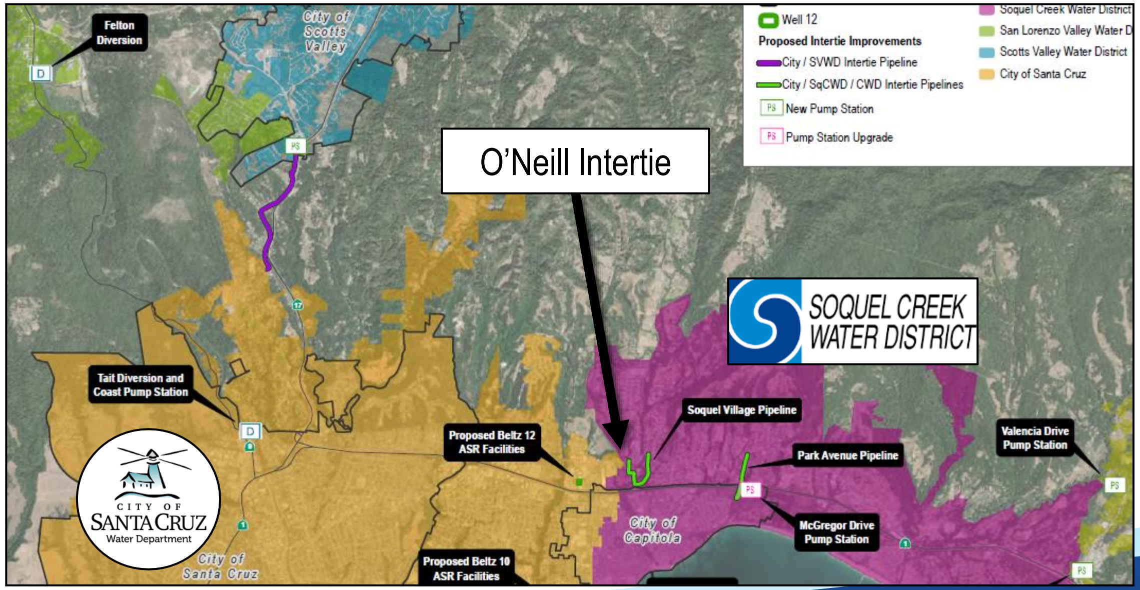


PUREWater Soquel
Water Transformed

GSP describes expected sustainability benefits of projects



Transfers from City to District



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Optimization Study using Groundwater Modeling

- Study Objective: Optimize **Planned Projects** for Santa Cruz Mid-County Groundwater Basin to improve regional water supply reliability
- Non-Basin supplemental supply project options in City Water Supply Augmentation Implementation Plan (WSAIP) not included in optimization
- Use groundwater modeling to identify alternatives that improve water supply reliability, are feasible and achieve Basin sustainability
- Hydraulic modeling informs infrastructure needs
- Select alternatives for further evaluation including:
    - Cost estimates
    - Permitting requirements and other local impacts
    - Water quality

Modified from Brown & Caldwell, 2023

Alternatives Selected from Tracks Defined by Infrastructure Needs

Track	Description	Pure Water Soquel (PWS)	City ASR	Transfers
☑ 1	Baseline Projects with transfers	1,500 AFY (1.3 MGD) 3 existing SWIP wells	4 existing Beltz wells	Winter (Nov-Apr): City to District (limited) Summer (May-Oct): District to City Existing O'Neill intertie capacity
☑ 2	Expand City's ASR	1,500 AFY (1.3 MGD) 3 existing SWIP wells	4 existing Beltz wells 1 New ASR well	Summer (May-Oct): District to City Expanded O'Neill intertie capacity
🚫 3	Optimize existing PWS capacity	1,500 AFY (1.3 MGD) 3 existing SWIP wells 1 new injection & extraction well	4 existing Beltz wells	Summer (May-Oct): District to City Expanded O'Neill intertie capacity District Demand Scenarios (Low & High)
🚫 4	Expand PWS treatment capacity	1,900 To 2,100 AFY (1.7 to 1.9 MGD) 1 new injection well 1-2 new extraction wells	4 existing Beltz wells	Summer (May-Oct): District to City Expanded O'Neill intertie capacity
☑ ☑ 5A/B	Expand City's ASR and PWS treatment capacity	1,900 To 2,100 AFY (1.7 to 1.9 MGD) 1-2 new injection wells Up to 1 new extraction well	4 existing Beltz wells 2-3 new ASR wells	Summer (May-Oct): District to City Expanded O'Neill intertie capacity

AFY = acre-feet per year
MGD = million gallons per day

Groundwater modeling indicates track alternatives summarized above can be feasible and sustainable

☑ = Team selected 4 alternatives for further evaluation beyond groundwater modeling
Selected alternatives do not represent specific proposed projects.

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Baseline Projects with Transfers to be Used for GSP Periodic Evaluation

Used for All Selected Alternatives

	Optimization Study	GSP
Climate	Catalog and City Realization 1270	Catalog
City Demand	2.9 Billion Gallons per Year (BGY) (2045)	2.6 BGY (2016-2018)
City Supply Model	SCWSM with Habitat Conservation Plan (HCP) flow rules	Confluence with assumed aquifer constraints
District Demand	3,900 AFY/1.3 BGY (Max in Urban Water Management Plan)	

Basin groundwater model updated to incorporate PWS and ASR aquifer test data

Alternative Track 1 to be presented in GSP Periodic Evaluation

	Optimization Study	GSP
City ASR	4 existing Beltz wells*	
PWS	1,500 AFY at 3 SWIP wells*	
City to District Transfers	Limited by HCP (average 6 AFY)	Described but not modeled
District to City Transfers	Limited to existing capacity of O'Neill Intertie (1,000 gpm)	Not described or modeled

** Well capacities updated for Optimization Study*

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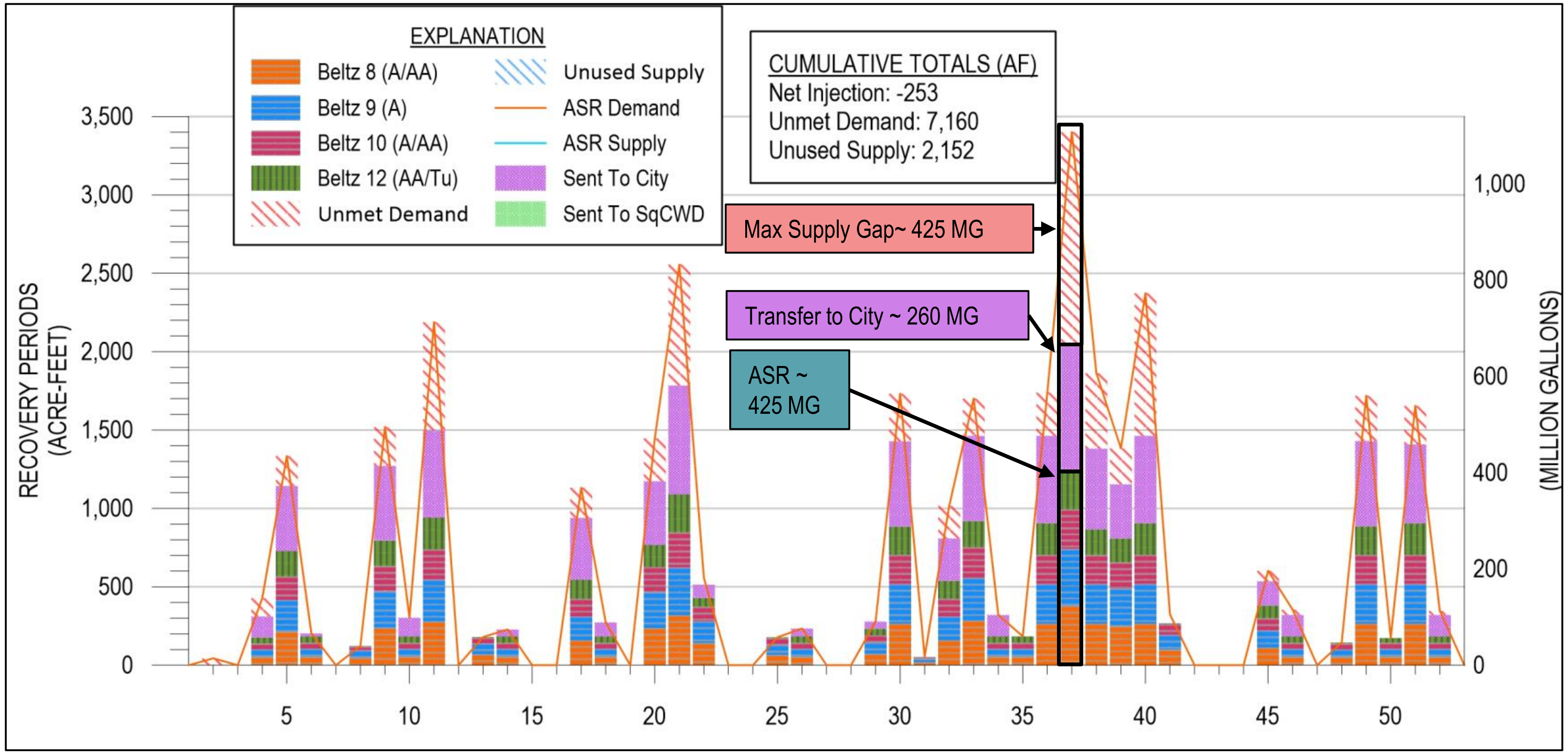
Alternative Track 1: Transfers with No Upgrades has Supply Gap for City

Simulation of Alternative 1 under Catalog Climate will be presented in GSP Periodic Evaluation



Additional alternative tracks evaluate reducing the supply gap with project expansion

Baseline with Transfers:

- Peak Drought Year:
  - ✓ City Supply Gap = 1,110 million gallons (MG) / 3,400 AF
  - ✓ ASR Supply = 425 MG / 1,300 AF
  - ✓ Transfers from District to City = 260 MG / 800 AFY
  - ✓ Remaining Gap = 425 MG / 1,300 AF

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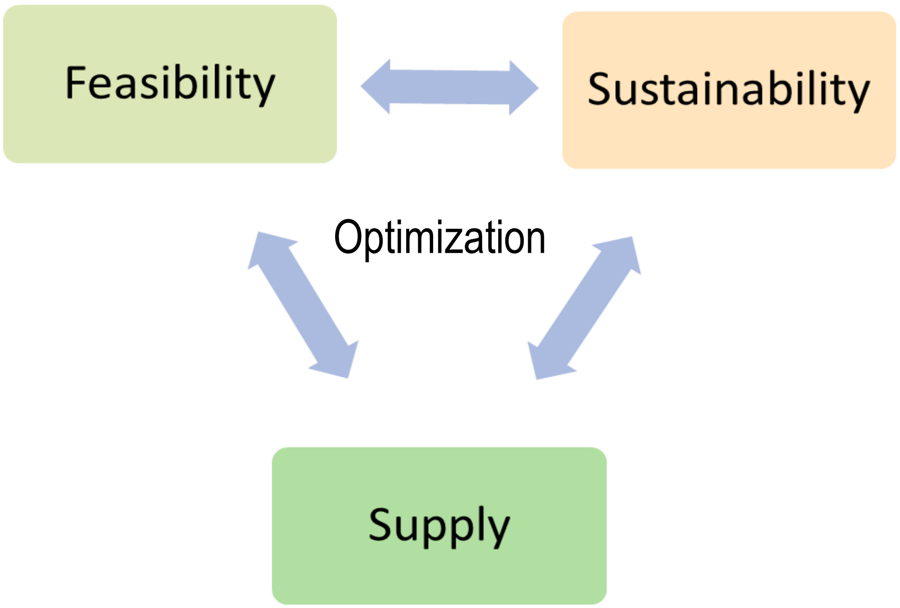
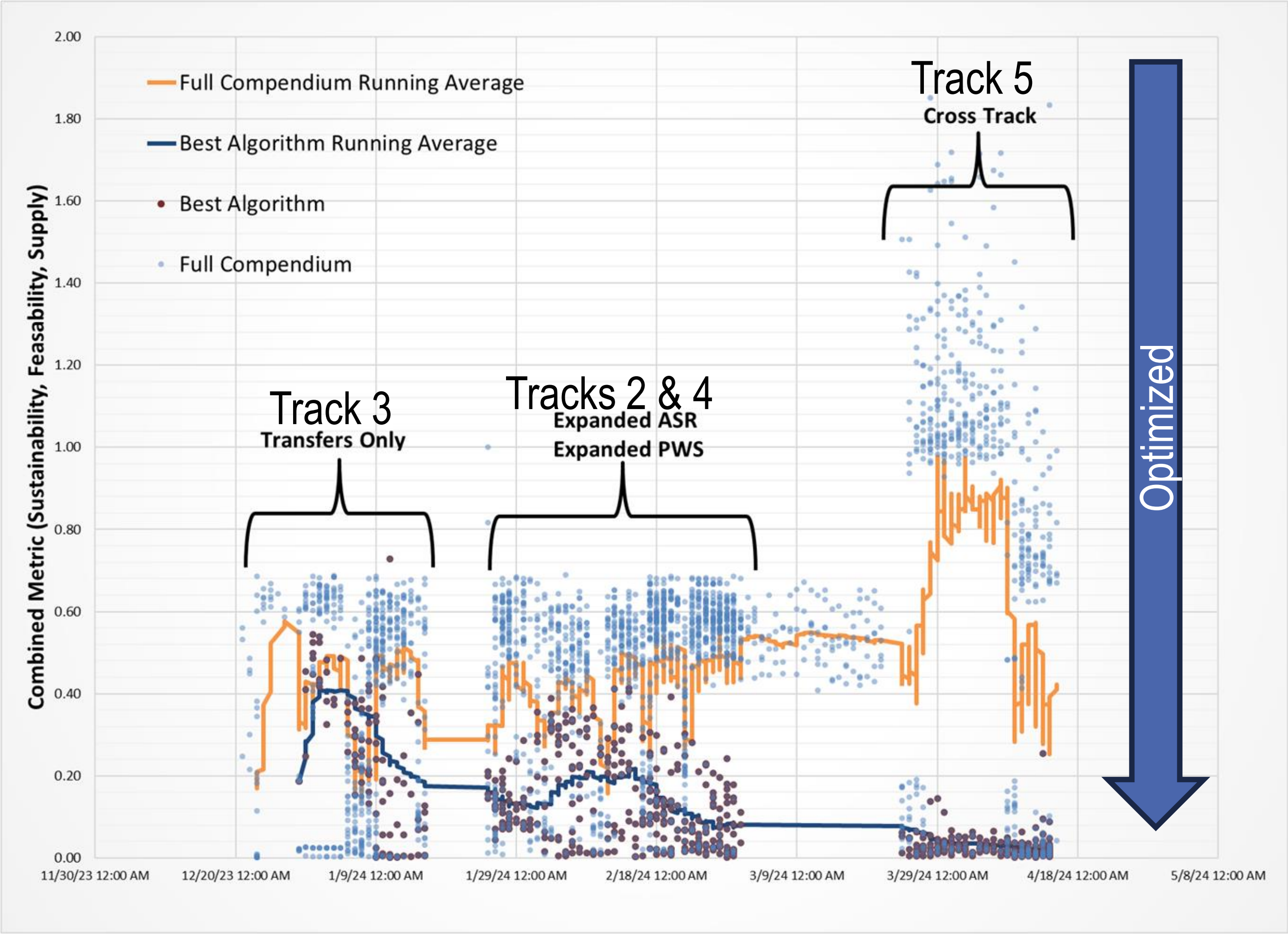
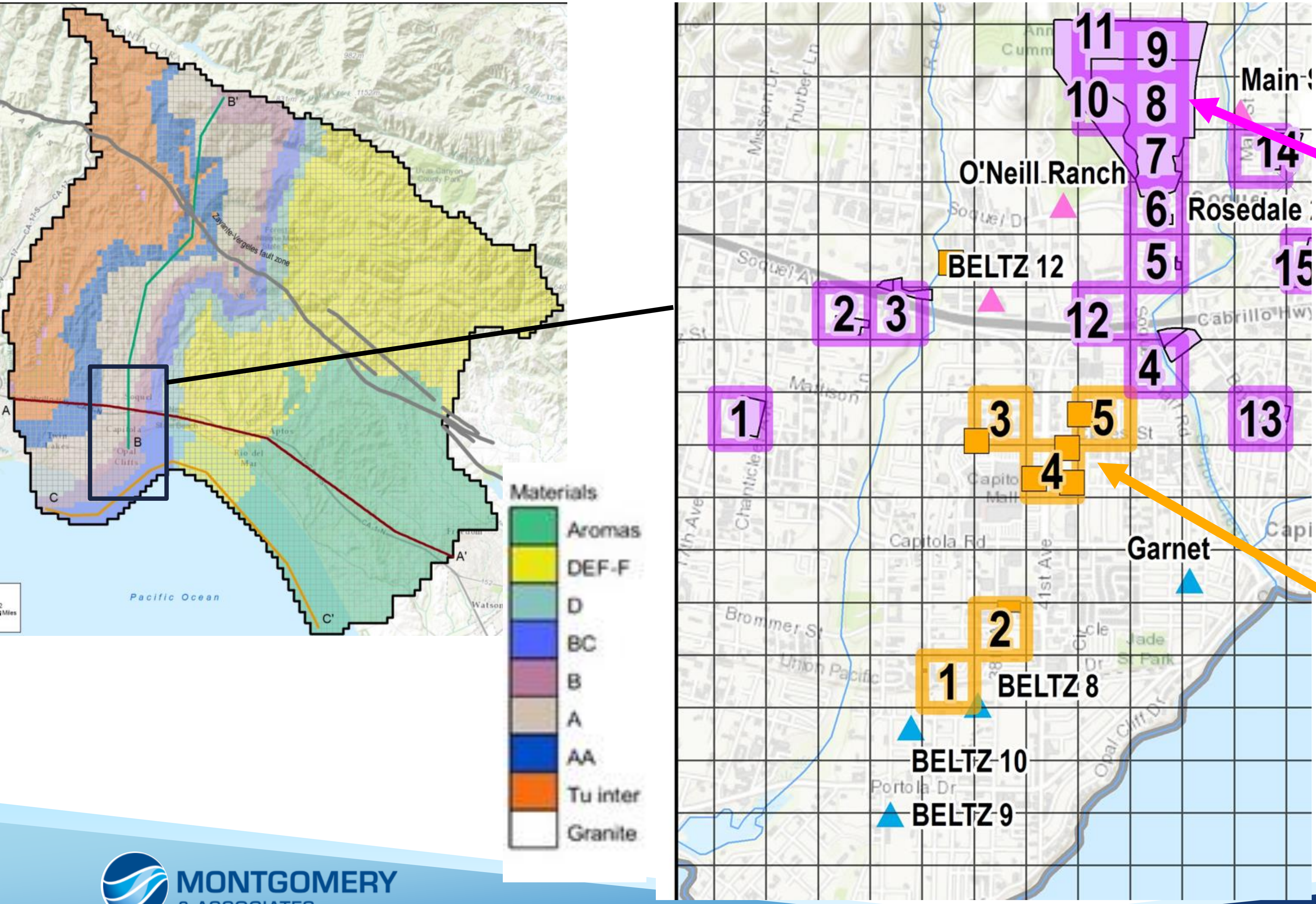
Optimization Guided by Machine Learning



- Thousands of groundwater model simulations run
- 3 layer combined neural network/random forest algorithm learned best over time



Simulated New Wells for Expanded ASR and PWS Identified based on Machine Learning



New PWS injection well(s)

Track 5A: AA/Tu

Track 5B: A/AA & AA/Tu

New ASR wells

Track 2: A/AA

Track 5A: AA/Tu

Track 5B: A/AA & AA/Tu

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Optimization Study Selected Alternatives Summary

Track	Description	Max Annual Demand (MGY)	ASR Max Supply (MGY)	Max Transfer District to City (MGY)	Remaining Supply Gap (MGY)	% Years with Supply Gap
1	GSP projects with transfers using existing infrastructure	1,110	425	260	425	40%
2	Expand City's ASR	1,110	490	330	290	30%
5A	Combination ASR and PWS expansion	1,110	590	520	0	0%
5B	Combination ASR and PWS expansion	1,110	710	400	0	0%

Table based on Catalog Climate results
Selected alternatives do not represent specific proposed projects.

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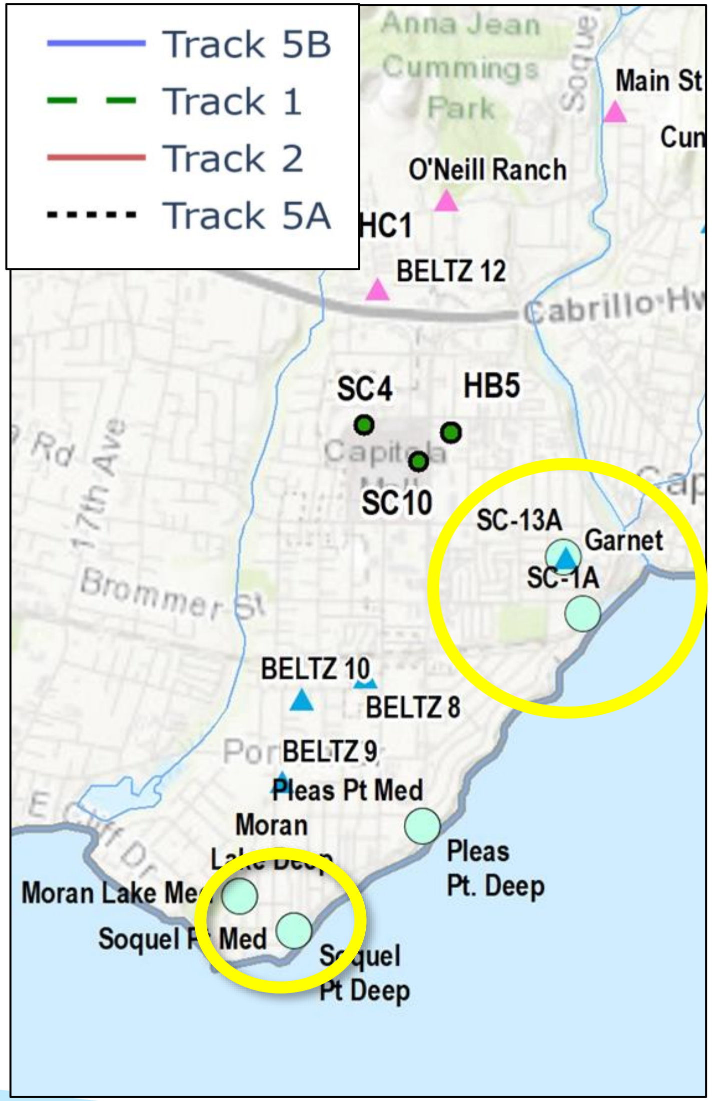
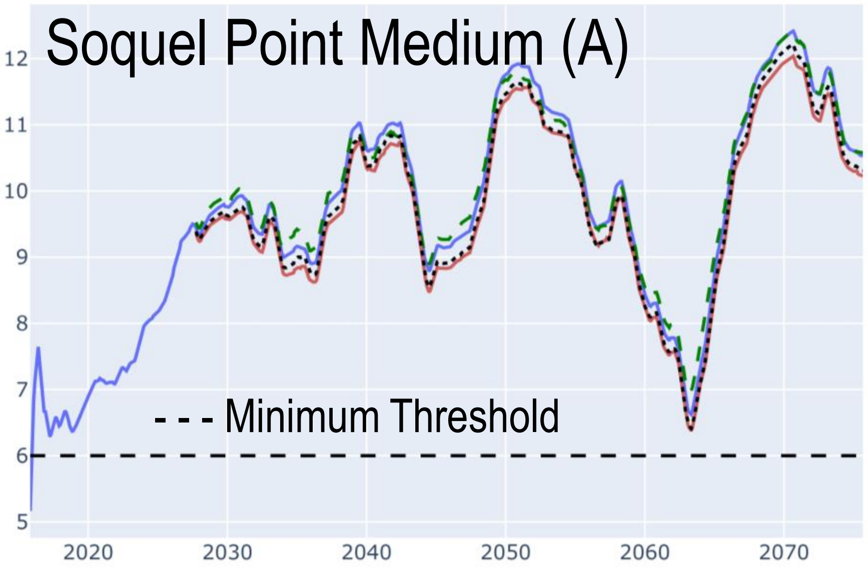
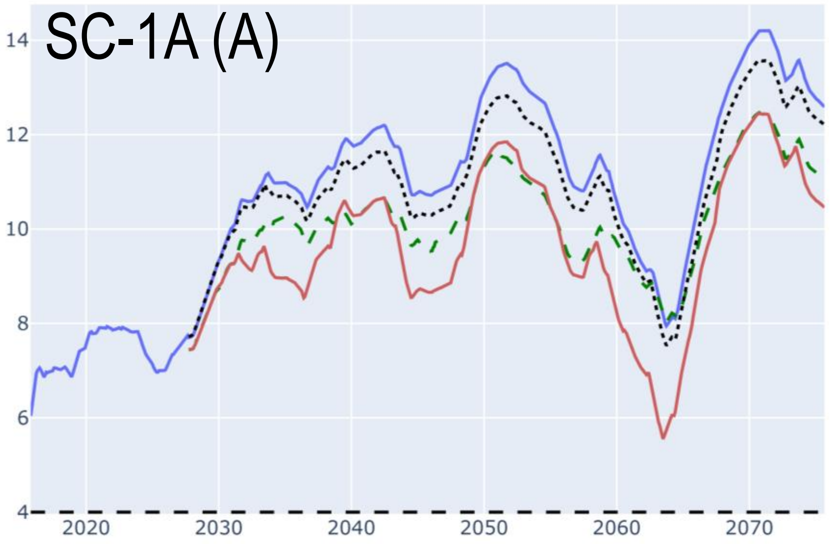
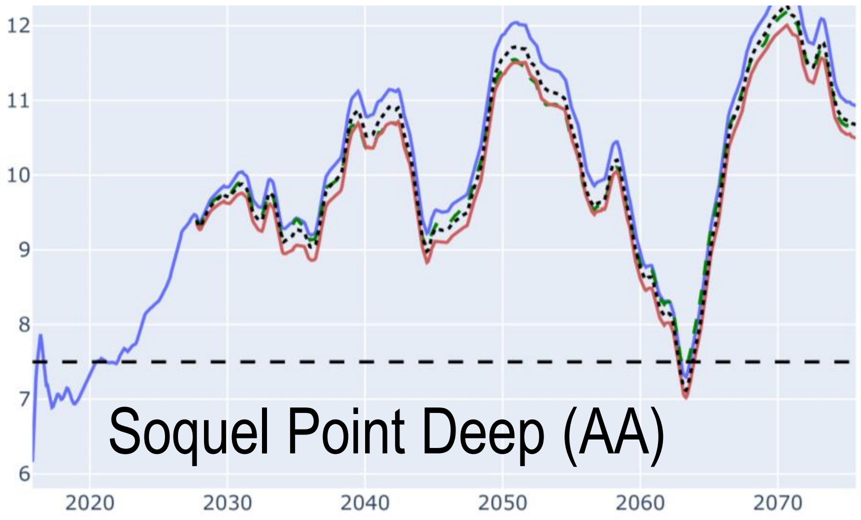
Groundwater Sustainability in and Near City Area

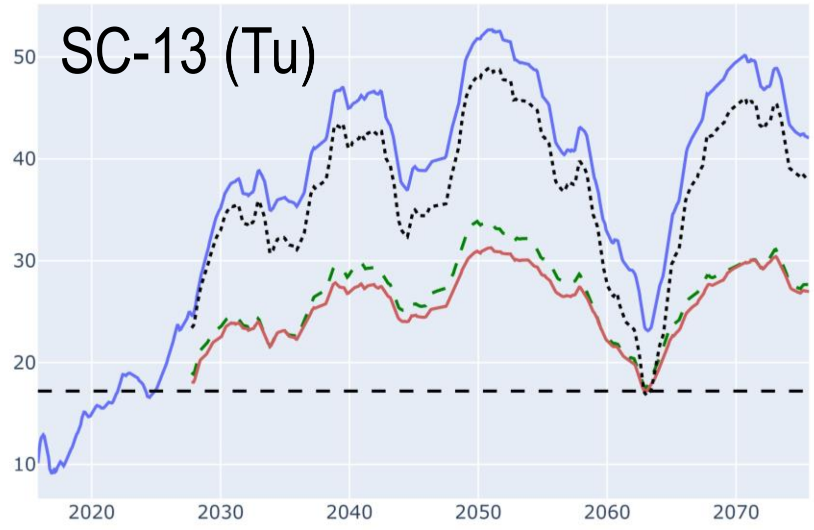
Seawater Intrusion











Catalog Climate

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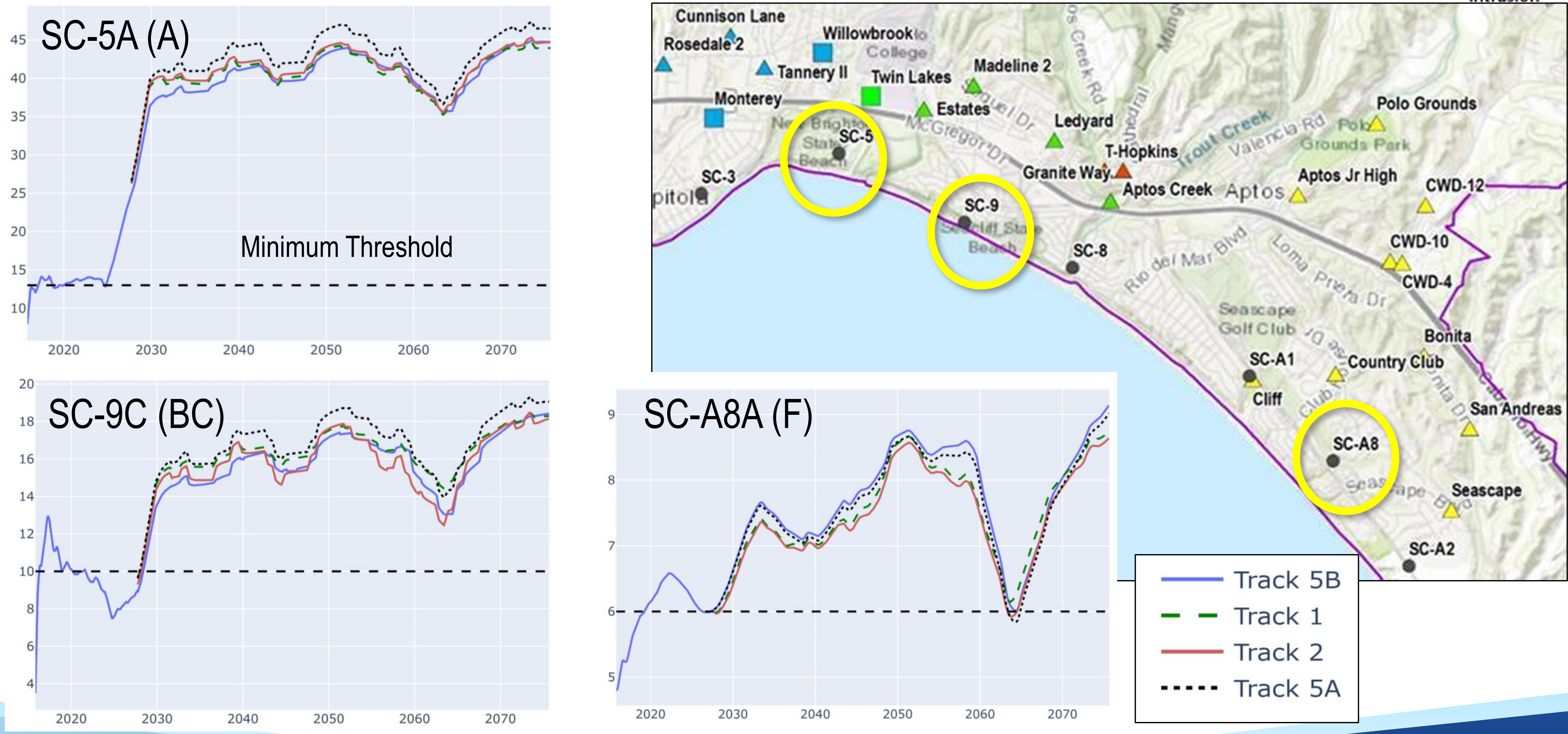
Groundwater Sustainability in District Area



Catalog Climate

Seawater Intrusion

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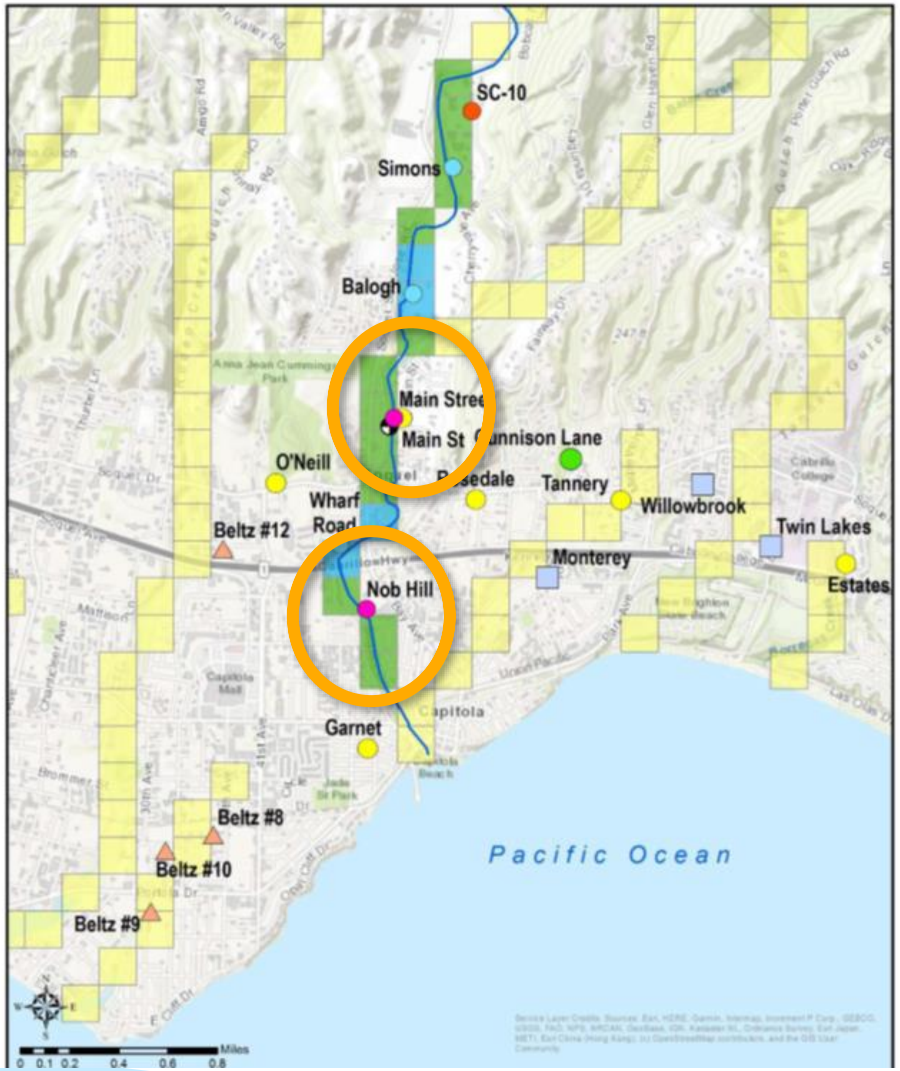
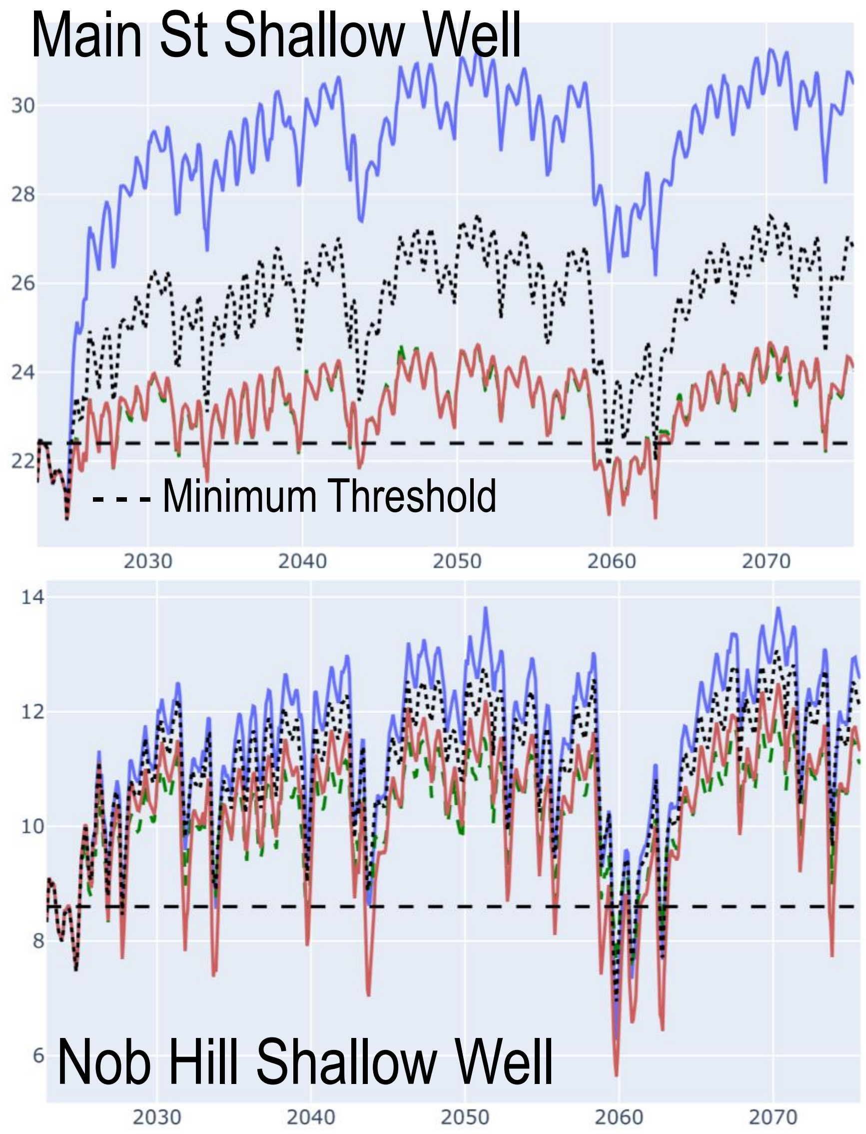
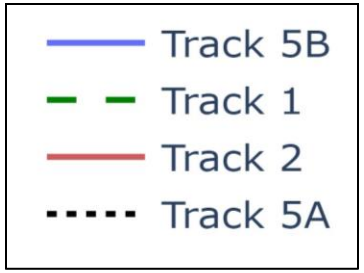
Interconnected Surface Water Sustainability





Catalog Climate



Interconnected Surface Water Sustainable Management Criteria likely to be re-evaluated by 2030 based on data from new monitoring locations and updated state guidance

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Optimization Study Next Steps

For 4 selected alternatives that are projected by groundwater modeling to improve water supply reliability, are feasible and achieve Basin sustainability, further evaluation will include:

- Document infrastructure needs (ASR wells, Intertie improvements)
- Assess travel time requirements for purified water injection
- Water Quality Assessment for transfers
- Economic considerations & Agencies Agreements
- Needs assessment – Social, Environmental, Political, Legal

Modified from Brown & Caldwell, 2023

Questions

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