Public Workshop -

Future Water Budget

Seawater Intrusion Sustainability Management Criteria

February 15, 2023

Team Members

CARPINTERIA GSA
GROUNDWATER SUSTAINABILITY AGENCY

Bob McDonald

PUEBLO water resources

Robert Marks

GSI Water Solutions, Inc.

Dave O’Rourke

Tim Nicely

Jeff Barry

GSP Project Approach

BUILD TRUST THROUGH CLARITY, CONSISTENCY, AND INVOLVEMENT

Complete

PHASE 1

FACT REPORTING AND EDUCATION

- GSP Kickoff
- Communication Plan
- Plan Area and Basin Setting: Hydrogeologic Conceptual Model, Current Historical GW Conditions, and Water Budget
- Groundwater Model Update

March 2022 to December 2022

In Progress

PHASE 2

SUSTAINABLE GOAL SETTING

- Sustainable Management Criteria: Management Areas
- Sustainability Goal, Measurable Objectives, Minimum Threshold, and Undesired Results

January 2023 to April 2023

Summer 2023

PHASE 3

PLAN TO SUSTAINABILITY

- Projects and Management Actions to Achieve Sustainability: Projects and Management Actions
- Plan Implementation: Estimate Costs and Schedule

May 2023 to September 2023

Fall 2023

PHASE 4

GSP DOCUMENTATION

- Administrative Draft GSP
- Public Comment Period
- Final GSP
- GSP Adoption
- **GSP submittal to DWR**

September 2023 to November 2023

DEFENSIBLE PLAN

Sustainable Management Criteria Development Process

February 2023 GSA Public Workshop #3

Draft Sustainability Goal

- Seawater Intrusion SMCs
- Introduce Water Level Decline and Reduction of Storage SMCs

March 2023 GSA Public Workshop #4

- Water Level Decline and Reduction of Storage SMCs
- Subsidence SMCs
- WQ SMCs
- GW/SW Interaction SMCs

April 2023 GSA Public Workshop #5

- Wrap up SMCs
- Goal is to reach consensus on SMC's to be included in Chapter 7
- Introduction to Projects and Management Actions

May 2023 GSA Public Workshop #6

- Purpose is to release Draft Chapter 7 – SMC for public comment
- Complete Projects and Management Actions

Public workshops after SMC stakeholder input will address Projects and Management Action, and Implementation.

Public Workshop
Projected Water Budget

Workshop No. 4

February 15, 2023

Robert C. Marks, PG, CHg
Principal Hydrogeologist
Pueblo Water Resources, Inc.

Presentation Outline

Projected Water Budget

1. Projected Water Budget Description
2. Methodology Used to Create Projected Water Budget
3. Projected Water Budget Results
4. Next Steps
5. Q&A

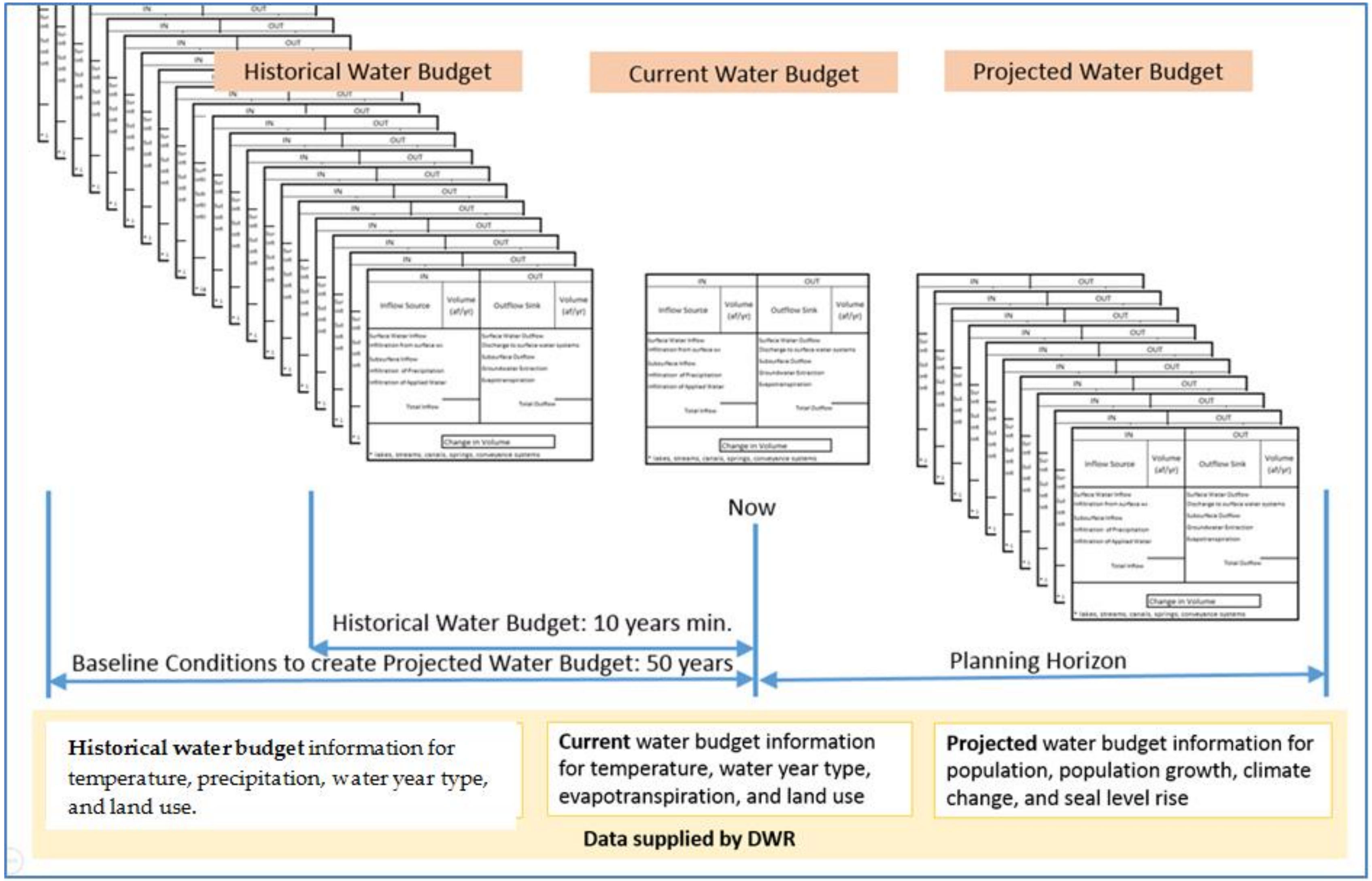
Projected Water Budget Description

Projected Water Budget

Use 50 years of historical precipitation, evapotranspiration, and stream flow information as the future baseline hydrology conditions, while taking into consideration:

1. Estimated climate change and sea level rise projections.
2. Future water demand.
3. Projected changes in local land use planning, population growth, and climate.

GSP Water Budget Timelines



50-Year Base Period Selection

Projected Water Budget

- ➢DWR Change Factors period of WY 1916 – WY 2011
- ➢Carpinteria Precipitation period of record of WY 1949 – current
- ➢Common period of record is WY 1949 – WY 2011 (63 years)
- ➢There are <u>**14**</u> 50-year historical periods to select from

50-Year Base Period Selection Criteria

Projected Water Budget

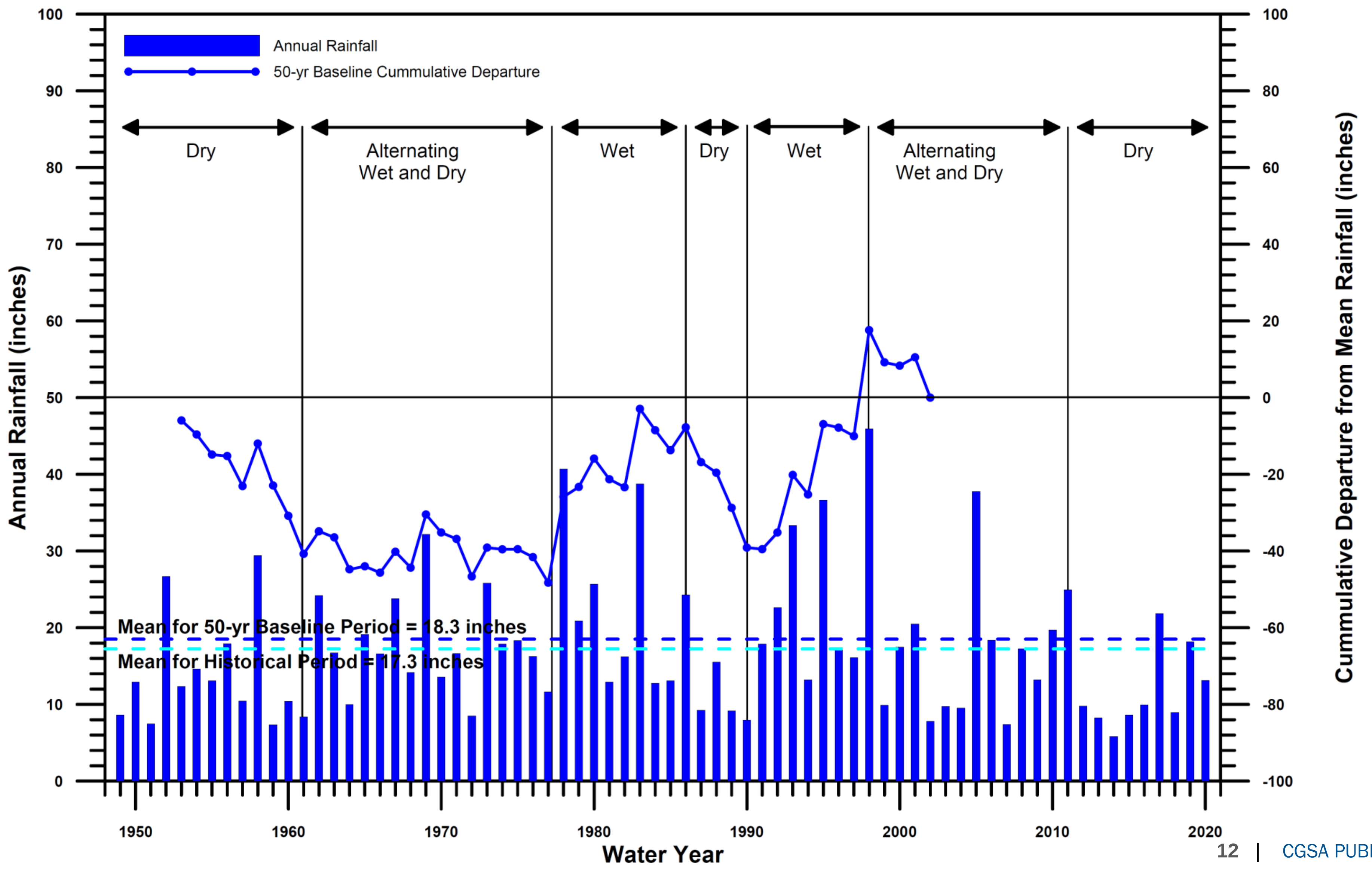
1. Include at least one period each of overall wet conditions and overall dry conditions (relative to average annual conditions)
2. Have an average precipitation that is close to the average precipitation for the entire period of record.
3. The beginning of the base period should be during a period of relatively dry conditions to eliminate the potential for any “in-transit” recharge
4. Should (to the extent feasible) begin and end at comparable points on the historical cumulative departure from the mean annual precipitation

50-Year Base Period Selection Summary

Projected Water Budget

50-yr Period (WY)		Avg. Annual Precipitation (in)
Start	End	
1949	1998	18.3
1950	1999	18.3
1951	2000	18.4
1952	2001	18.7
1953	**2002**	**18.3**
1954	2003	18.3
1955	2004	18.2
1956	2005	18.6
1957	2006	18.7
1958	2007	18.6
1959	2008	18.4
1960	2009	18.5
1961	2010	18.7
1962	2011	19.0

50-yr Base Period Selection Precipitation



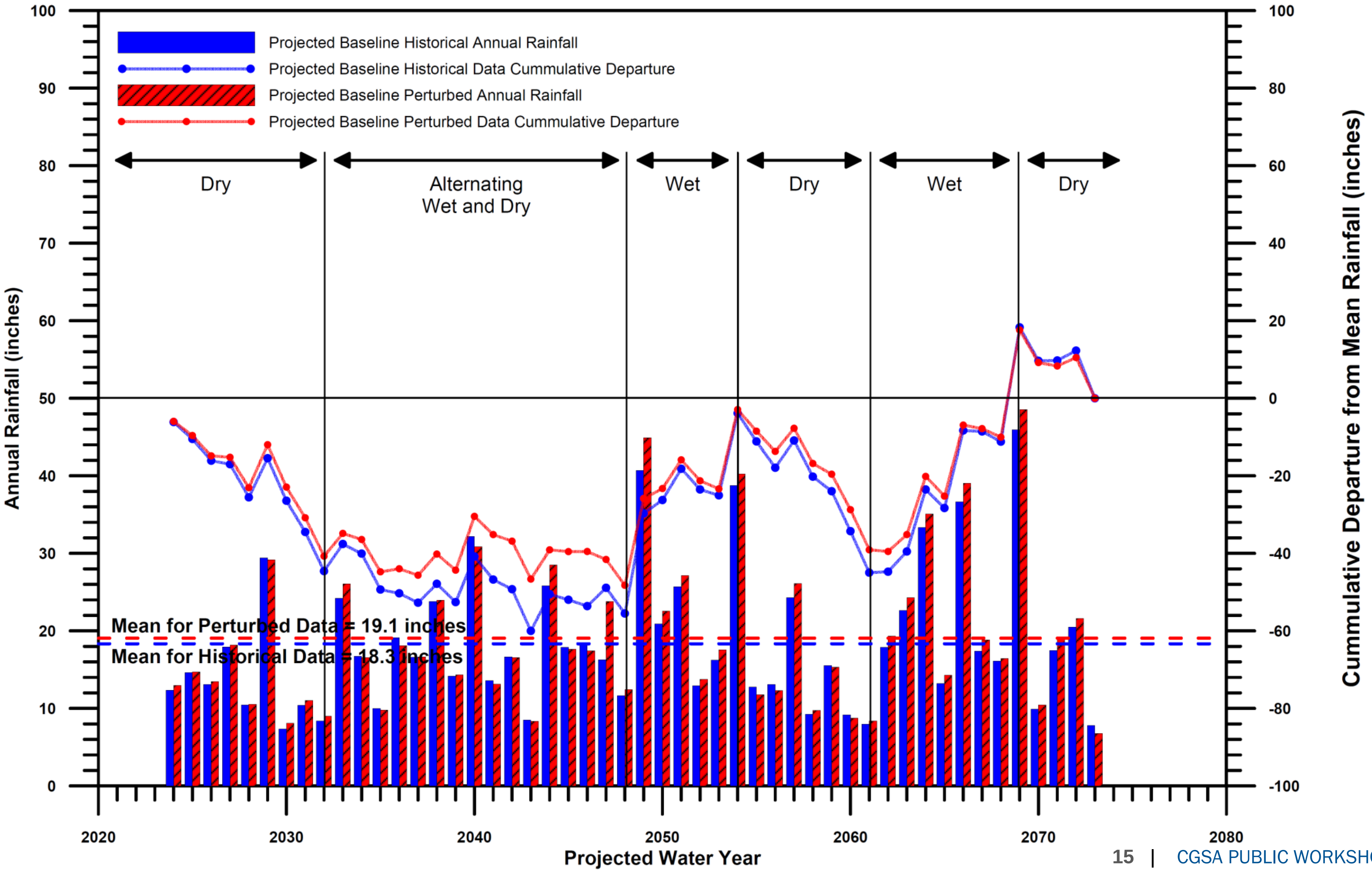
DWR Climate Change Data Sets

- Precipitation
- Evapotranspiration
- Streamflow
- Sea Level Rise
- SWP Contractor Deliveries

Incorporation of DWR Change Factors: Precipitation

- Monthly change factors range between 0 to 295 percent
- Average annual increase in precipitation of 4 percent

Baseline vs. Perturbed Precipitation

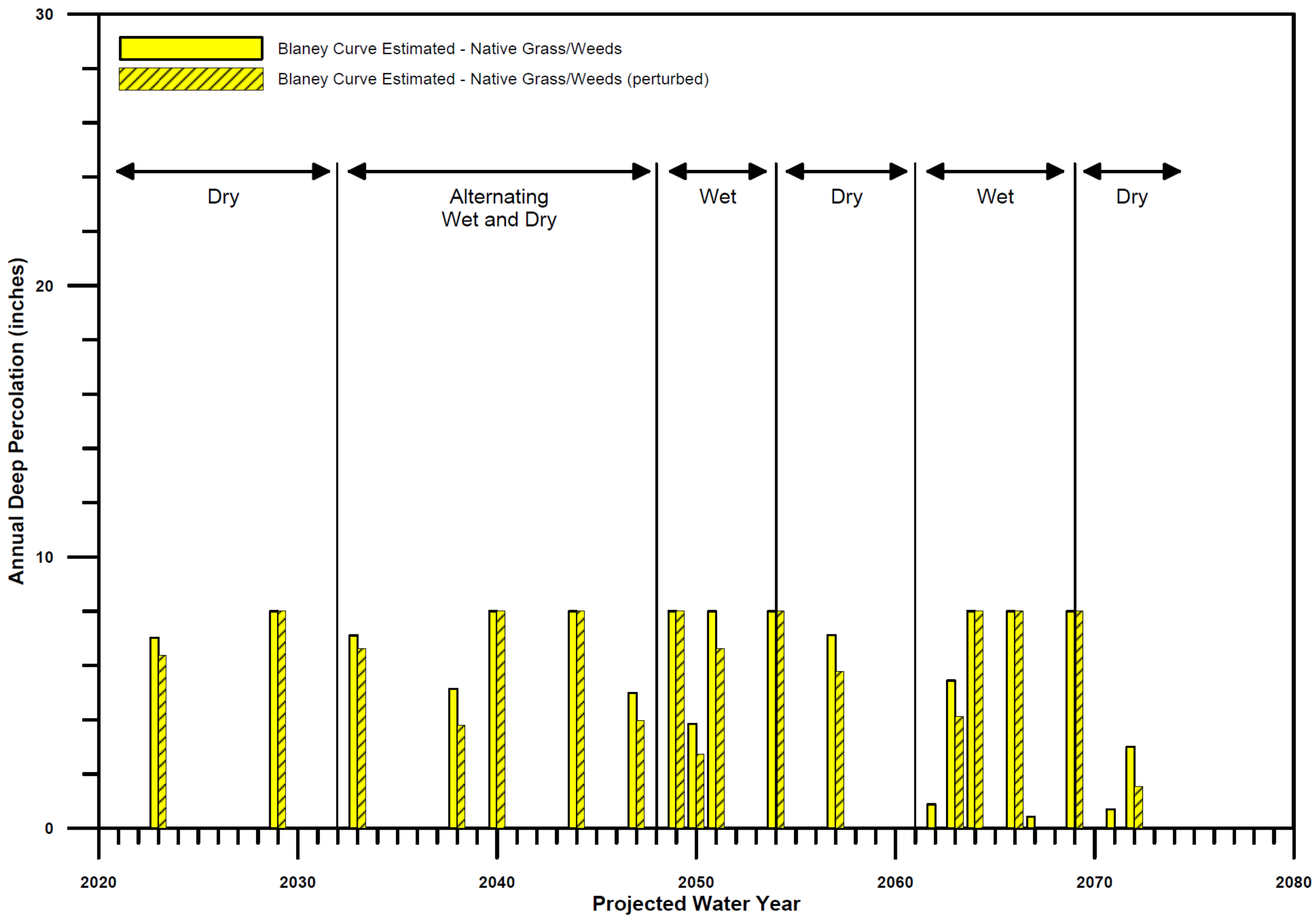


Incorporation of DWR Change Factors: Evapotranspiration

- Monthly change factors range between -3 to +20 percent
- Average annual increase in evapotranspiration of 6 percent

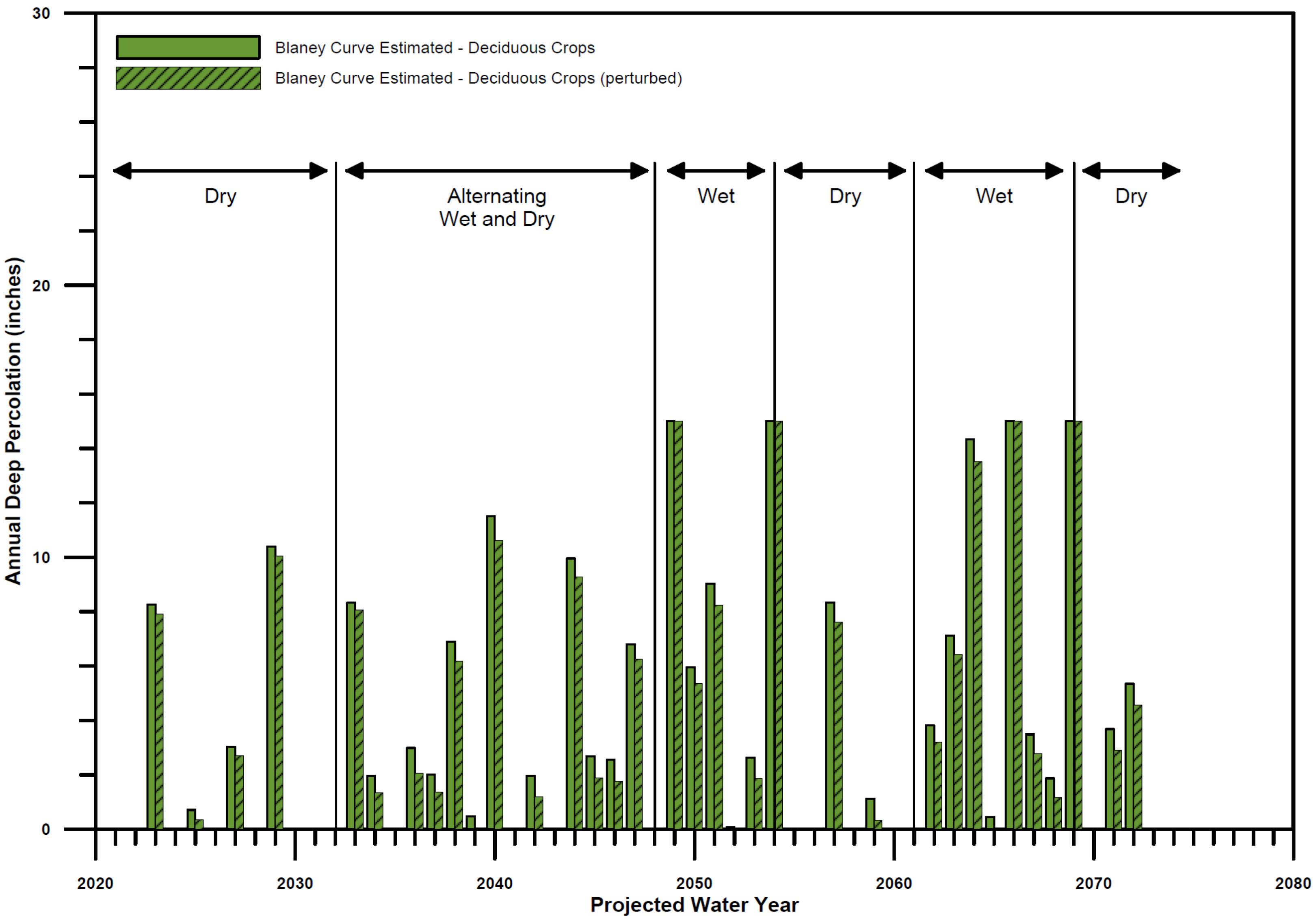
Native Grass/Weeds

Incorporation of DWR ET Change Factors



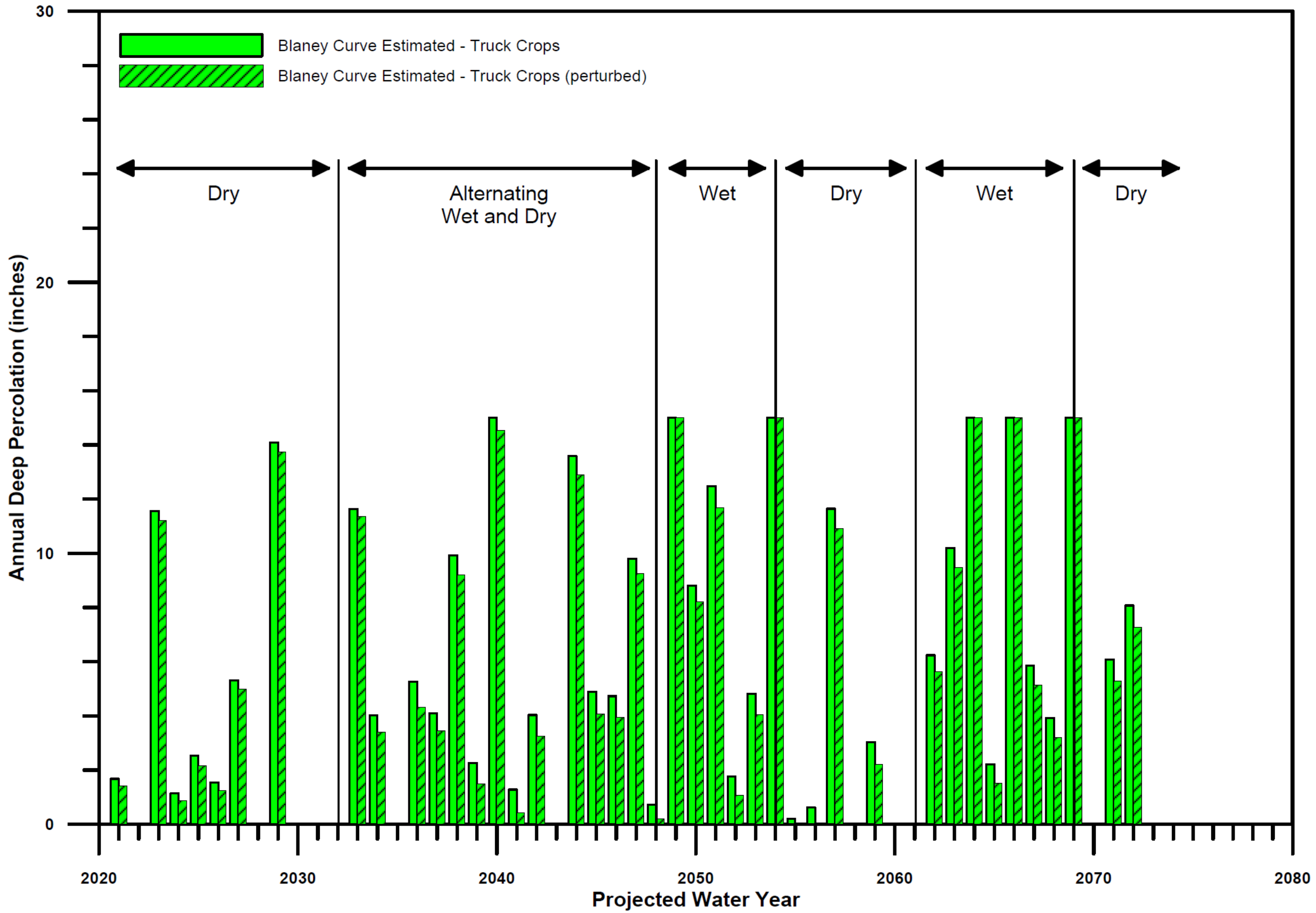
Deciduous Crops

Incorporation of DWR ET Change Factors



Truck Crops

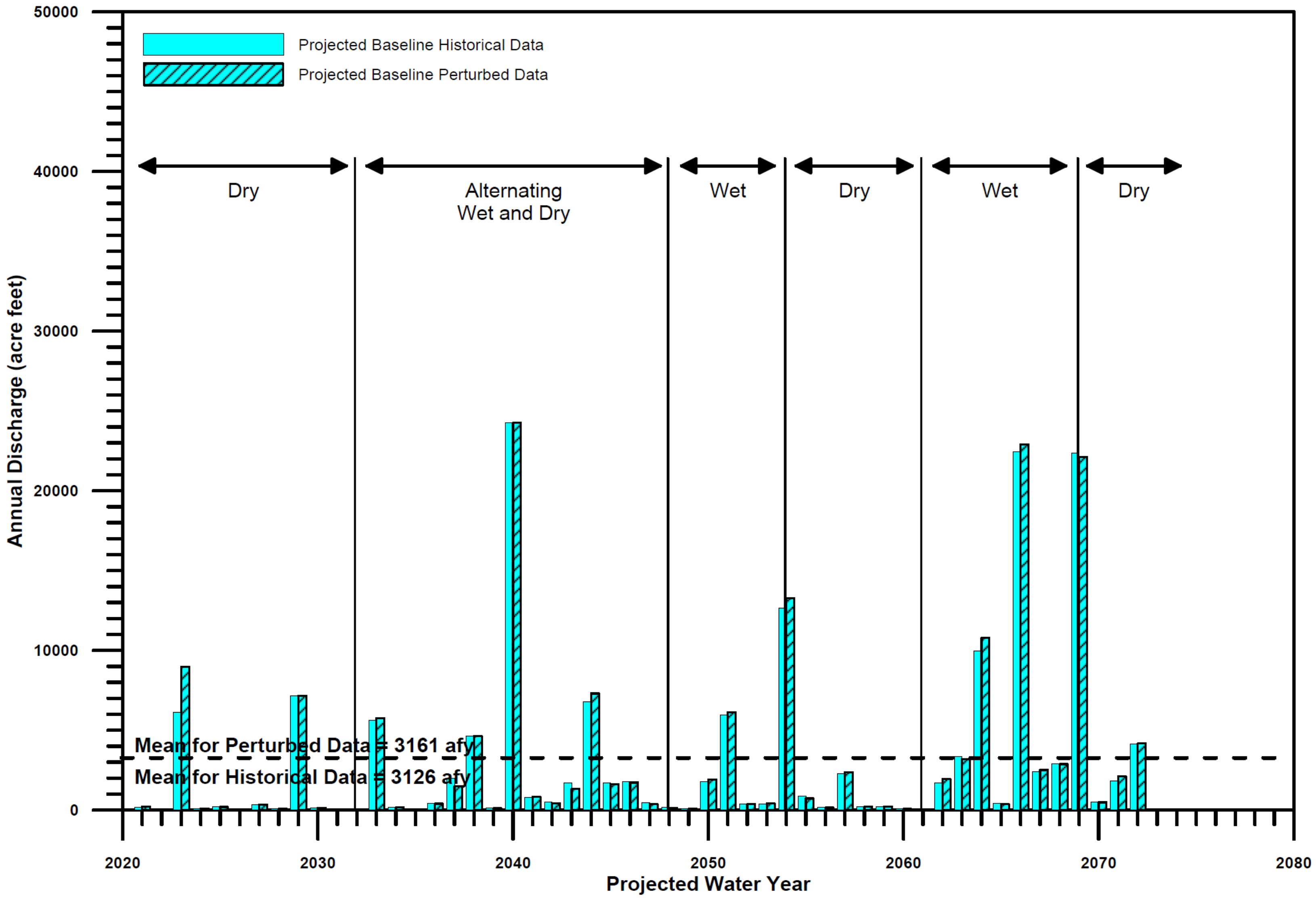
Incorporation of DWR ET Change Factors



Incorporation of DWR Change Factors: Streamflow (Carpinteria Creek)

- Monthly change factors range between 20 to 160 percent
- Average annual increase in streamflow of 0 percent

Baseline vs. Perturbed Streamflow (Carpinteria Creek)



Incorporation of DWR Change Factors: Sea Level Rise

- 15 cm (~0.5 ft) by 2030
- 45 cm (~1.5 ft) by 2070
- Incorporated into ocean boundary condition in groundwater model.

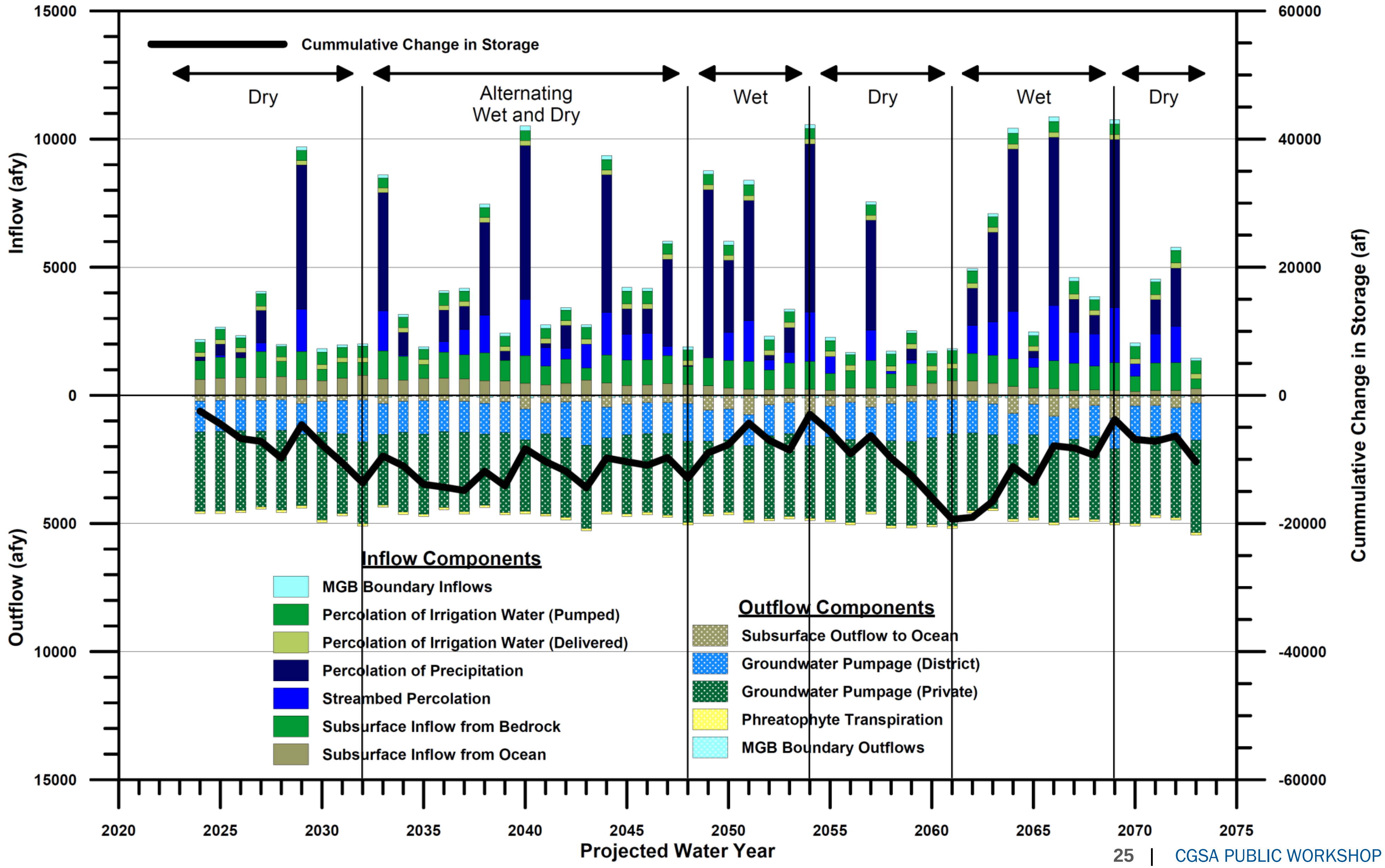
Projected Pumping: CVWD

Water Year Type	Projected Year				
	2025	2030	2035	2040	2045
Normal	1200	1200	1200	1200	1200
Single Dry	2017	1200	1307	1385	1455
Multiple Dry					
Year 1	2012	1173	1326	1394	1463
Year 2	2152	1255	1418	1492	1565
Year 3	2009	1185	1323	1392	1461
Year 4	1835	1070	1209	1272	1335
Year 5	1709	997	1126	1185	1243

Projected Pumping: Private Agricultural

Water Year Type	Projected Baseline Pumping (afy)
Wet	2676
Above Normal	2840
Below Normal	3005
Dry	3134
Critical	3333

Projected Water Budget Results – Annual Inventory

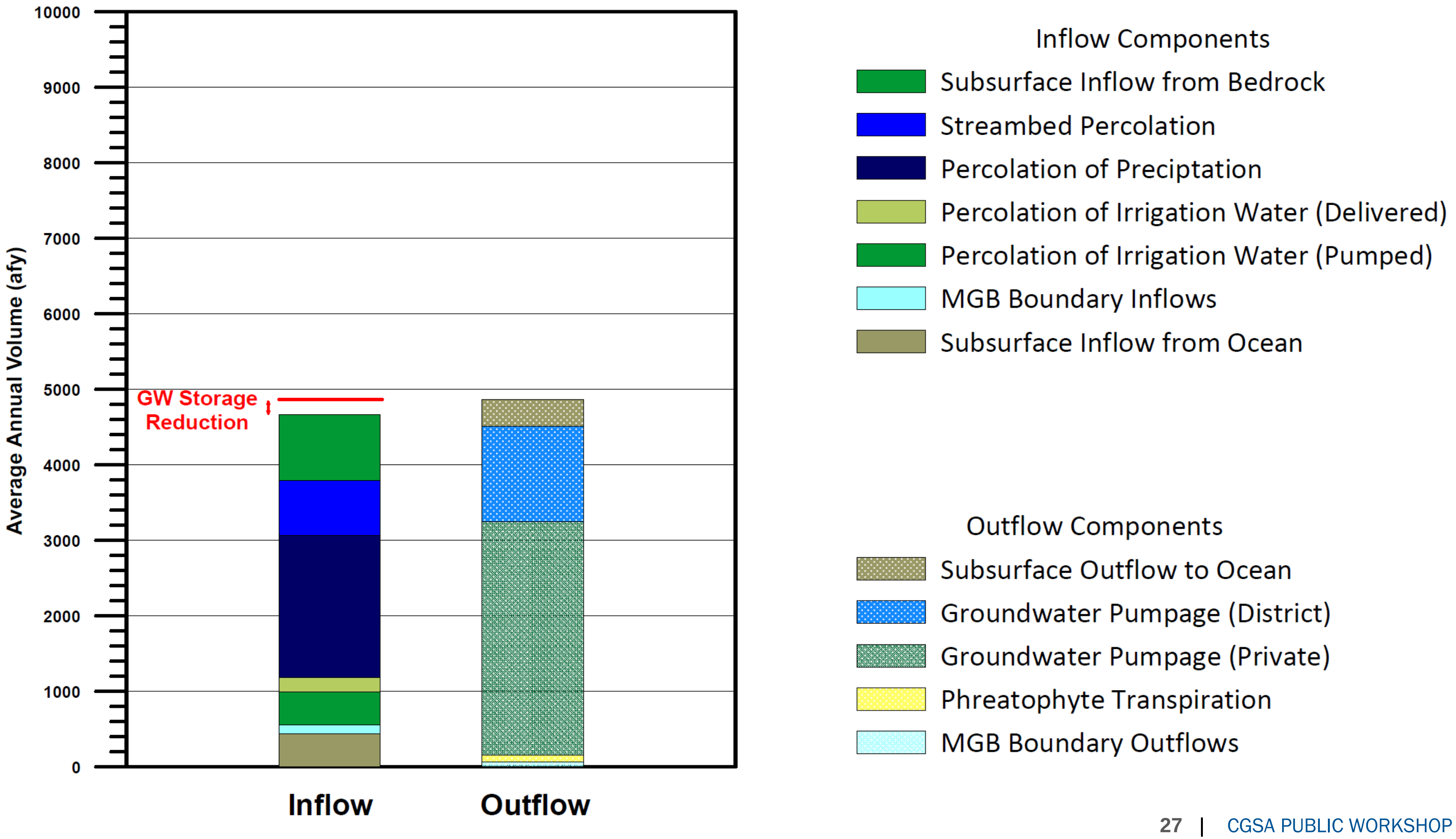


Projected Water Budget Results - Annual Averages

Groundwater Budget Component		Annual Minimum	Annual Maximum	Annual Average	Average %
Inflows (acre-feet per year)					
Subsurface Inflow		381	1,087	866	19
Streambed Percolation		0	2,186	734	16
Percolation of Precipitation		0	6,559	1,877	40
Percolation of Irrigation Water	Delivered	173	199	194	4
	Pumped	389	510	430	9
MGB Boundary Inflow		75	206	122	3
Subsurface Inflow from Ocean Boundary		155	784	438	9
			Total Inflow	**4,662**	**100**
Outflows (acre-feet per year)					
MGB Boundary Outflow		27	104	61	1
Subsurface outflow to Ocean Boundary		166	885	358	7
Groundwater Pumping	CVWD	1,200	1,709	1,263	26
	Private	2,752	3,607	3,094	64
Phreatophyte Transpiration		91	97	94	2
			Total Outflow	**4,870**	**100**

Change in Storage (acre-feet per year)	Cummulative	Average
	-10,388	-208

Projected Water Budget Results - Annual Averages Summary Chart

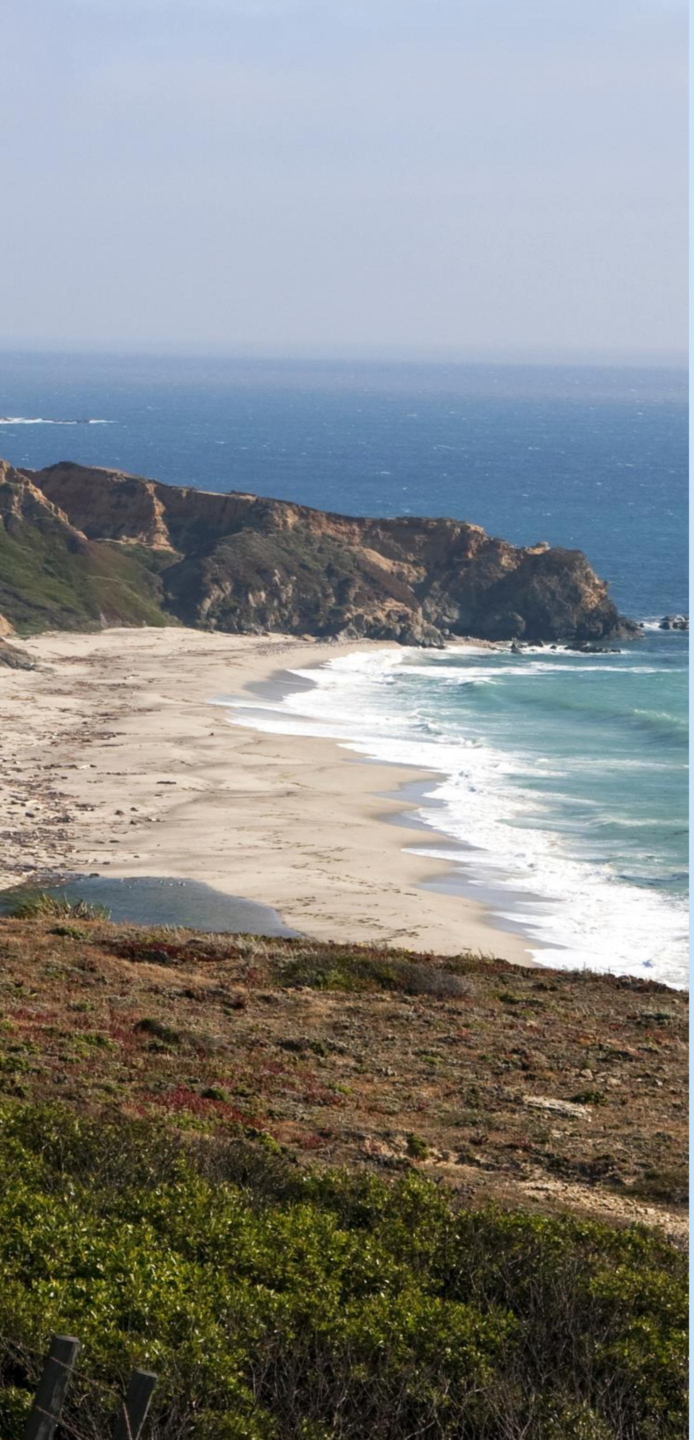


Next Steps

Projected Water Budget

What will the Projected Water Budget be used for?

- Baseline no-project groundwater model scenario
- Simulate various projects and management actions that may be needed to meet SMCs



PROJECTED WATER BUDGET

QUESTIONS?

Public Workshop – Seawater Intrusion Sustainability Management Criteria

February 15, 2023

David O Rourke, PG, CHG, PE
Principal Hydrogeologist
GSI Water Solutions, Inc.

Presentation Outline

Sustainability Management Criteria

1. General Review of SGMA and SMCs
2. Seawater Intrusion SMCs
   - Data Review
   - Definitions
   - MTs/MOs
3. Introduction to Water Level Decline and Reduction of GW in Storage SMCs
4. Next Steps
5. Q&A

SIX SUSTAINABILITY INDICATORS

Pathway to Sustainability

Seawater Intrusion

Chronic Lowering of Groundwater Levels

Reduction of Groundwater Storage

Water Quality Degradation

Interconnected Surface Water Depletions

Land Subsidence

SMC Definitions

Pathway to Sustainability

Representative Monitoring Sites (RMS)
A subset of a basin's complete monitoring network, where minimum thresholds, measurable objectives, and interim milestones are set.

SMCs

Minimum Threshold (MT) -The value that represents groundwater conditions at an RMS that, when exceeded individually or in combination with minimum thresholds at other monitoring sites, may cause an *undesirable result*(s) in the basin.

Interim Milestone (IM) -A target value representing measurable groundwater conditions, in increments of five years, set by an Agency as part of a Plan

Measurable Objective (MO) - Measurable objectives are aspirational goals that reflect the basin's desired groundwater conditions and allow the GSA to achieve the sustainability goal within 20 years.

SMC Relationships

Sustainability Indicator

SMCs – Management Criteria

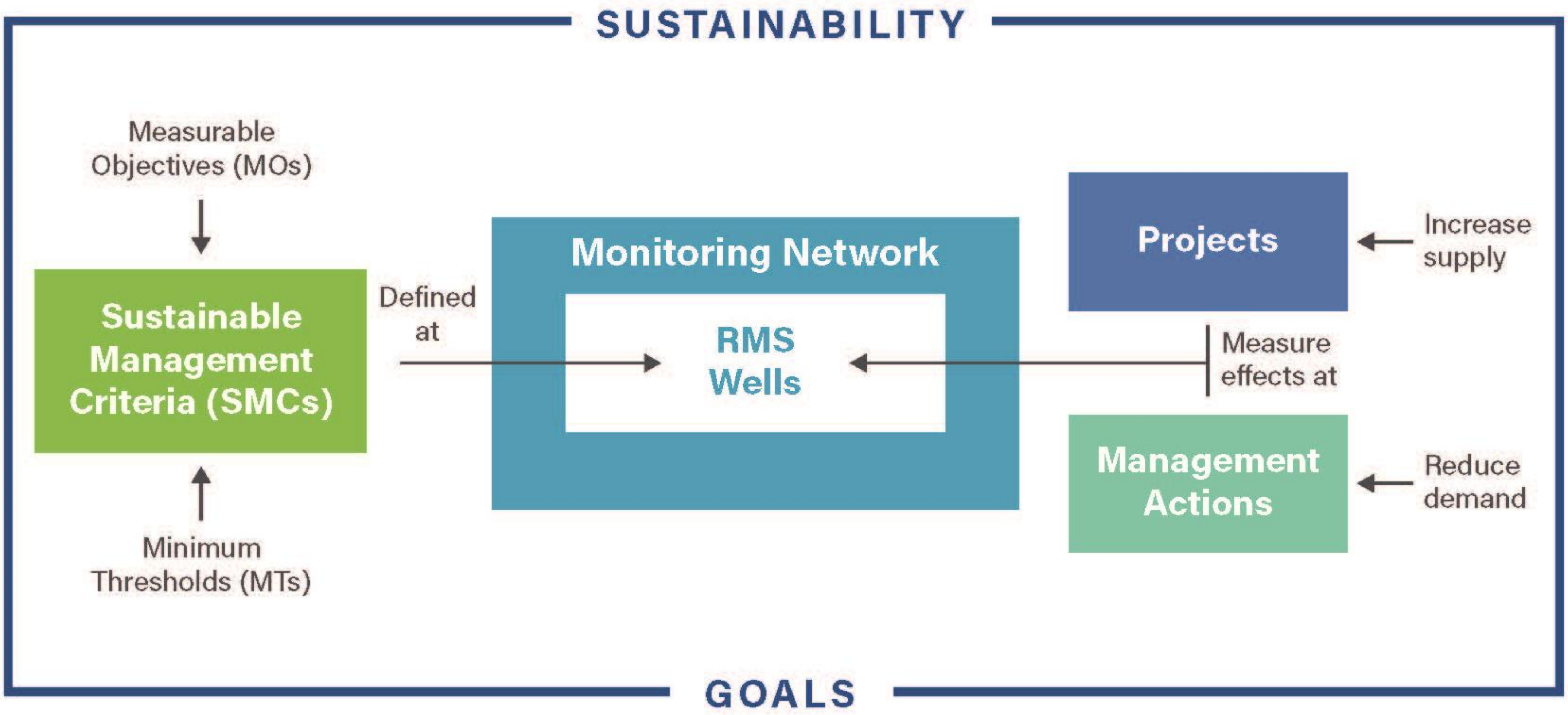
MOs – Measurable Objectives (Goals)

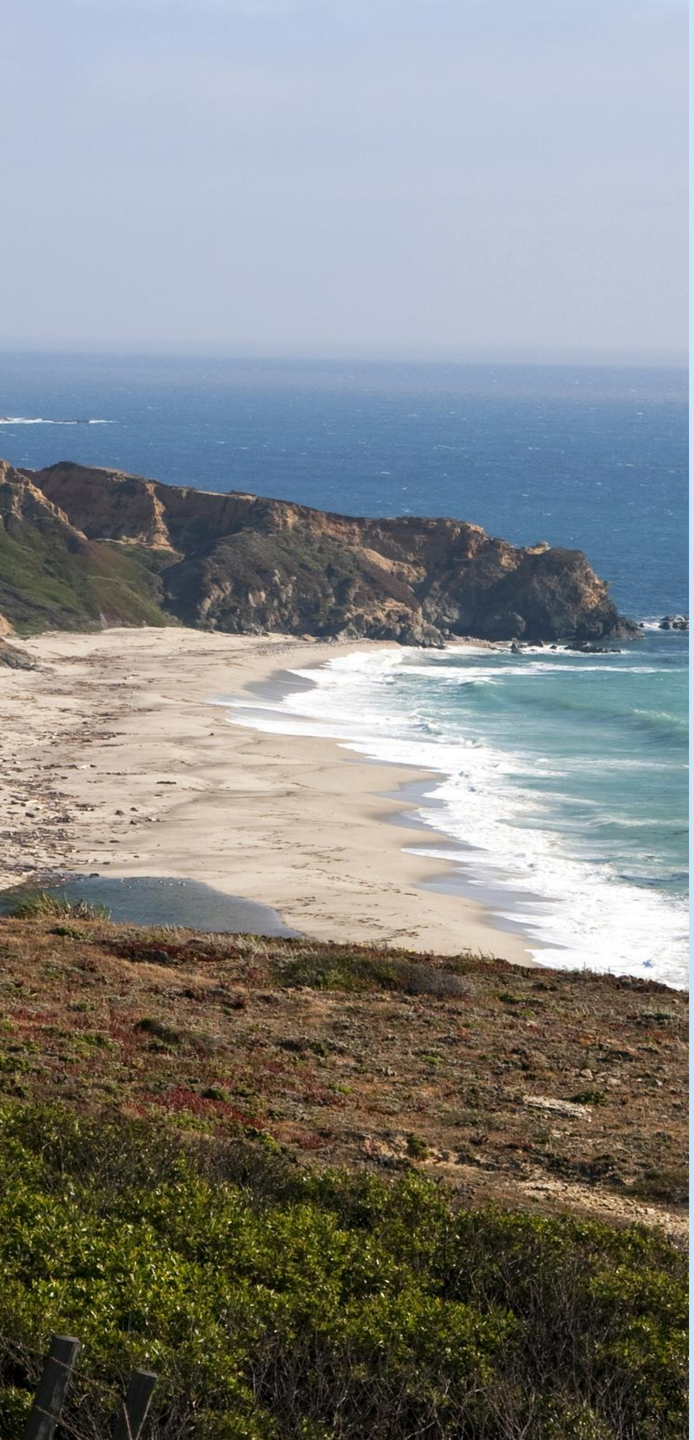
MTs – Minimum Thresholds (Triggers action)

IMs – Interim Milestones

Undesirable Results! – Triggers action (study, management action, etc.)

Getting to Sustainability – RMS Wells





SEAWATER INTRUSION

EXAMPLES OF SEAWATER INTRUSION UNDESIRABLE RESULTS

- **Saline groundwater migrating inland from ocean and reaching agricultural production wells, impacting crops and agricultural economy.**

- **Saline water reaching municipal (or domestic) production wells, impacting water quality for potable supply source, requiring increased level of treatment to serve customer base.**

RMS WELLS SELECTION CRITERIA

RMS Wells are a subset of larger Monitoring Network. SMCs are defined and measured at RMS wells.

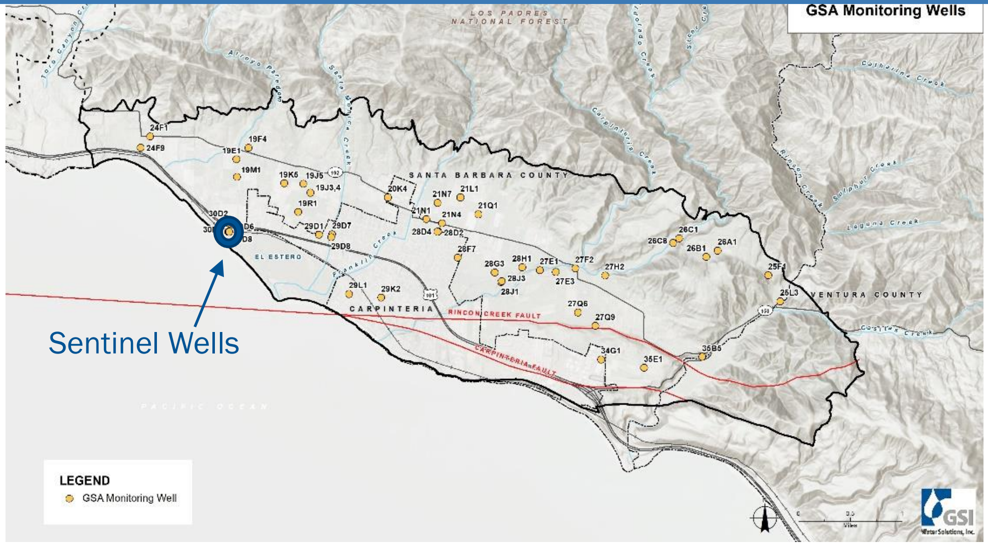
- Carpinteria Basin has ~45 wells in monitoring network.
- About 10-15 will be considered as RMS wells for various SMCs.

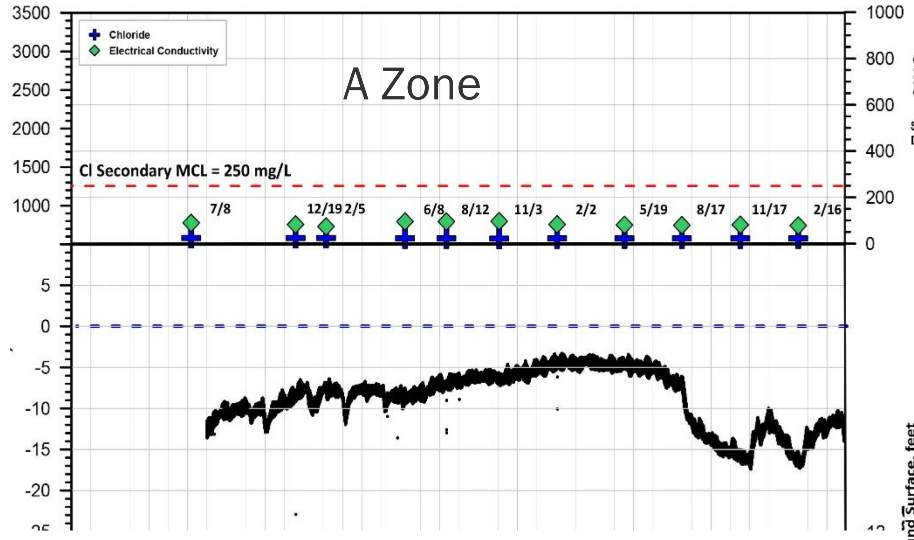
Qualities *desired* for RMS wells.

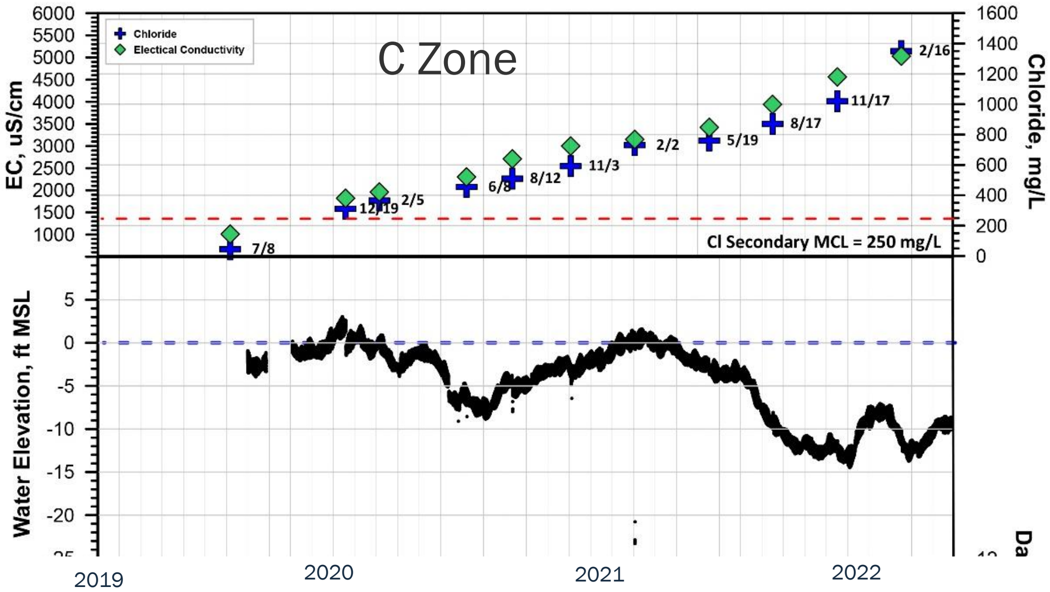
- Located in areas of interest or data gaps
- Accessibility of well for measurements
- Long Period of Record
- Documented Well Construction Details (depth, screen, etc.)
- Dedicated Monitoring Well Preferred – i.e., No Pumping

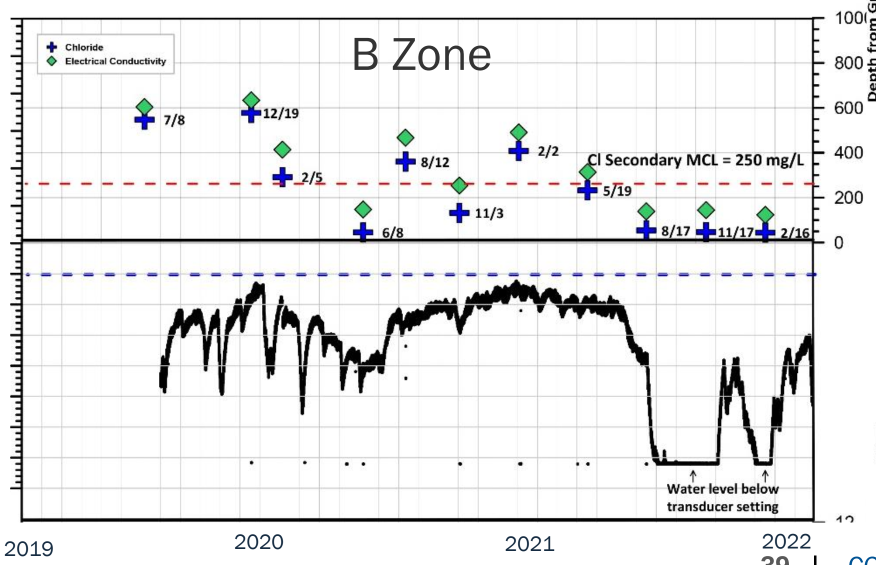
REVIEW OF SENTINEL WELL DATA

Seawater Intrusion SMCs









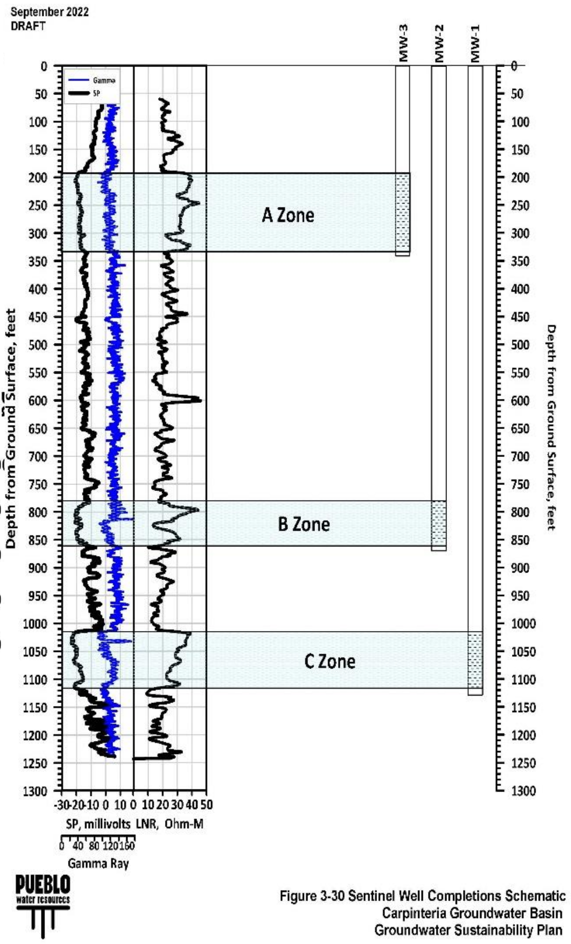
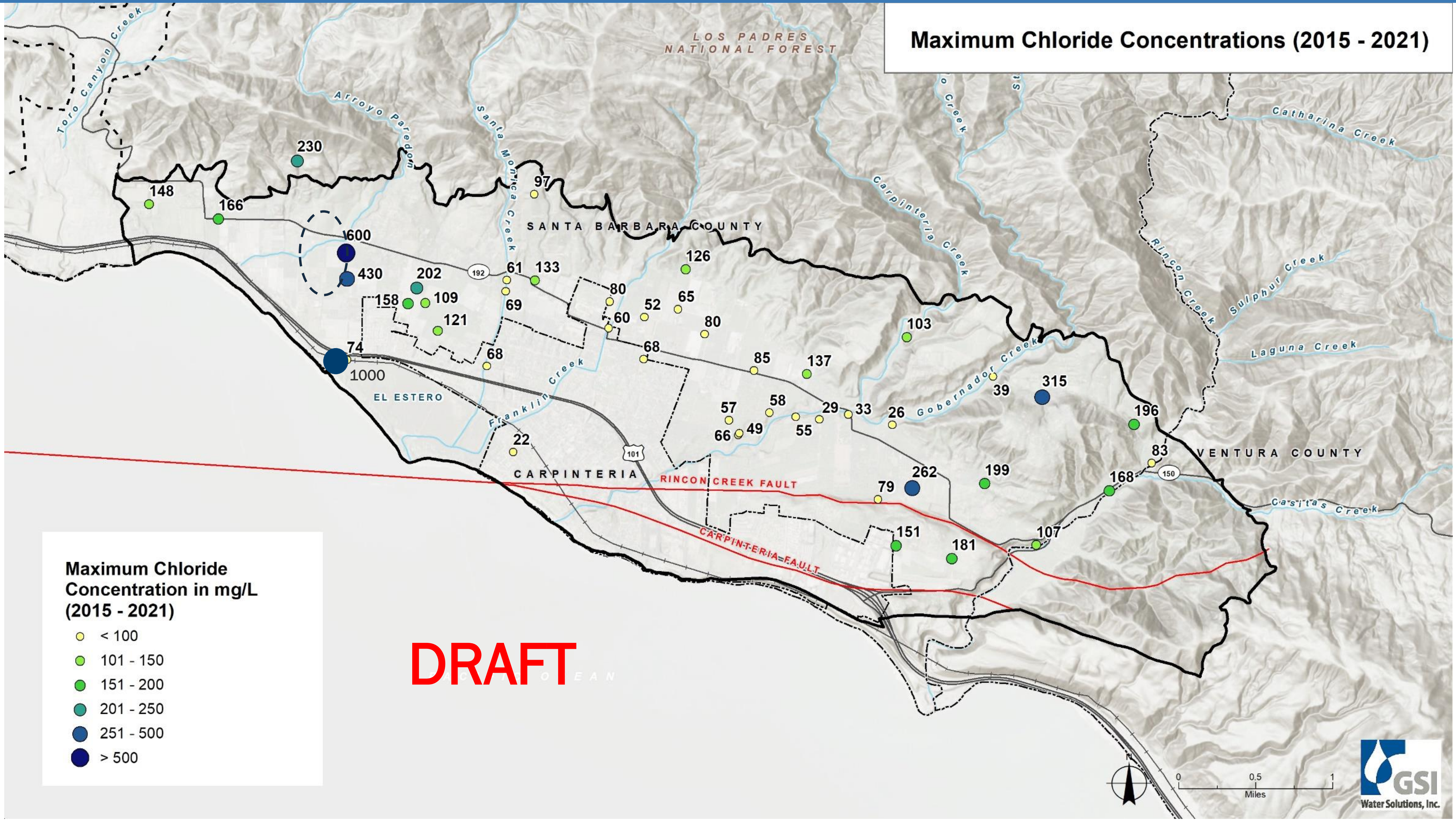


Figure 3-30 Sentinel Well Completions Schematic
Carpinteria Groundwater Basin
Groundwater Sustainability Plan

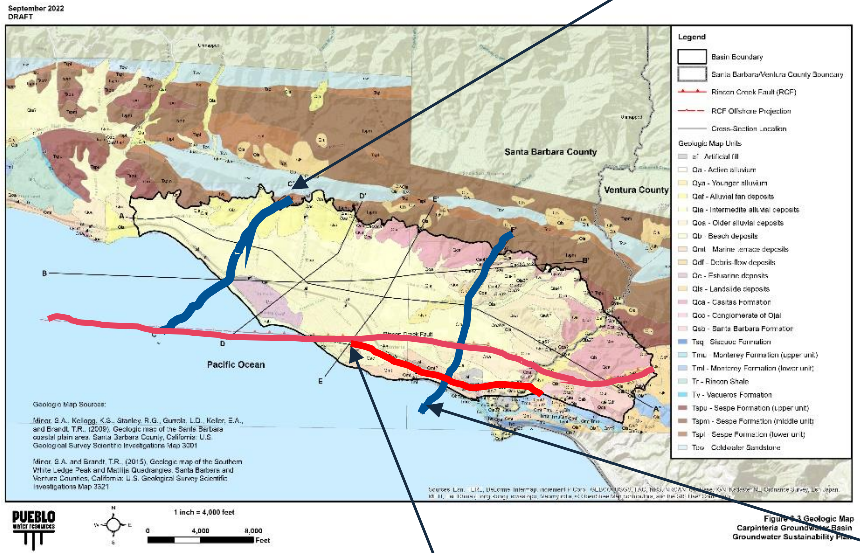
MAXIMUM CHLORIDE 2015-2021

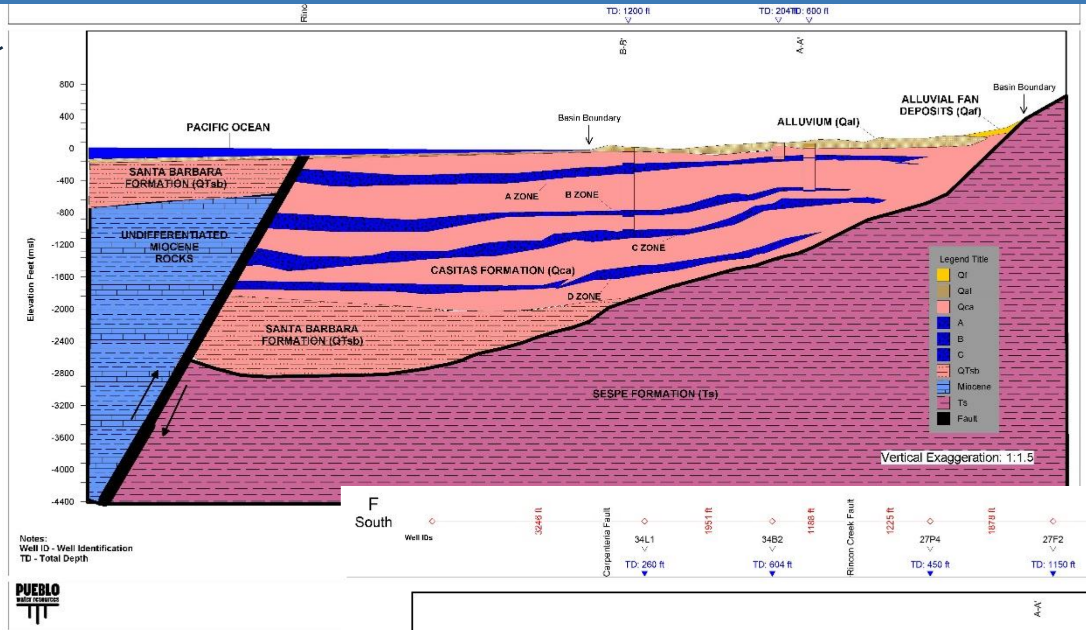
Seawater Intrusion SMCs

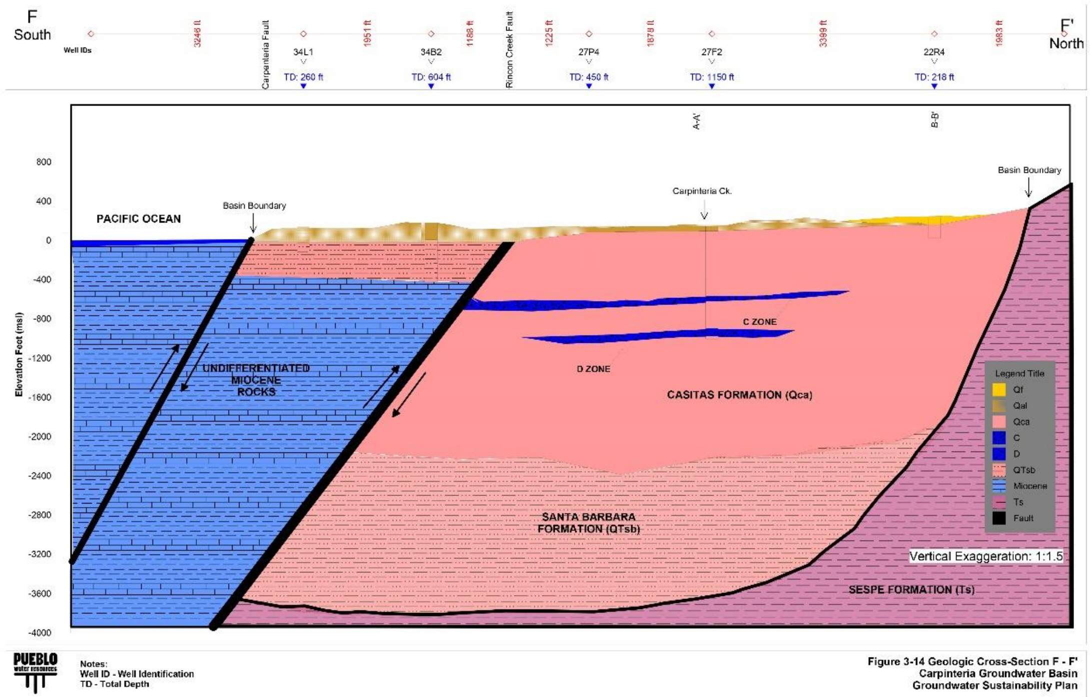


FAULT BARRIERS TO SEAWATER INTRUSION

Seawater Intrusion SMCs







Rincon Creek and Carpinteria Faults

SGMA Regulation: Seawater Intrusion SMCs – Chloride Concentration Isocontour Line

§ 354.28. Minimum Thresholds

(3) Seawater Intrusion.

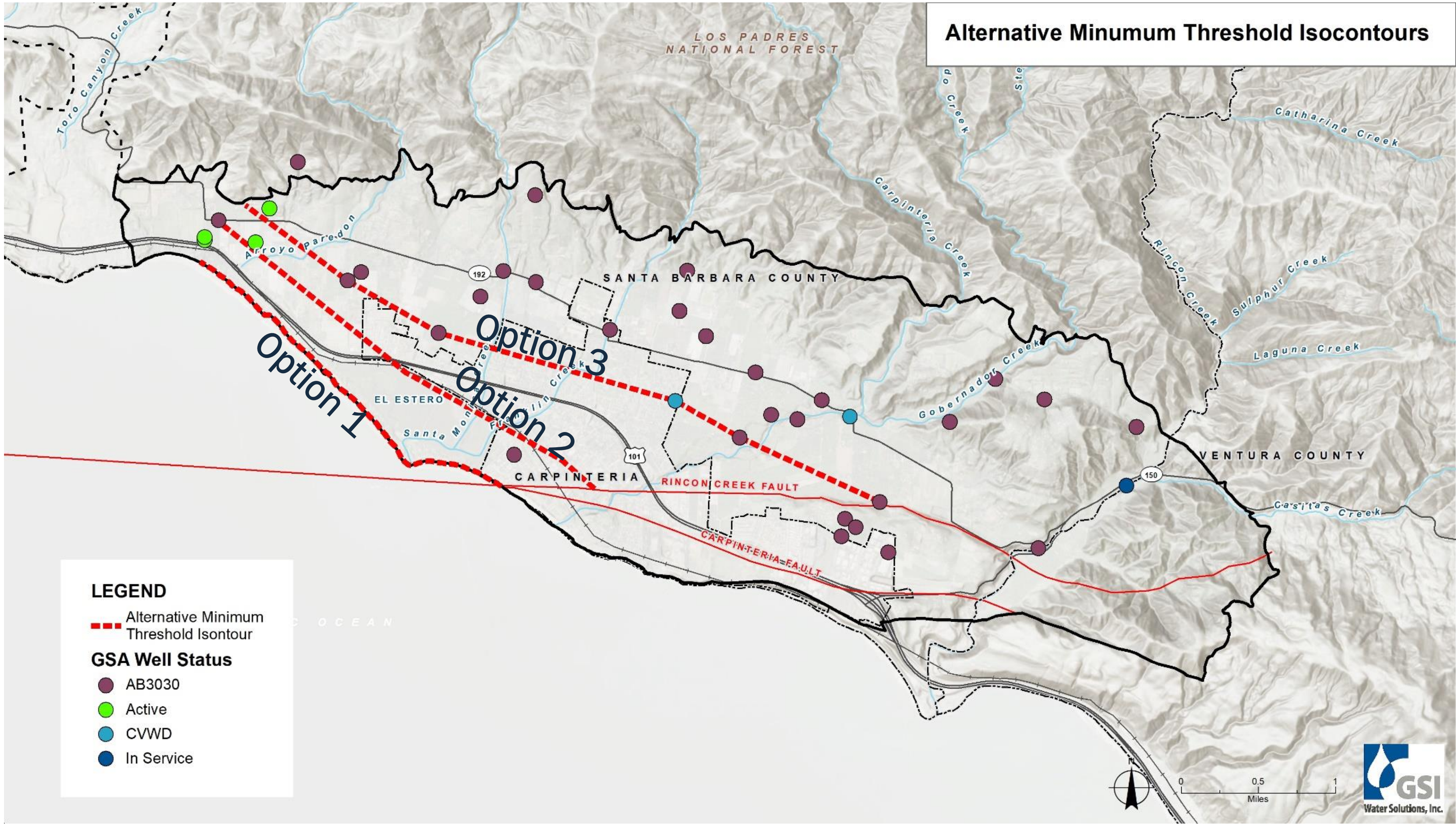
The minimum threshold for seawater intrusion shall be defined by a chloride concentration isocontour for each principal aquifer where seawater intrusion may lead to undesirable results.

Seawater Intrusion SMCs – Chloride Concentration Contour Line

Metric- Chloride Isocontour line.

Considerations for Analysis:

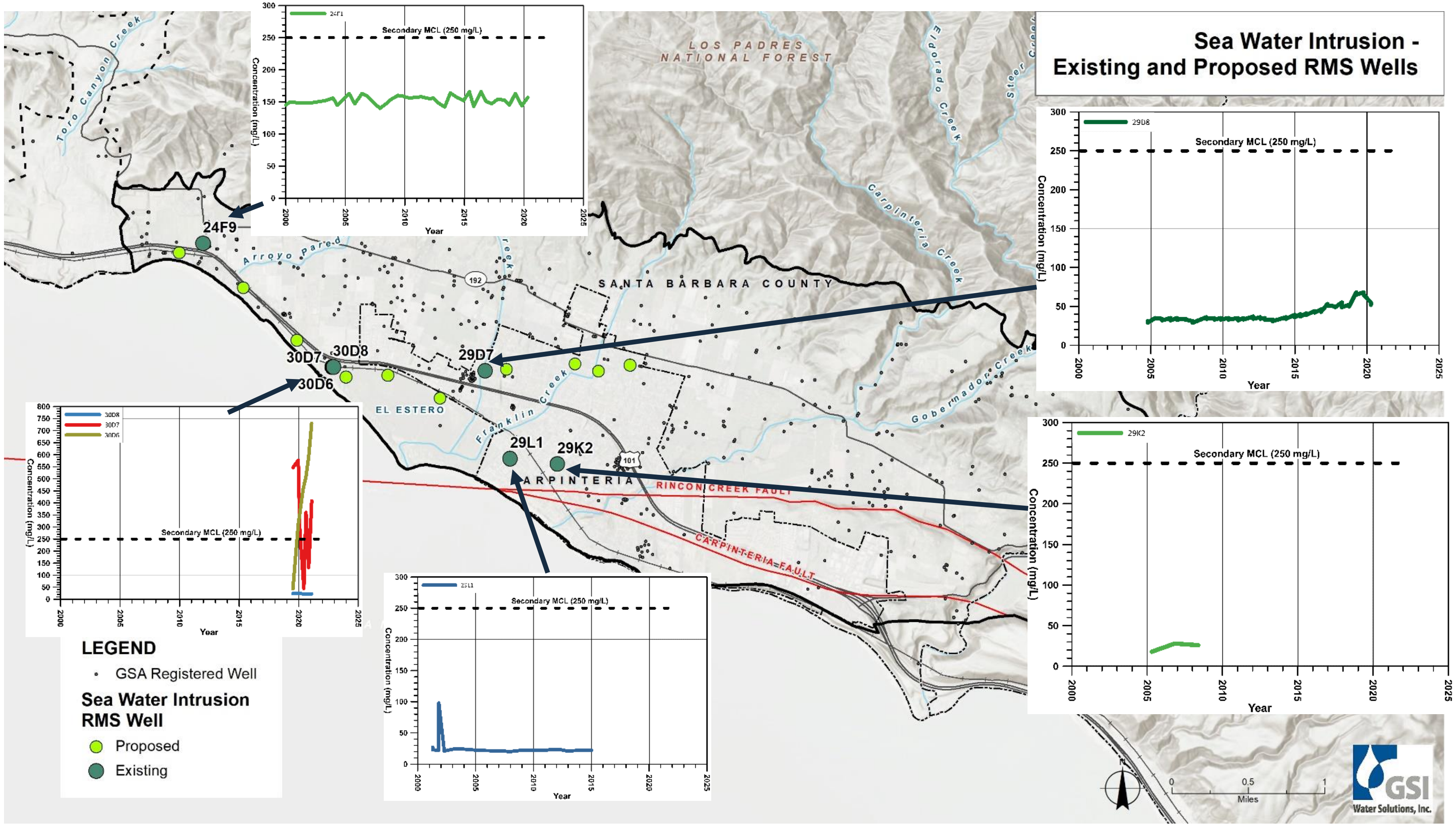
- Location of line (Coast? Inland?)
- Location/Distance to receptor wells, or travel time of saline water to wells
- Existing WQ Data
- Logistics of Future Monitoring



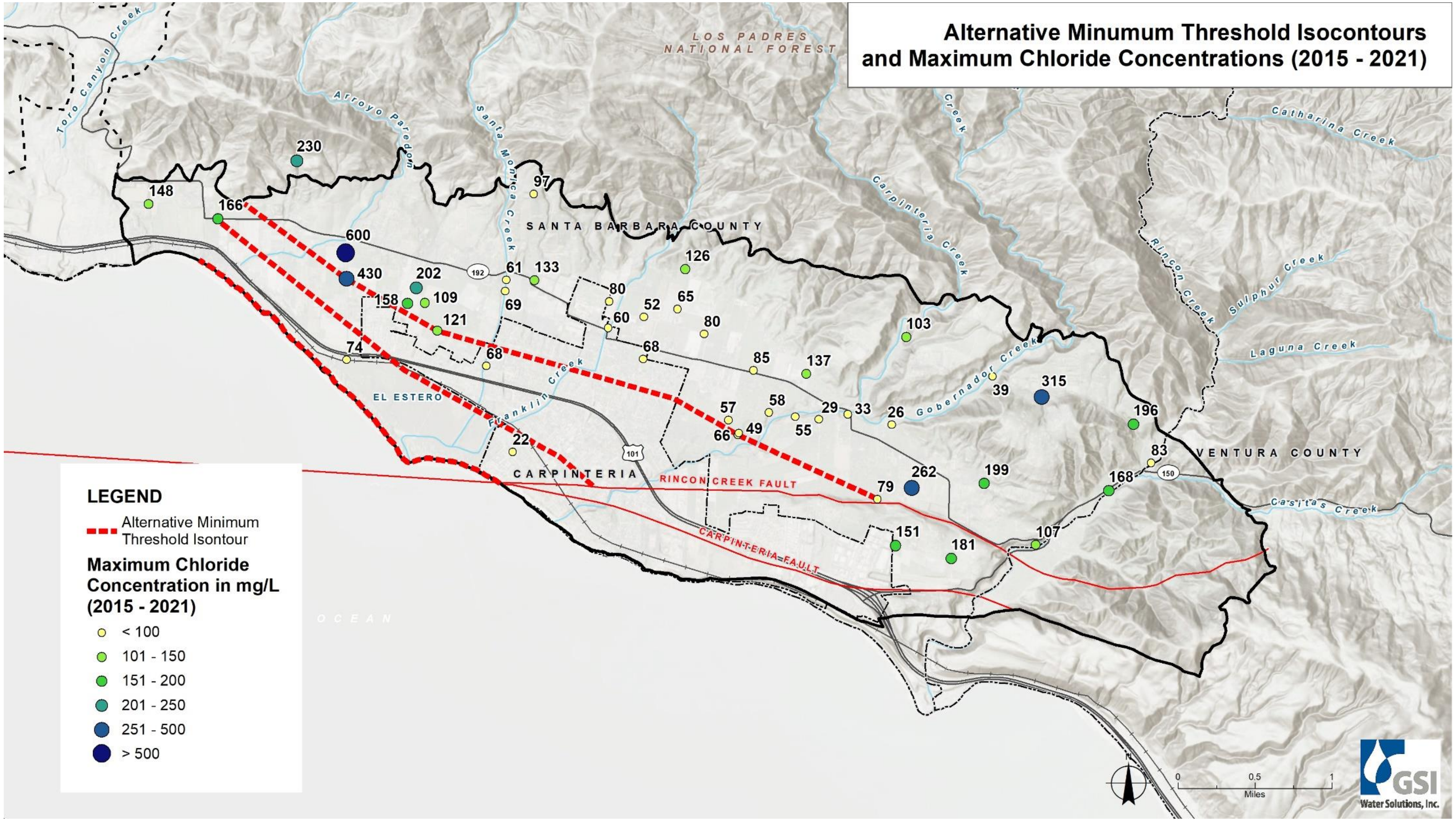
Seawater Intrusion SMCs – Proposed RMS Wells and Transient Chloride Concentrations

Considerations for Selection of SWI RMS Wells:

- **Proximity to Coast**
- **North of Rincon Creek Fault**
- **WQ Data History**
- **Known Well Construction Details**
- **Logistics of Future Monitoring**



Seawater Intrusion SMCs – Alternative Isocontour Locations with Maximum Recent Chloride

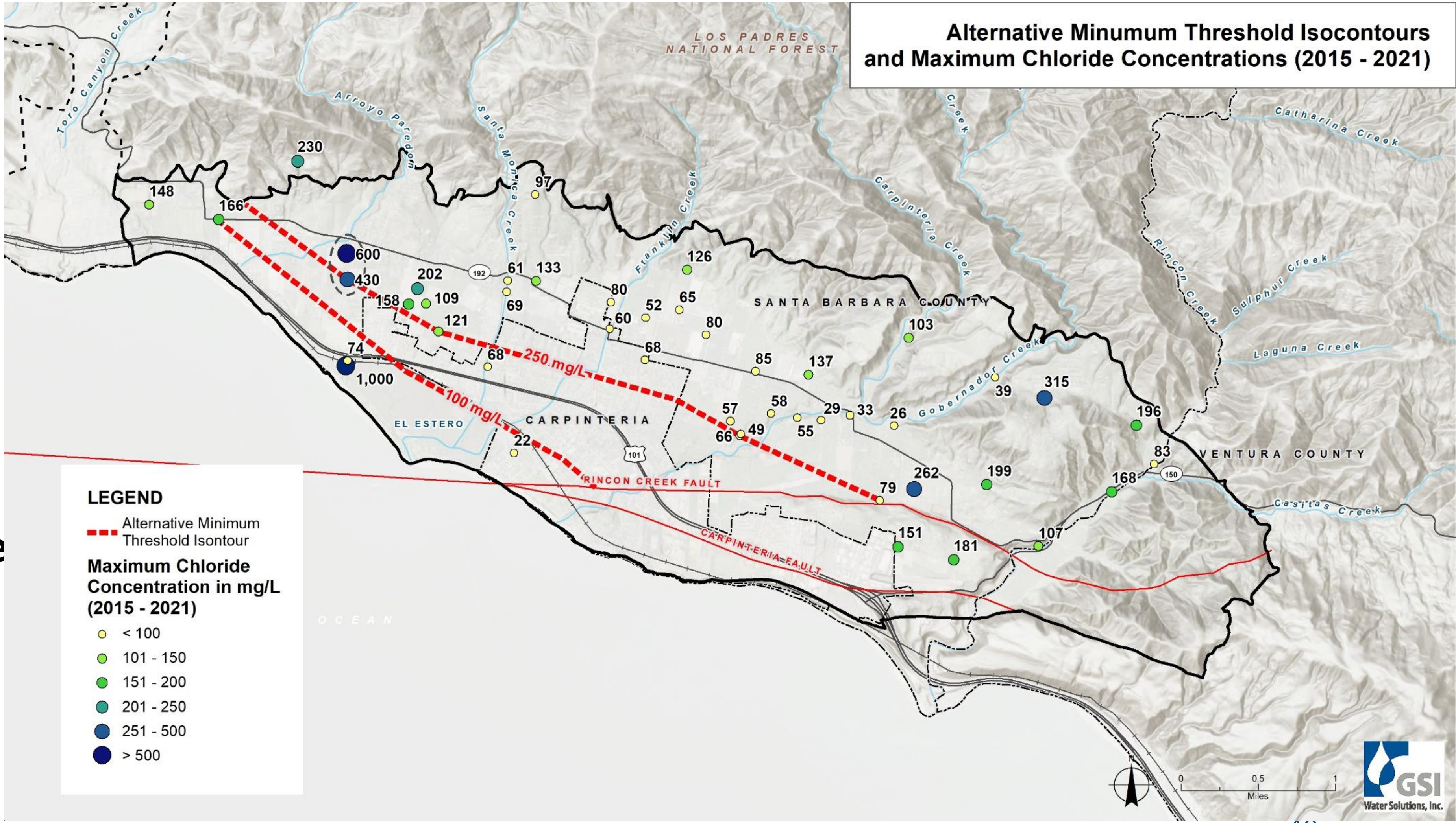


Seawater Intrusion SMCs – Proposed Minimum Threshold and Measurable Objective Isocontours

<u>Separate Isocontour lines for MTs and MOs.</u>

Considerations for Analysis:

- **MO = 100 mg/L isocontour ~ halfway between coast and active well locations. Future monitoring will focus on this line.**
- **MT = 250 mg/L on a line connecting active wells**
- **Specifically excludes area near Arroyo Paredon with documented high chlorides**



CHRONIC LOWERING OF GROUNDWATER LEVELS &

REDUCTION OF GROUNDWATER STORAGE

Example Undesirable Results of Lowered GW Levels & Reduction in Storage

Conditions causing undesirable results must be *significant* and *unreasonable*

- **Water levels falling below screen for Municipal production wells.**
- **Decline in yields of agricultural wells.**
- **Private domestic supply wells losing ability to supply water to homes.**

Types of data to be analyzed:

- **Well location**
- **Well depth**
- **Top of screened interval**
- **Pumping patterns**

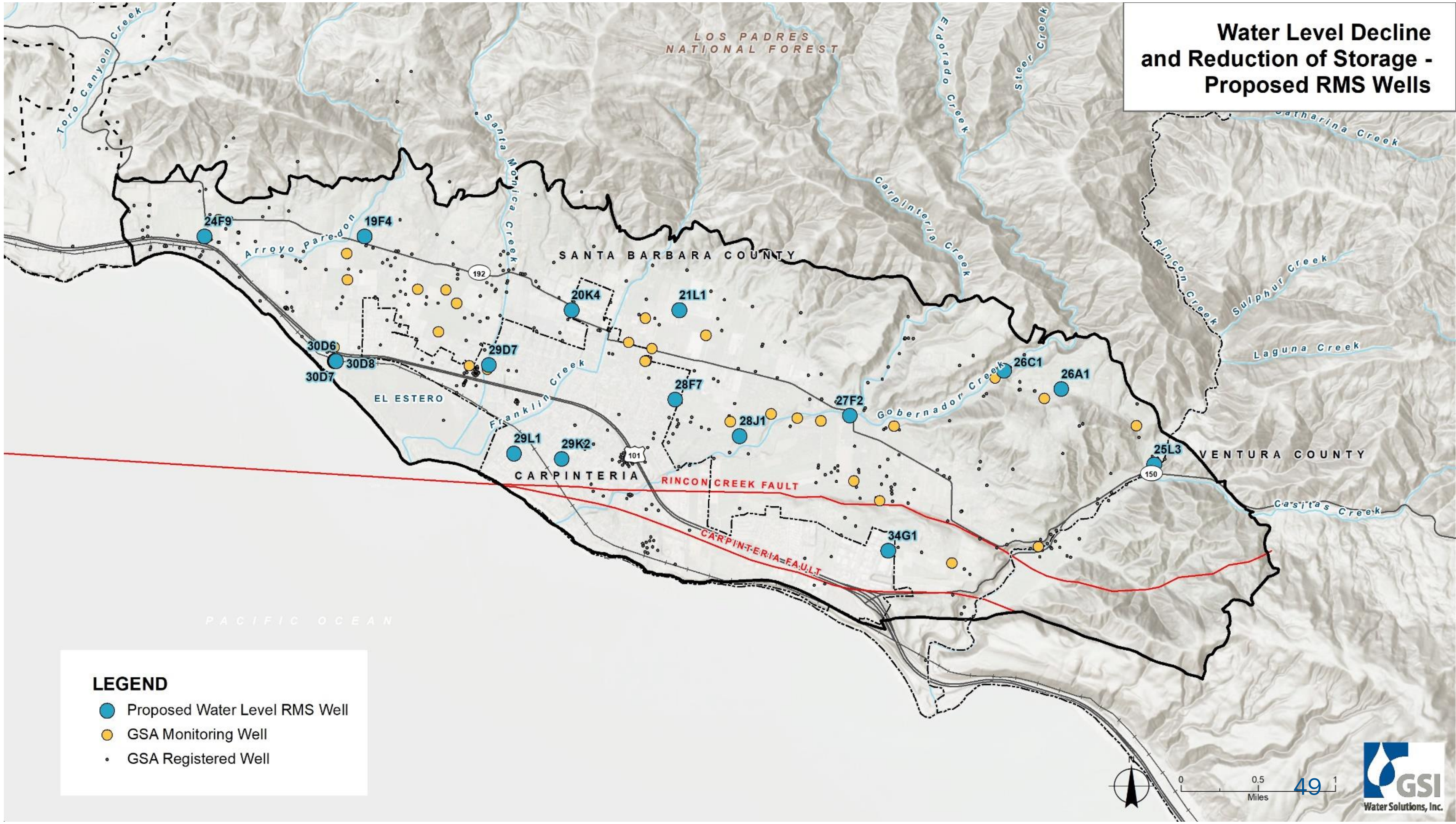
Reduction in Storage SMCs may be, and commonly are, defined as water levels similar to the Water Level Decline SMCs.

Water Level Decline and Reduction of GW in Storage Proposed RMS Wells

Metric- Defined GW Elevation

Considerations :

- **Period of Record**
- **Known construction details**
- **Dedicated monitoring well preferred**
- **Data Gaps/spatial distribution**
- **Accessibility for ongoing monitoring**



Water Level Decline and Reduction of GW in Storage
Proposed RMS Wells

Metric- Defined GW Elevation

Considerations :

- **Period of Record**
- **Known construction details**
- **Dedicated monitoring well preferred**
- **Data Gaps/spatial distribution**
- **Accessibility for ongoing monitoring**

PUEBLO water resources

Water Level Decline/Storage Reduction RMS Well Information Summary
Carpinteria Groundwater Sustainability Agency

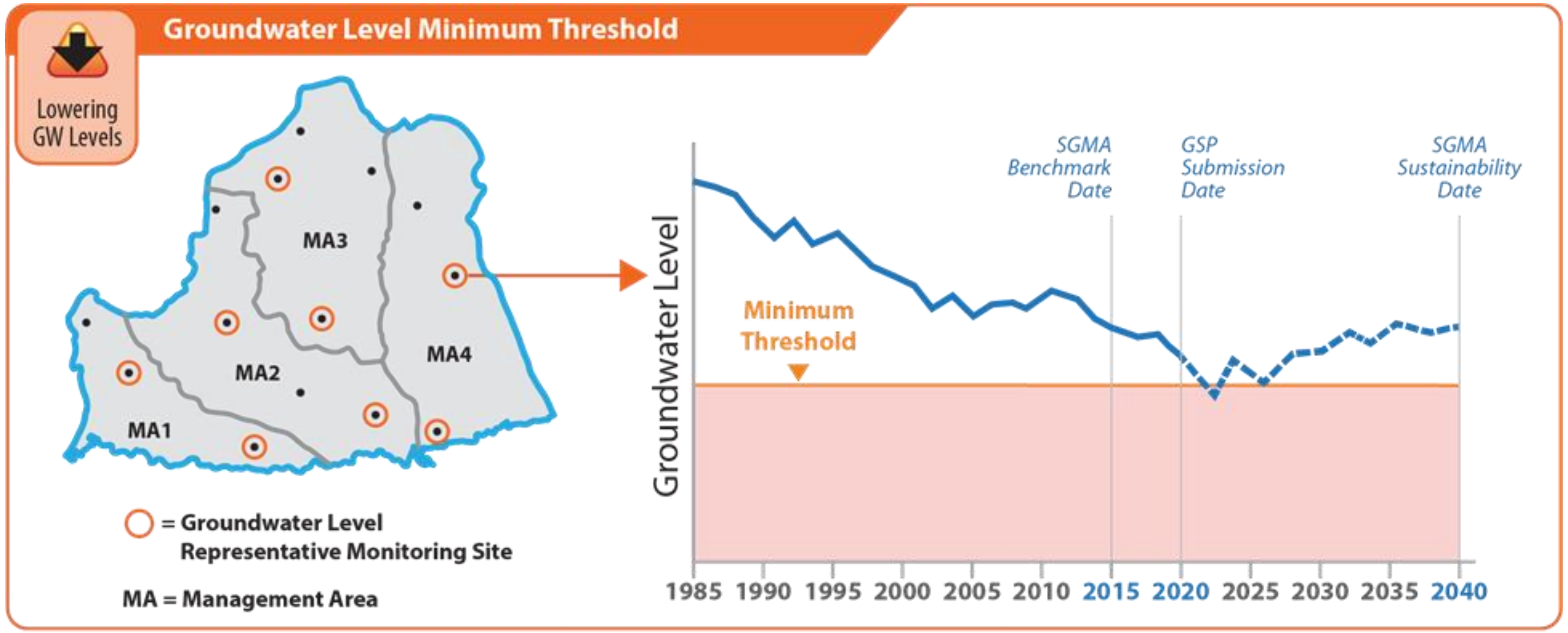
Well No.	Owner	Use	Water Level Monitor	Water Quality Monitor	Year Drilled	Drilled Depth (ft)	Casing Depth (ft)	Water Level Data Start
4N/25W-19F4	Private	M	yes		1930	250		1941
4N/25W-20K4	CVWD	I	yes		1989	1988	903	1989
4N/25W-21L1	Private	A	yes	yes	1991	810	732	1992
4N/25W-25L3	Private	A	yes	yes		190		1996
4N/25W-26A1	Private	M	yes		1941	228 vs 480?		1946
4N/25W-26C1	Private	M	yes			250		1949
4N/25W-27F2	CVWD	A	yes	yes	1975	1150	825	1975
4N/25W-28D5,6,7	CGSA	DM	yes	yes	2023	1240	360, 925, 1040	2023
4N/25W-28F7	CVWD	A	yes	yes	1976	1271	1240/980	1976
4N/25W-28J1	Private	A	yes	yes	1919	175	175	1940
4N/25W-29D7	CVWD	DM	yes		1972	982	950	1977
4N/25W-29K2	Private		yes		1989	320	320	1992
4N/25W-29L1	Private	M	yes			110		1946
4N/25W-30D6	CVWD	DM	yes	yes	2019	1240	1,120	2019
4N/25W-30D7	CVWD	DM	yes	yes	2019	1240	870	2019
4N/25W-30D8	CVWD	DM	yes	yes	2019	1240	340	2019
4N/25W-34G1	Private	M	yes		1990	279	278	1991
4N/26W-24F1	Private	A		yes	1922	262 vs 146	227 vs 146	
4N/26W-24F9	Private	A	yes	yes	1990	481	440	2022

* Data sources includes information collected from State Well Drillers reports, field inspection and SB Co. EHD Well Permits.

Use Categories: A - Active Production Well; I - Inactive Production Well; M - Monitoring Well; DM - Dedicated Monitoring Well.

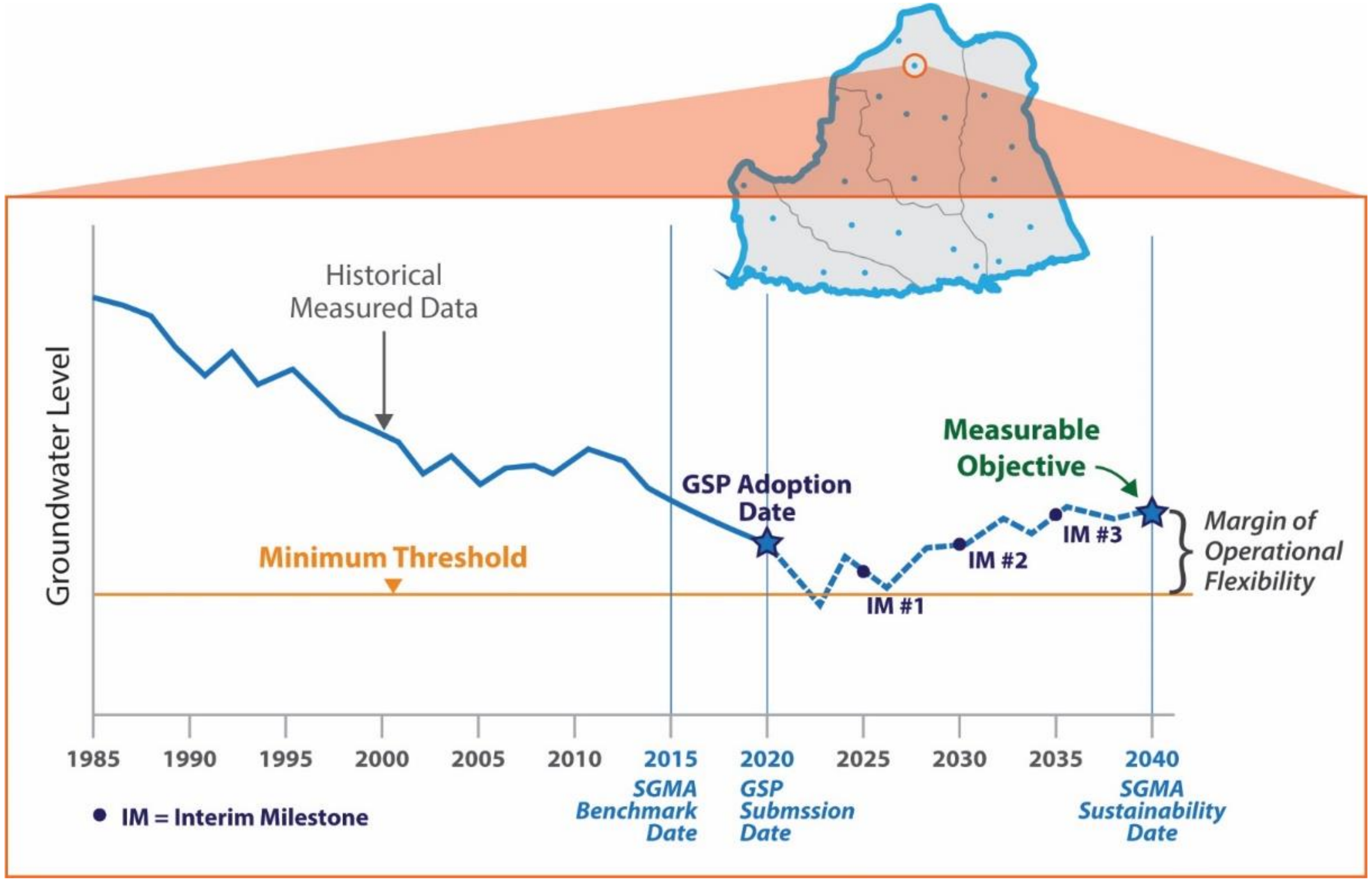
Example– Establish Minimum Thresholds (MTs)

What is a groundwater level Minimum Threshold?



Example– Establish Measurable Objectives (MOs)

What is a Measurable Objective?

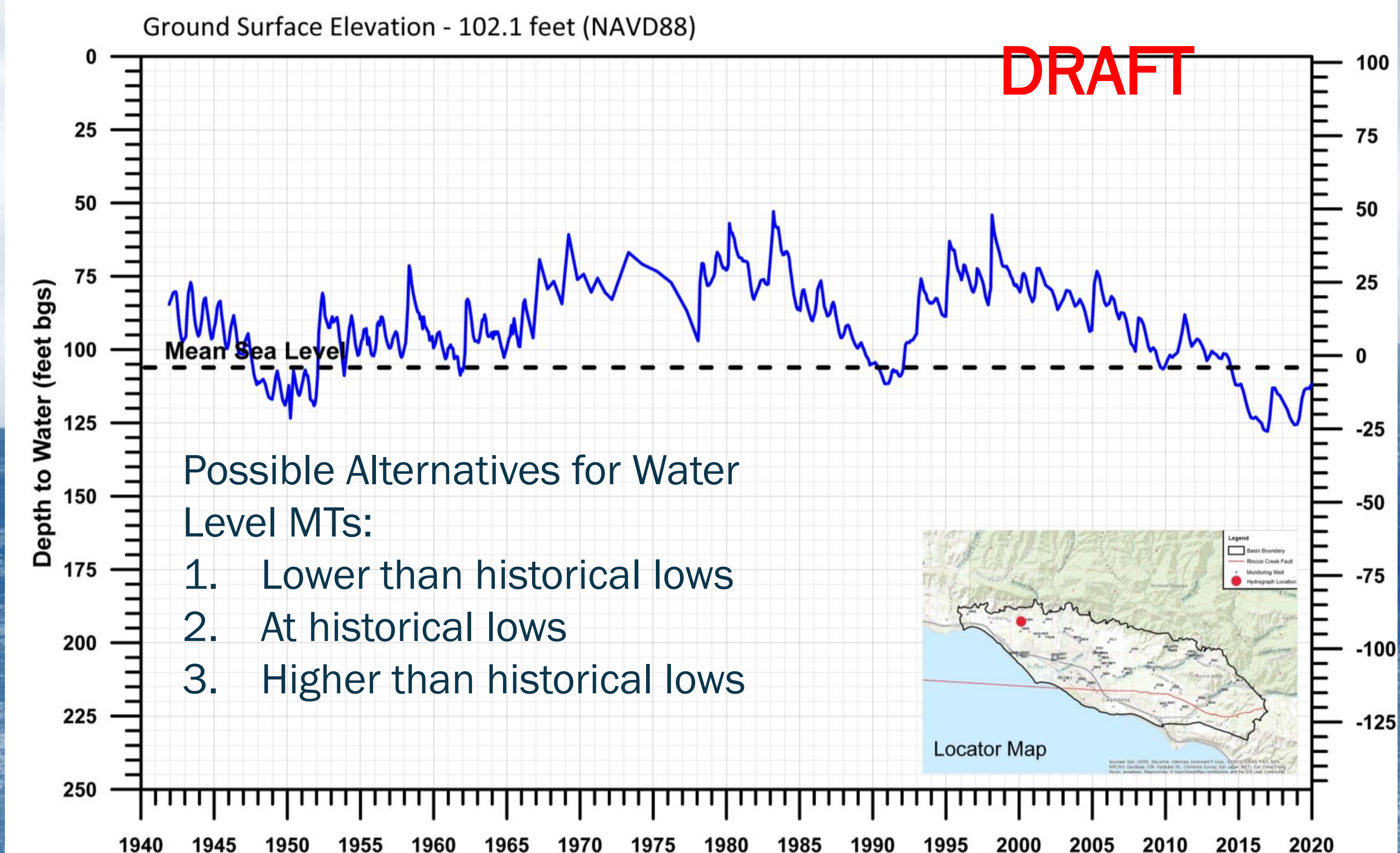


Defining SMCs

Evaluate historical trends

Chronic Lowering of Groundwater Levels

Reduction of Groundwater in Storage



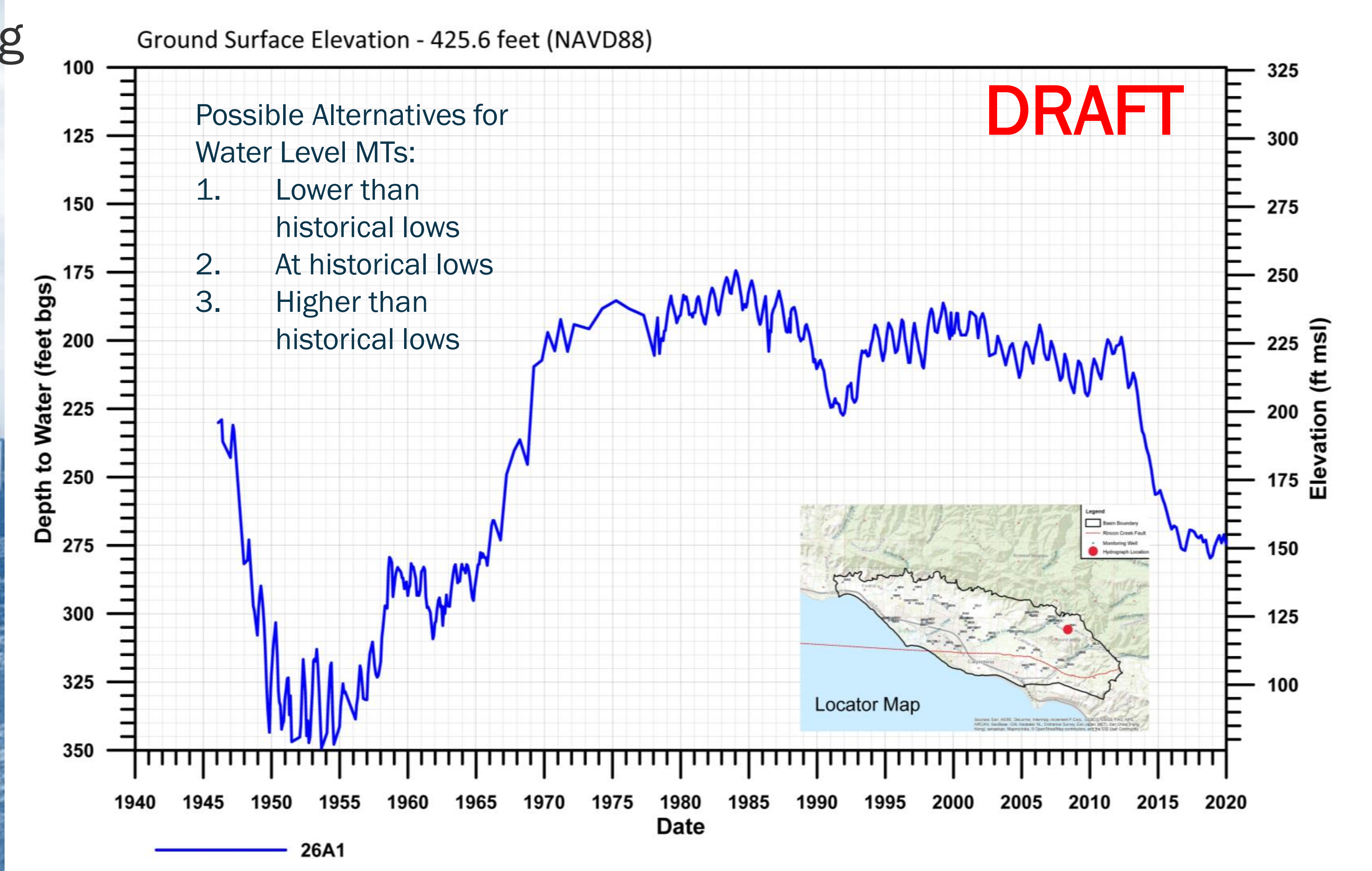
Possible Alternatives for Water Level MTs:

1. Lower than historical lows
2. At historical lows
3. Higher than historical lows

Defining SMCs

Evaluate historical trends

Chronic Lowering of Groundwater Levels



Reduction of Groundwater in Storage

WHAT'S NEXT

WHAT'S NEXT: Upcoming Public Workshops

SMCs

Projects and Management Actions

PUBLIC WORKSHOP.

GSA Public Workshop
March 15 2023•
6:00pm-8:00pm

PUBLIC WORKSHOP.

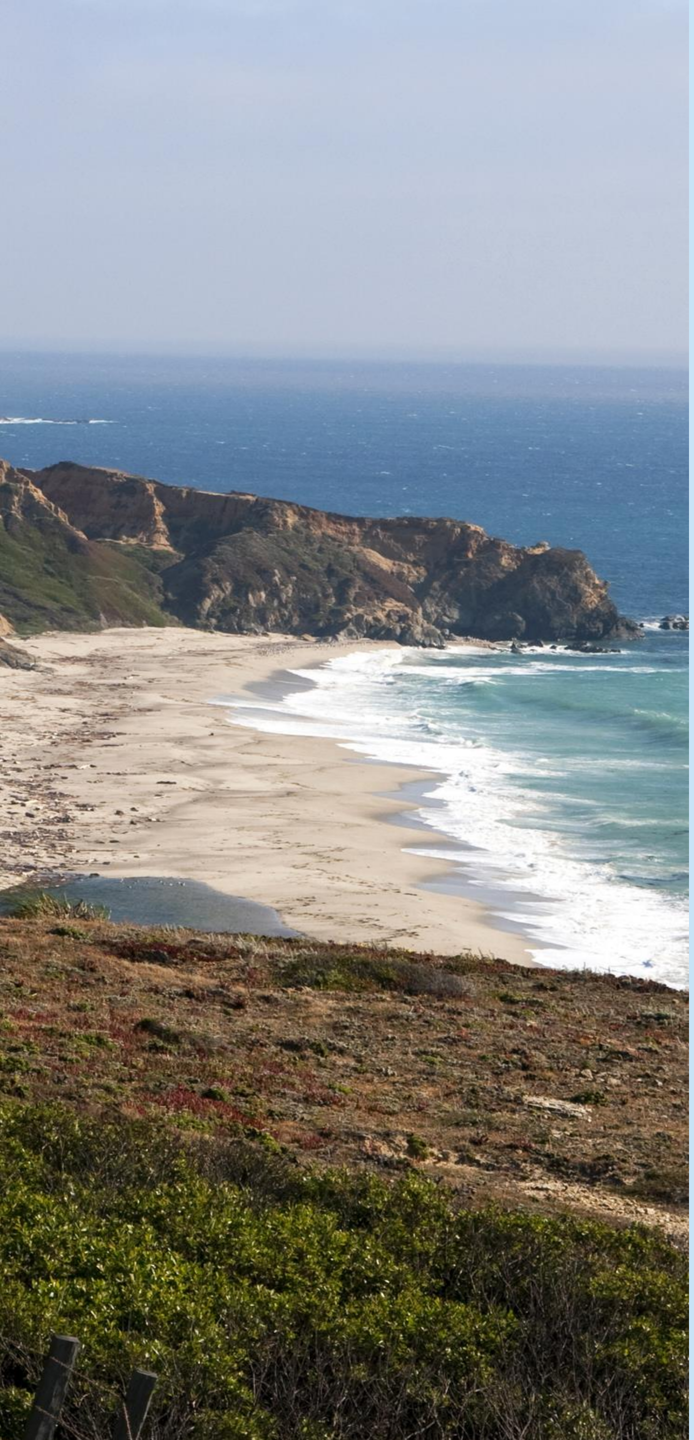
GSA Public Workshop
April 19 2023•
6:00pm-8:00pm

PUBLIC WORKSHOP.

GSA Public Workshop
May 17 2023•
6:00pm-8:00pm

Learn more or take action at

CarpGSA.org



QUESTIONS?