MARINA COAST WATER DISTRICT GSA STAKEHOLDER COMMITTEE MEETING

MONTEREY SUBBASIN

13 OCTOBER 2021

PRESENTATION OUTLINE

- Overview of Monterey Subbasin Groundwater Sustainability Plan (GSP) and Stakeholder Engagement
- Overview of GSP Chapters 6, 9 and 10
- Comments and Questions

GSP CHAPTER OUTLINE

1. Introduction and Agency Information
2. Plan Area
3. Stakeholder Engagement and Communication
4. Hydrogeological Conceptual Model (HCM)
5. Groundwater Conditions Assessment
6. Water Budget
7. Monitoring Network
8. Sustainable Management Criteria (SMCs)
9. Projects & Management Actions (P&MAs)
10. GSP Implementation

Draft Chapters 1 through 10
Released for Stakeholder Review

Stakeholder Questions/Comments today

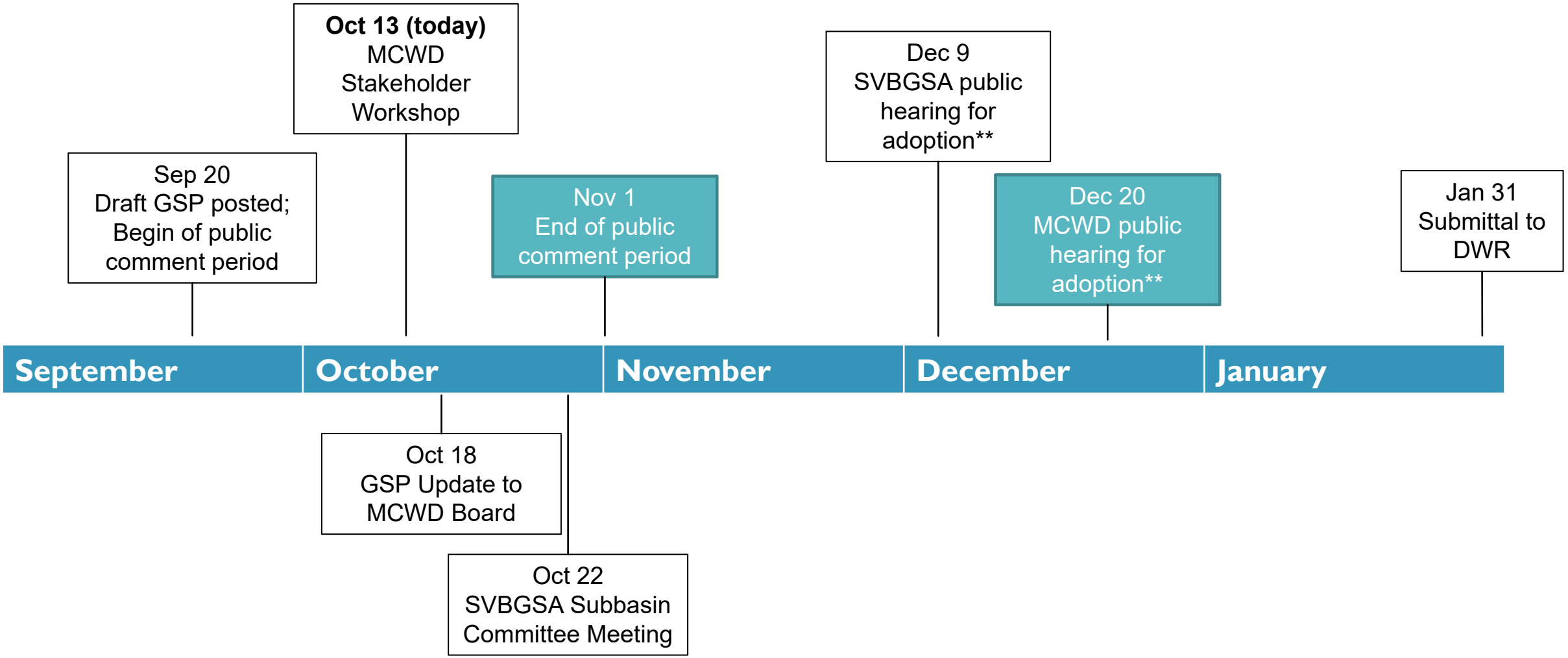
Overview Presented today

* 23-CCR Sections 354.16-20; www.water.ca.gov/groundwater/sgm/gsp.cfm

PUBLIC COMMENT PERIOD THROUGH NOV 1

- Draft GSP posted on MCWD website on September 20
- Public comment period open through **November 1**
  - Comments received by then will be considered in the final plan
- Comments can be submitted via multiple platforms
  - MCWD stakeholder meeting (today) / SVBGSA Subbasin Committee Meeting (Oct 22)
  - GSP update to MCWD GSA Board (Oct 18) open to the public
  - MCWD GSA Feedback Form under GSA dropdown at www.mcwd.org or visit https://form.jotform.com/202364609327051
  - SVBGSA Comment Form under GSP dropdown at www.svbgsa.org or visit https://form.jotform.com/201537036733047
- MCWD and SVBGSA are coordinating response

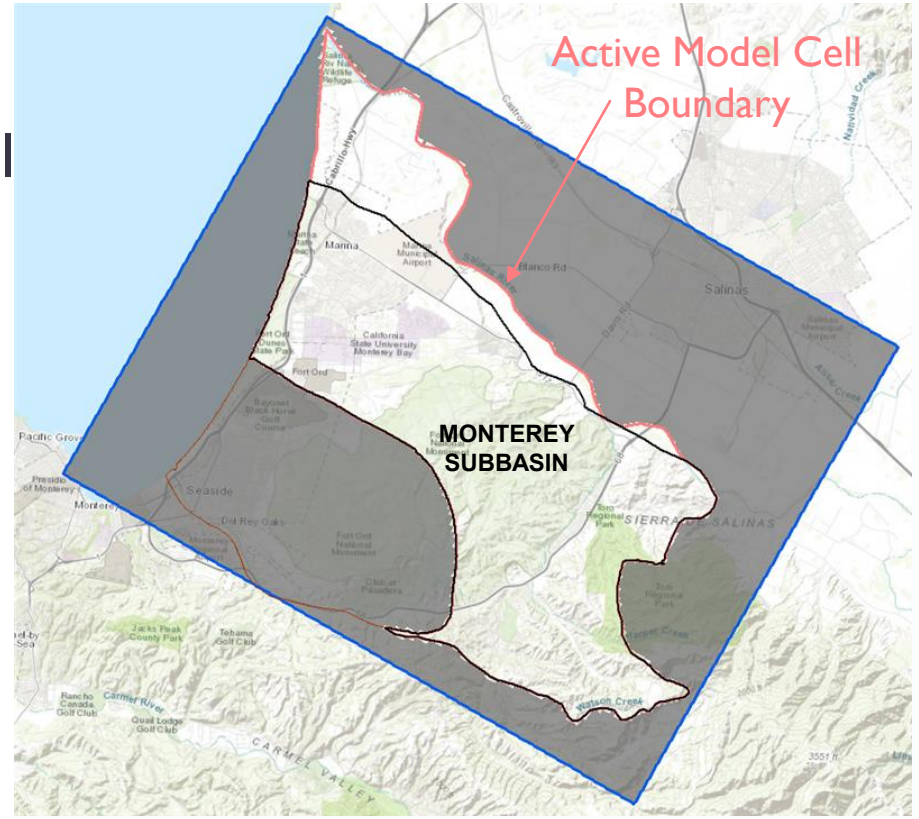
GSP PUBLIC REVIEW AND ADOPTION SCHEDULE



** SVBGSA Subbasin Committee & Advisory Committee meetings to consider the final GSP will be held between Nov 29 and Dec 3, 2021.
** May be continued during January board meetings if necessary.

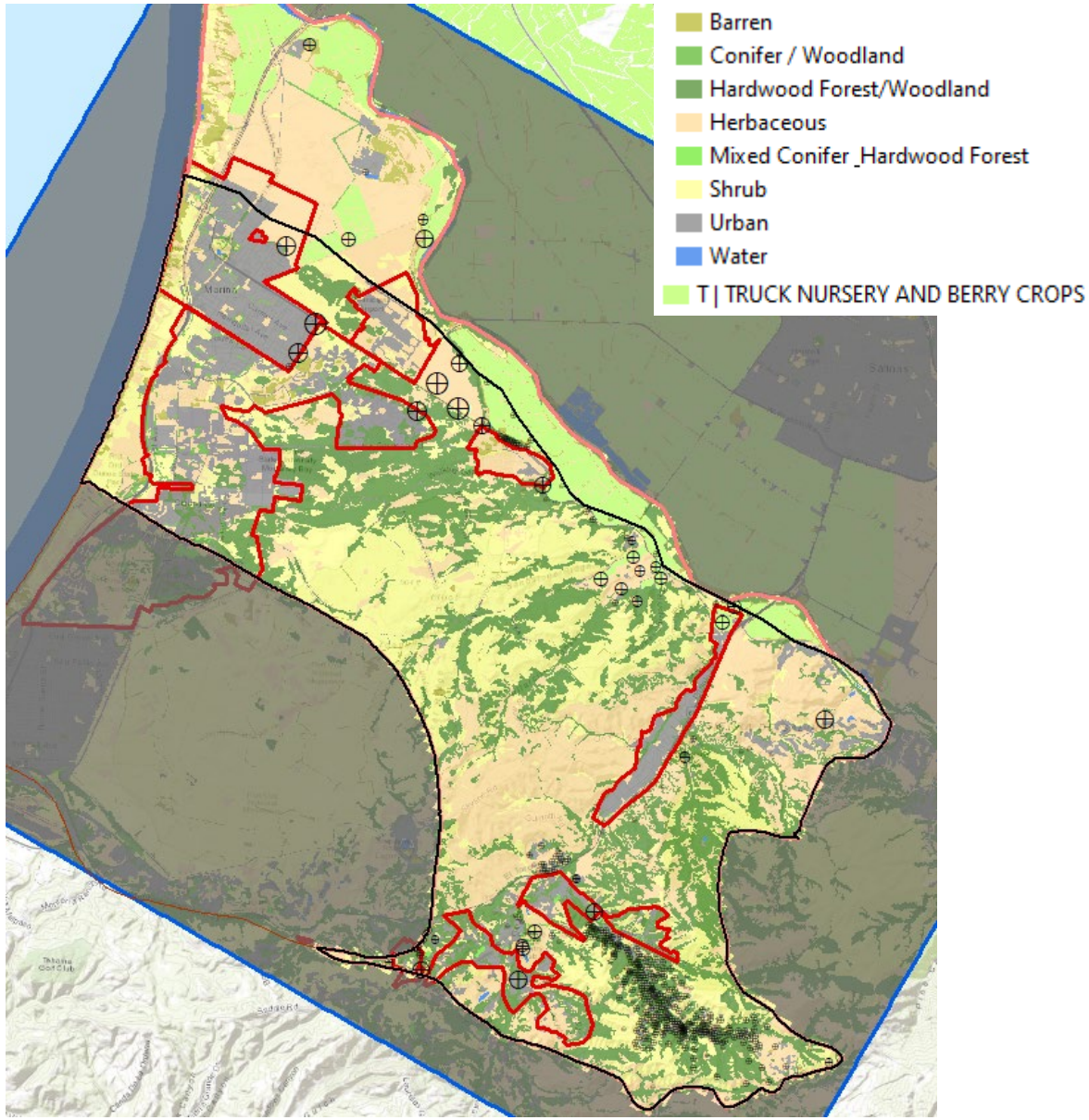
CHAPTER 6: WATER BUDGET

- Water budget results in the Monterey Subbasin are based on the Monterey Subbasin Groundwater Model
  - Prepared by MCWD in coordination with SVBGSA
  - Incorporates observed boundary conditions with the adjoining Seaside and 180/400-Foot Aquifer Subbasins
- Monterey Subbasin model is anticipated to eventually be coordinated with SVHIM and/or other SGMA regional model(s)



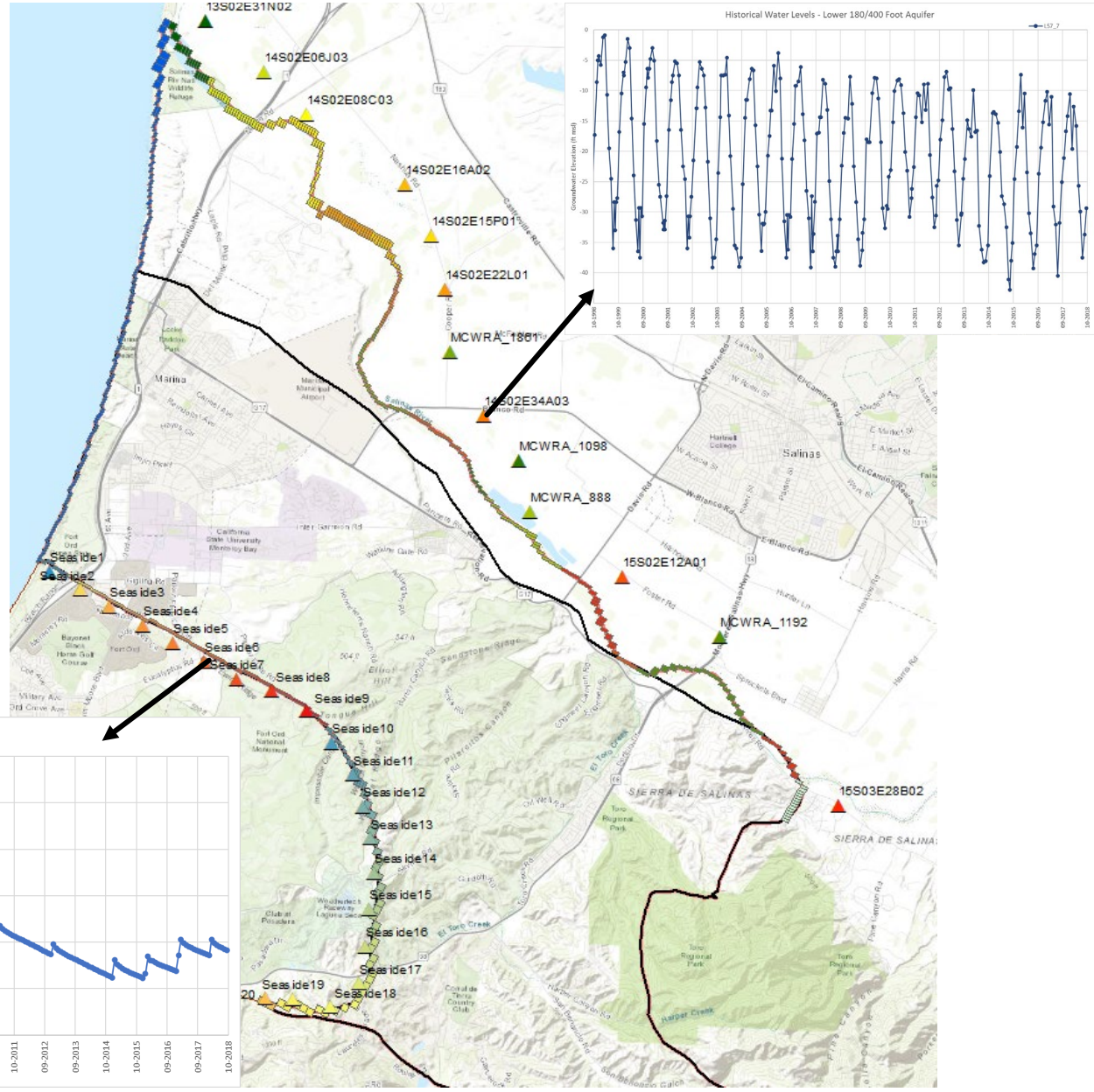
SOURCE OF DATA INPUTS

- Climate
  - Daily precipitation data from PRISM
  - Daily reference evapotranspiration data from CIMIS stations
- Land use
  - CalVeg – native land use classes
  - MCWD / SVBGSA – urban, water service area footprints
  - DWR – agricultural fields
- Groundwater pumping
  - MCWD supply well historical pumping records
  - SVBGSA historical pumping estimates for Corral de Tierra area
- Water elevation data
  - 30,555 observation from 608 wells



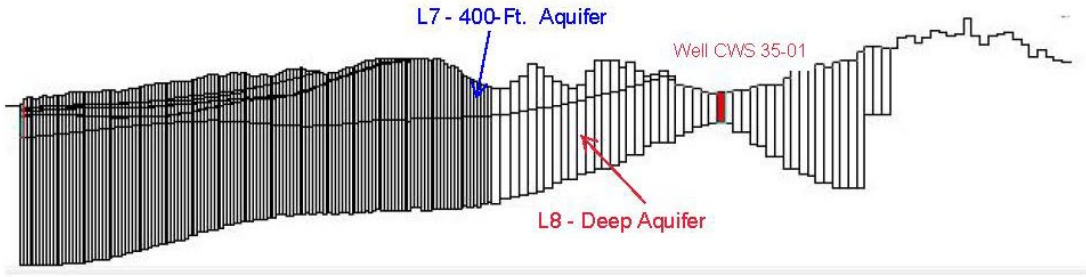
BOUNDARY CONDITIONS

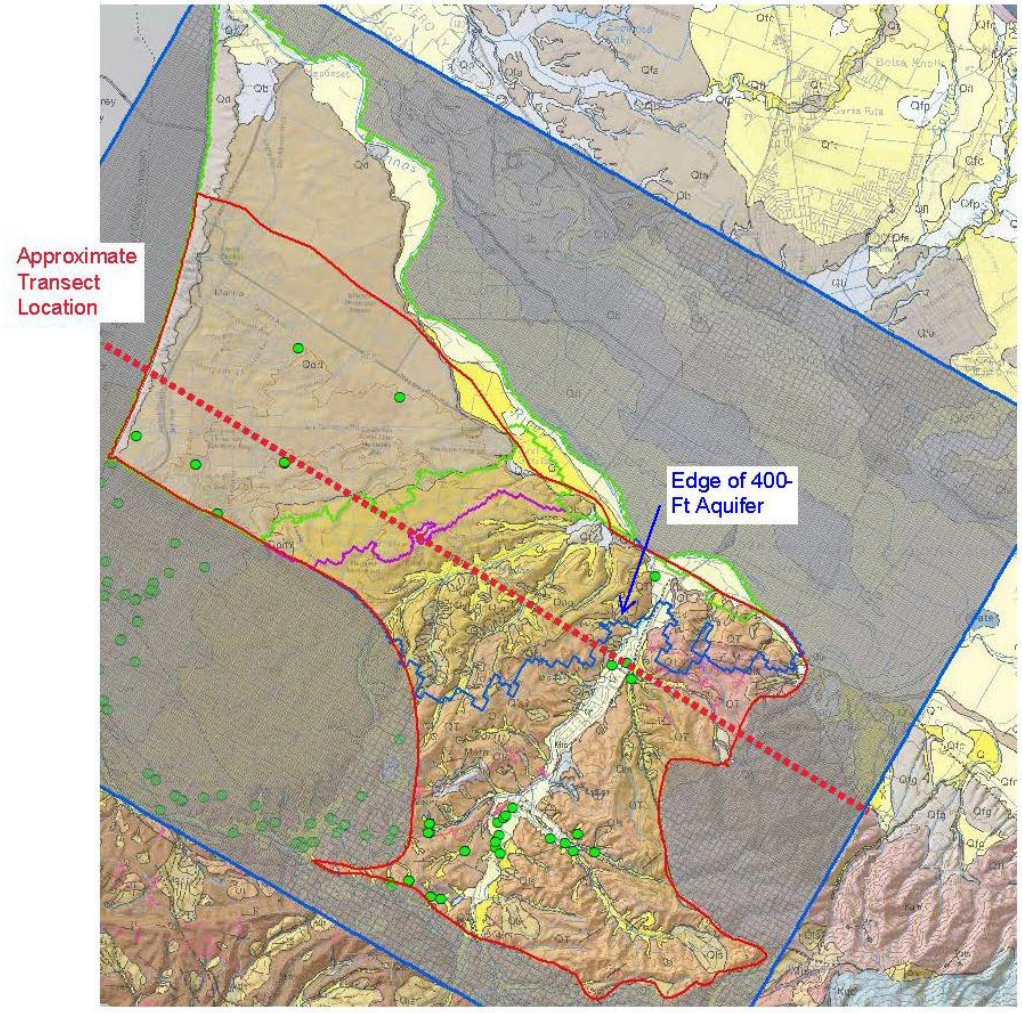
- Boundary conditions
  - 180/400 Subbasin: Observed water levels and compared to SVIHM simulated results
  - Seaside Subbasin: Seaside Model simulated water levels



MODEL CONSTRUCTION

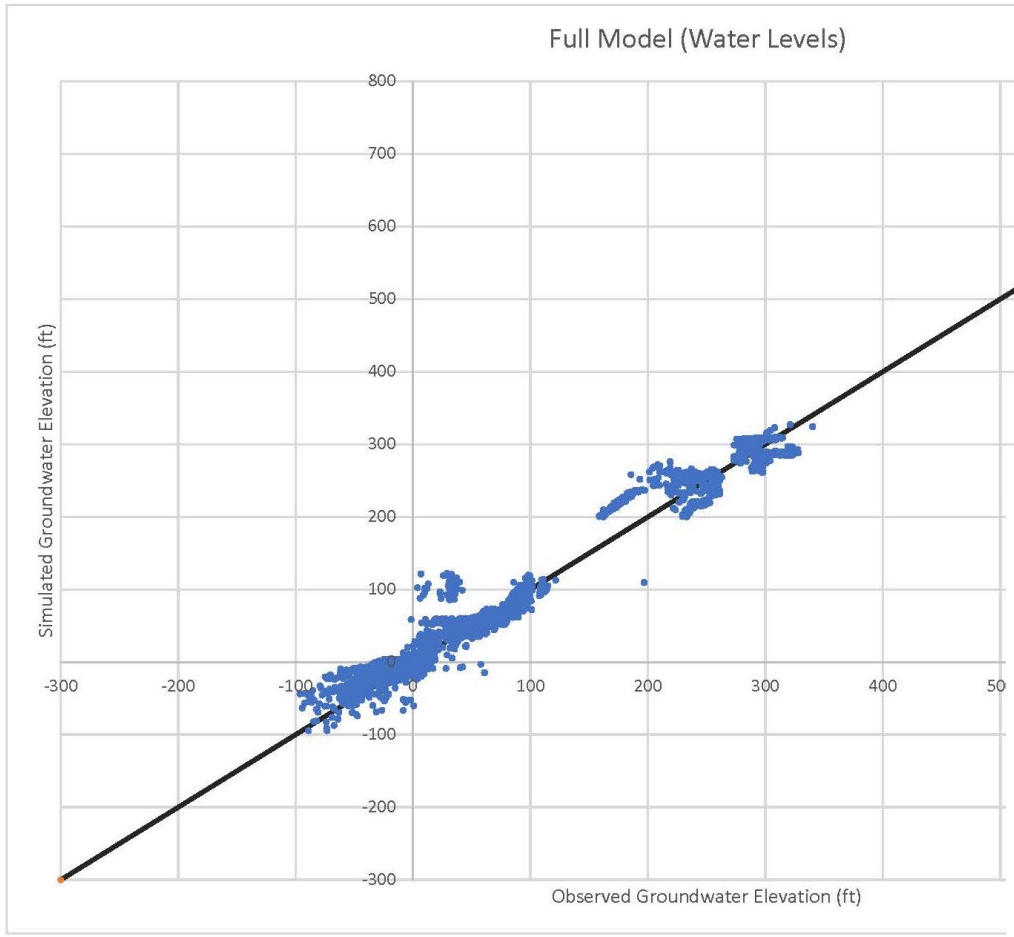
- Historical model runs from 10/1998 – 9/2018
  - Water budget results reported for 10/2003 – 9/2018
- Eight model layers, representing:
  - Dune Sand
  - Salinas Valley Aquitard
  - Upper 180-Foot Aquifer
  - 180 Aquitard
  - Lower 180-Foot Aquifer
  - 180/400 Aquitard
  - 400 Foot Aquifer – El Toro Primary Aquifer
  - Deep Aquifer – El Toro Primary Aquifer
- Accompanying Soil Moisture Balance Model calculates monthly recharge rates based on:
  - Precipitation, evapotranspiration rates
  - Soil and land use types
  - Deliveries, leakage in water agency service areas
  - Agricultural water use estimates





MODEL CALIBRATION

- Model calibrated to historical observed water levels by layer and management area
  - All calibration metrics meet or exceed minimum standards for reasonable calibration
- Water budget results compared to Seaside, SVIHM, other historical sources of information to confirm acceptable range in flux volumes

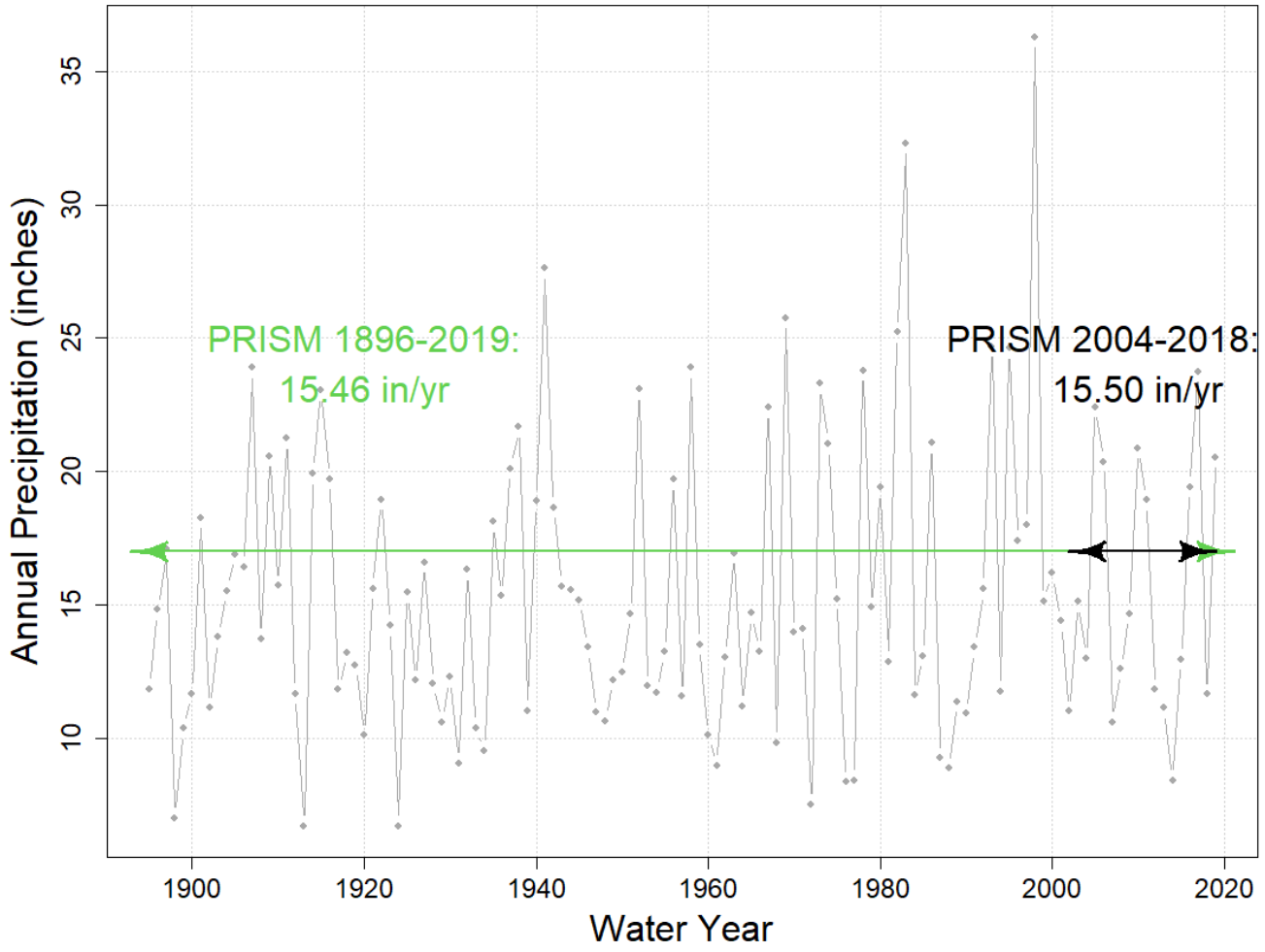


Number of Wells:	603
Number of Observations:	30354
Mean Residual (ft):	-1.32
Mean Absolute Residual (ft):	7.62
Root-Mean-Squared Residual (ft):	10.80
Residual Standard Deviation (ft):	10.72
Range in Observations (ft):	728.44
Scaled Mean Residual [%]:	-0.18%
Scaled Mean Absolute Residual [%]:	1.05%
Scaled Root-Mean-Squared Residual [%]:	1.48%
Scaled Residual Standard Deviation [%]:	1.47%
Coefficient of Determination (R^2):	0.96

**All results are preliminary and subjet to revision.*

WATER BUDGET ANALYSIS REQUIREMENTS

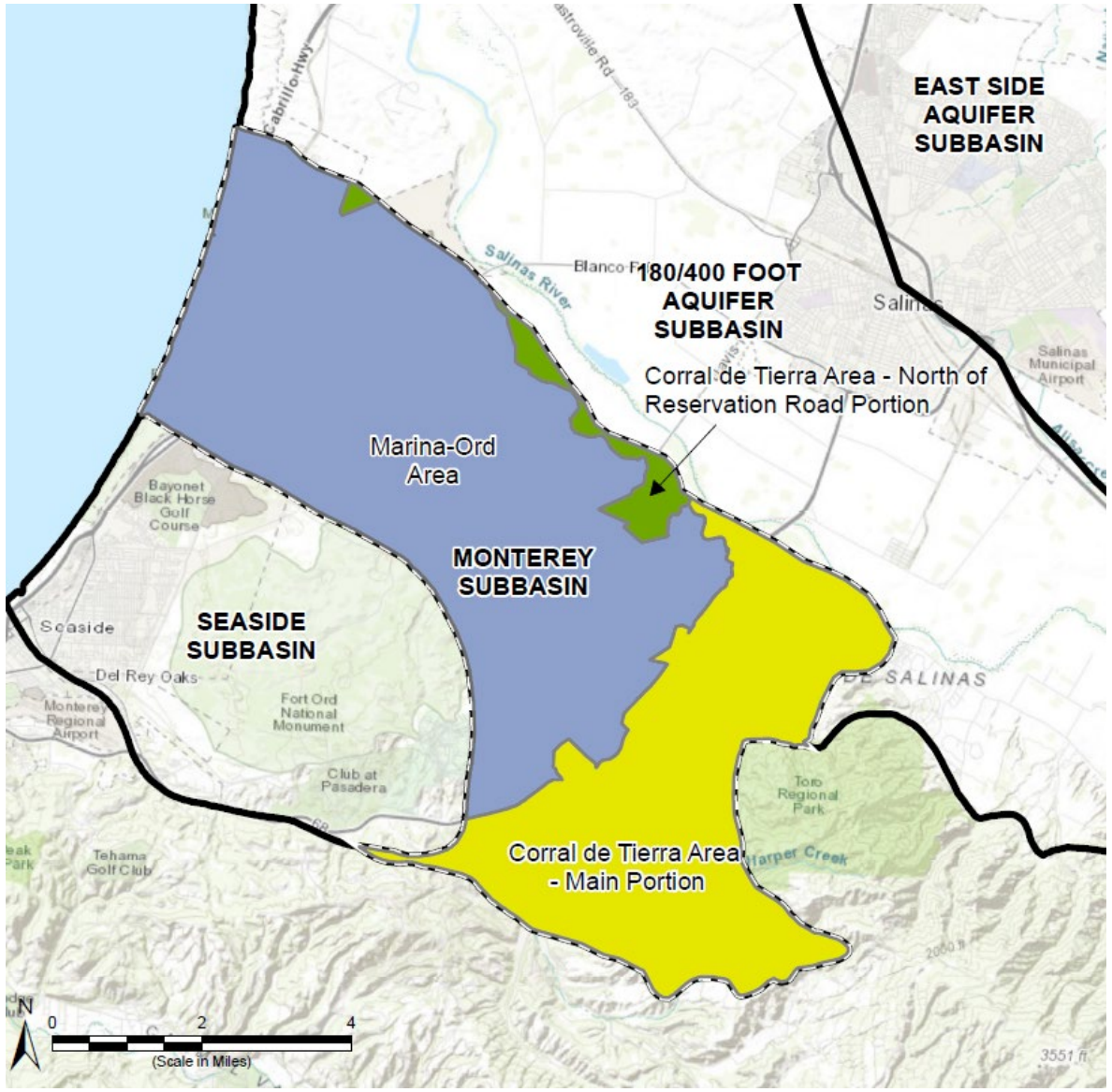
- SGMA requires every GSP include three water budgets
- Historical water budget
  - Water Years 2004 through 2018 (Oct 2003 to Sep 2018)
  - Average precipitation aligns with long-term record during WY 1986 - 2019
- Current water budget (WY 2015-2018)
- Projected water budget (simulated 50-year period)



WATER BUDGET ZONES (WBZ)

1. Marina Ord Area (WBZ)
   - Marina-Ord Area, plus
   - Reservation Road portion of the Corral de Tierra Area
2. Corral de Tierra Area (WBZ)
   - Remainder of the Corral de Tierra Area

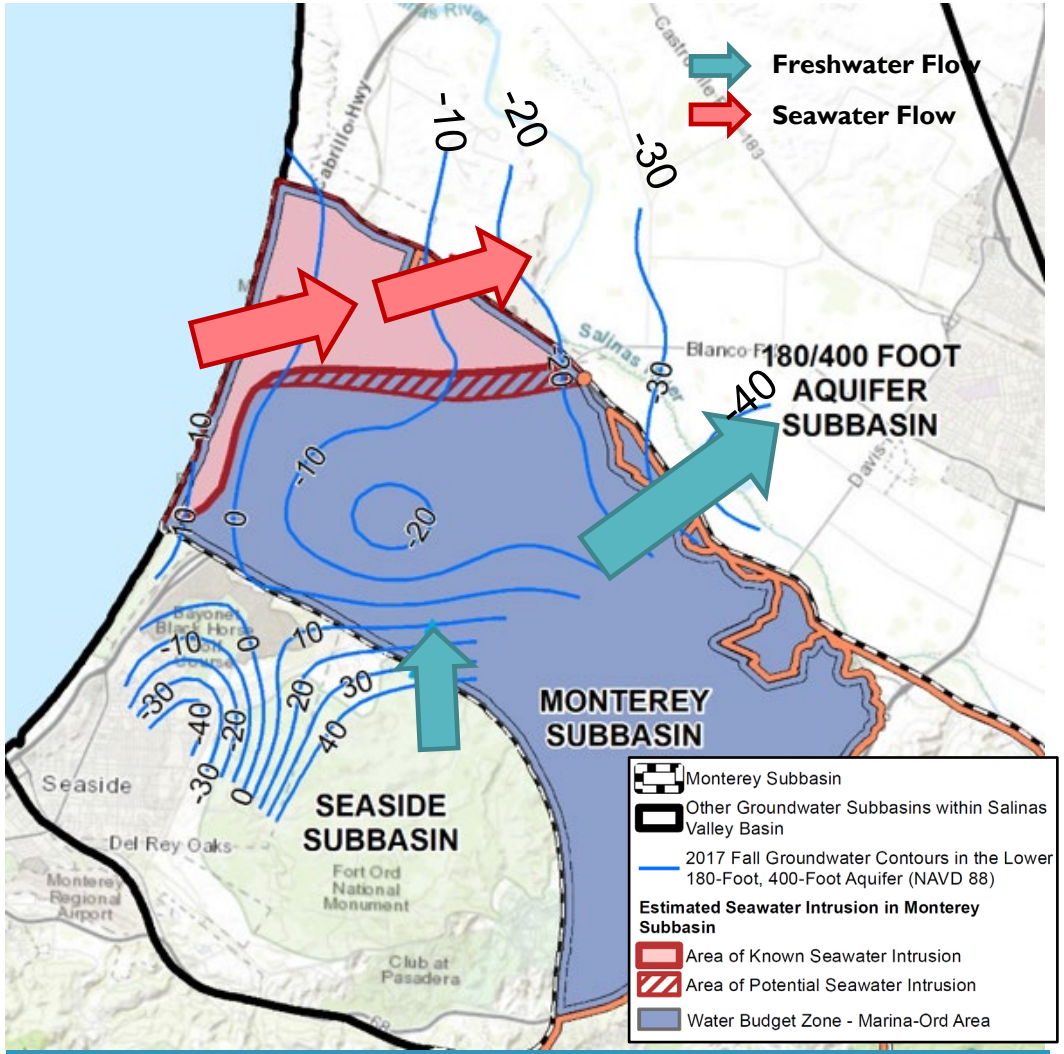
Note: The Reservation Road portion is a "flow-through" between the Marina-Ord Area and the 180/400-Foot Aquifer Subbasin. Has similar hydrostratigraphy as the Marina-Ord Area



HISTORICAL WATER BUDGET (2004-2018): *MARINA-ORD AREA WBZ*

Net Annual Groundwater Flows (AFY)	Net Inflows (+) Net Outflows (-)
Recharge	
● Rainfall, Irrigation, etc.	**+6,144**
Well Pumping	
● MCWD (180-Foot and 400-Foot Aquifers)	-1,797
● MCWD (Deep Aquifers)	-2,262
● Reservation Road Portion	-287
	-4,346
Net Inter-Basin Flow (Presumed Freshwater)	
● Seaside Subbasin	+1,310
● 180/400 Foot Aquifer Subbasin	-5,761
● Outflow to Ocean	-524
	-4,975
Net Inter-Basin Flow (Presumed Seawater)	
● 180/400 Foot Aquifer Subbasin	-2,872
● Ocean Inflow	+2,872
	0
Net Intra-basin Flow	
● Corral de Tierra Area (Water Budget Zone)	**+1,544**
NET ANNUAL CHANGE IN GROUNDWATER STORAGE	**-1,632**

Notes: Total may not sum due to rounding.

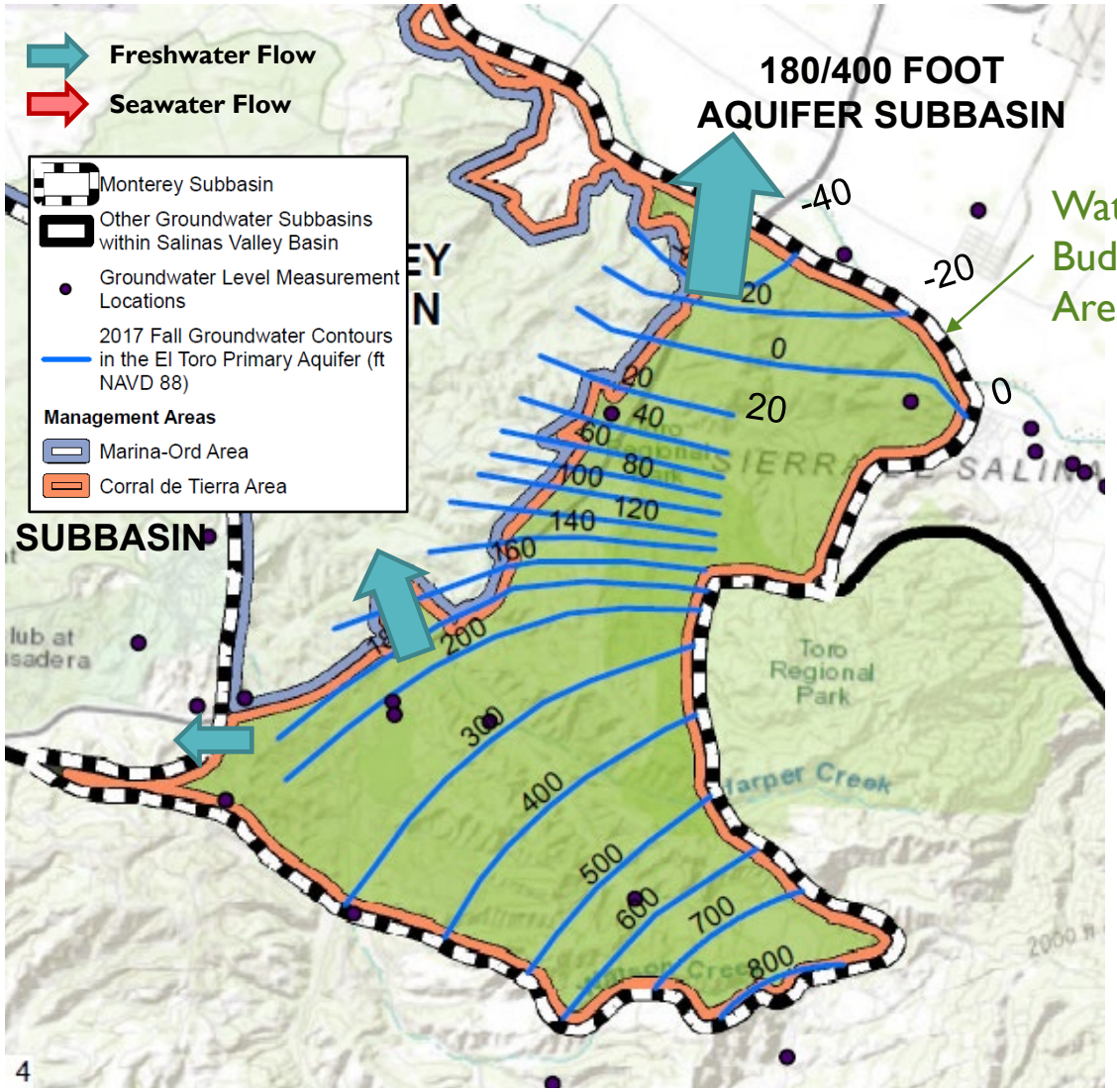


Lower 180 Ft and 400 Ft Aquifers

HISTORICAL WATER BUDGET (2004-2018): *CORRAL DE TIERRA WBZ*

Net Annual Groundwater Flows (AFY)	Net Inflows (+) Net Outflows (-)
Recharge	
● Rainfall, Irrigation, etc.	**+3,910**
Well Pumping	
● El Toro Primary Aquifer System	**-1,295**
Net Inter-Basin Flow (Presumed Freshwater	
● Seaside Subbasin	-392
● 180/400 Foot Aquifer Subbasin	-3,632
● Ocean Net Flow	0
	-4,024
Net Intra-basin Flow	
● Marina-Ord Area (Water Budget Zone)	**-1,544**
Net Surface Water Exchange	
● Salinas River Exchange	**+151**
NET ANNUAL CHANGE IN GROUNDWATER STORAGE	**-2,803**

Notes: Total may not sum due to rounding.

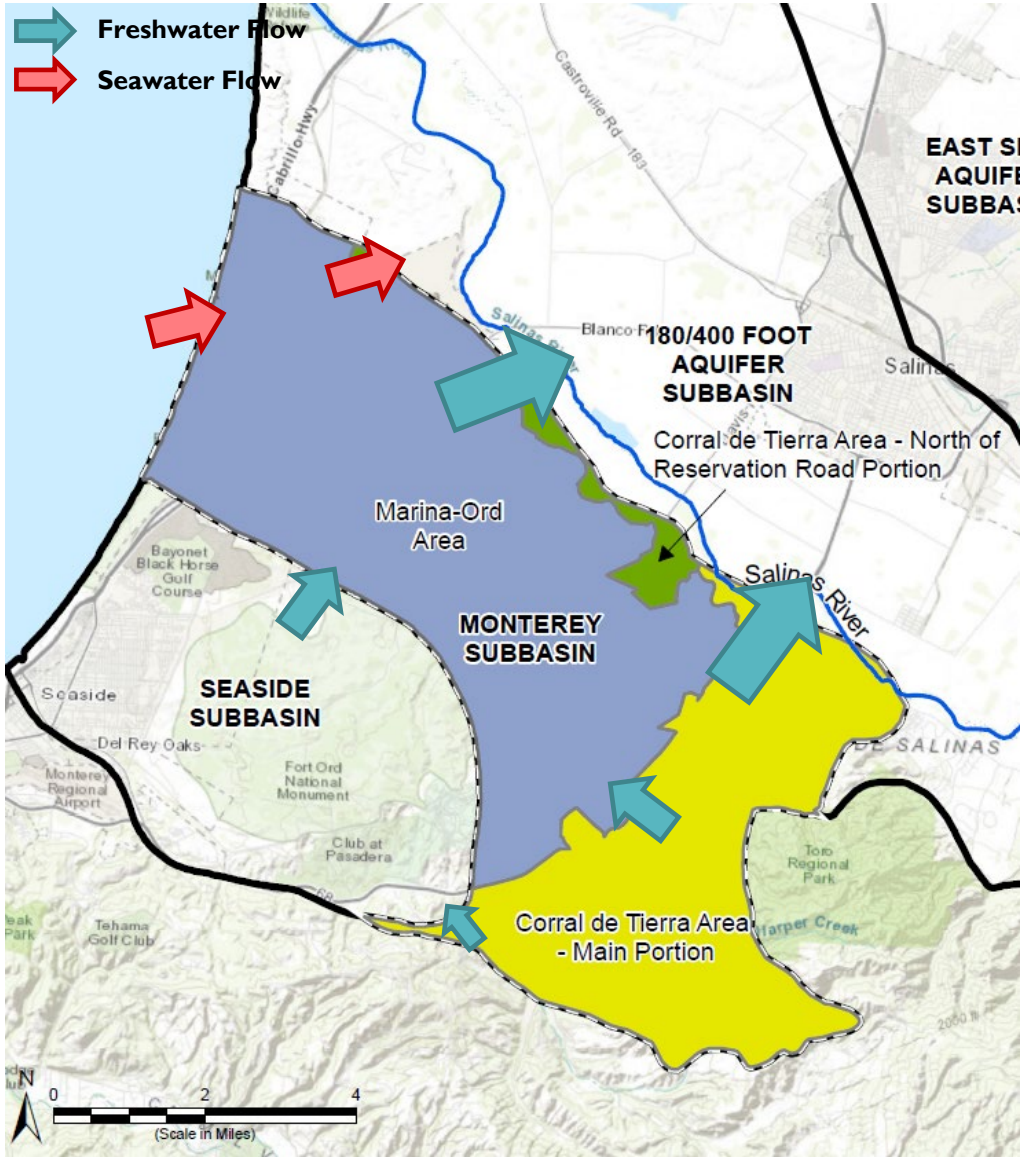


El Toro Primary Aquifer System

HISTORICAL WATER BUDGET (2004-2018): *MONTEREY SUBBASIN*

Net Annual Groundwater Flows (AFY)	Net Inflows (+) Net Outflows (-)
Recharge	
● Rainfall, Irrigation, etc.	**+10,055**
Well Pumping	
● Well Pumping	**-5,641**
Net Inter-Basin Flow (Presumed Freshwater)	
● Seaside Subbasin	+918
● 180/400 Foot Aquifer Subbasin	-9,393
● Outflow to Ocean	-524
	-8,999
Net Inter-Basin Flow (Presumed Seawater)	
● 180/400 Foot Aquifer Subbasin	-2,872
● Ocean Inflow	+2,872
	0
Net Surface Water Exchange	
● Salinas River Exchange	**+151**
NET ANNUAL CHANGE IN GROUNDWATER STORAGE	**-4,434**

Notes: Total may not sum due to rounding.

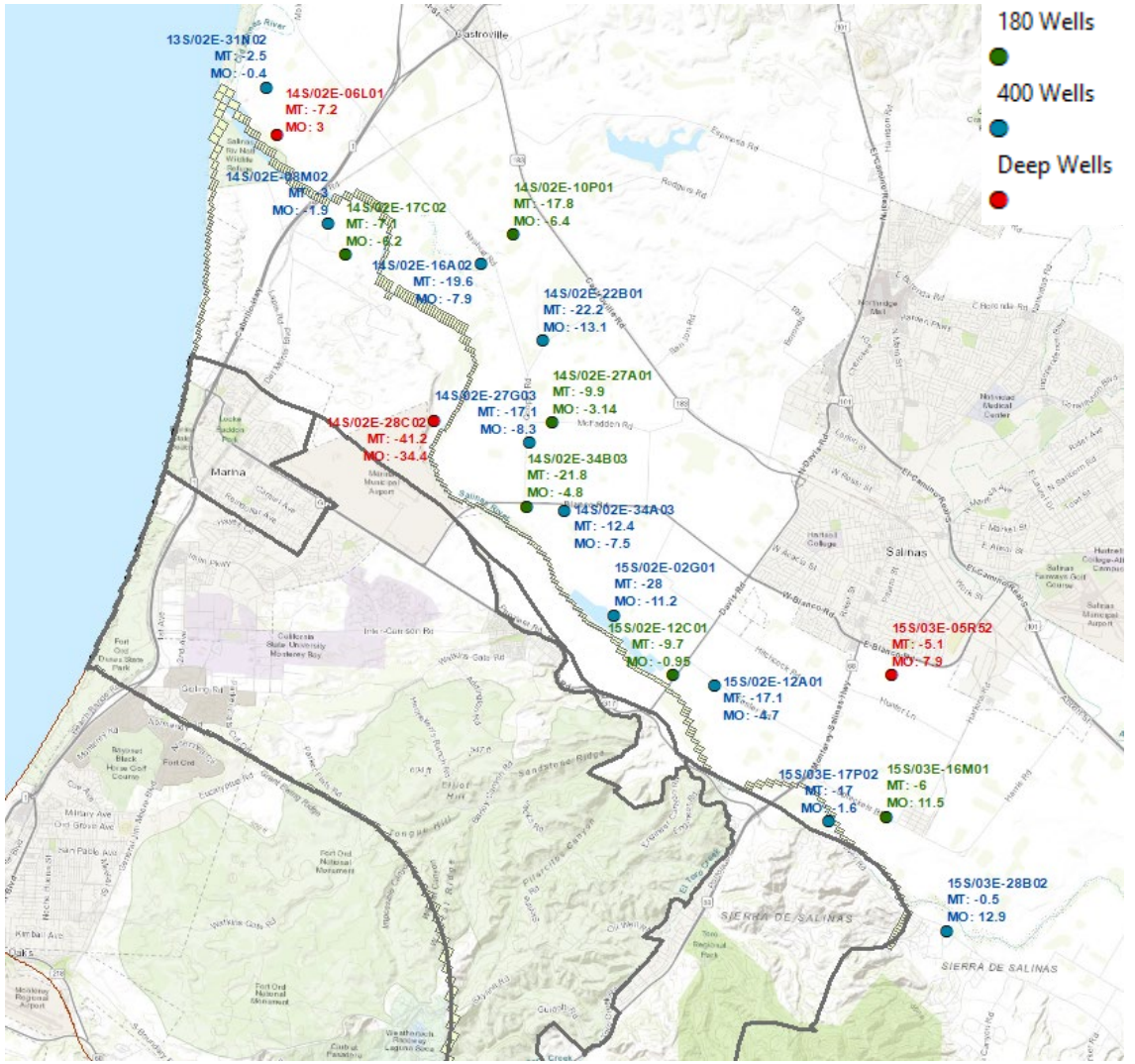


PROJECTED WATER BUDGET DEVELOPMENT

- Projected water budget calculations consider
  - Climate change
  - Future land use changes in Monterey Subbasin
  - Projected groundwater extraction in Monterey Subbasin
  - Several scenarios to simulate changes in boundary conditions as 180/400 Foot Aquifer subbasin and Seaside subbasin (as these basins reach sustainability)
- Results show:
  - Monterey Subbasin conditions are strongly dependent upon conditions in adjacent Subbasins
  - Future climate/recharge rates in Monterey Subbasin increase based on DWR Climate model

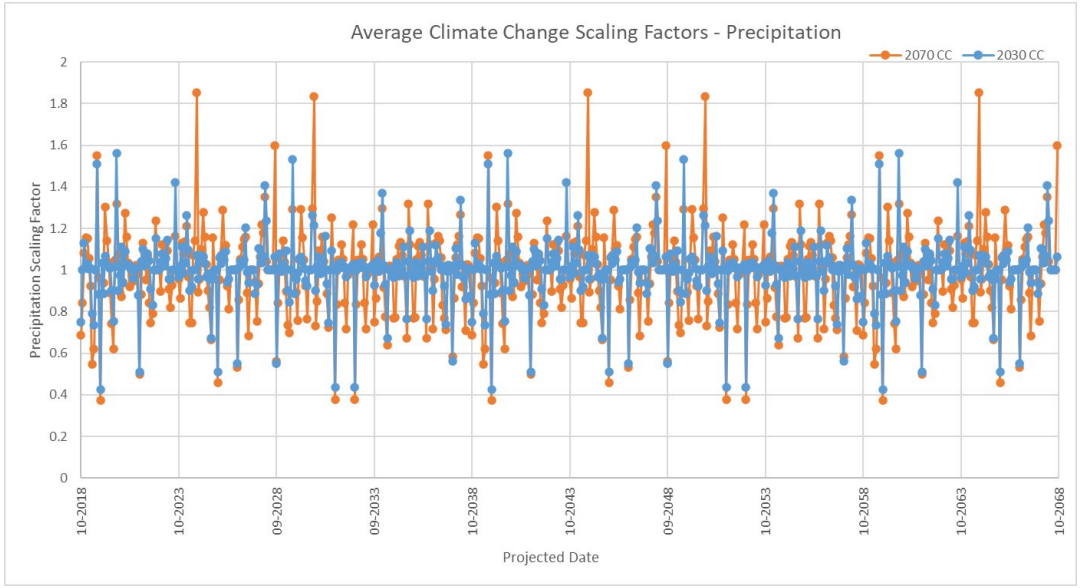
BOUNDARY CONDITIONS

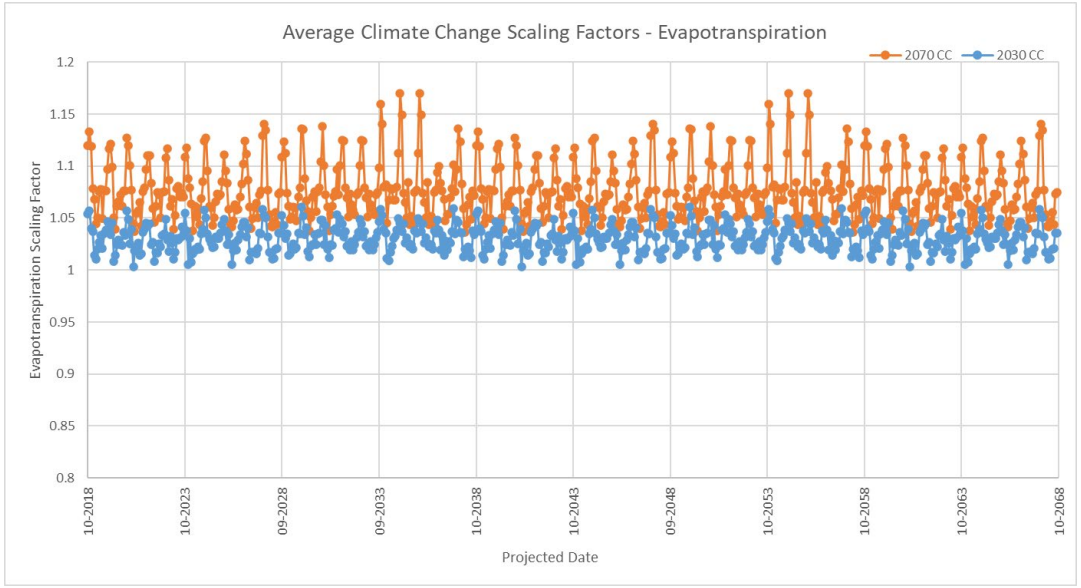
- Three scenarios considered at 180/400 Subbasin Boundary
  - Minimum Threshold (MT) GWEs
  - Measurable Objective (MO) GWEs
  - Seawater Intrusion "Protective" GWEs
    - Water levels set at freshwater equivalent ocean heads along entire length of the boundary (Deep Aquifer set at MO GWEs)
- Seaside Boundary uses constant heads based on final historical model (9/2018) outputs
  - Heads adjusted to MT water levels (170 ft msl) in Laguna Seca area wherever they were <170 ft msl at end of historical model run



CLIMATE CHANGE SCENARIOS

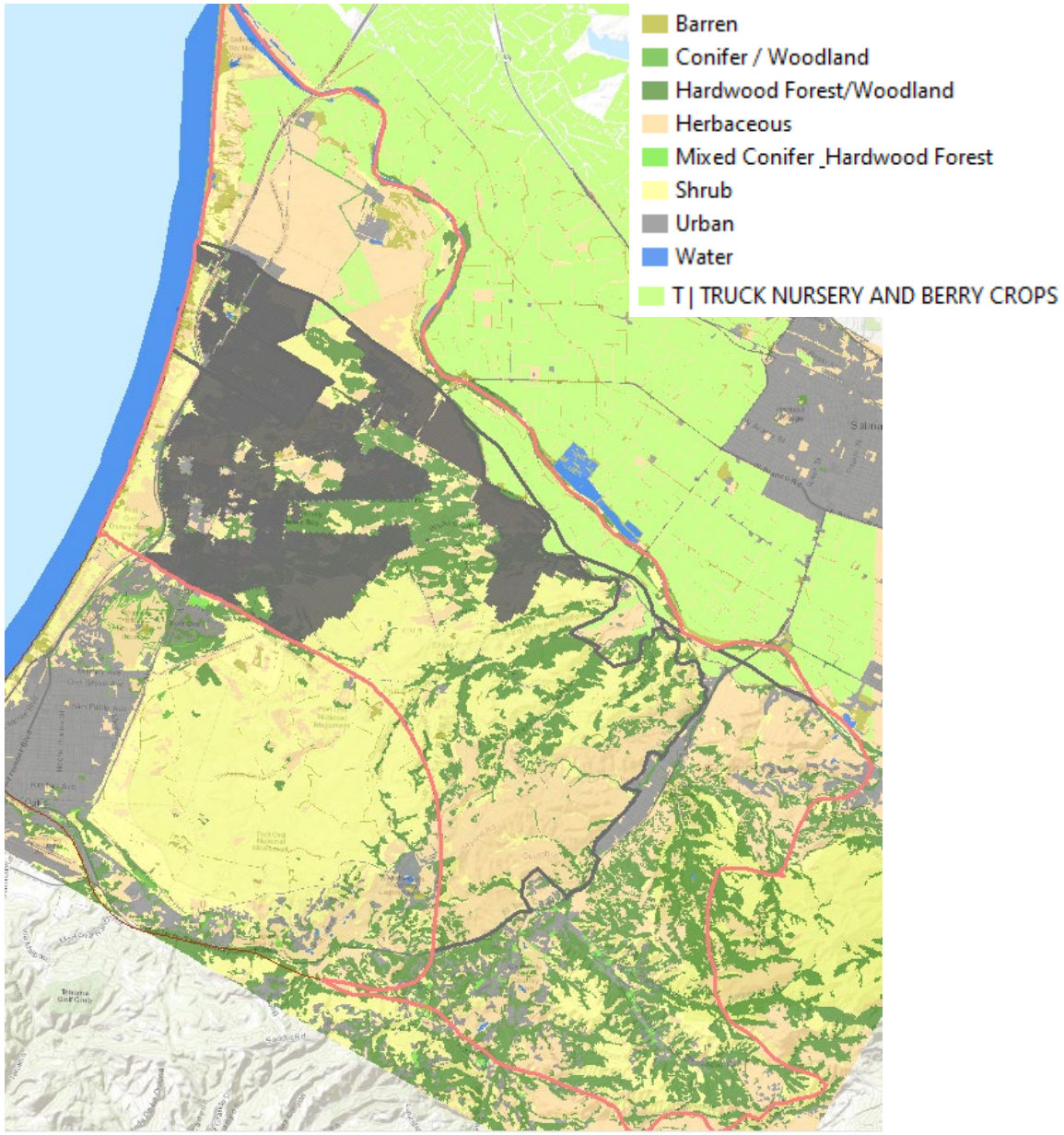
- DWR climate change scenarios used to adjust precip. & ET inputs in soil moisture balance model
- Three Climate Change scenarios considered
  - Baseline (no climate change)
  - DWR "2030" Climate Change Scenario
  - DWR "2070" Climate Change Scenario (central tendency)
- DWR 2030 and 2070: SHOW HIGHER RECHARGE IN MONTEREY SUBBASIN
- Ocean heads also adjusted
  - Baseline scenario: +0 cm
  - 2030 CC scenario: +15 cm (5.9")
  - 2070 CC scenario: +45 cm (17.7")





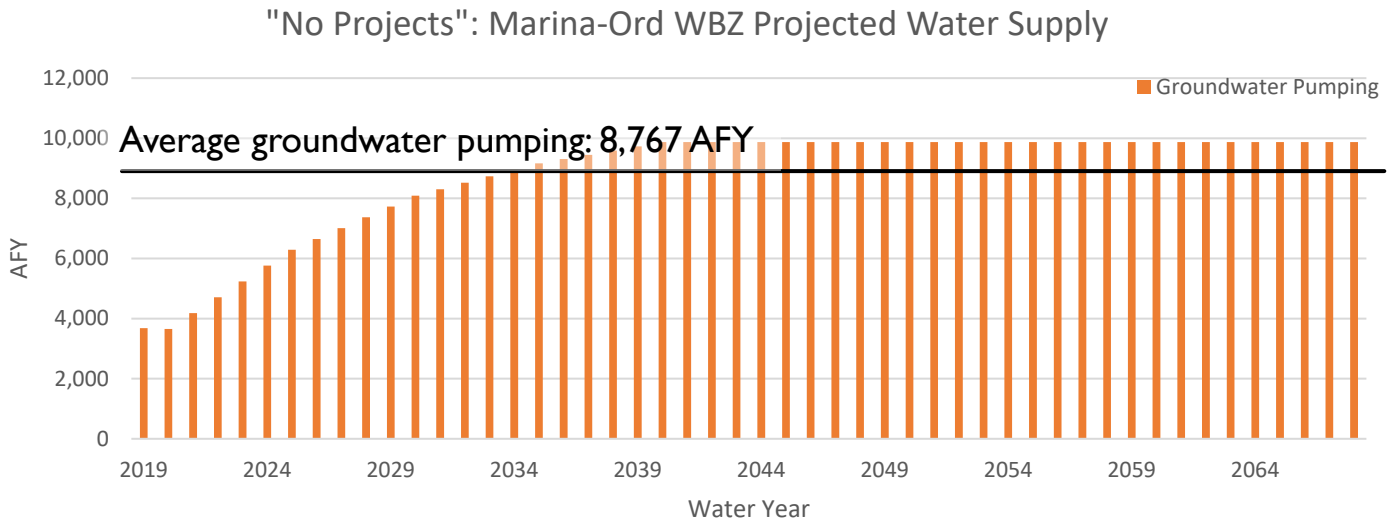
LAND USE CHANGES

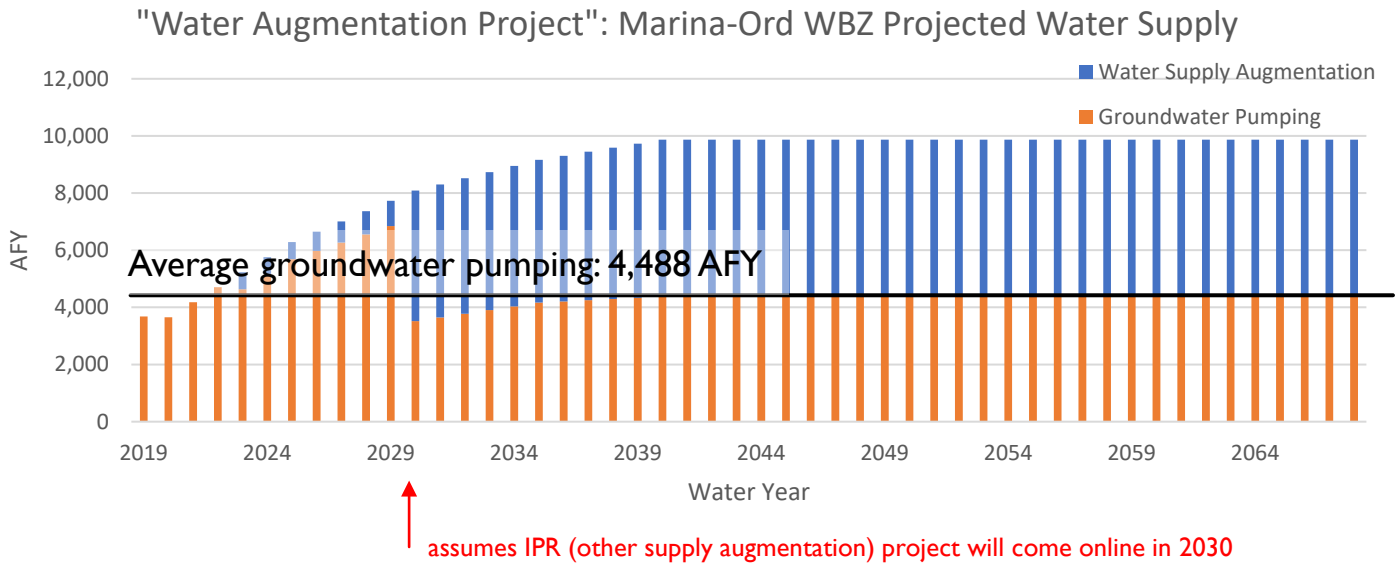
- MCWD Future Land Use projections used to update MCWD urban footprint
- All other land use assumed static based on historical model



PROJECTED FUTURE GROUNDWATER DEMANDS

- MCWD future groundwater pumping based on 2020 UWMP projections
  - "No Projects" assumes 100% of projected future demands met by groundwater
  - "Water Augmentation Project" assumes future recycled water availability and/or other supply augmentation projects will offset a portion of the projected groundwater demands
- All other pumping, deliveries assumed constant based on WY 2018 data



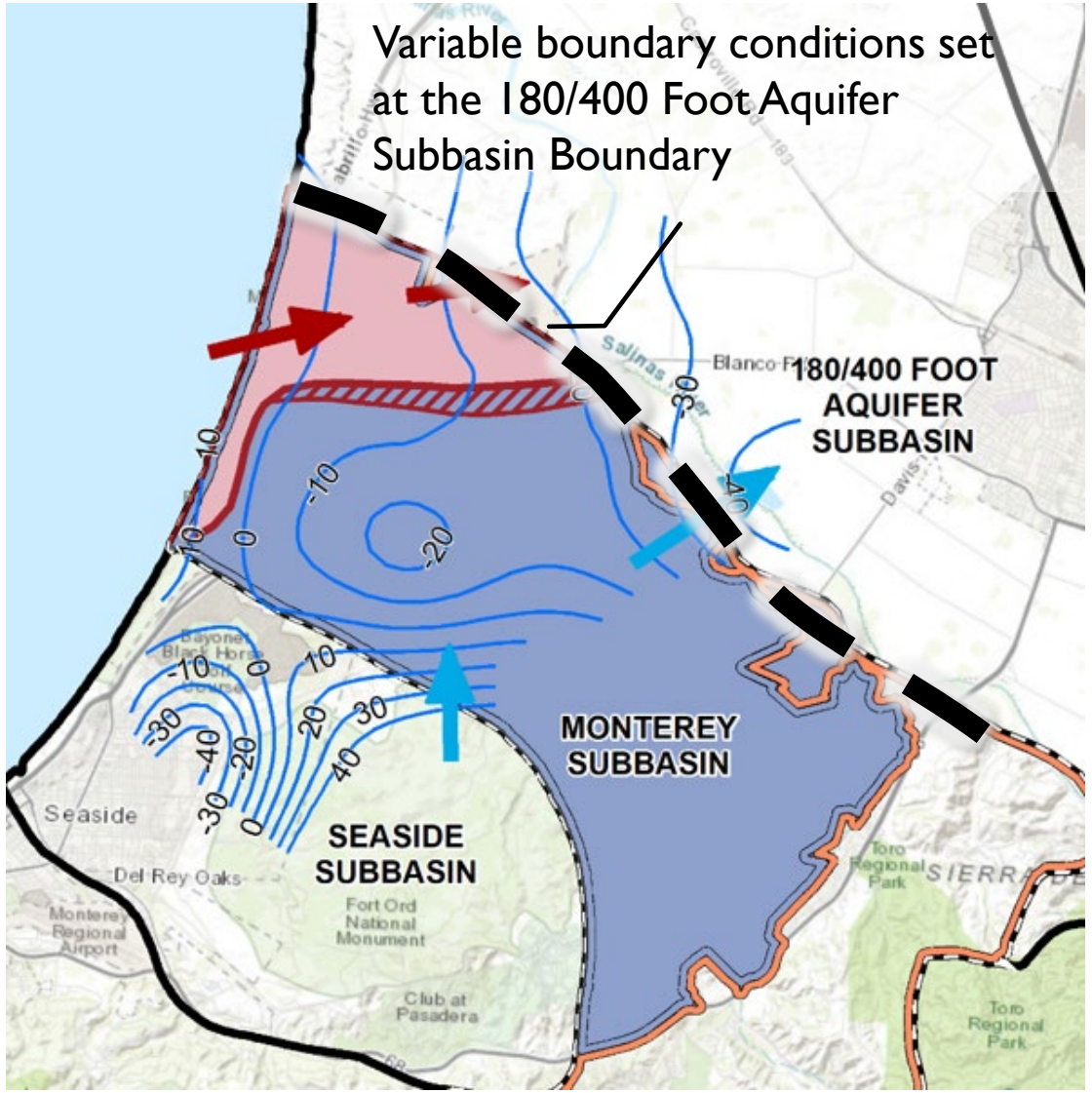


"NO PROJECTS" PROJECTED WATER BUDGET: MARINA-ORD WBZ

(VARIABLE BOUNDARY CONDITIONS IN 180/400 FOOT AQUIFER SUBBASIN)

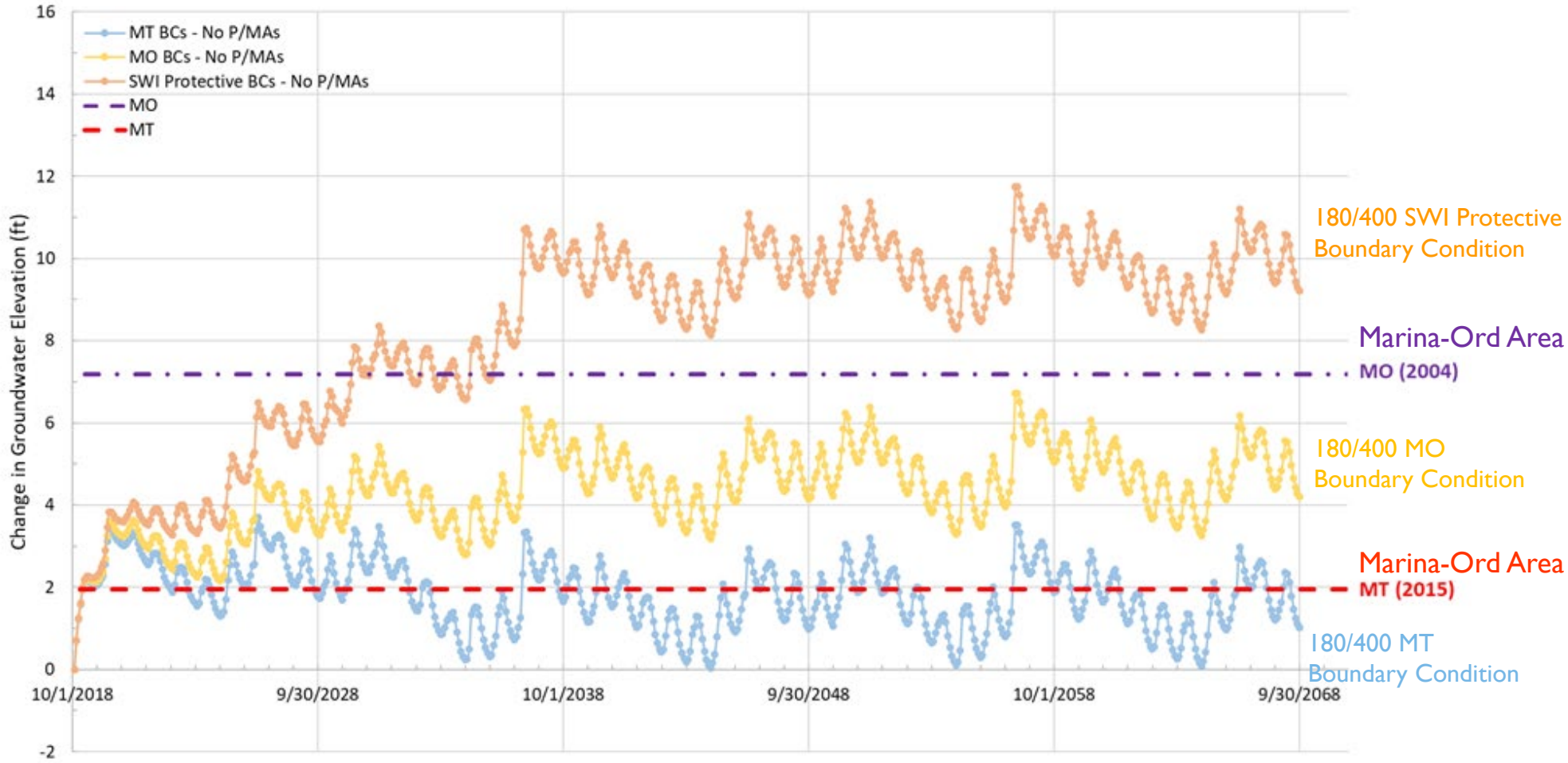
Net Annual Groundwater Flows (AFY)	Historical Annual Inflows (+) / Outflows (-) (WY 2004-2018)	Projected Annual Inflows (+) /Outflows (-) 2030 Climate Conditions		
		Minimum Threshold Boundary Conditions	Measurable Objective Boundary Conditions	Seawater Intrusion Protective Boundary Conditions
Recharge				
● Rainfall, Irrigation, etc.	**+6,144**	**+6,823**	**+6,823**	**+6,823**
Well Pumping				
● Well Pumping	**-4,346**	**-8,767**	**-8,767**	**-8,767**
Net Inter-Basin Flow				
● Seaside Subbasin	+1,310	+2,513	+1,361	-347
● 180/400 Foot Aquifer Subbasin	-8,633	-3,849	-1,927	+1,171
● Outflow to Ocean (Presumed Freshwater)	-524	-725	-752	-794
● Ocean Inflow (Presumed Seawater)	+2,872	+2,939	+2,369	+1,308
	-4,975	**+878**	**+1,051**	**+1,338**
Net Intra-basin Flow				
● Corral de Tierra Area (Water Budget Zone)	**+1,544**	**+923**	**+1,026**	**+985**
Net Surface Water Exchange				
● Salinas River Exchange	**0**	**0**	**0**	**0**
NET ANNUAL CHANGE IN GROUNDWATER STORAGE	**-1,632**	**-143**	**+133**	**+379**

Notes: Total may not sum due to rounding.



"NO PROJECT" PROJECTED WATER BUDGET: MARINA-ORD WBZ

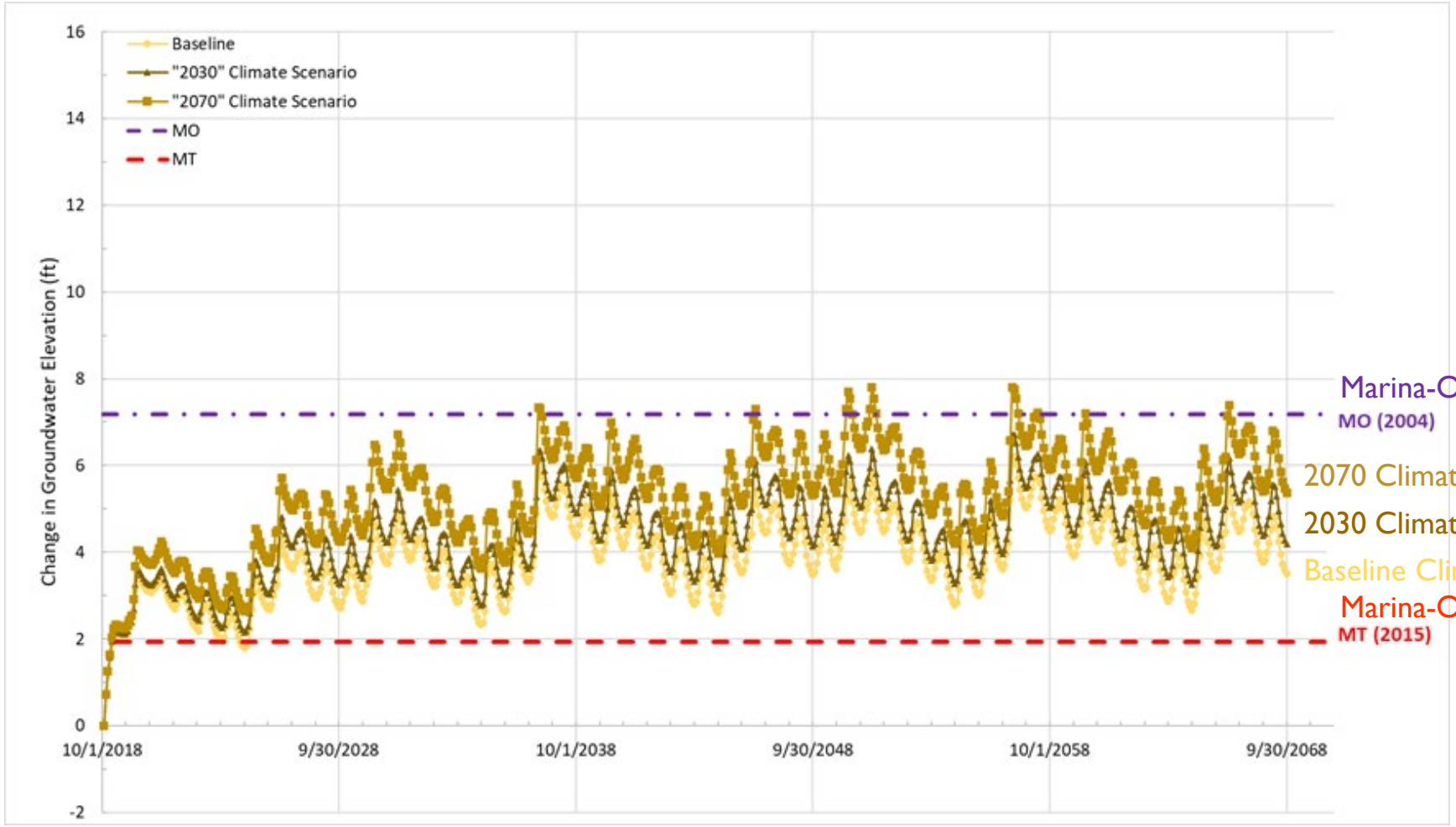
(VARIABLE BOUNDARY CONDITIONS IN 180/400 FOOT AQUIFER SUBBASIN)



Projected Change in Groundwater Levels in RMS Wells

"NO PROJECT" PROJECTED WATER BUDGET: MARINA-ORD WBZ

(180/400 FOOT AQUIFER MO BOUNDARY CONDITION: *VARIABLE CLIMATE SCENARIOS)*



Projected Change in Groundwater levels in RMS Wells

"WATER AUGMENTATION PROJECT": PROJECTED WATER BUDGET: MARINA-ORD AREA

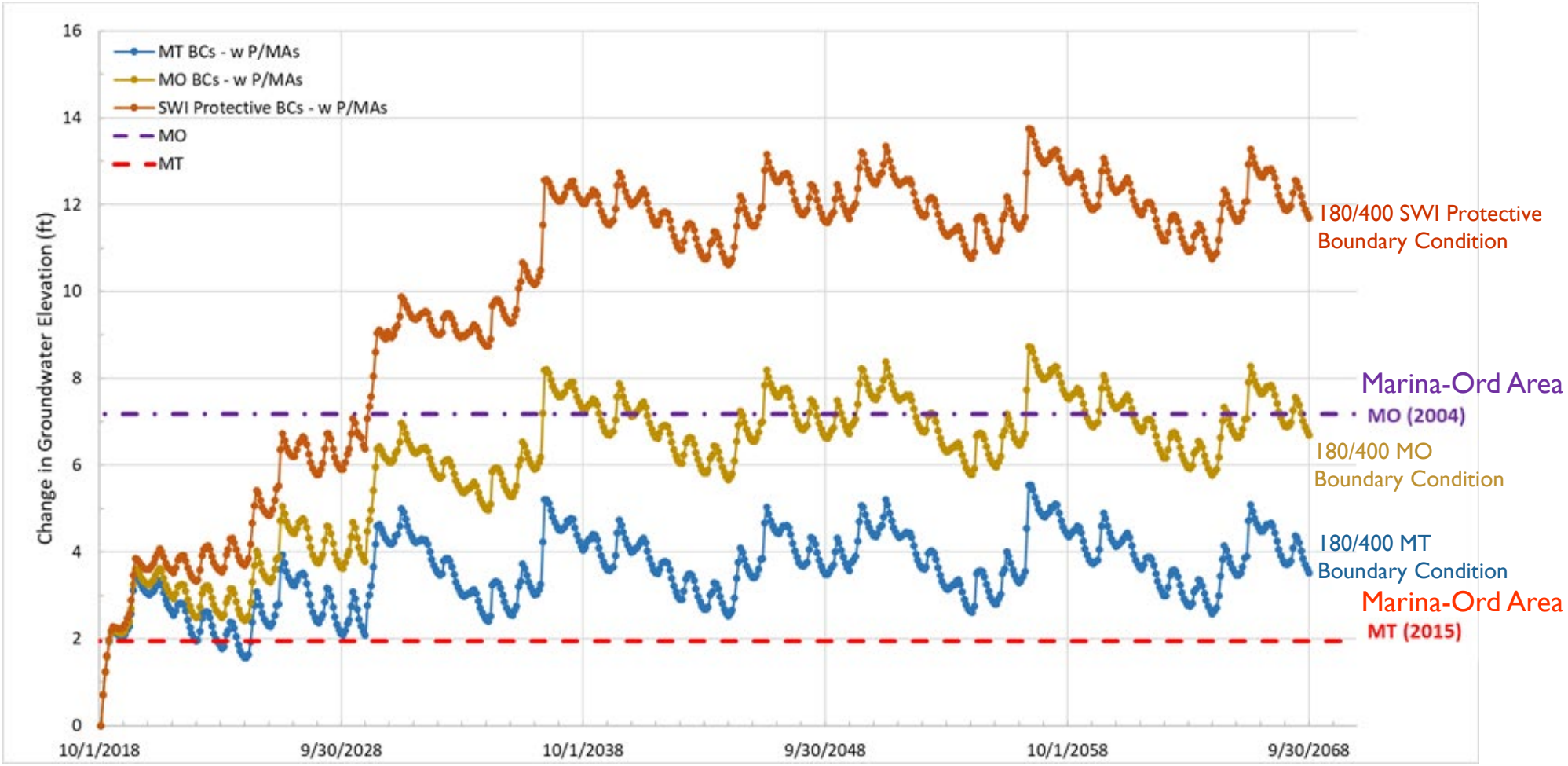
(VARIABLE BOUNDARY CONDITIONS IN 180/400 FOOT AQUIFER SUBBASIN)

Net Annual Groundwater Flows (AFY)	Historical Annual Inflows (+) / Outflows (-) (WY 2004-2018)	Projected Annual Inflows (+) /Outflows (-) 2030 Climate Conditions		
		Minimum Threshold Boundary Conditions	Measurable Objective Boundary Conditions	Seawater Intrusion Protective Boundary Conditions
Recharge				
● Rainfall, Irrigation, etc.	**+6,144**	**+6,823**	**+6,823**	**+6,823**
Well Pumping				
● Well Pumping	**-4,346**	**-4,488**	**-4,488**	**-4,488**
Net Inter-Basin Flow				
● Seaside Subbasin	+1,310	+1,776	+612	-1,115
● 180/400 Foot Aquifer Subbasin	-8,633	-6,833	-4,901	-1,788
● Outflow to Ocean (Presumed Freshwater)	-524	-738	-764	-806
● Ocean Inflow (Presumed Seawater)	+2,872	+2,617	+2,047	+989
	-4,975	**-3,178**	**-3,006**	**-2,721**
Net Intra-basin Flow				
● Corral de Tierra Area (Water Budget Zone)	**+1,544**	**+898**	**+1,001**	**+958**
Net Surface Water Exchange				
● Salinas River Exchange	**0**	**0**	**0**	**0**
NET ANNUAL CHANGE IN GROUNDWATER STORAGE	**-1,632**	**+55**	**+330**	**+572**

Notes: Total may not sum due to rounding.

"WATER AUGMENTATION PROJECT": PROJECTED WATER BUDGET: MARINA-ORD AREA

(VARIABLE BOUNDARY CONDITIONS IN 180/400 FOOT AQUIFER SUBBASIN)



PROJECTED WATER BUDGET CONCLUSIONS

- Future climate/recharge rates in Monterey Subbasin increase slightly based on DWR Climate model
- Monterey Subbasin conditions are strongly dependent upon conditions in adjacent Subbasins
  - If 180/400 Foot Aquifer Subbasin reaches water level SMCs (MT: 2015 water levels MO: ~2003 water levels) and Seaside subbasin groundwater levels stabilize at 2018 levels Marina Ord should stabilize
  - Projects will still likely be required to reach SMCs in Monterey Subbasin given projected increases in water demands in the Marina Ord Area and continued projected declines in groundwater levels in the Corral De Tierra area.
- Sustainability will take coordinated actions between subbasins

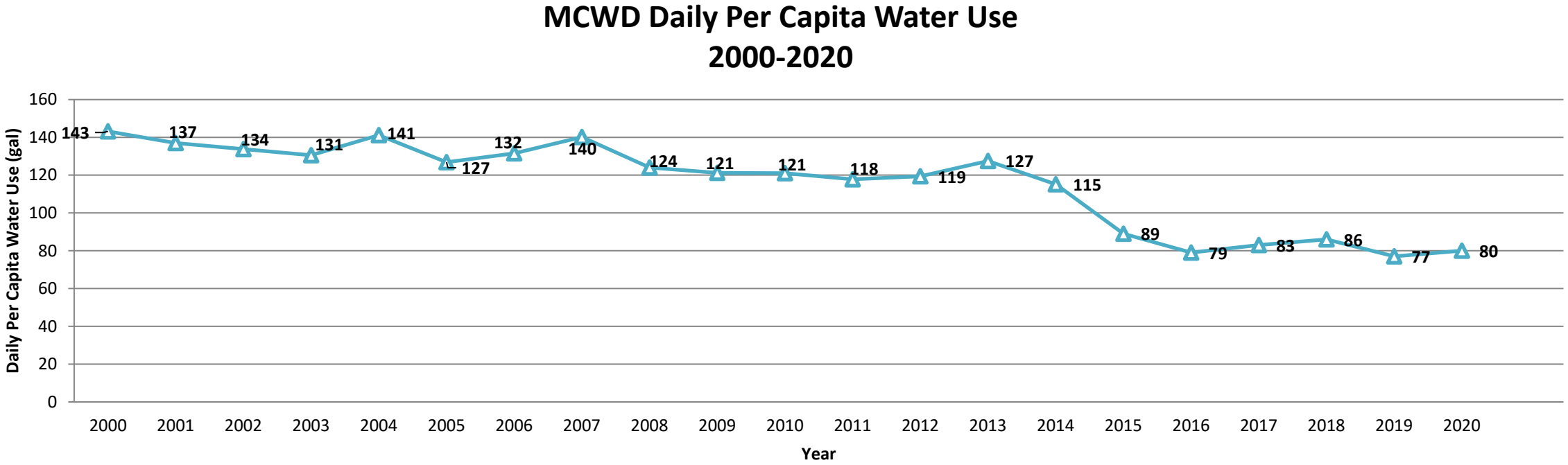
CHAPTERS 9 AND 10 PROJECT MANAGEMENT ACTIONS AND GSP IMPLEMENTATION

Projects and management actions will diversify the Subbasin' water supply portfolio, increase supply reliability, and protect the Subbasin's groundwater resources against seawater intrusion. The Subbasin's historical efforts to invest in water conservation will continue under SGMA.

PROJECTS AND MANAGEMENT ACTIONS MARINA-ORD AREA

- MCWD Demand Management Measures – Continued Conservation
- Stormwater Recharge Management
- Recycled Water Reuse through Landscape Irrigation and Indirect Potable Reuse
- Monitoring Wells
- Regional Projects
  - Winter Release from Reservoirs with ASR and Direct Delivery
  - Regional Municipal Supply through brackish water desalination extracted from seawater intrusion barrier

MCWD DEMAND MANAGEMENT MEASURES CONTINUED WATER CONSERVATION



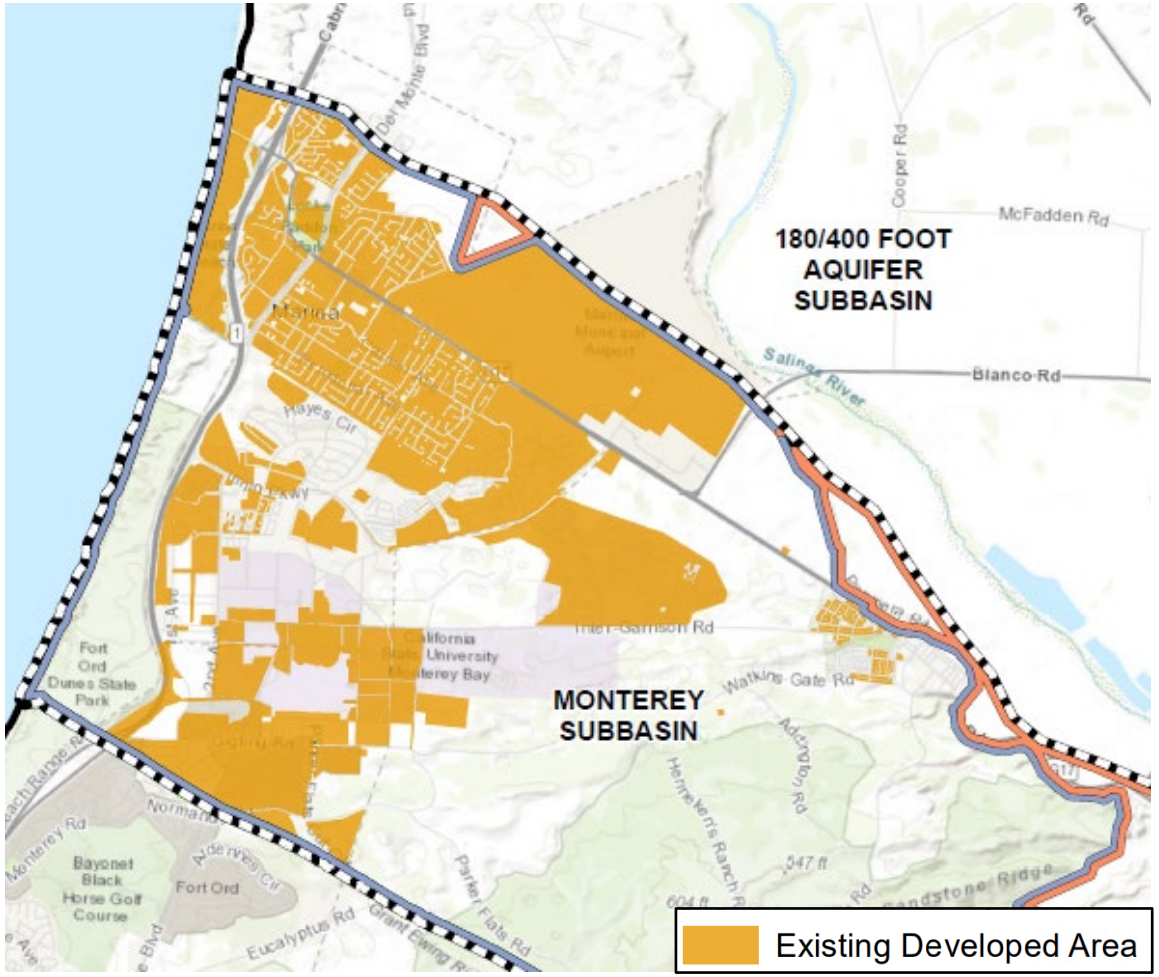
Description: Provides in-lieu recharge through reducing groundwater demands. Project includes existing and potentially new conservation programs to decrease MCWD Per Capita Water Use

Project Benefit: Equivalent to a **2,500 AFY** in-lieu recharge benefit at the current population.

Project Cost: $350,000 to $450,000 annually

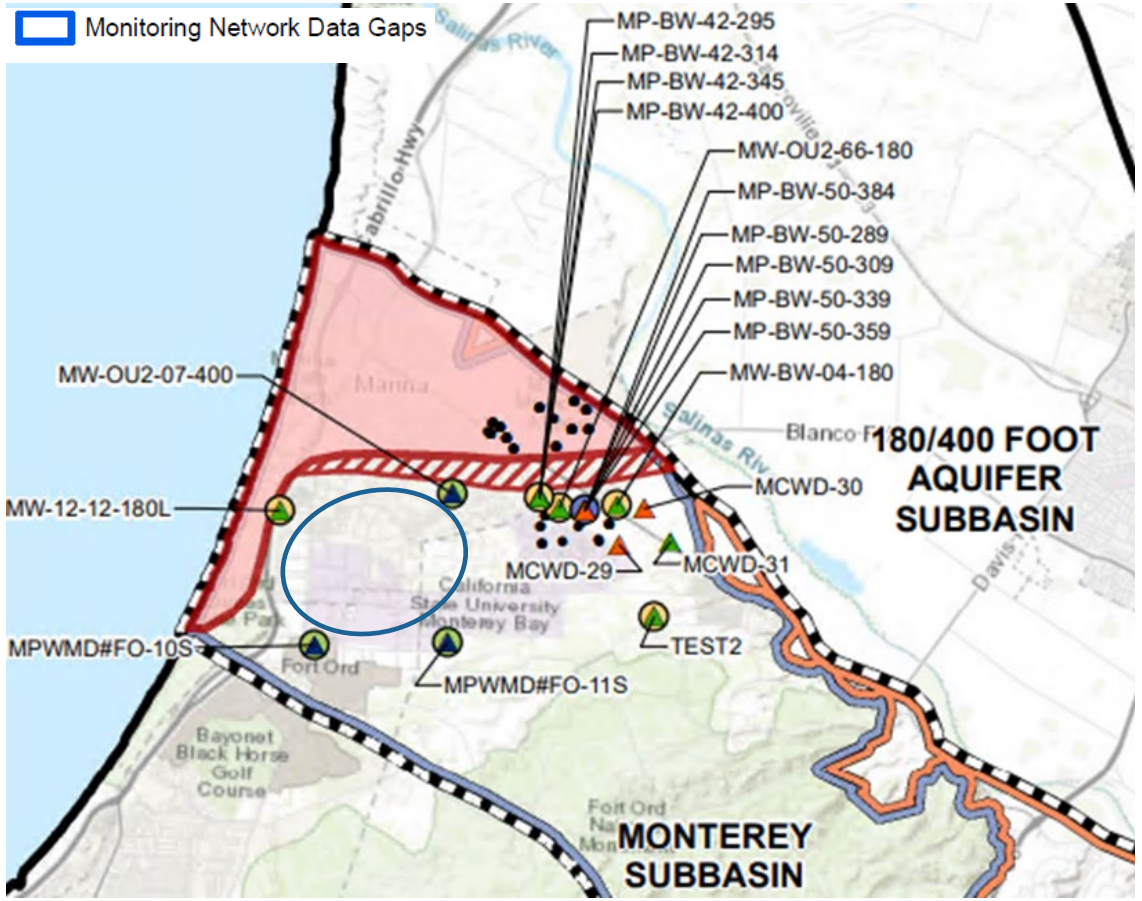
STORMWATER RECHARGE MANAGEMENT

- **Description**:
  - Existing policies facilitate and result in stormwater catchment and infiltration in urban areas
- **Project Benefit**:
  - Groundwater modeling indicates that: approximately 550 AFY is currently captured and reinfiltrated east of Highway 1, and 1,100 AFY of stormwater is projected to be captured and reinfiltrated within the total future development area even further east of Highway 1.
  - Estimated net additional recharge 200 to 500 AFY.
- **Cost Estimate**:
  - No additional cost to implement



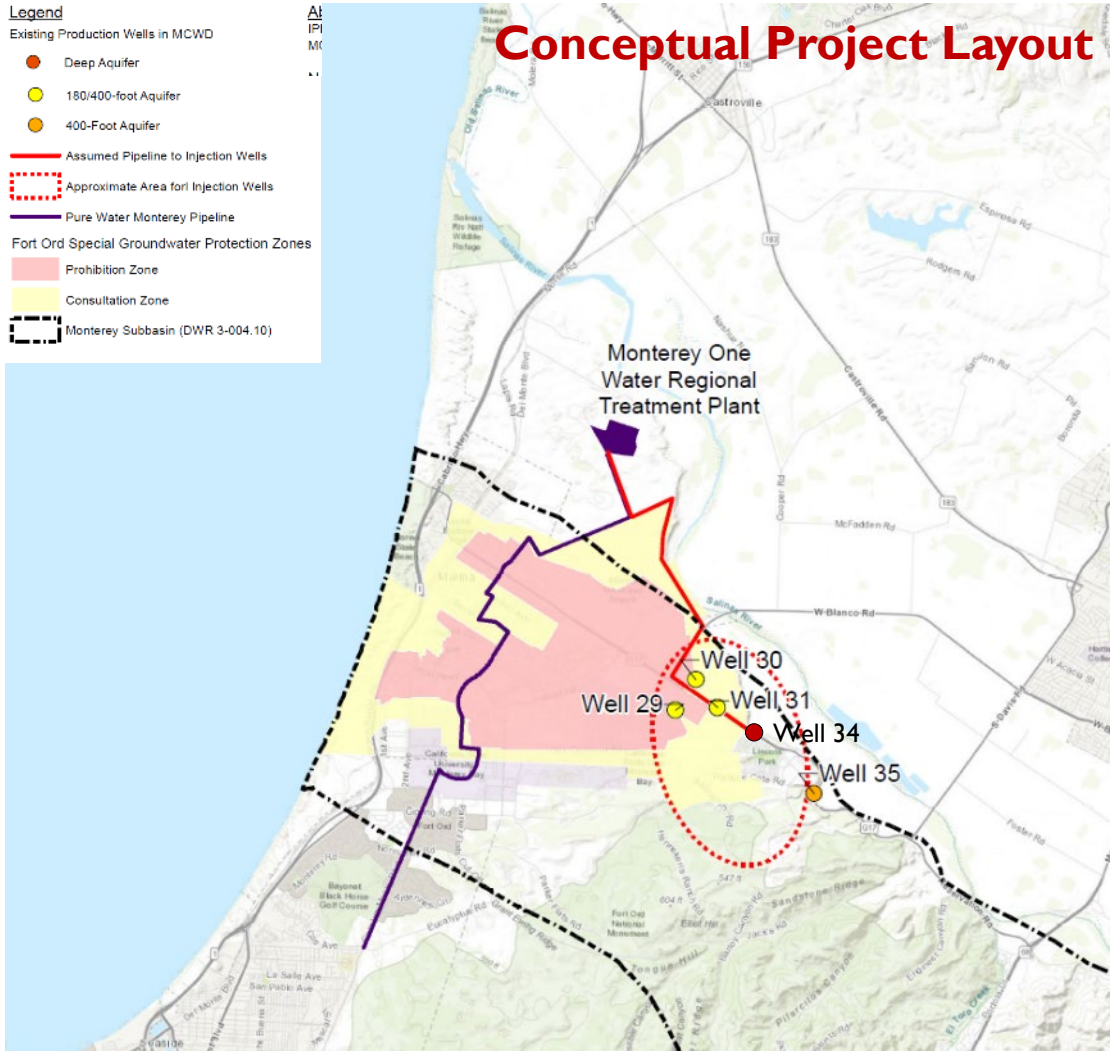
GROUNDWATER MONITORING WELLS *(400 FOOT AND DEEP AQUIFERS)*

- **Description**:
  - Install 400-Foot Aquifer and Deep Aquifer monitoring wells near coastal Seaside Subbasin boundary.
- **Project Benefit**:
  - Will fill critical data gaps on hydrostratigraphy, seawater intrusion, and groundwater recharge mechanisms for the 400-Foot Aquifer and Deep Aquifers.
  - Will provide critical information for design of recycled water reuse through Injection.
- **Conceptual Cost Estimate**:
  - Capital Cost: **$1.1 Million**



RECYCLED WATER REUSE THROUGH LANDSCAPE IRRIGATION AND INDIRECT POTABLE REUSE (INJECTION)

- **Description**:
  - Direct non-potable irrigation use and/or injection of advanced treated water from Monterey One Water (M1W) and extraction using existing MCWD wells or new production wells
- **Project Benefit**:
  - **~2,200 AFY to 5,500 AFY** advance treated recycled water available to MCWD based on current and projected wastewater flows
- **Conceptual Cost Estimate**:
  - Investments have already been made to deliver 600 AFY for landscape irrigation by 2022.
  - Capital Cost Landscape Irrigation (additional 827 AFY): $5,600,000
  - Unit Cost Landscape Irrigation for additional 827 AFY: **$1,600/AF**
  - Capital Cost IPR (2,400 AFY): $65 Million
  - Unit Cost IPR (2,400 AFY): **$3,300/AF**

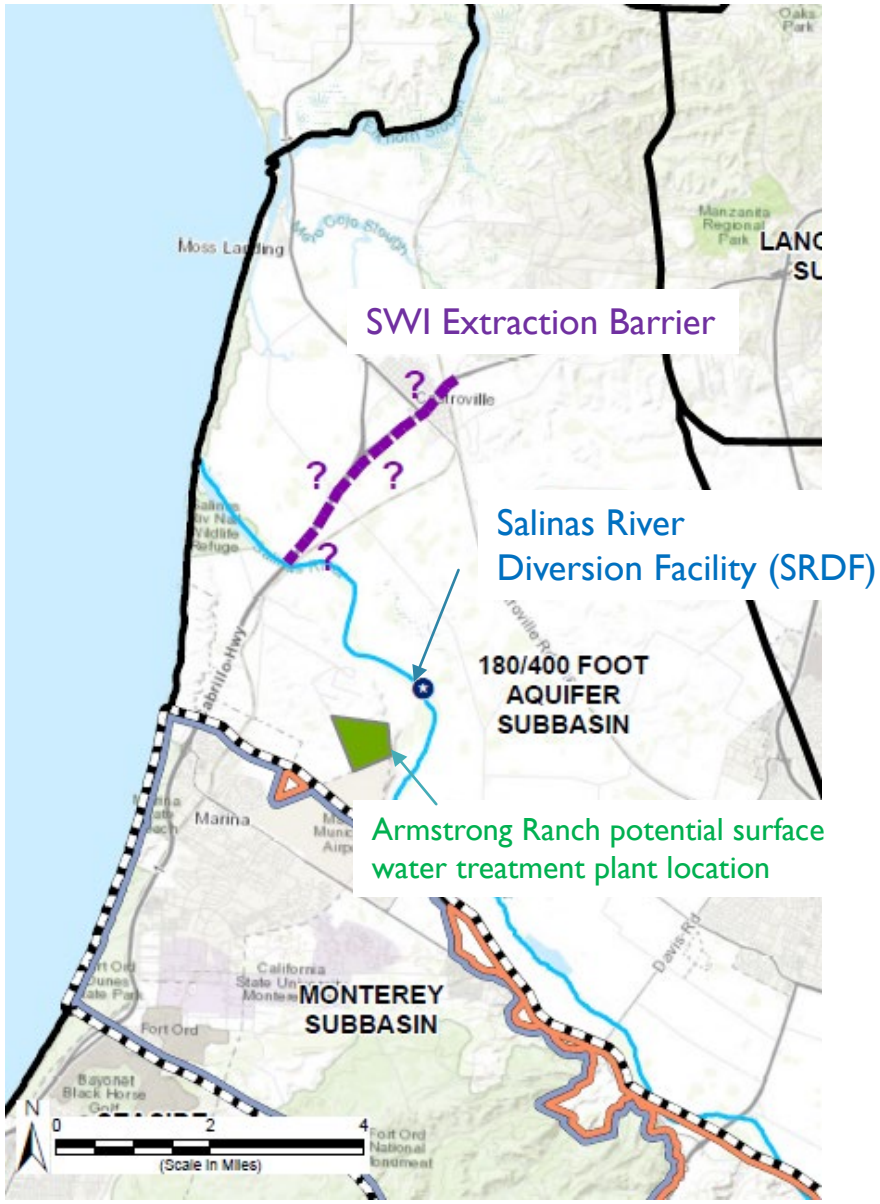


Notes:

1. *Per acre foot cost based on 25-year average (6% interest)*
2. *Capital Unit cost for Landscape irrigation based upon 827 AFY expansion*
3. *Capital and unit costs for IPR based on 2400 AFY of production. lower costs per AF with increased yield*

REGIONAL PROJECTS

- **Winter Release with ASR and Direct Delivery:**
  - Release flows from reservoirs during the winter when there's less water loss to the stream channels.
  - Divert these flows and any additional Permit 11043 water available for diversion at the SRDF during winter months.
  - Treat and inject flows into the 180/400-Foot Aquifer Subbasin for CSIP users' extraction during the summer and divert for direct municipal use.
- **Potential Direct Project Benefit to Marina-Ord:**
  - **1,600 AFY currently** and up to **4,500 AFY by 2040** (based on existing and projected winter water demands)
- **Conceptual Cost Estimate[1]:**
  - Multi-subbasin Capital Cost: $172 Million[2]
  - Unit Cost for ASR: $1,450/AF[3]
  - Unit Cost for Direct Delivery: **$1,100/AF**[4]

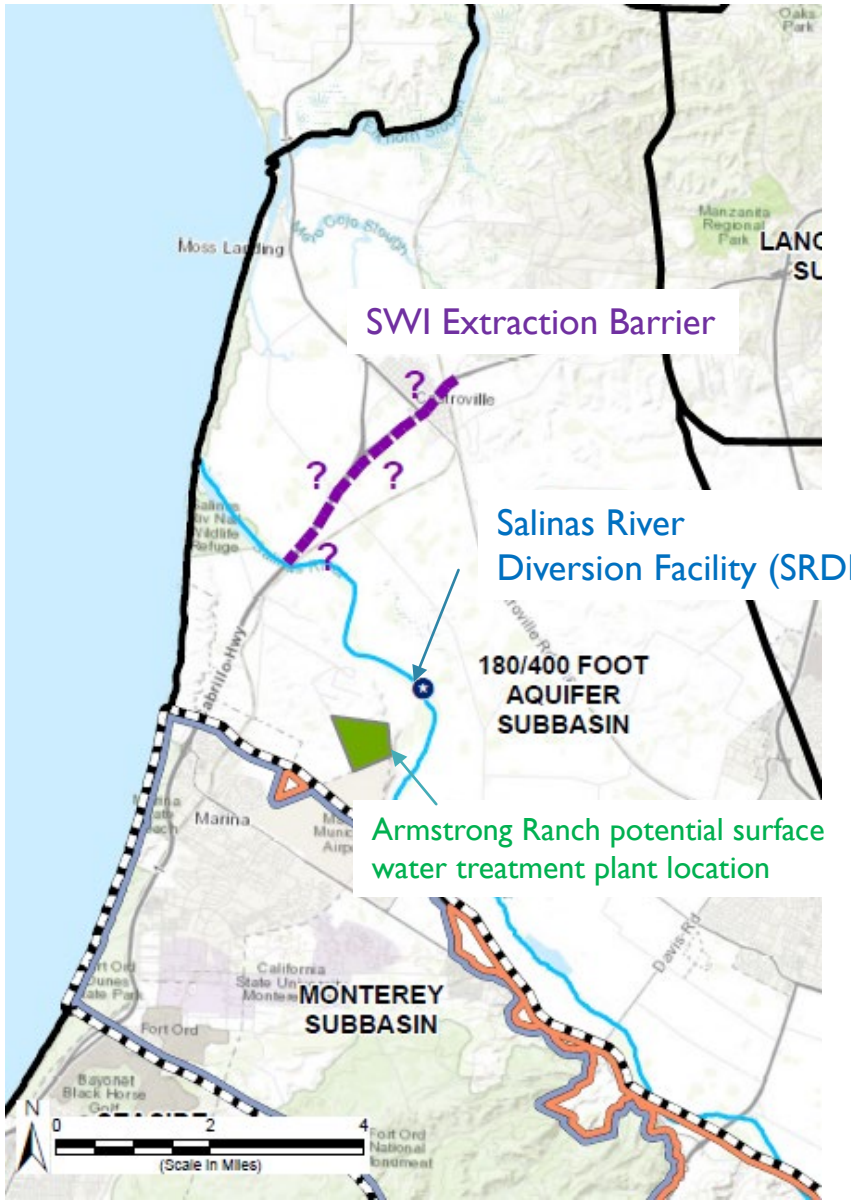


Notes:

1. *Per acre foot cost based on 25-year average (6% interest)*
2. *Distribution of benefits across subbasins will be determined through a benefits assessment*
3. *Unit cost for ASR based on 12,900 AFY benefit*
4. *Unit cost for direct delivery based on 3,600 AFY delivery to MCWD lower costs per AF with increased yield Assumes no additional diversion structure needed*

REGIONAL PROJECTS

- **Regional Municipal Supply (brackish desal):**
  - Build regional desalination plant to treat brackish water extracted from the seawater intrusion extraction barrier
  - Supply drinking water to municipalities in the Monterey Subbasin and other subbasins
- **Potential Regional Production: 15,000 AFY**
- **Conceptual Cost Estimate[1]:**
  - Multi-subbasin Capital Cost: $385 Million[2]
  - Unit Cost for production and delivery: $2,900/AF[3]
  - Capital and unit costs do not include cost of the extraction barrier itself, which adds another $1,200/AF



Notes:

1. *Per acre foot cost based on 25-year average (6% interest) lower costs per AF with increased yield*
2. *Distribution of benefits across subbasins will be determined through a benefits assessment*

IMPLEMENTATION ACTIONS

- MCWD actions that contribute to groundwater management that may indirectly benefit the Subbasin
- Focuses on regional coordination
  - Support for groundwater management and project planning in adjacent subbasins
  - Support for the Deep Aquifer Study and Monterey County's final well ordinance to protect the Deep Aquifers
  - Future modeling of seawater intrusion and projects using a regional model

CHAPTER 10 – GSP IMPLEMENTATION

- **SGMA Monitoring and Reporting**
  - Conduct SGMA and voluntary monitoring: groundwater elevation, water quality, induction logging, etc.
  - Document basin conditions and report annually to DWR
  - Improve monitoring networks and address data gaps
  - Conduct periodic evaluations of GSP and prepare five-year updates
- **Coordination and Stakeholder Engagement**
  - Continue intra- and inter-basin coordination
  - Continue stakeholder engagement and communication
- **Projects and Implementation Costs**
  - Refine projects during the first two years and begin implementation
  - Identify plan implementation costs