



# TURLOCK SUBBASIN GSP

## PROJECTS & MANAGEMENT ACTIONS | IMPLEMENTATION SUPPORT ACTIVITIES

JOINT GSA TECHNICAL ADVISORY COMMITTEE  
OCTOBER 28, 2021



# OUTLINE

- Sustainable Yield
- Projects and Management Actions
- Implementation Support Activities

# SUSTAINABLE YIELD

“The maximum quantity of water, calculated over a base period representative of long-term conditions in the basin and including any temporary surplus, that can be withdrawn annually from a groundwater supply without causing an undesirable result.”  
(CWC §10721(w))



DECLINING  
GROUNDWATER  
LEVELS



REDUCTION OF  
GROUNDWATER  
STORAGE



SEAWATER  
INTRUSION



WATER  
QUALITY  
DEGRADATION



LAND  
SUBSIDENCE

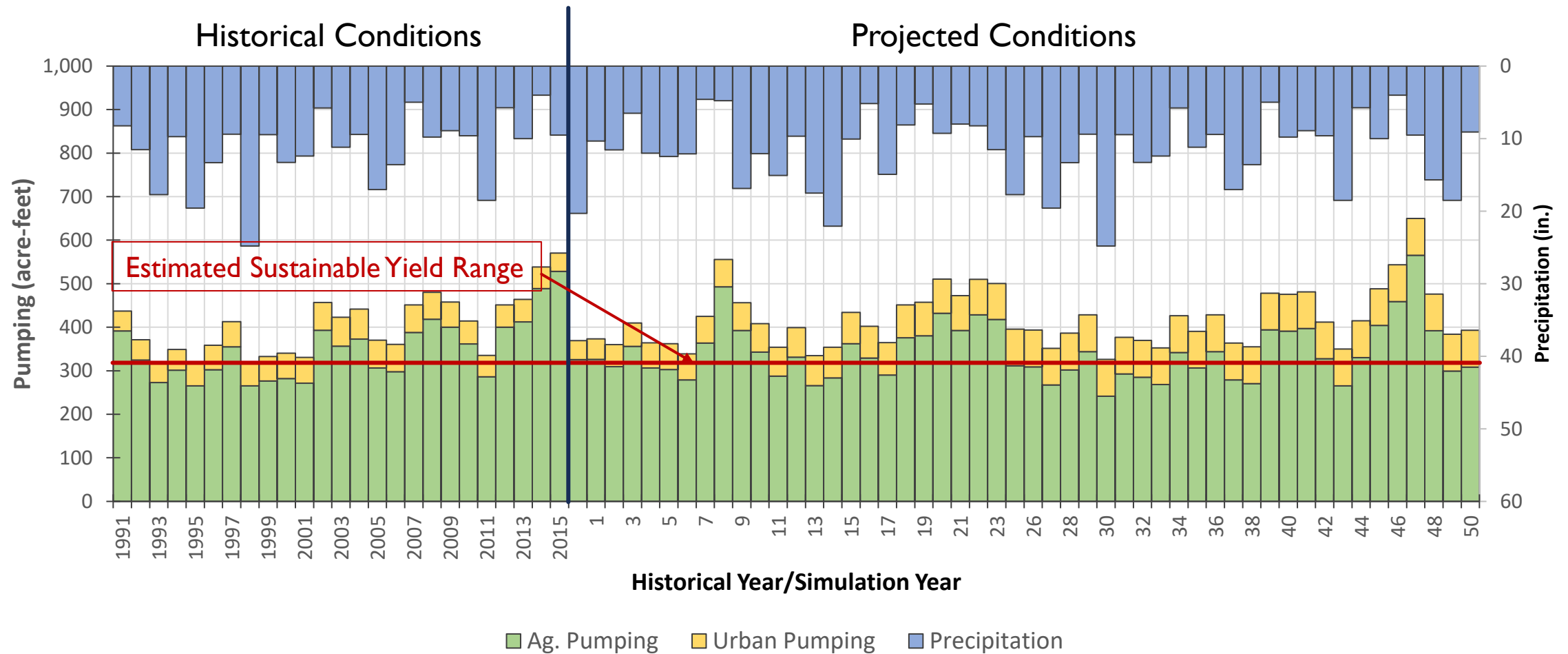


SURFACE  
WATER  
DEPLETIONS

# TURLOCK SUBBASIN ESTIMATED SUSTAINABLE YIELD

- A systematic analysis was performed to estimate the Sustainable Yield
- This analysis was performed using:
  - Latest state of knowledge on the subbasin hydrology, hydrogeology, land and water use conditions, and level of development
  - Estimate of 50-years of hydrologic record
  - Current climate conditions
  - Current reservoir operational rules and regulatory framework
  - The C2VSim™ model
- Based on the current data, information, and knowledge of the Subbasin, the best current estimate of the Sustainable Yield is 311,000 AFY

# GROUNDWATER PUMPING AND SUSTAINABLE YIELD



# HOW TO MEET SUBBASIN SUSTAINABILITY GOALS: PMA

- GSP Regulation 354.44 (a): Plan must include description of PMAs that GSAs have determined will achieve sustainability goal for the basin.
- GSP Regulation 354.44 (b)(1-9): Descriptions must contain:
  1. Measurable objective (sustainability indicator) benefits
  2. Circumstances for implementation
  3. Public notice process
  4. Quantification of demand reduction for mitigation of overdraft
  5. Permitting and regulatory process
  6. Time-table for initiation and completion
  7. Legal authority
  8. Estimated costs and funding plan
  9. Other inputs on water reliability and project applicability during drought

# PMAs DEFINITIONS

- **Projects:**

Physically constructed  
(structural) features

- **Management Actions:**

Non-structural programs or policies  
designed to implement programs or  
incentivize actions that result in  
improvements in sustainability

Together, meant to:

- Make progress toward meeting sustainability goals & MOs
- Avoid violating of MTs and causing undesirable results

# PROJECTS

## Groups 1 & 2

- Projects in place and will continue to be implemented OR currently planned and will be implemented
- Generally more detail

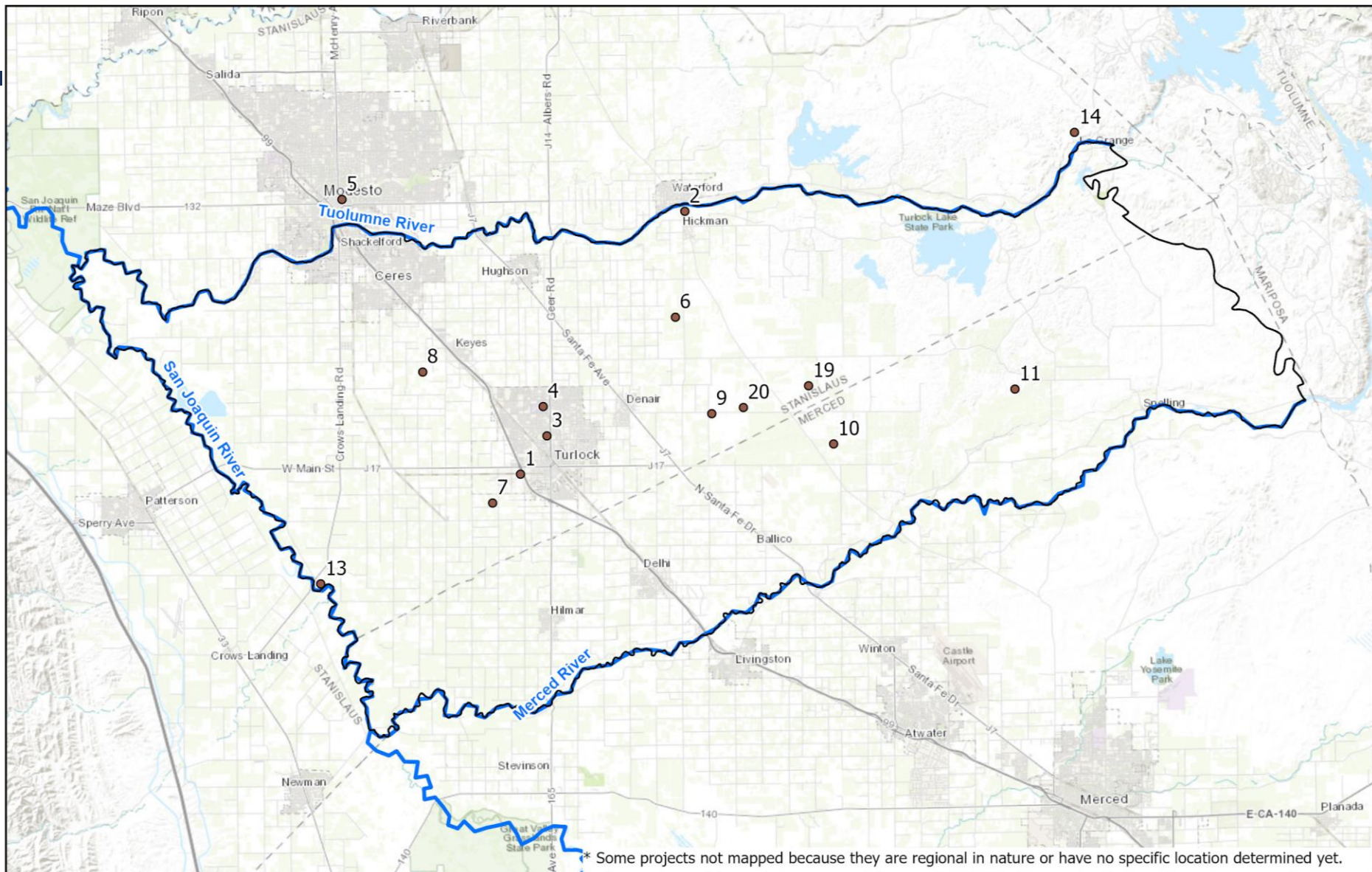
#	Project Name
1	Regional Surface Water Supply Project
2	Waterford/Hickman Surface Water Pump Station and Storage Tank
3	Dianne Storm Basin
4	Stanislaus State Stormwater Recharge
5	Advanced Metering Infrastructure Project (AMI)
6	TID On-Farm Recharge Project (in WTSGSA)
7	Recycled Water from City of Turlock
8	TID Ceres Main Regulating Reservoir
9	Agricultural Recharge Project (in ETSGSA)
10	Mustang Creek Flood Control Recharge Project
11	Upland/Waterford Pipeline

## Group 3

- Project identified which may occur, providing benefits
- Not evaluated in great detail; described at a more general level

#	Project Name
1	San Joaquin River Flood Diversions
2	La Grange Recharge Project (Within TID Irrigation Service Area)
3	TID Lateral 5.5 Regulating Reservoir
4	Additional TID Regulating Reservoirs
5	Recharge from TID Conveyance System
6	Intertie Projects
7	Rouse Lake Pipeline Recharge Project
8	Sand Creek Basin Runoff Recharge Project
9	La Grange Recharge Project
10	Merced ID Expansion Project
11	Development of Use of Diffused Water Through Existing and New Connections for Direct Recharge, FloodMAR, and In-Lieu Recharge
12	Dry Creek Development of Recharge Opportunities



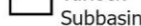




\* Some projects not mapped because they are regional in nature or have no specific location determined yet.

**Projects by Number**

**Legend**

-  Streams
-  Turlock Subbasin
-  Projects\*

- # Name
- 1 Regional Surface Water Supply Project
  - 2 Waterford/Hickman Surface Water Pump Station and Storage Tank
  - 3 Dianne Storm Basin
  - 4 Stanislaus State Stormwater Recharge
  - 5 Advanced Metering Infrastructure Project (AMI)
  - 6 TID On-Farm Recharge Project (in WTSGSA)
  - 7 Recycled Water from City of Turlock
  - 8 TID Ceres Main Regulating Reservoir
  - 9 Agricultural Recharge Project (in ETSGSA)
  - 10 Mustang Creek Flood Control Recharge Project
  - 11 Upland/Waterford Pipeline
  - 12 Demand Management

- # Name
- 13 San Joaquin River Flood Diversions
  - 14 La Grange Recharge Project (Within TID Irrigation Service Area)
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  - 17 Recharge from TID Conveyance System
  - 18 Intertie Projects
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  - 23 Development of Use of Diffused Water Through Existing and New Connections for Direct Recharge, FloodMAR, and In-Lieu Recharge
  - 24 Dry Creek Development of Recharge Opportunities



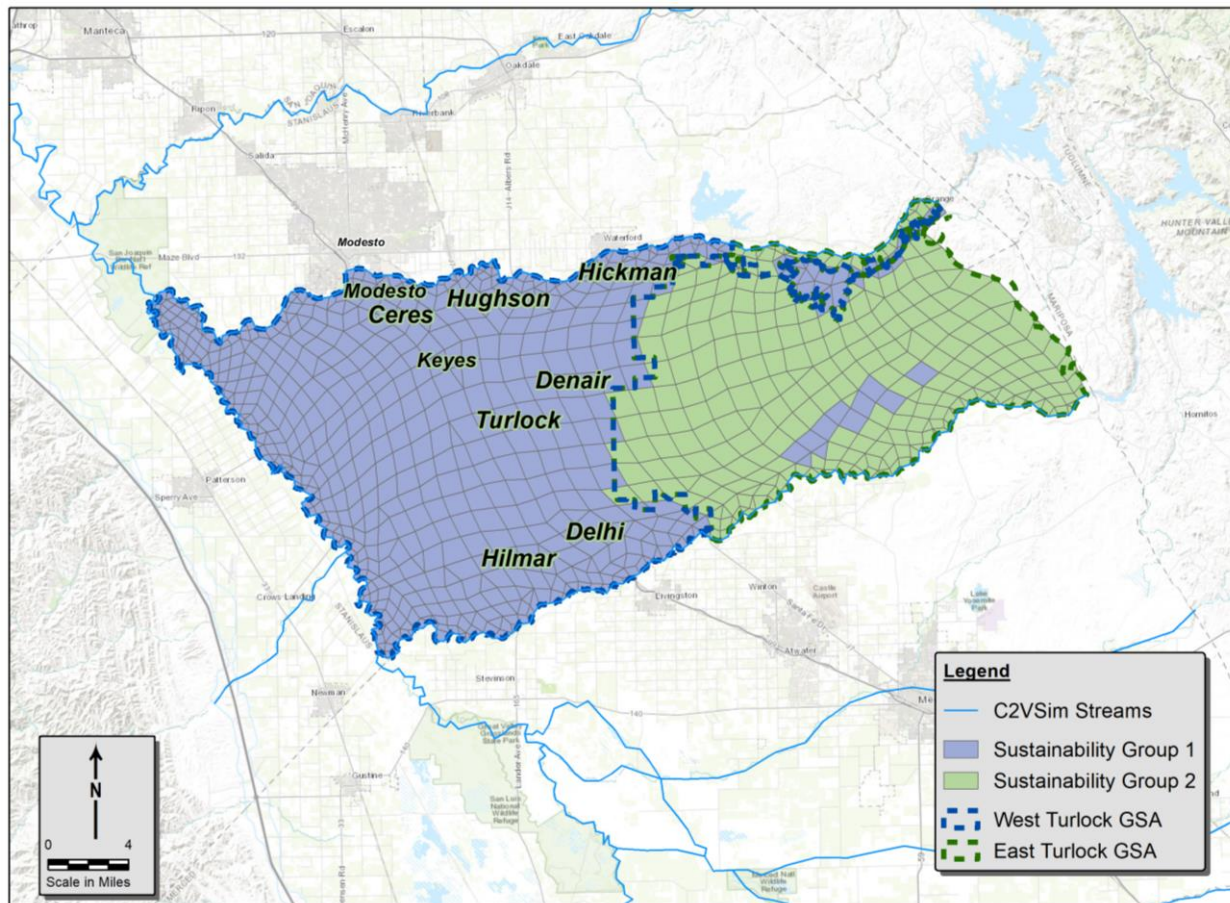
October 2021

# MODELING SCENARIOS

- **Approach:**
  - Use C2VSim™ model used to evaluate effectiveness against Sustainability Goals
- **Sustainability Indicators:**
  - Chronic Lowering of GW
  - Decline in GW Storage
  - Increase Land Subsidence
  - Depletion of Interconnected Streams

Urban and Municipal Projects		Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
1	Regional Surface Water Supply Project	X	X	X	X	X
2	Waterford/Hickman Surface Water Pump Station and Storage Tank	X	X	X	X	X
3	Dianne Storm Basin	X	X	X	X	X
4	Stanislaus State Stormwater Recharge	X	X	X	X	X
5	Advanced Metering Infrastructure Project (AMI)	X	X	X	X	X
WTSGSA – Agricultural Projects						
6	TID On-Farm Recharge Project (in WTSGSA)		X		X	X
7	Recycled water to TID from City of Turlock		X		X	X
8	TID Ceres Main Regulating Reservoir		X		X	X
ETSGSA – Agricultural Projects						
9	Agricultural Recharge Project (in ETSGSA)			X	X	X
10	Mustang Creek Flood Control Recharge Project			X	X	X
11	Upland/Waterford Pipeline			X	X	X
WTSGSA & ETSGSA – Management Actions						
12	Demand Management					X

# PROJECTS + DEMAND MANAGEMENT



## Water User Categories

### ■ A) SW&GW Users

- Turlock ID
- Merced ID
- Riparian SW users

### ■ B) GW Only Users

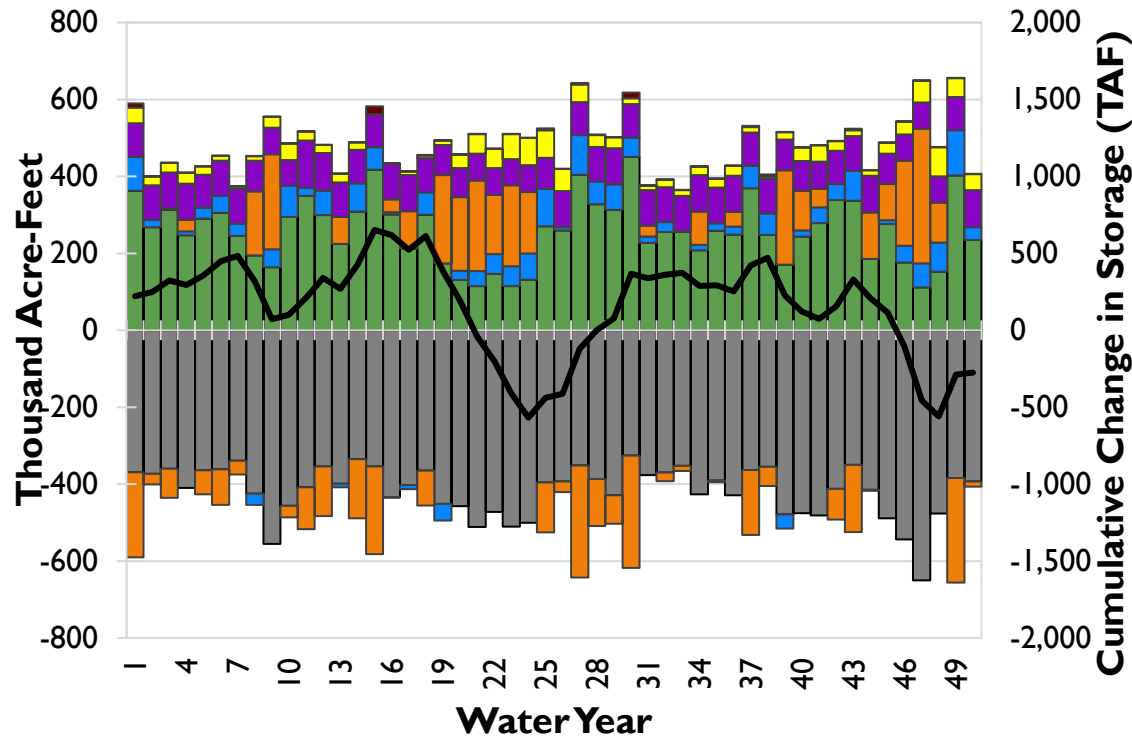
- Turlock, Ceres, Modesto, Hickman, Delhi, Denair, Hilmar, Hughson, and Keyes
- EWD, BCWD, & non-district agriculture on GW

# SUSTAINABLE MANAGEMENT CRITERIA 6: DEPLETIONS OF INTERCONNECTED SURFACE WATER

- Sustainability Criteria (Depletion of Interconnected Surface Water)
  - Groundwater levels at no more than 50% (i.e., 3 wells) of the representative monitoring wells along each river boundary selected to proxy stream depletions.
  - Merced River: Spring-2014 minimum thresholds for a period longer than 2-years
  - San Joaquin River: Fall-2015 minimum thresholds for a period longer than 2-years.
  - Tuolumne River: Fall-2015 minimum thresholds for a period longer than 2-years.
  - Compliance measured by two consecutive annual monitoring events
- SGMA requires an accounting of induced stream depletions and associated undesirable results affecting surface water uses

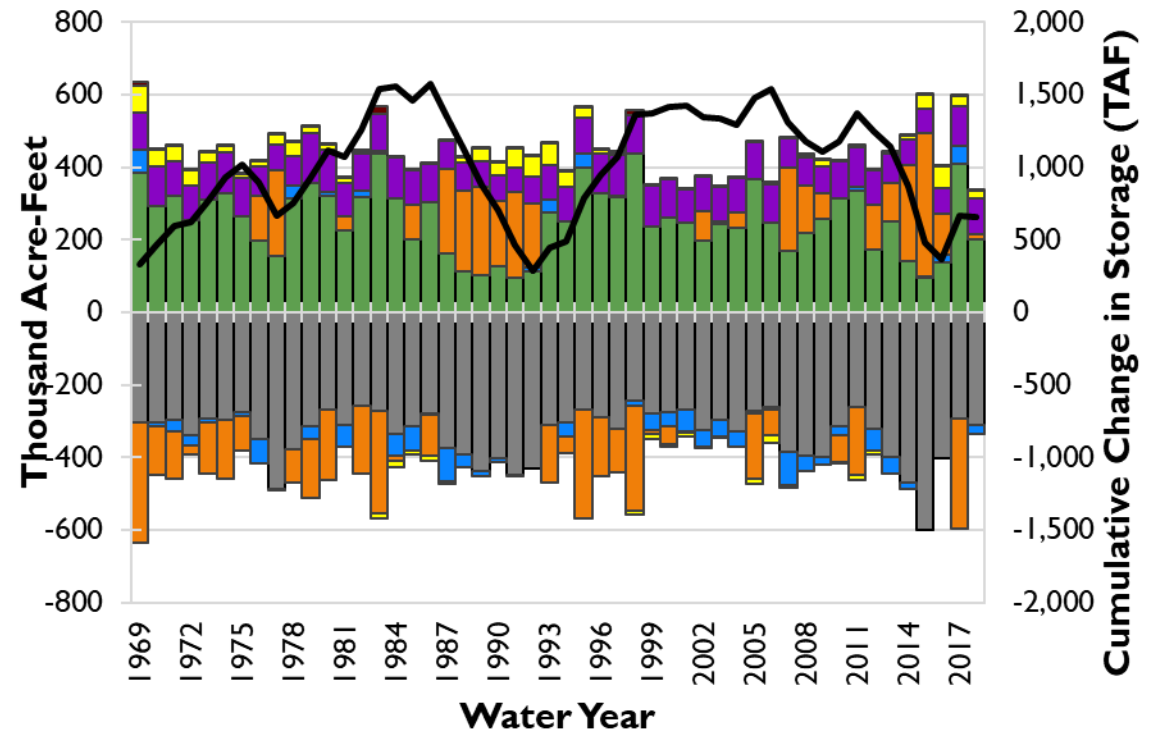
# GROUNDWATER BUDGET

## Baseline



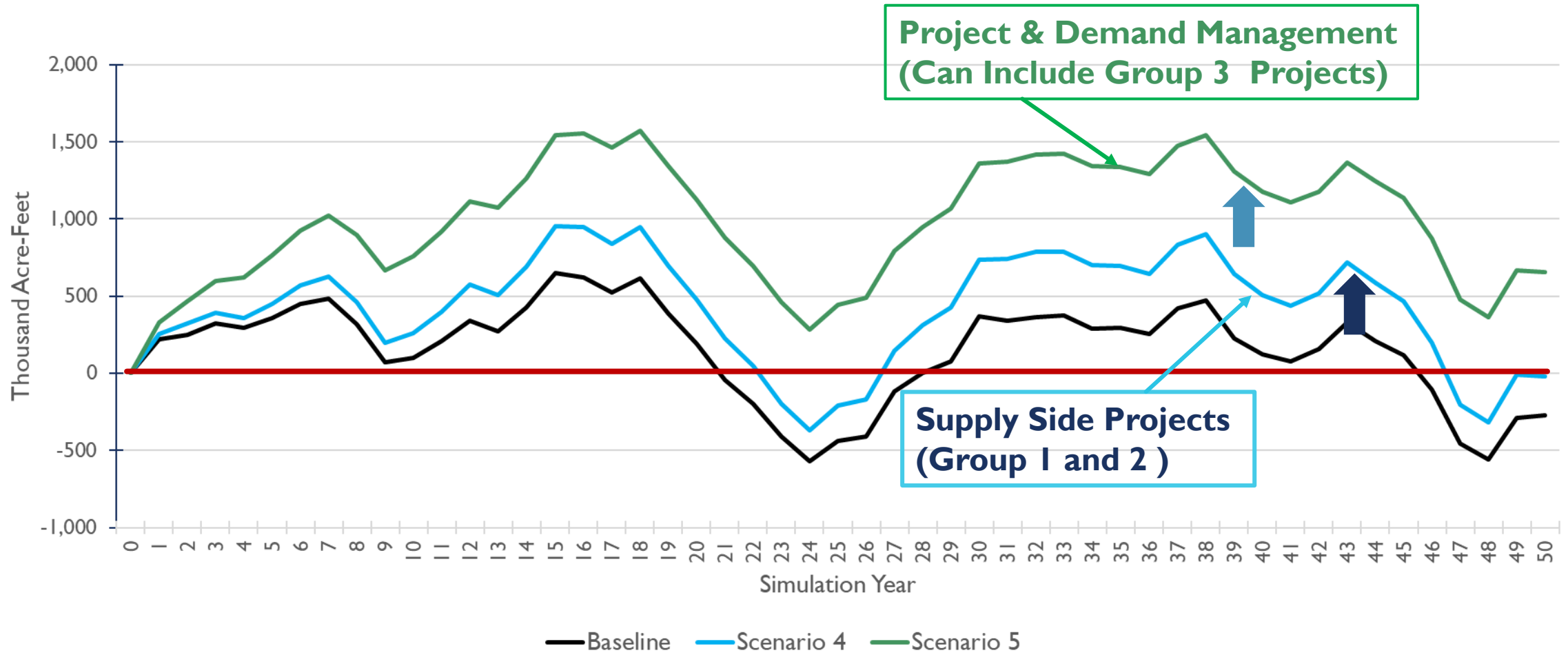
- Groundwater Pumping
- Deep Percolation
- Stream/Aquifer Interaction
- Change in GW Storage
- Canal and Reservoir Recharge
- Subsurface Flow from Adjacent Areas
- Inflow from Foothills
- Cumulative Change in Storage

## Scenario 5- Sustainable Scenario

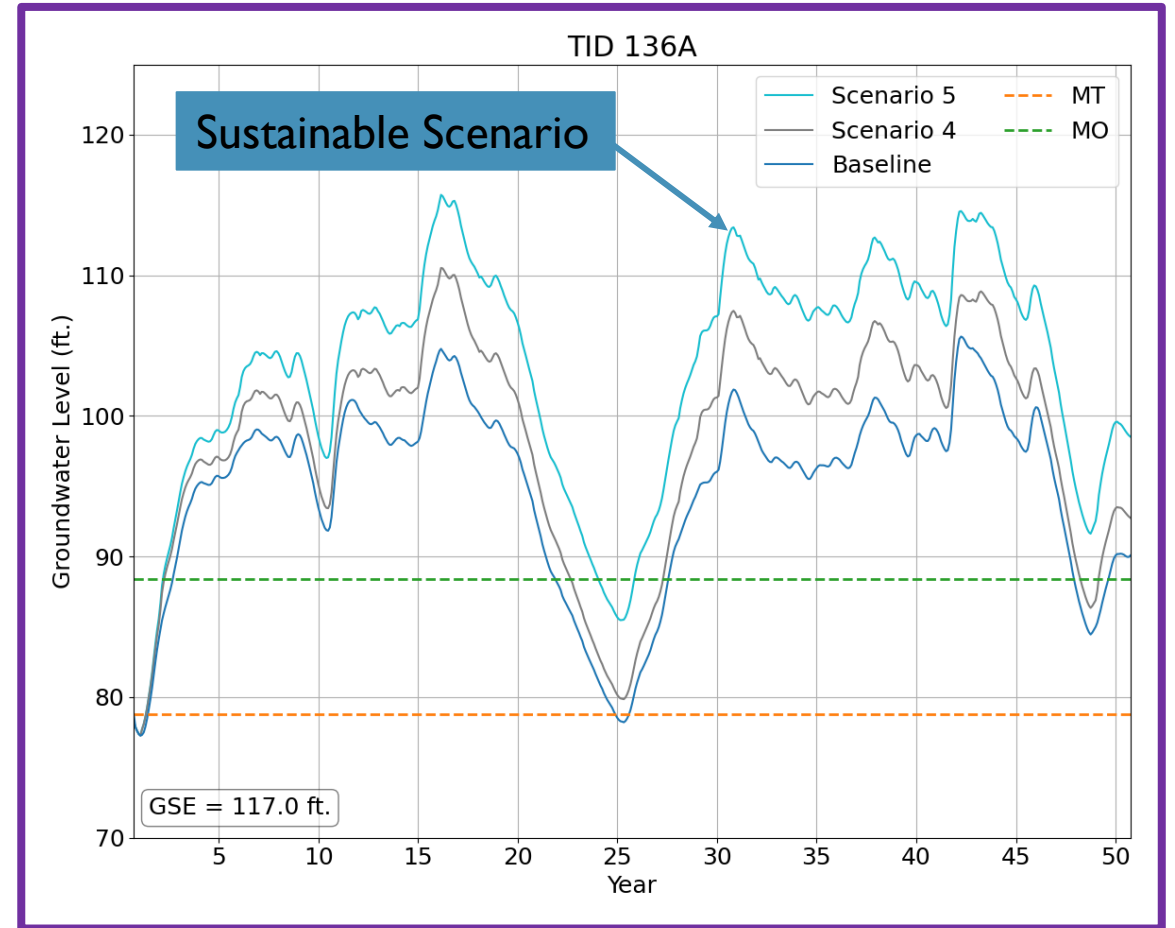
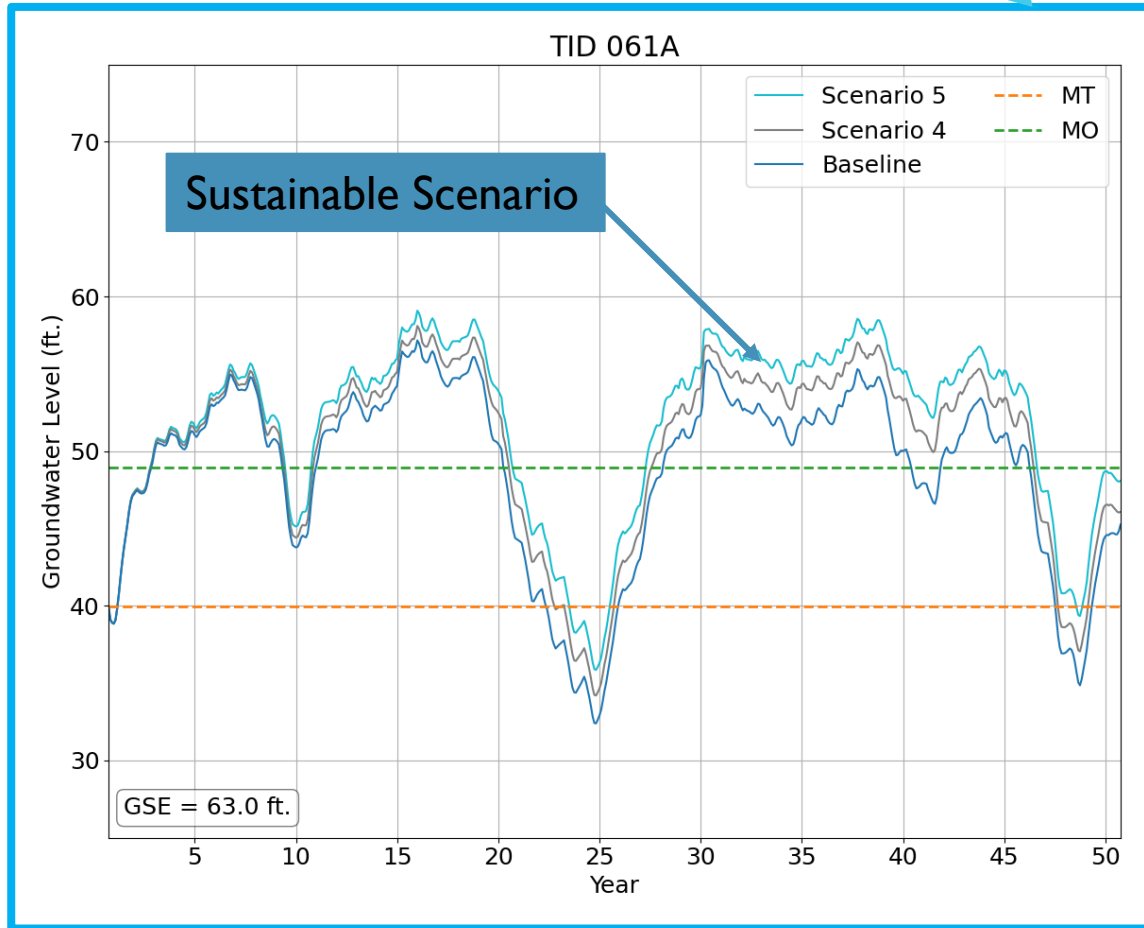
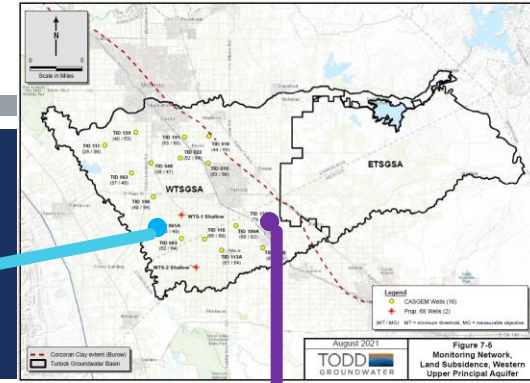


- Groundwater Pumping
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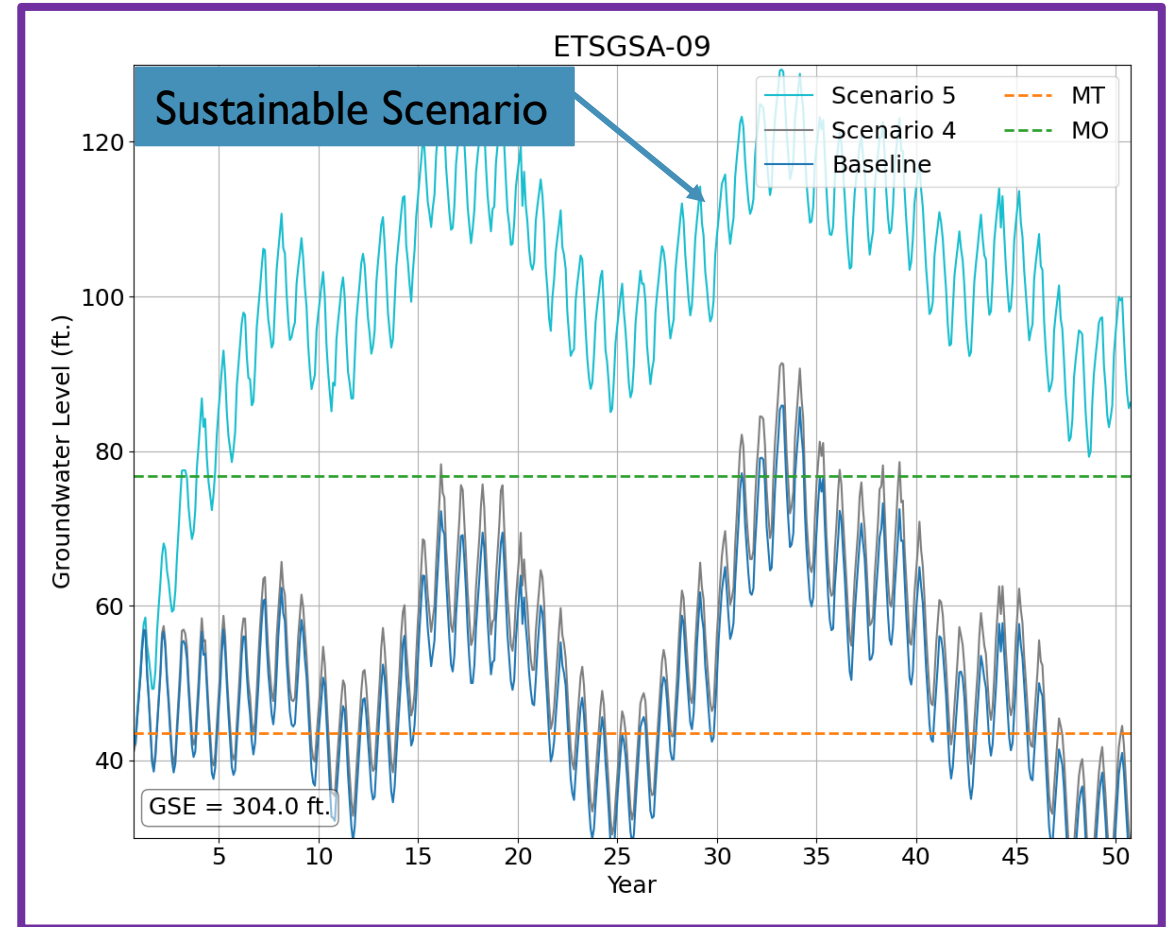
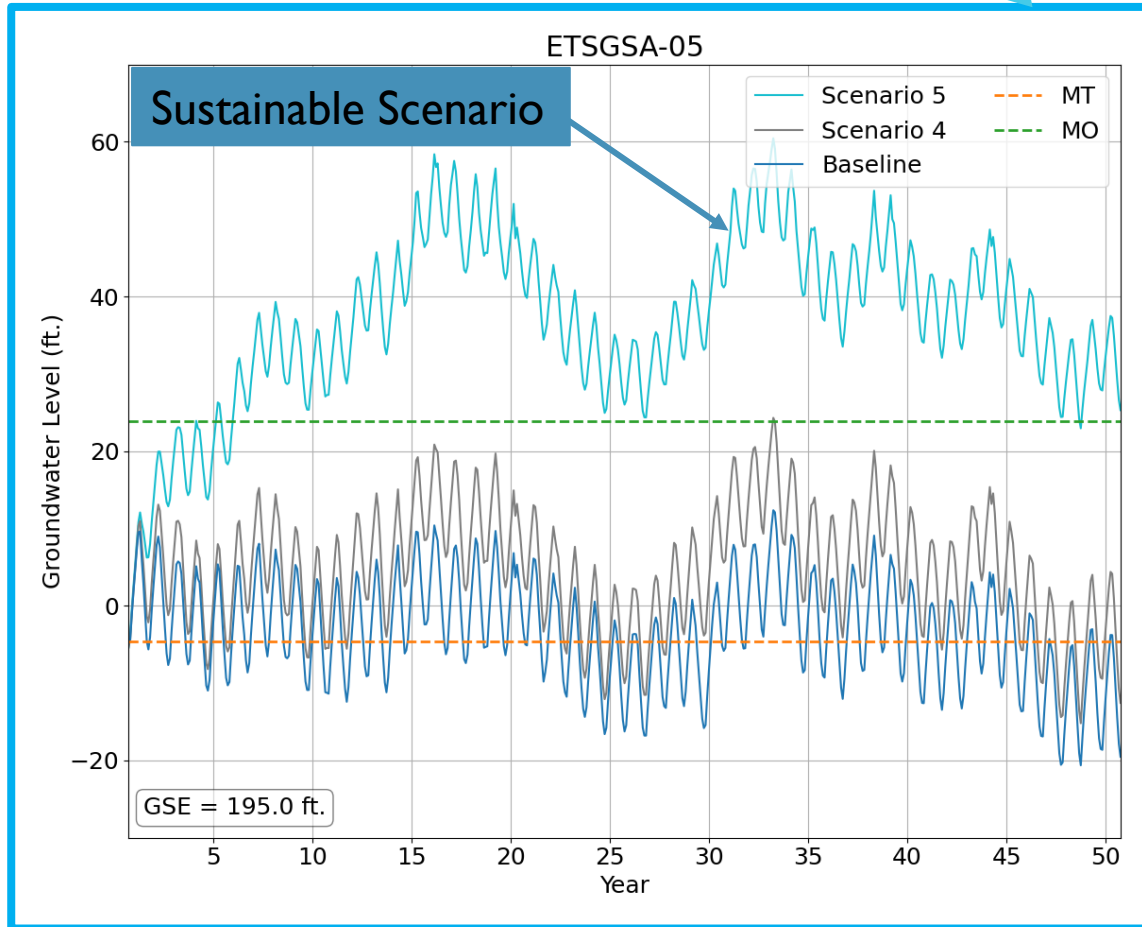
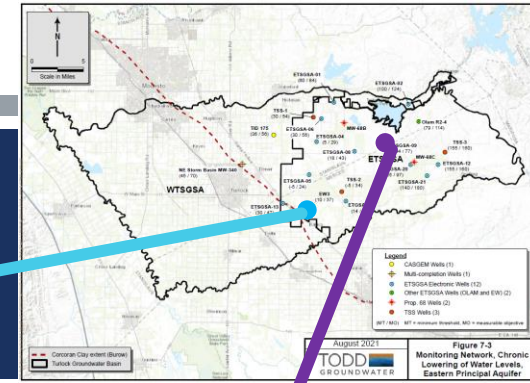
# IMPROVEMENTS IN GROUNDWATER STORAGE



# SMC5- CHRONIC LOWERING OF GW LEVELS

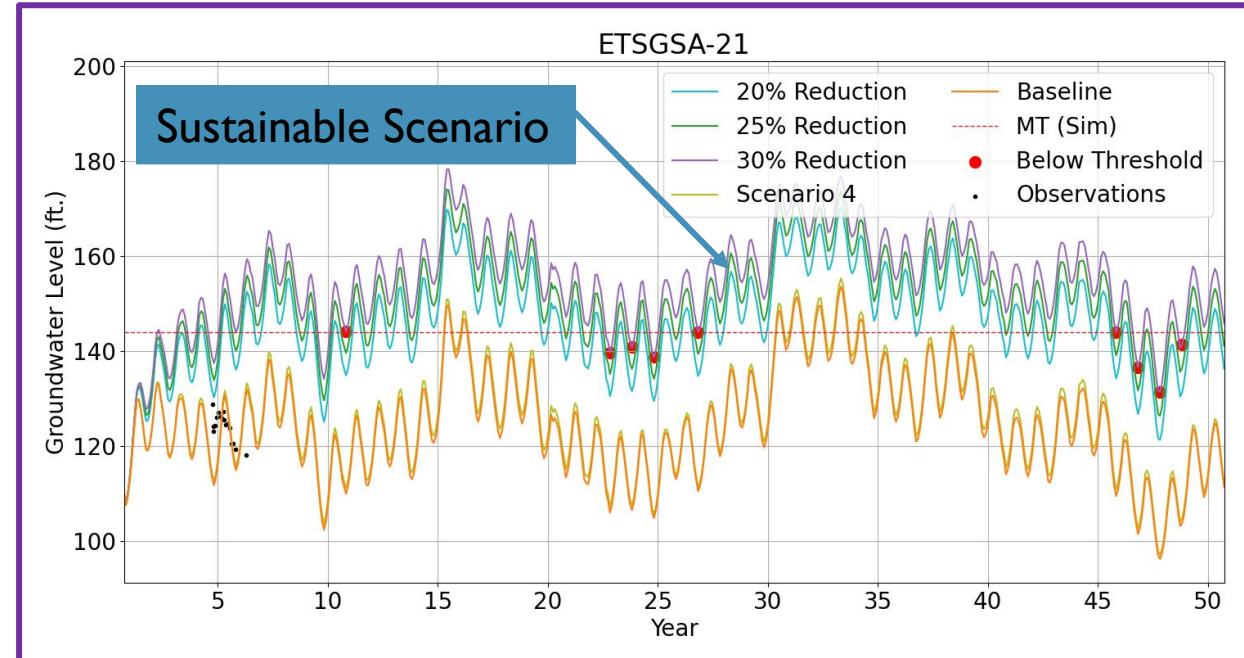
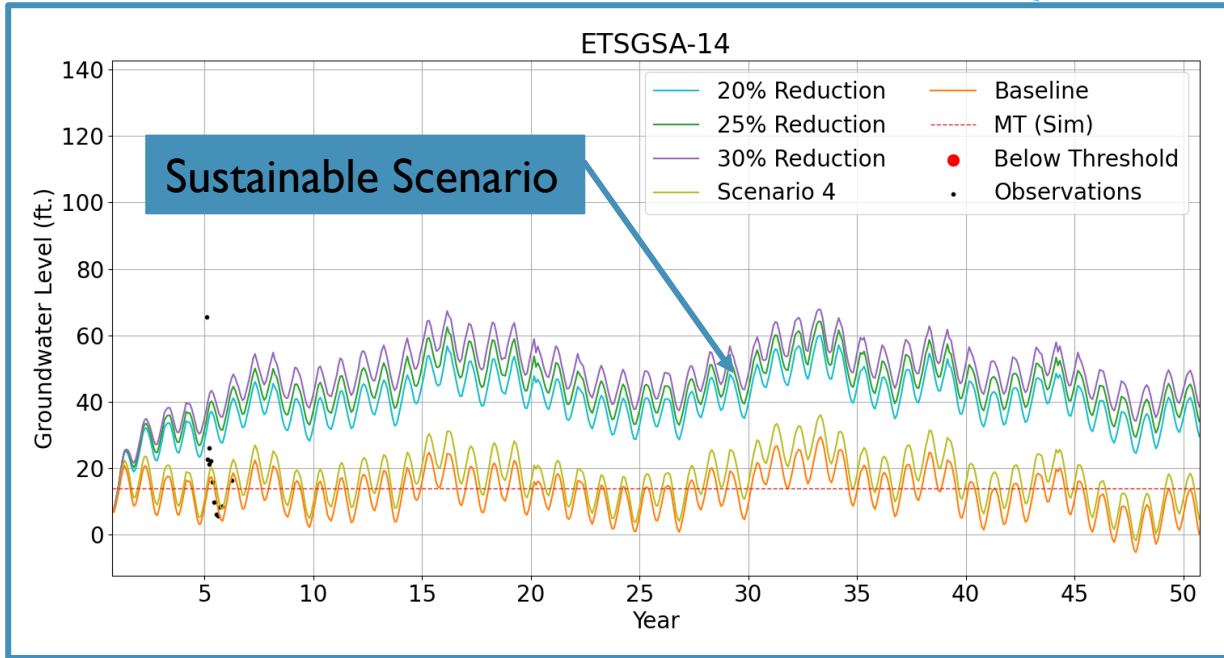
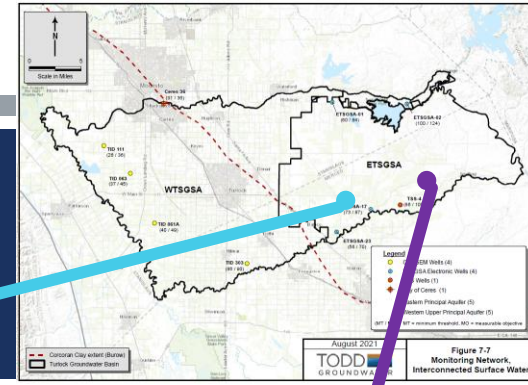


# SMC5- CHRONIC LOWERING OF GW LEVELS





# SMC6: DEPLETIONS OF INTERCONNECTED SURFACE WATER



# RESULTS & DISCUSSION

## ■ Sustainable Management – Modeling Results

- Estimated Sustainable Yield: 311,000 AFY
- Supply-Side Projects (Group 1 and 2): 31,000 AFY
  
- Supply-Side Projects (Group 1 and 2): Est. Net Project Benefit 23,000 AFY
- Sustainable Management: 334,000 AFY

## GSP Implementation – A Path Forward

- **Direction:** C2VSim™ uses the best currently available data to estimate sustainable conditions and support local policy makers.
- **Refinement:** Data gaps will be addressed, and monitoring conducted; which will serve as the basis for the 5-Year GSP update and approach refinement
- **Compliance:** is evaluated through observed data (minimum thresholds)
- **Adaptive Management:** GSP implementation is based on a flexible strategy that adapts to observed conditions

# ADAPTIVE MANAGEMENT

- Implement Initial Projects in Group 1 and 2
- Implement Monitoring Program
- Collect more Data and Information
- Recognize Uncertainties Throughout Planning and Implementation Process
- Perform analysis to re-evaluate the performance and benefits of the projects
- Prepare Annual State of the Basin Reports
- Assess Viability of Group 3 Projects and Initiate Planning and Implementation
- Re-Assess nature, Extent and Timing of Demand Reduction

# MANAGEMENT ACTIONS

Category	Number	Management Action
<b>Demand Reduction Strategies</b>	1	Voluntary Conservation and/or Land Fallowing
	2	Conservation Practices
<b>Pumping Management Framework</b>	3	Groundwater Extraction Reporting Program
	4	Groundwater Allocation and Pumping Management Program
	5	Groundwater Extraction Fee
	6	Groundwater Pumping Credit Market and Trading Program
<b>Domestic Well Mitigation</b>	7	Domestic Well Mitigation Program

# DEMAND REDUCTION STRATEGIES

- To be implemented in conjunction with projects

## Voluntary Conservation and/or Land Fallowing

- Assess options & develop a program to enact strategies in close coordination & collaboration with landowners, e.g.: repurposing of lands growing lower value crops to be:
  - dry farmed
  - fallowed in rotation
  - used for recreation, habitat improvement, groundwater recharge, solar power generation, or other uses.

## Conservation Practices

- Create program to support use of conservation practices in urban and agricultural sectors
- May evaluate UWMPs and AWMPs or expand to other areas
- Careful consideration to be given to issues surrounding deep percolation/seepage, unintended consequences for consumptive use, and other potential pitfalls.

# PUMPING MANAGEMENT FRAMEWORK

- Four Management Actions implemented in an adaptive manner; not all may be needed or implemented by each GSA

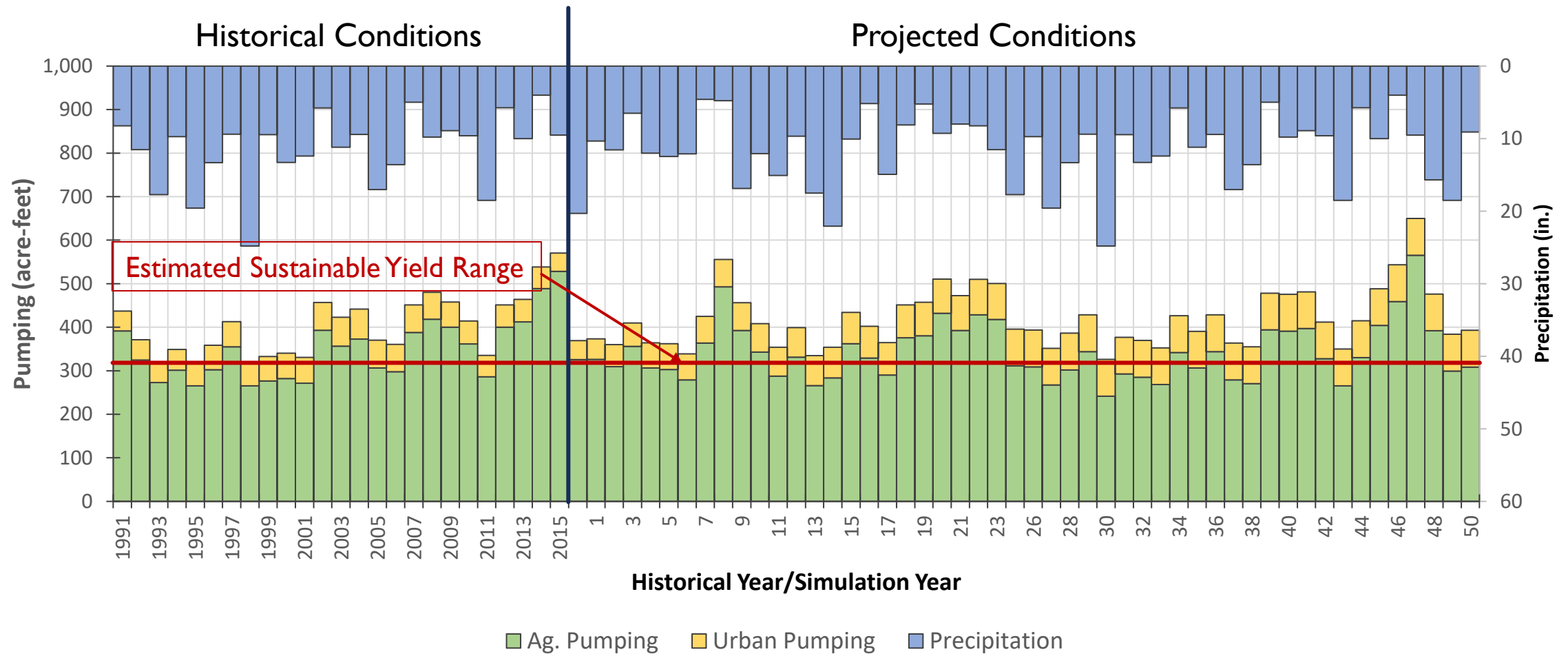
Groundwater Extraction Reporting Program

Groundwater Allocation and Pumping Management Program

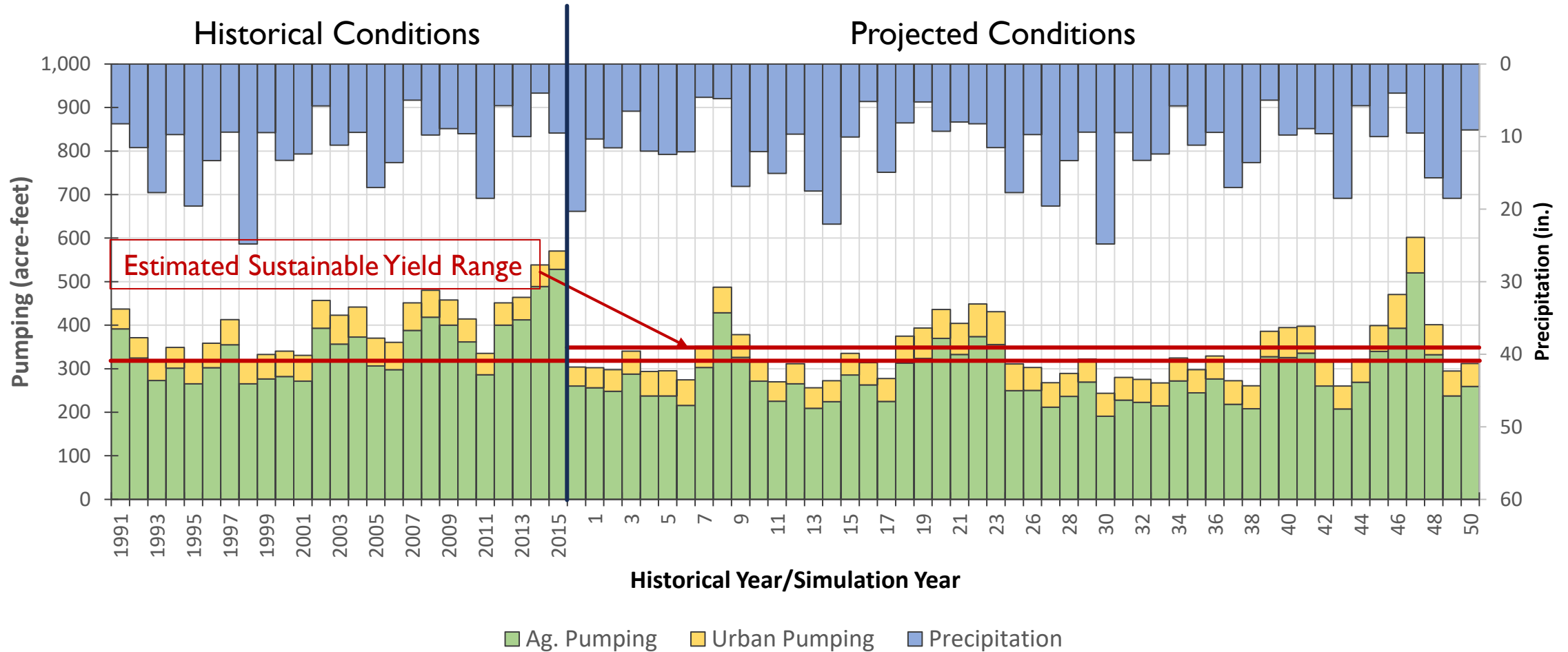
Groundwater  
Extraction Fee Program

Groundwater Pumping  
Credit Market and  
Trading Program

# GROUNDWATER PUMPING AND SUSTAINABLE YIELD



# GROUNDWATER PUMPING WITH PROJECTS AND MANAGEMENT ACTIONS





# DOMESTIC WELL MITIGATION PROGRAM

## Anticipated steps:

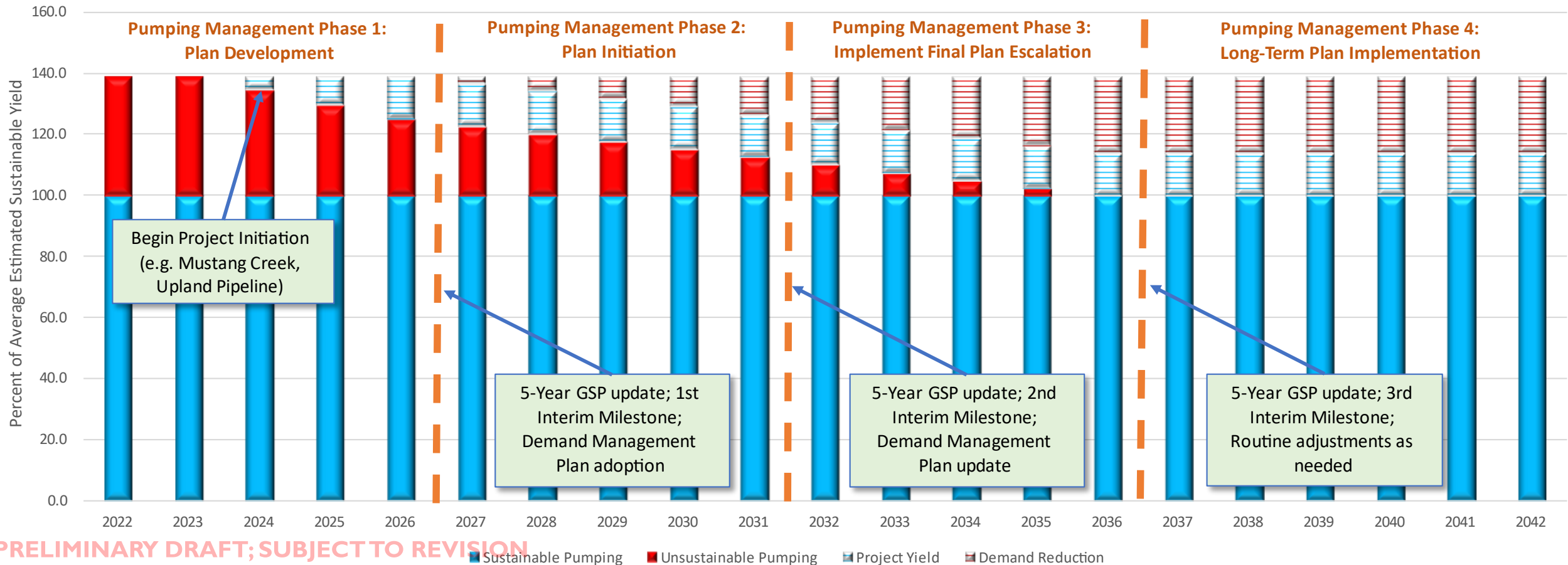
- Coordinate with existing programs
- Assess the need for a Well Registration Program for domestic wells
- Share information between local drinking water programs and well drillers on anticipated water levels
- Monitor areas of domestic well information gaps
- Target GSP projects in areas of potentially vulnerable wells
- Develop a 3-tiered Corrective Action Plan for potential domestic well mitigation

# MORE ON ADAPTIVE MANAGEMENT

- Uncertainty will always be present; use monitoring of groundwater conditions to determine additional actions needed; combination of:
  - Group 3 Projects
  - Pumping Management Framework
  - Demand Reduction Strategies
- Adaptive Management Strategy Concepts on Next Slides

# ADAPTIVE MANAGEMENT W/GROUP 1 & 2 PROJECTS

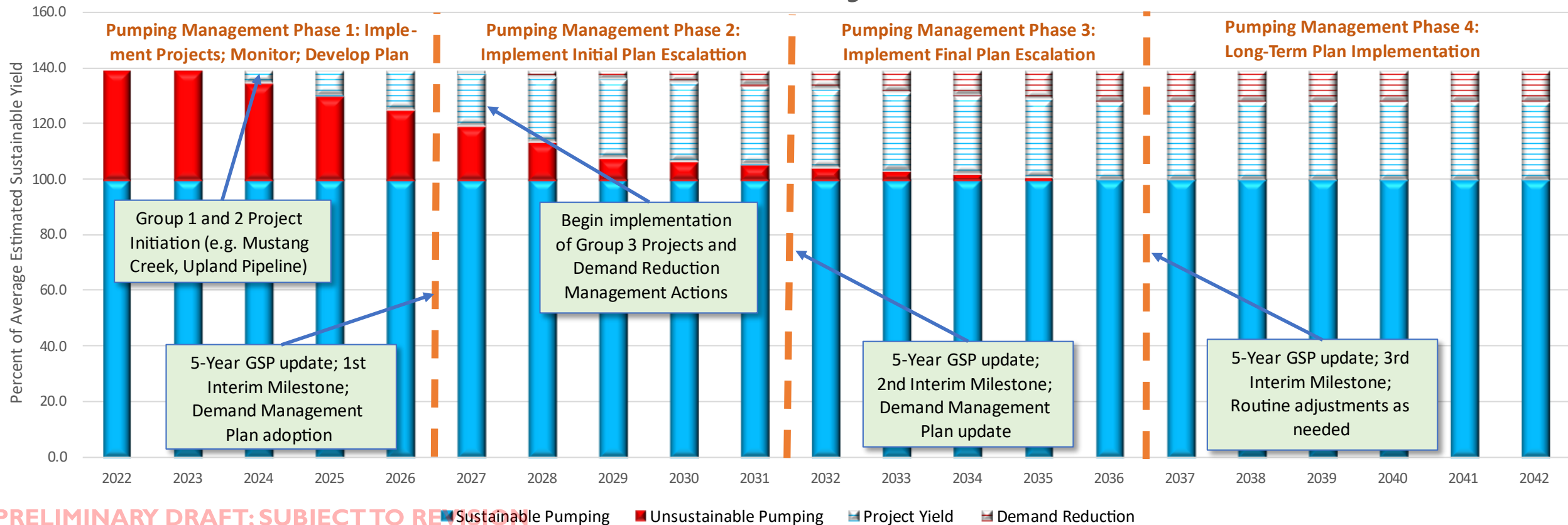
*Adaptive Management with Implementation of Group 1 and 2 Projects*



**PRELIMINARY DRAFT; SUBJECT TO REVISION**

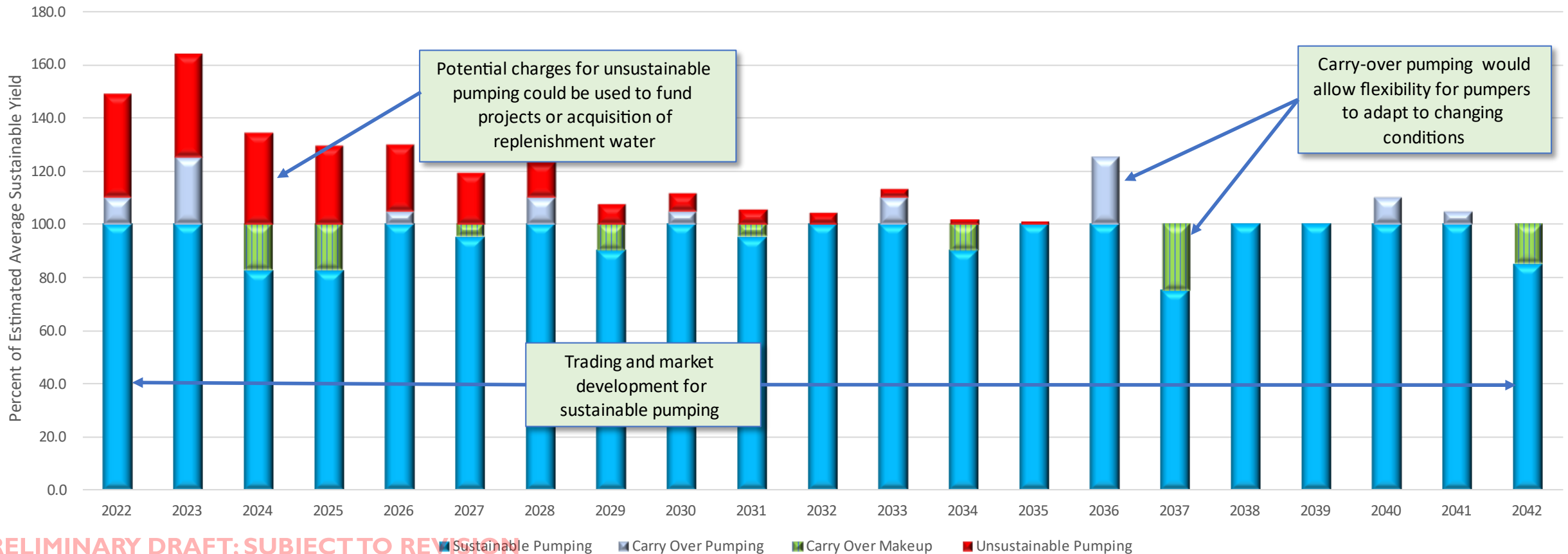
# ADAPTIVE MANAGEMENT W/GROUP 1, 2, & 3 PROJECTS

*Adaptive Management with Implementation of Group 1, 2 and 3 Projects and Demand Reduction Management Actions*



# ADAPTIVE MANAGEMENT W/CARRY-OVER PUMPING, ALLOCATION TRADING, MARKETS AND FEES

*Carry-Over Pumping; Allocation Trading, Markets and Fees*



# IMPLEMENTATION SUPPORT ACTIVITIES (ISA)

- Activities and actions in support of implementing GSP between 2022-2042, focusing on first 5 years

#	Implementation Support Activity
1	Monitoring, Reporting, and Outreach
2	Addressing Identified Data Gaps Including Updating and Improving the Existing Monitoring Network
3	Accounting Mechanism for Water Supplies within the Subbasin
4	Implement Project and Management Actions including an Adaptive Management Approach
5	Develop Action Plan for Exceedance of Minimum Thresholds Which May Result in Undesirable Results
6	Refine Groundwater Model Incorporating New Data and Studies
7	Further Develop Data Management System
8	Improve Coordination and Planning Integration
9	Well Registration and Management
10	Develop Financing Strategies, Including Seeking Grant Funding

# QUESTIONS?

