



# TURLOCK SUBBASIN GSP

REVIEW OF  
CHAPTER 8 – PROJECTS AND MANAGEMENT ACTIONS AND  
CHAPTER 9 – IMPLEMENTATION AND SUPPORT ACTIVITIES)

JOINT MEETING OF THE WTSGSA AND ETSGSA  
NOVEMBER 15, 2021



# OUTLINE

- **Sustainable Yield**
- **Chapter 8: Projects and Management Actions**
- **Chapter 9: Implementation & Support Activities**

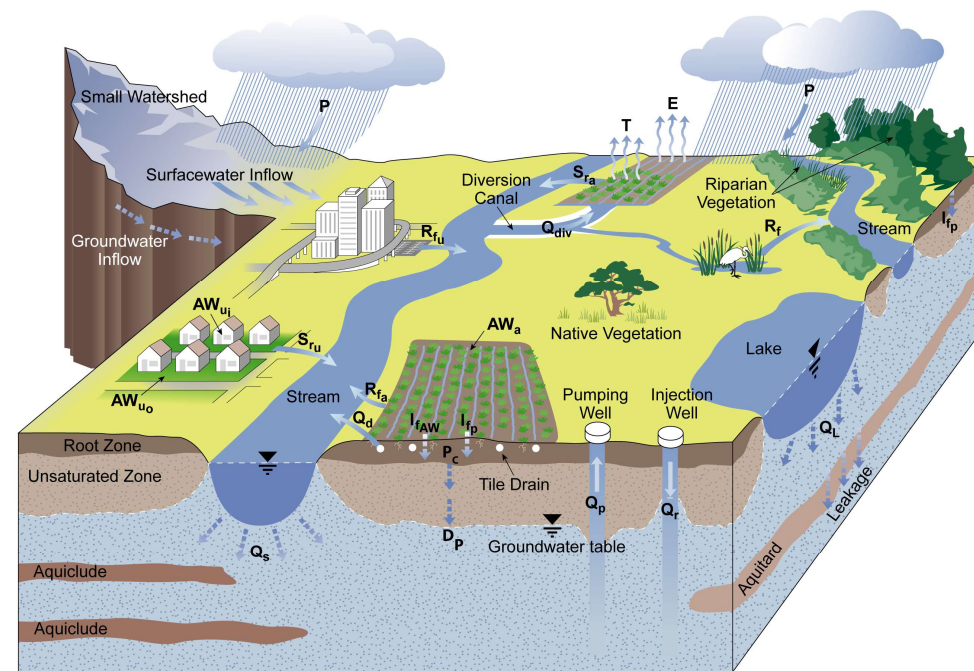
***Recommended Actions by the West & East Turlock Subbasin GSAs:***

***Motion:*** Authorizing the release of Chapter 8 of the draft Groundwater Sustainability Plan for public review and comment

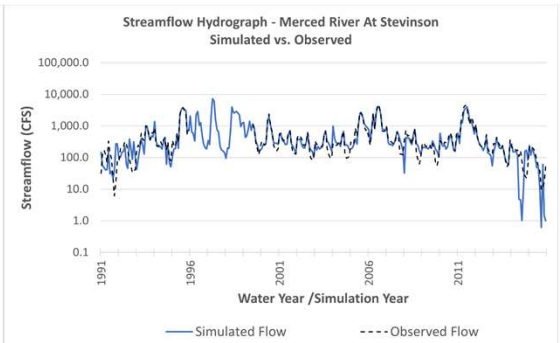
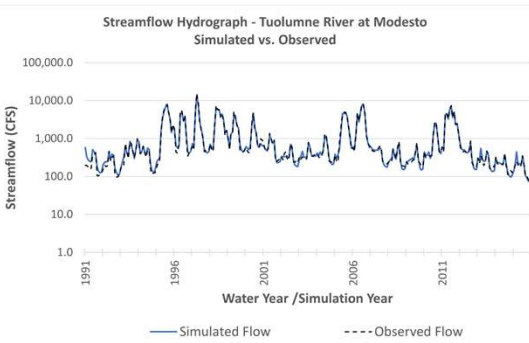
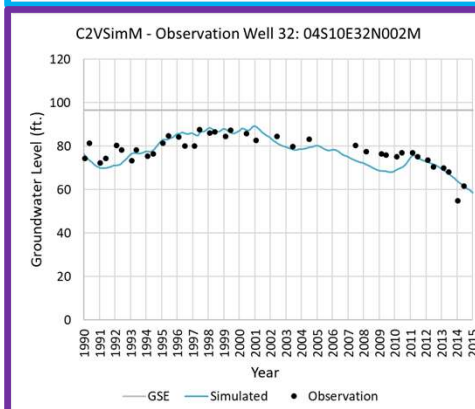
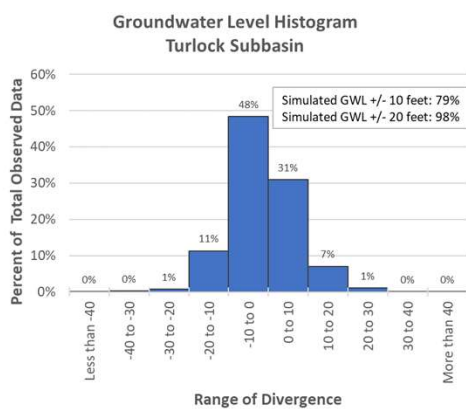
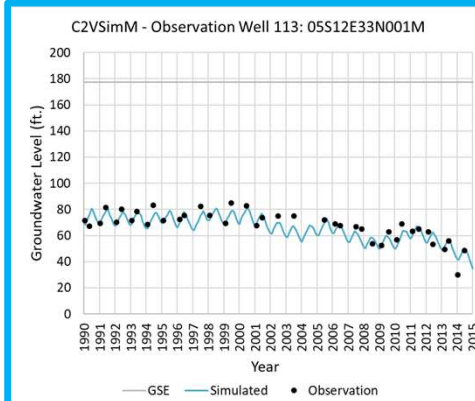
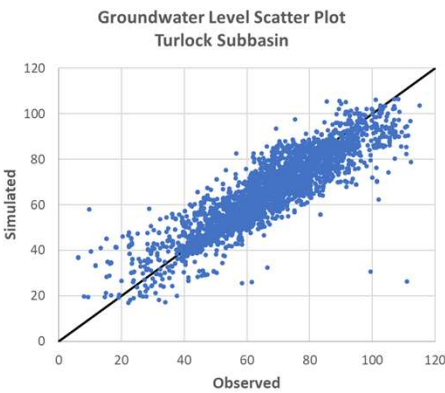
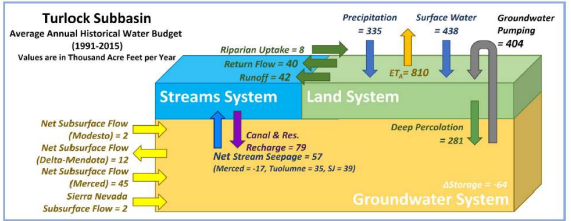
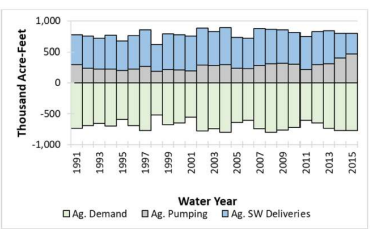
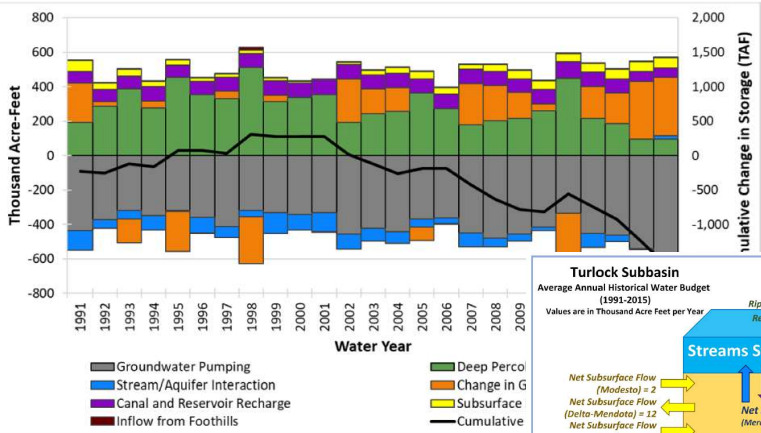
***Motion:*** Authorizing the release of Chapter 9 of the draft Groundwater Sustainability Plan for public review and comment

# APPLICATION OF MODELS FOR SUSTAINABILITY ANALYSIS

- Models provide a representation of physical system based on:
  - Data (Incl. Hydrologic, Hydrogeologic, Land use, Water supply, Operations)
  - Mathematical formulations and calibration to observed data



# MODEL WAS CALIBRATED IN AN OPEN AND TRANSPARENT ENVIRONMENT



# APPLICATION OF MODELS FOR SUSTAINABILITY ANALYSIS

- **Models Provide a Representation of Physical System Based on:**
  - **Best Available Data** (Incl. Hydrologic, Hydrogeologic, Land use, Water supply, Operations)
  - Mathematical formulations and calibration to observed data
  - Basin-wide and GSA level conditions
  - GW Levels, GW flow conditions, and interaction between the GW and river
- **Model has:**
  - Been calibrated to the historical records
  - Limitations and uncertainties which will improve over time
  - Reasonable predictions of changes in GW levels as a results of projects and actions over time, and NOT absolute GW levels

# 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

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# TURLOCK SUBBASIN ESTIMATED SUSTAINABLE YIELD

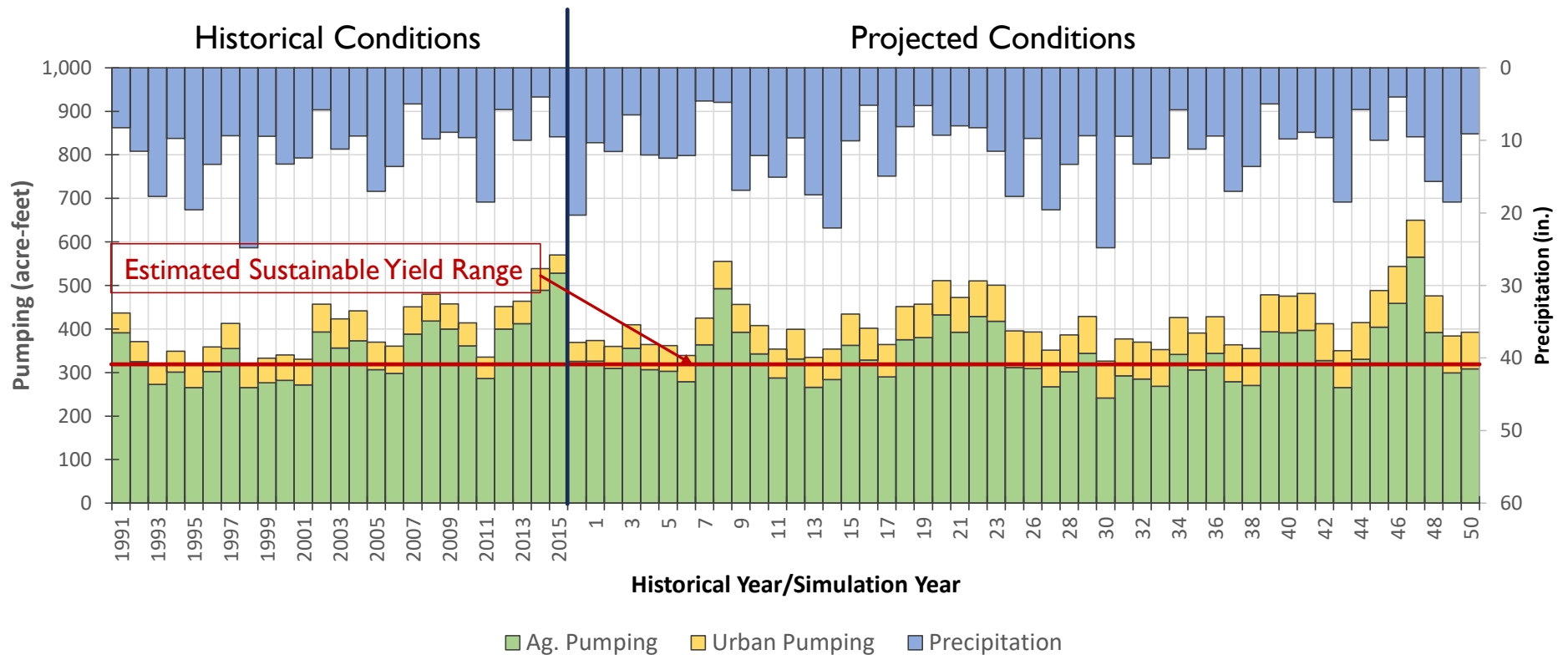
Sustainable Yield = 311,000 AFY\*

\* Based on current data, information, and knowledge of the Subbasin



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# GROUNDWATER PUMPING AND SUSTAINABLE YIELD



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# TURLOCK GSP CHAPTER 8: PROJECTS AND MANAGEMENT ACTIONS

# 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.

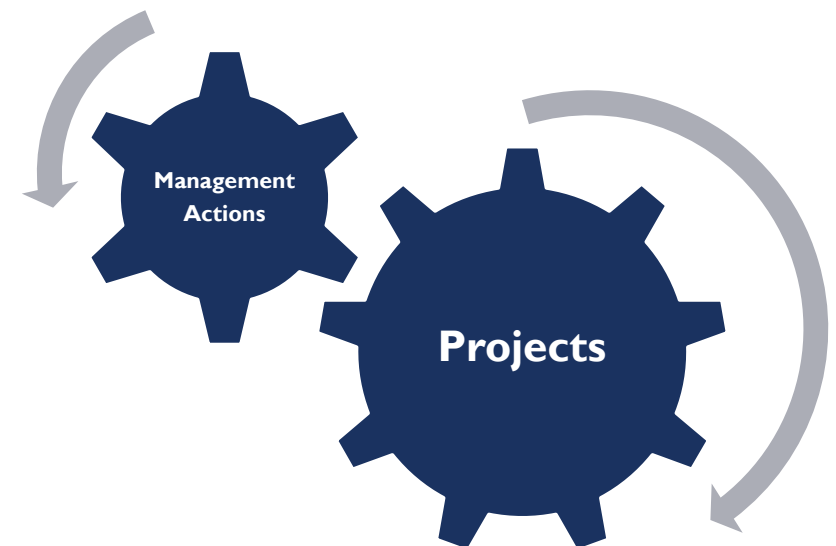
### **Projects:**

Physically constructed (structural) features

### **Management Actions:**

Non-structural programs or policies

PMAs are designed to incentivize programs and actions resulting in Subbasin sustainability



# REGULATORY REQUIREMENTS FOR EACH PROJECT

Plan must include description of PMAs that GSAs have determined will achieve sustainability goal for the basin  
*GSP Regulation 354.44 (a)*

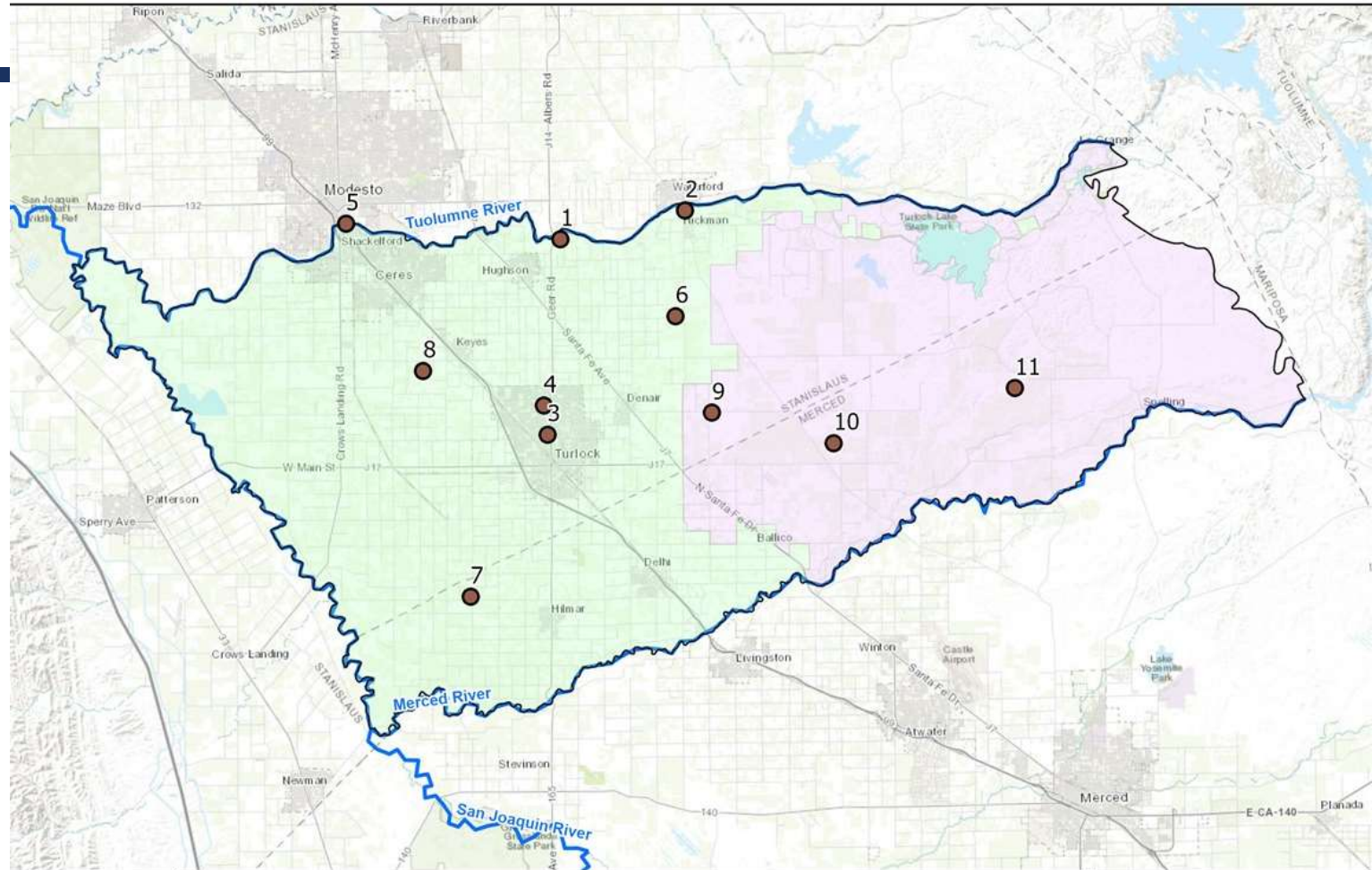


# GROUP 1 & 2 PROJECTS – IN PLACE/CURRENTLY PLANNED

#	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 Pipeline Project

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# GROUP 1 & 2 PROJECTS



## Group 1 & 2 Projects by Number

### Legend

- Rivers
- Turlock Subbasin
- East Turlock GSA
- West Turlock GSA
- Projects (Groups 1 & 2)

### No. 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)

### No. Name

- 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 Pipeline Project



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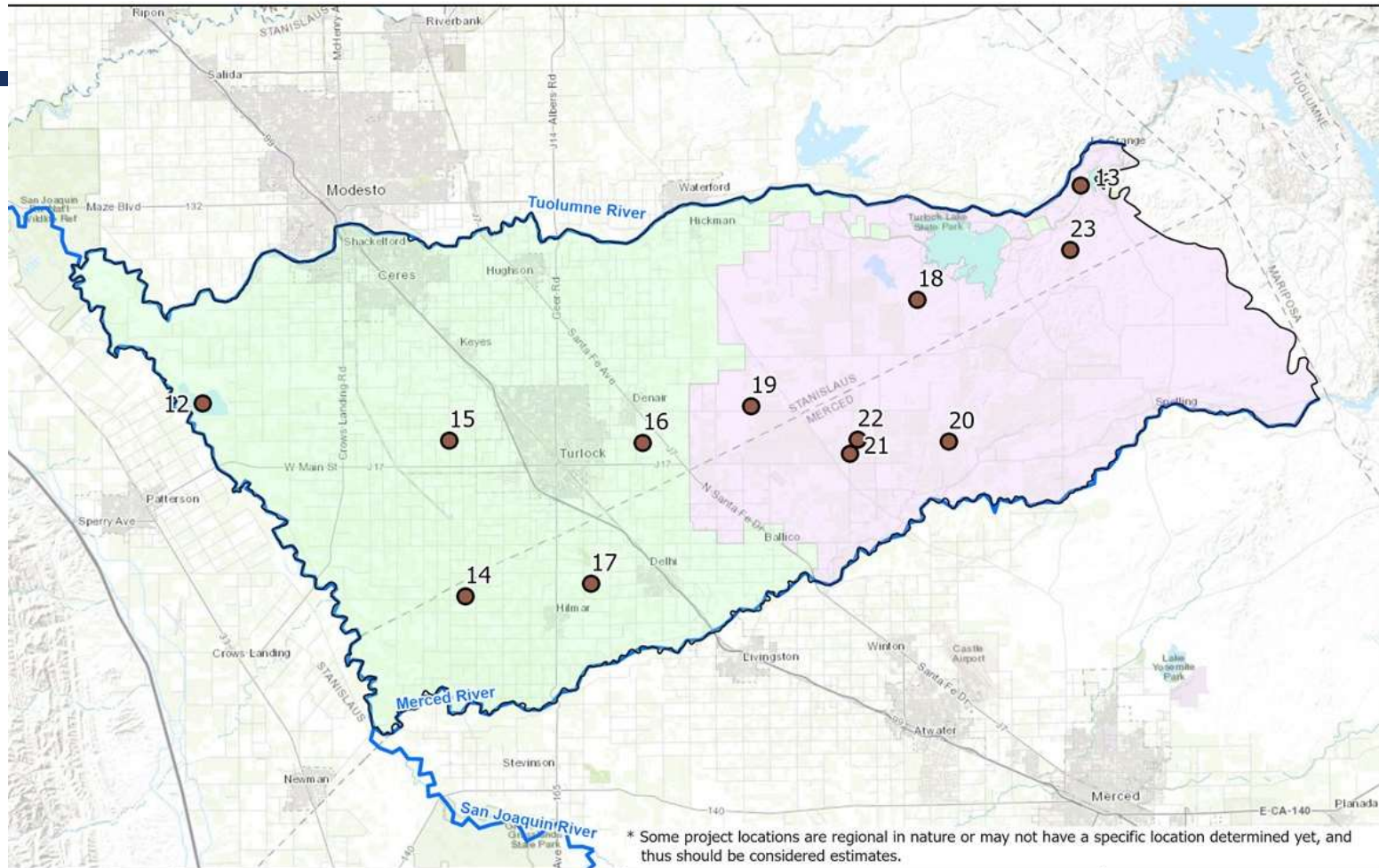
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# GROUP 3 PROJECTS – IMPLEMENTED AS NEEDED

#	Project Name
12	San Joaquin River Flood Diversions
13	La Grange Recharge Project (Within TID Irrigation Service Area)
14	TID Lateral 5 ½ Regulating Reservoir
15	Additional TID Regulating Reservoirs
16	Recharge from TID Conveyance System
17	Intertie Projects
18	Rouse Lake Pipeline Project
19	Sand Creek Watershed Runoff Recharge
20	Merced ID Expansion Project
21	Development of Diffused Stormwater Project
22	Dry Creek Watershed Recharge
23	Direct Recharge in Agriculture Areas

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# GROUP 3 PROJECTS



\* Some project locations are regional in nature or may not have a specific location determined yet, and thus should be considered estimates.

## Group 3 Projects by Number

### Legend

- Rivers
- Turlock Subbasin
- East Turlock GSA
- West Turlock GSA
- Projects (Group 3)\*

- | No. | Name  |
|-----|---|
| 12  | San Joaquin River Flood Diversions                              |
| 13  | La Grange Recharge Project (Within TID Irrigation Service Area) |
| 14  | TID Lateral 5 1/2 Regulating Reservoir                          |
| 15  | Additional TID Regulating Reservoirs                            |
| 16  | Recharge from TID Conveyance System                             |
| 17  | Intertie Projects   |

- | No. | Name                                       |
|-----|--|
| 18  | Rouse Lake Pipeline Project                |
| 19  | Sand Creek Watershed Runoff Recharge       |
| 20  | Merced ID Expansion Project                |
| 21  | Development of Diffused Stormwater Project |
| 22  | Dry Creek Watershed Recharge               |
| 23  | Direct Recharge in Agriculture Areas       |

0 3 Miles

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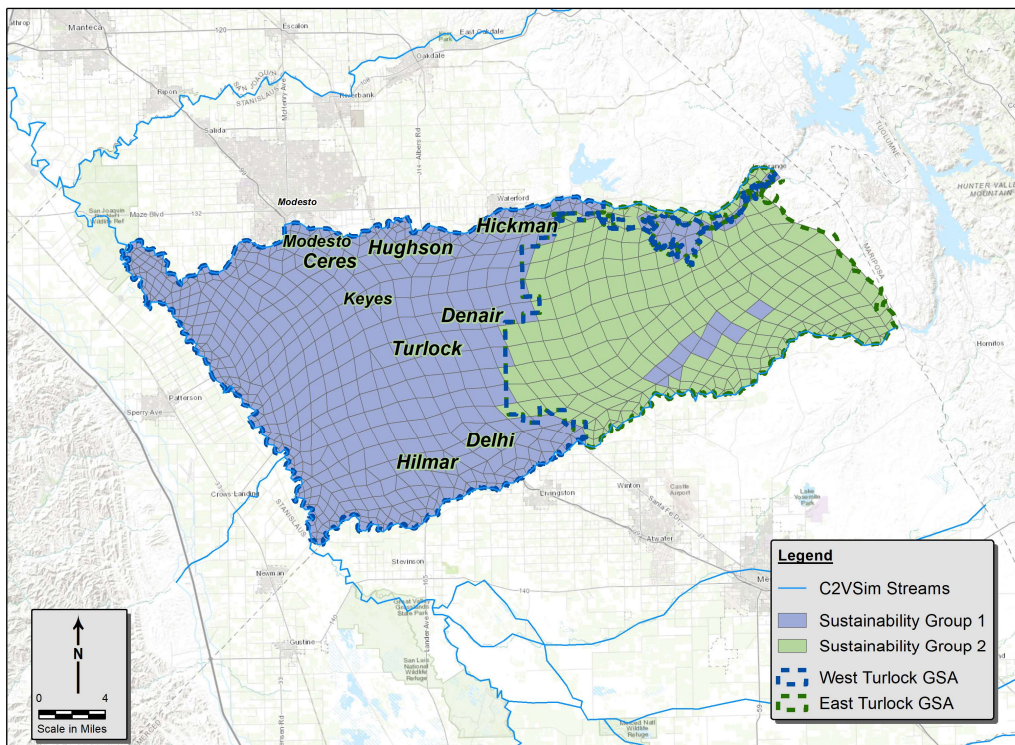
# MODELING SCENARIOS

- **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 (WTSGSA)		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
<b>WTSGSA – Agricultural Projects</b>						
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
<b>ETSGSA – Agricultural Projects</b>						
9	Agricultural Recharge Project (in ETSGSA)			X	X	X
10	Mustang Creek Flood Control Recharge Project			X	X	X
11	Upland Pipeline Project			X	X	X
<b>WTSGSA- and/or ETSGSA (as needed) – Demand Management Actions</b>						
12	Net Demand Reduction					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

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# SUSTAINABLE MANAGEMENT CRITERIA



## REDUCTION OF GROUNDWATER STORAGE

Long-term annual change in GW Storage to be zero



## DECLINING GROUNDWATER LEVELS

Minimum Thresholds set at 2015 GWL period more than 3 consecutive years



## LAND SUBSIDENCE

Use GW Levels as proxy to ensure no significant impacts on land subsidence



## SURFACE WATER DEPLETIONS

### **Minimum Thresholds for:**

Merced River: [Spring-2014](#)

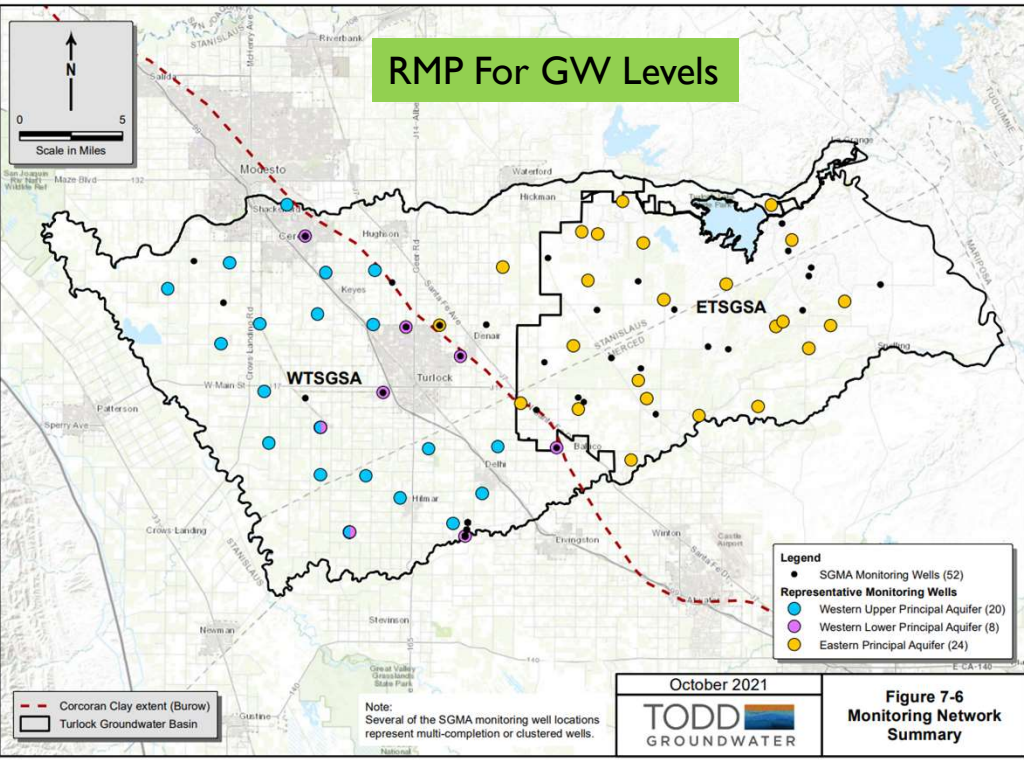
San Joaquin River: [Fall-2015](#)

Tuolumne River: [Fall-2015](#)

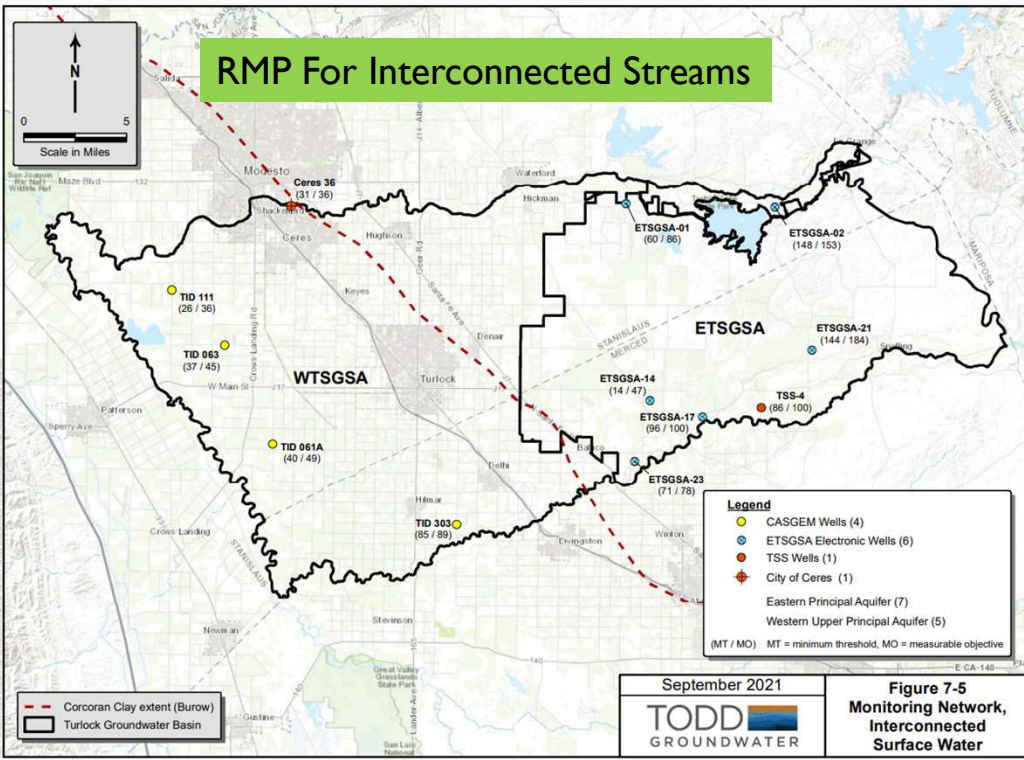
Compliance measured by two consecutive annual monitoring events

# REPRESENTATIVE MONITORING NETWORK

RMP For GW Levels



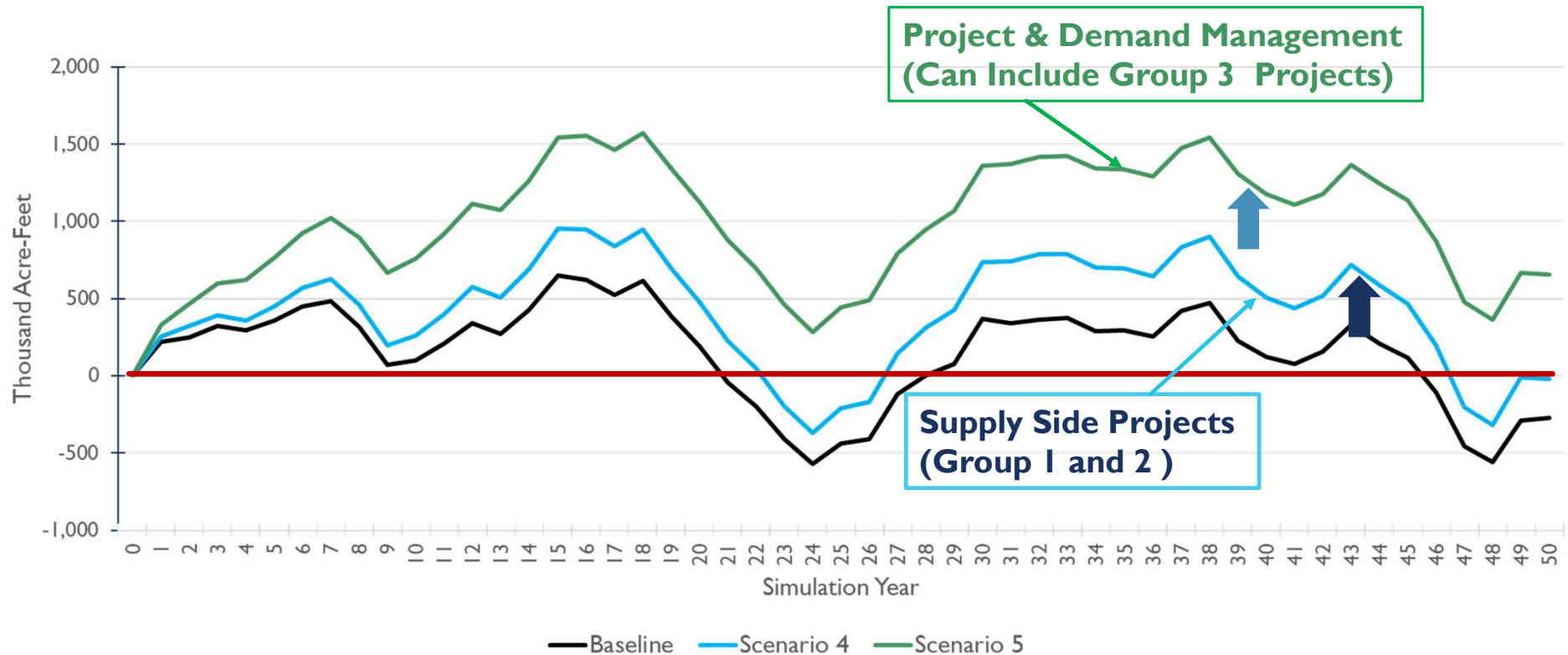
RMP For Interconnected Streams



# GROUNDWATER STORAGE SMC



REDUCTION OF  
GROUNDWATER  
STORAGE

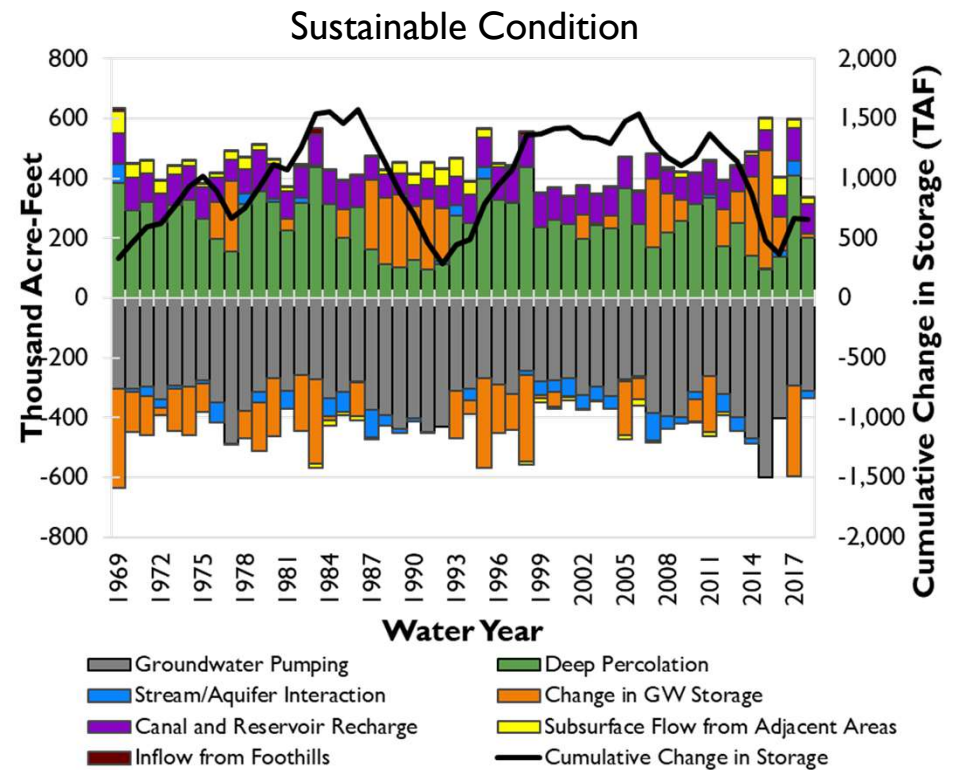
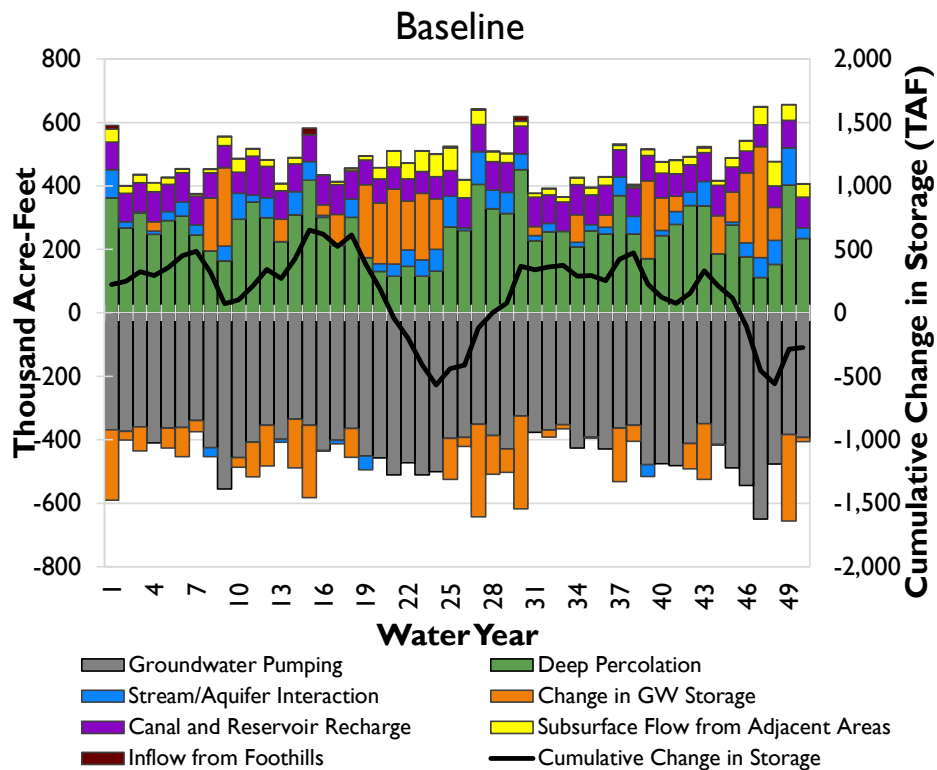


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# GROUNDWATER STORAGE SMC



REDUCTION OF  
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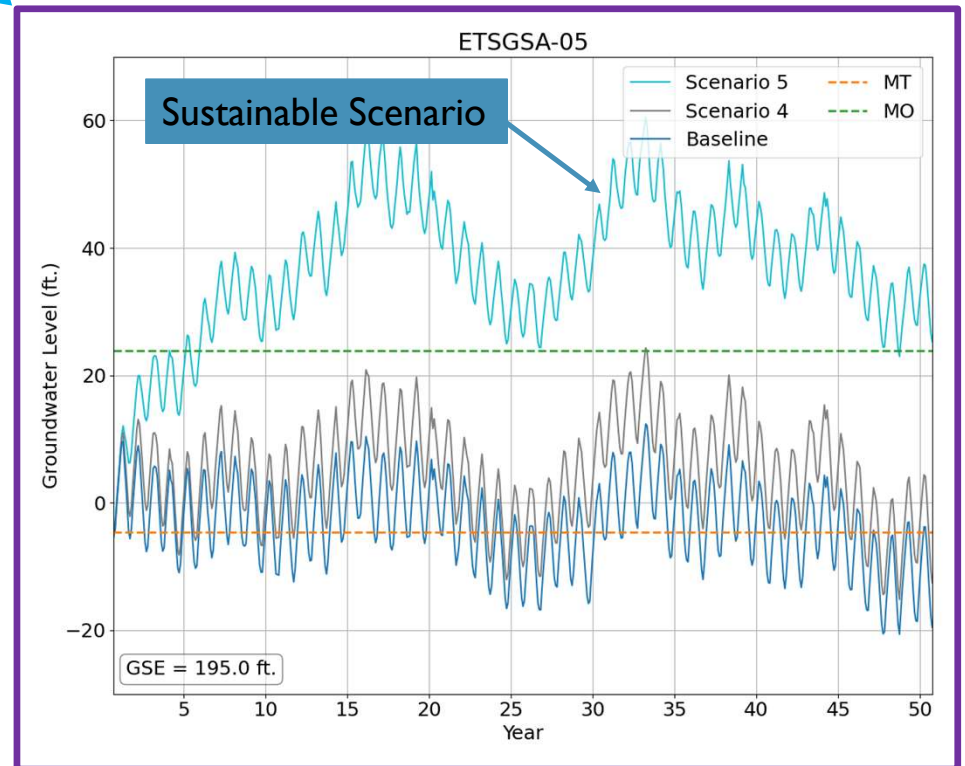
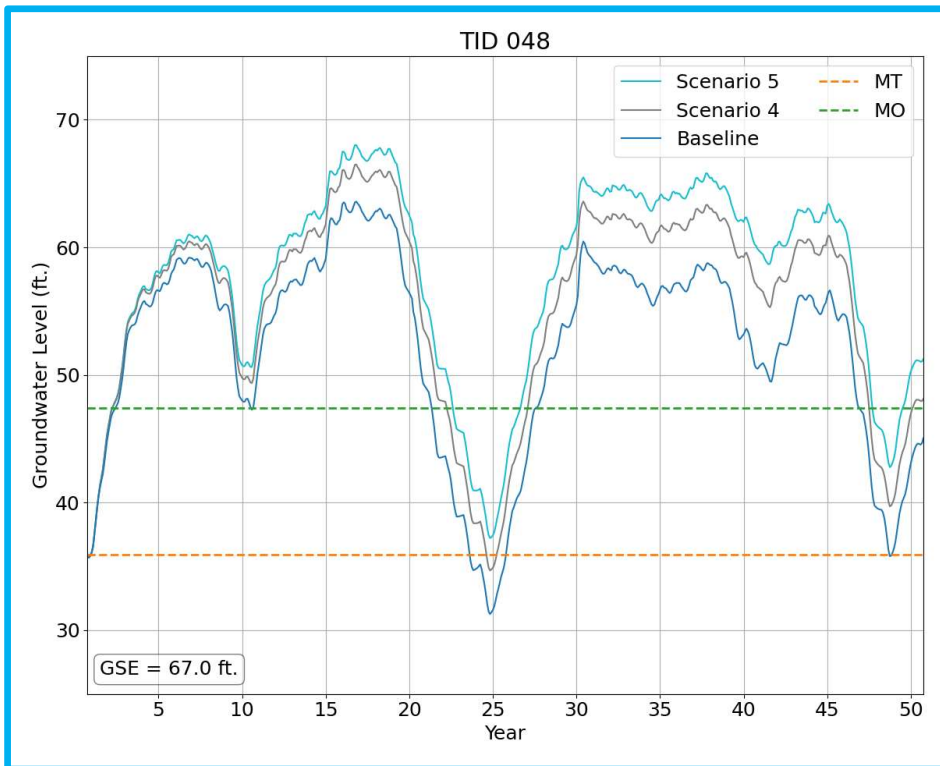
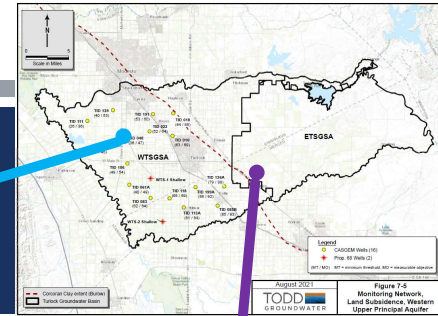


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# DECLINING GW LEVELS



DECLINING  
GROUNDWATER  
LEVELS

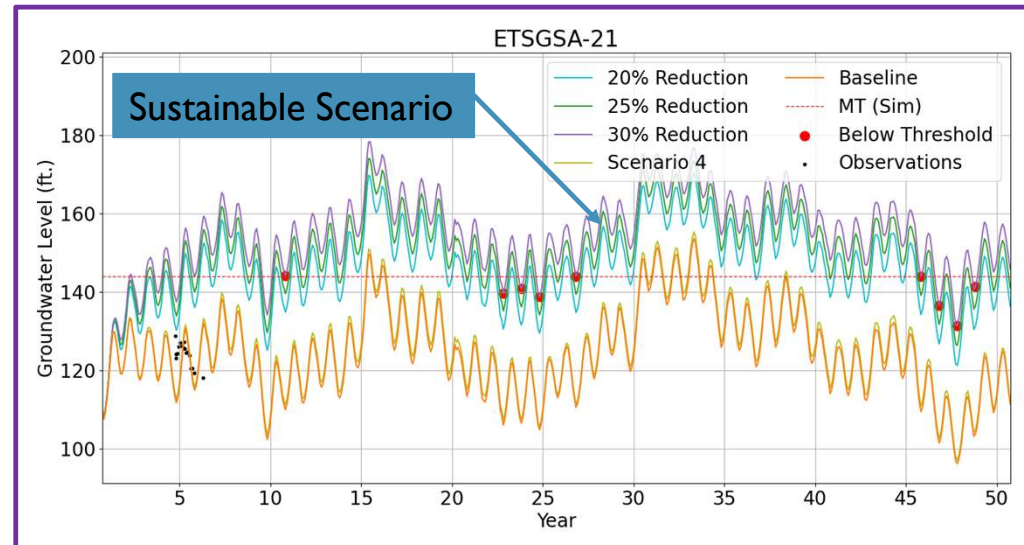
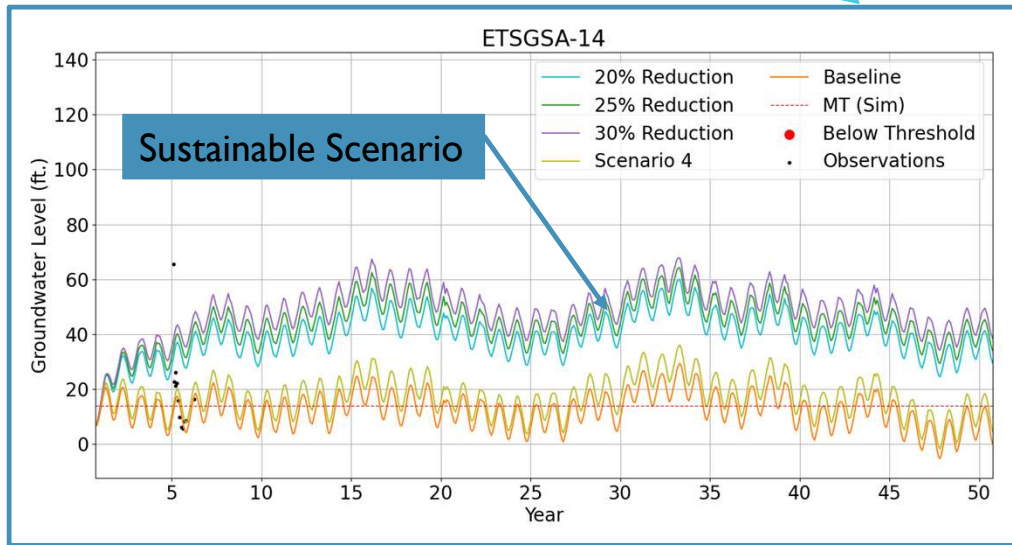
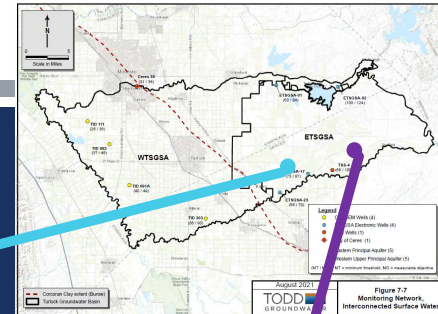


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# INTERCONNECTED SURFACE WATER DEPLETIONS SMC



**SURFACE WATER DEPLETIONS**



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# SUSTAINABLE MANAGEMENT STRATEGY

## FINDINGS

- Group 1 & 2 Projects have Significant Benefits
- Additional Projects and/or Demand Management is Needed to Meet Sustainability Goals
- Approximately 25% Reduction in Net GW Demand is Needed
- Net GW Demand Reduction can be Partially be Offset by Additional Projects



# GSP IMPLEMENTATION: ADAPTIVE MANAGEMENT PATH FORWARD

- **Sustainable Management Criteria:** Established estimated SY based on latest data, information, and knowledge of the GW Subbasin
- **Analysis Tool:** C2VSim™ uses the best currently available data to estimate sustainable conditions and support local GW management policies
- **Refinement:** Uncertainties exist; data gaps will be addressed, and monitoring to be conducted; which will serve as the basis for the 5-Year GSP update and refinement approach
- **Compliance:** is evaluated through observed data (MT and MO)
- **Adaptive Management:** GSP implementation is based on a flexible strategy that adapts to observed conditions

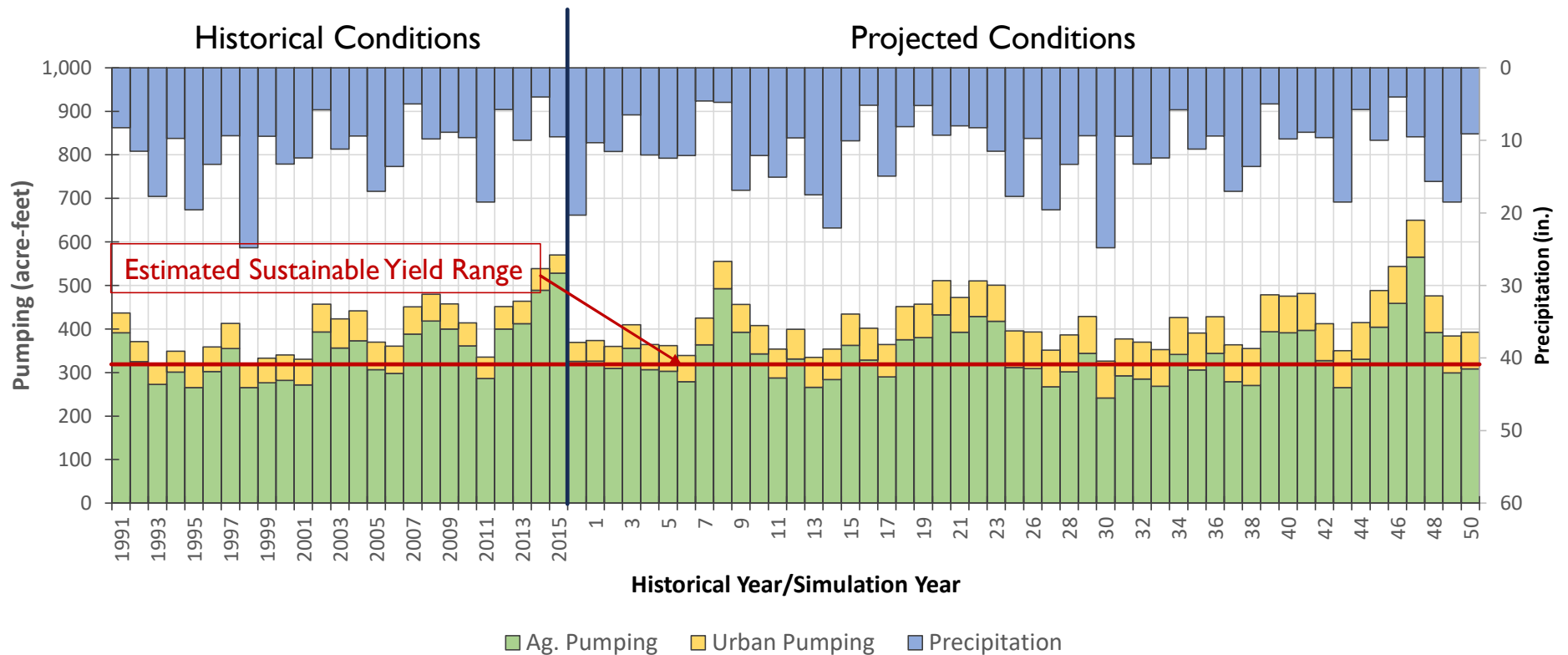
# ADAPTIVE MANAGEMENT

- 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

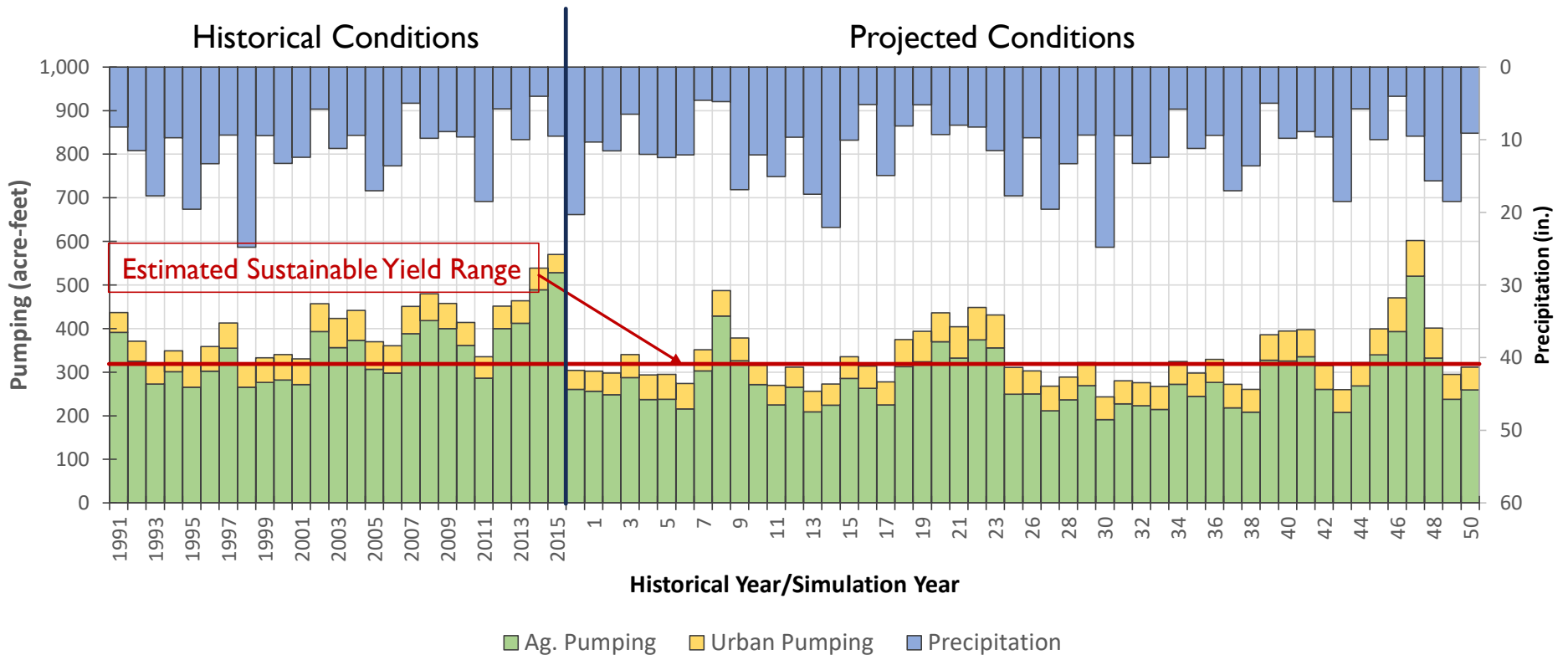
Category	Number	Management Action
<b>Demand Reduction Strategies</b>	1	Voluntary Conservation and/or Land Fallowing
	2	Conservation Practices
<b>Pumping Management Framework</b>	3	Groundwater Extraction Reporting Program
	4	Groundwater Allocation and Pumping Management Program
	5	Groundwater Extraction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

# GROUNDWATER PUMPING AND SUSTAINABLE YIELD



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# GROUNDWATER PUMPING WITH PROJECTS AND MANAGEMENT ACTIONS



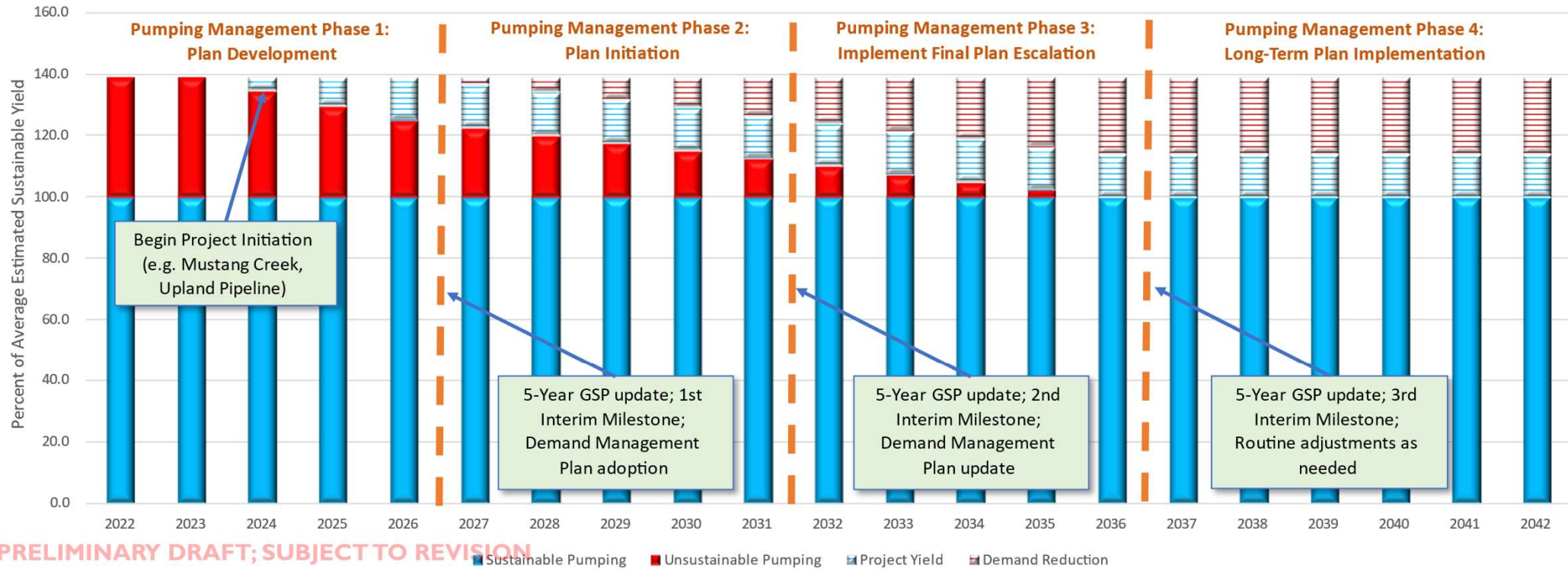
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# MORE ON ADAPTIVE MANAGEMENT

- 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*

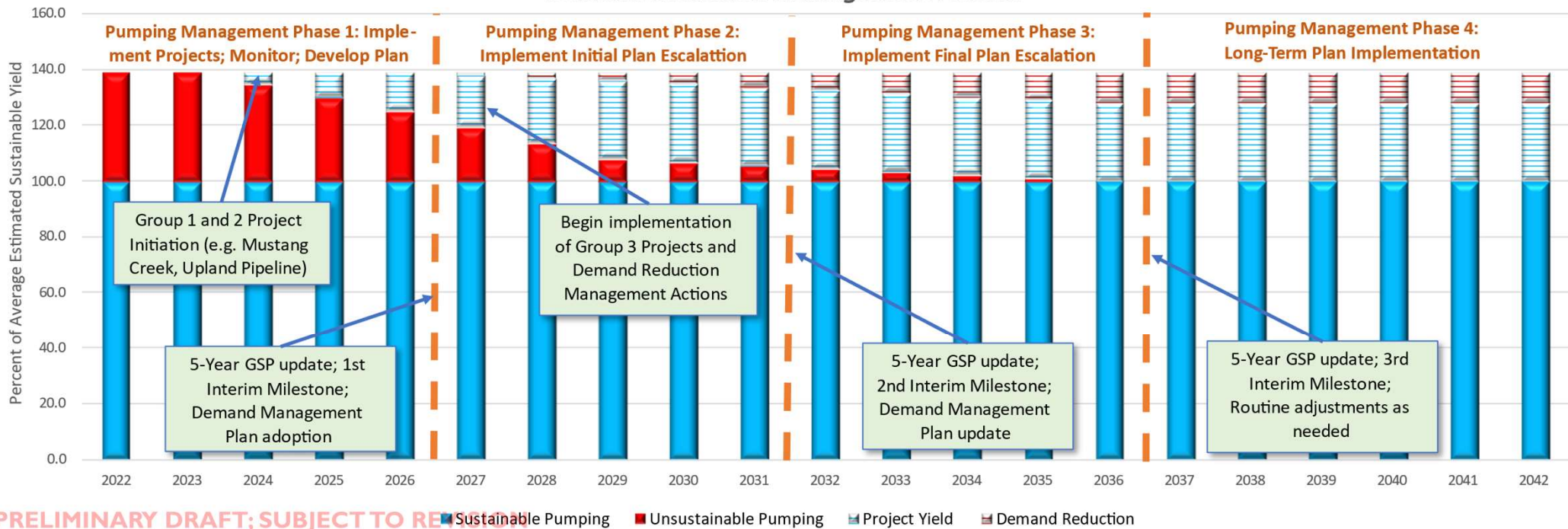


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■ Sustainable Pumping ■ Unsustainable Pumping ■ Project Yield ■ Demand Reduction

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

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



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# TURLOCK GSP CHAPTER 9: IMPLEMENTATION SUPPORT ACTIVITIES

# 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
11	Updating Opti to Include GSP Projects

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# ***RECOMMENDED ACTIONS BY EACH GSA***

- ***Chapter 8: Projects and Management Actions***
- ***Motion:*** Authorizing the release of Chapter 8 of the draft Groundwater Sustainability
  
- ***Chapter 9: Implementation and Support Activities***
- ***Motion:*** Authorizing the release of Chapter 9 of the draft Groundwater Sustainability

# DISCUSSION

