GSP Coordinating Committee

Coordinating Committee Meeting – September 24, 2018

Image courtesy: Veronica Adrover/UC Merced

Merced Irrigation-Urban GSA
Merced Subbasin GSA
Turner Island Water District GSA-1

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Agenda

1. Call to Order
2. Approval of Minutes for August 27, 2018
3. Stakeholder Committee Update
4. Presentation by Woodard & Curran on GSP Development
   a) Minimum Thresholds
   b) Projected Water Budget and Sustainable Yield
   c) Projects and Management Actions

Image courtesy: Veronica Adrover/UC Merced

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Agenda

5. CASGEM Update
6. Public Outreach Update
7. Coordination with Neighboring Basins
8. Public Comment
9. Next Steps and Adjourn

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Approval of Minutes

Image courtesy: Veronica Adrover/UC Merced

Stakeholder Committee Update

Image courtesy: Veronica Adrover/UC Merced

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Minimum Thresholds

Image courtesy: Veronica Adrover/UC Merced

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GSP Development

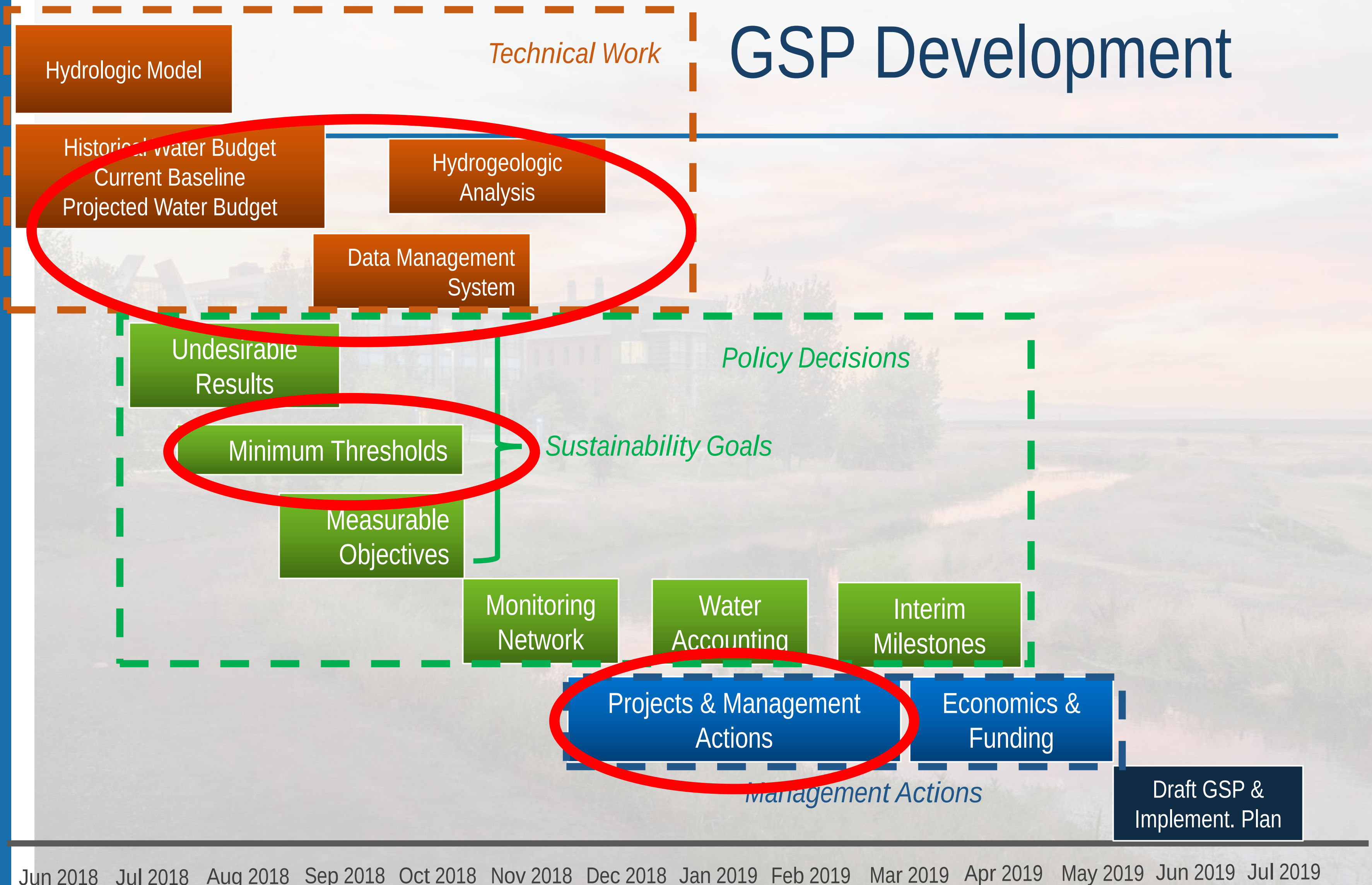

Image courtesy: Veronica Adrover/UC Merced

Minimum Thresholds will be Developed for Four of the Six Sustainability Indicators

- Chronic Lowering of Groundwater Levels
- ~~Reduction in Groundwater Storage~~
- ~~Seawater Intrusion~~
- Degraded Water Quality
- Land Subsidence
- Depletion of Interconnected Surface Water

Image courtesy: Veronica Adrover/UC Merced

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Developing Minimum Thresholds is an Iterative Process

- Water Budgets *(available water estimates and usage)* influence what kinds of Projects and Management Actions are needed (*actions needed to manage usage and reach sustainability)*
- Projects and Management Actions *(actions we take)* will in turn impact the Water Budget *(available water).* Projects and actions reflect stakeholder input *(what is important for the Subbasin?)*
- Depending on what projects and management actions are implemented and when, groundwater elevations may change *(thresholds and measurable objectives)*
- Additional information feeds into understanding the goals we want to achieve with projects and actions including what are our undesirable results, minimum thresholds and measurable objectives

Minimum Thresholds – Updated Approach

- Added 18 monitoring wells for threshold analysis
- Merced County domestic wells database
  - Active wells
  - Omits wells that do not meet County annular seal requirement
  - Filtered for other outliers
- Minimum threshold is defined as the shallowest of either
  - Historical low groundwater elevation at the monitoring well, minus a buffer (range of min & max GWLs from 2008-2018) – this assumes that over the next 20 years, GWE will decline at approximately half the max rate seen over the past 10 years
  - UNLESS this would dewater the **shallowest** nearby domestic well – in this case, threshold was increased to protect nearby wells

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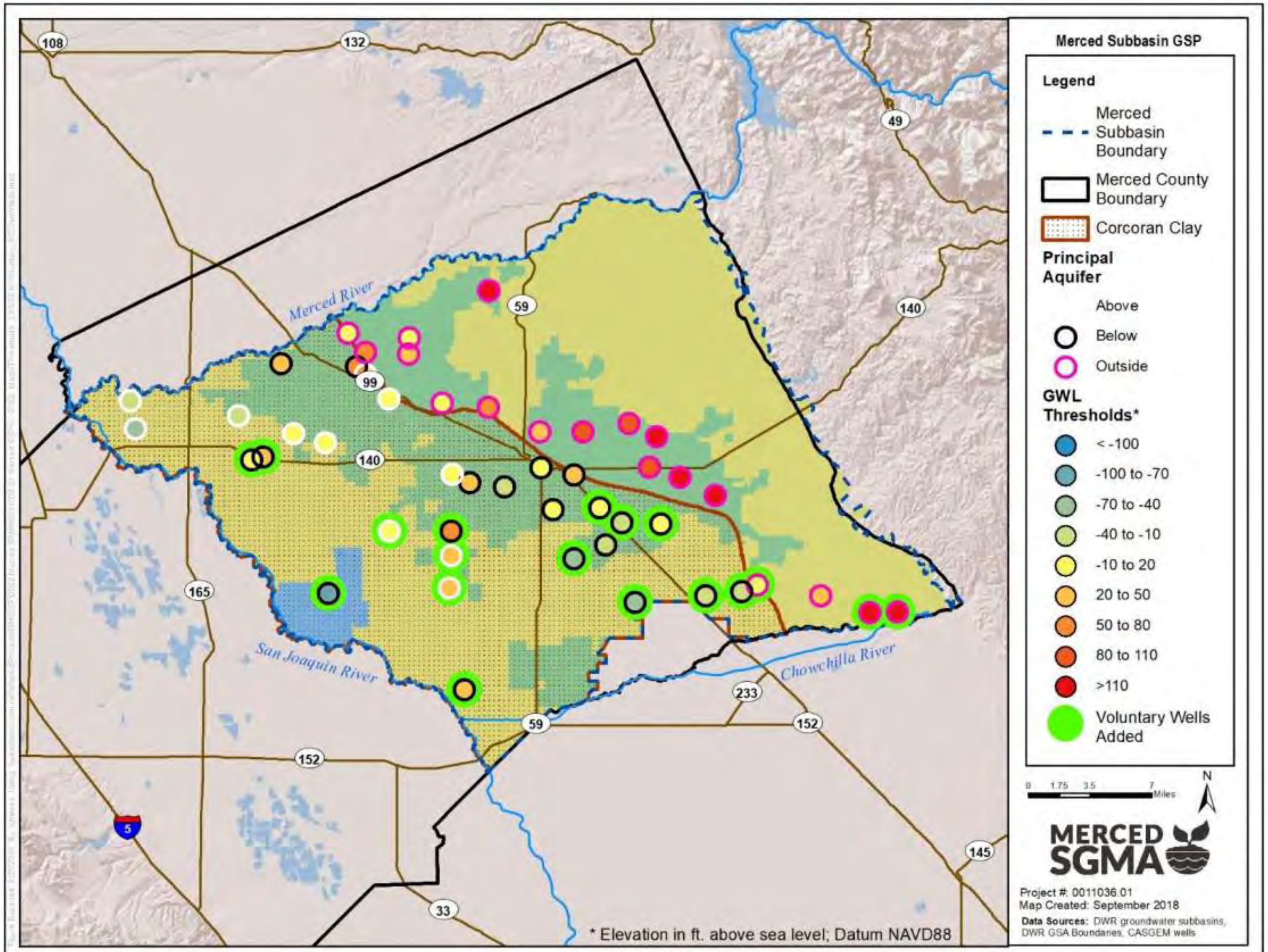
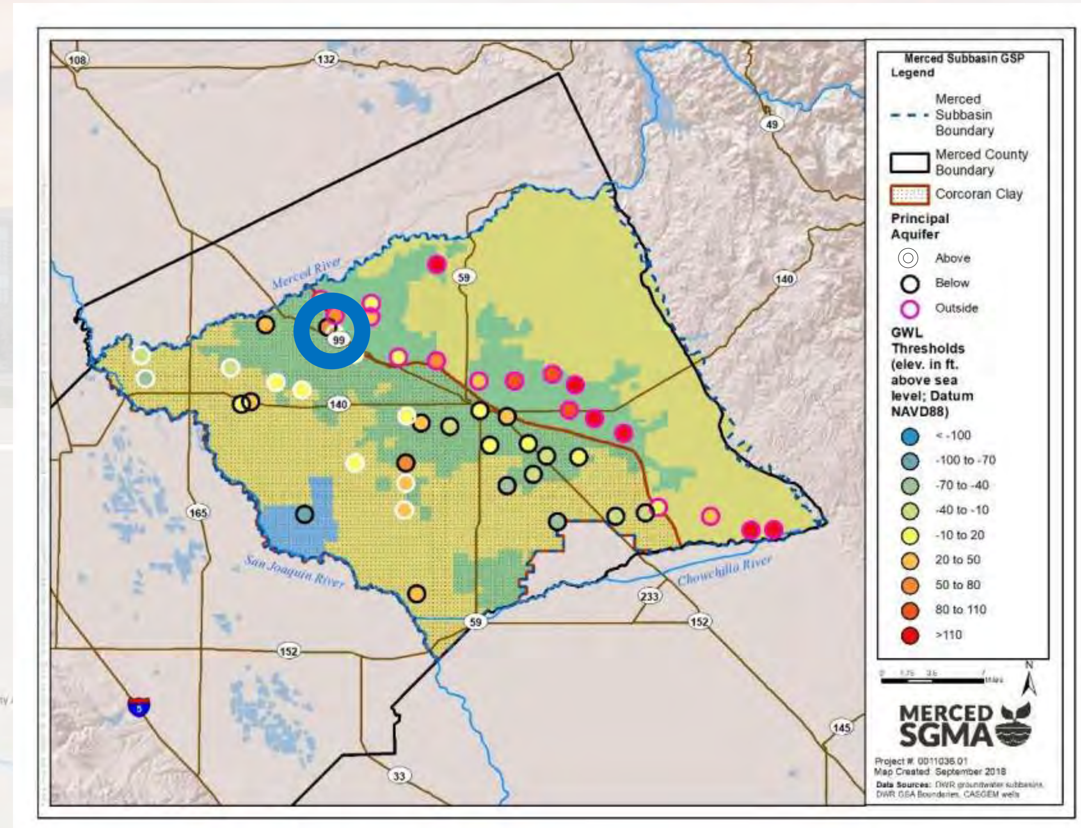
Voluntary Wells Added



Minimum Thresholds Example: Well 31916



Minimum Thresholds Example: Well 31916

Example:

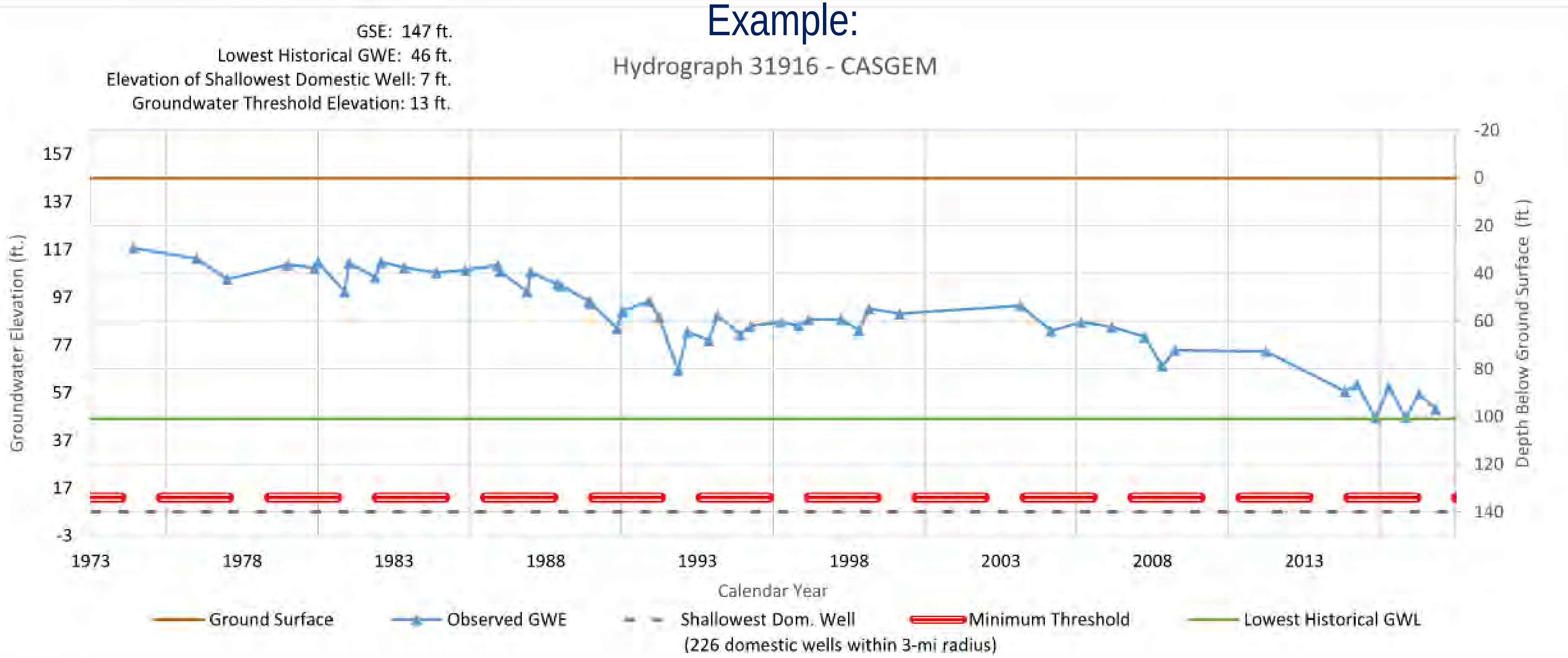


Image courtesy: Veronica Adrover/UC Merced

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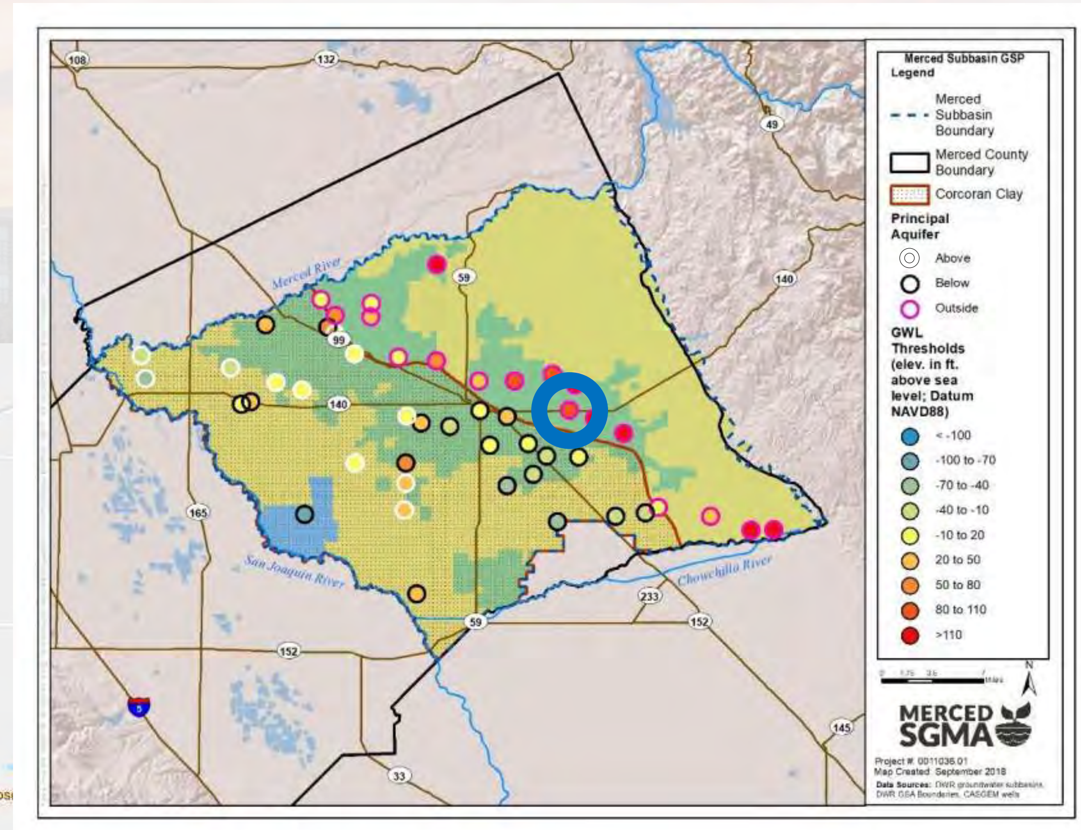
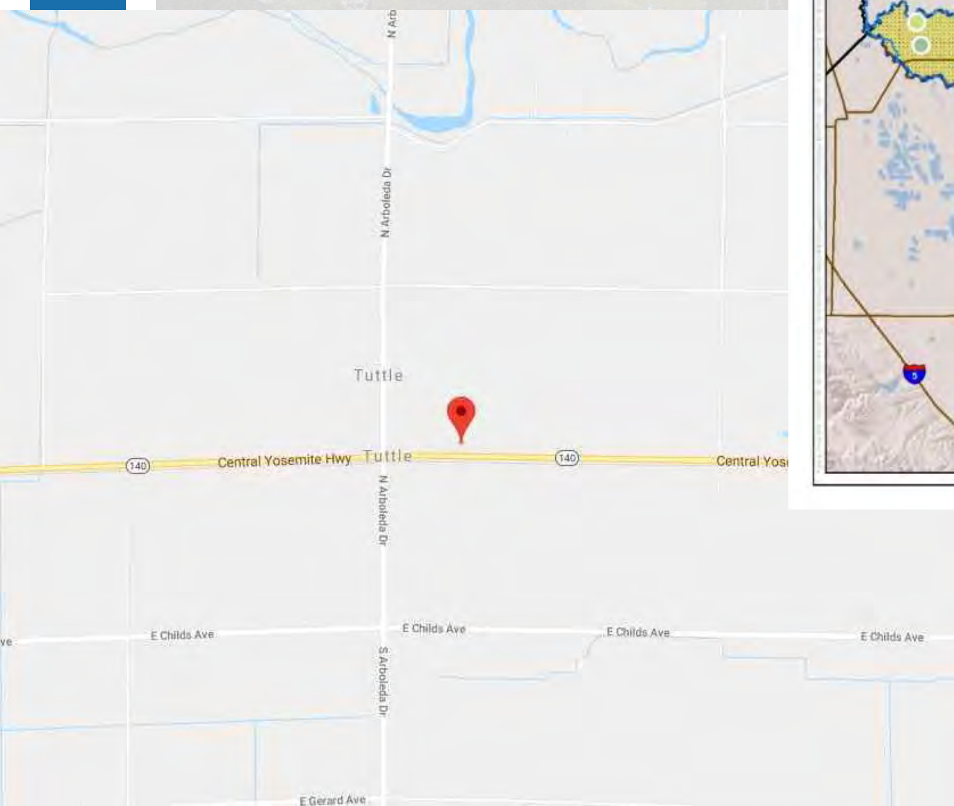
Minimum Thresholds Example: Well 31742





Minimum Thresholds Example: Well 31742

Example:

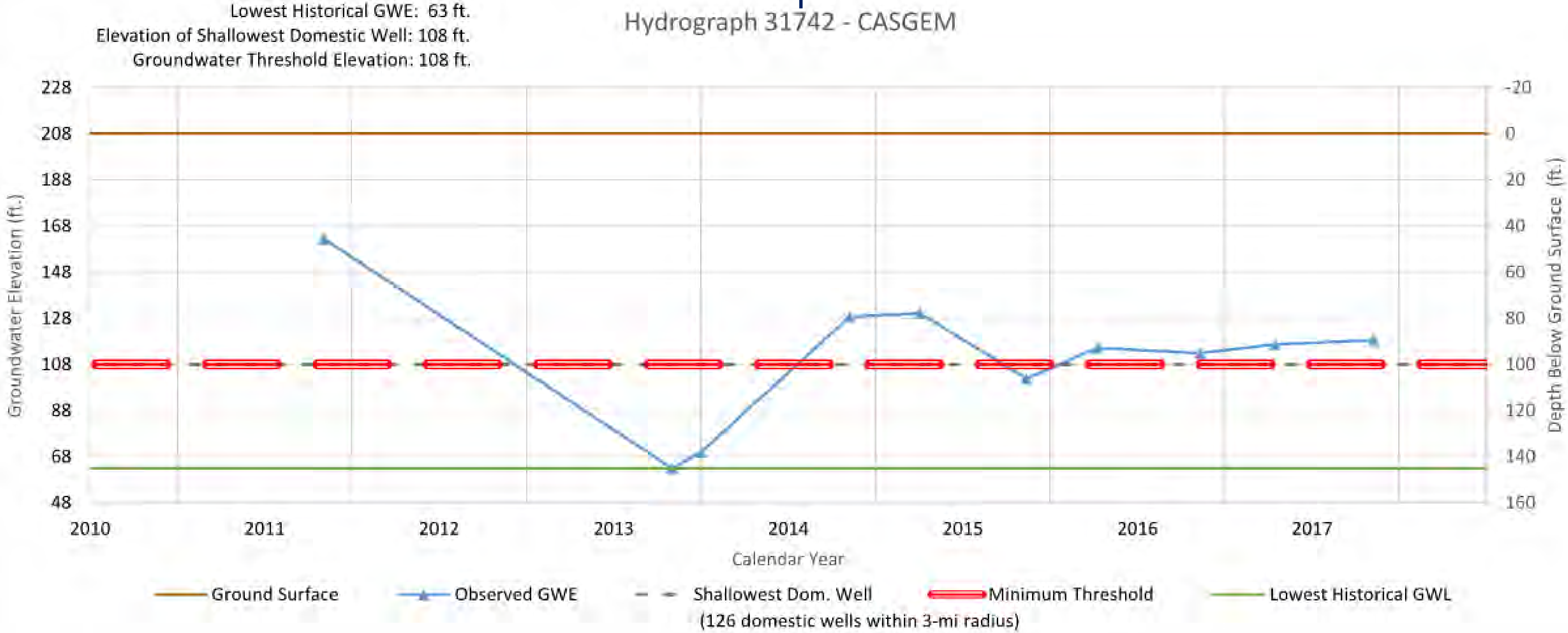


Image courtesy: Veronica Adrover/UC Merced

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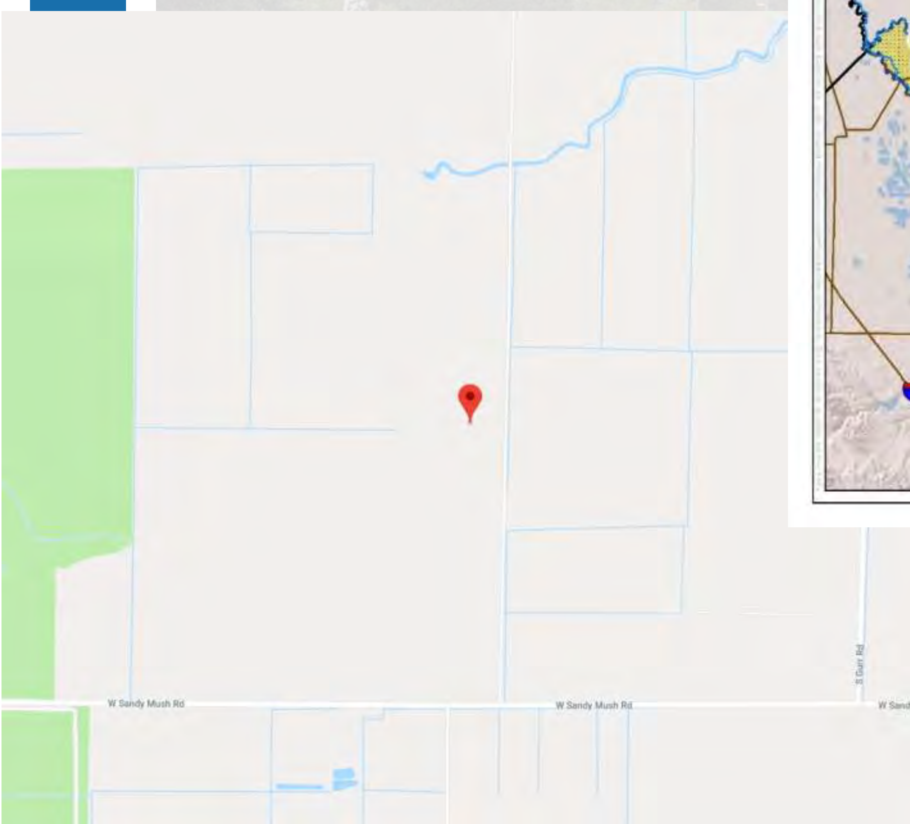
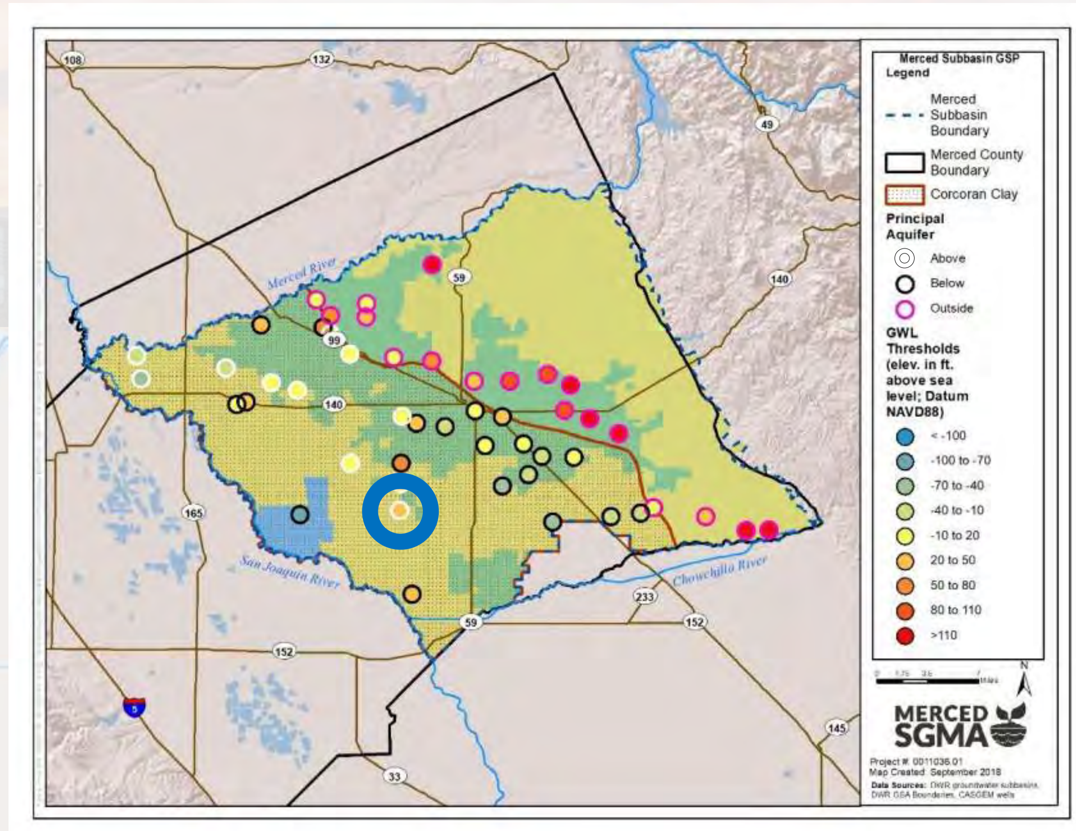
Minimum Thresholds Example: Well 32342 (new voluntary well)





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Minimum Thresholds Example: Well 32342 (new voluntary well)

Example:

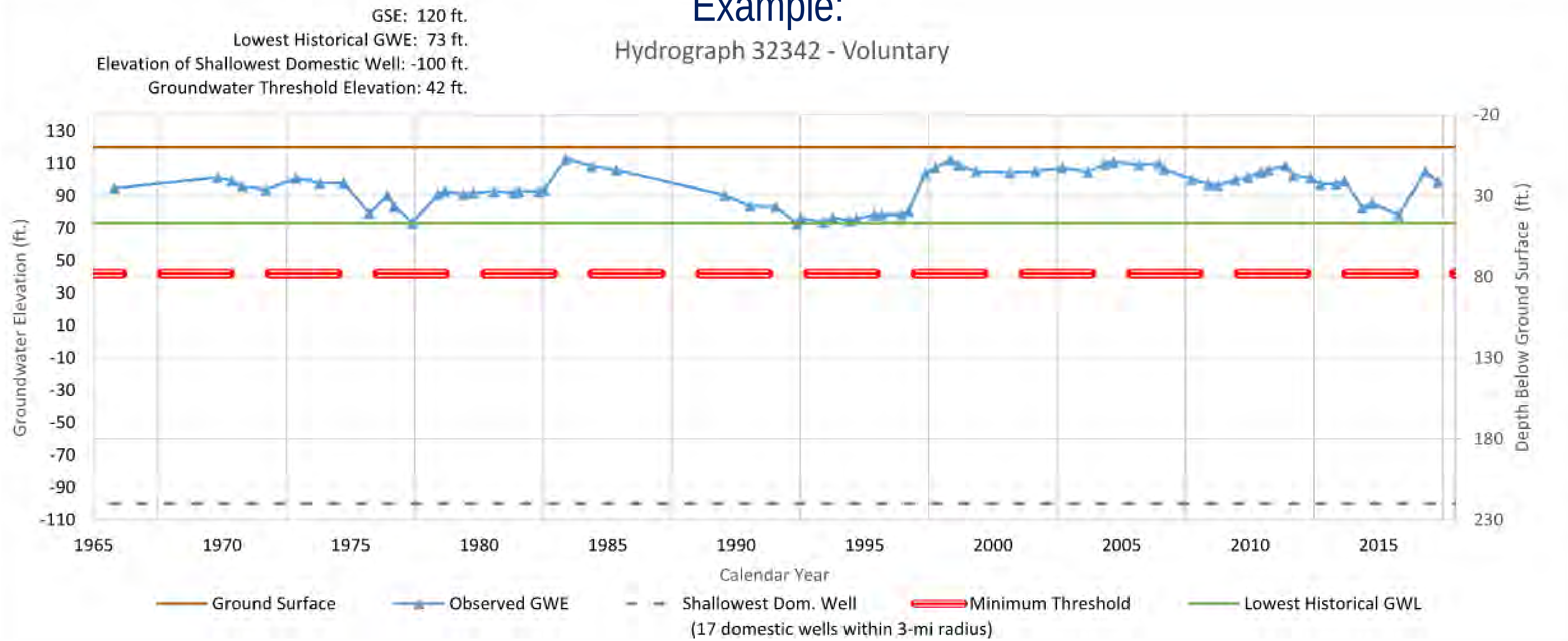

Image courtesy: Veronica Adrover/UC Merced

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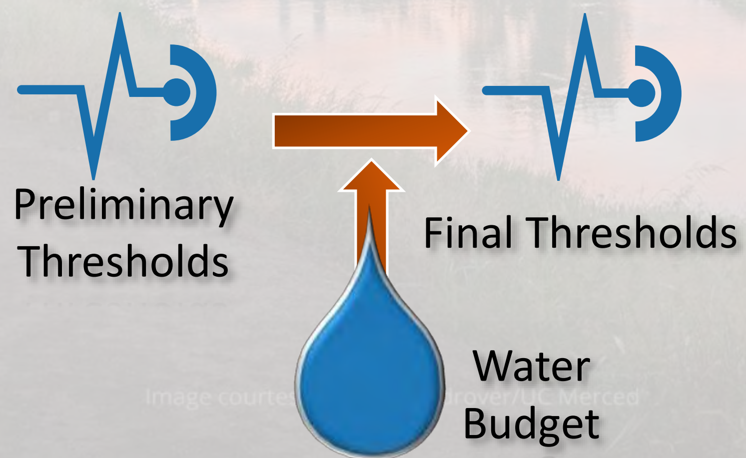
What Comes Next?

- Projected Water Budget will be used to understand average sustainable pumping rates basin-wide
- Projects and Management Actions need to be identified to include supply and demand-side measures to achieve sustainability
- Depending on rate of project implementation, groundwater elevation thresholds may need to be adjusted



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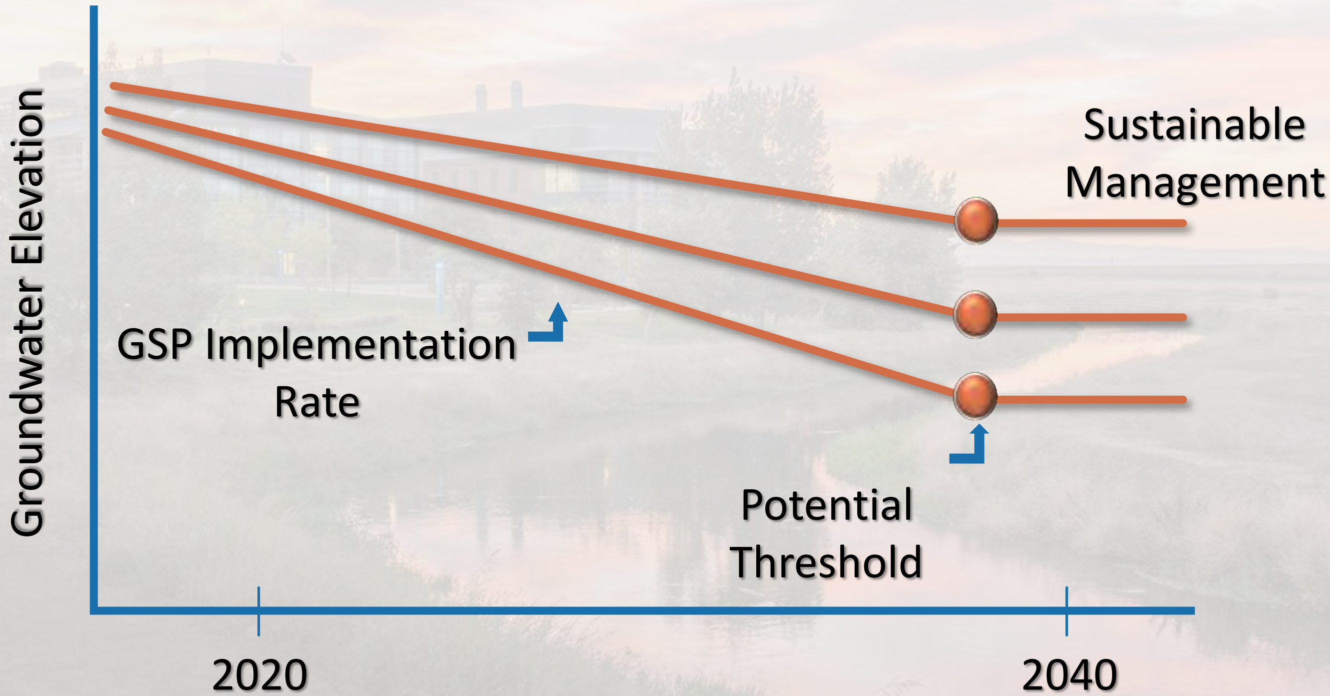
Rate of Plan Implementation May Necessitate Changes in GW Elevation Thresholds



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Minimum Thresholds Need will be Developed for Four of the Six Sustainability Indicators

- Chronic Lowering of Groundwater Levels
- ~~Reduction in Groundwater Storage~~
- ~~Seawater Intrusion~~
- Degraded Water Quality
- Land Subsidence
- Depletion of Interconnected Surface Water

Image courtesy: Veronica Adrover/UC Merced

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Undesirable Results for Degraded Water Quality

Degraded Water Quality

Why is this a concern? What are we trying to avoid?

- Localized salinity issues – connate water / upwelling saline brines in deep wells, delta brackish water intrusion from reduced water levels, and Corcoran Clay acting as a pathway and barrier
- Nitrates – historical agricultural uses. Being addressed through CV-SALTS and Irrigated Lands Regulatory Programs.

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Water Quality Recap

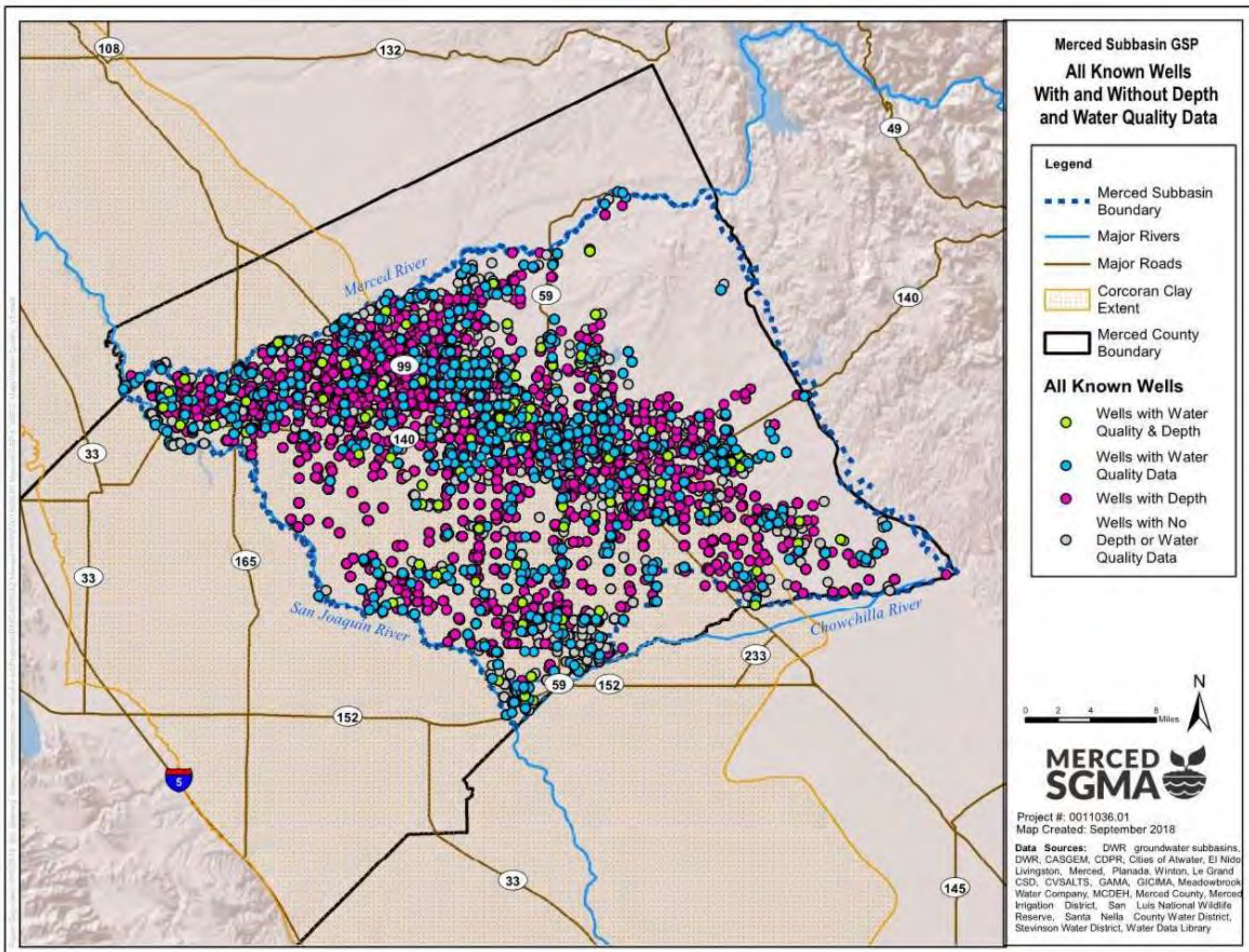
Focused on salinity – using TDS data

3 Primary Sources of Salinity:

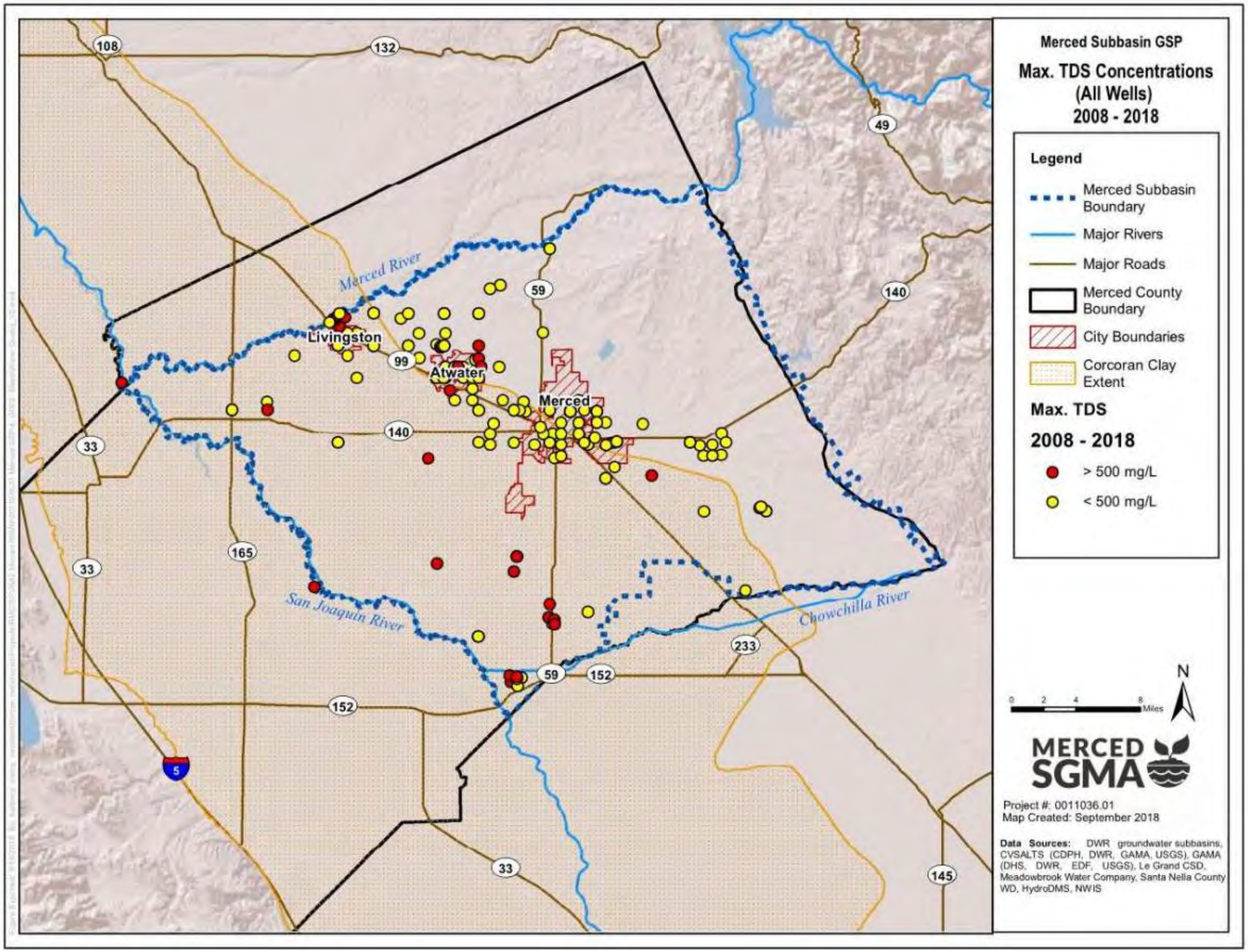
1. Saline, Connate Water from Marine Sedimentary Rocks - Pumping of Deep Wells in Western & Southern Basin (results in upwelling saline brines)
2. High-Chloride Water from San Joaquin Delta Sediments – Intrusion from declining groundwater levels
3. Corcoran Clay – Naturally impedes high TDS groundwater, but wells perforated create pathways for TDS to migrate

Image courtesy: Veronica Adrover/UC Merced

Majority of Wells with Water Quality Data Don’t Have Depth Data



Maximum Salinity Concentrations 2008 - 2018



Higher salinity is generally found **west**, towards the **San Joaquin River** and in **cities (Livingston & Atwater)**

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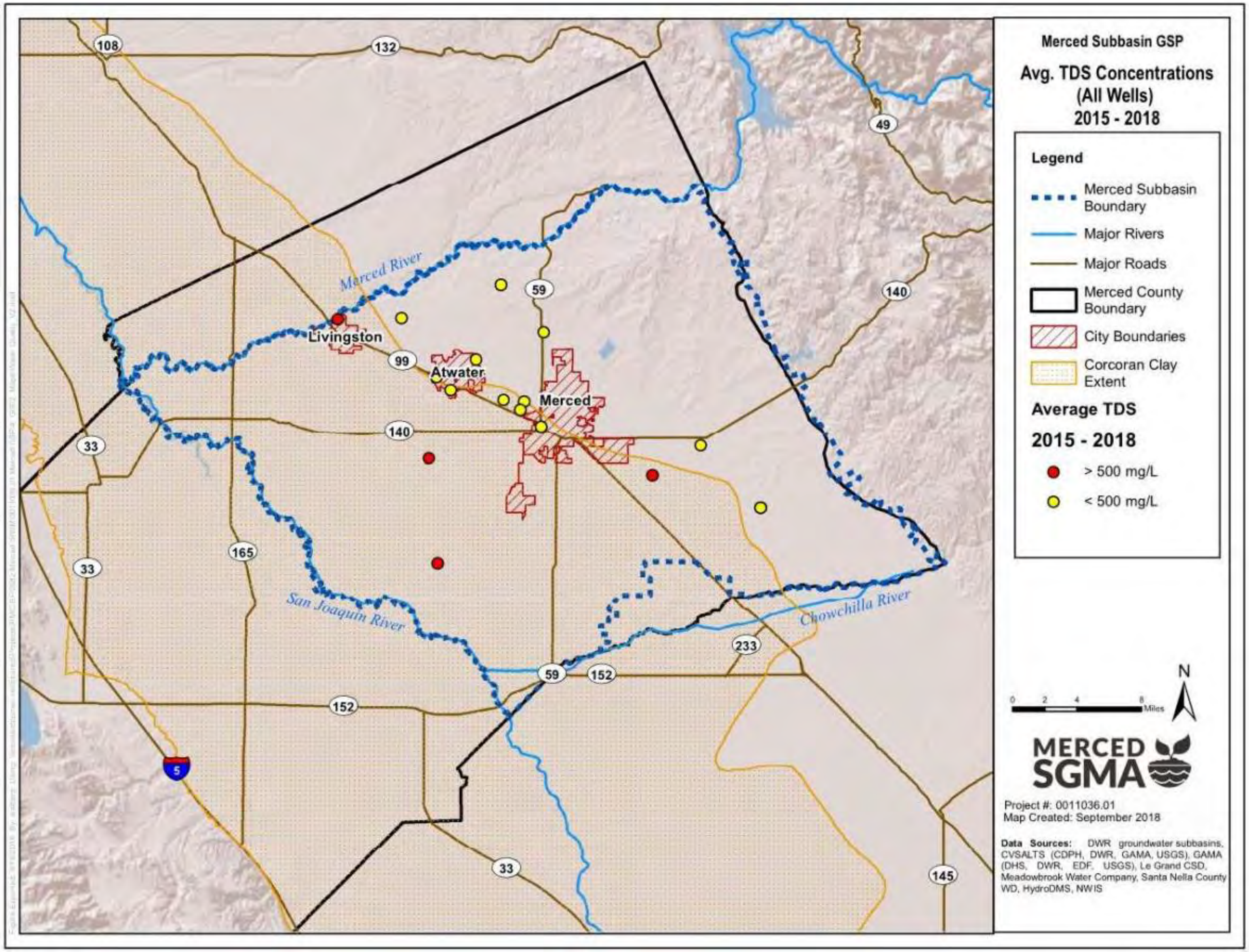
Fewer Recent Data Available (2015 – 2018)



High salinity generally correlates with the presence of **Corcoran Clay**

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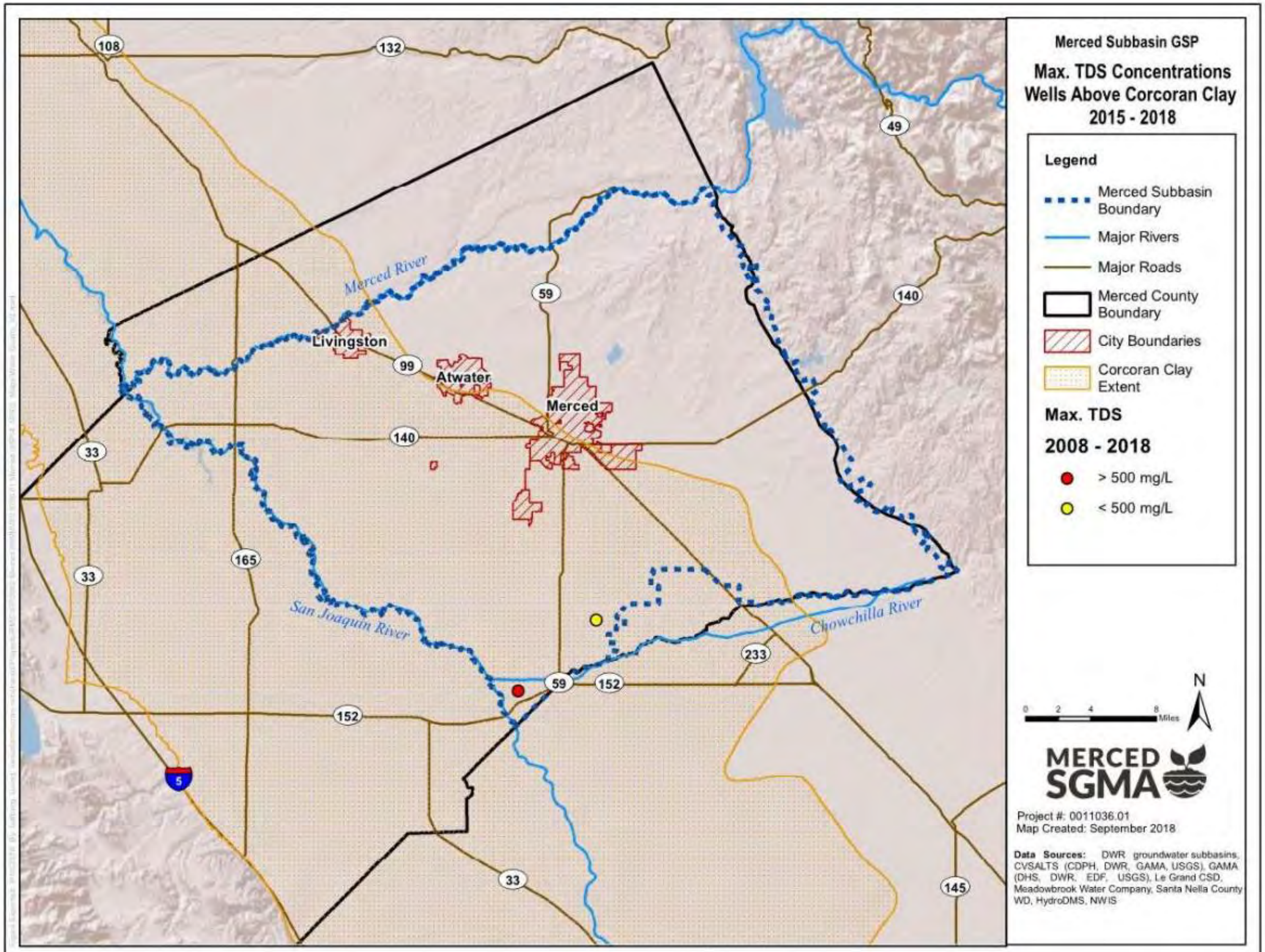
Little Data Available for Above Corcoran Clay



Lack of wells with recent TDS data and depth information

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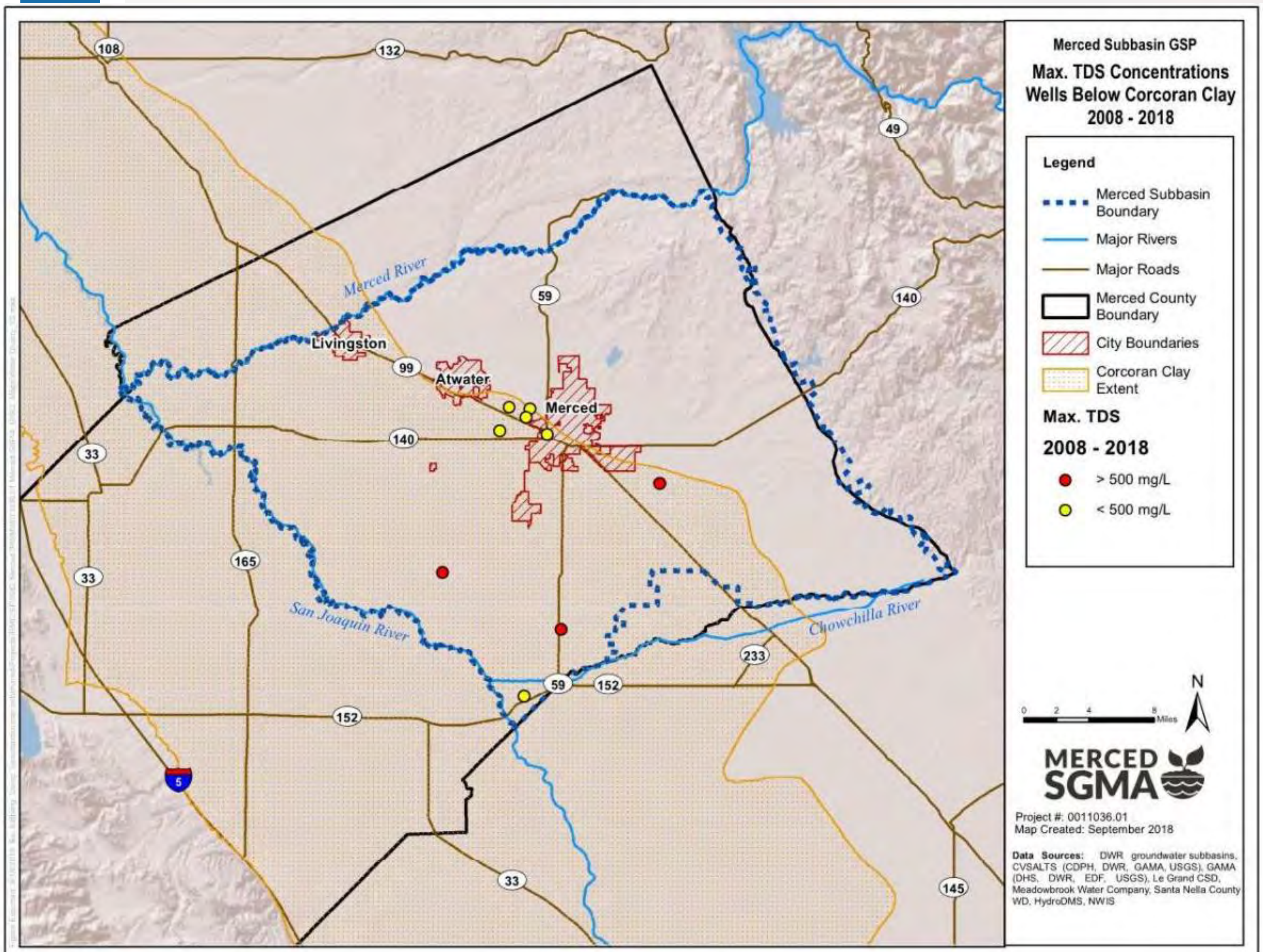
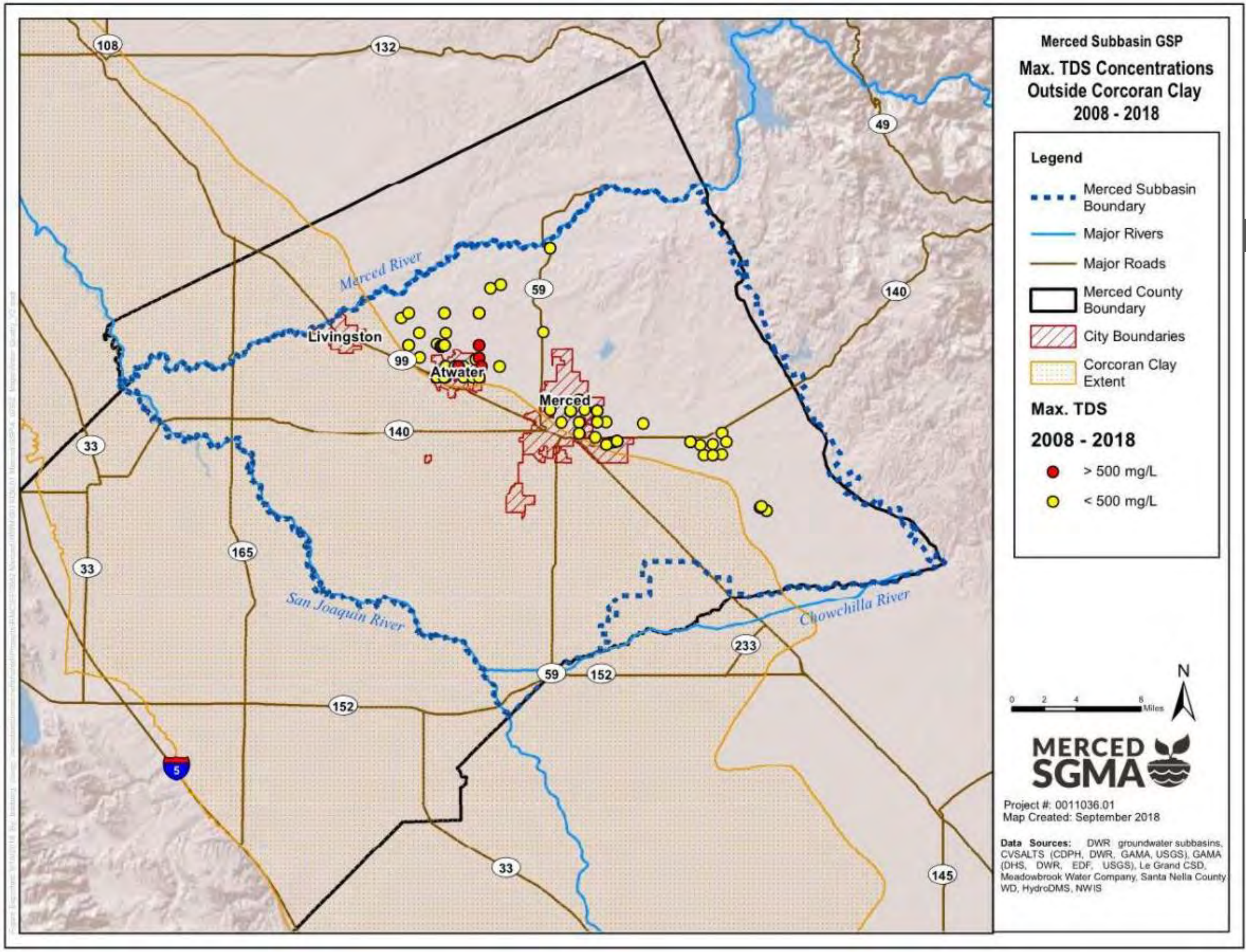
Little Data Available for Below Corcoran



Lack of wells with recent TDS data and depth information

Outside Corcoran Clay highest salinity is near Atwater



Exceedances limited near **Atwater**

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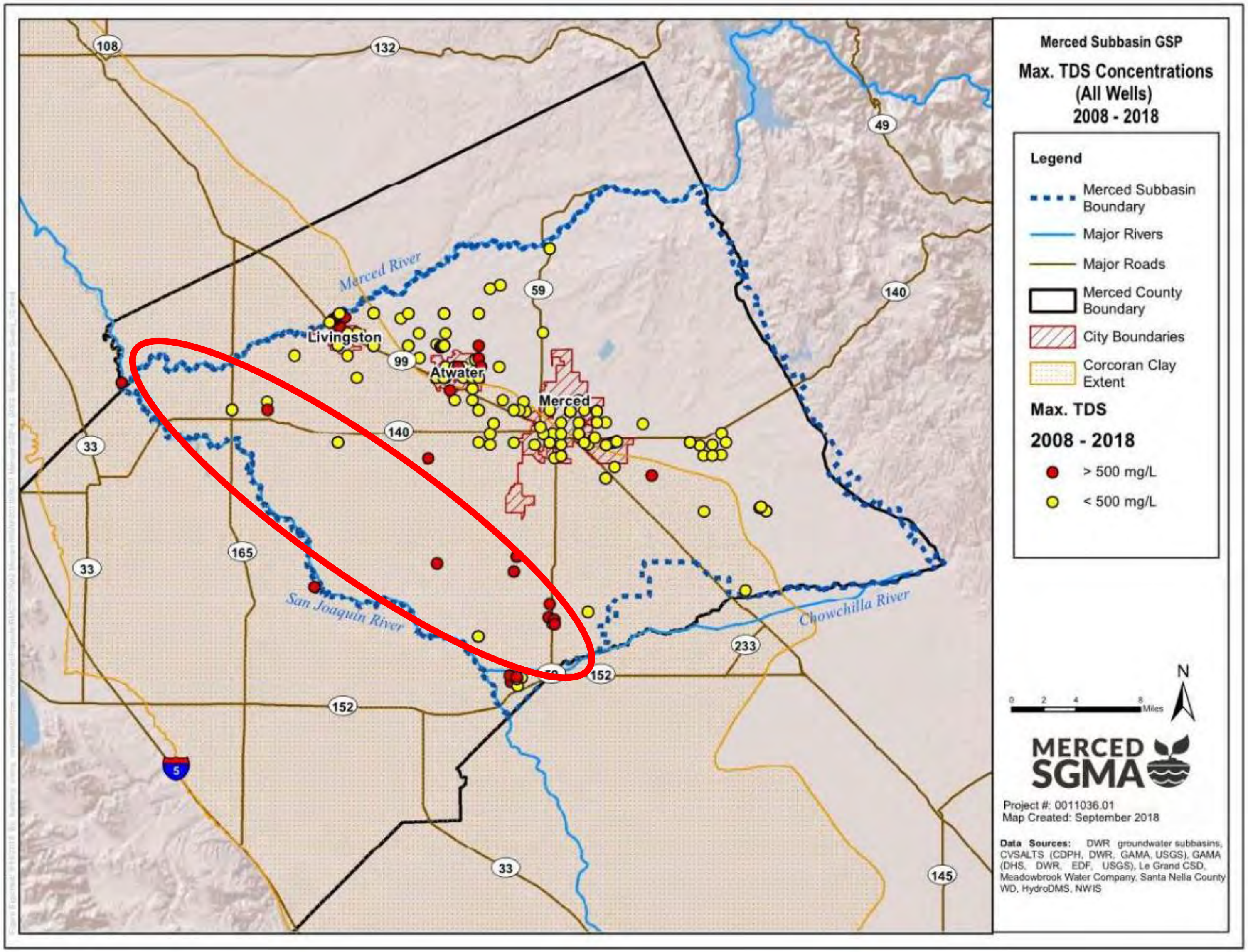
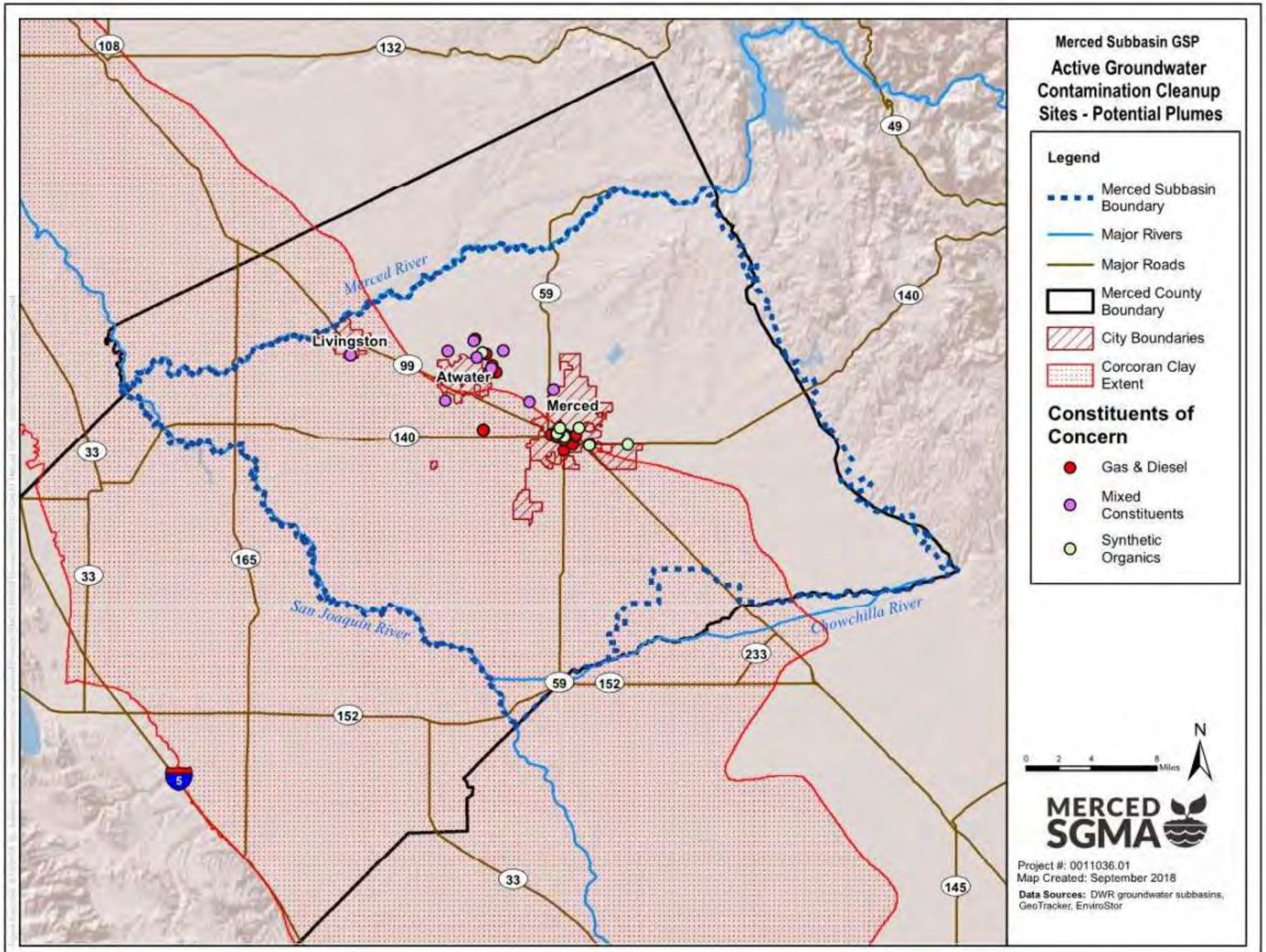
Identified Area of Data Gap



Data needed:

- Western-central portion of Subbasin & near the San Joaquin River
- In nested wells

Potential Plumes



- Sites with the potential to cause a groundwater plume (based on COCs)
- Avoid these sites when considering monitoring programs

Next Steps – Water Quality Thresholds

- Obtain construction information at select wells with salinity data
  - Refine well matching analysis in GIS
  - County of Merced is working on compiling a database of well construction data
  - Identify wells to measure total depth
  - Identify wells to video log
- Identify more “recent” TDS monitoring (since 2008+) if available

Image courtesy: Veronica Adrover/UC Merced

Projected Water Budget and Sustainable Yield

Image courtesy: Veronica Adrover/UC Merced

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Water Budgets: Defining Timeframes

Historical Water Budget

Uses historical information for hydrology, precipitation, water year type, water supply and demand, and land use going back a minimum of 10 years.

Current Water Budget

Holds constant the most recent or "current" data on population, land use, year type, water supply and demand, and hydrologic conditions.

Projected Water Budget

Uses the future planning horizon to estimate population growth, land use changes, climate change, etc.

Image courtesy: Veronica Adrover/UC Merced

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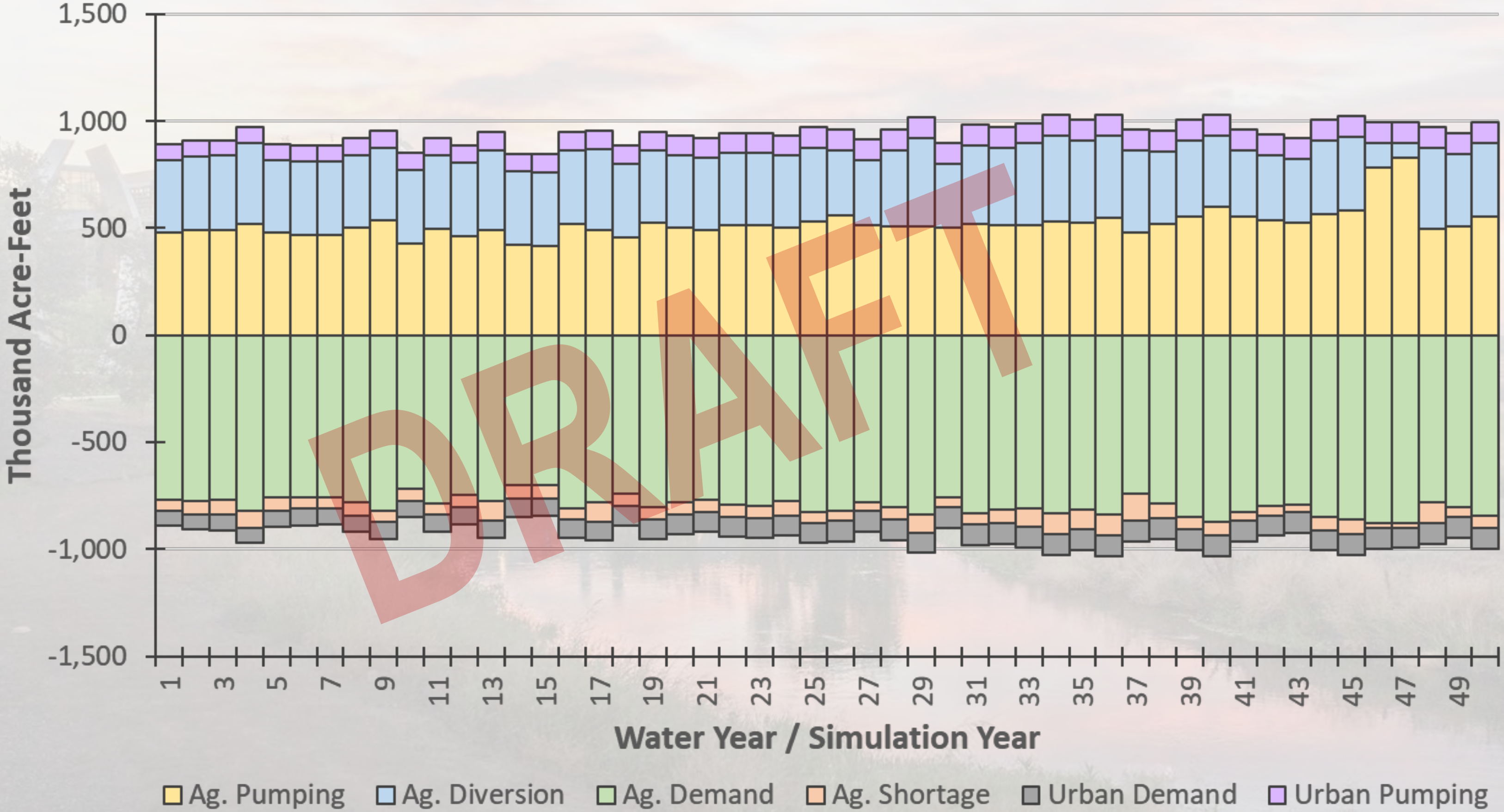
Projected Conditions Baseline – Modeling Inputs

- Hydrologic Period: Water Years 1969-2018 (50-Year Hydrology)
- River Flows
  - Merced: MercedSIM
  - San Joaquin: CalSim
  - Local Tributaries: Historic Records
- Land Use and Cropping Patterns:
  - 2013 CropScape modified based on discussions with GSAs
- Urban Water Use:
  - General Plan Buildout Conditions
  - Basin Average GPCD: 300
- Surface Water Deliveries provided by local purveyors

Image courtesy: Veronica Adrover/UC Merced

Projected Conditions Baseline Land & Water Use Budget

Merced Groundwater Subbasin



- Below 0 values indicate demand (including agricultural and urban)
- Above 0 values indicate supplies (including pumping and diversion)

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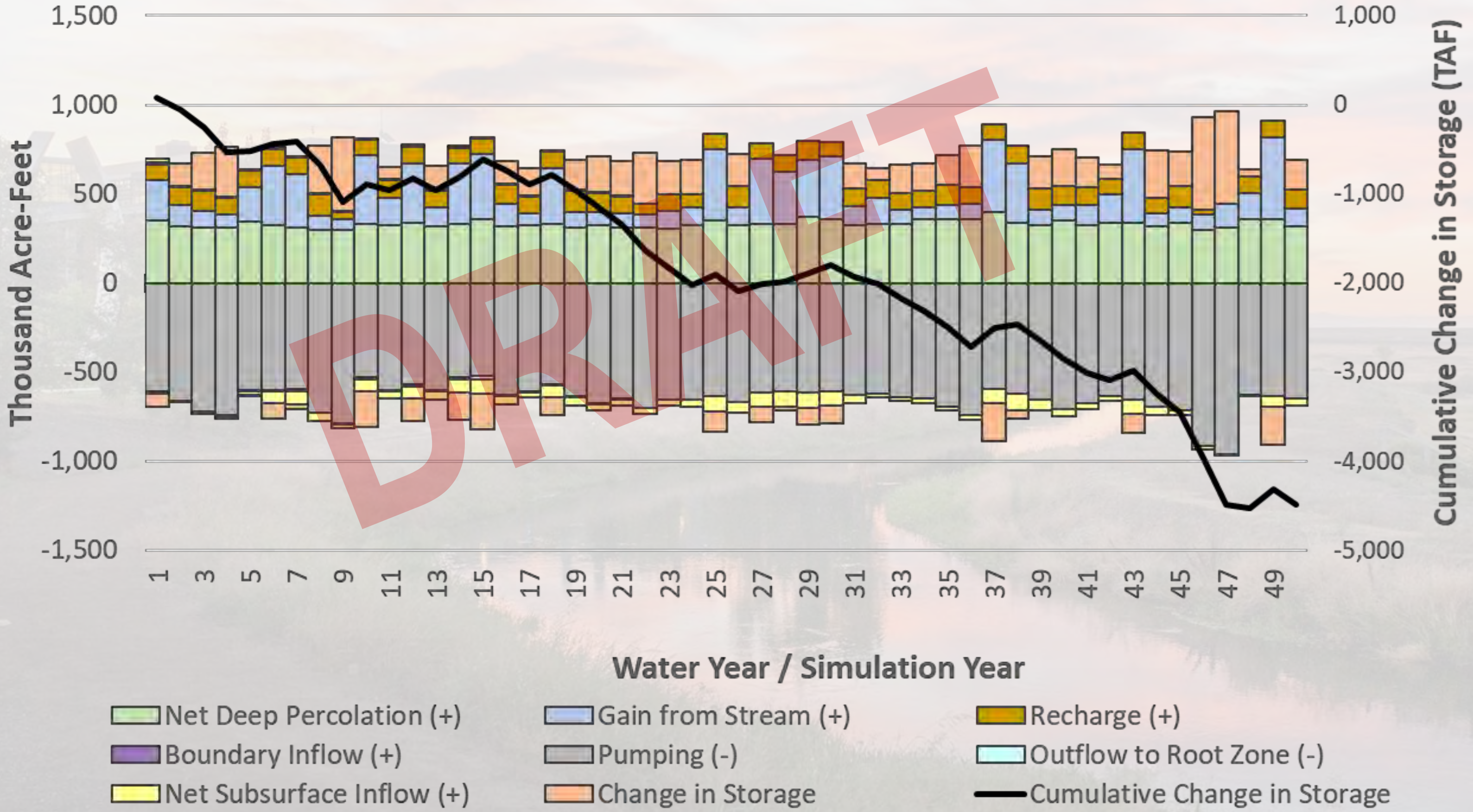
Projected Conditions Baseline Groundwater Budget

Merced Groundwater Subbasin



- Positive numbers show flow into aquifer
- Negative numbers show flow out of aquifer
- Line shows overall decline in stored groundwater over time

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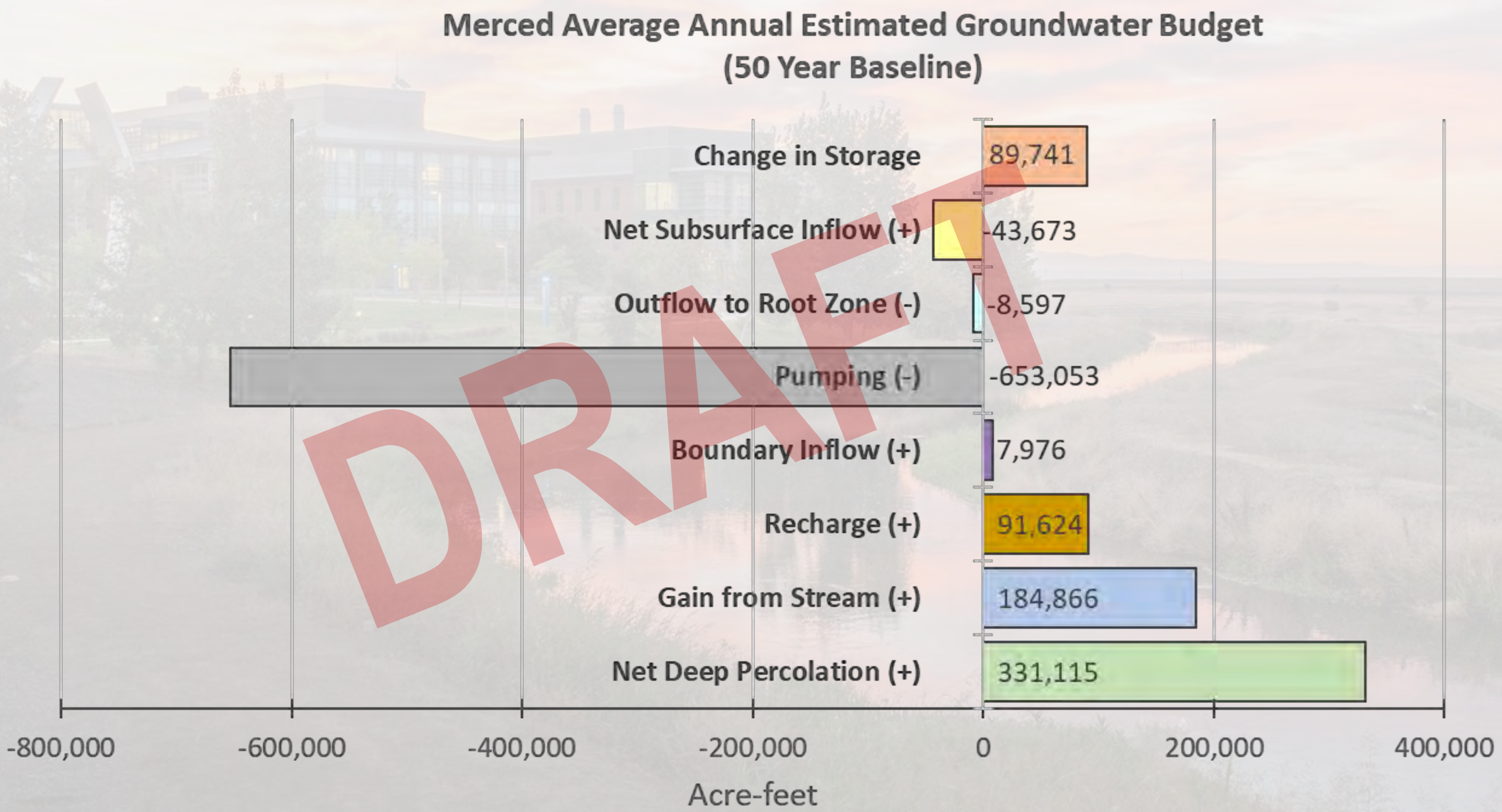
Projected Conditions Groundwater Budget

Merced Groundwater Subbasin



- The graph shows a representation of the inflows (on right) and outflows (on left)

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Going from Water Budgets to Quantifying Sustainable Yield

- What is 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.”
- How do we develop this?
  - Can be developed through a groundwater model scenario, modifying conditions to balance out the change in stored groundwater over time
- How do we work toward a balance?
  - Implement projects and management actions to increase recharge or decrease production

Image courtesy: Veronica Adrover/UC Merced

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Sustainable Yield – Modeling Analysis

- Modeling Approach
  - Lower groundwater production through reduced agricultural and urban demand across the model domain
- Assumptions
  - 25-Year Implementation Period: operations will remain consistent, and groundwater levels will continue to decline until 2040
  - Inter-Subbasin Flows: adjoining subbasins will operate similarly to Merced, whereas subsurface flows will remain similar to long-term average historical conditions

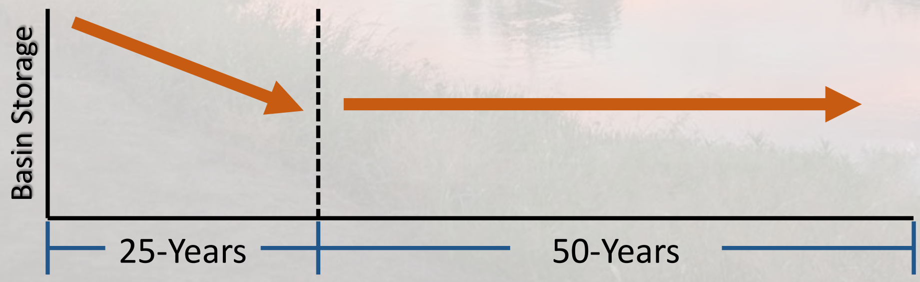

Image courtesy: Veronica Adrover/UC Merced

DRAFT Results: Initial simulations only address subbasin yield, analysis is needed to gauge effect on ensure minimum thresholds.

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Modeling Assumes "Glidepath" to Sustainability Between 2020 and 2040

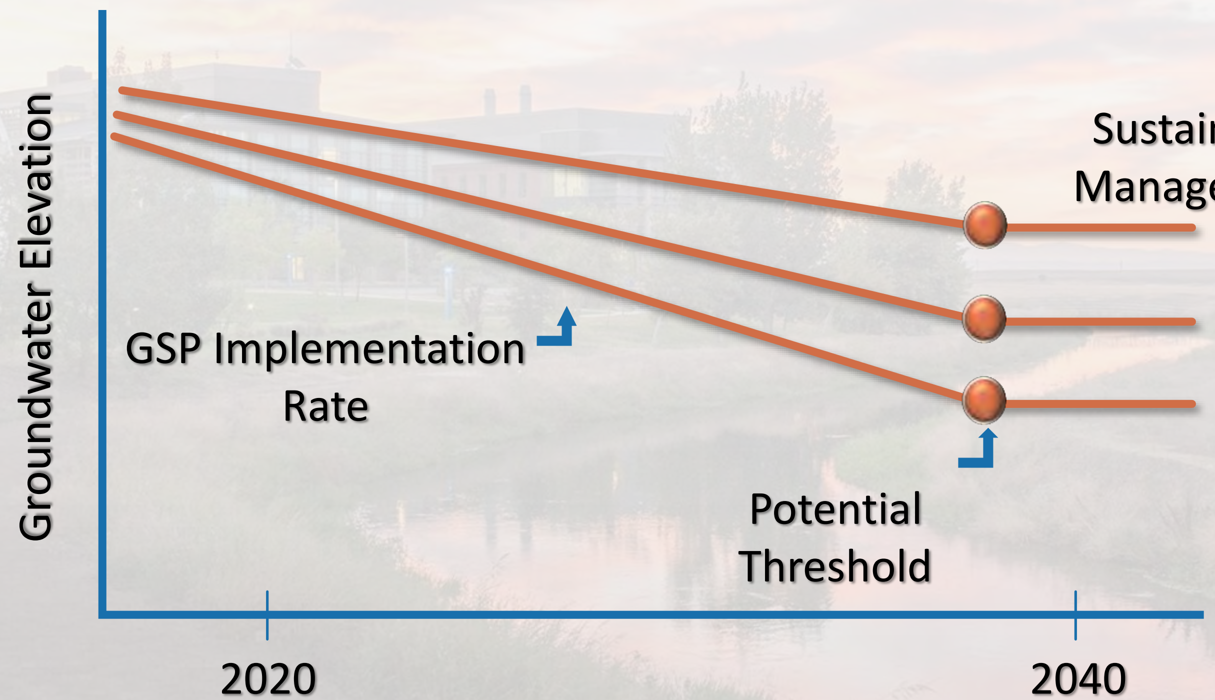

Image courtesy: Veronica Adrover/UC Merced

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Merced Groundwater Subbasin

[Sustainable Yield Land and Water Use Budget]

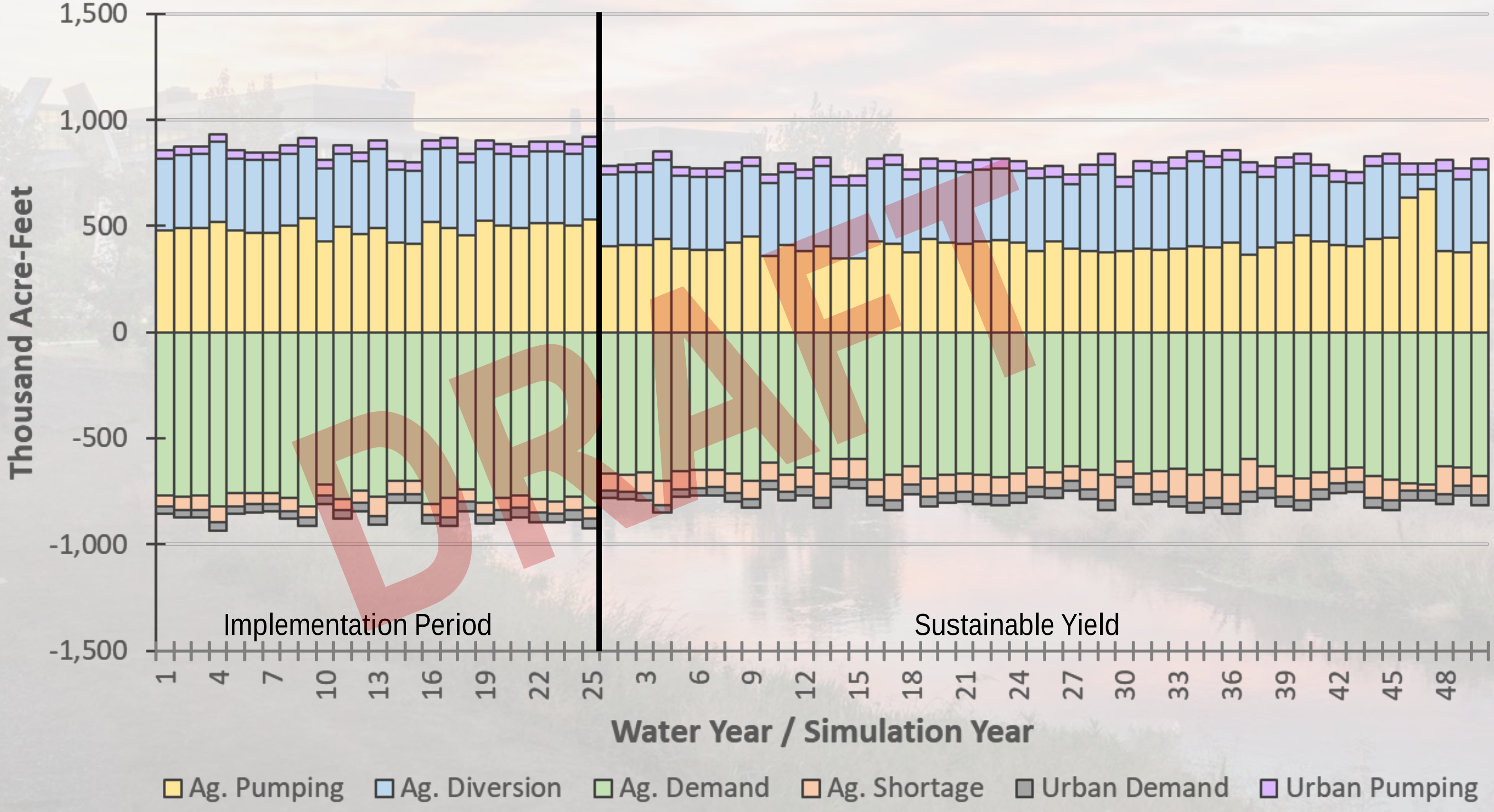

Image courtesy: Veronica Adrover/UC Merced

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Merced Groundwater Subbasin

[Sustainable Yield Groundwater Budget]

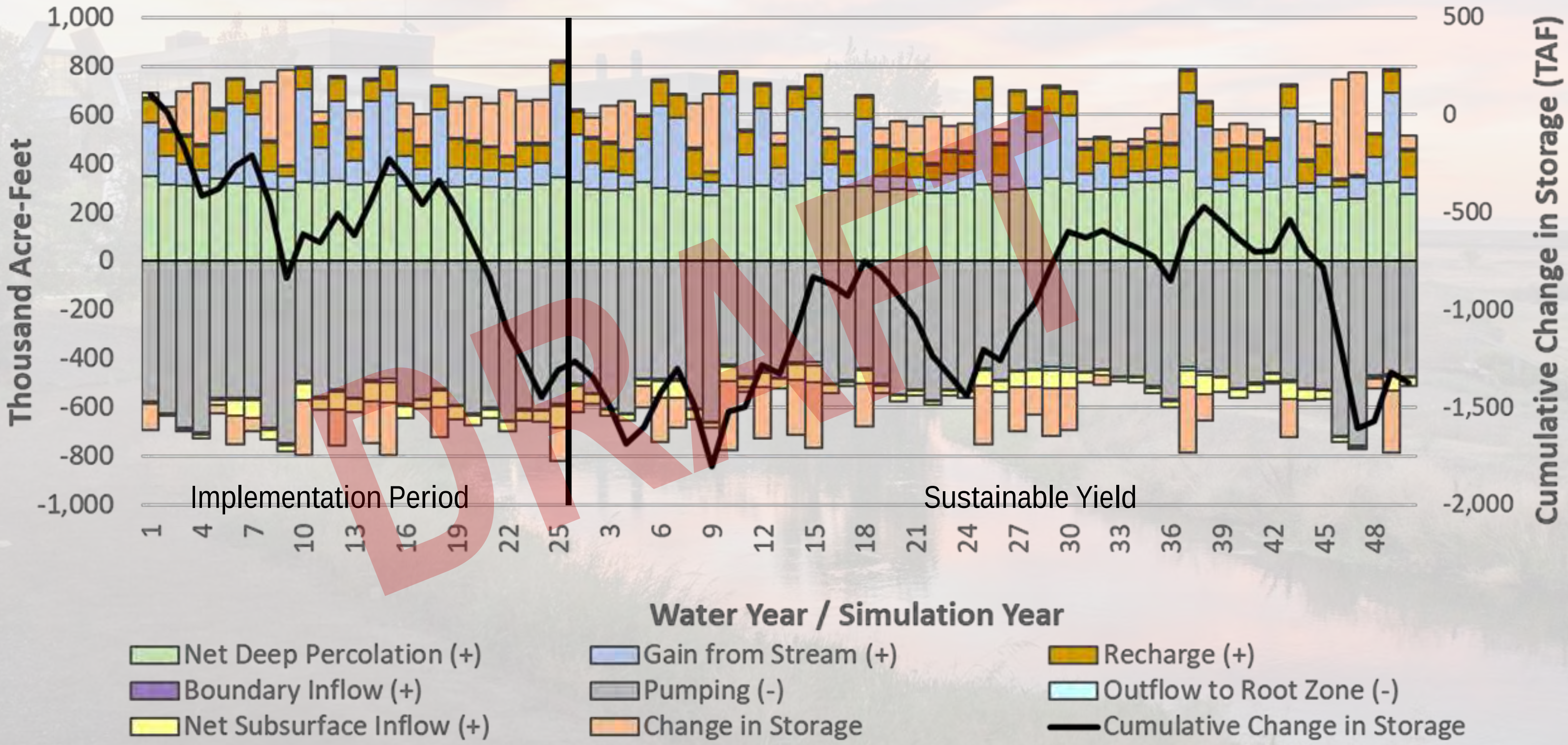

Image courtesy: Veronica Adrover/UC Merced

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Merced Groundwater Subbasin

[Sustainable Yield Groundwater Budget]

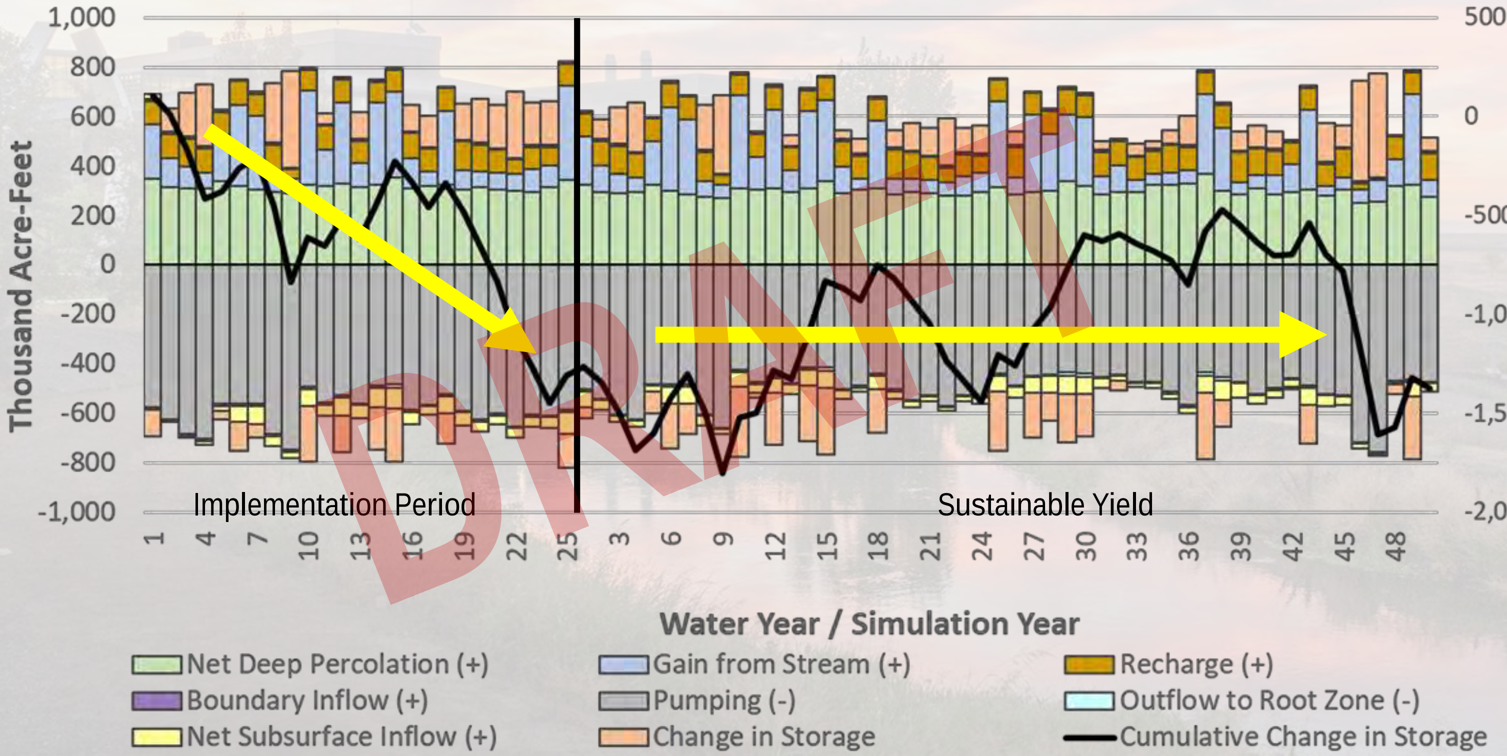

Image courtesy: Veronica Adrover/UC Merced

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Merced Groundwater Subbasin

[Sustainable Yield Groundwater Budget – Average Annual]

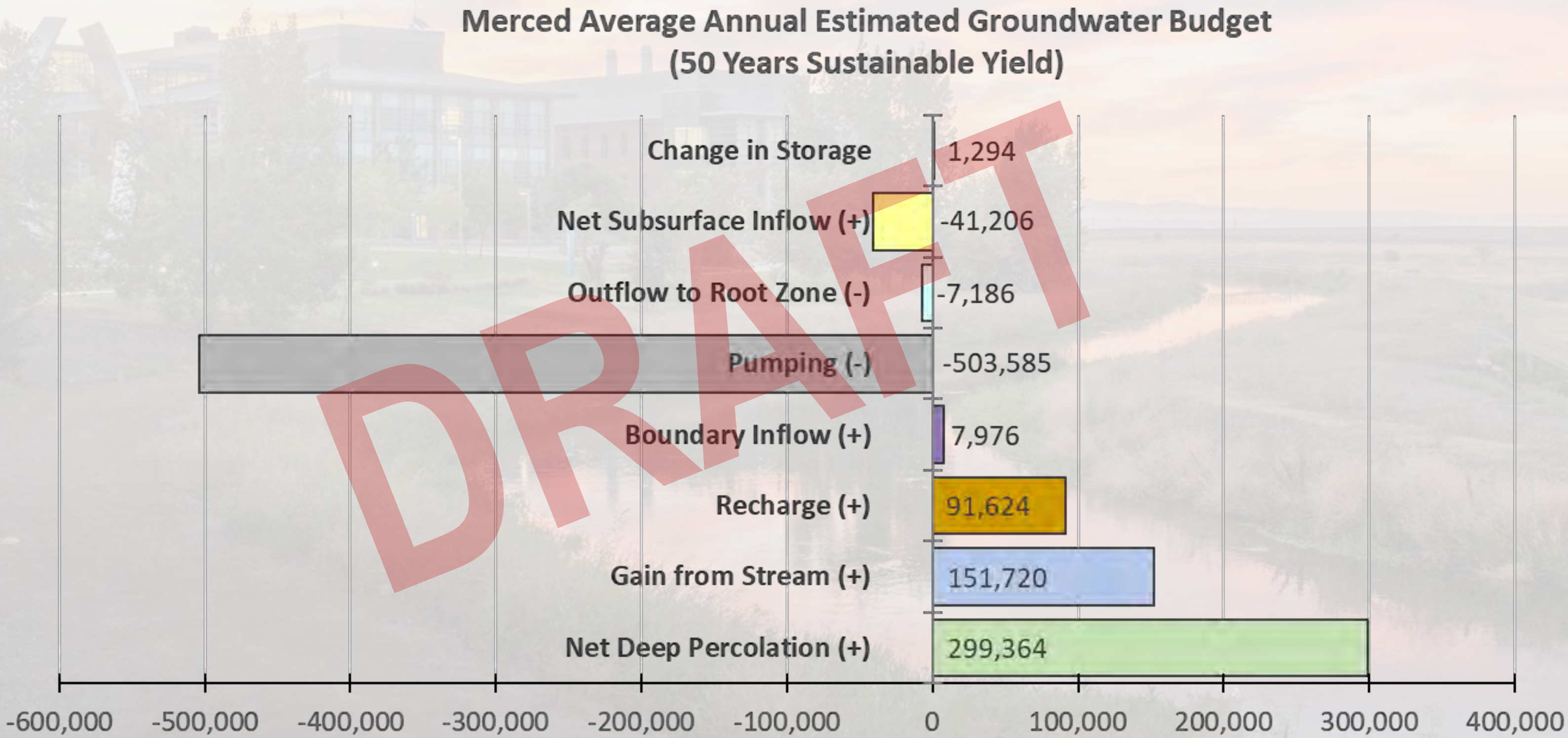

Image courtesy: Veronica Adrover/UC Merced

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Sustainable Yield – Modeling Results

- "Allocations" needed to bring the basin into sustainability by 2040

Surface Water Yield	460,000AF	~2.6 AF/Ac*
Groundwater Yield	500,000AF	~1.0 AF/Ac**
Pumping Reduction	150,000AF	~23%

Notes:

Surface Water Yield: is defined as total surface water supplies divided by the ag acreage within MID, SWD, MCWD, and TIWD

Groundwater Yield: is defined as basin pumping divided by the total acreage of the basin, both developed and undeveloped

Image courtesy: Veronica Adrover/UC Merced

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Sustainable Yield Water Budget

Budget Component	Units	MIUGSA
Area	Acres	163,000
Ag Demand	AF	402,000
Urban Demand	AF	82,000
Surface Water Diversions*	AF	407,000
Groundwater Allocation	AF	163,000
Total Water Demand	**ft**	**484,000**
Total Water Supply	**ft**	**570,000**

Budget Component	Units	MIUGSA
Ag Demand	ft	2.5
Urban Demand	ft	0.5
Surface Water Diversions*	ft	2.5
Groundwater Allocation	ft	1.0
Total Water Demand	**ft**	**3.0**
Total Water Supply	**ft**	**3.5**

Note: Surface water diversions do not incorporate canal seepage, evaporative losses, or discharge from district wells.

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Sustainable Yield Water Budget

Budget Component	Units	MSGSA
Area	Acres	338,000
Ag Demand	AF	429,000
Urban Demand	AF	7,000
Surface Water Diversions*	AF	39,000
Groundwater Allocation	AF	338,000
Total Water Demand	**ft**	**436,000**
Total Water Supply	**ft**	**377,000**

Budget Component	Units	MSGSA
Ag Demand	ft	1.3
Urban Demand	ft	0.0
Surface Water Diversions*	ft	0.1
Groundwater Allocation	ft	1.0
Total Water Demand	**ft**	**1.3**
Total Water Supply	**ft**	**1.1**

Note: Surface water diversions do not incorporate canal seepage, evaporative losses, or discharge from district wells.

Image courtesy: Veronica Adrover UC Merced

Sustainable Yield Water Budget

Budget Component	Units	TIWD
Area	Acres	12,000
Ag Demand	AF	23,000
Urban Demand	AF	-
Surface Water Diversions*	AF	20,000
Groundwater Allocation	AF	12,000
Total Water Demand	**ft**	**23,000**
Total Water Supply	**ft**	**32,000**

Budget Component	Units	TIWD
Ag Demand	ft	1.9
Urban Demand	ft	0.0
Surface Water Diversions*	ft	1.6
Groundwater Allocation	ft	1.0
Total Water Demand	**ft**	**1.9**
Total Water Supply	**ft**	**2.6**

Note: Surface water diversions do not incorporate canal seepage, evaporative losses, or discharge from district wells.

Discussion & Questions

- Do you understand the water budgets and sustainable yield?
- What are your questions and take-aways from the information presented on water budgets and sustainable yield?

Image courtesy: Veronica Adrover/UC Merced

Subsidence – Projected Groundwater Levels

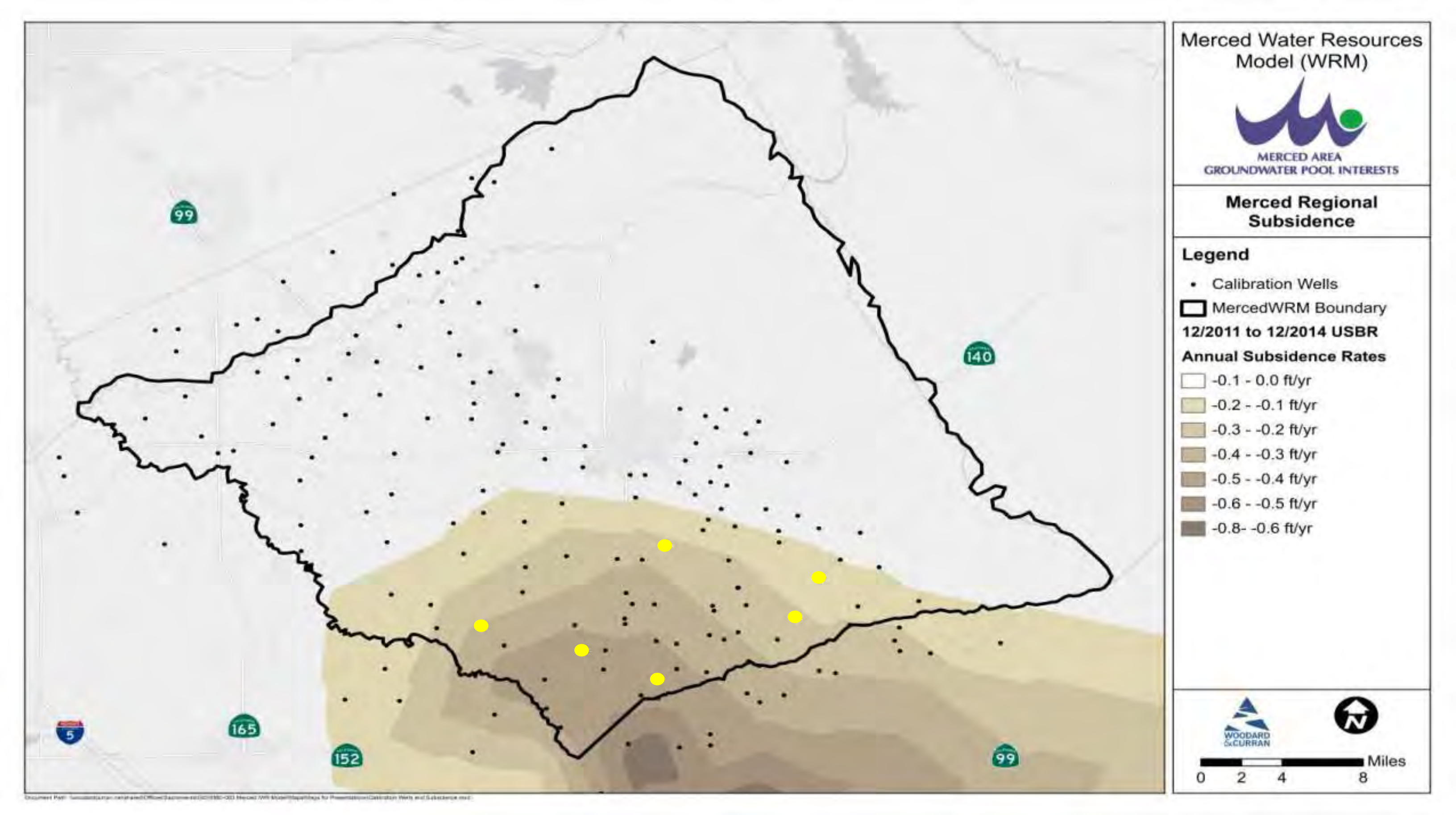

Image courtesy: Veronica Adrover/UC Merced

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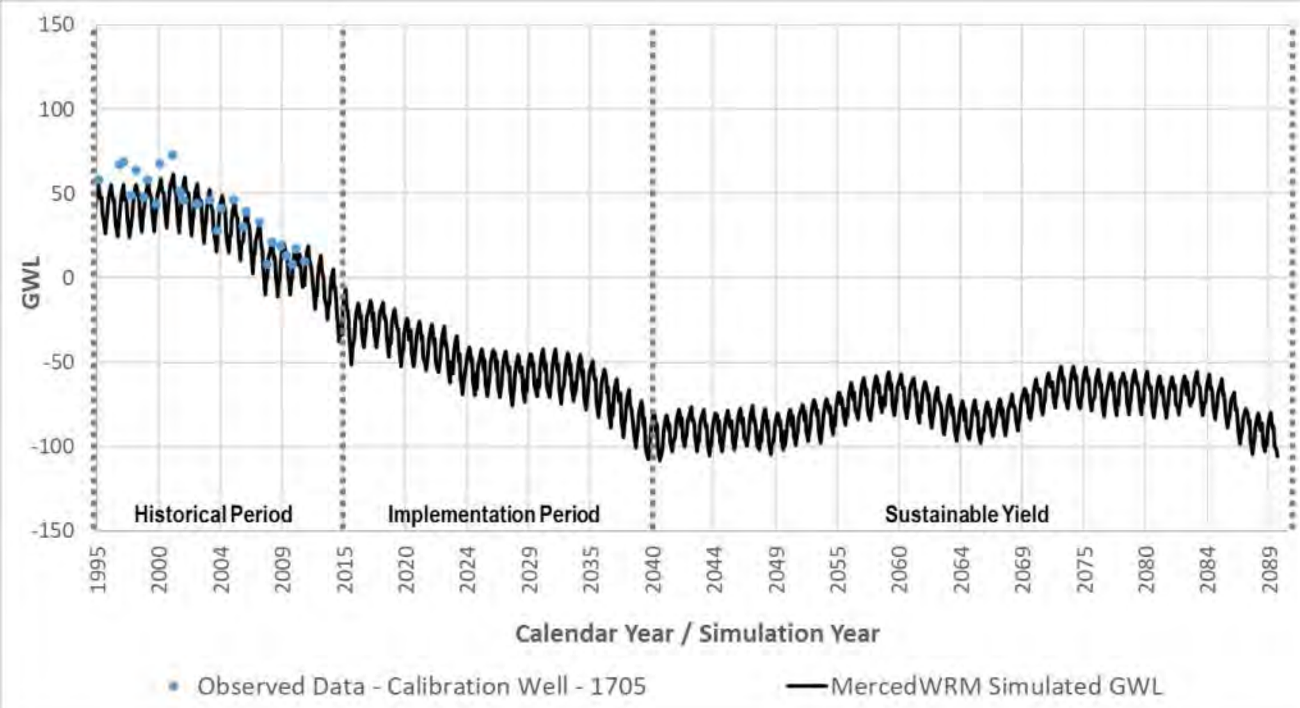
150
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GWL
Historical Period
Implementation Period
Sustainable Yield
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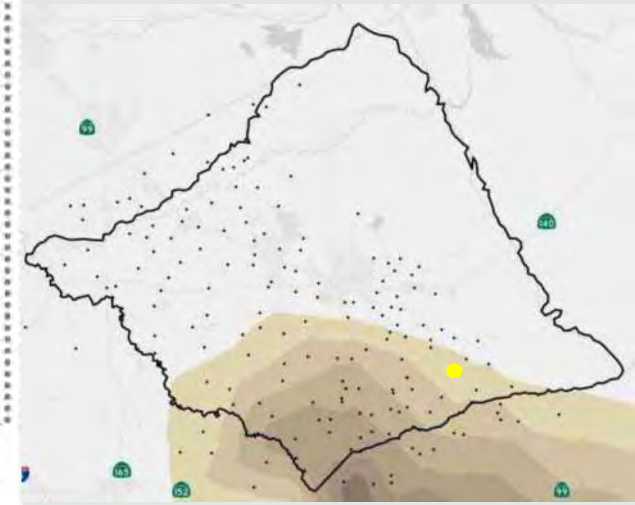
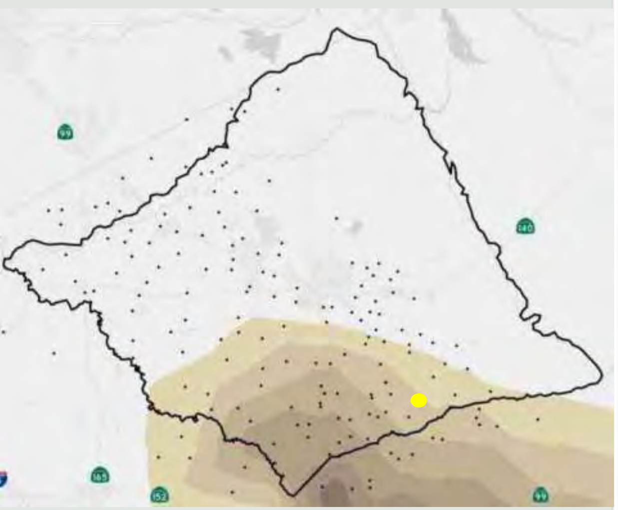
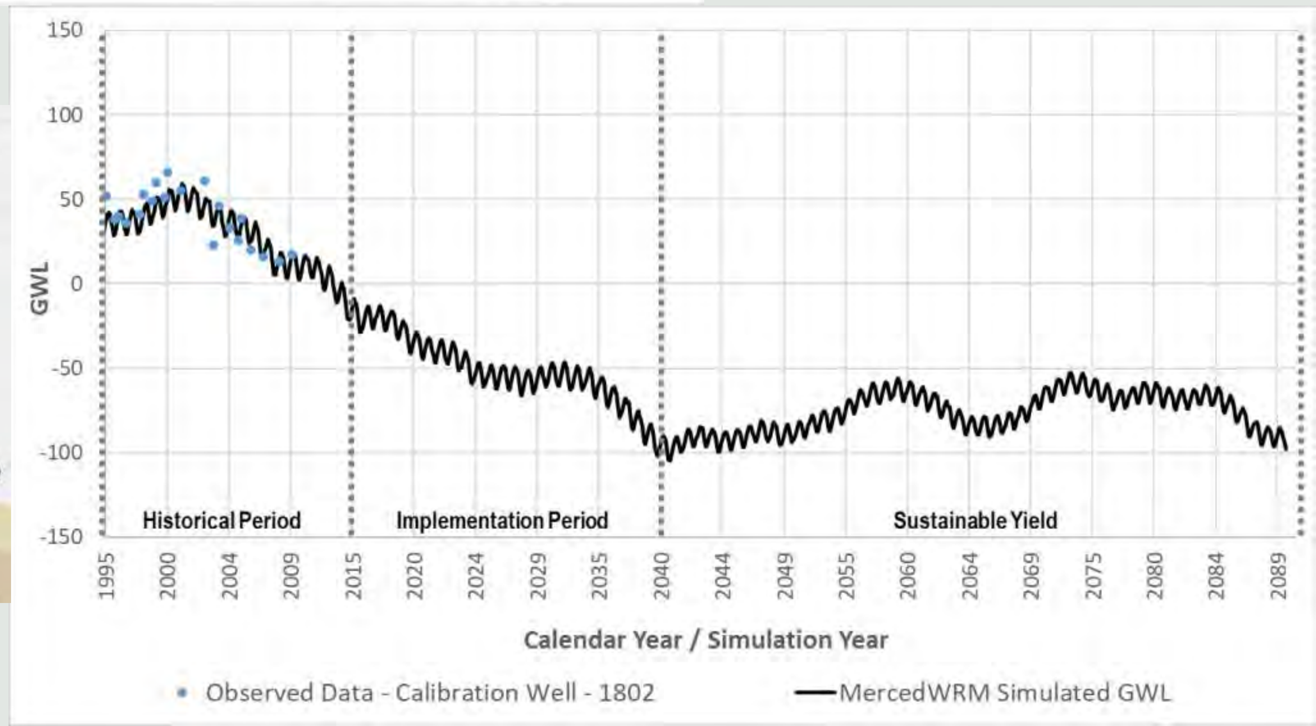
2084
2089
Calendar Year / Simulation Year
Observed Data - Calibration Well - 1705
MercedWRM Simulated GWL



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GWL
Historical Period
Implementation Period
Sustainable Yield
1995
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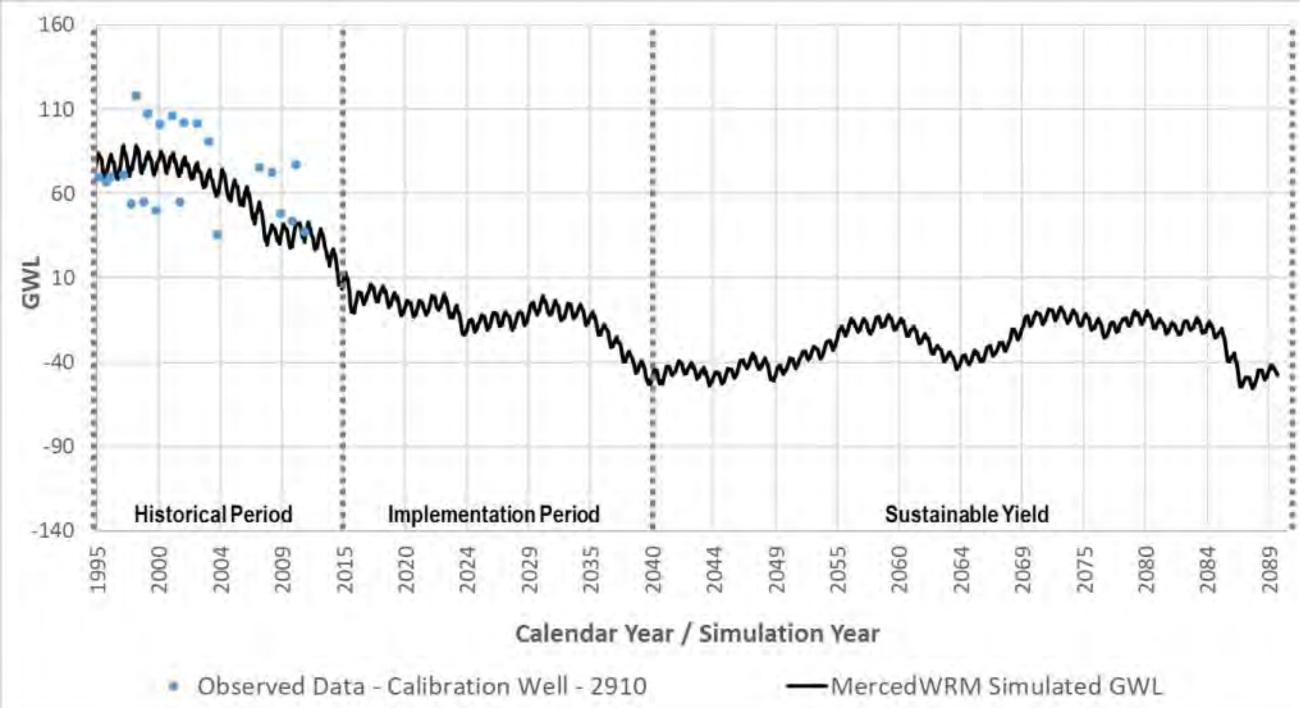
2080
2084
2089
Calendar Year / Simulation Year
Observed Data - Calibration Well - 1802
MercedWRM Simulated GWL


GWL
160
110
60
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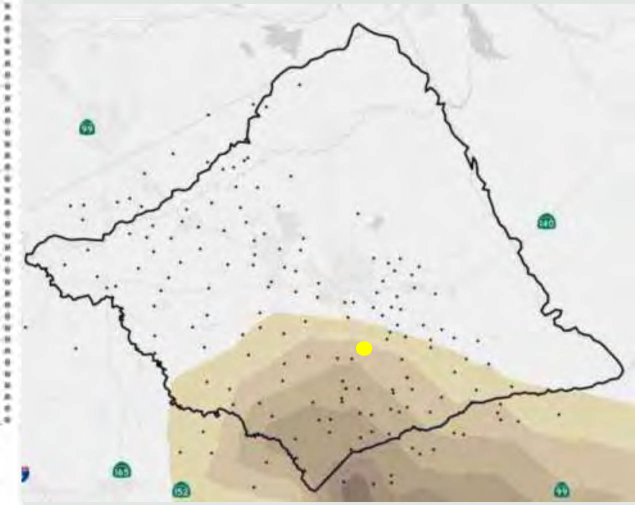
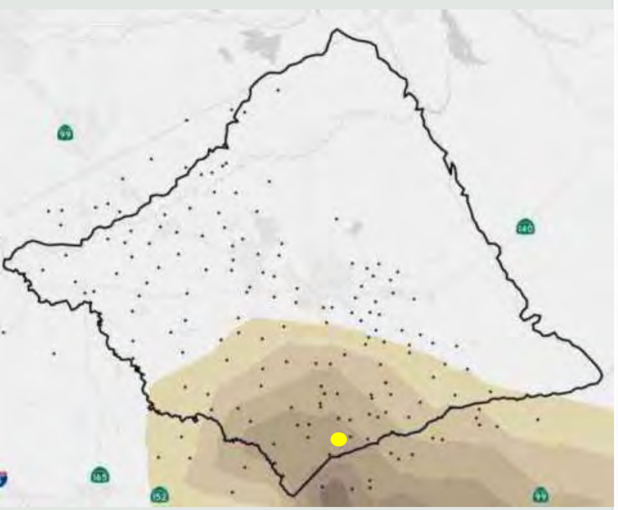
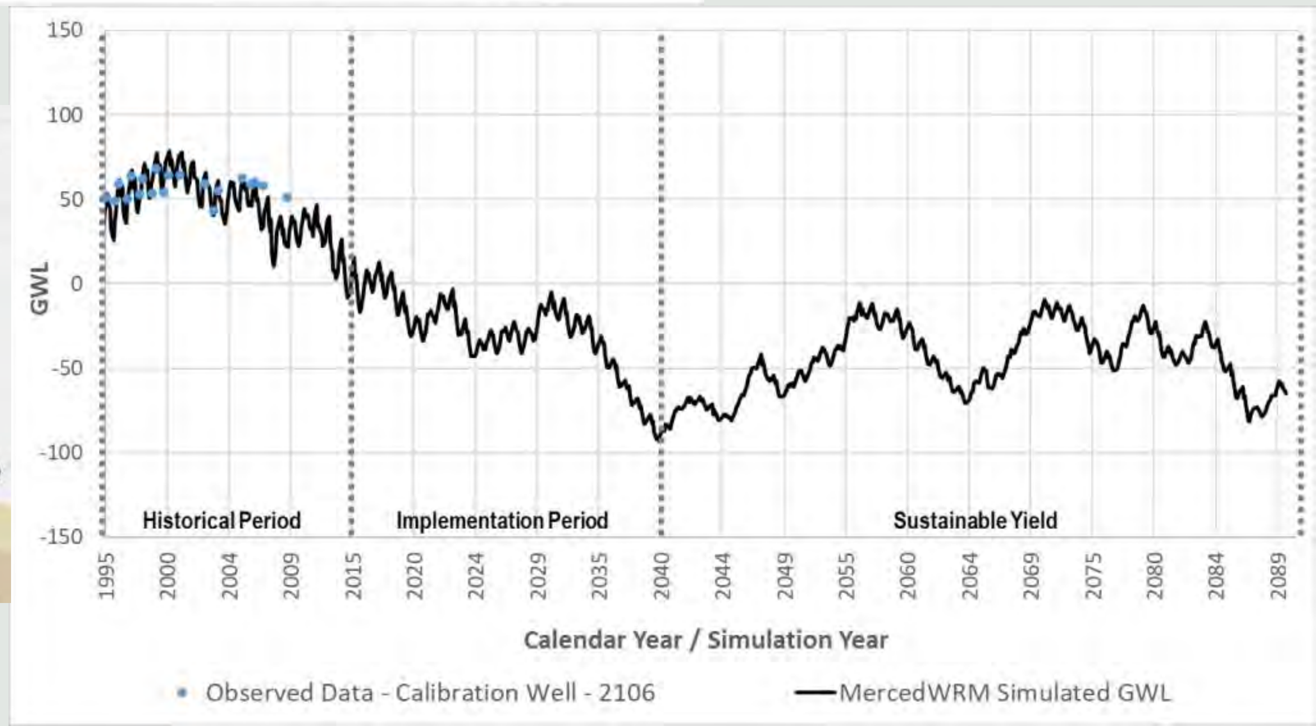
-40
-90
-140
Historical Period
Implementation Period
Sustainable Yield
1995 2000 2004 2009 2015 2020 2024 2029 2035 2040 2044 2049 2055 2060 2064 2069 2075 2080 2084 2089
Calendar Year / Simulation Year
Observed Data - Calibration Well - 2910
MercedWRM Simulated GWL






GWL
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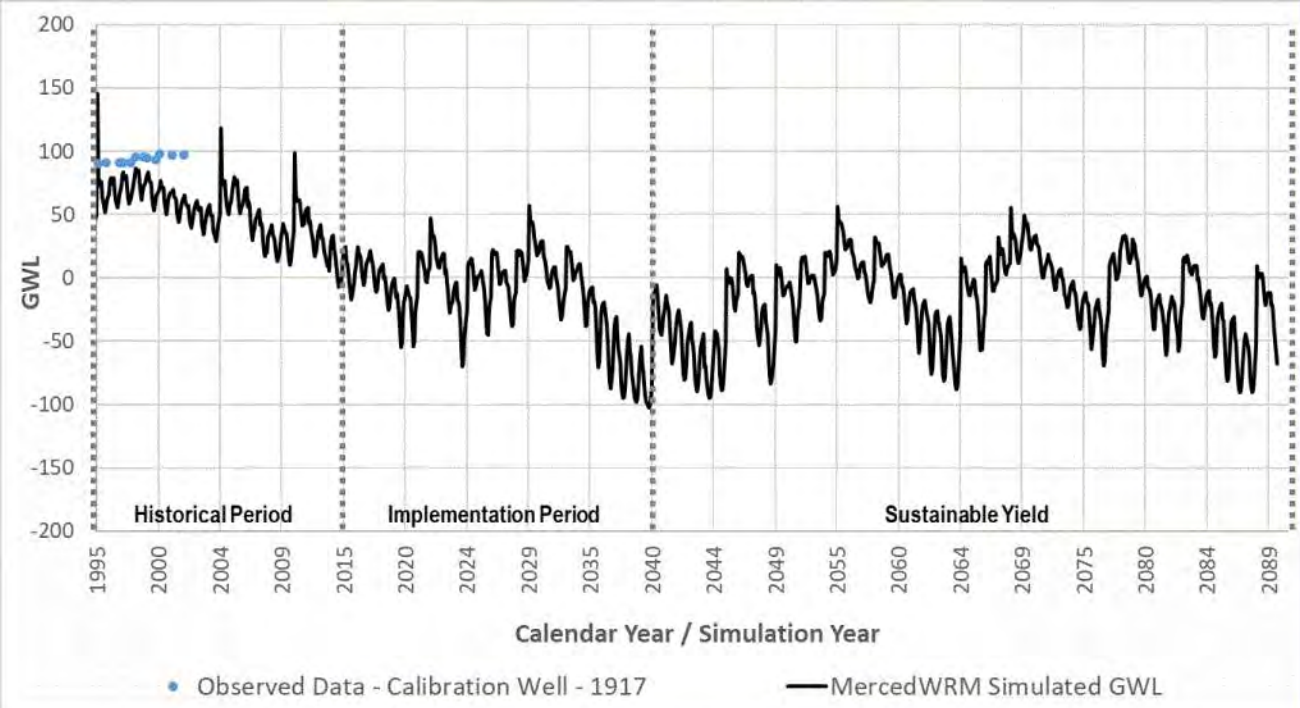
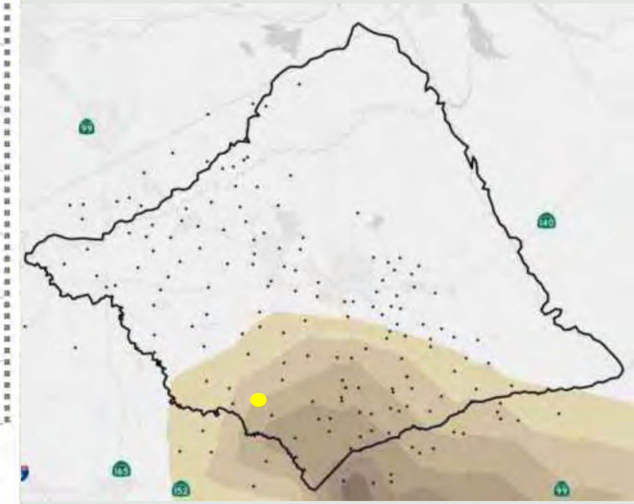
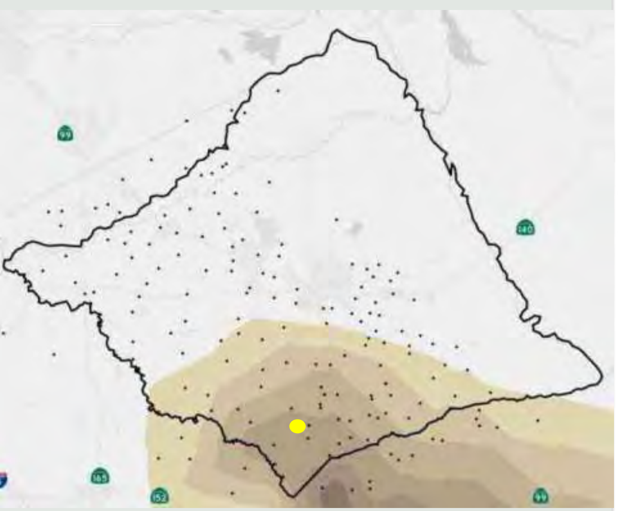
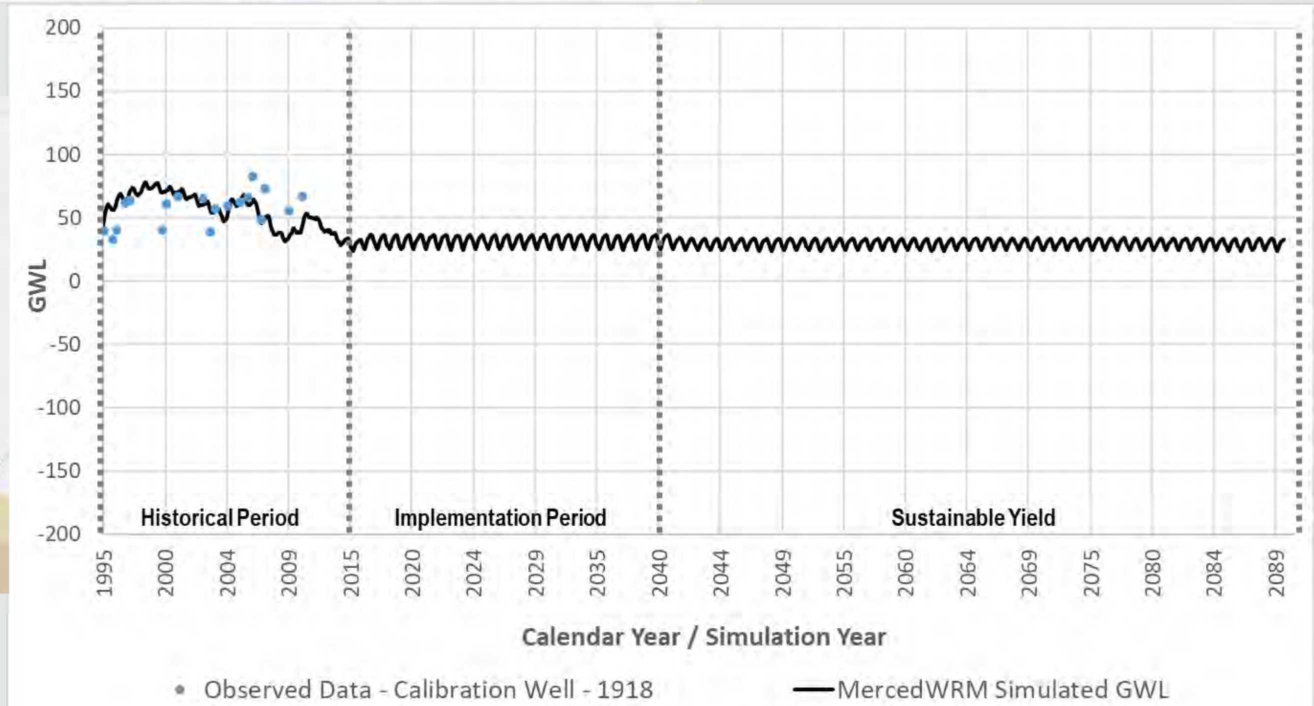
-150
Historical Period
Implementation Period
Sustainable Yield
1995 2000 2004 2009 2015 2020 2024 2029 2035 2040 2044 2049 2055 2060 2064 2069 2075 2080 2084 2089
Calendar Year / Simulation Year
Observed Data - Calibration Well - 2106
MercedWRM Simulated GWL


GWL
200
150
100
50
0
-50
-100
-150
-200
Historical Period
Implementation Period
Sustainable Yield
1995
2000
2004
2009
2015
2020
2024
2029
2035
2040
2044
2049
2055
2060
2064
2069
2075
2080
2084
2089
Calendar Year / Simulation Year
Observed Data - Calibration Well - 1917
MercedWRM Simulated GWL






GWL
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2075
2080
2084
2089
Calendar Year / Simulation Year
Observed Data - Calibration Well - 1918
MercedWRM Simulated GWL

Next Steps

- Identify strategies to return groundwater elevations to Jan 1 2015 levels in subsidence area
- Consider carving out management area as this area will need to be addressed differently than the rest of the basin
- Coordinate with neighboring basins on assumptions and thresholds for subsidence area

Image courtesy: Veronica Adrover/UC Merced

Projects and Management Actions

Image courtesy: Veronica Adrover/UC Merced

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Projects and Management Actions (overview)

- Projects should be implemented to help achieve sustainability management while minimizing impacts to groundwater beneficial users

- Projects and Management Actions can increase supply availability and / or reduce demand for groundwater
  - Evaluate supply-side options and their effect on yield
  - Evaluate various governance options (water market, etc.)

Image courtesy: Veronica Adrover/UC Merced

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Categories of Projects and Management Actions

- Flood/Stormwater Management
- Recycling
- Conservation
- Recharge
- Transfers

Image courtesy: Veronica Adrover/UC Merced

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Examples of Projects and Management Actions

- Intra-basin transfers
- Non-potable supply projects (expand recycled water use)
- Stormwater capture and recharge
- Conservation incentives
  - Improved water use efficiencies
  - Drought surcharges
  - Fallowing (fallowed land program)
  - Crop changes
- Potential ordinances
- Groundwater markets
- Pumping curtailments/fees

Image courtesy: Veronica Adrover/UC Merced

Next Steps

- Coordinate with GSAs and local agencies to understand what project and management options exist
- Identify potential options for inclusion in the GSP
- Determine affects of projects / management actions on basin conditions
- Develop implementation plan
- Revisit thresholds

Image courtesy: Veronica Adrover/UC Merced

What Information is Needed?

Project Details:

- Size
- Location
- Timeline
- Estimated Cost (Capital and O&M)
- Status of Design
- Permitting and Funding
- Project Partners and Beneficiaries Identified

Image courtesy: Veronica Adrover/UC Merced

Projects and Management Actions Discussion

- Preliminary thoughts on how best to solicit input and identify projects and management actions?
- What kinds of projects and actions do you want to consider?

Image courtesy: Veronica Adrover/UC Merced

CASGEM Update

Image courtesy: Veronica Adrover/UC Merced

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Public Outreach Update

Image courtesy: Veronica Adrover/UC Merced

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Public Outreach

- Public Outreach Meetings/Workshop - December
  - Project Update
  - Water Budgets
  - Management Actions and Projects
- Week of December 3
  - Any conflicts?

Image courtesy: Veronica Adrover/UC Merced

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Coordination With Neighboring Basins Update

Image courtesy: Veronica Adrover/UC Merced

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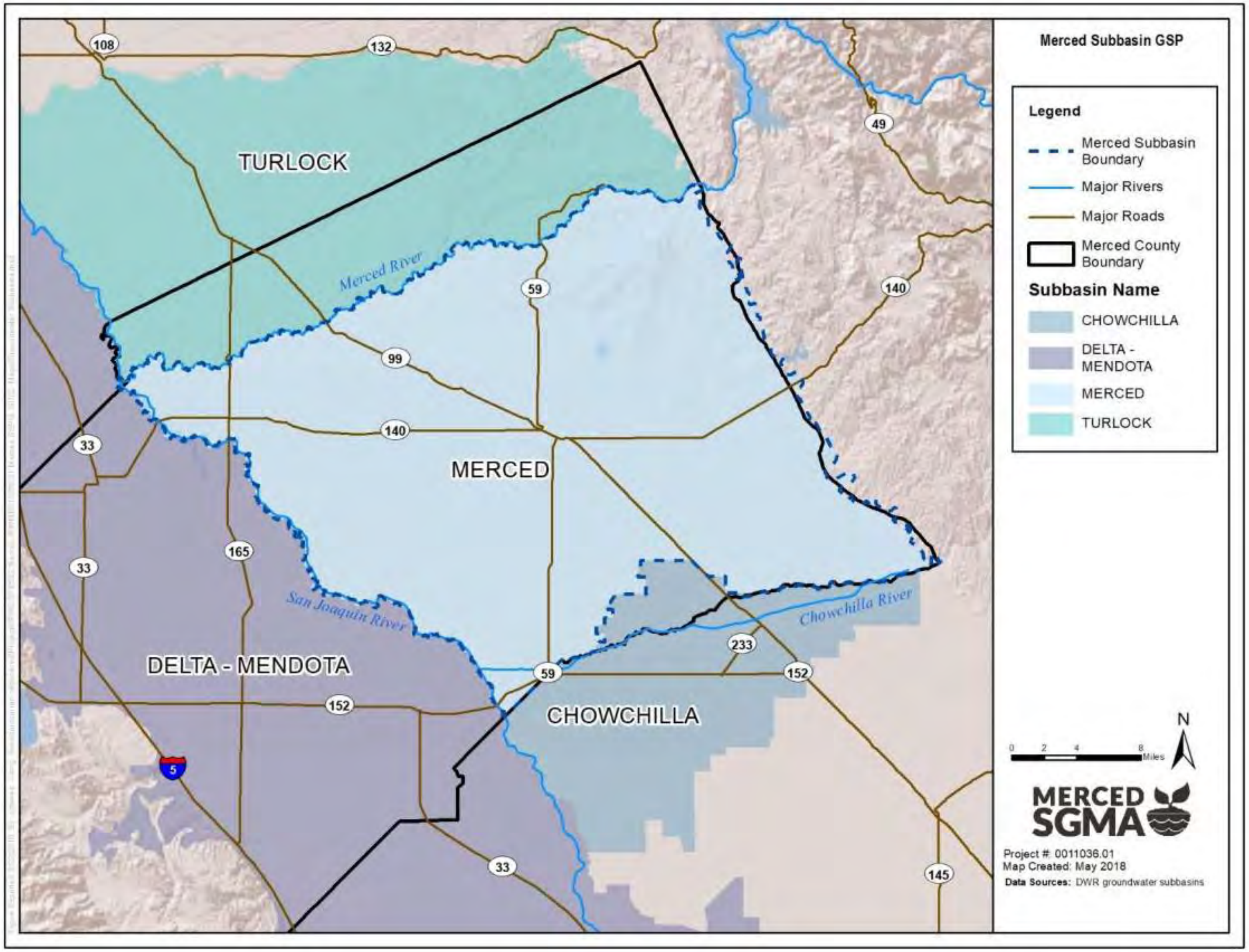
Coordination with Neighboring Basins



Inter-Subbasin Coordination

- Continued coordination on Chowchilla Subbasin Modeling Approach
- Preliminary discussion with Delta-Mendota Subbasin to understand timelines for future coordination

Image courtesy: Veronica Adrover/UC Merced

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Questions/Comments from Public

Image courtesy: Veronica Adrover/UC Merced

Next Steps

Image courtesy: Veronica Adrover/UC Merced

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Next Steps

- GSP Development Items:
  - Finalize water budgets and document assumptions for review and approval by GSAs (targeting November GSA Board Briefings)
  - Wrap up Sustainable Yield analysis
  - Identify projects and management actions for review and consideration

- Focus for October meeting
  - Projects and management actions

- Adjourn to next meeting (Monday, October 22, 2018 @ 1:30 PM, location Castle Airport)

Image courtesy: Veronica Adrover/UC Merced

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GSP Coordinating Committee

Coordinating Committee Meeting – September 24, 2018

Merced Irrigation-Urban GSA
Merced Subbasin GSA
Turner Island Water District GSA-1

Image courtesy: Veronica Adrover/UC Merced