



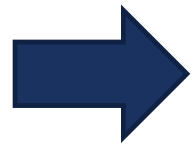
# TECHNICAL DISCUSSION SUSTAINABLE MANAGEMENT CRITERIA

JOINT TECHNICAL ADVISORY COMMITTEES (TACs) SPECIAL MEETING  
JULY 9, 2020



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# PRESENTATION OUTLINE



- Agenda Item #6: Projected Water Budgets Update
- Agenda Item #7: Sustainable Management Criteria

- Definition of Undesirable Results

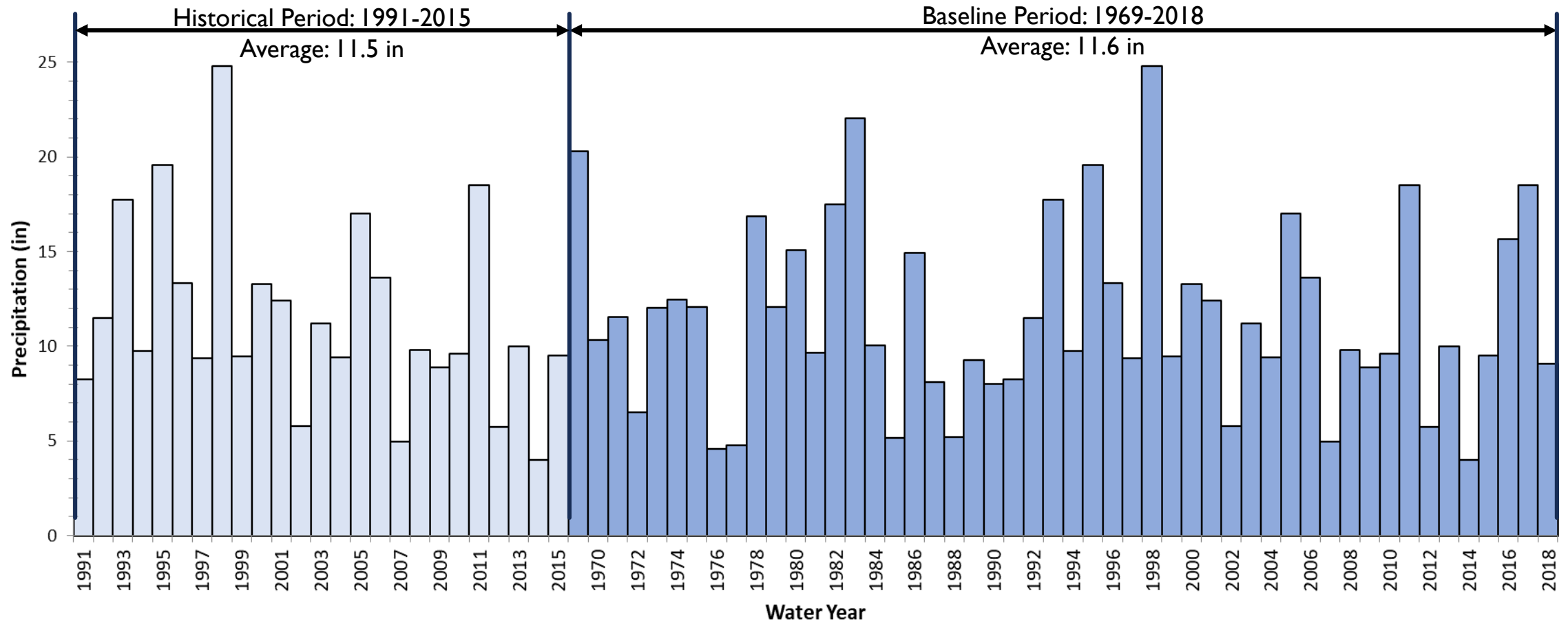


- Land Subsidence Draft Memorandum





# HYDROLOGIC PERIOD PRECIPITATION



□ Historical (1991 - 2015)    ■ Baseline (1969-2018)

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# AGRICULTURAL DATA UPDATE

## West Turlock GSA

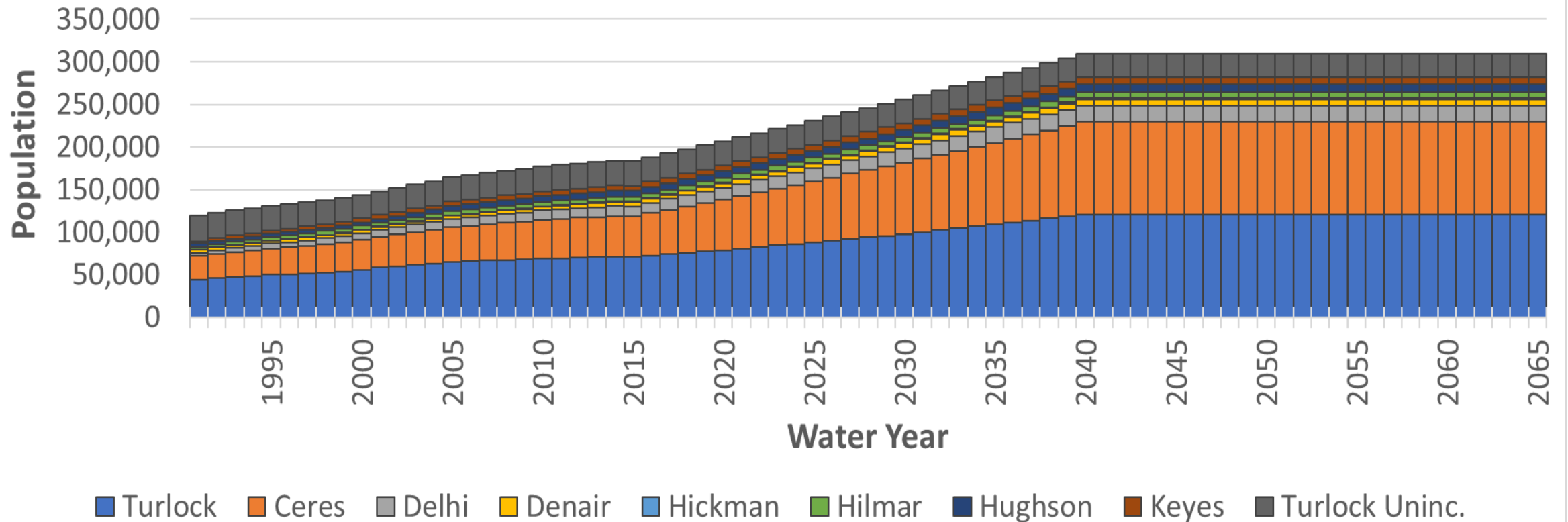
- TID working with team to provide:
  - Projected reservoir releases
  - Coordination with Modesto ID
  - Projected Turlock Lake operations
  - TID deliveries
- As needed:
  - Land use and cropping patterns
  - Groundwater wells and extractions

## East Turlock GSA

- As needed:
  - Land use and cropping patterns
  - Groundwater wells and extractions

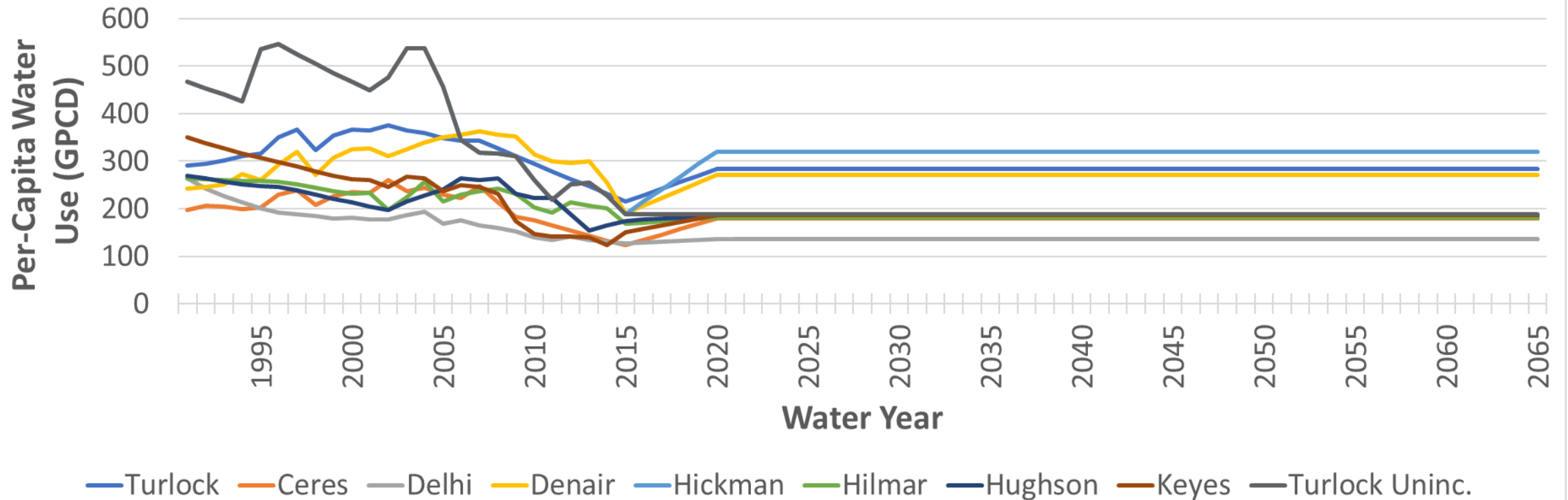


# URBAN DATA UPDATES POPULATION GROWTH



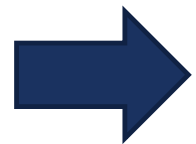


# URBAN DATA UPDATES PER CAPITA WATER USE



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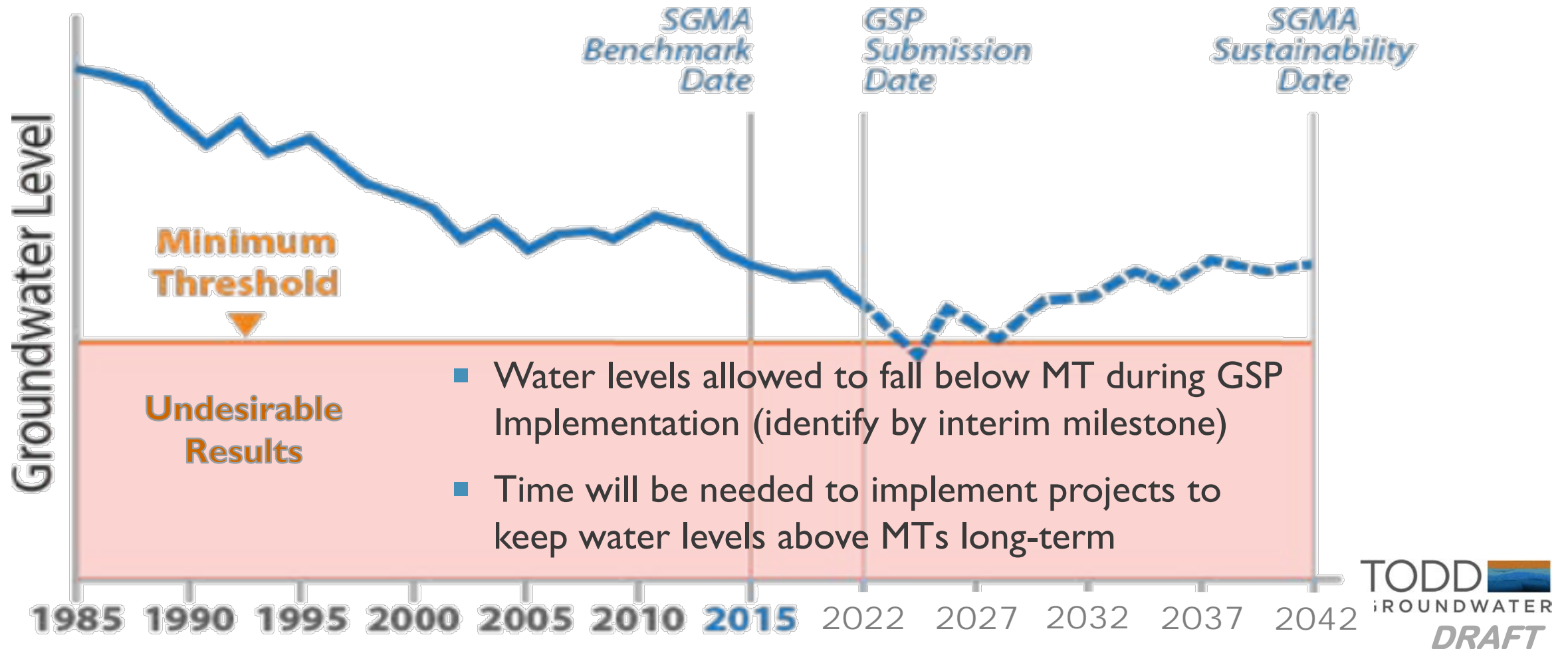


- Definition of Undesirable Results

- Land Subsidence Draft Memorandum

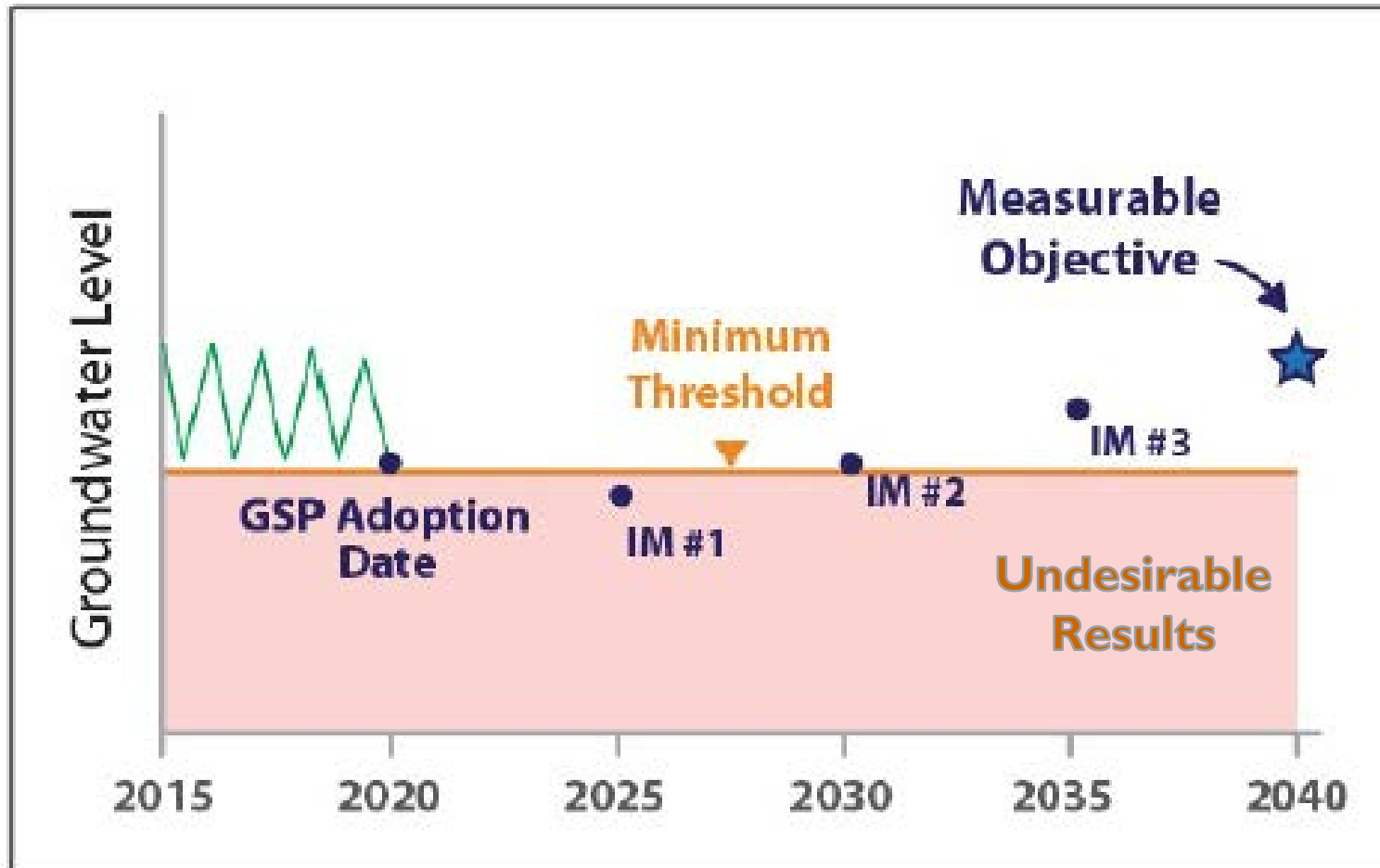


# UNDESIRABLE RESULTS DEFINED BY MINIMUM THRESHOLD



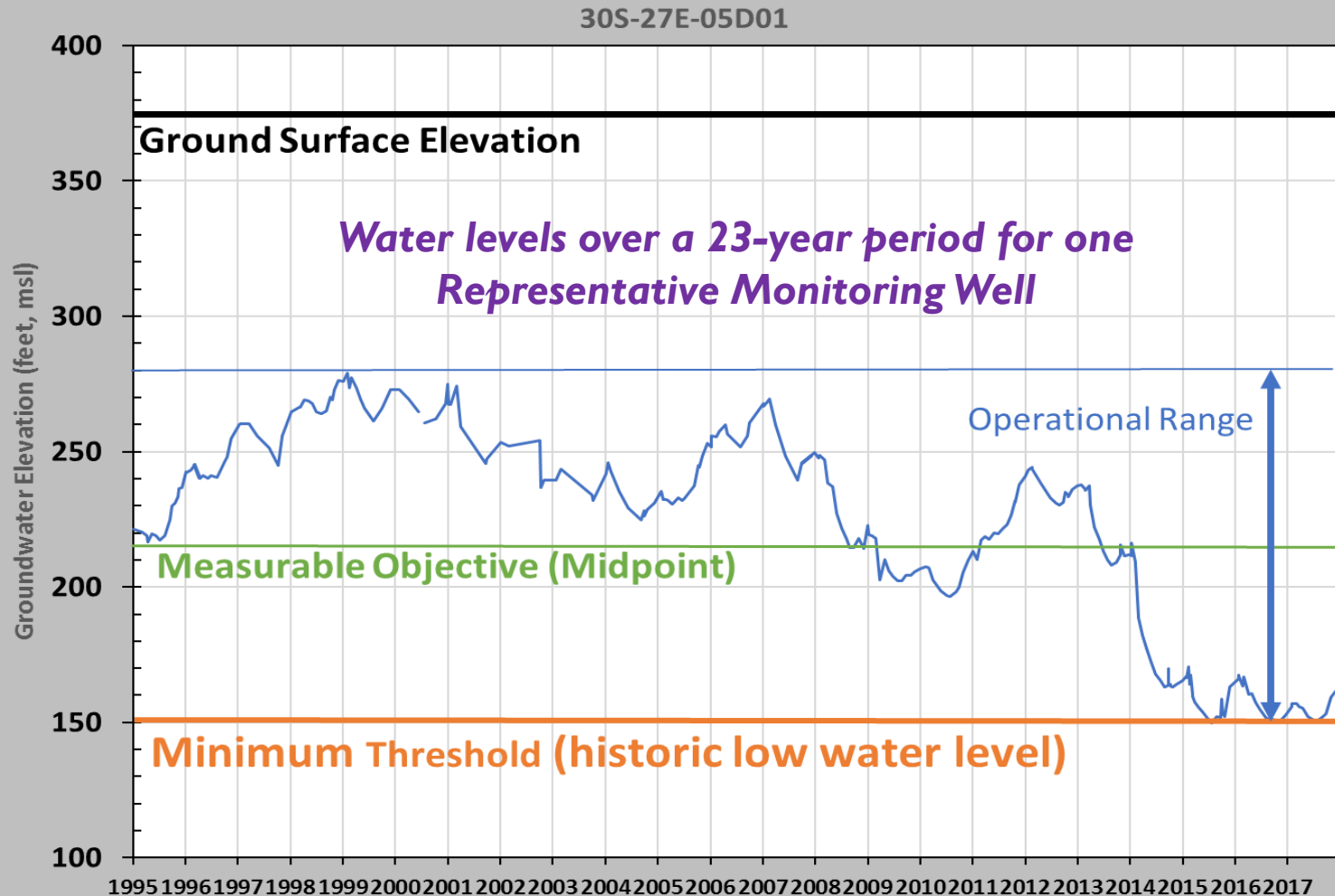


# UNDESIRABLE RESULTS DEFINED BY MINIMUM THRESHOLD



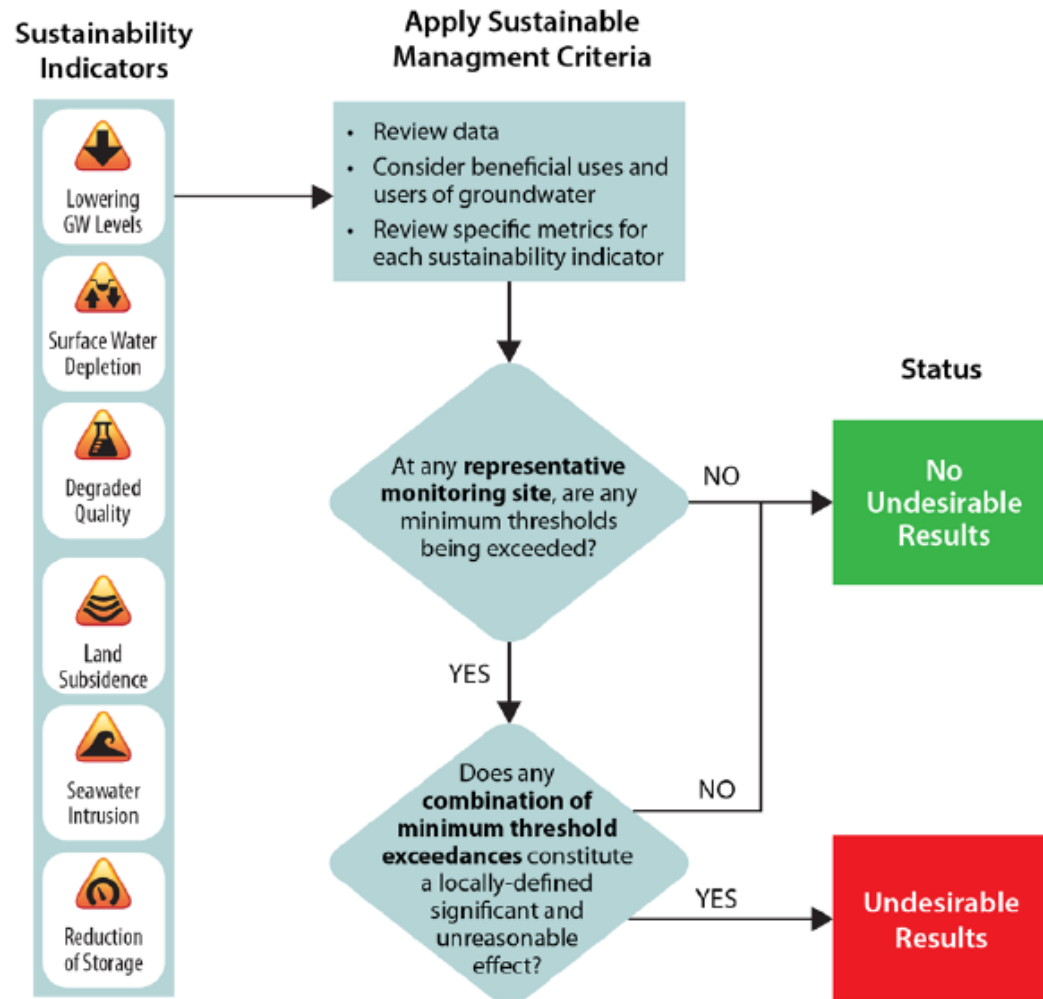
- Interim Milestones provide a buffer to meet MTs in the Implementation Period
- Measurable Objective is an operational target to ensure MT exceedances (and undesirable results) are avoided

# EXAMPLE FROM KERN SUBBASIN SUSTAINABLE MANAGEMENT CRITERIA









- Hydrograph from GSP Representative Monitoring Well
- Historic high and low water levels provide a operational range for water levels
- Historic low water levels selected as a minimum threshold (MT)
- The midpoint water level was selected as the Measurable Objective (MO) for a target water level on a moving average basis

# CONCEPT OF COMBINATION OF MT EXCEEDANCES INCORPORATED INTO UNDESIRABLE RESULTS



- GSAs may define undesirable results using a combination of Minimum Threshold exceedances
- One well exceeding a MT during one sampling event may not be sufficient to trigger undesirable results
- Definition can consider combination of number of wells and number of times when exceedances occur

# EXAMPLE SUSTAINABLE MANAGEMENT CRITERIA MERCED SUBBASIN

Sustainability Indicator	Minimum Threshold (MT)	Measurable Objective	Undesirable Result
 Groundwater Levels	Depth of shallowest well in a 2-mile radius of each representative well or minimum pre-January 1, 2015, elevation	Projected average future groundwater level under sustainable yield modeling simulation	Greater than 25% of representative wells fall below MT in 2 consecutive wet, above normal, or below normal years <sup>1</sup>
 Groundwater Storage	Not applicable - not present and not likely to occur in the Subbasin due to the significant volumes of freshwater in storage		
 Seawater Intrusion	Not applicable - not present and not likely to occur due to the distance between the Subbasin and the Pacific Ocean (and Sacramento-San Joaquin Delta)		
 Degraded Water Quality	1,000 mg/L TDS	500 mg/L TDS	At least 25% representative wells exceed MT for 2 consecutive years
 Land Subsidence	-0.75 ft/year	-0.25 ft/year	Exceedance of MT at 3 or more representative sites for 2 consecutive years
 Depletions of Interconnected Surface Waters	Groundwater levels used as a proxy for this sustainability indicator		







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# WORKING DEFINITIONS

## UNDESIRABLE RESULTS FOR THE TURLOCK SUBBASIN

	Significant and unreasonable water level declines such that water supply wells are adversely impacted during multi-year droughts in a manner that cannot be readily managed or mitigated.
	Significant and unreasonable depletions of groundwater in storage have not occurred and are not likely to occur in the Turlock Subbasin. Manage storage through sustainable yield and water levels.
	Seawater intrusion is not applicable to the Turlock Subbasin. In accordance with GSP regulations, no sustainable management criteria are established.
	Undesirable results would occur when significant and unreasonable impacts to groundwater quality, as caused by water management actions, affect the beneficial use of groundwater by overlying users.
	Significant and unreasonable inelastic land subsidence that adversely affects land use or reduces the viability of the use of critical infrastructure (critical infrastructure to be determined).
	Model surface water depletions associated with management actions and GSP projects and consider impacts to land uses. Water levels can also serve as a proxy.

# FRAMEWORK FOR MT EXCEEDANCES UNDESIRABLE RESULTS (URs) FOR THE TURLOCK SUBBASIN



URs will be evidenced by an exceedance of minimum thresholds (minimum water levels to be determined) in xx% of GSP monitoring wells in # consecutive semiannual monitoring events.



Significant and unreasonable depletions of groundwater in storage have not occurred and are not likely to occur in the Turlock Subbasin. Manage storage through sustainable yield and water levels.



Seawater intrusion is not applicable to the Turlock Subbasin. In accordance with GSP regulations, no sustainable management criteria are established.



URs will occur when the MT for an individual constituent of concern is exceeded in greater than xx% of the designated monitoring points within the Subbasin or within xx% of municipal drinking water wells in two consecutive monitoring events. MTs will be based on relevant drinking water standards.



This will be evidenced by an exceedance of MTs (to be determined) at x# of land subsidence monitoring locations (may include CGPS stations, RMWs, etc.) measured in two consecutive spring monitoring events. GSP monitoring events may be supplemented by annual screening-level analysis using InSAR data provided by DWR and tabulated in each annual report.



Depends on appropriate MTs from modeling.

# QUESTIONS AND COMMENTS?



- Comments on working definitions? Provide by July 20; discuss at July 25 TAC meeting.
- MT selection will be facilitated by projected water budget modeling
- Begin identification of monitoring wells for incorporation into GSP program at next TAC meeting
  - Appropriate CASGEM wells
  - Additional wells available for long-term access
  - Coordinate with other programs, including TSS funding in Turlock Subbasin
  - Targeted locations for monitoring wells under the DWR Grant



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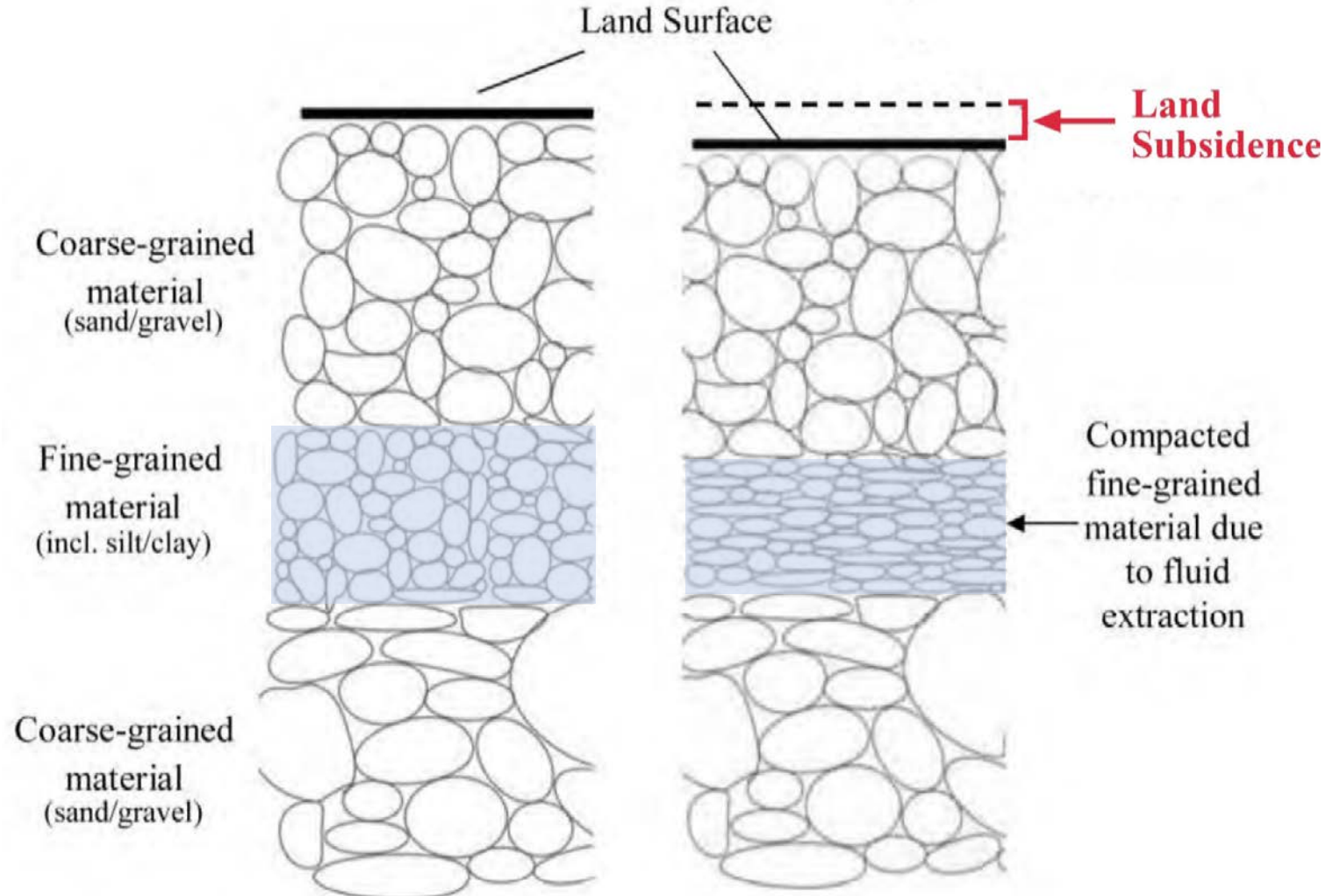


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# LAND SUBSIDENCE CONCEPTUAL DIAGRAM

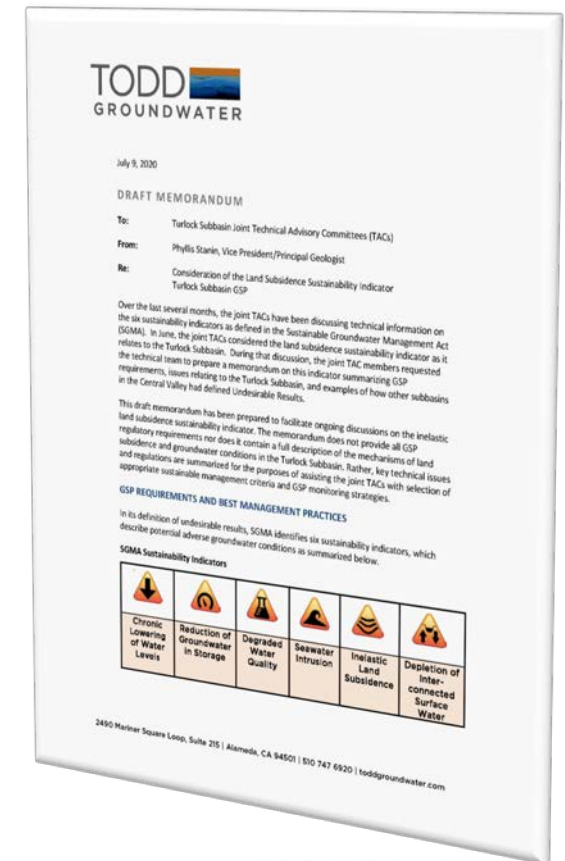


- Declining water levels decrease pore pressure
- Can lead to subsurface compaction of fine-grained material, allowing the land surface to sink
- Most of the land subsidence in the Central Valley is associated with the Corcoran Clay



# TECHNICAL MEMORANDUM ON LAND SUBSIDENCE

- Draft Technical Memorandum on Land Subsidence
- Summarizes GSP requirements and BMPs for selection of sustainable management criteria
- Includes technical materials discussed in previous meetings of the joint TACs
- Provides options for monitoring and selection of MTs
- Attachment I: Examples of Undesirable Results definitions from other GSPs





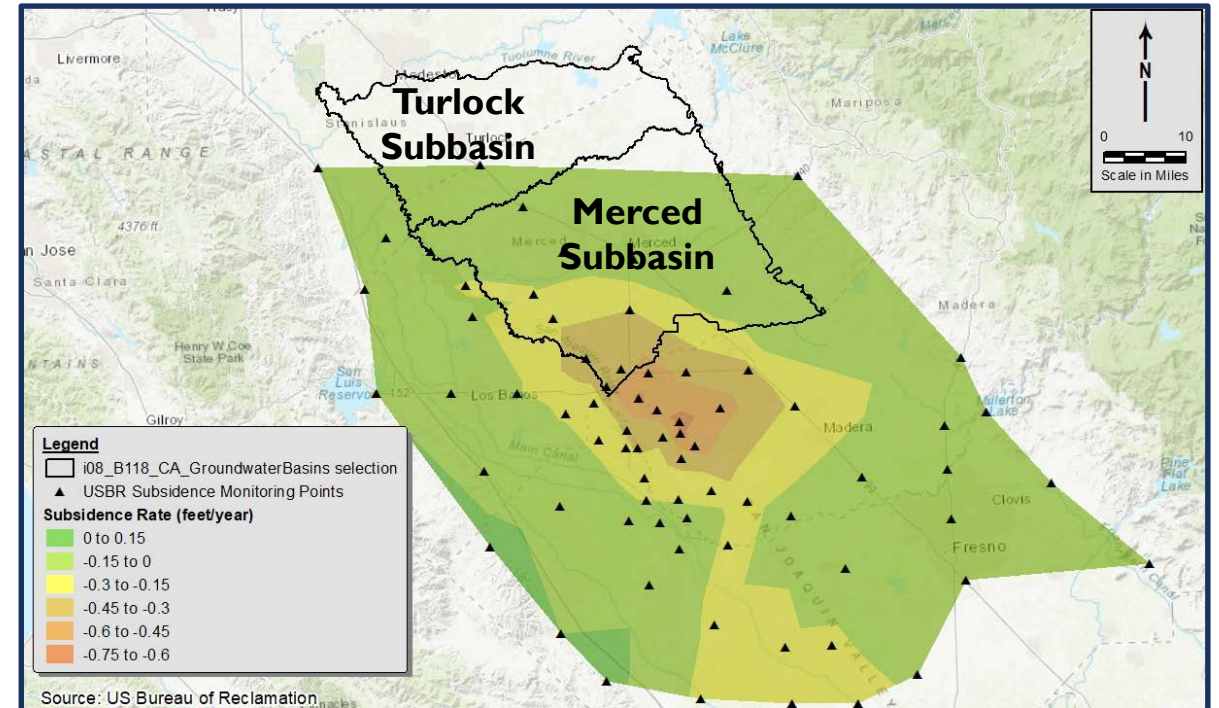
# EXAMPLE - MERCED SUBBASIN SUBSIDENCE SUSTAINABLE MANAGEMENT CRITERIA

## Undesirable results - definition

- Significant and unreasonable reduction in the viability of the use of infrastructure over the planning and implementation horizon of the GSP.
- Land subsidence that substantially interferes with surface land uses causes damage to public and private infrastructure (e.g., roads and highways, flood control, canals, pipelines, utilities, public buildings, residential and commercial structures).

## Undesirable results - identification

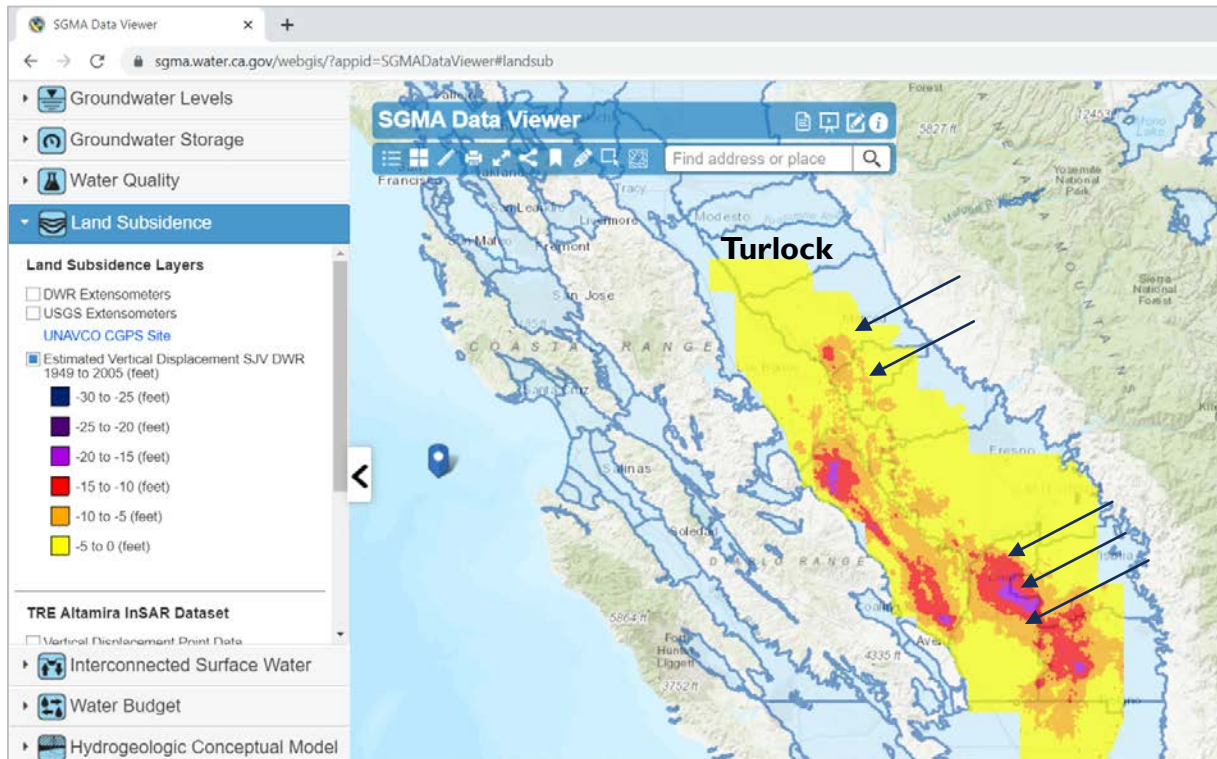
- Exceedance of minimum threshold (MT) rates of land subsidence at three or four (of four) monitoring sites for two consecutive years, where both years are categorized as hydrologically below normal, above normal or wet.







# ADDITIONAL EXAMPLE DEFINITIONS UNDESIRABLE RESULTS FOR LAND SUBSIDENCE



Examples of Undesirable Results from 5 GSPs: Merced, Chowchilla, Greater Kaweah, Mid-Kaweah, and Tulare Lake

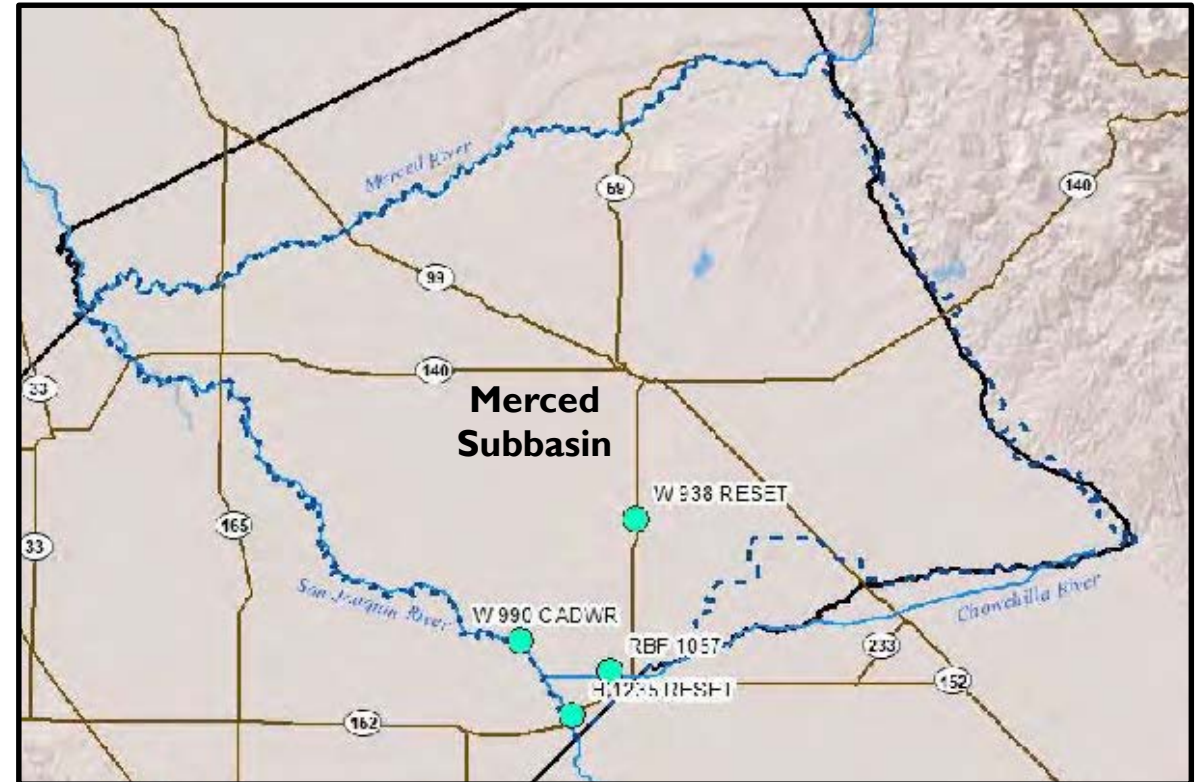
- Some definitions select MT as historic low water level where critical infrastructure has already been impacted; continued subsidence in those areas were judged unacceptable
- Water levels can be hard to correlate to rates of subsidence; challenges include long well screens, unknown well construction, and local water levels that are not indicative of the regional problem
- MTs rely on more than one monitoring point recognizing that inelastic land subsidence is a regional issue
- Recognize the need to coordinate with adjacent Subbasins in southern valley areas
- Several GSPs report areas with documented land subsidence but without affects on land use or infrastructure; differential land subsidence is associated with most adverse impacts



# MERCED SUBBASIN SUBSIDENCE SUSTAINABLE MANAGEMENT CRITERIA

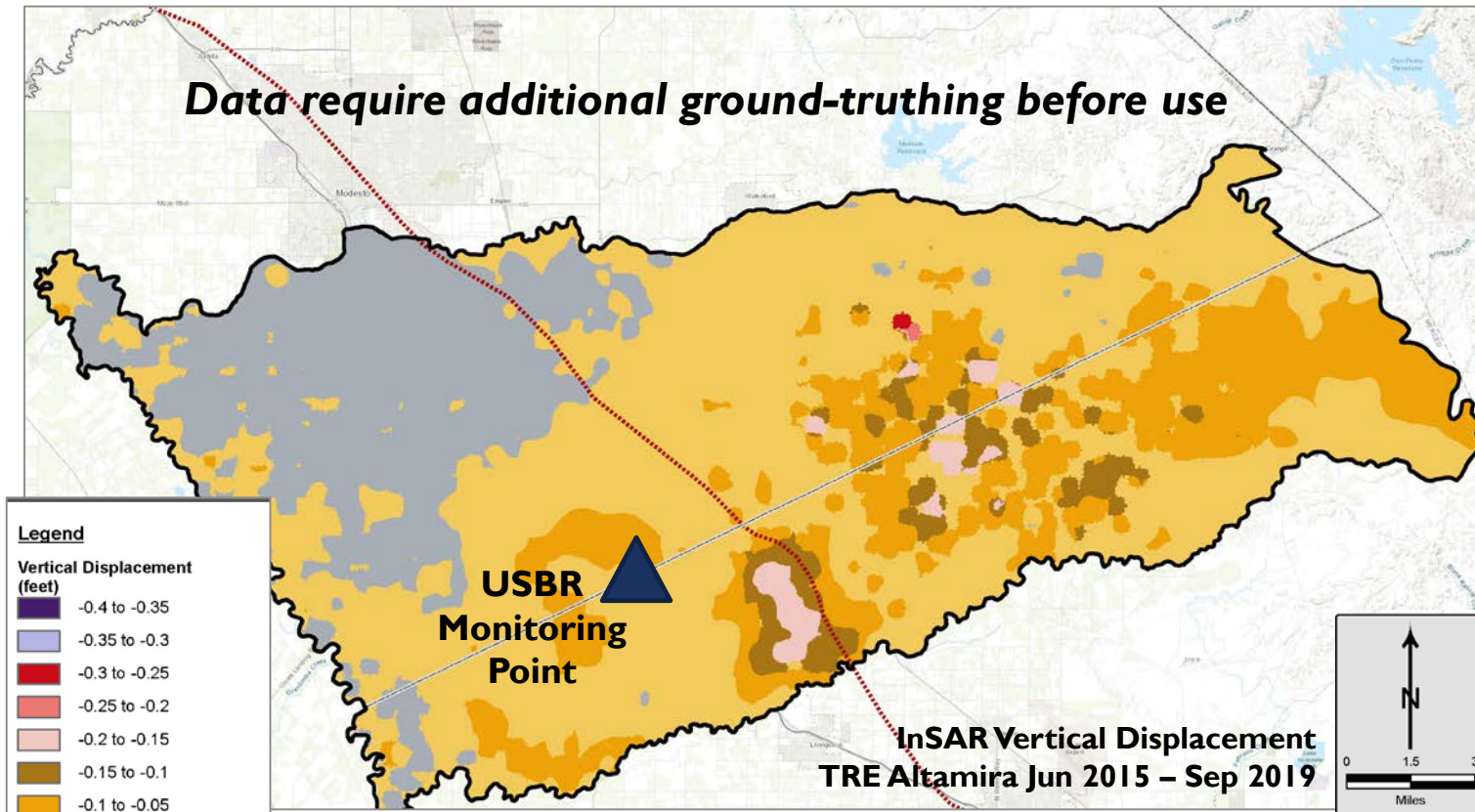
## Minimum thresholds:

- Defined for 4 USBR monitoring points in the southwestern Merced Subbasin
- Maximum annual subsidence rates from 2011 to 2018 ranged from -0.58 to -0.67 feet per year (No undesirable results during this time)
- Minimum threshold set at -0.75 feet per year (more than maximum annual values measured from 2011 to 2018)
- Minimum threshold may be reconsidered if additional information becomes available on the sensitivity of existing infrastructure





# LAND SUBSIDENCE TURLOCK SUBBASIN MONITORING STRATEGIES



*Small vertical displacements over 4-year period; maximum rate  
0.05 feet/year (Merced Subbasin 0.75 feet/year)*

- USBR Monitoring Station with direct measurements (semiannual)
- Online DWR InSAR data for screening analysis
- Direct monitoring
  - Continuous GPS Station
  - Extensometer
- Water Levels as a proxy
  - MTs at historic low water levels mitigate future subsidence



# NEXT STEPS

- Comments on Land Subsidence memorandum by July 20
- Projected Water Budgets and Sustainable Yield Analysis
- Select preliminary Sustainable Management Criteria
  - Identify monitoring program
- Projects and Management Actions to meet Subbasin Sustainable Yield



# QUESTIONS?



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