



COLUSA SUBBASIN

Colusa Subbasin GSP Revisions

Joint Technical Advisory Committee Meeting

March 9, 2024

Agenda

- 1. Timeline Review**
- 2. Takeaways from DWR Meetings (through 02/16) and Joint GSA Board Direction**
- 3. Discussion of Proposed Revisions:**
 - 1. Groundwater Level SMC**
 - 2. Subsidence Monitoring and SMC**
- 4. Next Steps**

Timeline Review

Feb 2024	02/09 – Joint TAC Meeting 02/16 – DWR Meeting #3 02/23 – Joint Board Meeting
Mar 2024	03/08 – Joint TAC Meeting 03/11-03/14 – DWR Meeting #4 03/22 – Joint Board Meeting 03/27 – Draft Revised GSP for Review
Apr 2024	04/09 – Comments on Draft Revised GSP 04/12 – Joint GSA Board Meeting (Review Draft Revised GSP and Comments) 04/16 – Final Revised GSP Released 04/19 – Joint GSA Board Meeting (Adopt Revised GSP) 04/22 – Submit Revised GSP

Takeaways from DWR Meetings (through 02/16) and Joint GSA Board Direction

Deficiencies As Outlined in DWR's Review Letter

1. **Overdraft:** “The GSP does not include a reasonable assessment of overdraft conditions and reasonable means to mitigate overdraft.”
2. **Groundwater Levels (GWL):** “The GSP does not establish sustainable management criteria (SMC) for chronic lowering of groundwater levels in a manner substantially compliant with the GSP regulations.”
3. **Subsidence:** The GSP does not establish SMC for land subsidence in a manner substantially compliant with the GSP regulations.

Our discussions are focused only on these deficiencies and the efforts needed to resolve these sufficiently.

Takeaways from DWR Meetings (Through 02/16)

- DWR's main concerns, priorities:
 - Existing conditions don't indicate the subbasin is on track to reach sustainability.
 - Undesirable results (URs) must be justified (DWR senses that URs have happened).
- The revisions should focus on:
 - Developing management actions as backstops to address overdraft, GW conditions.
 - Revising the SMC for more justifiable URs, minimum thresholds (MTs).
- Proposed GSP revision approaches are on the right track:
 - Proposed management actions to mitigate overdraft, subsidence and groundwater level decline (domestic well mitigation, demand management), with a timeline and framework.
 - GWL SMC revisions to avoid significant/unreasonable conditions (dry wells, subsidence), but allowing for different GWL that lead to those conditions in different areas.

Approaches Discussed with DWR and Joint Board Direction

- **Overdraft**

- Move forward with overdraft revisions based on groundwater levels (Annual Report approach)
- Provide for recurring evaluation each year (Annual Report)

- **PMAs**

- **Projects** (*lower priority*): Update available details on timeline, benefits
- **Management Actions** (*higher priority*): “Formal Agreement” approach
 - Understand that approach is conceptually suitable, but need to provide sufficient detail
 - Prepare draft “Formal Agreement” content to review with GSAs, DWR

- **SMC Revisions:**

- Groundwater levels and subsidence:
 - Revise URs, MTs to represent “unreasonable” conditions, with justification
 - Clarify relationship between groundwater level SMC and subsidence
- Subsidence-specific:
 - No ongoing subsidence after 2042 (SGMA requirements)
 - More frequent subsidence monitoring vs. SMC (InSAR)
 - Evaluate subsidence impacts to critical infrastructure

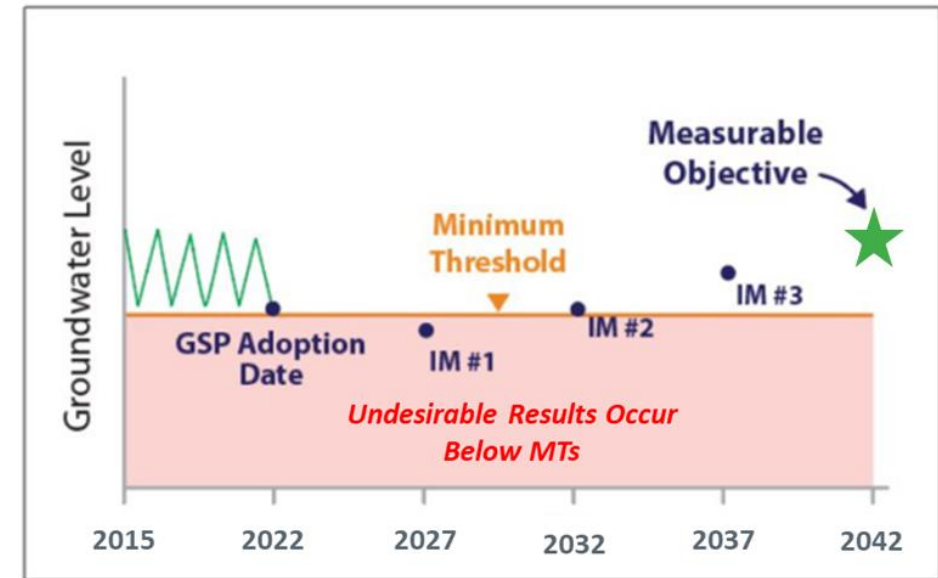
Focus
Today



Proposed Revisions: Groundwater Level (GWL) SMC

Relationship Between Sustainable Management Criteria (SMC)

- **Undesirable Results (URs):** Significant and unreasonable reduction of GWL, depletion of supply (*avoid*)
- **Minimum Thresholds (MTs):** GWL at RMS wells that, when exceeded, may cause URs (*avoid*)
- **Measurable Objectives (MOs):** GWL at RMS wells that reflect desired, sustainable conditions (*goal at 2042*)
- **Interim Milestones (IMs):** GWL targets, in five-year increments, representing the trajectory toward the MOs (*goals in 2027, 2032, 2037*)



Source: DWR, 2017. Sustainable Management Criteria Best Management Practices.

Groundwater Level (GWL) SMC: Deficiency Recap

- “The GSP does not establish SMC for chronic lowering of groundwater levels in a manner substantially compliant with the GSP regulations.”
- **Key Needs:**
 - Clearly justify why URs and MTs represent significant and unreasonable conditions, especially for domestic well users and GDEs, and why conditions before then do not. *(Requires rephrasing UR definitions and revising MTs.)*
 - Show clear consideration of PMAs that will supply alternate supplies of water and mitigate impacts to domestic wells (e.g., municipal connections, well mitigation).
 - Clarify relationship between GWL SMC and subsidence, if revised GWL SMC are lower than historical (pre-SGMA) levels.

GWL SMC: Undesirable Results (URs)

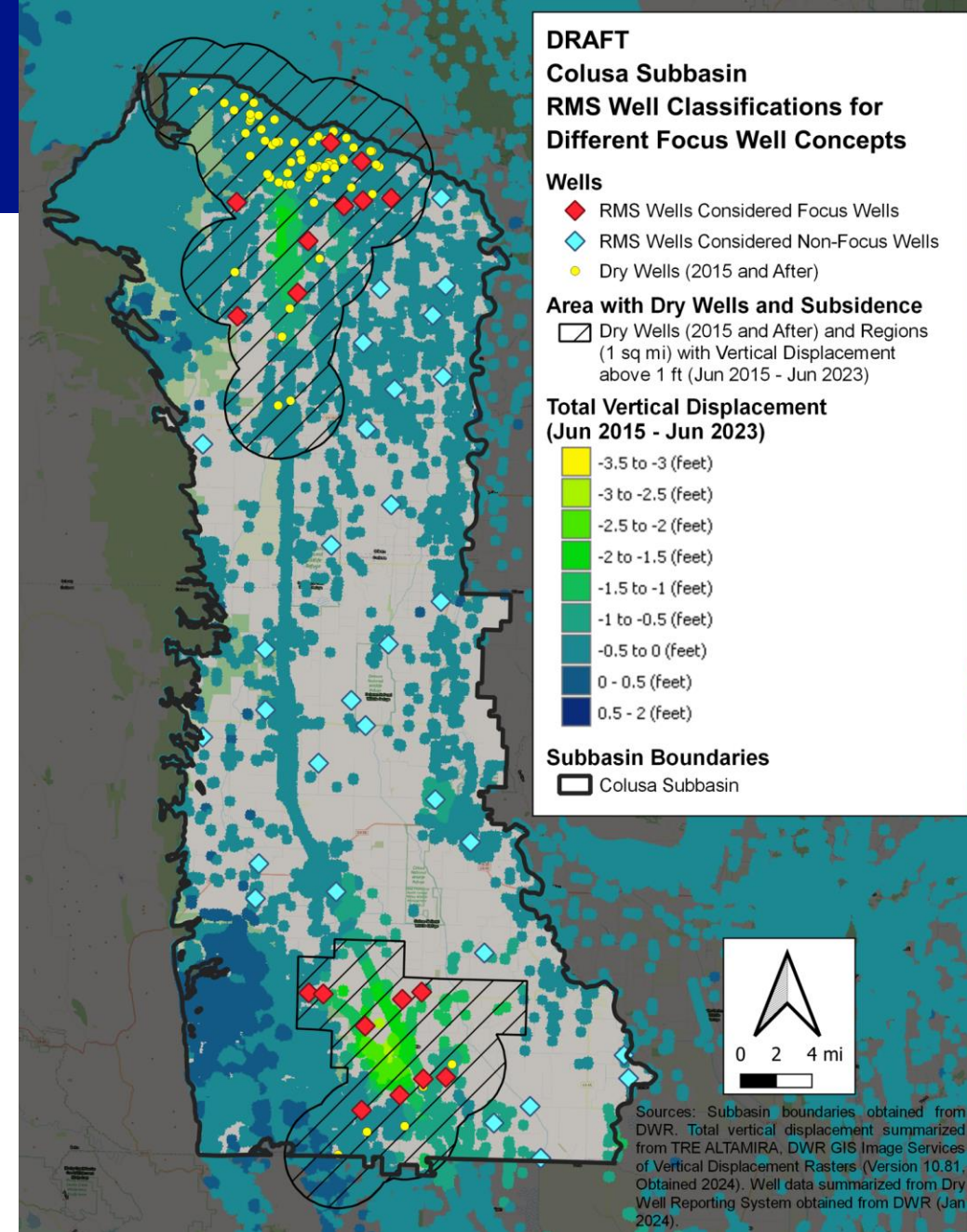
- Need to update UR definitions:
 - Describe what URs are (conditions that are significant/unreasonable) and impacts to beneficial users
 - Justify criteria for identifying (e.g., MT values and exceedance)
- Current Definition (Jan 2022) is vague, per DWR:
 - “A result that would cause significant and unreasonable reduction in the long-term viability of beneficial uses and users over the planning and implementation horizon of this GSP.”
 - “...Experienced if sustained groundwater levels are too low to reasonably satisfy beneficial uses/users”
 - Considered to occur when 25% or more of RMS wells fall below their MTs for 24 consecutive months
- **Need clarity –**
 - **What conditions are significant and unreasonable? (consider conditions in 2020-2022)**
 - **When do conditions reach the point of being significant and unreasonable? (consider localized issues)**

GWL SMC: Proposed Revisions to URs

- Revise definition to speak to conditions that occurred in 2020-2022:
 - “A result that would cause a significant and unreasonable reduction in groundwater supplies to meet beneficial uses and users’ needs over the planning and implementation horizon of this GSP.”
 - Beneficial uses and users include well users (domestic, industrial, agricultural), environmental users (including GDEs), land uses/users, property interests
 - Experienced if GWL declines result in:
 - Dry wells at rates observed in 2020-2022 (evaluated as a rate of dry wells per Thiessen polygon)
 - Adverse impacts to subsidence conditions at rates observed since SGMA (especially 2020-2022)
 - Evaluated by the subsidence monitoring network
 - Conditions that fail to meet the subsidence interim milestones (IMs) or that approach the MTs
 - Adverse impacts to the environment
 - Evaluated by the interconnected surface water (ISW) monitoring network
 - Conditions that fail to meet the ISW IMs or that approach the ISW MTs
- Provides clearer, justifiable basis for impacts to beneficial uses and users, subsidence and the GWL causing impacts.

GWL SMC: Proposed Revisions to MTs

- **Minimum Thresholds (MTs):** Based on 2020-2022 groundwater elevation data
 - **“Focus RMS Wells”:** MT is the **2020-2022 low** (in areas with dry wells and/or subsidence since 2015)
 - **“Non-Focus RMS Wells”:** MT is the **2020-2022 low – margin (~10-25 feet depending on local conditions)** (in areas without dry wells and/or subsidence since 2015)
 - Margin of operational flexibility selected to be protective of well impacts and subsidence (whichever is more limiting)
 - Analysis conducted for each RMS well, analyzing:
 - Risk of well impacts in surrounding area (i.e., Thiessen polygon)
 - Risk to subsidence (based on GWL-subsidence relationship)
 - Considerations:
 - Known conditions in 2020-2022 (undesirable, challenging)
 - Some wells do not have 2020-2022 data, use earlier period as needed
- **URs** occur if 12.5% of RMS wells (6 out of 48) exceed their MTs over a two-year period (average GW elevation)



Well Impacts Analysis

Well Impacts in Excess of 2020-2022 Impacts (to be mitigated)

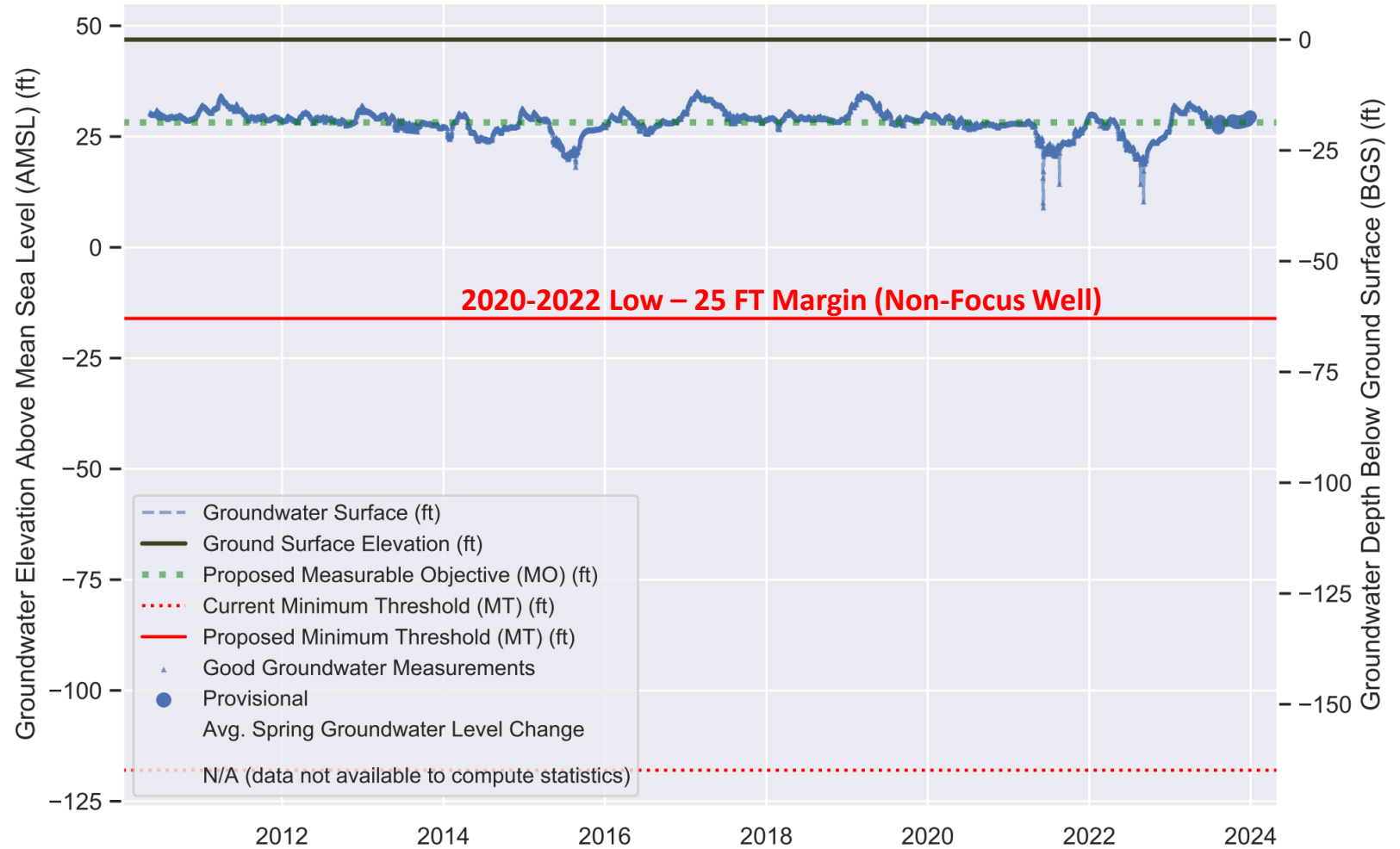
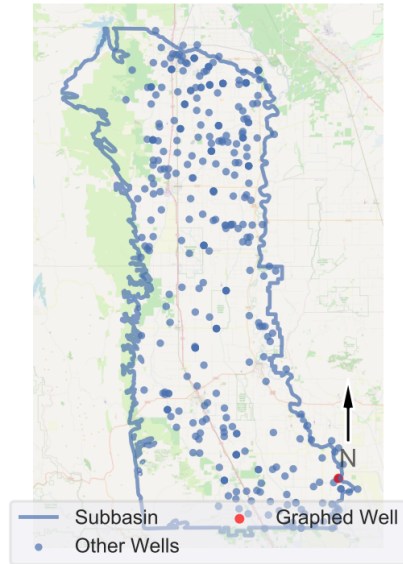
Scenario	Total Well Impacts (% Totals Wells)	Domestic (% Total)	Industrial (% Total)	Agriculture (% Total)
<i>Pre-SGMA Historical Low (< Jan 1, 2015)</i>	0 (0%)	0 (0%)	0 (0%)	0 (0%)
<i>2020-2022 low (all RMS wells)</i>	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Initial GSP MTs (lower of 20% domestic well impacts, or 50% below historical range)	728 (11%)	596 (16%)	8 (8%)	124 (5%)
Proposed MT Revision, Lower Bound (2020-2022 low for Focus RMS Wells, 2020-2022 low - 10 ft elsewhere)	38 (1%)	31 (1%)	0 (0%)	7 (0%)
Proposed MT Revision, Upper Bound (2020-2022 low for Focus RMS Wells, 2020-2022 low - 25 ft elsewhere)	153 (2%)	129 (4%)	1 (1%)	23 (1%)
2020-2022 low - 10 ft (all RMS wells)	121 (2%)	96 (3%)	3 (3%)	22 (1%)
2020-2022 low - 20 ft (all RMS wells)	265 (4%)	210 (6%)	4 (4%)	51 (2%)
2020-2022 low - 40 ft (all RMS wells)	581 (9%)	464 (13%)	7 (7%)	110 (4%)

- Scenarios describe groundwater elevations at RMS wells
- Analysis incorporates a 20 ft buffer for well impacts (i.e., wells were impacted if GWL dropped within 20 ft of the bottom perforation)
- Levels at RMS wells are applied across the area surrounding that well to identify impacts (i.e., Thiessen polygon method)
- **All domestic well impacts would be mitigated under the Domestic Well Mitigation Program**

COLUSA Subbasin - State Well Number (SWN): 14N01E35P003M

Perforation 1 (P1): 135.0 - 145.0; P2: 215.0 - 225.0 ft BGS

Well Location Map

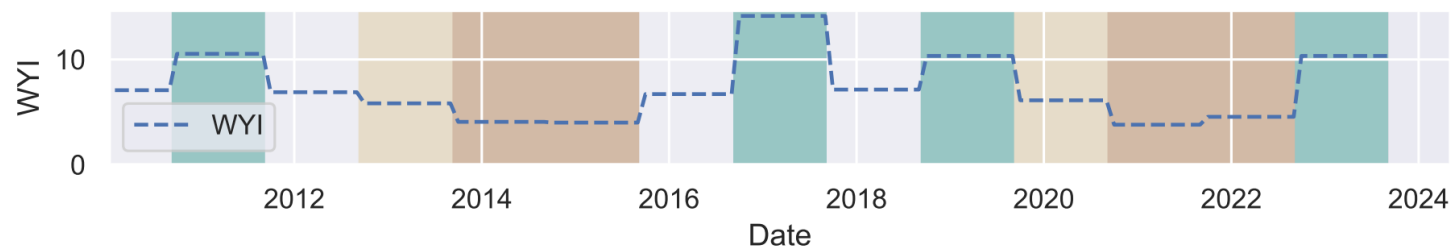
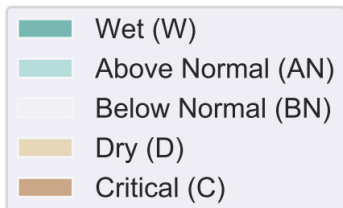


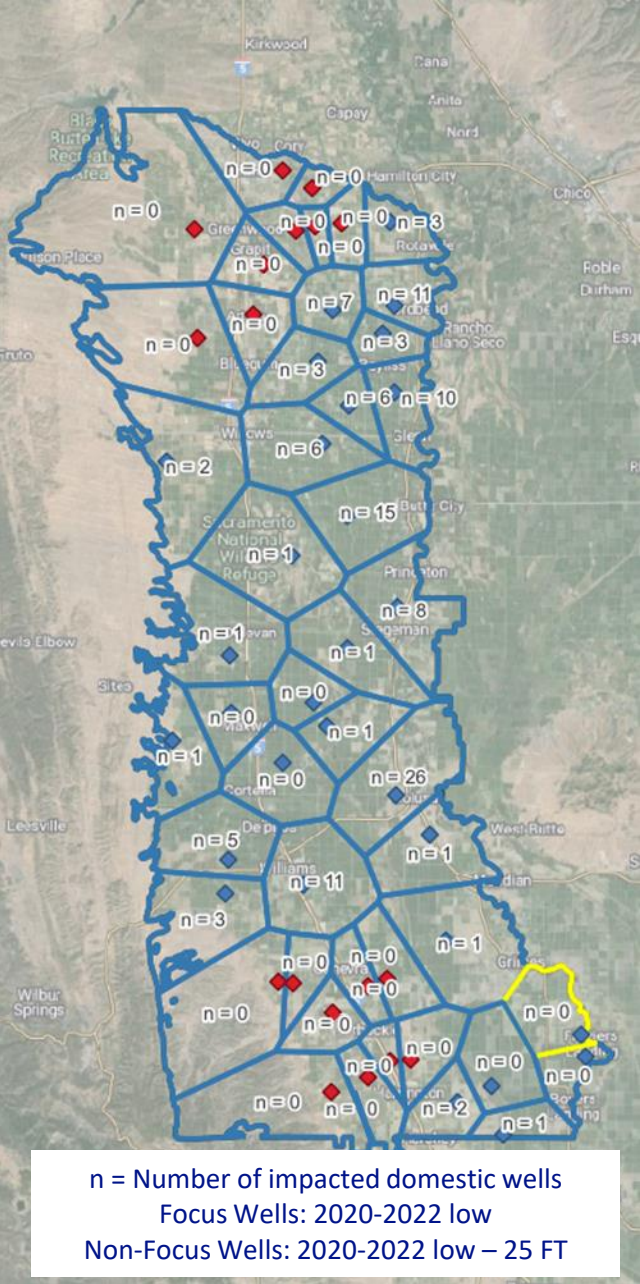
Sustainable Management Criteria:

IM (2027) = 28.0 ft AMSL
 MO = 28.0 ft AMSL
 MT = -118.0 ft AMSL

Minimum Threshold is the 20th Percentile of Domestic.

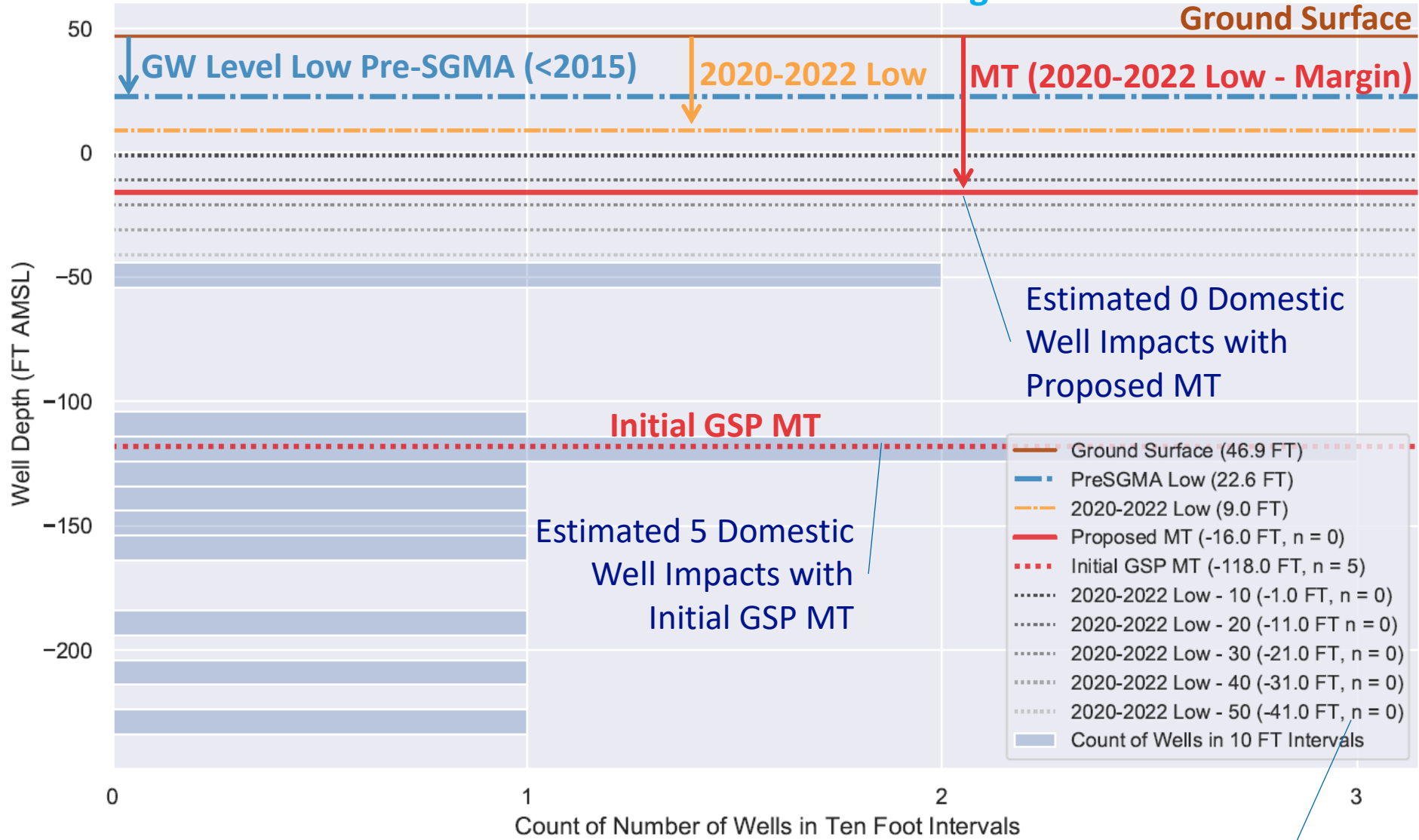
Sacramento Valley Water Year Index (WYI) shown on lower right. Meaning of colors defined below.





Domestic Well Impact Relative To Initial and Proposed MTs for RMS Well 14N01E35P003M (Non-Focus Well)
(Total Number of Domestic Wells = 13)

Non-Focus RMS Well – 25 FT Margin

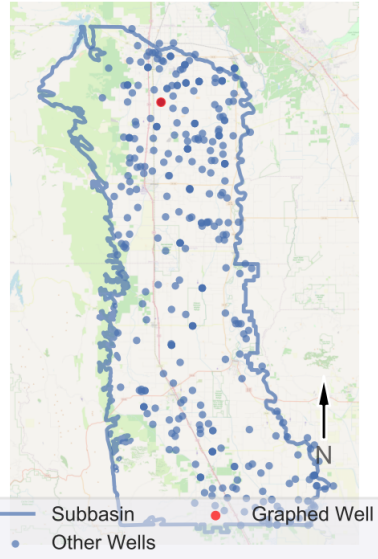


n = Number of impacted domestic wells for different margins below the 2020-2022 low

COLUSA Subbasin - State Well Number (SWN): 21N03W23D002M

Perforation 1 (P1): 142.0 - 152.0; P2: 160.0 - 170.0 ft BGS

Well Location Map

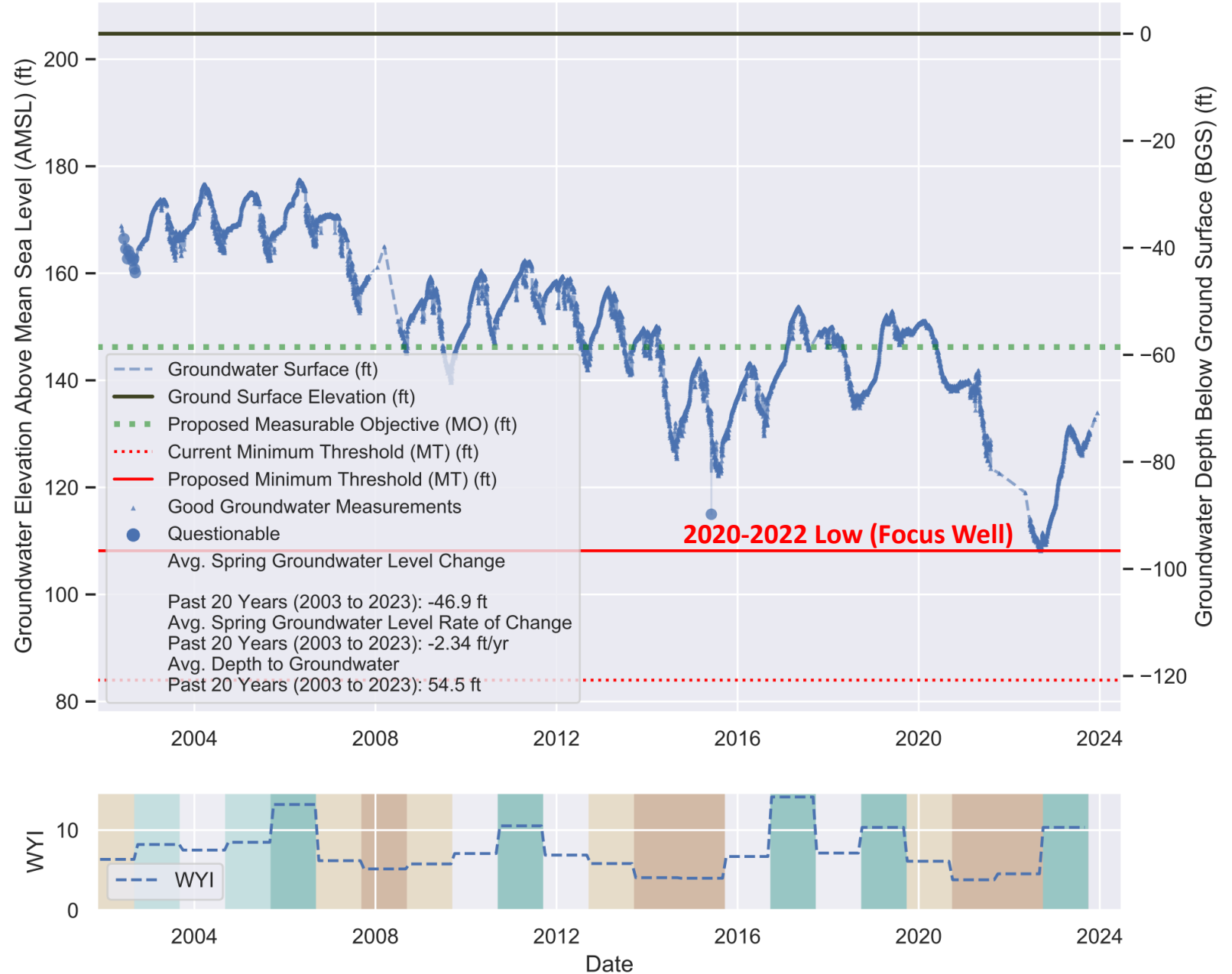
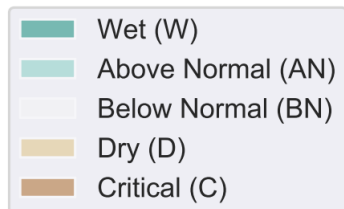


Sustainable Management Criteria:

IM (2027) = 140.0 ft AMSL
 MO = 140.0 ft AMSL
 MT = 84.0 ft AMSL

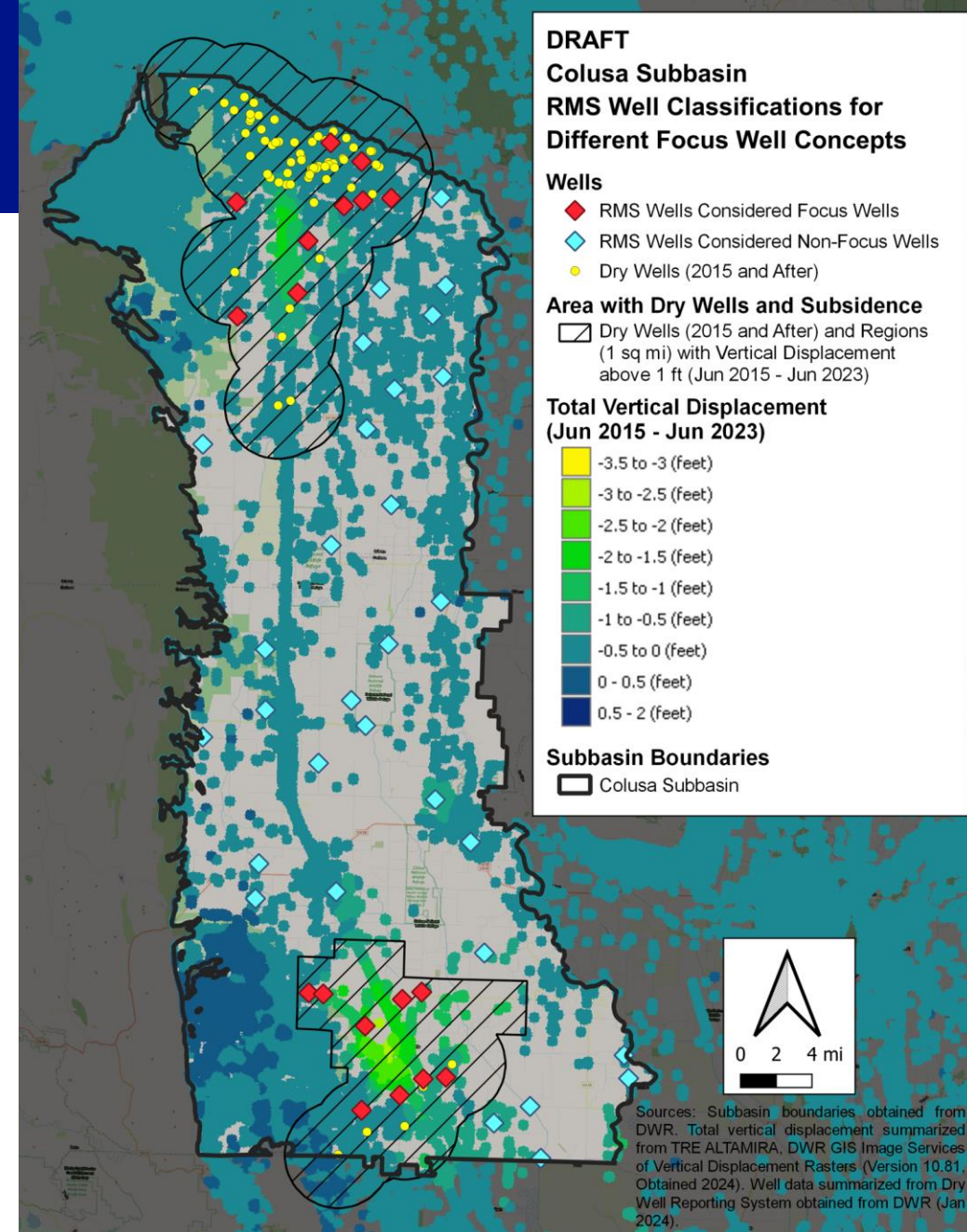
Minimum Threshold is 50% of Range Below Historical.

Sacramento Valley Water Year Index (WYI) shown on lower right. Meaning of colors defined below.



GWL SMC: Proposed Revisions to MOs, IMs

- **Measurable Objectives (MOs):** Avg. pre-SGMA GWL (2011-2015)
- **Interim Milestones (IMs):** spanning range from MTs → MOs
 - **“Focus RMS Wells”:**
 - 2027: IM is at a level below the 2020-2022 low determined by the last 20-year rate of GW elevation change
 - 2032: IM is at the MT
 - 2037: IM is 50% between the MT → MO
 - **“Non-Focus RMS Wells”:**
 - 2027: IM is at the MT
 - 2032: IM is 33% between MT → MO
 - 2037: IM is 67% between MT → MO



Proposed Approach: Subsidence Monitoring and SMC Basis

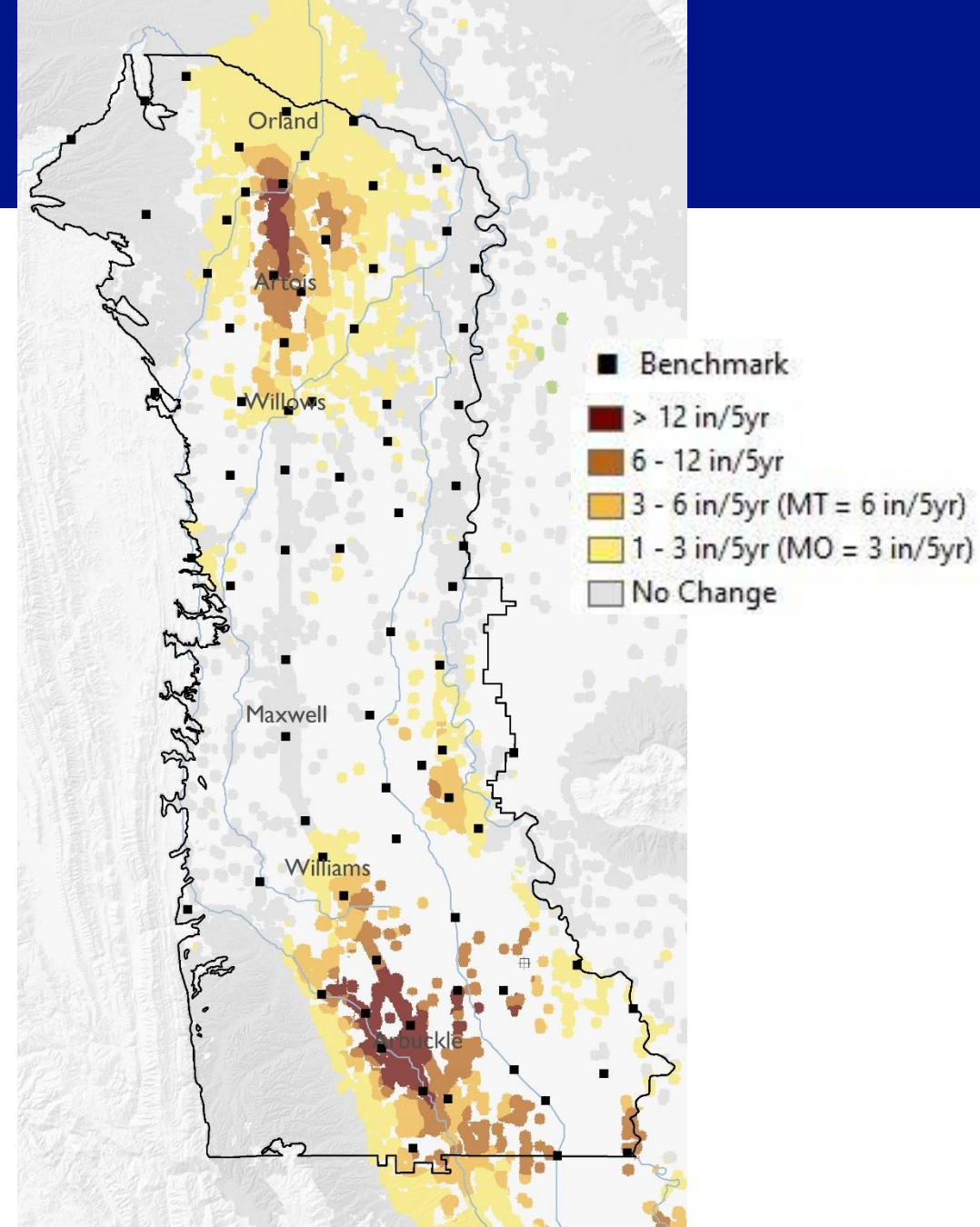
Land Subsidence: Deficiency Recap

- “The GSP does not establish SMC for land subsidence in a manner substantially compliant with the GSP regulations.”
- **Key Needs:**
 - Revise subsidence monitoring program (benchmark survey v. INSAR).
 - Quantify subsidence that would negatively impact functionality of identified critical infrastructure and land uses.
 - Clearly describe how significant and unreasonable conditions lead to URs for critical infrastructure and land uses.
 - Clearly justify how MTs relate to URs.
 - Identify PMAs that would minimize or eliminate subsidence.

Subsidence Monitoring

- **Currently based on Sacramento Valley Benchmark Network**
 - Last resurveyed in 2017
 - Twelve (12) new benchmarks installed and surveyed in 2022
 - No future resurveys planned by DWR
- **Revise monitoring based on InSAR***
 - Propose periodic spot-measurements at benchmarks to check against InSAR (e.g., biannually)
 - Consider localized subbasin-wide InSAR survey

* InSAR = Interferometric Synthetic Aperture Radar

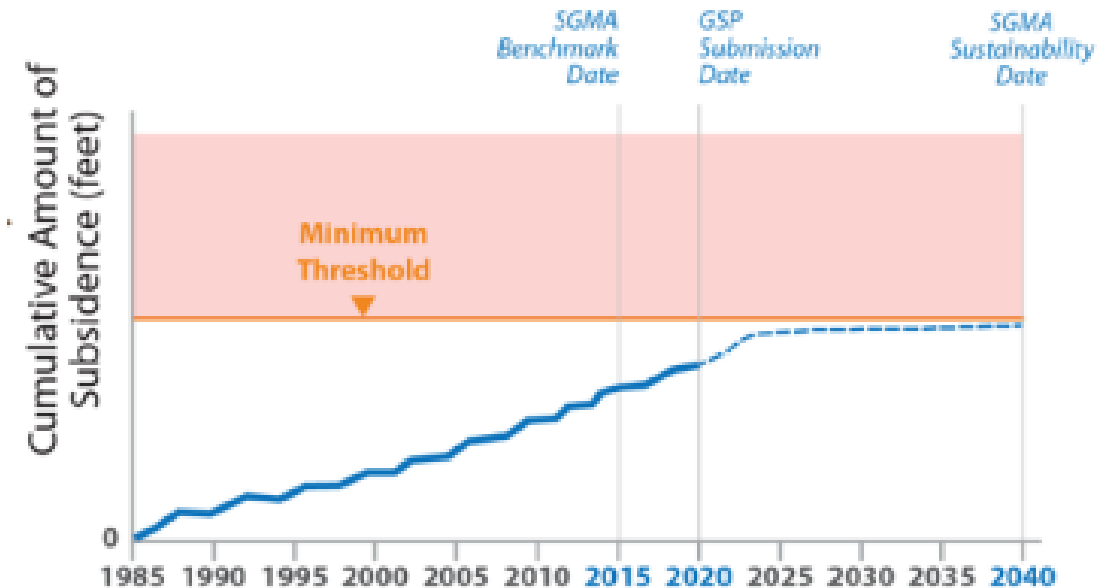


Subsidence SMC: Undesirable Results (URs)

- Current Definition (Jan 2022):
 - “...A result that would cause significant and unreasonable impacts to critical infrastructure over the planning and implementation horizon of this GSP.”
 - “...Experienced if groundwater withdrawal causes inelastic land subsidence that substantially interferes with the condition or functionality of critical infrastructure within the Subbasin...”
- Need to update UR definitions:
 - Describe URs (what conditions are significant/unreasonable) and impacts to beneficial users
 - Identify critical infrastructure and land uses.
 - Quantify subsidence that would negatively impact functionality of critical infrastructure and sensitive land uses.
 - Justify criteria for identifying (e.g., MT values and exceedance)
- **Need clarity –**
 - **What impacts to critical infrastructure or land use are considered significant/unreasonable?**

Subsidence SMC Revisions

- Current Definitions (Jan 2022):
 - Measurable Objective (MO): 0.25 feet per 5 years (3 in/5yr)
 - Minimum Threshold (MT): 0.5 feet per 5 years (6 in/5yr)
- Revision Considerations:
 - Clarify SGMA requirement of no subsidence past 2042 (+/- uncertainty each year, but no long-term subsidence over a multi-year averaging period)
 - Impacts to critical infrastructure and surface land uses. Have any impacts been reported or observed?

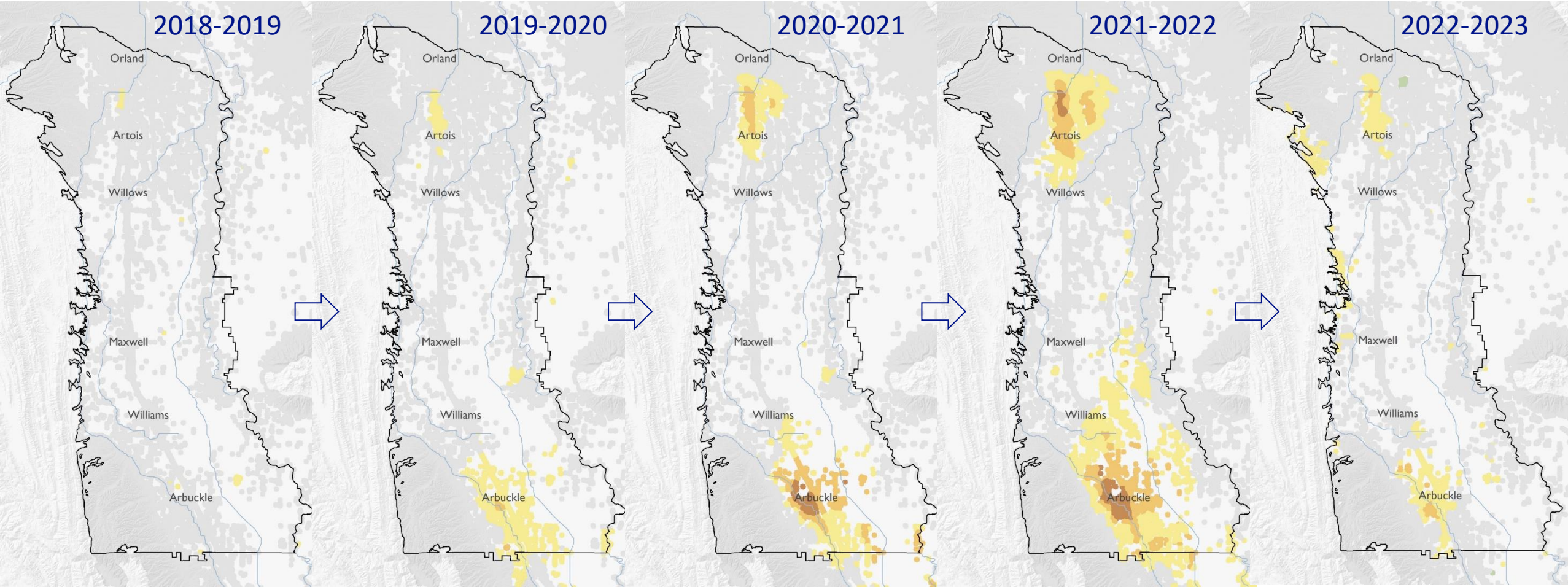


Source: DWR, 2017. Sustainable Management Criteria Best Management Practices.

Subsidence SMC: Comparison with Adjacent Subbasins

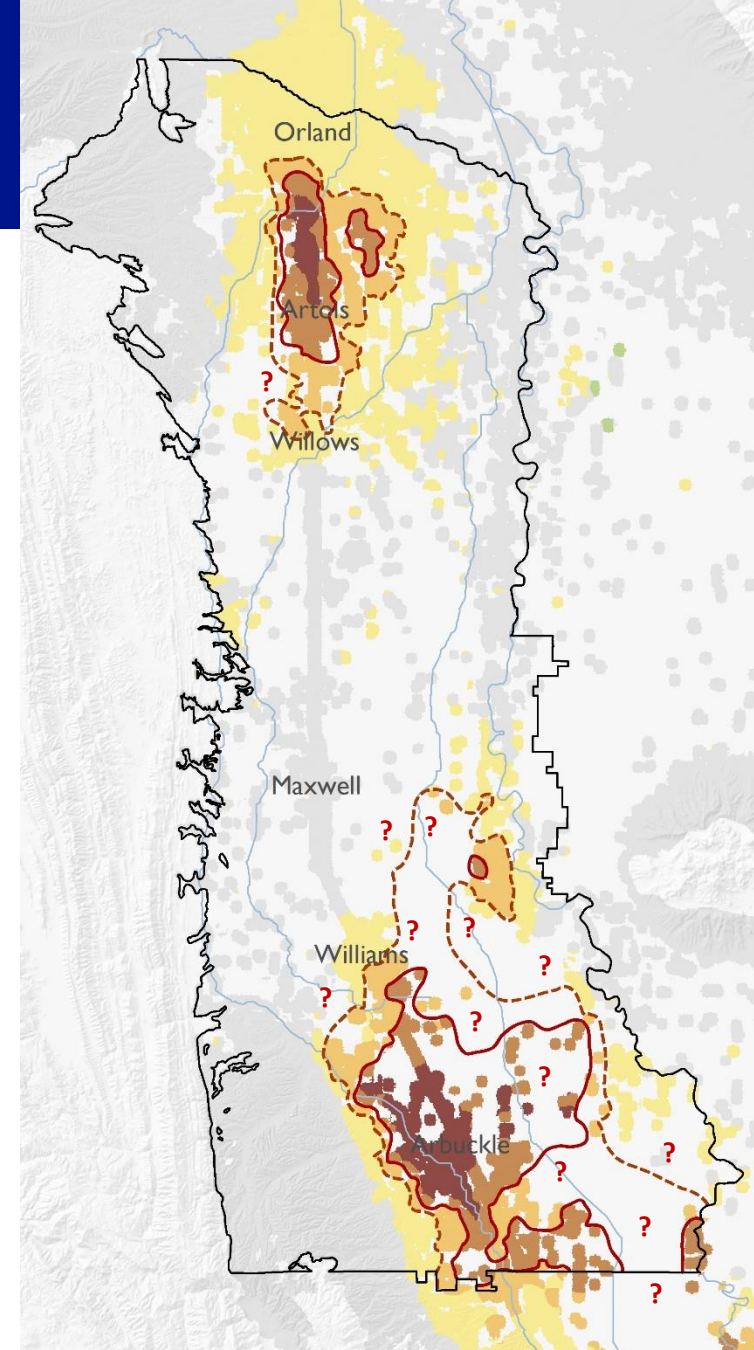
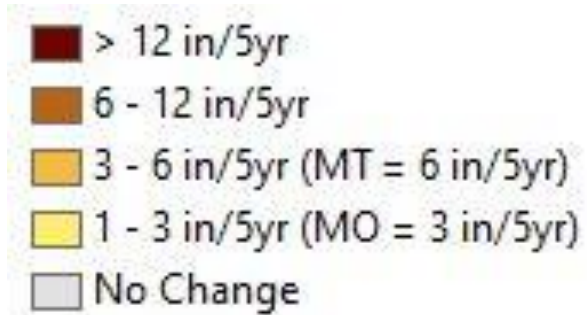
Subbasin	DWR Determination	Unreasonable Result	Minimum Threshold	Measurable Objective
Colusa	Incomplete	20% benchmarks exceed MT	0.5 ft/5yr	0.25 ft/5yr
Corning	Incomplete	Any MT exceedance that is irreversible and caused by lowering groundwater elevations	0.5 ft/5yr	No Subsidence
Butte	Approved	25% monitoring sites exceed MT	0.5 ft/5yr	0.25 ft/5yr
Sutter	Approved	25% monitoring sites exceed MT	0.5 ft/5yr	0.25 ft/5yr
Yolo	Approved	25% of Management Area (MA) exceeds the MT in ≥ 3 MAs	Avg. 3 cm/yr over 5 years (North Yolo MA)	Avg. 3 cm/yr over 3 years (North Yolo MA)

Annual Subsidence: October 2018 – October 2023



Cumulative Subsidence over 5 Years

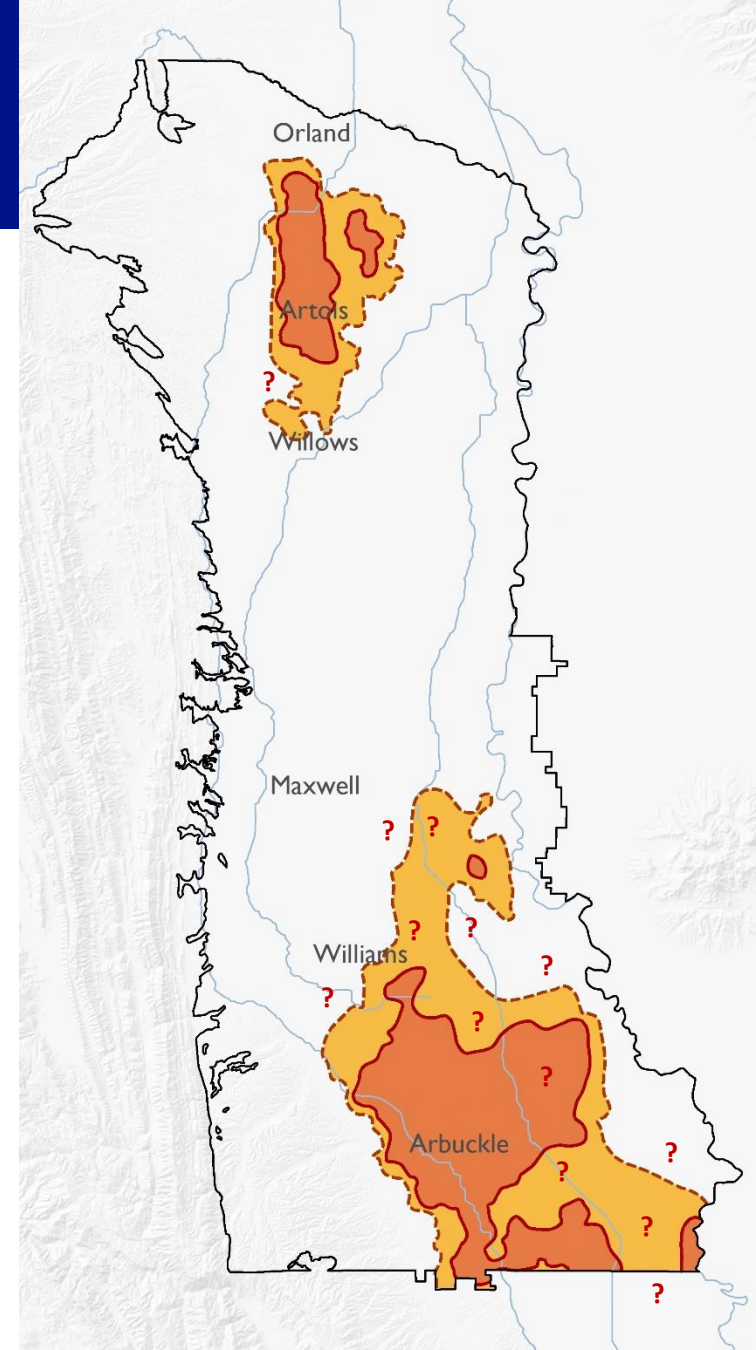
OCT 2018 to OCT 2023



Cumulative Subsidence over 5 Years

OCT 2018 to OCT 2023

- Area where Subsidence Exceeds the MO (3 in/5yr)
- Area where Subsidence Exceeds the MT (6 in/5yr)



Revision Considerations for Subsidence SMC

- Clarify SGMA requirement of no subsidence past 2042.
- Define significant and unreasonable impacts to critical infrastructure and land uses.
- What impacts been reported or observed?

Next Steps and Timeline

Next Steps and Timeline

- DWR Consultation Meeting #4 on 03/14
 - Discuss PMA details, proposed SMC revisions
 - Receive feedback from DWR on acceptability
 - *Anticipated to be the last DWR meeting*
- CGA/GGA Joint Board Meeting on 03/22
 - Propose PMA agreements, SMC revisions based on Joint TAC discussions and DWR feedback
 - Receive approval for approach
- DRAFT Revised GSP to be released at end of March

