Domestic Well Inventory Update

Project Background/Objectives

- DWR Prop 68 Grant Funding
- GSPs included Domestic Well Mitigation Programs to avoid adverse impacts to this group of beneficial users
- Need for improved understanding of locations, density, construction of active domestic wells (Part 1: Domestic Well Inventory)
- Identify/address additional monitoring needs with dedicated MWs (Part 2: Install new MWs in areas with clusters of domestic wells)

Project Background/Purpose

- Wells can experience three general types of problems: Pump, Well, Aquifer
- Pump Problem: Most wells pumps are designed to last up to 10-15 years before needing replacement (not related to declining water levels)
- Well Problem: Wells typically made of PVC or steel materials that degrade over time; typical well life may be 30-50 years (not related to declining water levels)
- Aquifer Problem: Declining water levels that may go below the bottom of a well, thereby causing no water to be available to well
- Intent of Domestic Well Mitigation Program is to assist well owners with "Aquifer" problem that occurs after submittal of GSP in January 2020.

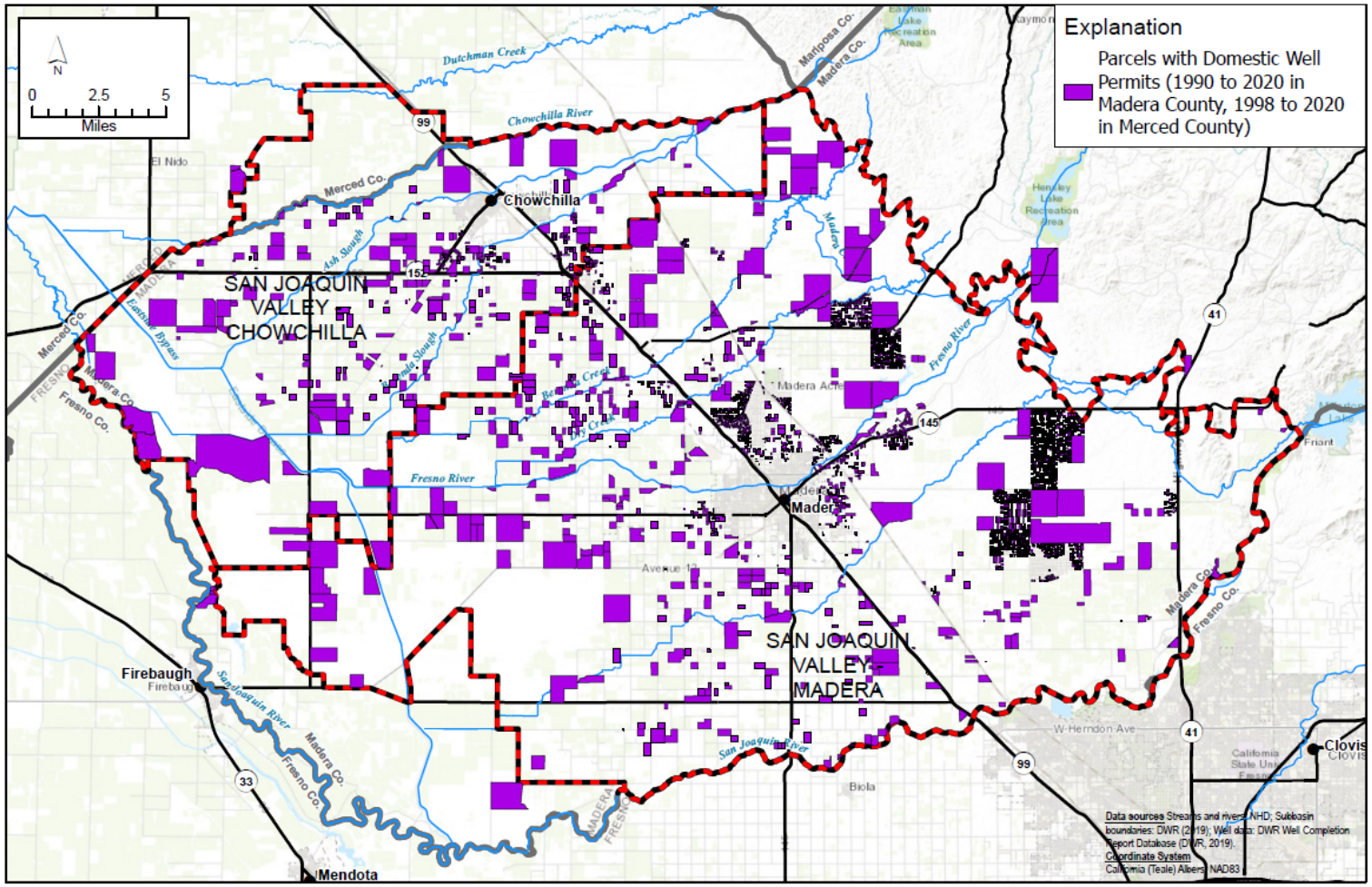
Recent (June 2021) DWR Review of GSPs

- Cuyama Valley and Paso Robles Subbasin GSPs were not approved in part because of deficiencies related to handling of Groundwater Level SMC and mitigation specific to domestic wells
- DWR evaluations state, “While SGMA does not require all impacts to groundwater uses and users be mitigated, the GSA should consider including mitigation strategies describing how drinking water impacts that may occur due to continued overdraft during the period between the start of GSP implementation and achievement of the sustainability goal will be addressed.”

Inventory Dataset Characteristics

Data Source	Historical Well Presence	Well Status (active)	Location Accuracy	Construction (depth, screens)
DWR Well Completion Report Database	Since early 1900s	**No**	**Variable** (some only to PLSS section)	Usually included
County Well Permit Database	Since 1990s (Mad=1990, Mer=1998)	**No**	**By APN** (not all match parcel GIS data)	**No** (only seal depth)
County Parcel Data	**Inferred from Use/Dwelling Code**	**No**	**By APN**	**No**
Census Information	**Inferred from # Homes**	**No**	**By Census Block**	**No**

County Well Permits Since 1990s



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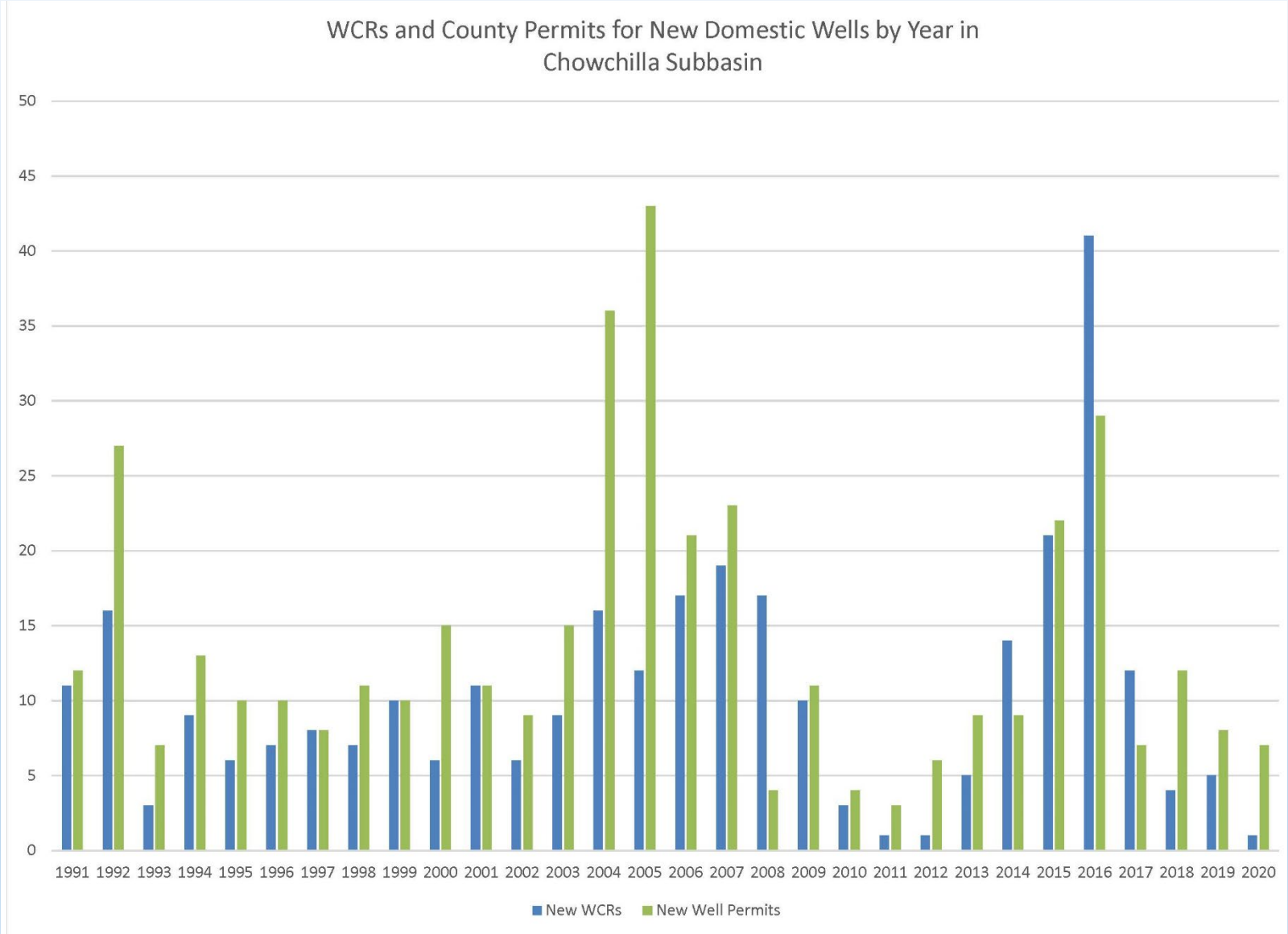
Luhdorff & Scalmanini Consulting Engineers

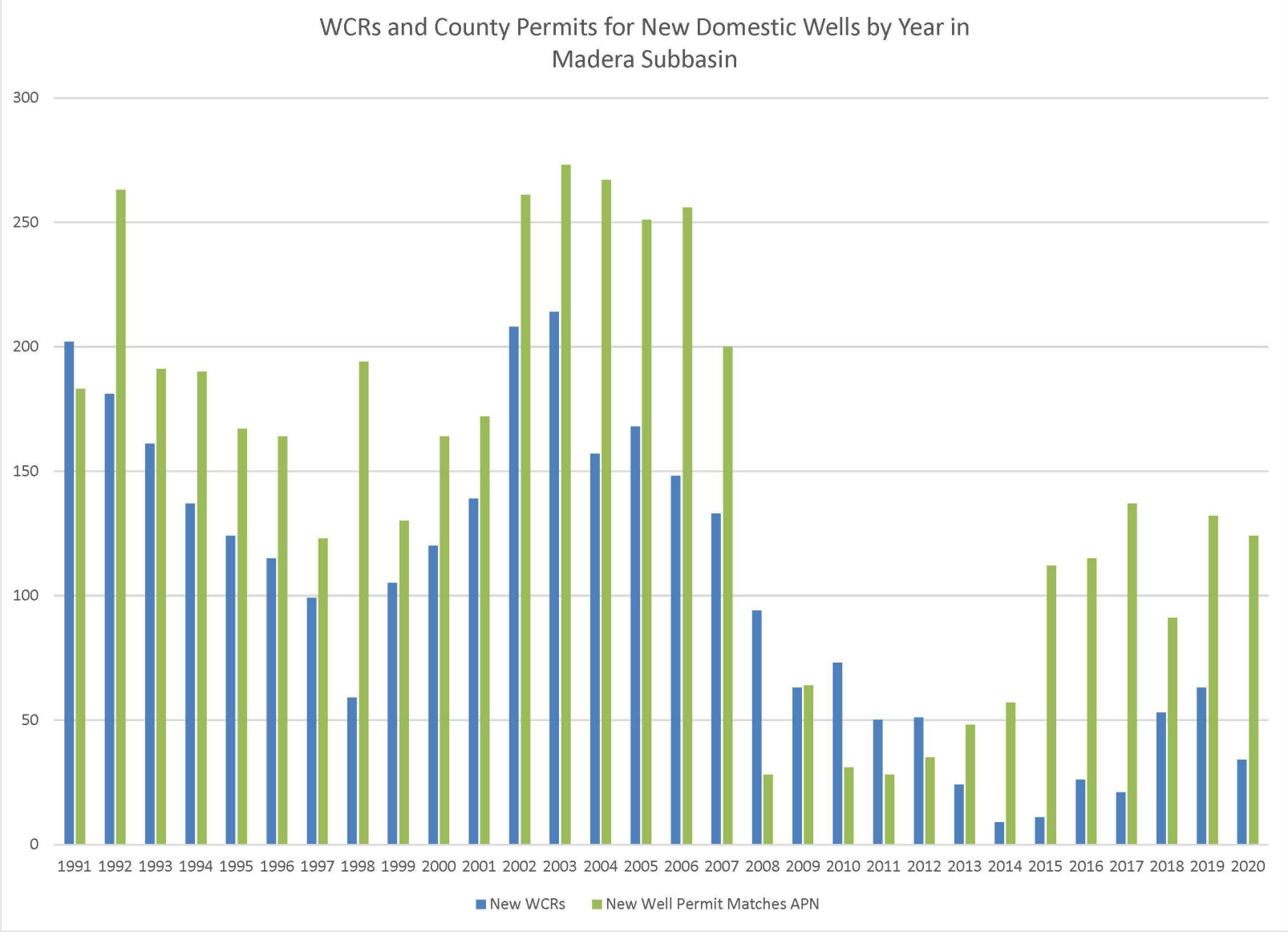
Map of Domestic Well Permits Matching Assessor Parcel Numbers

Madera and Chowchilla Subbasins Groundwater Sustainability Plan

Domestic Well WCRs vs. County Permits



Domestic Well WCRs vs. County Permits

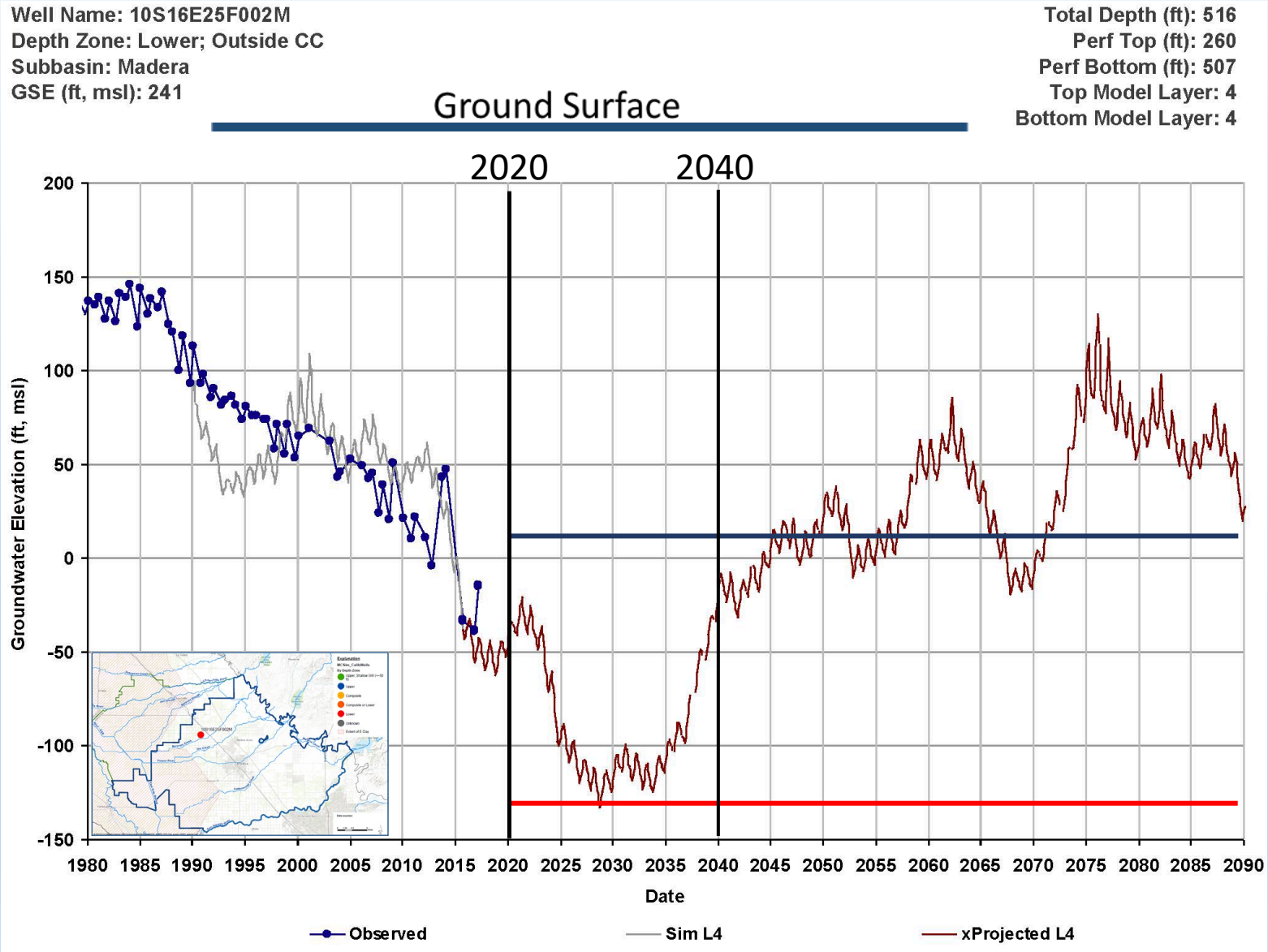


Refined Analysis of Dry Domestic Wells

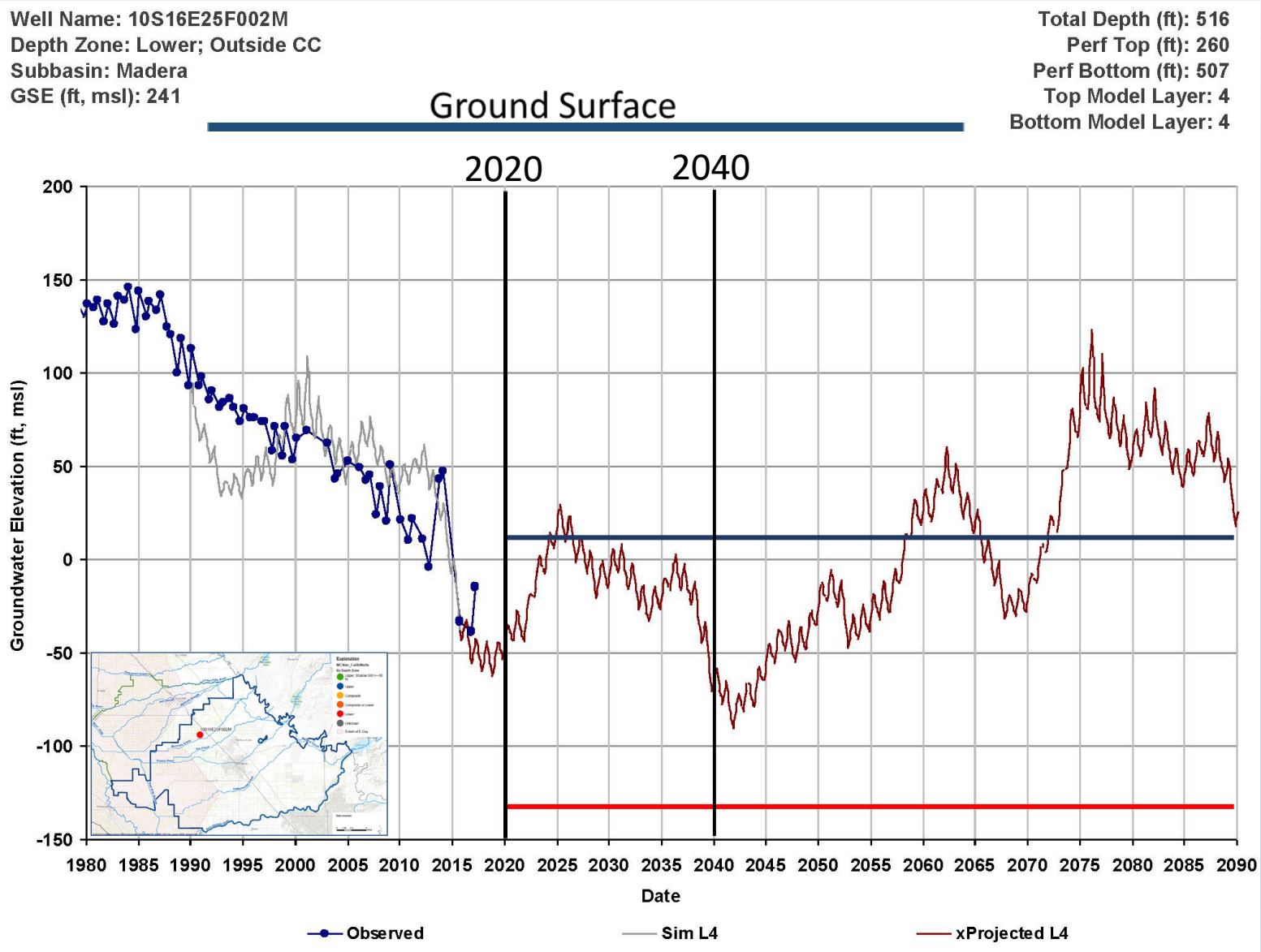
Typical Definition of Dry Well: Regional groundwater level below bottom of well or insufficient well saturation (e.g., 10 feet above bottom of well).

Note: A water level below a pump does not necessarily constitute a dry well – pump may just need to be lowered.

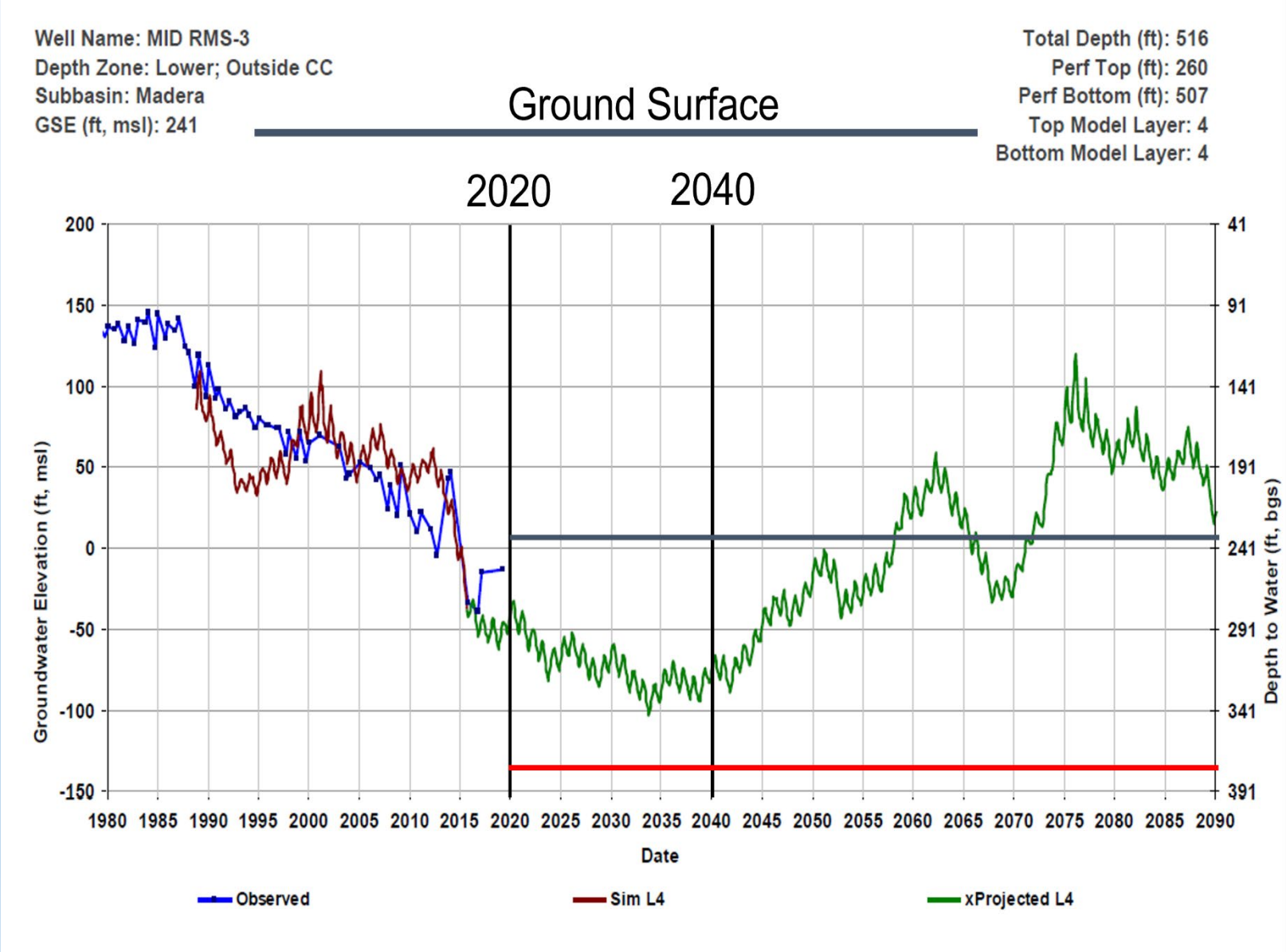
Sensitivity Run – Outside CC, with Projects, Dry Years Start to IP



Alternative – Outside CC, with Projects, Wet Years Start to IP



GSP Baseline – Outside CC, with Projects, Avg Years Start to IP



Analyses Completed

- Average year start to GSP Implementation Period using WCRs
- Average year start to GSP Implementation Period using WCRs scaled to County permits
- Dry year start to GSP Implementation Period using WCRs
- Dry year start to GSP Implementation Period using WCRs scaled to County permits
- Based on groundwater levels in Fall 2019, 2024, 2029, 2034, and 2039 (corresponding to end five-year intervals during GSP Implementation Period)
- Based on groundwater levels in Fall 2018, 2023, 2028, 2033, and 2038 (corresponding to regional GW elevation low points during each five-year interval)
- WCR database starting from 1970 (all wells up to 50 years old)
- WCR database starting from 1990 (all wells up to 30 years old)
- Range of well saturation depths from 0 to 100 feet

Decided to Use

- Dry-Year Sequence to Start GSP Implementation Period (for initial cost estimates)
- Adjusted domestic well WCR count for County Domestic Well Permits with a scaling factor
- Using all wells since 1970
- Using a 10-feet well saturation threshold

Final Analysis of Dry Domestic Wells Using Average-Year and Dry-Year Sequences to Start GSP Implementation Period Adjusted for County Permits (Chowchilla Subbasin)

Years	Average Year Sequence	Dry Year Sequence	Average of Two Sequences
2020 to 2024	46	98	72
2025 to 2029	0	70	35
2030 to 2034	48	1	25
2035 to 2039	1	0	1
Total 2020 to 2040	95	168	133

Notes: Analysis includes wells drilled since 1970 and assumes dry well threshold is 10 feet of well saturation above bottom of well.

Final Analysis of Dry Domestic Wells Using Average-Year and Dry-Year Sequences to Start GSP Implementation Period Adjusted for County Permits (Madera Subbasin)

Years	Average Year Sequence	Dry Year Sequence	Average of Two Sequences
2020 to 2024	350	427	389
2025 to 2029	185	1,017	601
2030 to 2034	406	134	270
2035 to 2039	0	0	0
Total 2020 to 2040	941	1,578	1,260

Notes: Analysis includes wells drilled since 1970 and assumes dry well threshold is 10 feet of well saturation above bottom of well.

Refined Analysis of Dry Domestic Wells

Issue	Type of Problem	Solution	Related to GSP	Typical Cost
Water level in well below pump setting depth	Pump	Lower Pump	Yes/No	$1,000 to $2,000
Pump not working (old age or pump-related issue)	Pump	Replace Pump and Equipment	No	$5,000 to $7,000
Well casing/screen failure (due to old age)	Well	Replace Well	No	$25,000 to $35,000
Water level below bottom of well	Aquifer	Replace Well	Yes	$25,000 to $35,000

Notes: Costs for lowering pump based on lowering pump by 100 to 150 feet; Pump replacement cost includes column pipe, wiring, control box, etc.; Replacement well cost is for drilling/installing new 600-foot deep well and does not include new pump/equipment; Well deepening for domestic wells is not a realistic option

Cost Analysis of Dry Domestic Wells Using the Dry-Year Sequence to Start GSP Implementation Period Adjusted for County Permits (Chowchilla Subbasin)

Years	Average Year Sequence	Dry Year Sequence	Average of Two Sequences	Replacement Well Cost (Million $)
2020 to 2024	46	98	72	2.9
2025 to 2029	0	70	35	2.1
2030 to 2034	48	1	25	0.0
2035 to 2039	1	0	1	0.0
Total 2020 to 2040	95	168	133	5.0

Notes: Replacement Well Costs based on Dry Year Start Climatic Sequence and $30,000/well

Cost Analysis of Dry Domestic Wells Using the Dry-Year Sequence to Start GSP Implementation Period Adjusted for County Permits (Madera Subbasin)

Years	Average Year Sequence	Dry Year Sequence	Average of Two Sequences	Replacement Well Cost (Million $)
2020 to 2024	350	427	389	12.8
2025 to 2029	185	1,017	601	30.5
2030 to 2034	406	134	270	4.0
2035 to 2039	0	0	0	0.0
Total 2020 to 2040	941	1,578	1,260	47.3

Notes: Replacement Well Costs based on Dry Year Start Climatic Sequence and $30,000/well

Current Cost Estimate vs. GSP Domestic Well Assessment

- Purpose of GSP Appendix 3.C:
  - Economic assessment of cost differences of developing Domestic Well Mitigation program vs. faster pumping reductions
  - Outline of draft Domestic Well Mitigation Program
  - Review of other similar programs
- Differences in the GSP vs. Updated domestic well analyses:
  - Comparison to top of screen (Appendix 3.C) vs. bottom of well (Update) – majority of wells impacted prior to 2020 (Appendix 3.C)
  - Excluding wells without construction information (Appendix 3.C) vs. estimating missing well construction information (Update)
  - Well replacement costs of $25,000/well (Appendix 3.C) vs. $30,000/well (Update)

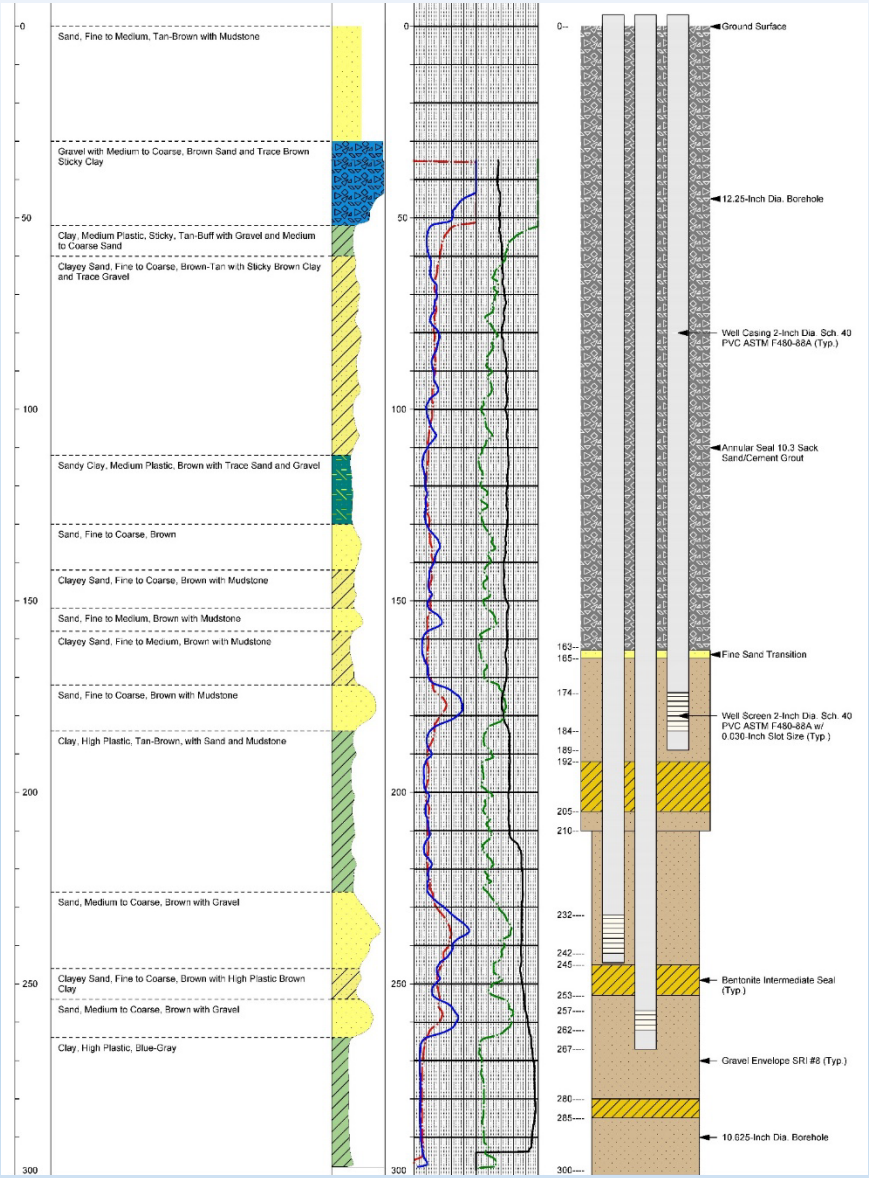
Current Cost Estimate vs. GSP Domestic Well Assessment

- Chowchilla Subbasin Appendix 3.C: Estimated number of dry wells was 186 for cost estimation purposes
- Chowchilla Subbasin Updated Analysis: Estimated number of dry wells ranged from 95 (Average-year start) to 168 (Dry-year start)

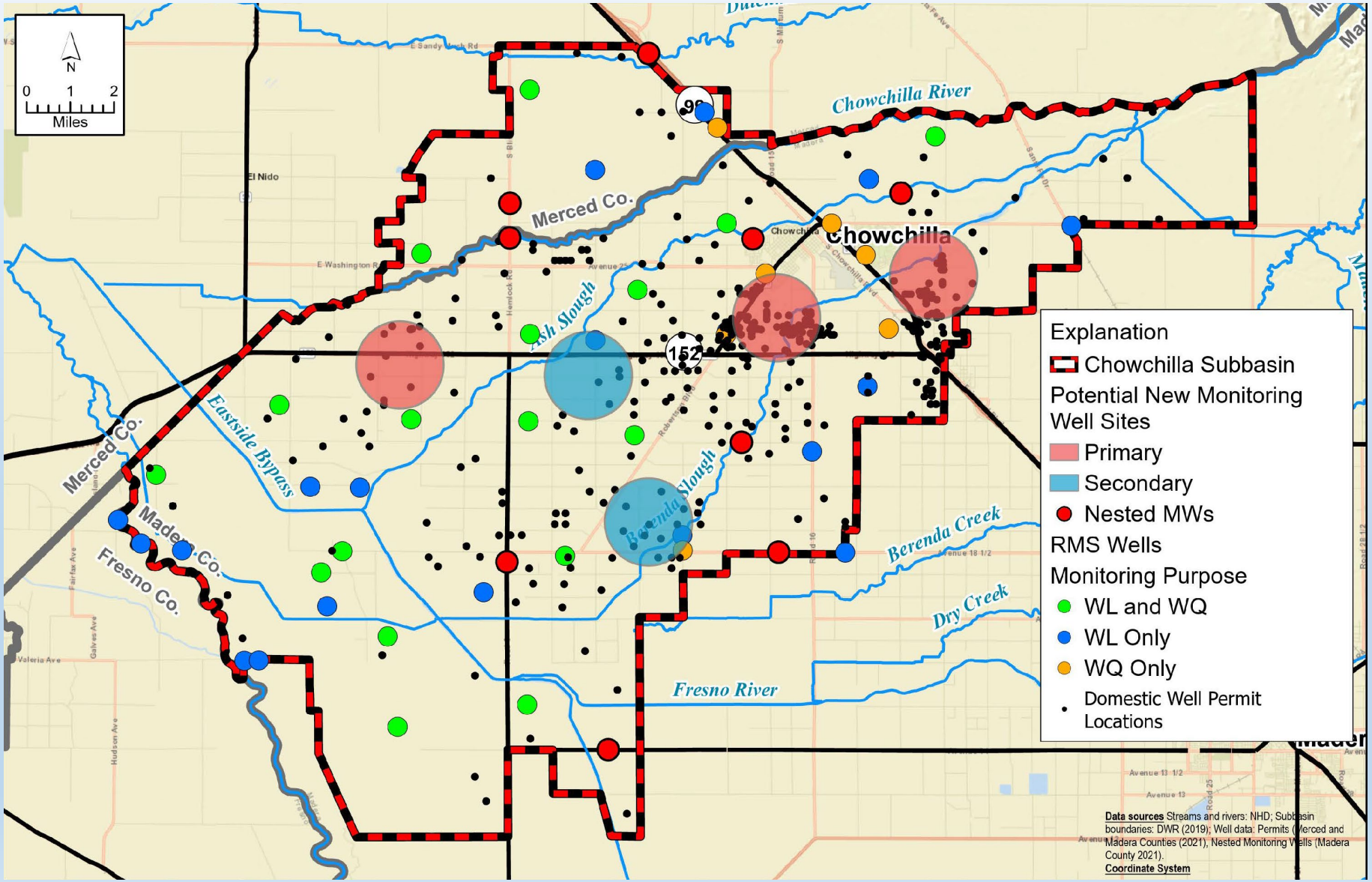
- Madera Subbasin Appendix 3.C: Estimated number of dry wells was from 240 for cost estimation purposes, and up to 1,000 when considering sensitivity analyses
- Madera Subbasin Updated Analysis: Estimated number of dry wells ranged from 941 (Average-year start) to 1,578 (Dry-year start)

Monitoring Well Construction and Instrumentation

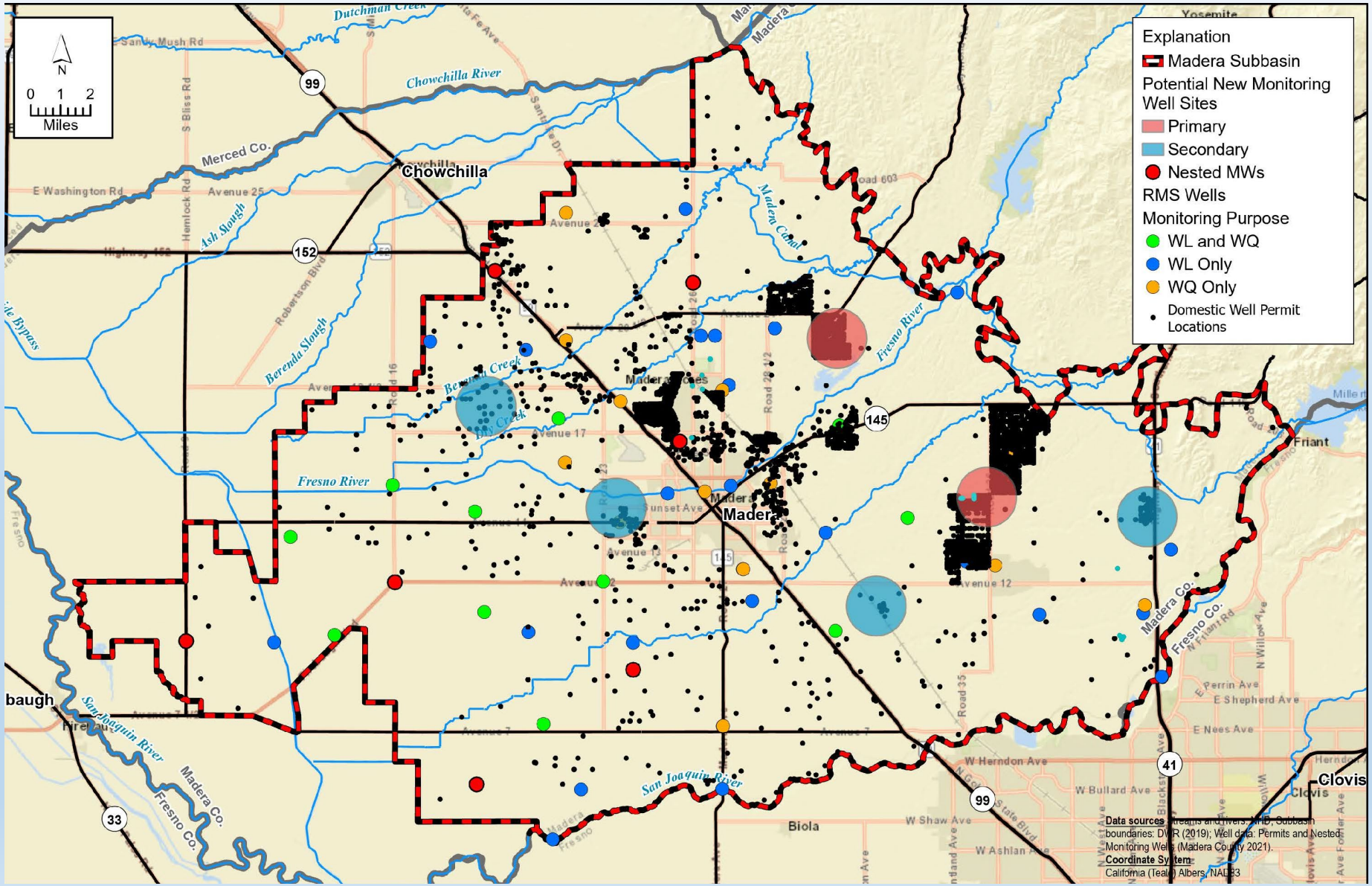
- Test hole drilling to 800 feet at two locations in Madera Subbasin
- Lithologic and geophysical logging of each test hole
- Construction of up to three wells at each location screened in different depth zones
- Measurement of groundwater levels and collection of groundwater quality samples from each well
- Install instrumentation for long-term water level monitoring; surveying



Monitoring Well Construction and Instrumentation - Chowchilla Subbasin



Monitoring Well Construction and Instrumentation – Madera Subbasin



Next Steps

- Prepare Domestic Well Inventory Reports (in progress)
- Evaluate optimum nested monitoring well locations
- Drill/install new nested monitoring wells
- Install transducers and collect GW quality samples
- Prepare Well Installation Reports

Questions