Appendix 2-A

Domestic Well Inventory

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APPENDICES

1 INTRODUCTION

This appendix documents the available data sources for estimating numbers and locations of domestic wells, domestic well construction details, and occurrence of domestic wells in Tehama County. To prepare this domestic well inventory, approximations of the number, depths, and locations of domestic wells were developed from available data sources. The domestic wells indicated to be present according to multiple data sources were reviewed and compared.

2 DOMESTIC WELL INVENTORY DATA SOURCES AND COMPILATION

Data from a variety of public agencies were assembled for consideration in the project. Compiled datasets included the following.

- Well Completion Report (WCR) Database from California Department of Water Resources (CDWR) Online System for WCRs (OSWCR)
- Tehama County well permit database (records since 2013)
- Tehama County assessor's parcel data
- Public Water System (PWS) service area boundaries and PWS well locations from State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW)

Except for the Tehama County well permit database, all the above-listed datasets were available in geospatial (e.g., GIS) formats. The well permit database was provided as tabular data, which was converted to geospatial information as described below.

2.1 DWR WCR Database

The primary source for well construction data in the subbasin is the CDWR WCR database (CDWR, 2020). Well drillers are required to submit a WCR to DWR for all wells drilled and constructed in the State of California. DWR tabulated information from WCRs for the State, including data from WCRs dating as far back as the early 1900s. The tabulated WCR information include well type and construction characteristics such as the intended use of the well, well depths, and screened intervals along with location, construction date, permit information, and other details. Although completed WCRs commonly include additional notes on borehole lithology and a variety of other types of information, lithology and some other well information included on WCRs is not entered or maintained in the DWR WCR database. It is notable that many well attributes in the WCR database are blank or incomplete because of missing or illegible information provided on the WCRs. Additionally, well locations in the WCR database are commonly only provided to the center of the Public Land Survey System (PLSS) section in which it is located, which translates to a locational accuracy of approximately +/- 0.5 mile.

2.1.1 Domestic Well WCRs

As part of the project, initial quality checks were conducted on the WCR database to identify obvious inconsistencies in well data, including conflicting well locations (e.g., latitude, longitude, PLSS coordinates) and construction (e.g., well depths, top and bottom of screens). Such questionable information and records were flagged for additional consideration during subsequent analyses. For this domestic well

inventory analysis, only WCRs indicated to be domestic water supply wells were included. To limit potential double counting of domestic wells, only WCRs for new well construction (i.e., not well repairs/modification or destruction) were included in the domestic well inventory.

2.1.2 WCR Dates

The typical lifespan of a small water well is estimated to be about 50 years based on the durability and longevity of typical domestic well materials, which are commonly constructed of PVC casing. Using a conservative estimate of a 40-year lifespan, wells drilled prior to 1980 were considered unlikely to still be in operation or nearing the end of their lifespan.

For these reasons, only WCRs for wells with dates on or after 1980, were included in the domestic well inventory and associated analyses. A total of 5,879 domestic wells constructed since 1980 were considered in the analysis.

2.1.3 WCR Locations

Wells with WCRs marked as domestic were selected and mapped based on one of four geolocation methods, depending on what information was available in the tabulated data. Only wells with installations in 1980 or later were considered. The geolocation methods, in order of priority, are as follows:

1. GPS – 4 wells
2. Address – 85 wells
3. APN – 2,193 wells
4. PLSS – 3,597 wells

A total of 5,879 domestic wells were located within the Tehama Subbasin using these methods (**Figure 1**). Wells located by PLSS are typically placed at the center of the section in which they are located, and thus may be out of position by as much as about 0.5 mile (half the typical width of a section). Initially, 5,790 of the 5,879 domestic well completion reports were located by PLSS. 4,313 of these wells include a partial APN, none of which were formatted consistently with the Tehama County Parcel APNs (e.g., ###-###-###-000).

Potential APNs were generated for the partial APNs by adding zeroes. As an example, partial APN "79-60-3" would become "079-060-003-000" by adding leading zeroes before each 3-digit section and appending "-000" to the end. This assumes partial APNs to be partial only by losing leading zeroes; however, this is not the only possible way to format a potential APN from a partial APN.

Generated APNs were matched to Parcel APNs. Because there is uncertainty in the formatting of the partial APN, only APNs which match parcels located within the same PLSS sections as the WCR were adopted. 2,193 matching APNs were adopted, and the locations of the associated WCRs were updated from section centroids to the centroid of each matching parcel.

Other sources of location error include changes in APNs over time; poorly matched addresses; and incorrect WCR entries for PLSS values, GPS coordinates, or addresses. Since many of the location symbols

for domestic wells plot on top of each other in **Figure 1**, the locations of domestic wells in the Subbasin by Township/Range/Section mapping is displayed in **Figure 2**. Domestic well completion reports are summarized by decade and subbasin in **Table 1**.

2.2 Well Permit Records

Under county regulation, a well permit is required prior to drilling and constructing a domestic well. Records of well permits were provided by Tehama County Department of Environmental Health as a tabular dataset (TCDEH, 2021); no GIS data were initially available for the well permits. The period of record for the well permits begins in 2013. The tabulated permit dataset includes permit number, permit date, APN, and well address.

2.2.1 Domestic Well Permits

There are 802 new construction permits for Tehama County. Domestic wells comprise 670 of the 802 new construction wells. Wells with uses other than domestic water supply are denoted with asterisks in the tabulated dataset. Only wells indicated as being sealed were considered.

2.2.2 Locating Well Permits

The 670 domestic well permits in Tehama County were located based on APNs associated with them. Domestic well permits in the County well permit database were located by matching the listed APN with the county parcel data, when possible. For permits with APNs not matching a parcel, the address was used to locate the permit and the APN was updated accordingly. Following this approach, all domestic well permits were matched to unique parcels located within the Tehama County.

A map of the domestic well permits located in the Tehama County is presented in **Figure 3a**. To directly compare well permits to well completion reports over the same period, a map of well completion reports completed 2013 to 2020 is presented in **Figure 3b**. Since many of the location dots for domestic wells plot on top of each other in **Figure 3a**, the count of domestic wells in the County by Township/Range/Section mapping is displayed in **Figure 4a**. Similarly, well completion reports dated 2013 to 2020 are summarized by section in **Figure 4b**.

Well completion reports and permits are additionally compared annually for Antelope, Bowman, Los Molinos, and Red Bluff Subbasins in **Figure 5a**, **Figure 5b**, **Figure 5c**, and **Figure 5d** respectively.

2.3 County Assessor Parcel Data

County Assessor parcel GIS data were provided by Tehama County (Tehama County Assessor's Office, 2021), including land use and other characteristics for each APN. The parcels dataset includes 26,600 unique APNs within the Tehama Subbasin. Of those, 15,959 are inferred as being residential. This includes parcels that are located within a public water system service area. Although the County parcel dataset does not include records related to the presence of domestic wells on parcels, the presence of a resident on a parcel is associated with a drinking water supply and potential for a domestic well. Land use codes used to infer residential parcels and therefore the presence of a domestic well are summarized in **Appendix 1**. Inferred residential parcels are displayed in **Figure 6**. Inferred domestic wells in residential

parcel are also summarized by section in **Figure 7**. All known and inferred domestic well locations are combined in **Figure 8**.

2.4 Water System Data

Public Water System (PWS), State Small Water System (SSWS), and Local Small Water System (LSWS) service area boundaries from State and local data sources were used to map and evaluate where and how many inferred well locations occur inside of a water system service area and therefore may not be supplied by a domestic well. Water system boundaries are a key dataset for comparing with potential domestic well locations identified through analysis of WCRs, parcels, and permits. The service area boundaries for water systems and new construction public water supply wells since 1980 identified in the County are presented in **Figure 9**.

2.4.1 State Regulated Systems

The PWS boundaries are part of an archived dataset developed by the California Environmental Health Tracking Program (CEHTP) and now maintained by the State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW) (SWRCB, 2021). This dataset is a publicly available GIS feature class of system boundaries provided voluntarily by water system operators over the period from 2012 to 2019. Previous assessments of this dataset suggest it includes approximately 85 percent of community water systems, although this can vary by region within the state. Of the state regulated PWS boundaries, 42 were identified to have service areas within Tehama County.

2.4.2 Public Water System Wells

PWS well locations were downloaded from the WCR dataset and used to check for any water system wells in areas not covered by the water systems service area boundaries data. Several wells with public water supply planned used are located outside of CEHTP PWS boundaries (**Figure 9a**). These wells are considered in analyses as possibly providing water to nearby users.

3 ANALYSIS AND RESULTS

Estimates of domestic wells were developed through analysis and comparison of the data sources discussed above. Estimates of the number and locations of domestic wells in Tehama County were made using three sources of data and approaches: from WCRs, well permits, and parcels with residents. Domestic well WCRs and well permits provide a more direct indication of the existence (past or present) of a domestic well whereas the parcel data provide a basis for inferring the existence of domestic wells. The County well permit database is believed to provide the most accurate estimate of the numbers and locations of domestic wells constructed during the available data record (since 2013). However, only the WCR data have information on well depths and construction. Additionally, while WCRs and well permits generally have a date associated with each record indicating the approximate date of well construction, the parcel data do not. However, estimates of well counts based on parcel data do provide an estimate of the maximum possible number of domestic wells, and a reference on the relative spatial density of domestic wells in the County.

Water system service area boundaries were used to refine domestic well estimates derived from parcel counts, with the expectation that parcels and households within a water system boundary are served water by the water system and therefore do not have a domestic well. The number of inferred parcels, well completion reports, and unique well permits (i.e., not collocated with a WCR) are summarized for the entire County, and within two subsets of water system service areas in **Table 2**. One subset includes the number of domestic wells within the community water system boundaries and within a half-mile of other PWS wells, while the other subset includes only community water system wells. It is assumed these public water supply wells supply water in their vicinity despite being located outside of water system boundaries; however, the area served by each PWS well is unknown so this is only an estimate of how these wells might impact domestic well counts. Many wells inferred to be in a parcel located within a community water service area were likely not installed, while wells known to be installed in these areas may no longer be used for domestic water supply. Results of the well location and counts analyses are described below.

3.1 Analysis of Domestic Well Locations and Counts

3.1.1 Domestic Well WCRs

The domestic well WCRs since 1980 were compared with water system boundaries in the two methods described above (**Figure 9b**, **Figure 9c**). Because the WCRs are records of actual wells that were constructed, those located within a water system service area are assumed to be correctly located. It is possible that wells that pre-existed the establishment of a water system in an area may remain in use after the water system is operational; however, whether this occurs, and how often, is unknown.

Of the 5,879 domestic wells represented by WCRs in the County, 260 are located within the known water system boundaries (**Figure 9b**). This represents approximately four (4) % of the domestic well WCRs in the County. However, when considering the half-mile radius around public water supply wells, 1,090 wells (19% of total) are captured.

3.1.2 Domestic Well Permits

Permits are expected to accurately identify well locations, but domestic well permits may exist for wells drilled and constructed prior to the operation of a water system in an area. As shown in annual comparisons for 2020 (**Figures 5a, 5b, 5c, 5d**), permits may be processed before well completion reports and supplement recent domestic well counts.

In contrast to the WCR dataset, which relies on submittal and entry of a WCR in DWR's database, the County well permit dataset is expected to be a more comprehensive representation of the wells drilled in the County for the period over which it spans (2013 to present). Over the same period, there are 670 well permits compared to 567 WCRs.

Of the 670 well permits, 338 domestic well permits in the County are not collocated with a WCR. There are 17 of these unique permits located within known water system boundaries (**Figure 9b**). Like the domestic WCRs in water system boundaries, this represents only five (5) % of the permit dataset. When additionally considering permits located withina 0.5 mile radius around other public supply wells, 71 well permits are represented (**Figure 9c**).

3.1.3 Parcels with Residents

For assessing the maximum possible number of domestic wells in the County, all parcels inferred to be residential were counted. Parcels were inferred as residential based on land use codes listed in **Appendix 1**. Parcels within service areas were also counted but removed from the total inferred count. In this approach, a parcel is considered within a water system service area if its centroid is within the service area.

Based on these criteria, within Tehama County there are a total of 15,959 residential parcels (**Figure 6**) with residents, 8,744 of which are outside of the service area boundaries of all 42 Public Water Systems serving residential parcels. There are only 6,725 inferred parcels outside of the potential radius of influence of other public water supply wells.

3.1.4 Comparisons of Domestic Well Location Information Sources

3.1.4.1 Domestic Wells Within PWS Service Areas

While most residences within a PWS service area are supplied with drinking water by that PWS, it is not unusual for wells that were drilled prior to the creation of the PWS to be retained and used for part, or all, of a residence's use, including for drinking water or landscape irrigation.

Of the 5,879 WCRs located in Tehama County, 260 are located within a water system service area. Of the 338 unique permits located within the Tehama Subbasin, 17 were located within a water system service area.

Of the 15,959 parcels with dwellings noted in the APN dataset, 7,215 are within a water system boundary. This represents a much larger portion of the total inferred dataset (45%) compared to WCRs and permits, suggesting most of those inferred parcels do not have domestic wells.

3.1.4.2 Comparing WCR Locations to Well Permits

The Tehama County well permits dataset, by count, is more complete in representing wells drilled in the County, but it only extends back to 2013. There is no direct linkage between WCRs and well permits on record (i.e., WCRs commonly do not indicate well permit numbers) for majority of the wells, and the available method for geolocating records for a given well present in both datasets may differ. However, it was determined that 332 of the parcels associated with permit locations coincided with WCR locations for domestic wells. Many WCRs are located by the center of section and therefore may not be placed in the correct parcel. This likely explains the low rate of coincidence of well permits and WCRs within parcels.

Consequently, in attempting to tally the permits and WCRs representing known domestic well locations, unique permits may be double counted as WCRs located by TRS. Because there are more permits over the permit's period of record than WCRs, it is assumed that not all WCRs located by TRS are associated with a permit.

3.1.5 Final Domestic Well Count and Location Estimates

The County permit database includes 670 domestic wells installed since 2013. Although over the same period, there are more permits than WCRs (567 domestic WCRs), the WCRs data back further than 1950 and are the more complete dataset. Although there are only 16% more permits than WCRs, 50% of the permits appear to be uniquely located. Given available WCR and well permit data, there are 5,781 uniquely located domestic wells (WCRs and permits) outside of community water systems. Because it appears permits supplement the WCR dataset to some extent, domestic well permit totals were estimated with projected complete 1980-2020 datasets.

A possible total number of domestic wells was estimated assuming that roughly 50% of permits are uniquely located as indicated by the best available location methods for all wells. Permit counts were projected for 1980-2013 given the same distribution as in 2013-2020. The inferred unique permits for 1980-2020 in **Table 2** estimate the maximum possible number of permits to be supplementary to the WCR dataset. There is a total of 8,948 WCRs and estimated unique permits (or wells otherwise not captured by the WCR dataset) outside community water systems, compared to the inferred 8,744 residential parcels outside water system boundaries. This estimated total drops to 6,673 total WCRs and estimated unique permits when assuming there are consistently 16% more permits than WCRs as indicated by the 2013-2020 totals, and that those permits are unique.

The current dataset of permits and WCRs outside community water systems at 5,781 domestic wells represents 68% of the inferred residential parcels. Dependent on the accuracy of extrapolation techniques, the total may represent 76 – 100% of the inferred parcels with a complete dataset.

Well permits generally provide a more complete representation of wells constructed in the County, but these permit records do not contain information on well perforations and depths. An analysis of well construction information was therefore performed on the WCR data only.

3.1.6 WCR Domestic Well Construction Information

Of the 5,879 domestic well WCRs in the Tehama Subbasin, 5,860 included some information on perforated interval (top of bottom of perforations) or total depth. Only WCR records determined to have sufficiently reliable well construction information (i.e., lack of obviously conflicting information on the well construction) were included in the summary and analyses relating to domestic well construction in the County. In analyses using well perforations (screens), where data for bottom of perforations was not available, the reported total well depth was used. A total of 1,070 WCRs included top of screened interval information. Average total depths of WCRs in each section were calculated and are displayed in **Figure 10**. Additionally, to evaluate changes in well depths over time, scatterplots of completed depth over time in Antelope, Bowman, Los Molinos, and Red Bluff Subbasin were plotted in **Figure 11a**, **Figure 11b**, **Figure 11c**, and **Figure 11d**, respectively. Minimum installed depths appear to be increasing with time in all Subbasins, and depths are much more variable within Bowman and Red Bluff Subbasins.

3.2 Public Water System Wells

PWS wells data are maintained by the State Water Resources Control Board Division of Drinking Water in the Safe Drinking Water Information System (SDWIS); however, these data are incomplete at this time. The WCR database was queried for PWS wells, and there were 59 wells drilled in 1980 or later with Public Water Supply as the planned use. Of these, only 16 fall within community water system boundaries. Depth to the bottom of perforated interval ranged from 100 to 840 feet below ground surface in these wells. The wells identified here are shown in **Figure 9a**.

4 REFERENCES

California Department of Water Resources. 2020. Well Completion Reports Dataset. Data retrieved from data.cnra.ca.gov (https://data.cnra.ca.gov/dataset/well-completion-reports) on 08/01/2020.

California Department of Water Resources. 2021. DAC Mapping Tool. Data retrieved from https://gis.water.ca.gov/app/dacs/ on 6/15/2021.

Tehama County Assessor's Office. 2021. GIS of Parcels with Land Use Attributes.

Tehama County Department of Environmental Health. 2021. Well Permits Tabular Dataset. Provided to LSCE in May 2021.

SWRCB. 2021. Water System Boundaries. Retrieved from https://www.waterboards.ca.gov/resources/data_databases/ on 01/15/2021.

SWRCB. 2021. Public Water System Wells. Retrieved from https://www.waterboards.ca.gov/gama/ on 1/15/2021.

TABLES

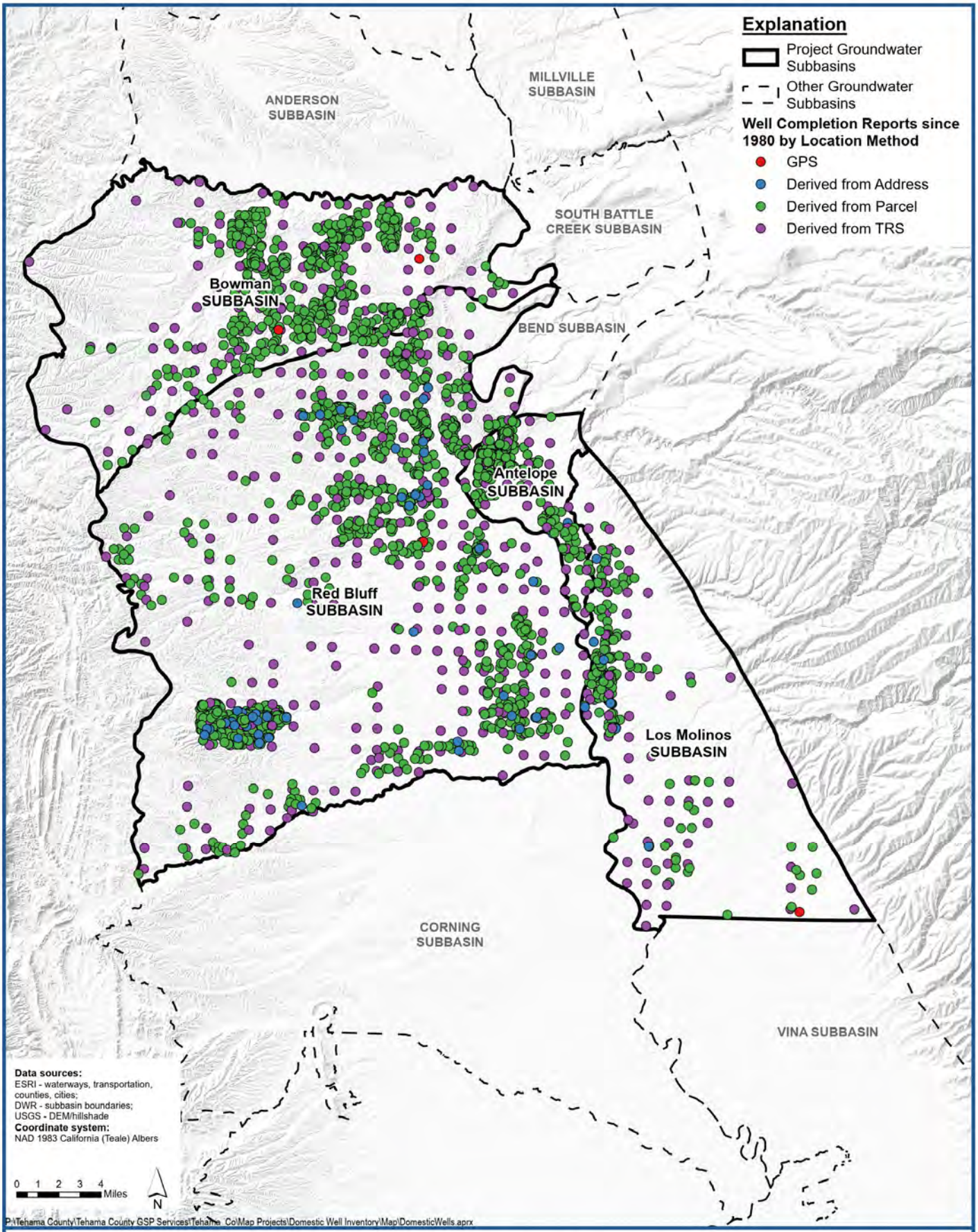
Table 1. Summary of domestic well WCRs by decade and subbasin.

WCR Date Range	Antelope WCRs in Date Range	Bowman WCRs in Date Range	Los Molinos WCRs in Date Range	Red Bluff WCRs in Date Range	Tehama WCRs in Date Range	Cumulative WCRs Since Beginning (Since 1980)
Pre-1950	16	1	9	22	48	48
1950-1959	40	14	21	77	152	200
1960-1969	123	70	47	267	507	707
1970-1979	207	411	187	812	1617	2324
1980-1989	196	421	252	853	1722	4046 (1722)
1990-1999	162	328	205	1080	1775	5801 (3497)
2000-2009	165	393	139	973	1670	7471 (5167)
2010-2019	149	122	57	374	702	8173 (5869)
Since 2020	1	4	0	5	10	8183 (**5879**)
Unknown	18	13	12	33	76	8259

Table 2. Summary of inferred and known domestic wells

Number of Inferred and Known Domestic Wells	Entire Region	Within Community Water System	Within Community Water System or near (within 0.5 mi) Public Water Supply wells
Number of Parcels with Inferred Domestic Wells	15,959	9,234	7,215
Number of Domestic Wells from WCRs 1980-2020	5,879	1,090	260
Number of Domestic Well Permits (unique; not matching WCRs) 2013-2020	338	71	17
Number of Inferred Unique Domestic Well Permits 1980-2020	3,505	736	176
Number of Domestic Wells + Unique (inferred) Permits 1980-2020	9,384	1,826	436

FIGURES



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Domestic Wells from Well Completion Reports
All New Construction Wells from 1980-2020

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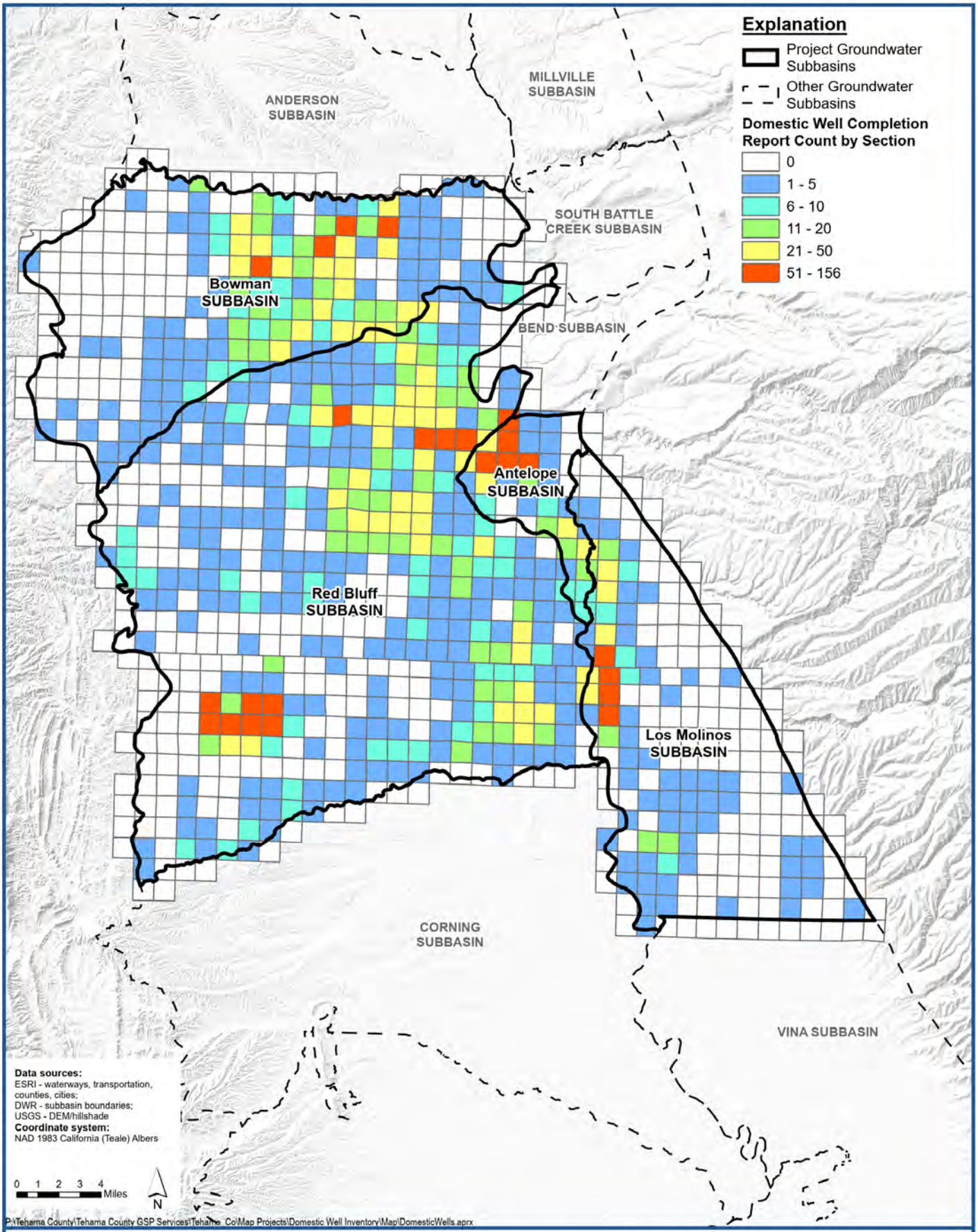
Tehama County, California

Figure 1



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Summary by Section of Domestic Well Completion Reports
All New Construction Wells from 1980-2020

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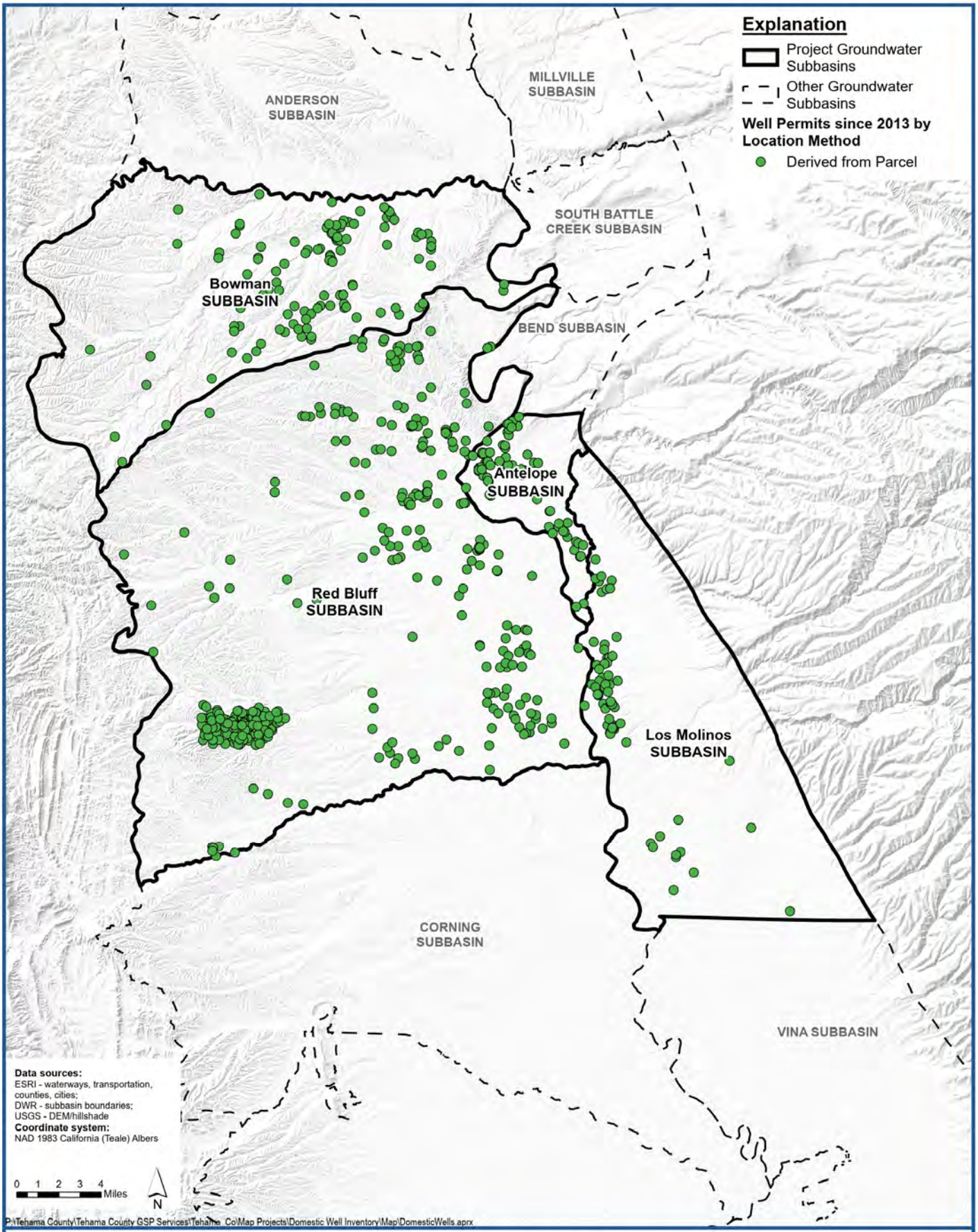
Figure 2



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Domestic Wells from Well Permits
All New Construction Wells from 2013-2020

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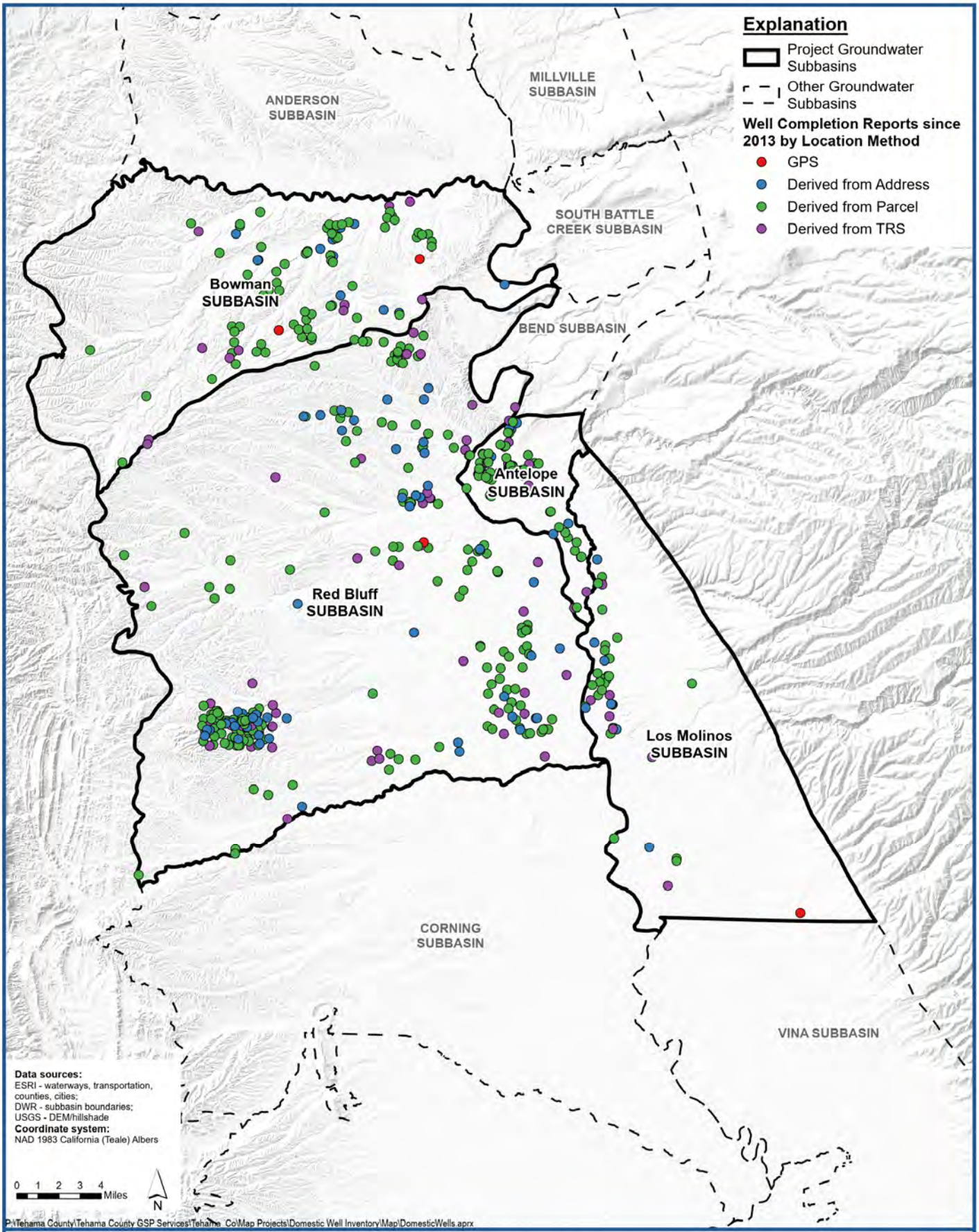
Figure 3a



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Domestic Wells from Well Completion Reports
All New Construction Wells from 2013-2020

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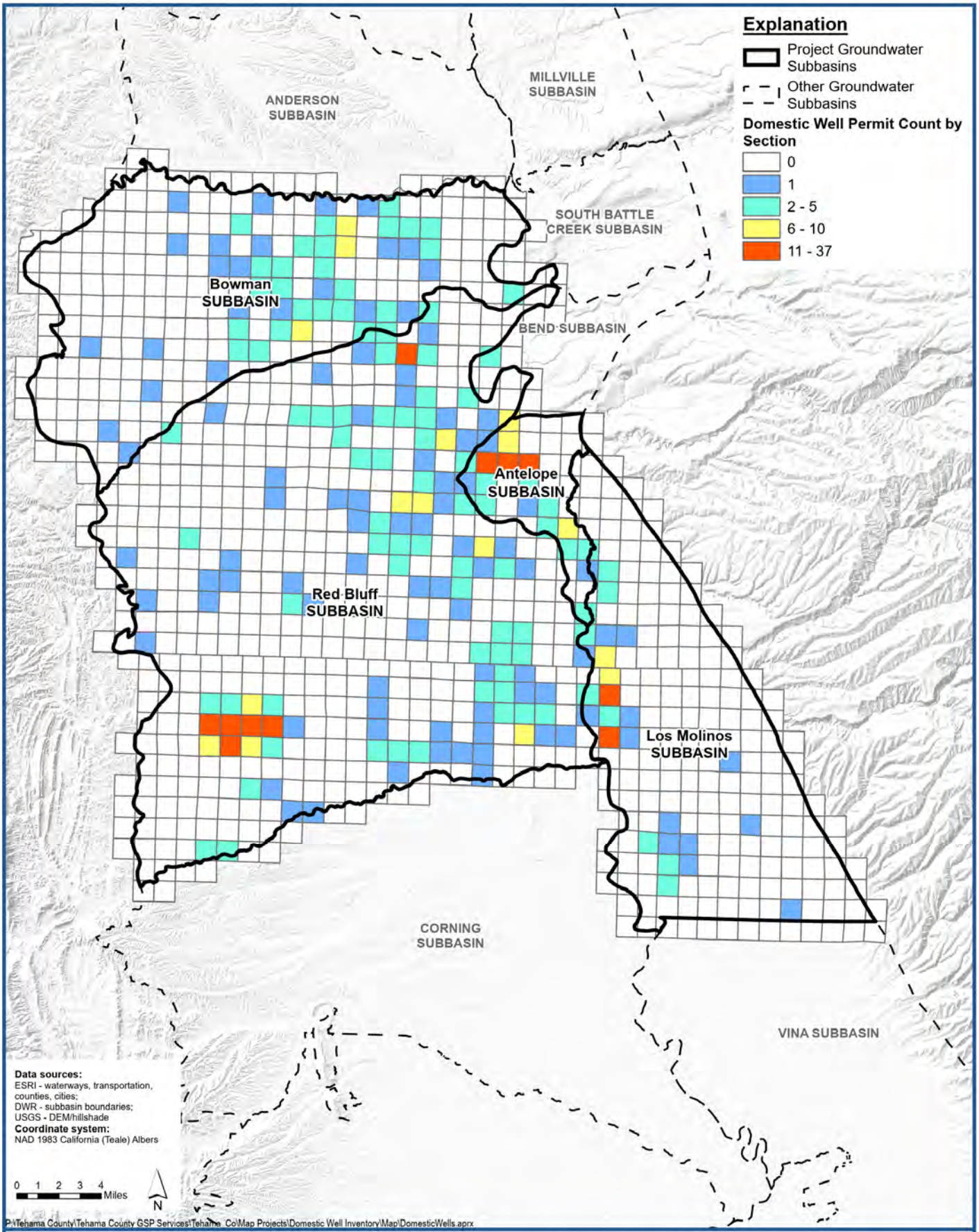
Figure 3b



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Summary by Section of Domestic Well Permits
All New Construction Wells from 2013-2020

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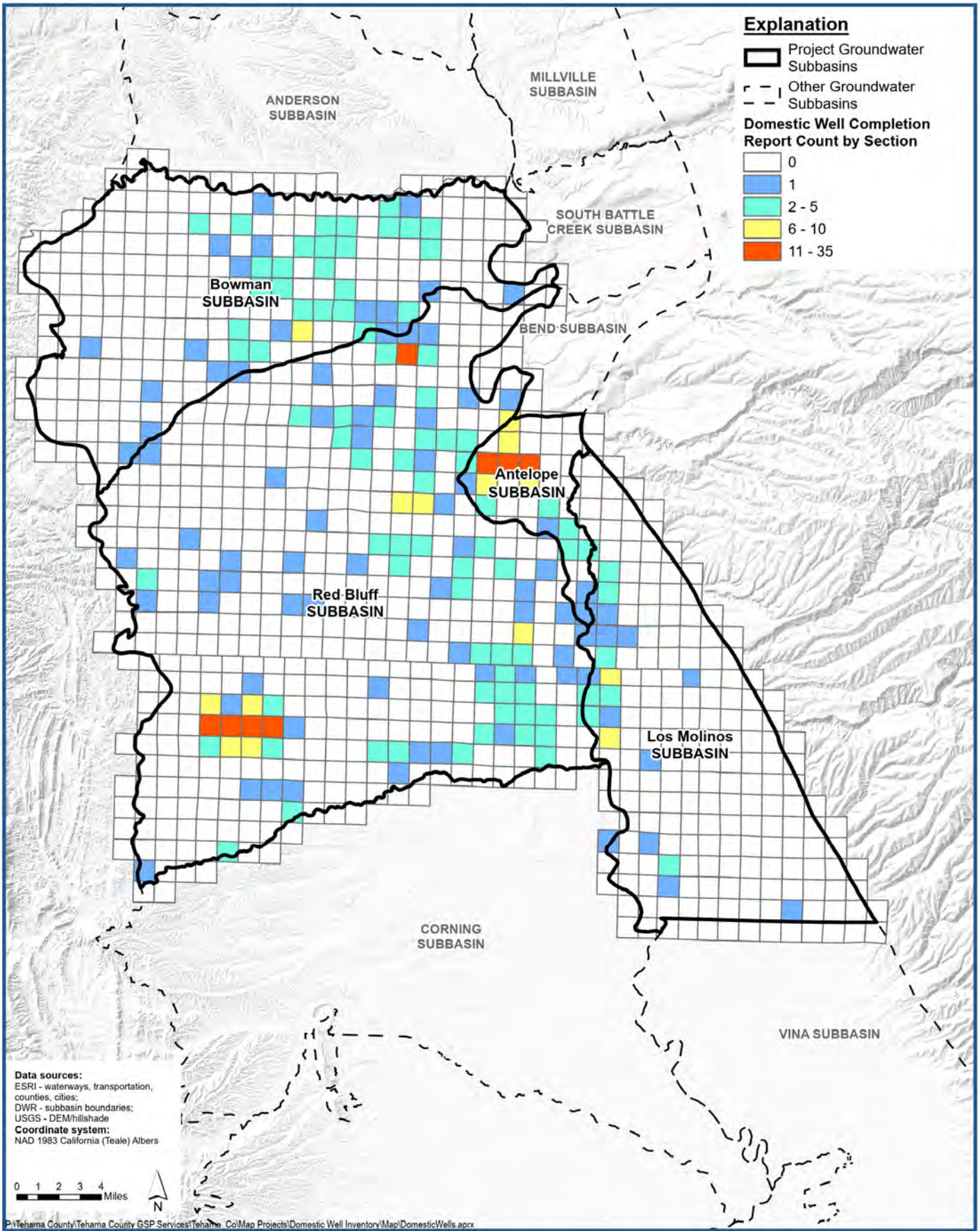
Figure 4a



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Summary by Section of Domestic Well Completion Reports
All New Construction Wells from 2013-2020

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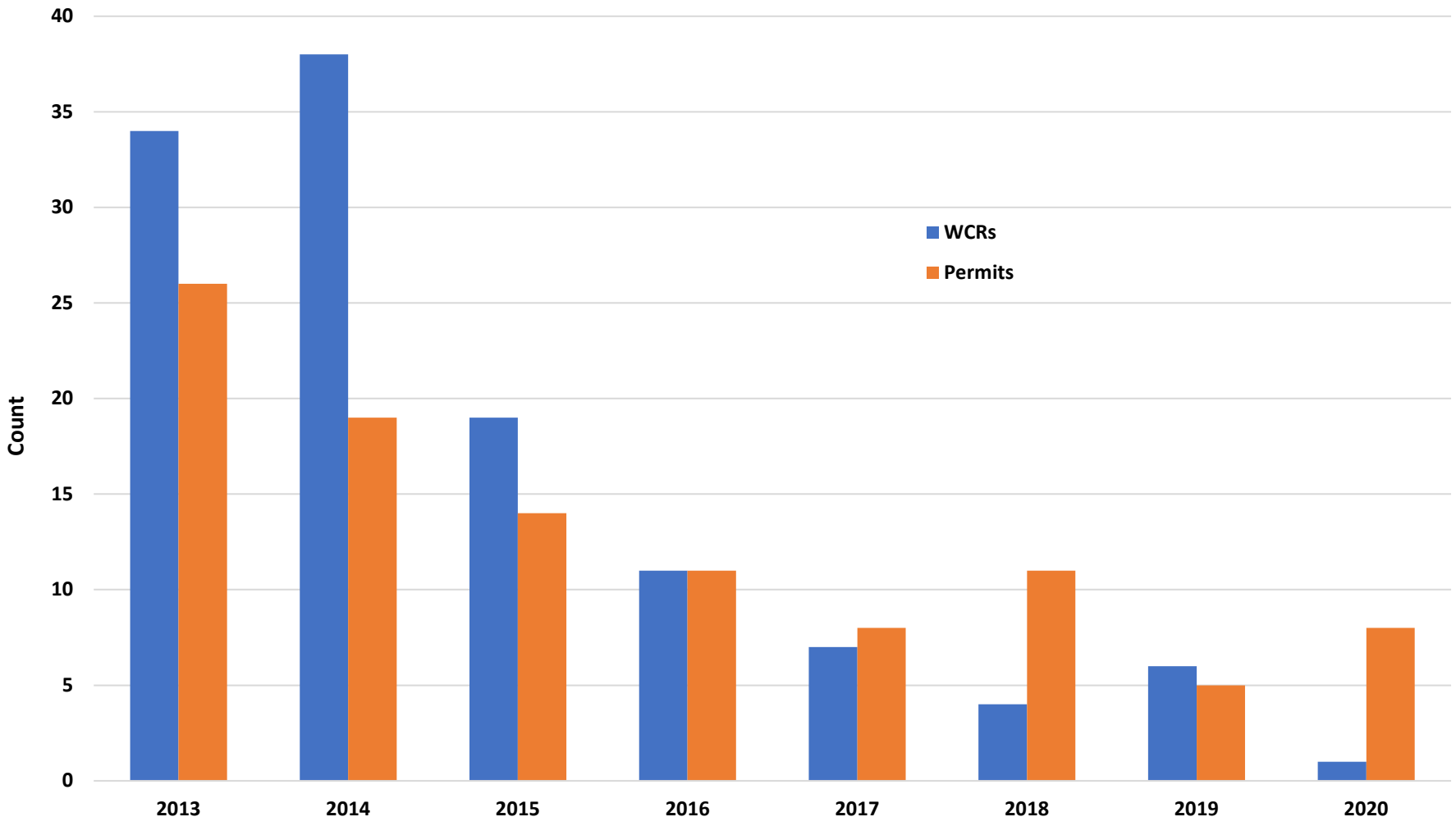
Figure 4b



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Total Annual Number of WCRs and Well Permits in Antelope Subbasin
All New Construction Wells 2013-2020

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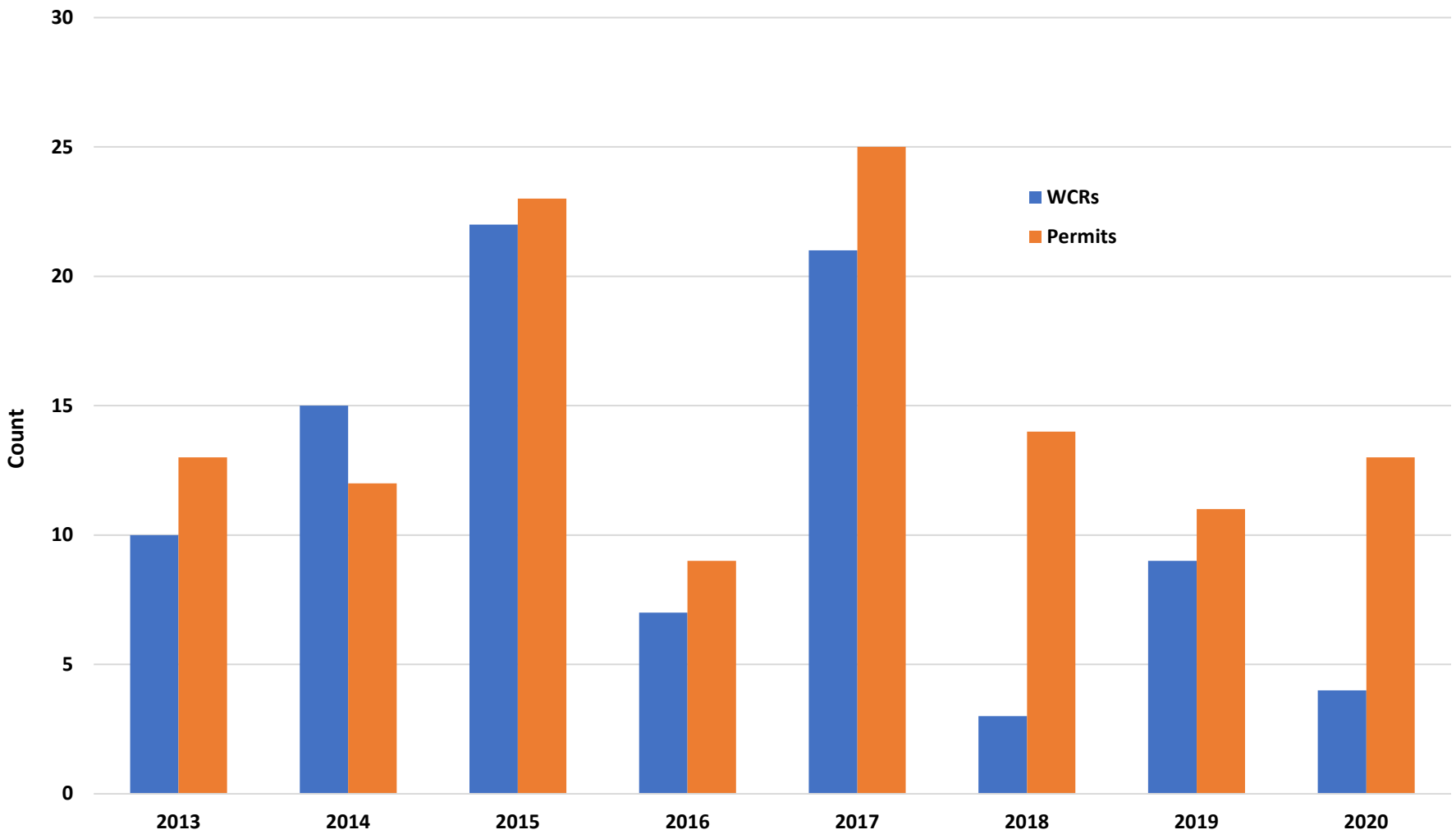
Figure 5a



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Total Annual Number of WCRs and Well Permits in Bowman Subbasin
All New Construction Wells 2013-2020

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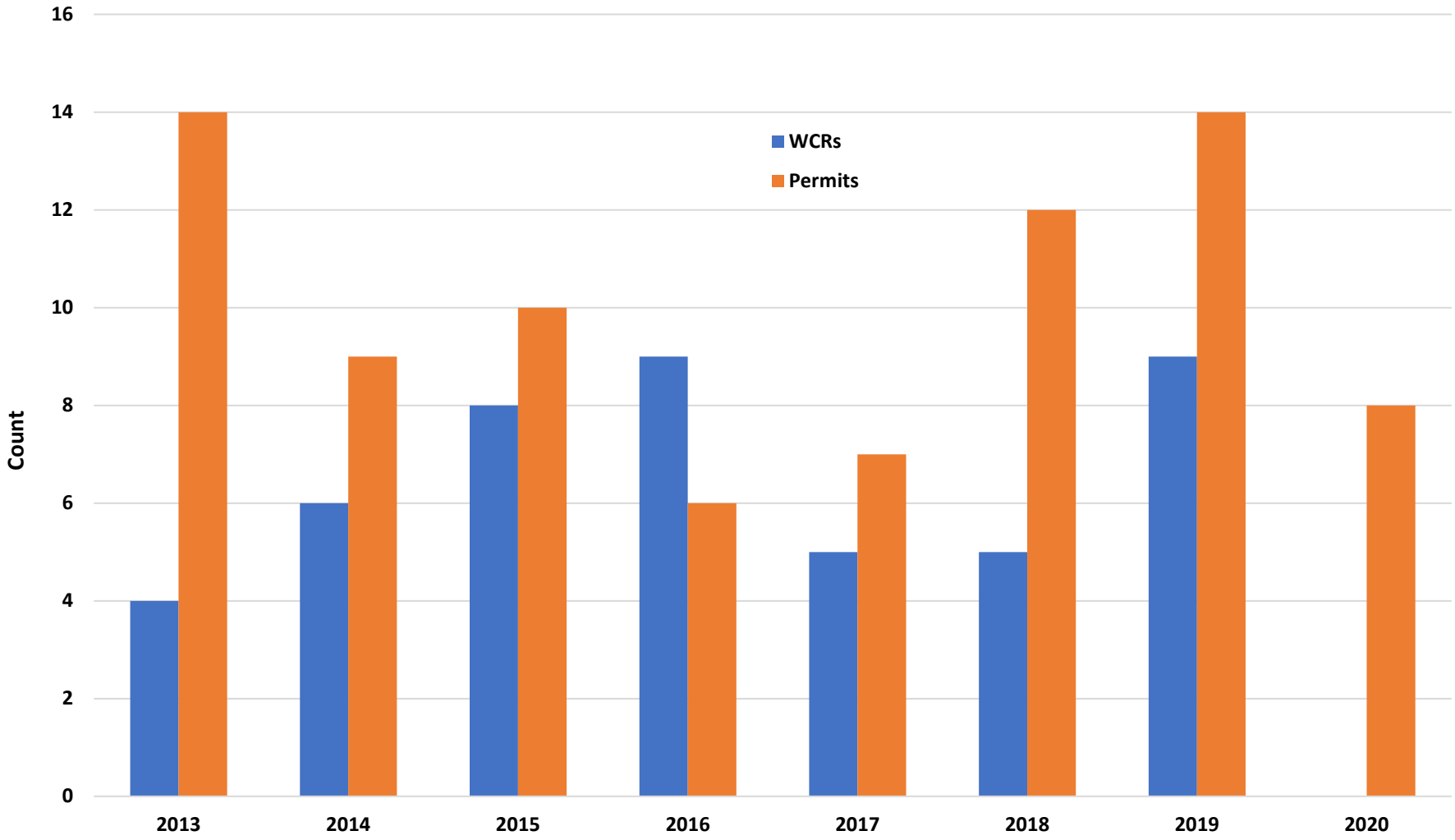
Figure 5b



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Total Annual Number of WCRs and Well Permits in Los Molinos Subbasin
All New Construction Wells 2013-2020

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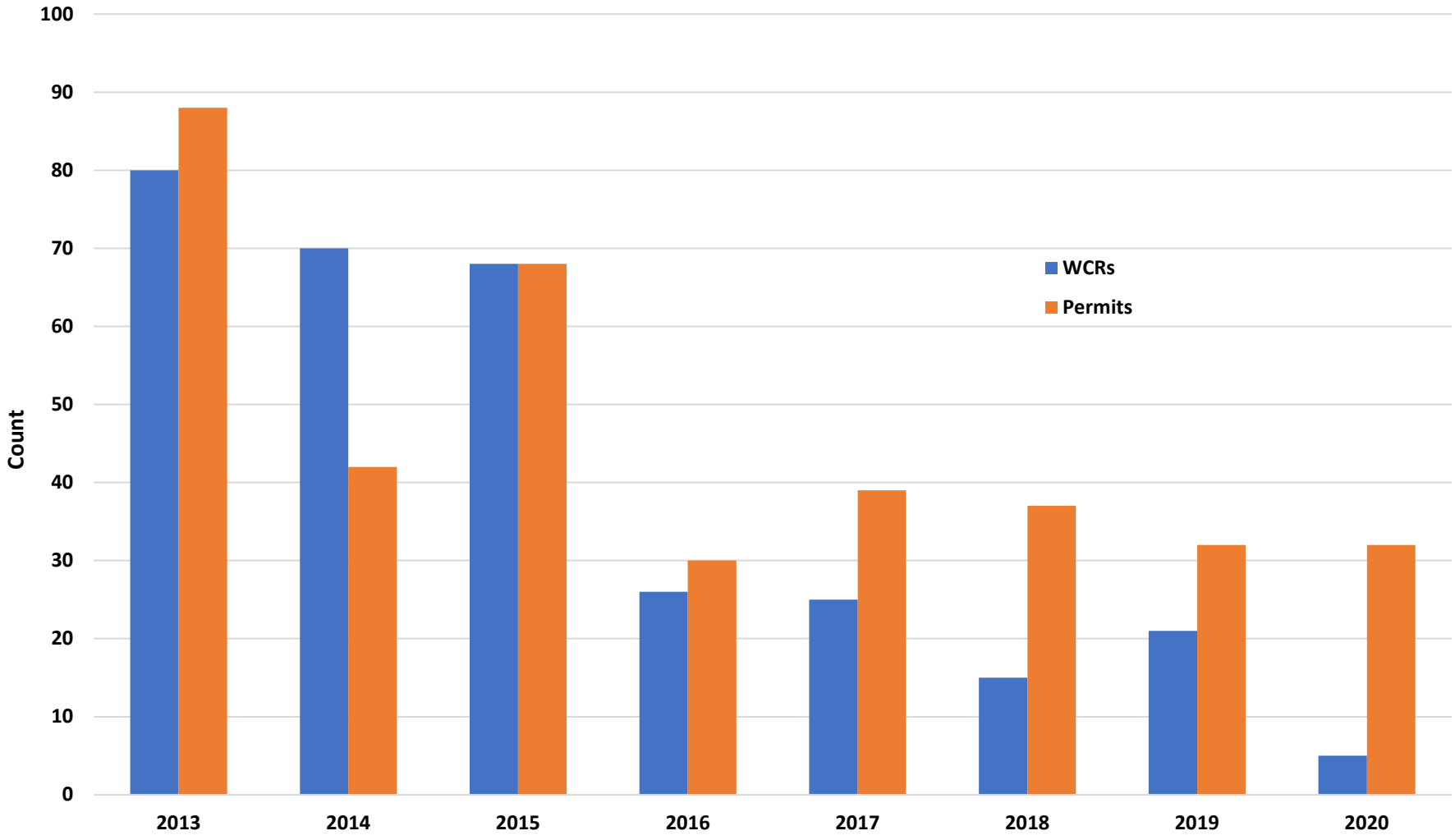
Figure 5c



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Total Annual Number of WCRs and Well Permits in Red Bluff Subbasin
All New Construction Wells 2013-2020

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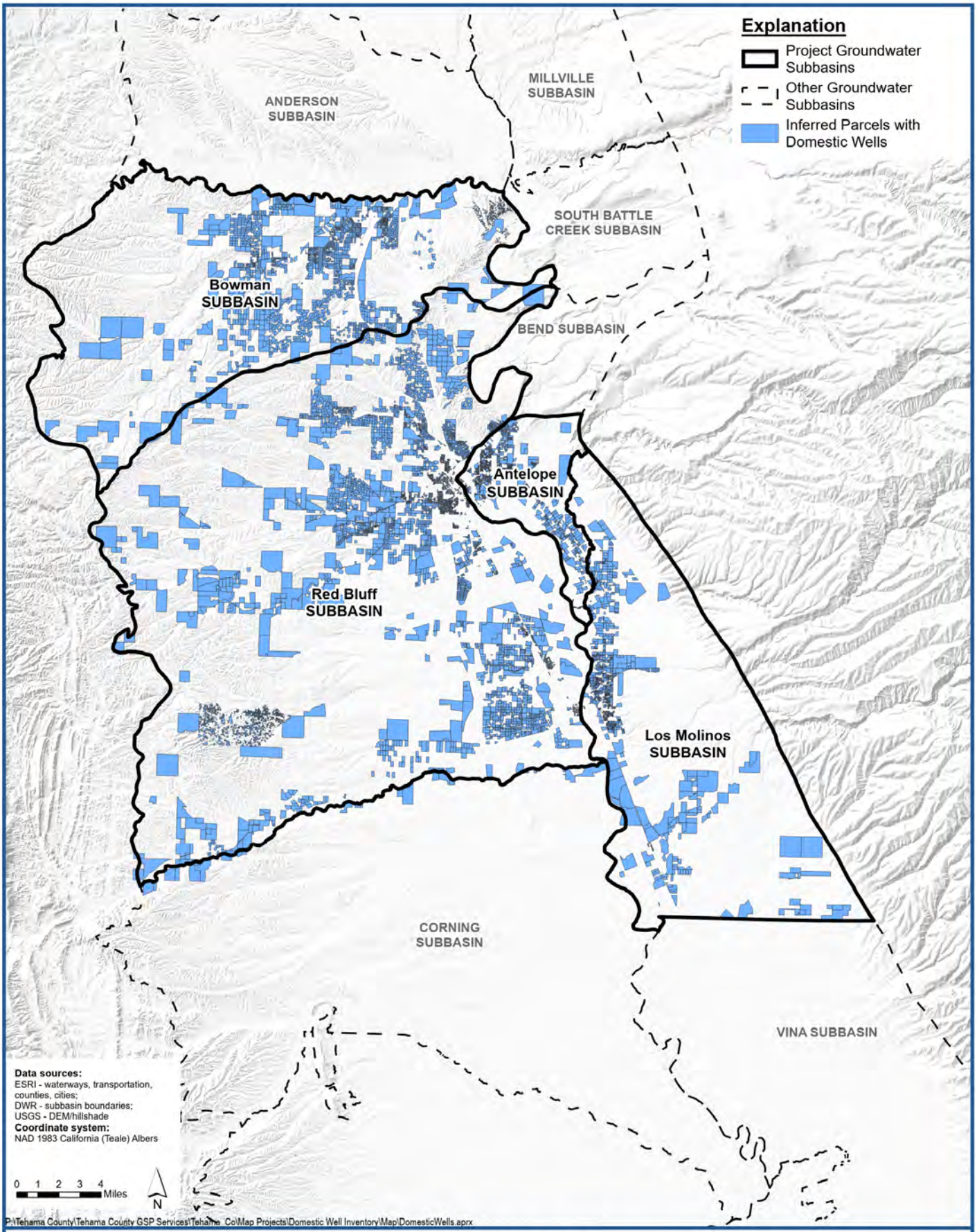
Figure 5d



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Parcels with Domestic Wells Inferred from Land Use Codes

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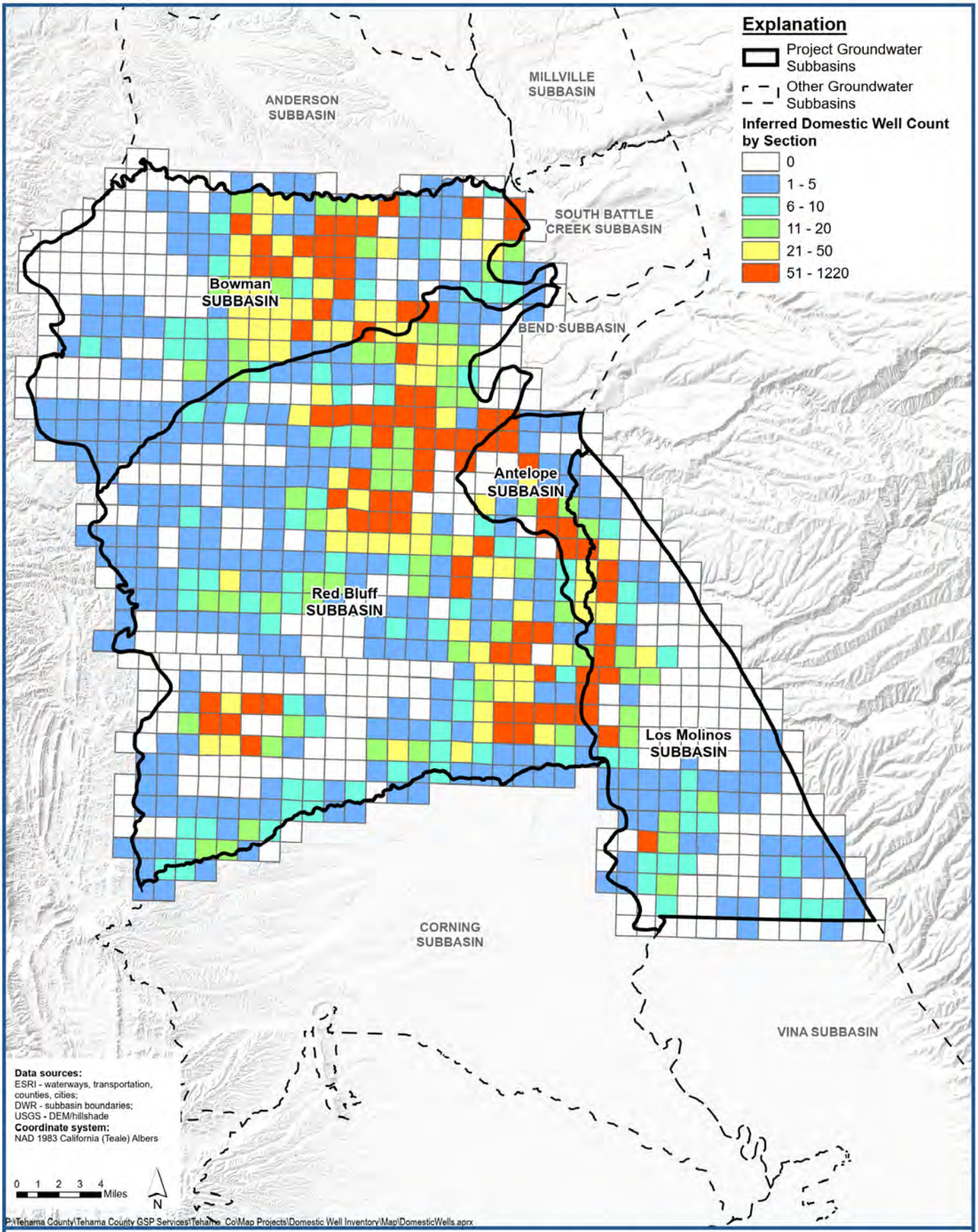
Figure 6



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Summary by Section of Inferred Domestic Wells
Well Locations Inferred by Parcel Land Use Codes

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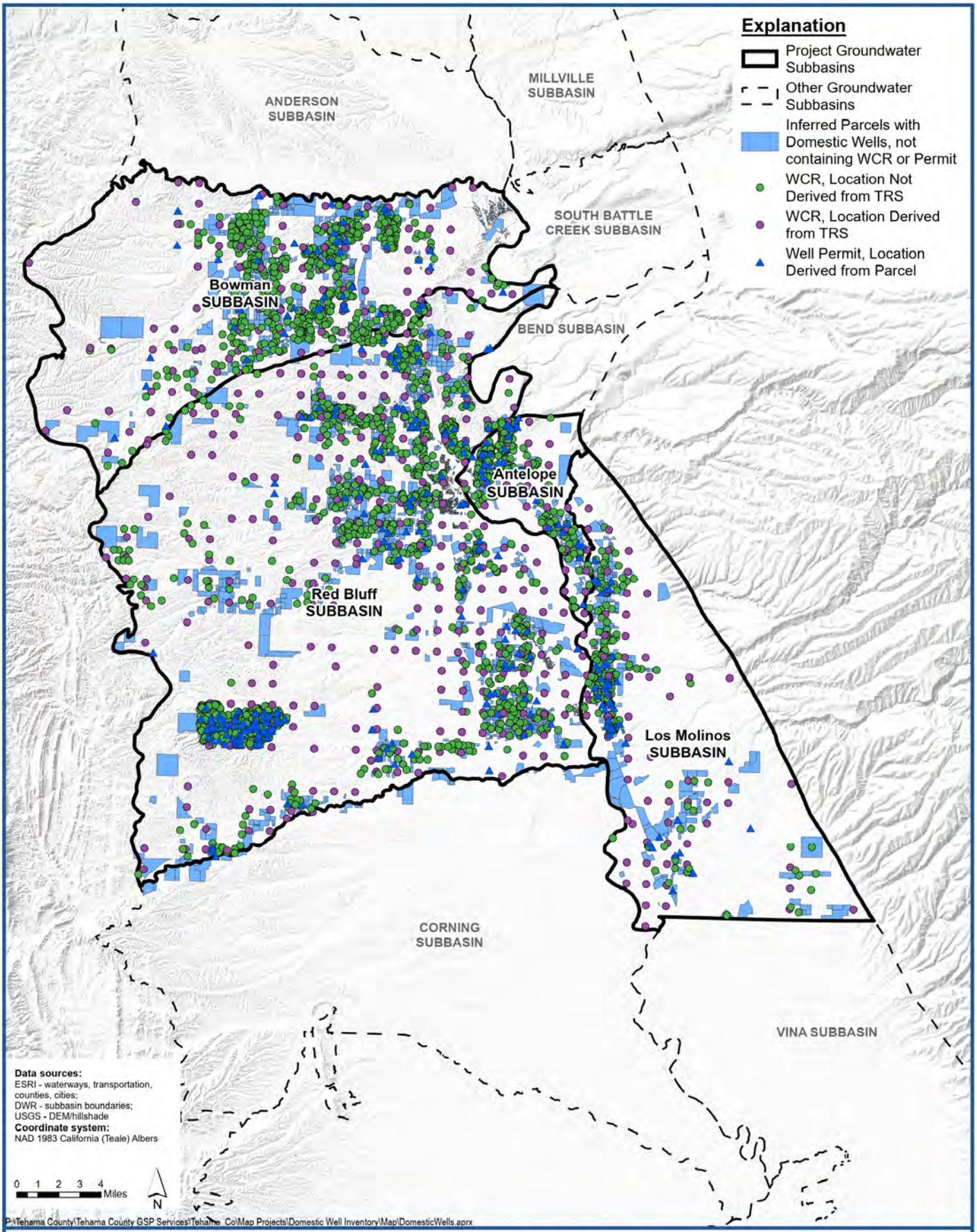
Figure 7



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Summary of Known and Inferred Domestic Well Locations
Data from Well Completion Reports, Permits, and Parcels

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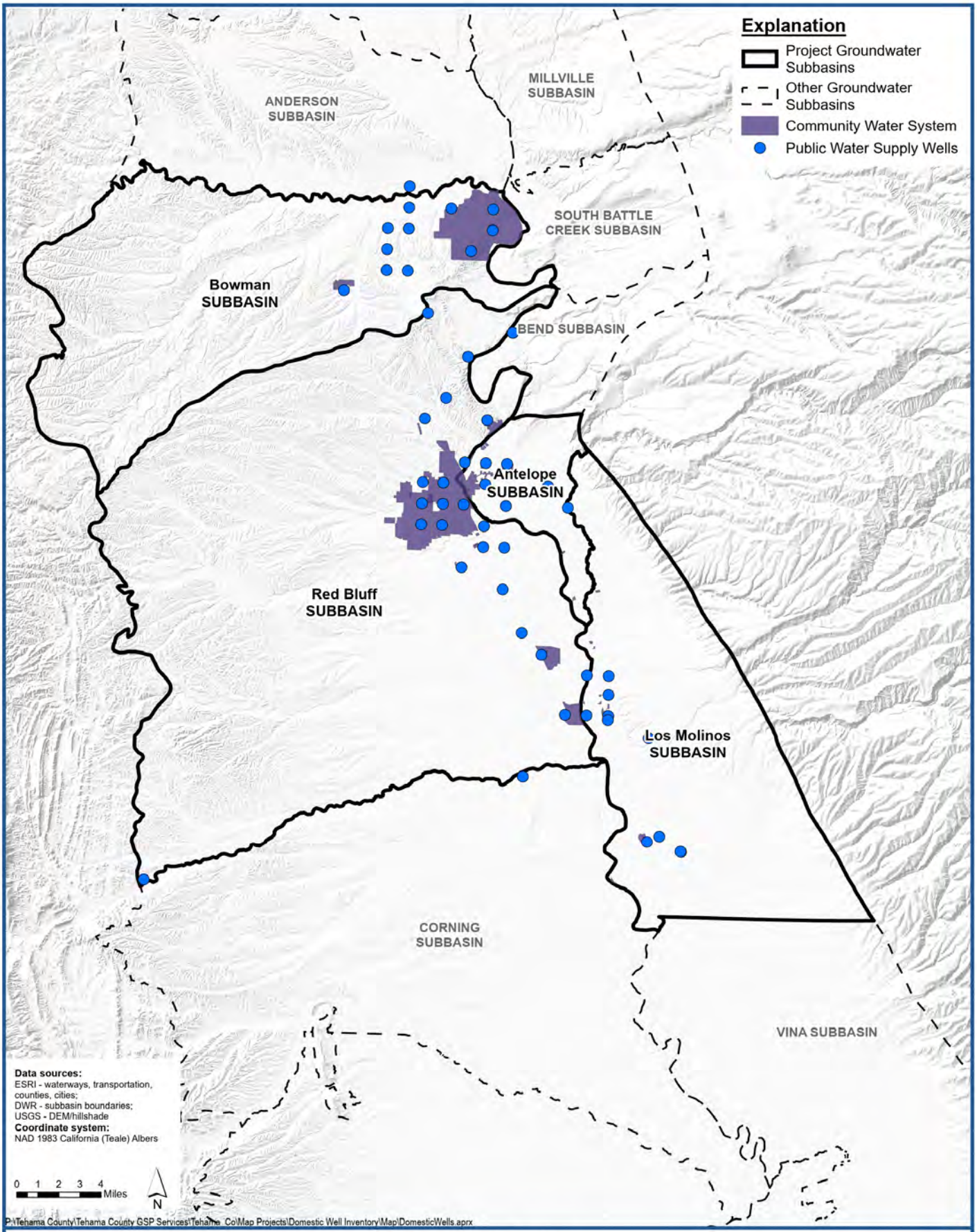
Figure 8



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Community Water Systems and Public Supply Well Locations

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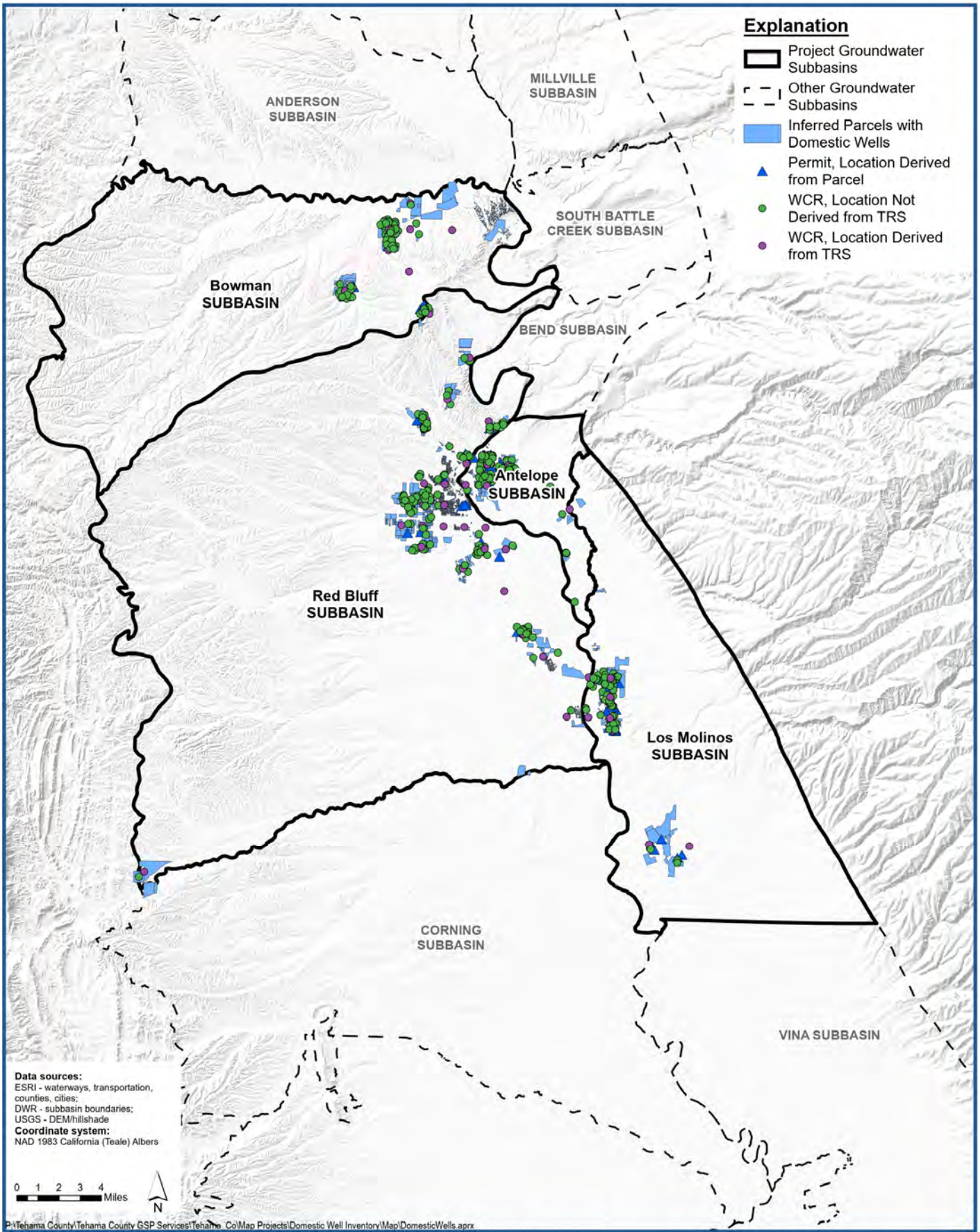
Tehama County, California

Figure 9a

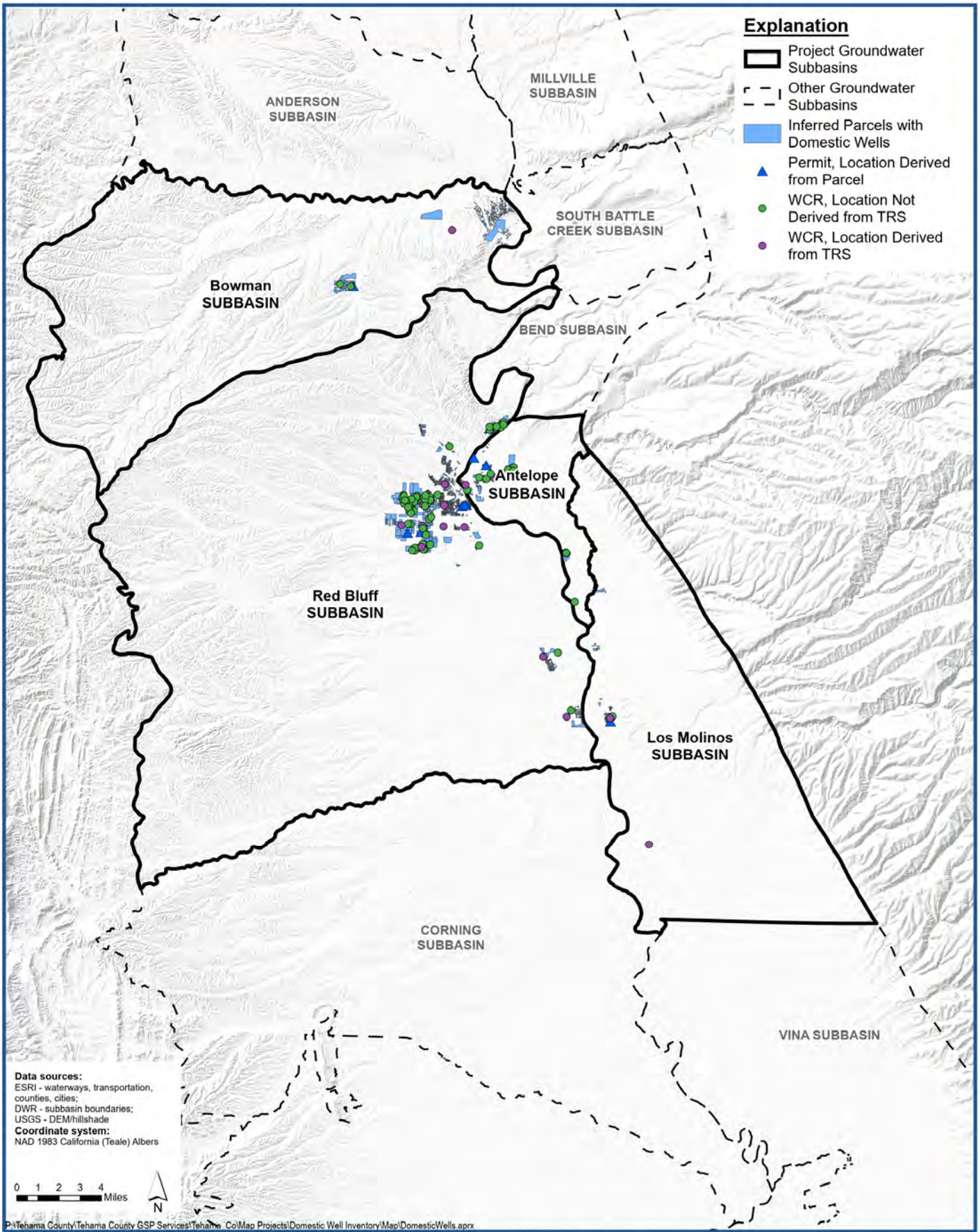


Luhdorff & Scalmanini Consulting Engineers

Known and Inferred Domestic Well Locations within Community Water Systems or near Public Supply Wells

Tehama County Groundwater Sustainability Plan
Tehama County, California

Figure 9b

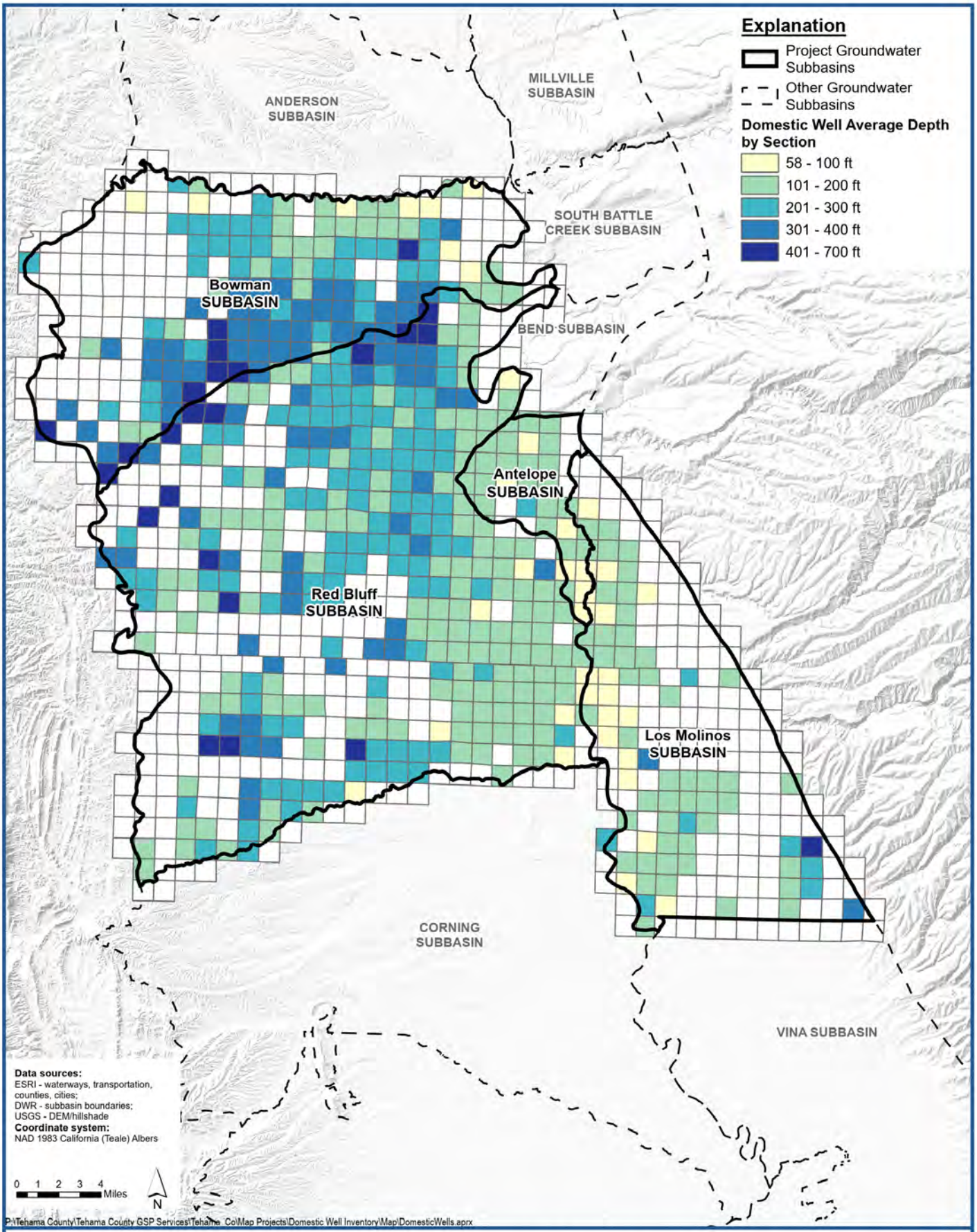


Luhdorff & Scalmanini Consulting Engineers

Known and Inferred Domestic Well Locations Within Community Water Systems

Tehama County Groundwater Sustainability Plan
Tehama County, California

Figure 9c

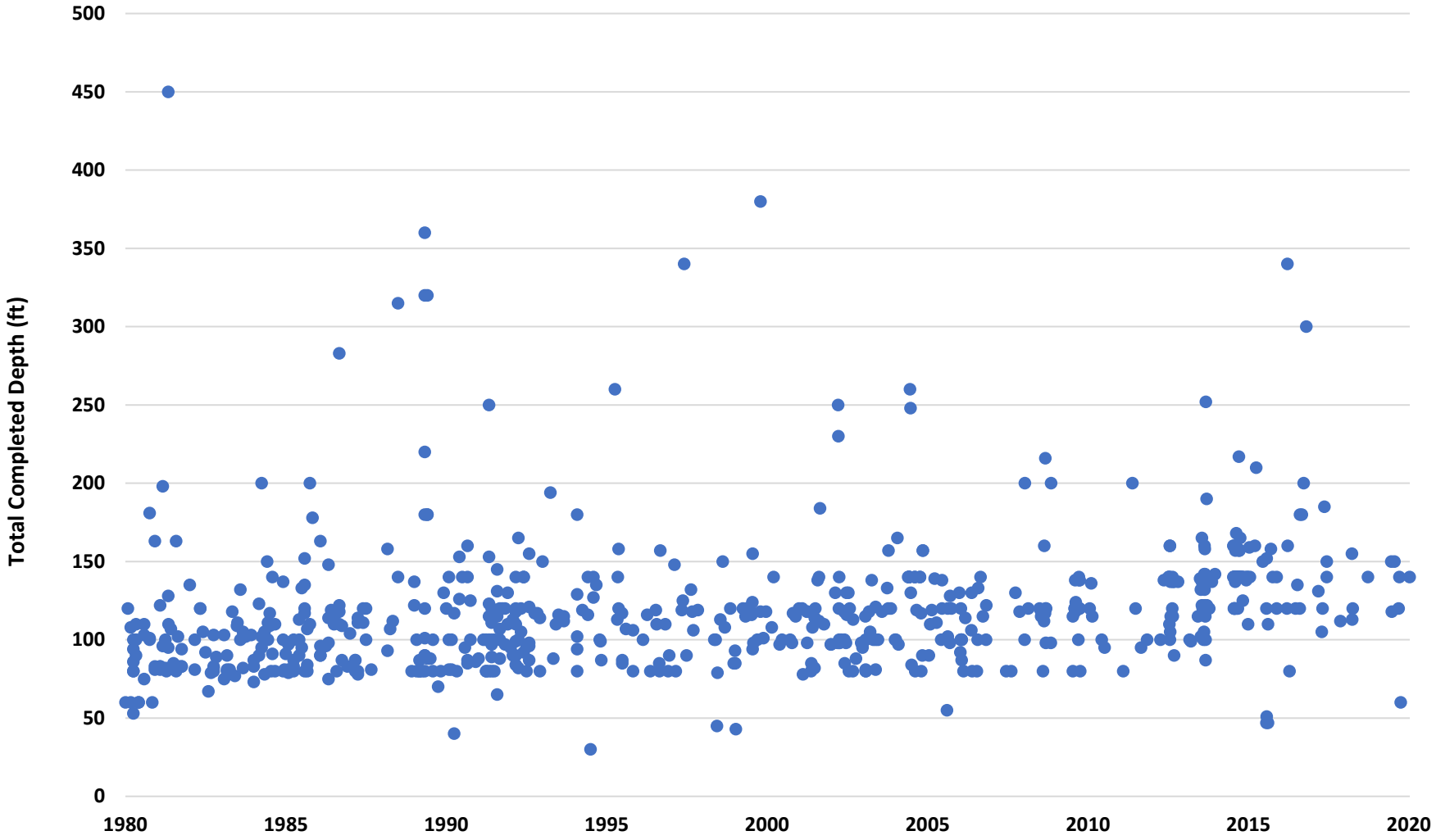


Luhdorff & Scalmanini Consulting Engineers

Average Domestic Well Depth by Section

Tehama County Groundwater Sustainability Plan
Tehama County, California

Figure 10

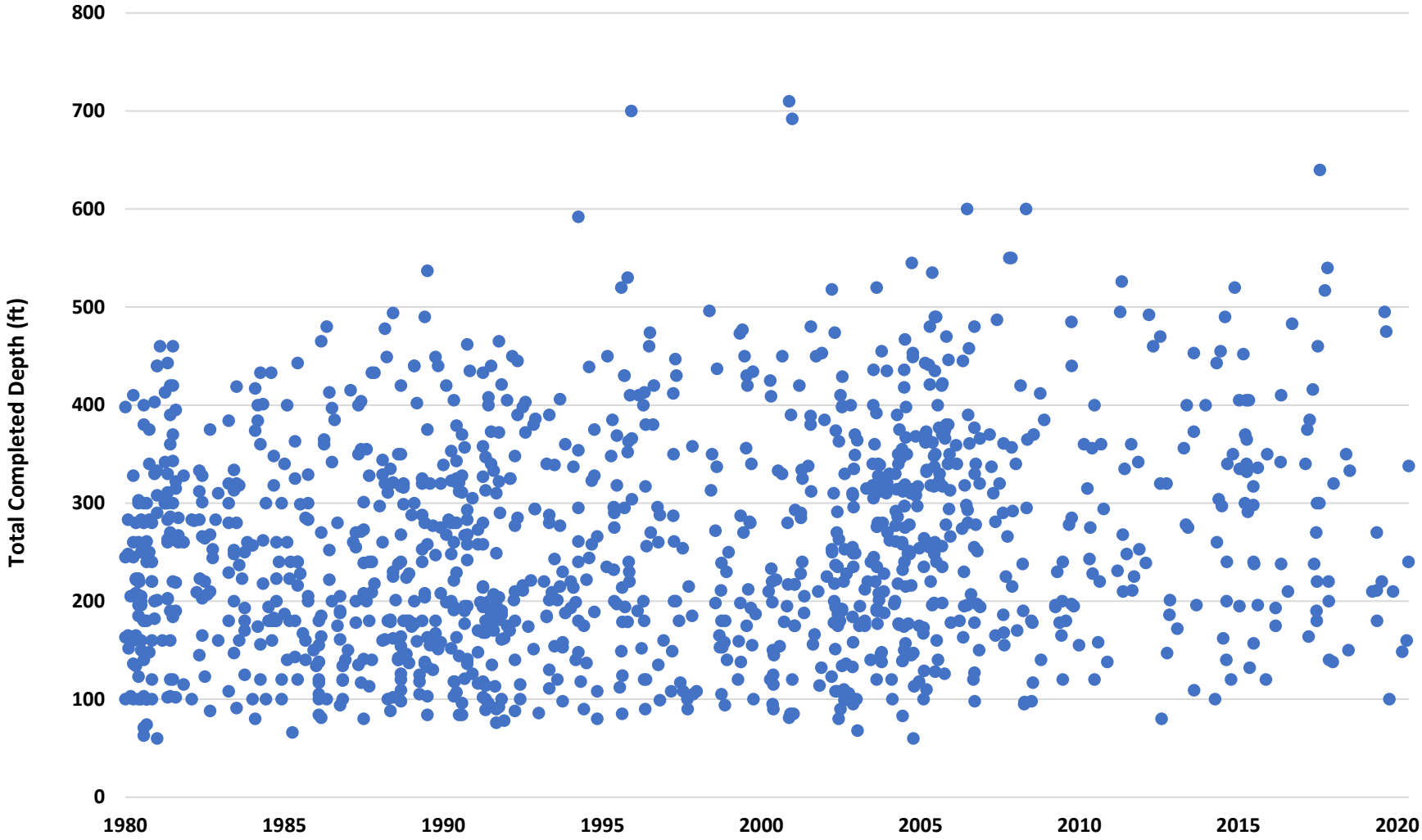


Luhdorff & Scalmanini Consulting Engineers

Well Depths by Year in Antelope Subbasin
Well Completion Reports from 1980-2020

Tehama County Groundwater Sustainability Plan
Tehama County, California

Figure 11a

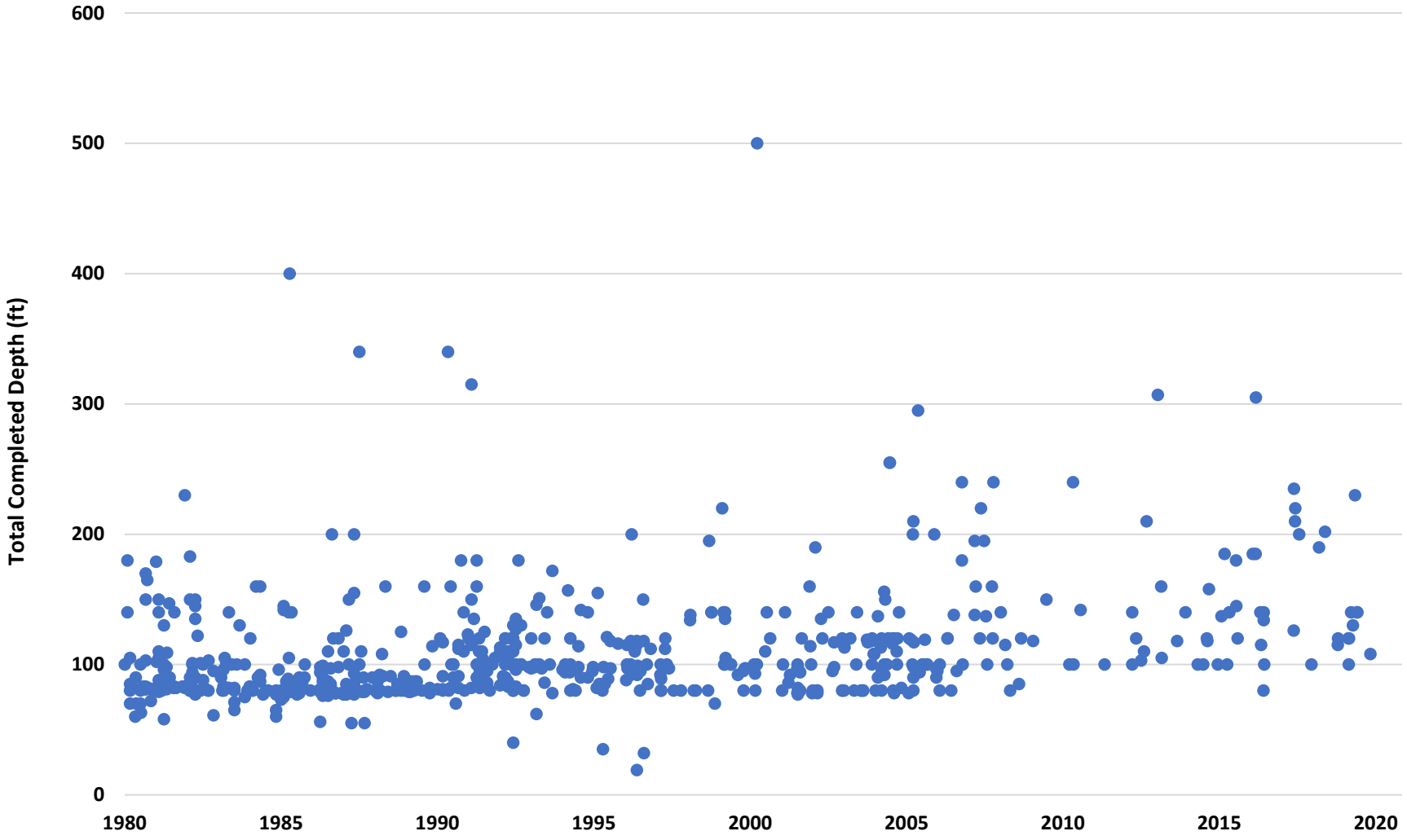


Luhdorff & Scalmanini
Consulting Engineers

Well Depths by Year in Bowman Subbasin
Well Completion Reports from 1980-2020

Tehama County Groundwater Sustainability Plan
Tehama County, California

Figure 11b

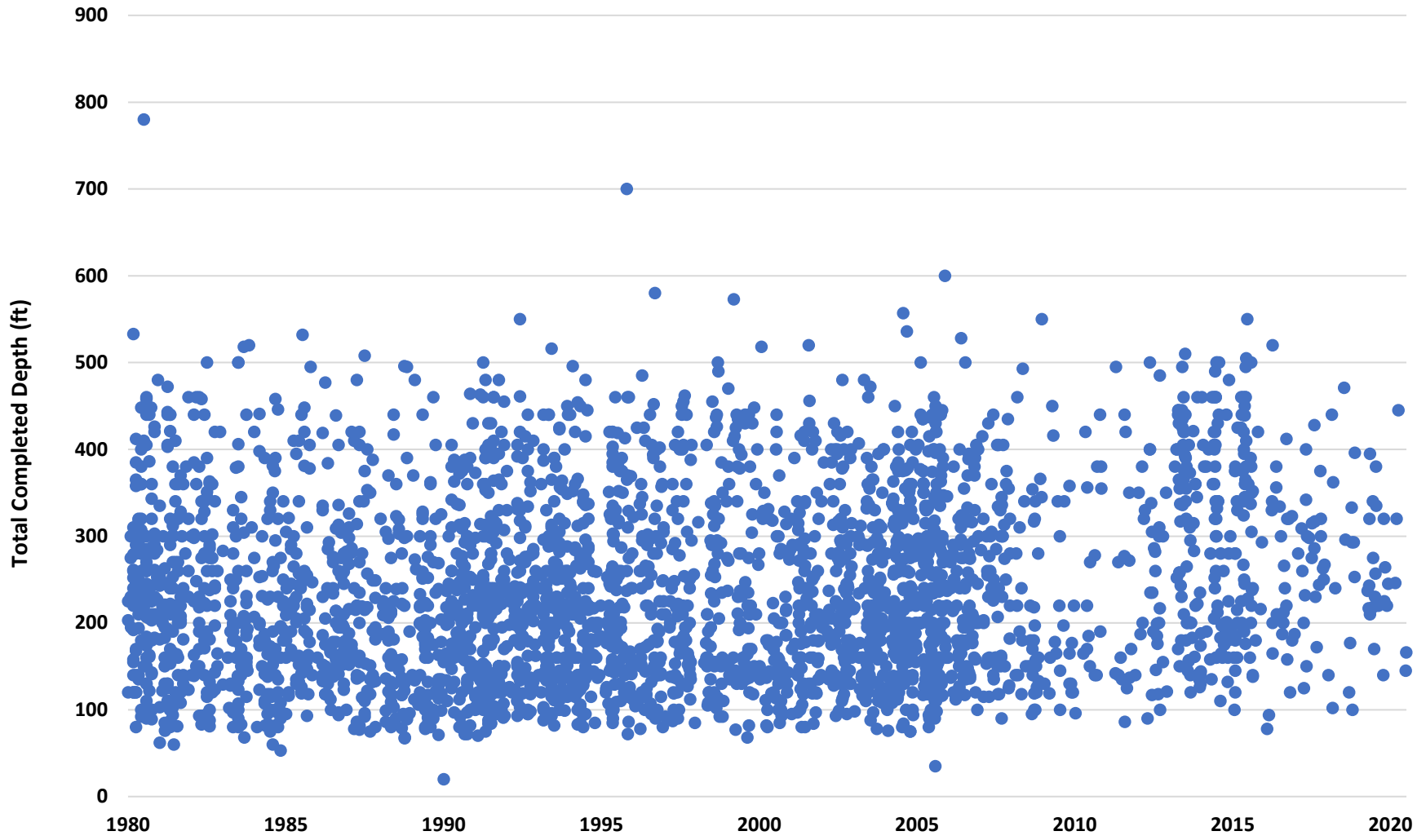


Luhdorff & Scalmanini Consulting Engineers

Well Depths by Year in Los Molinos Subbasin
Well Completion Reports from 1980-2020

Tehama County Groundwater Sustainability Plan
Tehama County, California

Figure 11c



Luhdorff & Scalmanini
Consulting Engineers

Well Depths by Year in Red Bluff Subbasin
Well Completion Reports from 1980-2020

Tehama County Groundwater Sustainability Plan
Tehama County, California

Figure 11d

APPENDIX 1

List of Land Use Codes Appendix 1. List of Land Use Codes of Parcels with Inferred Domestic Wells

APPENDICES

Appendix 1. List of Land Use Codes of Parcels with Inferred Domestic Wells

010	Single Family Dwellings
011	Condominium Units
013	SFD – Non-Conforming Use
014	SFD w/ Secondary Use
015	Living Unit in Planned Unit Dev
016	Mobile Home
017	SFD w/ Mobile Home
021	One Duplex – One Bldg
022	Two or more SFD on Single Parcel
024	2 MH/more on Single Parcel
031	Single Triplex
032	Three Units
033	Single Fourplex
034	Four Units
041	5-10 Res Units – Single Building
042	5-10 Units (2/more Bldg)
043	11-20 Res Units – Single Bldg
044	11-20 Units (2/more Bldg)
045	21-40 Units
046	41-100 Units
047	Over 100 Units
051	Rural Res – 1 Res
052	Rural Res – 2 or more REs
055	Rural Res – w/ Mobile Home
056	Rural Res – w/MH & Res
057	Rural Res – w/2 or more MH
058	Rural Res – w/Travel Trailer
060	Motels less than 25 Units
061	Motels over 25 Units
063	Over 25 Units
065	Motels over 25 Units w/ Shops
301	Irrig Prune Orchard – w/Res
302	Irrig Prune Orchard – w/MH
303	Irrig Prune Orchard – w/Res & MH
305	Irrig Prune Orchard – w/2 or More Res
306	Irrig Prune Orchard – w/2 or more MH
311	Irrig Walnut Orchard – w/Res
312	Irrig Walnut Orchard – w/MH
313	Irrig Walnut Orchard – w/Res & MH
315	Irrig Walnut Orchard – w/2 or More Res
316	Irrig Walnut Orchard – w/2 or More MH
321	Irrig Almond Orchard – w/Res
322	Irrig Almond Orchard – w/MH
323	Irrig Almond Orchard – w/Res & MH
325	Irrig Almond Orchard – w/2 or More Res
326	Irrig Almond Orchard – w/2 or More MH
331	Irrig Olive Orchard w/Res
332	Irrig Olive Orchard w/MH
333	Irrig Olive Orchard w/Res & MH
335	Irrig Olive Orchard w/2 or more Res

336	Irrig Olive Orchard w/2 or more MH
341	Irrig Misc Orchard w/ Res
342	Irrig Misc Orchard w/MH
343	Irrig Misc Orchard w/Res & MH
346	Irrig Misc Orchard w/ 2 or more MH
351	Irrig Vines & Bush w/Res
352	Irrig Vines & Bush w/MH
361	Irrig Row Crops w/Res
365	Irrig Row Crops w/2 or More Res
371	Irrig Field Crops w/Res
372	Irrig Field Crops w/MH
373	Irrig Field Crops w/Res & MH
375	Irrig Field Crops w/2 or more Res
401	Irrig Pasture w/Res
402	Irrig Pasture w/MH
403	Irrig Pasture w/Res & MH
405	Irrig Pasture w/2 or more Res
408	Irrig Pasture w/2 or more MH
411	Dairies w/Res
413	Dairies w/MH
415	Dairies w/2 or more Res
432	Feed Lots w/ MH
521	Field Crops w/Res
522	Field Crops w/MH
523	Field Crops w/Res & MH
525	Field Crops w/2 or more Res
526	Field Crops w/2 or more MH
531	Pasture w/Res
532	Pasture w/MH
533	Pasture w/Res & MH
535	Pasture w/2 or more Res
536	Pasture w/2 or more MH
551	Specialty Farms w/Res
552	Specialty Farms w/ MH
553	Specialty Farms w/Res & MH
555	Specialty Farms w/2 or more Res
556	Specialty Farms w/2 or more MH

Appendix 2-B

Communication and Engagement Plan

TEHAMA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
GROUNDWATER SUSTAINABILITY AGENCY

STAKEHOLDER COMMUNICATIONS AND ENGAGEMENT PLAN

Sustainable Groundwater Management Act (SGMA) Implementation (2021-2023)

Prepared by the Consensus Building Institute

Version 12.15.2021

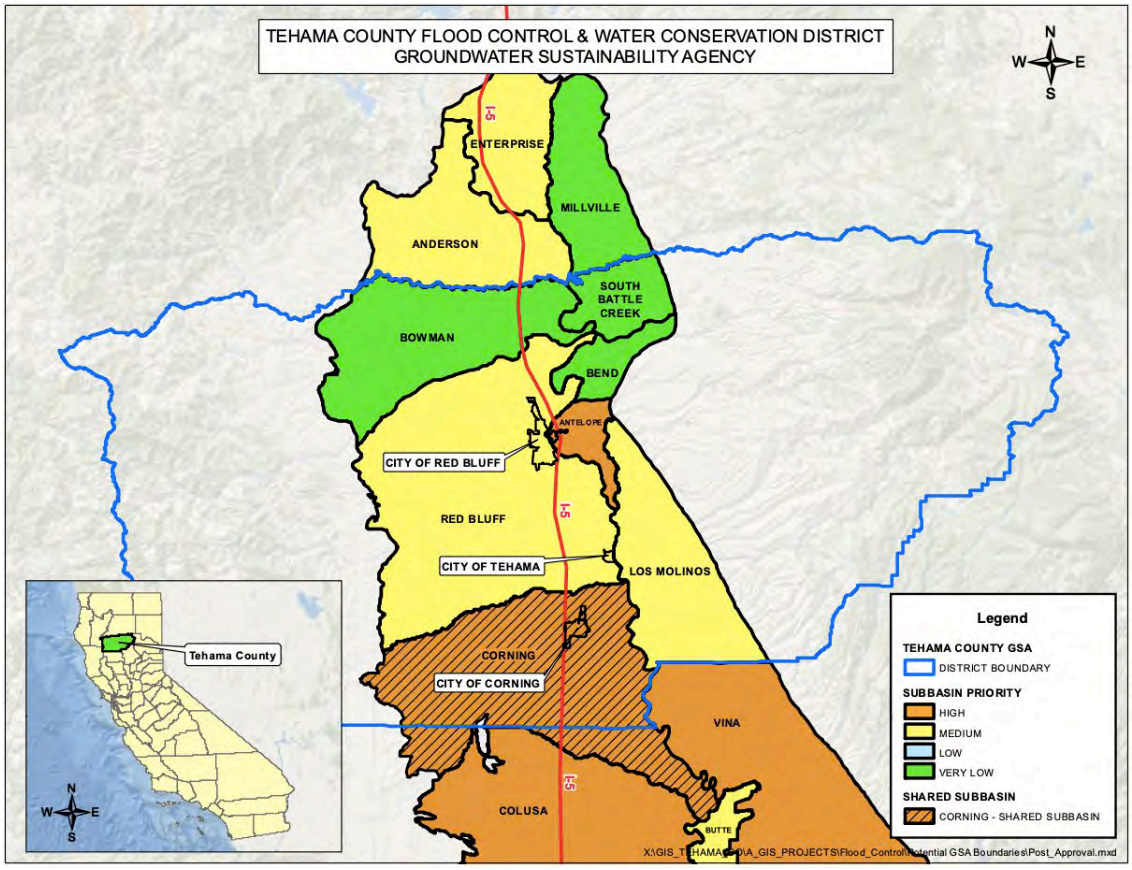
Table of Contents

SECTION 1 | DISTRICT-WIDE COMMUNICATION & ENGAGEMENT

Background

The purpose of the Sustainable Groundwater Management Act (SGMA), signed by Governor Brown in 2014, is to ensure local sustainable groundwater management in medium- and high- priority groundwater basins statewide. California's Department of Water Resources (DWR) has determined that, in Tehama County, the Antelope Subbasin is high priority, while Los Molinos and Red Bluff are medium priority; these three subbasins are subject to SGMA. Low to very low priority subbasins in Tehama County are Bowman, South Battle Creek, and Bend, which are not subject to SGMA. The Corning Subbasin (high priority; subject to SGMA) is partially within Tehama County and extends into Glenn County. [Refer to map below.]

SGMA requires that a Groundwater Sustainability Agency (GSA) (which can be a single local water authority or cooperating collection of local authorities) develops and executes a Groundwater Sustainability Plan (GSP) to manage a basin's shared resources. The **Tehama County Flood Control & Water Conservation District** (District)[1] serves as the exclusive GSA within Tehama County. The District is responsible for managing the portions of the seven subbasins located within Tehama County. The



[1] The Tehama County Flood Control & Water Conservation District was originally established in 1957 by the Tehama County Flood Control and Water Conservation District Act. This Act defined the boundary and territory of the District as: "all that territory of the County of Tehama lying within the exterior boundaries thereof."

District is one of two GSAs coordinating within the Corning Subbasin[2] to develop a single GSP; outreach for this subbasin is being covered under a separate Communications and Engagement Plan. The District is also coordinating with multiple agencies developing GSPs that border the District.

SGMA Milestones

GSA Formation and GSP Development. There is one exclusive GSA in Tehama County – the District. The GSA formed by the state-mandated deadline of June 30, 2017, constituting SGMA's first major milestone. The District operates as the GSA governing all portions of the subbasins within the exterior boundary of Tehama County; and will develop individual GSPs for four subbasins located entirely within the District (Antelope, Los Molinos, Red Bluff, and Bowman[3]). While the four GSPs and this Communication and Engagement Plan are specific to the Red Bluff, Antelope, Los Molinos, and Bowman Subbasins, the District is still responsible for the other remaining subbasins. The Tehama GSA (District) has agreed to coordinate with the Corning Subbasin GSA via a Memorandum of Understanding (MOU) to develop a single GSP for the Corning Subbasin.

GSP Adoption. The second major milestone in SGMA is the adoption of GSPs by January 31, 2022. GSPs are prescribed by SGMA and contain required elements not specified in this Communications & Engagement Plan.

Groundwater Sustainability. The third milestone is achieving sustainability by 2042.

Figure 1. SGMA Milestones

[2] Information on the Corning Subbasin can be found at CorningSubbasinGSP.org.

[3] Bowman Subbasin changed from a medium priority subbasin to a very low priority subbasin in 2018, and the District was able to secure funding under Proposition 1 to develop a GSP even though it is now a very low priority subbasin. Also, the District sees this as an area that may experience growth in the future and would like to manage the subbasin under a GSP.

Desired Goals and Outcomes of the Plan

Goals

SGMA requires the GSA to consider the interests of beneficial uses and users of groundwater, and encourages involvement of diverse social, cultural, and economic elements of the population within the subbasins during preparation and implementation of GSPs (Water Code Sections 10723.8(a)(4) and 10723.2).

The goals of the Stakeholder Communications & Engagement Plan are to:

1. Enhance understanding and inform the public about water and groundwater resources in the District subbasins, the purpose and need for sustainable groundwater management, the benefits of sustainable groundwater management, and the need for the GSPs.
2. Engage a diverse group of interested parties and stakeholders and promote informed feedback from stakeholders, the community, and groundwater-dependent users throughout the preparation and implementation process of the GSPs.
3. Coordinate communication and involvement between the subbasins and other local agencies, elected and appointed officials, and the general public.
4. Utilize the District Board and Groundwater Commission meetings to facilitate a public engagement process.
5. Employ a variety of outreach methods that make public participation accessible and that encourages broad participation.
6. Respond to public concerns and provide accurate and up-to-date information.
7. Manage communications and engagement in a manner that provides maximum value to the public and constitutes an efficient use of the GSA's resources.

Outcomes

The desired outcome of this Communication & Engagement Plan is to achieve understanding and support for adoption of the GSPs and implementation in consideration of the people, economy, and environment within the subbasins and in coordination with adjacent subbasins.

In practical terms, the GSP regulations require a communications section of the GSP that must include the following:

- Explanation of the GSA's decision-making process.
- Identification of opportunities for public engagement and involvement.
- Description of GSA's encouragement of active involvement of diverse elements of the population within each basin.
- Methods the GSA shall follow to inform the public about GSP progress.

This Communication & Engagement Plan forms the basis for the communications section of the GSPs.

Time Period

The Communication & Engagement Plan is intended to cover communications and engagement for August 2021 through December 2023.

In late September, the District will release the Draft GSPs (Bowman, Red Bluff, Antelope and Los Molinos subbasins) publicly for at least 45 days for public review and comment (public comment period expected: September 24 – November 19).

As required and planned, before the end of December 2021, the GSA will hold a formal public hearing on the Draft GSPs and then consider adopting the GSPs for submittal to the California Department of Water Resources in January 2022 as the law requires.

This Communication & Engagement Plan will also support the first two years of implementation. Since this is a multi-year effort, the key activities needed to achieve these goals will likely be broken down into annual work plans, and may be amended, as needed.

*Refer to **Table 1** for a summary of engagement progress to date and **Appendix A** and **Appendix B** for examples of outreach resources and coordination.*

Interested Parties and Other Stakeholders

SGMA identifies interested parties that the GSA must consider when developing and implementing the GSPs, including:

- Agricultural users of water
- Domestic well owners
- Municipal well operators
- Public water systems
- Land use planning agencies
- Environmental users of groundwater
- Surface water users
- The federal government
- California Native American Tribes (see **Appendix C** for Tribal Outreach Guidance Document)
- Disadvantaged communities (including those served by private domestic wells or small community water systems) (see **Appendix D** for DAC Guidance Document)

Outreach Roles

[Refer to the District's GSA governance structure][4]

The **District Board** of Directors (District Board) are elected officials and serve as the GSA Governing Body that has final approval authority for the GSPs and GSA. The District's five Board Members are comprised of the five County Board of Supervisors, which allows for additional collaboration within subbasins. In regard to outreach, the District Board is responsible for:

- Adopting and overseeing implementation of the Communication & Engagement Plan.
- Entering into MOUs with other public agencies to codify agency-to-agency engagement activities for the development and implementation of GSPs.

[4] http://www.tehamacountypublicworks.ca.gov/flood/sgma/governanace%20structure.pdf

- Considering the recommendations of the Groundwater Commission.
- Receiving public comments made verbally and in writing.

The **Groundwater Commission** is comprised of eleven (11) members representing the three incorporated Cities within Tehama County, private pumpers, and surface water agencies or districts.

Groundwater Commission Representation:
(1) City of Corning
(1) City of Red Bluff
(1) City of Tehama,
(1) El Camino Irrigation District
(1) Los Molinos Community Services District
(1) Rio Alto Water District
(5) County Supervisorial District representatives (one representative per district)

In regard to outreach, the Groundwater Commission is responsible for:

- Developing and implementing, with oversight from the District Board of Directors, the Communication & Engagement Plan.
- Receiving public comments made verbally and in writing.
- Considering and incorporating public and key stakeholder input during GSPs' development/implementation and making recommendations to the District Board.
- Offering the public an opportunity to be educated and to participate in the GSPs' development/implementation process through the Groundwater Commission meetings.

The District Board and Groundwater Commission are committed to keeping the **public informed**, providing the public with **balanced and objective information** to assist the public in understanding SGMA and **creating an open process** for public involvement on the development and implementation of GSPs.

Communications & Engagement for GSP Elements

To truly engage the public in development and implementation of GSPs that are science-based, complex, technical, and include achievable outcomes, the GSA will strive to meet these overall objectives:

- Educate the public in meaningful ways. Communicate what may often be complex concepts in straightforward, comprehensible ways.
- Offer the public and stakeholders a meaningful way to participate during the GSPs' development, adoption, and implementation process.
- Encourage members of the public and stakeholders to share historic data and to also help collect data to gain an improved understanding of the subbasins.
- To facilitate improved coordination amongst the seven subbasins within Tehama County, along with neighboring GSAs.
- Show how input received has been considered and incorporated as appropriate into the GSPs or planning process.
- Remain focused on results.

The GSA carried out community engagement activities during development of the GSPs. The GSPs were prepared iteratively and in a logical progression, building on previously developed technical and policy

information. Throughout the process of preparing the GSPs, background materials along with draft text, figures and tables for each section were provided to the public, including other interested parties, in advance of meetings for input and comment. Received input were then incorporated as appropriate into the Draft GSPs. Draft GSPs will be available for public review and comment in Fall 2021; public workshops will be held during the public comment period. The GSA will hold a formal public hearing and consider adopting the GSPs in December 2021 for a January 2022 submittal.

Implementing the GSPs will begin at the end of January 2022. Implementation will involve advancing projects, establish funding mechanisms, addressing data gaps, monitoring, and developing additional needed projects as part of adaptive management. The GSA will need to prepare annual reports and five-year updates to demonstrate progress toward sustainability. Public outreach will inform each of these activities.

Communication & Engagement Forum

Public Meetings/Hearing

Public meetings or hearings are formal opportunities for people to provide official comments on programs, plans and proposals. The District Board of Directors meetings and the Groundwater Commission meetings[5] constitute regular public meetings that will be noticed and conducted in accordance with the Ralph M. Brown Act. SGMA requires that a public meeting be held prior to the adoption of a fee and that public hearings are held for the adoption of GSP elements and the final GSPs. There are also constitutional requirements for public hearings for some fee/rate options. Public meetings and hearings are an important forum for people to share viewpoints and concerns, but often occur at the end of a process, when only one option is under consideration. The GSA will hold required public meetings and hearings but will also use less formal public workshops to solicit feedback and information early in the process.

Stakeholder Briefings

Groundwater Commission members will meet with and communicate regularly with organizations comprised of the stakeholder groups they represent. District staff will be available to assist with presenting any information upon request.

Public Workshops

Public educational workshops provide less formal opportunities for people to learn about groundwater, SGMA, and GSP elements. Workshops can be organized in a variety of ways, including open houses, “stations” where people can ask questions one-on-one, and traditional presentations with facilitated question and answer sessions. In order to solicit feedback from people who may not be comfortable speaking in public, workshops can include small group breakout discussions, comment cards and other techniques. Whatever format is used, workshops will be designed to maximize opportunities for public input.

Public Notices

Public notices, often required by law, aim to notify agencies and the public about activities that may affect the public. As outlined in this Communications and Engagement Plan, the GSA will sponsor a variety of opportunities for people to participate in the development and implementation of the GSPs, including workshops, public hearings, providing comments at District Board meetings and Groundwater

[5] Visit www.tehamacountywater.ca.gov for meeting information.

Commission meetings and through written comments. And, the GSA will comply with public noticing requirements.

Prior to adoption of or amendment(s) to GSPs, SGMA requires that GSA:

- Provides notice to cities and counties within Plan area
- Considers comments provided by the cities and counties
- Accommodates requests for consultation received from the cities and counties within 30 days
- No sooner than 90 days following public notice, holds public hearings

In addition, when a GSA considers any fees to support the work of sustainability, the GSA will provide public notice and other engagement activities.

Communication & Engagement Tools

The GSA will use a variety of communications and engagement tools to keep the public informed, including the following.

Interested Parties List

SGMA mandates the creation of an interested parties list. SGMA does not specify the type of list (email versus hard copy). The first preference is an email list, to get information out quickly and to reduce costs. A secondary list may be developed for people who don't use email. District Board of Directors and Groundwater Commissioners (and the agencies they represent) and District staff can contribute names of organizations, agencies, and individuals to the list. Individuals may also contact the GSA to be added to the interested parties list via the District website and public meetings or workshops.

The list is broad and includes anyone who would like to stay informed about SGMA activities and anyone the District Board and Groundwater Commission think should be informed about the SGMA process and the outcomes of the planning / management effort. The Groundwater Commission will coordinate the distribution of periodic updates to the interested parties list. This list will also be used for dissemination of information about public workshops, public meetings, etc. Additionally, interested parties can sign up to receive noticed agendas for the District Board meetings and Groundwater Commission meetings.

Informational Materials

Developing a variety of informational materials is critical to successful education and necessary to circulate consistent, accurate information. The District Board with input from the Groundwater Commission may develop / update a range of materials, which may include:

- **Talking Points:** Clear, concise messages that can be used by District Board and Groundwater Commission when communicating with stakeholders, organizations, and the media.
- **Fact Sheets:** For initiating the GSPs and /or implementing elements of the GSPs.
- **Periodic Updates:** As stated above, the District staff with assistance from their consultants will coordinate on the distribution of periodic updates that can then be used by the District Board, Groundwater Commission, and participating agencies for distribution to the groups and organizations they represent using existing communications tools, such as websites, newsletters, social media, list serves, utility bills, etc.

- **Newspaper public service announcements & editorials:** The District staff, with assistance from their consultants will coordinate on information and updates for submittal to local news sources.
- **Briefing Packets:** For milestone briefings to the public and stakeholders, briefing packets may be developed. Packets may include standard talking points, and other materials to assist in educational outreach and for soliciting feedback.

Website

www.tehamacountywater.org

The District website is a tool for distributing and archiving meeting and communication materials as well as a repository for any studies, informative, and educational materials. District staff coordinates to ensure that the website is updated on a consistent basis to ensure up to date, timely information. The website includes, but is not limited to, the following information:

- Home page: example content may include an overview, calendar of meetings and events, highlighted topics, etc.
- Groundwater basics, SGMA background including links to existing sources of relevant information
- Subbasin-specific information
- District Board information: members, agendas, and meeting materials
- Groundwater Commission information: members, agendas, and meeting materials

Mailings Utility Bill Notifications

District staff may coordinate with participating agencies to utilize postcards and include updates and relevant SGMA implementation information in utility bills.

Social Media

Existing Facebook, Twitter, and other emerging social media technologies may be leveraged to provide updates on milestone progress to interested parties.

Surveys

Online tools may be used periodically to gather stakeholder ideas and to provide feedback on key issues.

Media Plan

District staff will develop press releases and Public Service Announcements (if appropriate) at each milestone and for meetings and workshops. The press releases will be distributed to local and regional media and elected officials. See **Appendix E** for a media contact list that will be updated on a periodic basis.

Outreach Partners

In addition to the communication tools listed above, other organizations can also partner to assist the GSA reach its communications and engagement goals including, but not limited to:

Countywide

- ✓ Northern Sacramento Valley (NSV) Integrated Regional Water Management (IRWM) group
- ✓ Shasta-Tehama Watershed Education Coalition

- ✓ Tehama County Farm Bureau
- ✓ Resource Conservation District of Tehama County
- ✓ Rural Community Associates Corporation
- ✓ UC Cooperative Extension
- ✓ Tehama County Cattleman's Association
- ✓ Tehama County Cattlewomen's Association

Subbasin-Specific

Antelope

- ✓ City of Red Bluff

Los Molinos

- ✓ Los Molinos Mutual Water Company
- ✓ Los Molinos Community Services District
- ✓ Stanford Vina Ranch Irrigation Company
- ✓ Deer Creek Irrigation District
- ✓ Los Molinos Chamber of Commerce

Red Bluff

- ✓ Tehama Colusa Canal Authority
- ✓ Proberta Water District
- ✓ Rawson Water District
- ✓ Elder Creek Water District
- ✓ Gerber-Las Flores CSD
- ✓ Thomes Creek Irrigation District
- ✓ Rancho Tehama Association
- ✓ El Camino Irrigation District
- ✓ City of Red Bluff
- ✓ City of Tehama
- ✓ HOAs (e.g., Surrey Village)

Bowman

- ✓ Anderson-Cottonwood Irrigation District
- ✓ Lake California Property Owners Association
- ✓ Rio Alto Water District
- ✓ Large ranches (e.g., Bengard Ranch)

Intra-Basin and Inter-Basin Coordination

The term "**basin**" under SGMA refers to a groundwater basin, or subbasin, identified and defined under the groundwater inventory Bulletin 118, which is produced by the California Department of Water Resources (DWR) (California Water Code Section 10721). Coordination within (intra-basin) and across (inter-basin) basin/subbasin boundaries is important to coordinate management actions and share information.

- **Intra-basin coordination** – coordination between two or more GSAs with jurisdiction within the same basin/subbasin (as is the case within the Corning Subbasin).
- **Inter-basin coordination** – coordination across basin/subbasin boundaries.

Intra-Basin Coordination

The Corning Subbasin GSA has jurisdiction for the portion of the Corning Subbasin overlying Glenn County. The District works with the Corning Subbasin GSA to develop and implement a single GSP for the Corning Subbasin. The primary venue for their collaboration will occur at the Corning Subbasin Advisory Board (CSAB) meetings, which are a Brown Act compliant venue for collaboration on the GSP.

Inter-Basin Coordination

Subbasins within Tehama County boundaries. Inter-basin coordination across the subbasins within Tehama County is facilitated by the District serving as the single GSA for these subbasins. For instance, regularly occurring District Board and Groundwater Commission meetings provides a standard and open forum for sharing information with all subbasins within the County.

Subbasins outside of Tehama County boundaries. While inter-basin agreements are optional under SGMA, the District intends to coordinate with adjacent GSAs to share technical information and to ensure that the implementation of the GSPs in adjacent basins are compatible and will not cause any adverse effects in the District subbasins or any other adjacent basins.

Regional coordination. GSAs in the Northern Sacramento Valley (NSV) are building on the 10+ years of NSV Integrated Regional Water Management (IRWM) collaboration. GSA representatives from the Vina, Butte, Wyandotte Creek, Corning, Colusa, Bowman, Red Bluff, Antelope and Los Molinos subbasins are meeting to consider how to share information and strategically coordinate regional water management.

Refer to the table below for subbasins within the NSV as well as **Appendix B** on NSV Inter-basin coordination.

Basin Coordination Summary

Coordination	Subbasin	SGMA Priority	GSA(s)	County(ies)	Nearest Tehama County Subbasins
Inter-basin	Anderson	Medium	Enterprise Anderson	Shasta	Bowman
Intra-basin & Regional	Corning	High	Tehama County FCWCD; Corning Subbasin GSA	Glenn; Tehama	Corning portion within County; Red Bluff
Inter-basin & Regional	Colusa	High	Glenn Groundwater Authority; Colusa Groundwater Authority	Glenn; Colusa; Yolo	Corning
Inter-basin & Regional	Vina	High	Vina; Rock Creek Reclamation District	Butte	Corning; Los Molinos
Regional	Butte	Medium	Butte County Dept of Water and Resource Conservation	Butte	Corning; Los Molinos
Regional	Wyandotte Creek	Medium	Wyandotte Creek	Butte	Corning; Los Molinos

Evaluation and Assessment

Any communication strategy should include opportunities to check in at various points during implementation to ensure that it is meeting the communication and engagement goals and complying with SGMA. These check-ins should occur at least on an annual basis.

Table 1. Summary of Engagement Opportunities, Milestones, and Progress to Date

Timeframe	Milestone or Stage	Required Community Engagement Under SGMA	Communication Strategies	Status (as of August 2021)
Pre-SGMA (before 2015)	Voluntary groundwater management efforts (IRWM and AB3030)	N/A	Volunteer collaboratives and advisory committees engage subject-matter experts and stakeholders	• NSV IRWM group and AB 3030 Technical Advisory Committee (TAC) • Outreach for AB 3030 Groundwater Management Plan (1996 and 2012 update)
GSA Formation (2015-2017)	During GSA governance development	Notice of Intent (NOI) of GSA Formation	• Provide notice of GSA outreach resources: website, email listserv, calendar of District Board and Groundwater Commission meetings • Develop and continue to update list of interested parties	• District Board public meetings on GSA formation • NOI for the District to be the GSA (11/4/15) • Groundwater Commission established (6/7/16) • Website and initial interested parties list established
Shortly after GSA formation	After identification of outreach responsibilities among GSA entities	Notification of GSA formation	• District Board and Groundwater Commission meetings • Email notices and updates Newspaper notice of public workshop(s)	
Before GSP Planning Activities	Prior to beginning GSP development	Provide to the public and State, notice of intent to begin GSP planning and description of opportunities for interested parties to participate in GSP development and implementation	• Public workshop(s) • District Board and Groundwater Commission meetings • Email notices and updates • Newspaper notice of public workshop(s)	• NOI for development of GSPs submitted to DWR on 6/27/18 (Bowman, Antelope, Los Molinos, and Red Bluff) and 9/19/18 (Corning)
Between Notice of GSP Planning and January 31, 2022	During GSP development	Public workshops, public meetings, District Board meetings, Groundwater Commission meetings and other opportunities providing stakeholder avenues to participate in GSP development	• Public workshops and/or public meetings on GSP development. • District Board and Groundwater Commission meetings • Email notice of public workshops / meetings • Newspaper notices of public workshops / meetings • Updates and information on GSP development at standing meetings • Disseminate updates via interested parties list, websites social media, outreach partners	• Convened Groundwater Commission Ad Hoc committees • Developed and implemented Stakeholder Communication & Engagement Plan • Professional facilitation services to support outreach and engagement • Developed/updated resources (e.g., new website, factsheet, etc.) • Emailed interested parties list with public meeting notices; notifications when draft GSP chapters were available for comment, and the quarterly eNewsletter.

Timeframe	Milestone or Stage	Required Community Engagement Under SGMA	Communication Strategies	Status (as of August 2021)
				• Regular updates to NSV IRWM TAC and Board, NCWA Groundwater Management Task Force • Groundwater Commissioner briefings to their agencies. • Public meetings Oct and Dec 2020; April, August, September, October, and November 2021
	During GSP development	Active involvement of diverse social, cultural, and economic elements of the population within the subbasins	• Provide email notices and updates • Update website regularly • Convene regular District Board and Groundwater Commission meetings • Identify and communicate opportunities for public engagement on GSP development, (providing clear messages that GSA retains legal responsibility for final GSA and GSP related decisions) • Develop consistent, coordinated messages and talking points • Arrange for technical support to stakeholder groups through presentations or workshops conducted by GSA representatives/staff • Develop content appropriate to the audience and their interests, ensuring information can be easily understood • Conduct legislative briefings at strategic milestones (and any other groups upon request) • Utilize updated interested party stakeholder list, GSA listservs delivered via email and/or U.S. Mail, outreach partners mechanisms for communications and other media outlets such as newspaper and radio to provide notices • Strategically engage local, special SGMA identified groups • Utilize local channels and meetings to identify and communicate opportunities for public engagement and/or public comment during meetings on GSP development • Leverage and support local agencies and community organizations in disseminating information and engaging stakeholders, including through existing community meetings, newsletters, websites, and social media • Organize public meetings around concrete impacts to specific stakeholders • Develop additional, locally-targeted communication strategies to engage difficult-to-reach communities and community members	In addition to the activities listed above: • Briefings upon request (e.g., County Farm Bureau, STWEC Board, Tehama County Tea Party, Board of Supervisor District 2 Town Halls, etc.) • Informal briefing with the Paskenta Tribe (4/6/21) • Online survey focused on domestic well owners • Online survey eliciting ideas for projects and management actions • Framework for receiving public comments on the Draft GSPs via online survey, standard mail, and direct emails

Timeframe	Milestone or Stage	Required Community Engagement Under SGMA	Communication Strategies	Status (as of August 2021)
GSP Adoption or Amendment (initial GSP adoption no later than 1/31/22)	Prior to GSP adoption or amendment	• Provide notice to cities and counties within Plan area • Consider comments provided by the cities and counties • Accommodate requests for consultation received from the cities and counties within 30 days	SEE ABOVE	• Notices sent to cities with the Plan areas in August 2021(See example)
	Prior to GSP adoption or amendment	No sooner than 90 days following public notice, hold public hearing/ public workshop	SEE ABOVE	District Board Public Hearing to consider adopting the final GSPs – Dec 20, 2021

SECTION 2 | SUBBASIN COMMUNICATION & ENGAGEMENT

As previously stated, the GSA must identify and consider stakeholders interests when developing and implementing the GSP, including:

- Agricultural users of water
- Domestic well owners
- Municipal well operators
- Public water systems
- Land use planning agencies
- Environmental users of groundwater
- Surface water users
- The federal government
- California Native American Tribes
- Disadvantaged communities

This section identifies stakeholder groups (both county-wide and subbasin-specific) and the associated anticipated level of engagement. It is not an exhaustive list, but provide sufficient detail to guide more meaningful focused outreach and engagement. The list is also intended to be updated periodically or as needed.

Table 2. Tehama Stakeholder Group Interests & Purpose of Engagement

Category of Interest	District-Wide	Antelope	Los Molinos	Red Bluff	Bowman	Anticipated Level of Engagement
General Public • Citizens groups • Community leaders • Interested individual • Universities/Academia	• Interested Individuals on Interested Parties List maintained by GSA • Tehama County School District[6] • Latino Outreach of Tehama County • University of California Cooperative Extension • Board of Supervisors • Shasta College • Red Bluff-Tehama County Chamber of Commerce	• Red Bluff City Council • Schools (Antelope Elementary School District	• Chamber of Commerce • Lassen View Elementary • Los Molinos Unified School District	• Rancho Tehama Association • City of Tehama • City of Red Bluff • Rancho Tehama Elementary School • Schools (Gerber Union Elementary)Red Bluff Joint Union High School District • Antelope Elementary School District	• Lake California Property Owners Association • Evergreen Union School District • Sunset Hills development	Inform to improve public awareness of sustainable groundwater management
Land Use • Municipalities • Local land use agencies • Regional land use agencies • Community Service Districts	• Tehama County Planning Department • Tehama County Environmental Health • Tehama County Agricultural Department	• City of Red Bluff • Golden Meadows CSD • Tehama County Fairgrounds	• Los Molinos CSD	• City of Red Bluff • City of Tehama • Gerber Las Flores CSD • Paskenta CSD (outside of subbasin) • Reeds Creek CSD	• [County]	Consult and involve to ensure land use policies are supporting GSP and there are no conflicting policies between the GSPs and local government agencies
Urban/ Commercial & Non-Commercial Agricultural Users • Water agencies • Irrigation districts • Municipal water companies • Mutual water companies • Resource	• Farm Bureau • Cattlemen's Association • Cattlewomen's Association • County Agricultural Commissioner • University of California Cooperative Extension • Resource Conservation District	• Rio Ranch Estates CSD • Los Molinos Mutual Water Company • City of Red Bluff	• Los Molinos Mutual Water Company • Deer Creek Irrigation District • Stanford Vina Ranch Irrigation Company • New Clairvaux Monastery	• El Camino ID • Proberta WD • Rancho Tehama Association • Elder Creek WD • Rawson WD • Gerber Las Flores CSD • City of Red Bluff • City of Tehama	• Rio Alto Water District • Anderson Cottonwood Irrigation District (ACID) • Bengard Ranch	Inform and involve to ensure sustainable management of groundwater and consider viability of agricultural economy

[6] Refer to https://www.tehamaschools.org/Districts--Schools/index.html for additional specific school districts.

Category of Interest	District-Wide	Antelope	Los Molinos	Red Bluff	Bowman	Anticipated Level of Engagement
conservation districts • Farmers/Farm Bureaus • Water Districts • Water-users associations • Irrigated Lands Regulatory Program Coalition	(RCD) of Tehama County • Shasta Tehama Watershed Education Coalition					
Other Commercial Users • Commercial and industrial self-suppliers	• Renewable power companies • Cal Fire stations • Crain processing Plants • Sierra Pacific Industries • Tehama Co.	• Crain Processing Plant	• Norcal Water Works • Anderson & Sons Walnuts • Jones & Son Orchards	• SPI • Pactiv • CAPAX • Wilcox Oaks Golf Club • Oak Creek Golf Club • LA-Pacific Corp. • Walmart Distribution Center		Inform and involve in assessing impacts to users
Environmental and Ecosystem Uses • Federal and State agencies • Wetland managers • Environmental groups	• Audubon Society • The Nature Conservancy • California Dept of Fish & Wildlife • USFWS • BOR • BLM • USFS • NRCS • DWR • CA State Parks • Fire Safe Councils (Tehama Glenn FSC)	• CDFW (Antelope Creek) • USFS (Red Bluff Rec Area) • USFWS • BLM • BOR	• Nature Conservancy • Dye Creek preserve • Mill Creek conservancy • Deer Creek Watershed Conservancy • CDFW big interests in Dye, Mill and Deer Creeks – Salmon • Deer Creek Watershed Conservancy	• CDFW (Butler Slough Eco Reserve, Thomes Creek Preserve) • USFWS • USFS • BLM		Inform and involve to consider/ incorporate potential ecosystem impacts to GSP process
Surface Water Users • Irrigation Districts • Water Districts • Water users associations • Agricultural users	• Mutual Water Co • Water District • Agricultural users • Riparian water right holders	• Edwards Dam Diversions • Los Molinos Mutual Water Company	• Los Molinos Mutual Water Company • Deer Creek Irrigation District • Stanford Vina Ranch Irrigation Company	• Corning Water District • Tehama Colusa Canal Authority • Thomes Creek WD • USFWS	• ACID • Lake California POA to divert water for lake	Inform and involve to collaborate to ensure sustainable water supplies

Category of Interest	District-Wide	Antelope	Los Molinos	Red Bluff	Bowman	Anticipated Level of Engagement
Economic Development • Chambers of commerce • Business groups/associations • Elected officials • State legislature representatives • Economic Development Team	• County Board of Supervisors • James Gallagher (SA) • Jim Neilson (Senator) • Planning Commission • Red Bluff-Tehama County Chamber of Commerce		• Los Molinos Chamber of Commerce	• Red Bluff Tehama County Chamber of Commerce • Red Bluff City Council • City of Tehama City Council		Inform and involve to support a stable economy
Human Right to Water [7] • Disadvantaged communities • Small water systems • Environmental justice groups/community-based organizations • Domestic well owners	• Private well owners • Small Water Systems • Several Disadvantaged Communities	• Unincorporated County (Antelope Area) • Portion of the City of Red Bluff • Dairyville • Riverview MHC • Gurnsey Ave MW • Modern Village MWC • Howell's Lakeside WC • Antoinette MW • Friendly Acres MHP	• Los Molinos Vina • Antelope Creek MHP • Los Molinos CSD • Woodson Bridge • Del Oro Water Co.	• Proberta • Gerber Las Flores CSD • City of Tehama • City of Red Bluff • Rancho Tehama • Mira Monte WC • Surrey Village WC • Golden Meadows CSD	• Lake California • Bowman area, unincorporated County • Rio Alto Water District • Saddleback MWC	Inform and involve to provide safe and secure groundwater supplies to all communities reliant on groundwater
Tribes • Federally Recognized Tribes • Non-Federally Recognized Tribes	• California Tribal Water Commission • Paskenta Band of the Nomlaki (Corning Subbasin) • Greenville Rancheria			• Greenville Rancheria		Inform, involve and consult with tribal government
Integrated Water Management • Regional water management groups (IRWM regions) • Flood agencies	• NSV IRWM • Mid Upper Sacramento Regional Flood Management Group					Inform, involve and collaborate to improve regional sustainability

[7] This is not an exhaustive list as there are 100+ small water systems across the four subbasins.

Appendix A | Outreach Resources and Materials

Several resources and materials, including those identified below, are available on the website: https://tehamacountywater.org/gsa/library/

(Reminder that all Corning Subbasin resources are available on the Corning GSP website: https://www.corningsubbasingsp.org/. Some Corning resources are listed below for readers' convenience.)

Factsheets & Flyers

- Tehama County SGMA Factsheet – Link
- Corning General SGMA Factsheet - Link
- North Sacramento Valley SGMA Regional Coordination Flyer – Link
- Public Webinar Event flyers – October 2020 | December 2020 | April 2021 | August 2021
- Comment on Draft GSPs & Fall 2021 Public Meetings Flyer – Fall 2021

Quarterly eNewsletter

- Tehama County quarterly eNewsletter – Winter 2020 | Spring 2021 | Summer 2021 | Fall 2021

Online Surveys

Two online surveys launched in 2021. Responses were considered/incorporated into the Draft GSPs.

- Tehama County Subbasins Online Survey | Projects / Management Actions ideas (March - July 2021) – Link
    - 16 total responses.
- Tehama County Subbasins Online Survey | Domestic Well Owners (March 2021 – Present) – Link
    - To date: 17 total responses.

GSA and Advisory Boards Meetings

Updates were regularly shared at Groundwater Commission, District Board, and CSAB meetings. These resources and materials can be found on their respective meetings pages:

- Board of Directors - Link
- Groundwater Commission – Link
- Corning Subbasin Advisory Board - Link

SGMA and Tribal Engagement

- April 6, 2021 webinar presentation - Link

Public Meeting Presentations

Region-wide public meetings

- October 8, 2020 webinar - Video | Slide Deck
- December 9, 2020 webinar - Video (subbasin-specific slide decks provided below)
- September 29, 2021 webinar – Video | Slide Deck
- October 20, 2021 webinar - Video | Slide Deck
- November 15, 2021 in-person workshop – Agenda Handout | Slide Deck

Subbasin-specific public meetings

- **Bowman Subbasin**
  - October 15, 2020 tailgate - Slide Deck
  - December 9, 2020 webinar – Slide Deck
  - April 19, 2021 webinar – Slide Deck | Video
  - August 17, 2021 webinar – Slide Deck | Video
- **Red Bluff Subbasin**
  - October 21, 2020 tailgate – Slide Deck
  - October 6, 2020 Thomes Creek community tailgate – Slide Deck
  - December 9, 2020 webinar – Slide Deck
  - April 20, 2021 webinar – Slide Deck | Video
  - August 19, 2021 webinar – Slide Deck | Video
- **Antelope Subbasin**
  - October 14, 2020 tailgate – Slide Deck
  - December 9 2020 webinar – Slide Deck
  - April 21, 2021 webinar – Slide Deck | Video
  - August 23 webinar – Slide Deck | Video
- **Los Molinos Subbasin**
  - October 22, 2020 tailgate – Slide Deck
  - December 9, 2020 webinar – Slide Deck
  - April 22, 2021 webinar – Slide Deck | Video
  - August 25, 2021 webinar – Slide Deck | Video
- **Corning Subbasin**
  - December 9, 2020 webinar – Slide Deck
  - October 4, 2021 in-person workshop, Corning – Agenda Packet | Slide Deck
  - October 13, 2021 webinar – Agenda Packet | Slide Deck | Video

  (Visit the Corning GSP website for more information specific to the Corning Subbasin – Link)

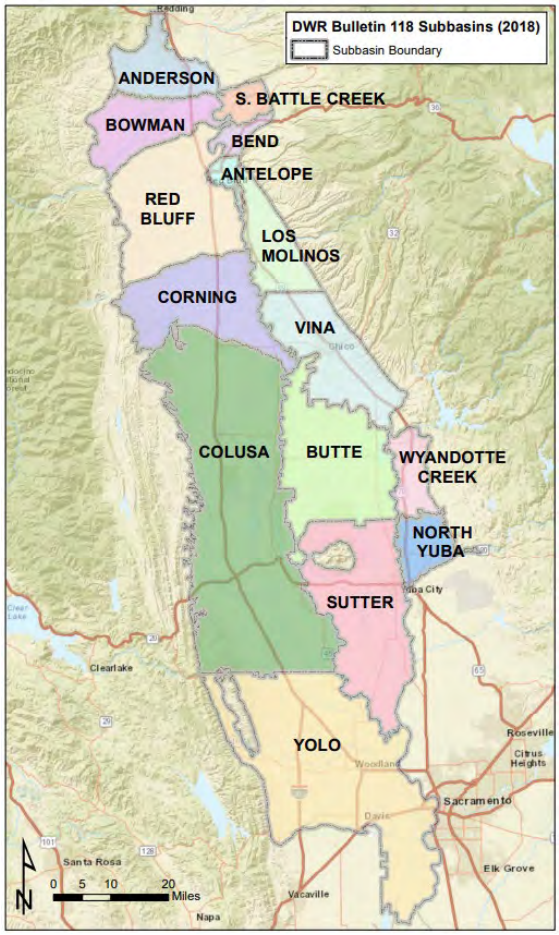
Appendix B | Inter-basin Coordination

In the Sacramento Valley, inter-basin coordination is critical as Groundwater Sustainability Agencies develop their Groundwater Sustainability Plans. We all recognize the interconnectedness of groundwater in the subbasins that together make up the larger Sacramento Valley groundwater basin.

Coordination among GSAs can be formalized through Coordination Agreements. These are voluntary, and the components of such agreements are described in the Groundwater Sustainability Regulations in Article 8.

Informal exchange of information and collaboration has been occurring between staff and consultants working on GSPs in subbasins throughout the region with facilitation support from the Consensus Building Institute. The effort began with conversations between County staff from Tehama, Glenn, Colusa, and Butte to identify priorities and resources available for inter-basin coordination.

These slides provide an overview of the scope and timeline of the Inter-basin Coordination efforts (Flier).



Framework for Inter-basin Coordination

Northern Sacramento Valley Inter-basin Coordination Report-Final

This report outlines a framework for inter-basin coordination for sustainable groundwater management in the Northern Sacramento Valley. It describes a menu of options for ongoing communication and collaboration between and among groundwater subbasins over the twenty-year implementation of the Sustainable Groundwater Management Act (SGMA). This framework can be used by Groundwater Sustainability Agencies (GSAs) to support Groundwater Sustainability Plan (GSP) development and implementation in several ways.

1. This inter-basin coordination report could be included as an appendix to the GSP and could be updated at regular intervals.
2. Individual subbasins could incorporate sections of the report into the body of the GSP, depending upon specific boundary conditions at adjoining subbasins.
3. Subbasins could draw on the inter-basin coordination framework if they would like to consider entering into one or more voluntary inter-basin agreements during GSP implementation (GSP Regulations in Article 8, Sec 357.2.

Staff throughout the region will present the framework as a supporting document to guide and inform discussions with GSA Boards and at other subbasin-specific public venues, such as advisory committees, groundwater commissions, or other relevant venues. These discussions could help determine GSA

priorities and the desired approach each GSA would like to take to draw upon the inter-basin coordination framework within their individual GSPs.
Subbasin staff acknowledge that while this report builds upon a long-standing history of regional collaboration, this is just the beginning of inter-basin coordination efforts under SGMA. Therefore, this framework will be continually refined throughout GSP implementation and inter-basin coordination activities will occur on an ongoing basis.

Visit the website for more information:
https://www.buttecounty.net/waterresourceconservation/Sustainable-Groundwater-Management-Act/Inter-basin-Coordination

Appendix C | Tribal Engagement in Tehama County: Guidance Document

Meaningful tribal outreach, dialogue, and consultation is a shared obligation of the GSA in the applicable subbasins where tribal lands exist.

Tribes in Tehama County

There are two[8] federally-recognized Native American Tribes in Tehama County, including:

- Greenville Rancheria of Maidu Indians
- Paskenta Band of Nomlaki Indians

The Native American Heritage Commission (NAHC) identified eight Tribes in Tehama County and Glenn County that may have an interest in groundwater management in the Bowman, Red Bluff, Antelope, Los Molinos, and/or Corning Subbasins:

- Estom Yumeka Maidu Tribe of the Enterprise Rancheria
- Greenville Rancheria of Maidu Indians
- Grindstone Rancheria of Wintun-Wailaki
- Mechoopda Indian Tribe
- Paskenta Band of Nomlaki Indians
- Redding Rancheria
- Shasta Nation
- Wintu Tribe of Northern California

Outreach Steps – Phase I

1. Confirm that the Native American tribes identified above are correctly posed for SGMA outreach.
2. The District will prepare background materials related to Native American tribal outreach and engagement. The material will include a compilation of past Native American tribal outreach methods, goals, and results (including primary points of contact). The materials will include SGMA-related obligations for GSAs pursuant to SGMA, and interests and goals as they relate to tribal outreach and potential participation in sustainable groundwater management planning (see *Relevant DWR Information* below).
3. The District will conduct an initial, informal communication with tribal primary points of contact to clarify interest in communicating formally regarding SGMA and tribal interests; request advice about appropriate avenues for outreach; and identify next steps. In the event a tribal representative cannot be contacted within 45 days, the District will consult with DWR's Office of Tribal Policy Advisor for guidance (Anecita Agustinez, DWR Tribal Policy Advisor - Anecita.Agustinez@water.ca.gov).
4. Following successful initial communication with the Native American tribes, the District will facilitate the implementation of the next steps identified in #3. Actions may include preparation

[8] Source: https://www.ihs.gov/california/index.cfm/tribal-consultation/resources-for-tribal-leaders/links-and-resources/list-of-federally-recognized-tribes-in-ca/?mobileFormat=0

of a formal letter from the Board to each of the tribes, involvement of other GSAs with the tribes, and/or establishing a consultation framework.

Outreach Steps – Phase II

Refer to Table 1 (Summary of Engagement Opportunities, Milestones, and Progress to Date) and Table 2 (Tehama Stakeholder Group Interests & Purpose of Engagement).

Relevant DWR Information

SGMA Section 10720.3. …any federally recognized Indian Tribe, appreciating the shared interest in assuring the sustainability of groundwater resources, may voluntarily agree to participate in the preparation or administration of a groundwater sustainability plan or groundwater management plan under this part through a joint powers authority or other agreement with local agencies in the basin. A participating Tribe shall be eligible to participate fully in planning, financing, and management under this part, including eligibility for grants and technical assistance, if any exercise of regulatory authority, enforcement, or imposition and collection of fees is pursuant to the Tribe's independent authority and not pursuant to authority granted to a groundwater sustainability agency under this part.

Guidance Document for Sustainable Management of Groundwater: Engagement with Tribal Governments [Link]

Discussion Questions Relating to Tribal Governments Engagement with GSAs [Link]

Must a local agency exclude federal and tribal lands from its service area when forming a GSA? No, federal lands and tribal lands need not be excluded from a local agency's GSA area if a local agency has jurisdiction in those areas; however, those areas are not subject to SGMA. But, a local agency in its GSA formation notice shall explain how it will consider the interests of the federal government and California Native American tribes when forming a GSA and developing a GSP. DWR strongly recommends that local agencies communicate with federal and tribal representatives prior to deciding to become a GSA. As stated in Water Code §10720.3, the federal government or any federally recognized Indian tribe, appreciating the shared interest in assuring the sustainability of groundwater resources, may voluntarily agree to participate in the preparation or administration of a GSP or groundwater management plan through a JPA or other agreement with local agencies in the basin. Water Code References: §10720.3, §10723.2, §10723.8

Tribal Outreach Resources

The follow are links to agency tribal outreach resources and considerations, each of which captures important principles and resources for tribal outreach. A short summary of key outreach principles can be found below.

- CalEPA Tribal Consultation Policy Memo (August 2015)
- DWR Tribal Engagement Policy (May 2016)
- CA Natural Resources Agency Tribal Consultation Policy (November 2012)
- SWRCB Proposed Tribal Beneficial Uses
- CA Court Tribal Outreach and Engagement Strategies
- Traditional Ecological Knowledge resources

- Water Education Foundation Tribal Water Issues

Key Outreach Principles

- Engage early and often
- Consider tribal beneficial uses in decision-making (identified by region here); identify and seek to protect tribal cultural resources
- Share relevant documentation with tribal officials
- Conduct meetings at times convenient for tribal participation with ample notifications
- Request relevant process input/data/information from tribes
- Empower tribes to act as tribal cultural resources caretakers
- Designate a tribal liaison(s) where appropriate
- Share resources for tribal involvement as is feasible
- Develop MOUs where relevant
- Be mindful of the traditions and cultural norms of tribes in your area

Key Outreach Partners/Liaisons

The following are potential partners for Tehama County tribal SGMA outreach:

- SGMA Tribal Advisory Group (TAG): "The Tribal Advisory Group (TAG) includes tribal leadership, subject matter experts, and technical and non-technical members of local, academic, and tribal governments that are actively engaged in local groundwater management and will be key in local implementation of SGMA. TAG members will be responsible for distribution of information and resources to their respective tribes and organizations."
- California Indian Water Commission, Inc.
- DWR Office of Tribal Advisor
- DWR Northern Regional Office Contact
- Central Valley Regional Board Tribal Coordinator

Appendix D | Disadvantaged Communities Engagement in Tehama County – Guidance Document

Important consideration should be given with regard to encouraging community participation in disadvantaged communities (DACs) / severely disadvantaged communities (SDACs) and ensuring accessible and transparent meetings especially in those communities with limited access to digital resources.

Disadvantaged Communities (DACs) in Tehama County Subbasins

DAC and SDAC communities were identified based on data from DWR DAC Mapping too, 2018 Census tract (categorized as "economically distressed areas" Census blockgroup) for the Bowman, Red Bluff, Antelope, Los Molinos, and Corning Subbasins. -- *Refer to the Plan Area chapters of the subbasins' GSPs.*

Outreach Steps

Phase I

1. Use DWR Disadvantaged Communities Mapping Tool or other geographic information system technology to help identify disadvantaged, severely disadvantaged and economically distressed communities within the Cosumnes subbasin.
2. GSAs share insights on engaging with members of these communities from past projects or efforts. Also consider the key outreach principles identified below.
3. Review catalog of existing outreach materials. Modify as necessary to fit the needs of each community. This may include translating select materials into one or more languages. Develop additional materials if advantageous.
4. Identify potential points of contacts / outreach partners for DAC engagement. See preliminary list of partners below. Conduct an initial, informal communication with organizational points of contact to clarify interest in engaging DAC communities on SGMA; request advice about appropriate avenues for outreach; and identify next steps.

Phase II

Refer to Table 1 (Summary of Engagement Opportunities, Milestones, and Progress to Date) and Table 2 (Tehama Stakeholder Group Interests & Purpose of Engagement).

Relevant DWR Information

Guidance on Engaging and Communicating with Underrepresented Groundwater Users [Link]

DWR recognizes that there are groups or communities of groundwater users that have been historically and frequently left out from decision-making with regard to sustainable groundwater management. These groups include, but are not limited to: disadvantaged communities, private domestic well owners, small growers and farmers, Tribes, and communities on small water systems. All beneficial uses and users of groundwater must be

part of the effort to achieve sustainability, and engagement should occur with all entities that could be affected by the implementation of a GSP.
California Water Code 10723.2 The groundwater sustainability agency shall consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing groundwater sustainability plans.
23 Cal. Code Regs. §354.10 Notice and Communication. Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following: (a) a description of the beneficial uses and users of groundwater in the basin, including the land uses and property interests potentially affected by the use of groundwater in the basin, the types of parties representing those interests, and the nature of consultation with those parties.

Outreach Resources

Tools for identifying DAC communities include:

- DWR Disadvantaged Community Mapping Tool
- DWR Economically Distressed Areas Mapping Tool
- State Water Board Human Right to Water Portal
- CalEnviroScreen
- US Census Bureau Data Portal

DAC Communications Best Practices and similar reference publications:

- DWR Guidance on Engaging and Communicating with Underrepresented Groundwater Users
- Local Government Commission Best Practices for Virtual Engagement Guide
- Self Help Enterprises webpage on SGMA engagement for DACs
- Self Help Enterprises Technical Assistance Program
- Clean Water Action's Collaborating for Success: Stakeholder Engagement for SGMA Implementation
- Water Education Foundation's Solving Water Challenges in DACs: A Handbook to Understanding the Issues in California and Best Practices for Engagement

Key Outreach and Engagement Principles[9]

- Decisions that impact DACs must be done with their guidance and input, and agencies should ensure that community residents are able to give meaningful input into the process.
- Partner with local community-based organizations as trusted messengers.
- Target outreach materials and approach appropriately by tailoring communications to the community's needs. Be mindful of language and cultural differences.
- Be aware of communities' level of access to computers, internet, and phone connections.
- Engage early and often. Reach out to community-based organizations and other stakeholders who may be in direct communication with residents early to help make sure that residents are informed and notified through multiple channels about options for public meetings.
- Understand who the target audience is (e.g., with whom you will be meeting) to understand where and when to meet (such as during the day vs. evening meetings)

[9] Principles extracted and summarized from best practices and other outreach sources noted in "Outreach Resources" section above.

- Conduct meetings at times convenient for public participation with ample notifications.
- When possible, travel to the target community to meet them in their locale.
- One-on-one meetings with individual communities and stakeholders may be more appropriate than trying to meet with several entities in one location.
- For virtual meetings, provide multiple options for teleconferencing, with two-way communication options that allows either computer-users or phone-users to engage. Consider using separate teleconference lines or audio channels to meet language access needs.
- Several meetings may be required to engage new communities and involve them in the SGMA process.
- Provide in-meeting translation and translated materials to the maximum extent possible.
- Though there may be commonalities across regions, each community/DAC/tribe/water system/stakeholder has unique and individualized water-related concerns.

Key Outreach Partners/ Liaisons

The following lists potential partners for outreach to DACs:

- Rural Community Assistance Corporation
- Self Help Enterprises
- Leadership Council for Justice and Accountability
- Clean Water Action

Appendix E | Media Contact List

Organization	Name	Email	Phone
The Sacramento Valley Mirror	Tim Crews	vmtim@pulsaroco.com	
	Doug Ross	yfyles@gmail.com	
	general	valleymirror@pulsaro.com	
Appeal Democrat (for Corning Observer)	News Room	adnewsroom@appealdemocrat.com (for paid notices)	530-749-6552
	Julie Johnson	jjohnson@tcnpress.com (for general information/ meeting notices)	
Action News Now		news@actionnewsnow.com	530-343-1212
Red Bluff Daily News	George Johnston	gjohnston@redbluffdailynews.com	
KRCR	News Room	news@krcrtv.com	530-243-7777
Multiple Spanish-speaking media	Armando Jimenez	ajimenez@bustosmedia.com	

Appendix F | Potential Venues List

The COVID-19 pandemic frequently caused the District and Groundwater Commission to meet virtually during development of the GSPs. As in-person meeting options became available, there was general interest to explore supporting virtual participation options during certain meetings such as public workshops. The following table summarizes potential venues in Tehama County subbasins for various meetings / workshops and identify key logistical amenities, particularly audio-visual capabilities that support virtual and in-person participation.

Subbasin	Name	Address	Capacity	Contact	Amenities	Notes
Red Bluff	County Board Chambers	727 Oak Street, Red Bluff		Denise Ranberg 530-527-4655	Projector & Screen, wired mics, wi-fi, teleconference; chamber is fixed seating; adjacent room is unfixed seating	GW Commission meeting location
Red Bluff	Red Bluff Community Senior Center	1500 South Jackson Street, Red Bluff	Varies, up to 120	Karen Shaffer Phone: 530-527-8181 kshaffer@cityofredbluff.org	Projector (additional fee)/Screen, microphone, wifi	
Red Bluff	County Dept. of Education	1135 Lincoln State., Red Bluff	Varies, 30-80	Melanie Lee mlee@tehamaschools.org	Projector and screen, mics, wi-fi,seating is not fixed	
Bowman	TBD					
Los Molinos	TBD					
Antelope	TBD					
Corning	Rolling Hills Casino	2655 Everett Freeman Way, Corning, California 96021	Varies	Karen Hiton eventsales@rollinghillscasino.com	Projector and screen, mics, wi-fi, Indoor and outdoor space, unfixed seating, room partitioning options	

Appendix G | Potential GSA Outreach Tasks

This appendix is intended to help identify and map out specific issues and strategies that the District, advisory groups, and/or partners may consider during implementation of the GSPs. This does not commit any entity to specific tasks nor preclude them from pursuing other strategies aligned with the subbasin GSPs, related governance documents, and the Communication & Engagement Plan.

Methods

The following are methods that have emerged as highly effective and/or strongly recommended by District Board members, Groundwater Commissioners, District staff, consultants, and/or other subject-matter experts, partners, stakeholders, and the public. As mentioned above, the list does not commit any entity to specific tasks nor preclude them from pursuing other strategies.

- Outreach/project partners and collaborative forums (mailing list networks, newsletters, events, etc.)
- Briefings upon request (communities, organizations, etc.)
- One-on-one communication with GSA representatives and staff
- District Board and Groundwater Commission meetings
- Recorded presentations (e.g., public webinars)
- District website
- Print-friendly handouts (factsheets, event flyers, etc.)
- Quarterly eNewsletter (including print-friendly format)
- Established popular physical locations to access materials (e.g., District office, library, etc.)
- Popular social media platforms / accounts
- Briefings with regulators and land managers (can inform funding and collaborative project opportunities)

Additional methods to consider during implementation of the GSPs

The following methods were not as widely used or perceived as substantially effective during development of the GSPs development, but these may be viewed as more feasible or effective going forward during implementation of the GSPs. Factors to that may influence selecting particular methods include: topic is of high interest to stakeholders / public, key milestones during SGMA implementation, available capacity and funding, etc.)

- Individual calls, texts, mailings
- Surveys
- News articles / op-eds
- Radio (e.g, 97.3, 91.7, and 88.9) / TV PSAs
- Kiosks, marquis, sign postings on community bulletin boards
- Expanding outreach partners (e.g., schools, faith-based groups, etc.)

Issues

The following are topics that have emerged as prominent issues of interest based on discussions among the District Board members, Groundwater Commissioners, District staff, consultants and other experts, partners, stakeholders, the public, etc. As mentioned above, the list does not commit any entity to specific tasks nor preclude them from pursuing other topics or strategies. Note that not all items listed

below are within the groundwater management authorities granted under SGMA; however, are still of interest to those who use groundwater and/or are interested in successful long-term management of groundwater in Tehama County's subbasins.

- Funding options and fees
- Areas with particular groundwater concerns
- Major data gaps (e.g., interconnected surface waters and groundwater dependent ecosystems) -- Refer to GSPs for more details
- Regional / watershed planning (e.g., inter-basin coordination)
- Well permitting process
- Coordination with land-use planning and development entities
- Groundwater vs. surface water use
- Impacts to shallow wells
- Socioeconomic impacts
- Affordable and reliable drinking water
- Public input opportunities (confirming interests are being conveyed and considered during SGMA implementation)
- Underrepresented and hard-to-reach communities (DACs, Tribes, etc.), particularly those with limited access to reliable internet or limited familiarity/comfort with virtual participation options.
- Expanding monitoring network
- Future conditions (e.g., drought trends)
- Project feasibility

Appendix 2-C

Northern Sacramento Valley Inter-basin Coordination Report

Northern Sacramento Valley Inter-basin Coordination Report

Antelope | Bowman | Butte | Colusa | Corning | Los Molinos | Red Bluff | Sutter | Vina | Wyandotte Creek | Yolo

Table of Contents

Glossary of Acronyms

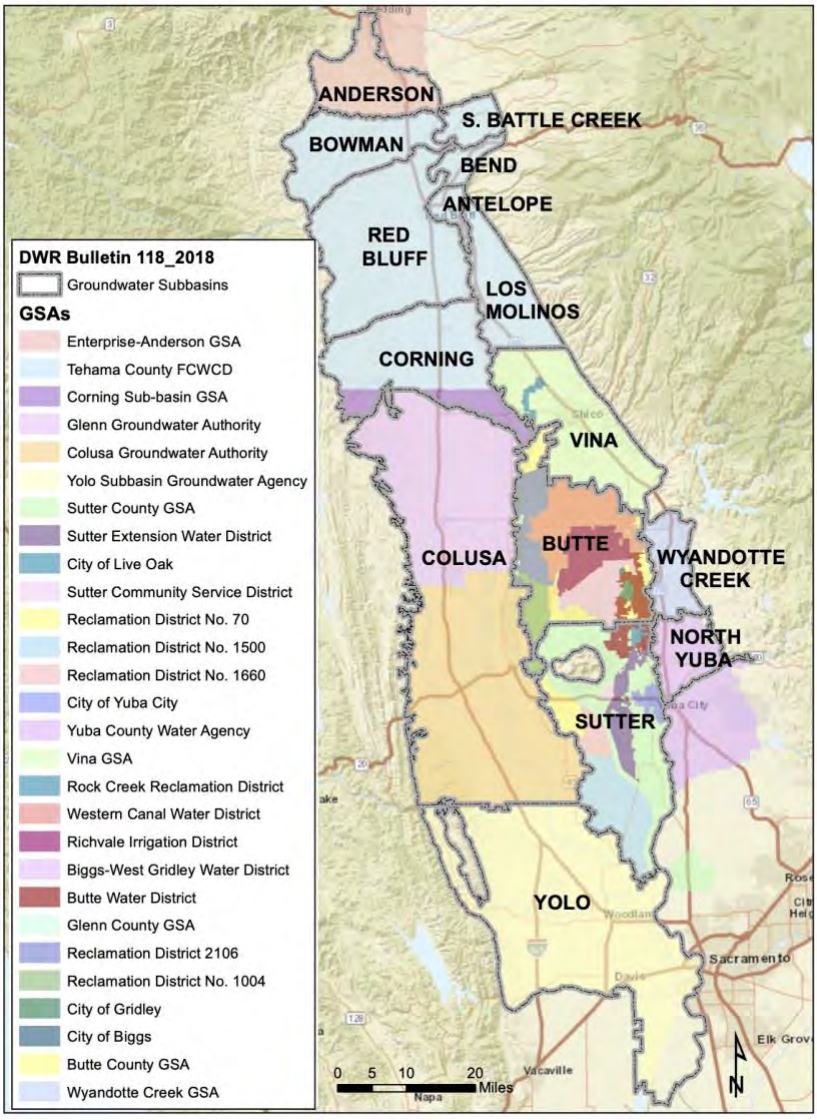
- ***CBI*** – *Consensus Building Institute [link]*
- ***DWR*** – *California Department of Water Resources*
- ***GSA*** – *Groundwater Sustainability Agency*
- ***GSP*** – *Groundwater Sustainability Plan*
- ***MOU*** – *Memorandum of Understanding*
- ***NCWA*** – *Northern California Water Association*
- ***NSV IRWM***– *Northern Sacramento Valley Integrated Regional Water Management*
- ***PMAs*** – *Projects and Management Actions*
- ***SGMA*** – *Sustainable Groundwater Management Act*
- ***SMC*** – *Sustainable Management Criteria*

1. Introduction & Background

The content of the report is the result of staff recommendations resulting from regional inter-basin coordination staff meetings in the Northern Sacramento Valley (2020-2021). The content will be presented to inform discussions among Groundwater Sustainability Agencies (GSAs) and gather public input through existing public venues, such as advisory committees, groundwater commissions, and GSA Board meetings.

Inter-basin coordination is critical in the Northern Sacramento Valley as GSAs develop and implement Groundwater Sustainability Plans (GSPs). Since groundwater subbasins in the Northern Sacramento Valley are hydrologically interconnected, water management decisions and actions in subbasins (i.e., groundwater pumping and processes affecting recharge, water demand, and supply including climate change) could change aquifer conditions. Understanding and accounting for these processes is important towards achieving sustainability in all subbasins.

Figure 1. Map of the Northern Sacramento Valley



Inter-basin coordination is described in the GSP Regulations in Article 8. Under the regulations, GSAs must describe how they coordinate with adjoining subbasins to demonstrate implementation will not adversely affect adjoining subbasins. The Department of Water Resources (DWR) is required to evaluate whether a GSP adversely affects the ability of an adjacent basin to implement their GSP or impedes achievement of sustainability goals in an adjacent basin (Water Code 17033(c)). Coordination among GSAs can be formalized in different ways and inter-basin agreements are voluntary. Appendix A describes components of Sec 357.2.

Inter-basin coordination discussions among staff representatives from 11 subbasins (Antelope, Bowman, Butte, Colusa, Corning, Los Molinos, Red Bluff, Sutter, Vina, Wyandotte Creek, and Yolo), with facilitation support from the Consensus Building Institute (CBI) began during the summer of 2020. While efforts have focused on these subbasins, coordination will occur, as warranted, with other neighboring subbasins (Anderson and North Yuba).

Initial stages of inter-basin coordination efforts (May-December 2020) were closely aligned with the GSP Regulations in Article 8 components and delineated in Section 3 *Evolution of Inter-basin Coordination Efforts*. After an initial attempt to compile technical information to better understand basin conditions at respective boundaries, staff realized differing timelines for the completion of Basin Setting content in each subbasin meant there would not be sufficient time during initial GSP development to fully characterize or address major inconsistencies. Therefore, the goal for regional inter-basin coordination shifted towards establishing a framework for long-term inter-basin coordination and dialogue (post GSP submittal in 2022). Informal coordination discussions among staff and consultants between neighboring subbasins continued during the GSP development process.

This report outlines the intent and purpose of inter-basin coordination in the Northern Sacramento Valley. It describes the process followed and materials developed throughout the process. It also outlines foundational elements, referred to as "key pillars," of a framework for sustained coordination through GSP implementation.

2. Intent & Purpose

Inter-basin coordination efforts in the Northern Sacramento Valley are focused on establishing a foundation and guidelines for sustained inter-basin coordination through GSP implementation, following the initial submittal of GSPs by January 31, 2022. GSAs intend to:

1. *Establish a framework allowing for continued dialogue and a venue to address issues and discrepancies during the implementation of the GSPs;*
2. *Coordinate on consistent messaging and communicate shared expectations at a regional level;*
3. *Demonstrate regional coordination efforts and outcomes; and*
4. *Leverage existing agreements and arrangements in the region (e.g., Northern Sacramento Valley Integrated Regional Water Management (NSV IRWM), the Six County Memorandum of Understanding among Butte, Colusa, Glenn, Tehama, Shasta, and Sutter).*

The proposed deliverable from this effort is the development of a common approach and draft language for incorporation into each subbasin's GSP. This narrative describes the facilitated effort as well as the framework and scope for long-term coordination during plan implementation. The public will have opportunities to weigh in and provide input on the proposed framework through each subbasin's existing public venues, such as advisory committees, groundwater commissions, and GSA board meetings.

3. Evolution of Inter-basin Coordination Efforts

Inter-basin coordination efforts, facilitated by the Consensus Building Institute (CBI) began in summer 2020 among Subbasin staff from Antelope, Bowman, Butte, Colusa, Corning, Los Molinos, Red Bluff, Vina, and Wyandotte Creek subbasins to identify priorities and resources available for inter-basin coordination. Soon after, staff representatives from the Sutter and Yolo subbasins joined the meetings. To date, CBI has facilitated nine inter-basin coordination meetings with staff and periodically with technical consultants from the subbasins. Subbasin staff and/or CBI communicated regular updates to GSA Boards and advisory committees in each of the subbasins regarding the status of inter-basin coordination activities [Access Webpage Here].

Initial stages of inter-basin coordination efforts were closely aligned with the GSP Regulations in Article 8:

1. ***General information*** *of subbasins, plans and agencies participating in the coordination agreement,*
2. ***Technical information*** *including consistent and coordinated data or methodology for inter-basin boundary flows and stream-groundwater interactions at basin boundaries, and information on sustainable management criteria and monitoring that would confirm that no adverse impacts of implementing the GSPs would result to any party to the agreement,*
3. *A description of the* ***process for identifying and resolving conflicts*** *between Agencies that are parties to an inter-basin coordination agreement.*
   Reference: *Sections 10727.2, 10733, and 10733.2, Water Code.*

The goal at the initial stage was to compile general and technical information identified by DWR in a consistent manner to establish an accurate basis of comparison and to identify any significant inconsistencies that may need to be addressed or resolved. This included developing a series of information-sharing documents and outreach materials, summarized below.

1. ***Inter-basin Coordination Directory–*** *This document provides an updated and centralized directory with contact information for GSA managers, technical consultants, and facilitators in the various subbasins. This document seeks to facilitate communication among the various representatives leading GSP development [Access Here].*
2. ***Technical Information-Sharing Template–*** *This template was developed among the managers and technical consulting teams to compile and compare information on modeling tools and water budget results for inter-basin flows, stream-aquifer interactions, and hydro-geologic conditions in the subbasins. Potentially, this document could be used to compile information about Sustainable Management Criteria and Monitoring Networks [Access Draft Template Here]. The first output from the technical information-sharing template summarizes the highlights of compiled model information across the subbasins [Access Here].*
3. ***Outreach Presentation****–This PowerPoint presentation provides updates on inter-basin coordination activities to the various SGMA public venues (GSA boards, advisory committees, etc.) and an overview of the scope and timeline of inter-basin coordination efforts. This presentation is continuously updated*

after each inter-basin coordination staff meeting for use in consistently communicating with GSA Boards/advisory committees and the public throughout the region [Access Here].

4. ***Outreach Factsheet–*** *The inter-basin coordination factsheet aims to support public outreach and information sharing in the various subbasins. This two-page flier or factsheet summarizes why regional coordination is important under SGMA, who is involved in ongoing efforts, what the coordination priorities are, and includes a table with links to each subbasin's website for additional subbasins' specific information [Access Here].*
5. ***Inter-basin Coordination Webpage****– Butte County hosts a webpage to provide the most up-to-date information on inter-basin coordination efforts in the Northern Sacramento Valley. The webpage provides an overview of the scope and makes available documentation and results of the inter-basin coordination work, including meeting agendas, summaries, and outputs [Access Here].*
6. ***Meeting Summaries****–CBI develops meeting summaries after each regional inter-basin coordination staff meeting to summarize key discussion themes, action items, and next steps. These summaries are publicly available on the inter-basin coordination webpage [Access Here].*

After an initial attempt to compile technical information, staff realized the broad aspirations were not feasible during the initial stages of GSP development. The process of compiling and comparing modeling outputs from the diverse regional hydrological models required a significant amount of time, resources, and varying levels of data. Further, subbasins were at different stages of GSP development and GSAs were facing tight timelines, competing priorities, and capacity limitations to meet the regulatory deadline. While communication on a neighbor-to-neighbor basis on technical components was encouraged through GSP development, subbasin staff representatives realized more robust technical analysis and coordination between and among subbasins was not possible until initial plans (including water budgets) were more fully developed or after adoption of the initial GSPs.

Following reflection from the separate inter-basin efforts and priorities moving forward, subbasin staff recommended shifting the focus of regional coordination meetings to establishing a framework for long-term inter-basin coordination and dialogue following GSP submission in January 2022. To do so, subbasin staff identified desired outcomes in the short-term (during initial GSP development), mid-term (first 5-year update), and long-term (GSP Implementation through 2042) [Access Here]. This approach recognizes adoption of the 2022 GSPs as an initial step in sustainable groundwater management, not the final step. Subbasin staff acknowledged while model outputs may not match perfectly, the main objective is to identify and acknowledge significant discrepancies, understand why those differences exist, and evaluate to the extent they need to be reconciled. Inter-basin coordination has been characterized as "a marathon not a sprint," and current efforts will serve to pave the path for long-term collaboration. Further, GSAs can take advantage of annual reporting and five-year GSP updates to identify and address discrepancies. Lastly, subbasin staff representatives acknowledge public participants are interested in inter-basin coordination efforts and concerns from some subbasins can easily affect others. Subbasin staff understand the need to share and educate the public on what is in the various GSPs, and the SGMA requirements for inter-basin coordination. Staff will continue to provide updates and gather GSA Board and public input related to the direction of current efforts and desired priorities, shared concerns, and possible ideas for inter-basin coordination during GSP implementation.

4. Inter-basin Coordination Framework

This section outlines the foundational pillars that comprise the framework for inter-basin coordination under SGMA between and among subbasins in the Northern Sacramento Valley. These pillars build upon a long-standing history of regional collaboration and embody a commitment for continued coordination, collaboration, and communication for successful groundwater management in the region. Honoring the individual authorities of the GSAs, these pillars represent a menu of options neighboring subbasins can draw upon, based on individual or neighboring subbasins' needs and challenges. GSA Boards can decide which of these options they would like to support and implement, acknowledging circumstances may change over time.

Pillars	Scale(s)	Timing
1. Information-sharing a. Inform each other on changing conditions (i.e., surface water cutbacks, land use changes, policy changes that inform groundwater management) b. Share annual reports and interim progress reports c. Share data and technical information and work towards building shared data across and/or along basin boundaries (e.g., monitoring data, water budgets, modeling inputs and outputs, and Groundwater Dependent Ecosystems)	• Neighbor-to-neighbor • Coordination groups [Refer to section 4.1 below]	• *Ongoing (GSP Development)* • *Near-term (5-year update)* • *Long-term (GSP implementation)*
2. Joint analysis & evaluation a. Evaluate and compare contents of GSPs with a focus on establishing a common understanding of basin conditions at boundaries b. Identify significant differences, uncertainties, and potential issues of concern related to groundwater interaction at the boundaries c. Engage in analysis and evaluation of SMCs between GSPs to assess impacts and identify significant differences and possible impacts between subbasins that could potentially lead to undesirable results	• Neighbor-to-neighbor • Coordination groups [Refer to section 4.1 below]	• *Near-term (5-year update)* • *Long-term (GSP implementation)*
3. Coordination on mutually beneficial activities a. Communicate, coordinate, and collaborate on mutually beneficial activities, which could include joint monitoring, joint reporting, regional modeling, and other efforts to address data gaps at subbasin boundaries b. Collectively pursue funding and collaborate on mutually agreed upon projects and management actions that provide benefits across boundaries c. Leverage existing collaboratives (NSV IRWM, NCWA etc.)	• Neighbor-to-neighbor • Coordination groups • Regional: NSV IRWM, NCWA Groundwater Task Force	• *Ongoing (GSP Development)* • *Near-term (5-year update)* • *Long-term (GSP implementation).*
4. Coordinated communication and outreach a. Coordinate and collaborate on regional-scale public engagement and communication strategies that promote awareness on groundwater sustainability, enhance public trust, and maintain institutional knowledge b. Maintain list of GSP/subbasin staff contacts and websites	• Regional: NSV IRWM and NCWA Groundwater Task Force	• *Ongoing (GSP Development)* • *Near-term (5-year update)* • *Long-term (GSP implementation)*
5. Issue-resolution process a. Establish and follow an agreed-upon process for identifying and resolving conflicts between GSAs by the first five-year update [Refer to Appendix D for more details and discussion prompts on issue resolution processes]	• Neighbor-to-neighbor • Coordination groups	• *Near-term (5-year update)* • *Long-term (GSP implementation).*

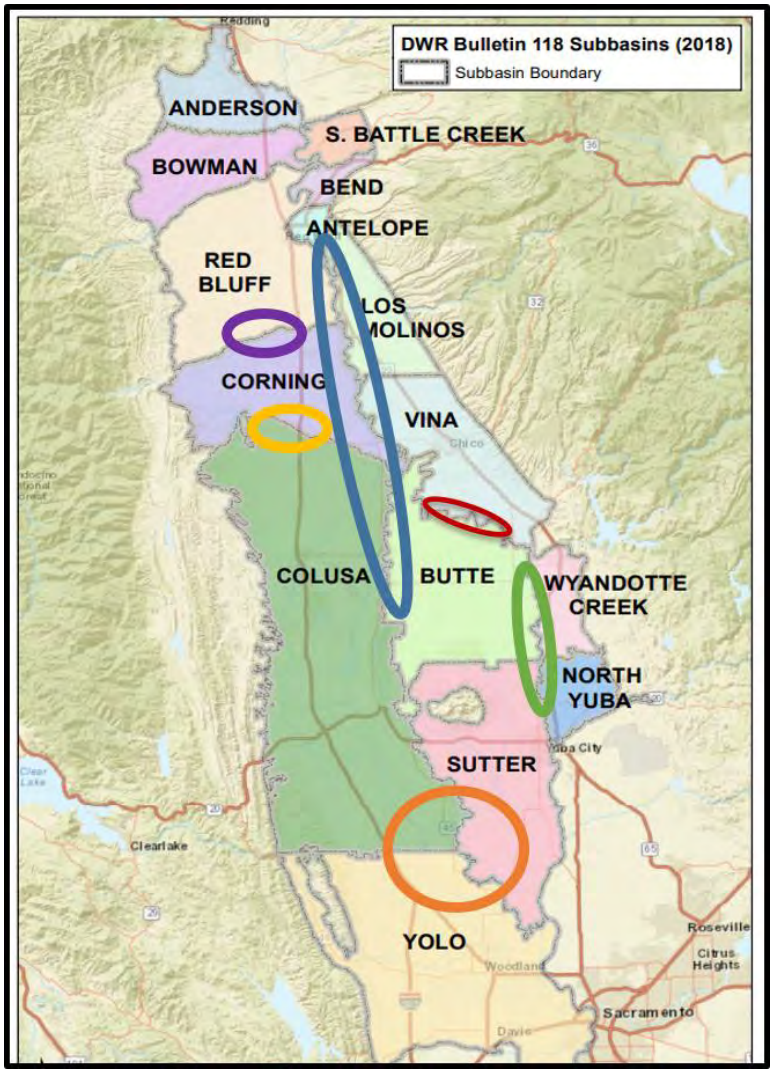
4.1. Inter-basin Coordination Groups

Inter-basin coordination efforts, as outlined in the pillars above, would require resources and technical support. Subbasin staff recommend organizing inter-basin coordination priorities by specific subbasin boundaries. One suggested approach identifies specific "Coordination Groups" (see Figure 3 and list below). Some of these groups are pairs and others include multiple subbasins around a river boundary.

1. ***Feather River Corridor***- *Butte, Wyandotte Creek, North Yuba, Sutter*
2. ***North Sacramento River Corridor***- *Antelope, Los Molinos, Red Bluff, Corning, Vina, Butte, Colusa*
3. ***South Sacramento Corridor***- *Colusa, Sutter, Yolo*

Neighbor to Neighbor, examples:

4. ***Stony Creek***- *Corning, Colusa*
5. ***Thomes Creek***- *Red Bluff, Corning*
6. ***Butte/Vina***- *Vina, Butte*



5. Conclusion and Next Steps

In sum, this report outlines a framework for inter-basin coordination for sustainable groundwater management in the Northern Sacramento Valley. The inter-basin coordination framework describes a menu of options for ongoing communication and collaboration around substantive issues over the twenty-year implementation of SGMA.

The pillars and other content from this report could be used by GSAs to support GSP development and implementation in a number of ways. This inter-basin coordination report could be included as an Appendix to the GSP and could be updated on a yearly basis. Individual subbasins can incorporate sections of the report into the body of the GSP, depending upon specific boundary conditions at adjoining subbasins. Finally, subbasins could draw on the inter-basin coordination framework if they would like to consider entering into one or more voluntary inter-basin agreements during GSP implementation.

The content of the report is the result of staff recommendations resulting from regional inter-basin coordination staff meetings. Staff will present the framework as a supporting document to guide and inform discussions with the GSA Boards and other existing public venues, such as advisory committees or groundwater commissions. GSAs in turn will discuss the menu of options for inter-basin coordination outlined in this report to determine their priorities and desired approach to draw on the inter-basin coordination framework in their individual GSPs. Lastly, Subbasin staff will come together to share input received and determinations from their respective GSAs.

Subbasin staff acknowledge that while this report builds upon a long-standing history of regional collaboration, this is just the beginning of inter-basin coordination efforts under SGMA. Therefore, this framework and inter-basin coordination activities will be continually refined throughout GSP implementation.

Appendices

Appendix A: GSP Emergency Regulations, Article 8: Interagency Agreements §357.2

§ 357.2. Inter-basin Agreements (access here)

Two or more Agencies may enter into an agreement to establish compatible sustainability goals and understanding regarding fundamental elements of the Plans of each Agency as they relate to sustainable groundwater management. Inter-basin agreements may be included in the Plan to support a finding that implementation of the Plan will not adversely affect an adjacent basin's ability to implement its Plan or impede the ability to achieve its sustainability goal. Inter-basin agreements should facilitate the exchange of technical information between Agencies and include a process to resolve disputes concerning the interpretation of that information. Inter-basin agreements may include any information the participating Agencies deem appropriate, such as the following:

(a) General information:
  (1) Identity of each basin participating in and covered by the terms of the agreement.
  (2) A list of the Agencies or other public agencies or other entities with groundwater management responsibilities in each basin.
  (3) A list of the Plans, Alternatives, or adjudicated areas in each basin.

(b) Technical information:
  (1) An estimate of **groundwater flow across basin boundaries**, including consistent and coordinated data, methods, and assumptions.
  (2) An estimate of **stream-aquifer interactions** at boundaries.
  (3) A **common understanding of the geology and hydrology** of the basins **and the hydraulic connectivity** as it applies to the Agency's determination of groundwater flow across basin boundaries and description of the different assumptions utilized by different Plans and how the Agencies reconciled those differences.
  (4) **Sustainable management criteria and a monitoring network** that would confirm that no adverse impacts result from the implementation of the Plans of any party to the agreement. If minimum thresholds or measurable objectives differ substantially between basins, the agreement should specify how the Agencies will reconcile those differences and manage the basins to avoid undesirable results. The Agreement should identify the differences that the parties consider significant and include a plan and schedule to reduce uncertainties to collectively resolve those uncertainties and differences.

(c) A description of the **process for identifying and resolving conflicts** between Agencies that are parties to the agreement.

(d) Inter-basin agreements submitted to the Department shall be posted on the Department's website.

Note: Authority cited: Section 10733.2, Water Code.
Reference: Sections 10727.2, 10733, and 10733.2, Water Code.

Northern Sacramento Valley | Sustainable Groundwater Management Act

Regional Coordination Between Subbasins

Antelope | Bowman | Butte | Colusa | Corning | Los Molinos | Red Bluff | Sutter | Vina | Wyandotte Creek | Yolo

Sustainable Groundwater Management Act

What is SGMA? California enacted the Sustainable Groundwater Management Act (SGMA) in 2014 to better manage groundwater over the long term. Sustainability is achieved by avoiding significant and unreasonable conditions for the six "sustainability indicators."

- Lowering of Groundwater Levels
- Reduction of Groundwater Storage
- Land Subsidence
- Surface Water Depletion
- Water Quality Degradation
- Sea Water Intrusion

Why is regional coordination important? In the Sacramento Valley, inter-basin coordination is critical as Groundwater Sustainability Agencies (GSA) develop their Groundwater Sustainability Plans (GSP). Since groundwater subbasins in the Northern Sacramento Valley (NSV) are hydrologically interconnected, water management decisions and actions in one subbasin (e.g. groundwater pumping) and processes like climate change could change aquifer conditions and affect flows to other subbasins. Understanding and accounting for these processes is key to achieve sustainability in all subbasins.

Who is involved in ongoing efforts?

Collaborative efforts have begun among representatives from 11 subbasins (Antelope, Bowman, Butte, Colusa, Corning, Los Molinos, Red Bluff, Sutter, Vina, Wyandotte Creek, Yolo), with facilitation support from the Consensus Building Institute. While efforts have focused on the subbasins mentioned, coordination will occur, as warranted, with other neighboring subbasins (Anderson and North Yuba).

What are the coordination priorities?

Groundwater Sustainability Agencies are working together to establish a foundation for open and transparent inter-basin coordination and communication by developing tools to:

- SHARE & COMPILE INFORMATION IN A CONSISTENT WAY
- OUTLINE A PROCESS TO IDENTIFY & RESOLVE ISSUES
- DOCUMENT COORDINATION EFFORTS

CBI CATALYZING COLLABORATION

Learn More & Get Involved

Receive Updates
Sign up for your GSA's interested parties list.

Contact Your GSA
Talk to your GSA representative

Attend Meetings
Attend public workshops, Advisory Board, and GSA Board meetings

Subbasin	GSA(s)	Website
Antelope	Tehama County Flood Control and Water Conservation District (FCWCD)	Website
Bowman	Tehama County FCWCD	Website
Butte	Biggs West Gridley WD, Butte County, Butte WD, City of Biggs, City of Gridley, Colusa Groundwater Authority, Glenn County, RD 1004, RD 2106, Richvale ID, Western Canal WD	Website
Los Molinos	Tehama County FCWCD	Website
Red Bluff	Tehama County FCWCD	Website
Corning	Corning Sub-basin GSA, Tehama County FCWCD	Website
Colusa	Glenn Groundwater Authority; Colusa Groundwater Authority	Websites (Glenn) | (Colusa)
Sutter	Butte WD, City of Live Oak, Sutter Community Service District, Sutter County, Sutter Extension Water District, RD 70, RD 1660, RD 1500, City of Yuba City	Website
Vina	Rock Creek Reclamation District, Vina GSA	Websites (Vina) | (RCDC)
Wyandotte Creek	Wyandotte Creek GSA	Website
Yolo	Yolo Subbasin Groundwater Agency	Website

Find more information about regional inter-basin coordination at:
ButteCounty.net/waterresourceconservation/Sustainable-Groundwater-Management-Act/Inter-basin-Coordination

APPENDIX C

Memorandum of Understanding
Four County (Butte, Colusa, Glenn, and Tehama Counties)
Regional Water Resource Coordination, Collaboration, and Communication

Memorandum of Understanding
Four County (Butte, Colusa, Glenn, and Tehama Counties) Regional Water Resource Coordination, Collaboration, and Communication

1. BACKGROUND
The counties of Butte, Colusa, Glenn, and Tehama share common surface water and groundwater resources. Based on these common resources, local water resource managers understand that regular coordination, collaboration, and communication can result in an improved water resource understanding at both the county and regional level.

2. PURPOSE
The purpose of this document is to establish the mutual understandings of the four counties with respect to their voluntary joint efforts toward regional coordination, collaboration, and communication.

3. GOALS
The goals of the Four County Memorandum of Understanding (MOU) are:

2.1. To foster coordination, collaboration and communication between the four counties on water-related issues, to achieve greater efficiencies, and enhance public services.

2.2. To provide a framework for the management and disbursement of funding associated with activities pursued jointly under this MOU.

2.3. To improve competitiveness for State and Federal grant funding.

4. DEFINITIONS
4.1. Four County. Participants including the counties of Butte, Colusa, Glenn, and Tehama, with representation by the following:

- Butte County: Department of Water and Resource Conservation
- Colusa County: Department of Planning and Building
- Glenn County: Department of Agriculture
- Tehama County: Flood Control and Water Conservation District

4.2. Project Manager. A project manager will be determined by the Counties signatory to this MOU for any given project regardless of funding source to meet the goals set forth in this MOU.

5. MUTUAL UNDERSTANDINGS
5.1. Participation. Signatories to this MOU constitute the current participants. Participation is strictly on a voluntary basis and may be

terminated at any time without recourse. Neighboring counties who share water resources common to the participating counties and who are engaged in similar activities will be invited to be signatory to this MOU. Signatories aspire to work collaboratively with other regional programs and technical outreach efforts.

5.2. Activities. Efforts pursued under this agreement will remain consistent with and will not exceed the current authority for any individual participating county. Efforts will include the study and investigation of water resources common to participants, monitoring and reporting, information dissemination and sharing between counties and with other county departments, public outreach and education, and other activities at the agreement and direction of individual county governing bodies.

5.3. County Funding. Counties are not required to commit funding associated with activities completed under this MOU. It is understood that activities under this MOU may result in the more efficient use of existing and future department funding resulting from improved collaboration and coordination.

5.4. External Funding. Signatories will work collaboratively in pursuit of external funding associated with common interest activities based on voluntary participation and agreement. When required, a mutually agreed upon County representative will serve as the Project Manager for activities completed under a contract with an external funding source. Existing county contracting mechanisms will be utilized where available for contractual and invoicing purposes between participating counties. Nothing in this MOU precludes individual counties from the individual pursuit, contracting and completion of work from an externally funded source regardless of a real or perceived regional interest.

5.5. Decision-making. Consensus will be sought when the need for a decision arises.

5.6. Non-binding nature. This document and participation under this MOU are nonbinding, and in no way suggest that a county may not continue its own activities as each county is expected to continue its own policies and procedures and undertake efforts to secure project funding from any source. A county may withdraw from participation at any time.

5.7. Termination. Because the MOU will require periodic review and updating for use into the future, it is envisioned that the joint efforts of those involved will be ongoing in maintaining a living document. Thus this document will remain as a reflection of the understandings of the participants. Individual signatories of this MOU may terminate their involvement at any time with no recourse.

6. SIGNATORIES TO THE MEMORANDUM OF UNDERSTANDING

We, the undersigned representatives of our respective counties, acknowledge the above as our understanding of how the Four County Coordination, Collaboration, and Communication MOU will be implemented.

MAR 14 2006 APPROVED JAN 24 2006

Date

Curt Josiassen, Chairman
Butte County Board of Supervisors

2/28/06

Approved As To Form:
Bruce Alpert, Butte County Counsel

6. SIGNATORIES TO THE MEMORANDUM OF UNDERSTANDING
We, the undersigned representatives of our respective counties, acknowledge the above as our understanding of how the Four County Coordination, Collaboration, and Communicative MOU will be implemented.

Date April 4, 2006

Christy Scofield, Chairperson
Colusa County Board of Supervisors

Approved As To Form:
Henry Rodegerdts, Colusa County Counsel

EXHIBIT B
PAGE 3 OF 3

6. SIGNATORIES TO THE MEMORANDUM OF UNDERSTANDING

We, the undersigned representatives of our respective counties, acknowledge the above as our understanding of how the Four County Coordination, Collaboration, and Communication MOU will be implemented.

12-13-05
Date

Vice Chairman, Tehama County Flood Control
And Water Conservation District

Approved As To Form:

by
County Counsel, Tehama County

Date

By Board Chair

County
Approved As To Form:

County Counsel

Date

By Board Chair

County
Approved As To Form:

County Counsel

Date

By Board Chair

County
Approved As To Form:

TEHAMA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
MINUTE ORDER

December 13, 2005

8. Approval of Four-County Regional Water Resource Coordination- MOU: Ernie Ohlin reviewed that in August 2004, the Board authorized staff to participate in the four county water effort. The MOU attached is allowing all counties to participate together in water resource collaboration and communication. This non-binding voluntary MOU recognizes coordination among Butte, Colusa, Glenn and Tehama County.

Roger Sherrill encouraged the four-county groups to participate and noted in Item 5.1 "Participation" is strictly voluntary. Shasta County provides a major part of the recharge for the northern part of the Sacramento Valley and to move forward could only make for a stronger overall group.

Mark Black, Ag Commissioner for Glenn County, added this will be presented to Glenn County next Tuesday for support. Discussions with Sutter and Yuba County brings interest and they are awaiting the outcome of the four counties. This is a good collaborative effort, giving us strength of possible capturing of funding.

Motion by Director Warner to approve the MOU for signature.

Director Willard questioned if this has been reviewed by County Counsel. Upon his approval, signature will be completed.

Motion revised by Director Warner to approve the MOU for signature by the Chair upon review of County Counsel. Second by Director Avilla and carried by those present 3-0 with 2 absent.

Ayes: Directors':, Charles Willard; Ron Warner; Gregg Avilla
Noes: None
Absent or Not Voting: Director's: Ross Turner, George Russell

STATE OF CALIFORNIA)
) ss
COUNTY OF TEHAMA)

I, Gary Antone, Director of the Tehama County Flood Control and Water Conservation District of the County of Tehama, State of California, hereby certify the above and foregoing to be full, true and correct copy of an order adopted by said Tehama County Flood Control and Water Conservation District on this **13th day of December, 2005**

Dated: This 13th day of **December, 2005**.

Gary Antone
Director of the Tehama County Flood Control and Water Conservation District of the County of Tehama, State of California

By Linda Madea
Linda Madea, Deputy

F:\ADMIN\MEETING\MINORDER\05MinOrd\Dec.wpd

FOUR COUNTY MEMORANDUM OF UNDERSTANDING
ADDENDUM ONE:
Statement of Principles Regarding Water Related Programs and Projects

In recognition that certain activities related to water resources do not recognize jurisdictional boundaries and require regional solutions, the parties identified in the Four County Memorandum of Understanding hereby agree to adhere to the following Statement of Principles Regarding Water Related Programs and Projects:

1. Programs and projects related to groundwater level and water quality monitoring shall be conducted in a cooperative manner and related data shall be shared between the participants to prevent negative impacts to our constituents.
2. Environmental documents associated with water projects and programs will automatically be circulated to all four counties for review and comment.
3. Incidents of abnormal water level or water quality readings will be immediately communicated to all participating counties resulting in a collaborative review and dissemination of related information.
4. Project and program related information will be disseminated on a regional basis through the independent county websites, augmented by regional public outreach meetings.
5. The parties will work cooperatively to acquire grant funding to conduct aquifer studies that further identify the linkages of the common groundwater resources.
6. Efforts pursued under this agreement will remain consistent with and will not exceed the current authority of any participating county.

We, the undersigned representatives of our respective counties, agree to adhere to the conditions of **Addendum One to the Four County MOU: Statement of Principles Regarding Water Related Programs and Projects.** The original MOU was signed by the Counties of Butte, Glenn, Colusa and Tehama in 2006.

Chair, Butte County Board of Supervisors	3-8-07 Date	County Counsel Approved As to Form	2/23/07 Date
Chair, Glenn County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Tehama County Board of Supervisors	Date	County Counsel Approved As to Form	Date

Vice-Chair Colusa County
Board of Supervisors

4-17-07
Date

County Counsel
Approved As to Form

Date

EXHIBIT A
PAGE 2 OF 2

COUNTY CONTRACT
1788

FOUR COUNTY MEMORANDUM OF UNDERSTANDING
ADDENDUM ONE:
Statement of Principles Regarding Water Related Programs and Projects

In recognition that certain activities related to water resources do not recognize jurisdictional boundaries and require regional solutions, the parties identified in the Four County Memorandum of Understanding hereby agree to adhere to the following Statement of Principles Regarding Water Related Programs and Projects:

1. Programs and projects related to groundwater level and water quality monitoring shall be conducted in a cooperative manner and related data shall be shared between the participants to prevent negative impacts to our constituents.
2. Environmental documents associated with water projects and programs will automatically be circulated to all four counties for review and comment.
3. Incidents of abnormal water level or water quality readings will be immediately communicated to all participating counties resulting in a collaborative review and dissemination of related information.
4. Project and program related information will be disseminated on a regional basis through the independent county websites, augmented by regional public outreach meetings.
5. The parties will work cooperatively to acquire grant funding to conduct aquifer studies that further identify the linkages of the common groundwater resources.
6. Efforts pursued under this agreement will remain consistent with and will not exceed the current authority of any participating county.

We, the undersigned representatives of our respective counties, agree to adhere to the conditions of **Addendum One to the Four County MOU: Statement of Principles Regarding Water Related Programs and Projects.** The original MOU was signed by the Counties of Butte, Glenn, Colusa and Tehama in 2006.

Chair, Butte County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Glenn County Board of Supervisors	4/3/2007 Date	County Counsel Approved As to Form	3/26/07 Date
Chair, Tehama County Board of Supervisors	Date	County Counsel Approved As to Form	Date

1

FOUR COUNTY MEMORANDUM OF UNDERSTANDING
ADDENDUM TWO:
Adding Sutter County to the Four County MOU

In recognition that certain activities related to water resources do not recognize jurisdictional boundaries and therefore require regional solutions, the parties identified in the original Four County Memorandum of Understanding: Counties of Butte, Colusa, Glenn and Tehama are hereby joined by Sutter County in the regional efforts discussed in the Four County MOU and the Statement of Principles Regarding Water Related Programs and Projects as discussed in Addendum One to the Four County MOU.

We, the undersigned as representative of our respective counties, agree to adhere to the conditions of the **Four County Memorandum of Understanding; Addendum One to the Four County MOU: Statement of Principles Regarding Water Related Programs and Projects. And Addendum Two: Adding Sutter County to the Four County MOU.**

The original MOU was signed by the Counties of Butte, Glenn, Colusa and Tehama in 2006. Through approval of this addendum, Sutter County makes the same commitment to regional cooperation and coordination that is outlined in the original MOU.

Bill Connelly	05 MAY 2009	Bruce L. Alpert	
Chair, Butte County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Glenn County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Tehama County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Colusa County Board of Supervisors	Date	County Counsel Approved As to Form	Date

C09-082

FOUR COUNTY MEMORANDUM OF UNDERSTANDING
ADDENDUM TWO:
Adding Sutter County to the Four County MOU

In recognition that certain activities related to water resources do not recognize jurisdictional boundaries and therefore require regional solutions, the parties identified in the original Four County Memorandum of Understanding: Counties of Butte, Colusa, Glenn and Tehama are hereby joined by Sutter County in the regional efforts discussed in the Four County MOU and the Statement of Principles Regarding Water Related Programs and Projects as discussed in Addendum One to the Four County MOU.

We, the undersigned as representative of our respective counties, agree to adhere to the conditions of the **Four County Memorandum of Understanding; Addendum One to the Four County MOU: Statement of Principles Regarding Water Related Programs and Projects. And Addendum Two: Adding Sutter County to the Four County MOU.**

The original MOU was signed by the Counties of Butte, Glenn, Colusa and Tehama in 2006. Through approval of this addendum, Sutter County makes the same commitment to regional cooperation and coordination that is outlined in the original MOU.

Chair, Butte County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Glenn County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Tehama County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Colusa County Board of Supervisors	5/5/09 Date	County Counsel Approved As to Form	Date 5/5/09

C09-082

FOUR COUNTY MEMORANDUM OF UNDERSTANDING
ADDENDUM TWO:
Adding Sutter County to the Four County MOU

In recognition that certain activities related to water resources do not recognize jurisdictional boundaries and therefore require regional solutions, the parties identified in the original Four County Memorandum of Understanding: Counties of Butte, Colusa, Glenn and Tehama are hereby joined by Sutter County in the regional efforts discussed in the Four County MOU and the Statement of Principles Regarding Water Related Programs and Projects as discussed in Addendum One to the Four County MOU.

We, the undersigned as representative of our respective counties, agree to adhere to the conditions of the **Four County Memorandum of Understanding; Addendum One to the Four County MOU: Statement of Principles Regarding Water Related Programs and Projects. And Addendum Two: Adding Sutter County to the Four County MOU.**

The original MOU was signed by the Counties of Butte, Glenn, Colusa and Tehama in 2006. Through approval of this addendum, Sutter County makes the same commitment to regional cooperation and coordination that is outlined in the original MOU.

Chair, Butte County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Glenn County Board of Supervisors	5/21/09 Date	County Counsel Approved As to Form	Date
Chair, Tehama County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Colusa County Board of Supervisors	5/5/09 Date	County Counsel Approved As to Form	5/5/09 Date

Chair, Sutter County
Board of Supervisors

Date

William J. Vanasek

County Counsel
Approved as to Form

4/14/09
Date

FOUR COUNTY MEMORANDUM OF UNDERSTANDING
ADDENDUM TWO:
Adding Sutter County to the Four County MOU

In recognition that certain activities related to water resources do not recognize jurisdictional boundaries and therefore require regional solutions, the parties identified in the original Four County Memorandum of Understanding: Counties of Butte, Colusa, Glenn and Tehama are hereby joined by Sutter County in the regional efforts discussed in the Four County MOU and the Statement of Principles Regarding Water Related Programs and Projects as discussed in Addendum One to the Four County MOU.

We, the undersigned as representative of our respective counties, agree to adhere to the conditions of the **Four County Memorandum of Understanding; Addendum One to the Four County MOU: Statement of Principles Regarding Water Related Programs and Projects. And Addendum Two: Adding Sutter County to the Four County MOU.**

The original MOU was signed by the Counties of Butte, Glenn, Colusa and Tehama in 2006. Through approval of this addendum, Sutter County makes the same commitment to regional cooperation and coordination that is outlined in the original MOU.

Chair, Butte County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Glenn County Board of Supervisors	Date	County Counsel Approved As to Form	Date
George Runner Chair, Tehama County Flood Control & Water Conservation District	6-23-09 Date	County Counsel Approved As to Form	Date
Chair, Colusa County Board of Supervisors	Date	County Counsel Approved As to Form	Date

FOUR COUNTY MEMORANDUM OF UNDERSTANDING:
ADDENDUM THREE
Expression of a Commitment to Begin An
Integrated Regional Water Management Planning Process
Within the Counties of Butte, Colusa, Glenn, Tehama and Sutter

Through adoption of this addendum, the signatories agree to begin a regional water management planning process pursuant to the Four County MOU, geographically covering the area of Butte, Colusa, Glenn, Tehama and Sutter Counties. The planning process shall utilize and incorporate existing plans and processes. The California legislature has recently adopted new criteria associated with the Integrated Regional Water Management Planning process. This new legislative criteria requires that acceptance and approval of the composition of all Integrated Regional Water Management Planning Areas be completed prior to accepting public funding associated with IRWMP grant funds. All IRWMP planning Regions and Plans must comply with the requirements as set forth in the Final Regional Acceptance Process Program Guidelines.

We, the undersigned as representative of our respective counties, agree to adhere to the conditions of **The Four County Memorandum of Understanding; Addendum One to the Four County MOU: Statement of Principles Regarding Water Related Programs and Projects; Addendum Two: Adding Sutter County to the Four County MOU; Addendum Three: Expression of a Commitment to Begin An Integrated Regional Water Management Planning Process Within the Counties of Butte, Colusa, Glenn, Tehama and Sutter.**

Bill Connelly	05 MAY 2009	Bruce L. Alpert	
Chair, Butte County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Glenn County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Tehama County Board of Supervisors	Date	County Counsel Approved As to Form	Date

Chair, Colusa County Board of Supervisors	5/5/09 Date	County Counsel Approved As to Form	5/6/09 Date
Chair, Sutter County Board of Supervisors	Date	County Counsel Approved as to Form	Date

C09-095
5-5-09

FOUR COUNTY MEMORANDUM OF UNDERSTANDING:
ADDENDUM THREE
Expression of a Commitment to Begin An
Integrated Regional Water Management Planning Process
Within the Counties of Butte, Colusa, Glenn, Tehama and Sutter

Through adoption of this addendum, the signatories agree to begin a regional water management planning process pursuant to the Four County MOU and geographically covering the area of Butte, Colusa, Glenn Tehama and Sutter Counties. The planning process shall utilize and incorporate existing plans and processes. The California legislature has recently adopted new criteria associated with the Integrated Regional Water Management Planning process. This new legislative criteria requires that acceptance and approval of the composition of all Integrated Regional Water Management Planning Areas be completed prior to accepting public funding associated with IRWMP grant funds. All IRWMP planning Regions and Plans must comply with the requirements as set forth in the Final Regional Acceptance Process Program Guidelines.

We, the undersigned as representative of our respective counties, agree to adhere to the conditions of **The Four County Memorandum of Understanding; Addendum One to the Four County MOU: Statement of Principles Regarding Water Related Programs and Projects; Addendum Two: Adding Sutter County to the Four County MOU; Addendum Three: Expression of a Commitment to Begin An Integrated Regional Water Management Planning Process Within the Counties of Butte, Colusa, Glenn, Tehama and Sutter.**

Chair, Butte County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Glenn County Board of Supervisors	5/21/09 Date	County Counsel Approved As to Form	Date
Chair, Tehama County Board of Supervisors	Date	County Counsel Approved As to Form	Date

CBI
CATALYZING COLLABORATION

Chair, Colusa County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Sutter County Board of Supervisors	Date	County Counsel Approved as to Form	4/14/09 Date

FOUR COUNTY MEMORANDUM OF UNDERSTANDING:
ADDENDUM THREE
Expression of a Commitment to Begin An
Integrated Regional Water Management Planning Process
Within the Counties of Butte, Colusa, Glenn, Tehama and Sutter

Through adoption of this addendum, the signatories agree to begin a regional water management planning process pursuant to the Four County MOU and geographically covering the area of Butte, Colusa, Glenn, Tehama and Sutter Counties. The planning process shall utilize and incorporate existing plans and processes. The California legislature has recently adopted new criteria associated with the Integrated Regional Water Management Planning process. This new legislative criteria requires that acceptance and approval of the composition of all Integrated Regional Water Management Planning Areas be completed prior to accepting public funding associated with IRWMP grant funds. All IRWMP planning Regions and Plans must comply with the requirements as set forth in the Final Regional Acceptance Process Program Guidelines.

We, the undersigned as representative of our respective counties, agree to adhere to the conditions of **The Four County Memorandum of Understanding; Addendum One to the Four County MOU: Statement of Principles Regarding Water Related Programs and Projects; Addendum Two: Adding Sutter County to the Four County MOU; Addendum Three: Expression of a Commitment to Begin An Integrated Regional Water Management Planning Process Within the Counties of Butte, Colusa, Glenn, Tehama and Sutter.**

Chair, Butte County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Glenn County Board of Supervisors	Date	County Counsel Approved As to Form	Date
George Lowell Chair, Tehama County Flood Control & Water Conservation District	6-23-09 Date	County Counsel Approved As to Form	Date

FOUR COUNTY MEMORANDUM OF UNDERSTANDING:
ADDENDUM FOUR
Expression of a Commitment to Begin An
Integrated Regional Water Management Planning Process
Within the Counties of Butte, Colusa, Glenn, Tehama, Sutter and Shasta

Through adoption of this addendum, the signatories agree:

1. Shasta County shall join the parties involved in the original Four County Memorandum of Understanding (MOU) and Addendum Two;

2. Signatories to the MOU and its addenda shall be called the Northern Sacramento Valley Integrated Regional Water Management Planning Group; and,

3. Begin a regional water management planning process pursuant to the Four County MOU, geographically covering the area of Butte, Colusa, Glenn, Tehama, Sutter and Shasta Counties. The planning process shall utilize and incorporate existing plans and processes. The California legislature has recently adopted new criteria associated with the Integrated Regional Water Management Planning process. This new legislative criteria requires that acceptance and approval of the composition of all Integrated Regional Water Management Planning Areas be completed prior to accepting public funding associated with IRWMP grant funds. All IRWMP planning Regions and Plans must comply with the requirements as set forth in the Final Regional Acceptance Process Program Guidelines.

4. The signatories to the MOU and its addenda reaffirm the provisions of section 5.6 of the MOU that the MOU and its addenda and participation under the MOU and its addenda are nonbinding.

We, the undersigned as representative of our respective counties, agree to adhere to the conditions of **The Four County Memorandum of Understanding; Addendum One to the Four County MOU: Statement of Principles Regarding Water Related Programs and Projects; Addendum Two: Adding Sutter County to the Four County MOU; Addendum Three: Expression of a Commitment to Begin An Integrated Regional Water Management Planning Process Within the Counties of Butte, Colusa, Glenn, Tehama and Sutter; Addendum Four: Expression of a Commitment to Begin An Integrated Regional Water Management Planning Process Within the Counties of Butte, Colusa, Glenn, Tehama, Sutter and Shasta.**

Bill Connelly — Chair, Butte County Board of Supervisors

APR 13 2010 — Date

County Counsel Approved As to Form

4.9.10 — Date

Chair, Glenn County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Tehama County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Colusa County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Sutter County Board of Supervisors	Date	County Counsel Approved as to Form	Date
Chair, Shasta County Board of Supervisors	4/27/10 Date	County Counsel Approved as to Form	5/6/10 Date

Chair, Glenn County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Tehama County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Colusa County Board of Supervisors	Date	County Counsel Approved As to Form	Date
Chair, Sutter County Board of Supervisors	4/20/10 Date	County Counsel Approved as to Form	4/13/10 Date
Chair, Shasta County Board of Supervisors	Date	County Counsel Approved as to Form	Date

Appendix D: Issue Resolution Process for Discussion Purposes

This document aims to guide discussions and provide pertinent information as subbasins consider inclusion of an issue resolution process in the Northern Sacramento Valley inter-basin coordination framework. These discussions will take place in the period leading up to the first five-year GSP update.

Discussion Prompts

1. *What are potential benefits/challenges or concerns of including an issue/dispute resolution process in the inter-basin coordination framework?*
2. *What are shared expectations between and among subbasins?*
3. *What are the GSAs preferences for addressing conflicts if/when they arise?*

Background

The Groundwater Sustainability Plan Regulations in Article 8 recommend including a "description of a process for identifying and resolving conflicts between Agencies" as a part of inter-basin coordination (Sections 10727.2, 10733, and 10733.2, Water Code). A recent study by Tara Moran, Janet Martinez, and William Blomquist, part of Stanford University's Water in the West found that the ability of interagency coordination "to solve complex challenges will be contingent on the ability of these organizations to effectively prevent and manage conflicts before they arise and to resolve these conflicts equitably and efficiently when they do." (Moran, Martinez, and Blomquist, 2021). Further, given how likely it is for disagreements at a local level to occur during SGMA implementation, the study suggests investing in establishing issue resolution processes before disagreements arise. Meanwhile, deferring their development could complicate the resolution process in times of conflict. Given these recommendations, consider the following questions for reflection and discussion.

Purposes of issue resolution processes

There are many options to identify and resolve issues that involve different parties, goals/objectives, and resources. Ideally, issue resolution processes are thoughtfully designed and tailored to specific contexts. **The broader goal for such a process can be to meet the agencies' long-term needs, considering local dynamics, desired outcomes, and expected uses**. Goals can include keeping things simple and efficient, maintaining relationships, ensuring quality of the process, fostering participation and community engagement, etc.

The figure below shows different types of dispute resolution processes. In some cases, agencies draft clauses that outline a tiered approach. They often begin with negotiation, which gives the parties control over the process and outcomes. Then, mediation, which brings in a neutral third-party (mediator) to facilitate the discussion and help parties work towards resolving issues. Often, negotiation and mediation lead to "non-binding" outcomes, non-enforceable by courts. Parties could opt to move towards arbitration or litigation, which are controlled by a third party (arbitrator or judge/jury) and can lead to binding and non-binding outcomes (Moran, Martinez, and Blomquist, 2019).

Figure 2. The spectrum of dispute resolution process. Modified from Amsler et al. (2020a).

Negotiation	Mediation	Arbitration	Trial
• No third party	• Third part (mediator)	• Third party (arbitrators)	• Third party (judge/jury)
• Non-binding	• Non-binding	• Non-binding or binding	• Binding

From Moran, Martinez, and Blomquist, 2019

Examples

1. Example from Moran, Martinez, and Blomquist, 2019

Box 2. A Draft Dispute Resolution Clause.

The blue text notes indicate how each of the preceding five questions are incorporated into the dispute resolution language.

In the event that any dispute [Q1: Provides instruction on what disputes can be addressed. Additional process goals, while not explicit should be subject to discussion.] arises among the Members relating to (i) this Agreement, (ii) the rights and obligations arising from this Agreement, (iii) a Member proposing to withdraw from membership in the Agency, or (iv) a Member proposing to initiate litigation within the Basin or the management of the Basin, the aggrieved Member or Members proposing to withdraw from membership shall provide written notice to the other Members of the controversy or proposal to withdraw from membership [Q2: Provides instruction on who can initiate and participate in the process.]. Within forty-five (45) days after such written notice, the Members shall attempt in good faith to resolve the controversy through informal negotiation [Q3: Describes a series of processes for dispute resolution, beginning with negotiation. Also includes a timeline for process stages.]. If the Members cannot agree upon a resolution of the controversy within forty-five (45) days from the providing of written notice specified above, the dispute shall be submitted to mediation prior to commencement of any legal action or prior to withdrawal of a Member proposing to withdraw from membership. The mediation shall be no less than a full day (unless agreed otherwise among the Members) and the cost of mediation shall be paid in equal proportion among the Members [Q4: Provides instruction on who will pay for dispute resolution processes.]. The mediator shall be either voluntarily agreed to or appointed by the Superior Court upon a suit and motion for appointment of an impartial mediator [Q3a: Provides a clear process for choosing an impartial mediator.]. Upon completion of mediation, if the controversy has not been resolved, any Member may exercise all rights to bring a legal action relating to the controversy or withdraw from membership as otherwise authorized pursuant to this Agreement. The Agency may, at its discretion, participate in mediation upon request by a stakeholder [to be defined by the parties to the Agreement] concerning a dispute alleged by the stakeholder concerning the management of the Basin or rights to extract groundwater from the Basin, with the terms of such mediation to be determined in the sole discretion of the Member Directors [Q2: Allows third-party participation in the dispute resolution process].

Note: This above dispute resolution clause is not intended to serve as an endorsement or illustration of effective practice.

2. Example from Butte Subbasin Cooperation Agreement

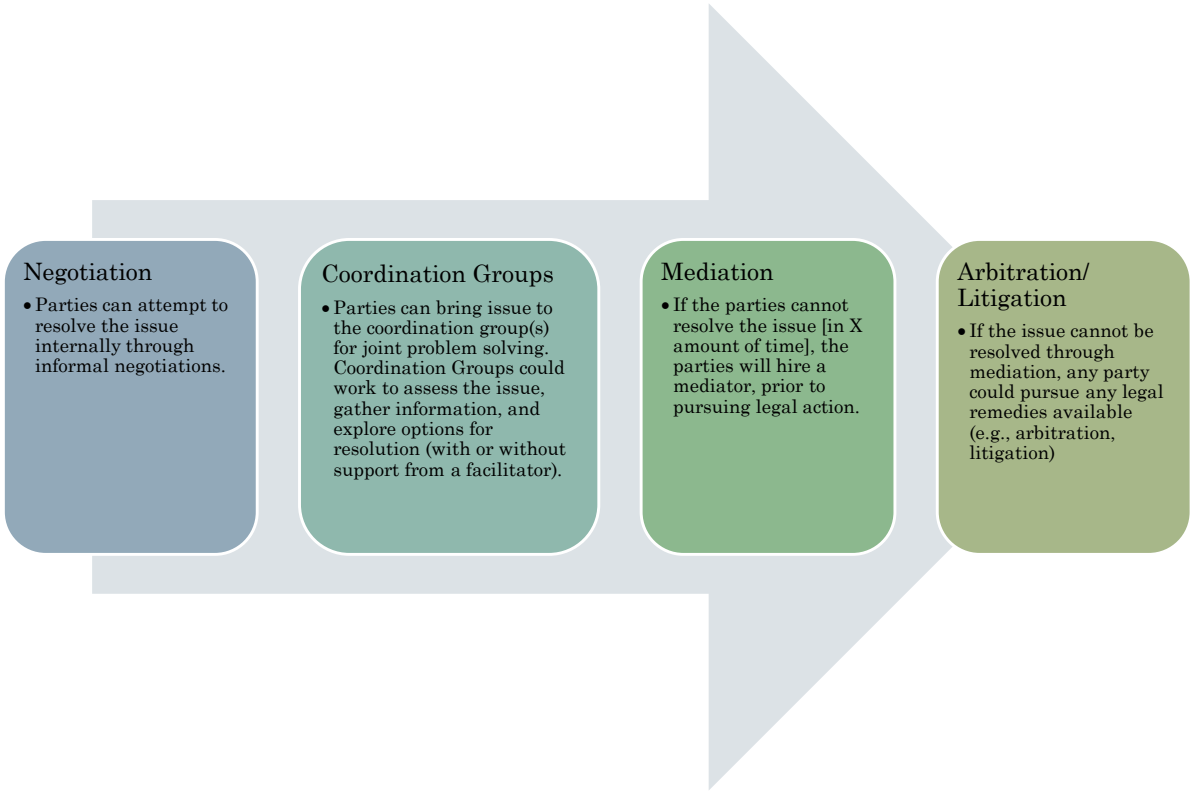
Note: This example doesn't provide much specificity. However, acknowledges shared intent to resolve disputes.

ARTICLE 9. DECISION-MAKING AND DISPUTE RESOLUTION

9.1. Decision-making Authority. Topics where the Members desire coordinated decision-making will be considered by the Advisory Board, and the Member Directors will strive for unanimous recommendations that will be presented to each Member's governing body for consideration. Such topics include, but are not limited to, development and implementation of the GSP, and associated financial arrangements. When unable to reach unanimous recommendations, the Advisory Board will outline the areas in which it does not agree, providing some explanation to inform the respective GSAs' governing bodies. Despite the recommendations of the Advisory Board, ultimate decision-making authority for topics considered by the Advisory Board resides with each Member's governing body.

9.2. Dispute Resolution. It is the desire of Members to informally resolve all disputes and controversies related to this Agreement, whenever possible, at the least possible level of formality and cost. If a dispute occurs, the disputing Members shall meet and confer in an attempt to resolve the matter. If informal resolution cannot be achieved, the matter will be referred to the Advisory Board for resolution. The Advisory Board may engage the services of a trained mediator or resort to all available legal and equitable remedies to resolve disputes.

Possible Process in the Northern Sacramento Valley



Worksheet: Key Questions and Considerations for Issue Resolution Process

The questions below could be used to guide the development of a specific issue resolution process in the context of inter-basin coordination in the Northern Sacramento Valley by the first 5-year GSP update. These questions could help to clarify the level of specificity that subbasins would find beneficial and mutually agreeable when/if conflict occurs.

Adapted from Moran, Martinez, and Blomquist, 2019

1) What are the process goals? a) Consider what disputes the process aims to address – all disputes arising at basin boundaries or only a subset? b) Consider inclusivity and transparency of the process, cost efficiency for parties and the GSA(s), timeframes, and other factors important to your agency(ies). c) Other potential objectives include dispute prevention, enhanced relationships, procedural and substantive fairness, legal compliance, durability of resolution and organizational improvement.	
2) Who can initiate and participate in the dispute resolution process? a) Consider what parties can initiate the dispute resolution process – is it only parties to the agreement or can external parties invoke it? There are pros and cons to both choices, so discussing this in advance will ensure thoughtful consideration.	
3) What processes are used to make decisions related to dispute resolution and what information is necessary? a) What is the process for selecting a mediator, facilitator, lawyer or other impartial party? b) Consider including a range of processes beginning with internal negotiations and escalating based on clear timelines.	
4) Who pays for the dispute resolution process? a) Consider who will pay for the mediator, facilitator, lawyer or other impartial party. Will it be paid for by the disputing parties, the GSA(s) or through a state-funded program? b) How could you assess whether the outcome of the dispute resolution process was successful?	

Other Resources

- Dutton, A. SGMA Updates, Coordination Considerations, and Potential Next Steps, Cosumnes Subbasin Working Group. February 21, 2018. http://cosumnes.waterforum.org/wp-content/uploads/2018/02/EKI_Cosumnes_TAC_meeting_2018-02-21.pdf
- Moran T., Martinez, J., and Blomquist W. Dispute Resolution Processes: Thinking through SGMA Implementation. Water in the West. Fall, 2019. https://waterinthewest.stanford.edu/publications/dispute-resolution-processes-thinking-through-sgma-implementation
- Moran T. Basin-scale Coordination is Key to SGMA's Success: Thoughts on DWR's Draft GSP Regulations. March 1, 2016. Stanford University. Water in the West. https://waterinthewest.stanford.edu/news-events/news-press-releases/basin-scale-coordination-key-sgma%E2%80%99s-success-thoughts-dwr%E2%80%99s-draft-gsp
- Moran et al. Dispute Resolution Clauses in Interorganizational Coordination Agreements: A Comparative Analysis. 2021. pending publication.
- Butte County. 2017. Technical Collaboration on Interconnected Subbasins to Advance Sustainable Groundwater Management: Assessment of Interconnected Subbasins. Available at: https://www.buttecounty.net/wrcdocs/Reports/SpecialProjects/InterbasinGWFlow/InterbasinSBAssessment-FINAL.pdf
- Butte County. 2017. Inter-basin Groundwater Flows Fact Sheet. Available at: https://www.buttecounty.net/wrcdocs/Reports/SpecialProjects/InterbasinGWFlow/FactSheet.pdf
- Buck, Christina. 2017. Butte County Inter-Basin Groundwater Flows Presentation, https://www.buttecounty.net/wrcdocs/Reports/SpecialProjects/InterbasinGWFlow/NSVBoardAssessment20170615.pdf

Appendix 2-D

GSA Outreach Events and Interested Parties List

GSA Outreach Events

General SGMA Updates

4/4/2016	Tehama County Public Meeting	SGMA Overview
5/25/2016	Tehama County Public Meeting	SGMA Overview
6/27/2016	Tehama County Public Meeting	SGMA Overview
5/30/2017	Tehama County Public Meeting	Tehama County GSA and Current GW Conditions
8/9/2017	Tehama County Public Meeting	Tehama Co Reconnaissance Level GW Sustainability Risk Assessment
10/23/2018	Corning City Council Meeting	Tehama County GSA and Current GW Conditions
11/14/2018	Tehama County Farm Bureau Meeting	Tehama County GSA and Current GW Conditions Tehama County GSA and Current GW Conditions
4/5/2019	SGMA in the N. Sacramento Valley Forum	Tehama County GSA and Current GW Conditions
5/8/2019	Shasta Tehama Watershed Education Coalition	Tehama County GSA and Current GW Conditions
1/30/2020	Capay Land Owners Association	Tehama County GSA and Current GW Conditions

General SGMA Presentations to Community Groups

4/14/2016 – Sacramento River Discovery Center (Topic: General SGMA Overview)
9/15/2016 – Sacramento River Discovery Center (Topic: Tehama County GSA)
3/11/2020 – Tehama County Agricultural Realtor Group (Topic: General SGMA and GSA Updates, Corning Subbasin, Update on Groundwater Levels)
10/13/2020 – El Camino Irrigation District Board (Topic: General SGMA, Groundwater Levels)
3/1/2021 – Tehama County Cattlemen's Association (Topic: General SGMA Presentation)
3/17/2021 – Tehama County Farm Bureau (Topic: GSA and GSP Update)
7/13/2021 – Tehama County Board of Supervisors (General SGMA update)
7/14/2021 - Shasta Tehama Watershed Education Coalition (Topic: Current Groundwater Conditions & Progress Update on Development of GSPs)
9/15/2021 – Red Bluff Kiwanis Club Presentation (General SGMA Update)
9/21/2021 – Red Bluff Rotary (General SGMA update and GSP overview)

Tribal Presentations

6/13/2019 – Meeting with Paskenta Tribal Council (Topic: General SGMA, GSA, and GSP overview, Corning Subbasin)
4/6/2021 – Meeting with Paskenta Tribal Council (Topic: SGMA and Tribal Engagement)

Subbasin Specific Outreach Series

Oct 6, 2020 - Thomes Creek Estates Group (Red Bluff Subbasin) – SGMA and GSP Overview, next steps
Oct 14, 2020 – Antelope Subbasin – SGMA and GSP Overview, next steps
Oct 15, 2020 – Bowman Subbasin – SGMA and GSP Overview, next steps
Oct 21, 2020 – Red Bluff Subbasin – SGMA and GSP Overview, next steps
Oct 22, 2020– Los Molinos Subbasin – SGMA and GSP Overview, next steps

December 9, 2020 –All Subbasins - review of recent SGMA activities, overview of management planning areas and basin settings

April 19, 2021 - Bowman Subbasin – Plan Area and Basin Setting, SMC
April 20, 2021 - Red Bluff Subbasin – Plan Area and Basin Setting, SMC
April 21, 2021 - Antelope Subbasin – Plan Area and Basin Setting, SMC
April 22, 2021 - Los Molinos Subbasin – Plan Area and Basin Setting, SMC

Aug 17, 2021 - Bowman Subbasin – SMCs, PMAs, and Public Review Schedule
Aug 19, 2021 - Red Bluff Subbasin – SMCs, PMAs, and Public Review Schedule
Aug 23, 2021 - Antelope Subbasin – SMCs, PMAs, and Public Review Schedule
Aug 25, 2021- Los Molinos Subbasin – SMCs, PMAs, and Public Review Schedule

Quarterly eNewsletters
December 2020
March 2021
July 2021

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Danny and Terrie	Rice
John and Linda	Pitter
Dave and Darlene	Yingst
Roberto and Lisa	Cruz
Mike and Patricia	Schager
Anderson	Cottonwood Irrigation District

Appendix 2-E

Comments on the Plan

Los Molinos Subbasin Groundwater Sustainability Plan
Public Draft Comments Received with Responses

Commenter Name	Section/ Subsection Number	Page Number	Figure/ Table Number (if applicable)	Comment	Name of Consultant Team Comment Responder	Consultant Team Response
Cathy Marcinkevage NOAA National Marine Fisheries Service Direction Questions to: Amanda.Cranford@noaa.gov	Chapter 3 Avoiding Undesirable Results			The draft chapter does not appear to adequately address the following requirement for minimum thresholds as spelled out in the SGMA regulations: "The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators." (CCR 23 §354.28(b)(2)) The draft Chapter 3 does not include a minimum threshold or measurable objective for streamflow depletion, explaining that a lack of information prevents them from doing so. In fact, the GSA has not even identified an appropriate undesirable result for streamflow depletion. According to DWR (2021), "it is up to GSAs to define in their GSPs the specific significant and unreasonable effects that would constitute undesirable results and to define the groundwater conditions that would produce those results in their basins." The GSA should qualitatively describe what conditions within the subbasin would constitute an undesirable result with regard to streamflow depletion, ensuring that the description accounts for impacts to instream habitat that support ESA-listed salmon and steelhead. Moreover, the final GSP should explain how any chosen minimum threshold for streamflow depletion will avoid impacting surface water beneficial uses. With regard to the lack of data on streamflow depletion impacts, NMFS recommends the final GSP follow guidance from California Department of Fish and Wildlife (2019) and develop conservative streamflow depletion thresholds as a cautionary principle until the surface flow/groundwater dynamic in the Los Molinos subbasin is better studied and understood.	LSCE	GSP states that interconnected surface water MOs and MTs are interim, and the chronic lowering of groundwater elevations will be used as a proxy for interconnected surface waters. MOs and MTs of groundwater level monitoring wells are included in interconnected surface water sections. Further shallow monitoring will better describe stream-aquifer interaction to determine potential impacts to beneficial users. GSP includes plan for future monitoring to address data gaps.
Cathy Marcinkevage NOAA National Marine Fisheries Service Direction Questions to: Amanda.Cranford@noaa.gov	Chapter 3 Using Groundwater Elevations as a Proxy for Streamflow Depletion			The GSA should provide an explanation, with supporting evidence, for why using groundwater level as a minimum threshold is a reasonable proxy for depletion of interconnected surface water, as well as why those interim levels are sufficient to avoid streamflow depletion that significantly impacts surface water beneficial uses.	LSCE	Comment noted. Further explanation will be provided as monitoring improves understanding of relationship between groundwater levels and depletion of interconnected surface water. Water levels serve as a proxy in the interim and appropriate MTs will be set in the future.

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Cathy Marcinkevage NOAA National Marine Fisheries Service Direction Questions to: Amanda.Cranford@noaa.gov	Chapter 3 Basing Sustainable Management Criteria on Historical Drought Conditions			The proposed groundwater elevations chosen as streamflow depletion minimum thresholds and measurable objectives are completely inappropriate for avoiding significant impacts to ESA-listed salmonids and their habitat. Basic hydraulic principles dictate that groundwater flow is proportional to the difference between groundwater elevations at different locations along a flow path. Using this basic principle, groundwater flow to a stream or, conversely, seepage from a stream to the underlying aquifer is proportional to the difference between water elevation in the stream and groundwater elevations at locations away from the stream. The interim minimum thresholds are based upon groundwater elevations that occurred during California's recent historical drought. These groundwater levels would likely create historically high streamflow depletion rates and result in instream conditions that negatively affect ESA-listed salmonids and their critical habitat, including EFH. In justifying the proposed minimum thresholds, the draft chapter offers the following (page 3-24): "The Los Molinos subbasin has not been fully developed and its extraction potential has yet to be realized. Therefore, although in some cases MT may be set at water levels not previously experienced in the subbasin, they are not anticipated to cause adverse impacts to most sectors." The above reasoning raises several questions, such as how the descriptors "fully developed" and "extraction potential" are defined, and what their relationship is to SGMA's definition of sustainable yield? In addition, what is the definition of "sectors" as it pertains to groundwater dependent ecosystems? Finally, there is no indication within the above reasoning, or within the entire draft Chapter 3, that environmental beneficial uses of surface water have been considered when developing the sustainable management criteria for interconnected surface water depletion. For instance, page 3-24 notes only "historical water level trends, future water level protections, and domestic well water levels were considered when establishing MT." During the first year of GSP implementation, the GSA should design and implement studies that better inform appropriate minimum thresholds and measurable objectives for streamflow depletion. The sustainable management criteria that result must avoid significant and unreasonable impacts to identified	LSCE	TSS well installation is ongoing. Specific plans will be developed over time to fill these identified data gaps, and potential impacts to environmental beneficial uses will be further assessed.

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				beneficial uses of surface water, which for Mill and Deer creeks include cold freshwater habitat; migration of aquatic organisms; and spawning, reproduction, and/or early development. In the interim, we again suggest the GSA follow guidance by the California Department of Fish and Wildlife (2019) that recommends conservative sustainability management criteria be established to ensure groundwater dependent ecosystem protection.		
Cathy Marcinkevage NOAA National Marine Fisheries Service Direction Questions to: Amanda.Cranford@noaa.gov	Chapter 3 NMFS recommendation for future Projects and Management Actions			We suspect that groundwater recharge projects are likely to be an important action implemented as part of the effort to achieve groundwater sustainability in the Los Molinos subbasin. NMFS encourages the GSA to consider implementing recharge projects that facilitate floodplain inundation, which offer multiple benefits including downstream flood attenuation, groundwater recharge, and ecosystem service. Managed floodplain inundation can recharge floodplain aquifers and then slowly release stored water back to the stream during summer months. These projects also reconnect the stream channel with floodplain habitat, which can benefit juvenile salmon and steelhead by creating off-channel habitat characterized by slow water velocities, ample cover in the form of submerged vegetation, and high food availability. As an added bonus, these types of multi-benefit projects likely have more diverse grant funding streams that can lower their cost as compared to traditional off-channel recharge projects. NMFS stands ready to work with any GSA interested in designing and implementing floodplain recharge projects.	LSCE	Comment noted. PMAs are implemented based on conditions to avoid undesirable results. The timing of the PMAs is not known at this time.
E. J. Remson The Nature Conservancy Other contributors to comments include: o Ngodoo Atume, Clean Water Action/Fund o J.Pablo Ortiz-Partida, Union of Concerned Scientists o Samantha Arthur, Audubon California o Danielle V. Dolan, Local Government Commission o Melissa M. Rohde, The Nature Conservancy o Kristen Culbert, California Central Valley River Conservation	Chapter 3 Identification of Key Beneficial Uses and Users			**Disadvantaged Communities and Drinking Water Users** The identification of Disadvantaged Communities (DACs) and drinking water users is insufficient. We note the following deficiencies with the identification of these key beneficial users. While the plan includes five different tools that were utilized to identify and map DACs within the subbasin including the use of DWR DAC mapping tool, it fails to identify each DAC by name and provide the population of DACs dependent on groundwater as their source of drinking water. These missing elements are required for the GSA to fully understand the specific interests and water demands of these beneficial users, and to support the consideration of beneficial users in the development of sustainable management criteria and selection of projects and management actions. **RECOMMENDATIONS** ● Identify each DAC by name and provide the population of each identified DAC. ● Identify the sources of drinking water for DAC members, including an estimate of how many people rely on groundwater	LSCE	Comments noted. DACs maps updated with population estimates.

Commenter Name	Section/ Subsection Number	Page Number	Figure/ Table Number (if applicable)	Comment	Name of Consultant Team Comment Responder	Consultant Team Response
				(e.g., domestic wells, state small water systems, and public water systems).		
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Commenter Name	Section/ Subsection Number	Page Number	Figure/ Table Number (if applicable)	Comment	Name of Consultant Team Comment Responder	Consultant Team Response
				contours of depth to groundwater along streams and other land surface depressions where GDEs are commonly found.		
E. J. Remson The Nature Conservancy Other contributors to comments include: o Ngodoo Atume, Clean Water Action/Fund o J.Pablo Ortiz-Partida, Union of Concerned Scientists o Samantha Arthur, Audubon California o Danielle V. Dolan, Local Government Commission o Melissa M. Rohde, The Nature Conservancy o Kristen Culbert, California Central Valley River Conservation	Chapter 3 Groundwater Dependent Ecosystems			The identification of Groundwater Dependent Ecosystems (GDEs) is insufficient. The GSP took initial steps to identify and map GDEs using the Natural Communities Commonly Associated with Groundwater dataset (NC dataset). Potential GDEs were identified in areas overlying groundwater within 30 feet of land surface based on Spring 2015 groundwater conditions, but this was the only dataset used to characterize groundwater conditions in the subbasin's GDEs. We recommend using groundwater data from multiple seasons and water year types over the pre-SGMA period (i.e., 2005-2015) to determine the range of depth to groundwater. Using seasonal groundwater elevation data over multiple water year types is an essential component of identifying GDEs and is necessary to capture the variability in groundwater conditions inherent in California's Mediterranean climate. The GDE Appendix (Appendix 2-H) refers to Figure 1 through Figure 4 that illustrate the steps of the GDE analysis. These figures appear to be missing from the appendix, however. The GSP does not provide an inventory of flora and fauna in the subbasin, nor is any discussion of threatened or endangered species provided **RECOMMENDATIONS** ● Include the missing Figures 1-4 in the GDE Appendix 2-H. ● Use depth-to-groundwater data from multiple seasons and water year types (e.g., wet, dry, average, drought) to determine the range of depth to groundwater around NC dataset polygons. We recommend that a baseline period (10 years from 2005 to 2015) be established to characterize groundwater conditions over multiple water year types. Refer to Attachment D of this letter for best practices for using local groundwater data to verify whether polygons in the NC Dataset are supported by groundwater in an aquifer. ● Provide depth-to-groundwater contour maps, noting the best practices presented in Attachment D. Specifically, ensure that the first step is contouring groundwater elevations, and then subtracting this layer from land surface elevations from a digital elevation model (DEM) to estimate depth-to-groundwater contours across the landscape. ● Refer to Attachment B for more information on TNC's plant rooting depth database. Deeper thresholds are necessary for plants that have reported maximum root depths that exceed the averaged 30-ft threshold, such as Valley Oak (Quercus lobata). We recommend that the reported max rooting depth for these	LSCE	Appendix 2-H Figures 1-4 included in final document. Inventory of flora and fauna added as an addition to Appendix 2-I. Spring 2015 water levels were used because 01/01/2015 is the baseline date for undesirable results. SGMA regulations state that "The plan may, but is not required to, address undesirable results that occurred before, and have not been corrected by, January 1, 2015". Depth-to-groundwater contours will not improve GDE identification as wells shallower than 50 feet were not included in contour analysis. As shown in Figures 2-63 and 2-64, availability of water level data from shallow wells (depth < 100 ft) are very limited in the Subbasin. The suggested 80-ft rooting depth for the Valley Oak is from a specific study in a fractured bedrock environment that is not applicable in Tehama County (Howard, 1992)*. *Howard, Janet L. 1992. Quercus lobata. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer).

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				deeper-rooted plants be used. For example, a depth-to-groundwater threshold of 80 feet should be used instead of the 30-ft threshold, when verifying whether Valley Oak polygons from the NC Dataset are connected to groundwater. It is important to emphasize that actual rooting depth data are limited and will depend on the plant species and site-specific conditions such as soil and aquifer types, and proximity to other water sources. ● If insufficient data are available to describe groundwater conditions within or near polygons from the NC dataset, include those polygons as "Potential GDEs" in the GSP until data gaps are reconciled in the monitoring network. ● Provide a complete inventory, map, or description of fauna (e.g., birds, fish, amphibian) and flora (e.g., plants) species in the subbasin and note any threatened or endangered species (see Attachment C in this letter for a list of freshwater species located in the Los Molinos Subbasin).		
E. J. Remson The Nature Conservancy Other contributors to comments include: o Ngodoo Atume, Clean Water Action/Fund o J.Pablo Ortiz-Partida, Union of Concerned Scientists o Samantha Arthur, Audubon California o Danielle V. Dolan, Local Government Commission o Melissa M. Rohde, The Nature Conservancy o Kristen Culbert, California Central Valley River Conservation	Chapter 3 Native Vegetation and Managed Wetlands			Native vegetation and managed wetlands are water use sectors that are required to be included in the water budget. The integration of native vegetation into the water budget is sufficient. We commend the GSA for including the groundwater demands of this ecosystem in the historical, current and projected water budgets. Managed wetlands are not mentioned in the GSP, so it is not known whether or not they are present in the subbasin. **RECOMMENDATION** ● State whether or not there are managed wetlands in the subbasin. If there are, ensure that their groundwater demands are included as separate line items in the historical, current, and projected water budgets.	LSCE	Statement added in GSP Chapter 2B on managed wetlands in Los Molinos. Managed wetlands now included in Figure 2-34.
E. J. Remson The Nature Conservancy Other contributors to comments include:	Chapter 3 Engaging Stakeholders			**Stakeholder Engagement During GSP Development** Stakeholder engagement during GSP development is insufficient. SGMA's requirement for public notice and engagement of stakeholders is not fully met by the description in the Communications and Engagement Plan (Appendix 2-A).	LSCE	Comments noted. Appendix 2-A updated to include recent outreach and engagement.

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o Ngodoo Atume, Clean Water Action/Fund o J.Pablo Ortiz-Partida, Union of Concerned Scientists o Samantha Arthur, Audubon California o Danielle V. Dolan, Local Government Commission o Melissa M. Rohde, The Nature Conservancy o Kristen Culbert, California Central Valley River Conservation				We note the following deficiencies with the overall stakeholder engagement process: ● The GSP documents opportunities for public involvement and engagement in very general terms for listed stakeholders. Public outreach and engagement activities include public meetings, public hearings, stakeholder briefings with Groundwater Commission members, public educational workshops, notices to cities and counties within the Plan area, quarterly newsletters, and opportunities to provide comments. While the GSP provides a guidance document on DAC engagement, its description consists primarily of informing DACs by outreach to DAC-related organizations. The GSP does not state whether DACs and environmental stakeholders are represented on a GSA Advisory Committee or Board. ● The plan does not include documentation on how stakeholder input from the above mentioned outreach and engagement was considered and incorporated into the GSP development process. ● We note that Appendix G of the Communications and Engagement Plan, called "Potential GSA Outreach Tasks," is still under development and will include more details of outreach to stakeholders during GSP implementation. Ensure that as this section is finalized, it includes a detailed plan for continual opportunities for engagement through the implementation phase of the GSP that is specifically directed to DACs, domestic well owners, and environmental stakeholders. **RECOMMENDATIONS** ● In the Communications and Engagement Plan, describe active and targeted outreach to engage all stakeholders throughout the GSP development and implementation phases. Refer to Attachment B for specific recommendations on how to actively engage stakeholders during all phases of the GSP process. While some of these resources have already been stated in the GSP, we recommend that the GSA should improve utilization of these resources and documentation of the engagement process ● Provide documentation on how stakeholder input was incorporated into the GSP development process. ● Utilize DWR's tribal engagement guidance to comprehensively identify, involve, and address all tribes and tribal interests that may be present in the subbasin.		
E. J. Remson The Nature Conservancy Other contributors to comments include:	Chapter 3 Considering Beneficial Uses and Users When Establishing Sustainable Management Criteria and Analyzing Impacts on			The consideration of beneficial uses and users when establishing sustainable management criteria (SMC) is insufficient. The consideration of potential impacts on all beneficial users of groundwater in the basin are required when defining undesirable results and establishing minimum thresholds. **Disadvantaged Communities and Drinking Water Users**	LSCE	The GSP documents the number of wells impacted at the MT, some of which may be used by DACs. SMCs are only established for TDS as other COCs are not caused by or related to groundwater depletion. SGMA functions together with existing water quality regulations and programs.

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o Ngodoo Atume, Clean Water Action/Fund o J.Pablo Ortiz-Partida, Union of Concerned Scientists o Samantha Arthur, Audubon California o Danielle V. Dolan, Local Government Commission o Melissa M. Rohde, The Nature Conservancy o Kristen Culbert, California Central Valley River Conservation	Beneficial Uses and Users			For chronic lowering of groundwater levels, the GSP states (p. 3-19): "The MTs were set to the following: Upper Aquifer: Spring groundwater elevation where less than 10 - 20% (on average) of domestic wells could potentially be impacted." No further details are provided on the minimum threshold impacts to domestic wells, including the methodology used to conduct the assessment. The GSP does not sufficiently describe whether minimum thresholds will avoid significant and unreasonable loss of drinking water to domestic well users that are not protected by the minimum threshold. In addition, the GSP does not sufficiently describe or analyze direct or indirect impacts on DACs or drinking water users when defining undesirable results, nor does it describe how the groundwater levels minimum thresholds are consistent with Human Right to Water policy. The undesirable result for chronic lowering of groundwater levels is established as (p. 3-32): "25% of groundwater elevations measured at the same RMS wells exceed the associated MTs for two (2) consecutive measurements. If the water year is dry or critically dry, then levels below the MTs are not undesirable if groundwater management allows for recovery in average or wetter years." By only using minimum threshold exceedances during non-drought years to define undesirable results for groundwater levels, significant and unreasonable impacts to beneficial users experienced during dry years or periods of drought will not result in an undesirable result. This is problematic since this subbasin is experiencing dry wells with this current drought and the GSP is failing to manage the subbasin in such a way that strives to minimize significant adverse impacts to beneficial users, which are often felt greatest in below-average, dry, and drought years. Furthermore, the requirement that 25% of monitoring wells exceed the minimum threshold before triggering an undesirable result means that areas with high concentrations of domestic wells may experience impacts significantly greater than the established minimum threshold because the 25% threshold isn't triggered. For degraded water quality, minimum thresholds are set for total dissolved solids (TDS) to 750 milligrams per liter (mg/L), lower than the upper secondary maximum contaminant level (SMCL) of 1,000 mg/L. This is the only constituent for which SMC are established. Section 2.1.3.7 (Migration of Contaminated Groundwater) and Section 2.2.2.3 (Groundwater Quality) discuss other constituents of concern (COCs), both naturally occurring and those associated with industrial activities, that have exceeded regulatory standards. SMC should be established for		

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				all COCs in the subbasin that may be impacted or exacerbated by groundwater use and/or management, in addition to coordinating with water quality regulatory programs. **RECOMMENDATIONS** **Chronic Lowering of Groundwater Levels** ● Describe direct and indirect impacts on DACs and domestic well owners when describing undesirable results and defining minimum thresholds for chronic lowering of groundwater levels. Include information on the impacts during prolonged periods of below average water years. ● Consider minimum threshold exceedances during drought years when defining the groundwater level undesirable result across the subbasin. **Degraded Water Quality** ● Describe direct and indirect impacts on DACs and drinking water users when defining undesirable results for degraded water quality. For specific guidance on how to consider these users, refer to "Guide to Protecting Water Quality Under the Sustainable Groundwater Management Act." ● Evaluate the cumulative or indirect impacts of proposed minimum thresholds for degraded water quality on DACs and drinking water users. ● Set minimum thresholds and measurable objectives for all water quality constituents within the subbasin that are impacted or exacerbated by groundwater use and/or management.		
E. J. Remson The Nature Conservancy Other contributors to comments include: o Ngodoo Atume, Clean Water Action/Fund o J.Pablo Ortiz-Partida, Union of Concerned Scientists o Samantha Arthur, Audubon California o Danielle V. Dolan, Local Government Commission o Melissa M. Rohde, The Nature Conservancy o Kristen Culbert, California Central Valley River Conservation	Chapter 3 Considering Beneficial Uses and Users When Establishing Sustainable Management Criteria and Analyzing Impacts on Beneficial Uses and Users			**Groundwater Dependent Ecosystems and Interconnected Surface Waters** Sustainable management criteria for chronic lowering of groundwater levels provided in the GSP do not consider potential impacts to environmental beneficial users. The GSP neither describes nor analyzes direct or indirect impacts on environmental users of groundwater when defining undesirable results. This is problematic because without identifying potential impacts on GDEs, minimum thresholds may compromise, or even destroy, these environmental beneficial users. Since GDEs are present in the subbasin, they must be considered when developing SMC Sustainable management criteria for depletion of interconnected surface water are established by proxy using groundwater levels. The GSP states (p. 3-28): "Minimum thresholds are interim and will be the same water levels used in for the chronic lowering of groundwater elevations described in Section 3.3.1.1. Extensive data gaps are discussed in Section 3.7.8.7. The GSA will continue to evaluate new monitoring information and determine these thresholds	LSCE	Comments noted. Further shallow monitoring will better describe stream-aquifer interaction to determine potential impacts to environmental users associated with groundwater levels. GSP now includes plan for future monitoring to address these data gaps.

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				later." While the GSP clearly recognizes the data gap for depletion of interconnected surface water SMC, we would like to see further discussion of how the interim SMC will affect beneficial users, and more specifically GDEs, or the impact of these minimum thresholds on GDEs in the subbasin. The GSP makes no attempt to evaluate how the proposed minimum thresholds and measurable objectives avoid significant and unreasonable effects on surface water beneficial users in the subbasin (see Attachment C for a list of environmental users in the subbasin), such as increased mortality and inability to perform key life processes (e.g., reproduction, migration). **RECOMMENDATIONS** ● When defining undesirable results for chronic lowering of groundwater levels, provide specifics on what biological responses (e.g., extent of habitat, growth, recruitment rates) would best characterize a significant and unreasonable impact to GDEs. Undesirable results to environmental users occur when 'significant and unreasonable' effects on beneficial users are caused by one of the sustainability indicators (i.e., chronic lowering of groundwater levels, degraded water quality, or depletion of interconnected surface water). Thus, potential impacts on environmental beneficial uses and users need to be considered when defining undesirable results in the subbasin. Defining undesirable results is the crucial first step before the minimum thresholds can be determined. ● When defining undesirable results for depletion of interconnected surface water, include a description of potential impacts on instream habitats within ISWs when minimum thresholds in the subbasin are reached. The GSP should confirm that minimum thresholds for ISWs avoid adverse impacts on environmental beneficial users of interconnected surface waters as these environmental users could be left unprotected by the GSP. These recommendations apply especially to environmental beneficial users that are already protected under pre-existing state or federal law. ● When establishing SMC for the subbasin, consider that the SGMA statute [Water Code §10727.4(l)] specifically calls out that GSPs shall include "impacts on groundwater dependent ecosystems."		
E. J. Remson The Nature Conservancy Other contributors to comments include:	Chapter 3 Climate Change			The SGMA statute identifies climate change as a significant threat to groundwater resources and one that must be examined and incorporated in the GSPs. The GSP Regulations require integration of climate change into the projected water budget to ensure that projects and management actions sufficiently account for the range of potential climate futures. The effects of climate change will intensify the impacts of water stress on GDEs, making available shallow groundwater resources	LSCE	Comments noted. Climate change is incorporated into the water budget projections. The scenarios listed may be added to future modeling for the five-year update.

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o Ngodoo Atume, Clean Water Action/Fund o J.Pablo Ortiz-Partida, Union of Concerned Scientists o Samantha Arthur, Audubon California o Danielle V. Dolan, Local Government Commission o Melissa M. Rohde, The Nature Conservancy o Kristen Culbert, California Central Valley River Conservation				especially critical to their survival. Condon et al. (2020) shows that GDEs are more likely to succumb to water stress and rely more on groundwater during times of drought. When shallow groundwater is unavailable, riparian forests can die off and key life processes (e.g., migration and spawning) for aquatic organisms, such as steelhead, can be impeded. The integration of climate change into the projected water budget is insufficient. The GSP incorporates climate change into the projected water budget using DWR change factors for 2030 and 2070. However, the plan does not consider multiple climate scenarios (e.g., the 2070 extremely wet and extremely dry climate scenarios) in the projected water budget. The GSP would benefit from clearly and transparently incorporating the extremely wet and dry scenarios provided by DWR into projected water budgets or selecting more appropriate extreme scenarios for the subbasin. While these extreme scenarios may have a lower likelihood of occurring, their consequences could be significant and their inclusion can help identify important vulnerabilities in the subbasin's approach to groundwater management. The GSP integrates climate change into key inputs (e.g., changes in precipitation, evapotranspiration, and surface water flow) of the projected water budget, and calculates a sustainable yield based on the projected water budget with climate change incorporated. However, if the water budgets are incomplete, including the omission of extreme climate scenarios, then there is increased uncertainty in virtually every subsequent calculation used to plan for projects, derive measurable objectives, and set minimum thresholds. Plans that do not adequately include climate change projections may underestimate future impacts on vulnerable beneficial users of groundwater such as ecosystems, DACs, and domestic well owners. **RECOMMENDATIONS** ● Integrate climate change, including extremely wet and dry scenarios, into all elements of the projected water budget to form the basis for development of sustainable management criteria and projects and management actions. ● Incorporate climate change scenarios into projects and management actions.		
E. J. Remson The Nature Conservancy	Chapter 3 Data Gaps			The consideration of beneficial users when establishing monitoring networks is insufficient, due to lack of specific plans to increase the Representative Monitoring Sites (RMSs) in the	LSCE	Comments noted. Figure 3-7 now included. TSS well installation is ongoing. Specific plans will be developed over time to fill these identified data gaps.

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Other contributors to comments include: o Ngodoo Atume, Clean Water Action/Fund o J.Pablo Ortiz-Partida, Union of Concerned Scientists o Samantha Arthur, Audubon California o Danielle V. Dolan, Local Government Commission o Melissa M. Rohde, The Nature Conservancy o Kristen Culbert, California Central Valley River Conservation				monitoring network that represent water quality conditions and shallow groundwater elevations around DACs, domestic wells, GDEs, and ISWs in the subbasin. These beneficial users may remain unprotected by the GSP without adequate monitoring and identification of data gaps in the shallow aquifer. The Plan therefore fails to meet SGMA's requirements for the monitoring network. Figure 3-1 (Representative Monitoring Sites) shows insufficient representation of DACs and drinking water users for water quality monitoring. Figure 3-2 (Groundwater Level Representative Monitoring Sites – Upper Aquifer) and Figure 3-3 (Groundwater Level Representative Monitoring Sites – Lower Aquifer) show insufficient representation of DACs, GDEs, and drinking water users for groundwater elevation monitoring. Refer to Attachment E for maps of these monitoring sites in relation to key beneficial users of groundwater. The GSP provides some discussion of data gaps for GDEs in Section 3.7.8.7 (Assessment and Improvement of Monitoring Network - Interconnected Surface Waters), but does not provide specific plans, such as locations or a timeline, to fill the data gaps. In addition, Figure 3-7 (Identification of Data Gaps (GDE)) is missing. **RECOMMENDATIONS** ● Provide the missing Figure 3-7 (Identification of Data Gaps (GDE)). ● Provide maps that overlay current and proposed monitoring well locations with the locations of DACs, domestic wells, and GDEs to clearly identify monitored areas. ● Increase the number of RMSs in the shallow aquifer across the subbasin as needed to map ISWs and adequately monitor all groundwater condition indicators across the subbasin and at appropriate depths for all beneficial users. Prioritize proximity to DACs, domestic wells, GDEs, and ISWs when identifying new RMSs. ● Ensure groundwater elevation and water quality RMSs are monitoring groundwater conditions spatially and at the correct depth for all beneficial users - especially DACs, domestic wells, and GDEs. ● Further describe biological monitoring that can be used to assess the potential for significant and unreasonable impacts to GDEs or ISWs due to groundwater conditions in the subbasin. Additional studies of GDEs and groundwater - surface water interactions are briefly discussed in the Projects and Management Actions chapter, but very few details are provided.		

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E. J. Remson The Nature Conservancy Other contributors to comments include: o Ngodoo Atume, Clean Water Action/Fund o J.Pablo Ortiz-Partida, Union of Concerned Scientists o Samantha Arthur, Audubon California o Danielle V. Dolan, Local Government Commission o Melissa M. Rohde, The Nature Conservancy	Chapter 3 Addressing Beneficial Users in Projects and Management Actions			The consideration of beneficial users when developing projects and management actions is incomplete. The GSP identifies the benefits or impacts of identified projects and management actions, including water quality impacts, to key beneficial users of groundwater such as GDEs and DACs. However, projects and management actions to improve water supply and GDE habitats (e.g., Invasive Species Plant Control, Levee Setback and Stream Channel Restoration) are described as potential projects without a known timeline for implementation. We commend the GSA for describing the environmental benefits of the Multi-Benefit Recharge Project (Section 4.3.3) in the subbasin, as developed with support and guidelines from The Nature Conservancy. The GSP describes the Tehama County Domestic Well Tracking and Outreach Program (Section 4.5.2.6) and the Well Deepening or Replacement Program (Section 4.5.2.7). However, these programs are described as potential projects to be implemented on an as-needed basis, instead of projects that will be implemented within the GSP planning horizon. We strongly recommend inclusion of a drinking water well impact mitigation program to proactively monitor and protect drinking water wells through GSP implementation. **RECOMMENDATIONS** ● Describe the projected timelines for implementing the Invasive Species Plant Control and Levee Setback and Stream Channel Restoration projects and management actions in Chapter 4 of the GSP. ● For DACs and domestic well owners, provide specific plans for implementation of a drinking water well impact mitigation program to proactively monitor and protect drinking water wells through GSP implementation. Refer to Attachment B for specific recommendations on how to implement a drinking water well mitigation program. ● Develop management actions that incorporate climate and water delivery uncertainties to address future water demand and prevent future undesirable results.	LSCE	Comments noted. Project and management actions will be implemented as needed based on MTs, therefore the timing of those projects is unknow at this time.
Robin Huffman Corning, CA				Public participation has appeared very low overall. Groundwater is as invisible as the greenhouse gasses in the air, measurable only by experts with sufficient equipment. Potable water, like breathable air, is a necessity for life, and we're expecting, even trusting our elected officials and the expert contractors to look out for us, the general public. As the song goes, "You never miss the water, till the well runs dry". In the plan, specify and	LSCE	Comment noted. Public participation is discussed within Appendix 2-A.

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				acknowledge the level of public participation so far, outside of elected officials and their appointees to committees and outside of special interests such as Farm Bureau officials. Somewhere in the GSPs, specify, or estimate, the amount of participation to date by individuals not appointed or paid by any agency to participate		
Robin Huffman Corning, CA				The GSP contractors have explained, during public presentations, that the possibility of correct analysis of groundwater is only as good as the available data. The experts acknowledge in meetings that crucial groundwater data is missing. Data is especially missing for the very areas where the growth in agricultural pumping is occurring, and yet there is no stopping growth in these areas, mainly west of I-5. Big ag has discovered Tehama County at the very time that they have developed ways to grow nut trees in the hot and dry grasslands on the west side of I-5. Add to the plan that big ag needs to establish and pay for the monitoring of groundwater data wherever a new orchard of a defined size is established. Define such a size that would require the developer to establish a groundwater monitoring station that provides data available to the public.	LSCE	Comment noted. The GSP recognizes data gaps and future efforts will be made by the GSA to fill those gaps including the installation of multi-completion wells through the TSS program.
Robin Huffman Corning, CA				There is no definition of big ag in the plan. It would be helpful to make the distinction because of the massive size of the industry establishing itself the county, much occurring before this plan is adopted. There is no established precedent in the plan as to the management of overconsumption. The last should be the first to be asked to stop pumping, but it should apply only to big ag because of the scale of their extraction of groundwater	LSCE	Comment noted. Agriculture users are defined among all the water users. The plan was written to avoid undesirable results and have groundwater sustainability.
Robin Huffman Corning, CA				Add whatever you can to make this plan more sustainable before its adoption, but adopt the GSPs because they are adaptable.	LSCE	Comment noted.
Robin Huffman Corning, CA				I understand the need for GSPs and appreciate the process; however, unless the plan becomes more rigorous than it appears in this first complete draft, big ag will continue to expand and extract more groundwater, getting us all farther from sustainability and costing us each a lot to pay for executing the plan. Additionally, more families will have to pay for new and deeper residential wells because this plan allows big ag to continue to expand for awhile. This allowable decline,	LSCE	Comment noted.

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				negotiated in ad hoc committees, is specified in the plan, and that makes the plan unsustainable as well as expensive. This version of the GSP, therefore, is a GUP, a Groundwater Unsustainability Plan		
Robin Huffman Corning, CA				Depending on grants as mitigation for allowing overexploitation of the groundwater is not a plan for sustainability. Even if every family having to dig a deeper well were paid for the cost of that well, whether by big ag or the State of California, that condition would not lead to sustainability. Mitigation is not a plan for sustainability.	LSCE	Comment noted.
Robin Huffman Corning, CA				The baseline established in the GSP is lower than the current groundwater level. To allow the groundwater to continue to decline is not in the direction of sustainability. Sustainability at this point means stopping the decline, at the very least, and not allowing additional decline. Measurement levels are complicated by drought, and drought is given exception for management action. The drought exception is problematic and should be omitted in the GSPs	LSCE	Comment noted. Sustainability is defined in the GSP and measured through different Sustainable Management Criteria (SMC) including groundwater levels.
Robin Huffman Corning, CA				There should be a definition of sustainability in the plan using recent academic sources. The GSP should open with a discussion of what sustainability is. We can hope that future generations can access [groundwater] resources as we can, which is one early definition of sustainability. The concept of sustainability came out of efforts to continue development, to allow continued growth despite increasingly obvious limits to growth. Since then, many scholars recognize the greenwashing that comes with sustainability plans that facilitate growth. This is one such plan. Include a definition of sustainability using recent academic sources. Collaborate with authors and educators with expertise on sustainability, and do not assume sustainability needs little definition or discussion in individual GSPs. Most people have no idea of what sustainability means.	LSCE	Comment noted. Sustainability is defined on page 1-5.
Robin Huffman Corning, CA				Any process which lets big ag continue to usurp groundwater, allowing the groundwater to continue to decline to some level below the current level and call it sustainable is unsustainable. This seemingly well intended process is unlikely to produce real sustainability in groundwater use because it does not stop the current expansion of big ag wells. The GSP needs to be specifically involved in the county's well permitting process. Add this requirement to the plans	LSCE	Comment noted. Well permitting will be addressed by the Tehama County Water Commission in the future. The GSP only includes information available at the time. Review of County Well Permitting Ordinances is one of the management actions.

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Robin Huffman Corning, CA				Knowing that too many current domestic wells went dry recently, knowing the groundwater levels have been declining, drought or not, because of big ag's already drawing the deep aquifer down, the authors of the GSP include more drawing down of the deep aquifer. There are currently over 50 ag well permits approved and not yet built, many likely for new orchards (the department approving the permits does not track the particular use other than "ag"). When the new orchards are established and start pumping, the groundwater will be sucked in mass quantity to water dry rangeland in the hot season, which is most of the year, to water trees which will die without regular and consistent watering. They must be irrigated, so there is no way to pause the pumping without losing the orchard. Big ag will not submit easily to their trees dying when the county gave them permit to draw water for their massive acreage of trees. This plan is not sustainable as it does not stop the expansion of big ag into dry areas of the county. There's no designation of inappropriate land use. There are no ideas specified about zoning changes needed to reach sustainability. Instead, the plan identifies the remaining creek beds and the total acreage which might yet be exploited by big ag. It's like an invitation, with a free study of where the water is, for big ag to buy rangeland and request well permits to grow nut trees. This GSP is literally a publicly funded study by a well drilling corporation seeking out where the groundwater is and how much might remain accessible to big ag. The plan does not define big ag. It does not require monitoring wells before big ag permits are granted in areas with no data. The only thing the GSP does is to establish the term sustainability, under-defined, and cost average residents lots of money while continuing to allow big ag to do whatever they want. If the Farm Bureau does not protest too much about this GSP, then we do not have a plan which could possibly get us to sustainability. The GSP, however well intended, needs to start with recommending the county instating specific restrictions and rules for new development. The plan needs to include the legality of such rules and restrictions. California has planning tools and court rulings which need to be included in the GSPs for reference by the Board of Supervisors as they must implement management actions, according to the GSPs	LSCE	Comments noted.
Robin Huffman Corning, CA				Sometimes common sense must take over to get to sustainability because by the time that the groundwater is fully understood, it will be too late. What is generally known about the deep aquifers is that they are a gift from the last ice age; this theory, supported by academic sources, should be included in the GSPs. Nature's systems cost us nothing until we take too	LSCE	Comment noted.

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				much. Grants for projects to clean and try to inject water into the ground are funded by debt to which we all have to pay service. There is no such thing as free money for projects. Acknowledge in the GSPs that slowing or stopping growth is the cheapest way in the direction of sustainability, and probably the only way.		
Robin Huffman Corning, CA				Management actions should include policies, in addition to any projects. There should be recommended policies since the county's groundwater is already in decline in large areas. We cannot get to sustainability via projects alone, not to mention that projects are expensive, no matter which budget they come from. Rules, such as no more growth in the acreage of orchards, is the way to sustainability, or at least to not crashing quite as soon. Projects, such as injecting water into the ground, if possible, would be expensive, and it would be a public expense unless the agency starts collecting money for the possible projects now. The expense for future projects, needed when the groundwater declines to the unacceptable level specified in the GSPs, should be collected now from companies extracting the groundwater for profit. State that in the GSPs as a recommended management action. Fairness needs to be indicated as a working principle in the GSPs. The companies who profit directly from the mass extraction of groundwater should be the ones who pay for restoring the groundwater to a sustainable level as defined in the GSPs Management Objectives.	LSCE	Comment noted. Management actions are distinct from projects as they are designed to affect water use (behavior) compared to physical projects that require construction. Management actions can be policies.
Robin Huffman Corning, CA				The commons is a shared resource, such as groundwater. Include a discussion of the tragedy of the commons, since the GSPs are trying to prevent that.	LSCE	Comment noted.
Robin Huffman Corning, CA				Setting the MT so low means many wells will fail, due to a combination of factors, such as extended drought, a general drawdown of the groundwater in most areas over the past few decades, and new ag wells supporting new orchards. Recommended management actions should include compensation for the loss of domestic wells and the cost of digging new or deeper domestic wells, adding individual domestic water tanks, and delivering water to homes in rural areas where wells have gone dry due to unsustainable groundwater pumping.	LSCE	Comments noted. One of the management actions in the GSP is Well Deepening or Replacement Program.
Robin Huffman Corning, CA				Mitigation measures may be used to imitate sustainability, but where they cost residents not profiting from the extraction of	LSCE	Comments noted.

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				mass quantities of groundwater for profit, a policy of fairness should be specified in the GSPs in the Management Objectives and Management Actions. Consistently recognize in specific recommended policies and actions that social equity is a major leg on which sustainability stands.		
Robin Huffman Corning, CA				The GSPs plan to continue to draw down the water table. The Minimum Threshold is set lower than the depths of most domestic wells, with no recommendation or policy, save hoping for the drought to end, to restore the groundwater level. State the intention to limit additional industrial agricultural wells because there is no place with consistent extra water that we can afford to pipeline in; that's why we're doing groundwater sustainability planning. We cannot afford expensive projects to deepen domestic wells, build more above ground storage; every project takes money. What doesn't take money is to limit new wells. Keep the range lands for grazing with every policy recommendation and planning tool available in California. State the tools available. Keep orchards where they have surface water availability, using groundwater only during droughts. It's that simple to become more sustainable. Sustainability is about balance; it's not about drawing down the water table until Undesirable Results occur. URs are already occurring. We're at the threshold of what's minimal. Our objective should not be to make domestic wells deeper, as recommended by the Farm Bureau. Digging and pumping from deeper depths is expensive. That's an undesirable result of too much agricultural development coupled with extended drought and overall overgrowth of California. Getting to sustainability starts with no growth in industrial wells. Sustainability is about balance between economic, environmental, and equity - profit, planet, and people. There's an energy component as well, as energy costs money and affects all three Es (or Ps). More engineering is costly, and even with grants, that doesn't get us to sustainability or provide a drop of water that isn't already spoken for. Nature works for free, and she knows what she is doing. We need to get out of the way, and she will replenish our groundwater, our streams and rivers. Regenerative agriculture can help pivot methods so that less water is required. Recommend regenerative agriculture as a management tool.	LSCE	Comments noted.
Robin Huffman Corning, CA				In the GSPs, define the unacceptable consequences, the indicators of groundwater unsustainability. It is unacceptable to have domestic wells lose water due to groundwater decline from industrial pumping. Recognize that it	LSCE	Comments noted.

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				is nearly impossible to prove that is happening to a specific resident because of a specific ag well, and that the onus currently is on the owner of the domestic well to prove. This is unfair and needs to be addressed in the GSPs. It is unacceptable to deplete the groundwater such that we lose what natural oaks remain. Nature needs more water than it's getting now due to the extensive extraction of groundwater. A sustainable plan would restore water for the ecosystem. Add recommendations for restoring groundwater in areas that are known to be, or are likely to be in decline. It is unacceptable to create losing streams. A sustainable groundwater management plan should restore flows in creeks, not allow continued big ag development alongside creeks. Add policy and management recommendations regarding losing streams. It is acceptable to not allow new industrial scale ag wells for water intensive perennial crops like almonds. Banning that kind of well is a relatively simple and inexpensive step towards managing groundwater that we can take now, so that we can continue living here. No one I know wants to be displaced because of almonds. The system will certainly not recover with additional wounds. Address this issue as a policy and management recommendation in the GSPs.		

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
650 Capitol Mall, Suite 5-100
Sacramento, California 95814-4700

September 29, 2021

Ryan Teubert
Water Resources Manager
Tehama County Flood Control and Water Conservation District GSA – Los Molinos
9380 San Benito Avenue
Gerber, California 96035-9701

Electronic transmittal only

Re: NOAA's National Marine Fisheries Service Comments on the Draft Chapter 3 of the Groundwater Sustainability Plan for the Los Molinos Subbasin.

Dear Mr. Teubert:

NOAA's National Marine Fisheries Service (NMFS) is the federal agency responsible for managing, conserving, and protecting living marine resources in inland, coastal, and offshore waters of the United States. We derive our mandates from numerous statutes, including the Federal Endangered Species Act (ESA) and the Magnuson-Stevens Fishery Conservation and Management Act (MSA). The purpose of the ESA is to conserve threatened and endangered species and their ecosystems.

In July 2021, the Los Molinos subbasin Groundwater Sustainability Agency (hereafter, "GSA") released their "draft Chapter 3: Sustainable Management Criteria" for public comment. The California Department of Water Resources (DWR) has designated the Los Molinos subbasin a "medium" priority for groundwater management, necessitating the development of a Groundwater Sustainability Plan (GSP) by January 2022, as required under California's Sustainable Groundwater Management Act of 2014 (SGMA). Several waterways that overlie portions of the Los Molinos Sub-basin support federally threatened California Central Valley (CCV) steelhead (*Oncorhynchus mykiss*) and threatened Central Valley (CV) spring-run Chinook salmon (*O. tshawytscha*). In addition, the Los Molinos subbasin is designated as Essential Fish Habitat (EFH) for Pacific Coast Chinook salmon, including CV fall-run Chinook salmon (*O. tshawytscha*), which are managed under the MSA. This letter transmits NMFS' comments regarding the draft Chapter 3.

Surface water and groundwater are hydrologically linked in the Los Molinos subbasin, and this linkage is critically important in creating seasonal habitat for steelhead and Chinook salmon. Where the groundwater aquifer supplements streamflow, the influx of cold, clean water is critically important for maintaining temperature and flow volume. Pumping water from these aquifer-stream complexes has the potential to affect salmon and steelhead habitat by lowering groundwater levels and interrupting the hyporheic flow between the aquifer and stream. NMFS is concerned that groundwater extraction in the Los Molinos subbasin is currently impacting

steelhead and Chinook salmon instream habitat, and that the draft GSP does not adequately address and minimize these impacts.

Comments

Avoiding Undesirable Results: The draft chapter does not appear to adequately address the following requirement for minimum thresholds as spelled out in the SGMA regulations:

> "The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators." (CCR 23 §354.28(b)(2))

The draft Chapter 3 does not include a minimum threshold or measurable objective for streamflow depletion, explaining that a lack of information prevents them from doing so. In fact, the GSA has not even identified an appropriate undesirable result for streamflow depletion. According to DWR (2021), "it is up to GSAs to define in their GSPs the specific significant and unreasonable effects that would constitute undesirable results and to define the groundwater conditions that would produce those results in their basins." The GSA should qualitatively describe what conditions within the subbasin would constitute an undesirable result with regard to streamflow depletion, ensuring that the description accounts for impacts to instream habitat that support ESA-listed salmon and steelhead. Moreover, the final GSP should explain how any chosen minimum threshold for streamflow depletion will avoid impacting surface water beneficial uses. With regard to the lack of data on streamflow depletion impacts, NMFS recommends the final GSP follow guidance from California Department of Fish and Wildlife (2019) and develop conservative streamflow depletion thresholds as a cautionary principle until the surface flow/groundwater dynamic in the Los Molinos subbasin is better studied and understood.

Using Groundwater Elevations as a Proxy for Streamflow Depletion: The GSA should provide an explanation, with supporting evidence, for why using groundwater level as a minimum threshold is a reasonable proxy for depletion of interconnected surface water, as well as why those interim levels are sufficient to avoid streamflow depletion that significantly impacts surface water beneficial uses.

Basing Sustainable Management Criteria on Historical Drought Conditions: The proposed groundwater elevations chosen as streamflow depletion minimum thresholds and measurable objectives are completely inappropriate for avoiding significant impacts to ESA-listed salmonids and their habitat. Basic hydraulic principles dictate that groundwater flow is proportional to the difference between groundwater elevations at different locations along a flow path. Using this basic principle, groundwater flow to a stream or, conversely, seepage from a stream to the underlying aquifer is proportional to the difference between water elevation in the stream and groundwater elevations at locations away from the stream. The interim minimum thresholds are based upon groundwater elevations that occurred during California's recent historical drought. These groundwater levels would likely create historically high streamflow depletion rates and result in instream conditions that negatively affect ESA-listed salmonids and their critical habitat, including EFH.

In justifying the proposed minimum thresholds, the draft chapter offers the following (page 3-24):

> "The Los Molinos subbasin has not been fully developed and its extraction potential has yet to be realized. Therefore, although in some cases MT may be set at water levels not previously experienced in the subbasin, they are not anticipated to cause adverse impacts to most sectors."

The above reasoning raises several questions, such as how the descriptors "fully developed" and "extraction potential" are defined, and what their relationship is to SGMA's definition of sustainable yield[1]? In addition, what is the definition of "sectors" as it pertains to groundwater dependent ecosystems? Finally, there is no indication within the above reasoning, or within the entire draft Chapter 3, that environmental beneficial uses of surface water have been considered when developing the sustainable management criteria for interconnected surface water depletion. For instance, page 3-24 notes only "historical water level trends, future water level protections, and domestic well water levels were considered when establishing MT."

During the first year of GSP implementation, the GSA should design and implement studies that better inform appropriate minimum thresholds and measurable objectives for streamflow depletion. The sustainable management criteria that result must avoid significant and unreasonable impacts to identified beneficial uses of surface water, which for Mill and Deer creeks include cold freshwater habitat; migration of aquatic organisms; and spawning, reproduction, and/or early development[2]. In the interim, we again suggest the GSA follow guidance by the California Department of Fish and Wildlife (2019) that recommends conservative sustainability management criteria be established to ensure groundwater dependent ecosystem protection.

NMFS recommendation for future Projects and Management Actions: We suspect that groundwater recharge projects are likely to be an important action implemented as part of the effort to achieve groundwater sustainability in the Los Molinos subbasin. NMFS encourages the GSA to consider implementing recharge projects that facilitate floodplain inundation, which offer multiple benefits including downstream flood attenuation, groundwater recharge, and ecosystem service. Managed floodplain inundation can recharge floodplain aquifers and then slowly release stored water back to the stream during summer months. These projects also reconnect the stream channel with floodplain habitat, which can benefit juvenile salmon and steelhead by creating off-channel habitat characterized by slow water velocities, ample cover in the form of submerged vegetation, and high food availability. As an added bonus, these types of multi-benefit projects likely have more diverse grant funding streams that can lower their cost as compared to traditional off-channel recharge projects. NMFS stands ready to work with any GSA interested in designing and implementing floodplain recharge projects.

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[1] "Sustainable yield" means 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. Water Code Section 10721(w).

[2] Water Quality Control Plan for the Sacramento River and San Joaquin River Basins. Copy at https://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/sacsjr_201805.pdf

Please direct questions regarding this letter to Amanda Cranford, of my staff, at Amanda.Cranford@noaa.gov or (916) 930-3706.

Sincerely,

A. Catherine Marcinkevage

Cathy Marcinkevage
Assistant Regional Administrator
California Central Valley Office

References:

California Department of Fish and Wildlife. 2019. Fish & Wildlife Groundwater Planning Considerations. California Department of Fish and Wildlife, Groundwater Program. June 2019. 28 pp. Available at: https://cawaterlibrary.net/document/fish-wildlife-groundwater-planning-considerations/

California Department of Water Resources. 2021. Letter from Craig Altare (DWR) to Taylor Blakslee (Cuyama Basin GSA), re. Cuyama Valley - 2020 Groundwater Sustainability Plan. Available at https://sgma.water.ca.gov/portal/gsp/assessments/32

Cc: To the File ARN 151422-WCR2021-SA00121

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November 12, 2021

From: Robin Huffman, Corning, California

The following comments are for the Red Bluff GSP, in which I live, and all Tehama County GSPs to which these comments apply. Most of the comments apply to all the GSPs. I submit that most of these comments should be addressed in all of the GSPs. The authors of the GSPs know, or can find, where in the GSPs to address the comments, and so while the following comments are general and not systematic, chapter to chapter, the formal responses should be specific to pages in applicable chapters. I am not paid to look up page numbers, even as I have much experience doing so. I cannot apologize for not putting in more time for free; nevertheless, I am participating for good reason. I look forward to reading the responses.

I am a general member of the public, a resident of Tehama County with a domestic well that is relatively deep and declining to a concerning level. Hundreds of acres of rangeland around me have, in the past two years, been converted to nut trees, and more big acreage orchards are being developed out here on the west side of I-5. I have been following the GSP process for a couple of years, and I have participated in some of the meetings, mostly listening.

Comments for the Tehama County GSPs

1. Public participation has appeared very low overall. Groundwater is as invisible as the greenhouse gasses in the air, measurable only by experts with sufficient equipment. Potable water, like breathable air, is a necessity for life, and we're expecting, even trusting our elected officials and the expert contractors to look out for us, the general public. As the song goes, "You never miss the water, till the well runs dry". In the plan, specify and acknowledge the level of public participation so far, outside of elected officials and their appointees to committees and outside of special interests such as Farm Bureau officials. Somewhere in the GSPs, specify, or estimate, the amount of participation to date by individuals not appointed or paid by any agency to participate.

2. The GSP contractors have explained, during public presentations, that the possibility of correct analysis of groundwater is only as good as the available data. The experts acknowledge in meetings that crucial groundwater data is missing. Data is especially missing for the very areas where the growth in agricultural pumping is occurring, and yet there is no stopping growth in these areas, mainly west of I-5. Big ag has discovered Tehama County at the very time that they have developed ways to grow nut trees in the hot and dry grasslands on the west side of I-5. Add to the plan that big ag needs to establish and pay for the monitoring of groundwater data wherever a new orchard of a defined size is established. Define such a size that would require the developer to establish a groundwater monitoring station that provides data available to the public.

3. There is no definition of big ag in the plan. It would be helpful to make the distinction because of the massive size of the industry establishing itself the county, much occurring before this plan is adopted. There is no established precedent in the plan as to the management of overconsumption. The last should be the first to be asked to stop pumping, but it should apply only to big ag because of the scale of their extraction of groundwater.

4. Add whatever you can to make this plan more sustainable before its adoption, but adopt the GSPs because they are adaptable.

5. I understand the need for GSPs and appreciate the process; however, unless the plan becomes more rigorous than it appears in this first complete draft, big ag will continue to expand and extract more groundwater, getting us all farther from sustainability and costing us each a lot to pay for executing the plan. Additionally, more families will have to pay for new and deeper residential wells because this plan allows big ag to continue to expand for awhile. This allowable decline, negotiated in ad hoc committees, is specified in the plan, and that makes the plan unsustainable as well as expensive. This version of the GSP, therefore, is a GUP, a Groundwater Unsustainability Plan.

6. Depending on grants as mitigation for allowing overexploitation of the groundwater is not a plan for sustainability. Even if every family having to dig a deeper well were paid for the cost of that well, whether by big ag or the State of California, that condition would not lead to sustainability. Mitigation is not a plan for sustainability.

7. The baseline established in the GSP is lower than the current groundwater level. To allow the groundwater to continue to decline is not in the direction of sustainability. Sustainability at this point means stopping the decline, at the very least, and not allowing additional decline. Measurement levels are complicated by drought, and drought is given exception for management action. The drought exception is problematic and should be omitted in the GSPs.

8. There should be a definition of sustainability in the plan using recent academic sources. The GSP should open with a discussion of what sustainability is. We can hope that future generations can access [groundwater] resources as we can, which is one early definition of sustainability. The concept of sustainability came out of efforts to continue development, to allow continued growth despite increasingly obvious limits to growth. Since then, many scholars recognize the greenwashing that comes with sustainability plans that facilitate growth. This is one such plan. Include a definition of sustainability using recent academic sources. Collaborate with authors and educators with expertise on sustainability, and do not assume sustainability needs little definition or discussion in individual GSPs. Most people have no idea of what sustainability means.

9. Any process which lets big ag continue to usurp groundwater, allowing the groundwater to continue to decline to some level below the current level and call it

sustainable is unsustainable. This seemingly well intended process is unlikely to produce real sustainability in groundwater use because it does not stop the current expansion of big ag wells. The GSP needs to be specifically involved in the county's well permitting process. Add this requirement to the plans.

10. Knowing that too many current domestic wells went dry recently, knowing the groundwater levels have been declining, drought or not, because of big ag's already drawing the deep aquifer down, the authors of the GSP include more drawing down of the deep aquifer. There are currently over 50 ag well permits approved and not yet built, many likely for new orchards (the department approving the permits does not track the particular use other than "ag"). When the new orchards are established and start pumping, the groundwater will be sucked in mass quantity to water dry rangeland in the hot season, which is most of the year, to water trees which will die without regular and consistent watering. They must be irrigated, so there is no way to pause the pumping without losing the orchard. Big ag will not submit easily to their trees dying when the county gave them permit to draw water for their massive acreage of trees. This plan is not sustainable as it does not stop the expansion of big ag into dry areas of the county. There's no designation of inappropriate land use. There are no ideas specified about zoning changes needed to reach sustainability. Instead, the plan identifies the remaining creek beds and the total acreage which might yet be exploited by big ag. It's like an invitation, with a free study of where the water is, for big ag to buy rangeland and request well permits to grow nut trees. This GSP is literally a publicly funded study by a well drilling corporation seeking out where the groundwater is and how much might remain accessible to big ag. The plan does not define big ag. It does not require monitoring wells before big ag permits are granted in areas with no data. The only thing the GSP does is to establish the term sustainability, under-defined, and cost average residents lots of money while continuing to allow big ag to do whatever they want. If the Farm Bureau does not protest too much about this GSP, then we do not have a plan which could possibly get us to sustainability. The GSP, however well intended, needs to start with recommending the county instating specific restrictions and rules for new development. The plan needs to include the legality of such rules and restrictions. California has planning tools and court rulings which need to be included in the GSPs for reference by the Board of Supervisors as they must implement management actions, according to the GSPs.

11. Sometimes common sense must take over to get to sustainability because by the time that the groundwater is fully understood, it will be too late. What is generally known about the deep aquifers is that they are a gift from the last ice age; this theory, supported by academic sources, should be included in the GSPs. Nature's systems cost us nothing until we take too much. Grants for projects to clean and try to inject water into the ground are funded by debt to which we all have to pay service. There is no such thing as free money for projects. Acknowledge in the GSPs that slowing or stopping growth is the cheapest way in the direction of sustainability, and probably the only way.

12. Management actions should include policies, in addition to any projects. There should be recommended policies since the county's groundwater is already in decline in large areas. We cannot get to sustainability via projects alone, not to mention that projects are expensive, no matter which budget they come from. Rules, such as no more growth in the acreage of orchards, is the way to sustainability, or at least to not crashing quite as soon. Projects, such as injecting water into the ground, if possible, would be expensive, and it would be a public expense unless the agency starts collecting money for the possible projects now. The expense for future projects, needed when the groundwater declines to the unacceptable level specified in the GSPs, should be collected now from companies extracting the groundwater for profit. State that in the GSPs as a recommended management action. Fairness needs to be indicated as a working principle in the GSPs. The companies who profit directly from the mass extraction of groundwater should be the ones who pay for restoring the groundwater to a sustainable level as defined in the GSPs Management Objectives.

13. The commons is a shared resource, such as groundwater. Include a discussion of the tragedy of the commons, since the GSPs are trying to prevent that.

14. Setting the MT so low means many wells will fail, due to a combination of factors, such as extended drought, a general drawdown of the groundwater in most areas over the past few decades, and new ag wells supporting new orchards. Recommended management actions should include compensation for the loss of domestic wells and the cost of digging new or deeper domestic wells, adding individual domestic water tanks, and delivering water to homes in rural areas where wells have gone dry due to unsustainable groundwater pumping.

15. Mitigation measures may be used to imitate sustainability, but where they cost residents not profiting from the extraction of mass quantities of groundwater for profit, a policy of fairness should be specified in the GSPs in the Management Objectives and Management Actions. Consistently recognize in specific recommended policies and actions that social equity is a major leg on which sustainability stands.

16. The GSPs plan to continue to draw down the water table. The Minimum Threshold is set lower than the depths of most domestic wells, with no recommendation or policy, save hoping for the drought to end, to restore the groundwater level. State the intention to limit additional industrial agricultural wells because there is no place with consistent extra water that we can afford to pipeline in; that's why we're doing groundwater sustainability planning. We cannot afford expensive projects to deepen domestic wells, build more above ground storage; every project takes money. What doesn't take money is to limit new wells. Keep the range lands for grazing with every policy recommendation and planning tool available in California. State the tools available. Keep orchards where they have surface water availability, using groundwater only during droughts. It's that simple to become more sustainable. Sustainability is about balance; it's not about drawing down the water table until

Undesirable Results occur. URs are already occurring. We're at the threshold of what's minimal. Our objective should not be to make domestic wells deeper, as recommended by the Farm Bureau. Digging and pumping from deeper depths is expensive. That's an undesirable result of too much agricultural development coupled with extended drought and overall overgrowth of California. Getting to sustainability starts with no growth in industrial wells. Sustainability is about balance between economic, environmental, and equity - profit, planet, and people. There's an energy component as well, as energy costs money and affects all three Es (or Ps). More engineering is costly, and even with grants, that doesn't get us to sustainability or provide a drop of water that isn't already spoken for. Nature works for free, and she knows what she is doing. We need to get out of the way, and she will replenish our groundwater, our streams and rivers. Regenerative agriculture can help pivot methods so that less water is required. Recommend regenerative agriculture as a management tool.

17. In the GSPs, define the unacceptable consequences, the indicators of groundwater unsustainability.

- It is unacceptable to have domestic wells lose water due to groundwater decline from industrial pumping. Recognize that it is nearly impossible to prove that is happening to a specific resident because of a specific ag well, and that the onus currently is on the owner of the domestic well to prove. This is unfair and needs to be addressed in the GSPs.

- It is unacceptable to deplete the groundwater such that we lose what natural oaks remain. Nature needs more water than it's getting now due to the extensive extraction of groundwater. A sustainable plan would restore water for the ecosystem. Add recommendations for restoring groundwater in areas that are known to be, or are likely to be in decline.

- It is unacceptable to create losing streams. A sustainable groundwater management plan should restore flows in creeks, not allow continued big ag development alongside creeks. Add policy and management recommendations regarding losing streams.

- It is acceptable to not allow new industrial scale ag wells for water intensive perennial crops like almonds. Banning that kind of well is a relatively simple and inexpensive step towards managing groundwater that we can take now, so that we can continue living here. No one I know wants to be displaced because of almonds. The system will certainly not recover with additional wounds. Address this issue as a policy and management recommendation in the GSPs.

Thank you in advance for addressing the points made in this comment letter. I look forward to reading the responses.

November 19, 2021

Tehama County Flood Control and Water Conservation District GSA
9380 San Benito Ave
Gerber, CA 96035

Submitted via email: nbethurem@tcpw.ca.gov

Re: Public Comment Letter for Los Molinos Subbasin Draft GSP

Dear Nichole Bethurem,

On behalf of the above-listed organizations, we appreciate the opportunity to comment on the Draft Groundwater Sustainability Plan (GSP) for the Los Molinos Subbasin being prepared under the Sustainable Groundwater Management Act (SGMA). Our organizations are deeply engaged in and committed to the successful implementation of SGMA because we understand that groundwater is critical for the resilience of California's water portfolio, particularly in light of changing climate. Under the requirements of SGMA, Groundwater Sustainability Agencies (GSAs) must consider the interests of all beneficial uses and users of groundwater, such as domestic well owners, environmental users, surface water users, federal government, California Native American tribes and disadvantaged communities (Water Code 10723.2).

As stakeholder representatives for beneficial users of groundwater, our GSP review focuses on how well disadvantaged communities, tribes, drinking water users, climate change, and the environment were addressed in the GSP. While we appreciate that some basins have consulted us directly via focus groups, workshops, and working groups, we are providing public comment letters to all GSAs as a means to engage in the development of 2022 GSPs across the state. Recognizing that GSPs are complicated and resource intensive to develop, the intention of this letter is to provide constructive stakeholder feedback that can improve the GSP prior to submission to the State.

Based on our review, we have significant concerns regarding the treatment of key beneficial users in the Draft GSP and consider the GSP to be **insufficient** under SGMA. We highlight the following findings:

1. Beneficial uses and users **are not sufficiently** considered in GSP development.
    a. Human Right to Water considerations **are not sufficiently** incorporated.
    b. Public trust resources **are not sufficiently** considered.
    c. Impacts of Minimum Thresholds, Measurable Objectives and Undesirable Results on beneficial uses and users **are not sufficiently** analyzed.
2. Climate change **is not sufficiently** considered.

3. Data gaps **are not sufficiently** identified and the GSP **needs additional plans** to eliminate them.
4. Projects and Management Actions **sufficiently consider** potential impacts or benefits to beneficial uses and users.

Our specific comments related to the deficiencies of the Los Molinos Subbasin Draft GSP along with recommendations on how to reconcile them, are provided in detail in **Attachment A.**

Please refer to the enclosed list of attachments for additional technical recommendations:

Attachment A	GSP Specific Comments
Attachment B	SGMA Tools to address DAC, drinking water, and environmental beneficial uses and users
Attachment C	Freshwater species located in the basin
Attachment D	The Nature Conservancy's "Identifying GDEs under SGMA: Best Practices for using the NC Dataset"
Attachment E	Maps of representative monitoring sites in relation to key beneficial users

Thank you for fully considering our comments as you finalize your GSP.

Best Regards,

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Western States Climate and Water Scientist
Union of Concerned Scientists

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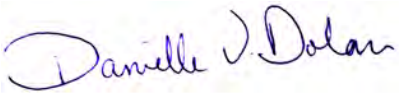

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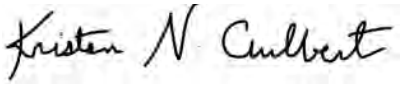

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Attachment A

Specific Comments on the Los Molinos Subbasin Draft Groundwater Sustainability Plan

1. Consideration of Beneficial Uses and Users in GSP development

Consideration of beneficial uses and users in GSP development is contingent upon adequate identification and engagement of the appropriate stakeholders. The (A) identification, (B) engagement, and (C) consideration of disadvantaged communities, drinking water users, tribes,[1] groundwater dependent ecosystems, streams, wetlands, and freshwater species are essential for ensuring the GSP integrates existing state policies on the Human Right to Water and the Public Trust Doctrine.

A. Identification of Key Beneficial Uses and Users

Disadvantaged Communities and Drinking Water Users

The identification of Disadvantaged Communities (DACs) and drinking water users is **insufficient**. We note the following deficiencies with the identification of these key beneficial users. While the plan includes five different tools that were utilized to identify and map DACs within the subbasin including the use of DWR DAC mapping tool, it fails to identify each DAC by name and provide the population of DACs dependent on groundwater as their source of drinking water.

These missing elements are required for the GSA to fully understand the specific interests and water demands of these beneficial users, and to support the consideration of beneficial users in the development of sustainable management criteria and selection of projects and management actions.

RECOMMENDATIONS
• Identify each DAC by name and provide the population of each identified DAC. • Identify the sources of drinking water for DAC members, including an estimate of how many people rely on groundwater (e.g., domestic wells, state small water systems, and public water systems).

Interconnected Surface Waters

The identification of Interconnected Surface Waters (ISWs) is **insufficient**, due to lack of supporting information provided for the ISW analysis. The GSP describes the use of a groundwater model (Tehama Integrated Hydrologic Model) to analyze the interaction between groundwater and surface water within the subbasin. While Appendix 2-J gives a detailed description of the model, the GSP could be improved by including a summary in the main GSP text. This information should include groundwater level monitoring well data and stream gauge

[1] Our letter provides a review of the identification and consideration of federally recognized tribes (Data source: SGMA Data viewer) within the GSP from non-tribal members and NGOs. Based on the likely incomplete information available to our organizations for this review, we recommend that the GSA utilize the California Department of Water Resources' "Engagement with Tribal Governments" Guidance Document (https://water.ca.gov/Programs/Groundwater-Management/SGMA-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents) to comprehensively address these important beneficial users in their GSP.

data that were incorporated into the model, the screening depths of wells used in the groundwater model, and description of the temporal (seasonal and interannual) variability of the data used to calibrate the model.

The GSP does not provide any concluding statements in the GSP text about which reaches are considered to be interconnected. Figure 2-63 (Surface Water and Shallow Groundwater Monitoring Stations) presents stream reaches in the subbasin labeled as perennial and intermittent/ephemeral. However, this figure does not label reaches as interconnected, disconnected, or reaches with data gaps.

RECOMMENDATIONS

- Provide a map showing all the stream reaches in the subbasin, with reaches clearly labeled as interconnected (gaining/losing) or disconnected. Consider any segments with data gaps as potential ISWs and clearly mark them as such on maps provided in the GSP.
- In the main text of the GSP, summarize the groundwater elevation data and stream flow data used in the modeling analysis. Discuss temporal (seasonal and interannual) variability of the data used to calibrate the model.
- To confirm and illustrate the results of the groundwater modeling, overlay the subbasin's stream reaches with depth-to-groundwater contour maps to illustrate groundwater depths and the groundwater gradient near the stream reaches. Show the location of groundwater wells used in the analysis.
- For the depth-to-groundwater contour maps, use the best practices presented in Attachment D. Specifically, ensure that the first step is contouring groundwater elevations, and then subtracting this layer from land surface elevations from a Digital Elevation Model (DEM) to estimate depth-to-groundwater contours across the landscape. This will provide accurate contours of depth to groundwater along streams and other land surface depressions where GDEs are commonly found.

Groundwater Dependent Ecosystems

The identification of Groundwater Dependent Ecosystems (GDEs) is **insufficient**. The GSP took initial steps to identify and map GDEs using the Natural Communities Commonly Associated with Groundwater dataset (NC dataset). Potential GDEs were identified in areas overlying groundwater within 30 feet of land surface based on Spring 2015 groundwater conditions, but this was the only dataset used to characterize groundwater conditions in the subbasin's GDEs. We recommend using groundwater data from multiple seasons and water year types over the pre-SGMA period (i.e., 2005-2015) to determine the range of depth to groundwater. Using seasonal groundwater elevation data over multiple water year types is an essential component of identifying GDEs and is necessary to capture the variability in groundwater conditions inherent in California's Mediterranean climate. The GDE Appendix (Appendix 2-H) refers to Figure 1 through Figure 4 that illustrate the steps of the GDE analysis. These figures appear to be missing from the appendix, however.

The GSP does not provide an inventory of flora and fauna in the subbasin, nor is any discussion of threatened or endangered species provided.

RECOMMENDATIONS

- Include the missing Figures 1-4 in the GDE Appendix 2-H.
- Use depth-to-groundwater data from multiple seasons and water year types (e.g., wet, dry, average, drought) to determine the range of depth to groundwater around NC dataset polygons. We recommend that a baseline period (10 years from 2005 to 2015) be established to characterize groundwater conditions over multiple water year types. Refer to Attachment D of this letter for best practices for using local groundwater data to verify whether polygons in the NC Dataset are supported by groundwater in an aquifer.
- Provide depth-to-groundwater contour maps, noting the best practices presented in Attachment D. Specifically, ensure that the first step is contouring groundwater elevations, and then subtracting this layer from land surface elevations from a digital elevation model (DEM) to estimate depth-to-groundwater contours across the landscape.
- Refer to Attachment B for more information on TNC's plant rooting depth database. Deeper thresholds are necessary for plants that have reported maximum root depths that exceed the averaged 30-ft threshold, such as Valley Oak (*Quercus lobata*). We recommend that the reported max rooting depth for these deeper-rooted plants be used. For example, a depth-to-groundwater threshold of 80 feet should be used instead of the 30-ft threshold, when verifying whether Valley Oak polygons from the NC Dataset are connected to groundwater. It is important to emphasize that actual rooting depth data are limited and will depend on the plant species and site-specific conditions such as soil and aquifer types, and proximity to other water sources.
- If insufficient data are available to describe groundwater conditions within or near polygons from the NC dataset, include those polygons as "Potential GDEs" in the GSP until data gaps are reconciled in the monitoring network.
- Provide a complete inventory, map, or description of fauna (e.g., birds, fish, amphibian) and flora (e.g., plants) species in the subbasin and note any threatened or endangered species (see Attachment C in this letter for a list of freshwater species located in the Los Molinos Subbasin).

Native Vegetation and Managed Wetlands

Native vegetation and managed wetlands are water use sectors that are required to be included in the water budget.[2,3] The integration of native vegetation into the water budget is **sufficient**. We commend the GSA for including the groundwater demands of this ecosystem in the historical, current and projected water budgets. Managed wetlands are not mentioned in the GSP, so it is not known whether or not they are present in the subbasin.

[2] "'Water use sector' refers to categories of water demand based on the general land uses to which the water is applied, including urban, industrial, agricultural, managed wetlands, managed recharge, and native vegetation." [23 CCR §351(al)]

[3] "The water budget shall quantify the following, either through direct measurements or estimates based on data: (3) Outflows from the groundwater system by water use sector, including evapotranspiration, groundwater extraction, groundwater discharge to surface water sources, and subsurface groundwater outflow." [23 CCR §354.18]

RECOMMENDATION

- State whether or not there are managed wetlands in the subbasin. If there are, ensure that their groundwater demands are included as separate line items in the historical, current, and projected water budgets.

B. Engaging Stakeholders

Stakeholder Engagement During GSP Development

Stakeholder engagement during GSP development is **insufficient**. SGMA's requirement for public notice and engagement of stakeholders is not fully met by the description in the Communications and Engagement Plan (Appendix 2-A).[4]

We note the following deficiencies with the overall stakeholder engagement process:

- The GSP documents opportunities for public involvement and engagement in very general terms for listed stakeholders. Public outreach and engagement activities include public meetings, public hearings, stakeholder briefings with Groundwater Commission members, public educational workshops, notices to cities and counties within the Plan area, quarterly newsletters, and opportunities to provide comments. While the GSP provides a guidance document on DAC engagement, its description consists primarily of informing DACs by outreach to DAC-related organizations. The GSP does not state whether DACs and environmental stakeholders are represented on a GSA Advisory Committee or Board.

- The plan does not include documentation on how stakeholder input from the above mentioned outreach and engagement was considered and incorporated into the GSP development process.

- We note that Appendix G of the Communications and Engagement Plan, called "Potential GSA Outreach Tasks," is still under development and will include more details of outreach to stakeholders during GSP implementation. Ensure that as this section is finalized, it includes a detailed plan for continual opportunities for engagement through the *implementation* phase of the GSP that is specifically directed to DACs, domestic well owners, and environmental stakeholders.

RECOMMENDATIONS

- In the Communications and Engagement Plan, describe active and targeted outreach to engage all stakeholders throughout the GSP development and implementation phases. Refer to Attachment B for specific recommendations on how to actively engage stakeholders during all phases of the GSP process. While some of these resources have already been stated in the GSP, we recommend that the GSA should improve utilization of these resources and documentation of the engagement process.

[4] "A communication section of the Plan shall include a requirement that the GSP identify how it encourages the active involvement of diverse social, cultural, and economic elements of the population within the basin." [23 CCR §354.10(d)(3)]

- Provide documentation on how stakeholder input was incorporated into the GSP development process.
- Utilize DWR's tribal engagement guidance to comprehensively identify, involve, and address all tribes and tribal interests that may be present in the subbasin.[5]

C. Considering Beneficial Uses and Users When Establishing Sustainable Management Criteria and Analyzing Impacts on Beneficial Uses and Users

The consideration of beneficial uses and users when establishing sustainable management criteria (SMC) is **insufficient**. The consideration of potential impacts on all beneficial users of groundwater in the basin are required when defining undesirable results and establishing minimum thresholds.[6,7,8]

Disadvantaged Communities and Drinking Water Users

For chronic lowering of groundwater levels, the GSP states (p. 3-19): *"The MTs were set to the following: Upper Aquifer: Spring groundwater elevation where less than 10 - 20% (on average) of domestic wells could potentially be impacted."* No further details are provided on the minimum threshold impacts to domestic wells, including the methodology used to conduct the assessment. The GSP does not sufficiently describe whether minimum thresholds will avoid significant and unreasonable loss of drinking water to domestic well users that are not protected by the minimum threshold. In addition, the GSP does not sufficiently describe or analyze direct or indirect impacts on DACs or drinking water users when defining undesirable results, nor does it describe how the groundwater levels minimum thresholds are consistent with Human Right to Water policy.[9]

The undesirable result for chronic lowering of groundwater levels is established as (p. 3-32): *"25% of groundwater elevations measured at the same RMS wells exceed the associated MTs for two (2) consecutive measurements. If the water year is dry or critically dry, then levels below the MTs are not undesirable if groundwater management allows for recovery in average or wetter years."* By only using minimum threshold exceedances during non-drought years to define undesirable results for groundwater levels, significant and unreasonable impacts to beneficial users experienced during dry years or periods of drought will not result in an undesirable result. This is problematic since this subbasin is experiencing dry wells with this current drought and the GSP is failing to manage the subbasin in such a way that strives to minimize significant adverse impacts to beneficial users, which are often felt greatest in below-average, dry, and drought years. Furthermore, the requirement that 25% of monitoring wells exceed the minimum threshold before triggering an undesirable result means that areas with high concentrations of domestic

[5] Engagement with Tribal Governments Guidance Document. Available at: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/Guidance-Doc-for-SGM-Engagement-with-Tribal-Govt_ay_19.pdf

[6] "The description of undesirable results shall include [...] potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results." [23 CCR §354.26(b)(3)]

[7] "The description of minimum thresholds shall include [...] how minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests." [23 CCR §354.28(b)(4)]

[8] "The description of minimum thresholds shall include [...] how state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the agency shall explain the nature of and the basis for the difference." [23 CCR §354.28(b)(5)]

[9] California Water Code §106.3. Available at: https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=WAT&sectionNum=106.3

wells may experience impacts significantly greater than the established minimum threshold because the 25% threshold isn't triggered.

For degraded water quality, minimum thresholds are set for total dissolved solids (TDS) to 750 milligrams per liter (mg/L), lower than the upper secondary maximum contaminant level (SMCL) of 1,000 mg/L. This is the only constituent for which SMC are established. Section 2.1.3.7 (Migration of Contaminated Groundwater) and Section 2.2.2.3 (Groundwater Quality) discuss other constituents of concern (COCs), both naturally occurring and those associated with industrial activities, that have exceeded regulatory standards. SMC should be established for all COCs in the subbasin that may be impacted or exacerbated by groundwater use and/or management, in addition to coordinating with water quality regulatory programs.

RECOMMENDATIONS

Chronic Lowering of Groundwater Levels

- Describe direct and indirect impacts on DACs and domestic well owners when describing undesirable results and defining minimum thresholds for chronic lowering of groundwater levels. Include information on the impacts during prolonged periods of below average water years.

- Consider minimum threshold exceedances during drought years when defining the groundwater level undesirable result across the subbasin.

Degraded Water Quality

- Describe direct and indirect impacts on DACs and drinking water users when defining undesirable results for degraded water quality.[10] For specific guidance on how to consider these users, refer to "Guide to Protecting Water Quality Under the Sustainable Groundwater Management Act."[11]

- Evaluate the cumulative or indirect impacts of proposed minimum thresholds for degraded water quality on DACs and drinking water users.

- Set minimum thresholds and measurable objectives for all water quality constituents within the subbasin that are impacted or exacerbated by groundwater use and/or management.

Groundwater Dependent Ecosystems and Interconnected Surface Waters

Sustainable management criteria for chronic lowering of groundwater levels provided in the GSP do not consider potential impacts to environmental beneficial users. The GSP neither describes nor analyzes direct or indirect impacts on environmental users of groundwater when defining undesirable results. This is problematic because without identifying potential impacts on GDEs, minimum thresholds may compromise, or even destroy, these environmental beneficial users. Since GDEs are present in the subbasin, they must be considered when developing SMC.

[10] "Degraded Water Quality [...] collect sufficient spatial and temporal data from each applicable principal aquifer to determine groundwater quality trends for water quality indicators, as determined by the Agency, to address known water quality issues." [23 CCR §354.34(c)(4)]

[11] Guide to Protecting Water Quality under the Sustainable Groundwater Management Act https://d3n8a8pro7vhmx.cloudfront.net/communitywatercenter/pages/293/attachments/original/1559328858/Guide_to_Protecting_Drinking_Water_Quality_Under_the_Sustainable_Groundwater_Management_Act.pdf?1559328858.

Sustainable management criteria for depletion of interconnected surface water are established by proxy using groundwater levels. The GSP states (p. 3-28): "*Minimum thresholds are interim and will be the same water levels used in for the chronic lowering of groundwater elevations described in Section 3.3.1.1. Extensive data gaps are discussed in Section 3.7.8.7. The GSA will continue to evaluate new monitoring information and determine these thresholds later."* While the GSP clearly recognizes the data gap for depletion of interconnected surface water SMC, we would like to see further discussion of how the interim SMC will affect beneficial users, and more specifically GDEs, or the impact of these minimum thresholds on GDEs in the subbasin. The GSP makes no attempt to evaluate how the proposed minimum thresholds and measurable objectives avoid significant and unreasonable effects on surface water beneficial users in the subbasin (see Attachment C for a list of environmental users in the subbasin), such as increased mortality and inability to perform key life processes (e.g., reproduction, migration).

RECOMMENDATIONS

- When defining undesirable results for chronic lowering of groundwater levels, provide specifics on what biological responses (e.g., extent of habitat, growth, recruitment rates) would best characterize a significant and unreasonable impact to GDEs. Undesirable results to environmental users occur when 'significant and unreasonable' effects on beneficial users are caused by one of the sustainability indicators (i.e., chronic lowering of groundwater levels, degraded water quality, or depletion of interconnected surface water). Thus, potential impacts on environmental beneficial uses and users need to be considered when defining undesirable results in the subbasin.[12] Defining undesirable results is the crucial first step before the minimum thresholds can be determined.[13]

- When defining undesirable results for depletion of interconnected surface water, include a description of potential impacts on instream habitats within ISWs when minimum thresholds in the subbasin are reached.[14] The GSP should confirm that minimum thresholds for ISWs avoid adverse impacts on environmental beneficial users of interconnected surface waters as these environmental users could be left unprotected by the GSP. These recommendations apply especially to environmental beneficial users that are already protected under pre-existing state or federal law.[6,15]

- When establishing SMC for the subbasin, consider that the SGMA statute [Water Code §10727.4(l)] specifically calls out that GSPs shall include "impacts on groundwater dependent ecosystems."

[12] "The description of undesirable results shall include [...] potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results". [23 CCR §354.26(b)(3)]

[13] The description of minimum thresholds shall include [...] how minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests." [23 CCR §354.28(b)(4)]

[14] "The minimum threshold for depletions of interconnected surface water shall be the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results." [23 CCR §354.28(c)(6)]

[15] Rohde MM, Seapy B, Rogers R, Castañeda X, editors. 2019. Critical Species LookBook: A compendium of California's threatened and endangered species for sustainable groundwater management. The Nature Conservancy, San Francisco, California. Available at: https://groundwaterresourcehub.org/public/uploads/pdfs/Critical_Species_LookBook_91819.pdf

2. Climate Change

The SGMA statute identifies climate change as a significant threat to groundwater resources and one that must be examined and incorporated in the GSPs. The GSP Regulations require integration of climate change into the projected water budget to ensure that projects and management actions sufficiently account for the range of potential climate futures.[16] The effects of climate change will intensify the impacts of water stress on GDEs, making available shallow groundwater resources especially critical to their survival. Condon *et al.* (2020) shows that GDEs are more likely to succumb to water stress and rely more on groundwater during times of drought.[17] When shallow groundwater is unavailable, riparian forests can die off and key life processes (e.g., migration and spawning) for aquatic organisms, such as steelhead, can be impeded.

The integration of climate change into the projected water budget is **insufficient**. The GSP incorporates climate change into the projected water budget using DWR change factors for 2030 and 2070. However, the plan does not consider multiple climate scenarios (e.g., the 2070 extremely wet and extremely dry climate scenarios) in the projected water budget. The GSP would benefit from clearly and transparently incorporating the extremely wet and dry scenarios provided by DWR into projected water budgets or selecting more appropriate extreme scenarios for the subbasin. While these extreme scenarios may have a lower likelihood of occurring, their consequences could be significant and their inclusion can help identify important vulnerabilities in the subbasin's approach to groundwater management.

The GSP integrates climate change into key inputs (e.g., changes in precipitation, evapotranspiration, and surface water flow) of the projected water budget, and calculates a sustainable yield based on the projected water budget with climate change incorporated. However, if the water budgets are incomplete, including the omission of extreme climate scenarios, then there is increased uncertainty in virtually every subsequent calculation used to plan for projects, derive measurable objectives, and set minimum thresholds. Plans that do not adequately include climate change projections may underestimate future impacts on vulnerable beneficial users of groundwater such as ecosystems, DACs, and domestic well owners.

RECOMMENDATIONS

- Integrate climate change, including extremely wet and dry scenarios, into all elements of the projected water budget to form the basis for development of sustainable management criteria and projects and management actions.
- Incorporate climate change scenarios into projects and management actions.

3. Data Gaps

The consideration of beneficial users when establishing monitoring networks is **insufficient**, due to lack of specific plans to increase the Representative Monitoring Sites (RMSs) in the monitoring network that represent water quality conditions and shallow groundwater elevations around DACs, domestic wells, GDEs, and ISWs in the subbasin. These beneficial users may remain unprotected by the GSP without

[16] "Each Plan shall rely on the best available information and best available science to quantify the water budget for the basin in order to provide an understanding of historical and projected hydrology, water demand, water supply, land use, population, climate change, sea level rise, groundwater and surface water interaction, and subsurface groundwater flow." [23 CCR §354.18(e)]
[17] Condon et al. 2020. Evapotranspiration depletes groundwater under warming over the contiguous United States. Nature Communications. Available at: https://www.nature.com/articles/s41467-020-14688-0

adequate monitoring and identification of data gaps in the shallow aquifer. The Plan therefore fails to meet SGMA's requirements for the monitoring network.[18]

Figure 3-1 (Representative Monitoring Sites) shows insufficient representation of DACs and drinking water users for water quality monitoring. Figure 3-2 (Groundwater Level Representative Monitoring Sites – Upper Aquifer) and Figure 3-3 (Groundwater Level Representative Monitoring Sites – Lower Aquifer) show insufficient representation of DACs, GDEs, and drinking water users for groundwater elevation monitoring. Refer to Attachment E for maps of these monitoring sites in relation to key beneficial users of groundwater.

The GSP provides some discussion of data gaps for GDEs in Section 3.7.8.7 (Assessment and Improvement of Monitoring Network - Interconnected Surface Waters), but does not provide specific plans, such as locations or a timeline, to fill the data gaps. In addition, Figure 3-7 (Identification of Data Gaps (GDE)) is missing.

RECOMMENDATIONS

- Provide the missing Figure 3-7 (Identification of Data Gaps (GDE)).
- Provide maps that overlay current and proposed monitoring well locations with the locations of DACs, domestic wells, and GDEs to clearly identify monitored areas.
- Increase the number of RMSs in the shallow aquifer across the subbasin as needed to map ISWs and adequately monitor all groundwater condition indicators across the subbasin and at appropriate depths for *all* beneficial users. Prioritize proximity to DACs, domestic wells, GDEs, and ISWs when identifying new RMSs.
- Ensure groundwater elevation and water quality RMSs are monitoring groundwater conditions spatially and at the correct depth for *all* beneficial users - especially DACs, domestic wells, and GDEs.
- Further describe biological monitoring that can be used to assess the potential for significant and unreasonable impacts to GDEs or ISWs due to groundwater conditions in the subbasin. Additional studies of GDEs and groundwater - surface water interactions are briefly discussed in the Projects and Management Actions chapter, but very few details are provided.

4. Addressing Beneficial Users in Projects and Management Actions

The consideration of beneficial users when developing projects and management actions is **sufficient** due to the plan's clear identification of the benefits and impacts of projects and management actions, including water quality impacts, to key beneficial users of groundwater such as GDEs and DACs.

We commend the GSA for including projects and management actions to improve water supply in the subbasin and GDE habitats (e.g., Deer Creek Instream Flow Enhancements and Conjunctive Use Management Projects, Lower Deer Creek Improvements and Habitat Restoration Projects). We also

[18] "The monitoring network objectives shall be implemented to accomplish the following: [...] (2) Monitor impacts to the beneficial uses or users of groundwater." [23 CCR §354.34(b)(2)]

commend the GSA for describing the environmental benefits of the Multi-Benefit Recharge Project (Section 4.3.3) in the subbasin, as developed with support and guidelines from The Nature Conservancy.

The GSP describes the Tehama County Domestic Well Tracking and Outreach Program (Section 4.5.2.6) and the Well Deepening or Replacement Program (Section 4.5.2.7). However, these programs are described as potential projects to be implemented on an as-needed basis, instead of projects that will be implemented within the GSP planning horizon. Given the number of drinking water wells going dry within the subbasin as reported by DWR's Household Water Shortage reporting tool,[19] we strongly recommend inclusion of a drinking water well impact mitigation program to proactively monitor and protect drinking water wells through GSP implementation.

RECOMMENDATIONS

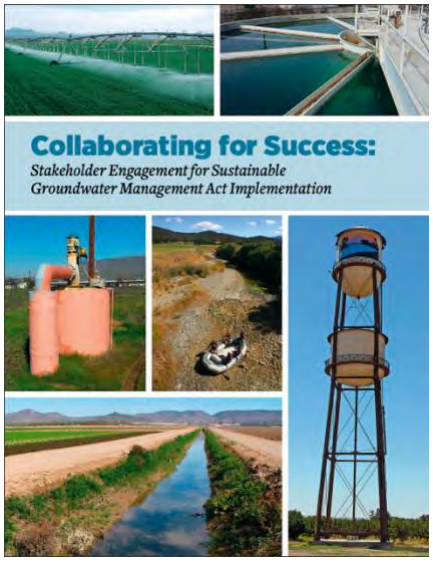
- For DACs and domestic well owners, provide specific plans for implementation of a drinking water well impact mitigation program to proactively monitor and protect drinking water wells through GSP implementation. Refer to Attachment B for specific recommendations on how to implement a drinking water well mitigation program.
- Develop management actions that incorporate climate and water delivery uncertainties to address future water demand and prevent future undesirable results.

[19]DWR Household Water Shortage reporting tool. Available at: https://mydrywell.water.ca.gov/report/publicpage

Attachment B

SGMA Tools to address DAC, drinking water, and environmental beneficial uses and users

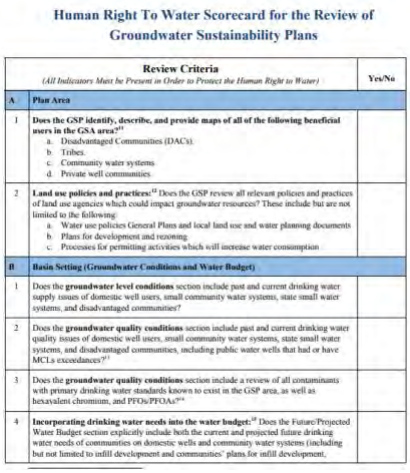
Stakeholder Engagement and Outreach



Clean Water Action, Community Water Center and Union of Concerned Scientists developed a guidance document called Collaborating for success: Stakeholder engagement for Sustainable Groundwater Management Act Implementation. It provides details on how to conduct targeted and broad outreach and engagement during Groundwater Sustainability Plan (GSP) development and implementation. Conducting a targeted outreach involves:

- Developing a robust Stakeholder Communication and Engagement plan that includes outreach at frequented locations (schools, farmers markets, religious settings, events) across the plan area to increase the involvement and participation of disadvantaged communities, drinking water users and the environmental stakeholders.
- Providing translation services during meetings and technical assistance to enable easy participation for non-English speaking stakeholders.
- GSP should adequately describe the process for requesting input from beneficial users and provide details on how input is incorporated into the GSP.

The Human Right to Water

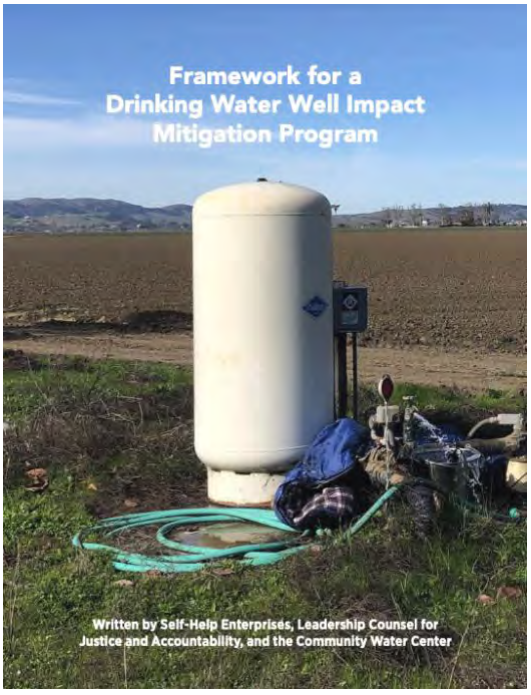


Human Right To Water Scorecard for the Review of Groundwater Sustainability Plans

	Review Criteria *(All Indicators Must be Present in Order to Protect the Human Right to Water)*	Yes/No
A	**Plan Area**	
1	**Does the GSP identify, describe, and provide maps of all of the following beneficial users in the GSA area?**[43] a. Disadvantaged Communities (DACs). b. Tribes. c. Community water systems. d. Private well communities.	
2	**Land use policies and practices:**[44] Does the GSP review all relevant policies and practices of land use agencies which could impact groundwater resources? These include but are not limited to the following: a. Water use policies General Plans and local land use and water planning documents b. Plans for development and rezoning. c. Processes for permitting activities which will increase water consumption.	
B	**Basin Setting (Groundwater Conditions and Water Budget)**	
1	Does the **groundwater level conditions** section include past and current drinking water supply issues of domestic well users, small community water systems, state small water systems, and disadvantaged communities?	
2	Does the **groundwater quality conditions** section include past and current drinking water quality issues of domestic well users, small community water systems, state small water systems, and disadvantaged communities, including public water wells that had or have MCLs exceedances?[45]	
3	Does the **groundwater quality conditions** section include a review of all contaminants with primary drinking water standards known to exist in the GSP area, as well as hexavalent chromium, and PFOs/PFOAs?[46]	
4	**Incorporating drinking water needs into the water budget:**[47] Does the Future/Projected Water Budget section explicitly include both the current and projected future drinking water needs of communities on domestic wells and community water systems (including but not limited to infill development and communities' plans for infill development,	

The Human Right to Water Scorecard was developed by Community Water Center, Leadership Counsel for Justice and Accountability and Self Help Enterprises to aid Groundwater Sustainability Agencies (GSAs) in prioritizing drinking water needs in SGMA. The scorecard identifies elements that must exist in GSPs to adequately protect the Human Right to Drinking water.

Drinking Water Well Impact Mitigation Framework



The Drinking Water Well Impact Mitigation Framework was developed by Community Water Center, Leadership Counsel for Justice and Accountability and Self Help Enterprises to aid GSAs in the development and implementation of their GSPs. The framework provides a clear roadmap for how a GSA can best structure its data gathering, monitoring network and management actions to proactively monitor and protect drinking water wells and mitigate impacts should they occur.

Groundwater Resource Hub

The Nature Conservancy has developed a suite of tools based on best available science to help GSAs, consultants, and stakeholders efficiently incorporate nature into GSPs. These tools and resources are available online at GroundwaterResourceHub.org. The Nature Conservancy's tools and resources are intended to reduce costs, shorten timelines, and increase benefits for both people and nature.

Rooting Depth Database

The Plant Rooting Depth Database provides information that can help assess whether groundwater-dependent vegetation are accessing groundwater. Actual rooting depths will depend on the plant species and site-specific conditions, such as soil type and

availability of other water sources. Site-specific knowledge of depth to groundwater combined with rooting depths will help provide an understanding of the potential groundwater levels are needed to sustain GDEs.

How to use the database

The maximum rooting depth information in the Plant Rooting Depth Database is useful when verifying whether vegetation in the Natural Communities Commonly Associated with Groundwater (NC Dataset) are connected to groundwater. A 30 ft depth-to-groundwater threshold, which is based on averaged global rooting depth data for phreatophytes[1], is relevant for most plants identified in the NC Dataset since most plants have a max rooting depth of less than 30 feet. However, it is important to note that deeper thresholds are necessary for other plants that have reported maximum root depths that exceed the averaged 30 feet threshold, such as valley oak (*Quercus lobata*), Euphrates poplar (*Populus euphratica*), salt cedar (*Tamarix spp.*), and shadescale (*Atriplex confertifolia*). The Nature Conservancy advises that the reported max rooting depth for these deeper-rooted plants be used. For example, a depth-to groundwater threshold of 80 feet should be used instead of the 30 ft threshold, when verifying whether valley oak polygons from the NC Dataset are connected to groundwater. It is important to re-emphasize that actual rooting depth data are limited and will depend on the plant species and site-specific conditions such as soil and aquifer types, and availability to other water sources.

The Plant Rooting Depth Database is an Excel workbook composed of four worksheets:

1. California phreatophyte rooting depth data (included in the NC Dataset)
2. Global phreatophyte rooting depth data
3. Metadata
4. References

How the database was compiled

The Plant Rooting Depth Database is a compilation of rooting depth information for the groundwater-dependent plant species identified in the NC Dataset. Rooting depth data were compiled from published scientific literature and expert opinion through a crowdsourcing campaign. As more information becomes available, the database of rooting depths will be updated. Please Contact Us if you have additional rooting depth data for California phreatophytes.

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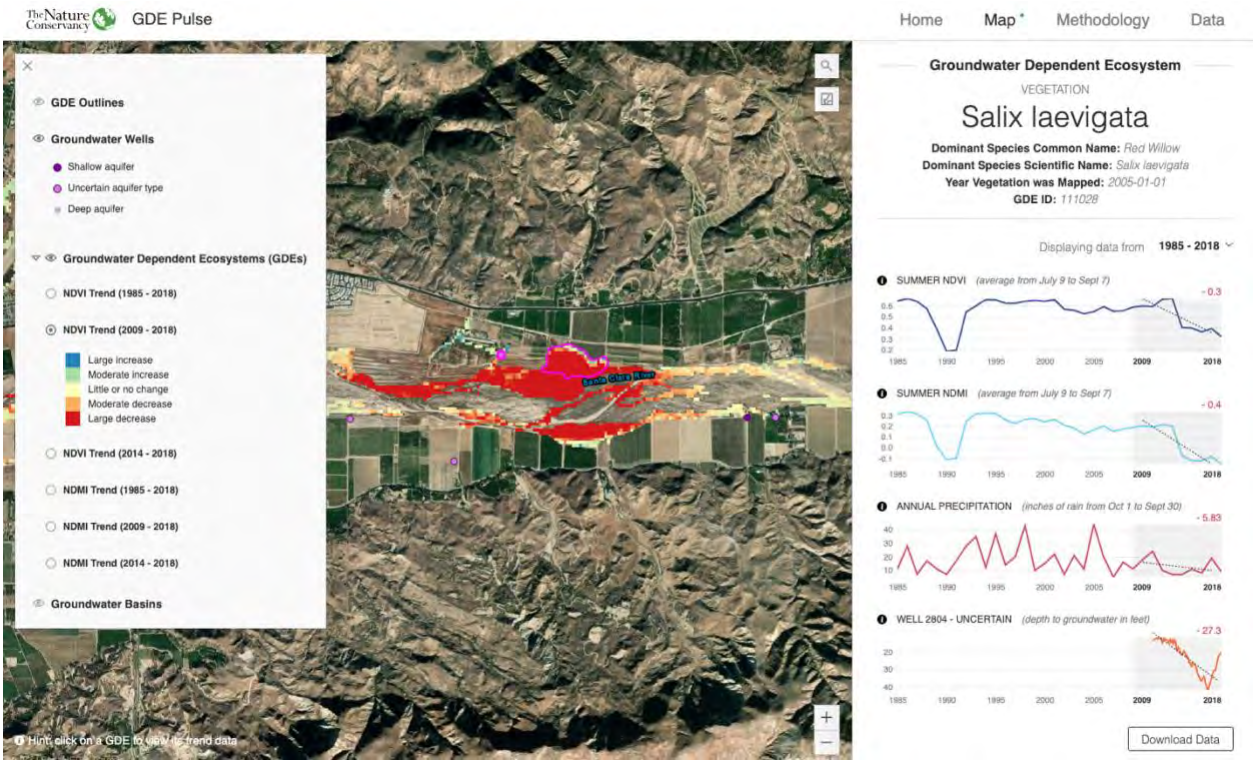
[1] Canadell, J., Jackson, R.B., Ehleringer, J.B. et al. 1996. Maximum rooting depth of vegetation types at the global scale. Oecologia 108, 583–595. https://doi.org/10.1007/BF00329030

GDE Pulse



GDE Pulse is a free online tool that allows Groundwater Sustainability Agencies to assess changes in groundwater dependent ecosystem (GDE) health using satellite, rainfall, and groundwater data. Remote sensing data from satellites has been used to monitor the health of vegetation all over the planet. GDE pulse has compiled 35 years of satellite imagery from NASA's Landsat mission for every polygon in the Natural Communities Commonly Associated with Groundwater Dataset. The following datasets are available for downloading:

Normalized Difference Vegetation Index (NDVI) is a satellite-derived index that represents the greenness of vegetation. Healthy green vegetation tends to have a higher NDVI, while dead leaves have a lower NDVI. We calculated the average NDVI during the driest part of the year (July - Sept) to estimate vegetation health when the plants are most likely dependent on groundwater.

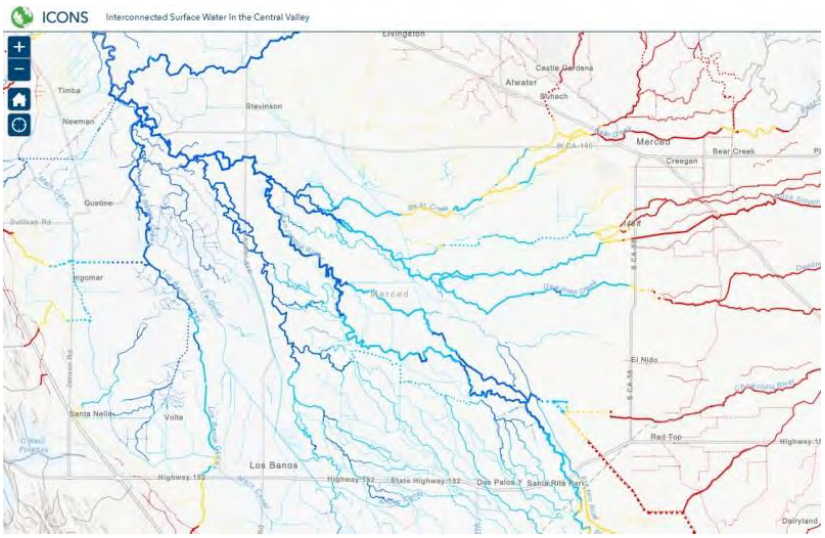
Normalized Difference Moisture Index (NDMI) is a satellite-derived index that represents water content in vegetation. NDMI is derived from the Near-Infrared (NIR) and Short-Wave Infrared (SWIR) channels. Vegetation with adequate access to water tends to have higher NDMI, while vegetation that is water stressed tends to have lower NDMI. We calculated the average NDVI during the driest part of the year (July–September) to estimate vegetation health when the plants are most likely dependent on groundwater.

Annual Precipitation is the total precipitation for the water year (October 1st – September 30th) from the PRISM dataset. The amount of local precipitation can affect vegetation with more precipitation generally leading to higher NDVI and NDMI.

Depth to Groundwater measurements provide an indication of the groundwater levels and changes over time for the surrounding area. We used groundwater well measurements from nearby (<1km) wells to estimate the depth to groundwater below the GDE based on the average elevation of the GDE (using a digital elevation model) minus the measured groundwater surface elevation.

ICONOS Mapper

Interconnected Surface Water in the Central Valley



ICONS maps the likely presence of interconnected surface water (ISW) in the Central Valley using depth to groundwater data. Using data from 2011-2018, the ISW dataset represents the likely connection between surface water and groundwater for rivers and streams in California's Central Valley. It includes information on the mean, maximum, and minimum depth to groundwater for each stream segment over the years with available data, as well as the likely presence of ISW based on the minimum depth to groundwater. The Nature Conservancy developed this database, with guidance and input from expert academics, consultants, and state agencies.

We developed this dataset using groundwater elevation data available online from the California Department of Water Resources (DWR). DWR only provides this data for the Central Valley. For GSAs outside of the valley, who have groundwater well measurements, we recommend following our methods to determine likely ISW in your region. The Nature Conservancy's ISW dataset should be used as a first step in reviewing ISW and should be supplemented with local or more recent groundwater depth data.

Attachment C

Freshwater Species Located in the Los Molinos Subbasin

To assist in identifying the beneficial users of surface water necessary to assess the undesirable result "depletion of interconnected surface waters", Attachment C provides a list of freshwater species located in the Los Molinos Subbasin. To produce the freshwater species list, we used ArcGIS to select features within the California Freshwater Species Database version 2.0.9 within the basin boundary. This database contains information on ~4,000 vertebrates, macroinvertebrates and vascular plants that depend on fresh water for at least one stage of their life cycle. The methods used to compile the California Freshwater Species Database can be found in Howard et al. 2015[1]. The spatial database contains locality observations and/or distribution information from ~400 data sources. The database is housed in the California Department of Fish and Wildlife's BIOS[2] as well as on The Nature Conservancy's science website[3].

Scientific Name	Common Name	Legal Protected Status		
		Federal	State	Other
BIRDS				
Coccyzus americanus occidentalis	Western Yellow-billed Cuckoo	Candidate - Threatened	Endangered	
Riparia riparia	Bank Swallow		Threatened	
Actitis macularius	Spotted Sandpiper			
Agelaius tricolor	Tricolored Blackbird	Bird of Conservation Concern	Special Concern	BSSC - First priority
Aix sponsa	Wood Duck			
Anas platyrhynchos	Mallard			
Ardea alba	Great Egret			
Ardea herodias	Great Blue Heron			
Butorides virescens	Green Heron			
Empidonax traillii	Willow Flycatcher	Bird of Conservation Concern	Endangered	
Fulica americana	American Coot			
Geothlypis trichas trichas	Common Yellowthroat			
Haliaeetus leucocephalus	Bald Eagle	Bird of Conservation Concern	Endangered	
Icteria virens	Yellow-breasted Chat		Special Concern	BSSC - Third priority
Lophodytes cucullatus	Hooded Merganser			
Megaceryle alcyon	Belted Kingfisher			
Mergus merganser	Common Merganser			
Pandion haliaetus	Osprey		Watch list	

[1] Howard, J.K. et al. 2015. Patterns of Freshwater Species Richness, Endemism, and Vulnerability in California. PLoSONE, 11(7). Available at: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0130710

[2] California Department of Fish and Wildlife BIOS: https://www.wildlife.ca.gov/data/BIOS

[3] Science for Conservation: https://www.scienceforconservation.org/products/california-freshwater-species-database

Pelecanus erythrorhynchos	American White Pelican		Special Concern	BSSC - First priority
Phalacrocorax auritus	Double-crested Cormorant			
Setophaga petechia	Yellow Warbler			BSSC - Second priority
Tachycineta bicolor	Tree Swallow			
CRUSTACEANS				
Branchinecta conservatio	Conservancy Fairy Shrimp	Endangered	Special	IUCN - Endangered
Branchinecta lynchi	Vernal Pool Fairy Shrimp	Threatened	Special	IUCN - Vulnerable
Lepidurus packardi	Vernal Pool Tadpole Shrimp	Endangered	Special	IUCN - Endangered
Hyalella azteca	An Amphipod			
Hyalella spp.	Hyalella spp.			
FISH				
Oncorhynchus mykiss irideus	Coastal rainbow trout			Least Concern - Moyle 2013
Acipenser medirostris ssp. 1	Southern green sturgeon	Threatened	Special Concern	Endangered - Moyle 2013
Oncorhynchus mykiss - CV	Central Valley steelhead	Threatened	Special	Vulnerable - Moyle 2013
Oncorhynchus tshawytscha - CV spring	Central Valley spring Chinook salmon	Threatened	Threatened	Vulnerable - Moyle 2013
Oncorhynchus tshawytscha - CV winter	Central Valley winter Chinook salmon	Endangered	Endangered	Vulnerable - Moyle 2013
HERPS				
Actinemys marmorata marmorata	Western Pond Turtle		Special Concern	ARSSC
Anaxyrus boreas boreas	Boreal Toad			
Rana boylii	Foothill Yellow-legged Frog	Under Review in the Candidate or Petition Process	Special Concern	ARSSC
Rana draytonii	California Red-legged Frog	Threatened	Special Concern	ARSSC
Spea hammondii	Western Spadefoot	Under Review in the Candidate or Petition Process	Special Concern	ARSSC
Taricha granulosa	Rough-skinned Newt			
Taricha torosa	Coast Range Newt		Special Concern	ARSSC
Thamnophis couchii	Sierra Gartersnake			
Thamnophis sirtalis sirtalis	Common Gartersnake			
INSECTS & OTHER INVERTS				

Ablabesmyia annulata				Not on any status lists
Ablabesmyia spp.	Ablabesmyia spp.			
Acentrella insignificans	A Mayfly			
Acentrella spp.	Acentrella spp.			
Acentrella turbida	A Mayfly			
Ambrysus amargosus	Ash Meadows Naucorid			
Ambrysus mormon				Not on any status lists
Ambrysus spp.	Ambrysus spp.			
Amiocentrus aspilus	A Caddisfly			
Anopheles franciscanus				Not on any status lists
Anopheles spp.	Anopheles spp.			
Antocha monticola				Not on any status lists
Antocha spp.	Antocha spp.			
Apedilum spp.	Apedilum spp.			
Aquarius amplus arizonensis				Not on any status lists
Aquarius spp.	Aquarius spp.			
Argia agrioides	California Dancer			
Argia spp.	Argia spp.			
Asioplax edmundsi	A Mayfly			
Asioplax spp.	Asioplax spp.			
Atherix pachypus				Not on any status lists
Atractelmis wawona	Wawona Riffle Beetle		Special	
Baetis adonis	A Mayfly			
Baetis flavistriga	A Mayfly			
Baetis spp.	Baetis spp.			
Baetis tricaudatus	A Mayfly			
Blepharicera jordani				Not on any status lists
Blepharicera spp.	Blepharicera spp.			
Brachycentrus occidentalis				Not on any status lists
Brillia flavifrons				Not on any status lists
Brillia spp.	Brillia spp.			
Caenis amica	A Mayfly			
Caenis latipennis	A Mayfly			
Calineuria californica	Western Stone			
Callibaetis californicus	A Mayfly			
Callibaetis spp.	Callibaetis spp.			
Cardiocladius platypus				Not on any status lists
Cardiocladius spp.	Cardiocladius spp.			
Caudatella columbiella				Not on any status lists

Caudatella spp.	Caudatella spp.			
Cheumatopsyche analis				Not on any status lists
Cheumatopsyche spp.	Cheumatopsyche spp.			
Chimarra adella				Not on any status lists
Chimarra spp.	Chimarra spp.			
Chimarra utahensis	A Caddisfly			
Chironomidae fam.	Chironomidae fam.			
Chironomus anonymus				Not on any status lists
Chironomus spp.	Chironomus spp.			
Corixidae fam.	Corixidae fam.			
Cricotopus annulator				Not on any status lists
Cricotopus spp.	Cricotopus spp.			
Cryptochironomus curryi				Not on any status lists
Cryptochironomus spp.	Cryptochironomus spp.			
Dicrotendipes adnilus				Not on any status lists
Dicrotendipes spp.	Dicrotendipes spp.			
Diphetor hageni	Hagen's Small Minnow Mayfly			
Dubiraphia brunnescens	Brownish Dubiraphian Riffle Beetle		Special	
Dubiraphia spp.	Dubiraphia spp.			
Enallagma anna	River Bluet			
Enallagma spp.	Enallagma spp.			
Epeorus albertae	A Mayfly			
Epeorus spp.	Epeorus spp.			
Ephemerella aurivillii	A Mayfly			
Eukiefferiella claripennis				Not on any status lists
Eukiefferiella spp.	Eukiefferiella spp.			
Fallceon quilleri	A Mayfly			
Glossosoma alascense	A Caddisfly			
Glossosoma oregonense	A Caddisfly			
Glossosoma spp.	Glossosoma spp.			
Glyptotendipes spp.	Glyptotendipes spp.			
Helichus suturalis				Not on any status lists
Helicopsyche borealis	A Caddisfly			
Helicopsyche spp.	Helicopsyche spp.			
Hesperoperla pacifica	Golden Stone			
Hetaerina americana	American Rubyspot			
Hetaerina spp.	Hetaerina spp.			
Hydrophilidae fam.	Hydrophilidae fam.			

Hydropsyche alternans				Not on any status lists
Hydropsyche californica	A Caddisfly			
Hydropsyche occidentalis	A Caddisfly			
Hydropsyche spp.	Hydropsyche spp.			
Hydroptila ajax	A Caddisfly			
Hydroptila arctia	A Caddisfly			
Hydroptila lenora				Not on any status lists
Hydroptila spp.	Hydroptila spp.			
Hygrotus acaroides				Not on any status lists
Hygrotus spp.	Hygrotus spp.			
Isonychia intermedia				Not on any status lists
Isonychia spp.	Isonychia spp.			
Labrundinia maculata				Not on any status lists
Labrundinia spp.	Labrundinia spp.			
Laccobius acutipenis				Not on any status lists
Laccobius spp.	Laccobius spp.			
Laccophilus biguttatus				Not on any status lists
Laccophilus spp.	Laccophilus spp.			
Lauterborniella spp.	Lauterborniella spp.			
Lepidostoma acarolum				Not on any status lists
Lepidostoma spp.	Lepidostoma spp.			
Leptoceridae fam.	Leptoceridae fam.			
Macromia magnifica	Western River Cruiser			
Microcylloepus formicoideus	Furnace Creek Riffle Beetle		Special	
Microcylloepus spp.	Microcylloepus spp.			
Microtendipes caducus				Not on any status lists
Microtendipes spp.	Microtendipes spp.			
Microvelia beameri				Not on any status lists
Microvelia spp.	Microvelia spp.			
Mideopsis spp.	Mideopsis spp.			
Mystacides alafimbriatus	A Caddisfly			
Mystacides spp.	Mystacides spp.			
Nanocladius anderseni				Not on any status lists
Nanocladius spp.	Nanocladius spp.			
Natarsia miripes				Not on any status lists
Natarsia spp.	Natarsia spp.			

Nectopsyche dorsalis	A Caddisfly			
Nectopsyche spp.	Nectopsyche spp.			
Neotrichia blinni				Not on any status lists
Neotrichia spp.	Neotrichia spp.			
Ochrotrichia alexanderi	A Caddisfly			
Ochrotrichia spp.	Ochrotrichia spp.			
Ochrotrichia stylata	A Caddisfly			
Octogomphus specularis	Grappletail			
Oecetis arizonica				Not on any status lists
Oecetis avara	A Caddisfly			
Oecetis disjuncta	A Caddisfly			
Oecetis spp.	Oecetis spp.			
Ophiogomphus arizonicus				Not on any status lists
Ophiogomphus occidentis	Sinuous Snaketail			
Ophiogomphus spp.	Ophiogomphus spp.			
Optioservus canus	Pinnacles Optioservus Riffle Beetle		Special	
Optioservus quadrimaculatus				Not on any status lists
Optioservus seriatus				Not on any status lists
Optioservus spp.	Optioservus spp.			
Orthocladius appersoni				Not on any status lists
Orthocladius spp.	Orthocladius spp.			
Oxyethira spp.	Oxyethira spp.			
Paratanytarsus grimmii				Not on any status lists
Paratanytarsus spp.	Paratanytarsus spp.			
Pentaneura inconspicua				Not on any status lists
Pentaneura spp.	Pentaneura spp.			
Petrophila confusalis				Not on any status lists
Petrophila spp.	Petrophila spp.			
Phaenopsectra dyari				Not on any status lists
Phaenopsectra spp.	Phaenopsectra spp.			
Polycentropus arizonensis				Not on any status lists
Polycentropus spp.	Polycentropus spp.			
Polypedilum albicorne				Not on any status lists
Polypedilum spp.	Polypedilum spp.			
Procladius barbatulus				Not on any status lists

Procladius spp.	Procladius spp.			
Progomphus borealis	Gray Sanddragon			
Prosimulium caudatum				Not on any status lists
Prosimulium esselbaughi				Not on any status lists
Prosimulium spp.	Prosimulium spp.			
Protanyderus margarita				Not on any status lists
Protanyderus spp.	Protanyderus spp.			
Protoptila balmorhea				Not on any status lists
Protoptila coloma	A Caddisfly			
Protoptila spp.	Protoptila spp.			
Psephenus arizonensis				Not on any status lists
Psephenus falli				Not on any status lists
Psephenus spp.	Psephenus spp.			
Pseudochironomus richardsoni				Not on any status lists
Pseudochironomus spp.	Pseudochironomus spp.			
Psychomyia flavida	A Caddisfly			
Pteronarcys californica	Giant Salmonfly			
Pteronarcys spp.	Pteronarcys spp.			
Rhagovelia becki				Not on any status lists
Rhagovelia spp.	Rhagovelia spp.			
Rheotanytarsus hamatus				Not on any status lists
Rheotanytarsus spp.	Rheotanytarsus spp.			
Rhithrogena decora	A Mayfly			
Rhithrogena spp.	Rhithrogena spp.			
Rhyacophila acuminata	A Caddisfly			Not on any status lists
Rhyacophila spp.	Rhyacophila spp.			
Serratella levis	A Mayfly			
Serratella micheneri	A Mayfly			
Serratella spp.	Serratella spp.			
Sialis spp.	Sialis spp.			
Sigara alternata				Not on any status lists
Sigara spp.	Sigara spp.			
Simulium anduzei				Not on any status lists
Simulium spp.	Simulium spp.			
Skwala americana	American Springfly			
Skwala spp.	Skwala spp.			
Sperchon spp.	Sperchon spp.			

Stenocolus scutellaris				Not on any status lists
Tanytarsus angulatus				Not on any status lists
Tanytarsus spp.	Tanytarsus spp.			
Tinodes belisus	A Caddisfly			
Tinodes spp.	Tinodes spp.			
Tricorythodes explicatus	A Mayfly			
Tricorythodes spp.	Tricorythodes spp.			
Tropisternus californicus				Not on any status lists
Tropisternus spp.	Tropisternus spp.			
Tvetenia spp.	Tvetenia spp.			
Tvetenia vitracies				Not on any status lists
Uvarus amandus				Not on any status lists
Uvarus spp.	Uvarus spp.			
Wormaldia anilla	A Caddisfly			
Wormaldia spp.	Wormaldia spp.			
Zaitzevia parvula				Not on any status lists
Zaitzevia spp.	Zaitzevia spp.			
MAMMALS				
Castor canadensis	American Beaver			Not on any status lists
Lontra canadensis canadensis	North American River Otter			Not on any status lists
Neovison vison	American Mink			Not on any status lists
Ondatra zibethicus	Common Muskrat			Not on any status lists
MOLLUSKS				
Anodonta californiensis	California Floater		Special	
Fluminicola ahjumawi	Ahjumawi pebblesnail			V
Fluminicola spp.	Fluminicola spp.			
Gonidea angulata	Western Ridged Mussel		Special	
Gyraulus spp.	Gyraulus spp.			
Helisoma spp.	Helisoma spp.			
Juga acutifilosa	Topaz Juga		Special	T
Juga spp.	Juga spp.			
Margaritifera falcata	Western Pearlshell		Special	
Menetus spp.	Menetus spp.			
Physa spp.	Physa spp.			
Pisidium spp.	Pisidium spp.			
Planorbidae fam.	Planorbidae fam.			
PLANTS				
Orcuttia pilosa	Hairy Orcutt Grass	Endangered	Endangered	CRPR - 1B.1
Orcuttia tenuis	Slender Orcutt Grass	Threatened	Endangered	CRPR - 1B.1

Tuctoria greenei	Green's Awnless Orcutt Grass	Endangered	Rare	CRPR - 1B.1
Agrostis oregonensis	Oregon Bentgrass			
Allium validum	Tall Swamp Onion			
Alnus rhombifolia	White Alder			
Alopecurus aequalis aequalis	Short-awn Foxtail			
Alopecurus carolinianus	Tufted Foxtail			
Alopecurus geniculatus geniculatus	Meadow Foxtail			
Alopecurus pratensis	NA			
Alopecurus saccatus	Pacific Foxtail			
Ammannia coccinea	Scarlet Ammannia			
Ammannia robusta	Grand Redstem			
Aquilegia eximia	Van Houtte's Columbine			
Arundo donax	NA			
Asarum lemmonii	Lemmon's Wild Ginger			
Azolla filiculoides	NA			
Baccharis salicina				Not on any status lists
Bacopa rotundifolia	NA			
Bergia texana	Texas Bergia			
Berula erecta	Wild Parsnip			
Bistorta bistortoides				Not on any status lists
Boehmeria cylindrica	NA			Not on any status lists
Bolboschoenus fluviatilis				Not on any status lists
Bolboschoenus glaucus	NA			Not on any status lists
Bolboschoenus maritimus paludosus	NA			Not on any status lists
Brodiaea nana				Not on any status lists
Callitriche fassettii	NA			Not on any status lists
Callitriche heterophylla bolanderi	Large Water-starwort			
Callitriche heterophylla heterophylla	Northern Water-starwort			
Callitriche longipedunculata	Longstock Water-starwort			
Callitriche marginata	Winged Water-starwort			
Callitriche trochlearis	Waste-water Water-starwort			
Carex amplifolia	Bigleaf Sedge			
Carex aquatilis aquatilis	Water Sedge			

Carex aurea	Golden-fruit Sedge			
Carex cusickii	Cusick's Sedge			
Carex densa	Dense Sedge			
Carex echinata echinata	Little Prickly Sedge			
Carex feta	Green-sheath Sedge			
Carex hirtissima	Fuzzy Sedge			
Carex integra	Smooth-beak Sedge			
Carex jonesii	Jones' Sedge			
Carex lasiocarpa	Slender Sedge		Special	CRPR - 2B.3
Carex lemmonii	Lemmon's Sedge	Endangered		
Carex limosa	Mud Sedge		Special	CRPR - 2B.2
Carex nebrascensis	Nebraska Sedge			
Carex nervina	Sierra Sedge			
Carex nigricans	Black Alpine Sedge			
Carex nudata	Torrent Sedge			
Carex praeceptorum	Teacher's Sedge			
Carex scopulorum bracteosa	Holm's Rocky Mountain Sedge			
Carex simulata	Copycat Sedge			
Carex spectabilis	Northwestern Showy Sedge			
Carex utriculata	Beaked Sedge			
Carex vesicaria vesicaria	Inflated Sedge			
Carex vulpinoidea	NA			
Castilleja miniata miniata	Greater Red Indian-paintbrush			
Castilleja minor minor	Alkali Indian-paintbrush			
Cephalanthus occidentalis	Common Buttonbush			
Chamaecyparis lawsoniana				Not on any status lists
Cicendia quadrangularis	Oregon Microcala			
Cirsium douglasii breweri				Not on any status lists
Cirsium scariosum scariosum	Drummond's Thistle			Not on any status lists
Cotula coronopifolia	NA			
Crassula aquatica	Water Pygmyweed			
Crypsis vaginiflora	NA			
Cyperus acuminatus	Short-point Flatsedge			
Cyperus bipartitus	Shining Flatsedge			
Cyperus erythrorhizos	Red-root Flatsedge			
Cyperus flavescens	NA			
Cyperus fuscus	NA			
Cyperus involucratus	NA			
Cyperus squarrosus	Awned Cyperus			

Damasonium californicum				Not on any status lists
Darlingtonia californica	California Pitcherplant		Special	CRPR - 4.2
Darmera peltata	Umbrella Plant			
Datisca glomerata	Durango Root			
Downingia bacigalupii	Bacigalup's Downingia			
Downingia bella	Hoover's Downingia			
Downingia bicornuta	NA			
Downingia cuspidata	Toothed Calicoflower			
Downingia insignis	Parti-color Downingia			
Downingia montana	Sierra Downingia			
Downingia ornatissima	NA			
Downingia pulchella	Flat-face Downingia			
Downingia pusilla	Dwarf Downingia		Special	CRPR - 2B.2
Drosera rotundifolia	NA			
Echinochloa oryzoides	NA			
Echinodorus berteroi	Upright Burhead			
Elatine brachysperma	Shortseed Waterwort			
Elatine californica	California Waterwort			
Elatine heterandra	Mosquito Waterwort			
Elatine rubella	Southwestern Waterwort			
Eleocharis acicularis acicularis	Least Spikerush			
Eleocharis acicularis gracilescens	Least Spikerush			
Eleocharis atropurpurea	Purple Spikerush			
Eleocharis bella	Delicate Spikerush			
Eleocharis bolanderi	Bolander's Spikerush			
Eleocharis coloradoensis				Not on any status lists
Eleocharis decumbens	Decumbent Spikerush			
Eleocharis engelmannii engelmannii	Engelmann's Spikerush			Not on any status lists
Eleocharis flavescens flavescens	Pale Spikerush			
Eleocharis macrostachya	Creeping Spikerush			
Eleocharis montevidensis	Sand Spikerush			
Eleocharis obtusa	Blunt Spikerush			
Eleocharis parishii	Parish's Spikerush			
Eleocharis quadrangulata	NA			
Eleocharis quinqueflora	Few-flower Spikerush			
Eleocharis rostellata	Beaked Spikerush			
Eleocharis suksdorfiana	NA			

Epilobium campestre	NA			Not on any status lists
Epilobium cleistogamum	Cleistogamous Spike-primrose			
Epilobium oregonense	Oregon Willow-herb			
Epipactis gigantea	Giant Helleborine			
Eragrostis hypnoides	Teal Lovegrass			
Eriophorum gracile gracile	Slender Cotton-grass		Special	CRPR - 4.3
Eryngium alismifolium	Inland Coyote-thistle			
Eryngium aristulatum aristulatum	California Eryngo			
Eryngium articulatum	Jointed Coyote-thistle			
Eryngium vaseyi vaseyi	Vasey's Coyote-thistle			Not on any status lists
Euphorbia hooveri	NA			Not on any status lists
Euthamia occidentalis	Western Fragrant Goldenrod			
Fimbristylis autumnalis	NA			
Floerkea proserpinacoides	False Mermaidweed			
Galium trifidum	Small Bedstraw			
Gentianella amarella acuta	Autumn Dwarf Gentian			
Gentianopsis simplex	One-flower Gentian			
Glyceria elata	Tall Mannagrass			
Gratiola ebracteata	Bractless Hedge-hyssop			
Gratiola heterosepala	Boggs Lake Hedge-hyssop		Endangered	CRPR - 1B.2
Hastingsia alba	White Rushlily			
Helenium bigelovii	Bigelow's Sneezeweed			
Helenium puberulum	Rosilla			
Heteranthera limosa	NA			
Hosackia oblongifolia	NA			1.B.3
Hydrocotyle ranunculoides	Floating Marsh-pennywort			
Hydrocotyle umbellata	Many-flower Marsh-pennywort			
Hydrocotyle verticillata verticillata	Whorled Marsh-pennywort			
Isoetes bolanderi	NA			
Isoetes howellii	NA			
Isoetes nuttallii	NA			
Isoetes orcuttii	NA			
Juncus acuminatus	Sharp-fruit Rush			
Juncus articulatus articulatus				Not on any status lists
Juncus dubius	Mariposa Rush			
Juncus effusus pacificus				

Juncus hemiendytus hemiendytus	Dwarf Rush			
Juncus leiospermus	NA		Special	
Juncus mertensianus	Mertens' Rush			
Juncus uncialis	Inch-high Rush			
Juncus usitatus	NA			Not on any status lists
Juncus xiphioides	Iris-leaf Rush			
Kyhosia bolanderi				Not on any status lists
Lasthenia ferrisiae	Ferris' Goldfields		Special	CRPR - 4.2
Lasthenia fremontii	Fremont's Goldfields			
Leersia oryzoides	Rice Cutgrass			
Lemna aequinoctialis	Lesser Duckweed			
Lemna gibba	Inflated Duckweed			
Lemna minor	Lesser Duckweed			
Lemna minuta	Least Duckweed			
Lemna trisulca	Star Duckweed			
Lemna turionifera	Turion Duckweed			
Leucothoe davisiae	Western Doghobble			
Lilium kelleyanum	Kelley's Lily			
Lilium pardalinum pardalinum	Leopard Lily			
Lilium pardalinum shastense	Leopard Lily			
Lilium parvum	Small Tiger Lily			
Limnanthes alba alba	White Meadowfoam			
Limnanthes alba versicolor	White Meadowfoam			
Limnanthes douglasii douglasii	Douglas' Meadowfoam			
Limnanthes douglasii nivea	Douglas' Meadowfoam			
Limnanthes douglasii rosea	Douglas' Meadowfoam			
Limnanthes floccosa californica	Shippee Meadowfoam	Endangered	Endangered	CRPR - 1B.1
Limnanthes floccosa floccosa	Woolly Meadowfoam		Special	CRPR - 4.2
Limosella acaulis	Southern Mudwort			
Limosella aquatica	Northern Mudwort			
Lindernia dubia	Yellowseed False Pimpernel			
Lipocarpha micrantha	Dwarf Bulrush			
Ludwigia palustris	Marsh Seedbox			
Ludwigia peploides montevidensis	NA			Not on any status lists
Ludwigia peploides peploides	NA			Not on any status lists
Lupinus polyphyllus polyphyllus	Bigleaf Lupine			

Lycopus americanus	American Bugleweed			
Lythrum californicum	California Loosestrife			
Lythrum portula	NA			
Marsilea vestita vestita	NA			Not on any status lists
Menyanthes trifoliata	Bog Buckbean			
Micranthes aprica				Not on any status lists
Micranthes odontoloma				Not on any status lists
Micranthes oregana	NA			Not on any status lists
Myosotis laxa	Small Forget-me-not			
Myosurus apetalus	Bristly Mousetail			
Myosurus minimus	NA			
Myosurus sessilis	Sessile Mousetail			
Myriophyllum aquaticum	NA			
Najas gracillima	NA			
Najas guadalupensis guadalupensis	Southern Naiad			
Navarretia cotulifolia	Cotula Navarretia			
Navarretia heterandra	Tehama Navarretia			
Navarretia intertexta	Needleleaf Navarretia			
Navarretia leucocephala bakeri	Baker's Navarretia		Special	CRPR - 1B.1
Navarretia leucocephala leucocephala	White-flower Navarretia			
Navarretia leucocephala minima	Least Navarretia			
Oenanthe sarmentosa	Water-parsley			
Oreostemma alpigenum andersonii	Anderson's Tundra Aster			
Orthilia secunda	One-side Wintergreen			
Oxypolis occidentalis	Western Cowbane			
Panicum acuminatum acuminatum				Not on any status lists
Panicum dichotomiflorum	NA			
Paspalum distichum	Joint Paspalum			
Pedicularis attollens	NA			
Pedicularis groenlandica	NA			
Perideridia bolanderi bolanderi	Bolander's Yampah			
Perideridia bolanderi involucrata	Bolander's Yampah			
Perideridia kelloggii	Kellogg's Yampah			
Perideridia lemmonii	Lemmon's Yampah			
Perideridia oregana	Oregon Yampah			

Perideridia parishii latifolia	Parish's Yampah			
Persicaria hydropiper	NA			Not on any status lists
Persicaria hydropiperoides				Not on any status lists
Persicaria lapathifolia				Not on any status lists
Persicaria maculosa	NA			Not on any status lists
Persicaria punctata	NA			Not on any status lists
Phacelia distans	NA			
Pilularia americana	NA			
Plagiobothrys acanthocarpus	Adobe Popcorn-flower			
Plagiobothrys austiniae	Austin's Popcorn-flower			
Plagiobothrys greenei	Greene's Popcorn-flower			
Plagiobothrys humistratus	Dwarf Popcorn-flower			
Plagiobothrys leptocladus	Alkali Popcorn-flower			
Plagiobothrys tener	NA			
Plantago elongata elongata	Slender Plantain			
Platanthera sparsiflora sparsiflora	Canyon Bog Orchid			
Platanus racemosa	California Sycamore			
Pogogyne douglasii	NA			
Pogogyne zizyphoroides				Not on any status lists
Populus trichocarpa	NA			Not on any status lists
Porterella carnosula	Western Porterella			
Potamogeton diversifolius	Water-thread Pondweed			
Potamogeton foliosus foliosus	Leafy Pondweed			
Potamogeton gramineus	Grassy Pondweed			
Potamogeton illinoensis	Illinois Pondweed			
Potamogeton natans	Floating Pondweed			
Potamogeton nodosus	Longleaf Pondweed			
Potamogeton pusillus pusillus	Slender Pondweed			
Primula tetrandra	NA			Not on any status lists
Psilocarphus brevissimus brevissimus	Dwarf Woolly-heads			

Psilocarphus oregonus	Oregon Woolly-heads			
Ranunculus alismifolius alismellus	Water-plantain Buttercup			
Ranunculus alismifolius alismifolius	Water-plantain Buttercup			
Ranunculus alismifolius hartwegii				Not on any status lists
Ranunculus aquatilis aquatilis	White Water Buttercup			
Ranunculus bonariensis	NA			
Ranunculus flammula flammula	Lesser Spearwort			
Ranunculus hystriculus				Not on any status lists
Ranunculus pusillus pusillus	Pursh's Buttercup			
Ranunculus repens	NA			
Ranunculus sardous	NA			
Ranunculus sceleratus	NA			
Rhododendron columbianum				Not on any status lists
Rhododendron occidentale occidentale	Western Azalea			
Rhynchospora californica	California Beakrush		Special	CRPR - 1B.1
Rhynchospora capitellata	Brownish Beakrush		Special	CRPR - 2B.2
Rorippa curvisiliqua curvisiliqua	Curve-pod Yellowcress			
Rorippa palustris palustris	Bog Yellowcress			
Rotala ramosior	Toothcup			
Sagina saginoides	Arctic Pearlwort			
Sagittaria cuneata	Wapatum Arrowhead			
Sagittaria latifolia latifolia	Broadleaf Arrowhead			
Sagittaria longiloba	Longbarb Arrowhead			
Sagittaria montevidensis calycina				Not on any status lists
Sagittaria sanfordii	Sanford's Arrowhead		Special	CRPR - 1B.2
Salix boothii	Booth's Willow			
Salix eastwoodiae	Eastwood's Willow			
Salix exigua exigua	Narrowleaf Willow			
Salix geyeriana	Geyer's Willow			
Salix gooddingii	Goodding's Willow			
Salix hookeriana	Hooker's Willow			
Salix jepsonii	Jepson's Willow			
Salix laevigata	Polished Willow			

Salix lasiandra lasiandra				Not on any status lists
Salix lasiolepis lasiolepis	Arroyo Willow			
Salix lemmonii	Lemmon's Willow			
Salix melanopsis	Dusky Willow			
Salix sitchensis	Sitka Willow			
Schoenoplectus acutus occidentalis	Hardstem Bulrush			
Schoenoplectus californicus	California Bulrush			
Schoenoplectus mucronatus	NA			
Schoenoplectus tabernaemontani	Softstem Bulrush			
Scirpus congdonii	Congdon's Bulrush			
Scirpus diffusus	Umbrella Bulrush			
Scirpus microcarpus	Small-fruit Bulrush			
Senecio triangularis	Arrow-leaf Groundsel			
Sequoia sempervirens				
Sidalcea calycosa calycosa	Annual Checker-mallow			
Sidalcea hirsuta	Hairy Checker-mallow			
Sidalcea oregana hydrophila	Water-loving Checker-mallow		Special	CRPR - 1B.2
Sidalcea oregana oregana	Oregon Checker-mallow			
Sisyrinchium elmeri	Elmer's Blue-eyed-grass			
Solidago elongata				Not on any status lists
Sphenosciadium capitellatum	Swamp Whiteheads			
Spiranthes romanzoffiana	Hooded Ladies'-tresses			
Spirodela polyrhiza	NA			
Stachys ajugoides	Bugle Hedge-nettle			
Stachys pycnantha	Short-spike Hedge-nettle			
Stachys stricta	Sonoma Hedge-nettle			
Stuckenia pectinata				Not on any status lists
Taxus brevifolia				
Toxicoscordion venenosum venenosum				Not on any status lists
Triglochin maritima	Common Bog Arrow-grass			
Typha domingensis	Southern Cattail			
Typha latifolia	Broadleaf Cattail			
Utricularia gibba	Humped Bladderwort			
Veronica americana	American Speedwell			

Veronica anagallis-aquatica	NA			
Viola macloskeyi	NA			
Wolffia brasiliensis	Pointed Watermeal		Special	CRPR - 2B.3
Zannichellia palustris	Horned Pondweed			

Attachment D

July 2019

IDENTIFYING GDEs UNDER SGMA
Best Practices for using the NC Dataset

The Sustainable Groundwater Management Act (SGMA) requires that groundwater dependent ecosystems (GDEs) be identified in Groundwater Sustainability Plans (GSPs). As a starting point, the Department of Water Resources (DWR) is providing the Natural Communities Commonly Associated with Groundwater Dataset (NC Dataset) online[1] to help Groundwater Sustainability Agencies (GSAs), consultants, and stakeholders identify GDEs within individual groundwater basins. To apply information from the NC Dataset to local areas, GSAs should combine it with the best available science on local hydrology, geology, and groundwater levels to verify whether polygons in the NC dataset are likely supported by groundwater in an aquifer (Figure 1)[2]. This document highlights six best practices for using local groundwater data to confirm whether mapped features in the NC dataset are supported by groundwater.

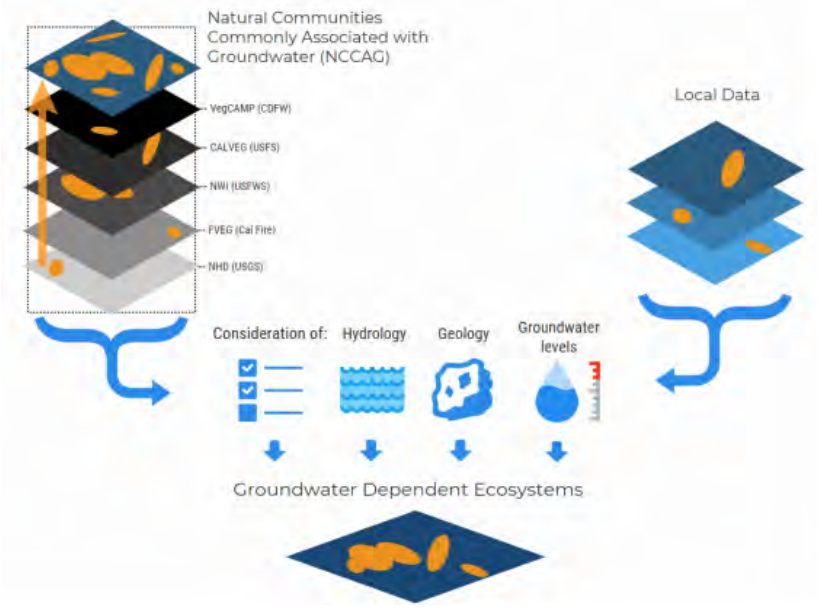


Figure 1. Considerations for GDE identification.
Source: DWR[2]

[1] NC Dataset Online Viewer: https://gis.water.ca.gov/app/NCDatasetViewer/
[2] California Department of Water Resources (DWR). 2018. Summary of the "Natural Communities Commonly Associated with Groundwater" Dataset and Online Web Viewer. Available at: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Data-and-Tools/Files/Statewide-Reports/Natural-Communities-Dataset-Summary-Document.pdf

The NC Dataset identifies vegetation and wetland features that are good indicators of a GDE. The dataset is comprised of 48 publicly available state and federal datasets that map vegetation, wetlands, springs, and seeps commonly associated with groundwater in California[3]. It was developed through a collaboration between DWR, the Department of Fish and Wildlife, and The Nature Conservancy (TNC). TNC has also provided detailed guidance on identifying GDEs from the NC dataset[4] on the Groundwater Resource Hub[5], a website dedicated to GDEs.

BEST PRACTICE #1. Establishing a Connection to Groundwater

Groundwater basins can be comprised of one continuous aquifer (Figure 2a) or multiple aquifers stacked on top of each other (Figure 2b). In unconfined aquifers (Figure 2a), using the depth-to-groundwater and the rooting depth of the vegetation is a reasonable method to infer groundwater dependence for GDEs. If groundwater is well below the rooting (and capillary) zone of the plants and any wetland features, the ecosystem is considered disconnected and groundwater management is not likely to affect the ecosystem (Figure 2d). However, it is important to consider local conditions (e.g., soil type, groundwater flow gradients, and aquifer parameters) and to review groundwater depth data from multiple seasons and water year types (wet and dry) because intermittent periods of high groundwater levels can replenish perched clay lenses that serve as the water source for GDEs (Figure 2c). Maintaining these natural groundwater fluctuations are important to sustaining GDE health.

Basins with a stacked series of aquifers (Figure 2b) may have varying levels of pumping across aquifers in the basin, depending on the production capacity or water quality associated with each aquifer. If pumping is concentrated in deeper aquifers, SGMA still requires GSAs to sustainably manage groundwater resources in shallow aquifers, such as perched aquifers, that support springs, surface water, domestic wells, and GDEs (Figure 2). This is because vertical groundwater gradients across aquifers may result in pumping from deeper aquifers to cause adverse impacts onto beneficial users reliant on shallow aquifers or interconnected surface water. The goal of SGMA is to sustainably manage groundwater resources for current and future social, economic, and environmental benefits. While groundwater pumping may not be currently occurring in a shallower aquifer, use of this water may become more appealing and economically viable in future years as pumping restrictions are placed on the deeper production aquifers in the basin to meet the sustainable yield and criteria. Thus, identifying GDEs in the basin should done irrespective to the amount of current pumping occurring in a particular aquifer, so that future impacts on GDEs due to new production can be avoided. A good rule of thumb to follow is: *if groundwater can be pumped from a well - it's an aquifer*.

[3] For more details on the mapping methods, refer to: Klausmeyer, K., J. Howard, T. Keeler-Wolf, K. Davis-Fadtke, R. Hull, A. Lyons. 2018. Mapping Indicators of Groundwater Dependent Ecosystems in California: Methods Report. San Francisco, California. Available at: https://groundwaterresourcehub.org/public/uploads/pdfs/iGDE_data_paper_20180423.pdf
[4] "Groundwater Dependent Ecosystems under the Sustainable Groundwater Management Act: Guidance for Preparing Groundwater Sustainability Plans" is available at: https://groundwaterresourcehub.org/gde-tools/gsp-guidance-document/
[5] The Groundwater Resource Hub: www.GroundwaterResourceHub.org

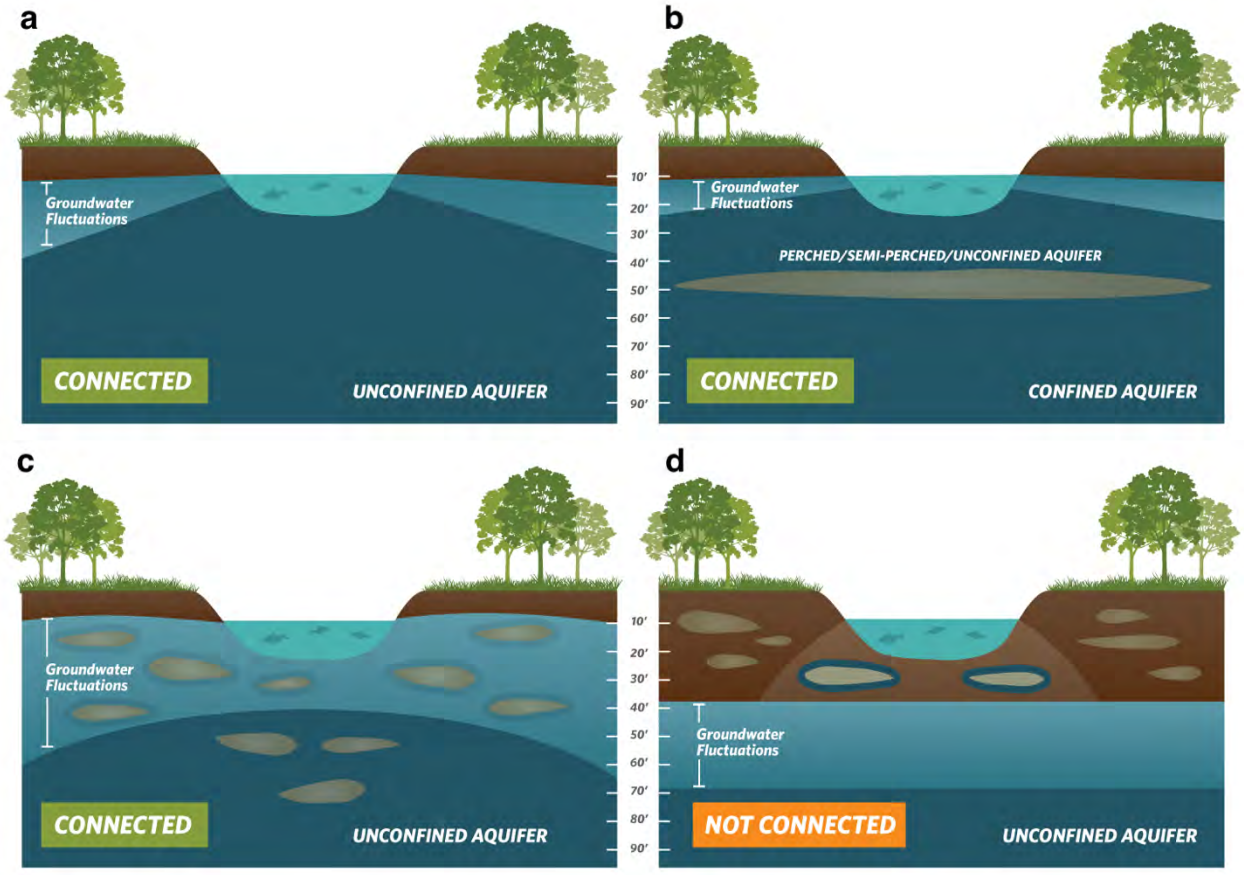


Figure 2. Confirming whether an ecosystem is connected to groundwater. Top: (a) Under the ecosystem is an unconfined aquifer with depth-to-groundwater fluctuating seasonally and interannually within 30 feet from land surface. (b) Depth-to-groundwater in the shallow aquifer is connected to overlying ecosystem. Pumping predominately occurs in the confined aquifer, but pumping is possible in the shallow aquifer. Bottom: (c) Depth-to-groundwater fluctuations are seasonally and interannually large, however, clay layers in the near surface prolong the ecosystem's connection to groundwater. (d) Groundwater is disconnected from surface water, and any water in the vadose (unsaturated) zone is due to direct recharge from precipitation and indirect recharge under the surface water feature. These areas are not connected to groundwater and typically support species that do not require access to groundwater to survive.

BEST PRACTICE #2. Characterize Seasonal and Interannual Groundwater Conditions

SGMA requires GSAs to describe current and historical groundwater conditions when identifying GDEs [23 CCR §354.16(g)]. Relying solely on the SGMA benchmark date (January 1, 2015) or any other single point in time to characterize groundwater conditions (e.g., depth-to-groundwater) is inadequate because managing groundwater conditions with data from one time point fails to capture the seasonal and interannual variability typical of California's climate. DWR's Best Management Practices document on water budgets[6] recommends using 10 years of water supply and water budget information to describe how historical conditions have impacted the operation of the basin within sustainable yield, implying that a baseline[7] could be determined based on data between 2005 and 2015. Using this or a similar time period, depending on data availability, is recommended for determining the depth-to-groundwater.

GDEs depend on groundwater levels being close enough to the land surface to interconnect with surface water systems or plant rooting networks. The most practical approach[8] for a GSA to assess whether polygons in the NC dataset are connected to groundwater is to rely on groundwater elevation data. As detailed in TNC's GDE guidance document[4], one of the key factors to consider when mapping GDEs is to contour depth-to-groundwater in the aquifer that is supporting the ecosystem (see Best Practice #5).

Groundwater levels fluctuate over time and space due to California's Mediterranean climate (dry summers and wet winters), climate change (flood and drought years), and subsurface heterogeneity in the subsurface (Figure 3). Many of California's GDEs have adapted to dealing with intermittent periods of water stress, however if these groundwater conditions are prolonged, adverse impacts to GDEs can result. While depth-to-groundwater levels within 30 feet[4] of the land surface are generally accepted as being a proxy for confirming that polygons in the NC dataset are supported by groundwater, it is highly advised that fluctuations in the groundwater regime be characterized to understand the seasonal and interannual groundwater variability in GDEs. Utilizing groundwater data from one point in time can misrepresent groundwater levels required by GDEs, and inadvertently result in adverse impacts to the GDEs. Time series data on groundwater elevations and depths are available on the SGMA Data Viewer[9]. However, if insufficient data are available to describe groundwater conditions within or near polygons from the NC dataset, include those polygons in the GSP until data gaps are reconciled in the monitoring network (see Best Practice #6).

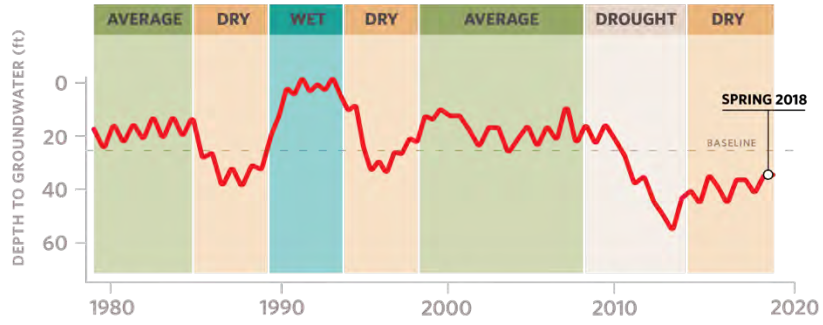


Figure 3. Example seasonality and interannual variability in depth-to-groundwater over time. Selecting one point in time, such as Spring 2018, to characterize groundwater conditions in GDEs fails to capture what groundwater conditions are necessary to maintain the ecosystem status into the future so adverse impacts are avoided.

[6] DWR. 2016. Water Budget Best Management Practice. Available at: https://water.ca.gov/LegacyFiles/groundwater/sgm/pdfs/BMP_Water_Budget_Final_2016-12-23.pdf

[7] Baseline is defined under the GSP regulations as "historic information used to project future conditions for hydrology, water demand, and availability of surface water and to evaluate potential sustainable management practices of a basin." [23 CCR §351(e)]

[8] Groundwater reliance can also be confirmed via stable isotope analysis and geophysical surveys. For more information see The GDE Assessment Toolbox (Appendix IV, GDE Guidance Document for GSPs[4]).

[9] SGMA Data Viewer: https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer

BEST PRACTICE #3. Ecosystems Often Rely on Both Groundwater and Surface Water

GDEs are plants and animals that rely on groundwater for all or some of its water needs, and thus can be supported by multiple water sources. The presence of non-groundwater sources (e.g., surface water, soil moisture in the vadose zone, applied water, treated wastewater effluent, urban stormwater, irrigated return flow) within and around a GDE does not preclude the possibility that it is supported by groundwater, too. SGMA defines GDEs as "ecological communities and species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface" [23 CCR §351(m)]. Hence, depth-to-groundwater data should be used to identify whether NC polygons are supported by groundwater and should be considered GDEs. In addition, SGMA requires that significant and undesirable adverse impacts to beneficial users of surface water be avoided. Beneficial users of surface water include environmental users such as plants or animals[10], which therefore must be considered when developing minimum thresholds for depletions of interconnected surface water.

GSAs are only responsible for impacts to GDEs resulting from groundwater conditions in the basin, so if adverse impacts to GDEs result from the diversion of applied water, treated wastewater, or irrigation return flow away from the GDE, then those impacts will be evaluated by other permitting requirements (e.g., CEQA) and may not be the responsibility of the GSA. However, if adverse impacts occur to the GDE due to changing groundwater conditions resulting from pumping or groundwater management activities, then the GSA would be responsible (Figure 4).

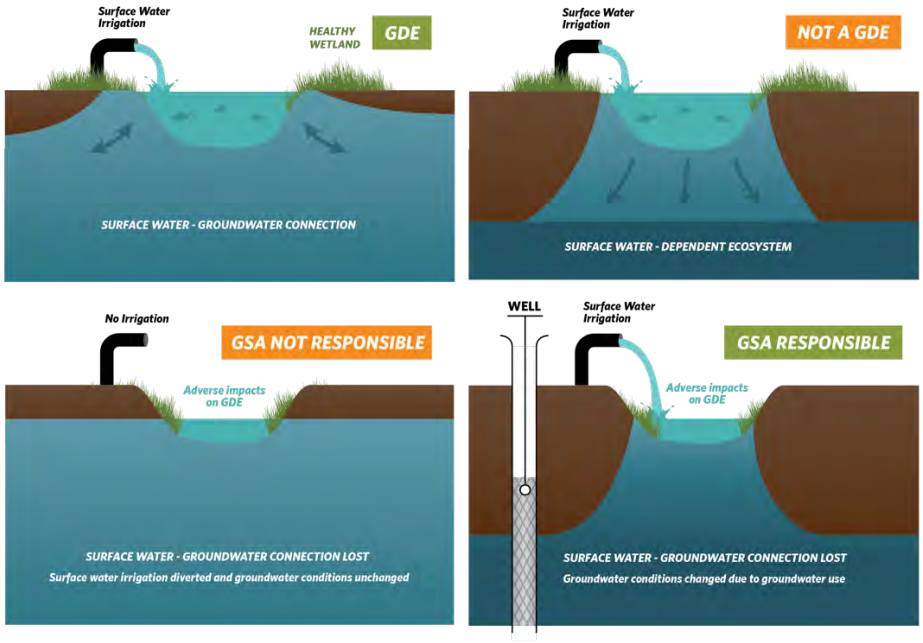


Figure 4. Ecosystems often depend on multiple sources of water. Top: (Left) Surface water and groundwater are interconnected, meaning that the GDE is supported by both groundwater and surface water. (Right) Ecosystems that are only reliant on non-groundwater sources are not groundwater-dependent. Bottom: (Left) An ecosystem that was once dependent on an interconnected surface water, but loses access to groundwater solely due to surface water diversions may not be the GSA's responsibility. (Right) Groundwater dependent ecosystems once dependent on an interconnected surface water system, but loses that access due to groundwater pumping is the GSA's responsibility.

[10] For a list of environmental beneficial users of surface water by basin, visit: https://groundwaterresourcehub.org/gde-tools/environmental-surface-water-beneficiaries/

BEST PRACTICE #4. Select Representative Groundwater Wells

Identifying GDEs in a basin requires that groundwater conditions are characterized to confirm whether polygons in the NC dataset are supported by the underlying aquifer. To do this, proximate groundwater wells should be identified to characterize groundwater conditions (Figure 5). When selecting representative wells, it is particularly important to consider the subsurface heterogeneity around NC polygons, especially near surface water features where groundwater and surface water interactions occur around heterogeneous stratigraphic units or aquitards formed by fluvial deposits. The following selection criteria can help ensure groundwater levels are representative of conditions within the GDE area:

- Choose wells that are within 5 kilometers (3.1 miles) of each NC Dataset polygons because they are more likely to reflect the local conditions relevant to the ecosystem. If there are no wells within 5km of the center of a NC dataset polygon, then there is insufficient information to remove the polygon based on groundwater depth. Instead, it should be retained as a potential GDE until there are sufficient data to determine whether or not the NC Dataset polygon is supported by groundwater.

- Choose wells that are screened within the surficial unconfined aquifer and capable of measuring the true water table.

- Avoid relying on wells that have insufficient information on the screened well depth interval for excluding GDEs because they could be providing data on the wrong aquifer. This type of well data should not be used to remove any NC polygons.

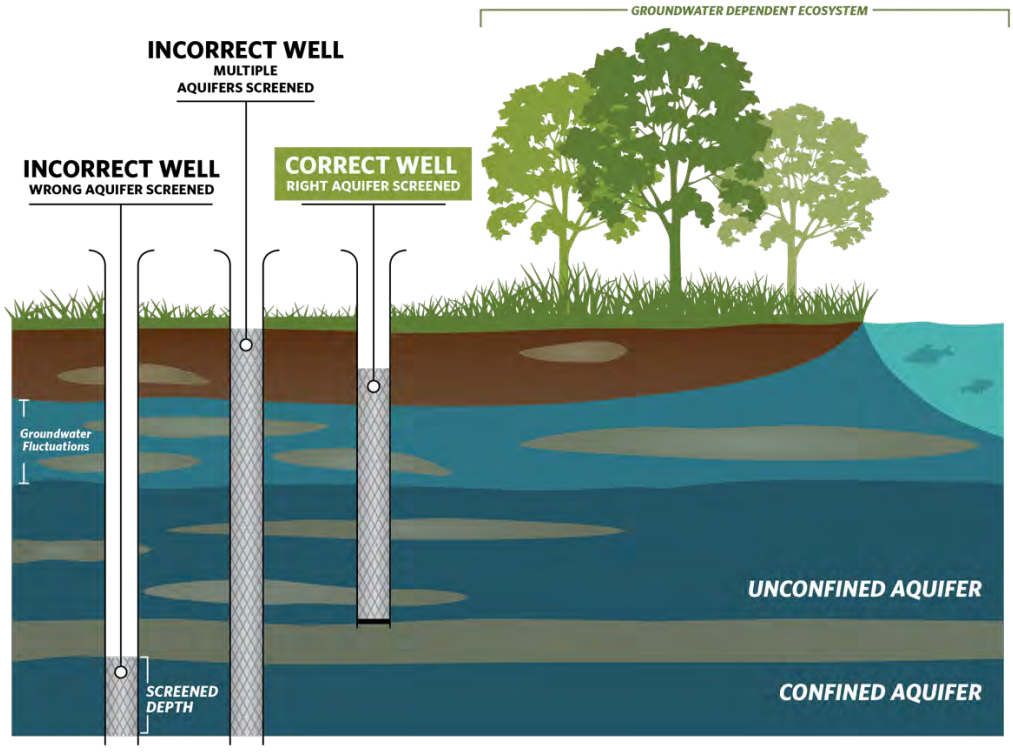


Figure 5. Selecting representative wells to characterize groundwater conditions near GDEs.

BEST PRACTICE #5. Contouring Groundwater Elevations

The common practice to contour depth-to-groundwater over a large area by interpolating measurements at monitoring wells is unsuitable for assessing whether an ecosystem is supported by groundwater. This practice causes errors when the land surface contains features like stream and wetland depressions because it assumes the land surface is constant across the landscape and depth-to-groundwater is constant below these low-lying areas (Figure 6a). A more accurate approach is to interpolate groundwater elevations at monitoring wells to get groundwater elevation contours across the landscape. This layer can then be subtracted from land surface elevations from a Digital Elevation Model (DEM)[11] to estimate depth-to-groundwater contours across the landscape (Figure b; Figure 7). This will provide a much more accurate contours of depth-to-groundwater along streams and other land surface depressions where GDEs are commonly found.

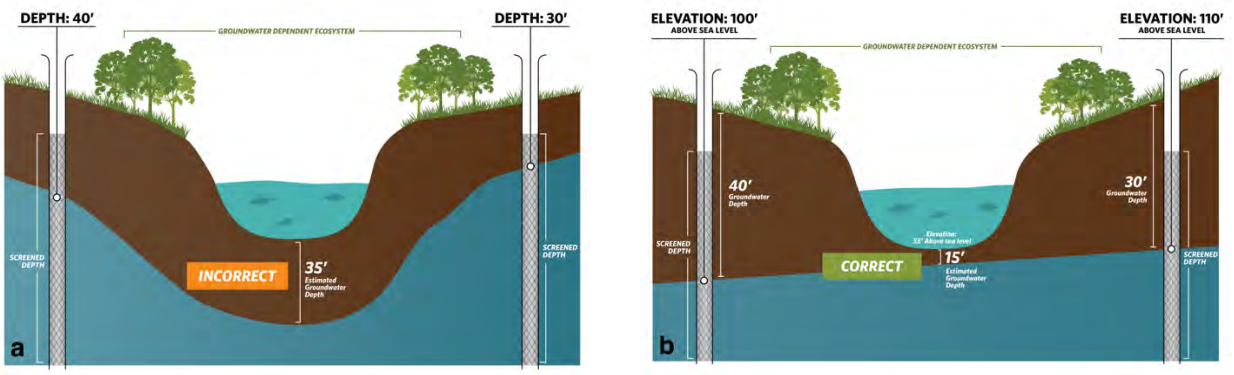


Figure 6. Contouring depth-to-groundwater around surface water features and GDEs. (a) Groundwater level interpolation using depth-to-groundwater data from monitoring wells. (b) Groundwater level interpolation using groundwater elevation data from monitoring wells and DEM data.

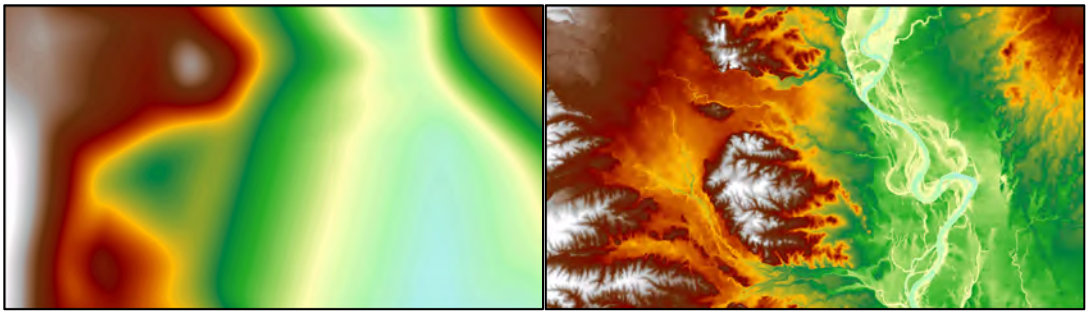


Figure 7. Depth-to-groundwater contours in Northern California. (Left) Contours were interpolated using depth-to-groundwater measurements determined at each well. (Right) Contours were determined by interpolating groundwater elevation measurements at each well and superimposing ground surface elevation from DEM spatial data to generate depth-to-groundwater contours. The image on the right shows a more accurate depth-to-groundwater estimate because it takes the local topography and elevation changes into account.

[11] USGS Digital Elevation Model data products are described at: https://www.usgs.gov/core-science-systems/ngp/3dep/about-3dep-products-services and can be downloaded at: https://iewer.nationalmap.gov/basic/

BEST PRACTICE #6. Best Available Science

Adaptive management is embedded within SGMA and provides a process to work toward sustainability over time by beginning with the best available information to make initial decisions, monitoring the results of those decisions, and using the data collected through monitoring programs to revise decisions in the future. In many situations, the hydrologic connection of NC dataset polygons will not initially be clearly understood if site-specific groundwater monitoring data are not available. If sufficient data are not available in time for the 2020/2022 plan, The Nature Conservancy strongly advises that questionable polygons from the NC dataset be included in the GSP until data gaps are reconciled in the monitoring network. Erring on the side of caution will help minimize inadvertent impacts to GDEs as a result of groundwater use and management actions during SGMA implementation.

KEY DEFINITIONS

Groundwater basin is an aquifer or stacked series of aquifers with reasonably well-defined boundaries in a lateral direction, based on features that significantly impede groundwater flow, and a definable bottom. *23 CCR §341(g)(1)*

Groundwater dependent ecosystem (GDE) are ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface. *23 CCR §351(m)*

Interconnected surface water (ISW) surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted. *23 CCR §351(o)*

Principal aquifers are aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems. *23 CCR §351(aa)*

ABOUT US

The Nature Conservancy is a science-based nonprofit organization whose mission is *to conserve the lands and waters on which all life depends*. To support successful SGMA implementation that meets the future needs of people, the economy, and the environment, TNC has developed tools and resources (www.groundwaterresourcehub.org) intended to reduce costs, shorten timelines, and increase benefits for both people and nature.

Attachment E

Maps of representative monitoring sites in relation to key beneficial users

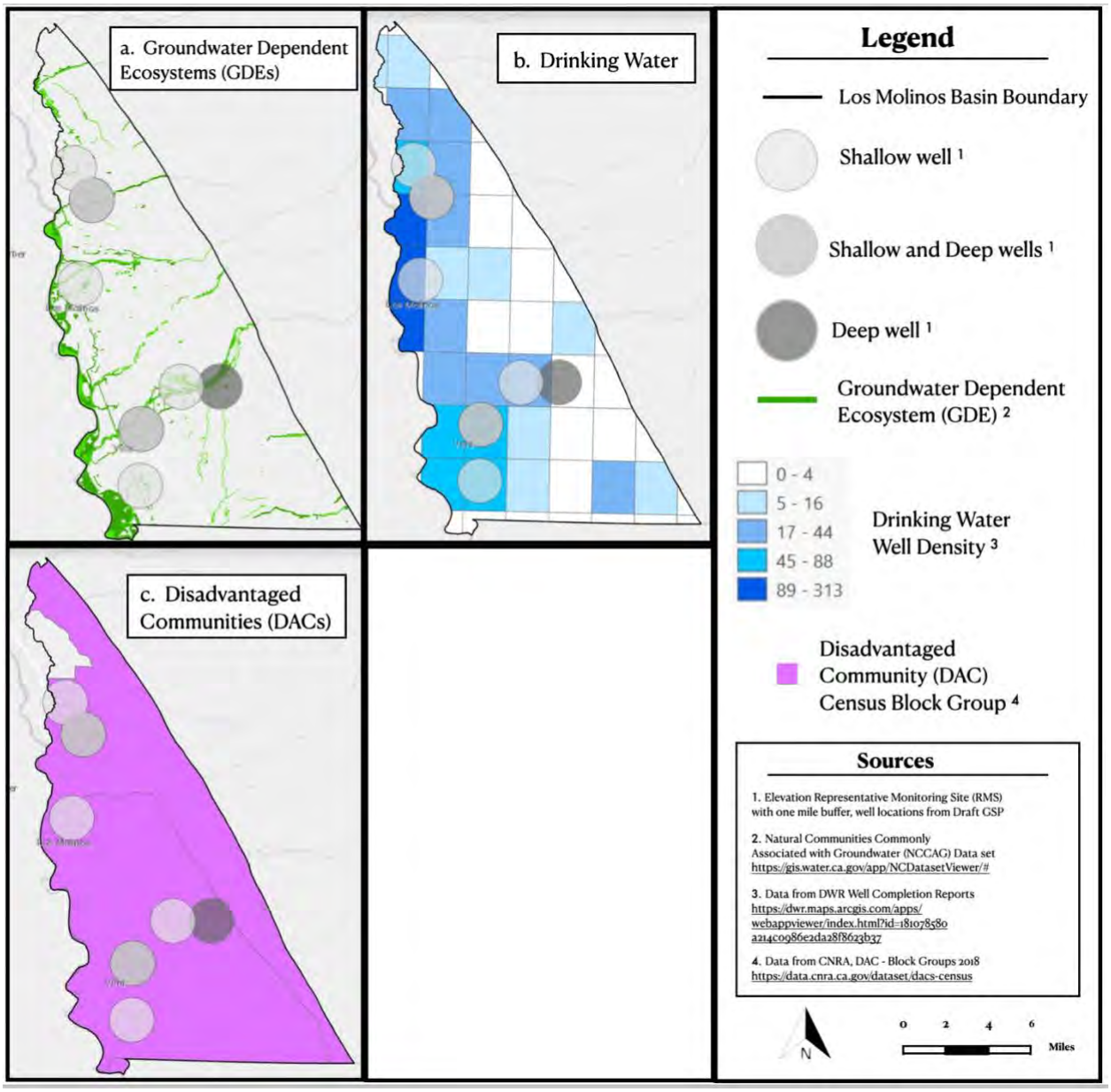


Figure 1. Groundwater elevation representative monitoring sites in relation to key beneficial users: a) Groundwater Dependent Ecosystems (GDEs), b) Drinking Water users, c) Disadvantaged Communities (DACs), and d) Tribes.

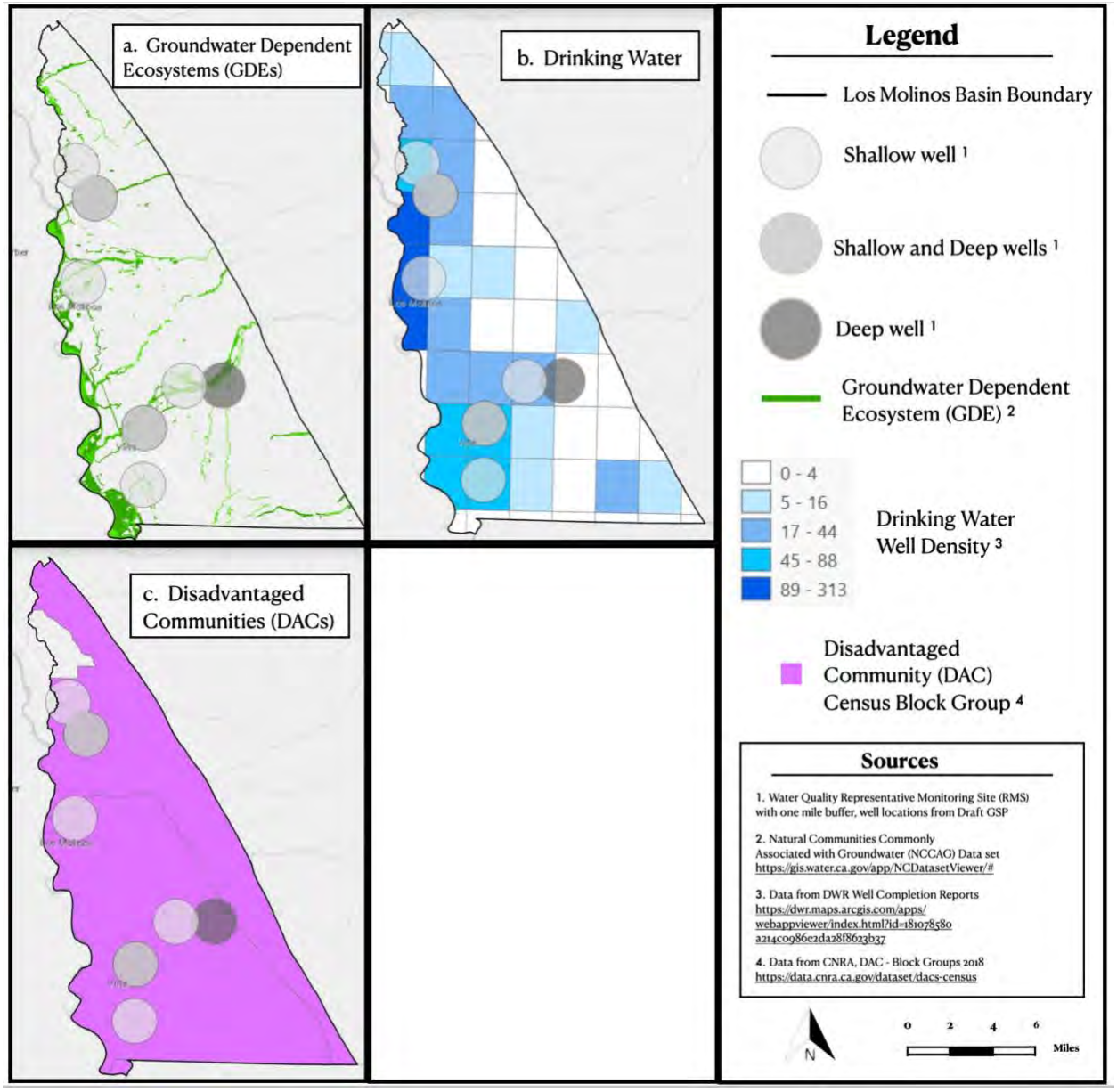


Figure 2. Groundwater quality representative monitoring sites in relation to key beneficial users: a) Groundwater Dependent Ecosystems (GDEs), b) Drinking Water users, c) Disadvantaged Communities (DACs), and d) Tribes.

Appendix 2-F

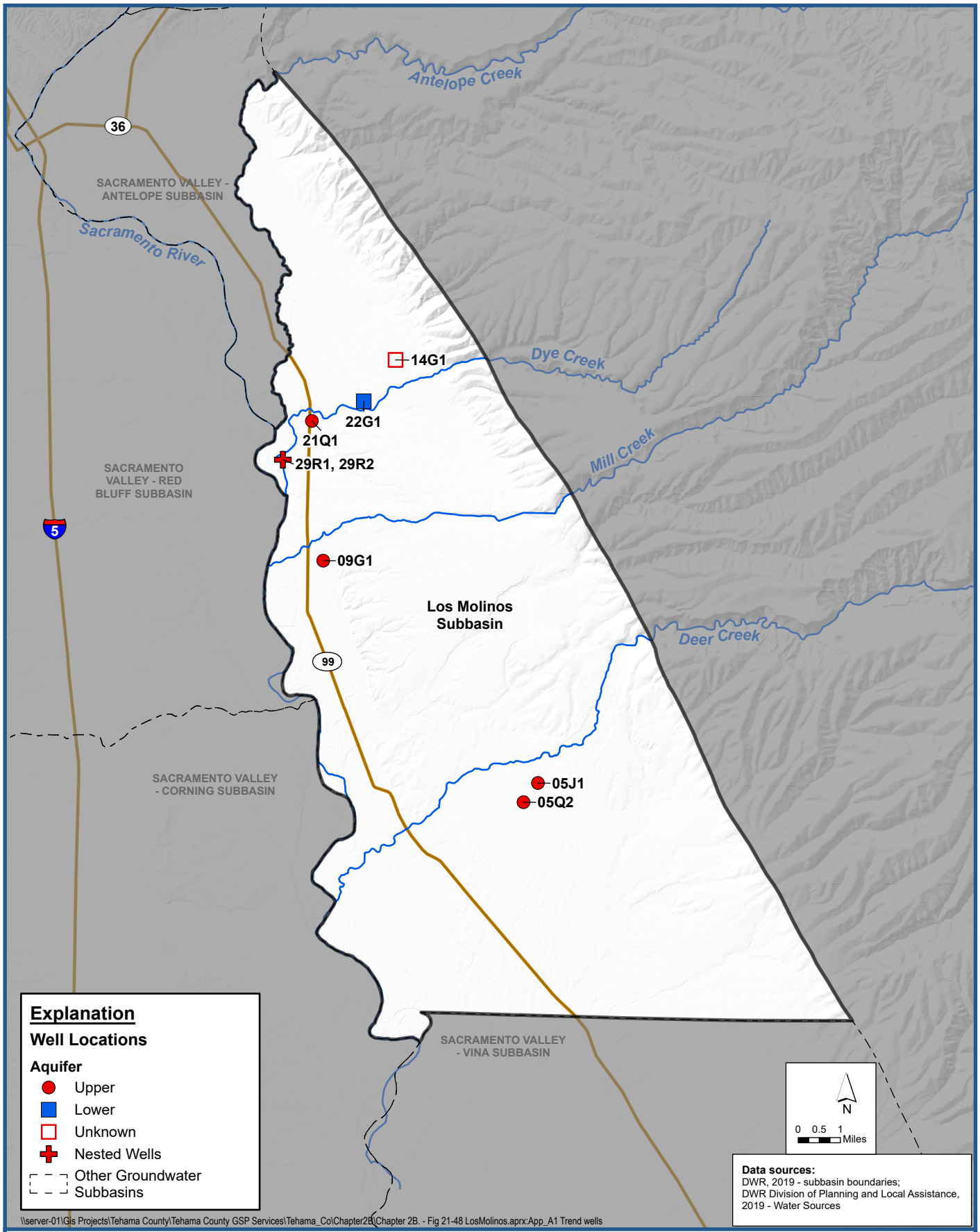
Hydrograph Well Locations, Hydrographs, and Groundwater Level Trend Statistics

Appendix 2-F

Hydrograph Well Locations, Hydrographs, and Trend Statistics

Los Molinos Subbasin

Hydrographs of Wells Used for Groundwater Level Trend Analysis



TEHAMA COUNTY

LSCE Team

Locations of Wells Used for Groundwater Level Trend Analysis

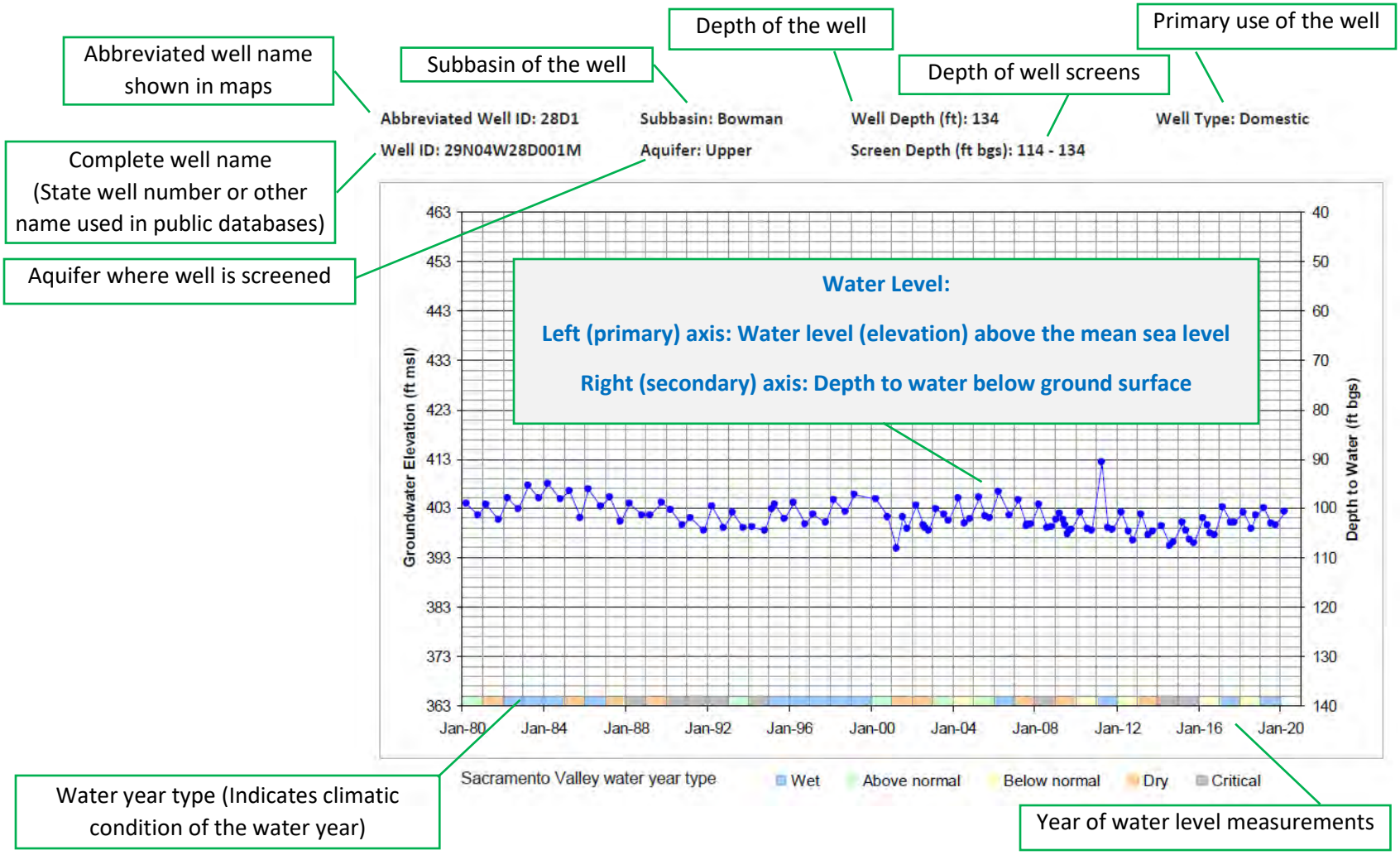
Groundwater Sustainability Plan
Los Molinos Subbasin

Figure 1

Table A1 - Trends of Groundwater Level Change from 1990 to 2018

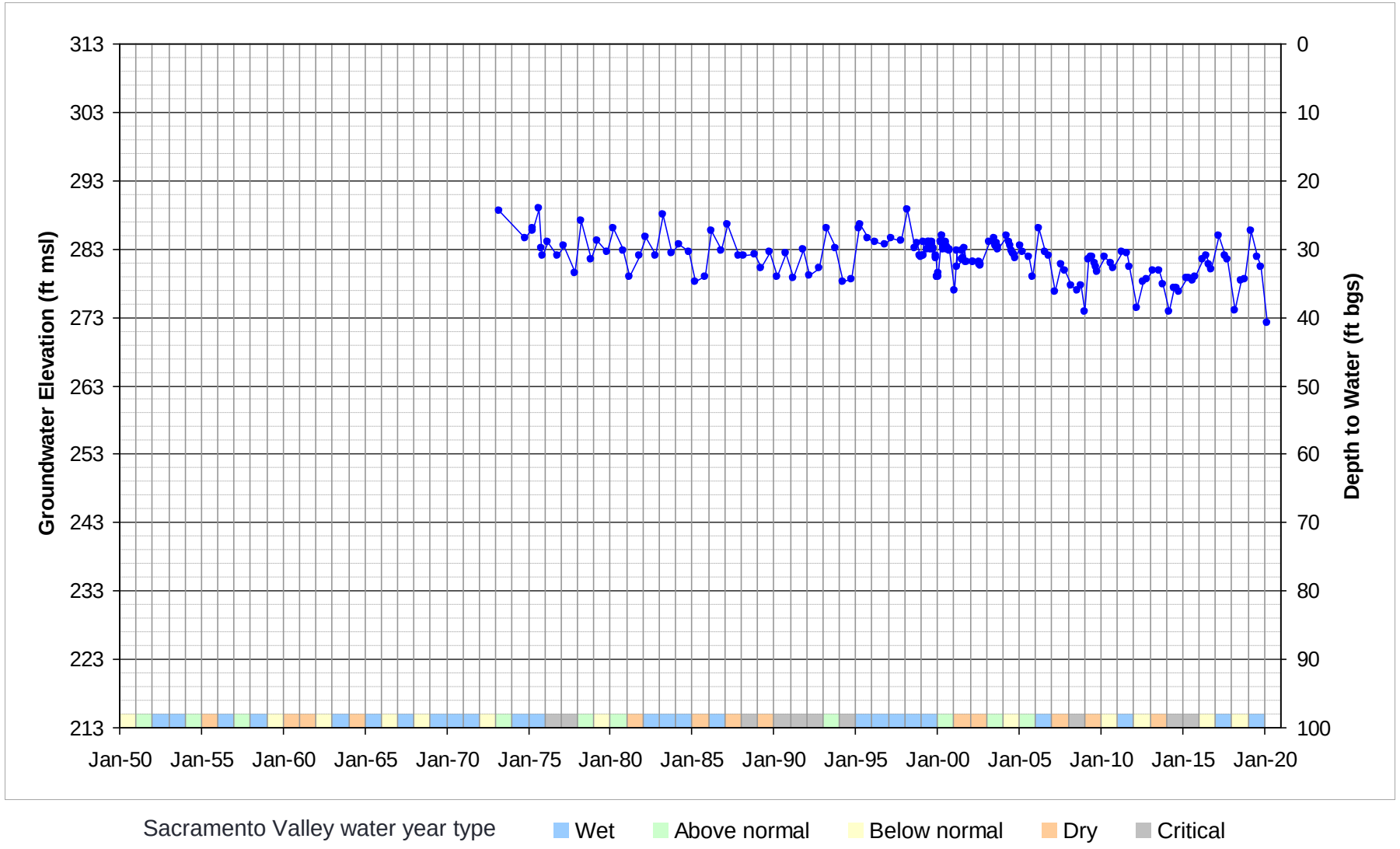
						Parametric Method (OLSR)			Non-parametric Methods	
Abbreviated Well Name	Well Name	Well Depth (ft)	Screen Interval (ft bgs)	Aquifer	Number of Seasonal High (Spring) Measurements from 1990 to 2018	Regression of Water Level Change (ft/year)	R^2	p value	Mann-Kendall Test	Theil-Sen Slope (ft/year)
05J1	24N01W05J001M	178	NA	Upper	28	-0.16	0.13	0.06	Insufficient evidence to identify a significant trend	-0.18
05Q2	24N01W05Q002M	150	60 - 150	Upper	28	-0.27	0.42	0.00	Significant decreasing trend	-0.25
09G1	25N02W09G001M	60	40 - 60	Upper	28	-0.10	0.08	0.15	Insufficient evidence to identify a significant trend	-0.10
21Q1	26N02W21Q001M	55	48 - 55	Upper	28	-0.08	0.19	0.02	Significant decreasing trend	-0.07
29R1	26N02W29R001M	184	183.5 - 184	Upper	28	0.20	0.87	0.00	Significant increasing trend	0.19
22G1	26N02W22G001M	604	350 - 587	Lower	23	-0.19	0.36	0.00	Significant decreasing trend	-0.13
29R2	26N02W29R002M	900	839.5 - 840.5	Lower	28	-0.12	0.23	0.01	Significant decreasing trend	-0.13
14G1	26N02W14G001M	394	NA	Unknown (likely composite)	26	-0.11	0.15	0.05	Insufficient evidence to identify a significant trend	-0.11

Water Level Hydrograph: Shows water level change over time



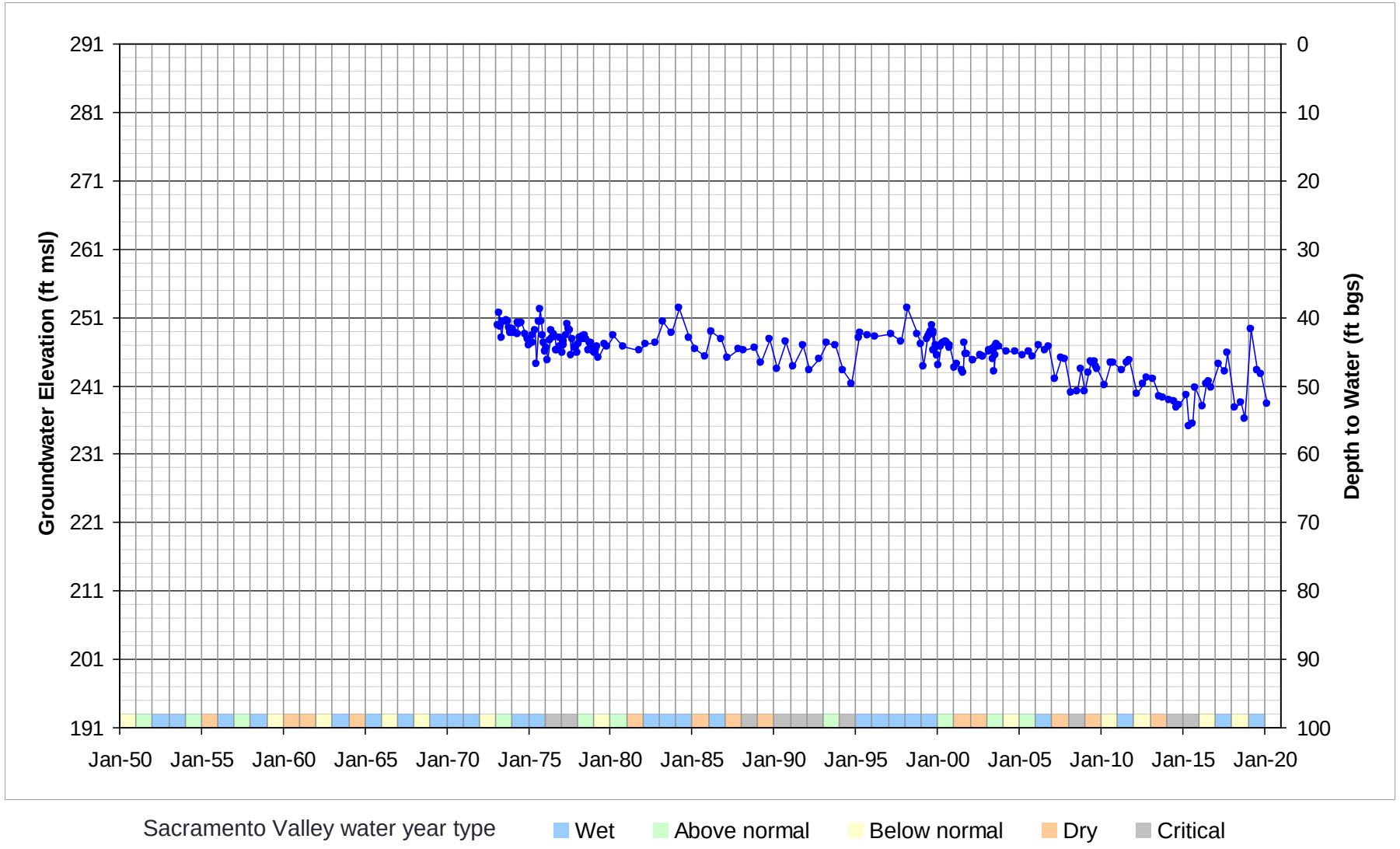
Abbreviated Well Name: 05J1 **Subbasin: Los Molinos** **Well Depth (ft): 178** **Well Type: Domestic**

Well Name: 24N01W05J001M **Aquifer: Upper** **Screen Depth (ft bgs): N/A**



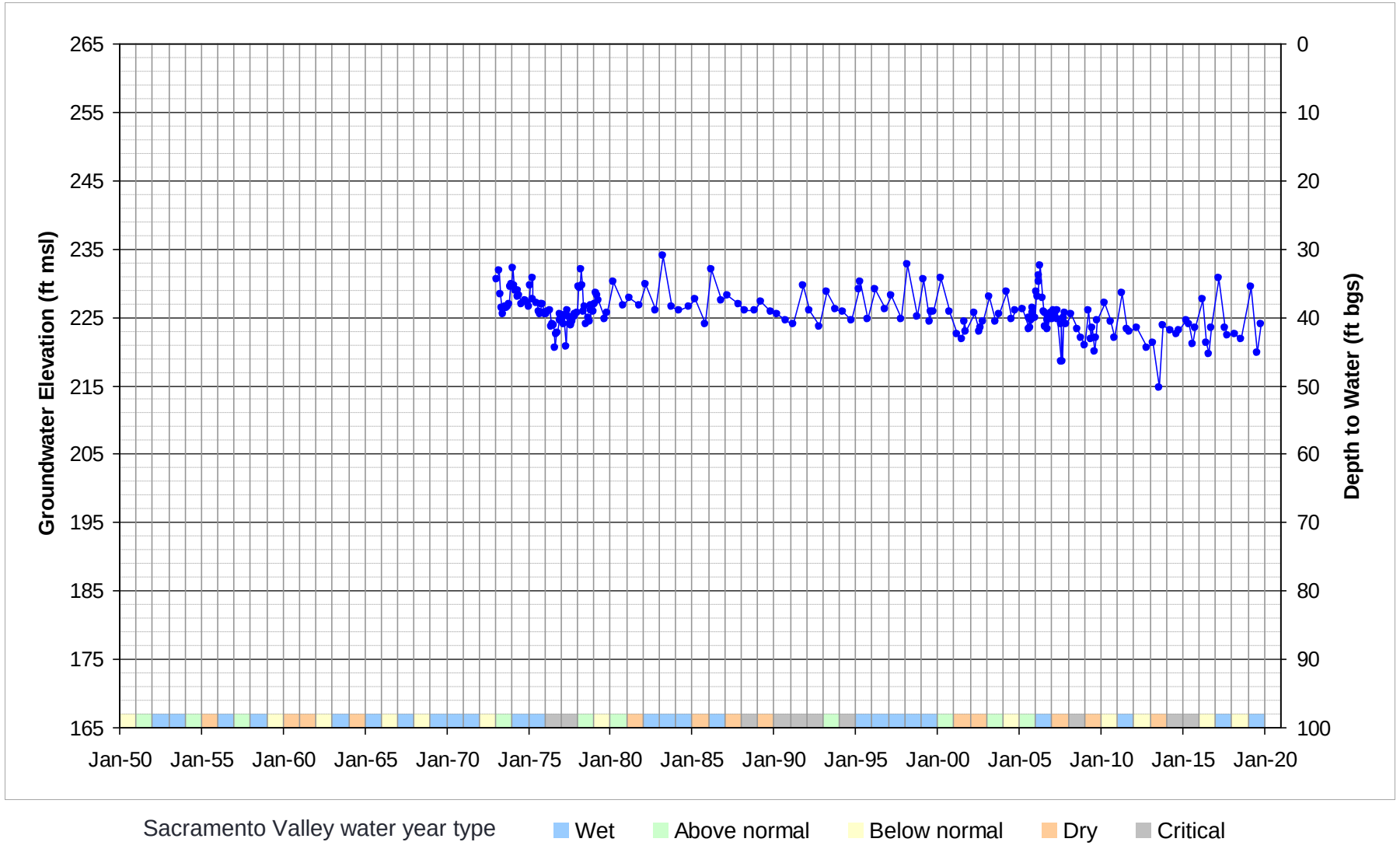
Abbreviated Well Name: 05Q2 **Subbasin: Los Molinos** **Well Depth (ft): 150** **Well Type: Domestic**

Well Name: 24N01W05Q002M **Aquifer: Upper** **Screen Depth (ft bgs): 60 - 150**



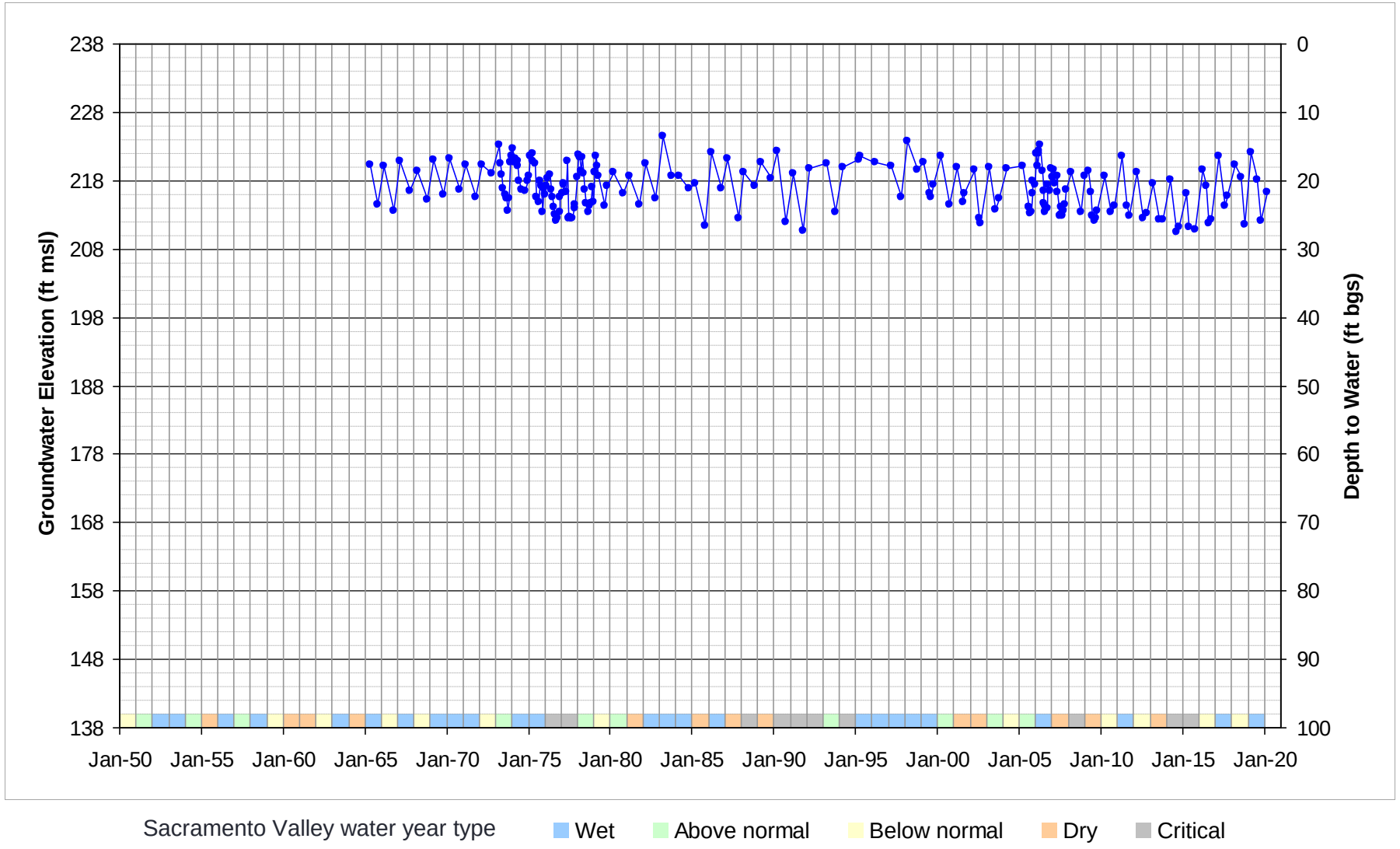
Abbreviated Well Name: 09G1 **Subbasin: Los Molinos** **Well Depth (ft): 60** **Well Type: Domestic**

Well Name: 25N02W09G001M **Aquifer: Upper** **Screen Depth (ft bgs): 40 - 60**



Abbreviated Well Name: 21Q1 **Subbasin: Los Molinos** **Well Depth (ft): 55** **Well Type: Domestic**

Well Name: 26N02W21Q001M **Aquifer: Upper** **Screen Depth (ft bgs): 48 - 55**

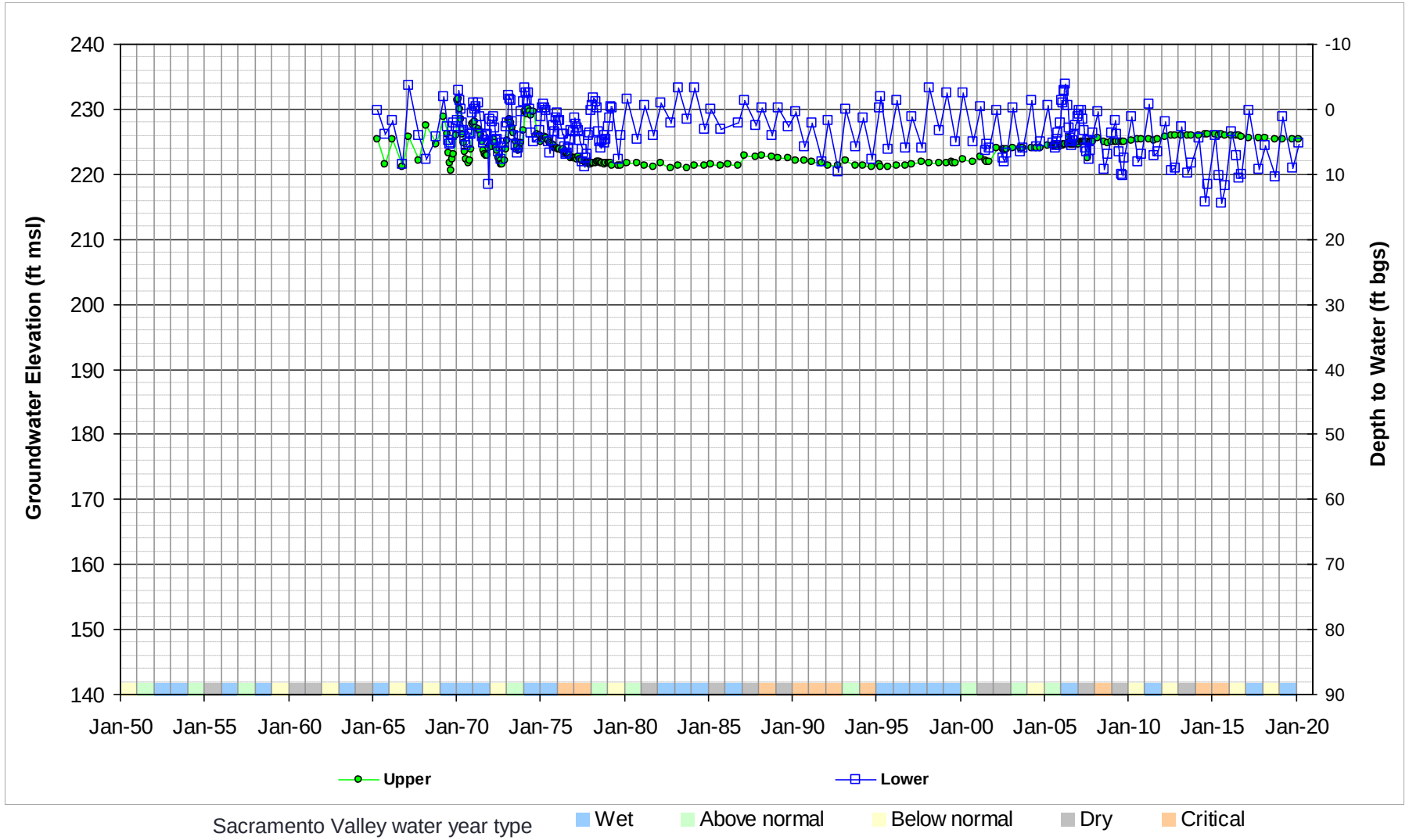


Abbreviated Well Namess: Upper: 29R1 and 29R2 (Nested Wells)

Well Names: Upper: 26N02W29R001M; Lower: 26N02W29R002M

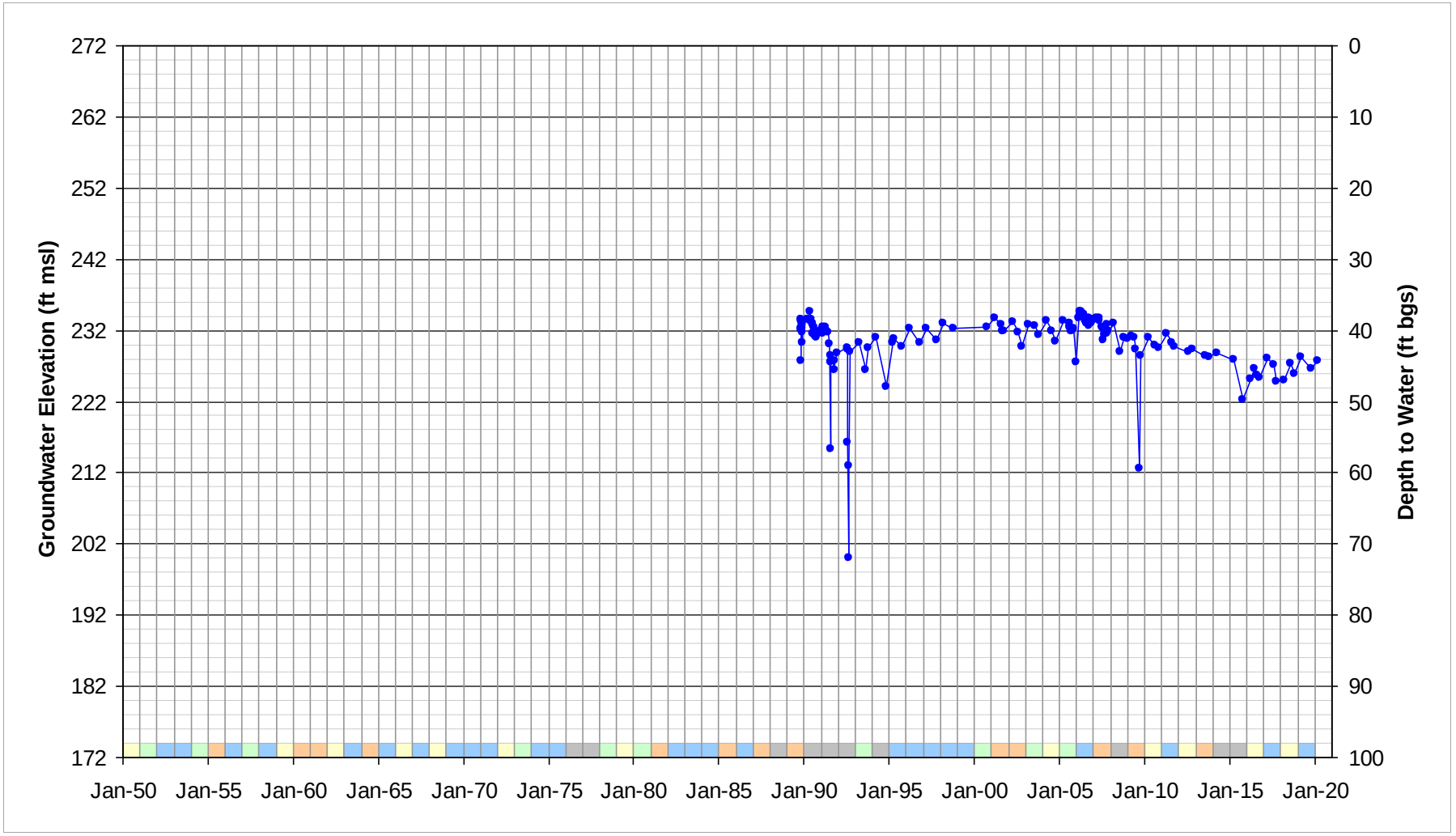
Subbasin: Los Molinos

Screens Depths (ft bgs): Upper: 183.5-184; Lower: 839.5-840.5



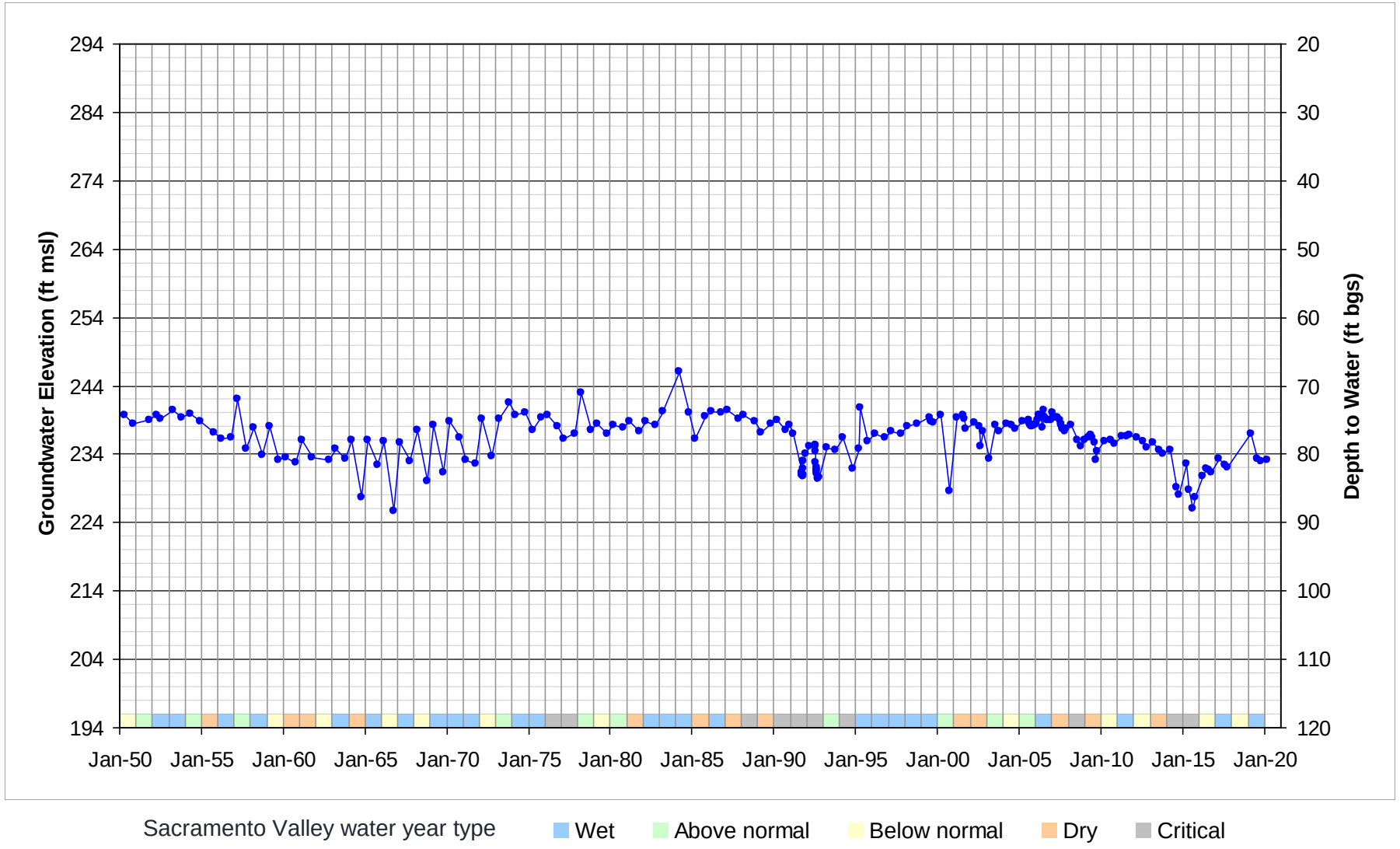
Abbreviated Well Name: 22G1 **Subbasin: Los Molinos** **Well Depth (ft): 604** **Well Type: Irrigation**

Well Name: 26N02W22G001M **Aquifer: Lower** **Screen Depth (ft bgs): 350 - 587**

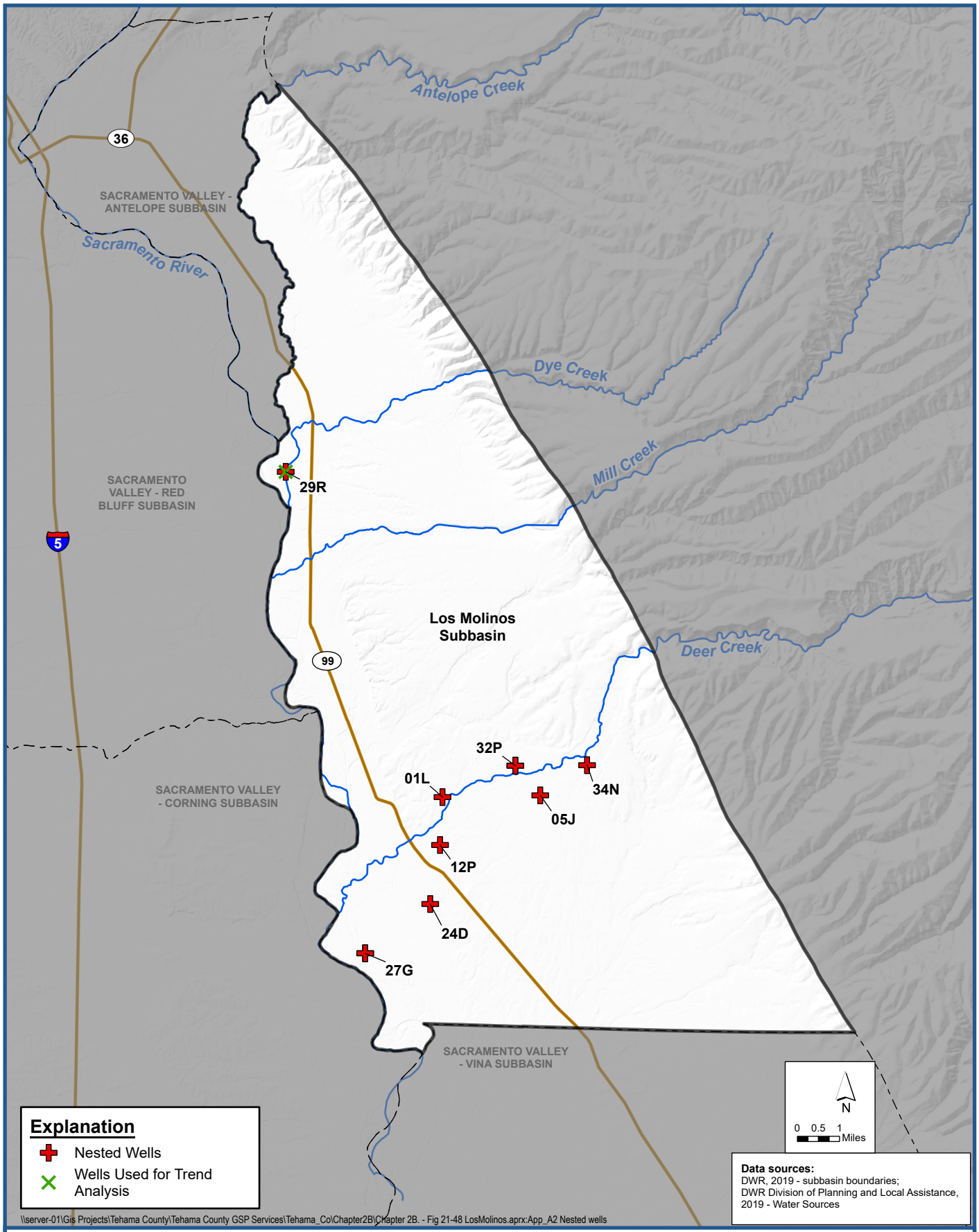


Abbreviated Well Name: 14G1 **Subbasin: Los Molinos** **Well Depth (ft): 394** **Well Type: Irrigation**

Well Name: 26N02W14G001M **Aquifer: Unknown** **Screen Depth (ft bgs): N/A**



Hydrographs of Nested Wells



TEHAMA COUNTY
FLOOD CONTROL AND WATER CONSERVATION DISTRICT

LSCE Team

Locations of Nested Wells with Water Level Hydrographs

Groundwater Sustainability Plan
Los Molinos Subbasin

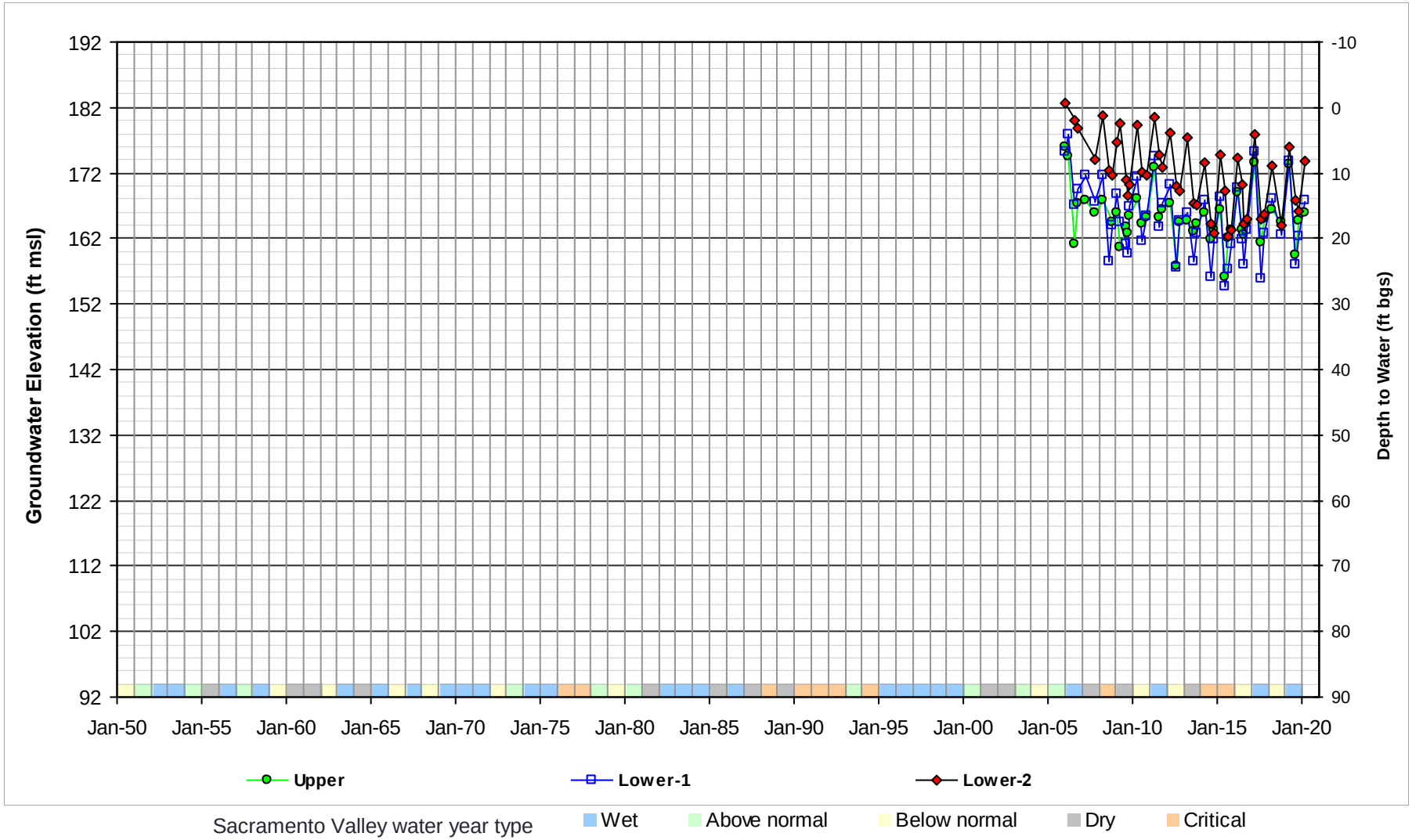
Figure A-2

Well Nest Name: 27G

Well Names: Upper: 24N02W27G003M; Lower-1: 24N02W27G002M; Lower-2: 24N02W27G001M

Subbasin: Los Molinos

Screens Depth (ft bgs): Upper: 168-178; Lower-1: 495-505; Lower-2: 911-921

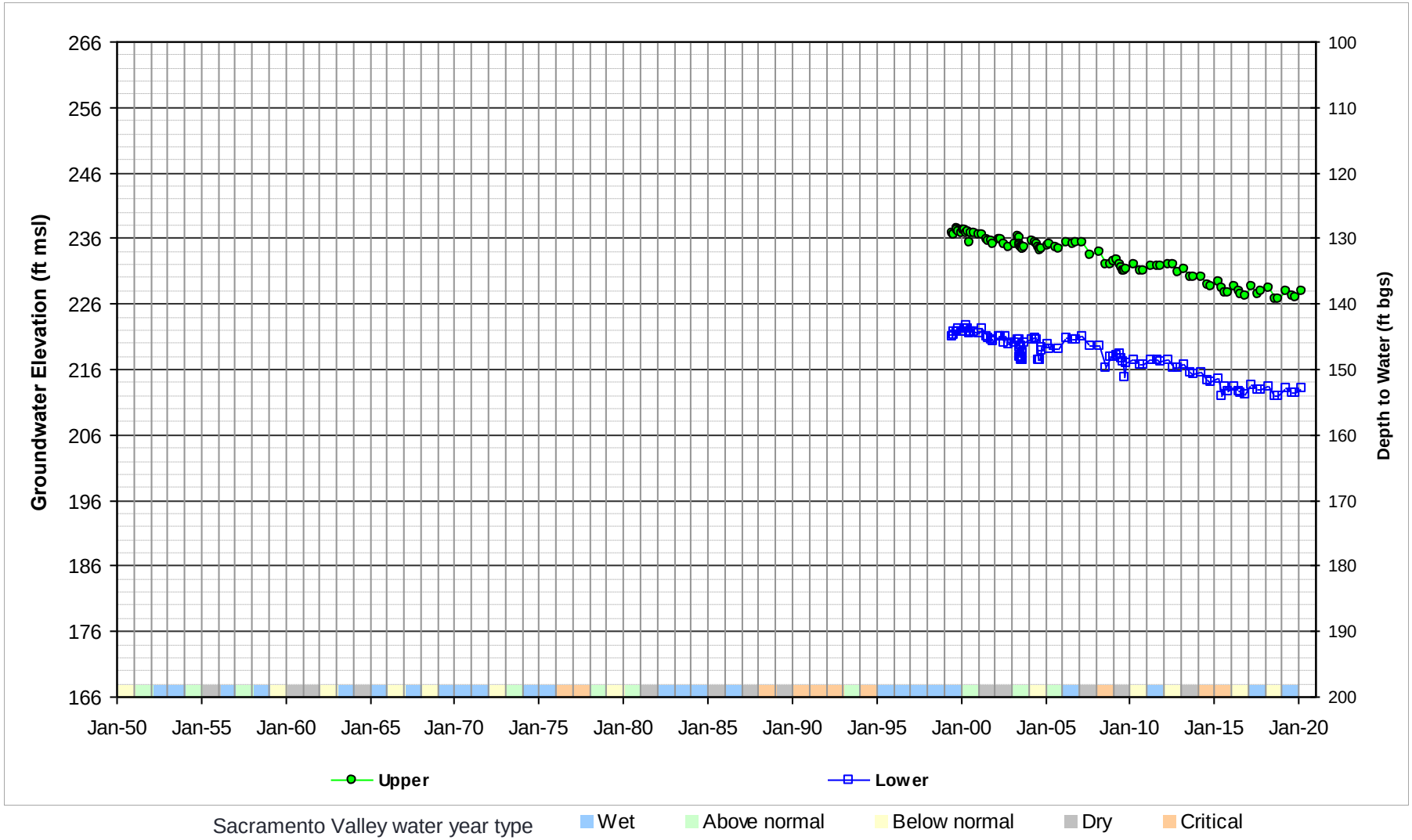


Well Nest Name: 34N

Well Names: Upper: 25N01W34N002M; Lower: 25N01W34N003M

Subbasin: Los Molinos

Screens Depth (ft bgs): Upper: 207-217; Lower: 625-680

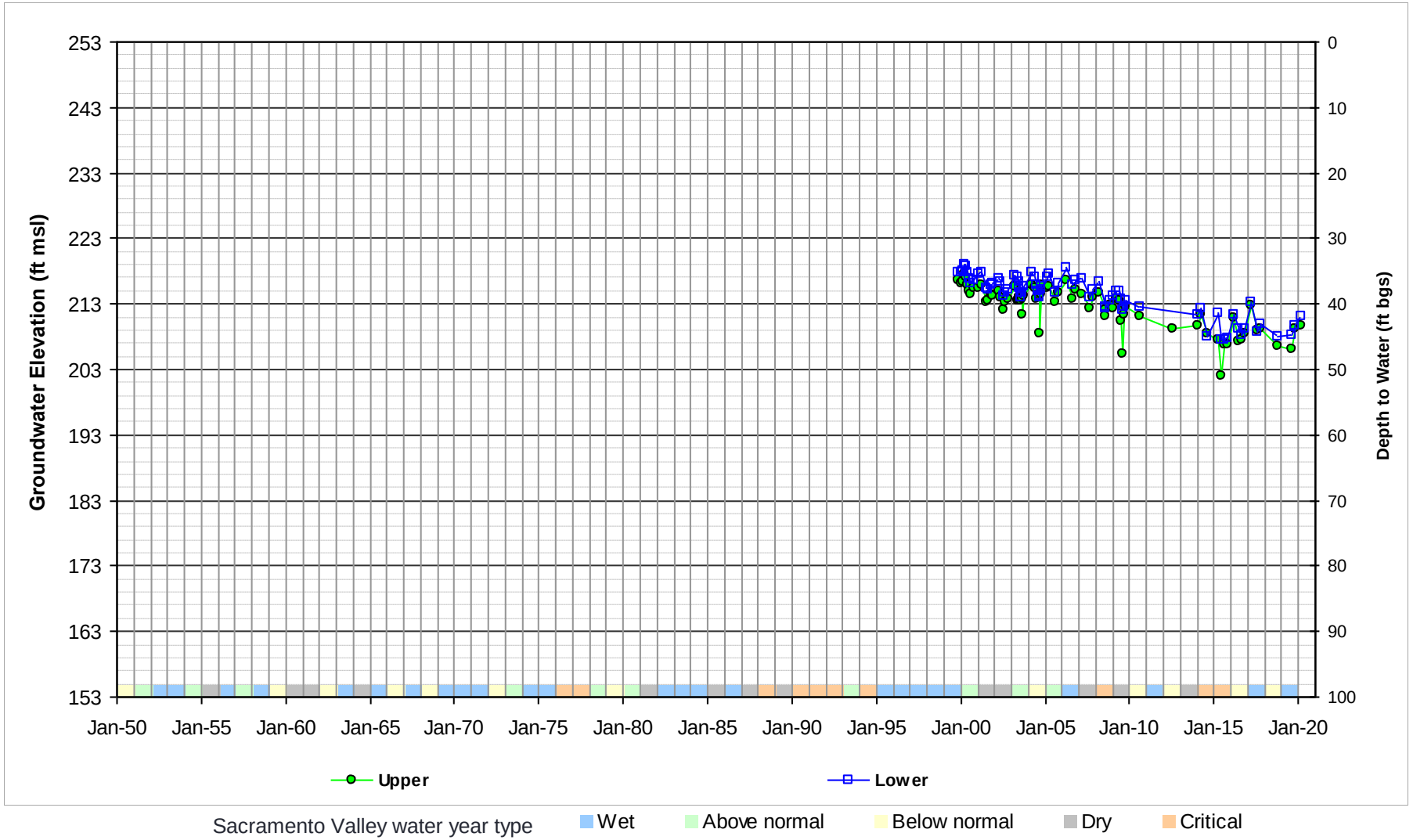


Well Nest Name: 01L

Well Names: Upper: 24N02W01L001M; Lower: 24N02W01L002M

Subbasin: Los Molinos

Screen Depth (ft bgs): Upper: 350-450; Lower: 750-840

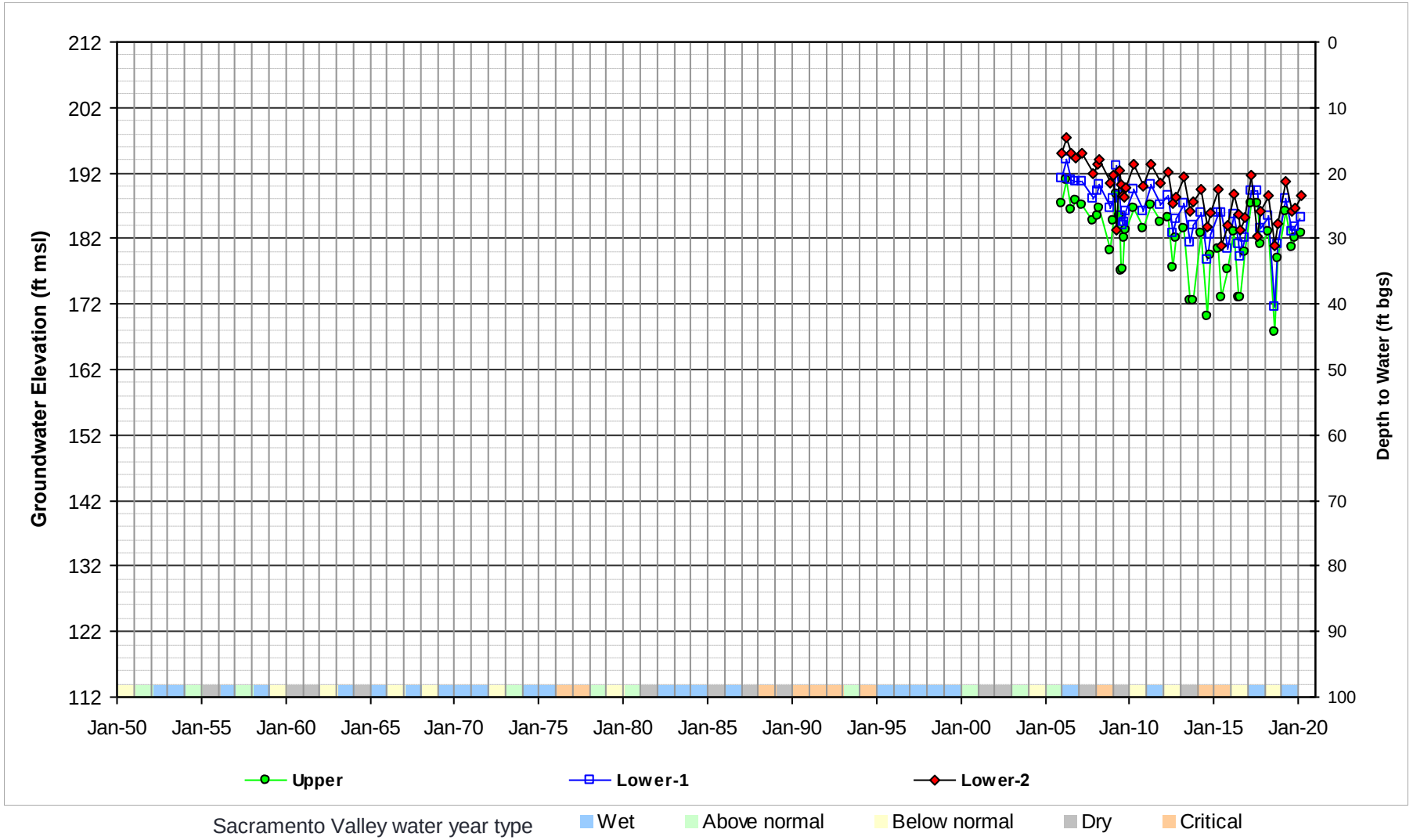


Well Nest Name: 24D

Subbasin: Los Molinos

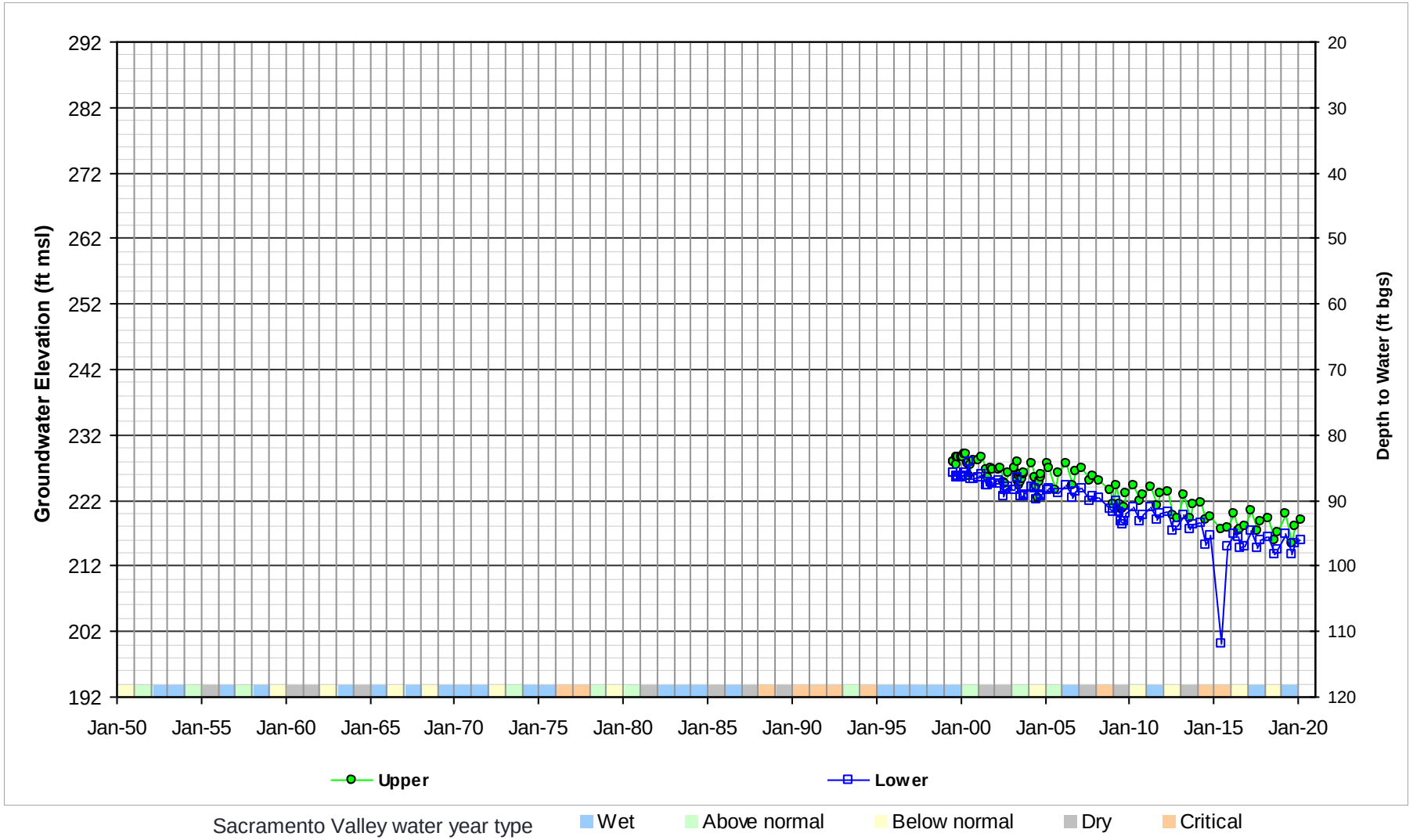
Well Names: Upper: 24N02W24D004M; Lower-1: 24N02W24D003M; Lower-2: 24N02W24D002M

Screen Depth (ft bgs): Upper: 345-355; Lower-1: 731.5-741.5; Lower-2: 990-1000



Well Nest Name: 05J **Well Names: Upper: 24N01W05J003M; Lower: 24N01W05J004M**

Subbasin: Los Molinos **Screen Depth (ft bgs): Upper: 295-335; Lower: 650-722**

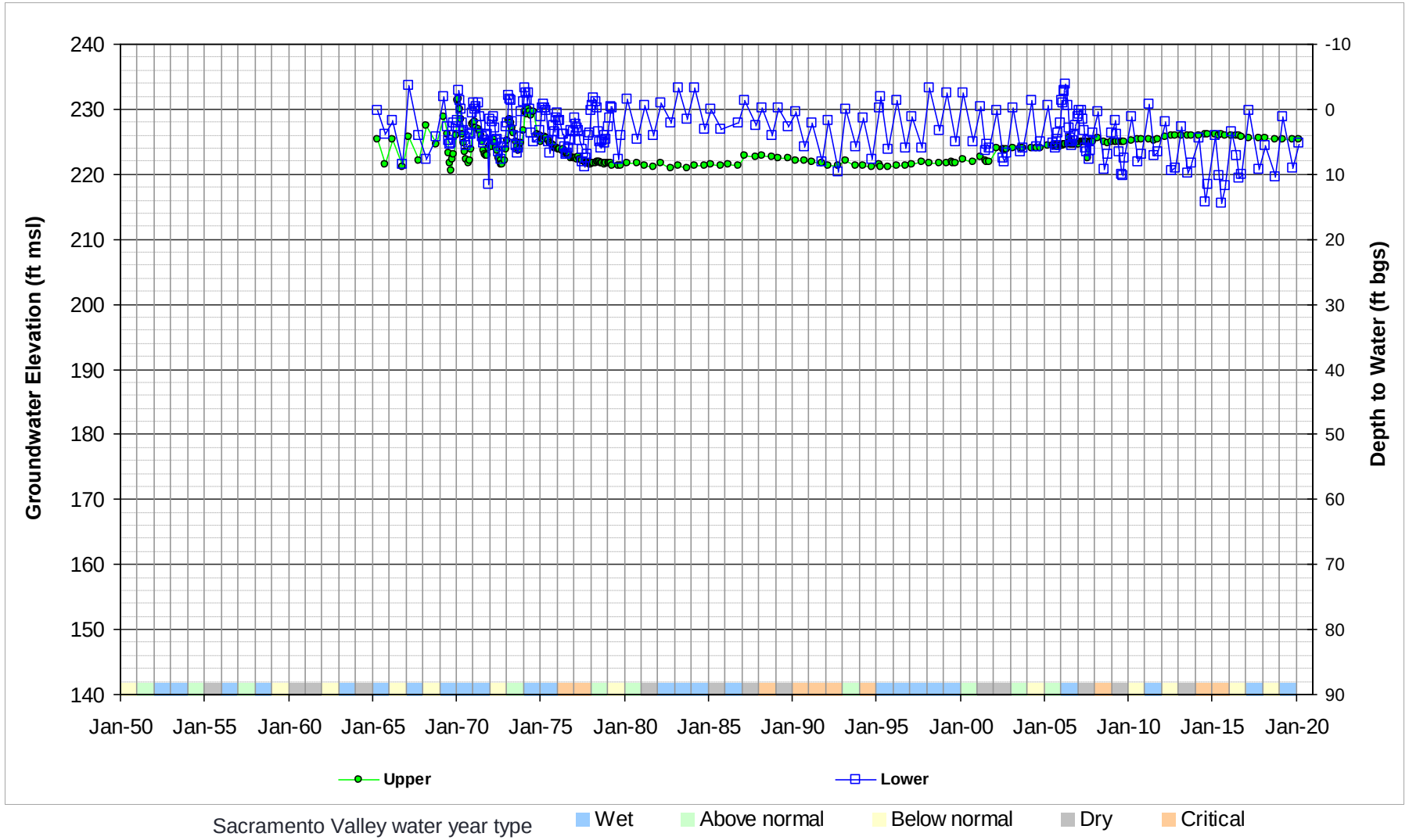


Well Nest Name: 29R

Subbasin: Los Molinos

Well Names: Upper: 26N02W29R001M; Lower: 26N02W29R002M

Screens Depths (ft bgs): Upper: 183.5-184; Lower: 839.5-840.5

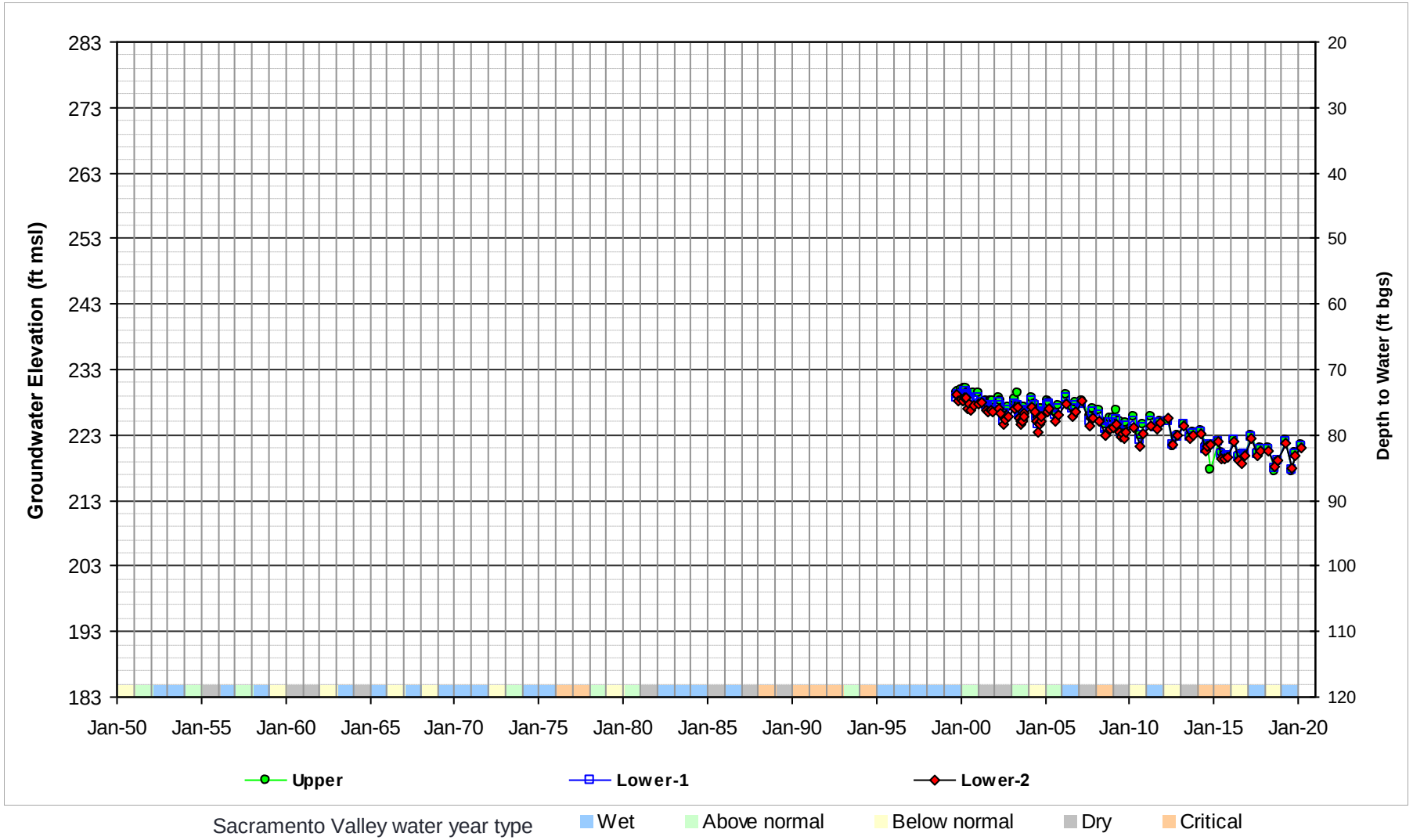


Well Nest Name: 32P

Well Namess: Upper: 25N01W32P001M; Lower-1: 25N01W32P002M; Lower-2: 25N01W32P003M

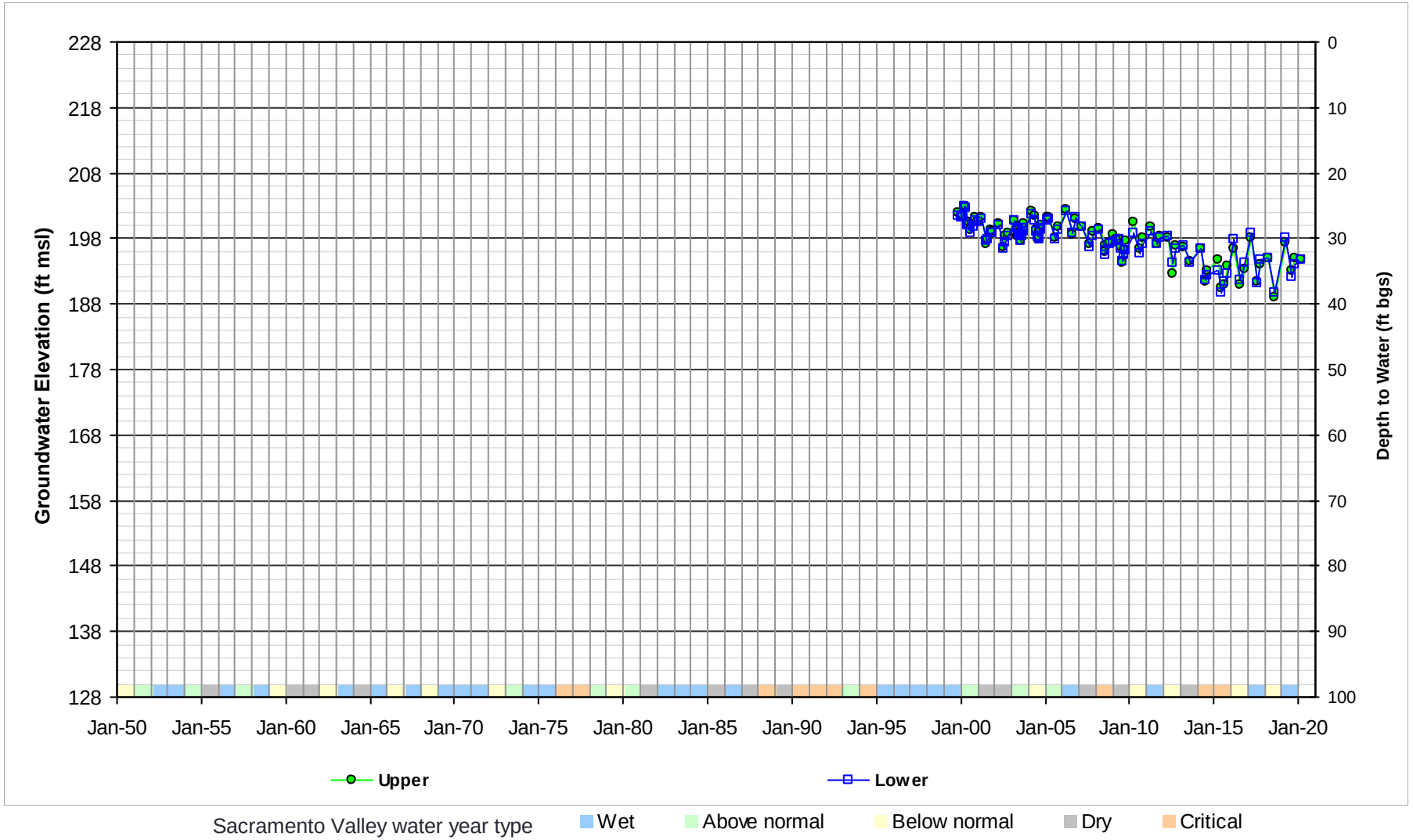
Subbasin: Los Molinos

Screen Depth (ft bgs): Upper: 209-256; Lower-1: 442-510; Lower-2: 650-660

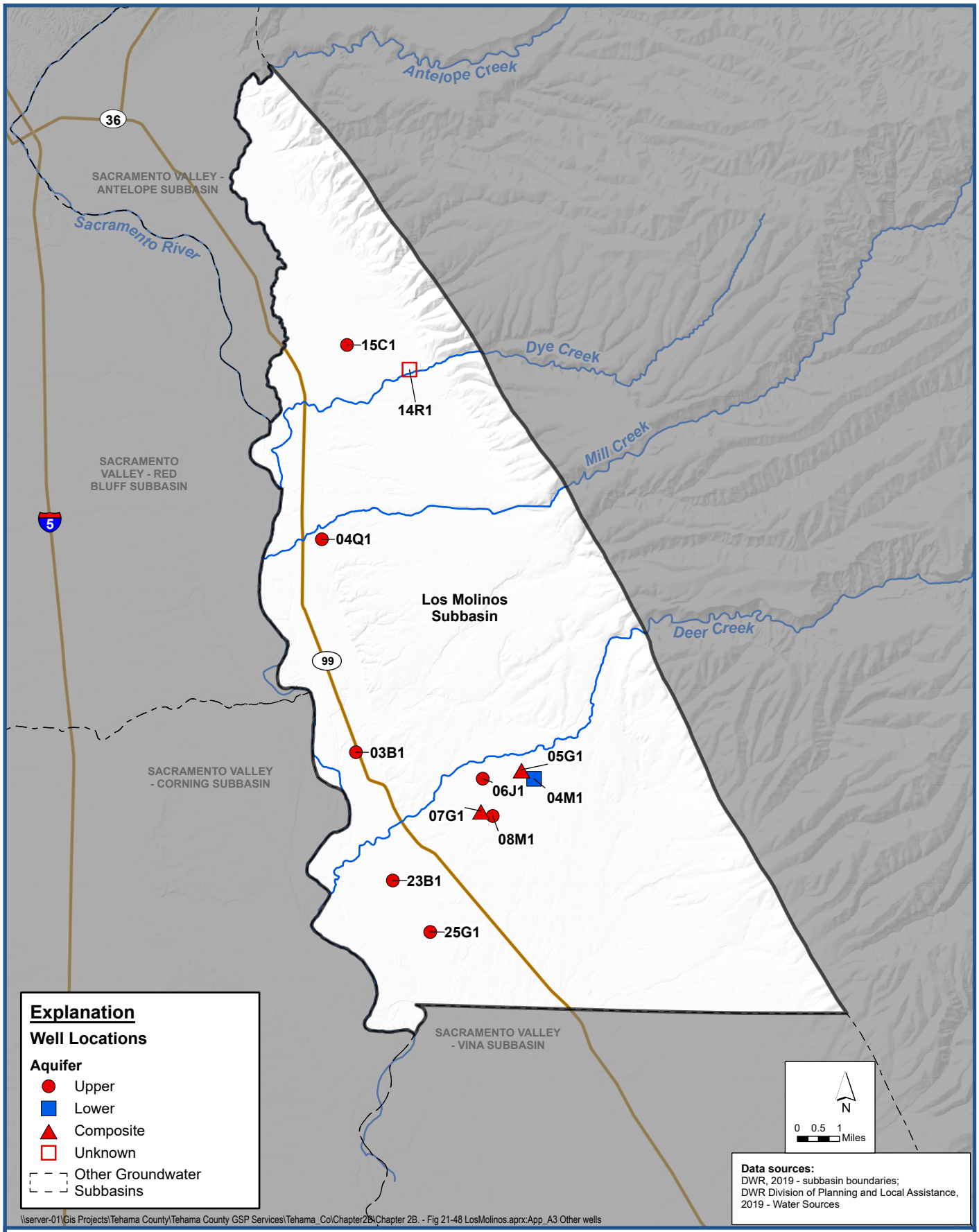


Well Nest Name: 12P **Well Names: Upper: 24N02W12P001M; Lower: 24N02W12P002M**

Subbasin: Los Molinos **Screen Depth (ft bgs): Upper: 165-360; Lower: 760-850**



Other Hydrographs Used for Evaluation of Groundwater Levels



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FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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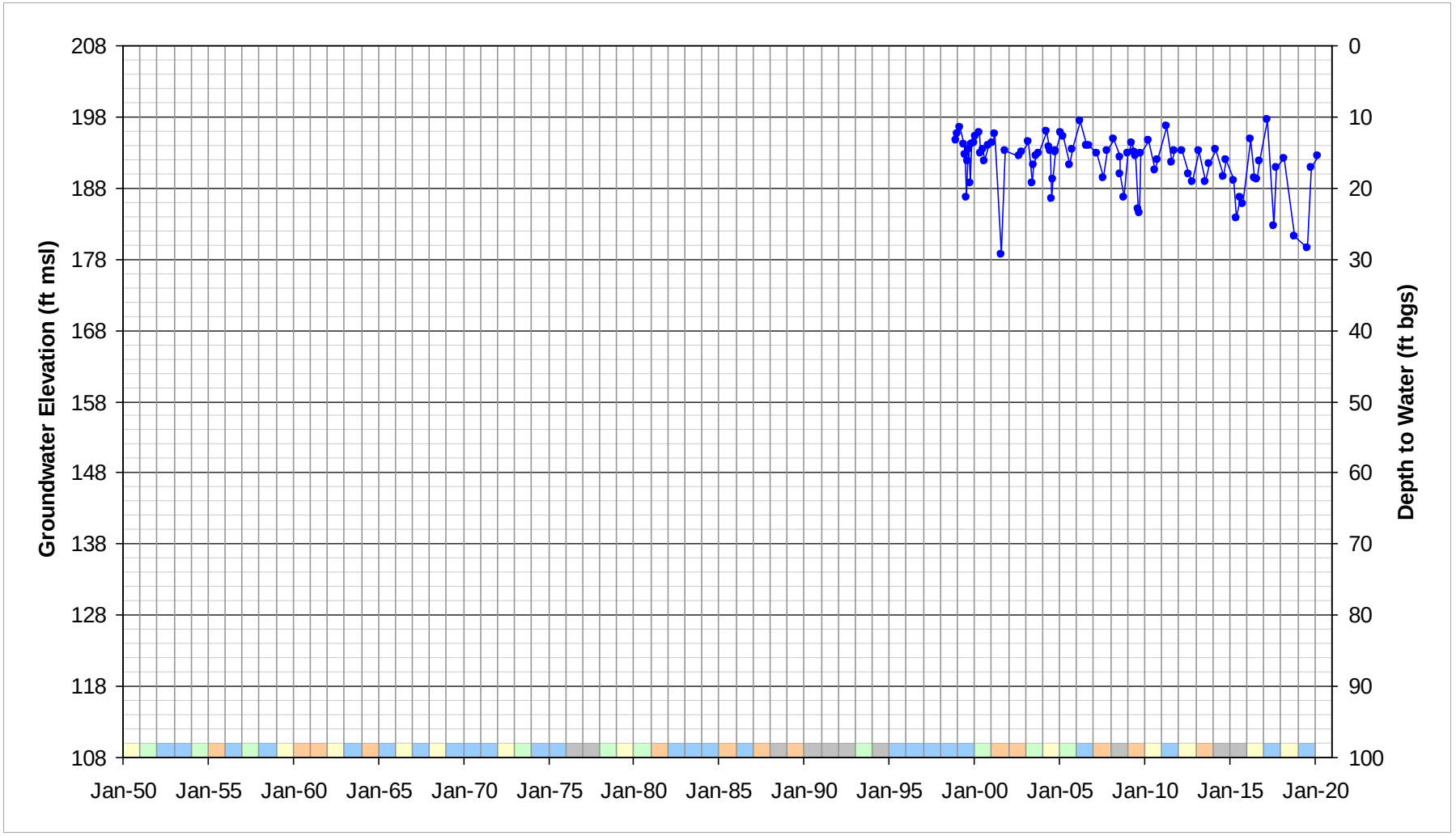
Locations of Other Wells with Water Level Hydrographs

Groundwater Sustainability Plan
Los Molinos Subbasin

Figure A-3

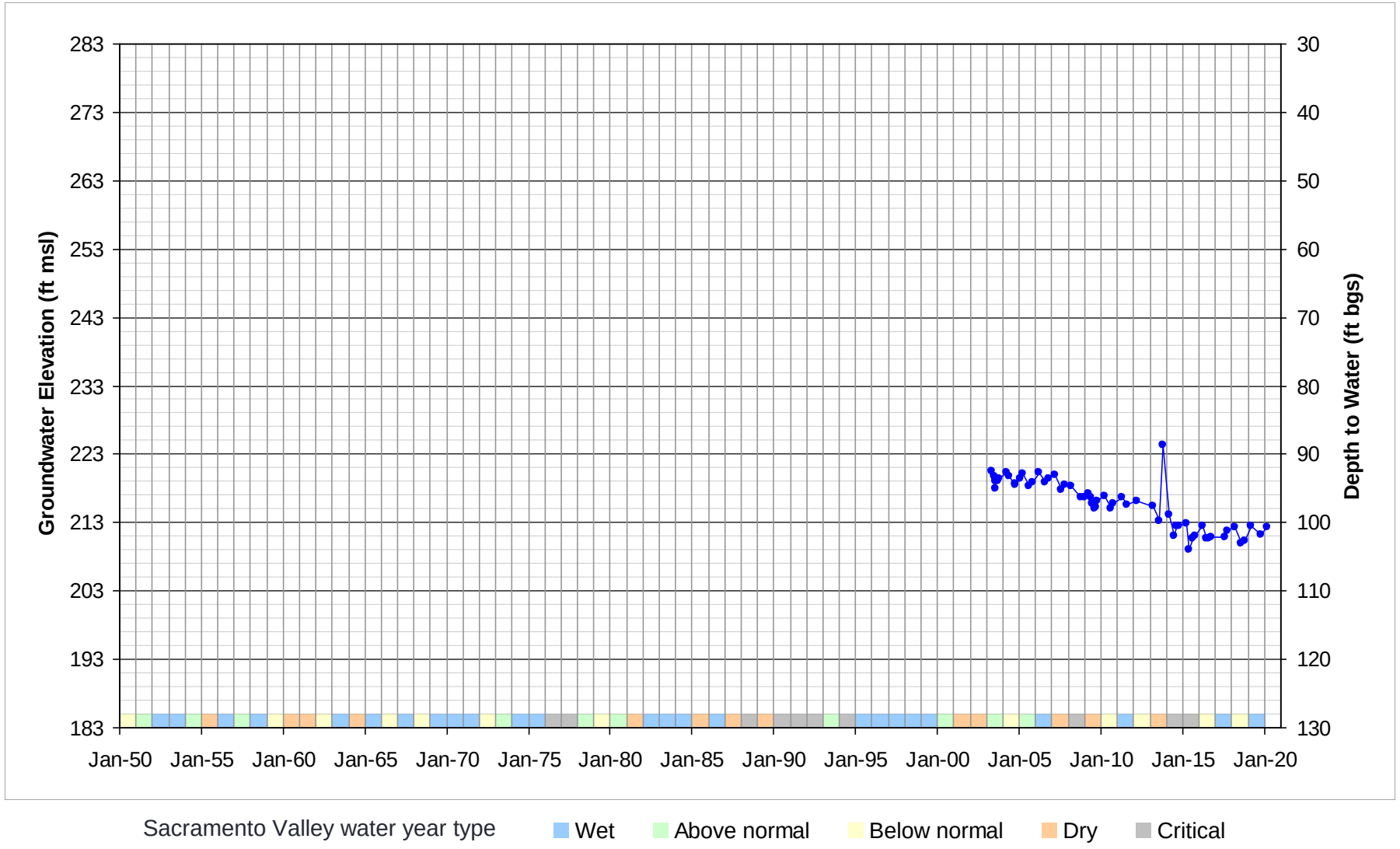
Abbreviated Well Name: 03B1 **Subbasin: Los Molinos** **Well Depth (ft): 368** **Well Type: Irrigation**

Well Name: 24N02W03B001M **Aquifer: Upper** **Screen Depth (ft bgs): 152 - 368**



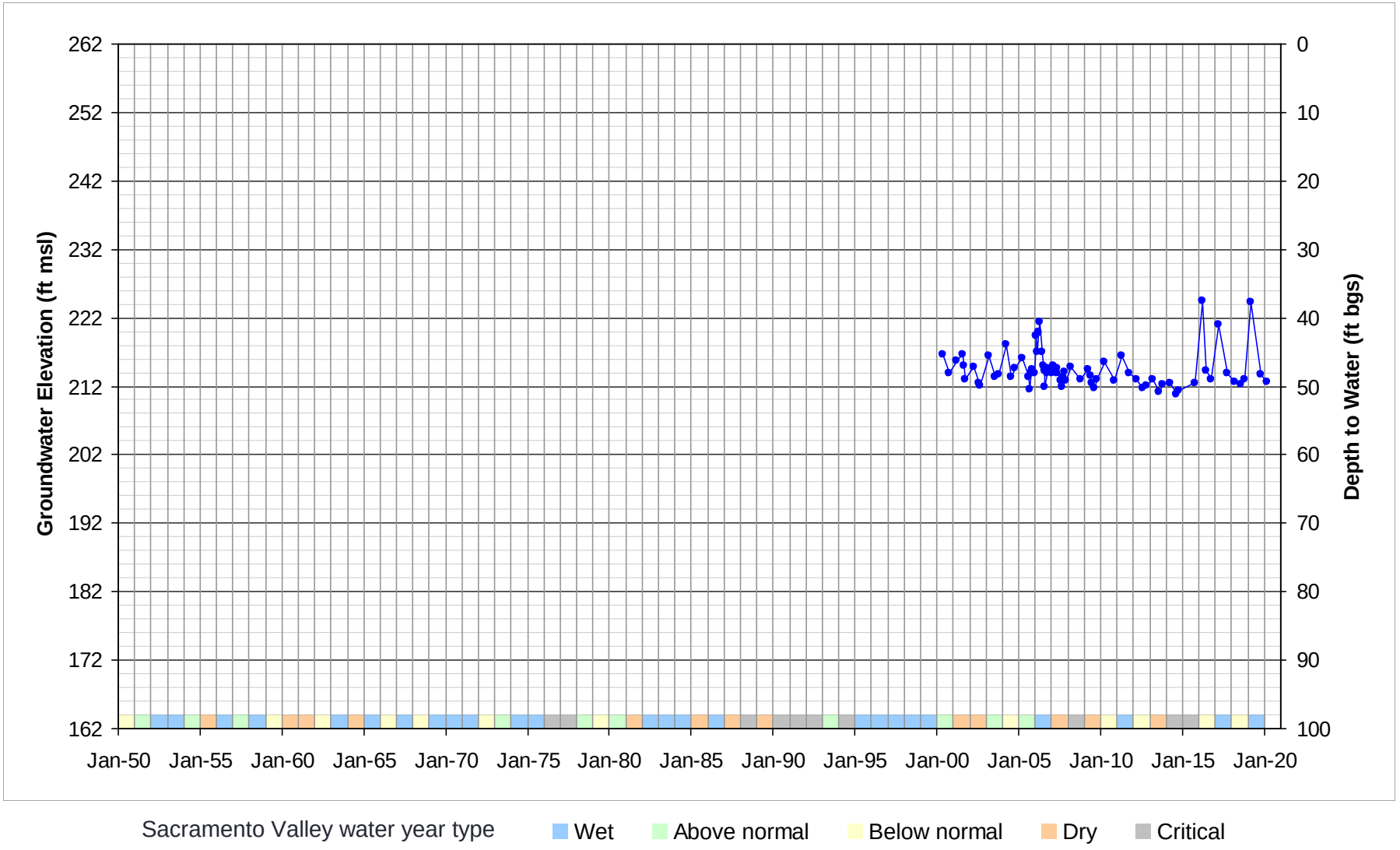
Abbreviated Well Name: 04M1 **Subbasin: Los Molinos** **Well Depth (ft): 960** **Well Type: Irrigation**

Well Name: 24N01W04M001M **Aquifer: Lower** **Screen Depth (ft bgs): 620 - 920**



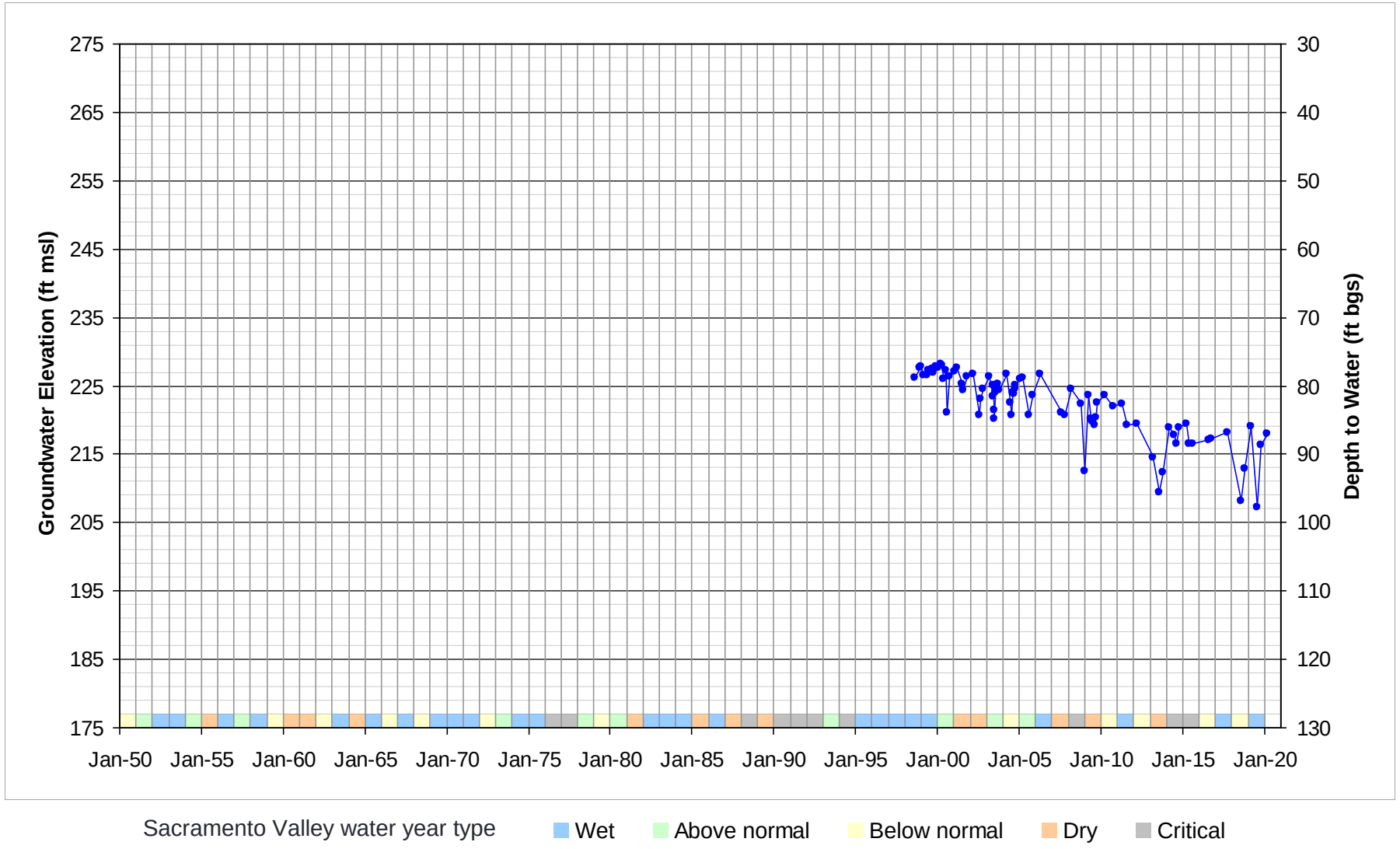
Abbreviated Well Name: 04Q1 **Subbasin: Los Molinos** **Well Depth (ft): 110** **Well Type: Domestic**

Well Name: 25N02W04Q001M **Aquifer: Upper** **Screen Depth (ft bgs): 78 - 110**



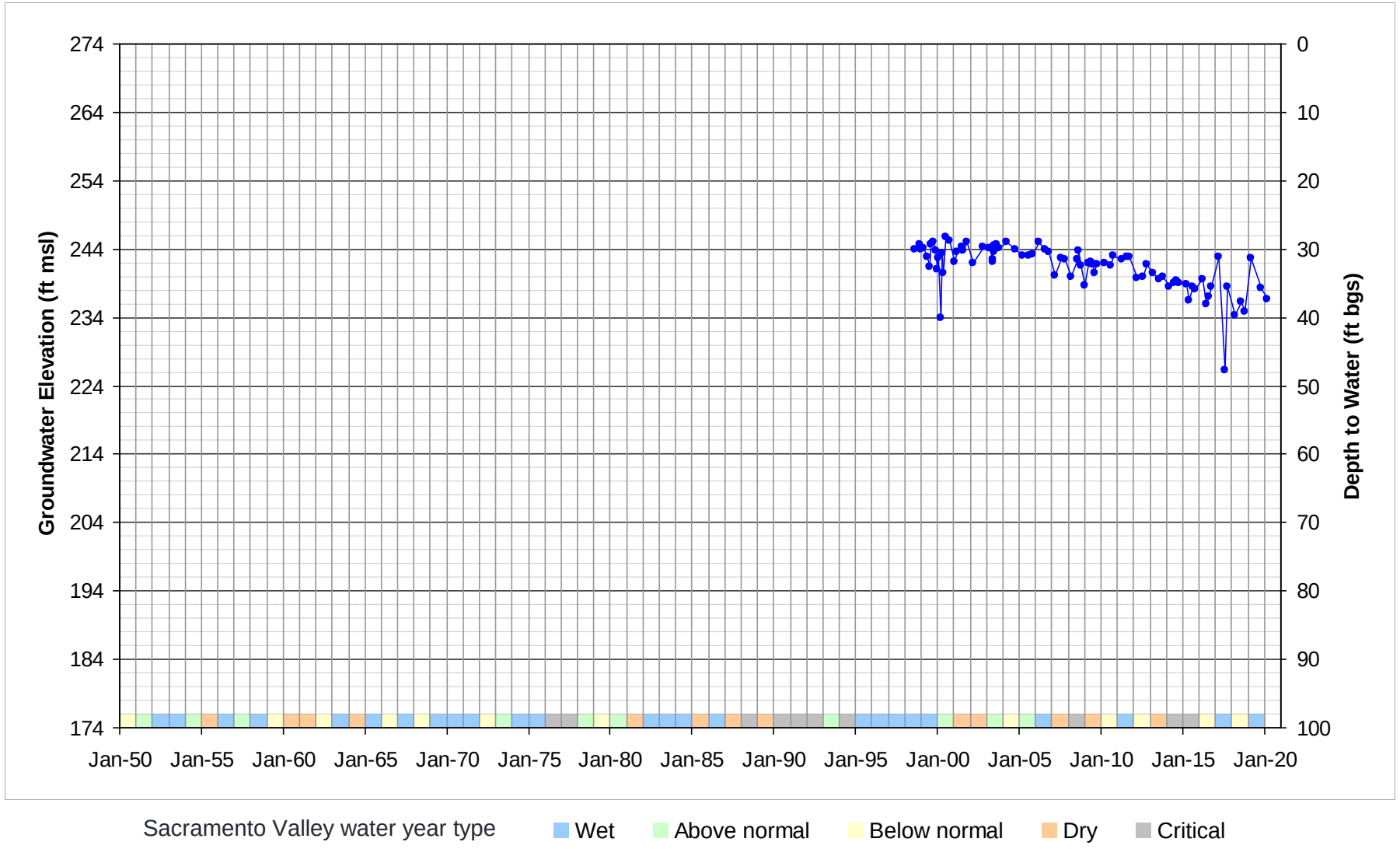
Abbreviated Well Name: 05G1 **Subbasin: Los Molinos** **Well Depth (ft): 490** **Well Type: Irrigation**

Well Name: 24N01W05G001M **Aquifer: Composite** **Screen Depth (ft bgs): 130 - 490**



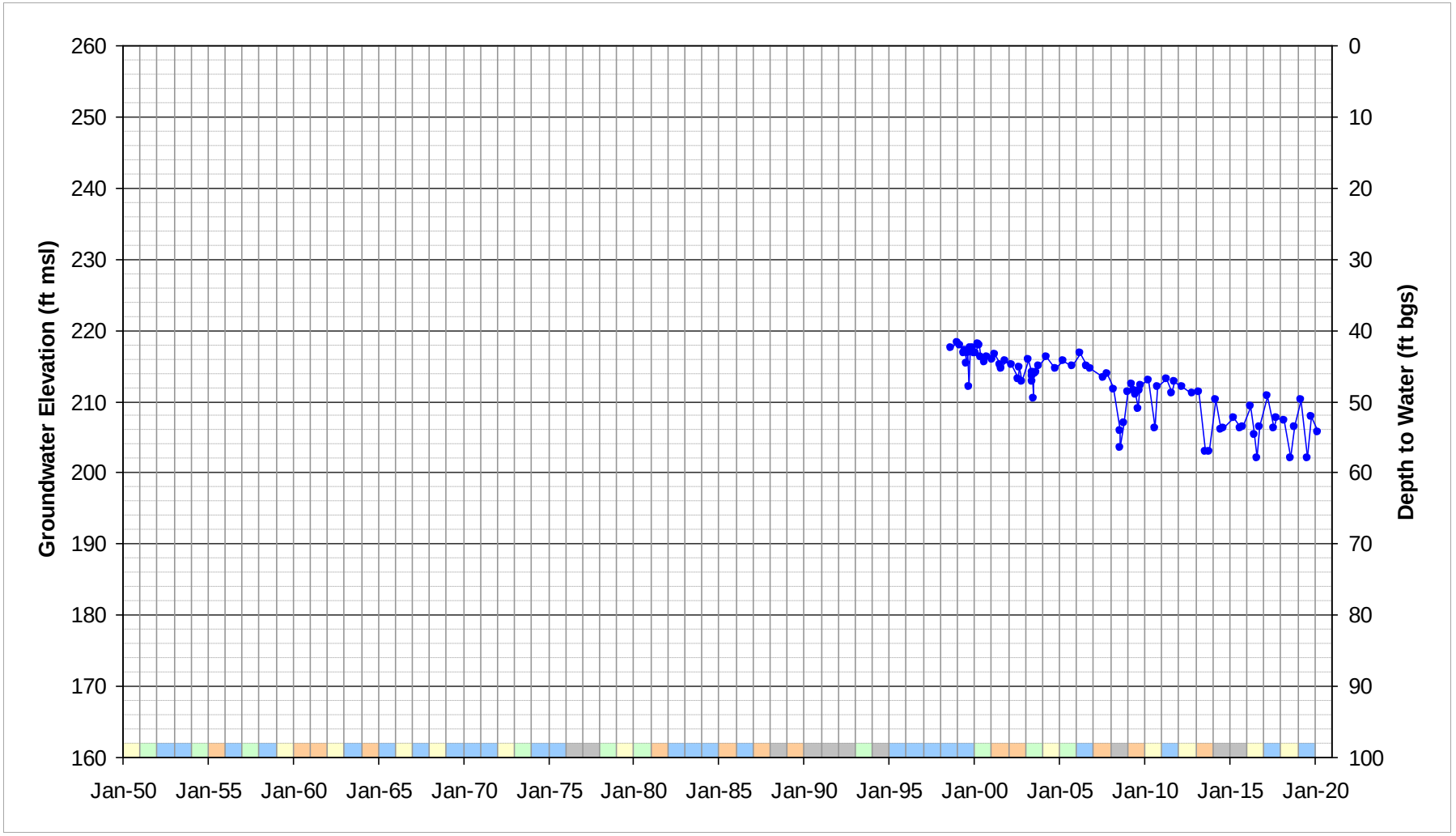
Abbreviated Well Name: 06J1 **Subbasin: Los Molinos** **Well Depth (ft): 100** **Well Type: Domestic**

Well Name: 24N01W06J001M **Aquifer: Upper** **Screen Depth (ft bgs): 60 - 100**



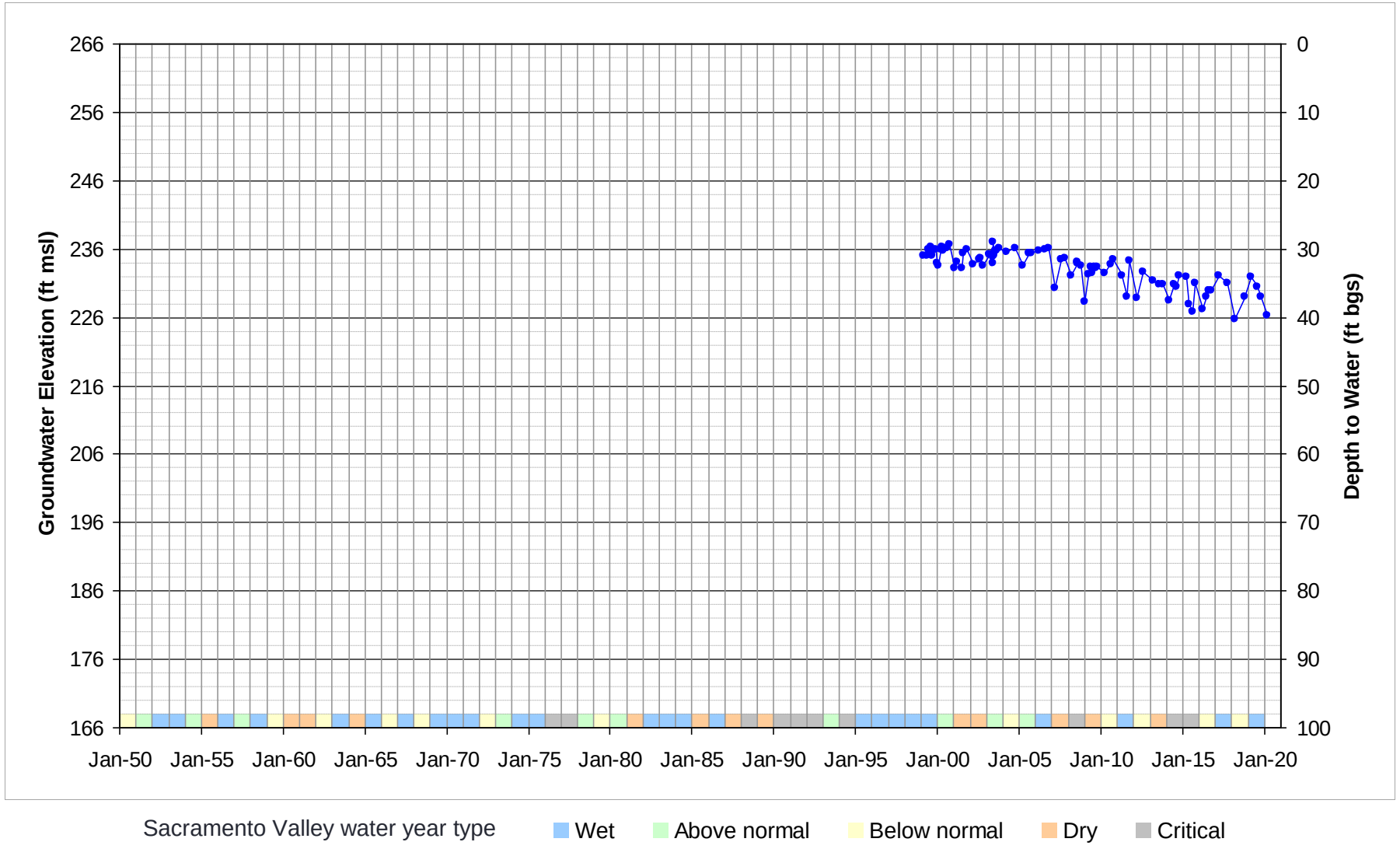
Abbreviated Well Name: 07G1 **Subbasin: Los Molinos** **Well Depth (ft): 525** **Well Type: Irrigation**

Well Name: 24N01W07G001M **Aquifer: Composite** **Screen Depth (ft bgs): 70 - 525**



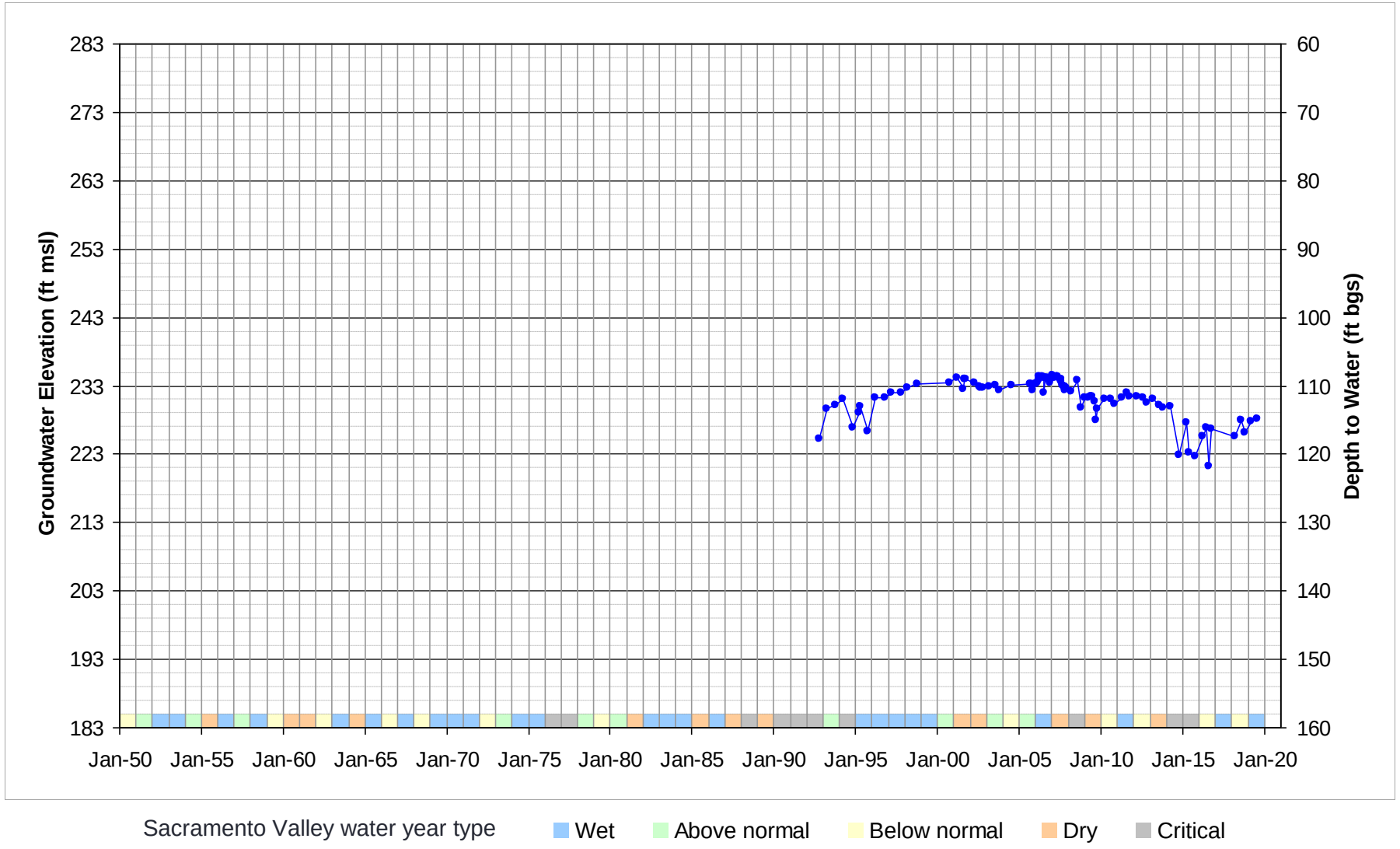
Abbreviated Well Name: 08M1 **Subbasin: Los Molinos** **Well Depth (ft): 116** **Well Type: Domestic**

Well Name: 24N01W08M001M **Aquifer: Upper** **Screen Depth (ft bgs): 60 - 116**



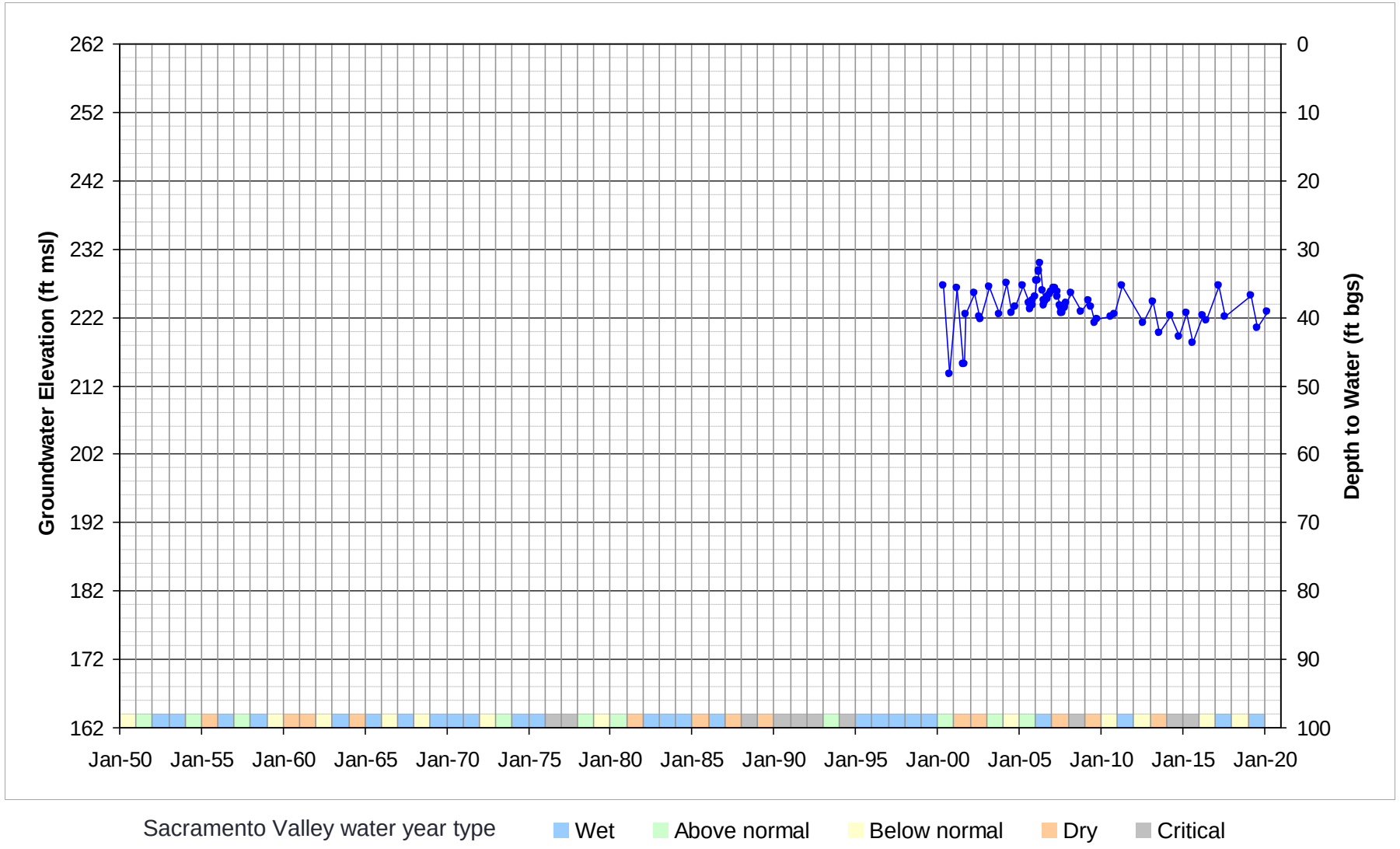
Abbreviated Well Name: 14R1 **Subbasin: Los Molinos** **Well Depth (ft): 495** **Well Type: Irrigation**

Well Name: 26N02W14R001M **Aquifer: Unknown** **Screen Depth (ft bgs): N/A**



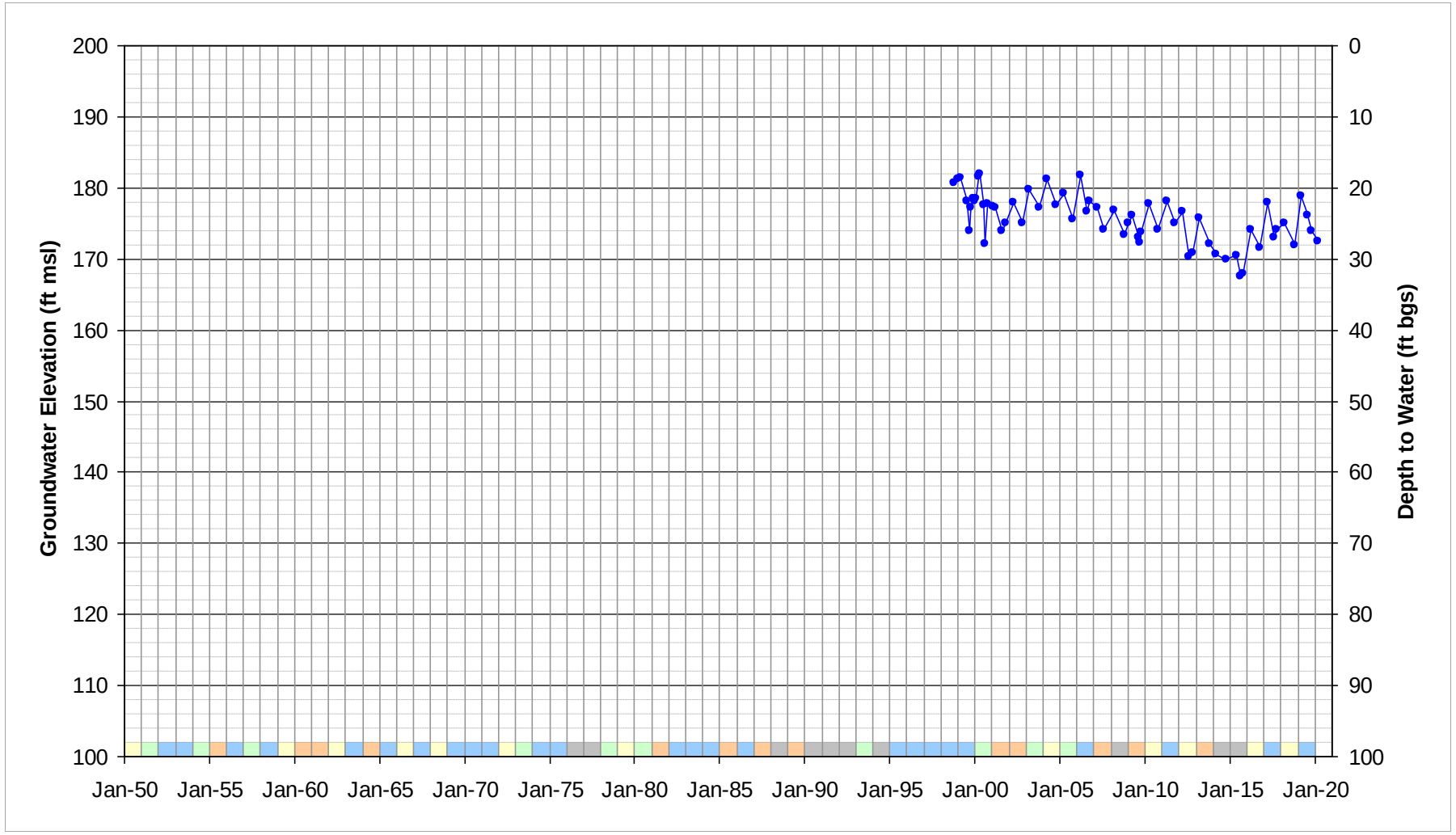
Abbreviated Well Name: 15C1 **Subbasin: Los Molinos** **Well Depth (ft): 100** **Well Type: Domestic**

Well Name: 26N02W15C001M **Aquifer: Upper** **Screen Depth (ft bgs): 78 - 100**



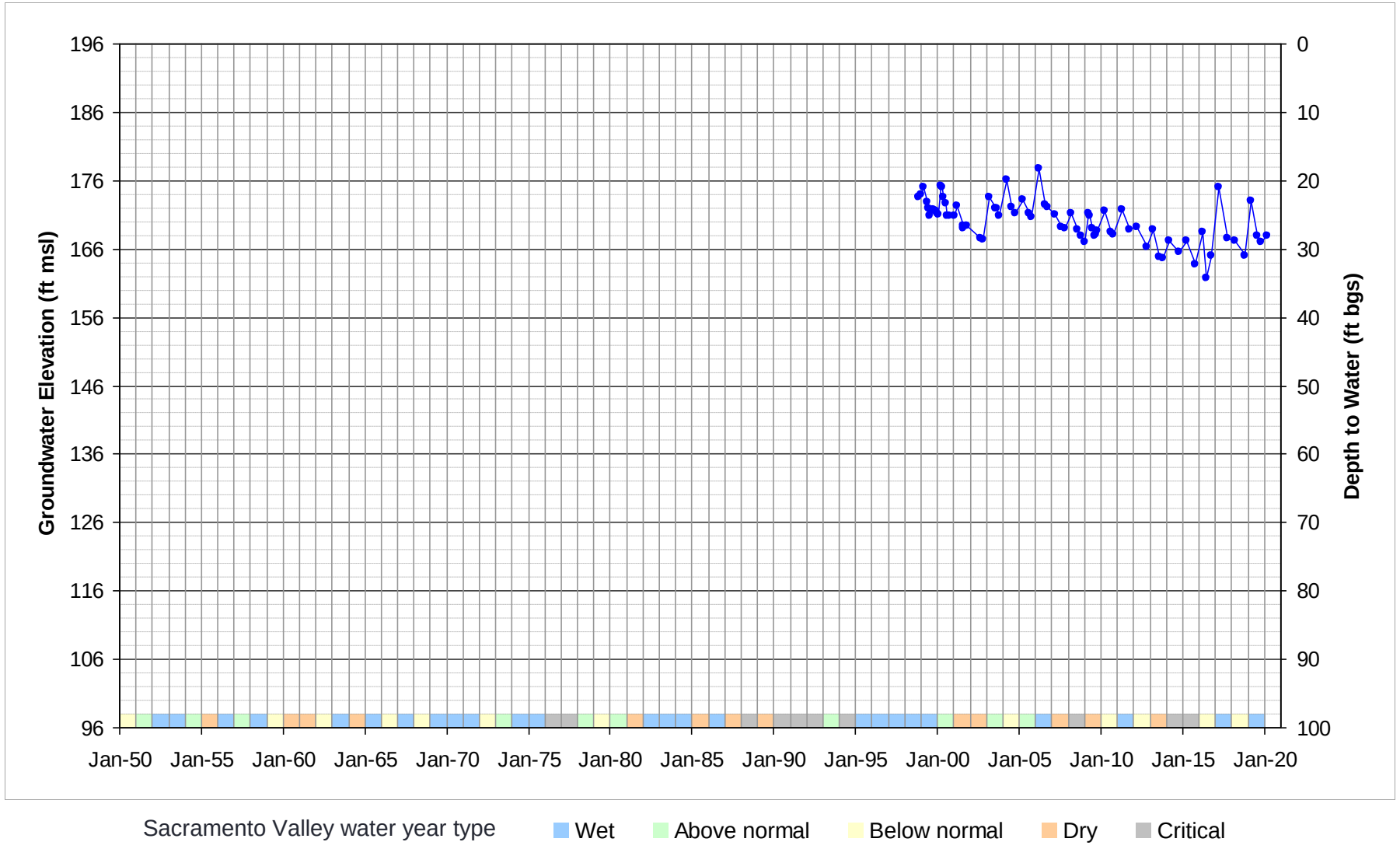
Abbreviated Well Name: 23B1 **Subbasin: Los Molinos** **Well Depth (ft): 285** **Well Type: Irrigation**

Well Name: 24N02W23B001M **Aquifer: Upper** **Screen Depth (ft bgs): 194 - 285**



Abbreviated Well Name: 25G1 **Subbasin: Los Molinos** **Well Depth (ft): 256** **Well Type: Irrigation**

Well Name: 24N02W25G001M **Aquifer: Upper** **Screen Depth (ft bgs): 108 - 256**



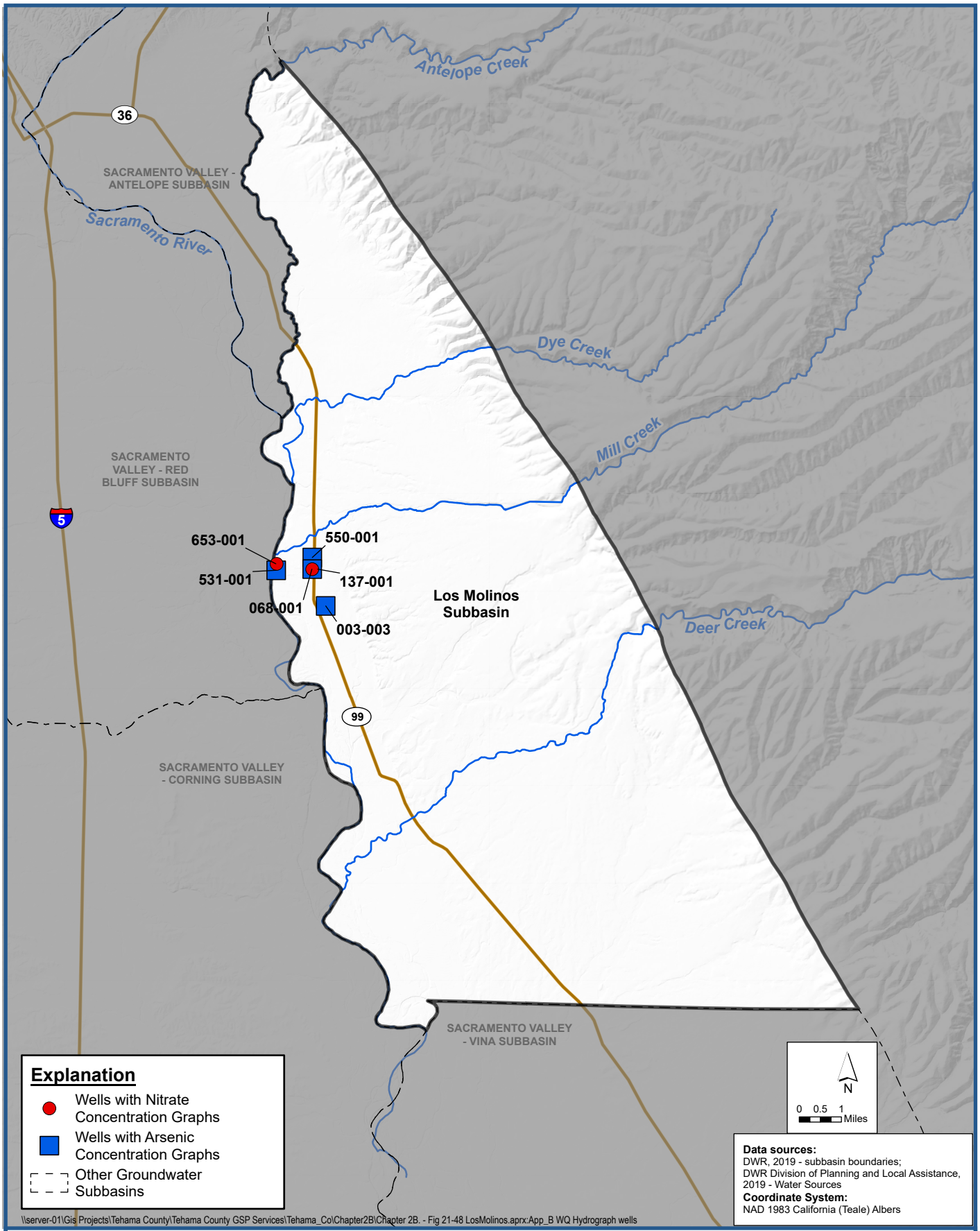
Appendix 2-G

Water Quality Hydrographs

Appendix 2-G

Groundwater Quality (Nitrate and Arsenic)
Hydrographs of Select Wells

Los Molinos Subbasin



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Locations of Wells with Water Quality Hydrographs

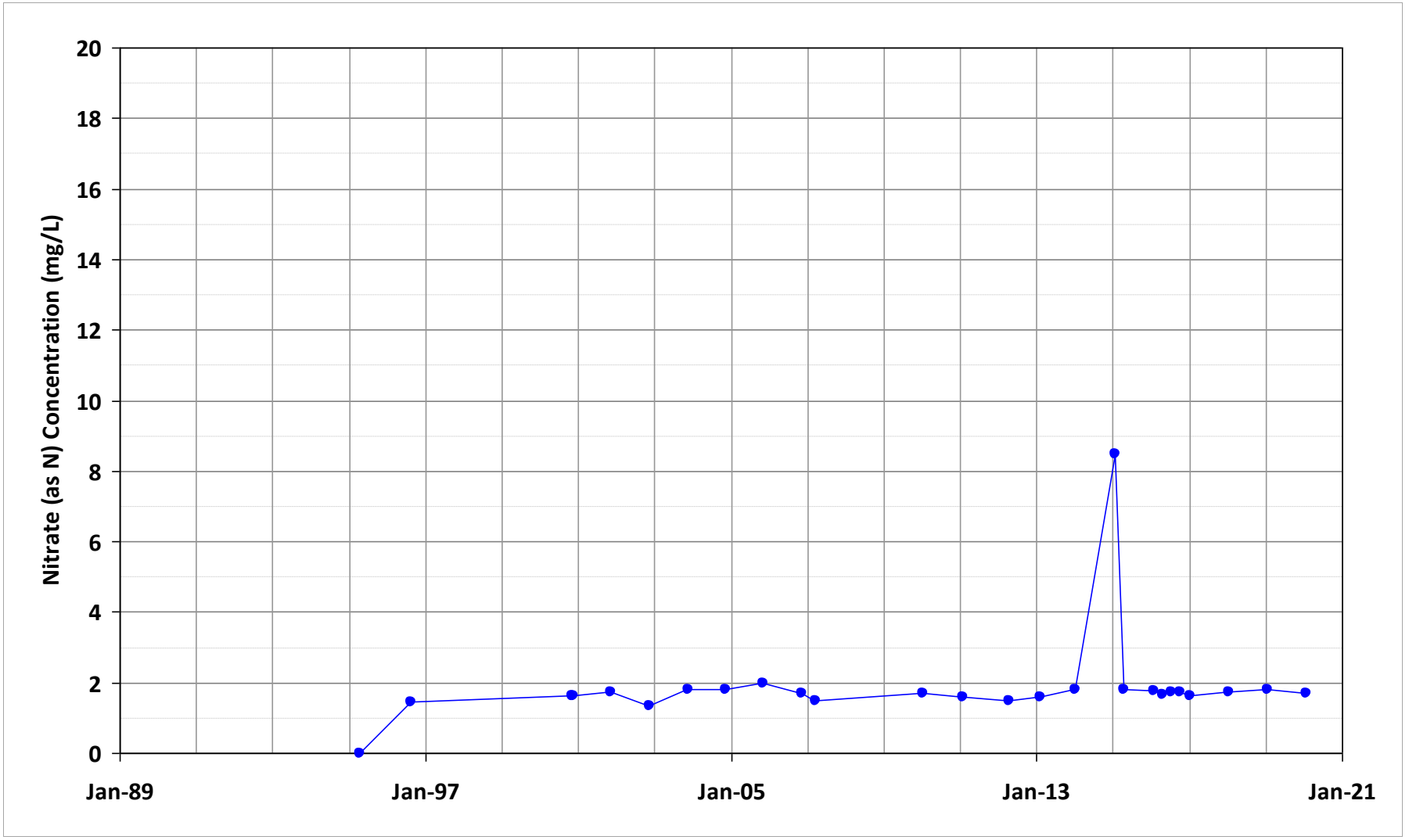
Groundwater Sustainability Plan
Los Molinos Subbasin

Figure B-1

Nitrate concentration hydrographs

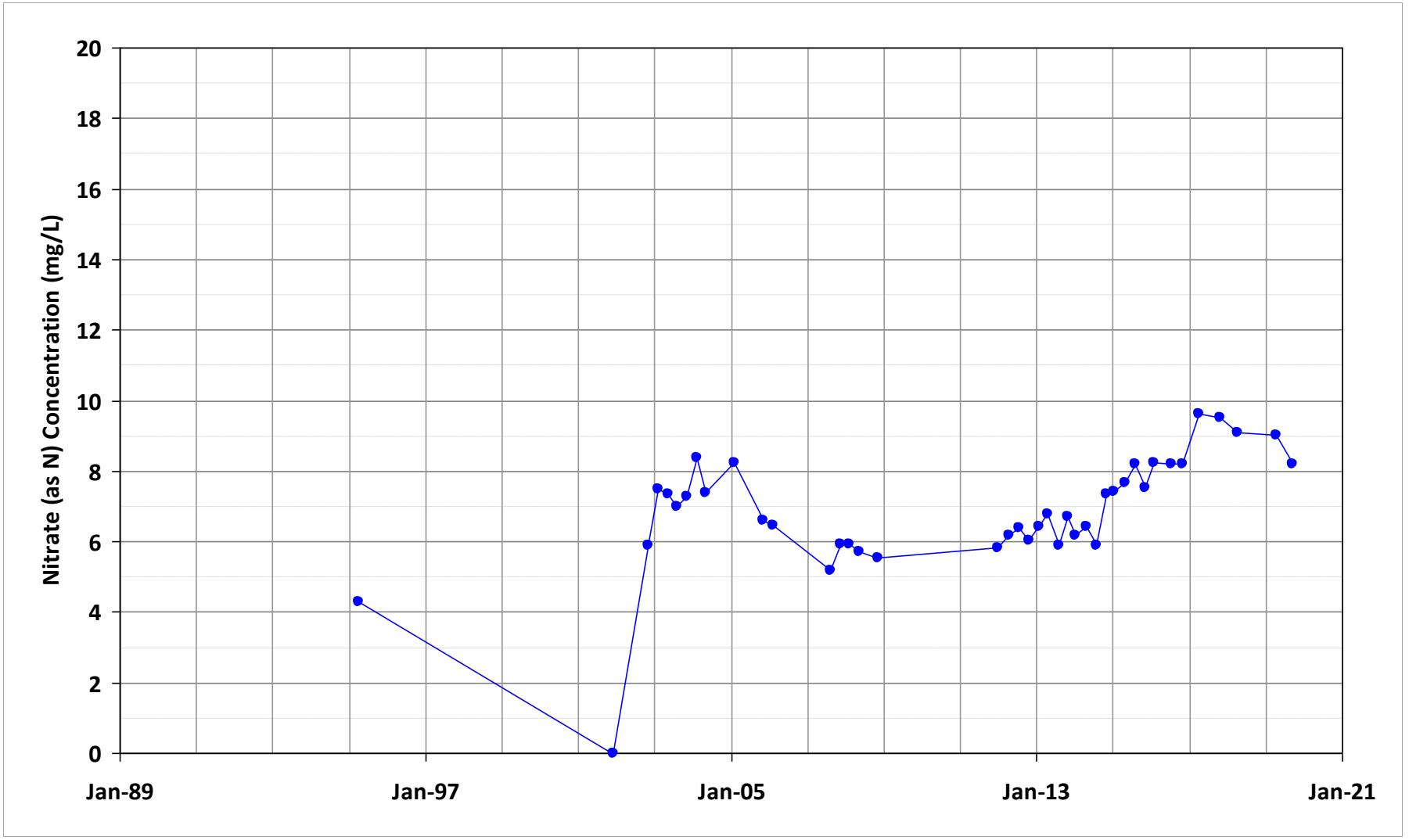
Abbreviated Well Name: 653-001 | Subbasin: Los Molinos | Well Depth (ft): N/A | Well Type: Municipal

Well Name: 5200653-001 | Aquifer: Unknown | Screen Depth (ft bgs): N/A



Abbreviated Well Name: 068-001 | Subbasin: Los Molinos | Well Depth (ft): N/A | Well Type: Municipal

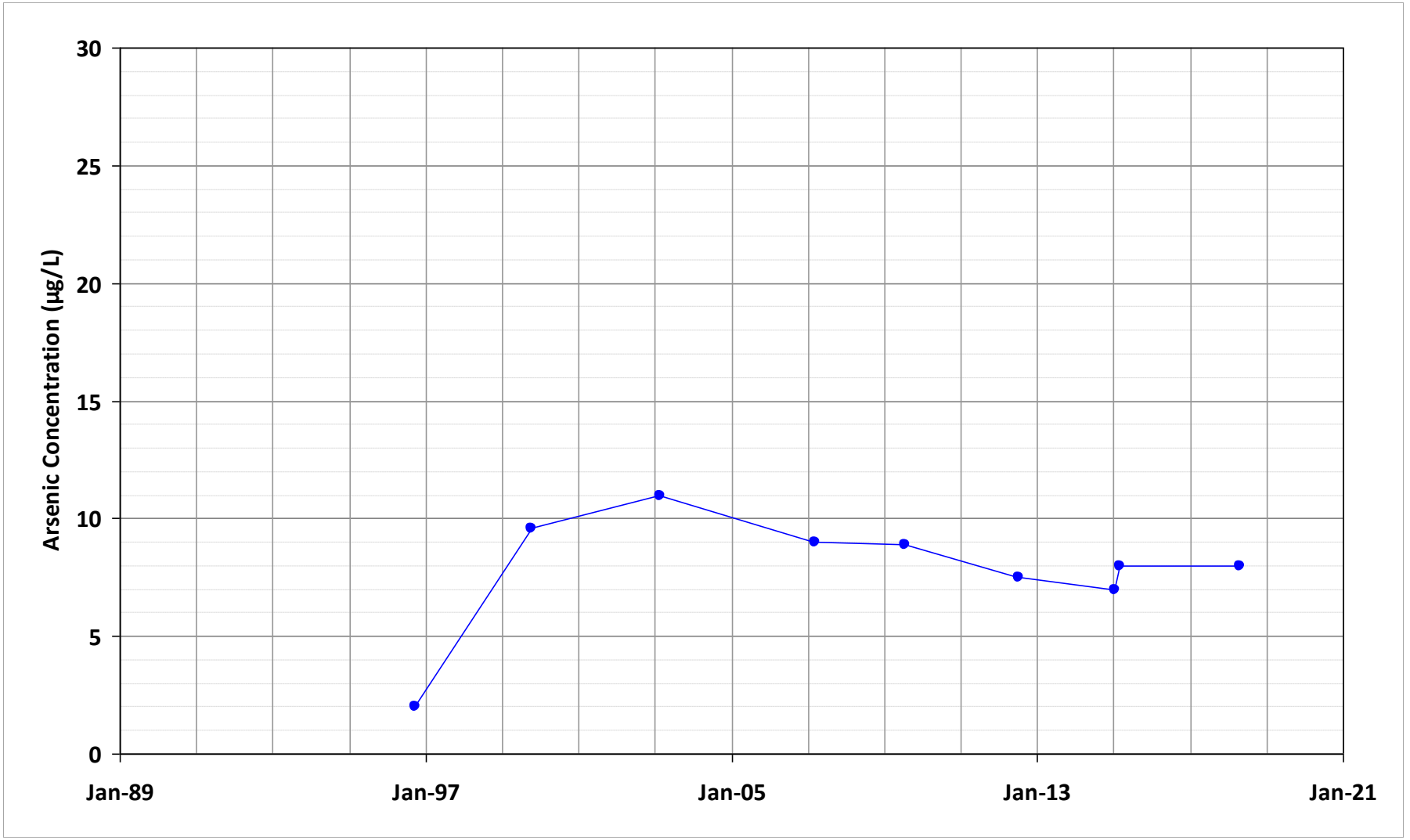
Well Name: 5201068-001 | Aquifer: Unknown | Screen Depth (ft bgs): N/A



Arsenic concentration hydrographs

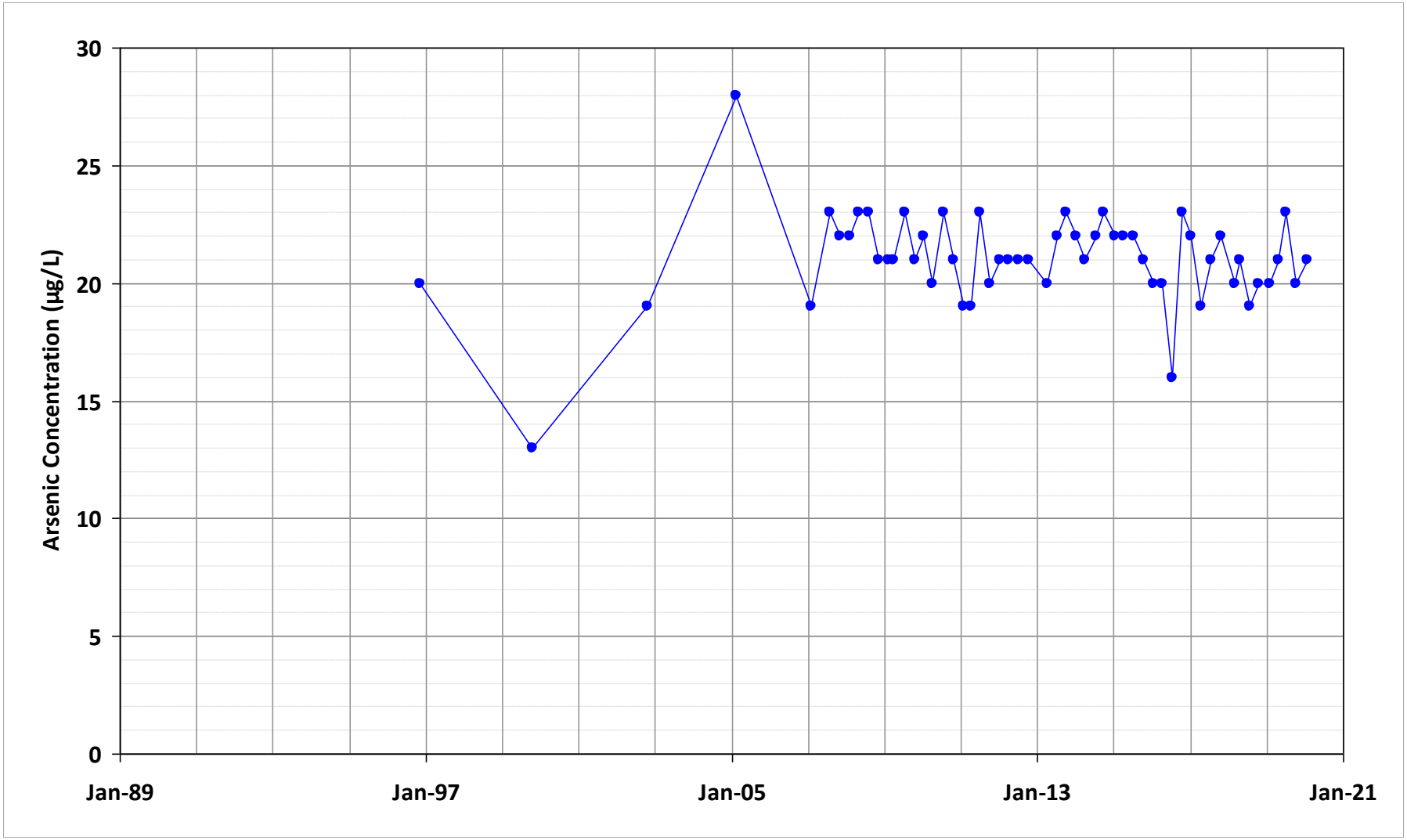
Abbreviated Well Name: 531-001 **Subbasin: Los Molinos** **Well Depth (ft): N/A** **Well Type: Municipal**

Well Name: 5200531-001 **Aquifer: Unknown** **Screen Depth (ft bgs): N/A**



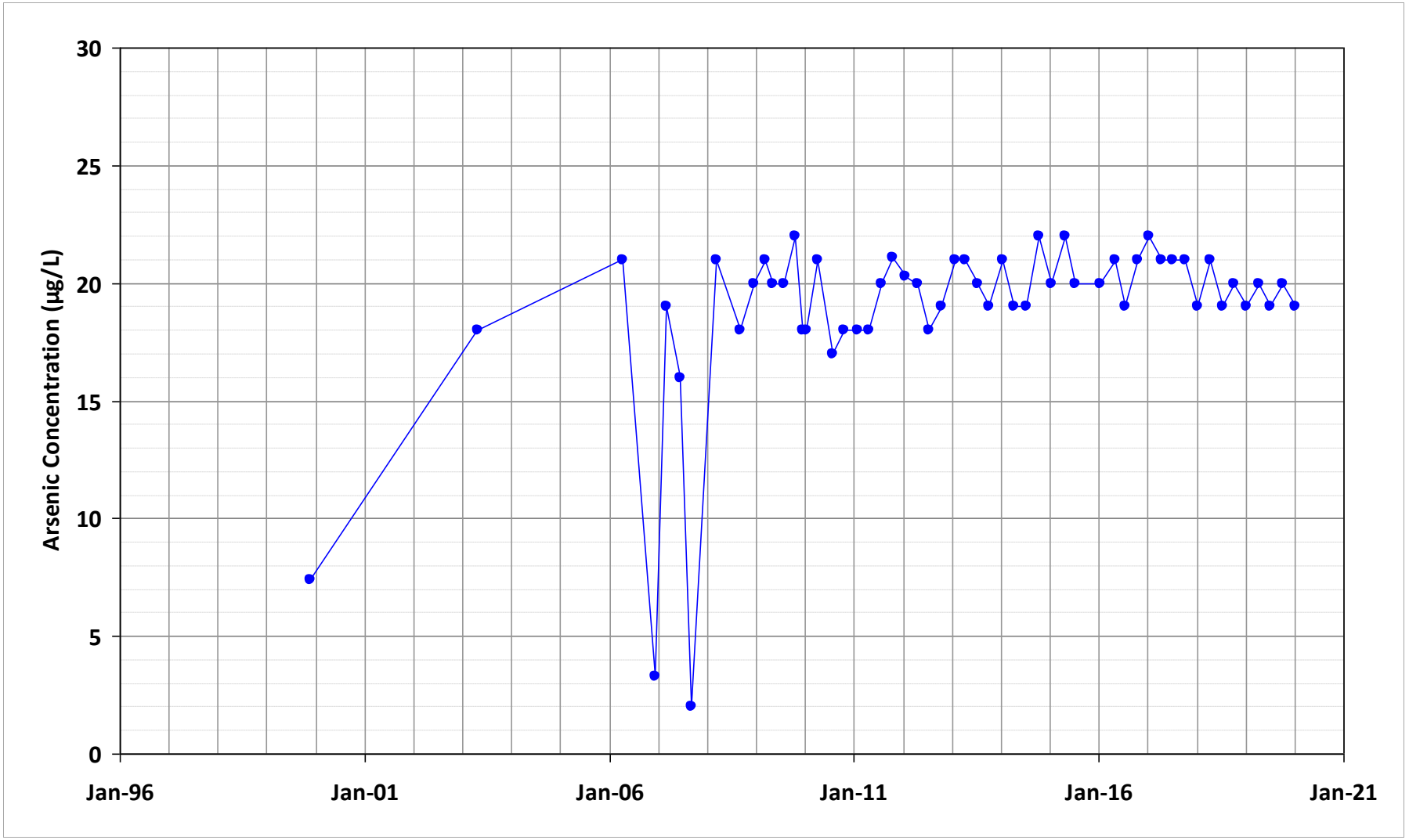
Abbreviated Well Name: 550-001 | Subbasin: Los Molinos | Well Depth (ft): N/A | Well Type: Municipal

Well Name: 5200550-001 | Aquifer: Unknown | Screen Depth (ft bgs): N/A



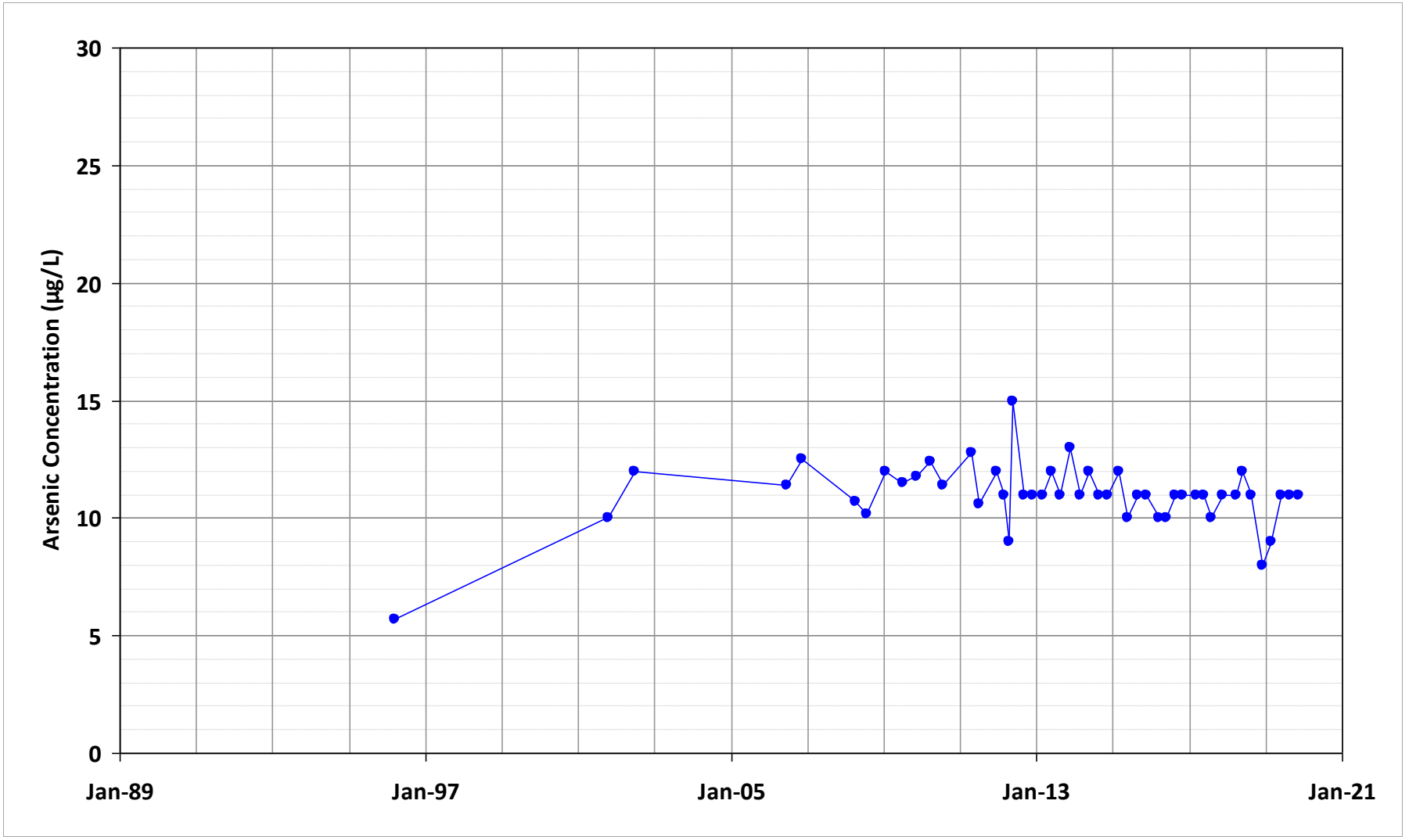
Abbreviated Well Name: 137-001 | Subbasin: Los Molinos | Well Depth (ft): N/A | Well Type: Municipal

Well Name: 5201137-001 | Aquifer: Unknown | Screen Depth (ft bgs): N/A



Abbreviated Well Name: 003-003 | Subbasin: Los Molinos | Well Depth (ft): N/A | Well Type: Municipal

Well Name: 5210003-003 | Aquifer: Lower | Screen Depth (ft bgs): 456 - 466



Appendix 2-H

Groundwater Flora and Fauna

Freshwater Species Located in the Los Molinos Subbasin

Scientific Name	Common Name	Legal Protected Status		
		Federal	State	Other
BIRDS				
Coccyzus americanus occidentalis	Western Yellow-billed Cuckoo	Candidate - Threatened	Endangered	
Riparia riparia	Bank Swallow		Threatened	
Actitis macularius	Spotted Sandpiper			
Agelaius tricolor	Tricolored Blackbird	Bird of Conservation Concern	Special Concern	BSSC - First priority
Aix sponsa	Wood Duck			
Anas platyrhynchos	Mallard			
Ardea alba	Great Egret			
Ardea herodias	Great Blue Heron			
Butorides virescens	Green Heron			
Empidonax traillii	Willow Flycatcher	Bird of Conservation Concern	Endangered	
Fulica americana	American Coot			
Geothlypis trichas trichas	Common Yellowthroat			
Haliaeetus leucocephalus	Bald Eagle	Bird of Conservation Concern	Endangered	
Icteria virens	Yellow-breasted Chat		Special Concern	BSSC - Third priority
Lophodytes cucullatus	Hooded Merganser			
Megaceryle alcyon	Belted Kingfisher			
Mergus merganser	Common Merganser			
Pandion haliaetus	Osprey		Watch list	
Pelecanus erythrorhynchos	American White Pelican		Special Concern	BSSC - First priority
Phalacrocorax auritus	Double-crested Cormorant			
Setophaga petechia	Yellow Warbler			BSSC - Second priority
Tachycineta bicolor	Tree Swallow			
CRUSTACEANS				
Branchinecta conservatio	Conservancy Fairy Shrimp	Endangered	Special	IUCN - Endangered
Branchinecta lynchi	Vernal Pool Fairy Shrimp	Threatened	Special	IUCN - Vulnerable
Lepidurus packardi	Vernal Pool Tadpole Shrimp	Endangered	Special	IUCN - Endangered
Hyalella azteca	An Amphipod			
Hyalella spp.	Hyalella spp.			
FISH				
Oncorhynchus mykiss irideus	Coastal rainbow trout			Least Concern - Moyle 2013
Acipenser medirostris ssp. 1	Southern green sturgeon	Threatened	Special	Endangered - Moyle 2013

Oncorhynchus mykiss - CV	Central Valley steelhead	Threatened	Special	Vulnerable - Moyle 2013
Oncorhynchus tshawytscha - CV spring	Central Valley spring Chinook salmon	Threatened	Threatened	Vulnerable - Moyle 2013
Oncorhynchus tshawytscha - CV winter	Central Valley winter Chinook salmon	Endangered	Endangered	Vulnerable - Moyle 2013
HERPS				
Actinemys marmorata marmorata	Western Pond Turtle		Special Concern	ARSSC
Anaxyrus boreas boreas	Boreal Toad			
Rana boylii	Foothill Yellow-legged Frog	Under Review in the Candidate or Petition Process	Special Concern	ARSSC
Rana draytonii	California Red-legged Frog	Threatened	Special Concern	ARSSC
Spea hammondii	Western Spadefoot	Under Review in the Candidate or Petition Process	Special Concern	ARSSC
Taricha granulosa	Rough-skinned Newt			
Taricha torosa	Coast Range Newt		Special Concern	ARSSC
Thamnophis couchii	Sierra Gartersnake			
Thamnophis sirtalis sirtalis	Common Gartersnake			
INSECTS & OTHER INVERTS				
Ablabesmyia annulata				Not on any status lists
Ablabesmyia spp.	Ablabesmyia spp.			
Acentrella insignificans	A Mayfly			
Acentrella spp.	Acentrella spp.			
Acentrella turbida	A Mayfly			
Ambrysus amargosus	Ash Meadows Naucorid			
Ambrysus mormon				Not on any status lists
Ambrysus spp.	Ambrysus spp.			
Amiocentrus aspilus	A Caddisfly			
Anopheles franciscanus				Not on any status lists
Anopheles spp.	Anopheles spp.			
Antocha monticola				Not on any status lists
Antocha spp.	Antocha spp.			
Apedilum spp.	Apedilum spp.			
Aquarius amplus arizonensis				Not on any status lists
Aquarius spp.	Aquarius spp.			
Argia agrioides	California Dancer			
Argia spp.	Argia spp.			
Asioplax edmundsi	A Mayfly			

Asioplax spp.	Asioplax spp.			
Atherix pachypus				Not on any status lists
Atractelmis wawona	Wawona Riffle Beetle		Special	
Baetis adonis	A Mayfly			
Baetis flavistriga	A Mayfly			
Baetis spp.	Baetis spp.			
Baetis tricaudatus	A Mayfly			
Blepharicera jordani				Not on any status lists
Blepharicera spp.	Blepharicera spp.			
Brachycentrus occidentalis				Not on any status lists
Brillia flavifrons				Not on any status lists
Brillia spp.	Brillia spp.			
Caenis amica	A Mayfly			
Caenis latipennis	A Mayfly			
Calineuria californica	Western Stone			
Callibaetis californicus	A Mayfly			
Callibaetis spp.	Callibaetis spp.			
Cardiocladius platypus				Not on any status lists
Cardiocladius spp.	Cardiocladius spp.			
Caudatella columbiella				Not on any status lists
Caudatella spp.	Caudatella spp.			
Cheumatopsyche analis				Not on any status lists
Cheumatopsyche spp.	Cheumatopsyche spp.			
Chimarra adella				Not on any status lists
Chimarra spp.	Chimarra spp.			
Chimarra utahensis	A Caddisfly			
Chironomidae fam.	Chironomidae fam.			
Chironomus anonymus				Not on any status lists
Chironomus spp.	Chironomus spp.			
Corixidae fam.	Corixidae fam.			
Cricotopus annulator				Not on any status lists
Cricotopus spp.	Cricotopus spp.			
Cryptochironomus curryi				Not on any status lists
Cryptochironomus spp.	Cryptochironomus spp.			
Dicrotendipes adnilus				Not on any status lists
Dicrotendipes spp.	Dicrotendipes spp.			
Diphetor hageni	Hagen's Small Minnow Mayfly			
Dubiraphia brunnescens	Brownish Dubiraphian Riffle Beetle		Special	
Dubiraphia spp.	Dubiraphia spp.			
Enallagma anna	River Bluet			

Enallagma spp.	Enallagma spp.			
Epeorus albertae	A Mayfly			
Epeorus spp.	Epeorus spp.			
Ephemerella aurivillii	A Mayfly			
Eukiefferiella claripennis				Not on any status lists
Eukiefferiella spp.	Eukiefferiella spp.			
Fallceon quilleri	A Mayfly			
Glossosoma alascense	A Caddisfly			
Glossosoma oregonense	A Caddisfly			
Glossosoma spp.	Glossosoma spp.			
Glyptotendipes spp.	Glyptotendipes spp.			
Helichus suturalis				Not on any status lists
Helicopsyche borealis	A Caddisfly			
Helicopsyche spp.	Helicopsyche spp.			
Hesperoperla pacifica	Golden Stone			
Hetaerina americana	American Rubyspot			
Hetaerina spp.	Hetaerina spp.			
Hydrophilidae fam.	Hydrophilidae fam.			
Hydropsyche alternans				Not on any status lists
Hydropsyche californica	A Caddisfly			
Hydropsyche occidentalis	A Caddisfly			
Hydropsyche spp.	Hydropsyche spp.			
Hydroptila ajax	A Caddisfly			
Hydroptila arctia	A Caddisfly			
Hydroptila lenora				Not on any status lists
Hydroptila spp.	Hydroptila spp.			
Hygrotus acaroides				Not on any status lists
Hygrotus spp.	Hygrotus spp.			
Isonychia intermedia				Not on any status lists
Isonychia spp.	Isonychia spp.			
Labrundinia maculata				Not on any status lists
Labrundinia spp.	Labrundinia spp.			
Laccobius acutipenis				Not on any status lists
Laccobius spp.	Laccobius spp.			
Laccophilus biguttatus				Not on any status lists
Laccophilus spp.	Laccophilus spp.			
Lauterborniella spp.	Lauterborniella spp.			
Lepidostoma acarolum				Not on any status lists
Lepidostoma spp.	Lepidostoma spp.			
Leptoceridae fam.	Leptoceridae fam.			
Macromia magnifica	Western River Cruiser			
Microcylloepus formicoideus	Furnace Creek Riffle Beetle		Special	

Microcylloepus spp.	Microcylloepus spp.			
Microtendipes caducus				Not on any status lists
Microtendipes spp.	Microtendipes spp.			
Microvelia beameri				Not on any status lists
Microvelia spp.	Microvelia spp.			
Mideopsis spp.	Mideopsis spp.			
Mystacides alafimbriatus	A Caddisfly			
Mystacides spp.	Mystacides spp.			
Nanocladius anderseni				Not on any status lists
Nanocladius spp.	Nanocladius spp.			
Natarsia miripes				Not on any status lists
Natarsia spp.	Natarsia spp.			
Nectopsyche dorsalis	A Caddisfly			
Nectopsyche spp.	Nectopsyche spp.			
Neotrichia blinni				Not on any status lists
Neotrichia spp.	Neotrichia spp.			
Ochrotrichia alexanderi	A Caddisfly			
Ochrotrichia spp.	Ochrotrichia spp.			
Ochrotrichia stylata	A Caddisfly			
Octogomphus specularis	Grappletail			
Oecetis arizonica				Not on any status lists
Oecetis avara	A Caddisfly			
Oecetis disjuncta	A Caddisfly			
Oecetis spp.	Oecetis spp.			
Ophiogomphus arizonicus				Not on any status lists
Ophiogomphus occidentis	Sinuous Snaketail			
Ophiogomphus spp.	Ophiogomphus spp.			
Optioservus canus	Pinnacles Optioservus Riffle Beetle		Special	
Optioservus quadrimaculatus				Not on any status lists
Optioservus seriatus				Not on any status lists
Optioservus spp.	Optioservus spp.			
Orthocladius appersoni				Not on any status lists
Orthocladius spp.	Orthocladius spp.			
Oxyethira spp.	Oxyethira spp.			
Paratanytarsus grimmii				Not on any status lists
Paratanytarsus spp.	Paratanytarsus spp.			
Pentaneura inconspicua				Not on any status lists
Pentaneura spp.	Pentaneura spp.			
Petrophila confusalis				Not on any status lists

Petrophila spp.	Petrophila spp.			
Phaenopsectra dyari				Not on any status lists
Phaenopsectra spp.	Phaenopsectra spp.			
Polycentropus arizonensis				Not on any status lists
Polycentropus spp.	Polycentropus spp.			
Polypedilum albicorne				Not on any status lists
Polypedilum spp.	Polypedilum spp.			
Procladius barbatulus				Not on any status lists
Procladius spp.	Procladius spp.			
Progomphus borealis	Gray Sanddragon			
Prosimulium caudatum				Not on any status lists
Prosimulium esselbaughi				Not on any status lists
Prosimulium spp.	Prosimulium spp.			
Protanyderus margarita				Not on any status lists
Protanyderus spp.	Protanyderus spp.			
Protoptila balmorhea				Not on any status lists
Protoptila coloma	A Caddisfly			
Protoptila spp.	Protoptila spp.			
Psephenus arizonensis				Not on any status lists
Psephenus falli				Not on any status lists
Psephenus spp.	Psephenus spp.			
Pseudochironomus richardsoni				Not on any status lists
Pseudochironomus spp.	Pseudochironomus spp.			
Psychomyia flavida	A Caddisfly			
Pteronarcys californica	Giant Salmonfly			
Pteronarcys spp.	Pteronarcys spp.			
Rhagovelia becki				Not on any status lists
Rhagovelia spp.	Rhagovelia spp.			
Rheotanytarsus hamatus				Not on any status lists
Rheotanytarsus spp.	Rheotanytarsus spp.			
Rhithrogena decora	A Mayfly			
Rhithrogena spp.	Rhithrogena spp.			
Rhyacophila acuminata	A Caddisfly			Not on any status lists
Rhyacophila spp.	Rhyacophila spp.			
Serratella levis	A Mayfly			
Serratella micheneri	A Mayfly			
Serratella spp.	Serratella spp.			
Sialis spp.	Sialis spp.			

Sigara alternata				Not on any status lists
Sigara spp.	Sigara spp.			
Simulium anduzei				Not on any status lists
Simulium spp.	Simulium spp.			
Skwala americana	American Springfly			
Skwala spp.	Skwala spp.			
Sperchon spp.	Sperchon spp.			
Stenocolus scutellaris				Not on any status lists
Tanytarsus angulatus				Not on any status lists
Tanytarsus spp.	Tanytarsus spp.			
Tinodes belisus	A Caddisfly			
Tinodes spp.	Tinodes spp.			
Tricorythodes explicatus	A Mayfly			
Tricorythodes spp.	Tricorythodes spp.			
Tropisternus californicus				Not on any status lists
Tropisternus spp.	Tropisternus spp.			
Tvetenia spp.	Tvetenia spp.			
Tvetenia vitracies				Not on any status lists
Uvarus amandus				Not on any status lists
Uvarus spp.	Uvarus spp.			
Wormaldia anilla	A Caddisfly			
Wormaldia spp.	Wormaldia spp.			
Zaitzevia parvula				Not on any status lists
Zaitzevia spp.	Zaitzevia spp.			
MAMMALS				
Castor canadensis	American Beaver			Not on any status lists
Lontra canadensis canadensis	North American River Otter			Not on any status lists
Neovison vison	American Mink			Not on any status lists
Ondatra zibethicus	Common Muskrat			Not on any status lists
MOLLUSKS				
Anodonta californiensis	California Floater		Special	
Fluminicola ahjumawi	Ahjumawi pebblesnail			V
Fluminicola spp.	Fluminicola spp.			
Gonidea angulata	Western Ridged Mussel		Special	
Gyraulus spp.	Gyraulus spp.			
Helisoma spp.	Helisoma spp.			
Juga acutifilosa	Topaz Juga		Special	T
Juga spp.	Juga spp.			
Margaritifera falcata	Western Pearlshell		Special	
Menetus spp.	Menetus spp.			

Physa spp.	Physa spp.			
Pisidium spp.	Pisidium spp.			
Planorbidae fam.	Planorbidae fam.			
PLANTS				
Orcuttia pilosa	Hairy Orcutt Grass	Endangered	Endangered	CRPR - 1B.1
Orcuttia tenuis	Slender Orcutt Grass	Threatened	Endangered	CRPR - 1B.1
Tuctoria greenei	Green's Awnless Orcutt Grass	Endangered	Rare	CRPR - 1B.1
Agrostis oregonensis	Oregon Bentgrass			
Allium validum	Tall Swamp Onion			
Alnus rhombifolia	White Alder			
Alopecurus aequalis aequalis	Short-awn Foxtail			
Alopecurus carolinianus	Tufted Foxtail			
Alopecurus geniculatus geniculatus	Meadow Foxtail			
Alopecurus pratensis	NA			
Alopecurus saccatus	Pacific Foxtail			
Ammannia coccinea	Scarlet Ammannia			
Ammannia robusta	Grand Redstem			
Aquilegia eximia	Van Houtte's Columbine			
Arundo donax	NA			
Asarum lemmonii	Lemmon's Wild Ginger			
Azolla filiculoides	NA			
Baccharis salicina				Not on any status lists
Bacopa rotundifolia	NA			
Bergia texana	Texas Bergia			
Berula erecta	Wild Parsnip			
Bistorta bistortoides				Not on any status lists
Boehmeria cylindrica	NA			Not on any status lists
Bolboschoenus fluviatilis				Not on any status lists
Bolboschoenus glaucus	NA			Not on any status lists
Bolboschoenus maritimus paludosus	NA			Not on any status lists
Brodiaea nana				Not on any status lists
Callitriche fassettii	NA			Not on any status lists
Callitriche heterophylla bolanderi	Large Water-starwort			
Callitriche heterophylla heterophylla	Northern Water-starwort			
Callitriche longipedunculata	Longstock Water-starwort			
Callitriche marginata	Winged Water-starwort			
Callitriche trochlearis	Waste-water Water-starwort			
Carex amplifolia	Bigleaf Sedge			
Carex aquatilis aquatilis	Water Sedge			

Carex aurea	Golden-fruit Sedge			
Carex cusickii	Cusick's Sedge			
Carex densa	Dense Sedge			
Carex echinata echinata	Little Prickly Sedge			
Carex feta	Green-sheath Sedge			
Carex hirtissima	Fuzzy Sedge			
Carex integra	Smooth-beak Sedge			
Carex jonesii	Jones' Sedge			
Carex lasiocarpa	Slender Sedge		Special	CRPR - 2B.3
Carex lemmonii	Lemmon's Sedge	Endangered		
Carex limosa	Mud Sedge		Special	CRPR - 2B.2
Carex nebrascensis	Nebraska Sedge			
Carex nervina	Sierra Sedge			
Carex nigricans	Black Alpine Sedge			
Carex nudata	Torrent Sedge			
Carex praeceptorum	Teacher's Sedge			
Carex scopulorum bracteosa	Holm's Rocky Mountain Sedge			
Carex simulata	Copycat Sedge			
Carex spectabilis	Northwestern Showy Sedge			
Carex utriculata	Beaked Sedge			
Carex vesicaria vesicaria	Inflated Sedge			
Carex vulpinoidea	NA			
Castilleja miniata miniata	Greater Red Indian-paintbrush			
Castilleja minor minor	Alkali Indian-paintbrush			
Cephalanthus occidentalis	Common Buttonbush			
Chamaecyparis lawsoniana				Not on any status lists
Cicendia quadrangularis	Oregon Microcala			
Cirsium douglasii breweri				Not on any status lists
Cirsium scariosum scariosum	Drummond's Thistle			Not on any status lists
Cotula coronopifolia	NA			
Crassula aquatica	Water Pygmyweed			
Crypsis vaginiflora	NA			
Cyperus acuminatus	Short-point Flatsedge			
Cyperus bipartitus	Shining Flatsedge			
Cyperus erythrorhizos	Red-root Flatsedge			
Cyperus flavescens	NA			
Cyperus fuscus	NA			
Cyperus involucratus	NA			
Cyperus squarrosus	Awned Cyperus			
Damasonium californicum				Not on any status lists
Darlingtonia californica	California Pitcherplant		Special	CRPR - 4.2
Darmera peltata	Umbrella Plant			
Datisca glomerata	Durango Root			
Downingia bacigalupii	Bacigalup's Downingia			
Downingia bella	Hoover's Downingia			

Downingia bicornuta	NA			
Downingia cuspidata	Toothed Calicoflower			
Downingia insignis	Parti-color Downingia			
Downingia montana	Sierra Downingia			
Downingia ornatissima	NA			
Downingia pulchella	Flat-face Downingia			
Downingia pusilla	Dwarf Downingia		Special	CRPR - 2B.2
Drosera rotundifolia	NA			
Echinochloa oryzoides	NA			
Echinodorus berteroi	Upright Burhead			
Elatine brachysperma	Shortseed Waterwort			
Elatine californica	California Waterwort			
Elatine heterandra	Mosquito Waterwort			
Elatine rubella	Southwestern Waterwort			
Eleocharis acicularis acicularis	Least Spikerush			
Eleocharis acicularis gracilescens	Least Spikerush			
Eleocharis atropurpurea	Purple Spikerush			
Eleocharis bella	Delicate Spikerush			
Eleocharis bolanderi	Bolander's Spikerush			
Eleocharis coloradoensis				Not on any status lists
Eleocharis decumbens	Decumbent Spikerush			
Eleocharis engelmannii engelmannii	Engelmann's Spikerush			Not on any status lists
Eleocharis flavescens flavescens	Pale Spikerush			
Eleocharis macrostachya	Creeping Spikerush			
Eleocharis montevidensis	Sand Spikerush			
Eleocharis obtusa	Blunt Spikerush			
Eleocharis parishii	Parish's Spikerush			
Eleocharis quadrangulata	NA			
Eleocharis quinqueflora	Few-flower Spikerush			
Eleocharis rostellata	Beaked Spikerush			
Eleocharis suksdorfiana	NA			
Epilobium campestre	NA			Not on any status lists
Epilobium cleistogamum	Cleistogamous Spike-primrose			
Epilobium oregonense	Oregon Willow-herb			
Epipactis gigantea	Giant Helleborine			
Eragrostis hypnoides	Teal Lovegrass			
Eriophorum gracile gracile	Slender Cotton-grass		Special	CRPR - 4.3
Eryngium alismifolium	Inland Coyote-thistle			
Eryngium aristulatum aristulatum	California Eryngo			
Eryngium articulatum	Jointed Coyote-thistle			
Eryngium vaseyi vaseyi	Vasey's Coyote-thistle			Not on any status lists
Euphorbia hooveri	NA			Not on any status lists

Euthamia occidentalis	Western Fragrant Goldenrod			
Fimbristylis autumnalis	NA			
Floerkea proserpinacoides	False Mermaidweed			
Galium trifidum	Small Bedstraw			
Gentianella amarella acuta	Autumn Dwarf Gentian			
Gentianopsis simplex	One-flower Gentian			
Glyceria elata	Tall Mannagrass			
Gratiola ebracteata	Bractless Hedge-hyssop			
Gratiola heterosepala	Boggs Lake Hedge-hyssop		Endangered	CRPR - 1B.2
Hastingsia alba	White Rushlily			
Helenium bigelovii	Bigelow's Sneezeweed			
Helenium puberulum	Rosilla			
Heteranthera limosa	NA			
Hosackia oblongifolia	NA			1.B.3
Hydrocotyleranunculoides	Floating Marsh-pennywort			
Hydrocotyle umbellata	Many-flower Marsh-pennywort			
Hydrocotyle verticillata verticillata	Whorled Marsh-pennywort			
Isoetes bolanderi	NA			
Isoetes howellii	NA			
Isoetes nuttallii	NA			
Isoetes orcuttii	NA			
Juncus acuminatus	Sharp-fruit Rush			
Juncus articulatus articulatus				Not on any status lists
Juncus dubius	Mariposa Rush			
Juncus effusus pacificus				
Juncus hemiendytus hemiendytus	Dwarf Rush			
Juncus leiospermus	NA		Special	
Juncus mertensianus	Mertens' Rush			
Juncus uncialis	Inch-high Rush			
Juncus usitatus	NA			Not on any status lists
Juncus xiphioides	Iris-leaf Rush			
Kyhosia bolanderi				Not on any status lists
Lasthenia ferrisiae	Ferris' Goldfields		Special	CRPR - 4.2
Lasthenia fremontii	Fremont's Goldfields			
Leersia oryzoides	Rice Cutgrass			
Lemna aequinoctialis	Lesser Duckweed			
Lemna gibba	Inflated Duckweed			
Lemna minor	Lesser Duckweed			
Lemna minuta	Least Duckweed			
Lemna trisulca	Star Duckweed			
Lemna turionifera	Turion Duckweed			
Leucothoe davisiae	Western Doghobble			
Lilium kelleyanum	Kelley's Lily			
Lilium pardalinum pardalinum	Leopard Lily			
Lilium pardalinum shastense	Leopard Lily			
Lilium parvum	Small Tiger Lily			

Limnanthes alba alba	White Meadowfoam			
Limnanthes alba versicolor	White Meadowfoam			
Limnanthes douglasii douglasii	Douglas' Meadowfoam			
Limnanthes douglasii nivea	Douglas' Meadowfoam			
Limnanthes douglasii rosea	Douglas' Meadowfoam			
Limnanthes floccosa californica	Shippee Meadowfoam	Endangered	Endangered	CRPR - 1B.1
Limnanthes floccosa floccosa	Woolly Meadowfoam		Special	CRPR - 4.2
Limosella acaulis	Southern Mudwort			
Limosella aquatica	Northern Mudwort			
Lindernia dubia	Yellowseed False			
Lipocarpha micrantha	Dwarf Bulrush			
Ludwigia palustris	Marsh Seedbox			
Ludwigia peploides montevidensis	NA			Not on any status lists
Ludwigia peploides peploides	NA			Not on any status lists
Lupinus polyphyllus polyphyllus	Bigleaf Lupine			
Lycopus americanus	American Bugleweed			
Lythrum californicum	California Loosestrife			
Lythrum portula	NA			
Marsilea vestita vestita	NA			Not on any status lists
Menyanthes trifoliata	Bog Buckbean			
Micranthes aprica				Not on any status lists
Micranthes odontoloma				Not on any status lists
Micranthes oregana	NA			Not on any status lists
Myosotis laxa	Small Forget-me-not			
Myosurus apetalus	Bristly Mousetail			
Myosurus minimus	NA			
Myosurus sessilis	Sessile Mousetail			
Myriophyllum aquaticum	NA			
Najas gracillima	NA			
Najas guadalupensis guadalupensis	Southern Naiad			
Navarretia cotulifolia	Cotula Navarretia			
Navarretia heterandra	Tehama Navarretia			
Navarretia intertexta	Needleleaf Navarretia			
Navarretia leucocephala bakeri	Baker's Navarretia		Special	CRPR - 1B.1
avarretia leucocephala leucocepha	White-flower Navarretia			
Navarretia leucocephala minima	Least Navarretia			
Oenanthe sarmentosa	Water-parsley			
Oreostemma alpigenum andersonii	Anderson's Tundra Aster			
Orthilia secunda	One-side Wintergreen			
Oxypolis occidentalis	Western Cowbane			
Panicum acuminatum acuminatum				Not on any status lists

Panicum dichotomiflorum	NA			
Paspalum distichum	Joint Paspalum			
Pedicularis attollens	NA			
Pedicularis groenlandica	NA			
Perideridia bolanderi bolanderi	Bolander's Yampah			
Perideridia bolanderi involucrata	Bolander's Yampah			
Perideridia kelloggii	Kellogg's Yampah			
Perideridia lemmonii	Lemmon's Yampah			
Perideridia oregana	Oregon Yampah			
Perideridia parishii latifolia	Parish's Yampah			
Persicaria hydropiper	NA			Not on any status lists
Persicaria hydropiperoides				Not on any status lists
Persicaria lapathifolia				Not on any status lists
Persicaria maculosa	NA			Not on any status lists
Persicaria punctata	NA			Not on any status lists
Phacelia distans	NA			
Pilularia americana	NA			
Plagiobothrys acanthocarpus	Adobe Popcorn-flower			
Plagiobothrys austiniae	Austin's Popcorn-flower			
Plagiobothrys greenei	Greene's Popcorn-flower			
Plagiobothrys humistratus	Dwarf Popcorn-flower			
Plagiobothrys leptocladus	Alkali Popcorn-flower			
Plagiobothrys tener	NA			
Plantago elongata elongata	Slender Plantain			
Platanthera sparsiflora sparsiflora	Canyon Bog Orchid			
Platanus racemosa	California Sycamore			
Pogogyne douglasii	NA			
Pogogyne zizyphoroides				Not on any status lists
Populus trichocarpa	NA			Not on any status lists
Porterella carnosula	Western Porterella			
Potamogeton diversifolius	Water-thread Pondweed			
Potamogeton foliosus foliosus	Leafy Pondweed			
Potamogeton gramineus	Grassy Pondweed			
Potamogeton illinoensis	Illinois Pondweed			
Potamogeton natans	Floating Pondweed			
Potamogeton nodosus	Longleaf Pondweed			
Potamogeton pusillus pusillus	Slender Pondweed			
Primula tetrandra	NA			Not on any status lists
Psilocarphus brevissimus brevissimus	Dwarf Woolly-heads			
Psilocarphus oregonus	Oregon Woolly-heads			
Ranunculus alismifolius alismellus	Water-plantain Buttercup			

Ranunculus alismifolius alismifolius	Water-plantain Buttercup			
Ranunculus alismifolius hartwegii				Not on any status lists
Ranunculus aquatilis aquatilis	White Water Buttercup			
Ranunculus bonariensis	NA			
Ranunculus flammula flammula	Lesser Spearwort			
Ranunculus hystriculus				Not on any status lists
Ranunculus pusillus pusillus	Pursh's Buttercup			
Ranunculus repens	NA			
Ranunculus sardous	NA			
Ranunculus sceleratus	NA			
Rhododendron columbianum				Not on any status lists
Rhododendron occidentale occidentale	Western Azalea			
Rhynchospora californica	California Beakrush		Special	CRPR - 1B.1
Rhynchospora capitellata	Brownish Beakrush		Special	CRPR - 2B.2
Rorippa curvisiliqua curvisiliqua	Curve-pod Yellowcress			
Rorippa palustris palustris	Bog Yellowcress			
Rotala ramosior	Toothcup			
Sagina saginoides	Arctic Pearlwort			
Sagittaria cuneata	Wapatum Arrowhead			
Sagittaria latifolia latifolia	Broadleaf Arrowhead			
Sagittaria longiloba	Longbarb Arrowhead			
Sagittaria montevidensis calycina				Not on any status lists
Sagittaria sanfordii	Sanford's Arrowhead		Special	CRPR - 1B.2
Salix boothii	Booth's Willow			
Salix eastwoodiae	Eastwood's Willow			
Salix exigua exigua	Narrowleaf Willow			
Salix geyeriana	Geyer's Willow			
Salix gooddingii	Goodding's Willow			
Salix hookeriana	Hooker's Willow			
Salix jepsonii	Jepson's Willow			
Salix laevigata	Polished Willow			
Salix lasiandra lasiandra				Not on any status lists
Salix lasiolepis lasiolepis	Arroyo Willow			
Salix lemmonii	Lemmon's Willow			
Salix melanopsis	Dusky Willow			
Salix sitchensis	Sitka Willow			
Schoenoplectus acutus occidentalis	Hardstem Bulrush			
Schoenoplectus californicus	California Bulrush			
Schoenoplectus mucronatus	NA			

Schoenoplectus tabernaemontani	Softstem Bulrush			
Scirpus congdonii	Congdon's Bulrush			
Scirpus diffusus	Umbrella Bulrush			
Scirpus microcarpus	Small-fruit Bulrush			
Senecio triangularis	Arrow-leaf Groundsel			
Sequoia sempervirens				
Sidalcea calycosa calycosa	Annual Checker-mallow			
Sidalcea hirsuta	Hairy Checker-mallow			
Sidalcea oregana hydrophila	Water-loving Checker-mallow		Special	CRPR - 1B.2
Sidalcea oregana oregana	Oregon Checker-mallow			
Sisyrinchium elmeri	Elmer's Blue-eyed-grass			
Solidago elongata				Not on any status lists
Sphenosciadium capitellatum	Swamp Whiteheads			
Spiranthes romanzoffiana	Hooded Ladies'-tresses			
Spirodela polyrhiza	NA			
Stachys ajugoides	Bugle Hedge-nettle			
Stachys pycnantha	Short-spike Hedge-nettle			
Stachys stricta	Sonoma Hedge-nettle			
Stuckenia pectinata				Not on any status lists
Taxus brevifolia				
Toxicoscordion venenosum venenosum				Not on any status lists
Triglochin maritima	Common Bog Arrow-grass			
Typha domingensis	Southern Cattail			
Typha latifolia	Broadleaf Cattail			
Utricularia gibba	Humped Bladderwort			
Veronica americana	American Speedwell			
Veronica anagallis-aquatica	NA			
Viola macloskeyi	NA			
Wolffia brasiliensis	Pointed Watermeal		Special	CRPR - 2B.3
Zannichellia palustris	Horned Pondweed			

Appendix 2-I

Surface Water Depletion and GDE Methodology and Analysis

Appendix 2-I

Part 1

Groundwater Dependent Ecosystem Analysis and Prioritization Methodology

Los Molinos Subbasin

MEMORANDUM

DATE: September 7, 2021

TO: Eddy Teasdale

FROM: Andrew Francis

RE: Groundwater Dependent Ecosystem Analysis and Prioritization Methodology

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Introduction

The purpose of this memorandum is to outline the process used to identify and prioritize groundwater dependent ecosystems (GDE) in four Tehama County (TC) subbasins: the Antelope, Bowman, and Red Bluff Subbasins. The results of the identification and prioritization process is presented in the groundwater sustainability plans (GSP)s developed for the individual Subbasins. GDEs are defined under the Sustainable Groundwater Management Act (SGMA) as "ecological communities that depend on groundwater emerging from an aquifer or on groundwater occurring near the ground surface" (23 CCR § 351 (m)). GSP regulations state that GDE's are to be identified and that all beneficial users of groundwater are to be considered in the development of a GSP (23 CCR § 355.4 (b)(4)). The approach used to both identify and prioritize GDE's was based on the guidance document *Groundwater Dependent Ecosystems under the Sustainable Groundwater Management Act – Guidance for Preparing Groundwater Sustainability Plans* (Rohde et al., 2018), which provides information on the data types and methods that can be used to identify and prioritize GDEs. The guidance document was produced by The Nature Conservancy (TNC), an environmental stakeholder who has been actively involved in GSP development and review throughout the State. The identification process includes using mapped vegetation, mapped naturally occurring surface water features, and shallow groundwater level data to assess if there is a connection to groundwater in areas where vegetation or surface water is present. In addition to the information provided by TNC, feedback from local stakeholders was a key component in this process to incorporate GDE's in the four Subbasin GSPs in TC.

The following outlines the data sources and processes used to identify and prioritize GDE's:

1. GDE Identification – TNC Guidance
    a. GDE indicators (GDEi) – Natural Communities Commonly Associated with Groundwater (NCCAG)
        i. Vegetation
        ii. Wetlands
    b. Review of Aerial Imagery

        i. LandIQ, 2018
    c. Establish a connection to groundwater
        i. Depth to Water Contours
    d. Final GDE Designations
2. GDE Prioritization
    a. GDE Pulse Analysis – Vegetation Prioritization
    b. Wetlands Prioritization

1. GDE Identification – TNC Guidance

The TNC guidance document lays out a two-step process for identifying GDEs. The first is to review aerial imagery to identify land use changes that may have occurred in areas that were mapped as vegetation or surface water, and the second is to assess if there is a connection to groundwater. The TNC guidance document also recommends additional steps for specific GDE types (e.g., river, wetlands, terrestrial vegetation, springs/seeps) under conditions where there does not appear to be a connection to groundwater based on the 30-foot threshold. These additional steps require field evaluation which have not been conducted and are not discussed in this memorandum.

a. GDE Indicators (GDEi) – Natural Communities Commonly Associated with Groundwater

The mapped vegetation and surface water features used to identify GDEs was the Natural Communities Commonly Associated with Groundwater (NCCAG) dataset. The NCCAG is a compilation of 48 publicly available state and federal agency datasets that map vegetation, wetlands, springs, and seeps in California. The NCCAG was developed by a working group comprised of the Department of Water Resources (DWR), the California Department of Fish and Wildlife (DFW), and TNC (Klausmeyer et al, 2018). Historic mapping of vegetation and surface water was screened to exclude areas that are less likely to be associated with groundwater. This resulted in two individual datasets: *Vegetation* and *Wetlands*. Both of these are geospatial datasets that can be used in a mapping software such as ArcGIS. The vegetation includes all terrestrial vegetation and identifies the dominate species for each area. The wetlands data is a collection of surface water features that are potentially reliant on groundwater including streams, springs, seeps, and wetlands. The mapped areas vegetation and surface water in NCCAG data set are considered indicators of GDEs (GDEi).

i. Vegetation

The mapped NCCAG vegetation is presented in Figure 1 is primarily located along the Sacramento River and its tributaries. There is minimal coverage in the western parts of the Red Bluff and Bowman subbasins and lighter coverage in the eastern portions of Antelope and Los Molinos. There are approximately 12,000 acres of Vegetation GDEi across the four TC Subbasins. Also symbolized in this figure is the year the individual GDEi were mapped. The dates range from 1994 to 2014.

ii. Wetlands

The mapped wetlands GDEi are presented in Figure 2. The wetlands data set includes all surface water ecosystems that are potentially supported by groundwater including wetlands, rivers, lakes, springs, and seeps. There are approximately 7,600 acres of Wetland GDEI across the four TC Subbasins. Also symbolized in this figure is the year the individual GDEi were mapped. The dates range from 1972 to 2010.

b. Review of Aerial Imagery

The first step for identifying GDEs was to determine where land use changes had occurred between the time the GDEi were originally mapped and current conditions. The timeframe for GDEi is between 1972 and 2014 and the current land use conditions are represented by a 2018 land use dataset produced by Land IQ. GDEi were reviewed by comparing the vegetation and wetlands NCCAG datasets to the 2018 Land IQ dataset. If there were GDEi that overlayed or intersected with areas in the Land IQ dataset that were identified as developed, the GDEi were removed as potential GDEs. GDEi are generally accurate based on the Land IQ data. TNC vegetation and wetlands GDEi consistently aligned with the areas that are mapped as native vegetation and surface water in the 2018 Land IQ imagery. The areas of developed and undeveloped land are presented in Figure 3.

c. Evaluate Existence of a Connection to Groundwater

i. Depth to Water Contours

Groundwater dependence is required for a GDE and depth to water measurements were used to indicate the groundwater connection. Rhode et al, 2018 provides a work sheet outlining steps to assess if there a connection to groundwater. The first and primary step of this worksheet was to identify areas where depth to groundwater is less than 30 feet bgs. Well construction and groundwater level data were obtained from multiple public agency online databases including DWR, United States Geological Survey (USGS), the State Water Resource Control Board (SWRCB).

To identify areas where depth to groundwater exceeded 30 feet, shallow groundwater level data from wells constructed to depths of up to 100 feet bgs were used to create depth to

water contours. Contours for Spring 2015 are presented in Figure 4. 2015 was selected as this is the baseline year of SGMA. There are a limited number of shallow wells with ground water level data in each of the individual subbasins. Where data gaps exist, the depth to water and groundwater connection may not be possible to determine. To generalize, water levels are shallow (less than 30 feet) along the Sacramento River and
water levels away from the Sacramento River appear to be greater than 30 feet, indicating a lack of a connection to groundwater

d. Final GDE Designation

Final GDE designation included all of those GDEi that are located in areas that have not been developed and where the depth to groundwater is not greater than 30 feet bgs.

2. GDE Prioritization

Following the identification of GDE's that currently exist (post 2015 baseline), the GDEi were prioritized using TNC's GDE Pulse tool. The GDE Pulse tool provides information on the health of vegetation. The purpose of prioritizing GDEs was to identify areas that have potentially been impacted by declining water levels. Information from the prioritized areas will assist with determining undesirable results and minimum thresholds for the groundwater sustainability indicators.

a. GDE Pulse Analysis - Vegetation Prioritization

Given the large area of all the designated GDEs, areas were prioritized based on their observed health using remote sensing data. TNC developed the GDE Pulse tool (https://gde.codefornature.org/#/map) which allowed for easy access to processed remote sensing data to evaluate vegetation health. The metric used in the GDE pulse tool to evaluate changes in vegetation health was the Normalized Derived Vegetation Index (NDVI). This NDVI is a value calculated from the measured near-infrared (NIR) radiation and visible red light. Figure 5 shows an example of healthy and unhealthy vegetation along with an example for how the NDVI value is calculated.

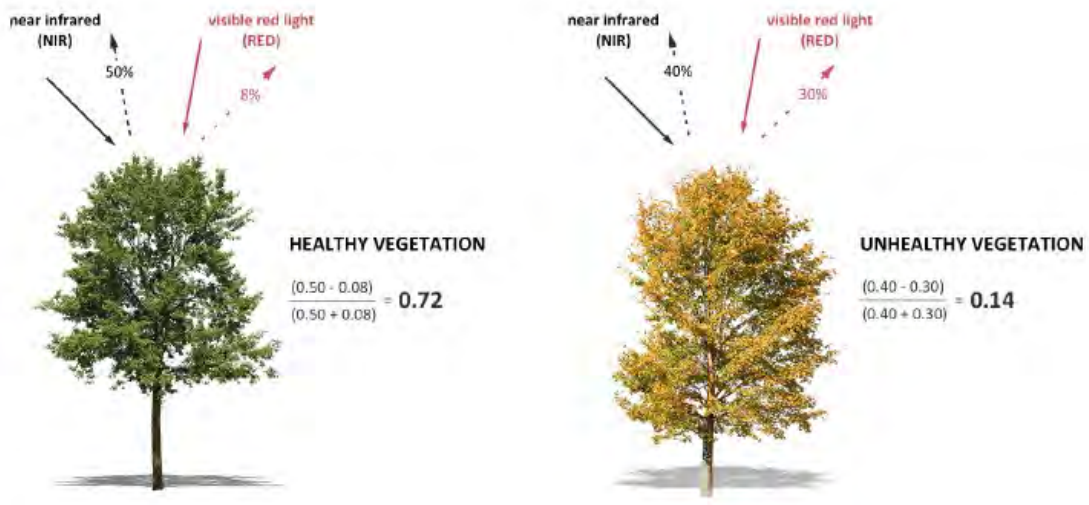


Figure 5. Example NDVI Calculation from Klausmeyer et al. 2019

The NDVI values calculated were based on images collected between July 9 and September 7 for each year. This time frame was selected based on the findings from Huntington et al., 2016 in that this is the time of year that vegetation is most likely relying on groundwater.

An annual NDVI value based on summer conditions was assigned to each individual GDE. A linear regression was performed to determine the trend of NDVI values between 1990 and 2018. This timeframe was selected as it is the baseline period for historic water conditions in the four TC Subbasins. The results from that analysis are presented in Figure 6.

NDVI trends were divided into three categories based on the magnitude of change from 1990 to 2018: *No Decline*, *Minimal Decline – Low Priority, Significant Decline – High Priority.* The magnitude of change is not a representation of actual vegetation health, but how the health of the vegetation has changed over the baseline period. High priority sites should be evaluated further to better understand the relationship between groundwater conditions and GDE health. High priority areas will also serve as the representative monitoring sites for all GDEs across the four Subbasins.

b. Wetlands Prioritization

The GDE pulse tool did not include any metrics on the health of areas in the Wetlands dataset. Wetland prioritization was determined by their proximity to Vegetation GDEs with declining NDVI values. Wetlands GDEs were assigned either high or low prioritization if in contract with or overlaying a Vegetation GDE with a high or low prioritization.

References

Huntington, Justin, Kenneth McGwire, Charles Morton, Keirith Snyder, Sarah Peterson, Tyler Erickson, Richard Niswonger, Rosemary Carroll, Guy Smith, and Richard Allen. 2016. "Assessing the Role of Climate and Resource Management on Groundwater Dependent Ecosystem Changes in Arid Environments with the Landsat Archive." *Remote Sensing of Environment.* https://doi.org/ 10.1016/j.rse.2016.07.004.

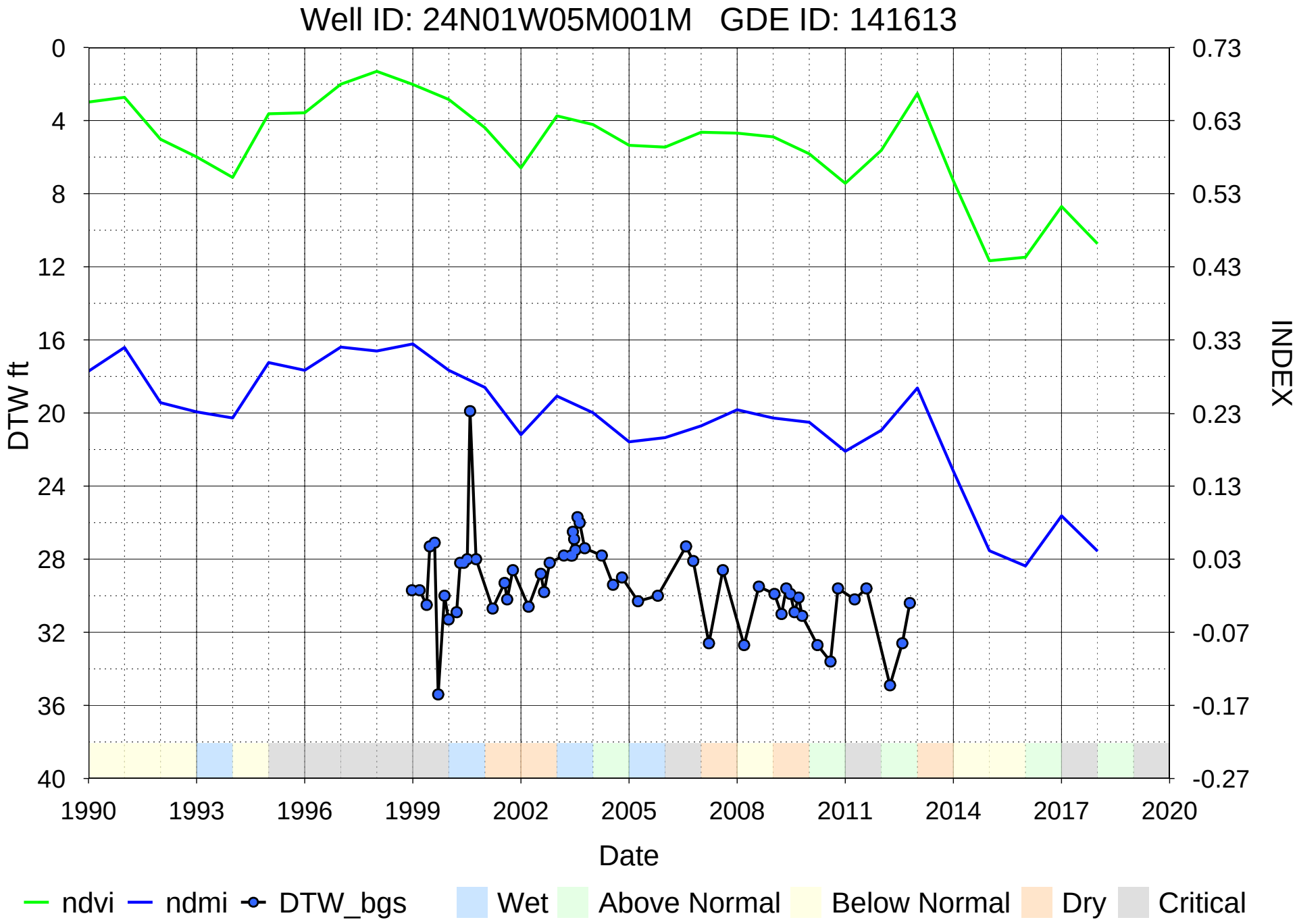
Klausmeyer, K., Howard J., Keeler-Wolf T., Davis-Fadtke K., Hull R., and Lyons A. (2018). Mapping Indicators of Groundwater dependent ecosystems in California

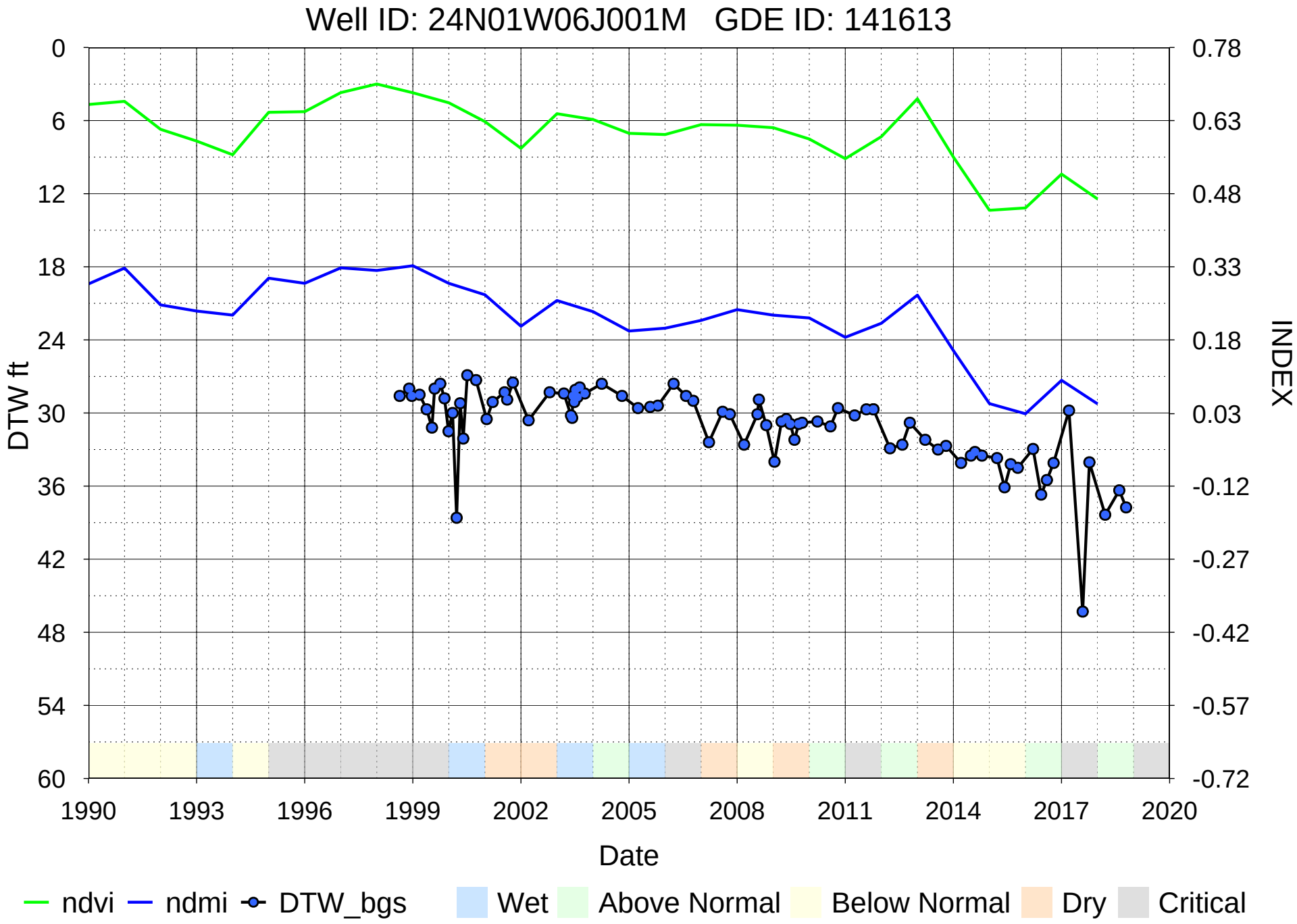
Rohde, M. M., S. Matsumoto, J. Howard, S. Liu, L. Riege, and E. J. Remson. 2018. Groundwater Dependent Ecosystems under the Sustainable Groundwater Management Act: Guidance for Preparing Groundwater Sustainability Plans. The Nature Conservancy, San Francisco, California.

Appendix 2-I

Part 2

Timeseries Graphs of Depth to Water at Shallow Wells and NDVI and NDMI of Adjacent Vegetation


Well ID: 24N01W05M001M GDE ID: 141613
DTW ft
INDEX
Date
0
4
8
12
16
20
24
28
32
36
40
0.73
0.63
0.53
0.43
0.33
0.23
0.13
0.03
-0.07
-0.17
-0.27
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
2020
ndvi
ndmi
DTW_bgs
Wet
Above Normal
Below Normal
Dry
Critical


Well ID: 24N01W06J001M GDE ID: 141613
DTW ft
INDEX
0
6
12
18
24
30
36
42
48
54
60
0.78
0.63
0.48
0.33
0.18
0.03
-0.12
-0.27
-0.42
-0.57
-0.72
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
2020
Date
ndvi
ndmi
DTW_bgs
Wet
Above Normal
Below Normal
Dry
Critical