# 5. MINIMUM THRESHOLDS, MEASURABLE OBJECTIVES, AND INTERIM MILESTONES

This chapter defines the sustainability criteria used to avoid undesirable results during GSP implementation. SGMA requires the application of minimum thresholds (MTs), measurable objectives (MOs), and interim milestones (IMs) to all representative monitoring sites identified in the GSP. These values, or thresholds, will help the Cuyama Basin Groundwater Sustainability Agency (CBGSA) and other groundwater users in the Basin identify sustainable values for the established SGMA sustainability indicators, and will help identify progress indicators over the 20-year GSP implementation period.

## 5.1 Useful Terms

There are several terms used in this chapter that describe Basin conditions and the values calculated for the representative sites. These terms are intended as a guide for readers, and are not a definitive definition of any term.

- **Interim Milestones** – IMs are a target value representing measurable conditions, set in increments of five years. They are set by the CBGSA as part of the GSP; IMs will help the Basin reach sustainability by 2040.
- **Measurable Objectives** – MOs are specific, quantifiable goals for maintaining or improving specified groundwater conditions that are included in the adopted GSP to achieve the Basin's sustainability goal.
- **Minimum Thresholds** – MTs are a numeric value for each sustainability indicator, which are used to define when undesirable results occur if minimum thresholds are exceeded in a percentage of sites in the monitoring network.
- **Sustainability Goals** – Sustainability goals are the culmination of conditions in the absence of undesirable results within 20 years of the applicable statutory deadline.
- **Undesirable Results** – Undesirable results are the significant and unreasonable occurrence of conditions that adversely affect groundwater use in the Basin, as defined in Chapter 3.

- **Sustainability Indicators** – These indicators refer to any of the effects caused by groundwater conditions occurring throughout the Basin that, when significant and unreasonable, cause undesirable results, as described in Water Code Section 10721(x). These include the following:
  - Lowering groundwater levels
  - Reduction of groundwater storage
  - Seawater intrusion
  - Degraded water quality
  - Land subsidence
  - Depletion of interconnected surface water

Both MOs and MTs are applied to all sustainability indicator representative sites. Sites in the Basin's monitoring networks that are not classified as representative sites are not required to have MOs or MTs. All of the Basin's representative sites will also have IMs calculated for 2025, 2030, and 2035 to help guide the CBGSA toward its 2040 sustainability goals. All wells meeting the representative well criteria outlined in this GSP are included in the Basin's monitoring network, although participation in the SGMA monitoring program is dependent upon agreements between the CBGSA and the well owners.

The following subsections describe the process of establishing MOs, MTs, and IMs for each of the sustainability indicators described above. They also discuss the results of this process.

## 5.2 Chronic Lowering of Groundwater Levels

The undesirable result for the chronic lowering of groundwater levels is a result that causes significant and unreasonable reduction in the long-term viability of domestic, agricultural, municipal, or environmental uses over the planning and implementation horizon of this GSP.

Groundwater conditions, as discussed in Chapter 2, Section 2.2, vary across the Basin. Groundwater conditions are influenced by geographic attributes, geologic attributes, and overlying land uses in the Basin. Because of the variety of conditions, six threshold regions were established in the Basin so appropriate sustainability criteria could be set more precisely for each region.

### 5.2.1 Threshold Regions

The six threshold regions were defined to allow areas with similar conditions to be grouped together for calculation of MOs, MTs, and IMs. These threshold regions are shown in Figure 5-1. The following subsections discuss threshold region characteristics and boundaries.

## Southeastern Threshold Region

The Southeastern Threshold Region lies on the southeastern edge of the Basin, and is characterized as having moderate agricultural land use with steep geographic features surrounding the valley. Groundwater is generally high in this area, with recent historical data showing levels around 50 feet or less below ground surface, which indicates that this region is likely currently in a full condition. Groundwater levels in this region are subject to declines during drought periods, but have typically recovered back to previous levels during historically wet periods. The northern boundary of this region is the narrows at the Cuyama River approximately at the boundary with U.S. Forest Service lands, and the eastern boundary is the extent of alluvium. The southern and western extent of this region is defined by the groundwater basin boundary.

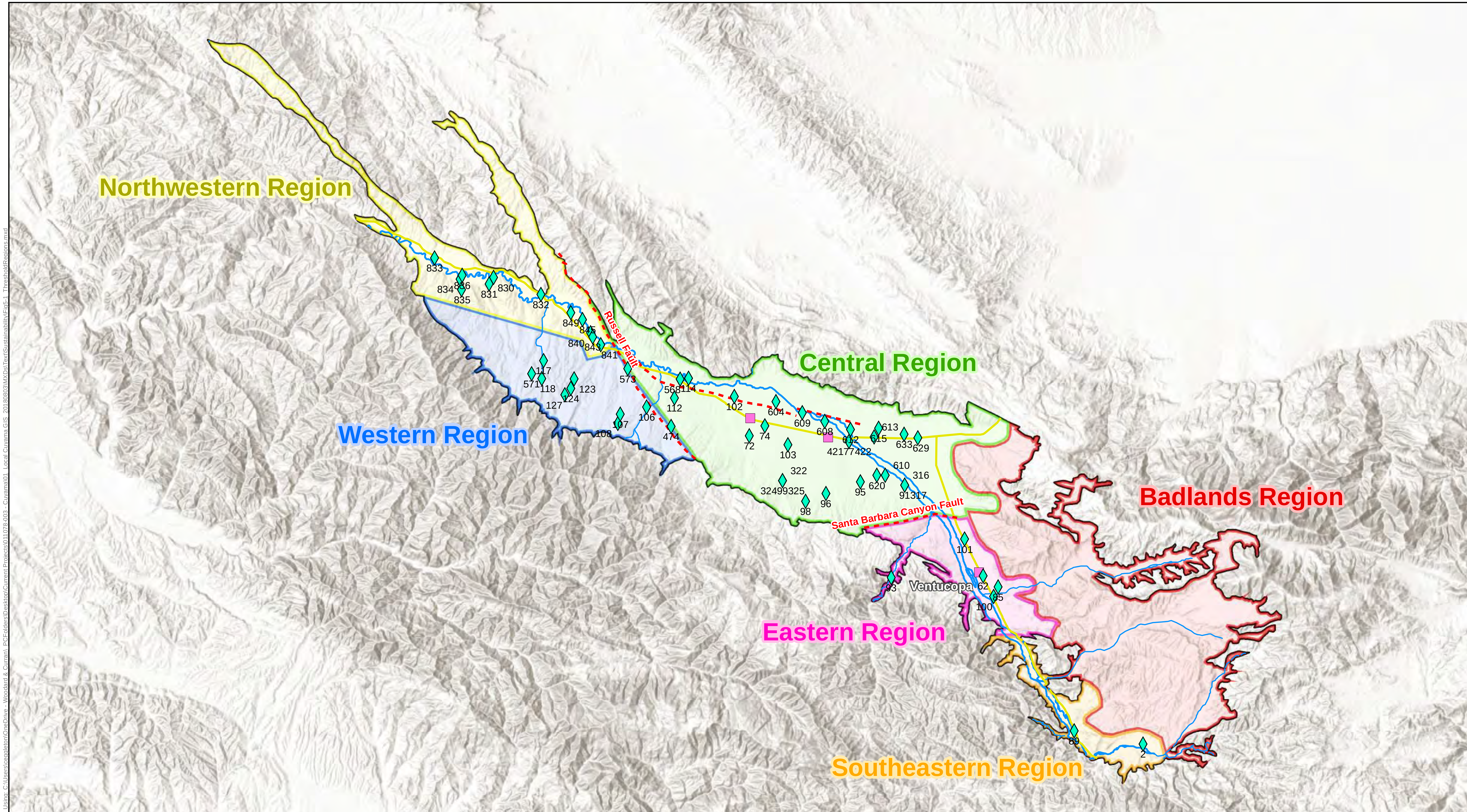


**Figure 5-1: Cuyama GW Basin Groundwater Level Representative Wells & Threshold Regions**

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

December 2019

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*Legend*

- Cuyama Basin
- Towns
- Representative Wells
- Faults
- Highways
- Cuyama River
- Streams

**Threshold Regions**

- Badlands Region
- Central Region
- Eastern Region
- Northwestern Region
- Southeastern Region
- Western Region

N

0 2.75 5.5 11 Miles

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## Eastern Threshold Region

The Eastern Threshold Region lies southeast of the central part of the Basin and encompasses Ventucopa and much of the surrounding agricultural property. This part of the Basin has agricultural pumping. Hydrographs in this region indicate that groundwater levels have historically ranged widely and repeatedly over the last 50 years, and in general, are declining over the past 20 years. However, these levels are generally higher than those in the Central Threshold Region. The northern boundary of this region is the SBCF, and the southern boundary is where the Cuyama Valley significantly narrows due to geographic changes. The eastern boundary is the extent of the boundary, and the western boundary is defined by the groundwater basin boundary.

## Central Threshold Region

The Central Threshold Region incorporates the majority of agricultural land use in the Basin, as well as the towns of Cuyama and New Cuyama. The greatest depths to groundwater are also found in the Central Threshold Region, and groundwater levels have generally been declining in this region since the 1950s. The southeastern boundary is defined by the SBCF, and the western boundary by the Russell Fault. The northern and southern boundary of this region is defined by the Basin boundary.

## Western Threshold Region

The Western Threshold Region is characterized by shallow depth to water, and recent historical data and hydrographs in this region indicate that it is likely this portion of the Basin is currently in a full condition. Land uses in this area generally include livestock and small agricultural operations. It lies primarily on the north facing slope of the lower Cuyama Valley. The eastern boundary is defined by the Russell Fault, and the northern boundary was drawn to differentiate distinct land uses. The southwestern boundary is defined by the groundwater basin boundary.

## Northwestern Threshold Region

The Northwestern Threshold Region is the bottom of the Cuyama Basin and has undergone changes in land use from small production agricultural and grazing to irrigated crops over the last four years. Recent historical data and hydrographs in this portion of the Basin indicate that this portion is likely currently in a full condition. The southern border was drawn to differentiate between the land uses of the Western and Northwestern Threshold regions, resulting in different kinds of agricultural practices. The rest of the region is defined by the Basin boundary.

## Badlands Threshold Region

The Badlands Threshold Region includes the areas east of the Central, East, and Southeast Threshold regions on the west facing slope of the Cuyama Valley. There are no active wells and there is little groundwater use in this area. There is no monitoring in this region, and no sustainability criteria were developed for this region.

### 5.2.2 Minimum Thresholds, Measurable Objectives, and Interim Milestones

This section describes how MTs, MOs, and IMs were established by threshold region, and explains the rationale behind each selected methodology.

## Southeastern Threshold Region

Monitoring in this threshold region indicates groundwater levels are static except during drought conditions from 2013 to 2018. Static groundwater levels indicate this area of the Basin is generally at capacity; therefore, the MT is protective of domestic, private, public, and environmental uses.

The MO for the Southeastern Threshold Region's wells was calculated by finding the measurement taken closest to (but not before) January 1, 2015 and not after April 30, 2015. If no measurement was taken during this four-month period, then a linear trendline was applied to the data and the value for January 1, 2015 was extrapolated.

To provide an operational flexibility range, the MT was calculated by subtracting five years of groundwater storage from the MO. Five years of storage was calculated by finding the decline in groundwater levels from 2013 to 2018, which was considered a period of drought. If measurements were insufficient for this time period, a linear trendline was used to extrapolate the value decline value.

IMs were set to equal the MT in 2025, with a projected improvement to one-third the distance between the MT and MO in 2030 and half the distance between the MT and MO in 2035. As a result, IMs will measure progress toward sustainability over the GSP's planning horizon.

Groundwater levels will be measured using the protocols documented in Chapter 4's Appendix A.

## Eastern Threshold Region

Monitoring in this threshold region indicates a downward trend in groundwater levels. However, much of this downward trend is due to hydrologic variability and may be recovered in the future. Therefore, MTs have been set to allow for greater flexibility as compared to other regions. The MT for wells in this region intends to protect domestic, private, public and environmental uses of the groundwater by allowing for managed extraction in areas that have beneficial uses and protecting those with at risk infrastructure.

Stakeholders reported concern about the dewatering of domestic wells in this region, and groundwater levels have been declining in monitoring wells. Both the MT and MO consider the sustainability of water levels in regard to both domestic and agricultural users.

The MT was calculated by taking the total historical range of recorded groundwater levels and used 35 percent of the range. This 35 percent was then added below the value closest to January 1, 2015 (as described above).

MOs were calculated by subtracting five years of groundwater storage from the MT. Five years of storage was found by calculating the decline in groundwater levels from 2013 to 2018 (a drought period). If measurements were insufficient for this time period, a linear trendline was used to extrapolate the value.

IMs were set to equal the MT in 2025, with a projected improvement to one-third the distance between the MT and MO in 2030 and half the distance between the MT and MO in 2035. As a result, IMs will measure progress toward sustainability over the GSP's planning horizon.

Groundwater levels will be measured using the protocols documented in Chapter 4's Appendix A.

### Central Threshold Region

Monitoring in this threshold region indicates a decline in groundwater levels, indicating an extraction rate that exceeds recharge rates. The MT for this region is set to allow current beneficial uses of groundwater while reducing extraction rates over the planning horizon to meet sustainable yield. The MO is intended to allow sufficient operational flexibility for future drought conditions.

The MT for representative wells in the Central Threshold Region was calculated by finding the maximum and minimum groundwater levels for each representative well, and calculating 20 percent of the historical range. This 20 percent was then added to the depth to water measurement closest to, but not before, January 1, 2015, and no later than April 30, 2015. If no measurement was taken during this four-month period, then a linear trendline was applied to the wells data, and the value for January 1, 2015 was extrapolated.

The MO was calculated by subtracting five years of groundwater storage from the MT. Five years of storage was found by calculating the decline in groundwater levels from 2013 to 2018 (a drought period). If measurements were insufficient for this time period, a linear trendline was used to extrapolate the value.

For Opti Wells 74, 103, 114, 568, 609, and 615, a modified MO calculation was used where the MO used the linear trendline of the full range of measurements to extrapolate a January 1, 2015 value. This modification was made because measurements from 2013 to 2018 in these wells did not provide sufficient data to provide an adequate trendline for calculating the MO.

IMs were set to equal the in 2025, with a projected improvement to one-third the distance between the MT and MO in 2030 and half the distance between the MT and MO in 2035. As a result, IMs will measure progress toward sustainability over the GSP's planning horizon.

Groundwater levels will be measured using the protocols documented in Chapter 4's Appendix A.

### Western Threshold Region

Monitoring in this threshold region indicates groundwater levels are stable, and levels varied significantly depending on where representative wells were in the region. The most common use of groundwater in this region is for domestic use. Due to these hydrologic conditions, the MT was set to protect the water levels from declining significantly, while allowing beneficial land surface uses of the groundwater and protection of current well infrastructure. The MT was calculated by taking the difference between the total well depth and the value closest to mid-February, 2018, and calculating 15 percent of that depth. Values from 2018 are used because data collected during this time represent a full basin condition. That value was then subtracted from the mid-February, 2018 measurement to calculate the MT. This allows users in this region to use their groundwater supply without increasing the risk of running a well beyond acceptable limits, and this methodology is responsive to the variety of conditions and well depths in this region.

The MO was then calculated by finding the measurement closest to mid-February, 2018, which monitoring indicates is likely a full condition.

Opti Well 474 uses a modified MO calculation where the historical high elevation measurement was used as the MO. This was done to allow for a sufficient operational flexibility based on historical data for the well.

IMs were set to equal the in 2025, with a projected improvement to one-third the distance between the MT and MO in 2030 and half the distance between the MT and MO in 2035. As a result, IMs will measure progress toward sustainability over the GSP's planning horizon.

Groundwater levels will be measured using the protocols documented in Chapter 4's Appendix A.

### Northwestern Threshold Region

Monitoring in this threshold region indicates levels are stable, with some declines in the area where new agriculture is established. Due to these hydrologic conditions, the MT was set to protect the water levels from declining significantly, while allowing beneficial land surface uses (including domestic and agricultural uses) and using the storage capacity of this region. The MT for the this region was found by determining the region's total average saturated thickness for the primary storage area, and calculating 15 percent of that depth. This value was then set as the MT.

The MO for this region was calculated using 5 years of storage. Because historical data reflecting new operations in this region are limited, 50 feet was used as 5 years of storage based on local landowner input.

There are several representative wells in this region that were reclassified as far-west northwestern wells, and include Opti Wells 830, 831, 832, 833, 834, 835, and 836. These wells have total depths that are shallower, and they use the same strategies as the Western Threshold Region for their MOs and MTs to be more protective of these wells and ensure levels do not drop below the total well depth.

IMs were set to equal the MT in 2025, with a projected improvement to one-third the distance between the MT and MO in 2030 and half the distance between the MT and MO in 2035. As a result, IMs will measure progress toward sustainability over the GSP's planning horizon.

Groundwater levels will be measured using the protocols documented in Chapter 4's Appendix A.

#### Badlands Threshold Region

This threshold region has no groundwater use or active wells. As a result, no MO, MT, or IM was calculated.

### 5.2.3 Selected MT, MO, and IM Graphs, Figures, and Tables

Figure 5-2 shows an example hydrograph with indicators for the MT, MO, and IM over the hydrograph. The left axis shows elevation above mean sea level, the right axis shows depth to water below ground surface. The brown line shows the ground surface elevation, and time in years is shown on the bottom axis. Each measurement taken at the monitoring well is shown as a blue dot, with blue lines connecting between the blue dots indicating the interpolated groundwater level between measurements. The MT and IM are shown as a red line, and the MO is shown as a green line. Appendix A includes hydrographs with MT, MO and IM for each representative monitoring well.

Table 5-1 shows the representative monitoring network and the numerical values for the MT, MO, and IM.

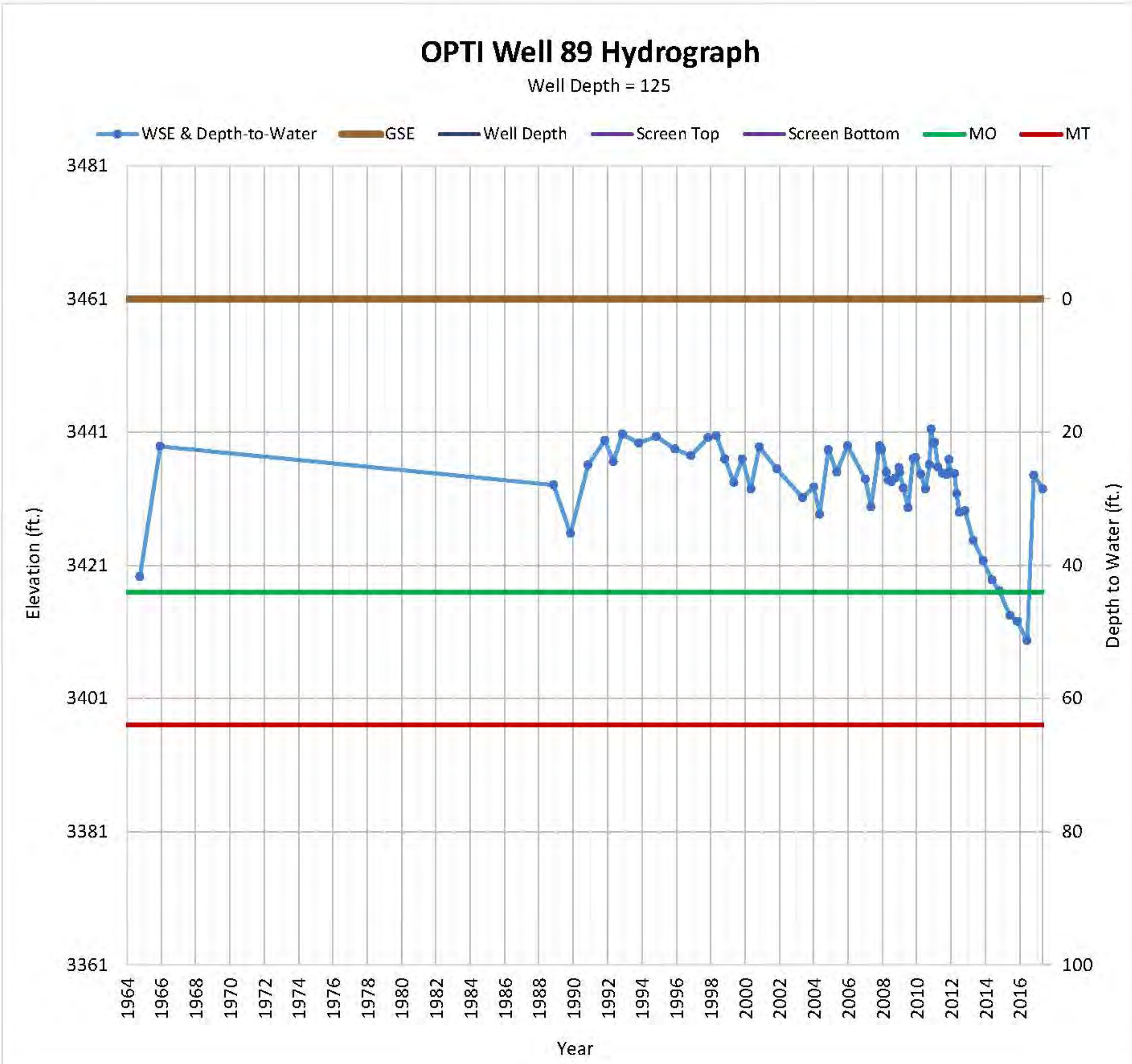


**Figure 5-2: Example Hydrograph**

**Table 5-1: Representative Monitoring Network and Sustainability Criteria**

| OPTI Well | Region | Final MT | Final MO | 2025 IM | 2030 IM | 2035 IM | Well Depth (feet) | Screen Top (feet) | Screen Bottom (feet) | GSE (feet) |
|---|---|---|---|---|---|---|---|---|---|---|
| 72 | Central | 169 | 124 | 169 | 154 | 147 | 790 | 340 | 350 | 2,171 |
| 74 | Central | 256 | 243 | 256 | 252 | 250 | -- | -- | -- | 2,193 |
| 77 | Central | 450 | 400 | 450 | 433 | 425 | 980 | 960 | 980 | 2,286 |
| 91 | Central | 625 | 576 | 625 | 609 | 601 | 980 | 960 | 980 | 2,474 |
| 95 | Central | 573 | 538 | 573 | 561 | 556 | 805 | -- | -- | 2,449 |
| 96 | Central | 333 | 325 | 333 | 330 | 329 | 500 | -- | -- | 2,606 |
| 98 | Central | 450 | 439 | 450 | 446 | 445 | 750 | -- | -- | 2,688 |
| 99 | Central | 311 | 300 | 311 | 307 | 306 | 750 | 730 | 750 | 2,513 |
| 102 | Central | 235 | 197 | 235 | 222 | 216 | -- | -- | -- | 2,046 |
| 103 | Central | 290 | 235 | 290 | 272 | 263 | 1,030 | -- | -- | 2,289 |
| 112 | Central | 87 | 85 | 87 | 86 | 86 | 441 | -- | -- | 2,139 |
| 114 | Central | 47 | 45 | 47 | 46 | 46 | 58 | -- | -- | 1,925 |
| 316 | Central | 623 | 574 | 623 | 607 | 599 | 830 | -- | -- | 2,474 |
| 317 | Central | 623 | 573 | 623 | 606 | 598 | 700 | -- | -- | 2,474 |
| 322 | Central | 307 | 298 | 307 | 304 | 303 | 850 | -- | -- | 2,513 |
| 324 | Central | 311 | 299 | 311 | 307 | 305 | 560 | -- | -- | 2,513 |
| 325 | Central | 300 | 292 | 300 | 297 | 296 | 380 | -- | -- | 2,513 |
| 420 | Central | 450 | 400 | 450 | 433 | 425 | 780 | -- | -- | 2,286 |

Table 5-1: Representative Monitoring Network and Sustainability Criteria

| OPTI Well | Region | Final MT | Final MO | 2025 IM | 2030 IM | 2035 IM | Well Depth (feet) | Screen Top (feet) | Screen Bottom (feet) | GSE (feet) |
|---|---|---|---|---|---|---|---|---|---|---|
| 421 | Central | 446 | 398 | 446 | 430 | 422 | 620 | -- | -- | 2,286 |
| 422 | Central | 444 | 397 | 444 | 428 | 421 | 460 | -- | -- | 2,286 |
| 474 | Central | 188 | 169 | 188 | 182 | 179 | 213 | -- | -- | 2,369 |
| 568 | Central | 37 | 36 | 37 | 37 | 37 | 188 | -- | -- | 1,905 |
| 604 | Central | 526 | 487 | 526 | 513 | 507 | 924 | 454 | 924 | 2,125 |
| 608 | Central | 436 | 407 | 436 | 426 | 422 | 745 | 440 | 745 | 2,224 |
| 609 | Central | 458 | 421 | 458 | 446 | 440 | 970 | 476 | 970 | 2,167 |
| 610 | Central | 621 | 591 | 621 | 611 | 606 | 780 | 428 | 780 | 2,442 |
| 612 | Central | 463 | 440 | 463 | 455 | 452 | 1,070 | 657 | 1070 | 2,266 |
| 613 | Central | 503 | 475 | 503 | 494 | 489 | 830 | 330 | 830 | 2,330 |
| 615 | Central | 500 | 468 | 500 | 489 | 484 | 865 | 480 | 865 | 2,327 |
| 620 | Central | 606 | 566 | 606 | 593 | 586 | 1,035 | 550 | 1035 | 2,432 |
| 629 | Central | 559 | 527 | 559 | 548 | 543 | 1,000 | 500 | 1000 | 2,379 |
| 633 | Central | 547 | 493 | 547 | 529 | 520 | 1,000 | 500 | 1000 | 2,364 |
| 62 | Eastern | 182 | 157 | 182 | 169 | 170 | 212 | -- | -- | 2,921 |
| 85 | Eastern | 233 | 209 | 233 | 204 | 221 | 233 | -- | -- | 3,047 |
| 100 | Eastern | 181 | 152 | 181 | 162 | 167 | 284 | -- | -- | 3,004 |
| 101 | Eastern | 111 | 88 | 111 | 101 | 100 | 200 | -- | -- | 2,741 |
| 840 | Northwestern | 203 | 153 | 203 | 186 | 178 | 900 | 200 | 880 | 1,713 |

## Table 5-1: Representative Monitoring Network and Sustainability Criteria

| OPTI Well | Region | Final MT | Final MO | 2025 IM | 2030 IM | 2035 IM | Well Depth (feet) | Screen Top (feet) | Screen Bottom (feet) | GSE (feet) |
|---|---|---|---|---|---|---|---|---|---|---|
| 841 | Northwestern | 203 | 153 | 203 | 186 | 178 | 600 | 170 | 580 | 1,761 |
| 843 | Northwestern | 203 | 153 | 203 | 186 | 178 | 620 | 60 | 600 | 1,761 |
| 845 | Northwestern | 203 | 153 | 203 | 186 | 178 | 380 | 100 | 360 | 1,712 |
| 849 | Northwestern | 203 | 153 | 203 | 186 | 178 | 570 | 150 | 550 | 1,713 |
| 2 | Southeastern | 72 | 55 | 72 | 66 | 64 | 73 | -- | -- | 3,720 |
| 89 | Southeastern | 64 | 44 | 64 | 57 | 54 | 125 | -- | -- | 3,461 |
| 106 | Western | 154 | 141.4 | 154 | 150 | 148 | 227.5 | -- | -- | 2,327 |
| 107 | Western | 91 | 72.23 | 91 | 85 | 82 | 200 | -- | -- | 2,482 |
| 108 | Western | 165 | 135.62 | 165 | 155 | 150 | 328.75 | -- | -- | 2,629 |
| 117 | Western | 160 | 150.82 | 160 | 157 | 155 | 212 | -- | -- | 2,098 |
| 118 | Western | 124 | 57.22 | 124 | 102 | 91 | 500 | -- | -- | 2,270 |
| 123 | Western | 31 | 12.59 | 31 | 25 | 22 | 138 | -- | -- | 2,165 |
| 124 | Western | 73 | 57.12 | 73 | 68 | 65 | 160.55 | -- | -- | 2,287 |
| 127 | Western | 42 | 31.74 | 42 | 39 | 37 | 100.25 | -- | -- | 2,364 |
| 571 | Western | 144 | 120.5 | 144 | 136 | 132 | 280 | -- | -- | 2,307 |
| 573 | Western | 118 | 67.5 | 118 | 101 | 93 | 404 | -- | -- | 2,084 |
| 830 | Far-West Northwestern | 59 | 56 | 59 | 58 | 58 | 77.2 | -- | -- | 1,571 |
| 831 | Far-West Northwestern | 77 | 52 | 77 | 69 | 65 | 213.75 | -- | -- | 1,557 |
| 832 | Far-West Northwestern | 45 | 30 | 45 | 40 | 38 | 131.8 | -- | -- | 1,630 |

**Table 5-1: Representative Monitoring Network and Sustainability Criteria**

| OPTI Well | Region | Final MT | Final MO | 2025 IM | 2030 IM | 2035 IM | Well Depth (feet) | Screen Top (feet) | Screen Bottom (feet) | GSE (feet) |
|---|---|---|---|---|---|---|---|---|---|---|
| 833 | Far-West Northwestern | 96 | 24 | 96 | 72 | 60 | 503.55 | -- | -- | 1,457 |
| 834 | Far-West Northwestern | 84 | 42 | 84 | 70 | 63 | 320 | -- | -- | 1,508 |
| 835 | Far-West Northwestern | 55 | 36 | 55 | 49 | 46 | 162.2 | -- | -- | 1,555 |
| 836 | Far-West Northwestern | 79 | 36 | 79 | 65 | 58 | 325 | -- | -- | 1,486 |

## 5.3 Reduction of Groundwater Storage

The undesirable result for the reduction in groundwater storage is a result that causes significant and unreasonable reduction in the viability of domestic, agricultural, municipal, or environmental uses over the planning and implementation horizon of this GSP.

Direct measurement of the reduction of groundwater storage in the Basin is not needed because monitoring in several areas of the Basin (i.e., the western, southeastern, and portions of the north facing slope of the Cuyama Valley near the center of the Basin) indicate that those regions are likely near, or at full conditions. Additionally, the Basin's primary aquifer is not confined and storage closely matches groundwater levels.

SGMA regulations define the MT for reduction of groundwater storage as "…the total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results."

Undesirable results for groundwater storage volumes in this GSP will use groundwater levels as a proxy, as the groundwater level sustainability criteria are protective of groundwater in storage.

### 5.3.1 Threshold Regions

Groundwater storage is measured by proxy using groundwater level thresholds, and thus uses the same methodology and threshold regions as groundwater levels.

### 5.3.2 Proxy Monitoring

Reduction of groundwater storage in the Basin uses groundwater levels as a proxy for determining sustainability, as permitted by Title 23 of the California Code of Regulations in Section 354.26 (d), Chapter 1.5.2.5. Additionally, there are currently no state, federal, or local standards that regulate groundwater storage. As described above, any benefits to groundwater storage are expected to coincide with groundwater level management.

## 5.4 Seawater Intrusion

Due to the geographic location of the Basin, seawater intrusion is not a concern, and thus is not required to establish criteria for undesirable results for seawater intrusion, as supported by Title 23 of the California Code of Regulations in Section 354.26 (d), Chapter 1.5.2.5

## 5.5 Degraded Water Quality

The undesirable result for degraded water quality is a result stemming from a causal nexus between SGMA-related groundwater quantity management activities and groundwater quality that causes significant and unreasonable reduction in the long-term viability of domestic, agricultural, municipal, or environmental uses over the planning and implementation horizon of this GSP.

The SGMA regulations specify that, "minimum thresholds for degraded water quality shall be the degradation of water quality, including the migration of contaminant plumes that impair water supplies or other indicator of water quality as determined by the Agency that may lead to undesirable results."

Salinity (measured as TDS), arsenic, and nitrates have all been identified as potentially being of concern for water quality in the Basin. However, as noted in the Groundwater Conditions section, there have only been two nitrate measurements and three arsenic measurements in recent years that exceeded MCLs. In the case of arsenic, all of the high concentration measurements have been taken at groundwater depths of greater than 700 feet, outside of the range of pumping. Furthermore, unlike with salinity, there is no evidence to suggest a causal nexus between potential GSP actions and arsenic or salinity. Therefore, the groundwater quality network has been established to monitor for salinity (measured as TDS) but does not include arsenic or nitrates at this time.

TDS is being monitored by the CBGSA for several reasons. Local stakeholders identified TDS as one of the constituents of concerns in the GSP development processes, and TDS has had several exceedance measurements near domestic and public supply wells. Although high TDS concentrations are naturally occurring within the Basin, it is believed that management of groundwater levels may help improve TDS concentration levels towards levels reflective of the natural condition.

### 5.5.1 Threshold Regions

Groundwater quality monitoring does not use threshold regions. because the same approach is used for all wells in the Basin. Figure 5-3 shows groundwater quality representative well locations in the Basin.

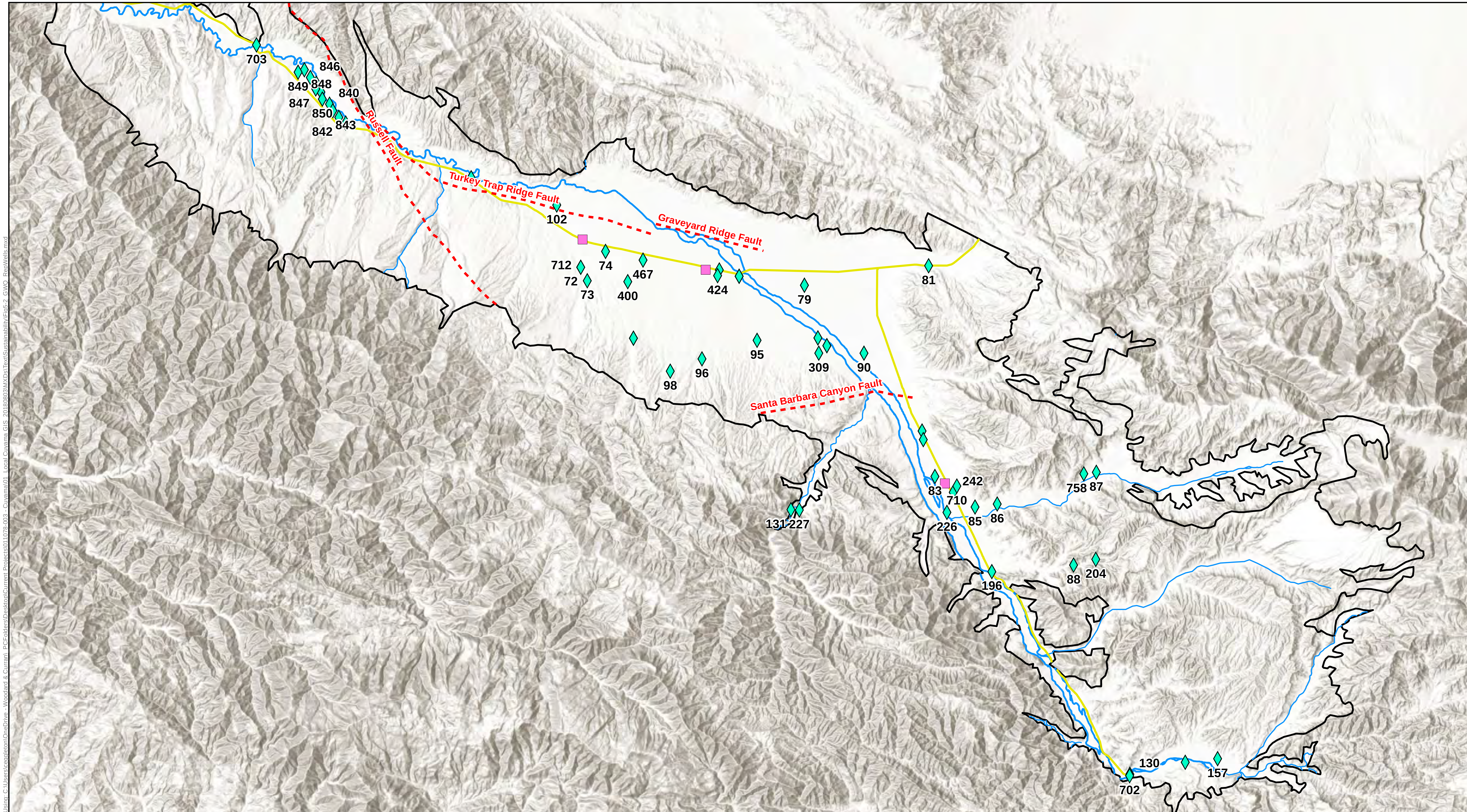


**Figure 5-3: Cuyama GW Basin Groundwater Quality Representative Wells**

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

December 2019

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*Legend*

- Cuyama Basin
- Towns
- Faults
- Highways
- Cuyama River
- Streams
- Representative Groundwater Quality Wells

N

0 1.75 3.5 7 Miles

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### 5.5.2 Proxy Monitoring

Proxy monitoring is not used for groundwater quality monitoring in the Basin.

### 5.5.3 Minimum Thresholds, Measurable Objectives, and Interim Milestones

The CBGSA has decided to address TDS within the Basin by setting MTs, MOs, and IMs as shown in Table 5-2. TDS does not have a primary (MCL, but does have both a California Division of Drinking Water and U.S. Environmental Protection Agency. Secondary standard of 500 mg/L, and a short-term standard of 1,500 mg/L. Current levels in the Basin range from 84 to 4,400 mg/L. This is due to saline conditions in the portions of the watershed where rainfall percolates through marine sediments that contain large amounts of salt.

Due to this natural condition, additional data will be collected during GSP implementation to increase the CBGSA's understanding of TDS sources in the Basin. It should be noted however, that TDS levels in groundwater may not detrimentally impact the agricultural economy of the Basin. Much of the crops grown in the Basin, including carrots, are not significantly affected by the kinds of salts in the Basin.

Due to these factors, the MT for representative well sites was set to be the 20 percent of the total range of each representative monitoring site above the 90$^{th}$ percentile of measurements for each site. For example, Opti Well 72 has a minimum recorded TDS value of 955 mg/L and a maximum of 1,020 mg/L. This is a range of 65 mg/L, and 20 percent of that range is 13 mg/L. The 90$^{th}$ percentile for Opti Well 72 is 1,010 mg/L. The MT is then calculated by taking the 90$^{th}$ percentile of 1,010 mg/L and adding 13mg/L to reach a final MT of 1,023 mg/L.

To provide for an acceptable margin of operational flexibility, the MO for TDS levels in the Basin have been set to the temporary MCL of 1,500 mg/L for each representative well where the latest measurements as of 2018 are greater than 1,500 mg/L. For wells with recent measurements of less than 1,500 mg/L, the MO was set to the most recent measurement as of 2018.

GSP regulations require GSAs to avoid undesirable results by 2040, which means they must meet or exceed the MTs. The CBGSA also recognizes that reaching an MO is a priority, but meeting or exceeding the MT is required by SGMA. For this reason, the IMs for 2025 has been set as the same value as the MT, with a projected improvement to one-third of the distance between the MT and MO in 2030 and one-half of the distance between the MT and MO in 2035.

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**Table 5-2: MOs, MTs, and Interim Milestones for Groundwater Quality Representative Sites - TDS**

| Opti Well | Well Depth (feet below GSE) | Screen Interval (feet below GSE) | Well Elevation (feet above MSL) | Most Recent Measurement (feet) | Minimum Value (mg/L) | Maximum Measurement Value (mg/L) | 20% of Range (mg/L) | 90th Percentile (mg/L) | MO (mg/L) | MT (mg/L) | 2025 IM (mg/L) | 2030 IM (mg/L) | 2035 IM (mg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 61 | 357 | Unknown | 3,681 | 585 | 468 | 602 | 26.8 | 588.4 | 585 | 615.2 | 615 | 605 | 600 |
| 72 | 790 | 340 – 350 | 2,171 | 996 | 955 | 1020 | 13 | 1010 | 996 | 1,023 | 1023 | 1014 | 1010 |
| 73 | 880 | Unknown | 2,252 | 805 | 777 | 844 | 13.4 | 842.5 | 805 | 855.9 | 856 | 839 | 830 |
| 74 | -- | Unknown | 2,193 | 1,550 | 1,530 | 1,820 | 58 | 1775 | 1,500 | 1,833 | 1833 | 1722 | 1667 |
| 76 | 720 | Unknown | 2,277 | 1,700 | 1,280 | 2,190 | 182 | 2,124.9 | 1,500 | 2,306.9 | 2307 | 2038 | 1903 |
| 77 | 980 | 960 – 980 | 2,286 | 1,520 | 1,520 | 1,580 | 12 | 1580 | 1,500 | 1,592 | 1592 | 1561 | 1546 |
| 79 | 600 | Unknown | 2,374 | 2,140 | 1,810 | 2,280 | 94 | 2226 | 1,500 | 2,320 | 2320 | 2047 | 1910 |
| 81 | 155 | Unknown | 2,698 | 2,620 | 2,620 | 2,760 | 28 | 2760 | 1,500 | 2,788 | 2788 | 2359 | 2144 |
| 83 | 198 | Unknown | 2,858 | 1,660 | 1,660 | 1,720 | 12 | 1714 | 1,500 | 1,726 | 1726 | 1651 | 1613 |
| 85 | 233 | Unknown | 3,047 | 618 | 491 | 1,500 | 201.8 | 1,189.4 | 618 | 1,391.2 | 1391 | 1133 | 1005 |
| 86 | 230 | Unknown | 3,141 | 969 | 912 | 969 | 11.4 | 963.3 | 969 | 974.7 | 975 | 973 | 972 |
| 87 | 232 | Unknown | 3,546 | 1,090 | 891 | 1,160 | 53.8 | 1,111 | 1,090 | 1,164.8 | 1165 | 1140 | 1127 |
| 88 | 400 | Unknown | 3,549 | 302 | 302 | 302 | 0 | 302 | 302 | 302 | 302 | 302 | 302 |
| 90 | 800 | Unknown | 2,552 | 1,530 | 1,440 | 1,580 | 28 | 1,565 | 1,500 | 1,593 | 1593 | 1562 | 1547 |
| 91 | 980 | 960 – 980 | 2,474 | 1,410 | 1,410 | 1,480 | 14 | 1,473 | 1,410 | 1,487 | 1487 | 1461 | 1449 |
| 94 | 550 | Unknown | 2,456 | 1,050 | 1,050 | 1,230 | 36 | 1,209 | 1,050 | 1,245 | 1245 | 1180 | 1148 |
| 95 | 805 | Unknown | 2,449 | 1,710 | 1,710 | 1,840 | 26 | 1,840 | 1,500 | 1,866 | 1866 | 1744 | 1683 |
| 96 | 500 | Unknown | 2,606 | 1,500 | 1,500 | 1,620 | 24 | 1,608 | 1,500 | 1,632 | 1632 | 1588 | 1566 |
| 98 | 750 | Unknown | 2,688 | 2,220 | 2,220 | 2,370 | 30 | 2,370 | 1,500 | 2,400 | 2400 | 2100 | 1950 |
| 99 | 750 | 730 – 750 | 2,513 | 1,490 | 1,490 | 1,550 | 12 | 1,550 | 1,490 | 1,562 | 1562 | 1538 | 1526 |
| 101 | 200 | Unknown | 2,741 | 1,550 | 1,550 | 1,680 | 26 | 1,667 | 1,500 | 1,693 | 1693 | 1629 | 1597 |
| 102 | -- | Unknown | 2,046 | 1,970 | 1,920 | 2,290 | 74 | 2,277 | 1,500 | 2,351 | 2351 | 2067 | 1926 |
| 130 | -- | Unknown | 3,536 | 1,800 | 1,800 | 1,850 | 10 | 1,845 | 1,500 | 1,855 | 1855 | 1737 | 1678 |
| 131 | -- | Unknown | 2,990 | 1,850 | 1,850 | 1,970 | 24 | 1,958 | 1,500 | 1,982 | 1982 | 1821 | 1741 |
| 157 | 71 | Unknown | 3,755 | 1,930 | 1,910 | 2,320 | 82 | 2,278 | 1,500 | 2,360 | 2360 | 2073 | 1930 |

Table 5-2: MOs, MTs, and Interim Milestones for Groundwater Quality Representative Sites - TDS

| Opti Well | Well Depth (feet below GSE) | Screen Interval (feet below GSE) | Well Elevation (feet above MSL) | Most Recent Measurement (feet) | Minimum Value (mg/L) | Maximum Measurement Value (mg/L) | 20% of Range (mg/L) | 90th Percentile (mg/L) | MO (mg/L) | MT (mg/L) | 2025 IM (mg/L) | 2030 IM (mg/L) | 2035 IM (mg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 196 | 741 | Unknown | 3,117 | 851 | 682 | 868 | 37.2 | 866.5 | 851 | 903.7 | 904 | 886 | 877 |
| 204 | -- | Unknown | 3,693 | 253 | 253 | 266 | 2.6 | 266 | 253 | 268.6 | 269 | 263 | 261 |
| 226 | -- | Unknown | 2,945 | 1,760 | 1,760 | 1,830 | 14 | 1,830 | 1,500 | 1,844 | 1844 | 1729 | 1672 |
| 227 | -- | Unknown | 3,002 | 1,780 | 1,780 | 2,200 | 84 | 2,146 | 1,500 | 2,230 | 2230 | 1987 | 1865 |
| 242 | 155 | Unknown | 2,933 | 1,470 | 1,470 | 1,510 | 8 | 1,510 | 1,470 | 1,518 | 1518 | 1502 | 1494 |
| 269 | -- | Unknown | 2,756 | 1,570 | 1,570 | 1,690 | 24 | 1,678 | 1,500 | 1,702 | 1702 | 1635 | 1601 |
| 309 | 1,100 | Unknown | 2,513 | 1,410 | 1,410 | 1,500 | 18 | 1,491 | 1,410 | 1,509 | 1509 | 1476 | 1460 |
| 316 | 830 | Unknown | 2,474 | 1,380 | 1,380 | 1,460 | 16 | 1,452 | 1,380 | 1,468 | 1468 | 1439 | 1424 |
| 317 | 700 | Unknown | 2,474 | 1,260 | 1,260 | 1,330 | 14 | 1,323 | 1,260 | 1,337 | 1337 | 1311 | 1299 |
| 318 | 610 | Unknown | 2,474 | 1,080 | 1,080 | 1,140 | 12 | 1,140 | 1,080 | 1,152 | 1152 | 1128 | 1116 |
| 322 | 850 | Unknown | 2,513 | 1,350 | 1,350 | 1,380 | 6 | 1,380 | 1,350 | 1,386 | 1386 | 1374 | 1368 |
| 324 | 560 | Unknown | 2,513 | 746 | 746 | 772 | 5.2 | 772 | 746 | 777.2 | 777 | 767 | 762 |
| 325 | 380 | Unknown | 2,513 | 1,470 | 1,470 | 1,560 | 18 | 1,551 | 1,470 | 1,569 | 1569 | 1536 | 1520 |
| 400 | 2,120 | Unknown | 2,298 | 918 | 680 | 948 | 53.6 | 922 | 918 | 975.6 | 976 | 956 | 947 |
| 420 | 780 | Unknown | 2,286 | 1,430 | 1,430 | 1,480 | 10 | 1,480 | 1,430 | 1,490 | 1490 | 1470 | 1460 |
| 421 | 620 | Unknown | 2,286 | 1,520 | 1,520 | 1,600 | 16 | 1,600 | 1,500 | 1,616 | 1616 | 1577 | 1558 |
| 422 | 460 | Unknown | 2,286 | 1,810 | 1,810 | 1,930 | 24 | 1,918 | 1,500 | 1,942 | 1942 | 1795 | 1721 |
| 424 | 1,000 | Unknown | 2,291 | 1,540 | 1,540 | 1,580 | 8 | 1,580 | 1,500 | 1,588 | 1588 | 1559 | 1544 |
| 467 | 1,140 | Unknown | 2,224 | 1,630 | 1,530 | 1,730 | 40 | 1,724 | 1,500 | 1,764 | 1764 | 1676 | 1632 |
| 568 | 188 | Unknown | 1,905 | 871 | 871 | 1,180 | 61.8 | 1,129.6 | 871 | 1,191.4 | 1191 | 1085 | 1031 |
| 702 | -- | Unknown | 3,539 | 110 | 48 | 1,900 | 370.4 | 1,704 | 110 | 2,074.4 | 2074 | 1420 | 1092 |
| 703 | -- | Unknown | 1,613 | 400 | 16 | 4,500 | 896.8 | 3,200 | 400 | 4,096.8 | 4097 | 2865 | 2248 |
| 710 | -- | Unknown | 2,942 | 1,040 | 1,040 | 1,040 | 0 | 1,040 | 1,040 | 1,040 | 1040 | 1040 | 1040 |
| 711 | -- | Unknown | 1,905 | 928 | 928 | 928 | 0 | 928 | 928 | 928 | 928 | 928 | 928 |
| 712 | -- | Unknown | 2,171 | 977 | 972 | 977 | 1 | 9,76.5 | 977 | 977.5 | 978 | 977 | 977 |

Table 5-2: MOs, MTs, and Interim Milestones for Groundwater Quality Representative Sites - TDS

| Opti Well | Well Depth (feet below GSE) | Screen Interval (feet below GSE) | Well Elevation (feet above MSL) | Most Recent Measurement (feet) | Minimum Value (mg/L) | Maximum Measurement Value (mg/L) | 20% of Range (mg/L) | 90th Percentile (mg/L) | MO (mg/L) | MT (mg/L) | 2025 IM (mg/L) | 2030 IM (mg/L) | 2035 IM (mg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 713 | -- | Unknown | 2,456 | 1,200 | 1,200 | 1,200 | 0 | 1,200 | 1,200 | 1,200 | 1200 | 1200 | 1200 |
| 721 | -- | Unknown | 2,374 | 2,170 | 2,170 | 2,170 | 0 | 2,170 | 1,500 | 2,170 | 2170 | 1947 | 1835 |
| 758 | -- | Unknown | 3,537 | 900 | 760 | 923 | 32.6 | 9,21.7 | 900 | 954.3 | 954 | 936 | 927 |
| 840 | 900 | 200 – 880 | 1,713 | 559 | 559 | 559 | 0 | 559 | 559 | 559 | 559 | 559 | 559 |
| 841 | 600 | 170 – 580 | 1,761 | 561 | 561 | 561 | 0 | 561 | 561 | 561 | 561 | 561 | 561 |
| 842 | 450 | 60 – 430 | 1,759 | 547 | 547 | 547 | 0 | 547 | 547 | 547 | 547 | 547 | 547 |
| 843 | 620 | 60 – 600 | 1,761 | 569 | 569 | 569 | 0 | 569 | 569 | 569 | 569 | 569 | 569 |
| 844 | 730 | 100 – 720 | 1,713 | 481 | 481 | 481 | 0 | 481 | 481 | 481 | 481 | 481 | 481 |
| 845 | 380 | 100 – 360 | 1,712 | 1,250 | 1,250 | 1,250 | 0 | 1,250 | 1,250 | 1,250 | 1250 | 1250 | 1250 |
| 846 | 610 | 130 – 590 | 1,715 | 918 | 918 | 918 | 0 | 918 | 918 | 918 | 918 | 918 | 918 |
| 847 | 600 | 180 – 580 | 1,733 | 480 | 480 | 480 | 0 | 480 | 480 | 480 | 480 | 480 | 480 |
| 848 | 390 | 110 – 370 | 1,694 | 674 | 674 | 674 | 0 | 674 | 674 | 674 | 674 | 674 | 674 |
| 849 | 570 | 150 – 550 | 1,713 | 1,780 | 1,780 | 1,780 | 0 | 1,780 | 1,500 | 1,780 | 1780 | 1687 | 1640 |
| 850 | 790 | 180 – 780 | 1,759 | 472 | 472 | 472 | 0 | 472 | 472 | 472 | 472 | 472 | 472 |

GSE = ground surface elevation

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## 5.6 Subsidence

The undesirable result for land subsidence is a result that causes significant and unreasonable reduction in the viability of the use of infrastructure over the planning and implementation horizon of this GSP.

### 5.6.1 Threshold Regions

Subsidence monitoring does not use threshold regions. because the same approach is used for all wells in the Basin. Figure 5-4 shows representative locations of subsidence in the Basin.

### 5.6.2 Representative Monitoring

As discussed in Chapter 4, Section 4.9, all monitoring network subsidence monitoring stations in the Basin, and three additional sites outside of the Basin are designated as representative monitoring sites (Figure 5-4). Detrimental impacts of subsidence include groundwater storage reductions and potential damage to infrastructure, such as large pipelines, roads, bridges and canals. However, the Basin does not currently have infrastructure of this type, and storage losses are small enough they are unlikely to have a meaningful effect on the Basin water budget.

Subsidence in the central portion of the Basin is approximately 0.5 inches per year, as shown in Chapter 2, Section 2.2. Currently, there are no state, federal, or local standards that regulate subsidence rates.

### 5.6.3 Minimum Thresholds, Measurable Objectives, and Interim Milestones

Although several factors may affect subsidence rates, including natural geologic processes, oil pumping, and groundwater pumping, the primary influence within the Basin is due to groundwater pumping. Because current subsidence rates (approximately 0.8 inches per year) are not significant and unreasonable, the MT rate for subsidence was set at 2 inches per year to allow for flexibility as the Basin works toward sustainability in 2040. This rate is applied primarily to the two stations in the Basin (CUHS and VCST), as the other stations in the monitoring network represent ambient changes in vertical displacement, primarily due to geological influences. This level of subsidence is considered unlikely to cause a significant and unreasonable reduction in the viability of the use of infrastructure over the planning and implementation horizon of this GSP.

Subsidence is expected to be influenced through the management of groundwater pumping through the groundwater level MOs, MTs, and IMs. Thus, the MO for subsidence is set for zero lowering of ground surface elevations.

IMs are not needed for the subsidence sustainability indicator because the current rate of subsidence is above the MT.

Subsidence rates will be measured in the frequency of measurement and monitoring protocols documented in Section 4’s Appendix A.

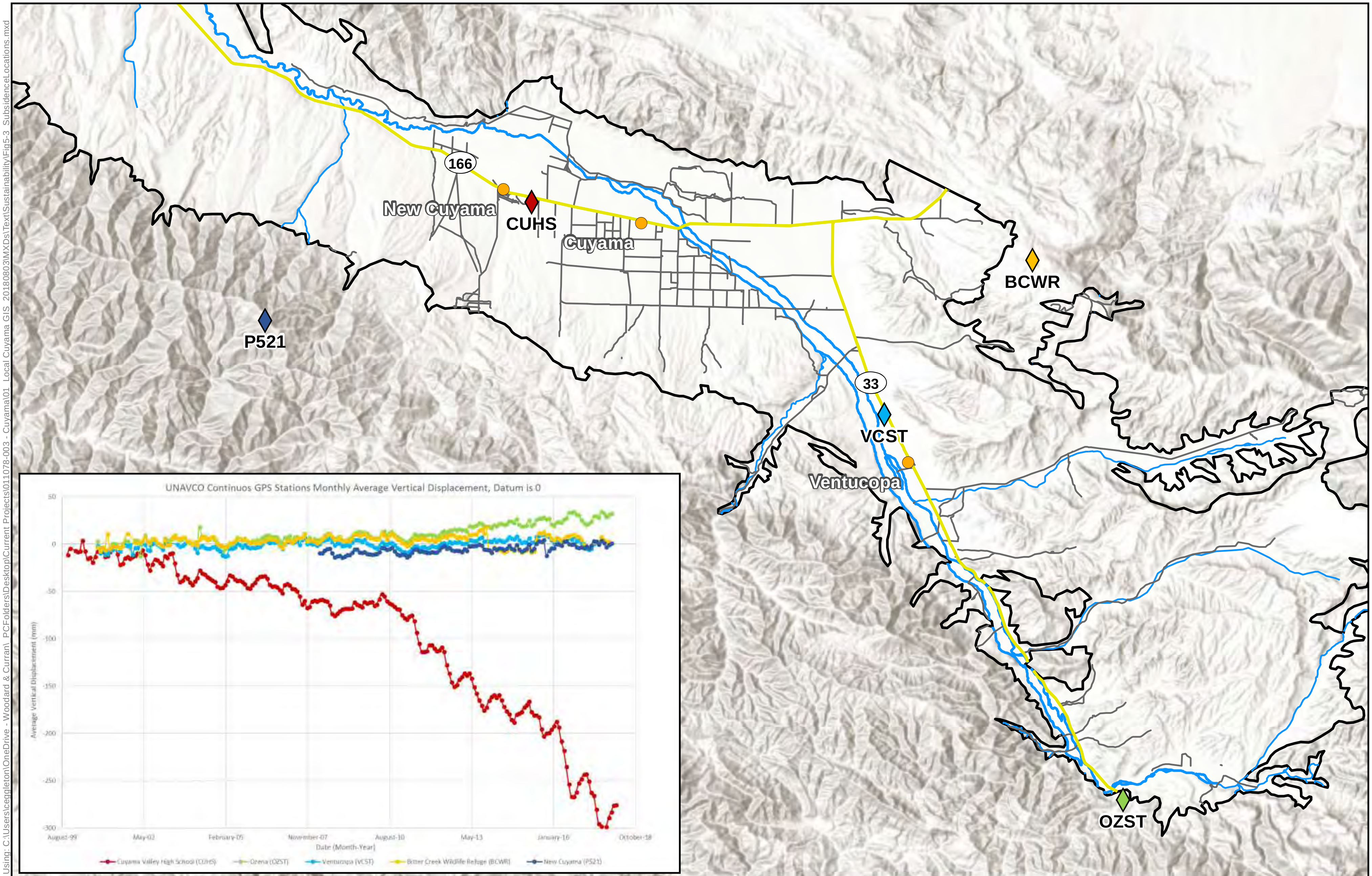


**Figure 5-4: Cuyama GW Basin Subsidence Monitoring Locations**

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

December 2019

WOODARD & CURRAN

*Legend*

Cuyama Basin
Towns
Highways
Local Roads
Cuyama River
Streams

0 2 4 8 Miles

N

Figure Exported: 2/1/2019 By: ceggleton Using: C:\Users\ceggleton\OneDrive - Woodard & Curran_PCFolders\Desktop\Current Projects\011078-003 - Cuyama\01_Local Cuyama GIS_20180803\MXDs\Text\Sustainability\Fig5-3_SubsidenceLocations.mxd

## 5.7 Depletions of Interconnected Surface Water

The undesirable result for depletions of interconnected surface water is a result that causes significant and unreasonable reductions in the viability of agriculture or riparian habitat in the Basin over the planning and implementation horizon of this GSP.

SGMA regulations define the MT for interconnected surface water as "…the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on the beneficial uses of the surface water and may lead to undesirable results." Under normal surface water conditions in the Basin as of January 1, 2015, surface flows infiltrate into the groundwater system and are used by phreatophytes, except in the most extreme flash flood events, when surface water flows out of the Basin. Historically, these flash flood events flow for less than one week of the year. Conditions have not changed since January 1, 2015, and surface flows continue to infiltrate into the groundwater system for use by local phreatophytes.

Because current Basin conditions have not varied from January 1, 2015 conditions, the groundwater level thresholds established in Section 5.2 will act to maintain depletions of interconnected surface water at similar levels to those that existed in January 1, 2015. Therefore, groundwater level thresholds are used by proxy to protect the Basin from undesirable results related to depletion of interconnected surface water.

## 5.8 References

California Water Boards Irrigated Land Regulatory Program (ILRP) website. https://www.waterboards.ca.gov/centralvalley/water_issues/irrigated_lands/. Accessed January 11, 2019.

## 5.2 Supplemental Section 5.2: Minimum Thresholds, Measurable Objectives, and Interim Milestones, Chronic Lowering of Groundwater Levels

The groundwater levels MTs included in the GSP were developed with the intention of avoiding the URs of excessive drawdowns in the Basin while minimizing the number of domestic wells that could go dry and the potential impacts on GDEs in the Basin. Following receipt of DWR's letter, two technical analyses were performed to provide additional information related to the effects of the GSP's groundwater levels MTs and URs definitions on well infrastructure (i.e., domestic, public, and other production wells) and on environmental uses of groundwater (i.e., GDEs).

The results of these analyses demonstrate that the MTs included in the GSP achieve the goals of avoiding URs in the Basin. In particular, the following conclusions can be made:

- The sustainability criteria are protective of production wells (including domestic wells) in the Basin. Only five wells (two percent of all wells in the Basin) are at risk of going dry if MTs are reached throughout the Basin (i.e., at all representative wells). The CBGSA will strive to prevent domestic wells in the Basin from going dry through the Adaptive Management approach included in the GSP (Section 7.6) which calls for an investigation of the potential causes of groundwater level declines and the development of appropriate response strategies. Therefore, the potential for a small number of domestic wells to be at risk is not considered to be a significant and unreasonable result.
- A numerical modeling analysis of proposed MTs at Wells 841 and 845 show that these thresholds would have no negative impact on local domestic wells and only minimal impact at a single GDE location. Stream depletions could potentially increase by a small amount.

The results of these technical analyses demonstrate that the MTs included in the GSP are protective against significant and unreasonable results for production wells and GDEs in the Basin. The approach and results of each technical analysis are described below.

### Assessment of Minimum Thresholds as Compared to Domestic and Production Well Screen Intervals

An assessment was performed of the MT levels included in the GSP as compared to the well screen intervals of production wells throughout the Basin to try to determine how many production wells may be at risk of going dry if the groundwater levels were to fall to MT levels at monitoring well locations throughout the Basin. This assessment scenario is conservative, as groundwater levels throughout the Basin are unlikely to fall to MT levels simultaneously. The assessment was performed using well location and construction information provided by the counties that overlie the Basin, including Santa Barbara, San Luis Obispo, Ventura, and Kern. To accomplish this, the CBGSA collected all available well data from public sources and the four counties in tabular formats. In the Northwestern Region, well completion reports were also individually collected, processed, and included in the analysis.

Since pump depth data was not available, wells were processed in GIS by utilizing their screen interval (or well depth if screen interval data was unavailable) to compare those values with MTs at monitoring wells located throughout for the Basin. Some basic filtering criteria were applied to the analysis to remove wells from consideration, including those wells that are destroyed or non-compliant in the county datasets, wells that are far away from active groundwater management and monitoring (e.g., the Badlands region), and wells that were already dry as of January 1, 2015.

The results of the analysis are shown in Table 5-3 and Figure 5-5. Out of a total of 250 production wells that were evaluated, a total of five (two percent of the total) are at risk of going dry if MTs are reached. Three of these five wells are domestic wells. As noted above, the CBGSA will strive to use adaptive management to prevent these domestic wells from going dry.

The CBGSA conducted an investigation to determine the potential impacts if these wells were to go dry. The three domestic wells appear to serve approximately four or five households between them. The two production wells serve vineyards with a total irrigated acreage of approximately two acres. Given that the entire basin encompasses about 18,000 irrigated acres, two acres represents about 0.01 percent and would appear to be a less than significant impact. Based on data developed for the direct economic impact analysis conducted for the Cuyama Basin, it is estimated that loss of production in these acres would represent a loss of about $10,000-15,000 per year.

**Table 5-3: Domestic and Production Wells and MT Summary Statistics**

| Threshold Region | Total Number of Production Wells | Domestic Wells at Risk to Go Dry if GWLs reach MTs | Total Production Wells at Risk to Go Dry if GWLs reach MTs | Percentage of Wells at Risk of Going Dry |
|---|---|---|---|---|
| Northwestern | 16 | 0 | 0 | 0% |
| Western | 40 | 0 | 0 | 0% |
| Central | 89 | 0 | 0 | 0% |
| Eastern | 39 | 2 | 4 | 10% |
| Southeastern | 66 | 1 | 1 | 2% |
| ***Whole Basin*** | ***250*** | ***3*** | ***5*** | ***2%*** |

As shown in Figures 2-79 and 2-80, most wells with nitrate and arsenic concentrations exceeding MCLs are located in the central threshold region. The locations in the Basin of high arsenic concentrations are focused to the south of the town of New Cuyama near the existing Cuyama Community Services District (CCSD) well. This is a known issue for the CCSD that will be mitigated by the construction of a replacement well for the district, which was included as a project in the GSP (see Section 7.4.4).

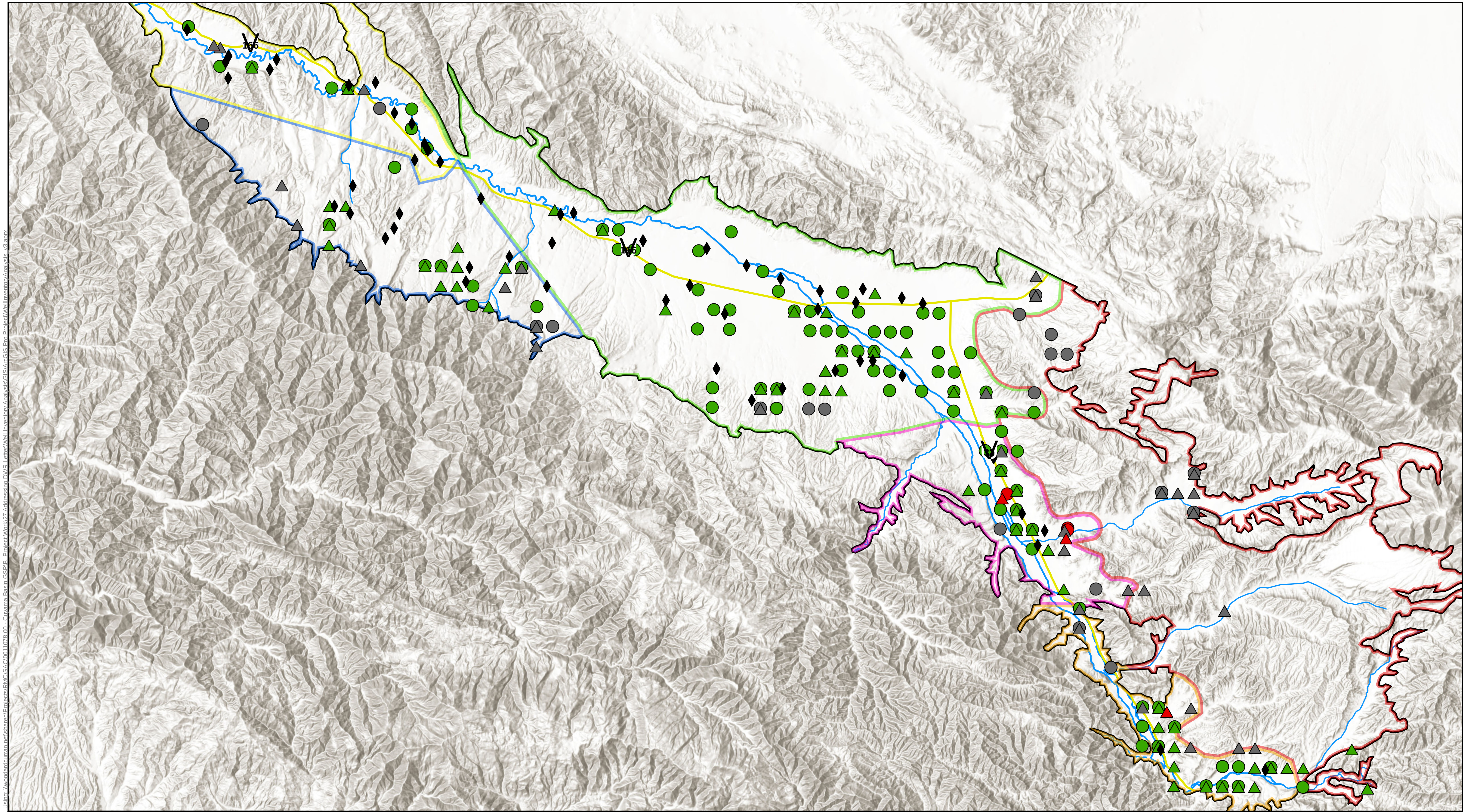

**Figure 5-5: Well Status Based on Minimum Threshold Analysis**

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

April 2022

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*Legend*

- Cuyama Basin
- Cuyama River
- Representative Monitoring Well

Threshold Region

- Badlands Region
- Central Region
- Eastern Region
- Northwestern Region
- Southeastern Region
- Western Region

Well Status

- At Risk of Going Dry
- Not At Risk of Going Dry
- Filtered from analysis

Minimum thresholds were extrapolated from representative monitoring wells to extend coverage throughout the Cuyama Basin. The extrapolated MTs were then compared to the screen depths of domestic and production wells (if screen depth data was unavailable, total well depth was used). Note: Some wells shown are approximate locations extracted from DWR WCR reports.

0 2 4 8 Miles

N

## Modeling Analysis of Northwestern Threshold Groundwater Levels Minimum Thresholds

Concern was presented in DWR's Letter about whether the thresholds established in the Northwestern Threshold Region at Opti wells 841 and 845 are protective of nearby beneficial users of water. Specifically, DWR questioned what impact(s) may occur to nearby domestic wells and GDEs if groundwater levels were to reach MTs in representative wells. To address this, the Cuyama Basin Water Resources Model (CBWRM) was used to simulate groundwater level conditions by artificially dropping groundwater levels near Opti Wells 841 and 845 to the set MTs. This was done by assigning specified head boundary conditions at the MT levels for the model nodes near these well locations. The simulation was run for 10 years over the historical period between water years (WY) 2011 to 2020 during which the specified head boundary conditions at the MT levels were continuously active.

Figure 5-6 shows the modeled change in groundwater elevations resulting from setting groundwater levels at the MTs at wells 841 and 845. Areas shaded in red or tan color on the figure had reduced groundwater elevations as compared to the baseline condition. Areas shaded in lime green were unaffected by the change in groundwater elevations at the well 841 and 845 locations. As shown in the figure, there are no active domestic wells within the area affected by the lowered groundwater elevations at wells 841 and 845. The only GDE which may be affected is the GDE located at the confluence of Cottonwood Creek and the Cuyama River, which has an expected impact of less than 5 feet. However, even with this difference, the estimated depth to water at this GDE location would be shallower than 30 feet. Potential impacts on this GDE location will be monitored at nearby Opti well 832.

As noted above, the other potential beneficial use that may be affected comes from Cuyama River inflows into Lake Twitchell. The model simulation also showed an increase in stream depletion in the affected portion of the aquifer of about 1,200 acre-feet per year. This represents about 12 percent (out of 10,200 AFY) of the modeled streamflow in the Cuyama River at this location during the WY 2011-2020 model simulation period. However, the actual change in inflows into Lake Twitchell would be less than 1,200 AFY because of stream depletions that would occur between Cottonwood Creek and Lake Twitchell. For comparison, during the same period the USGS gage on the Cuyama River just upstream of Lake Twitchell (11136800) recorded an average annual flow of 7,900 AFY, only a portion of which comes from the Cuyama Basin. Given the lack of data regarding the hydrology and stream seepage between Cottonwood Creek and Lake Twitchell, it is uncertain how much of an impact this would have on the flows that ultimately are stored in Lake Twitchell.

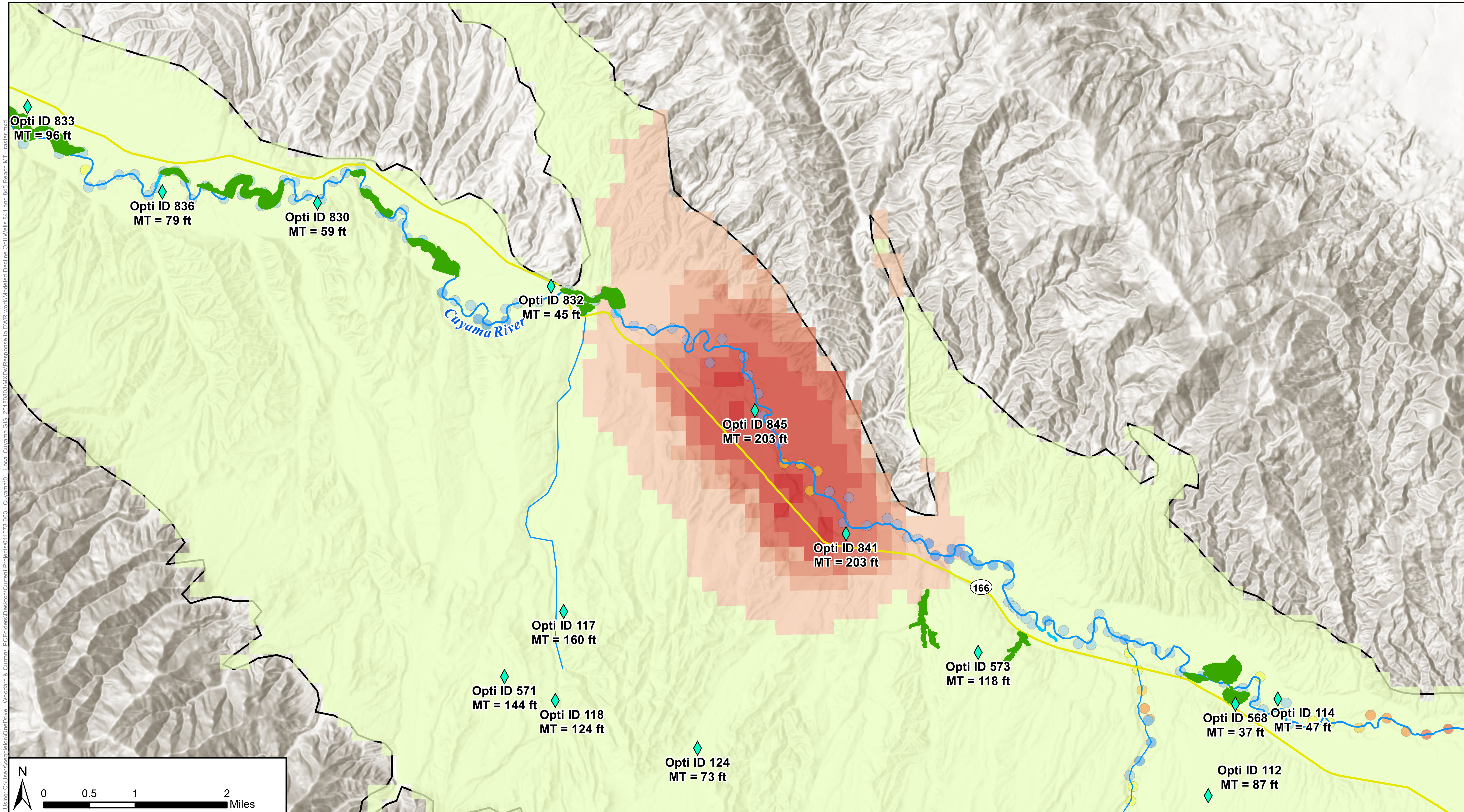


**Figure 5-6: Change in GWLs in Northwestern Region from CBWRM Test Simulation**

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

September 2021

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*Legend*

- Cuyama Basin
- GWL Representative Network
- Probable GDE Vegetation from GSP*
- Probable GDE Vegetation from GSP*
- Cuyama River
- Streams

**Modeled change in GWLs if Opti Wells 845 and 841 reach their MTs (baseline - change)**

- No Change
- <0 - 15 ft.
- 15 - 30 ft.
- 30 - 50 ft.
- 50 - 100 ft.
- 100 - 150 ft.
- 150 - 200 ft.

**Modeled Depth to Groundwater for January 1, 2015**

- -55 - -10 ft DTW
- -9 - 0 ft DTW
- 1 - 30 ft DTW
- 31 - 50 ft DTW
- 51 - 100 ft DTW
- 101 - 200 ft DTW
- 201 - 700 ft DTW

*Note that areas shown for probable GDEs has been given a large buffer to be seen at this extent. Actual GDE area is much smaller than what is shown.

## 5.5 Supplemental Section 5.5: Minimum Thresholds, Measurable Objectives, and Interim Milestones, Degraded Water Quality

### Why Groundwater Management is Unlikely to Affect Nitrate and Arsenic Concentrations

As discussed in the submitted GSP, nitrates are the result of fertilizer application on agricultural land. The CBGSA does not have the regulatory authority granted through SGMA to regulate the application of fertilizer. This regulatory authority is held by the SWRCB through the Irrigated Lands Program (ILP). The CBGSA can encourage agricultural users in the Basin to use best management practices when using fertilizers but cannot limit their use. Because the CBGSA has no mechanism to directly control nitrate concentrations, the GSA believes that setting thresholds for nitrates is not appropriate. However, it should be noted that GSP implementation will likely have an indirect effect on nitrates in the central Basin due to the reduction in pumping allocations that were included in the GSP. This will likely reduce the application of fertilizers in the central part of the Basin as agricultural production in the Basin is reduced over time.

Similarly, because arsenic is naturally occurring, the CBGSA does not believe the establishment of thresholds for arsenic is appropriate. As shown in Figure 2-79, wells with high arsenic concentrations are located in a relatively small area of the Basin south of New Cuyama. A review of production well data provided by the counties (discussed in Section 2) indicates that there are no active private domestic wells located in this part of the Basin. The only operational public well that that is located in this part of the Basin serves the Cuyama Community Services District (CCSD). As noted above, the CCSD is currently pursuing the drilling of a new production well, which was included as a project in the GSP. Once this well is completed, it is not believed that any domestic water users will be using a well that accesses groundwater with known high arsenic concentrations.

### Monitoring Approach for Nitrates and Arsenic

The CBGSA intends to leverage and make use of existing monitoring programs for nitrates and arsenic, in particular ILP for nitrates and USGS for arsenic. Wells in the Basin where recent monitoring data is available for these constituents are shown in Figures 2-79 and 2-80. The CBGSA intends to collect data from the ILP and USGS and perform analysis at each 5-year GSP update to monitor constituent level changes and reassess their impacts on the Basin and its beneficial uses and users. In addition to the planned data collection and analysis efforts, the CBGSA plans to collect water quality data for nitrate and arsenic at each water quality well identified in the GSP (Figure 4-20) during calendar year 2022. This will provide a baseline constituent level in all groundwater quality representative monitoring network locations that can be utilized for future Basin planning. Additional measurements may be considered by the GSA in the future in anticipation of five-year updates.

The CBGSA will continue to monitor TDS and utilize the undesirable results statement and UR triggers identified in Section 3.2.4 to determine the appropriate actions and timing of applicable actions to address water quality concerns. As discussed in Section 7.6 Adaptive Management, the CBGSA has also set adaptive management triggers. Adaptive management triggers are thresholds that, if reached, initiate the process for considering implementation of adaptive management actions or projects. During GSP implementation, regular monitoring reports will be prepared for the CBGSA that summarize and provide updates on groundwater conditions, including groundwater quality.

Although nitrate and arsenic concentrations in groundwater do not currently fall within the regulatory authority of the CBGSA, as stated above, nitrates are regulated by ILP. In addition, the CBGSA will reevaluate nitrate and arsenic concentrations at each 5-year GSP update. The CBGSA will continue to coordinate and work with the Regional Water Quality Control Board and other responsible regulatory programs on a regular basis for the successful and sustainable management of water resources that protect against undesirable conditions related to nitrates and arsenic.

In the event groundwater conditions related to nitrate and arsenic begin to impact the beneficial uses and users of groundwater in the Basin, the CBGSA will notify the appropriate regulatory program and/or agency and initiate more frequent coordination to address those conditions and support their regulatory actions to address those conditions. If undesirable groundwater conditions for nitrate and arsenic are found to be the result of Basin management by the CBGSA, a process may be developed to help mitigate or assist those uses and users by utilizing adaptive management strategies, including pumping management or well rehabilitation or replacement. At this time, however, the CBGSA will rely on the current processes and programs set forth to manage nitrate and arsenic in a sustainable manner.