CUYAMA BASIN GROUNDWATER SUSTAINABILITY AGENCY

STANDING ADVISORY COMMITTEE

Committee Members

Roberta Jaffe (Chair)	Brad DeBranch	Joe Haslett
Brenton Kelly (Vice Chair)	Louise Draucker	Mike Post
Claudia Alvarado	Jake Furstenfeld	Hilda Leticia Valenzuela

AGENDA

November 29, 2018

Agenda for a meeting of the Cuyama Basin Groundwater Sustainability Agency Standing Advisory Committee to be held on Thursday, November 29, 2018 at 4:00 PM, at the Cuyama Valley Family Resource Center, 4689 CA-166, New Cuyama, CA 93254. To hear the session live, call (888) 222-0475, code: 6375195#.

The order in which agenda items are discussed may be changed to accommodate scheduling or other needs of the Committee, the public or meeting participants. Members of the public are encouraged to arrive at the commencement of the meeting to ensure that they are present for Committee discussion of all items in which they are interested.

In compliance with the Americans with Disabilities Act, if you need disability-related modifications or accommodations, including auxiliary aids or services, to participate in this meeting, please contact Taylor Blakslee at (661) 477-3385 by 4:00 p.m. on the Friday prior to this meeting. Agenda backup information and any public records provided to the Committee after the posting of the agenda for this meeting will be available for public review at 4689 CA-166, New Cuyama, CA 93254. The Cuyama Basin Groundwater Sustainability Agency reserves the right to limit each speaker to three (3) minutes per subject or topic.

1. Call to Order
2. Roll Call
3. Pledge of Allegiance
4. Approval of Minutes
5. Groundwater Sustainability Plan
    a. Groundwater Sustainability Plan Update
    b. Groundwater Conditions Chapter Adoption
    c. Discussion on Data Management Chapter
    d. Review of Preliminary Threshold Numbers
    e. Technical Forum Update
    f. Stakeholder Engagement Update
6. Groundwater Sustainability Agency
    a. Report of the Executive Director
    b. Board of Directors Agenda Review

   c. Report of the General Counsel

7. Items for Upcoming Sessions

8. Committee Forum

9. Public comment for items not on the Agenda

   At this time, the public may address the Committee on any item not appearing on the agenda that is within the subject matter jurisdiction of the Committee. Persons wishing to address the Committee should fill out a comment card and submit it to the Executive Director prior to the meeting.

10. Adjourn

Cuyama Basin Groundwater Sustainability Agency Standing Advisory Committee Meeting

November 1, 2018

Draft Meetings Minutes

Cuyama Valley Family Resource Center, 4689 CA-166, New Cuyama, CA 93254

PRESENT:
Jaffe, Roberta – Chair
Kelly, Brenton – Vice Chair
Alvarado, Claudia
DeBranch, Brad
Draucker, Louise
Furstenfeld, Jake
Post, Mike *(telephonically)*
Valenzuela, Hilda Leticia
Beck, Jim – Executive Director
Hughes, Joe – Legal Counsel

ABSENT:
Haslett, Joe

1. **Call to Order**
   Chair Roberta Jaffe called the Standing Advisory Committee (SAC) to order at 4:00 p.m.

   Chair Jaffe reported that Santa Barbara County Water Agency's Water Resources Program Manager Matt Young was present telephonically and available as a technical advisor to the SAC.

2. **Roll Call**
   Hallmark Group Project Coordinator Taylor Blakslee called roll of the Committee (shown above).

3. **Pledge of Allegiance**
   The pledge of allegiance was led by Chair Jaffe.

4. **Approval of Minutes**
   Cuyama Basin Groundwater Sustainability Agency (CBGSA) Executive Director Jim Beck presented the September 27, 2018 SAC minutes. A motion was made by Committee member Jake Furstenfeld to adopt the minutes and seconded by Committee Member Louise Draucker. A roll call vote was made, and the motion passed.

5. **Groundwater Sustainability Plan**

a. Groundwater Sustainability Plan Update
Woodard & Curran (W&C) Project Manager Brian Van Lienden provided an update on Groundwater Sustainability Plan (GSP) activities, which is included in the SAC packet.

1. GSP Schedule and Outline
Mr. Van Lienden presented a GSP component slide, along with a GSP outline, to assist the Committee in understanding the GSP development process.

Chair Jaffe asked if the Counties need to approve the GSP prior to final CBGSA adoption. CBGSA Executive Director Jim Beck said yes and he expects CBGSA participants to receive authorization from their governing Boards prior to CBGSA Board adoption.

Chair Jaffe asked when the missing components of the released chapters and sections will be completed. Mr. Van Lienden said when the GSP public draft is released. He stated the SAC and Board will have an opportunity to review and comment on the GSP public draft prior to adoption.

Vice Chair Brenton Kelly arrived at 4:22 pm

W&C Senior Hydrogeologist John Ayers provided an update on the Tritium study that was performed by the USGS. Mr. Ayres reported that water with Tritium in it is typically considered younger water due to the atmospheric accumulation of Tritium caused by nuclear testing in the 1960s and 70s. Mr. Ayres demonstrated how Tritium is not always a reliable test of determining if water recovery is occurring from older water aquifers.

Ms. Wooster said USGS worked with Santa Barbara County to test for water quality. Prior to testing, she said they pumped the well multiple times. Mr. Ayers said when taking a proper water sample, water is typically purged three volumes of the casing volume, but this amount is not enough to affect Tritium levels.

Landowner Steve Gliessman said the reason the Tritium study arose was because they primarily wanted to know the age of water. Mr. Ayres said old water can be present and accessed for a really long time, and if you are pulling up old water, new water can be sucked down to the well perforations.

Landowner Ann Myhre said the reason new water does not reach the bottom of the basin is because it is full. Mr. Ayres stated there is recharge occurring in the Basin and W&C is running a model to figure out how much.

Chair Jaffe asked if we are interested in the age of the water because of the potential heavy metals being drawn up and the effect on water quality. Mr. Ayres said we do not have nearly

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enough data to determine this because water quality changes by depth and location. He said the basin's data issue is a supply issue. Mr. Ayres recommended making groundwater levels the main focus of the conversation. He reminded the group that other issues, such as water quality, need to be addressed, but we need to understand groundwater levels and how to stabilize them first.

Cuyama Valley Family Resource Center Executive Director Lynn Carlisle asked if Mr. Ayres thinks Tritium and the age of water is an issue. Mr. Ayres said he does not think it is a factor since the Sustainable Groundwater Management Act (SGMA) is about regional water management and the Tritium study focuses on a few localized wells. Mr. Ayres stated the presence of Tritium does not mean deep well percolation is not occurring.

UC Santa Barbara Associate Professor of Sociocultural Anthropology Casey Walsh asked if we are tracking the Vadose zone. Mr. Ayres said we have not tracked the Vadose zone because it is very expensive, and those costs could be avoided by tracking groundwater levels.

Vice Chair Kelly thanked Mr. Ayres for the Tritium presentation. He asked where percolated water is accounted for and if it is called recharge within the water budget. Mr. Ayres replied the water budget is being calculated by the numeric groundwater model, in which represents physical conditions and various factors within the basin. The model estimates how much water is being pumped, along with storage capacity.

2. Sustainability Discussion

Mr. Beck reported that Management Areas were discussed last month at the September 27, 2018 SAC meeting with Mr. Ayres present. At the October 3, 2018 Board meeting, several Board members had questions regarding management areas and the need for them.

Mr. Beck informed the group that the basis for management areas is for setting different thresholds for different regions. Mr. Ayres commented that management areas and sustainability thresholds are so intertwined that we need to talk about them simultaneously. Mr. Ayres reported that if your groundwater levels are below the minimum threshold, you are experiencing undesirable results. Minimum thresholds are set using a rationale to reach a quantitative threshold and this occurs at each monitoring well. He stated that minimum thresholds are applied to representative wells in the monitoring network. He reported that 49 out of 88 wells are representative wells.

Chair Jaffe said the representative wells in Cottonwood Canyon are located in the riverbed but are functioning significantly different from nearby wells. Mr. Ayres said he can look into it and make a change if appropriate. Mr. Ayres said if one representative well is not perfect, that is not a big deal because the California Department of Water Resources (DWR) does not encourage management of a discrete portion of the basin as they relate to individual monitoring wells. Mr. Beck commented that representative wells can be changed in the future if a need is determined.

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Vice Chair Kelly asked if there are only six wells in the Ventucopa area in the monitoring network section. Mr. Ayres said the wells located in the Ventucopa area are the only ones being provided by Ventura County in 2017.

Ms. Myhre said there are only four wells being used as representative wells in the San Juan basin. These wells were tracked for 20 years and she said their water levels should not move by more than 25 feet. She reported her well decreased by as much as 100 feet in a year, but her overall deviation was only 12 feet. She recommended management areas because of the complexity of the Cuyama basin.

Ms. Carlisle asked why five years of storage was chosen for the Margin of Operational Flexibility. Mr. Ayres said five years is the approximate length of a drought period, however this is a subjective value that can be changed.

Mr. Walsh asked if the same rationale is needed for every representative well. Mr. Ayres said no and that is why they want to use management areas.

Ms. Wooster asked if the threshold can be set with how much water is in each well and Mr. Ayres said that is possible. Mr. Ayres commented that using the shallowest well method for setting thresholds does not work as well in canyons or areas with elevation changes.

3. Update on Management Areas

Mr. Ayres provided background on why the recommended management areas were suggested last month. He said setting thresholds based on the same rationale does not make sense if the conditions are different. He reported that he chose the term “management areas” because DWR defines the use of management areas for setting different minimum thresholds and measurable objectives. Mr. Ayres stated we can use any term where we apply threshold rationales. He said he can narratively describe the separate monitoring areas if areas delineated on a map are of concern to the CBGSA Board.

Mr. Beck asked Mr. Ayres to address why they want to use management areas for setting thresholds as opposed to setting thresholds for each of the 49 representative wells. Mr. Ayres said setting thresholds for each well would be a very challenging and expensive process, and he would anticipate a number of cases where they would have to be calculated estimates.

Committee members Claudia Alvarado and Hilda Leticia Valenzuela left at 6:00 pm

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Mr. Ayres reported that management areas were generally selected where land use and conditions were similar.

Ms. Wooster said there is a lot of concern about setting management areas in the central basin since new development is occurring in the Ventucopa area and punitive actions may be

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enforced in the central basin to restrict pumping. Mr. Beck said those are valid issues that will need to be discussed in the near future with the Board.

Ms. Myhre said the use of the term “management areas” is semantics and maybe we can use a different term.

Mr. Young read the DWR Management Areas definition and disagreed with W&C’s interpretation of their purpose, since in his interpretation, DWR’s definition implies different operations may occur with management areas.

Ms. Carlisle asked if there is potential that the GSP can be produced by 2020 without management actions, and Mr. Beck replied that management actions will be addressed in the GSP.

Ms. Myhre said the term management areas should be used over threshold regions to be in sync with other GSAs and DWR’s terminology.

Mr. Beck said W&C needs direction from the Board on management areas because this decision will impact the schedule. Mr. Ayres presented several options for potential threshold regions and reported that they preferred option D, which is illustrated on page 56 of the SAC packet. This would separate the basin into six regions for the purpose of setting rationales for determining minimum thresholds and measurable objectives.

Vice Chair Kelly said he generally agreed with Option D, however he commented that there are significant data gaps in the river corridor of the Ventucopa area. Mr. Ayres agreed that additional monitoring is needed in the Ventucopa area.

Committee member Furstenfeld agreed with W&C’s approach.

Chair Jaffe asked for clarification on why the westside of the basin was broken into two areas. Mr. Ayres said they looked at the shallowest wells within the area, and to be protective of dewatering those shallow wells, they separated the deep and shallow wells into two areas. This will allow a separate methodology to incorporate the conditions in the uphill area and the area downhill. If conditions uphill were to deteriorate while land use remains consistent, then we know the thresholds downhill are too low and potentially affecting them.

Chair Jaffe asked if the western region was kept all the same, could the minimum threshold be set at 2015 levels. Mr. Ayres said in 2015 groundwater levels in the western basin were about 20 feet below the surface, which is not significantly undesirable.

Ms. Wooster commented that if you start new farming operations you cannot expect levels to stay the same, so using 2015 conditions as a minimum threshold does not make sense.

Mr. Gliessman said their well levels have been decreasing in the last couple years but have not for years prior which, to him, indicates some connectivity. Mr. Ayres said he will present an overview of a spike of water moving down the Cottonwood Canyon he found in the data at next month's SAC meeting he thinks can explain Mr. Gliessman's observation of water level changes.

Ms. Wooster said we do not know if we will manage these areas differently in the future but there is a need to figure out the data first. Mr. Beck said because the term management areas is emotionally charged, he thinks threshold regions or sub-regions should be used. Mr. Ayres clarified that each region will have the same rationale for determining representative well sustainability thresholds.

Ms. Carlisle asked what thresholds will be applied to each representative well. Mr. Ayres said he will present recommended thresholds for the SAC to review, which will ultimately go to the Board for approval.

Chair Jaffe said the well measurements from their wells have not been included in the Data Management System. Mr. Van Lienden said W&C included all the data received. He said every well in the western basin could be made as a representative well if the CBGSA Board would like to do that.

Ms. Wooster said she is concerned with putting the Russel Fault area in the central basin region threshold. Mr. Ayres said he is comfortable that we will be able to come up with a solution to present an appropriate rationale for determining thresholds across the basin.

Chair Jaffe suggested making two motions: 1) support threshold regions, 2) direct W&C to use threshold region boundaries.

1) Vice Chair Kelly made a motion to recommend threshold regions be adopted. The motion was seconded by Committee Member Furstenfeld and passed unanimously. Committee member Post was not able to participate at this time in the meeting and therefore, roll call was not needed.

2) Vice Chair Kelly made a motion to direct Woodard & Curran to use Option D to develop preliminary threshold numbers. The motion was seconded by Committee Member Draucker and passed unanimously.

b. Discussion on Monitoring Networks Chapter

Mr. Ayres provided an overview on the Monitoring Networks and what that chapter includes.

Mr. Kelly asked what the certainty of the model is given the data gaps. Mr. Van Lienden said the model will be composed initially with the data we have, but as we move forward we will gather more data.

Chair Jaffe said there are many groundwater dependent ecosystems in the canyons and it is

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important that we keep that in mind.

c. **DWR Technical Support Services Update**
Mr. Beck reported that the memo is in the SAC packet and could be discussed if there are any questions.

d. **Technical Forum Update**
Mr. Beck reported that the memo is in the SAC packet and could be discussed if there are any questions.

e. **Stakeholder Engagement Update**
Mr. Beck reported that the memo is in the SAC packet and could be discussed if there are any questions.

6. **Groundwater Sustainability Agency**

a. **Report of the Executive Director**
Mr. Beck reported the December SAC meeting will likely conflict with the Christmas Holiday schedule and we will need to move those dates.

b. **Board of Directors Agenda Review**
Mr. Beck reported that the memo is in the SAC packet and could be discussed if there are any questions.

c. **Report of the General Counsel**
Nothing to report.

7. **Items for Upcoming Sessions**
Nothing to report.

8. **Committee Forum**
Nothing to report.

9. **Public comment for items not on the Agenda**
Nothing to report.

10. **Adjourn**
Chair Jaffe adjourned the meeting at 7:51 p.m.

I, Jim Beck, Executive Director of the Cuyama Basin Groundwater Sustainability Agency, do hereby certify that the foregoing is a fair statement of the proceedings of the meeting held on Thursday, November 1, 2018, by the Cuyama Basing Groundwater Sustainability Agency Standing Advisory Committee.

Jim Beck

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Dated: November 29, 2018

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TO:	Standing Advisory Committee Agenda Item No. 5a
FROM:	Brian Van Lienden, Woodard & Curran (W&C)
DATE:	November 29, 2018
SUBJECT:	Groundwater Sustainability Plan Update

Issue
Update on the Cuyama Basin Groundwater Sustainability Agency Groundwater Sustainability Plan.

Recommended Motion
None – information only.

Discussion
Cuyama Basin Groundwater Sustainability Agency Groundwater Sustainability Plan (GSP) consultant Woodard & Curran's GSP update is provided as Attachment 1.

Cuyama Basin Groundwater Sustainability Agency

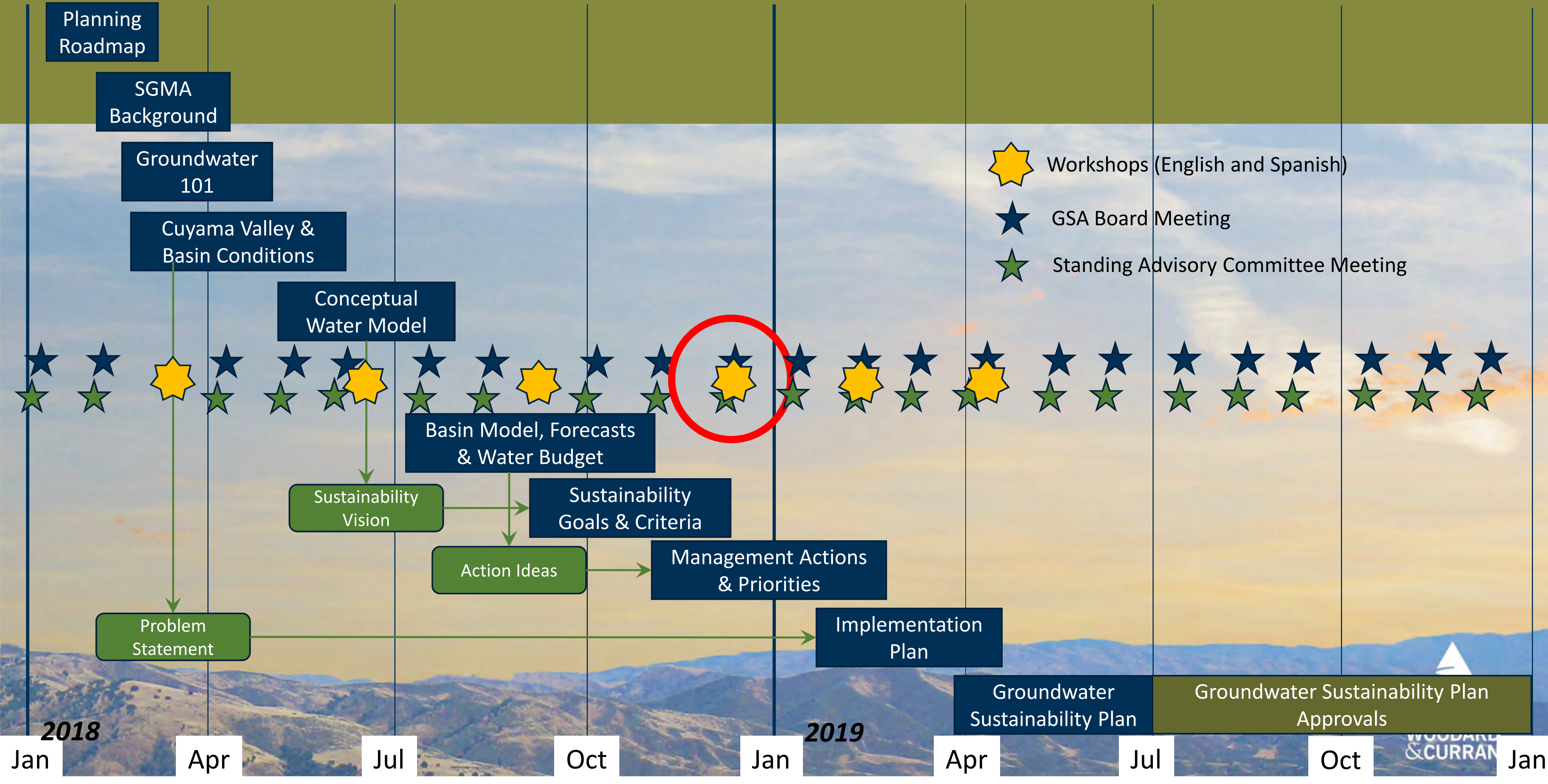
Groundwater Sustainability Plan Update

November 29, 2018

Contents

WOODARD &CURRAN

Cuyama Basin Groundwater Sustainability Plan – Planning Roadmap



November GSP Accomplishments

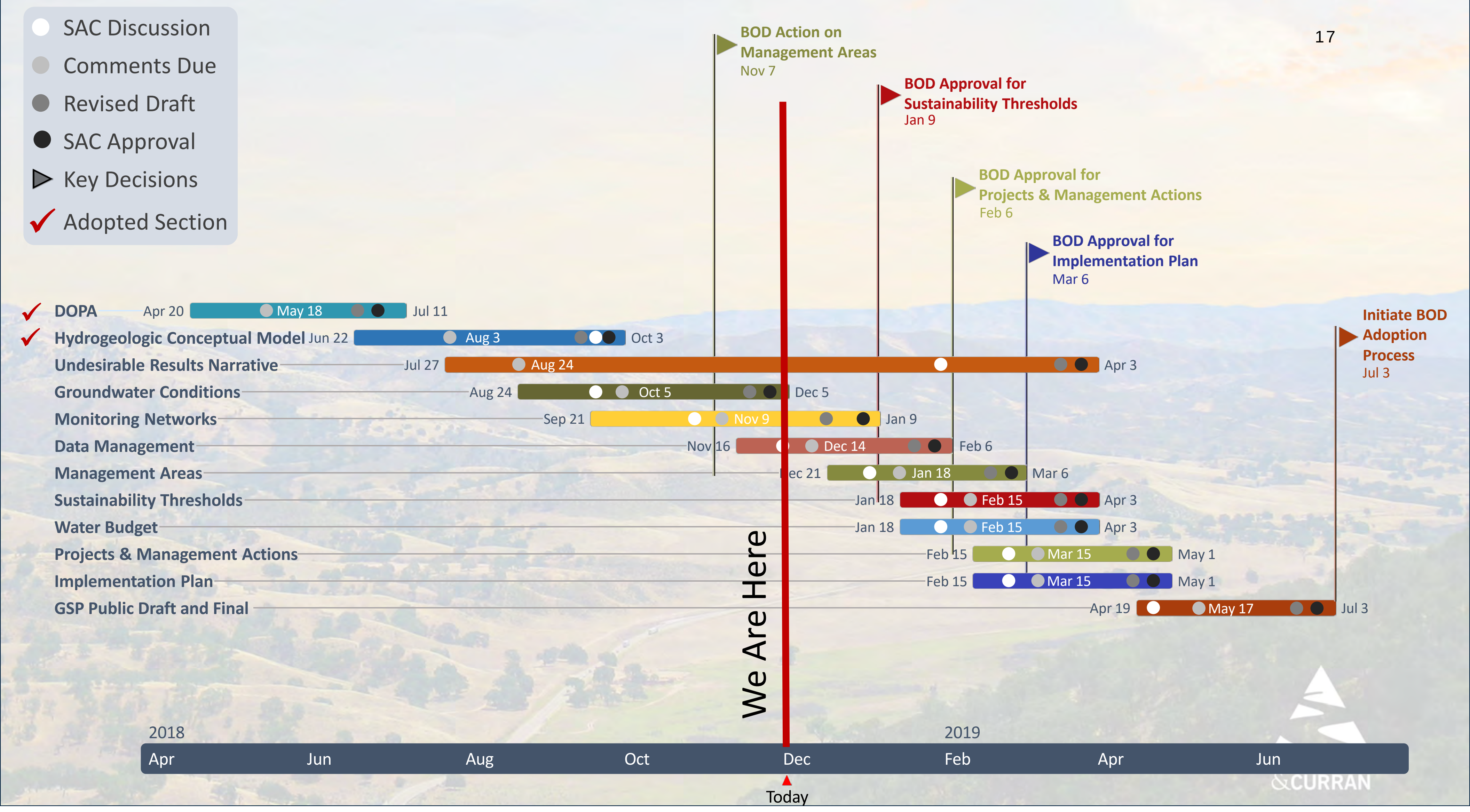
- ✓ Distributed revised Groundwater Conditions GSP section
- ✓ Revised potential management / threshold areas for discussion
- ✓ Developed potential sustainability thresholds for discussion
- ✓ Distributed draft Data Management GSP section
- ✓ Refined historical calibration of GSP numerical model
- ✓ Updated Data Management System data in response to comments

WOODARD & CURRAN

GSP Sections

1. Introduction
   - 1.1 GSA Authority & Structure
   - 1.2 Plan Area
   - 1.3 Outreach Documentation
2. Basin Settings
   - 2.1. HCM
   - 2.2 GW Conditions
   - 2.3 Water Budget
     - *Appendix:* Numerical GW Model Documentation
3. Undesirable Results
   - 3.1 Sustainability Goal
   - 3.2 Narrative/Effects
   - 3.2 ID Current Occurrence
4. Monitoring Networks
   - 4.1 Data Collection/Processing
   - 4.2 GSP Monitoring Networks
5. Sustainability Thresholds
   - 5.1 Threshold Regions
   - 5.2 Minimum Thresholds, Measurable Objectives, Margin of Operational Flexibility, Interim Milestones
6. Data Management System
   - *Appendix:* DMS User Guide
7. Projects & Management Actions
8. GSP Implementation

WOODARD & CURRAN


SAC Discussion
Comments Due
Revised Draft
SAC Approval
Key Decisions
Adopted Section
BOD Action on Management Areas
Nov 7
BOD Approval for Sustainability Thresholds
Jan 9
BOD Approval for Projects & Management Actions
Feb 6
BOD Approval for Implementation Plan
Mar 6
Initiate BOD Adoption Process
Jul 3
DOPA Apr 20 May 18 Jul 11
Hydrogeologic Conceptual Model Jun 22 Aug 3 Oct 3
Undesirable Results Narrative Jul 27 Aug 24 Apr 3
Groundwater Conditions Aug 24 Oct 5 Dec 5
Monitoring Networks Sep 21 Nov 9 Jan 9
Data Management Nov 16 Dec 14 Feb 6
Management Areas Dec 21 Jan 18 Mar 6
Sustainability Thresholds Jan 18 Feb 15 Apr 3
Water Budget Jan 18 Feb 15 Apr 3
Projects & Management Actions Feb 15 Mar 15 May 1
Implementation Plan Feb 15 Mar 15 May 1
GSP Public Draft and Final Apr 19 May 17 Jul 3
We Are Here
2018
2019
Apr
Jun
Aug
Oct
Dec
Feb
Apr
Jun
Today

Cuyama Basin Groundwater Sustainability Plan - Preparation Checklist for GSP Submittal

GSP Regulations Section	Water Code Section	Requirement	Description	GSP Section and Status
Article 3. Technical and Reporting Standards				
352.2		Monitoring Protocols	• Monitoring protocols adopted by the GSA for data collection and management • Monitoring protocols that are designed to detect changes in groundwater levels, groundwater quality, inelastic surface subsidence for basins for which subsidence has been identified as a potential problem, and flow and quality of surface water that directly affect groundwater levels or quality or are caused by groundwater extraction in the basin	Section 4 *Monitoring Networks - Appendix C* (not yet developed)
Article 5. Plan Contents, Subarticle 1. Administrative Information				
354.4		General Information	• Executive Summary • List of references and technical studies	*Executive Summary* (not yet developed)
354.6		Agency Information	• GSA mailing address • Organization and management structure • Contact information of Plan Manager • Legal authority of GSA • Estimate of implementation costs	Section 1.1 *GSA Authority and Structure* (not yet developed)
354.8(a)	10727.2(a)(4)	Map(s)	• Area covered by GSP • Adjudicated areas, other agencies within the basin, and areas covered by an Alternative • Jurisdictional boundaries of federal or State land • Existing land use designations • Density of wells per square mile	Section 1.2 *Plan Area* (adopted by GSA Board)

GSP Regulations Section	Water Code Section	Requirement	Description	GSP Section and Status
Article 5. Plan Contents, Subarticle 1. Administrative Information (Continued)				
354.8(b)		Description of the Plan Area	• Summary of jurisdictional areas and other features	Section 1.2 *Plan Area* (adopted by GSA Board)
354.8(c) 354.8(d) 354.8(e)	10727.2(g)	Water Resource Monitoring and Management Programs	• Description of water resources monitoring and management programs • Description of how the monitoring networks of those plans will be incorporated into the GSP • Description of how those plans may limit operational flexibility in the basin • Description of conjunctive use programs	Section 4 *Monitoring Networks* (under review by GSA Board)
354.8(f)	10727.2(g)	Land Use Elements or Topic Categories of Applicable General Plans	• Summary of general plans and other land use plans • Description of how implementation of the GSP may change water demands or affect achievement of sustainability and how the GSP addresses those effects • Description of how implementation of the GSP may affect the water supply assumptions of relevant land use plans • Summary of the process for permitting new or replacement wells in the basin • Information regarding the implementation of land use plans outside the basin that could affect the ability of the Agency to achieve sustainable groundwater management	Section 1.2 *Plan Area* (adopted by GSA Board)

GSP Regulations Section	Water Code Section	Requirement	Description	GSP Section and Status
Article 5. Plan Contents, Subarticle 1. Administrative Information (Continued)				
354.8(g)	10727.4	Additional GSP Contents	**Description of Actions related to:** • Control of saline water intrusion • Wellhead protection • Migration of contaminated groundwater • Well abandonment and well destruction program • Replenishment of groundwater extractions • Conjunctive use and underground storage • Well construction policies • Addressing groundwater contamination cleanup, recharge, diversions to storage, conservation, water recycling, conveyance, and extraction projects • Efficient water management practices • Relationships with State and federal regulatory agencies • Review of land use plans and efforts to coordinate with land use planning agencies to assess activities that potentially create risks to groundwater quality or quantity • Impacts on groundwater dependent ecosystems	Section 8. *GSP Implementation* (not yet developed)
354.10		Notice and Communication	• Description of beneficial uses and users • List of public meetings • GSP comments and responses • Decision-making process • Public engagement • Encouraging active involvement • Informing the public on GSP implementation progress	Section 8. *GSP Implementation* (not yet developed)

GSP Regulations Section	Water Code Section	Requirement	Description	GSP Section and Status
Article 5. Plan Contents, Subarticle 2. Basin Setting				
354.14		Hydrogeologic Conceptual Model	• Description of the Hydrogeologic Conceptual Model • Two scaled cross-sections • Map(s) of physical characteristics: topographic information, surficial geology, soil characteristics, surface water bodies, source and point of delivery for imported water supplies	Section 2.1 *Hydrogeologic Conceptual Model* (adopted by GSA Board)
354.14(c)(4)	10727.2(a)(5)	Map of Recharge Areas	• Map delineating existing recharge areas that substantially contribute to the replenishment of the basin, potential recharge areas, and discharge areas	Section 2.3 *Water Budgets* (not yet developed)
	10727.2(d)(4)	Recharge Areas	• Description of how recharge areas identified in the plan substantially contribute to the replenishment of the basin	Section 2.3 *Water Budgets* (not yet developed)
354.16	10727.2(a)(1) 10727.2(a)(2)	Current and Historical Groundwater Conditions	• Groundwater elevation data • Estimate of groundwater storage • Seawater intrusion conditions • Groundwater quality issues • Land subsidence conditions • Identification of interconnected surface water systems • Identification of groundwater-dependent ecosystems	Section 2.2 *Groundwater Conditions* (draft submitted for adoption by GSA Board)
354.18	10727.2(a)(3)	Water Budget Information	• Description of inflows, outflows, and change in storage • Quantification of overdraft • Estimate of sustainable yield • Quantification of current, historical, and projected water budgets	Section 2.3 *Water Budgets* (not yet developed)
	10727.2(d)(5)	Surface Water Supply	• Description of surface water supply used or available for use for groundwater recharge or in-lieu use	Section 2.3 *Water Budgets* (not yet developed)

GSP Regulations Section	Water Code Section	Requirement	Description	GSP Section and Status
Article 5. Plan Contents, Subarticle 2. Basin Setting (Continued)				
354.20		Management Areas	• Reason for creation of each management area • Minimum thresholds and measurable objectives for each management area • Level of monitoring and analysis • Explanation of how management of management areas will not cause undesirable results outside the management area • Description of management areas	Section 2.4 *Management Areas* (not yet developed)
Article 5. Plan Contents, Subarticle 3. Sustainable Management Criteria				
354.24		Sustainability Goal	• Description of the sustainability goal	Section 3.1 *Sustainability Goal* (not yet developed)
354.26		Undesirable Results	• Description of undesirable results • Cause of groundwater conditions that would lead to undesirable results • Criteria used to define undesirable results for each sustainability indicator • Potential effects of undesirable results on beneficial uses and users of groundwater	Section 3.2 *Undesirable Results Narrative* (revised draft under development)
354.28	10727.2(d)(1) 10727.2(d)(2)	Minimum Thresholds	• Description of each minimum threshold and how they were established for each sustainability indicator • Relationship for each sustainability indicator • Description of how selection of the minimum threshold may affect beneficial uses and users of groundwater • Standards related to sustainability indicators • How each minimum threshold will be quantitatively measured	Section 5.2 *Minimum Thresholds, Measurable Objectives, Margin of Operational Flexibility, Interim Milestones* (not yet developed)

GSP Regulations Section	Water Code Section	Requirement	Description	GSP Section and Status
Article 5. Plan Contents, Subarticle 3. Sustainable Management Criteria (Continued)				
354.30	10727.2(b)(1) 10727.2(b)(2) 10727.2(d)(1) 10727.2(d)(2)	Measurable Objectives	• Description of establishment of the measureable objectives for each sustainability indicator • Description of how a reasonable margin of safety was established for each measureable objective • Description of a reasonable path to achieve and maintain the sustainability goal, including a description of interim milestones	Section 5.2 *Minimum Thresholds, Measurable Objectives, Margin of Operational Flexibility, Interim Milestones* (not yet developed)
Article 5. Plan Contents, Subarticle 4. Monitoring Networks				
354.34	10727.2(d)(1) 10727.2(d)(2) 10727.2(e) 10727.2(f)	Monitoring Networks	• Description of monitoring network • Description of monitoring network objectives • Description of how the monitoring network is designed to: demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features; estimate the change in annual groundwater in storage; monitor seawater intrusion; determine groundwater quality trends; identify the rate and extent of land subsidence; and calculate depletions of surface water caused by groundwater extractions • Description of how the monitoring network provides adequate coverage of Sustainability Indicators • Density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends • Scientific rational (or reason) for site selection • Consistency with data and reporting standards • Corresponding sustainability indicator, minimum threshold, measureable objective, and interim milestone	Section 4 *Monitoring Networks* (under review by GSA Board)

GSP Regulations Section	Water Code Section	Requirement	Description	GSP Section and Status
			(Monitoring Networks Continued) • Location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used • Description of technical standards, data collection methods, and other procedures or protocols to ensure comparable data and methodologies	
354.36		Representative Monitoring	• Description of representative sites • Demonstration of adequacy of using groundwater elevations as proxy for other sustainability indicators • Adequate evidence demonstrating site reflects general conditions in the area	Section 4 *Monitoring Networks* (under review by GSA Board)
354.38		Assessment and Improvement of Monitoring Network	• Review and evaluation of the monitoring network • Identification and description of data gaps • Description of steps to fill data gaps • Description of monitoring frequency and density of sites	Section 4 *Monitoring Networks* (under review by GSA Board)

GSP Regulations Section	Water Code Section	Requirement	Description	GSP Section and Status
Article 5. Plan Contents, Subarticle 5. Projects and Management Actions				
354.44		Projects and Management Actions	• Description of projects and management actions that will help achieve the basin's sustainability goal • Measureable objective that is expected to benefit from each project and management action • Circumstances for implementation • Public noticing • Permitting and regulatory process • Time-table for initiation and completion, and the accrual of expected benefits • Expected benefits and how they will be evaluated • How the project or management action will be accomplished. If the projects or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included. • Legal authority required • Estimated costs and plans to meet those costs • Management of groundwater extractions and recharge	Section 7. *Projects and Management Actions* (not yet developed)
354.44(b)(2)	10727.2(d)(3)		• Overdraft mitigation projects and management actions	Section 7. *Projects and Management Actions* (not yet developed)

GSP Regulations Section	Water Code Section	Requirement	Description	GSP Section and Status
Article 8. Interagency Agreements				
357.4	10727.6	Coordination Agreements - Shall be submitted to the Department together with the GSPs for the basin and, if approved, shall become part of the GSP for each participating Agency.	**Coordination Agreements shall describe the following:** • A point of contact • Responsibilities of each Agency • Procedures for the timely exchange of information between Agencies • Procedures for resolving conflicts between Agencies • How the Agencies have used the same data and methodologies to coordinate GSPs • How the GSPs implemented together satisfy the requirements of SGMA • Process for submitting all Plans, Plan amendments, supporting information, all monitoring data and other pertinent information, along with annual reports and periodic evaluations • A coordinated data management system for the basin • Coordination agreements shall identify adjudicated areas within the basin, and any local agencies that have adopted an Alternative that has been accepted by the Department	The Cuyama Basin does not need a coordination agreement because the basin is using a single GSP

TO:	Standing Advisory Committee Agenda Item No. 5b
FROM:	Brian Van Lienden, Woodard & Curran (W&C)
DATE:	November 29, 2018
SUBJECT:	Groundwater Conditions Chapter Adoption

Issue
Recommend adoption of the Groundwater Conditions chapter.

Recommended Motion
Adopt the Groundwater Conditions chapter.

Discussion
An overview of the revised Groundwater Conditions chapter is provided as Attachment 1. The comments and responses matrix is provided as Attachment 2, and the revised Groundwater Conditions chapter is provided as Attachment 3.

Cuyama Basin Groundwater Sustainability Agency

Groundwater Conditions Section

November 29, 2018

Groundwater Conditions GSP Section

- Revised GSP Section provided to SAC and Board for review as part of Board Packet on August 24th
- Revised section reflects responses to comments received on August Draft version
- Description of Plan Area describes:
  - Groundwater trends
  - Changes in groundwater storage (placeholder)
  - Land subsidence
  - Groundwater quality
  - Interconnected surface water systems (placeholder)
  - Groundwater dependent ecosystems (placeholder)
- Seeking SAC recommendation for approval by Board at Dec 3 meeting

WOODARD & CURRAN

Cuyama Basin Groundwater Conditions September Draft
Summary of Public Comments and Responses
November 19, 2018

Comment #	Commenter	Commenter Organization	Section	Section Paragraph #	Paragraph's Sentence #	Sentence Starts with, "...	Comment	Response to Comment
1	Brenton Kelly	Quail Springs Permaculture	General	N/A	N/A	N/A	The text is overtly understated regarding significante conditions depicted with conclusive data sets & trends.There is a need to "state the obvious" when viewing conclusive data sets.	Comment noted. No change required in document.
2	Brenton Kelly	Quail Springs Permaculture	General	N/A	N/A	N/A	No historical baseline is established for the discussion of measurable objectives. The contextual perspective of past or current conditions is not generally available. The uncertainty of this will not be helped when a algorithm generates it in the model.	Comment noted. No change required in document.
3	Brenton Kelly	Quail Springs Permaculture	General	N/A	N/A	N/A	Data Gaps are recognized as a significant challenge to fully understanding the groundwater conditions and drive a higher degree of uncertainty when making assumptions & conclusions	
4	Brenton Kelly	Quail Springs Permaculture	2.2	1	N/A	Bullets # 4,5 & 6 of 7	Three intended objectives outlined in the first paragraph of section 2.2, have not been addressed	As noted in the document, these sections are under development and will be available in a future version of this section.
5	Brenton Kelly	Quail Springs Permaculture	2.2.1	N/A	N/A	Fig. 2.2-1	Landmarks - Caliente Range - Ventucopa Uplands (Badlands) - Apache Canyon	Caliente Range and Apache Canyon have been added to Figure 2.2-1. Ventucopa Uplands are not specifically discussed in this section.
6	Brenton Kelly	Quail Springs Permaculture	2.2.3	N/A	N/A	Fig. 2.2-16 to18	If the screening intervals and perforation depths of these three multi completion wells are know and presented here, then why are they not in the Opti DMS?	This information will be added to the Opti DMS for these well locations
7	Brenton Kelly	Quail Springs Permaculture	2.2.3	N/A	N/A	Fig. 2.2-19	Text should explain that the blue arrows indicate the direction of the downward horizontal groundwater flow. These arrows are helpful and should be used in other Groundwater Contour maps.	The text referring to this figure has been updated. There are no other figures in this section for which these arrows would be appropriate.
8	Brenton Kelly	Quail Springs Permaculture	2.2.3	N/A	N/A	Fig. 2.2-20	Illustrates a classic example of a Bullseye depression. Speak to the significance of these conditions. Speak also to the Data Gaps representing the missing northeast area, near the intersections of 166 & 33. How big or deep is the zone of depression?	Comment noted. The document notes that the depth to water is up to 600 feet deep.
9	Brenton Kelly	Quail Springs Permaculture	2.2.4	1	N/A	Bullet #1	Storage loss is a significant groundwater condition that should be measurable, but we are going to model it first. The cart is before the horse!	While changes in groundwater storage can be inferred from changes in groundwater levels, storage quantities cannot be directly measured with the available data. The numerical model will provide the best available estimate of groundwater storage.
10	Brenton Kelly	Quail Springs Permaculture	2.2.6	2	1	Subsidence	Subsidence at a rate of > 0.5" / year should not be dismissed or diminished by comparison to the collapse of the San Joaquin. This is a critical Data Gap with only one monitor site in the central basin. It may or may not be anomalous without anything to compare it to	Comment noted. The need for additional subsidence monitoring is discussed in the Monitoring Networks section.
11	Brenton Kelly	Quail Springs Permaculture	2.2.7 Literature Review	8	1	The USGS reported the following	The USGS, SBCWA & the GAMA data files all indicate constituante levels (TDS, Nitrate, Sulfate, & Arsenic) above MCL in the central basin implicating a causal nexus with localized excessive groundwater extraction.	Comment noted. The data is insufficient to make a definitive conclusion about the relationship between groundwater extraction and water quality.
12	Brenton Kelly	Quail Springs Permaculture	2.2.7	5	2	Toward the northeast end of the basin...	The available data is inconclusive in establishing any trends in conditions over time, stable or otherwise. How can we quantify a minimum threshold and how can we monitor this causal nexus between groundwater extraction & groundwater quality degradation?	Comment noted. The data is insufficient to make a definitive conclusion about the relationship between groundwater extraction and water quality.
13	Brenton Kelly	Quail Springs Permaculture	2.2.7	N/A	N/A	Groundwater Quality	Available groundwater age & temperature data should be used to help determine flow rates over faults, intermixing of aquifer layers, and recharge rates of deep percolation.The response to this same comment on the Draft HCM was that it would be presented in this section of the GSP. What section will it be in next?	As discussed at the November 1 SAC meeting,
14	Brenton Kelly	Quail Springs Permaculture	2.2.8	N/A	N/A	InterconnectedSurface Water Systems	When this section is developed it should additionally include the following: 1.)Consideration of the causal nexus between declines in ephemeral and intermittent streams, and SGMA related activities. 2.)Estimates of the ecological services and emergent benefits of interconnected surface water systems. 3.)Literature Review of the historic loss of the riparian habitats through the valley. 4.)Consider potentials for river channel modification to slow, spread & sink stream discharge for enhanced recharge.	Comment noted. This will be taken into consideration when this section is developed.
15	Brenton Kelly	Quail Springs Permaculture	2.2.9	N/A	N/A	Groundwater Dependent Ecosystems	When this section is developed it should additionally include the following: 1.)Estimates of Evapotranspiration needs of existing GDEs and the stream discharge requirements to satisfy their dependance. 2.)Assessment of the Beneficial Uses and emergent benefits of the biology associated with the GDEs. 3) Consider the causal nexus of desertification and the loss of native wetland habitats due to SGMA related activities. 4)Consideration of enhancing GDEs to facilitate stormwater capture and recharge by the reduction of flash runoff	Comment noted. This will be taken into consideration when this section is developed.
16	Brenton Kelly	Quail Springs Permaculture	2.2.10	N/A	N/A	Data Gaps	Recognised Data Gaps include: 1) Recent groundwater level & quality data in the Ventucopa upland & river corridor, 2) Historical groundwater data from the Cottonwood subarea. 3) More multi-completion wells in the main basin to better understand the zone of depression. 4) Data for Groundwater elevations in the north and west of the basin. 5) Well Completion Data with perforation intervals. Available from down hole video logging. 6) More CGPS Subsidence monitors in the main basin. 7) Current Groundwater quality data basin wide. 8) Surface water flow gauges on the Cuyama in the Basin, at bridges on Hwy 33 in Ventucopa uplands and Hwy 166 in the central basin. 9) Data concerning GDEs in the basin.	Comment noted. This will be taken into consideration when this section is developed.
17	Brenton Kelly	Quail Springs Permaculture	2.2.10	N/A	N/A	Data Gaps	Major Data Gaps continue to generate the concern for the uncertainty of any conclusions made from the assumptions needed to develop a numerical model. Greater uncertainty requires a more conservative approach to model assumptions.	Comment noted. No change required in document.
18	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	General	N/A	N/A	N/A	In its current form, the draft GWC chapter is incomplete relative to 23 CCR §354.16 because several GWC elements identified above (groundwater storage changes, interconnected surface water systems, and groundwater dependent ecosystems) are included in the chapter only as placeholders and are not complete	Comment noted. No change required in document.
19	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2.2 GW Hydrographs 2.2.3 GW Contours	N/A	N/A	N/A	The GWC chapter does not adequately reference the hydrogeologic conceptual model (HCM). The discussion of groundwater contour figures lacks any mention of the hydraulic effect of faults. For instance, the HCM documents that SBCF is a barrier to groundwater flow. This significant fact should be used to interpret water level observations ("Groundwater Hydrographs" [2.2.2]; "Groundwater Contours" [2.2.3]).	Comment noted. No change required in document.
20	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2.2 GW Hydrographs 2.2.3 Vertical Gradients 2.2.3 GW Contours	N/A	N/A	N/A	The GWC chapter does not adequately reference the hydrogeologic conceptual model (HCM). Similarly, the HCM discusses varying hydraulic conductivities between the younger alluvium, older alluvium, and Morales Formation. The effects of hydrostratigraphy should be considered in discussions of vertical gradients, hydrograph comparisons, and groundwater elevation contours ("Groundwater Hydrographs" [2.2.2]; "Vertical Gradients" [2.2.3]; "Groundwater Contours" [2.2.3]).	Comment noted. No change required in document.
21	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2.3			1947 to 1966 Groundwater Trends	The chapter cites results from the outdated CUVHM model. Cited CUVHM results ("1947 to 1966 Groundwater Trends" [2.2.3]) may be unreliable and obsolete given that WC is developing a new model.	Comment noted. Even after development of the updated model, data from the USGS study will still be a primary source of information for the earlier period from 1947-1966.

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22	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	Figures 2.2-11 to 2.2-15				Hydrograph figures lack organization and their interpretation is insufficiently clear (2.2-11 to - 15). Partial overlap and repetition of hydrographs make the figures confusing. Figures should be revised so that each one exclusively covers a portion of the basin with unique hydrographs. Well 620 should be discussed under "central portion" because it is north of SBCF and follows the pattern of decline in that region. South of the fault to the Ventucopa area is showing a largely consistent picture of long-term steady elevations (Wells 40, 41, 85) with the exception of decline in Well 62 since the 1990s. The area of decline in the western portion of the basin extends to Well 70, just west of Bitter Creek. Regarding the statement that "all monitoring wells in [the central portion of the basin] show consistent declines, consider that Well 28 has elevations leveling off in the 1990s and then starting to recover in the 2000s.	The figure and text have been made consistent. Title corrected.
23	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2.3				Referenced hydrographs are missing, or more useful selections are available. Hydrographs for Wells 40, 316, and 640 are discussed in the text but not included in the figures. Consider adding hydrographs for Wells 70, 107, 110, 112, and 114, because they have significantly long data records, fill spatial gaps, and preserve the variation in water level trends observed in the basin. Consider removing hydrographs for Wells 108, 121, 571, 830, 840, and 846 because their data records are too short to reveal much about water level trends.	The figure and text have been made consistent. Title corrected.
24	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2.3 GW Hydrographs			Groundwater levels followed	The GWC chapter contains unsupported statements. The statement, "Groundwater levels followed climactic patterns" ("Groundwater Hydrographs" [2.2.3]) is ambiguous. If it refers to cycles of wet and dry years, a hyetograph of monthly or annual rainfall totals should be included to support it.	Comment noted. No change required in document.
25	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2.7 Data Analysis			The spikes of TDS	The GWC chapter contains unsupported statements. The statement, "The spikes of TDS increases correspond with Cuyama River flow events" ("Data Analysis" [(2.2.7]) should be supported by showing a river hydrograph on the same plot.	Figures showing the climactic variability will be included in the Water Budgets section.
26	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2.1 Useful Terminology 2.2.3 Vertical Gradients				Wells that are screened in different intervals are not differentiated. In two mentions of wells having different depths ("Useful Terminology" [2.2.1], "Vertical Gradients" [2.2.3]), language should be precise that perforations are at different depth intervals.	Comment noted. No change required in document.
27	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2.3 Vertical Gradients				Improvements are needed in vertical gradient hydrographs and interpretation ("Vertical Gradients" [2.2.3]). The hydrographs should have finer x-axis label resolution than annual, because seasonality is discussed in the document. Regarding their interpretation, hydrographs that behave similarly lend themselves into being grouped by geographic subareas when possible. This type of grouping is one consideration when defining potential groundwater management areas. It is therefore important that these assessments accurately represent the data. Uncertainty must be clearly communicated by (for example) use of hydrographs which reflect the variability observed in a spatial grouping. Some specific examples include:	The scale of the hydrographs have been modified to show greater vertical detail
28	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2.3 Vertical Gradients				a. (CVFR) "There is no vertical gradient." At the scale of the hydrograph figure, we cannot discern whether there is no gradient or a small gradient.	The scale of the hydrographs have been modified to show greater vertical detail
29	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2.3 Vertical Gradients				b. (CVBR) We cannot dismiss the contribution of horizontal recharge; the CVFR site shows the basin is not vertically driven, at least not everywhere. Also, given the depth to water it is speculative to conclude vertical recharge exceeds horizontal. Furthermore, the hydrographs show "shallow" wells are influenced by seasonal conditions just as much as "deep" wells.	The text has been revised for clarity.
30	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2.3 Vertical Gradients				c. (CVKR) "The hydrograph of the four completions shows that at the deeper completions are slightly lower than the shallower completions in the spring at each completion, and deeper completions are generally lower in the summer and fall." This statement seems to say groundwater levels decrease with depth in the in the spring, summer, and fall. Why is winter excluded—no measurements?	The text has been revised for clarity.
31	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2.3 Vertical Gradients				d.(CVKR) "This likely indicates that...the vertical gradient is significantly smaller at this location in the spring measurements." Or does it indicate that there is no vertical gradient during unpumped conditions?	The text has been revised for clarity.
32	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2.3 Appendix Y				Errors and overgeneralizations exist in the mapped groundwater elevation contours (including Appendix Y). The text analyzing the contour figures (including in the appendices) contains interpretive errors ("Groundwater Contours" [2.2.3]). For instance, "In the southeastern portion of the basin near Ventucopa, groundwater is mostly between 100 and 150 feet bgs" should be "between 150 and 200 feet bgs."	The text has been revised for clarity.
33	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2.3 Appendix Y				The same discussions of contour maps in Appendix Y seem to be reused for each season/map, ignoring or smoothing over distinctions between them. For example, an area of low groundwater elevation is described as "northeast of...Cuyama" for Figures Y-1, -3, -5, and -7, yet the figures show that area shifting between the north and northwest of Cuyama.	The text has been revised for clarity.
34	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2.3 Appendix Y				In several instances, "groundwater levels rising" should be replaced with "depth to water decreasing" because the topic is DTW contours. Contour labels on Figure Y-4 neither match values posted on wells nor represent a 50-ft contour interval.	Figure Y-4 has been corrected.
35	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2.3 Appendix Y				Explanation of the maps should specify that they "improve understanding of recent horizontal trends in the basin." The inferred contours are unnecessary, speculative, and often seem to be physically unreasonable. The small contour interval relative to low well density causes several occurrences of a "target" effect, where a single well drives the appearance of a dramatic groundwater mound (like a "bullseye"). In some cases, the actual cause of the large head differential appears to be the SBCF. Larger contour intervals would decrease this effect.	Due to the regional nature and large topographic and groundwater depth ranges in the Cuyama Basin, the 50 foot contour interval was chosen to capture trends while not ignoring conditions that are shallower than 100 feet. Like many presentation figure decisions, this one is a compromise. No change made to contour maps.
36	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2.7 Data Analysis				Explanation of water quality constituents is needed. An explanation of why TDS, nitrate, and arsenic are selected for mapping and discussion would be helpful ("Data Analysis" [2.2.7]).	These consituents were selected because they were identified as being of interest during the stakeholder process. Very limited data is available for analysis of other constituents.
37	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2.7 Data Analysis				An incorrect Nitrate MCL is cited. The nitrate MCL is cited as 5 mg/L ("Data Analysis" [2.2.7]). It actually is 10 mg/L as N.	The MCL value has been corrected
38	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	Figure 2.2-25				Consistent time scales in Figure 2.2-25 should be used for clarity. The plot time scales are inconsistent, which makes interpretation unnecessarily difficult.	The time scales on the plots have been set to allow readers to clearly see the data.

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39	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	Appendix X				The hydrograph appendix contains errors and omissions. Many wells are symbolized in the map but not labeled. Many wells labeled in the map do not have hydrographs included. Data axis label intervals are inconsistent (one year vs. three years). For Wells 90 and 639, the y-axis minimum is too high.	Wells symbolized in the maps incorporated into Appendix X incorporate all "OPTI Wells." These includes both groundwater level monitoring and groundwater quality wells that are included in the source datasets. This means that some wells on the map will not have a hydrograph associated with them. Additionally, some of the wells may overlap one another so closely that GIS is unable to automate every well number label on the map. These limitations are not affected in the online DMS, but Appendix X is intended to provide as much information as reasonable in print form. Hydrograph label axis intervals are automated. Labels still effectively show GWE and DTW. The Y-axis in the hydrographs have been adjusted to show all data in wells 90 and 639.
40	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	Appendix Z			This loss of aquifer	The subsidence appendix requires further explanation. Regarding the statement, "This loss of aquifer is limited to the water that was stored in the compressed clays, and storage capacity lost is limited to the water that was stored in clays that were compressed" ("How Subsidence Occurs"), what does WC intend to communicate regarding the difference between loss of aquifer and loss of storage capacity? Aren't they effectively the same thing?	The text has been revised for clarity.
41	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2 GW Conditions	1	1	The groundwater conditions section	Chapter scope. The statement, "The groundwater conditions section is intended to…Define measurable objectives to maintain or improve specified groundwater conditions" ("Groundwater Conditions" [2.2]) is more accurately worded in the following paragraph: "The groundwater conditions described in this section…are used elsewhere in the GSP to define measurable objectives."	The text has been revised for clarity.
42	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2.1 Useful Terminology				Terms not used in the document. Two defined terms ("Useful Terminology" [2.2.1]) are not used elsewhere in the document, and their purposes should be stated: "historical high groundwater elevation" and "historical low groundwater elevation."	These definitions have been removed from the section.
43	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	Figures 2.2-1 & 2.2-2				Map symbology. Figure 2.2-1 has non-intuitive and inconsistent symbology. Purple lines and points represent an eclectic set of "landmarks". All the canyons are labeled, but most of the creeks are not. Bitter Creek is referenced many times in this document, but it is not shown on any subsequent figures. In Figure 2.2-2, Bitter Creek and SBCF are mentioned in the text discussion but not shown on the figure.	Comment noted. The purpose of Figure 2.2-1 is to show the locations of elected landmarks in the Basin to assist in discussion of conditions in the section. It is not necessary to repeat each landmark in subsequent figures.
44	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2.3 GW Hydrographs			In the western area	Unclear sentences. There are several incomplete and/or confusing sentences in the document. "In the western area west of Bitter Creek are near the surface near the Cuyama river, and deeper below ground to the south, uphill from the river, and have been generally stable since 1966" ("Groundwater Hydrographs" [2.2.3]).	The text has been revised for clarity.
45	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2.3 Vertical Gradients			The hydrograph of the four completions	Unclear sentences. There are several incomplete and/or confusing sentences in the document. "The hydrograph of the four completions shows that at the deeper completions are slightly lower than the shallower completions in the spring at each completion, and deeper completions are generally lower in the summer and fall" ("Vertical Gradients" [2.2.3]).	The text has been revised for clarity.
46	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2.3 GW Countours			Measurements from wells of different	Unclear sentences. There are several incomplete and/or confusing sentences in the document. "Measurements from wells of different depths are representative of conditions at that location and there are no vertical gradients" should say "…assumes there are no vertical gradients" ("Groundwater Contours" [2.2.3]).	The text has been revised for clarity.
47	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2.7 Data Analysis			TDS in the central portion	Unclear sentences. There are several incomplete and/or confusing sentences in the document. "TDS in the central portion of the basin" ("Data Analysis" [2.2.7]).	The text has been revised for clarity.
48	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2.7 Data Analysis			The chart for Well 85	Unclear sentences. There are several incomplete and/or confusing sentences in the document. "The chart for Well 85 at the intersection of Quatal Canyon and the Cuyama River is generally below 800 mg/L TDS with spikes of TDS increases" ("Data Analysis" [2.2.7]).	The text has been revised for clarity.
49	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	Appendix Z			[Subsidence is] not restricted	Unclear sentences. There are several incomplete and/or confusing sentences in the document. "[Subsidence is] not restricted in rate, magnitude, or area involved" (Appendix Z).	The text has been revised for clarity.
50	Jeff Shaw, Anona Dutton, John Fio, Tim Ingrum	EKI Environment and Water	2.2.7 Reference and Data Collection				Links and sources identical. Two different DWR data source links ("Reference and Data Collection" [(2.2.7]) share the same web address.	The link for the CNRA dataset has been updated.
51	Mike Post	SAC Member	General	N/A	N/A	N/A	It seems that there has been no examination of faults/aquitards down stream (West) from the basin border. While it is acknowledged that the GSA has no authority beyond the defined basin, it would seem that knowing what the further extent of pooled ground water is present and where/why that water is held back would be important for making management decisions in that segment of the basin. It may well be that the basin's western limit was drawn for exactly to account for this but that does not seem to be clearly spelled out.	Comment noted. This is outside of the scope of the GSP.
52	Jane Wooster	CBGSA Board member	Figure 2.2-1				On Figure 2.2-1 the location of the Russell Ranch Oil Field is not too accurate….it is also wrong on OPTI ID (Jane to send Brian a map).	Russell Ranch Oil Field has been removed from the figure.
53	Jane Wooster	CBGSA Board member	Appendix X				In the hydrographs (appendix X), many of the wells on our place are no longer there. It is misleading because some wells were drilled, tested once and that was it. I guess they give info about water depth.	The maps and data in Appendix X are intended to show the groundwater level information that is available historically in the Basin. Because of this, many wells that no longer exist will be included.
54	Jane Wooster	CBGSA Board member	Figures Y-4 & Y-6				Just based on what I know the stats were on our wells, it looks like Figures Y-4 and Y-6 are over-generalized. Some places we saw differences and some places the Wells didn't fluctuate all.	Comment noted. The contour maps represent estimates based on the available information in each period.
55	Stephen Gliessman & Roberta Jaffe	Farmers/residents; Standing Advisory Committee Chair (Roberta)	General				On all maps, in every section, please show the major faults and major streams as landmarks for easier location of what is being shown on the specific map.	This represents too much detail for most maps in the section. Figure 2.2-1 is intended to provide geographic locations of features for reference.

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56	Stephen Gliessman & Roberta Jaffe	Farmers/residents; Standing Advisory Committee Chair (Roberta)	General				Age dating of water is an important component of groundwater conditions since it indicates sources and recharge. Any claim for surface recharge of the groundwater needs to be validated by tritium analysis.	This is incorrect. Tritium analysis can provide some useful information about groundwater recharge, but is not a conclusive method for determining whether surface recharge has occurred.
57	Stephen Gliessman & Roberta Jaffe	Farmers/residents; Standing Advisory Committee Chair (Roberta)	General				The Cuyama Basin needs dedicated test wells at critical locations in order to better understand groundwater availability and movement	Comment noted. Potential locations of new monitoring wells is discussed in the Monitoring Networks section.
58	Stephen Gliessman & Roberta Jaffe	Farmers/residents; Standing Advisory Committee Chair (Roberta)	2.2.3 GW Trends				While the maps clearly show the decades-long downward trend of the central basin (Figure 2.2-7), the narrative just mentions specifics and does not give enough of a full watershed overview of how there are records since 1950 of extraction without replenishment which has created a record of a severe downward trend of approximately 500 feet over 6+ decades. This overview is key to establishing minimum thresholds for the GSP since this downward trend needs to stop with no continued depletion. We recommend adding a summation overview to this section.	Comment noted. This level of detail is not needed in this section.
59	Stephen Gliessman & Roberta Jaffe	Farmers/residents; Standing Advisory Committee Chair (Roberta)	2.2.4 Change in GW Storage				The determination of groundwater storage from the model seems backwards, since the model is highly dependent on how much water there is to pump. Isn't there data available to inform the groundwater storage available in certain areas? Without such data the accuracy of the model seems much more uncertain.	The model provides the best estimate currently available of the quantity of groundwater storage available.
60	Stephen Gliessman & Roberta Jaffe	Farmers/residents; Standing Advisory Committee Chair (Roberta)	2.2.6 Land Subsidence				Any subsidence can negatively affect groundwater storage. The very limited measurements to date don't adequately determine if current subsidence has been occurring for a long period of time or is just beginning. This creates a data gap that adds more uncertainty to the model and therefore more monitoring sites are needed to determine both rates and extent of subsidence.	Comment noted. The need for additional subsidence monitoring is discussed in the Monitoring Networks section.
61	Stephen Gliessman & Roberta Jaffe	Farmers/residents; Standing Advisory Committee Chair (Roberta)	2.2.7 GW Quality				This section on groundwater quality reports on various constituents' historical conditions, but does not develop a foundation for a baseline for future monitoring nor identify what constituents are recommended for monitoring.	Monitoring is addressed in the Monitoring Networks section. There is not enough existing historical data to 'establish a baseline' in this basin.
62	Stephen Gliessman & Roberta Jaffe	Farmers/residents; Standing Advisory Committee Chair (Roberta)	2.2.7 GW Quality				In reviewing the information in this section, plus in discussing this in meetings as well as with the CCSD and other hydrologists involved in monitoring wells in the Cuyama Basin, we would recommend that current baselines be established for TDS, nitrate levels, and specific heavy metals such as arsenic relevant to different areas of the basin	What is a 'baseline' for TDS, arsenic, nitrates and metals? This is not a term typically used in conjunction with water quality
63	Stephen Gliessman & Roberta Jaffe	Farmers/residents; Standing Advisory Committee Chair (Roberta)	2.2.7 GW Quality				Monitoring be established that relates depth of groundwater extraction to constituents present and monitors for changes over time. Water quality analysis should also include tritium analysis to determine the age dating of water and verify if recharge from the surface is occurring.	The relationship between depth to groundwater and the concentration of water quality constituents is not known in this basin due to limited groundwater quality monitoring information - therefore - the relation between depth and constituent concentration cannot be developed accurately, and is a data gap that should be filled during GSP implementation
64	Stephen Gliessman & Roberta Jaffe	Farmers/residents; Standing Advisory Committee Chair (Roberta)	2.2.7 GW Quality				How will nitrogen loading from both agricultural applications and groundwater use be monitored?	GSAs do not have authority toregulate agricultural fertilizer practices - therefore, the GSA will not be monitoring them.
65	Stephen Gliessman & Roberta Jaffe	Farmers/residents; Standing Advisory Committee Chair (Roberta)	2.2.7 GW Quality				How will arsenic induction by extraction of ancient water be monitored?	It won't be performed as a part of the initial GSP - the relationship between depth to groundwater and the concentration of water quality consituents (like arsenic) is not known at this time. The GSA board may decide to establish an arsenic monitoring program as part of GSP implementation and expansion of the water quality monitoring grid, but existing monitoring is erratic, spatially inaedquate and not useful for this purpose.
66	Stephen Gliessman & Roberta Jaffe	Farmers/residents; Standing Advisory Committee Chair (Roberta)	2.2.7 GW Quality				Does CCSD have a time series of arsenic level in their wells to see if changes have occurred?	The CCSD has not provided water quality data
67	Stephen Gliessman & Roberta Jaffe	Farmers/residents; Standing Advisory Committee Chair (Roberta)	2.2.8 Interconnected Surface Water Systems				This section will also need a historical component of surface water loss through looking at riparian habitats.	Comment noted. Historical information on surface water loss is not available except through model estimates.
68	Stephen Gliessman & Roberta Jaffe	Farmers/residents; Standing Advisory Committee Chair (Roberta)	2.2.9 GDE				A response to the study being conducted by a consulting biologist: this study should be done when GDEs are most biologically active and engage ground-truthing by accessing local knowledge of the different areas of the Basin.	Comment noted.
69	Stephen Gliessman & Roberta Jaffe	Farmers/residents; Standing Advisory Committee Chair (Roberta)	2.2.10 Data Gaps				Throughout this section data gaps are referred to, but are not listed here. The fact that there are so many data gaps in this section is very disconcerting, since most of these gaps provide critical data to inform the model. Not having these data introduces greater uncertainty in the validity of the model.	Comment noted. The model will be developed based on the best available information that is currently available, but can be updated in the future.
70	Cathy Martin	County of San Luis Obispo	Ch 2 Intro	1	1	This document includes the	It looks like some the GSP regulations for § 354.8 is missing or maybe part of another chapter. Other GSP Regulations seem to be included but not listed.	As noted, this is just one section that will satisfy the requirements of § 354.8
71	Cathy Martin	County of San Luis Obispo	2.2.1 Useful Terminology	N/A	N/A	MCL – Maximum Contaminant	Suggest defining the Primary and Secondary MCL which is discussed in the document, but not defined.	These terms are not used in the document.
72	Cathy Martin	County of San Luis Obispo	2.2.2 GW Elevation Data Processing	Bullet list	N/A	N/A	Please verify if any wells are duplicates and/or reported to multiple agencies?	This was performed prior to development of the section.

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73	Cathy Martin	County of San Luis Obispo	2.2.2 GW Elevation Data Processing	2	2	Data collected also included	Please clarify the meaning of "questionable measurement code"	This information is provided by monitoring agencies to indicate when conditions at a well effect the quality of a measurement. This level of detail is not needed in this document.
74	Cathy Martin	County of San Luis Obispo	Figure 2.2-2 & 2.2-4	N/A	N/A	N/A	Please label [Bitter Creek] on figure.	The location of Bitter Creek is shown in Figure 2.2-1
75	Cathy Martin	County of San Luis Obispo	2.2.1 Useful Terminology	N/A	N/A	Figure 2.2-1	Add faults to acronym list (missing GRF and TTRF)	These have been added to the acronyms list
76	Cathy Martin	County of San Luis Obispo	Figure 2.2-2	N/A	N/A	N/A	Suggest removing the word Earlier from figure and adding actual years, if possible	This change is not needed as the purpose of this figure is to highlight wells with recently measured data.
77	Cathy Martin	County of San Luis Obispo	General	N/A	N/A	N/A	Suggest showing State and Federal lands on all of the figures. This may help the public understand why some areas have no wells or water quality data.	These are shown on the figures in the Plan Area section.
78	Cathy Martin	County of San Luis Obispo	General	N/A	N/A	N/A	Suggest adding stream/creek names to all figures that mentioned streams/creeks in the description of the figure.	The stream names have been added to Figure 2.2-1
79	Cathy Martin	County of San Luis Obispo	Figure 2.2-3	N/A	N/A		Suggest adding on figure abbrev. or defining terms in the description of Figure 2.2-3 for CVKR, CVFR, CVBR	These are names that are provided for the wells. We assume they are abreviations, but have not come across definitions, and thus cannot provide that information.
80	Cathy Martin	County of San Luis Obispo	Figure 2.2-5	N/A	N/A		Suggest - Label on figure (Russell Ranch Oilfields, Cottonwood Canyon, & Aliso Canyon)	These are labeled on Figure 2.2-1
81	Cathy Martin	County of San Luis Obispo	Figure 2.2-11	Bullet list	N/A		Round Springs Canyon, near Ozena Fire Station & Springs Canyon, near Ozena Fire Station - Please label on figures.	These are labeled on Figure 2.2-1
82	Cathy Martin	County of San Luis Obispo	2.2.3 GW Hydrographs			Figure 2.2-12 shows	Suggest stating your interpretation of why this area is having a quick recovery (for example - stream influence provides recharge to this basin area / fault/ etc.), if known or is additional investigation required?	Comment noted. This is beyond the scope of this section.
83	Cathy Martin	County of San Luis Obispo	2.2.3 GW Hydrographs			Near Ventucopa, hydrographs for Wells 85	Suggest defining climatic patterns.	Figures showing the climactic variability will be included in the Water Budgets section.
84	Cathy Martin	County of San Luis Obispo	Figure 2.2-12			The hydrograph for Well 40	Missing: Suggest adding well hydrograph to the Figure 2.2-12. (for wells 40 & 316)	The text has been revised for clarity.
85	Cathy Martin	County of San Luis Obispo	2.2.3 GW Hydrographs	9	2	The hydrographs in this area show consistent	Suggest adding your interpretation of why this area shows consistent decline and little to no responses, if known or is additional investigation required?	Comment noted. This is beyond the scope of this section.
86	Cathy Martin	County of San Luis Obispo	Figure 2.2-14	10	3	Levels remain lowered along	Missing: Suggest adding well hydrograph to the Figure 2.2-14. (well 640)	The text has been revised for clarity.
87	Cathy Martin	County of San Luis Obispo	2.2.3 GW Hydrographs	10	4	Groundwater levels are higher to the west	Suggest adding your interpretation of why this area shows consistent decline, if known or is additional investigation required?	Comment noted. This is beyond the scope of this section.
88	Cathy Martin	County of San Luis Obispo	Figure 2.2-15	N/A	N/A		Please define GSE and WSE – located on hydrographs	These have been added to the acronyms list
89	Cathy Martin	County of San Luis Obispo	2.2.3 Vertical Gradients	Bullet list	N/A	CVFR is comprosed of four completion	Please clarify term "completion". Is this a cluster of monitoring wells?	A sentence has been added to the section to define "multiple completion well"
90	Cathy Martin	County of San Luis Obispo	2.2.3 Vertical Gradients	Bullet lists	N/A	N/A	Suggest showing the map location for CVFR, CVBR, and CVKR if possible.	The locations of these wells are shown in Figure 2.2-3
91	Cathy Martin	County of San Luis Obispo	2.2.3 GW Countours	Bullet List	N/A	Due to the limited spatial amount	Please explain more of the process to generate the contours in this section or in an appendix, number of wells used, etc.	Comment noted. Additional information is not needed.
92	Cathy Martin	County of San Luis Obispo	2.2.3 GW Countours			The contour maps are not indicative	Suggest adding: do not account for topography ***or faults*** . A short discussion on faults would be helpful to the public with the groundwater contours.	The faults are discussed in detail in the GCM section.
93	Cathy Martin	County of San Luis Obispo	Figure 2.2-20				Bitter Creek - Place label on figure	This is labeled on Figure 2.2-1
94	Cathy Martin	County of San Luis Obispo	2.2.3 GW Countours			Contour maps for spring 2017	Suggest explaining the difference between the years from all of these figures, to help the public understand what they are reviewing.	The text has been added to the document.
95	Cathy Martin	County of San Luis Obispo	Figure Y-1, Y-3, Y-5, Y-7				Suggest adding groundwater flow arrows to the figure	Groundwater flow arrows have been added to these figures
96	Cathy Martin	County of San Luis Obispo	Figure Y-1				Ozena fire station - place label on figure	This is labeled on Figure 2.2-1
97	Cathy Martin	County of San Luis Obispo	2.2.3 GW Countours			The contour map shows a steep	The contour map shows a steep gradient ***north*** of - Suggest verifying the direction	The text has been revised for clarity.
98	Cathy Martin	County of San Luis Obispo	2.2.6 Land Subsidence	N/A	N/A	N/A	Suggest showing and discussing the entire basin area, as well as showing the three stations (P521, OZST, and BCWR) on a figure with graphs, if possible.	The current figure shows all 3 station locations. The data for P521 is shown because it is the most relevant.
99	Cathy Martin	County of San Luis Obispo	2.2.7 Data Analysis	2	2	In 1966, TDS was above the MCL	Please list and discuss all of the secondary MCL standards for TDS (500 mg/L; 1,000 mg/L and 1,500 mg/L) and why 1,500 mg/L is being recommended.	Comment noted. No change needed.
100	Cathy Martin	County of San Luis Obispo	Figure 2.2-23	N/A	N/A	N/A	Place label on figure (Ozena Fire Station, Santa Barbara Canyon, and upper Quatal Canyon)	These are labeled on Figure 2.2-1
101	Cathy Martin	County of San Luis Obispo	2.2.7 Data Analysis			In the 2011-2018 period, TDS was	In the 2011-2018 period, TDS was above the **MCL** in over 50% of measurements. - Suggest listing which MCL standard?	Comment noted. No change needed.
102	Cathy Martin	County of San Luis Obispo	Figure 2.2-24	N/A	N/A		Place label on figure (Quatal Canyon, and along the Cuyama River between Cottonwood Canyon and Schoolhouse Canyon)	These are labeled on Figure 2.2-1
103	Cathy Martin	County of San Luis Obispo	Figure 2.2-25	N/A	N/A		Place label on figure (Quatal Canyon)	This is labeled on Figure 2.2-1

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104	Cathy Martin	County of San Luis Obispo	2.2.7 Data Analysis			Figure 2.2-26 shows that the	Figure 2.2 26 shows that data collected in 1966 was below the MCL of 5 mg/L throughout the basin, with **some measurements** above the **MCL** in the central portion of the basin where irrigated agriculture was operating Suggest adding number of samples: ## samples out of ### total samples & Suggest adding the primary MCL for nitrates to be consistent with the rest of the page	Nitrate MCL has been corrected to 10 mg/L
105	Cathy Martin	County of San Luis Obispo	2.2.7 Data Analysis			Figure 2.2-27 shows that the	Figure 2.2 27 shows that data collected over this period **was generally** below the **MCL**, with two measurements that were over 20 mg/L. Suggest adding number of samples: ## samples out of ### total samples & Suggest adding the primary MCL for nitrates to be consistent with the rest of the page	Nitrate MCL has been corrected to 10 mg/L
106	Cathy Martin	County of San Luis Obispo	2.2.7 Data Analysis			Figure 2.2-28 shows that the	Figure 2.2 28 shows arsenic measurements from 2008-2018. Data was not available prior to this time period in significant amounts. Figure 2.2 28 shows arsenic measurements **were below** the MCL of 10 ug/L where data was available. Suggest adding number of samples, ## samples out of ### total samples	Text has been revised for clarity.
107	Cathy Martin	County of San Luis Obispo	Figure 2.2-31				Place label on figure (Ballinger, Quatal, and Apache Canyons)	These are labeled on Figure 2.2-1
108	Cathy Martin	County of San Luis Obispo	2.2.7 Literature Review	Bullet List		97% of samples had concentrations greater than	Is this the MCL for each concentration? If so, please add the MCL in the bullet point	These are not the MCL. No change needed.
109	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	General				This section as a whole requires significant revision. The description of wells needs to be revised to be clear what entity conducted the monitoring, not what database W&C gathered the data from. For a discussion of SBCWA monitoring programs in the basin, the SBCWA contract with the USGS, and its relationship to CASGEM, please contact Matt Scrudato. This section contains minimal analysis of groundwater conditions, just reporting of selected hydrographs, with little explanation or interpretation. The water quality section is confusingly structured and incomplete. Finally, although we understand the time sensitivities in preparing the GSP by spring 2019, it would save reviewers quite a bit of time if a technical editor or senior W&C staff member reviewed these sections prior to distribution.	The section has been revised for clarity.
110	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	General				Most of the wells in the basin are not dedicated monitoring wells, but are frequently described in this section as such.	Text has been revised for clarity.
111	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.1 Useful Terminology	Bullet list		There are two versions of contour maps	Consider breaking identification of gw elevation and depth to water info out into a separate bullet point. GW elevation and depth to water are not just used on contour maps, they are used in hydrographs as well.	Text has been revised for clarity.
112	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	General				Please change "collected" to "compiled" throughout this section. It is potentially confusing to the reader to describe gathering data from various sources as collecting data. Typically collecting well data refers to taking measurements	Text has been revised for clarity.
113	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.2 GW Elevation Data Processing	1	1	Groundwater well information and	"collected from **local stakeholders**" - These appear to be included in the 8 major sources.	Text has been revised for clarity.
114	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.2 GW Elevation Data Processing	Bullet List		Well and groundwater elevation data were	Was data collected from the CSD? If so, include in list.	No data was collected from the CSD
115	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.2 GW Elevation Data Processing	Bullet List		list of data	Include references for publically available data sources; Any available info on data validation, and collection would be useful for these.	References are included in the Data Management GSP section
116	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.2 GW Elevation Data Processing			Data collected included well information	Data accuracy section is needed. What standards/protocols are each of these data collection entities following? How is ground surface elevation being determined. DGPS like the original USGS model? Off a map with +/-20 foot accuracy? Please elaborate.	This has been addressed in a footnote.
117	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	Figure 2.2-2 & 2.2-3				Figures should be titled differently. These are not DWR wells. They are wells with data pulled from the DWR database. The DWR database I assume is CASGEM, which was ultimately collected by SBCWA/USGS. The database that Woodard and Curran compiled the data from is ultimately less important than how it was gathered. Need to make distinction in the title (which is different on the actual figure) of what this is supposed to show. Where they got the data and/or who collected it? Actual title on figure says "DWR Wells" which is not an accurate statement.	Figure titles have been revised for clarity.
118	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.2 GW Elevation Data Processing			Roughly half of the wells from DWR's database	Please provide context for why this is important in the text. "measured in 17-18 is mentioned throughout without context. This is a plan that will be issued in 2020. Why 17-18 is the focus needs to be explained.	Text has been revised for clarity.
119	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.2 GW Elevation Data Processing			Data collected from the DWR	This is confusing. Data was perhaps collected by Woddard and Curren from DWR, but the data was not collected by DWR. Clarify data received (how / where did they locate the data) vs collected (who and how collected.	Text has been revised for clarity.
120	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.2 GW Elevation Data Processing			Data collected from the DWR	"one measurement in the spring, and one measurement in the fall " - If this refers to the CASGEM wells this is not entirely true – most wells monitored 1xyear with a few 2xyear	Text has been revised for clarity.
121	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	Figure 2.2-3				This list of wells is mostly accurate, but is missing some wells like Spanish Ranch on far west end.	Wells included in Figure 2.2-3 have been reviewed and it has been confirmed that the Figure includes all well data provided by the USGS
122	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.2 GW Elevation Data Processing			Data collected from USGS has been typically measured bi-annually	Not entirely true. And there is data overlap here with CASGEM program. Again, describe SBCWA/USGS monitoring program.	Text has been revised for clarity.

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123	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.2 GW Elevation Data Processing			Santa Barbara wells are concentrated in the western portion	This does not include all wells monitored by the County. The County does not own these wells, and monitors far more than just these wells.	The maps show the wells and data that had been provided as of June 2018.
124	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.2 GW Elevation Data Processing			Data collected from the counties	"measured bi-annually" - Currently making quarterly measurements. Appear to be missing wells. Were a few select wells chosen?	Text has been revised for clarity.
125	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	Figure 2.2-4				Missing a few. Difficult to determine how many. At some point need to should describe why/how these are different from DWR/CASGEM and USGS program. For example, Matt Scrudato is monitoring in the west end because there is a lack of data in that area – something SBCWA agreed to do to help with GSP development.	The maps show the wells and data that had been provided as of June 2018.
126	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.2 GW Elevation Data Processing				Need to add a section somewhere that describes QA/QC process, who does it (USGS, SBCWA), who doesn't (Bolthouse/Grimmway/Grapevine), and why.	This has been addressed in a footnote.
127	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.2 GW Elevation Data Processing			The locations of SBCWA well data are located	What is the difference between these wells and the wells referenced in Figure 2.2-4? SBCWA should be taken off Figure 2.2-5 for several reasons (we don't own the wells shown, we're not a private company, we're not ag, etc). All of wells measured by Matt Scrudato should be in Figure 2,2-4	Wells included in these figures have been reviewed and it has been confirmed that the Figure 2.2-4 includes all well data provided by the SBCWA and that Figure 2.2-5 includes all well data provided by private landowners.
128	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.2 GW Elevation Data Processing			The locations of SBCWA	"The locations of SBCWA well data are located **west of Cottonwood Canyon**" - West of Aliso Canyon would be more accurate	Text has been revised for clarity.
129	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.2 GW Elevation Data Processing			The date of measurement varies significantly by year.	Explain why this is important as context for the reader.	Text has been revised for clarity.
130	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.2 GW Elevation Data Processing				"Data provided by Grapevine Capital Partners is **bi-annual** " - quarterly	Text has been revised for clarity.
131	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	Figure 2.2-7				This graph is more confusing than helpful. Please reomve. Well locations are already identified previously and hydrographs are better described in later sections. The need for this statement and graph appears to be validation for the quality of water level data provided by Grimway and Bolthouse. This should be done in a separate data validation section. Please remove the statement "accurate measurements" from this paragraph. At best, the statement can note that data "match ing tracking historical trends within a 4-mile area", but in no way should refer to these data as "accurate measurements". Then again, what is the definition of an "accurate measurement"? The USGS states that discrete water level measurements made with graduated steel or electric tapes are accurate to 0.01 foot. What standard is Woodard & Curran using? If this graph is kept in the document, the graph should start in about year 1977 when there is a comparison between the data sets. The data prior to this is irrelevant. It is not clear which well relates to which line on the graph. 1. Were there any wells which were monitored by BOTH Grimway/Bolthouse and the USGS where data can be compared for a single location? Are these all the Grimway/Bolthouse wells where data are available or only a select few? 2. DWR are not collecting well data in Cuyama	The figure is included because of interest expressed during public meetings regarding how data provided by private landowners compares with data provided by public agencies. The text describing the figure has been revised for clarity.
132	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.2 GW Elevation Data Processing			Figure 2.2-7 shows a comparison of data	Need context to explain why this comparison is being done.	Text has been revised for clarity.
133	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.2 GW Elevation Data Processing			Figure 2.2-8 shows a comparison of data	Need context to explain why this comparison is being done.	Text has been revised for clarity.
134	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	Figure 2.2-8				The need for this statement and graph appears to be validation for the quality of water level data provided by Grapevine Capital Partners. Please remove both the discussion (page 2.2-11) and the graph as these data illustrates nothing at all. 1. Two of the Santa Barbara County wells are not even part of the network. I don't even think these wells exist in the Valley. It is unclear where these data came from. 2. You appear to be comparing very shallow wells to a 6 of the 12 deep production wells. 3. Are these discrete static water level measurements used for the Grapevine data or select points from the continuous 5-minute data sets? SBCWA has been making periodic discrete water level measurements at the 12 productions wells on the Harvard property. A comparison of 26 measurements shows differences between discrete water level and computed water levels ranging from -47.9 feet to 150.36 feet. These are large outliers when compared to all the measurements, but would be a better indication of the data quality (see chart below). SBCWA has measurements from 9/2018 to compare as well. There would be some variation of only a few feet in this comparison based on equipment PSI (most likely higher PSI being used due to large level changes and therefor reduced accuracy), MP elevation choice, computation procedures, etc. Please contact Matt Scrudato to discuss specifics.	The figure is included because of interest expressed during public meetings regarding how data provided by private landowners compares with data provided by public agencies. The text describing the figure has been revised for clarity.
135	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.2 GW Elevation Data Processing			A long term comparison is not possible	The wells are in different locations, what value does this provide?	The figure is included because of interest expressed during public meetings regarding how data provided by private landowners compares with data provided by public agencies. The text describing the figure has been revised for clarity.

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136	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	Figure 2.2-5				Again, misleading title here vs. actual figure which states "Owners and Operating Entities" SBCWA does not own or operate the wells assigned to us in this graph. We only own and maintain CVFR, CVKR, and CVBR. Further this map does not include most of the wells measured by the SBCWA	The figure title has been revised for clarity
137	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.3 GW Trends				This section needs major reorganization. There is a time based section, then a number of other sections without a designated timeframe. Also, the wording in this section needs a thorough review by a technical editor.	The text has been revised for clarity.
138	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.3 1947 to 1966 GW Trends			1947 to 1966 Groundwater Trends	Hydrographs illustrated are all through 2018. Are you trying to differentiate between times or is the next section a separate concept? If so, there needs to be discussion on more current trends following 1966.	The text has been revised for clarity.
139	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.3 GW Hydrographs			Groundwater Hydrographs	This is confusing. The previous section is about a specific time period. If this is 1966-present you should say so.	The text has been revised for clarity.
140	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.3 GW Hydrographs			Groundwater hydrographs were developed to provide indicators	What indicators? Don't the hydrographs just show trends?	The text has been revised for clarity.
141	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.3 GW Hydrographs			Hydrographs for all monitoring wells with elevation	There can be a big difference between a monitoring well and a well that is being monitored. Be more clear.	The text has been revised for clarity.
142	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	Appendix X				Comments on Appendix X: 1) Some graphs extrapolate off the hydrograph – is this in error or is there a data point(s) not shown? 2) Similarly, some graphs don't show any data points. 3) Scale issues 4) No need for one per page, consider 4 5) Hydrographs don't identify data source, who and how collected and whether data has been QA/QC. Consider adding an index of all wells, like a lookup table, with OPTI number, USGS number, and well number owner/operator uses, etc.	1) This has been fixed by increasing vertical scale 2) Some OPTI wells only have groundwater quality data associated with them. Because there are so many wells, a hydrograph was made for every OPTI well; therefore some do not have level data. 3) This has been addressed in #1. The graph scales were selected to show the depth to water of all wells on the same scale. 4)One figure per page allows greate detail to be seen in the graphs, as some have a significant amount of data points. 5) This information is available through OPTI for those who would like to review it.
143	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.3 GW Hydrographs			Figure 2.2-11 shows Hydrographs in different portions	Please describe in the text why these wells were chosen. Are they representative of the areas?	The text and figure have been revised for clarity.
144	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.3 GW Hydrographs	Bullet list		In the area southeast of Round Springs Canyon	Please edit for clarity and grammar. Also, if you are going to describe the hydrographs, you should describe all of them If they want to generalize then make the graph mimic these areas, pick 5 representative hydrographs. Right now there are 7 on the Figure which looks cluttered.	The text has been revised for clarity.
145	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	Figure 2.2-11				Bitter Creek area - Illustrate on map as a reference	This is labeled on Figure 2.2-1
146	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.3 GW Hydrographs			Figure 2.2-12 shows selected hydrographs	Why is this section in a different format than the previous. Please make consistent.	Comment noted. No change needed.
147	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	Figure 2.2-12				Well 40 & 316 - where? Not shown in map	The text has been revised for clarity.
148	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.3 GW Hydrographs			Figure 2.2-13 shows hydrographs of discontinued monitoring wells	Then need to explain why they were selected.	The text has been revised for clarity.
149	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	General				Stick with one descriptor – either elevation or depth to water. Mixing elevation and depth to water is confusing to the reader.	The section consistently discusses depth to water
150	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	Figure 2.2-14				Well 640 - where? Not shown in map	The text has been revised for clarity.
151	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.3 GW Hydrographs			Figure 2.2-15 shows hydrographs of monitoring wells	The discussion on west end hydrographs and the related Figure 2.2-15 is misleading. Continuous data sets from the 12 wells indicate water levels drops as large as 100 feet in CHG-14 since data collection started in June 2017. This well is the extreme, where other production wells on Harvard vineyard property show water level drops of 25-50 feet. The trends indicate the yearly hydrologic minimum continues to drop.	Wells shown in Figure 2.2-15 show a range of conditions in the western edge of the Basin. OPTI Well 840 shows conditions see in part of the Basin.

Cuyama Basin Groundwater Conditions September Draft
Summary of Public Comments and Responses
November 19, 2018

Comment #	Commenter	Commenter Organization	Section	Section Paragraph #	Paragraph's Sentence #	Sentence Starts with, "...	Comment	Response to Comment
152	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.3 GW Hydrographs			Hydrographs for wells 571 and 108	Earlier discrete data located in NWIS.	Well 571 (USGS Code 345847119534901) only has two measurements as shown in the hydrograph (https://groundwaterwatch.usgs.gov/AWLSites.asp?S=345847119534901&ncd=) Well 108 has 8 measurements. Individual points are difficult to destinguish due to hydrograph size, but the hydrograph is correct.
153	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	Figure 2.2-11				Suggest illustrating hydrographs using same scale / minimize white space for all Figures in this section	All hydrographs on each figure are the same scale
154	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	Figure 2.2-12 & 2.2-13				Actual Figure has typo in title Also for all Figures in this section, suggest only showing hydrographs referred to in text.	The figure and text have been made consistent. Title corrected.
155	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.3 Vertical Gradients			Knowledge about vertical gradients is required by regulation	Please cite the regulation for the reader.	The text has been revised for clarity.
156	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.3 Vertical Gradients			Figure 2.2-16 shows the combined hydrograph	State that these wells were installed by USGS as part of the Cuyama Valley Water Availability Study in cooperation with the SBCWA. Multiple completion wells are owned by SBCWA.	This text has been added.
157	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	Figure 2.2-16, 2.2-17, 2.2-18				The data used to determine there is no vertical gradient as illustrated in the figure 2.2-16 (page 2.2-27) appear to be discrete measurements. At times, there were only two discrete measurements in a year with the remainder of the year interpolated. This is not enough data for an elevation comparison. The USGS used continuous 15-minute unit value data for this nested well and concluded the following (from page 39, Scientific Investigations Report 2013-5108) CVFR.....did show similar seasonal and longer-term changes. Similar to CVKR and CVBR, the vertical hydraulic gradients were upward during the winter months and reversed to downward gradients during the irrigation season; however the gradients at the CVFR site were notably smaller. USGS conclusion supported by water chemistry samples showing increased tritium with depth which may result from younger water from shallow sytem. Woodard & Curran should review the full continuous data set prior to making a conclusion about vertical gradients. Data are available on NWIS. This is data for 3B2- https://nwis.waterdata.usgs.gov/ca/nwis/uv?cb_72019=on&format=gif_default&site_no=345351119323102&period=&begin_date=2010-09-04&end_date=2012-09-01 1.The scale used in these graphs (2.2-16, 17 and 18) mask the trends and makes any analysis impossible. Please change the graph scale for all three graphs (2.2-16-18). 2.The x-axis date scale for Figures 2.2-16 and 17 follow an unusual interval. Is this done for any specific reason (see figure below)? A graph with a scale that masks everything that is happening. A 600 ft axis for a graph with an 80 ft range.	Available Continuous Data has been added. Continuous data is only available from 7/21/201 through 11/28/2012 as it has been "Approved." All other "Provisional" data is only available in summary form, which is the data that was being shown in the hydrograph. Newly added continuous data follows the trend that was already shown on hydrograph.
158	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.3 GW Countours			Groundwater contour maps were prepared for	Where is 2016	The hydrograph periods were selected to show the change over the most recent period of 3 years for which data was available in the Spring (from 2015 to 2018) and from the Fall (from 2014 to 2017). Therefore, a figure for 2016 was not necessary.
159	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.3 GW Countours			These years were selected	Explain in the text the importance of this date in relation to SGMA. Why? Explain. I may have missed this in earlier sections but are they choosing Jan 1 2015 as their baseline?	The text has been revised for clarity.
160	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.3 GW Countours			Each contour map is contoured at	Labels and symbols should be obvious on the map without having to describe in the text	Comment noted. No change needed.
161	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.3 GW Countours			Due to the limited temporal amount	Non-pumping and static measurements? What was the selection of wells based on? It appears wells are missing.	The maps are based on available data during the period in question.
162	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.3 GW Countours			These assumptions make the contours	Explain in the text which wells aree used and why? Howe was data interpolated?	The maps are based on available data during the period in question.
163	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	Figure 2.2-19				Correct typo in text on lower right of map - "limitated"	The figure has been corrected.
164	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	Appendix Y				Where are contour maps for 2016?	The hydrograph periods were selected to show the change over the most recent period of 3 years for which data was available in the Spring (from 2015 to 2018) and from the Fall (from 2014 to 2017). Therefore, a figure for 2016 was not necessary.
165	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.3 GW Countours				These descriptions are not useful with the maps in the appendix. The descriptions should be with the maps, either here in the text or back in the appendix.	Comment noted. No change needed.

Cuyama Basin Groundwater Conditions September Draft
Summary of Public Comments and Responses
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Comment #	Commenter	Commenter Organization	Section	Section Paragraph #	Paragraph's Sentence #	Sentence Starts with, "...	Comment	Response to Comment
166	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.3 GW Countours			Figure Y-1 through Figure Y-8	Explain reason for changes in seasonal contours.	Comment noted. No change needed.
167	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.4 Change in GW Storage			Change in groundwater storage for the last 10 years	Why 10?	SGMA requires 10 years of data for historical water budgets
168	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.6 Land Subsidence				The paper mentions that the USGS determined 0.2 feet of subsidence in 10 years. This appears to be the change in daily land surface elevation starting in about May 2007 (0.00 mm) and ending in April 2012 (-68mm). This would be a 5-year period of record for analysis. The full 12 year period of record from 2000-2012 is 0.4 feet of subsidence and the 10-years mentioned in the W&C paper (2000-2010) is 0.26 feet of subsidence. Woodard&Curran used data from 1999 to 2018 to determine 1 foot of subsidence. The brief and general summary of the USGS data and analysis from SIR 2013-5108 does not seem to correlate to what is written in this paper. Please expand on the first paragraph related to the USGS data. This will help the reader determine what was completed prior to your analysis of these data.	The subsidence estimate in the first paragraph has been corrected.
169	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	Appendix Z				Appendix Z adds little value to the document, appears to be at least partly taken directly from Wikipedia, only focuses on subsidence effects on agriculture, and appears to have been written prior to W&C contracting with the GSA. It is unclear why this was included in the document. Background educational materials data on, e.g., water level data collection, water quality, and other topics is not provided, so why provide this for subsidence. Please delete.	Comment noted. The appendix is included because some readers are interested in this content.
170	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.7 GW Quality				A summary of the conclusions drawn about water quality would be very useful. As written, the section is quite disjointed. There is a smattering of data analysis, and review of other studies, but no conclusions about what groundwater quality conditions are in various regions of the basin. There is no explanation of why constituents were selected for analysis. The literature review might be better placed before the data analysis to provide context.	Some additional explanation has been added, including an explanation has been added for why these constituents were included.
171	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.7 Reference and Data Collection				Why was age dating data not considered in this analysis and discussion? Why no data from the CSD? Does this (USGS) include NWIS?	The CSD did not provide water quality data. Age dating does not provide information on water quality conditions in the data. The USGS data does include NWIS.
172	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.7 Reference and Data Collection			Data used in reference studies was not generally available	This is not correct. ALL data used in USGS and SBCWA studies (3 out of the 4 referenced in this section) are available and are therefore represented in the data.	The text has been revised for clarity.
173	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.7 Data Analysis			Collected data was analyzed for TDS, nitrate, and arsenic	Explain in the text why only these constituents were selected. Explain for the lay reader what the possible sources of these constituents are	The text has been revised for clarity.
174	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.7 Data Analysis			Figure 2.2-24 shows TDS of groundwater	Note: Additional data for west end collected July 2018 will be available soon.	Comment noted. Due to budget and schedule constraints, data provided after June 2018 will not be incorporated into the current version of the plan.
175	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.7 Data Analysis			Multiple years of collected data were used	Where is the comparison? Figure 2.2-23 (1966 data) shows high (>2000mgL) TDS for wells on west end N of river. These are very shallow and recharged by the river. Figure 2.2-24 shows wells directly S of river with low TDS. These are new deep wells. They shouldn't be compared as the same unit. The map aludes to the fact that they are. That possibly the quality has improved	The text does not make a direct comparison because there is insufficient data to make specific conclusions regarding how TDS may have changed over time.
176	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	Figure 2.2-25				Include a line showing the MCL on the figure	MCL lines have been added to the figure.
177	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.7 Data Analysis			Figure 2.2 28 shows arsenic measurements	USGS data indicate 4 of the 33 wells were >10 Only 25 wells used in this study. Why the discrepancy and why were the 4 wells with >10 not used? Please elaborate on data selection used for this analysis.	The text and figure have been reviewed and updated.
178	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.7 Data Analysis			Figure 2.2-28 shows arsenic measurements	What about the CSD? They treat for arsenic.	The CSD did not provide any arsenic data.
179	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.7 Data Analysis			Figure 2.2-29 shows that most of these sites	Describe for the reader what this means – leaks from storage tanks?	The text has been revised for clarity.
180	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.7 Literature Review	1	1	In 1970, Singer and Swarzenski reported	"TDS was as high as 1,500 to 1,800 mg/L TDS" - contradicts following sentence; "and higher (3,000-6,000 mg/L) in wells " - This is much higher than the first sentence says.	The text has been revised for clarity.
181	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.7 Literature Review	1		They state that the high TDS is generated	"water from marine rocks" - Confusing if you don't identify them geologically	Comment noted. No change needed.
182	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.7 Literature Review	2		The study identified that specific conductance	In the text, please provide context for why this is important and what this means in the context of groundwater quality.	The text has been revised for clarity.
183	Matt Young, Matt Scrudato, & Fray Crease	Santa Barbara County Water Agency	2.2.7 Literature Review			In 2013, USGS reported	Please discuss any vertical gradients in constituent concentrations in the multicompletion wells.	The text and figure have been reviewed and updated.

Attachment 3

Cuyama Valley Groundwater Basin

Groundwater Sustainability Plan

Groundwater Conditions

Revised Draft

Prepared by:

November 2018

Table of Contents

List of Figures

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Chapter 2 Chapter 2.2 Groundwater Conditions

This document includes the Groundwater Conditions Section that will be included as part of a report section in the Cuyama Basin Groundwater Sustainability Plan that satisfies § 354.8 of the Sustainable Groundwater Management Act Regulations. Water budget components will be included in the upcoming Groundwater Sustainability Plan (GSP) Section titled "Water Budgets". The amounts of water moving through the basin, consumptive uses, and inflows and outflows of the basin, comparisons of extractions to recharge, and other components, will be presented in the water budget section.

The majority of published information about groundwater in the Cuyama Valley Groundwater Basin has been focused on the central part of the basin, roughly from an area a few miles west of New Cuyama to roughly Ventucopa. The eastern uplands and western portion of the basin has been studied less, and consequentially, fewer publications have been written about those areas, and less historical information is available in those areas.

There are a small number of sub-sections that are not complete at this time, due to requiring either groundwater modeling results or field work to complete the sub-section. These subsection titles are highlighted yellow and a list of the subsections intended contents is listed.

2.1 Acronyms

Basin	Cuyama Valley Groundwater Basin
bgs	below ground surface
CUVHM	Cuyama Valley Hydrologic Model
DWR	Department of Water Resources
ft.	feet
ft/day	feet per day
GAMA	Groundwater Ambient Monitoring and Assessment
GPS	global positioning system
GRF	Graveyard Ridge Fault
GSE	Ground Surface Elevation
GSP	Groundwater Sustainability Plan
InSAR	Interferometric Synthetic-Aperture Radar
MCL	Maximum Contaminant Level
RWQCB	Regional Water Quality Control Board
SBCF	Santa Barbara Canyon Fault
SBCWA	Santa Barbara County Water Agency
SGMA	Sustainable Groundwater Management Act
TDS	Total Dissolved Solids

TTRF	Turkey Trap Ridge Fault
UNAVCO	University NAVSTAR Consortium
USGS	United States Geological Survey
WSE	Water Surface Elevation

2.2 Groundwater Conditions

This section describes the historical and current groundwater conditions in the Cuyama Valley Groundwater Basin (Basin). As defined by the GSP regulations promulgated by the Department of Resources (DWR), the groundwater conditions section is intended to:

- Define current and historical groundwater conditions in the Basin
- Describe the distribution, availability, and quality of groundwater
- Identify interactions between groundwater, surface water, groundwater-dependent ecosystems, and subsidence
- Establish a baseline of groundwater quality and quantity conditions that will be used to monitor changes in the groundwater conditions relative to measurable objectives and minimum thresholds
- Provide information to be used for defining measurable objectives to maintain or improve specified groundwater conditions
- Support development of a monitoring network to demonstrate that the GSP is achieving sustainability goals of the Basin

The groundwater conditions described in this section are intended to convey the present and historical availability, quality, and distribution of groundwater and are used elsewhere in the GSP to define measurable objectives, identify sustainability indicators, and establish undesirable results. Groundwater conditions in the Basin vary by location. To assist in discussion of the location of specific groundwater conditions, Figure 2.2-1 shows selected landmarks in the Basin to assist discussion of the location of specific groundwater conditions. Figure 2.2-1 shows major faults in the basin in red, highways in yellow, towns as orange dots, and canyons and Bitter Creek in purple lines that show their location.

2.2.1 Useful Terminology

The groundwater conditions section includes descriptions of the amounts, quality, and movement of groundwater, among other related components. A list of technical terms and a description of the terms are listed below. The terms and their descriptions are identified here to guide readers through the section and are not a definitive definition of each term:

- **Depth to Groundwater –** This is the distance from the ground surface to groundwater, typically reported at a well.
- **Horizontal gradient** – The gradient is the slope of groundwater from one location to another when one location is higher, or lower than the other. The gradient is shown on maps with an arrow showing the direction of groundwater flow in a horizontal direction.
- **Vertical gradient** – A vertical gradient describes the movement of groundwater perpendicular to the ground surface. Vertical gradient is measured by comparing the elevations of groundwater in wells that are of different depths. A downward gradient is one where groundwater is moving down into the ground, and an upward gradient is one where groundwater is upwelling towards the surface.
- **Contour Map –** A contour map shows changes in groundwater elevations by interpolating groundwater elevations between monitoring sites. The elevations are shown on the map with the

use of a contour line, which indicates that at all locations that line is drawn, it represents groundwater being at the elevation indicated. There are two versions of contour maps shown in this section:
  - Elevation of groundwater above mean sea level (msl), which is useful because it can help identify the horizontal gradients of groundwater, and
  - Depth to water (i.e. the distance from the ground surface to groundwater), which is useful because it can help identify areas of shallow or deep groundwater.
- **Hydrograph –** A hydrograph is a graph that shows the changes in groundwater elevation over time for each monitoring well. Hydrographs show how groundwater elevations change over the years and indicate whether groundwater is rising or descending over time.
- **MCL –** Maximum Contaminant Levels (MCLs) are standards that are set by the State of California for drinking water quality. An MCL is the legal threshold limit on the amount of a substance that is allowed in public water systems. The MCL is different for different constituents.
- **Elastic Land Subsidence -** is the reversible and temporary fluctuation in the earth's surface in response to seasonal periods of groundwater extraction and recharge.
- **Inelastic Land Subsidence** – is the irreversible and permanent decline in the earth's surface resulting from the collapse or compaction of the pore structure within the fine-grained portions of an aquifer system

2.2.2 Groundwater Elevation Data Processing

Groundwater well information and groundwater level monitoring data were compiled from four public sources, with additional data compiled from private landowners. These include the following:

- United States Geologic Survey (USGS)
- Department of Water Resources (DWR)
- Santa Barbara County Water Agency (SBCWA)
- San Luis Obispo County
- Private Landowners

Data provided by these sources included well information such as location, well construction, owner, ground surface elevation and other related components, as well as groundwater elevation data including information such as date measured, depth to water, groundwater surface elevation, questionable measurement code, and comments. At the time that this analysis was performed, groundwater elevation data was available for the time period from 1949 to June 2018.[1] There are many wells with monitoring data from some time in the past, but no recent data, while a small number of wells have monitoring data recorded for periods of greater than 50 years. Figure 2.2-2 through Figure 2.2-5 show the locations of well with available monitoring data as well as the entity that maintains monitoring records at each well. The figures also show in a larger, darker symbol if the monitoring well has been measured in 2017 or 2018.

Figure 2.2-2 shows the locations of well data received from the DWR database. As an assessment of which wells have been monitored recently, the wells with monitoring data collected between January 2017 and June 2018 were identified. Roughly half of the wells from DWR's database contain monitoring data in 2017-18, with roughly half the wells having no monitoring data during this period. Wells in DWR's database are concentrated in the central portion of the basin, east of Bitter Creek and north of the

[1] The analysis shown in this section was performed in the summer of 2018 and does not reflect data that may have been collected after June 2018. In addition, the analysis reflects the available data as provided by each entity - an assessment has not been performed on the standards and protocols followed by each entity that compiles and maintains the available datasets.

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Santa Barbara Canyon Fault (SBCF). Many wells in DWR's database have been typically measured bi-annually, with one measurement in the spring, and one measurement in the fall.

Figure 2.2-3 shows the locations of well data received from the USGS database. It should be noted that many of these wells are duplicative of wells contained in the DWR database. The majority of wells from the USGS database were not monitored in 2017-18. Wells that were monitored in 2017-18 are concentrated in the western portion of the basin, west of New Cuyama, with a small number of monitoring wells in the central portion of the basin and near Ventucopa. Many wells in the USGS database haves been typically measured bi-annually, with one measurement in the spring, and one measurement in the fall.

Figure 2.2-4 shows the locations of well data received from the Santa Barbara and San Luis Obispo Counties. The wells from both counties were monitored in 2017-18. Wells monitored by Santa Barbara County are concentrated in the western portion of the basin west of Bitter Creek. The two wells monitored by San Luis Obispo County are located in the central portion of the basin and also appeared in the USGS database. Data is collected in many of these wells on a bi-annual basis, with one measurement in the spring, and one measurement in the fall, with some measurements at some wells occurring on a quarterly basis.

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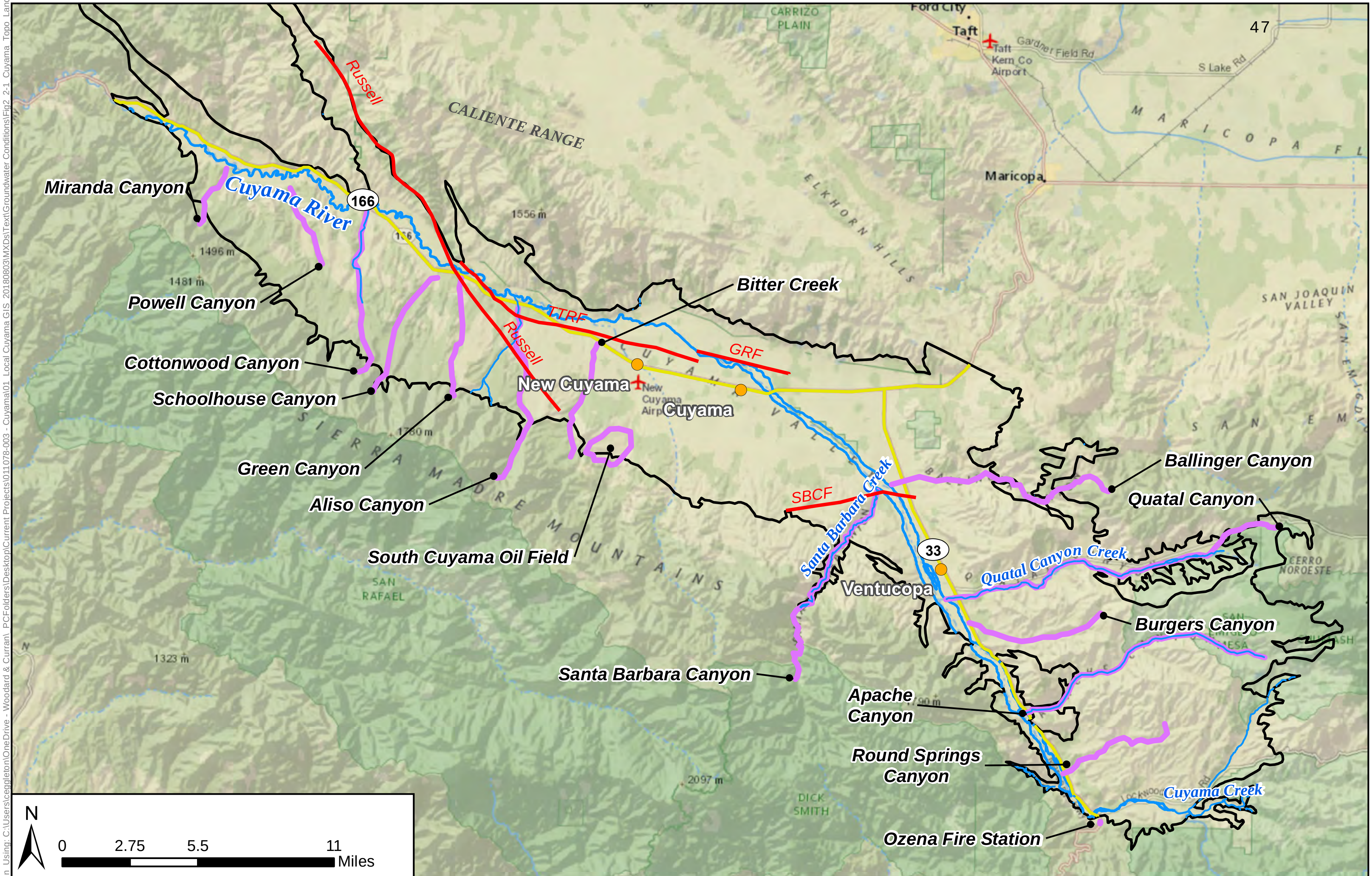

Figure 2.2-1 - Cuyama Basin Landmarks

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

August 2018

WOODARD & CURRAN

Legend

- Cuyama Basin
- Cuyama River
- Streams
- Faults
- Highways
- Landmarks
- Towns

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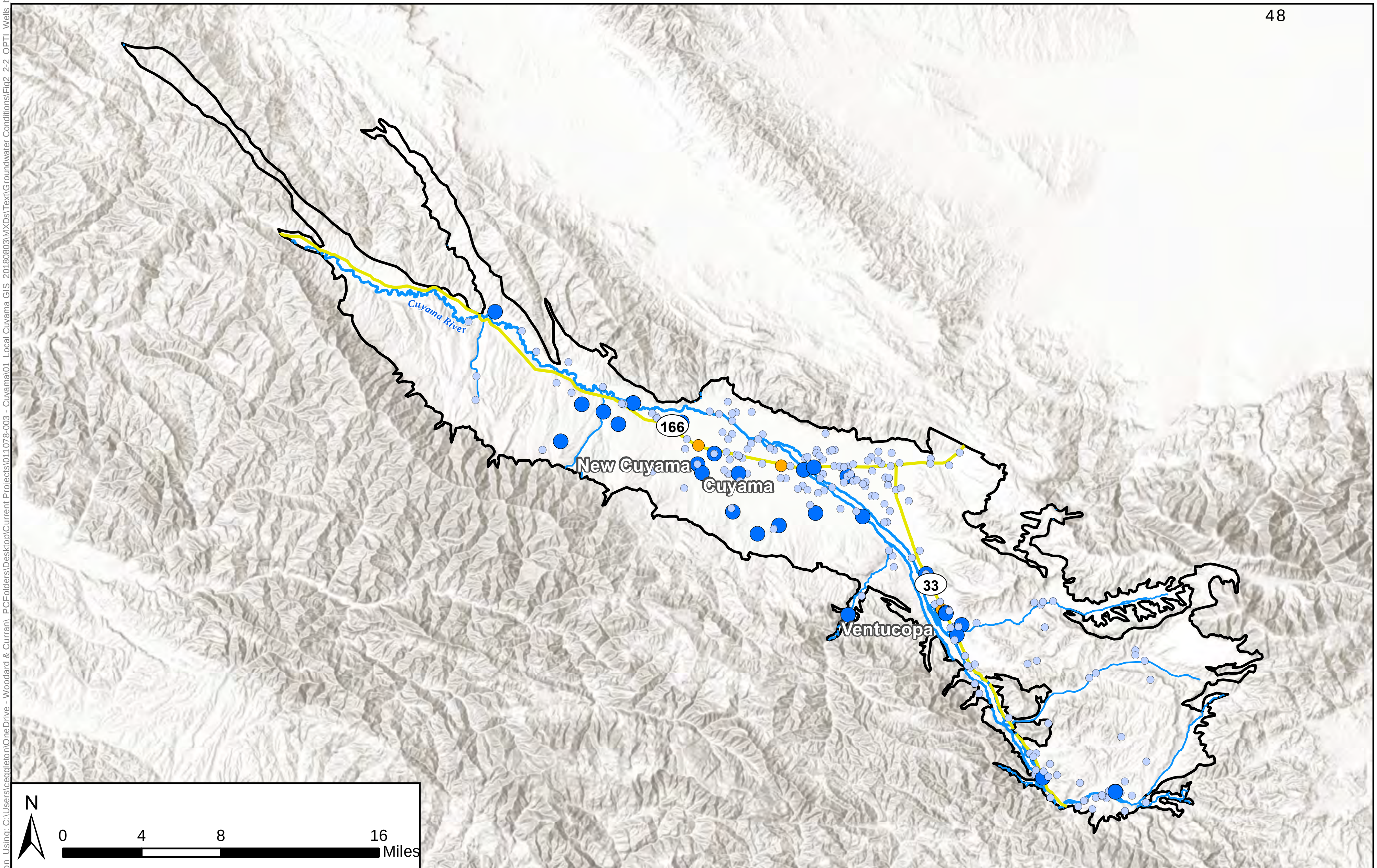

Figure 2.2-2: Cuyama GW Basin Wells with Monitoring Data Provided by DWR

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

August 2018

WOODARD & CURRAN

Legend

- Cuyama Basin
- Towns
- Highways
- Cuyama River
- Streams
- DWR Database Wells Last Measured in 2017-2018
- DWR Database Wells Last Measured 2016 and Earlier

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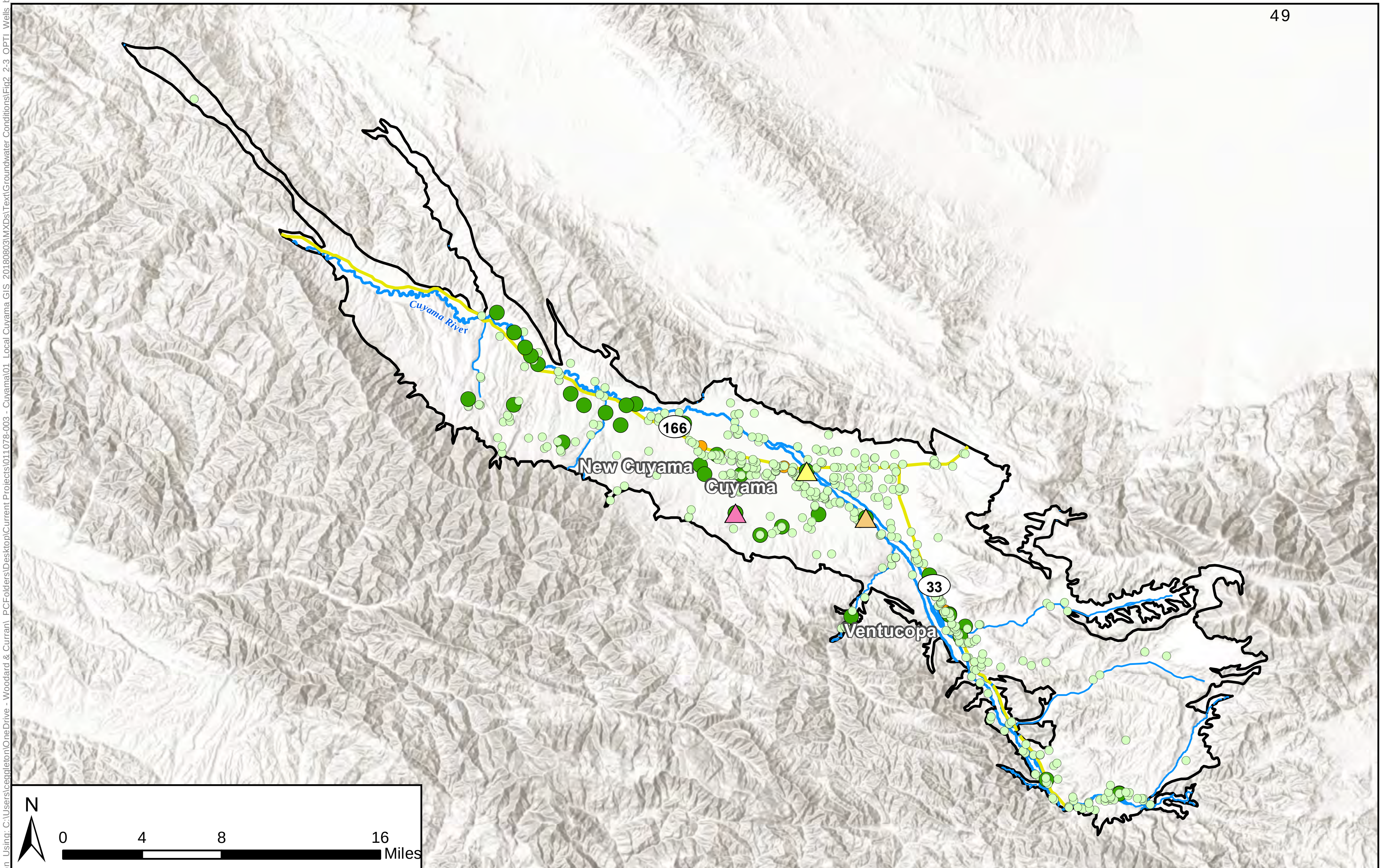

Figure 2.2-3: Cuyama GW Basin Wells with Monitoring Data Provided by USGS

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

August 2018

WOODARD & CURRAN

Legend

- Cuyama Basin
- Towns
- Highways
- Cuyama River
- Streams
- USGS Database Wells Last Measured in 2017-2018
- USGS Database Wells Last Measured 2016 or Earlier
- CVBR Multi-Completion Well
- CVFR Multi-Completion Well
- CVKR Multi-Completion Well

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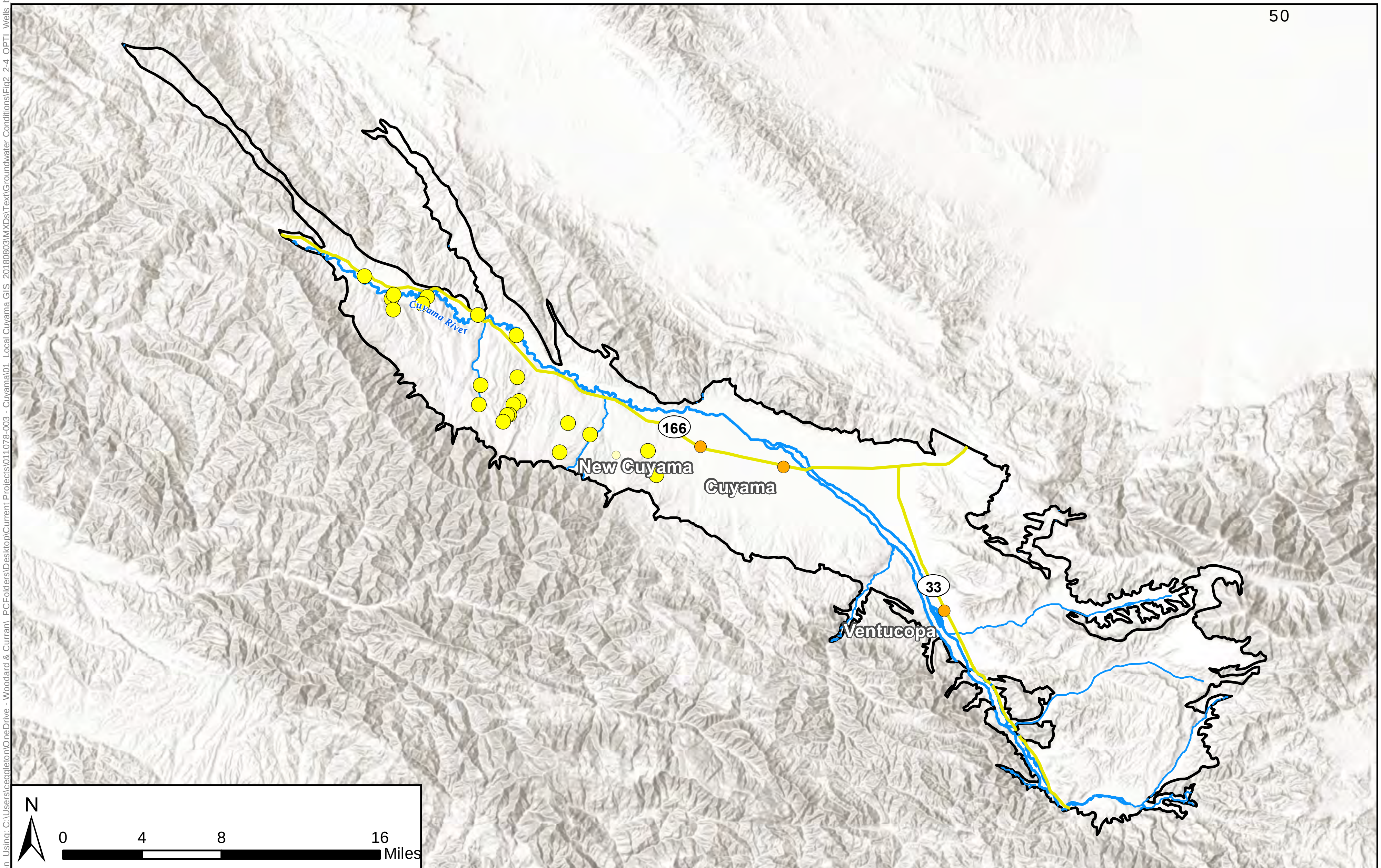

Figure 2.2-4: Cuyama GW Basin Wells with Monitoring Data Provided by Local Agencies

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

August 2018

WOODARD & CURRAN

Legend

- Cuyama Basin
- Towns
- Highways
- Cuyama River
- Streams
- County Database Wells Last Measured in 2017-2018
- County Database Wells Last Measured 2016 or Earlier

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Figure 2.2-5 shows the locations of well data received from private landowners. The majority of wells provided by private landowners are located in the central portion of the basin, between the Cuyama River and Highway 33, generally running along Highway 166. Additional wells provided by private landowners are located along the Cuyama River and Highway 166, near the Russell Ranch Oilfields. Associated data provided with private landowners varies by source. Some data and measurements were taken annually, while other well owners were taken biannually or quarterly.

Figure 2.2-6 shows the locations of collected data from all entities by their last measured date. Wells with monitoring data in 2017-2018 are shown in bright green triangles. There are recent measurements in many different parts of the Basin:

- Near the Cuyama river in the eastern uplands and near Ventucopa
- In the central portion of the basin, especially north of Highway 166 but with some wells located in the southern portion of the central basin
- In the western portion of the basin east of Aliso Canyon. An additional concentration of recent monitoring points is present along the Cuyama River near the Russell Ranch Oilfields.

Figure 2.2-7 shows a comparison of data provided by private landowners and data compiled from the DWR and the USGS databases in the central portion of the Basin. This figure was developed to provide information on the consistency between data from these differing sources. The figure shows the location of compared wells, and the measurements on those wells by source. The measurements of groundwater elevation among the measured wells indicate that the monitoring by the private landowners and agencies approximately match in tracking historical trends from the public databases.

Figure 2.2-8 shows a comparison of data collected from other private landowners, and data collected from SBCWA. This figure was developed to provide information on the consistency between data from these differing sources. The figure shows the location of compared wells, and the measurements on those wells by source. A long-term comparison is not possible due to the shorter measurement period of the Santa Barbara County wells, but the measurements of groundwater elevation among the measured wells indicate that the monitoring by private landowners in the western portion of the Basin and the county are similar in elevation, with the county's data showing slightly higher elevations.

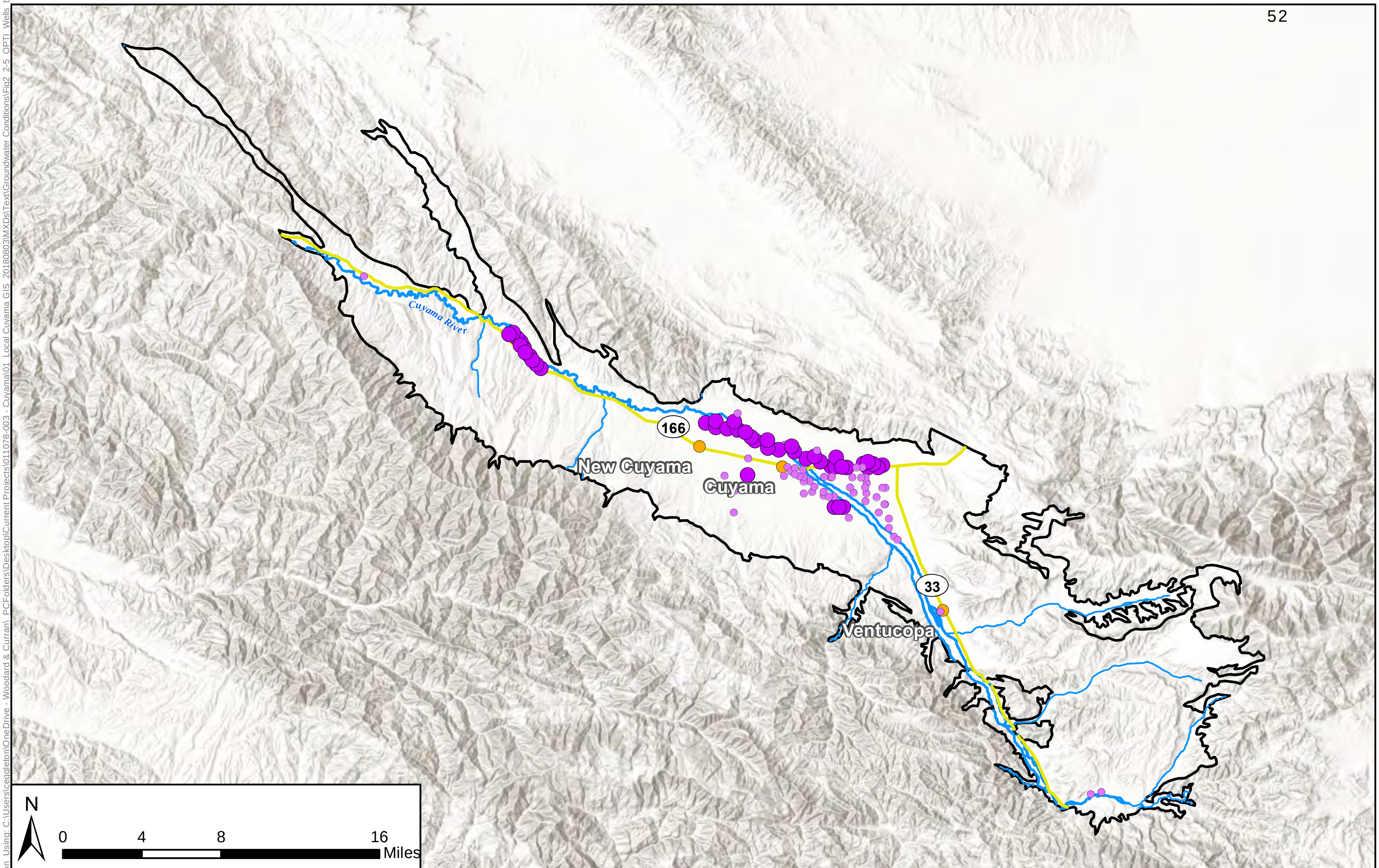

Figure 2.2-5: Cuyama GW Basin Wells with Monitoring Data Provided by Private Landowners

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

August 2018

WOODARD & CURRAN

Legend

- Cuyama Basin
- Towns
- Highways
- Cuyama River
- Streams
- Private Landowners Reported Wells Last Measured in 2017-2018
- Private Landowners Reported Wells Last Measured 2016 and Earlier

Figure Exported: 11/19/2018 By: ceggleton Using: C:\Users\ceggleton\OneDrive - Woodard & Curran_PCFolders\Desktop\Current Projects\011078-003 - Cuyama\01_Local Cuyama GIS_20180803\MXDs\Text\Groundwater Conditions\Fig2_2-5_OPTI_Wells_by_Agency

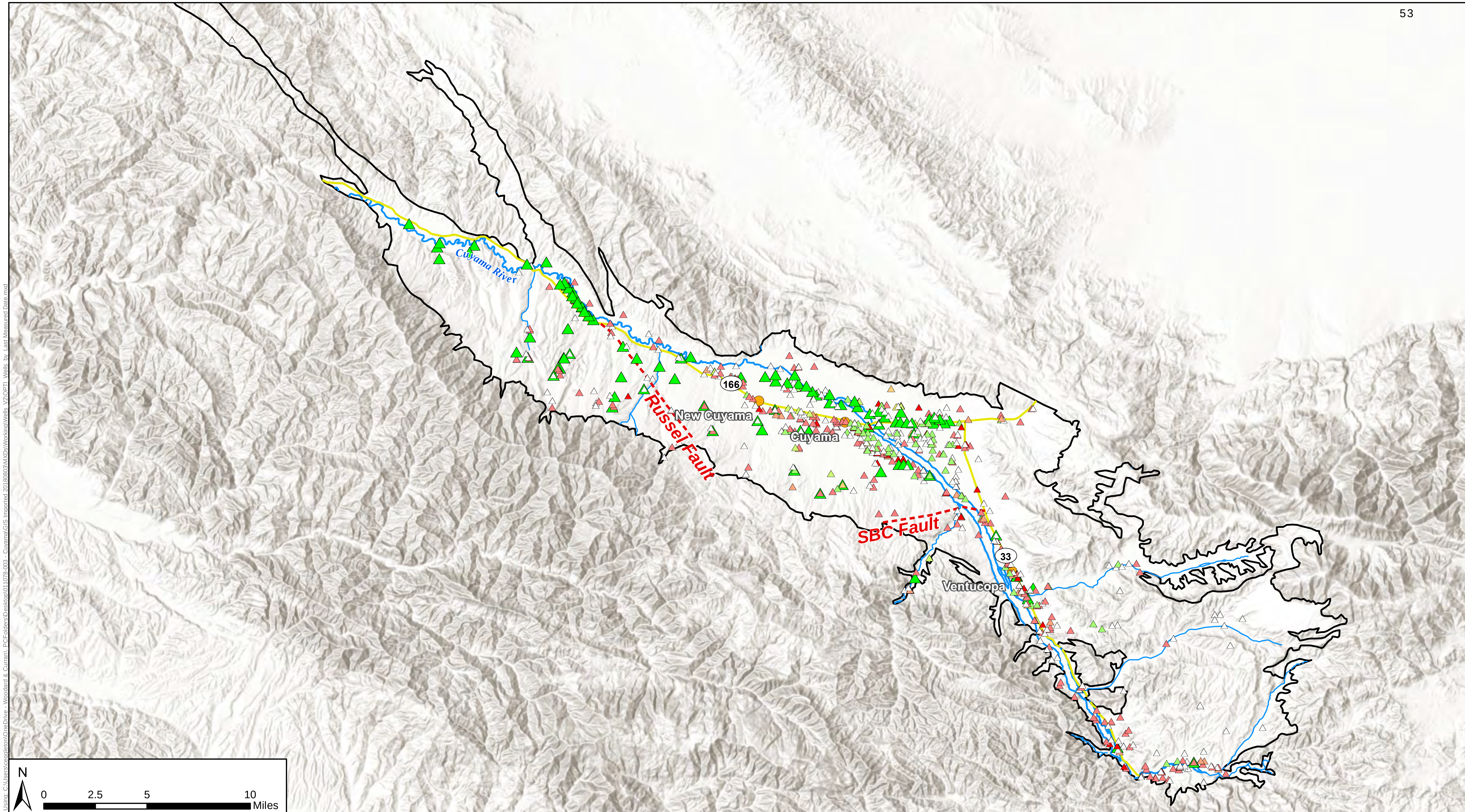

Figure 2.2-6: Cuyama GW Basin Wells by Last Measurement Date

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

August 2018

WOODARD & CURRAN

Legend

Most Recent Year with Measurements

Cuyama Basin
Towns
Highways
Cuyama River
Streams
Fault
2017 - 2018
2010 - 2016
2000 - 2009
1990 - 1999
1980 - 1989
1970 - 1979
1960 - 1969
1950 - 1959
Pre-1950
No Measurment Data

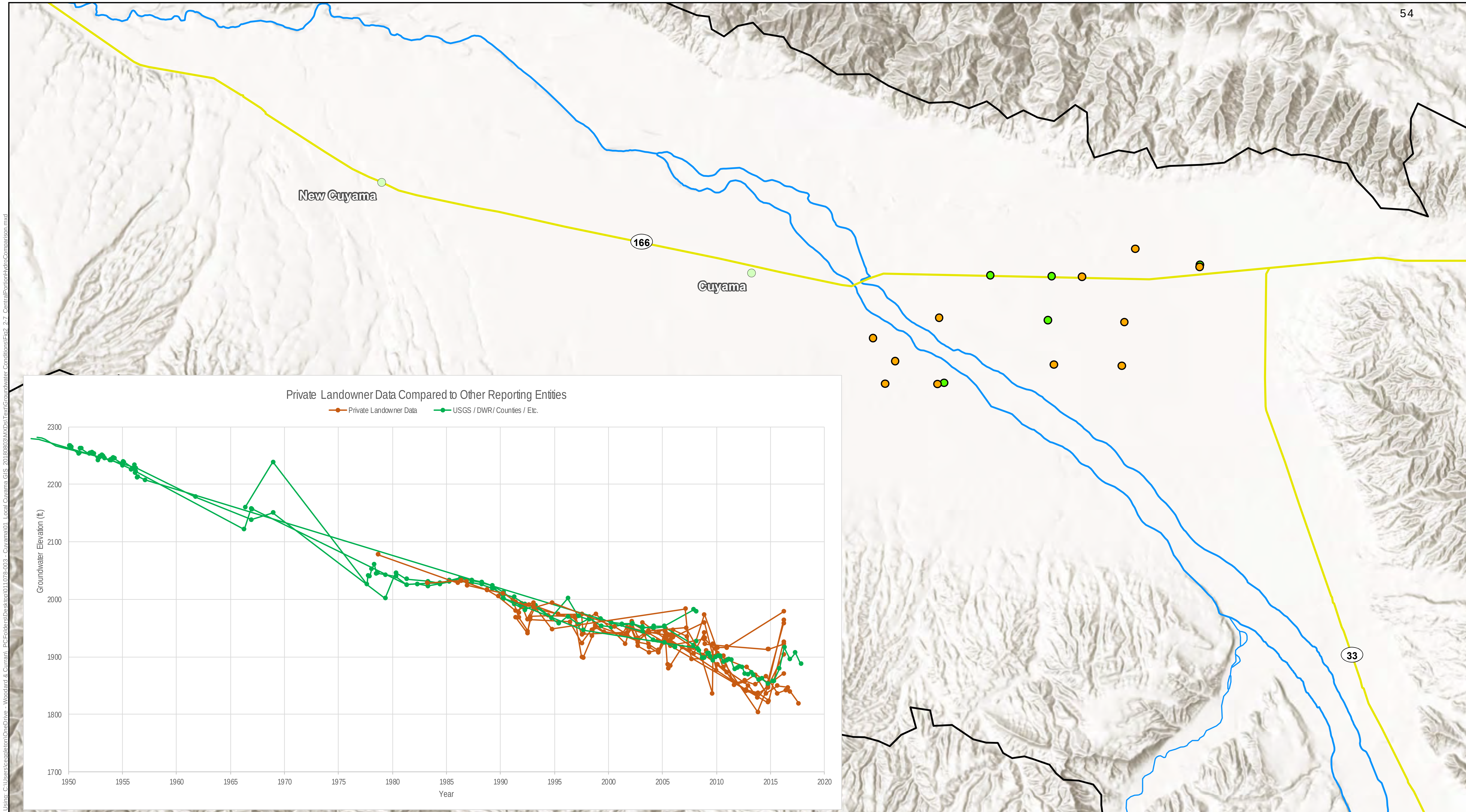

Figure 2.2-7: Central Cuyama GW Basin Wells and Hydrographs by Data Source

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

August 2018

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Legend

- Cuyama Basin
- Towns
- Highways
- Cuyama River
- Streams
- USGS, DWR, County, Etc., Wells
- Private Landowners

N

0 0.5 1 2 Miles

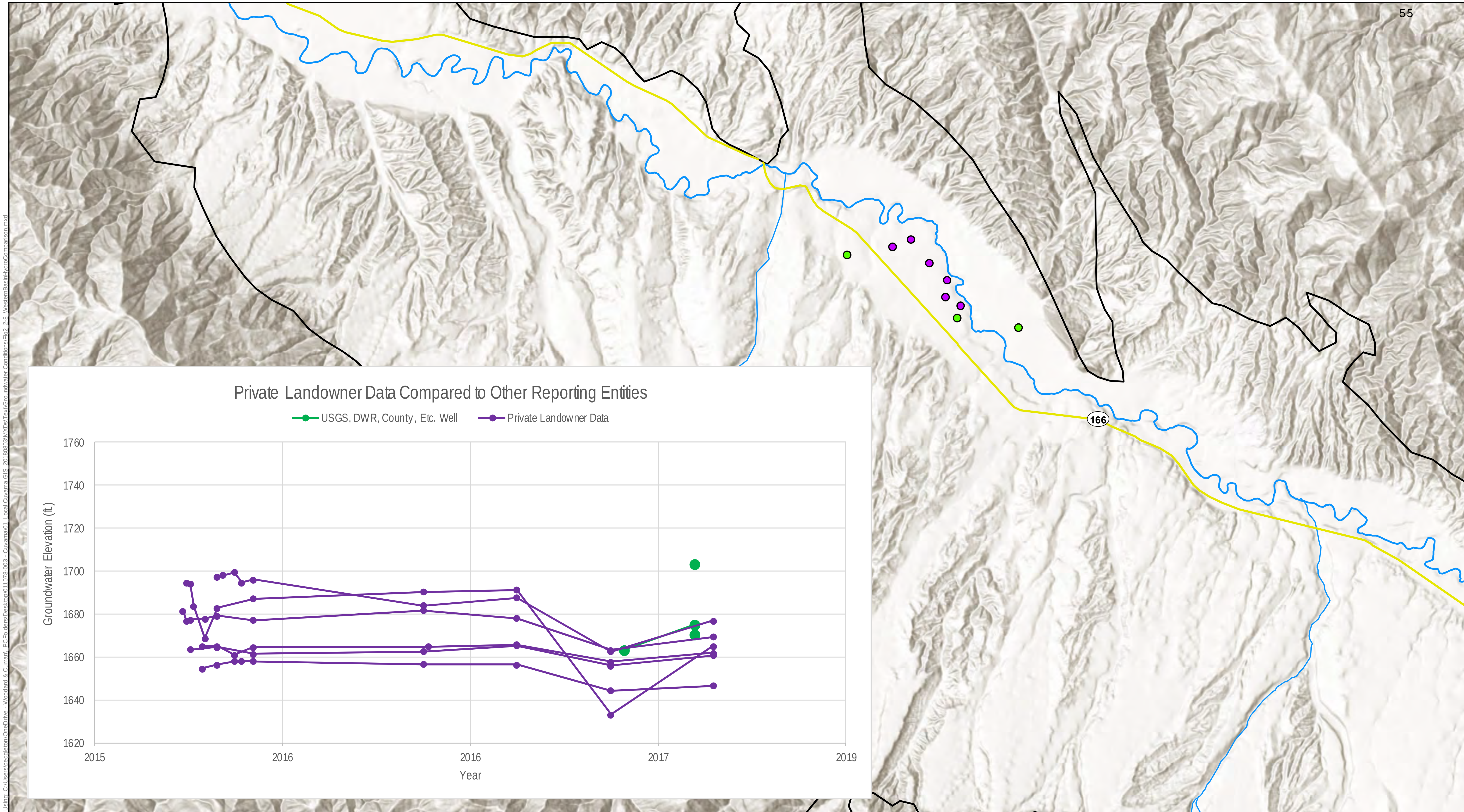

Figure 2.2-8: Western Cuyama GW Basin Wells and Hydrographs by Data Source

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

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Legend

- Cuyama Basin
- Highways
- Cuyama River
- Streams
- USGS, DWR, County, Etc. Wells
- Private Landowner Wells

2.2.3 Groundwater Trends

This section describes groundwater trends in the basin generally from the oldest available studies and data to the most recent. Groundwater conditions vary widely across the Basin. In the following sections, some historical context is provided by summarizing information contained in relevant reference studies about conditions during the 1947-1966 period, followed by discussion of how groundwater conditions have changed based on available historical groundwater level monitoring data.

Historical Context - 1947 to 1966 Groundwater Trends

This section discusses public reports about conditions from 1947-1966. Information about groundwater conditions in the basin in this period are limited to reports that discuss the central portion of the basin and scattered groundwater elevation measurements in monitoring wells.

The report *Water Levels in Observation Wells in Santa Barbara County, California* (USGS 1956) discussed groundwater elevation monitoring in the Cuyama Valley Groundwater Basin. The report states that prior to 1946, there was no electric power in the valley, which restricted intensive irrigation, and that groundwater levels in the central portion of the basin remained fairly static until 1946. The report states that:

"Declines in groundwater began after 1946" (USGS 1956). Groundwater declined "as much as 8.8 feet from the spring of 1955 to 1956; the average decline was 5.2 feet. The decline of water levels at the lower and upper ends of the valley during this period was not so great as in the middle portion and averaged 1.7 and 2.2 feet respectively. Since 1946, water levels in observation wells have decline on the average about 27 feet."

The report *Hydrologic Models and Analysis of Water Availability in the Cuyama Valley, California* (USGS 2015) presents two maps generated by the Cuyama Valley Hydrologic Model (CUVHM) simulated data. Figure 2.2-9 shows the estimated drawdown in the central portion of the basin from 1947 to 1966. Figure 2.2-9 shows that estimated drawdown ranged from zero at the edges of the central basin to over 160 feet in the southeastern portion of the central basin. Figure 2.2-10 shows the estimated contours of groundwater elevation for September 1966. These contours show a low area in the central portion of the central basin, and a steep groundwater gradient in the southeast near Ventucopa and in the highlands. A gentle groundwater gradient occurs in the southwestern portion of the central basin, generally matching topography.

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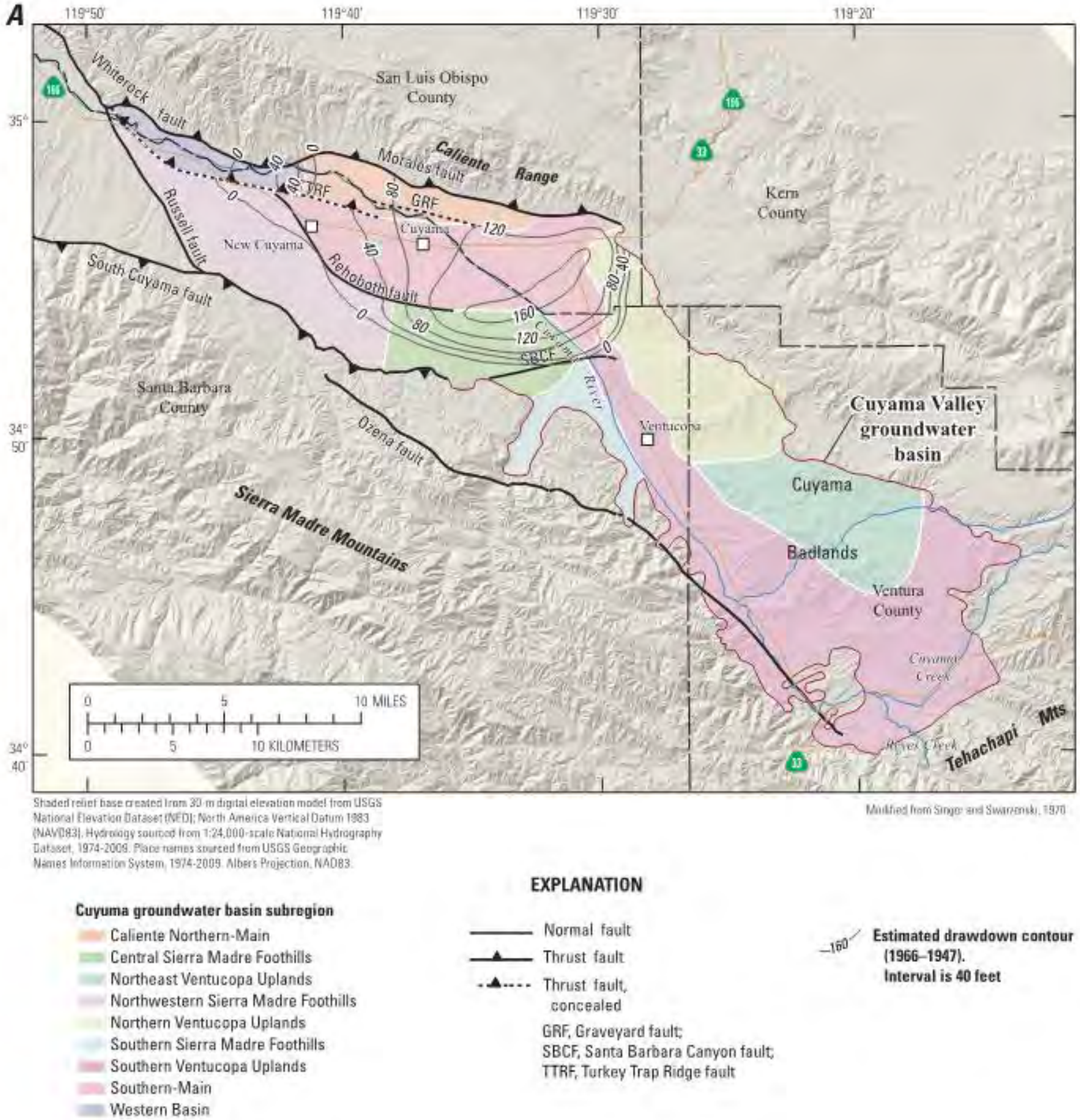

Figure 2.2-9: USGS 2015 – Water Level Drawdown Contours 1966 - 1947

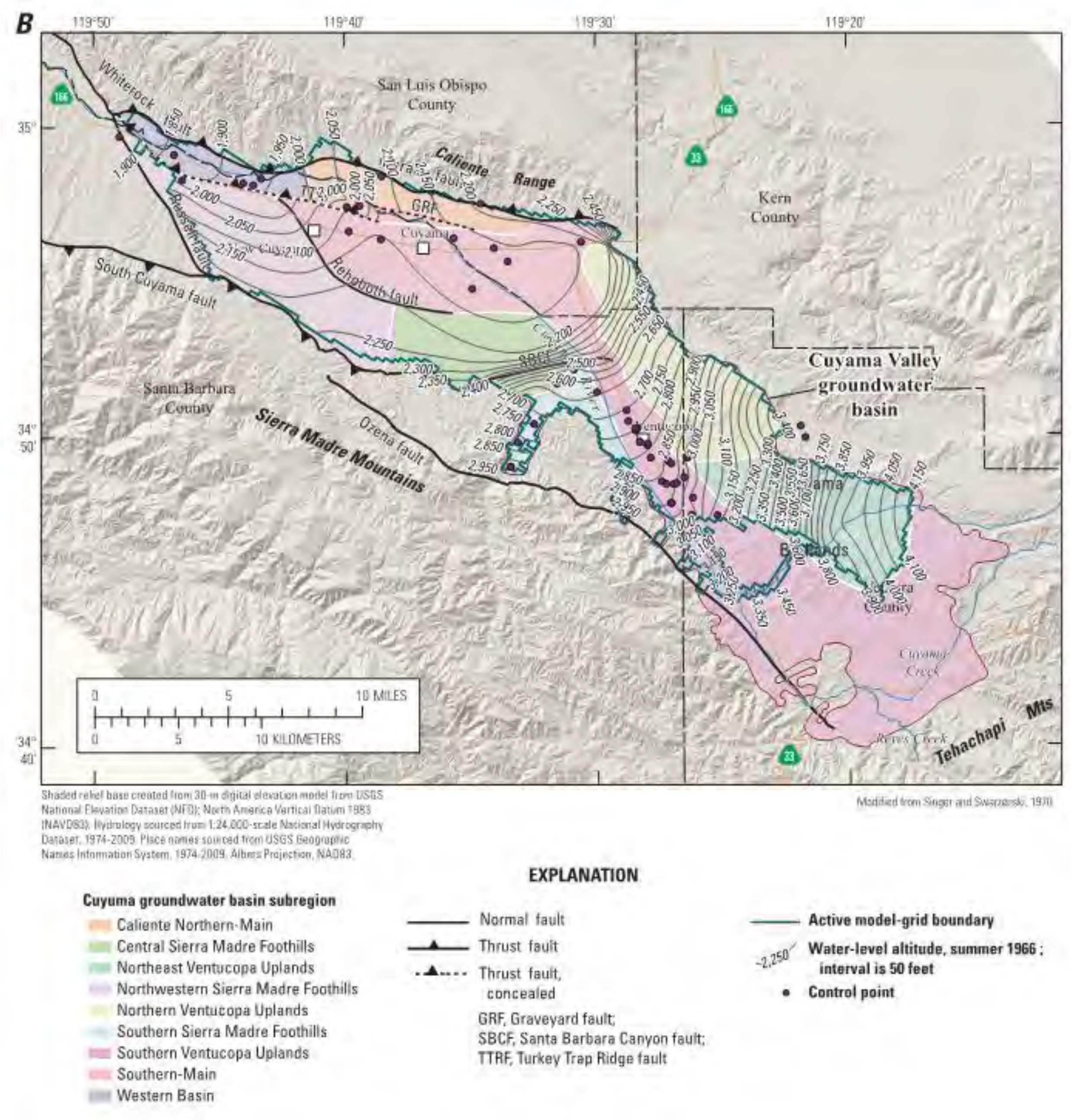

Figure 2.2-10: USGS 2015 – Water Level Contours 1966

Groundwater Trends from Available Monitoring Data

To understand how groundwater conditions have changed in the Basin in recent decades, groundwater hydrographs, vertical gradients and contours have been developed and analyzed. These are discussed in the sections below.

Groundwater Hydrographs

Groundwater hydrographs were developed to provide indicators of groundwater trends throughout the Basin. Measurements from each well with historical monitoring data were compiled into one hydrograph for each well. These hydrographs are presented in Appendix X.

In many cases, changes in historical groundwater conditions at particular wells have been influences by climactic patterns in the Basin. Figures showing historical precipitation and flows in the Basin will be included in the Water Budgets section. The historical precipitation is highly variable, with several relatively wet years as well as some multi-year droughts.

Groundwater conditions generally vary in different parts of the Basin. Figure 2.2-11 shows hydrographs in select wells in different portions of the basin. These wells were selected because of their representative nature of Basin conditions in their areas. In general:

- In the area southeast of Round Springs Canyon, near Ozena Fire Station (e.g. well 89) - Groundwater levels have stayed relatively stable with a small decline in the 2012-2015 drought and quick recovery.
- In the vicinity of Ventucopa (e.g. well 62) - Groundwater levels followed climactic patterns and have generally been declining since 1995.
- Just south of the SBCF (e.g. well 101) – Groundwater levels have been fairly stable and are closer to the surface than levels in Ventucopa.
- North of the SBCF and east of Bitter Creek in the central portion of the basin (e.g. wells 55 and 615) - Groundwater levels have been declining consistently since 1950.
- In the area west of Bitter Creek (e.g. wells 119 and 830) – groundwater levels are near ground surface in the vicinity of the Cuyama riveR; and deeper below ground in the area to the south, uphill from the river; and have been generally stable since 1966.

Figure 2.2-12 shows selected hydrographs for wells in the area near Ventucopa. In the area southeast of Round Springs Canyon, near Ozena Fire Station, the hydrograph for Well 89 is representative of monitoring wells in this area, and groundwater levels have stayed relatively stable with a small decline in the 2012-2015 drought and quick recovery. Near Ventucopa, hydrographs for Wells 85 and 62 show the same patterns and conditions from 1995 to the present and show that groundwater levels in this area respond to climactic patterns, but also have been in decline since 1995 and are currently at historic low elevations. The hydrograph for Well 85 shows that prior to 1985 groundwater levels responded to drought conditions but recovered during wetter years. Well 40 is located just south of the SBCF and its hydrograph indicates that groundwater levels in this location have remained stable from 1951 to 2013, when monitoring ceased. Wells 91 and 620 are north of the SBCF and their hydrographs show more recent conditions, where depth to water has declined consistently and is below 580 below ground surface (bgs).

Figures 2.2-13 and 2.2-14 show hydrographs of discontinued and currently monitored wells in the central portion of the basin, north of the SBCF and east of Bitter Creek. The hydrographs of discontinued wells in this area are shown in Figure 2.2-13. These hydrographs show consistent declines of groundwater levels and little to no responses to either droughts or wetter periods. The hydrograph for Well 35 shows a consistent decline from 1955 to 2008, from 30 feet bgs to approximately 150 feet bgs. Well 472 shows a decline from approximately 5 feet bgs in 1949 to approximately 85 feet bgs in 1978.

Figure 2.2-14 shows hydrographs of currently monitored wells in the central portion of the basin. In general, these hydrographs show that groundwater levels are decreasing, with the lowest levels in the southeast portion of the area just northwest of the SBCF, as shown in the Well 610 hydrograph, where groundwater levels were below 600 feet bgs. Levels remain lowered along the Cuyama River, as shown in

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the hydrographs for Wells 604 and 618, which are currently approximately 500 feet bgs. Groundwater levels are higher to the west (Well 72) and towards the southern end of the area (Well 96). However, almost all monitoring wells in this area show consistent declines in elevation.

Figure 2.2-15 shows hydrographs of monitoring wells in the western portion of the basin, west of Bitter Creek. Hydrographs in this area show that generally, groundwater levels are near the surface near the Cuyama River, and further from the surface to the south, which is uphill from the river. The hydrograph for Well 119 shows a few measurements from 1953-1969, as well as three recent measurements, all measurements on this well show a depth to water of 60 feet bgs. The hydrograph for Well 846 shows that in 2015 depth to water was slightly above 40 feet and is slightly below 40 feet in 2018. The hydrograph for Well 840 shows a groundwater level near ground surface in 2015, and a decline to 40 feet bgs in 2018. Hydrographs for wells uphill from the river (Wells 573 and 121) show that groundwater is roughly 70 feet bgs in this area. Hydrographs for wells 571 and 108, at the edge of the basin only have recent measurements, show groundwater levels that range from 120 to 140 feet bgs.

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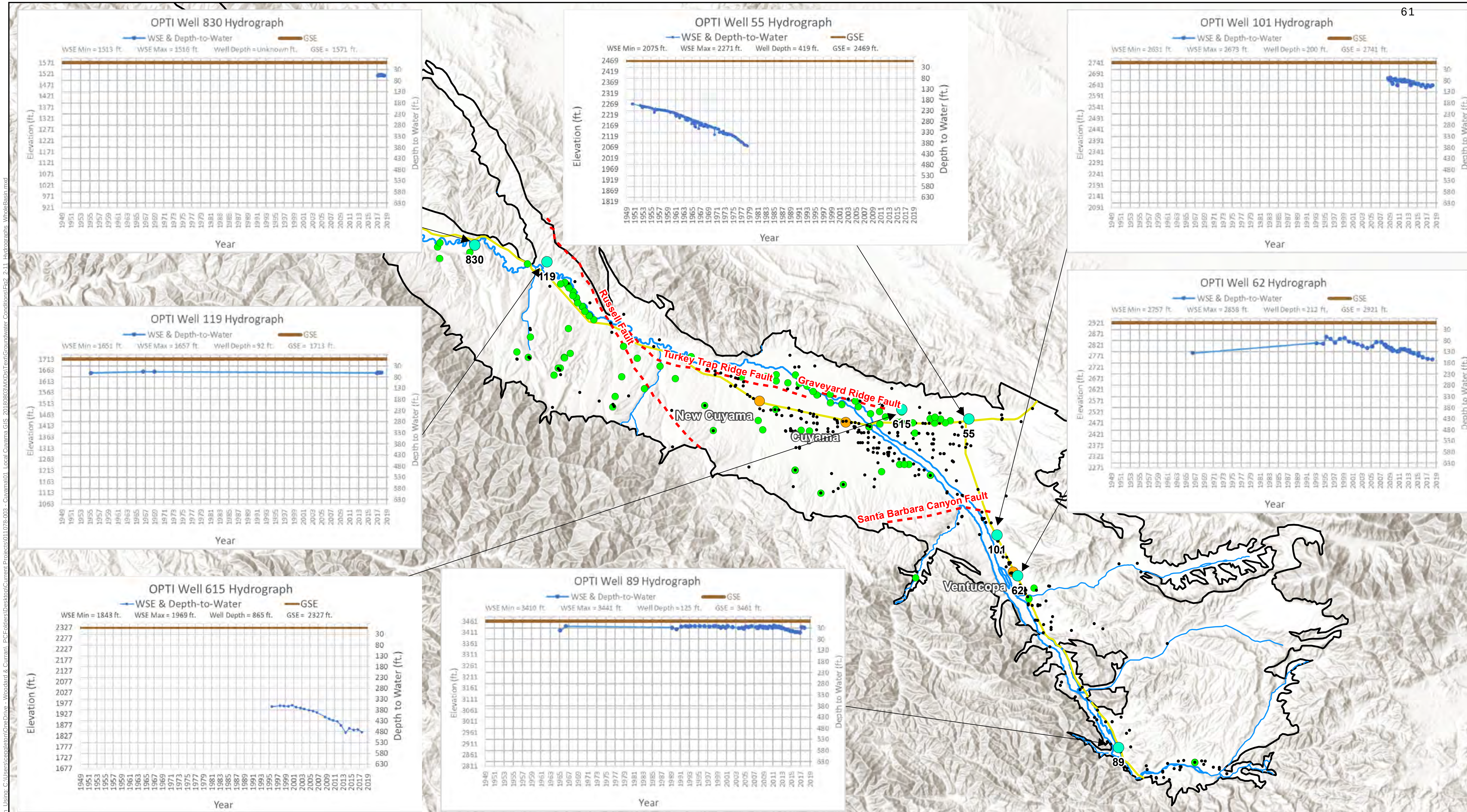

Figure 2.2-11: Cuyama GW Basin Hydrographs

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

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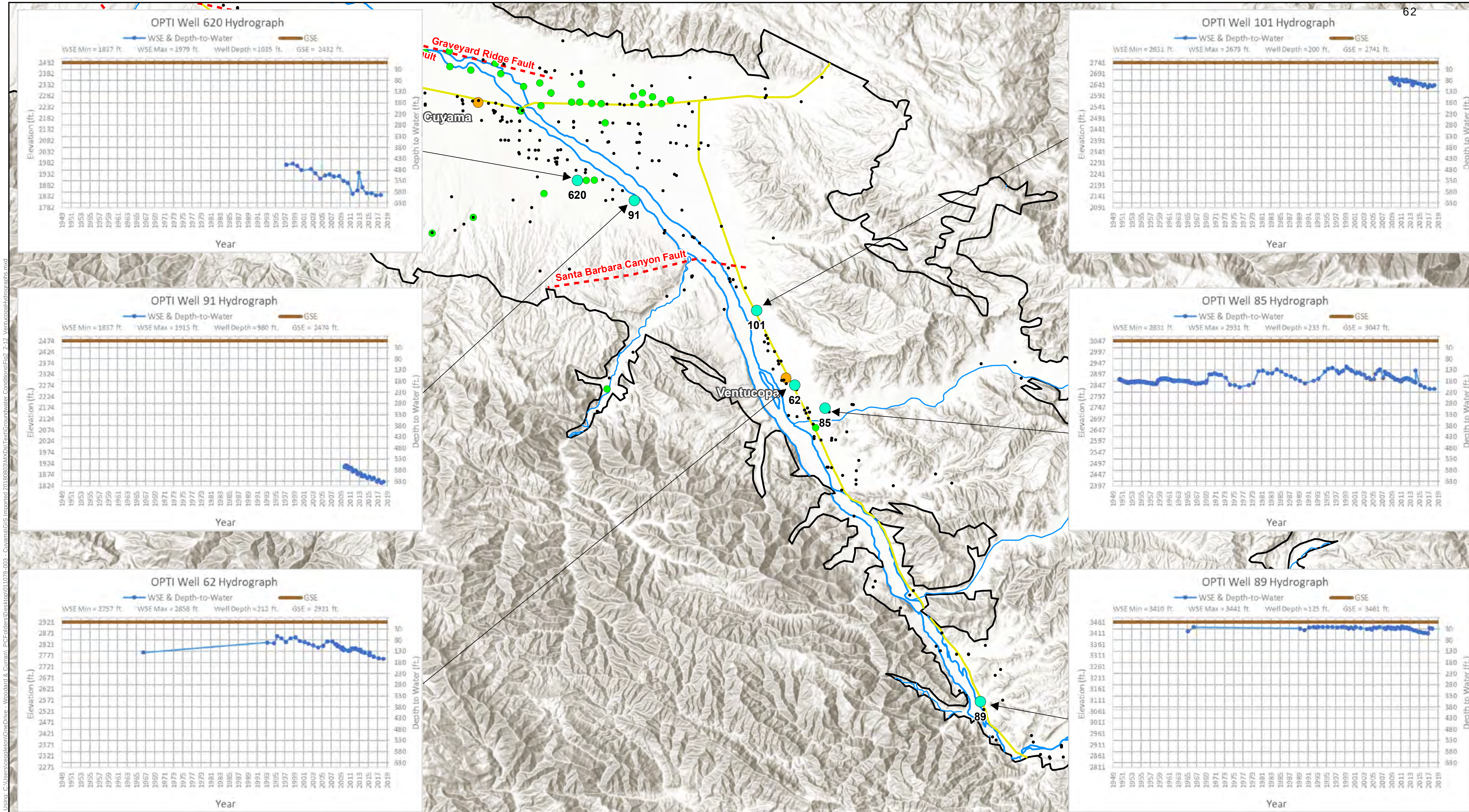

Figure 2.2-12: Cuyama GW Basin Hydrographs for the Ventucopa Area of the Basin

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

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Legend

- Cuyama Basin
- Towns
- Highways
- Cuyama River
- Streams
- Faults
- Hydrographed Wells
- Currently Monitored Wells
- Not Currently Monitored

N

0 1.25 2.5 5 Miles

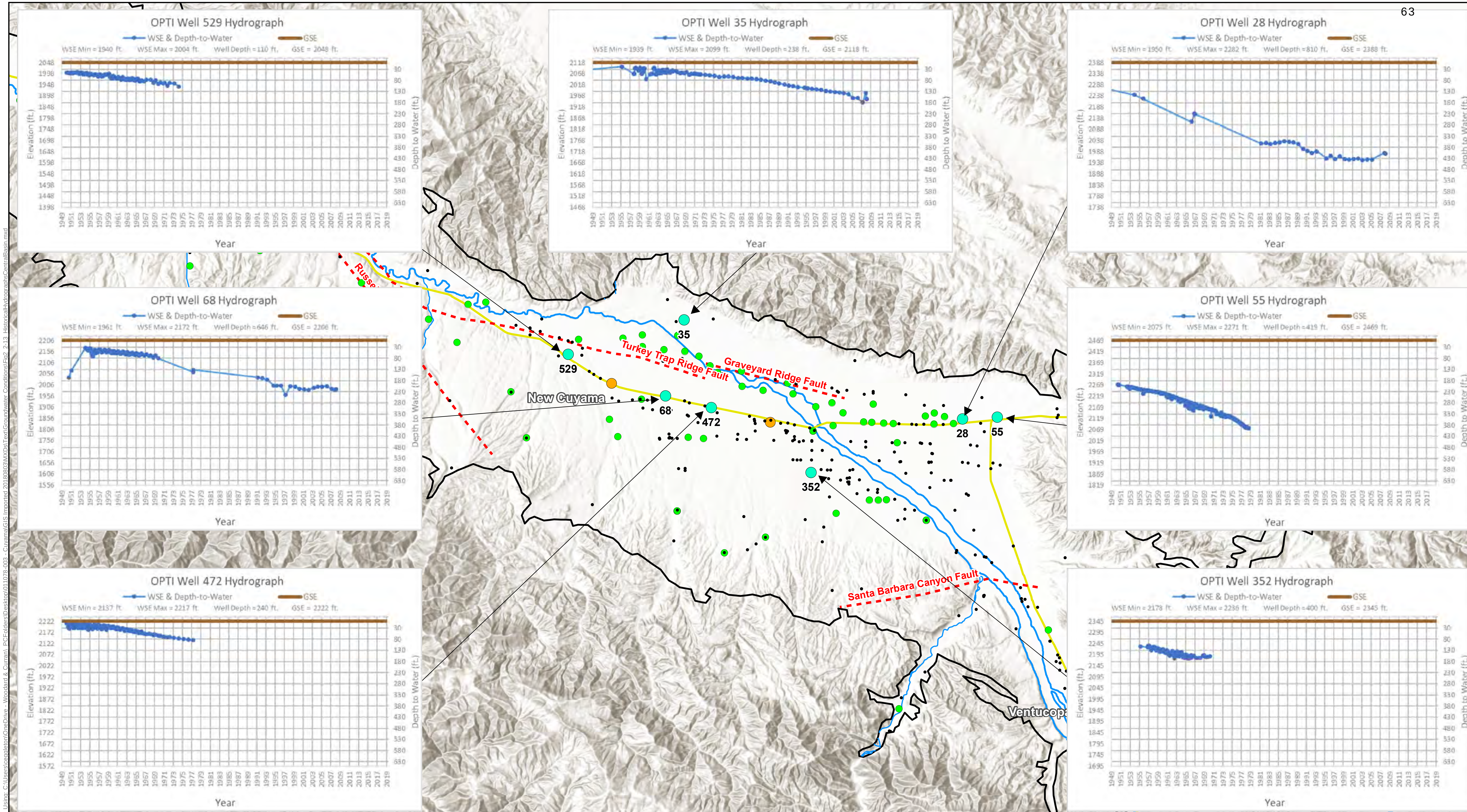

Figure 2.2-13: Cuyama GW Basin Hsitorical Hydrographs in the Central Basin

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

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Legend

- Cuyama Basin
- Towns
- Highways
- Cuyama River
- Streams
- Faults
- Hydrographed Wells
- Currently Monitored Wells
- Not Currently Monitored

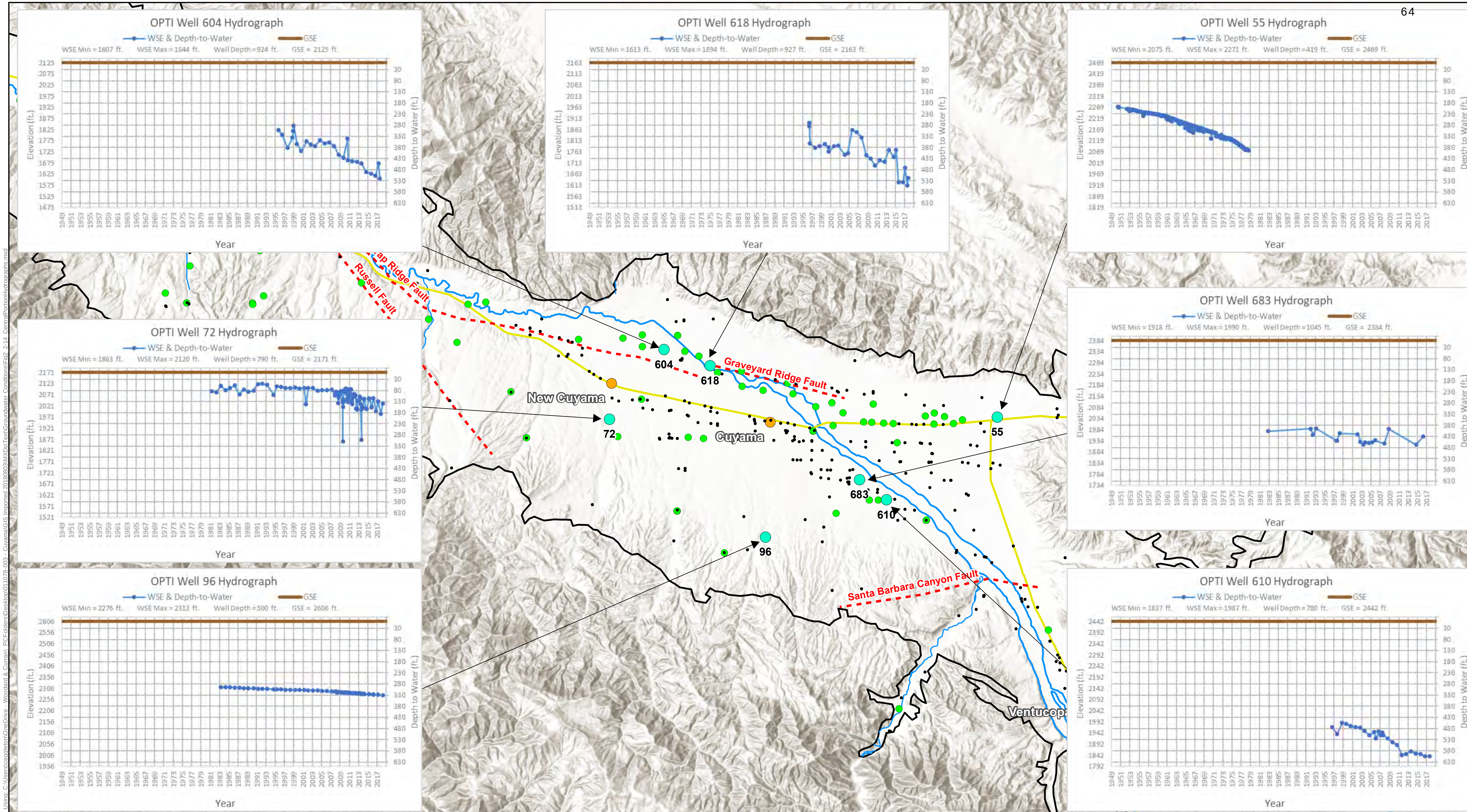

Figure 2.2-14: Cuyama GW Basin Hydrographs for the Central Portion of the Basin

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

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Legend

- Cuyama Basin
- Towns
- Highways
- Cuyama River
- Streams
- Faults
- Hydrographed Wells
- Currently Monitored Wells
- Not Currently Monitored

N

0 1.25 2.5 5 Miles

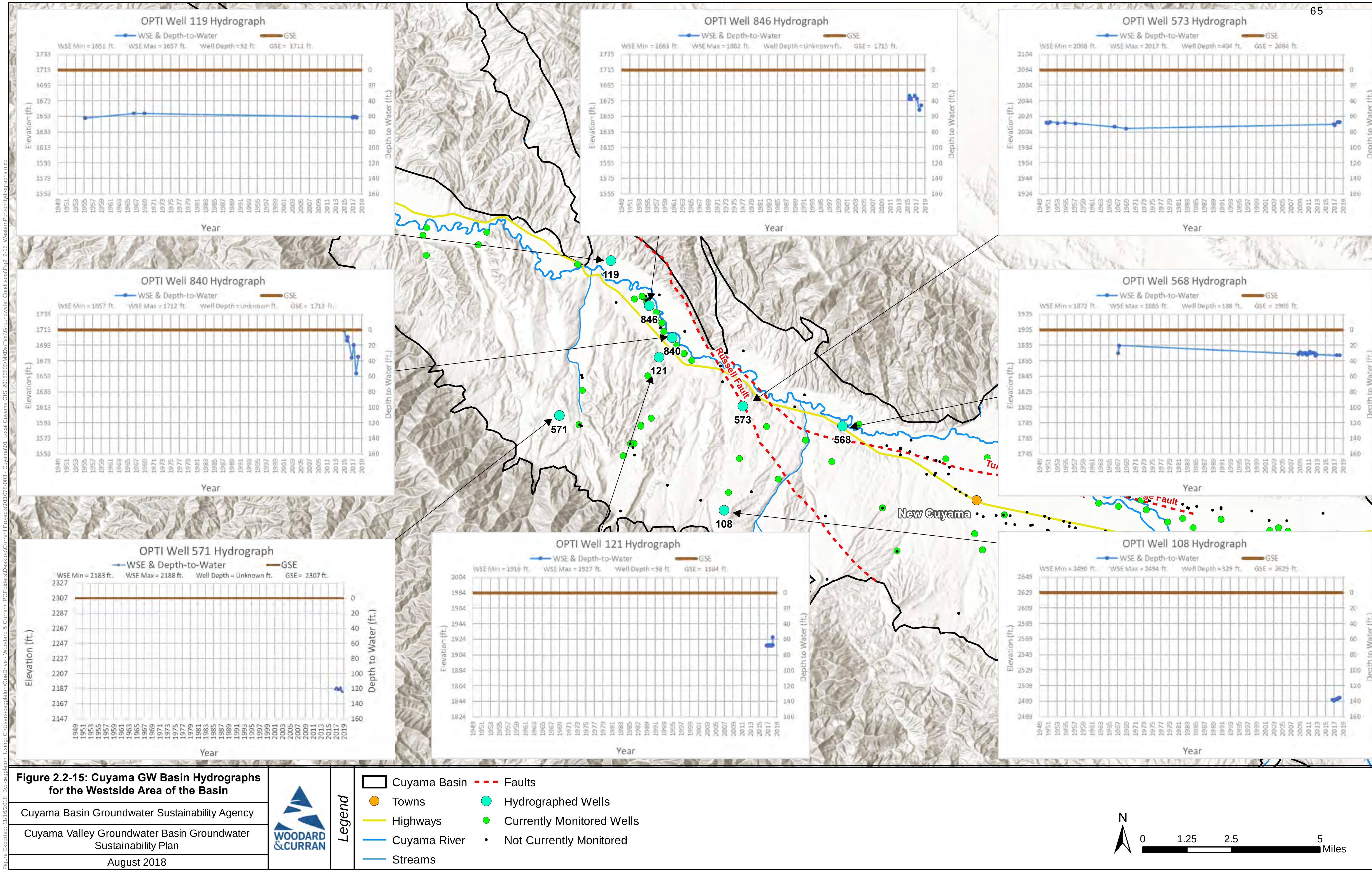

Figure 2.2-15: Cuyama GW Basin Hydrographs for the Westside Area of the Basin

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

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Vertical Gradients

A vertical gradient describes the movement of groundwater perpendicular to the ground surface. The vertical gradient is typically measured by comparing the elevations of groundwater in a well with multiple completions that are of different depths. If groundwater elevations in the shallower completions are higher than in the deeper completions, the gradient is identified as a downward gradient. A downward gradient is one where groundwater is moving down into the ground. If groundwater elevations in the shallower completions are lower than in the deeper completions, the gradient is identified as an upward gradient. An upward gradient is one where groundwater is upwelling towards the surface. If groundwater elevations are similar throughout the completions, there is no vertical gradient to identify. Knowledge about vertical gradients is required by Regulation 354.16(a) and is useful for understanding how groundwater moves in the Basin.

There are three multiple completion wells in the Basin. A multiple completion well includes perforations at multiple perforation intervals and therefore provides information at multiple depths at the well location. The locations of the multiple completion wells are shown in Figure 2.2-3. The three multiple completion wells are located in the central portion of the basin, north of the SBCF and east of Bitter Creek.

Figure 2.2-16 shows the combined hydrograph for the multiple completion well CVFR, which was installed by the USGS[2]. CVFR is comprised of four completions, each at different depths:

- CVFR-1 is the deepest completion with a screened interval from 960 to 980 feet bgs
- CVFR-2 is the second deepest completion with a screened interval from 810 to 830 feet bgs
- CVFR-3 is the third deepest completion with a screened interval from 680 to 700 feet bgs
- CVFR-4 is the shallowest completion with a screened interval from 590 to 610 feet bgs

The hydrograph of the four completions shows that they are very close to the same elevation at each completion, and therefore it is unlikely that there is any vertical gradient at this location.

Figure 2.2-17 shows the combined hydrograph for the multiple completion well CVBR, which was installed by the USGS. CVBR is comprised of four completions, each at different depths:

- CVBR-1 is the deepest completion with a screened interval from 830 to 850 feet bgs
- CVBR-2 is the second deepest completion with a screened interval from 730 to 750 feet bgs
- CVBR-3 is the third deepest completion with a screened interval from 540 to 560 feet bgs
- CVBR-4 is the shallowest completion with a screened interval from 360 to 380 feet bgs

The hydrograph of the four completions shows that at the deeper completions, groundwater elevations are slightly lower than the shallower completions in the winter and spring, and deeper completions are generally lower than the shallower completion in the summer and fall. This indicates that during the irrigation season, the deeper portions of the aquifer are likely to be where pumping occurs. This pumping removes water from the deeper portion of the aquifer, creating a vertical gradient during the summer and fall. By the spring, enough water has moved down or horizontally to replace removed water, and the vertical gradient is significantly smaller at this location in the spring measurements.

Figure 2.2-18 shows the combined hydrograph for the multiple completion well CVKR, which was installed by the USGS. CVKR is comprised of four completions, each at different depths:

- CVKR-1 is the deepest completion with a screened interval from 960 to 980 feet bgs
- CVKR-2 is the second deepest completion with a screened interval from 760 to 780 feet bgs

[2] All three multiple completion wells were installed by the USGS as part of the Cuyama Valley Water Availability Study in cooperation with SBCWA

- CVKR-3 is the third deepest completion with a screened interval from 600 to 620 feet bgs
- CVKR-4 is the shallowest completion with a screened interval from 440 to 460 feet bgs

The hydrograph of the four completions shows that at the deeper completions are slightly lower than the shallower completions in the spring at each completion, and deeper completions are generally lower in the summer and fall. This indicates that during the irrigation season, the deeper portions of the aquifer are likely to be where pumping occurs. This pumping removes water from the deeper portion of the aquifer, creating a vertical gradient during the summer and fall. By the winter and spring, enough water has moved down to replace removed water, and the vertical gradient is very small at this location in the spring measurements.

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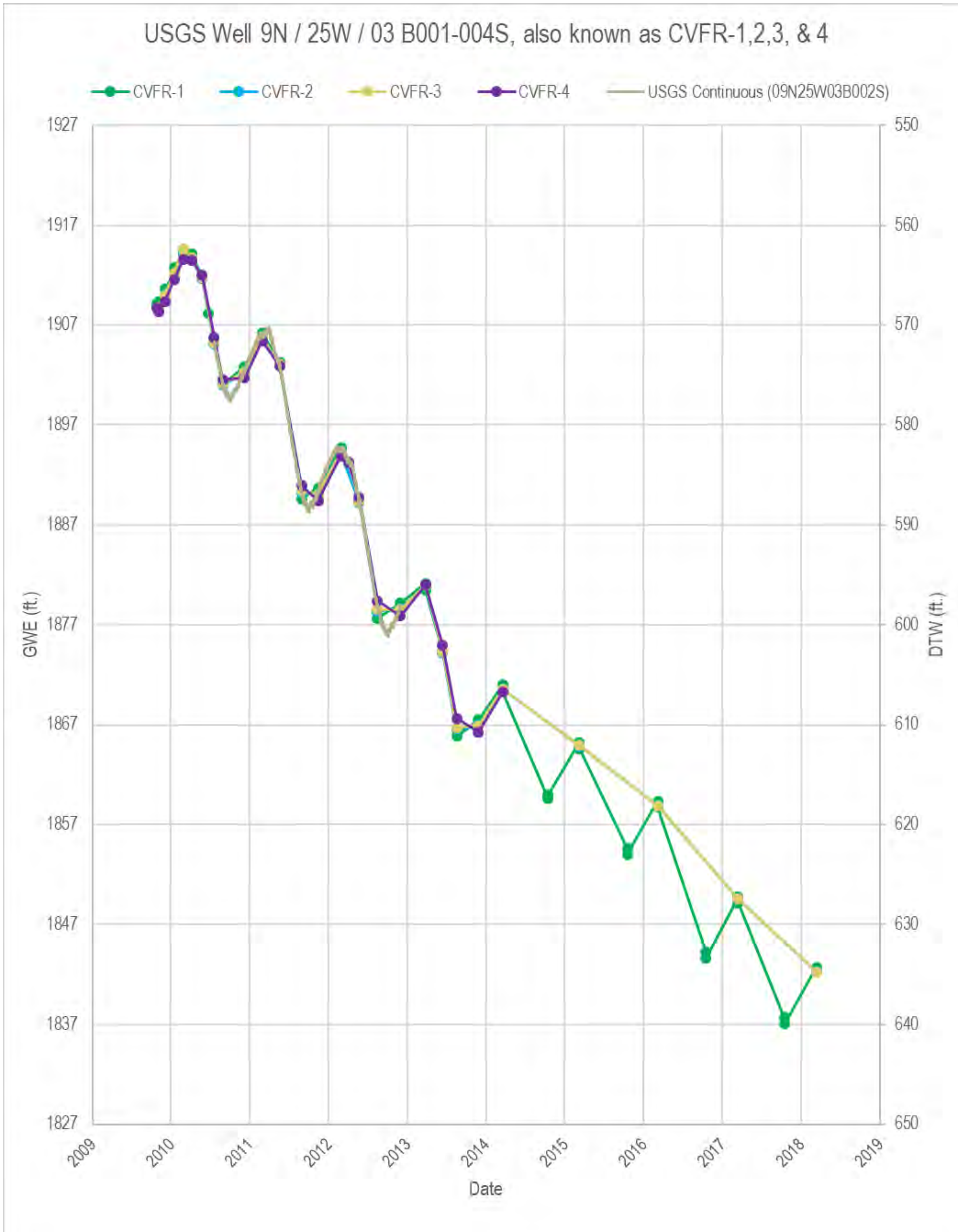

Figure 2.2-16: Hydrographs of CVFR1-4

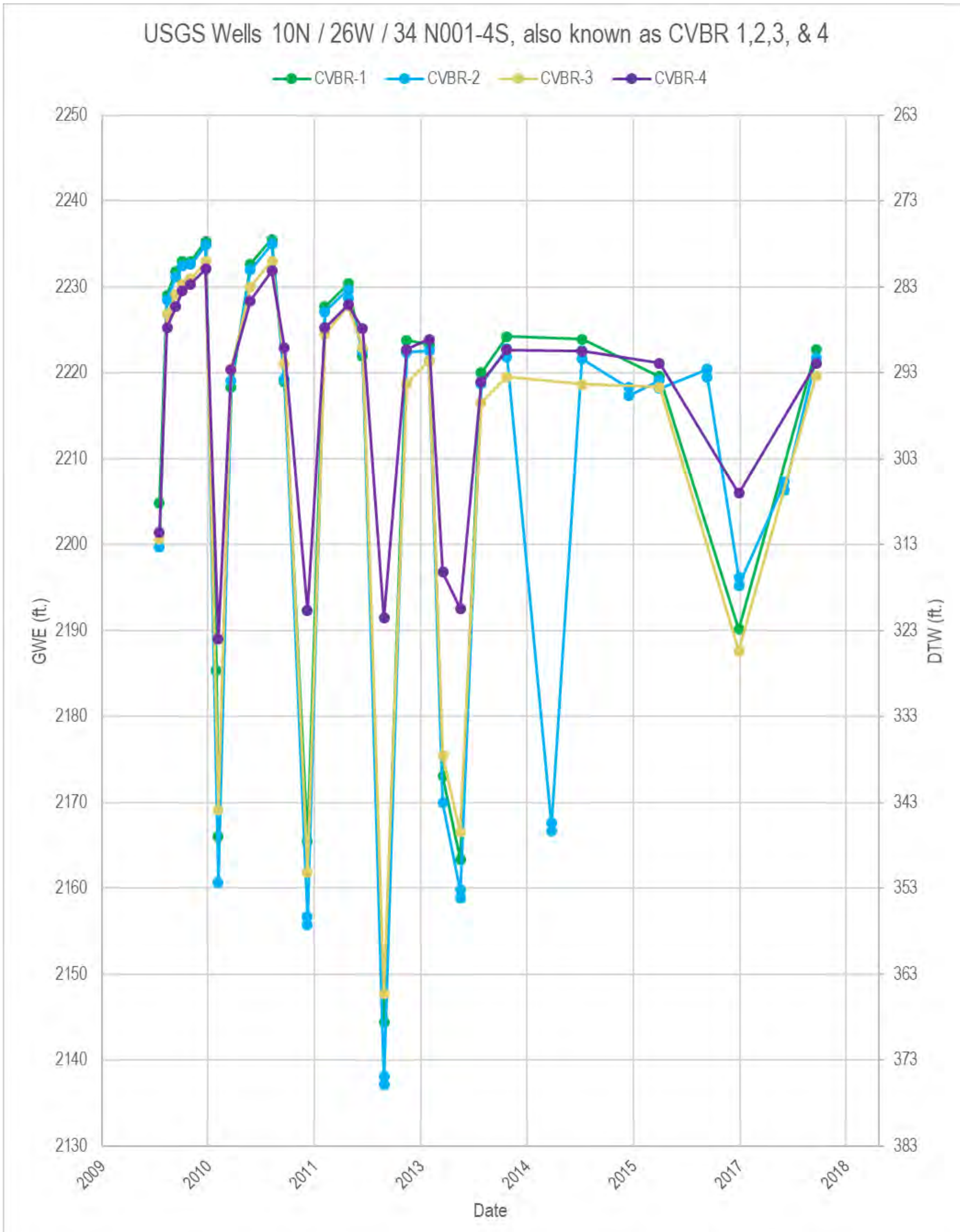

Figure 2.2-17: Hydrographs of CVBR1-4

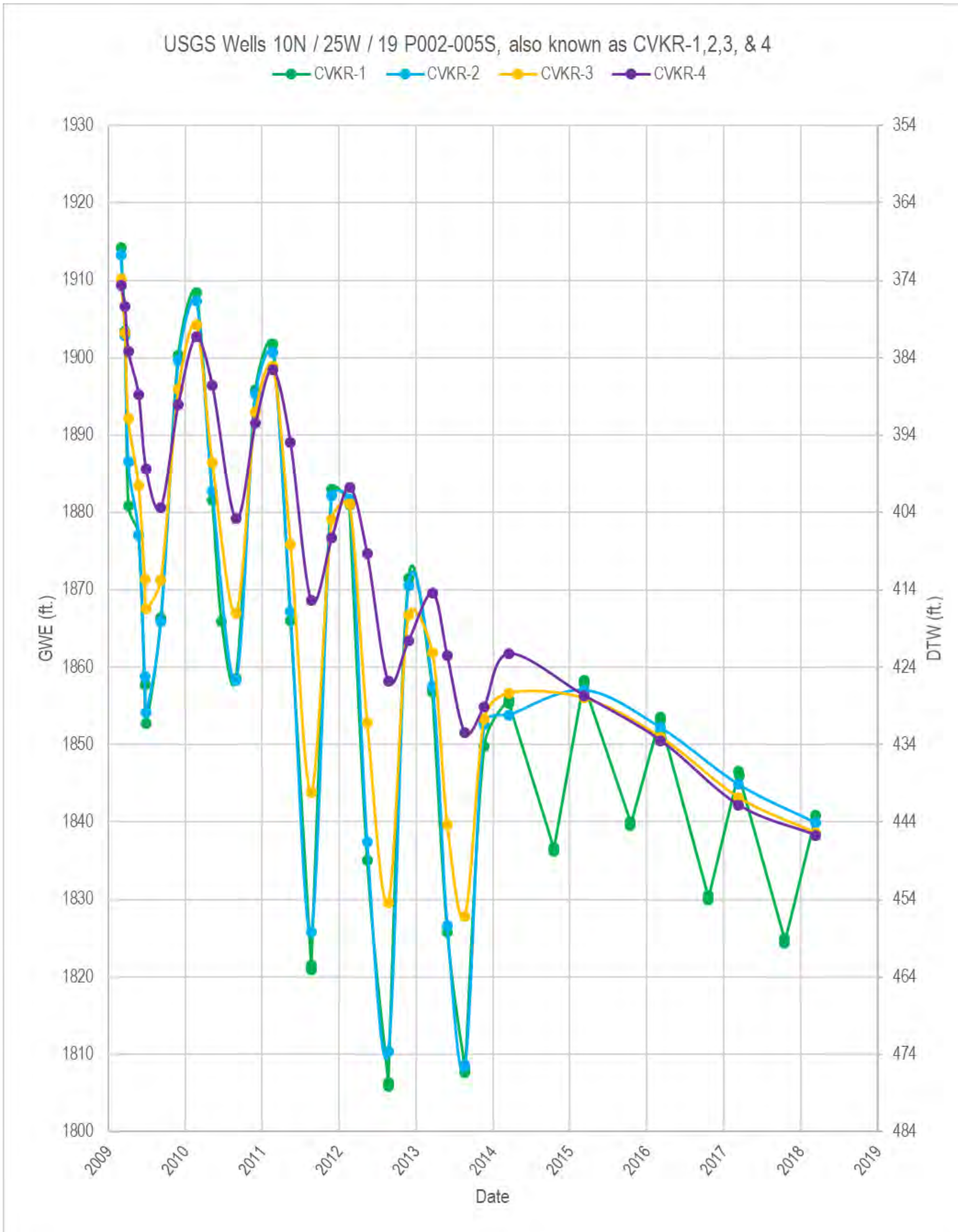

Figure 2.2-18: Hydrographs of CVKR1-4

Groundwater Contours

Groundwater contour maps were prepared to improve understanding of recent groundwater trends in the basin. Data collected in Section 2.2.2 was used to develop the contour maps. A contour map shows changes in groundwater elevations by interpolating groundwater elevations between monitoring sites. The elevations are shown on the map with the use of a contour line, which indicates that at all locations that line is drawn, it represents groundwater being at the elevation indicated. There are two versions of contour maps used in this section, one which shows the elevation of groundwater above msl, which is useful because it can be used to identify the horizontal gradients of groundwater, and one which shows contours of depth to water, the distance from the ground surface to groundwater, which is useful because it can identify areas of shallow or deep groundwater.

Groundwater contour maps were prepared for both groundwater elevation and depth to water for the following periods and are described below: Spring 2018, Fall 2017, Spring 2017, Spring 2015, and Fall 2014. These years were selected for contours to provide analysis of current conditions, and to identify conditions near January 1, 2015, the date whenthe Sustainable Groundwater Management Act (SGMA) came into effect.

Each contour map follows the same general format. Each contour map is contoured at a 50 foot contour interval, with contour elevations indicated in white numeric labels, and measurements at individual monitoring points indicated in black numeric labels. Areas where the contours are dashed and not colored in are inferred contours that extend elevations beyond data availability and are included for reference only. The groundwater contours prepared for this section were based on several assumptions in order to accumulate enough data points to generate useful contour maps:

- Measurements from wells of different depths are representative of conditions at that location and there are no vertical gradients. Due to the limited spatial amount of monitoring points, data from wells of a wide variety of depths were used to generate the contours.
- Measurements from dates that may be as far apart temporally as three months are representative of conditions during the spring or fall season, and conditions have not changed substantially from the time of the earliest measurement used to the latest. Due to the limited temporal amount of measurements in the basin, data from a wide variety of measurement dates were used to generate the contours.

These assumptions make the contours useful at the planning level to understand groundwater levels across the basin, and to identify general horizontal gradients and regional groundwater level trends. The contour maps are not indicative of exact values across the basin because groundwater contour maps approximate conditions between measurement points, and do not account for topography. Therefore, a well on a ridge may be farther from groundwater than one in a canyon, and the contour map will not reflect that level of detail.

Expansion and improvement of the monitoring network in order to generate more accurate understandings of groundwater trends in the basin is discussed in Section Z: Monitoring Networks

Figure 2.2-19 shows groundwater elevation contours for spring of 2018, along with arrows showing the direction of groundwater flow. In the southeastern portion of the basin near Ventucopa, groundwater has a horizontal gradient to the northwest. The gradient increases in the vicinity of the SBCF and flows to an area of lowered groundwater elevation southeast of the town of Cuyama. From the town of New Cuyama to the west, groundwater has a horizontal gradient that generally flows to the northeast, from areas with higher elevation topography towards areas with lower elevation topography where the Cuyama River is located.

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Figure 2.2-20 shows depth to groundwater contours for spring of 2018.. Just south the SBCF, groundwater is near 100 feet bgs. North of the SBCF, depth to groundwater declines rapidly and is over 600 feet bgs. Depth to groundwater reduces to the west towards New Cuyama, where groundwater is around 150 feet bgs. West of Bitter Creek, groundwater is shallower than 100 feet bgs in most locations, and is shallower than 50 feet bgs in the far west and along the Cuyama River.

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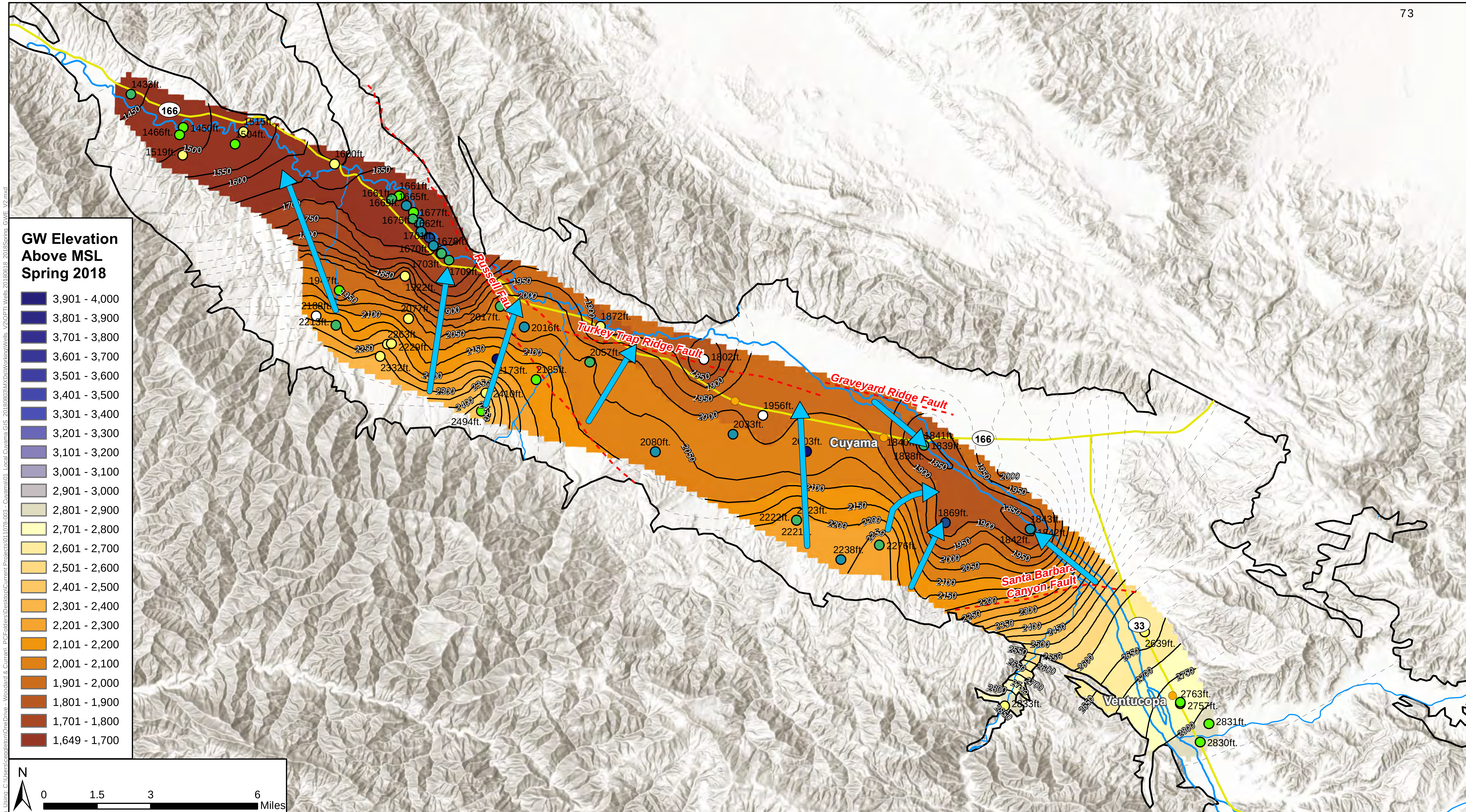

Legend	Cuyama Basin
	Cuyama River
	Faults
	Groundwater Elevation Above MSL
	Inferred Groundwater Elevation Above MSL
	Groundwater Flow Direction

Well Depth Below GSE

- Unknown
- 0 - 200 ft
- 200 - 400 ft
- 400 - 600 ft
- 600 - 800 ft
- 800 - 1,000 ft
- 1,000 - 1,200 ft

Contours were interpolated using data measured from 2/1/2018 - 4/30/2018 due to limited data availability.

Contours Interval: 50 ft.

Figure 2.2-19: Cuyama GW Basin Wells by Groundwater Surface Elevation

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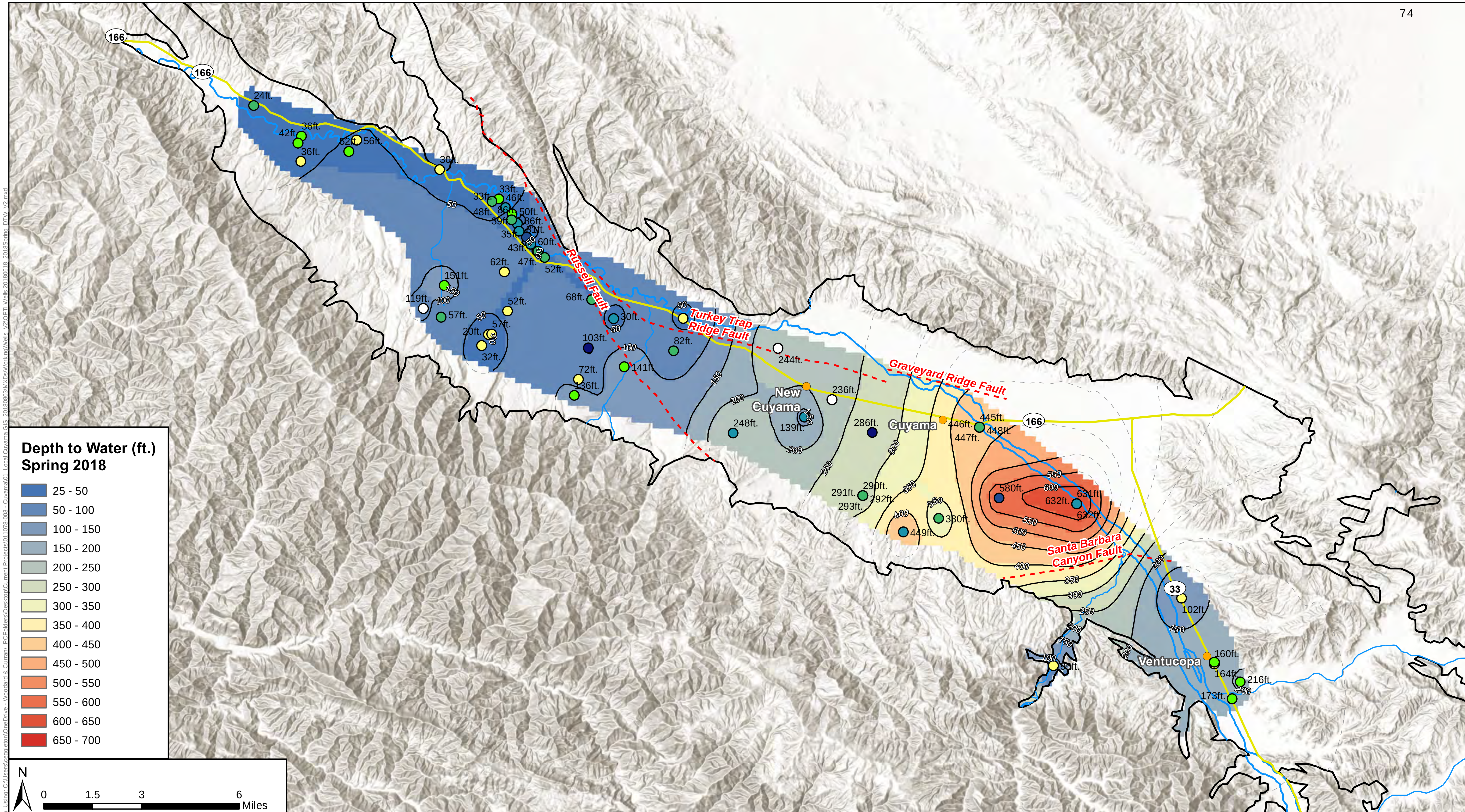

Figure 2.2-20: Cuyama GW Basin Wells by Depth to Water

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

August 2018

Legend

- Cuyama Basin
- Cuyama River
- Faults
- Groundwater Depth-to-Water Contours below Groundsurface
- Inferred Groundwater Depth-to-Water Contours below Groundsurface

Well Depth Below GSE

- Unknown
- 0 - 200 ft
- 200 - 400 ft
- 400 - 600 ft
- 600 - 800 ft
- 800 - 1,000 ft
- 1,000 - 1,200 ft

Contours were interpolated using data measured from 2/1/2018 - 4/30/2018 due to limitated data availability.

Contours Interval: 50 ft.

Contour maps for spring 2017, fall 2017, spring 2015, and fall 2014 are included in Appendix Y. These dates were selected to show the changes over the most recent period of 3 years for which data was available in the Spring (from 2015 to 2018) and from the Fall (from 2014 to 2017). Each contour map is described in this section.

Figure Y-1 shows groundwater elevation contours for fall of 2017. Because more data was available in this time frame, the contour map has increased detail in some areas. In the southeastern portion of the basin near the Ozena fire station, groundwater gradients appear to indicate flows that follow the Cuyama River. The contour map shows a steep gradient across the SBCF and flows to an area of lowered groundwater elevation northeast of the town of Cuyama. From the town of New Cuyama to the west, groundwater has a horizontal gradient that generally flows to the northeast, from areas with higher elevation topography towards areas with lower elevation topography where the Cuyama River is located.

Figure Y-2 shows depth to water contours for fall of 2017. Because more data was available in this time frame, the contour map has increased detail in some areas. In the southeastern portion of the basin near the Ozena fire station, depth to water is under 50 feet bgs. There is a steep gradient near the SBCF, and groundwater is below 600 feet bgs immediately northwest of the SBCF. The central portion of the basin generally has a depth to water between 400 and 500 feet bgs, with depth to groundwater decreasing to the west of New Cuyama. West of Bitter Creek, groundwater is generally shallower than 100 feet below bgs, and is shallower than 50 feet bgs along the Cuyama River in most cases.

Figure Y-3 shows groundwater elevation contours for spring of 2017. Because more data was available in this time frame, the contour map has increased detail in some areas. In the southeastern portion of the basin near the Ozena fire station, groundwater gradients appear to indicate flows that follow the Cuyama River. The contour map shows a steep gradient across the SBCF and flows to an area of lowered groundwater elevation northeast of the town of Cuyama. From the town of New Cuyama to the west, groundwater has a horizontal gradient that generally flows to the northeast, from areas with higher elevation topography towards areas with lower elevation topography where the Cuyama River is located.

Figure Y-4 shows depth to water contours for spring of 2017. In the southeastern portion of the basin near the Ozena fire station, depth to water is under 50 feet bgs. Depth to groundwater near Ventucopa is between 150 and 200 feet bgs. There is a steep gradient near the SBCF, and groundwater is below 600 feet bgs immediately northwest of the SBCF. The central portion of the basin generally has a depth to water between 350 and 500 feet bgs, withdepth to groundwdater decreasing to the west of New Cuyama. West of Bitter Creek, groundwater is generally shallower than 100 feet below bgs, and is shallower than 50 feet bgs along the Cuyama River in most cases.

Figure Y-5 shows groundwater elevation contours for spring of 2015. In the southeastern portion of the basin near the Ozena fire station, groundwater gradients appear to indicate flows that follow the Cuyama River. The contour map shows a steep gradient across the SBCF and flows to an area of lowered groundwater elevation northeast of the town of Cuyama. From the town of New Cuyama to the west, the limited number of data points restrict strong interpretation of the gradient, which is to the northwest.

Figure Y-6 shows depth to water contours for spring of 2015. In the southeastern portion of the basin near the Ozena fire station, depth to water is under 50 feet bgs. Depth to groundwater near Ventucopa is between 150 and 200 feet bgs. There is a steep gradient near the SBCF, and groundwater is below 600 feet bgs immediately northwest of the SBCF. The central portion of the basin generally has a depth to water between 350 and 450 feet bgs, with groundwater levels rising to the west of New Cuyama. These depths are in general less severe than those shown for the spring of 2017, reflecting deepening depth to groundwater conditions in the central portion of the Basin. Interpretation from New Cuyama to monitoring points in the northwest is hampered by a limited set of data points.

Figure Y-7 shows groundwater elevation contours for fall of 2014. In the southeastern portion of the basin near the Ozena fire station, groundwater gradients appear to indicate flows that follow the Cuyama River. The contour map shows a steep gradient across the SBCF and flows to an area of lowered groundwater elevation northeast of the town of Cuyama.

Figure Y-8 shows depth to water contours for fall of 2014. In the southeastern portion of the basin near the Ozena fire station, depth to water is under 50 feet bgs. There is a steep gradient near the SBCF, and groundwater is below 600 feet bgs immediately northwest of the SBCF. The central portion of the basin generally has a depth to water between 350 and 500 feet bgs, with groundwater levels rising to the west of New Cuyama. These depths are in general less severe than those shown for the fall of 2017, reflecting depth to groundwater conditions in the central portion of the Basin.. Interpretation from New Cuyama to monitoring points in the northwest is hampered by a limited set of data points.

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2.2.4 Change in Groundwater Storage

This section is under development and will feature outputs from model development. This section will include the following:

- Change in groundwater storage for the last 10 years
- How change in storage was calculated
- Estimates of annual use
- Water year types and their relationship to changes in storage
- Cover conditions at Jan 1 2015, or as close as possible

2.2.5 Seawater Intrusion

Seawater intrusion is not an applicable sustainability indicator, because seawater intrusion is not present in the Basin and is not likely to occur due to the distance between the Basin and the Pacific Ocean, bays, deltas, or inlets.

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2.2.6 Land subsidence

The USGS measured land subsidence as part of its technical analysis of the Cuyama Valley in 2015. The USGS used two continuous global positioning systems (GPS) sites and five reference point interferometric synthetic-aperture radar (InSAR) sites, shown in Figure 2.2-21 (USGS, 2015). There are 308 monthly observations from 2000 to 2012, and total subsidence over the 2000 to 2012 period ranged from 0.0 to 0.4 feet. The USGS simulated subsidence using CUVHM, and estimated that inelastic subsidence began in the late 1970s (USGS, 2015).

Subsidence data was collected from the University NAVSTAR Consortium (UNAVCO) database. UNAVCO maintains data on five GPS monitoring stations in the area in and around the basin. Figure 2.2-22 shows the monitoring stations and their measurements since 1999. Three stations (P521, OZST, and BCWR) are located just outside the basin. The three stations' measurements show ground surface level as either staying constant or slightly increasing. The increase is potentially due to tectonic activity in the region. Two stations (VCST and CUHS) are located within the basin. Station VCST is located near Ventucopa and indicates that subsidence is not occurring in that area. Station CUHS indicates that 300 millimeters (approximately 12 inches) of subsidence have occurred in the vicinity of New Cuyama over the 19 years that were monitored. The subsidence at this station increases in magnitude following 2010, and generally follows a seasonal pattern. The seasonal pattern is possibly related to water level drawdowns during the summer, and elastic rebound occurring during winter periods.

A white paper that provides information about subsidence and subsidence monitoring techniques is included in Appendix Z.

DRAFT

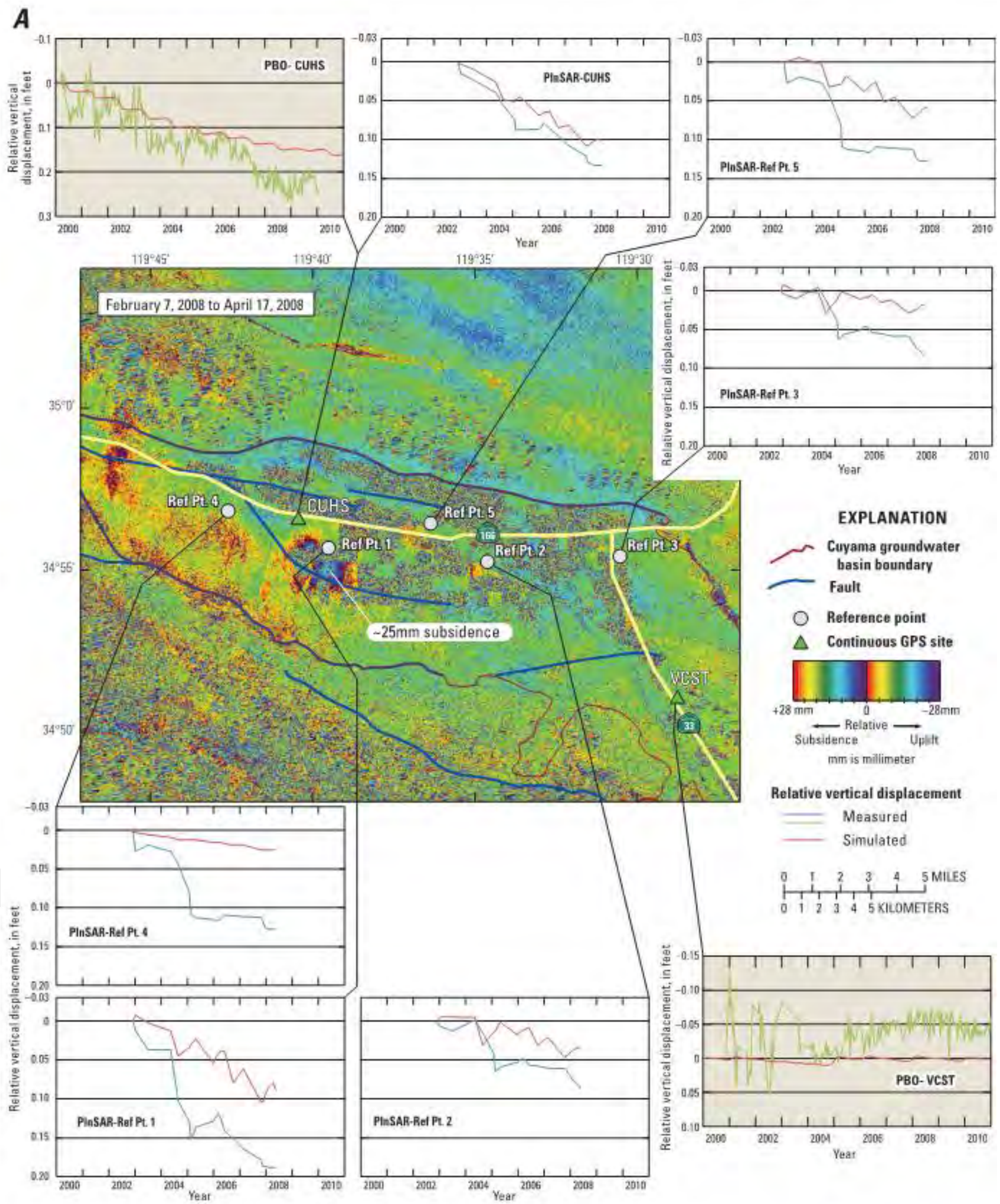

Figure 29. Historical subsidence as *A*, map of seasonal InSAR with graphs of simulated and measured time series for selected locations of relative land-surface deformation from Plate-Boundary Observation (PBO) sites and Point InSAR targets, and *B*, simulated total subsidence 1950–2010 for the calibrated hydrologic flow model, Cuyama Valley, California.

-

Source: USGS, 2015

Figure 2.2-21: Locations of Continuous GPS and Reference InSAR Sites in the Cuyama Valley

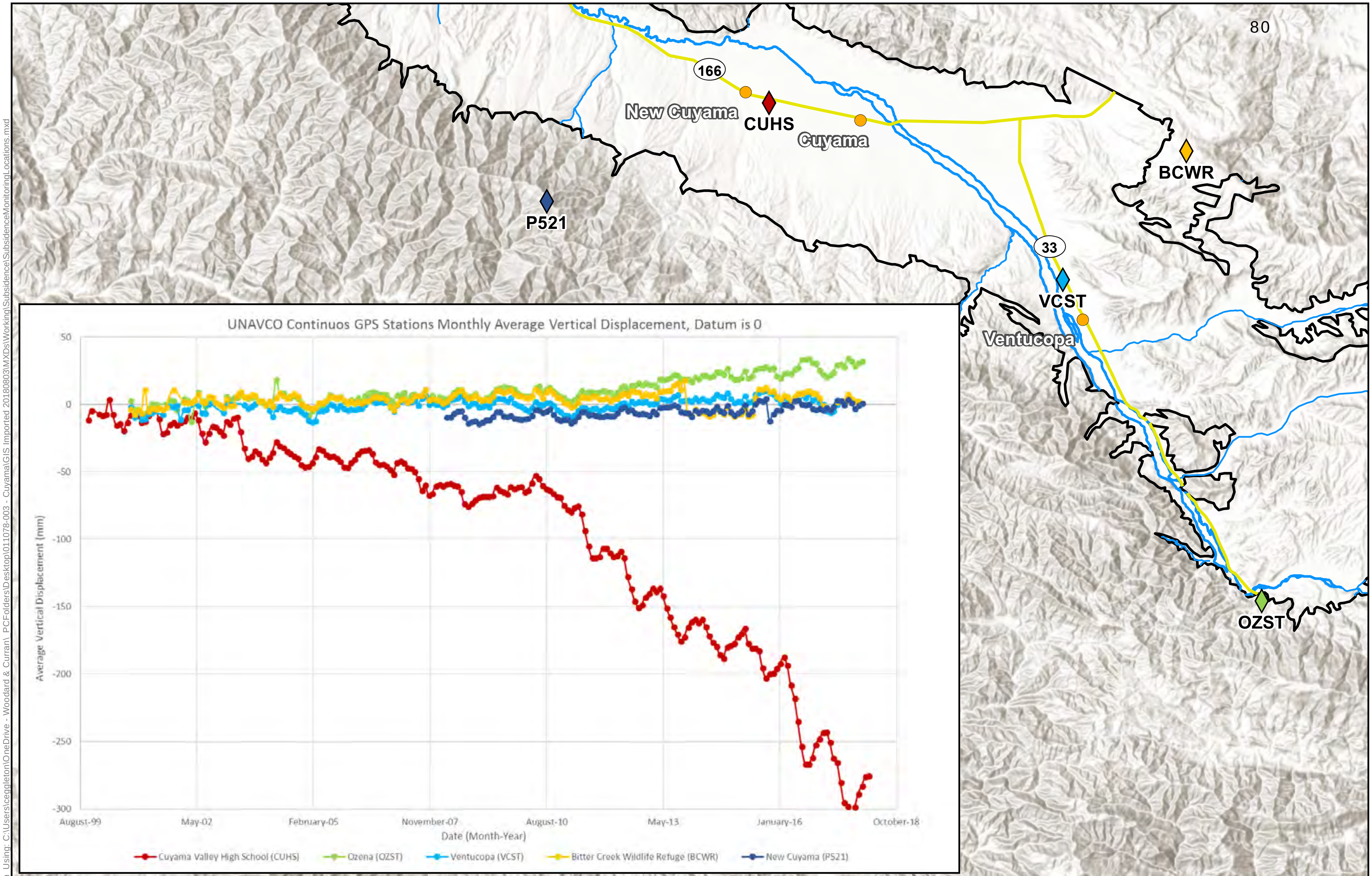

Figure 2.2-22: Subsidence Monitoring Locations

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

August 2018

WOODARD & CURRAN

Legend

- Cuyama Basin
- Towns
- Highways
- Cuyama River
- Streams

0 2.5 5 10 Miles

N

Figure Exported: 8/20/2018 By: ceggleton Using: C:\Users\ceggleton\OneDrive - Woodard & Curran\ PCFolders\Desktop\011078-003 - Cuyama\GIS Imported 20180803\MXDs\Working\Subsidence\SubsidenceMonitoringLocations.mxd

2.2.7 Groundwater Quality

This section presents groundwater quality information in the basin, including a discussion of available water quality data and references, analysis of water quality data that was performed for the GSP, and a literature review of previous studies of water quality in the Basin.

Reference and Data Collection

References and data related to groundwater quality were collected from a variety of sources. Data was collected from:

- National Water Quality Monitoring Council (USGS)- Downloaded 6/1/2018 from https://www.waterqualitydata.us/portal/
- GeoTracker GAMA (DWR)- Downloaded 6/5/2018, for each county, from http://geotracker.waterboards.ca.gov/gama/datadownload
- California Natural Resources Agency (DWR) downloaded 6/14/2018 from https://data.cnra.ca.gov/dataset/periodic-groundwater-level-measurements
- County of Ventura
- Private landowners

Data was compiled into a database for analysis.

References containing groundwater quality information were also compiled. The information included in these references are used to enhance understanding of groundwater quality conditions beyond available data. References used in this section include:

- Singer and Swarzensky, 1970 – *Pumpage and Ground-Water Storage Depletion in Cuyama Valley, 1947-1966.* This report focused on groundwater depletion, but also included information about groundwater quality.
- USGS, 2008 - Groundwater-Quality Data in the South Coast Interior Basins Study Unit, 2008: Results from the California Groundwater Ambient Monitoring and Assessment (GAMA) Program. This study performed water quality testing on 12 wells in the Cuyama Valley and tested for a variety of constituents.
- SBCWA 2011 – *Santa Barbara County 2011 Groundwater Report.* This report provided groundwater conditions throughout the County, and provided water quality information for the Cuyama Valley.
- USGS 2013c – Geology, Water-Quality, Hydrology, and Geomechanics of the Cuyama Valley Groundwater Basin, California, 2008-12. This report investigated a wide variety of groundwater components including water quality.

Data Analysis

Collected data was analyzed for Total Dissolved Solids (TDS), nitrate, and arsenic. These three constituents have been included because they were cited during public meetings as being of concern to stakeholders in the Basin.

Figure 2.2-23 shows TDS of groundwater measured in wells in 1966. In 1966, TDS was above the MCL of 1,500 micrograms per liter (mg/L) in over 50% of measurements. TDS was over 2,000 mg/L near the Cuyama River in the southeast portion of the basin near the Ozena Fire Station, Santa Barbara Canyon, and upper Quatal Canyon, indicating that high TDS water was entering the basin from the watershed above these measurement points. TDS measurements were over the Maximum Contaminant Level (MCL) throughout the central portion of the basin where irrigated agriculture was operating, and near the towns of Cuyama and New Cuyama, and along the Cuyama River to the northwest of New Cuyama. TDS was less than 500 mg/L in a number of measurements between Bitter Creek and Cottonwood Canyon, indicating that lower TDS water was entering the basin from the watersheds in this area.

Figure 2.2-24 shows TDS of groundwater measured in wells between 2011 and 2018. Multiple years of collected data were used to generate enough mapped data density for comparison to 1966 data. In the 2011-2018 period, TDS was above the MCL in over 50% of measurements. TDS was over 1,500 mg/L near the Cuyama River in the southeast portion of the basin near the Ozena Fire Station, and in Santa Barbara Canyon, indicating that high TDS water was entering the basin from the watershed above these measurement points. TDS measurements were over the MCL throughout the central portion of the basin where irrigated agriculture was operating. A number of 500-1,000 mg/L TDS concentrations were measured near New Cuyama and in upper Quatal Canyon, and along the Cuyama River between Cottonwood Canyon and Schoolhouse Canyon.

Figure 2.2-25 shows measurements of TDS for selected monitoring points over time. Monitoring points were selected by the number of measurements, with higher counts of measurements selected to be plotted. The charts indicate that TDS in the vicinity of New Cuyama has been over 800 mg/L TDS throughout the period of record, and that TDS has either slightly increased or stayed stable over the period of record. The chart for Well 85 at the intersection of Quatal Canyon and the Cuyama River is generally below 800 mg/L TDS with rapid spikes of TDS increases above that level. The timing of rapid increases in measured TDS correspond with Cuyama River flow events, indicating a connection between rainfall and stream flow and an increase in TDS. This is the only location where this trend was detected.

Figure 2.2-26 shows measurements of nitrate in 1966. Figure 2.2-26 shows that data collected in 1966 was below the MCL of 10 mg/L throughout the basin, with some measurements above the MCL in the central portion of the basin where irrigated agriculture was operating.

Figure 2.2-27 shows measurements of nitrate of groundwater measured in wells between 2011 and 2018. Multiple years of collected data were used to generate enough mapped data density for comparison to 1966 data. Figure 2.2-27 shows that data collected over this period was generally below the MCL, with two measurements that were over 20 mg/L.

Figure 2.2-28 shows arsenic measurements from 2008-2018. Data was not available prior to this time period in significant amounts. Figure 2.2-28 shows that arsenic measurements were below the MCL of 10 ug/L in the majority of the Basin where data was available. However, high arsenic values exceeding 20 ug/L were recorded at three well locations in the area to the South of the town of New Cuyama – all of these high concentration samples were taken at depths of 700 feet or greater; readings in the same area taken at shallower depths were below the MCL level.

Figure 2.2-29: shows the results of a query with the Regional Water Quality Control Board (RWQCB)'s Geotracker website. Geotracker documents contaminant concerns that the RWQCB is or has been working with site owners to clean up. As shown in Figure 2.2-29, in most of these sites gas, oil and/or diesel have been cited as the contaminant of concern.

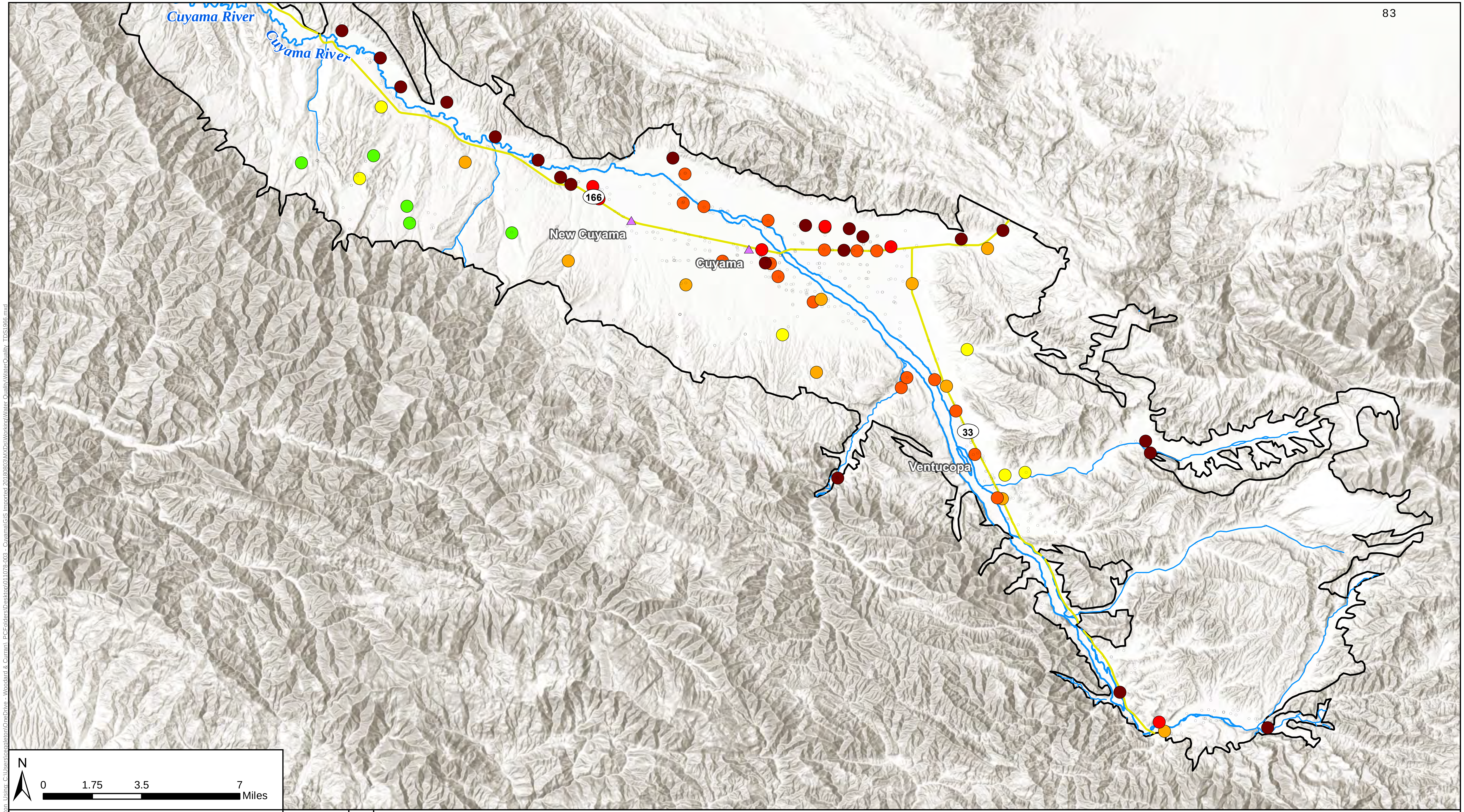

Figure 2.2-23: 1966 Average Well Measurements of Total Dissolved Solids, mg/L

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

August 2018

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Legend

TDS, mg/L

- No Measurements
- < 500 mg/L
- 500 - 1,000 mg/L
- 1,000 - 1,500 mg/L
- 1,500 - 1,750 mg/L
- 1,750 - 2,000 mg/L
- >2,000 mg/L

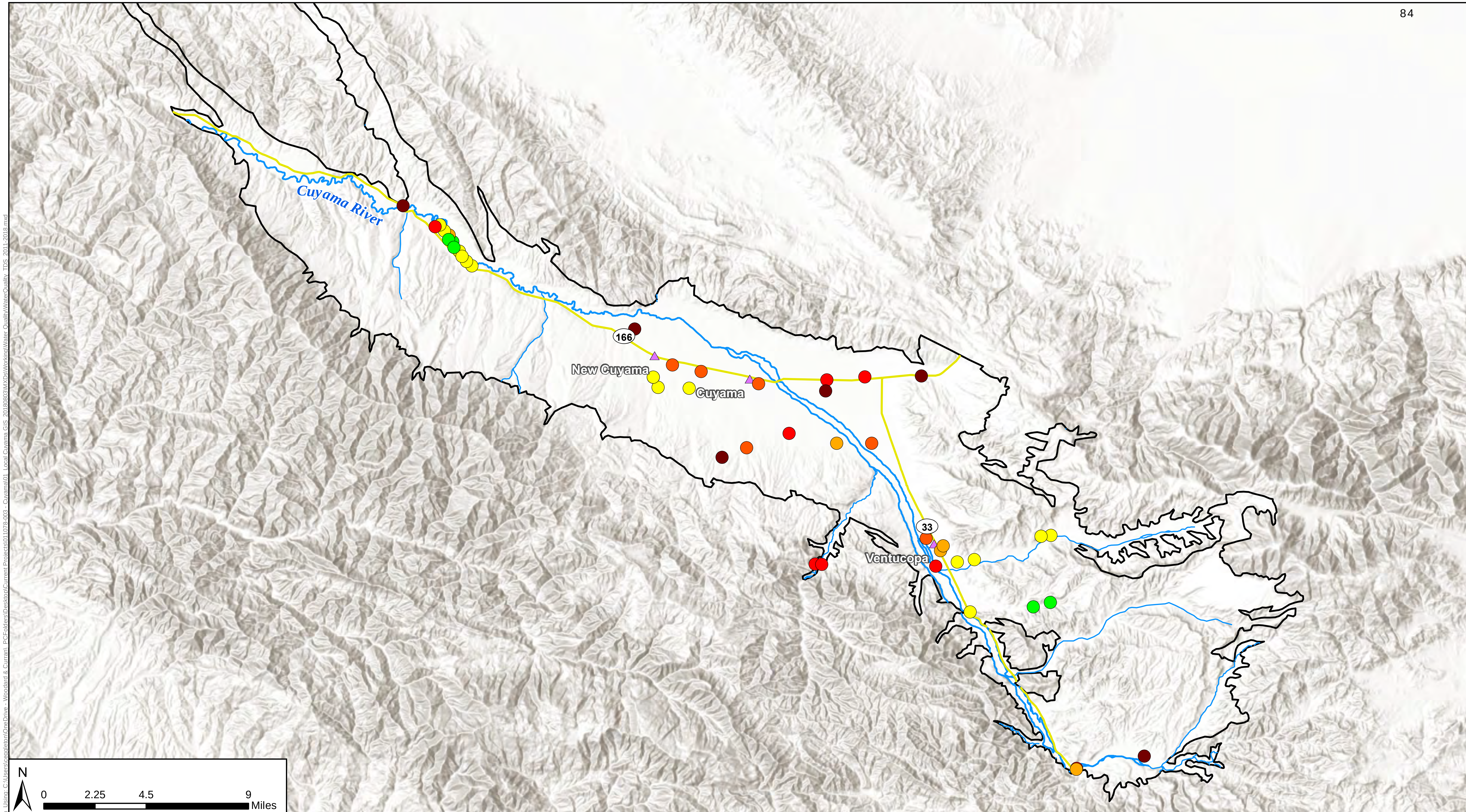

Figure 2.2-24:2011-2018 Average Well Measurements of Total Disolved Solids, mg/L

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

August 2018

WOODARD & CURRAN

Legend

TDS, mg/L

Average_Re

- < 500 mg/L
- 500 - 1,000 mg/L
- 1,000 - 1,500 mg/L
- 1,500 - 1,750 mg/L
- 1,750 - 2,000 mg/L
- > 2,000 mg/L

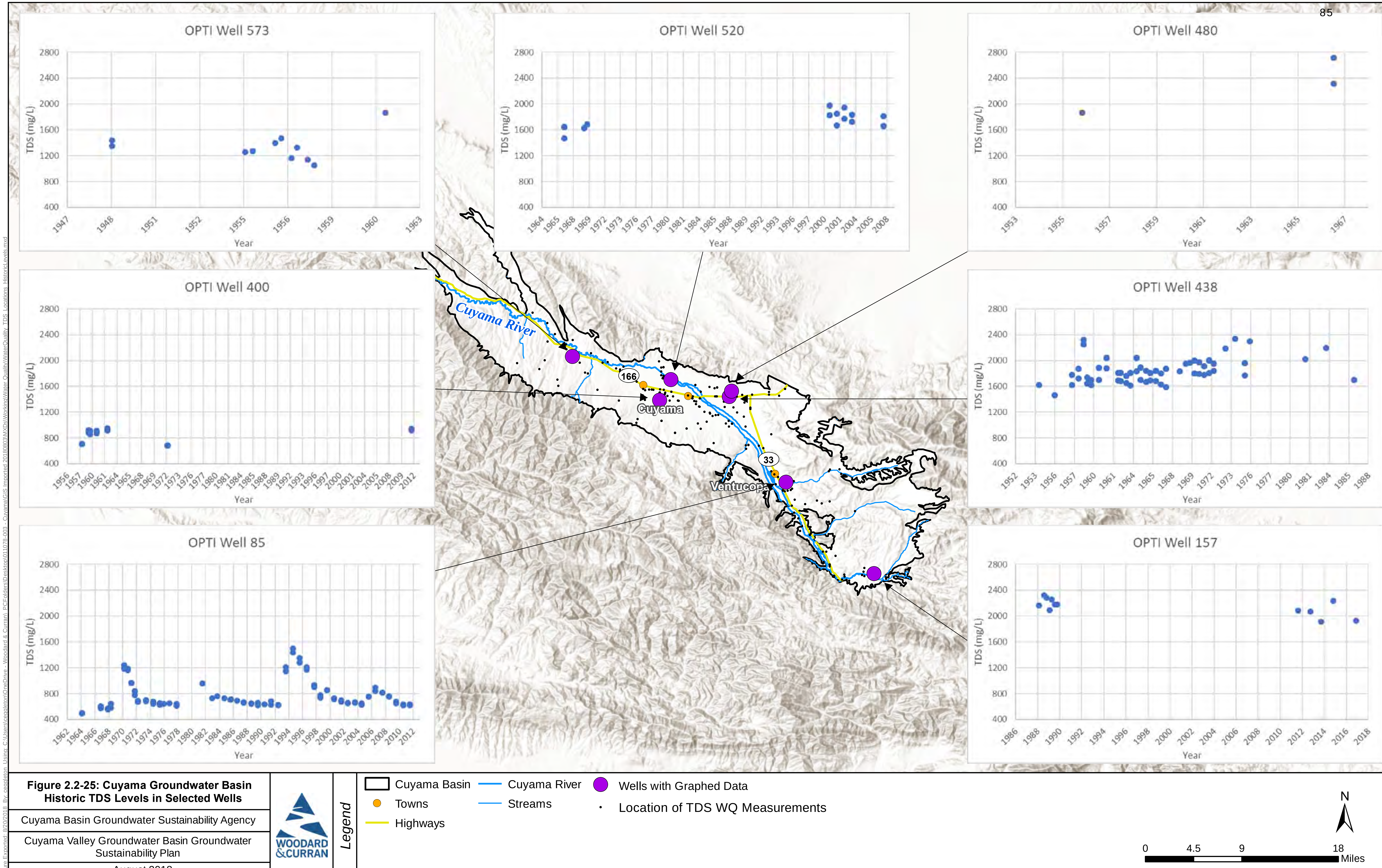

Figure 2.2-25: Cuyama Groundwater Basin Historic TDS Levels in Selected Wells

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

August 2018

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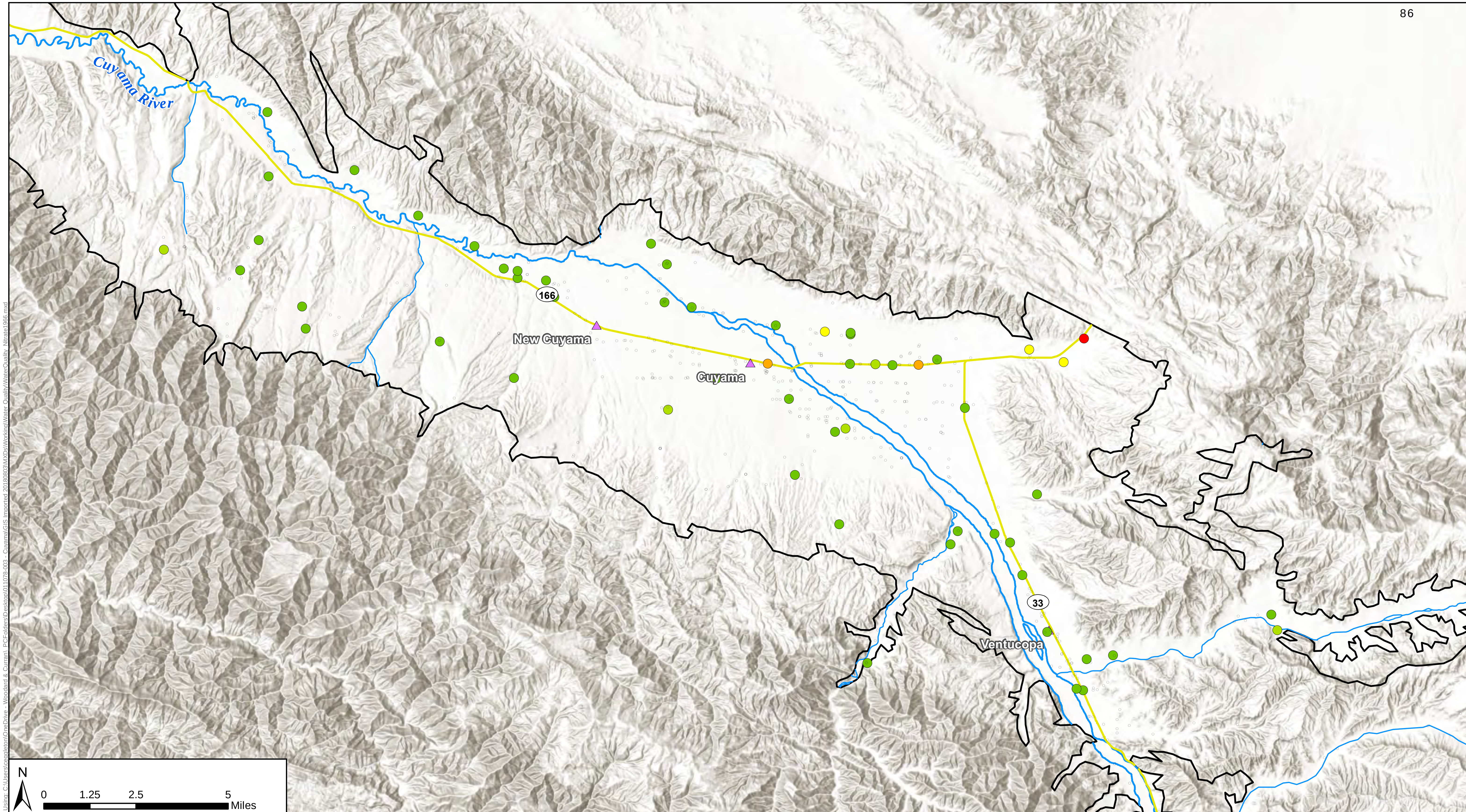

Figure 2.2-26: 1966 Average Well Measurements of Nitrate (NO3) as Nitrogen

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

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Legend

Nitrate (NO3) as N, mg/L

- No Measurements
- < 5 mg/L
- 5 - 8 mg/L
- 8 - 10 mg/L
- 10 - 15 mg/L
- 15 - 20 mg/L
- > 20 mg/L

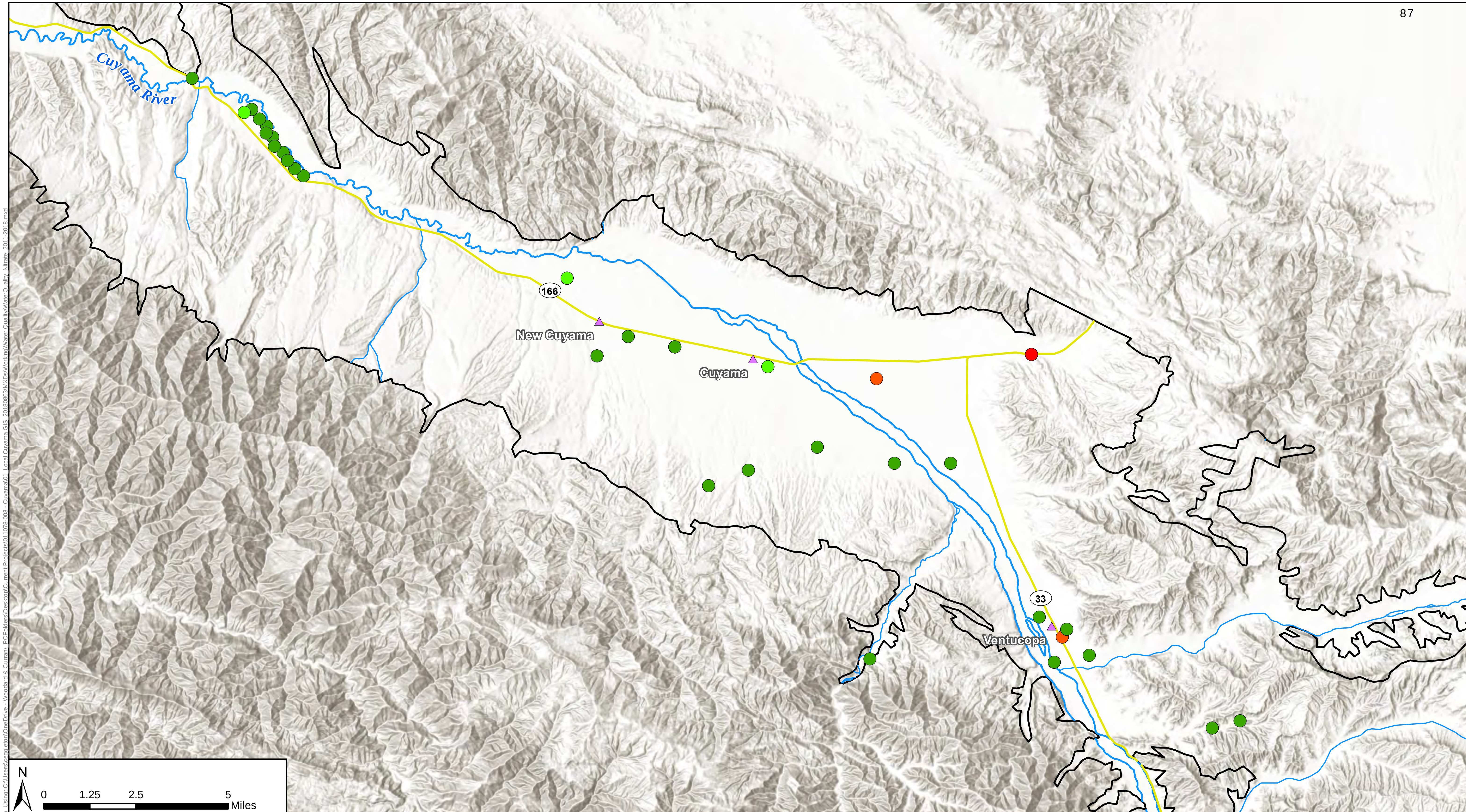

Figure 2.2-27: 2011-2018 Average Well Measurements of Nitrate (NO3) as Nitrogen

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

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Legend

Nitrate (NO3) as N, mg/L

- < 5 mg/L
- 5 - 8 mg/L
- 8 - 10 mg/L
- 10 - 15 mg/L
- 15 - 20 mg/L
- > 20 mg/L

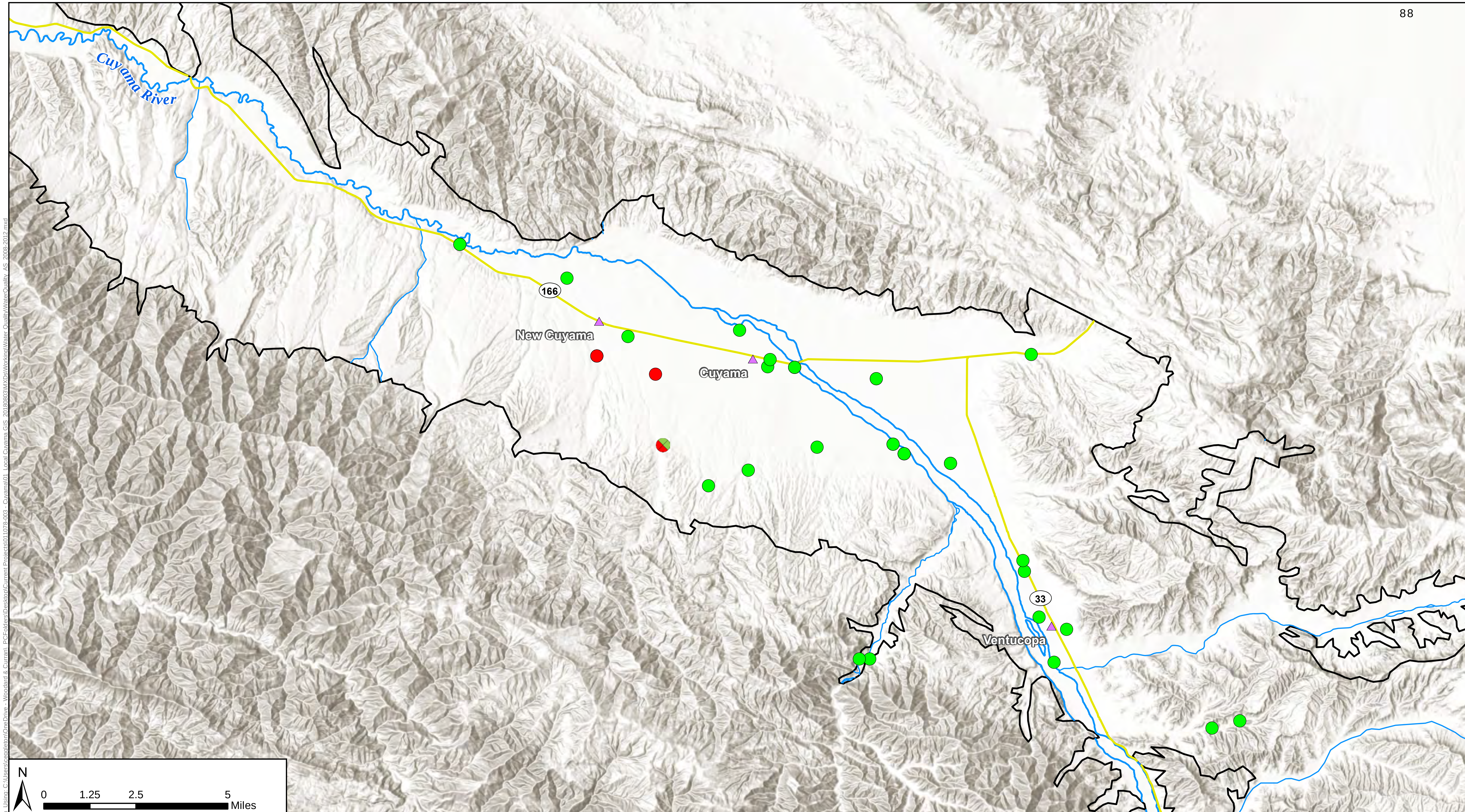

Figure 2.2-28: 2008-2018 Average Well Measurements of Arsenic, ug/L

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

August 2018

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Legend

Aresenic (As), ug/L

- < 5 ug/L
- 5 - 10 ug/L
- 10 - 20 ug/L
- > 20 ug/L

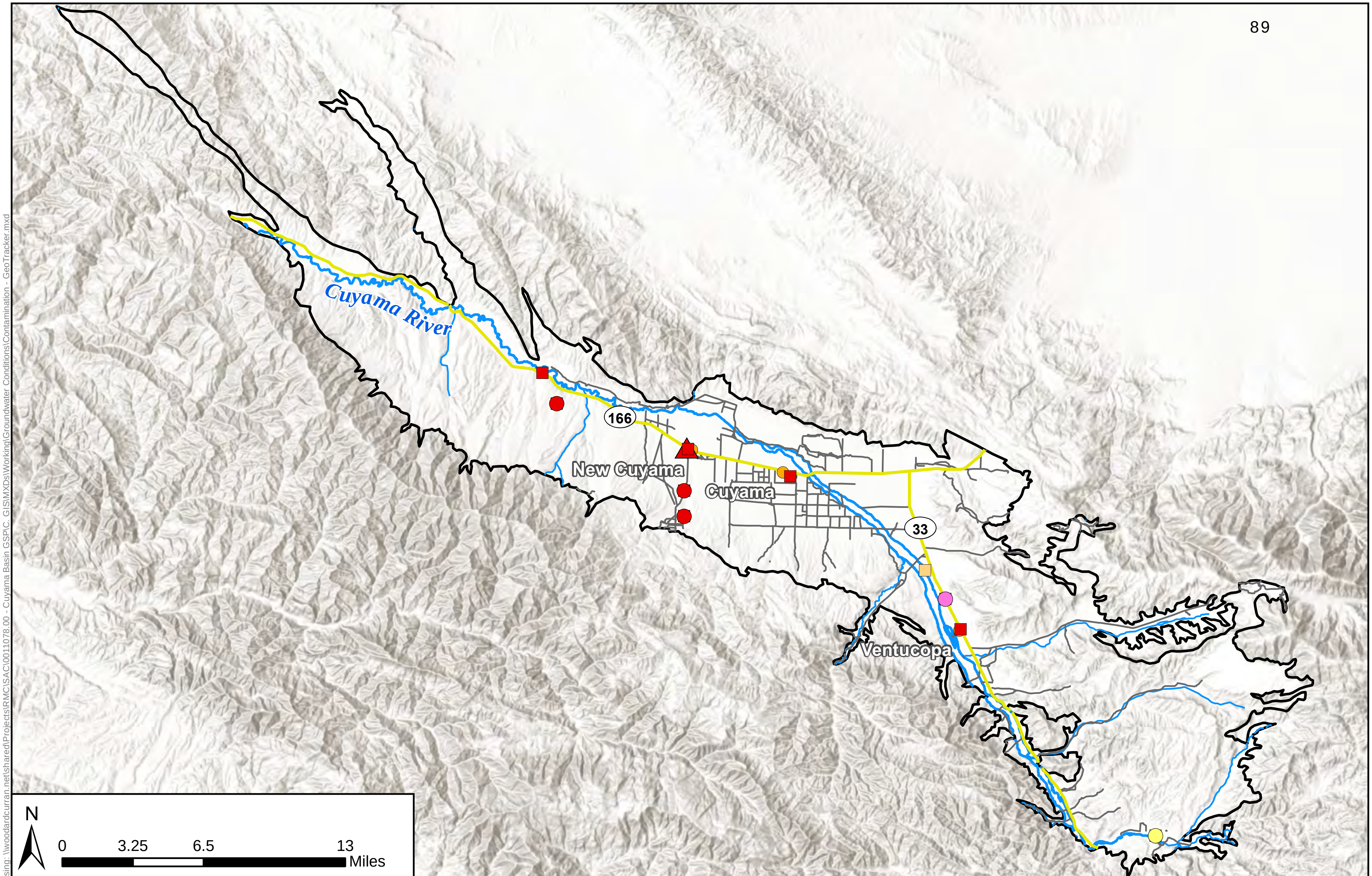

Figure 2.2-29 - Sites with Water Quality Concerns

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

August 2018

WOODARD & CURRAN

Legend

- Cuyama Basin
- Towns
- Highways
- Local Roads
- Cuyama River
- Streams

Site Status

- Open Sites
- Closed Sites
- Permitted UST

Contaminant of Concern

- Gas, Oil &/or Diesel
- TPH & Lead
- VOCs
- Alcohols

Figure Exported: 8/7/2018 By: Isalberg Using: \\woodardcurran.net\shared\Projects\RMC\SAC\0011078.00 - Cuyama Basin GSP\C. GIS\MXDs\Working\Groundwater Conditions\Contamination - GeoTracker.mxd

Literature Review

In 1970, Singer and Swarzenski reported that TDS in the central basin was in the range of 1,500 to 1,800 mg/L TDS, and that the cations that contributed to the TDS and the amount of TDS varied by location in the basin. They reported that TDS was lower (400 to 700 mg/L) in areas downstream from the Sierra Madre Mountains where TDS was made up of sodium or calcium bicarbonate, and higher (3,000-6,000 mg/L) in wells close to the Caliente Range and in the northeastern part of the valley. They stated that the high TDS is generated by mixing of water from marine rocks with more recent water from alluvium. They determined that groundwater movement favors movement of brackish water from the north of the Cuyama River towards areas of groundwater depletion, and that return of some water applied during irrigation and needed for leaching the soil carries dissolved salts with it to the water table (Singer and Swarzensky, 1970).

In 2008, the USGS reported the results of the GAMA study, which sampled 12 wells for a wide variety of constituents. The locations of the wells provided in the GAMA study are shown in Figure 2.2-30. The study identified that specific conductance, which provides an indication of salinity, ranged from 637 to 2,380 uS/cm across the study's 12 wells. The GAMA study reported that the following constituents were not detected at levels above the MCL for each constituent in any samples for the following constituents:

- Pesticides or pesticide degradates
- Gasoline and refrigerants
- Aluminum, antimony, barium, beryllium, boron, cadmium, copper, iron, and lead
- Ammonia and phosphate
- Lithium, Molybdenum, Nickel, Selenium, Strontium, Thallium, Tungsten, Uranium, Vanadium, and Zinc
- Bromide, Calcium, Chloride, Fluoride, Iodide, Magnesium, Potassium, Silica, and Sodium

The GAMA study reported that there were detections at levels above the MCL for the following constituents:

- Manganese exceeded its MCL in two wells.
- Arsenic exceeded the MCL in one well.
- Nitrate exceeded the MCL in two wells
- Sulfate exceeded its MCL in eight wells
- TDS exceeded its MCL in seven wells
- VOCs detected in one well.

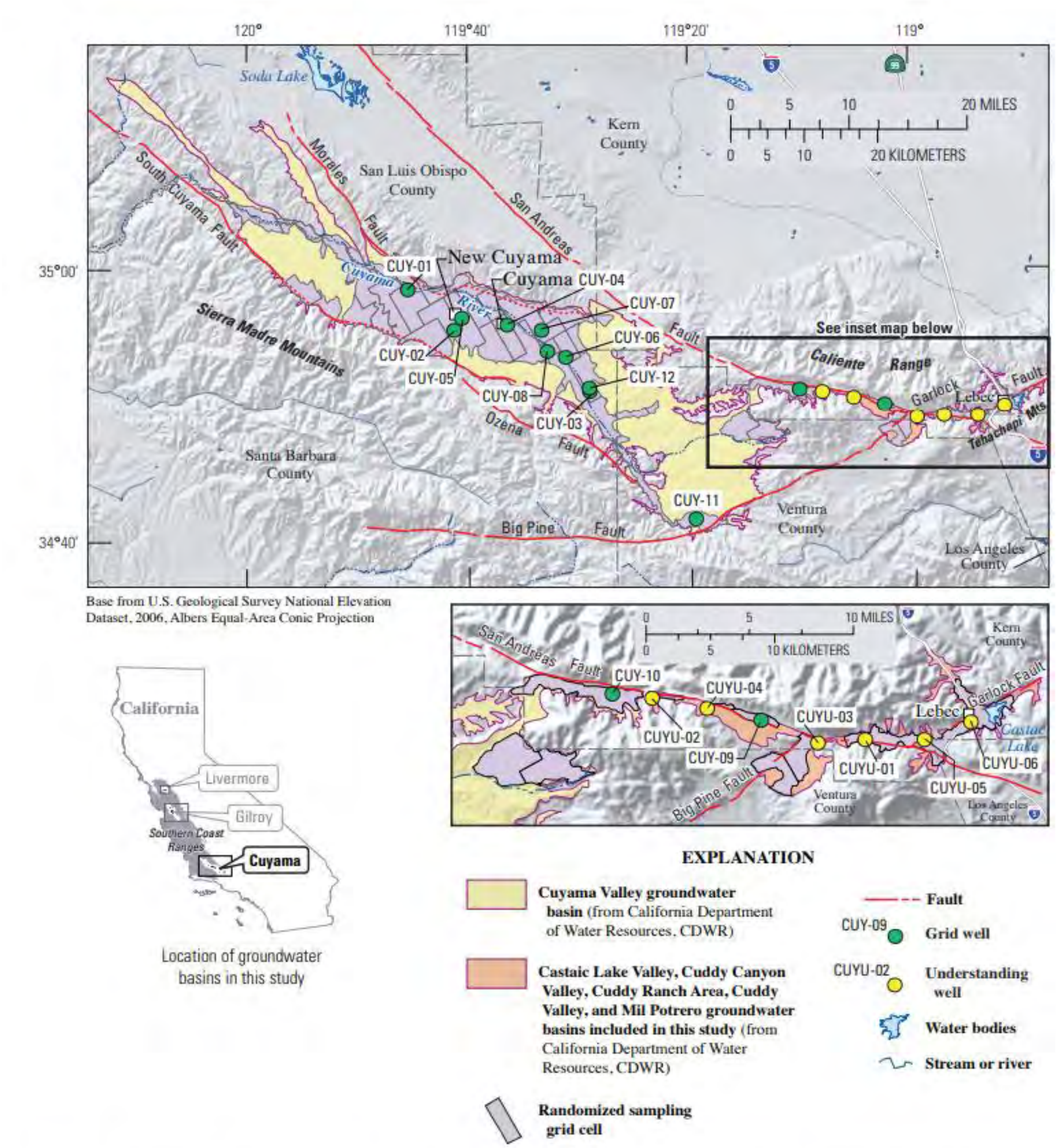

Figure 5. The South Coast Interior Basins Groundwater Ambient Monitoring and Assessment (GAMA) study unit showing the distribution of the Cuyama study-area grid cells, the location of sampled grid wells and understanding wells, the Cuyama Valley, Castaic Lake Valley, Cuddy Canyon Valley, Cuddy Ranch Area, Cuddy Valley, and Mil Potrero groundwater-basin boundaries (as defined by the California Department of Water Resources, CDWR), major cities, major roads, topographic features, and hydrologic features. Alphanumeric identification numbers for grid wells

Source: USGS, 2008

Figure 2.2-30: Locations of GAMA Sample Locations

In 2011, SBCWA reported that TDS in the basin typically ranges from 1,500 to 1,800 mg/L in the main part of the basin, while the eastern portion of the Cuyama Badlands near Ballinger, Quatal, and Apache Canyons has better water quality with TDS typically ranging rom 400 to 700mg/L. SBCWA noted spikes in TDS in the Badlands Well following the wet rainfall years of 1969 and 1994 and state that the spikes are attributable to overland flow from rainfall which is flushing the upper part of the basin after dry periods.

SBCWA reported that boron is generally higher in the upper part of the basin and is of higher concentration in the uplands than in the deeper wells in the central part of the basin. Toward the northeast end of the basin at extreme depth there exists poor quality water, perhaps connate (trapped in rocks during deposition) from rocks of marine origin.

SBCWA also reported: "There was little change in TDS, calcium, magnesium, nitrates and sulfates during the 2009- 2011 period. In some cases, concentrations of these nutrients actually fell during the period, most likely due to a lack of rainfall, recharge and flushing of the watershed. As the Cuyama watershed is mostly dry, water quality data must be examined with caution as sometimes overland flow from rainfall events "flushes" the watershed and inorganic mineral concentrations actually peak during storm flows. Typically, in other areas of Santa Barbara County mineral concentrations are diluted during widespread storm runoff out of natural watersheds."

In 2013, USGS reported that they collected groundwater quality samples at 12 monitoring wells, 27 domestic wells, and 2 springs for 53 constituents including: field parameters (water temperature, specific conductance, pH, DO, alkalinity), major & minor ions, nitrate, trace elements, stable isotopes of hydrogen and oxygen, tritium and carbon-14 activities, arsenic, iron, and chromium. The USGS sampling locations are presented in a figure from the report in Figure 2.2-31. The USGS reported the results of the sampling as:

- Groundwater in the alluvial aquifer system has high concentrations of TDS and sulfate
- 97% of samples had concentrations greater than 500 mg/L for TDS
- 95% of samples had concentrations greater than 250 mg./L for sulfate
- 13% of samples had concentrations greater than 10 mg/L for nitrate
- 12% of samples had concentrations greater than 10 ug/L for arsenic
- 1 sample had concentrations greater than the MCL for fluoride
- 5 samples had concentrations greater than 50 mg/L for manganese
- 1 sample had concentration of iron greater than 300 mg/L for iron
- 1 sample had concentration of aluminum greater than 50 mg/L

The USGS reported that nitrate was detected in five locations above the MCL of 10 mg/L. Four wells where nitrate levels were greater than the MCL were in the vicinity of the center of agricultural land-use area. Irrigation return flows are possible source of high nitrate concentrations. There was a decrease in concentrations with depth in the agricultural land use area which indicated the source of higher nitrate concentrations likely to be near the surface. The lowest nitrate levels were outside the agricultural use area, and low concentrations of nitrate (less than 0.02 mg/L) in surface water samples indicated surface water recharge was not a source of high nitrate

The USGS reported that arsenic was found in greater concentration than the MCL of 10 ug/L in 4 of the 33 wells sampled, and samples of total chromium ranged from no detections to 2.2 ug/L, which is less than the MCL of 50 ug/L. Hexavalent chromium ranged from 0.1 to 1.7 ug/L which is less than the MCL of 50 ug/L.

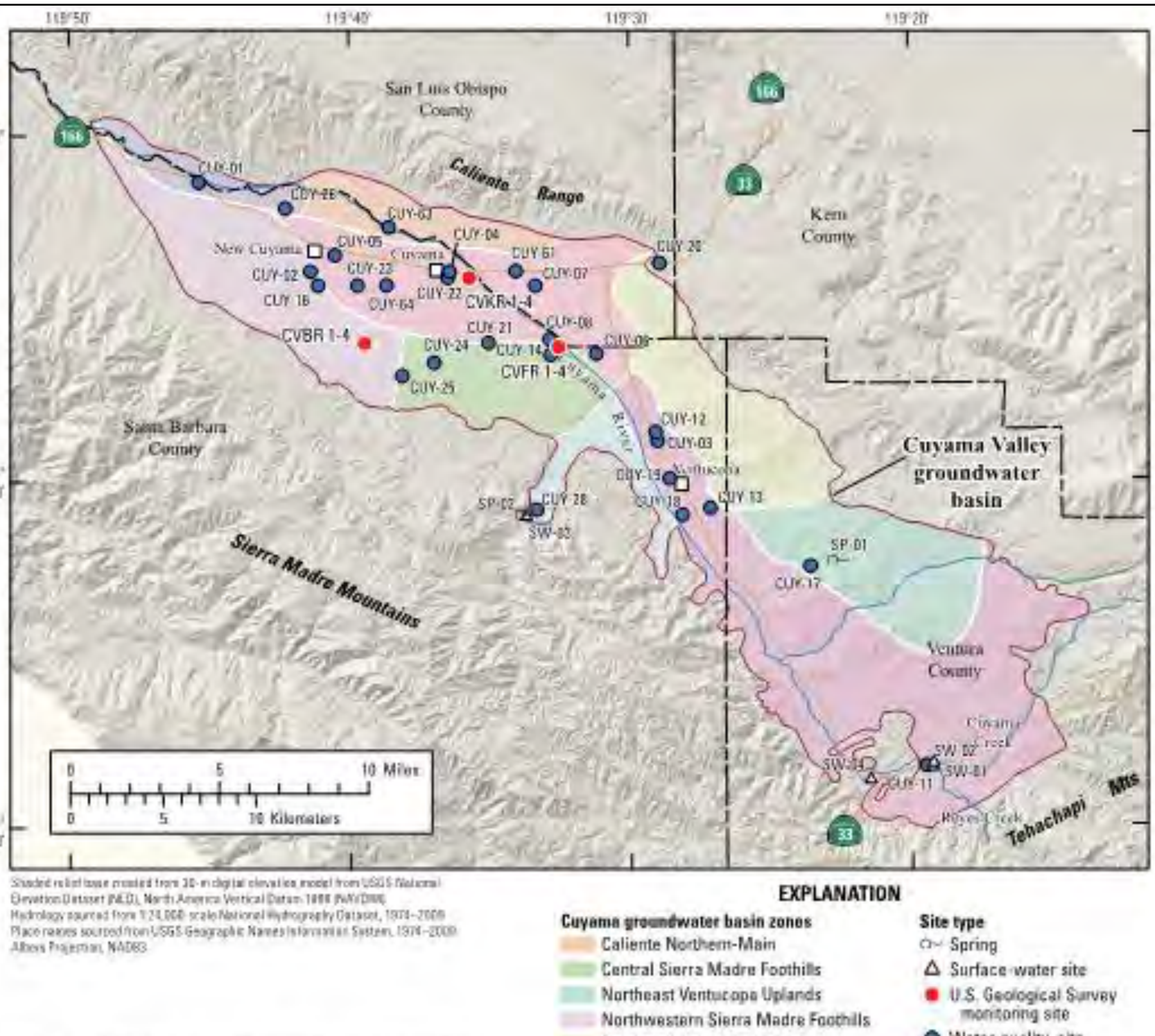

Figure 8. The location of multiple-well monitoring sites, domestic and supply wells, springs, and surface water sites with available water-quality data, Cuyama Valley, Santa Barbara County, California.

USGS 2013c

Figure 2.2-31: USGS 2013c Water Quality Monitoring Sites

2.2.8 Interconnected Surface Water Systems

This section is under development and will feature outputs from model development. This section will include the following:

- Identification of interconnected surface water systems
- Estimates of timing and quantity of depletions
- Map of interconnected surface water systems
- Consideration of ephemeral and intermittent streams, and where they may cease to flow if applicable

DRAFT

2.2.9 Groundwater Dependent Ecosystems

This section is under development and study is being performed by a biologist. This section will include the following:

- Summary of Groundwater Dependent Ecosystem (GDE) analysis
- Describe locations and types of GDEs
- Map of GDEs

DRAFT

2.2.10 Data Gaps

This subsection will be used to document identified data gaps in the groundwater conditions section of the GSP. Feedback from stakeholders is essential in identifying data gaps.

2.2.11 References

Cleath-Harris. 2016. Groundwater Investigations and Development, North Fork Ranch, Cuyama, California. Santa Barbara, California.

Dudek. 2016. Hydrogeologic Conceptual Model to Fulfill Requirements in Section I of the Basin Boundary Modification Application for the Cuyama Valley Groundwater Basin. http://sgma.water.ca.gov/basinmod/docs/download/784. Accessed September 14, 2018

DWR 2004 https://water.ca.gov/LegacyFiles/groundwater/bulletin118/basindescriptions/3-13.pdf

DWR, 2018. https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Data-and-Tools/Files/Statewide-Reports/Natural-Communities-Dataset-Summary-Document.pdf

EKI. 2017. Preliminary Findings from Review of the USGS Study of the Cuyama Valley Groundwater Basin. Burlingame, California.

Singer, J.A., and Swarzenski, W.V. 1970. *Pumpage and ground-water storage depletion in Cuyama Valley California*. https://pubs.usgs.gov/of/1970/0304/report.pdf. Accessed June 4, 2018.

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United States Geological Survey (USGS). 2013a. *Construction of 3-D Geologic Framework and Textural Models for Cuyama Valley Groundwater Basin, California.* https://pubs.usgs.gov/sir/2013/5127/pdf/sir2013-5127.pdf. Accessed January 19, 2018.

USGS. 2013b. *Geology, Water-Quality, Hydrology, and Geomechanics of the Cuyama Valley Groundwater Basin, California, 2008-12.* https://pubs.usgs.gov/sir/2013/5108/pdf/sir2013-5108.pdf. Accessed April 12, 2018.

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Upson and Worts. 1951. *Groundwater in the Cuyama Valley California.* https://pubs.usgs.gov/wsp/1110b/report.pdf. Accessed April 18, 2018.

Santa Barbara County Water Agency (1977) Adequacy of the Groundwater Basins of Santa Barbara County. *http://www.countyofsb.org/uploadedFiles/pwd/Content/Water/WaterAgency/Adequacy%20of%20the%20GW%20Basins%20of%20SBC%201977_sm.pdf*

Appendix X - Hydrographs

This appendix presents hydrographs of every monitoring well with groundwater elevation data that was collected during development of the GSP. Each hydrograph has been assigned a database number, and the maps at the front of this section should be used to find the location of hydrographs of interest to the reader. The beginning of this appendix presents a map showing the locations of four detailed maps with the well identification numbers. The four location maps are intended to facilitate identifying the location of a specific hydrograph.

DRAFT

Appendix Y - Groundwater Contours

This appendix includes groundwater elevation and depth to water contour maps for the following periods:

- Figure Y-1: Fall 2017 Groundwater Elevation
- Figure Y-2: Fall 2017 Depth to Water
- Figure Y-3: Spring 2017 Groundwater Elevation
- Figure Y-4: Spring 2017 Depth to Water
- Figure Y-5: Spring 2015 Groundwater Elevation
- Figure Y-6: Spring 2015 Depth to Water
- Figure Y-7: Fall 2014 Groundwater Elevation
- Figure Y-8: Fall 2014 Depth to Water

Descriptions of each contour map are included in 2.2.3 Groundwater Trends.

DRAFT

Appendix Z - Subsidence Information White Paper

DRAFT

Groundwater Conditions Section Exhibits

Due to the number of pages in the exhibits, the links have been included below:

- **Appendix X – Hydrographs –** This file contains hydrographs of groundwater elevation data. http://www.cuyamabasin.org/assets/pdf/Cuyama-GSP-Appendix-X-Hydrographs.pdf
- **Appendix Y – Groundwater Contours –** This file contains groundwater elevation and depth contour maps. http://www.cuyamabasin.org/assets/pdf/Cuyama-GSP-Appendix-Y-Groundwater-Contours.pdf
- **Appendix Z – Subsidence White Paper –** This file contains on information of subsidence. http://www.cuyamabasin.org/assets/pdf/Cuyama-GSP-Appendix-Z-Subsidence-White-Paper.pdf

TO: Standing Advisory Committee
Agenda Item No. 5c

FROM: Brian Van Lienden, Woodard & Curran (W&C)

DATE: November 29, 2018

SUBJECT: Discussion on Data Management Chapter

Issue
Discussion on the Data Management chapter.

Recommended Motion
None – information only.

Discussion
An update on the Data Management chapter is provided as Attachment 1.

Cuyama Basin Groundwater Sustainability Agency

Data Management Update

November 29, 2018

Review of GSP Data Collection Effort

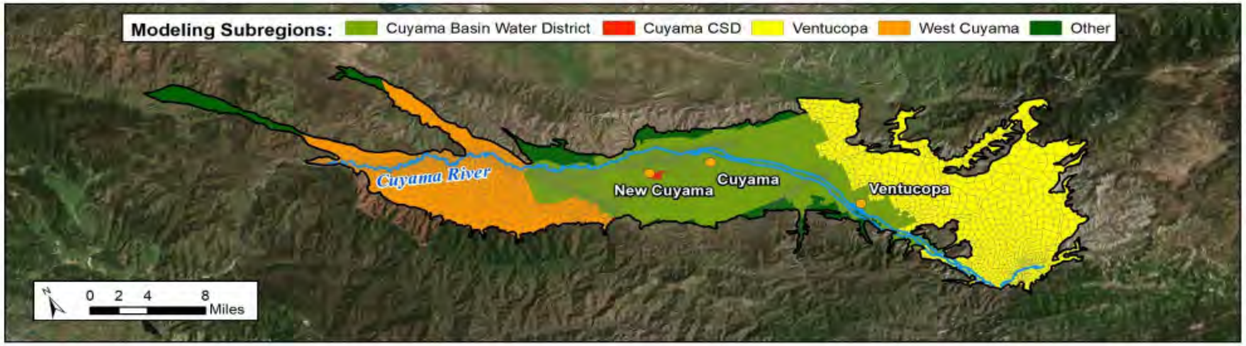
- Conducted from Jan-June 2018
- Data/information received from:
  - State/Federal agencies
  - Local agencies/counties
  - Private Landowners

Cuyama Basin Groundwater Sustainability Plan - Availability of Data by Modeling Subregion 6/22/2018

Data Type	Cuyama Basin WD	Cuyama CSD	Ventucopa	West Cuyama	Other
Geology	●	●	◖	●	○
GW Levels	●	●	○	◖	○
GW Well Locations	●	●	◖	◖	◖
GW Pumping	○	○	○	○	○
Land Use/Cropping	●	●	◖	◖	◖
Precipitation	◖	●	◖	◖	○
Subsidence	◖	◖	◖	○	○
Surface Water Flow	○	○	○	○	○
Water Quality	◖	◖	○	○	○

Key
- ● Robust data available
- ◖ Moderate data available
- ○ Little or no data available

Note: Synthetic data will be developed where little or no data is available for groundwater pumping and surface water flows



Review of Data Management System

- Draft Data Management System (DMS) for the Cuyama Groundwater Basin posted to GSA website on September 20
- Data Management System includes information on
  - Groundwater wells
  - Groundwater elevations and quality
  - Streamflows
  - Precipitation
  - Subsidence
- Includes a quick start guide with instructions on how to use the DMS

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DMS Groundwater Well Information

- Which groundwater wells are included in the DMS?
  - Includes wells that have been included in groundwater elevation and groundwater quality datasets
  - Does not include all production wells
  - Includes some wells previously used for monitoring that no longer exist
- DMS well information includes data provided electronically for each well
  - Some information on well completion reports (e.g. perforation intervals) may not be included

DMS Data Sources: Groundwater Elevations

Data Source	Date Collected	Activities Performed
US Geological Survey (USGS)	5/4/2018	• Removed duplicate records • Recalculated GSE based on DEM on select wells
California Department of Water Resources (DWR) CASGEM/Water Data Library (WDL)	4/18/2018	• Removed duplicate records • Recalculated GSE based on DEM on select wells
San Luis Obispo County	4/2/2018	• Removed duplicate records • Recalculated GSE based on DEM on select wells
Santa Barbara County	3/27/2018	• Removed duplicate records • Recalculated GSE based on DEM on select wells
Ventura County	3/8/2018	• Removed duplicate records • Recalculated GSE based on DEM on select wells
Private Landowners	Various	• Removed duplicate records • Recalculated GSE based on DEM on select wells

WOODARD & CURRAN

DMS Data Sources: Groundwater Quality

Data Source	Date Collected	Activities Performed
San Luis Obispo County	4/2/2018	• Removed duplicate records • Recalculated GSE based on DEM on select wells
Ventura County	3/8/2018	• Removed duplicate records • Recalculated GSE based on DEM on select wells
California Department of Water Resources (DWR)	6/14/2018	• Removed duplicate records
GeoTracker	6/5/2018	• Removed duplicate records
California Environmental Data Exchange Network (CEDEN)	8/29/2018	• Removed duplicate records
National Water Quality Monitoring Council	6/1/2018	• Removed duplicate records
Private Landowners	Various	• Removed duplicate records • Recalculated GSE based on DEM on select wells

WOODARD & CURRAN

DMS Data Sources: Streamflows, Precipitation and Subsidence

Data Source	Datasets Collected	Date Collected	Activities Performed
U.S. Geological Survey (USGS)	• Streamflow • Precipitation	5/4/2018	• Removed duplicate records
Santa Barbara County Water Agency	• Precipitation	3/27/2018	• Removed duplicate records
Ventura County	• Precipitation	3/8/2018	• Removed duplicate records
UNAVCO	• Ground Surface Elevation	3/12/2018	• None

WOODARD & CURRAN

Data Management System Draft GSP Section

- Draft GSP Section provided to SAC and Board for review on November 16th
- Data Management System GSP section describes:
  - Overview of the data management system
  - Functionality of the data management system
  - Data included in the data management system
- Comments are due on December 14th

WOODARD &CURRAN

Discussion on the Data Management System

- Do any components of the Cuyama Basin Data Management System need further clarification?

- Do any of the components of the GSP Data Management System section need further clarification?
  - Overview of the data management system
  - Functionality of the data management system
  - Data included in the data management system

TO: Standing Advisory Committee
Agenda Item No. 5d

FROM: John Ayres, Woodard & Curran (W&C)

DATE: November 29, 2018

SUBJECT: Review of Preliminary Threshold Numbers

Issue
Review of preliminary Threshold numbers.

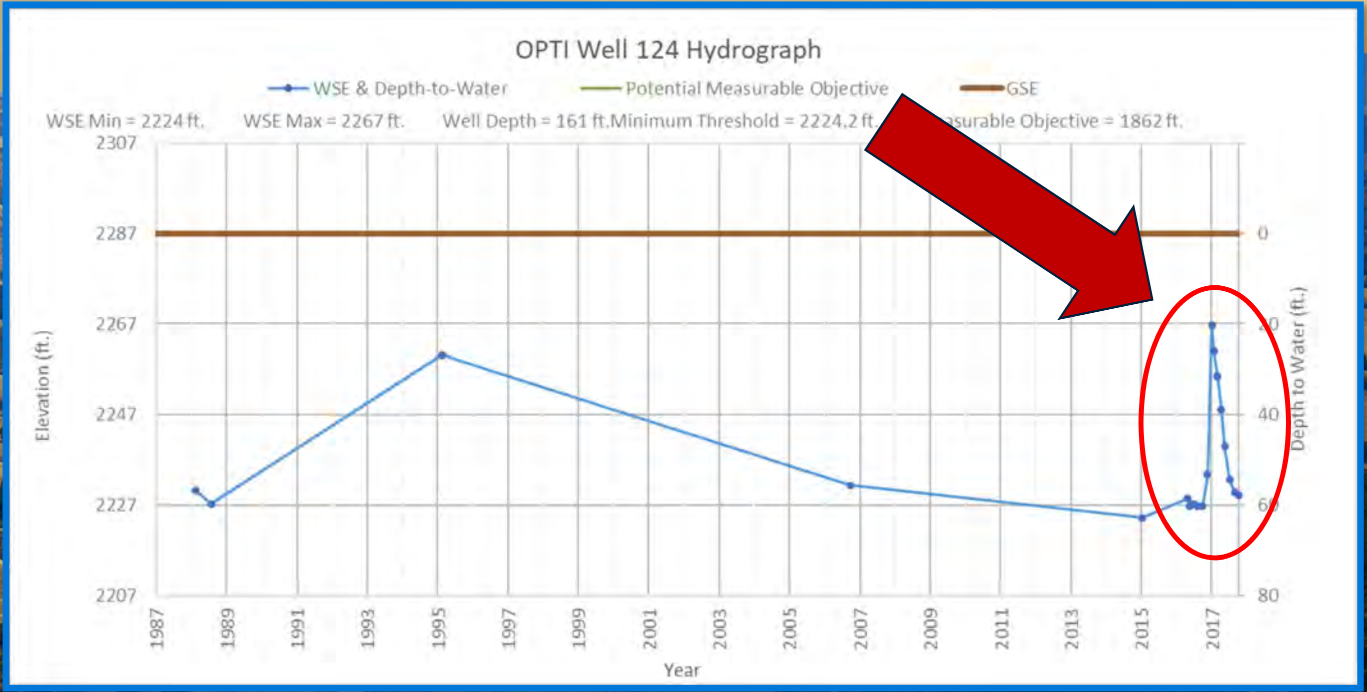
Recommended Motion
None – information only.

Discussion
An update on the preliminary Threshold numbers is provided as Attachment 1.

Attachment 1

Cuyama Basin Groundwater Sustainability Agency

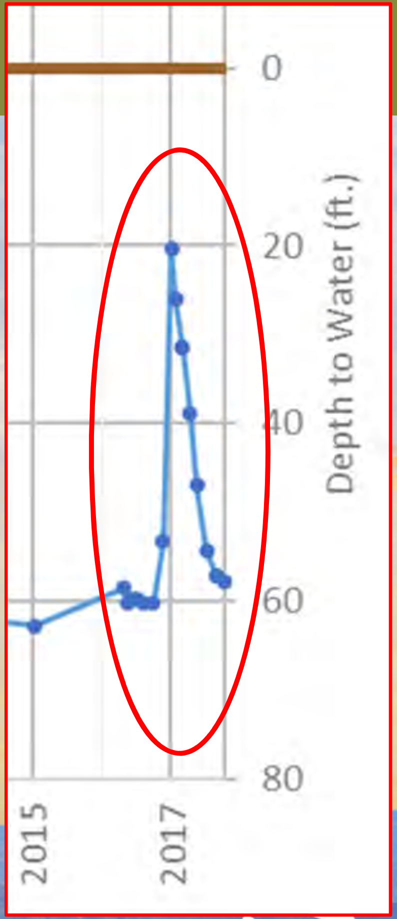
Detailed Monitoring Analysis in Schoolhouse Canyon



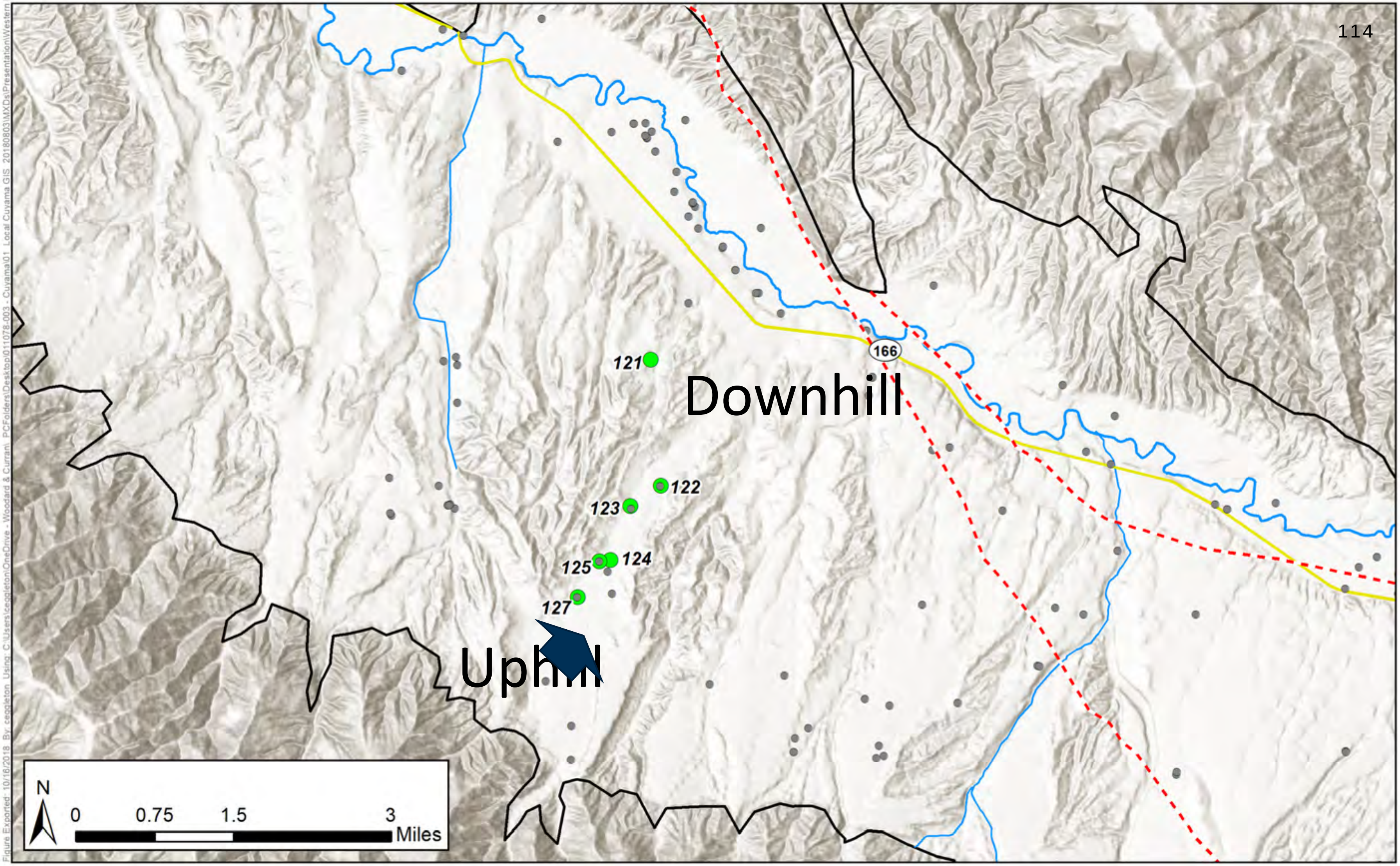
WOODARD &CURRAN

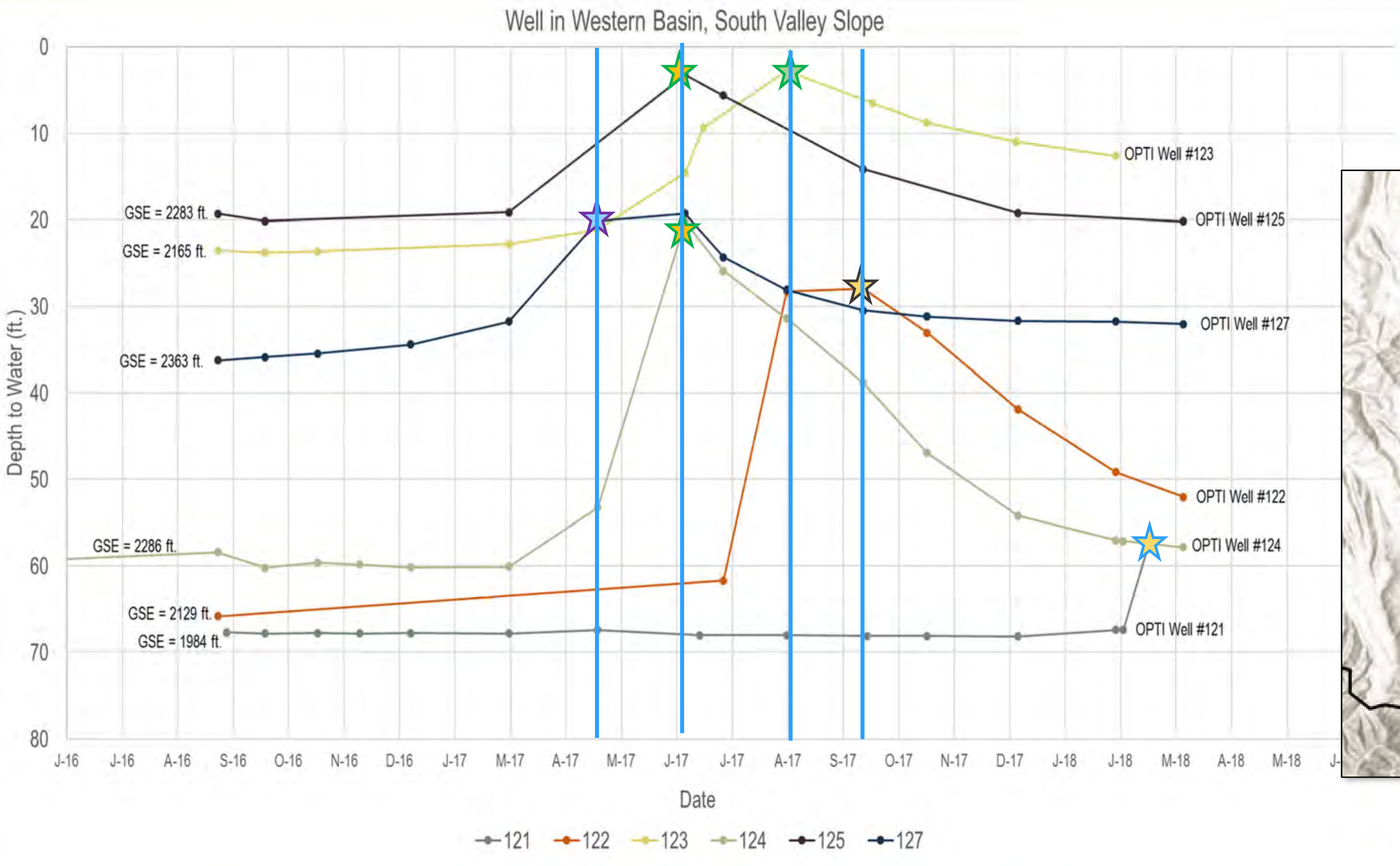
What Does a Spike in Groundwater Elevations in Schoolhouse Canyon Tell Us?

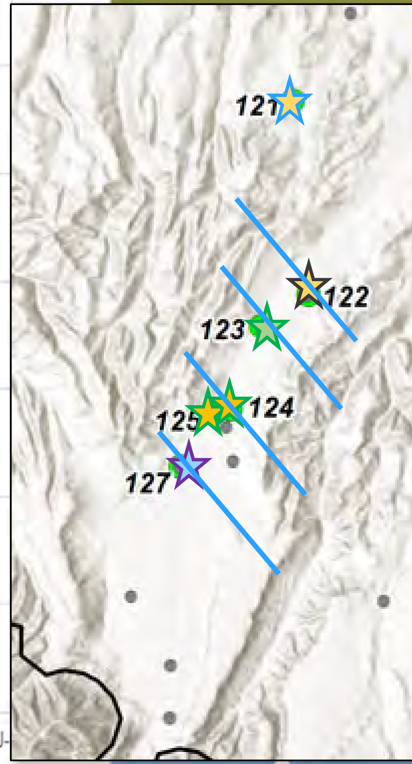
- Occurs in 7 wells
- Occurs over the summer of 2017
- Appears to be a recharge and discharge phenomenon
- Wet Season in Spring 2017
- Pulse moves down the canyon



WOODARD & CURRAN


121
Downhill
166
122
123
125
124
127
Uphill
N
0
0.75
1.5
3
Miles





WOODARD &CURRAN

Cuyama Basin Groundwater Sustainability Agency

Review of Preliminary Threshold Numbers

November 29, 2018

Why Minimum Thresholds?

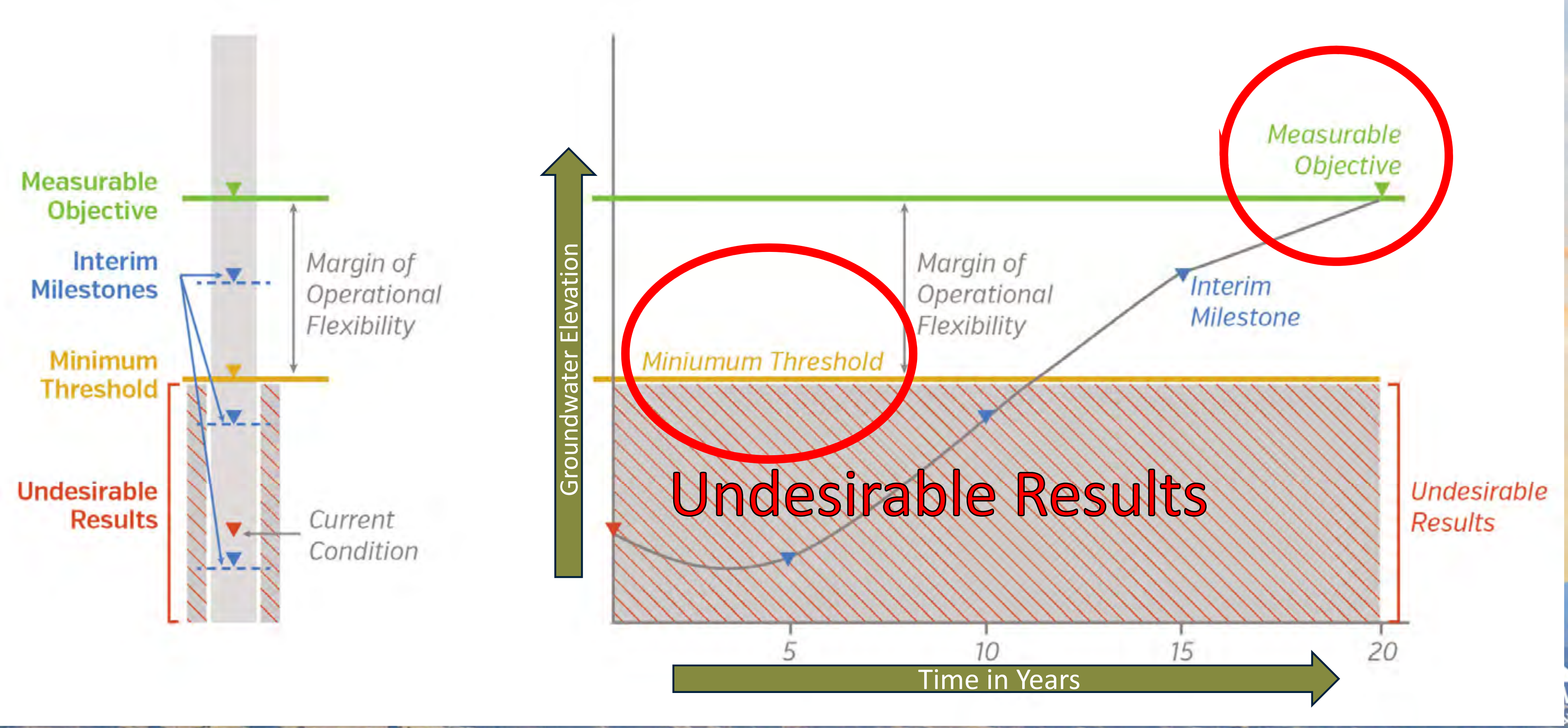
- Required by SGMA
- Establish Range of Operation in Groundwater Basin
- Protect other Groundwater Pumpers

- For Example:

Keep Groundwater Levels High Enough to:

1. Ensure adjacent pumpers have access to groundwater
2. Protect access to groundwater in Community Services District well

Minimum Thresholds and Measurable Objectives Example



Board Direction on Minimum Thresholds

Approved Motion from November 7, 2018 Board Meeting

Direct Woodard & Curran to use Option D to develop preliminary threshold numbers.

Option D

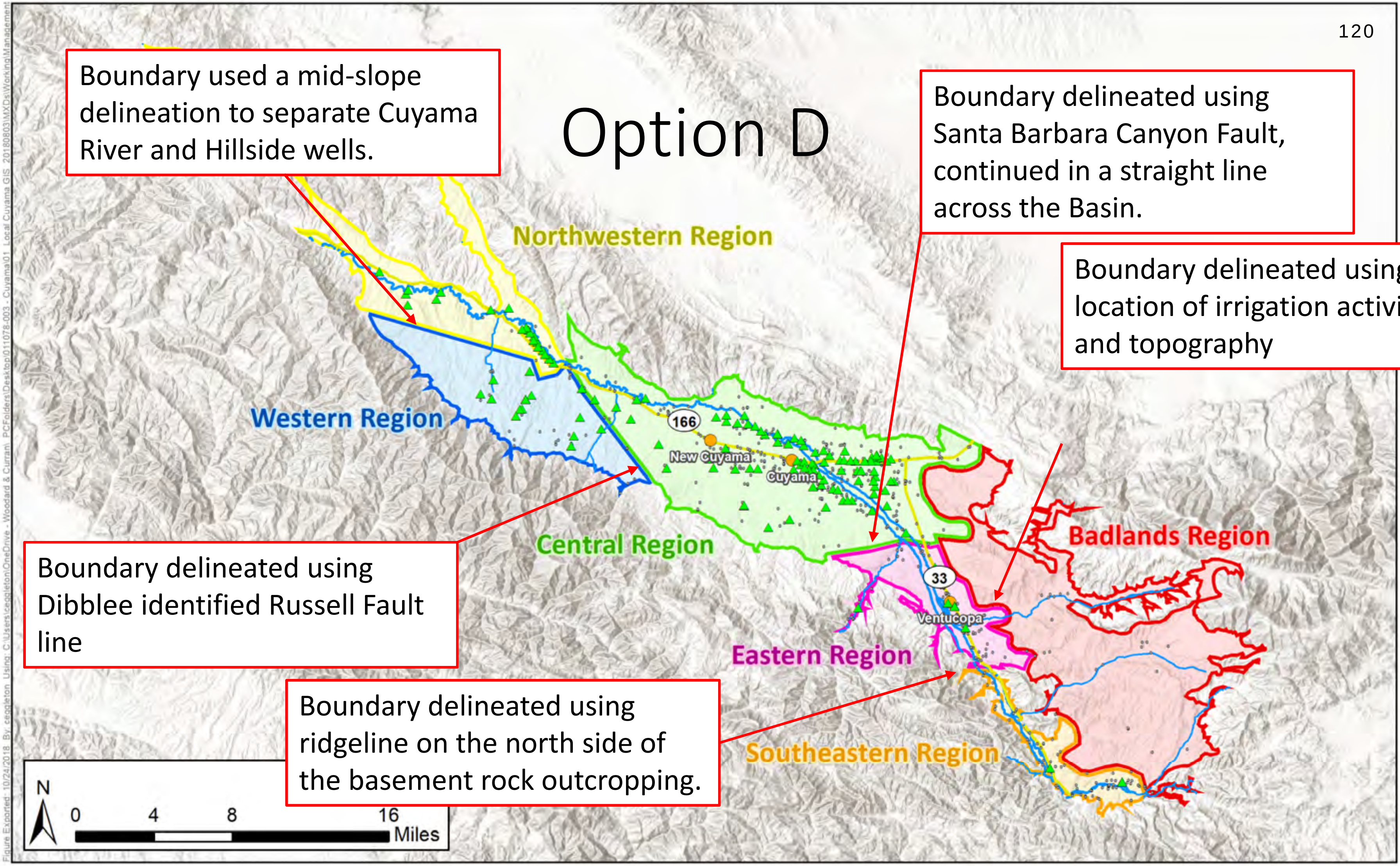
Boundary used a mid-slope delineation to separate Cuyama River and Hillside wells.

Boundary delineated using Santa Barbara Canyon Fault, continued in a straight line across the Basin.

Boundary delineated using location of irrigation activities and topography

Boundary delineated using Dibblee identified Russell Fault line

Boundary delineated using ridgeline on the north side of the basement rock outcropping.



Schedule for Thresholds Discussion

- Tech Forum – Oct 23
- SAC – Nov 1
- Board – Nov 7

Input and Discussion

- Tech Forum – Nov 28
- SAC – Nov 29
- Board – Dec 3
- Public Workshop – Dec 3

Initial Recommendations

- **Board Direction on Sustainability Thresholds – Jan 9**
- **Release Thresholds GSP Section – Jan 18**
- SAC – Jan 31

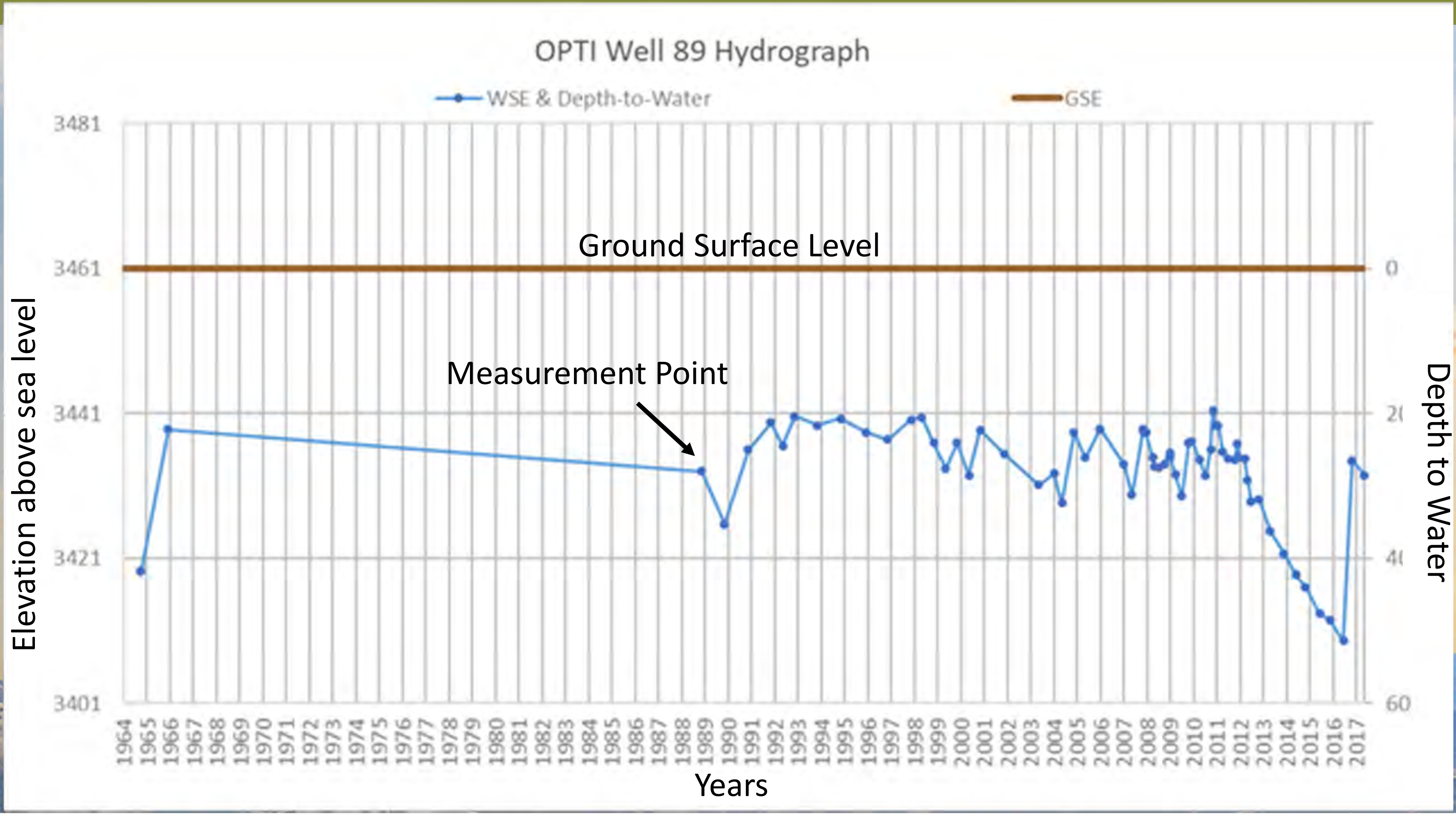
Discussion on Draft GSP Section

WOODARD & CURRAN

Purposes of Meeting

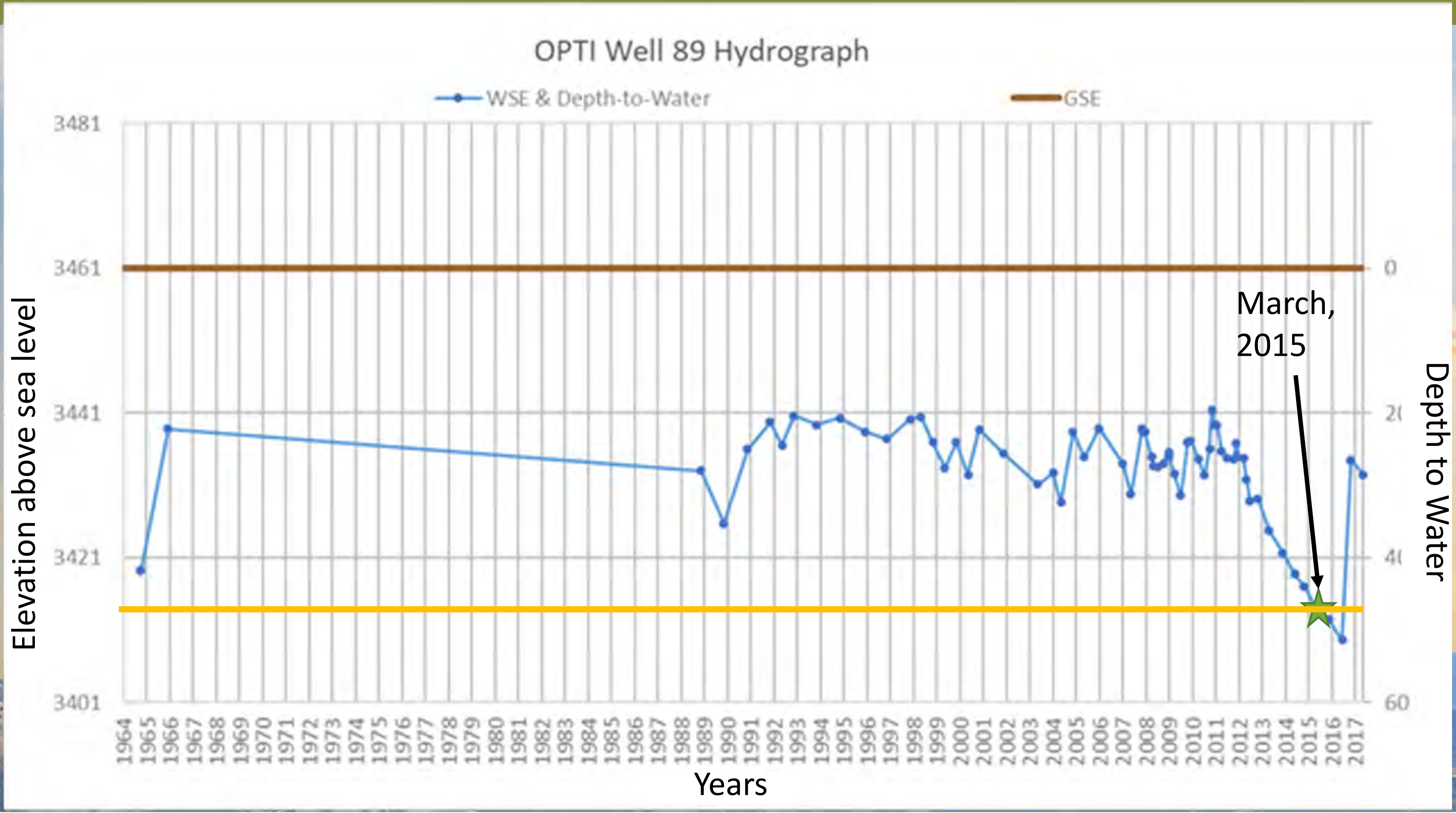
- Present preliminary threshold rationales for threshold regions
- Gain consensus on recommended threshold rationales
- Gain clarification on threshold rationales in regions without a recommendation
  - Some regions have differing perspectives on appropriate threshold rationale
  - Threshold rationale options present today meet technical/regulatory requirements
  - Local control via CBGSA Board allows board to select appropriate thresholds

Threshold Rationale Components Example Hydrograph Refresher



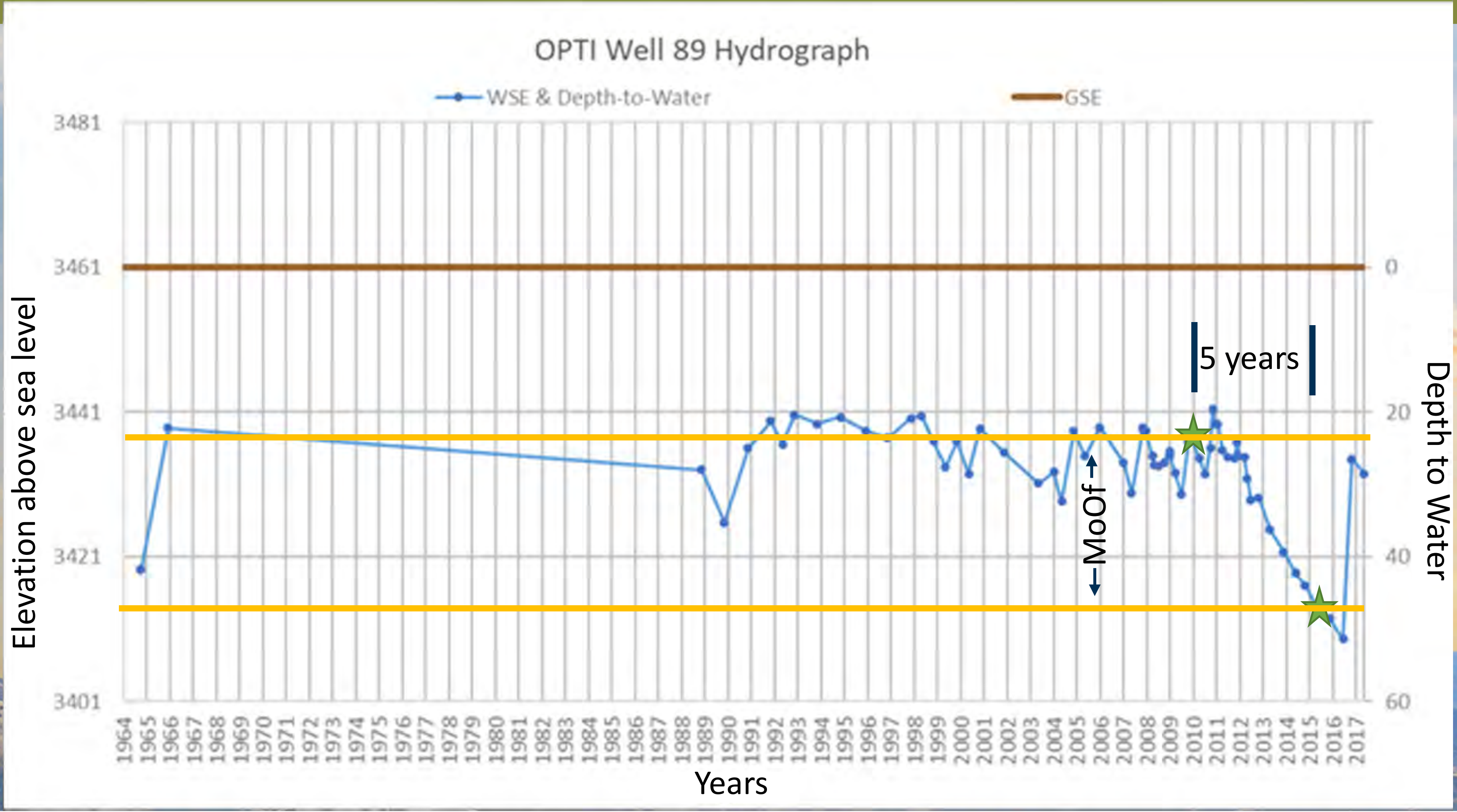
WOODARD & CURRAN

Threshold Rationale Components Example Nearest to January 1, 2015



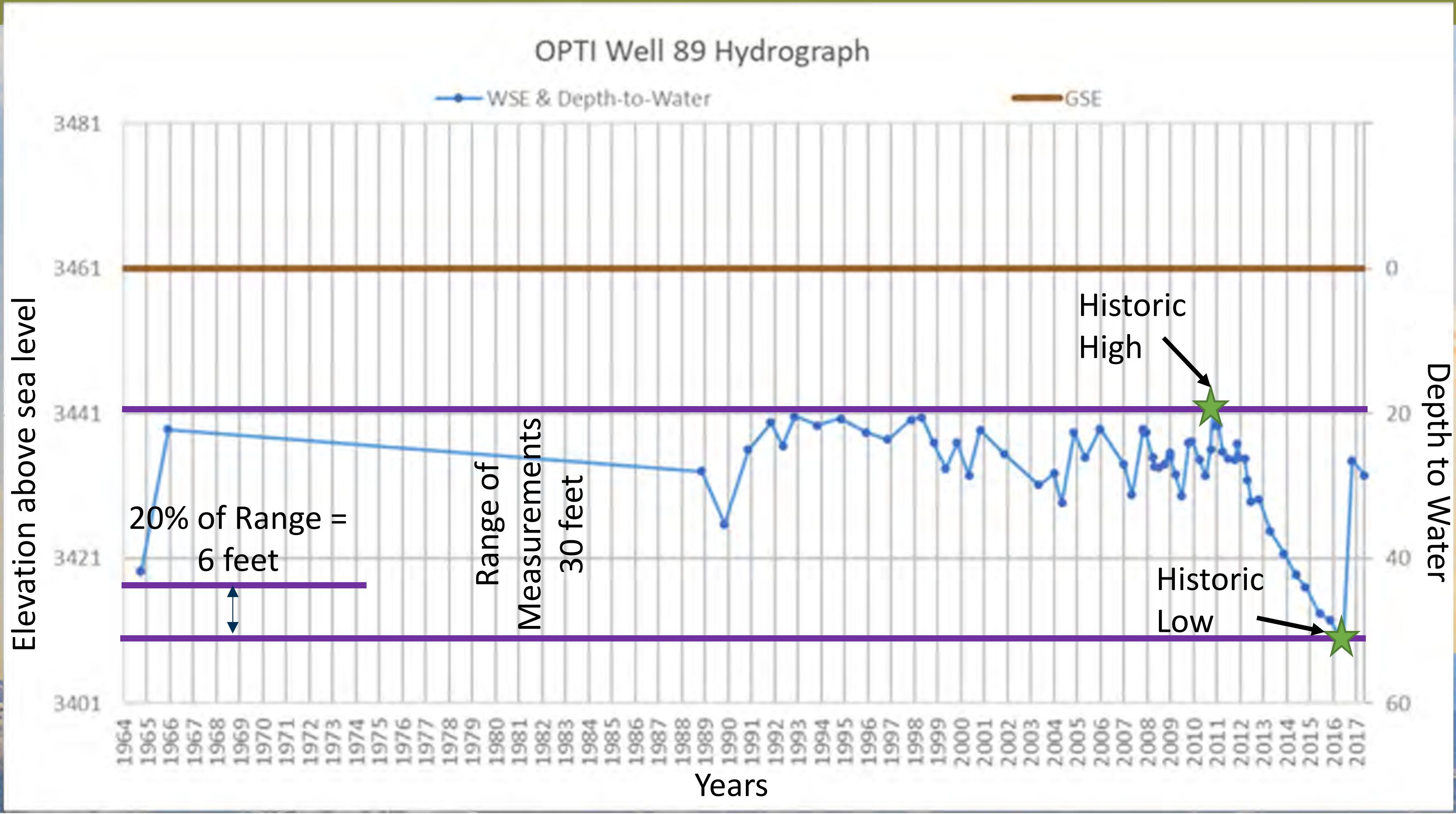
WOODARD & CURRAN

Threshold Rationale Components Example
5 Years of Storage - 5 years before 2015



WOODARD &CURRAN

Threshold Rationale Components Example
20% of Range



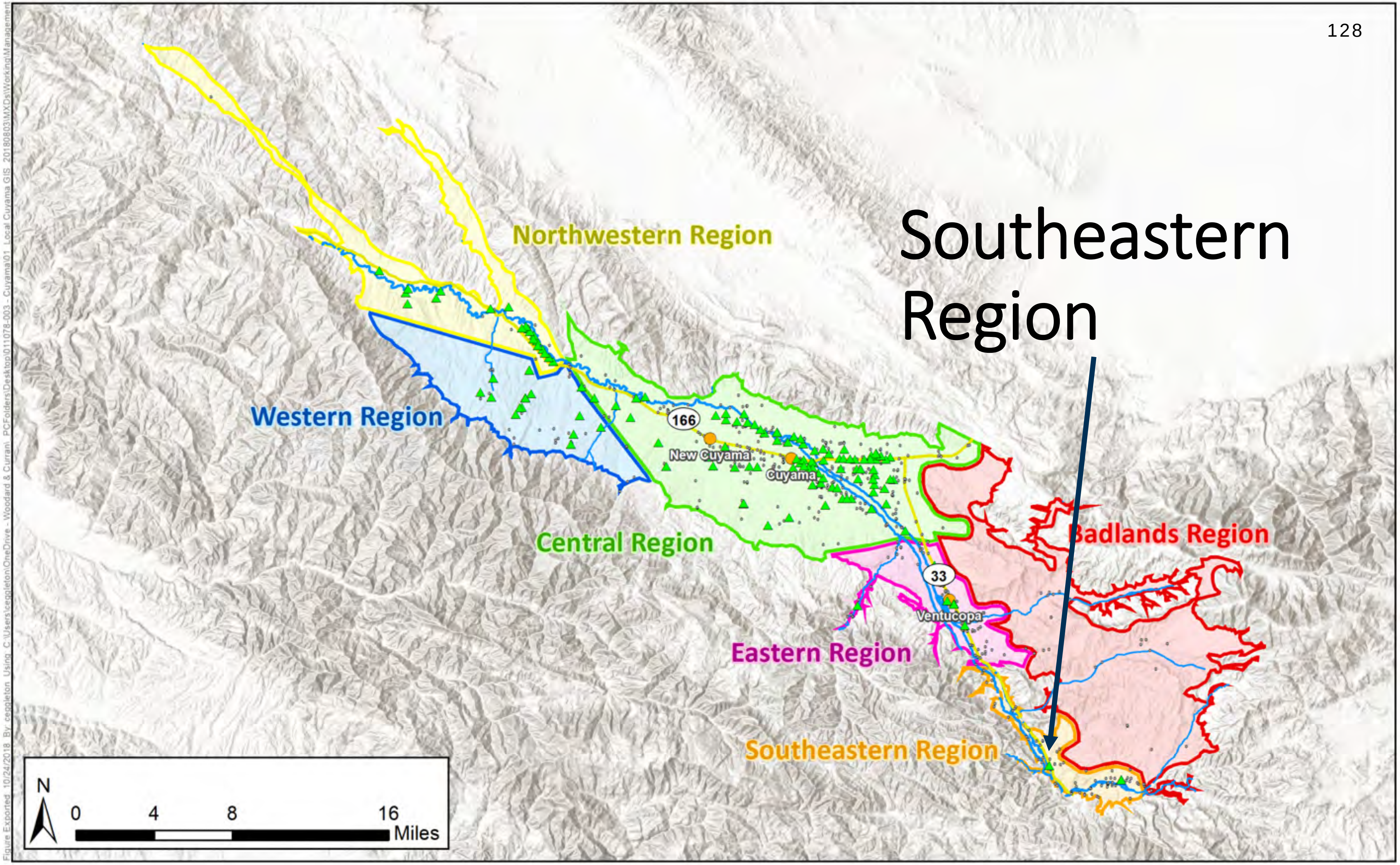
WOODARD & CURRAN

Measurable Objectives (MOs) & Minimum Thresholds (MTs) Key Thoughts

- Thresholds in the 2020 Cuyama GSP are a *Starting Point* to identify what is sustainable in the basin
- No single rationale or method works across the entire basin
- Limited periods of record in monitoring in some wells cause uncertainty in defining thresholds and will require updates as more data is collected over time
- Thresholds will be updated in GSP update in 2025

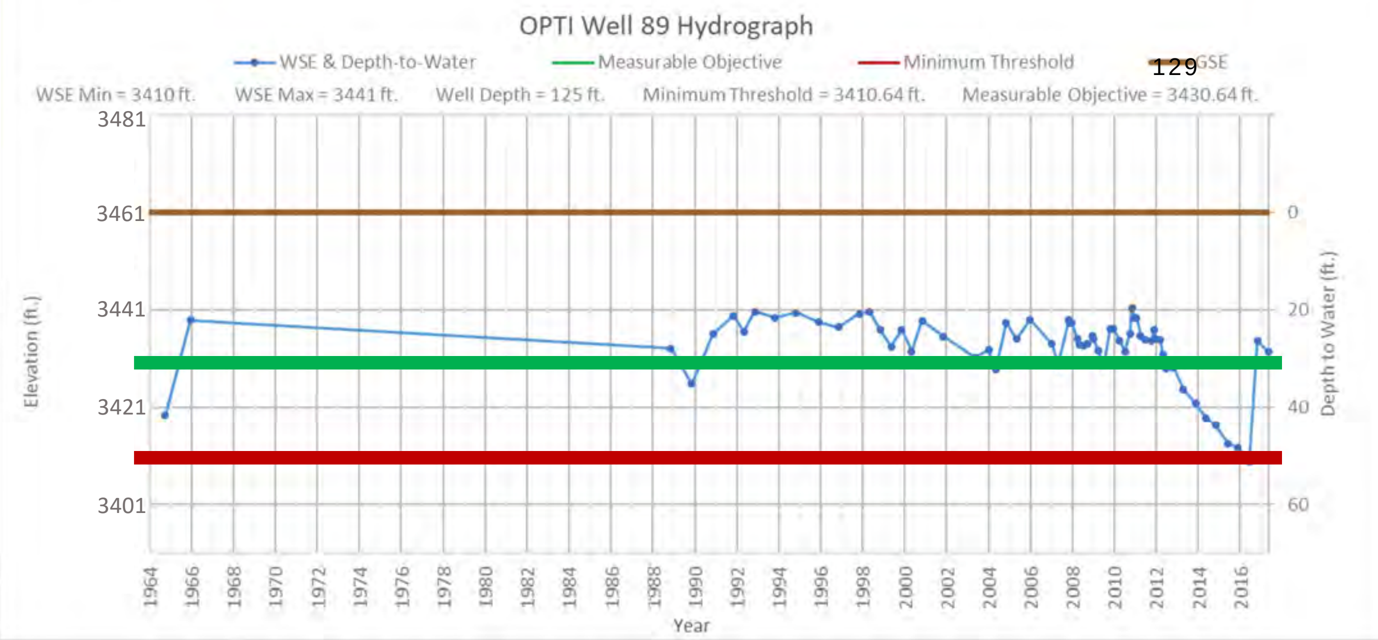
WOODARD & CURRAN

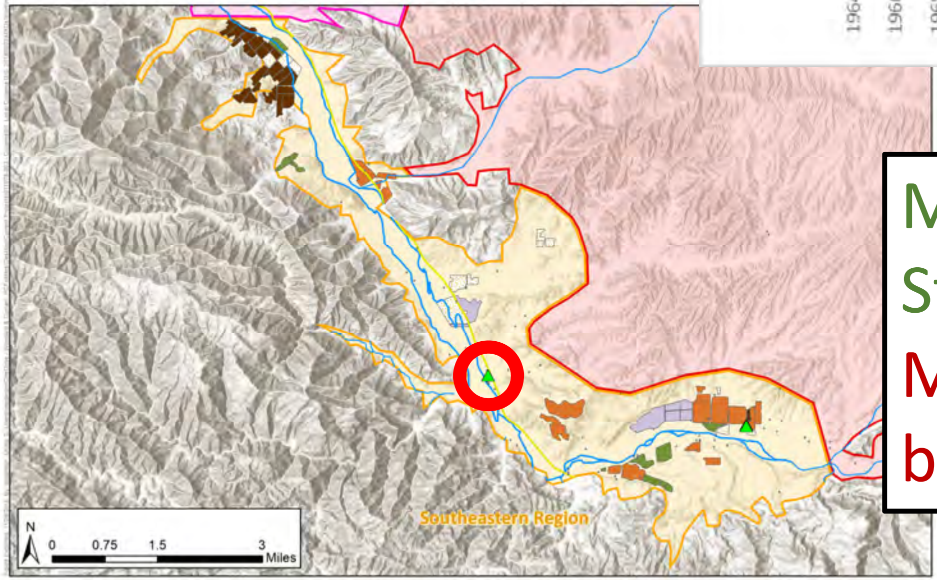
Southeastern Region



Southeastern Region

Propose 20% of Range





Measurable Objective – 5-years of Storage

Minimum Threshold – 20% of Range below 1/1/2015 Measurement

WOODARD &CURRAN

Southeastern Region - Advantages/ Disadvantages 20% of Range as Basis for Minimum Thresholds

Advantages

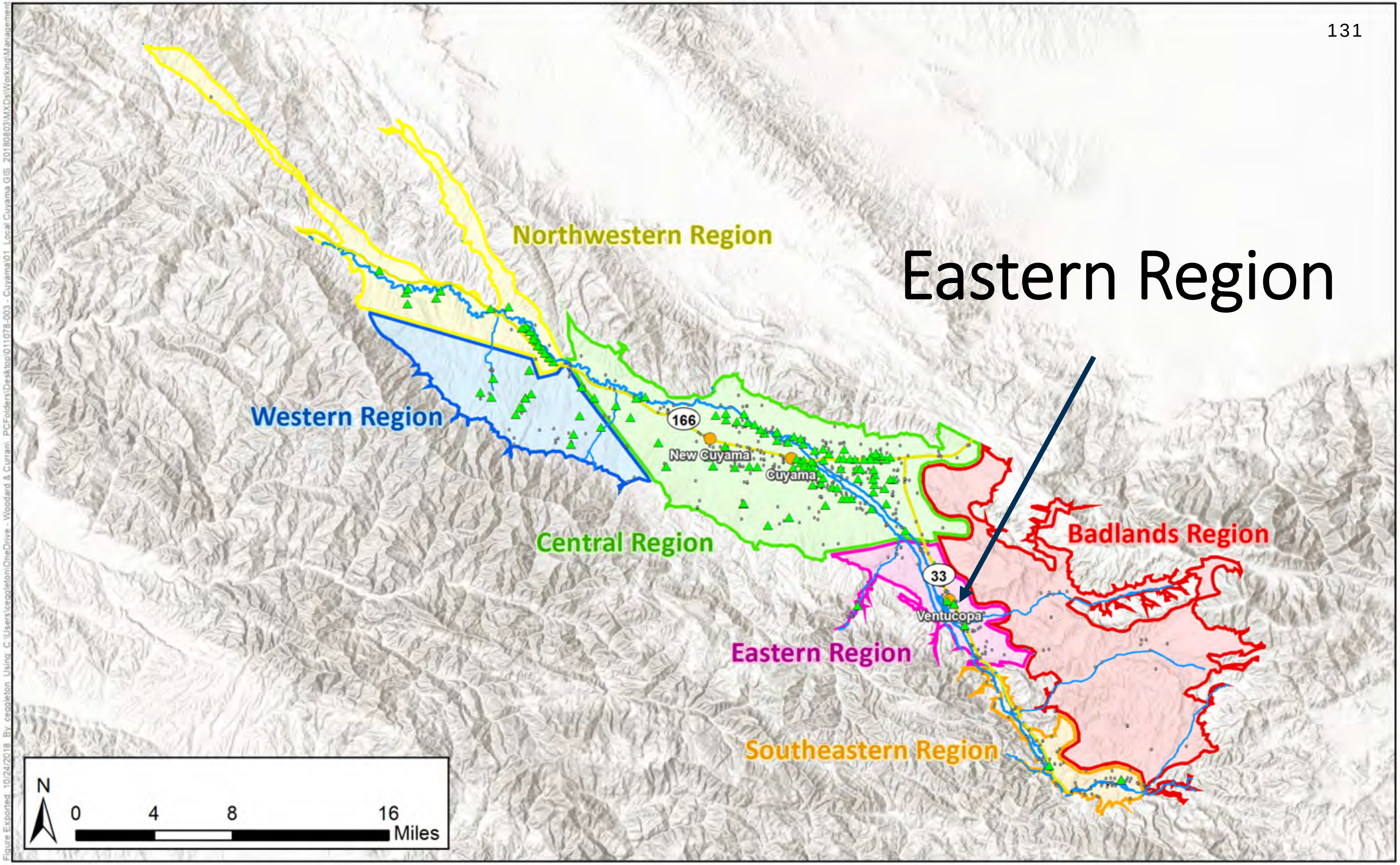
- Maintains 5 years of storage between minimum threshold and measurable objective
- Maintains groundwater elevations 6 feet below 2015 levels

Disadvantages

- Maintains groundwater elevations 6 feet below 2015 levels

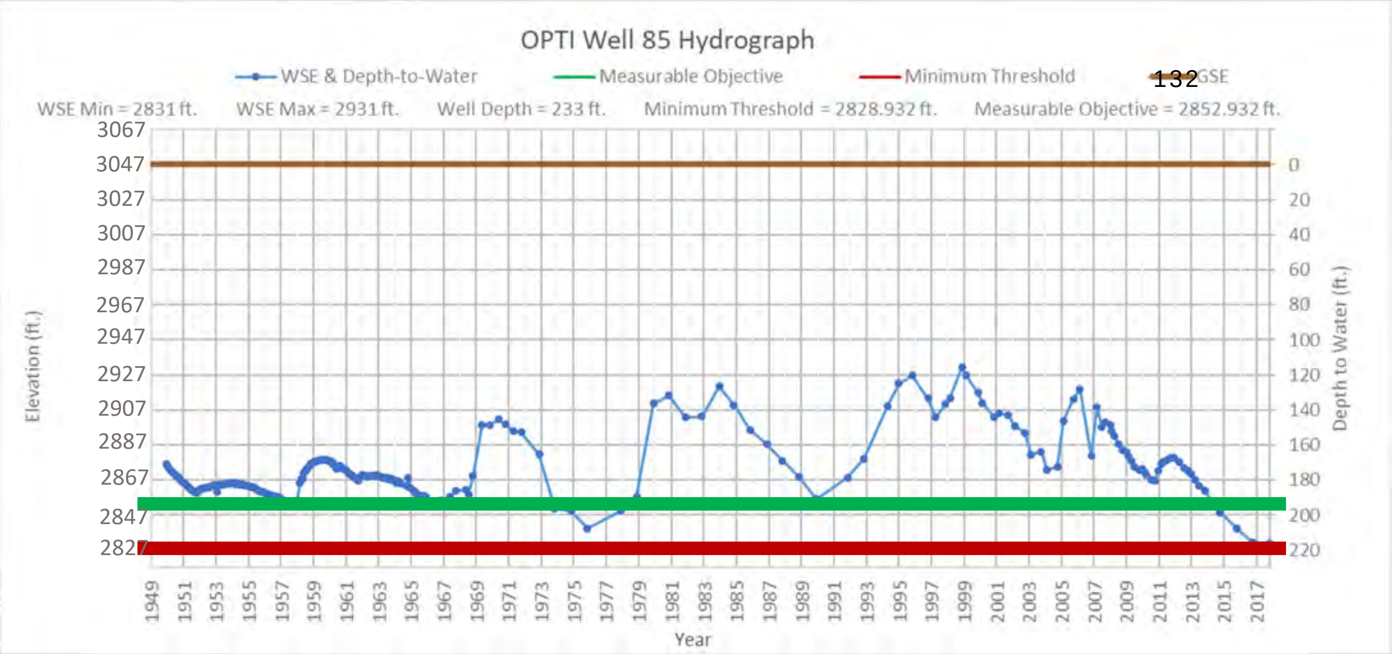
WOODARD & CURRAN

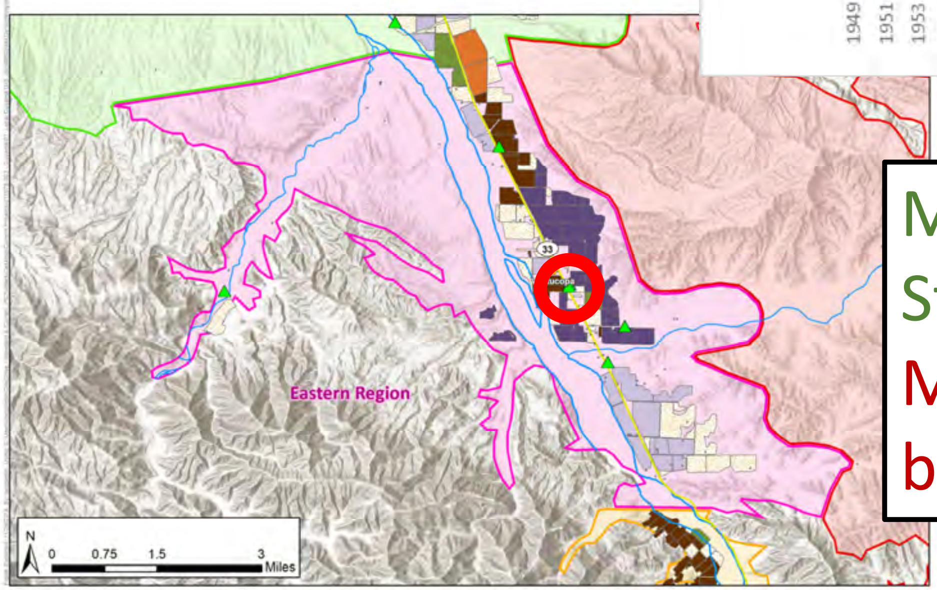
Eastern Region



Eastern Region

Propose 20% of Range





Measurable Objective – 5-years of Storage

Minimum Threshold – 20% of Range below 1/1/2015 Measurement

WOODARD & CURRAN

Eastern Region - Advantages/ Disadvantages 20% of Range as Basis for Minimum Thresholds

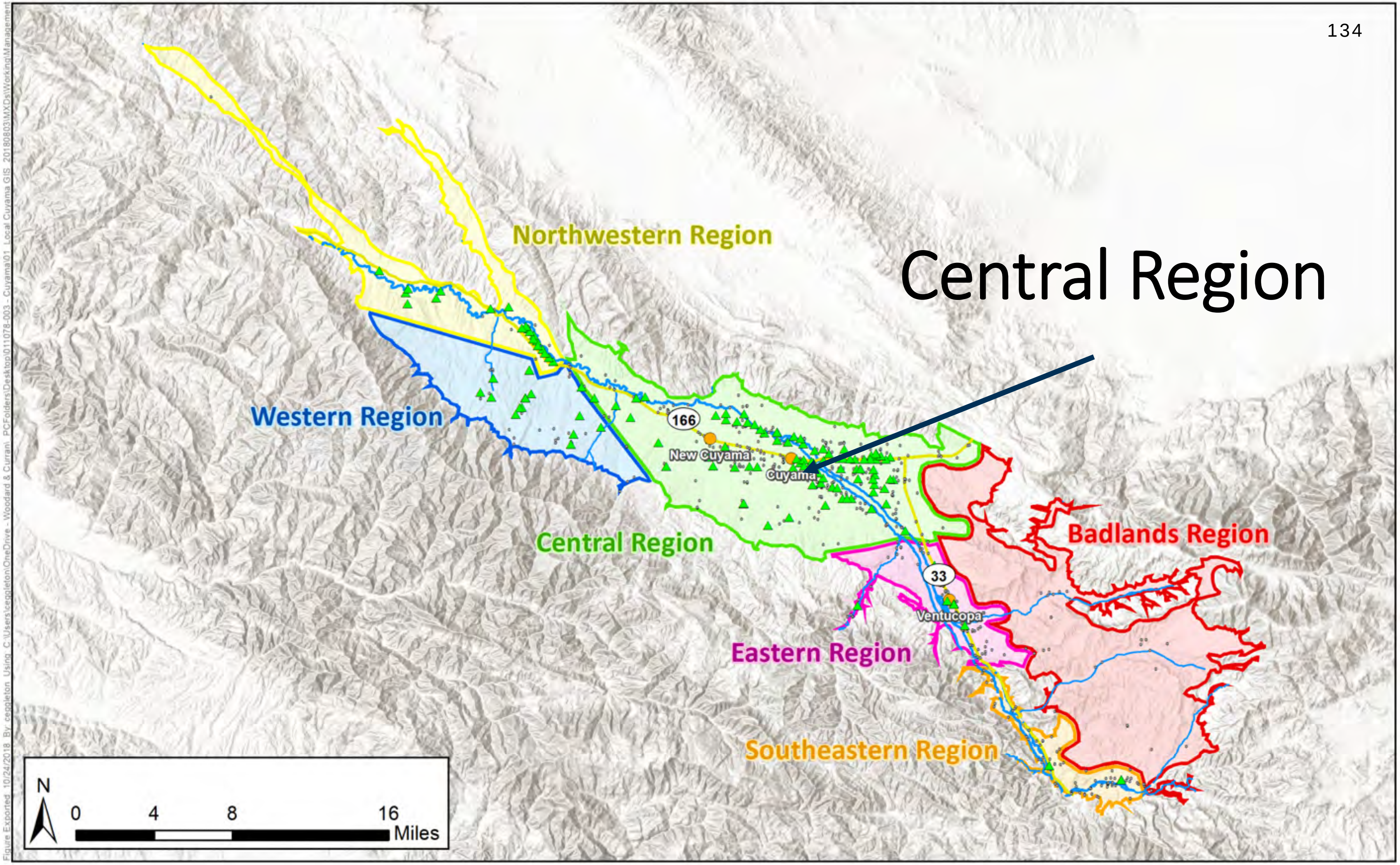
Advantages

- Maintains 5 years of storage between minimum threshold and measurable objective

Disadvantages

- May not restore groundwater levels to 2015 conditions

Central Region

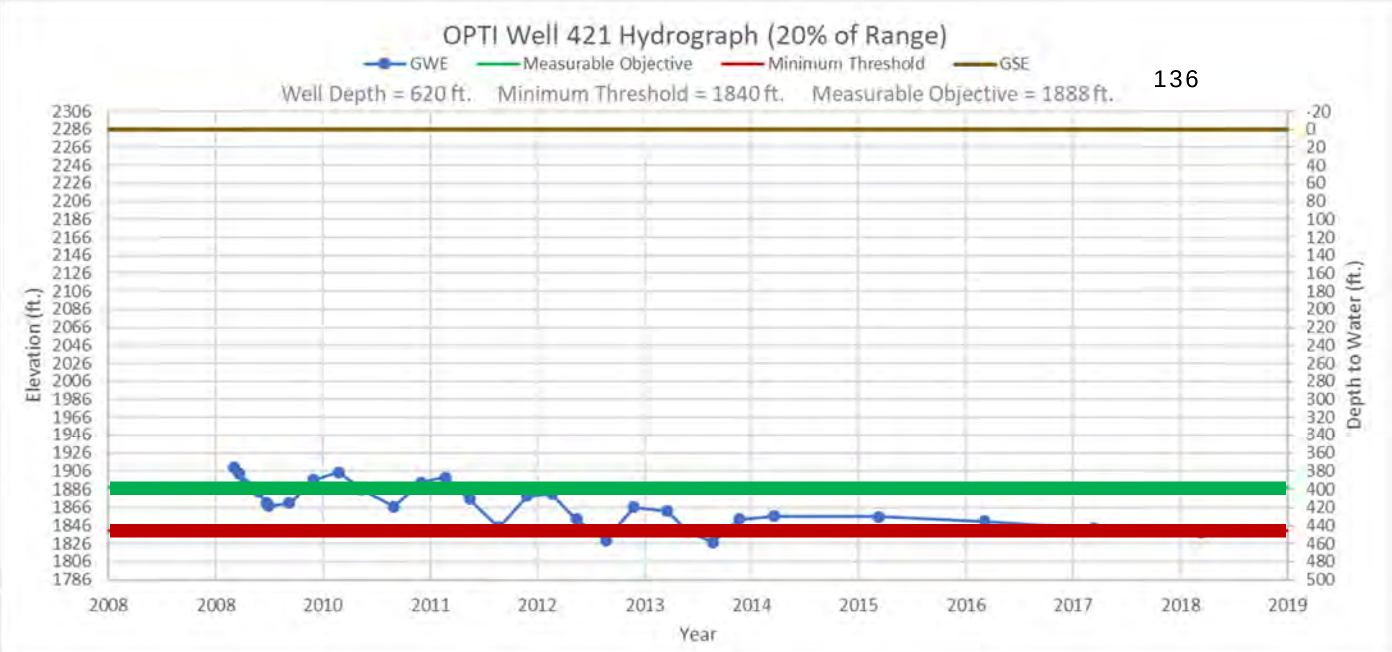


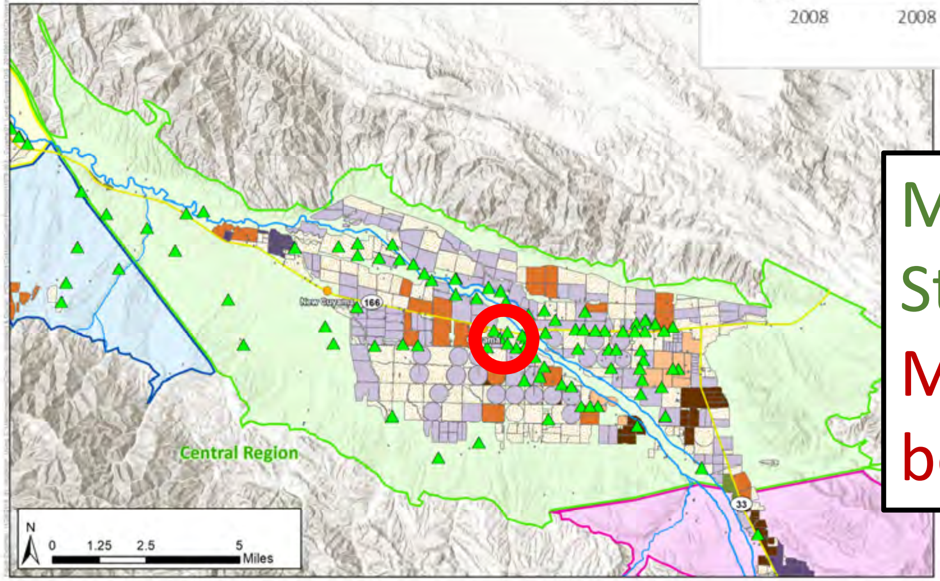
Three Minimum Threshold Options for Central Region

1. Use 20% of Range below 1/1/2015 measurement
2. Use 2015 measurement as minimum threshold (MT)
3. Use 2015 measurement as measurable objective (MO)

Central Region

1) 20% of Range





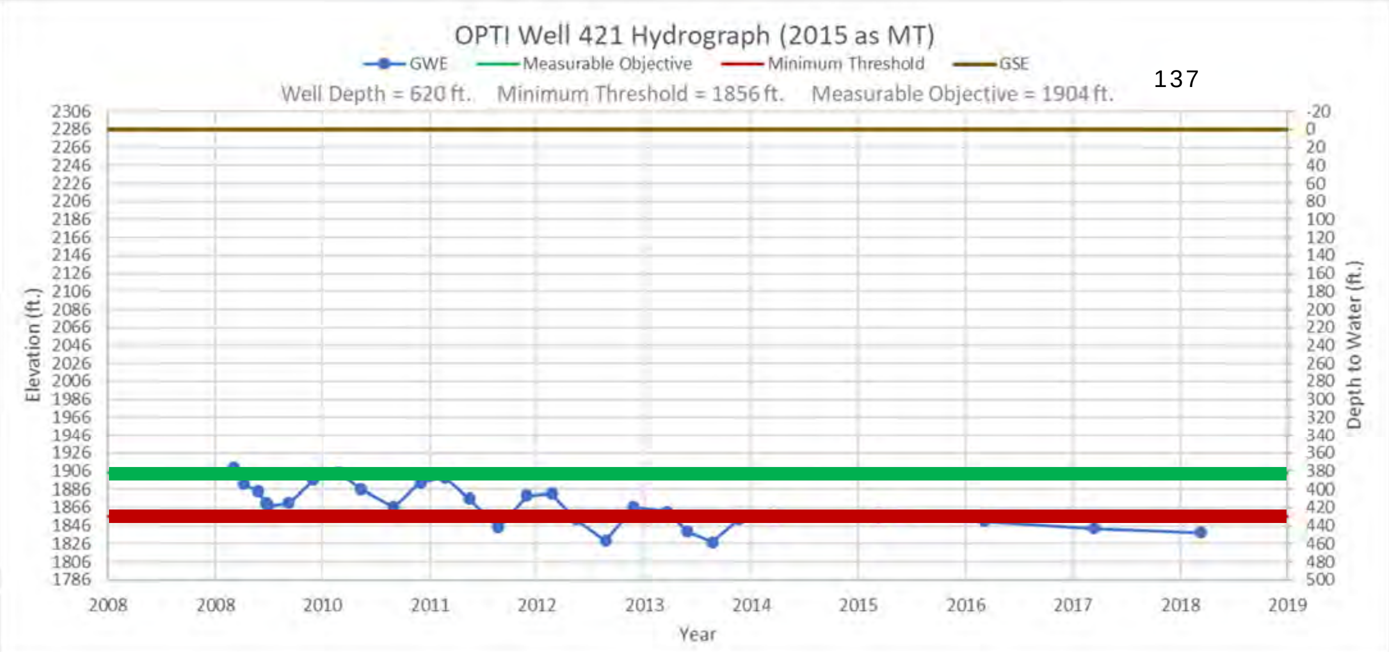
Measurable Objective – 5-years of Storage

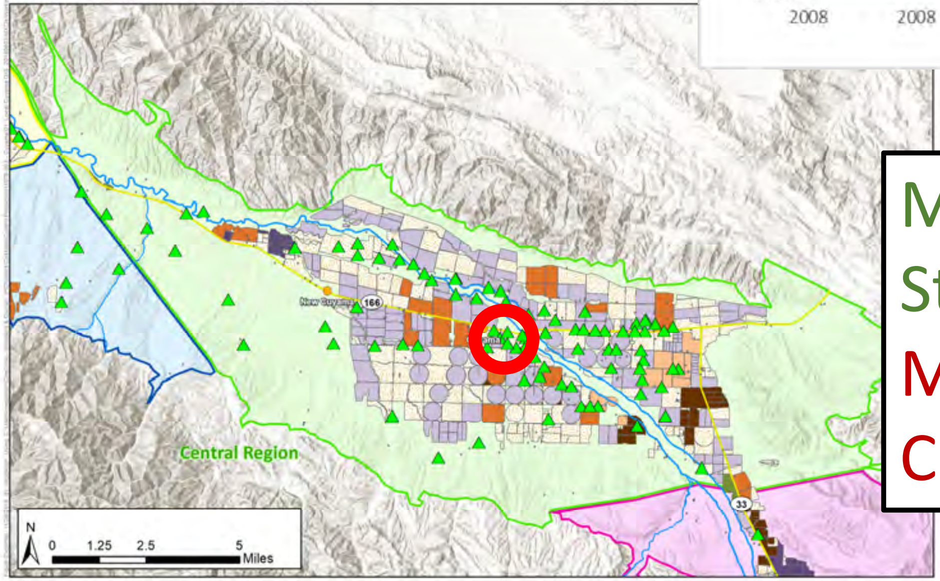
Minimum Threshold – 20% of Range below 1/1/2015 Measurement

WOODARD & CURRAN

Central Region

2) 2015 as MT





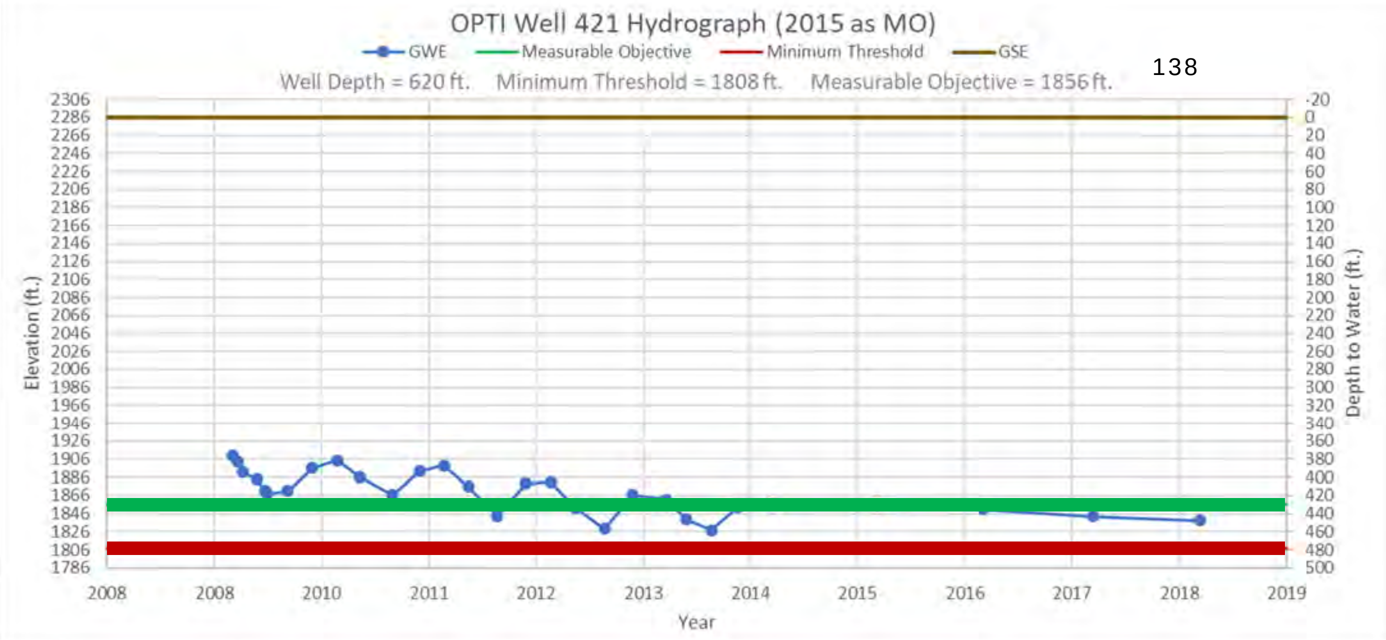
Measurable Objective – 5-years of Storage

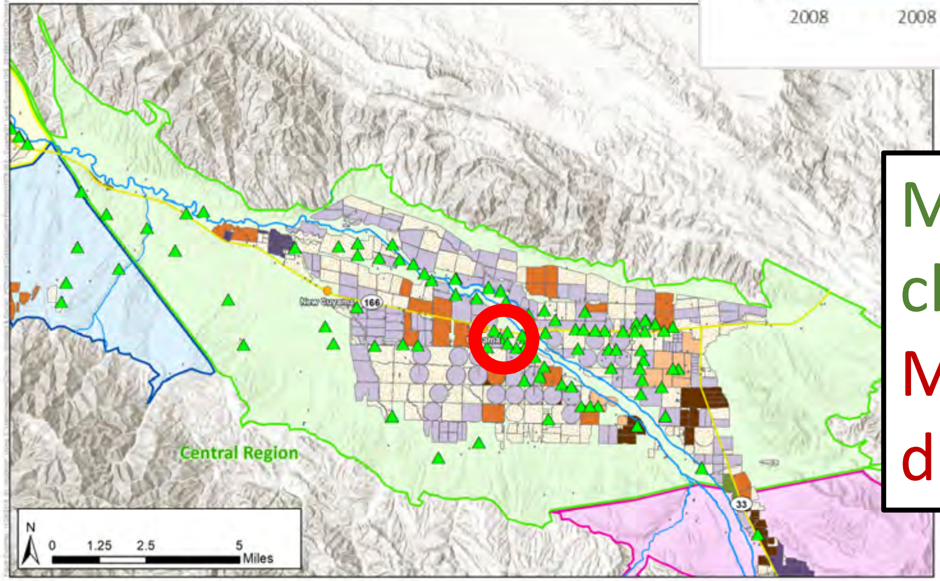
Minimum Threshold – Measurement Closest to (but after) January 1, 2015

WOODARD & CURRAN

Central Region

3) 2015 as MO





Measurable Objective – 1/1/2015 (or closest Measurement, or calculated)

Minimum Threshold – 5-years of drought storage

WOODARD & CURRAN

Central Region - Advantages/ Disadvantages of Three Options for Minimum Thresholds

Advantages

20% of Range

- Recognizes current conditions

2015 as Minimum Threshold

- Attempts to regain 2015 groundwater levels

2015 as Measurable Objective

- Provides flexibility to adjust land and water use practices

Disadvantages

20% of Range

- Lower long-term groundwater levels

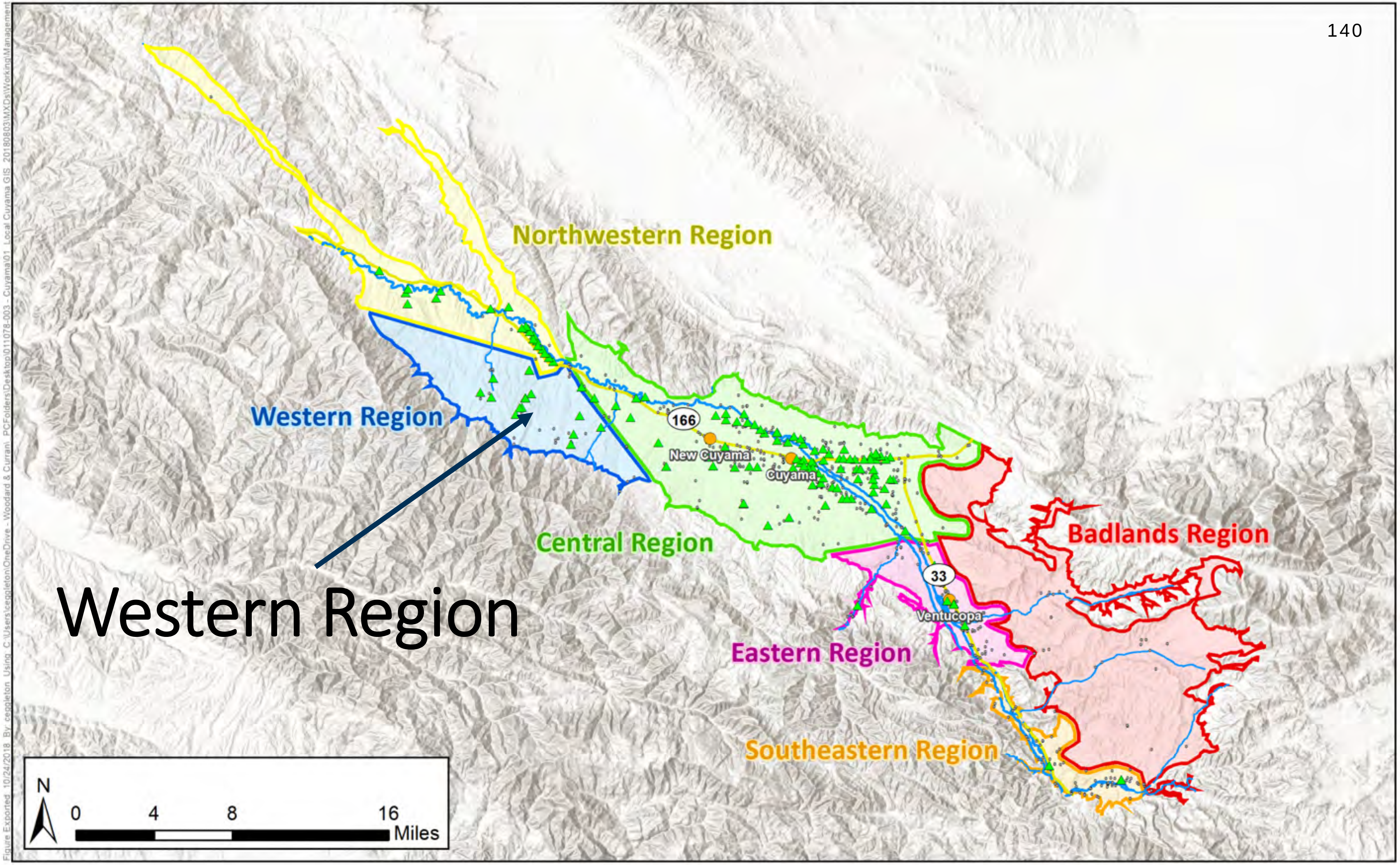
2015 as Minimum Threshold

- Current levels are below minimum threshold

2015 as Measurable Objective

- Lower long-term groundwater levels

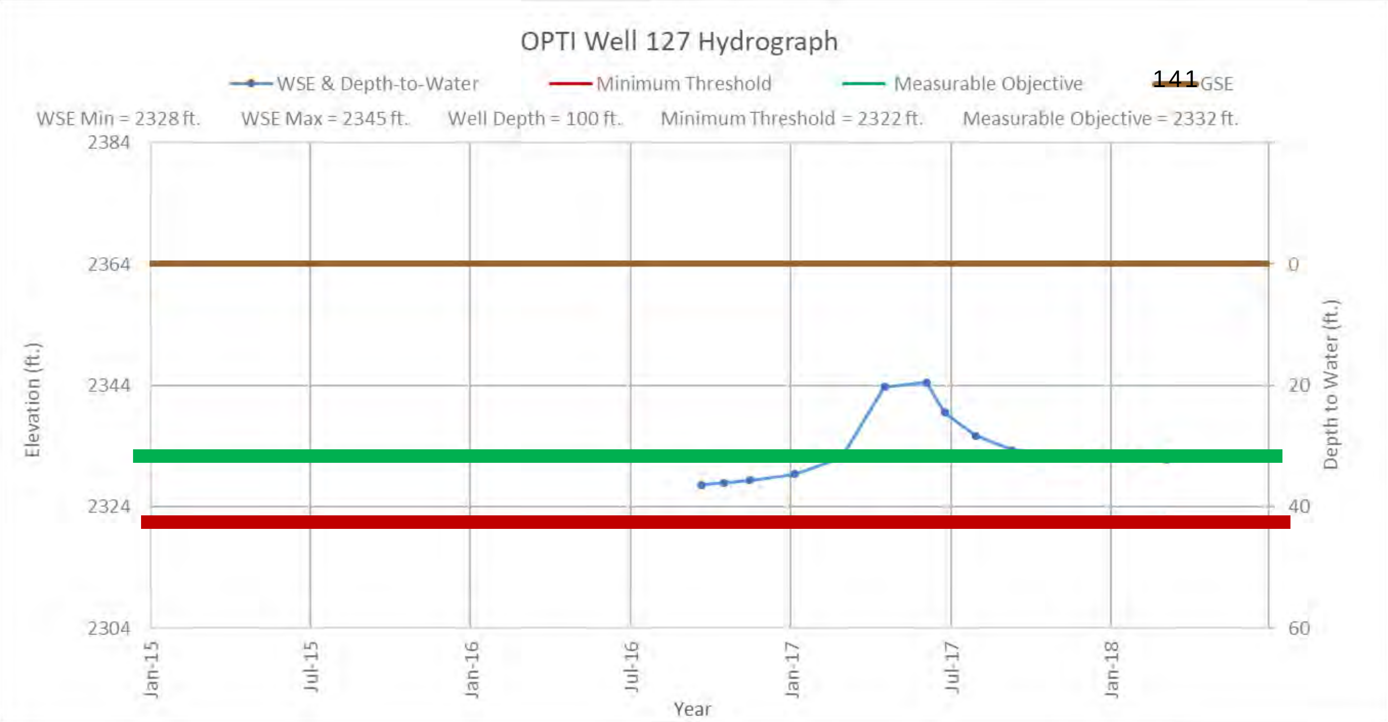
WOODARD & CURRAN

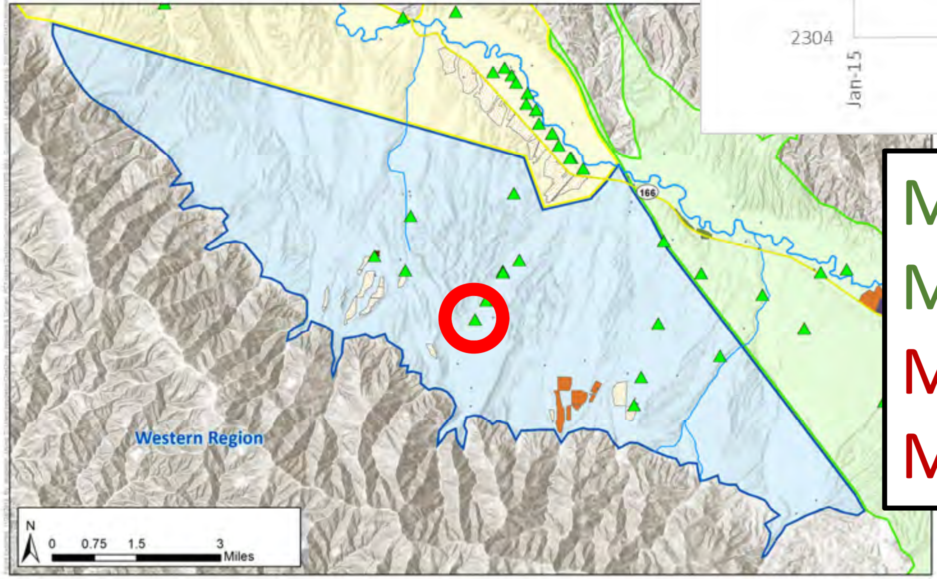


Western Region

Western Region

2018 as MO, – 10 feet as MT





Measurable Objective – 2/1/2015 Measurement

Minimum Threshold – 10 feet below Measurable Objective

WOODARD & CURRAN

Western Region - Advantages/ Disadvantages of Using 2015 for Measurable Objective

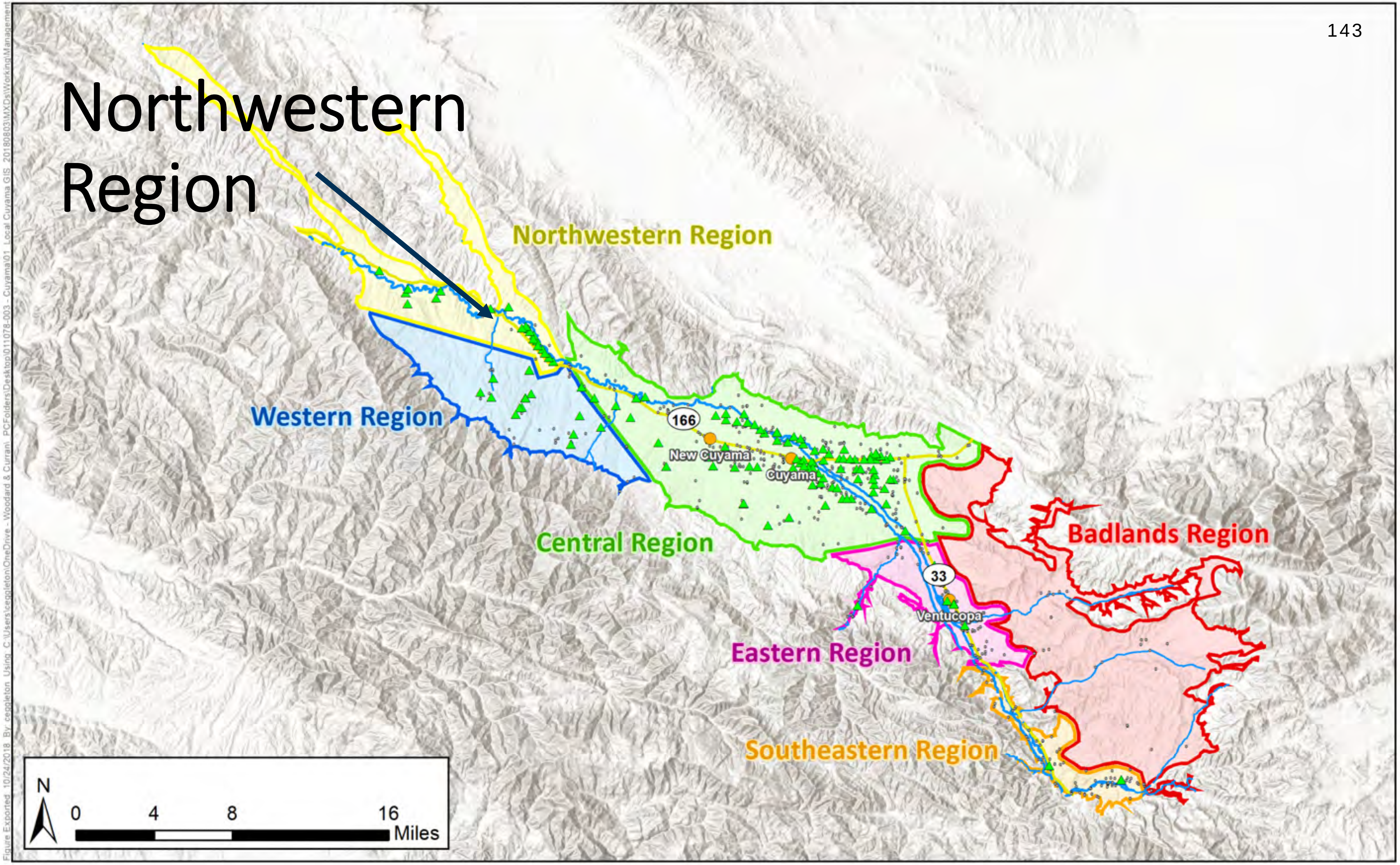
Advantages

- Recognizes lack of historic data
- Provides flexibility for moving forward, can adjust as needed
- Maintains estimated 5 years of storage between minimum threshold and measurable objective

Disadvantages

WOODARD & CURRAN

Northwestern Region



Three Minimum Threshold Options for Northwestern Region

1. Use 2015 measurement as minimum threshold

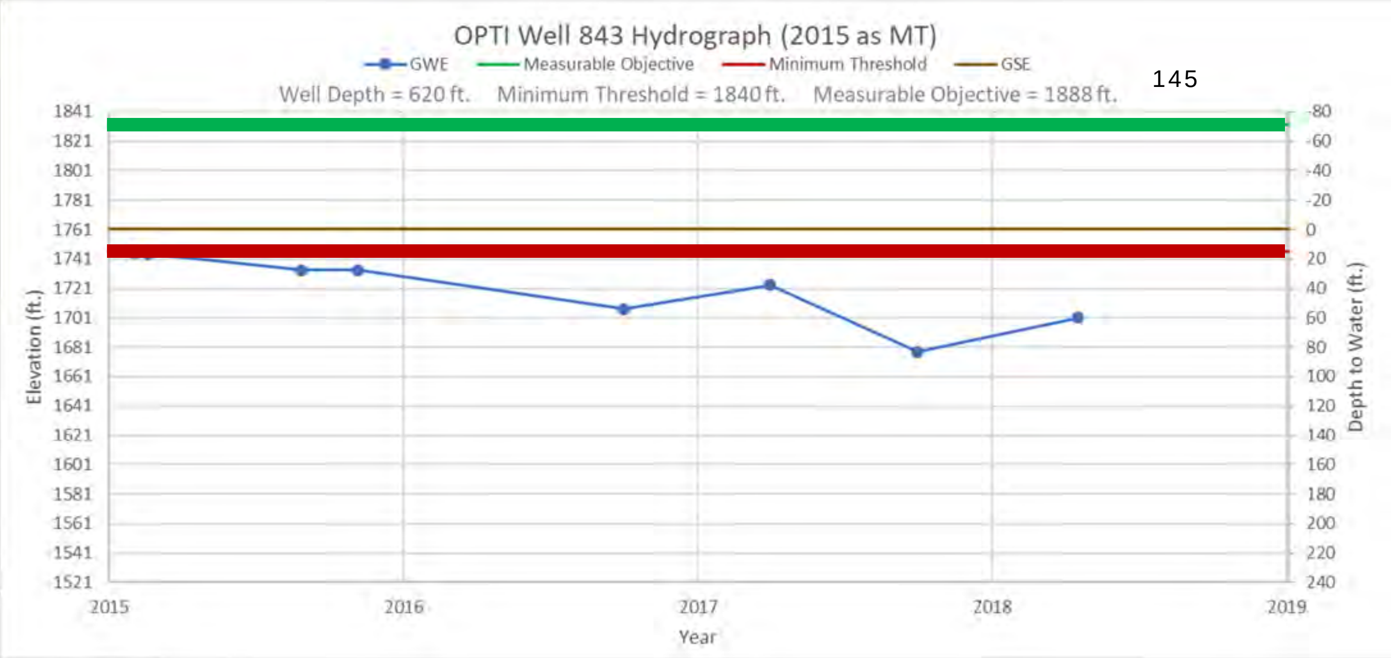
2. Use 2015 measurement as measurable objective

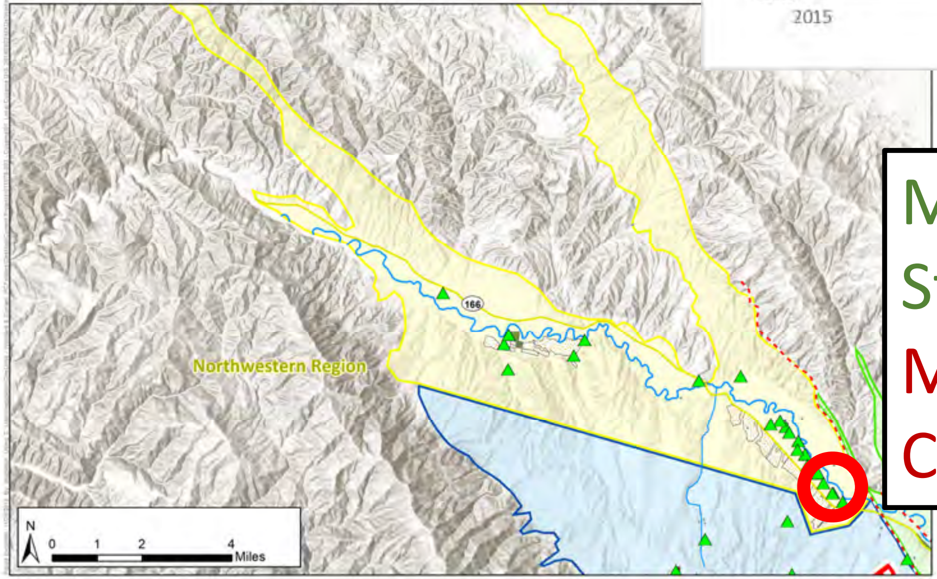
3. Minimum threshold based on subsidence & saturated aquifer thickness

WOODARD &CURRAN

Northwestern Region

1) 2015 as MT





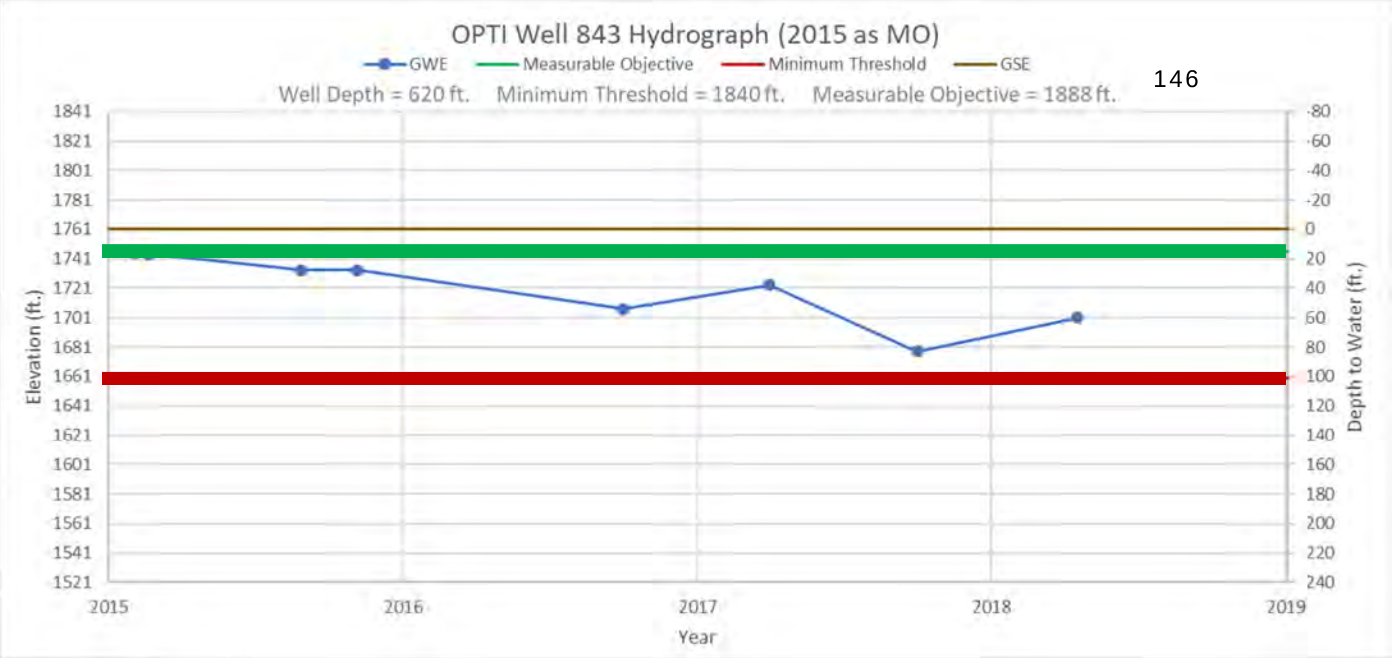
Measurable Objective – 5-years of Storage

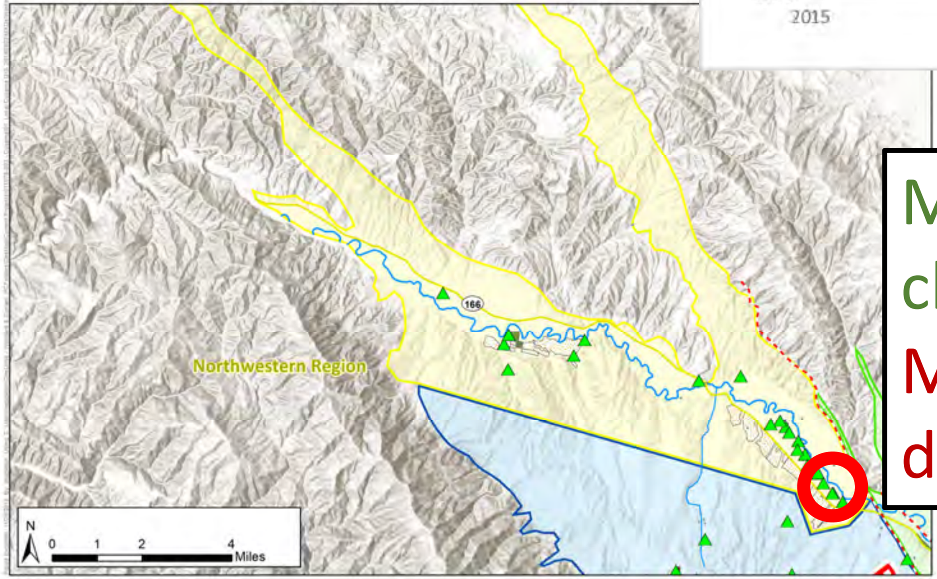
Minimum Threshold – Measurement Closest to (but after) January 1, 2015

WOODARD & CURRAN

Northwestern Region

2) 2015 as MO





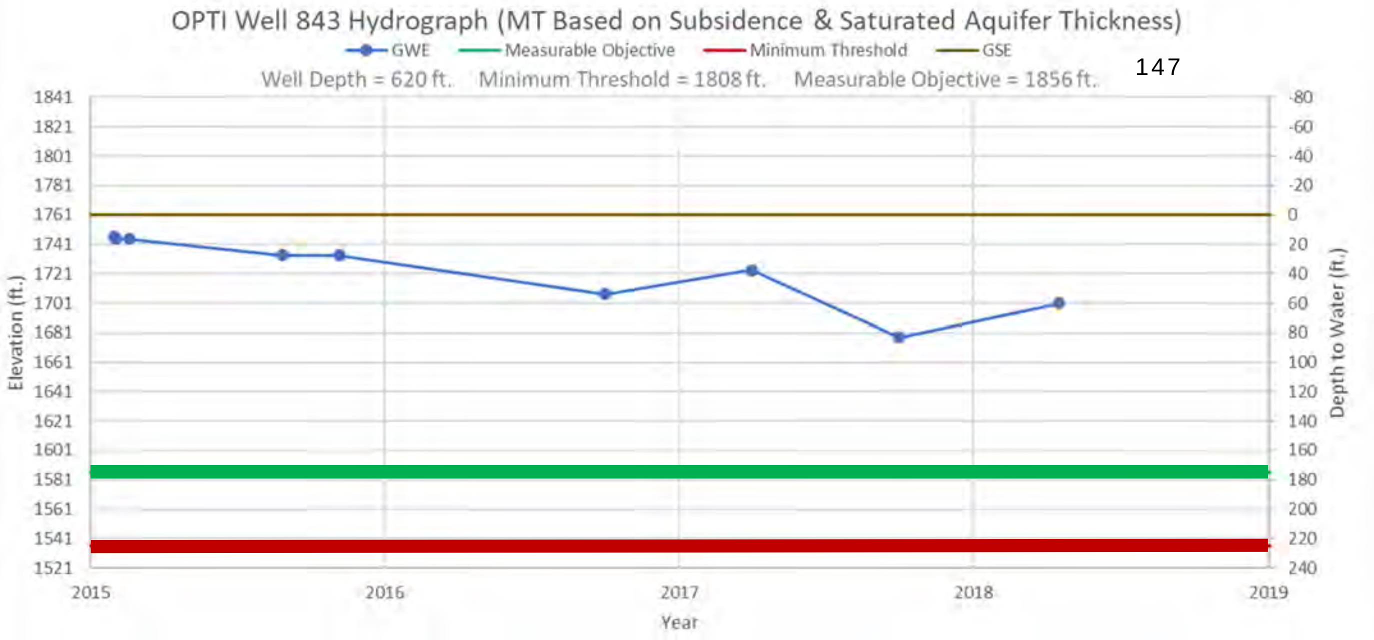
Measurable Objective – 1/1/2015 (or closest Measurement, or calculated)

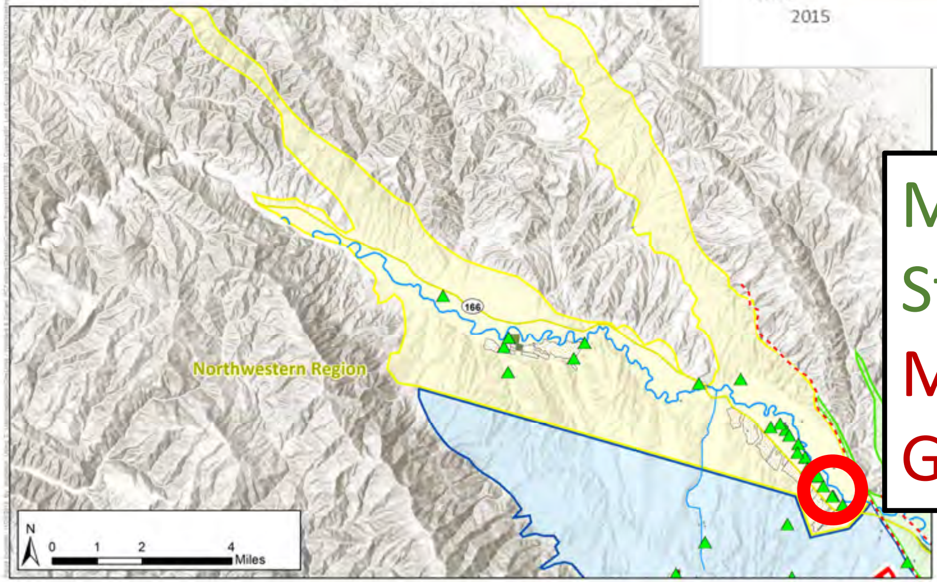
Minimum Threshold – 5-years of drought storage

WOODARD &CURRAN

Northwestern Region

3) MT based on subsidence & saturated aquifer thickness





Measurable Objective – 5-years of Storage

Minimum Threshold – 225 ft. below Ground Surface Elevation

WOODARD & CURRAN

Northwestern Region - Advantages/ Disadvantages of Three Options for Minimum Thresholds

Advantages

2015 as Minimum Threshold

- Attempts to regain 2015 groundwater levels

2015 as Measurable Objective

- Provides flexibility to adjust land and water use practices

Based on subsidence & saturated aquifer thickness

- Provides more flexibility for operations

Disadvantages

2015 as Minimum Threshold

- Current levels are below minimum threshold

2015 as Measurable Objective

- Lower long-term groundwater levels

Based on subsidence & saturated aquifer thickness

- Lowest long-term groundwater levels

WOODARD &CURRAN

Next Steps

- Prepare thresholds for wells in Representative Monitoring Network for review by Standing Advisory Committee meeting and consideration by the Board in January 2019
- Prepare draft Thresholds GSP Section

TO: Standing Advisory Committee
Agenda Item No. 5e

FROM: Brian Van Lienden, Woodard & Curran (W&C)

DATE: November 29, 2018

SUBJECT: Technical Forum Update

Issue
Update on the Technical Forum.

Recommended Motion
None – information only.

Discussion
At the request of Cuyama Valley landowners, Cuyama Basin Groundwater Sustainability Agency Groundwater Sustainability Plan (GSP) consultant Woodard & Curran (W&C) has been meeting monthly with technical consultants representing landowners to discuss W&C's approach and to provide input where appropriate.

A summary of the topics discussed at the October 23, 2018 technical forum meeting is provided as Attachment 1, and the next forum date is to be determined.

COMMITMENT & INTEGRITY
DRIVE RESULTS

1545 River Park Drive | Suite 425
Sacramento, California 95815
www.woodardcurran.com

T 916.999.8700

MEETING MEMORANDUM

PROJECT: Cuyama Basin Groundwater Sustainability Plan Development

MEETING DATE: 10/23/2018

MEETING: Technical Forum Conference Call

ATTENDEES: Matt Young (Santa Barbara County Water Agency)
Fray Crease (Santa Barbara County Water Agency)
Matt Klinchuch (Cuyama Basin Water District)
Neil Currie (Cleath-Harris Geologists)
Tim Cleath (Cleath-Harris Geologists)
John Fio (EKI)
Jeff Shaw (EKI)
Anona Dutton (EKI)
Matt Naftaly (Dudek)
Brian Van Lienden (Woodard & Curran)
Sercan Ceyhan (Woodard & Curran)
Ali Taghavi (Woodard & Curran)
Micah Eggleton (Woodard & Curran)

1. AGENDA

- GSP Development Process and GSP Outline Update
- Update on Management Areas
- Sustainability Thresholds Overview
- Numerical Model Development Update
- Next Steps

2. DISCUSSION ITEMS

The following table summarizes comments raised during the conference call and the response and plan for resolution (if appropriate) identified for each item.

Item No.	Comment	Commenter	Response/Plan for Resolution
1	Would the rationale used for sustainability indicators be similar with each threshold region?	Jeff Shaw	The intent is to use the threshold regions to help identify rationales used to set the sustainability indicators in each region.
2	Using the term "threshold regions" as opposed to "management areas" may be confusing	Matt Young	Comment noted. The terminology used will need to be clarified going forward.

3	Why a straight line instead of using a hydrogeologic barrier in Northeast boundary?	Neil Currie	The intent of the boundary is just to separate out wells in different regions. The exact boundary line can be adjusted in the future.
4	We should separate out all of the undeveloped area in the eastern basin into a separate region.	Multiple	This proposal has been included in the options to be presented to the SAC and Board.
5	In the central basin, we should consider using the 2015 levels as the measurable objective rather than the minimum threshold.	Anona Dutton	This will be considered as an option as the proposed thresholds are developed.
6	The shallowest well rationale is limited because we don't have good data on which wells are still active.	Anona Dutton	This limitation has been added to the presentation materials for the SAC and Board.
7	Undesirable results for each sustainability indicator need to be clearly defined.	Tim Cleath	Comment noted. These will be described in the relevant GSP section.
8	We should describe the reasoning behind each rationale in the presentations to the SAC and Board	Anona Dutton	Descriptions for each rationale will be added to the SAC and Board presentations.
9	Why were the wells in the presentation selected?	Jeff Shaw	The wells used in the presentation are just example wells selected to demonstrate how each potential rationale would work.
10	Instead of using a different rationale in each region, W&C should use a step function to implement the criteria that can be applied throughout the Basin.	Jeff Shaw and Anona Dutton	It would be very difficult to develop a single function that can be applied basin-wide. Using different rationales in each region provides more flexibility to define thresholds and objectives for each well in a reasonable way. The reasoning for why rationales were selected in each region will be described in the relevant GSP section.

Attachment 2

Cuyama Basin Groundwater Sustainability Agency

Technical Forum Update

November 29, 2018

WOODARD & CURRAN

November 27th Technical Forum Discussion

- Review of Preliminary Threshold Numbers
- Numerical Model Development Update
- Next Steps
- Next Meeting in December – date TBD

WOODARD & CURRAN

Technical Forum Members

- Catherine Martin, San Luis Obispo County
- Matt Young, Santa Barbara County Water Agency
- Matt Scrudato, Santa Barbara County Water Agency
- Matt Klinchuch, Cuyama Basin Water District
- Jeff Shaw, EKI
- Anona Dutton, EKI
- John Fio, EKI
- Dennis Gibbs, Santa Barbara Pistachio Company
- Neil Currie, Cleath-Harris Geologists
- Matt Naftaly, Dudek

WOODARD & CURRAN

TO: Standing Advisory Committee
Agenda Item No. 5f

FROM: Mary Currie, Catalyst Group

DATE: November 29, 2018

SUBJECT: Stakeholder Engagement Update

Issue
Update on the Cuyama Basin Groundwater Sustainability Agency Groundwater Sustainability Plan stakeholder engagement.

Recommended Motion
None – information only.

Discussion
Cuyama Basin Groundwater Sustainability Agency (CBGSA) Groundwater Sustainability Plan (GSP) outreach consultant the Catalyst Group's stakeholder engagement update is provided as Attachment 1.

Attachment 1

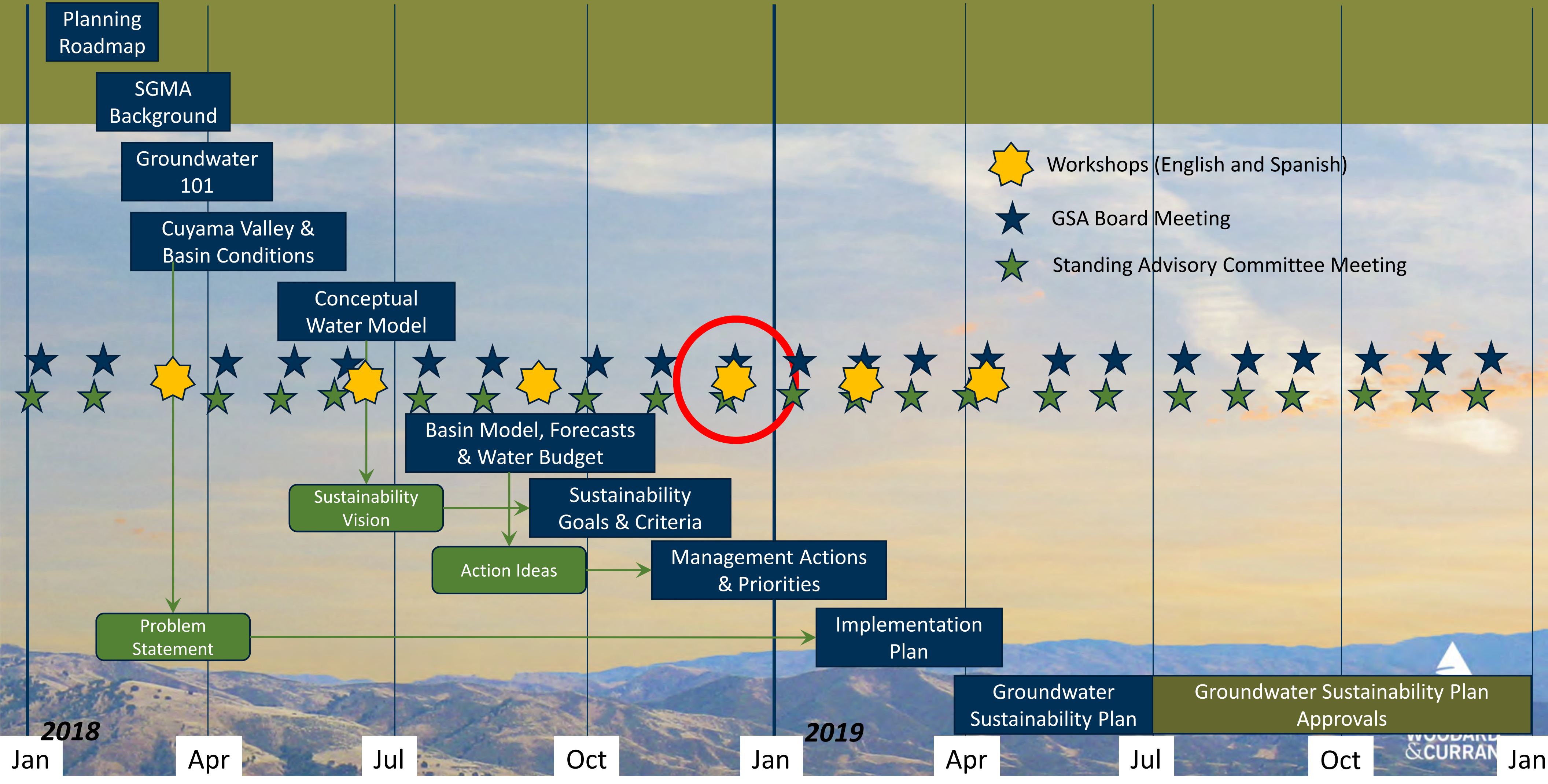
Cuyama Basin Groundwater Sustainability Agency

Groundwater Sustainability Plan Stakeholder Engagement Update

November 29, 2018

WOODARD & CURRAN

Cuyama Basin Groundwater Sustainability Plan – Planning Roadmap



Update on Outreach Activities

- Community Workshops - Monday, December 3, 6:30 p.m. to 8:30 p.m.
  - New Cuyama High School Cafeteria – English Language
  - Adjacent Classroom – Spanish Language
  - Food Sponsor is Sunridge Farms
  - Topics and Discussions will include:
    - Water Model Update and Water Budget
    - Sustainability Goals and Thresholds
  - Comment Forms will include Questions for Community Input
- Next Newsletter – January/February 2019

WOODARD &CURRAN

TO: Standing Advisory Committee
Agenda Item No. 6b

FROM: Jim Beck, Executive Director

DATE: November 29, 2018

SUBJECT: Board of Directors Agenda Review

Issue
Review of the December 3, 2018 Cuyama Basin Groundwater Sustainability Agency Board of Directors agenda.

Recommended Motion
None – information only.

Discussion
The December 3, 2018 Cuyama Basin Groundwater Sustainability Agency Board of Directors agenda is provided as Attachment 1 for review.

Attachment 1

JOINT MEETING OF CUYAMA BASIN GROUNDWATER SUSTAINABILITY AGENCY BOARD OF DIRECTORS AND STANDING ADVISORY COMMITTEE

Board of Directors

Derek Yurosek Chairperson, Cuyama Basin Water District
Lynn Compton Vice Chairperson, County of San Luis Obispo
Das Williams Santa Barbara County Water Agency
Cory Bantilan Santa Barbara County Water Agency
Glenn Shephard County of Ventura
Zack Scrivner County of Kern
Paul Chounet Cuyama Community Services District
George Cappello Cuyama Basin Water District
Byron Albano Cuyama Basin Water District
Jane Wooster Cuyama Basin Water District
Tom Bracken Cuyama Basin Water District

Standing Advisory Committee

Roberta Jaffe Chairperson
Brenton Kelly Vice Chairperson
Claudia Alvarado
Brad DeBranch
Louise Draucker
Jake Furstenfeld
Joe Haslett
Mike Post
Hilda Leticia Valenzuela

AGENDA

December 3, 2018

Agenda for a meeting of the Cuyama Basin Groundwater Sustainability Agency Board of Directors to be held on Monday, December 3, 2018 at 4:00 PM, at the Cuyama Valley Family Resource Center, 4689 CA-166, New Cuyama, CA 93254. To hear the session live call (888) 222-0475, code: 6375195#.

The order in which agenda items are discussed may be changed to accommodate scheduling or other needs of the Board or Committee, the public, or meeting participants. Members of the public are encouraged to arrive at the commencement of the meeting to ensure that they are present for discussion of all items in which they are interested.

In compliance with the Americans with Disabilities Act, if you need disability-related modifications or accommodations, including auxiliary aids or services, to participate in this meeting, please contact Taylor Blakslee at (661) 477-3385 by 4:00 p.m. on the Friday prior to this meeting. Agenda backup information and any public records provided to the Board after the posting of the agenda for this meeting will be available for public review at 4689 CA-166, New Cuyama, CA 93254. The Cuyama Basin Groundwater Sustainability Agency reserves the right to limit each speaker to three (3) minutes per subject or topic.

1. Call to Order
2. Roll Call
3. Pledge of Allegiance
4. Approval of Minutes
    a. November 7, 2018
5. Report of the Standing Advisory Committee
6. Technical Forum Update
7. Groundwater Sustainability Plan

a. Groundwater Sustainability Plan Update

i. Data Management Chapter Release

b. Groundwater Conditions Chapter Adoption

c. Review of Preliminary Threshold Numbers

d. Stakeholder Engagement Update

8. Groundwater Sustainability Agency

a. Report of the Executive Director

b. Progress & Next Steps

c. Report of the General Counsel

9. Financial Report

a. Financial Management Overview

b. Financial Report

c. Hallmark Group Task Order Adoption

d. Payment of Bills

10. Reports of the Ad Hoc Committees

11. Directors’ Forum

12. Public comment for items not on the Agenda

At this time, the public may address the Board on any item not appearing on the agenda that is within the subject matter jurisdiction of the Board. Persons wishing to address the Board should fill out a comment card and submit it to the Board Chair prior to the meeting.

13. Public Workshops (6:30 pm) – New Cuyama High School Cafeteria, 4500 CA-166, New Cuyama, CA 93254

14. Adjourn (8:30 pm)