Section 6. The approval of this Resolution and the actions described herein are exempt from the requirements of the California Environmental Quality Act CEQA since:

1) they are not a project for purposes of CEQA Guidelines 14 Cal. Code Regs. 15378 b5 because the approval will not result in direct or indirect physical changes in the environment, and

2) it can be seen with certainty that there is no possibility that the approval in question may have a significant effect on the environment. CEQA Guidelines 14 Cal. Code Regs. 15061b3. Staff is directed to file and post within five 5 business days a Notice of Exemption associated with this approval with the Clerk of the Board of Supervisors of San Luis Obispo County.

Section 7. The Secretary to the Board does hereby certifies the adoption of this resolution.

PASSED APPROVED AND ADOPTED this 27th day of October 2016 by the following Vote:

AYES BUCKMAN, DAWES, GREEN, KALVANS, REUCK

NOES

ABSENT

John Green, Board President
San Miguel Community Services District

ATTEST:

Darrell W. Gentry

Darrell W. Gentry, General Manager and
Secretary to the Board of Directors

APPROVED AS TO FORM:

Doug White, District General Counsel

EXHIBIT 4

(LIST OF INTERESTED PARTIES)

4-H Clubs- Paso Robles
807 Sycamore canyon
Paso Robles, CA 93446

4-H Clubs- San Luis Obispo
2156 Sierra Way #C
San Luis Obispo, CA 93422

Agricultural Liaison Advisory Board (ALAB)

Almira Water Association
P.O. Box 752
Paso Robles, CA 93447

Arciero Winery
5011 CA-46
Paso Robles, CA 93446

Atascadero Mutual Water Company
5005 El Camino Real
Atascadero, CA 93422

Atascadero State Hospital
10333 El Camino Real
Atascadero, CA 93422

Cal Trans Shandon Rest Stop
1120 N Street MS 49 Ca-46
Sacramento, CA 95814

Camp Roberts
billeting office, bldg 6037
Camp Roberts, CA 93451

Central Coast Salmon Enhancement
229 Stanley Ave.
Arroyo Grande, CA 93420

Central Coast Vineyard Team
5915 El Camino Real
Atascadero, CA 93422

Central Coast Wine Grape Growers Association

Chumash Casino Resort
3400 E. Hwy 246
Santa Ynez, CA 93460

City of Atascadero
6500 Palma Ave.
Atascadero, CA 93422

City of Atascadero
6500 Palma Ave.
Atascadero, CA 93422

City of Paso Robles
1000 Spring Street
Paso Robles, CA 93446

City of Paso Robles
1000 Spring Street
Paso Robles, CA 93446

County of Monterey
168 West Alisal Street 3rd fl
Salinas, CA 93901

County of Monterey
140 Church St
Salinas, CA 93901

County of San Luis Obispo
1055 Monterey Street
San Luis Obispo, CA 93408

County of San Luis Obispo Planning Department & Planning Commission
976 Osos Street #200
San Luis Obispo, CA 93408

Courtside Cellars
2425 Mission Street
San Miguel, CA 93451

Creston Country Store
6330 Webster Rd.
Creston, CA 93432

Creston Elementary School
5105 O'donovan Rd.
Creston, CA 93432

Department of Water Resources
1416 9th Street
Sacramento, CA 95814

El Paso De Robles Youth Correction Facility
4545 Airport Road
Paso Robles, CA 93446

Garden Farms Community Water District
17005 Walnut Ave.
Atascadero, CA 93422

Green River Mutual Water Company
5 Grace Dr.
Paso Robles, CA 93446

Grower-Shipper Association
512 Pajaro Street
Salinas, CA 93901

Heritage Ranch CSD
4870 Heritage Road
Paso Robles, CA 93446

Heritage Ranch CSD
4870 Heritage Road
Paso Robles, CA 93446

Huerhuero Ranch
9620 Huer Huero Road
Creston, CA 93432

Hunter Ranch Golf Course
4041 CA-46
Paso Robles, CA 93446

Independent Grape Growers of Paso Robles
P.O. Box 599
Paso Robles, CA 93447

Jack Ranch Cafe
19215 CA-46
Shandon, CA 93461

Land Conservancy of San Luis Obispo
1137 Pacific Street #A
San Luis Obispo, CA 93401

Las Posas Tablas Resource Conservation District
65 S. Main Street #107
Templeton, CA 93465

Loading Chute
6350 Webster Road
Creston, CA 93432

Local Chapter California Certified Organic Farms
P.O. Box 838
Paso Robles, CA 93447

Longbranch Saloon
6258 Webster Road
Creston, CA 93432

Los Robles Mobile Estates
3165 Theatre Dr.
Paso Robles, CA 93446

Meridian Vineyard
7000 Hwy 46
Paso Robles, CA 93446

Monterey County Parks Department
168 West Alisal Street 2rd fl
Salinas, CA 93901

Monterey County Water Resources Agency
893 Blanco Circle
Salinas, CA 93901

Mustang Springs Mutual Water Company
1606 Spring Street
Paso Robles, CA 93446

Native American Heritage Commission
915 Capital Mall #364
Sacramento, CA 95814

North County Farmers Market Association
P.O. Box 1783
Paso Robles, CA 93447

Paso Robles Chamber of Commerce
1225 Park Street
Paso Robles, CA 93446

Paso Robles RV Ranch
398 Exline Road
Paso Robles, CA 93446

Paso Robles Truck Plaza (San Paso)
81 Wellsona Rd.
Paso Robles, CA 93446

Paso Robles Vintners and Growers Association
30 10th Street
Paso Robles, CA 93446

Paso Robles Wine Country Alliance
1446 Spring Street #103
Paso Robles, CA 93446

Pete Johnston GM
2485 Theater Drive
Paso Robles, CA 93446

Pleasant Valley Elementary
025 Ranchita Canyon Road
San Miguel, CA 93451

Rancho Salinas Mutual Benefit Water Company
3563 Empleo Street
San Luis Obispo, CA 93408

Regional Water Quality Control Board
320 West Fourth St #200
Los Angeles, CA 90013

Salinan Nation Cultural Association
P.O. Box 56
Lockwood, CA 93932

San Luis Obispo Council of Government (SLO COG)
919 Palm Street #T
San Luis Obispo, CA 93401

San Luis Obispo County Flood Control
& Water Conservation
976 Osos Street #206
San Luis Obispo, CA 93408

San Miguel Cemetery District
P.O. Box 237
San Miguel, CA 93451

San Miguel School District
1601 L Street
San Miguel, CA 93451

SATCOM- Camp Roberts
billeting office, bldg 6037
Camp Roberts, CA 93451

SLO County Farm Supply
1450 Ramada Dr.
Paso Robles, CA 93446

Spanish Lakes Mutual Water Company
330 Morro Road
Atascadero, CA 93422

The Nature Conservancy
9 Pacific St
Monterey, CA 93940

UC Cooperative Extension
649 San Benito Street #115
Hollister, CA 95023

USDA Farm Service Agency
680 Campus Drive
Hanford, CA 93230

San Miguel Advisory Council
P.O. Box 822
San Miguel , CA 93451

San Miguel Chamber of Commerce
P.O. Box 385
San Miguel, CA 93451

Santa Ynez Band of Mission Indians
P.O. Box 517
Santa Ynez, CA 93460

SLO County Cattlemen
P.O. Box 302
Paso Robles, CA 93447

SLO County Visitors & Conference Bureau
1334 Marsh Street
San Luis Obispo, CA 93401

Templeton CSD
420 Crocker St.
Templeton, CA 93465

The Nature Conservancy
895 Napa Ave
Morro Bay, CA 93442

Upper Salinas-Las Tablas Resource Conservation District
65 S. Main St. #107
Templeton , CA 93465

Walnut Hills Mutual Water Company
245 Nutwood Circle
Paso Robles, CA 93446

San Miguel Catholic Church—Monterey Diocese
P.O. Box 69
San Miguel , CA 93451

San Miguel CSD
P.O. Box 180
San Miguel, CA 93451

Santa Ysabel Ranch Mutual Water Company
P.O. Box 1988
Atascadero, CA 93422

SLO County Cattlewomen
9765 Carrisa Hwy
Santa Margarita, CA 93453

SLO Farm Bureau
4875 Morabito Place
San Luis Obispo, CA 93401

Templeton CSD
420 Crocker St.
Templeton, CA 93465

U.S. Fish & Wildlife
1849 C Street NW
Washington, DC 20240

USDA Conservation Service
21001 Elliot Road
Lockeford, CA 95237

MEMORANDUM OF AGREEMENT REGARDING PREPARATION OF A GROUNDWATER SUSTAINABILITY PLAN FOR THE PASO ROBLES GROUNDWATER BASIN

This Memorandum of Agreement regarding Preparation of a Groundwater Sustainability Plan for the Paso Robles Groundwater Basin ("MOA") is entered into by and between the City of El Paso de Robles ("City"), the San Miguel Community Services District ("SMCSD"), the Heritage Ranch Community Services District ("HRCSD"), the County of San Luis Obispo ("County") and the Shandon-San Juan Water District ("SSJWD") (each referred to individually as a "Party" and collectively as the "Parties") for purposes of preparing a groundwater sustainability plan for the Paso Robles Area Subbasin.

Recitals

WHEREAS, on September 16, 2014, Governor Jerry Brown signed into law Senate Bills 1168 and 1319 and Assembly Bill 1739, known collectively as the Sustainable Groundwater Management Act (Water Code §§ 10720 *et seq.*) ("SGMA"), which became effective on January 1, 2015 and which have been and may continue to be amended from time to time; and

WHEREAS, SGMA requires the establishment of a groundwater sustainability agency ("GSA") or agencies for all basins designated as medium or high priority by the California Department of Water Resources ("DWR") on or before June 30, 2017; and

WHEREAS, SGMA further requires the adoption of a groundwater sustainability plan ("GSP") or coordinated GSPs for all basins designated by DWR as high or medium priority and subject to critical conditions of overdraft on or before January 31, 2020; and

WHEREAS, DWR has designated the Paso Robles Area Subbasin (Basin No. 3-004.06) ("Basin") as a high priority basin subject to critical conditions of overdraft; and

WHEREAS, each of the Parties has decided to become the GSA within its respective service area overlying the Basin and has informed DWR of its decision and intent to undertake sustainable groundwater management therein; and

WHEREAS, each of the Parties desires to collectively develop and implement a single GSP to sustainably manage the portions of the Basin underlying their combined service areas (*i.e.* all portions of the Basin located within the County of San Luis Obispo); and

WHEREAS, the Parties share the common goal of cost effective, sustainable groundwater management that considers the interests and concerns of all beneficial uses and users of groundwater within the Basin; and

WHEREAS, on April 6, 2017, the San Luis Obispo Local Agency Formation Commission conditionally approved the formation of the Estrella-El Pomar-Creston Water District ("EPCWD"), subject to, among other things, a successful vote on the formation pursuant to Water Code Section 34500, for purposes of serving as a GSA within its service area; and

WHEREAS, the EPCWD, if formed, will not be formed until after the June 30, 2017 deadline, and the County included the potential service area of the EPCWD within the Paso Basin – County of San Luis Obispo Groundwater Sustainability Agency that the County formed on May 16, 2017 by Resolution 2017-134; and

WHEREAS, the Parties acknowledge the cooperative efforts of the working group, including representatives of each Party and the applicant and several petitioners desiring to form the EPCWD, that commenced meeting in August 2016 and that culminated in this MOA; and

WHEREAS, this MOA provides for the future addition of EPCWD as a Party to this MOA provided that certain conditions are satisfied, including, but not limited to, a successful vote on the formation of the EPCWD pursuant to Water Code Section 34500 and the County Board of Supervisors decides to withdraw from serving as the GSA for the EPCWD service area; and

WHEREAS, the active involvement and cooperation of all users of groundwater within the Basin is highly valued by the Parties and their continued willing cooperation in SGMA implementation is deemed critical for successful sustainable management of the Basin.

NOW, THEREFORE, it is mutually understood and agreed as follows:

Section 1
Purpose

The purpose of this MOA is to establish a committee to develop a single GSP that will be considered for adoption by each individual Party and subsequently submitted to DWR for approval. This MOA may also serve as the basis for continued cooperation among the Parties in the management of the Basin during the period between adoption of the GSP by each Party and approval of the GSP by DWR. As more specifically set forth in Section 12.2 below, this MOA shall automatically terminate upon DWR's approval of the GSP for the Basin.

Section 2
Term

This MOA shall become effective on the date that the last of the five (5) Parties signs ("Effective Date") and shall remain in effect until terminated in accordance with Section 9.2 or Section 12.2 below.

Section 3
EPCWD

If and only if the EPCWD is formed and its Board of Directors decides to become the GSA within its service area and the County Board of Supervisors decides to withdraw from serving as the GSA within said area, the EPCWD may become a Party to this Agreement by signing the Addition of Party to Memorandum of Agreement regarding Preparation of a Groundwater Sustainability Plan for the Paso Robles Groundwater Basin in the form attached hereto as Exhibit A ("Addition") provided that the County Board of Supervisors has accepted the Addition as part of its decision to withdraw.

Section 4
Paso Basin Cooperative Committee

4.1 The Parties hereby establish the Paso Basin Cooperative Committee ("Cooperative Committee") which shall be composed of a member and alternate member from each of the five (5) Parties.

4.2 The governing body of each Party shall promptly appoint a member and alternate member to the Cooperative Committee. Each Cooperative Committee member and alternate member shall serve at the pleasure of the appointing Party, and may be removed from the Cooperative Committee by the appointing Party at any time. Each Cooperative Committee member's compensation, if any, for his or her service on the Cooperative Committee shall be the responsibility of the appointing Party.

4.3 If and only if the EPCWD becomes a Party to this MOA in accordance with Section 3 of this MOA, the Cooperative Committee shall also include a member and alternate member from the EPCWD appointed by the EPCWD.

4.4 The Cooperative Committee shall conduct activities related to GSP development and SGMA implementation at the pleasure and under the guidance of the Parties, including, but not limited to:

A. Development of a GSP that achieves the goals and objectives outlined in SGMA;

B. Review and participation in the selection of consultants related to Cooperative Committee efforts, as more specifically set forth in Section 6 below;

C. Development of recommended annual budgets and additional funding needs for consideration and approval of the Parties and development of a record of expenditures, in accordance with and subject to Section 5 below. Consistent with Section 7 below, it is expected that each of the Parties will contribute in-kind staff support; therefore, recommended annual budgets shall generally not include the staff or overhead costs of any Party associated with participation in this MOA;

D. Development of a plan that describes the anticipated tasks to be performed under this MOA and a schedule for performing said tasks;

E. Implementation of the actions and/or policies undertaken pursuant to this MOA and resolution of any issues related to these actions and/or policies;

F. Development of measures that may be implemented in the event insufficient or unsatisfactory progress is being made in development of the GSP;

G. Development of a stakeholder participation plan that includes public outreach and education programs and workshops as appropriate and that involves the interested stakeholders in developing and implementing the GSP (*e.g.* workshops at key milestones); if determined necessary by the Cooperative Committee and supported by the Parties, the Cooperative Committee may lead implementation of the stakeholder participation plan or other stakeholder engagement activities;

H. Establishment from time to time of one or more standing or *ad hoc* committees to assist in carrying out the purposes and objectives of the Cooperative Committee as may be necessary;

I. Recommendation that each individual Party adopt the GSP developed under this MOA;

J. Resolution of differences among the Parties;

K. Coordination with neighboring GSAs in the Salinas Valley Groundwater Basin and with neighboring GSPs as may be required and/or to ensure no adverse effects.

4.5 The Cooperative Committee shall meet at least quarterly to carry out the activities described above. The Cooperative Committee shall prepare and maintain minutes of its meetings, and all meetings of the Cooperative Committee shall be conducted in accordance with the Ralph M. Brown Act (Government Code §§ 54950 *et seq.*). A majority of the members of the Cooperative Committee shall constitute a quorum for purposes of transacting business, except that less than a quorum may vote to adjourn the meeting. Attendance at all Cooperative Committee meetings may be augmented to include Parties' staff or consultants to ensure that the appropriate expertise is available.

4.6 Subject to Section 4.7 below, on all matters considered by the Cooperative Committee, the vote of each member shall be weighted in accordance with the following percentages:

City Member	15%
SMCSD Member	3%
HRCSD Member	1%

SSJWD Member	20%
County Member	61%

4.7 If and only if the EPCWD becomes a Party to this MOA in accordance with Section 3 of this MOA, the voting percentages set forth in Section 4.6 shall be modified as follows:

City Member	15%
SMCSD Member	3%
HRCSD Member	1%
SSJWD Member	20%
County Member	32%
EPCWD Member	29%

4.8 Any action or recommendation considered by the Cooperative Committee shall require the affirmative vote of 67 percent based on the percentages set forth in Section 4.6 or 4.7 above, as applicable. Notwithstanding the foregoing, the following shall require the affirmative vote of 100 percent based on the percentages set forth in Section 4.6 or 4.7 above, as applicable: (A) a recommendation that each of the Parties adopt the GSP or adopt any amendment thereto prepared in response to comments from DWR and (B) a recommendation that the Parties amend this MOA. For purposes of determining whether the requisite voting threshold has been met, the voting percentage of each member must be included in the calculation with the following limited exception: in the event that a member recuses himself or herself (A) said member's voting percentage shall be allocated *pro rata* to the other members for purposes of determining whether the 67 percent threshold has been met and (B) said members' affirmative vote shall not be required to reach the 100 percent threshold (i.e. all members who have not recused themselves must vote in the affirmative). Without limiting the foregoing, an absence by any member(s) shall not result in any *pro rata* distribution for purposes of determining whether the 67 percent threshold has been met or result in elimination of the requirement that said member vote in the affirmative for purposes of determining whether the 100 percent threshold has been met.

4.9 The creation of the Cooperative Committee shall not be construed as a delegation of any powers or authorities, and all powers and authorities of each individual Party shall reside with that Party.

Section 5
Funding

5.1 The Fiscal Year of the Cooperative Committee shall be July 1 through June 30.

5.2 For Fiscal Years 2017 – 2018, 2018 – 2019 and 2019 – 2020, the Cooperative Committee shall develop a recommended budget for consideration by each Party. Subject to each Party's approval of the budget for the relevant Fiscal Year, each Party shall be responsible for funding a portion of said budgeted costs in accordance with the percentages set forth in Section 4.6 or Section 4.7 above, as applicable. Neither the Cooperative Committee nor any Party on behalf of the Cooperative Committee shall make any financial expenditures or incur any financial obligations or liabilities pursuant to this MOA for Fiscal Years 2017 – 2018, 2018 – 2019 or 2019 – 2020 prior to approval of the budget for the relevant Fiscal Year by each Party.

5.3 For Fiscal Year 2020 – 2021 and following, the Cooperative Committee shall develop a recommended budget and recommended contribution percentages for consideration by each Party. Subject to each Party's approval of the budget and its contribution percentage, each Party shall be responsible for funding a portion of said budgeted costs in accordance with the percentages approved by each Party. Neither the Cooperative Committee nor any Party on behalf of the Cooperative Committee shall make any financial expenditures or incur any financial obligations or liabilities pursuant to this MOA for Fiscal Year 2020 – 2021 and following prior to approval of the budget and contribution percentages for the relevant Fiscal Year by each Party.

5.4 It is anticipated that the vast majority of budgeted costs will involve costs for consultant services. Consequently, most contributions shall be paid to the City in the manner described in Section 6.6 below. For budgeted costs that do not involve consultant services (if any), the Cooperative Committee shall determine the manner in which such contributions shall be paid consistent with Section 5.2 and Section 5.3 above.

5.5 The Cooperative Committee shall make recommendations related to any additional non-budgeted funding needs, but shall have no authority to require any Party to contribute funds over and above those included in the budgets approved by each Party.

5.6 On an annual basis, the Cooperative Committee and/or contracting agent shall provide the Parties with a record of expenditures from the previous Fiscal Year related to this MOA.

Section 6
Engagement of Consultants

6.1 It is anticipated that the Cooperative Committee will desire to retain the services of one or more consultants in conducting the activities identified in Section 4.4 above, including, but not necessarily limited to, its development of the GSP.

6.2 The City agrees to act as the contracting agent on behalf of the Cooperative Committee and shall follow its own procurement policies in the engagement of such consultant(s) subject to Section 6.3 below.

6.3 The City agrees that the Parties and the Cooperative Committee shall be included in the selection of any consultant retained by the City on behalf of the Cooperative Committee.

More specifically, staff representatives from each of the Parties shall be given an opportunity to review and approve all requests for proposals prior to their release and to participate in the various stages of the selection process, including, but not limited to, review of proposals and participation on interview panels. In addition, the City shall not issue a notice to proceed to any selected consultant until the Cooperative Committee has confirmed the consultant and related contract.

6.4 The Cooperative Committee may request that the City terminate a consultant contract entered into on behalf of the Cooperative Committee subject to and in accordance with the terms specified in the contract.

6.5 All consultant contracts entered into by the City on behalf of the Cooperative Committee shall include the following: (A) a provision that the consultant shall not commence work until a notice to proceed is issued and acknowledgement that a notice to proceed will not be issued until the Cooperative Committee confirms the consultant and contract; (B) a provision requiring that the consultant name each Party, its employees, officers and agents as an additional insured; and (C) an expected spend plan estimating the amount of the not to exceed contract amount that the consultant expects to invoice the City each month.

6.6 Upon receipt of each invoice from a consultant retained on behalf of the Cooperative Committee, the City shall calculate each Party's payment obligation based on the percentages set forth in Section 4.6 or Section 4.7, as applicable, or on the percentages approved by each Party as set forth in Section 5.3, depending on the Fiscal Year. The City shall submit an invoice to each Party showing the foregoing calculation, and each Party shall remit payment to the City within thirty (30) days.

Section 7
Roles and Responsibilities of the Parties

In addition to performance of the roles and responsibilities set forth above related to, among other things, appointment of members and alternate members to the Cooperative Committee, consideration of annual budgets and cost contributions and participation in the selection of consultants, the Parties shall:

A. Work to jointly to meet the objectives of this MOA through, among other things, coordination of all activities related to fulfillment of said objectives;

B. Internally or jointly designate a staff person(s) to provide expertise and existing information in a timely manner and to participate in the development of the GSP and/or related technical studies and/or other materials or actions being considered by the Cooperative Committee;

C. Upon recommendation of the Cooperative Committee, consider adoption of the GSP and, as defined in the GSP once approved, implement the GSP within its respective GSA service area. Notwithstanding the foregoing, nothing contained in this MOA shall be construed as obligating any Party to adopt the GSP developed under this MOA, or as preventing any Party from adopting the GSP developed under this MOA in the event that the Cooperative Committee fails to recommend approval or another Party (or Parties) elects not to adopt the GSP developed under this MOA;

D. Bring any dispute over any of the activities discussed in this MOA to the Cooperative Committee in order to provide the Cooperative Committee with an opportunity to resolve the dispute.

Section 8
Interagency Communication and Providing Proper Notice

8.1 In order to provide for consistent and effective communication among the Parties, each Party agrees to designate a representative as its central point of contact on all matters relating to this MOA and the GSP. Additional representatives from the community or staff may be appointed to serve as points of contact on specific actions or issues.

8.2 All notices, statements or payments related to implementing the objectives of this MOA shall be deemed to have been duly given if given in writing and delivered electronically, personally or mailed by first-class, registered, or certified mail to the Parties at the addresses set forth in Exhibit B. Notwithstanding any other provision of this MOA, the Parties may update Exhibit B from time to time without formally amending this MOA.

Section 9
Withdrawal and Termination

9.1 Any Party may unilaterally withdraw from this MOA without causing or requiring termination of this MOA. Withdrawal shall become effective upon thirty (30) days written notice to the remaining Parties' designated addresses as listed in Exhibit B. Nothing contained in this Section 9 shall be construed as prohibiting a Party that has withdrawn from this MOA from developing its own GSP for its service area within the Basin. A Party that has withdrawn from this MOA shall remain obligated to pay its percentage cost share of expenses and obligations as outlined in the current budget incurred, accrued or encumbered up to the date the Party provided notice of withdrawal, including, but not limited to, its cost share obligation under any existing consultant contract for which the City has issued a notice to proceed. If a Party withdraws, the Cooperative Committee shall reassess the contributions of each remaining Party to fund the current budget and determine if the Cooperative Committee needs to request the contribution of additional funding from the governing board of each Party.

9.2 This MOA may be terminated upon unanimous written consent of all current Parties.

Section 10
Amendments

This MOA may be amended only by unanimous written consent of all current Parties. Approval from a Party is valid only after that Party's governing body approves the amendment at a public meeting. Neither individual Cooperative Committee members nor individual members of the Parties' governing boards have the authority, express or implied, to amend, modify, waive or in any way alter this MOA or the terms and conditions hereof.

Section 11
Indemnification

No Party, nor any officer or employee of a Party, shall be responsible for any damage or liability occurring by reason of anything done or omitted to be done by another Party under or in connection with this MOA. The Parties further agree, pursuant to Government Code Section 895.4, that each Party shall fully indemnify and hold harmless each other Party and its agents, officers, employees and contractors from and against all claims, damages, losses, judgments, liabilities, expenses and other costs, including litigation costs and attorney fees, arising out of, resulting from, or in connection with any work delegated to or action taken or omitted to be taken by such Party under this MOA.

Section 12
Miscellaneous

12.1 Execution in Counterparts. This MOA may be executed in counterparts.

12.2 Automatic Termination of MOA. This MOA shall automatically terminate upon DWR's approval of the adopted GSP. Depending on the content of the GSP, the Parties may decide to enter into a new agreement to coordinate GSP implementation.

12.3 Choice of Law. This MOA is made in the State of California, under the Constitution and laws of said State and is to be so construed.

12.4 Severability. If any provision of this MOA is determined to be invalid or unenforceable, the remaining provisions shall remain in force and unaffected to the fullest extent permitted by law and regulation.

12.5 Entire Agreement. This MOA constitutes the sole, entire, integrated and exclusive agreement between the Parties regarding the contents herein. Any other contracts, agreements, terms, understandings, promises, representations not expressly set forth or referenced in this writing are null and void and of no force and effect.

12.6 Construction and Interpretation. The Parties agree and acknowledge that this MOA has been developed through negotiation, and that each Party has had a full and fair

opportunity to revise the terms of this MOA. Consequently, the normal rule of construction that any ambiguities are to be resolved against the drafting party shall not apply in construing or interpreting this MOA.

IN WITNESS WHEREOF, the Parties have executed this MOA on the dates shown below.

CITY OF EL PASO DE ROBLES

By: ______________________
Tom Frutchey

Its: City Manager

Date: ______________________

APPROVED AS TO FORM AND LEGAL EFFECT:

By: ______________________

Its: ______________________

Date: ______________________

SHANDON SAN JUAN WATER DISTRICT

By: ______________________
Willy Cunha

Its: President, Board of Directors

Date: ______________________

APPROVED AS TO FORM AND LEGAL EFFECT:

By: ______________________

Its: ______________________

Date: ______________________

COUNTY OF SAN LUIS OBISPO

By: ______________________
John Peschong

Its: Chair, Board of Supervisors

Date: 8/22/2017

APPROVED AS TO FORM AND LEGAL EFFECT:

By: ______________________

Its: Deputy County Counsel

Date: ______________________

HERITAGE RANCH COMMUNITY SERVICES DISTRICT

By: ______________________
Scott Duffield

Its: General Manager

Date: ______________________

APPROVED AS TO FORM AND LEGAL EFFECT:

By: ______________________

Its: ______________________

Date: ______________________

ATTEST:

Tommy Gong, County Clerk-Recorder and
Ex-Officio Clerk of the Board of Supervisors

By, ______________________
Deputy Clerk

opportunity to revise the terms of this MOA. Consequently, the normal rule of construction that any ambiguities are to be resolved against the drafting party shall not apply in construing or interpreting this MOA.

IN WITNESS WHEREOF, the Parties have executed this MOA on the dates shown below.

CITY OF EL PASO DE ROBLES

By: Thomas Frutchey
Tom Frutchey

Its: City Manager

Date: 9-20-17

APPROVED AS TO FORM AND LEGAL EFFECT:

By: Iris P. Yang

Its: City Attorney

Date: 9/20/17

SHANDON SAN JUAN WATER DISTRICT

By: ____________________
Willy Cunha

Its: President, Board of Directors

Date: ____________________

APPROVED AS TO FORM AND LEGAL EFFECT:

By: ____________________

Its: ____________________

Date: ____________________

COUNTY OF SAN LUIS OBISPO

By: ____________________
John Peschong

Its: Chair, Board of Supervisors

Date: ____________________

APPROVED AS TO FORM AND LEGAL EFFECT:

By: ____________________

Its: ____________________

Date: ____________________

HERITAGE RANCH COMMUNITY SERVICES DISTRICT

By: ____________________
Scott Duffield

Its: General Manager

Date: ____________________

APPROVED AS TO FORM AND LEGAL EFFECT:

By: ____________________

Its: ____________________

Date: ____________________

opportunity to revise the terms of this MOA. Consequently, the normal rule of construction that any ambiguities are to be resolved against the drafting party shall not apply in construing or interpreting this MOA.

IN WITNESS WHEREOF, the Parties have executed this MOA on the dates shown below.

CITY OF EL PASO DE ROBLES

By: ______________________
Tom Frutchey

Its: City Manager

Date: ______________________

APPROVED AS TO FORM AND LEGAL EFFECT:

By: ______________________

Its: ______________________

Date: ______________________

COUNTY OF SAN LUIS OBISPO

By: ______________________
John Peschong

Its: Chair, Board of Supervisors

Date: ______________________

APPROVED AS TO FORM AND LEGAL EFFECT:

By: ______________________

Its: ______________________

Date: ______________________

SHANDON SAN JUAN WATER DISTRICT

By: ______________________
Willy Cunha

Its: President, Board of Directors

Date: 7-26-2017

APPROVED AS TO FORM AND LEGAL EFFECT:

By: ______________________ of Young Wooldridge, LLP

Its: District Counsel

Date: 7/26/17

HERITAGE RANCH COMMUNITY SERVICES DISTRICT

By: ______________________
Scott Duffield

Its: General Manager

Date: ______________________

APPROVED AS TO FORM AND LEGAL EFFECT:

By: ______________________

Its: ______________________

Date: ______________________

opportunity to revise the terms of this MOA. Consequently, the normal rule of construction that any ambiguities are to be resolved against the drafting party shall not apply in construing or interpreting this MOA.

IN WITNESS WHEREOF, the Parties have executed this MOA on the dates shown below.

CITY OF EL PASO DE ROBLES

By: ______________________
Tom Frutchey

Its: City Manager

Date: ______________________

APPROVED AS TO FORM AND LEGAL EFFECT:

By: ______________________

Its: ______________________

Date: ______________________

SHANDON SAN JUAN WATER DISTRICT

By: ______________________
Willy Cunha

Its: President, Board of Directors

Date: ______________________

APPROVED AS TO FORM AND LEGAL EFFECT:

By: ______________________

Its: ______________________

Date: ______________________

COUNTY OF SAN LUIS OBISPO

By: ______________________
John Peschong

Its: Chair, Board of Supervisors

Date: ______________________

APPROVED AS TO FORM AND LEGAL EFFECT:

By: ______________________

Its: ______________________

Date: ______________________

HERITAGE RANCH COMMUNITY SERVICES DISTRICT

By: Scott Duffield
Scott Duffield

Its: General Manager

Date: 07/31/2017

APPROVED AS TO FORM AND LEGAL EFFECT:

By: ______________________

Its: District Counsel

Date: 7/26/17

SAN MIGUEL COMMUNITY
SERVICES DISTRICT

By: ______________________
Rob Roberson

Its: Interim General Manager

Date: 8/29/2017

APPROVED AS TO FORM AND
LEGAL EFFECT:

By: ______________________

Its: Douglas White

Date: 9/6/17

EXHIBIT A

Addition of Party to Memorandum of Agreement regarding Preparation of a Groundwater Sustainability Plan for the Paso Robles Groundwater Basin

WHEREAS, certain local agencies that each decided to become the groundwater sustainability agency within their respective service areas overlying the Paso Robles Area Subbasin (Basin No. 3-004.06) have entered into an agreement entitled "Memorandum of Agreement regarding Preparation of a Groundwater Sustainability Plan for the Paso Robles Groundwater Basin" ("Agreement"); and

WHEREAS, the Estrella-El Pomar-Creston Water District ("EPCWD") could not be an original signatory to the Agreement, because it had not yet been formed; and

WHEREAS, Section 3 of the Agreement sets forth the process by which the EPCWD can become a party to the Agreement provided that certain conditions are met; and

WHEREAS, the EPCWD has received and reviewed a copy of the Agreement; and

WHEREAS, on ___________, the EPCWD Board of Directors held a public hearing and by Resolution _________decided to become the groundwater sustainability agency within its service area and a signatory to the Agreement; and

WHEREAS, on ___________, the County of San Luis Obispo Board of Supervisors held a public hearing and by Resolution _________decided to withdraw from serving as the groundwater sustainability agency within the EPCWD's service area and to accept the signature below.

NOW, THEREFORE, acknowledging that the recitals above are correct and are part of this agreement, the EPCWD, upon acceptance by signature below by the County of San Luis Obispo Board of Supervisors, shall become a party to the Agreement effective immediately. The EPCWD shall bear the benefits and enjoy the burdens of the Agreement as though the EPCWD had originally executed said Agreement as it now exists or may be amended in the future, and for so long as the Agreement remains in effect or for so long as the EPCWD is a party to the Agreement.

ACCEPTED AND APPROVED BY THE ESTRELLA-EL POMAR-CRESTON WATER DISTRICT BOARD OF DIRECTORS:

By: ________________________ Date: ______________________

Its: _________________________

APPROVED AS TO FORM AND LEGAL EFFECT:

By: ________________________ Date: ______________________

Its: _________________________

Address for purposes of Exhibit B to the Agreement:

Estrella-El Pomar-Creston Water District

____

____

Attention: _____________

ACCEPTED AND APPROVED BY THE COUNTY OF SAN LUIS OBISPO BOARD OF SUPERVISORS IN ACCORDANCE WITH THE AGREEMENT:

By: ________________________ Date: ______________________

Its: _________________________

APPROVED AS TO FORM AND LEGAL EFFECT:

By: ________________________ Date: ______________________

Its: _________________________

EXHIBIT B
PARTY ADDRESS LIST

County of San Luis Obispo
976 Osos Street, Room 206
San Luis Obispo, CA 93408
Attention: Wade Horton, Public Works Director

City of El Paso de Robles
1000 Spring Street
Paso Robles, CA 93451
Attention: Dick McKinley, Public Works Director

San Miguel Community Services District
1150 Mission Street
San Miguel, CA 93451
Attention: Rob Roberson, Interim General Manager

Heritage Ranch Community Services District
4870 Heritage Road
Paso Robles, CA 93446
Attention: Scott Duffield, General Manager

Shandon San Juan Water District
365 Truesdale Road PO Box 150
Shandon, CA 93461
Attention: Willy Cunha, President, Board of Directors

Appendix B

Additional Well Logs Used to Supplement Cross Sections and Precipitation Data

*The free Adobe Reader may be used to view and complete this form. However, software must be purchased to complete, save, and reuse a saved form.

File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0188056

Page 1 of 2

Owner's Well Number SVW3

Date Work Began 07/24/2013 Date Work Ended 7/26/2013

Local Permit Agency San Luis Obispo County Environmental Health Services

Permit Number 2013-116 Permit Date 7/3/13

DWR Use Only – Do Not Fill In

State Well Number/Site Number

Latitude N Longitude W

APN/TRS/Other

Geologic Log

Orientation ⦿ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Direct Rotary Drilling Fluid Bentonite mud

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc)
0	30	Conductor
0	600	Brown Clay Streaks w/Sand, Course and Fine
600	645	Cemented Course Sands w/Brown Clay
645	750	Course Sand w/Brown Clay
750	940	Brown Clay w/Course Sand
940	1,090	Fine Sand w/Brown Clay

Total Depth of Boring 1090 Feet

Total Depth of Completed Well 790 Feet

Well Owner

Well Location

Address 3385 Truesdale Road

City Shandon County San Luis Obispo

Latitude 35 Deg 36 Min 1776 Sec. N Longitude 120 Deg 22 Min 1767 Sec. W

Datum Dec. Lat. 35.60477 Dec. Long. 120.37158

APN Book Page Parcel

Township 27S Range 15E Section 4 M

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

West East

SEE

ATTACHED MAP

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

⦿ New Well
○ Modification/Repair
○ Deepen
○ Other
○ Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

⦿ Water Supply
☐ Domestic ☐ Public
☑ Irrigation ☐ Industrial
○ Cathodic Protection
○ Dewatering
○ Heat Exchange
○ Injection
○ Monitoring
○ Remediation
○ Sparging
○ Test Well
○ Vapor Extraction
○ Other

Water Level and Yield of Completed Well

Depth to first water 194 (Feet below surface)

Depth to Static Water Level 194 (Feet) Date Measured 09/25/2013

Estimated Yield * 3,000 (GPM) Test Type Step-Drawndown

Test Length 6.8 (Hours) Total Drawdown 243 (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	30	36	Conductor	Low Carbon Steel	1/4	30		
0	330	26	Blank	Mild Steel	5/16	16.5		
330	640	26	Screen	HSLA Ful Flo	5/16	16.5	Louver	0.080
640	655	26	Blank	HSLA	5/16	16.5		
655	665	26	Screen	HSLA Ful Flo	5/16	16.5	Louver	0.080
665	680	26	Blank	HSLA	5/16	16.5		

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	60	Cement	6 Sack Slurry
60	800	Filter Pack	80-1/4x10, 20-8x16
800	1,090	Fill	Cuttings

Attachments

☐ Geologic Log
☐ Well Construction Diagram
☐ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☐ Other

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Tyson R. Davis, Pacific Coast Well Drilling, Inc.
Person, Firm or Corporation

P.O. Box 184 Templeton CA 93465
Address City State Zip

Signed [signature] 10/25/2013 927400
C-57 Licensed Water Well Contractor Date Signed C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

RECEIVED

NOV 19 2013

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File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0188056

Page 2 of 2

Owner's Well Number SVW3

Date Work Began 07/24/2013 Date Work Ended 7/26/2013

Local Permit Agency San Luis Obispo County Environmental Health Services

Permit Number 2013-116 Permit Date 7/3/13

DWR Use Only – Do Not Fill In

State Well Number/Site Number

Latitude N Longitude W

APN/TRS/Other

Geologic Log

Orientation ⦿ Vertical ◯ Horizontal ◯ Angle Specify

Drilling Method Direct Rotary Drilling Fluid Bentonite mud

Depth from Surface Feet	to Feet	Description Describe material, grain size, color, etc

Total Depth of Boring 1090 Feet

Total Depth of Completed Well 790 Feet

Well Owner

Well Location

Address 3385 Truesdale Road

City Shandon County San Luis Obispo

Latitude 35 Deg. 36 Min. 1776 Sec. N Longitude 120 Deg. 22 Min. 1767 Sec. W

Datum ____ Dec. Lat. 35.60477 Dec. Long. 120.37158

APN Book ____ Page ____ Parcel ____

Township 27S Range 15E Section 4

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

West East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

⦿ New Well
◯ Modification/Repair
◯ Deepen
◯ Other
◯ Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

⦿ Water Supply
☐ Domestic ☐ Public
☑ Irrigation ☐ Industrial
◯ Cathodic Protection
◯ Dewatering
◯ Heat Exchange
◯ Injection
◯ Monitoring
◯ Remediation
◯ Sparging
◯ Test Well
◯ Vapor Extraction
◯ Other

Water Level and Yield of Completed Well

Depth to first water ____ (Feet below surface)

Depth to Static Water Level ____ (Feet) Date Measured ____

Estimated Yield * ____ (GPM) Test Type ____

Test Length ____ (Hours) Total Drawdown ____ (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
680	700	26	Screen	HSLA Ful Flo	5/16	16.5	Louver	0.080
700	730	26	Blank	HSLA	5/16	16.5		
730	750	26	Screen	HSLA Ful Flo	5/16	16.5	Louver	0.080
750	790	26	Blank	Mild Steel	5/16	16.5		

Annular Material

Depth from Surface Feet	to Feet	Fill	Description

Attachments

☐ Geologic Log
☐ Well Construction Diagram
☐ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☐ Other

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Tyson R. Davis, Pacific Coast Well Drilling, Inc.
Person, Firm or Corporation

P.O. Box 184 (Address) Templeton (City) CA (State) 93465 (Zip)

Signed [signature] C-57 Licensed Water Well Contractor 1025/2013 Date Signed 927400 C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

e0188056

WELL PERMIT PLOT PLAN

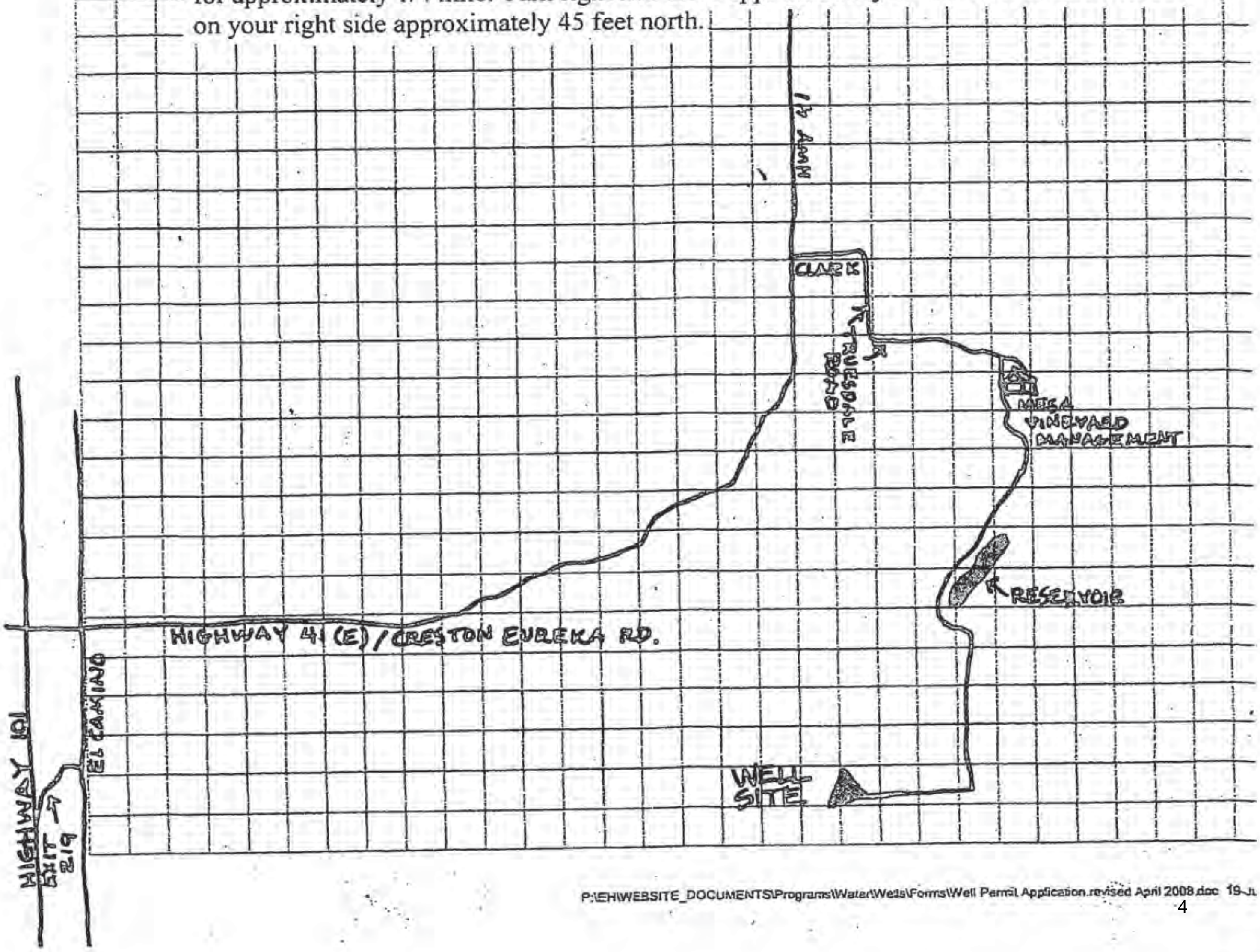
SAN LUIS OBISPO COUNTY ENVIRONMENTAL HEALTH SERVICES
2156 Sierra Way
San Luis Obispo, California 93401
Telephone: 805-781-5544

SCALE: ¼ inch = 25 feet

INDICATE BELOW THE **EXACT LOCATION** OF PROPOSED WELL WITH RESPECT TO THE FOLLOWING ITEMS: PROPERTY LINES, WATER BODIES OR WATER COURSES, DRAINAGE PATTERN, ROADS, EXISTING WELLS, SEWERS AND PRIVATE SEWAGE DISPOSAL SYSTEMS, ANIMAL ENCLOSURES AND ANY OTHER CONCENTRATED SOURCES OF POLLUTION. **INCLUDE DIMENSIONS.** ALL PROPOSED WELL SITES SHALL BE DESIGNATED WITH A FLAGGED SURVEYOR'S STAKE LABELED "WELL SITE." DRILLING SHALL NOT COMMENCE UNTI THIS APPLICATION IS APPROVED.

Assessor's Parcel Number-

Take Highway 101 (N) and take Exit #219 toward Morro Road/Highway 41. Turn left onto El Camino Real at the stop light. Drive to the next stop light, approximately 500 feet. Turn right onto CA-41/Creston Eureka Road and drive for approximately 18 miles. Turn right onto Clark Road and drive for approximately 1/2 mile. Turn right onto Truesdale Road and drive for approximately 1 mile. Truesdale turns to the left. Continue on Truesdale for approximately another 1 mile. 3385 Truesdale Road is on your right. There will be a sign that says "Mesa Vineyard Management" Turn right and drive approximately 400 feet. Turn right before building and drive approximately 100 feet. Turn left along side the building and drive approximately 250 feet. Turn right and drive approximately 1/4 mile. There will be a reservoir on your left. Drive along side of the reservoir and round to the left. Turn right and drive along side vineyards (to your right) for approximately 1/4 mile. Turn right and drive approximately 1/4 mile. Well site will be on your right side approximately 45 feet north.



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File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0188061

Page 1 of 2

Owner's Well Number SJW4

Date Work Began 07/31/2013 Date Work Ended 8/2/2013

Local Permit Agency San Luis Obispo County Environmental Health Department

Permit Number 2013-117 Permit Date 7/3/13

DWR Use Only – Do Not Fill In

State Well Number/Site Number

Latitude N Longitude W

APN/TRS/Other

Geologic Log

Orientation ⦿ Vertical ○ Horizontal ○ Angle Specify ___

Drilling Method Direct Rotary Drilling Fluid Bentonite mud

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc)
0	30	Conductor
0	465	Fine Brown Sand w/Streaks of Brown Clay
465	502	Gravel (Rough Drilling)
502	745	Course Sand w/Streaks of Brown Clay
745	815	Small Gravel (Rough Drilling)
815	975	Fine Sand
975	1,050	Course Sand w/Less Brown Clay

Total Depth of Boring 1050 Feet

Total Depth of Completed Well 1040 Feet

Well Owner

Well Location

Address 2575 San Juan Road

City Shandon County San Luis Obispo

Latitude 35 Deg. 37 Min. 4814 Sec. N Longitude 120 Deg. 22 Min. 257 Sec. W

Datum ___ Dec. Lat. 35.62997 Dec. Long. 120.36792

APN Book ___ Page ___ Parcel ___

Township 26S Range 15E Section 33 C

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

West SEE ATTACHED MAP East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

- ⦿ New Well
- ○ Modification/Repair
  - ○ Deepen
  - ○ Other ___
- ○ Destroy

Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

- ⦿ Water Supply
  - ☐ Domestic ☐ Public
  - ☑ Irrigation ☐ Industrial
- ○ Cathodic Protection
- ○ Dewatering
- ○ Heat Exchange
- ○ Injection
- ○ Monitoring
- ○ Remediation
- ○ Sparging
- ○ Test Well
- ○ Vapor Extraction
- ○ Other ___

Water Level and Yield of Completed Well

Depth to first water 140 (Feet below surface)

Depth to Static Water Level 140 (Feet) Date Measured 08/02/2013

Estimated Yield * 1,000 (GPM) Test Type Air Lift

Test Length 6.0 (Hours) Total Drawdown ___ (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	30	36	Conductor	Low Carbon Steel	1/4	30		
0	200	26	Blank	Mild Steel	5/16	16.5		
200	410	26	Screen	HSLA	5/16	16.5	Louver	0.070
410	470	26	Blank	Mild Steel	5/16	16.5		
470	500	26	Screen	HSLA	5/16	16.5	Louver	0.070
500	590	26	Blank	Mild Steel	5/16	16.5		

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	60	Cement	6 Sack Slurry
60	850	Filter Pack	80-1/4*10&20-8*16
850	1,050	Fill	Cuttings

Attachments

- ☐ Geologic Log
- ☐ Well Construction Diagram
- ☐ Geophysical Log(s)
- ☐ Soil/Water Chemical Analyses
- ☐ Other ___

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Tyson R. Davis, Pacific Coast Well Drilling, Inc. (Person, Firm or Corporation)

P.O. Box 184 (Address) Templeton (City) CA (State) 93465 (Zip)

Signed [signature] (C-57 Licensed Water Well Contractor) 11-1-13 (Date Signed) 927400 (C-57 License Number)

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

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File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0188061

Page 2 of 2

Owner's Well Number SJW4

Date Work Began 07/31/2013 Date Work Ended 8/2/2013

Local Permit Agency San Luis Obispo County Environmental Health Department

Permit Number 2013-117 Permit Date 7/3/13

DWR Use Only – Do Not Fill In

State Well Number/Site Number

Latitude N Longitude W

APN/TRS/Other

Geologic Log

Orientation ⦿ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Direct Rotary Drilling Fluid Bentonite mud

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc)
0	30	Conductor
0	465	Fine Brown Sand w/Streaks of Brown Clay
465	502	Gravel (Rough Drilling)
502	745	Course Sand w/Streaks of Brown Clay
745	815	Small Gravel (Rough Drilling)
815	975	Fine Sand
975	1,050	Course Sand w/Less Brown Clay

Total Depth of Boring 1050 Feet

Total Depth of Completed Well 1040 Feet

Well Owner

Well Location

Address 2575 San Juan Road

City Shandon County San Luis Obispo

Latitude 35 Deg. 37 Min. 4814 Sec. N Longitude 120 Deg. 22 Min. 257 Sec. W

Datum ____ Dec. Lat. 35.62997 Dec. Long. 120.36792

APN Book ____ Page ____ Parcel ____

Township 26S Range 15E Section 33

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

West

East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

⦿ New Well
○ Modification/Repair
○ Deepen
○ Other
○ Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

⦿ Water Supply
☐ Domestic ☐ Public
☑ Irrigation ☐ Industrial
○ Cathodic Protection
○ Dewatering
○ Heat Exchange
○ Injection
○ Monitoring
○ Remediation
○ Sparging
○ Test Well
○ Vapor Extraction
○ Other

Water Level and Yield of Completed Well

Depth to first water ____ (Feet below surface)

Depth to Static Water Level ____ (Feet) Date Measured ____

Estimated Yield * ____ (GPM) Test Type ____

Test Length ____ (Hours) Total Drawdown ____ (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
590	630	26	Screen	HSLA	5/16	16.5	Louver	0.070
630	700	26	Blank	Mild Steel	5/16	16.5		
700	730	26	Screen	HSLA	5/16	16.5	Louver	0.070
730	750	26	Blank	Mild Steel	5/16	16.5		
750	810	26	Screen	HSLA	5/16	16.5	Louver	0.070
810	840	26	Blank	Mild Steel	5/16	16.5		

Annular Material

Depth from Surface Feet	to Feet	Fill	Description

Attachments

☐ Geologic Log
☐ Well Construction Diagram
☐ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☐ Other

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Tyson R. Davis, Pacific Coast Well Drilling, Inc.
Person, Firm or Corporation

P.O. Box 184 (Address) Templeton (City) CA (State) 93465 (Zip)

Signed [signature] C-57 Licensed Water Well Contractor Date Signed 11-1-13 C-57 License Number 927400

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

e0188061

WELL PERMIT PLOT PLAN

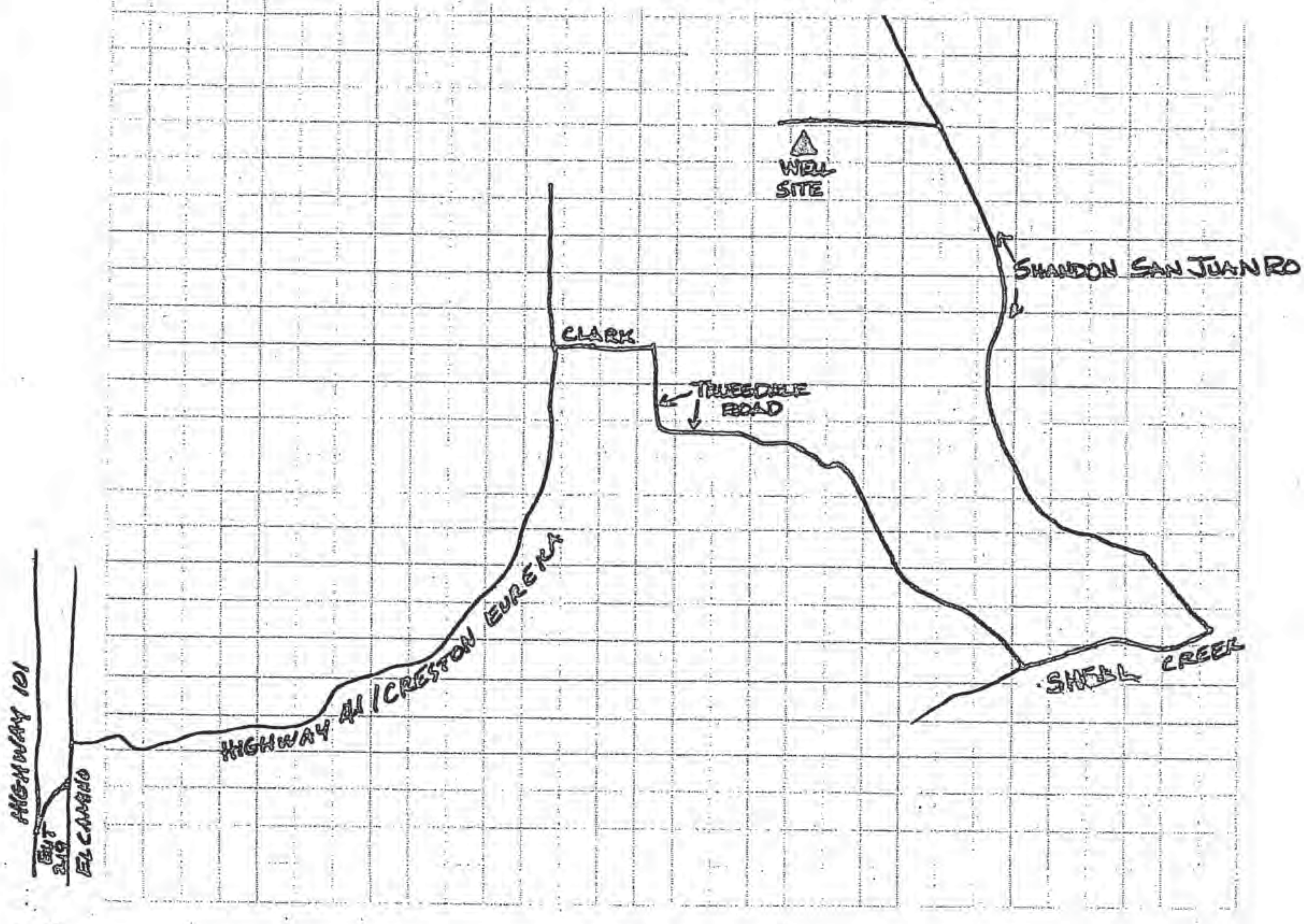
SAN LUIS OBISPO COUNTY ENVIRONMENTAL HEALTH SERVICES
2156 Sierra Way
San Luis Obispo, California 93401
Telephone: 805-781-5544

SCALE: ¼ inch = 25 feet

INDICATE BELOW THE **EXACT LOCATION** OF PROPOSED WELL WITH RESPECT TO THE FOLLOWING ITEMS: PROPERTY LINES, WATER BODIES OR WATER COURSES, DRAINAGE PATTERN, ROADS, EXISTING WELLS, SEWERS AND PRIVATE SEWAGE DISPOSAL SYSTEMS, ANIMAL ENCLOSURES AND ANY OTHER CONCENTRATED SOURCES OF POLLUTION. **INCLUDE DIMENSIONS.** ALL PROPOSED WELL SITES SHALL BE DESIGNATED WITH A FLAGGED SURVEYOR'S STAKE LABELED "WELL SITE." DRILLING SHALL NOT COMMENCE UNTIL THIS APPLICATION IS APPROVED.

Assessor's Parcel Number-

Take Highway 101 (N) and take Exit #219 toward Morro Road/Highway 41. Turn left onto El Camino Real at the stop light. Drive to the next stop light, approximately 500 feet. Turn right onto CA-41/Creston Eureka Road and drive for approximately 18 miles. Turn right onto Clark Road and drive for approximately 1/2 mile. Turn right onto Truesdale Road and drive for approximately 4 miles. Turn left on Shell Creek Road and drive for approximately 3/4 mile. Turn left onto Shandon San Juan Road and drive for approximately 2.9 miles and turn left onto dirt road. Drive a little over 1/4 mile and the Well Site is on your left approximately 50-55 feet.



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File Original with DWR

State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0162372

Page 1 of 2

Owner's Well Number Continental Vineyards

Date Work Began 08/01/2012 Date Work Ended 8/10/2012

Local Permit Agency County of San Luis Obispo Public Health

Permit Number 2012-149 Permit Date 7/30/12

DWR Use Only – Do Not Fill In

State Well Number/Site Number

Latitude N Longitude W

APN/TRS/Other

Geologic Log

Orientation ⦿ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Reverse Circulation Rotary Drilling Fluid Bentonite mud

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc)
0	40	Clay
40	55	Gravel
55	65	Clay
65	150	Gravel
150	160	Clay
160	165	Gravel
165	180	Clay
180	200	Gravel
200	230	Clay
230	280	Gravel
280	318	Clay
318	320	Sand
320	336	Clay
336	340	Gravel
340	355	Clay
355	360	Gravel
360	370	Clay
370	390	Gravel
390	400	Clay
400	435	Gravel
435	480	Clay
480	530	Gravel
530	560	Clay
560	605	Gravel
605	620	Clay
620	635	Gravel
635	650	Clay
650	730	Clay
730	810	Clay
810	830	Gravel

Total Depth of Boring 1,110 Feet

Total Depth of Completed Well 1,100 Feet

Well Owner

Well Location

Address 11000 Hwy. 46E

City Paso Robles County San Luis Obispo

Latitude 35 Deg. 67 Min. 95 Sec. N Longitude 120 Deg. 48 Min. 19 Sec. W

Datum ____ Decimal Lat. ____ Decimal Long. ____

APN Book ____ Page ____ Parcel 019.121.013

Township 26S Range 14E Section 8

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

West SEE ATTACHED East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

⦿ New Well

○ Modification/Repair

○ Deepen

○ Other ____

○ Destroy

Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

⦿ Water Supply

☐ Domestic ☐ Public

☑ Irrigation ☐ Industrial

○ Cathodic Protection

○ Dewatering

○ Heat Exchange

○ Injection

○ Monitoring

○ Remediation

○ Sparging

○ Test Well

○ Vapor Extraction

○ Other ____

Water Level and Yield of Completed Well

Depth to first water 205 (Feet below surface)

Depth to Static Water Level 205 (Feet) Date Measured 09/04/2012

Estimated Yield * 1,900 (GPM) Test Type Constant Rate

Test Length 12.0 (Hours) Total Drawdown 89 (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size If Any (Inches)
0	320	24	Blank	Low Carbon Steel	.250	14		
320	560	24	Screen	Low Carbon Steel	.250	14	Louver	0.080
560	600	24	Blank	Low Carbon Steel	.250	14		
600	650	24	Screen	Low Carbon Steel	.250	14	Louver	0.080
650	720	24	Blank	Low Carbon Steel	.250	14		
720	760	24	Screen	Low Carbon Steel	.250	14	Louver	0.080

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	50	Cement	6 Sac Slurry
50	1,110	Filter Pack	1/4 * 10

Attachments

☐ Geologic Log

☐ Well Construction Diagram

☐ Geophysical Log(s)

☐ Soil/Water Chemical Analyses

☐ Other ____

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Pacific Coast Well Drilling, Inc.
Person, Firm or Corporation

P.O. Box 184 (Address) Templeton (City) CA (State) 93465 (Zip)

Signed [signature] C-57 Licensed Water Well Contractor Date Signed 8-25-12 C-57 License Number 927400

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

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State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0162372

Page 2 of 2

Owner's Well Number Continental Vineyards

Date Work Began 08/01/2012 Date Work Ended 8/10/2012

Local Permit Agency County of San Luis Obispo Public Health

Permit Number 2012-149 Permit Date 7/30/12

DWR Use Only – Do Not Fill In

State Well Number/Site Number

N Latitude W Longitude

APN/TRS/Other

Geologic Log

Orientation ⦿ Vertical O Horizontal O Angle Specify

Drilling Method Reverse Circulation Rotary Drilling Fluid Bentonite mud

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc)
830	860	Clay
860	920	Gravel
920	990	Clay
990	1,030	Gravel
1030	1,040	Clay
1040	1,080	Gravel
1080	1,110	Clay

Total Depth of Boring 1,110 Feet

Total Depth of Completed Well 1,100 Feet

Well Owner

Well Location

Address 11000 Hwy. 46E

City Paso Robles County San Luis Obispo

Latitude 35 Deg. 67 Min. 95 Sec. N Longitude 120 Deg. 48 Min. 19 Sec. W

Datum ____ Decimal Lat. ____ Decimal Long. ____

APN Book ____ Page ____ Parcel 019.121.013

Township 26S Range 14E Section 8

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North / West / East / South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

⦿ New Well
O Modification/Repair
O Deepen
O Other ____
O Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

⦿ Water Supply
☐ Domestic ☐ Public
☑ Irrigation ☐ Industrial
O Cathodic Protection
O Dewatering
O Heat Exchange
O Injection
O Monitoring
O Remediation
O Sparging
O Test Well
O Vapor Extraction
O Other ____

Water Level and Yield of Completed Well

Depth to first water ____ (Feet below surface)

Depth to Static Water Level ____ (Feet) Date Measured ____

Estimated Yield * ____ (GPM) Test Type ____

Test Length ____ (Hours) Total Drawdown ____ (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
760	800	24	Blank	Low Carbon Steel	.250	14		
800	1,080	24	Screen	Low Carbon Steel	.250	14	Louver	0.080
1,080	1,100	24	Blank	Low Carbon Steel	.250	14		

Annular Material

Depth from Surface Feet	to Feet	Fill	Description

Attachments

☐ Geologic Log
☐ Well Construction Diagram
☐ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☐ Other ____

Attach additional information, if it exists.

Certification Statement

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Person, Firm or Corporation

P.O. Box 184 (Address) Templeton (City) CA (State) 93465 (Zip)

Signed [signature] C-57 Licensed Water Well Contractor

Date Signed 8-25-12 C-57 License Number 927400

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

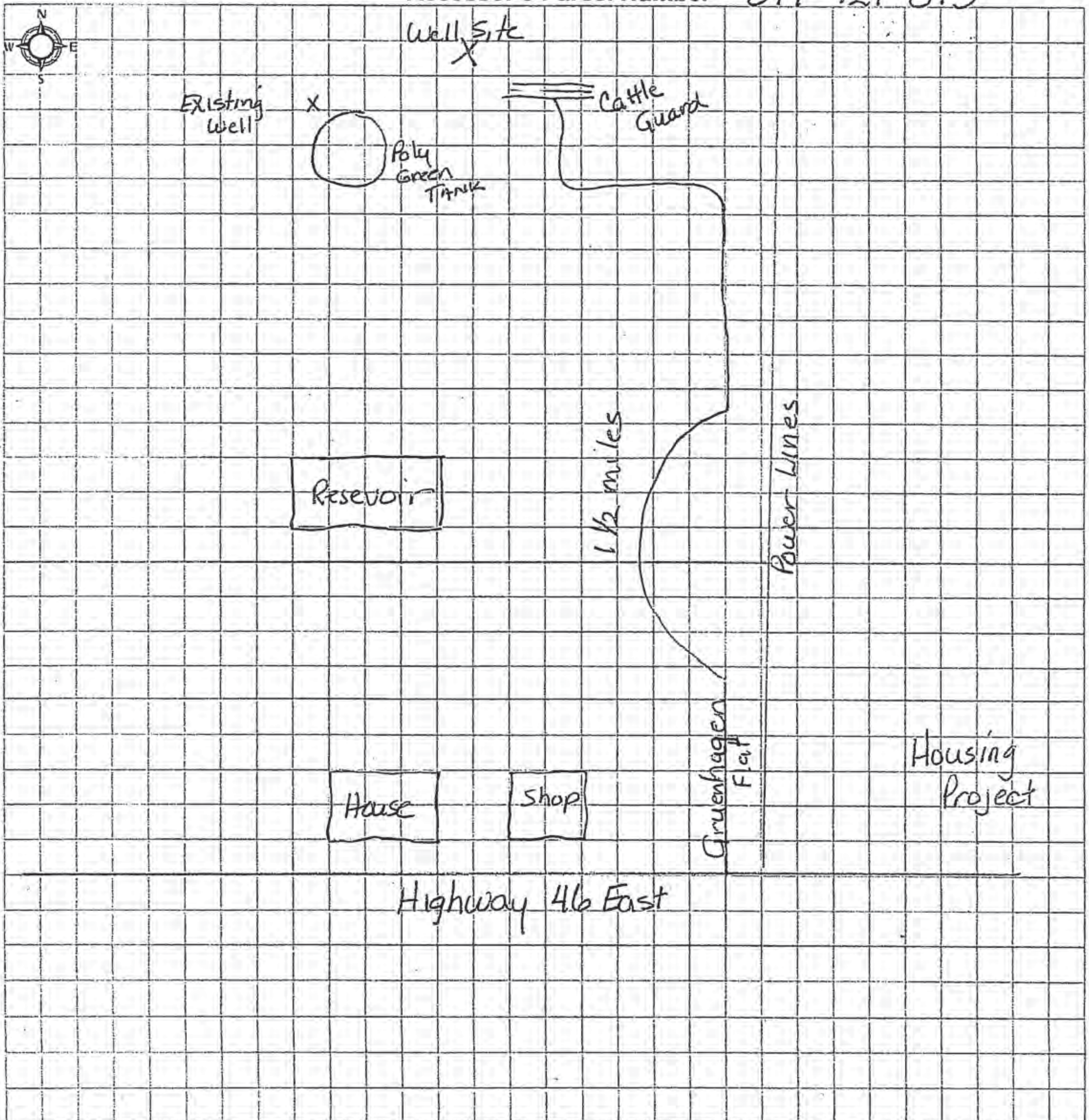
WELL PERMIT PLOT PLAN

SAN LUIS OBISPO COUNTY ENVIRONMENTAL HEALTH SERVICES
2156 Sierra Way
San Luis Obispo, California 93401
Telephone: 805-781-5544

SCALE: ¼" = 25"   Indeck Paso Robles, LLC

INDICATE BELOW THE **EXACT LOCATION** OF PROPOSED WELL WITH RESPECT TO THE FOLLOWING ITEMS: PROPERTY LINES, WATER BODIES OR WATER COURSES, DRAINAGE PATTERN, ROADS, EXISTING WELLS, SEWERS AND PRIVATE SEWAGE DISPOSAL SYSTEMS, ANIMAL ENCLOSURES AND ANY OTHER CONCENTRATED SOURCES OF POLLUTION. **INCLUDE DIMENSIONS.** ALL PROPOSED WELL SITES SHALL BE DESIGNATED WITH A FLAGGED SURVEYOR'S STAKE LABELED "WELL SITE." DRILLING SHALL NOT COMMENCE UNTIL THIS APPLICATION IS APPROVED.

Assessor's Parcel Number- 019-121-013



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State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0164974

Page 1 of 4

Owner's Well Number John Hancock Well #1

Date Work Began 11/01/2012 Date Work Ended 2/26/2013

Local Permit Agency San Luis Obispo County Environmental Health Services

Permit Number 2012-229 Permit Date 10/15/12

DWR Use Only – Do Not Fill In

State Well Number/Site Number

N W

Latitude Longitude

APN/TRS/Other

Geologic Log

Orientation ⦿ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Reverse Circulation Rotary Drilling Fluid Bentonite mud

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc)
0	40	Conductor
40	80	Clay
80	90	Gravel
90	100	Clay
100	110	Clay
110	120	Gravel
120	150	Course Sand
150	165	Gravel w/Clay
165	205	Gravel
205	210	Clay
210	220	Gravel
220	230	Gravel
230	240	Gravel
240	250	Clay
250	260	Clay
260	270	Clay
270	290	Clay
290	300	Clay
300	310	Clay
310	320	Gravel
320	330	Gravel
330	340	Clay
340	350	Clay
350	360	Clay
360	370	Clay
370	380	Gravel
380	390	Gravel
390	400	Clay
400	410	Clay
410	420	Clay

Total Depth of Boring 1393 Feet

Total Depth of Completed Well 870 Feet

Well Owner

Well Location

Address Exit 241, San Miguel

City San Miguel County San Luis Obispo

Latitude 35 Deg. 76 Min. 464 Sec. N Longitude 120 Deg. 72 Min. 51 Sec. W

Datum ____ Decimal Lat. ____ Decimal Long. ____

APN Book ____ Page ____ Parcel 027,011,036

Township ____ Range ____ Section ____

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North / West / East / South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

⦿ New Well
○ Modification/Repair
○ Deepen
○ Other
○ Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

⦿ Water Supply
☐ Domestic ☐ Public
☑ Irrigation ☐ Industrial
○ Cathodic Protection
○ Dewatering
○ Heat Exchange
○ Injection
○ Monitoring
○ Remediation
○ Sparging
○ Test Well
○ Vapor Extraction
○ Other

Water Level and Yield of Completed Well

Depth to first water ____ (Feet below surface)

Depth to Static Water Level ____ (Feet) Date Measured ____

Estimated Yield * ____ (GPM) Test Type ____

Test Length ____ (Hours) Total Drawdown ____ (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
0	40	36	Conductor	Mild Steel	5/16	30		
0	195	24	Blank	Mild Steel	5/16	14.5		
195	210	24	Screen	Mild Steel	5/16	14.5	Louver	0.070
210	220	24	Blank	Mild Steel	5/16	14.5		
220	270	24	Screen	Copper Bearing	5/16	14.5	Louver	0.070
270	290	24	Blank	Copper Bearing	5/16	14.5		

Annular Material

Depth from Surface Feet	to Feet	Fill	Description
0	50	Cement	6 Sak
50	1,388	Filter Pack	75% SRI #6
			25% SRI #8

Attachments

☐ Geologic Log
☐ Well Construction Diagram
☐ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☐ Other

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Pacific Coast Well Drilling, Inc.
Person, Firm or Corporation

P.O. Box 184 (Address) Templeton (City) CA (State) 93465-0184 (Zip)

Signed [signature] C-57 Licensed Water Well Contractor Date Signed 1/17/13 C-57 License Number 927400

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State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0164974

Page 2 of 4

Owner's Well Number John Hancock Well #1

Date Work Began 11/01/2012 Date Work Ended 2/26/2013

Local Permit Agency San Luis Obispo County Environmental Health Services

Permit Number 2012-229 Permit Date 10/15/12

DWR Use Only – Do Not Fill In

State Well Number/Site Number

N Latitude W Longitude

APN/TRS/Other

Geologic Log

Orientation ⦿ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Reverse Circulation Rotary Drilling Fluid Bentonite mud

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc)
420	430	Clay
430	440	Clay
440	450	Clay
450	460	Clay
460	470	Clay
470	480	Clay
480	490	Clay
490	500	Clay
500	510	Clay
510	520	Gravel/Clay
520	530	Clay
530	540	Clay
540	550	Slurry/Clay
550	560	Clay
560	570	Clay
570	575	Gravel
575	580	Clay
580	625	Gravel
625	660	Course Sand
660	755	Clay w/Sand
755	805	Rough Drilling
805	910	Sand/Gravel, Brown, Sandy Clay
910	930	Sand/Gravel, Brown, Sandy Clay
930	940	Clay
940	950	Clay/Sandy
950	960	Clay/Sandy
960	970	Clay/Sandy
970	980	Clay/Sandy
980	990	Gravel
990	1,000	Gravel

Total Depth of Boring 1393 Feet

Total Depth of Completed Well 870 Feet

Well Owner

Well Location

Address Exit 241, San Miquel

City San Miquel County San Luis Obispo

Latitude 35 Deg. 76 Min. 464 Sec. N Longitude 120 Deg. 72 Min. 51 Sec. W

Datum ____ Decimal Lat. ____ Decimal Long. ____

APN Book ____ Page ____ Parcel 027,011,036

Township ____ Range ____ Section ____

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

West East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

⦿ New Well
○ Modification/Repair
○ Deepen
○ Other
○ Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

⦿ Water Supply
☐ Domestic ☐ Public
☑ Irrigation ☐ Industrial
○ Cathodic Protection
○ Dewatering
○ Heat Exchange
○ Injection
○ Monitoring
○ Remediation
○ Sparging
○ Test Well
○ Vapor Extraction
○ Other

Water Level and Yield of Completed Well

Depth to first water ____ (Feet below surface)

Depth to Static Water Level ____ (Feet) Date Measured ____

Estimated Yield * ____ (GPM) Test Type ____

Test Length ____ (Hours) Total Drawdown ____ (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
290	350	24	Screen	Copper Bearing	5/16	14.5	Louver	0.070
350	370	24	Blank	Copper Bearing	5/16	14.5		
370	410	24	Screen	Copper Bearing	5/16	14.5	Louver	0.070
410	450	24	Blank	Copper Bearing	5/16	14.5		
450	530	24	Screen	Copper Bearing	5/16	14.5	Louver	0.070
530	580	24	Blank	Copper Bearing	5/16	14.5		

Annular Material

Depth from Surface Feet	to Feet	Fill	Description

Attachments

☐ Geologic Log
☐ Well Construction Diagram
☐ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☐ Other ____

Attach additional information, if it exists.

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name Pacific Coast Well Drilling, Inc.
Person, Firm or Corporation

P.O. Box 184 (Address) Templeton (City) CA (State) 93465-0184 (Zip)

Signed [signature] C-57 Licensed Water Well Contractor 1/17/13 Date Signed 927400 C-57 License Number

DWR 188 REV. 1/2006

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State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0164974

DWR Use Only – Do Not Fill In

State Well Number/Site Number

Latitude N Longitude W

APN/TRS/Other

Page 3 of 4

Owner's Well Number John Hancock Well #1

Date Work Began 11/01/2012 Date Work Ended 2/26/2013

Local Permit Agency San Luis Obispo County Environmental Health Services

Permit Number 2012-229 Permit Date 10/15/12

Geologic Log

Orientation ⦿ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Reverse Circulation Rotary Drilling Fluid Bentonite mud

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc)
1,000	1,010	Sandy Clay
1,010	1,020	Sandy Clay
1020	1,030	Gravel
1030	1,040	Sandy Clay
1040	1,050	Clay
1050	1,060	Sandy Clay
1060	1,070	Sandy Clay
1070	1,080	Sandy Clay
1080	1,090	Gravel
1090	1,100	Gravel
1100	1,110	Gravel
1110	1,120	Sandy Clay
1120	1,130	Sandy Clay
1130	1,140	Sandy Clay
1140	1,150	Sandy Clay
1150	1,160	Clay
1160	1,170	Clay
1170	1,180	Clay
1180	1,190	Sandy Clay
1190	1,200	Clay Brown
1200	1,220	Small Gravel, Sandy Clay
1220	1,240	Brown Clay
1240	1,255	Rough Drilling Gravel
1255	1,295	Brown Clay
1295	1,305	Gravel
1305	1,335	Clay
1335	1,356	Course Sand
1356	1,363	Gravel/Course Sand
1363	1,366	Clay
1366	1,368	Gravel/Course Sand

Total Depth of Boring 1393 Feet

Total Depth of Completed Well 870 Feet

Well Owner

Well Location

Address Exit 241, San Miguel

City San Miguel County San Luis Obispo

Latitude 35 Deg. 76 Min. 464 Sec. N Longitude 120 Deg. 72 Min. 51 Sec. W

Datum Decimal Lat. Decimal Long.

APN Book Page Parcel 027,011,036

Township Range Section

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North

West East

South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

⦿ New Well

○ Modification/Repair

○ Deepen

○ Other

○ Destroy

Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

⦿ Water Supply

☐ Domestic ☐ Public

☑ Irrigation ☐ Industrial

○ Cathodic Protection

○ Dewatering

○ Heat Exchange

○ Injection

○ Monitoring

○ Remediation

○ Sparging

○ Test Well

○ Vapor Extraction

○ Other

Water Level and Yield of Completed Well

Depth to first water (Feet below surface)

Depth to Static Water Level (Feet) Date Measured

Estimated Yield * (GPM) Test Type

Test Length (Hours) Total Drawdown (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
580	600	24	Screen	Copper Bearing	5/16	14.5	Louver	0.070
600	660	24	Blank	Copper Bearing	5/16	14.5		
660	700	24	Screen	Copper Bearing	5/16	14.5	Louver	0.070
700	740	24	Blank	Copper Bearing	5/16	14.5		
740	790	24	Screen	Copper Bearing	5/16	14.5	Louver	0.070
790	810	24	Blank	Copper Bearing	5/16	14.5		

Annular Material

Depth from Surface Feet	to Feet	Fill	Description

Attachments

☐ Geologic Log

☐ Well Construction Diagram

☐ Geophysical Log(s)

☐ Soil/Water Chemical Analyses

☐ Other

Attach additional information, if it exists.

Certification Statement

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Name Pacific Coast Well Drilling, Inc.

Person, Firm or Corporation

P.O. Box 184 Templeton CA 93465-0184

Address City State Zip

Signed [signature] 1/17/13 927400

C-57 Licensed Water Well Contractor Date Signed C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

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State of California

Well Completion Report

Refer to Instruction Pamphlet

No. e0164974

Page 4 of 4

Owner's Well Number John Hancock Well #1

Date Work Began 11/01/2012 Date Work Ended 2/26/2013

Local Permit Agency San Luis Obispo County Environmental Health Services

Permit Number 2012-229 Permit Date 10/15/12

DWR Use Only – Do Not Fill In

State Well Number/Site Number

N Latitude W Longitude

APN/TRS/Other

Geologic Log

Orientation ⦿ Vertical ○ Horizontal ○ Angle Specify

Drilling Method Reverse Circulation Rotary Drilling Fluid Bentonite mud

Depth from Surface Feet	to Feet	Description (Describe material, grain size, color, etc)
1,368	1,375	Clay
1,375	1,385	Rough Drilling Sand
1385	1,393	Clay/Silt

Total Depth of Boring 1393 Feet

Total Depth of Completed Well 870 Feet

Well Owner

Well Location

Address Exit 241, San Miguel

City San Miguel County San Luis Obispo

Latitude 35 Deg. 76 Min. 464 Sec. N Longitude 120 Deg. 72 Min. 51 Sec. W

Datum Decimal Lat. Decimal Long.

APN Book Page Parcel 027,011,036

Township Range Section

Location Sketch

(Sketch must be drawn by hand after form is printed.)

North / West / East / South

Illustrate or describe distance of well from roads, buildings, fences, rivers, etc. and attach a map. Use additional paper if necessary. Please be accurate and complete.

Activity

⦿ New Well
○ Modification/Repair
○ Deepen
○ Other
○ Destroy
Describe procedures and materials under "GEOLOGIC LOG"

Planned Uses

⦿ Water Supply
☐ Domestic ☐ Public
☑ Irrigation ☐ Industrial
○ Cathodic Protection
○ Dewatering
○ Heat Exchange
○ Injection
○ Monitoring
○ Remediation
○ Sparging
○ Test Well
○ Vapor Extraction
○ Other

Water Level and Yield of Completed Well

Depth to first water (Feet below surface)

Depth to Static Water Level (Feet) Date Measured

Estimated Yield * (GPM) Test Type

Test Length (Hours) Total Drawdown (Feet)

*May not be representative of a well's long term yield.

Casings

Depth from Surface Feet	to Feet	Borehole Diameter (Inches)	Type	Material	Wall Thickness (Inches)	Outside Diameter (Inches)	Screen Type	Slot Size if Any (Inches)
810	830	24	Screen	Copper Bearing	5/16	14.5	Louver	0.070
830	870	24	Blank	Copper Bearing	5/16	14.5		

Annular Material

Depth from Surface Feet	to Feet	Fill	Description

Attachments

☐ Geologic Log
☐ Well Construction Diagram
☐ Geophysical Log(s)
☐ Soil/Water Chemical Analyses
☐ Other

Attach additional information, if it exists.

Certification Statement

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Person, Firm or Corporation

P.O. Box 184 Templeton CA 93465-0184
Address City State Zip

Signed [signature] 1/17/13 927400
C-57 Licensed Water Well Contractor Date Signed C-57 License Number

DWR 188 REV. 1/2006

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

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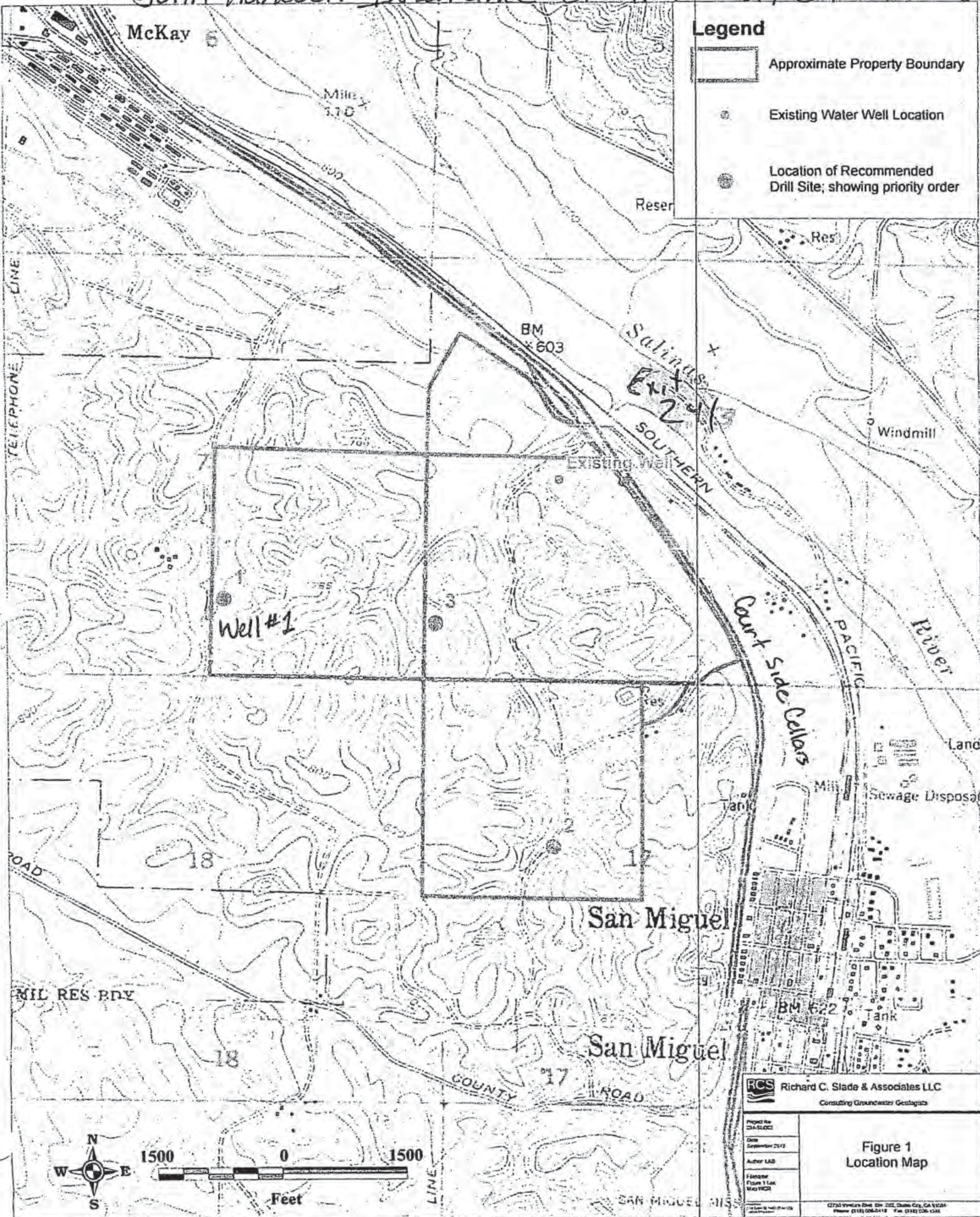
E0164974

APPENDIX B

John Hancock Insurance Co. APN: 027-011-036 Well#1



ORIGINAL
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Page 1 of 1

Owner's Well No. ____

Date Work Began 9-16-04, Ended 9-22-04

Local Permit Agency Monterey County Health Dept

Permit No. 04-07838 Permit Date 7-26-04

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. e016462

DWR USE ONLY — DO NOT FILL IN

24S/13E-36

STATE WELL NO./STATION NO.

LATITUDE | LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD Rotary FLUID Bentonite

DEPTH FROM SURFACE Ft. to Ft.		DESCRIPTION *Describe material, grain size, color, etc.*
0	2	Top soil
2	5	Brown clay
5	7	Sand & gravel
7	65	Lite green clay
65	75	Sand & gravel
75	140	Lite brown clay
140	150	Shale gravel
150	160	Brown clay
160	175	Coarse sand & gravel
175	180	Brown clay
180	250	Brown clay with gravel
250	260	Sand & gravel
260	280	Brown clay
280	295	Shale gravel
295	400	Brown clay
400	425	Shale gravel
425	430	Brown clay
430	465	Shale gravel-layers brown clay
465	520	Brown clay
520	535	Shale gravel
535	560	Lite blue clay
560	585	Shale gravel
585	620	Lite blue clay
620	690	Shale gravel some lite brown shale
690	700	Blue clay

NOTE: ANY PERSON REMOVING THE CAP FROM THIS WELL OTHER THAN MILLER DRILLING CO OR AUTHORIZED CONTRACTOR APPROVED BY US WILL VOID ALL STRUCTURAL WARRANTIES.

TOTAL DEPTH OF BORING 700 (Feet)

TOTAL DEPTH OF COMPLETED WELL 695 (Feet)

WELL OWNER

WELL LOCATION

Address 77509 Hog Cyn

City San Miguel

County Monterey County

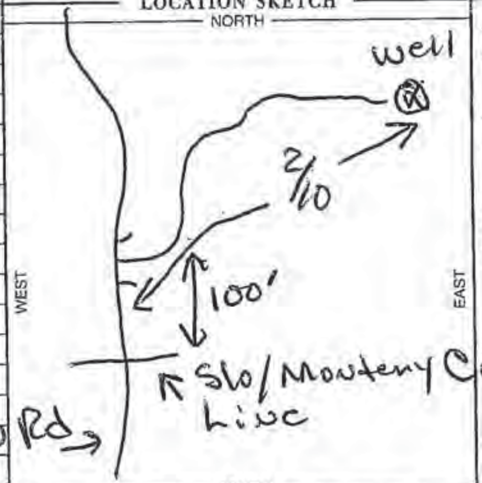
APN Book 424 Page 151 Parcel 027

Township 24S Range 13E Section 36

Latitude 35 47 30.9 NORTH (DEG. MIN. SEC.) Longitude 120 32 18.1 WEST (DEG. MIN. SEC.)

LOCATION SKETCH

NORTH



WEST | EAST

SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. ***PLEASE BE ACCURATE & COMPLETE.***

ACTIVITY (✓)

X NEW WELL

MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)

___ DESTROY *(Describe Procedures and Materials Under "GEOLOGIC LOG")*

PLANNED USES (✓)

WATER SUPPLY
X Domestic ___ Public
___ Irrigation ___ Industrial

MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER 520 (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL 410 (Ft.) & DATE MEASURED 9-22-04

ESTIMATED YIELD * 14@500 75@680 (GPM) & TEST TYPE Blow test

TEST LENGTH ____ (Hrs.) TOTAL DRAWDOWN ____ (Ft.)

* *May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	520	9 7/8	X				F480 PVC	5	.265	
520	540	9 7/8		X			F480 PVC	5	.265	.040 P
540	560	9 7/8	X				F480 PVC	5	.265	
560	600	9 7/8		X			F480 PVC	5	.265	.040 P
600	620	9 7/8	X				F480 PVC	5	.265	
620	695	9 7/8		X			F480 PVC	5	.265	.040 P

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	61	X			
61	695				Bye

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ____

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Miller Drilling Company (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 301 North Main Street CITY Templeton STATE Calif. ZIP 93465

Signed [signature] WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED 9-23-04 C-57 LICENSE NUMBER 324634 AA

DWR 188 REV. 11-97 IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

ORIGINAL
File with DWR

Page 1 of 1

Owner's Well No. ______

Date Work Began 09-29-05, Ended 10-5-05

Local Permit Agency Monterey County Health Dept

Permit No. 05-10531 Permit Date 7-05

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. e030073

DWR USE ONLY — DO NOT FILL IN

24S/13E-33

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD Rotary FLUID Bentonite

DEPTH FROM SURFACE Ft. to	Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	5	Top soil
5	30	Sand & gravel
30	60	Brown clay
60	90	Sand & gravel
90	110	Brown clay
110	115	Sand & gravel
115	160	Brown clay
160	220	Sand & gravel
220	330	Brown clay with gravel cemented
330	350	Sand & gravel
350	360	Brown clay with gravel
360	390	Sand & gravel
390	470	Brown clay with gravel, tight
470	485	Shale gravel
485	500	Brown clay with gravel, tight
500	510	Shale gravel
510	650	Brown claywith gravel, tight
650	680	Blue clay

NOTE:
ANY PERSON REMOVING THE CAP FROM THIS WELL OTHER THAN MILLER DRILLING CO OR AUTHORIZED CONTRACTOR APPROVED BY US WILL VOID ALL STRUCTURAL WARRANTIES.

TOTAL DEPTH OF BORING 680 (Feet)

TOTAL DEPTH OF COMPLETED WELL 650 (Feet)

WELL LOCATION

Address Ranchita Cyn LOT 2 Tract 3A South 1/2

City San Miguel

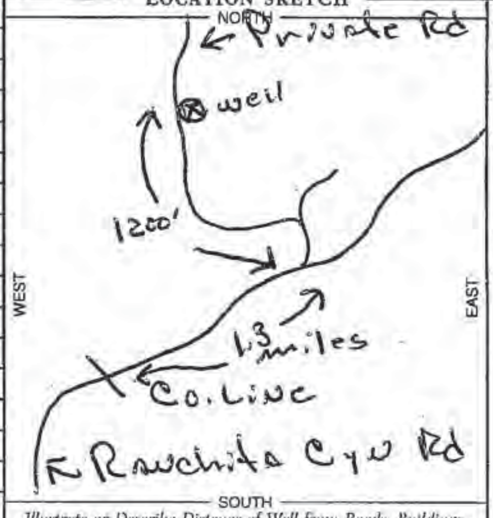
County Monterey

APN Book 424 Page 405 Parcel 058

Township 24S Range 13E Section 33

Latitude 35 ,48.126 NORTH Longitude 120 ,34.064 WEST
DEG. MIN. SEC. DEG. MIN. SEC.

LOCATION SKETCH



Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL

MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)

___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USES (✓)

WATER SUPPLY
X Domestic ___ Public
___ Irrigation ___ Industrial

MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER 470 (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL 332 (Ft.) & DATE MEASURED 10-5-05

ESTIMATED YIELD 20@440 (GPM) & TEST TYPE Blow test

TEST LENGTH 75@640 (Hrs.) TOTAL DRAWDOWN ___ (Ft.)

** May not be representative of a well's long-term yield.*

CASING (S) / ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)	DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	470	9 7/8	X				F480 PVC	5	.265		0	60	X			
470	550	9 7/8		X			F480 PVC	5	.265	.040 P	60	650				Lapis3 mix
550	570	9 7/8	X				F480 PVC	5	.265							
570	590	9 7/8		X			F480 PVC	5	.265	.040 P						
590	610	9 7/8	X				F480 PVC	5	.265							
610	650	9 7/8		X			F480 PVC	5	.265	.040 P						

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ______

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Miller Drilling Company
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

301 North Main Street Templeton Calif. 93465
ADDRESS CITY STATE ZIP

Signed [signature] 10-19-05 324634 AA
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

Paso Robles Historical Precipitation by Water Year

Water Year	Annual Precipitation (inches)[a]	Water Year	Annual Precipitation (inches)	Water Year	Annual Precipitation (inches)
1894	4.95	1937	22.57	1979	14.09
1895	15.3	1938	31.1	1980	19.73
1896	14.31	1939	8.72	1981	11.14
1897	15.5	1940	15.14	1982	15.62
1898	4.77	1941	30.5	1983	26.21
1899	11.3	1942	15.28	1984	8.54
1900	11.66	1943	16.91	1985	9.29
1901	22.84	1944	12.3	1986	17.1
1902	11.15	1945	12	1987	7.48
1903	11.24	1946	11.46	1988	13.81
1904	0.44	1947	10.05	1989	9.47
1906	8.48	1948	10.43	1990	7.22
1907	22	1949	10.61	1991	13.9
1908	15.31	1950	11.97	1992	14.35
1909	---	1951	9.82	1993	26.43
1910	15.78	1952	18.15	1994	11.45
1911	26.05	1953	10.9	1995	29.86
1912	12.37	1954	11.27	1996	13.76
1913	9.17	1955	11.19	1997	17.55
1914	18.88	1956	17.28	1998	26.77
1915	24.96	1957	10.94	1999	9.37
1916	21.02	1958	26.49	2000	13.21
1917	17.53	1959	7.87	2001	15.43
1918	14.82	1960	9.07	2002	8.32
1919	11.55	1961	8.66	2003	13.76
1920	13.06	1962	17.23	2004	9.51
1921	14.14	1963	17.06	2005	33.21
1922	21.37	1964	10.14	2006	15.55
1923	15.74	1965	12.56	2007	6.59
1924	6.11	1966	11.94	2008	13.8
1925	12.95	1967	24.55	2009	9.06
1926	14.56	1968	7.95	2010	20.99
1927	21.91	1969	31.5	2011	21.97
1928	11.5	1970	8.97	2012	10.8
1929	9.83	1971	10.9	2013	7.18
1930	10.99	1972	7.65	2014	6.16
1931	12.23	1973	22.83	2015	12.35
1932	16.5	1974	17.22	2016	10.46
1933	9.62	1975	11.24	2017	23.77
1934	11.62	1976	9.26	2018	10.62
1935	21.45	1977	7.55	2019	20.56
1936	18.16	1978	24.89		

Notes:
[a] Annual precipitation calculated as sum of daily values as reported by National Oceanic Atmospheric Administration Climate Data Online for Paso Robles Station (USC00046730)
--- = incomplete or inaccurate data
Source: https://www.ncdc.noaa.gov/cdo-web/, downloaded 10/29/19

Appendix C

Methodology for Identifying Potential Groundwater Dependent Ecosystems

TODD GROUNDWATER

January 31, 2022

MEMORANDUM

To: Blaine Reely, San Luis Obispo County and
Christopher Alakel, City of Paso Robles

From: Gus Yates, PG, CHG and Iris Priestaf, PhD

Re: Interconnected Surface Water Assessment, Paso Robles Basin GSP

The Sustainable Groundwater Management Act (SGMA) regulations define interconnected surface water as “surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted” (§351 (o)). SGMA requires that GSPs evaluate “impacts on groundwater dependent ecosystems.” (Water Code §10727.4(l)). Groundwater dependent ecosystems (GDEs) are defined in the GSP regulations as “ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface” (CCR § 351 (mm)). GDEs can be divided into two groups: plants and animals that depend on surface flow in streams (for example, fish, invertebrates, amphibians) and plants and animals that depend on a shallow water table accessible by plant roots (phreatophytic riparian vegetation and bird or other animal species that inhabit riparian vegetation). In this GSP, GDEs are discussed in the general category of interconnected surface water even though organisms in the second group strictly speaking rely only on a shallow water table, not surface flow in a stream.

This GSP addresses both types of interconnection between groundwater and surface water: interconnection with open surface water (streams, springs or lakes) and interconnection with the root zone of riparian vegetation. These two categories involve different groundwater elevation thresholds and often have different frequencies and durations of occurrence. Along seasonally intermitted streams—which includes all stream reaches crossing the Subbasin—large surface inflow events can quickly raise the alluvial water table up to near the level of the water in the stream. At that point, surface water and groundwater are hydraulically interconnected, and there may be short gaining and losing segments along the overall stream reach. When surface inflow dries up, regional groundwater discharge may continue to sustain flow for a longer period. The maximum water table depth at which the roots of phreatophytic riparian vegetation can access groundwater is perhaps 30 feet below the ground surface based on the observed locations of dense riparian vegetation. After the water table falls below the stream bed elevation during the dry season, it will remain within the 0 to 30 foot depth range for an extended period, in some locations perennially. Thus, the duration of interconnection of groundwater with the riparian root zone is much greater than the duration of interconnection with surface flow in the stream.

Locations of interconnection between groundwater and surface water are shown in Figure 1. The identification of interconnected stream reaches was based on a joint evaluation of stream flows, groundwater levels and riparian vegetation. For GSP purposes, it is further necessary to separate the effect of groundwater levels from the effects of other hydrologic variables that are typically correlated over time, such as precipitation and surface runoff. The following data sets were analyzed to quantify the relationships among variables:

- Annual precipitation and cumulative departure of annual precipitation at Paso Robles
- Gaged stream flows in the Salinas and Estrella Rivers
- Historical aerial photographs from 1989-2021
- Groundwater levels in shallow alluvial wells and deeper (Paso Robles Formation) wells
- Changes in the extent and density of riparian and wetland vegetation
- The water status of vegetation based on spectral analysis of satellite images during 1987-2020

Each of these data sets is described below. Taken together, the data sets were remarkably consistent with a hydrogeologic conceptual model of the Subbasin described in a SWRCB decision in 1982. That conceptual model and its extension to interconnected surface water is presented first to provide a framework for considering the individual data sets.

Many of the data used in the analysis pre-date 2015, which was the start of the SGMA management period. SGMA does not require that GDEs be restored to any condition that occurred prior to 2015. However, long-term data sets provide greater opportunity for differentiating the separate effects of variables that are often correlated. For example, precipitation, stream flow and groundwater levels are all potential sources of water for riparian vegetation, and all three are low during droughts. The extensive use of pre-2015 data in the analysis does not mean that this GSP intends to restore any conditions to a pre-2015 level.

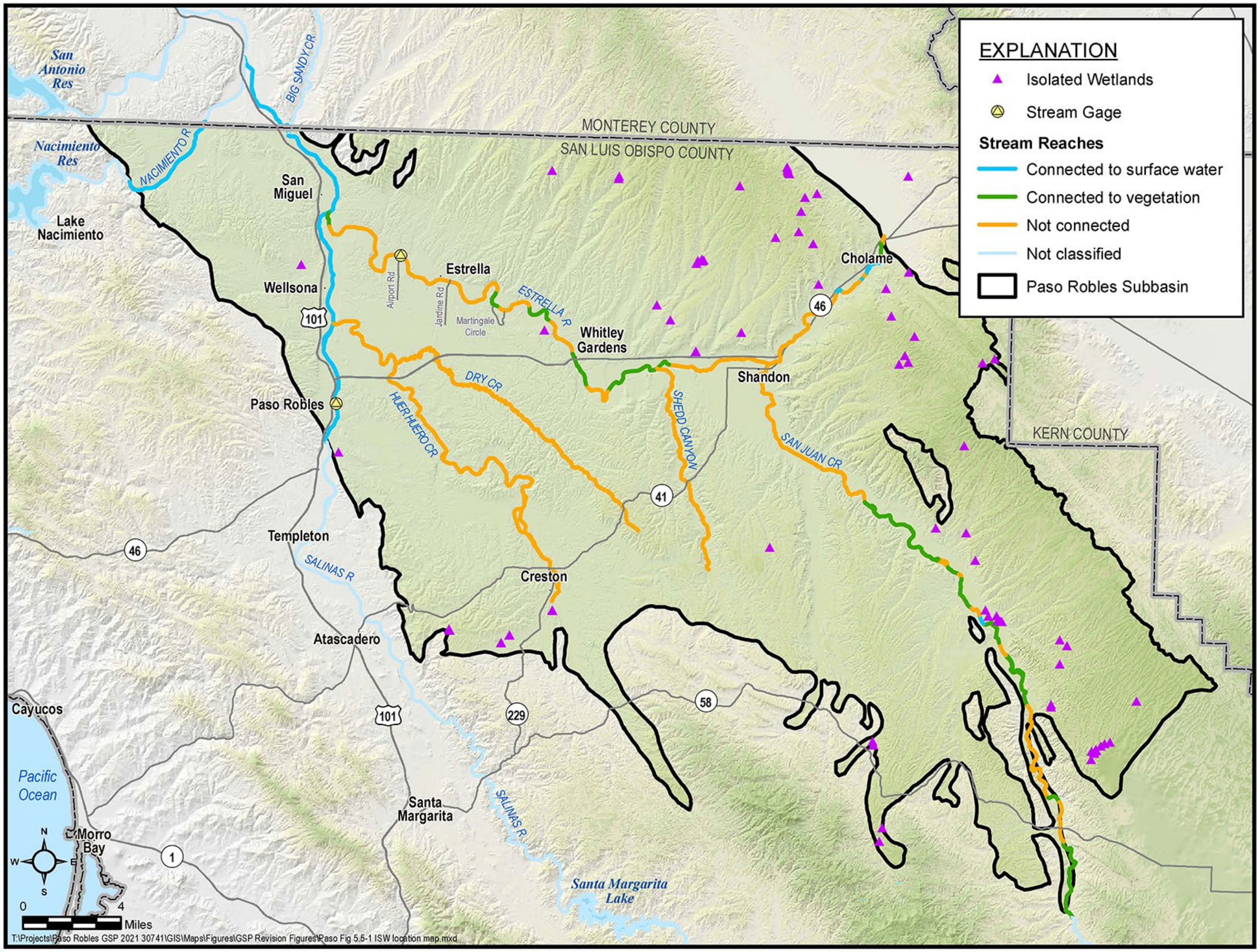


Figure 1. Locations of Interconnection Between Groundwater and Surface Water

1. CONCEPTUAL MODEL OF INTERCONNECTED SURFACE WATER

In 1982, the SWRCB issued Decision 1585 regarding a group of applications for surface diversions from tributaries to the Salinas River between Salinas Dam and the Nacimiento River (SWRCB, 1982). By that date, the SWRCB had already determined that groundwater in alluvial deposits along the Salinas River was classified as underflow subject to the rules of surface water appropriation. The Decision described hydrogeologic conditions and recharge processes in the Paso Robles Groundwater Basin, stating that there are “silty clays of low permeability existing within the upper portion of the Paso Robles Formation beneath and adjacent to the Salinas River alluvium… [that] appear to be sufficiently thick and extensive to act as a barrier separating underflow in the river alluvium from groundwater that occurs in the underlying older water-bearing formations.” The clays were said to extend eastward to about the community of Estrella along the Estrella River and the community of Creston along Huerhuero Creek. Upstream of the clays, percolation from the Estrella River and Huerhuero Creek directly recharges the Paso Robles Formation.

This hydrogeological conceptual model suggests that groundwater pumping—the preponderance of which is from the Paso Robles Formation—would tend to deplete stream flows upstream of the clay layers but have only a small effect on stream flows overlying the clay layers. An additional geographic variation in regional hydrology is that the western part of the watershed surrounding the Subbasin is much wetter than the eastern part. Average annual precipitation over the Coast Ranges along the western side of the watershed is about four times greater than precipitation along the eastern edge of the watershed. As a result, surface runoff into the Salinas River is substantially greater than surface runoff into the Estrella River. The combined effect of greater surface inflow and confining layers beneath the alluvium is to enable the Salinas River to maintain high, steady groundwater levels that support the establishment and growth of riparian vegetation. Except during major droughts, river recharge has been able to outpace leakage across the confining layers, even after water levels in deep wells declined by many tens of feet. In contrast, many stream reaches in the eastern half of the Subbasin do not appear to be buffered from the effects of pumping. Over several decades, pumping has lowered groundwater levels in the Paso Robles Formation, depleted stream flow and may have caused the observed decrease in the extent and health of riparian vegetation.

2. PRECIPITATION

The history of annual precipitation at Paso Robles is useful for interpreting other data sets. It identifies individual dry and wet years as well as droughts and sequences of wet years and allows changes in groundwater levels and vegetation to be related to general hydrologic conditions. For example, comparing vegetation at the end of one drought with vegetation at the end of a later drought controls for drought effects and allows the effects of long-term water-level declines to be assessed.

Figure 2 shows annual precipitation at Paso Robles during water years 1910-2021. The blue bars show annual precipitation, and the orange line shows the cumulative departure of annual precipitation. The cumulative departure line goes down in years that are drier than average and up in years that are wetter than average. Thus, droughts appear as long, large declining segments of the cumulative departure line. Two droughts used in the present analysis were 1987-1990 and 2012-2016. They were similar in intensity (63-64 percent of long-term average precipitation), but the more recent drought was one year longer.

3. STREAM FLOW

Stream flow gages with useful historical records are "Salinas River at Paso Robles" (USGS station 11147500), with a period of record of water years 1940-2021, and "Estrella River near Estrella" (USGS station 11148500), with a period of record of water years 195696 and 2016-2018. The Salinas River gage is near the upstream end of the reach crossing the Subbasin. Flows at that location do not reflect pumping depletion within the basin, but they can be used to evaluate flow duration and the amount of flow required to create continuous throughflow to the Nacimiento River confluence. Aerial photographs from nineteen dates between 1989 and 2021 were examined to determine whether throughflow was present, which was on five dates. However, the amount of flow at the gage associated with throughflow is inconsistent and might have been affected by flows over the weeks and months preceding the respective photograph. Live flow was present with gaged flows as small as 5-8 cubic feet per second (cfs), when flow had been continuous but slowly receding for weeks beforehand. Conversely, discontinuous flow was present with gaged flows as high as 73 cfs. The location where flow first becomes discontinuous was not obvious from the aerial photographs. Commonly, the entire reach from about Wellsona to the Nacimiento River was dry, damp or flowing.

Along the Estrella River, open water or at least ribbons of very damp soil along the channel were commonly present at various locations from about 4 miles upstream of Whitley Gardens to about 0.5 mile downstream of Whitley Gardens and along about a 1-mile reach near Martingale Circle (about 5 channel miles downstream of Whitley Gardens) prior to 2012. Since then, those possible gaining reaches have not been visible in dry season air photos.

Figure 3 shows annual discharge and cumulative departure of annual discharge in the Salinas River at the Paso Robles gage. The patterns of annual discharge and cumulative departure are similar to those for precipitation, which confirms that river flows derive primarily from rainfall runoff.

Flows in the Estrella River are much smaller than those in the Salinas River due primarily to the smaller amount of annual rainfall. For example, average annual discharge in the Salinas River during water years 1972-1994 (74,925 acre-feet per year) was close to the long-term average and was 4.6 times greater than annual discharge in the Estrella River for the same time period.

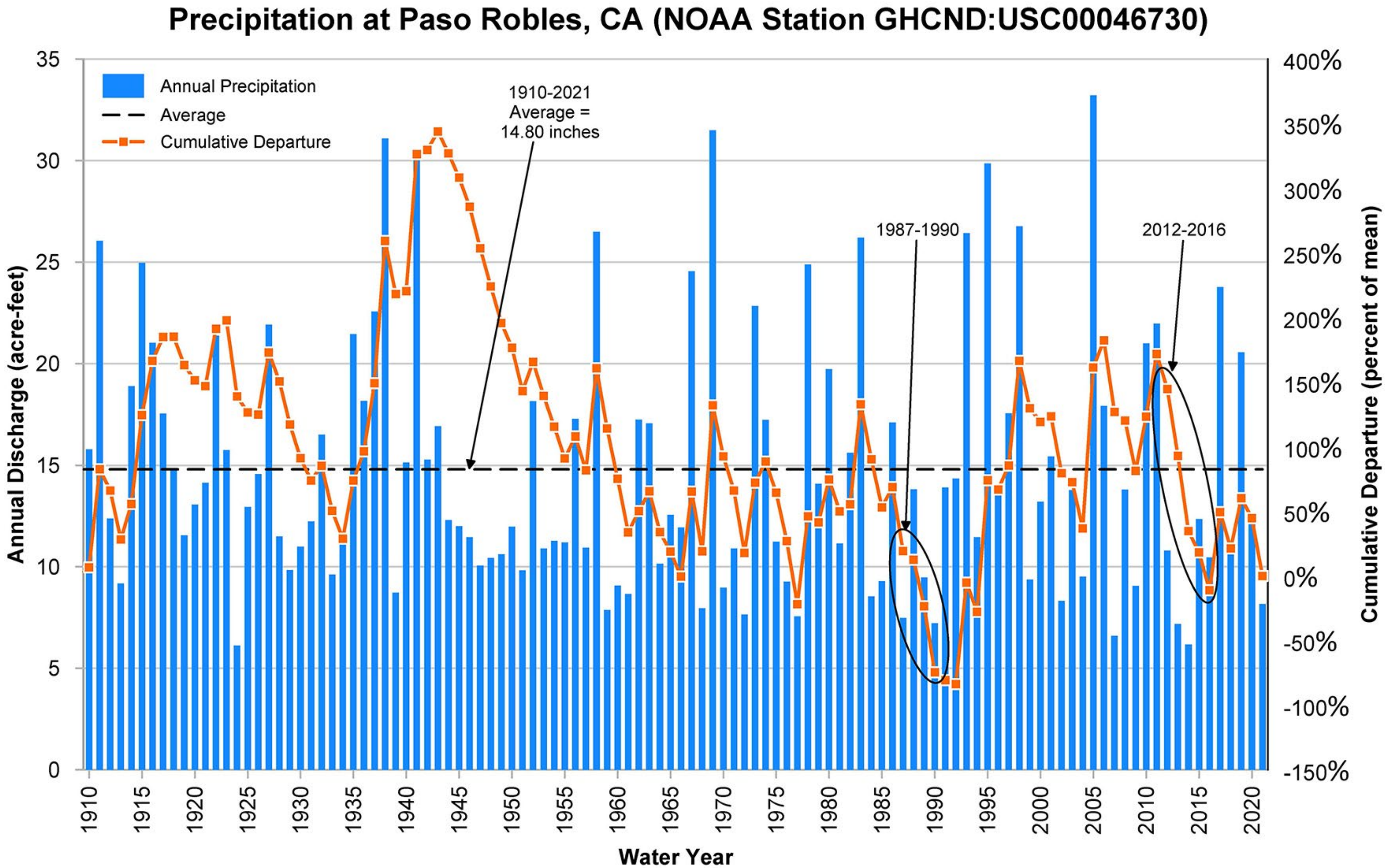


Figure 2. Annual Precipitation at Paso Robles, Water Years 1910 to 2021

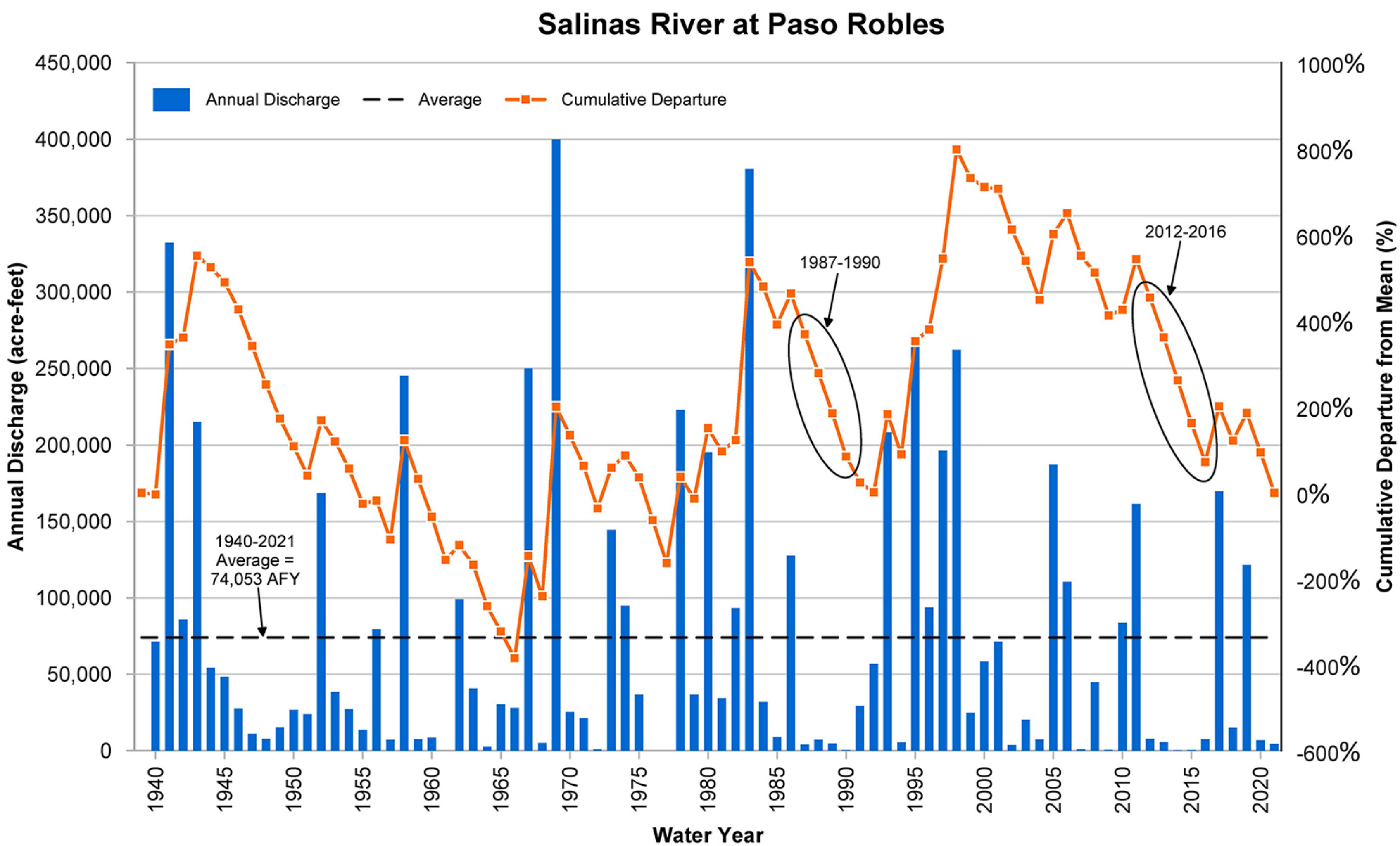


Figure 3. **Annual Discharge and Cumulative Departure of Annual Discharge, Salinas River at Paso Robles Gage**

Estrella River flows at the “near Estrella” gage (see Figure 1) have also been depleted by groundwater pumping and declining groundwater levels, whereas the Salinas River flows have not. Figure 4 shows flow-duration curves for both rivers for four three-year time intervals, roughly a decade apart from the 1960s to 2010s. Each curve displays all daily flows during a three-year period sorted from largest to smallest. The horizontal X axis shows the percentage of time each flow magnitude is exceeded. For perennial streams, the curves would extend across the entire width of the graph because flow exceeds zero 100 percent of the time. For seasonally intermittent streams, the curve bends down and crosses the X axis indicating the percentage of time flow is greater than zero. By plotting the vertical Y axis on a logarithmic scale, changes in low flows are visually expanded. If groundwater pumping is depleting stream flow, the effect is to curtail the duration of low flows (bend the curve downward) and shift the X axis intercept to the left.

As documented in Figure 4, in the Estrella River, low flows have become increasingly depleted by groundwater pumping over the past five decades, causing the curves to shift progressively to the left. In contrast, the curves for the Salinas River have remained in a cluster, with no trend to the right or left. The Estrella River gage is near the eastern edge of the shallow clay layers in the Paso Robles Formation. These curves confirm that flows upstream of the gage were historically interconnected with groundwater and subject to depletion by groundwater pumping and lowered groundwater levels.

Prior to 2012, there were several locations along the Estrella River where subsurface hydrogeologic conditions appeared to push the water table closer to the land surface, resulting in flow or visible dampness along the low-flow channel when nearby reaches were dry. This most commonly occurred 3-4.5 miles above Highway 46, 0-1 miles above Highway 46 (at Whitley Gardens), and 3.8-5 miles downstream of Highway 46 near Martingale Circle. Neither flow nor dampness has been visible during the dry season at these locations since 2012.

4. GROUNDWATER LEVELS

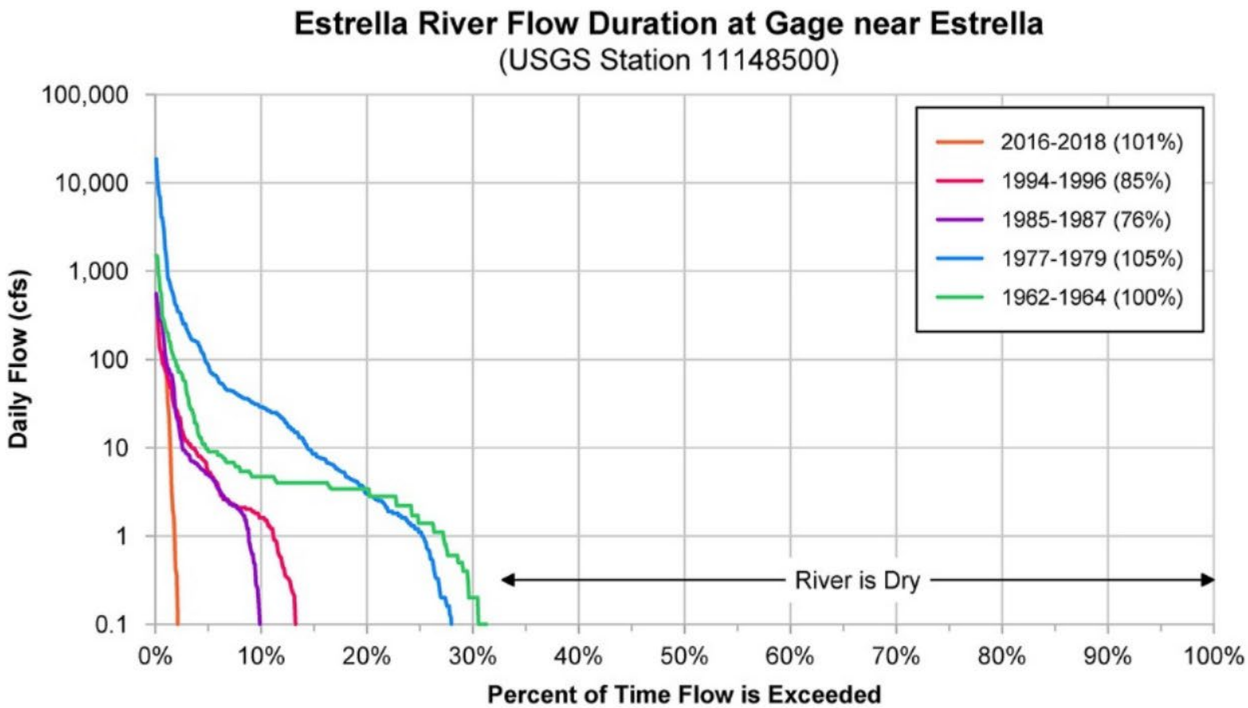
Relating groundwater levels to interconnected surface water requires that the depth of the well screen be known because wells screened at different depths can have different water levels. Only the true water table at the uppermost zone of saturation is relevant to interconnection with surface water or tree roots. In alluvial basins like the Paso Robles Subbasin the true water table is typically higher than the water level in deeper aquifer units tapped by water supply wells because confining layers within the basin fill materials slow the rates at which pumping from deep aquifers affect water levels in shallow ones. For example, a very large difference between shallow and deep water levels was found near the Airport Road bridge over the Estrella River (see Figure 1), where two monitoring wells were installed in 2021. The shallower well was screened down to 40 feet below the ground surface and had a depth to water of 29.5 feet (Cleath-Harris Geologists, 2021). The top of the screen in the second well was 160 feet deeper and its water level was 158 feet lower.

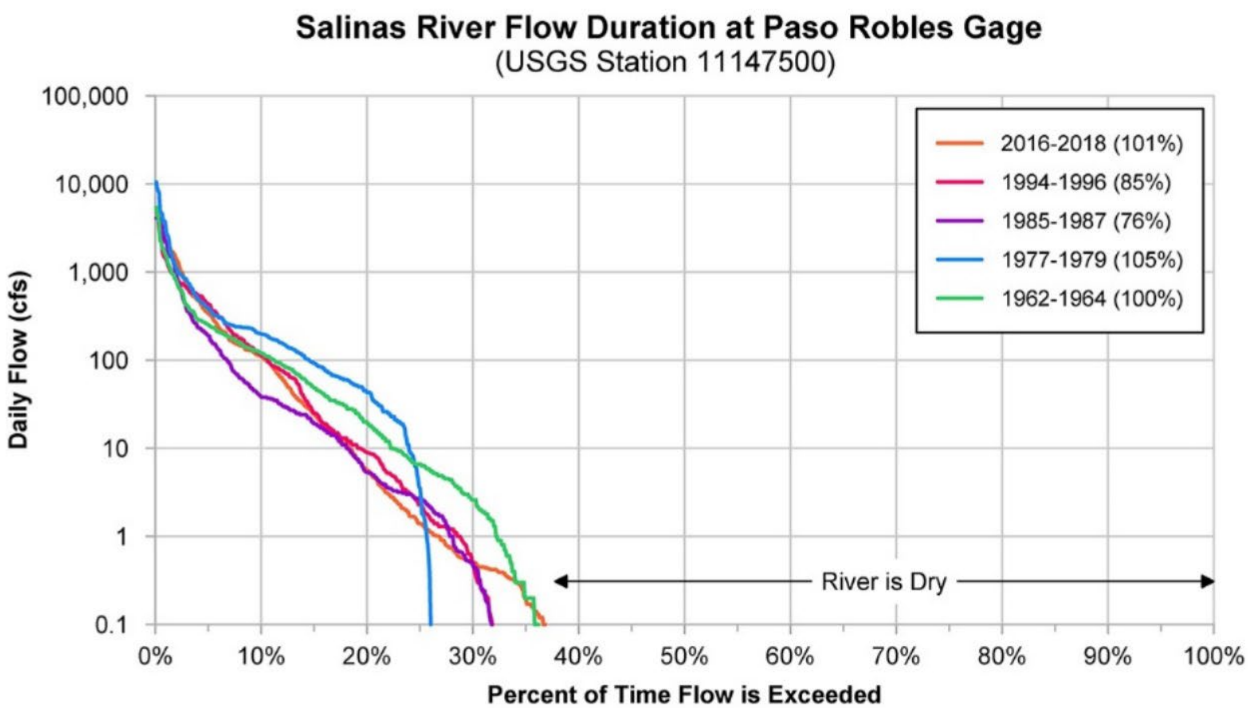
This represents a vertical water-level gradient close to unity, which means the shallow aquifer is perched and there is an unsaturated zone between the shallow and deep aquifers.

Most attempts to group water level data by well depth have been hampered by lack of depth or screened interval information for the wells (see for example GSP Sections 4.4 and 4.4.4). Groundwater levels have been monitored in about 3,600 wells in the Subbasin by SLOFCWCD, but construction information is available for only 244 of them. Only one well was usable as an RMS for alluvial aquifer groundwater levels.

A different approach was used for this analysis of interconnected surface water. Monitored wells with relatively long periods of record and located within about 2,000 feet of a surface waterway were selected from the water level database. Of these 31 wells, most were along the Salinas and Estrella Rivers, with a few along San Juan Creek, Huerhuero Creek and Shedd Canyon. The hydrographs for these wells were classified as alluvial or Paso Robles based on the water level patterns. In alluvial wells, water levels were close to the adjacent stream bed elevation, had small seasonal fluctuations and were stable from year to year except during droughts, when larger water-level declines occurred. Figure 5 shows examples of alluvial well hydrographs. The figure also shows examples of hydrographs characteristic of Paso Robles Formation wells. In those hydrographs, seasonal fluctuations are larger, water levels in winter are more irregular and not necessarily close to the elevation of the nearby stream, and steady long-term water-level declines commenced sometime between the 1970s and 2000s. Almost all of the hydrographs fit clearly into one or the other of these two patterns.

All of the wells along the Salinas River fit the alluvial well hydrograph pattern except for two multi-depth monitoring well clusters in San Miguel that appeared to be completed in the Paso Robles Formation. The only well along the Estrella River with the alluvial well signature is the one farthest downstream, within the region characterized by shallow clay layers that separate alluvial groundwater levels from deeper Paso Robles groundwater levels. All of the wells farther upstream along the Estrella River exhibit the Paso Robles well pattern. One well next to San Juan Creek has a hydrograph closer to an alluvial pattern than a Paso Robles pattern. This well is upstream of most agricultural pumping. It might be completed in the Paso Robles Formation but has not yet experienced long-term water-level declines due to pumping. The geographic distribution of all of the hydrographs fits the conceptual model for interconnected surface water: where extensive shallow clay layers are present in the Paso Robles Formation, alluvial groundwater levels have remained relatively stable and at an elevation close to that of the adjacent stream bed. The aforementioned new multi-depth monitoring well site on the Estrella River at Airport Road likewise fits the pattern.





Note: Percentages in legend indicate precipitation at Paso Robles as percent of 1910-2021 average

Figure 4. Flow-Duration Curves for Estrella and Salinas Rivers

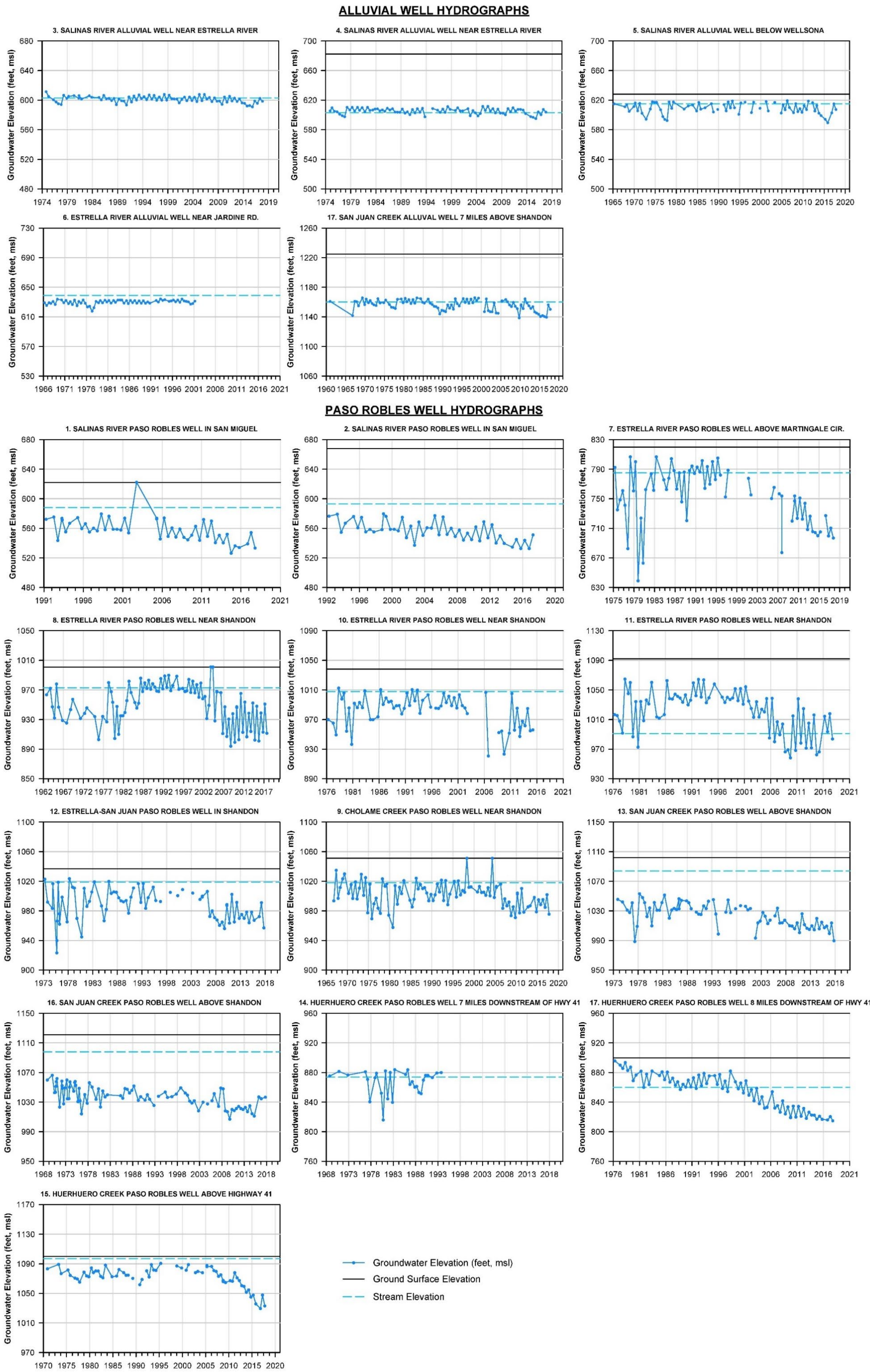


Figure 5. Alluvial and Paso Robles Well Hydrographs

5. RIPARIAN VEGETATION

Vegetation patterns along streams can also be used to map potential interconnection of surface water and groundwater because growth is more vigorous where plant roots can reach the water table. There are limitations to this approach, however. First, some plant species are facultative phreatophytes, which means they will establish and grow with or without access to the water table. A second limitation is that riparian vegetation in shallow water table areas is subject to mechanical removal by flood scour or by clearing for agricultural land use. A third limitation is that a narrow band of vegetation can survive along a stream channel even where the water table is deep if surface flows periodically replenish soil moisture in the stream bank. In spite of these limitations, broad patches of dense riparian vegetation stand out in aerial photographs and provide an indication of where the water table is shallow and interconnected with the root zone and possibly also the stream channel.

Two sources of vegetation mapping were used in the analysis: maps of Natural Communities Commonly Associated with Groundwater (NCCAG) and historical aerial photographs. The NCCAG maps of potential riparian and wetland vegetation are statewide compilations of numerous local vegetation mapping studies, mostly from the early 2000s. The NCCAG maps are provided in georeferenced digital formats on DWR's SGMA Data Portal. Historical aerial photographs taken on nineteen dates between 1989 and 2021 can be viewed on Google Earth©. Some of the older photography was low-resolution, so the Google Earth data were supplemented with high-resolution photography for 1994 obtained from Netronline (www.historicaerials.com).

A comparison of the NCCAG maps with aerial photographs revealed that the accuracy of the NCCAG vegetation delineations is poor in the Subbasin. This is illustrated in Figure 6, which shows NCCAG vegetation polygons overlain on aerial photographs at four locations along the Salinas and Estrella Rivers. The riparian vegetation polygons clearly miss many areas of vegetation that is denser and more likely phreatophytic than the vegetation in the polygons or simply cover areas with little vegetation at all. The wetland polygons along the river channels were mapped in greater detail but do not consistently correspond to a particular type of vegetation visible in the photograph. In particular, wetlands within the river channels are commonly present as long, narrow ribbons along the low-flow channel. Slight shifting in the low-flow channel location or small errors in georeferencing the data can place the mapped polygon over the incorrect type of vegetation.

The NCCAG wetland map also includes numerous off-channel vegetation patches mapped as springs or seeps. Mapping accuracy for these features was also uneven, as shown in Figure 7.

For the purposes of the interconnected surface water analysis for this GSP, a new map of riparian and wetland vegetation was created by digitally outlining areas of visibly dense riparian trees or shrubs more than about 50 feet wide along river and creek channels based on May 2017 aerial photography. The photography represents dry-season conditions in a year close to the start of the SGMA management era (January 2015). In-channel wetlands are indicated where bright green herbaceous vegetation was visible, generally in narrow strips along low-flow channels. This type of wetland vegetation comes and goes between seasons and years. The mapping is intended to show areas where it can often be found.

For isolated wetlands, all of the mapped features in the NCCAG data set were reviewed and classified as groundwater dependent wetlands if they exhibited open water or bright green herbaceous vegetation in the dry season. Many of the features in the data set do not appear to be wetlands at all, are artificial water features such as stock ponds or are seasonal wetlands. Seasonal wetlands—including vernal pools—are transient features that derive water from ponding of rainfall runoff in localized depressions. In some instances, near-surface groundwater perched on the same shallow clay layer that holds the surface runoff might contribute subsurface flow to the seasonal wetland for a few weeks or months (Williamson and others, 2005). That shallow groundwater is perched above an unsaturated zone and not connected to regional groundwater. Where regional groundwater intersects the land surface, it generally does so perennially or nearly so. Hence, it supports wetland vegetation that is green year-round.

The resulting map of groundwater-dependent vegetation is shown in Figure 8. In-channel riparian and wetland vegetation is mapped as polygons accurately delineating the perimeter of the vegetation patch. Isolated wetlands are shown using symbols because many of them would otherwise be too small to see on a basin-scale map. The vegetation distribution is generally consistent with the conceptual model for interconnected surface water. Dense riparian vegetation is most abundant along the Salinas River, which has relatively large and persistent surface flows as well as consistently shallow depth to groundwater. These conditions also result in a relatively high abundance of in-channel wetlands. Riparian vegetation along the Estrella River is sparser and has become more so in recent decades, as described below. Patches of sparse and dense riparian vegetation and even wetlands are present along San Juan Creek at locations more than about 10 miles upstream of Shandon.

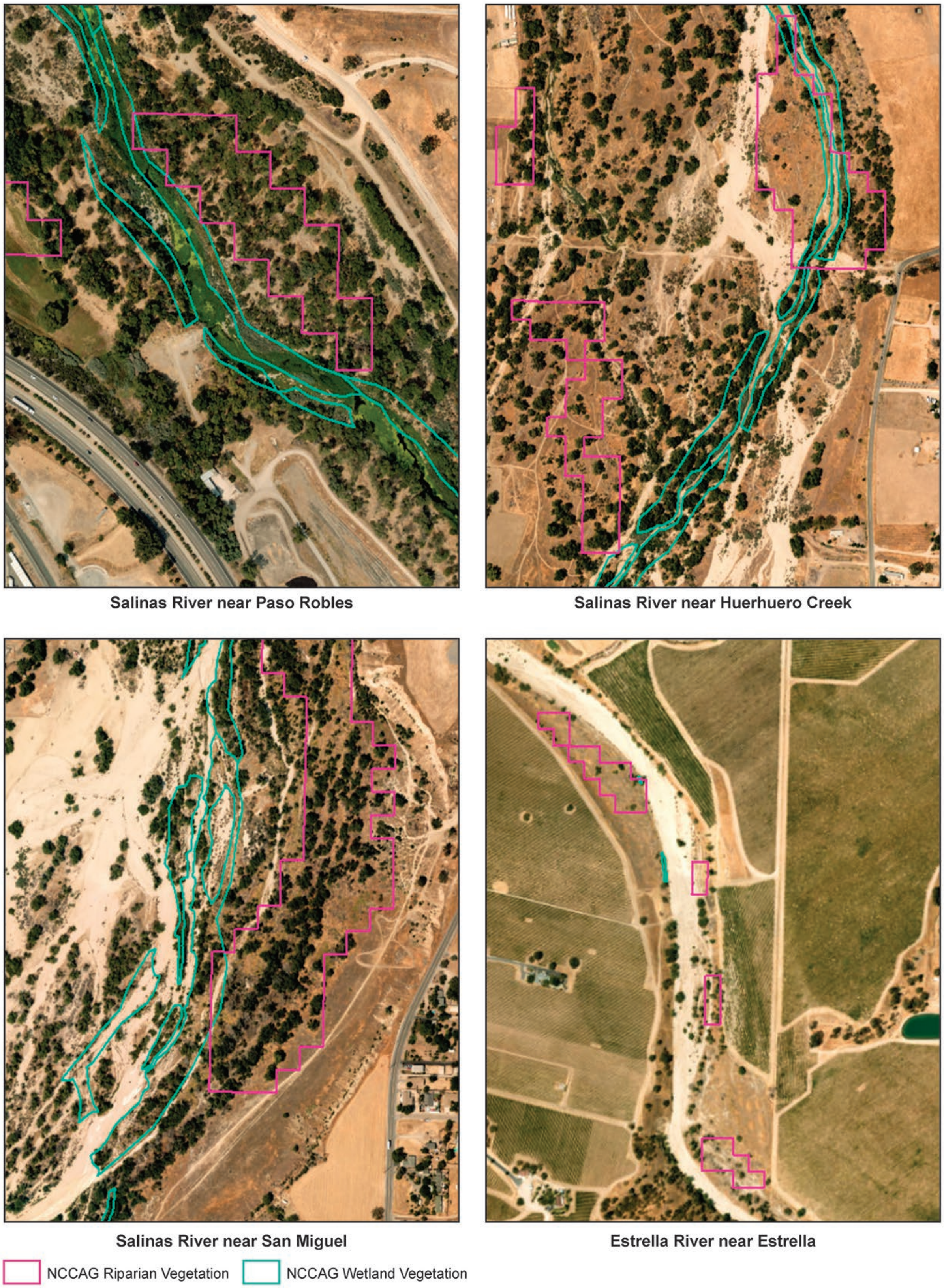


Figure 6. NCCAG Vegetation Polygon Accuracy Along the Salinas and Estrella Rivers

Figure 7. NCCAG Wetland Map Accuracy within Paso Robles Subbasin

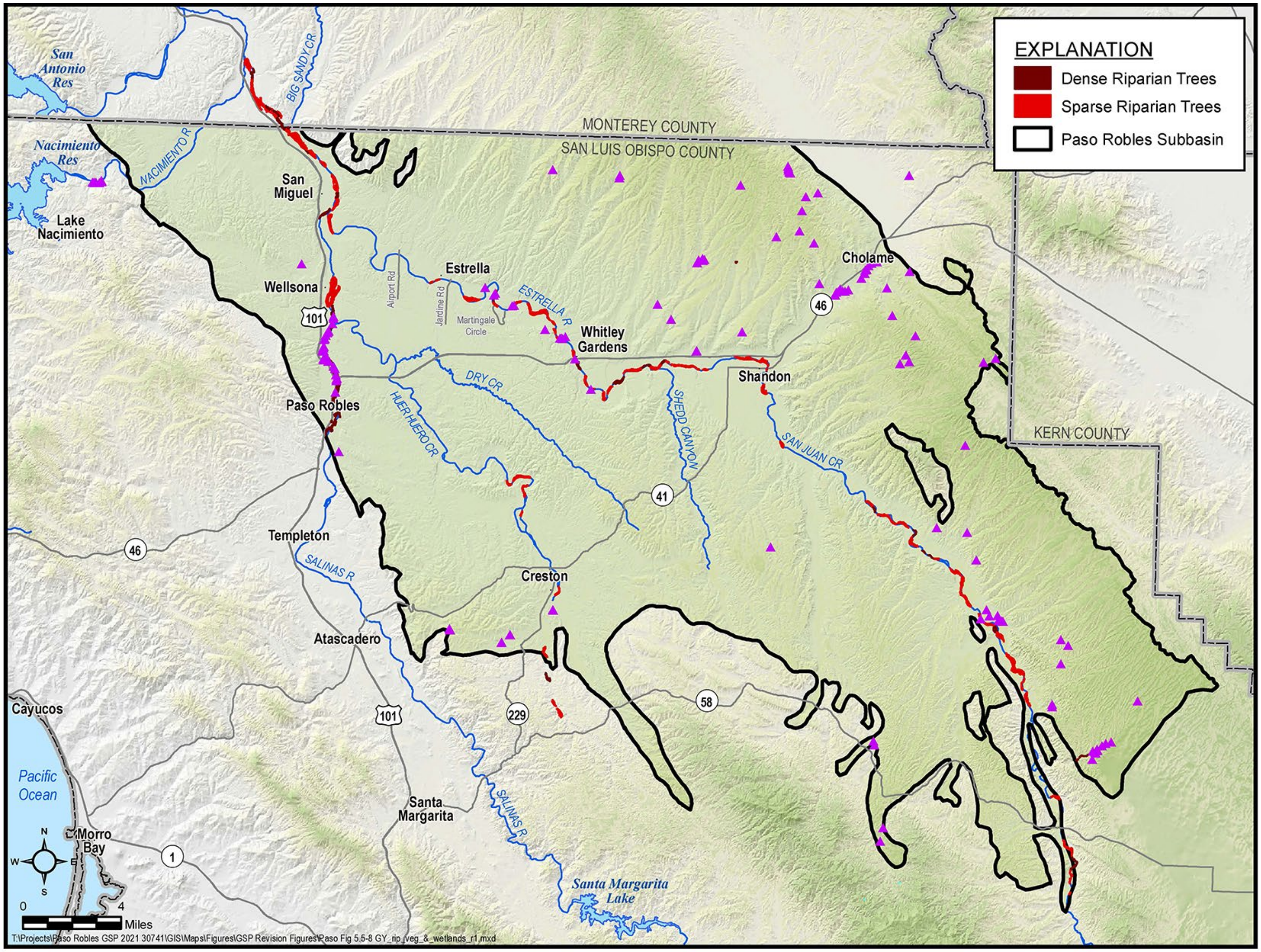


Figure 8. Groundwater-Dependent Vegetation in Paso Robles Subbasin

6. CHANGES IN RIPARIAN VEGETATION OVER TIME

Changes in the location, extent and density of riparian tree and shrub canopy over time provide important clues regarding the variables affecting vegetation GDEs. For example, unusually low stream flow and water levels occurred along the Salinas River only during the 2012-2016 drought, whereas stream flow and groundwater levels along the upper half of the Estrella River and lower reach of San Juan Creek have been gradually declining for decades. Thus, if vegetation impacts can be observed in aerial photographs or satellite imagery, then the timing of the impacts is informative. Three types of temporal vegetation analysis were completed: comparisons of vegetation in 1949, 1978, 1994, 2003 and 2018, mapping of riparian tree mortality during the 2012-2016 drought, and mapping of changes in satellite-based measurements of vegetation moisture status over time.

6.1 Comparison of Riparian Vegetation in 1949-2018

In 2004, the Upper Salinas-Las Tablas Resource Conservation District measured changes in the extent and density of riparian vegetation at several locations along Subbasin streams by comparing aerial photographs from 1949, 1978 and 2003 (US-LTRCD, 2004). Along two Salinas River sample reaches near Atascadero and Paso Robles, the percent cover of in-channel riparian vegetation decreased from 84-95 percent in 1949 to 10-23 percent in 2003. Similar tabulations at thirteen additional locations along the Salinas and Estrella Rivers and Huerhuero Creek found that overall about two-thirds of the riparian vegetation that existed along those waterways in 1949 had disappeared by 2003. The report listed nine possible causes of the decrease in riparian vegetation but did not include any analysis to quantify which were the most significant.

Looking back at those data, some conclusions regarding causality can be inferred. The reductions in riparian vegetation along the Estrella River and Huerhuero Creek could not have been the result of upstream dam operation, which was a potential cause of reductions along the Salinas River (Salinas Dam was completed in 1942). It is possible that riparian vegetation was exceptionally abundant in 1949 because it was a few years after 1936-1943, which was the largest sequence of wet years in the 1910-2021 period of record for precipitation (see Figure 2). Long-term declines in groundwater levels could not have explained the decrease in vegetation along the Salinas River, where alluvial water levels have remained stable and shallow since at least the early 1970s. Elsewhere in the Subbasin, chronic declines in groundwater levels mostly started in the 1980s or 1990s, although they started earlier in a few cases. Water-level declines since 1980 could not have caused vegetation declines during 1949-1978.

A similar analysis was completed for this GSP, comparing riparian vegetation conditions in 2018 with conditions in 1994 along the entire lengths of the Salinas River, Estrella River, Huerhuero Creek and San Juan Creek using aerial photographs. Each of those dates were soon after the end of a major drought. As discussed in section 5.5.2, the 1987-1990 drought and the 2012-2016 drought were similar in intensity (low precipitation), but the more recent drought lasted a year longer. In other words, precipitation and stream flow conditions during the years immediately preceding the two photographs were similar, but groundwater levels were different. Between those two periods, there were cumulative water-level declines in the Paso Formation wells of 25-70 feet in the eastern part of the Subbasin. Water levels along the Salinas River remained stable until 2011, declined 12-18 feet during 2012-2016 and then recovered (see Figure 5). The density and extent of patches of riparian vegetation along the waterways in 2018 was visually classified as “more”, “the same” or “less” than in 1994.

The results of the vegetation comparison are shown in Figure 9. Where there were differences along the Salinas River, they were all decreases in vegetation coverage. This suggests that the relatively small and temporary water level declines during 2012-2016 were large enough to adversely impact vegetation. Along the Estrella River, vegetation coverage mostly declined near Shandon and along the downstream end toward the Salinas River. Along the middle reach, however, vegetation coverage unexpectedly increased in a number of locations. This is the same river segment where gaining flow could be seen in aerial photographs up until 2012, indicating a near-surface water table. Although that river segment is thought to be east of the extensive near-surface clay layers in the Paso Robles Formation, some aspect of hydrogeology and recharge appears to be sustaining a high water table in spite of large water-level declines in deeper wells in that region.

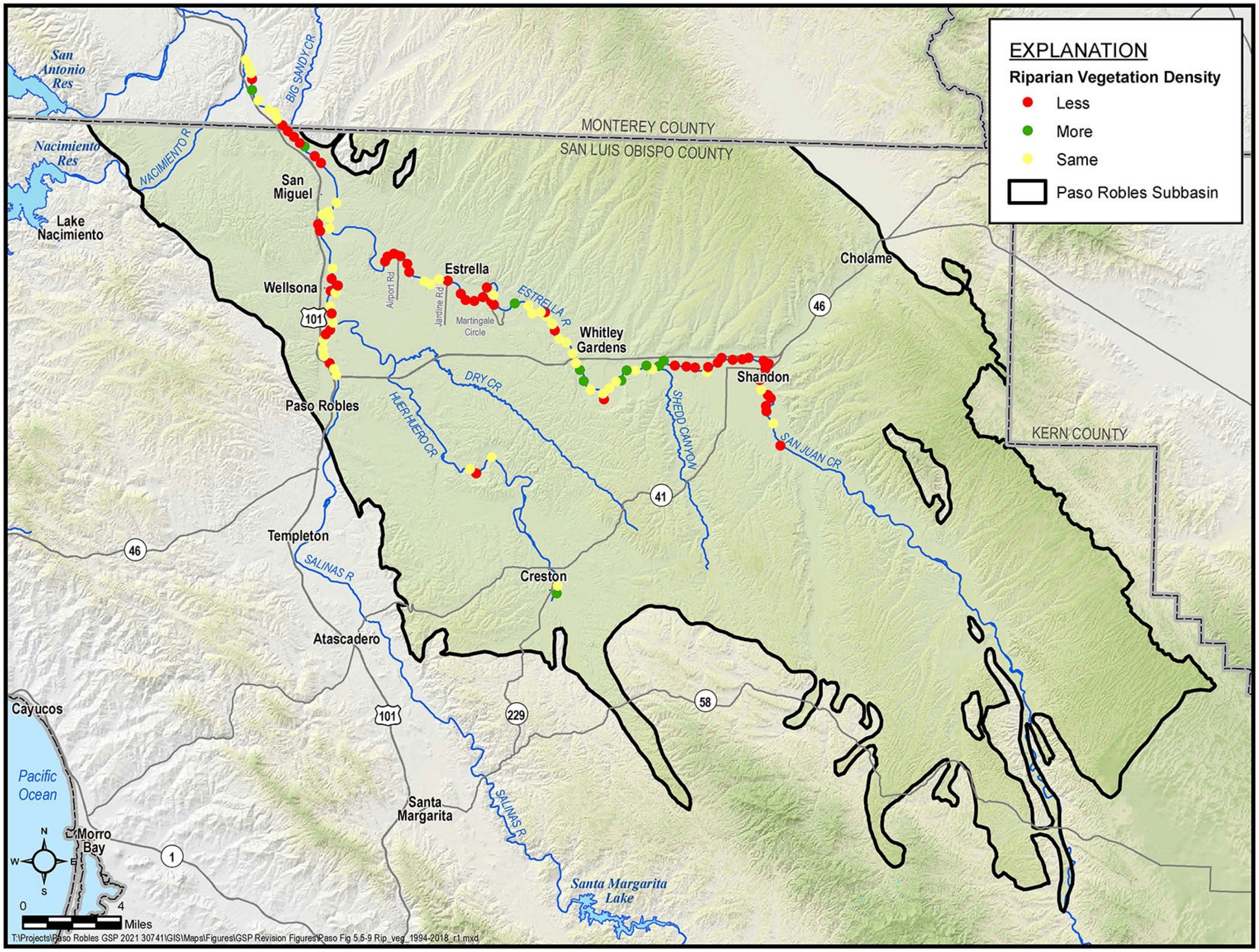


Figure 9. Density of Riparian Vegetation, Paso Robles Subbasin

6.2 Riparian Tree Mortality during 2013-2017

The resolution of recent historical aerial photographs on Google Earth© is sufficiently high that the death of individual trees or groups of trees can be readily detected by comparing photographs before and after the mortality event. The 2012-2016 drought caused noticeable riparian tree mortality in a number of locations. Aerial photographs bracketing the drought (2013 and 2017) were systematically compared to map locations of significant tree mortality. Pairs of photographs illustrating tree mortality are shown in Figure 10, and a map showing the locations and percent canopy reduction where mortality was observed is shown in Figure 11.

Mortality occurred along the Salinas and Estrella Rivers. The number of locations and extent of mortality was less for the Salinas River. Along the Salinas River, groundwater levels declined 12-18 feet during the drought as a result of insufficient surface flow to maintain the normal high water table. This indicates that for trees accustomed to shallow depths to water (less than 20 feet), water-level declines of 12-18 feet can be fatal. The situation along the Estrella River is more complex. Tree mortality was concentrated during the 2012-2016 period even though Paso Robles Formation groundwater levels had been declining for years before the drought. Like the presence of emergent flow and relatively dense riparian vegetation along the middle segment of the Estrella River prior to 2012, the delayed mortality of trees along the river might indicate the presence of a water table normally shallower than the water levels in nearby Paso Robles Formation wells.

6.3 Trends in Moisture Status using NDVI and NDMI

The health and vigor of riparian vegetation cannot be reliably detected in aerial photographs. However, spectral analysis of light reflected from the vegetation does provide that information and can be obtained from Landsat satellite imagery. Two commonly used metrics of vegetation health and vigor are the normalized difference vegetation index (NDVI) and normalized difference moisture index (NDMI), both of which involve ratios of selected visible and infrared wavelengths. NDVI relates to the greenness of vegetation and NDMI relates to transpiration. The Nature Conservancy compiled these two metrics from historical satellite imagery for riparian vegetation throughout California and incorporated it into the GDE Pulse on-line mapping tool (The Nature Conservancy, 2019b). Values are only calculated for NCCAG mapped wetland and riparian vegetation polygons. For each polygon, the tool displays time series plots of annual summertime NDVI and NDMI during 198719. Figure 12 shows examples of NDVI and NDMI time series for two vegetation polygons and illustrates the GDE Pulse tool that calculates trends for user-selected periods. In general, NDVI and NDMI tend to rise and fall together, as they both represent measures of water-related vegetation health.

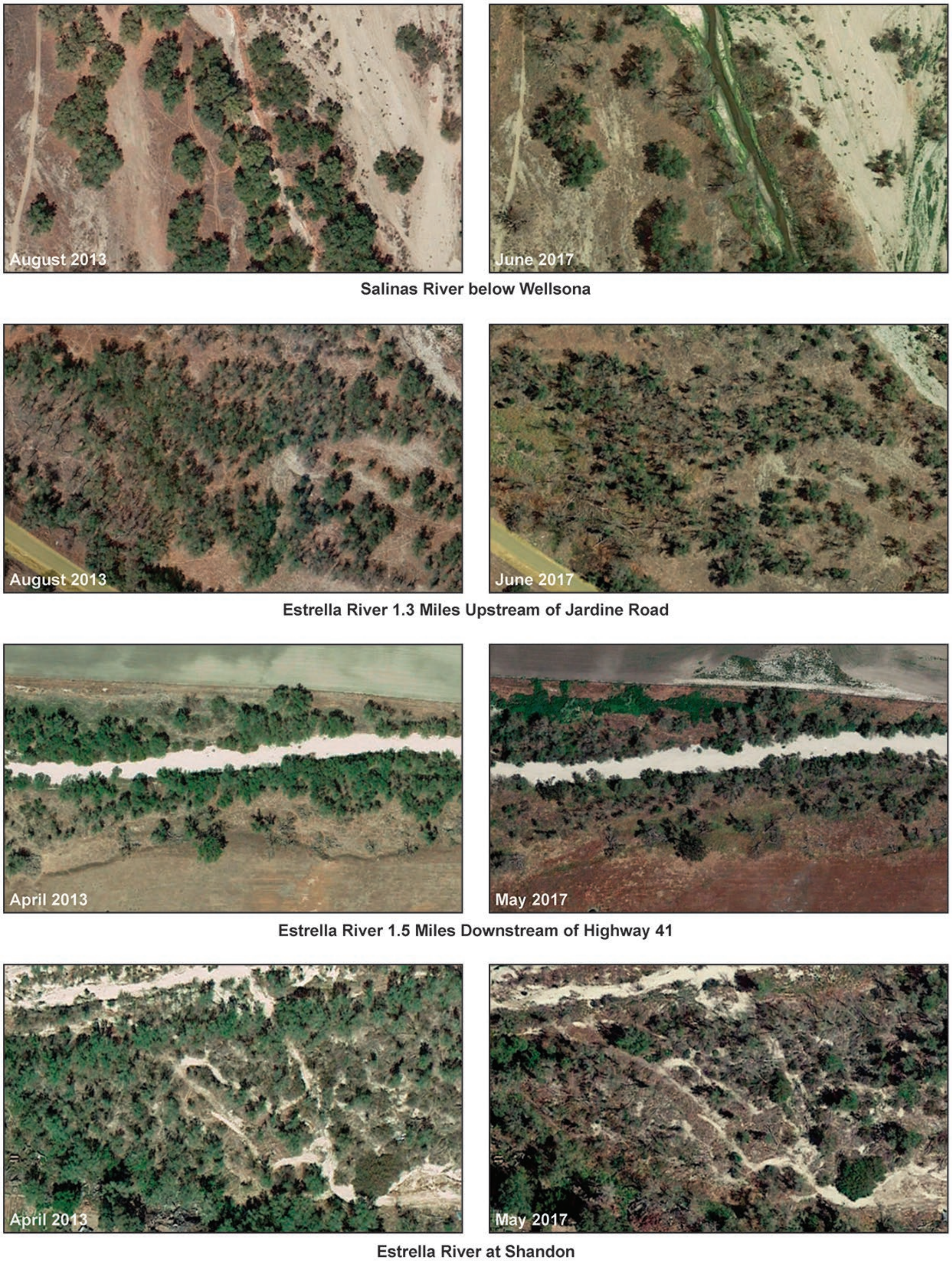


Figure 10. Riparian Vegetation Mortality between 2013 and 2017

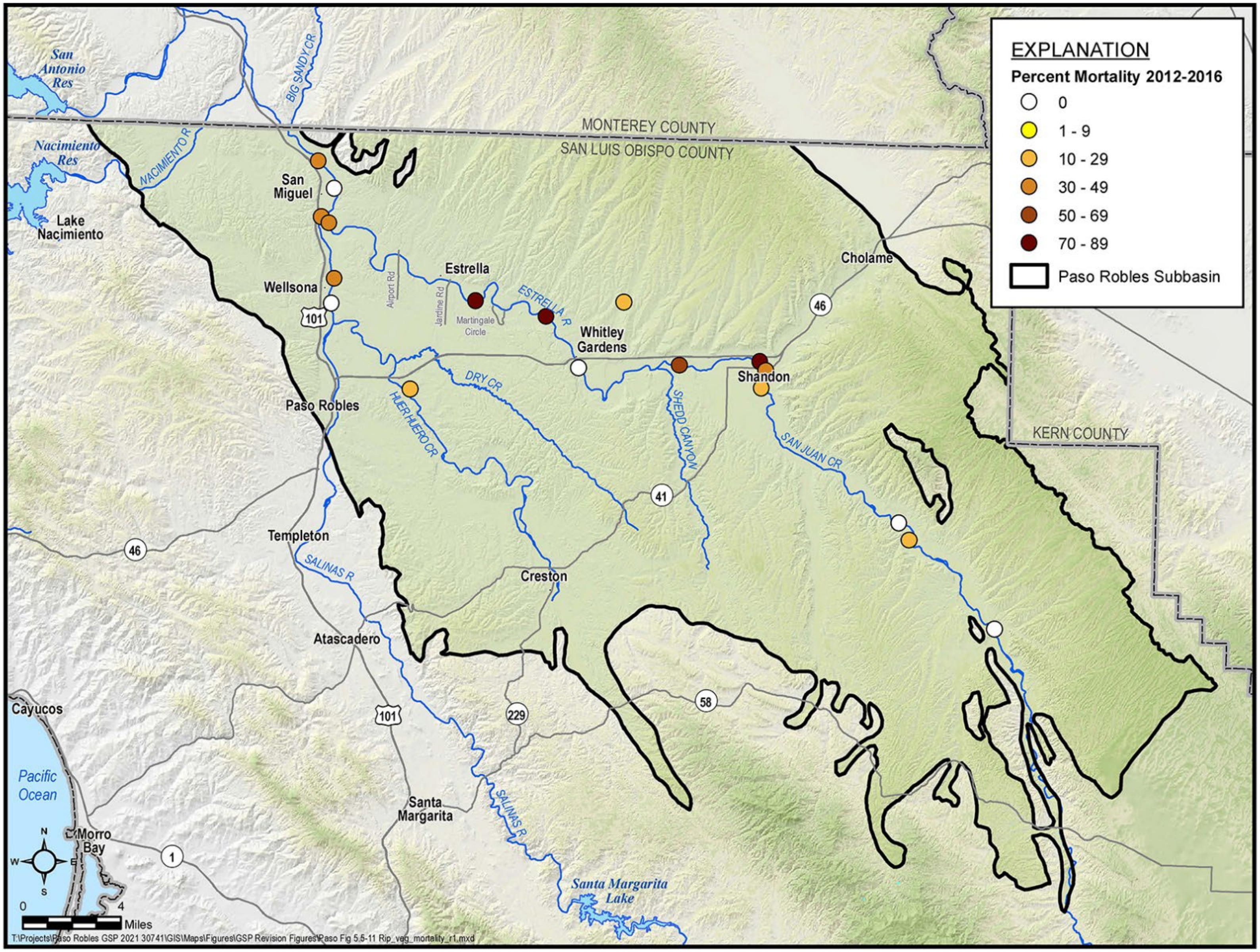
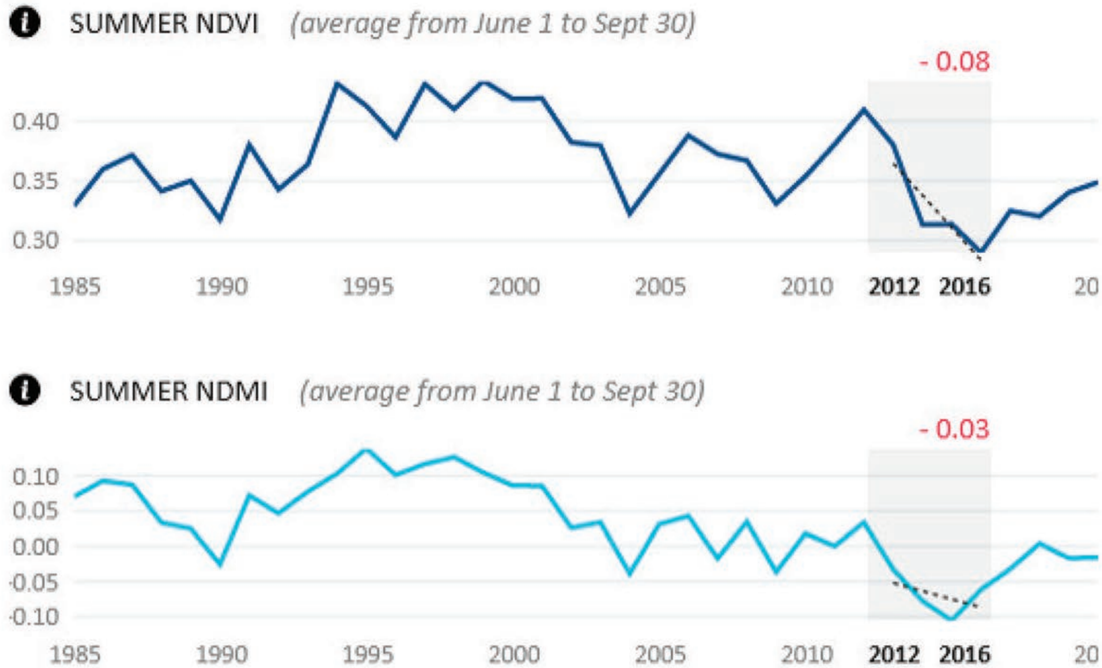
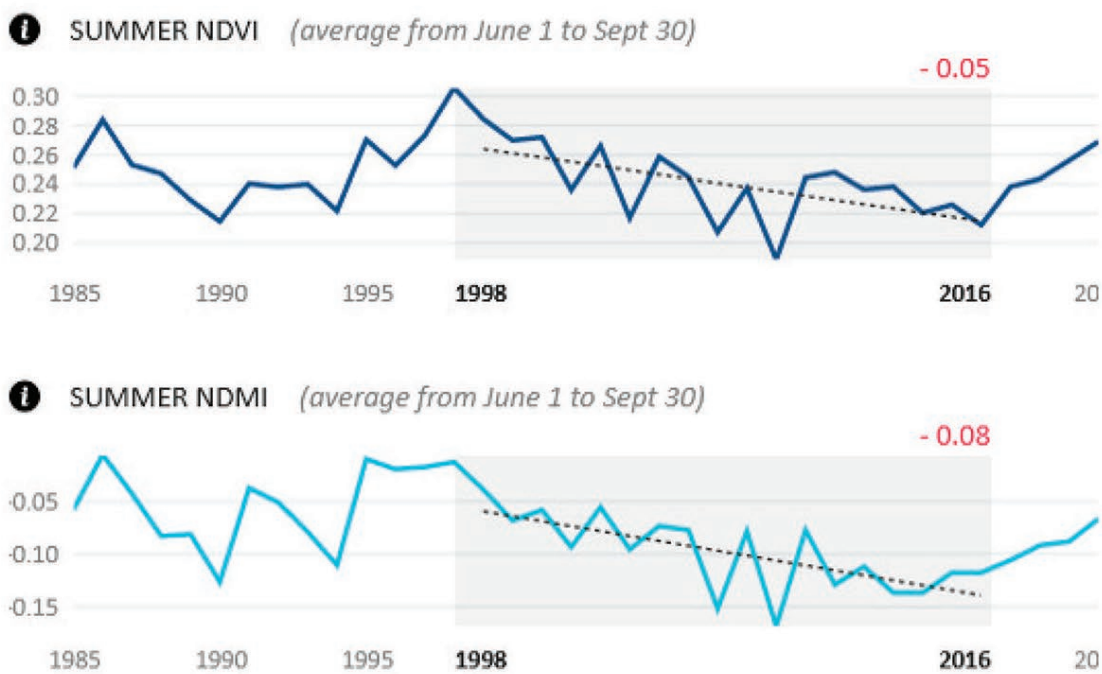


Figure 11. Riparian Canopy Reduction between 2013 and 2017



A. Valley Foothill Riparian Polygon on Salinas River near Huerhuero Creek



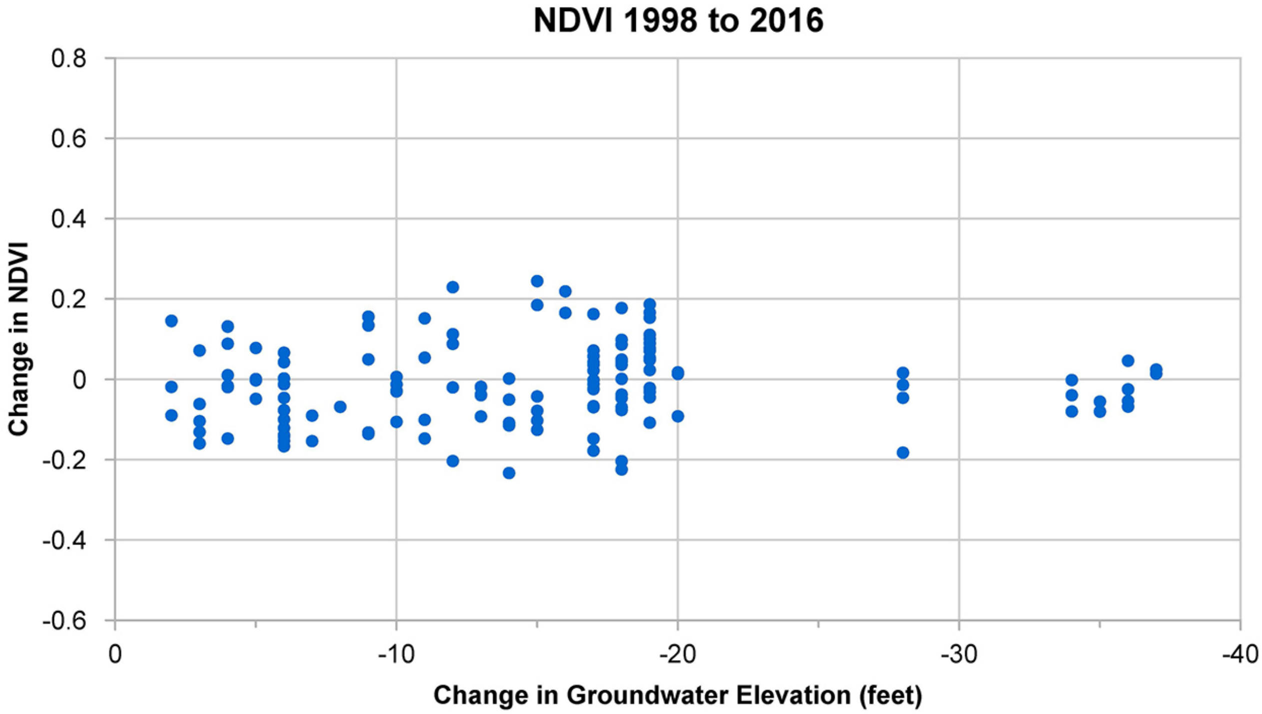
B. Valley Foothill Riparian Polygon on Estrella River near Shandon

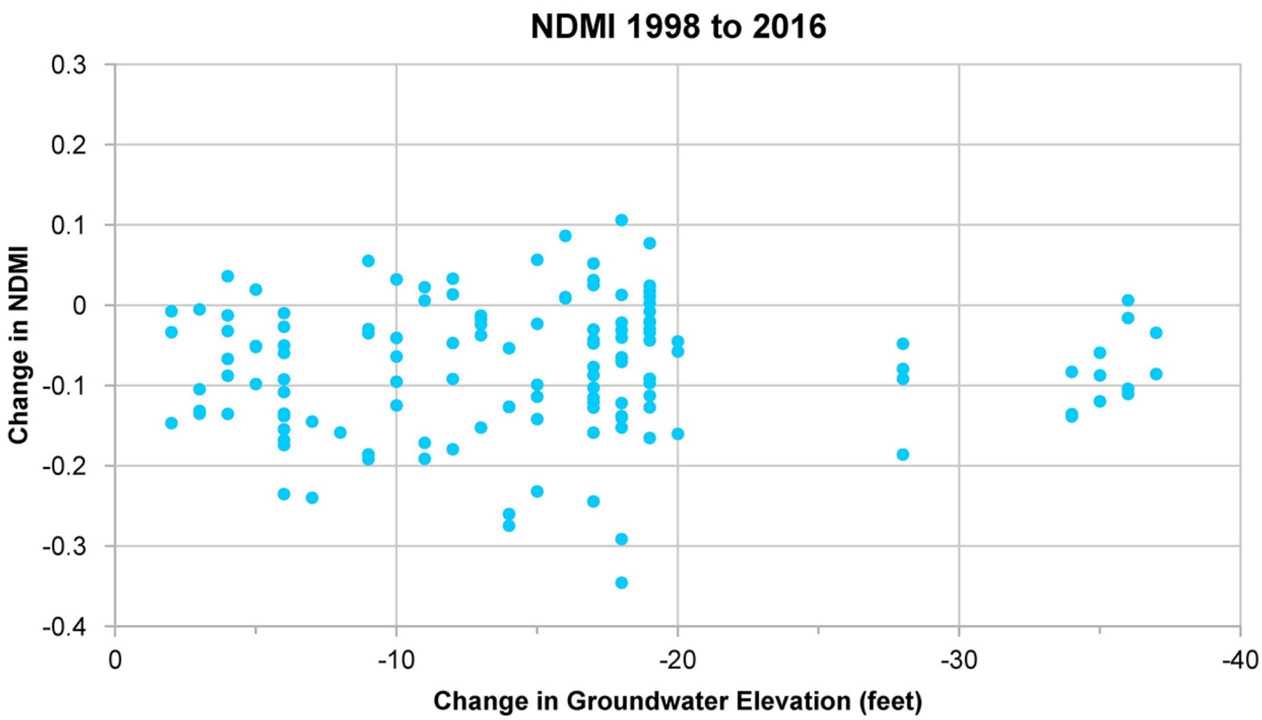
Figure 12. NDVI and NDMI Time Series, Two Vegetated Areas

The NDVI and NDMI data were tested for consistency with changes in precipitation, water levels, vegetation extent and vegetation mortality. The first test consisted of tabulating the NDVI and NDMI trends during 2012-2016 and 2016-2020 for all riparian vegetation polygons along the Salinas and Estrella Rivers. The expectation was that trends would be declining during 2012-2016 due to drought conditions and rising during 2016-2020 due to the return to more normal hydrologic conditions. Along the Salinas River between Paso Robles and Camp Roberts, 95 percent of the polygons had declining NDVI trends during 2012-2016 (72 percent for NDMI). During 2016-2020, 86 percent of the polygons had increasing trends (82 percent for NDMI). So that reach of the Salinas River exhibited the expected pattern. Below Camp Roberts, NDVI and NDMI results were inconsistent during 2012-2016 (75 percent decreased in NDVI; 82 percent increased in NDMI). Results in this reach were also mixed during 2016-2020 (only about half of the polygons experienced an increasing trend in NDVI or NDMI).

Results for the Estrella River were generally counterintuitive. Downstream of Martingale Circle, NDVI and NDMI both increased in 92 percent of polygons during 2012-2016, and 69-75 percent continued increasing during 2016-2020. From Martingale Circle up nearly to Shedd Canyon Road, 62-92 percent of polygons decreased in NDVI or NDMI during 2012-2016, and 71-77 percent increased during 2016-2020 (the expected pattern). From Shedd Canyon Road up to Shandon, NDVI and NDMI conflicted during 2012-2016 (92 percent decreased in NDVI while 85 percent increased in NDMI). However, both metrics tended to increase during 2016-2020.

A second analysis compared changes in NDVI and NDMI with changes in groundwater levels. A common pattern in NDVI and NDMI plots for riparian vegetation polygons was a declining trend from around 1998 to around 2016. The net change in each of those metrics for each riparian polygon was compared with the net change in groundwater elevation at that location. Historical groundwater elevations for those two dates at each polygon were obtained from simulated groundwater levels in layer 1 of the regional groundwater flow model. Layer 1 represents the alluvial deposits along rivers and creeks in the Subbasin. If vegetation is groundwater-dependent, one would expect a decline in groundwater levels to be correlated with a decline in NDVI and NDMI. However, the scatterplots of change in NDVI and NDMI versus change in groundwater level exhibited no correlation. The plots are shown in Figure 13. A possible explanation for the lack of correlation is inaccuracies in the vegetation mapping, which were described in Section 5.5.5. Riparian and wetland vegetation patches along river channels tend to be long and narrow. A small lateral offset in registering the satellite data with the vegetation mapping could result in selecting satellite image pixels for land cover adjacent to the intended vegetation type. Alternatively, the distribution of vegetation patches in the year that polygons were mapped might not have been the same as the distribution in 1998 or 2016. Finally, simulated groundwater levels might not be highly accurate, but errors would tend to appear as a bias affecting a broad region equally or affecting 1998 or 2016 uniformly. That type of bias would still allow NDVI and NDMI patterns to appear, rather than the random results seen in the data plots.





Source: each data point represents one NCCAG riparian vegetation polygon from GDE Pulse map: https://gde.codefornature.org/#/map

Figure 13. NDVI and NDMI Versus Change in Groundwater Level

In any case, the apparent lack of correlation between groundwater levels and NDVI or NDMI is not interpreted here as proving that vegetation is not dependent on groundwater. Rather, it just demonstrates that this particular data set is not particularly helpful for quantifying that relationship.

7. SIMULATED GROUNDWATER-SURFACE WATER INTERCONNECTION

The regional groundwater flow model used to develop water budgets for this GSP is another source of information regarding interconnected surface water. The simulated basin-wide groundwater budgets for 1981-2011 (Tables 6-3 and 6-4) included stream percolation averaging 26,900 AFY (38 percent of total inflows), and groundwater discharge to streams averaging 7,300 AFY (9 percent of total outflows). Stream reaches that lose water to percolation are not necessarily interconnected with groundwater. They can be perched high above the water table. In contrast, reaches where groundwater discharges into streams are by definition interconnected. Thus, simulated discharge to streams amounting to 9 percent of total basin outflow indicates that substantial reaches of one or more streams in the Subbasin are interconnected with groundwater.

Simulated gains and losses in stream flow for every stream reach and stress period in the model were extracted from the results for the historical calibration simulation. The gaining and losing stream reaches in September 1998 (high groundwater levels) and September 2016 (low groundwater levels) were then plotted on the maps shown in Figures 14 and 15. Along the Salinas River in 1998, most of the reaches from Paso Robles to Wellsona and from San Miguel to the Nacimiento River were gaining. In 2016, there were gaining reaches in both of those general locations, but considerably shortened at both the upstream and downstream ends.

Along lower San Juan Creek and the Estrella River, flow was absent or losing to a point downstream of Shandon in 1998 and 2016. In 1998, predominantly gaining conditions were present from above Shedd Canyon almost to Estrella, with one lengthy losing reach upstream of Martingale Circle. The gaining reaches retracted substantially but did not disappear entirely in 2016. They were still present upstream of Highway 46 at Whitley Gardens and near the Shedd Canyon confluence.

The accuracy of these particular model results is uncertain because few stream flow and alluvial water level measurements are available for model calibration. It is noteworthy, however, that the reaches simulated as gaining by the model correspond closely to reaches where riparian vegetation is relatively dense and/or gaining flow or damp soils could be seen in aerial photographs. Also, the difference in length of the gaining reaches between 1998 and 2016 is reasonably consistent with differences that would be expected based on the stream flow, water level and vegetation data.

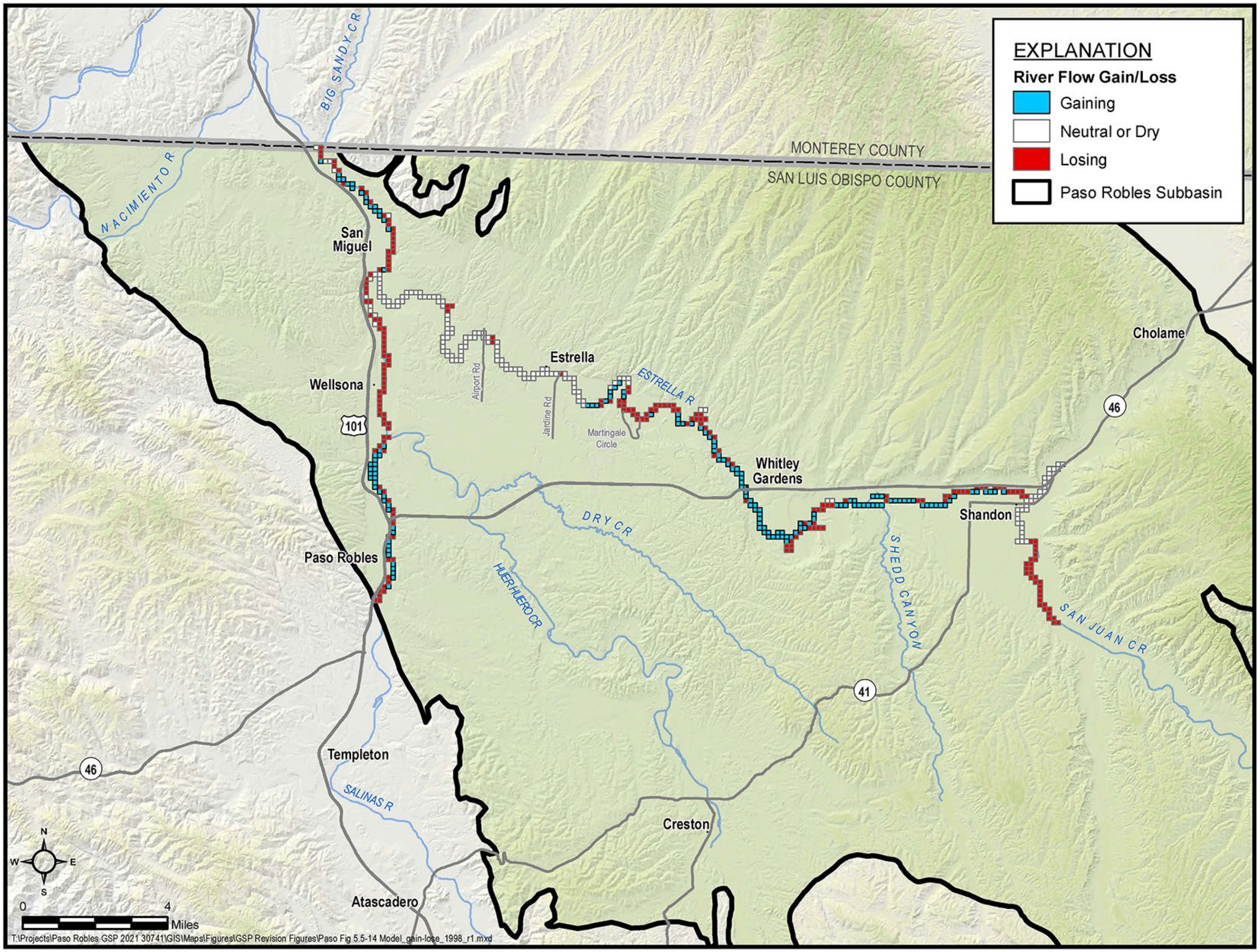


Figure 14. Gaining and Losing Stream Reaches, September 1998 (high groundwater levels)

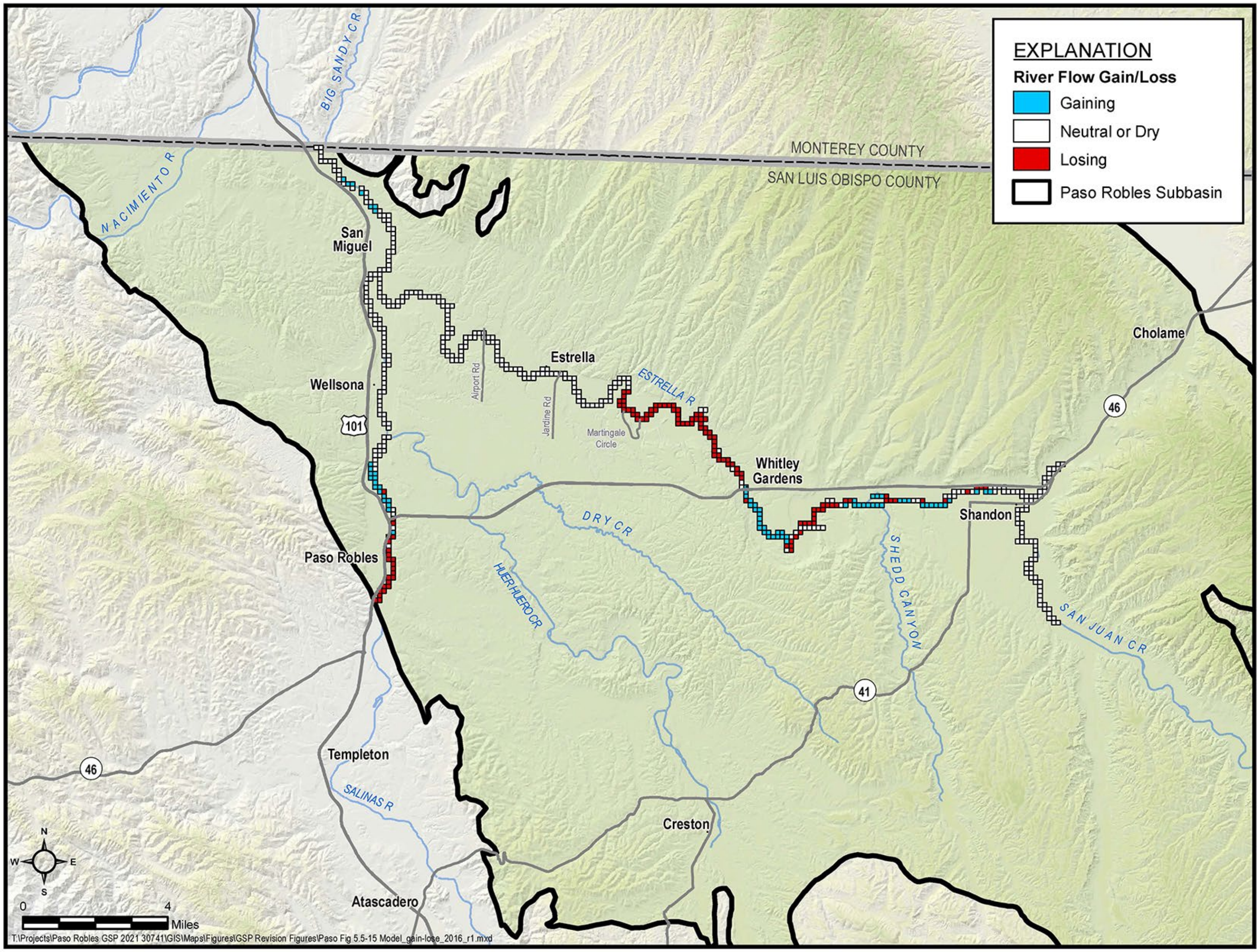


Figure 15. Gaining and Losing Stream Reaches, September 2016 (low groundwater levels)

8. NON-CONFORMING DATA

Some of the data reviewed for this section do not appear to fit the conceptual model for interconnected surface water and are worth mentioning. They include the following:

- The lower part of the Estrella River, from Estrella to the confluence with the Salinas River reportedly overlies shallow clay layers in the Paso Robles Formation and should have shallow alluvial water levels similar to those along nearby reaches of the Salinas River. The new shallow monitoring well at Airport Road confirmed the presence of a water table only 30 feet below the ground surface. On the basis of groundwater conditions, one would expect dense riparian vegetation to be present along this reach of the Estrella River, but vegetation has been absent or sparse continuously since at least the early 1990s. One possible explanation is that surface flows are too infrequent and brief to support recruitment of new phreatophytic vegetation. That is, a depth to water of 30 feet might be shallow enough to sustain mature vegetation with deep roots, but sustained surface flows and a shallower water table—at least in wet years—is probably necessary for new seedlings to become established. The magnitude and duration of surface flows have steadily decreased over the past four decades, so the probability of successful recruitment has become increasingly slim.
- Dense riparian vegetation and even emergence of groundwater at various points along the middle segment of the Estrella River (roughly from Shedd Canyon Road to Martingale Circle) appears inconsistent with regionally declining groundwater levels. That reach is reportedly upstream of the shallow clay layers in the western part of the Subbasin. Thus, pumping from wells in the Paso Robles Formation would be expected to lower the water table and deplete surface flows. It appears that some aspect of subsurface hydrogeology sustains a relatively high and steady alluvial water table along this reach. One possible mechanism is that shallow clay layers extend farther up the Estrella River than previously thought. Another possible explanation is that recharge and groundwater flowing south from the uplands on the north side of the river provide inflow to shallow aquifer horizons that helps buffer their water levels against drawdown caused by deeper pumping. An example of high Paso Robles water levels on the north side of the river is shown in hydrograph 11 of Figure 5. Water levels in that well were historically 40-50 feet above the riverbed elevation before starting to decline around 2000. A third possible explanation could be the presence of a fault or a northward extension of the Creston Anticlinorium creating a barrier to westward groundwater flow. In any case, there appears to be some combination of subsurface hydrogeology and recharge processes that has helped sustain riparian vegetation to at least a limited extent along the middle reach of the Estrella River.
- There was considerable local variability in the observed changes in riparian vegetation extent and density from 1994 to 2018, especially along the Estrella River. Changes in groundwater levels would likely be more uniform over broader areas. One possible explanation for the local variability in vegetation is the limitations of air photo interpretation for that purpose. Tree and shrub species cannot be accurately identified in the photographs. Some species are facultative phreatophytes, meaning they can become established and grow with or without access to the water table. Coast live oak is an example. Changes in non-phreatophytic vegetation could obscure changes in phreatophytic vegetation.

9. DELINEATION OF INTERCONNECTED SURFACE WATER

The delineation of interconnected surface water (Figure 1) reflects a preponderance of evidence based on the data and analyses described in the preceding sections. This involved some subjective assessments such as differentiating “dense” from “sparse” riparian vegetation or estimating how frequent and persistent interconnection must be to be designated “interconnected”. Along stream channels, two categories of interconnection were assigned: interconnection with surface water and interconnection with riparian vegetation. The former requires higher water levels and typically occurs less frequently or for shorter periods of time. The latter includes areas where the water table is less than about 25 feet below the stream bed most of the time. Empirically, this is the root zone depth associated with the present of dense riparian vegetation. These considerations are discussed by stream reach below.

The entire length of the Salinas River from Paso Robles to the confluence with the Nacimiento River was classified as interconnected with surface water. The presence of very stable water levels close to the river bed elevation in all alluvial wells along that reach supports this designation, as does the presence of sparse to dense riparian vegetation along most of the reach. Even small inflows to the upper end of the reach commonly extend along the entire length of the reach, which also indicates that the water table is at or near the riverbed elevation along the entire length of the reach.

The Estrella River below Estrella (near Jardine Road) was classified as not interconnected. This classification reflects the very small amount of riparian vegetation along the entire reach throughout the analysis period (1989-2021). Although shallow clay layers are thought to be present in this area and the new shallow monitoring well at Airport Road confirms the presence of a water table 30 feet below the ground surface, this depth to water appears to be too great for vegetation to readily establish given the low frequency and duration of surface flow in the river.

The middle reach of the Estrella River, from Jardine Road up to Shedd Canyon contains alternating segments that are not connected or are connected to the vegetation root zone. These segments were classified primarily on the density of riparian vegetation. The only confirmation of groundwater levels is at a single well near the downstream end of the middle reach, where the depth to water was consistently about 10 feet below the riverbed. Emergent flow was present in some dry-season aerial photographs along a segment below Shedd Canyon, about 2.5 to 4 miles upstream of Highway 46. Open water or wet channel sediments can still be seen in some air photos in winter or spring but not during the dry season since about 2012. Thus, that segment was not classified as interconnected with surface water as of the start of the SGMA management period (2015).

The Estrella River from Shedd Canyon up to Shandon and lowermost 10 miles of San Juan Creek were classified as not interconnected. Although sparse riparian vegetation is present in places, the depth to groundwater in wells has been declining for decades and now exceeds the rooting depth of riparian vegetation. The vegetation that remains probably consists of facultative phreatophytes or is vestigial mature vegetation that has managed to survive declining water levels. In any case, recruitment of new phreatophytic riparian vegetation is very unlikely under current conditions.

Much of San Juan Creek more than 10 miles upstream of Shandon appears to be interconnected to riparian vegetation based on the presence of sparse or dense vegetation along most of the reach. One short reach was classified as interconnected to surface water because it usually has emerging groundwater along a low-flow channel bordered by wetland vegetation. The one well with water-level data along this reach has water levels that are usually within 10 feet of the creek bed elevation.

The lowermost 5 miles of Cholame Creek were delineated as not connected based on the absence of significant riparian vegetation and water levels in the sole monitoring well that average about 30 feet below the ground surface. Farther up the creek, however, is a reach several miles long that has open water or wetland vegetation in most historical aerial photographs. Shallow groundwater along that reach could be caused by faults that pass through the area (see Figure 4-4) or by fine-grained geologic layers intersecting the land surface and impeding lateral groundwater flow. For unknown reasons, the shallow water table and surface flow conditions have not caused the establishment of dense woody riparian vegetation.

Riparian vegetation is rare along Huerhuero Creek, Dry Creek and Shedd Canyon and is typically sparse where it is present. The depth to water in wells in that part of the Subbasin is uniformly too large to support riparian vegetation. Accordingly, those waterways were all classified as not connected to groundwater.

The reach of the Nacimiento River that traverses the northwest corner of the Subbasin was classified as interconnected to surface water because reservoir releases during the dry season are more than sufficient to sustain a high water table adjacent to the river. That reach is far from major pumping centers in the Paso Robles Subbasin and hence unlikely to be significantly depleted by pumping.

Isolated, off-channel wetlands shown on the interconnected surface water map (Figure 1) are the subset of the NCCAG wetlands where distinctly green vegetation was visible in dry season aerial photographs and the feature appeared to be a natural depression, not a constructed stockpond.

10. GROUNDWATER DEPENDENT ANIMALS

Many fish and wildlife species use aquatic and riparian habitats that are supported by groundwater. For the purpose of this GSP, beneficial use for habitat is limited to native species present in the Subbasin as of 2015, when SGMA took effect. The focus was on species that are state or federally listed as threatened, endangered or of special concern. This implicitly assumes that non-listed species will probably also be sustained if hydrologic conditions are suitable for sustaining the rarer species. The life history needs of listed bird, mammal, reptile, amphibian, and insect species were reviewed to estimate whether they have groundwater requirements beyond those needed to sustain the riparian habitat in which they live. A separate analysis was made for fish, which have flow requirements considerably different from the requirements to sustain vegetation.

References that were used to inventory and evaluate groundwater dependent animal species included the Upper Salinas River Watershed Plan (US-LTRCD, 2004), the California Department of Fish and Wildlife's (CDFW) BIOS on-line habitat map tool (https://apps.wildlife.ca.gov/bios/), critical habitat area maps for listed species prepared by the U.S. Fish and Wildlife Service (USFWS) also available on-line (https://fws.maps.arcgis.com/home/webmap/viewer.html?webmap=9d8de5e265ad4fe09893cf75b8dbfb77), several reports on steelhead trout (NMFS, 2007; Woodard, 2012; Stillwater Sciences, 2020), and interviews with Upper Salinas-Las Tablas Resource Conservation District (US-LTRCD) and National Marine Fisheries Service (NMFS) staff (Bell, 2021; Stevens and Rogers, 2021).

10.1 Invertebrates, Amphibians, Reptiles, Mammals and Birds

USFWS delineates critical habitat areas for federally listed species, and the three critical habitat areas overlapping the Subbasin are for vernal pool fairy shrimp, California red-legged frog (CRLF) and California tiger salamander. Their critical habitat areas are shown in Figure 16. A large area in the central part of the Subbasin is mapped as critical habitat for vernal pool fairy shrimp. Vernal pools are not considered GDEs in this GSP. They form for a few weeks to a few months in spring where rainfall runoff collects in depressions underlain by clay soils that allow ponding to persist. In some cases, vernal pools can receive inflow from shallow, perched aquifers covering a limited upslope area (Williamson and others, 2005). However, that supply is also seasonal and is perched over an unsaturated zone separating it from the regional groundwater system that is the focus of the GSP. Groundwater pumping from the regional aquifer does not impact vernal pools or adjacent perched aquifers. The critical habitat area for California tiger salamander overlaps a tiny part of the far eastern edge of the subbasin. Tiger salamanders are a primarily upland species, but they lay eggs in vernal pools. Thus, they are not considered a groundwater dependent species.

The mapped critical habitat area for CRLF also overlies a small part of the eastern edge of the Subbasin. That area is a hilly region far from significant amounts of groundwater pumping, which mostly occurs in agricultural areas. Thus, the handful of springs that might be used by frogs in that region are very unlikely to be depleted by groundwater pumping. The potential for suitable CRLF habitat in the Subbasin exceeds the mapped critical habitat area. The Upper Salinas River Watershed Plan (Plan) noted that the frogs are present along the Salinas River near Paso Robles and in Atascadero Creek. The surface flow requirements for CRLF are shallow, slow-moving water with emergent vegetation, with flow persisting at least to mid-summer to provide enough time for the tadpoles to metamorphose. These flow conditions could plausibly be met along the Salinas River—especially close to Paso Robles—and possibly some locations along San Juan Creek. Thus, groundwater pumping that depletes base flow and in-channel wetland habitat probably decreases CRLF habitat.

The Plan asserts that a number of other species dependent on riparian habitat are present in the upper Salinas River watershed, but in some cases the BIOS database does not show the Subbasin as being within the range of that species or possessing suitable habitat. These include Arroyo toad and Swainson's hawk. Western pond turtle is a listed species that has been found in the canyon reach of the Salinas River below Salinas Dam. However, it requires channel and flow conditions not present in stream reaches overlying the Subbasin. The turtle needs deep, slow-moving perennial pools with boulders or large woody debris. The wide, gravelly channels with intermittent flow in the Subbasin area would not be suitable for Western pond turtle. The Plan also mentions Least Bell's vireo, but the Subbasin does not contain critical habitat for that species, and expanses of dense willows preferred by the bird are generally not present in the Subbasin.

10.2 Fish

The Plan states that four native fish species are present in the upper Salinas River watershed: Sacramento sucker, hitch, three spine stickleback and southern steelhead. All of these require clear, cold, perennial flow for spawning and rearing, and those conditions are present only in the upper reaches of the Salinas River and its tributaries. Those locations are far from groundwater pumping intense enough to materially affect flow. Unlike the other three species, southern steelhead is anadromous and does migrate seasonally up and down stream reaches that cross the Subbasin.

Steelhead require a minimum amount of flow to swim along a stream channel. This minimum passage flow is defined by the minimum required width and depth of flow at the shallowest point along the channel reach, which is called the “critical riffle”. At the critical riffle, the water must be at least 0.7 foot deep for adult steelhead up-migration and cover at least 25 percent of the channel width. For out-migrating smolts, the minimum depth is 0.3 foot (Woodard, 2012). The only stream channel in the Subbasin used for migration by steelhead is the Salinas River, which the fish traverse to reach spawning areas in tributaries farther upstream: Graves, Santa Rita, Atascadero and Santa Margarita Creeks, which enter the river in the Atascadero Subbasin (Stillwater Sciences, 2020). No study has been done to identify the critical riffle along the Subbasin reach of the Salinas River or to estimate the passage flow associated with it (Stevens and Rogers, 2021; Bell, 2021). A reasonable estimate would be the minimum passage flow at Bradley (9 miles downstream of the Subbasin), which the National Marine Fisheries Service estimated at 300-380 cfs in the biological opinion prepared for the Salinas River Water Project (NMFS 2007). Sections of the Salinas River channel between Paso Robles and the Nacimiento River confluence are at least as wide and gravelly as the channel at Bradley.

The lowest flows along the Subbasin reach of the Salinas River are largely protected by the “live stream” requirement in the water rights permit for Salinas Dam. That requirement was first imposed in 1952 and allows Salinas River flow to be diverted to storage behind Salinas Dam (in Santa Margarita Lake) only when there is continuous flow in the Salinas River from the dam to the confluence with the Nacimiento River (SWRCB, 1982). The purpose of this condition on the water right permit was to ensure that the needs of downstream users with prior rights were being met, including groundwater users pumping from the underflow of the river. It was assumed that as long as continuous flow was present, the river was replenishing the underflow at a rate sufficient to meet those needs. The live stream requirement is implemented by visually inspecting Salinas River flow at nine bridge crossings between Salinas Dam and the Nacimiento River. When one or more locations has zero flow, live stream conditions are not met and diversions to storage must cease. At that point, all inflows to Santa Margarita Lake are passed through Salinas Dam to the downstream reach of the river. San Luis Obispo County staff conduct the “live stream” observations, and records since 2011 show that flow at the Paso Robles gage on the day live stream conditions ended was on average 5.5 cfs. This means a very small flow at Paso Robles was able to maintain continuous flow all the way across the Subbasin. This confirms the ISW conceptual model assertion that Salinas River inflows are generally able to sustain high water table elevations in the alluvium along the river, such that percolation losses are small at the time flow recession in spring eventually becomes discontinuous.

The live stream requirement is reasonably protective of groundwater users and riparian vegetation, but not necessarily of fish passage. If there were 300 cfs of inflow to Santa Margarita Lake during the steelhead migration season, only a few cfs would need to be released to sustain live flow to the Nacimiento River. Thus, the diversion to storage would eliminate the passage opportunity unless tributary inflows below the dam were sufficient to provide it.

Groundwater pumping would not plausibly decrease the duration of steelhead passage flows along the Subbasin reach of the Salinas River. This is because the shallow clay layers beneath the river alluvium greatly diminish the ability of deeper wells (in the Paso Robles Formation) from lowering alluvial groundwater levels and depleting river flow. This is borne out by the alluvial well hydrographs, which show steady water table elevations near the river bed elevation in all years and seasons except when large droughts substantially diminish Salinas River inflows to the Subbasin reach.

Even without the clay layers, groundwater pumping would not likely diminish passage opportunity to a significant degree because the high flows required for passage tend to recede quickly anyway. Suppose, for example, that 10,000 AFY of the 26,900 AFY of stream recharge simulated in the groundwater model were from the Salinas River and all of the percolation resulted from pumping-induced percolation, it would be equivalent to 13.8 cfs of flow depletion. That depletion would only affect passage opportunity when flow is between the minimum passage flow and 13.8 cfs greater than that flow. If flows were higher than that range, passage would still be possible even with the depletion. If flows were lower, passage would not have been possible anyway. Assuming a minimum passage flow of 300 cfs, which is the low end of the estimated range at Bradley, the depletion would only affect passage opportunity when flow is 300-313.8 cfs. Thirty-six flow event recession rates during 1970-2019 were evaluated, and the average time during which flow was in that range averaged 8 hours (minimum = 1 hour; maximum = 34 hours). These results are illustrated in Figure 17. A flow event duration of two days would probably be needed for steelhead to traverse the reach from the Nacimiento River to Paso Robles, based on the 5-day estimate for swimming upstream from Monterey Bay to Bradley (NMFS, 2007). Almost all flow events with flows greater than 300 cfs were above 300 cfs for at least two days. This simplified passage analysis did not account for downstream flow conditions such as releases from Nacimiento and San Antonio Reservoirs to meet the NMFS flow prescription for steelhead, or concurrent Arroyo Seco flows or whether the beach barrier between the Salinas River lagoon and Monterey Bay is open or closed. Those factors would likely decrease the height of the blue bars somewhat. Nevertheless, even under this unrealistically worst-case scenario, the impact of flow depletion on steelhead passage opportunity would usually be a few hours. Although this would be detrimental, it would not likely result in a significant decrease in long-term reproductive success.

To summarize the analysis of GDE animals, it appears that sustainability criteria that would be protective of riparian vegetation and wetlands would be protective of the animal species that use those habitats. Any impact of groundwater pumping on steelhead passage opportunity appears to be negligibly small.

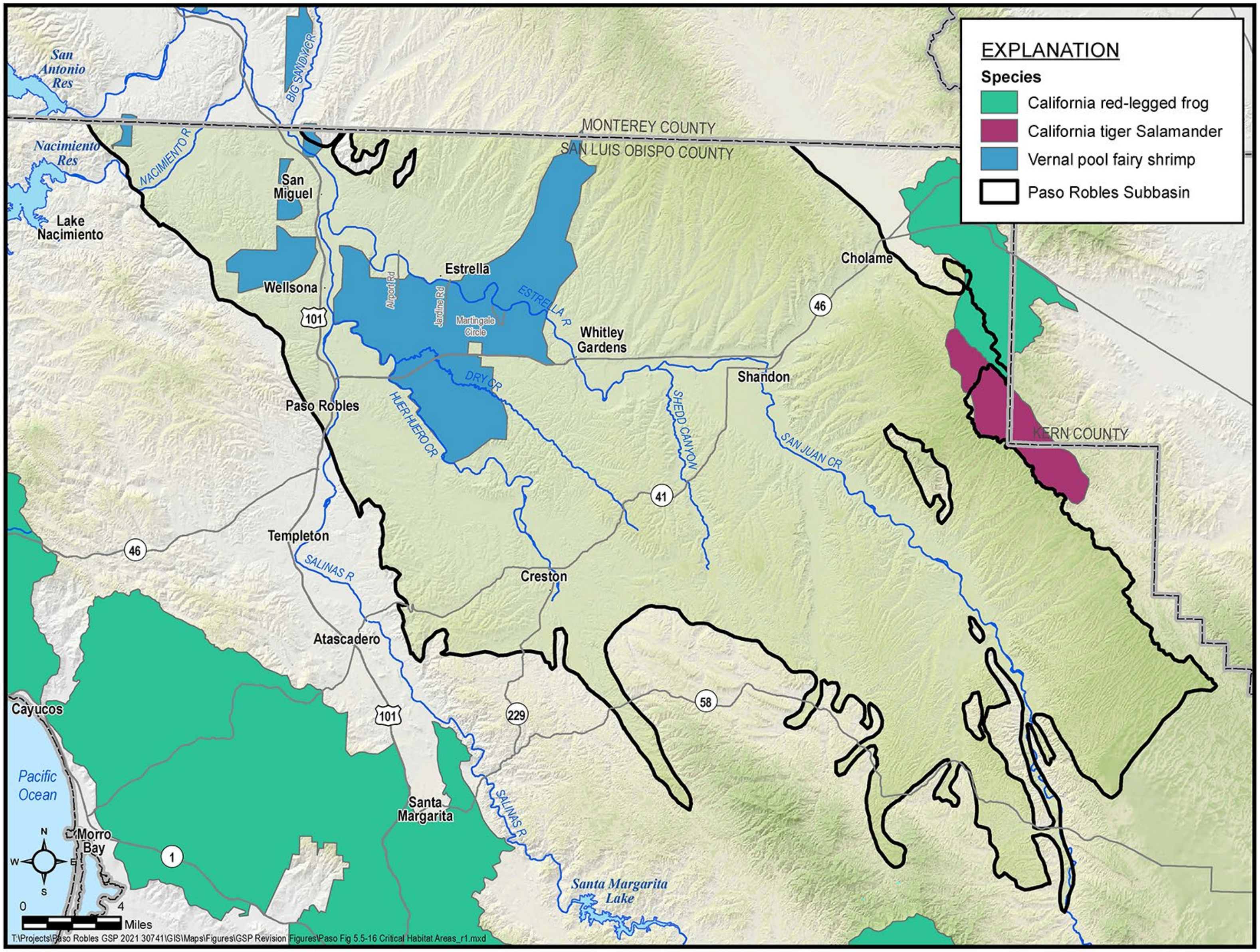


Figure 16. Critical Habitat Areas

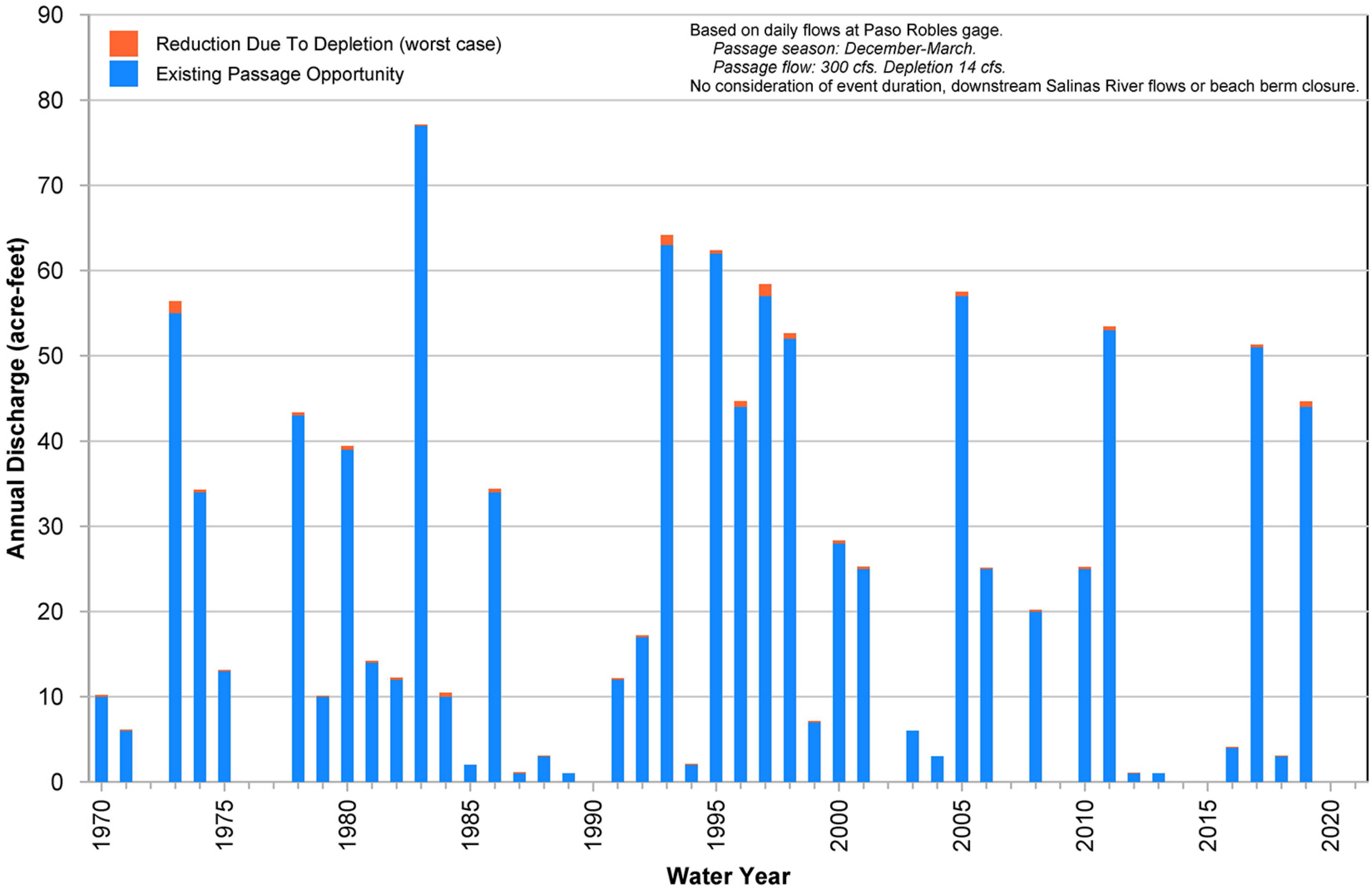


Figure 17. Simplified Steelhead Passage Opportunity, Salinas River

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TECHNICAL MEMORANDUM

Paso Robles Basin Riparian Health Trend Analysis as an Indicator of SW-GW Interaction

To: Blaine Reely, Groundwater Sustainability Director, County of San Luis Obispo

From: Nate Page, GSI Water Solutions, Inc.

Dave O'Rourke, GSI Water Solutions, Inc.

Attachments: Attachment A: Enhanced Vegetation Index Trend Analyses – Riparian Areas, Paso Robles Basin

Date: April 22, 2022

1. Introduction

GSI Water Solutions (GSI) was retained by the County of San Luis Obispo Groundwater Sustainability Director to perform an Enhanced Vegetation Index (EVI) trend analysis of riparian vegetation communities within the Paso Robles Groundwater Basin (Basin). The purpose of this analysis is to identify and evaluate trends in riparian vegetation health as an indicator of potential long-term trends in surface water-groundwater interactions.

2. Methods

An Enhanced Vegetation Index (EVI) analysis was completed for riparian vegetation areas in the Basin using Landsat data processed in Climate Engine[1]. EVI data provides an indicator of healthy, well-watered vegetation. It is calculated from the proportions of visible and near-infrared sunlight reflected by vegetation. EVI values typically range from zero to over 0.7. Healthy, or well-watered, vegetation absorbs most of the visible light that hits it and reflects a large portion of near-infrared light, resulting in a high EVI value. Unhealthy, dry, or dormant vegetation reflects more visible light and less near-infrared light, leading to a lower EVI value.

The EVI analysis was constrained to areas identified by Todd Groundwater (Todd) as 'sparse' and 'dense' riparian areas[2]. The sparse and dense riparian areas were each split up into subareas and each subarea was analyzed separately. The locations of each subarea are presented on Figure 1 and listed in Table 1.

[1] Climate Engine (Huntington et al., 2017) is an online tool for cloud computing of climate and remote sensing data powered by Google Earth Engine (Gorelick et al., 2017) (https://app.climateengine.org/climateEngine)
[2] As presented in Figure 5-16 of the draft revisions to Paso Robles Basin GSP Section 5.5 Interconnected Surface Water.

Table 1. EVI Analysis Subareas

Sparse Riparian	Dense Riparian
Salinas River	Salinas River
Estrella River upstream of Whitley Gardens	Estrella River upstream of Whitley Gardens
Estrella River downstream of Whitley Gardens	Estrella River downstream of Whitley Gardens
San Juan Creek	San Juan Creek
Creston (Huer Huero Creek)	

The EVI analyses for each riparian subarea were processed in Climate Engine using Landsat data from January 2009 through present. This analysis period is considered representative of recent hydrologic conditions as it begins and ends with similar hydrologic conditions and includes dry, wet, and average periods. Importantly, this analysis period captures the severe drought years of 2013 and 2014 and includes the period since the January 2015 Sustainable Groundwater Management Act (SGMA) date of compliance. EVI results are based on daily statistical mean EVI values calculated over the analysis area for each day the satellites were overhead (approximately once every 8 days).

3. Results and Discussion

Key Findings:

- EVI values typically vary seasonally with observed annual minimums and maximums correlating strongly with water year type (i.e., wet, dry, normal),
- 'Dense' riparian areas; each EVI trend analysis shows a slightly increasing trend in EVI values over the analysis period,
- 'Sparse' riparian areas; all but one EVI trend analysis show a slightly increasing trend in EVI values over the analysis period,
    - The one exception, 'sparse' Creston area, shows essentially a flat/stable trend over the analysis period
- These stable to slightly increasing EVI trends indicate stable to slightly increasing riparian vegetation health within the identified riparian areas over the long-term.

The results of each EVI trend analysis are presented graphically in Attachment A. The graphs include total monthly precipitation recorded at the Paso Robles station (NOAA 46730) to facilitate comparison between EVI and water year type. In general, winters with higher precipitation totals correlate with higher EVI values during the following dry season. Conversely, winters with lower precipitation totals, including the exceptionally dry winters of 2013 and 2014, are generally followed by below normal dry season EVI values.

Without exception, riparian vegetation health, as indicated by EVI, recovers to 2009-2010 levels in the years following 2014. Even in the flat trend 'sparse' Creston analysis area, EVI values appear to recover to 2010 levels by 2019. These patterns show that while riparian vegetation health may decline during drought it fully recovers during subsequent wet/normal water years. The results of this study indicate that riparian vegetation health has remained stable over the analysis period and may in fact be slightly increasing throughout the majority of the 'sparse' and 'dense' riparian areas in the Basin. This stability of riparian vegetation health suggests that alluvial groundwater levels have remained consistently within the rooting zone depth of the established riparian vegetation in the analysis areas. These results also suggest that water levels in the alluvial aquifer supporting these established riparian communities have not been affected by long-term declining water levels induced by groundwater pumping in the underlying Paso Robles Formation Aquifer.

4. Conclusions

GSI performed an EVI trend analysis of riparian vegetation communities within the Basin for the purpose of identifying and evaluating trends in riparian vegetation health as an indicator of potential long-term trends in surface water-groundwater interactions within reaches of the adjacent streams. The results of this study indicate that riparian vegetation health has generally remained stable to slightly increasing over the analysis period suggesting that alluvial groundwater levels have remained consistently within the rooting zone depth of the established riparian communities. The patterns of increasing and decreasing riparian vegetation health typically vary seasonally with annual minimums and maximums correlating strongly with water year type. These observations indicate that water levels in the alluvial aquifer are independent from the long-term declining water levels induced by groundwater pumping in the underlying Paso Robles Formation Aquifer. This suggests the presence of a clay layer at the base of the alluvial aquifer supporting these riparian communities. Based on the results of this study there does not seem to be any long-term trend in surface water-alluvial aquifer groundwater interactions within the Basin. Further investigations are required to evaluate any potential surface water-groundwater interactions with the Paso Robles Formation Aquifer.

FIGURES

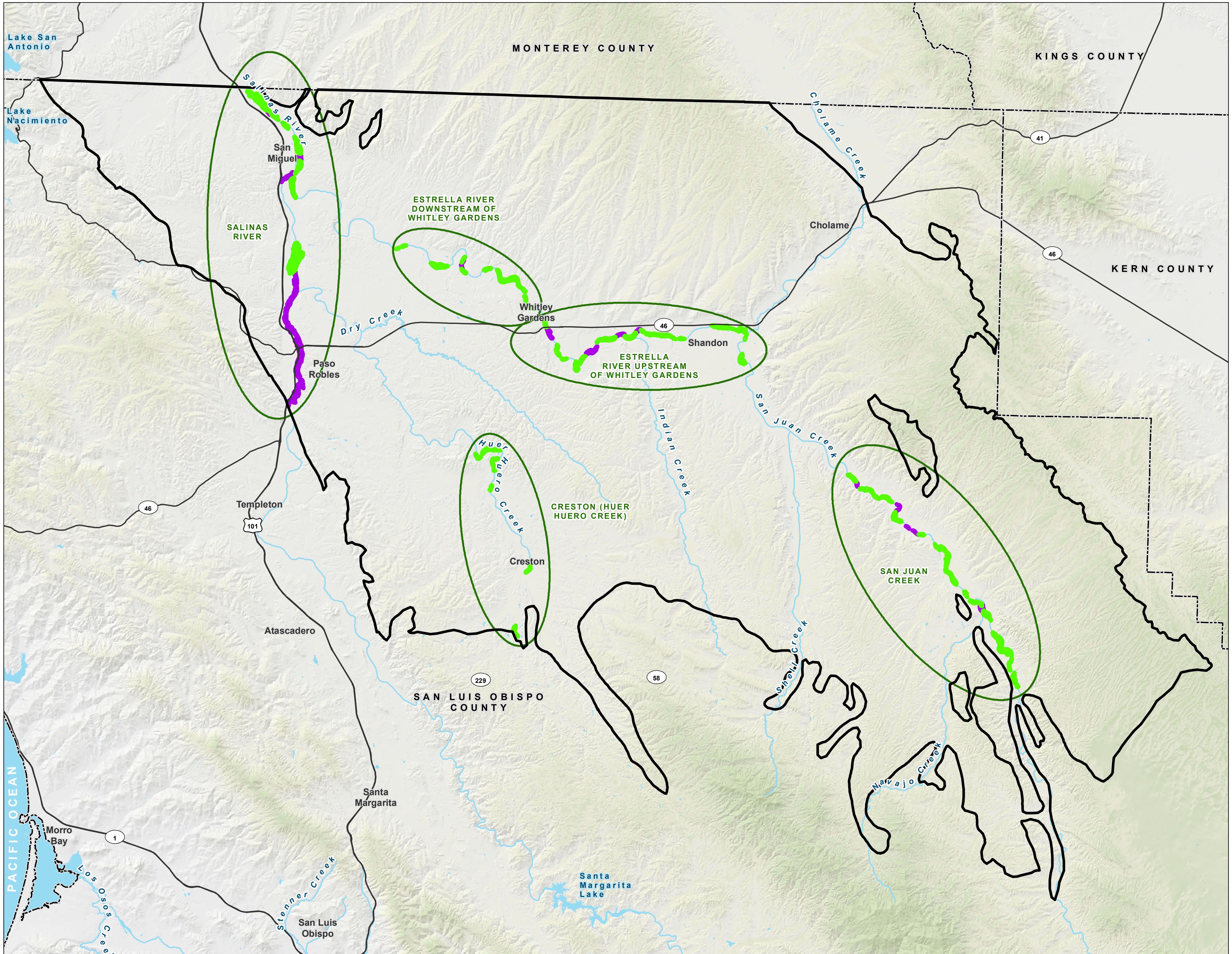


FIGURE 1

Riparian EVI Analysis Subareas

Paso Robles Basin
Riparian Health Trend Analysis
as an Indicator of
SW-GW Interaction

LEGEND

Sparse Riparian Area
Dense Riparian Area
Riparian Subarea

All Other Features

Paso Robles Subbasin
County Boundary
Major Road

N

0 10,000 20,000 30,000
Feet

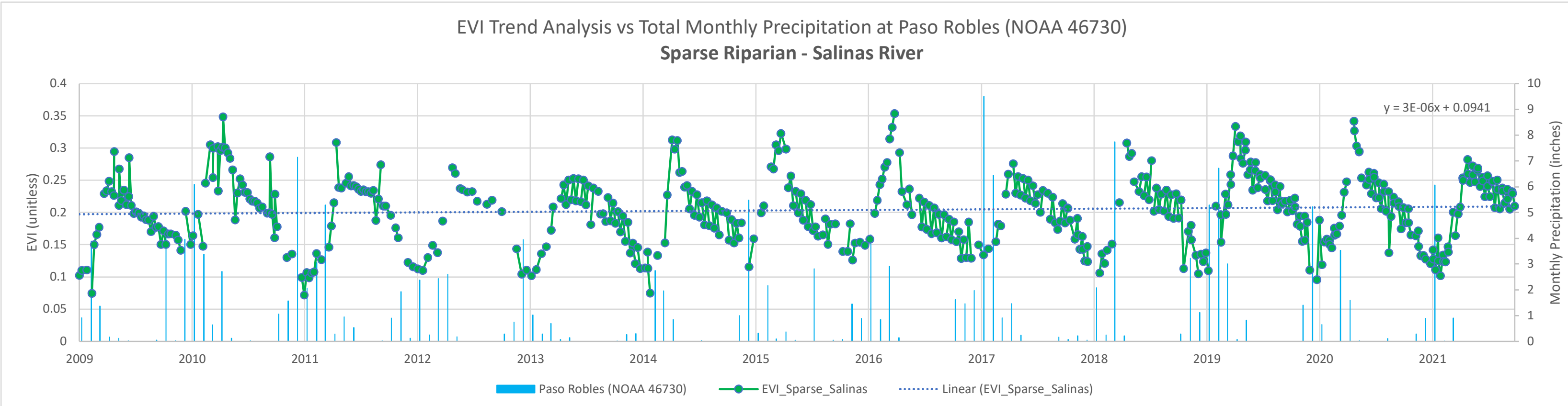
Date: April 25, 2022
Data Sources: CA DWR, SLO Co., City of Paso Robles, USGS

GSI Water Solutions, Inc.

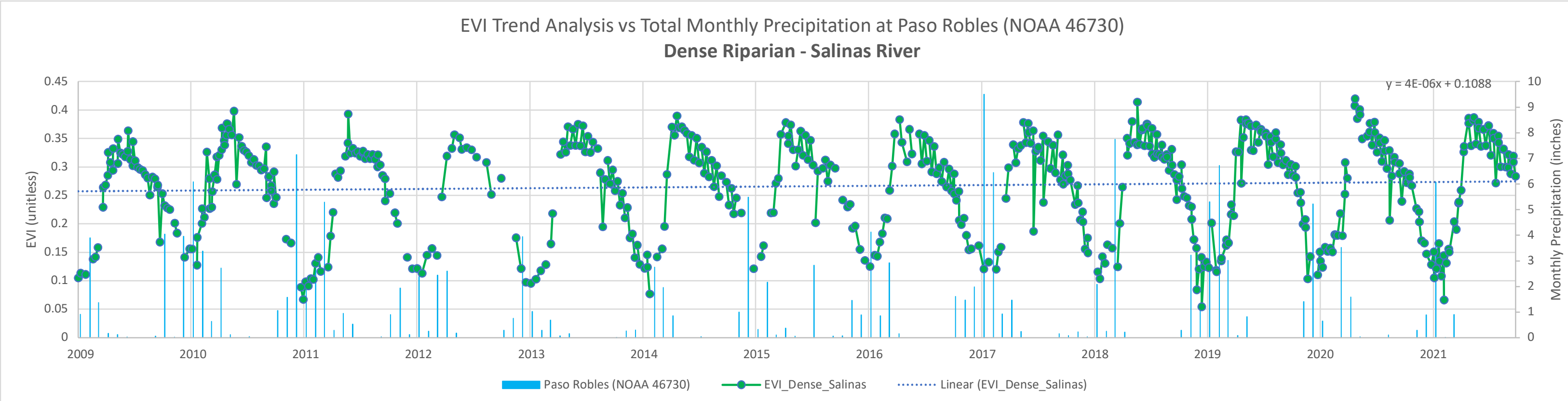
ATTACHMENT A

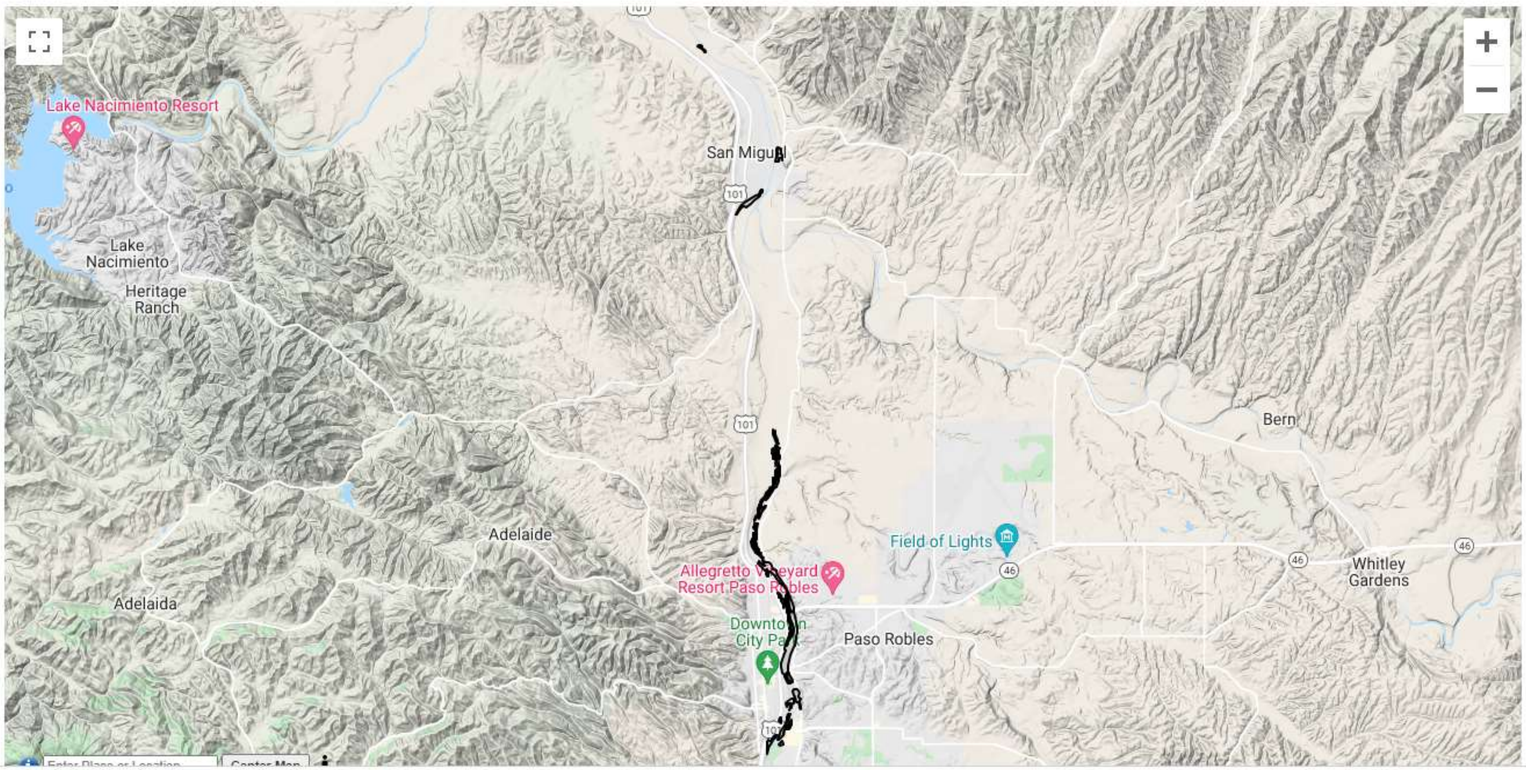
Enhanced Vegetation Index Trend Analyses

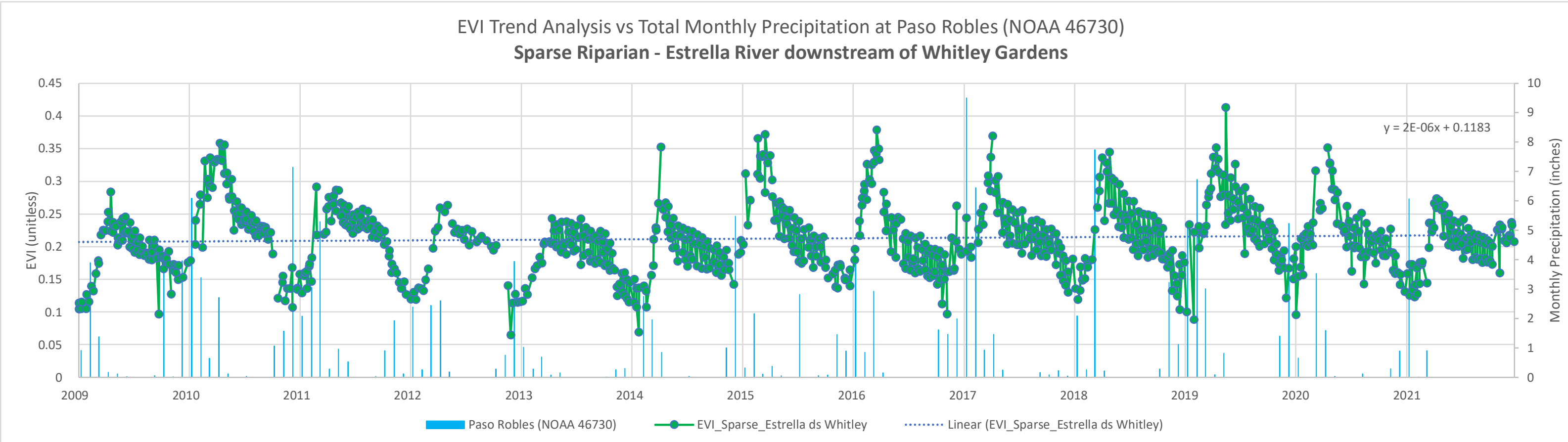
Riparian Areas - Paso Robles Basin

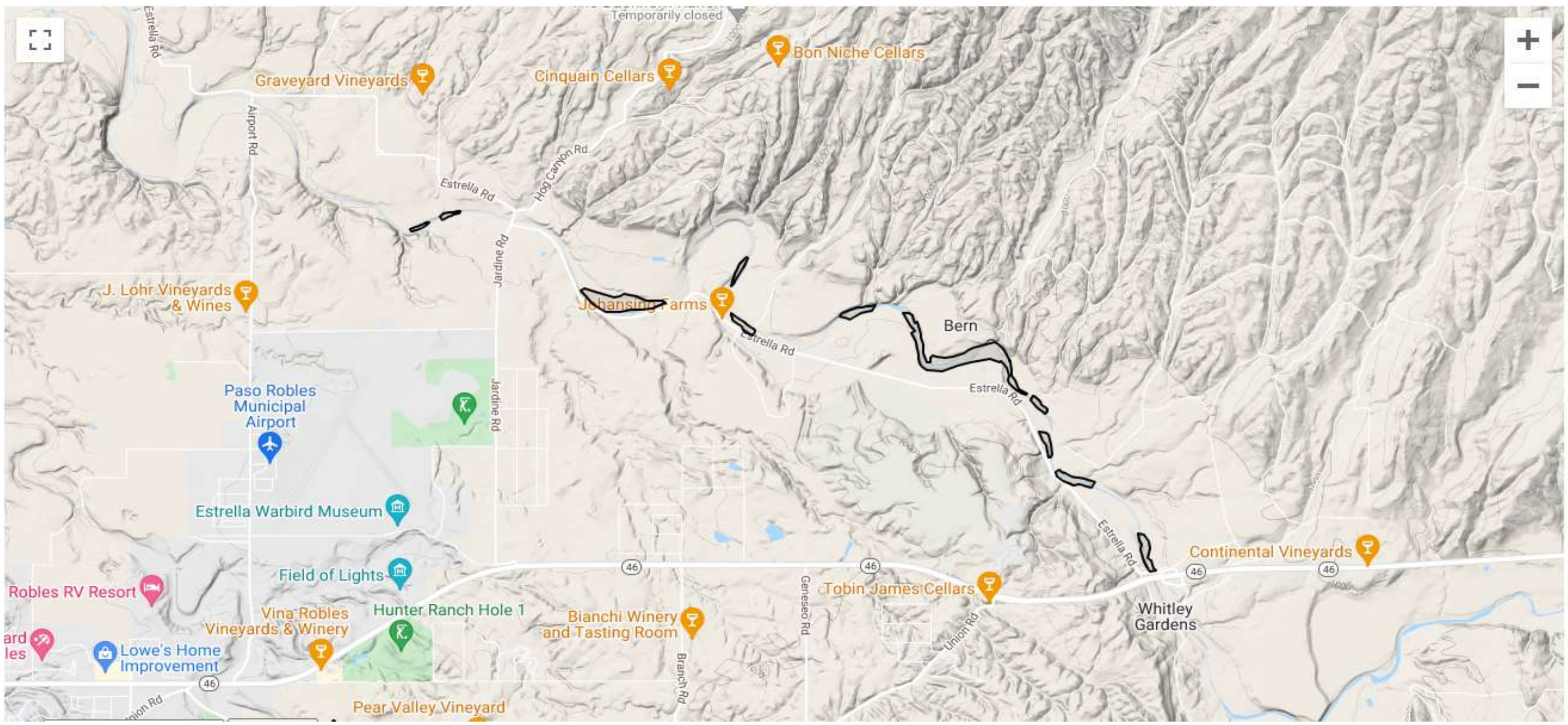

EVI Trend Analysis vs Total Monthly Precipitation at Paso Robles (NOAA 46730)
Sparse Riparian - Salinas River
EVI (unitless)
Monthly Precipitation (inches)
y = 3E-06x + 0.0941
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0
1
2
3
4
5
6
7
8
9
10
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Paso Robles (NOAA 46730)
EVI_Sparse_Salinas
Linear (EVI_Sparse_Salinas)

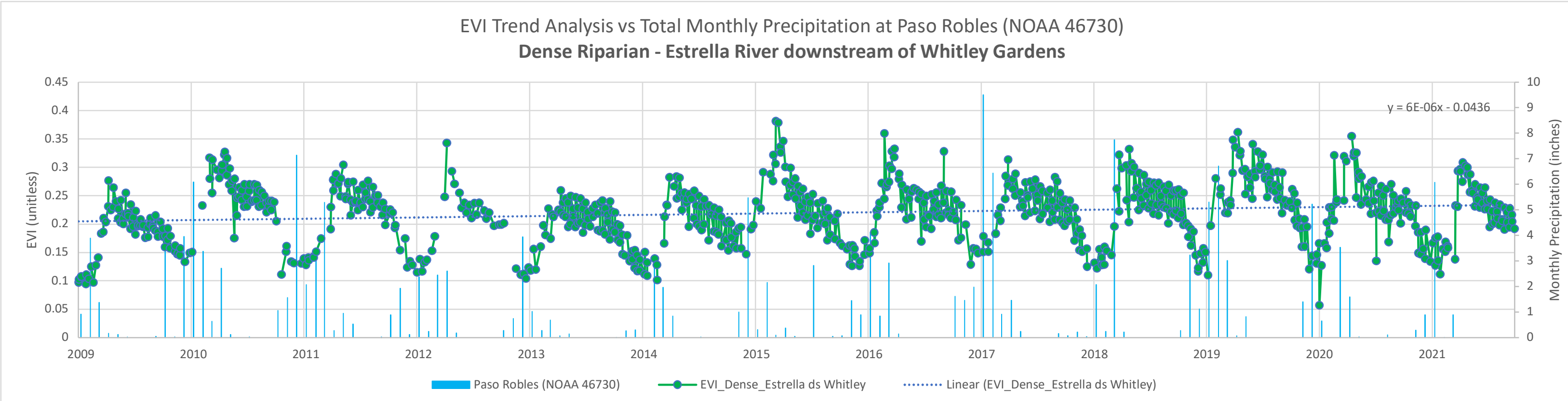

Nacimiento
Work Family
Guest Ranch
Lake Nacimiento Resort
San Miguel
Lake
Nacimiento
Heritage
Ranch
Bern
Adelaide
Field of Lights
Whitley
101
46

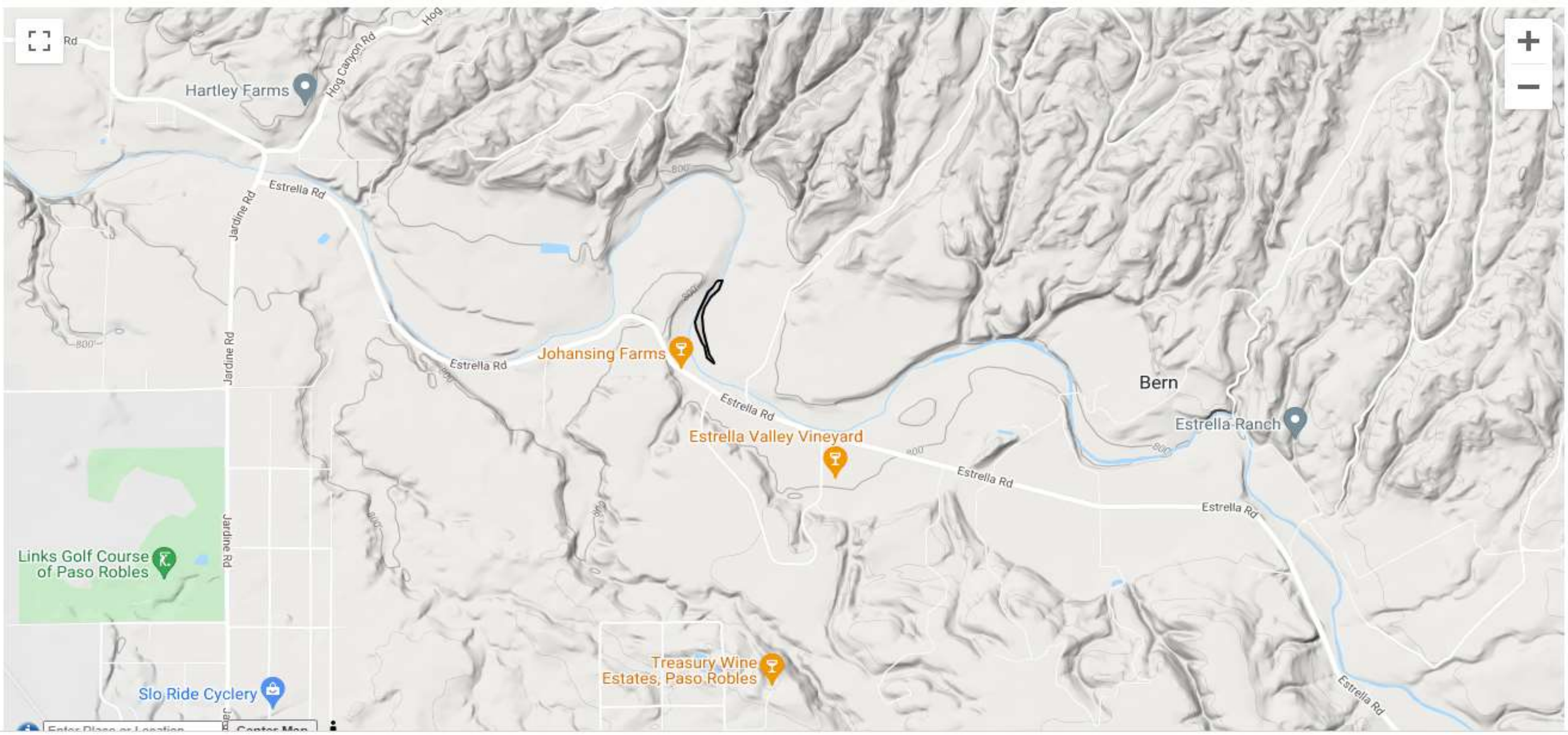

EVI Trend Analysis vs Total Monthly Precipitation at Paso Robles (NOAA 46730)
Dense Riparian - Salinas River
y = 4E-06x + 0.1088
EVI (unitless)
Monthly Precipitation (inches)
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
10
9
8
7
6
5
4
3
2
1
0
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Paso Robles (NOAA 46730)
EVI_Dense_Salinas
Linear (EVI_Dense_Salinas)

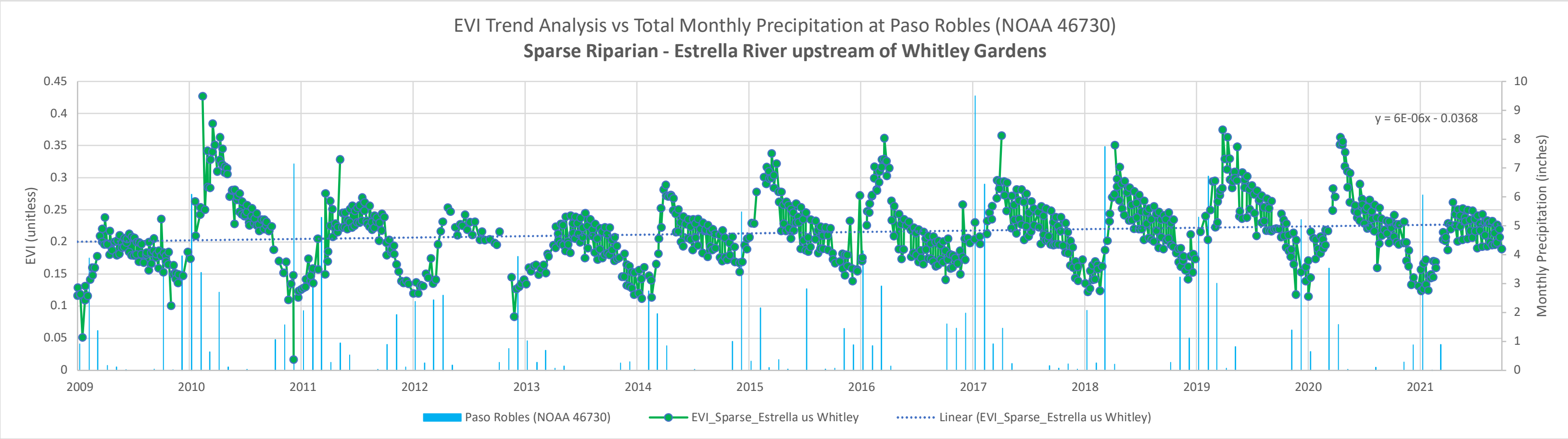

Lake Nacimiento Resort
Lake Nacimiento
Heritage Ranch
San Miguel
101
Bern
Adelaide
Adelaida
Field of Lights
Allegretto Vineyard Resort Paso Robles
46
Whitley Gardens
Downtown City Park
Paso Robles


EVI Trend Analysis vs Total Monthly Precipitation at Paso Robles (NOAA 46730)
Sparse Riparian - Estrella River downstream of Whitley Gardens
EVI (unitless)
Monthly Precipitation (inches)
y = 2E-06x + 0.1183
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
10
9
8
7
6
5
4
3
2
1
0
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Paso Robles (NOAA 46730)
EVI_Sparse_Estrella ds Whitley
Linear (EVI_Sparse_Estrella ds Whitley)

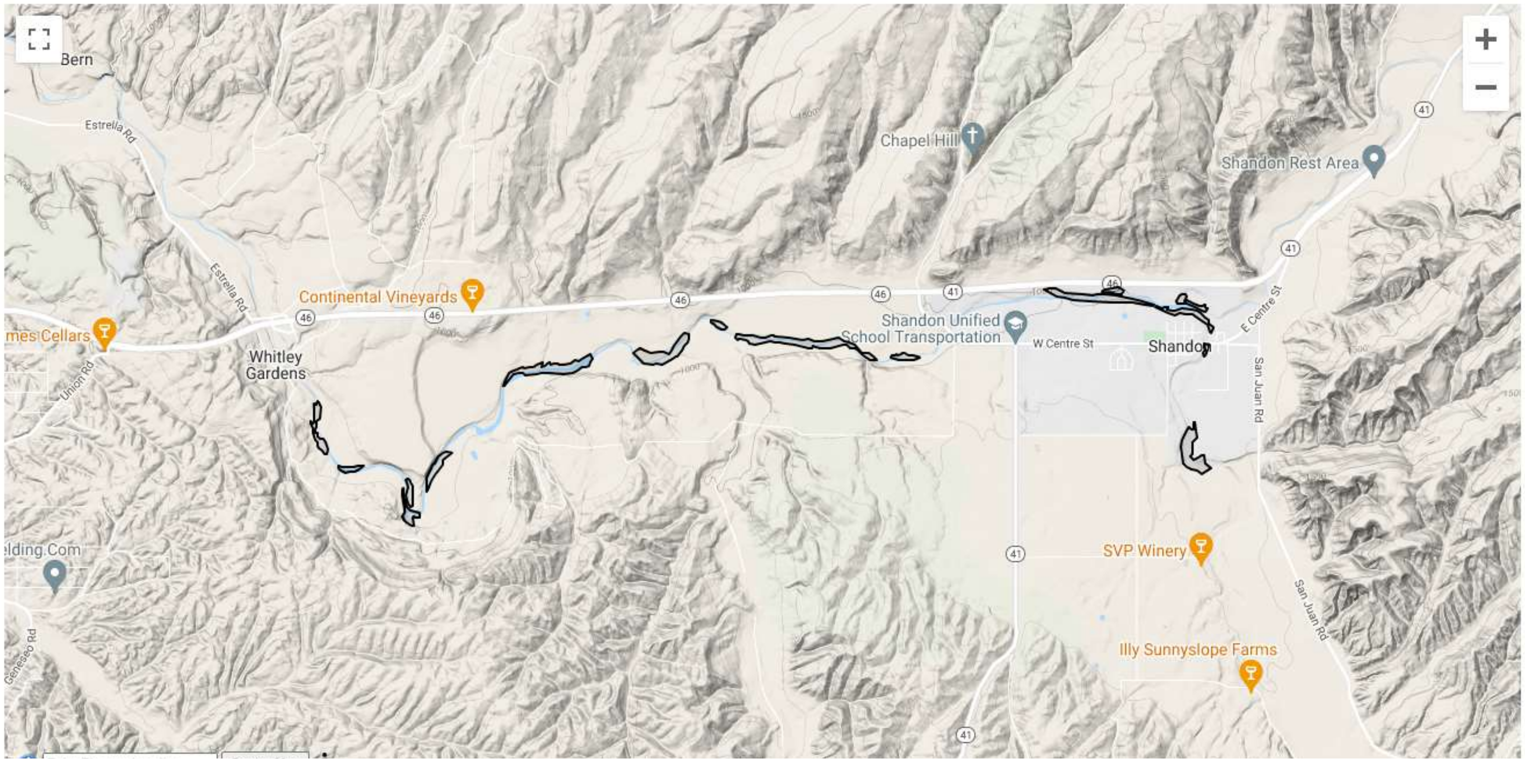

Temporarily closed
Bon Niche Cellars
Graveyard Vineyards
Cinquain Cellars
Estrella Rd
Airport Rd
Hog Canyon Rd
Jardine Rd
J. Lohr Vineyards & Wines
Johansing Farms
Bern
Estrella Rd
Paso Robles Municipal Airport
Estrella Warbird Museum
Field of Lights
Robles RV Resort
Vina Robles Vineyards & Winery
Hunter Ranch Hole 1
Bianchi Winery and Tasting Room
Tobin James Cellars
Continental Vineyards
Whitley Gardens
Lowe's Home Improvement
Pear Valley Vineyard
Geneseo Rd
Union Rd
Branch Rd
46


EVI Trend Analysis vs Total Monthly Precipitation at Paso Robles (NOAA 46730)
Dense Riparian - Estrella River downstream of Whitley Gardens
EVI (unitless)
Monthly Precipitation (inches)
y = 6E-06x - 0.0436
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Paso Robles (NOAA 46730)
EVI_Dense_Estrella ds Whitley
Linear (EVI_Dense_Estrella ds Whitley)

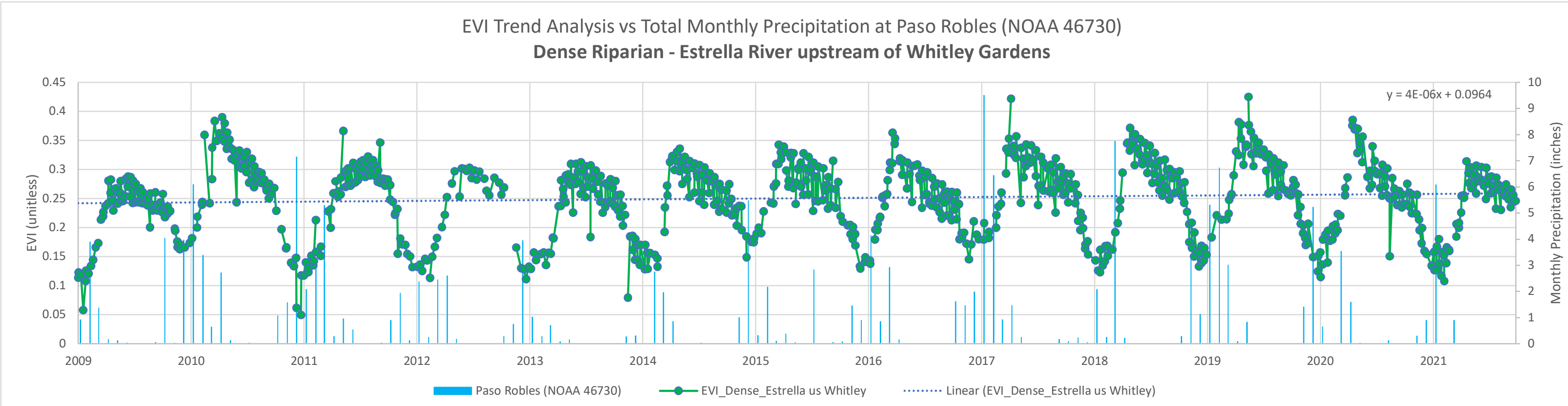

Hartley Farms
Hog Canyon Rd
Estrella Rd
Jardine Rd
Johansing Farms
Estrella Valley Vineyard
Bern
Estrella Ranch
Links Golf Course of Paso Robles
Treasury Wine Estates, Paso Robles
Slo Ride Cyclery



EVI Trend Analysis vs Total Monthly Precipitation at Paso Robles (NOAA 46730)
Sparse Riparian - Estrella River upstream of Whitley Gardens
EVI (unitless)
Monthly Precipitation (inches)
y = 6E-06x - 0.0368
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Paso Robles (NOAA 46730)
EVI_Sparse_Estrella us Whitley
Linear (EVI_Sparse_Estrella us Whitley)

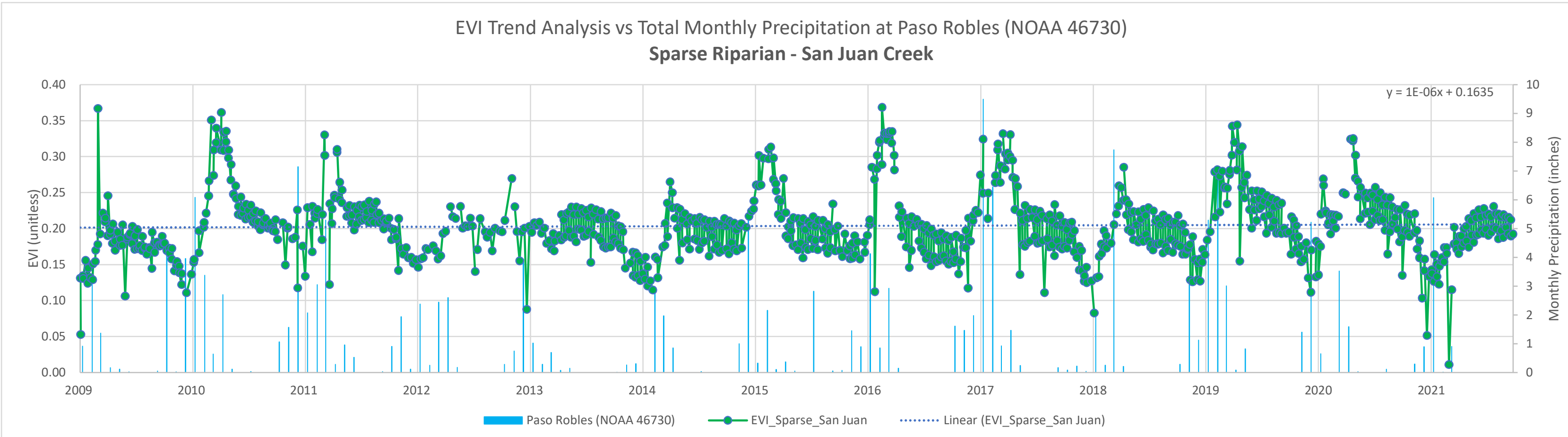


Bern
Estrella Rd
Chapel Hill
Shandon Rest Area
Continental Vineyards
Shandon Unified School Transportation
W Centre St
Shandon
E Centre St
San Juan Rd
Whitley Gardens
Union Rd
SVP Winery
Illy Sunnyslope Farms


EVI Trend Analysis vs Total Monthly Precipitation at Paso Robles (NOAA 46730)
Dense Riparian - Estrella River upstream of Whitley Gardens
y = 4E-06x + 0.0964
EVI (unitless)
Monthly Precipitation (inches)
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
10
9
8
7
6
5
4
3
2
1
0
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Paso Robles (NOAA 46730)
EVI_Dense_Estrella us Whitley
Linear (EVI_Dense_Estrella us Whitley)


Estrella Rd
Estrella Rd
Haley Land & Livestock
Green River Mutual Water
Continental Vineyards
Clevenger Cattle
Whitley Gardens
46
46
46
46
46
46
46
1200

ip



EVI Trend Analysis vs Total Monthly Precipitation at Paso Robles (NOAA 46730)
Sparse Riparian - San Juan Creek
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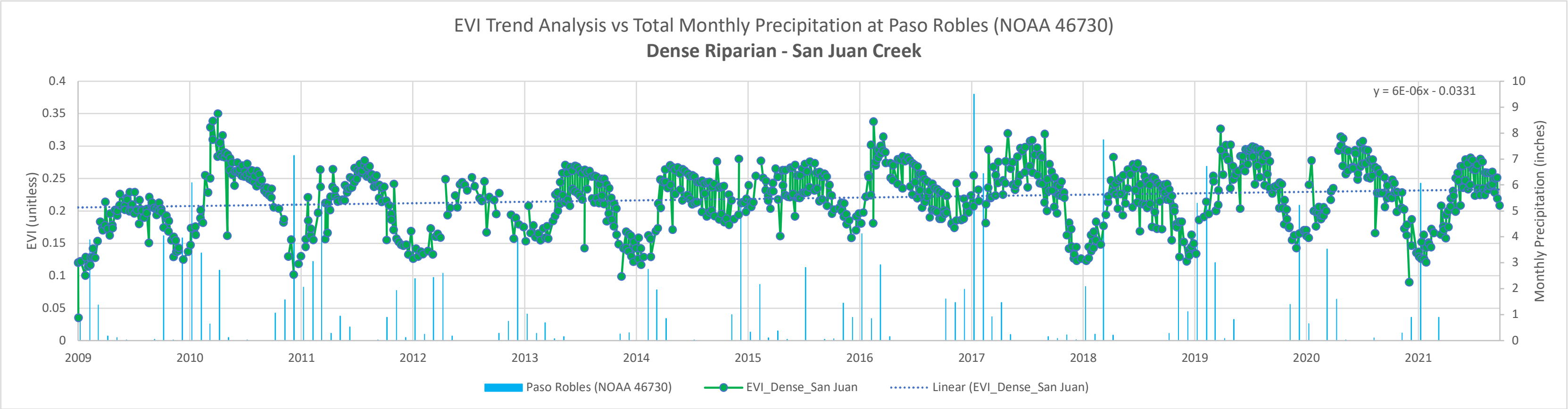
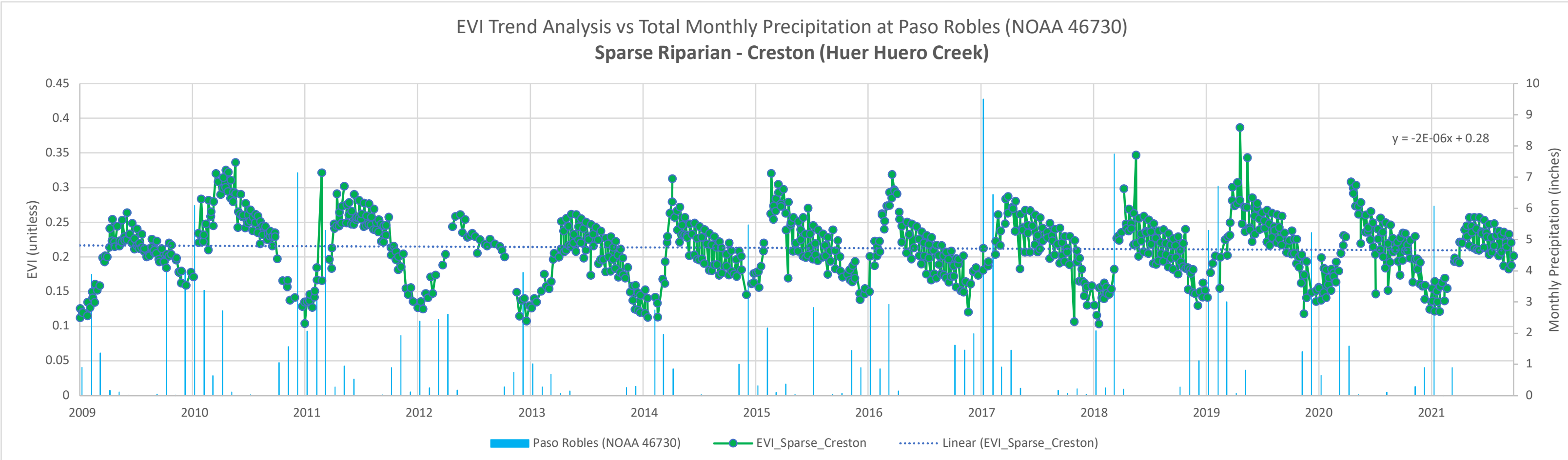
EVI (unitless)
Monthly Precipitation (inches)
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
10
9
8
7
6
5
4
3
2
1
0
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Paso Robles (NOAA 46730)
EVI_Sparse_San Juan
Linear (EVI_Sparse_San Juan)

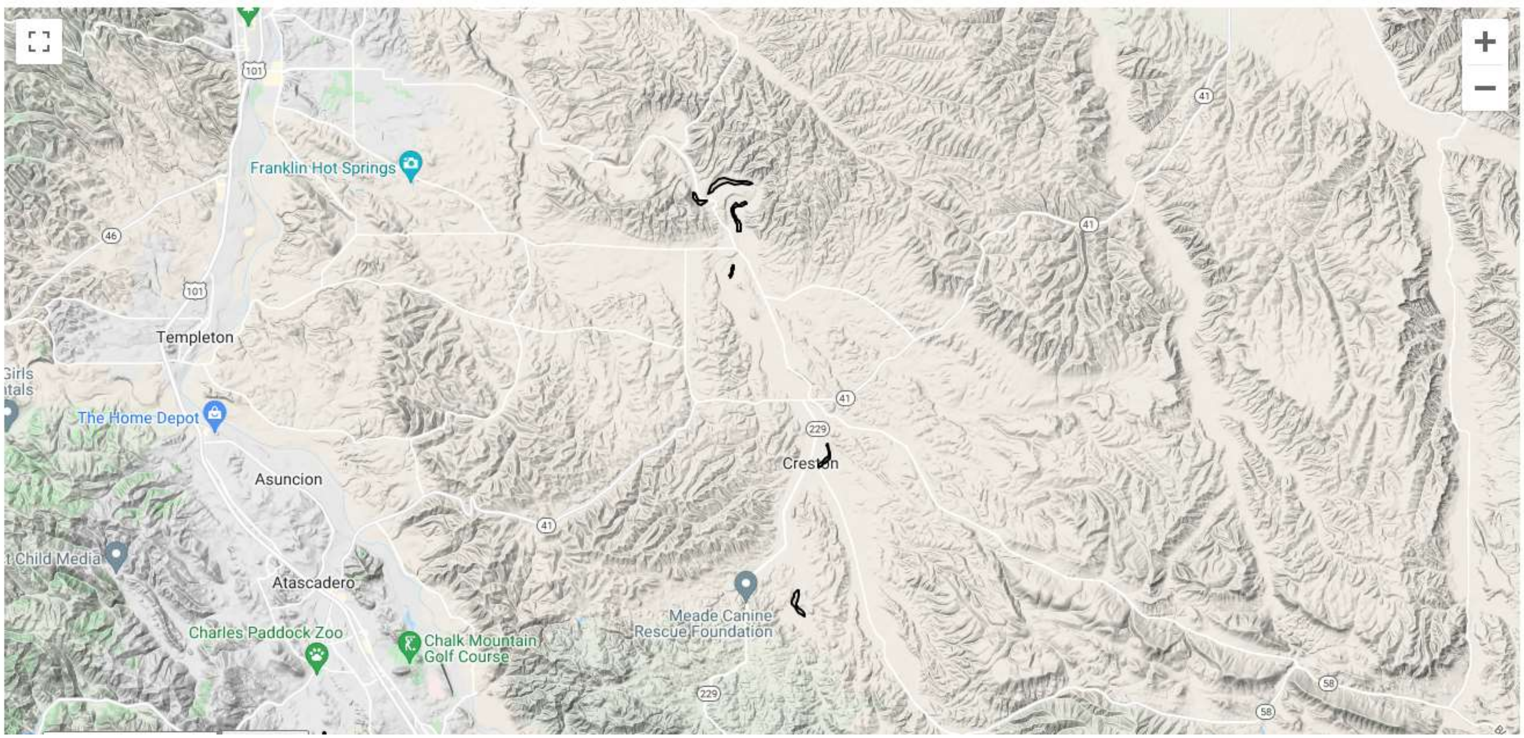
41
41
58
58
Blue Star Memorial


EVI Trend Analysis vs Total Monthly Precipitation at Paso Robles (NOAA 46730)
Dense Riparian - San Juan Creek
y = 6E-06x - 0.0331
EVI (unitless)
Monthly Precipitation (inches)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0
1
2
3
4
5
6
7
8
9
10
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Paso Robles (NOAA 46730)
EVI_Dense_San Juan
Linear (EVI_Dense_San Juan)


Shell Creek Rd
hell Creek Vineyards
Shell Creek Rd



EVI Trend Analysis vs Total Monthly Precipitation at Paso Robles (NOAA 46730)
Sparse Riparian - Creston (Huer Huero Creek)
EVI (unitless)
Monthly Precipitation (inches)
y = -2E-06x + 0.28
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
10
9
8
7
6
5
4
3
2
1
0
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Paso Robles (NOAA 46730)
EVI_Sparse_Creston
Linear (EVI_Sparse_Creston)



Franklin Hot Springs
Templeton
The Home Depot
Asuncion
Atascadero
Charles Paddock Zoo
Chalk Mountain Golf Course
Meade Canine Rescue Foundation
Creston
101
46
41
229
58

INTRODUCTION

Groundwater dependent ecosystems (GDEs) within the Paso Robles Subbasin are identified in accordance with §354.16(g) of the Groundwater Sustainability Plan regulations. The procedure for identifying GDEs follows guidance developed by

The Nature Conservancy (TNC) and detailed in the *Groundwater Dependent Ecosystems under the Sustainable Groundwater Management Act: Guidance for Preparing Groundwater Sustainability Plans* report (Rohde et al., 2018). This process differentiates between indicators of Groundwater Dependent Ecosystems (iGDEs), potential Groundwater Dependent Ecosystems, and true Groundwater Dependent Ecosystems.

- iGDEs were developed by The Nature Conservancy in partnership with the California Department of Fish and Wildlife (DFW) and DWR using the best available statewide data. The iGDEs are identified using locations of springs and seeps, wetlands, and vegetation known to use groundwater. The Nature Conservancy also uses the term "Natural Communities Commonly Associated with Groundwater" to refer to these iGDEs.

- Potential GDE are iGDEs that, through mapping analyses, may be connected to shallow groundwater and therefore be supported by shallow groundwater.

- True GDEs are potential GDE's that have been field verified to establish that they are supported by groundwater. The methodology described herein does not identify true GDEs.

The procedure consists of the following steps:

- Review geospatial data from TNC that showing indicators of groundwater dependent ecosystems (iGDEs) within the Subbasin

- Assess the connection to groundwater for indicators of groundwater dependent ecosystems

- Identify potential GDEs. Potential GDEs are iGDEs that might be connected to groundwater. Potential GDEs should be field verified before they are established as true GDEs.

Geospatial data showing iGDEs were downloaded from TNC's website for Natural Communities Commonly Associated with Groundwater

(NCCAG; https://gis.water.ca.gov/app/NCDatasetViewer). The iGDEs present in the Paso Robles Subbasin include potential GDEs identified as Wetlands or GDE Vegetation. All iGDEs in the Subbasin, as identified by TNC, are shown on Figure C-1.

Datasets used to assess the potential connection of the iGDEs to groundwater include the San Luis Obispo (SLO) County surface geologic map (County of San Luis Obispo, 2007), measured groundwater levels in the San Luis Obispo County groundwater monitoring network, geospatial data included in the National Hydrographic Dataset (NHD) provided by the U.S. Geological Survey showing the location of mapped springs and seeps, and the updated numerical groundwater flow model of the Paso Robles Subbasin.

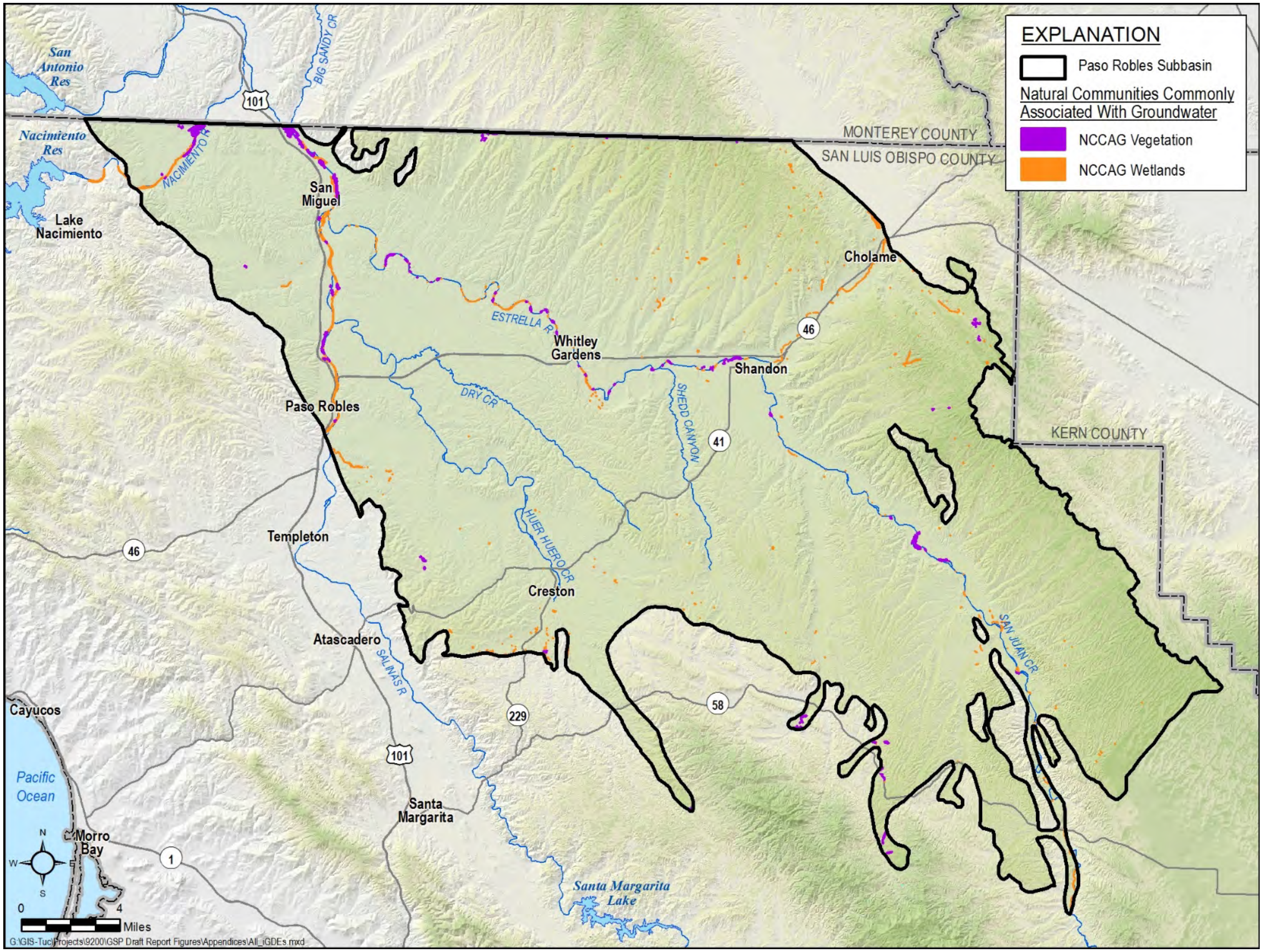


Figure C-1: Areas with Indicators of Groundwater Dependent Ecosystems (iGDEs) (*from TNC*)

CRITERIA FOR CONNECTION TO GROUNDWATER

The iGDEs identified by TNC data can only be potential GDEs if they are connected to a groundwater source that supports the vegetation or wetlands. Potential iGDEs that are supported by streamflows, soil moisture, or shallow perched aquifers, rather than by a regional groundwater aquifer, are not considered GDEs for this report. The report by Rohde et al. (2018) provides a general list of questions, or criteria, applicable to all iGDEs for assessing connection to groundwater. These general questions are:

- Is the iGDE underlain by a shallow unconfined or perched aquifer that has been delineated as being part of a Bulletin 118 principal aquifer in the Subbasin?
- Is the depth to groundwater under the iGDE less than 30 feet?
- Is the iGDE located in an area known to discharge groundwater (e.g. springs/seeps)?

The datasets described above are used to assess the potential connection of iGDEs to groundwater based on the three criteria listed above. To be considered a potential GDE, the iGDEs must satisfy at least one of the three criteria described above; or the landforms around the iGDE must suggest the area could support potential GDEs. Following the suggestions in Rhode (2018), example landforms that could support potential GDEs might be mapped springs, seeps, or a break in the slope of the ground. In the absence of more formal field reconnaissance, the results of this screening level analysis only identify potential GDEs in the Subbasin. Additional field verification is necessary to definitively determine the true GDEs in the Paso Robles Subbasin.

Question 1: Is the iGDE underlain by a shallow unconfined or perched aquifer that has been delineated as being part of a Bulletin 118 principal aquifer in the Subbasin?

Bulletin 118 (DWR, 2003) identifies two primary water-bearing formations in the Subbasin: Quaternary alluvium (Qa) and the Plio-Pleistocene-age Paso Robles formation (QTp). The Qa's thickness ranges from 30 to 130 feet and is highly permeable relative to the QTp. Groundwater in the Qa occurs under unconfined, or water-table conditions. The Qa extent shown on Figure C-2 was determined based on the surficial geologic map of San Luis Obispo County (San Luis Obispo County, 2007). This analysis assumes that all iGDEs that overlie the Quaternary alluvial unit are connected to shallow groundwater Qa sediments, and are therefore classified as potential GDEs as recommended by Rohde and others (2018). The Qa's extent and coincident potential GDEs are shown on Figure C-2. Most iGDEs within the Subbasin fall within the Qa extent.

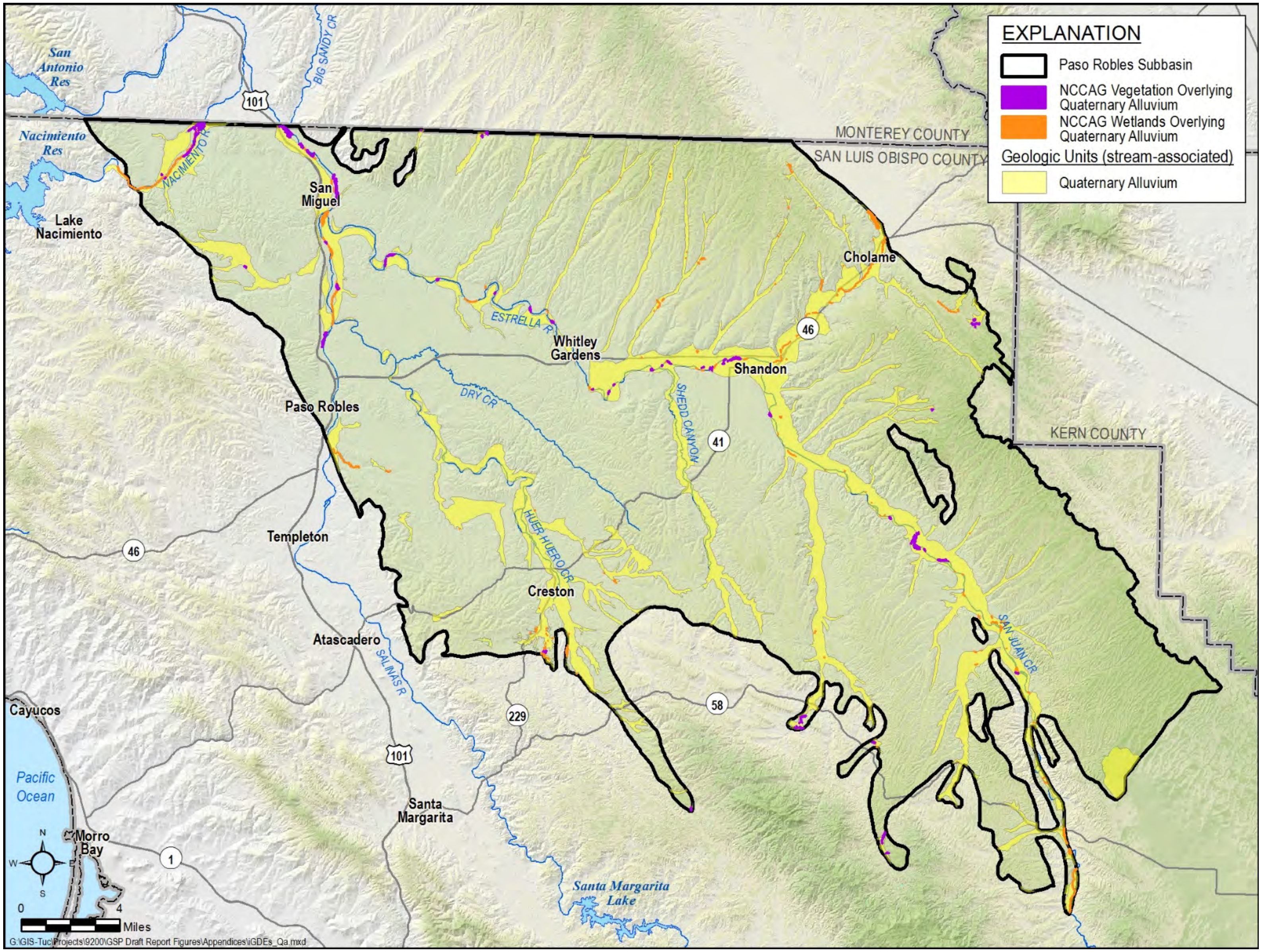


Figure C-2: iGDEs Associated with the Shallow, Unconfined Quaternary Alluvial (Qa) Aquifer

This criterion clearly has the potential to overestimate the number of potential GDEs in the Subbasin. The subjective assessment of what constitutes a shallow unconfined aquifer may result in identifying potential GDEs in areas that do not have the underlying groundwater to support the GDE. This emphasizes the need for field verification of the potential GDEs identified in this GSP.

Question 2: Is depth to groundwater under the iGDE less than 30 feet?

Depth to water is routinely measured by San Luis Obispo County staff within a network of monitoring wells. Figure C-3 shows the locations of San Luis Obispo County monitoring wells completed in the Qa. This analysis uses spring 2017 depth to water data where available. A representative value for spring depth to water was used based on review of historical groundwater levels to establish depth to water for wells at which spring 2017 data were unavailable. Wells where depth to water is less than 30 feet are shown in blue on Figure C-3. Wells where depth to water is greater than 30 feet are shown in yellow. Results from the groundwater model were used to supplement the measured groundwater level data. The simulated spring 2016 groundwater elevations were analyzed to further identify areas where depth to water is less than 30 feet. Based on the measured groundwater level data and model results, iGDEs overlying areas where estimated depth to groundwater is less than 30 feet are shown on Figure C-3.

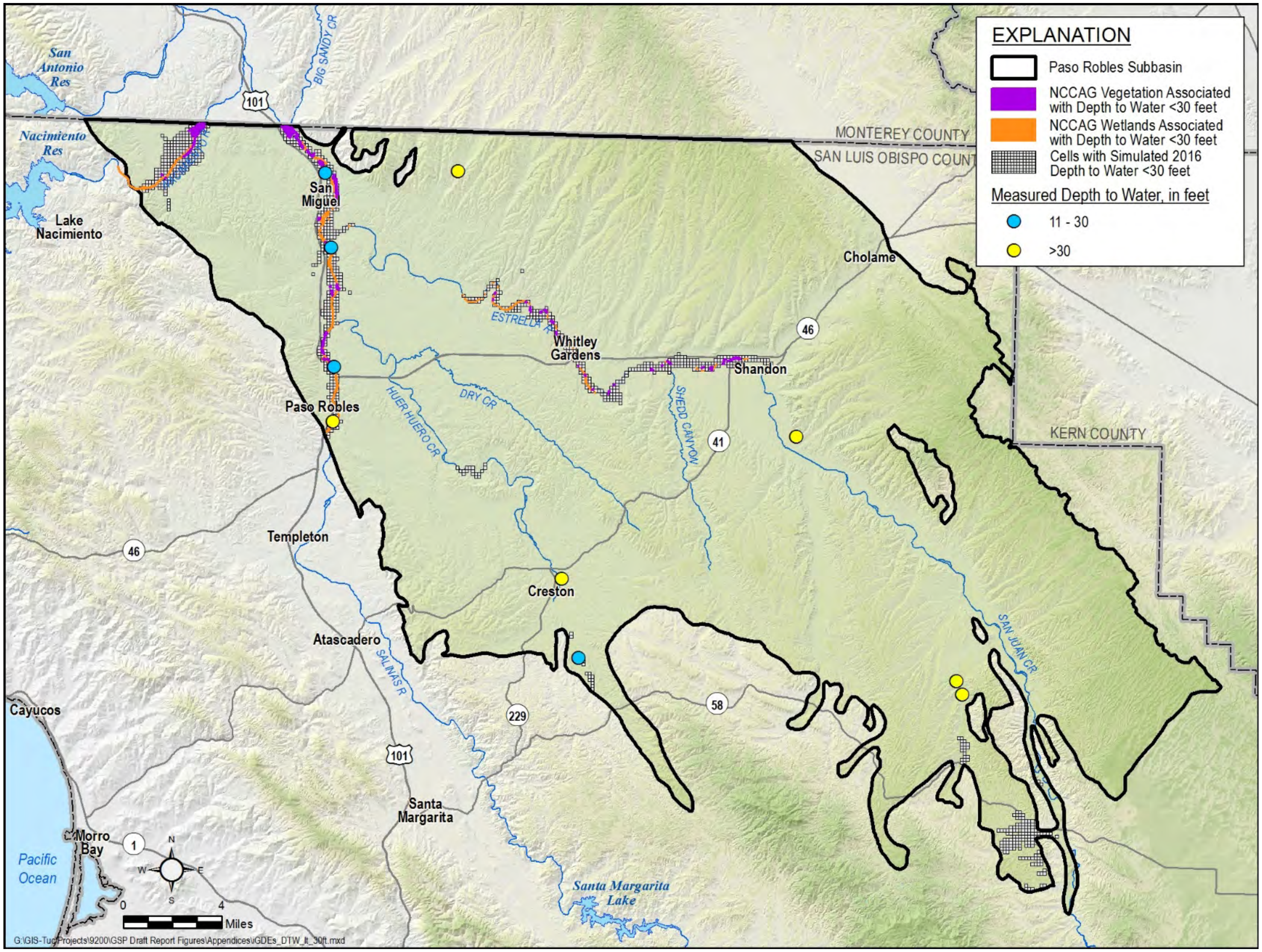


Figure C-3: Qa monitoring wells, Model Cells with Depth to Water Less than 30 Feet, and Potential GDEs based on Depth to Groundwater Less than 30 Feet

Is the iGDE located in an area known to discharge groundwater (e.g., springs/seeps)?

Springs and seeps in the Subbasin identified in National Hydrography Dataset (NHD) tend to be located in the foothills of the Santa Lucia and Temblor mountain ranges, which bound the Subbasin to the west and east, respectively.

Figure C-4 shows the location of NHD seeps and springs. iGDEs within 0.5 miles of a seep/spring point are classified as potential GDEs.

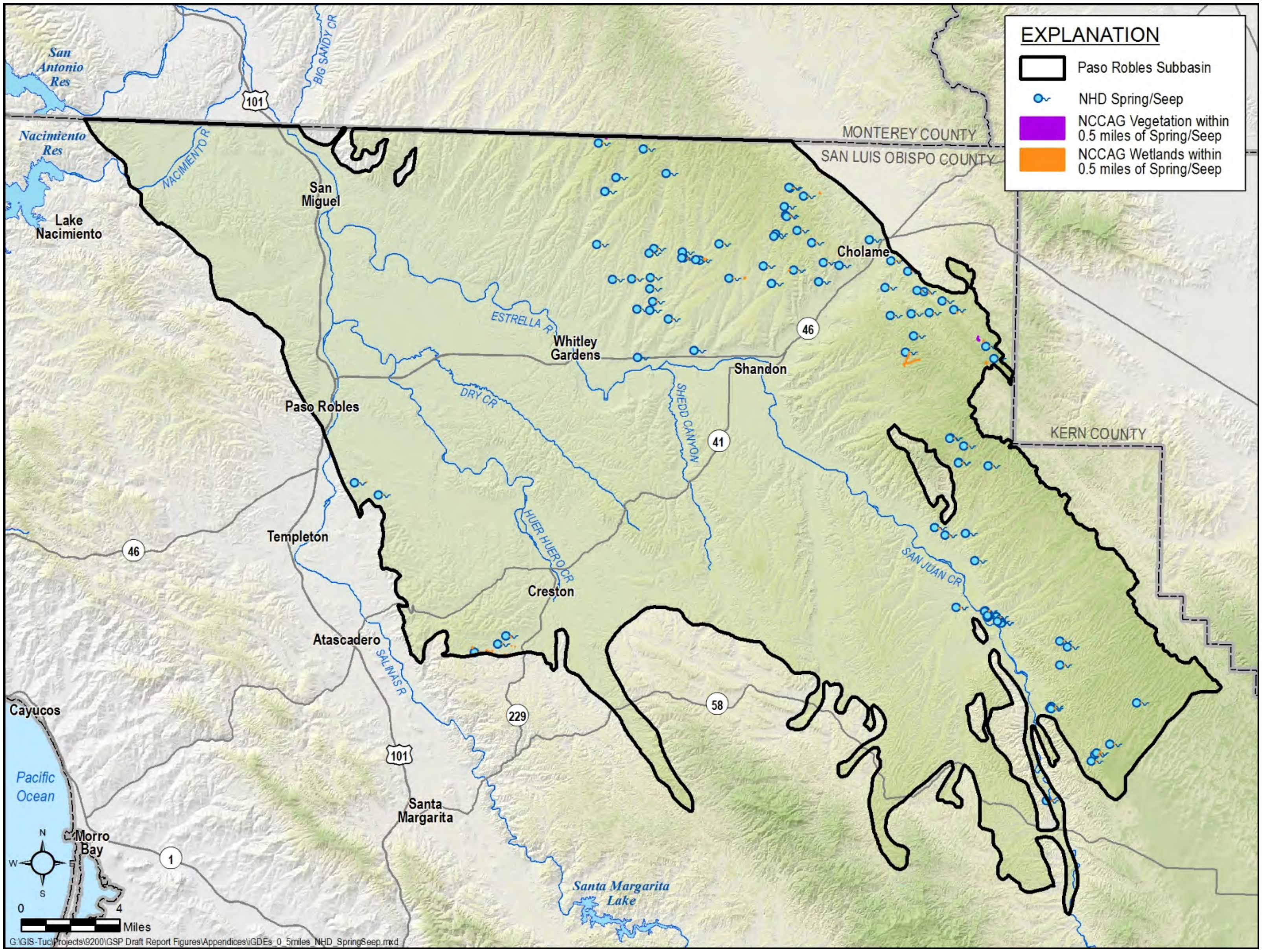


Figure C-4: NHD Springs and Seeps and iGDEs Within 0.5 Miles of a Spring or Seep

FINAL DELINEATION OF POTENTIAL GROUNDWATER DEPENDENT ECOSYSTEMS

After evaluating the three criteria listed above for connection to groundwater, additional iGDEs were identified that should be classified as potential GDEs based on landforms that suggest potential GDEs, effectively loosening the criteria for association with either the shallow alluvial aquifer or springs and seeps. The purpose for this task was to ensure that the extent of potential GDEs would err on the side of estimating maximum GDE extent. Specifically:

1. iGDEs within 0.5 miles of the mapped Qa outcrop are assumed to be hydraulically connected to the shallow alluvial aquifer. Furthermore, iGDEs that appear to be physically connected with other identified potential GDEs in the Qa were manually identified and added to the extent of potential GDEs. Figure C-5 shows all potential GDEs resulting from this analysis.
2. Remaining iGDEs were evaluated to determine their relationship to areas where seeps and springs might occur. These include areas near mapped clusters of seeps and springs such as the northeast mountainous region of the Subbasin shown on Figure C-6; or areas with breaks in the slope of the land surface that may cause “groundwater to emerge or vegetation to congregate on the surface” (Rohde and others, 2018). Figure C-6 shows all potential GDEs associated with known springs or seeps or located in areas that potentially host springs or seeps.

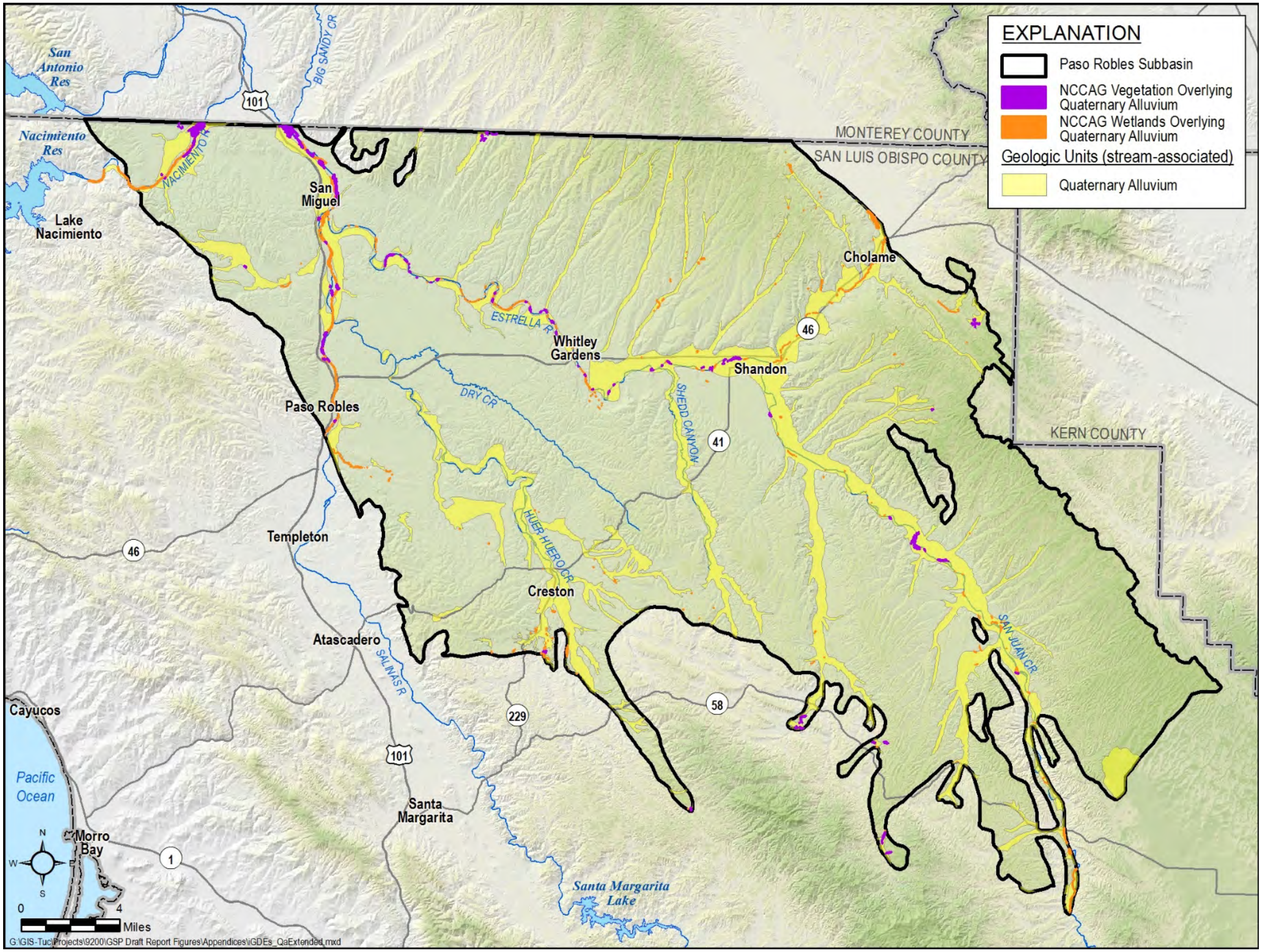


Figure C-5: iGDEs Associated with Quaternary Alluvium (Overlying, Within 0.5 miles, or Manually Selected)

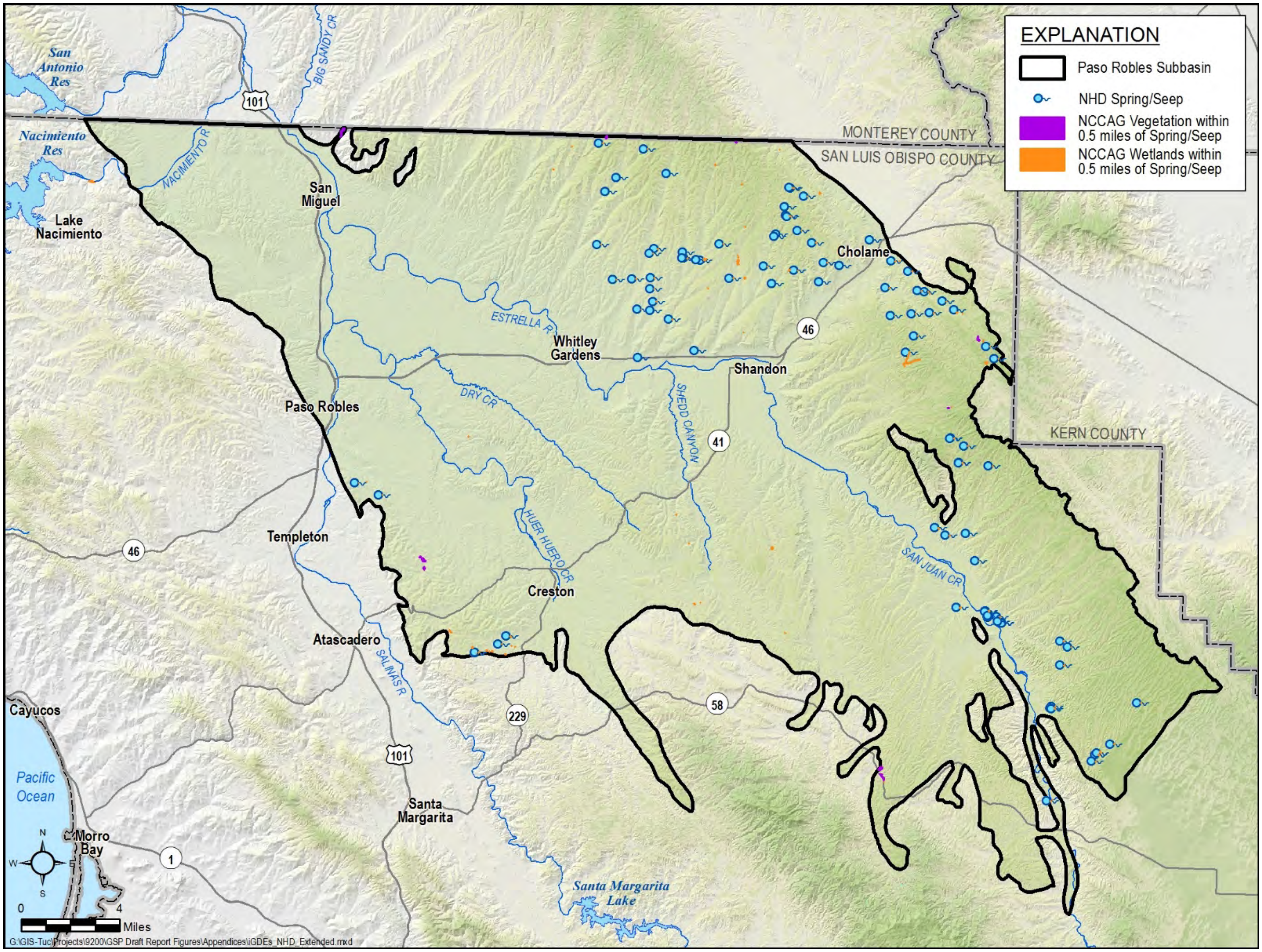


Figure C-6: iGDEs Associated with Springs or Seeps or Located in an Area with Potential Springs or Seeps

Measured groundwater levels within SLO County do not suggest additional areas where groundwater is close enough to the surface to be a significant source for natural communities. The report by Rhode et al. (2018) lists additional spatial data that could be considered for identifying GDS including Critical Habitat for Threatened and Endangered Species, California Protected Areas, and Areas of Conservation Emphasis. None of these datasets show additional potential GDEs in the Subbasin. No additional potential GDEs were identified based on a review of local water and environmental management reports.

The final set of potential GDEs in the Subbasin are shown in Figure C-7. Field verification is necessary to assess whether these potential GDEs are true GDEs.

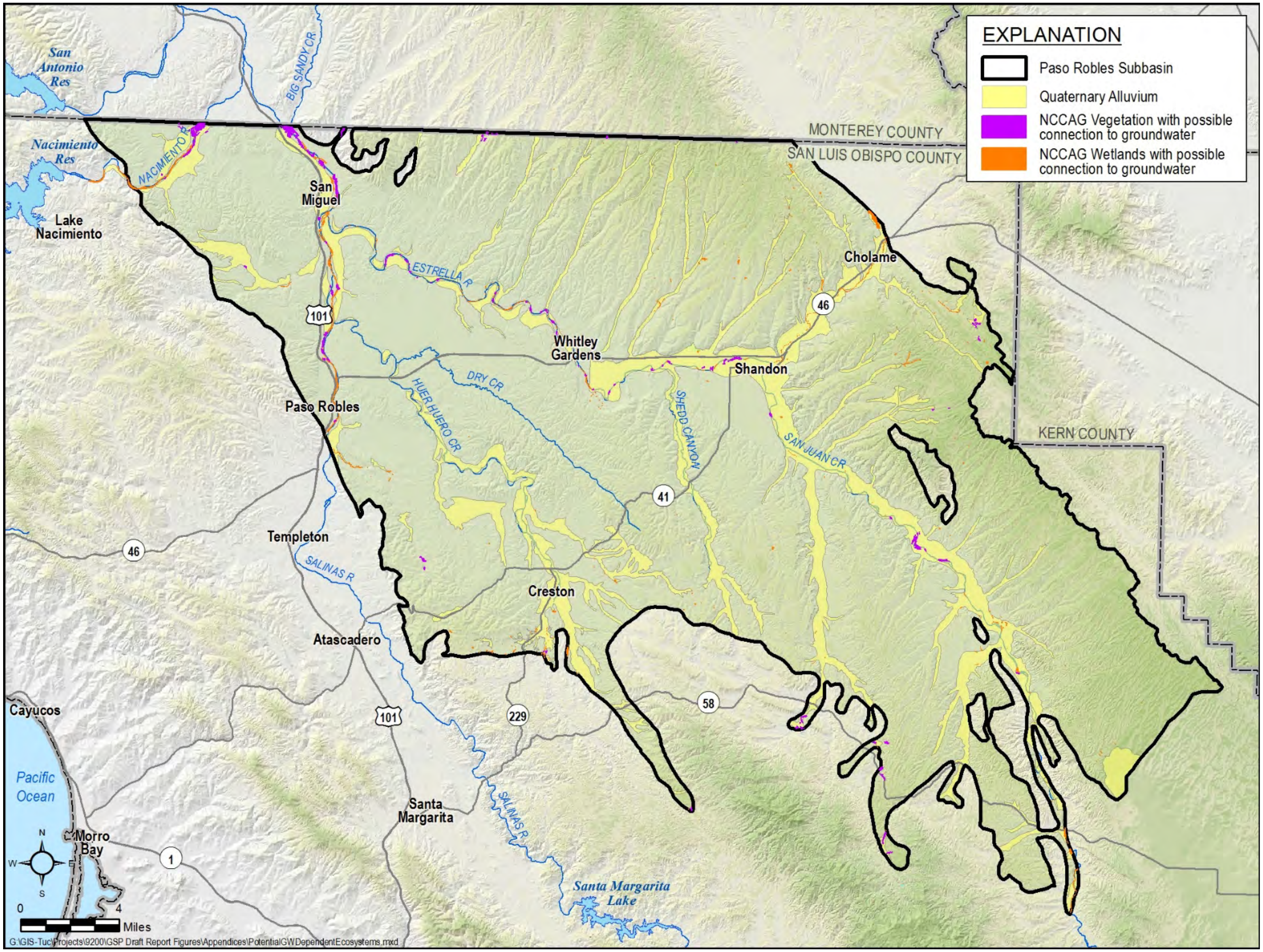


Figure C-7: Extent of Potential GDEs

REFERENCES

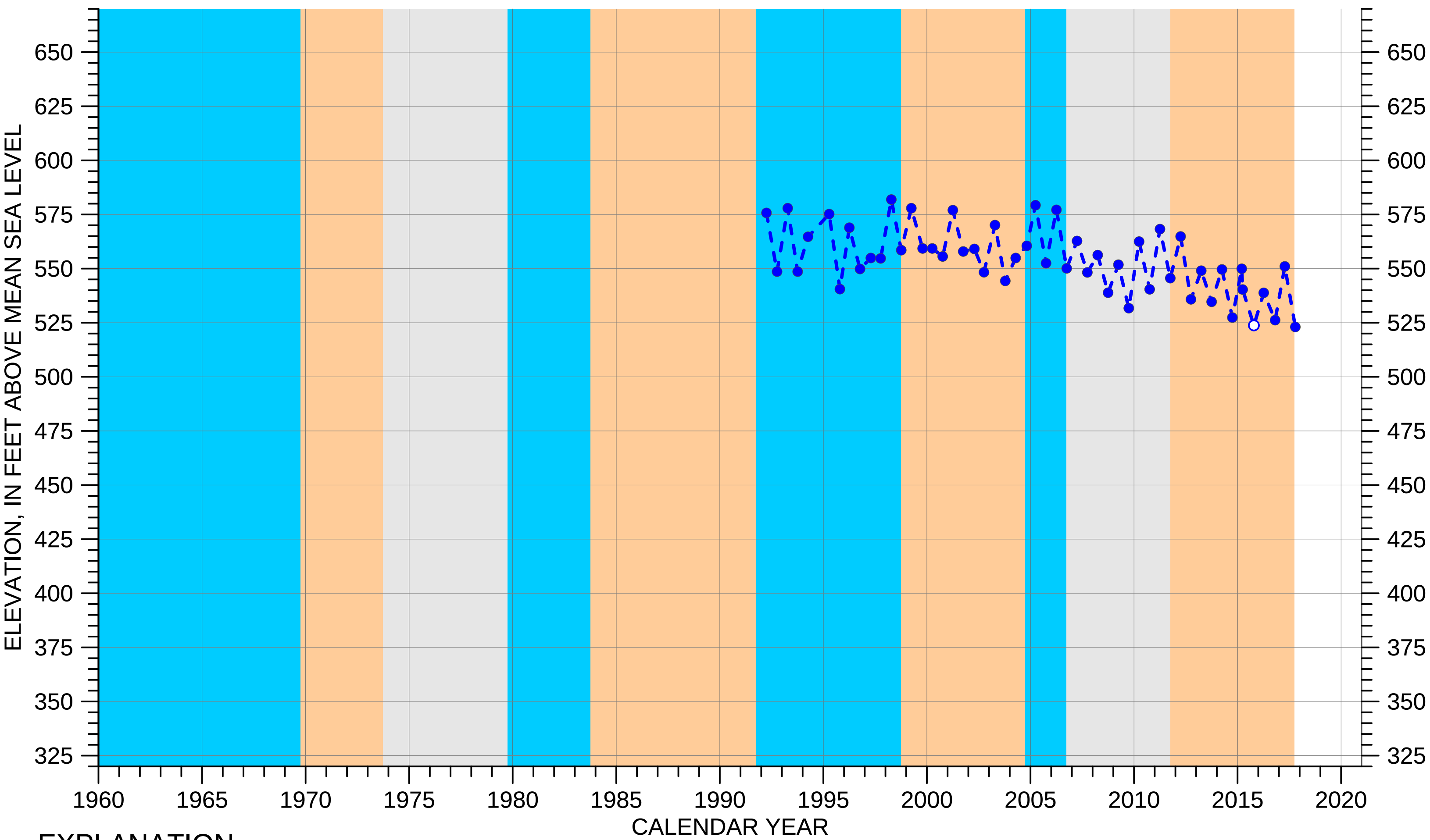
Rohde, M. M., S. Matsumoto, J. Howard, S. Liu, L. Riege, and E.J. Remson, 2018, Groundwater Dependent Ecosystems under the Sustainable Groundwater Management Act: Guidance for Preparing Groundwater Sustainability Plans: The Nature Conservancy, San Francisco, California.

California Department of Water Resources (DWR), 2003, Bulletin 118 Basin Descriptions: Salinas Valley Groundwater Basin, Paso Robles Area Subbasin, accessed at https://water.ca.gov/Programs/Groundwater-Management/ Bulletin-118

County of San Luis Obispo, Planning and Building Department, 2007, Surface geology map, accessed at https://lib.calpoly.edu/gis/browse.jsp?by=e&e=2

Appendix D

Hydrographs



EXPLANATION

GROUNDWATER ELEVATION

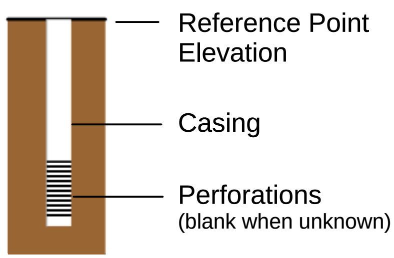
MEASUREMENT NOT VERIFIED*

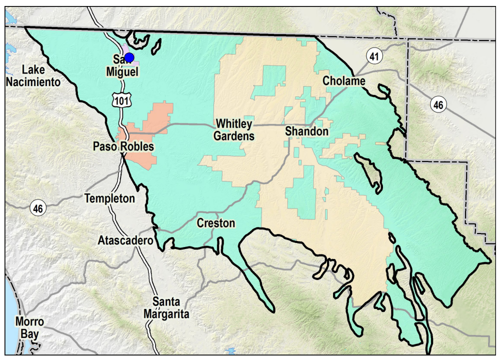
CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET

Well Depth: 350 feet
Screened Interval: 300-310, 330-340 feet below ground surface
Reference Point Elevation: 669.8 feet above mean sea level

* Measurement reported as not static





MEASURED WATER LEVELS FOR 25S/12E-16K05

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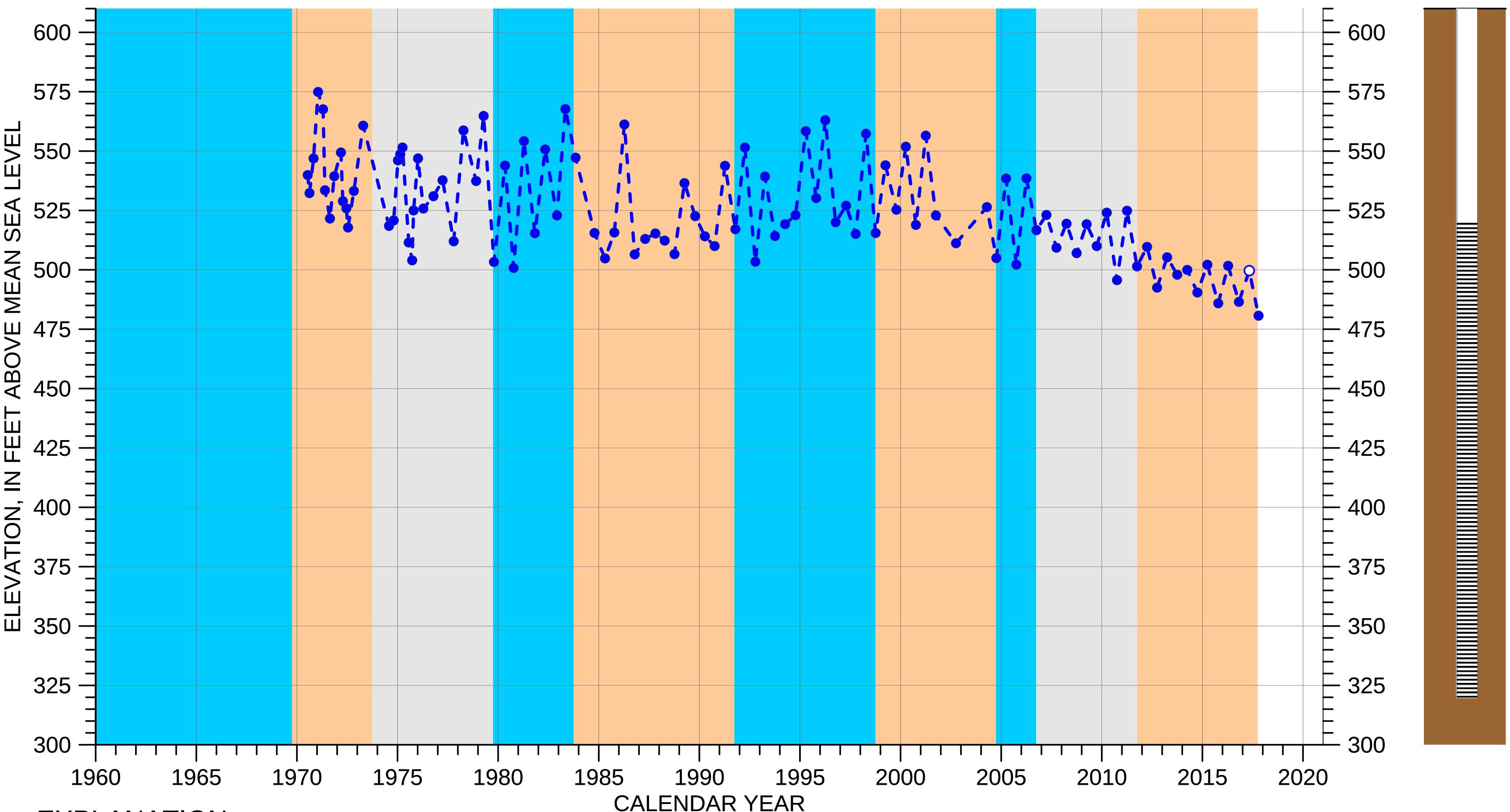


EXPLANATION

GROUNDWATER ELEVATION

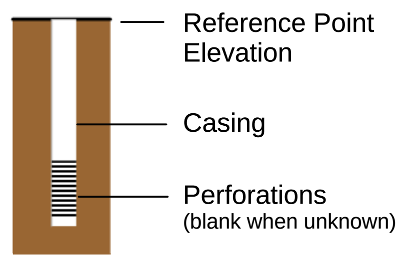
MEASUREMENT NOT VERIFIED*

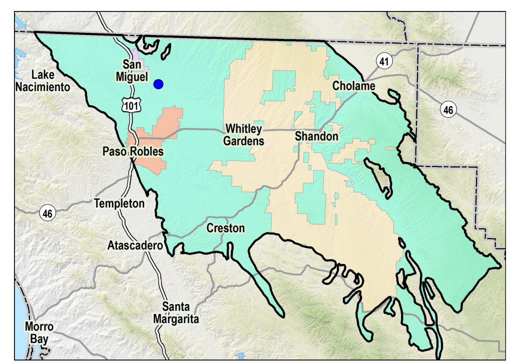
CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET

Well Depth: 400 feet
Screened Interval: 200-400 feet below ground surface
Reference Point Elevation: 719.7 feet above mean sea level

* Measurement reported as not static





MEASURED WATER LEVELS FOR 25S/12E-26L01

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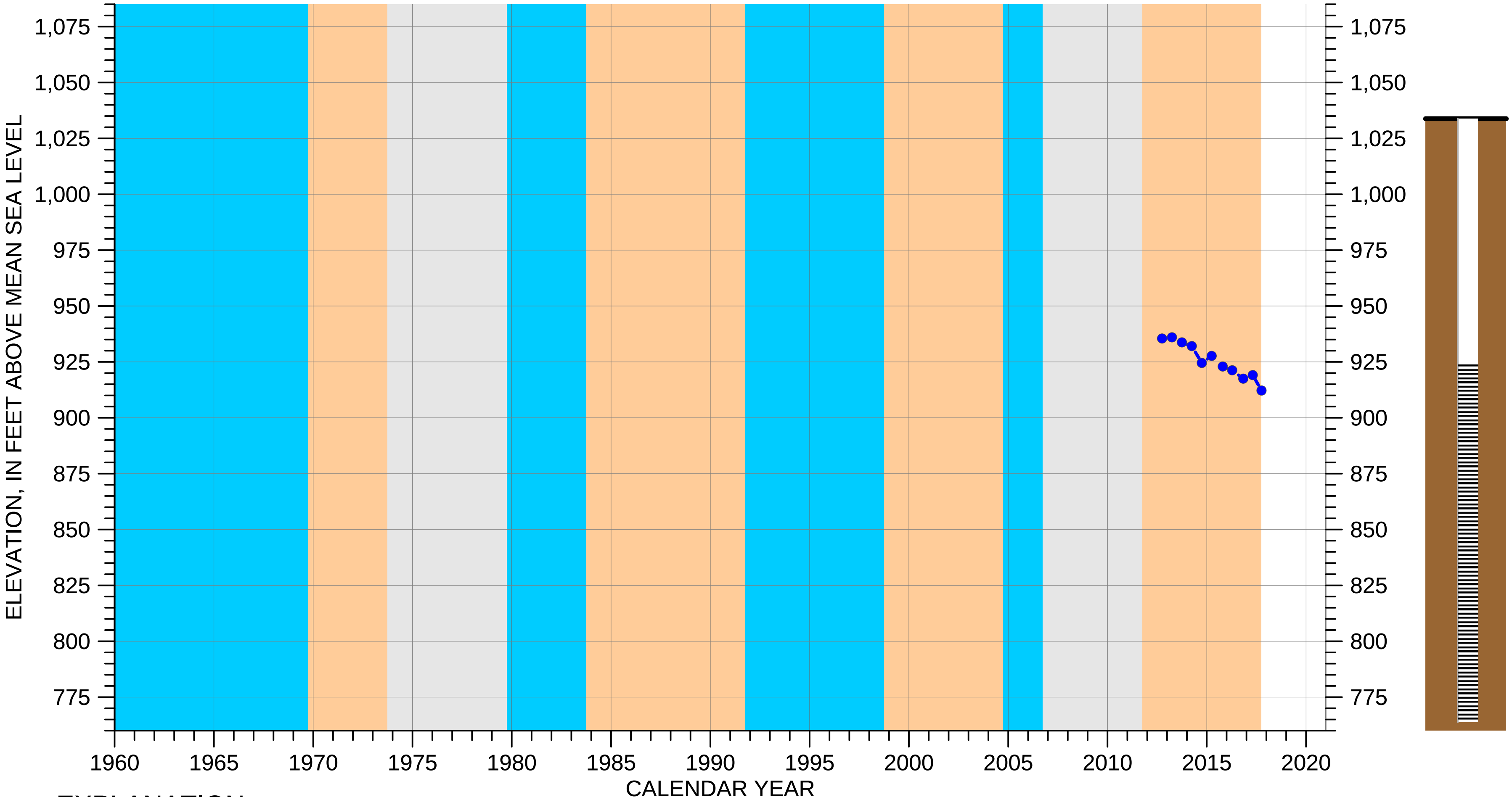


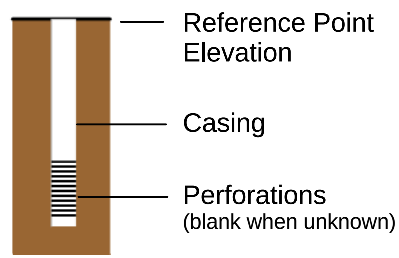
EXPLANATION

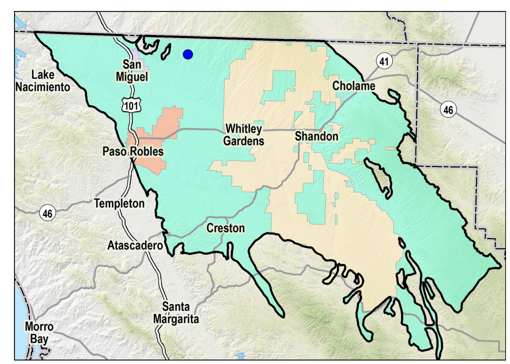
GROUNDWATER ELEVATION

MEASUREMENT NOT VERIFIED*

CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET





Well Depth: 270 feet
Screened Interval: 110-270 feet below ground surface
Reference Point Elevation: 1033.8 feet above mean sea level

* Measurement reported as not static

MEASURED WATER LEVELS FOR 25S/13E-08L02

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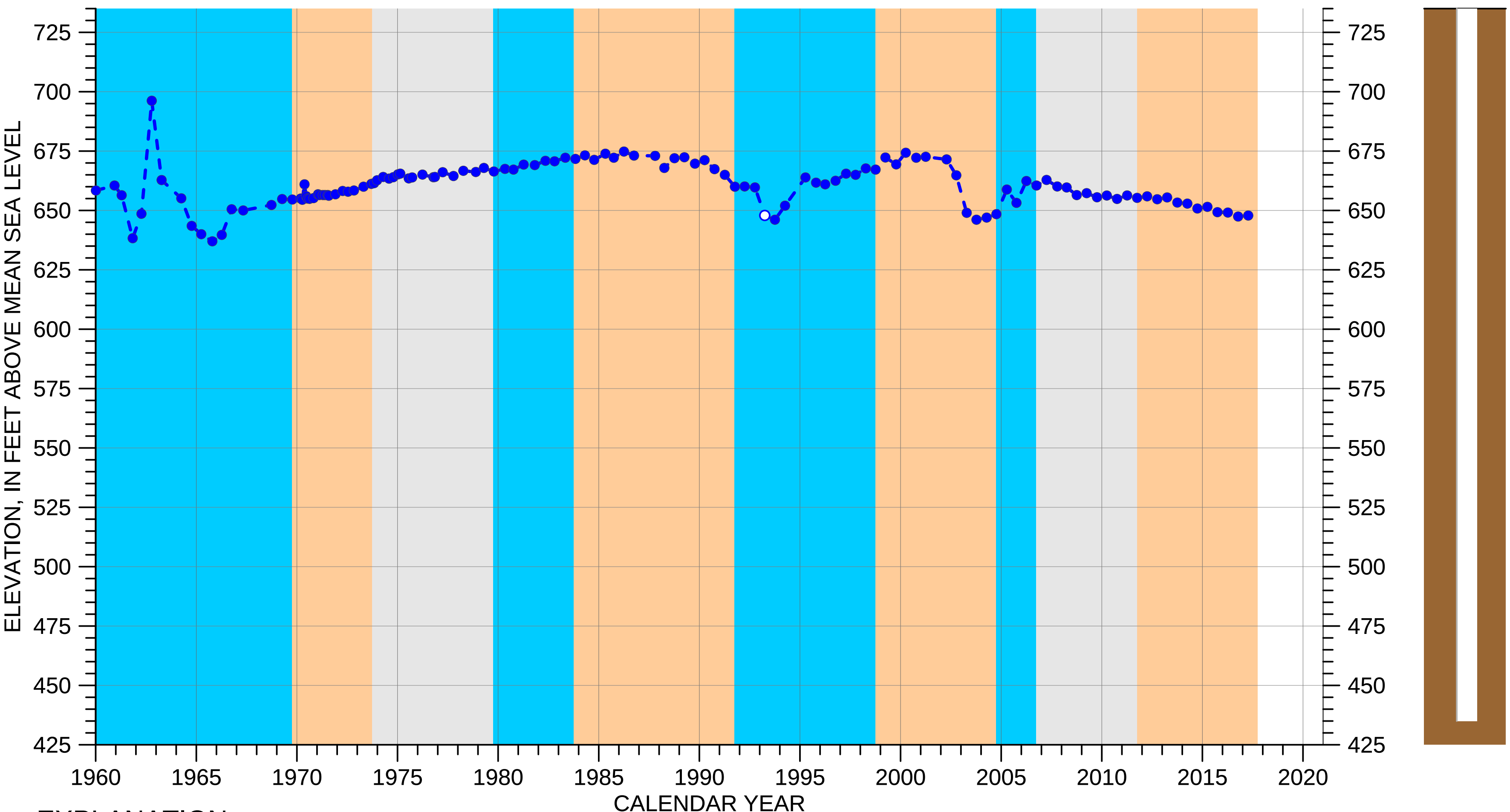


EXPLANATION

GROUNDWATER ELEVATION

MEASUREMENT NOT VERIFIED*

CLIMATE PERIOD CLASSIFICATION

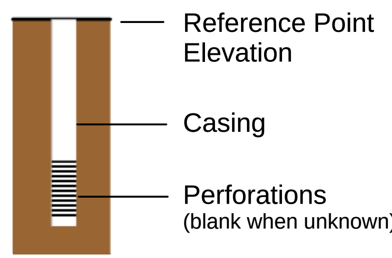
DRY

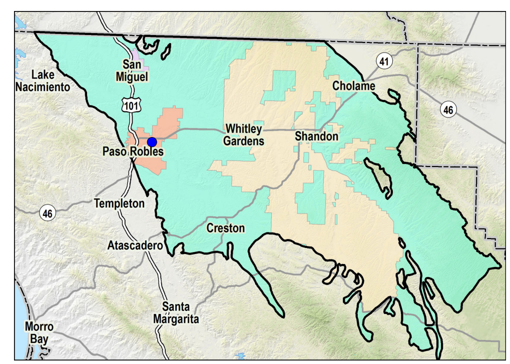
AVERAGE/ALTERNATING

WET

Well Depth: 400 feet
Screened Interval: unknown
Reference Point Elevation: 835 feet above mean sea level

* Measurement reported as not static





MEASURED WATER LEVELS FOR 26S/12E-26E07

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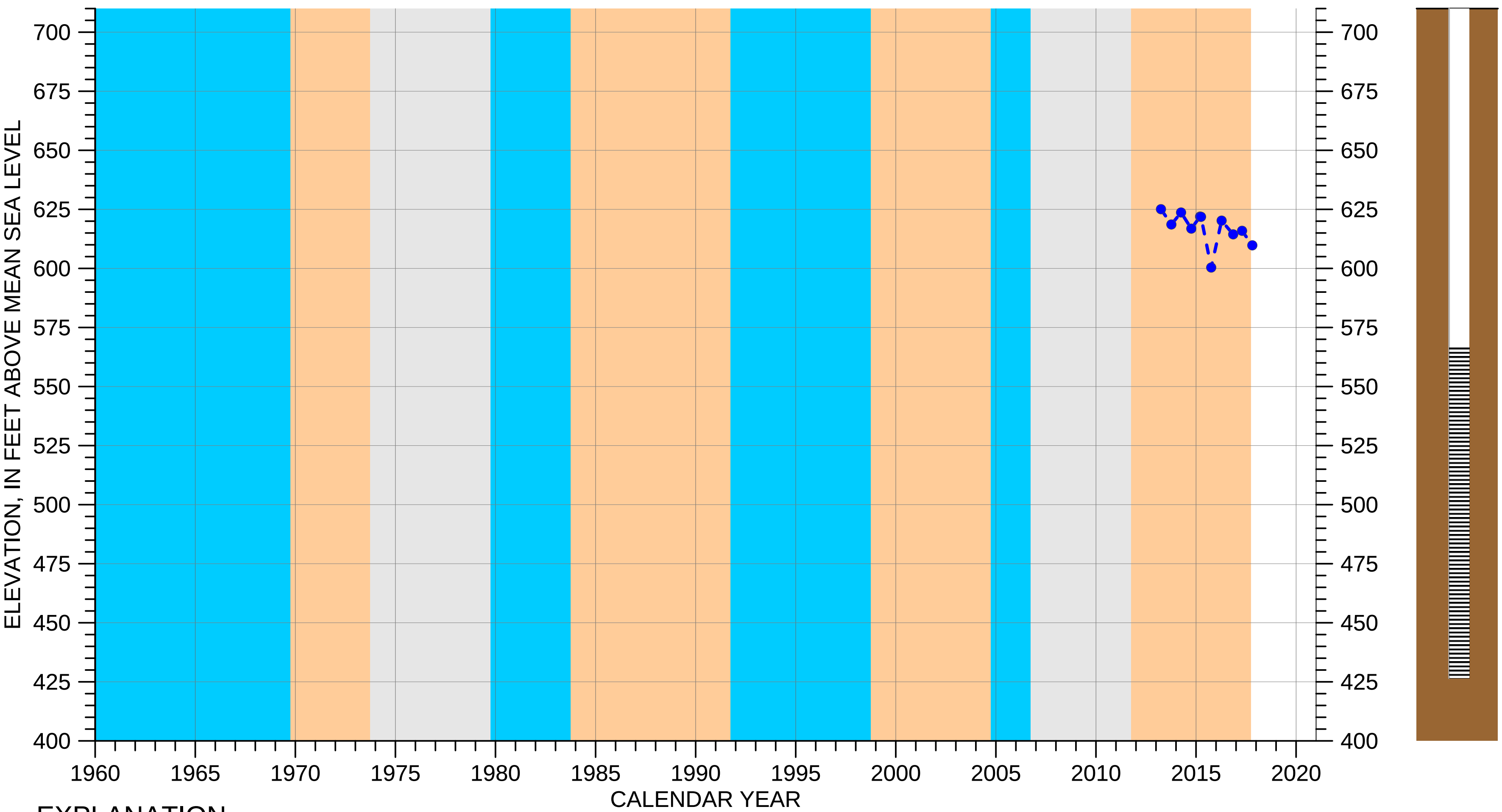


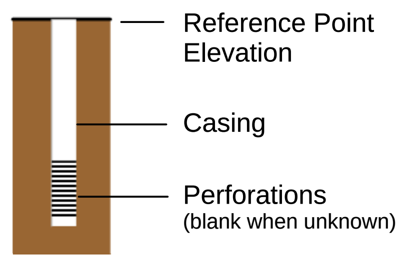
EXPLANATION

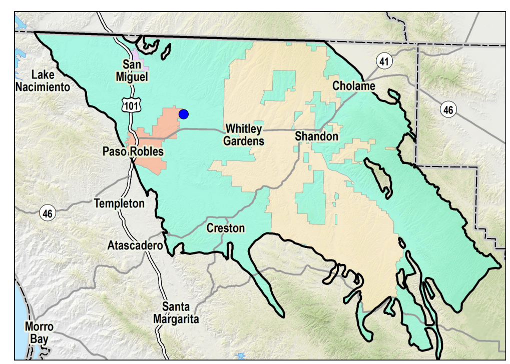
GROUNDWATER ELEVATION

MEASUREMENT NOT VERIFIED*

CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET





Well Depth: 400 feet
Screened Interval: 260-400 feet below ground surface
Reference Point Elevation: 827.9 feet above mean sea level

* Measurement reported as not static

MEASURED WATER LEVELS FOR 26S/13E-08M01

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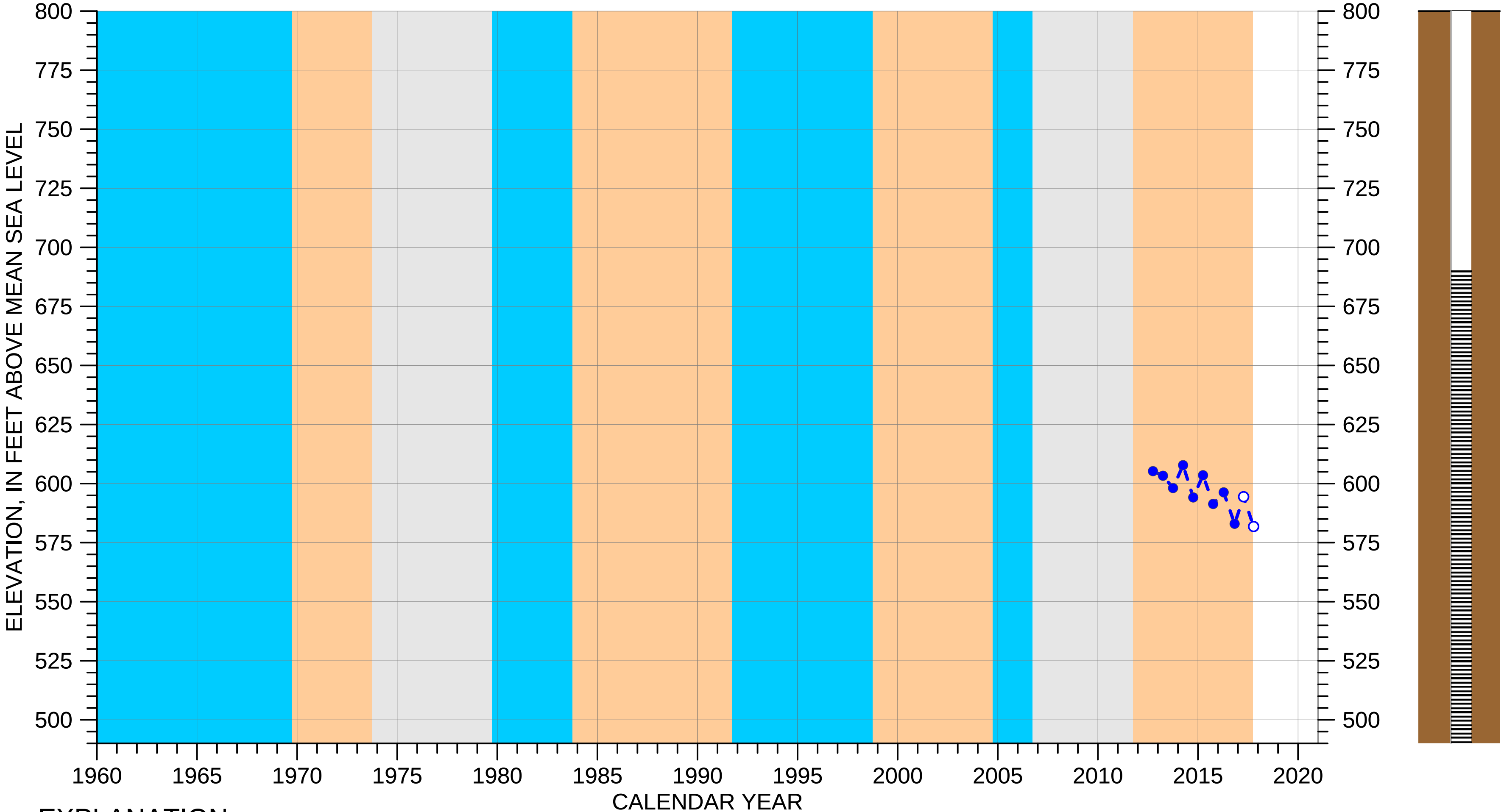


EXPLANATION

GROUNDWATER ELEVATION

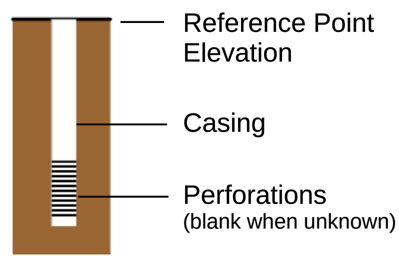
MEASUREMENT NOT VERIFIED*

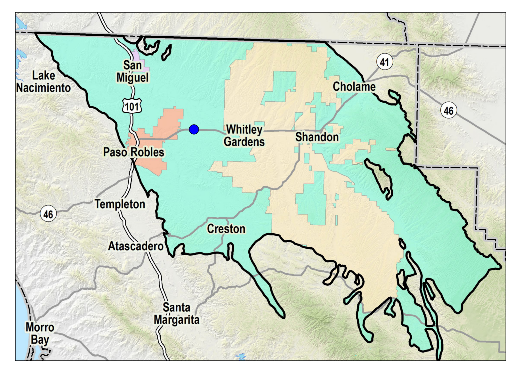
CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET

Well Depth: 400 feet
Screened Interval: 200-400 feet below ground surface
Reference Point Elevation: 890.2 feet above mean sea level

* Measurement reported as not static





MEASURED WATER LEVELS FOR 26S/13E-16N01

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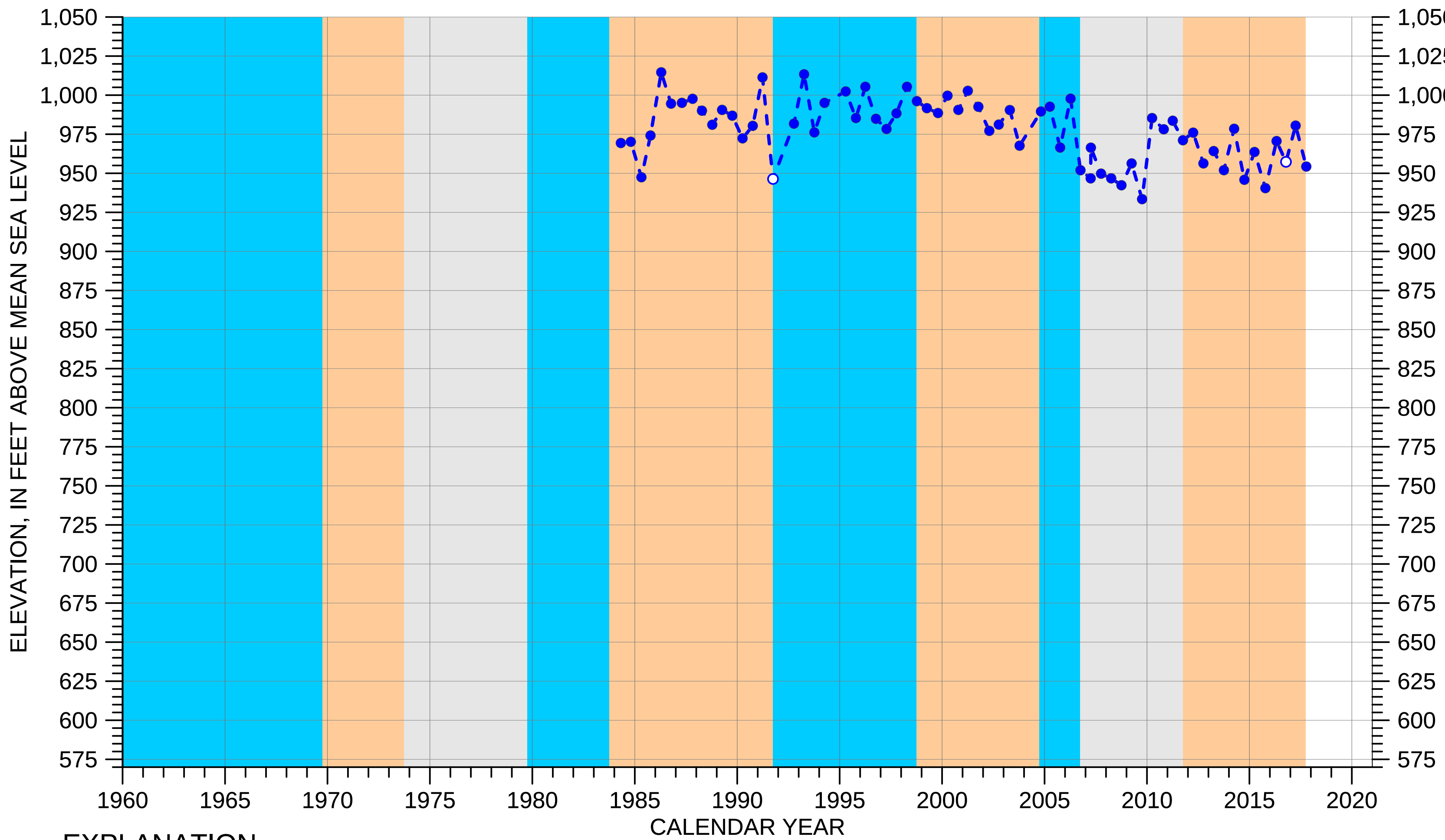
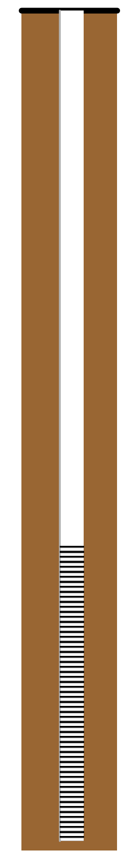




EXPLANATION

GROUNDWATER ELEVATION

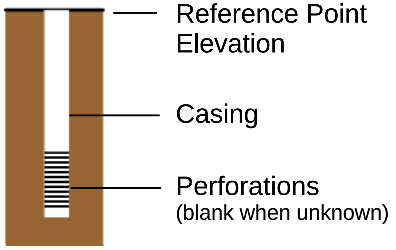
MEASUREMENT NOT VERIFIED*

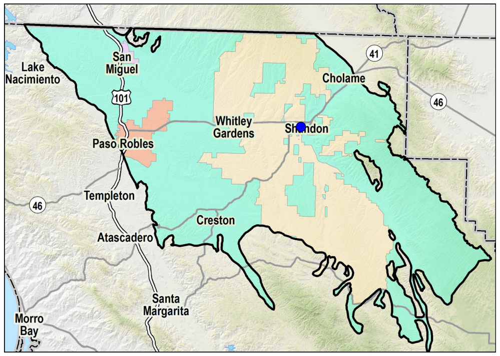
CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET

Well Depth: 461 feet
Screened Interval: 297-461 feet below ground surface
Reference Point Elevation: 1036.36 feet above mean sea level

* Measurement reported as not static





MEASURED WATER LEVELS FOR 26S/15E-20B04

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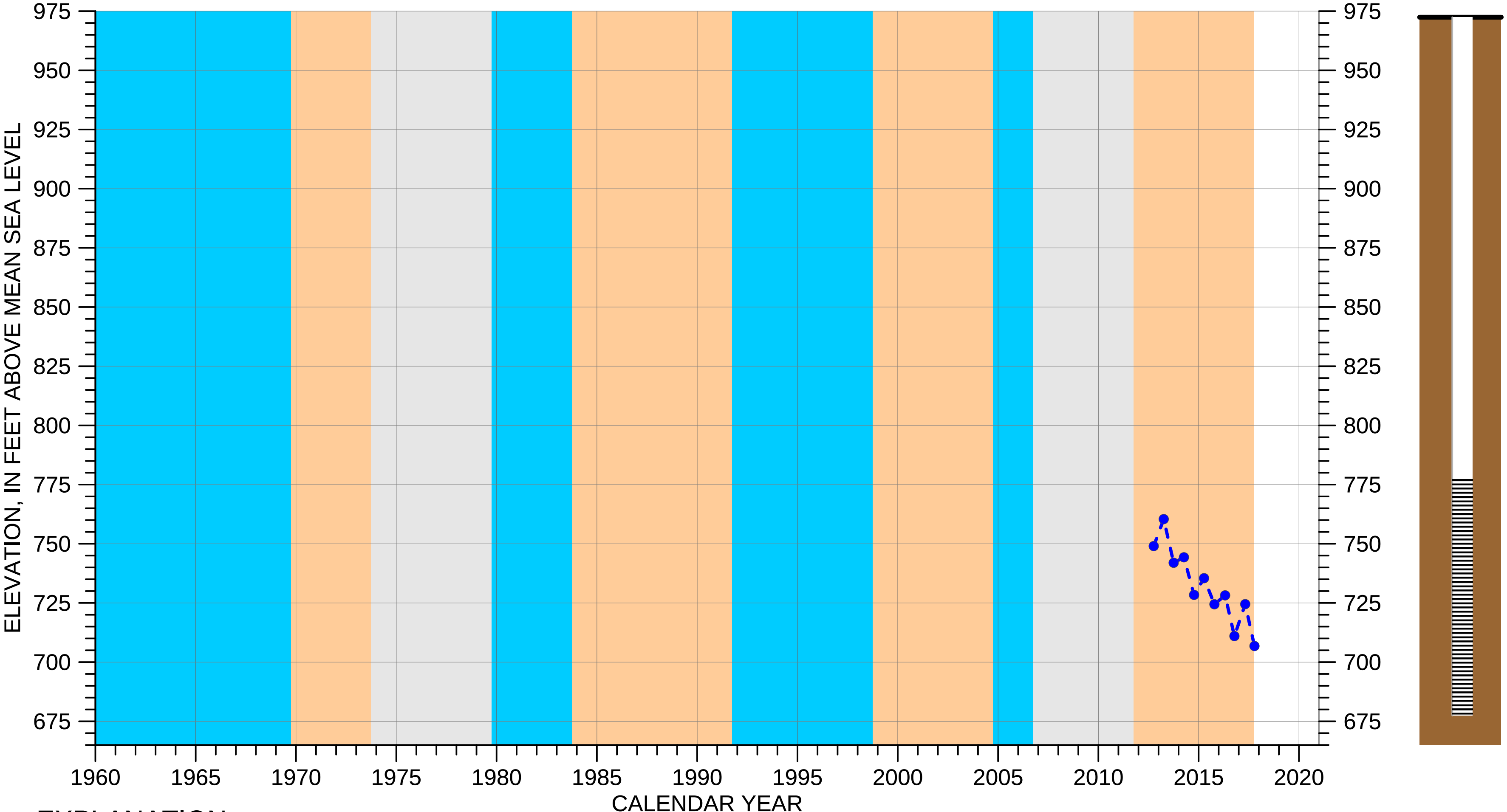


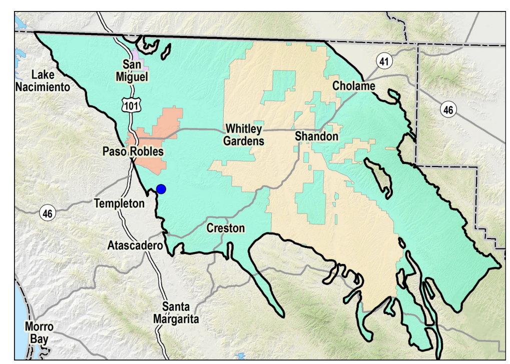
EXPLANATION

GROUNDWATER ELEVATION

MEASUREMENT NOT VERIFIED*

CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET



Well Depth: 295 feet
Screened Interval: 195-295 feet below ground surface
Reference Point Elevation: 972.4 feet above mean sea level

* Measurement reported as not static

MEASURED WATER LEVELS FOR 27S/12E-13N01

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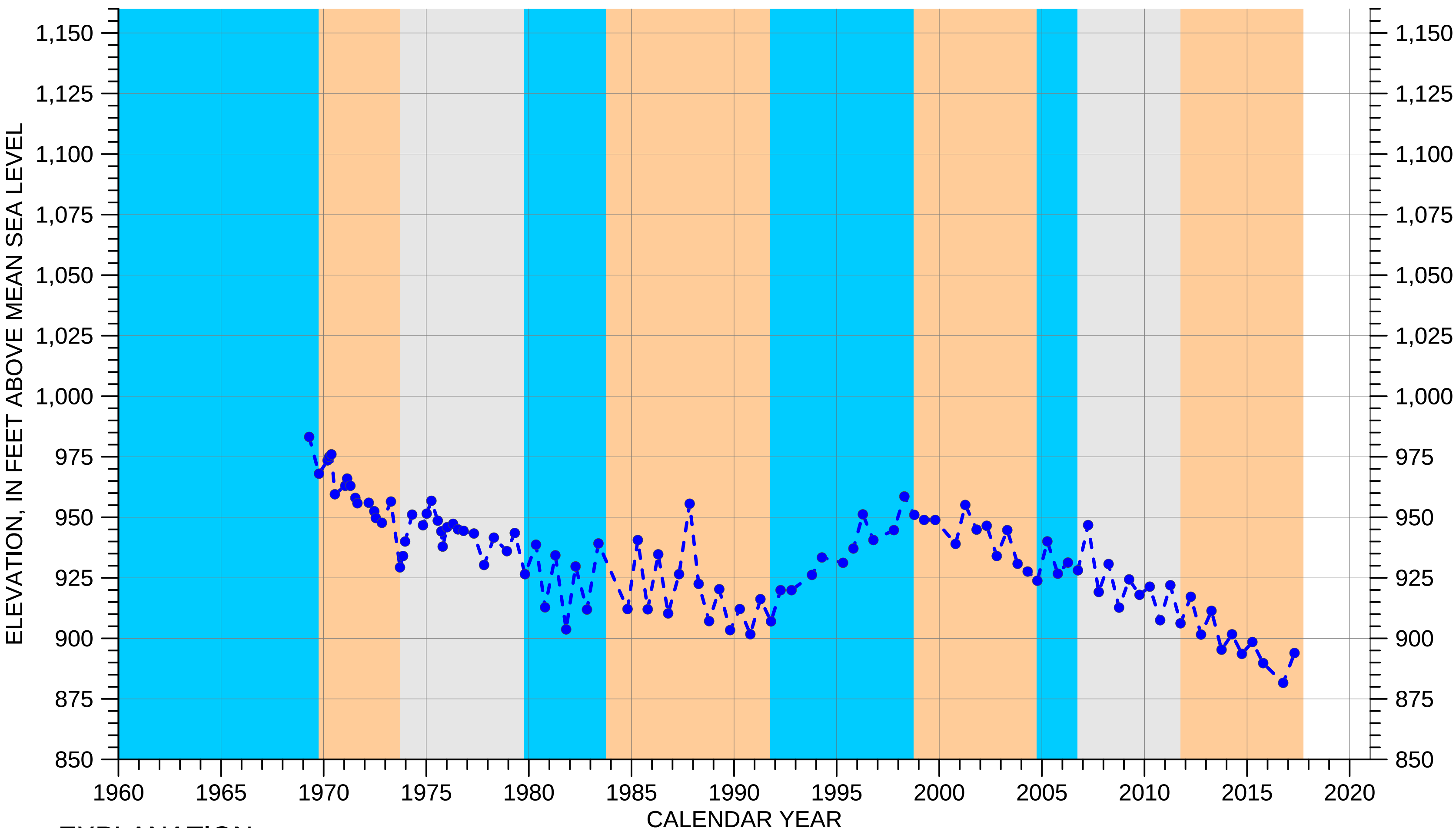
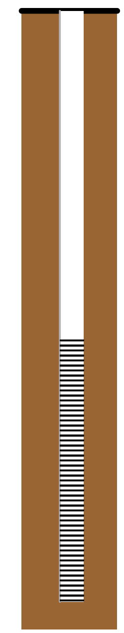




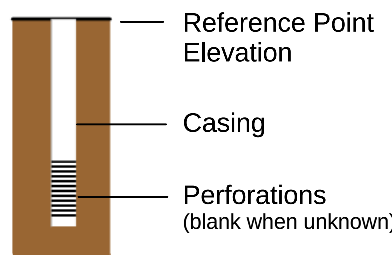
EXPLANATION

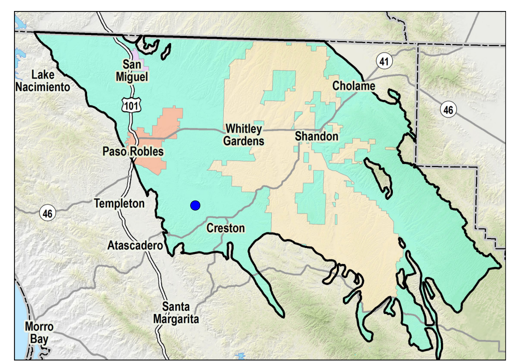
GROUNDWATER ELEVATION

MEASUREMENT NOT VERIFIED*

CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET



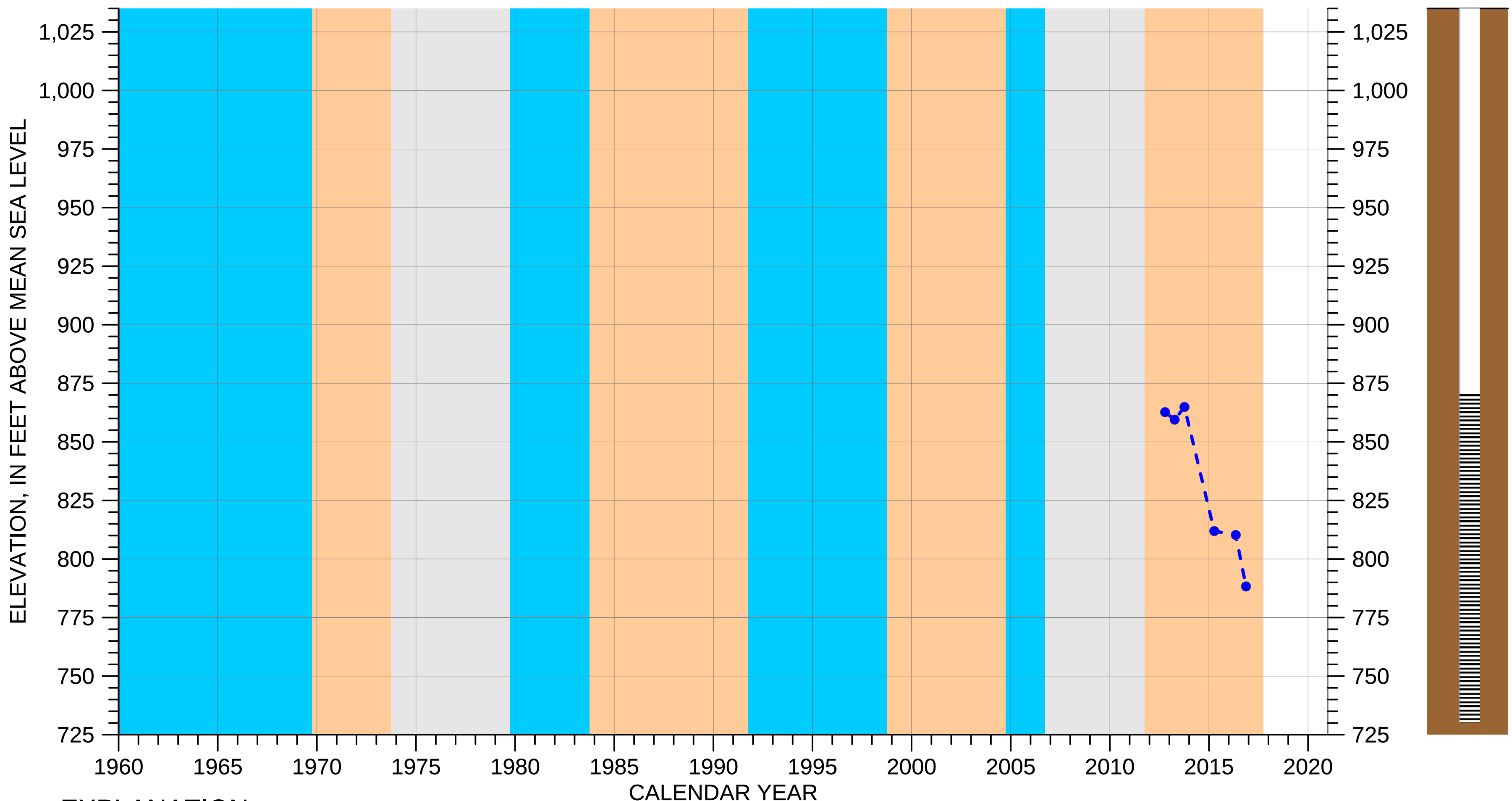


Well Depth: 212 feet
Screened Interval: 118-212 feet below ground surface
Reference Point Elevation: 1072 feet above mean sea level

* Measurement reported as not static

MEASURED WATER LEVELS FOR 27S/13E-28F01

S:\projects\9200_Paso Robles GSP\GSP\Ch 9-10 Coordination Effort\Ch 9\Appendices\AppendixJ_SimulatedHydrographs\grf\Observed_only_noSMC\Fig09_27S_13E-28F01.grf



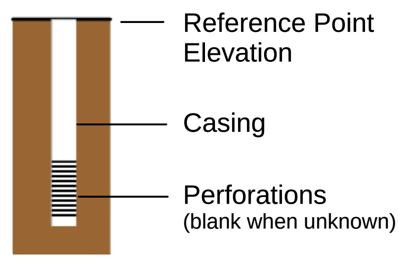
EXPLANATION

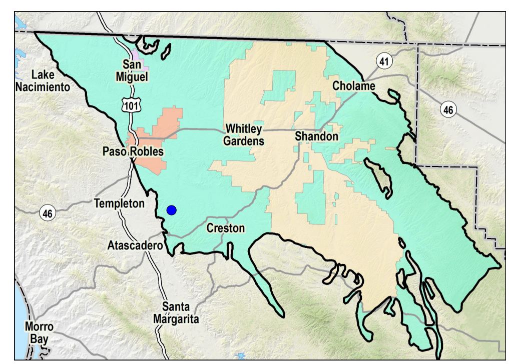
GROUNDWATER ELEVATION

MEASUREMENT NOT VERIFIED*

CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET



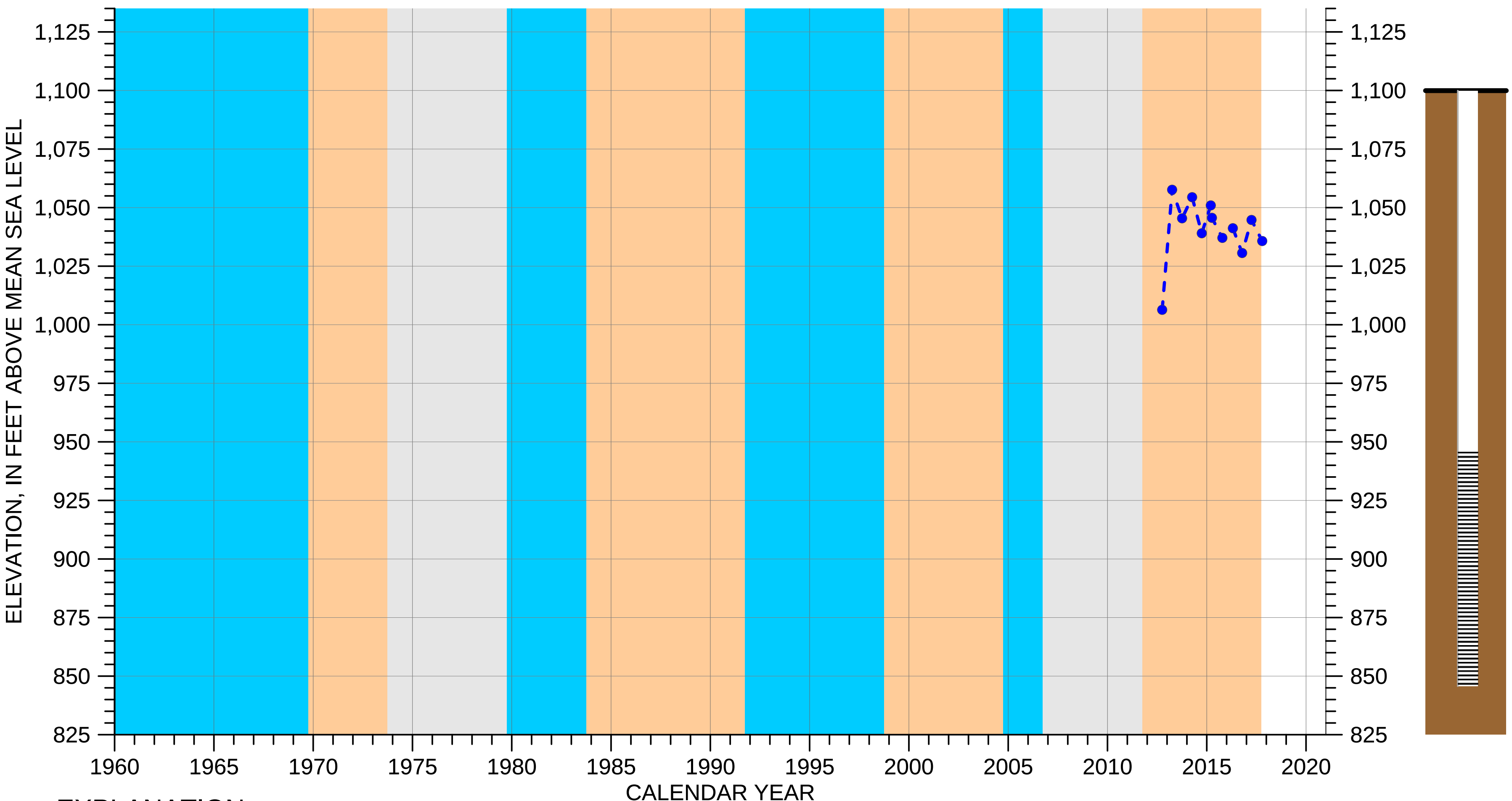


Well Depth: 355 feet
Screened Interval: 215-235, 275-355 feet below ground surface
Reference Point Elevation: 1086.7 feet above mean sea level

* Measurement reported as not static

MEASURED WATER LEVELS FOR 27S/13E-30N01

S:\projects\9200_Paso Robles GSP\GSP\Ch 9-10 Coordination Effort\Ch 9\Appendices\AppendixJ_SimulatedHydrographs\grf\Observed_only_noSMC\Fig10_27S_13E-30N01.grf



EXPLANATION

GROUNDWATER ELEVATION

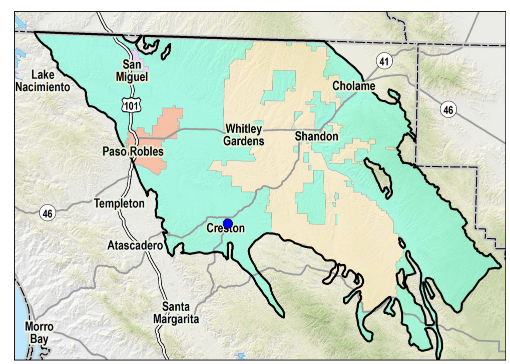
MEASUREMENT NOT VERIFIED*

CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET

Well Depth: 254 feet
Screened Interval: 154-254 feet below ground surface
Reference Point Elevation: 1099.9 feet above mean sea level

* Measurement reported as not static



MEASURED WATER LEVELS FOR 28S/13E-01B01

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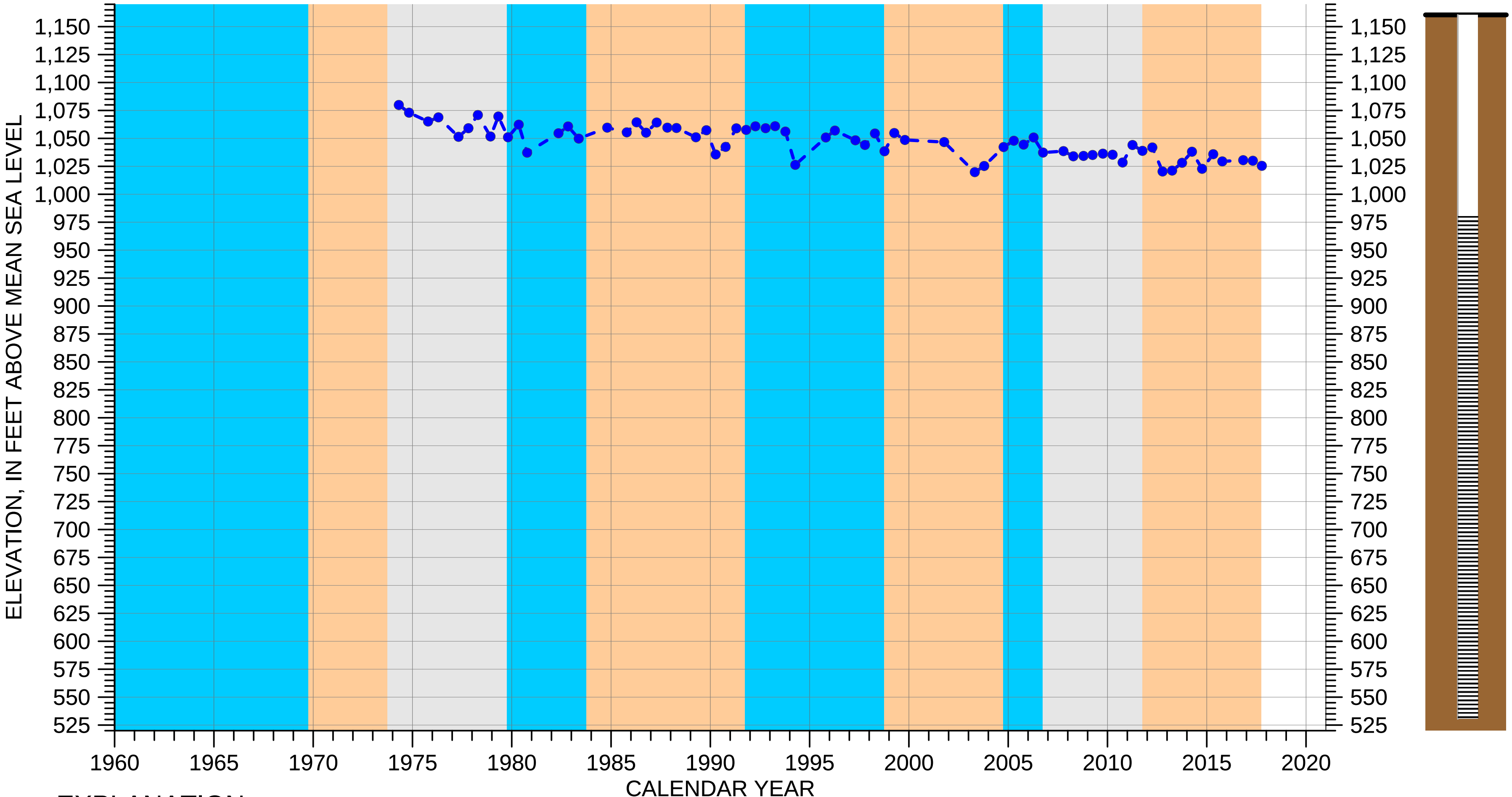


EXPLANATION

GROUNDWATER ELEVATION

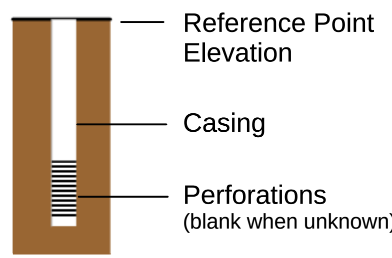
MEASUREMENT NOT VERIFIED*

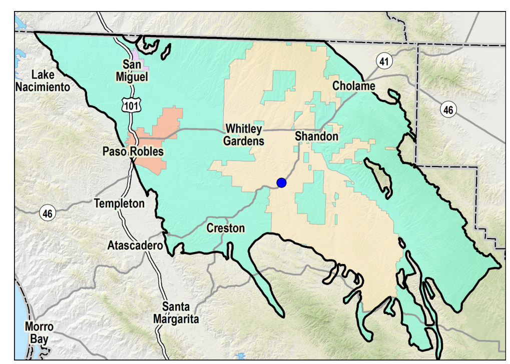
CLIMATE PERIOD CLASSIFICATION

DRY | AVERAGE/ALTERNATING | WET

Well Depth: 630
Screened Interval: 180-630 feet below ground surface
Reference Point Elevation: 1160.5 feet above mean sea level

* Measurement reported as not static





MEASURED WATER LEVELS FOR 27S/14E-11R01

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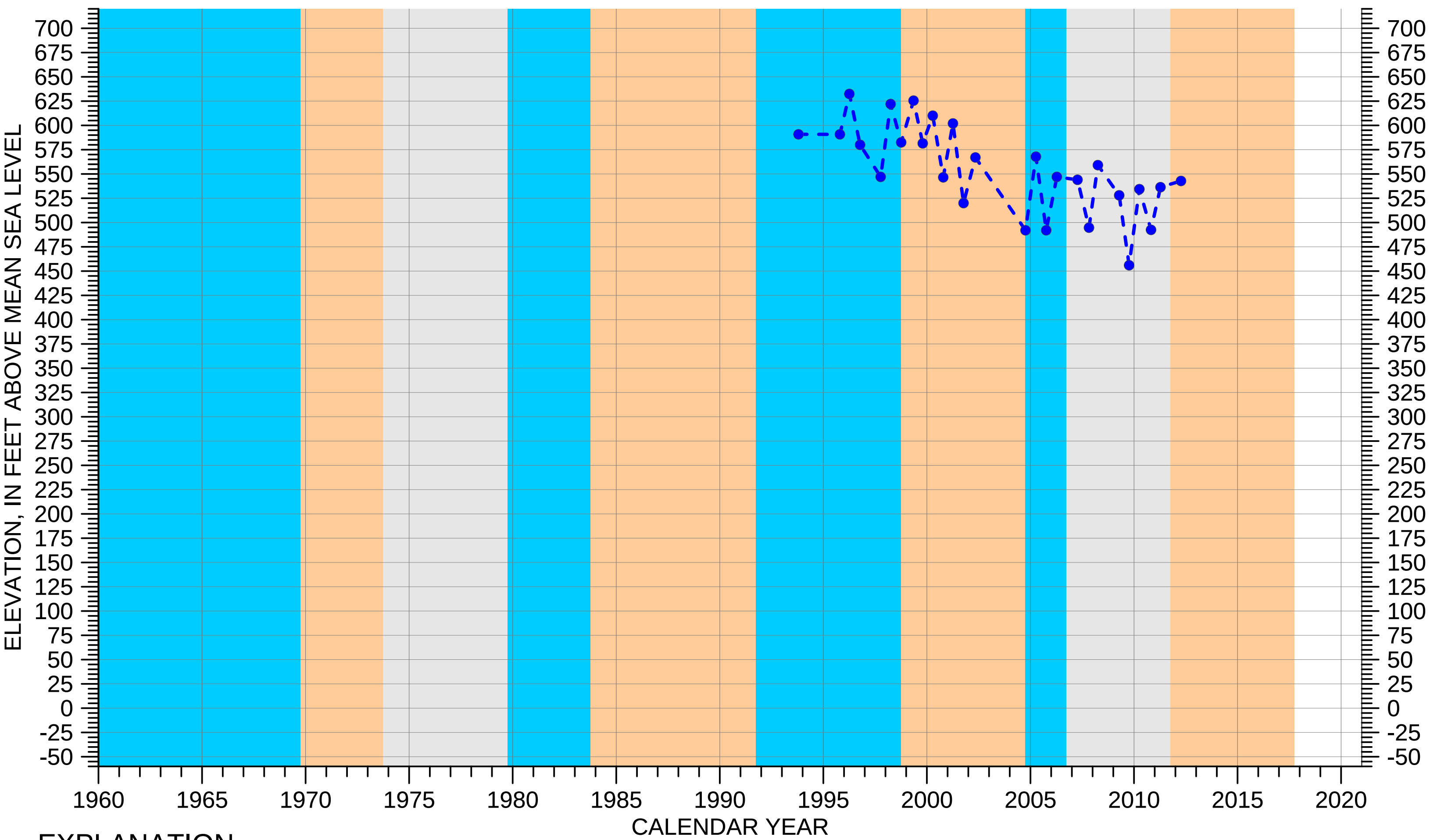


EXPLANATION

GROUNDWATER ELEVATION

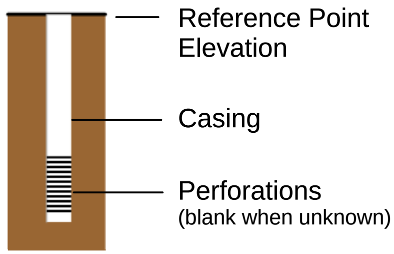
MEASUREMENT NOT VERIFIED*

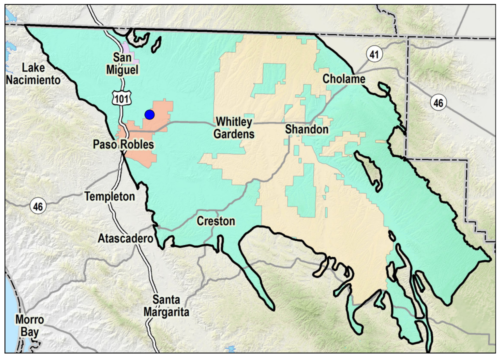
CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET

Well Depth: 840
Screened Interval: 640- ~840 feet below ground surface
Reference Point Elevation: 787 feet above mean sea level

* Measurement reported as not static





MEASURED WATER LEVELS FOR 26S/12E-14G02

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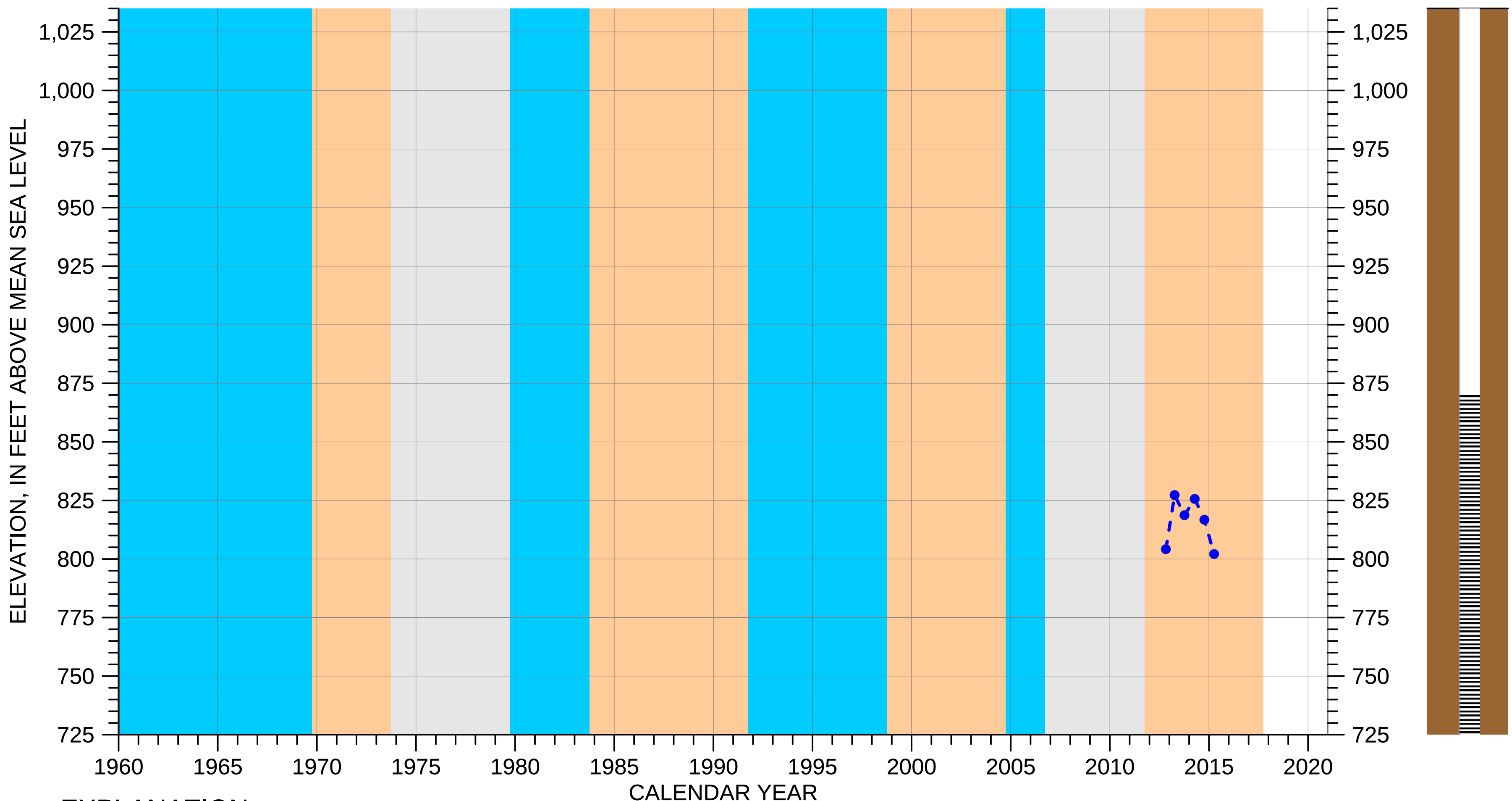


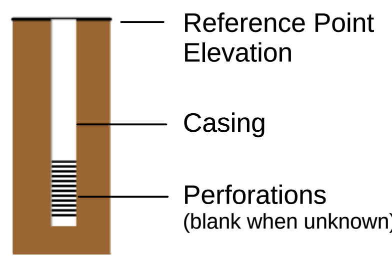
EXPLANATION

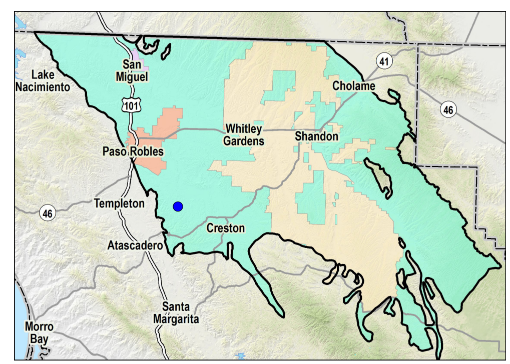
GROUNDWATER ELEVATION

MEASUREMENT NOT VERIFIED*

CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET



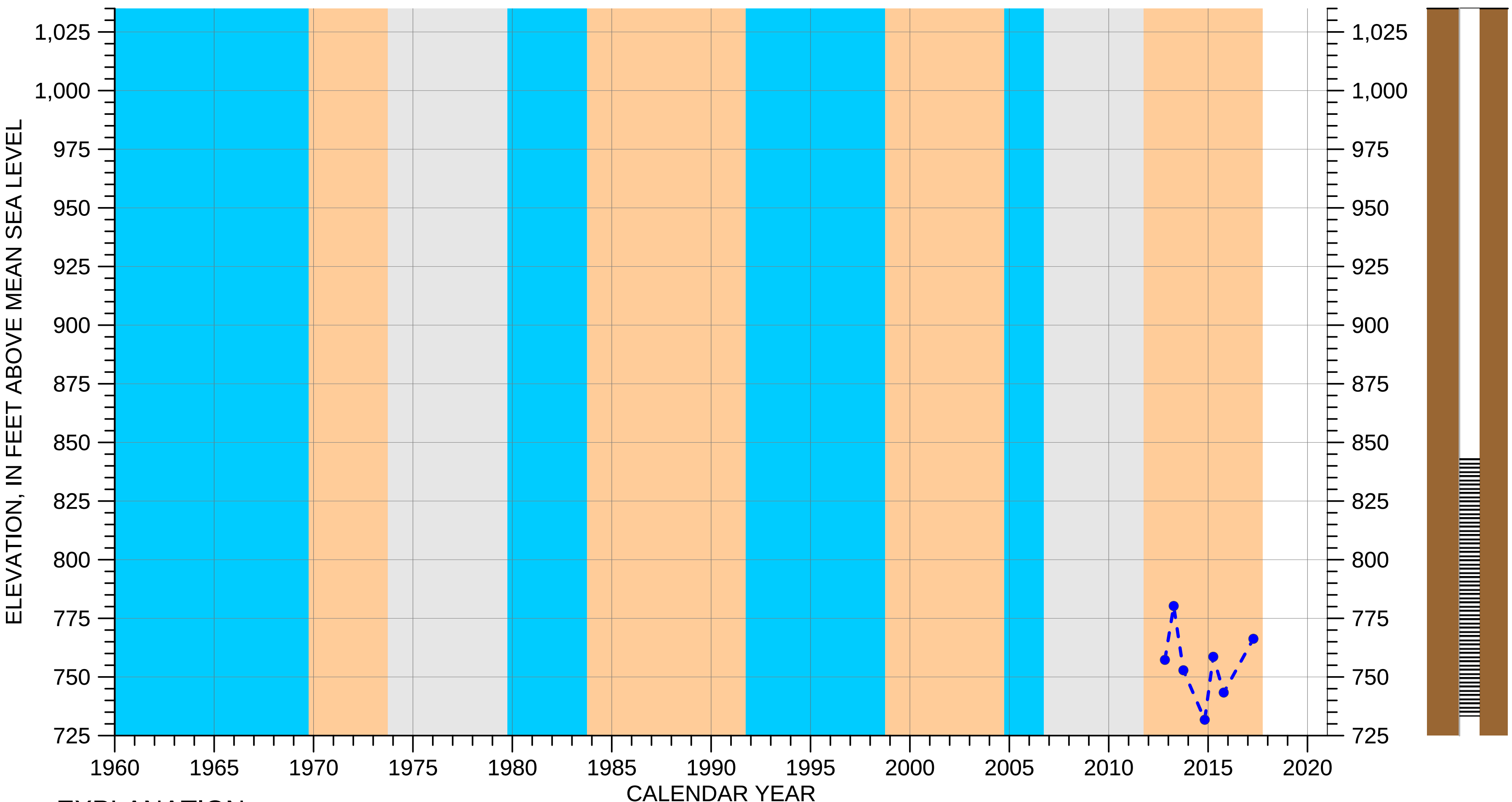


Well Depth: 685
Screened Interval: 225-685 feet below ground surface
Reference Point Elevation: 1095 feet above mean sea level

* Measurement reported as not static

MEASURED WATER LEVELS FOR 27S/13E-30J01

S:\projects\9200_Paso Robles GSP\GSP\Ch 9-10 Coordination Effort\Ch 9\Appendices\AppendixJ_SimulatedHydrographs\grf\Observed_only_noSMC\Fig13_27S_13E-30J01.grf



EXPLANATION

GROUNDWATER ELEVATION

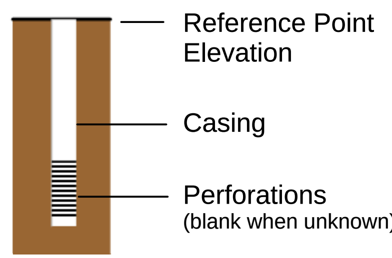
MEASUREMENT NOT VERIFIED*

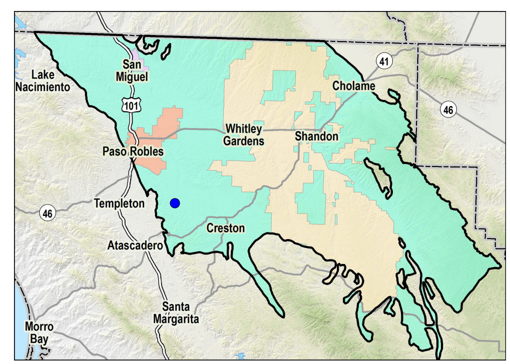
CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET

Well Depth: 310
Screened Interval: 200-310 feet below ground surface
Reference Point Elevation: 1043.2 feet above mean sea level

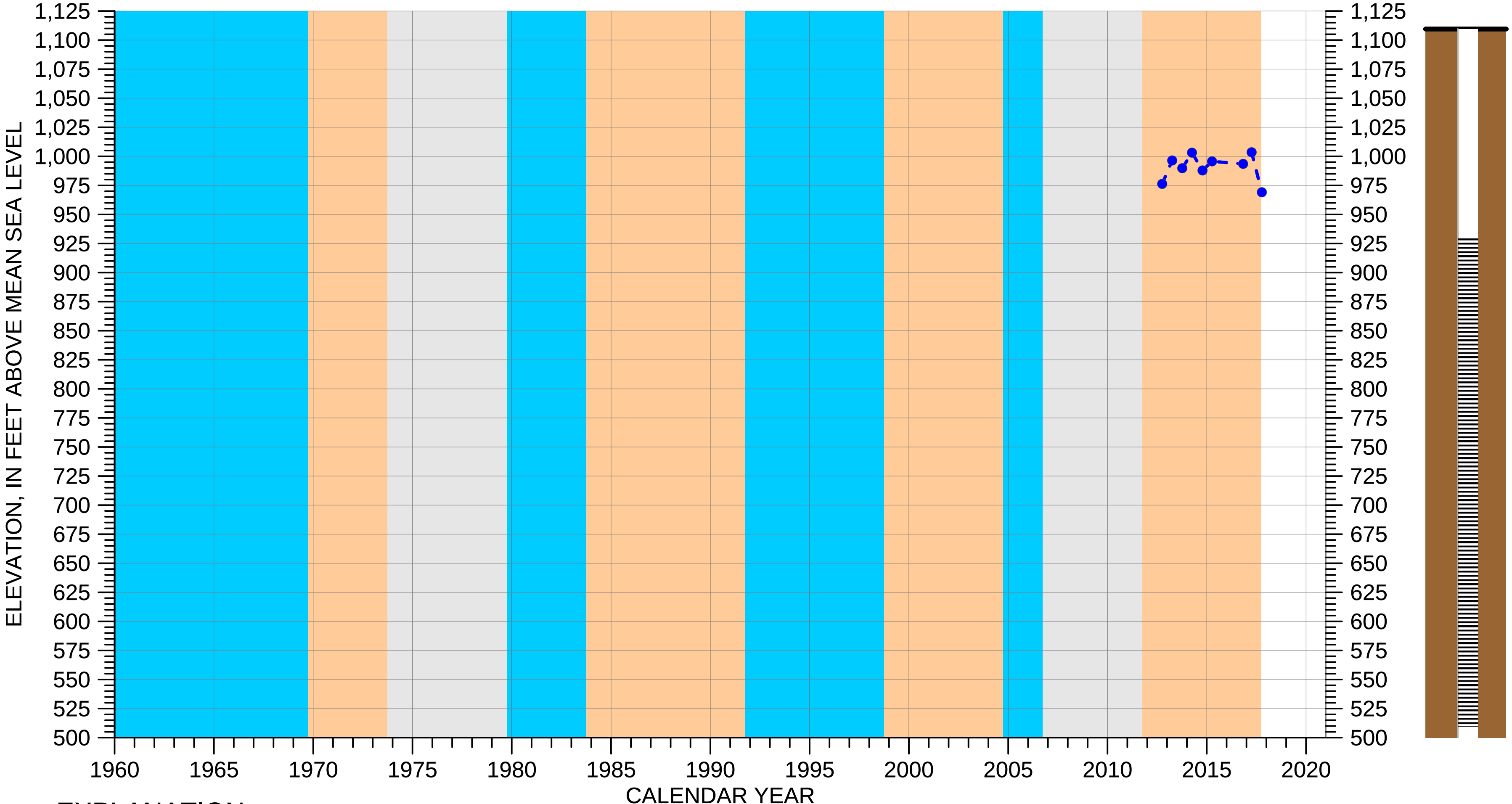
* Measurement reported as not static





MEASURED WATER LEVELS FOR 27S/13E-30F01

S:\projects\9200_Paso Robles GSP\GSP\Ch 9-10 Coordination Effort\Ch 9\Appendices\AppendixJ_SimulatedHydrographs\grf\Observed_only_noSMC\Fig14_27S_13E-30F01.grf



EXPLANATION

GROUNDWATER ELEVATION

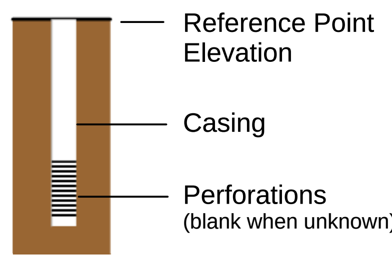
MEASUREMENT NOT VERIFIED*

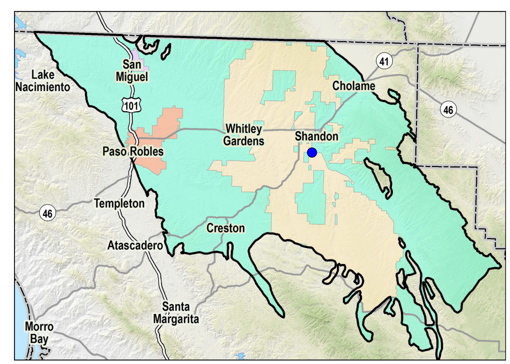
CLIMATE PERIOD CLASSIFICATION

DRY   AVERAGE/ALTERNATING   WET

Well Depth: 600
Screened Interval: 180-600 feet below ground surface
Reference Point Elevation: 1109.5 feet above mean sea level

* Measurement reported as not static





MEASURED WATER LEVELS FOR 26S/15E-29R01

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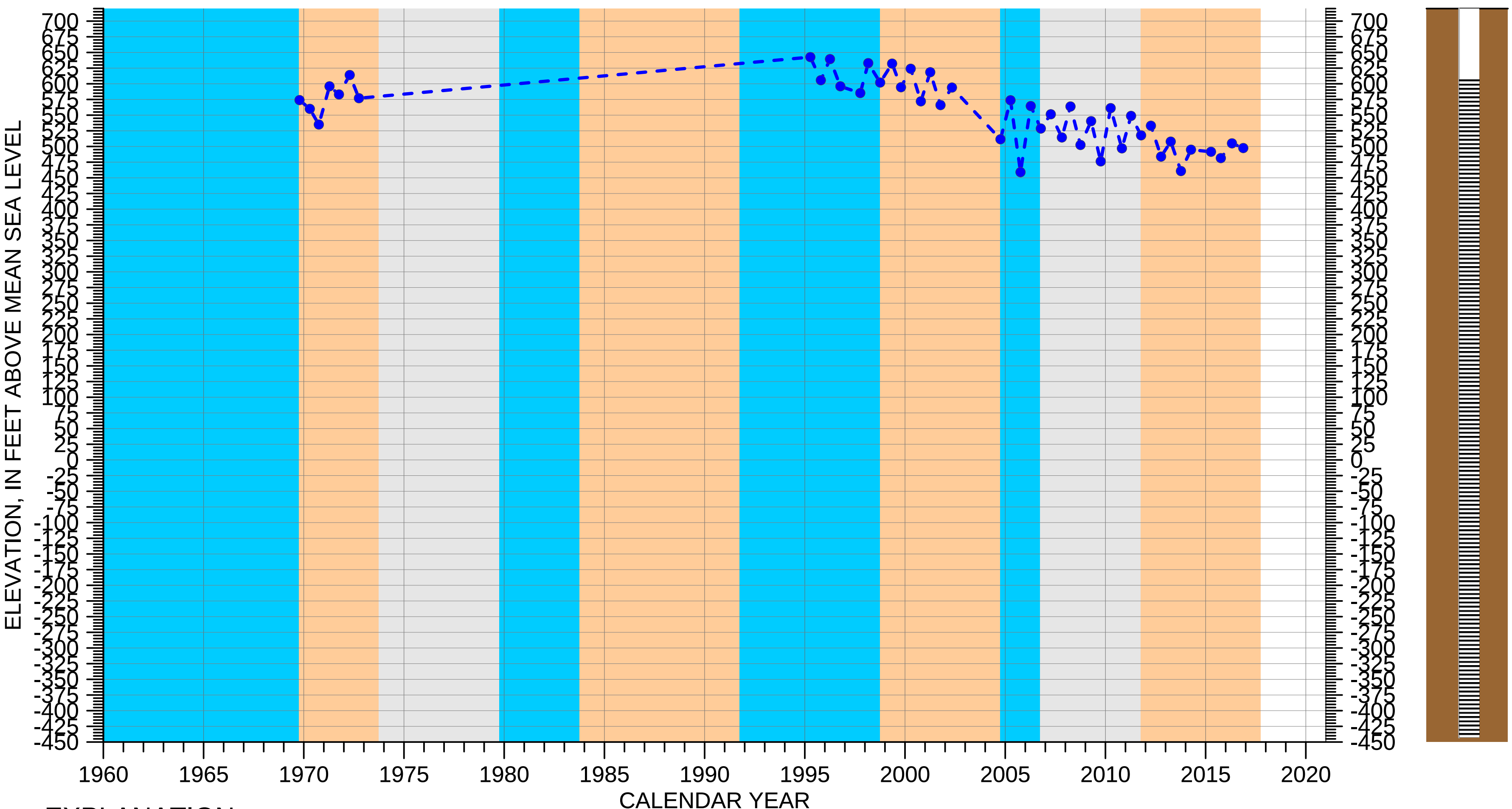


EXPLANATION

GROUNDWATER ELEVATION

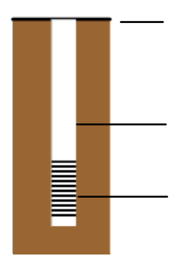
MEASUREMENT NOT VERIFIED*

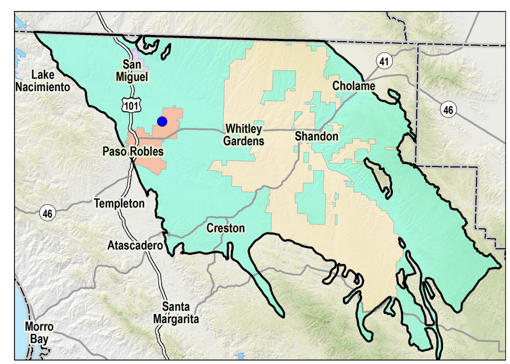
CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET

Well Depth: 1230
Screened Interval: 180-~1230 feet below ground surface
Reference Point Elevation: 790 feet above mean sea level

* Measurement reported as not static





MEASURED WATER LEVELS FOR 26S/12E-14H01

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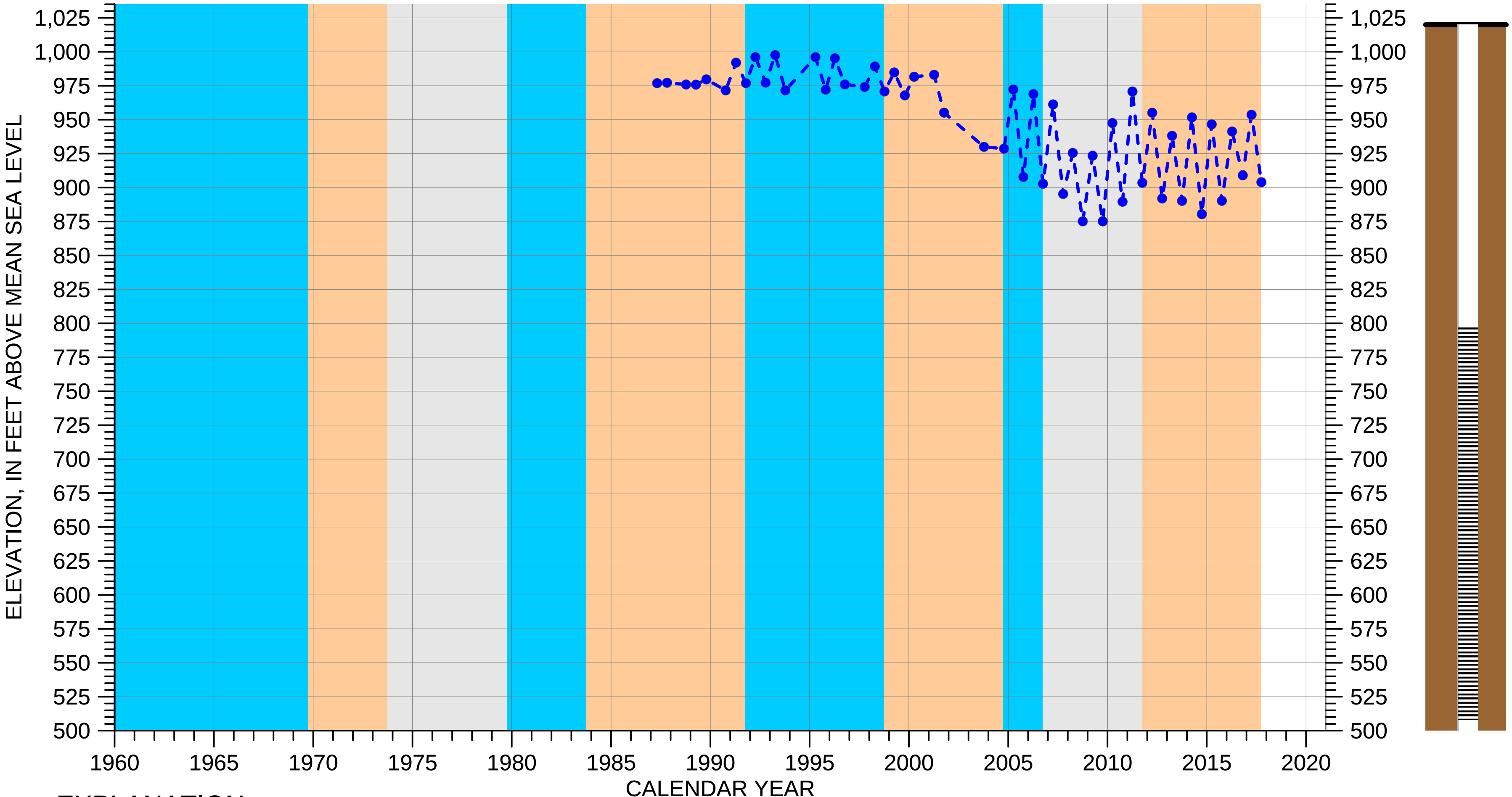


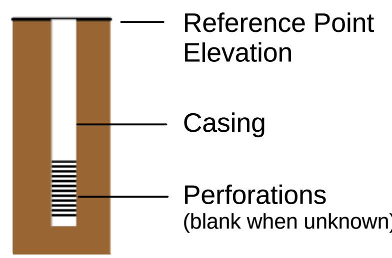
EXPLANATION

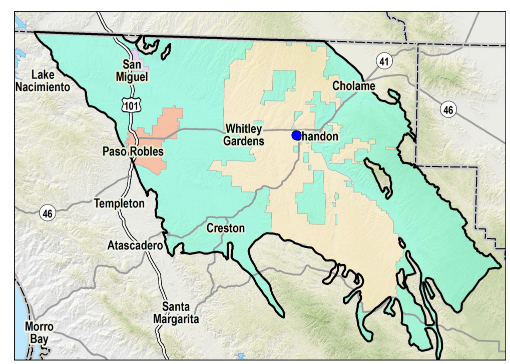
GROUNDWATER ELEVATION

MEASUREMENT NOT VERIFIED*

CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET



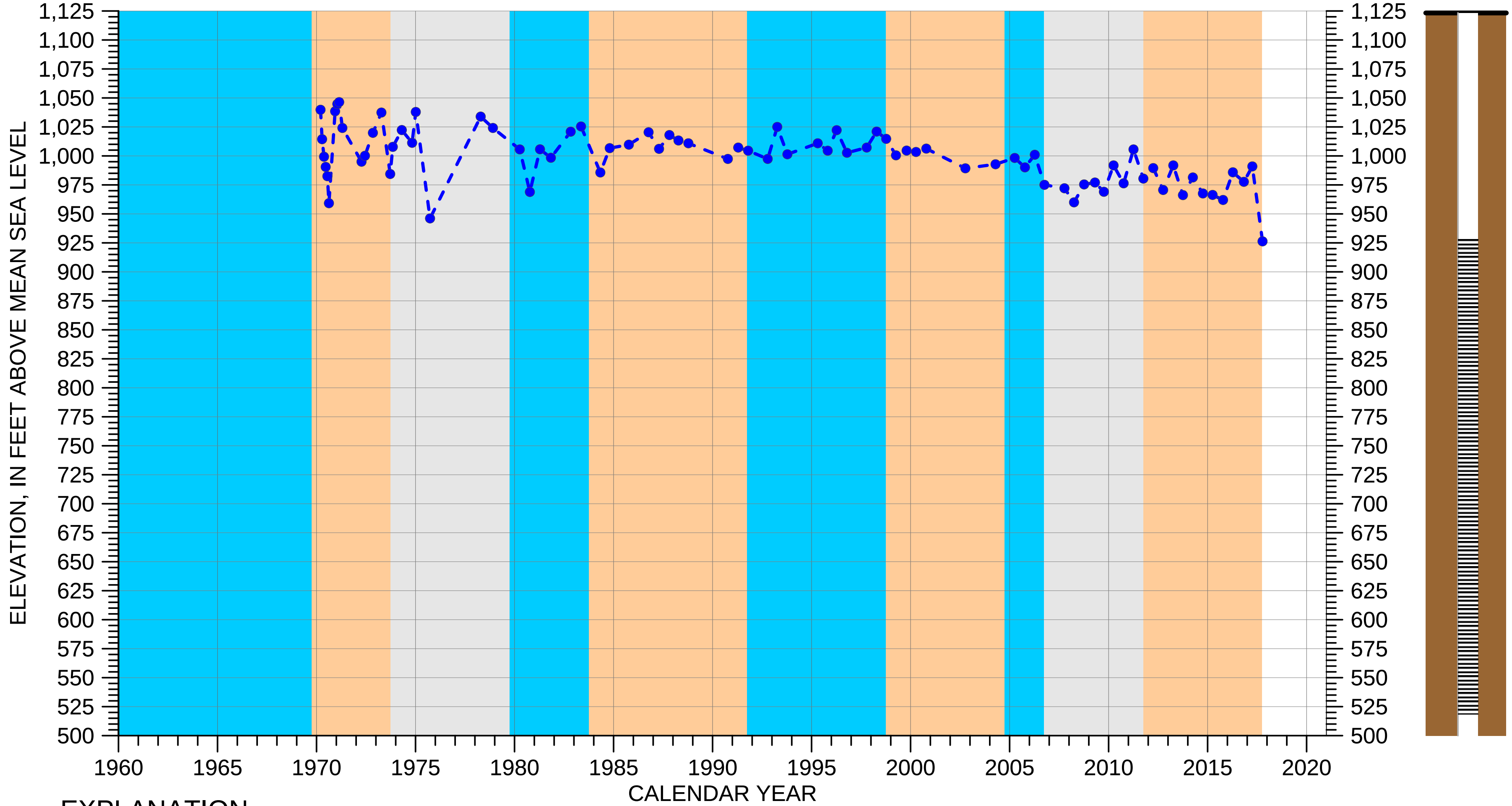


Well Depth: 512
Screened Interval: 223-512 feet below ground surface
Reference Point Elevation: 1020 feet above mean sea level

* Measurement reported as not static

MEASURED WATER LEVELS FOR 26S/15E-19E01

S:\projects\9200_Paso Robles GSP\GSP\Ch 9-10 Coordination Effort\Ch 9\Appendices\AppendixJ_SimulatedHydrographs\grf\Observed_only_noSMC\Fig17_26S_15E-19E01.grf



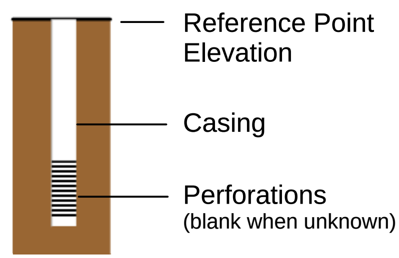
EXPLANATION

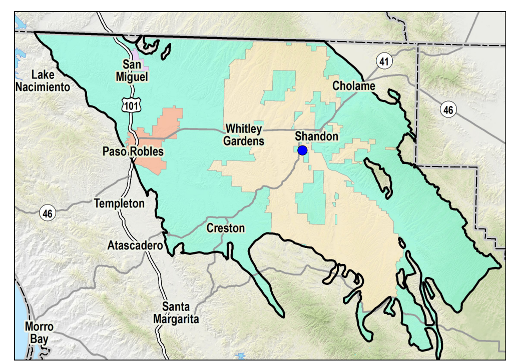
GROUNDWATER ELEVATION

MEASUREMENT NOT VERIFIED*

CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET



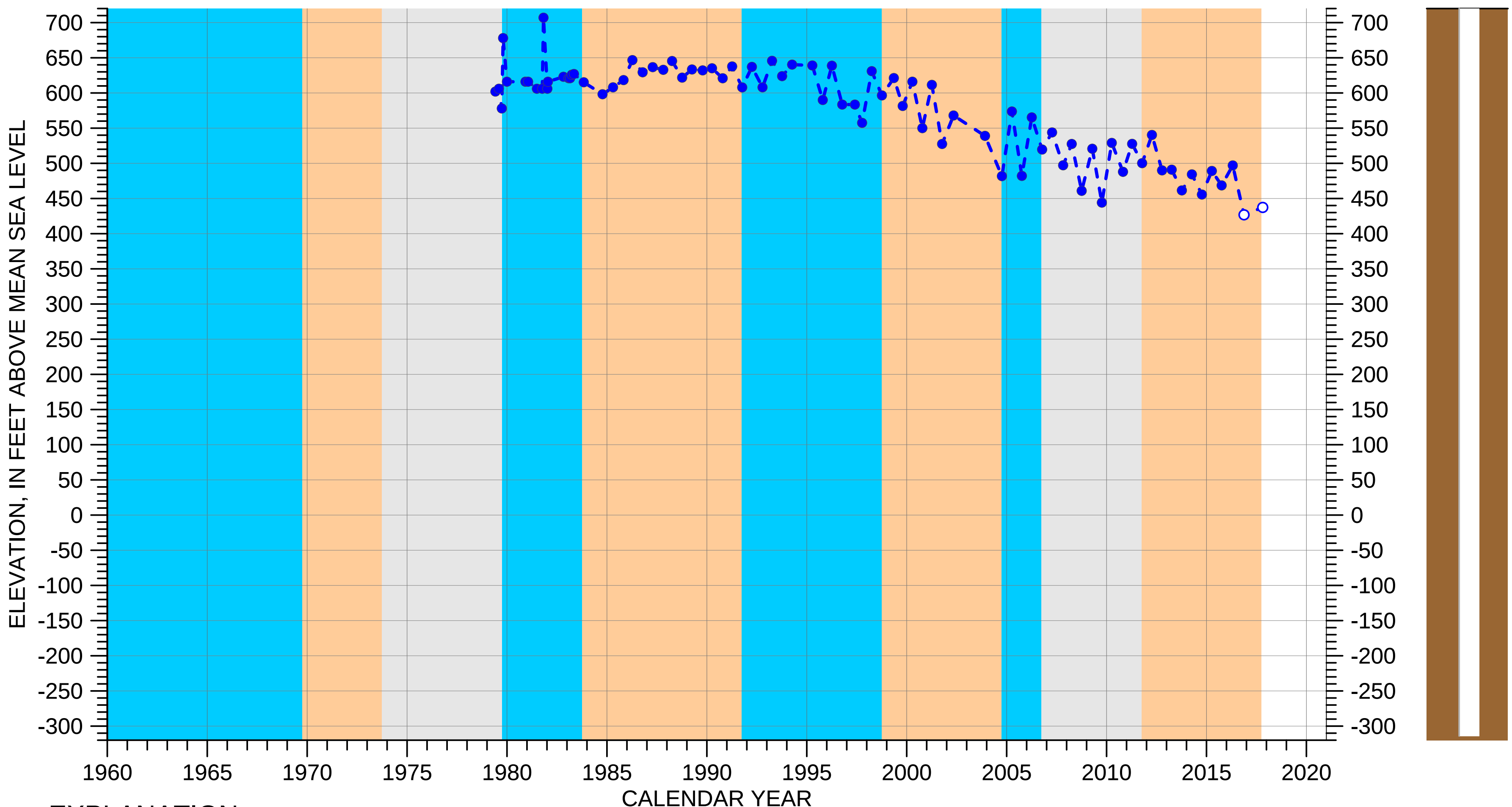


Well Depth: 605
Screened Interval: 195-605 feet below ground surface
Reference Point Elevation: 1123.3 feet above mean sea level

* Measurement reported as not static

MEASURED WATER LEVELS FOR 26S/15E-30J01

S:\projects\9200_Paso Robles GSP\GSP\Ch 9-10 Coordination Effort\Ch 9\Appendices\AppendixJ_SimulatedHydrographs\grf\Observed_only_noSMC\Fig18_26S_15E-30J01.grf



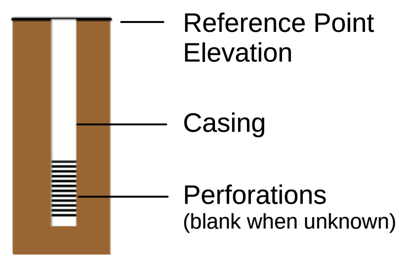
EXPLANATION

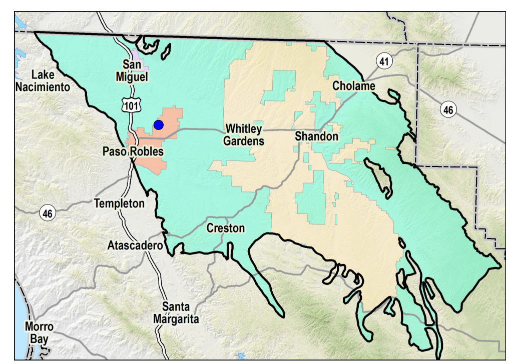
GROUNDWATER ELEVATION

MEASUREMENT NOT VERIFIED*

CLIMATE PERIOD CLASSIFICATION

DRY | AVERAGE/ALTERNATING | WET





Well Depth: 1100
Screened Interval: unknown
Reference Point Elevation: 786 feet above mean sea level

* Measurement reported as not static

MEASURED WATER LEVELS FOR 26S/12E-14K01

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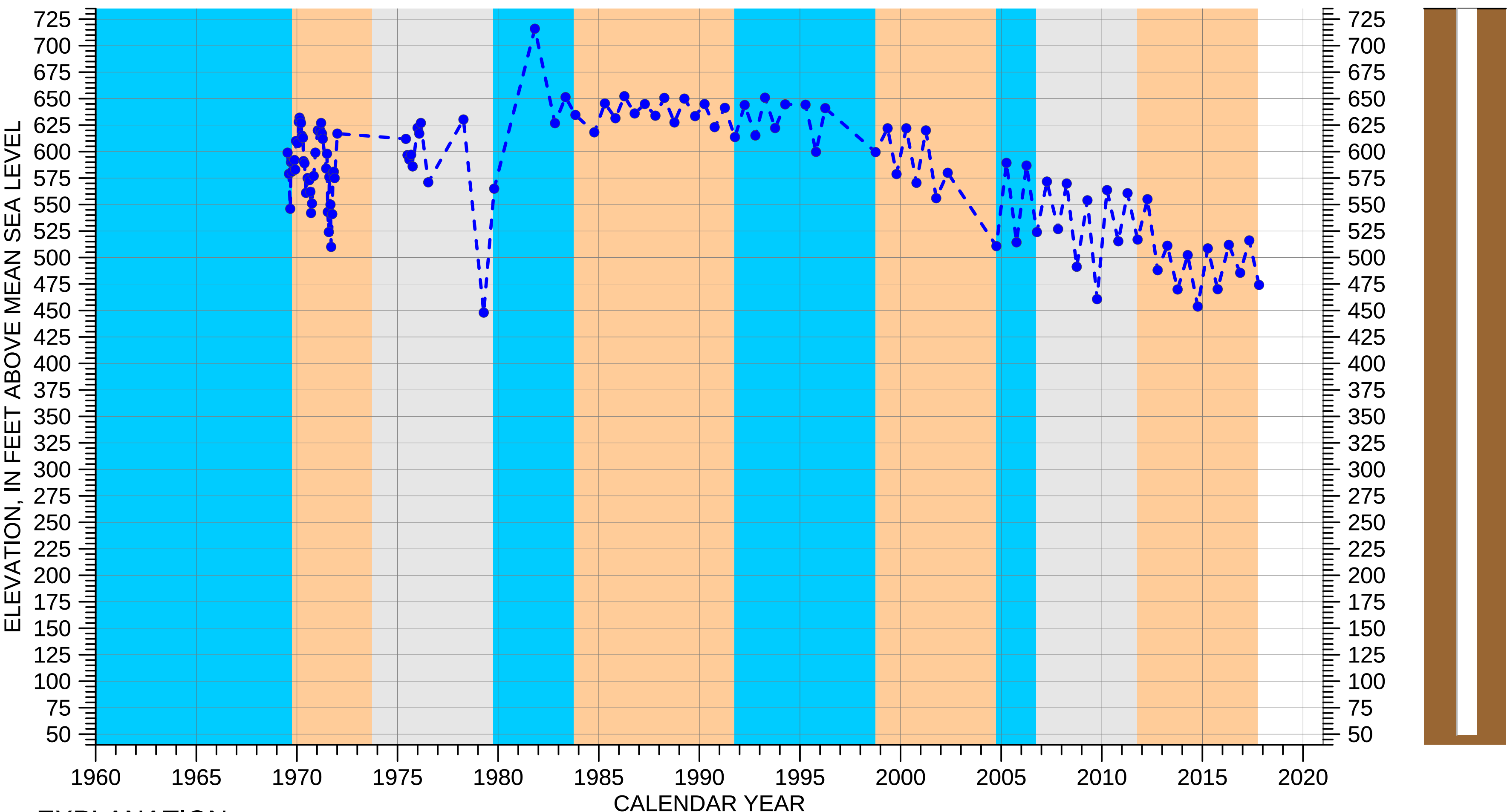


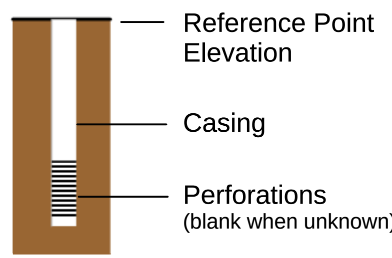
EXPLANATION

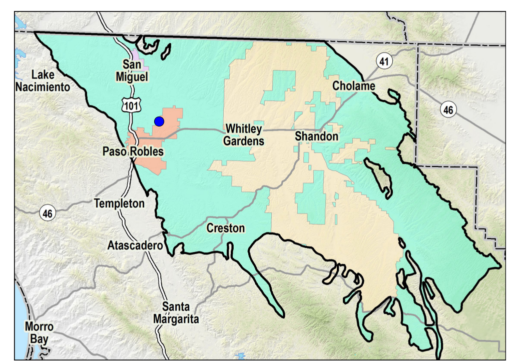
GROUNDWATER ELEVATION

MEASUREMENT NOT VERIFIED*

CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET



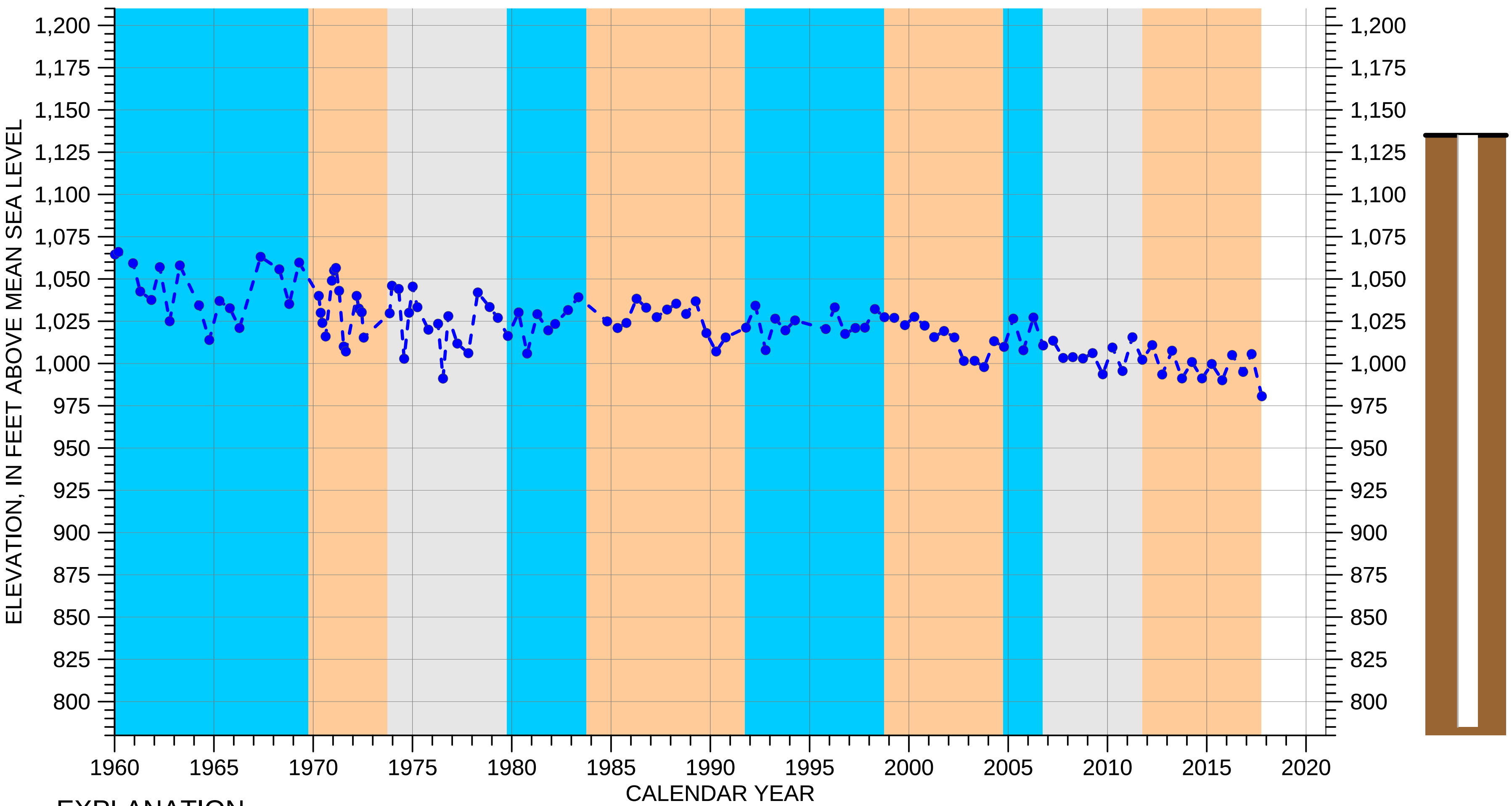


Well Depth: 740
Screened Interval: unknown
Reference Point Elevation: 789.3 feet above mean sea level

* Measurement reported as not static

MEASURED WATER LEVELS FOR 26S/12E-14G01

S:\projects\9200_Paso Robles GSP\GSP\Ch 9-10 Coordination Effort\Ch 9\Appendices\AppendixJ_SimulatedHydrographs\grf\Observed_only_noSMC\Fig20_26S_12E-14G01.grf



EXPLANATION

GROUNDWATER ELEVATION

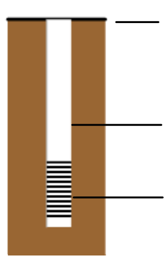
MEASUREMENT NOT VERIFIED*

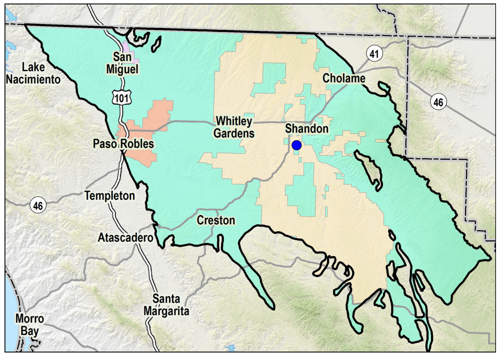
CLIMATE PERIOD CLASSIFICATION

DRY AVERAGE/ALTERNATING WET

Well Depth: 350
Screened Interval: unknown
Reference Point Elevation: 1135 feet above mean sea level

* Measurement reported as not static





MEASURED WATER LEVELS FOR 26S/15E-29N01

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Appendix E

Summary of Model Update and Modifications

Appendix E. Summary of Model Update and Modifications

LIST OF FIGURES

LIST OF TABLES

E1 INTRODUCTION

This appendix briefly summarizes modeling work done for the GSP. A hydrologic modeling platform was developed for the Paso Robles Subbasin during the period from 2005 through 2016. This modeling platform was adapted for the GSP. Modeling work conducted for the GSP included the following activities:

- Updating the platform with recent hydrologic information
- Modifying certain components of the platform to address computational issues identified during the update process
- Adapting the water budgeting process to be consistent with the new boundary of the Paso Robles Subbasin[1]. Figure E-1 of the GSP shows the new Subbasin Boundary (in green); the GSP only applies to the new Subbasin area, thus, water budgets reported in the GSP do not include areas within the former Subbasin boundary that lie north of the San Luis Obispo County Line and do not include the Atascadero Subbasin. Therefore, groundwater budgets reported in the GSP are not directly comparable to previously reported groundwater budgets.

[1] The Subbasin boundary was formally modified by the California Department of Water Resources on February 11, 2019. Information on the modified boundary can be found at https://water.ca.gov/Programs/Groundwater-Management/Basin-Boundary-Modifications.

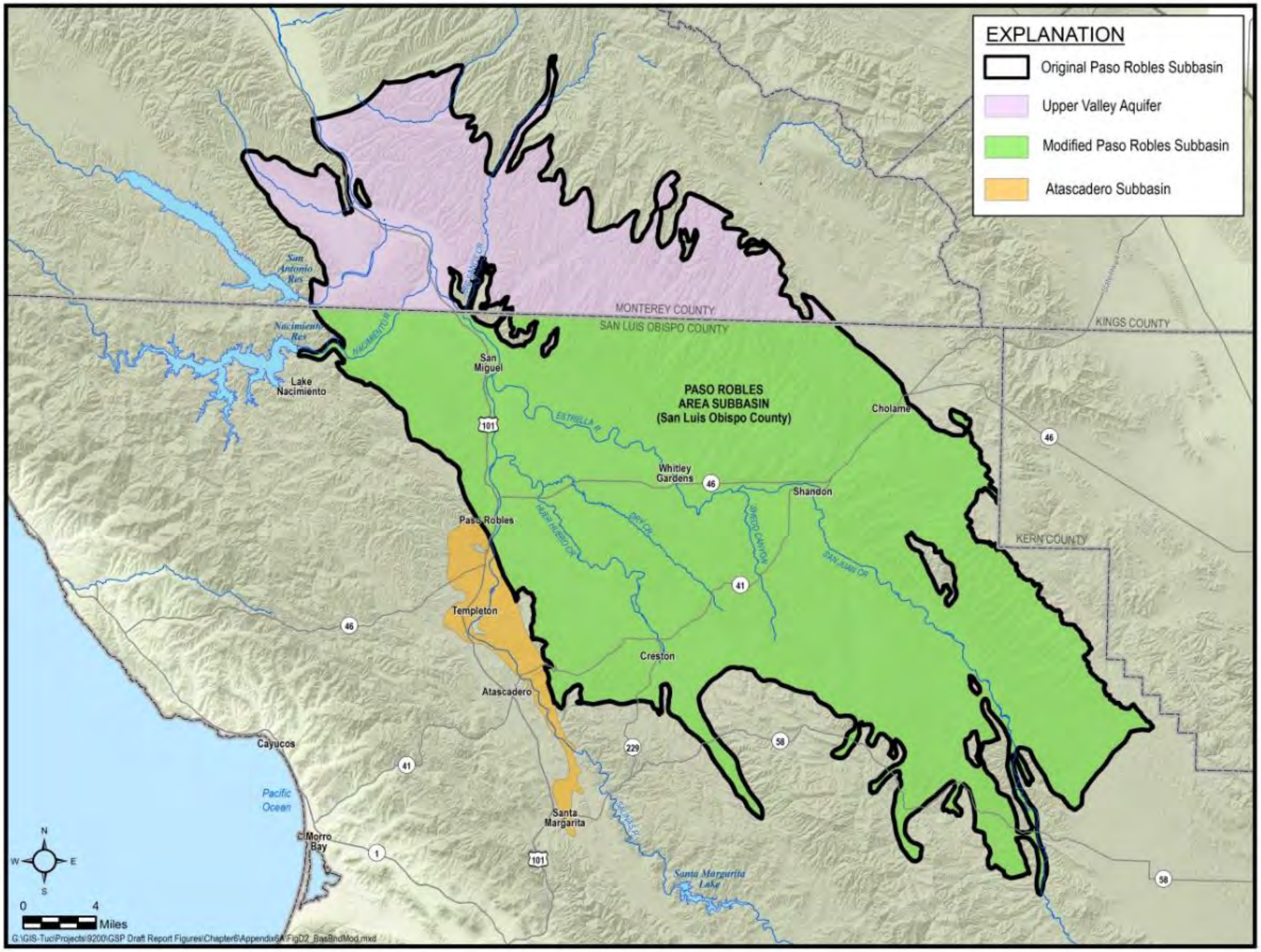

Figure E-1. Map Showing Paso Robles Subbasin Boundary

This appendix summarizes the model update process and effects of changes to the modeling platform and the change in Subbasin boundary on computed groundwater budgets, and presents a comparison between previously reported groundwater budgets and the computed groundwater budget for the GSP.

The appendix is subdivided into the following sections.

- Description of GSP Model
- Model Update
- Model Modifications
- Comparison of Groundwater Budgets

The hydrologic modeling platform includes a numerical groundwater flow model and two additional models that are used to compute groundwater model input data for streamflow, recharge, and groundwater pumping [Geoscience Support Services, Inc. (GSSI), 2014 and 2016]. The two additional models consist of a Soil Water Balance (SWB) spreadsheet model and a surface water model. The interrelationship between the groundwater model, SWB model, and surface water model are shown on Figure E-2. Hereafter in this appendix, the original hydrologic modeling platform developed by GSSI is referred to as "the GSSI model."

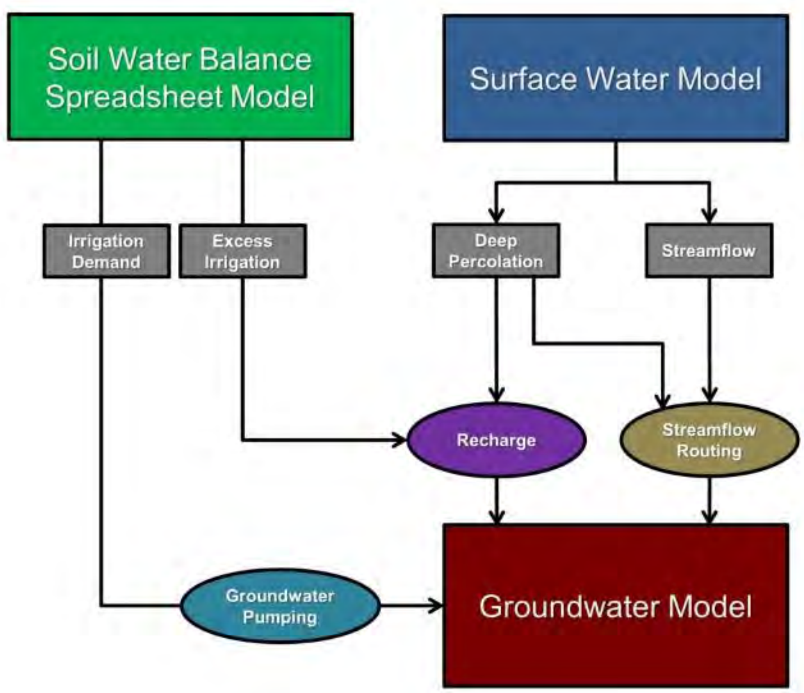

Figure E-2. Schematic for Modeling Platform

The GSSI model was updated for the GSP. The model update process included compiling hydrologic data and preparing model input files to extend the simulation time period from 2012 through 2016. Model modifications included changes to model structure, input/output processing routines, and model assumptions. Modifications were made to address issues that had a potentially significant impact on the computed water budget and groundwater storage deficit. These modifications were made to develop an updated estimate of the groundwater storage deficit that must be addressed during implementation of the GSP.

As was planned from the outset of GSP development, and to meet critical deadlines, the GSP model was not recalibrated. In lieu of recalibration, a focused comparison of model-projected and observed groundwater elevations at wells and stream flows at selected stream gages was conducted. Results of this comparison indicated that the calibration of the GSP model was similar to the GSSI model, thus, the model was considered appropriate for use on the GSP. The GSP model will be recalibrated in the future when additional hydrogeologic data are available.

E1.1 Overview of Differences in Computed Sustainable Yield

Previous and current estimates of sustainable yield of the Subbasin were computed using the modeling platform. Both the model modifications and the change in Subbasin boundary influence the computed sustainable yield. Over the historical base period from 1981 through 2011, the computed sustainable yield from the 2016 GSSI model is about 89,700 acre-feet per year (AFY). This estimate of sustainable yield pertains to the original Subbasin boundary and the Atascadero Subbasin. By comparison, the computed sustainable yield for the modified Subbasin boundary from the updated GSP model is about 59,800 AFY. The difference between these two values is nearly 30,000 AFY. About 80% of this difference is due to changes in the Subbasin boundary. The remaining difference is the result of modifications made to the model components.

E2 DESCRIPTION OF GSP MODEL

E2.1 Soil Water Balance Spreadsheet Model

The SWB model uses rainfall, evapotranspiration, soil, and crop data to estimate groundwater irrigation demand for crops in the Subbasin. Irrigated crops in the Paso Robles Subbasin are assigned to seven crop categories (Carollo and others, 2012), including alfalfa, nursery, pasture, citrus, deciduous, vegetables, and vineyard. For the GSP model, geospatial crop datasets compiled by the Agricultural Commissioner's Office of San Luis Obispo County were intersected with different climate zones and soil types in both the Paso Robles Subbasin and surrounding watershed. For each of the seven crop categories, existing discrete SWB models were extended in time for each unique intersection of crop acreage, climate zone, and soil type to cover the current period (2012-2016).

The underlying structure and data requirements are identical for all of the SWB spreadsheet models, except vineyards. All of the SWB models operate on a daily time step, and require daily precipitation and reference evapotranspiration rates as input. SWB models developed for vineyards also require daily minimum temperature data to estimate frost prevention groundwater pumping during March and April.

The SWB model computes daily irrigation demand rates in inches. Groundwater pumping to satisfy the irrigation demand is higher than the actual crop demand due to excess irrigation losses, which depend on assumed irrigation efficiency. The study documented by GSSI (2014) defined irrigation efficiency for each of the seven crop categories, and those efficiency values were also used in this study. The difference between groundwater pumping and crop irrigation demand is assumed to percolate past the base of the root zone, ultimately becoming groundwater recharge. This recharge is referred to as irrigation return flow in Chapter 6.

E2.2 Surface Water Model

A surface water model was developed by GSSI (2014) for the watershed contributing to the Paso Robles Subbasin. The surface water model was developed using the Hydrologic Simulation Program – Fortran (HSPF) code. The model simulates land surface processes and surface water flow at the subwatershed scale (Bicknell and others, 2001). The surface water model simulates daily time steps, and requires daily precipitation, reference evapotranspiration, and reservoir releases as input. Historical watershed simulations developed by GSSI (2014) used land use data for 1985, 1997, and 2011 in the surface water model. The 2011 land use data were used to update the GSP model.

The surface water model simulates deep percolation of precipitation past the base of the root zone and streamflow leaving the outlet of each subwatershed. The amount of deep percolation of precipitation computed by the surface water model was included in the recharge assigned to the groundwater model, and simulated streamflow at the subwatershed outlet was used to compute surface flow rates for stream segments simulated in the groundwater model.

E2.3 Groundwater Model

The groundwater flow model for the Paso Robles Subbasin uses the MODFLOW-2005 code (GSSI, 2014 and 2016). The extent and structure of the GSSI model are based on an earlier version of the groundwater flow model developed by Fugro (2005). Groundwater inflows simulated in the model include areal recharge, subsurface inflow at the model boundaries, and streambed percolation. Areal recharge includes both recharge from precipitation and irrigation return flow. Groundwater outflows simulated in the model include subsurface flow out of the Subbasin, groundwater pumping, and riparian evapotranspiration.

Areal recharge and subsurface inflow are computed based on excess irrigation from the SWB model and deep percolation of precipitation from the surface water model. Streambed percolation depends on both simulated water table elevation and simulated streamflow, which in turn is based on simulated streamflow from the surface water model. Agricultural groundwater pumping is specified based on irrigation demand computed in the SWB model.

E3 MODEL UPDATE

SGMA regulations require estimation of surface water and groundwater budgets for both a historical base period and current period. For the Subbasin, the historical base period covers Water Years (WY) 1981 through 2011 and the current period covers WY 2012 through 2016. The existing model covers only the historical base period (GSSI, 2014; GSSI, 2016). To comply with SGMA regulations for developing a current water budget, it was necessary to update the 2016 version of the GSSI model to include hydrologic data from 2012 through 2016.

Each of the three components of the modeling platform was updated to include the current period. Table E-1 lists datasets used for the model update, along with the source for each dataset.

Table E-1. Data Sources for Model Update

Dataset	Responsible Agency or Entity	Type of Data	Data Source
Meteorological Data			
Paso Robles Station (46730); Santa Margarita Booster Station (47933)	NOAA[1]	Daily precipitation	https://www.ncdc.noaa.gov/cdo-web/datatools/findstation
San Miguel Wolf Ranch (47867)	NOAA[1]	Daily precipitation	ftp://ftp.ncdc.noaa.gov/pub/data/hpd/auto/v2/beta/
Oak Shores WWTP (201)	San Luis Obispo County	Daily precipitation	Electronic transmittal from SLO County
Paso Robles	WWG[2]	Daily reference evapotranspiration	Electronic transmittal
Atascadero (163)	CIMIS[3]	Daily reference evapotranspiration	https://cimis.water.ca.gov/WSNReportCriteria.aspx
Hydrologic Data			
Nacimiento Reservoir	Monterey County Water Resources Agency	Daily reservoir releases	http://www.co.monterey.ca.us/government/government-links/water-resources-agency/projects-facilities/historical-data#wra
San Antonio Reservoir	Monterey County Water Resources Agency	Daily reservoir releases	http://www.co.monterey.ca.us/government/government-links/water-resources-agency/projects-facilities/historical-data#wra
Salinas Dam	San Luis Obispo County	Daily reservoir releases	https://wr.slocountywater.org/site.php?site_id=25&site=2d50a617-2e23-4efc-a9be-e3a2c4a7100b
Water Use Data			
San Miguel CSD	San Miguel CSD	Monthly groundwater pumping	Excel file (Paso_Water_Use_Tables_v7.xlsx) received from GEI Consultants on 14 June 2018; data provided to GEI by San Miguel CSD
City of Paso Robles	City of Paso Robles	Monthly groundwater pumping	Excel file (Paso_Water_Use_Tables_v7.xlsx) received from GEI Consultants on 14 June 2018; data provided to GEI by City

			of Paso Robles
Templeton CSD	Templeton CSD	Annual groundwater pumping	Water Supply Buffer Update, January 31, 2018
Atascadero MWC	Atascadero MWC	Annual groundwater pumping	Atascadero MWC Urban Water Management Plan
Small commercial pumping	N/A	Annual groundwater pumping	For pumping that started before 2010, projected based on historic use in 2016 model (linear regression trend). For water use that began in 2010; assume 1% annual increase through 2016.
Domestic pumping	N/A	Annual groundwater pumping	Projected based on historic use in 2016 model (linear regression trend).
Agricultural pumping	N/A	Annual groundwater pumping	Pumping based on groundwater demand from soil water-balance spreadsheets
Wastewater Recharge			
Wastewater recharge (all utilities)	N/A	Annual recharge to groundwater from wastewater	Projected based on rates in 2016 model (linear regression trend).
Crop Data			
San Luis Obispo County, 2013-2016	San Luis Obispo County	Geospatial data attributed with acreage and crop group	Electronic transmittal from SLO County
State of California, 2014	CA DWR[4]	Geospatial data attributed with acreage and crop group	https://gis.water.ca.gov/app/CADWRLandUseViewer/

(1) National Oceanic and Atmospheric Administration

(2) Western Weather Group

(3) California Irrigation Management Information System

(4) California Department of Water Resources

E4 MODEL MODIFICATIONS

E4.1 Modifications to Model Components

Groundwater budgets for the Subbasin were derived from the groundwater flow model, which depends on the SWB models and surface water model for key input data. During the model update process for the GSP model, several modifications were made to the individual models to improve two computational aspects of the model.

E4.1.1 Modifications to Agricultural Irrigation Routing

In the model input files developed by GSSI and provided to the GSAs by the County of San Luis Obispo, irrigation return flow was routed to the surface water model. This irrigation return flow was treated as an external lateral surface inflow to the land surface. The surface water model combines this water with all direct precipitation that was not intercepted by the crop canopy. Some of the water accumulating at the land surface becomes streamflow. The remaining water enters the soil root zone. In the GSSI model, excess irrigation return flow water accumulating in the upper and lower soil root zones was subject to evapotranspiration. However, excess irrigation return flow represents water that has moved past the root zone, and should not be subject to evapotranspiration. Thus, irrigation return flow was inadvertently subjected to soil evaporation twice. The net effect of double-counting soil evaporation was to underestimate the quantity of water that ended up as deep percolation to groundwater.

The models were modified so that irrigation return flow calculated in the SWB models was routed to groundwater recharge in the groundwater flow model instead of routed to the surface water model. As a result, areal recharge specified in the GSP model is greater than areal recharge specified in the GSSI model.

E4.1.2 Modifications to Streamflow Routing Outside the Paso Robles Subbasin

In the GSSI model, subsurface inflow was computed as the sum of irrigation return flow, deep percolation of direct precipitation, and streambed percolation occurring outside the Subbasin boundaries. Streambed percolation was computed by HSPF as an outflow from each stream reach. The streambed percolation was computed using reference information from the HSPF Best Management Practices toolkit developed by the U.S. Environmental Protection Agency (GSSI, 2014).

Modifications were made to the process described above to ensure consistency in the simulated water balance. In HSPF, stream outflows and streambed percolation are routed to the next downstream stream reach. Consequently, when a stream enters the margin of the Paso Robles

Subbasin, HSPF routes all of the streamflow and streambed percolation into the stream network within the Subbasin. However, in the GSSI model, the streambed percolation water was also being added to the groundwater model as subsurface inflow. This means percolating water through streambeds in the watershed outside of the Subbasin was being double counted: as both stream inflow and subsurface inflow.

To avoid double counting the inflow, M&A modified the groundwater model input files so that subsurface inflow no longer included HSPF model-computed streambed percolation outside the Paso Robles, Atascadero, and Upper Valley Subbasins. The primary effect of this change was a reduction in subsurface inflow into the groundwater model. A secondary effect of this change was a reduction in inflow to streams inside the Subbasin boundary due to excess subsurface inflow.

Reduction in stream inflows as a result of modifications described above is due to an input processing procedure developed by GSSI (2016). Specifically, the 2016 version of the GSSI model included an empirical procedure for re-assigning computed subsurface inflow above a threshold value as surface water inflow to streams inside the Subbasin boundaries. The GSP model uses the same procedure; however, streambed percolation is no longer double counted, thus computed subsurface inflow in excess of the threshold is lower in the GSP model than compared to the GSSI (2016) model.

E4.1.3 Summary of Effects of Model Modifications

The net effect of correcting excess agricultural irrigation routing was to increase areal recharge within the Paso Robles Subbasin. The net effect of removing streambed percolation computed by the surface water model from subsurface inflow to the groundwater model was to reduce both subsurface inflow and surface water inflow to streams in the groundwater flow model. The combined effect of these two modifications was to reduce the amount of water recharging the groundwater system in the Subbasin.

E4.2 Change in Subbasin Boundary

The boundary of the Paso Robles Subbasin changed between completion of the 2016 GSSI model and the GSP model update.

In 2018, the California Department of Water Resources (DWR) redefined the Paso Robles Subbasin boundary in response to two basin boundary modification requests. As a result of this modification, the Atascadero Subbasin, and all land north of the Monterey County line are no longer included in the Paso Robles Subbasin (Figure E-1). The modified Subbasin area (in green) is addressed in the GSP. Groundwater budgets for the GSP are reported for the smaller Subbasin area. Previous groundwater budgets using the 2016 GSSI model were reported for the entire original Paso Robles Groundwater Subbasin, including the Atascadero Subbasin (GSSI, 2016).

Therefore, the GSP groundwater budgets are not directly comparable to the previous groundwater budgets.

E5 COMPARISON OF GROUNDWATER BUDGETS

Differences between previously published groundwater budgets and the groundwater budget published in the GSP are caused by:

- Modifications made to the modeling platform components
- Changes in the Subbasin boundary

These changes have a direct effect on the computed water budget, long-term groundwater storage deficit and sustainable yield in the Subbasin.

The effect of modifying the modeling platform on groundwater storage deficit and sustainable yield can be quantified by comparing the computed water budgets from 2016 GSSI and GSP models for the same Subbasin boundary. The effect of changing the Subbasin boundary on groundwater storage deficit and sustainable yield can be quantified by comparing the computed groundwater budget of the original Paso Robles Subbasin boundary to the groundwater budget of the modified Paso Robles Subbasin boundary using either the 2016 GSSI or GSP model.

E5.1 Effect of Model Modifications on Water Budgets

This section summarizes changes in water budget components, groundwater storage deficit, and sustainable yield that result from modifications made to the individual models of the modeling platform. Table E-2 compares annual average groundwater pumping rates by water use sector for the historical base period (1981 to 2011) specified for the original Paso Robles Subbasin boundary in the GSSI (2016) and GSP models.

Table E-2. Simulated Groundwater Pumping

	Original Subbasin Boundary	
Water Use Sector	GSSI (2016)	GSP model
Agricultural	75,900	75,800
Municipal	12,000	12,000
Rural-Domestic	2,800	2,800
Small Commercial	2,200	2,200
Total	92,900	92,800

Note: All values in AFY

Annual average groundwater pumping rates are nearly identical between the two models. The small increase of 100 AFY in annual average agricultural pumping in the GSP model is the result of minor modifications made to the model data processing spreadsheets.

Table E-3 compares simulated annual average inflow and outflow components of the groundwater budget for the original Paso Robles Subbasin boundary for the historical base period for the GSSI (2016) and GSP models.

Table E-3. Comparison of Annual Average Inflow and Outflow Components

	Original Subbasin Boundary	
	GSSI (2016)	GSP model
Inflow		
Streamflow Percolation	53,000	39,500
Total Recharge[1]	50,500	51,600
Treated Wastewater Leakage	5,600	5,600
Total Inflow	109,100	96,700
Outflow		
Groundwater Pumping	92,900	92,800
Discharge to Streams and Rivers	14,300	13,200
Riparian Evapotranspiration	3,500	3,500
Subsurface Outflow [2]	1,600	1,600
Total Outflow	112,300	111,100

Notes: All values in AFY

(1) Includes areal recharge and subsurface inflow from the surrounding watershed

(2) Includes subsurface outflow in the Salinas Alluvium and Paso Robles Formation at the northern boundary of the original Paso Robles Subbasin

Total inflow in the GSP model is about 12,400 AFY lower than the GSSI (2016) model for the original Subbasin boundary. The reduction in total inflow reflects the net change in inflow caused by a reduction of 13,500 AFY in streambed percolation and an increase of 1,100 AFY in total recharge. The changes in streamflow and recharge are described in Section D-E4.1.

Table E-4 compares the computed annual average groundwater storage deficit and sustainable yield from the GSSI (2016) and GSP models, for the original Subbasin boundary and historical base period of 1981 through 2011.

Table E-4. Annual Average Groundwater Storage Deficit and Sustainable Yield

	Original Subbasin Boundary	
	GSSI (2016)	GSP model
Storage Deficit	3,200	14,400
Sustainable Yield	89,700	78,400

Note: All values in AFY

The computed annual average storage deficit for the original Subbasin boundary for the GSP model is about 11,200 AFY greater than the GSSI (2016) model. The increase in the computed storage deficit is due almost entirely to the reduction in total groundwater inflows, as shown in Table E-3. The reduction in total inflow is the result of the reduction in streamflow that resulted from modifying the model components. Consequently, the annual average sustainable yield of the original Subbasin boundary estimated using the GSP model is about 11,300 AFY lower than that computed by the GSSI model.

E5.2 Effect of Changes in Subbasin Boundary on Water Budgets

This section summarizes changes in water budget components, groundwater storage deficit, and sustainable yield that result from the change in Subbasin boundary. The 2016 GSSI model was used for this evaluation because it does not included the effect of modifications made to the model components discussed in Section D-E5.1. Table E-5 compares annual average groundwater pumping rates by water use sector specified for both the original and modified Subbasin boundaries, for the historical base period, and for the 2016 GSSI model.

Table E-5. Simulated Groundwater Pumping

	GSSI (2016) model	
Water Use Sector	Original Subbasin Boundary	Modified Subbasin Boundary
Agricultural	75,900	65,400
Municipal	12,000	3,100
Rural-Domestic	2,800	2,500
Small Commercial	2,200	1,400
Total	92,900	72,400

Note: All values in AFY

Simulated annual average total pumping rate is about 20,500 AFY lower for the modified Subbasin boundary compared to the original Subbasin boundary. The total amount of groundwater pumping is lower because pumping in the Atascadero Subbasin and the portion of the original Paso Robles Subbasin located in Monterey County is no longer accounted for in the modified Subbasin. Thus, the reduction in pumping is equivalent to the amount of groundwater pumping in the Atascadero Subbasin and in the portion of the original Paso Robles Subbasin located in Monterey County.

Table E-6 compares simulated annual average inflow and outflow components of the groundwater budget for the original and modified Subbasin boundaries, the historical base period, and the 2016 GSSI model.

Table E-6. Comparison of Simulated Inflow and Outflow

	GSSI (2016) model	
	Original Subbasin Boundary	Modified Subbasin Boundary
Inflow		
Streamflow Percolation	53,000	36,700
Total Recharge	50,500	34,000
Wastewater Pond Leakage	5,600	3,400
Subsurface Inflow [1]	0	3,600
Total Inflow	109,100	77,700
Outflow		
Groundwater Pumping	92,900	72,400
Discharge to Streams and Rivers	14,300	8,100
Riparian Evapotranspiration	3,500	1,700
Subsurface Outflow [2]	1,600	2,500
Total Outflow	112,300	84,700

Note: All values in AFY

(1) Subsurface inflow from the Atascadero Subbasin

(2) Subsurface outflow from the Paso Robles Subbasin to the Upper Valley Subbasin.

E5.2.1 Differences in Simulated Inflows

Total simulated annual average groundwater inflow is about 31,400 AFY lower for the modified Subbasin than the original Subbasin. The reduction reflects the net change in streamflow percolation, recharge, wastewater pond leakage, and subsurface inflow, as described further below.

- Simulated annual average streamflow percolation for the modified Subbasin boundary is about 16,300 AFY lower compared to the original Subbasin boundary. The lower streamflow percolation is due to reductions in the number and length of stream channels present within the modified Subbasin boundary compared to the original Subbasin boundary.
- Simulated annual average recharge for the modified Subbasin boundary is about 16,500 AFY lower compared to the original Subbasin boundary. The lower recharge is due to:
    - Smaller area within the modified Subbasin, resulting in less areal recharge from direct precipitation
    - Smaller area of irrigated fields within the modified Subbasin, resulting in less recharge from irrigation return flow

  - o Reduced length of contact between Subbasin and surrounding watershed, resulting in less subsurface inflow

- Simulated annual average wastewater pond leakage for the modified Subbasin boundary is about 2,200 AFY lower compared to the original Subbasin boundary. Wastewater pond leakage is lower because it does not include wastewater pond leakage within the Atascadero Subbasin.
- Simulated annual average subsurface inflow for the modified Subbasin boundary is about 3,600 AFY higher compared to the original Subbasin boundary. Subsurface inflow to the modified Subbasin includes groundwater flow from the Atascadero Subbasin into the Paso Robles Subbasin. When modeling the original Subbasin boundary, which includes both the Atascadero Subbasin and Paso Robles Subbasin, the flow between the Subbasins was an internal flow within the model and not an inflow crossing the boundary of the model.

E5.2.2 Differences in Simulated Outflows

Total simulated annual average outflow for the modified Subbasin boundary is about 27,600 AFY lower compared to the original Subbasin boundary. The reduction in total simulated outflow is due to changes in simulated discharge to rivers and streams, riparian evapotranspiration, and subsurface outflow, as described further below.

- Simulated annual average total groundwater pumping for the modified Subbasin is about 20,500 AFY lower than that of original Subbasin. The amount of groundwater pumping is lower because the modified Subbasin boundary does not include pumping from the Atascadero Subbasin or the portion of the original Paso Robles Subbasin in Monterey County.
- Simulated annual average discharge to streams and rivers for the modified Subbasin boundary is about 6,200 AFY lower compared to the original Subbasin boundary. The lower discharge to rivers and streams is due to exclusion of channel segments that receive groundwater discharge in the Atascadero Subbasin and portion of the original Paso Robles Subbasin in Monterey County.
- Simulated annual average riparian evapotranspiration for the modified Subbasin boundary is about 1,800 AFY lower compared to the original Subbasin boundary. The amount of riparian evapotranspiration is lower because the number and length of stream channels along which riparian vegetation are lower in the modified Subbasin compared to the original Subbasin.
- Simulated annual average subsurface outflow for the modified Subbasin boundary is about 900 AFY higher compared to the original Subbasin boundary. Similar to subsurface inflow, the higher subsurface outflow occurs because this flow crosses a

boundary (the Monterey County line) when modeling the modified Subbasin boundary, whereas, this flow is internally accounted for when modeling the original Subbasin boundary.

E5.2.3 Differences in Simulated Sustainable Yield

Table E-7 compares the computed average annual groundwater storage deficit and sustainable yield for the original and modified Subbasin boundaries, the historical base period, and using the 2016 GSSI model.

Table E-7. Average Annual Groundwater Storage Deficit and Sustainable Yield

	2016 GSSI Model	
	Original Subbasin	Modified Subbasin
Storage Deficit	3,200	7,000
Sustainable Yield	89,700	65,400

Note: All values in AFY

The computed annual average storage deficit from the 2016 GSSI model is about 3,200 AFY for the original Subbasin. Groundwater storage deficits similar to this value have been commonly reported in the Paso Robles Subbasin in the past. For the modified Subbasin, the computed annual average storage deficit from the 2016 GSSI model is about 7,000 AFY. Therefore, the computed annual average groundwater storage deficit for the modified Subbasin is about 3,800 AFY higher compared to the original Subbasin. The increase in computed annual average groundwater storage deficit is the result of differences in the magnitude of reductions in total inflow and total outflow.

Figure E-3 shows a map of computed sustainable yields from the 2016 GSSI model. The area of the original Paso Robles Subbasin outside of the modified Subbasin (green area) has been divided into the Atascadero Subbasin and the Upper Valley Aquifer Subbasin for illustration purposes. The sustainable yield of the Upper Valley Aquifer, Paso Robles, and Atascadero Subbasins shown on Figure E-3 sum to the sustainable yield of the original Subbasin as listed in Table E-7.

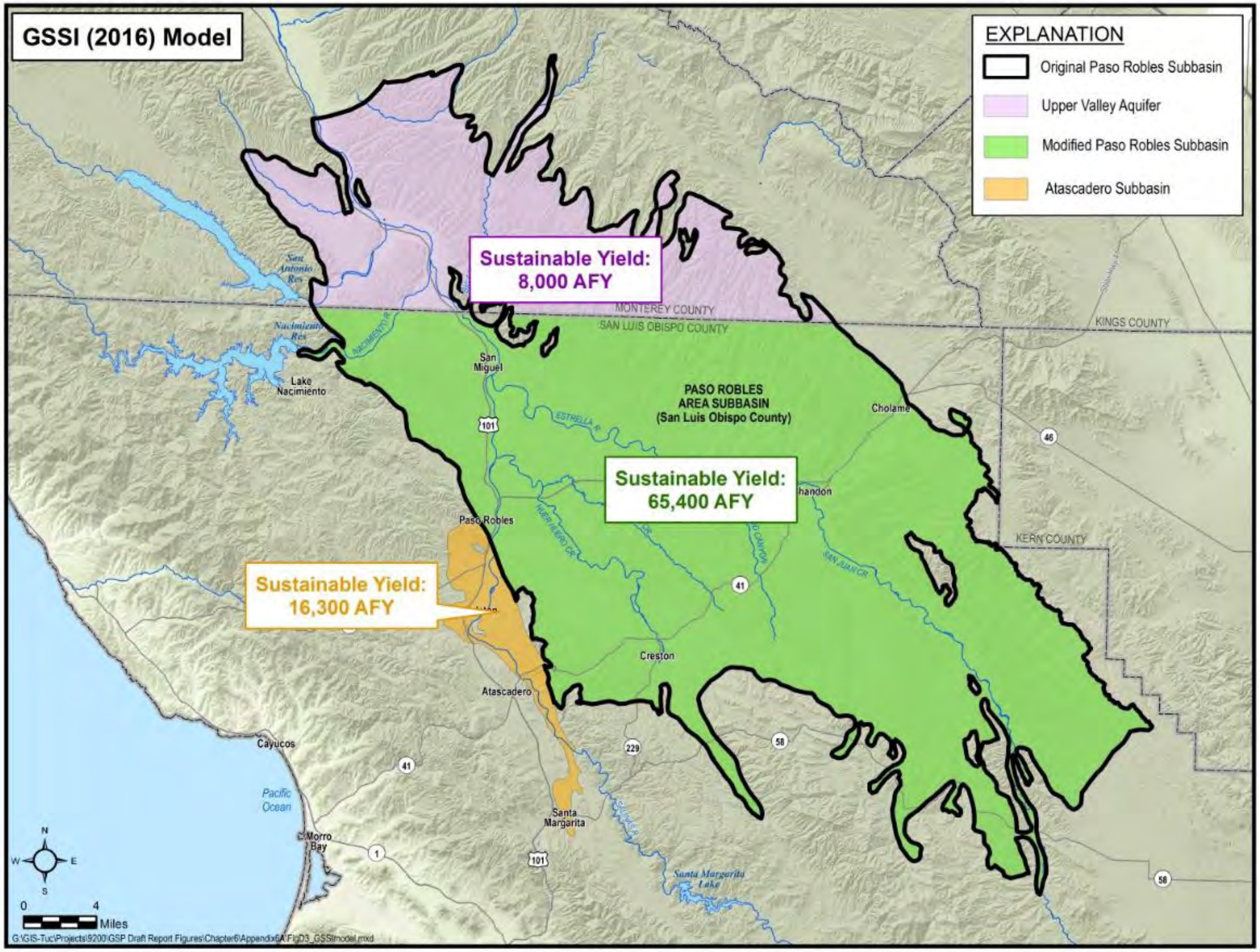

Figure E-3. Sustainable Yield Computed by GSSI (2016) Model

E5.3 Combined Effect of Model Modifications and Changes in Subbasin Boundary on Water Budgets

This section summarizes changes in water budget components, groundwater storage deficit, and sustainable yield that result from both modifications made to model components and the change the Subbasin boundary. For this evaluation, the GSP model was used because it includes both types of changes. Table E-8 compares annual average groundwater pumping rates by water use sector specified for both the original and modified Subbasin boundaries, for the historical base period, using the GSP model.

Table E-8. Simulated Groundwater Pumping for GSP Model

	GSP Model	
Water Use Sector	Original Subbasin	Modified Subbasin
Agricultural	75,800	65,400
Municipal	12,000	3,100
Rural-Domestic	2,800	2,500
Small Commercial	2,200	1,400
Total	92,800	72,400

Note: All values in AFY

Table E-9 compares simulated annual average inflow and outflow components of the groundwater budget for the original and modified Subbasin boundaries, for the historical base period, using the GSP model.

Table E-9. Comparison of Simulated Inflow and Outflow for GSP Model

	GSP model	
	Original Subbasin	Modified Subbasin
Inflow		
Streamflow Percolation	39,500	26,900
Total Recharge	51,600	38,000
Wastewater Pond Leakage	5,600	3,400
Subsurface Inflow[1]	--	3,100 [1]
Total Inflow	96,700	71,400
Outflow		
Groundwater Pumping	92,800	72,400
Discharge to Streams and Rivers	13,200	7,300
Riparian Evapotranspiration	3,500	1,700
Subsurface Outflow	1,600 [2]	2,600 [3]
Total Outflow	111,100	84,000

Note: All values in AFY

(1) Subsurface inflow from the Atascadero Subbasin

(2) Includes subsurface outflow in the Salinas Alluvium and Paso Robles Formation at the northern boundary of the original Paso Robles Subbasin

(3) Subsurface outflow from the Paso Robles Subbasin to the Upper Valley Subbasin.

E5.3.1 Differences in Simulated Inflows

Total simulated annual average groundwater inflow is about 25,300 AFY lower for the modified Subbasin than the original Subbasin. The reduction reflects the net change in streamflow percolation, recharge, wastewater pond leakage, and subsurface inflow, as described further below.

- Simulated annual average streamflow percolation for the modified Subbasin boundary is about 12,600 AFY lower compared to the original Subbasin boundary. The lower streamflow percolation is due to reductions in the number and length of stream channels present within the modified Subbasin boundary compared to the same for original Subbasin boundary.
- Simulated annual average recharge for the modified Subbasin boundary is about 13,600 AFY lower compared to the original Subbasin boundary. The lower recharge is due to:
    - Smaller area within the modified Subbasin, resulting in less recharge from direct precipitation
    - Smaller area of irrigated fields in the modified Subbasin, resulting in less recharge from irrigation return flow
    - Reduced length of contact between Subbasin and surrounding watershed, resulting in less subsurface inflow
- Simulated annual average wastewater pond leakage for the modified Subbasin boundary is about 2,200 AFY lower compared to the original Subbasin boundary. The amount of wastewater pond leakage is lower because the modified Subbasin does not include wastewater pond leakage within the Atascadero Subbasin.
- Simulated annual average subsurface inflow for the modified Subbasin boundary about 3,100 AFY higher compared to the original Subbasin boundary. Subsurface inflow to the modified Subbasin includes groundwater flow from the Atascadero Subbasin into the Paso Robles Subbasin. When modeling the original Subbasin boundary, which includes both the Atascadero Subbasin and Paso Robles Subbasin, the flow between the Subbasins is an internal flow within the model and not an inflow crossing the boundary of the modified Subbasin.

E5.3.2 Differences in Simulated Outflows

Total simulated annual average outflow for the modified Subbasin boundary is about 27,100 AFY lower compared to the original Subbasin boundary. The reduction in total simulated outflow is due to changes in simulated discharge to rivers and streams, riparian evapotranspiration, and subsurface outflow, as described further below.

- Simulated annual average total groundwater pumping for the modified Subbasin is reduced by about 20,400 AFY compared to the original Subbasin. The amount of groundwater pumping is lower because the modified Subbasin does not include pumping from the Atascadero Subbasin or the portion of the original Paso Robles Subbasin in Monterey County.
- Simulated annual average discharge to streams and rivers for the modified Subbasin boundary is about 5,900 AFY compared to the original Subbasin boundary. The amount of discharge to rivers and streams is lower because the modified Subbasin does not include channel segments that receive groundwater discharge in the Atascadero Subbasin and portion of the original Paso Robles Subbasin in Monterey County.
- Simulated annual average riparian evapotranspiration for the modified Subbasin boundary is about 1,800 AFY lower compared to the original Subbasin boundary. The amount of riparian evapotranspiration is lower because the modified Subbasin has fewer stream channels and shorter stream channel lengths along which riparian vegetation is present than the original Subbasin.
- Simulated annual average subsurface outflow for the modified Subbasin boundary is about 1,000 AFY higher compared to the original Subbasin boundary. Similar to subsurface inflow, the higher subsurface outflow occurs because this flow crosses a boundary (the Monterey County line) when modeling the modified Subbasin, whereas, this flow is internally accounted for when modeling the original Subbasin.

E5.3.3 Differences in Computed Sustainable Yield

Table E-10 compares the computed average annual groundwater storage deficit and sustainable yield for the original and modified Subbasin boundaries, the historical base period, and for the GSP model.

Table E-10. Average Annual Groundwater Storage Deficit and Sustainable Yield

	GSP Model	
	Original Subbasin	Modified Subbasin
Storage Deficit	14,400	12,600
Sustainable Yield	78,400	59,800

Note: All values in AFY

The computed annual average storage deficit from the GSP model is about 14,400 AFY for the original Subbasin boundary. For the modified Subbasin, the computed annual average storage deficit from the GSP model is about 12,600 AFY. Therefore, the computed annual average groundwater storage deficit for the modified Subbasin boundary is about 1,800 AFY lower compared to the original Subbasin boundary. The decrease in computed annual average groundwater storage deficit is the result of differences in the magnitude of reductions in total inflow and total outflow.

Figure E-4 shows a map of computed sustainable yields from the GSP model. The area of the original Paso Robles Subbasin outside of the modified Subbasin (green area) has been divided into the Atascadero Subbasin and the Upper Valley Aquifer Subbasin for illustration purposes. The sustainable yield of the Upper Valley Aquifer, Paso Robles, and Atascadero Subbasins shown on Figure E-4 sum to the sustainable yield of the original Subbasin as listed in Table E-10.

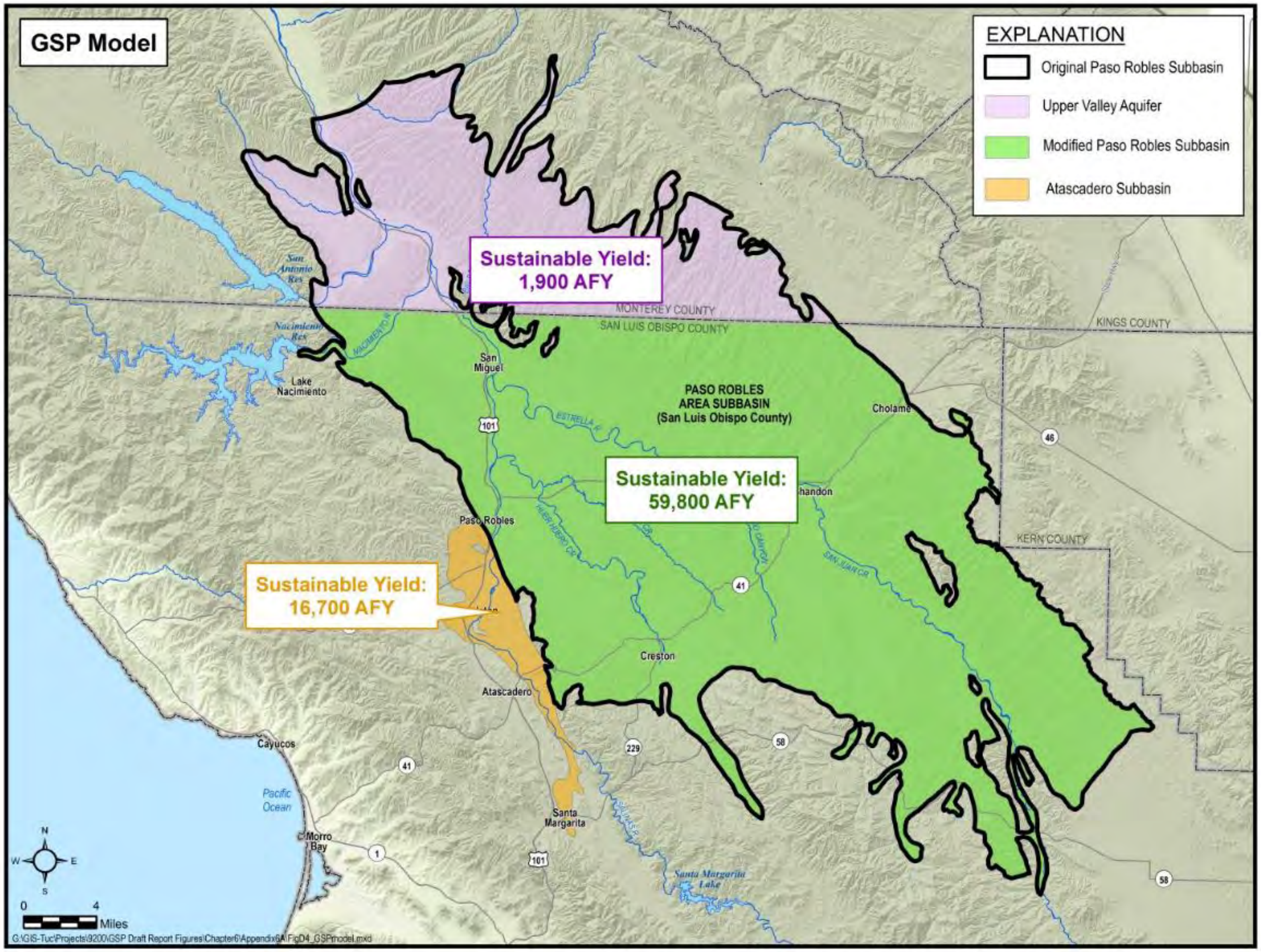

Figure E-4. Sustainable Yield as Computed by GSP Model

E6 CONCLUSIONS

Both the model modifications and the change in Subbasin boundary influence the computed sustainable yield. Over the historical base period, the computed sustainable yield for the original Subbasin boundary from the 2016 GSSI model is about 89,700 AFY. By comparison, the computed sustainable yield for the modified Subbasin boundary from the updated GSP model is about 59,800 AFY. The difference between these two values is nearly 30,000 AFY. Most of this difference is due to changes in the Subbasin boundary. The computed sustainable yield from 2016 GSSI model for the modified Subbasin boundary is 65,400 AFY; a reduction of about 24,300 AFY from the sustainable yield of the original Subbasin. The change in Subbasin boundary accounts for about 80% of the reduction in reported sustainable yields. The remaining difference is the result of modifications made to the model components.

Appendix F

Monitoring Protocols

County of San Luis Obispo Procedures for Measuring Depth to Water in Groundwater Wells

The following procedures must be followed when conducting depth to water measurements for the County of San Luis Obispo and the San Luis Obispo County Flood Control and Water Conservation District's groundwater monitoring program. These procedures are adapted from the USGS publication "Groundwater Technical Procedures of the U.S. Geological Survey" compiled by William L. Cunningham and Charles W. Schalk in 2011 and "Best Management Practices for the Sustainable Management of Groundwater – Monitoring Protocols, Standards and Sites" published by the California Department of Water Resources in December 2016.

Key Terms

1. RP (Reference Point): Total distance from the measuring point (typically the top of casing) to the surface of the water
2. WS: Length of wetted chalk on steel tape.
3. FT ABOVE: Distance from measuring point reference to land surface.
4. DIST to WATER: The distance from the measuring point to the water surface. RP – WS – FT ABOVE = DIST to Water.
5. OBS INIT: In the well book, note the initials of the person performing the measuring in this column. Determined by the login user on the iPad.
6. REMARKS or COMMENTS: Note any special remarks regarding the measurement of each well, including, any significant factors potentially affecting the well level, pumping or temporary blocked access, changes in RP, etc.
7. PUMPING: Fill the pumping column according to the Pumping Key Legend
    a. D = Dry
    b. E = Estimated
    c. F = Flowing
    d. N = Nearby pumping
    e. R = Recently pumped
    f. S = See well book
    g. T = Temporarily no access

Preparation

1. Groundwater elevation data, which will form the basis of basin-wide water table and piezometric maps, should approximate conditions at a discrete period in time. Therefore, all groundwater levels in a basin should be collected within as short a time as possible, preferably within a **1 to 2-week period**.
2. Check well log books for notifications about **one week** before you begin performing the bi-annual well measuring.
    a. Go through all the well data log books to check which wells have a special note of notifying owner. Make sure you contact the owners in accordance with the instructions.
    b. This information is also listed by well data book here: G:\WR\Tech Unit\x Groundwater\Well Information Resources\Well Books\Well Number Lists.
3. Verify the description of the well using the field iPad GIS program.

   a. You must ensure that you are measuring the correct well by comparing it to the iPad GIS and well book as well as any other description of the well.
   b. There should be a picture of every well in each of the data books and iPad database.

Reference Point

1. Verify the Reference Point (RP) by using the field iPad GIS program.
   a. Depth to groundwater must be measured relative to an established RP on the well casing. The RP can be identified with a permanent marker, paint spot, or a notch in the lip of the well casing. By convention in open casing monitoring wells, the RP is located on the north side of the well casing.
   b. In the well book and in the well database, there are pictures and descriptions of the RP to be used for each well. Always ask questions if you are uncertain about the location of the RP.
2. Make sure the measured RP is equal to the one listed on the first well card for each well. Note if there is a difference.
3. If no RP is apparent, measure the depth to groundwater from the north side of the top of the well casing, and note it in the comments.
4. If an access becomes blocked or a RP changes for any reason, this must be noted in the Comments, the new RP elevation must be surveyed, and the new value of RP feet above or below ground surface must be measured and recorded. New photographs to identify the new RP must also be taken and put into the iPad well database. All measurements are to be made in US Survey feet.

Measurement

1. After locating the RP, remove any cap, lid, or plug that covers the monitoring access point, listening for pressure release. If a release is observed, wait and allow the water level to equilibrate. Note in the Comments that a pressure release was observed and whether the pressure was causing air to flow out of or into the casing.
2. Never measure a well while it is pumping. Instead, record a P in the Pumping column and include any relevant notes in the Comments. If possible, visit the well later in the day or on a different day to obtain a static water level measurement.
3. If the well is rebounding or drawing down, record the appropriate code in the Pumping Key. Make a note of the distance that the water moved (up or down) and the time between measurements in the Comments. If possible, visit the well later in the day or on a different day to try and obtain a static water level measurement.
4. **Depth to groundwater must be measured to an accuracy of 0.01 feet.**
   a. This is true when using both the steel tape and the electronic sounding tape. The steel tape should be used in wells that have a history of oil on the surface of the water.
   b. Also use the steel tape if there are obstructions or tight spaces in the casing in which the electronic sounding tape could get stuck. Otherwise, use the electronic sounding tape.

   c. Repeat measurement after 15 minutes to verify that the static levels are not rebounding. Repeat until measurements are consistent. Typically, this should not be repeated over 3 times. But this process is left to the discretion of the technician. If consistency is not achieve, add note in the Comments.
5. See **Appendix A** for measurement and recording procedures using the steel tape.
6. See **Appendix B** for measurement and recording procedures using the sounder and electronic sounding tape.
7. Complete the well card and electronic water level measurement field form in accordance with the recording procedures.
   a. Assess the area around the well to determine any significant factors potentially affecting the well level and note any factors that may influence the depth to water readings, such as weather, nearby irrigation, flooding, tidal influence, and well condition.
   b. If there is a questionable measurement or the measurement could not be obtained, note it in the in the Pumping column and in the Comments.

Special Cases

1. If you find a well that has not been monitored during the past three monitoring periods and this information has been documented in the Comments (e.g. could not find, no access to old RP, well removed, etc.), make a special note and mark this well page in the book. Inform the Technical Unit Supervisor, so that the well can be removed from the well books.
2. If you are unable to measure a well, due to pumping or temporary blocked access for example, note the reason in the Comments.
3. In some wells, a layer of oil may float on the water surface.
   a. If the oil layer is a foot or less thick, use the steel tape. See **Appendix A** for the procedure for using the steel tape. Read the steel tape at the top of the oil mark and use this value for the water-level measurement instead of the wetted chalk mark. The measurement will differ slightly from the water level that would be measured were the oil not present. If there is oil in the well, it must be noted in the Comments and an E for estimated must be entered in the Pumping column of the electronic water level measurement field form.
   b. If several feet of oil are present in the well, or if it is necessary to know the thickness of the oil layer, a commercially available water-detector paste can be used that will detect the presence of water in the oil. The paste is applied to the lower end of the tape and will show the top of the oil as a wet line, and the top of the water will show as a distinct color change. Because oil density is about three-quarters that of water, the water level can be estimated by adding the thickness of the oil layer times its density to the oil- water interface elevation.

Decontamination

1. Do not decontaminate the tape between measurements at the same well. Only decontaminate the tape after completing the well measurement and before moving on to the next well.
2. To decontaminate the electronic sounding tape or steel tape, use a bleach water solution of 50 mg/liter (0.005 percent) to avoid any cross-contamination between wells.

3. If there is oil on the tape, use a non-toxic degreaser and remove all traces of oil before you use the bleach solution.

Appendix A: Procedure for Steel Tape

Materials and Instruments

1. A steel tape graduated in feet, tenths, and hundredths of feet
2. Blue carpenters' chalk
3. Well book
4. Pencil and eraser
5. iPad and electronic water level measurement field form
6. Wrenches with adjustable jaws and other tools to remove well cap

Data Accuracy and Limitations

1. A graduated steel tape is commonly accurate to 0.01 feet.
2. The water level should be within 500 feet of the land surface for steel tapes.
3. If the well casing is not plumb, the depth to water will have to be corrected.
4. When measuring deep water levels, tape expansion and stretch is an additional consideration.

Instructions

1. Chalk the lower 20 to 40 feet of the tape by pulling the tape across a piece of blue carpenter's chalk. The wetted chalk mark will identify that part of the tape that was submerged.
2. Lower the weight and tape into the well until the lower end of the tape is submerged below the water. The weight and tape should be lowered into the water slowly to prevent splashing. Continue to lower the end of the tape into the well until the next graduation (a whole-foot mark) is opposite the measuring RP, record this number in the RP column of the electronic water level measurement field form. The length of tape needed to reach the water surface can be estimated from previous water-level measurements. Otherwise, the length of tape needed to reach the water surface will have to be found by trial and error.
3. Rapidly bring the tape to the surface before the wetted chalk mark dries and becomes difficult to read.

Recording

1. Record the number of the wetted chalk mark in the WS column of the well book card.
2. Subtract the wetted chalk mark number (WS) from to the measuring RP. Record this number in the FT ABOVE column of the well book card.

3. Apply the RP correction to get the depth to water below (or above) the land-surface. If the RP is above land surface, the distance between the RP and land surface datum is subtracted from the depth to water from the RP to obtain the depth to water below land surface. If the RP is below land surface precede the RP correction value with a minus (-) sign and subtract the distance between the RP and land surface datum from the depth to water from the RP to obtain the depth to water below land surface. Record this number in the DIST TO WATER column of the well book card.
4. Record initials of the in the OBS. INT. column.
5. Once you have calculated and recorded the measurement in the well book, open the WELLS app on the iPad. Select the well you are measuring by clicking the blue "i" symbol. This should bring up all previous information on that specific well. If you wish to add a picture of the well to the information, select the camera icon next to "Add Data."
6. Click "Add Data" and select "Tape" for "Tool Used." Input your measurement into the "Tape Reading" section of the electronic water level measurement field form. Click "Update." You have successfully measured the well level.

Maintenance

1. Maintain the tape in good working condition by periodically physically checking the tape for rust, breaks, kinks, and possible stretch due to the suspended weight of the tape and the tape weight.
2. Our steel tapes are sent to USGS for calibration every two years.

Appendix B: Procedure for Electronic Sounding Tape

Materials and Instruments

1. Sounder and electric sounding tape
2. iPad and electronic water level measurement field form
3. Wrenches with adjustable jaws and other tools to remove well cap

Data Accuracy and Limitations

1. Oil, ice, or other debris may interfere with the water level measurement
2. Corrections to the measurements are necessary if the well casing is angled, and when measuring deep water levels because of tape expansion and stretch

Instructions

1. When using the sounder to measure depth to groundwater, it is generally good practice to use the least sensitive setting. Using a more sensitive setting will sometimes give false positives due to a wet or leaking casing. If you suspect that the casing has a hole, mention it in the Comments column on the electronic water level measurement field form. Do your best to ascertain the approximate depth of the hole relative to the reference point.
2. Approach the well with the sounder in hand. Then, place the sounder level on the ground or another surface near the opening of the well. Turn on the sounder device by turning the dial with "SENSITIVITY" written in bold letters above it to the least sensitive setting possible. Press the lest button located on the same side as the knob. If you successfully turned on the sounder, a ringing noise will be clearly produced, and the red light above the test button will remain solid until you let go of the button. If there is no sound, start over.
3. Once the sounder is on, pull out the silver end of the tape and prepare to lower it into the well. Loosen the wheel knob on the other side of the sounder, opposite of both the test button and the "SENSITIVITY" knob. Once this knob is loosened, place the silver end of the tape into the entrance of the well. If the silver end does not begin to descend on its own, you may need to feed it into the entrance until there is enough weight for it to draw down by itself.
4. **Do not let go of the sounder.** If the well opening is big enough, the sounder may fall in. At that point, it will be lost. This equipment is expensive, and there are only so many in the County's possession. If the sounder becomes stuck, report its location to the Technical Unit Supervisor.

5. As you feed the silver end of the tape into the well or as it draws down under its own weight, belay the tape with your hand so that the tape is not damaged by the entrance of the well. Keep the descent as smooth as possible and avoid letting the silver end descend too quickly. If the well happens to be dry and the silver end hits the ground too hard, it may damage the equipment.
6. Once the same ringing noise from the test button sounds, pull the tape back until the noise is no longer heard. Then, slowly let the silver end descend again without belaying the line with your hand, as this may lead to an inaccurate measurement. Once you hear the ringing noise again, place your index finger at the point that the tape enters the well. Turn the tape over, and read the tape for the depth to groundwater measurement.
7. **You may now turn off the sounder; the ringing that it produces will be quite loud.**

Recording

1. When reading the tape, **ensure you record the full measurement.** Often, the depth to groundwater will not be an exact number (e.g. 100.00 ft). Numbers between 1 and 9 are tenths (0.10s) of a foot. Therefore, if your finger is on a number between 1 and 9, you must backtrack on the tape until you reach the next whole number. For example, if the number was six and the next whole number was 145, the full measurement would be 145.6 ft.
2. Once you have double-checked the measurement, open the WELLS app on the iPad. Select the well you are measuring by clicking the blue “i” symbol. This should bring up all previous information on that specific well. If you wish to add a picture of the well to the information, select the camera icon next to “Add Data.”
3. Click “Add Data” and select the “Sounder” for “Tool Used.”
4. The reference elevation should already be calculated. If the reference elevation is missing, determine your current altitude. (This can be done by searching “what is my altitude” on Google.)
5. For “Tape Reading (RP),” input your measurement in both the left and right field.
6. Continue to “Feet Above.” “Feet Above” is the height of the well entrance from the ground. This simple measurement can be determined using a measuring tape or a ruler. If the measurement is already in the form, do not change it.
7. Once you have inputted all the information, click “Update.” You have successfully measured the well level.

Calibration:

Our sounders are sent to USGS for calibration every two years.

Flowmeter Calibration Test Report

Well Owner: Well Operator:

Owner Address: Operator Address:

City, State, Zip: City, State, Zip:

Owner Telephone: Operator Telephone:

Contact Person: Contact Person:

State Well Number: Owner's Well Number:

Well or Site Address: Thomas Guide - Page & Section:

Meter Manufacturer: Is This Meter New from Manufacturer?

YES NO

Meter Serial Number: Discharge Pipe Size (inches):

Manufacturer Date: Tap Size & Type:

Meter Size (inches): Meter Bypass Piping: YES NO Other

Meter Units: AF CF Gal MI/h Other Is This A Bypass Meter?: YES NO

Meter Multiplier Underground Vault: YES NO Other

Meter Type: Pump Motor/Engine (horsepower):

Meter Use: Agricultural Domestic Municipal Industrial

Calibration or Repair Test Results

	Meter End	Meter Start	Volume Pumped	Run Time	Flow rate	Accuracy (%)
Test 1						
Test 2						
Test 3						

Remarks

California Regional Water Quality Control Board
Central Coast Region

Monitoring and Reporting Program
Order No. R3-2017-0002-01

TIER 1

Dischargers Enrolled Under
Conditional Waiver of Waste Discharge Requirements For
Discharges from Irrigated Lands

This Monitoring and Reporting Program Order No. R3-2017-0002-01 (MRP) is issued pursuant to California Water Code (Water Code) sections 13267 and 13269, which authorize the California Regional Water Quality Control Board, Central Coast Region (hereafter Central Coast Water Board) to require preparation and submittal of technical and monitoring reports. Water Code section 13269 requires a waiver of waste discharge requirements to include as a condition the performance of monitoring and the public availability of monitoring results. *Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands*, Order No. R3-2017-0002 (Order) includes criteria and requirements for three tiers. This MRP sets forth monitoring and reporting requirements for **Tier 1 Dischargers** enrolled under the Order. A summary of the requirements is shown below.

SUMMARY OF MONITORING AND REPORTING REQUIREMENTS FOR TIER 1:

Part 1: Surface Receiving Water Monitoring and Reporting *(cooperative or individual)*
Part 2: Groundwater Monitoring and Reporting *(cooperative or individual)*

Pursuant to Water Code section 13269(a)(2), monitoring requirements must be designed to support the development and implementation of the waiver program, including, but not limited to, verifying the adequacy and effectiveness of the waiver's conditions. The monitoring and reports required by this MRP are to evaluate effects of discharges of waste from irrigated agricultural operations and individual farms/ranches on waters of the state and to determine compliance with the Order.

MONITORING AND REPORTING BASED ON TIERS

The Order and MRP include criteria and requirements for three tiers, based upon those characteristics of individual farms/ranches at the operation that present the highest level of waste discharge or greatest risk to water quality. Dischargers must meet conditions of the Order and MRP for the appropriate tier that applies to their land and/or the individual farm/ranch. Within a tier, Dischargers comply with requirements based on the specific level of discharge and threat to water quality from individual farms/ranches. The lowest tier, Tier 1, applies to dischargers who discharge the lowest level of waste (amount or concentration) or pose the lowest potential to cause or contribute to an exceedance of water quality standards in waters of the State or of the United States. The highest tier, Tier 3, applies to dischargers who discharge the highest level of waste or pose the greatest potential to cause or contribute to an exceedance of water quality standards in waters of the State or of the United States. Tier 2 applies to dischargers whose discharge has a moderate threat to water quality. Water quality is defined in terms of regional, state, or federal numeric or narrative water quality standards. Per the Order, Dischargers may submit a request to the Executive Officer to approve transfer to a lower tier. If the Executive Officer approves a transfer to a lower tier, any interested person may request that the Central Coast Water Board conduct a review of the Executive Officer’s determination.

PART 1. SURFACE RECEIVING WATER MONITORING AND REPORTING REQUIREMENTS

The surface receiving water monitoring and reporting requirements described herein are generally a continuation of the surface receiving water monitoring and reporting requirements of Monitoring and Reporting Program Order No. 2012-0011-01, as revised August 22, 2016, with the intent of uninterrupted regular monitoring and reporting during the transition from Order No. R3-2012-0011-01 to Order No. R3-2017-0002-01.

Monitoring and reporting requirements for surface receiving water identified in Part 1.A. and Part 1.B. apply to Tier 1 Dischargers. Surface receiving water refers to water flowing in creeks and other surface waters of the State. Surface receiving water monitoring may be conducted through a cooperative monitoring program on behalf of Dischargers, or Dischargers may choose to conduct surface receiving water monitoring and reporting individually. Key monitoring and reporting requirements for surface receiving water are shown in Tables 1 and 2.

A. Surface Receiving Water Quality Monitoring

1. Dischargers must elect a surface receiving water monitoring option (cooperative monitoring program or individual receiving water monitoring) to comply with surface receiving water quality monitoring requirements, and identify the option selected on the Notice of Intent (NOI).

2. Dischargers are encouraged to choose participation in a cooperative monitoring program (e.g., the existing Cooperative Monitoring Program or a similar program) to comply with receiving water quality monitoring requirements. Dischargers not participating in a cooperative monitoring program must conduct surface receiving water quality monitoring individually that achieves the same purpose.

3. Dischargers (individually or as part of a cooperative monitoring program) must conduct surface receiving water quality monitoring to a) assess the impacts of their waste discharges from irrigated lands to receiving water, b) assess the status of receiving water quality and beneficial use protection in impaired waterbodies dominated by irrigated agricultural activity, c) evaluate status, short term patterns and long term trends (five to ten years or more) in receiving water quality, d) evaluate water quality impacts resulting from agricultural discharges (including but not limited to tile drain discharges), e) evaluate stormwater quality, f) evaluate condition of existing perennial, intermittent, or ephemeral streams or riparian or wetland area habitat, including degradation resulting from erosion or agricultural discharges of waste, and g) assist in the identification of specific sources of water quality problems.

Surface Receiving Water Quality Sampling and Analysis Plan

4. **By March 1, 2018, or as directed by the Executive Officer**, Dischargers (individually or as part of a cooperative monitoring program) must submit a surface receiving water quality Sampling and Analysis Plan (SAAP) and Quality Assurance Project Plan (QAPP); this requirement is satisfied if an approved SAAP and QAPP addressing all surface receiving water quality monitoring requirements described in this Order has been submitted pursuant to Order No. R3-2012-0011 and associated Monitoring and Reporting Programs. Dischargers (or a third party cooperative monitoring program) must develop the Sampling and Analysis Plan to describe how the proposed monitoring will achieve the objectives of the MRP and evaluate compliance with the Order. The Sampling and Analysis Plan may propose alternative monitoring site locations, adjusted monitoring parameters, and other changes as necessary to assess the impacts of waste discharges from irrigated lands to receiving water. The Executive Officer must approve the Sampling and Analysis Plan and QAPP.

5. The Sampling and Analysis Plan must include the following minimum required components:
    a. Monitoring strategy to achieve objectives of the Order and MRP;
    b. Map of monitoring sites with GIS coordinates;
    c. Identification of known water quality impairments and impaired waterbodies per the 2010 Clean Water Act 303(d) List of Impaired Waterbodies (List of Impaired Waterbodies);
    d. Identification of beneficial uses and applicable water quality standards;
    e. Identification of applicable Total Maximum Daily Loads;
    f. Monitoring parameters;
    g. Monitoring schedule, including description and frequencies of monitoring events;

h. Description of data analysis methods;

6. The QAPP must include receiving water and site-specific information, project organization and responsibilities, and quality assurance components of the MRP. The QAPP must also include the laboratory and field requirements to be used for analyses and data evaluation. The QAPP must contain adequate detail for project and Water Board staff to identify and assess the technical and quality objectives, measurement and data acquisition methods, and limitations of the data generated under the surface receiving water quality monitoring. All sampling and laboratory methodologies and QAPP content must be consistent with U.S. EPA methods, State Water Board's Surface Water Ambient Monitoring Program (SWAMP) protocols and the Central Coast Water Board's Central Coast Ambient Monitoring Program (CCAMP). Following U.S. EPA guidelines[1] and SWAMP templates[2], the receiving water quality monitoring QAPP must include the following minimum required components:
    a. Project Management. This component addresses basic project management, including the project history and objectives, roles and responsibilities of the participants, and other aspects.
    b. Data Generation and Acquisition. This component addresses all aspects of project design and implementation. Implementation of these elements ensures that appropriate methods for sampling, measurement and analysis, data collection or generation, data handling, and quality control activities are employed and are properly documented. Quality control requirements are applicable to all the constituents sampled as part of the MRP, as described in the appropriate method.
    c. Assessment and Oversight. This component addresses the activities for assessing the effectiveness of the implementation of the project and associated QA and QC activities. The purpose of the assessment is to provide project oversight that will ensure that the QA Project Plan is implemented as prescribed.
    d. Data Validation and Usability. This component addresses the quality assurance activities that occur after the data collection, laboratory analysis and data generation phase of the project is completed. Implementation of these elements ensures that the data conform to the specified criteria, thus achieving the MRP objectives.

[1] USEPA. 2001 (2006) USEPA Requirements for Quality Assurance Project Plans (QA/R-5) Office of Environmental Information, Washington, D.C. USEPA QA/R-5

[2] http://waterboards.ca.gov/water_issues/programs/swamp/tools.shtml#qa

7. The Central Coast Water Board may conduct an audit of contracted laboratories at any time in order to evaluate compliance with the QAPP.

8. The Sampling and Analysis Plan and QAPP, and any proposed revisions are subject to approval by the Executive Officer. The Executive Officer may also revise the Sampling and Analysis Plan, including adding, removing, or changing monitoring site locations, changing monitoring parameters, and other changes as necessary to assess the impacts of waste discharges from irrigated lands to receiving water.

Surface Receiving Water Quality Monitoring Sites

9. The Sampling and Analysis Plan must, at a minimum, include monitoring sites to evaluate waterbodies identified in Table 1, unless otherwise approved by the Executive Officer. The Sampling and Analysis Plan must include sites to evaluate receiving water quality impacts most directly resulting from areas of agricultural discharge (including areas receiving tile drain discharges). Site selection must take into consideration the existence of any long term monitoring sites included in related monitoring programs (e.g. CCAMP and the existing CMP). Sites may be added or modified, subject to prior approval by the Executive Officer, to better assess the pollutant loading from individual sources or the impacts to receiving waters caused by individual discharges. Any modifications must consider sampling consistency for purposes of trend evaluation.

Surface Receiving Water Quality Monitoring Parameters

10. The Sampling and Analysis Plan must, at a minimum, include the following types of monitoring and evaluation parameters listed below and identified in Table 2:

    a. Flow Monitoring;
    b. Water Quality (physical parameters, metals, nutrients, pesticides);
    c. Toxicity (water and sediment);
    d. Assessment of Benthic Invertebrates.

11. All analyses must be conducted at a laboratory certified for such analyses by the State Department of Public Health (CDPH) or at laboratories approved by the Executive Officer. Unless otherwise noted, all sampling, sample preservation, and analyses must be performed in accordance with the latest edition of *Test Methods for Evaluating Solid Waste*, SW-846, U.S. EPA, and analyzed as specified herein by the above analytical methods and reporting limits indicated. Certified laboratories can be found at the web link: http://www.cdph.ca.gov/certlic/labs/Documents/ELAPLablist.xls

12. Water quality and flow monitoring is used to assess the sources, concentrations, and loads of waste discharges from individual farms/ranches and groups of Dischargers to surface waters, to evaluate impacts to water quality and beneficial uses, and to evaluate the short term patterns and long term trends in receiving water quality. Monitoring data must be compared to existing numeric and narrative water quality objectives.

13. Toxicity testing is to evaluate water quality relative to the narrative toxicity objective. Water column toxicity analyses must be conducted on 100% (undiluted) sample. At sites where persistent unresolved toxicity is found, the Executive Officer may require concurrent toxicity and chemical analyses and a Toxicity Identification Evaluation (TIE) to identify the individual discharges causing the toxicity.

Surface Receiving Water Quality Monitoring Frequency and Schedule

14. The Sampling and Analysis Plan must include a schedule for sampling. Timing, duration, and frequency of monitoring must be based on the land use, complexity, hydrology, and size of the waterbody. Table 2 includes minimum monitoring frequency and parameter lists. Agricultural parameters that are less common may be monitored less frequently. Modifications to the receiving water quality monitoring parameters, frequency, and schedule may be submitted for Executive Officer consideration and approval. At a minimum, the Sampling and Analysis Plan schedule must consist of monthly monitoring of common agricultural parameters in major agricultural areas, including two major storm events during the wet season (October 1 – April 30).

15. Storm event monitoring must be conducted within 18 hours of storm events, preferably including the first flush run-off event that results in significant increase in stream flow. For purposes of this MRP, a storm event is defined as precipitation producing onsite runoff (surface water flow) capable of creating significant ponding, erosion or other water quality problem. A significant storm event will generally result in greater than 1-inch of rain within a 24-hour period.

16. Dischargers (individually or as part of a cooperative monitoring program) must perform receiving water quality monitoring per the Sampling and Analysis Plan and QAPP approved by the Executive Officer.

B. Surface Receiving Water Quality Reporting

Surface Receiving Water Quality Data Submittal

1. Dischargers (individually or as part of a cooperative monitoring program) must submit water quality monitoring data to the Central Coast Water Board electronically, in a format specified by the Executive Officer and compatible with SWAMP/CCAMP electronic submittal guidelines, each January 1, April 1, July 1, and October 1.

Surface Receiving Water Quality Monitoring Annual Report

2. **By July 1, 2017,** and every July 1 annually thereafter, Dischargers (individually or as part of a cooperative monitoring program) must submit an Annual Report, electronically, in a format specified by the Executive Officer including the following minimum elements:

a. Signed Transmittal Letter;
b. Title Page;
c. Table of Contents;
d. Executive Summary;
e. Summary of Exceedance Reports submitted during the reporting period;
f. Monitoring objectives and design;
g. Monitoring site descriptions and rainfall records for the time period covered;
h. Location of monitoring sites and map(s);
i. Tabulated results of all analyses arranged in tabular form so that the required information is readily discernible;
j. Summary of water quality data for any sites monitored as part of related monitoring programs, and used to evaluate receiving water as described in the Sampling and Analysis Plan.
k. Discussion of data to clearly illustrate compliance with the Order and water quality standards;
l. Discussion of short term patterns and long term trends in receiving water quality and beneficial use protection;
m. Evaluation of pesticide and toxicity analyses results, and recommendation of candidate sites for Toxicity Identification Evaluations (TIEs);
n. Identification of the location of any agricultural discharges observed discharging directly to surface receiving water;
o. Laboratory data submitted electronically in a SWAMP/CCAMP comparable format;
p. Sampling and analytical methods used;
q. Copy of chain-of-custody forms;
r. Field data sheets, signed laboratory reports, laboratory raw data;
s. Associated laboratory and field quality control samples results;
t. Summary of Quality Assurance Evaluation results;

u. Specify the method used to obtain flow at each monitoring site during each monitoring event;
v. Electronic or hard copies of photos obtained from all monitoring sites, clearly labeled with site ID and date;
w. Conclusions.

PART 2. GROUNDWATER MONITORING AND REPORTING REQUIREMENTS

Groundwater monitoring may be conducted through a cooperative monitoring and reporting program on behalf of growers, or Dischargers may choose to conduct groundwater monitoring and reporting individually. Qualifying cooperative groundwater monitoring and reporting programs must implement the groundwater monitoring and reporting requirements described in this Order, unless otherwise approved by the Executive Officer. An interested person may seek review by the Central Coast Water Board of the Executive Officer's approval or denial of a cooperative groundwater monitoring and reporting program.

Key monitoring and reporting requirements for groundwater are shown in Table 3.

A. Groundwater Monitoring

1. Dischargers must sample private domestic wells and the primary irrigation well on their farm/ranch to evaluate groundwater conditions in agricultural areas, identify areas at greatest risk for nitrogen loading and exceedance of drinking water standards, and identify priority areas for follow up actions.

2. Dischargers must sample at least one groundwater well for each farm/ranch on their operation, including groundwater wells that are located within the property boundary of the enrolled county assessor parcel numbers (APNs). For farms/ranches with multiple groundwater wells, Dischargers must sample all domestic wells and the primary irrigation well. For the purposes of this MRP, a "domestic well" is any well that is used or may be used for domestic use purposes, including any groundwater well that is connected to a residence, workshop, or place of business that may be used for human consumption, cooking, or sanitary purposes. Groundwater monitoring parameters must include well screen interval depths (if available), general chemical parameters, and general cations and anions listed in Table 3.

3. Dischargers must conduct two rounds of monitoring of required groundwater wells during calendar year 2017; one sample collected during spring (**March - June)** and one sample collected during fall **(September - December)**.

4. Groundwater samples must be collected by a qualified third party (e.g., consultant, technician, person conducting cooperative monitoring) using proper sampling methods, chain-of-custody, and quality assurance/quality

control protocols. Groundwater samples must be collected at or near the well head before the pressure tank and prior to any well head treatment. In cases where this is not possible, the water sample must be collected from a sampling point as close to the pressure tank as possible, or from a cold-water spigot located before any filters or water treatment systems.

5. Laboratory analyses for groundwater samples must be conducted by a State certified laboratory according to U.S. EPA approved methods; unless otherwise noted, all monitoring, sample preservation, and analyses must be performed in accordance with the latest edition of *Test Methods for Evaluating Solid Waste*, SW-846, United States Environmental Protection Agency, and analyzed as specified herein by the above analytical methods and reporting limits indicated. Certified laboratories can be found at the web link below: http://www.waterboards.ca.gov/centralcoast/water_issues/programs/ag_waivers/docs/resources4growers/2016_04_11_labs.pdf

6. If a discharger determines that water in any domestic well exceeds 10 mg/L of nitrate as N, the discharger or third party must provide notice to the Central Coast Water Board within 24 hours of learning of the exceedance. For domestic wells on a Discharger's farm/ranch that exceed 10 mg/L nitrate as N, the Discharger must provide written notification to the users within 10 days of learning of the exceedance and provide written confirmation of the notification to the Central Coast Water Board.

   The drinking water notification must include the statement that the water poses a human health risk due to elevated nitrate concentration, and include a warning against the use of the water for drinking or cooking. In addition, Dischargers must also provide prompt written notification to any new well users (e.g. tenants and employees with access to the affected well), whenever there is a change in occupancy.

   For all other domestic wells not on a Discharger's farm/ranch but that may be impacted by nitrate, the Central Coast Water Board will notify the users promptly.

   The drinking water notification and confirmation letters required by this Order are available to the public.

B. Groundwater Reporting

1. **Within 60 days of sample collection,** Dischargers must coordinate with the laboratory to submit the following groundwater monitoring results and information, electronically, using the Water Board's GeoTracker electronic deliverable format (EDF):
   a. GeoTracker Ranch Global Identification Number

b. Field point name (Well Name)
c. Field Point Class (Well Type)
d. Latitude
e. Longitude
f. Sample collection date
g. Analytical results
h. Well construction information (e.g., total depth, screened intervals, depth to water), as available

2. Dischargers must submit groundwater well information required in the electronic Notice of Intent (eNOI) for each farm/ranch and update the eNOI to reflect changes in the farm/ranch information within 30 days of the change. Groundwater well information reported on the eNOI includes, but is not limited to:

a. Number of groundwater wells present at each farm/ranch
b. Identification of any groundwater wells abandoned or destroyed (including method destroyed) in compliance with the Order
c. Use for fertigation or chemigation
d. Presence of back flow prevention devices
e. Number of groundwater wells used for agricultural purposes
f. Number of groundwater wells used for or may be used for domestic use purposes (domestic wells).

PART 3. GENERAL MONITORING AND REPORTING REQUIREMENTS

A. Submittal of Technical Reports

1. Dischargers must submit reports in a format specified by the Executive Officer. A transmittal letter must accompany each report, containing the following penalty of perjury statement signed by the Discharger or the Discharger’s authorized agent:

   “In compliance with Water Code §*13267, I certify under penalty of perjury that this document and all attachments were prepared by me, or under my direction or supervision following a system designed to assure that qualified personnel properly gather and evaluate the information submitted. To the best of my knowledge and belief, this document and all attachments are true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment”.*

2. If the Discharger asserts that all or a portion of a report submitted pursuant to this Order is subject to an exemption from public disclosure (e.g. trade secrets or secret processes), the Discharger must provide an explanation of how those portions of the reports are exempt from public disclosure. The

Discharger must clearly indicate on the cover of the report (typically an electronic submittal) that the Discharger asserts that all or a portion of the report is exempt from public disclosure, submit a complete report with those portions that are asserted to be exempt in redacted form, submit separately (in a separate electronic file) unredacted pages (to be maintained separately by staff). The Central Coast Water Board staff will determine whether any such report or portion of a report qualifies for an exemption from public disclosure. If the Central Coast Water Board staff disagrees with the asserted exemption from public disclosure, the Central Coast Water Board staff will notify the Discharger prior to making such report or portions of such report available for public inspection.

B. Central Coast Water Board Authority

1. Monitoring reports are required pursuant to section 13267 of the California Water Code. Pursuant to section 13268 of the Water Code, a violation of a request made pursuant to section 13267 may subject you to civil liability of up to $1000 per day.

2. The Water Board needs the required information to determine compliance with Order No.R3-2017-0002. The evidence supporting these requirements is included in the findings of Order No.R3-2017-0002.

John M. Robertson
Executive Officer

March 8, 2017
Date

Table 1. Major Waterbodies in Agricultural Areas[1]

Hydrologic SubArea	Waterbody Name	Hydrologic SubArea	Waterbody Name
30510	Pajaro River	30920	Quail Creek
30510	Salsipuedes Creek	30920	Salinas Reclamation Canal
30510	Watsonville Slough	31022	Chorro Creek
30510	Watsonville Creek[2]	31023	Los Osos Creek
30510	Beach Road Ditch[2]	31023	Warden Creek
30530	Carnadero Creek	31024	San Luis Obispo Creek
30530	Furlong Creek[2]	31024	Prefumo Creek
30530	Llagas Creek	31031	Arroyo Grande Creek
30530	Miller's Canal	31031	Los Berros Creek
30530	San Juan Creek	31210	Bradley Canyon Creek
30530	Tesquisquita Slough	31210	Bradley Channel
30600	Moro Cojo Slough	31210	Green Valley Creek
30910	Alisal Slough	31210	Main Street Canal
30910	Blanco Drain	31210	Orcutt Solomon Creek
30910	Old Salinas River	31210	Oso Flaco Creek
30910	Salinas River (below Gonzales Rd.)	31210	Little Oso Flaco Creek
30920	Salinas River (above Gonzales Rd. and below Nacimiento R.)	31210	Santa Maria River
30910	Santa Rita Creek[2]	31310	San Antonio Creek[2]
30910	Tembladero Slough	31410	Santa Ynez River
30920	Alisal Creek	31531	Bell Creek
30920	Chualar Creek	31531	Glenn Annie Creek
30920	Espinosa Slough	31531	Los Carneros Creek[2]
30920	Gabilan Creek	31534	Arroyo Paredon Creek
30920	Natividad Creek	31534	Franklin Creek

[1] At a minimum, monitoring sites must be included for these waterbodies in agricultural areas, unless otherwise approved by the Executive Officer. Monitoring sites may be proposed for addition or modification to better assess the impacts of waste discharges from irrigated lands to surface water. Dischargers choosing to comply with surface receiving water quality monitoring, individually (not part of a cooperative monitoring program) must only monitor sites for waterbodies receiving the discharge.

[2] These creeks are included because they are newly listed waterbodies on the 2010 303(d) list of Impaired Waters that are associated with areas of agricultural discharge.

Table 2. Surface Receiving Water Quality Monitoring Parameters

Parameters and Tests	RL[3]	Monitoring Frequency[1]
Photo Monitoring		
Upstream and downstream photographs at monitoring location		With every monitoring event
WATER COLUMN SAMPLING		
Physical Parameters and General Chemistry		
Flow (field measure) (CFS) following SWAMP field SOP[9]	.25	Monthly, including 2 stormwater events
pH (field measure)	0.1	"
Electrical Conductivity (field measure) (µS/cm)	2.5	"
Dissolved Oxygen (field measure) (mg/L)	0.1	"
Temperature (field measure) (^{o}C)	0.1	"
Turbidity (NTU)	0.5	"
Total Dissolved Solids (mg/L)	10	"
Total Suspended Solids (mg/L)	0.5	"
Nutrients		
Total Nitrogen (mg/L)	0.5	Monthly, including 2 stormwater events
Nitrate + Nitrite (as N) (mg/L)	0.1	"
Total Ammonia (mg/L)	0.1	"
Unionized Ammonia (calculated value, mg/L))		"
Total Phosphorus (as P) (mg/L)	0.02	
Soluble Orthophosphate (mg/L)	0.01	"
Water column chlorophyll a (µg/L)	1.0	"
Algae cover, Floating Mats, % coverage	-	"
Algae cover, Attached, % coverage	-	"
Water Column Toxicity Test		
Algae - *Selenastrum capricornutum (*96-hour chronic; Method1003.0 in EPA/821/R-02/013)	-	4 times each year, twice in dry season, twice in wet season
Water Flea – *Ceriodaphnia dubia* (7-day chronic; Method 1002.0 in EPA/821/R-02/013)	-	"
Midge - *Chironomus spp.* (96-hour acute; Alternate test species in EPA 821-R-02-012)	-	"

Parameters and Tests	RL[3]	Monitoring Frequency[1]
Toxicity Identification Evaluation (TIE)	-	As directed by Executive Officer
Pesticides[2] /Herbicides (µg/L)		
Organophosphate Pesticides		
Azinphos-methyl	0.02	2 times in both 2017 and 2018, once in dry season and once in wet season of each year, concurrent with water toxicity monitoring
Chlorpyrifos	0.005	"
Diazinon	0.005	"
Dichlorvos	0.01	"
Dimethoate	0.01	"
Dimeton-s	0.005	"
Disulfoton (Disyton)	0.005	"
Malathion	0.005	"
Methamidophos	0.02	"
Methidathion	0.02	"
Parathion-methyl	0.02	"
Phorate	0.01	"
Phosmet	0.02	"
Neonicotinoids		
Thiamethoxam	.002	"
Imidacloprid	.002	"
Thiacloprid	.002	"
Dinotefuran	.006	"
Acetamiprid	.01	"
Clothianidin	.02	"
Herbicides		
Atrazine	0.05	"
Cyanazine	0.20	"
Diuron	0.05	"
Glyphosate	2.0	"
Linuron	0.1	"
Paraquat	0.20	"
Simazine	0.05	"
Trifluralin	0.05	"
Metals (µg/L)		
Arsenic (total) [5,7]	0.3	2 times in both 2017 and 2018, once in dry season and once in wet season of each year, concurrent with water toxicity monitoring
Boron (total) [6,7]	10	"
Cadmium (total & dissolved) [4.5,7]	0.01	"

Parameters and Tests	RL[3]	Monitoring Frequency[1]
Copper (total and dissolved) [4,7]	0.01	"
Lead (total and dissolved) [4,7]	0.01	"
Nickel (total and dissolved) [4,7]	0.02	"
Molybdenum (total) [7]	1	"
Selenium (total)[7]	0.30	"
Zinc (total and dissolved) [4.5,7]	0.10	"
Other (µg/L)		
Total Phenolic Compounds[8]	5	2 times in 2017, once in spring (April-May) and once in fall (August-September)
Hardness (mg/L as CaCO3)	1	"
Total Organic Carbon (ug/L)	0.6	"
SEDIMENT SAMPLING		
Sediment Toxicity - *Hyalella azteca* 10-day static renewal (EPA, 2000)		2 times each year, once in spring (April-May) and once in fall (August-September)
Pyrethroid Pesticides in Sediment (µg/kg)		
Gamma-cyhalothrin	2	2 times in both 2017 and 2018, once in spring (April-May) and once in fall (August-September) of each year, concurrent with sediment toxicity sampling
Lambda-cyhalothrin	2	"
Bifenthrin	2	"
Beta-cyfluthrin	2	"
Cyfluthrin	2	"
Esfenvalerate	2	"
Permethrin	2	"
Cypermethrin	2	"
Danitol	2	"
Fenvalerate	2	"
Fluvalinate	2	"
Other Monitoring in Sediment		
Chlorpyrifos (µg/kg)	2	"
Total Organic Carbon	0.01%	"
		"
Sediment Grain Size Analysis	1%	"

[1]Monitoring frequency may be used as a guide for developing alternative Sampling and Analysis Plans implemented by individual growers.
[2]Pesticide list may be modified based on specific pesticide use in Central Coast Region. Analytes on this list must be reported, at a minimum.
[3] Reporting Limit, taken from SWAMP where applicable.
[4] Holmgren, Meyer, Cheney and Daniels. 1993. Cadmium, Lead, Zinc, Copper and Nickel in Agricultural Soils of the United States. J. of Environ. Quality 22:335-348.

[5]Sax and Lewis, ed. 1987. Hawley's Condensed Chemical Dictionary. 11th ed. New York: Van Nostrand Reinhold Co., 1987. Zinc arsenate is an insecticide.
[6]Http://www.coastalagro.com/products/labels/9%25BORON.pdf; Boron is applied directly or as a component of fertilizers as a plant nutrient.
[7]Madramootoo, Johnston, Willardson, eds. 1997. Management of Agricultural Drainage Water Quality. International Commission on Irrigation and Drainage. U.N. FAO. SBN 92-6-104058.3.
[8]http://cat.inist.fr/?aModele=afficheN&cpsidt=14074525; Phenols are breakdown products of herbicides and pesticides. Phenols can be directly toxic and cause endocrine disruption.
[9]See SWAMP field measures SOP, p. 17
mg/L – milligrams per liter; ug/L – micrograms per liter; ug/kg – micrograms per kilogram;
NTU – Nephelometric Turbidity Units; CFS – cubic feet per second.

Table 3. Groundwater Sampling Parameters

Parameter	RL	Analytical Method[3]	Units
pH	0.1	Field or Laboratory Measurement EPA General Methods	pH Units
Specific Conductance	2.5		µS/cm
Total Dissolved Solids	10		mg/L
Total Alkalinity as $CaCO_3$		EPA Method 310.1 or 310.2	
Calcium	0.05	General Cations[1] EPA 200.7, 200.8, 200.9	
Magnesium	0.02		
Sodium	0.1		
Potassium	0.1		
Sulfate (SO4)	1.0	General Anions EPA Method 300 or EPA Method 353.2	
Chloride	0.1		
Nitrate + Nitrite (as N)[2] or Nitrate as N	0.1		

[1]General chemistry parameters (major cations and anions) represent geochemistry of water bearing zone and assist in evaluating quality assurance/quality control of groundwater monitoring and laboratory analysis.
[2]The MRP allows analysis of "nitrate plus nitrite" to represent nitrate concentrations (as N). The "nitrate plus nitrite" analysis allows for extended laboratory holding times and relieves the Discharger of meeting the short holding time required for nitrate.
[3]Dischargers may use alternative analytical methods approved by EPA.
RL – Reporting Limit; µS/cm – micro siemens per centimeter

Table 4. Tier 1 - Time Schedule for Key Monitoring and Reporting Requirements (MRPs)

REQUIREMENT	TIME SCHEDULE[1]
Submit Sampling And Analysis Plan and Quality Assurance Project Plan (SAAP/QAPP) for Surface Receiving Water Quality Monitoring *(individually or through cooperative monitoring program)*	By March 1, 2018, or as directed by the Executive Officer; satisfied if an approved SAAP/QAPP has been submitted pursuant to Order No. R3-2012-0011 and associated MRPs
Initiate surface receiving water quality monitoring *(individually or through cooperative monitoring program)*	Per an approved SAAP and QAPP
Submit surface receiving water quality monitoring data *(individually or through cooperative monitoring program)*	Each January 1, April 1, July 1, and October 1

Submit surface receiving water quality Annual Monitoring Report *(individually or through cooperative monitoring program)*	By July 1 2017; annually thereafter by July 1
Initiate monitoring of groundwater wells	First sample from March-June 2017, second sample from September-December 2017
Submit groundwater monitoring results	Within 60 days of the sample collection

[1] Dates are relative to adoption of this Order, unless otherwise specified.

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION

MONITORING AND REPORTING PROGRAM
ORDER NO. R3-2017-0002-02

TIER 2

DISCHARGERS ENROLLED UNDER
THE CONDITIONAL WAIVER OF WASTE DISCHARGE REQUIREMENTS FOR
DISCHARGES FROM IRRIGATED LANDS

This Monitoring and Reporting Program Order No. R3-2017-0002-02 (MRP) is issued pursuant to California Water Code (Water Code) sections 13267 and 13269, which authorize the California Regional Water Quality Control Board, Central Coast Region (hereafter Central Coast Water Board) to require preparation and submittal of technical and monitoring reports. Water Code section 13269 requires a waiver of waste discharge requirements to include as a condition the performance of monitoring and the public availability of monitoring results. *Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands*, Order No. R3-2017-0002 (Order) includes criteria and requirements for three tiers. This MRP sets forth monitoring and reporting requirements for **Tier 2 Dischargers** enrolled under the Order. A summary of the requirements is shown below.

SUMMARY OF MONITORING AND REPORTING REQUIREMENTS FOR TIER 2:

Part 1: Surface Receiving Water Monitoring and Reporting *(cooperative or individual)*
Part 2: Groundwater Monitoring and Reporting *(cooperative or individual)*
Total Nitrogen Applied Reporting *(required for subset of Tier 2 Dischargers if farm/ranch growing any crop with high nitrate loading risk to groundwater);*
Part 3: Annual Compliance Form

Pursuant to Water Code section 13269(a)(2), monitoring requirements must be designed to support the development and implementation of the waiver program, including, but not limited to, verifying the adequacy and effectiveness of the waiver's conditions. The monitoring and reports required by this MRP are to evaluate effects of discharges of waste from irrigated agricultural operations and individual farms/ranches on waters of the state and to determine compliance with the Order.

MONITORING AND REPORTING BASED ON TIERS

The Order and MRP include criteria and requirements for three tiers, based upon those characteristics of the individual farms/ranches at the operation that present the highest level of waste discharge or greatest risk to water quality. Dischargers must meet conditions of the Order and MRP for the appropriate tier that applies to their land and/or the individual farm/ranch. Within a tier, Dischargers comply with requirements based on the specific level of discharge and threat to water quality from individual farms/ranches. The lowest tier, Tier 1, applies to dischargers who discharge the lowest level of waste (amount or concentration) or pose the lowest potential to cause or contribute to an exceedance of water quality standards in waters of the State or of the United States. The highest tier, Tier 3, applies to dischargers who discharge the highest level of waste or pose the greatest potential to cause or contribute to an exceedance of water quality standards in waters of the State or of the United States. Tier 2 applies to dischargers whose discharge has a moderate threat to water quality. Water quality is defined in terms of regional, state, or federal numeric or narrative water quality standards. Per the Order, Dischargers may submit a request to the Executive Officer to approve transfer to a lower tier. If the Executive Officer approves a transfer to a lower tier, any interested person may request that the Central Coast Water Board conduct a review of the Executive Officer's determination.

PART 1. SURFACE RECEIVING WATER MONITORING AND REPORTING REQUIREMENTS

The surface receiving water monitoring and reporting requirements described herein are generally a continuation of the surface receiving water monitoring and reporting requirements of Monitoring and Reporting Program Order No. 2012-0011-02, as revised August 22, 2016, with the intent of uninterrupted regular monitoring and reporting during the transition from Order No. R3-2012-0011-02 to Order No. R3-2017-0002-02.

Monitoring and reporting requirements for surface receiving water identified in Part 1.A. and Part 1.B. apply to Tier 2 Dischargers. Surface receiving water refers to water flowing in creeks and other surface waters of the State. Surface receiving water monitoring may be conducted through a cooperative monitoring program on behalf of Dischargers, or Dischargers may choose to conduct surface receiving water monitoring and reporting individually. Key monitoring and reporting requirements for surface receiving water are shown in Tables 1 and 2. Time schedules are shown in Table4.

A. Surface Receiving Water Quality Monitoring

1. Dischargers must elect a surface receiving water monitoring option (cooperative monitoring program or individual receiving water monitoring) to comply with surface receiving water quality monitoring requirements, and identify the option selected on the Notice of Intent (NOI).

2. Dischargers are encouraged to choose participation in a cooperative monitoring program (e.g., the existing Cooperative Monitoring Program or a similar program) to comply with receiving water quality monitoring requirements. Dischargers not participating in a cooperative monitoring program must conduct surface receiving water quality monitoring individually that achieves the same purpose.

3. Dischargers (individually or as part of a cooperative monitoring program) must conduct surface receiving water quality monitoring to a) assess the impacts of their waste discharges from irrigated lands to receiving water, b) assess the status of receiving water quality and beneficial use protection in impaired waterbodies dominated by irrigated agricultural activity, c) evaluate status, short term patterns and long term trends (five to ten years or more) in receiving water quality, d) evaluate water quality impacts resulting from agricultural discharges (including but not limited to tile drain discharges), e) evaluate stormwater quality, f) evaluate condition of existing perennial, intermittent, or ephemeral streams or riparian or wetland area habitat, including degradation resulting from erosion or agricultural discharges of waste, and g) assist in the identification of specific sources of water quality problems.

<u>Surface Receiving Water Quality Sampling and Analysis Plan</u>

4. **By March 1, 2018, or as directed by the Executive Officer**, Dischargers (individually or as part of a cooperative monitoring program) must submit a surface receiving water quality Sampling and Analysis Plan (SAAP) and Quality Assurance Project Plan (QAPP); this requirement is satisfied if an approved SAAP and QAPP addressing all surface receiving water quality monitoring requirements described in this Order has been submitted pursuant to Order No.R3-2012-0011 and associated Monitoring and Reporting Programs. Dischargers (or a third party cooperative monitoring program) must develop the Sampling and Analysis Plan to describe how the proposed monitoring will achieve the objectives of the MRP and evaluate compliance with the Order. The Sampling and Analysis Plan may propose alternative monitoring site locations, adjusted monitoring parameters, and other changes as necessary to assess the impacts of waste discharges from irrigated lands to receiving water. The Executive Officer must approve the Sampling and Analysis Plan and QAPP.

5. The Sampling and Analysis Plan must include the following minimum required components:
    a. Monitoring strategy to achieve objectives of the Order and MRP;
    b. Map of monitoring sites with GIS coordinates;

c. Identification of known water quality impairments and impaired waterbodies per the 2010 Clean Water Act 303(d) List of Impaired Waterbodies (List of Impaired Waterbodies);
d. Identification of beneficial uses and applicable water quality standards;
e. Identification of applicable Total Maximum Daily Loads;
f. Monitoring parameters;
g. Monitoring schedule, including description and frequencies of monitoring events;
h. Description of data analysis methods;

6. The QAPP must include receiving water and site-specific information, project organization and responsibilities, and quality assurance components of the MRP. The QAPP must also include the laboratory and field requirements to be used for analyses and data evaluation. The QAPP must contain adequate detail for project and Water Board staff to identify and assess the technical and quality objectives, measurement and data acquisition methods, and limitations of the data generated under the surface receiving water quality monitoring. All sampling and laboratory methodologies and QAPP content must be consistent with U.S. EPA methods, State Water Board's Surface Water Ambient Monitoring Program (SWAMP) protocols and the Central Coast Water Board's Central Coast Ambient Monitoring Program (CCAMP). Following U.S. EPA guidelines[1] and SWAMP templates[2], the receiving water quality monitoring QAPP must include the following minimum required components:
    a. Project Management. This component addresses basic project management, including the project history and objectives, roles and responsibilities of the participants, and other aspects.
    b. Data Generation and Acquisition. This component addresses all aspects of project design and implementation. Implementation of these elements ensures that appropriate methods for sampling, measurement and analysis, data collection or generation, data handling, and quality control activities are employed and are properly documented. Quality control requirements are applicable to all the constituents sampled as part of the MRP, as described in the appropriate method.
    c. Assessment and Oversight. This component addresses the activities for assessing the effectiveness of the implementation of the project and associated QA and QC activities. The purpose of the assessment is to provide project oversight that

[1] USEPA 2001 (2006) USEPA requirements for Quality Assurance Project Plans (QA/R-5) Office of Environmental Information, Washington, D.C. USEPA QA/R-5
[2] http://waterboards.ca.gov/water_issues/programs/swamp/tools.shtml#qa

will ensure that the QA Project Plan is implemented as prescribed.

d. Data Validation and Usability. This component addresses the quality assurance activities that occur after the data collection, laboratory analysis and data generation phase of the project is completed. Implementation of these elements ensures that the data conform to the specified criteria, thus achieving the MRP objectives.

7. The Central Coast Water Board may conduct an audit of contracted laboratories at any time in order to evaluate compliance with the QAPP.

8. The Sampling and Analysis Plan and QAPP, and any proposed revisions are subject to approval by the Executive Officer. The Executive Officer may also revise the Sampling and Analysis Plan, including adding, removing, or changing monitoring site locations, changing monitoring parameters, and other changes as necessary to assess the impacts of waste discharges from irrigated lands to receiving water.

Surface Receiving Water Quality Monitoring Sites

9. The Sampling and Analysis Plan must, at a minimum, include monitoring sites to evaluate waterbodies identified in Table 1, unless otherwise approved by the Executive Officer. The Sampling and Analysis Plan must include sites to evaluate receiving water quality impacts most directly resulting from areas of agricultural discharge (including areas receiving tile drain discharges). Site selection must take into consideration the existence of any long term monitoring sites included in related monitoring programs (e.g. CCAMP and the existing CMP). Sites may be added or modified, subject to prior approval by the Executive Officer, to better assess the pollutant loading from individual sources or the impacts to receiving waters caused by individual discharges. Any modifications must consider sampling consistency for purposes of trend evaluation.

Surface Receiving Water Quality Monitoring Parameters

10. The Sampling and Analysis Plan must, at a minimum, include the following types of monitoring and evaluation parameters listed below and identified in Table 2:

    a. Flow Monitoring;
    b. Water Quality (physical parameters, metals, nutrients, pesticides);
    c. Toxicity (water and sediment);
    d. Assessment of Benthic Invertebrates.

11. All analyses must be conducted at a laboratory certified for such analyses by the State Department of Public Health (CDPH) or at laboratories approved by the Executive Officer. Unless otherwise noted, all sampling, sample preservation, and analyses must be performed in accordance with the latest edition of *Test Methods for Evaluating Solid Waste*, SW-846, U.S. EPA, and analyzed as specified herein by the above analytical methods and reporting limits indicated. Certified laboratories can be found at the web link: http://www.cdph.ca.gov/certlic/labs/Documents/ELAPLablist.xls

12. Water quality and flow monitoring is used to assess the sources, concentrations, and loads of waste discharges from individual farms/ranches and groups of Dischargers to surface waters, to evaluate impacts to water quality and beneficial uses, and to evaluate the short term patterns and long term trends in receiving water quality. Monitoring data must be compared to existing numeric and narrative water quality objectives.

13. Toxicity testing is to evaluate water quality relative to the narrative toxicity objective. Water column toxicity analyses must be conducted on 100% (undiluted) sample. At sites where persistent unresolved toxicity is found, the Executive Officer may require concurrent toxicity and chemical analyses and a Toxicity Identification Evaluation (TIE) to identify the individual discharges causing the toxicity.

Surface Receiving Water Quality Monitoring Frequency and Schedule

14. The Sampling and Analysis Plan must include a schedule for sampling. Timing, duration, and frequency of monitoring must be based on the land use, complexity, hydrology, and size of the waterbody. Table 2 includes minimum monitoring frequency and parameter lists. Agricultural parameters that are less common may be monitored less frequently. Modifications to the receiving water quality monitoring parameters, frequency, and schedule may be submitted for Executive Officer consideration and approval. At a minimum, the Sampling and Analysis Plan schedule must consist of monthly monitoring of common agricultural parameters in major agricultural areas, including two major storm events during the wet season (October 1 – April 30).

15. Storm event monitoring must be conducted within 18 hours of storm events, preferably including the first flush run-off event that results in significant increase in stream flow. For purposes of this MRP, a storm event is defined as precipitation producing onsite runoff (surface water flow) capable of creating significant ponding, erosion or other water quality problem. A

significant storm event will generally result in greater than 1-inch of rain within a 24-hour period.

16. Dischargers (individually or as part of a cooperative monitoring program) must perform receiving water quality monitoring per the Sampling and Analysis Plan and QAPP approved by the Executive Officer.

B. Surface Receiving Water Quality Reporting

Surface Receiving Water Quality Data Submittal

1. Dischargers (individually or as part of a cooperative monitoring program) must submit water quality monitoring data to the Central Coast Water Board electronically, in a format specified by the Executive Officer and compatible with SWAMP/CCAMP electronic submittal guidelines, each January 1, April 1, July 1, and October 1.

Surface Receiving Water Quality Monitoring Annual Report

2. **By July 1, 2017,** and every July 1 annually thereafter, Dischargers (individually or as part of a cooperative monitoring program) must submit an Annual Report, electronically, in a format specified by the Executive Officer including the following minimum elements:
   a. Signed Transmittal Letter;
   b. Title Page;
   c. Table of Contents;
   d. Executive Summary;
   e. Summary of Exceedance Reports submitted during the reporting period;
   f. Monitoring objectives and design;
   g. Monitoring site descriptions and rainfall records for the time period covered;
   h. Location of monitoring sites and map(s);
   i. Tabulated results of all analyses arranged in tabular form so that the required information is readily discernible;
   j. Summary of water quality data for any sites monitored as part of related monitoring programs, and used to evaluate receiving water as described in the Sampling and Analysis Plan.
   k. Discussion of data to clearly illustrate compliance with the Order and water quality standards;
   l. Discussion of short term patterns and long term trends in receiving water quality and beneficial use protection;
   m. Evaluation of pesticide and toxicity analyses results, and recommendation of candidate sites for Toxicity Identification Evaluations (TIEs);

n. Identification of the location of any agricultural discharges observed discharging directly to surface receiving water;
o. Laboratory data submitted electronically in a SWAMP/CCAMP comparable format;
p. Sampling and analytical methods used;
q. Copy of chain-of-custody forms;
r. Field data sheets, signed laboratory reports, laboratory raw data;
s. Associated laboratory and field quality control samples results;
t. Summary of Quality Assurance Evaluation results;
u. Specify the method used to obtain flow at each monitoring site during each monitoring event;
v. Electronic or hard copies of photos obtained from all monitoring sites, clearly labeled with site ID and date;
w. Conclusions.

PART 2. GROUNDWATER MONITORING AND REPORTING REQUIREMENTS

Groundwater monitoring may be conducted through a cooperative monitoring and reporting program on behalf of growers, or Dischargers may choose to conduct groundwater monitoring and reporting individually. Qualifying cooperative groundwater monitoring and reporting programs must implement the groundwater monitoring and reporting requirements described in this Order, unless otherwise approved by the Executive Officer. An interested person may seek review by the Central Coast Water Board of the Executive Officer's approval or denial of a cooperative groundwater monitoring and reporting program.

Key monitoring and reporting requirements for groundwater are shown in Table 3.

A. Groundwater Monitoring

1. Dischargers must sample private domestic wells and the primary irrigation well on their farm/ranch to evaluate groundwater conditions in agricultural areas, identify areas at greatest risk for nitrogen loading and exceedance of drinking water standards, and identify priority areas for follow up actions.

2. Dischargers must sample at least one groundwater well for each farm/ranch on their operation, including groundwater wells that are located within the property boundary of the enrolled county assessor parcel numbers (APNs). For farms/ranches with multiple groundwater wells, Dischargers must sample all domestic wells and the primary irrigation well. For the purposes of this MRP, a "domestic well" is any well that is used or may be used for domestic use purposes, including any groundwater well that is connected to a residence, workshop, or place of business that may be used for human consumption, cooking, or sanitary purposes. Groundwater monitoring

parameters must include well screen interval depths (if available), general chemical parameters, and general cations and anions listed in Table 3.

3. Dischargers must conduct two rounds of monitoring of required groundwater wells during calendar year 2017; one sample collected during spring (**March - June)** and one sample collected during fall **(September - December)**.

4. Groundwater samples must be collected by a qualified third party (e.g., consultant, technician, person conducting cooperative monitoring) using proper sampling methods, chain-of-custody, and quality assurance/quality control protocols. Groundwater samples must be collected at or near the well head before the pressure tank and prior to any well head treatment. In cases where this is not possible, the water sample must be collected from a sampling point as close to the pressure tank as possible, or from a cold-water spigot located before any filters or water treatment systems.

5. Laboratory analyses for groundwater samples must be conducted by a State certified laboratory according to U.S. EPA approved methods; unless otherwise noted, all monitoring, sample preservation, and analyses must be performed in accordance with the latest edition of *Test Methods for Evaluating Solid Waste*, SW-846, United States Environmental Protection Agency, and analyzed as specified herein by the above analytical methods and reporting limits indicated. Certified laboratories can be found at the web link below: http://www.waterboards.ca.gov/centralcoast/water_issues/programs/ag_waivers/docs/resources4growers/2016_04_11_labs.pdf

6. If a discharger determines that water in any domestic well exceeds 10 mg/L of nitrate as N, the discharger or third party must provide notice to the Central Coast Water Board within 24 hours of learning of the exceedance. For domestic wells on a Discharger’s farm/ranch, that exceed 10 mg/L of nitrate as N, the Discharger must provide written notification to the users within 10 days of learning of the exceedance and provide written confirmation of the notification to the Central Coast Water Board.

   The drinking water notification must include the statement that the water poses a human health risk due to elevated nitrate concentration, and include a warning against the use of the water for drinking or cooking. In addition, Dischargers must also provide prompt written notification to any new well users (e.g. tenants and employees with access to the affected well), whenever there is a change in occupancy.

   For all other domestic wells not on a Discharger’s farm/ranch but that may be impacted by nitrate, the Central Coast Water Board will notify the users promptly.

The drinking water notification and confirmation letters required by this Order are available to the public.

B. Groundwater Reporting

1. **Within 60 days of sample collection,** Dischargers must coordinate with the laboratory to submit the following groundwater monitoring results and information, electronically, using the Water Board's GeoTracker electronic deliverable format (EDF):
    a. GeoTracker Ranch Global Identification Number
    b. Field point name (Well Name)
    c. Field Point Class (Well Type)
    d. Latitude
    e. Longitude
    f. Sample collection date
    g. Analytical results
    h. Well construction information (e.g., total depth, screened intervals, depth to water), as available

2. Dischargers must submit groundwater well information required in the electronic Notice of Intent (eNOI) for each farm/ranch and update the eNOI to reflect changes in the farm/ranch information within 30 days of the change. Groundwater well information reported on the eNOI includes, but is not limited to:
    a. Number of groundwater wells present at each farm/ranch
    b. Identification of any groundwater wells abandoned or destroyed (including method destroyed) in compliance with the Order
    c. Use for fertigation or chemigation
    d. Presence of back flow prevention devices
    e. Number of groundwater wells used for agricultural purposes
    f. Number of groundwater wells used for or may be used for domestic use purposes (domestic wells).

C. Total Nitrogen Applied Reporting

1. By March 1, 2018, and by March 1 annually thereafter, Tier 2 Dischargers growing any crop with a high potential to discharge nitrogen to groundwater must record and report total nitrogen applied for each specific crop that was irrigated and grown for commercial purposes on that farm/ranch during the preceding calendar year (January through December).

    Crops with a high potential to discharge nitrogen to groundwater are: beet, broccoli, cabbage, cauliflower, celery, Chinese cabbage (napa), collard, endive, kale, leek, lettuce (leaf and head), mustard, onion (dry and green), spinach, strawberry, pepper (fruiting), and parsley.

Total nitrogen applied must be reported on the Total Nitrogen Applied Report form as described in the Total Nitrogen Applied Report form instructions.

Total nitrogen applied includes any product containing any form or concentration of nitrogen including, but not limited to, organic and inorganic fertilizers, slow release products, compost, compost teas, manure, and extracts.

2. The Total Nitrogen Applied Report form includes the following information:
    a. General ranch information such as GeoTracker file numbers, name, location, acres.
    b. Nitrogen concentration of irrigation water
    c. Nitrogen applied in pounds per acre with irrigation water
    d. Nitrogen present in the soil
    e. Nitrogen applied with compost and amendments
    f. Specific crops grown
    g. Nitrogen applied in pounds per acre with fertilizers and other materials to each specific crop grown
    h. Crop acres of each specific crop grown
    i. Whether each specific crop was grown organically or conventionally
    j. Basis for the nitrogen applied
    k. Explanation and comments section
    l. Certification statement with penalty of perjury declaration
    m. Additional information regarding whether each specific crop was grown in a nursery, greenhouse, hydroponically, in containers, and similar variables.

PART 3. ANNUAL COMPLIANCE FORM

Tier 2 Dischargers must submit annual compliance information, electronically, on the Annual Compliance Form. The purpose of the electronic Annual Compliance Form is to provide information to the Central Coast Water Board to assist in the evaluation of threat to water quality from individual agricultural discharges of waste and measure progress towards water quality improvement and verify compliance with the Order and MRP. Time schedules are shown in Table 4.

A. Annual Compliance Form

1. **By March 1, 2018, and updated annually thereafter by March 1**, Tier 2 Dischargers must submit an Annual Compliance Form electronically, in a

format specified by the Executive Officer. The electronic Annual Compliance Form includes, but is not limited to the following minimum requirements[1]:

a. Question regarding consistency between the Annual Compliance Form and the electronic Notice of Intent (eNOI);
b. Information regarding type and characteristics of discharge (e.g., number of discharge points, estimated flow/volume, number of tailwater days);
c. Identification of any direct agricultural discharges to a stream, lake, estuary, bay, or ocean;
d. Identification of specific farm water quality management practices completed, in progress, and planned to address water quality impacts caused by discharges of waste including irrigation management, pesticide management, nutrient management, salinity management, stormwater management, and sediment and erosion control to achieve compliance with this Order; and identification of specific methods used, and described in the Farm Plan consistent with Order Provision 44.g., for the purposes of assessing the effectiveness of management practices implemented and the outcomes of such assessments;
e. Proprietary information question and justification;
f. Authorization and certification statement and declaration of penalty of perjury.

PART 5. GENERAL MONITORING AND REPORTING REQUIREMENTS

A. Submittal of Technical Reports

1. Dischargers must submit reports in a format specified by the Executive Officer. A transmittal letter must accompany each report, containing the following penalty of perjury statement signed by the Discharger or the Discharger's authorized agent:

   "In compliance with Water Code §*13267, I certify under penalty of perjury that this document and all attachments were prepared by me, or under my direction or supervision following a system designed to assure that qualified personnel properly gather and evaluate the information submitted. To the best of my knowledge and belief, this document and all attachments are true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment".*

[1] Items reported in the Annual Compliance Form are due by March 1, 2018, and annually thereafter, unless otherwise specified.

2. If the Discharger asserts that all or a portion of a report submitted pursuant to this Order is subject to an exemption from public disclosure (e.g. trade secrets or secret processes), the Discharger must provide an explanation of how those portions of the reports are exempt from public disclosure. The Discharger must clearly indicate on the cover of the report (typically an electronic submittal) that the Discharger asserts that all or a portion of the report is exempt from public disclosure, submit a complete report with those portions that are asserted to be exempt in redacted form, submit separately (in a separate electronic file) unredacted pages (to be maintained separately by staff). The Central Coast Water Board staff will determine whether any such report or portion of a report qualifies for an exemption from public disclosure. If the Central Coast Water Board staff disagrees with the asserted exemption from public disclosure, the Central Coast Water Board staff will notify the Discharger prior to making such report or portions of such report available for public inspection.

B. Central Coast Water Board Authority

1. Monitoring reports are required pursuant to section 13267 of the California Water Code. Pursuant to section 13268 of the Water Code, a violation of a request made pursuant to section 13267 may subject you to civil liability of up to $1000 per day.

2. The Water Board needs the required information to determine compliance with Order No. R3-2017-0002. The evidence supporting these requirements is included in the findings of Order No. R3-2017-0002.

John M. Robertson
Executive Officer

March 8, 2017
Date

Table 1. Major Waterbodies in Agricultural Areas[1]

Hydrologic SubArea	Waterbody Name	Hydrologic SubArea	Waterbody Name
30510	Pajaro River	30920	Quail Creek
30510	Salsipuedes Creek	30920	Salinas Reclamation Canal
30510	Watsonville Slough	31022	Chorro Creek
30510	Watsonville Creek[2]	31023	Los Osos Creek
30510	Beach Road Ditch[2]	31023	Warden Creek
30530	Carnadero Creek	31024	San Luis Obispo Creek
30530	Furlong Creek[2]	31024	Prefumo Creek
30530	Llagas Creek	31031	Arroyo Grande Creek
30530	Miller's Canal	31031	Los Berros Creek
30530	San Juan Creek	31210	Bradley Canyon Creek
30530	Tesquisquita Slough	31210	Bradley Channel
30600	Moro Cojo Slough	31210	Green Valley Creek
30910	Alisal Slough	31210	Main Street Canal
30910	Blanco Drain	31210	Orcutt Solomon Creek
30910	Old Salinas River	31210	Oso Flaco Creek
30910	Salinas River (below Gonzales Rd.)	31210	Little Oso Flaco Creek
30920	Salinas River above Gonzales Rd. and below Nacimiento R.)	31210	Santa Maria River
30910	Santa Rita Creek[2]	31310	San Antonio Creek[2]
30910	Tembladero Slough	31410	Santa Ynez River
30920	Alisal Creek	31531	Bell Creek
30920	Chualar Creek	31531	Glenn Annie Creek
30920	Espinosa Slough	31531	Los Carneros Creek[2]
30920	Gabilan Creek	31534	Arroyo Paredon Creek
30920	Natividad Creek	31534	Franklin Creek

[1] At a minimum, monitoring sites must be included for these waterbodies in agricultural areas, unless otherwise approved by the Executive Officer. Monitoring sites may be proposed for addition or modification to better assess the impacts of waste discharges from irrigated lands to surface water. Dischargers choosing to comply with surface receiving water quality monitoring, individually (not part of a cooperative monitoring program) must only monitor sites for waterbodies receiving the discharge.

[2] These creeks are included because they are newly listed waterbodies on the 2010 303(d) list of Impaired Waters that are associated with areas of agricultural discharge.