SMGWA

Santa Margarita Groundwater Agency

Board of Directors Meeting Agenda

Date: November 29, 2018 Time: 7:00 p.m. Location: Santa Margarita Community Room
2 Civic Center Drive, Scotts Valley, CA 95066

1. CONVENE MEETING

1.1 Call to Order and Roll Call
1.2 Additions/Deletions to the Agenda
1.3 Public Comments (on matters not on the Agenda)

2. ADMINISTRATIVE BUSINESS

2.1 Approval of October 25, 2018, Board of Directors Meeting Minutes
2.2 Committee Meeting Reports
- Technical Consultant Selection Committee November 13, 2018 (Oral)
- Facilitation Committee November 14, 2018

2.3 Procurement Policy, approved as amended October 25, 2018

3. PRESENTATION

3.1 Information Session
County Water Resources Programs in the Santa Margarita Basin
Sierra Ryan, County of Santa Cruz

4. CONSENT AGENDA

4.1 Ratification of Signature on Joint Exercise of Powers Agreement
Recommendation: Acknowledge and Accept Resolution 9 (18-19) of the San Lorenzo Valley Water District

5. GENERAL BUSINESS

5.1 Resignation of Nick Vrolyk as a Board Member of the SMGWA
Recommendation: Acknowledge the resignation of Nick Vrolyk as a Board Member (Well Owner Representative) of the SMGWA and provide direction to staff regarding the process for replacement

5.2 Groundwater Model Evaluation
Recommendation: Accept the Santa Margarita Groundwater Model Evaluation Report prepared by EKI Environment and Water as completed

5.3 Facilitation Services: Guiding Principles
Recommendation: 1) Review and provide input; 2) Consider approving SMGWA Guiding Principles as a document that defines a set of mutual core values; 3) Determine the procedure by which the Guiding Principles are formalized, endorsed and upheld

5.4 Technical Consultant Services Selection Process
Recommendation: Review and provide input

6. STAFF REPORTS

- Legal Counsel Update (oral, Terry Rein)
- Communications & Outreach Monthly Report (Piret Harmon/Bill Maxfield)

7. DIRECTORS REPORTS

Individual Directors' Reports (oral)

- Travel/Training
- Meetings

8. FUTURE ITEMS

- Election of Officers (December/January)
- Appointment of committee members (December/January)
- Appointment of ACWA/JPIA representatives (December/January)
- Quarterly Financial Reports (January, April)
- Records Retention Policy
- Financial Controls for Borrowing Money

Information Sessions

- Land Use and Water Supply Planning – Educational Series (January 12, 2019)
- Water Budget, Groundwater & Surface Water Interconnectedness – Educational Series (February 9, 2019)
- Integrated Water Management Option – Educational Series (March 9, 2019)
- Groundwater Sustainability Plan Elements
- Meeting Conduct: Rosenburg's Rules of Order

9. INFORMATIONAL ITEMS (none)

10. ADJOURNMENT

The next Board of Directors meeting is scheduled for December 20, 2018.

PURSUANT TO TITLE II OF THE AMERICANS WITH DISABILITIES ACT OF 1990, THE SANTA MARGARITA GROUNDWATER AGENCY REQUESTS THAT ANY PERSON IN NEED OF ANY TYPE OF SPECIAL EQUIPMENT, ASSISTANCE OR ACCOMMODATION(S) IN ORDER TO EFFECTIVELY COMMUNICATE AT THE AGENCY'S PUBLIC MEETING PLEASE MAKE SUCH A REQUEST TO THE SANTA MARGARITA GROUNDWATER AGENCY AT 2 CIVIC CENTER DRIVE, SCOTTS VALLEY, CA 95066, OR BY CALLING (831) 438-2363 A MINIMUM OF THREE (3) WORKING DAYS PRIOR TO THE SCHEDULED MEETING. ADVANCE NOTIFICATION WITHIN THIS GUIDELINE WILL ENABLE THE DISTRICT TO MAKE REASONABLE ARRANGEMENTS TO ENSURE ACCESSIBILITY.

Santa Margarita Groundwater Agency

Board of Directors Meeting Minutes

Date: October 25, 2018 **Time:** 7:00 p.m. **Location:** Santa Margarita Community Room
2 Civic Center Drive, Scotts Valley, CA 95066

1. CONVENE MEETING

1.1 Call to Order and Roll Call

Chair Perri called the meeting of the Santa Margarita Groundwater Agency Board of Directors to order at 7:00 p.m.

Board of Directors Present:

B. McPherson, J. Leopold, D. Engfer, D. Lind, C. Baughman, G. Ratcliffe, C. Perri, R. Stiles, D. Pollock, C. Perri, A. Franklin (arrived late), *E. Cassidy (Vrolyk)*

Alternates Present:

J. Dilles (Lind), D. Reber (Stiles/Perri)

Staff Present

P. Harmon, R. Menard, J. Michelsen, A. Poncato, T. Rein, J. Ricker

1.2 Additions/Deletions to the Agenda None

1.3 Public Comments (on matters not on the Agenda) None

2. ADMINISTRATIVE BUSINESS

2.1 Approval of the September 27, 2018, Board of Directors Meeting Minutes

MOTION: Stiles/Lind to approve the September 27, 2018, Board of Directors Meeting Minutes as corrected.

The motion passed by the following voice vote:

AYES:	Engfer, Lind, Baughman, Ratcliffe, Perri, Stiles, Pollock, Cassidy
NOES:	None
ABSTAIN:	Leopold, McPherson
ABSENT:	Franklin

**Alternate Board Directors*

2.2 Facilitation Committee Meeting

Director Baughman provided information from the October 17, 2018, Facilitation Committee meeting.

3. PRESENTATIONS

3.1 Information Session: City of Santa Cruz Water System and Supply Augmentation Strategy
Presentation by Rosemary Menard, City of Santa Cruz Water Department
Presentation available at www.smgwa.org, click here to view.
Discussion by Board and staff.
Public comments made by S. Wharton and D. Loren.

4. CONSENT

4.1 Agreement for Grant Administration Services
Recommendation: Approve and authorize staff to execute the agreement with the Regional Water Management Foundation (RWMF), a nonprofit corporation and subsidiary of the Community Foundation of Santa Cruz County, for Grant Administration Services.
Discussion by Board and staff.
MOTION: Leopold/Stiles to move the Consent Agenda

The motion passed by the following voice vote:

AYES: Leopold, McPherson, Engfer, Lind, Baughman, Ratcliffe, Perri, Stiles, Pollock, Cassidy

NOES: None

ABSTAIN: None

ABSENT: Franklin

5. GENERAL BUSINESS

5.1 Procurement Policy

Recommendation: Adopt Resolution No. 2018-04 establishing Policy P2 Procurement.

Discussion by Board and staff.

MOTION: Engfer/McPherson to move this item to a discussion.

Discussion by Board and staff.

MOTION: Adopt Resolution No. 2018-04 establishing Policy P2 Procurement as amended.

The motion passed by the following roll call vote:

AYES: Leopold, McPherson, Engfer, Lind, Baughman, Ratcliffe, Perri, Stiles, Pollock

NOES: Cassidy

ABSTAIN: None

ABSENT: Franklin

Director Franklin arrived at the meeting (7:48 p.m.)

5.2 Groundwater Model Evaluation

Recommendation: Accept the Santa Margarita Groundwater Model Evaluation Report, prepared by EKI Environmental and Water (formerly HydroFocus) as completed.

An incorrect version of the Groundwater Model Evaluation report was placed into the agenda packet. Administrative support staff will send out the correct Groundwater Model Evaluation to the Board on Friday, October 26, 2018, and this item will be brought back to the November 29, 2018, meeting for consideration.

5.3 Facilitation Services: Educational Series

Recommendation: Approve the conceptual program and tentative schedule of the Educational Series, and direct staff to proceed with preparation and promotion of the events.

Motion: Leopold/Baughman moved to approve the conceptual program.

Public comment by L. Henry and D. Loren.

The motion passed by the following voice vote:

AYES: Leopold, McPherson, Engfer, Lind, Baughman, Ratcliffe, Perri, Stiles, Pollock, Cassidy

NOES: None

ABSTAIN: None

ABSENT: Franklin

6. STAFF REPORTS

- Financial Report
- Communications & Outreach Monthly Report (Bill Maxfield and Piret Harmon)
- EKI (formerly Hydrofocus) Agreement Additional Scope Update (John Ricker)

7. DIRECTOR REPORTS

None

8. FUTURE AGENDA ITEMS

Timeline

9. ADJOURNMENT

A motion was called to adjourn the meeting by Leopold and seconded by Stiles at 8:58 p.m. The next Santa Margarita Groundwater Agency Board of Directors meeting is scheduled for November 29, 2018.

APPROVED BY:

______________________________ _______________

Chris Perri, Chair Date

ATTEST:

______________________________ _______________

Angela Franklin, Secretary Date

Santa Margarita Groundwater Agency

Facilitation Committee Meeting
November 14, 2018 – 2:00 p.m.
Santa Margarita Community Room
2 Civic Center Drive, Scotts Valley, CA 95066

Meeting Report

1. Convene Meeting

1.1 Call to Order and Roll Call
The meeting convened at 2:06 p.m. in the Santa Margarita Community Room, 2 Civic Center Drive, Scotts Valley, CA

Present: Director Baughman, Director Brown (alternate for Director McPherson), Director Perri, Director Franklin via teleconference, and Consultant Dave Ceppos via teleconference
Staff: Piret Harmon, John Ricker, Rick Rogers, Sierra Ryan, Jen Michelsen, and Amy Poncato

1.2 Additions/Deletions to the Agenda
There were no additions or deletions to the agenda.

1.3 Public Comments (on matters not on the Agenda)
There were no public comments.

2. Discussion Items

2.1 Educational Series in support of Joint Goal Setting Process
2.1.1 Update on Education Series

Piret Harmon and Jennifer Murray, of Miller Maxfield, provided an update on the Educational Series planning. The location chosen is the Felton Community Hall and staff is in the process of securing a reservation for January 12, 2019, February 9, 2019, and March 9, 2019.

2.2 Updated Preliminary Draft Guiding Principles
2.2.1 Proposed additional Assessment interviews – incoming Board of Directors

Mr. Ceppos would like to interview the newly-elected Board of Directors from both the Scotts Valley Water District and the San Lorenzo Valley Water District.

Director Pollock arrived (2:32 p.m.)

2.2.2 Review the updated Draft Guiding Principles, provide input and plan the schedule for individual organizational discussions with Sacramento State consultant

Staff discussed and agreed upon on several changes to the Draft Guiding Principles.

An attachment defining the Basin's Beneficial Users and Uses, as defined in the Sustainable Groundwater Act, will accompany the Guiding Principles.

Staff agreed to send the final draft to the Board of Directors for review.

3. Future Agenda Items

4. Adjournment

The meeting adjourned at 3:58 p.m.

Policy No.: P2	**Policy Title**: Procurement
Effective Date: 10/25/18	**Resolution No:** 2018-04
Policy Description: Establishes Guidelines for Procuring Services and Supplies	

POLICY

1.10. Procurement of Services and Supplies

(a) Professional and consulting services ("Services") are of a technical and professional nature, and, due to the nature of the services to be provided, do not fall within the "low bid" competitive bidding process.

(b) Except as provided in subparagraph (c) below, when selecting professional or consulting consultants, the Agency representatives evaluating the proposals will consider the consultant's demonstrated experience and competence, insurability, understanding of the scope of work, financial ability, resources to perform the work, willingness to cooperate with the Agency representatives and other consultants, and proposed methods to ensure timely and acceptable performance and management of the work. An award of a contract will be made to a qualified consultant whose proposal will be most advantageous to the Agency, with price and other factors considered.

(c) The selection for professional services of private architectural, landscape architectural, engineering, environmental, land surveying, or construction project management firms will be on the basis of demonstrated competence and on the professional qualifications necessary for the satisfactory performance of the services required, pursuant to Government Code Section 4526.

(d) Selection of the successful vendor of supplies or equipment ("Supplies") will be based on the proposal that is most advantageous to the Agency, with price and other factors considered.

1.20 Contracting Authority -- Less Than $25,000

The General Manager of the Business Agent ("General Manager") of the Santa Margarita Groundwater Agency may, by negotiated contract or purchase order, enter into contracts for Services or Supplies in the amount of less than $25,000, provided there are funds in the approved budget for such Services or Supplies.

1.30 Contracting Authority -- $25,000 or More But Less Than $50,000

(a) The General Manager, after seeking written proposals, may enter into contracts for Services or Supplies in the amount of $25,000 or more but less than $50,000, provided there are funds in the approved budget for such Services or Supplies.

(b) If the General Manager enters into a contract for Services or Supplies in the amount specified in Section 1.30(a), the General Manager will inform the Agency Board of such contract at the next regularly scheduled Board meeting.

1.40 Contracting Authority -- $50,000 or More

The General Manager will seek competitive written proposals for Services or Supplies estimated to cost $50,000 or more. Agency representatives will review and rank proposals. Based on the findings of Agency representatives, the General Manager will make a recommendation to the Agency Board. Contracts for Services and Supplies in the amount of $50,000 or more will be approved by the unanimous vote of the six (6) Member Directors of the Agency (Scotts Valley Water District; San Lorenzo Valley Water District and County of Santa Cruz). (Section 9.3 of the Agency's JPA Agreement).

1.50 Renewals or Extensions

The General Manager may amend, extend or renew contracts for Services or Supplies with existing contractors, consultants or suppliers (each, an "Amendment") without seeking competitive proposals, provided the contract limit on the Amendment is less than $50,000, and further provided there are funds in the approved budget for such Services or Supplies.
If the General Manager enters into an Amendment for Services or Supplies in the amount of $25,000 or more but less than $50,000, the General Manager will inform the Agency Board of such Amendment at the next regularly scheduled Board meeting.

An Amendment in the amount of $50,000 or more shall be approved by the unanimous vote of the six (6) Member Directors of the Agency (Scotts Valley Water District; San Lorenzo Valley Water District and County of Santa Cruz). (Section 9.3 of the Agency's JPA Agreement).

1.60 Exceptions

The Agency or its representatives are not required to obtain competitive proposals in the following circumstances:

(a) When the Services or Supplies are needed on an emergency basis.

(b) When competitive procurement would fail to produce an advantage or when the procurement process is undesirable, impractical, or impossible. Examples include situations when the Services or Supplies are to be performed in partnership with other public agencies or nonprofit organizations; or are to be paid for with private funds;

(c) When the Services or Supplies are either:
   (i) available from only one source, or
   (ii) unique due to the specialized skill or experience of the contractor, consultant or supplier, or
   (iii) proprietary in nature.

(d) When the Services or Supplies are required to match, integrate or be compatible with an existing project or program and the work, materials or services are from a contractor, consultant or vendor who previously satisfactorily performed/provided work, materials or services to a Member of the Agency or the Agency.

(e) When the Services or Supplies are obtained by cooperative procurements or "piggyback" on the competitive procurement process of another agency. The Agency shall have the authority to join with other public jurisdictions in cooperative purchasing plans, programs or pricing agreements. The Agency may also contract for Services and Supplies at a price established by competitive procurement by another public jurisdiction in substantial compliance with that public agency's competitive procurement process. The Agency may also contract with any federal, state, municipality or other public agency.

(f) In the event any of the exceptions to the competitive procurement process are used, the recommendation will be documented in writing and approved by the General Manager for procurements within the authority of the General Manager and by the Agency Board for procurements requiring Agency Board approval.

AGENDA REPORT

Santa Margarita Groundwater Agency

To: Board of Directors

Date: November 29, 2018

Item: Consent Agenda 4.1

Subject: **Ratification of Signature on Joint Exercise of Powers Agreement**

SUMMARY

Recommendation: Acknowledge and Accept Resolution No. 9 (18-19) of the San Lorenzo Valley Water District

Fiscal Impact: No direct impact from this action.

BACKGROUND

The Board of Directors ("Board") of the San Lorenzo Valley Water District ("SLVWD") entered into the Joint Exercise of Powers Agreement dated June 1, 2017, among the Scotts Valley Water District, the SLVWD and the County of Santa Cruz creating the Santa Margarita Groundwater Agency ("JPA Agreement"). Under Agenda Item 13(b) at SLVWD's special meeting on May 25, 2017, Board President Gene Ratcliffe was authorized to sign the JPA Agreement. Another member of the SLVWD's Board, Vice President Chuck Baughman, signed the JPA Agreement on behalf of SLVWD.

On November 15, 2018, SLVWD adopted Resolution No. 9 (18-19) to accept Chuck Baughman's signature as the valid, proper and authorized signature on behalf of SLVWD, and to ratify and confirm the JPA Agreement as of its effective date. The Resolution states that the JPA Agreement is ratified and confirmed by SLVWD as of its effective date and shall remain in full force and effect in accordance with its original terms and provisions.

DISCUSSION

It is requested that the Santa Margarita Groundwater Agency Board of Directors acknowledge and accept Resolution 9 (18-19) of the SLVWD, and direct staff to maintain a copy of the Resolution in Santa Margarita Groundwater Agency's official records.

Submitted by,

Piret Harmon
General Manager
Scotts Valley Water District

Attached: SLVWD Resolution No. 9 (18-19)

San Lorenzo Valley Water District
Resolution to Ratify the Joint Exercise of Powers Agreement
Creating the Santa Margarita Groundwater Agency

RESOLUTION NO. 9 (18-19)

WHEREAS, the Board of Directors ("**Board**") of the San Lorenzo Valley Water District ("**SLVWD**") entered into that certain Joint Exercise of Powers Agreement dated June 1, 2017 by and among the Scotts Valley Water District, the SLVWD and the County of Santa Cruz creating the Santa Margarita Groundwater Agency ("**JPA Agreement**").

WHEREAS, under Agenda Item 13(b) at SLVWD's special Board meeting on May 25, 2017, Board President Gene Ratcliffe was authorized to sign the JPA Agreement;

WHEREAS, another member of the SLVWD's Board, Vice President Chuck Baughman, signed the JPA Agreement on behalf of SLVWD;

WHEREAS, SLVWD desires to accept Chuck Baughman's signature as the valid, proper and authorized signature on behalf of SLVWD, and to ratify and confirm the JPA Agreement as of its effective date.

NOW THEREFORE be it resolved by the Board of Directors of the SLVWD:

RESOLVED, that Vice President Chuck Baughman's signature shall be accepted as the valid, proper and authorized signature on behalf of SLVWD on the JPA Agreement.

FURTHER RESOLVED, that the JPA Agreement is hereby ratified and confirmed by SLVWD as of its effective date, and shall remain in full force and effect in accordance with its original terms and provisions.

Passed and adopted this 15th day of November, 2018 by the following roll call vote:

AYES, Hayes, Smallman, Ratcliffe, Baughman, Bruce
NOES,
ABSENT,
ABSTAIN

Approved: Charles Baughman
Board President, SLVWD

Attest: Holly B. Hossack
Secretary of the Board, SLVWD

AGENDA REPORT

Santa Margarita Groundwater Agency

To: Board of Directors

Date: November 29, 2018

Item: General Business Agenda 5.1

Subject: **Resignation of Nick Vrolyk as a Board Member of the SMGWA**

SUMMARY

Recommendation: Acknowledge the resignation of Nick Vrolyk as a Board Member (Well Owner Representative) of the SMGWA and provide direction to staff regarding the process for replacement

Fiscal Impact: No direct impact from this action.

BACKGROUND

Under the Joint Exercise of Powers Agreement ("JPA Agreement"), the process for appointing well-owner representatives is as follows.

Section 6.1 of the JPA Agreement, the Agency shall be governed by a Board of Directors ("Board"). The Board shall consist of eleven (11) Directors. Two (2) of the Board members are required to be representatives of private well owners or small public water systems within the boundaries of the Agency.

Section 6.3.7 of the JPA Agreement provides that the two representatives of private well owners shall be appointed by unanimous vote of the Member Agency Directors unless the private well owners choose their representatives by a method of self-selection as described in the Bylaws. The procedures for nominating the private well owners shall be set forth in the Bylaws.

Section 6.4 of the JPA Agreement provides that one Alternate shall also be appointed to act as a substitute Director for the two Directors representing private well owners.

Section 6.5 of the JPA Agreement provides that a Director representing private well owners may be removed or reappointed in the same manner as he or she was appointed as set forth in Section 6.3.

Section 6.7 of the JPA Agreement provides that a vacancy on the Board of Directors shall occur when a Director resigns.

The Bylaws of the SMGWA establish the process for filling the seat on the Board of Directors.

Section 2.1 of the Bylaws provides that two (2) representatives of private well owners or small public water systems within the boundaries of the Agency ("Well Owner Representatives").

Section 2.2 of the Bylaws provides that the term of appointment for a Well Owner Representative is three (3) years.

Section 2.3 of the Bylaws provides that Well Owner Representatives may be chosen by a self-selection process. At minimum, one (1) of the two (2) Well Owner Representatives shall be from an Individual Water System, which is defined as a private well that serves 1-4 connections and if one (1) of two (2) Well Owner Representatives is from a Small Water System, then the preference in choosing an Alternate Well Owner Representative shall be given to an Individual Water System representative. The procedure for self-selection of Well Owner Representatives is as follows:

> 2.3.3 The Agency shall provide notice of the opportunity for individuals to submit an application to serve as a Well Owner Representative or an Alternate. The notice shall include a description of the work of the Agency, the minimum qualifications of Well Owner Representatives, the desired characteristics and skills of Well Owner Representatives, criteria to be used in evaluating applications received, as well as the timeline for decision-making on appointees. The notice shall also describe the opportunity for the applicants as a group to self-select Well Owner Representatives by limiting the number of applications to only the number of positions available. To encourage participation, a variety of print media, electronic and other formal and informal communication mechanisms shall be utilized, and the period of notice shall cover, at a minimum, 10 working days.
>
> 2.3.4 Any person meeting the qualifications of a Well Owner Representative may apply to serve as a Well Owner Representative (individually "Applicant" or collectively, the "Applicants"). At a minimum, an Applicant shall (a) be a private well owner located within the boundaries of the Agency, a tenant of property with a private well located within the boundaries of the Agency, or a representative of a small public water system located within boundaries of the Agency; (b) be at least 18 years of age; and (c) exhibit high standards of integrity, commitment, and good judgment.
>
> At the conclusion of the period for receiving applications, if there are more Applicants than the number of positions available, the Applicants shall be notified of the opportunity to act as a group to self-select the Well Owner Representatives and their Alternate by reaching agreement among themselves for some Applicants to withdraw

their applications so that the remaining number of applications is the same as the number of positions available.

Applicants shall be given the names and contact information of the other Applicants and shall be allowed at least forty (40) days (“Deadline”) to meet and/or confer and endeavor to seek agreement on which Applicants shall voluntary withdraw their applications and which Applicants shall be recommended to fill the positions available. An Applicant may withdraw his/her application by delivering a written request to the Principal Office. If before the Deadline, the proposed Well Owner Representatives are identified by the Applicants and all other Applicants voluntarily withdraw their applications, then the Board shall consider the remaining Applicants and appoint them as Well Owner Representatives if they meet the qualifications established by the Agency.

2.3.5 If the self-selection process does not result in the final selection Well Owner Representatives, or if the number of Applicants remains greater than the number of positions available, then a committee of the Board, with the participation of Designated Staff shall review and evaluate the applications. The committee may hold interviews with the top Applicants and develop recommendations for consideration by the Members. Final Appointment of Well Owner Representatives shall be made by a unanimous vote of the Members in compliance with Section 6.3.7 of the Agreement and Section 2.3.2 of these Bylaws.

DISCUSSION

On November 11, 2018, Well Owner Representative Nick Vrolyk submitted a letter of resignation from the Board of Directors effective immediately. Staff would like to thank Nick for his service and invite him to remain involved with the Agency as a stakeholder and beneficial user in the basin.

This resignation has brought to light the failure of the existing bylaws to allow for an alternate director to assume the position of the vacant board seat. Pursuant to the bylaws, the alternate Well Owner Representative would have to apply for the position, go through the self-selection process, and if appointed to the board, resign as the alternate, which would then trigger another self- selection process. The self-selection process is time consuming, and under the bylaws, could take several months to accomplish.

Another option is to amend the bylaws to 1) allow for the appointment of an alternate director for the seat of a voting member, and 2) make other minor adjustments clarifying the self-selection process. The staff is prepared to bring the proposed amendments to the bylaws back to the board at the December board meeting. If adopted, the bylaws will go into effect immediately allowing the alternate to assume the role of the voting member right away.

Submitted by,

Piret Harmon
General Manager
Scotts Valley Water District

STAFF REPORT

Santa Margarita Groundwater Agency Board of Directors

To: Board of Directors

Date: November 29, 2018

Item: General Business Agenda 5.2

Subject: **Groundwater Model Evaluation**

SUMMARY

Recommendation: Accept the Santa Margarita Groundwater Model Evaluation Report, prepared by EKI Environment and Water (formerly HydroFocus), as completed.

Fiscal Impact: No direct impact from this action

BACKGROUND

One of the main tools for evaluating a basin is a groundwater model. The first model for Santa Margarita Groundwater Basin was developed in 1988 (Watkins-Johnson) and updated in 1997 and 2000 (Todd Engineers), again in 2004 (ETIC Engineering, 2006), and again in 2015 (Kennedy Jenks).

As a result of local concerns about some potential deficiencies in the current model and the need to ensure that the model conforms to the requirements for developing a Groundwater Sustainability Plan, staff recommended that the model be evaluated and needed improvements or upgrades identified. In December 2017, the board formed a Selection Committee to provide input for the Request for Qualifications (RFQ), evaluate the proposals and make a recommendation for selecting the top candidate. Four proposals were received in response to the RFQ and the Selection Committee chose John Fio of HydroFocus as the most qualified candidate for this work. At the April 26, 2018 meeting the Board approved a $59,150 contract with HydroFocus to perform the model evaluation. (During the course of this project, HydroFocus merged with the larger firm, EKI Environment and Water and John Fio continued as the lead consultant.)

During this evaluation, HydroFocus met twice with the Technical Advisory Group (TAG) consisting of local agency staff and consultants. Technical advisors included Nick Johnson with Exponent, consultant to SLVWD; Cameron Tana, Montgomery & Associates, consultant to SVWD; and Robert Marks, Pueblo Engineering, consultant to City of Santa Cruz Water Department. HydroFocus also made direct individual contacts to the technical advisors. At the conclusion of the effort, the second TAG meeting was held with all advisors in attendance. At that meeting, John Fio presented and discussed the findings. In addition, the advisors were given the opportunity to submit comments in writing, which are attached (Attachment 2). In response to comments received, John Fio produced the final report (Attachment 1).

DISCUSSION

The completed evaluation report is attached, including the executive summary in a cover memo from EKI. Some of the discussion is fairly technical, reflecting the technical nature of the groundwater model. Although no fatal flaws were identified, there are areas of needed improvement. The evaluation made recommendations for improvements in four areas as described below in an excerpt from the executive summary (the estimated cost range for addressing the deficiencies are shown in parentheses):

Geohydrologic Framework: Model improvements include expanding the model grid to agree with DWR basin boundaries and improve the representation of the basin water budget, and refine modeled water transmitting properties to improve conformance with reported aquifer tests, particularly vertical hydraulic conductivity. ($30,000-$70,000)

Water Budget and Landscape Properties: The pre-processor employed to calculate recharge for the model requires detailed review, documentation, and likely modification to improve recharge estimates and increase model adaptability – especially for developing projected hydrology that considers climate change. The MODFLOW ET package should be de-activated or the recharge calculations refined to prevent double counting of plant water use. ($30,000-$70,000)

Performance and Uncertainty: Quality Assurance and Quality Control procedures need to be reviewed for both field data collection and data entry into model input files. The discretization of time can be reduced from quarterly to monthly to potentially improve model-calculated stream flows and seasonal changes in model-calculated baseflows. The assessment of model performance and uncertainty can be improved by extending the simulation period to include 2017-2018. ($30,000-$100,000)

SGMA Objectives: Work is needed to develop the projected hydrology and model input data sets to assess both the extension of current baseline conditions into the future and assess the potential effects of climate change on the basin water budget. ($35,000-$80,000)

This stage of the evaluation is essentially complete and reflects the input from the TAG. Additional comments or questions can still be posed and would be addressed by the consultant hired to update the model.

Submitted by

John Ricker

Water Resources Division Director, County of Santa Cruz

Attached: Santa Margarita Groundwater Model Evaluation
Comments by Technical Advisory Group

2827 Spafford Street
Davis, CA 95618
(650) 292-9100
ekiconsult.com

15 October 2018

Santa Margarita Groundwater Model Evaluation to Support Groundwater Sustainability Plan Development (EKI B80057.00)

To: Santa Margarita Groundwater Agency

From: Christina Lucero, PG, EKI Environment & Water, Inc. (EKI)
John Fio, Principal Hydrogeologist, EKI

1 INTRODUCTION

The use of models is highly recommended for developing a Groundwater Sustainability Plan (GSP). The purposes of modeling include providing knowledge of the past and present behavior of the surface and groundwater system, the likely responses to future changes and management actions, and the uncertainty in those responses over the 50-year planning and implementation horizon required under the Sustainable Groundwater Management Act (SGMA).

It is important to recognize that a model approximates a real-world system, and the output from a model is therefore never exact (there is always a discrepancy between measured and model-calculated conditions – model error). Because model error produces uncertainty in model output, part of model development requires characterizing the error. Our Santa Margarita Groundwater Model (SMGWM) evaluation characterized model reliability and error through the lens of the SGMA by focusing on the following four areas.

1. The Geohydrologic Framework, which refers to how the geometry and physical structure of the basin is represented by the model. This included review of the basin/model boundaries, the correspondence between model layers and geologic formations, and the water-transmitting and storage properties of water-bearing and relatively non-water bearing zones (aquifers and aquitards, respectively).

2. The quantitative representation of the Water Budget and Landscape processes, which entails characterizing the reasonableness of model-calculated water inflows and outflows like rainfall, groundwater extractions, infiltration and runoff, and so forth.

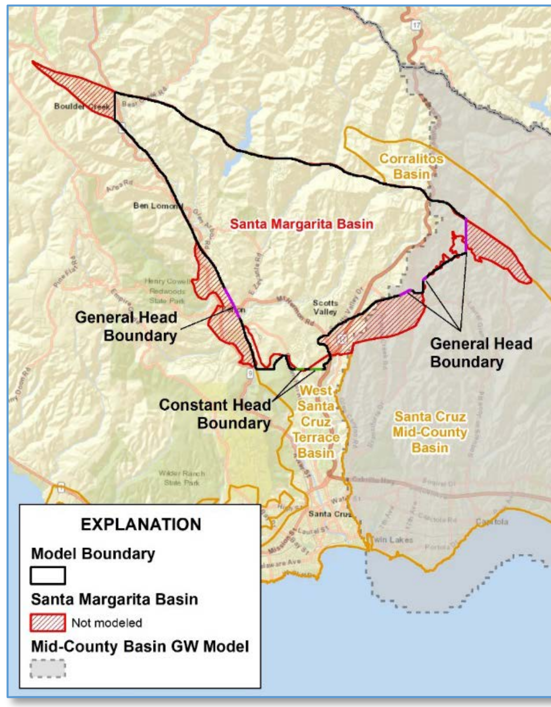
3. Model performance and error (or uncertainty), which considers model reproducibility, calibration uncertainty (how well the model reproduces historical observations), and prediction uncertainty (what model uncertainties most influence projected outcomes).

4. Model standards and objectives relative to SGMA as reflected in the regulations and Best Management Practices (BMPs) published by the California Department of Water Resources (DWR).

This memorandum summarizes our SMGWM evaluation and recommendations for model upgrades based on our September 12, 2018 presentation to the Technical Work Group. The presentation and detailed presentation notes are provided as Attachment 1.

2 GEOHYDROLOGIC FRAMEWORK

The SGMA requires that the model encompass the entire basin and consistency between cross-boundary/basin flows. Our evaluation of the geohydrologic framework concluded that the model grid needs to be expanded to overlap the mapped basin boundaries (no change is recommended to model cell dimensions or layering) and the vertical hydraulic conductivity of the modeled aquifers should be adjusted to better match reported aquifer test results. The grid expansion should consider including the San Lorenzo River and associated alluvial areas outside the defined basin boundaries, which likely can improve comparisons between model calculated and reported baseflows. The Santa Cruz Mid-County Basin Model (SCMCM) is the only adjacent existing model, and the cross-boundary flows between the two models are fairly small (on the order of 100's of acre-feet per year [AFY]) and appear to be opposite in direction. This discrepancy can likely be resolved as part of the model grid expansion and re-calibration.



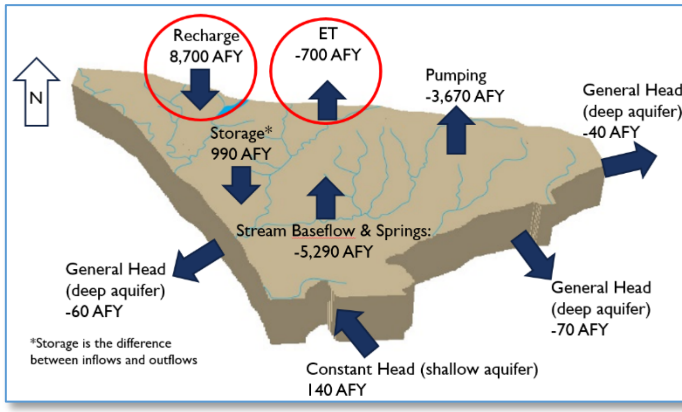
Extents of the SMGWM and the SCMCM. Areas of Santa Margarita Basin in which the SMGWM are not modeled are shown in red.

Hydraulic conductivity is a measure of the ability for a formation to transmit water. The modeled horizontal hydraulic conductivity values generally represent the low end of the range in reported aquifer test results, but the values may be reasonable (aquifer tests conducted on existing water supply wells can represent high-yielding areas of the aquifer, whereas the larger-scale regional model may encompass both relatively high- and low-yielding basin areas). The modeled vertical hydraulic conductivity values seem unrealistically low, and model calibration adjustments should explore the efficacy of using values more consistent with aquifer test results.

The storage coefficient (or storativity) represents the volume of water an aquifer releases or takes in per unit surface area of the aquifer per unit change in water level. Aquifer tests conducted on wells screened in the Santa Margarita Aquifer indicate that modeled storativity values are near the upper end of the reported aquifer test results. In the Lompico Aquifer, the modeled storativity values are within the reported range of aquifer test results. Aquifer tests conducted on wells screened in the Lower Butano indicate modeled storativity values are generally near the lower end of the reported range. Storativity influences projected changes in groundwater storage and model calculated stream baseflows. It is important therefore to characterize the uncertainty in model projections to uncertainty in storativity.

3 WATER BUDGET AND LANDSCAPE PROPERTIES

Our evaluation of the water budget and landscape properties indicated substantial differences between the SMGWM recharge pre-processor results and other independent recharge estimates for the basin. These discrepancies should be explained, or the pre-processor modified as needed to improve consistency between studies. Any modifications to the pre-processor should consider the need to implement downscaled climate change effects as required by SGMA. It may be helpful to coordinate these modifications with on-going efforts in adjacent basins to ensure consistency between methodologies.



Water inflows and outflows budget diagram: Historical Model (1985-2012) Average

Percolating recharge is intercepted by the water table, and in the SMGWM the resulting groundwater volume is reduced by about 8% using the MODFLOW ET package; the MODFLOW ET package was utilized to represent water consumption by groundwater dependent vegetation. The water consumption calculated by MODFLOW ET is in addition to plant transpiration of water from the root zone already included by the preprocessor when calculating groundwater recharge. The use of the ET package should either be removed from the model, or the recharge calculations conducted by the pre-processor updated to prevent double counting of plant water consumption.

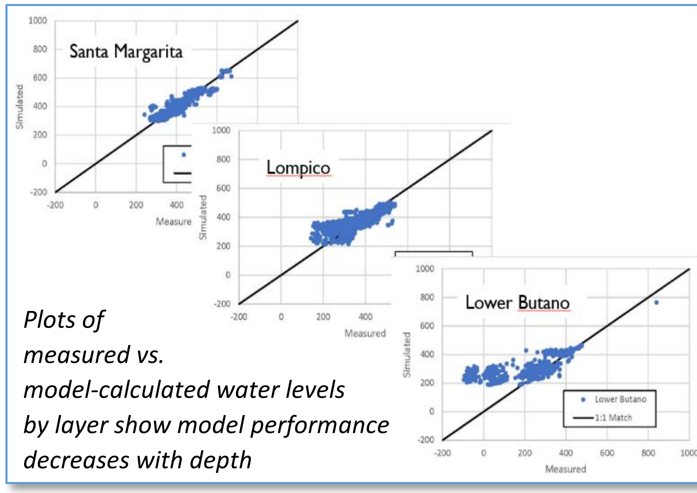
4 PERFORMANCE AND UNCERTAINTY

Model performance evaluates model reproducibility and calibration reliability, whereas an evaluation of model uncertainty explores the relationships between model input having the greatest influence on model results and the reliability of model projections.

Model reproducibility determines whether an independent party can run the model and obtain the results documented in the report. Calibration reliability evaluates the discrepancies between model-calculated and measured conditions to characterize model error. Calibration reliability can also be assessed with a "post-audit," whereby model input data sets are updated for a post-calibration period and the resulting projections compared to the measured conditions that occurred. The results from the model performance tests follow.

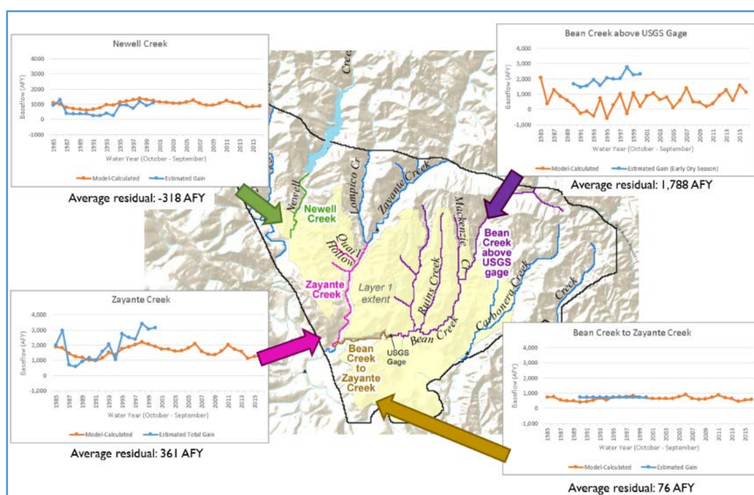
- Plots comparing model-calculated and measured water levels from the historical calibration period are distinctly different from similar plots reported in the model documentation, indicating that the model results were not re-producible.

- Plots comparing model-calculated and measured water levels during the 2013-2016 post audit period are generally like the historical calibration, indicating the model performed reasonably well projecting groundwater levels for the 3-year period.
- The spatial distribution of model error was investigated by constructing water level comparisons for individual aquifers/layers, and results showed that model error generally increases with depth; the agreement between model-calculated and measured water levels is best in the Santa Margarita Aquifer and poorest in the Lower Butano.
- Comparisons of model-calculated and observed vertical gradients showed that model-calculated gradients are generally greater in magnitude than observed, indicating that the water level differences calculated by the model tend to be greater than measured. These comparisons are generally consistent for both the calibration and post-audit periods.



Plots of measured vs. model-calculated water levels by layer show model performance decreases with depth

- The model-calculated stream flows reproduce seasonal cycles, with peak flows in the winter and low flows in the summer. Measured and model-calculated flows are generally similar during low flow conditions, however the measured flows during the highest flow periods are generally greater than calculated by the model. The discrepancies' during high flow conditions are likely due at least in part to differences between model stress period length and stream measurement period.
- Measured and model-calculated base-flows generally agree in magnitude and trend (the average residuals range in absolute magnitude from about 100 to about 400 AFY in "Newell Creek," "Zayante Creek," and the reach "Bean Creak to Zayante Creek"). In contrast, the model-calculated baseflow for "Bean Creek above the USGS Gage" was on average almost 1,800 AFY lower than measured.



Comparison of model-calculated and estimated baseflows

Calibration tests indicated that model calibration was most sensitive to horizontal hydraulic conductivity and least sensitive to vertical conductivity. The most sensitive parameter is the horizontal conductivity of the Santa Margarita Aquifer (layer 1), which likely is because model-calculated baseflows are most sensitive to conditions in layer 1 and most of the measured water levels are from wells constructed in the Santa Margarita Aquifer. Prediction sensitivity was evaluated using an illustrative example; the example simulated injection of 93 AFY of recycled water at 6 existing wells screened within the Lompico Aquifer (Layer 4). Results indicated that model sensitivity is fairly similar between aquifer parameters, and the most sensitive input parameters are the unconfined storativity (Sy) and confined specific storage (Ss). Adjustments to Sy and Ss values for the Lompico Aquifer representing their plausible ranges from field measurements showed that projected changes in groundwater storage and stream baseflows are fairly insensitive to decreases in the modeled storage coefficient, but they are sensitive to increases in the storage coefficient.

5 SGMA OBJECTIVES

The design and functionality of the SMGWM was reviewed and evaluated for meeting the standards recommended by SGMA and DWR. The SMGWM fails to meet several DWR SGMA modeling considerations. First, the model grid does not cover the entire basin and should encompass the area potentially affected by basin pumping and recharge. Second, the boundary conditions between adjacent basins/models should be consistent, but overlapping areas represented by the SMGWM and SCMCM simulate approximately similar quantities of cross-boundary flow but in opposite directions. Third, model adaptability is impeded by the lack of free-standing documentation on the recharge pre-processor and its potential limitations for the effective downscaling of climate change effects. Moreover, the SGMA required input data sets to project future conditions and consider climate change effects have not been developed.

I. COMPARE TO SGMA STANDARDS

Standard	Evaluation	Notes	Recommendation
Publicly available documentation	✓	USGS MODFLOW-NWT	---
Peer reviewed mathematical foundation and model code	✓	USGS MODFLOW-NWT	---
Public domain open-source software	✓	USGS MODFLOW-NWT	---
Covers entire basin (at a minimum)	No	Needs to encompass entire area affected by the GSA's gw activities (pumping, recharge projects, etc).	Expand active model grid to represent entire basin as defined by DWR Bulletin 118.
Boundary conditions consistent between adjacent basin models	No	Santa Cruz Mid-County Basin model	Modify as part of grid expansion for consistency with Mid-County Basin model.
Based on detailed HCM	✓	Based on expert reports and input from basin stakeholders	---
Sensitivity tests and uncertainty analysis	✓	Limited to climate scenario.	GSP and local applications will require prediction sensitivity analysis.
Model adaptability (e.g., accommodate additional data and/or refined HCM)	✓	MODFLOW platform provides multiple versions and capabilities making it adaptable. Recharge estimator can be problematic.	Recharge estimator requires documentation.

6 SUMMARY

The SMGWM approximates the real-world hydrogeologic system, and model error is therefore expected. As a result, models can always be improved. Our evaluation characterized model error through the lens of the SGMA and developed recommendations for model improvements in the following four areas.

Geohydrologic Framework: Model improvements include expanding the model grid to agree with DWR basin boundaries and improve representation of the basin water budget, and refine modeled water transmitting properties to improve conformance with reported aquifer tests (particularly vertical hydraulic conductivity).

Water Budget and Landscape Properties: The pre-processor employed to calculate recharge for the model requires detailed review, documentation, and likely modification to improve recharge estimates and increase model adaptability – especially for developing projected hydrology that considers climate change. The MODFLOW ET package should be de-activated or the recharge calculations refined to prevent double counting of plant water use.

Performance and Uncertainty: Quality Assurance and Quality Control procedures need to be reviewed for both field data collection and data entry into model input files. The discretization of time can be reduced from quarterly to monthly to potentially improve model-calculated stream flows and seasonal changes in model-calculated baseflows. The assessment of model performance and uncertainty can be improved by extending the simulation period to include 2017-2018.

SGMA Objectives: Work is needed to develop the projected hydrology and model input data sets to assess both the extension of current baseline conditions into the future and assess the potential effects of climate change on the basin water budget.

ATTACHMENT 1

Santa Margarita Groundwater Model

Evaluation to Support Groundwater Sustainability Plan Development

September 12, 2018

SANTA MARGARITA GROUNDWATER MODEL

EVALUATION TO SUPPORT GROUNDWATER SUSTAINABILITY PLAN DEVELOPMENT

PHILOSOPHY BEHIND REVIEW

- A characteristic of all models -
  - "No Model is Perfect."
  - "All Models are Wrong."
- Appropriate model application includes -
  - How wrong can it be?
  - Does potential error (uncertainty) change the decision?
  - Uncertainty guides future data collection and improvements.

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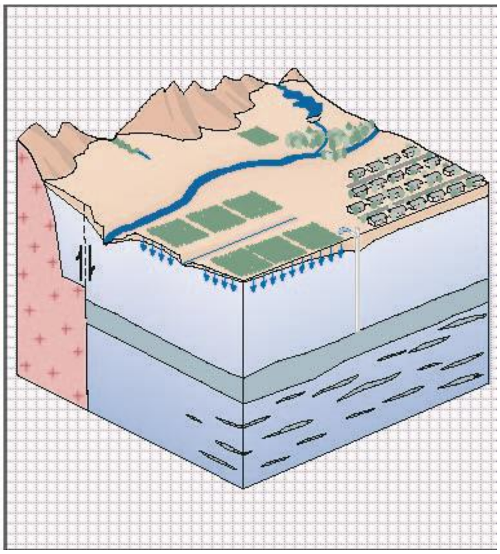
The information obtained from a model is used to help make decisions. It is important to recognize that a model is an approximation of the real-world system, and the output from a model is never exact (there is always a discrepancy between measured and model-calculated conditions – model error). Because model error produces uncertainty in model output, part of model development requires the error be characterized. When using the information from models to make decisions, it is necessary to evaluate whether that error is sufficient to change the decision. This uncertainty in model output guides future data collection and/or model improvements designed to increase confidence in model results and the decisions-making process.

GROUNDWATER-FLOW MODEL REVIEW TOPICS



I. Geohydrologic Framework
- Basin Boundaries
- Layering
- Water transmitting and storage parameters (K/S)

II. Water Budget/Landscape Properties
- Water Inflows
- Water Outflows

III. Performance/Uncertainty

IV. SGMA Objectives

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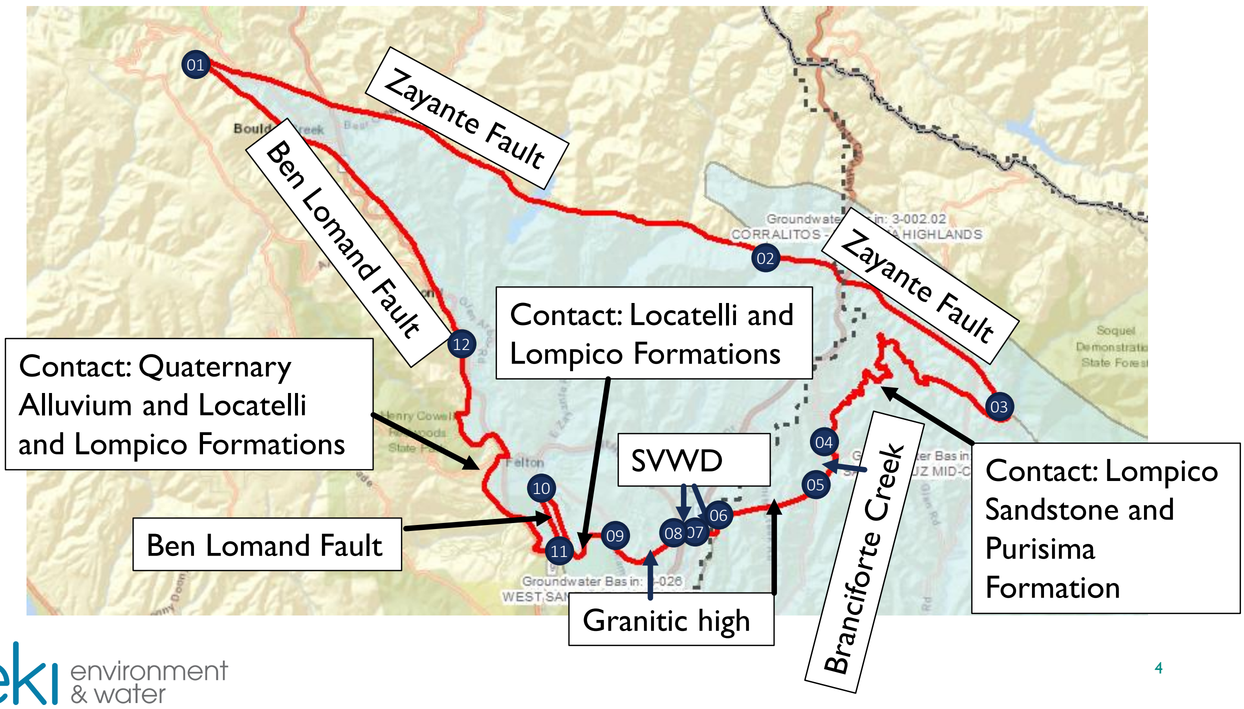
The Santa Margarita Groundwater Model (SMGWM) review focused on the following four areas.

1. The Geohydrologic Framework, which refers to how the geometric and physical structure of the basin is represented by the model. This included review of the basin/model boundaries, the hydrologic conditions represented at those boundaries, the correspondence between model layers and geologic formations, and the water-transmitting and storage properties.
2. The quantitative representation of the Water Budget and Landscape processes, which entails review of water inflows and outflows like rainfall, groundwater extractions, infiltration and runoff, and so forth.
3. Model performance and error (or uncertainty), which considers model reproducibility, calibration uncertainty (how well the model reproduces historical observations), and prediction uncertainty (what model uncertainties most influence projected outcomes).
4. Model evaluation through the lens of SGMA, which compared the model to standards and objectives stated by SGMA and reflected in the regulations and Best Management Practices (BMPs) published by the California Department of Water Resources (DWR).

BASIN BOUNDARIES DEFINED BY DWR



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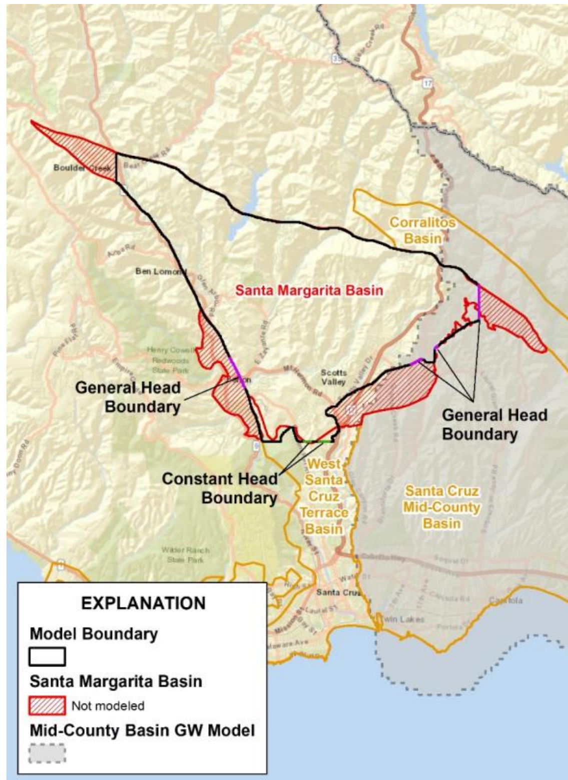
The approved basin boundary for the Santa Margarita Groundwater Basin is composed of both physical (geologic) and jurisdictional boundaries. As reported by DWR, the northern boundary from (1), (2), and (3) is formed by the Zayante Fault. The eastern boundary from (3) to (4) is the geological contact between the Lompico Sandstone and Purisima Formation, and from (4) to (5) is Branciforte Creek. The southeastern boundary from (5) to (6) is geologic and formed by the granitic high; from (6), (7), and 8 is a jurisdictional boundary (Scotts Valley Water District). From (8) to (9) is a geologic boundary and also represented by the granitic high. From (9) to (10) is the geological contact between the Locatelli and Lompico Formations, and from (10) to (11) is the Ben Lomand Fault. The western boundary from (11) to (12) along the geological contact between the Quaternary Alluvium and the Locatelli and Lompico Formations; and from (12) back to (1) is the Ben Lomand Fault.

MODEL BOUNDARIES DO NOT ENCOMPASS DWR BASIN BOUNDARIES

Most boundaries are no-flow, but head-dependent flux boundaries are employed to simulate limited exchange of water between model area and adjacent basin areas.

- Partial over-lap with Mid-County Basin Model; General Head along SE boundary (layer 7 only).
- Constant Head along interface with West Santa Cruz Terrace Basin (layer 1 only).
- SW general Head along part of Ben Lomond fault (layer 7 only).



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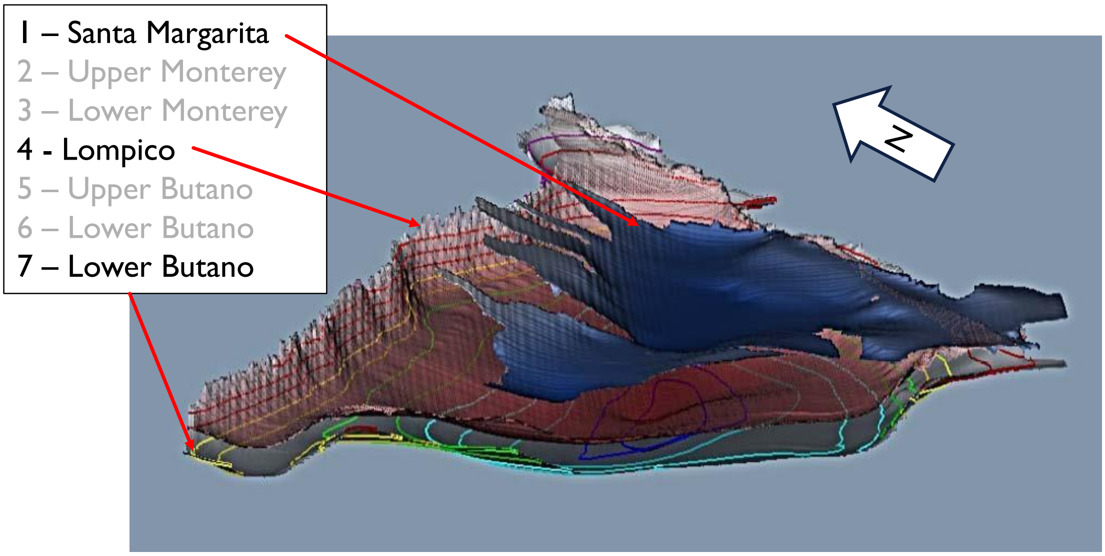
SGMA requires that (1) the model encompass the entire basin; and, (2) cross boundary flows between adjacent models are consistent. The Santa Margarita Groundwater Model (SMGWM) does not cover the entire Santa Margarita Groundwater Basin as defined by DWR. Expanding the model grid to cover some areas likely provides little benefit to model reliability because the areas have little significance in regards to recharge and groundwater use. In contrast, the San Lorenzo River is a significant hydrologic feature, and it meanders across portions of the western basin boundary defined by DWR, effectively excluding parts of the river and associated alluvial areas from consideration in basin calculations. This should be considered when developing future plans to modify model boundaries.

The SMGWM simulates relatively small quantities of groundwater inflow and outflow across limited portions of its boundaries, and these flows represent the exchange of groundwater with basin areas not included by the model. The southeastern (SE) boundary simulates groundwater outflow from the deepest model layer into the underlying bedrock, and southwestern (SW) boundary flows also simulate outflow from the deepest model layer beneath the Felton area. These deep outflows from the model were incorporated during model calibration, and therefore are speculative. Along the southern boundary, the model simulates groundwater inflow from the West Santa Cruz Terrace Basin. These flows occur in layer 1 only, and represent rainfall recharge on alluvial deposits south of the basin that flow into the basin across the southern boundary. This subsurface inflow is not based on observed groundwater levels, and it is opposite to the flow direction inferred from land surface topography and surface water runoff. However, maps showing the elevation of the underlying granitic rocks indicate the lower boundary of the basin slopes to the north and in the direction of the model-calculated inflow.

The Santa Cruz Mid-County Basin Model (SCMCM) is the only adjacent existing model. The quantity of model-calculated groundwater flow out of the SMGWM and into the shared area represented by the SCMCM is only about 100 acre-feet per year (see slide 12 for a detailed explanation of the model-calculated water budget). In contrast, the SCMCM reportedly simulates 320-560 acre-feet per year of groundwater outflow across its western boundary, which corresponds to 320-560 acre-feet per year of groundwater inflow into the SMGWM (HydroMetrics, 2016, Santa Cruz Mid-County Groundwater Model Boundaries Update"). The cross-boundary flows between the two models therefore appear to be opposite in direction.

MULTI-LAYERED (7) MODEL CONSISTENT WITH UNDERSTANDING OF GEOLOGIC FORMATIONS



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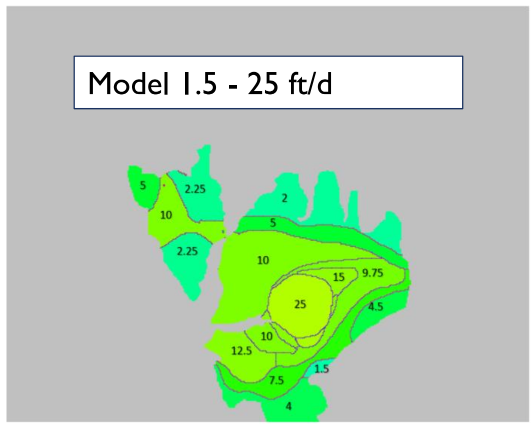
The model utilizes fairly small cells (110 ft x 110 ft), and as a result closely mimics spatial topographic and elevation changes. The SMGWM is comprised of seven model layers. Layer 1 represents the Santa Margarita aquifer, layers 2 and 3 represent the Monterey formation, layer 4 represents the Lompico aquifer, and layers 5, 6, and 7 represent the Butano aquifer (parts of layers 5 and 6 can represent the Locatelli aquifer in some places). The Monterey formation is considered an aquitard, but contains sand interbeds that provide water to a limited number of wells. The formation is represented by two layers to characterize the depth distribution of inferred interbed connectivity. The upper Monterey is represented by layer 3, where measured water levels reportedly do not seem to exhibit substantial interconnectivity between interbeds. In contrast, water levels in the lower Monterey represented by layer 4 reportedly do show correlation with trends in the underlying Lompico and suggest some degree of interconnectivity. Our evaluation did not seek to corroborate these observations because using either a single layer or two layers to represent the Monterey formation likely has little effect on model reliability. The Butano Formation is considered a three-member aquifer, and each member is represented by a different model layer. The thickness and extent of model layers were reportedly determined from existing maps and borehole logs, and our evaluation review indicated general consistency with those materials; however, our evaluation did not quantitatively compare model layers against geologic sections, maps, and boring logs.

SANTA MARGARITA AQUIFER (LAYER 1): 14 DIFFERENT HORIZONTAL CONDUCTIVITY ZONES, AND VALUES ARE AT THE LOW END OF THE RANGE FROM AQUIFER TESTS

Observation well locations support more than one zone.

Aquifer Test Results (0.2 – 130 ft/d)



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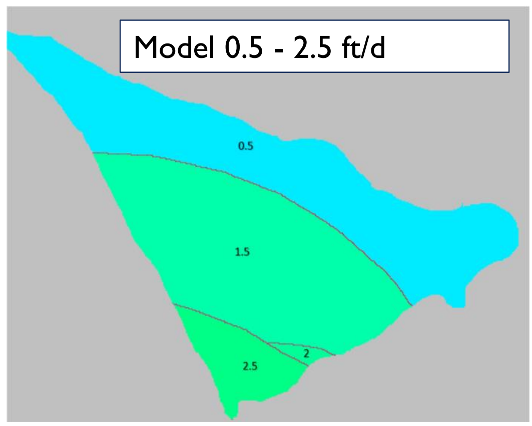
Hydraulic conductivity is a measure of a water-bearing formation to transmit water. In the Santa Magarita Aquifer (layer 1), there are 14 different horizontal hydraulic conductivity zones and the modeled values fall within the lower range from reported aquifer test results (Appendix D from 2015 model report). The modeled spatial variability in horizontal conductivity suggests substantial precision in the representation of water transmitting properties. There is a relatively large number of observation wells that represent water level conditions in the Santa Margarita Aquifer, but the correspondence between water level observation wells, aquifer test locations, and hydraulic conductivity zones is not evaluated or reported; no explanation for the physical basis of the model zonation is provided. The modeled hydraulic conductivity values represent the low end of the range in reported results, but this may be reasonable because aquifer tests conducted on existing water supply wells can represent high-yielding areas of the aquifer, whereas a larger-scale regional model encompasses both relatively high- and low-yielding basin areas.

LOMPICO AQUIFER (LAYER 4) HORIZONTAL CONDUCTIVITY VALUES ARE AT THE LOW END OF THE RANGE FROM AQUIFER TESTS

Observation well locations provide limited support for zones.

Aquifer Test Results

(0.7 – 25 ft/d)



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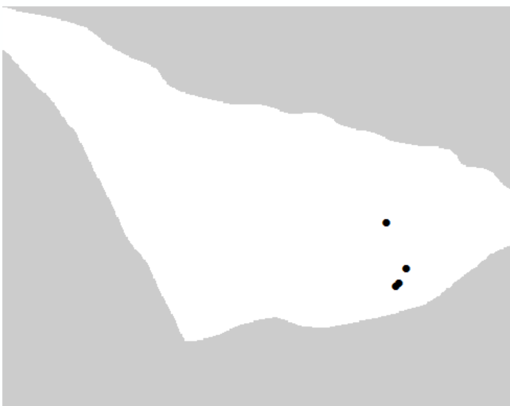
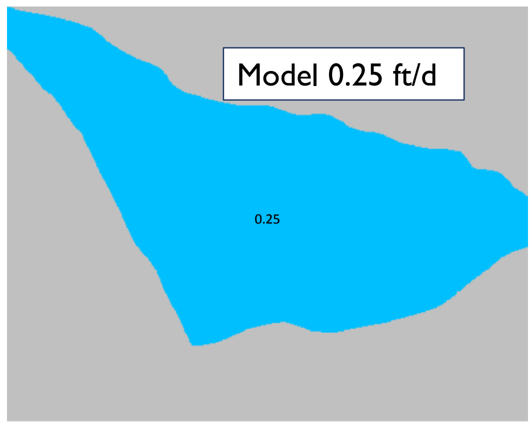
The modeled horizontal hydraulic conductivity values in the Lompico Aquifer (layer 4) is specified in four zones, and the values fall within the lower range of reported test results (Appendix D from 2015 model report). The distribution of observation wells is limited to locations near the southeastern model boundary, and the relationship between observation wells locations, aquifer test locations, and modeled conductivity zones is not reported. No explanation for the physical basis of the model zonation is provided. The modeled hydraulic conductivity values represent the low end of the range in reported results, but this may be reasonable because aquifer tests conducted on existing water supply wells can represent high-yielding areas of the aquifer, whereas a larger-scale regional model encompasses both relatively high- and low-yielding basin areas.

LOWER BUTANO FORMATION (LAYER 7) HORIZONTAL CONDUCTIVITY VALUES ARE AT THE LOW END OF THE RANGE FROM AQUIFER TESTS

Observation well locations.



Reported transmissivity values for the Butano range from 177 to 1,637 ft2/d (0.2 – 1.6 ft/d K assuming 1,000 ft layer 7 thickness)



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There are only a handful of observation wells available to represent conditions in the Lower Butano formation (layer 7). The horizontal hydraulic conductivity of model layer 7 (Lower Butano) is represented by a single conductivity zone, and is consistent with this limited spatial distribution of observation wells for characterizing conditions in layer 7. The modeled horizontal hydraulic conductivity value (0.25 ft/d) is similar to the lowest values estimated from reported aquifer test results (Appendix D from 2015 model report).

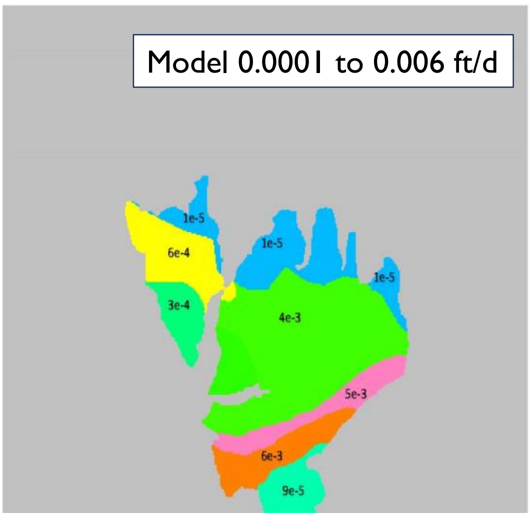
VERTICAL CONDUCTIVITY IS UNREALISTICALLY LOW

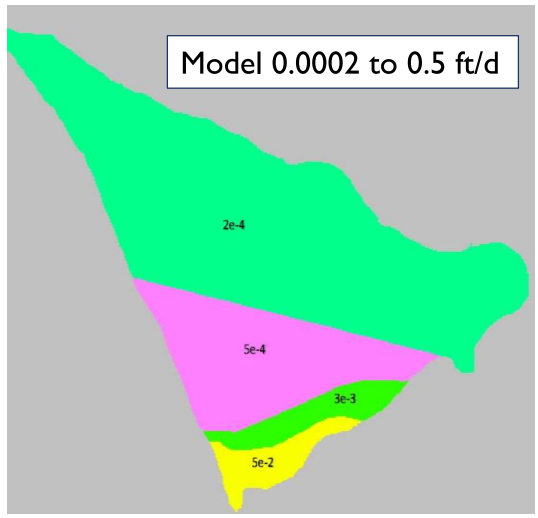
Santa Margarita Aquifer Tests

4 – 11 ft/d

Lompico Aquifer Tests

0.02 – 1.2 ft/d





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The vertical conductivity values of layer 1 (Santa Margarita Aquifer) and layer 4 (Lompico Aquifer) are lower than the reported values from aquifer test results (Appendix D from 2015 model report). Vertical conductivity estimates from aquifer test results are typically considered less reliable than horizontal conductivity estimates, but the range in measured values for tests conducted in the basin is small relative to the modeled values. Measured vertical conductivity values range by about 1 to 1.5 orders of magnitude, whereas the range in modeled values is much greater. The measured The vertical conductivity in layer 1 is on the order of 1,000 to 100,000 times smaller than the aquifer test results; the vertical conductivity in layer 4 is on the order of 25 to 6,000 times smaller than the aquifer test results.

The modeled vertical conductivity values seem unrealistically low, especially when combined with the hydraulic influence of the low vertical conductivity of layers in-between these aquifers (model layers 2 and 3 represent the upper and lower Monterey formation, which is an aquitard and represented by vertical conductivity values as low as 0.00001 ft/d). In other words, the modeled vertical conductivity of the aquifers are not much different from the modeled vertical conductivity of the aquitards. These observations emphasize the importance of matching the measured magnitude and trends in vertical gradients between aquifers during model calibration, and quantifying the sensitivity of the model-calculated gradients to specified vertical conductivity values. Moreover, adjustments to model calibration should explore the efficacy of using aquifer vertical conductivity values more consistent with test results and adjust the vertical conductivity of intervening layers representing the aquitards during calibration accordingly.

STORATIVITY VALUES IN MODEL ARE REASONABLE BUT INCORRECTLY REPORTED

Aquifer	Typical Values "Storativity"	Basin Aquifer Test Results "Storativity"	SMGWM	
			"Specific storage"*	"Storativity" (estimated)
Santa Margarita	1e-05 to 1e-03	9e-05 to 6e-02	1e-04	2e-02
Lompico	1e-05 to 1e-03	1e-05 to 7e-02	8e-06 to 2e-05	2e-03 to 5e-03
Lower Butano	1e-05 to 1e-03	7e-04 to 1e-02	1e-07 to 1e-06	2e-04 to 2e-03

*Values incorrectly labeled as "storativity" in Table 6-1 of 2015 report.

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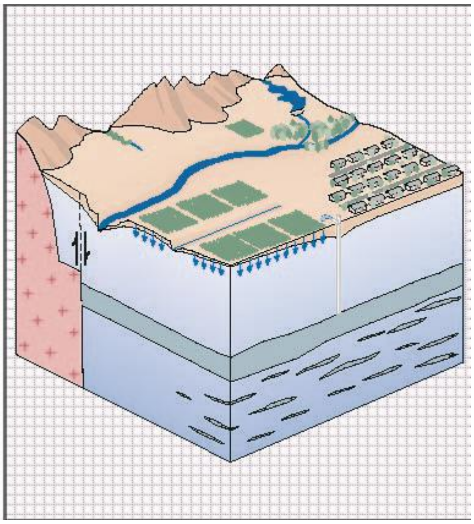
The storage coefficient (or storativity) represents the volume of water an aquifer releases or takes in per unit surface area of the aquifer per unit change in water level. The storativity for unconfined aquifers typically ranges from 0.01 to 0.30, whereas the storativity for confined aquifers typically ranges from 1e-03 to 1e-05 (Driscoll, "Groundwater and Wells," Second Edition, 1995). In MODFLOW, the input parameter is "specific storage," and storativity is calculated by multiplying the specific storage of each model cell by the cell thickness. Hence, storativity in the SMGWM is estimated by multiplying the specific storage values in the above table by the model layer thickness. The average model layer thicknesses are 180 ft, 310 ft and 1,500 ft for the Santa Margarita, Lompico and Lower Butano aquifers (model layers 1, 4, and 6 and 7 combined, respectively). [*It is important to clarify that "storativity" was specified in the SMGWM input file (Groundwater Vistas) rather than specific storage. Some versions of MODFLOW (MODFLOW 2005) can utilize storativity rather than specific storage if directed to do so. However, the version of MODFLOW employed by the SMGWM (MODFLOW NWT) does not have the option to use storativity. MODFLOW NWT only* *accepts specific storage. In other words, MODFLOW NWT expects the user to provide it values corresponding to specific storage. Because the SMGWM input files specify storativity, those storativity values written to the input files by Groundwater Vistas are read and utilized by MODFLOW NWT as if they are specific storage values, which they are not. As it turns out, the storativity values calculated by MODFLOW NWT using the erroneous specific storage values in the MODFLOW input file result in reasonable values when utilized by the model.*]

Aquifer tests conducted on wells screened in the Santa Margarita indicate storativity values that range from about 9e-05 to 6e-02; the estimated storativity utilized in the SMGWM is about 0.02 (180 x 0.0001) and near the upper end of the reported storativity range. In the Lompico Aquifer, tests indicate storativity values that range from 1e-05 to 7e-02; the estimated storativity values in the SMGWM range from 2e-03 to 5e-03 and are within the reported range of storativity values. Aquifer tests conducted on wells screened in the Lower Butano indicate storativity values that range from 7e-04 to 1e-02; the storativity values in the SMGWM range from 2e-04 to 2e-03, which is generally within the lower reported range of storativity values.

RECOMMENDED GROUNDWATER-FLOW MODEL UPDATES



I. Geohydrologic Framework

- **Expand Model to agree with Basin Boundaries.**
- **No change in model cell dimensions or layering.**
- **Revise water transmitting parameters (vertical hydraulic conductivity Kv).**

II. Water Budget/Landscape Properties

III. Performance/Uncertainty

IV. SGMA Objectives

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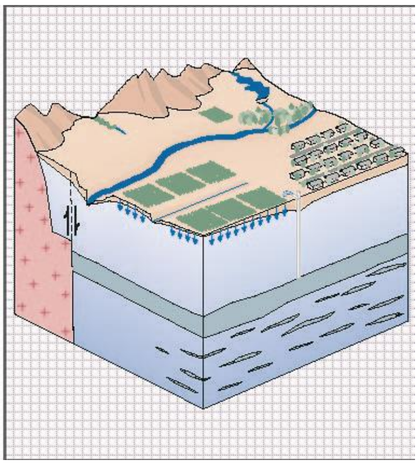
In summary, review findings suggest the model grid needs to be expanded to overlap the mapped basin boundaries (no change is recommended to model cell dimensions or layering) and the vertical hydraulic conductivity of the modeled aquifers should be adjusted to better match reported aquifer test results. The grid expansion should include the San Lorenzo River and associated alluvial areas, which likely can improve comparisons between model calculated and reported baseflows. The grid should extend west to the contact between the alluvial deposits and older sandstone and shale deposits. In the expanded model grid, the alluvium likely be approximated by a single zone of uniform thickness and representative hydraulic conductivity.

GROUNDWATER-FLOW MODEL REVIEW TOPICS



I. Geohydrologic Framework
- Basin Boundaries
- Layering
- Water transmitting and storage parameters (K/S)

II. Water Budget/Landscape Properties
- **Water Inflows**
- **Water Outflows**

III. Performance/Uncertainty

IV. SGMA Objectives

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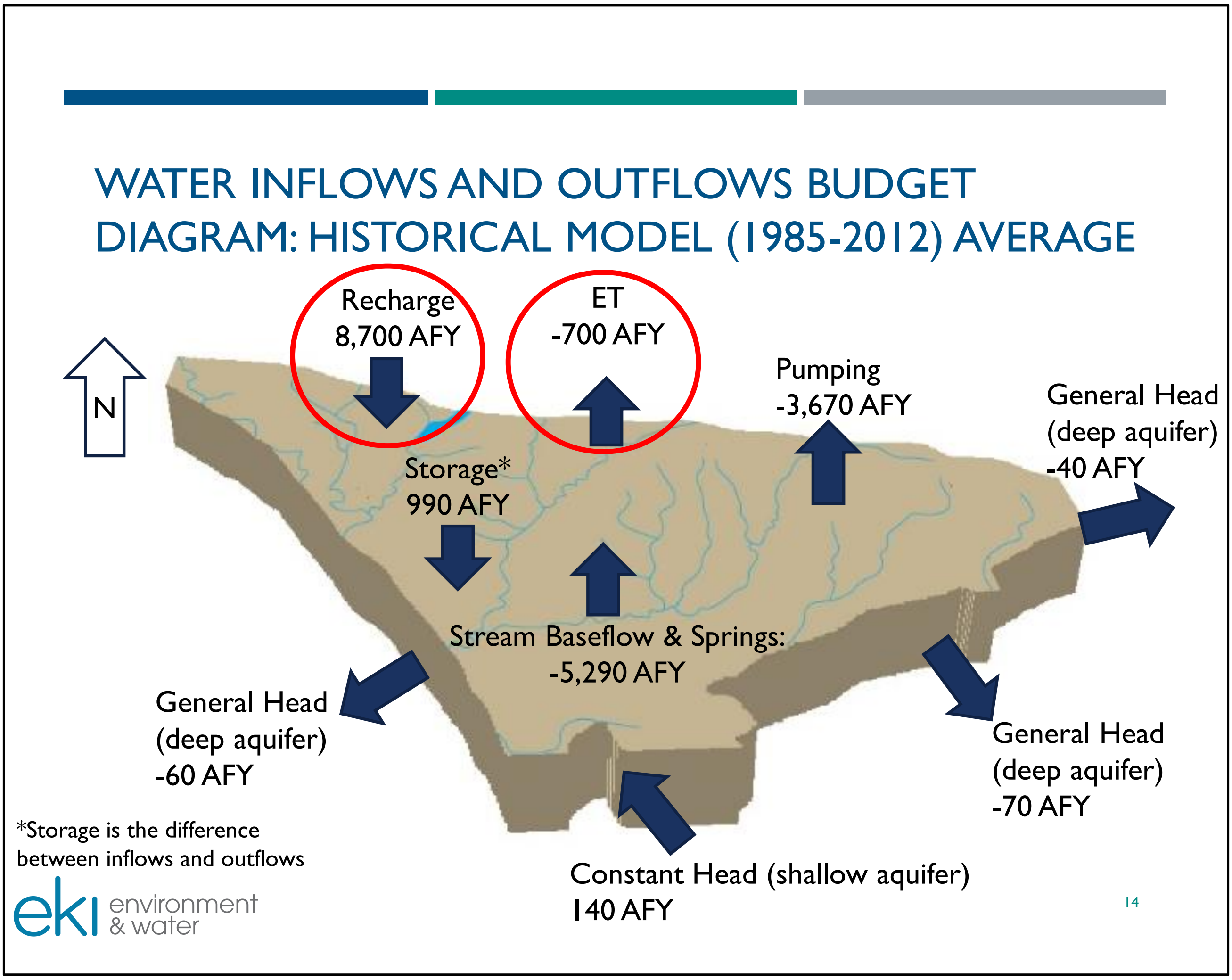
Water budget information quantifies water entering and leaving the basin by water source. The quantification of water budget components includes specified inflows and outflows (for example, rainfall recharge, well extractions, and so forth), and model-calculated inflows and outflows (for example, groundwater discharge to streams as baseflows).



The diagram above summarizes the average historical SMGWM calculated water budget for water years 1985-2012.

The boundary flows (general head and constant head) are small relative to total inflows (1%) and outflows (2%), and insignificant relative to the basin water balance. As noted in slide 5, the approximately 100 acre-feet per year of outflow from the SE general head boundaries is opposite in direction relative to the SCMCM (320-560 acre-feet per year of groundwater inflow).

Model simulated recharge is calculated by a separate model (a “recharge pre-processor,” of “recharge estimator”), that is not explicitly part of the groundwater-flow model. The recharge estimator is poorly described in the model report, and developing a detailed documentation and manual for the estimator based on report text, tables, maps, and associated excel spreadsheets is needed – should it continue to be used – but was beyond the scope of this model evaluation. This evaluation reviewed the report information and spreadsheet calculations, conducted preliminary exploratory sensitivity tests, and compared the estimator results to similar results from independent investigations.

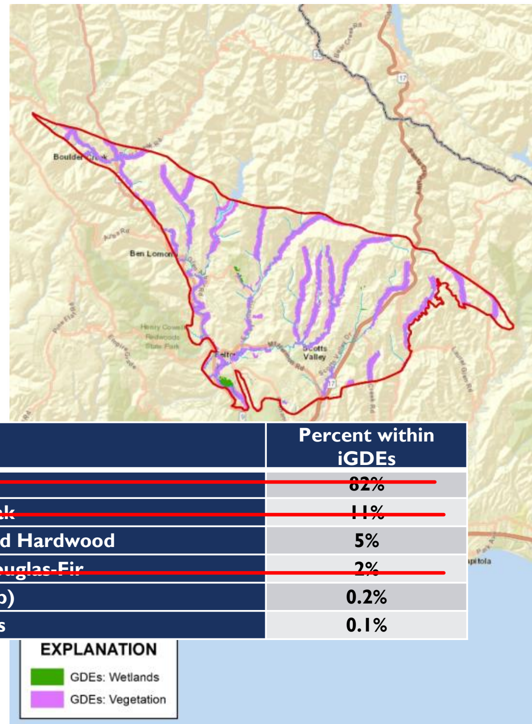
Recharge specified in the model (8,700 AFY) is about 30% lower than independently estimated by Johnson (Administrative Draft: San Lorenzo Valley Water District Water Supply Master Plan, 2009) [12,000 AFY]. The model calculated recharge values can be highly sensitive to assumed input values (e.g., the “recharge coefficients” assigned to geology and land use combinations), but their determination is not transparent in the documentation.

During our review, an implementation error was discovered in the worksheets utilized to calculate recharge for input to the model. The error was corrected and resulted in a slight increase in specified recharge (about 300 AFY, or an increase of about 3%). The calculated recharge for the model was still substantially lower than the 12,000 AFY estimated by Johnson (2009).

Specified recharge is intercepted by the water table, and this water is reduced by about 8% using the MODFLOW ET package; the MODFLOW ET package was utilized to represent water consumption by groundwater dependent vegetation. The water consumed by these vegetation and calculated by MODFLOW ET is in addition to plant transpiration of water from the root zone that was already included in the calculation of groundwater recharge.

INDICATORS OF GROUNDWATER DEPENDENT ECOSYSTEMS (GDEs)

- Wetlands: Ecosystems that rely on surface expression of groundwater
- Vegetation: Ecosystems that rely on sub-surface presence of groundwater



Vegetation	Percent within iGDEs
~~Redwood~~	~~82%~~
~~Coast Live Oak~~	~~11%~~
Riparian Mixed Hardwood	5%
~~Redwood - Douglas-Fir~~	~~2%~~
Willow (Shrub)	0.2%
Wet Meadows	0.1%

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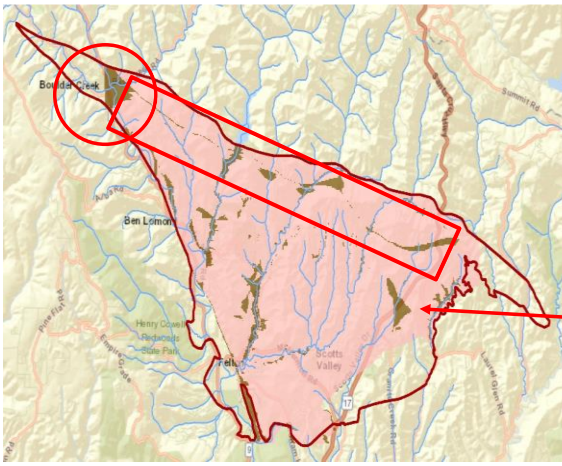
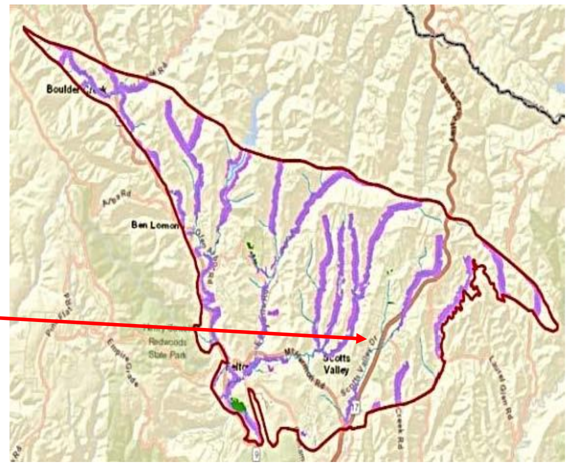
Groundwater dependent ecosystems (GDEs) are defined under SGMA as “*ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface*.” The map above shows “indicators” of GDEs (iGDEs) for both vegetation and wetlands as developed by The Nature Conservancy in conjunction with DWR (groundwaterresourceshub.org and gis.water.ca.gov/app/NCDatasetViewer/); the actual identification of GDEs requires detailed land use, hydrology, and geologic information. Vegetation classified as GDEs include “*ecosystems that rely on the sub-surface presence of groundwater, including phreatophytes*” and wetlands are classified as “*ecosystems that rely on the surface expression of groundwater, including springs, perennial wetlands, and rivers whose flow is augmented by groundwater*.” The minimum mapping unit for iGDEs is 1,000 square-meters (~¼ acre), which means that areas smaller than ¼ acre are not considered (for comparison, the area of each model cell represents less than 0.25 acre). Map base scales vary for inputs into the iGDE database. For the Santa Margarita Basin, the base scale for vegetation is 2.5 acres and for wetlands is 0.5 acres, meaning wetlands have a higher mapped resolution compared to vegetation. Therefore, ground-truthing of iGDEs is required during GSP development to produce more accurate maps of GDEs. Within the Santa Margarita Basin, the Nature Conservancy and DWR classified iGDEs are predominantly Redwood (82%), followed by Coast Live Oak (11%), and Riparian Mixed Hardwood (5%); Douglas Fir, Willow, and wet meadows make up the remainder of iGDEs which when combined is less than 3%. However, Redwood, Coast Live Oak, and Douglas Fir in the Santa Margarita Basin are not generally considered phreatophytes. Ground-truthing of the iGDE maps is likely required before using them as part of detailed water budget calculations.

ET = 700 AFY (8% OF RECHARGE)

Model calculated ET



Mapped GDE's



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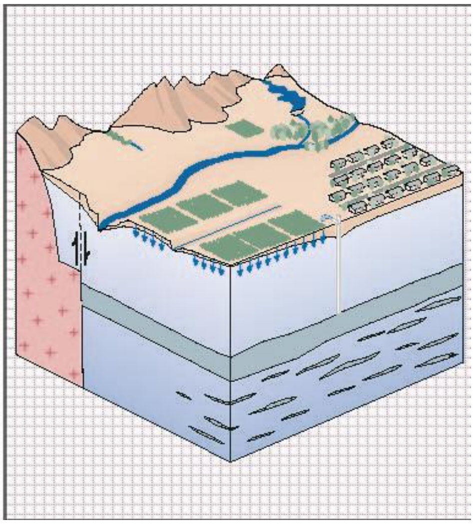
The SMGWM employs the MODFLOW ET package to simulate plant consumption of shallow groundwater. Model input files are specified so that model calculated ET can occur across the entire basin, and therefore ET is a function of model-calculated depth to water rather than the known presence of plants that utilize shallow groundwater.

Inspection of model results provides evidence that the ET calculations by the groundwater model might be unwarranted. The map on the left shows model cells that simulate ET during stress period 40 (a time period of low rainfall and relatively deep water table conditions), which presumably represents the minimum areal distribution of model calculated ET; most other time periods have greater recharge and presumably larger simulated areas where ET is calculated by the SMGWM. The map on the right shows the distribution of iGDEs as identified by the Nature Conservancy in conjunction with DWR (groundwaterresourceshub.org and gis.water.ca.gov/app/NCDatasetViewer/). Comparisons between the two maps show reasonable agreement in some areas, and limited to no correspondence in others. For example, the model results indicate shallow groundwater conditions over an unrealistically large area near the northwestern model boundary and large area northwest of Scotts Valley. Additionally, there is a narrow band of ET simulated across the basin that appears to be an artifact of internal model boundaries and parameterization rather than real-world hydrologic conditions. Moreover, because the recharge calculations consider plant water consumption as part of its calculations, utilizing the ET package to simulate additional water consumption by plants in these areas seems to double-count plant water use. The implementation of the ET package in the SMGWM could be restricted to known areas where plants rely on shallow groundwater for their water needs, if there are any, and recharge calculations and model-calculated discharges (e.g., ET) could be modified for these areas to prevent double counting of water use and characterize the sensitivity of groundwater flow to GDEs to changes in groundwater storage.

RECOMMENDED GROUNDWATER-FLOW MODEL UPDATES



I. Geohydrologic Framework
- Expand Model to agree with Basin Boundaries.
- No change in model cell dimensions or layering.
- Revise water transmitting parameters (vertical hydraulic conductivity Kv).

II. Water Budget/Landscape Properties
- **Refine recharge estimates.**
- **Modify or remove ET package**

III. Performance/Uncertainty

IV. SGMA Objectives

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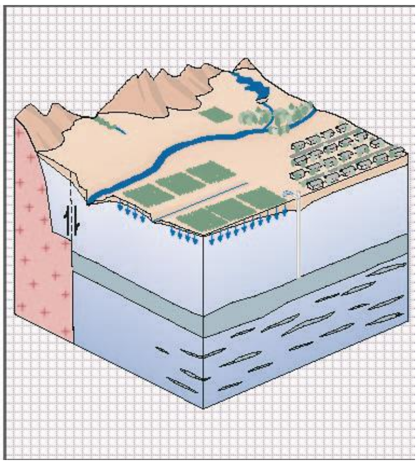
In summary, review findings indicate that the methodology for calculating recharge should be reviewed and modified, and the discrepancy between its results and other independent recharge estimates explained. Modifications to the recharge estimator should also consider its ability to implement downscaled climate change effects based on temperature. It may be helpful to coordinate the effort to downscale climate change effects with other similar on-going efforts in adjacent basins to ensure consistency. The use of the ET package to simulate shallow groundwater use by phreatophytes should be revisited; the ET package should either be removed, or the existence of groundwater dependent ecosystems verified and recharge calculations updated accordingly to prevent double counting of their water use. Other methods, like soil moisture budget accounting algorithms, might be considered as an alternative to the current recharge estimator utilized by the model.

GROUNDWATER-FLOW MODEL REVIEW TOPICS



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Model performance considers reproducibility of model results and the discrepancies between measured (observed) and model-calculated conditions. Model uncertainty considers model sensitivity to changes in model input and the discrepancies with historical observations (calibration uncertainty), and similar uncertainty in projected future conditions (what changes to the model most influence the projected outcomes). The analysis of uncertainty helps prioritize data collection efforts that target key basin characteristics, the selection of a reasonable margin of operational flexibility, and integrating the uncertainty of future conditions (for example, the effects of climate change).

MODEL PERFORMANCE

- Measured and Model-Calculated Water Levels in Wells
  - Reproducibility
  - History match and post audit
- Trends – water level hydrographs
- Vertical gradients
- Stream flows and baseflows

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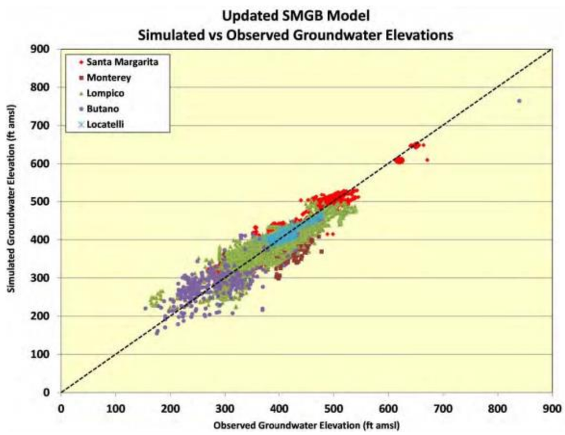
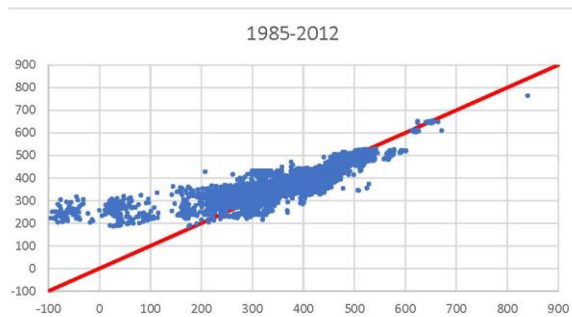
Model performance assessed reproducibility (can an independent party run the model and obtain the same results as reported in the model documentation), calibration reliability (the 1985-2012 period utilized to calibrate the model), and projected results during 2013-2016 using new input data collected after model development. Calibration reliability was also assessed by comparing short- and long-term trends, vertical gradients between relatively shallow and deep well pairs, and the magnitude and trends in estimated and model-calculated baseflows available for select streams. The model evaluation did not compare measured and model-calculated groundwater elevation contours, which is also an effective measure of model performance in areas and for time-periods when maps are available. However, the results from these comparisons, had they been included, likely would not substantially alter the conclusions and recommendations developed by this evaluation.

MODEL-CALCULATED WATER LEVELS ARE DIFFERENT FROM REPORTED “UPDATED” MODEL RESULTS





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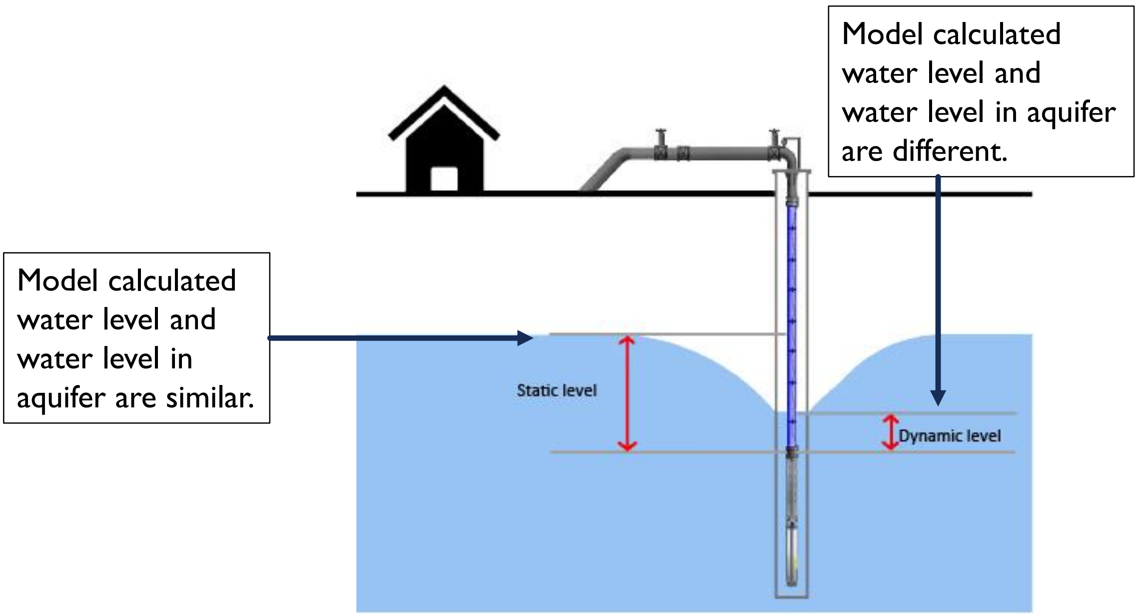
One measure of model performance is a comparison of model-calculated and measured water levels. If the model reproduces measured values exactly, the data pairs all plot along a line that passes through the origin with a slope equal to one (the “1 to 1” or “match” line). The scatter of data points around the match line represents model error. We created this plot to confirm model reproducibility (check whether or not the model version we ran reproduced the results described in the 2015 report) and to assess model error.

The 2015 model report included plots of model calculated (“simulated”) and measured (“observed”) groundwater elevations for the 1985-2012 calibration period. The plot on the left is for the “updated” model as provided in the 2015 report, and the plot on the right is the output from the model version provided for this review. There are distinct differences between the two plots, and model results were therefore not re-producible; investigation into the cause for these discrepancies was beyond the scope of this investigation. (We also note that the volumetric budget components were compared with results in the 2015 report and found that the comparisons are close, but not exact [within 20 to 30 AFY]).

The data pairs that plot above the match line in the lower left hand corner of the plot on the right indicate model-calculated water levels that are substantially greater than measured water levels in the wells. Closer inspection indicated that these data points are from wells that have dual measurements (likely "static" measurements – water levels measured in an inactive well – and "dynamic" measurements – water levels measured in an active or recently pumped well).

MODEL-CALCULATED WATER LEVELS REPRESENT "STATIC LEVELS"



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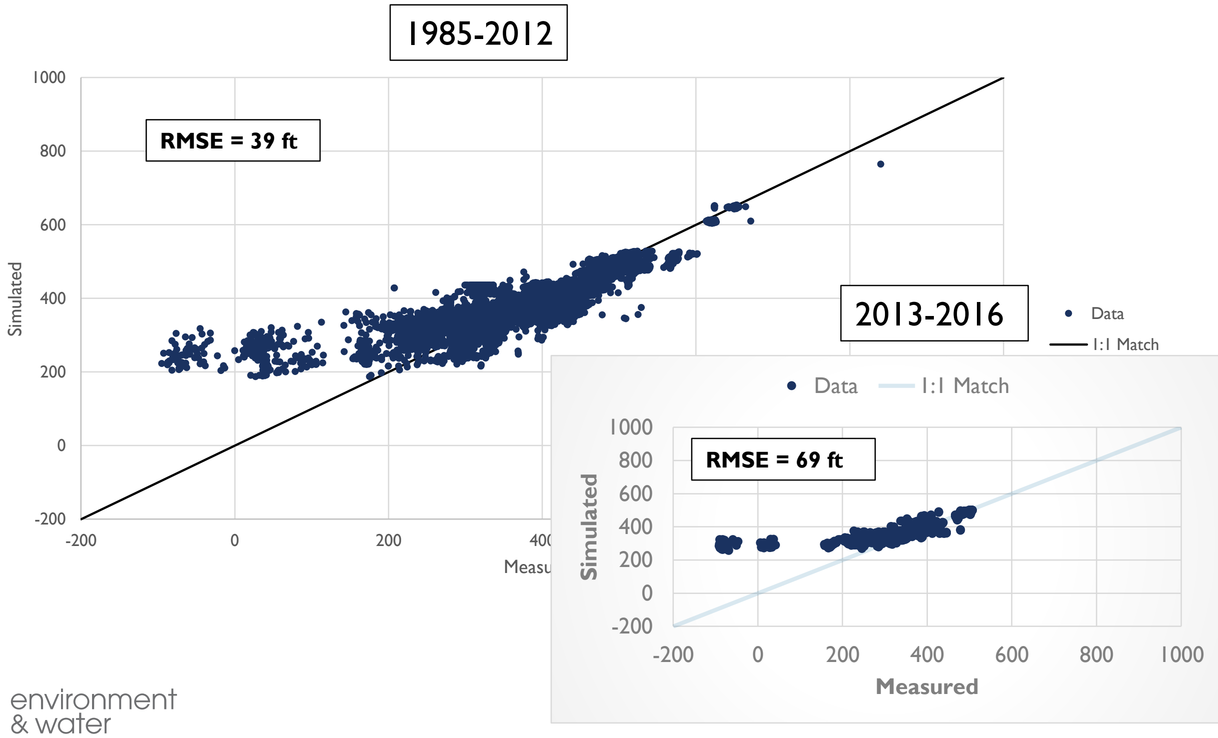
"Static" water levels refers to when the well is inactive (not pumped), and the water levels in the well and adjacent aquifer are essentially the same. The groundwater flow model results represent the water levels in the aquifer. Therefore under static conditions the measured water levels and model-calculated water levels should be similar. "Dynamic" water levels refer to when the well is active or recently active (pumping or recently pumped), and drawdown in the well causes the water level in the well casing to be lower than the water level in the adjacent aquifer. The water level in an actively pumping well (or recently pumped well) are lower due to water removed from storage in the well casing and inefficiencies that occur as water in the aquifer moves through the filter pack and well screen and into the well. Under dynamic conditions the measured water levels in the well are expected to be lower than the model-calculated water levels representing conditions in the adjacent aquifer.

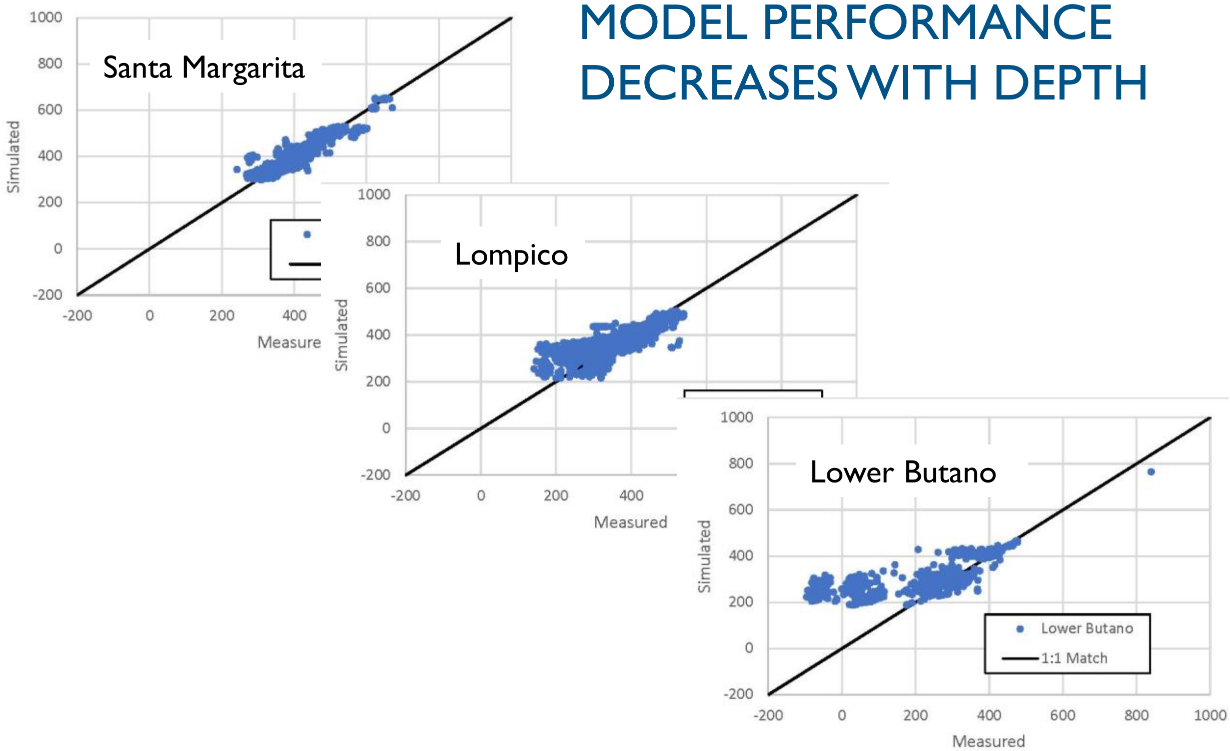
SIMULATED VS. MEASURED WATER LEVELS (1985-2012 CALIBRATION AND 2013-2016 POST AUDIT).



The comparisons between model-calculated and measured water levels were further analyzed to assess model error. Model-calculated water levels represent the average water level within the 110 x 110 ft2 model cell area where the well is located (typically outside the well casing in the adjacent aquifer). The model-calculated water levels typically agree reasonably well with "static" water levels, but are greater than the dynamic water levels. Hence, the water levels that plot above the line compare model-calculated water levels with measured dynamic/pumped water levels (water levels that are lower than the level of groundwater in the aquifer adjacent to the well).

A model post-audit compares model results for a time period after the calibration period. In a post audit, the input data sets based on climate, water supply, water use, and so forth are all known. The extended data set is then used with the model to "project" the expected groundwater changes that occur as a result of these "future" conditions. The SMGWM data set was previously extended to include 2013-2016, and comparisons between model-calculated and measured water levels are generally similar to the historical calibration (the lower right figure inserted above). This means the model performed reasonably well with projecting groundwater levels over the extended 3-year period.

MODEL PERFORMANCE DECREASES WITH DEPTH



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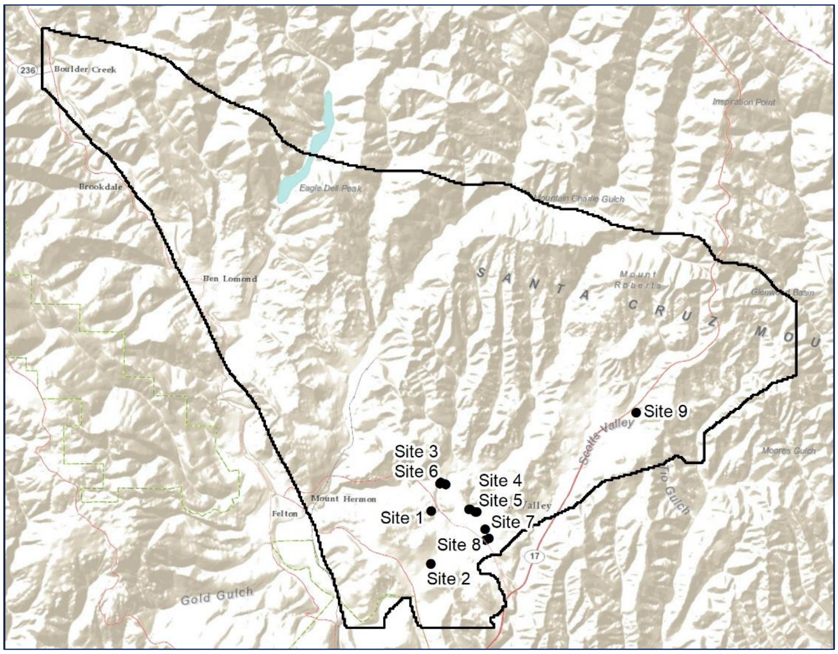
The spatial distribution of model error was investigated by constructing the 1985-2012 water level comparisons for individual aquifers/layers: the Santa Margarita (layer 1), Lompico (layer 4), and Lower Butano (layers 6 and 7). Model error represented by the scatter above and below the match line generally increases with depth. The agreement between model-calculated and measured water levels is best in the Santa Margarita Aquifer, and the poorest comparison is the Lower Butano. In the Butano, a substantial portion of the discrepancy is attributed to uncertainty in measured water levels. The problematic data points are from two Scotts Valley Water District wells (SVWD #3B and SVWD #7A), and the data set for those wells includes measured water levels likely under “static/inactive” and “dynamic/active” conditions.

SITES WITH PAIRED WELLS



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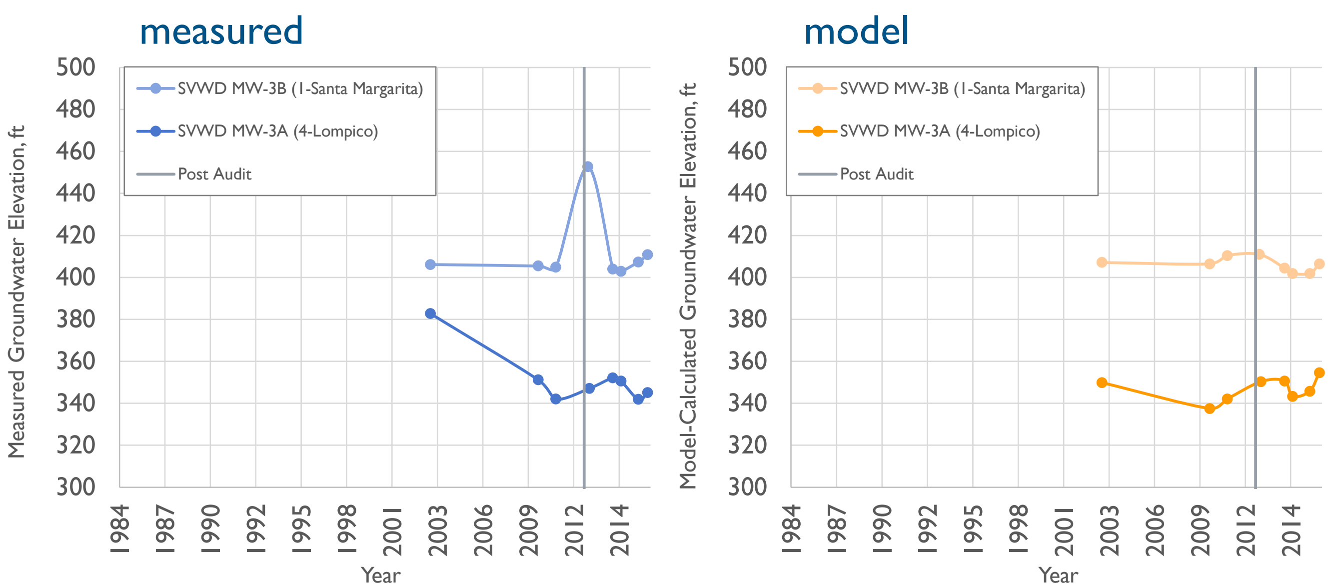
Nine sites were identified where measured water levels are available representing different depth intervals in the basin. The inspection of model-calculated and measured water levels over time (hydrographs) at these sites provide insight into model reliability for simulating water level trends and the vertical gradients between aquifers.

SITE 1: REASONABLE AGREEMENT IN MAGNITUDE AND TREND



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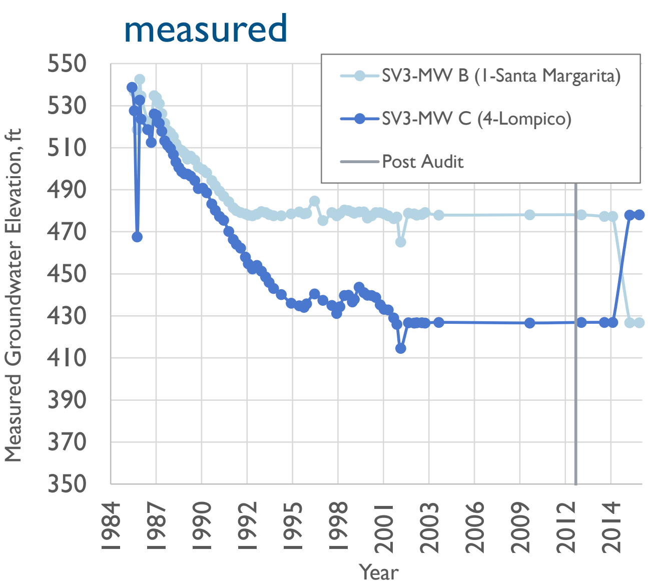
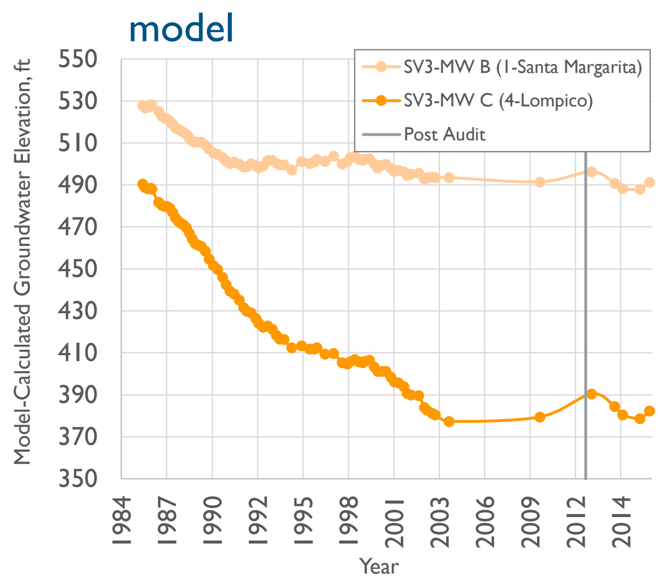
Site 1: measured and model-calculated water levels generally agree in magnitude and temporal trend. A notable exception is the 2012 measurement for the Santa Margarita; the 195 feet water level rise between January and October 2012 is suspicious, and not reproduced in the model results. This discrepancy between measured and model-calculated water levels can be attributed to data errors in the field (data recording error) or in the model (data entry error when translating the observations to MODFLOW).

SITE 2: TRENDS AGREE BUT NOT MAGNITUDES.





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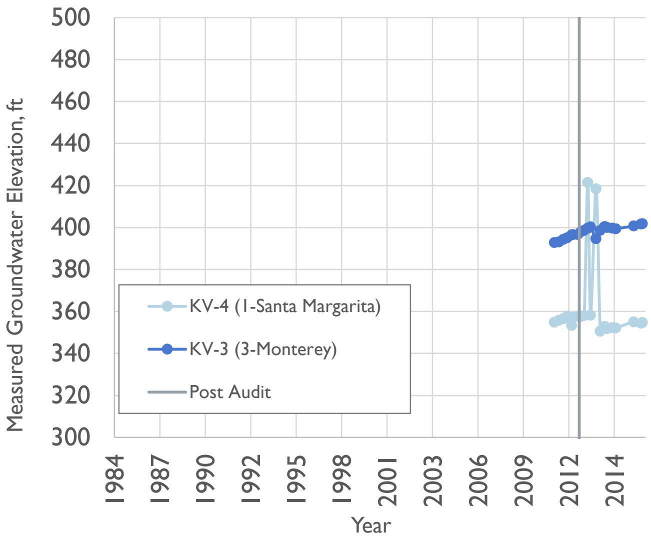
Site 2: model-calculated and measured water levels decline and stabilize. In the Santa Margarita, water levels decline during the period 1985 to about 1992, however the model-calculated decline of about 30-feet (light orange) is less than measured (the light blue plot showing a decline of about 60-feet). In the Lompico, model-calculated and measured water levels both decline about 100-feet during the period 1985 to about 2003. The model-calculated water level in the Lompico (dark orange) is about 50 feet lower than measured (dark blue), and as a result the model-calculated difference between water levels in the Santa Margarita and Lompico is greater than measured.

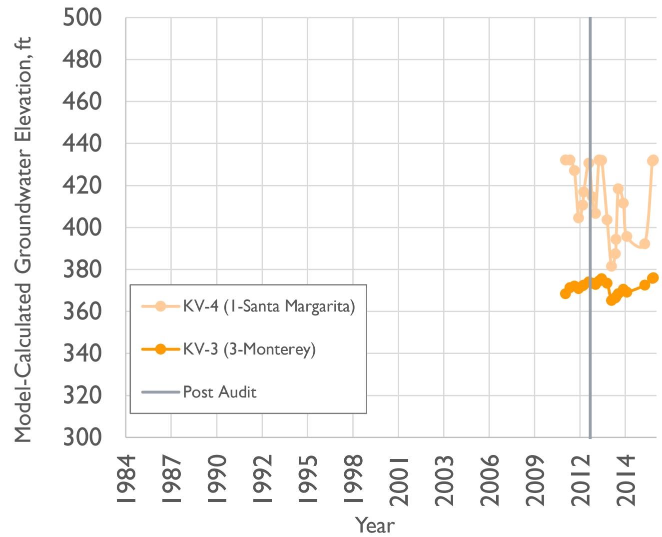
Note that the last two data points in the graph on the left (the measured values) appear to be switched, suggesting either data entry errors in the field or model input errors when transferring the measurements to MODFLOW.

SITE 5: MAGNITUDES AND RELATIVE DIFFERENCES BETWEEN DEPTHS DO NOT AGREE.

measured



model



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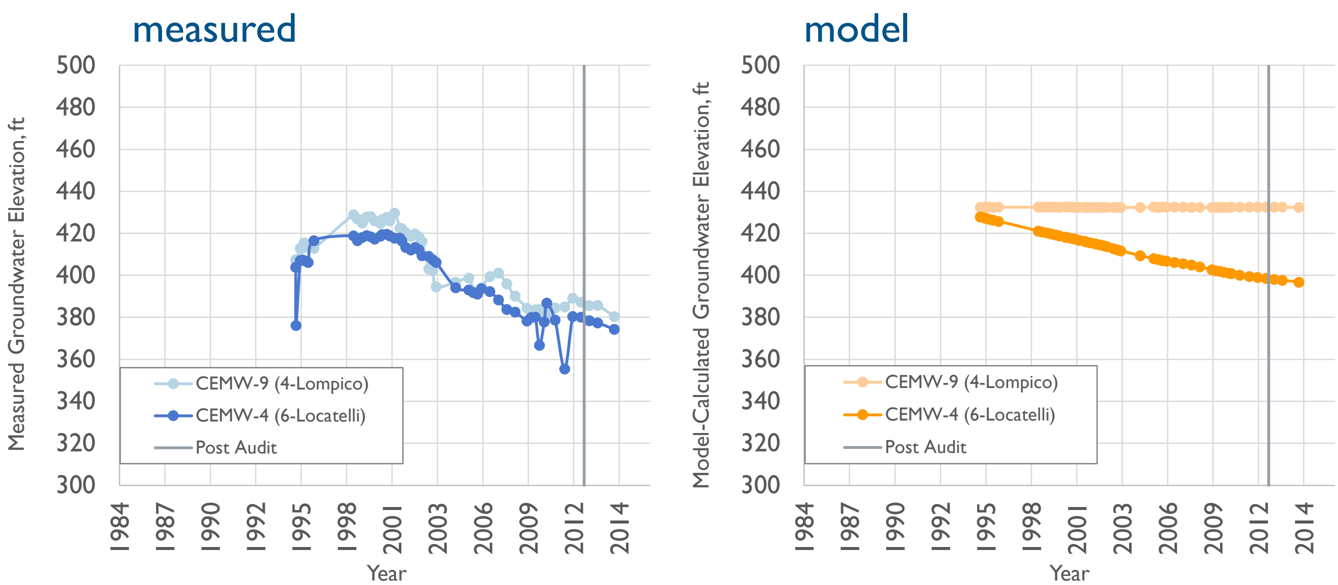
Site 5: in the Santa Margarita Aquifer, the measured water levels (light blue) and model-calculated water levels (light orange) do not show a clear trend, and the model-calculated water levels show much more temporal variability. The model-calculated water levels are also about 40 feet greater than measured. The sudden measured 60-feet water level rise represented by two data points is suspicious and may indicate measurement, reporting, or data entry error. The deeper well is screened in the Monterey (model layer 3); the measured water levels (dark blue) are about 20 feet greater than calculated by the model (dark orange), but the measured and model-calculated trends are generally similar. The measured values indicate the water levels in the Santa Margarita are lower than in the underlying Monterey. In contrast, the model-calculated water levels indicate that the water levels in the Santa Margarita are greater than in the underlying Monterey. The relative differences in measured and model-calculated water levels between depths are therefore reversed.

SITE 8: TREND AND MAGNITUDE DO NOT AGREE



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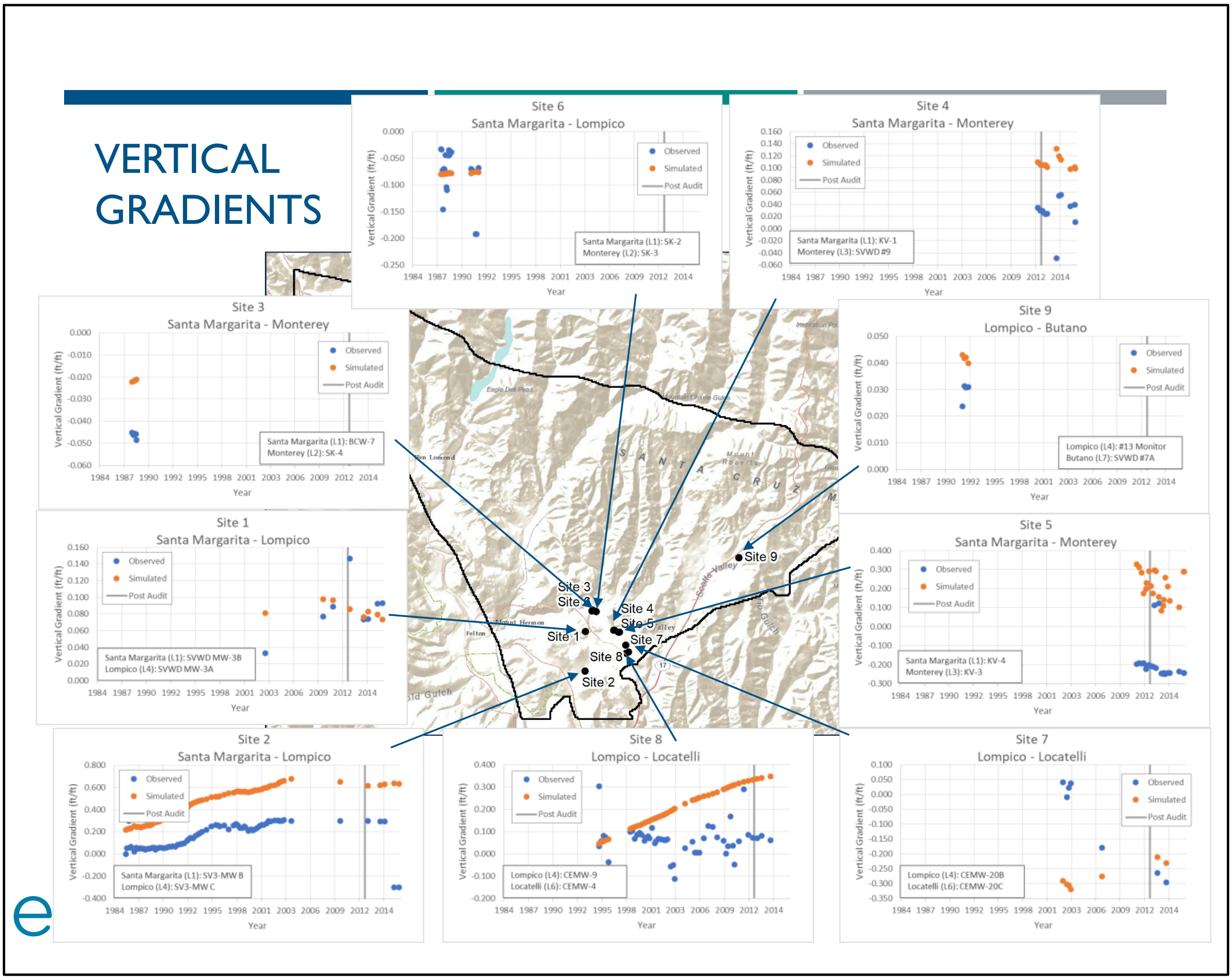
Site 8: the magnitude and trend in measured water levels are similar in the Lompico and Locatelli aquifers, whereas the magnitude and trend in model-calculated water levels are different in the two aquifers. There is no model-calculated trend in the Lompico Aquifer, and the declining trend in the Locatelli Aquifer is less steep than measured. The model-calculated water levels in the Lompico Aquifer (light orange) are 10 to 50 feet greater than measured (light blue), and in the Locatelli the model-calculated water levels (dark orange) are 10 to 20 feet greater than measured (dark blue).



We compared model-calculated and observed vertical gradients at nine sites. The sites are all located near the southeastern basin boundary. The gradients were calculated from water level differences in wells screened in different model layers/formations. The orange data points are model-calculated gradients, and the blue data points are observed vertical gradients. The vertical gray line separates the data set into two periods: the 1985-2012 calibration period (the longer record to the left of the gray line) and the 2013-2016 post-audit period (the shorter record to the right of the gray line).

Five of the sites indicate a general downward potential for groundwater flow, whereas three of the sites indicate an upward potential for flow; the model-calculated and observed gradients at one site (Site 5) are reversed (the model indicates downward flow but observed gradients indicate upward flow). The model-calculated gradients are generally greater in magnitude than observed, indicating that the water level differences calculated by the model tend to be greater than measured. These comparisons are generally consistent for both the calibration and post-audit periods.

Site 1: The model-calculated and observed vertical gradient between the Santa Margarita and Lompico aquifers (model layers 1 and 4, respectively) indicate a general downward potential for groundwater flow. The modeled gradient appears to decrease over time (downward trend), whereas the observed gradient is relatively flat and has more “noise.” The comparisons are generally consistent in the calibration and post-audit periods.

Site 2: The model-calculated and observed vertical gradient between the Santa Margarita and Lompico aquifers (model layers 1 and 4, respectively) indicate a general downward potential for groundwater flow. The model-calculated and observed gradients increase with time (upward trend), and the trends agree reasonably well. The magnitude of the model-calculated gradient is greater than observed. The last two data points appear to be reversed, possibly indicating a data recording error in the field or data entry error in the model.

Site 3: The data record is limited, but the model-calculated vertical gradient between the Santa Margarita and Upper Monterey (model layers 1 and 2, respectively), indicate a general upward potential for groundwater flow. The model-calculated gradients are lower in magnitude (less negative) than the observed gradients.

Site 4: The model-calculated and observed vertical gradient between the Santa Margarita and Lower Monterey (model layers 1 and 3, respectively), indicate a general downward potential for groundwater flow. The model-calculated gradient is greater than observed.

Site 5: The model-calculated and observed vertical gradient between the Santa Margarita and Lower Monterey (model layers 1 and 3, respectively) are reversed; the model-calculated gradient indicates a general downward potential for groundwater flow, whereas the observed gradient indicates a general upward potential for groundwater flow. The model-calculated gradient generally decreases with time, whereas the observed gradient is relatively stable and flat.

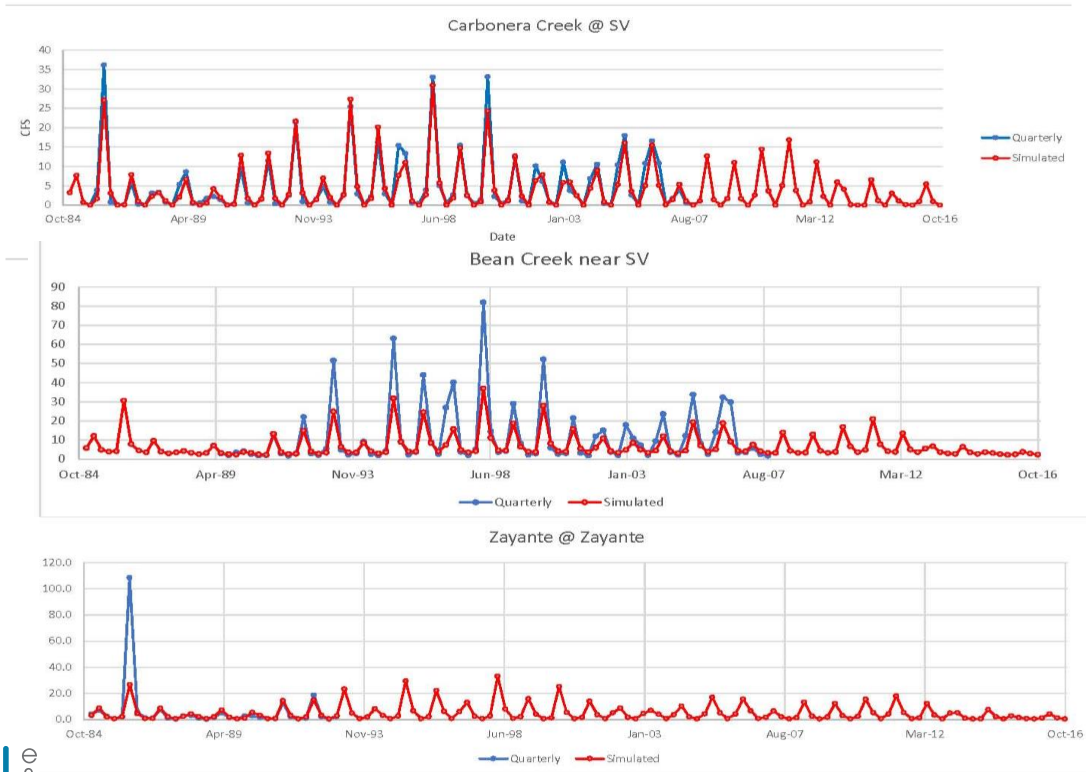
Site 6: The model-calculated vertical gradient between the Santa Margarita and Upper Monterey (model layers 1 and 2, respectively), indicate a general upward potential for groundwater flow. The model-calculated gradients show a general trend toward becoming positive (e.g., the gradient is becoming less negative), whereas the observed gradient appears more noisy.

Site 7: The model-calculated and observed vertical gradient between the Lompico and Locatelli aquifers (model layers 4 and 6, respectively) indicate a general upward potential for groundwater flow. The modeled gradients appear to show a general trend toward becoming less negative, whereas the observed gradient switches from positive (downwards) in the early portion of the record to negative (upwards) in the later portion of the calibration period and the post audit period.

Site 8: The model-calculated and observed vertical gradient between the Lompico and Locatelli aquifers (model layers 4 and 6, respectively) indicate a general downward potential for groundwater flow. However, the magnitude and trends of the model-calculated and observed gradients are substantially. The model-calculated gradient increases over time whereas the overall observed trend is relatively stable. By the time of the post-audit, the model-calculated gradient is about three times greater than observed.

Site 9: The model-calculated and observed vertical gradient between the Lompico and Lower Butano aquifers (model layers 4 and 7, respectively) indicate a general downward potential for groundwater flow. The period of record is limited, and shows the model-calculated gradient is greater than observed.

COMPARISONS BETWEEN MEASURED AND MODEL-CALCULATED STREAMFLOW



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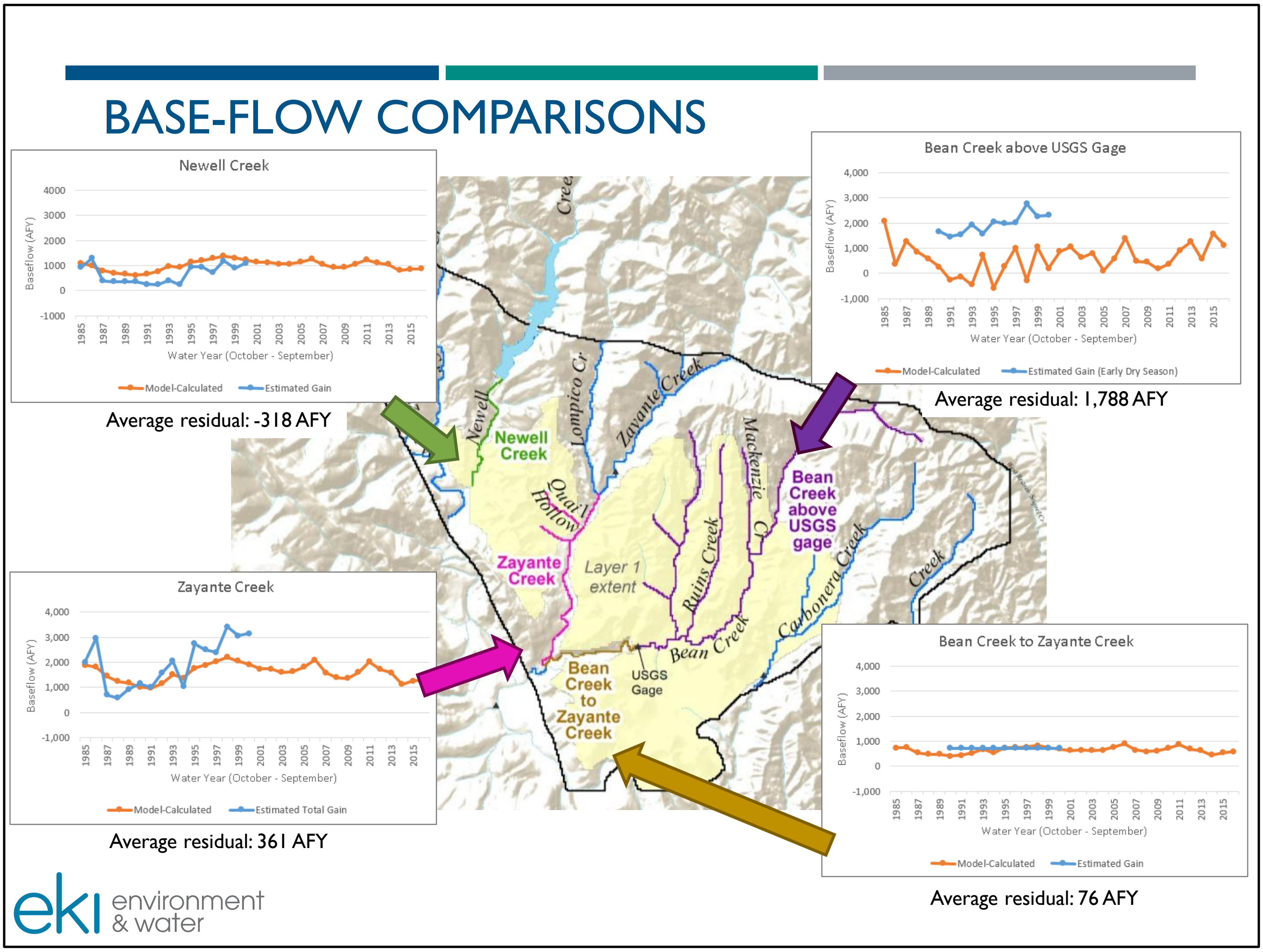
The figures above plot measured and model-calculated stream flows for Carbonera, Bean and Zayante creeks. The model-calculated stream flows reproduce seasonal cycles with peak flows in the winter and low flows in the summer. Measured and model-calculated flows are generally similar during low flow conditions, however during the highest flow periods the model-calculated flows are lower than measured. The discrepancies' during high flow conditions are likely due at least in part to differences between model stress period length and stream measurement periods. For example, the quarterly averaging period for rainfall, temperature, and runoff employed by the model likely miss the contributions from relatively shorter term, high volume peak flows captured in the higher frequency measured data.



The evaluation compared model-calculated baseflow to the spatial distribution and magnitude of reported estimated baseflows; model-calculated discharge to springs was included as part of model-calculated baseflow. Stream baseflow is a key concern for the basin, as the creeks are considered among the best prospects for sustaining Central Coast steelhead and salmon fisheries.

The graphs above compare model-calculated and estimated baseflows from various reports (references are provided below by creek name). The map identifies the model cells used to output the model-calculated baseflow values. The “residual” represents the discrepancy between measured and model calculated values. The residual was calculated by subtracting the model-calculated value from the measured value (positive values indicate that the model under-estimates baseflow, and negative values indicate that the model over-estimates baseflow).

With the exception of “Bean Creek above the USGS Gage,” the measured and model-calculated base-flows generally agree in magnitude and trend (the average residuals range from about 100 to about 400 AFY in absolute magnitude). In contrast, the model-calculated baseflow for “Bean Creek above the USGS Gage” are on average almost 1,800 AFY lower than measured. The measured baseflow in Bean Creek was assumed to include all streams and tributaries above the gage, and the estimated baseflow represents the early dry season. Specific information for each gage data set is provided below.

Newell Creek: Total baseflow gains were estimated between Loch Lomond to San Lorenzo River (Table 10 in Johnson NM, 2001, “Conceptual Hydrogeologic Model of the Quail Hollow Area” Prepared for San Lorenzo Valley Water District, September 2001)

Zayante Creek: Total baseflow gains were estimated between Lompico Creek and Bean Creek. About 2/3 of the total baseflow gains are assumed to originate from Quail Hollow, which resides in model layer 1. (Table 10 in Johnson NM, 2001, “Conceptual Hydrogeologic Model of the Quail Hollow Area” Prepared for San Lorenzo Valley Water District, September 2001)

Bean Creek: Baseflow was estimated at the USGS gage, which was assumed to include all streams and tributaries above the gage within the model domain. The length and tributaries included in the estimated baseflow were not clearly identified, and Bean Creek extends north outside the model domain. The model calculated values therefore may not capture the same contributions to baseflow as those represented by the measurements at the gage. Baseflow was estimated using best fit recession curves to hydrograph data; the middle recession curve (II) representing the early dry season was used here as a conservative representation of estimated baseflow gains. Approximately 724 AFY enters Bean Creek between the USGS gage and Zayante Creek, however this is a reported average value and does not have associated monthly values. (Table 6 in Johnson NM, 2002, “DRAFT Conceptual Hydrogeologic Model of the Pasatiempo Area” Prepared for San Lorenzo Valley Water District, June 2002).

Additional baseflow estimates and low-flow measurements may be available, and updated model development and calibration efforts should strive to consider all available baseflow data to assess model performance.

MODEL UNCERTAINTY

- Most sensitive input for history match (calibration).
- Most sensitive input for projection run.

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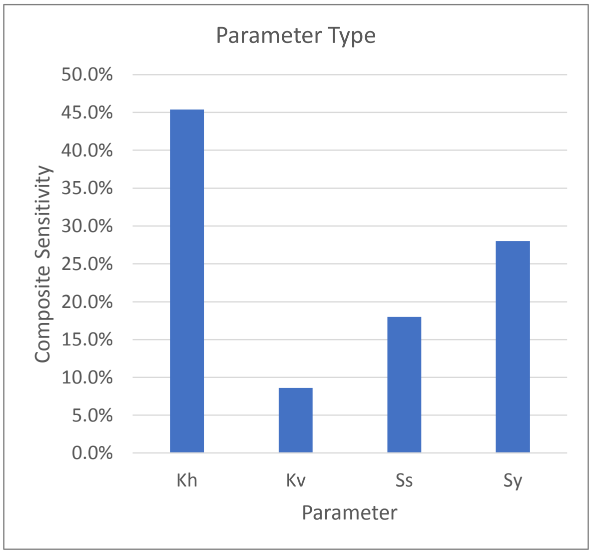
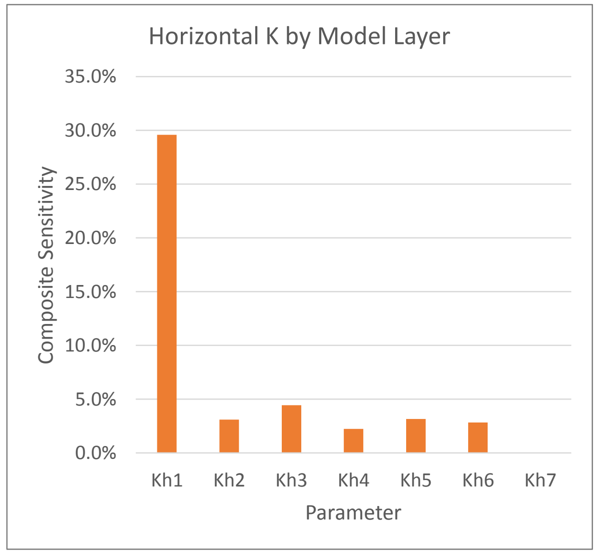
Model tests included calibration sensitivity and prediction sensitivity. Calibration sensitivity identifies model input that has the most influence on the comparisons between measured and model-calculated values. For example, the test identifies the most sensitive model input that influences model-calculated water levels when compared to historical measurements in wells. Prediction sensitivity identifies the model input that has the most influence on projected results for a specific project. For example, if the model were utilized to evaluate the effects from extractions by a new well, the prediction sensitivity results identify the model input that has the greatest influence on the simulated changes in water levels, groundwater storage, and creek baseflow to the proposed extractions from the new well. The model sensitivity calculations for this evaluation were conducted using PEST, but attempts to improve model calibration were beyond the scope of the evaluation.

COMPOSITE SENSITIVITY TEST





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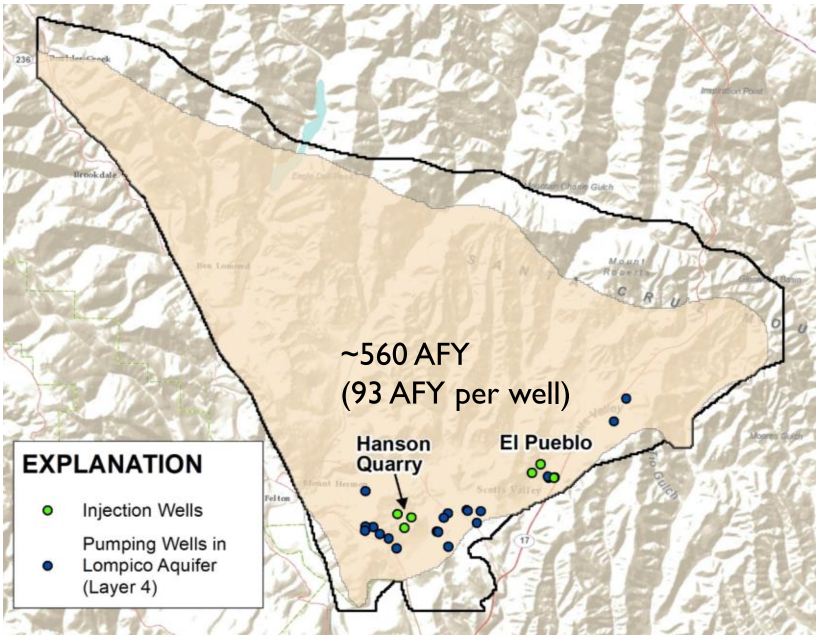
Model calibration seeks to minimize the differences between measured and model-calculated observations ("residuals"). The parameters that have the greatest influence on the residuals have the greatest influence on the historical conditions simulated by the model.

The composite sensitivity test was conducted on the historical simulation for both measured water levels and estimated baseflows**.** Each model parameter is adjusted by a small percent (1%), and the change in residuals summarized. The resulting composite sensitivity is greatest for the parameters that have the greatest influence on model results and residuals. Results are summarized in the bar charts above. Model-calculated water levels are most sensitive to horizontal hydraulic conductivity and least sensitive to vertical conductivity. The bar chart on the right isolates the composite sensitivity for the horizontal conductivity of each layer, and the most sensitive is the horizontal conductivity of the Santa Margarita Aquifer (layer 1). This is most likely because baseflows are most sensitive to layer 1 and most of the measured water levels are also from wells constructed in layer 1.

PREDICTION SENSITIVITY TEST – INJECTION INTO LOMPICO AQUIFER (LAYER 4) AT HANSON QUARRY AND SCOTTS VALLEY EL PUEBLO SITE



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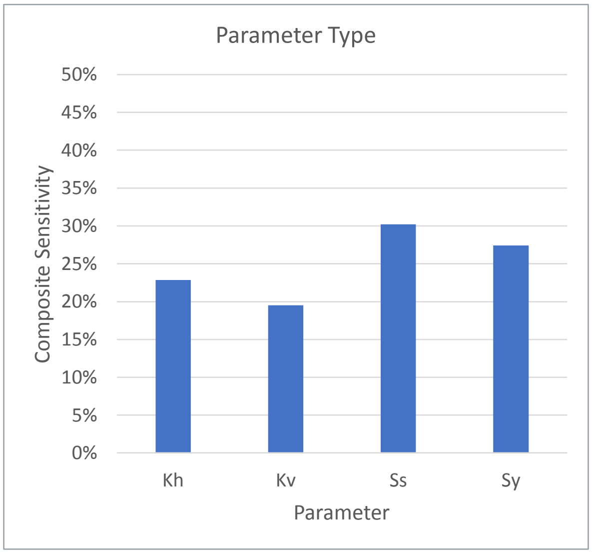
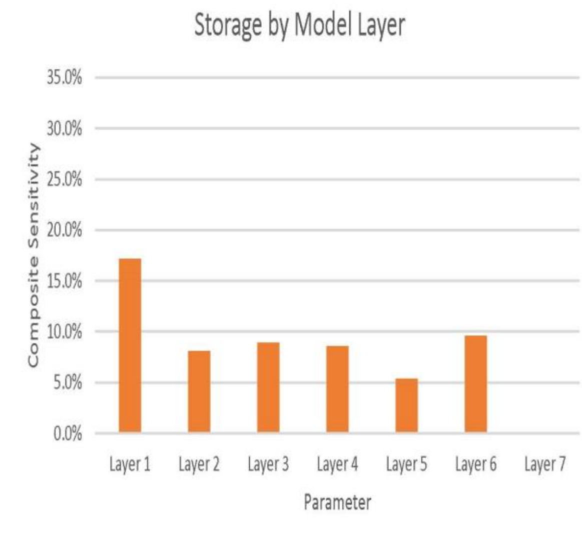
Injection Source: Kennedy/Jenks Consultants, "*Santa Margarita Groundwater Basin Recycled Water Groundwater Replenishment Program FINAL Facilities Planning Report,*" Prepared for Scotts Valley Water District, February 2017

The prediction sensitivity test evaluates which model parameter(s) have the greatest influence on model calculations that analyze a possible project or changes due to future projected hydrologic conditions. A previous analysis of recycled water injection in the basin (Kennedy/Jenks Consultants, "*Santa Margarita Groundwater Basin Recycled Water Groundwater Replenishment Program FINAL Facilities Planning Report,*" prepared for Scotts Valley Water District, February 2017) was approximately repeated for illustration purposes only. Our example analysis simulated injection of 93 AFY of recycled water at 6 wells screened within the Lompico Aquifer (Layer 4), and included several other simplifications and assumptions. Using this example, each model parameter was adjusted by a small percent (1%) and the change in projected hydrologic conditions calculated and summarized. The prediction sensitivity results will be greatest for the parameters that have the greatest influence on the projected conditions simulated by the model.

PREDICTION RUN COMPOSITE SENSITIVITY





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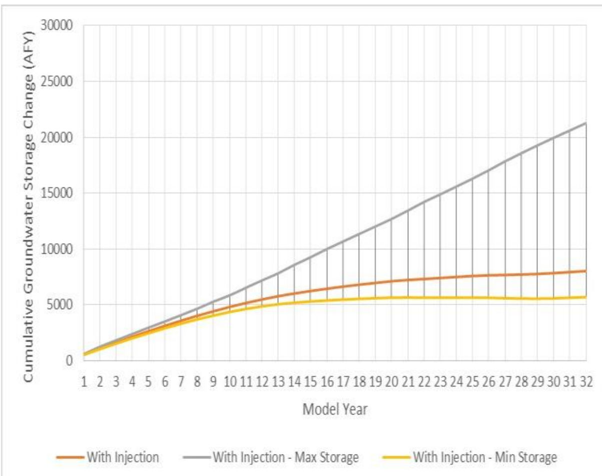
For the injection scenario, model sensitivity is fairly uniform between aquifer parameters. In contrast to the composite sensitivity calculated on the historical run, the most sensitive input parameters were the unconfined storativity (Sy) and confined specific storage (Ss). This means projected conditions in response to injection are most sensitive to the modeled storage coefficients, and uncertainty in projected conditions are influenced by uncertainty in storage coefficient values. The bar chart on the right isolates the composite sensitivity for the storage coefficient of each layer, and the most sensitive is the Santa Margarita Aquifer (layer 1). This again is most likely because baseflows are most sensitive to layer 1 water levels and most of the measured water levels are from wells constructed in layer 1. However, the model is also sensitive to changes in deeper layer storage coefficients, which is likely explained by deeper wells being located in the areas where the proposed injection occurs.

SENSITIVITY OF PROJECTED INJECTION RESPONSE TO LOMPICO AQUIFER STORAGE COEFFICIENT

Cumulative Storage Change



Baseflow

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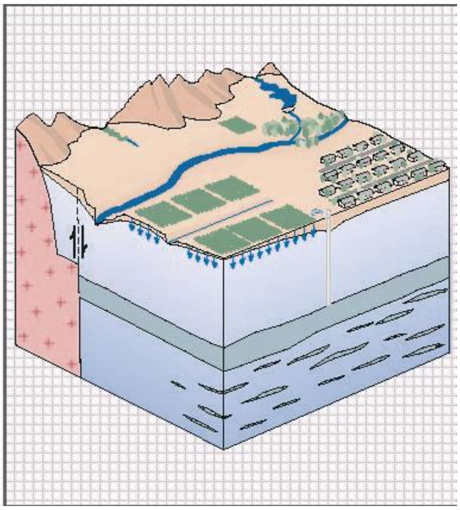
Specific storage values from aquifer tests for the Lompico aquifer vary by a factor of about 100. Three model scenarios were simulated to illustrate the sensitivity of model-calculated groundwater storage changes and stream baseflows to the uncertainty in the Lompico aquifer storage coefficient. In all three scenarios simulated, the initial groundwater levels were set equal to the model-calculated water levels at the end of water year 2016. The 32-year groundwater recharge time-series from the historical run was repeated, and the most recent 5-year average monthly pumping rate repeated for each well annually for the entire simulation. The sensitivity of the model-calculated changes in groundwater storage and stream baseflow were then calculated and compared.

The orange line in the above plots labeled “with injection” show the cumulative change in groundwater storage on the left and annual stream baseflow on the right; both figures are reported relative to the same projected hydrologic conditions without injection (the No Project scenario). Injection operations cause groundwater storage to gradually increase, but the rate of increase decreases over time and approximately stabilizes after about 25 years (left plot), indicating groundwater inflow is balanced by groundwater outflow. Model results that employ the smaller storage coefficient show similar trends, but the storage change stabilizes at a value that is about 2,500 AF lower (approximately 5,000 AF versus 7,500 AF, respectively). In contrast, model results that employ the larger storage coefficient show a steady increase in storage throughout the entire simulation and stream baseflow generally decreases with time.

Stream baseflow is a primary groundwater outflow. Model-calculated baseflow gradually increases over time where it parallels the increase in cumulative storage. The quantity of recharge discharged as baseflow is greater for the simulation using the smaller storage coefficient. In contrast, using the larger storage coefficient results in a decrease in baseflow (gray line on the right), and the annual baseflows are relatively independent of the steady increase in groundwater storage (gray line on the left). As a result, model-calculated water table elevation and baseflow is influenced primarily by climatic changes.

In summary, model calculations indicate a limited capacity to store injected water in the Lompico aquifer, and as the aquifer fills the quantity of water discharged to streams as baseflow increases. The sensitivity test results indicate that these model projected changes in storage and baseflow are fairly insensitive to decreases in the estimated storage coefficient for the Lompico aquifer. For example, an approximately ten-fold decrease in the storage coefficient results in a relatively small uncertainty in model-calculated baseflow (a difference of about 100 AFY or less). In contrast, model calculated changes in storage and baseflow can be quite sensitive to an increase in the storage coefficient. An approximately ten-fold increase in the Lompico aquifer storage coefficient resulted in a substantial increase in capacity for the aquifer to store the injected water, and the basin never fills during the 32-year simulation period to the point of increasing baseflows.

RECOMMENDED GROUNDWATER-FLOW MODEL UPDATES



I. Geohydrologic Framework

- Expand Model to agree with Basin Boundaries.
- No change in model cell dimensions or layering.
- Revise water transmitting parameters (vertical hydraulic conductivity Kv).

II. Water Budget/Landscape Properties

- Refine recharge estimates.
- Modify or remove ET package

III. Performance/Uncertainty

- **Data QA/QC.**
- **Extend simulation by adding 2017-18.**
- **Update calibration.**

IV. SGMA Objectives

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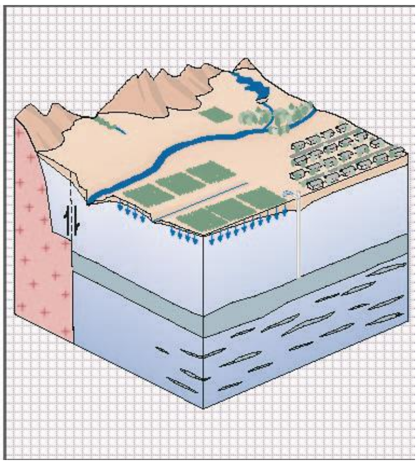
In summary, the assessment of model performance and uncertainty indicate a need to conduct QA/QC measures to assure model reproducibility and ensure accuracy of input data. Additional insight may be gained by extending the data set to include 2017-2018 conditions to extend the model post audit period. The extended simulation period can be utilized to update the model calibration that will be required after revisions to the Geohydrologic Framework and Water Budget/Landscape properties. For example, changes in model grid extent, the discretization of time (for example, changing model stress periods from quarterly to monthly), and/or potential changes to the magnitude and timing of groundwater recharge due to refinement or modification of the recharge estimator will require re-evaluation of model performance and an update to model calibration. The updated calibration should consider:

1. Comparisons between measured and model-calculated water levels including data collected after 2012 and used as part of the post-audit assessment. The comparisons should consider the entire model and smaller model subareas, both aerially and with depth (for example, previously identified basin subareas and different aquifers).
2. Comparisons between measured and model-calculated vertical gradients between aquifers, both their magnitudes and trends. This can be important to understanding the relationship between deep aquifer storage changes and changes in water table elevations and stream baseflows.
3. Comparisons between reported and model-calculated groundwater elevation contours for different aquifers, time periods, and basin subareas when available.
4. Comparisons between measured/reported and model-calculated stream flows and stream base-flows, dry-season/low-flow stream measurements, and spring discharges.

GROUNDWATER-FLOW MODEL REVIEW TOPICS



I. Geohydrologic Framework
- Basin Boundaries
- Layering
- Water transmitting and storage parameters (K/S)

II. Water Budget/Landscape Properties
- Water Inflows
- Water Outflows

III. Performance/Uncertainty

IV. SGMA Objectives

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The design and functionality of the SMGWM was reviewed and evaluated for meeting the standards recommended by SGMA and DWR.

I. COMPARE TO SGMA STANDARDS

Standard	Evaluation	Notes	Recommendation
Publicly available documentation	✓	USGS MODFLOW-NWT	---
Peer reviewed mathematical foundation and model code	✓	USGS MODFLOW-NWT	---
Public domain open-source software	✓	USGS MODFLOW-NWT	---
Covers entire basin (at a minimum)	No	Needs to encompass entire area affected by the GSA's gw activities (pumping, recharge projects, etc).	Expand active model grid to represent entire basin as defined by DWR Bulletin 118.
Boundary conditions consistent between adjacent basin models	No	Santa Cruz Mid-County Basin model	Modify as part of grid expansion for consistency with Mid-County Basin model.
Based on detailed HCM	✓	Based on expert reports and input From basin stakeholders.	---
Sensitivity tests and uncertainty analysis	✓	Limited to climate scenario.	GSP and local applications will require prediction sensitivity analysis.
Model adaptability (e.g., accommodate additional data and/or refined HCM)	✓	MODFLOW platform provides multiple versions and capabilities making it adaptable. Recharge estimator can be problematic.	Recharge estimator requires documentation.

California Department of Water Resources Sustainable Groundwater Management Program, "Best Management Practices for the Sustainable Management of Groundwater Modeling BMP," December 2016.
California Department of Water Resources Sustainable Groundwater Management Program, "Best Management Practices for the Sustainable Management of Groundwater Hydrogeologic Conceptual Model BMP," December 2016.
DWR Sustainable Groundwater Management Program, "Groundwater Sustainability Plan (GSP) Emergency Regulations Guide," 2016.

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The SMGWM fails to meet two DWR SGMA modeling considerations related to the spatial extent and boundaries of the model. First, DWR recommends that the model cover at a minimum the entire basin, and the model grid should be large enough to encompass the area potentially affected by pumping and recharge projects in the basin. As shown previously, the model boundaries do not encompass the basin boundaries as mapped by DWR in Bulletin 118, but neglecting some of these areas is likely inconsequential to model calculations. Secondly, the boundary conditions between adjacent basin models should be consistent, but the exchange of groundwater between overlapping areas represented by the SMGWM and SCMCM have been found to be inconsistent.

DWR SGMA modeling considerations also include the need for model adaptability. For example, model adaptability starts with relatively simple models and adds complexity over time as the amount of information and expert knowledge about the basin increases. The SMGWM includes a pre-processor to create the recharge input data set (recharge estimator), but the estimator does not have free-standing documentation to support the efficient expansion or modification of its input data set. This represents a limitation in model adaptability.

Note: the tabulated results above evaluate strictly whether or not the existing model has the capabilities to meet SGMA requirements, but it does not evaluate whether those capabilities when applied by the SMGWM are sufficiently accurate to provide reliable results for GSP development. For example, the model report includes a detailed Hydrogeological Conceptual Model (HCM) and therefore meets the requirements of SGMA. However, the assessment represented in the table above does not imply that the HCM described in the report is sufficiently reliable and agreed upon by basin stakeholders to support GSP development.

II. SGMA OBJECTIVES

Objective	Evaluation	Notes	Recommendation
Water Budget			
Historical (1985-2016) and current (2015) conditions	✓	1985-2016	---
Forecasting changes and undesirable results (50-year planning and implementation horizon)			
Predicted response	No	2016-2066	Develop projected hydrology including climate change effects on rainfall and temperature.
Chronic lowering of groundwater levels	✓	2016-2066	Develop projected hydrology
Reduction of groundwater storage	✓	2016-2066	Develop projected hydrology
Land subsidence	No	Not applicable	---
Seawater intrusion	No	Not applicable	---
Degraded groundwater quality	No	Superfund site and non-point source nitrogen issues.	Implement MT3D or MODPATH as/if needed (not required by DWR).
Depletions of surface water interconnected to groundwater	✓	Baseflows needed to address fishery and supply issues.	Develop projected hydrology
Other Criteria			
Land Use changes	No	Paving and cannabis farms can change rainfall and runoff.	Develop methodology/instructions to adjust land use in recharge estimator.

California Department of Water Resources Sustainable Groundwater Management Program, "Best Management Practices for the Sustainable Management of Groundwater Modeling BMP," December 2016.
California Department of Water Resources and Climate Change Technical Advisory Group, "Perspectives and Guidance for Climate Change Analysis," August 2015.

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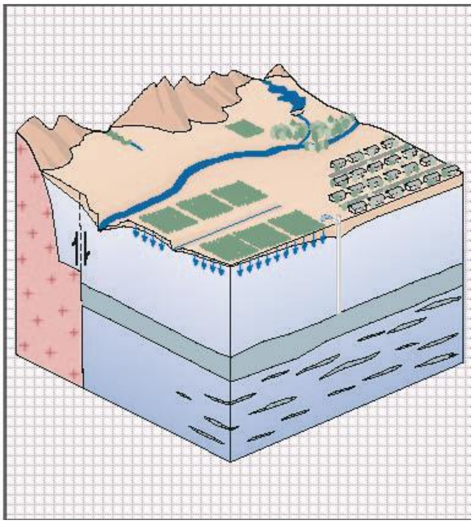
The design and functionality of the SMGWM was reviewed and evaluated for meeting the objectives required by SGMA and DWR. The key missing component is to update and improve the projected hydrology to simulate future conditions and consider climate change. The projected hydrology should be based on monthly input to provide greater temporal resolution of simulated hydrologic conditions. Additionally, the projected hydrology will require updating to reflect likely modifications needed to the recharge calculations. Under SGMA, the model must provide sufficient information about the future condition of each sustainability indicator relevant to the basin, and improve the ability to avoid undesirable results and achieve the basin sustainability goal. Two of the six sustainability indicators are not relevant in the Santa Margarita Groundwater Basin (land subsidence and seawater intrusion); the SMGWM provides information on three of the remaining four indicators (lowering of groundwater levels, groundwater storage reduction, and surface water groundwater interconnections). The SMGWM currently does not have solute transport capabilities for assessing the degradation of groundwater quality as a result of groundwater sustainability planning activities, but solute transport modeling capabilities are not required by DWR for sustainability planning unless needed for specific basin conditions. For example, when sustainability planning must consider potential for contaminant plumes to migrate and impair groundwater quality. Solute transport modeling capabilities are available as a post-processing step using the MODFLOW output from the SMGWM (MT3D or MODPATH) should they be needed.

RECOMMENDED GROUNDWATER-FLOW MODEL UPDATES



I. Geohydrologic Framework **($30-$70K)**
- Expand Model to agree with Basin Boundaries.
- No change in model cell dimensions or layering.
- Revise water transmitting parameters (vertical hydraulic conductivity Kv).

II. Water Budget/Landscape Properties **($30-$70K)**
- Refine recharge estimates.
- Modify or remove ET package.

III. Performance/Uncertainty **($30-$100K)**
- Data QA/QC.
- Extend simulation by adding 2017-18.
- Update calibration.

IV. SGMA Objectives **($35-$80K)**
- Change from quarterly to monthly stress periods.
- Include down-scaled climate change in projected hydrology.

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The key recommended model updates and ranges in estimated possible costs are summarized above.

THE END

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Santa Margarita Groundwater Model Evaluation
Comments by Technical Advisory Group

Comments from Nick Johnson, Exponent (SLVWD GW Consultant)

General comments:
The model evaluation was conducted by professionals unfamiliar with the area that found the basin to be "very complicated." Though objective, it is fair to say that the evaluation and its recommendations did not benefit from, or substantially build upon, local knowledge.

Model domain and layering:
Regarding the expansion of the model domain to the basin boundaries defined by DWR:

- I agree that expanding the model to include the northwest and northeast corners of the basin will contribute to satisfying the requirements of SGMA, but otherwise may be fairly inconsequential.

- I suggest expanding the model domain for the convenience of achieving an improved and more defensible calibration to stream baseflows. For example, the river crosses back and forth across the model's current western boundary, and some alleviated areas are nearly isolated from the rest of the model.

- The model evaluation did not comment on how the Ben Lomond fault and subsurface geology should be modeled for the portions of the model domain that occur west of the fault.

- The presented model evaluation does not appear to have rigorously checked for the consistency between the model layers and existing geologic cross sections and well logs.

Modeled hydraulic properties:
I agree that the model should be based on a more thorough and documented analysis of existing transmissivity, hydraulic conductivity (horizontal and vertical), storage coefficient, and specific storage measurements and estimates.

I agree that the model has unrealistic values of vertical hydraulic conductivity and reflects a misunderstanding of the difference between specific storage and storativity.

Modeled water balance:

The presented model evaluation provides a fairly superficial review of the model's simulated recharge. The presented assessment does not thoroughly evaluate how the simulated recharge rates were determined, how simulated recharge is distributed in time and space within the model, and specifically how recharge is simulated compared to previous models and estimates. Additionally, the evaluation does not provide any specific guidance on how recharge should be modeled.

The presented model evaluation does not comment on whether or not the spatial distribution and magnitude of simulated groundwater discharge to springs and streams is realistic.

I agree that the model simulates evapotranspiration unrealistically.

Model calibration:

Given the range of model shortcomings described above, the model's current degree of calibration is somewhat irrelevant.

The presented model evaluation does not assess the model's simulated groundwater discharge to spring flow and stream baseflow in comparison to available data and estimates. Additionally, the evaluation does not adequately express the importance of calibrating to baseflows, nor does it provide recommendations for how this should be done and what data are available.

The presented model evaluation could be improved by including a comparison of simulated versus estimated groundwater elevation contours.

Although the model evaluation included a calibration sensitivity analysis, the model's calibration could be better assessed and improved using parameter optimization software such as the program PEST.

Comments from Jen Michelsen, San Lorenzo Valley Water District

I support Nick's comments and would add:

The model needs to simulate groundwater base flow conditions for Groundwater Dependent Ecosystems. I would like to see the model numbers compared to the streamflow data that is available for the basin.

Comments from Robert Marks, Pueblo Water Resources, Inc. (Santa Cruz Water Department GW consultant)

I think that John Fio has done an excellent job with the evaluation and have no substantive concerns with his findings or conclusions. I agree with all of John's recommendations for improving the model and support their implementation as expeditiously as possible.

Comments from Cameron Tana, Montgomery & Associates (SVWD GW consultant) Department GW consultant)

I generally agree with the recommendations provided in the report.

I do have the following comments/questions.

Were you able to identify a modeling purpose for the layering? For example, if the Monterey Formation is an aquitard and serves to control vertical flow between Santa Margarita and Lompico, are two layers (2 and 3) really necessary? What is the reason why the Lower Butano is divided into layers 6 and 7? (Slide 6)

Reiterating my point from the meeting, horizontal conductivity on a low range of aquifer tests is reasonable given the different scale for the regional model compared to tests (Slides 7-9).

Vertical conductivity is a relatively difficult number to estimate from aquifer tests, and changes based on layer thickness, etc. In general, I would prioritize model calibration to regional, long-term vertical gradients versus honoring the results of aquifer tests (slide 10).

Also, expanding upon my point from the meeting, the model is simulating vertical flow between layers. Since there are layers representing aquitards, the aquitard layers control vertical flow and vertical conductivities within the aquifer layers are not as important for simulating the system. Therefore, having low Kz within aquifers should not result in questions about the ability of the calibrated model to simulate groundwater conditions. Instead, the evaluation should be of whether vertical separation between aquifers makes sense in different areas.

When recalibrating, it could make sense to increase Kz in the aquifers so that only aquitard Kz can be used to adjust vertical flow. If the purpose of layers 2 and 3 are to provide resistance to vertical flow, it may make sense to calibrate by changing the Kzs of the two layers together.

Was the specification of storativity in the SMGWM input file a specification in the MODFLOW input file resulting from output from a graphical user interface such as Groundwater Vistas? It would be good to identify the graphical user interface. (slide 11)

I agree that the recharge calculations are some of the most important factors that need to be addressed. I agree with ET implementation being problematic as there should be some physical basis for the ET. In running the model, we have noticed increasing recharge increases spring flows significantly, which doesn't seem realistic.

To refine what I said in the meeting, the recharge calculator is set up to simulate climate change using approach following DWR guidance where change factors are applied to historical precip and evapotranspiration. However, I have questions about whether DWR change factors provided for the Santa Cruz area appropriately represent intended conditions. The recharge calculator is limited in its ability to implement downscaled climate change based on temperature. Since the City of Santa Cruz is using the model to evaluate its plans and needs to coordinate with the simulation of climate change in its surface water model and the Santa Cruz Mid-County model, the City and its consultants should be consulted before making decisions on how to move forward with recharge calculation that affects implementation of climate change.

It should be clarified that simulating water quality with the model is not required by DWR for a GSP.

It would be helpful to define what is recommended for inclusion in the calibration update. I understand it will add calibration to baseflows, but are there areas of groundwater calibration that should be improved or would the goal be to restore groundwater level calibration similar to what has been achieved by the current model? Either way, the current calibration should be a good starting point. Depending on what needs to be addressed, the cost of this task could substantially exceed the estimate of $40k.

AGENDA REPORT

Santa Margarita Groundwater Agency

To: Board of Directors

Date: November 29, 2018

Item: General Business Agenda 5.3

Subject: **Facilitation Services: Guiding Principles**

SUMMARY

Recommendation: 1) Review and provide input; 2) Consider approving SMGWA Guiding Principles as a document that defines a set of mutual core values; 3) Determine the procedure by which the Guiding Principles are formalized, endorsed and upheld

Fiscal Impact: No direct impact from this action

BACKGROUND

Prior to beginning the work on the development of the groundwater sustainability plan (GSP), the board decided to conduct a joint goal setting process that allows them to establish a solid foundation for the planning work that will be required during the GSP development. The Agency retained Dave Ceppos, a Managing Senior Mediator at California State University Sacramento, College of Continuing Education, Consensus and Collaboration Program to lead the effort. The consultant conducted background reviews, conducted a situation assessment presenting the report to the board at the July 27th meeting. The board formed a Facilitation Committee to work with the consultant in designing and implementing a joint goal setting process.

The Facilitation Committee has met several times reviewing the recommendations from the assessment report, preparing guiding principles and determining the appropriate timeline for necessary activities. One of the recommendations was to convene the education process that includes various topics relevant to the basin, sustainable groundwater management, and stakeholder interests.

DISCUSSION

Attached is a document titled "Santa Margarita Groundwater Agency (SMGWA) Guiding Principles" (Guiding Principles). This document is an outcome from the work of the Facilitation Committee as directed by the Board of Directors as part of the Agency's Joint Goal Setting process.

The Guiding Principles mark a major milestone for the SMGWA. They define a set of mutual core values and commitments that the current Board and future Boards will ideally live by and do their work by. The Guiding Principles add to the canon of documents (including the agency's Joint Powers Agreement and Bylaws) that define how the agency does and will function.

As used by other organizations and agencies, Guiding Principles (and similar) are an important and applied tool that guides the work of a governing body. Amongst many uses, the SMGWA Guiding Principles can:

- Be provided to the Basin Beneficial Users as a written description of key interests and a commitment/pledge by the Board as to how it will implement SGMA.
- Be used by all Board members as a means to regularly assess the direction of discussions and potential Board decisions and to ensure that said discussions and decisions are consistent with these Principles.
- Be provided as handouts, posters, presentation slide and/or initial convening statements by a Board Chair at the beginning of each meeting as a regularly renewed commitment about the work of the Board and agency.

To maintain visibility of the document and support commitment to the values, the staff recommends appending the Guiding Principles to the Bylaws and/or having all board members to sign it as a pledge to the Agency and its mission.

Submitted by,

Piret Harmon
General Manager
Scotts Valley Water District

Attached: Santa Margarita Groundwater Guiding Principles

Draft Final
Santa Margarita Groundwater Agency
Guiding Principles

1. The Santa Margarita Groundwater Basin (Basin) is located entirely within Santa Cruz County (county). The Basin is a diverse area. It:

   - Is characterized by different communities with various land uses and land and water management approaches.
   - Is defined by a complex set of aquifers through which groundwater passes and on which residents and ecosystems depend.
   - Has extensive biodiversity hotspots and supports important terrestrial and aquatic ecosystems and species, many of which are protected by the California and Federal Endangered Species Acts.
   - Provides essential connectivity between groundwater and surface water upon which the base flows of several creeks and rivers (including the San Lorenzo River) rely.
   - Is subject to climatological changes which in addition to unsustainable groundwater, surface water, and land use management practices, can alone significantly impact the availability of water.
   - Is hydrogeologically disconnected from other groundwater basins. There are no current plans to receive imported water from outside of the county and therefore, the Basin's Beneficial Users (as defined in the Sustainable Groundwater Management Act [SGMA] – See Attachment A) rely on effective management of a water budget to achieve sustainable groundwater and surface water conditions.

2. SGMA affects all Beneficial Users in the Basin. It describes groundwater sustainability requirements and mandates that all Beneficial Users are able to fully participate in steps to achieve and maintain sustainable groundwater conditions in the Basin.

3. In response to SGMA, the Santa Margarita Groundwater Agency (SMGWA) represents and preserves the water interests of all Beneficial Uses / Users in the Basin equitably and transparently. The SMGWA is a governing public agency, granted with regulatory authorities as provided in SGMA, to ensure that the Basin achieves and maintains sustainable groundwater conditions.

4. Consistent with Principle 3 above and SGMA, private groundwater users that extract two acre-feet of groundwater or less per year for domestic purposes are defined as "de minimis". This classification limits the statutory financial and measurement responsibilities of these private groundwater extractors and is a means through which some SGMA-related burdens are minimized to individual private groundwater users. The SMGWA is committed to this principle, the definition of de minimis and opportunities to minimize SGMA-related impacts to private groundwater extractors.

5. While the Member agencies and participants serving as Directors of the SGMWA Board have unique responsibilities to serve their respective organizations and interests, these individuals also

have a sworn responsibility (as signatory parties to the Joint Powers Agreement that formed the SMGWA) to serve the interests and regulatory authorities of the SGMWA in its required role to identify, achieve and maintain sustainable groundwater conditions in the Basin. SMGWA Directors and staff are committed to fulfill this SGMA-specific responsibility.

6. In addition to its statutory responsibilities and authorities, the SMGWA is committed to provide consistent, transparent educational opportunities for all Beneficial Users about water resources, land uses and land and water management approaches in the Basin.

7. Historic groundwater management, surface water management, and land use practices in the Basin have created overdraft conditions in the underlying aquifers. The practices that created overdraft conditions were not sustainable and the practices that took place will not be repeated by any member of the SMGWA nor any Beneficial User in the Basin.

8. Future sustainable groundwater conditions will depend on Basin land uses and water demand targets being in balance with available water resources. The SMGWA is committed to work with land use agencies in the Basin to promote land use practices and water demand targets that achieve sustainable water resources.

9. The SMGWA will ensure that a Groundwater Sustainability Plan (GSP) is in place by and after January 2022. Actions to achieve sustainable conditions will be described in the GSP for the Basin. The GSP will include a comprehensive description of groundwater and surface water conditions and uses in the Basin, management objectives and minimum sustainability thresholds for groundwater and actions necessary to achieve and maintain sustainable groundwater conditions. Objectives and thresholds may be set Basin-wide or may be defined differently for unique parts of the Basin in “Management Areas” (as allowed for under SGMA).

10. Beyond minimum sustainability thresholds and objectives described in the GSP, the SMGWA will examine possibilities to recover/restore the Basin’s aquifers and restore tributary base flows to the best extent possible.

11. SMGWA members and Beneficial Users may have different requirements under different water resource conditions to ensure that minimum thresholds are achieved and exceeded. These potential different requirements will be defined in the GSP and implemented by the SMGWA.

12. Actions to achieve sustainable outcomes, report said outcomes to the State and maintain the daily activities of the SMGWA will require consistent funding. Financial contributions to support this work will be proportionally distributed among the SMGWA membership and many Beneficial Users based on impacts and benefits to groundwater and surface water resources. Specific proportional contributions will be determined in the future.

13. Integrated water management is a set of methods to extract, transport, store, use and share groundwater and surface water throughout a groundwater basin to ensure a resilient water supply for all water users. To support SGMA objectives and Basin-wide water needs, the SMGWA

will pursue an integrated water management approach for this Basin. An integrated water management approach will honor the social, cultural, natural and economic diversity of the Basin. It will capitalize on the diverse water resources throughout the Basin and will seek to ensure that all Beneficial Users have the necessary water resources. An integrated water management approach may rely on but may not be limited to:

- Science-based decision making.
- Methods to recover and restore the Basin aquifers.
- Collective and individual groundwater use requirements to ensure that groundwater elevations are not depleted below minimum thresholds.

14. Discussions between SMGWA Directors, Directors and staff, and SMGWA representatives and Beneficial Users to address the above responsibilities and outcomes may be challenging at times. Consistent with the SMGWA Board of Directors Code of Conduct (as presented in Appendix A of the SMGWA Bylaws), the SMGWA will conduct these discussions at all times in a collaborative manner with a commitment to respectful civil discourse between all participants.

ATTACHMENT A

10723.2. CONSIDERATION OF ALL INTERESTS OF ALL BENEFICIAL USES AND USERS OF GROUNDWATER

The groundwater sustainability agency shall consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing groundwater sustainability plans. These interests include, but are not limited to, all of the following:

(a) Holders of overlying groundwater rights, including:
  (1) Agricultural users.
  (2) Domestic well owners.

(b) Municipal well operators.

(c) Public water systems.

(d) Local land use planning agencies.

(e) Environmental users of groundwater.

(f) Surface water users, if there is a hydrologic connection between surface and groundwater bodies.

(g) The federal government, including, but not limited to, the military and managers of federal lands.

(h) California Native American tribes.

(i) Disadvantaged communities, including, but not limited to, those served by private domestic wells or small community water systems.

(j) Entities listed in Section 10927 that are monitoring and reporting groundwater elevations in all or a part of a groundwater basin managed by the groundwater sustainability agency.

AGENDA REPORT

Santa Margarita Groundwater Agency

To: Board of Directors

Date: November 29, 2018

Item: General Business Agenda 5.4

Subject: **Technical Consultant Selection Process**

SUMMARY

Recommendation: Receive information and provide input

Fiscal Impact: No direct impact from this action

BACKGROUND

The board formed an ad-hoc Selection Committee to work with the staff in designing the process and participating in selecting a firm to provide Groundwater Sustainability Plan (GSP) technical consultancy services.

DISCUSSION

The Selection Committee met in November to discuss the optimal process for SMGWA to conduct the selection of the technical consultant. The committee decided that soliciting proposals through a Request for Qualifications (RFQ) process is the most efficient and fitting for the Agency's needs. As frequently used in contracting for professional services in the public sector, the goal of an RFQ is to determine the best fit for addressing a need of the agency based on the qualifications of the candidates. After an initial review and ranking of the submittals, follow up interviews could be conducted with the top candidates to better evaluate the experience, approach, and suitability of the firms. The highest rated candidate will be asked to prepare a proposal for the purposes of negotiating a contract.

The committee is working on developing the draft RFQ that is anticipated to be ready for board approval in December with solicitation for submittals commencing shortly thereafter. The interested parties are required to provide their conceptual approach to the task at hand and a current fee schedule in addition to their experience, qualifications and client references.

The committee will review the submittals and present to the board their recommendation for the top candidate at their future board meeting in Spring 2019.

Submitted by,

Piret Harmon
General Manager

Scotts Valley Water District

Attached: GSP Technical Consultant Services Outline of Tasks and Activities
DWR Guidance Document: GSP Annotated Outline

SANTA MARGARITA GROUNDWATER AGENCY

GROUNDWATER SUSTAINABILITY PLAN (GSP) TECHNICAL CONSULTANT SERVICES

REQUEST FOR QUALIFICATIONS

Tasks

Santa Margarita Groundwater Agency is looking for a consultant to provide the services to prepare a Groundwater Sustainability Plan including the following tasks:

- Description of the basin setting
- Enhancements to the hydrogeologic model
- Description of current and historic groundwater conditions and relationships to surface water and groundwater dependent ecosystems
- Development of the basin water budget
- Identification of potential management areas
- Development of sustainability criteria (undesirable results, sustainability goals, minimum thresholds, and measurable objectives)
- Refinement and consolidation of existing groundwater and surface water monitoring programs
- Identification of representative monitoring wells for sustainability indicators
- Analysis of the potential for various projects and/or management actions to contribute to basin sustainability
- Development of projected hydrology including climate change effects on rainfall, temperature, and recharge
- Implementation of MT3D or MODPATH if needed to better understand the effects of management practices on existing contaminant plumes
- Identification of specific projects/activities necessary to maintain or achieve sustainability
- Development of GSP monitoring and reporting system

Activities

These tasks entail the consultant working with a wide variety of interested and involved parties in compiling and verifying data, disseminating information, writing and presenting GSP plan sections, gathering and responding to comments and preparing progress reports. Anticipated activities include but are not limited to:

- Collect, process and validate technical (hydrogeological, geological etc.) data
- Improve the current groundwater model by implementing the recommendations from the model evaluation study recently completed by EKI/HydroFocus which include:

- Expanding the model grid to cover the entire basin
    - Converting the model from a quarterly time step to a monthly time-step
    - Updating methods of calculating recharge and evapotranspiration
    - Updating model calibration, including calibration to stream baseflow
    - Expanding the model period
    - Considering and incorporating comments (if deemed necessary) by the technical experts

- Convert complex concepts into user friendly information for distribution to various stakeholders
- Prepare materials and make presentations to the board and committees
- Develop and present materials, concepts and analyses aimed at general public audiences, in support of the community engagement efforts and in collaboration with other consultants Provide subject matter expert services and strategic consultation to staff
- Coordinate with DWR to ensure GSP alignment with SGMA
- Prepare the GSP that meets DWR's regulatory requirements, coordinate the community review process of the plan, submit the final plan to DWR

Depending on the qualifications of the candidate firms, the Agency could contract with more than one consultant and include a coordination of services among consultants in the scope of work.

Qualifications

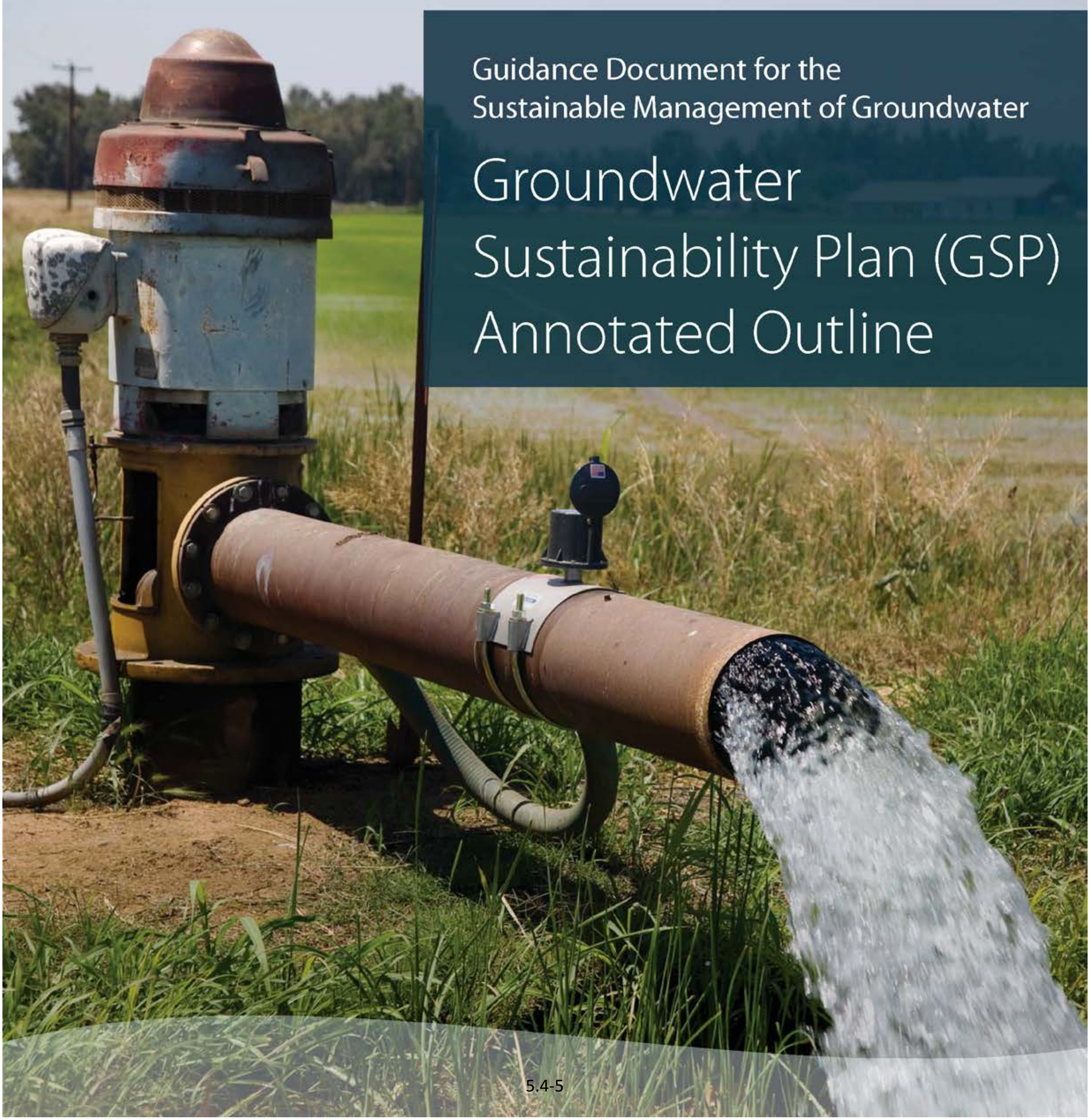
- Strong understanding of the Sustainable Groundwater Management Act (SGMA)
- Demonstrated knowledge and experience compiling and authoring similar public agency plans within the scope, schedule and budget
- Knowledge and experience working with hydrological models
- Knowledge and experience assessing groundwater surface water interactions
- Ability to produce clear and effective written and graphic products
- Strong technical writing skills
- Capability to bring a diverse and competent team (including subcontractors if needed) addressing all necessary disciplines
- Creativity in working with diverse stakeholders to arrive at mutually acceptable outcomes
- Willingness to collaborate and aptitude for effectively working with various subject matter experts and agency representatives
- Proven skills in oral and written communications, including expertise in presenting technical topics to a variety of technical and non-technical audiences
- Experience in working with large, multi-faceted teams and partners
- Familiarity with the region, its characteristics and complexities is desirable

California Department of Water Resources
Sustainable Groundwater Management Program

December 2016

Guidance Document for the Sustainable Management of Groundwater

Groundwater Sustainability Plan (GSP) Annotated Outline



Guidance Document for the Sustainable Management of Groundwater

Groundwater Sustainability Plan (GSP) Annotated Outline

December 2016

The objective of this Guidance Document is to provide Groundwater Sustainability Agencies (GSAs) and other stakeholders an example **Groundwater Sustainability Plan (GSP) Annotated Outline** to aid in GSP development and standardize future reporting.

The GSP Annotated Outline is only intended to be a guide. GSAs have the option of using this information as they develop a GSP. The content provided here does not create any new requirements or obligations for the GSA or other stakeholders.

Guidance Documents are not a substitute for the GSP Emergency Regulations (GSP Regulations) or the Sustainable Groundwater Management Act (SGMA). Those GSAs developing a GSP are strongly encouraged to fully read the GSP Regulations and SGMA. In addition, using this Guidance Document to develop a GSP does not equate to an approval determination by DWR.

Context with GSP Regulations and SGMA

The GSP Annotated Outline can be used by GSAs, in conjunction with the *Preparation Checklist for GSP Submittal Guidance Document*, to develop a GSP and determine if the GSP (or coordinated GSPs) meets the minimum requirements of the GSP Regulations and statutory provisions of SGMA. The detailed requirements of a GSP may be found in the GSP Regulations, primarily in Article 5 – Plan Contents, and in SGMA, primarily in Chapter 6 beginning with California Water Code Section 10727. All references to GSP Regulations relate to Title 23 of the California Code of Regulations, Division 2, Chapter 1.5, and Subchapter 2. All references to SGMA relate to California Water Code sections in Division 6, Part 2.74.

California Department of Water Resources
Sustainable Groundwater Management Program
1416 Ninth Street
P.O. Box 942836
Sacramento, CA 94236-0001
www.water.ca.gov/groundwater

Potential Groundwater Sustainability Plan Outline

Executive Summary *(Reg. § 354.4)*

1.0 Introduction

1.1 Purpose of the Groundwater Sustainability Plan (GSP or Plan)

1.2 Sustainability Goal

1.3 Agency Information *(Reg. § 354.6)*

1.3.1 Organization and Management Structure of the Groundwater Sustainability Agency (GSA or Agency)

1.3.2 Legal Authority of the GSA

1.3.3 Estimated Cost of Implementing the GSP and the GSA's Approach to Meet Costs

1.4 GSP Organization

- Description of how the GSP is organized
- Preparation Checklist for GSP Submittal

2.0 Plan Area and Basin Setting

2.1 Description of the Plan Area *(Reg. § 354.8)*

2.1.1 Summary of Jurisdictional Areas and Other Features *(Reg. § 354.8 b)*

- Map(s) *(Reg. § 354.8 a)*:
  - Area covered by GSP
  - Adjudicated areas, other Agencies within the basin, and areas covered by an Alternative
  - Jurisdictional boundaries of federal or State land
  - Existing land use designations
  - Density of wells per square mile

2.1.2 Water Resources Monitoring and Management Programs *(Reg. § 354.8 c, d, e)*

- Description of water resources monitoring and management programs
  - Description of how monitoring networks of those programs will be incorporated into the GSP
  - Descriptions of how those programs may limit operation flexibility in the basin
  - Description of conjunctive use programs

2.1.3 Land Use Elements or Topic Categories of Applicable General Plans *(Reg. § 354.8 f)*

- Summary of general plans and other land use plans
  - Information could include crop types and acreages, urban land designation, and identification of open spaces.
- Description of how implementation of the GSP may change water demands or affect achievement of sustainability and how the GSP addresses those effects
- Description of how implementation of the GSP may affect the water supply assumptions of relevant land use plans
- Summary of the process for permitting new or replacement wells in the basin
- Information regarding the implementation of land use plans outside the basin that could affect the ability of the Agency to achieve sustainable groundwater management

2.1.4 Additional GSP Elements *(Reg. § 354.8 g)*

- Control of saline water intrusion
- Wellhead protection
- Migration of contaminated groundwater
- Well abandonment and well destruction program
- Replenishment of groundwater extractions
- Conjunctive use and underground storage
- Well construction policies

- Groundwater contamination cleanup, recharge, diversions to storage, conservation, water recycling, conveyance, and extraction projects
- Efficient water management practices
- Relationships with State and federal regulatory agencies
- Land use plans and efforts to coordinate with land use planning agencies to assess activities that potentially create risks to groundwater quality or quantity
- Impacts on groundwater dependent ecosystems

2.1.5 Notice and Communication *(Reg. § 354.10)*

- Description of beneficial uses and users in the basin
- A Communications Section that describes:
    - Decision-making processes
    - Public engagement opportunities
    - Encouraging active involvement
    - Informing the public on GSP implementation progress

2.2 Basin Setting

2.2.1 Hydrogeologic Conceptual Model *(Reg. § 354.14)*

- Graphical and narrative description of the physical components of the basin
- At least two scaled cross-sections
- Map(s) of physical characteristics
    - Topographic information
    - Surficial geology
    - Soil characteristics
    - Delineation of existing recharge areas that substantially contribute to the replenishment of the basin, potential recharge areas, and discharge areas
    - Surface water bodies
    - Source and point of delivery for local and imported water supplies

2.2.2 **Current and Historical Groundwater Conditions *(Reg. § 354.16)***

- Groundwater elevation data
- Estimate of groundwater storage
- Seawater intrusion conditions
- Groundwater quality issues
- Land subsidence conditions
- Identification of interconnected surface water systems
- Identification of groundwater-dependent ecosystems
  - Including potentially related factors such as instream flow requirements, threatened and endangered species, and critical habitat.

2.2.3 **Water Budget Information *(Reg. § 354.18)***

- Description of inflows, outflows, and change in storage
- Quantification of overdraft (as applicable)
- Estimate of sustainable yield
- Quantification of current, historical, and projected water budget
- Description of surface water supply used or available for use for groundwater recharge or in-lieu use

2.2.4 **Management Areas (as Applicable) *(Reg. § 354.20)***

- Reason for creation of each management area
- Level of monitoring and analysis
- Description of management areas
- Explanation of how management of management areas will not cause undesirable results outside the management area

3.0 Sustainable Management Criteria

3.1 Sustainability Goal *(Reg. § 354.24)*

- Description of sustainability goal, including:
  - Information from the basin setting used to establish the sustainability goal
  - Discussion of the measures that will be implemented to ensure that the basin will be operated within its sustainable yield

- Explanation of how the sustainability goal is likely to be achieved within 20 years of Plan implementation and is likely to be maintained through the planning and implementation horizon

3.2 Measureable Objectives *(Reg. § 354.30)*

- Description of each measureable objective and how the measurable objectives were established for each relevant sustainability indicator
- Description of how a reasonable margin of safety was established for each measureable objective
- Description of a reasonable path to achieve and maintain the sustainability goal including a description of interim milestones for each relevant sustainability indicator
  - Measurable Objective for Sustainability Indicator 1
    - Interim Milestone at 5 years
    - Interim Milestone at 10 years
    - Interim milestone at 15 years
    - Milestone at 20 years
  - Measurable Objective for Sustainability Indicator 2
    - Interim Milestone at 5 years
    - Interim Milestone at 10 years
    - Interim milestone at 15 years
    - Milestone at 20 years
  - Measurable Objective for Sustainability Indicator X
- If management areas are used, a description of *(Reg. § 354.20 b)*:
  - The measurable objectives established for each management area, and an explanation of the rationale for selecting those values, if different from the basin at large.
  - An explanation of how the management area can operate under different measurable objectives without causing undesirable results outside the management area, if applicable.

3.3 Minimum Thresholds *(Reg. § 354.28)*

- Description of each minimum threshold and how they were established for each relevant sustainability indicator

- Relationship for each sustainability indicator
- Description of how minimum thresholds have been selected to avoid causing undesirable results
- Description of how minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.
- Standards related to sustainability indicators
- How each minimum threshold will be quantitatively measured for each relevant sustainability indicator
- If management areas are used, a description of *(Reg. § 354.20 b)*:
    - o The minimum thresholds established for each management area, and an explanation of the rationale for selecting those values, if different from the basin at large.
    - o An explanation of how the management area can operate under different minimum thresholds without causing undesirable results outside the management area, if applicable.

3.4 Undesirable Results *(Reg. § 354.26)*

- Description of undesirable results for any of the sustainability indicators
- Cause of groundwater conditions that would lead to undesirable results
- Criteria used to define undesirable results based on minimum thresholds
- Potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results

3.5 Monitoring Network

3.5.1 Description of Monitoring Network *(Reg. § 354.34)*

- Description of how the monitoring network is capable of collecting sufficient data to demonstrate short-term, seasonal, and long-term trends in groundwater and related surface conditions, and yield representative information about groundwater conditions as necessary to evaluate Plan implementation

- Description of monitoring network objectives including explanation of how the network will be developed and implemented to monitor:
  - Groundwater and related surface conditions
  - Interconnection of surface water and groundwater
- Description of how implementation of the monitoring network objectives demonstrate progress toward achieving the measureable objectives, monitor impacts to beneficial uses or users of groundwater, monitor changes in groundwater conditions, and quantify annual changes in water budget components
- Description of how the monitoring network is designed to accomplish the following for each sustainability indicator:
  - Chronic Lowering of Groundwater Levels. Demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features
  - Reduction of Groundwater Storage. Estimate the change in annual groundwater in storage
  - Seawater Intrusion. Monitor seawater intrusion
  - Degraded Water Quality. Determine groundwater quality trends
  - Land Subsidence. Identify the rate and extent of land subsidence
  - Depletions of Interconnected Surface Water. Calculate depletions of surface water caused by groundwater extractions
- Description of how the monitoring plan provides adequate coverage of the sustainability indicators
- Density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends

- Scientific rational (or reason) for site selection
- Consistency with data and reporting standards
- Corresponding sustainability indicator, minimum threshold, measureable objective, and interim milestone
- Location and type of each site on a map
- If management areas are used, a description of the level of monitoring and analysis appropriate for each management area. *(Reg. § 354.20 b)*

3.5.2 Monitoring Protocols for Data Collection and Monitoring *(Reg. § 352.2)*

- Description of technical standards, data collection methods, and other procedures or protocols to ensure comparable data and methodologies.

3.5.3 Representative Monitoring *(Reg. § 354.36)*

- Description of representative sites if designated
- Demonstration of adequacy of using groundwater elevations as proxy for other sustainability indicators
- Adequate evidence demonstrating site reflects general conditions in the area

3.5.4 Assessment and Improvement of Monitoring Network *(Reg. § 354.38)*

- Review and evaluation of the monitoring network
- Identification and description of data gaps
- Description of steps to fill data gaps
- Description of monitoring frequency and density of sites

4.0 Projects and Management Actions to Achieve Sustainability Goal *(Reg. § 354.44)*

4.1 Project #1 Description

- Measureable objective that is expected to benefit from the project or management action
- Circumstances for implementation

- Public noticing
- Overdraft mitigation projects and management actions
- Permitting and regulatory process
- Time-table for initiation and completion, and the accrual of expected benefits
- Expected benefits and how they will be evaluated
- How the project or management action will be accomplished. If the projects or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included.
- Legal authority required
- Estimated costs for the projects and managements and plans to meet those costs (economic analysis and finance strategy for projects and management actions)
- Management of groundwater extractions and recharge
- Relationship to additional GSP elements as described in Water Code §10727.4.

4.2 Project #2 Description

4.3 Project #X Description

5.0 Plan Implementation

5.1 Estimate of GSP Implementation Costs *(Reg. § 354.6)*

5.2 Schedule for Implementation

5.3 Annual Reporting

- GSA's plan for required annual reporting

5.4 Periodic Evaluations

- GSA's process for required periodic evaluations

6.0 References and Technical Studies *(Reg. § 354.4)*

Appendices

- Interbasin and Coordination Agreements (as applicable) *(Reg. § 357)*
- Contact Information for Plan Manager and GSA Mailing Address *(Reg. § 354.6)*
- List of Public Meetings *(Reg. § 354.10)*
- Technical Appendices
- Groundwater Model Documentation
- Comments and Responses *(Reg. § 354.10)*

STAFF REPORT

Santa Margarita Groundwater Agency Board of Directors

To: Board of Directors

Date: November 29, 2018

Item: Staff Report

Subject: **Communications & Outreach Monthly Report**

The following activities took place during November, as per the SMGWA Miller Maxfield (M2) Communication Work Plan specific elements:

Planning and strategy for education series

Consultation on design, scoping and scheduling related to upcoming 3-part education series, including strategic counsel regarding goals, format, etc. Actions included development timeline of deliverables, proposed content and speakers, and draft press release. Promotion of events to begin in December, including press release, Facebook event page, email newsletter and more.

Develop a glossary of terms and FAQ

Drafted comprehensive glossary of terms for the SMGWA website (attached). Glossary to be updated/expanded as needed. Frequently Asked Questions document under development.

Development of explanatory graphics for key concepts

Development started on five explanatory graphic-themed tools including a map of the basin, a timeline of milestones, a cross-section of the aquifer, water demand over time, and water use (household, landscape, etc.). Graphics to be available via SMGWA website, Facebook and education series.

Refine draft community group list

Augmented draft list of community/constituent groups throughout the SMGWA basin boundaries for future outreach, based on input from SMGWA board and staff. The list, which is considered a "living document" is updated continuously as needed, includes community-based groups, non-profits, senior living areas, faith-based groups, school organizations, and other local organizations, attached. Contact information for each group has been added and will be used to help promote the upcoming education series.

Maintain/post content to Facebook page

Development and promotion of two to three posts per week, as well as promotion of the page in order to increase the number of "likes" and "followers."

Submitted by,

Bill Maxfield
Miller Maxfield

Attached: SMGWA glossary 11.13

SMGWA Glossary

aquifer — a geologic formation(s) that is water bearing; a geological formation or structure that stores and/or transmits water, such as to wells and springs. Use of the term is usually restricted to those water-bearing formations capable of yielding water in sufficient quantity to constitute a usable supply for people's needs.

aquifer (confined) — soil or rock below the land surface that is saturated with water. There are layers of impermeable material both above and below it, and it is under pressure so that when the aquifer is penetrated by a well, the water will rise above the top of the aquifer.

aquifer (unconfined) — an aquifer whose upper water surface (water table) is at atmospheric pressure, and thus is able to rise and fall.

aquitard — a geologic formation or stratum that lies adjacent to an aquifer and that allows only a small amount of liquid to pass.

artificial recharge — a process where water is put back into groundwater storage from surface-water supplies such as irrigation, or induced infiltration from streams or wells.

de minimis extractor – a person who extracts, for domestic purposes, two acre-feet or less per year.

Department of Water Resources (DWR) – State agency that oversees the implementation of SGMA.

diversion canal — a waterway used to divert water from its natural course.

drainage basin — the land area where precipitation runs off into streams, rivers, lakes, and reservoirs. It is a land feature that can be identified by tracing a line along the highest elevations between two areas on a map, often a ridge. Large drainage basins, like the area that drains into the Mississippi River, contain thousands of smaller drainage basins. Also called a "watershed."

drawdown — a lowering of the groundwater surface caused by pumping.

evapotranspiration — the process by which water is transferred from the land to the atmosphere by evaporation from the soil and other surfaces and by transpiration from plants.

groundwater — (1) water that flows or seeps downward and saturates soil or rock, supplying springs and wells. The upper surface of the saturate zone is called the water table. (2) Water stored underground in rock crevices and in the pores of geologic materials that make up the Earth's crust.

groundwater, confined — groundwater under pressure significantly greater than atmospheric, with its upper limit the bottom of a bed with hydraulic conductivity distinctly lower than that of the material in which the confined water occurs.

groundwater recharge — inflow of water to a groundwater reservoir from the surface. Infiltration of precipitation and its movement to the water table is one form of natural recharge. Also, the volume of water added by this process.

Groundwater Sustainability Agency (GSA) – one or more local agencies that implement SGMA. The Santa Margarita Groundwater Agency (SMGWA) is the GSA for the Santa Margarita Basin.

Groundwater Sustainability Plan – a plan of a groundwater sustainability agency proposed or adopted pursuant to SGMA.

groundwater, unconfined — water in an aquifer that has a water table that is exposed to the atmosphere.

groundwater management plan — identifies actions necessary to contribute to an effective water resources management framework. It is intended to provide planned and coordinated monitoring, operation and administration of groundwater basins with the goal of long-term groundwater resource sustainability.

injection well — an injection well is used to place fluid underground into porous geologic formations. These underground formations may range from deep sandstone or limestone to a shallow soil layer. Injected fluids may include water, wastewater, brine (salt water) or water mixed with chemicals.

in-lieu use – the use of surface water by persons that could otherwise extract groundwater in order to leave groundwater in the basin.

monitoring well — a well designed and installed to obtain representative groundwater quality samples and hydrogeologic information. Deep and shallow monitoring wells provide controlled access for sampling groundwater near an agricultural waste storage or treatment facility to detect seepage and monitor groundwater quality.

overdraft — overdraft occurs when, over a period of years, more water is pumped from a groundwater basin than is replaced from all sources – such as rainfall, irrigation water, streams fed by mountain runoff and intentional recharge. While many of its individual aquifers are not overdrafted, California as a whole uses more groundwater than is replaced.

private pumpers — groundwater users operating their own wells outside of any water agency.

recharge — water added to an aquifer. For instance, rainfall that seeps into the ground.

Sustainable Groundwater Management Act (SMGA) — the SGMA provides a framework for sustainable management of groundwater supplies by local authorities. Recognizing that groundwater is most effectively managed at the local level, the SGMA empowers local agencies to achieve sustainability within 20 years. The SGMA establishes minimum standards for sustainable groundwater management, improves coordination between land use and groundwater planning, provides state technical assistance, protects water rights, and creates a mechanism for state intervention if a local agency is not managing its groundwater sustainability.

surface water — water that is on the Earth's surface, such as in a stream, river, lake or reservoir.

undesirable result – under SGMA, one or more of the following effects caused by groundwater conditions occurring throughout the basin:

- chronic lowering of groundwater levels
- significant and unreasonable reduction of groundwater storage
- significant and unreasonable seawater intrusion
- significant and unreasonable degraded water quality
- significant and unreasonable land subsidence
- depletions of interconnected surface water

water table — the top of the water surface in the saturated part of an aquifer.

water year — the water year is Oct. 1 to Sept. 30.

water use — water that is used for a specific purpose, such as for domestic use, irrigation or industrial processing. Water use pertains to human's interaction with and influence on the hydrologic cycle and includes elements such as water withdrawal from surface and groundwater sources, water delivery to homes and businesses, consumptive use of water, water released from wastewater treatment plants, water returned to the environment, as well as instream uses, such as using water to produce hydroelectric power.

watershed — the land area that drains water to a particular stream, river or lake. It is a land feature that can be identified by tracing a line along the highest elevations between two areas on a map, often a ridge. Large watersheds, like the Mississippi River Basin, contain thousands of smaller watersheds.

Well Owner Representative – director on the Santa Margarita Groundwater Agency Board who represents private pumpers.