

September 25, 2023

**MEETING NOTICE & REQUEST FOR RSVP****TO: AGRICULTURAL WATER ADVISORY COMMITTEE****Jurisdiction**

District 1  
District 2  
District 4  
District 5  
District 6  
Loma Prieta Resource Conservation District  
Santa Clara County Farm Bureau

**Representative**

Erin Gil  
James Provenzano  
Sheila Barry  
Jan F. Garrod  
Tim Chiala  
Peter Van Dyke  
Dhruv Khanna

**Representative**

Mitchell Mariani  
  
Brent Bonino  
Trevor Garrod  
Robert Long

The regular meeting of the Agricultural Water Advisory Committee is scheduled to be held on **Monday, October 2, 2023, at 1:30 p.m., at Headquarters Building Boardroom, 5700 Almaden Expressway, San Jose, CA 95118.**

Enclosed are the meeting agenda and corresponding materials. Please bring this packet with you to the meeting. Additional copies of this meeting packet are available on our new website at <https://www.valleywater.org/how-we-operate/committees/board-advisory-committees>.

A majority of the appointed membership is required to constitute a quorum, which is fifty percent plus one. A quorum for this meeting must be confirmed at least 48 hours prior to the scheduled meeting date or it will be canceled.

Further, a quorum must be present on the day of the scheduled meeting to call the meeting to order and take action on agenda items.

Members with two or more consecutive unexcused absences will be subject to rescinded membership.

Please confirm your attendance no later than **12:00 p.m., Thursday, September 28, 2023**, by contacting Ms. Glenna Brambill at 1-408-630-2408, or [gbrambill@valleywater.org](mailto:gbrambill@valleywater.org).

Enclosures



## Agricultural Water Advisory Committee Meeting

Public and Non-presenting staff may Join Zoom Meeting:  
<https://valleywater.zoom.us/j/98850905996>

Meeting ID: 988 5090 5996

One tap mobile

+16699009128,,98850905996# US (San Jose)

Dial by your location

+1 669 900 9128 US (San Jose)

Meeting ID: 988 5090 5996





## **Santa Clara Valley Water District Agricultural Water Advisory Committee Meeting**

**Headquarters Building Boardroom  
5700 Almaden Expressway  
San Jose CA 95118**

### **REGULAR MEETING AGENDA**

**Monday, October 2, 2023  
1:30 PM**

**District Mission: Provide Silicon Valley safe, clean water for a healthy life, environment and economy.**

COMMITTEE:  
Jan Garrod, Chair  
Peter Van Dyke, Vice Chair

BOARD REPRESENTATIVES:  
Director Jim Beall (District 4)  
Director Richard P. Santos (District 3)  
Director John L. Varela (District 1)

All public records relating to an item on this agenda, which are not exempt from disclosure pursuant to the California Public Records Act, that are distributed to a majority of the legislative body will be available for public inspection at the Office of the Clerk of the Board at the Santa Clara Valley Water District Headquarters Building, 5700 Almaden Expressway, San Jose, CA 95118, at the same time that the public records are distributed or made available to the legislative body. Santa Clara Valley Water District will make reasonable efforts to accommodate persons with disabilities wishing to attend Board of Directors' meeting. Please advise the Clerk of the Board Office of any special needs by calling (408) 265-2600.

Vincent Gin  
Darin Taylor, (Staff Liaisons)  
  
Glenna Brambill, (COB Liaison)  
Management Analyst II  
gbrambill@valleywater.org  
1-408-630-2408

**Note: The finalized Board Agenda, exception items and supplemental items will be posted prior to the meeting in accordance with the Brown Act.**

**Santa Clara Valley Water District**  
**Agricultural Water Advisory Committee**  
**REGULAR MEETING**  
**AGENDA**

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Monday, October 2, 2023

1:30 PM

Headquarters Building Boardroom  
5750 Almaden Expressway  
San Jose CA 95118

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\*\*\*IMPORTANT NOTICES AND PARTICIPATION INSTRUCTIONS\*\*\*

Santa Clara Valley Water District (Valley Water) Board of Directors/Board Committee meetings are held as a “hybrid” meetings, conducted in-person as well as by telecommunication, and is compliant with the provisions of the Ralph M. Brown Act.

To maximize public safety while still maintaining transparency and public access, members of the public have an option to participate by teleconference/video conference or attend in-person. To observe and participate in the meeting by teleconference/video conference, please see the meeting link located at the top of the agenda. If attending in-person, you are required to comply with Ordinance 22-03 - AN ORDINANCE OF THE SANTA CLARA VALLEY WATER DISTRICT SPECIFYING RULES OF DECORUM FOR PARTICIPATION IN BOARD AND COMMITTEE MEETINGS located at <https://s3.us-west-2.amazonaws.com/valleywater.org.if-us-west-2/f2-live/s3fs-public/Ord.pdf>

In accordance with the requirements of Gov. Code Section 54954.3(a), members of the public wishing to address the Board/Committee during public comment or on any item listed on the agenda, may do so by filling out a Speaker Card and submitting it to the Clerk or using the “Raise Hand” tool located in the Zoom meeting application to identify yourself in order to speak, at the time the item is called. Speakers will be acknowledged by the Board/Committee Chair in the order requests are received and granted speaking access to address the Board.

- Members of the Public may test their connection to Zoom Meetings at: <https://zoom.us/test>
- Members of the Public are encouraged to review our overview on joining Valley Water Board Meetings at: <https://www.youtube.com/watch?v=TojJpYCxXm0>

Valley Water, in complying with the Americans with Disabilities Act (ADA), requests individuals who require special accommodations to access and/or participate in Valley Water Board of Directors/Board Committee meetings to please contact the Clerk of the Board’s office at (408) 630-2711, at least 3 business days before the scheduled meeting to ensure that Valley Water may assist you.

This agenda has been prepared as required by the applicable laws of the State of California, including but not limited to, Government Code Sections 54950 et. seq. and has

not been prepared with a view to informing an investment decision in any of Valley Water's bonds, notes or other obligations. Any projections, plans or other forward-looking statements included in the information in this agenda are subject to a variety of uncertainties that could cause any actual plans or results to differ materially from any such statement. The information herein is not intended to be used by investors or potential investors in considering the purchase or sale of Valley Water's bonds, notes or other obligations and investors and potential investors should rely only on information filed by Valley Water on the Municipal Securities Rulemaking Board's Electronic Municipal Market Access System for municipal securities disclosures and Valley Water's Investor Relations website, maintained on the World Wide Web at <https://emma.msrb.org/> and <https://www.valleywater.org/how-we-operate/financebudget/investor-relations>, respectively.

Under the Brown Act, members of the public are not required to provide identifying information in order to attend public meetings. Through the link below, the Zoom webinar program requests entry of a name and email address, and Valley Water is unable to modify this requirement. Members of the public not wishing to provide such identifying information are encouraged to enter "Anonymous" or some other reference under name and to enter a fictional email address (e.g., attendee@valleywater.org) in lieu of their actual address. Inputting such values will not impact your ability to access the meeting through Zoom.

**Join Zoom Meeting:**

**<https://valleywater.zoom.us/j/98850905996>**

Meeting ID: 988 5090 5996

Join by Phone:

1 (669) 900-9128, 98850905996#

**1. CALL TO ORDER:**

1.1. Roll Call.

**2. TIME OPEN FOR PUBLIC COMMENT ON ANY ITEM NOT ON THE AGENDA.**

*Notice to the public: Members of the public who wish to address the Board/Committee on any item not listed on the agenda may do so by filling out a Speaker Card and submitting it to the Clerk or using the "Raise Hand" tool located in the Zoom meeting application to identify yourself to speak. Speakers will be acknowledged by the Board/Committee Chair in the order requests are received and granted speaking access to address the Board/Committee. Speakers' comments should be limited to two minutes or as set by the Chair. The law does not permit Board/Committee action on, or extended discussion of, any item not on the agenda except under special circumstances. If Board/Committee action is requested, the matter may be placed on a future agenda. All comments that require a response will be referred to staff for a reply in writing. The Board/Committee may take action on any item of business appearing on the posted agenda.*

### **3. APPROVAL OF MINUTES:**

#### **3.1. Approval of Minutes.**

[23-0974](#)

Recommendation: Approve the August 7, 2023, Special Meeting Minutes.

Manager: Candice Kwok-Smith, 408-630-3193

Attachments: [Attachment 1: 08072023 Ag Wtr DRAFT Mins](#)

Est. Staff Time: 5 Minutes

### **4. REGULAR AGENDA:**

#### **4.1. Untreated Surface Water Program Activities and Water Master Charge pricing follow-up.**

[23-0975](#)

Recommendation: Receive information on the Untreated Surface Water Program activities as follow-up to August 7, 2023 Agricultural Water Advisory Committee meeting.

Manager: Greg Williams, 408-630-2867  
Darin Taylor, 408-630-3068

Attachments: [Attachment 1: Surface Water Permittees Map](#)  
[Attachment 2: Resolution 99-21 Pricing Policy](#)  
[Attachment 3: PowerPoint Presentation](#)

Est. Staff Time: 15 Minutes

#### **4.2. Flood-Managed Aquifer Recharge (Flood-MAR) Pre-Feasibility Study for Santa Clara County.**

[23-0976](#)

Recommendation: Receive and discuss the Pre-Feasibility Study for a Flood-MAR Program in the Santa Clara Valley Water District Service Area, Santa Clara County, CA.

Manager: Kirsten Struve, 408-630-3138

Attachments: [Attachment 1: FloodMAR Study Report](#)  
[Attachment 2: PowerPoint Presentation](#)

Est. Staff Time: 15 Minutes

#### **4.3. Review Agricultural Water Advisory Committee Work Plan, the Outcomes of Board Action of Committee Requests; and the Committee's Next Meeting Agenda.**

[23-0977](#)

Recommendation: Review the Committee work plan to guide the committee's discussions regarding policy alternatives and implications for Board deliberation.

Manager: Candice Kwok-Smith, 408-630-3193

Attachments: [Attachment 1: AWAC 2023 Work Plan October](#)

Est. Staff Time: 5 Minutes

**5. INFORMATION ITEM:**

5.1. Review Fiscal Year 2023-2024 Board Work Plan.

[23-0978](#)

Recommendation: Review the Board's work plan to guide the committee's discussions regarding policy alternatives and implications for Board deliberation.

Manager: Candice Kwok-Smith, 408-630-3193

Attachments: [Attachment 1: Board Strategic Plan FY2023-24](#)

Est. Staff Time: 10 Minutes

**6. CLERK REVIEW AND CLARIFICATION OF COMMITTEE REQUESTS.**

*This is an opportunity for the Clerk to review and obtain clarification on any formally moved, seconded, and approved requests and recommendations made by the Committee during the meeting.*

**7. REPORTS:**

7.1. Director's Report

7.2. Manager's Report

7.3. Committee Member Report

7.4. Information Links:

<https://www.valleywater.org/how-we-operate/committees/board-committees>

- Board Policy and Planning Committee (BPPC)
- Environmental Creek Cleanup Committee (Formerly Homeless Encampment Committee)
- Water Storage Exploratory Committee (WSEC)

<https://www.valleywater.org/how-we-operate/committees/board-advisory-committees>

- Water Conservation and Demand Management Committee (WCaDMC)

<https://www.valleywater.org/your-water/water-supply-planning/monthly-water-tracker>

- Water Tracker:

**8. ADJOURN:**

8.1. Adjourn to Regular Meeting at 1:30 p.m., on Monday, January 8, 2024.





# Santa Clara Valley Water District

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**File No.:** 23-0974

**Agenda Date:** 10/2/2023

**Item No.:** 3.1.

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## **COMMITTEE AGENDA MEMORANDUM Agricultural Water Advisory Committee**

Government Code § 84308 Applies: Yes ☐ No ☒  
(If "YES" Complete Attachment A - Gov. Code § 84308)

### **SUBJECT:**

Approval of Minutes.

### **RECOMMENDATION:**

Approve the August 7, 2023, Special Meeting Minutes.

### **SUMMARY:**

A summary of Committee discussions, and details of all actions taken by the Committee, during all open and public Committee meetings, is transcribed and submitted for review and approval.

Upon Committee approval, minutes transcripts are finalized and entered into the District's historical records archives and serve as historical records of the Committee's meetings.

### **ENVIRONMENTAL JUSTICE IMPACT:**

There are no environmental Justice impacts associated with this item.

### **ATTACHMENTS:**

Attachment 1: 08072023, Ag Water Draft Meeting Mins.

### **UNCLASSIFIED MANAGER:**

Candice Kwok-Smith, 408-630-3193







AGRICULTURAL WATER ADVISORY COMMITTEE MEETING

# DRAFT MINUTES

MONDAY, AUGUST 7, 2023

A special meeting of the Agricultural Water Advisory Committee was held on August 7, 2023, at Santa Clara Valley Water District, Headquarters Building Boardroom, 5700 Almaden Expressway, San Jose CA 95118.

**1. CALL TO ORDER/ROLL CALL**

Committee Chair Jan Garrod called the meeting to order at 1:30 p.m.

**Members in attendance were:**

Jurisdiction

District 1

District 2

District 4

District 5

District 6

Loma Prieta Resource Conservation District

Santa Clara County Farm Bureau

Representative

Erin Gil

Mitchell Mariani

James Provenzano

Brent Bonino

Jan Garrod

Trevor Garrod

Tim Chiala\*

Robert Long

Peter Van Dyke

Dhruv Khanna

**Members in not attendance were:**

Jurisdiction

District 4

Representative

Sheila Barry

Committee Member arrived at time noted below.

Board members in attendance were: Director Jim Beall (District 4), Board Alternate, and Director Richard P. Santos (District 3) Board Representative.

Staff members in attendance were Jennifer Abadilla, Gina Adriano, Aaron Baker, Glenna Brambill, Luan Buckley, Justin Burks, Usha Chatwani, Vanessa De La Piedra, Paola Giles, Vincent Gin, Samantha Greene, Jason Gurdak, Cindy Kao, Candice Kwok-Smith, Dave Leon, Carmen Narayanan, Maral Najafkhani, Metra Richert, Don Rocha, Ashley Shannon, Diahann Soleno, Kirsten Struve, Darin Taylor,

Attachment 1

Page 1 of 4

Greg Williams, and Eric Worrell.

Public in attendance was: Hon. Rebecca Eisenberg (Valley Board Member-District 7).

**2. TIME OPEN FOR PUBLIC COMMENT ON ANY ITEM NOT ON AGENDA**

Director Richard P. Santos advised the Committee about vacancies for Districts 3 and 7 and could use the Committee's assistance to help find farmers to fill these spots.

Agricultural Water Advisory Committee Member Dhruv Khanna noted concerns with the homeless issues within the County.

\*Tim Chiala arrived at 1:40 p.m.

**3. APPROVAL OF MINUTES**

**3.1 APPROVAL OF MINUTES**

It was moved by James Provenzano, second by Peter Van Dyke, and carried by unanimous vote approved the April 3, 2023, Agricultural Water Advisory Committee meeting minutes, as presented.

**4. REGULAR AGENDA ITEMS:**

**4.1 UNTREATED SURFACE WATER PROGRAM ACTIVITIES AND WATER MASTER CHARGE OVERVIEW**

Gregory Williams and Carmen Narayanan reviewed the materials as outlined in the agenda item and answered questions as needed.

The Agricultural Water Advisory Committee discussed the following: revenue collections, costs, readings, surface water vs. groundwater, municipal vs ag water and the master charge.

The Agricultural Water Advisory Committee took no action; however, more information is needed to come back to the committee.

**4.2 CONSIDER PROPOSED AMENDED REQUIREMENTS FOR METERING OF WELLS IN ALL VALLEY WATER GROUNDWATER BENEFIT ZONES**

Carmen Narayanan reviewed the materials as outlined in the agenda item and answered questions as needed.

The Agricultural Water Advisory Committee discussed the following: meters, crop factors and enforcement policy.

The Agricultural Water Advisory Committee took no action.

#### **4.3 REVIEW AGRICULTURAL WATER ADVISORY COMMITTEE WORK PLAN, THE OUTCOMES OF BOARD ACTION OF COMMITTEE REQUESTS; AND THE COMMITTEE'S NEXT MEETING AGENDA**

Glenna Brambill reviewed the materials as outlined in the agenda.

The Agricultural Water Advisory Committee took the following action:

It was moved by Dhruv Khanna, second Tim Chiala, and unanimously approved to have the Board consider the Agricultural Water Advisory Committee's recommendation to receive an update of Valley Water's activities of the unhoused and information of the enforcement of violations for private landowners.

Committee Member would like information on the Joe Serna Farmworker Housing Program, no formal motion.

It was moved by Erin Gil, second by Peter Van Dyke, and carried by unanimous vote approved to have the Board consider placing the topic of ecosystems benefits on agriculture in Santa Clara County on the Agricultural Water Advisory Committee's work plan.

#### **5. INFORMATION ITEMS:**

##### **5.1 STANDING ITEMS REPORT**

Glenna Brambill reviewed the materials as outlined in the agenda.

The Agricultural Water Advisory Committee took no action.

#### **6. CLERK REVIEW AND CLARIFICATION OF COMMITTEE REQUESTS TO THE BOARD**

Glenna Brambill reported there were 2 actions for Board consideration:

Agenda Item 4.3:

1. The Committee unanimously voted to approve to have the Board consider the Agricultural Water Advisory Committee's recommendation to receive an update of Valley Water's activities of the unhoused and information of the enforcement of violations for private landowners.
2. The Committee unanimously voted to approve to have the Board consider placing the topic of ecosystems benefits on agriculture in Santa Clara County on the Agricultural Water Advisory Committee's work plan.

#### **7. REPORTS**

##### **7.1 Director's Report**

Director Jim Beall reported on:

- Legislation - Valley Water Bills looking good
- Valley Water Capital Projects

Director Richard P. Santos thanked everyone for the topical discussion

## **7.2 Manager's Report**

Aaron Baker thanked everyone for the discussion and input

## **7.3 Committee Member Reports**

Glenna Brambill gave an update on working to schedule the tour to Anderson Dam.

Peter Van Dyke shared some important activities Loma Prieta Resource Conservation District is working on:

- organic growing with a focus for minorities/underserved communities
- flood damage inspections
- Land Trust meetings/Habitat Agencies
- mitigating urban expansion

Dhruv Khanna reported on:

- wine sales are down and the decrease of corporate events

## **7.4 Informational Link Reports**

Links were provided in the Committee's agenda packet. Please add the Environmental Creek Cleanup Committee link.

## **8. ADJOURNMENT**

Committee Chair Jan Garrod adjourned the meeting at 3:16 p.m. to the regular meeting on Monday, October 2, 2023, at 1:30 p. m.

Glenna Brambill  
Board Committee Liaison  
Office of the Clerk of the Board

Approved:



# Santa Clara Valley Water District

File No.: 23-0975

Agenda Date: 10/2/2023

Item No.: 4.1.

## COMMITTEE AGENDA MEMORANDUM Agricultural Water Advisory Committee

Government Code § 84308 Applies: Yes ☐ No ☒  
(If "YES" Complete Attachment A - Gov. Code § 84308)

### SUBJECT:

Untreated Surface Water Program Activities and Water Master Charge pricing follow-up.

### RECOMMENDATION:

Receive information on the Untreated Surface Water Program activities as follow-up to August 7, 2023 Agricultural Water Advisory Committee meeting.

### SUMMARY:

The Untreated Surface Water Program activities and the Surface Water Master Charge were brought to the Agricultural Water Advisory Committee for discussion August 7, 2023. As a follow-up, staff is providing further information regarding costs related to the Surface Water Program and Santa Clara Valley Water District's (Valley Water) Pricing Policy.

### Background:

On April 2, 1974, the Board adopted Resolution 74-28 establishing rules (Surface Water Rules) to offset groundwater pumping through the direct distribution of surface water, when available. Untreated surface water (surface water) is an interruptible source of supply for permittees. Currently there are around 60 permittees in the Untreated Surface Water Program (Program). Attachment 1 includes a map highlighting the Program diversion points throughout the County.

### Surface Water Program Costs:

The Program has an annual operating budget of about \$345,000. Components of the operating budget include:

- General program oversight, such as data analysis, database management, internal meetings, permit review and processing, and records maintenance;
- External meetings and correspondence;
- Reading meters, conducting field inspections, and performing maintenance;
- Preparing for and presenting at Valley Water's Board and committee meetings;

- Time spent on billing and legal/internal consultations.

#### Pricing Policy and Surface Water Master Charge:

The charge for water distributed under the Program is comprised of two components: the Basic User Charge and the Surface Water Master Charge.

Valley Water manages water conjunctively, with activities benefiting groundwater, surface water, and treated water. The Basic User Charge is a volumetric rate (\$/AF) and varies within each of the four (4) groundwater benefit zones. The Basic User Charge, which is set equal to the groundwater production charge, includes the cost of meter reading and billing for groundwater customers.

The Surface Water Master Charge, also a volumetric rate (\$/AF), pays for the costs that are specific to surface water users only - such as the cost of field activities, operations & maintenance, program management, meter reading, billing, etc. A question was raised at the August 7 Committee meeting with regard to the equity of the current Surface Water pricing structure as it relates to meter reading and billing costs.

Surface Water customers pay both the Basic User Charge and the Surface Water Master Charge, in accordance with the Board's Pricing Policy (Attachment 2). While the general approach of the policy is to charge the recipients of the various benefits for the benefits received, a key concept of the policy is that all water sources and water facilities contribute to common benefit within a zone regardless of cost, which is known as the "pooling" concept. This concept helps Valley Water maximize the effective use of available water resources, and avoid shortages of water in one area, and surplus in another.

The Pricing Policy also requires that "whenever costs associated with specific benefits are clearly and easily measurable," those costs shall be charged to the beneficiaries. The policy identifies the Surface Water Master Charge as an example of a specific charge to meet the special needs of a group of users. The Pricing Policy seeks to balance competing concepts, in this case the concepts of "pooling" costs and "specific charges for specific benefits". Minor inequities are inevitable in the achievement of optimal compromise. However, the cost of preserving groundwater (including meter reading and billing) via the basic user charge is the foundational water availability charge that helps make surface water available for permitted use, and as such provides support for pricing surface water as currently structured. Additional background information on the Pricing Policy will be presented at the meeting (Attachment 3).

The methodology to calculate the Surface Water Master Charge in any given fiscal year is equivalent to:

$$\text{Surface Water Master Charge (\$/AF)} = \frac{\text{Surface Water Program Project Budget (\$)}}{\text{Total Surface Water Use (AF)}}$$

Agricultural water customers benefit from a low agricultural groundwater charge, which is set at 10% of the lowest Municipal & Industrial (M&I) groundwater charge in any groundwater benefit zone and is

the same in all four groundwater benefit zones.

**ENVIRONMENTAL JUSTICE IMPACT:**

There are no environmental justice impacts associated with this item.

**ATTACHMENTS:**

Attachment 1: Map

Attachment 2: Resolution 99-21, Pricing Policy

Attachment 3: PowerPoint Presentation

**UNCLASSIFIED MANAGER:**

Greg Williams, 408-630-2867

Darin Taylor, 408-630-3068



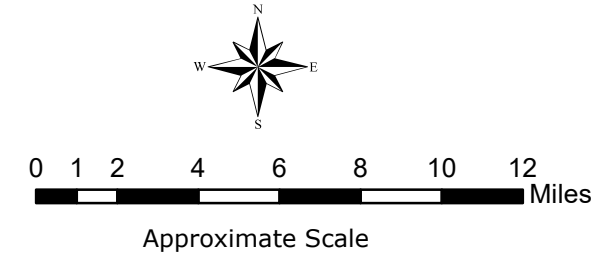


Surface/Untreated Water Program Permit Locations

District Number	Director	Number of Permits
1	John L. Varela	52
2	Barbara F. Keegan	0
3	Richard P. Santos	4
4	Jim Beall	2
5	Nai Hsueh	1
6	Tony Estremera	1
7	Rebecca Eisenberg	2
Total:		62

**Legend**

- Surface/Untreated Water Program Permits (12/13/2022)
- Raw
- Treated
- ▭ Valley Water Board of Directors Districts



GIS themes are for illustration and general analysis purposes only and are not accurate to surveying or engineering standards. Information is not guaranteed to be accurate, current, or complete and use of this information is your responsibility.

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RESOLUTION NO. 99- 21

ADOPTING "WATER UTILITY TAXING AND PRICING POLICY" AND  
RESCINDING RESOLUTION NO. 96-82

WHEREAS, the Santa Clara Valley Water District (District) adopted a District mission, goals and objectives on February 19, 1985, in order to conduct a sound water management program that serves the community; and

WHEREAS, the District Act authorizes the District to enter into water sales contracts and to levy and collect taxes and assessments on property within the District and in the respective zones of the District and sets forth requirements for groundwater charges and rates between agricultural and nonagricultural water; and

WHEREAS, several Board resolutions, as identified in Exhibit "A," are related to the management of water resources and the implementation of this water taxing and pricing policy; and

WHEREAS, several changes which affect revenue sources and benefit distribution have occurred since adoption of Resolution No. 96-82. These changes include: (1) passage of Resolution Nos. 98-44 and 98-45 setting agricultural charges for groundwater and surface water at 10 percent of the nonagricultural charges; (2) revisions to the policy governing sale of noncontract water in 1998; (3) pending completion of an agreement to act as the wholesaler to deliver recycled water in South County.

BE IT RESOLVED, by the Board of Directors of the District as follows:

1. **The policy of the District in the areas of taxation and water pricing for water utility revenues shall be and is hereby adopted:**

**Policy Statement**

The intent of this water utility taxing and pricing policy is to provide revenue for the management of water resources and operation of the water utility enterprise. This policy establishes a framework for establishing a system of water charges as permitted by the District Act to meet revenue requirements and to allocate costs amongst the beneficiaries. The general approach is to charge the recipients of the various benefits for the benefits received from the District's comprehensive water utility program.

The consumptive and nonconsumptive benefits provided by District water supply facilities and operations are listed and described below:

- Provision of a water supply and effective management of water resources available to the community from a variety of sources of supply, transmission, and water treatment facilities operated by the District.
- Protection of water quality through the purification and treatment of water and the protection of water supplies.
- Stewardship of watersheds and riparian corridor.
- Administration of related programs and projects such as recycled water and water conservation administered solely by the District or in partnership with another organization.

Resolution Adopting "Water Utility Taxing and Pricing Policy" and Rescinding Resolution No. 96-82

- Ancillary flood protection.
- Recreation, such as fishing, boating, picnicking, hiking, and other related recreation activities.
- Support for the economic well being of the community.
- Protection of the community infrastructure from subsidence.

**2. Policy Implementation**

The following water taxing and pricing concepts and framework shall be implemented in order to provide for revenue in order to continue providing direct and ancillary benefits to the customers of the District and the community of Santa Clara County.

**Water Taxing and Pricing Concepts**

- **Water Pooling:** Water is considered to be a single commodity irrespective of the water's source or cost. It is a single commodity whether it is from water provided locally, imported, or recycled, and all users benefit from the availability of multiple sources of water.
- **Water Facilities Cost Pooling:** All water supply facilities contribute to the common benefit of effective water resources management. In general, the water charges and property taxes are based on the common benefits of the capital and operations outlays, rather than reference to named facilities, with the exception of the liability for bonded indebtedness which is applied to each zone of benefit.
- **Water Resources Management:** Water supplies are managed, through taxing and pricing, to obtain the effective utilization of the water resources of the District to the advantage of the present and future populations of the County. This concept provides for development of taxing and pricing structures that will achieve the effective use of available resources and conserve supplies for potential drought conditions.
- **Revenue Pooling:** For the most part, water utility revenues are collected in a common fund and not designated for a specific cost. Such revenues are available for the general capital and operating outlays of the water utility enterprise. Some revenues such as certain property taxes are specifically designated for debt service and the fixed costs of the State Water Project, and are not available to the common fund. Water charges are established to provide the revenues that are required in the common fund for general capital and operating outlays and that are over and above revenues from ad valorem taxes, interest, and miscellaneous sources. This provides flexibility in managing continuing operations and funding capital outlays.

**Water Taxing and Pricing Framework**

The following procedures are intended as a general framework to guide staff in the development of a water rate structure implementing this policy:

- **Zones of Benefit:** Zones of benefit are to be identified and established in accordance with the District Act. Groundwater charges and property taxes are levied for the benefits received by the water users and property owners benefitting from that zone. For each zone, a basic

Resolution Adopting "Water Utility Taxing and Pricing Policy" and Rescinding Resolution No. 96-82

water user charge is determined for current groundwater and raw surface water users to be applied to the quantities of water used or consumed.

- **Basic Water Charge Zones:** The objective of establishing various water charge zones is to recover costs for the benefits resulting from conservation, import, and recharge of water which occur only within that zone. Water charges are levied for water producing operations, such as groundwater pumping and raw surface water diversion. In addition, users may be subject to specific charges that meet special needs of a group of users, such as water master charges for surface water deliveries, a capital charge for equipment or facilities, and power costs for pumping.
- **Treated Water Surcharge:** A treated water surcharge shall be added to the basic water charge for the price of treated surface water delivered by the District. The charge is to be established at an amount that would promote the effective use of available water resources. The charge may differ between treatment plants to better manage regional variations in groundwater conditions.
- **Costs for Specific Benefits:** Whenever costs associated with specific benefits are clearly and easily measurable, those costs shall be charged to the beneficiaries, in accordance with their specific zones of benefit. Where there is a question as to the identity of the beneficiary or the method of measuring the benefit, the allocation of costs should remain flexible and be determined in accordance with accepted practices and sound judgements based on the four water pricing concepts. The District recognizes and supports the State Legislature's limitation imposed on the District that rates for agricultural water shall not exceed one-fourth of the rate for all water other than agricultural water. In order to encourage the continuance of agricultural use of land in the County, to encourage the preservation of open space, to defer intensification of users and to further support the limitation imposed by the State Legislature, it is the District's policy that rates for agricultural water shall not exceed one-tenth the rate for all water other than agricultural water.

Both water charges and property taxes are used to recover costs incurred for the benefit of current water users. The costs for future supply sources can be recovered using current revenues or through project specific long-term financing.

- **Balancing Costs:** The District recognizes that there may be imbalances between revenues and costs within a zone of benefit from year to year. The District will strive to achieve balance over the long-term in accordance with the District Act and to properly charge recipients for the benefits received.
- **Incentives:** Incentives in the form of subsidies may be provided in order to reduce the price of specific sources of water in order to optimize use of available or future water resources.
- **Recycled Water:** From time to time, the District may enter into agreements to provide wholesale delivery or other services related to recycled water. The District will strive to recover the costs of these facilities consistent with the pooling concepts outlined above, while adhering to the specifics of any agreement.



Resolution Adopting "Water Utility Taxing and Pricing Policy" and Rescinding Resolution No. 96-82

**3. Executive and Staff Limitations**

District staff are authorized to develop a water rate structure which meets the objectives set forth herein, in accordance with the District Act, and using the concepts set forth above. The District's rate structure is implemented only by resolutions approved by the Board of Directors.

Staff is authorized to recommend water charges for consideration by the Board in accordance with the District Act. Water charges, if any, shall be recommended by staff each year be at fixed and uniform rates for agricultural water and for all water other than agricultural water, respectively, except that each such rate for agricultural water shall be one-tenth of the rate for all water other than agricultural water. The Board has determined that agricultural use of lands is of value to the County and the state, and that agricultural lands provide an open space benefit. The Board's limiting staff to a recommendation of agricultural water rates below the maximum allowed by the District Act will benefit water users Countywide, and is necessary to carry out the policies of the State Legislature and the District Board of Directors.

Staff is authorized to prepare, for the Board's consideration, resolutions for the collection of property taxes as needed and authorized under applicable laws.

**4. Previous Policy Rescinded**

The "Water Taxing and Pricing Policy," adopted by Resolution No. 96-82, is hereby rescinded.

PASSED AND ADOPTED by the Board of Directors of Santa Clara Valley Water District on  
March 16, 1999 by the following vote:

AYES: Directors Gross, Zlotnick, Judge, Kamei, Sanchez, Estremera, Wilson

NOES: Directors None

ABSENT: Directors None

SANTA CLARA VALLEY WATER DISTRICT

By:

  
Chair/Board of Directors

ATTEST: LAUREN L. KELLER

  
Clerk/Board of Directors

# Untreated Surface Water Pricing Follow-Up

Agricultural Water Advisory Committee – October 2, 2023

Presented by: **Darin Taylor**, Chief Financial Officer

# Surface Water Program Financial Update 2

- Program Cost Recovery via Surface Water Master Charge
- Cost recovery was well aligned prior to FY 22
  - Minor under or over collections in any given year
- Program Costs increased in FY 22 due to enhanced and refined program
- Staff projecting under collection of \$300K per year going forward
- Staff considering graduated plan to increase SW Master Charge over time to achieve full cost recovery



# Surface Water Master Charge

- Surface Water Master Charge Methodology

$$\text{Surface Water Master Charge (\$/AF)} = \frac{\text{Surface Water Program Project Budget (\$)}}{\text{Total Surface Water Use (AF)}}$$

- FY2023-24 Example
  - FY2023-24 project budget is \$345,000
  - Estimated use is 2,500 AF
  - Calculated SW Master Charge is \$138.00/AF
  - Adopted charge of \$54.00/AF will under-collect by approximately \$210,000

**Presented to Ag Committee on August 7, 2023**

# Questions from Ag Committee (8/7/23)

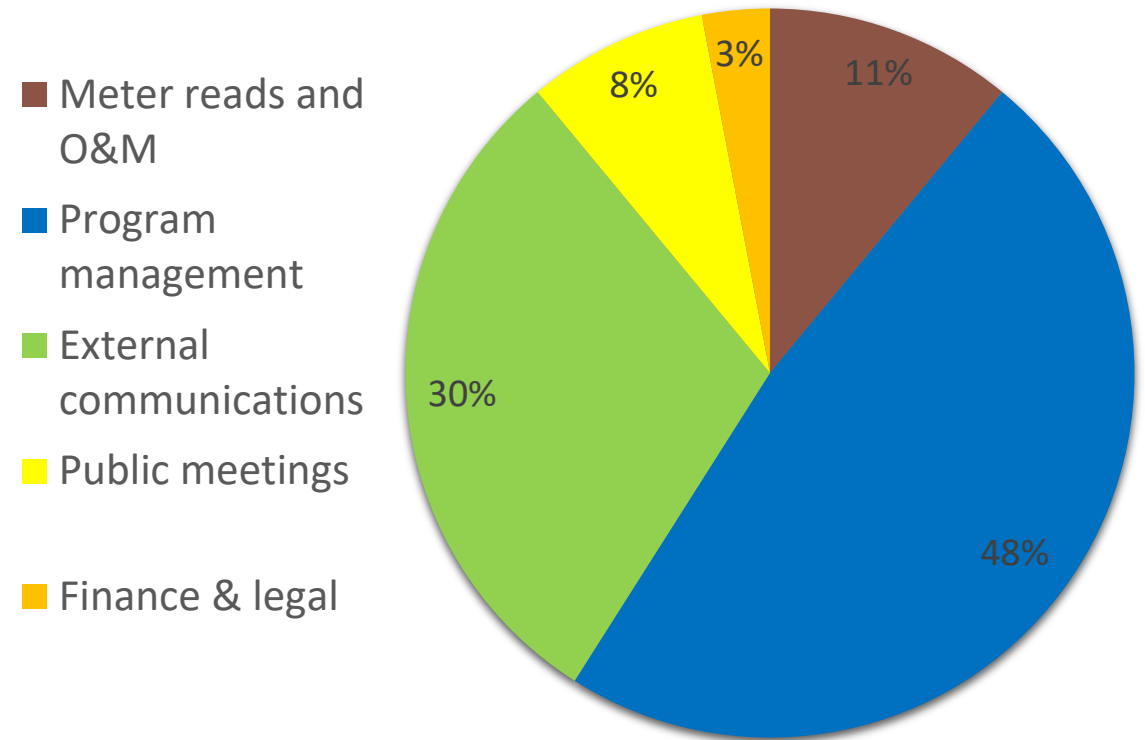
4

## 1. Question: Provide breakdown of FY 24 surface water program budget

### Breakdown of Surface Water Program Budget (about \$345K / year)

- 48% General program oversight: Data analysis, database management, internal meetings, permit review and processing, and records maintenance
- 30% External meetings and correspondence
- 11% Meter reads, field inspections, and maintenance
- 8% Preparing for and presenting at Valley Water's Board and committee meetings
- 3% Billing time and legal/internal consultations

SURFACE WATER PROGRAM ADMINISTRATION AND O&M COSTS



# Questions from Ag Committee (8/7/23)

2. Question: Why do Surface Water users pay for GW meter reading and billing?

Background: Basic user charge is set equal to the groundwater production charge and includes cost of meter reading and billing for groundwater users, while surface water master charge includes cost of field activities, O&M, program management, meter reading, billing, etc..., for surface water users

Answer #1: Staff is following Board's pricing policy. Pricing policy is based on competing principles of "pooling" costs and "specific charges for specific benefits". Minor inequities are inevitable in the achievement of optimal compromise.

# Questions from Ag Committee (8/7/23)

Answer #2: Pricing policy framework consists of two types of charges, a basic user charge, or “basic water availability” charge, plus a surcharge for cost of delivery. Groundwater is the common denominator. It is the central water resource feature, and management of it is key to meeting water needs. There is no surcharge for groundwater because the groundwater basin provides capacity to distribute or deliver water. However, a surcharge is added for the cost of delivery of treated water or raw surface water (which may be modified to incentivize responsible water management). The cost of preserving groundwater (including meter reading and billing) via the basic user charge is the foundational water availability charge that helps make surface water available for permitted use.

# Water Utility Pricing Policy Background

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General approach:

- Charge recipients for benefits received

Taxing and Pricing Concepts:

- Water Pooling: Water is considered a single commodity that contributes to common benefit of users within a zone regardless of cost.
- Water Facilities Cost Pooling: All water supply facilities contribute to common benefit of effective water resources management
- Water Resources Management: Taxing and pricing structures developed to achieve the effective utilization of water resources for present and future populations
- Revenue Pooling: In general, revenues are collected in a common fund and not designated for specific costs

# Water Utility Pricing Policy Background

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## General Framework:

- Four Groundwater Benefit Zones
  - W-2: North County
  - W-5, W-7, & W-8: South County
  - Ability to create new zones or superimpose new zone over existing zones
- Four Customer Classes
  - Groundwater
  - Surface Water
  - Treated Water
  - Recycled Water

# Water Utility Pricing Policy Background

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## General Framework, continued:

- Groundwater & Surface Water Charges
  - Basic User Charge (equal to the Groundwater Production Charge)
    - “For each zone, a basic water user charge is determined for current groundwater and raw surface water users to be applied to the quantities of water used or consumed” (Page 3 of Pricing Policy, Resolution 99-21)
    - Must be “fixed and uniform” for both agricultural water and non-agricultural water
    - Ability to provide incentives/financial assistance to optimize available resources
  - Specific charges for specific benefits (i.e., Surface Water Master Charge)
    - “In addition, users may be subject to specific charges that meet special needs of a group of users, such as water master charges for surface water deliveries...” (Page 3 of Pricing Policy, Resolution 99-21)

# Water Utility Pricing Policy Background 10

## General Framework, continued:

- Costs for Specific Benefits
  - “Whenever costs associated with specific benefits are clearly and easily measurable, those costs shall be charged to the beneficiaries, in accordance with their specific zones of benefit. Where there is a question as to the identity of the beneficiary or the method of measuring the benefit, the allocation of costs should remain flexible and be determined in accordance with accepted practices and sound judgements base on the four water pricing concepts.”



# QUESTIONS



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# Santa Clara Valley Water District

**File No.:** 23-0976

**Agenda Date:** 10/2/2023

**Item No.:** 4.2.

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## **COMMITTEE AGENDA MEMORANDUM Agricultural Water Advisory Committee**

Government Code § 84308 Applies: Yes ☐ No ☒  
(If "YES" Complete Attachment A - Gov. Code § 84308)

### **SUBJECT:**

Flood-Managed Aquifer Recharge (Flood-MAR) Pre-Feasibility Study for Santa Clara County.

### **RECOMMENDATION:**

Receive and discuss the Pre-Feasibility Study for a Flood-MAR Program in the Santa Clara Valley Water District Service Area, Santa Clara County, CA.

### **SUMMARY:**

For decades, the Santa Clara Valley Water District (Valley Water) has been implementing managed aquifer recharge (MAR) using imported surface water supplies from the Bay-Delta watershed and local surface water supplies captured in 10 surface water reservoirs. Between 2000 and 2019, Valley Water MAR averaged almost 90,000 acre-feet of water per year countywide. Given future uncertainties with climate change and regulations related to local and imported surface water supplies, the Water Supply Master Plan 2040 (Master Plan) recommends evaluating approaches for mitigating the potential loss of supplies. The Master Plan has a suite of conservation and stormwater capture projects, referred to as the "no regrets package," that the Valley Water Board of Directors (Board) approved for further planning and evaluation. One of the "no regrets" projects is Flood-MAR, which uses flow and/or infrastructure modifications to capture and infiltrate high-magnitude or excess surface water flows on open space, such as agricultural or other working lands.

Valley Water is interested in whether Flood-MAR can enhance water supply while also providing co-benefits related to watershed stewardship. Valley Water has contracted with UC Water, a team of researchers from across the University of California system, to conduct a pre-feasibility study (study) on Flood-MAR implementation in Valley Water's service area (Attachment 1). The study has two interrelated tasks: Task 1 evaluates economic, management, legal, and policy issues related to implementing Flood-MAR, whereas task 2 develops a mapping tool to preliminarily screen potentially suitable Flood-MAR sites for further evaluation.

Pilot Flood-MAR projects in California have primarily been single projects conducted by smaller

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agencies and private landowners. Since Valley Water may not have direct control of lands that present good recharge opportunities, a Flood-MAR program could support effective implementation of projects on non-Valley Water property through incentive structures, project development, and oversight to ensure expected benefits are attained. Given Valley Water's size and range of responsibilities, the program would require careful planning and implementation to ensure incentives are properly developed and implemented, regulations are followed, program staffing and coordination is efficient, and water supply benefits are accurately tracked.

The study identified three types of Flood-MAR projects that are being piloted in other parts of California and their potential viability in Valley Water's service area:

- 1) Active diversion of high magnitude streamflow: diverts unappropriated flows onto agricultural fields or other open space.
- 2) Floodplain restoration: reclaims large floodplains without harming adjacent public or private interests
- 3) Hillslope runoff capture: captures hillslope runoff downstream of existing reservoirs or in unregulated watersheds and infiltrates the runoff on adjacent agricultural fields or other open space.

Given the geography and hydrology in Valley Water's service area, hillslope runoff capture projects will likely be the most feasible for Valley Water. Unlike other areas of California, where large Flood-MAR projects may have a significant water supply benefit (thousands of acre-feet per year), individual hillside runoff projects are expected to provide lower volumes of recharge (e.g., tens to hundreds of acre-feet per year). Therefore, Flood-MAR would likely provide a relatively small recharge benefit compared to Valley Water's existing MAR program. Other benefits of well-placed hillslope runoff Flood-MAR could also include diversifying surface water supplies, improving surface water quality, maintaining or improving groundwater quality, and/or improving habitat quality.

Key findings related to potential Flood-MAR program development include:

- A third-party entity that supports landowner outreach, project-level water accounting, and monetary incentive calculations could improve stakeholder communication and maintain trust between Valley Water and landowners.
- Recharge Net Metering (ReNeM) is a rebate-based incentive structure currently being piloted in the Pajaro Valley. However, institutional differences may affect ReNeM's viability in Valley Water's service area. For example, groundwater pumping fees for agricultural water users are almost an order of magnitude higher in the Pajaro Valley (~\$263 per AF) than in Valley Water's service area (~\$37 per AF), reducing the potential motivational power of a rebate on pumping fees. In addition, Valley Water would need to evaluate whether such a rebate is consistent with legal requirements such as the District Act and Proposition 26.
- Given that Valley Water manages the groundwater and has extensive experience managing surface water rights, and because the landowner will not have rights to the recharged water, when water rights are necessary, Valley Water should consider being the water rights applicant and manager for individual Flood-MAR projects.

The study also analyzed spatial data from Valley Water's service area using a mapping tool to identify

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locations having multiple favorable conditions that could indicate Flood-MAR suitability. The preliminary suitability map is based on surface and subsurface conditions that affect runoff, infiltration, and recharge. The current tool does not account for land cover type or source water availability, which are also important considerations for overall Flood-MAR suitability. The suitability map is a dynamic, living tool that will continue to be updated as new data become available, including land cover and hydrology data.

The preliminary suitability map indicates there may be land areas within the Santa Clara and Llagas subbasins that have physical conditions potentially favorable for Flood-MAR (Attachment 1). Potentially favorable locations will require further evaluation using the mapping tool to examine water source availability and landcover suitability. Further, the suitability map is based on regional data and therefore, potential Flood-MAR implementation at individual sites would depend on additional feasibility considerations, such as a field survey confirming recharge capability and evaluating soil contaminant load, design and construction costs, permitting, source water, participation incentives, and landowner interest.

#### Next Steps

The results of the pre-feasibility study indicate a Flood-MAR program may be viable for Valley Water, though it will provide a relatively small water supply benefit and will need to navigate key uncertainties regarding permitting, water rights, water supply benefit, and incentive structure. To begin addressing those uncertainties, staff will begin developing a pilot Flood-MAR program structure at Valley Water. Developing a Flood-MAR program includes activities such as developing eligibility criteria, incentives, and water supply benefit accounting. In addition, staff will add a hydrology component to the mapping tool to refine the identification of suitable areas for hillslope runoff capture. An enhanced mapping tool coupled with a pilot program will enable Valley Water to identify potential locations and partners for a pilot project. The costs and benefits associated with individual projects, along with the county-wide cost and benefit potential, will be a key consideration in determining whether to recommend converting the pilot program into an official Valley Water program. Based on projects completed in the Pajaro Valley Water Management Agency service area, each project site implementation could cost hundreds of thousands of dollars.

Valley Water is actively pursuing grant funding to support the pilot program. In early 2023, Valley Water received a \$350,000 grant from the Pajaro River Watershed Integrated Regional Water Management Group Proposition 1 funding. Valley Water will use this grant funding to develop the pilot Flood-MAR program. Valley Water expects Flood-MAR implementation projects may be competitive in future State grant solicitations since Governor Newsom's California Water Plan identified Flood-MAR as an important tool for securing California's water future.

Staff will provide regular updates on the Flood-MAR pilot program development to the Agricultural Water Advisory Committee, Water Conservation and Demand Management Committee, and the Environmental and Water Resources Committee.

#### **ENVIRONMENTAL JUSTICE IMPACT:**

There are no Environmental Justice impacts associated with this item.

**ATTACHMENTS:**

Attachment 1: Flood-MAR study report

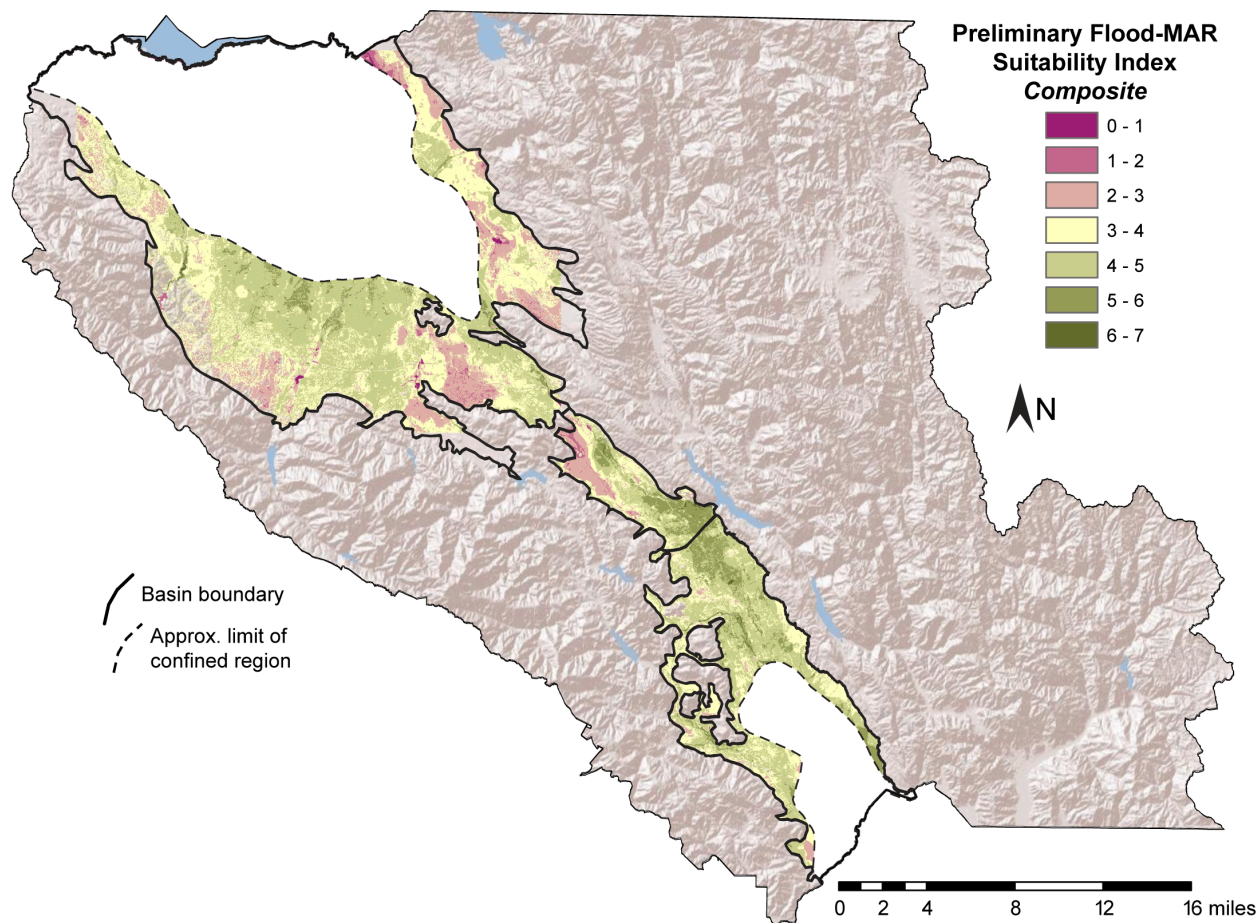
Attachment 2: PowerPoint Presentation

**UNCLASSIFIED MANAGER:**

Kirsten Struve, 408-630-3138



## Pre-Feasibility Study for a Flood-MAR Program in the Santa Clara Valley Water District Service Area, Santa Clara County, CA



### Water Resource Innovation Partnership (WRIP)

Award A4412X to the University of California (UC Water)

**Final:** 17 July 2023

A. T. Fisher<sup>1</sup>, N. Green Nylen<sup>2</sup>, J. Pensky<sup>1</sup>, M. Bruce<sup>2</sup>, M. Kiparsky<sup>2</sup>, V. Bautista<sup>1</sup>,  
E. Kam<sup>1</sup>, N. Santos<sup>3</sup>, J. Viers<sup>3</sup>, A. Rallings<sup>3</sup>, G. Fogg<sup>4</sup>

<sup>1</sup> Earth and Planetary Sciences Department, University of California, Santa Cruz, CA 95064

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<sup>4</sup> Department of Land, Air, and Water Resources, University of California, Davis, CA, 95616

# Executive Summary

Flood-managed aquifer recharge (Flood-MAR) collects and infiltrates high-magnitude or excess surface water flows on agricultural lands or other working or open landscapes. UC Water has partnered with Santa Clara Valley Water District (Valley Water) to explore the potential for implementing Flood-MAR in Valley Water's service area to support the augmentation of water supplies in Valley Water groundwater recharge zones.

This report provides both a high-level evaluation of options and considerations for Flood-MAR in Valley Water's service area and a mapping tool to support preliminary evaluation of potential Flood-MAR locations. The evaluation of options and considerations suggests that small, distributed recharge projects which collect and infiltrate local hillslope runoff from heavy rain events may be the most feasible types of Flood-MAR projects for Valley Water to focus on initially. Individually, these projects would contribute small water supply benefits relative to Valley Water's existing managed aquifer recharge (MAR) program. However, they could also help diversify Santa Clara County's water supplies, slow and infiltrate stormwater runoff, maintain or improve groundwater quality, and provide ecosystem benefits.

The report articulates key questions Valley Water will want to assess to determine whether Flood-MAR is legally, administratively, institutionally, and technically viable; identifies potential pathways for answering those questions; and provides recommendations for next steps for exploring Flood-MAR implementation in Valley Water's service area.

## Options and considerations for a Flood-MAR program

We evaluated the potential for a programmatic approach to Flood-MAR, as compared to developing Flood-MAR through a series of one-off projects. A Flood-MAR program would support short- and long-term planning, information gathering, and evaluation and enable ongoing adjustment of both individual projects and Valley Water's Flood-MAR strategy. Because Valley Water may not have direct control of lands that present the best opportunities for Flood-MAR, a program could support effective implementation of projects on non-Valley Water property, including by providing appropriate incentive structures and oversight to ensure that Flood-MAR projects individually and collectively meet expectations. A programmatic structure would also support internal collaboration within Valley Water, foster economies of scale, leverage dispersed institutional expertise, and house institutional memory relevant to Flood-MAR.

Building an agency-scale Flood-MAR program at a large and complex agency like Valley Water would be a novel and ambitious approach. **Table ES-1** summarizes considerations for developing a Flood-MAR program within Valley Water and related questions, grouped into three main categories: (1) program goals and objectives, (2) internal program support, and (3) program functions. Some considerations are likely shared with other Valley Water programs, enabling Valley Water to straightforwardly leverage existing expertise in the Flood-MAR context, whereas other considerations will require innovation.

We examined three types of Flood-MAR projects and their potential viability in Valley Water's service area:

- 1) Flooding agricultural fields or other open space with high-magnitude streamflows,
- 2) Floodplain restoration, and



- 3) Distributed recharge projects that collect and infiltrate local hillslope runoff resulting from heavy precipitation events.

Given the geography, hydrology, and existing utilization of other types of MAR in Valley Water's service area, distributed recharge projects that collect and infiltrate hillslope runoff are likely the most promising type of Flood-MAR for Valley Water to focus on initially, allowing relatively rapid progress and implementation. Individual hillslope runoff projects are expected to provide lower volumes of recharge (tens to hundreds of acre-feet per year) than the large Flood-MAR projects (providing water supply benefits of thousands of acre-feet per year) that may be more feasible in other parts of California. Therefore, Flood-MAR would likely provide a relatively small additional water supply benefit compared to Valley Water's existing MAR program. However, Flood-MAR projects that collect and infiltrate hillslope runoff could also benefit Santa Clara County by diversifying water supplies, slowing and infiltrating stormwater runoff during major rain events, maintaining or improving groundwater quality, and supporting groundwater dependent ecosystems (including by increasing baseflow to rivers and streams).

Additional key points and findings include the following:

- Valley Water's existing MAR facilities already occupy many of the best recharge sites in Santa Clara County (County), and their recharge capacity exceeds the volume of water available for recharge from Valley Water's traditional sources in many years. However, the mapping tool discussed below indicates there may be areas suitable for Flood-MAR, pending further evaluation.
- If Valley Water pursues distributed Flood-MAR projects that collect and infiltrate local hillslope runoff, organizing Flood-MAR efforts at a programmatic level will likely be more efficient and effective than pursuing individual projects with less coordination.
- Valley Water could partner with other landowners and managers to develop Flood-MAR projects, a process it could facilitate with incentives.
- One potential model for providing incentives for Flood-MAR implementation is Recharge Net Metering (ReNeM), a rebate-based incentive structure developed through a collaborative effort in nearby Pajaro Valley. However, differences in the physical and institutional contexts of the two areas may affect the potential viability of a ReNeM-like incentive structure for Flood-MAR in Valley Water's service area. For example, groundwater production charges for agricultural water users are more than seven times higher in the Pajaro Valley (~\$282 per AF) than in Valley Water's service area (~\$37 per AF), reducing the potential motivational power of a rebate on those charges.
- Most permitting needs for Flood-MAR projects, summarized in **Table ES-2**, will likely be familiar to Valley Water because of its extensive experience with MAR implementation. However, Valley Water would need to decide how to address permitting needs for small Flood-MAR projects that are distributed across its service area on non-Valley Water property. Valley Water may be best positioned to pursue most permits and other regulatory approvals for such projects.
- It may make sense for Valley Water, rather than individual landowners, to apply for any necessary water right permits for Flood-MAR projects, including those on private land.

These institutional findings support, and are supported by, a Flood-MAR suitability mapping tool and related analysis.

## **Pre-feasibility analysis of surface and subsurface suitability for Flood-MAR**

To support Valley Water in identifying the potential for Flood-MAR within its service area, UC Water also developed a mapping tool to identify areas that may be suitable for Flood-MAR, pending further evaluation. The mapping tool uses multi-criteria decision analysis (MCDA) with spatial data from the Valley Water service area to identify locations with multiple favorable conditions that could justify Flood-MAR development. MCDA is a decision-making approach that evaluates several factors (criteria) together to aid consideration of alternatives.

The mapping tool is based mainly on five data coverages (**Figure ES-1A**):

- Three data sets showing surface conditions throughout Santa Clara County: soil infiltration capacity, land use/land cover, and shallow geology; and
- Two data sets showing subsurface conditions within three groundwater management areas: vadose zone thickness (the depth of the unsaturated zone that extends from the land surface down to the groundwater table) and climate sensitivity of groundwater levels.

Other datasets incorporated as part of the mapping tool include surface slope, aquifer properties (as applied in regional groundwater models), water quality, locations of operating managed recharge systems, and areas designated as "open space." These and other datasets can be used to filter results from an initial screening (for example, removing sites that are too steep for infiltration for Flood-MAR) or can help prioritize potential project sites for field investigation.

Sites with the highest Flood-MAR suitability tend to be located where multiple criteria are satisfied: on old stream channels, on or near active (although often ephemeral) stream channels, and on other coarse Quaternary fluvial and alluvial deposits; where land is undeveloped, has low-intensity development, or is used for agricultural activities; where there is a vadose (unsaturated) zone 20-100 ft thick; and where there have been large differences in groundwater levels during dry climate periods compared to wet periods. Areas with potentially favorable Flood-MAR conditions are found throughout the project region, suggesting that some distribution of benefits may be possible, depending on additional considerations including design and construction costs, permitting, available water supplies, incentives for participation, and landowner interest.

The areas with the most favorable conditions for Flood-MAR, based on this pre-feasibility assessment, include (**Figure ES-1B**):

- Santa Clara Plain - along the western and southern margins of the basin, around and outside of the region generally dominated by confined conditions.
- Coyote Valley - along the southern and eastern half of the basin, particularly along active and old stream channels and other stream deposits.
- Llagas Subbasin - in the northern half and along the western margin of the subbasin, particularly where fluvial deposits cut across areas having finer soils.

This pre-feasibility assessment is designed to be used by Valley Water as a screening tool and guide, not as an absolute assessment upon which final decisions are based. There are multiple steps that Valley Water may find useful in advancing Flood-MAR efforts in this region, several of which could be advanced simultaneously or in close succession:

- Assess drainage areas and runoff generation to identify sites that may produce adequate hillslope runoff to support Flood-MAR projects that collect and infiltrated local hillslope runoff resulting from heavy precipitation events.
- Extend the MCDA by incorporating more existing datasets and/or by updating existing coverages or adding new coverages.
- Use the existing MCDA to identify potential field sites, advancing the effort towards quantitative feasibility assessment of specific project options.
- For potential Flood-MAR sites that pass a desktop analysis, conduct a field assessment to identify areas that prove to be more favorable based on observed, local conditions. Field assessment can include one or more of these approaches:
  - Conduct geophysical surveys using electrical, radar, and/or seismic methods and/or exploratory drilling to collect geotechnical data and/or continuous cores.
  - Monitor rainfall on site and in areas contributing to drainage, and potentially measure runoff if channelized flow occurs, to better understand local patterns and magnitudes, with comparison to historic records.
  - Sample local wells, with relatively high temporal and spatial resolution, to understand local groundwater quality and variability of quality.
  - Test local infiltration conditions at a plot to field scale.
  - Estimate project cost based on expected size, method to be used for collection/retention, and other engineering and institutional considerations.

## **A path forward**

There is statewide consensus that enhancing recharge could benefit many parts of California, and there are working examples of successful Flood-MAR projects. This study looked at the preliminary feasibility of Flood-MAR within Santa Clara County for expanding the County's recharge capacity. Flood-MAR could be a useful complement to the variety of tools and methods Valley Water currently uses to manage resources for its large and heterogeneous service area. Advancing a Flood-MAR program could help Valley Water stay at the forefront of innovation and stewardship, contribute to resource resilience, and address future water management challenges. Valley Water's existing MAR systems provide an average of 90,000 acre-feet of recharge per year, and related pond sets have capacity to recharge 1,500 to 7,700 acre-feet per year. Flood-MAR projects that collect hillslope runoff in other parts of California generate <1,000 acre-feet per year of annual recharge per site; while smaller in magnitude, such projects could augment Valley Water's existing MAR program. Flood-MAR remains developmental in many ways, requiring creativity, care, and persistence to implement successfully.

In summary, our findings suggest both that a Flood-MAR program may be institutionally viable for Valley Water and that physical potential for Flood-MAR may exist within Valley Water's service area. We present a set of tools Valley Water can use and suggest other actions it can take to further investigate Flood-MAR feasibility. Positive indications of institutional viability and Flood-MAR suitability will be necessary at each stage to justify Valley Water's continued exploration of Flood-MAR. We find both at this pre-feasibility stage.

**Table ES-1.** Preliminary assessment of considerations for implementing a Flood-MAR program in Santa Clara County, assuming an initial focus on distributed recharge projects that collect hillslope runoff.

PROGRAM GOALS AND OBJECTIVES	
What primary benefits are sought?	Enhancing water supply, advancing stakeholder engagement, and supporting climate change adaptation and resilience
What incidental benefits / co-benefits are sought, or would be desirable?	Reducing flood risk, preserving working landscapes, enhancing riparian habitat, maintaining / improving groundwater quality, and minimizing land subsidence potential
What negative impacts must be avoided?	Harm to fish/ecosystems, flooding, and property / infrastructure damage
What specific objectives would the program work towards in the short (and longer) term?	Developing appropriate incentive structures, legal / regulatory compliance support, and oversight for distributed projects
INTERNAL PROGRAM SUPPORT	
Where could the program reside in Valley Water?	Water Supply Planning and Conservation Unit (lead)
Who else would be involved internally?	Likely: staff from Groundwater Management Unit; Raw Water Operations Unit; Raw Water Field Operations & Pipeline Maintenance Unit; Hydrology, Hydraulics, and Geomorphology Unit; Watershed Policy and Planning Unit; Environmental Planning Unit; Financial Planning and Revenue Unit; Communications Unit; Treasury-Debt Management Unit; Office of the District Counsel; and related capital program design and implementation units
How would the program be funded?	Likely revenue from water charges, grant funding, and other appropriate Valley Water sources
PROGRAM FUNCTIONS	
<b>1. Assessing source water options and availability</b>	
When/where do high-magnitude flows occur in Valley Water's service area, and how are they expected to change in the future?	Hillslope runoff during heavy precipitation events, downstream of existing reservoirs and in unregulated watersheds (expected to increase in the future)
What flow / other requirements may affect the viability of potential source waters?	Valley Water's Fish and Aquatic Habitat Collaborative Effort (FAHCE) Program, Lake and Streambed Alteration Agreements (LSAAs), downstream water rights, fully appropriated stream system (FASS) designations, etc.
What storage / conveyance infrastructure would be needed to move potential source waters to potential recharge locations?	Ditches and culverts for collecting and conveying hillslope runoff to dedicated infiltration basins or lands, stream diversions for diverting flood water to off-stream lands
What legal permissions would be needed to access potential water sources?	Likely water right permits for capturing hillslope runoff, LSAAs and water rights for stream diversions, and related agreements with participating landowners / managers
<b>2. Assessing areas suitable for recharge and recharge options</b>	
What areas have moderate-to-high surface and subsurface suitability for Flood-MAR?	Areas with Flood-MAR Suitability Index $\geq 4$ in the site-suitability tool (confirm through field investigation)

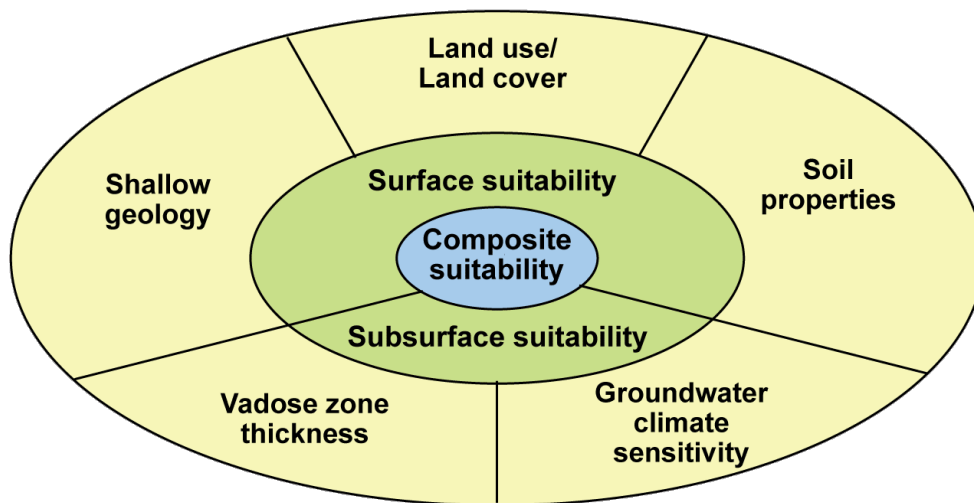
Which of these areas have compatible current land uses?	See site-suitability tool land use/land cover data set, other data to assess risks/benefits related to flooding, habitat, water quality
What are the water quality implications of recharging water in these areas?	Assess by comparing quality / contaminant profile data for potential source waters, soil / vadose zone, and groundwater
Which types of Flood-MAR projects, using which potential water sources, would be useful and feasible in these areas?	Initially, focus on distributed recharge projects that collect hillslope runoff and infiltrate it in dedicated recharge basins; but assess potential for other types of projects / water sources
<b>3. External coordination and engagement needs</b>	
Who owns and manages the land in potential recharge areas?	Private parties, especially growers, and other public agencies
Who holds or might be involved in acquiring water rights to potential water sources?	Valley Water may be best positioned to apply for water right permits from the State Water Resources Control Board (with landowner cooperation), especially to collect hillslope runoff
Who might be involved in acquiring other necessary permits and approvals?	Likely Valley Water (with cooperation from landowners, land managers, consultants, construction contractors, and others)
Who else might be interested in or be affected by Flood-MAR implementation?	Nearby landowners / tenants, downstream surface water users, domestic well users/groups, non-government organizations (NGOs), wildlife/other agencies
What partnerships, coordination, and other outreach/engagement will be needed to effectively implement / fund the program?	Potentially: private landowners/tenants, Santa Clara Valley Open Space Authority (OSA), Peninsula Open Space Trust (POST), Guadalupe-Coyote Resource Conservation District (GCRCD)
<b>4. Incentives for Flood-MAR implementation on non-Valley Water property</b>	
For what purposes might incentives be helpful or necessary?	To encourage recharge projects on non-Valley Water property.
What forms could incentives take?	Multiple options could be considered: direct payment, rebate, funding construction / land rental, and support for maintenance
What size / type of incentive may be needed to encourage sufficient participation?	Not clear; will require evaluation of interest, motivation, and other factors for potential program participants
How would incentives be administered?	Valley Water or a third-party certifier could administer incentives
<b>5. Legal and regulatory compliance</b>	
How would the program support / coordinate / fund permitting for Flood-MAR projects?	Valley Water may be better positioned to apply for water rights and other permits than individual landowners.
What level of environmental review would be required to support projects?	Projects may be eligible for CEQA suspension under Executive Order B-39-17 or Executive Order N-7-22.
What water rights would be needed to access potential water sources?	Temporary permits (180-day, 5-year) to support pilot efforts, standard permits for long-term operations.
What water quality permits / other approvals would projects need?	Potentially: NPDES Construction General Permit + Stormwater Pollution Prevention Plan, Section 404 permit, Section 401 Water Quality Certification
What species and ecosystem protections would affect projects?	Potentially: FAHCE, Lake and Streambed Alteration Agreements (LSAAs), CESA Incidental Take Permits, ESA Section 7 compliance
What cultural resources might be affected?	Depends on site (National Historic Preservation Act Section 106)

What other local, state, or federal permits or requirements might apply?	Santa Clara County Grading Permit, Valley Water District Act requirements
How would the program affect Valley Water's ability to meet its own statutory responsibilities and other legal obligations?	TBD — Would help meet SGMA requirements for sustainable groundwater management; projects could be selected to help meet FAHCE Settlement Agreement obligations
What funding sources are legally appropriate for Flood-MAR projects?	TBD — Would need to discuss with District Counsel's office and Finance
<b>6. Tracking, oversight, evaluation, and adjustment</b>	
How would the program provide effective oversight of Flood-MAR projects?	TBD — Would need to track project level recharge/infiltration effectiveness, water quality impacts, other benefits and risks
How would the program track its overall progress and effectiveness?	TBD — Would need to track program-level recharge/infiltration effectiveness, water quality impacts, other benefits and risks
What would happen if / when a project does not meet expectations?	TBD — Would need to require corrective measures when recharge is ineffective or the project creates substantial risks
How would the program learn / adjust?	TBD — Would need clear mechanisms for adaptive management

**Table ES-2.** Potential permitting and regulatory compliance needs for Flood-MAR projects

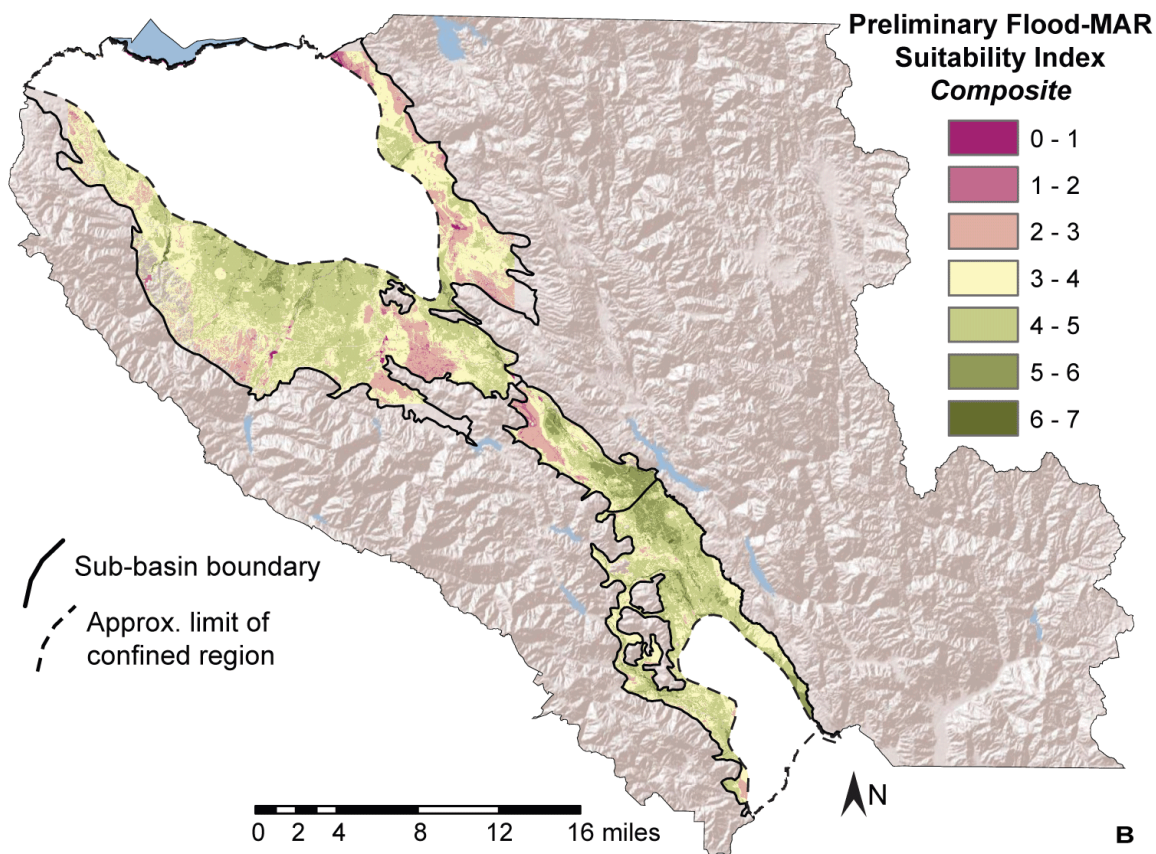
Category	Permit or approval	Agency	Applicability
<b>Environmental review</b>	CEQA compliance <i>Initial Study → (Mitigated) Negative Declaration or Environmental Impact Report</i>	Lead Agency	The project has the potential to affect the environment.
<b>Water rights</b>	Temporary water right permit –180-day or 5-year	State Water Resources Control Board: Division of Water Rights	The project involves temporary diversion and beneficial use of surface water (e.g., for pilot or while standard permit is pending).
	Standard water right permit	State Water Resources Control Board: Division of Water Rights	The project involves long-term diversion and beneficial use of surface water.
<b>Water quality</b>	CWA Section 401 Water Quality Certification	State Water Resource Control Board / Regional Water Quality Control Board	The project involves a federal permit or license for an activity that may result in a discharge of dredged or fill material into waters of the United States.
	CWA Section 404 Permit	U.S. Army Corps of Engineers	The project involves discharge of dredged or fill material into waters of the United States
	NPDES Construction General Permit + Storm Water Pollution Prevention Plan	State Water Resource Control Board / Regional Water Quality Control Board	The project disturbs one (1) or more acres of soil.
<b>Species / ecosystems</b>	Section 1602 Lake and Streambed Alteration Agreement (LSAA)	California Department of Fish and Wildlife	The project involves streambed alteration.
	CESA Section 2081 Incidental Take Permit	California Department of Fish and Wildlife	The project may affect state-listed species.
	ESA Section 7 compliance	U.S. Fish and Wildlife Service / National Marine Fisheries Service	The project involves a federal permit or license for an activity that may affect federally listed species.
<b>Historic preservation</b>	National Historic Preservation Act Section 106 compliance	State Office of Historic Preservation	The project involves construction near cultural resources.
<b>Grading</b>	Grading Permit	Santa Clara County	The project involves grading.





**Assessment of suitability for Flood-MAR using stormwater**

**A**



**Figure ES-1. A.** Overview of approach taken to combine factors for evaluation of suitability for Flood-MAR projects in Santa Clara County, using a geographic information system. The primary analysis used five factors, each weighted 20%. An alternative analysis added subsurface properties as used in regional groundwater models. **B.** Preliminary Flood-MAR suitability based on surface and subsurface factors, with values  $\geq 4$  indicating moderate to high suitability. White polygons with dashed boundaries denote areas having confined groundwater conditions.



# Acknowledgements

This work was completed as part of the Water Resource Innovation Partnership (WRIP) between the University of California (UC) and Valley Water. UC participants are grateful to the many Valley Water personnel who contributed to this effort, including regular meetings and administrative oversight, review and preparation of datasets that were subsequently incorporated into the GIS, and Valley Water-UC workshops to exchange information, ideas, and opinions. The following individuals contributed to this effort, but UC personnel take responsibility for errors in fact or interpretation that may be found. We are especially grateful to S. Greene and J. Gurdak, who were primary technical and administrative leads, meeting with UC personnel on a regular basis, coordinating data delivery, explaining how Valley Water operates and introducing us to colleagues, discussing issues and interpretations in detail, and providing editorial guidance. K. Struve, A. Fulcher, B. Kassab, and E. Olson of Valley Water provided valuable technical and editorial feedback. V. de la Piedra helped to develop the WRIP and participated in numerous discussions, and C. Abuye and N. Murphy provided important data and editorial suggestions, and R. Harmon gave advice on data processing. Additionally, UC colleagues and Pajaro Valley Water Management Agency (PV Water) personnel shared insights and experiences that informed the report's findings. This work was supported by Valley Water (Contract #A4412X), the Gordon and Betty Moore Foundation (Award #9956), USDA/NIFA (Award #2021-67019-33595) and The Recharge Initiative ([www.rechargeinitiative.org](http://www.rechargeinitiative.org)).

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# I. Introduction

## A. Background and motivation

Groundwater resources in California are increasingly stressed by rising demand, a changing climate, and shifting land use. Groundwater basins in central California are particularly vulnerable to growing groundwater demand and decreasing supply. Climate change is increasing both drought frequency and rainfall intensity. Urbanization and agricultural development tend to route water quickly off the landscape, limiting opportunities for infiltration and recharge, and long-term agricultural, industrial, and municipal needs are growing.

To help address these challenges, California's 2014 Sustainable Groundwater Management Act (SGMA) requires priority groundwater basins across the state to form groundwater sustainability agencies (GSAs), develop groundwater sustainability plans (GSPs), and implement practices to help maintain the supply and quality of water resources for coming generations. Santa Clara Valley Water District (Valley Water) is the GSA for the groundwater subbasins in Santa Clara County, which include the Santa Clara and Llagas subbasins. Both subbasins are listed as high priority by the Department of Water Resources (DWR). Valley Water has conjunctively managed groundwater and surface water in these basins for many decades.

The primary goal of this project is to explore the potential for implementation of flood-managed aquifer recharge (Flood-MAR) in Valley Water's service area to augment water supplies and provide additional benefits. In this report, we provide both a high-level evaluation of options and considerations for Flood-MAR in Valley Water's service area and a mapping tool to support preliminary evaluation of potentially suitable locations for Flood-MAR implementation. The report articulates key questions Valley Water will want to assess to determine whether a Flood-MAR program is legally, administratively, institutionally, and technically viable; identifies potential pathways for answering those questions; and provides recommended next steps for exploring Flood-MAR implementation in Valley Water's service area.

## B. What is Flood-MAR?

Boosting groundwater recharge can help California communities make the most of increasingly variable precipitation and surface water resources.<sup>1</sup> Managed aquifer recharge (**MAR**) is a strategy that can improve both the supply and quality of groundwater<sup>2</sup> by routing excess surface water into aquifers using a variety of techniques. MAR intentionally replenishes aquifers for later recovery and use or to achieve other benefits.<sup>3</sup> Today, MAR is playing a growing role in maintaining groundwater as an effective drought reserve and in slowing or reversing the effects of years of unsustainable groundwater pumping.<sup>4</sup> However, as climate change stretches the limits of California's surface water storage and conveyance systems, making MAR even more imperative, finding suitable sources of water for recharge can be challenging.

Therefore, water managers are increasingly looking for underutilized water sources to support recharge. High-magnitude surface water flows that result from heavy precipitation events, mostly during the wet season, are expected to increase with continued climate change.<sup>5</sup> In many stream systems, these flows remain unappropriated (not already spoken for under existing water rights). They have historically been considered a nuisance or hazard, rather than a potentially

useful water source. Therefore, most existing water infrastructure was not designed to retain these flows. They occur less frequently, sometimes with little warning, and capturing and storing sudden large volumes of water in surface reservoirs can be difficult and risky.

Flood-MAR aims to prepare for—and capitalize on—opportunities to collect and infiltrate high-magnitude surface water flows. **Box 1** explains how the State of California defines Flood-MAR. Essentially, Flood-MAR is multi-benefit MAR that can aid in flood-risk reduction and involves agricultural lands or other working landscapes. This broad definition encompasses a wide range of recharge-related activities, including flooding agricultural fields with high-magnitude streamflows during the wet season, floodplain restoration, and distributed recharge projects that collect and infiltrate hillslope runoff during heavy rainfall events.

### **Box 1. Flood-MAR defined**

The California Department of Water Resources (DWR) defines Flood-MAR as “an integrated and voluntary resource management strategy that uses flood water resulting from, or in anticipation of, rainfall or snow melt for managed aquifer recharge...on agricultural lands and working landscapes.”<sup>6</sup> DWR described the contours of Flood-MAR more fully in a 2018 white paper,<sup>7</sup> including the following key details:

- **Flood-MAR uses “flood water”** — DWR’s conception of “flood water” includes both (1) “high flows resulting from the largest annual precipitation...or snowmelt events typically during the winter and spring” and (2) “flows released from flood control reservoirs ahead of rain or snowmelt to evacuate additional flood control space” when those flows are “above regulatory instream flow requirements.” “Flood water” is a broad category that potentially encompasses non-urban stormwater. In fact, DWR describes Flood-MAR as “similar in concept to [urban] stormwater capture and reuse programs currently employed in many areas across the State.”
- **Flood-MAR involves agricultural lands or working landscapes** — “Flood-MAR focuses on the ability to use direct spreading on large acreages of active agricultural land, fallowed land, working landscapes, dedicated recharge basins (new or existing), or open space. For active farmland, recharge water is anticipated to be applied during the non-irrigation season, using existing or additional irrigation equipment or conveyance facilities.” DWR notes that working landscapes that may be suitable for Flood-MAR include, but are not limited to, “refuges, floodplains, and flood bypasses.”
- **Flood-MAR can be implemented at multiple scales** — “Flood-MAR can be implemented at multiple scales, from individual landowners diverting flood water with existing infrastructure, to using extensive detention/recharge areas and modernizing flood protection infrastructure/operations.”
- **Flood-MAR is an integrated, multi-benefit adaptation strategy** — Flood-MAR involves “better integration of flood and groundwater management” and is inherently “multi-benefit—providing flood risk reduction, drought preparedness, aquifer replenishment, ecosystem enhancement, and other potential benefits.” As a result, Flood-MAR is a promising adaptation strategy that can “help address two of the most challenging elements of future climate changes: more flashy/intense flood flows, and longer/deeper droughts.” To fulfill this promise, DWR emphasizes the importance of proactive, strategic, and integrated planning across scales and jurisdictions to ensure that “California’s water systems... are resilient to changing conditions and able to adapt nimbly and dynamically to stressors.”

Flood-MAR can be designed and implemented to achieve a range of desirable benefits like enhancing water supply, reducing flood risk, preserving working landscapes, improving water quality, and mitigating land subsidence.<sup>8</sup> The actual benefits achieved will differ from project to project and will depend on the Flood-MAR approach employed, as well as a host of other site- and project-specific factors.

## **C. Valley Water's setting and interest in exploring Flood-MAR**

Valley Water is responsible for providing clean water, flood protection, and stewardship of streams for more than 2 million residents of Santa Clara County (**Figure I-1**). Water supplies in Valley Water's service area include groundwater, local and imported surface water, and recycled water. Groundwater pumping accounts for about 40% of water use, and groundwater levels are managed through a MAR program that recharges local and imported surface water supplies. Hydrologic conditions, water resource needs, and considerations for developing projects to enhance water supplies and other resources vary across the service area.

Although Valley Water already has an extensive MAR program, it is interested in understanding the potential for Flood-MAR to enhance water supply and water-supply resilience in Santa Clara County. Valley Water maintains 102 groundwater recharge ponds comprising 285 acres and 98 miles of controlled instream recharge (**Figure I-2**).<sup>9</sup> These recharge facilities have a total potential recharge capacity of about 143,500 acre-feet per year (AFY), although the actual amount recharged rarely approaches this maximum.<sup>10</sup> Valley Water's service area includes three groundwater management areas. In the northern part of Santa Clara County, the Santa Clara Subbasin consists of the Santa Clara Plain and Coyote Valley groundwater management areas; to the south lies the Llagas Subbasin, another groundwater management area (**Figure I-1**). This report refers to the three groundwater management areas as: the Santa Clara Plain, Coyote Valley, and Llagas Subbasin. Between 2010 and 2019, Valley Water's MAR program recharged an average of 88,500 AFY of imported and local surface water, including 53,000 AFY in the Santa Clara Plain principal aquifer, 13,500 AFY in the Coyote Valley, and 22,000 AFY in the Llagas subbasin.<sup>11</sup>

Valley Water defines four primary benefit zones (**Figure I-1B**): designated regions where the agency replenishes groundwater, monitors conditions, and protects groundwater from pollutants. Valley Water collects a groundwater production charge from owners and operators of groundwater wells in the benefit zones to fund agency activities that protect and replenish groundwater supplies.<sup>12</sup> The charge is based on the amount of groundwater pumped and the purpose of use (agricultural or non-agricultural). For fiscal year 2022–2023, agricultural groundwater production charges are \$36.85 per AF in all benefit zones, whereas non-agricultural groundwater production charges, depending on the groundwater charge zone, range from \$368.50 to \$1,724.00 per AF.<sup>13</sup>

Despite a long history of major investments in improving water supply reliability, Valley Water faces water supply challenges during extended droughts, which are expected to become more frequent and intense with continued climate change.<sup>14</sup> Both imported and local surface water supplies are becoming less reliable as increasing precipitation extremes—wet and dry—test the limits of existing surface water storage and conveyance systems. Meanwhile, rising temperatures and a thirstier atmosphere are increasing the amount of water necessary to meet the

same evapotranspiration needs and increasing reservoir evaporation, exacerbating short- and long-term imbalances between water supply and water demand.

To help meet these challenges, Valley Water has commenced planning efforts to pursue a “no regrets” package of water conservation and local stormwater collection and recharge projects it hopes will reduce county-wide water demand by ~10,000 AFY while increasing available water supplies by ~1,000 AFY by 2040.<sup>15</sup> This package could include Flood-MAR. Indeed, among the potential projects discussed in Valley Water’s Water Supply Master Plan are “[f]looding or recharge on South County agricultural parcels during the winter months” targeted to increase supply by approximately 1,000 AFY.<sup>16</sup>

Flood-MAR projects on non-Valley Water land could expand recharge, enhancing water supply in Santa Clara County. Valley Water’s existing MAR projects already occupy most of the best recharge sites on Valley Water property, and their recharge capacity generally exceeds the volume of water available for recharge from Valley Water’s traditional sources during most years. However, there may be areas under private ownership, or under other public agencies’ management jurisdictions, that may be suitable for recharge to take advantage of surface supplies from storms during all year types that are not currently accessible.

Flood-MAR also has the potential to help Valley Water meet other important responsibilities and goals. Depending on the type of project and sites selected, potential incidental or co-benefits of Flood-MAR may include:

- Supporting climate change adaptation,
- Increasing meaningful stakeholder engagement,
- Reducing flood risk,
- Maintaining or improving groundwater quality (especially where nitrate/ salts are a concern),
- Preserving working landscapes,
- Strengthening surface water-groundwater connections by raising groundwater levels in the vicinity of streams (and therefore baseflow),
- Enhancing groundwater dependent ecosystems, potentially including riparian habitat, and
- Minimizing the potential for resumed land subsidence in the Santa Clara Plain.

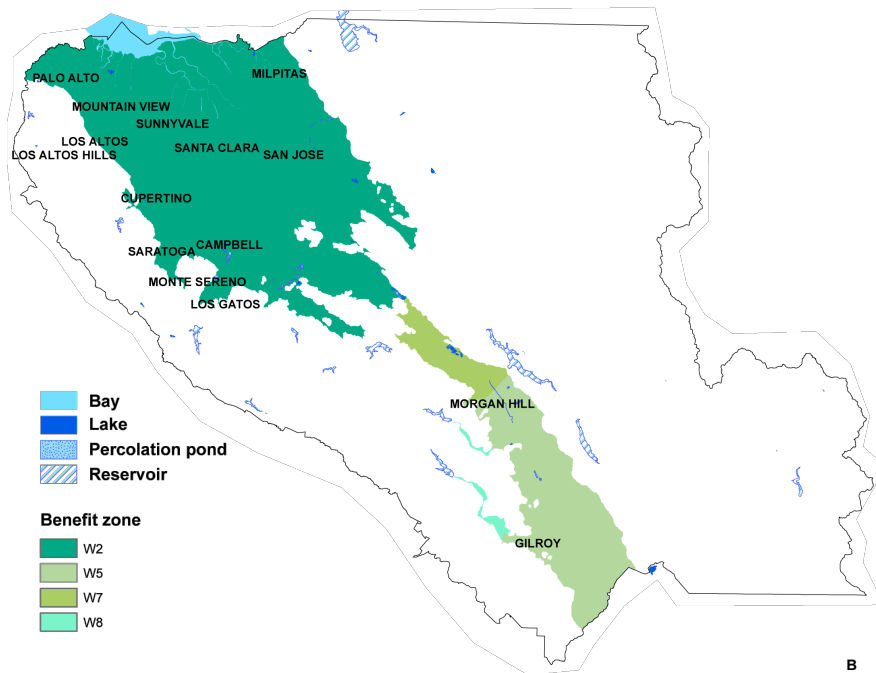
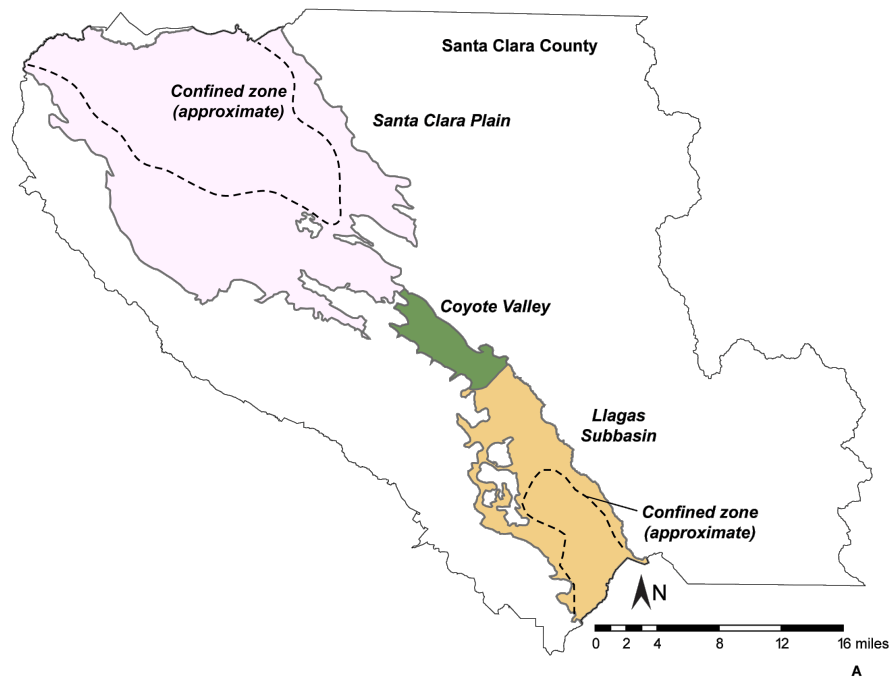
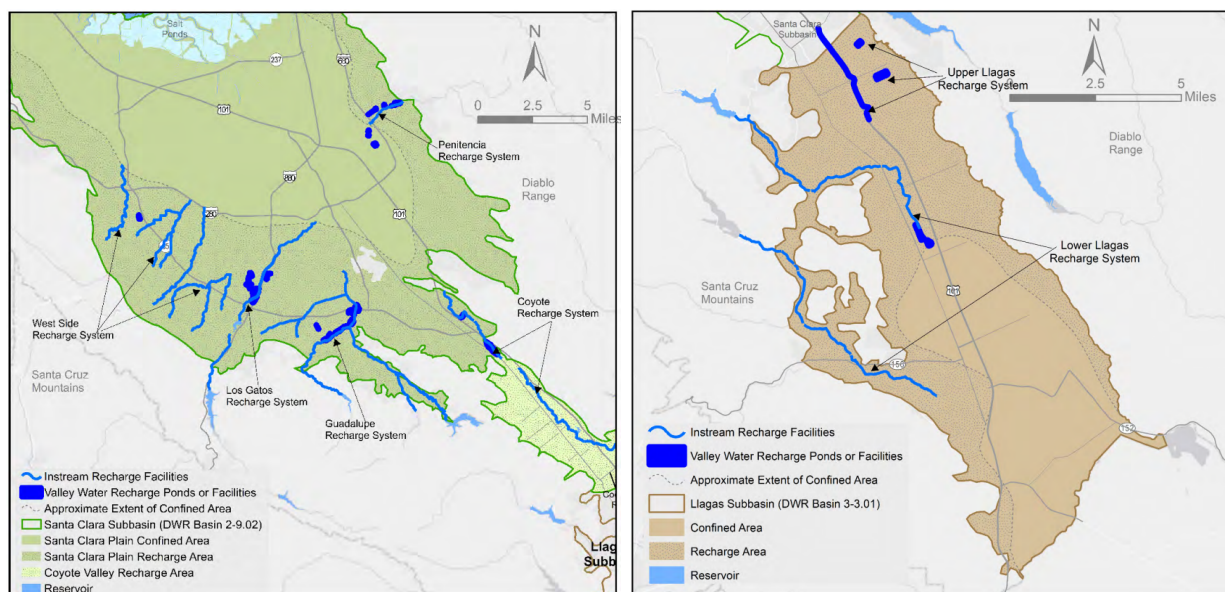


Figure I-1

Figure I-1. Regional map, project area, basins, benefit zones, subregions and features.



**Figure I-2.** Existing MAR facilities in the Santa Clara Subbasin, including the Coyote Valley, on the left, and the Llagas Subbasin, on the right.<sup>17</sup>

## D. Project components and general approach

The Water Resource Innovation Partnership (WRIP) between Valley Water and a team of water researchers from the University of California (UC Water) has completed a pre-feasibility assessment of opportunities to develop a Flood-MAR program to help augment and diversify Valley Water’s managed recharge program while generating additional benefits for the region.

The WRIP included two tasks. Task 1 was a high-level analysis of institutional, economic, management, legal, and policy considerations for a potential Flood-MAR program in Valley Water’s service area. Part II of this report describes the results of that high-level analysis. Task 2 comprised spatial data compilation, interpretation, and analysis to assess where Flood-MAR objectives might be accomplished. The results of this work are summarized in Part III of this report. In addition to this report, our deliverables include a functional geographic information system (GIS) -based tool that can help Valley Water identify promising Flood-MAR sites for further evaluation and support the next stages in feasibility assessment, including evaluating costs, permitting, and other factors related to developing and operating a new program.

Valley Water is rich in data, knowledge, and expertise in groundwater management, including MAR. The WRIP is intended to supplement Valley Water's many capabilities by building capacity and stimulating innovative thinking that can help Valley Water continue to secure and sustain water resources for Santa Clara County into the future.



## **II. Options and considerations for a Potential Flood-MAR Program**

### **A. Utility of a Flood-MAR program**

A Flood-MAR program could be designed to strategically and adaptively steer Flood-MAR efforts in Santa Clara County. Identifying and prioritizing the best opportunities for Flood-MAR will require coordinated consideration of Flood-MAR options, potential collaborators, funding possibilities, and incentives.

For the purposes of this report, we make a distinction between *programs* and *projects*. We define a project as an individual MAR installation such as a defined infiltration basin, along with the defined set of actions that are necessary to successfully implement such an installation, such as planning, design, and permitting. In contrast, we define a program as the institutional umbrella under which a range of related projects could be carried out.

A Flood-MAR program could support short- and long-term planning, information gathering, evaluation, and adjustment. It could guide a modular or phased approach to Flood-MAR implementation that, for example, initially prioritizes certain project types or co-benefits. Because Valley Water may not have direct control of lands that present the best opportunities for Flood-MAR, a program could support effective implementation of projects on non-Valley Water property, including by providing appropriate incentive structures, outreach, and oversight to ensure that Flood-MAR projects individually and collectively meet expectations. A programmatic structure would also support internal collaboration within Valley Water, facilitate outreach and other forms of public engagement around Flood-MAR, foster economies of scale, leverage dispersed institutional expertise, and house institutional memory relevant to Flood-MAR.

To inform potential development of a Flood-MAR program at Valley Water, we use the remainder of Part II to outline three different approaches to Flood-MAR, discuss considerations for developing a Flood-MAR program, and summarize key takeaways regarding options and considerations for Flood-MAR.

### **B. Three approaches considered for Flood-MAR**

We examined three types of Flood-MAR projects and their potential viability in Valley Water's service area:

- 1) Flooding agricultural fields or other open space with high-magnitude streamflows,
- 2) Floodplain restoration, and
- 3) Distributed recharge projects that collect and infiltrate local hillslope runoff resulting from heavy precipitation events.

#### **1. Flooding agricultural fields**

Flooding agricultural fields with high-magnitude streamflows, either local or imported, may be the most widely known approach to Flood-MAR. This approach is a subset of agricultural

managed aquifer recharge (Ag-MAR)— "intentionally flooding fallow, dormant, or active cropland when excess surface water is available."<sup>18</sup> Ag-MAR is the focus of significant ongoing research<sup>19</sup> and is seen as a key tool for addressing unsustainable overdraft in some parts of California, particularly the Central Valley.

Risks to groundwater quality are generally higher for Ag-MAR than for other types of MAR. Ag-MAR has the potential to leach in-use and legacy contaminants (nitrogen, salts, etc.) from current agricultural practices and past agricultural use,<sup>20</sup> in addition to geogenic contaminants such as arsenic,<sup>21</sup> into the underlying groundwater. However, strategic Ag-MAR implementation can reduce water quality risks and even improve groundwater quality. For example, Ag-MAR implementation can prioritize sites where crops had low nitrogen needs, there is low to medium historical nitrogen loading, growers are currently using best practices for managing salts and applying fertilizers and other chemicals, and it is possible to recharge large volumes of relatively clean, high-magnitude flood flows.<sup>22</sup> Where groundwater quality is poor, high-volume Ag-MAR has the potential to actively improve groundwater quality through dilution. Care should be taken to meaningfully include those who could be affected by Ag-MAR in decision making processes. This includes communities that rely on shallow drinking water wells that could benefit from higher groundwater levels or experience negative impacts, such as short- or long-term water quality degradation.<sup>23</sup>

Whether this type of Flood-MAR would be feasible or cost effective in Santa Clara County is unclear. It would rely on diverting high flows from streams and moving that water to appropriate agricultural fields. However, the State currently considers many of the streams in Santa Clara County to be “fully appropriated” (see **Box 2**), which could make establishing new water rights to divert high flows from those streams challenging. Furthermore, Valley Water already has surface storage reservoirs and MAR facilities associated with the County’s most productive watersheds that may be able to accept some high flows.

To better understand the potential utility of this Flood-MAR approach in its service area, Valley Water could explore how often and where unappropriated high streamflows occur within its service area. Depending on the location of a potential Ag-MAR site relative to the source of high streamflows and existing conveyance infrastructure, new permanent or temporary infrastructure may be needed to convey water to it.<sup>24</sup> Existing infrastructure that could, in theory, be used to support Ag-MAR may have limited capacity to carry flood flows, since such infrastructure was generally designed to move and distribute water under more moderate flow conditions to meet irrigation demands. On the other hand, due to the intermittent nature of water availability, it may be cost-effective for some Ag-MAR implementers whose property is close to a source of high flows to rely in part on temporary infrastructure and rented equipment.

**Example:** Terranova Ranch and the larger McMullin On-Farm Flood Capture Expansion Project (McMullin) increase conveyance capacity from the Kings River to farmland, grazing land, and fallow land in an effort to grapple with flooding during times of excess water, augment groundwater recharge and in-lieu recharge across the region, and address the impacts of climate change.<sup>25</sup> Terranova and McMullin target both private and public properties where economic productivity won’t be negatively impacted by temporary flood conditions.<sup>26</sup> As a pilot study, Terranova diverted roughly 14 AF per day to 1,000 acres of farmland growing tomatoes, wine grapes, alfalfa, pistachios, olives, walnuts, and almonds, though McMullin plans to expand the program’s capacity to divert roughly 1,000 AF per day to more than 15,000 acres.<sup>27</sup> Terranova’s estimated costs for the pilot were \$36 per AF.<sup>28</sup>

## 2. Floodplain restoration

Another approach to Flood-MAR is floodplain restoration. Whereas the other two approaches we discuss here involve actively diverting high flows, floodplain restoration projects take a different tack. When portions of artificial levees—constructed to keep flood water out of the floodplain—are removed or set back, high flows can once again access these areas, bringing sediment, nutrients, and water that help to rebuild lost ecosystem function.

Floodplain restoration projects can have a broad suite of potential benefits, including for riparian ecosystems and habitat, and may help reduce downstream flooding. Due to the relatively unconstrained nature of water flow into areas where levees have been removed, it may not be possible to measure the volume of water spread or infiltrated. However, measurements of groundwater levels in nearby wells can be used to derive estimates and demonstrate benefits.

A key consideration for this approach for Valley Water is that much of Santa Clara County is densely populated, so there may be limited areas in which this approach could be used. Valley Water could explore whether there are areas in the County where levees currently exist, levee breaches or setbacks would likely have recharge benefits, and floodplain restoration efforts would be unlikely to exacerbate local flood impacts.

**Example:** The Lower Cosumnes River Floodplain Restoration Project in the eastern Sacramento-San Joaquin Delta alters or removes levees to reintroduce natural flooding regimes and promote habitat restoration and enhancement, though the program previously used active management measures like wetland construction and hand-planting of native plant species.<sup>29</sup> Although recharge is not its primary goal, the 50,000-acre, landscape-scale public-private partnership (initiated by The Nature Conservancy in 1985) slows and detains floodwaters, allowing them to infiltrate and augment groundwater.<sup>30</sup>

## 3. Distributed recharge projects that collect hillslope runoff

A third approach to Flood-MAR is developing an array of relatively small (~100–1,000 AFY) recharge projects, each collecting drainage from 100s to 1,000s of acres, that collect and infiltrate local stormwater in locations that are especially well suited for recharge. Targeted incentives may be especially important for this Flood-MAR approach. For example, a program in the Pajaro Valley incentivizes individual landowners and Pajaro Valley Water Management Agency (PV Water) to support projects that collect some of the hillslope runoff from significant precipitation events and route it through ditches, culverts, and a sediment detention basin before the runoff flows into a dedicated infiltration basin.

Given the geography, hydrology, and existing utilization of other types of MAR in Valley Water's service area, distributed recharge projects that collect hillslope runoff are likely the most promising type of Flood-MAR for Valley Water to focus on initially. This approach would complement Valley Water's existing MAR program by tapping a currently underutilized water source and expanding recharge efforts on lands owned and managed by others. Routing hillslope runoff from heavy precipitation events into local, dedicated infiltration basins would enable site-appropriate design and the ability to incorporate soil amendments tailored to best protect or enhance groundwater quality. As we note in **Part III.D**, Valley Water could assess potential water supplies for this Flood-MAR approach by assessing drainage areas and estimating runoff to identify especially promising areas for implementation within its service area.

**Example:** PV Water operates a recharge net metering (ReNeM) program that uses performance-based financial incentives to encourage groundwater recharge at individual project sites, typically on private property. Specifically, the program uses ditches and canals to divert hillslope runoff generated by heavy precipitation events to infiltration basins where the collected runoff can help recharge groundwater.<sup>31</sup> PV Water initiated its ReNeM program as a pilot study in 2016 and made the program permanent in 2021.<sup>32</sup> The agency aims to scale the program to eventually infiltrate approximately 1,000 AFY; together, the three currently deployed projects collectively infiltrate about one-third of this volume. **Figure II-1** shows the infiltration basin for one of these projects.



**Figure II-1.** Hillslope-runoff collection and infiltration project at Bokariza-Drobac Ranch, showing the 4.3 acre infiltration basin during dry conditions (top) and wet conditions (bottom). Photo credit: A. Fisher (UCSC).

## C. Considerations for developing a Flood-MAR program

If Valley Water decides to pursue Flood-MAR, establishing a Flood-MAR program would be helpful for coordinating, prioritizing, and ensuring effective implementation of Flood-MAR projects regardless of the type, scale, or number of projects envisioned. A Flood-MAR program could be especially critical for providing the incentive structure and oversight necessary to support the Flood-MAR approach we have identified as most promising for early implementation in Valley Water’s service area: distributed recharge projects that collect hillslope runoff.

Below, we discuss considerations for developing a Flood-MAR program within Valley Water and related questions, grouped into three main categories:

- 1) program goals and objectives,
- 2) internal program support, and
- 3) program functions.

Note that many considerations overlap with or influence one another. Additionally, some considerations are likely shared with other Valley Water programs, enabling Valley Water to straightforwardly leverage that existing expertise in the Flood-MAR context. Other considerations may be largely uncharted territory, creating the opportunity for state-level leadership and innovation by Valley Water.

### 1. Program goals and objectives

A Flood-MAR program’s goals inform all other aspects of the program, including what types of projects, scales of recharge, recharge locations, partnerships, and incentive structures are likely to be necessary or helpful. Goals should be based on the benefits sought, or that would be desirable, as well as the negative impacts it needs to avoid. In addition to broad goals, a Flood-MAR program needs specific objectives. For example, initial objectives for Valley Water might include identifying program design features and functions that would support an early focus on distributed recharge projects that collect hillslope runoff. We summarize key questions associated with program goals and objectives—and our preliminary assessment of answers for Valley Water—in **Table II-1**.

**Table II-1.** Preliminary assessment of considerations related to goals and objectives for a potential Flood-MAR program in Santa Clara County, assuming an initial focus on distributed recharge projects that collect hillslope runoff.

PROGRAM GOALS AND OBJECTIVES	
What primary benefits are sought?	Enhancing water supply, advancing stakeholder engagement, and supporting climate change adaptation and resilience
What incidental benefits / co-benefits are sought, or would be desirable?	Reducing flood risk, preserving working landscapes, enhancing riparian habitat, maintaining / improving groundwater quality, and minimizing land subsidence potential
What negative impacts must be avoided?	Harm to fish/ecosystems, flooding, and property / infrastructure damage
What specific objectives would the program work towards in the short (and longer) term?	Developing appropriate incentive structures, legal / regulatory compliance support, and oversight for distributed projects

## 2. Internal program support

Developing and operating a Flood-MAR program requires sufficient internal program support. We summarize key considerations related to internal program support in **Table II-2**, noting our preliminary assessment of these considerations for Valley Water.

Where a Flood-MAR program is housed within an agency will influence the program's goals, functions, and design. This will be especially true in large agencies whose subcomponents are compartmentalized, with relatively distinct, well-defined functions, funding streams, and boundaries. Valley Water is such an agency. Based on discussions with staff, a Flood-MAR program would likely be spearheaded by the Water Supply Planning and Conservation Unit, within the Water Supply Division of its Water Utility business area. This placement reflects Flood-MAR's potential to enhance water supply. Other units would likely provide support, as summarized in **Table II-2**.

The program could be funded with revenue from water charges, supplemented by grants from agencies such as California's Department of Water Resources and the U.S. Department of Agriculture's Natural Resources Conservation Service. If a Flood-MAR program proves feasible from a water supply lens, Valley Water might consider prioritizing projects likely to generate multiple benefits. For example, some Flood-MAR projects could also help meet Watersheds goals and responsibilities by enhancing habitat. Multi-benefit projects might make program operations, program decision making, and project permitting more complex, but it could also enhance opportunities to secure external funding.

**Table II-2.** Preliminary assessment of considerations related to internal program support for a potential Flood-MAR program in Santa Clara County, assuming an initial focus on distributed recharge projects that collect hillslope runoff.

INTERNAL PROGRAM SUPPORT	
Where could the program reside in Valley Water?	Water Supply Planning and Conservation Unit (lead)
Who else would be involved internally?	Likely: staff from Groundwater Management Unit; Raw Water Operations Unit; Raw Water Field Operations & Pipeline Maintenance Unit; Hydrology, Hydraulics, and Geomorphology Unit; Watershed Policy and Planning Unit; Environmental Planning Unit; Financial Planning and Revenue Unit; Communications Unit; Treasury-Debt Management Unit; Office of the District Counsel; and related capital program design and implementation units
How would the program be funded?	Likely revenue from water charges, grant funding, and other appropriate Valley Water sources

## 3. Program functions

A Flood-MAR program needs to perform a range of functions to enable coordinated and effective project implementation. In **Table II-3**, we summarize key considerations related to program functions and our preliminary assessment of these considerations for Valley Water, organized into 6 main categories: (1) assessing source water options and availability, (2) assessing areas suitable for recharge and recharge options, (3) external coordination and engagement needs, (4) incentives for Flood-MAR implementation on land not owned by Valley



Water, (5) legal and regulatory compliance, and (6) tracking, oversight, evaluation, and adjustment. We highlight several considerations in more depth below.

**Table II-3.** Preliminary assessment of considerations related to program functions for a potential Flood-MAR program in Santa Clara County, assuming an initial focus on distributed recharge projects that collect hillslope runoff.

<b>PROGRAM FUNCTIONS</b>	
<b>1. Assessing source water options and availability</b>	
When/where do high-magnitude flows occur in Valley Water's service area, and how are they expected to change in the future?	Hillslope runoff during heavy precipitation events, downstream of existing reservoirs and in unregulated watersheds (expected to increase in the future)
What flow / other requirements may affect the viability of potential source waters?	Valley Water's Fish and Aquatic Habitat Collaborative Effort (FAHCE) Program, Lake and Streambed Alteration Agreements (LSAAs), downstream water rights, fully appropriated stream system (FASS) designations, etc.
What storage / conveyance infrastructure would be needed to move potential source waters to potential recharge locations?	Ditches and culverts for collecting and conveying hillslope runoff to dedicated infiltration basins or lands, stream diversions for diverting flood water to off-stream lands
What legal permissions would be needed to access potential water sources?	Likely water right permits for capturing hillslope runoff, LSAAs and water rights for stream diversions, and related agreements with participating landowners / managers
<b>2. Assessing areas suitable for recharge and recharge options</b>	
What areas have moderate-to-high surface and subsurface suitability for Flood-MAR?	Areas with Flood-MAR Suitability Index $\geq 4$ in the site-suitability tool (confirm through field investigation)
Which of these areas have compatible current land uses?	See site-suitability tool land use/land cover data set, other data to assess risks/benefits related to flooding, habitat, water quality
What are the water quality implications of recharging water in these areas?	Assess by comparing quality / contaminant profile data for potential source waters, soil / vadose zone, and groundwater
Which types of Flood-MAR projects, using which potential water sources, would be useful and feasible in these areas?	Initially, focus on distributed recharge projects that collect hillslope runoff and infiltrate it in dedicated recharge basins; but assess potential for other types of projects / water sources
<b>3. External coordination and engagement needs</b>	
Who owns and manages the land in potential recharge areas?	Private parties, especially growers, and other public agencies
Who holds or might be involved in acquiring water rights to potential water sources?	Valley Water may be best positioned to apply for water right permits from the State Water Resources Control Board (with landowner cooperation), especially to collect hillslope runoff
Who might be involved in acquiring other necessary permits and approvals?	Likely Valley Water (with cooperation from landowners, land managers, consultants, construction contractors, and others)
Who else might be interested in or be affected by Flood-MAR implementation?	Nearby landowners / tenants, downstream surface water users, domestic well users/groups, non-government organizations (NGOs), wildlife/other agencies

What partnerships, coordination, and other outreach/engagement will be needed to effectively implement / fund the program?	Potentially: private landowners/tenants, Santa Clara Valley Open Space Authority (OSA), Peninsula Open Space Trust (POST), Guadalupe-Coyote Resource Conservation District (GCRCD)
<b>4. Incentives for Flood-MAR implementation on non-Valley Water property</b>	
For what purposes might incentives be helpful or necessary?	To encourage recharge projects on non-Valley Water property.
What forms could incentives take?	Multiple options could be considered: direct payment, rebate, funding construction / land rental, and support for maintenance
What size / type of incentive may be needed to encourage sufficient participation?	Not clear; will require evaluation of interest, motivation, and other factors for potential program participants
How would incentives be administered?	Valley Water or a third-party certifier could administer incentives
<b>5. Legal and regulatory compliance</b>	
How would the program support / coordinate / fund permitting for Flood-MAR projects?	Valley Water may be better positioned to apply for water rights and other permits than individual landowners.
What level of environmental review would be required to support projects?	Projects may be eligible for CEQA suspension under Executive Order B-39-17 or Executive Order N-7-22.
What water rights would be needed to access potential water sources?	Temporary permits (180-day, 5-year) to support pilot efforts, standard permits for long-term operations.
What water quality permits / other approvals would projects need?	Potentially: NPDES Construction General Permit + Stormwater Pollution Prevention Plan, Section 404 permit, Section 401 Water Quality Certification
What species and ecosystem protections would affect projects?	Potentially: FAHCE, Lake and Streambed Alteration Agreements (LSAAs), CESA Incidental Take Permits, ESA Section 7 compliance
What cultural resources might be affected?	Depends on site (National Historic Preservation Act Section 106)
What other local, state, or federal permits or requirements might apply?	Santa Clara County Grading Permit, Valley Water District Act requirements
How would the program affect Valley Water's ability to meet its own statutory responsibilities and other legal obligations?	TBD — Would help meet SGMA requirements for sustainable groundwater management; projects could be selected to help meet FAHCE Settlement Agreement obligations
What funding sources are legally appropriate for Flood-MAR projects?	TBD — Would need to discuss with District Counsel's office and Finance
<b>6. Tracking, oversight, evaluation, and adjustment</b>	
How would the program provide effective oversight of Flood-MAR projects?	TBD — Would need to track project level recharge/infiltration effectiveness, water quality impacts, other benefits and risks
How would the program track its overall progress and effectiveness?	TBD — Would need to track program-level recharge/infiltration effectiveness, water quality impacts, other benefits and risks
What would happen if / when a project does not meet expectations?	TBD — Would need to require corrective measures when recharge is ineffective or the project creates substantial risks
How would the program learn / adjust?	TBD — Would need clear mechanisms for adaptive management



*a. Considerations related to water rights for recharge*

One important function of a Flood-MAR program would be to identify the legal clearances, such as a water right permit, needed to divert a potential water source and how best to approach obtaining those clearances for individual projects.

Acquiring a water right permit to divert and use high-magnitude stream flows (or hillslope runoff) for groundwater recharge is not necessarily easy or straightforward. First, the State Water Resources Control Board (State Water Board) simply has less experience considering permit applications that seek to divert sporadic flood flows or to recharge any source of water in order to serve non-extractive beneficial uses, such as reducing the development of “undesirable results” under SGMA<sup>33</sup> (like significant and unreasonable land subsidence, seawater intrusion, degradation of water quality, or depletion of interconnected surface waters). Likewise, GSAs and other local water management agencies across the state have little experience to date applying for water right permits like these. Additionally, the regulatory landscape is changing in real time as the Governor directs the State Water Board and other agencies to expedite permitting of recharge projects to “maximize the extent to which winter precipitation recharges underground aquifers.”<sup>34</sup>

The California Legislature and the State Water Board have both taken steps in recent years to try to better support water right permitting for these types of projects. In 2019, the Legislature added a five-year temporary permit option (in addition to the existing 180-day temporary permit option)<sup>35</sup> as a bridge to a standard permit, and the State Water Board developed a streamlined administrative process for those pursuing a standard permit to divert water for recharge during “high flow conditions” or “imminent threat” of flooding,<sup>36</sup> summarized in **Table II-4**.<sup>37</sup> Both options are open only to groundwater sustainability agencies or other “local agencies” under SGMA, and each defines slimmed down requirements for water availability analysis (used to demonstrate that water is available to be appropriated; see also **Box 2** regarding fully appropriated stream systems) that are nonetheless intended to provide adequate protection for fish and other wildlife and other water users. To help potential MAR proponents understand permitting options and requirements associated with water rights for recharge, the State Water Board created several webpages,<sup>38</sup> including one that lists all applications for temporary permits for underground storage received since 2016,<sup>39</sup> and fact sheets. One fact sheet discusses the distinctions between flood-control projects that result in incidental recharge—which do not require a water right—and other recharge activities—which do.<sup>40</sup> A second fact sheet explains what California’s requirement for “beneficial use” means in the context of water rights for recharge and provides guidance on demonstrating / accounting for different beneficial uses of recharged water.<sup>41</sup>

Despite these efforts, important issues related to water right permitting for recharge projects remain unclear, creating stumbling blocks for those trying to implement certain types of recharge projects. To date, only two applications have been submitted for 5-year temporary permits.<sup>42</sup> Both identify extractive beneficial uses (agricultural irrigation). One, submitted on August 24, 2022, was approved on January 11, 2023,<sup>43</sup> while the other application, submitted on November 16, 2022, is still pending as of February 21, 2023.<sup>44</sup> Because, to date, few entities have sought to include non-extractive uses in their water right applications (or to pursue entirely non-extractive beneficial uses), it is not clear how an applicant might demonstrate that the beneficial use is accruing or what level of proof the State Water Board will expect an applicant to provide.

Similarly, to date, there are no examples of applications to support a small recharge project that collects and infiltrates hillslope runoff, including those in the Pajaro Valley. Therefore, it is unclear what the State Water Board will require of successful applicants for such projects and whether there might be circumstances under which a water right would not be needed to implement this type of project.

We expect greater clarity to emerge as more Flood-MAR project proponents submit, and the State Water Board responds to, water right permit applications that address a wider range of water source characteristics and post-recharge purposes of use.

**Table II-4.** Comparison of traditional permit options and newer permit options (outlined with a heavy black line) tailored to support groundwater recharge projects under SGMA.<sup>45</sup>

	Temporary Permits		Standard Permits	
Permit pathway	Temporary Permit (urgent need)	Temporary Permit for Diversion to Underground Storage	Streamlined Permit for Groundwater Recharge	Standard Permit
Authority	Water Code §§ 1425–1431	Water Code §§ 1433–1433.6	Administrative adjustment to standard permit process	Water Code §§ 1375–1410.2
Duration	Up to 180 days <i>(revocable; no priority)</i>	Up to 5 years <i>(revocable; no priority)</i>	Permanent authorization <i>(secures a priority date)</i>	Permanent authorization <i>(secures a priority date)</i>
Eligibility	“Any person” demonstrating “an urgent need to divert and use [surface] water” for beneficial use	A GSA (or other “local agency” under SGMA) proposing “diversion of surface water to underground storage for beneficial use that advances the sustainability goal of a groundwater basin”	A GSA (or other “local agency” under SGMA) proposing diversions of high flows between Dec. 1 and Mar. 31 to underground storage for beneficial use	“Any person” proposing to divert and use surface water for beneficial use
Water availability analysis	Simplified	Simplified <i>(simplified analysis OK if diversion would occur only when flow exceeds flood stage)</i>	Streamlined <i>(availability assumed when defined “high flow conditions” or “imminent threat of flood conditions” exist)</i>	Standard <i>(must demonstrate reasonable likelihood water is available to appropriate)</i>
CEQA review	Required <i>(unless suspended by executive order)</i>	Must be completed before applying	Must be completed before applying	Required
Required findings	<ul style="list-style-type: none"> <li>No injury to other legal water users</li> <li>No unreasonable effects on fish/wildlife</li> <li>In the public interest</li> <li><u>Urgent need</u></li> </ul>	<ul style="list-style-type: none"> <li>No injury to other legal water users</li> <li>No unreasonable effects on fish/wildlife</li> <li>In the public interest</li> <li><u>Consistent with GSP, if applicable</u></li> </ul>	<ul style="list-style-type: none"> <li>No injury to other legal water users</li> <li>No unreasonable effects on fish/wildlife</li> <li>In the public interest</li> </ul>	<ul style="list-style-type: none"> <li>No injury to other legal water users</li> <li>No unreasonable effects on fish/wildlife</li> <li>In the public interest</li> </ul>
Guidance on “Best Use”	For pilot projects <i>or when applicants need to get a diversion authorized quickly</i>	As a bridge to get a recharge project up and running while a streamlined / standard application is in process	For qualifying recharge projects seeking permanent authorization	For permanent recharge projects that don’t qualify under the streamlined pathway

## **Box 2. Fully appropriated stream systems and new water right permits**

Another set of challenges arises if the proposed water source is part of a fully appropriated stream system (FASS). Stream systems that have been designated as fully appropriated year round are generally off limits for new water rights.<sup>46</sup> Additionally, an application won't be accepted if it proposes to divert water from a seasonally fully appropriated stream during the season it is deemed fully appropriated. A water right applicant can request the State Water Board to revise its FASS determination through a petition process that requires an additional \$10,000 fee and can take several years to complete before a related permit application can be processed.<sup>47</sup> In Santa Clara County, the portion of Uvas Creek upstream of Uvas Dam, Moody Gulch, and Alamitos Creek have been declared fully appropriated year round, while Casey Gulch Creek, Coyote River, Guadalupe Creek, and the remainder of Uvas Creek have been declared fully appropriated seasonally.<sup>48</sup>

We anticipate that Valley Water, rather than individual landowners, is better positioned to apply for water right permits that may be necessary for Flood-MAR projects on non-Valley Water property. First, Valley Water has extensive experience applying for and managing water rights and the expertise and resources needed to do so efficiently. Second, the water right permitting options that are tailored to MAR are only available to GSAs or other local water agencies under SGMA. Third, CEQA is currently suspended for local or state agencies seeking certain temporary permits for capturing water from high-runoff events for local recharge. Finally, having Valley Water apply for the permit helps to assure that project goals remain aligned with the overall Flood-MAR program and priorities.<sup>49</sup>

### ***b. Considerations related to Recharge Net Metering incentives***

Valley Water could support Flood-MAR implementation in its service area by directly constructing and maintaining Flood-MAR projects on land it owns or acquires, collaborating on projects sited on other agencies' lands, and/or creating incentives for others to implement Flood-MAR projects on non-Valley Water land.

Recharge net metering (ReNeM) is an incentive structure that encourages distributed groundwater recharge at individual project sites located on private or public land by compensating rechargers for project performance—the net increase in infiltration associated with the project's operation.<sup>50</sup> This compensation is intended to offset the operation, maintenance, and opportunity costs rechargers incur as a result of maintaining hillslope runoff collection systems and infiltration basins on their properties. Under PV Water's ReNeM program, incentives are structured as partial rebates against groundwater production charges (known as groundwater augmentation charges) based on the volume of water infiltrated on an annual basis. At present, all recharge projects operated through ReNeM were developed for resource benefit (non-regulatory) purposes.

For a ReNeM program to successfully support a cooperative partnership between parties, it is crucial that the parties share a mutual understanding of the incentive structure and agreement. This includes establishing a mutually-agreed upon manner for determining the incentive payment<sup>51</sup>—in the case of ReNeM, an agreed-upon valuation of the water that is infiltrated. Valley Water could support this mutual understanding in several ways. A contract between participants or similar tool can establish a list of expectations and understandings that support a

trustworthy and reliable partnership. Ideally, this tool would also detail the understood method for arbitrating requested changes to the program or program disputes. This tool should also clarify the method for establishing the incentive amount—in the case of ReNeM, a means of establishing the amount of water infiltrated in order to calculate the payment amount.

One avenue for building trust in a ReNeM program is by incorporating a third-party certifier (TPC) who is delegated key responsibilities in order to minimize conflict and demonstrate the trustworthiness of the program. In the case of ReNeM, the TPC could be responsible for (or contribute to) ensuring the reliability of the measurements upon which payments to rechargers are predicated, overseeing incentive payments to rechargers, evaluating program performance, preparing reports, and determining when adjustments are needed. To ensure the TPC builds trust into the program, the TPC entity must have both the expertise and the capacity necessary to carry out the responsibilities it has been delegated.

Though incentivizing private participation in Flood-MAR seems promising in concept, it is not without challenges that Valley Water would need to navigate successfully. For example, differences in the physical and institutional contexts of PV Water and Valley Water may affect the potential viability of a ReNeM-like incentive structure for Flood-MAR in Valley Water's service area. Most importantly, groundwater production charges for agricultural water users are more than seven times higher in the Pajaro Valley (\$282 per AF<sup>52</sup>) than in Valley Water's service area (~\$37 per AF<sup>53</sup>), reducing the potential motivational power of a rebate on those charges. Another useful comparison is the cost of incentive compared to the next potential water source.

*c. Considerations related to legal and regulatory compliance for small, distributed recharge projects*

To be effective, a Flood-MAR program would likely need to support and coordinate permitting for individual Flood-MAR projects. Most Flood-MAR projects will require permits or other approvals from multiple local, state, and/or federal agencies. **Table II-3** summarizes many of these permitting and approval requirements, and **Table II-5** provides additional information about when they might come into play.

This support and coordination role would be especially important for smaller, distributed projects that collect hillslope runoff, since individual rechargers may lack the resources and bandwidth to identify and address all regulatory requirements on their own. In particular, Valley Water has—and would further build—essential institutional knowledge that could both aid individual project development and contribute to economies of scale. Therefore, Valley Water may be better positioned than individual landowners to apply for the regulatory approvals needed for particular projects. Additionally, Valley Water can explore possibilities for addressing some regulatory requirements (such as environmental review) on a programmatic-level for similar projects (such as distributed stormwater recharge projects implemented under a ReNeM-like incentive structure).

**Table II-5.** Potential permitting and regulatory compliance needs for Flood-MAR projects.

Category	Permit or approval	Agency	Applicability
<b>Environmental review</b>	CEQA compliance <i>Initial Study → (Mitigated) Negative Declaration or Environmental Impact Report</i>	Lead Agency	The project has the potential to affect the environment.
<b>Water rights</b>	Temporary water right permit –180-day or 5-year	State Water Resources Control Board: Division of Water Rights	The project involves temporary diversion and beneficial use of surface water (e.g., for pilot or while standard permit is pending.
	Standard water right permit	State Water Resources Control Board: Division of Water Rights	The project involves long-term diversion and beneficial use of surface water.
<b>Water quality</b>	CWA Section 401 Water Quality Certification	State Water Resource Control Board / Regional Water Quality Control Board	The project involves a federal permit or license for an activity that may result in a discharge of dredged or fill material into waters of the United States.
	CWA Section 404 Permit	U.S. Army Corps of Engineers	The project involves discharge of dredged or fill material into waters of the United States
	NPDES Construction General Permit + Storm Water Pollution Prevention Plan	State Water Resource Control Board / Regional Water Quality Control Board	The project disturbs 1 or more acres of soil.
<b>Species / ecosystems</b>	Section 1602 Lake and Streambed Alteration Agreement (LSAA)	California Department of Fish and Wildlife	The project involves streambed alteration.
	CESA Section 2081 Incidental Take Permit	California Department of Fish and Wildlife	The project may affect state-listed species.
	ESA Section 7 compliance	U.S. Fish and Wildlife Service / National Marine Fisheries Service	The project involves a federal permit or license for an activity that may affect federally listed species.
<b>Historic preservation</b>	National Historic Preservation Act Section 106 compliance	State Office of Historic Preservation	The project involves construction near cultural resources.
<b>Grading</b>	Grading Permit	Santa Clara County	Project involves grading

## D. Key takeaways regarding options and considerations

In Part II, we discussed the utility of a Flood-MAR program, described three approaches to Flood-MAR, and summarized considerations for developing a Flood-MAR program, which we have distilled into **Tables II-1, II-2, and II-3**. Below, we highlight key takeaways for Valley Water.

- Valley Water’s existing MAR facilities already occupy many of the best recharge sites in Santa Clara County (County), and their recharge capacity exceeds the volume of water available for recharge from Valley Water’s traditional sources in many years. However, the mapping tool discussed below indicates there may be areas suitable for Flood-MAR, pending further evaluation.
- If Valley Water pursues distributed Flood-MAR projects that collect and infiltrate local hillslope runoff, organizing Flood-MAR efforts at a programmatic level will likely be more efficient and effective than pursuing individual projects with less coordination.
- Valley Water could partner with other landowners and managers to develop Flood-MAR projects, a process it could facilitate with incentives.
- One potential model for providing incentives for Flood-MAR implementation is Recharge Net Metering (ReNeM), a rebate-based incentive structure developed through a collaborative effort in nearby Pajaro Valley. However, differences in the physical and institutional contexts of the two areas may affect the potential viability of a ReNeM-like incentive structure for Flood-MAR in Valley Water’s service area. For example, groundwater production charges for agricultural water users are more than seven times higher in the Pajaro Valley (~\$282 per AF) than in Valley Water’s service area (~\$37 per AF), reducing the potential motivational power of a rebate on those charges.
- Most permitting needs for Flood-MAR projects, summarized in **Table ES-2**, will likely be familiar to Valley Water because of its extensive experience with MAR implementation. However, Valley Water would need to decide how to address permitting needs for small Flood-MAR projects that are distributed across its service area on non-Valley Water property. Valley Water may be best positioned to pursue most permits and other regulatory approvals for such projects.
- It may make sense for Valley Water, rather than individual landowners, to apply for any necessary water right permits for Flood-MAR projects, including those on private land.

Considerable work is still needed to develop and implement a successful Flood-MAR program at Valley Water. Flood-MAR remains developmental in many ways, and Valley Water could continue to evaluate whether a Flood-MAR program could help increase water resilience in its service area, in part supported by the Flood-MAR suitability mapping tool discussed in the next section of this report.

### III. Pre-feasibility Analysis of Surface and Subsurface Suitability for Flood-MAR

A primary goal of this project is to assess sites where there may be good opportunities to improve groundwater resources using Flood-MAR in Santa Clara County, particularly distributed locations that could host recharge systems supplied by local stormwater collection. The methods used in this study have been applied in other regions,<sup>54</sup> but this report presents results of the first regional effort to map suitability for Flood-MAR in Santa Clara County. Results of this work have direct implications for this region, and may serve as a template for other parts of the state and country, where planning and implementation of new groundwater projects are expected to be increasingly common and important in coming years.

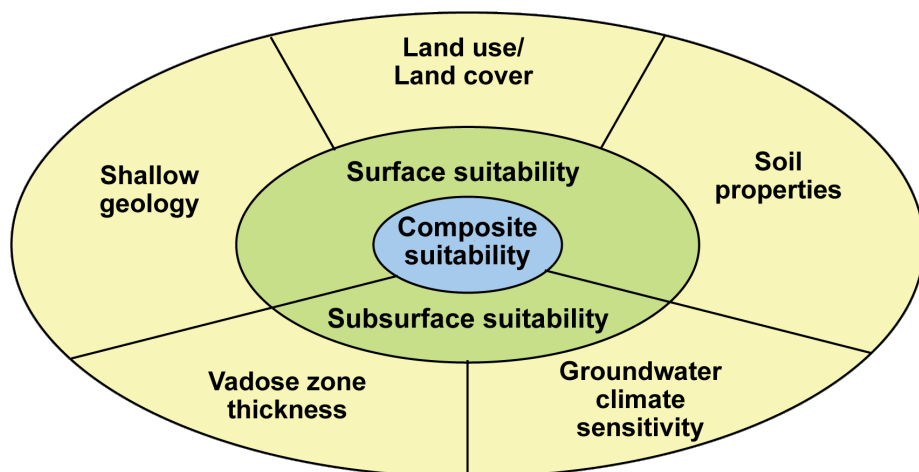
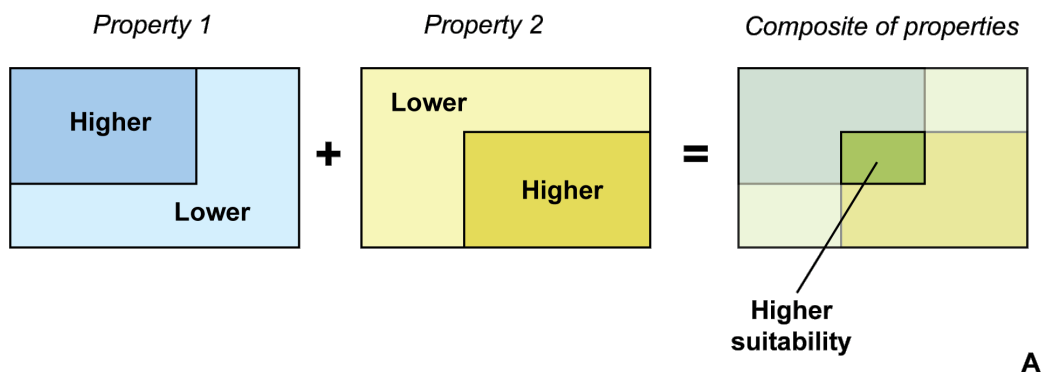
#### A. Data and Methods

##### 1. Multicriteria decision analysis (MCDA) for Flood-MAR suitability

A Geographic Information System (GIS) is a computer-based mapping and analysis system, combining a geospatial database that uses a variety of data types and formats, visualization tools for displaying datasets, and scripting tools for modifying and combining datasets to generate new data coverages. The use of a GIS for spatial assessment of Flood-MAR suitability through multicriteria decision analysis (MCDA) is well established in the technical literature (**Fig. III-1**).<sup>55</sup> Individual datasets are acquired and imported into the GIS in digital format, with adjustments made as needed to the geographic projection, resolution, data gaps or errors, and/or units of measurement and display. Each dataset used as part of the formal analysis is called a "**factor**." Each factor includes spatial data in either real-world units (e.g., ft/day for infiltration capacity) or categories (e.g., row crops or moderate urban development for land use/land cover). An assessment is made as to how each factor varies across the study region, and a classification scale is developed for simplified representation of the data, known as a "**rating**." Once all the factors of interest are rated, multiple factors are combined according to their importance ("**weight**") to generate a spatial suitability "**index**," helping to identify locations where there is alignment of properties that are the most favorable for the processes or activities of interest (**Fig. III-1A**). Note that factors could be developed that are either positive or negative with respect to feasibility, using a particular method, and some could be used to filter potential project regions or focus on specific subregions. These issues are discussed later when data are presented.

For the current project to assess suitability for Flood-MAR, we divided the assessment into two general classes of coverages: *surface* and *subsurface* (**Fig. III-1B**). Surface coverages included parameters the soil infiltration capacity, land use/land cover, and the nature of shallow geologic units, found at the surface or below soils. These datasets are available for the full study region, although, as described later, considerable processing was required to put them in suitable formats. Subsurface coverages included hydrogeologic parameters such as geometry (lateral extent, thickness) of aquifers and confining layers, vadose zone thickness (distance from the ground surface to top of groundwater) and the climate sensitivity of groundwater levels to inter-annual variations. We also explored use of transmissive and storage properties within uppermost aquifer units (as applied in groundwater models), but as described later, these were not

incorporated into the MCDA as delivered. Subsurface factor coverages were available mainly within spatially defined groundwater management areas.



**Assessment of suitability for Flood-MAR using stormwater**

**B**

**Figure III-1.** Selected concepts applied for this study. **A.** Overview of general approach taken using a geographic information system (GIS), with independent factors rated on the basis of perceived suitability for Flood-MAR, then combined to identify areas with a higher or lower suitability index. **B.** Cartoon illustrating primary factors and weights as applied for this study. Individual surface and subsurface factors were weighted equally in primary analysis, although additional factors and weights were also tested, as discussed in text. Weights can be adjusted as desired using the GIS project to recalculate suitability indices.

This project uses existing GIS data coverages to efficiently develop new datasets, maps, interpretations, and recommendations. Many GIS datasets were available when this project began, so we focused first on evaluation of these coverages, identifying gaps or other problems, and determining what additional work can be justified in support of improving the Flood-MAR suitability assessment, rather than investing extensive effort before potential benefits are clear. We revisit this issue later in this report.

In order to combine disparate data types for classifying Flood-MAR suitability with MCDA, we used the following workflow:



- Factor datasets, polygons delineating spatial regions, and point data were acquired and documented, then imported into a draft (working) GIS project for evaluation. Data that were selected for use with the main GIS project were reprojected and/or regridded, if needed, to assure consistency with project standards and to align values with those from other factor datasets. For this project, a 1/9-arc-second digital elevation model (DEM) with ~10 ft x 10 ft resolution was selected as the spatial template; all subsequent datasets were reprojected and/or regridded so that values would align with pixels comprising the DEM.
- Some data incorporated into the main project were in vector form, comprising shapes or factor values at individual points, although most of the data subjected to quantitative assessment through MCDA were applied as raster data. Shapes were used mainly to define project subareas or to focus investigation and interpretation, e.g., parcel maps indicating open space or otherwise accessible properties.
- Factors used quantitatively as part of MCDA for Flood-MAR suitability were rated on an integer scale with eight levels: 0 to 7, where 0 indicates *poor suitability* and 7 indicates *excellent suitability*. Ratings were assigned independently for each factor, based on consideration of the nature of the data (quantitative or categorical) and the distribution of values/categories in a spatial sense and within a probability density function (PDF, aka, *histogram*). In general, we sought to have intermediate values on each rating scale (3 to 4) apply for conditions that were "acceptable" or "satisfactory" for Flood-MAR, with higher values (5 to 7) being *good to excellent* and lower values (0 to 2) being *poor to fair*. Ratings were also assigned with an eye towards showing the diversity of conditions. Criteria used to assign ratings are specific to each factor, as discussed later in this report, and maps and histograms of assigned factor ratings are shown.
- Factors were analyzed initially as part of separate surface and subsurface assessments, with factor weights (fractional values,  $0 < W_f < 1$ ) assigned based on the inferred importance of each factor and confidence in data accuracy (**Figure III-1B**). For assessment of Flood-MAR suitability based on surface factors, we used ratings for soil infiltration capacity, shallow geology, and land use/land cover, with each factor weighted equally ( $W_{f\text{-surface}} = 0.33$  for each). For assessment of Flood-MAR suitability based on subsurface factors, we assigned equal weights to vadose zone thickness and climate sensitivity of groundwater levels ( $W_{f\text{-subsurface}} = 0.50$ ). We also tested incorporation of transmissivity and storage values from shallow aquifer layers (as applied in groundwater models) weighting these at half the value of other subsurface factors. Independent consideration of surface and subsurface data resulted in generation of two Flood-MAR suitability index maps: surface and subsurface.
- Surface and subsurface Flood-MAR suitability indices were combined to create a map of composite Flood-MAR suitability, with each of five total factors weighted evenly ( $W_{f\text{-composite}} = 0.20$ ) (**Figure III-1A**). As discussed in more detail below, there is no standard or rigorous basis for assigning relative weights to different factors, so as an initial analysis, we chose equal weighting, reasoning that the initial set of five factors were all fundamentally important for siting Flood-MAR projects. That said, relative weighting can be adjusted in the future and used to generate new maps, and variations in weighting of factors or indices could be applied to different sites based on local conditions, preferred

mode of MAR (infiltration basin, flood plain inundation, etc.). The working GIS project can be updated and/or augmented to include or exclude data as desired, based on what makes sense for particular goals and subareas of the Valley Water service area.

- The map of Flood-MAR suitability using surface data was updated prior to combining with the subsurface assessment to exclude areas with slopes that exceed some reasonable threshold (as discussed later), based on the understanding that the first Flood-MAR projects that might be considered during future work may involve a dedicated infiltration basin supplied with excess stormwater runoff from nearby hillslopes (the Flood-MAR approach identified as initially most promising in **Part II**). The engineering challenges of building a Flood-MAR infiltration basin on a steep slope are likely to outweigh any perceived advantages offered by good surface or subsurface conditions. It makes sense to focus first on areas where construction and operation is easier and cheaper. The use of slope as a factor to exclude parts of the study area is an example of application of a *filter*, independent of the rated factors used to calculate Flood-MAR suitability indices. Later in this report we discuss how additional filters could be applied to help focus site evaluation.
- Additional maps were generated to highlight subregions of the project area and additional factors that could be of particular interest, including open space, the spatial extent of Valley Water's groundwater benefit zones, and water quality data. As discussed below, these factors were not used in the quantitative calculation of Flood-MAR suitability indices because these could be considered to be positive or negative characteristics, depending on the nature of project scope, type, funding, and other characteristics. It may be preferred to view these factors as *overlays* on maps showing a Flood-MAR suitability index, as a means to highlight or exclude specific project options. And as with application of filters, additional overlays could be added to the digital GIS project in the future, as new data become available or additional issues are found to be useful for this purpose.

## 2. GIS development, data sources, and datasets

### *a. Creation and structure of a Flood-MAR suitability GIS*

Geographic information system work for this project was completed using *ArcGIS*, Version 10.7 (released December 2018), commercial software that is widely used for environmental resource assessment, run on the *Windows 10* operating system. A copy of the project was saved in version 10.4 format for distribution, to assure compatibility with systems and software in current use by Valley Water. The GIS created for this project uses a geographic coordinate system (GCS) based on the North American Datum, 1983, California Zone 3. Incoming data that used a different GCS were regrided and/or reprojected to be compatible with the standard GCS. Data are plotted in State Plane Coordinates in units of feet.

In the context of the discussion in this section, a "GIS project" comprises an ArcGIS file ending with the .mxd extension that, when opened, displays one or more data layers linked to a geodatabase. When this project was completed, it was transferred to Valley Water as a Map Package, a self-contained and compressed folder and file structure with a .mpk extension. This GIS project contains symbology, a map layout, organized and nested data layers, and other components as needed to make the project self-contained and usable on a computer system other

than the one on which it was created. To facilitate this, the GIS project developed and delivered for this Flood-MAR suitability assessment (VWMAR104.mpk) was set up so that (a) folder and file locations are specified relative to the main project file (rather than with absolute file paths), and (b) the project uses a single geodatabase that travels with the rest of the files and data in a dedicated folder (VW.gdb). Of course, the computer on which the project is opened must have a suitable version of *ArcGIS* installed, with compatible *ArcGIS* settings, have associated *Windows 10* files installed, etc.

The project team compiled and reviewed a large number of documents that were available on the Valley Water website or made available by Valley Water collaborators, then created an initial listing of potentially useful data. Some of data coverages were immediately available on the Valley Water website or other websites organized and maintained by federal, state, or regional agencies or other groups; we started work with these data and coverages. Metadata concerning incoming data was collected in a *GoogleSheet* (*WRIP-GIS\_IncomingArchive\_Metadata*), to aid in tracking file status and potential utility:

[https://docs.google.com/spreadsheets/d/1JIMUDHgKZLWLiAWLkIJ59SMlikV\\_qDnoYvfQCYK9pAA/edit#gid=0](https://docs.google.com/spreadsheets/d/1JIMUDHgKZLWLiAWLkIJ59SMlikV_qDnoYvfQCYK9pAA/edit#gid=0)

All incoming datasets were placed initially in a dedicated *IncomingArchive* folder on the UCSC Hydrogeology data server (a redundant RAID 1+0, with data mirroring and striping), secured behind a firewall and backed up regularly. These incoming data were preserved without editing, so that we could reopen them later to check status and verify earlier decisions.

Any of these files that required additional steps for assessment (e.g., reprojection, clipping, and/or numerical manipulation) were subsequently copied to a working folder (*ScratchShared*), which contains numerous files, subfolders, and informal projects. Neither this working folder nor the *IncomingArchive* folder are considered to be part of the main project, which is located in a separate folder (*VW\_MAR\_Proj*) on the UCSC server.

As GIS data were acquired, they were imported into one or more temporary (working) GIS projects for assessment in informal "scratch" GIS projects. Simply importing a GIS data coverage can result in generation of new files, so we were careful to do this outside the *IncomingArchive* folder. If data were considered to be useful for the main project, they were exported from the working project into a dedicated folder/file structure for the main project, including renaming as needed (using *ArcCatalog*) so that folders and files would be readily identifiable and named in a consistent way. Files subsequently imported into the main project are listed on a dedicated *GoogleSheet* of metadata, *WRIP-GIS\_MainProject\_Metadata*,

<https://docs.google.com/spreadsheets/d/1vjHjco1cknS8gmZcEhFzcMVLbTc3dD0csiXQ2kFebKk/edit#gid=1052823668>

Individual datasets in the main project are nested in a series of folders and subfolders by category, including short and descriptive names that are also used in naming data layers in the project itself, e.g., 01\_ProjAreas, 05\_DEM, 10\_Soils, etc. Each of these folders contains either a single set of *ArcGIS* files needed to comprise a data layer, or (more often) a series of files and subfolders that are needed in support of one or more data layers, each with one or more datasets. The metadata *GoogleSheet* contains two tabs, one each for *Data Folders* and *Data Files*, including details concerning sources and formats. An overview of data categories and types used in the main GIS project is presented in **Table III-1**.

**Table III-1.** Main data types and sources used for this project.

Surface	Data Source <sup>a</sup>
Soil infiltration capacity	SSURGO
Land use/Land cover	NLCD
Geology	USGS
Subsurface	
Vadose zone thickness	Valley Water
Aquifer transmissivity	Valley Water
Aquifer storage	Valley Water
Sensitivity of water levels to climate	Valley Water
Filter	
Slope	USGS
Applications	
Selected open space areas	SCV-OSA, Valley Water
Groundwater benefit zones	Valley Water
Water quality (TDS and nutrients)	Valley Water

<sup>a</sup> SSURGO = Soil Survey Geographic Database, USDA/NRCS  
 NLCD = National Land Cover Database  
 USGS = United States Geological Survey  
 SCV-OSA = Santa Clara Valley, Open Space Authority  
 Additional metadata for data sources available here:  
<https://docs.google.com/spreadsheets/d/1vjHjco1cknS8gmZcEhFzcMVLbTc3dD0csiXQ2kFebKk/e/dit#gid=0>

## ***b. Datasets used in project***

### ***i. Project Area polygons and features***

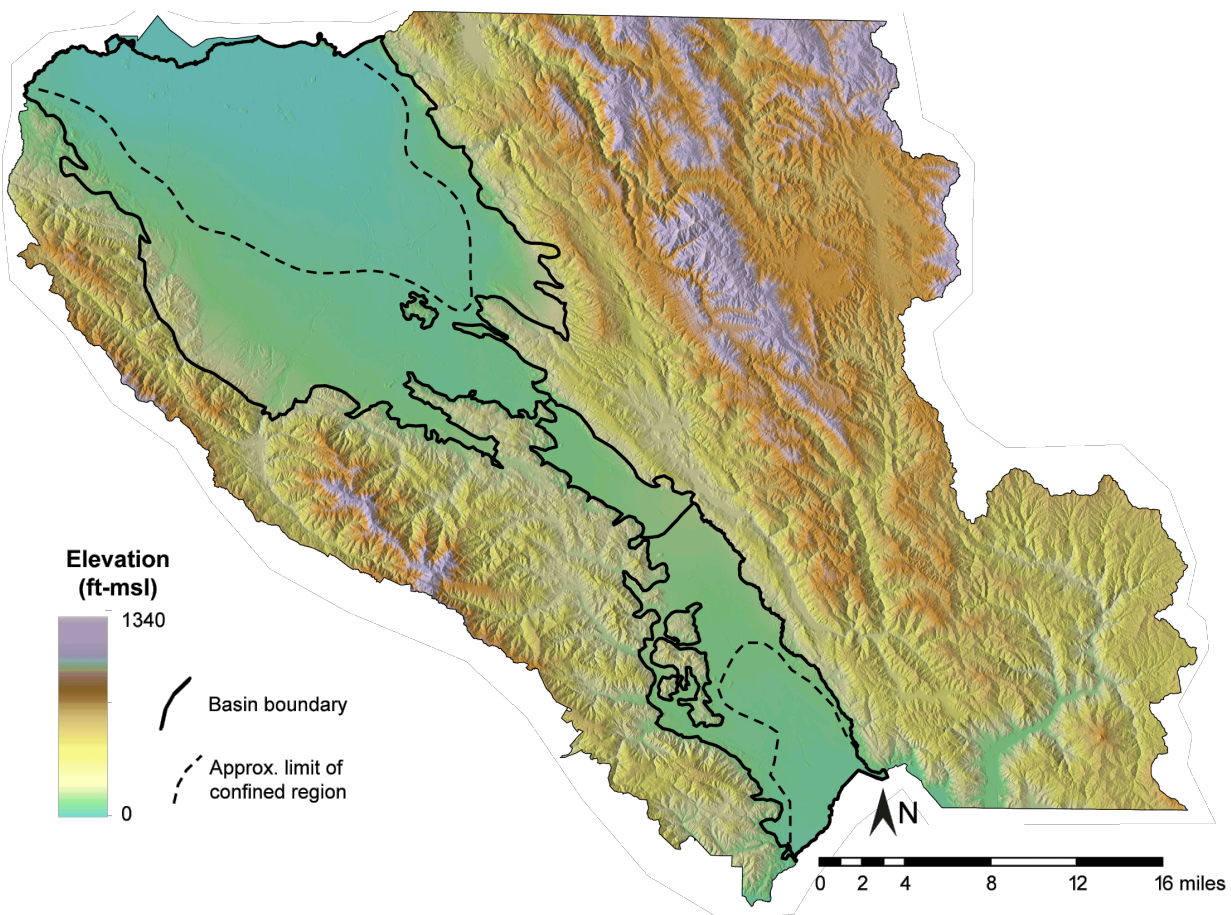
The full project area is Santa Clara County, but most groundwater resources are found in the Santa Clara Plain, Coyote Valley, and Llagas Subbasin (**Figure I-1**). The Santa Clara Plain is more urbanized, although there are population centers in Coyote Valley and the Llagas Subbasin as well. In general, Coyote Valley and the Llagas Subbasin have considerable land areas in agricultural production and designated as undeveloped. Groundwater flow directions are generally from the NNW to SSE in the Llagas Subbasin, and from SSE to NNW in Coyote Valley and the Santa Clara Plain; of course there are local gradients and flow patterns in association with variations in stratigraphy, recharge, and pumping.

Valley Water defines a series of groundwater “benefit zones” that roughly correspond to the following groundwater management areas: W2 (Santa Clara Plain), W7 (Coyote Valley), and W5 and W8 (Llagas Subbasin) (**Figure I-1**). Valley Water has identified regions in the Santa Clara Plain and Llagas Subbasin where groundwater conditions are generally confined, meaning that there are fine-grained layers forming the top of important aquifer units, limiting local recharge into underlying, principal aquifers. The limits of confined conditions were mapped decades ago and appear on numerous Valley Water documents, as well as figures shown in this report. Other important hydrologic features included in the main GIS project created as part of this study

include water bodies and channels, particularly losing stream reaches and the locations of operating percolation basins.

ii. Land surface elevation (DEMs)

We used a USGS digital elevation model (DEM) as the basis for the full project, with pixel dimensions and locations forming a template for incorporation of all additional raster data (**Figure III-2**). The selected DEM uses the NAD83 datum, has resolution of 1/9-arc-second, equivalent in the project area to ~10 ft x 10 ft, and has complete coverage across Santa Clara County. This resolution is fine enough to allow relatively detailed assessment, without creating excessive computational or visualization burdens. We also incorporated a 1/3-arc-second DEM in the project, which can be useful for displays of the full project area because it renders more quickly than the finer DEM.



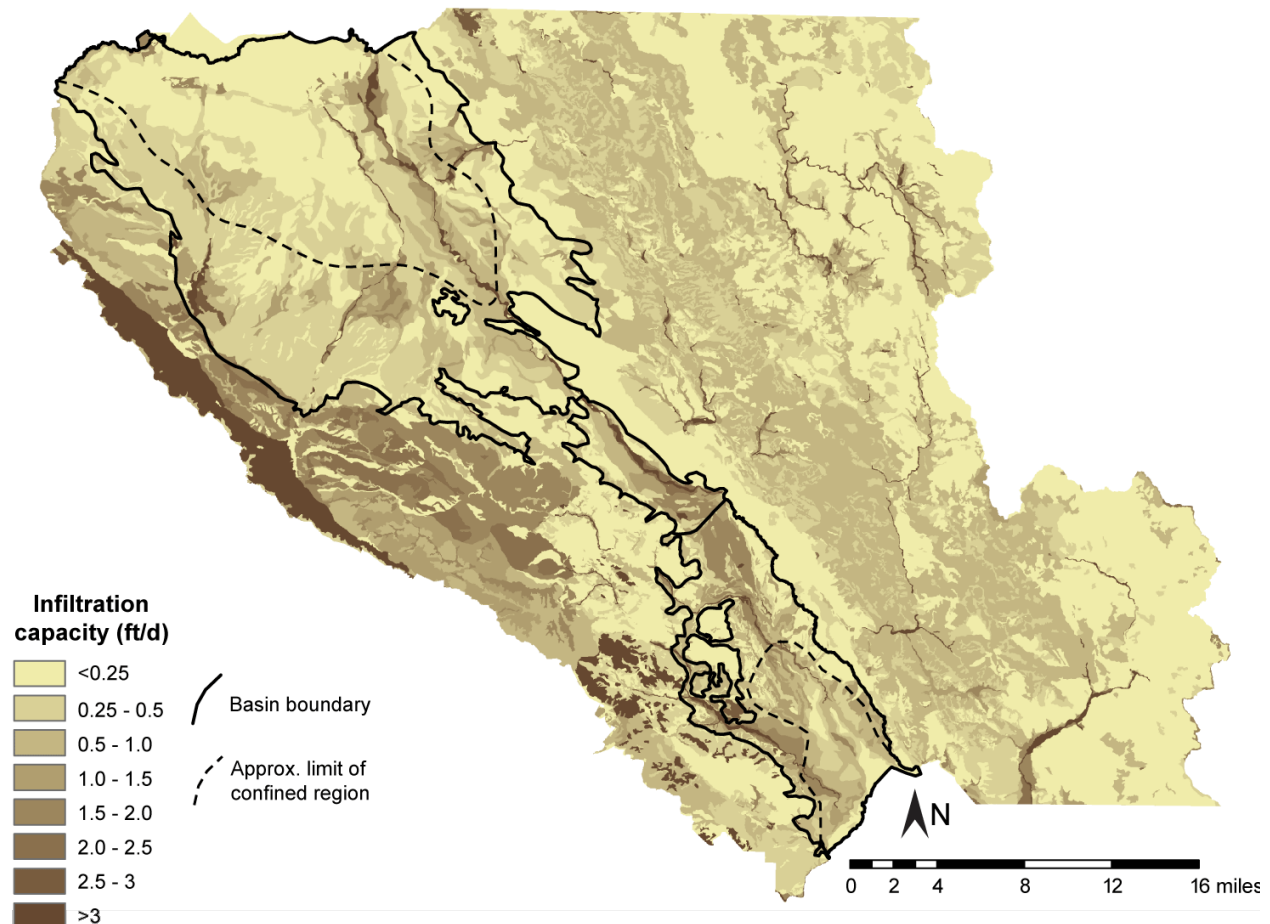
**Figure III-2.** Hill-shade digital elevation model of full project area (Santa Clara County), showing groundwater subbasins and approximate limits of confined regions.

A hill-shade DEM illustrates variations in slopes in Santa Clara County, emphasizing that primary aquifers that are the focus of this study are located mainly below valley floors and define the Santa Clara Plain, Coyote Valley, and Llagas Subbasin (**Figure III-2**). That said, there local areas with steep slopes, especially near basin edges and where stratigraphically deeper geological units penetrate through the valley fill deposits.



### iii. Infiltration capacity

Soil information was extracted from the NRCS SSURGO database<sup>56</sup> and processed for plotting (**Figure III-3**). Infiltration capacity is not provided as a simple spatial coverage in the SSURGO database. Instead, polygons are defined for a wide variety of map unit symbol codes (MUSYM), and for each code there is information on the thickness of individual soil layers and their typical properties, including each layers' saturated hydraulic conductivity. The latter usually appears as a range of values, often extending across 1–2 orders of magnitude. Thus considerable manipulation of SSURGO data was required to generate a map of soil infiltration capacity for use in Flood-MAR suitability analysis.



**Figure III-3.** Infiltration capacity of soils in study area, binned to highlight areas with most favorable properties for Flood-MAR. In general, Flood-MAR project sites should be identified in areas where infiltration rates are  $\geq 0.5$  ft/day. Higher rates are better for increasing water supply.

We extracted data for each soil type represented in Santa Clara County and linked these to soil polygons. For each soil type, we took the arithmetic mean of saturated conductivity listed for each soil horizon, then calculated the harmonic mean of layer values, accounting for both differences in properties and the thickness reported for each soil layer:

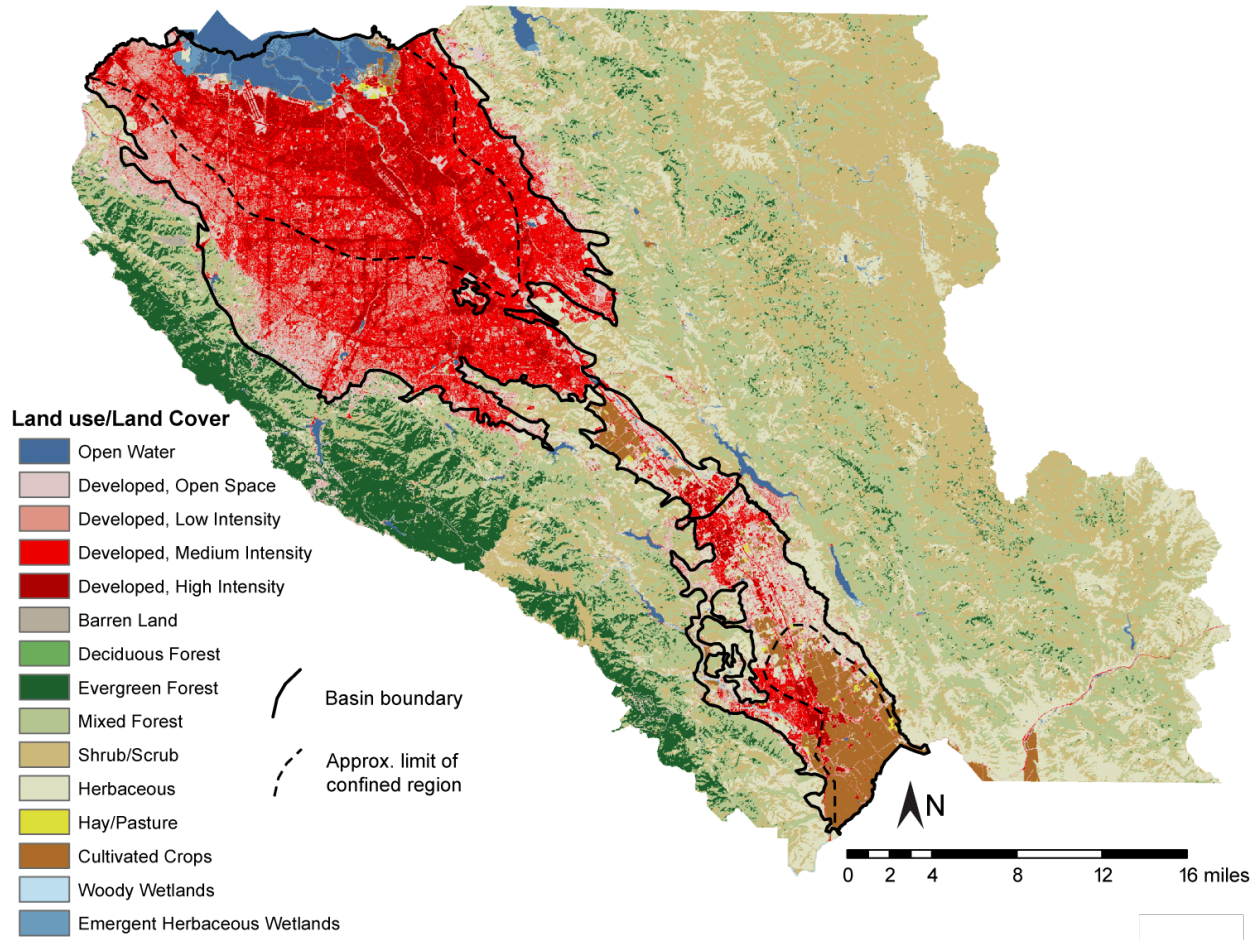
$$IC_E = \frac{\sum_{i=1}^n d_i}{\sum_{i=1}^n \left( \frac{d_i}{\overline{K}_i} \right)} \quad (1)$$

where  $IC_E$  = soil infiltration capacity (ft/day),  $d_i$  = layer thickness (ft), and  $\overline{K}_i$  = arithmetic mean of the range of conductivity values reported for individual layers (ft/day). This approach allowed for a wide range of soil properties to be represented, while giving more importance for vertical infiltration to layers having the lowest (limiting) infiltration capacity. This approach also recognizes that, within each soil polygon, more infiltration is likely to occur where conditions are most favorable. Soil  $IC_E$  values were converted to units noted above during compilation and processing, then rasterized. The resulting map is interpreted as representing the infiltration capacity of shallow soils, and is available for the full project region (**Figure III-3**).

#### iv. Land use/land cover

We considered numerous datasets that define land use/land cover (LULC) across the project region, and decided to work mainly with the 2019 National Land Cover Dataset (NLCD, <https://www.mrlc.gov/data/nlcd-2019-land-cover-conus>) (**Figure III-4**). This dataset offers several advantages compared to other options. First, this is a well-established data product generated for the full continental United States by the U.S. Geological Survey in collaboration with regional partners, applying standardized methods and incorporating data from 2001-19. The NLCD includes the full project region, rather than leaving gaps that would require patching (with a different classification scheme), has the same resolution as the DEM used as the raster template for GIS work (after regriding to align pixels), and uses a self-consistent set of LULC designations with sufficient granularity for the present application. For example, the NLCD includes four designations for "developed" land, ranging from high intensity to open space, distinguishes between deciduous, evergreen, and mixed forests, and has distinct classifications for cultivated crops and hay/pasture. Areas designated as cultivated crops could be updated with an overlay that includes classifications based on crop type or land practices, if desired, but we did not attempt this for the initial suitability analysis for several reasons.

Some earlier studies using MCDA for recharge suitability analysis have favored specific crops on the basis of associated soils types, perceived economic value, or application of fertilizers or nutrients.<sup>57</sup> However, cropping datasets have incomplete coverage for the project area (which covers all of Santa Clara County). The accuracy of various data products is a concern, but coarser classification means that LULC designations are more likely to be correct than for more detailed assignment of practices. In addition, cropping data is not necessarily indicative of farming practices, e.g., distinguishing between conventional, organic, or dry-farming techniques. We have a separate data coverage for soil properties, so linking crops to infiltration would involve "double-counting" soil properties (e.g., rice is grown frequently where soils are hydrophobic). In some areas, crops are rotated annually or more frequently, so no single snapshot will be indicative of "typical" conditions during some designated time period, and the extent and reliability of available data is highly variable across the region. Indeed, many more detailed cropping datasets are not well documented, so the sources and reliability of data are unknown.



**Figure III-4.** Land use/land cover in the study area, based on categories in the National Land Cover Dataset.

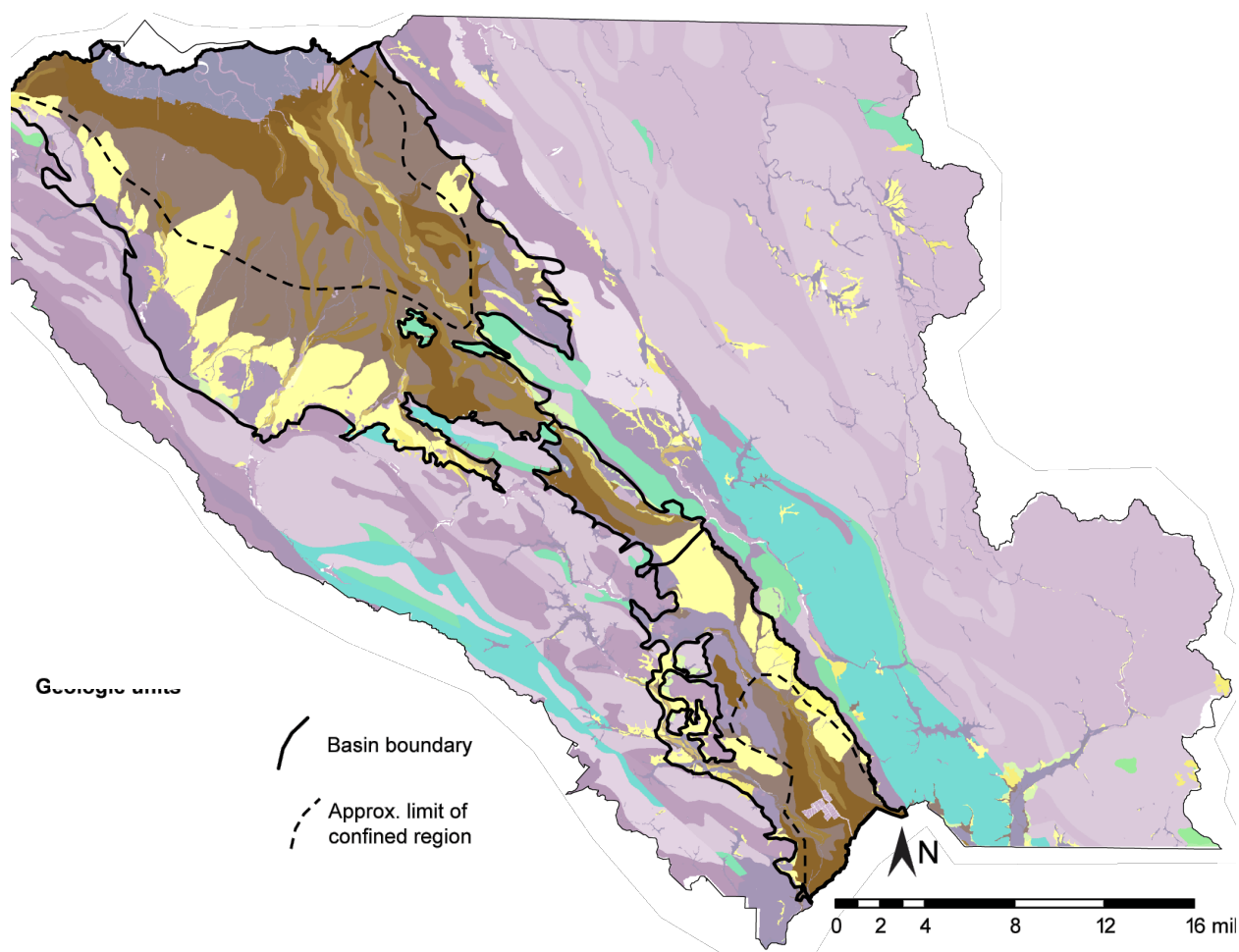
As discussed later in the section on rating of datasets, we did not wish to apply a rating system that would favor particular crops, for reasons noted above and because how one rates individual crops depends on a series of potentially useful but ultimately arbitrary classifications. For example, one could consider some perennial vine or tree crops to be either favorable or contraindicated for Flood-MAR projects, because the plants will or will not tolerate inundation (depends on MAR operations as well as soils and crop species). Similarly, one could decide that a lower value crop is more favorable for Flood-MAR because a grower removing that land from production in favor of MAR might seem more likely, but in practice these are decisions made by individuals and companies on the basis of many considerations. We note that a more granular cropping coverage could be overlain as a replacement for selected NLCD designations (e.g., cultivated crops could be divided into a finer classification), if desired.

#### v. Geology

Regional geology maps for the study region were combined to develop a composite coverage, using a geodatabase downloaded from the USGS. In the context of this study, *Geology* refers to 72 formations or other lithologic units or designations identified with specific codes (**Figure III-5**). For Quaternary deposits that are found near the surface in most of the designated groundwater basin areas, we used a compilation of datasets created by *Whitter et al.* (2006)<sup>58</sup> and digitized by



*Wentworth et al.* (2006),<sup>59</sup> defining 55 "type names." For areas with older geological units, data was obtained from the USGS State Geologic Map Compilation (SGMC) geodatabase,<sup>60</sup> including 13 formations ranging in age from Eocene to Mesozoic, and four Quaternary units. Where the latter was also represented by Quaternary deposits in the *Wentworth et al.* (2006) compilation, the latter designations superseded those from the statewide compilation.



**Figure III-5.** Geologic units mapped across study area, including 72 distinct lithologies and other classifications. A full listing is included in metadata, but in general, areas with lithologies most conducive to Flood-MAR activities are coarse Quaternary deposits, including areas colored buff-tan to brown to dark lavender.

In general, Quaternary deposits comprise the primary aquifer units in the three groundwater management areas, but particularly at basin edges, older units may be interlayered with younger deposits and therefore could be important for Flood-MAR suitability assessment. Basin edges, where alluvial and fluvial units may pinch out against bedrock deposits, are often locations of "mountain front" recharge because primary aquifer units are sometimes exposed ("daylighted") in these areas. In contrast, areas closer to valley centers often contain wetland or estuarine deposits that are fine grained and can result in development of confined conditions in underlying aquifers. Thus the lateral edges of the groundwater basins are of particular interest for assessing Flood-MAR suitability.

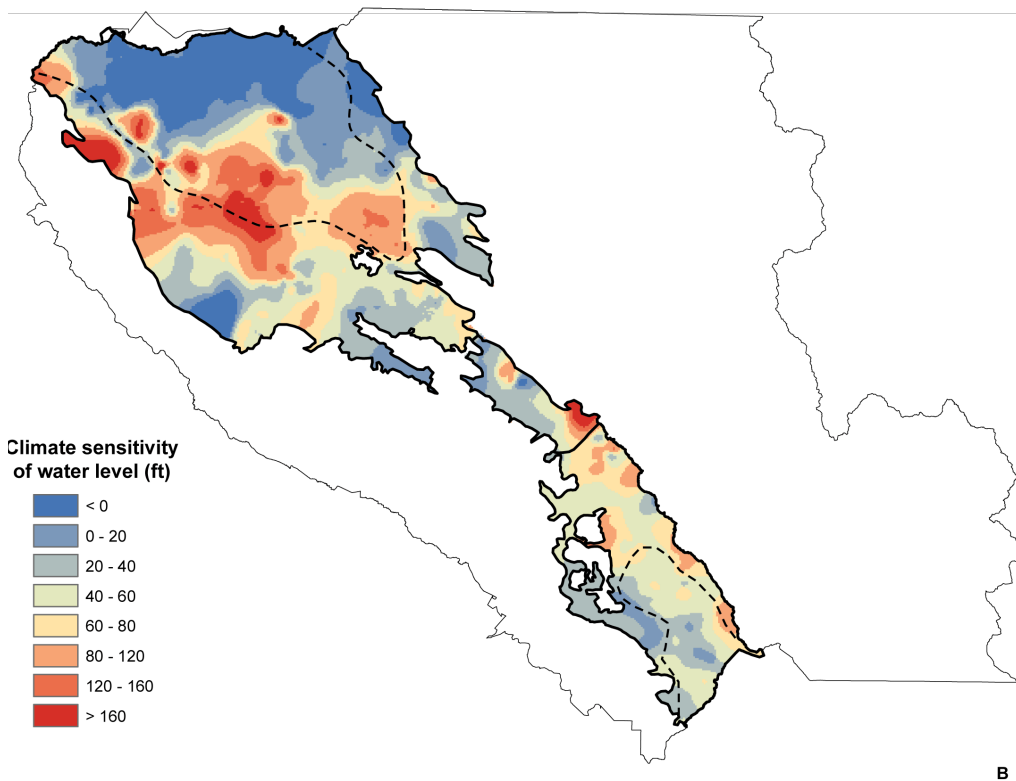
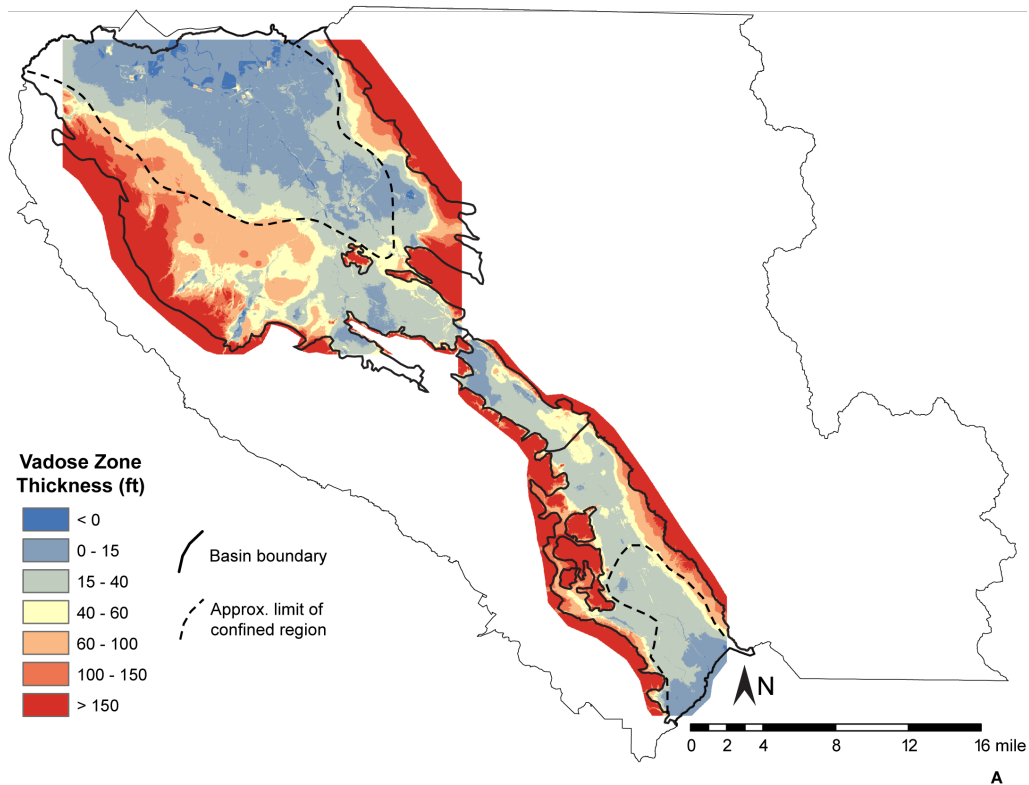
In addition, rural agricultural and residential activities may be supported by individual wells or small well networks in some areas, and the inclusion of older deposits from regional maps is helpful for assuring that there is analysis of surface datasets for the full project area, allowing identification of potential project sites that, while not accessing one of the main groundwater basins, could be useful for local pumpers, streams systems, and/or wetlands. As discussed in greater detail in the section on rating of geological units, many of the Quaternary units have similar descriptions that make interpretation difficult (for example: Qha = Holocene alluvial deposits, undifferentiated; Qhay = Latest Holocene alluvial deposits, undifferentiated). This is true particularly where designated units comprise a wide range of sediment/rock textures (e.g., gravel, sand, silt, clay), and where the dominant texture of deposits is expected to vary at a small spatial scale. Accurate representation of the influence of these deposits on potential Flood-MAR projects will require careful and site-specific field investigation, but the suitability analysis should nevertheless be useful in initial (desktop) screening of options.

#### vi. Hydrogeology – water levels

Several datasets were made available by Valley Water containing groundwater level data, expressed as depth below ground surface (aka, depth to water,  $DTW$ ), and used for multiple calculations and data coverages: (a) median water levels in groundwater wells during 2010-19, (b) maximum depth to water during a recent drought, 2014-15, and (c) minimum depth to water during a long time period that includes multiple periods with relatively wet conditions, 1978-2019, with the majority of data being post-1994, and ~25% of minimum depth observations from 2005-06. These maps were provided as raster coverages created by Valley Water using measurements from monitoring and production wells. All of these subsurface datasets, and those for additional coverage discussed in this section of the report, extend close to the limits of groundwater basin extent, a subset of the total project area (Santa Clara County).

We examined additional maps of water levels around the groundwater management areas, including maps going back the early 1990s, but many of these were either PDF scans of hand-contoured maps or maps generated using *AutoCAD* software or *ArcGIS* "package files" with labeled contours rather than raster data. None of these maps could be used in the present application because Flood-MAR suitability index calculations require a gridded (raster) representation. In principle, contour lines could have been digitized and converted to point values, then these data could be gridded to generate a water level raster, but this would be twice removed from data values used to generate the original contours.

In application to the Flood-MAR suitability index, median water level was interpreted to be equivalent to vadose zone thickness, the depth from the ground surface to groundwater level in a producing aquifer (**Figure III-6A**). The coverages for maximum depth to water (under dry conditions,  $DTW_{dry}$ ) and minimum depth to water (wet conditions,  $DTW_{wet}$ ) were used to calculate a climate sensitivity factor,  $C_s = DTW_{dry} - DTW_{wet}$ , resulting in higher values at locations where there were the greatest differences in water levels between dry and wet conditions (**Figure III-6B**). We interpret larger values of  $C_s$  to be a positive indicator of Flood-MAR suitability, identifying locations where infiltrated surface water may have a good opportunity to reach a pumped aquifer where there is available storage space. We also note that higher groundwater levels under wet conditions and lower water levels under dry conditions could result from differences in pumping. Thus the phrase "climate sensitivity" represents a hybrid of hydrologic and human (behavioral) influences.



**Figure III-6. A.** Vadose zone thickness based on median depth to water (*DTW*) during 2010-19. **B.** Climate sensitivity of *DTW* defined as  $DTW_{dry} (2014-15) - DTW_{wet} (1978-2019, \text{minimum})$ . White spaces within the subbasins in panel A indicate areas where vadose zone thickness is not interpolated because of limited depth-to-water data.

The vadose zone tends to be thinnest near the basin centers, particular at the north end of the Santa Clara Plain and the southern end of the Llagas Subbasin, where confined conditions are dominant, and on the northern side of Coyote Valley. The vadose zone tends to be thickest where there are local topographic highs, including locations where bedrock formations are surrounded by valley fill deposits, and on the edges of the groundwater basins as they slope upward into surrounding mountain ranges (**Figure III-6A**). The climate sensitivity of water levels is highly variable around the project region, and is notably high in the central and western sides of the Santa Clara Plain (near large well fields and percolation basins), at the southeastern end of Coyote Valley, and along the margins of Llagas Basin (**Figure III-6B**).

#### vii. Hydrogeology – Transmissivity and Storage

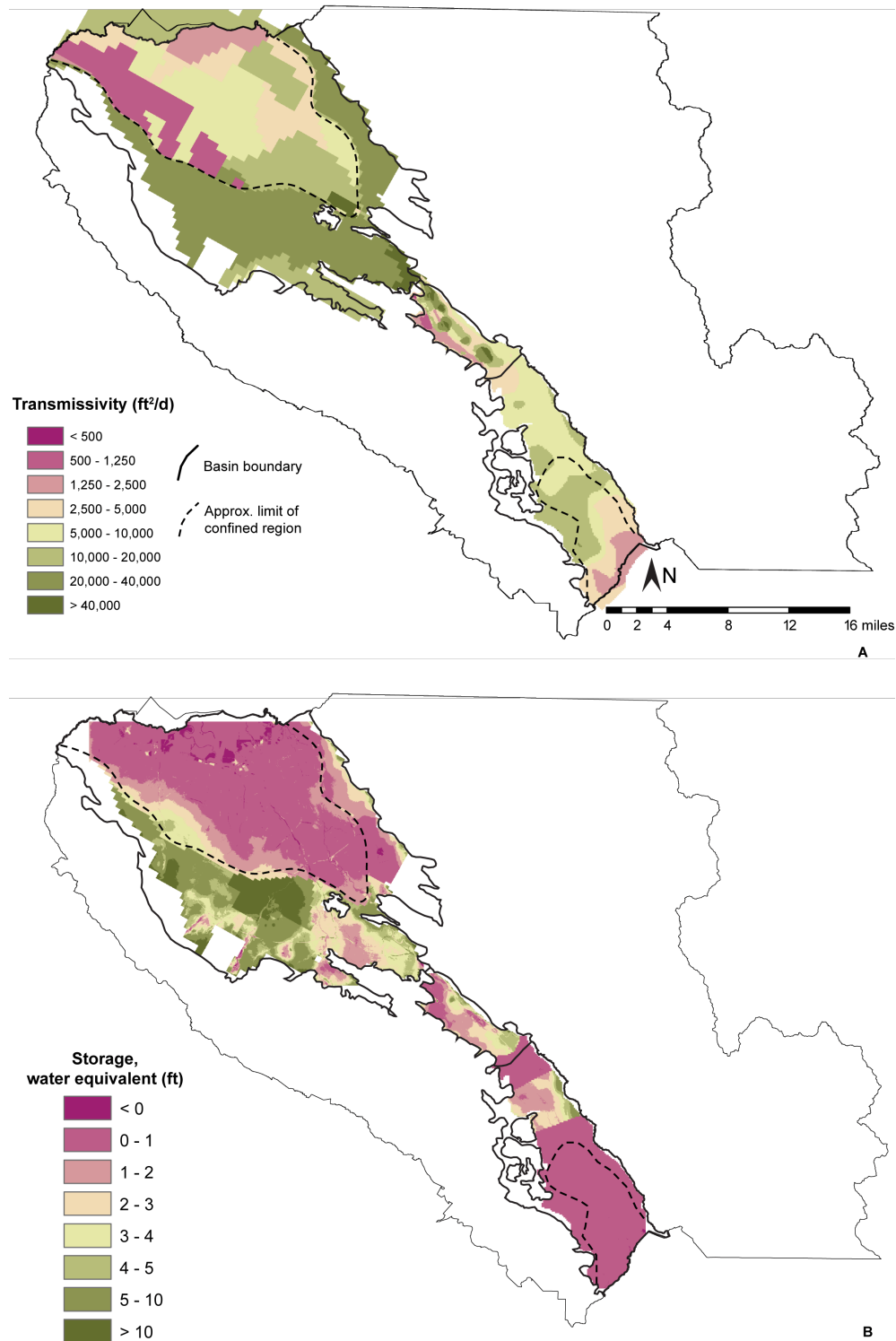
Multiple data coverages were used to assemble maps of aquifer properties, as applied for groundwater models currently in use by Valley Water, including updated versions of simulations developed for the Santa Clara Plain, Coyote Valley, and the Llagas Subbasins (**Figure III-7**). Acquisition and development of these data coverages for use in the current project varied by management area and model, as summarized in this section. Transmissivity is defined as the product of horizontal hydraulic conductivity multiplied by aquifer thickness for a tabular, horizontal aquifer layer or layers. Thus for unconfined conditions, transmissivity varies with water level. The storage factor calculated for the present application is the product of specific yield ( $S_y$ ) and aquifer layer thickness, indicating space available for storage of supplemental surface water. Data used for this analysis was provided by Valley Water personnel and subject to evaluation and discussion to determine how it might be applied.

For the model of groundwater flow in the Santa Clara Plain, data were evaluated for the top three model layers (1, 2, 3), for which lateral grid resolution was typically 1,000 to 6,000 ft. Layers 1 and 2 exist for this model only where the principal aquifer is confined, representing the upper unconfined and confining layers, respectively. Where Layer 1 exists, in the confined region, its thickness is ~80 to 100 ft. Where Layers 1 and 2 are absent (outside the confined region), Layer 3 is the uppermost active model layer and is ~100 to 500 ft thick. For transmissivity calculations for this model, we multiplied horizontal conductivity ( $K_h$ ) by layer thickness for Layer 1 in confined areas, or by Layer 3 where the main aquifer is unconfined and model Layers 1 and 2 are inactive. This approach accounts for there being limited (but often non-zero) transmissivity above confined parts of the Santa Clara Plain, but generally results in greater transmissivity where there are unconfined conditions that correspond to thicker aquifer layers. Layer 1 values of horizontal conductivity were constant in the model,  $K_h = 70$  ft/day, whereas Layer 3 values varied,  $K_h = 5$  to 333 ft/day.

A similar approach was applied for storage from the Santa Clara Plain model, using Layer 1 where it was active above a confining layer, and Layer 3 where conditions were unconfined. In each case, we multiplied the value of  $S_y$  by layer thickness in the same cell location. Specific yield in the Layers 1 and 3 of this model varied with location,  $S_y = 0.02$  to 0.21.

For input data used with groundwater models for Coyote Valley and the Llagas Subbasin, we worked only with the uppermost layer, Layer 1. For the Coyote Valley model, Layer 1 has spatial resolution of 250 by 250 ft. Although  $K_x$  and  $K_y$  are specified separately (with a range of 35 to 650 ft/day), they are assigned the same values ( $K_x = K_y$ ) in individual cells. In addition,  $S_y = 0.08$  in this model throughout the domain, so differences in storage calculations as applied in

this study depend entirely on cell thickness. Cells in Layer 1 of the Coyote Valley model are assigned thicknesses of 13 to 376 ft.



**Figure III-7.** Aquifer properties from MODFLOW property files. **A.** Transmissivity from upper layers. **B.** Storage from upper layers, defined as specific yield x thickness of vadose zone.

For the Llagas Subbasin model, calculations were made for Layer 1, which has a spatial resolution of 500 x 500 ft. As with the Coyote Valley model,  $K_x$  and  $K_y$  are specified separately (with a range of 14 to 134 ft/day), but are assigned same values ( $K_x = K_y$ ) within individual cells. Specific yield is much lower in the Llagas Subbasin model than in the other two models, with values of  $S_y = 0.005$  to  $0.06$ , and cell thicknesses are 150 to 295 ft.

Resulting values of transmissivity vary from  $<500$  ft<sup>2</sup>/day to  $>40,000$  ft<sup>2</sup>/day, with the highest values calculated from model input data in the unconfined part of the Santa Clara Plain (**Figure III-7A**). There are some elevated values apparent along the center of Coyote Valley, and transmissivity is lower along valley edges, especially on the southwest side. Transmissivity values tend to be lower overall in Llagas Subbasin, with the lowest values in the confined area along the southeastern side of the basin. The overall coarse granularity of model cells is apparent in the calculated transmissivity values, as the model resolution is several orders of magnitude coarser than the  $\sim 10 \times 10$  ft pixel size applied in this study, but there is "structure" in the variability that seems to be broadly consistent with the nature of basin fill deposits.

The distribution of storage factor values suffers in comparison, with large areas in which there is little variability. In the Santa Clara Plain, there appears to be considerable storage associated with the unconfined area along the southwestern side of the basin. There are much smaller parts of Coyote Valley and Llagas Subbasin with elevated storage potential, and large sections of Llagas Subbasin, in particular, with little available storage based on values used in the groundwater models (**Figure III-7B**). As discussed later in the report, after an initial analysis using transmissivity and storage ratings and discussion with Valley Water personnel, we elected to not use transmissivity and storage values in the suitability analysis.

### *c. Filters and constraints for application of Flood-MAR*

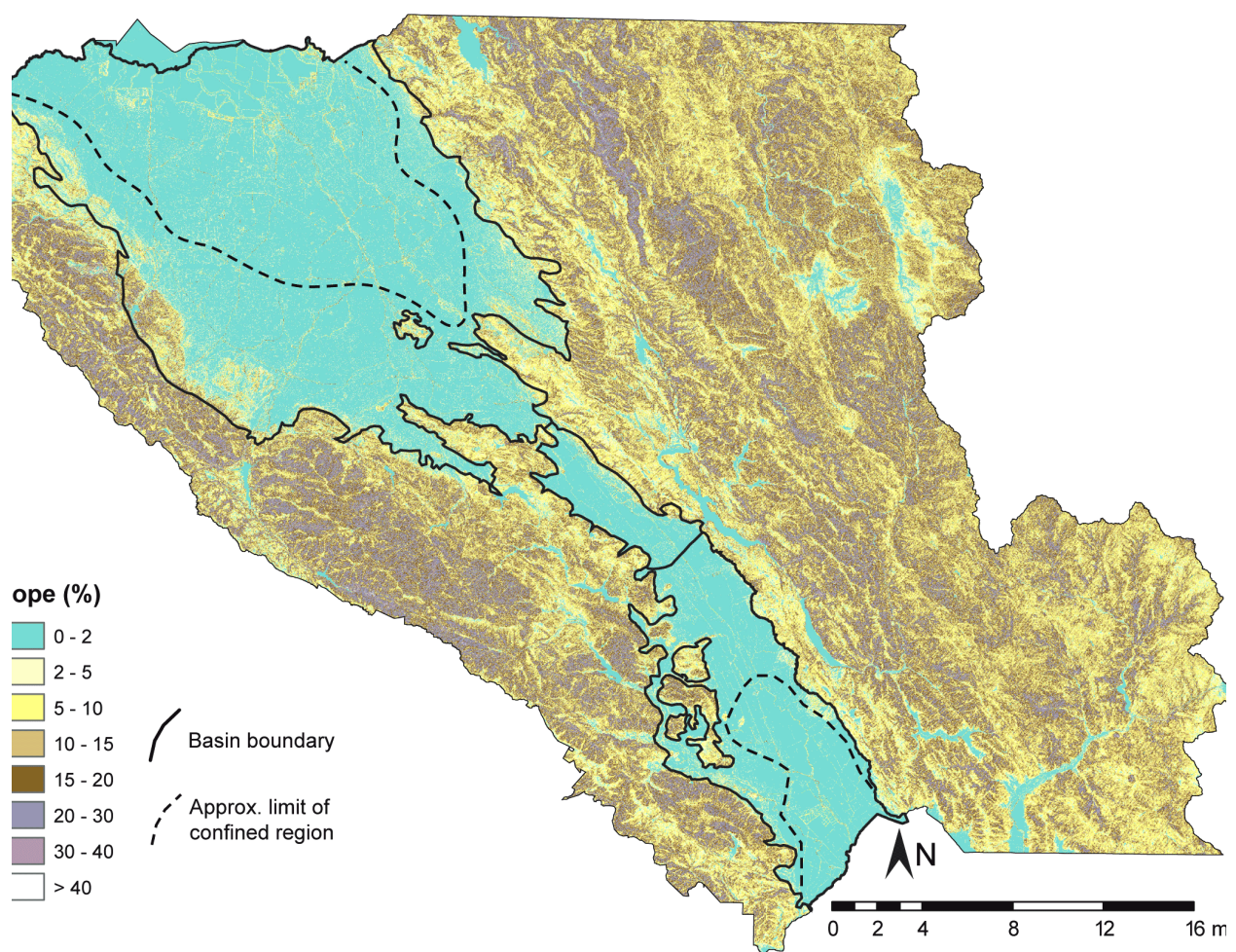
Remaining factors applied in this pre-feasibility assessment of Flood-MAR suitability for the Valley Water service area were not applied directly as part of suitability index calculations, but were used instead as either (a) *filters* to limit the extent of the analysis to a subset of the total project region, or (b) *constraints* that help to focus investigation of specific subregions. Each of these approaches is explained in this section. These should be considered as examples of a filter and/or constraint approach, for which numerous additional datasets could be applied, as discussed later.

We apply DEM slope as a filter to suitability index calculations, removing areas having a ground surface slope  $\geq 10\%$ , reasoning that these areas are less desirable based on challenges in collection of hillslope runoff under steep conditions (**Figure III-8**). Some areas with slopes  $>10\%$  might still be viable for projects, but the most feasible sites are likely to be in or close to the main groundwater basins that occupy valleys. That said, we don't include slope as a numerical factor as part of suitability index calculations because we don't consider there to be a continuous, monotonic relation between slope and project feasibility. Instead, we suggest that this factor is suitable for binary categorization, separating areas that are too steep from other areas that could be viable. Setting a limit at 10% slope is admittedly arbitrary, but we include the map of slope values as part of the working GIS project, and an alternative slope filter could be created and applied if desired.

Other potential filters that were discussed as this project was developed included (a) proximity to a known channel (perhaps gaining channels or channels with groundwater dependent



ecosystems, GDEs) and (b) the mapped extent of confined areas. We did not include the first of these factors as a filter because how it would be applied depends on several additional considerations, and could vary depending on potential project goals and methods used for MAR. For example, if a project were conceived entirely as a means to enhance groundwater storage for subsequent recovery by pumping, then closer proximity to a stream (especially a gaining stream) might be considered to be a negative factor. Alternatively, if the stream channel were known to contain a GDE or other important species, proximity of a Flood-MAR project could be considered to be a positive factor. If any of these considerations were to apply, one would also need to decide how to design the filter, what distance limit might be appropriate (1000 ft, 5000 ft, etc.). Similar considerations could apply depending on whether the primary approach to be taken is infiltration in a dedicated basin, with an area of perhaps 1-10 acres, or if flood-plain inundation across a larger area were possible. We don't argue against adding these or other constraints, but for this pre-feasibility analysis, we elected to filter locations based only on slope.



**Figure III-8.** Values of slope from the digital elevation model, used as a filter for Flood-MAR suitability maps (areas with slopes  $\geq 10\%$  removed from consideration).

Considerations for placement of a Flood-MAR project could include identification of parcels designated as open space, for which restoration goals might be consistent with enhanced infiltration for Flood-MAR (**Figure III-9**). Open space parcels could be additionally categorized based on ownership; flood zone designation; or presence of endangered, threatened, or endemic

species. Additional considerations could include the boundaries of Valley Water benefit zones (**Figure I-1**), or the presence of disadvantaged communities. We also added data to the project showing the distribution of water quality indicators (**Figure III-10**). Whether these or other factors were considered to be positive or negative with respect to placement of a Flood-MAR project depends on numerous additional considerations, and it will often be useful to simply render maps of a Flood-MAR suitability index with an overlay of polygons representing additional information. Addition of these coverages also helps to illustrate the benefit of working directly with the GIS project, rather than as single-display maps, so that additional features can be added and symbology to clarify spatial variations.

#### *d. Suitability ratings*

Ratings for each factor used in the calculation of a suitability index were applied on a scale from 0 to 7, where lower ratings indicate less suitability for Flood-MAR and higher ratings indicate more suitability. The establishment of a rating scale for each factor is discussed in the next section. Once surface and subsurface factors were assigned spatially, three Flood-MAR suitability indices were calculated for the project region: surface suitability, subsurface suitability, and composite suitability. Each suitability index calculation was based on rated and weighted factors, using the following formulas:

$$SI_{\text{surface}} = (0.33 \times IC_r) + (0.33 \times LULC_r) + (0.33 \times Geol_r) \quad (2a)$$

$$SI_{\text{subsurface}} = (0.50 \times VZ_r) + (0.50 \times CS_r) \quad (2b)$$

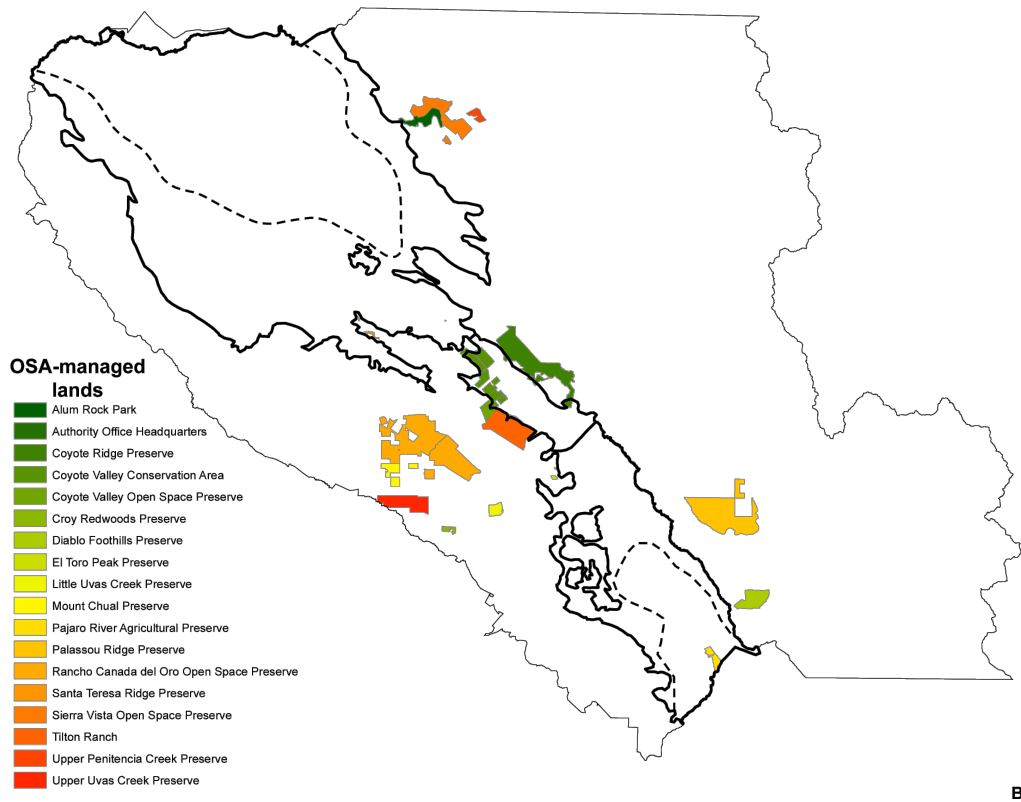
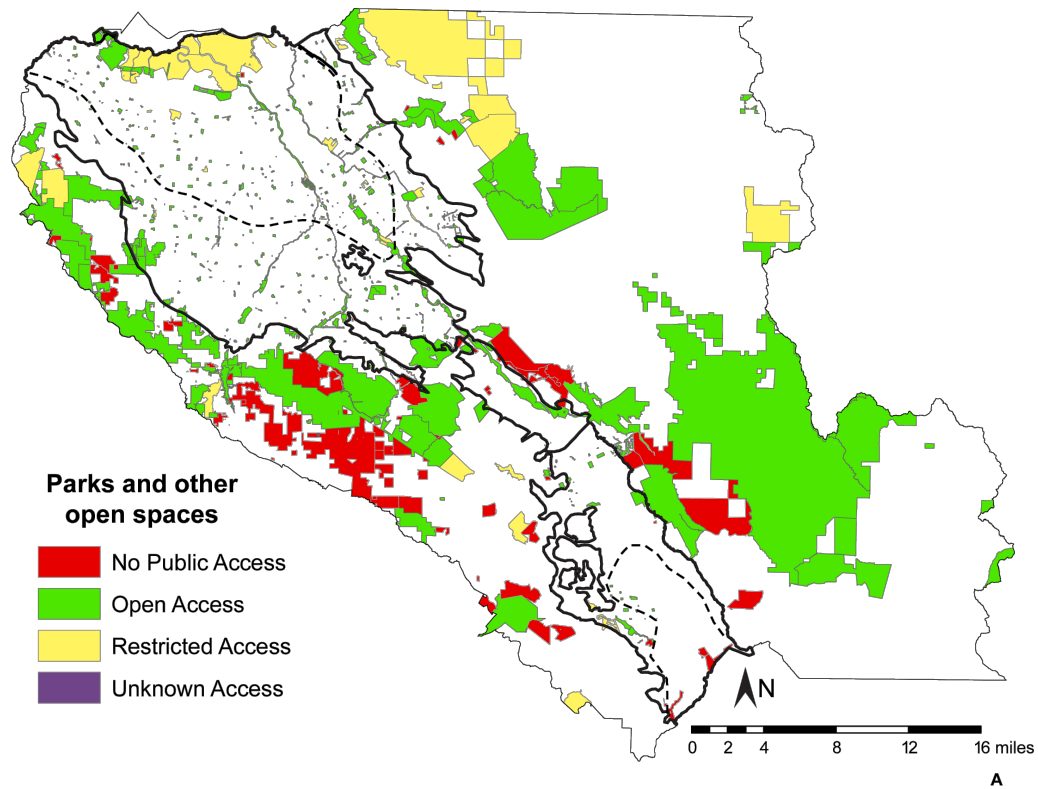
$$SI_{\text{composite}} = (0.6 \times SI_{\text{surface}}) + (0.4 \times SI_{\text{subsurface}}) \quad (2c)$$

with the last equation being equivalent to:

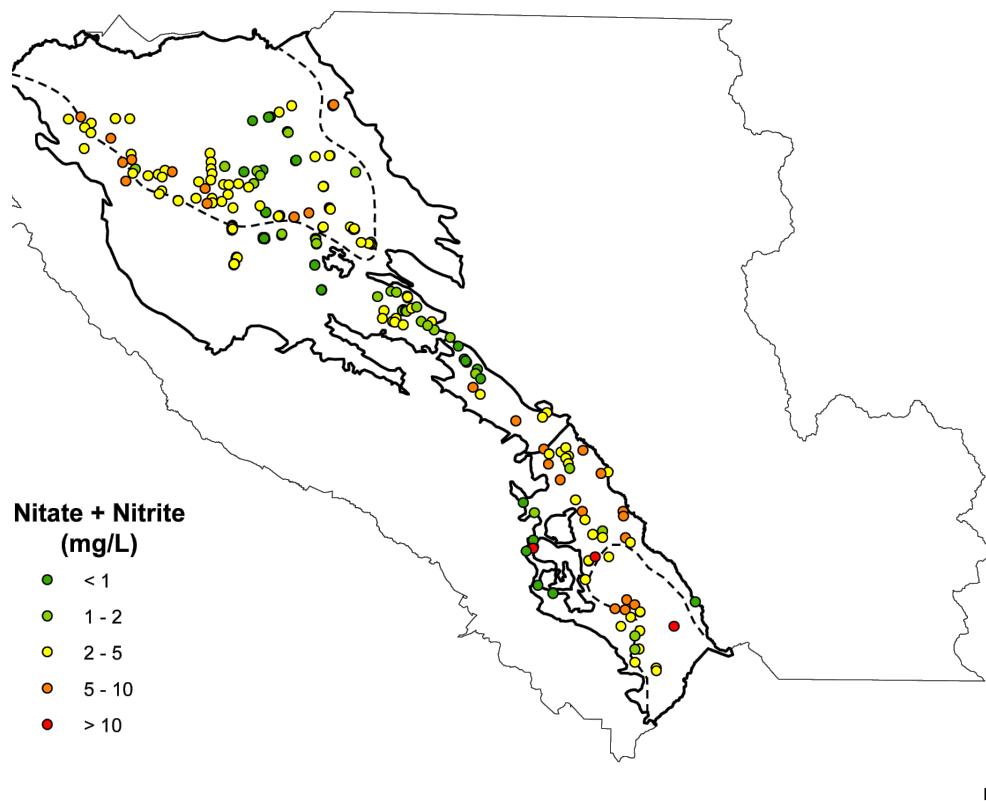
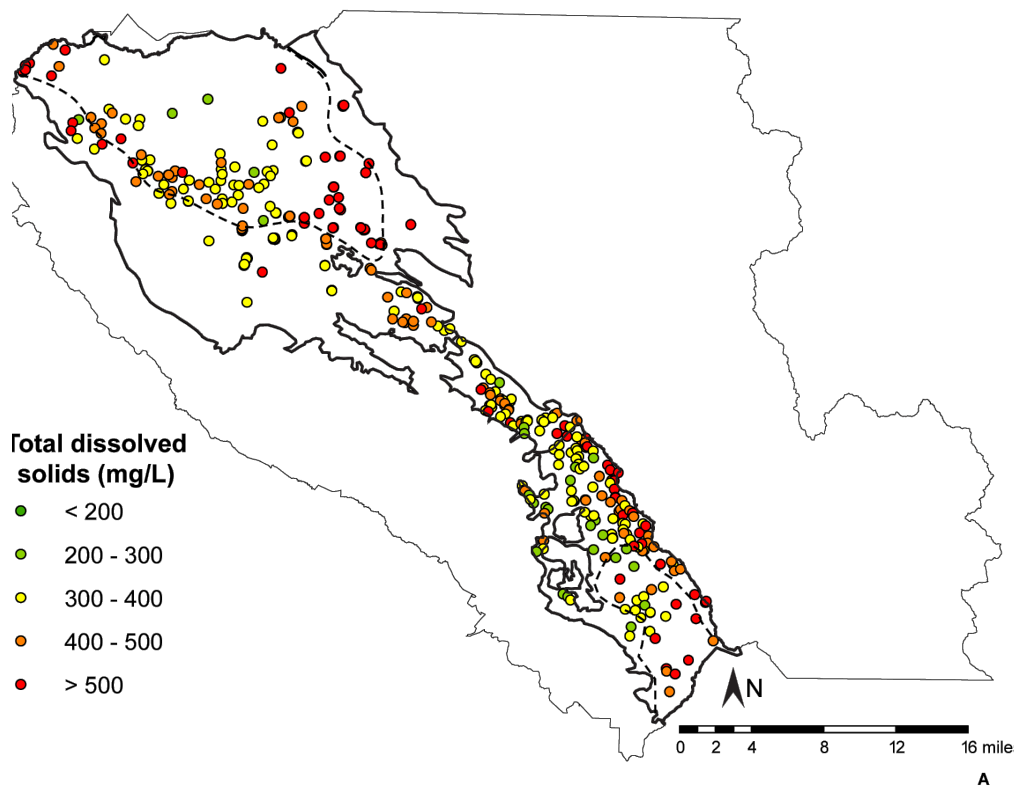
$$SI_{\text{composite}} = (0.2 \times IC_r) + (0.2 \times LULC_r) + (0.2 \times Geol_r) + (0.2 \times VZ_r) + (0.2 \times CS_r)$$

The use of equal weights for the five main factors considered is broadly consistent with other analyses of MAR suitability (e.g., Sallwey et al., 2018). These formulae could be modified in the future on the basis of new information or to assess the sensitivity of associated calculations.





**Figure III-9.** Selected categories of open space, which could be used to focus application of suitability maps. **A.** Regional parks and related spaces. **B.** Properties managed by the Open Space Authority of Santa Clara County.



**Figure III-10.** Water quality indicator examples, which could be used to focus application of Flood-MAR projects. **A.** Total dissolved solids. **B.** Concentrations of nitrate+nitrite.

## B. MAR Suitability Analyses

### 1. Surface factor ratings and suitability index

#### a. Infiltration capacity

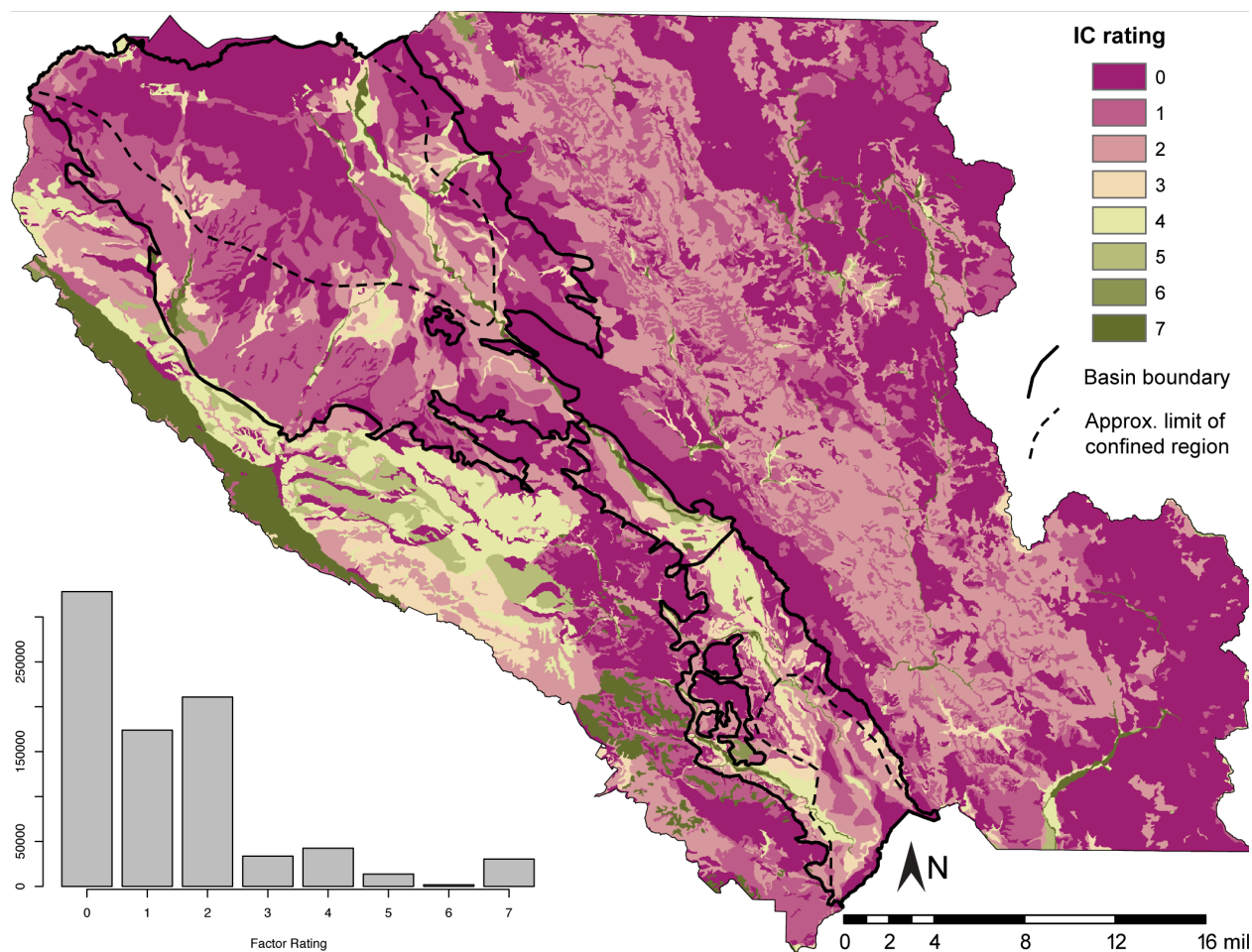
The rating scale was set so that  $IC$  values that are moderately favorable for a Flood-MAR project would be rated  $IC_r = 3$  to 4 on a scale of 0 to 7, representing values of  $IC = 1$  to 2 ft/day (**Table III-2**). Areas with the highest infiltration capacity rating are located mainly in association with current streams, previous channels, and sandstone units in the Santa Cruz Mountains (**Figure III-11**). Active stream channels (either perennial or ephemeral) are not likely to be used for creation of new Flood-MAR projects, but near-stream areas could prove useful for this purpose if there is a suitable water supply available.

Overall, soils in Santa Clara County tend to be unfavorable for infiltration for recharge, with  $IC \leq 1$  ft/day ( $IC_r \leq 2$ ) mainly because many of the valley fill and wetland units are a complex mixture of textures and depositional facies, including common fine units. About 10% of the study region has moderately to highly favorable soils based on  $IC$ , comprising ~90,000 acres (**Table III-2**). Within the groundwater management areas, favorable soils tend to occur in clusters, particularly at the southern end of Coyote Valley, the northern and southwestern side of Llagas Basin, and around the edges of the limit of confined aquifer conditions in the Santa Clara Plain (**Figure III-11**). In many cases, these are active, ephemeral, or paleo-stream channels or associated deposits, as identified in earlier studies.<sup>61</sup>

**Table III-2.** Summary of ratings for infiltration capacity.

Suitability Rating	Infiltration Capacity (ft/day)	Area (acres) <sup>a</sup>	% Land Area <sup>a</sup>
0	< 0.25	328,200	39.3
1	0.25 - 0.5	173,900	20.8
2	0.5 - 1.0	210,800	25.2
3	1.0 - 1.5	33,700	4.0
4	1.5 - 2.0	42,600	5.1
5	2.0 - 2.5	13,800	1.6
6	2.5 - 3.0	1,800	0.2
7	> 3.0	30,400	3.6

<sup>a</sup> Area rounded to nearest 100 acres. Percent land area calculated based on the total area represented in Santa Clara County.



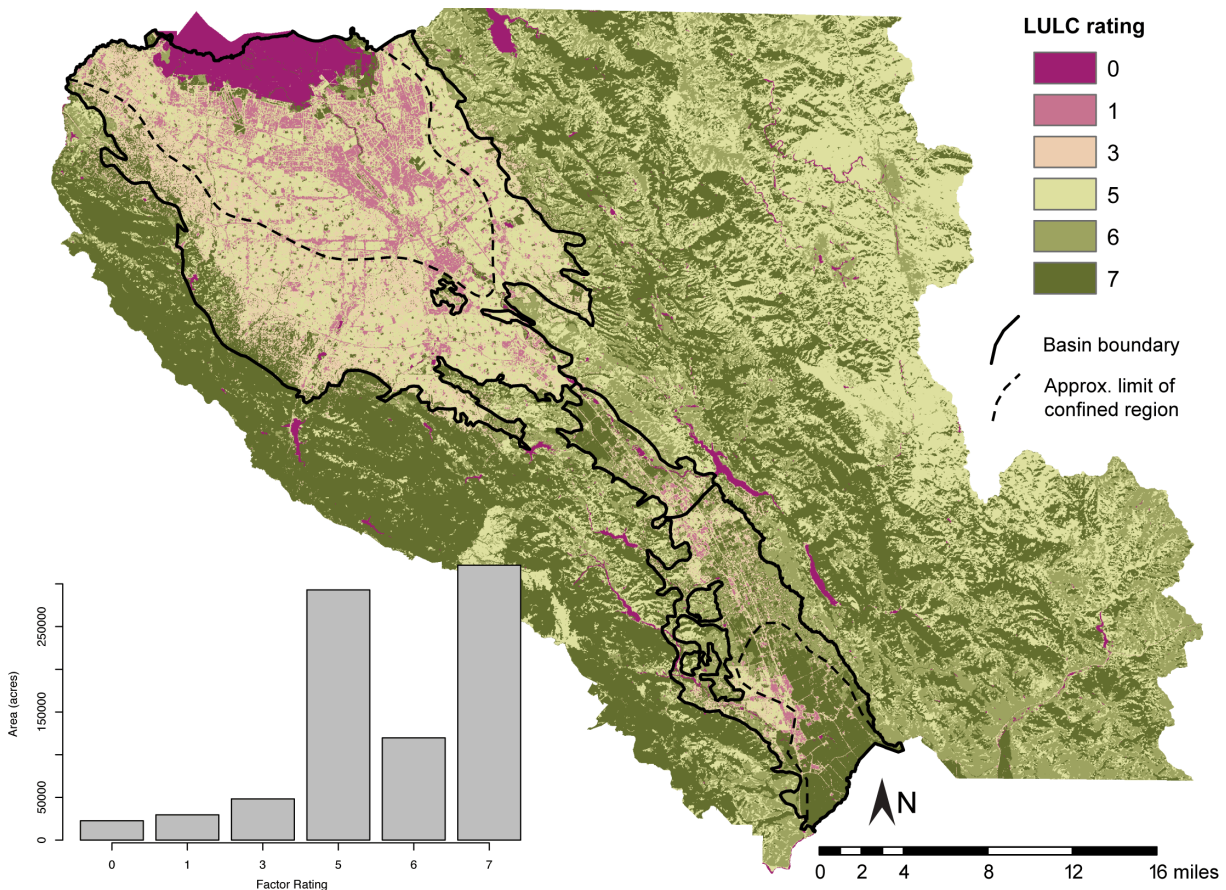
**Figure III-11.** Infiltration capacity ratings. Rating values defined in **Table III-2** and discussed in text.

### *b. Land use/land cover*

Much of the project area appears to be favorable for Flood-MAR on the basis of land use/land cover (LULC) (**Figure III-12**). However, the regions with the most continuous favorable LULC ratings are outside the groundwater management areas, particularly outside the Santa Clara Plain. The rating system used for LULC extends across the full range of 0 to 7, but we elected to use a somewhat less granular categorization scheme, with six rating values (0, 1, 3, 5, 6, 7).  $LULC_r = 0$  was assigned mainly for open water and wetlands (which often have hydrophobic soils), whereas  $LULC_r = 1$  was assigned only for high-intensity development (urban areas) (**Table III-3**). Medium- and low-intensity development was rated 3 and 5, respectively, reasoning that the latter could prove suitable for Flood-MAR if there were sufficient open spaces capable of hosting a project. This could be compatible with developed land use if a parcel were zoned as a park or for environmental benefit.

Areas with *LULC* categories indicating extensive vegetation, other than wetland, were rated  $LULC_r = 5, 6$ , or 7 (**Table III-3**). Scrub/shrub and herbaceous landscapes were rated  $LULC_r = 5$  and 6, respectively, and all forests, cultivated crops, and hay/pasture were rated  $LULC_r = 7$ . The latter rating deserves particular justification. Unlike other studies that favored particular crop types,<sup>62</sup> we are more neutral with regard to using this factor to indicate suitability, for several reasons. As noted previously, the presence of specific crops is likely to be a weak indicator of

Flood-MAR suitability on its own because (a) cropping changes over time, (b) within individual crops there can be large differences in landscape management, (c) and it is possible that a grower may wish to set aside some land for Flood-MAR, even if that land is productive. Alternatively, there could be incentives for land fallowing, or limitations in access to water for that makes land less valuable for agriculture.



**Figure III-12.** Land use/land cover ratings. Rating values defined in **Table III-3** and discussed in text.

**Table III-3.** Summary of ratings for land use/land cover.

Suitability Rating	Land Use	Area (acres)	% Land Area <sup>a</sup>
0	Open Water, Woody Wetlands, Emergent Herbaceous Wetlands	22,600	2.7
1	Developed-High Intensity	29,600	3.5
3	Developed-Medium Intensity	48,300	5.8
5	Developed-Low Intensity, Shrub/Scrub	293,000	35.1
6	Herbaceous	119,700	14.3
7	Developed-Open Space, Barren Land, Deciduous Forest, Evergreen Forest, Mixed Forest, Hay/Pasture, Cultivated Crops	321,900	38.5

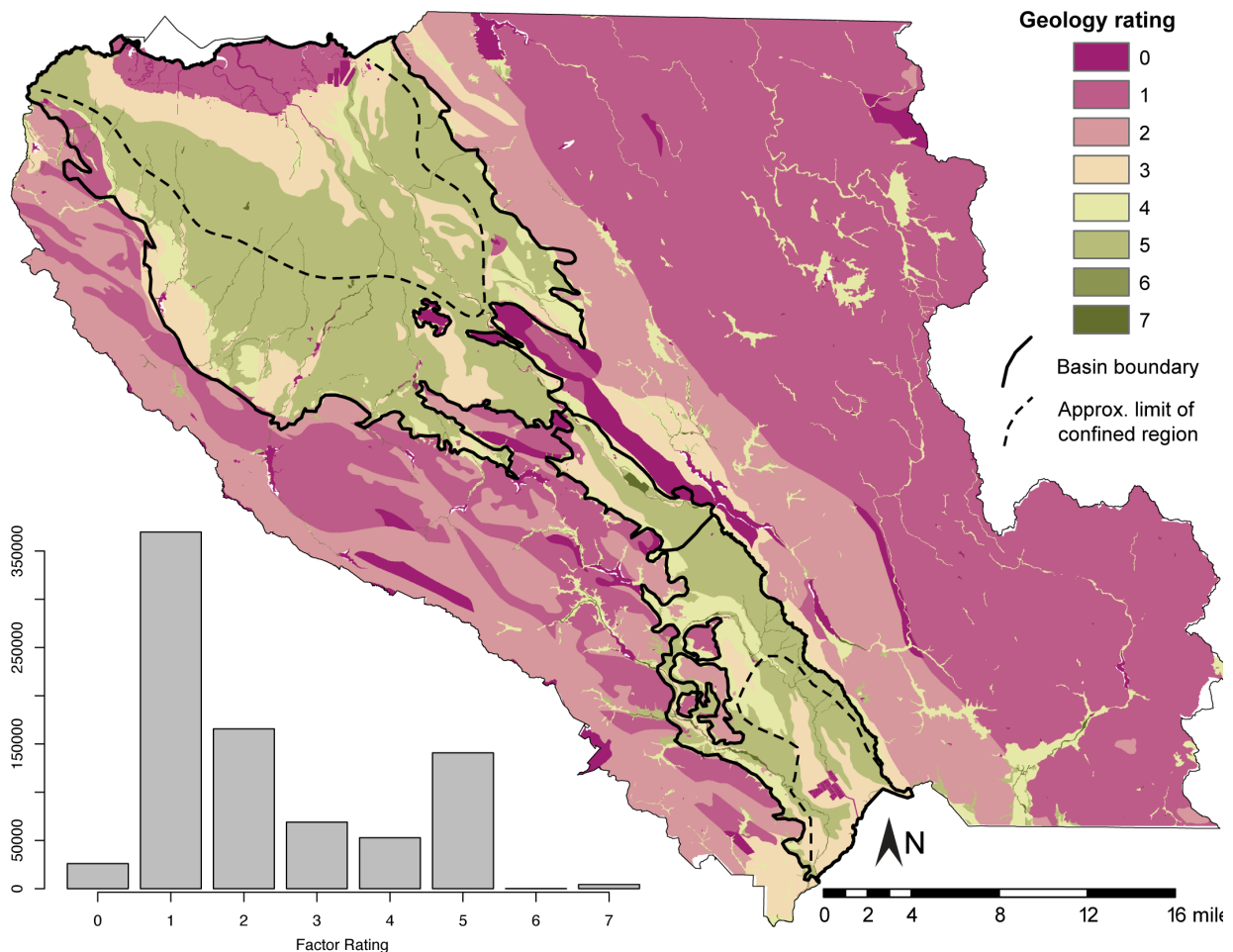
<sup>a</sup> Area rounded to nearest 100 acres, percent is relative to all of Santa Clara County.



There are exceptions to this approach that may be worth considering, for example areas planted in perennial crops that do not tolerate frequent or long-term inundation (e.g., stone fruit trees); but even in those areas, an infiltration basin with an area of 1 to 5 ac might be accommodated, particularly if that part of a parcel were not especially productive and had favorable characteristics for MAR. There also could be specific agricultural land uses that are contraindicators for Flood-MAR, e.g., dairy operations that tend to generate animal waste, and thus elevated TDS and nitrate values in runoff. The current framework allows for more specificity that could include lower  $LULC_r$  for particular land uses, but we have not attempted this in the initial set of calculations.

### c. Geology

Geology and landscape type categories were rated for 72 specific substrate types (**Figure III-13**). Quaternary units that include former stream channels have the highest geology ratings  $Geol_r = 6$  or 7 (**Table III-4**), and tend to be found close to current/active channels. Other Quaternary valley fill and fluvial units generally have high ratings as well  $Geol_r = 4$  or 5, but some units were largely undifferentiated (gravel to sand to silt to clay) or were identified as generally being older and more lithified, resulting in classification of  $Geol_r = 3$ .  $Geol_r \leq 3$  were generally assigned to units that were Plio-Pleistocene or older, including crystalline rocks in the Santa Cruz Mountains.



**Figure III-13.** Regional geology ratings. Rating values defined in **Table III-4** and discussed in text.

In general, the groundwater basins have more favorable geology for Flood-MAR, and there is considerable variability and structure (**Figure III-13**). More than 7% of the land area in Santa Clara County has geology characterized as  $Geol_r \geq 5$ , comprising nearly 60,000 acres, most of which is located in the groundwater management areas.

**Table III-4.** Summary of ratings for geology.

Suitability Rating	Lithology <sup>a</sup>	Area (acres)	% Land Area <sup>b</sup>
0	Ultramafic rocks, chiefly Mesozoic, unit 3 (Coast Ranges and Western Klamath Mountains), H2O, nm	26,000	3.1
1	Franciscan mélange/Franciscan Complex, unit 1 (Coast Ranges)/Tertiary intrusive rocks (hypabyssal), unit 2 (Quien Sabe Volcanic Field)/Qhbm/adf/Qhb/Qhf	370,000	44.6
2	Mesozoic volcanic rocks, unit 1 (Coast Ranges)/Cretaceous marine rocks (in part nonmarine), unit 1 (Coast Ranges)/Eocene marine rocks/Miocene marine rocks	166,000	20.0
3	Plio-Pleistocene and Pliocene loosely consolidated deposits/Pliocene marine rocks/Qhff/Qt/Qhfe/Qht/Qhty/Qhcb/Qot/Qpt/Qht1/Qht2/Qt1/Qt2	69,000	8.3
4	Older Quaternary alluvium and marine deposits/Quaternary alluvium and marine deposits/Qha/Qa/Qpa/Qf/Qhfy/Qoa/Qhly-Qhty/Qhf-Qhff	52,700	6.4
5	Qhl1/Qpf/Qhly/Qhf1/Qhl/Qhf2/Qhf/Qof/Qhf-Qpf/Qhf-Qhl/Qhl-Qpf/Qof2/Qof1	141,000	17.0
6	Qhc-Qhly	65	0.01
7	Qhc/gq	4,300	0.5

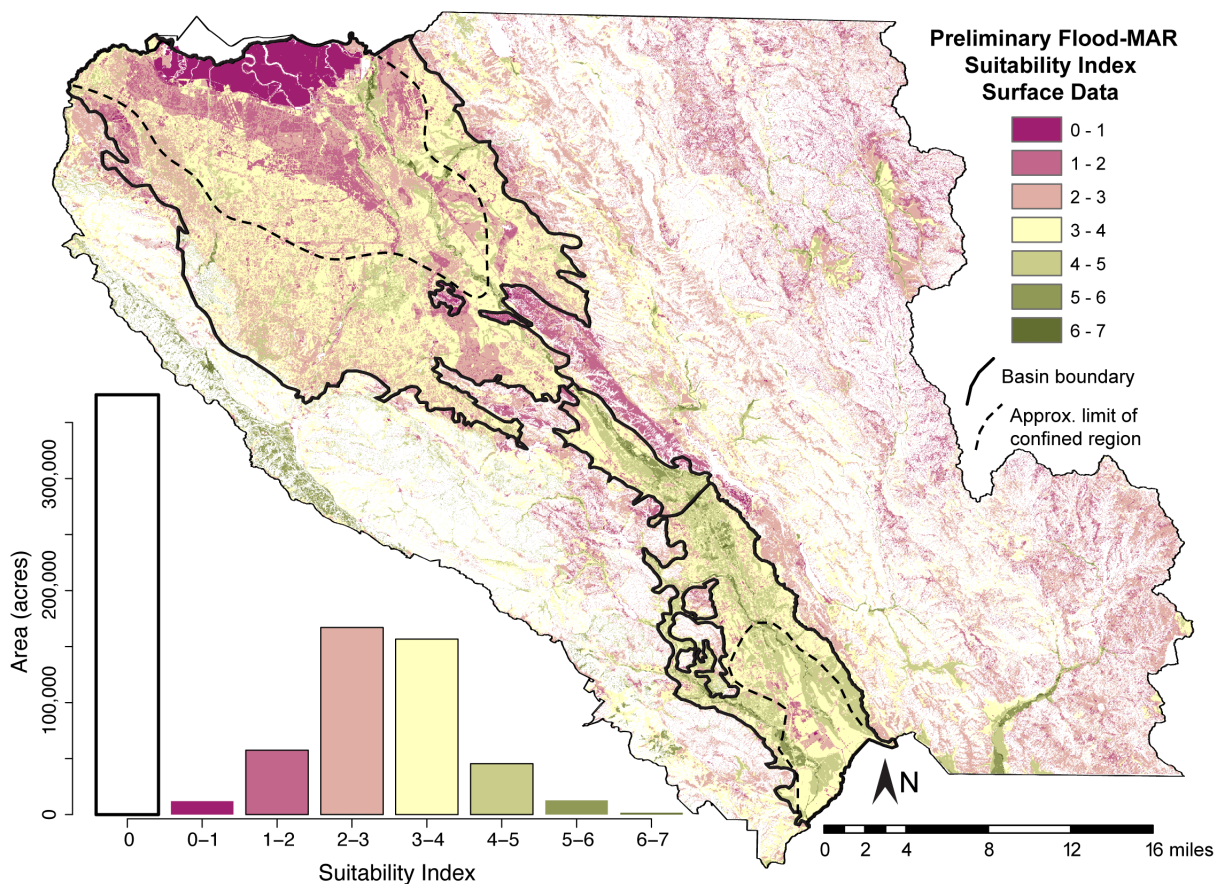
<sup>a</sup> Lithologic units as identified on USGS geological maps. Full definitions available for all units in metadata on suitability rating factors, [https://docs.google.com/spreadsheets/d/1qTI0mknAR5wT8NDZxh9YfkHwd\\_g0RzeQ6uQ0Umtm9KA/edit?usp=sharing](https://docs.google.com/spreadsheets/d/1qTI0mknAR5wT8NDZxh9YfkHwd_g0RzeQ6uQ0Umtm9KA/edit?usp=sharing)

<sup>b</sup> Percent land area was calculated based on the total area of Santa Clara County.

#### d. Surface suitability index

The three surface factors were weighted equally to derive a Flood-MAR Suitability Index (**Figure III-14**). Because the three surface factors applied are mostly independent (perhaps with limited correlation between  $IC_r$  and  $Geol_r$ ), the resulting map is highly granular and shows considerable variability and complexity across the project region. We also filtered out all pixels having slopes  $\geq 10\%$ , which removed mountainous areas to the west and east of the groundwater basins. More than 7% of the land area has Flood-MAR Suitability based on surface data characterized as  $SI_{\text{surface}} = 4$  to 7, comprising ~60,000 acres, most of which is located in the groundwater management areas, and particularly Coyote Valley and the Llagas Subbasin. If we consider areas with  $SI_{\text{surface}} = 3$ -4, the center of the range calculated, this comprises another ~19% of land area, an additional ~150,000 acres that is (once again) mostly in the groundwater management areas.

On the one hand, this is a promising result, suggesting that there may be many opportunities around the Valley Water service area to accomplish Flood-MAR goals. On the other hand, one application for this GIS project is to set priorities for specific regions, so having too much of an area rated highly could make screening difficult. The addition of subsurface data helps to narrow the spatial focus of potential Flood-MAR project sites.



**Figure III-14.** Preliminary Flood-MAR suitability index for full project area based on surface datasets, filtered to remove areas with slopes  $\geq 10\%$  (resulting in suitability index = 0). Factors used for this analysis include: infiltration capacity, geology, and land use/land cover, filtered using the digital elevation model. Areas with each index are listed in **Table III-5**.



**Table III-5.** Summary of Flood-MAR suitability based on surface datasets.

Suitability Rating	Area (acres) <sup>a</sup>	% Land Area <sup>a</sup>
0 <sup>b</sup>	374,800	45.3
0 - 1	11,900	1.4
1 - 2	57,500	6.9
2 - 3	167,000	20.2
3 - 4	156,600	18.9
4 - 5	45,500	5.5
5 - 6	12,700	1.5
6 - 7	1,600	0.2

<sup>a</sup> Area rounded to nearest 100 acres, percent is relative to all of Santa Clara County.

<sup>b</sup> Includes land filtered by slope >10%.

## 2. Subsurface suitability ratings and index

### a. Vadose zone thickness

Ratings for vadose zone thickness have the most complex (and arguably, the most subjective) categorization system. At the limits, a high water table with  $DTW < 10$  ft is considered too shallow for Flood-MAR; mounding and saturation of shallow soils are likely to occur ( $VZ_r = 0$  in this analysis). A somewhat thicker vadose zone, 10-20 ft, was assigned  $VZ_r = 1$ . At the other extreme, a vadose zone >200 ft thick indicates that groundwater is so deep that surface infiltration seems likely to be perched rather than reach a depth from which groundwater pumping is common ( $VZ_r = 2$ ).  $VZ$  values between 20 and 200 ft were assigned intermediate  $VZ_r$  values, with the peak in thickness assigned for  $VZ_r = 7$  when  $DTW = 20$ -60 ft (**Table III-6**).

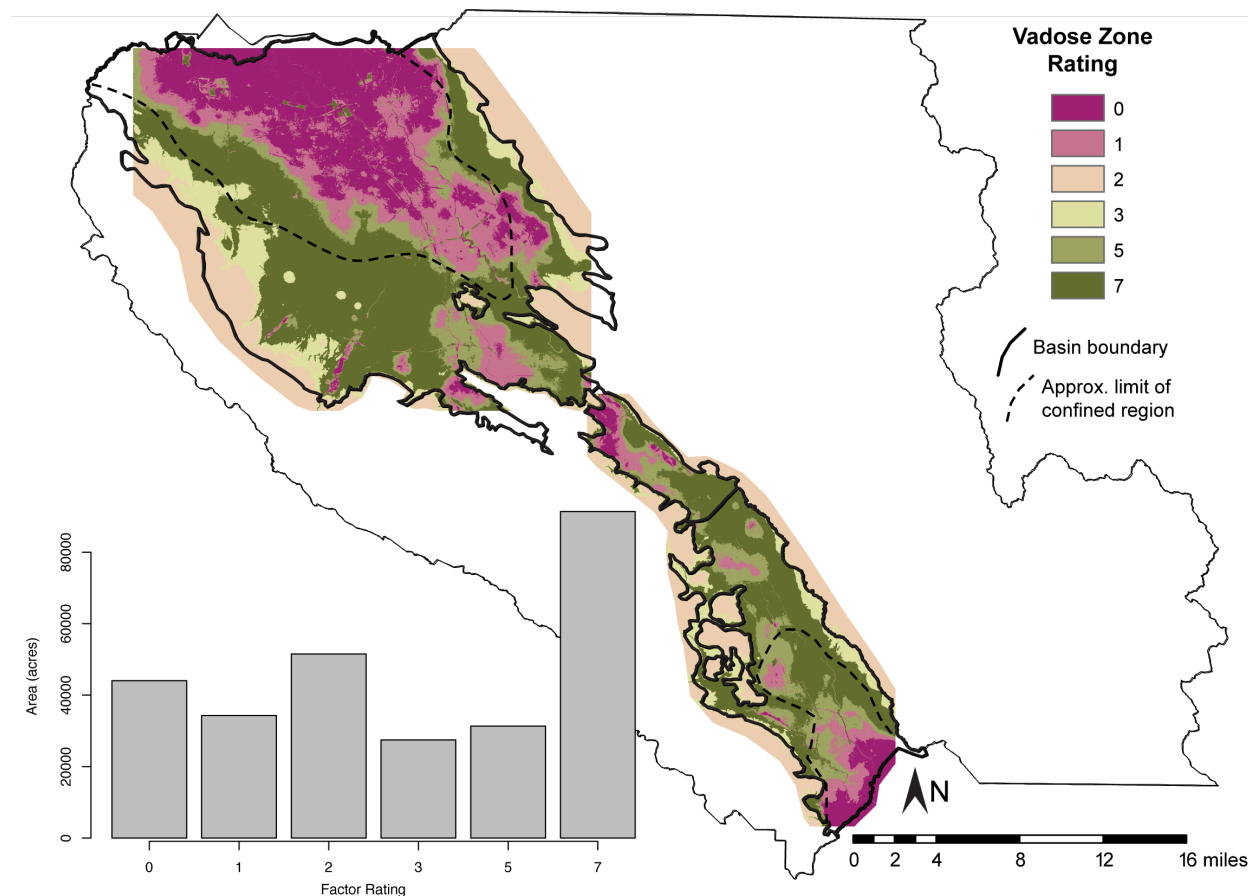
**Table III-6.** Summary of ratings for vadose zone thickness.

Suitability Rating	Vadose Zone Thickness (ft)	Area (acres) <sup>a</sup>	% Land Area <sup>a</sup>
0	< 10	44,000	15.7
1	10 - 20	34,300	12.2
7	20 - 60	91,400	32.6
5	60 - 100	31,300	11.2
3	100 - 200	27,400	9.8
2	> 200	51,500	18.4

<sup>a</sup> Area rounded to nearest 100 acres, percent is relative to extent of the vadose zone thickness coverage.

Much of the project area (groundwater basins for this and other subsurface datasets) has relatively high vadose zone ratings ( $VZ_r = 5$  to 7, 44% of the basin areas), particularly unconfined

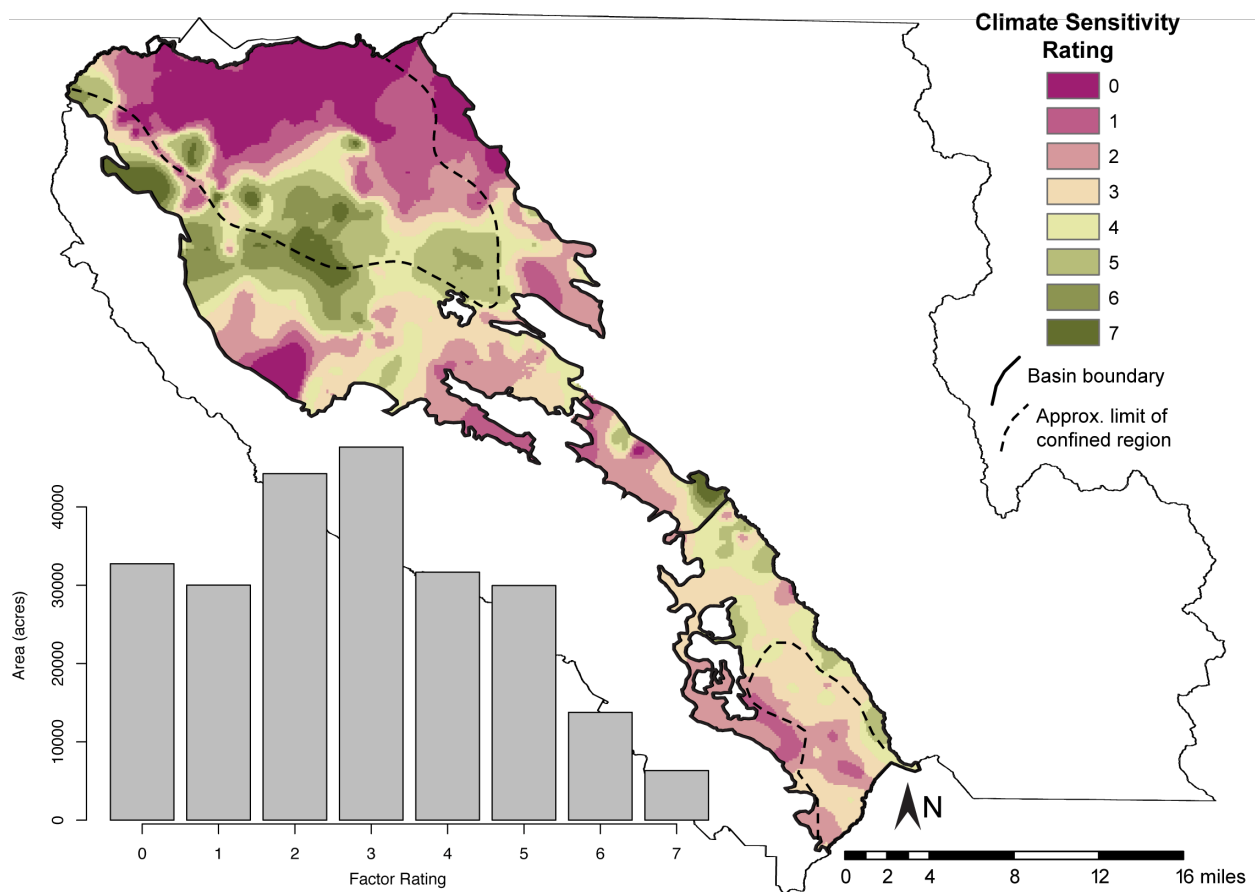
areas in the Santa Clara Plain and Llagas Basins, and the southern and eastern sides of Coyote Valley (**Figure III-15**). We used a limited rating scale, omitting values of 4 and 6, mainly because there was not enough confidence in finer granularity in classification (e.g., it was not clear if  $DTW = 120$  ft is really much better than  $DTW = 175$  ft).



**Figure III-15.** Vadose zone thickness ratings. Rating values defined in **Table III-6** and discussed in text.

#### *b. Climate sensitivity of groundwater levels*

Climate sensitivity of groundwater levels is more variable across the project region, with scattered patches having elevating ratings (**Figure III-16**). This factor is based on the difference in water levels during dry and wet periods; it is intended to indicate which areas appear to be capable of receiving recharge or being highly susceptible to differences in pumping rates or patterns. Large areas of elevated  $CS_r$  (5 to 7) are found in the Santa Clara Plain, but there are also patches in Coyote Valley and the Llagas Subbasin, particularly along the eastern basin edges. These areas comprise >20% of the groundwater management areas, covering >50,000 acres (**Table III-7**).



**Figure III-16.** Ratings of climate sensitivity of groundwater levels. Rating values defined in Table III-7 and discussed in text.

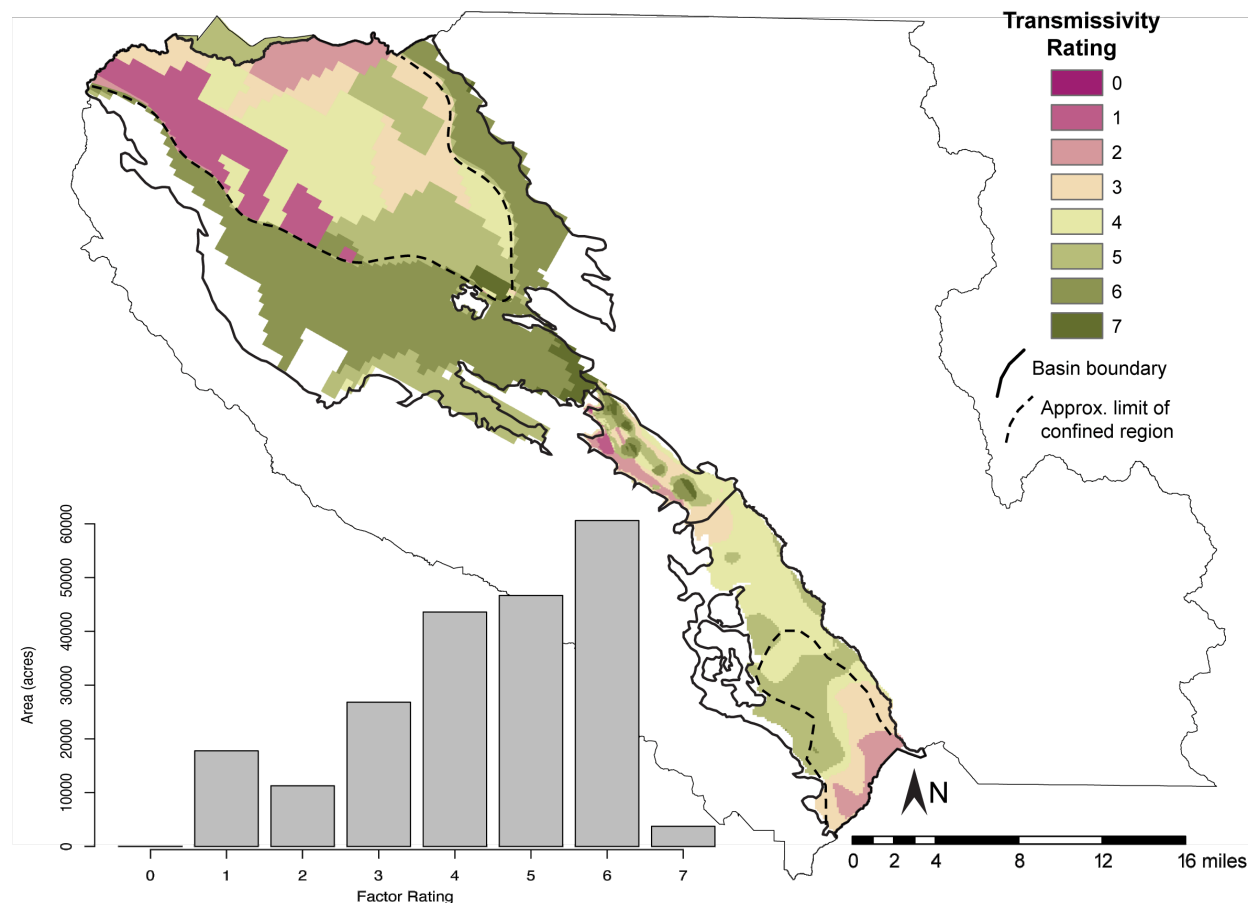
**Table III-7.** Summary of ratings for climate sensitivity of groundwater water levels.

Suitability Rating	Difference in depth to water, $DTW_{dry} - DTW_{wet}$ (ft)	Area (acres) <sup>a</sup>	% Land Area <sup>a</sup>
0	< 0	32,700	13.9
1	0 - 20	30,000	12.7
2	20 - 40	44,300	18.7
3	40 - 60	47,600	20.2
4	60 - 80	31,700	13.4
5	80 - 120	30,000	12.7
6	120 - 160	13,800	5.8
7	> 160	6,300	2.7

<sup>a</sup> Area rounded to nearest 100 acres, percent is relative to extent of the climate sensitivity coverage.

### c. Transmissivity

Transmissivity ratings ( $T_r = 6$  to 7) are highest in unconfined areas where there are thick and conductive surface layers, with the highest values in southern Santa Clara Plain and central Coyote Valley. Moderate ratings ( $T_r = 4$  to 5) are common in clusters throughout the project region, including much of Llagas Subbasin (**Figure III-17**). Because the Santa Clara Plain groundwater model incorporates no variation in horizontal conductivity in the confined area, variations in  $T_r$  result entirely from variations in cell thickness. Somewhat greater granularity is apparent in Coyote Valley and the Llagas Subbasin (**Figure III-17**). The majority of the management areas have shallow transmissivity on the upper 50% of the rating scale (**Table III-8**). As noted previously, ratings for transmissivity are not included in the final suitability analysis.



**Figure III-17.** Ratings of transmissivity from groundwater model datasets. Rating values defined in **Table III-8** and discussed in text.

**Table III-8.** Summary of ratings for transmissivity.

Suitability Rating	Transmissivity (ft <sup>2</sup> /day)	Area (acres) <sup>a</sup>	% Land Area <sup>a</sup>
0	0 - 500	0	0
1	500 – 1,250	17,800	8.4
2	1,250 – 2,500	11,300	5.4
3	2,500 – 5,000	26,800	12.7
4	5,000 – 10,000	43,600	20.7
5	10000 – 20,000	46,700	22.2
6	20,000 – 40,000	60,600	28.8
7	> 40,000	3,700	1.8

<sup>a</sup> Area rounded to nearest 100 acres, percent is relative to the total extent of the transmissivity coverage.

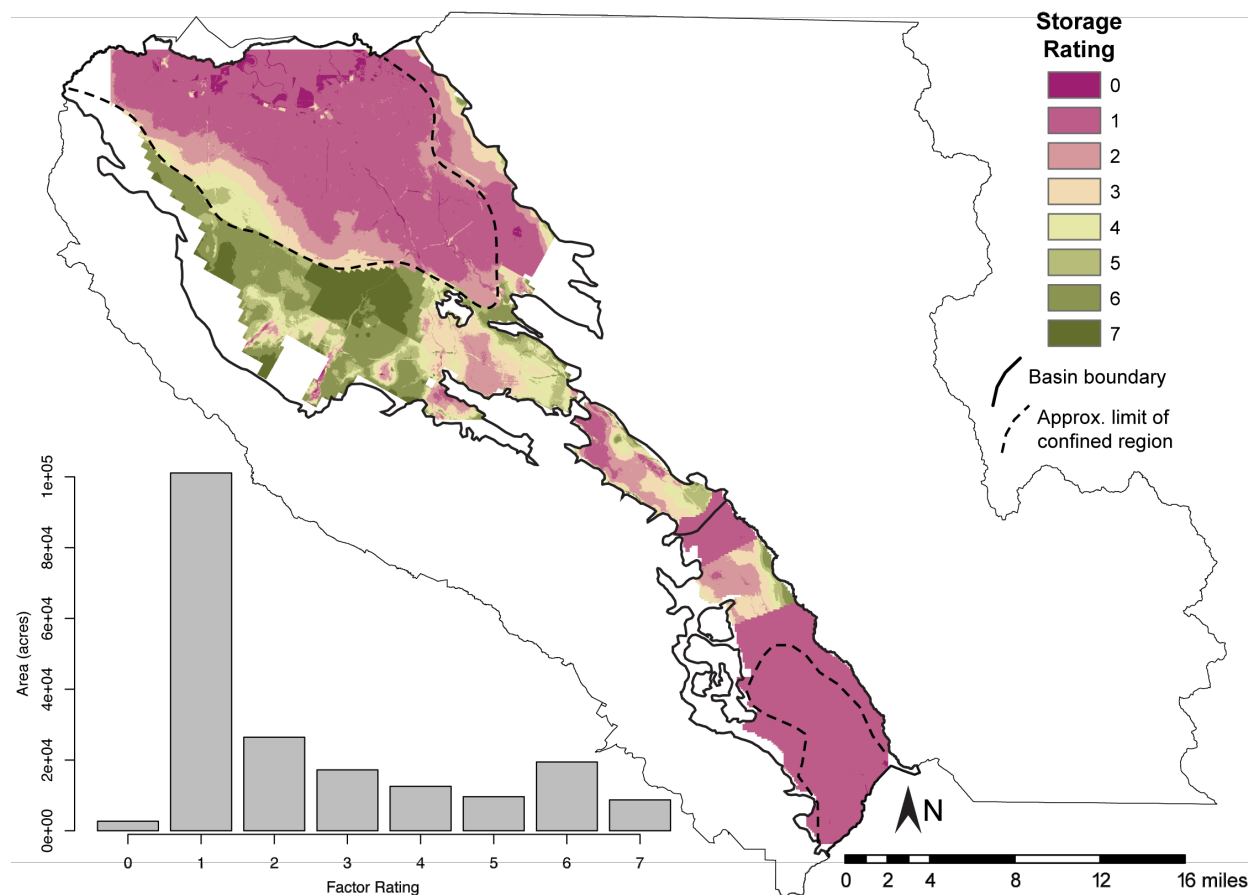
#### *d. Available storage*

The distribution of rated storage factors ( $S_r$ ) is similar in some ways to that for shallow transmissivity, with the lowest values in confined areas (**Figure III-18**). The overall range is low, with 85% of the study areas apparently having <5 ft of available storage ( $S_r \leq 5$ , product of vadose zone thickness and specific yield). There is reason to suspect that values of aquifer thickness and/or specific yield might be underrepresented in computer models. Particularly in the Llagas Subbasin, the majority of the study region is rated as having essentially no available storage, mainly on the basis of low  $S_y$  values. Given the distribution of values derived from the regional computer models, there would be little benefit to expanding the storage rating scale to boost intermediate values ( $S_r = 3$  to 5), but this analysis suggests that it may be worth considering a more holistic assessment of basin stratigraphy that incorporates detailed information available from groundwater well logs and other data.<sup>63</sup> Still, >25% of the study region has moderate to high  $S_r$  values (**Table III-9**). As noted previously, ratings for available storage are not included in the final suitability analysis.

#### *e. Subsurface suitability index*

Subsurface datasets were combined to generate a Flood-MAR suitability index based on these data coverages alone (**Figure III-19, Table III-10**). Given limitations in transmissivity and storage data as represented in regional groundwater models, and following discussion with Valley Water personnel, we eliminated use of these factors and focused instead on vadose zone thickness and climate sensitivity of water levels (**Figure III-1**). The areas with the highest suitability index for Flood-MAR based on subsurface data are in unconfined regions of the three groundwater management areas where water levels are moderately deep, allowing for reasonable transit times for infiltration to reach the water table and demonstrating considerable variability between wet and dry climate periods. There is a relatively uniform distribution of  $SI_{\text{subsurface}}$  ratings, and ~50% of the study region has moderate to high suitability based on subsurface data,  $SI_{\text{subsurface}} = 4$  to 7 (**Table III-10**). During an earlier analysis, when transmissivity and storage data originating from groundwater models was applied to subsurface suitability assessment, the

mapped pattern was much the same, although average values were lower overall and there was less area with higher ratings, mainly because storage ratings tend to be low (compare **Figure III-19** to **Figure III-18**).

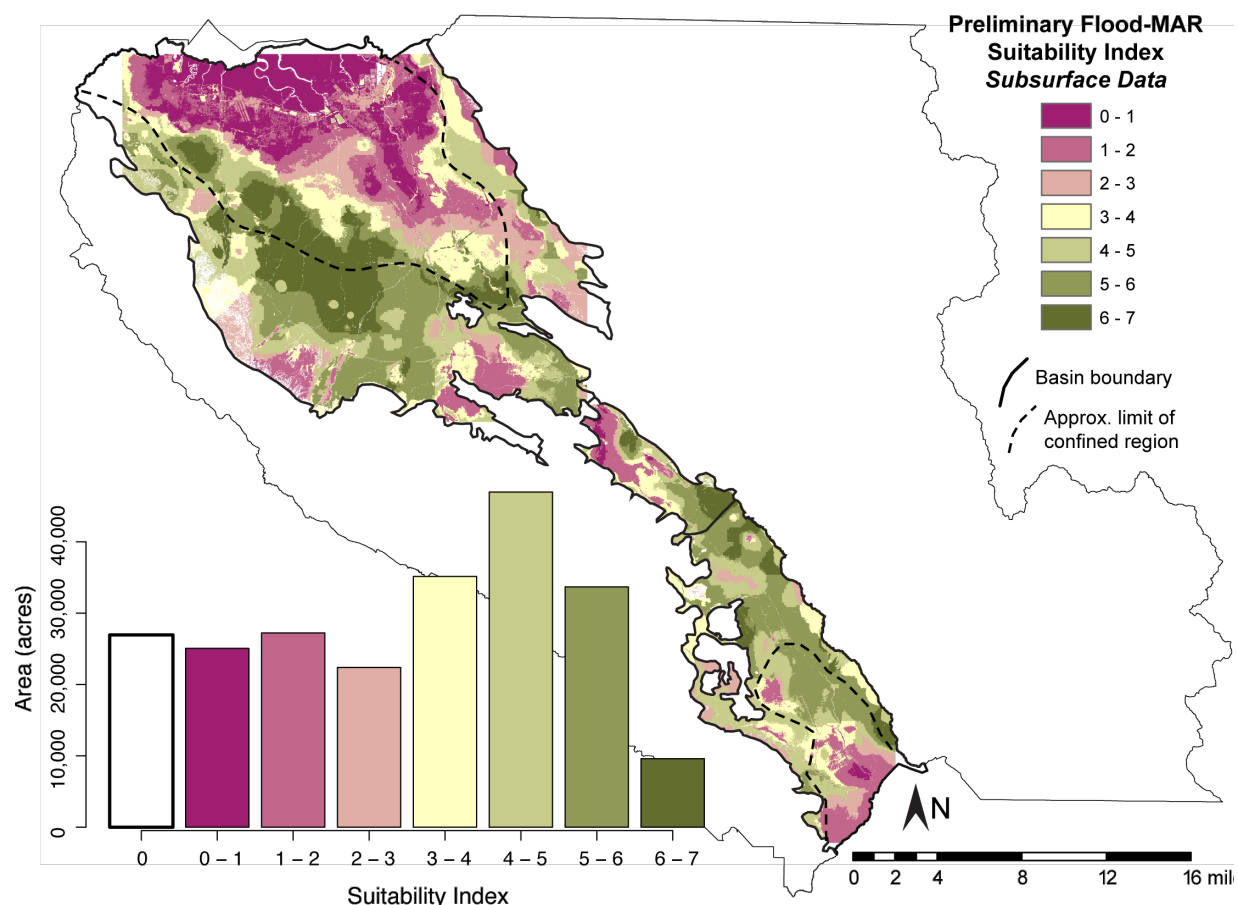


**Figure III-18.** Ratings of available storage. Rating values defined in **Table III-8** and discussed in text.

**Table III-9.** Summary of ratings for available storage.

Suitability Rating	Storage (ft)	Area (acres) <sup>a</sup>	% Land Area <sup>a</sup>
0	0	2,700	1.4
1	0 - 1	101,100	51.1
2	1 - 2	26,400	13.4
3	2 - 3	17,200	8.7
4	3 - 4	12,600	6.4
5	4 - 5	9,600	4.9
6	5 - 10	19,400	9.8
7	> 10	8,700	4.4

<sup>a</sup> Area rounded to nearest 100 acres, percent is relative to extent of the storage coverage.



**Figure III-19.** Preliminary Flood-MAR suitability index for groundwater basins based on subsurface datasets. Factors used for this analysis were vadose zone thickness and climate sensitivity of groundwater levels. Shallow aquifer properties as represented in groundwater models were applied initially, but not used in the (final) analysis shown above because of coarse resolution and concerns about reliability based on model calibration. Areas with each index are listed in **Table III-10**. White spaces within the subbasins in panel A indicate areas where vadose zone thickness is not interpolated because of limited depth-to-water data.

**Table III-10.** Preliminary Flood-MAR suitability based on subsurface datasets.

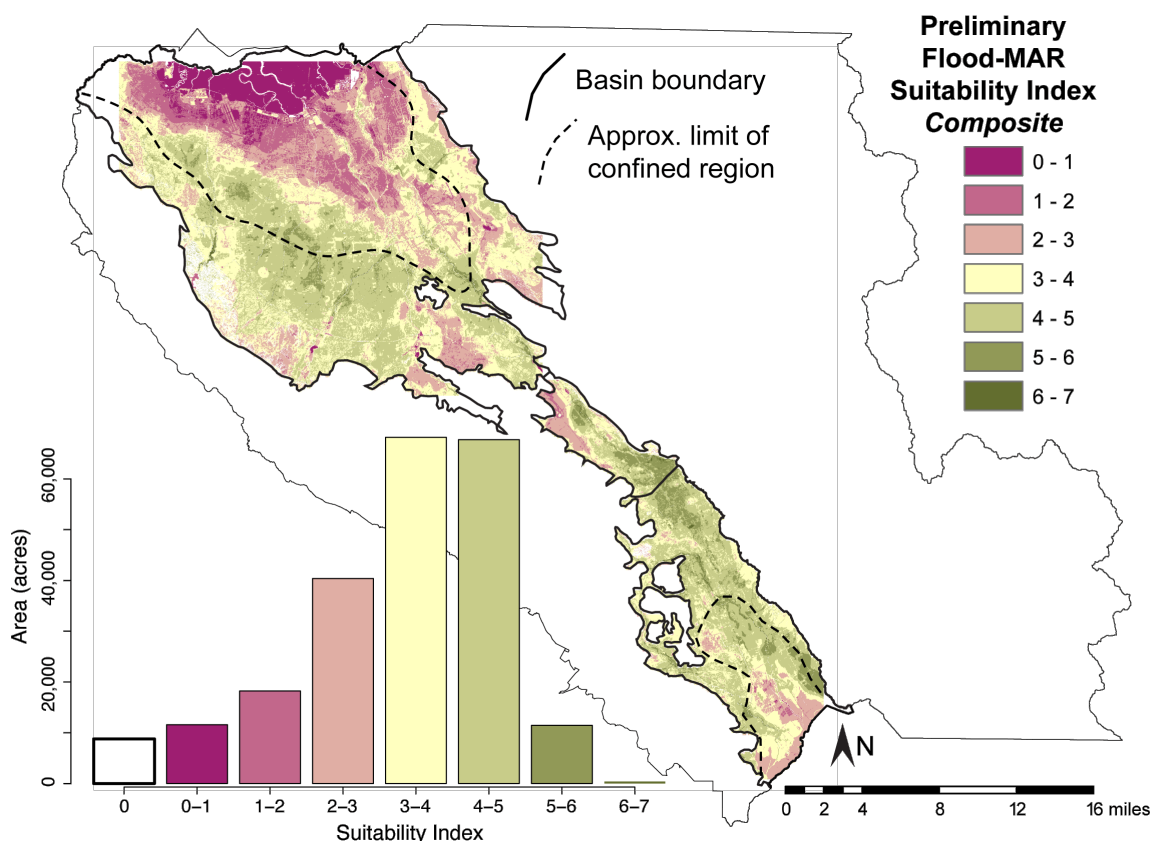
Suitability Rating	Area (acres) <sup>a</sup>	% Land Area <sup>a</sup>
0	26,900	11.9
0 - 1	25,100	11.0
1 - 2	27,200	12.0
2 - 3	22,400	9.9
3 - 4	35,100	15.5
4 - 5	47,000	20.7
5 - 6	33,700	14.8
6 - 7	9,600	4.2

<sup>a</sup> Area rounded to nearest 100 acres, percent is relative to extent of the subsurface rating coverage.

### 3. Composite suitability index

A composite Flood-MAR suitability index map, based on all surface and subsurface factors that were rated and weighted, shows considerable spatial variability (**Figure III-20**). This is largely a consequence of the granularity and resolution of surface datasets. More than 35% of the study region for which all datasets exist (i.e., within the groundwater subbasins) has  $SI_{\text{composite}}$  values of 4 to 7, comprising ~79,000 acres (**Table III-11**). Importantly, patches with elevated  $SI_{\text{composite}}$  values are found throughout the basins.

Three additional displays illustrate ways in which preliminary Flood-MAR  $SI$  maps can be helpful in planning and screening project activities. **Figure III-21** shows  $SI_{\text{composite}}$  with Valley Water's existing managed recharge operations, including in-stream recharge and groundwater recharge ponds, which are located outside the confined areas within the groundwater subbasins. The location of the mapped boundary between the confined and unconfined aquifer conditions is based on long-standing geologic interpretations, going back decades. While this boundary is considered approximate due to geologic uncertainty and aquifer heterogeneity, it continues to be supported by substantial geologic and hydrogeologic data. Flood-MAR projects would likely be prioritized outside the confined areas in the recharge zones and in locations that complement the spatial coverage of existing managed recharge operations.



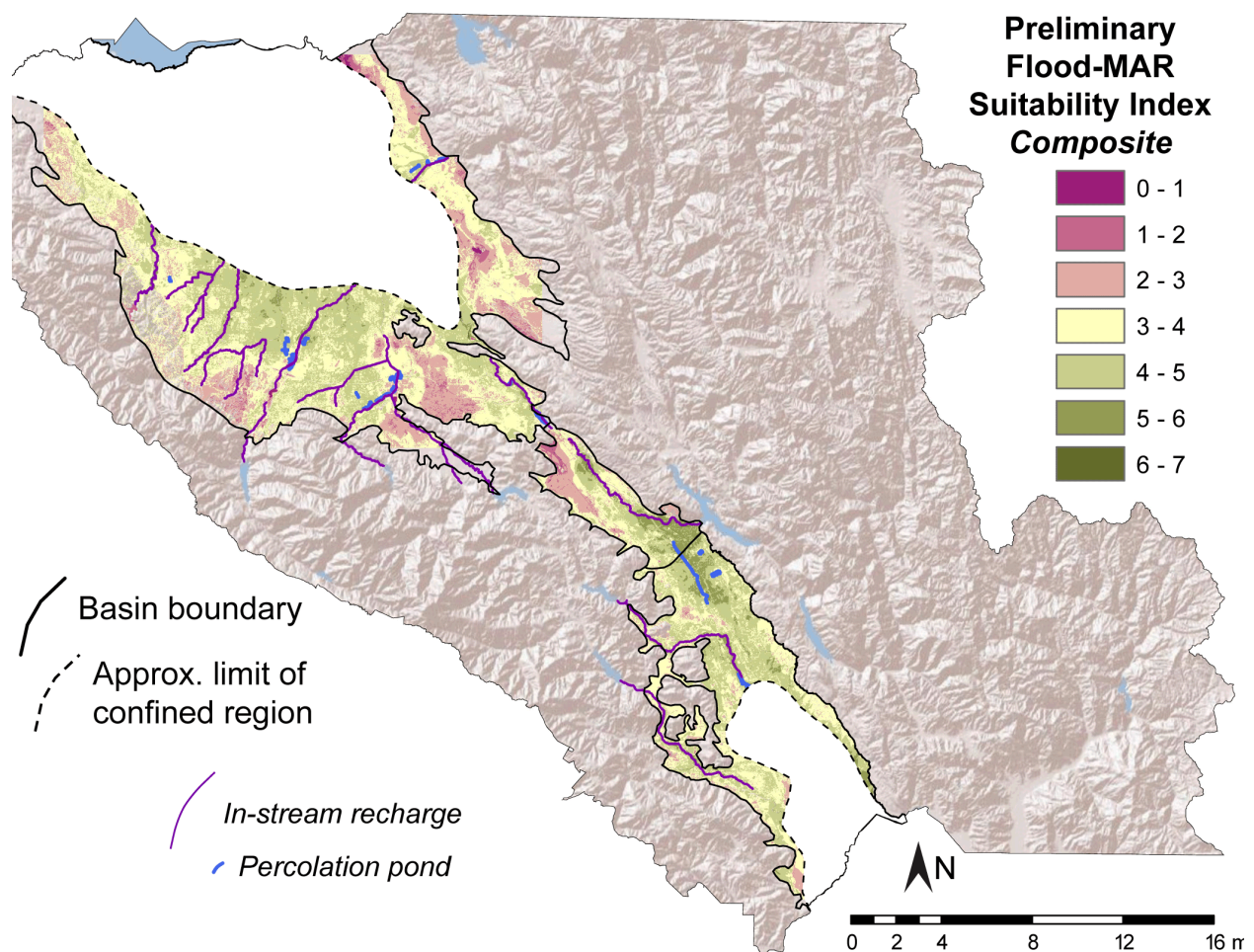
**Figure III-20.** Preliminary Flood-MAR suitability index for groundwater basins based on composite of surface and subsurface datasets, filtered to remove areas with slopes  $\geq 10\%$ . Combined surface and subsurface factors were weighted evenly (**Figure III-1A**). Areas with each index are listed in **Table III-11**. White spaces within the subbasins in panel A indicate areas where vadose zone thickness is not interpolated because of limited depth-to-water data.



**Table III-11.** Preliminary Flood-MAR suitability based on composite analysis.

Suitability Rating	Area (acres) <sup>a</sup>	% Land Area <sup>a</sup>
0	8,800	3.9
0 - 1	11,600	5.1
1 - 2	18,200	8.0
2 - 3	40,400	17.8
3 - 4	68,200	30.1
4 - 5	67,700	29.9
5 - 6	11,500	5.1
6 - 7	400	0.2

<sup>a</sup> Area rounded to nearest 100 acres, percent is relative to extent of the composite rating coverage.



**Figure III-21.** Valley Water's existing managed recharge operations and losing streams overlaid on the preliminary Flood-MAR suitability index map. Comparison of these data allows identification of potential Flood-MAR project sites that complement existing activities and conditions. Areas having confined conditions are denoted with white polygons having dashed boundaries.

A plot of water quality (represented by TDS concentration) on top of  $SI_{\text{composite}}$  helps to show where areas with elevated suitability have more or less salt in ambient groundwater (**Figure III-22A**). Depending on project goals, Flood-MAR projects could be prioritized where water quality is better or worse, implying consequent application of recovered water having higher quality or likely dilution where groundwater is impaired, respectively. A map showing parks and related open spaces over  $SI_{\text{composite}}$  (**Figure III-22B**) could help with identification of potential project sites that could help to generate multiple ancillary benefits, including improved habitat, where there are fewer concerns about food safety compared to areas that are developed for agriculture. These maps are shown as examples; one benefit of generating a working GIS project is that this allows for new factors to be considered, analyses to be revised, and new maps generated as program and project ideas develop. The working GIS also allows for higher-resolution assessment of potential site locations than is apparent on printed pages or image files with a fixed raster format.

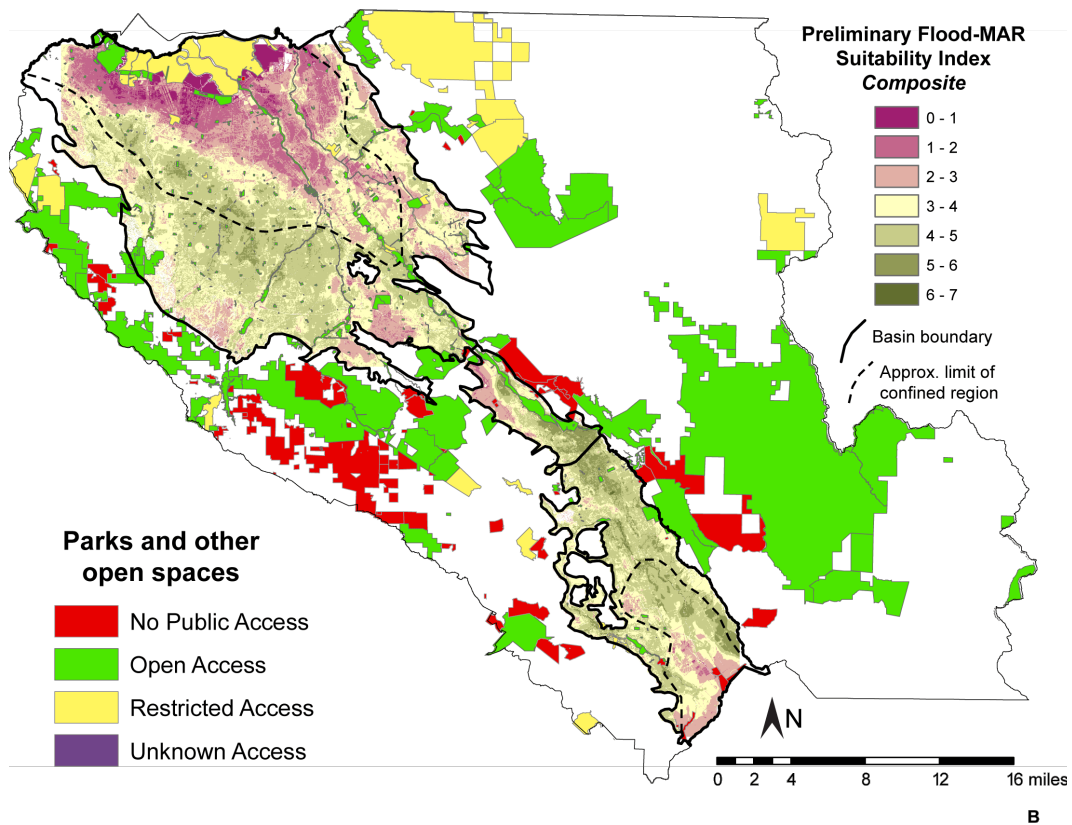
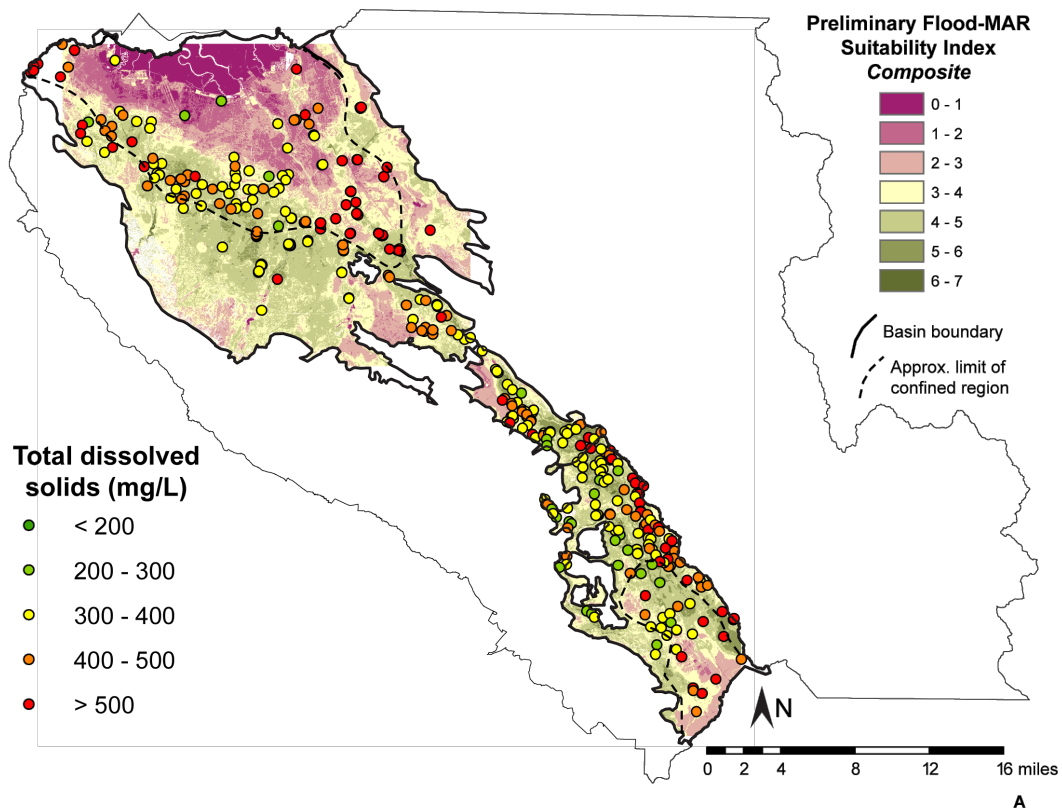
## C. Discussion of Results, Limitations, and Next Steps

### 1. Use and limitations of work to date

This GIS project should prove useful to Valley Water and their stakeholders, contractors, and collaborators in exploring options for developing a Flood-MAR program in the Valley Water service area. Resulting  $SI$  maps (**Figures III-14, III-19, and III-20**) suggest that there could be opportunities, but also indicate important limitations to this approach. First, mapping of Flood-MAR suitability should be considered as useful mainly as a screening tool, particularly in the early stages of program and site assessment. It can also be useful for explaining why a site that "seems good" to a stakeholder or based on initial inspection may not be suitable because subsurface conditions are often not well correlated to those seen at the surface.

Even within this context and use case, the  $SI$  maps are fundamentally limited by the accuracy and resolution of available data. For surface coverages like *LULC*, these can change over short time periods, and factor coverages derived over multiple years (or even decades) could result in inconsistent merging of data periods. For subsurface coverages like transmissivity or available storage, there are limitations based on model resolution and the direct measurements that provided the basis for calibrating groundwater models. Groundwater models have been calibrated multiple times over a period of years, beginning when there was much less available data and the development of a three-dimensional stratigraphic model was more difficult than it would be today, and the resolution of these models is relatively coarse.

We encourage considering the datasets used in this study to be a useful snapshot of the state of available knowledge, a foundation upon which Valley Water can build greater understanding and aid in systematic decision making about if, how, and where to create a Flood-MAR program and develop initial projects. Because the main product of this work is a dynamic GIS project, not a small series of static maps, the potential for expansion and application of this work can grow over time. The dynamic nature of the GIS also allows for a sensitivity study to assess how robust the  $SI$  maps may be to different choices in the MCDA process.



**Figure III-22.** Examples of data overlays that could be used to focus on specific areas for potential Flood-MAR projects, with composite suitability index used as base map. **A.** Water quality indicator (total dissolved solids). **B.** Open space.

## 2. Additional filters and constraints that could be applied

Numerous additional considerations were not included in this pre-feasibility assessment. Perhaps the most important of these is an evaluation of available water supplies. In the Pajaro Valley, a similar GIS-based assessment of Flood-MAR suitability was augmented by hydrologic runoff analyses, using a catalog of climate responses under different land-use scenarios, to quantify how much stormwater runoff could be generated at potential project sites.<sup>64</sup> Deterministic simulations of this kind are certainly useful, but they require compilation and manipulation of dozens of high-resolution datasets, then running numerical models and performing a complex calibration process. It may be that some form of statistical assessment could provide useful indications of opportunities for stormwater collection in non-urban areas within the Valley Water service area. Other potential water sources in support of Flood-MAR could, in principle, include storm flows in creeks and streams, advanced purified water, or imported water. However, Valley Water presently has sufficient managed recharge facilities to recharge its available local and imported water. In addition, there are infrastructure limitations that would pose challenges for delivering advanced purified water to a decentralized system of Flood-MAR basins. Some assessment of water supply options is provided in Part II.

Given options for water supplies, as well as methods for accomplishing Flood-MAR objectives, water cost and value considerations could be incorporated into the MCDA process for assessing site suitability. Valley Water could also take into account the presence of disadvantaged communities or other social factors, and potential benefits of Flood-MAR efforts for baseflow and aquatic systems. As previously noted, this project is being delivered as a working GIS that can be updated, revised, or modified to incorporate priorities and values as desired and as conditions and interests shift over time.

## 3. Implications and Next Steps

Maps of Flood-MAR suitability can be used to focus (a) incorporation of additional datasets that currently exist, (b) generation of new datasets that could be useful for improving the *SI* analyses, and (c) screening or targeting specific locations for potential Flood-MAR projects. These next steps could be managed in series or parallel.

*SI* maps indicate that there could be many good opportunities to accomplish Flood-MAR objectives in the Valley Water service area. In general, the Flood-MAR opportunities appear to be most common (as a percentage of groundwater management areas) in the Coyote Valley and Llagas Subbasin. Areas with the highest suitability include old stream channels and other features that have relatively coarse surface and near-surface lithologies, as well as room in the subsurface to receive and transmit excess surface water.

**Part III** of this report and the associated GIS project should be considered in the context of the findings in **Part II**, which focuses on institutional, incentive, legal, and policy issues. In particular, cost and access considerations could be important filters that help to focus attention on specific physical locations. If institutional and suitability indicators are positive, initial field visits and exploration of water supply options may be justified. It may also be worth considering larger-scale efforts in data collection and generation of datasets that could be added to the existing GIS. Most MAR suitability studies have focused on surface data coverages, but the complexity of the hydrogeologic framework in Valley Water's groundwater basins could help to justify updating the three-dimensional stratigraphic understanding of one or more of these

systems, perhaps in concert with efforts to add resolution to representation of groundwater flow processes simulated with numerical models. The latter could aid in testing of Flood-MAR scenarios. The effort needed to revise the subsurface stratigraphic framework would be significant. For comparison, analysis of ~1,000 groundwater well logs in the Pajaro Valley to define the complex layering and variability of subsurface deposits was a multi-year effort, with a large USGS and agency team, as part of development of a new, regional groundwater model.<sup>65</sup>

## **D. Summary of Findings and Recommendations**

Multicriteria decision analysis of spatial data from the Valley Water service area, using a GIS, suggests that there are numerous locations where surface and subsurface conditions are favorable for Flood-MAR. Within the three primary groundwater management areas, preliminary Flood-MAR suitability based on a composite MCDA using surface and subsurface data is relatively high across ~79,000 acres, equivalent to >35% of the land area. Sites with the highest suitability for Flood-MAR tend to be located where many of these criteria are satisfied: on old stream channels, on and near active (although often ephemeral) stream channels, and on other coarse Quaternary fluvial and alluvial deposits; where land is undeveloped, has low-intensity development, or is used for agricultural activities; where there is a vadose zone 20-100 ft thick; where there have been large differences in groundwater levels during dry climate periods compared to wet periods; and where shallow aquifer properties include high transmissivity and/or high potential for storage of supplemental recharge.

Conditions in the Santa Clara Plain appear to be most favorable for Flood-MAR along the western and southern margins, around and outside of the region dominated by confined conditions. Areas that are unfavorable for Flood-MAR include those underlain by fine-grained bay, wetland, and estuarine deposits. Groundwater levels are relatively high and space for augmenting storage is limited within the urbanized core of this management area, where Valley Water efforts in MAR have operated successfully for decades, but other areas could be considered if suitable water sources were found.

Conditions in the Coyote Valley appear to be most favorable for Flood-MAR along the southern and eastern half of the basin, particularly along active and old stream channels and other fluvial deposits. The northwestern part of Coyote Valley is part of the Laguna Seca wetland complex that has a shallow water table and hydrophobic soils, making it unfavorable for Flood-MAR activities.

Conditions in the Llagas Subbasin appear to be most favorable for Flood-MAR in the northern half and along western margin of the basin, particularly where fluvial deposits cut across areas having finer soils. The southern part of this basin is mapped as being mostly confined, and the regional groundwater flow direction is to the south-southeast and out of the basin, so focusing on northern areas may be most beneficial in terms of improving resource conditions.

There are multiple steps that Valley Water may find useful in advancing Flood-MAR efforts in its service area; these are not mutually exclusive, and it will likely accelerate the pace of progress to undertake more than one at a time.

- The MCDA was completed using a stand-alone GIS with a limited suite of available data coverages. More datasets could be added if it were decided that standard rating

scales could be applied. For example, a dataset showing proximity to losing stream reaches could be added if this were considered to be desirable as a means to enhance aquatic ecosystems, or water quality data could be gridded and added based on whether it would be preferred to adding recharge to areas with higher or lower water quality indicators.

- The existing MCDA can be used to start identifying potential field sites, allowing for a quantitative feasibility assessment of specific project options like site access, permitting, and available water supplies. For the latter variable, an assessment of drainage areas and runoff potential could help to identify sites that meet some threshold criteria (e.g., 200 AFY of available runoff at a single project during a median water year, based on historical or project hydrologic conditions).
- Existing MCDA datasets can be updated to generate new data coverages that will provide additional benefit to Valley Water operations. As one possible example, knowledge of subsurface aquifer properties is currently limited by the resolution and accuracy of existing groundwater models. It is likely that hundreds of well logs that were not available when these models were initially developed could be used to generate a higher-resolution representation of subsurface geological conditions, and this information could be used to assess likely transmission and storage properties. This would be a major effort and is probably not justified on the basis only of improving the MCDA for Flood-MAR; but if an improved stratigraphic representation were helpful for updating groundwater models, it could provide co-benefits for Flood-MAR assessment.
- Potential Flood-MAR sites identified by Valley Water personnel or service area constituents that pass a desktop assessment (including consideration of water supplies, access, and other factors) could be prioritized for nested and increasingly detailed field investigations, to help screen out areas that are not likely to result in a successful project. A typical field assessment might include one or more of these steps:
  - Systematic geophysical surveys using electrical, radar, and/or seismic methods, to determine the site-specific layering and nature of subsurface materials in the upper 75-150 ft-below ground surface.
  - Exploratory drilling using a relatively efficient approach like direct push to collect geotechnical data and/or continuous cores, to assess soil texture, available carbon, shallow groundwater levels, and other characteristics.
  - Monitoring of rainfall on site and in areas contributing to drainage, and potentially measuring (and sampling) runoff if channelized flow occurs, to better understand local patterns and magnitudes relative to those available from long-term meteorological stations.
  - Sampling of local production wells, or monitoring wells if available, with repeat visits on a monthly or quarterly schedule. Standard water quality panels can be run to improve understanding of local groundwater quality and variability.
  - Sites that look favorable following one or more of the criteria noted above could be tested directly for infiltration conditions, at a scale of tens of ft<sup>2</sup> to acres, if there were access to a suitable water supply for multi-day testing.

Designing, creating, and operating Flood-MAR projects remains at the forefront of technical and institutional innovation. Each region and every potential site is different, and while there are many practices that have proven successful in other areas, a staged and thoughtful approach is important, as is the recognition that one goal of testing and evaluation is to eliminate sites that are not likely to work for Flood-MAR. Evaluating five or ten sites may be required in order to find one or two that have a high probability of success. Screening of projects and sites that would not work for Flood-MAR is an essential part of building a successful Flood-MAR program.

Additional considerations for developing a Flood-MAR program are listed and discussed in Part II of this report. In aggregate, these analyses should help Valley Water to develop a plan for advancing Flood-MAR, helping to distribute a variety of benefits across their service area, and strengthening the resilience and sustainability of essential water resources.



# Endnotes

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<sup>1</sup> See Mahesh L. Maskey Mustafa S. Dogan, Angel Santiago Fernandez-Bou, Liying Li, Alexander Guzman, Wyatt Arnold, Erfan Goharian, Jay R. Lund, and Josue Medellin-Azuara, *Managing Aquifer Recharge to Overcome Overdraft in the Lower American River, California, USA*, 14 WATER 966 (2022), available at <https://doi.org/10.3390/w14060966>; see also *Climate Change Basics*, CALIFORNIA DEPARTMENT OF WATER RESOURCES, <https://water.ca.gov/Water-Basics/Climate-Change-Basics> (last visited July 27, 2022); California Department of Water Resources, News Release: State Agencies Fast-track Groundwater Recharge Pilot Project to Capture Flood Waters for Underground Storage (Jan. 13, 2021), available at <https://water.ca.gov/News/News-Releases/2023/Jan-23/State-Agencies-Fast-track-Groundwater-Recharge-Pilot-Project>.

<sup>2</sup> Herman Bouwer, *Artificial recharge of groundwater: hydrogeology and engineering*, 10 HYDROGEOLOGY JOURNAL 121–142 (2002), available at <https://doi.org/10.1007/s10040-001-0182-4>.

<sup>3</sup> P. Dillon, S. Toze, D. Page, J. Vanderzalm, E. Bekele, J. Sidhu, and S. Rinck-Pfeiffer, *Managed aquifer recharge: rediscovering nature as a leading edge technology*, 62 WATER SCIENCE & TECHNOLOGY 2338–2345 (2010).

<sup>4</sup> See, e.g., Janny Choy and Geoff McGhee, *Groundwater: Ignore It, and It Might Go Away*, WATER IN THE WEST (July 31, 2014), <https://waterinthewest.stanford.edu/groundwater/overview/>.

<sup>5</sup> Elad Levintal, Maribeth L. Kniffin, Yonatan Ganot, Nisha Marwaha, Nicholas P. Murphy, and Helen E. Dahlke, *Agricultural managed aquifer recharge (Ag-MAR)—a method for sustainable groundwater management: A review*, 53 CRITICAL REVIEWS IN ENVIRONMENTAL SCIENCE & TECHNOLOGY 291–314 (2022), available at <https://doi.org/10.1080/10643389.2022.2050160>.

<sup>6</sup> *Flood-Managed Aquifer Recharge*, CALIFORNIA DEPARTMENT OF WATER RESOURCES, <https://water.ca.gov/Programs/All-Programs/Flood-MAR> (last visited Feb. 21, 2023).

<sup>7</sup> California Department of Water Resources, White Paper: Flood-MAR: Using Flood Water for Managed Aquifer Recharge to Support Sustainable Water Resources (June 2018) (“2018 Flood-MAR White Paper”), available at [https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Flood-Management/Flood-MAR/DWR\\_FloodMAR-White-Paper\\_a\\_y20.pdf](https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Flood-Management/Flood-MAR/DWR_FloodMAR-White-Paper_a_y20.pdf).

<sup>8</sup> See 2018 Flood-MAR White Paper, *supra* note 7, at 23–28.

<sup>9</sup> Santa Clara Valley Water District, Groundwater Management Plan for the Santa Clara and Llagas Subbasins at 1-7 (2021) (“2021 Groundwater Management Plan”), available at <https://www.valleywater.org/your-water/where-your-water-comes/groundwater/sustainable>; see also *id.* Appendix I, with modifications based on personal communication with Valley Water staff (J. Gurdak, B. Kassab, 5/31/23).

<sup>10</sup> 2021 Groundwater Management Plan, *supra* note 9, at 4-4, 4-6, fig. 4-4.

<sup>11</sup> 2021 Groundwater Management Plan, *supra* note 9, at 4-4, 4-14 to 4-19.

<sup>12</sup> See *Current Water Charges*, VALLEY WATER, <https://www.valleywater.org/your-water/current-water-charges> (last visited Feb. 21, 2023); see also *2022–23 Groundwater Production Charge-Setting Process*, VALLEY WATER, <https://www.valleywater.org/your-water/current-water-charges/groundwater-production-charge-setting-process-2022-23> (last visited Feb. 21, 2023).

<sup>13</sup> *Current Water Charges*, *supra* note 12.

<sup>14</sup> Santa Clara Valley Water District, Water Supply Master Plan 2040 at 13–16 (2019) (“Master Plan”), available at [https://www.valleywater.org/sites/default/files/Water%20Supply%20Master%20Plan%202040\\_11.01.2019\\_v2.pdf](https://www.valleywater.org/sites/default/files/Water%20Supply%20Master%20Plan%202040_11.01.2019_v2.pdf).

<sup>15</sup> Master Plan, *supra* note 14, at Appendix G (Board Agenda Memorandum for January 14, 2019).

<sup>16</sup> Master Plan, *supra* note 14, at Appendix H (Project List as of February 2019).

<sup>17</sup> 2021 Groundwater Management Plan, *supra* note 9, figures 4-2, 4-3.

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<sup>18</sup> Hannah Waterhouse, Taylor Broadhead, Aysha Massell, Helen Dahlke, Thomas Harter, and Daniel Mountjoy., *Management considerations for protecting groundwater quality under agricultural managed aquifer recharge*, at 3 (2021), available at <https://suscon.org/wp-content/uploads/2021/06/Management-Considerations-for-Protecting-Groundwater-Quality-Under-AgMAR.pdf>.

<sup>19</sup> Levintal et al. (2022), *supra* note 5.

<sup>20</sup> Levintal et al. (2022), *supra* note 5.

<sup>21</sup> See Sarah Fakhreddine et al., *Mobilization of Arsenic and Other Naturally Occurring Contaminants during Managed Aquifer Recharge: A Critical Review*, 55 ENVIRONMENTAL SCIENCE & TECHNOLOGY 2208–2223 (2021), available at <https://dx.doi.org/10.1021/acs.est.0c07492>.

<sup>22</sup> Waterhouse et al. (2021), *supra* note 18, at 3; Levintal et al. (2022), *supra* note 5.

<sup>23</sup> Waterhouse et al. (2021), *supra* note 18, at 10, 17; Levintal et al. (2022), *supra* note 5.

<sup>24</sup> Levintal et al. (2022), *supra* note 5.

<sup>25</sup> Mehdi Ghasemizade, Kwabena O. Asante, Christian Petersen, Tiffany Kocis, Helen E. Dahlke, and Thomas Harter, *An integrated approach toward sustainability via groundwater banking in the southern Central Valley, California*, 55 WATER RESOURCES RESEARCH 2742–2759 (2019), <https://doi.org/10.1029/2018WR024069>; Don Cameron, *Can Flooding Planted Fields Save California Farms?* AMERICAN VEGETABLE GROWER, January 2020, available at <https://www.terranovaranch.com/sustainability/sustainability-water-recharge/can-flooding-planted-fields-save-california-farms/>.

<sup>26</sup> Philip Bachand, Sujoy B. Roy, Nicole Stern, Joseph Choperena, Don Cameron, and William R. Horwath, *On-farm flood capture could reduce groundwater overdraft in Kings River Basin*, 70 CALIFORNIA AGRICULTURE 200–207 (2016), available at <https://escholarship.org/uc/item/1vd7b35c>.

<sup>27</sup> Bachand et al. (2016), *supra* note 26; McMullin Area Groundwater Sustainability Agency, McMullin On-Farm Flood Capture Expansion Project, Project Brief (2022), available at [https://www.mcmullinarea.org/wp-content/uploads/2022/04/20220324-MAGSA-Expansion-Project-Brief\\_FINAL.pdf](https://www.mcmullinarea.org/wp-content/uploads/2022/04/20220324-MAGSA-Expansion-Project-Brief_FINAL.pdf); Kings Basin Water Authority, Project Information Form: On-Farm Flood Capture Expansion Project (2015), available at [http://www.kingsbasinauthority.org/documents/IRWMP\\_Project\\_List/Project\\_Info\\_Forms/144\\_Terranova.pdf](http://www.kingsbasinauthority.org/documents/IRWMP_Project_List/Project_Info_Forms/144_Terranova.pdf).

<sup>28</sup> Bachand et al. (2016), *supra* note 26.

<sup>29</sup> Ramona O. Swenson, Keith Whitener, and Mike Eaton, *Restoring Floods to Floodplains: Riparian and Floodplain Restoration at the Cosumnes River Preserve, California riparian systems: processes and floodplains management, ecology, and restoration*, at 224–229 in P.M. Faber, editor California Riparian Systems: Processes and Floodplains Management, Ecology, and Restoration. 2001 Riparian Habitat and Floodplains Conference Proceedings. Riparian Habitat Joint Venture. Riparian Habitat Joint Venture, Sacramento, CA. (2003), available at [http://www.sjrdotmdl.org/concept\\_model/phys-chem\\_model/documents/300001823.pdf](http://www.sjrdotmdl.org/concept_model/phys-chem_model/documents/300001823.pdf).

<sup>30</sup> Swenson, Whitener, and Eaton, *supra* note 29; Michelaina Johnson, *Cosumnes River Provides Model for Floodplain Restoration in California*, WATER DEEPLY (April 19, 2017), <https://deeply.thenewhumanitarian.org/water/articles/2017/04/19/cosumnes-river-provides-model-for-floodplain-restoration-in-california>.

<sup>31</sup> S. Beganskas and A.T. Fisher, *Coupling distributed stormwater collection and managed aquifer recharge: Field application and implications*, 200 JOURNAL OF ENVIRONMENTAL MANAGEMENT 366–379 (2017), <https://doi.org/10.1016/j.jenvman.2017.05.058>.

<sup>32</sup> Kathleen Miller, Andrew T. Fisher, and Michael Kiparsky, *Incentivizing Groundwater Recharge in the Pajaro Valley Through Recharge Net Metering (ReNeM)*, 5 CASE STUDIES IN THE ENVIRONMENT 1222393 (2021), <https://doi.org/10.1525/cse.2021.1222393>; PV Water, News Release: PV Water Board Approves Recharge Net Metering Program, October 14, 2021, available at <https://www.pvwater.org/recharge-net-metering-extended>.

<sup>33</sup> See State Water Resources Control Board, Fact Sheet: Purposes of Use for Underground Storage Projects, [https://www.waterboards.ca.gov/waterrights/water\\_issues/programs/applications/docs/purposes\\_of\\_use\\_fact\\_sheet\\_final.pdf](https://www.waterboards.ca.gov/waterrights/water_issues/programs/applications/docs/purposes_of_use_fact_sheet_final.pdf) (last updated June 2020).

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<sup>34</sup> See, e.g., Governor Gavin Newsom, Executive Order N-3-23, Feb. 13, 2023, available at <https://www.gov.ca.gov/wp-content/uploads/2023/02/Feb-13-2023-Executive-Order.pdf?emrc=63f5cc8b93d44>.

<sup>35</sup> See *Temporary Permits for Groundwater Recharge*, STATE WATER RESOURCES CONTROL BOARD, [https://www.waterboards.ca.gov/waterrights/water\\_issues/programs/applications/groundwater\\_recharge/temporary\\_permits.html](https://www.waterboards.ca.gov/waterrights/water_issues/programs/applications/groundwater_recharge/temporary_permits.html) (last visited Feb. 21, 2023); see also CAL. WATER CODE §§ 1425–1431 (governing 180-day temporary permits); CAL. WATER CODE §§ 1433–1433.6 (governing 5-year temporary permits); State Water Resources Control Board, Water Rights Fiscal Year 2022–2023 Fee Schedule Summary, available at [https://www.waterboards.ca.gov/resources/fees/water\\_rights/docs/FY-22-23-Fee-Schedule-Summary-Final.pdf](https://www.waterboards.ca.gov/resources/fees/water_rights/docs/FY-22-23-Fee-Schedule-Summary-Final.pdf). It is important to note that temporary permits are simply conditional, temporary approvals to divert and use available water. A temporary permit is not a water right, and applying for one does not get the applicant a spot in line in California’s first-in-time, first-in-right system of appropriative water rights. See **Figure II-4**.

<sup>36</sup> See *Streamlined Processing for Standard Groundwater Recharge Water Rights*, STATE WATER RESOURCES CONTROL BOARD, [https://www.waterboards.ca.gov/waterrights/water\\_issues/programs/applications/groundwater\\_recharge/streamlined\\_permits.html](https://www.waterboards.ca.gov/waterrights/water_issues/programs/applications/groundwater_recharge/streamlined_permits.html) (last visited Feb. 21, 2023).

<sup>37</sup> See also Kate Fritz and Nell Green Nylen, *Water right permitting options for groundwater recharge: Avoiding unintended consequences*, LEGAL PLANET (July 27, 2020), <https://legal-planet.org/2020/07/27/water-right-permitting-options-for-groundwater-recharge-avoiding-unintended-consequences/>.

<sup>38</sup> See *Permits for Groundwater Recharge*, STATE WATER RESOURCES CONTROL BOARD, [https://www.waterboards.ca.gov/waterrights/water\\_issues/programs/applications/groundwater\\_recharge/](https://www.waterboards.ca.gov/waterrights/water_issues/programs/applications/groundwater_recharge/) (last visited Feb. 21, 2023); see also web pages linked from this page.

<sup>39</sup> See *Pending Temporary Permits for Underground Storage consistent with Governor Executive Orders*, STATE WATER RESOURCES CONTROL BOARD, (hereinafter “Pending Temporary Permits”), [https://www.waterboards.ca.gov/waterrights/water\\_issues/programs/applications/groundwater\\_recharge/pending\\_applications.html](https://www.waterboards.ca.gov/waterrights/water_issues/programs/applications/groundwater_recharge/pending_applications.html) (last visited Feb. 21, 2023) (listing temporary permit applications and explaining how to look up application documents in the State Water Board’s eWRIMS database).

<sup>40</sup> See State Water Resources Control Board, Fact Sheet: Flood Control, Groundwater Recharge, and Water Rights, available at [https://www.waterboards.ca.gov/publications\\_forms/publications/factsheets/docs/flood\\_control\\_factsheet.pdf](https://www.waterboards.ca.gov/publications_forms/publications/factsheets/docs/flood_control_factsheet.pdf) (last updated July 2020); see also Kate Fritz and Nell Green Nylen, *When does a groundwater recharge project NOT need a water right?*, LEGAL PLANET (August 3, 2020), <https://legal-planet.org/2020/08/03/when-does-a-groundwater-recharge-project-not-need-a-water-right/>.

<sup>41</sup> See State Water Resources Control Board, Fact Sheet: Purposes of Use for Underground Storage Projects, [https://www.waterboards.ca.gov/waterrights/water\\_issues/programs/applications/docs/purposes\\_of\\_use\\_fact\\_sheet\\_final.pdf](https://www.waterboards.ca.gov/waterrights/water_issues/programs/applications/docs/purposes_of_use_fact_sheet_final.pdf) (last updated June 2020); see also Kathleen Miller, Nell Green Nylen, Holly Doremus, Dave Owen, and Andrew Fisher, Issue Brief: When is Groundwater Recharge a Beneficial Use of Surface Water in California? (August 2018), available at <https://www.law.berkeley.edu/research/clee/research/wheeler/gw-recharge-beneficial-use/>; Kathleen Miller, Groundwater Recharge in the SGMA Era: California clarifies beneficial use guidelines for recharge projects addressing SGMA undesirable results LEGAL PLANET (May 3, 2019), <https://legal-planet.org/2019/05/03/groundwater-recharge-in-the-sgma-era/>.

<sup>42</sup> See Pending Temporary Permits, *supra* note 39.

<sup>43</sup> Application T033322 by Omochumne-Hartnell Water District and the approved Temporary Permit to Divert and Use Water are both available at <https://ciwqs.waterboards.ca.gov/ciwqs/ewrims/DocumentRetriever.jsp?appNum=T033322&wrType=Temporary%20Permit&docType=DOCS>.

<sup>44</sup> Application T033287 by Central California Irrigation District is available at <https://ciwqs.waterboards.ca.gov/ciwqs/ewrims/DocumentRetriever.jsp?appNum=T033287&wrType=Temporary%20Permit>.

<sup>45</sup> Table is from Fritz & Green Nylen (July 27, 2020), *supra* note 37.

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<sup>46</sup> See State Water Resources Control Board, Order WR 98-08 Revising Declaration of Fully Appropriated Stream Systems (Nov. 19, 1988), *available at* [https://www.waterboards.ca.gov/waterrights/board\\_decisions/adopted\\_orders/orders/1998/wro98-08.pdf](https://www.waterboards.ca.gov/waterrights/board_decisions/adopted_orders/orders/1998/wro98-08.pdf).

<sup>47</sup> See *Groundwater Recharge Permitting - Frequently Asked Questions*, STATE WATER RESOURCES CONTROL BOARD, [https://www.waterboards.ca.gov/waterrights/water\\_issues/programs/applications/groundwater\\_recharge/faqs.html](https://www.waterboards.ca.gov/waterrights/water_issues/programs/applications/groundwater_recharge/faqs.html) (last visited Feb. 21, 2023); State Water Resources Control Board, Water Rights Fiscal Year 2022–2023 Fee Schedule Summary, *available at* [https://www.waterboards.ca.gov/resources/fees/water\\_rights/docs/FY-22-23-Fee-Schedule-Summary-Final.pdf](https://www.waterboards.ca.gov/resources/fees/water_rights/docs/FY-22-23-Fee-Schedule-Summary-Final.pdf).

<sup>48</sup> See *Fully Appropriated Stream Systems*, STATE WATER RESOURCES CONTROL BOARD, [https://www.waterboards.ca.gov/waterrights/water\\_issues/programs/fully\\_appropriated\\_streams/](https://www.waterboards.ca.gov/waterrights/water_issues/programs/fully_appropriated_streams/) (last visited Feb. 21, 2023) (displaying FASS on an interactive map); see also State Water Resources Control Board, Map: Declaration of Fully Appropriated Stream Systems, Santa Clara County (August 22, 1991), *available at* [https://www.waterboards.ca.gov/waterrights/water\\_issues/programs/fully\\_appropriated\\_streams/docs/fas\\_maps/santa\\_clara.pdf](https://www.waterboards.ca.gov/waterrights/water_issues/programs/fully_appropriated_streams/docs/fas_maps/santa_clara.pdf).

<sup>49</sup> Miller et al. (2018), *supra* note 41.

<sup>50</sup> Miller, Fisher, and Kiparsky (2021), *supra* note 32.

<sup>51</sup> See Christina Babbitt, Kate Gibson, Scott Sellers, Nicholas Brozović, Anthony Saracino, Ann Hayden, Maurice Hall, and Sandra Zellmer, *The Future of Groundwater in California: Lessons in Sustainable Management from Across the West* (2018), *available at* <https://www.edf.org/sites/default/files/groundwater-case-study.pdf>.

<sup>52</sup> See *Rates*, PV WATER, <https://www.pvwater.org/rates> (last visited Feb. 21, 2023). PV Water collects “groundwater augmentation charges” from those who pump groundwater in its service area and does not distinguish between agricultural and non-agricultural users. For the period from December 2022 through November 2023, the augmentation charge for metered users pumping groundwater outside the delivered water zone is \$282 per AF. *Id.*; see also Pajaro Valley Water Management Agency, Ordinance No. 2021–02, April 21, 2021, *available at* [https://www.pvwater.org/images/board-and-committees/board\\_of\\_directors\\_assets/ordinances/Ord.2021-02\\_Augmentation.Charge.Increase.in.Rates\\_web.pdf](https://www.pvwater.org/images/board-and-committees/board_of_directors_assets/ordinances/Ord.2021-02_Augmentation.Charge.Increase.in.Rates_web.pdf) (adjusting groundwater augmentation charges).

<sup>53</sup> *Current Water Charges*, *supra* note 12. For 2022–2023, agricultural groundwater production charges are \$36.85 per AF in all benefit zones, while non-agricultural groundwater production charges range from \$368.50 to \$1,724.00 per AF. *Id.* Valley Water’s District Act caps groundwater charges for “agricultural water” at “one-fourth of the rate for all water other than agricultural water.” Santa Clara Valley Water District Act, § 26.7(a)(3)(D), codified at CAL. WATER CODE § 60-26.7(a)(3)(D). Valley Water’s Board of Directors has further restricted charges for agricultural water users through its pricing policies. It adopted Resolution 99-21 in 1999, establishing an “open space credit” that limits groundwater production charges for agricultural water to “one-tenth of the rate for all water other than agricultural water.” LAFCO of Santa Clara County, 2011 Countywide Water Service Review: Chapter 3. Santa Clara Valley Water District at 77 (2011), *available at* [https://santaclaralafco.org/sites/default/files/service\\_reviews/Santa%20Clara%20Valley%20Water%20District.pdf](https://santaclaralafco.org/sites/default/files/service_reviews/Santa%20Clara%20Valley%20Water%20District.pdf).

<sup>54</sup> See, e.g., Nisha Marwaha, George Kourakos, Elad Levintal, and Helen E. Dahlke, *Identifying Agricultural Managed Aquifer Recharge Locations to Benefit Drinking Water Supply in Rural Communities*, 57 WATER RESOURCES RESEARCH, e2020WR028811 (2021), <https://doi.org/10.1029/2020WR028811>; Tess A. Russo, Andrew T. Fisher, and Brian S. Lockwood, *Assessment of managed aquifer recharge potential and impacts using a geographical information system and numerical modeling*, 53 GROUNDWATER 389–400 (2015, Epub 2014), <https://doi.org/10.1111/gwat.12213>.

<sup>55</sup> See, e.g., Ismail Chenini, I., Abdallah Ben Mammou, and Moufida El May, *Groundwater recharge zone mapping using GIS-based multi-criteria analysis: a case study in central Tunisia (Maknassy Basin)*, 24 WATER RESOURCES MANAGEMENT 921–939, (2010), <https://doi.org/10.1007/s11269-009-9479-1>; A.S. Jasrotia, R. Kumar, and A. K. Saraf, *Delineation of groundwater recharge sites using integrated remote sensing and GIS in Jammu District, India*, 28 INTERNATIONAL JOURNAL OF REMOTE SENSING 5019–5036 (2007), <https://doi.org/10.1080/01431160701264276>; A.T. O’Geen, T., M. B. B. Saal, H. Dahlke, D. Doll, R. Elkins, A. Fulton, G. Fogg, T. Harter, J. W. Hopmans, C. Ingels, F. Niederholzer, S. S. Solis, P. Verdegaa, and M. Walkinshaw, *Soil suitability index identifies potential areas for groundwater banking on agricultural lands*, 69 CALIFORNIA AGRICULTURE 75–84 (2015), <https://doi.org/10.3733/ca.v069n02p75>; Russo, Fisher, and Lockwood (2014), *supra* note 54; J. Sallwey, J. P.



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Bonilla Valverde, F. Vásquez López, R. Junghanns, and C. Stefan, *Suitability maps for managed aquifer recharge: a review of multi-criteria decision analysis studies*, 27 ENVIRONMENTAL REVIEWS 138–150 (2018), <https://doi.org/10.1139/er-2018-0069>.

<sup>56</sup> Soil Survey Staff, Soil Survey Geographic (SSURGO) Database (2014), U. S. Department of Agriculture, Washington, D. C.

<sup>57</sup> See, e.g., Marwaha et al. (2021), *supra* note 54; O’Geen et al. (2015), *supra* note 55.

<sup>58</sup> R.C. Whitter, K. L. Knudson, J. M. Sowers, C. M. Wentworth, K. D. Koehler, and C. E. Randolph, Maps of Quaternary Deposits and Liquefaction Susceptibility in the Central San Francisco Bay Region, California, (2006), U. S. Geological Survey Open-File Report 2006-1037, v. 1.1, Reston, VA, *available at* <https://pubs.usgs.gov/of/2006/1037/>.

<sup>59</sup> C.M. Wentworth, S. K. Brooks, and K. D. Gans, Digital database: Maps of Quaternary Deposits and Liquefaction Susceptibility in the Central San Francisco Bay Region, California, (2006), U. S. Geological Survey Open-File Report 2006-1037, v. 1.1, Reston, VA, *available at* <https://pubs.usgs.gov/of/2006/1037/>.

<sup>60</sup> J.D. Horton, C. A. San Juan, and D. B. Stoesser, The State Geologic Map Compilation (SGMC) geodatabase of the conterminous United States, (ver. 1.1, August 2017), U. S. Geological Survey Data Series 1052, Denver, CO, *available at* <https://pubs.er.usgs.gov/publication/ds1052>.

<sup>61</sup> See, e.g., E.J. Helley, K. R. Lajoie, W. E. Spangle, and M. L. Blair, Flatland deposits of the San Francisco Bay region, California — Their geology and engineering properties, and their importance to comprehensive planning (1979), U. S. Geological Survey Professional Paper 943, *available at* <https://pubs.er.usgs.gov/publication/pp943>.

<sup>62</sup> Marwaha et al. (2021), *supra* note 54; O’Geen et al. (2015), *supra* note 55.

<sup>63</sup> See, e.g., S.F. Carle, S. F., B. K. Esser, and J. E. Moran, *High-resolution simulation of basin-scale nitrate transport considering aquifer system heterogeneity*, 2 GEOSPHERE 195–209 (2006), <https://doi.org/10.1130/GES00032.1>.

<sup>64</sup> S. Beganskas, K. S. Young, A. T. Fisher, R. Harmon, and S. Lozano, *Runoff modeling of a coastal basin to assess variations in response to shifting climate and land use: Implications for managed recharge*, 33 WATER RESOURCES MANAGEMENT 1683–1698 (2019), <https://doi.org/10.1007/s11269-019-2197-4>.

<sup>65</sup> R.T. Hanson, Geohydrologic framework of recharge and seawater intrusion in the Pajaro Valley, Santa Cruz and Monterey Counties, California (2003), U. S. Geological Survey Water Resources Investigations Report 03-4096, Sacramento CA, *available at* <https://pubs.usgs.gov/wri/wri034096/>; R.T. Hanson, W. Schmid, C. C. Faunt, J. Lear, and B. Lockwood, Integrated Hydrologic Model of Pajaro Valley, Santa Cruz and Monterey Counties, California (2014), U. S. Geological Survey Scientific Investigations Report 2014-5111, Menlo Park, CA, *available at* <https://pubs.usgs.gov/sir/2014/5111/>.



# Flood-Managed Aquifer Recharge Pre-feasibility Study in Santa Clara County

Samantha Greene, Ph.D. and Jason Gurdak, Ph.D., Senior Water Resources Specialists

Andrew Fisher, Ph.D., Professor, UC Santa Cruz

Michael Kiparsky, Ph.D., Nell Green Nysten, Ph.D., J.D., and Molly Bruce, J.D., M.E.M., UC Berkeley

Agricultural Water Advisory Committee, October 2, 2023

Photo courtesy of the Santa Clara Valley Open Space Authority

# Water Supply “Ensure Sustainability” Strategy



Secure  
existing  
supplies and  
infrastructure



Expand  
conservation  
and reuse



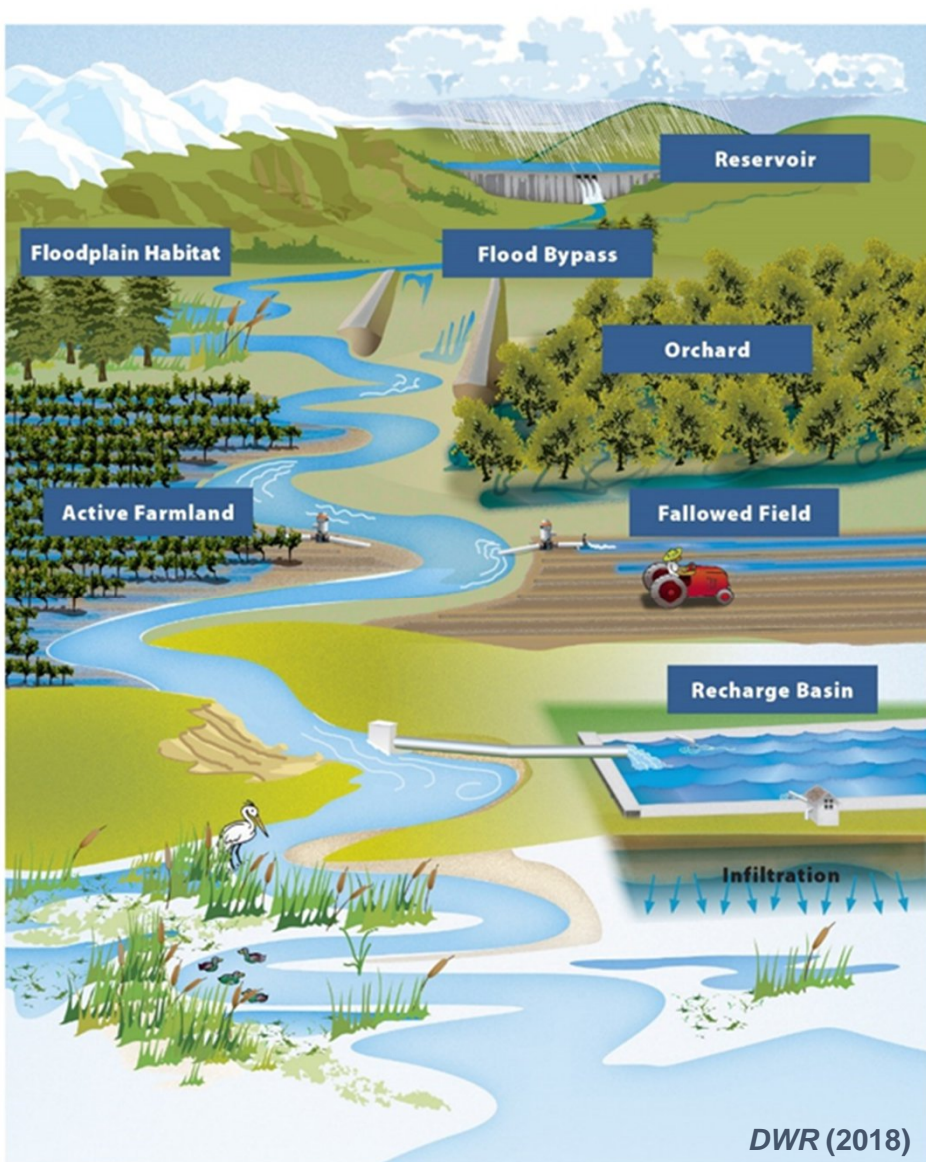
Optimize  
the system

- “No Regrets” Package of conservation and stormwater capture projects
  - Includes Flood-Managed Aquifer Recharge (Flood-MAR) on open lands
- Flood-MAR smaller in magnitude than existing Valley Water MAR (tens to hundreds AFY versus ~90,000 AFY)



# Flood-MAR

- Physical improvements to captures high flows for aquifer recharge on open space.
- Example Components:
  - Site selection
  - Stormwater collection/routing/infiltration
  - Regulatory requirements
  - Participation incentives
  - Water accounting
- Example considerations:
  - Recharge effectiveness
  - Water quality
  - Implementation costs (scale: hundreds of thousands of dollars per project)



# Roadmap for Flood-MAR Study in Santa Clara County

- Step 1: Preliminary feasibility study with UC Water (Water Resources Innovation Partnership)
- Step 2: Pilot Flood-MAR program development, including refining site suitability identification
- Step 3: Pilot Flood-MAR project implementation
- Step 4: Implement Flood-MAR program full scale

Moving to each subsequent step requires positive results from previous steps

Valley Water is currently completing Step 1

# Step 1: Water Resources Innovation Partnership

(Jan 2021 to June 2023)

- Partnership Goal: complete a preliminary feasibility study on Flood-MAR implementation in Santa Clara County
  - Evaluate potential program features (e.g., incentives, staffing, permitting, etc.)
  - Develop mapping tool to determine the potential availability of Flood-MAR sites
- Key preliminary feasibility questions:
  - 1) Does Valley Water have the tools and information to develop a pilot program?
  - 2) Does the mapping tool indicate sufficient potential site availability to support pilot program development?



# A Flood-MAR program could provide a framework for:

- Project implementation on non-Valley Water land
- Regulatory and engineering management
- Water recharge tracking
- Incentive calculation



Photos: Flood-MAR site  
in the Pajaro Valley  
(courtesy of Dr. Andrew  
Fisher)



# Programmatic considerations

- Hillslope capture and infiltration most viable approach
- Creek flow diversions potentially feasible, but most surface water is captured by upstream reservoir
- Third-party entity could support
  - Landowner partnerships
  - Water recharge tracking
  - Incentive calculation
- Valley Water may oversee permitting and water rights applications and tracking/reporting

# Costs and Incentives Ideas

- Water rates and grants:
  - Infrastructure costs
  - Program management costs
  - Incentive reimbursement
- Incentives like “Recharge Net Metering”
  - Water rate-based reimbursement may not have motivational power in Santa Clara County
  - Need to evaluate if rebates are consistent with District Act and Proposition 26



**Pumping** – **Rebate** = Recharge Net Metering

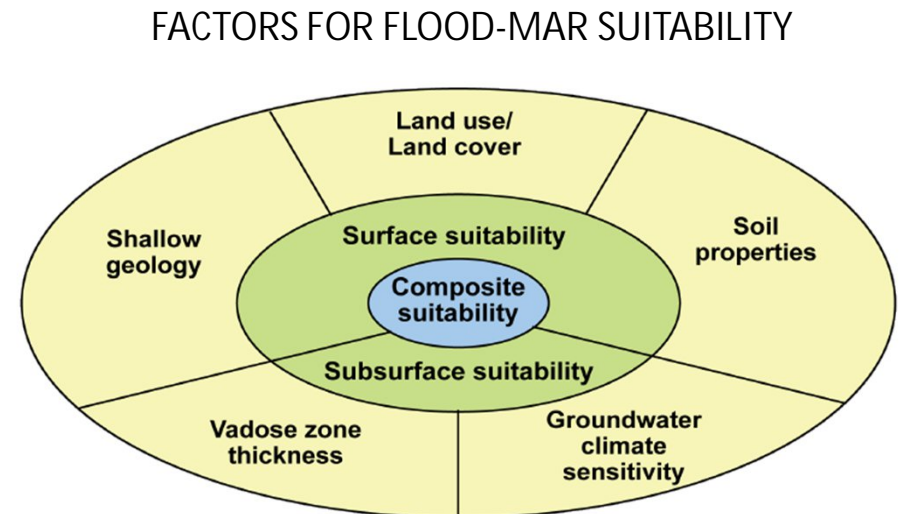
Source: [law.berkeley.edu/ReNeM](http://law.berkeley.edu/ReNeM)



# Mapping Tool Development

General goal: Identify areas where factors beneficial to Flood-MAR overlap – indicates increased potential for Flood-MAR success in that region.

- Selected datasets incorporated into mapping tool
- Combine datasets into a composite suitability index
- Regional tool → not site-specific



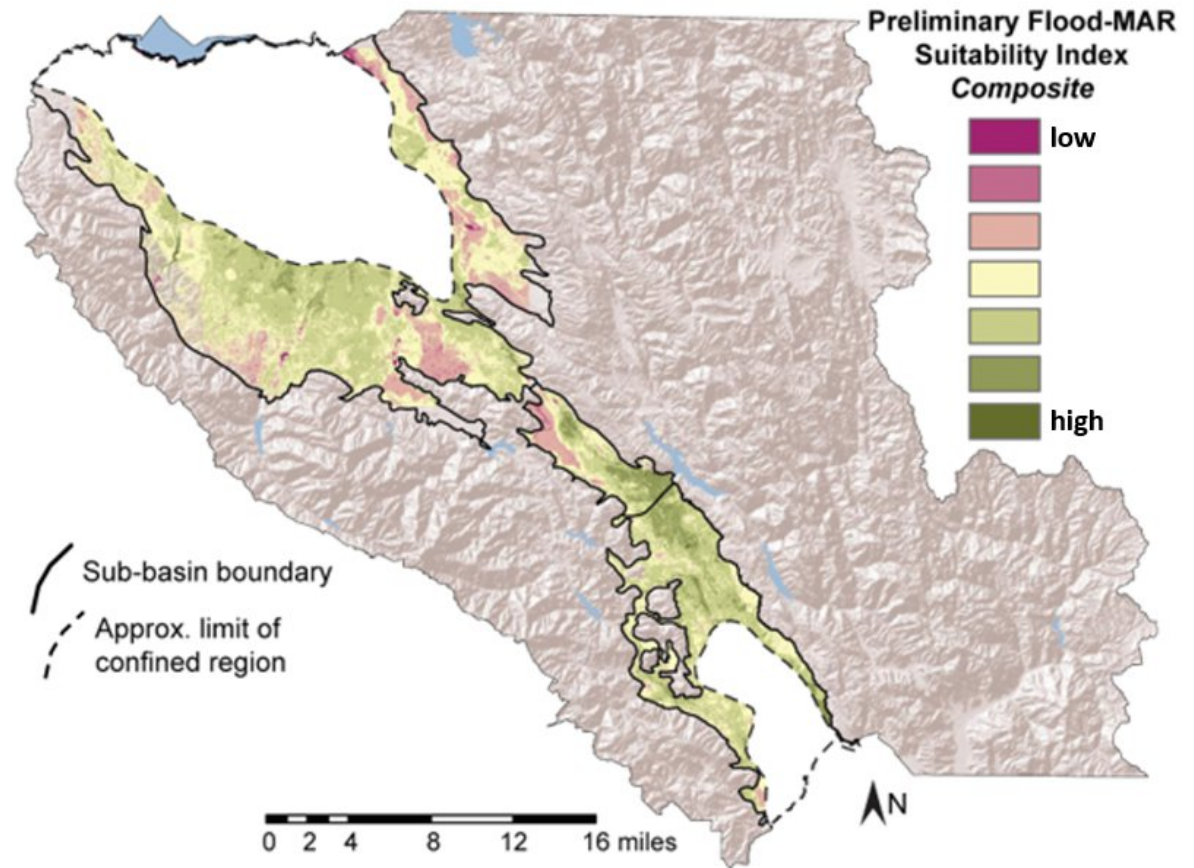


# Preliminary Screening

Developed with large-scale datasets

Mapping tool will be refined using additional criteria like water source and land slope.

Field analysis to confirm site suitability will be required at potential project sites



# Next Steps

- Pilot program development
  - Design eligibility criteria, permitting approach, and incentive structure
  - Develop third-party partnerships and internal staffing needs
  - Determine project (site level) implementation needs
- Add surface water runoff to mapping tool
- Apply for grant funding as available

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# Santa Clara Valley Water District

**File No.:** 23-0977

**Agenda Date:** 10/2/2023

**Item No.:** 4.3.

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## **COMMITTEE AGENDA MEMORANDUM Agricultural Water Advisory Committee**

Government Code § 84308 Applies: Yes ☐ No ☒  
(If "YES" Complete Attachment A - Gov. Code § 84308)

### **SUBJECT:**

Review Agricultural Water Advisory Committee Work Plan, the Outcomes of Board Action of Committee Requests; and the Committee's Next Meeting Agenda.

### **RECOMMENDATION:**

Review the Committee work plan to guide the committee's discussions regarding policy alternatives and implications for Board deliberation.

### **SUMMARY:**

The attached Work Plan outlines the topics for discussion to be able to prepare policy alternatives and implications for Board deliberation. The work plan is agendized at each meeting as accomplishments are updated and to review any work plan assignments by the Board.

### **BACKGROUND:**

#### **Governance Process Policy-8:**

The District Act provides for the creation of advisory boards, committees, or commissions by resolution to serve at the pleasure of the Board.

Accordingly, the Board has established Advisory Committees, which bring respective expertise and community interest, to advise the Board, when requested, in a capacity as defined: prepare Board policy alternatives and provide comment on activities in the implementation of the District's mission for Board consideration. In keeping with the Board's broader focus, Advisory Committees will not direct the implementation of District programs and projects, other than to receive information and provide comment.

Further, in accordance with Governance Process Policy-3, when requested by the Board, the Advisory Committees may help the Board produce the link between the District and the public through information sharing to the communities they represent.

**ENVIRONMENTAL JUSTICE IMPACT:**

There are no Environmental Justice impacts associated with this item.

**ATTACHMENTS:**

Attachment 1: Agricultural Water Advisory Committee (AWAC) 2023 Work Plan

**UNCLASSIFIED MANAGER:**

Candice Kwok-Smith, 408-630-3193

## 2023 Work Plan: Agricultural Water Advisory Committee

Update: September 2023

The annual work plan establishes a framework for committee discussion and action during the annual meeting schedule. The committee work plan is a dynamic document, subject to change as external and internal issues impacting the District occur and are recommended for committee discussion. Subsequently, an annual committee accomplishments report is developed based on the work plan and presented to the District Board of Directors.

ITEM	WORK PLAN ITEM BOARD POLICY	MEETING DATE	INTENDED OUTCOME(S) (Action or Information Only)	ACCOMPLISHMENT DATE AND OUTCOME
1	Election of Chair and Vice Chair for 2023	January 9	<ul style="list-style-type: none"> <li>Committee Elects Chair and Vice Chair for 2023. <b>(Action)</b></li> </ul>	<b>Accomplished January 9, 2023:</b> The Committee unanimously approved Jan Garrod as the 2023 Agricultural Water Advisory Committee Chair and Peter Van Dyke as the 2023 Agricultural Water Advisory Committee Vice-Chair.
2	Annual Accomplishments Report	January 9	<ul style="list-style-type: none"> <li>Review and approve 2022 Accomplishments Report for presentation to the Board. <b>(Action)</b></li> <li>Submit requests to the Board, as appropriate.</li> </ul>	<b>Accomplished January 9, 2023:</b> The Committee unanimously approved the 2022 Annual Accomplishments Report. <i>The Board received the Committee's presentation at its March 28, 2023, meeting.</i>
3	Review and Comment to the Board on the Fiscal Year 2023 – 2024 Preliminary Groundwater Production Charges	January 9	<ul style="list-style-type: none"> <li>Review and comment to the Board on the Fiscal Year 2023-2024 Preliminary Groundwater Production Charges. <b>(Action)</b></li> <li>Submit requests to the Board, as appropriate.</li> </ul>	<b>Accomplished January 9, 2023:</b> The Committee reviewed and commented on the Fiscal Year 2023-2024 Preliminary Groundwater Production Charges and took the following action: The Committee unanimously approved the Committee forming a subcommittee to discuss the rates and comparison data from other agencies regarding farming.
4	Quarterly Drought Response Update	January 9 April 3	<ul style="list-style-type: none"> <li>Receive an update on the Drought Response. <b>(Information)</b></li> </ul>	<b>Accomplished January 9, 2023/April 3, 2023:</b> The Committee received an update on the Drought Response and took no action.

Yellow = Update Since Last Meeting

Blue = Action taken by the Board of Directors

Attachment 1

Page 1 of 9

## 2023 Work Plan: Agricultural Water Advisory Committee

Update: September 2023

ITEM	WORK PLAN ITEM BOARD POLICY	MEETING DATE	INTENDED OUTCOME(S) (Action or Information Only)	ACCOMPLISHMENT DATE AND OUTCOME
5	Agricultural Water Use Baseline Study Update	January 9	•Receive information on the Agricultural Water Use Baseline Study. <b>(Information)</b>	<b>Accomplished January 9, 2023:</b> The Committee received information on the Agricultural Water Use Baseline Study and took no action.
6	Information on Proposal to Update the Untreated Surface Water Program	January 9	•Receive information on Proposal to Update the Untreated Surface Water Program. <b>(Information)</b>	<b>Accomplished January 9, 2023:</b> The Committee received information on Proposal to Update the Untreated Surface Water Program and took no action.
7	Review of Agricultural Water Advisory Committee Work Plan, the Outcomes of Board Action of Committee Requests and the Committee's Next Meeting Agenda	January 9 April 3 August 7 October 2	<ul style="list-style-type: none"> <li>•Receive and review the 2023 Board-approved Committee work plan. <b>(Action)</b></li> <li>•Submit requests to the Board, as appropriate.</li> </ul>	<p><b>Accomplished January 9, 2023:</b> The Committee received and reviewed the 2023 Board-approved Committee work plan and took no action.</p> <p><b>Accomplished April 3, 2023:</b> The Committee received and reviewed the 2023 Board-approved Committee work plan and took the following action: The Committee unanimously approved having a special meeting Monday, August 7, 2023, at 1:30 p.m.</p> <p><b>Accomplished August 7, 2023:</b> The Committee received and reviewed the 2023 Board-approved Committee work plan and took the following actions: 1.The Committee unanimously voted to approve to have the Board consider the Agricultural Water Advisory Committee's recommendation to receive an update of Valley Water's activities of the unhoused and information of the enforcement of violations for private landowners.</p>

Yellow = Update Since Last Meeting

Blue = Action taken by the Board of Directors

Attachment 1

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## 2023 Work Plan: Agricultural Water Advisory Committee

Update: September 2023

ITEM	WORK PLAN ITEM BOARD POLICY	MEETING DATE	INTENDED OUTCOME(S) (Action or Information Only)	ACCOMPLISHMENT DATE AND OUTCOME
				2.The Committee unanimously voted to approve to have the Board consider placing the topic of ecosystems benefits on agriculture in Santa Clara County on the Committee's work plan.  <i>The recommendations are going to the Board at its October 10, 2023, meeting.</i>
8	Standing Items Report Fiscal Year 2023 Goals and Strategies:	January 9 August 7	•Receive quarterly reports on standing items, FY2023. <b>(Information)</b>	<b>Accomplished January 9, 2023 and August 7, 2023:</b> The Committee received the quarterly report on standing items for FY2023 and took no action.
GOAL	OBJECTIVE	FY23 TACTICS		MONITORING COMMITTEE
<b>INTEGRATED WATER RESOURCES MANAGEMENT</b> <i>"Efficiently manage water resources across business areas."</i>	<u>Objective #1 Challenge/Opportunity</u> <i>The maintenance of Valley Water's infrastructure is crucial to ensuring we continue to provide safe, clean water and critical flood protection for our communities. Timely maintenance is the most cost-effective investment, whereas deferred maintenance disproportionately increases costs and causes unplanned outages and failures risking the population of the county. In addition, aging assets are reaching the end of the design life and will require major recapitalization.</i>	<ul style="list-style-type: none"> <li>• Develop a Fuel Management Policy to guide the incorporation of wildfire planning efforts in an integrated and programmatic way.</li> <li>• Continue a robust preventive maintenance program including monitoring asset condition and risk.</li> <li>• Strategically plan for larger infrastructure renewal projects through Safe Clean Water Project F8 – Sustainable Creek Infrastructure for Continued Public Safety; Water Treatment Plant, Distribution System, and SCADA Implementation Plans; Watersheds and Water Utility Operations and Maintenance Plans; and various Asset Management Plans.</li> <li>• Advance infrastructure renewal projects identified in strategic planning efforts by initiating new Capital or Small Capital Projects, or by conducting work as part of ongoing operations projects.</li> <li>• Develop comprehensive infrastructure master plans for all water utility treatment plant and distribution infrastructure (e.g. pipelines and pump stations) to plan out 30-year capital investments that meet future regulatory requirements, and fold in projects identified in the Asset Management and Operations &amp; Maintenance Plans.</li> <li>• Expedient execution of the adopted Capital program and projects.</li> </ul>		Board Policy and Planning Committee (BPPC) CIP Committee (CIPC)
	<u>Objective #2 Challenge/Opportunity</u>	<ul style="list-style-type: none"> <li>• Continue to provide for agency-wide regulatory planning and</li> </ul>		BPPC

Yellow = Update Since Last Meeting

Blue = Action taken by the Board of Directors

Attachment 1

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# 2023 Work Plan: Agricultural Water Advisory Committee

Update: September 2023

ITEM	WORK PLAN ITEM BOARD POLICY	MEETING DATE	INTENDED OUTCOME(S) (Action or Information Only)	ACCOMPLISHMENT DATE AND OUTCOME
	<i>Valley Water continues to pursue legislative and administrative solutions to resolve regulatory and permitting issues at the federal and state levels. The Board's efforts will continue to focus on improving internal capacity when applying for permits, as well as continuing to build relationships with regulatory agencies and staying abreast of the regulatory environment.</i>		<p>permitting effort and pursue other efforts at the state and federal level to expedite permit review.</p> <ul style="list-style-type: none"> <li>•Continue to foster better relationships with regulatory agencies and open dialogue with environmental, environmental justice and other stakeholders.</li> <li>•Continue to work with the Regional Water Quality Control Board (RWQCB) under the terms of our memorandum of understanding (MOU) to expedite issue resolution and prevent regulatory overreach.</li> <li>•Collaborate with RWQCB on the Steelhead Regional Temperature Study.</li> </ul>	
<b>WATER SUPPLY</b> <i>"Provide a reliable, safe, and affordable water supply for current and future generations in all communities served."</i>	<u>Objective #1 Challenge/Opportunity</u> <i>Half of Santa Clara County's water supply is imported from outside the county. At this time, when there is a lot of water, Valley Water may not be able to take advantage of these supplies due to limitations in existing storage and transmission infrastructure as well as regulatory constraints. Having a diverse portfolio of storage options helps Valley Water be resilient. Therefore, Valley Water is evaluating whether diversifying its storage portfolio could help maximize our use of storage and stored water recovery under future conditions. Water storage in reservoirs also provides environmental, recreational, and incidental flood risk reduction benefits. Challenges include determining the appropriate level of participation for Valley Water in collaborative water storage projects and prioritizing projects within funding constraints.</i>		<ul style="list-style-type: none"> <li>•Explore opportunities to develop new surface and groundwater storage projects that help Valley Water meet future water supply needs and be resilient to climate change.</li> <li>•Determine level of participation for projects and decisions about partnerships in accordance with the Water Supply Master Plan and water affordability.</li> <li>•Explore partnership opportunities for the Pacheco Reservoir Expansion Project</li> <li>•Validate Valley Water's continued participation in the Pacheco Reservoir Expansion Project during the MAP review process, bi-annual budget development, and following review and certification of the project's Environmental Impact Report (EIR).</li> </ul>	Water Storage Exploratory Committee (WSEC)
	<u>Objective #2 Challenge/Opportunity</u> <i>The Water Supply Master Plan's "Ensure Sustainability" strategy includes securing existing water supplies and infrastructure. Valley Water's local and imported water supplies are vulnerable to climate change impacts, droughts, earthquake, and regulatory requirements that may restrict the amount of available water.</i>		<ul style="list-style-type: none"> <li>•Participate in and influence decisions regarding the Delta Conveyance Project.</li> <li>•Participate in regional water supply resilience efforts.</li> <li>•Build and maintain effective partnerships to increase resiliency.</li> <li>•Complete and implement infrastructure master plans and asset management plans.</li> <li>•Partner with the California Department of Water Resources (DWR) to ensure reliability of the South Bay Aqueduct.</li> </ul>	Water Conservation and Demand Management Committee (WCaDMC) (Groundwater) CIPC (infrastructure projects)
	<u>Objective #3 Challenge/Opportunity</u> <i>Recycled and purified water is a drought resilient, locally controlled water supply important to long-term</i>		<ul style="list-style-type: none"> <li>•Implement the first phase of the Purified Water Program, including release of a Request For Proposal (RFP) and enter into a contract for an Indirect Potable Reuse project that is implemented via a Public Private</li> </ul>	Recycled Water Committee (RWC)

Yellow = Update Since Last Meeting

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# 2023 Work Plan: Agricultural Water Advisory Committee

Update: September 2023

ITEM	WORK PLAN ITEM BOARD POLICY	MEETING DATE	INTENDED OUTCOME(S) (Action or Information Only)	ACCOMPLISHMENT DATE AND OUTCOME
	<i>sustainability. The Water Supply Master Plan includes developing up to 24,000 acre-feet per year of purified water by 2040. Purified water is recycled water that has been treated further using reverse osmosis and other advanced treatment to make it fit for drinking. Valley Water is pursuing indirect potable reuse which would use this purified water to replenish our groundwater. Implementation challenges include securing wastewater supply contractual agreements with wastewater agencies, available land, stringent regulatory requirements, and implementation costs.</i>		<ul style="list-style-type: none"> <li>Partnership.</li> <li>Implement the Countywide Water Reuse Master Plan.</li> <li>Develop a Comprehensive Water Reuse Agreement for South County to advance water reuse and its production, distribution, and wholesaling in South County.</li> <li>Continue to actively be involved with the Direct Potable Reuse (DPR) guidance and ensure Valley Water is positioned to implement a DPR project in the future.</li> <li>Continue collaboration on the Silicon Valley Advanced Water Purification Center including building a strong collaborative relationship with the San José-Santa Clara Regional Wastewater Facility to expand the facility.</li> </ul>	
	<u>Objective #4 Challenge/Opportunity</u> <i>As our largest reservoir, Anderson serves not only as a critical water supply facility, but also supports Valley Water's mission of flood protection and environmental stewardship. Given the reservoir's critical importance to ensuring safe, clean water for our communities and to protect public safety, it is imperative that the Anderson Dam Seismic Retrofit Project (ADSRP) move forward expeditiously. This includes the reconstruction of the Dam and completion of the interim risk reduction measures resulting from the February 20, 2020, directive from the Federal Energy Regulatory Commission (FERC).</i>		<ul style="list-style-type: none"> <li>Maintain the Anderson Reservoir level at the FERC directed level.</li> <li>Complete the construction on the Anderson Dam Tunnel Project (ADTP).</li> <li>Complete the design of the ADSRP.</li> <li>Continue to work with appropriate regulatory agencies to advance the ADSRP.</li> <li>Release the Draft Environmental Impact Report for the ADSRP.</li> <li>Obtain all necessary permits for ADSRP construction.</li> <li>Continue to educate and engage the public, key stakeholders, decision makers, and elected officials of the project progress and construction timeline.</li> <li>Coordinate long term ADSRP operations with the Fisheries and Aquatic Habitat Collaborative Effort (FAHCE).</li> </ul>	CIPC Stream Planning and Operations Committee (SPOC)
	<u>Objective #5 Challenge/Opportunity</u> <i>Droughts are a recurring feature of California's climate and may intensify with climate change. Water conservation is an essential component in providing a reliable water supply and Valley Water has set a water conservation goal for annual water savings of 99,000 acre-feet (AF) by 2030 and 109,000 AF by 2040. As Valley Water faces challenges from climate change and drought, water conservation will continue to be amongst the most cost-effective tools for efficiently meeting current and future demands while mitigating droughts.</i>		<ul style="list-style-type: none"> <li>Continue communication and educational outreach to promote Valley Water's water conservation programs.</li> <li>Increase collaboration with our retailer partners to promote Valley Water's water conservation programs.</li> <li>Implement new water conservation programs and engagement strategies identified within the Water Conservation Strategic Plan.</li> <li>Engage and support private-sector stakeholders, local, state, and federal agencies that promote water conservation.</li> <li>Develop and implement a Drought Response Plan with support and input from our retailer partners and the broader community to guide short-term behavioral changes during water shortages.</li> </ul>	WCaDMC
<b>NATURAL FLOOD PROTECTION</b> "Provide Natural Flood Protection to reduce risk"	<u>Objective #1 Challenge/Opportunity</u> <i>Valley Water is challenged to sustain ecosystem health while managing local water resources for flood protection and water supply. By using an integrated approach to planning and</i>		<ul style="list-style-type: none"> <li>Make significant progress on One Water plans for the Guadalupe and Pajaro watersheds.</li> <li>Complete construction of Reaches 1-3 of the Shoreline Phase I Project and pursue funding alternatives for Reaches 4-5 to provide 100-year</li> </ul>	CIPC BPPC

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# 2023 Work Plan: Agricultural Water Advisory Committee

Update: September 2023

ITEM	WORK PLAN ITEM BOARD POLICY	MEETING DATE	INTENDED OUTCOME(S) (Action or Information Only)	ACCOMPLISHMENT DATE AND OUTCOME
and improve health and safety."	<i>designing flood protection planning, there is an opportunity to create projects with multiple benefits.</i>		<p>coastal flood risk management, ecosystem restoration, recreational opportunities, and resiliency for sea level rise.</p> <ul style="list-style-type: none"> <li>• Complete construction of Phase 2A of the Upper Llagas Flood Protection Project to provide flood protection and habitat enhancement.</li> <li>• Advance the Palo Alto Flood Basin Project into construction, a repair project to ensure a functional flood basin with wetland habitat.</li> <li>• Advance the Sunnyvale East/West Channels Project into construction to provide 100-year storm water flood protection.</li> <li>• Complete the U.S. Army Corps of Engineers Upper Guadalupe River Project General Reevaluation Study to provide 100-year flood protection.</li> <li>• Advance the San Francisquito Creek upstream 101 Project into construction to provide flood protection.</li> <li>• Advance the Coyote Creek Flood Mitigation and Flood Protection Projects into construction to provide flood protection for an event equivalent to the 2017 storm event.</li> </ul>	
	<u>Objective #2 Challenge/Opportunity</u> <i>As Valley Water continues to advance flood protection projects, the Board has an opportunity to strengthen relationships and improve coordination with conservation and environmental justice groups, as well as other local jurisdictions, with a specific focus on ensuring the voices of disadvantaged communities are equitably represented.</i>		<ul style="list-style-type: none"> <li>• Advance One Water Countywide Framework in a comprehensive manner that includes diverse community-wide stakeholders and the incorporation of environmental justice policies in all planning efforts.</li> <li>• Continue progress on flood protection capital projects consistent with Valley Water's commitment to the Safe, Clean Water Program and equitability in all regions.</li> <li>• Plan flood risk reduction projects to provide a minimum level of protection countywide.</li> </ul>	CIPC BPPC
ENVIRONMENTAL STEWARDSHIP "Sustain ecosystem health while managing local water resources for flood protection and water supply."	<u>Objective #1 Challenge/Opportunity</u> <i>Valley Water's projects and programs require integrated planning to ensure capital improvements, operations, and maintenance activities are balanced with environmental stewardship goals. Valley Water strives to protect and restore habitats to support native species throughout Santa Clara County.</i>		<ul style="list-style-type: none"> <li>• Continue to develop an integrated water resource plan for each watershed, including appropriate metrics to monitor Valley Water's impacts on and benefit to the environment.</li> <li>• Implement high priority actions included in the Climate Change Action Plan.</li> <li>• Make significant progress on the grant-funded planning study for the San Tomas Aquino Calabazas Creek Realignment Project.</li> <li>• Advance construction for the Bolsa Creek and Hale Creek projects to begin in Summer 2022.</li> <li>• Advance Almaden Lake Improvement Project to begin construction in 2023.</li> <li>• Continue to develop and build on partnerships with environmental organizations and tribal communities when developing projects.</li> </ul>	BPPC

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# 2023 Work Plan: Agricultural Water Advisory Committee

Update: September 2023

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	<p><u>Objective #2 Challenge/Opportunity</u> Valley Water continues to coordinate with local cities and agencies to improve the health of our local waterways, including pollution prevention and addressing threats to water quality. Opportunities exist to further collaborate with the County, cities, and social services agencies on encampment abatement efforts and to develop long-term solutions for the homeless to keep our creeks clean.</p>		<ul style="list-style-type: none"> <li>•Continue efforts to protect the ecosystem and water quality of our water Bodies and the integrity of our infrastructure. Such efforts include preventing stormwater pollution, increased implementation of green stormwater infrastructure, addressing mercury pollution, and homeless encampment clean ups.</li> <li>• Coordinate with the County, cities, and other service providers to try to ensure the permanent removal of homeless encampments from creeks and trails.</li> <li>• Continue partnerships and investments on a regional scale such as the South Bay Salt Pond Restoration and Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP).</li> </ul>	Environmental Creek Cleanup Committee (ECCC) (SPOC)
	<p><u>Objective #3 Challenge/Opportunity</u> For nearly 20 years, Valley Water has been working to resolve a water rights complaint surrounding fish, wildlife, water quality, and other beneficial uses in Coyote Creek, Guadalupe River, and Stevens Creek watershed areas. Challenges include completing the environmental review process, obtaining federal and state permits from multiple regulatory agencies, refining and processing water rights change petitions, the technical complexity of the fisheries impacts analysis, coordination with other ongoing related projects and managing stakeholder expectations.</p>		<ul style="list-style-type: none"> <li>•Finalize the June 2021 Guadalupe River and Stevens Creek Environmental Impact Report (EIR) consistent with existing stakeholder agreement.</li> <li>•Advance 10 water right change petitions for securing water right orders.</li> <li>• Continue to implement the pilot flow program in Guadalupe and Stevens Creek.</li> <li>• Continue to implement feasibility studies, monitoring activities, and Planning and construction of various fish passage improvements as identified in existing stakeholder agreement.</li> <li>• Continue fisheries monitoring program.</li> <li>• Continue to support an adaptive management program that encompasses all three creeks.</li> </ul>	SPOC
CLIMATE CHANGE "Mitigate Carbon Emissions and Adapt Valley Water Operations to Climate Change Impacts."	<p><u>Objective #1 Challenge/Opportunity</u> Valley Water's ability to fulfill its mission will be challenged in the future by warmer temperatures, changing precipitation patterns, reduced snowpack, and rising sea levels. Valley Water has been working on greenhouse reduction efforts since 2008 and many adaptation actions over the past decade; however, with adoption of the Climate Change Action Plan there is an opportunity for greater impact.</p>		<ul style="list-style-type: none"> <li>•Update carbon accounting and establish new emissions reduction goal if needed.</li> <li>•Make significant progress on development of an agency-wide greenhouse gas reduction plan.</li> </ul>	Climate Adaptation and Sustainability Committee (CAASC)
BUSINESS MANAGEMENT "Promote effective management of water supply, flood protection, and environmental stewardship through responsive and socially	<p><u>Objective #1 Challenge/Opportunity</u> Valley Water is committed to creating and maintaining a diverse, inclusive, and equitable work environment that is devoid of discrimination and harassment and provides equal opportunity employment and advancement. Valley Water aims to implement the same values in the community through its flood protection, water supply, and environmental stewardship</p>		<ul style="list-style-type: none"> <li>•Develop and implement a Diversity, Equity and Inclusion Master Plan that institutes best practices to address internal and external disparities and builds an organizational culture that is consistent with the Board's Resolution addressing racial equity, diversity, and inclusion.</li> <li>• Remain committed to environmental justice and the fair treatment and meaningful engagement of all people regardless of race, color, national</li> </ul>	Diversity & Inclusion Ad Hoc Committee (DIAHC)

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# 2023 Work Plan: Agricultural Water Advisory Committee

Update: September 2023

ITEM	WORK PLAN ITEM BOARD POLICY	MEETING DATE	INTENDED OUTCOME(S) (Action or Information Only)	ACCOMPLISHMENT DATE AND OUTCOME
	<i>responsible business services."</i>	<i>projects, and has an opportunity to serve as a leader for racial equity, diversity, and inclusion throughout the state.</i>	origin, religion, gender identity, disability status, tribe, culture, income, immigration status, or English language proficiency, with respect to the planning, projects, policies, services, and operations of Valley Water. • Continue to collaborate with external stakeholders that are engaged in developing diversity, equity, and inclusion initiatives and actively participate in and provide leadership for diversity, equity, and inclusion efforts throughout the state. • Advance and foster mutually beneficial partnerships with regional tribal communities.	
9	Review Proposed Fiscal Year 2023-24 Groundwater Production Charges and Receive Committee Feedback	April 3	•Review Proposed Fiscal Year 2023-24 Groundwater Production Charges and Receive Committee Feedback. <b>(Action)</b>	<b>Accomplished April 3, 2023:</b> The Committee reviewed proposed Fiscal Year 2023-24 Groundwater Production Charges and took the following actions: 1. The Committee unanimously approved to continue keeping the groundwater production charges (rates) low. 2. The Committee unanimously approved, have Vice Chair Peter Van Dyke of the subcommittee write a letter to the Board on behalf of the full committee regarding suggestions for keeping rates low and explaining the benefits of agriculture (farming). <i>The Board received the Committee's recommendation at its May 16, 2023, meeting and took action.</i>
10	Provide Feedback to the Board Policy and Planning Committee on the Committee's Purpose and Accomplishments and Suggest Areas of Improvement.	April 3	•Review feedback provided to the Board Policy and Planning Committee on February 6, 2023, by the Board Advisory Committees' Chairs/Vice Chairs on the Committees' purposes and accomplishments, and suggest areas of improvement. <b>(Action)</b>	<b>Accomplished April 3, 2023:</b> The Committee reviewed feedback provided to the Board Policy and Planning Committee on February 6, 2023, by the Board Advisory Committees' Chairs/Vice Chairs on the Committees' purposes and accomplishments and suggest areas of improvement and took no action.

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## 2023 Work Plan: Agricultural Water Advisory Committee

Update: September 2023

ITEM	WORK PLAN ITEM BOARD POLICY	MEETING DATE	INTENDED OUTCOME(S) (Action or Information Only)	ACCOMPLISHMENT DATE AND OUTCOME
			•Provide additional feedback for BPPC consideration.	
11	Untreated Surface Water Program Activities and Water Master Charge Overview	August 7 October 2	•Receive information on the Untreated Surface Water Program activities and Water Master Charge overview. <b>(Information)</b>	<b>Accomplished August 7, 2023:</b> The Committee received information on the Untreated Surface Water Program activities and Water Master Charge overview and staff will be returning with further information at the next meeting.
12	Setting Requirements for Metering of Wells in All Valley Water Groundwater Benefit Zones	August 7	•Receive information on Setting Requirements for Metering of Wells in All Valley Water Groundwater Benefit Zones. <b>(Information)</b>	<b>Accomplished August 7, 2023:</b> The Committee received information on Setting Requirements for Metering of Wells in All Valley Water Groundwater Benefit Zones and took no action.
13	Flood-Managed Aquifer Recharge Preliminary Feasibility Study for Santa Clara County	October 2	•Receive a presentation on the Flood-Managed Aquifer Recharge Preliminary Feasibility Study for Santa Clara County. <b>(Information)</b>	
14	Review Fiscal Year 2023-2024 Board Work Plan	October 2	•Review Fiscal Year 2023-2024 Board Work Plan <b>(Information)</b>	

### BOARD WORK PLAN GOALS:

**Integrated Water Resources Management** - Goal: Efficiently manage water resources across business areas.

1. **Water Supply** – Goal: Provide a reliable, safe, and affordable water supply for current and future generations in all communities served.

2. **Natural Flood Protection** – Goal: Provide natural flood protection to reduce risk and improve health and safety.

4. **Environmental Stewardship** – Goal: Sustain ecosystem health while managing local water resources for flood protection and water supply.

5. **Addressing Encampment of Unsheltered People** – Goal: Humanely assist in the permanent relocation of unsheltered people on Valley Water lands along waterways and at water supply and flood risk reduction facilities in order to address the human health, public safety, operational, and environmental challenges posed by encampments.

6. **Climate Change** – Goal: Mitigate carbon emissions and adapt Valley Water operations to climate change impacts.

7. **Business Management** – Goal: Promote effective management of water supply, flood protection, and environmental stewardship through responsive and socially responsible business services.

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# Santa Clara Valley Water District

**File No.:** 23-0978

**Agenda Date:** 10/2/2023

**Item No.:** 5.1.

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## **COMMITTEE AGENDA MEMORANDUM Agricultural Water Advisory Committee**

Government Code § 84308 Applies: Yes ☐ No ☒  
(If "YES" Complete Attachment A - Gov. Code § 84308)

### **SUBJECT:**

Review Fiscal Year 2023-2024 Board Work Plan.

### **RECOMMENDATION:**

Review the Board's work plan to guide the committee's discussions regarding policy alternatives and implications for Board deliberation.

### **SUMMARY:**

The attached Work Plan outlines the Board-approved topics for discussion to be able to prepare policy alternatives and implications for Board deliberation.

### **BACKGROUND:**

In May 3, 2023, the Board conducted its annual planning session to evaluate and refine goals, objectives, challenges, and opportunities and identify the specific areas requiring tactical engagement and monitoring during Fiscal Year 2023-2024 (FY24).

During the strategic planning session, the Board participated in a facilitated discussion and received staff recommendations for the FY24 Board Work Plan. After providing comments and feedback, the Board directed the Board Policy and Planning Committee (BPPC) to review the information collected and develop a draft FY24 Board Work Plan, in collaboration with staff, for Board review and approval.

The BPPC met June 5, 2023, to provide input on the draft FY24 Board Work Plan, and the Board approved their work plan on June 24, 2023.

### **ENVIRONMENTAL JUSTICE IMPACT:**

There are no Environmental Justice impacts associated with this item.

### **ATTACHMENTS:**

Attachment 1: Board's FY24 Work Plan

**UNCLASSIFIED MANAGER:**

Candice Kwok-Smith, 408-630-3193



**Valley Water**

**FY 2023-24**

# **Board Work Plan**





## Chair's Message

At the Santa Clara Valley Water District, we manage a complex water resource system that provides clean, safe water, flood protection and stewardship of streams and creeks to about 2 million residents and businesses here in Santa Clara County.

As elected officials, we are tasked with balancing the needs of our constituents and the county-wide challenges we face including our aging infrastructure, the need for storage capacity and federal funding for both our water supply and flood protection projects. While the goals identified in our Board Governance Policies provide guidance to achieve Valley Water's mission, the Board's work plan is a roadmap for the year ahead. It also helps us provide appropriate financial resources and staff through our budget process.

Part of our annual strategic planning process, my fellow board members and I have identified specific areas that we will be monitoring closely and engaging as necessary. We believe diversifying our water supply portfolio through recycled and purified water efforts and partnerships and pursuing storage opportunities will ensure water supply during this drought and the next one. At the same time, reducing flood risks and preparing our county for emergencies will remain top of mind. This year we have added a goal to assist in the relocation of unsheltered people along Valley Water's waterways and to enhance collaboration with countywide agencies to find solutions to homelessness.

While our role is as policy makers, we will continue to engage in discussions through board committees, provide direction, and monitor progress in the focus areas. We also remain committed to supporting diversity, equity and inclusion initiatives to attract and maintain our valued workforce.

I am honored to lead my fellow board members during these challenging times and together, we'll continue to focus on providing safe, secure and equitable water for everyone in Santa Clara County.



**John L. Varela**  
Board Chair  
Santa Clara Valley Water District



## Valley Water

Founded in 1929, the Santa Clara Valley Water District (Valley Water) is the primary water resources agency for Santa Clara County, with key water supply, water quality, flood protection, and environmental stewardship responsibilities.

## Valley Water Mission

Provide Silicon Valley safe, clean water for a healthy life, environment, and economy.

## Values

1. Valley Water is entrusted to serve the public by carrying out its mission for the benefit of the community.
2. Valley Water is committed to providing excellent service to all customers.
3. All individuals are unique and important, and will be treated with fairness, dignity, and respect.
4. Valley Water takes pride in its work and is accountable to carry out its responsibilities safely with honesty and integrity.
5. Initiative, leadership, personal development, and training are vital for continuous improvement.
6. Open communication, cooperation, and teamwork are shared responsibilities and essential to the successful performance of Valley Water's work.
7. Valley Water is committed to creating an inclusive work environment, which reflects and supports the diversity of the community and enriches our perspectives.
8. Valley Water strives to support a work culture and workplace environment that attracts and retains superior employees empowered to make decisions about, and take responsibility for, how they do their jobs.
9. Valley Water is committed to its employees and supports market-based competitive compensation that is equitable and rewards accomplishment and encourages high performance.
10. Valley Water is committed to sustaining a healthy work-life balance for its employees and places a high value on all the things that provide enrichment and fulfillment, including work and career, health and fitness, family and relationships, spirituality, community service, hobbies and passions, intellectual stimulation, rest and recreation.



# Board of Directors

The Santa Clara Valley Water District Board of Directors (Board) is comprised of seven members, each elected from equally-divided districts. Specific job outputs of the Board include connecting with the community in Santa Clara County, developing policies to further Valley Water’s mission, and monitoring the performance of the organization.

The Board governs with an emphasis on outward vision, encouragement of diversity in viewpoints, strategic leadership more than administrative detail, and proactivity rather than reactivity.

The Board meets twice a month on the second and fourth Tuesday. All meetings are conducted in accordance with the Brown Act.



Left to right: Tony Estremera, District 6; Nai Hsueh, District 5; Richard P. Santos, District 3; John L. Varela, District 1; Barbara Keegan, District 2 ; Jim Beall, District 4; Rebecca Eisenberg, District 7

# Board Committees

The Board of Directors has established Board Committees to assist in performing its job. Committees meet regularly and are conducted in accordance with the Brown Act.

- Agricultural Water Advisory Committee
- Board Audit Committee
- Board Ethics and Conduct Ad Hoc Committee
- Board Policy and Planning Committee
- Capital Improvement Program (CIP) Committee
- Diversity and Inclusion Ad Hoc Committee
- Environmental and Water Resources Committee
- Environmental Creek Cleanup Committee
- Joint Recycled Water Committee with the City of Sunnyvale
- Joint Recycled Water Policy Advisory Committee with the Cities of San Jose and Santa Clara (TPAC)
- Joint Recycled Water Policy Committee with the Cities of Palo Alto, East Palo Alto, and Mountain View
- Joint Water Resources Committee with the Cities of Morgan Hill and Gilroy
- Recycled Water Committee
- San Felipe Division Reach One Committee
- Santa Clara Valley Water Commission
- Santa Clara Valley Water District Youth Commission
- Stream Planning and Operations Committee (SPOC)
- Water Conservation and Demand Management Committee
- Water Storage Exploratory Committee





# Purpose of the Board Work Plan

The purpose of the Fiscal Year 2023-2024 Board Work Plan is to inform the public, community and stakeholders about the Board's strategic focus and how it supports Valley Water's mission and long-term goals and objectives.

To perform its job, the Board adheres to established Board Governance Policies. Included in the Board Governance Policies are Ends Policies, which are long-term goals and objectives for each of Valley Water's core business areas (Water Supply, Natural Flood Protection, Water Resources Stewardship, and Climate Change Mitigation and Adaptation).

Every year, the Board conducts planning sessions to evaluate their goals, objectives, challenges, and opportunities, and identifies the specific areas requiring tactical engagement for the upcoming fiscal year. The Board outlines their focus areas and process for monitoring progress in the Board Work Plan.

Throughout the year, the Board provides input, direction, and oversight on Valley Water's budget, Capital Improvement Program, and other program plans and master plans to ensure there is funding and support to accomplish Valley Water's mission. A strategy implementation is monitored by the Board through Executive Limitation requirements, staff-developed programs and plans, assigned Board Committee work, and Board Appointed Officer performance evaluations.



# FY 2023–24 Board Work Plan Goals

 <p><b>Integrated Water Resources Management</b></p>	 <p><b>Water Supply</b></p>	 <p><b>Natural Flood Protection</b></p>
<p><b>GOAL:</b></p> <p><i>Efficiently manage water resources across business areas.</i></p>	<p><b>GOAL:</b></p> <p><i>Provide a reliable, safe, and affordable water supply for current and future generations in all communities served.</i></p>	<p><b>GOAL:</b></p> <p><i>Provide natural flood protection to reduce risk and improve health and safety.</i></p>

 <p><b>Environmental Stewardship</b></p>	 <p><b>Addressing Encampments of Unshelterd People</b></p>	 <p><b>Climate Change</b></p>	 <p><b>Business Management</b></p>
<p><b>GOAL:</b></p> <p><i>Sustain ecosystem health while managing local water resources for flood protection and water supply.</i></p>	<p><b>GOAL:</b></p> <p><i>Humanely assist in the permanent relocation of unsheltered people on Valley Water lands along waterways and at water supply and flood risk reduction facilities in order to address the human health, public safety, operational, and environmental challenges posed by encampments.</i></p>	<p><b>GOAL:</b></p> <p><i>Mitigate carbon emissions and adapt Valley Water operations to climate change Impacts.</i></p>	<p><b>GOAL:</b></p> <p><i>Promote effective management of water supply, flood protection, and environmental stewardship through responsive and socially responsible business services.</i></p>



# INTEGRATED WATER RESOURCES MANAGEMENT

**GOAL:** *Efficiently manage water resources across business areas.*

Objective 1	Protect and maintain existing assets and infrastructure and advance new projects.
Challenge/ Opportunity	<p>The maintenance of Valley Water’s infrastructure is crucial to ensuring we continue to provide safe, clean water and critical flood protection for our communities. Timely maintenance is the most cost-effective investment, whereas deferred maintenance disproportionately increases costs and may result in unplanned outages and failures. In addition, there is a list of assets that are reaching the end of their design life and will require significant recapitalization.</p>
FY24 Tactics	<ul style="list-style-type: none"><li>▪ Develop a Fuel Management Policy to guide the incorporation of wildfire planning efforts in an integrated and programmatic way.</li><li>▪ Continue a robust preventive maintenance program including monitoring asset condition and risk.</li><li>▪ Strategically plan for larger infrastructure renewal projects through Safe Clean Water Project F8 – Sustainable Creek Infrastructure for Continued Public Safety; Water Treatment Plant, Distribution System, and SCADA Master Plan Implementation Projects; Watersheds and Water Utility Operations and Maintenance and Asset Renewal Plans; and other Asset Management Plans.</li><li>▪ Advance infrastructure renewal projects identified in strategic planning efforts by initiating new Capital or Small Capital Projects, or by conducting work as part of ongoing operations projects.</li><li>▪ Expediently execute adopted Capital program and projects.</li></ul>
Monitoring	<ul style="list-style-type: none"><li>▪ Board Policy and Planning Committee</li><li>▪ Capital Improvement Program Committee</li></ul>
Related Staff Plans	<ul style="list-style-type: none"><li>▪ Safe, Clean Water and Natural Flood Protection Program</li><li>▪ Water Treatment Plant Master Plan Implementation Project</li><li>▪ Distribution System Master Plan Implementation Project</li><li>▪ SCADA Master Plan Implementation Project</li><li>▪ Watersheds and Water Utility Five-Year Operations and Maintenance and Asset Renewal Plans</li><li>▪ District-wide Asset Management Plan</li><li>▪ Watershed Asset Management Plan</li><li>▪ San Felipe Division Reach 1 FY23 Asset Condition Report</li><li>▪ Capital Improvement Program FY 2024-28 Five-Year Plan</li></ul>





## INTEGRATED WATER RESOURCES MANAGEMENT

Objective 2	Improve internal capability to negotiate and acquire regulatory permits.
Challenge/ Opportunity	Valley Water continues to face increased project costs and extended timelines due to sometimes conflicting regulatory mandates from external agencies. Valley Water continues to pursue legislative and administrative solutions to resolve regulatory and permitting issues at the federal and state levels. Efforts should focus on staff capability and expertise, and the ability to negotiate effectively and build positive relationships with key regulatory agencies.
FY24 Tactics	<ul style="list-style-type: none"><li>• Continue to pursue efforts at the state and federal level to expedite permit review.</li><li>• Keep local, state, and federal legislators up to date on critical projects in case escalation is necessary.</li><li>• Continue to foster relationships at all levels within regulatory agencies and maintain an open dialogue with environmental and other stakeholders.</li><li>• Continue to work with the Regional Water Quality Control Board (RWQCB) and the State Water Quality Control Board (SWQCB) under the terms of our Memorandum of Understanding (MOU) to ensure that they protect water supply interests consistent with their authority.</li></ul>
Monitoring	<ul style="list-style-type: none"><li>• Board Policy and Planning Committee</li><li>• Capital Improvement Program Committee</li><li>• Stream Planning and Operations Committee</li></ul>
Related Staff Plans	<ul style="list-style-type: none"><li>• One Water Plan</li></ul>







## INTEGRATED WATER RESOURCES MANAGEMENT

Objective 3	Educate the community, elected officials, and external stakeholders on our management of water resources in Santa Clara County.
<b>Challenge/ Opportunity</b>	<p>A reliable supply of clean water is necessary for the social, economic, and environmental wellbeing of Santa Clara County. Valley Water must effectively communicate with the public on our management of water resources around several key issues including: the cost of water, the public perception of costs of different types of water, how to effectively implement our water supply strategies into the future, as well as our flood protection and environmental stewardship efforts.</p>
<b>FY24 Tactics</b>	<ul style="list-style-type: none"><li>• Continue to apply strategies for effective community/stakeholder engagement and education.</li><li>• Continue to develop and refine metrics to understand and improve the return on investment (ROI) of outreach strategies.</li><li>• Continue increasing efforts to educate the public about the mix of different types of water in Valley Water’s portfolio, as well as our flood protection and environmental stewardship efforts.</li><li>• Engage directly with local government jurisdictions through strategic meetings.</li><li>• Continue engagement with cities on flood plain management, Community Rating System (CRS) program, and emergency action plans.</li><li>• Directly involve the Valley Water Board of Directors, local area partners, retailers, and the public with all water supply Master Plan development processes. Share the plan widely, and at the phase of a project where project alternatives are considered, key issues such as the cost of water, quality of water, reliability of our infrastructure, and strategies for implementing different improvement projects with varying levels of service will be explained through public meetings.</li></ul>
<b>Monitoring</b>	<ul style="list-style-type: none"><li>• Board of Directors</li><li>• Capital Improvement Program Committee</li><li>• Recycled Water Committee</li></ul>
<b>Related Staff Plans</b>	<ul style="list-style-type: none"><li>• Water Supply Master Plan</li><li>• Countywide Water Reuse Master Plan</li><li>• Water Treatment Plant Master Plan</li><li>• Distribution System Master Plan</li></ul>



## WATER SUPPLY

**GOAL:** *Provide a reliable, safe, and affordable water supply for current and future generations in all communities served.*

Objective 1	Pursue new and diversified water supply and storage opportunities.
Challenge/ Opportunity	<p>Half of Santa Clara County’s water supply is imported from outside the county. During years when there is a lot of water, Valley Water may not be able to take advantage of these supplies due to limitations in existing storage and transmission infrastructure as well as regulatory constraints. Having a diverse portfolio of storage options helps Valley Water be resilient. Therefore, Valley Water is evaluating whether diversifying its storage portfolio could help maximize our use of storage and stored water recovery under future conditions. Water storage in reservoirs also provides environmental, recreational, and incidental flood risk reduction benefits. Challenges include determining the appropriate level of participation for Valley Water in collaborative water storage projects and prioritizing projects within funding constraints. In addition, as part of the Water Supply Master Plan, Valley Water continues to pursue the “no regrets” package which addresses advanced metering infrastructure, Graywater Rebate Program expansion, leak repair incentives, New Development Model Ordinance, and stormwater capture (agricultural land recharge, stormwater recharge in San Jose and Saratoga, rain barrel rebates, and rain garden rebates).</p>
FY24 Tactics	<ul style="list-style-type: none"><li>• Explore opportunities to develop new surface and groundwater storage projects that help Valley Water meet future water supply needs and be resilient to climate change.</li><li>• Update the Water Supply Master Plan to provide information on participation levels, water supply benefits and costs of various portfolios to support water supply project and partnership decisions, including the “no regrets” package.</li><li>• Determine level of participation for projects and decisions about partnerships in accordance with the Water Supply Master Plan and water affordability.</li><li>• Pursue additional funding and partnership opportunities for the Pacheco Reservoir Expansion Project.</li><li>• Evaluate Valley Water’s continued participation in water storage projects during the MAP review process, bi-annual budget development, and other project-specific milestones.</li><li>• Explore, evaluate, and make progress on additional stormwater capture feasibility as part of the “no regrets” package.</li></ul>
Monitoring	<ul style="list-style-type: none"><li>• Water Storage Exploratory Committee</li><li>• Recycled Water Committee</li><li>• Water Conservation and Demand Management Committee</li></ul>
Related Staff Plans	<ul style="list-style-type: none"><li>• Water Supply Master Plan</li><li>• Annual Monitoring and Assessment Program (MAP) Updates</li><li>• Stormwater Resource Plans</li></ul>



## WATER SUPPLY

Objective 2	Secure existing water supplies and water supply infrastructure.
Challenge/ Opportunity	The Water Supply Master Plan’s “Ensure Sustainability” strategy includes securing existing water supplies and infrastructure. Valley Water’s local and imported water supplies are vulnerable to climate change impacts, droughts, earthquakes, and regulatory requirements that may restrict the amount of available water.
FY24 Tactics	<ul style="list-style-type: none"><li>▪ Participate in and influence decisions regarding the Delta Conveyance Project.</li><li>▪ Participate in regional water supply resilience efforts.</li><li>▪ Build and maintain effective partnerships to increase resiliency.</li><li>▪ Complete and implement infrastructure master plans and asset management plans.</li><li>▪ Partner with the California Department of Water Resources (DWR) to ensure reliability of the South Bay Aqueduct.</li></ul>
Monitoring	<ul style="list-style-type: none"><li>▪ Water Conservation and Demand Management Committee (Groundwater)</li><li>▪ Capital Improvement Program Committee (infrastructure projects)</li></ul>
Related Staff Plans	<ul style="list-style-type: none"><li>▪ Water Supply Master Plan</li><li>▪ Groundwater Management Plan</li><li>▪ Infrastructure and Asset Management Plans</li></ul>





## WATER SUPPLY

Objective 3	Lead purified water efforts with committed partners.
<b>Challenge/ Opportunity</b>	<p>Recycled and purified water is a drought resilient, locally controlled water supply important to long-term sustainability. Purified water is recycled water that has been treated further using reverse osmosis and other advanced treatment to make it fit for drinking. Valley Water is pursuing indirect potable reuse which would use this purified water to replenish our groundwater. Implementation challenges include securing wastewater supply contractual agreements with wastewater agencies, available land, stringent regulatory requirements, and implementation costs.</p>
<b>FY24 Tactics</b>	<ul style="list-style-type: none"><li>▪ Implement the first phase of the Purified Water Program, including release of a Request for Proposal (RFP) and enter into a contract for an Indirect Potable Reuse project that is implemented via a Public Private Partnership.</li><li>▪ Implement the Countywide Water Reuse Master Plan.</li><li>▪ Develop a Comprehensive Water Reuse Agreement for South County to advance water reuse and its production, distribution, and wholesaling in South County.</li><li>▪ Continue to actively be involved with the Direct Potable Reuse (DPR) guidance and ensure Valley Water is positioned to implement a DPR project in the future.</li><li>▪ Implement the Letter of Intent executed with the Cities of San José and Santa Clara to expand collaboration on the Silicon Valley Advanced Water Purification Center to develop a second potable reuse project.</li><li>▪ Continue to pursue recycled water grant funding.</li><li>▪ Continue to expand communications strategies to increase public awareness and acceptance of the Purified Water Program.</li><li>▪ Increase outreach to key stakeholders such as elected officials, chambers of commerce, environmental groups, and community organizations to increase support for the expansion of purified water for potable reuse.</li></ul>
<b>Monitoring</b>	<ul style="list-style-type: none"><li>▪ Recycled Water Committee</li></ul>
<b>Related Staff Plans</b>	<ul style="list-style-type: none"><li>▪ Water Supply Master Plan</li><li>▪ Countywide Water Reuse Master Plan</li></ul>







## WATER SUPPLY

Objective 4	Complete the Anderson Dam Seismic Retrofit Project.
<b>Challenge/ Opportunity</b>	<p>As our largest reservoir, Anderson serves not only as a critical water supply facility, but also supports Valley Water’s mission of flood protection and environmental stewardship. Given the reservoir’s critical importance to ensuring safe, clean water for our communities and to protect public safety, it is imperative that the Anderson Dam Seismic Retrofit Project (ADSRP) move forward expeditiously. This includes the reconstruction of the dam and completion of the interim risk reduction measures resulting from the February 20, 2020 directive from the Federal Energy Regulatory Commission (FERC).</p>
<b>FY24 Tactics</b>	<ul style="list-style-type: none"><li>▪ Maintain the Anderson Reservoir level in compliance with the FERC mandate.</li><li>▪ Continue the construction on the Anderson Dam Tunnel Project (ADTP).</li><li>▪ Continue the design of the ADSRP.</li><li>▪ Continue to work with appropriate regulatory agencies to advance the ADSRP.</li><li>▪ Release the Draft Environmental Impact Report for the ADSRP.</li><li>▪ Pursue necessary permits for ADSRP construction.</li><li>▪ Continue to educate and engage the public, key stakeholders, decision makers, and elected officials of the project progress and construction timeline.</li><li>▪ Coordinate ADSRP operations with the Fisheries and Aquatic Habitat Collaborative Effort (FAHCE).</li><li>▪ Compile lessons learned during the design, permitting and construction of the ADSRP to inform future capital project delivery.</li></ul>
<b>Monitoring</b>	<ul style="list-style-type: none"><li>▪ Capital Improvement Program Committee</li><li>▪ Stream Planning and Operations Committee</li></ul>
<b>Related Staff Plans</b>	<ul style="list-style-type: none"><li>▪ Safe, Clean Water and Natural Flood Protection Program</li><li>▪ Fish Habitat Restoration Plan</li><li>▪ Coyote Feasibility Study</li><li>▪ Water Supply Master Plan</li><li>▪ Capital Improvement Program FY 2024-28 Five-Year Plan</li><li>▪ Ogier Ponds Feasibility Study</li></ul>



## WATER SUPPLY

<b>Objective 5</b>	
<b>Make water conservation a California way of life in Santa Clara County.</b>	
<b>Challenge/ Opportunity</b>	<p>Droughts are a recurring feature of California’s climate and may intensify with climate change. Water conservation is an essential component in providing a reliable water supply and Valley Water has set an aggressive water conservation goal for annual water savings of 99,000 acre-feet (AF) by 2030 and 109,000 AF by 2040. As Valley Water faces challenges from climate change and drought, water conservation will continue to be amongst the most cost-effective tools for efficiently meeting current and future demands while mitigating droughts.</p>
<b>FY24 Tactics</b>	<ul style="list-style-type: none"><li>• Build on the recent drought’s momentum and continue achieving water savings from the public and encouraging conservation as a way of life through year-round educational outreach, effective water conservation programs, and media campaigns. Continue enforcement program of water waste restrictions as needed.</li><li>• Continue communication and educational outreach to promote Valley Water’s water conservation programs.</li><li>• Increase collaboration with our retailer partners to promote Valley Water’s water conservation programs.</li><li>• Implement new water conservation programs and engagement strategies identified within the Water Conservation Strategic Plan.</li><li>• Engage and support private-sector stakeholders, local, state, and federal agencies that promote water conservation.</li><li>• Develop and implement a Drought Response Plan with support and input from our retailer partners and the broader community to guide short-term behavioral changes during water shortages.</li><li>• Ensure water conservation programs support disadvantaged community members.</li><li>• Engage in opportunities and make efforts to obtain water use data from Valley Water retailers.</li><li>• Expand outreach and engagement to local businesses and corporations so they can be more actively involved in water conservation efforts.</li></ul>
<b>Monitoring</b>	<ul style="list-style-type: none"><li>• Water Conservation and Demand Management Committee</li></ul>
<b>Related Staff Plans</b>	<ul style="list-style-type: none"><li>• Water Conservation Strategic Plan</li><li>• Water Supply Master Plan</li><li>• Safe, Clean Water and Natural Flood Protection Program</li></ul>





## NATURAL FLOOD PROTECTION

**GOAL:** *Provide natural flood protection to reduce risk and improve health and safety.*

Objective 1	Protect people and property from flooding by applying a comprehensive, integrated watershed management approach that balances environmental quality, sustainability, and cost.
Challenge/ Opportunity	Valley Water is challenged to sustain ecosystem health while managing local water resources for flood protection and water supply. By using an integrated approach to planning and design, there is an opportunity to create flood protection projects with multiple benefits.
FY24 Tactics	<ul style="list-style-type: none"><li>▪ Strengthen partnerships with the county and local municipalities to improve collaboration and coordination on flood protection projects and areas that are subject to flooding.</li><li>▪ Complete One Water plans for the Guadalupe and Pajaro watersheds.</li><li>▪ Complete construction of Reaches 1-3 of the Shoreline Phase I Project and pursue funding alternatives for Reaches 4-5 to provide 100-year coastal flood risk management, ecosystem restoration, recreational opportunities, and resiliency for sea level rise.</li><li>▪ Complete construction of Phase 2A of the Upper Llagas Flood Protection Project to provide flood protection and habitat enhancement; and finalize Natural Resources Conservation Service (NRCS) funding agreement and begin construction for Phase 2B.</li><li>▪ Explore federal funding and grant opportunities to advance the Palo Alto Flood Basin Project into construction, a repair project to ensure a functional flood basin with wetland habitat.</li><li>▪ Advance the Sunnyvale East/West Channels Project into construction to provide 100-year storm water flood protection.</li><li>▪ Work with USACE to design Upper Guadalupe River Project to provide 100-year flood protection.</li><li>▪ Continue to partner with the San Francisquito Joint Powers Authority (JPA) on the San Francisquito Creek upstream 101 Project.</li><li>▪ Continue design and construction of the Coyote Creek Flood Mitigation and Flood Protection Projects.</li><li>▪ Begin to evaluate and prioritize addressing areas in the county known to flood on a regular basis.</li></ul>
Monitoring	<ul style="list-style-type: none"><li>▪ Capital Improvement Program Committee</li><li>▪ Board Policy and Planning Committee</li><li>▪ Safe Clean Water and Natural Flood Protection Program Independent Monitoring Committee</li></ul>
Related Staff Plans	<ul style="list-style-type: none"><li>▪ One Water Plan</li><li>▪ Safe, Clean Water and Natural Flood Protection Program</li></ul>



## NATURAL FLOOD PROTECTION

Objective 2	Provide flood protection equitably in all regions of the County, prioritizing disadvantaged communities.
Challenge/ Opportunity	As Valley Water continues to advance flood protection projects, the Board has an opportunity to strengthen relationships and improve coordination with conservation and environmental justice groups, as well as other local jurisdictions, with a specific focus on ensuring the voices of disadvantaged communities are equitably represented.
FY24 Tactics	<ul style="list-style-type: none"> <li>• Advance One Water Integrated Water Resources Master Plan through diverse community-wide stakeholder engagement for the Guadalupe and Upper Pajaro watersheds.</li> <li>• Continue progress on flood protection capital projects consistent with Valley Water's commitment to the Safe, Clean Water Program and equitability in all regions.</li> <li>• Plan flood risk reduction projects to provide a minimum level of protection countywide.</li> </ul>
Monitoring	<ul style="list-style-type: none"> <li>• Capital Improvement Program Committee</li> <li>• Board Policy and Planning Committee</li> </ul>
Related Staff Plans	<ul style="list-style-type: none"> <li>• One Water Plan</li> <li>• Safe, Clean Water and Natural Flood Protection Program</li> </ul>



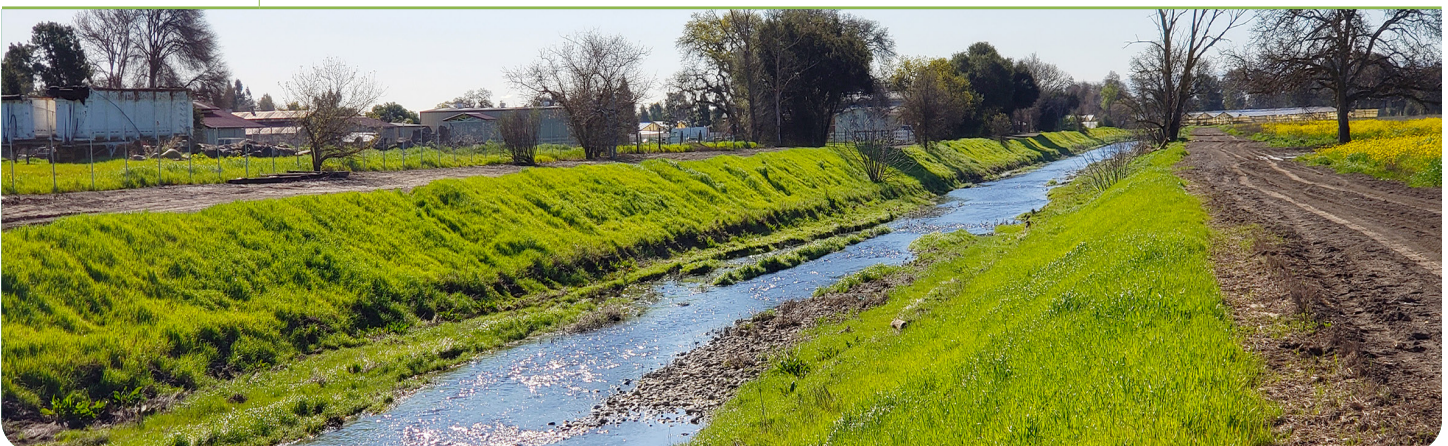




## ENVIRONMENTAL STEWARDSHIP

**GOAL:** *Sustain ecosystem health while managing local water resources for flood protection and water supply.*

<b>Objective 1</b>	<b>Plan and design projects with multiple benefits, including protecting ecosystem functions, enhancing habitat, and improving connectivity, equitably in all regions of the County.</b>
<b>Challenge/ Opportunity</b>	Valley Water’s projects and programs require integrated planning to ensure capital improvements, operations, and maintenance activities are balanced with environmental stewardship goals. Valley Water strives to protect and restore habitats to support native species throughout Santa Clara County.
<b>FY24 Tactics</b>	<ul style="list-style-type: none"> <li>▪ Continue to develop an integrated water resource plan for each watershed, including appropriate metrics to monitor Valley Water’s impacts on and benefit to the environment.</li> <li>▪ Complete Greenhouse Gas Reduction Plan as part of the Climate Change Action Plan implementation.</li> <li>▪ Make significant progress on the grant-funded planning study for the San Tomas Aquino Calabazas Creek Realignment Project (which includes Pond A4).</li> <li>▪ Complete construction of the Bolsa Creek Project by December 2023.</li> <li>▪ Initiate access improvements and beneficial reuse of sediment at Pond A4.</li> <li>▪ Continue to develop and build on partnerships with environmental organizations and tribal communities when developing projects.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>▪ Board Policy and Planning Committee</li> <li>▪ Capital Improvement Program Committee</li> </ul>
<b>Related Staff Plans</b>	<ul style="list-style-type: none"> <li>▪ One Water Plan</li> <li>▪ Climate Change Action Plan</li> </ul>





## ENVIRONMENTAL STEWARDSHIP

Objective 2	Protect creeks, bay, and other aquatic ecosystems from threats of pollution and degradation.
Challenge/ Opportunity	<p>Valley Water continues to coordinate with local cities and agencies to improve the health of our local waterways, including pollution prevention and addressing threats to water quality. Opportunities exist to further collaborate with the County, cities, and social services agencies on encampment management efforts and to develop long-term solutions for unhoused individuals to keep our creeks clean.</p>
FY24 Tactics	<ul style="list-style-type: none"><li>• Continue efforts to protect the ecosystem and water quality of our water bodies and the integrity of our infrastructure. Such efforts include preventing stormwater pollution, increased implementation of green stormwater infrastructure, addressing mercury pollution, encampment clean ups, and other efforts under Safe Clean Water B and F priorities.</li><li>• Continue partnership with City of San José to continue trash rafts removals.</li><li>• Continue partnerships and investments on a regional scale such as the South Bay Salt Pond Restoration and Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP).</li><li>• Initiate Clean Camps Clean Creeks and portable toilet facility programs.</li><li>• Finalize Memorandum of Agreement (MOA) with City of San José to manage encampments within stormwater Municipal Regional Permit (MRP) discharge sites on Coyote Creek.</li><li>• Expand opportunities for volunteers to support cleanup efforts and events.</li><li>• Support legislative efforts to eliminate or reduce waste entering waterways.</li></ul>
Monitoring	<ul style="list-style-type: none"><li>• Environmental Creek Cleanup Committee</li></ul>
Related Staff Plans	<ul style="list-style-type: none"><li>• One Water Plan</li><li>• Santa Clara Valley Urban Runoff Pollution Prevention Program</li><li>• Stormwater Resource Plan</li><li>• Safe, Clean Water and Natural Flood Protection Program</li></ul>





## ENVIRONMENTAL STEWARDSHIP

Objective 3	Complete and implement the Fisheries and Aquatic Habitat Collaborative Effort (FAHCE) agreement.
Challenge/ Opportunity	<p>For over 25 years, Valley Water has been working to resolve compliance challenges and disagreements surrounding fish, wildlife, water quality, and other beneficial uses in the Coyote Creek, Guadalupe River, and Stevens Creek watershed areas. Challenges to implementing the FACHE agreement include completing the environmental review process, obtaining federal and state permits from multiple regulatory agencies, refining and processing water rights change petitions, the technical complexity of the fisheries impacts analysis, coordination with other ongoing related projects, and managing stakeholder expectations.</p>
FY24 Tactics	<ul style="list-style-type: none"><li>▪ Prioritize the implementation of the FAHCE agreement and related efforts as soon as possible.</li><li>▪ Finalize the June 2021 Guadalupe River and Stevens Creek Environmental Impact Report (EIR).</li><li>▪ Advance 10 water right change petitions for securing water right orders.</li><li>▪ Continue to implement the FAHCE Plus pilot flow program in Guadalupe and Stevens Creek.</li><li>▪ Continue to implement feasibility studies, monitoring activities, and planning for various fish passage and habitat improvements as identified in existing stakeholder agreement.</li><li>▪ Continue fisheries monitoring program.</li><li>▪ Continue to support an adaptive management program that encompasses all three creeks.</li><li>▪ Continue coordination with the ADSRP project.</li></ul>
Monitoring	<ul style="list-style-type: none"><li>▪ Stream Planning and Operations Committee</li></ul>
Related Staff Plans	<ul style="list-style-type: none"><li>▪ Fish Habitat Restoration Plan for Coyote Creek, Guadalupe River, and Stevens Creek Watersheds</li><li>▪ Seismic Retrofit Programs for Dam Safety</li><li>▪ Aquatic habitat restoration plans/feasibility studies/site-specific improvements affecting all three watersheds (e.g., Countywide Large Woody Debris Program)</li><li>▪ Collaborative agreements for in-stream habitat improvements (e.g., Singleton Fish Barrier Removal with City of San José, Ogier Pond Feasibility Study in collaboration with the County)</li><li>▪ One Water Plan</li></ul>





## ADDRESSING ENCAMPMENTS OF UNSHELTERED PEOPLE

**GOAL:** *Humanely assist in the permanent relocation of unsheltered people on Valley Water lands along waterways and at water supply and flood risk reduction facilities in order to address the human health, public safety, operational, and environmental challenges posed by encampments.*

<b>Objective 1</b>	<b>Collaborate with agencies and other service providers to address the challenges posed by encampments and their impacts to waterways, water supply, and flood risk reduction facilities, including supporting the provision of outreach, counseling, transitional or affordable housing, or other services by these agencies and service providers.</b>
<b>Challenge/ Opportunity</b>	<p>The number of unsheltered individuals living in Santa Clara County has increased by 36 percent in the last five years, rising from 7,394 in 2017 to 10,028 in 2022, according to the Homeless Point-in-Time Count and Survey. In 2022, 77% of the unhoused population in the county were unsheltered, and Valley Water estimates that over 2,300 have taken refuge on Valley Water's property or land easements. The waterways in Santa Clara County are flashy, meaning seemingly small creeks quickly can turn into raging torrents, surprising unsheltered people often hidden in riparian vegetation and potentially resulting in drownings or serious injury. These riparian areas include threatened and endangered species, sensitive constructed and natural habitats, and public infrastructure that is critical to water supply, groundwater recharge, and flood risk reduction activities.</p>
<b>FY24 Tactics</b>	<ul style="list-style-type: none"><li>• Coordinate with the County, cities, and other service providers in a regional approach to safely relocate unsheltered individuals living along waterways and at water supply and flood risk reduction facilities.</li><li>• Initiate Clean Camps Clean Creeks and portable toilet facility programs.</li><li>• Enhance Valley Water's participation in countywide collaboration efforts to address challenges associated with homelessness.</li><li>• Implement MOA with Santa Clara County to provide outreach services to unsheltered individuals living within waterways and at water supply and flood risk reduction facilities countywide.</li><li>• Implement MOA with City of San José to provide comprehensive services to unsheltered individuals living within the high-risk flood zones of the Coyote Creek project footprint.</li><li>• Develop a framework from internal working group recommendations on both short- and long-term strategies to address the challenges posed by encampments of unsheltered people living on Valley Water lands along waterways and at water supply and flood risk reduction facilities.</li><li>• Work to develop a method to track encampments located on Valley Water lands along waterways and at water supply and flood risk reduction facilities to measure effectiveness of collaborative efforts.</li></ul>
<b>Monitoring</b>	<ul style="list-style-type: none"><li>• Environmental Creek Cleanup Committee</li></ul>
<b>Related Staff Plans</b>	





## ADDRESSING ENCAMPMENTS OF UNSHELTERED PEOPLE

<b>Objective 2</b>	<b>Collaborate with the County and municipal partners to secure the safety of unsheltered people living on Valley Water lands along waterways and at water supply and flood risk reduction facilities, as well as secure the safety of residential neighbors and Valley Water staff.</b>
<b>Challenge/ Opportunity</b>	<p>There are a number of growing safety concerns and challenges for the large number of unsheltered individuals and families living in encampments along waterways and water resource facilities with many of these located in high-risk flood areas and vulnerable to the perils of rushing stormwaters in creeks, which can result in serious injury or fatalities. There are additional challenges, concerns and risks for Valley Water staff who work to manage encampment generated trash and debris as well as community members who reside in the proximity of existing encampments. Valley Water staff managing cleanup operations and maintenance of and around encampments are frequently exposed to weapons, biowaste, and dangerous animals (oftentimes off-leash dogs), and at times aggressive and intimidating behavior from unhoused individuals. Staff require support from jurisdictional police departments (PD) to provide a safe environment when carrying out cleanup and maintenance operations, which increases operational costs for added security and places limitations on the operation schedule contingent on PD availability, potentially causing delays in important services (such as facility inspections, vegetation management, flood protection, and biological surveys). Lastly, residential neighbors have a similar level of exposure to some of these dangers, including wildfire hazards that can occur from campfires, solar panels and use of propane tanks in vegetated areas.</p>
<b>FY24 Tactics</b>	<ul style="list-style-type: none"><li>▪ Coordinate with the County and municipal partners, in a regional approach to identify lands to provide transitional or affordable housing or other services, allowing for unsheltered individuals and families to be safely relocated from flood risk areas, and reducing challenges for Valley Water staff performing operations and maintenance along waterways and at water supply and flood risk reduction facilities.</li><li>▪ Continue working with the County, municipal partners and police departments to support Valley Water staff safety, as well as the public safety of unsheltered individuals and residential neighbors when conducting encampment cleanup operations and maintenance activities.</li><li>▪ Continue to perform weed abatement and fuel reduction work around encampments to reduce wildfire risks.</li><li>▪ Implement agreements with the County and municipal partners to provide outreach or other necessary services to unsheltered individuals living along waterways and at water supply and flood risk reduction facilities countywide.</li></ul>
<b>Monitoring</b>	<ul style="list-style-type: none"><li>▪ Environmental Creek Cleanup Committee</li></ul>
<b>Related Staff Plans</b>	



# CLIMATE CHANGE

**GOAL:** *Mitigate carbon emissions and adapt Valley Water operations to climate change impacts.*

Objective 1	Address future impacts of climate change to Valley Water's mission and operations.
Challenge/ Opportunity	Valley Water's ability to fulfill its mission will be challenged in the future by warmer temperatures, changing precipitation patterns, reduced snowpack, and rising sea levels. Valley Water has been working on greenhouse reduction efforts since 2008 and many adaptation actions over the past decade; however, with adoption of the Climate Change Action Plan there is an opportunity for greater impact.
FY24 Tactics	<ul style="list-style-type: none"> <li>• Complete Greenhouse Gas Reduction Plan: Identify specific and measurable actions to reduce emissions and approve long-term emissions reduction goals ensuring that all Valley Water activities are considered.</li> <li>• Continue to monitor progress on adaptation actions as identified in the Climate Change Action Plan and support high priority projects such as the South San Francisco Bay Shoreline.</li> <li>• Ensure incorporation of environmental justice (EJ) considerations into planning and processes to support mitigation of carbon emissions and climate change impacts.</li> <li>• Explore opportunities for carbon sequestration in all our programs and projects.</li> </ul>
Monitoring	<ul style="list-style-type: none"> <li>• Board Policy and Planning Committee</li> </ul>
Related Staff Plans	<ul style="list-style-type: none"> <li>• Climate Change Action Plan</li> </ul>

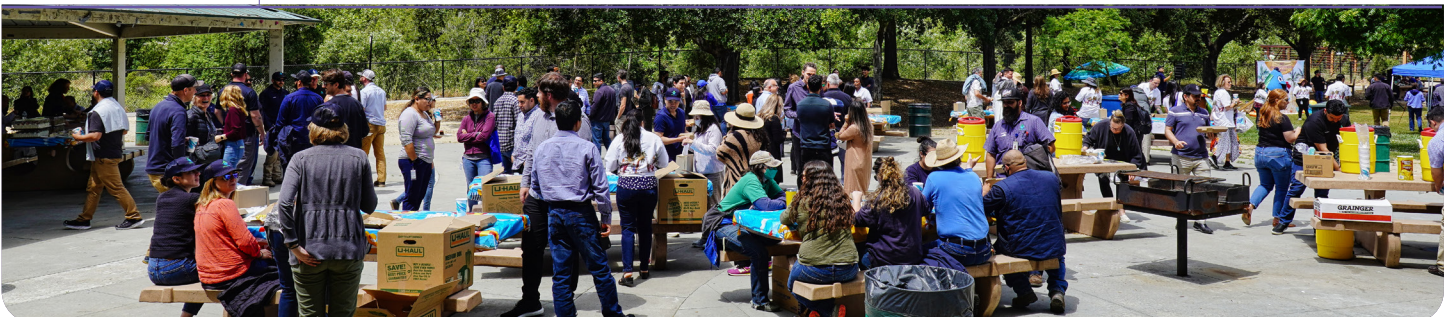




## BUSINESS MANAGEMENT

**GOAL:** *Promote effective management of water supply, flood protection, and environmental stewardship through responsive and socially responsible business services.*

<b>Objective 1</b>	<b>Incorporate racial equity, diversity and inclusion throughout Valley Water as a core value.</b>
<b>Challenge/ Opportunity</b>	Valley Water is committed to creating and maintaining a diverse, inclusive, and equitable work environment that is devoid of discrimination and harassment and provides equal opportunity employment and advancement. Valley Water aims to implement the same values in the community through its flood protection, water supply, and environmental stewardship projects and has an opportunity to serve as a leader for racial equity, diversity, and inclusion throughout the state.
<b>FY24 Tactics</b>	<ul style="list-style-type: none"> <li>▪ Continue to monitor implementation of a Diversity, Equity and Inclusion Master Plan that institutes best practices to address internal and external disparities and builds an organizational culture that is consistent with the Board's Resolution addressing racial equity, diversity, and inclusion.</li> <li>▪ Remain committed to environmental justice, equity, and the fair treatment and meaningful engagement of all people regardless of race, color, sex, gender, gender identity, gender expression, sexual orientation, disability status (mental and physical), medical condition, genetic information, ancestry, national origin, immigration status, age, marital status, tribe, culture, income, religion, military status, or English language proficiency, with respect to the planning, projects, policies, services, and operations of Valley Water.</li> <li>▪ Continue to collaborate with external stakeholders that are engaged in developing diversity, equity, and inclusion initiatives and actively participate in and provide leadership for diversity, equity, and inclusion efforts throughout the state.</li> <li>▪ Continue to advance and foster mutually beneficial partnerships with regional tribal communities.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>▪ Diversity &amp; Inclusion Ad Hoc Committee</li> </ul>
<b>Related Staff Plans</b>	<ul style="list-style-type: none"> <li>▪ Racial Equity, Diversity &amp; Inclusion Master Plan</li> </ul>







## BUSINESS MANAGEMENT

Objective 2	Maintain appropriate staffing levels and expertise while prioritizing the safety of our staff.
Challenge/ Opportunity	<p>The Board recognizes that Valley Water’s workforce is the critical component to providing clean, safe drinking water, effective flood protection, and environmental stewardship. The Board therefore remains committed to supporting the recruitment of capable employees with knowledge and subject matter expertise, investing in staff training to meet changing skills and capacity needs, developing the necessary policies and guidance that strengthen employee safety, and establishing Valley Water as an employer of choice.</p>
FY24 Tactics	<ul style="list-style-type: none"><li>• Implement an automated forecasting tool to develop and finalize a long-term staffing strategy that aligns with future capital and operational needs.</li><li>• Continue to implement initiatives that will expand hiring outreach to individuals that are disabled or have health conditions/impairments, military veterans, and formerly incarcerated individuals, with an emphasis on hiring from the local region.</li><li>• Develop next generation and career pathways program to provide internal and external development for professional growth.</li><li>• Advance the development of a skilled trades apprenticeship program.</li><li>• Maximize the safety of staff working in creeks, encampments, and Valley Water facilities, and continue to promote health &amp; safety guidance to protect staff from public health emergencies and environmental impacts.</li></ul>
Monitoring	<ul style="list-style-type: none"><li>• Environmental Creek Cleanup Committee</li><li>• Diversity &amp; Inclusion Ad Hoc Committee</li><li>• Financial Sustainability Working Group</li></ul>
Related Staff Plans	





## BUSINESS MANAGEMENT

Objective 3	Provide affordable and cost-effective level of services.
<b>Challenge/ Opportunity</b>	<p>The Board understands its responsibility to regularly evaluate and monitor Valley Water's financial status to ensure the level of services provided are reasonable and cost effective. As such, driving continual improvement efforts are key to delivering affordable and effective services while controlling expectations regarding what Valley Water can achieve and what it can afford to do. In addition, the affordability of water continues to be a major issue faced by communities across the nation, particularly disadvantaged communities. The Board has an opportunity to raise issues around water affordability at local and statewide levels and advocate for changes that benefit disadvantaged communities.</p>
<b>FY24 Tactics</b>	<ul style="list-style-type: none"> <li>▪ Complete 3-4 Board-initiated or management-initiated performance audits, or other performance improvement efforts, benchmarking studies, or best practice implementations.</li> <li>▪ Establish Valley Water as a statewide leader in conversations around water affordability.</li> <li>▪ Implement Biennial Budget for FY24.</li> <li>▪ Continue to seek and obtain grants and funding opportunities from federal, state and other sources.</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>▪ Board Audit Committee</li> <li>▪ Financial Sustainability Working Group</li> </ul>
<b>Related Staff Plans</b>	<ul style="list-style-type: none"> <li>▪ Operating and Capital Budget</li> <li>▪ Board and Management Audit Reports</li> </ul>



# Appendix A

## Board Governance Policies/Ends Policies

The Board has adopted **Board Governance Policies** which describe how the board conducts its business, what they have directed the Board Appointed Officers (BAO) to accomplish, and constraints on the BAOs that establish prudent and ethical boundaries within which all activity and decisions must take place.

Ends Policies, also referred to as **Long Term Goals and Objectives**, provide direction to the BAOs to accomplish Valley Water's mission.

A full list of the Board Governance Policies can be found here:

<https://www.valleywater.org/how-we-operate/board-governance-policies>

### Ends Policy E-1: Mission and General Principles

**In implementing Board directions, staff will be guided by the following general principles:**

- 1.1. An integrated, socially equitable, and balanced approach in managing a sustainable water supply, effective natural flood protection, and healthy watersheds is essential to the future of all communities served.
- 1.2. Effective public engagement by Valley Water is achieved through transparent, open communication that informs and generates participation among all communities, including disadvantaged communities, communities of color, and communities with limited English proficiency, as well as other key stakeholders.
- 1.3. Collaboration with government, academic, private, non-governmental, and non-profit organizations, as well as diverse and disadvantaged communities is integral to accomplishing the Valley Water mission.
- 1.4. A net positive impact on the environment and providing benefits equitably across all communities is required in order to accomplish the Valley Water mission.
- 1.5. Recognize that Valley Water operations and services are critical to the economic vitality of Silicon Valley, ensuring that economic benefits are equitable for all communities that we serve.
- 1.6. As standard practice, all work products shall be visually pleasing, sustainable, cost-effective, culturally appropriate, equitable across all communities, and reflect the characteristics of the surrounding urban setting and natural habitat using appropriate materials, colors, shapes, art works, vegetation, and surface treatments. This includes the naming of facilities in a manner that is respectful of all diverse communities.
- 1.7. Valley Water is committed to environmental justice and shall provide for the fair treatment and meaningful engagement of all people regardless of race, color, gender identity, disability status, national origin, tribe, culture, income, immigration status, or English language proficiency, with respect to the planning, projects, policies, services, and operations of Valley Water. Environmental Justice is achieved when all people receive:
  - equitable consideration in the planning and execution of flood protection, water supply, safe drinking water, water resources stewardship projects, and protection from environmental and health hazards, and
  - equal access to Valley Water's decision-making process.

### Ends Policy E-2: Water Supply Services

**Valley Water provides a reliable, safe, and affordable water supply for current and future generations in all communities served.**

#### GOAL

- 2.1. Meet 100 percent of annual water demand during non-drought years and at least 80 percent of demand in drought years.

#### GOAL

- 2.2. Protect and sustain the county's existing, diverse water supplies.



**Objectives**

- 2.2.1. Manage groundwater to ensure sustainable supplies and avoid land subsidence.
- 2.2.2. Aggressively protect groundwater from the threat of contamination.
- 2.2.3. Protect imported water supplies and associated contracts and partnerships.
- 2.2.4. Protect and manage local surface water supplies and associated water rights.
- 2.2.5. Deliver reliable, high quality drinking water from water treatment plants.

**GOAL**

- 2.3. Protect and maintain existing water infrastructure.

**Objectives**

- 2.3.1. Plan for infrastructure maintenance and replacement to reduce risk of failure.
- 2.3.2. Prioritize funding for maintenance and replacement of existing water infrastructure over investments in new infrastructure.
- 2.3.3. Prepare for and respond effectively to water utility emergencies.

**GOAL**

- 2.4. Increase regional self-reliance through water conservation and reuse.

**Objectives**

- 2.4.1. Maximize utilization of all demand management tools.
- 2.4.2. Incentivize water use efficiency and water conservation.
- 2.4.3. Promote, protect and expand potable and non-potable water reuse.
- 2.4.4. Promote stormwater capture and reuse.

**GOAL**

- 2.5. Manage water resources using an integrated, science-based approach.

**Objectives**

- 2.5.1. Plan for future water supply needs.
- 2.5.2. Promote efficient and reliable operation of water supply systems.
- 2.5.3. Promote water supply projects with multiple benefits, including environmental stewardship and flood protection.
- 2.5.4. Invest in and rely on science to support planning and decision-making.
- 2.5.5. Build and maintain effective partnerships to achieve water supply goals.

**GOAL**

- 2.6. Promote access to equitable and affordable water supplies.

**Objectives**

- 2.6.1. Promote equal access to clean, safe, and affordable water supply across all communities served.
- 2.6.2. Maintain affordable water rates through cost-effective water supply investments and management.
- 2.6.3. Continue customer assistance and incentive programs.

**Ends Policy E-3: Natural Flood Protection**

**Natural flood protection is provided to reduce risk and improve health and safety for residents, businesses, and visitors, now and into the future.**

**GOAL**

- 3.1. Maintain flood protection facilities to design levels of protection.

**Objectives**

- 3.1.1. Prioritize maintenance of existing facilities over construction of new capital projects.
- 3.1.2. Inspect and maintain facilities on a regular basis.
- 3.1.3. Perform maintenance using maintenance guidelines updated on a regular basis.

**GOAL**

- 3.2. Assist people, businesses, schools, and communities to prepare for, respond to, and recover from flooding through equitable and effective engagement.

**Objectives**

- 3.2.1. Develop, maintain, and communicate emergency action plans.
- 3.2.2. Develop, maintain, and communicate flood information to the community.

- 3.2.3. Provide expertise in flood forecasting and flood warning systems to municipalities.
- 3.2.4. Provide expertise to encourage public agencies to reduce flood risk and protect floodplain benefits.

#### **GOAL**

- 3.3. Increase the health and safety of residents countywide by reducing community flood risk.

##### **Objectives**

- 3.3.1. Provide equitable, timely, and achievable flood protection for health and safety.
- 3.3.2. Protect people and property from flooding by applying a comprehensive, integrated watershed management approach that balances environmental quality, sustainability, and cost.

## **Ends Policy E-4: Water Resources Stewardship**

### **Water resources stewardship protects and enhances ecosystem health.**

#### **GOAL**

- 4.1. Use a science-based, inclusive approach to protect Santa Clara County's watersheds and aquatic ecosystems for current and future generations.

##### **Objectives**

- 4.1.1. Develop and share data to support resilient ecosystems and healthy populations of native species.
- 4.1.2. Monitor stream, reservoir, and Bay ecosystem health.
- 4.1.3. Use data to prioritize and equitably implement actions to reduce pollution, restore endangered species habitat, and enhance ecosystem function.

#### **GOAL**

- 4.2. Sustain ecosystem health while managing local water resources for flood protection and water supply.

##### **Objectives**

- 4.2.1. Plan and design projects with multiple benefits, including protecting ecosystem functions, enhancing habitat, and improving connectivity, equitably in all regions of the county.
- 4.2.2. Operate Valley Water facilities to balance water supply, flood protection, and ecosystem sustainability.

#### **GOAL**

- 4.3. Encourage inclusive, sustainable management of water resources in the Bay-Delta and its watersheds to protect imported water supply.

##### **Objectives**

- 4.3.1. Meet future water supply demand through diverse and coordinated water supply planning.
- 4.3.2. Promote holistic ecosystem management through science-based decision-making.
- 4.3.3. Actively engage in the protection of source water quality through collaboration and funding.

#### **GOAL**

- 4.4. Prevent and address pollution of local streams, reservoirs, and the Bay, equitably across all communities. Protect waterbodies from pollution and degradation.

##### **Objectives**

- 4.4.1. Encourage stormwater capture, treatment, and reuse.
- 4.4.2. Prepare and respond to spills and dumping that threaten local waterways.
- 4.4.3. Collaborate with agencies and nonprofits to address homelessness and its impacts to Santa Clara County Waterways.

#### **GOAL**

- 4.5. Engage the community to promote watershed stewardship by providing meaningful engagement in Valley Water programs for all people regardless of race, color, gender identity, disability status, national origin, tribe, culture, income, immigration status, or English language proficiency.

##### **Objectives**

- 4.5.1. Provide appropriate and equal public access to Valley Water's streamside and watershed lands.
- 4.5.2. Engage and educate the community in stream and watershed protection.
- 4.5.3. Build partnerships to protect and enhance watersheds and aquatic ecosystems.

## **Ends Policy E-5: Climate Change Mitigation and Adaptation**

**Valley Water is carbon neutral and provides equitable, climate-resilient water supply, flood protection, and water resource stewardship to all communities in Santa Clara County. This will be accomplished through the implementation of the Climate Change Action Plan.**

### **GOAL**

5.1. Minimize greenhouse gas emissions from Valley Water's operations.

#### **Objectives**

5.1.1. Expand the use of clean technology in vehicles, equipment, and buildings, and develop carbon-efficient construction and service delivery practices.

5.1.2. Optimize energy use and expand renewable energy portfolio.

5.1.3. Incentivize low carbon practices, projects, and efforts by employees, contractors, and partners.

### **GOAL**

5.2. Adapt Valley Water's assets and operations to reduce climate change impacts.

#### **Objectives**

5.2.1. Improve the resiliency of Santa Clara County's water supply to drought and other climate change impacts.

5.2.2. Provide equitable protection from sea level rise and flooding, prioritizing disadvantaged communities.

5.2.3. Improve ecosystem resiliency through water resources stewardship.

5.2.4. Prepare for climate-related emergencies and provide equal access to information and services, particularly to disadvantaged communities.

# Appendix B

## Staff Program Plans and Master Plans

Program plans and master plans are developed by staff to achieve the Board's long-term goals and objectives in relation to Valley Water's mission and overall business management.

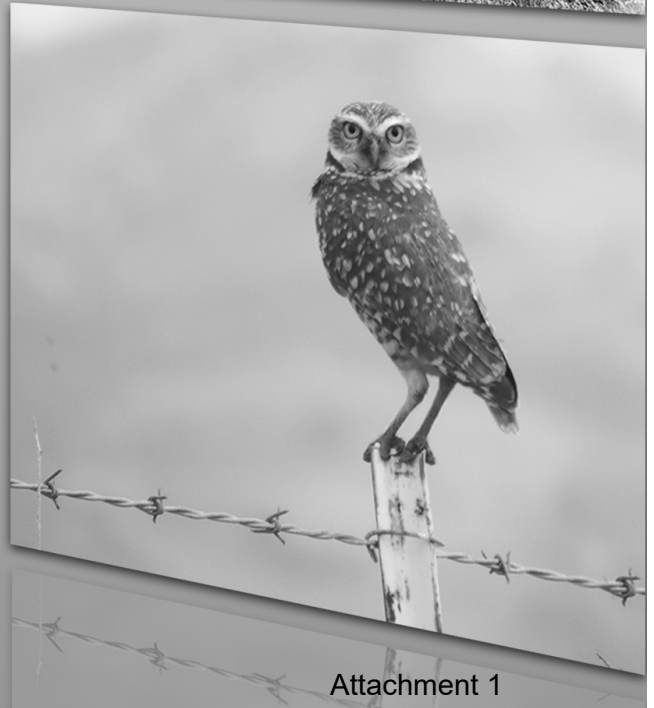
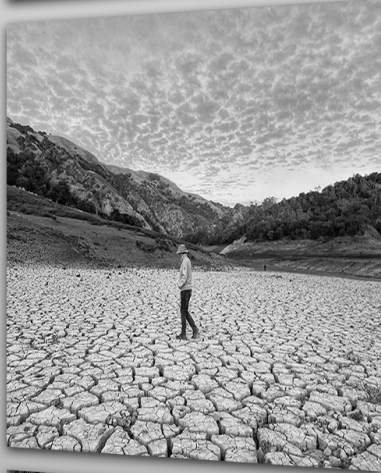
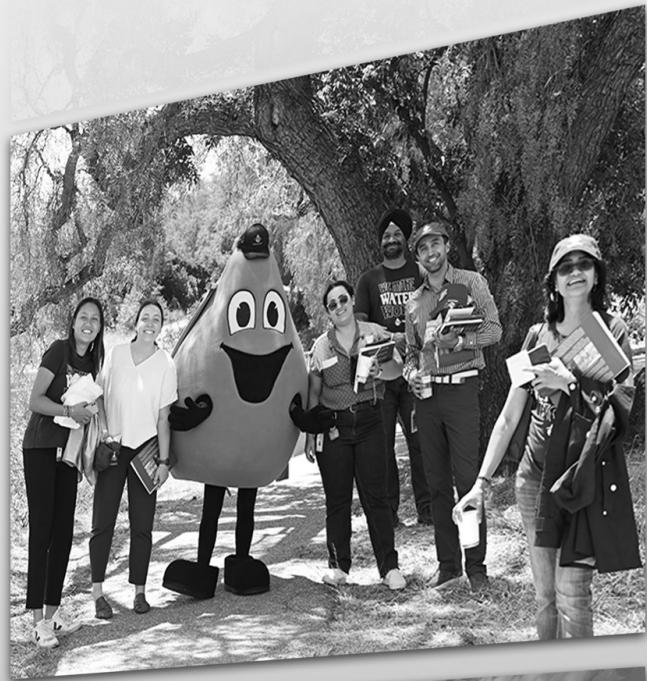
Below is a list of program and master plans that have been referenced in the Board Work Plan. Other plans not listed below can be obtained by contacting the Office of the Clerk of the Board at **(408) 630-2277** or **[clerkoftheboard@valleywater.org](mailto:clerkoftheboard@valleywater.org)**.

- Board Audit Reports  
<https://www.valleywater.org/board-audit-committee-audit-reports>
- Capital Improvement Program  
<https://www.valleywater.org/how-we-operate/five-year-capital-improvement-program>
- Climate Change Action Plan  
<https://www.valleywater.org/your-water/water-supply-planning/climate-change-action-plan>
- Countywide Water Reuse Master Plan  
<https://www.valleywater.org/your-water/recycled-and-purified-water>
- Groundwater Management Plan  
<https://www.valleywater.org/your-water/where-your-water-comes/groundwater/sustainable>
- Ogier Ponds Feasibility Study  
<https://www.valleywater.org/project-updates/ogier-ponds-coyote-creek-separation-project>
- One Water Plan  
<https://www.valleywater.org/project-updates/one-water-plan>
- Operating and Capital Budget  
<https://www.valleywater.org/how-we-operate/financebudget>
- Racial Equity, Diversity and Inclusion Master Plan  
<https://www.valleywater.org/how-we-operate/about-valley-water/office-racial-equity-diversity-inclusion>
- Safe, Clean Water and Natural Flood Protection Program  
<https://www.valleywater.org/safe-clean-water-and-natural-flood-protection-program>
- Santa Clara Valley Urban Runoff Pollution Prevention Program  
<https://scvurppp.org/>
- Stormwater Resource Plan  
<https://scvurppp.org/swrp/>
- Water Conservation Strategic Plan  
<https://www.valleywater.org/droughtsaving-water/studies-and-reports>
- Water Supply Master Plan  
<https://www.valleywater.org/your-water/water-supply-planning/water-supply-master-plan>
- Water Utility Infrastructure Master Plan  
<https://www.valleywater.org/project-updates/water-utility-infrastructure-master-plan-implementation-projects>

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# Valley Water

Clean Water • Healthy Environment • Flood Protection

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