SAN GORGONIO PASS WATER AGENCY
1210 Beaumont Avenue, Beaumont, CA
Board of Directors Engineering Workshop
Agenda
February 8, 2016 at 4:00 p.m.

1. **Call to Order, Flag Salute and Roll Call**

2. **Public Comment:**
   Members of the public may address the Board at this time concerning items relating to any matter within the Agency's jurisdiction. To comment on specific agenda items, please complete a speaker's request form and hand it to the board secretary.

3. **Overview of California Water Fix**

4. **Discussion of Yucaipa Basin Groundwater Studies* (Page 2)**

5. **Discussion of Bunker Hill Conjunctive Use Project Memorandum of Understanding (MOU)* (Page 7)**

6. **Discussion of Proposed USGS Work Plan* (Page 21)**

7. **Announcements**
   A. Office closed February 15, 2016 in observance of Presidents' Day.
   B. Regular Board Meeting, **Tuesday**, February 16, 2016 at 7:00 p.m.
   C. Finance and Budget Workshop, February 22, 2016 at 4:00 p.m.
   D. San Gorgonio Pass Regional Water Alliance, February 24, 2016
      1. Technical Committee at 4:30 p.m. – Banning City Hall Conference Room
      2. Regular Board Meeting at 6:00 p.m. – Banning City Council Chambers

8. **Adjournment**

***Information included in Agenda Packet**

(1) Materials related to an item on this Agenda submitted to the Board of Directors after distribution of the agenda packet are available for Public inspection in the Agency's office at 1210 Beaumont Avenue, Beaumont during normal business hours. (2) Pursuant to Government Code section 54957.5, non-exempt public records that relate to open session agenda items and are distributed to a majority of the Board less than seventy-two (72) hours prior to the meeting will be available for public inspection at the Agency's office, located at 1210 Beaumont Avenue, Beaumont, California 92223, during regular business hours. When practical, these public records will also be made available on the Agency's Internet Web site, accessible at http://www.sgpwa.com." (3) Any person with a disability who requires accommodation in order to participate in this meeting should telephone the Agency (951 845-2577) at least 48 hours prior to the meeting in order to make a request for a disability-related modification or accommodation.

SAN BERNARDINO Valley MUNICIPAL WATER DISTRICT

DATE: February 9, 2016

TO: Board of Directors' Workshop

FROM: Aaron Jones, Assistant Engineer
Bob Tincher, Manager of Water Resources

SUBJECT: Consider the Development of a Field Recharge Test Work Plan for Locations within Yucaipa Basin Area

This is the next step in the process that Valley District and its partners have been working through to gain a better understanding of the Yucaipa Basin in order to improve basin management and to possibly use the Yucaipa Basin for regional conjunctive use. The project involves developing a recharge test work plan in areas identified as being suitable for recharge based upon soil borings conducted under the previous step in this process, the *Recharge Investigation of the Yucaipa Groundwater Basin* project (December 2014). Once the work plan is developed for the sites selected by the partners the pilot recharge test can be conducted. Upon completion of the pilot recharge test Valley District and its partners will have a recharge rate (ft/day) that will enable the sizing of future recharge basins and will also be useful for the groundwater flow model that is being developed by the United States Geological Survey (USGS).

Due to irregularities proposals were solicited from four (4) pre-selected consultants which included MWH, AECOM, Stetson Engineers, and TODD Groundwater. Out of the four proposal received the review team elected to interview MWH, Stetson Engineers and TODD Groundwater. The recommendation from staff is to consider hiring TODD Groundwater for a price of $36,909 to develop a field recharge test work plan for various locations within the Yucaipa Basin area.

As we move through this process, it appears that the primary purpose for recharge in Yucaipa Basin may be for regional, or even watershed-wide, conjunctive use. Valley District has reached out to the past partnering agencies to see if they would allocate the same percentage amount

for this phase as they had previously allocated. Below is a table of the proposed contribution amounts by the project partner's.

Agency	Basin Production	Previous Allocation	Field Recharge Test Work Plan
SGPWA		8%	$2,953
City of Yucaipa		3%	$1,107
Valley District		50%	$18,455
Yucaipa Valley Water District	61%	26%	$9,596
Western Heights Water Company	20%	5%	$1,845
South Mesa Water Company	16%	8%	$2,953
City of Redlands	3%	0%	$0
Total	100%	100%	$36,909

BACKGROUND

The San Bernardino Valley Municipal Water District (Valley District) has historically taken a leadership role in studying and managing groundwater resources within its service area. Valley District funded a large portion of the study of the San Bernardino Basin Area by the United States Geological Survey (USGS) which resulted in a groundwater flow model that has been extremely useful in assisting with management decisions and estimating the benefit of various water management strategies. Valley District has also been funding a large portion (currently 75%) of the present USGS study of the Yucaipa Basin area (Basin). The first USGS study of the Basin was completed in 1970. More recently (since the late 1990's), Valley District has been participating in the funding of the following USGS tasks:

1. Construct a multi-level monitoring well near Wilson Creek
2. Track the path of State Water Project water recharged at Wilson Creek spreading basins.
3. Develop lithologic descriptions
4. Develop electronic versions of geophysical logs

5. Use existing information to define groundwater subbasins
6. Use gravity model to determine the depth and configuration of the basin and subbasins

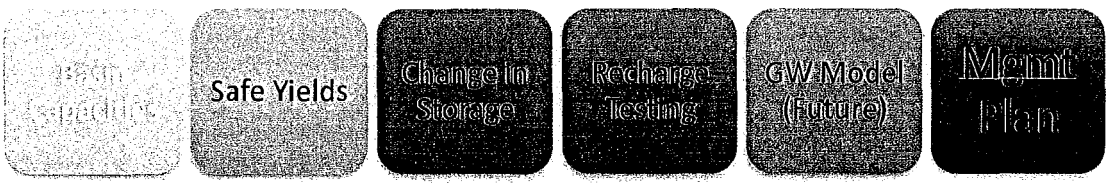
In addition to the work by the USGS, the Basin has also been studied by John Mann in 1986 and David Keith Todd in 1988. In 1990, John Mann and David Keith Todd recommended using a working safe yield of 9,270 acre-feet which is the average of their independent safe yield estimates. A summary of the estimated safe yield values for the Basin from the various studies is below:

Study	*Safe Yield (acre-ft)*
USGS (1970)	7,000
Mann (1986)	10,634
Todd (1988)	7,910
Mann and Todd, average (1990)	**9,270**

Average extractions from the Basin have consistently exceeded this estimated safe yield. Starting in 2003, imported State Project Water began being delivered to help close the gap between safe yield and actual production.

The South Mesa Water Company, Western Heights Water Company and Yucaipa Valley Water District utilize the Basin to meet most of the water needs for their nearly 50,000 customers. In addition, the City of Redlands has pumped some water from the Basin.

The water agencies realized that the level of extractions from the Basin were not sustainable and started meeting together with the goal to develop a groundwater management plan for this important resource. The general steps toward a management plan are summarized in the below figure.



Valley District and the San Gorgonio Pass Water Agency (Pass Agency) are the wholesale water agencies for the area. Valley District serves the area north of the county line and the Pass Agency serves the area south of the county line. The retail water agencies asked both wholesale water agencies to partner with them on the development of the groundwater management plan. The safe yield, or average amount of precipitation stored as groundwater, was calculated to be about 9,600 acre-feet which is very close to the 1990 safe yield calculation (see below).

Yucaipa Basin Safe Yield

Mann and Todd, 1990	*GSSI, 2013*		
	Method 1: Water Balance	Method 2: Net-Zero Draft	Method 3: Hill Method
9,270	**9,683**	**9,590**	**9,645**

The estimated storage capacity, by sub-basin, is summarized below:

BASIN	Storage Capacity (acre-ft)
Triple Falls Creek	10,437
Crafton	22,076
Gateway	68,437
Oak Glen	25,516
Wilson Creek	59,015
Western Heights	58,479
Calimesa	123,523
TOTAL	367,484

In 2014, the water agencies completed two more steps in the process toward a management plan: (1) calculating the annual change in storage and (2) investigating possible recharge locations. Recharge locations were investigated using exploratory borings that were sited strategically based upon the availability of land and based upon their proximity to the East Branch Extension of the State Aqueduct. The investigation revealed that sediments found at the following locations were generally suitable for surface spreading of water to recharge the groundwater basin.

Recharge Investigation Location	Groundwater Basin
Wildwood Creek Stormwater Detention Basins	Calimesa Basin
Wildwood Creek at California Street	Calimesa Basin
Wilson Creek at Avenue D	Western Heights Basin
Garden Air Creek at County Line Road	Calimesa Basin
Garden Air Creek at Singleton Road	Calimesa Basin
Wilson Creek Spreading Basins	Gateway Basin
Oak Glen Creek Spreading Basins	Wilson Creek Basin
Wilson Creek III Site South of Oak Glen Rd and 2nd St	Gateway Basin

Agencies are now proposing to move forward with a field recharge test work plan for selected locations, which will ultimately lead to conducting the pilot recharge tests and thereby result in characterizing the recharge rate in feet per day (ft/day). The recharge rate is needed to size any future recharge basins.

Staff Recommendation

Staff recommends that the Board of Directors direct staff to forward the TODD Groundwater scope and proposal for the Development of a Field Recharge Test Work Plan for Locations within the Yucaipa Basin Area at a cost of $36,909 to a future Board of Directors meeting for consideration.

Attachments:

1. EXHIBIT 1: Areas of Investigation
2. EXHIBIT 2: TODD Groundwater Proposal

Memorandum of Understanding
For the Bunker Hill Basin Conjunctive Use Project

This Memorandum of Understanding for the Bunker Hill Basin Conjunctive Use Project ("**MOU**") is entered into and effective this 15th day of December, 2015 by and among the City of Colton ("**Colton**"), the City of Redlands ("**Redlands**"), the City of Rialto ("**Rialto**"), the City of Riverside Public Utilities ("**RPU**"), the City of San Bernardino Municipal Water Department ("**SBMWD**"), East Valley Water District ("**East Valley**"), San Bernardino Valley Municipal Water District ("**Valley District**"), Western Municipal Water District of Riverside County ("**Western**"), West Valley Water District ("**WVWD**"), South Mesa Water Company ("**SMWC**"), San Gorgonio Pass Water Agency ("**SGPWA**"), Western Heights Water Company, Elsinore Valley Municipal Water District ("**EVMWD**"), and Yucaipa Valley Water District ("**Yucaipa Valley**"), each of which is referred to as a "**Party.**"

Recitals

A. In September 2014, the California Legislature enacted the Sustainable Groundwater Management Act of 2014 (SGMA), which established a statewide framework for the sustainable management of groundwater resources.

B. In the Upper Santa Ana River Groundwater Basin, as defined by the California Department of Water Resources' Bulletin 118, there are a number of groundwater basins: the Arlington Basin, Rialto-Colton Basin (including the area commonly known as No Man's Land), the Riverside Basin, the San Bernardino Basin Area (including the Bunker Hill Basin and the Lytle Basin), the San Timoteo Basin and the Yucaipa Basin, surface water and groundwater supplies are governed by a number of judicial decrees and contracts, including but not limited to the *Orange County* Judgment, the *Western* Judgment, and the 1961 decree governing the Rialto-Colton Basin.

C. The Parties to this MOU wish to collaborate in an effort to build on the foundation of existing laws and regulations, contracts and judicial decrees, and the recent enactment of SGMA to develop a cooperative effort to conjunctively manage surface water and groundwater in the Bunker Hill Basin so as to improve their drought resilience and water supply reliability.

D. The Parties wish to memorialize their commitments by means of this MOU.

Understandings

1. *Term.* This MOU shall remain in full force and effect until December 31, 2016 unless terminated earlier by a written agreement signed by all of the Parties.

    a. It is the Parties' intent to develop one or more detailed agreements for the projects to be studied under the auspices of this MOU by December 31, 2016.

b. In the event that any Party chooses to withdraw from this MOU, the MOU shall remain in force among the remaining Parties.

c. Nothing in this MOU shall be construed to interfere with or prohibit two or more Parties, either acting independently or with all or a portion of the other Parties or with non-Parties, from developing one or more projects that would serve to conjunctively manage surface water and groundwater in the Bunker Hill Basin so as to improve drought resilience and water supply reliability. Such projects may, but need not, be the subject of a detailed agreement of the type referred to in subparagraph (a) above.

2. *Project Development.* As a general matter, the Parties wish to develop plans for: (i) the physical systems necessary to use the Bunker Hill Basin conjunctively to enhance water supply reliability and flexibility for the region, and (ii) an equitable cost allocation for these physical systems for potential participants based on classes of service and value.

a. *Project Facilities.* The Parties agree to evaluate the feasibility and cost of the facilities listed on Exhibit A, which is attached hereto and incorporated herein by reference. The Parties understand that the goal of this effort is to develop up to 35,000 afy of new dry-year yield. Any additional capacity as a result of design refinement and operation optimization will be shared proportionally among the Parties based on their respective participation levels.

b. *Operational Scenarios.* As part of the evaluation of the facilities listed on Exhibit A, the Parties agree also to evaluate a range of operational scenarios wherein the Parties would import wet-year water for direct or in-lieu recharge and subsequent extraction. Recharge shall take place in advance of extraction and any extraction amounts will be subject to the loss factor described below.

c. *Financing.* The Parties will develop a coordinated financing plan for the proposed facilities that will include, without limitation, seeking bond funding, state loan funds, and imposing appropriate fees and assessments.

d. *Loss Factor.* The Parties understand that a loss factor currently estimated to be approximately 10% will be scientifically developed based on anticipated evapotranspiration and reduced natural recharge due to the project. The loss factor will be applied accordingly upon implementation of the project. The factor may be revisited from time to time as deemed necessarily by the Parties.

e. *Cost Allocation.* The Parties will develop an equitable cost-allocation proposal for consideration by all Parties no later than June 30, 2016. The proposed cost-allocation will be generally based on the following principles:

(1) Up to 70% of the cost will be paid by participants receiving a firm supply, with 20% of the cost being paid by participants receiving an interruptible

supply. The remaining 10% of the cost will be paid by Valley District as the basin manager; or

(2) Up to 55% of the cost will be paid by Parties with peak capacity rights (May through October deliveries) while Parties with off-peak capacity rights will pay up to 35% of the cost for deliveries from November through April. The remaining 10% of the cost will be paid by Valley District as the basin manager.

(3) Each Party may purchase a quantity of water to be supplied on either a firm or interruptible basis, on a peak or non-peak capacity, or a combination thereof. The Party's costs will be based on its selection of a type of supply, the capacity being used and the quantity. A sample proposed cost-allocation is attached hereto as Exhibit B for illustrative purposes only.

(4) The Parties understand that the cost allocation will be developed and refined collaboratively. The final cost allocation and methodology may be different than identified from those above when fully developed.

3. *Schedule*. The Parties agree that they will use their best efforts to complete the project evaluation described in paragraph 2 above no later than June 30, 2016 so as to allow for the negotiation of definitive project agreement(s) and for the approval of those agreement(s) by governing boards no later than December 31, 2016.

4. *Water Rights and Prior Agreements*. Nothing in this MOU shall be construed to create or confer any new rights to the groundwater basin to any of the Parties or to interfere with or divest any non-Party of any right to the groundwater basin that may exist as of the effective date of this MOU. This MOU shall not operate to validate or invalidate, modify or affect any Party's water rights or any Party's obligations under any agreement, contract or memorandum of understanding/agreement entered into prior to the effective date of this MOU. Each Party to this MOU reserves any and all claims and causes of action respecting its water rights and/or any agreement, contract or memorandum of understanding/agreement; any and all defenses against any water rights claims or claims under any agreement, contract or memorandum of understanding/agreement; and any claims arising from contamination or water quality degradation.

5. *Cost-Sharing*. Each Party agrees that it will devote sufficient staff time and other resources to actively participate in this effort. If a Party wishes to involve counsel in the review or development of the project agreement(s), all such costs will be borne only by that Party. The Parties shall agree on how the technical/consultant costs associated with implementing this MOU will be funded, which allocation is likely to be based on the Parties' respective participation levels.

6. *Withdrawal.* Any Party may withdraw by providing the other Parties with sixty days' written notice of withdrawal. Such Party's withdrawal shall be conditioned upon the Party's payment of its proportionate share of the costs of this effort, as described in paragraph 5 above, up through and including the date of its notice of withdrawal.

7. *General Provisions*

a. *Authority.* Each signatory of this MOU represents that s/he is authorized to execute this MOU on behalf of the Party for which s/he signs. Each Party represents that it has legal authority to enter into this MOU and to perform all obligations under this MOU.

b. *Amendment.* This MOU may be amended or modified only by a written instrument executed by each of the Parties to this MOU.

c. *Jurisdiction and Venue.* This MOU shall be governed by and construed in accordance with the laws of the State of California, except for its conflicts of law rules. Any suit, action, or proceeding brought under the scope of this MOU shall be brought and maintained to the extent allowed by law in the County of San Bernardino, California.

d. *Headings.* The paragraph headings used in this MOU are intended for convenience only and shall not be used in interpreting this MOU or in determining any of the rights or obligations of the Parties to this MOU.

e. *Construction and Interpretation.* This MOU has been arrived at through negotiations and each Party has had a full and fair opportunity to revise the terms of this MOU. As a result, the normal rule of construction that any ambiguities are to be resolved against the drafting Party shall not apply in the construction or interpretation of this MOU.

f. *Entire Agreement.* This MOU constitutes the entire agreement of the Parties with respect to the subject matter of this MOU and supersedes any prior oral or written agreement, understanding, or representation relating to the subject matter of this MOU.

g. *Partial Invalidity.* If, after the date of execution of this MOU, any provision of this MOU is held to be illegal, invalid, or unenforceable under present or future laws effective during the term of this MOU, such provision shall be fully severable. However, in lieu thereof, there shall be added a provision as similar in terms to such illegal, invalid or unenforceable provision as may be possible and be legal, valid and enforceable.

h. *Successors and Assigns.* This MOU shall be binding on and inure to the benefit of the successors and assigns of the respective Parties to this MOU. No Party

may assign its interests in or obligations under this MOU without the written consent of the other Parties, which consent shall not be unreasonably withheld or delayed.

i. *Waivers*. Waiver of any breach or default hereunder shall not constitute a continuing waiver or a waiver of any subsequent breach either of the same or of another provision of this MOU and forbearance to enforce one or more of the remedies provided in this MOU shall not be deemed to be a waiver of that remedy.

j. *Attorneys' Fees and Costs*. The prevailing Party in any litigation or other action to enforce or interpret this MOU shall be entitled to reasonable attorneys' fees, expert witnesses' fees, costs of suit, and other and necessary disbursements in addition to any other relief deemed appropriate by a court of competent jurisdiction.

k. *Necessary Actions*. Each Party agrees to execute and deliver additional documents and instruments and to take any additional actions as may be reasonably required to carry out the purposes of this MOU.

l. *Compliance with Law*. In performing their respective obligations under this MOU, the Parties shall comply with and conform to all applicable laws, rules, regulations and ordinances.

m. *Third Party Beneficiaries*. This MOU shall not create any right or interest in any non-Party or in any member of the public as a third party beneficiary.

n. *Counterparts*. This MOU may be executed in one or more counterparts, each of which shall be deemed to be an original, but all of which together shall constitute but one and the same instrument.

o. *Notices*. All notices, requests, demands or other communications required or permitted under this MOU shall be in writing unless provided otherwise in this MOU and shall be deemed to have been duly given and received on: (i) the date of service if served personally or served by electronic mail or facsimile transmission on the Party to whom notice is to be given at the address(es) provided below, (ii) on the first day after mailing, if mailed by Federal Express, U.S. Express Mail, or other similar overnight courier service, postage prepaid, and addressed as provided below, or (iii) on the third day after mailing if mailed to the Party to whom notice is to be given by first class mail, registered or certified, postage prepaid, addressed as set forth in its signature block below.

AGREED AND ACCEPTED:

Name of Party: _____

Signatory:
Title:

Notice E-mail: _____
Address:

Phone:

Exhibit A.

Proposed Bunker Hill CUP Facilities (Phase 1)

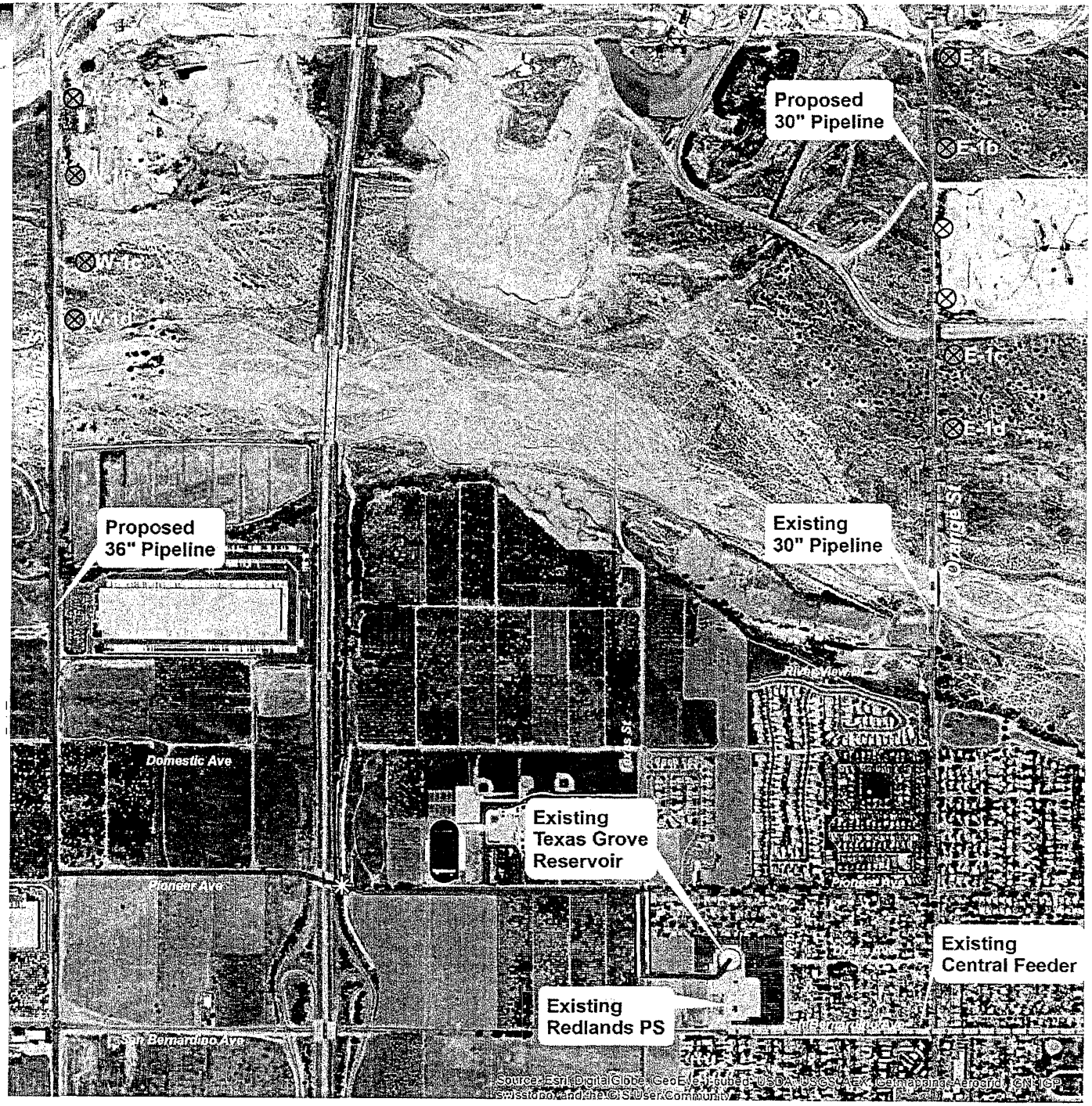
Legend

- Project Wells
- Existing Redlands Wells
- Jack & Bore Locations
- Existing Redlands Pipeline
- Central Feeder
- Easements

Project Pipelines

- Alabama St
- Orange St

N



Sample Cost Allocation to Specific Participants

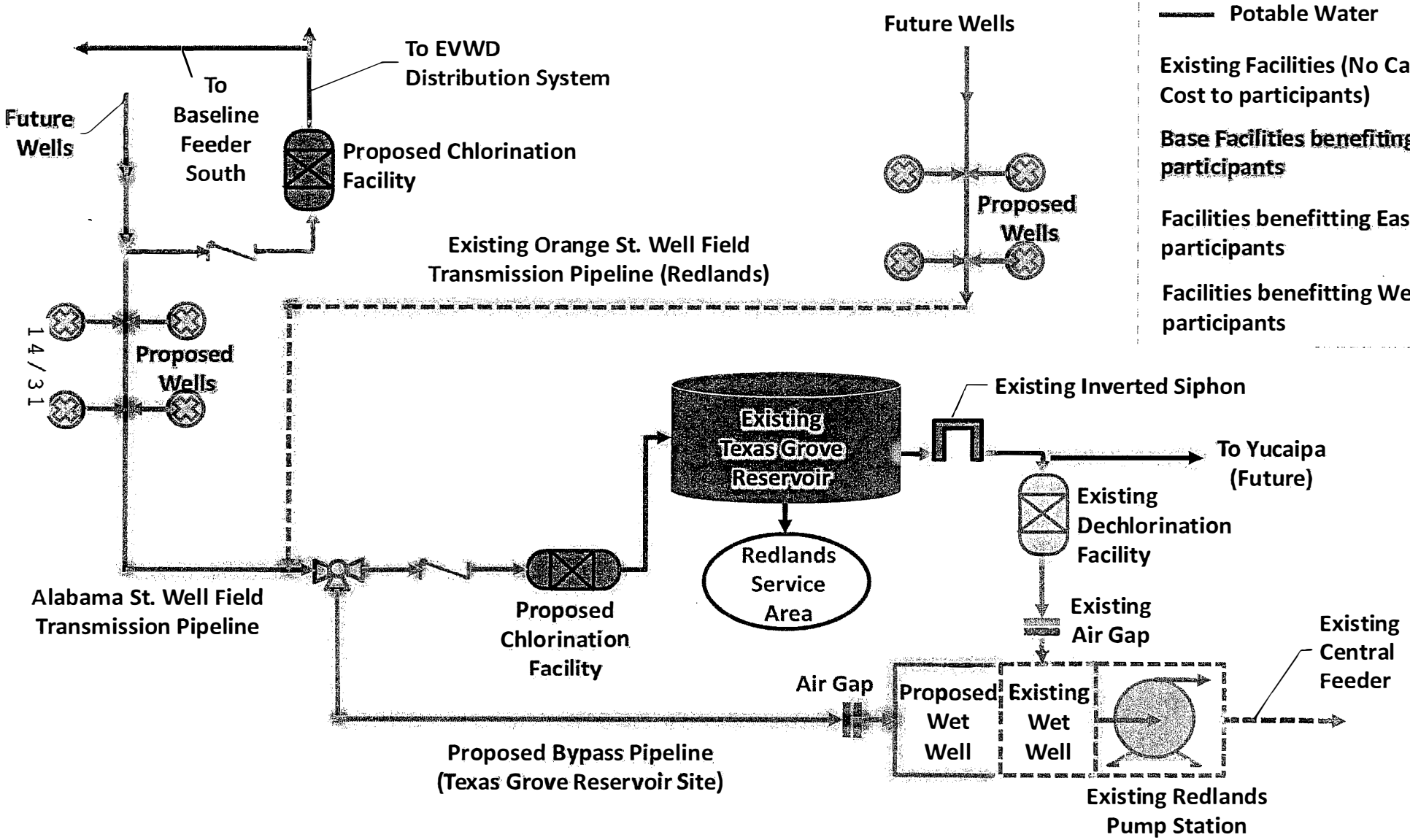


Exhibit B.

Original Cost Allocation Concept (Firm & Interruptible)

- Create two main types of participant levels: Firm and Interruptible
- Firm Capacity participants pay more for firm water and can request water up to their requested Share %; 70% Cost
- Interruptible Capacity participants pay less, but their rights to capacity are junior to Firm Capacity participants – beneficial to users with access to their own storage capacity; 20% Cost
- Basin Management reserved for Valley District to manage groundwater levels, typically in wet years; 10% Cost
- A participant may subscribe to more than one level of service class

Proposed Cost Allocation (Peak and Off-Peak)

- Create two types of participant levels based on the seasonal demand patterns: Peak and Off-Peak
- Peak Capacity participants pay more for capacity during peak demand season: May – October; 50-60% Cost
- Off-Peak Capacity participants pay less, but their rights to capacity limited to lower demand season: November – April; 30-40% Cost
- Basin Management reserved for Valley District to manage groundwater levels, typically in wet years; 10% Cost
- A participant may subscribe to more than one level of service class up to System maximum capacity

Proposed Cost Allocation by Seasonal Demands

Capital Cost = $29.5M
Amortized Cost (30 years @ 4%) = $1.71M

Cost Allocation by Participant Level

Participant Level	Capital Cost Level Example	Annual Amortized Capital Cost
Peak	55% (50-60%)	$941,000
Off-Peak	35% (30-40%)	$599,000
Basin Mgmt	10%	$171,000
Total	**100%**	**$1,710,000**

The division of costs at 55/35/10 percent is selected for the proposed cost allocation, and may be adjusted before the program is finalized

Proposed Capital Cost Allocation – Peak Capacity (May-Oct)

Capital Cost = $29.5M
Amortized Cost (30 years @ 4%) = $1.71M
Share of Capital Cost = 55%

User	Extraction Capacity Purchased (AF)	Extraction Capacity Purchased (%)	Cost Allocation	Annual Capital Cost	Delivery Capacity Capacity (cfs)
SBVMWD	3,000	17%	9%	$157,000	8.4
YVWD/SGPWA	5,000	28%	15%	$261,000	13.9
WMWD	3,500	19%	11%	$183,000	9.7
WVWD	1,500	8%	5%	$78,000	4.2
Rialto/Colton	500	3%	2%	$26,000	1.4
SBMWD	4,000	22%	12%	$209,000	11.1
WHWC	500	3%	2%	$26,000	1.4
Total	18,000	**100%**	**55%**	**$940,000**	50.1

Proposed Capital Cost Allocation – Off-Peak Capacity (Nov-Apr)

Capital Cost = $29.5M
Amortized Cost (30 years @ 4%) = $1.71M
Share of Capital Cost = 35%

User	Extraction Capacity Purchased (AF)	Extraction Capacity Purchased (%)	Cost Allocation	Annual Capital Cost	Delivery Capacity Purchased (cfs)
YVWD/SGPWA	5,000	29%	10%	$176,000	13.9
WMWD	4,500	26%	9%	$158,000	12.5
WVWD	1,500	9%	3%	$53,000	4.2
Rialto/Colton	500	3%	1%	$18,000	1.4
SBMWD	5,000	29%	10%	$176,000	13.9
SMWC	500	3%	1%	$18,000	1.4
Total	**17,000**	**100%**	**35%**	**$599,000**	**47.4**

Sample Dry Year (Peak & Off-Peak Capacity)

Agency	Subscribed Capacity Share %	Cost Allocation (%)	Water Produced (AF)
SBVMWD	17%	9%	3,000
YVWD/SGPWA	28%	15%	5,000
WMWD	19%	11%	3,500
WVWD	8%	5%	1,500
Rialto/Colton	3%	2%	500
SBMWD	22%	12%	4,000
WHWC	3%	2%	500
Subtotal: Peak	100%	**55%**	**18,000**
YVWD/SGPWA	29%	10%	5,000
WMWD	26%	9%	4,500
WVWD	9%	3%	1,500
Rialto/Colton	3%	1%	500
SBMWD	29%	10%	5,000
SMWC	3%	1%	500
Subtotal: Off-Peak	**100%**	**35%**	**17,000**
Total		**90%**	**35,000**

United States Department of the Interior

U. S. GEOLOGICAL SURVEY
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Sacramento, California 95819-6129
Phone: (916) 278-3026 Fax: (916) 278-3045
http://water.wr.usgs.gov

IN REPLY REFER TO:

Draft

Mr. Jeff Davis
General Manager and Chief Engineer
San Gorgonio Pass Water Agency
1210 Beaumont Avenue
Beaumont, California 92223

Dear Mr. Davis:

This letter confirms discussions between our respective staffs, concerning the cooperative program between the San Gorgonio Pass Water Agency (SGPWA) and the U.S. Geological Survey (USGS) during the period February 1, 2016 to November 30, 2017. The work proposed under the enclosed Joint Funding Agreement (JFA) is a continuation of the cooperative basin-wide monitoring network and study to identify, characterize and evaluate potential artificial-recharge sites for conjunctive use in the San Gorgonio Pass area. The program consists of two main tasks: (1) basin-wide monitoring, (2) Burnt Canyon flow analysis. A detailed description of progress on these tasks is included as an attachment to this letter.

The total cost of the proposed cooperative water-resources program is $252,095.00. Of this total, SGPWA will contribute $199,220.00 and, subject to the availability of Federal Matching Funds (FMF), the USGS will contribute $52,875.00. The proposed period for this program is February 1, 2016 to November 30, 2017. On the following page you will find a summary of costs.

Table 1. FFY16 Budget

Program element	USGS	SGPWA	Total
Task 1: Basin-Wide Monitoring			
A. Water-Level Monitoring	$14,110	$41,290	$55,400
B. Water-Quality Monitoring	$9,200	$42,050	$51,250
C. Recharge Monitoring	$0	$0	$0
subtotal	**$23,310**	**$83,340**	**$106,650**
Task 2: Burnt Canyon Flow Analysis	$4,550	$16,270	$20,820
Total FFY16	**$27,860**	**$99,610**	**$127,470**

Table 2. FFY17 Budget
These costs are for planning purposes only and are estimated. Each year an updated cost will be provided for the final agreement. Detailed description of location and cost of new monitoring sites will be based on discussions between USGS and SGPWA staff.

Federal Fiscal Year	USGS	SGPWA	Total
FFY17 Monitoring			
Task 1: Basin – Wide Monitoring			
A. Water-Level Monitoring	$11,015	$40,840	$51,855
B. Water-Quality Monitoring	$9,500	$42,500	$52,000
C. Recharge Monitoring	$0	$0	$0
Subtotal	**$20,515**	**$83,340**	**$103,855**
Task 2: Burnt Canyon Flow Analysis	$4,500	$16,270	$20,770
Total FFY17	**$25,015**	**$99,610**	**$124,625**

Enclosed are two copies of Joint Funding Agreement (JFA) 16XXX for your approval. Work performed with funds from this agreement will be conducted on a fixed-price basis. If the JFA is acceptable, please return one of the signed copies with original signatures to our office for further processing. The other is for your files.

If you have any questions concerning the program described above, please contact Allen Christensen at (619) 225-6175 or Matthew Landon at (619) 225-6109, in or San Diego Office. If you have any administrative questions, please contact Nancy Mora at (619) 225-6428.

Sincerely,

Eric Reichard
Director
USGS California Water Science Center

San Gorgonio Pass Water Agency Cooperative Program: Progress, Plans, and Costs

Task 1A – Groundwater-Level Monitoring

Progress

A basin-wide groundwater-level monitoring network was established in the San Gorgonio Pass area in Federal Fiscal Year 1997 (FFY97) to evaluate existing hydrologic conditions and to monitor the effects of pumping and artificial recharge on the groundwater system. A key component of the network is collecting data from the multiple-well monitoring sites, which provide information on water-level changes and vertical gradient in the different aquifers.

In FFY15, U.S. Geological Survey (USGS) personnel accompanied San Gorgonio Pass Water Agency (SGPWA) personnel in the spring and fall to measure water levels in 107 wells. Data collected as part of the water-level network are available through the USGS National Water Information System (NWIS) online database (table 2).

Water-Level Change

Water-level changes measured in the monitoring wells between fall 2013 and fall 2014 and spring 2014 and spring 2015 are shown on figures 1 and 2, respectively. Of the 82 wells with water-level change between fall 2013 and 2014, 19 wells recorded a water-level rise greater than 5 ft, 59 wells recorded little or no change (rise or decline less than 5 ft), and 4 wells recorded a water-level decline greater than 5 ft (fig. 1). Of the 86 wells with water-level change between spring 2014 and 2015, 23 wells recorded a water-level rise greater than 5 ft, 54 wells recorded little or no change (rise or decline less than 5 ft), and 9 wells recorded a water-level decline greater than 5 ft (fig. 2).

Multiple-Well Monitoring Sites

A total of 15 transducers recorded continuous water-level data at multiple-well monitoring sites 1, 3, 6, 8, 9, and 10 during FFY14 (fig. 1). These data were used to help determine vertical gradients in the aquifer system and document long-term water-level changes in the SGPWA service area. Sites 1 and 3 are discussed in the recharge monitoring task.

Site 6—Site 6 (002S001W35J001-4) is in the northeastern part of the Beaumont storage unit, and includes four 2-inch piezometers installed in the same borehole: 35J1 perforated between 860-900 ft bls; 35J2 perforated between 750-770 ft bls; 35J3 perforated between 610-630 ft bls; and 35J4 perforated between 240-260 ft bls (dry). Prior to late 2008 the water levels measured in the different piezometers at Site 6 (fig. 3) were similar; however, after late 2008 the depth to water in the piezometers increases with the depth of the perforated interval. This change is likely a response to pumping from the nearby BCVWD production well 25. BCVWD well 25 (shown on figure 1 in blue) is about 0.7 mile southwest of Site 6 and started regular groundwater production for municipal supply in October 2008. Water levels at the site have declined between 34 and 40 ft during the period February 2002 and November 2015. The rate of decline was greater than 5 ft per

year (ft/yr) prior to 2010. Since late 2010, all 3 wells have shown recovery of about 15ft between the seasonal highs measured during spring of 2010-2015. All wells at the site have continued to show overall year-to-year recovery since 2010, with the greatest recovery occurring between late 2012 and late 2015. The water levels at the site continued to recover about 2 ft between seasonal highs in 2014 and 2115. The recent recovery at this site may have resulted from changes in pumping patterns in the area, natural recharge from recent wet years, artificial recharge at the SGPWA and BCVWD recharge facilities, or a combination of these factors.

Site 8—Site 8 (003S002E07P001-4) is in the central part of the Cabazon storage unit, and includes four 2-inch piezometers installed in the same borehole: 7P1 perforated between 980-1,000 ft bls; 7P2 perforated between 790-810 ft bls; 7P3 perforated between 640-660 ft bls; and 7P4 perforated between 550-570 ft bls. The hydrographs for site 8 show variations in water levels with depth at the site (fig. 3). In general, the water-level altitude increases with depth at the site with an upward groundwater gradient between the lower and upper aquifer system. The deepest well (7P1) has the highest water level altitude, more than 25 ft higher than water-level altitude in the shallower wells. This large difference in water-level altitudes indicates that well 7P1 is perforated in a different aquifer than the other wells. Wells 7P2 and 7P3 also show greater daily variation than wells 7P1 and 7P4. This variation likely is a response to pumping by the nearby supply well used by the Cabazon County Water District, shown as a black dot (fig. 1) 0.3 miles east of Site 8. The water-level decline measured at the site between May 2007 and Nov 2015 was 29, 27, 27, and 27 ft at wells 7P1, 7P2, 7P3, 7P4, respectively. The rate of decline at these wells has risen from 2.8, reported in 2014 to 3.5ft/yr for well 7P1 and 3.3 ft/yr at well 7P1-3 during the period mid-2007 to late-2015. Since mid-2013, all wells show a general increase in the rate of decline during the period mid-2013 to late-2015 as compared with the period mid-2012 to early-2014.

Site 9—Site 9 (003S002E15P001-3) is in the eastern part of the Cabazon storage unit, and includes three 2-inch piezometers: 15P1 perforated between 373-383 ft bls; 15P2 perforated between 330-350 ft bls; and 15P3 perforated between 240-260 ft bls. Prior to early 2011, water-level altitude in well 15P1 is slightly higher than the water-level altitude in well 15P2, indicating an upward groundwater gradient conditions at the site. (fig. 4). The water-level decline measured at the site between May 2007 and April 2011 was 9.3 ft (about 2.4 ft/yr) at well 15P1and 8.5 ft (about 2.2 ft/yr) at 15P2. In April-May, 2011 both wells show rapid increases in water-level altitude at the site. The transducer in well 15P1 recorded a 4.6 ft rise in water table between late-April and late-August, 2011. The transducer in well 15P2 recorded a 10.3 ft rise in water table between mid-May and mid-August, 2011. It is important to note that this water-level rise event occurred in the deeper well (15P1) first then approximately 1 month later started in the shallower well (15P2). This event also reverses the vertical gradients at the site. This recharge event was likely the result of recent natural recharge in the area. Since this event in 2011, both wells show nearly parallel water-level decline and continue to show a downward gradient between the two wells. Prior to May, 2011 manual water-level measurements collected from the shallow well (15P3) were dry. Manual measures in well 15P3 also captured this

water-level rise event with a measured water level at 220.8 ft below land surface or about 115 ft above the water levels measured in wells 15P1 and 15P2. The USGS installed a transducer in well 15P3 in June 2014, and the well has been dry since November 2011. The overall decline at well 15P1 is approximately 21.4 ft and the overall rate of decline is 2.76 ft per year since 2007. The overall decline at well 15P2 is 11.2 ft and the overall rate of decline is 1.5 ft per year during the period mid-2007 and early-2015 when the well went dry.

Site 10—Site 10 (003S001E11F001-4) is in the western part of the Cabazon storage unit, and includes four 2-inch piezometers installed in the same borehole: 11F1 perforated between 1060 and 1040 ft bls; 11F2 perforated between 860 and 840 ft bls; 11F3 perforated between 660 and 680 ft bls; and 11F4 perforated between 600 and 580 ft bls. The water-level decline measured at the site between August 2009 and November 2011 was 8.8, 8.7, 8.9, and 9.25 ft at wells 11F1, 11F2, 11F3, and 11F4, respectively (fig. 4). In November 2011 water-level altitudes at the site began to increase. The water-level rise measured at the site between November 2011 and June 2013 was 5.5, 5.3, 5.1, and 5.2 ft at wells 11F1, 11F2, 11F3, and 11F4, respectively (fig. 4).Wells 11F3 and 11F4 have nearly identical depth to water and water-level change indicating these wells are in the same aquifer. Since mid-2013, when water levels at the site reached recent highs, water levels have declined between 17 and 21 ft at the site. Since mid-2013 the rate of decline at the site has increased as compared with the rate of decline measured during the period mid-2009 to 2012.

Plans

During FFY16, SGPWA personnel will collect water-level data from groundwater-level monitoring-network wells (fig. 2) on a semi-annual basis. The USGS will continue to canvass new wells, and verify well information for wells in the network. Water-level data will be collected at one-hour intervals at all sites equipped with pressure transducers (table 2); these sites will be downloaded on a quarterly basis by the USGS. The USGS will continue to enter water-level and well-site data collected by SGPWA and USGS personnel into the USGS database with appropriate quality-control checks, including accompanying SGPWA personnel during both spring and fall measurement periods. Water-level data are available through the USGS NWIS online database. As part of the calibration process completed in FFY14, it was noted that many of the transducers are near or have exceeded expected serviceable lifetime of the transducers. The factory expected serviceable lifetime of the transducers used at the continuous monitoring sites is between 7-10 years. The USGS will continue to monitor each transducer and recommend replacement as needed. Currently the SGPWA has 15 transducers deployed and the replacement cost is approximately $1,100. The SGPWA should expect one or two transducer failures per year for the next 5-10 years until all transducers are replaced. The proposed number of wells in the FFY16 water-level network was reduced from 107 wells to 102 wells in FFY16 for reasons noted in table 2. Data collection at the transducer located at the San Gorgonio Recharge facility is included as part of this task.

Total cost for the above work is $55,400. Of this total, San Gorgonio will contribute $41,290 and subject to the availability of Federal Matching Funds (FMF), the USGS will contribute $14,110, as reflected in the summary funding table.

Total FFY 2016 cost for water-level monitoring $ 55,400

Task 1B – Water-Quality Monitoring

Progress

In FFY16, 11 water-quality network wells were sampled. The samples were analyzed for major ions, nutrients, selected trace elements, stable isotopes of oxygen and hydrogen. Complete results for all samples collected as part of the water-quality monitoring network are available through the USGS NWIS online database. NWIS links to individual wells are provided in table 3. Note, wells denoted with "X*" on table 3, column 2016 are scheduled to be sampled in 2016 as part of FFY15 funding carried over from the previous cooperative agreement. These wells were not available for sampling during the summer of 2015.

Plans

The current water-quality monitoring network includes 38 wells (fig. 5 and table 3). About one third of the wells are sampled on a triennial basis. Water-quality samples will be collected and analyzed from 12 wells in FFY16. The samples will be analyzed for major ions, nutrients, selected trace elements, stable isotopes of oxygen and hydrogen. All data collected will be entered into the USGS database with appropriate quality control, and are available upon request.

Total cost for he above work is $51,250. Of this total, San Gorgonio will contribute $42,050 and subject to the availability of Federal Matching Funds (FMF), the USGS will contribute $9,200, as reflected in the summary funding table.

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Total FFY 2016 cost for water-quality monitoring $ 51,250

Task 1C – Recharge Monitoring

Progress

The SGPWA has been artificially recharging the groundwater basin using imported water from the California State Water Project (SWP) via recharge ponds along the Little San Gorgonio Creek in Cherry Valley since November 2002; however, full-scale recharge operations started in June 2003. To evaluate the effect of the artificial recharge on water levels and water quality in the underlying aquifer, data were collected from nine wells and suction-cup lysimeters at five locations including the SWP pipeline at the southern pond of the San Gorgonio Pass Recharge Facility (fig. 6 and table 4). The total deliveries of SWP water to the San Gorgonio Creek recharge ponds between November 2002 and November 2015 was 10,649 acre-ft (fig. 7).

Water-Level Data

Water-level data have been collected on a continuous basis using pressure transducers at wells 002S001W22P006 (Site 3), 002S001W27L001 (Site 1), and 002S001W35J001 (Site 6) (fig. 6). Water-level data collected from well 22P006, located above the perching layer beneath (240 ft blsd) the San Gorgonio Recharge facility show water-level rises and declines corresponding to changes in deliveries of SWP to the recharge facility (fig 8). Since 1999, the highest water-level altitude of 2727 ft above sea level (asl) or about 185 ft below land surface datum (lsd) was measured in December 2008. Since 2008, the delivery rate increased with the greatest daily delivery rate increase occurring in mid-2008 and mid-2010. Since 2013, the rate of recharge has decreased due to limited availability of SWP because of ongoing drought conditions in California. This change in delivery rate also cause a corresponding decline in the perched water table of approximately 40 ft from December 2012 to November 2015, 30 ft of the noted decline occurred during the period January 2014 to November 2015. This rate of water-level decline is consistent with other periods of steep decline in early 2009 and mid-2011 indicating that the perched aquifer system continues to drain rapidly in response to reduced application of recharge water. As previously mention in past program letters, the generally flat long-term change in the water table beneath the recharge facility indicates that the maximum recharge rate has not yet been reached. Water-level altitude measured above the perched layer are near low levels measured in mid-2004 and just after recharge began in early 2004.

Water-Level Changes in the Regional Aquifer

Well 22P3 is adjacent to the recharge pond in Area 3 and perforated in the regional aquifer. From 1999, when the well was first installed, until late 2006 the water level at

well 22P3 was declining at a rate of about 4.3 ft/yr (fig. 9). From late 2006 until May 2009, the water level rose about 35 ft (about 13.1 ft/yr) (fig. 9). Water-level data has not been collected at 22P3 (Site 3) since 2009 due to access problems. This water-level rise is likely the result of artificial recharge.

Water-level data collected at well 27L1 (Site 1) indicate about 77 ft of water-level decline between December 1989 and September 2008 (about 8.5 ft/yr). However, from September 2008 through early 2014, the water level at 27L1 has increased about 48 ft (about 8 ft/yr). In early 2014 the water-level measured at well 27L reached 15 year high of 2261 ft above sea-level. Water-level data collected at well 35J1, east of the recharge facilities, also shows a water-level rise of about 15 ft since late 2009. The increase in water level at these sites probably is the result of artificial recharge of SWP water at the SGPWA and BCVWD recharge facilities or reduced groundwater withdrawal in the area (Fig. 9). As of June 2014, the SGPWA recharge facility has received 10,649 acre-ft and BCVWD recharge facility has received 60,990 acre-ft of SWP water since 2002, for a total of about 71,639 acre-ft

Water-Quality Data

During FFY15, no water-quality samples were collected due to the lack of availability of recharge water and due the lower moisture content in the unsaturated zone beneath the recharge facility. Since FFY99, the USGS has collected a total of 189 water-quality samples at the recharge ponds. A total of 38 samples were collected from the SWP discharge into the recharge ponds and 151 samples were collected from the saturated and unsaturated zones beneath the recharge ponds. Sample volume permitting, samples were analyzed for major ions, nutrients, selected trace elements, and the stable isotopes of oxygen ($\delta^{18}O$) and hydrogen (δD). Data collected as part of the recharge monitoring network are available through the USGS NWIS online database, links to individual wells are provided in table 4.

Nitrate (nitrate plus nitrite) concentrations for all samples collected from suction-cup lysimeters and wells beneath the recharge ponds ranged from less than the laboratory reporting level of 0.04 to 9.0 milligram per liter (mg/L) as N (fig. 10). The U.S. Environmental MCL for nitrate reported as N is 10 mg/L. Nitrate concentrations in samples from the 32-ft lysimeter (002S001W22P011) were 9.0 mg/L as N in 2004 and 0.8 mg/L as N in 2014, reflecting the recharge of SWP water that contains low nitrate concentrations (0.2 to 1.0 mg/L as N). Similarly, nitrate concentrations in samples collected from the perched aquifer at the 235-ft lysimeter (002S001W22P007) were 4.6 mg/L as N in 2004 and 0.6 mg/L as N in 2014. Since late 2007, the nitrate concentration has not exceeded 1.5 mg/L as N for samples collected from the perched aquifer. Concentrations below 1 mg/L are similar to concentrations found in the SWP recharge water. Nitrate concentrations in samples from the regional aquifer beneath the recharge ponds (well 002S001W22P003) varied between 4-6 mg/L in samples collected in 2000-2006, prior to the arrival of the applied artificial-recharge water at the water table. Samples have not been collected at the well 002S001W22P003 since 2005, due to a damaged pump at the site.

The stable isotopes of oxygen ($\delta^{18}O$) and hydrogen (δD) for samples collected from the SWP discharge at the recharge ponds and the suction-cup lysimeters or wells beneath the ponds are shown on figure 11 in relation to the meteoric water line. Samples were separated into four groups based on isotopic differences: (1) SWP water, (2) perched-aquifer samples from 1999 to 2005, (3) perched-aquifer samples from 2005 to 2014, and (4) samples from the regional aquifer. In general, the isotopic composition of the SWP water is lighter (more negative) and lies beneath the meteoric water line compared to local groundwater. Samples collected from the perched aquifer from 1999 to 2005 and the regional aquifer represent local groundwater and plot above the meteoric water line (fig. 11). Since 2005, samples collected from the perched aquifer plot below the meteoric water line and above the SWP water indicating that these samples contain a mix of SWP and local groundwater. Isotopic results from samples from the perched aquifer collected since 2008 show a distinct departure from samples collected from 2005 to 2007. Samples collected from 2008 to 2012 are isotopically lighter than the 2005 to 2007 samples indicating a higher percentage of SWP water in the samples. These results are confirmed by the low nitrate concentrations measured in samples collected from the lysimeters installed above the perching layer (fig. 10).

Plans

During FFY16, water-quality monitoring of the instruments install beneath the recharge facility will not be monitored. The decision to suspend water-quality monitoring was made based on communication between respective staffs of the SGPWA and the USGS due to the lack of availability of recharge water and the aforementioned drying of the unsaturated zone. As the moisture content in the unsaturated zone lowers (due to lack of recharge) the instruments installed in the unsaturated zone stop producing water need to make water-quality analyses.

Total FFY 2016 cost for recharge monitoring - $ 0

Total FFY 2016 cost for task 1 - $ 106,650

Task 2: Burnt Canyon Flow Analysis

Progress

In FFY07, the USGS completed a series of investigations to determine flow characteristics within the Burnt Canyon steam section between Raywood Flat and the lower Burnt Canyon weir (Figure 12). Based on data collected between August 2007 and November 2007 cumulative losses along the Burnt Canyon reach to the lower weir were approximately 11.3 million cubic feet or 80 acre feet. In FFY13, the USGS reconstructed and re-installed the temporary weir at the lower collection pond to compare flow between the turnout at upper Burnt Canyon and the collection pond at lower Burnt Canyon. The USGS also installed a new transducer at the lower weir site and factory-recalibrated the

transducer used at the upper weir to collect stage at 15 minute intervals. The USGS completed detailed flow measurements; (1) in the flume south of the east fork diversion; (2) in the flume before the weir at the turnout into upper Burnt Canyon; (3) in the stream above the collection pond at lower Burnt Canyon. These flow measurements were used to calibrate and rate weirs installed at the turn out of upper Burnt Canyon and lower Burnt Canyon and to determine losses or gains between upper and lower Burnt Canyon. Data collected at the upper Burnt Canyon weir and the lower Burnt Canyon weir have been reviewed and uploaded to the USGS on-line data base. Discharge data derived from stage measurements are shown on figures 13a and 13b. The complete flow record is shown on both figures (fig13a and 13b), the scale of the discharge was reduced in figure 13b to show flow detail at lower rates. The maximum rated (calibrated) flow at Upper and Lower Burnt Canyon weirs is 6.09 cfs. Flows in excess of 6.09 cfs will over top the weir, flows greater than 6.09 cfs were filtered out of the data used to generate figures 13a and 13b. The complete data set is available upon request or by download using the USGS online database. Data in excess of 6.09 cfs are estimated from stage reported by the transducer and stream geometry these values should be considered poor. Comparing flows between the Upper Burnt and Lower Burnt Canyon shows continual losses between the upper and lower weirs, except for a few periods of storms as noted above. Generally, the loss is approximately 0.25-0.5 cfs. During the summer of 2015, flows from the upper weir were less than 0.5 cfs. At that rate and during summer conditions little or no flow was measured at the lower weir. Based on analysis of flows, losses are generally constant between October to January, then tend to increase during spring and summer months (April to September). This is expected as evapotranspiration rate increases in spring and summer in the canyon reach between the upper and lower weirs.

Plans

During FFY16, the USGS is proposing to continue to maintain the sites. In addition, the USGS will complete quarterly (access permitting) detailed flow measurements to insure accurate flow ratings. Site maintenance includes; quarterly data downloads (access permitting), site inspection, and complete leveling surveys between reference marks annually. Since the lower weir is subject to periodic removal during high flow events, the USGS will complete detailed flow measurements and leveling surveys after the lower weir is periodically replaced to insure accurate flow measurements are maintained. Data collected will be added to the USGS database with appropriate quality-control checks. Data collected as a result of this study will be used to determine daily and seasonal losses or gains along the Burnt Canyon reach.

Total cost for he above work is $20,820. Of this total, San Gorgonio will contribute $16,270 and subject to the availability of Federal Matching Funds (FMF), the USGS will contribute $4,550, as reflected in the summary funding table.

Total FFY 2016 cost for task 2 - $ 20,820

Future Work

To assist in future planning for the USGS and SGPWA cooperative program. The USGS has proposed work for FFY 2017. As stated in past agreements the CAWSC policy with respect to matching funds is on a first come basis, with priority going to multi-year agreements. This multi-year program will help the USGS plan for future Federal Matching Funds, the current program between the USGS and SGPWA is year to year and does not allow for the USGS to plan the allocation of future matching funds. The USGS is suggesting that the cooperative agreement be change to a multi-year agreement. This change does not obligate future funds for the USGS or the SGPWA and is for planning purposes only (Table 2.). In order to address questions concerning the interactions between the Cabazon Basin and the Coachella Basins, the USGS is proposing several monitoring wells, one monitoring well near the eastern boundary of the Cabazon basin, and one well near the western boundary of the Coachella Basin. These wells are needed to help determine groundwater gradients and better estimate groundwater interactions between basins. There are other locations within the basin where the understanding of the groundwater system could greatly improve with the installation of additional monitoring s, including the proposed recharge facility near Beaumont Avenue. Further discussion between respective staffs is need to determine the best approach to meet the research goals of the USGS and the groundwater management needs of the SGPWA.

References

U.S. Environmental Protection Agency, 2009, Drinking water contaminants, accessed November, 2009, at *http://www.epa.gov/safewater/contaminants/index.html*.