AGENDA
Borrego Valley Groundwater Basin: Borrego Springs Subbasin
Sustainable Groundwater Management Act (SGMA)
Advisory Committee (AC)
March 29, 2018 @ 10:00 AM – 3:00 PM
Location: University of California, Irvine
Steele/Burnand Anza-Borrego Desert Research Center
401 Tilting T Drive, Borrego Springs, CA 92004-2098

Remote Access: https://csus.zoom.us/j/196372386 **Call-In:** (408) 638-0968 **Meeting ID:** 196 372 386

Lunch: Lunch will be provided at no charge for Advisory Committee members and $10 for members of the public.

I. OPENING PROCEDURES [10:00 am – 11:00 am]
- **A.** Call to Order
- **B.** Pledge of Allegiance
- **C.** Roll Call of Attendees
- **D.** Review of Meeting Agenda
- **E.** Approval of January 25, 2018 AC Meeting Minutes
- **F.** Updates from the Core Team
    a. $1M Proposition 1 Funding
    b. Water Supply and Water Quality Act of 2018 with $35M Earmark for Borrego
    c. Other
- **G.** Updates from Advisory Committee Members

II. TECHNICAL AND POLICY ISSUES FOR DISCUSSION OR INTRODUCTION [11:00 am – 2:20 pm with lunch approximately 12:00 – 12:30 pm]
- **A.** Recommendation for Considering Human Right to Water Use – *Borrego Water District*
- **B.** Municipal Allocations – *Core Team*
- **C.** Projects and Management Actions to be Considered – *Core Team*
    a. Water Conservation and Efficiency Programs
    b. Agricultural Land Fallowing Program
    c. Intrabasin Water Transfer

III. INFORMATIONAL ITEMS [2:20 pm – 2:40 pm]
- **A.** Updates from Severely Disadvantaged Community (SDAC) Proposition 1 Grant Pre-Scoping Meeting held March 5, 2018
- **B.** Public Outreach Efforts
- **C.** Bill Mills Study

IV. CLOSING PROCEDURES [2:40 pm – 3:00 pm]
- **A.** Correspondence
- **B.** General Public Comments (comments may be limited to 3 minutes)
- **C.** Review Action Items from Previous AC Meetings, Next AC Meeting Date(s), and Next Steps

The next regular meeting of the Advisory Committee is tentatively scheduled for **May 31, 2018** at the UCI Steele/ Burnand Anza-Borrego Desert Research Center (*location is subject to change).

Please be advised that times associated with agenda are approximations only. Public comment periods will be accommodated at the end of each item listed for discussion and possible action. The duration of each comment period will be at the discretion of the meeting Facilitator. Any public record provided to the A/C less than 72 hours prior to the meeting, regarding any item on the open session portion of this agenda, is available for public inspection during normal business hours at the Office of the Borrego Water District, located at 806 Palm Canyon Drive, Borrego Springs CA 92004. The Borrego Springs Water District complies with the Americans with Disabilities Act. Persons with special needs should call Geoff Poole at 760-767-5806 at least 48 hours in advance of the start of this meeting, in order to enable the District to make reasonable arrangements to ensure accessibility. Borrego SGMA Website: http://www.sandiegocounty.gov/content/sdc/pds/SGMA/borrego-valley.html

MINUTES
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I. OPENING PROCEDURES

A. Call to Order

The meeting was called to order at 10:00 a.m. by Borrego Water District (BWD) President Beth Hart.

B. Pledge of Allegiance

Those present stood for the Pledge of Allegiance.

C. Roll Call of Attendees

Committee members: Present: Jim Seley, Jim Wilson, Rebecca Falk, Dave Duncan, Bill Berkley, Gina Moran, Ryan Hall, Jack McGrory, Diane Johnson

Core Team members: Beth Hart, BWD; Jim Bennett, County of San Diego; Geoff Poole, BWD; Leanne Crow, County of San Diego

Staff: Meagan Wylie, Center for Collaborative Policy; Wendy Quinn, Recording Secretary; Julia Chase, County of San Diego; Trey Driscoll, Dudek, GSP Consultant; Doug Baumwirt, Consulting Team

Public: Michael Sadler, *Borrego Sun*; Linda Haneline; Cathy Milkey, Rams Hill; Bill Haneline; Mike McElhatton; Ray Shindler, independent ratepayers; Martha Deichler; Ray Burnand

D. Review of Meeting Agenda

Meagan Wylie reviewed the meeting ground rules, Agenda and Brown Act provisions. Member Duncan asked if Item V.B, Updates and Comments from Advisory Committee Members, could be moved to new Item I.G during Opening Procedures. Upon motion by Member Duncan, seconded by Member Falk and unanimously carried, the request was approved.

E. Approval of November 27, 2017 AC Meeting Minutes

Upon motion by Member Moran, seconded by Member Johnson and unanimously carried, the Minutes of the November 27, 2017 AC Meeting were approved as amended (Section II.B amended to read: "Member Berkley noted that at least one of Rams Hill's wells had once been owned jointly by the BWD and Rams Hill. Rams Hill had owned 85% of well #12 until mid-2011 when the BWD bought Rams Hill's entire interest in the well from the previous Rams Hill owners. He pointed out that Rams Hill is now irrigating with non-potable water from its wells on Rams Hill property. Member Berkley suggested using aerial photos to determine the amount of irrigated acreage multiplied by the amount of water required by each crop (adjusted by local evapotranspiration rates) to estimate both golf course and agriculture water usage. This is preferable because the recreation and agriculture pumping records are incomplete and, in most cases, not available. Mr. Bennett said that if the farmers provide their extraction data to the Core Team by the end of the year [2017], the information would be reviewed to determine if it could be used instead of the estimates"; and add a hyphen to read "Anza-Borrego" in Section IV.A).

F. Updates from the Core Team

a. Proposition 1 Funding

Geoff Poole reported that Leanne Crow had compiled a Proposition 1 grant application on behalf of the Groundwater Sustainability Agency (GSA) and submitted it by the December deadline. The total amount of grant applications matched the funds available. A sum of ten million dollars is in a separate pool for Severely Disadvantaged Communities. A decision on allocation of grant funding by Department of Water Resources (DWR) is expected in February, and BWD is ready to move forward on the projects/efforts described in the grant application prior to award notification. The BWD Board will consider this at a February meeting, the 20th or the 28th.

b. Water Supply and Water Quality Act of 2018

BWD Director Brecht reported that BWD had been working with Sacramento on a public initiative bond for the 2018 ballot and encouraging local agricultural and recreational pumpers to contribute support. The bond includes a $35 million earmark for Borrego Springs, and it is very probable it will qualify for the ballot. A committee is currently discussing marketing for ballot support, and researching potential grant conditions, upon approval by the BWD Board. Grant funds may be used to reimburse expenditures for approved projects or put into escrow to be drawn upon. Funds must be spent within three years of award or they are returned to the State.

c. Groundwater Sustainability Plan (GSP) Development Schedule

Jim Bennett presented slides depicting the proposed GSP schedule for the next six months. Today the AC will again discuss baseline pumping allocations, i.e. the amount of water each groundwater pumper has prior to SGMA-related actions, and how to determine the amount for each pumper. Beginning in March and throughout the spring, Dudek's initial findings on projects and management actions to achieve sustainability will be available for AC input. A water trading program is also being investigated, as well as agricultural fallowing and management of fallowed land, and groundwater quality.

Mr. Bennett noted that another topic to be covered today is the water credits program, which has been used for a few years to mitigate new water extraction by developers. Dudek is looking at how to transfer that program into SGMA, and this relates to the water trading program. Other topics for further discussion include sustainability indicators and establishment of thresholds for undesirable effects of excessive groundwater pumping. In March, the AC will discuss how each sector (municipal, recreational and agricultural) may respond to water use reductions. Work is underway on a draft well metering plan by Dudek for discussion at a future AC. Hopefully, the Proposition 1 grant application will be approved by the March AC meeting; if so, it will be discussed at aforementioned meeting. In April through June, the AC will discuss a financing plan, fees and penalties, as well as SGMA-related regulatory land use changes.

Member Falk recommended a February AC meeting, noting that there are pending issues that the community needs to discuss, including the possible implementation of the recommendation on baseline pumping allocations made by the AC, and the Human Right to Water. Member Falk requested a briefing on the Human Right to Water law, now included in the California Water Code. Member Duncan shared her concerns. Mr. Bennett pointed out that the deadline for the first draft GSP is January 20, 2019, so there is some time for important discussions. Member Johnson supported the idea of community discussions on the effects of SGMA in February, and Member Hall thought it acceptable to wait until March for that discussion. Member Moran thought more discussion on socioeconomic effects was needed and suggested establishing deadlines for interim decisions. Member Berkley supported Member Falk's recommendations and asked the Core Team when the economic impacts to the community that GSP projects and management actions would be addressed. Further discussion followed, with AC and Core Team members pointing out the final 01/31/2020 GSP deadline and the aim to complete the draft by 12/19/2018 for public input several months in advance of approval by the County Board of Supervisors and BWD Board of Directors. Interim milestones related to socio-economic focused efforts will be established once there is a decision on the Proposition 1 grant application. Director Brecht reminded AC and public of the BWD Town Hall Meeting on March 28, 2018, which will be an opportunity for public updates and input. Mr. Bennett explained that the Core Team is addressing difficult and sensitive technical and legal issues and needs time in advance of the next AC meeting to frame them in an understandable way.

Member Moran suggested a scoping meeting in February for Proposition 1 socio-economic efforts, including input from the community. Member Wilson supported a February meeting, noting the need for better communication with the public. President Hart suggested that the Core Team discuss these issues during the lunch break. Leanne Crow pointed out that the Core Team was trying to develop a meeting schedule to ensure there is tangible technical material to discuss, with information that had been thoroughly investigated, before bringing issues to the AC. In this way, the CT would be ready to answer questions from the AC and public. She said the Core Team and consultants would not have time to adequately prepare technical materials for a February meeting. Public member Mike McElhatton supported the February meeting, opining that the non-technical components of SGMA should get attention equal to that of the technical aspects. He added that seasonal Borrego residents begin leaving at the end of March.

G. Updates and Comments from Advisory Committee Members

Member Duncan reported that many ratepayers expressed the concerns discussed today, i.e. that there are many competent technical people on the SGMA team, but this is really a socioeconomic issue for community members. Member Falk reported that the Sponsor Group is concerned about the quality of life after GSP adoption and would not support the recommended baseline pumping allocations until that was addressed more fully. Member Johnson reported that the Stewardship Council also wants the "big picture" addressed, as well as land use and redevelopment.

II. ITEMS FOR DISCUSSION AND POSSIBLE RECOMMENDATION

A. AC POLICY ISSUE #2: Baseline Pumping Allocation (BPA)

Mr. Bennett recommended that the baseline pumping allocation be based on the maximum one-year water use during a five-year period, January 1, 2010 through December 31, 2014, as discussed in the November meeting. He asked the AC members to look at this issue from the point of view of their constituents and hoped that they would reach a consensus today. Member McGrory supported the Core Team proposal, subject to working with the County on assumptions regarding how much water is actually being used on his properties. He expressed concern that Member Berkley's concerns form the previous meeting's discussion had not been addressed; i.e. Rams Hill Golf course had been closed for an extended period and the Borrego Springs Resort had closed nine of its twenty-seven holes during this proposed baseline allocation period. Mr. Bennett reported he was working with BWD and Rams Hill to address this unique situation as the allocation process is developed. Mr. Poole added that he works on it daily. It is a priority. Ms. Wylie explained that the issue before the AC today is a policy decision. The AC will address methodology in the future. Trey Driscoll explained that in the absence of pumping data, the consultants would look at amount of irrigated turf and apply the consumptive use published in the County Groundwater Ordinance.

Member Falk reported that the Sponsor Group favors using a ten-year average. Discussion followed regarding metering data from the farmers, and Member Seley had some metered data reports with him today which he distributed to the CT. Member Berkley said his constituents had discussed the baseline pumping allocation but hadn't voted. They all have individual concerns. Member Moran expressed the State Park's support for the five-year maximum. Public member Cathy Milkey stated that the proposed five-year period is not acceptable to Ram's Hill because of the temporary fallowing of the golf course. She asked that a different methodology be used for that golf course.

The AC voted on the following Policy Issue: *The baseline pumping allocation will be developed based upon the highest annual water consumption during the 5-year period from January 1, 2010 through December 31, 2014. The pumping allocation will take into account water use by all pumpers within Borrego Springs Subbasin. Do you recommend a Baseline Pumping Allocation (prior to any SGMA required reductions) using the highest annual water consumption based upon the five-year period from Jan. 1, 2010 thru Dec. 31, 2014?* Using the established comfort levels (1- Agree wholeheartedly; 2- Accept as best option; 3- Can live with it but not enthused; 4- Do not fully agree and want to register view, but don't want to block the decision so will stand aside; 5- Need more work before consensus; and 6- Wants to block the decision), the vote was as follows: Member Falk 5, Member Wilson 2, Member Duncan 4, Member Hall 1,

Member Berkley 5, Member Moran 2, Member Johnson 3, Member Seley 3, Member McCrory 2. As the AC failed to reach consensus, the Core Team will make the decision.

The Committee broke for lunch at 12:10 p.m. and reconvened at 12:40 p.m.

President Hart noted that a socioeconomic study is included in the Proposition 1 grant application, and per the requests made by the AC during the morning discussion period, a scoping meeting with the consultant was planned. It is tentatively scheduled for early March. The AC and Core Team will be notified by e-mail when it is confirmed.

III. TECHNICAL AND POLICY ISSUES FOR INTRODUCTION OR DISCUSSION

A. Sustainability Indicators

Mr. Driscoll reported on the groundwater monitoring results since fall, 2017. Thirty-six wells were included. Graphs and data were presented for each of the three management areas (North, Central and South). The North and Central areas showed continuing declines in groundwater elevation, but in the South there was variation. This may be in part because for a time Rams Hill Golf Course was getting its water from the Central area, but is now using its own wells; plus, the course was closed in 2014-15. Mr. Driscoll noted that the highest groundwater elevations are in Coyote Creek and the De Anza area.

The groundwater quality in the monitoring wells was also tested. The tests were for arsenic, fluoride, radionuclides, nitrate, sulfate and total dissolved solids. The arsenic levels in the North Management Area do not yet show trends because more samples are needed, but all wells tested were at a level acceptable for drinking, as were those in the Central and South Management Areas. Continued semi-annual monitoring is planned. Mr. Driscoll went on to summarize the results of testing for other contaminants in the three Management Areas. Ray Shindler inquired about soil monitoring, and Mr. Driscoll agreed to come back to this topic at a future time.

Doug Baumwirt of Geosyntech, part of the GSP Consulting Team, reminded the AC of the sustainability indicators, lowering of groundwater level, reduction in storage and degradation of water quality. The GSA needs to develop measurable objectives for reaching groundwater sustainability, interim milestones in four to five-year increments, undesirable results and minimum thresholds. Each Management Area should have at least one monitoring well and may have several. Mr. Baumwirt showed slides depicting possible well sites and graphs of sustainability indicators. Director Brecht recommended including dynamics such as climate change in modelling efforts.

B. Water Credits Program

Ms. Wylie announced that the water credits program would be on the AC Agenda for March. President Hart explained that the program allows farmers to fallow their land in exchange for water credits, which are offered both by the County and BWD. Mr. Driscoll reported that 1,885.5 water credits have been issued, 45.5 retired and 1,840 available. To determine whether credits could be included in the baseline pumping allocation, he took the maximum allowable acreage for all credit sites, determined the crop types and used the consumptive use factor, then compared the baseline to the credits to determine conformance. They were comparable. He recommended that acceptable water credits be converted to baseline pumping allocations and included in the GSP, and that the water credit program be dissolved and replaced with a GSA water trading program. The County staff will put Mr. Driscoll's slides on the County website and will present more details on the water trading program at the March AC meeting. Mr. Bennett explained that the baseline pumping allocations could be traded and used for development like the water credits.

C. Projects and Management Actions to be Considered

Mr. Bennett referred to the AC's discussion in April regarding types of projects that would be useful for achieving sustainability. The list of projects to be presented today will be discussed further in March. Mr. Baumwirt presented a preliminary list of six projects and management actions, noting that more could be added and he welcomed suggestions. Those listed were the water trade program, water conservation and efficiency programs, modification of land use designations, agricultural land fallowing, groundwater quality mitigation, and intra-basin water transfer. Mr. Baumwirt showed a chart depicting how these projects relate

to each other. Member Moran requested an example of how these projects would support the allocation and reduction system in March.

IV. INFORMATIONAL ITEMS

A. Fall 2017 Groundwater Monitoring – Groundwater Levels and Water Quality

This item was presented previously.

B. Public Outreach Efforts

Mr. Poole reported that he had been working with Member Duncan on the ratepayers' meetings. Information on the GSP process is being included in the BWD water bills. Member Falk suggested including Member Duncan's contact information on water bill inserts. Mr. Poole further reported that the BWD website now includes a list of water studies transferred from the old BWD website. The new site is continually improved and updated, and suggestions are welcome. Member Johnson suggested posting flyers on the bulletin boards around town and including information on social media sites.

Member Falk inquired about forming AC subcommittees, as discussed at the last meeting. Ms. Wylie explained that the AC can form ad hoc subcommittees as long as they are not on a set meeting schedule or for a long period of time and less than a quorum participates. President Hart added that small groups could work informally before the next AC meeting, but in order to actually form a subcommittee it would have to wait until the next meeting.

V. CLOSING PROCEDURES

A. Correspondence

None.

C. General Public Comments

None.

D. Review Action Items from Previous AC Meetings, Next AC Meeting Date(s), and Next Steps

The next AC meeting was scheduled for March 29. Ms. Wylie asked that anyone with questions e-mail her.

There being no further business, the meeting was adjourned at 3:00 p.m.

March 29, 2018

TO: Advisory Committee

FROM: Core Team

SUBJECT: Item II.A: Policy for Human Right to Water Use

The human right to water derives from the United Nations Human Rights Council (UN Resolution 64/292, 2010). California became the first state in the nation to legally recognize the human right to water with the adoption of Assembly Bill (AB) 685 that was signed into law by Governor Jerry Brown on September 25, 2012. AB 685 states, "It is hereby declared to be the established policy of the state that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes" (Water Code §106.3).

AB 685 creates an ongoing obligation for state agencies to explicitly consider the human right to water in every relevant agency decision and activity. The California Water Code requires all relevant state agencies, specifically Department of Water Resources, the State Water Recourses Control Board, and California Department of Public Health, to "consider" how state actions impact the human right to water (Water Code §106.3 et seq.).

The Core Team will present an analysis of the human right to water for existing eligible equivalent dwelling units (EDUs).

March 29, 2018

TO: Advisory Committee

FROM: Core Team

SUBJECT: Item II.B: Municipal Allocation

Based on the proposed human right to water for existing eligible equivalent dwelling units (EDUs), the Core Team will present a hypothetical municipal baseline pumping allocation for the Borrego Water District.

March 29, 2018

TO: Advisory Committee

FROM: Core Team

SUBJECT: Item III.C Projects and Management Actions to be Considered

The Core Team has identified six projects and management action categories to be evaluated as part of the Groundwater Sustainability Plan. The six projects and management action categories include:

1. Project 1 - Water Trading Program
2. Project 2 - Water Conservation and Efficiency Programs
3. Project 3 - Modification of Land Use Designations
4. Project 4 - Agricultural Land Fallowing Program
5. Project 5 - Groundwater Quality Mitigation Program
6. Project 6 - Intrabasin Water Transfer

For the March AC meeting additional information will be provided regarding three of the six projects:

1. Project 2 - Water Conservation and Efficiency Programs
2. Project 4 - Agricultural Land Fallowing Program
3. Project 6 - Intrabasin Water Transfer

PROJECTS AND MANAGEMENT ACTION #2: Water Conservation and Efficiency

Opportunities exist for water savings through implementation of water conservation programs and measures. In addition to reducing the need for basin groundwater extractions, such programs increase awareness of water as a critical resource, provide opportunity for user participation and input, and demonstrate a commitment by the Groundwater Sustainability Agency (GSA) and Borrego Water District (District) to efficient water use.

There is precedent for proactive water management and conservation within the Borrego Springs Subbasin including a tiered water rates structure, rebate programs for low water use toilets and appliances, and incentivizing turf removal and replacement with xeriscaping. There are additional opportunities to implement conservation both by the District and in cooperation with State and County agencies. A potential cost/benefit analysis is possible for some programs; while others may be evaluated qualitatively.
Potential programs were evaluated for the Agricultural, Municipal and Recreational sectors. In addition, some programs and actions are applicable to multiple sectors and are listed as General Programs, below:

General Programs:

- Conservation Coordinator – This individual may coordinate conservation programs and outreach with water users and County and State entities, thereby maximizing the benefits of a comprehensive conservation program.
- Conservation Webpage – A dedicated webpage provides water user access to a variety of tools and information related to conservation. A webpage specific to the Borrego Springs community may be

created and maintained as a high school project, similar to that prepared for the District's general website.

- Membership in the California Water Efficiency (CWEP) Partnership – Membership in CWEP provides access to state-wide collaboration and tools related to conservation and water efficiency. The cost is variable and is determined upon application.
- School education programs – Typically targeting kindergarten through high school, programs provides curricula, videos, and activities specific to water conservation.

Agriculture:

Agricultural groundwater use is the largest of the sectors and therefore represents a significant opportunity for potential reduction. It is assumed that SGMA compliance will require the enactment of pumping fees, and these, in addition to existing costs related to pumping will provide significant economic incentives to reduce groundwater extractions for agricultural use.

- Irrigation Audits – Evaluations may include irrigation distribution uniformity (DU), irrigation methods, system sizing, and operation. Soil surveys include soil type, depth, and texture. The use of lysimeters allows for measurement and adjustment of the water infiltrating past the crop root zone. Evaluations may be conducted (and potentially paid for) by Resource Conservation Districts or universities and result in a report with recommended actions (both physical and operational) for the reduction of water use.

Municipal (Outdoor):

Approximately 75% of municipal water use is for outdoor use. Therefore, outdoor conservation programs will have the most impact. A reasonable range for a conservation goal is from 10% to 25% for the municipal sector. This equates to from 167 AFY to 419 AFY of the approximately 1678 AFY produced per year (District Water Savings Summary, December 2017). Potential water savings programs in the municipal sector are described below:

- Homeowner Association (HOA) Landscape Reduction – The removal or replacement of non-essential communal turf.
    - Approximate Water Savings: **66 AFY**
    - Estimated Cost per AF of Water Saved over 25 years: **$339**
- Homeowner Association (HOA) Irrigation Efficiency Improvements – Assessment and improvement of irrigation methods and equipment.
    - Approximate Water Savings: **26 AFY**
    - Estimated Cost per AF of Water Saved over 25 years: **$1200**
- Landscape Irrigation Audits – An evaluation of irrigation methods and soil types, similar to that for agriculture, may be conducted for commercial and residential landscaping.
- Smart Irrigation Controllers - Smart Irrigation Controllers utilize data from real-time weather stations to automatically adjust watering schedules and amounts.
- Information Availability – Tools available to municipal users, typically via a website, include a *landscape watering calculator* which refine watering quantity based on location, soil types, and irrigation systems and a *watering index* which provided a daily percentage by which controllers may be reduced based on real-time weather conditions.

Municipal (Indoor):

As noted, there is relatively little potential for large water savings in the indoor municipal sector. In addition, some indoor conservation programs have previously been implemented. Such programs may include shower head exchange, indoor water audits, and rebate programs for low water use toilets, clothes washers, and water heaters. Recent relaxing of State plumbing codes have facilitated the ease of greywater utilization from

showers, clothes washers, and wash basins. Where installed, such systems may provide significant water savings for outdoor irrigation.

Recreation:
Recreational water savings opportunities are primarily within the Subbasin's golf courses. Existing non-essential turf may be converted to low water, native landscaping. In addition, existing irrigation practices may be evaluated and improved with potential cost and benefit as shown below (aggregated for all of the golf course acreage):

- Conversion of Irrigated Turf to Native Landscaping:
    - Approximate Water Savings: **471 AFY**
    - Estimated Cost per AF of Water Saved over 25 years: **$128**
- Irrigation System Management
    - Approximate Water Savings: **203 AFY**
    - Estimated Cost: **$66,800 per year or $1,670,000 over 25 years**

Management Action #2: Water Conservation and Efficiency is an important project to implement in order to improve the long-term water conservation and efficiency of the Subbasin. Over the SGMA implementation period, the Municipal and Recreation sectors will become a larger percentage of overall Subbasin groundwater use as agricultural land is fallowed. Thus, it will be important that all sectors become highly efficient. A detailed cost-benefit analysis will be completed for potential water conservation and efficiency projects and a competitive process developed to select projects to be implemented.

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PROJECT AND MANAGEMENT ACTION #4: Agricultural l Land Fallowing Program

As the largest water use sector in the Borrego Valley Subbasin, permanent fallowing of agriculture will be required to achieve sustainability. Fallowing consists of conversion of irrigated land to potentially open space/public lands, and development. Modification of land use designation is a separate Project and Management Action that will be considered as part of the GSP.

Acquisition of land to provide for transfer of baseline pumping allocation is being examined in detail. Potential acquisition costs are being examined. As part of acquisition cost analysis, several factors require consideration. These factors include land value, water rights value, fallowing costs, and legacy costs such as proper abandonment of water wells, removal of infrastructure and land restoration.

Additionally, an evaluation of environmental conditions, such as an environmental site assessment, will be required to identify recognized environmental conditions and risk-based threat to the environment and human-health. For agricultural properties, this typically includes evaluation of historical use of pesticides and fertilizers, potential impact to groundwater quality, and potential for health impacts due to migration of airborne dust emissions when the properties become fallow.

To begin the assessment of permanent fallowing, Dudek reviewed all water credits projects fallowed to date to assist with developing fallowing standards. To date, nine projects have been fallowed representing 560 acres within the Subbasin. The Core Team will present preliminary findings of fallowed sites and challenges associated with fallowing practices including airborne emissions through wind-blown dust, invasive plant species, and visual blight. A framework that provides a review of restoration feasibility in fallowed orchards and best practices for fallowing orchards is needed to support future decision-making under implementation of the GSP.

Factors that should be considered when evaluating future land use and fallowing priorities include:

- Risk of airborne emissions, which varies by site conditions such as soil texture (finer particle soils have a higher risk for airborne emission), landscape position (topography, wind corridors, etc.), ground cover (vegetative and otherwise), etc.
- Potential future land use options for fallowed lands including open space/public lands, and development.
- Relative water reduction on a per acre basis (groundwater pumping, ET loss, etc.)
- Probability of success
- Proximity to natural open space

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PROJECT AND MANAGEMENT ACTION #6. Mitigation Though Intrabasin Water Transfers

Transfer of water from outside of the Borrego Springs Subbasin (Subbasin) (i.e. Interbasin water transfer) has been extensively studied. Previous interbasin water transfer projects evaluated include: Clark Dry Lake, Ocotillo Wells Subbasin (San Diego County), Allegretti Farms—Ocotillo Wells Subbasin (Imperial County), San Diego County Water Authority Storage Project, Lake Henshaw, Southeast California Regional Basin Study (U.S. Department of the Interior Bureau of Reclamation) and Coachella Valley Water District—Imperial Irrigation District pipeline. All potential interbasin water transfer alternatives have been determined to not be economically viable at this time. Further study is not warranted as part of preparation of the Groundwater Sustainability Plan.

The GSA is considering development of an Intrabasin Water Transfer Plan for the Subbasin. Intrabasin water transfers involve potential transfer of water within the Subbasin among the North, Central and South Management Areas to manage groundwater resources sustainability. The purpose of the plan would be to mitigate existing and future reductions in groundwater storage and groundwater quality impairment by establishing conveyance of water from alternative areas in the Subbasin. This involves evaluation of both short-term and longer-term projects.

In the draft funding recommendations for the Proposition 1 Grant, there is funding available to complete a Water Vulnerability/New Well Site Feasibility Study including ranking of potential potable water well drilling targets and an update of the District's WaterCAD Model to evaluate existing hydraulic capacity of District pipelines and feasibility of proposed capacity improvements. The goal of the analyses will be to identify a drilling target for the installation of a monitoring well to characterize subsurface lithology and water quality for ultimate drilling of a new production well for the District. In addition to the single monitoring well included in the Proposition 1 grant, several other potential well locations will be located for future District production wells. In particular, several project alternatives will be evaluated to allow for transfer of water among the North, Central and South Management Areas. This will include transfer of water for both potable and non-potable use.

Borrego SGMA Advisory Committee (AC) & Core Team (CT)

Work Planning & Timeline Chart

Draft Version 03/21/2018

Date	Meeting / Milestone / Action	Topics to Discuss / Notes
March 2018		
March 5, 2018	**Borrego SGMA Socioeconomic Community Meeting** UCI Research Center 5:30pm – 7:30pm	• GSP Overview • Proposition 1 Overview • Community Input Session
March 28, 2018	**Borrego Town Hall Meeting** Performing Arts Center 4:00 – 5:30 pm	

March 29, 2018	**Borrego AC Meeting #10**
	UCI Research Center
	10:00am – 3:00pm
		• Discussion of Sector Reductions and Allocations (Agricultural, Municipal, and Recreational)
		• Initial Discussion of Projects and Management Actions
		  ○ Water Trading Program
		  ○ Water Conservation and Efficiency Programs
		  ○ Land Use
		  ○ Agricultural Land Fallowing Program
		  ○ Groundwater Quality Mitigation Program
		  ○ Intrabasin Water Transfer
		• Discussion of draft Well Metering Plan
		• Prop 1 Grant Tasks (tentative): Decision Support System Model, GoldSim Applicability, SDAC Community Engagement, CEQA documentation, etc.

April 2018 through June 2018		

Dates TBD
 	
(May 30th AC #11, to be confirmed)
	Borrego AC Meeting #11, #12, etc.
	Location TBD
	10:00am – 3:00pm
		• Projects and Management Actions
		  ○ Water Trading Program
		  ○ Water Conservation and Efficiency Programs
		  ○ Land Use
		  ○ Agricultural Land Fallowing Program
		  ○ Groundwater Quality Mitigation Program
		  ○ Intrabasin Water Transfer
		• Financing Plan (Fees and Penalties)
		• Potential Regulatory Changes (Land Use, Ordinance Amendments, etc. for implementation of GSP)

Dates TBC	**Borrego SGMA Socioeconomic Community Meetings & Associated Efforts**	•
Fall / Winter 2018		
-	**Draft GSP Development Continues**	• Dudek continues efforts to draft comprehensive Borrego Valley Subbasin GSP
December (TBC)	**Draft GSP available for public review and comment**	
Summer 2019		•
-	**GSP Adoption by BWD and County Boards of Supervisors**	

February 5, 2018

TO: Borrego Springs GSP Core Team Members, Borrego Water District Board Members, Geoff Poole

At the January 4, 2018 Borrego Sponsor Group meeting, an important issue arose during the discussion of Borrego Country Club Estates (DS24) as part of a larger decision to submit a letter from the Sponsor Group to San Diego County as part of the Supplemental EIR for Property Specific Requests for a General Plan Amendment.

A Sponsor Group member brought to our attention that if Borrego Springs is to provide its residents and visitors with 24/7 walk-in medical care (somewhere between an urgent and the emergency room) and a pharmacy open 24/7, that we need to have a full time population of 8000.

The Sponsor Group continues to express its concern about the overdrafted aquifer and implications for land use decisions as a result of limitations water use may place on the town. At the same time, we want Borrego Springs to prosper and it is well known that the lack of more comprehensive medical facilities is a problem for many residents.

We would like to see a study of whether a goal of 8000 residents is possible given water use restraints under SGMA and what paths would make that possible. What is the sustainable population of Borrego under conceivable scenarios? At what costs? This is very important information for the Advisory Committee and the GSA to consider as soon as possible as decisions get made going forward. Having an idea of what our community may look like and at what cost to ratepayers as a consequence of possible GSP decisions is important to every Borregan.

Sincerely,

Rebecca Falk

Rebecca Falk

Rebecca Falk, Chair, Borrego Community Sponsor Group and Member of the Advisory Committee for the Groundwater Sustainability Plan

Letter approved by Borrego Springs Community Sponsor Group at the February 1, 2018 meeting.

Tubb Canyon Desert Conservancy

February 6, 2018

GSA Core Team
Borrego Water District Board of Directors
Geoff Poole

To Whom It May Concern:

I am writing in follow up to my letter of August 29, 2017 to the Core Team, which I have enclosed for ease of reference. In that letter I requested to know **the analytical basis for using the year 2040 as the target date for the Borrego Basin to reach sustainable yield.** Thus far I have received no information regarding my question.

If there is an analytical basis for the use of 2040 as the target date for sustainable yield, please forward it to me or direct me to it. If there is no analytical basis for using 2040 as the target date, what efforts have been, or will be, undertaken to establish an analytically valid target date for the Borrego Basin to reach sustainable yield.

In my view, establishing a valid target date for sustainable yield is one of the more critical issues confronting the GSA's. The most brilliant, comprehensive, community-supported Groundwater Sustainability Plan that has 2040 as a target date would be utterly worthless if the target date that would leave us with a viable community is really 2030. We must have this information if the GSP is to have credibility.

I look forward to your response to this specific question at your earliest convenience.

Sincerely yours,

J. David Garmon, M.D.
President, Tubb Canyon Desert Conservancy

Tubb Canyon Desert Conservancy
8899 University Center Lane #170, San Diego, CA 92122 ✱ 858.535.9121 ✱ contact.tcdc@tubbcanyondesertconservancy.org
www.TubbCanyonDesertConservancy.Org

Tubb Canyon Desert Conservancy

August 29, 2017

Jim Bennett
Leanne Crow
Core Team, San Diego County
Borrego Valley GSP

Dear Mr. Bennett and Ms. Crow,

I have noticed the current groundwater sustainability planning process is using what I understand to be the arbitrary date, legislated in SGMA, of 2040 as the deadline by which the Borrego Basin must achieve sustainability. **What is the analytical basis for using the 2040 date for the Borrego Basin to reach sustainable yield?**

Given the risk of water quality degradation as the water table continues to decline in the Borrego Basin and the attendant economic costs of treating degraded water, I am concerned about the use of 2040 as the deadline for achieving sustainable yield in the Borrego Basin, and I am therefore requesting the analytical basis for using the 2040 date.

If there is data to support the use of the 2040 date for the Borrego Basin, I would like to see it. On the other hand, if there is no objective, analytical basis for using 2040 as the date for achieving sustainability in the Borrego Basin, I am concerned we could be on a path to an undesirable outcome, i.e. that we reach sustainable yield by 2040, but that the cost of treating degraded groundwater is so great that Borrego Springs dies an economic death.

Additionally, if there is no analytical basis for the use of the 2040 date, what actions are being taken to discern an appropriate date for the Borrego Basin to achieve sustainability such that the undesirable outcome described above can be avoided.

I look forward to hearing from you at your earliest convenience.

Sincerely,

J. David Garmon, M.D.
President, TCDC

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www.TubbCanyonDesertConservancy.Org

Comments by Agricultural Alliance for Water and Resource Education (AAWARE)
March 5, 2018 Advisory Committee Meeting
Regarding Public Input on Socio Economic and Other Issues Related to Development of the Groundwater Sustainability Plan for Borrego Springs

The Agricultural Alliance for Water and Resource Education ("AAWARE") is comprised of most of the agricultural well owners in Borrego Valley. AAWARE seeks to protect and preserve the Borrego Basin groundwater resources. To that end, AAWARE is a member of the Borrego Water Coalition, and two of AAWARE's members serve as agricultural representatives on the Advisory Committee to the Borrego Valley California Groundwater Basin ("Borrego Basin") Groundwater Sustainability Agency ("GSA").

When the Sustainable Groundwater Management Act ("SGMA") was enacted, the Legislature adopted the following State policy:

> It is the policy of the state that groundwater resources be managed sustainably for long-term reliability and multiple economic, social, and environmental benefits for current and future beneficial uses. Sustainable groundwater management is best achieved locally through the development, implementation, and updating of plans and programs based on the best available science.

(Water Code section 113.) AAWARE is pleased to submit the following comments for consideration as part of this effort.

1. Listening Session

- Present Day: Issues and Concerns Related to Water Quality, Availability and Usage
    - Information about present day agricultural water use was previously provided to the Advisory Committee.
    - The Borrego Water District's ("BWD") November 2015 Water Operations Report indicates that Improvement District 4 has a system loss of 16.9%. Much lower losses were reported for Improvement Districts 1 and 3. Combining the data for Improvement Districts 1 and 3, we see that a 2.4% loss is attainable. The system loss in Improvement District 4 should be reduced to achieve efficiency closer to that of Improvement Districts 1 and 3. As discussed below, funding is earmarked for BWD programs including end-use efficiency in the 2018 water bond measure.

- GSP Implementation Concerns: Impacts on Rate Payers; and Economic Impacts

    - The USGS groundwater basin model is overestimating groundwater level declines. Page 15 of the October 26, 2017 Advisory Committee Agenda packet says, regarding Dudek's calibration of the USGS Model, "the model is overestimating groundwater level decline in some areas of the aquifer", and that the model may be "overestimating pumping, underestimating recharge, underestimating water stored in the aquifer, or some combination of these three factors." The Department of Water Resources' ("DWR") draft Sustainable Management Criteria Best Management Practices ("BMP") explains that "A GSA will need to understand the basin's physical condition, the overlying management and legal structures, and the basin's water supplies and demands prior to developing sustainable management criteria." (DWR [Draft] Sustainable Management Criteria BMP, p. 3.) The model should be corrected before the sustainability criteria are approved (including the 70% water reduction) in order to avoid undue socioeconomic burdens on the Borrego Valley community.

    - A study commissioned by San Diego County ("County") in 2015 concluded that agriculture has a 1.62 multiplier effect. Whatever the actual crop price is multiplied by 1.62 gives the true value of agriculture to the local economy. The multiplier accounts for business-to-business transactions and payment for services as well as employee and owner spending. For instance, in 2016 the value of all crops in the county was $1.746 billion. Multiply that by 1.62 and it gives a total value to the County's economy of $2.83 billion. A proper economic impact analysis should account for such direct losses due to reduction in agricultural production.

    - The reduction or loss of agriculture would also have indirect economic impacts on the community. A proper economic impact analysis should evaluate impacts such as the effect on local ratepayers due to the reduction in agricultural contribution to electricity and gas transmission to the area, impacts to local schools due to reduction in agricultural employment base, etc.

2. Identifying Solutions that Work

- The Groundwater Model should be corrected and validated with DWR support as necessary to appropriately define "undesirable results" and sustainable management criteria

The first step of stakeholder engagement is to properly inform the stakeholder. (DWR Stakeholder Communication and Engagement Guidance Document, p. 4.) As discussed in Dudek Consultants' slides 19-22 at the October 27, 2017 Advisory Committee

Meeting and as further discussed by the AAWARE January 24, 2018 Agricultural Water Use Survey and Report, there is not yet a working groundwater model and the analyses to date have not included best available data for agricultural irrigation water production and return flows.

The foundational step for a GSP is to obtain correct basin information. "A GSA will need to understand the basin's physical condition, the overlying management and legal structures, and the basin's water supplies and demands prior to developing sustainable management criteria." (DWR [Draft] Sustainable Management Criteria BMP, p. 3.) "A thorough understanding of the historical and current state of the basin is necessary before sustainable management criteria can be set. Much of the understanding is gained in the development of a hydrogeologic conceptual model, water budget, and description of groundwater conditions." (*Id.*) It is only after that correct foundation is laid that sustainable management criteria can be evaluated with appropriate public involvement.

Without a working model and supportable water budget, the true extent of overdraft and contribution by the various constituents cannot be reliably determined or meaningfully resolved through the GSP stakeholder input process: "When setting sustainable management criteria, GSAs must consider the beneficial uses and users of groundwater in their basin. Consideration of the potential effects on beneficial uses and users underpin the minimum thresholds." (DWR [Draft] Sustainable Management Criteria BMP, p. 3.) Without a working model and reliable water budget, minimum thresholds and other GSP sustainable management criteria cannot be reliably determined.

- Additional study should be undertaken with DWR support to assist in correcting and refining the groundwater model

  1) It is recommended that DWR funding be sought by the GSA to install lysimeters (which record the amount of water percolating through the soil) to more accurately measure irrigation return flows. Funding is available under the DWR's Sustainable Groundwater Management Program whose initial focus is for the very purpose of providing technical assistance to GSAs in the development of their GSPs for critically overdrafted basins.

  2) The GSA should obtain DWR technical support to develop a graphic model of the Borrego Basin based on available well logs, and if necessary, additional soil data. DWR technical support is available particularly to GSAs in critically overdrafted basins.

  3) The GSA should obtain DWR technical support to identify inaccuracies in the model as necessary to verify the model. Until a verified model is developed, GSP program elements such as the basin's sustainable yield and production allocations should be considered only interim measures.

4) The portion of agricultural irrigation resulting in return flows to the basin (potentially 41% based on best available information) should be calculated and agricultural recharge to the basin should be credited against agricultural production restrictions.

5) The current irrigated agricultural acreage in Borrego Valley should be verified to determine whether there is any additional irrigated agricultural acreage not included in AAWARE's January 24, 2018 Agricultural Water Use Survey and Report.

- Sustainable management factors including undesirable results, minimum thresholds and sustainable yield should be defined after correcting the model and receiving community input

The Agenda Package for the March 5 meeting incorrectly says that there is a "state mandated goal that requires an approximately 70% groundwater use reduction by 2040." (March 5, 2018 Agenda Packet, p. 2.) That statement puts the cart before the horse. Rather, under SGMA, "GSAs will need to set minimum thresholds at representative monitoring sites for each applicable sustainability indicator after considering the interests of beneficial uses and users of groundwater, land uses, and property interests in the basin." (DWR [Draft] Sustainable Management Criteria BMP, p. 8, emphasis added.)

The GSP development process must proceed with interested party input, not merely obtain interested party comment after the fact: "The GSP must discuss how groundwater conditions at a selected minimum threshold could affect beneficial uses and users. This information should be supported by a description of the beneficial uses [of] groundwater and identification of beneficial uses, which should be developed through communication, outreach, and/or engagement with parties representing those beneficial uses and users, along with any additional information the GSA used when developing the minimum threshold." (DWR [Draft] Sustainable Management Criteria BMP, p. 9; see also Water Code, § 10727.8 [active involvement of all elements of the population during development of GSP].)

As discussed above, the 70% cutback measure is based on a groundwater model that does not accurately estimate the basin's sustainable yield and is not required by the state. Among other things, the 2015 USGS model and report do not appear to account for the amount of groundwater in storage that might allow for production from the basin without causing any locally determined undesirable result. The minimum thresholds for chronic overdraft are not defined in terms of groundwater use or consumption, but instead are defined in terms of groundwater levels. (DWR [Draft] Sustainable Management Criteria BMP, pp. 10-11.) Minimum thresholds may be selected by a GSA at groundwater levels below currently existing levels. (*Id*, pp. 28-29.)

Undesirable results are defined in terms of minimum threshold exceedances, which are determined locally by each GSA as part of the flexible GSA stakeholder process: "The

GSP Regulations require undesirable results to be quantified by minimum threshold exceedances. GSAs have significant flexibility in defining the combinations of minimum threshold exceedances that constitute an undesirable result. GSA should evaluate multiple spatial scales when setting the criteria for undesirable results." (DWR [Draft] Sustainable Management Criteria BMP, p. 23.) Fortunately, there is flexibility in the Borrego Valley Basin, unlike other critically overdrafted basins experiencing a "basinwide loss of domestic well pumping capacity." (*Id.*, p. 6.)

Rather than requiring a 70% cutback in production, the Core Team should work with the stakeholders to determine appropriate groundwater levels, with cutbacks implemented if the groundwater levels fall below the defined minimum thresholds.

- Significant infrastructure leakage should be repaired

  The source of BWD Improvement District 4's system leakage should be verified and repaired. The 2018 bond measure includes $35 million in funding for BWD programs such as water end-use efficiency.

- A program should be developed to fund agricultural land acquisition and/or fallowing and to provide for landowner pumping rights transfers.

  The details of funding for agricultural land acquisition and fallowing, and for transfer of production rights should be agendized for discussion at the upcoming Advisory Committee meeting. The Borrego Water Coalition recommended a program to fund agricultural land acquisition and/or fallowing and to provide for landowner pumping rights transfers. The Coalition members made it clear that without such a program, support for the Policy Recommendations from all members of the Coalition should be considered non-binding.

  The 2018 bond measure proceeds are intended to expand water supplies primarily through the purchase and preservation of agricultural lands and water rights, and investment in agricultural water conservation programs, among other authorized uses of any bond proceeds.

- A program should be developed to fund agricultural water use efficiency for remaining agricultural operations

  The 2018 bond measure funding for end-use efficiency also could be used to improve agricultural water use efficiency for agricultural operations desiring to remain in operation. This could reduce the loss of agricultural production and the resulting direct and indirect socioeconomic benefits contributed by the agricultural sector.

- A proper socioeconomic impact study should be completed

  It is unclear from the Agenda Packet what constituencies the socioeconomic impact/demographic analysis will focus on. The scope of work should be provided at the upcoming Advisory Committee meeting. It appears that the study may be focused on the Severely Disadvantaged Community ("SDAC"). However, impacts to SDAC are only a part of the equation. SGMA is clear that the interests (economic and other) of all beneficial uses and users of water must be considered, including agricultural users. (Water Code, § 10723.2.)

  Other factors should be studied through the Advisory Committee process, including: composition of the local economy, connection of each economic sector to water use, employment composition of each economic sector, population demographics, sales level composition, labor profile, government and private sector data, etc.

County of San Diego

MARK WARDLAW
DIRECTOR

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KATHLEEN A. FLANNERY
ASSISTANT DIRECTOR

March 21, 2018

Jim Seley
Agricultural Alliance for Water and Resource Education
1675 Euclid Avenue
San Marino, CA 91108
Jim@SeleyCo.com

SUBJECT: AAWARE AGRICULTURAL WATER USE SURVEY AND REPORT—2017

Dear Mr. Seley:

The Borrego Valley Groundwater Sustainability Agency (GSA) appreciates submittal of the Agricultural Water Use Survey and Report—2017 (Survey and Report) by the Agricultural Alliance for Water and Resource Education (AAWARE). While the GSA is hopeful that the information contained in the Survey and Report will be useful in developing the Borrego Valley Groundwater Basin Groundwater Sustainability Plan (GSP), additional information is required to ensure the GSP is technically sound and developed in accordance with industry-accepted standards.

In the Survey and Report, Table 1 presents Borrego Valley Agricultural Water Production and Calculated Unit Values Compared with Coachella Valley.

The aggregate data presented in Table 1 includes 1,219 acres of crops with metered water use data. Additionally, water use is estimated for 2,320 acres of unmetered crops for a total of 3,539 acres representing "89% of total agricultural acreage [3,976 acres] calculated by the Borrego Water District (BWD) in 2015". Thus, about 34% of the 3,539 documented crop acreage in the Survey and Report has metered data.[1]

The metered data is only presented in aggregate and it is uncertain if the metered data presented is from a single calendar year (e.g. 2016) or water year (e.g. 2016/2017) or from multiple years (e.g. Farm A from 2010 and Farm B from 2017). The GSA requests clarification of when the metered data was collected and if all the data was collected from the same timeframe.[2]

[1] 1,219 acres metered water use / 3,539 acres total acreage in the Survey and Report = 34% (rounded).
[2] Noted on page 9 of the Survey and Report that some of the data is from 2015 and 2016 and some is from the base period but uncertain when the data metered was actually collected.

Additionally, in order for the metered water use data to be validated by the GSA, it is necessary to present data on the individual level and include specific identification of the well and flow meter type, San Diego County Assessor's Parcel Number (APN) for each parcel served by each well, and farm identification.

The survey data should also document crop type by parcel and by area (acreage) irrigated. Figure 1 illustrates an example of one well serving multiple parcels within a farm with multiple crop types:

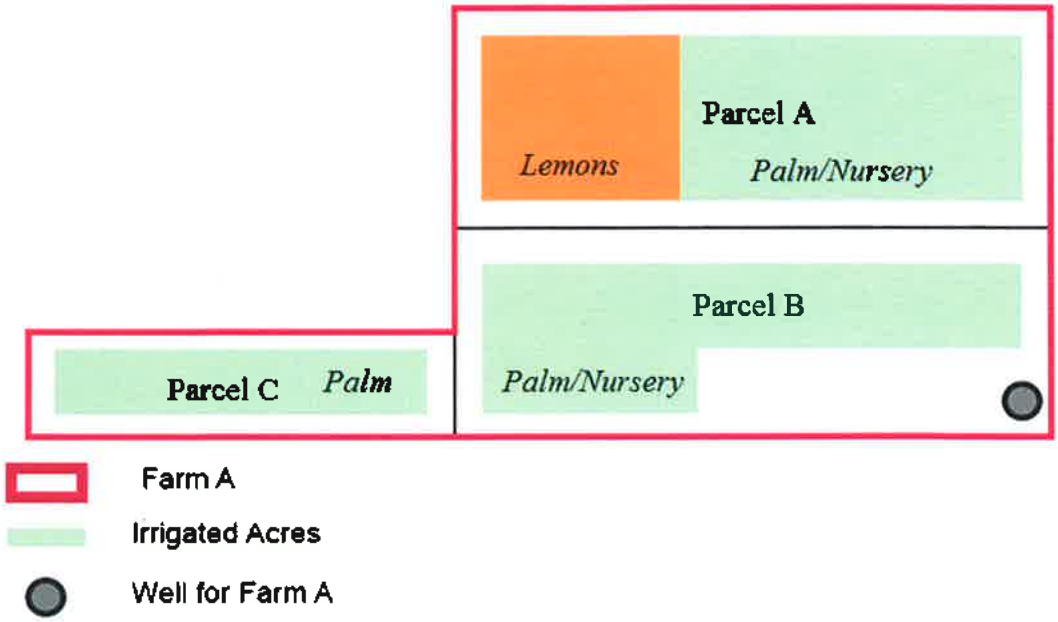


Figure 1. Example Documentation of Parcels Served by a Well for a Farm

Preliminary but not exhaustive comments on the Survey and Report are provided as follows:

- While the Survey and Report indicates, "AAWARE is comprised of most of the agricultural well owners in Borrego Valley" it is unclear which well owners and assessor's parcel numbers (APNs) are covered.

- There is no citation or reference on page 2 for "earlier study calculating 22% agricultural irrigation return flows in Borrego Basin." Is this Netto as indicated on page 14 of the Survey and Report?

- There is no reference/source for endnote No. 10 on page 4. Would you please provide the reference(s)/source(s)? Also, reference to well logs and hydraulic testing of agricultural wells is not sufficiently specific. Please provide documentation of well logs and hydraulic testing.

- The "existence of agricultural applied water return flows is evident from the continued existence of healthy trees and crops" is not substantiated. While leaching of soil salinity

is a recognized requirement to maintain plant health, it only indicates that salts have been flushed below the root zone. The continued existence of healthy trees and crops has no correlation as to whether applied water actually reaches the aquifer past the unsaturated zone that is hundreds of feet thick in many areas of the Borrego Springs Subbasin.

- No site-specific information is provided regarding additional water demand required for plant spacing, frost protection, and moisture holding capacity of the soils.

- It is unclear if the water metering devices were the same for all AAWARE participants. Is all the data presented in the Survey and Report based on propeller type water meter reads or is some of the data based on electricity usage?

- The closest CIMIS station is located in the Borrego Valley (Station #207) and not Oasis, California (Station #136) as suggested on pages 7 and 13 of the Survey and Report.

- There is no site-specific data presented for soils or temperature in the Borrego Valley to support the assertion on page 14 that, "Borrego Valley citrus growers who also farm in Coachella Valley report differences in soil types and frequency of freezing temperatures requiring supplemental water in Borrego Valley." The GSA will not accept anecdotal information to support a conclusion. While water use in Coachella Valley is potentially insightful, there needs to be documentation of varying conditions (i.e. actual soil types and temperatures) to support conclusions.

- To address concerns regarding the confidentiality of pumping data on page 8 of the Survey and Report, the raw data will remain confidential pursuant to Government Code 6254(e). These data will be maintained for use by the GSA, and only publicly available as aggregate values by water use sector (i.e. Agriculture, Municipal, and Recreation).

- The GSA requests the detailed questionnaire described on pages 8 and 9 of the Survey and Report be released by each well owner.

- The methodology used by the AAWARE engineer and registered geologist to identify anomalies and aggregate data into usage by crop type is not provided. Thus, it is uncertain what data was used in the aggregate analysis.

- Page 9 of the Survey and Report states, "More than half of those responding have metered delivery records." It is unclear if this is referring to metering by propeller type flow meter or includes metered delivery based on electrical usage.

- The Survey and Report indicates that "Nearly 80% of the respondents were utilizing sophisticated conservation techniques such as drip irrigation and soil moisture measurements and measured percentages for root salinity flushing to determine timing

and amounts of irrigation water delivers." The GSA requests specific information regarding these items.

- Page 12 of the Survey and Report states, "various factors may be at play in the Borrego Valley, including salt leaching, frost protection, supplemental irrigation water required due to more porous soil with lower holding capacity, or large fruit sizes." No site-specific information is provided for the Borrego Valley. The GSA requests site-specific information for these factors.

- On page 13, the reference evapotranspiration calculated from the CIMIS station located in the Borrego Valley (Station #207) should be used.

- Please provide additional information regarding the DWR funding to establish lysimeters as it is unclear what grant funding program this technical assistance would be derived. Also, please provide the contact information for the person AAWARE is coordinating with from DWR.

- On page 18, it is unclear where the value of "potentially 41%" agricultural return flow is derived as previous section of the Survey and Report cite 22% to 30%. Please provide a reference for this value.

- It is unclear from the data presented in the Survey and Report what irrigated acreage (on a parcel level) provided data for this analysis and what irrigated acreage did not provide data.

- Reference 3, Coachella Valley Water District Annual Statement of Groundwater Production, Average Annual Water Use Requirements, 2016 was not available for download form the Jackson Tidus share file site. Please provide a copy of this reference.

Sincerely,

LEANNE CROW, Hydrogeologist
County of San Diego Planning & Development Services

cc:
Jim Bennett, County of San Diego Planning & Development Services
Geoff Poole, Borrego Water District
Trey Driscoll, Dudek

AGRICULTURAL WATER USE SURVEY AND REPORT—2017

BORREGO VALLEY, CA

January 25, 2018

by

Agricultural Alliance for Water and Resource Education ("AAWARE")
William R. Mills, P.E., R.G., DEE
Jackson Tidus—A Law Corporation

Chapter 1.0 Executive Summary

The Agricultural Alliance for Water and Resource Education ("AAWARE") is comprised of most of the agricultural well owners in Borrego Valley. AAWARE seeks to protect and preserve the Borrego Basin groundwater resources, and is a member of the Borrego Water Coalition. Two of AAWARE's members serve as agricultural representatives on the Advisory Committee to the Borrego Valley California Groundwater Basin ("Borrego Basin") Groundwater Sustainability Agency ("GSA").

This report summarizes groundwater production data obtained from a confidential survey presented to AAWARE members and other and agricultural well owners in the Borrego Basin to determine agricultural groundwater production information, crop types and acreages. The information obtained from the survey was reviewed and synthesized by William R. Mills, a professional engineer/registered geologist. This report responds to a request from the GSA Core Team for agricultural groundwater production information, and is intended for use in preparing a water budget in connection with a Groundwater Sustainability Plan ("GSP") for the Borrego Basin under the Sustainable Groundwater Management Act ("SGMA," Water Code, sections 10720-10737.8)..

Existing studies note the lack of measured agricultural groundwater production and crop acreage information for the Borrrego Valley. The absence of measured agricultural groundwater production and of crop acreage information hinders the development of a GSP groundwater budget for the Borrego Valley. Without measured agricultural groundwater production and crop acreage information, it is difficult to accurately determine crop water consumption (also known as evapotranspiration) and irrigation water return flows to the groundwater basin. If return flows are not counted in the water budget, then agricultural consumptive use may be significantly overstated.

Agricultural groundwater production amounts included in Table 1 of this report are based on data from metered agricultural wells representing 89% of total agricultural acreage calculated by Borrego Water District ("BWD") in 2015. Agricultural evapotranspiration included in Table 2 of this report has been estimated based upon climate data and established consumption rates for each type of crop and upon reported crop acreages. Table 3 of this Report shows the potential irrigation return flows from agriculture applied water, determined by subtracting the evapotranspiration amount in Table 2 from the groundwater production amount in Table 1.

To summarize the results of Tables 1-3, the highest total Borrego Valley agricultural groundwater production determined from the agricultural acreage responding to the survey is about 16,300 acre-feet per year ("AFY"), the total agricultural consumptive use is calculated to be about 9,600 AFY, and the potential agricultural irrigation return flow to the Borrego Basin is estimated to be between 3,600 AFY (based on an earlier study calculating 22% agricultural irrigation return flows in Borrego Basin) and 6,700 AFY (based on the difference between groundwater production and crop evapotranspiration). Further study should be undertaken to refine the agricultural return flow number by means of measurements with lysimeters as discussed below.

Chapter 2.0 The Report Helps Fill Gaps for the GSP Water Budget

Section 2.1 Agricultural Factors of a GSP Water Budget

SGMA requires the GSP to include a groundwater basin water budget. The water budget must provide an accounting and assessment of the total annual volume of groundwater and surface water entering and leaving the basin. The water budget is the basis for estimating the basin's sustainable yield and is a key component in understanding whether a basin is operating within its sustainable yield and avoiding undesirable results.[1]

Water budgets are highly variable between groundwater basins. While precipitation may be the main contributor to groundwater recharge in some basins, in other basins the main source of recharge may be infiltration and seepage of applied irrigation water (called "irrigation return flows").[2] Identifying which water budget components are most appropriate to estimate through balancing of the water budget equation will depend on the local ability to independently measure or estimate the remaining water budget components.[3]

Some of the factors in the water budget are derived from groundwater applied for agricultural irrigation. For example, the water budget must quantify, either through direct measurements or estimates based on data: (1) inflows to the groundwater system by water source type, including applied water; (2) outflows from the groundwater system, including evapotranspiration.[4] Inflows to the groundwater system include deep percolation generated by irrigation water infiltrating downward through the root and unsaturated zones.[5] Outflows from the groundwater system include outflows due to evapotranspiration within the root zone.[6]

Crucial to the development of the water budget is the admonition: "Each Plan shall rely on the best available information and best available science to quantify the water budget for the basin."[7] A water budget that accurately identifies and tracks changing inflows and outflows to a basin will be critically important to support GSP decision making.[8]

Section 2.2 Accounting for Production, Consumption and Return Flow

An accounting of agricultural irrigation water return flow into the Borrego Basin originates with groundwater production from the basin, and excludes that amount of water that is lost through evapotranspiration within the root zone, where plants extract moisture to meet their water needs, and any runoff or evaporation during irrigation.[9] Borrego Valley well logs do not evidence a widespread clay layer or other barrier to return flows. Instead, well logs and hydraulic testing of agricultural wells shows fine to coarse sand and gravel and water level recovery indicating the influence of a recharge source to the aquifer.[10]

Existing Borrego Valley reports and studies mention varied estimates of agricultural applied water irrigation return flows.[11] However, current calculations by the Core Team and Advisory Group seem to calculate the agricultural contribution to overdraft as the amount of agricultural water production (a portion of which is return flow), rather than the amount of crop evapotranspiration (which is consumed).[12] Because those calculations assume that agricultural production equates to consumptive use, they do not account for groundwater recharge from irrigation return flows in calculating the sustainable yield.[13]

It has been established by various studies that a significant amount of agricultural applied water must occur beyond evapotranspiration to flush away or leach out soil salinity; otherwise, the citrus and other crops would perish.[14] Therefore, the existence of agricultural applied water return flows is evident from the continued existence of healthy trees and crops.

Furthermore, additional amounts of applied water beyond evapotranspiration and leaching may be necessary due to various factors, including the plant spacing, frost protection and the moisture holding capacity of the soils, potentially adding to the amount of return flows.[15]

With more accurate groundwater production amounts based upon metering, the data gap[16] can be bridged and an accounting of maximum potential applied water irrigation return flows can take place. By more accurately quantifying agricultural groundwater production, and by subtracting a more refined estimate of particular crop evapotranspiration using actual crop and local climate information, the net water balance remaining after evapotranspiration (and any irrigation losses such as runoff and soil evaporation) should closely approximate the applied water irrigation return flows back into the basin.

All reference documents cited in this report are available for review at: https://docshare.jacksontidus.law; Username: AAWARE1; Password: 7uRNtH3L1G4t!

Section 2.3 Determining Production, Consumption and Return Flow

A. WUCOLS III Production Estimating Methodology

Prior studies have attempted to quantify applied/delivered and consumptively used amounts of water for agricultural production in the Borrego Valley without obtaining actual measurements of water produced or of particular crop acreage.[17] Instead, the prior studies rely on estimation methodologies. The most current DWR methodology for estimating delivered and consumptively used amounts of water for agricultural production is known as Water Use Classification of Landscape Species ("WUCOLS") III.[18]

The methodology uses a California map that allows the identification of the potential evaporation rate of turf grass, as derived from over 100 California Irrigation Management Information System ("CIMIS") stations located throughout the state.[19] CIMIS collects data from calibrated weather stations at more than 100 sites throughout California.[20] The hourly weather data is used to compute daily evapotranspiration (ETo) values for each station, using a standardized formula (known as a modified Penman equation).[21] Locating the agricultural site on this map provides the investigator with the approximate long term or reference evapotranspiration rate for turf grass.[22]

Next, a plant factor, or crop coefficient (Kc) for the specific crop is obtained from the most recent publications by the State of California.[23] Crop coefficients have been developed for many crops.[24] In practice, appropriate crop coefficients for a specific crop vary by region, soil type, irrigation frequency and type, reference crop type, and a host of other factors that are specific to management practices and the environment.[25] For example larger size trees and larger size fruit may consume more water.[26]

Finally, the product of the ETo and Kc estimates the consumptive use of irrigation water by the specific crop, which is then multiplied times the amount of irrigated acreage for that crop to obtain the total crop evapotranspiration.[27] When crop types and acreages are not known, they are estimated from aerial photographs.

However, caution must be exercised in using a "one-size fits all" crop coefficient for a particular crop: "In short, in order to calculate crop evapotranspiration using the equation above, one must have the reference crop evapotranspiration (ETo) for one's particular region, soil type, irrigation type, etc. However in most cases, only one set of crop coefficients per region is provided, which may not match the particulars of a grower's situation, and in cases of an unusual crop for the region, there may not be any coefficients available at all."[28]

When measured amounts of applied water are not available, they can be estimated by applying a deemed irrigation efficiency rate to the evapotranspiration amount (defined as the amount of water directly used to satisfy the plant's needs as compared to the amount of water applied). This deemed irrigation efficiency rate is expressed as a percentage of the applied water.[29] Dividing the consumptive use by the irrigation efficiency theoretically should yield an estimate of the delivered or applied water.[30]

However, a determination of deemed irrigation efficiency is challenging – a standard method has not been established.[31] Estimating irrigation efficiency is a subjective process where two assessments of the same system can vary widely.[32] The deemed irrigation efficiency rate attempts to take into account water not directly used by the plant, which may include losses from runoff and evaporation from wet soil during irrigation,[33] but does not account for supplemental agricultural water used for soil leaching, frost protection and additional irrigation needed to compensate for the low moisture holding capacity of more permeable soil discussed above.

B. Agricultural Production in Borrego Valley is Determined Based on Irrigation Metering

Because actual crop acreages and irrigation efficiencies may vary from those obtained from the method discussed above, as individual growers tend to manage the delivery amounts based on varying climatic conditions such as wind and temperature and on particular crop or soils needs, it is important to establish actual production amounts by individual growers. Thus, AAWARE undertook a survey of the growers to establish a more accurate groundwater production and consumption from the basin as described in Section 2.4 below. Table 1 is based on the results of that survey for metered crops.

Groundwater production can be directly measured with a high degree of accuracy, certainty and reliability using water meters, and other readily available monitoring

devices.[34] SGMA approves of meters as well as "any other reasonable method" to determine groundwater production.[35] For electrically powered well pumps, another reasonable and accurate method to measure groundwater production is to multiply the electricity usage as shown by electric bills times the pumping capacity as shown by well pump test reports.[36]

C. Estimating Agricultural Production Based on the County Groundwater Ordinance Consumptive Use Factors is Not Appropriate

The Core Team apparently is considering estimating agricultural production based on a formula in the San Diego County Groundwater Ordinance that calculates the water allowance for a municipal water provider resulting from a change in agricultural use to municipal use.[37] . Under the Ordinance, the amount of water credited to the municipal water supplier is calculated by multiplying the agricultural acreage irrigated times a designated consumptive use factor for the agricultural crop previously grown.[38] Because the municipal production will be 100% consumptively used, the municipal water allowance credited is approximately equal to what is deemed to be the prior crop's consumptive use.[39]

However, the County's Groundwater Ordinance is not relevant to calculate agricultural groundwater production for SGMA purposes. The amount credited under the Ordinance does not account for non-consumptive agricultural uses in Borrego Valley (such as groundwater beneficially used to flush the root zone or protect against frost damage to agricultural crops or supplemental water required to irrigate sandy soils with low moisture holding capacity) and the resulting return flows that would no longer occur in situations where agricultural use is displaced by municipal use. The Ordinance itself says that it does not fix the amount of agricultural groundwater extraction that may take place in the absence of a development that constitutes a change in use from agricultural to urban use.[40] The stated intent of the Ordinance is not to limit or restrict agricultural activities, but instead to prevent development from encroaching on water supplies currently utilized for agriculture.[41]

D. Crop Evapotranspiration is Estimated Using WUCOLS III Methodology

Using the WUCOLS III methodology, evapotranspiration was determined based upon climate data and DWR established consumption rates for each type of crop. Crop-specific consumptive use factors were determined by local California Irrigation Management Information System ("CIMIS") data, by reported crop

acreages, and by crop coefficients established by the Irrigation Training and Research Center ("ITRC"). Agricultural evapotranspiration amounts included in Table 2 of this report are thus based on the best currently available data, without taking into consideration the variability of the crop coefficients discussed above.

Because the nearest CIMIS station is located in Coachella Valley, adjustments should be made to account for differences in water use reported by Borrego Valley citrus growers who also farm in Coachella Valley, including supplemental water needed for irrigation due to Borrego Valley's more permeable soils and for frost protection due to Borrego Valley's more frequent occurrences of freezing temperatures overnight.

E. The Report Estimates Potential Irrigation Return Flows and Recommends Additional Study

Table 3 of this Report shows the estimated agricultural return flows from irrigated agriculture to the Borrego Basin. To estimate the potential agricultural irrigation return flows into the basin, the evapotranspiration is subtracted from the groundwater production. As noted above, irrigation return flows result from the portion of agricultural water used above and beyond the plant's consumptive use and any runoff or evaporation during irrigation. In Borrego Valley, agricultural water uses contributing to irrigation return flows include water used for salt leaching from the root zone, frost protection, and supplemental irrigation required for more permeable soils with lower holding capacity.

Section 2.4 Agricultural Water and Crop Information Obtained

Because prior estimates of agricultural water production and consumptive use were made without reporting by the agricultural community by applying general water duties to agricultural acreage shown on aerial photographs and using uncertain irrigation efficiency estimates, AAWARE undertook the task of compiling water use information and production measurements from growers. AAWARE undertook this task to assist with development of the GSP, despite there being no requirement to provide this information prior to adoption of the GSP.[42]

SGMA requires the GSA to protect well owners' personal information (name, usage data, home address, and telephone number) from public disclosure to the same extent as information about utility customers of Borrego Water District ("BWD") and other local agencies.[43] There is not yet a GSA protocol in place to protect well owners' personal information. Knowing the importance of a water

budget to the GSP process, in the spirit of cooperation, AAWARE is providing the best information currently available in response to the Core Team's request in a manner consistent with SGMA's privacy protections, instead of waiting until a privacy protection protocol is approved by the GSA.

To address SGMA's privacy protection mandate, AAWARE distributed a detailed confidential questionnaire to each grower that was returned to AAWARE's attorney to maintain confidentiality of the well owners' personal information.[44] The questionnaire requested information regarding: crop types, crop acreage, crop density, irrigation methods, conservation methods, irrigation meter measurements, irrigation power records and well pump tests.

AAWARE's professional engineer and registered geologist reviewed the responses and made individual checks for anomalies. The data set was then aggregated into usage by crop type. From these data, a gross agricultural water production amount was developed, and consumptive use factors were applied to determine evapotranspiration and irrigation return flows. To address SGMA's privacy protection mandate, this report summarizes groundwater production data without including the well owners' personal information.

Growers responding to the survey reported 3,539 acres of various crops, which is approximately 89% of the 3,976 total agricultural acreage calculated by BWD in 2015. More than half of those responding had metered delivery records. Nearly 80% of the respondents were utilizing sophisticated conservation techniques such as drip irrigation and soil moisture measurements and measured percentages for root salinity flushing to determine timing and amounts of irrigation water deliveries. From the metered production numbers using these best management practices, Borrego Valley delivery application rates were determined for each crop. Where metered data was not available, the delivery rates developed from the metered production was applied to the reported crops and crop acreages.

Figure 1 on the following page is a 2018 satellite depiction of the Borrego Valley showing the agricultural production.[45]

Figure 1


Google
Imagery ©2018 DigitalGlobe, Landsat / Copernicus, U.S. Geological Survey, USDA Farm Service Agency Map data ©2018 Google 1 mi

Chapter 3.0 Production, Consumption and Return Flow Results

Section 3.1 Production Based Upon Metered Operations

Agricultural groundwater production amounts included in Table 1 of this report are based on reported metered well and crop acreage data from the agricultural survey. As shown in Table 1, the grower survey respondents returned information on four citrus crops, palm trees and potatoes. Most of the crops were metered and thus a metered Applied Water Unit Value is calculated and shown in Table 1. Metered Unit Delivery Rates were cross checked against rates found in the literature or those developed with the WUCOLS III procedure to ensure they were within reasonable range. The Applied Water Unit Value calculated for metered irrigation was then used for irrigated crops that were not metered to determine water deliveries to those crops shown in Table 1.

About 42% of the water production is measured by meters. The growers who reported production based on meters all use highly efficient irrigation techniques of drip and micro spray and irrigate during night hours. In addition to efficient methods of application, those growers using meters have also become quite sophisticated in timing of irrigation, using real-time CIMIS data (discussed below) and tensiometers installed at depths between 12 and 16 inches below ground surface to determine when watering is needed.

Also shown in Table 1 are the Applied Water Unit Values previously developed and accepted for Coachella Valley (**"CVUV"**) irrigated agriculture using the WUCOLS III procedure. The Coachella Valley CIMIS station is the one nearest to the Borrego Valley and, as such, has the most similar climate. This Report considered using CVUV delivery rates to estimate delivered water for potato crops since no Applied Water Unit Value delivery rates for that particular crop were not available from the survey. However, the potato grower confirmed that the applied rate is lower, at 2.5 AFY.

Table 1 Borrego Valley Agricultural Water Production and Calculated Unit Values ("UV" in acre-feet per acre) Compared with Coachella Valley

Crop	Method	Acres	Production	UV	CVUV[46]
Grapefruit	Meter	253	1557 AFY	6.1	6.3
Lemon	Meter	478	3420 AFY	7.1	5.8
Tangerine	Meter	53	289 AFY	5.5	6.1
Citrus	Meter	110	782 AFY	7.1	6.1
Palm	Meter	325	835 AFY	2.6	None
Metered Total		1219	6883 AFY		
Lemon	UV	254	1803 AFY	7.1	5.8
Citrus	UV	881	6255 AFY	7.1	6.1
Palm	UV	285	741 AFY	2.6	None
Potato	GUV 250		625 AFY	2.5 (GUV*) 3.4	
Potato (Fallow)		650			
Unit Value Total		2320	9424 AFY		
Grand Total		3539	16307 AFY		

*GUV= Unit Value Applied by Grower

The metered information allowed for a more refined calculation of delivered unit values for each type of crop. It should be noted that individual grower delivery unit values vary according to irrigation method, crop age and other factors. With respect to lemons and citrus, it appears that the Borrego Valley growers tend to apply more water than calculated using the WUCOLS III procedure for the Coachella Valley.[47] As discussed in this Report, various factors may be at play in the Borrego Valley, including salt leaching, frost protection, supplemental irrigation water required due to more porous soil with lower holding capacity, or larger fruit sizes. As discussed in Section 2.3(A) above, the developed crop coefficients in studies are regional in nature and not crop- or location-specific, and the irrigation efficiencies used in studies are similarly generalized, as reported by the studies themselves. (See, ITRC, p. 2 and Endnotes 27, 30 and 31.)

3.2 Evapotranspiration Based on Reported Acreage

The evapotranspiration for the listed crops was determined using the above described WUCOLS III methodology.

The closest CIMIS station to the Borrego Valley is Station 136 located in Oasis, CA (Imperial/Coachella Valley). DWR provides Internet accessible real time information from the various CIMIS stations. The Chart below lists the long term average evapotranspiration by month at the Station as measured in inches of water from the soil surface of turf grass.

Chart--Long Term Average Evapotranspiration at CIMIS Station 36 (inches)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2.48	3.36	5.27	6.9	8.68	9.6	9.61	8.68	6.9	4.96	3.00	2.17	71.6

As indicated, the evapotranspiration information in the Chart is for grass. However, the grass evapotranspiration can be converted to the evapotranspiration value for other crops, using crop-specific coefficients. CIMIS presents a general coefficient for desert citrus of 0.65. The coefficient is multiplied times the evapotranspiration for grass to obtain the evapotranspiration for citrus. Using the coefficient, the annual evapotranspiration rate for citrus in the Coachella Valley region is estimated at 46.8 inches per year or 3.9 feet per year.

Table 2 below presents the estimated total annual consumptive use for acreages of the various crops grown in the Borrego Valley, as reported by the various growers. It is based on the acres irrigated for each crop set forth in Table 1, with the acreage for all of the various types of citrus grouped together, because they all have the same evapotranspiration rate and crop coefficient. Potatoes and palms are grouped separately, even though they have the same evapotranspiration rate and crop coefficient.

Table 2 Annual Evapotranspiration (ET) for Each Borrego Valley Crop Type

Crop Type	Acres Irrigated	Crop Coefficient	ET Rate	Annual ET
Citrus (all)	2,029	0.65	3.9	7,914
Palm	610	0.5	2.0	1,220
Potato	250	0.5	2.0	500
Fallow	650			
Total	3,539			9,634

As discussed above, the actual crop coefficient for the various crops may be different from that reported in the studies using the WUCOLS III methodology, because crop coefficients for a specific crop vary by area, soil type, irrigation

frequency and type, reference crop type, and a host of other factors that are specific to management practices and the environment. For example, Borrego Valley citrus growers who also farm in Coachella Valley report differences in soil types and frequency of freezing temperatures requiring supplemental water in Borrego Valley. Thus, the annual evapotranspiration amount in the Borrego Valley may vary from that calculated above.

3.3 Potential Irrigation Return Flow Based on Water Balancing

As previously stated, the groundwater produced and applied to crops must be sufficient to satisfy the consumptive use or evapotranspiration need of the crop (without a reduction in yield) and to satisfy the salt leaching, frost protection and soils holding capacity requirements. Thus, that portion of the delivered water not consumed or lost as runoff or evaporation during irrigation is returned to the groundwater basin and is commonly referred to as "irrigation return flow" or "applied water return flow".

Estimates of agricultural irrigation return flows have been made by prior investigators. The 2015 U.S. Geological Survey ("USGS") model of Borrego Basin estimates the irrigation return flows as high as 30% of the delivered water. The Netto field study determined the irrigation return flows in one Borrego Valley grower's field at 22% by comparing the salinity of water contained in the root zone to that of the delivered water. (See Endnote 10.) Based on these studies, the agricultural irrigation return flows to the Borrego Basin resulting from the survey information is estimated at about 3,600-5,000 AFY

Another alternative is to estimate the return flow using a generalized irrigation efficiency rate of the delivered water. However, the estimate would be highly inaccurate, because not all irrigators need the same amount of water for leaching, not all soils have the same holding capacity, and different crops have different needs, such as frost protection, as explained above.

This Report estimates the potential irrigation return flow based on the reported delivery rate and regional evapotranspiration value for the crop. For example, if a grower reported an application rate of 5.0 AFY for citrus, the evapotranspiration value as reported by CIMIS (Oasis) was deducted to obtain the return flow amount. In this case, the amount is 5.0 minus 3.9 = 1.1 AFY. This value was multiplied by the number of acres of production reported by the grower. If a grower reported an

application rate 5.7 acre-feet per acre, then the return flow amount would be 5.7 minus 3.9 or 1.8 AFY times the acreage.

Table 3 summarizes the total agricultural acreage, the total delivered water amounts determined by the survey using metered data or applied water values, the evapotranspiration amounts determined by CIMIS evapotranspiration data and regional crop coefficients, and the resulting estimated irrigation return flows.

Table 3 Potential Irrigation Return Flows

Acreage	Delivered Water	ET Amount	Potential Return Flow
3539	16,307 AFA	9,634 AFA	6,673 AFA

The difference between the delivered water and consumptive use is the potential irrigation return flow from the applied water that passes the root zone after satisfying the crops' consumptive use requirement and eventually reaches Borrego Basin,. Given the irrigation best management practices employed for water conservation, it is not likely that much of the applied water is lost from runoff and/or soil evaporation.

As explained above, the consumptive use crop coefficient is regional in nature and does not take into account the particular grower practices regarding irrigation methodology, soils and crop types. For example, a larger tree canopy, a larger trunk diameter, larger fruit size and more sandy alluvium may require supplemental applied water, some of which factors may increase the crop coefficient and amount of consumptive use beyond that shown.

Chapter 4.0 Conclusions and Recommendations

4.1 Conclusions

This report provides valuable information that helps bridge the data gaps regarding agricultural irrigation production, evapotranspiration and return flows with respect to formulation of a water budget.

As concluded by Dudek at the October 27, 2017 Advisory Committee Meeting in its Borrego Valley Model Water Budget Update powerpoint and notes, the Borrego Valley Hydrologic Model used by USGS in 2015 only estimated agricultural extraction using the WUCOLS III Farm Process, and metered agricultural pumping would "markedly" reduce uncertainty regarding extraction in model simulations. (Dudek, Slide 22.) Also, "The biggest reduction in uncertainty can be gained by using metered pumping for irrigated fields." (Dudek, Slide 20.)

As found by Dudek, "The [2015 USGS] model tends to predict lower groundwater levels than observed. In general, the model showed a slight bias towards lower modeled heads than observed heads in areas of intense pumping (i.e., the model is overestimating groundwater level declines in some areas of the aquifer). The model may overestimate groundwater level declines in the basin because it is overestimating pumping, underestimating recharge, underestimating water stored in the acquifer, or some combination of these three factors. While model calibration and validation indicated a tendency of the model to simulate lower heads than those observed in the basin, additional data is need to determine which model inputs are responsible for this model bias." (Dudek, Slide 19)

As the following conclusions explain, this report provides valuable additional data to help determine which model inputs are responsible for model bias and thus establish a more accurate water budget:

1. Confidential information related to water production and crop acreages were collected from individual growers representing 89% of the total agricultural acreage calculated by BWD in 2015. Responses are reported in a manner to comply with SGMA's privacy protection requirements.[48] A competent professional who has skillfully represented both the local water district and local growers in Borrego Valley reviewed and assimilated the information and helped fill data gaps.

2. The state places a high degree of confidence in metered and other measured well production data.[49] This is especially true when those reporting are employing the most efficient irrigation application techniques available. About 80% of the irrigated acreage is irrigated by either drip or micro spray methods. Furthermore, the metered production from which the unit values are obtained are employing best management practices for irrigation scheduling and quantification. Techniques employed include tensiometers and CIMIS real time data.

3. The predominant crops grown in the Borrego Valley are lemons, oranges, grapefruit and tangerines. Based on the survey responses, about 82% of the irrigated agricultural acreage is devoted to citrus.

4. The highest total groundwater extracted and applied each year to irrigate the agricultural acreage responding to the survey is about 16,300 acre-feet.

5. Of that amount, about 9,600 acre-feet of the agricultural water withdrawn from the Borrego Basin each year is consumptively used.

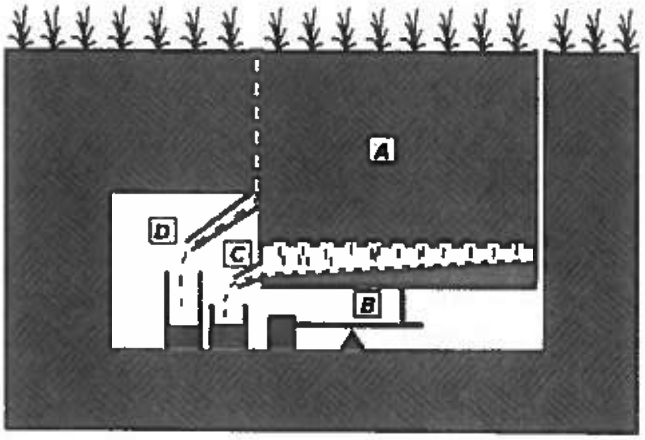
6. Potentially as much as 6,700 acre-feet of the agricultural irrigation water is returned to the Borrego Basin each year.

4.2 Recommendations

1. Additional Study Recommended With DWR Support

Given the high variability of crop coefficient values and of irrigation practices, it is possible that the consumptive use of the crops may be understated. It is difficult to substantiate the amount of water needed to account for the poor moisture holding capacity of sandy soils, or to differentiate from one field to another the tree trunk, canopy and fruit size. Therefore, it is highly recommended that in order to further refine the agricultural consumptive use and agricultural irrigation return flow estimates, lysimeters should be employed at grower locations to more precisely quantify the irrigation return flow amounts. A lysimeter is a measuring device that records the amount of water percolating through the soil. A schematic of a lysimeter station is shown in Figure 2 below. Lysimeter readings are scientifically accepted methods for measuring irrigation return flows.[50]

Figure 2



It is recommended that DWR funding be sought by the GSA to establish the lysimeters under the DWR's Sustainable Groundwater Management Technical Support Services funded by DWR's Sustainable Groundwater Management Program whose initial focus is for the very purpose of providing technical assistance to GSAs in the development of their GSPs for critically overdrafted basins.

The application must be made by the GSA by mid-February and the DWR point person for project funding has already discussed with an AAWARE representative how DWR funds would be appropriately used for testing to help fill in the data gap regarding irrigation return flows in the Borrego Valley.

2. ***The GSA should obtain DWR technical support to develop a graphic model of the Borrego Basin based on available well logs, and if necessary, additional soil data.*** DWR technical support is available particularly to GSAs in critically overdrafted basins as stated above.

3. ***The GSA should obtain DWR technical support to identify inaccuracies in the Model as necessary to verify the Model. Until a verified Model is developed, the sustainable yield and resulting production allocations should be considered only interim measures.***

4. ***The portion of agricultural irrigation resulting in return flows to the basin (potentially 41% based on currently available information) should be calculated and agricultural production resulting in recharge to the basin should not be subject to agricultural production restrictions.***

Chapter 4.0
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pdfs/BMP_Water_Budget_Final_2016-12-23.pdf ("Water Budget BMP"), pp. 7, 24.

[2] Water Budget BMP, p. 3.

[3] Water Budget BMP, p. 4.

[4] 23 California Code of Regulations ("CCR"), § 354.18, subd. (b)(2)&(3).

[5] Water Budget BMP, p. 30.

[6] Water Budget BMP, p. 31.

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[8] Water Budget BMP, p. 8.

[9] Water Budget BMP, p. 29.

[11] 2015 Faunt, C.C., Stamos, C.L., Flint. L.E., Wright, M.T., Burgess, M.K., Sneed, Michelle, Brandt, Juntin, Maartin, Peter, and Coes, A.L. 2015, Hydrogeology, hydrologic effects of development, and simulation of groundwater flow in the Borrego Valley, San Diego County, California, U.S. Geological Survey Scientific Investigations Report 2015-5150, 135 p., http://dx.doi.org/10.3133/sir20155150 ("2015 USGS Report"), p. 2 [recharge from irrigation return flows as indicated by model results was at 10-30% for agricultural and recreational pumpages], p. 48 ["From the 1940s onward, these sources of anthropogenic recharge have significantly increased the total groundwater recharge in the valley, at times becoming many times larger in magnitude than natural recharge."]; Netto, Steven, *Water Resources of the Borrego Valley, San Diego County, California.* Master's Thesis, San Diego State University, 2002 ("Netto"), p. 109 [22%].

[12] See Dudek, November 16, 2017 Working Draft Technical Memorandum—Baseline Pumping Allocation [using production rather than consumption numbers for irrigated agriculture]; Dudek, November 15, 2017 Working Draft Technical Memorandum—Pumping Allowance [using production rather than consumption numbers for irrigated agriculture]

[13] 2015 USGS Report, p. 2 ["Over the 66-year study period, on average, the natural recharge that reached the saturated groundwater system was approximately 5,700 acre-feet per year."] ; p. 88 ["In addition to these natural sources of recharge, irrigation return flow from agricultural fields and municipal lawns and infiltration of treated and untreated wastewater also contribute to recharge."].

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[15] 1945 Department of Public Works Division of Water Resources, Bulletin No. 51—Irrigation Requirements of California Crops ("Irrigation Requirements"), p. 16 ["The amount of soil moisture available for plant use depends upon a number of factors such as plant spacing, volume, porosity of soil occupied by the root system, and such characteristics as field capacity, wilting percentage (sometimes called wilting range) and readily available moisture."]; Mauk, Peggy, and Shea, Tom, Questions and Answers to Citrus Management, University of California Cooperative Extension, Revised from 1994, http://homeorchard.ucanr.edu/files/140618.pdf, p. 5 ["Limes and lemons (except for Meyer lemon) are most susceptible to frost damage. Healthy trees that are well supplied with water are better able to withstand frost than weak, dry trees. … When frost is expected, keep the soil surface below the tree clean and wet as this will act as a heat sink."].)

[16] 23 CCR, § 351, subd. (l) ["data gap" is defined as lack of information that significantly affects the understanding of the basin setting or evaluation of the efficacy of plan implementation and could limit the ability to assess whether a basin is being sustainably managed].)

[17] 2015 USGS Report, p. 97 ["There is no known reported pumpage for Borrego Valley that can be used as additional calibration data for agricultural pumpage."].

[18] Irrigation Guide, pp. 5-7, 29-31.

[19] Irrigation Guide, p. 5 and Appendix A.

[20] January 2013 Irrigation Training and Research Center, California Crop and Soil Evapotranspiration for Water Balances and Irrigation Scheduling/Design, IRTC Report No. R 03-001, www.itrc.org/reports/pdf/californiacrop.pdf. ["ITRC Report"], p. 2.

[21] ITRC Report, p. 2.

[22] CIMIS, Reference Evapotranspiration, www.cimis.water.ca.gov/App_Themes/images/etozonemap.jpg.

[23] Irrigation Guide, p. 6.

[24] ITRC Report, p. 2.

[25] ITRC Report, p. 2

[26] Koo, R C., Water Requirements of Citrus and Response to Supplemental Irrigation, Agricultural and Education Center IFAS, University of Florida, http://irrec.ifas.ufl.edu/flcitrus/pdfs/short_course_and_workshop/second_international_citrus/Koo-Water_Requirements_of_Citrus.pdf, p. 26.

[27] Irrigation Guide, p. 5-7.

[28] ITRC Report, p. 2.

[29] Irrigation Guide, pp. 29-31.

[30] Irrigation Guide, pp. 29-31.

[31] Irrigation Guide, p. 29.

[32] Irrigation Guide, p. 30.

[33] Irrigation Guide, p. 30.

[34] Water Budget BMP, p. 35.

[35] Water Code, § 10725.8, subds. (a) & (d).

[36] Water Code, § 1840, subd. (a)(1)(B)(i).

[37] County Code, §§ 67.702, 67.711.

[38] County Code, § 67.720, subds. (A) & (B)(1).

[39] County Code, § 67.720, subds. (A) and (B)(1)(d).

[40] County Code, § 67.711.

[41] County Code, § 67.702.

[42] Water Code, § 10725.8.

[43] Water Code, § 10730.8(b).

[44] Water Code, § 10730.8; Govt. Code, § 6254.16.

[45] 2018 DigitalGlobe, Landsat/Copernicus, U.S. Geological Survey, USDA Farm Service Agency, Map data, https://www.google.com/maps/@33.3052367,-116.3635645,11087m/data=!3m1!1e3?hl=en

[46] Coachella Valley Unit Values obtained from ITRC Report.

[47] 2016 Coachella Valley Water District Annual Statement of Groundwater Production Form, p. 2

[48] Water Code, §§ 10730.8; Govt. Code, § 6254.16.

[49] Water Code, §§ 1840, subd. (a)(1)(B)(i), 10725.8.

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