February 2, 2023

Agenda for the Regular Meeting of the Commissioners of the Antelope Valley State Water Contractors Association

to be held at 6500 West Avenue N, Palmdale
or via video conference: https://bit.ly/3IZ5qoK or
teleconference: (669) 900-6833 Meeting ID: 839 3795 7835#
FOR THE PUBLIC: VIA TELECONFERENCE ONLY
Dial-In Number: (669) 900-6833 Meeting ID: 839 3795 7835#
Thursday, February 9, 2023
6:00 p.m.

NOTE: To comply with the Americans with Disabilities Act, to participate in any Association meeting please contact Danielle Henry at 661-947-4111 x1059 at least 48 hours prior to an Association meeting to inform us of your needs and to determine if accommodation is feasible.

Agenda item materials, as well as materials related to agenda items submitted after distribution of the agenda packets, are available for public review at the Palmdale Water District's office located at 2029 E. Ave. Q, Palmdale. Please call Danielle Henry at 661-947-4111 x1059 for public review of materials.

PUBLIC COMMENT GUIDELINES: The prescribed time limit per speaker is three-minutes. Please refrain from public displays or outbursts such as unsolicited applause, comments, or cheering. Any disruptive activities that substantially interfere with the ability of the Association to carry out its meeting will not be permitted and offenders will be requested to leave the meeting.

Each item on the agenda shall be deemed to include any appropriate motion, resolution, or ordinance to take action on any item.

1) Pledge of Allegiance.
2) Roll call.
3) Adoption of agenda.
4) Public comments for items not on the agenda.

5) Presentation on Pure Water AV. (PWD Engineering Manager Rogers)

6) Consideration and possible action on minutes of regular meeting held December 8, 2022.

7) Payment of bills.

8) Consideration and possible action on Resolution No. 2023-1 being a Resolution of the Board of Commissioners of the Antelope Valley State Water Contractors Association Ratifying the Proclamation of a State of Emergency by the Governor Issued March 4, 2020, and Authorizing Remote Teleconference Meetings of the Legislative Bodies of the Antelope Valley State Water Contractors Association for the Period Beginning February 9, 2023 and Ending February 28, 2023 Pursuant to Brown Act Provisions. (General Counsel Lemieux/General Manager Thompson II)

9) Consideration and possible action on election of officers. (General Manager Thompson II)

10) Consideration and possible action on appointment of Association of California Water Agencies/Joint Powers Insurance Authority (ACWA/JPIA) representative. (General Manager Thompson II)

11) Consideration and possible action on acceptance of Draft Feasibility Study for the Big Rock Creek Joint Groundwater Recharge Project. (General Manager Thompson II/Mr. Paul Chau, Kennedy/Jenks Consultants)

12) Report of General Manager.

    a) Status updates:

        1) Antelope Valley Watermaster meetings.

        2) Antelope Valley and Fremont Basin IRWMP Stakeholder meetings.

        3) Emergency Response Agreement with Antelope Valley Mutual Water Companies.

        4) 2023 Replacement Water Assessment.

        5) Ethics AB 1234 Training.

13) Report of Controller.

    a) Update on Revenue, Expenses and Change in Net Position.

14) Reports of Commissioners.

15) Report of Attorney.

16) Commission members' requests for future agenda items.

17) Consideration and action on scheduling the next Association meeting April 13, 2023.

18) Adjournment.

RESOLUTION NO. 2023-1

A RESOLUTION OF THE BOARD OF COMMISSIONERS OF THE ANTELOPE VALLEY STATE WATER CONTRACTORS ASSOCIATION RATIFYING THE PROCLAMATION OF A STATE OF EMERGENCY BY THE GOVERNOR ISSUED MARCH 4, 2020, AND AUTHORIZING REMOTE TELECONFERENCE MEETINGS OF THE LEGISLATIVE BODIES OF THE ANTELOPE VALLEY STATE WATER CONTRACTORS ASSOCIATION FOR THE PERIOD BEGINNING FEBRUARY 9, 2023 AND ENDING FEBRUARY 28, 2023 PURSUANT TO BROWN ACT PROVISIONS.

WHEREAS, the Antelope Valley Water Contractors Association ("AVSCWA") is committed to preserving and nurturing public access and participation in meetings of the Board of Commissioners; and

WHEREAS, all meetings of AVSCWA's legislative bodies are open and public, as required by the Ralph M. Brown Act (Cal. Gov. Code 54950 – 54963), so that any member of the public may attend, participate, and watch AVSCWA's legislative bodies conduct their business; and

WHEREAS, the Brown Act, Government Code section 54953(e), makes provisions for remote teleconferencing participation in meetings by members of a legislative body, without compliance with the requirements of Government Code section 54953(b)(3), subject to the existence of certain conditions; and

WHEREAS, a required condition is that a state of emergency is declared by the Governor pursuant to Government Code section 8625, proclaiming the existence of conditions of disaster or of extreme peril to the safety of persons and property within the state caused by conditions as described in Government Code section 8558; and

WHEREAS, a proclamation is made when there is an actual incident, threat of disaster, or extreme peril to the safety of persons and property within the jurisdictions that are within AVSCWA's boundaries, caused by natural, technological, or human-caused disasters; and

WHEREAS, it is further required that state or local officials have imposed or recommended measures to promote social distancing, or, the legislative body meeting in person would present imminent risks to the health and safety of attendees; and

WHEREAS, such conditions now exist in AVSCWA, specifically, a State of Emergency has been proclaimed by the Governor of the State of California on March 4, 2020 in response to the global outbreak of the novel Coronavirus disease ("COVID-19"); and

WHEREAS, meeting in person would present an imminent risk to the health and safety of attendees due to the continued impact of the COVID-19 pandemic; and

WHEREAS, the Board of Commissioners does hereby find that a State of Emergency has been proclaimed as a result of the threat of COVID-19 and the contagious nature of COVID-19 have caused, and will continue to cause, conditions of peril to the safety of persons within AVSCWA that are likely to be beyond the control of services, personnel, equipment, and facilities of AVSCWA, and desires to ratify the proclamation of state of emergency by the Governor of the State of California; and

WHEREAS, such conditions now exist in AVSCWA, specifically County of Los Angeles Department of Public Health – Order of the Health Officer issued April 21, 2022 and effective April 22, 2022, the State Public Health Officer Order – Beyond the Blueprint last updated June 8, 2022, Beyond the Blueprint for Industry and Business Sectors updated as of May 2, 2022, strongly recommending continued use of face masks while indoors in general, regardless of vaccination status, and requiring the continued use of face masks for indoor settings with higher risks for transmission, due to the evidence of increasing

transmission of COVID-19 within the County and worldwide, particularly due to the Omicron variant of the virus. Further, County health orders and guidance incorporates a variety of local, state, and federal declarations, proclamations, guidance, and recommendations, including continued social distancing of six (6) feet from others, especially while indoors, and especially while indoors for extended periods of time; and

WHEREAS, as a consequence of the imminent risks to the health and safety of attendees due to the continued impact of the COVID-19 pandemic, the Board of Commissioners does hereby find that the legislative bodies of the AVSCWA shall conduct their meetings without compliance with paragraph (3) of subdivision (b) of Government Code section 54953, as authorized by subdivision (e) of section 54953, and that such legislative bodies shall comply with the requirements to provide the public with access to the meetings as prescribed in paragraph (2) of subdivision (e) of section 54953.

NOW, THEREFORE, THE BOARD OF COMMISSIONERS OF THE ANTELOPE VALLEY STATE WATER CONTRACTORS ASSOCIATION DOES HEREBY RESOLVE AS FOLLOWS:

Section 1. Recitals. The Recitals set forth above are true and correct and are incorporated into this Resolution by this reference.

Section 2. Finding of Imminent Risks. The Board hereby finds that meeting in person would present imminent risks to the health and safety of attendees due to the serious and contagious nature of COVID-19.

Section 3. Ratification of Governor's Proclamation of a State of Emergency. The Board hereby ratifies the Governor of the State of California's Proclamation of a State of Emergency, effective as of its issuance date of March 4, 2020.

Section 4. Remote Teleconference Meetings. The staff, General Manager, and legislative bodies of AVSWCA are hereby authorized and directed to take all actions necessary to carry out the intent and purpose of this Resolution including conducting open and public meetings in accordance with Government Code section 54953(e) and other applicable provisions of the Brown Act.

Section 5. Effective Date of Resolution. This Resolution shall take effect immediately upon its adoption and shall be effective until the earlier of (i) February 28, 2023, which is 19 days from the adoption of this Resolution, or (ii) such time the Board of Commissioners adopts a subsequent resolution in accordance with Government Code section 54953(e)(3) to extend the time during which the legislative bodies of the Antelope Valley State Water Contractors Association may continue to teleconference without compliance with paragraph (3) of subdivision (b) of section 54953.

PASSED AND ADOPTED by the Board of Commissioners of the Antelope Valley State Water Contractors Association this 9th day of February, 2023, by the following vote:

AYES:
NOES:
ABSENT:
ABSTAIN:

_____
Robert Parris, Chair

ATTEST:

_____

Don Wilson, Secretary

APPROVED AS TO FORM:

_____

Aleshire & Wynder, LLP, General Counsel

ANTELOPE VALLEY
STATE WATER CONTRACTORS ASSOCIATION

COMMISSION MEMORANDUM

DATE: January 26, 2023 **February 9, 2023**

TO: AVSWCA Commissioners **Commission Meeting**

FROM: Mr. Peter Thompson II, General Manager

RE: ***AGENDA ITEM NO. 9 - CONSIDERATION AND POSSIBLE ACTION ON ELECTION OF OFFICERS (GENERAL MANAGER THOMPSON II)***

The bylaws for the Antelope Valley State Water Contractors Association state, "At the regular meeting in January each year, officers shall be elected to serve for one year. There shall be at least one officer from each of the governing Boards."

Current officers are as follows:

Robert Parris (AVEK) – Chair

Kathy MacLaren-Gomez (PWD) – Vice Chair

Leo Thibault (LCID) – Treasurer-Auditor

Don Wilson (PWD) – Secretary

Keith Dyas (AVEK) – Commissioner

Barbara Hogan (LCID) – Commissioner

Alternate Commissioners are as follows:

Gloria Dizmang (PWD)

Shelly Sorsabal (AVEK)

Tim Clark (LCID)

John Tenerelli (LCID)

AGENDA ITEM NO. 10

ANTELOPE VALLEY
STATE WATER CONTRACTORS ASSOCIATION

COMMISSION MEMORANDUM

DATE: January 26, 2023 **February 9, 2023**

TO: AVSWCA Commissioners **Commission Meeting**

FROM: Mr. Peter Thompson II, General Manager

RE: ***AGENDA ITEM NO. 10 - CONSIDERATION AND POSSIBLE ACTION ON APPOINTMENT OF ASSOCIATION OF CALIFORNIA WATER AGENCIES/ JOINT POWERS INSURANCE AUTHORITY (ACWA/JPIA) REPRESENTATIVE***

Each member agency of the Association of California Water Agencies/Joint Powers Insurance Authority (ACWA/JPIA) has a designated Representative and Alternate Representative to act on behalf of their agency. Since designated Representatives are authorized to vote on behalf of their agency, ACWA/JPIA requires Board approval of an agency's designated Representatives.

Commissioner Mac Laren-Gomez is the Association's current ACWA/JPIA Representative. At this time, the Association does not have a formally appointed Alternative Representative.

JPIA Board of Directors - Member/Alternate

An excerpt from the JPIA Agreement:

"Article 7 - Board of Directors"

(a) The Authority shall be governed by the Board of Directors which is hereby established and which shall be composed of one representative from each Member, who shall be a Member director selected by the governing board of that Member. Each Member, in addition to appointing its member of the Board, shall appoint at least one alternate who shall be an officer, member of the governing board, or employee of that Member. The alternate appointed by a Member shall have the authority to attend and participate in any meeting of the Board when the regular member for whom he or she is an alternate is absent from said meeting.

(b) Each Director or alternate of the Board shall serve until a successor is appointed. Each Director or alternate shall serve at the pleasure of the Member by which he or she has been appointed.

(c) Each Director representing a Member, or his or her alternate, shall have one vote.

Please have your agency's Board of Directors designate a JPIA Director Representative and Alternate Representative.

Member Agency: _____

JPIA Director Representative: _____

Must be a member of the agency's board of directors.

Preferred mailing address: _____

_____

E-mail address: _____

Phone number: _____

Assuming office date: _____

JPIA Alternate Representative: _____

Preferred mailing address: _____

_____

E-mail address: _____

Phone number: _____

Please mail or fax form to: Chimene Camacho
ACWA JPIA, PO Box 619082, Roseville, CA 95661-9082
Fax: (916) 774-7040

AGENDA ITEM NO. 11

ANTELOPE VALLEY
STATE WATER CONTRACTORS ASSOCIATION

COMMISSION MEMORANDUM

DATE: January 27, 2023 **February 9, 2023**

TO: AVSWCA Commissioners **Commission Meeting**

FROM: Mr. Peter Thompson II, General Manager

RE: ***AGENDA ITEM NO. 11 – CONSIDERATION AND POSSIBLE ACTION ON ACCEPTANCE OF DRAFT FEASIBILTY STUDY FOR BIG ROCK CREEK JOINT GROUNDWATER RECHARGE PROJECT. (GENERAL MANAGER THOMPSON II/MR. PAUL CHAU, KENNEDY/JENKS CONSULTANTS)***

Recommendation:

Staff recommends that the Commissioner accept the Draft Feasibility Study for the Big Rock Creek Joint Groundwater Recharge Project completed by Kennedy/Jenks Consultants as the Final Study.

Background:

Staff discussed the Feasibility Study with Kennedy/Jenks and reached the consensus that for the purposes of the Feasibility Study, Kennedy/Jenks has completed its review of the potential options for groundwater recharge at the Big Rock Creek site. Currently there remains three unsettled issues that impact the feasibility of the two most favorable option. Alternative 2 (Culverts at East Avenues T and S) requires feedback and coordination with Los Angeles County Flood Control District. Alternative 3 (Offsite Recharge Basins and Pipelines) requires some coordinated analysis between PWD and AVEK to determine how soon a project like this would be utilized by either agency and projections of when other East Branch Contractors may have additional supplies that could be delivered to the Project. Both Alternatives require confirmation from the Departement of Water Resources (DWR) that the siphon at the Big Rock Creek test site can be utilized as a turnout for the Project. Staff has made inquiries to L.A. County Flood Control District and to DWR and are awaiting feedback. It is the opinion of staff that these final unsettled issues should not hold up the completion of the Feasibility Study by Kennedy/Jenks. Staff can continue to pursue resolutions to the remaining issues and report back to the Commisisoner as these issues are resolved.

Following the Commissioners recommendation at the December 9, 2022 Association meeting, the Draft Feasibility Study has been presented to all individual Boards of the Association's member agencies.

Acceptance of the Study will bring a close to the work provided by Kennedy/Jenks in determining the feasibility of a recharge project in or adjacent to Big Rock Creek. Staff will work to resolve the remaining questions and update the Commissioners as either Alternative 2 or 3 become viable for initiating a project.

Supporting Documents:

- Draft Feasibility Study for the Big Rock Creek Joint Groundwater Recharge Project

Kennedy Jenks

300 N. Lake Ave, Suite 1020
Pasadena, CA 91101
626-568-4300
FAX: 626-683-8938

Big Rock Creek Groundwater Recharge Project Alternatives Feasibility Study

7 December 2022

DRAFT

Prepared for

Antelope Valley State Water Contractors Association

2029 East Avenue Q, Palmdale, CA 93550

KJ Project No. 1844525*00

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Section 1: Introduction

The Antelope Valley Groundwater Basin has been in continuous overdraft since about 1930. With adjudication now in place and groundwater production being curtailed, the Antelope Valley State Water Contractors Association (AVSWCA) is interested in evaluating the feasibility of implementing a groundwater recharge project within Big Rock Creek. The recharge water supply would be State Water Project (SWP) water from the East Branch of the California Aqueduct, with allocations provided by the member agencies of the AVSWCA. The recharged (banked) water would then be available as additional groundwater pumping rights for the respective AVSWCA agencies to pump using their existing wells in the Pearland Subbasin or elsewhere with the approval of the Watermaster.

To evaluate the feasibility of utilizing Big Rock Creek for recharge without significant facility investment, a limited recharge demonstration test was conducted in 2019. The results of the demonstration test are summarized in **Section 2**.

Based on the result of the recharge demonstration test, AVSWCA decided to evaluate potential alternatives for developing recharge capacity in and around Big Rock Creek. The preliminary alternatives analysis is summarized in **Section 3.**

The recommendations of the preliminary alternatives analysis consist of moving forward with two preferred alternatives: in-channel culverts and offsite recharge basins. A refined engineering and cost analysis for these two preferred alternatives is summarized in **Section 4**.

Section 2: Recharge Demonstration Test

The most cost effective recharge concept for Big Rock Creek recharge is to utilize the natural creek for conveyance and recharge of SWP water. This concept minimizes required additional facilities and associated capital costs.

The first task completed under this study was conducting a recharge demonstration test (Test), which consisted of a limited recharge operation using the existing SWP blowoff to convey SWP water to Big Rock Creek. The goal of the Test was to ascertain the feasibility of utilizing Big Rock Creek for a minimum of 10,000 acre-feet per year (AFY) of artificial recharge.

2.1 Pre-Test Model Simulation

A HEC-RAS model run was performed to predict the extent of potential flows in the Big Rock Creek during the Test. The model simulated a release of 30.0 cubic feet per second (cfs) of SWP water for 90 days, as illustrated in Figure 2-1. As shown, the predicted stream caused by the release was expected to travel as far as about 3 miles with an end point between Pearblossom Highway and East Avenue T. The predicted streambed percolation rate was 2 feet per day (ft/day) to 3 ft/day in the creek, and 5 ft/day closer to the release point. The anticipated width of the stream with recharge water ranged from 19 feet to 67 feet. The figure also shows the location of the Granite Well, which was used as a water level monitoring location during the Test.

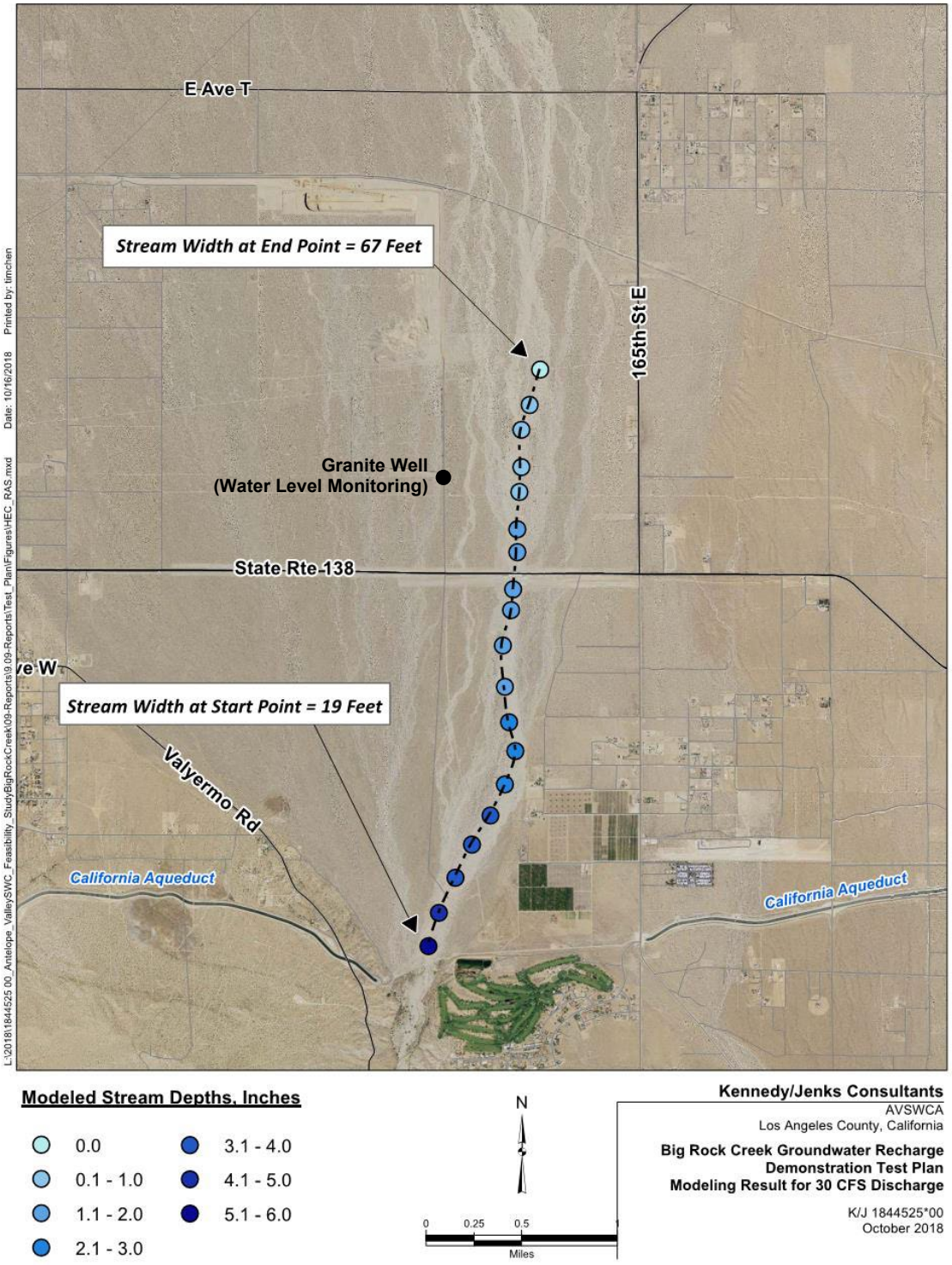


Figure 2-1: Pre-Test Model Simulation Results

2.2 Test Results

The Test was run from July 16th, 2019 to December 5, 2019, with a total cumulative recharge volume of 654 acre-feet (ac-ft, AF). The main limiting factor for recharge was impact to the Avenue T crossing, which is an at-grade crossing of the creek. When surface water was present at this location of the creek, it crossed overland over Avenue T, as shown in Figure 2-2. The Test flow rate was limited as to not allow surface water to reach Avenue T. In addition, the Test could not be conducted when the creek had natural stream flow crossing Avenue T. As shown in the next subsection, this severely limited the Test flows. In addition, the recharge water did not spread out to the natural width of the creek as anticipated. Instead, it channelized as a very narrow stream and flowed north to Avenue T under even low flow rates. On days the Test could run, the average flow rate was 3.1 cfs.

There was a significant number of days when the test could not run due to natural runoff in the creek crossing Avenue T. In fact, the Test was intended to start on March 7th, 2019, but did not actually start until July 16th, 2019 due to the presence of natural runoff. In total, the Test could not run on 65 percent of days between March 7th and December 31st, 2019.

Source: Google Maps, image taken in May 2019

Figure 2-2: Avenue T Crossing at Big Rock Creek

2.3 Turnout Flow Rate & Cumulative Recharge Volume

The Test daily average flow rate and cumulate recharge volume is presented in Figure 2-3. On days when the Test was active, the average flow rate was 3.1 cfs. This was much lower than the anticipated flow rate of 20 to 30 cfs. This was due to protection of Avenue T from flowing and flow channelization, which did not allow for use of the full width of the creek to spread flow. The Test recharged a total volume of 654 ac-ft, which was well short of the goal of 3,150 ac-ft.

As mentioned previously, the Test was not run on approximately 65 percent of days between March and December 2019 due to the presence of natural flow in the channel crossing Avenue T. There is an existing stream gauge, United States Geological Survey (USGS) Station ID 10263500, approximately 4.2 miles upstream the Test turnout. Flow data from the USGS gauge is presented in Figure 2-4 in comparison with the Test recharge flow data. The Test was not able to operate when the gauge flow was above approximately 8 cfs.

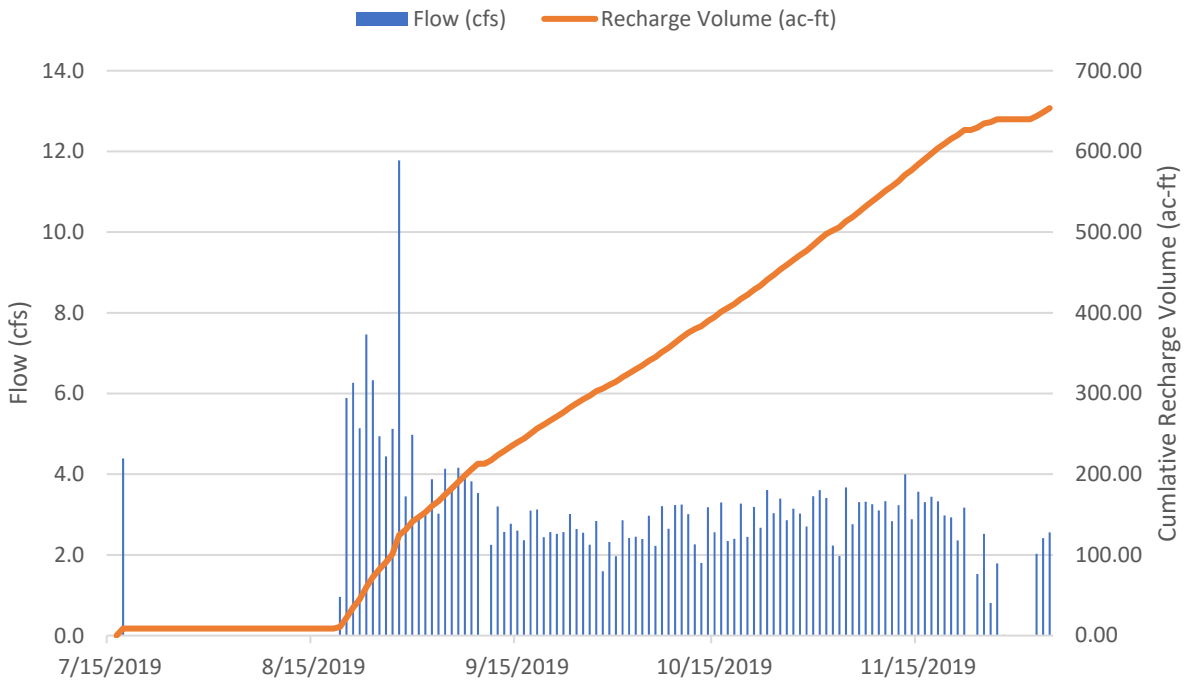


Figure 2-3: Demonstration Test Flow and Cumulative Recharge Volume

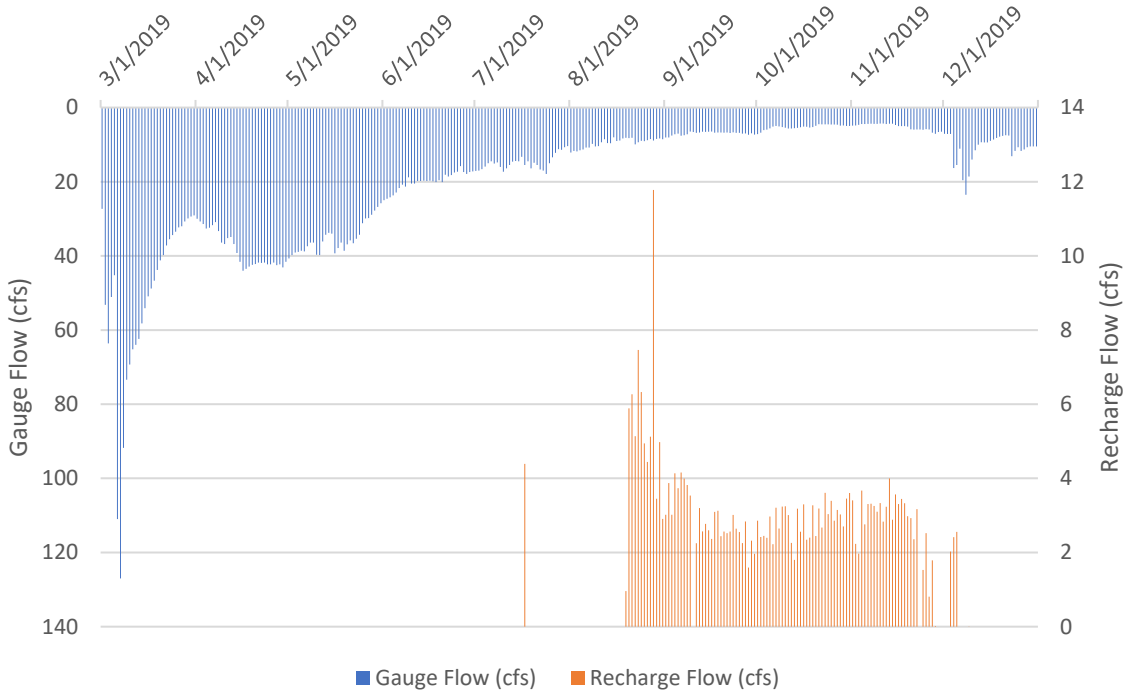


Figure 2-4: Recharge Flow & Gauge Flow during Demonstration Test

2.4 Surface Water Extent with Aerial Surveying Data

During the Test, periodic drone flights were conducted to capture aerial imagery. The images show the extent and width of the surface water flow in the creek when artificial recharge was conducted. Aerial imagery was captured on 11 separate days between 8/20/2019 and 10/22/2019. The longitudinal length of the surface water flow from the turnout to the wetted front for each day is shown in Figure 2-5. The length is calculated along the centerline of the creek flow.

As described previously, the major limitation on recharge during the Test was keeping the extent of the surface water flow from reaching Avenue T. The surface water flow channelized and maintained a very narrow width as it traveled down the creek. Based on the aerial imagery data, the average flow width was 12 feet, which was significantly smaller than the anticipated average flow width of 43 feet predicted by the pre-Test hydrologic model.

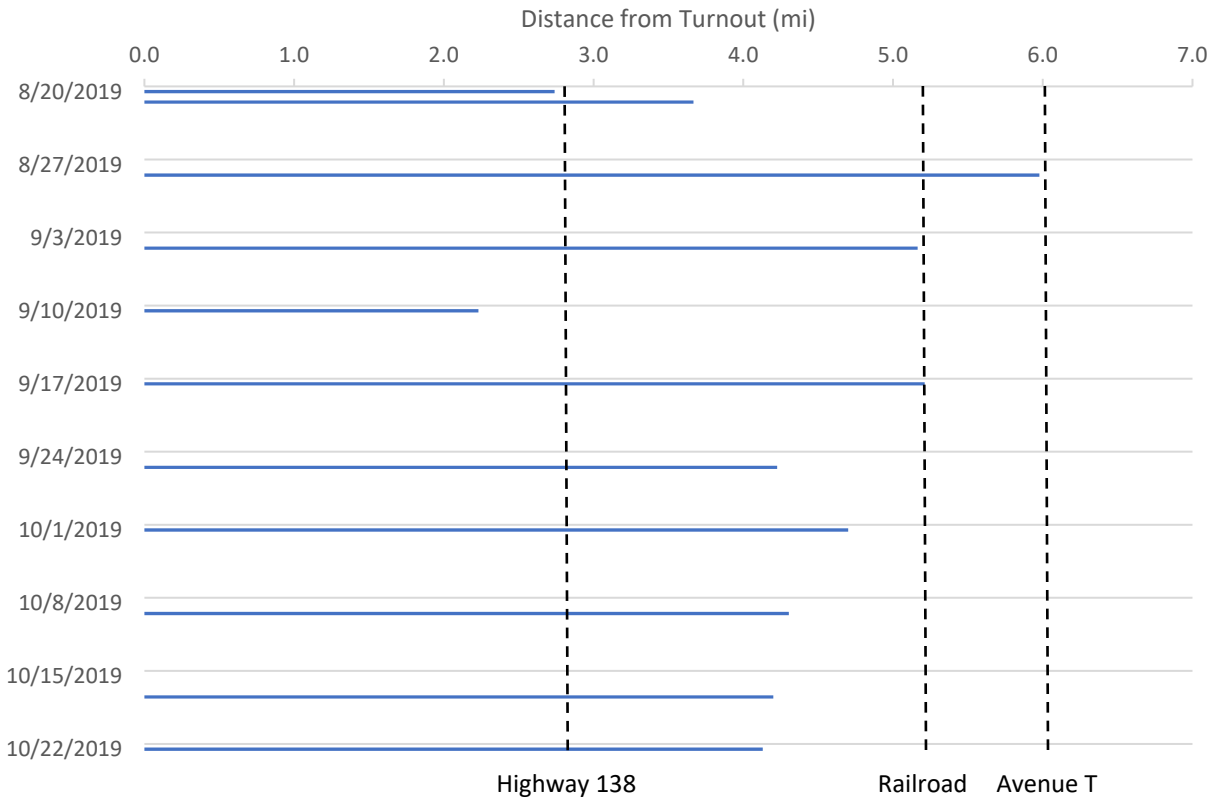


Figure 2-5: Recharge Surface Water Extent

2.5 Groundwater Levels

The Granite Well, as shown in Figure 2-1, was utilized for water level monitoring during the Test. Groundwater level data from the Granite Well is shown in Figure 2-6. Although one can see a general trend of slightly increasing groundwater levels during the Test between August and December 2019, one can also see quite a bit of variation throughout the monitoring period, which is likely due to local pumping. This is not surprising since the volume of recharge water was small, so the impact to the groundwater level is small, especially relative to other variables impacting the basin. It is somewhat surprising that natural runoff between February and July 2019 did not impact the average static water level that much.

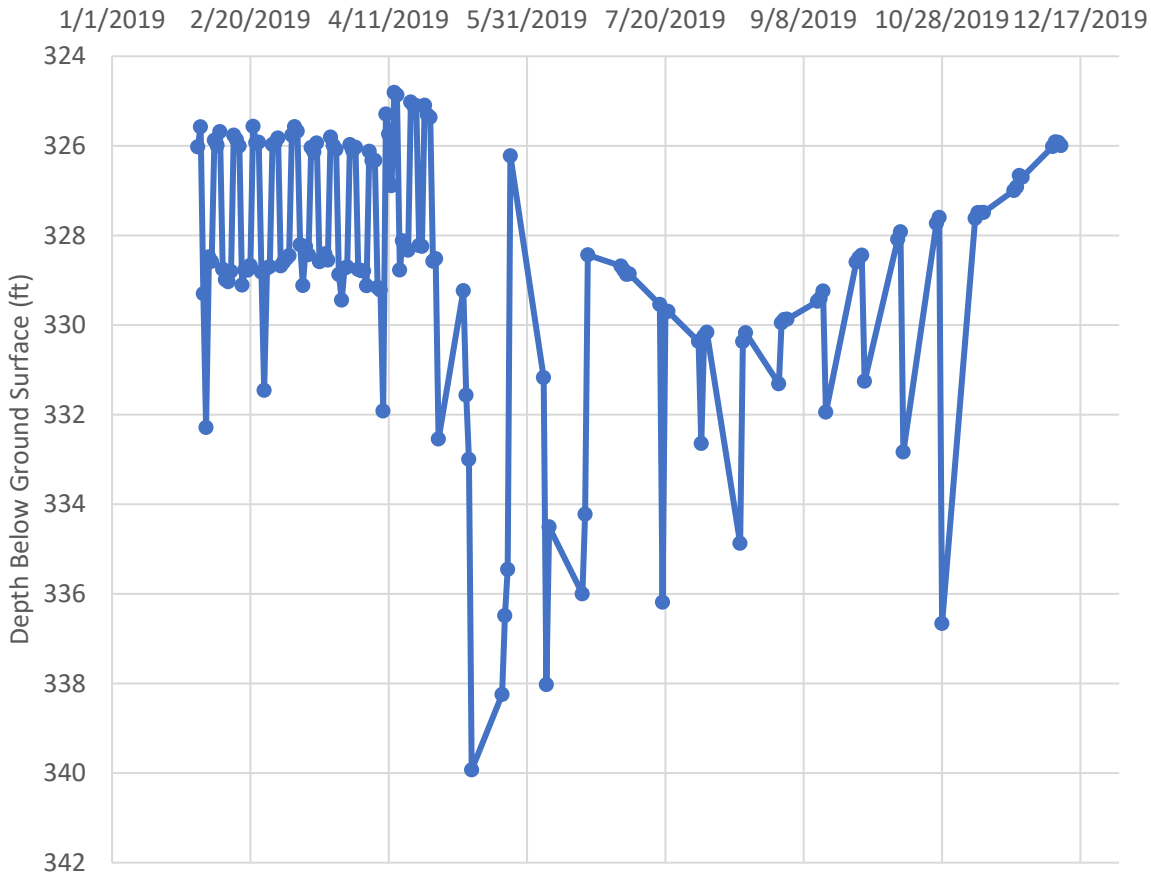


Figure 2-6: Groundwater Levels During Demonstration Test

There are three USGS monitoring wells that are located in the general region of Big Rock Creek (USGS Site IDs 343205117525801, 343242117500601, and 343155117501001). Groundwater level data is captured once a year in these wells by USGS staff, which is not frequent enough to provide useful data for the purposes of the Test.

2.6 Conclusion

The Test resulted in 654 ac-ft of artificial recharge for a period of 273 days from March 7th through December 5th, 2019. Extrapolating this level of recharge to a full year results in a projected recharge rate of 874 AFY, which is well short of the 10,000-AFY recharge goal. Since the Test did not come close to achieving the recharge objective, alternative project concepts are evaluated, as described in the next section.

A detailed Technical Memorandum summarizing the Test plan and results is provided as Appendix A.

Section 3: Preliminary Alternatives Analysis

Due to the poor results of the Recharge Demonstration Test described in the previous section, KJ evaluated four (4) recharge facilities alternatives and their ability to meet the recharge objectives of AVSWCA. If feasible, the facilities are designed to have a maximum recharge capacity of 20,000 AFY. The four (4) alternatives are as follows:

- **Alternative 1 – In-Channel Berms**: Construct in-channel pushup berms within the Big Rock Creek wash to help spread recharge water across the full width of the creek bed.
- **Alternative 2 – East Avenue T Culverts**: Construct culverts across East Avenue T and East Avenue S to allow creek water to continue recharging downstream without flooding the roadways.
- **Alternative 3 – Offsite Recharge Basins**: Construct a pipeline from the turnout to offsite recharge basins located to the east of Big Rock Creek.
- **Alternative 4 – Water Booster Station/Pipeline**: Convey water from the turnout at Antelope Valley-East Kern Water Agency's (AVEK) turnout at the Carl B. Hunter Water Treatment Plant (WTP) via a water booster station/pipeline to Big Rock Creek, downstream of East Avenue T.

Several evaluation criteria, consisting of as recharge capacity, capital and operation & maintenance (O&M) costs, required permitting, ease of construction, and community impacts, are utilized to evaluate and rank the proposed alternatives listed above, as described in Section 3.2. Planning level cost estimates are provided in Appendix B for each alternative. A 20-year lifecycle was assumed for the operation and maintenance (O&M) costs analyses.

3.1 Recharge Facilities Alternative Descriptions and Costs

A description of each alternative is provided in the following subsections. Project capacity, costs, and environmental compliance & permitting requirements are provided for each alternative. For all alternatives, California Environmental Quality Act (CEQA) compliance will require surveys for Desert Tortoise, Mohave Ground Squirrel (MGS), San Bernardino Kangaroo Rat (SBKR), burrowing owl (BUOW), Rare Plants, potentially Joshua trees, and other sensitive habitat communities.

3.1.1 Alternative 1 – In-Stream Berms

The purpose of Alternative 1 is to construct berms within Big Rock Creek to promote utilization of the full width of the creek bed for recharge area. Alternative 1 includes the installation of approximately 25,000 linear-feet (LF) of in-stream pushup berms between Highway 138 and East Avenue T as well as a pole-mounted security camera and level sensor facility located just to the south of East Avenue T. The berms will create approximately 980 acres of recharge area. Water released from the Big Rock Creek Turnout (See Appendix A for facility description and location) flows north under Highway 138 before the streambed widens and flattens out as it is forced to meander through the pushup berms (see Figure 3-1). The mounted security camera

can be used to visually verify that the flow being released at the upstream turnout is not inadvertently flooding East Avenue T.

Capacity: The in-stream berms will allow the maximum recharge capacity objective of 20,000 AFY to be achieved. However, there is an elevated risk of unavailability either during a local rain event, when large amounts of stormwater runoff is flowing through the creek, or after a large rain event when the berms need to be re-constructed.

Costs: Of the four alternatives, Alternative 1 has the second lowest capital cost of $0.52M due to the relatively simple construction of using backhoes to create pushup berms from native soils within the streambed. However, Alternative 1 has the highest 20-Year O&M Cost of $1.65M due to the high amount of maintenance and berm reconstruction required, particularly after large rain events.

Environmental Compliance/Permitting: This alternative has the most intense environmental compliance and permitting requirements of the four alternatives. With nearly a thousand acres of disturbed creek area, this alternative requires the most biological and cultural resources survey area. In addition, the project area will need to be re-surveyed for biological and cultural resources every time the pushup berms are re-built due to damage from stormwater runoff. Since the project is within a jurisdictional waterway, a California Department of Fish & Wildlife (CDFW) Section 1602 permit and Lahontan Regional Water Quality Control Board (RWQCB) Waste Discharge Requirements (WDR) permit will be required. Given that this project is expected to be a significant water impact, the initial permit may take up to two years to obtain. There is also a possibility that obtaining the required permits will be practically infeasible, given potential costly or timely restrictions imposed by the permitting agencies that are not known at this time.

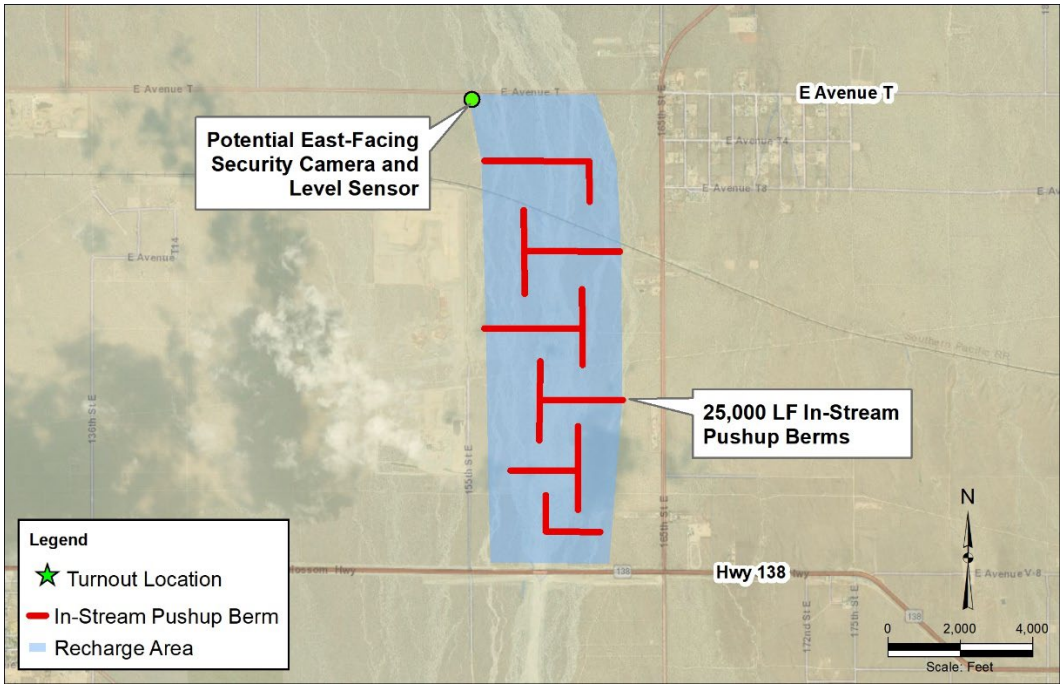


Figure 3-1: Alternative 1 Facilities Map

3.1.2 Alternative 2 – Culverts

The purpose of Alternative 2 is to mitigate flooding of Avenue T and Avenue S by constructing culverts to allow creek water to flow beneath the road crossings. For the East Avenue T crossing, two (2) sets of three (3) arched reinforced concrete pipe (RCP) culverts will be installed at two (2) separate locations where flooding currently occurs across East Avenue T (see Figure 3-2 for culvert locations and lengths). Further downstream, another set of three (3) arched RCP culverts will allow flow to pass under East Avenue S and recharge up to East Avenue R. Based on available USGS contour data and a required minimum culvert slope of 0.5 percent, the installation of culverts across East Avenue R would not be feasible due to the shallow road crossing.

Note that this alternative can potentially provide community benefits aside from supplementing water supply. The culverts will increase public safety by allowing some stormwater runoff to pass under the road crossings, thereby reducing road flooding events.

Capacity: At the minimum slope, each set of three (3) arched culverts, with 18-inch inside rise and 28.5-inch inside span, provides a total culvert capacity of 45 cfs at 75 percent full. The project capacity is limited by the recharge capacity of the creek between the turnout and Avenue R, which is estimated to be 2,200 AFY. Although the culverts allow recharge water to reach Avenue R, it does not address the narrow channelization issue that is inherent to the natural creek bed.

Costs: Of the four alternatives, Alternative 2 has the lowest capital cost of $0.51 M due to the small project footprint and relative ease of construction. Alternative 2 also has the lowest 20-Year O&M Cost of $40,000 due to the minimal amount of required maintenance (periodic flushing of debris).

Environmental Compliance/Permitting: This alternative has a relatively moderate level of environmental compliance and permitting requirements. Since the project is within a jurisdictional waterway, a CDFW Section 1602 permit and RWQCB WDR permit will be required. Given that this project is expected to have limited water impact, the initial permit may take up to one year to obtain and is considered more feasible to obtain compared to Alternative 1.

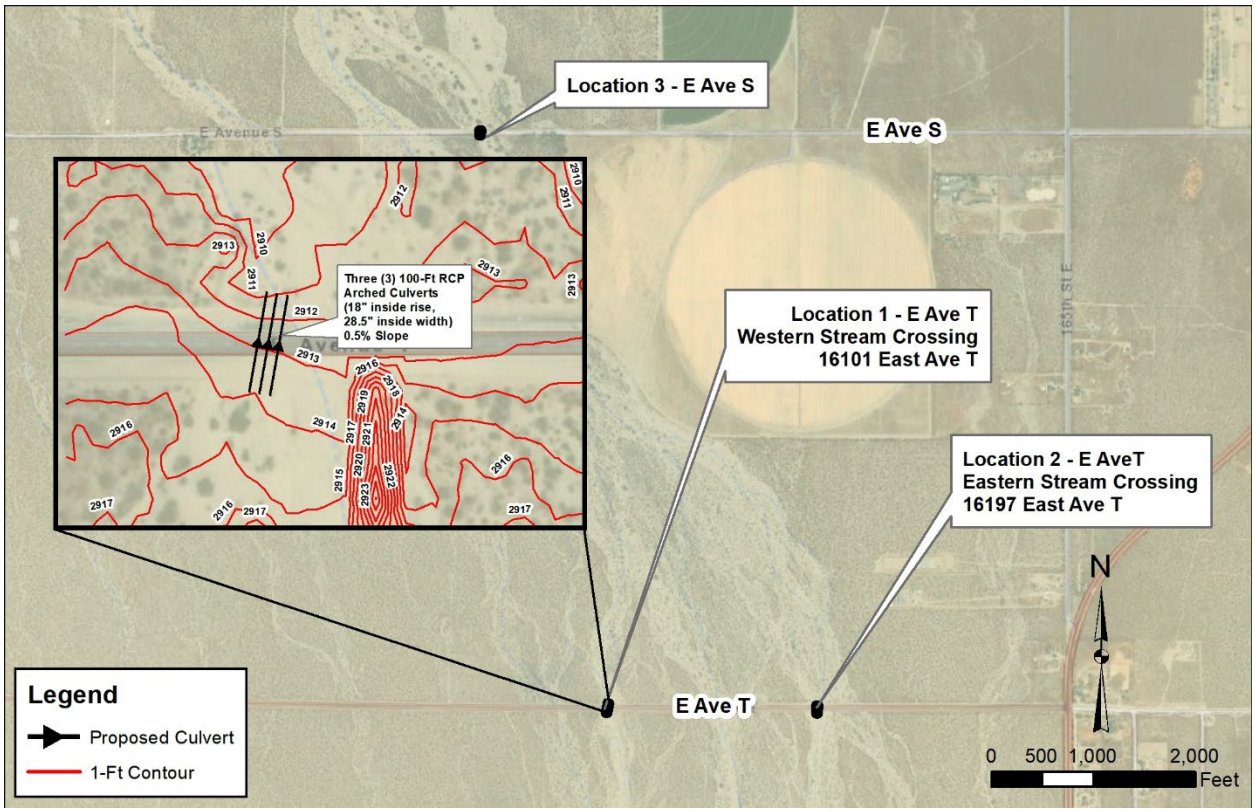


Figure 3-2: Alternative 2 Facilities Map

3.1.3 Alternative 3 – Offsite Recharge Basins and Pipeline

The purpose of this alternative is to utilize engineered facilities for conveyance and recharge of SWP water, instead of the creek. Alternative 3 includes the construction of approximately 14,300 feet of pipeline from the Big Rock Creek turnout to offsite recharge basins located to the northeast of the turnout near the east bank of Big Rock Creek. Approximately 60 acres of land for the recharge basins would require purchase by AVSWCA. Figure 3-3 shows the alignment and the pipeline as well as the location of the offsite recharge basins. The recharge basins are located conservatively in an area isolated from residential areas and outside the jurisidictional waterway of Big Rock Creek. The basins are primarily designed based on available USGS contour data.

Capacity: The basins are designed for the maximum recharge capacity objective of 20,000 AFY to be achieved with an assumed percolation rate of 2 ft/day.

Costs: Of the four alternatives, Alternative 3 has the second highest capital costs of $9.7M as well as the third highest 20-year lifecycle O&M cost of $1.01M.

Environmental Compliance/Permitting: This alternative has a relatively low level of environmental compliance and permitting requirements. Since the project is not within the creek,

a CDFW Section 1602 permit and RWQCB WDR permit are not required. As long as the recharge basins are located on previously disturbed farmland, it is anticipated that an Environmental Impact Report may not be required for CEQA compliance.

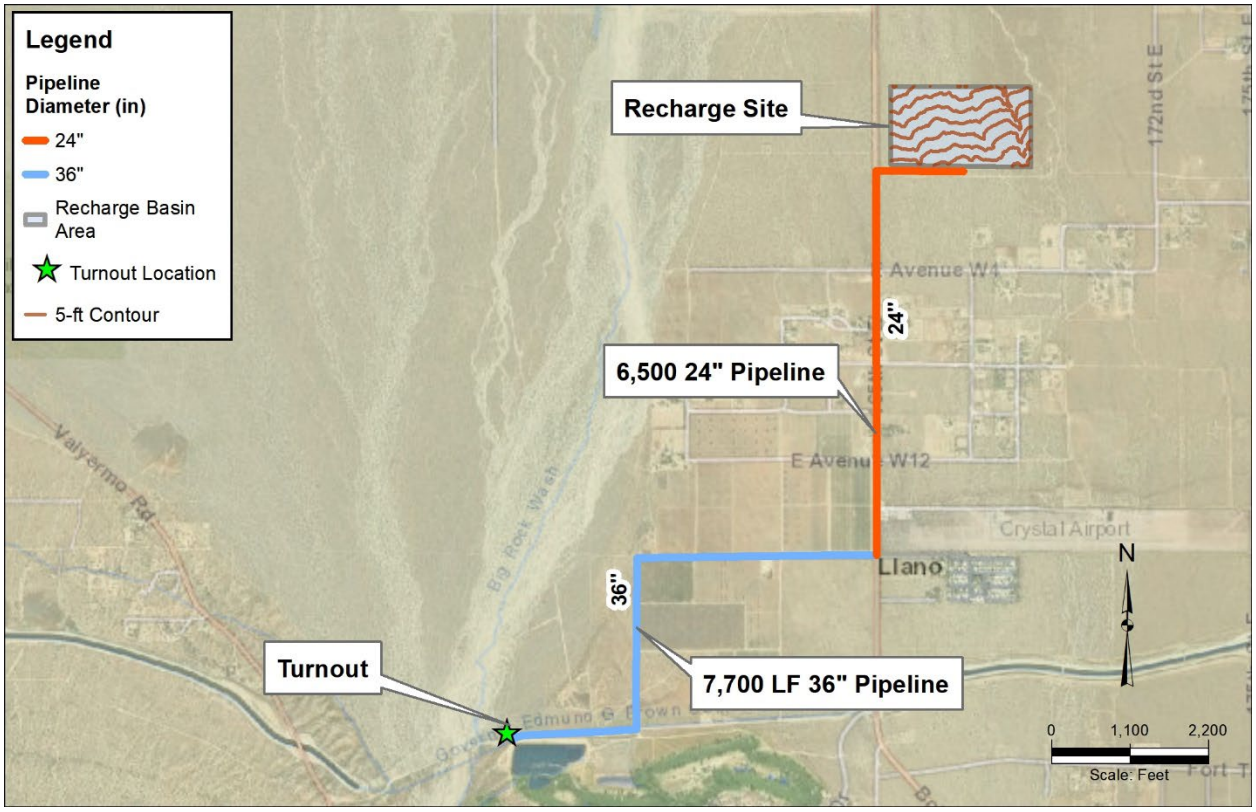


Figure 3-3: Alternative 3 Facilities Map

3.1.4 Alternative 4 – Water Booster Station and Pipeline from Carl B. Hunter WTP

The purpose of Alternative 4 is to avoid the Avenue T flooding issue by delivering water to the downstream end of the Avenue T crossing from an alternative turnout located near the AVEK Carl B. Hunter Water Treatment Plant. Alternative 4 includes the construction of a new 2 million-gallon per day (MGD) water booster station (WBS) located on site at the Carl B Hunter WTP and roughly 5.6 miles of 12-inch pipeline conveying flow to a discharge point just north of East Avenue T.

Figure 3-4 shows the location and alignment of the WBS and the pipeline. Under this alternative, SWP water would still be applied from the Big Rock Creek turnout to the Avenue T crossing.

Capacity: The project capacity is limited by the recharge capacity of the creek between the turnout and Avenue S, which is estimated to be 1,100 AFY. Although the new facilities avoid flooding of Avenue T, it does not address the narrow channelization issue that is inherent to the natural creek bed.

Costs: Of the four alternatives, Alternative 4 has the highest capital cost of $10.1M and the second highest 20-year lifecycle O&M cost of $1.38M due to the inclusion of a pump station and the relatively long pipeline alignment.

Environmental Compliance/Permitting: This alternative has a relatively moderate level of environmental compliance and permitting requirements. Since the project will recharge water within a jurisdictional waterway, a CDFW Section 1602 permit and RWQCB WDR permit will be required. Given that this project is expected to have limited water impact, the initial permit may take up to one year to obtain and is considered more feasible to obtain compared to Alternative 1.

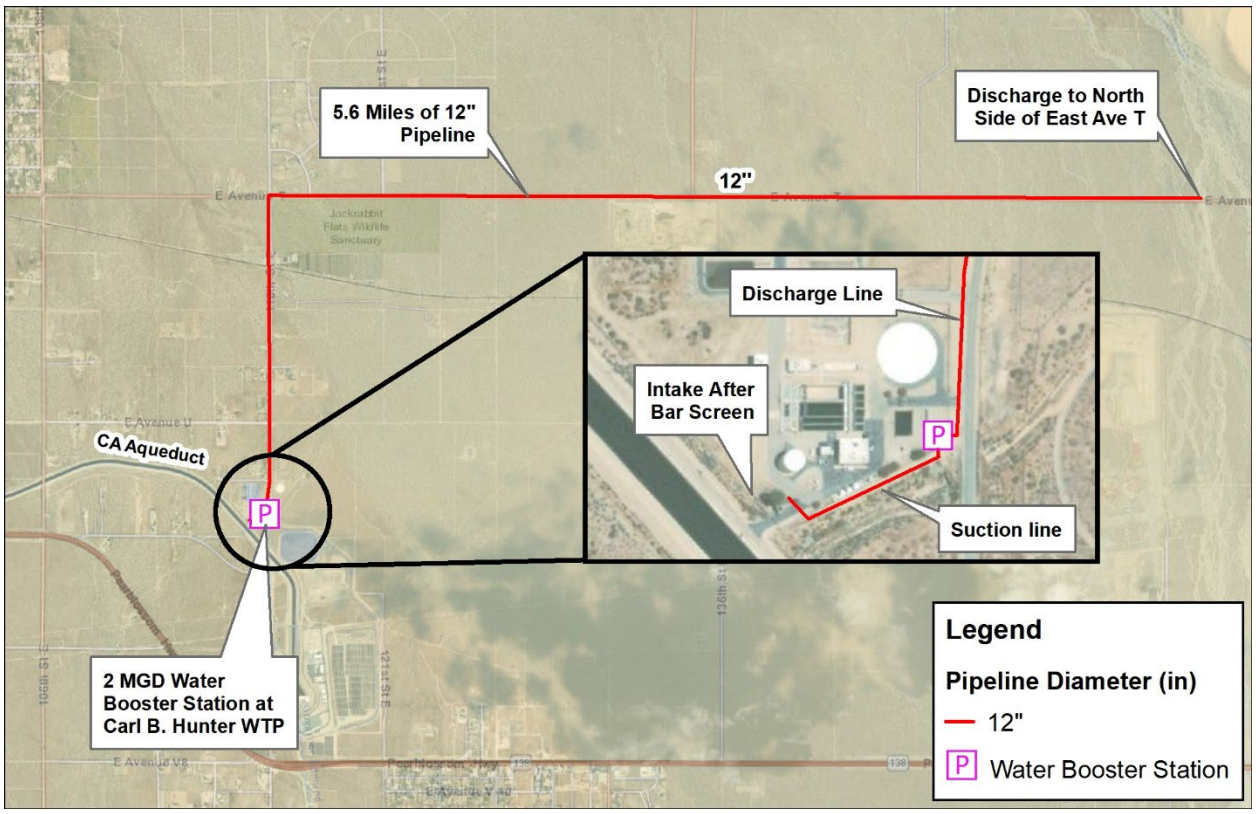


Figure 3-4: Alternative 4 Facilities Map

3.2 Alternatives Evaluation

The alternatives are evaluated using a weighted criteria analysis to develop a short list of alternatives for further refinement and evaluation. KJ worked with AVSWCA staff to develop the criteria and weighting factors utilized for the alternatives analysis. The criteria are summarized in Table 3-1.

Recharge capacity, defined as the alternative's anticipated annual recharge volume, is assigned the highest weighting factor of 30 percent, which speaks to the importance of meeting AVSWCA's recharge objective for the project. Capital cost is defined as the construction cost for the alternative, which includes a 30 percent contingency, while O&M cost represents a net present value of O&M costs over a 20-year period, including power, staffing, and maintenance costs. Capital and O&M costs collectively have a weighting factor of 25 percent. The scoring for recharge capacity, capital cost, and O&M cost is calculated using the relative values for each alternative. For recharge capacity, the alternative with the highest capacity is assigned a score of 5, while the other alternatives are calculated scores using the relative recharge capacity value of the alternative compared to the highest recharge capacity. For capital and O&M costs, the alternative with the lowest cost is assigned a score of 5, while the other alternatives are calculated scores using the relative costs of the alternative compared to the lowest cost alternative.

Subjective scores are assigned for regulatory and permitting requirements, ease of construction, and community impacts. Alternatives with less complex regulatory and permitting requirements and are easier to construct are assigned higher scores. Alternatives that provide a positive community impact, such as the culverts with Alternative 2, are assigned higher scores.

For each alternative, the score for each criterion is multiplied by the criterion's weighting factor, then aggregated to produce a total score. A summary of the alternatives scoring evaluation is provided as Table 3-2.

Alternative 2 – Culverts and Alternative 3 – Offsite Recharge Basins and Pipeline are the two highest scoring alternatives and are selected for further refinement and evaluation. Alternative 2 scored well for being cost effective and providing an ancillary positive community impact by reducing overall road flooding events. Alternative 3 scored well for providing the maximum recharge capacity objective and having the least complex regulatory and permitting requirements.

While Alternative 1 scored well for costs and ease of construction, it was assigned the lowest score for regulatory and permitting requirements. Alternative 4 scored poorly due to high costs and low recharge capacity.

Table 3-1: Alternatives Evaluation Criteria

Evaluation Criteria Definition			
Evaluation Criteria	**Definition**	**Point Scoring Range**	**Weighting Factor**
Recharge Capacity	Total annual recharge volume (AFY) anticipated for the alternative	0 (Worst) - 5 (Best)	30%
Capital Cost	The capital cost required to construct the alternative	0 (Worst) - 5 (Best)	15%
20-Year O&M Cost	The 20-year lifespan O&M cost required to operate and maintain the alternative	0 (Worst) - 5 (Best)	10%
Regulatory and Permitting Requirements	Required regulatory and permitting requirements needed to construct and operate the alternative	0 (Worst) - 5 (Best)	25%
Ease of Construction	Accounts for complexity of construction and the project footprint	0 (Worst) - 5 (Best)	10%
Community Impacts	Potential positive and/or negative impacts to the surrounding community during and after construction of the alternative	0 (Worst) - 5 (Best)	10%

Table 3-2: Alternatives Analysis Scoring Evaluation

			Alternative 1		Alternative 2		Alternative 3		Alternative 4	
			In-Channel Berms		East Avenue T/S Culverts		Offsite Recharge Basins		Water Booster Station/Pipeline	
		$/AF	$1		$12		$25		$480	
Criteria	**Weight**	**Range**	**Score**	**Weighted Score**	**Score**	**Weighted Score**	**Score**	**Weighted Score**	**Score**	**Weighted Score**
Recharge Capacity	30%	0 - 5	5.0	1.50	0.54	0.16	5.0	1.50	0.26	0.08
Capital Cost	15%	0 - 5	5.0	0.75	4.90	0.74	0.3	0.04	0.25	0.04
20-Year O&M Cost	10%	0 - 5	0.1	0.01	5.00	0.50	0.2	0.02	0.14	0.01
Regulatory and Permitting Requirements	25%	0 - 5	0.5	0.13	4.00	1.00	5.0	1.25	3.00	0.75
Ease of Construction	10%	0 - 5	5.0	0.50	4.00	0.40	3.0	0.30	2.00	0.20
Community Impacts	10%	0 - 5	3.0	0.30	5.00	0.50	3.0	0.30	3.00	0.30
Total	**100%**			**3.19**		**3.30**		**3.41**		**1.38**

Section 4: Preferred Alternatives Development

Based on the alternatives analysis described in the previous section, Alternative 2 – Culverts and Alternative 3 – Offsite Recharge Basins and Pipeline are selected for further development and evaluation.

4.1 Culverts

This section describes design refinements of Alternative 2, which includes the installation of culverts across East Avenue T and East Avenue S. Since one of the main benefits of this alternative is to provide a community benefit of reducing road flooding under both artificial recharge and natural stormwater runoff conditions, the culvert design criteria are re-examined to allow a majority of stormwater runoff events to flow through the culvert. In addition, box culvert and circular culvert design concepts are described, which provide feasible design alternatives to the arch design concept described previously.

As mentioned before, there is an existing stream gauge, USGS Station ID 10263500, that is approximately 4.2 miles upstream of the turnout site. Twenty years of historical flow data from this stream gauge is provided as Figure 4-1. It is assumed that most of the flow measured at this stream gauge makes its way to Big Rock Creek. Based on the historical flow data, a flow design criterion of 200 cfs is selected for the culverts. In the past twenty years, flow has exceeded 200 cfs at the stream gauge only on eight occasions.

For a box culvert concept, a design flow of 200 cfs requires a box culvert that is 8 feet wide and 2 feet high. A hydraulic profile of the box culvert concept is provided as Figure 4-2. The capital cost is estimated to be approximately $260,000.

For a circular culvert concept, a design flow of 200 cfs requires seven 24-inch circular culverts. A hydraulic profile of the circular culvert concept is provided as Figure 4-3. The capital cost is estimated to be approximately $185,000.

Building culverts at Avenue T and Avenue S will require coordination with Los Angeles County Department of Public Works (LACDPW), who own and operate the roads and manage flood control in the region. It is likely that LACDPW will have design criteria and standards that will be applied for this concept. AVSWCA staff is currently engaged with LACDPW on discussing this project concept.

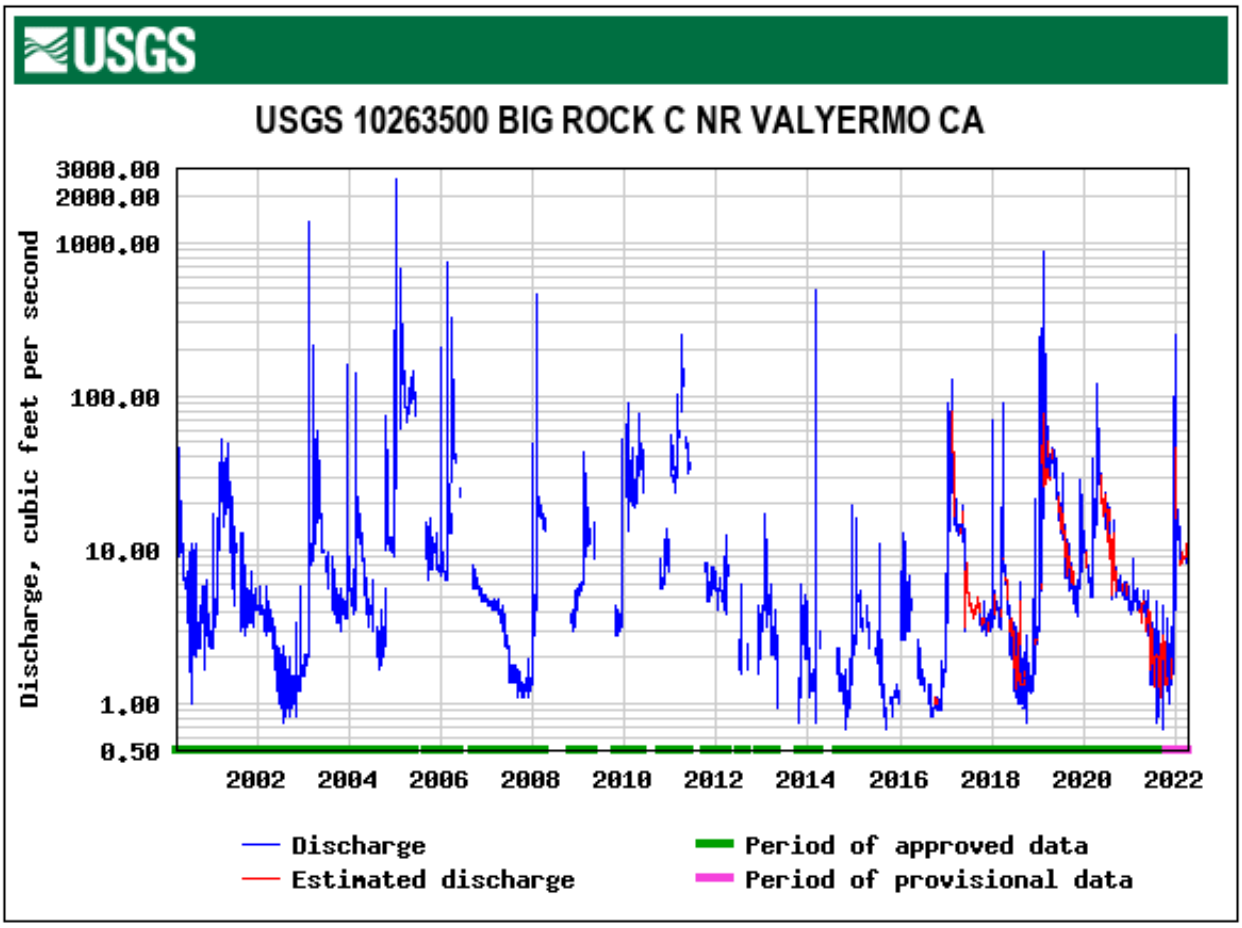
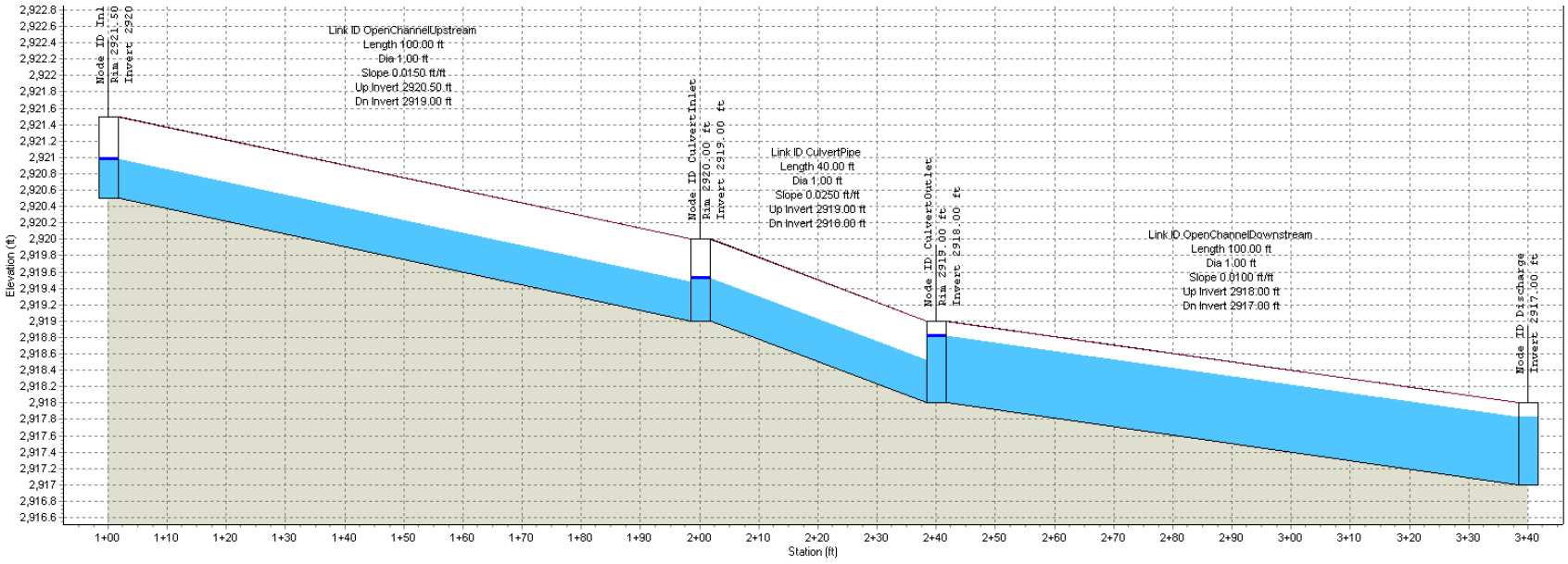


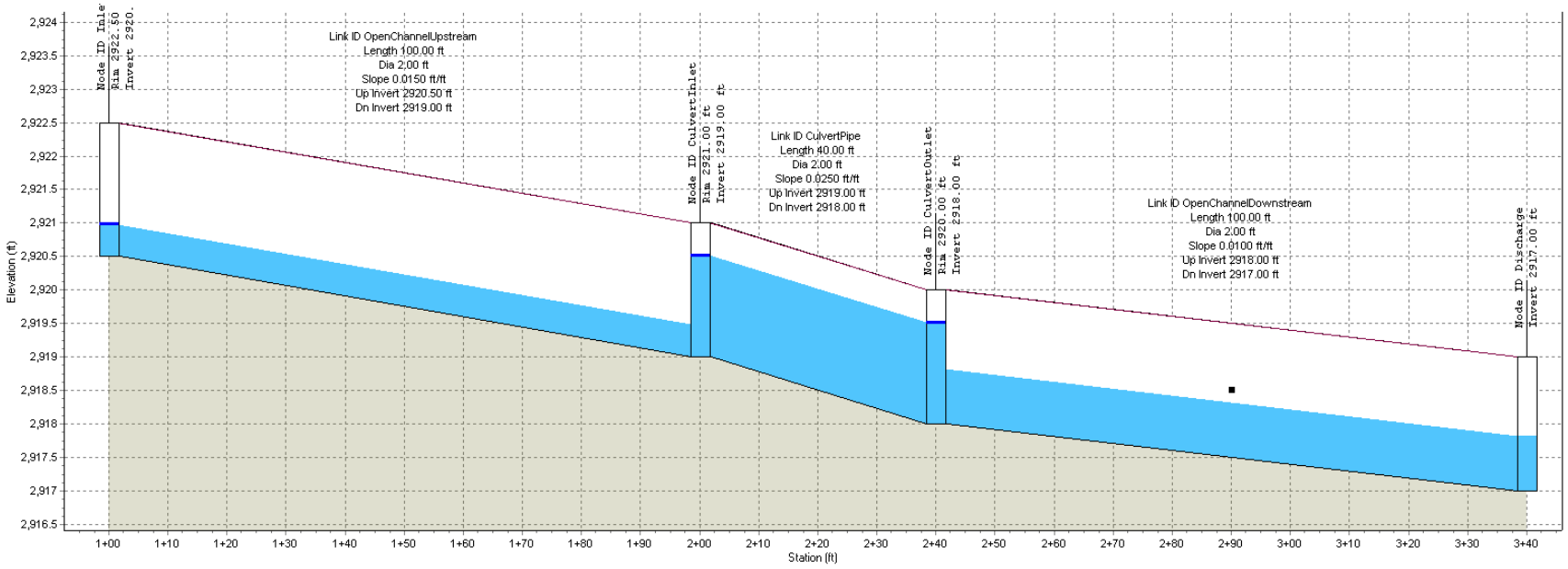
Figure 4-1: Big Rock Creek Stream Gauge Historical Flow Data



Node ID:	Inlet	CulvertInlet	CulvertOutlet	Discharge
Rim (ft):	2921.50	2920.00	2919.00	
Invert (ft):	2920.50	2919.00	2918.00	2917.00
Min Pipe Cover (ft):	0.00	0.00	0.00	
Max HGL (ft):	0.00	0.00	0.00	0.00

Link ID:	OpenChannelUpstream	CulvertPipe	OpenChannelDownstream
Length (ft):	100.00	40.00	100.00
Dia (ft):	1.00	1.00	1.00
Slope (ft/ft):	0.0150	0.0250	0.0100
Up Invert (ft):	2920.50	2919.00	2918.00
Dn Invert (ft):	2919.00	2918.00	2917.00
Max Q (cfs):	0.00	0.00	0.00
Max Vel (ft/s):	0.00	0.00	0.00
Max Depth (ft):	0.00	0.00	0.00

Figure 4-2: Box Culvert Hydraulic Profile



Node ID:	Inlet	CulvertInlet	CulvertOutlet	Discharge
Rim (ft):	2922.50	2921.00	2920.00	
Invert (ft):	2920.50	2919.00	2918.00	2917.00
Min Pipe Cover (ft):	0.00	0.00	0.00	
Max HGL (ft):	0.00	0.00	0.00	0.00

Link ID:	OpenChannelUpstream	CulvertPipe	OpenChannelDownstream
Length (ft):	100.00	40.00	100.00
Dia (ft):	2.00	2.00	2.00
Slope (ft/ft):	0.0150	0.0250	0.0100
Up Invert (ft):	2920.50	2919.00	2918.00
Dn Invert (ft):	2919.00	2918.00	2917.00
Max Q (cfs):	0.00	0.00	0.00
Max Vel (ft/s):	0.00	0.00	0.00
Max Depth (ft):	0.00	0.00	0.00

Figure 4-3: Circular Culvert Hydraulic Profile

4.2 Offsite Recharge Basins and Pipeline

The main drawback with this project concept is the relatively high capital cost of $9.7M. Approximately 80 percent of the capital cost estimate is attributed to the 2.7 miles of pipeline required to convey recharge water from the turnout to the recharge basin site.

One of the main design refinements made for this project concept is to identify potential recharge basin sites that are closer to the turnout site, thereby decreasing pipeline cost for the project. Working with local landowners, AVSWCA staff identified two parcels that can serve as potential recharge basin sites, as shown in Figure 4-4.

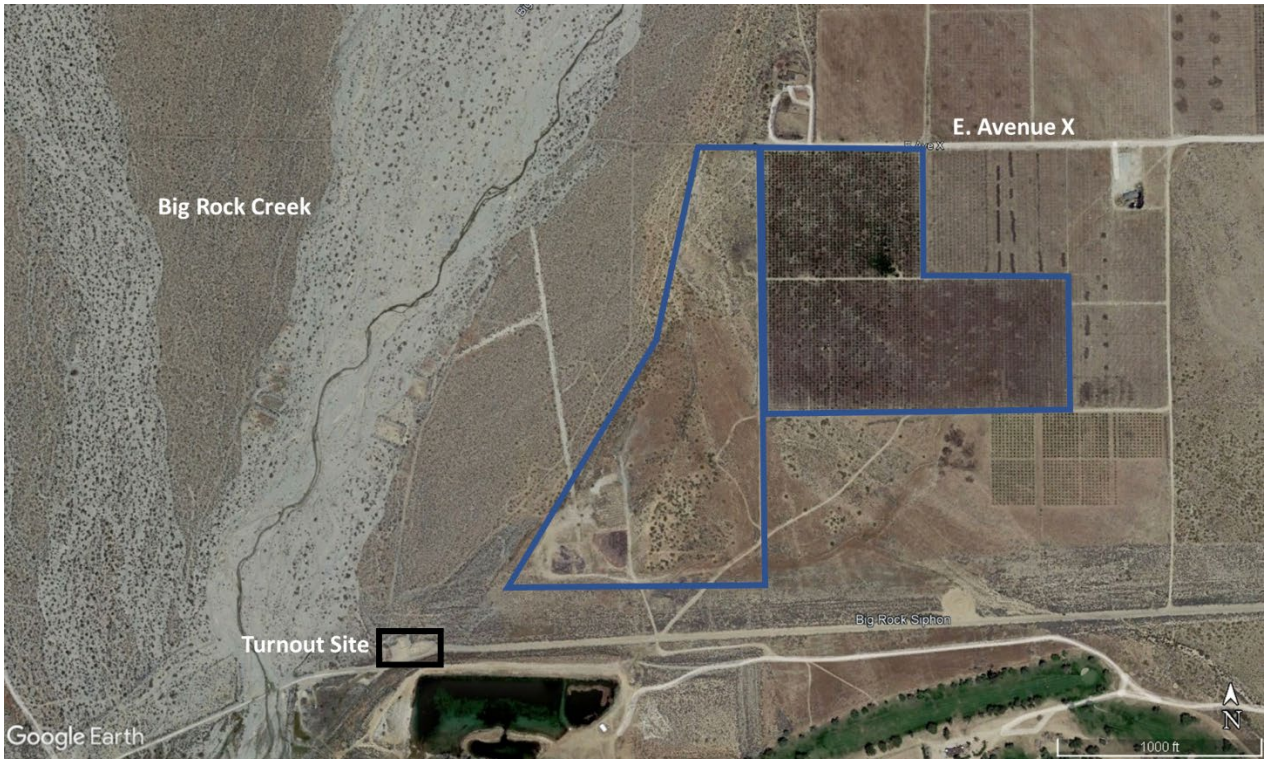


Figure 4-4: Potential Recharge Sites

Three recharge site options are developed utilizing these two parcels. **Option 1** utilizes only the western parcel for recharge and is shown in Figure 4-5. This option produces 20.5 acres of recharge basins and requires 2,200 LF of 24" pipeline and 800 LF of 12" pipeline from the Big Rock Creek turnout to the recharge site. The capital cost is estimated to be $2.1M.

Option 2 utilizes only the eastern parcel for recharge and is shown in Figure 4-6. This option produces 17.8 acres of recharge basins and requires approximately 3,200 LF of 24" pipeline and 1,600 LF of 16" pipeline from the Big Rock Creek turnout to the recharge site. The middle

section of the parcel is not developed to not disturb existing utilities that the landowner would like to protect in place. The capital cost is estimated to be $2.3M.

Option 3 is a combination of Options 1 and 2 and is shown in Figure 4-7. This option produces 38.3 acres of recharge basins and requires approximately 3,200 LF of 24" pipeilne, 1,600 LF of 16" pipeline, and 300 LF of 12" pipeline from the Big Rock Creek turnout to the recharge site. The capital cost is estimated to be $3.3M.

The capital costs range from $2.1M to $3.3M for the three options described, which is significantly less than the $9.7M capital cost estimated for the recharge concept utilized in the preliminary alternatives analysis. The cost estimate details for the three options are provide in Appendix B.

Infiltration Tests

In support of the development of the recharge site options, two double ring infiltration tests were conducted at the two parcels by Soils Engineering, Inc. The locations of the two tests are shown with yellow stars on Figure 4-7. The test results indicate that the raw infiltration rate for the western location is 29 ft/day and the raw infiltration rate for the eastern location is 13 ft/day (see Appendix C). The higher infiltration rate of the western location is likely due to its close proximity to Big Rock Creek.

Typically, a factor of safety (FOS) is applied to infiltration test results for the purposes of planning and design. The FOS accounts for uncertainty with extrapolating results from point locations to a much larger recharge site and the fact that the vadose zone is not saturated as it will be during normal operation of the recharge site.

For this study, a FOS of 10 is recommended, which results in a design percolation rate of 2.9 ft/day for Option 1 and 1.3 ft/day for Option 2. A summary of the recharge capacity and construction cost for the three options is provided in Table 4-1.

Table 4-1: Recharge Options Summary

	Option 1	Option 2	Option 3
Percolation Rate (ft/day)	2.9	1.3	1.3-2.9
Basin Area (acres)	20.5	17.8	38.3
Recharge Capacity (AFY)	**21,700**	**8,400**	**30,100**
Construction Cost Estimate	**$2.1M**	**$2.3M**	**$3.3M**
Construction Unit Cost ($/AFY)	**$97/AFY**	**$274/AFY**	**$110/AFY**

4.3 Turnout Modifications

For either the culvert or offsite recharge project concepts, the existing SWP blowoff at Big Rock Creek will need to be retrofitted for use as a turnout. It is anticipated that the blowoff function can still be maintained while accommodating operation as a turnout through piping and appurtenance modifications at the blowoff site. Any modifications to the blowoff and plans for

utilizing this location as a turnout for recharge operation will require coordination and approval from the Department of Water Resources (DWR).

4.4 Conclusions and Recommendations

Both the culvert and offsite recharge project concepts are considered technically and financially feasible, but require further coordination with impacted agencies, including DWR for the turnout modifications and LACDPW for the culverts. Input and requirements from these other agencies may impact feasibility, scope, and cost for the project concepts. For the offsite recharge project concept, AVSWCA will also need to purchase land for the recharge site.

Based on feedback from the Antelope Valley Basin Watermaster Engineer, recharge in the Big Rock Creek area is considered a good location for banking of replacement water obligation supply, which will likely be the primary use of a Big Rock Creek recharge project. The recharge project can also serve as a water storage option for the member agencies of AVSWCA.

If DWR is supportive of the turnout modifications and LACDPW is supportive of the culverts concept, it is recommended to move forward with implementation of the culverts concept, which can provide approximately 2,200 AFY of recharge capacity. If greater recharge capacity is required or if LACDPW is not supportive of the culverts concept, the offsite recharge basin concept is recommended for implementation.

Note that the Big Rock Creek turnout is located downstream of the SWP Pearblossom Pump Station, which is a hydraulic bottleneck in the East Branch of the California Aqueduct. AVSWCA will likely need to coordinate with other SWP contractors to deliver water to the Big Rock Creek recharge project, depending on the quantity and timing of required flows.

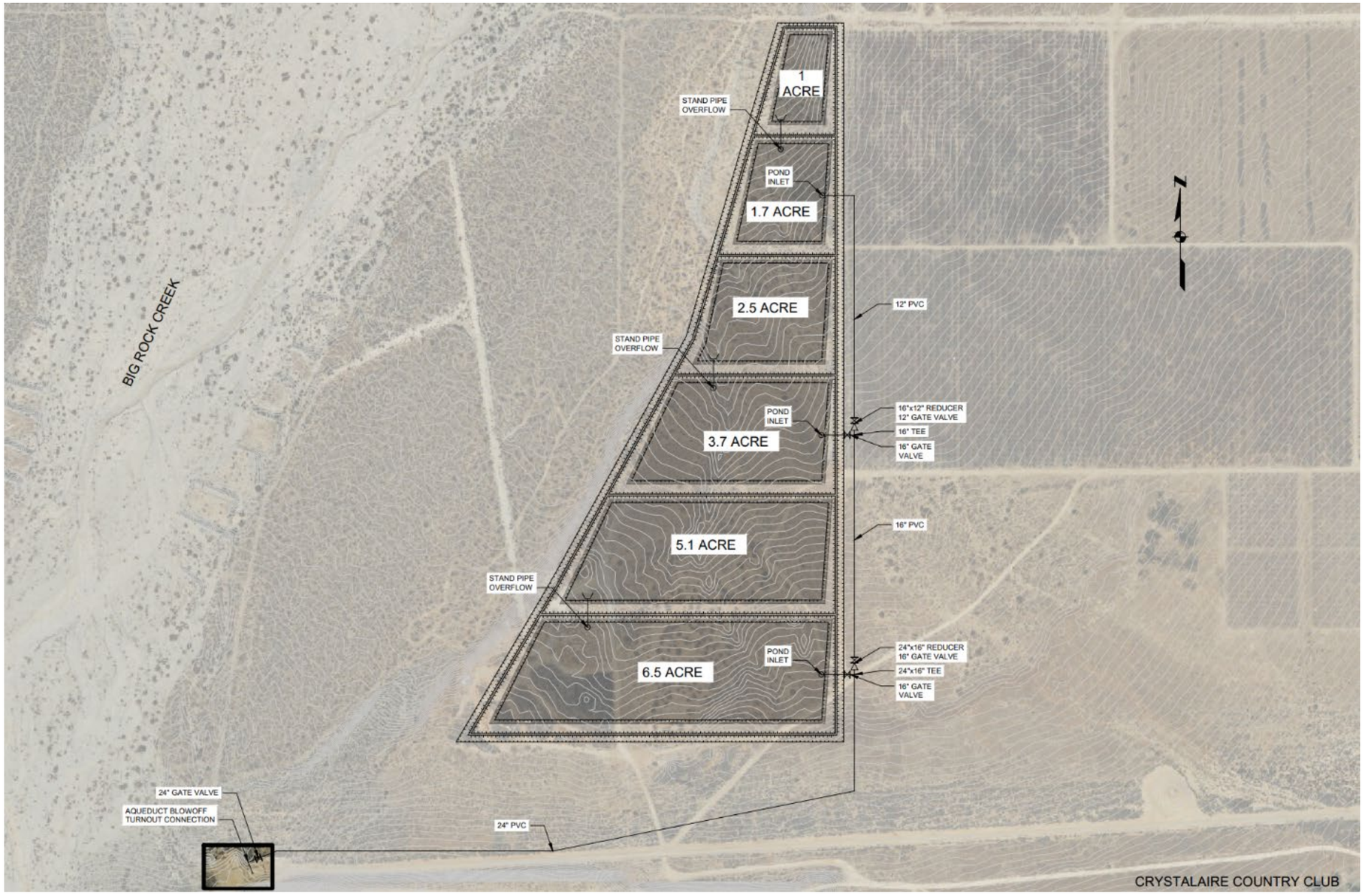


Figure 4-5: Option 1 Recharge Basins & Pipeline

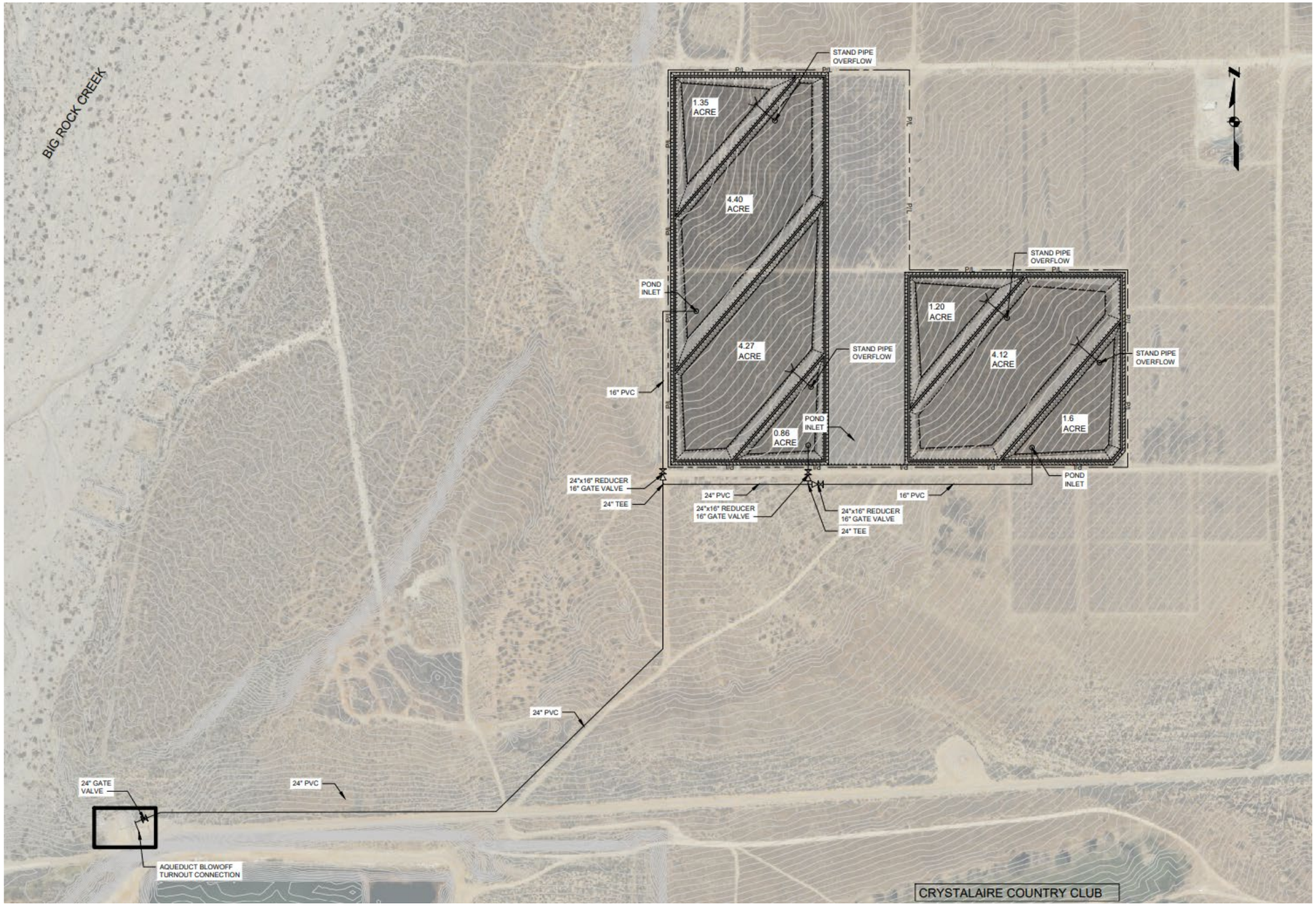
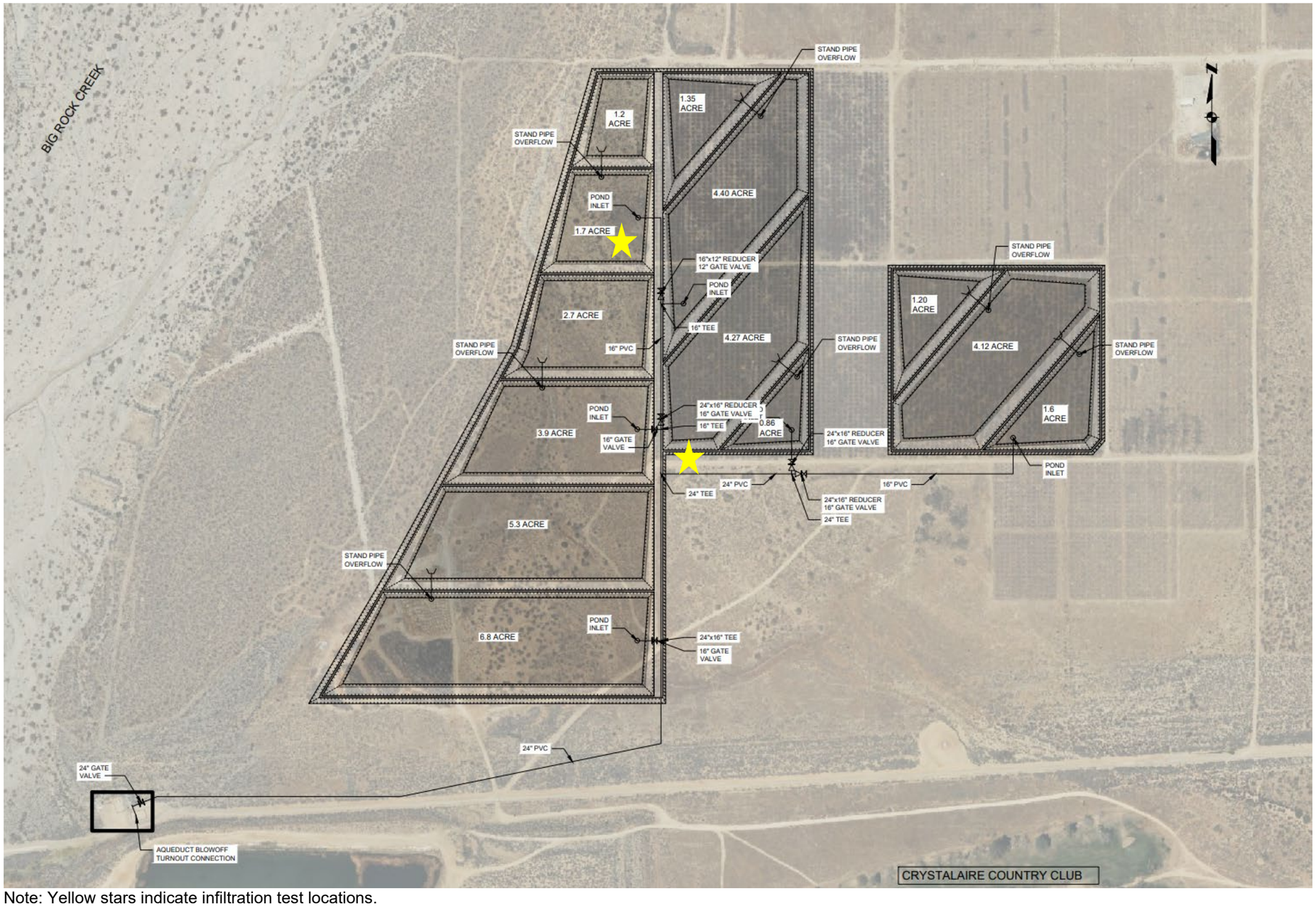


Figure 4-6: Option 2 Recharge Basins & Pipeline



Note: Yellow stars indicate infiltration test locations.

Figure 4-7: Option 3 Recharge Basins & Pipeline

Appendix A: Big Rock Creek Groundwater Recharge Demonstration Project Test Results Summary

31 July 2020

Draft Technical Memorandum

To: Matt Knudson and Peter Thompson Jr.
Antelope Valley State Water Contractors Association

From: David Ferguson, PhD, P.E. and Paul Chau, P.E.
Kennedy Jenks

Subject: Big Rock Creek Groundwater Recharge Demonstration Project Test Plan
K/J 1844525*00

This technical memorandum summarizes the results of the Demonstration Test (Test) that was conducted for the Antelope Valley State Water Contractors Association (Association) Big Rock Creek Groundwater Recharge Feasibility Study. The purpose of the Test was to determine the feasibility of conducting artificial recharge operations using Big Rock Creek to convey and spread State Water Project water in the Pearland Subbasin of the Antelope Valley Groundwater Basin.

Pre-Test Evaluation and Test Setup

Model Simulation

A HEC-RAS model run was performed to predict the extent of potential flows in the Big Rock Creek during the Test. The model simulated a release of 30.0 cubic feet per second (cfs) of SWP water for 90 days, as illustrated in Figure 1. As shown, the predicted stream caused by the release is expected to travel as far as about 3 miles with an end point between Pearblossom Hwy. and East Avenue T. The predicted streambed percolation rate was 2 ft/day to 3 ft/day in the creek, and 5 ft/day closer to the release point. The anticipated width of the stream with recharge water ranged from 19 feet to 67 feet.

As will be described later, the Test results did not exhibit near the level of recharge anticipated by the model due to channelization of the recharge flow, which resulted in a very narrow stream width.

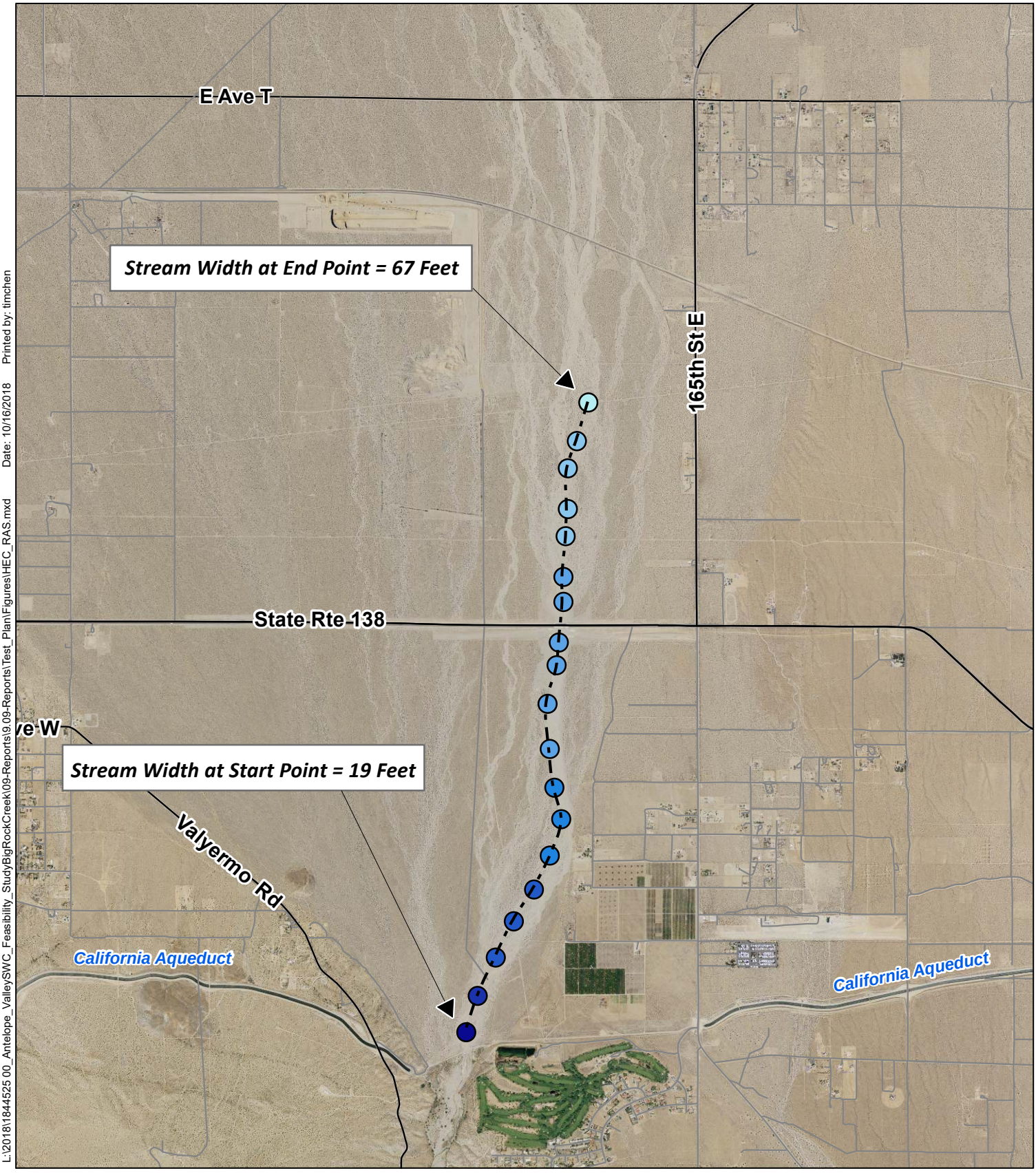
Monitoring Equipment Installation

To analyze the impact on groundwater levels by the recharge water, a groundwater level data logger was installed in the Granite Well, which is located approximately 1,000 feet west of the Big Rock Creek (see Figure 2). This is an ideal location to monitoring the groundwater table responses during the Test since the groundwater flows from east to west and it is downstream of the recharging stream.

In addition, flow data from United State Geological Survey (USGS) Gauge ID 10263500 was collected to analyze the level of natural runoff in Big Rock Creek.

California Aqueduct Turnout Extension

There are two existing California Aqueduct Turnouts west of the Big Rock Creek, and the Test will utilize the one in the west (see Figure 3). The west turnout is currently terminated with an existing DWR's butterfly valve. To mitigate the energy from the pressure head and velocity head of the 30 cfs release and prevent potential erosion to the channel soil, a temporary turnout extension was installed prior to the Test.



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Modeled Stream Depths, Inches

- 0.0
- 0.1 - 1.0
- 1.1 - 2.0
- 2.1 - 3.0
- 3.1 - 4.0
- 4.1 - 5.0
- 5.1 - 6.0

N

0 0.25 0.5 1

Miles

Kennedy/Jenks Consultants

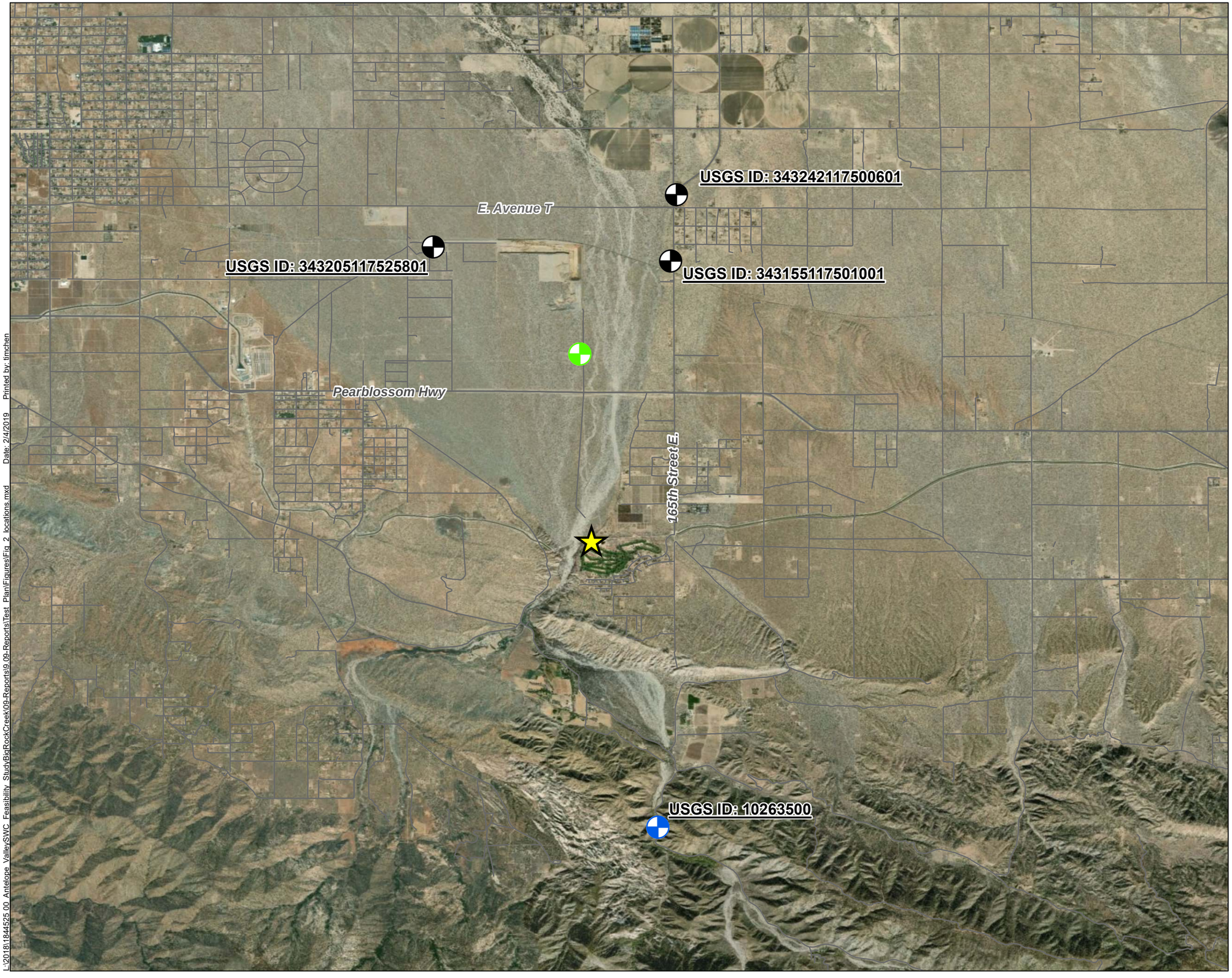
AVSWCA
Los Angeles County, California

Big Rock Creek Groundwater Recharge Demonstration Test Plan
Modeling Result for 30 CFS Discharge

K/J 1844525*00
October 2018

Figure 1

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Legend

- SWP Water Releasing Point
- Granite Well
- USGS Groundwater Monitoring Well
- USGS Stream Gage

N

0 0.5 1 2
Miles

Kennedy/Jenks Consultants

AVSWCA
Los Angeles County, California

Big Rock Creek Groundwater Recharge Demonstration Test Plan
Monitoring Wells and Stream Gage Locations

K/J 1844525*00
February 2019
Figure 2

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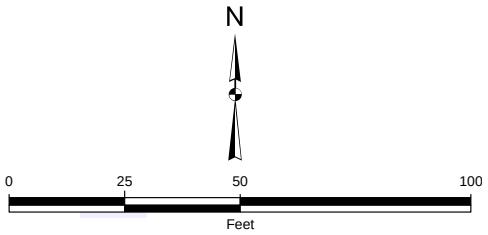

Kennedy/Jenks Consultants

AVSWCA
Los Angeles County, California

Big Rock Creek Groundwater Recharge Demonstration Test Plan
SWP Existing Turnout Locations

K/J 1844525*00
December 2018

Figure 3

Data Collection during the Test

The following data was collected during the Test:

- Turnout flow rate
- Stream flow rate, upstream of turnout
- Groundwater level
- Aerial imagery

Demonstration Test Summary

The Test was run from July 16th, 2019 to December 5, 2019, with a total cumulative recharge volume of 654 acre-feet (ac-ft). As mentioned previously, the goal of the Test was to ascertain the feasibility of utilizing Big Rock Creek for artificial recharge of the Antelope Valley Groundwater Basin. The main limiting factor for recharge was impact to the Avenue T crossing, which is an at-grade crossing of the creek. When surface water is present at this location of the creek, it crosses overland over Avenue T, as shown in Figure 4. The Test flow rate was limited as to not allow surface water to reach Avenue T. In addition, the Test could not be conducted when the creek had natural stream flow crossing Avenue T. As shown in the next section, this severely limited the Test flows. The recharge water did not spread out to the natural width of the creek as anticipated. Instead, it channelized as a very narrow stream and flowed north to Avenue T under even low flow rates. On days the Test could run, the average flow rate was 3.1 cfs.

There was a significant amount of days when the test could not run due to natural runoff in the creek crossing Avenue T. In fact, the Test was intended to start on March 7th, 2019, but did not actually start until July 16th, 2019 due to the presence of natural runoff. In total, the Test could not run on 65 percent of days between March 7th and December 31st, 2019.

Source: Google Maps, image taken in May 2019

Figure 4: Avenue T Crossing at Big Rock Creek

Turnout Flow Rate & Cumulative Recharge Volume

The Test daily average flow rate and cumulate recharge volume is presented in Figure 5. On days when the Test was active, the average flow rate was 3.1 cfs. This was much lower than the anticipated flow rate of 20 to 30 cfs. This was due to the channelization of flow, which did not allow for use of the full width of the creek to spread flow. The Test recharged a total volume of 654 ac-ft, which was well short of the goal of 3,150 ac-ft.

As mentioned previously, the Test was not run on approximately 65 percent of days between March and December 2019 due to the presence of natural flow in the channel crossing Avenue T. There is an existing stream gauge, USGS Station ID 10263500, approximately 4.2 miles upstream the Test turnout. Flow data from the USGS gauge is presented in Figure 6 in comparison with the Test recharge flow data. The Test was not able to operate when the gauge flow was above approximately 8 cfs.

Memorandum

Matt Knudson and Peter Thompson Jr.
31 July 2020
1844525*00

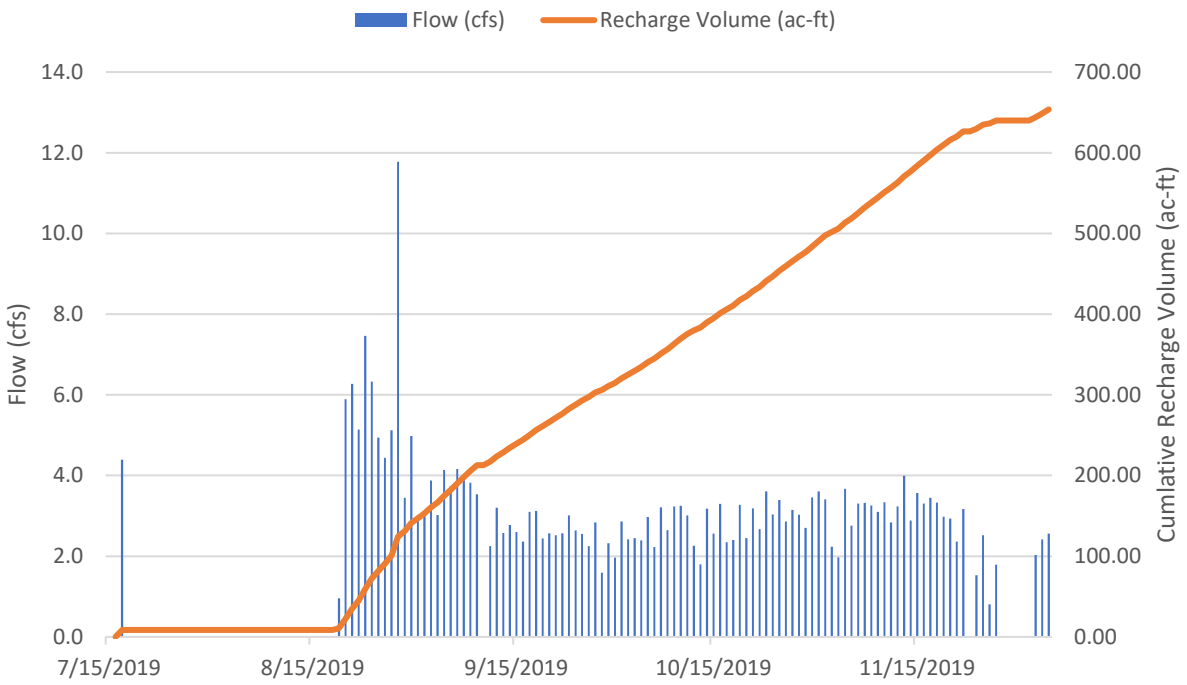

Figure 5: Demonstration Test Flow and Cumulative Recharge Volume

Memorandum

Matt Knudson and Peter Thompson Jr.
31 July 2020
1844525*00

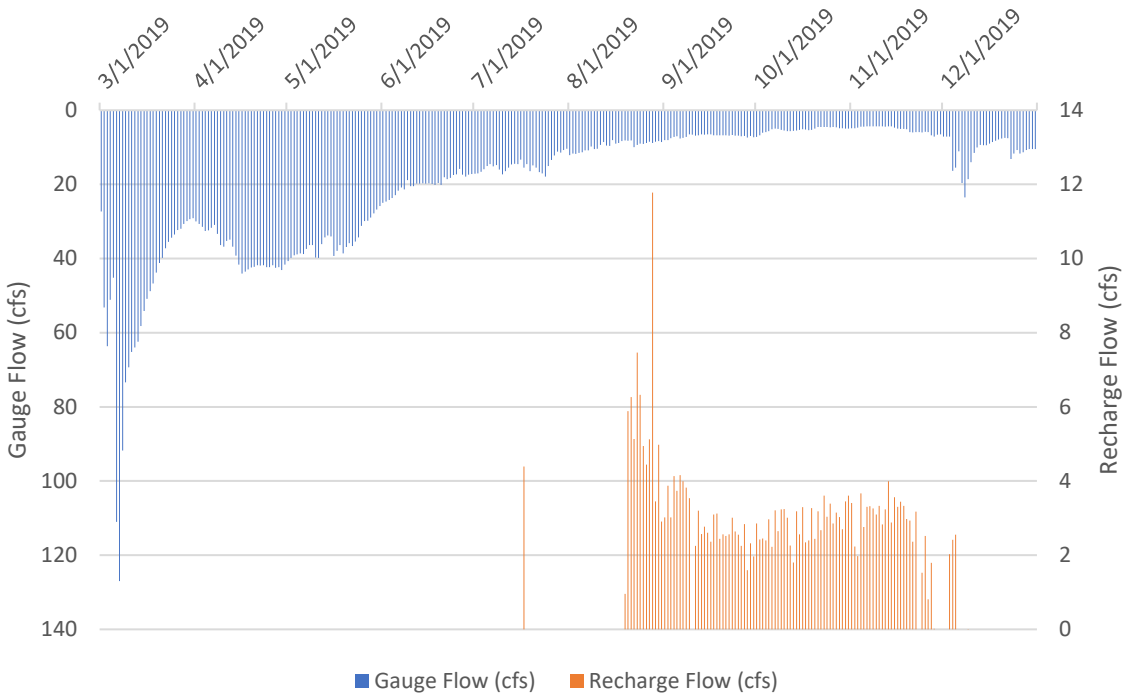

Figure 6: Recharge Flow & Gauge Flow during Demonstration Test

Surface Water Extent with Aerial Surveying Data

During the course of the Test, periodic drone flights were conducted to capture aerial imagery. The images show the extent and width of the surface water flow in the creek when artificial recharge was conducted. Aerial imagery was captured on 11 separate days between 8/20/2019 and 10/22/2019. The longitudinal length of the surface water flow from the turnout to the wetted front for each day is shown in Figure 7. The length is calculated along the centerline of the creek flow.

As described previously, the major limitation on recharge during the Test was keeping the extent of the surface water flow from reaching Avenue T. The surface water flow channelized and maintained a very narrow width as it traveled down the creek. Based on the aerial imagery data, the average flow width was 12 feet, which was significantly smaller than the anticipated average flow width of 43 feet predicted by the pre-Test hydrologic model.

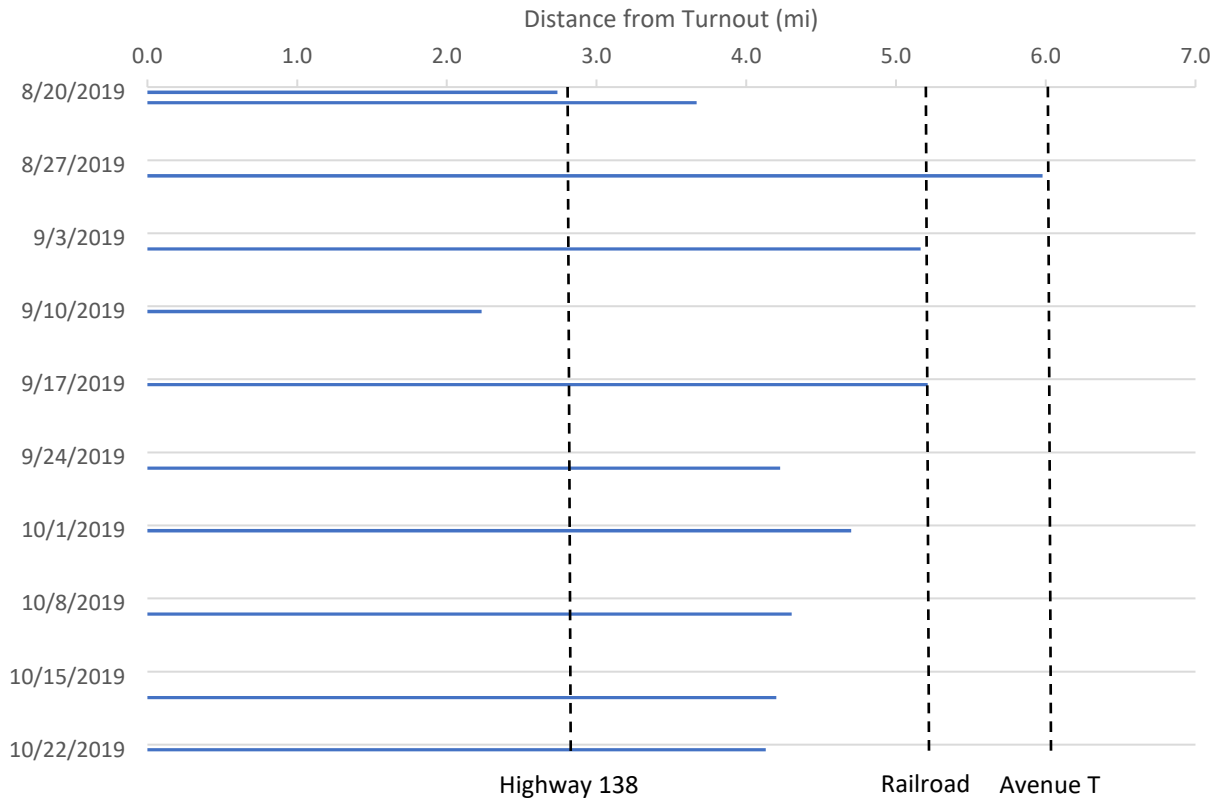

Figure 7: Recharge Surface Water Extent

Groundwater Levels

Groundwater level data from the pressure transducer located in the Granite Well is shown in Figure 8. Although one can see a general trend of slightly increasing groundwater levels during the Test between August and December 2019, one can also see quite a bit of variation throughout the monitoring period, which is likely due to local pumping. This is not surprising since the volume of recharge water was small, so the impact to the groundwater level is small, especially relative to other variables impacting the basin. It is somewhat surprising that natural runoff between February and July 2019 did not impact the average static water level that much.

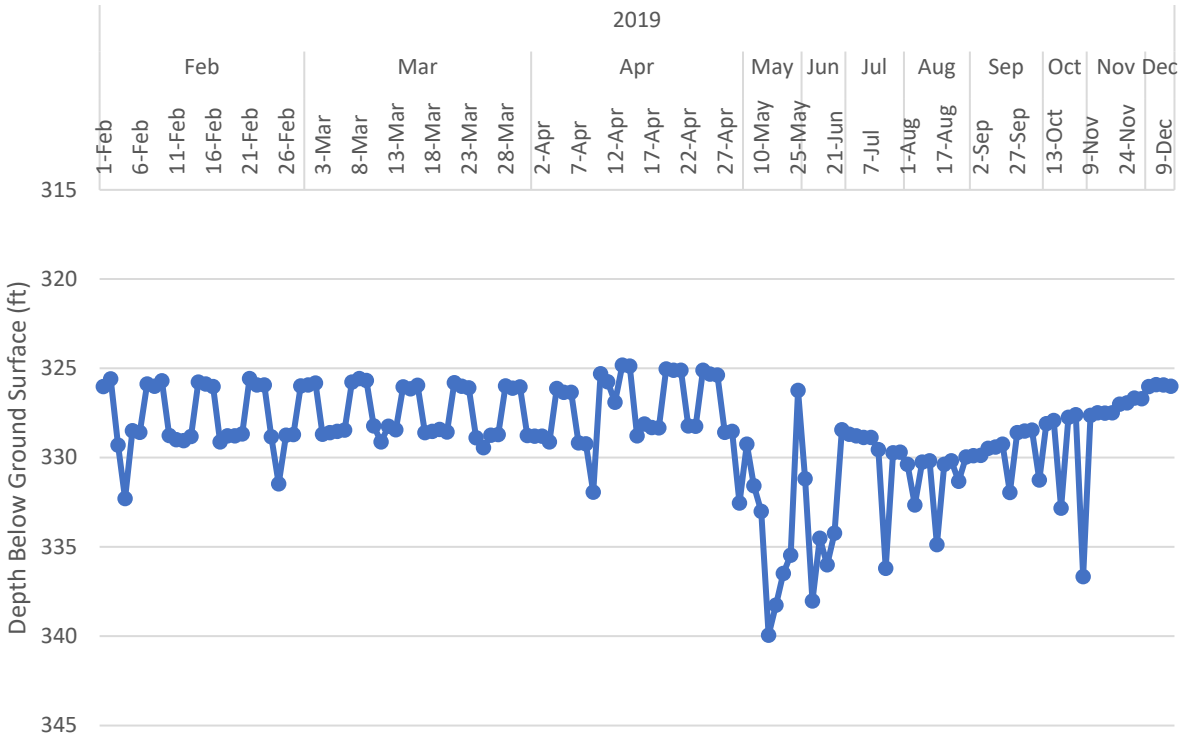

Figure 8: Groundwater Levels During Demonstration Test

There are three USGS monitoring wells that are located in the general region of Big Rock Creek (USGS Site IDs 343205117525801, 343242117500601, and 343155117501001). Groundwater level data is captured once a year in these wells by USGS staff, which is not frequent enough to provide useful data for the purposes of this study. If this project is studied further in the future, it is recommended to work with USGS to gather groundwater level data from these wells on a more frequent basis.

Since the Test did not come close to achieving the recharge objectives and there was not a large impact on groundwater levels, hydrogeological modeling was not performed to analyze the Test data.

Recommendations and Next Steps

It is recommended that the Association explore engineered solutions to mitigate the operational limitations of utilizing Big Rock Creek for artificial recharge. Some options include:

- Build berms in the creek to help spread the recharge water across the full width of the creek bed. This will allow more recharge water to be applied before reaching the Avenue T crossing.
- Build a culvert at Avenue T to allow creek water to pass underneath the road crossing. This will eliminate the need to limit surface water flow from reaching Avenue T and allow more recharge.
- Build off-site engineered recharge basins adjacent to the creek. This will avoid the operational limitations of using the creek for conveyance and recharge but will require the most capital investment.

Appendix B: Planning Level Construction Cost Estimates

OPINION OF PROBABLE CONSTRUCTION COST

KENNEDY/JENKS CONSULTANTS

Project: Antelope Valley SWC Big Rock Creek

Building, Area: Alt 1 - In Stream Berms

Prepared By: JLH/CR
Date Prepared: 22-Nov-20
K/J Proj. No. 1844525*00

Current at ENR 11455
Escalated to ENR 11885
Months to Midpoint of Construct 18

Estimate Type:
[x] **Conceptual**
[ ] **Preliminary (w/o plans)**
[ ] **Design Development @** **% Complete**
[ ] **Construction**
[ ] **Change Order**

Category		Description	Qty	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Sub-contractor $/Unit	Sub-contractor Total	Total
Berms											
		Clearing of Light Scrub & Misc. Debris	25	ACRE			1,133.00	28,325			28,325
		Earthwork - Berms Between Basins Place and Compact	66,667	CY			4.00	266,666			266,666
Site Security											
		Power Drop	1	LS					15,000	15,000	15,000
		Light Pole	1	LS					3,000	3,000	3,000
		Security Camera	1	LS					1,000	1,000	1,000
		Level Sensor	1	LS					5,000	5,000	5,000
		Communications	1	LS					10,000	10,000	10,000
		Subtotal						**266,666**		**34,000**	**328,991**
		Mobilization / Demobilization/ General Conditions	@	8%				21,333		2,720	24,053
		Taxes on Materials	@	8.75%							
		Subtotals						**288,000**		**36,720**	**324,720**
		Contractor MU on Sub	@	12%						4,406	4,406
		Subtotals						**288,000**		**41,126**	**329,126**
		Contractor OH&P	@	15%				43,200			43,200
		Subtotals						**331,200**			**372,326**
		Bonds and Insurance	@	2.5%							9,308
		Subtotals									**381,634**
		Estimating Contingency	@	30%							114,490
		Escalation to Midpoint per year	@	2.5%							14,311
		Estimated Bid Cost									**510,436**
		Total Estimate (Rounded)									**$520,000**

Estimate Accuracy	
+50%	-30%

Estimated Range of Probable Cost		
+50%	Total Est.	-30%
$780,000	**$520,000**	**$364,000**

OPINION OF PROBABLE CONSTRUCTION COST | **KENNEDY/JENKS CONSULTANTS**

Project: Antelope Valley SWC Big Rock Creek

Building, Area: Alt 2- East Ave T Culvert

Prepared By: JLH/CR
Date Prepared: 22-Nov-20
K/J Proj. No. 1844525*00

Current at ENR 11455
Escalated to ENR 11885
Months to Midpoint of Construct 18

Estimate Type:
[x] **Conceptual**
[ ] **Preliminary (w/o plans)**
[ ] **Design Development @** **% Complete**
[ ] **Construction**
[ ] **Change Order**

Category		Description	Qty	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Sub-contractor $/Unit	Sub-contractor Total	Total
Earthwork											
		Clearing of Light Scrub & Misc. Debris	11	ACRE			1,133.00	13,005			13,005
		Rough Grading Site with Grader	500,000	SF			0.04	20,910			20,910
Culverts											
		Remove Pavement	750	SY					10	7,500	7,500
		Trenching /Backfill with box	705	LF					70	49,350	49,350
		RCP Concrete Arch Culverts	705	LF					140	98,700	98,700
		Head Walls	9	EA					6,000	54,000	54,000
		Replace Roadway Base & AC Paving 32' wide	175	LF					212	37,100	37,100
		Traffic Controls/ Detours	10%	LS					246,650	24,665	24,665
		Subtotal						**33,915**		**271,315**	**305,230**
		Mobilization / Demobilization/ General Conditions	@	8%				2,713		21,705	24,418
		Taxes on Materials	@	8.75%							
		Subtotals						**36,629**		**293,020**	**329,649**
		Contractor MU on Sub	@	12%						35,162	35,162
		Subtotals						**36,629**		**328,183**	**364,811**
		Contractor OH&P	@	15%				5,494			5,494
		Subtotals						**42,123**			**370,306**
		Bonds and Insurance	@	2.5%							9,258
		Subtotals									**379,563**
		Estimating Contingency	@	30%							113,869
		Escalation to Midpoint per year	@	2.5%							14,234
		Estimated Bid Cost									**507,666**
		Total Estimate (Rounded)									**$510,000**

Estimate Accuracy	
+50%	-30%

Estimated Range of Probable Cost		
+50%	Total Est.	-30%
$765,000	**$510,000**	**$357,000**

OPINION OF PROBABLE CONSTRUCTION COST

KENNEDY/JENKS CONSULTANTS

Project: Antelope Valley SWC Big Rock Creek

Building, Area: Alt 3 Offsite Recharge

Prepared By: JLH/CR
Date Prepared: 22-Nov-20
K/J Proj. No. 1844525*00

Current at ENR 11455
Escalated to ENR 11885
Months to Midpoint of Construct 18

Estimate Type:
[x] **Conceptual**
[ ] **Preliminary (w/o plans)**
[ ] **Design Development @**
[ ] **Construction**
[ ] **Change Order**
% Complete

Category		Description	Qty	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Sub-contractor $/Unit	Sub-contractor Total	Total
Recharge Basins											
		Clearing of Light Scrub & Misc. Debris	60	ACRE			1,133.00	67,980			67,980
		Earthwork - Perimeter Berms - Place and Compact	20,488	CY			5.00	102,439			102,439
		Earthwork - Berms Between Basins Place and Compact	8,878	CY			4.00	35,511			35,511
		Rough Grading Site with Grader	2,613,600	SF			0.04	109,303			109,303
		Pond Overflow Structures	3	EA	2,500.00	7,500	5,000.00	15,000			22,500
Conveyance Pipeline											
		Connection to Existing Steel Pipe (Butstrap Tee)	1	LS	10,000.00	10,000	12,000.00	12,000			22,000
		36" Isolation Valve	1	Ea	9,750.00	9,750	554.41	554			10,304
		Trenching 36"	7,700	LF			58.75	452,375			452,375
		Bedding 36"	7,700	LF	22.52	173,404	13.81	106,337			279,741
		36" CMLC Steel Pipe 5/16" Wall	7,700	LF	134.25	1,033,725	83.88	645,876			1,679,601
		36" Fitting	4	EA	5,000.00	20,000	4,000.00	16,000			36,000
		Trenching 24"	7,000	LF			18.60	130,200			130,200
		Bedding 24"	7,000	LF	17.09	119,630	10.48	73,360			192,990
		24" CMLC Steel Pipe 5/16" Wall	7,000	LF	129.20	904,400	55.92	391,440			1,295,840
		24" Fitting	2	EA	4,000.00	8,000	2,500.00	5,000			13,000
		Trenching 18"	300	LF			18.60	5,580			5,580
		Bedding 18"	300	LF	17.09	5,127	10.48	3,144			8,271
		Distribution Headers 18" 5/16" wall	300	LF	96.90	29,070	41.94	12,582			41,652
		Trenching 12"	150	LF			11.05	1,658			1,658
		Bedding 12"	150	LF	8.18	1,227	5.02	753			1,980
		Distribution Headers 12"	150	LF	59.02	8,853	37.55	5,633			14,486
		12" Isolation Valve w/ Valve Can	6	EA	3,000.00	18,000	554.38	3,326			21,326
		12" Flow Meter (Self Powered / Automatic Reading System)	6	EA	15,000.00	90,000	1,980.00	11,880			101,880
		12" Meter Vault Boxes	6	EA	4,000.00	24,000	3,000.00	18,000			42,000
		18"Distribution Assembly Mushroom Bubbler	6	EA	4,000.00	24,000	2,500.00	15,000			39,000
		24" PRV Vault Boxes	1	EA	12,500.00	12,500	15,000.00	15,000			27,500
		24" PRV Valve	1	EA	20,000.00	20,000	5,000.00	5,000			25,000
		PVC Conduit (for fiber)	3,000	LF					6	17,250	17,250
		Pullboxes	6	EA					3,000	19,200	19,200
		Fiber Optic Cable	3,000	LF					2	6,000	6,000
Land Acquisition											
			60	AC	5,000	300,000					300,000
Site Access Road											
		Access Road Grade Subgrade for Base Course 20' wide	15,556	SY			0.61	9,551			9,551
		Aggregate Base Paving 16' wide (8" Deep)	12,444	SY	9.13	113,618	2.31	28,722			142,340
Site Security / Access											
		8' Chain Link Fencing with barb wire	6,000	LF					50	300,000	300,000
		Automated Rolling Gate w/Operator	1	LS					25,000	25,000	25,000
		Power To Gate (conduit / wire)	1,500	LF					15	22,500	22,500
		Subtotal				**2,932,804**		**2,299,204**		**389,950**	**5,621,958**
		Mobilization / Demobilization/ General Conditions	@	8%		234,624		183,936		31,196	449,757
		Taxes on Materials	@	8.75%		256,620					256,620
		Subtotals				**3,424,048**		**2,483,140**		**421,146**	**6,328,334**
		Contractor MU on Sub	@	12%						50,538	50,538
		Subtotals				**3,424,048**		**2,483,140**		**471,684**	**6,378,872**
		Contractor OH&P	@	15%		513,607		372,471			886,078
		Subtotals				**3,937,656**		**2,855,611**			**7,264,950**
		Bonds and Insurance	@	2.5%							181,624
		Subtotals									**7,446,574**
		Estimating Contingency	@	30%							2,233,972
		Escalation to Midpoint per year	@	2.5%							279,247
		Estimated Bid Cost									**9,959,793**
		Total Estimate (Rounded)									**$10,000,000**

* Assumes Pipelines are adjacent to / not in roadway.

Estimate Accuracy	
+50%	-30%

Estimated Range of Probable Cost		
+50%	Total Est.	-30%
$15,000,000	**$10,000,000**	**$7,000,000**

OPINION OF PROBABLE CONSTRUCTION COST | **KENNEDY/JENKS CONSULTANTS**

Project: Antelope Valley SWC Big Rock Creek

Building, Area: Alt 4 - Pump Station and Pipeline to Northern East Ave T Creekbed

Prepared By: JLH/CR
Date Prepared: 22-Nov-20
K/J Proj. No. 1844525*00

Estimate Type: [x] Conceptual [ ] Preliminary (w/o plans) [ ] Design Development @ [ ] Construction [ ] Change Order % Complete

Current at ENR 11455
Escalated to ENR 11885
Months to Midpoint of Construct 18

Category	Description	Qty	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Sub-contractor $/Unit	Sub-contractor Total	Total
Booster Pump Station 2 MGD										
	Sitework/ Excavation	1	LS					50,000	50,000	50,000
	Concrete Pump Slab	1	LS					25,000	25,000	25,000
	Vertical Turbine Pumps 50 HP	2	EA	25,000.00	50,000	2,500.00	5,000			55,000
	Pump Cans	2	EA	7,500.00	15,000	1,500.00	3,000			18,000
	Suction Header	1	LS	10,000.00	10,000	2,500.00	2,500			12,500
	Suction Piping & Valves	2	EA	5,000.00	10,000	1,500.00	3,000			13,000
	Discharge Piping & Valves	2	EA	10,000.00	20,000	2,500.00	5,000			25,000
	Discharge Header	1	LS	10,000.00	10,000	2,500.00	2,500			12,500
	12" Isolation Valve	1	EA	5,000.00	5,000	1,500.00	1,500			6,500
	12" Flow Meter	1	EA					15,000	15,000	15,000
	12" Flow Meter Vault	1	LS					10,000	10,000	10,000
	E&IC	30%						242,500	72,750	72,750
Conveyance Pipeline										
	12" Isolation Valve	1	Ea	5,000.00	5,000	554.41	554			5,554
	Trenching 12"	30,000	LF			19.58	587,500			587,500
	Bedding 12"	30,000	LF	22.52	675,600	4.60	138,100			813,700
	12" CMLC Steel Pipe 5/16" Wall	30,000	LF	44.75	1,342,500	84.19	2,525,760			3,868,260
	12" Fitting	2	EA	5,000.00	10,000	4,000.00	8,000			18,000
	Discharge Structure	1	LS					50,000	50,000	50,000
Adder for Downstream Culverts										
	E Ave S Culverts (roughly 1/3 material cost from Alt 2)	33%	LS					271,315	90,438	90,438
	Subtotal				**2,153,100**		**3,259,914**		**313,188**	**5,748,703**
	Mobilization / Demobilization/ General Conditions	@	8%		172,248		260,793		25,055	458,096
	Taxes on Materials	@	8.75%		188,396					188,396
	Subtotals				**2,513,744**		**3,520,708**		**338,243**	**6,372,695**
	Contractor MU on Sub	@	12%						40,589	40,589
	Subtotals				**2,513,744**		**3,520,708**		**378,833**	**6,413,284**
	Contractor OH&P	@	15%		377,062		528,106			905,168
	Subtotals				**2,890,806**		**4,048,814**			**7,318,452**
	Bonds and Insurance	@	2.5%							182,961
	Subtotals									**7,501,413**
	Estimating Contingency	@	30%							2,250,424
	Escalation to Midpoint per year	@	2.5%							281,303
	Estimated Bid Cost									**10,033,141**
	Total Estimate (Rounded)									**$10,100,000**

Estimate Accuracy	
+50%	-30%

* Assumes Pipelines are adjacent to / not in roadway.
***Assumes Booster Pump Station is outdoor station, no building.**
sufficient

Estimated Range of Probable Cost		
+50%	Total Est.	-30%
$15,150,000	**$10,100,000**	**$7,070,000**

OPINION OF PROBABLE CONSTRUCTION COST

KENNEDY/JENKS CONSULTANTS

Project: Antelope Valley SWC Big Rock Creek

Building, Area: Alt 2- Box Culverts

Prepared By: JLH/CR/DZ
Date Prepared: 18-May-22
K/J Proj. No. 1844525*00

Current at ENR 13004
Escalated to ENR 14174
Months to Midpoint of Construct 18

Estimate Type:
[x] **Conceptual**
[ ] **Preliminary (w/o plans)**
[ ] **Design Development @** **% Complete**
[ ] **Construction**
[ ] **Change Order**

Category		Description	Qty	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Sub-contractor $/Unit	Sub-contractor Total	Total
Earthwork	**Flow to Culvert**										
		Clearing of Light Scrub & Misc. Debris	0.8	ACRE			4,553.40	3,415			3,415
		Grading	4,000	SY			3.00	12,000			12,000
		Riprap	500	LCY	48.00	24,000	33	16,575			40,575
Box Culvert Under Road											
		Sawcut Pavement	80	LF			5	400			400
		Remove/Dispose of Pavement	53	SY			20	1,067			1,067
		Excavation	142	CY			25	3,556			3,556
		Crushed Rock -12" under culvert	23	LCY	30.00	693	15.00	347			1,040
		Concrete Box Culverts	40	LF	1,435.00	57,400	150	6,000			63,400
		Backfill	53	CY			15	800			800
		Restore Base Course under Paving	23	LCY	30.00	693	15.00	347			1,040
		Paving Restoration	53	SY					157	8,373	8,373
		Stripping Reinstall	1	LS	50.00	50	150	150			200
		Traffic Controls/ Detours	1	LS					6,000	6,000	6,000
		Subtotal				**82,837**		**44,655**		**14,373**	**141,865**
		Mobilization / Demobilization/ General Conditions	@	10%		8,284		4,466		1,437	14,187
		Taxes on Materials	@	8.75%		7,248					7,248
		Subtotals				**98,369**		**49,121**		**15,811**	**163,300**
		Contractor MU on Sub	@	12%						1,897	1,897
		Subtotals				**98,369**		**49,121**		**17,708**	**165,197**
		Contractor OH&P	@	15%		14,755		7,368			22,123
		Subtotals				**113,124**		**56,489**			**187,321**
		Bonds and Insurance	@	2.5%							4,683
		Subtotals									**192,004**
		Estimating Contingency	@	25%							48,001
		Escalation to Midpoint per year	@	6.0%							17,280
		Estimated Bid Cost									**257,285**
		Total Estimate (Rounded)									**$258,000**

Estimate Accuracy	
+50%	-30%

Estimated Range of Probable Cost		
+50%	Total Est.	-30%
$387,000	**$258,000**	**$180,600**

OPINION OF PROBABLE CONSTRUCTION COST **KENNEDY/JENKS CONSULTANTS**

Project: Antelope Valley SWC Big Rock Creek
Building, Area: Alt 2- Circular Culverts

Prepared By: JLH/CR/DZ
Date Prepared: 18-May-22
K/J Proj. No. 1844525*00

Current at ENR 13004
Escalated to ENR 14174
Months to Midpoint of Construct 18

Estimate Type: [x] **Conceptual** [ ] **Preliminary (w/o plans)** [ ] **Design Development @** [ ] **Construction** [ ] **Change Order** **% Complete**

Category		Description	Qty	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Sub-contractor $/Unit	Sub-contractor Total	Total
Earthwork	**Flow to Culvert**										
		Clearing of Light Scrub & Misc. Debris	0.8	ACRE			4,553.40	3,415			3,415
		Grading	4,000	SY			3.00	12,000			12,000
		Riprap	500	LCY	48.00	24,000	33	16,575			40,575
Box Culvert Under Road											
		Sawcut Pavement	80	LF			5	400			400
		Remove/Dispose of Pavement	53	SY			20	1,067			1,067
		Excavation	142	CY			25	3,556			3,556
		Crushed Rock -12" under culvert	23	LCY	30.00	693	15.00	347			1,040
		Concrete Circular 24" Culverts	7	Ea	3,166.26	22,164	150	1,050			23,214
		Backfill	53	CY			15	800			800
		Restore Base Course under Paving	23	LCY	30.00	693	15.00	347			1,040
		Paving Restoration	53	SY					157	8,373	8,373
		Stripping Reinstall	1	LS	50.00	50	150	150			200
		Traffic Controls/ Detours	1	LS					6,000	6,000	6,000
		Subtotal				**47,600**		**39,705**		**14,373**	**101,679**
		Mobilization / Demobilization/ General Conditions	@	10%		4,760		3,971		1,437	10,168
		Taxes on Materials	@	8.75%		4,165					4,165
		Subtotals				**56,526**		**43,676**		**15,811**	**116,012**
		Contractor MU on Sub	@	12%						1,897	1,897
		Subtotals				**56,526**		**43,676**		**17,708**	**117,909**
		Contractor OH&P	@	15%		8,479		6,551			15,030
		Subtotals				**65,004**		**50,227**			**132,940**
		Bonds and Insurance	@	2.5%							3,323
		Subtotals									**136,263**
		Estimating Contingency	@	25%							34,066
		Escalation to Midpoint per year	@	6.0%							12,264
		Estimated Bid Cost									**182,593**
		Total Estimate (Rounded)									**$183,000**

Estimate Accuracy	
+50%	-30%

Estimated Range of Probable Cost		
+50%	Total Est.	-30%
$274,500	**$183,000**	**$128,100**

OPINION OF PROBABLE CONSTRUCTION COST

KENNEDY/JENKS CONSULTANTS

Project: Antelope Valley SWC Big Rock Creek

Building, Area: Alt 3 Offsite Recharge Layout 1

Prepared By: JLH/CR
Date Prepared: 22-Nov-20
K/J Proj. No. 1844525*00

Current at ENR 11455
Escalated to ENR 11885
Months to Midpoint of Construct 18

Estimate Type:
[x] **Conceptual**
[ ] **Preliminary (w/o plans)**
[ ] **Design Development @**
[ ] **Construction**
[ ] **Change Order**
% Complete

Category		Description	Qty	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Sub-contractor $/Unit	Sub-contractor Total	Total
Recharge Basins											
		Clearing of Light Scrub & Misc. Debris	21	ACRE			1,133.00	23,227			23,227
		Earthwork - Perimeter Berms - Place and Compact	7,171	CY			5.00	35,854			35,854
		Earthwork - Berms Between Basins Place and Compact	3,107	CY			4.00	12,429			12,429
		Rough Grading Site with Grader	892,980	SF			0.04	37,345			37,345
		Pond Overflow Structures	6	EA	2,500.00	15,000	5,000.00	30,000			45,000
Conveyance Pipeline											
		Trenching 24"	2,190	LF			18.60	40,734			40,734
		Bedding 24"	2,190	LF	17.09	37,427	10.48	22,951			60,378
		24" PVC Pipe	2,190	LF	76.11	166,681					166,681
		24" Valve	2	EA	13,012.94	26,026					26,026
		24" Tees	2	EA	11,374.94	22,750					22,750
		Trenching 16"	800	LF			18.60	14,880			14,880
		Bedding 16"	800	LF	17.09	13,672	10.48	8,384			22,056
		16" PVC Pipe	800	LF	32.86	26,288					26,288
		16" Valve	1	EA	5,314.37	5,314					5,314
		16" Tees	1	EA	3,960.31	3,960					3,960
		Trenching 12"	800	LF			11.05	8,840			8,840
		Bedding 12"	800	LF	8.18	6,544	5.02	4,016			10,560
		12" PVC Pipe	800	LF	28.53	22,824					22,824
		12" Valve	1	EA	2,255.11	2,255					2,255
		24" PRV Vault Boxes	1	EA	12,500.00	12,500	15,000.00	15,000			27,500
		24" PRV Valve	1	EA	20,000.00	20,000	5,000.00	5,000			25,000
		PVC Conduit (for fiber)	3,000	LF					6	17,250	17,250
		Pullboxes	6	EA					3,000	19,200	19,200
		Fiber Optic Cable	3,000	LF					2	6,000	6,000
Land Acquisition											
			21	AC	5,000	105,000					105,000
Site Access Road											
		Access Road Grade Subgrade for Base Course 20' wide	4,867	SY			0.61	2,988			2,988
		Aggregate Base Paving 16' wide (8" Deep)	3,893	SY	9.13	35,546	2.31	8,986			44,532
Site Security / Access											
		8' Chain Link Fencing with barb wire	5,800	LF					50	290,000	290,000
		Automated Rolling Gate w/Operator	1	LS					25,000	25,000	25,000
		Power To Gate (conduit / wire)	1,500	LF					15	22,500	22,500
		Subtotal				**521,788**		**247,407**		**379,950**	**1,172,371**
		Mobilization / Demobilization/ General Conditions	@	8%		41,743		19,793		30,396	91,932
		Taxes on Materials	@	8.75%		45,656					45,656
		Subtotals				**609,187**		**267,199**		**410,346**	**1,286,732**
		Contractor MU on Sub	@	12%						49,242	49,242
		Subtotals				**609,187**		**267,199**		**459,588**	**1,335,974**
		Contractor OH&P	@	15%		91,378		40,080			131,458
		Subtotals				**700,565**		**307,279**			**1,467,432**
		Bonds and Insurance	@	2.5%							36,686
		Subtotals									**1,504,118**
		Estimating Contingency	@	30%							451,235
		Escalation to Midpoint per year	@	2.5%							56,404
		Estimated Bid Cost									**2,011,758**
		Total Estimate (Rounded)									**$2,100,000**

Estimate Accuracy	
+50%	-30%

* Assumes Pipelines are adjacent to / not in roadway.

Estimated Range of Probable Cost		
+50%	Total Est.	-30%
$3,150,000	**$2,100,000**	**$1,470,000**

OPINION OF PROBABLE CONSTRUCTION COST

KENNEDY/JENKS CONSULTANTS

Project: Antelope Valley SWC Big Rock Creek

Building, Area: Alt 3 Offsite Recharge Layout 2

Prepared By: JLH/CR
Date Prepared: 22-Nov-20
K/J Proj. No. 1844525*00

Current at ENR 11455
Escalated to ENR 11885
Months to Midpoint of Construct 18

Estimate Type:
[x] **Conceptual**
[ ] **Preliminary (w/o plans)**
[ ] **Design Development @** **% Complete**
[ ] **Construction**
[ ] **Change Order**

Category	Description	Qty	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Sub-contractor $/Unit	Sub-contractor Total	Total
Recharge Basins										
	Clearing of Light Scrub & Misc. Debris	25	ACRE			1,133.00	28,495			28,495
	Earthwork - Perimeter Berms - Place and Compact	1,711	CY			5.00	8,556			8,556
	Earthwork - Berms Between Basins Place and Compact	1,153	CY			4.00	4,612			4,612
	Rough Grading Site with Grader	1,095,534	SF			0.04	45,816			45,816
	Pond Overflow Structures	6	EA	2,500.00	15,000	5,000.00	30,000			45,000
Conveyance Pipeline										
	Trenching 24"	3,175	LF			18.60	59,055			59,055
	Bedding 24"	3,175	LF	17.09	54,261	10.48	33,274			87,535
	24" PVC Pipe	3,175	LF	76.11	241,649					241,649
	24" Tees	3	EA	11,374.94	34,125					34,125
	24" Valves	1	EA	13,012.94	13,013					13,013
	Trenching 16"	1,550	LF			18.60	28,830			28,830
	Bedding 16"	1,550	LF	17.09	26,490	10.48	16,244			42,734
	16" PVC Pipe	1,550	LF	32.68	50,654					50,654
	16" Valves	3	EA	5,314.37	15,943					
	24" PRV Vault Boxes	1	EA	12,500.00	12,500	15,000.00	15,000			27,500
	24" PRV Valve	1	EA	20,000.00	20,000	5,000.00	5,000			25,000
	PVC Conduit (for fiber)	3,000	LF					6	17,250	17,250
	Pullboxes	6	EA					3,000	19,200	19,200
	Fiber Optic Cable	3,000	LF					2	6,000	6,000
Land Acquisition										
		25	AC	5,000	125,000					125,000
Site Access Road										
	Access Road Grade Subgrade for Base Course 20' wide	7,056	SY			0.61	4,332			4,332
	Aggregate Base Paving 16' wide (8" Deep)	5,644	SY	9.13	51,534	2.31	13,027			64,561
Site Security / Access										
	8' Chain Link Fencing with barb wire	5,800	LF					50	290,000	290,000
	Automated Rolling Gate w/Operator	1	LS					25,000	25,000	25,000
	Power To Gate (conduit / wire)	1,500	LF					15	22,500	22,500
	Subtotal				**660,168**		**263,747**		**379,950**	**1,316,417**
	Mobilization / Demobilization/ General Conditions	@	8%		52,813		21,100		30,396	104,309
	Taxes on Materials	@	8.75%		57,765					57,765
	Subtotals				**770,746**		**284,847**		**410,346**	**1,465,939**
	Contractor MU on Sub	@	12%						49,242	49,242
	Subtotals				**770,746**		**284,847**		**459,588**	**1,515,181**
	Contractor OH&P	@	15%		115,612		42,727			158,339
	Subtotals				**886,358**		**327,574**			**1,673,520**
	Bonds and Insurance	@	2.5%							41,838
	Subtotals									**1,715,358**
	Estimating Contingency	@	30%							514,607
	Escalation to Midpoint per year	@	2.5%							64,326
	Estimated Bid Cost									**2,294,291**
	Total Estimate (Rounded)									**$2,300,000**

Estimate Accuracy	
+50%	-30%

* Assumes Pipelines are adjacent to / not in roadway.

Estimated Range of Probable Cost		
+50%	Total Est.	-30%
$3,450,000	**$2,300,000**	**$1,610,000**

OPINION OF PROBABLE CONSTRUCTION COST

KENNEDY/JENKS CONSULTANTS

Project: Antelope Valley SWC Big Rock Creek

Building, Area: Alt 3 Offsite Recharge Layout 3

Prepared By: JLH/CR
Date Prepared: 22-Nov-20
K/J Proj. No. 1844525*00

Current at ENR 11455
Escalated to ENR 11885
Months to Midpoint of Construct 18

Estimate Type:
[x] **Conceptual**
[ ] **Preliminary (w/o plans)**
[ ] **Design Development @**
[ ] **Construction**
[ ] **Change Order**
% Complete

Category		Description	Qty	Units	Materials $/Unit	Materials Total	Installation $/Unit	Installation Total	Sub-contractor $/Unit	Sub-contractor Total	Total
Recharge Basins											
		Clearing of Light Scrub & Misc. Debris	46	ACRE			1,133.00	51,721			51,721
		Earthwork - Perimeter Berms - Place and Compact	8,882	CY			5.00	44,410			44,410
		Earthwork - Berms Between Basins Place and Compact	4,260	CY			4.00	17,041			17,041
		Rough Grading Site with Grader	1,988,514	SF			0.04	83,161			83,161
		Pond Overflow Structures	7	EA	2,500.00	17,500	5,000.00	35,000			52,500
Conveyance Pipeline											
		Trenching 24"	3,175	LF			18.60	59,055			59,055
		Bedding 24"	3,175	LF	17.09	54,261	10.48	33,274			87,535
		24" PVC Pipe	3,175	LF	76.11	241,649					241,649
		24" Tees	3	EA	11,374.94	34,125					34,125
		24" Valves	1	EA	13,012.94	13,013					13,013
		Trenching 16"	1,550	LF			18.60	28,830			28,830
		Bedding 16"	1,550	LF	17.09	26,490	10.48	16,244			42,734
		16" PVC Pipe	1,550	LF	32.68	50,654					50,654
		16" Valves	3	EA	5,314.37	15,943					
		24" PRV Vault Boxes	1	EA	12,500.00	12,500	15,000.00	15,000			27,500
		24" PRV Valve	1	EA	20,000.00	20,000	5,000.00	5,000			25,000
		PVC Conduit (for fiber)	3,000	LF					6	17,250	17,250
		Pullboxes	6	EA					3,000	19,200	19,200
		Fiber Optic Cable	3,000	LF					2	6,000	6,000
Land Acquisition											
			46	AC	5,000	228,250					228,250
Site Access Road											
		Access Road Grade Subgrade for Base Course 20' wide	11,922	SY			0.61	7,320			7,320
		Aggregate Base Paving 16' wide (8" Deep)	9,538	SY	9.13	87,080	2.31	22,013			109,093
Site Security / Access											
		8' Chain Link Fencing with barb wire	11,600	LF					50	580,000	580,000
		Automated Rolling Gate w/Operator	2	LS					25,000	50,000	50,000
		Power To Gate (conduit / wire)	3,000	LF					15	45,000	45,000
		Subtotal				**801,464**		**366,349**		**717,450**	**1,921,041**
		Mobilization / Demobilization/ General Conditions	@	8%		64,117		29,308		57,396	150,821
		Taxes on Materials	@	8.75%		70,128					70,128
		Subtotals				**935,710**		**395,657**		**774,846**	**2,106,212**
		Contractor MU on Sub	@	12%						92,982	92,982
		Subtotals				**935,710**		**395,657**		**867,828**	**2,199,194**
		Contractor OH&P	@	15%		140,356		59,348			199,705
		Subtotals				**1,076,066**		**455,005**			**2,398,899**
		Bonds and Insurance	@	2.5%							59,972
		Subtotals									**2,458,871**
		Estimating Contingency	@	30%							737,661
		Escalation to Midpoint per year	@	2.5%							92,208
		Estimated Bid Cost									**3,288,740**
		Total Estimate (Rounded)									**$3,300,000**

Estimate Accuracy	
+50%	-30%

* Assumes Pipelines are adjacent to / not in roadway.

Estimated Range of Probable Cost		
+50%	Total Est.	-30%
$4,950,000	**$3,300,000**	**$2,310,000**

Appendix C: Infiltration Test Results

SOILS ENGINEERING, INC.

July 21, 2022 SEI File No. 22-18483

Kennedy Jenks Consultants
300 N. Lake Avenue, Suite 1020
Pasadena, CA 91101

Attention: Mr. Paul Chau

Subject: **Double Ring Infiltration Testing**
Project: Water Recharge Basin
Location 1: 34.4803, -117.8459 | Los Angeles County, CA
Location 2: 34.4826, -117.8469 | Los Angeles County, CA

Dear Mr. Chau,

Thank you for contacting Soils Engineering, Inc. (SEI) for the opportunity to provide services for the above listed project located in Los Angeles County, California.

PROJECT DESCRIPTION

The proposed development entails testing for two water recharge basins at separate sites in proximity of each other. The total water surface for Location 1 will be approximately 20.5 acres and 5 feet in depth. The total water surface for Location 2 will be approximately 25.15 acres and 5 feet in depth. At each site, a double ring infiltration test is required. The site is presented in the attached Test Location Map.

DOUBLE RING INFILTRATION TEST

At each test location, the site was excavated to a depth of 4 feet below existing grade with a backhoe. At Location 1, at a depth of 4 feet, the soils consist of sand/silty sand, fine to coarse grained sand with trace to some gravel. At Location 2, at a depth of 4 feet, the soils consist of gravelly sand, fine to coarse sand with some rock greater than 3 inches. The infiltration rates are presented below and as an attachment.

Location 1: Average infiltration is 16.69 cm/hr or 6.57 in/hr
Location 2: Average infiltration is 36.79 cm/hr or 14.48 in/hr

The design engineer should apply appropriate safety factor to account for siltation at the bottom of recharge basin and hydro-compaction of the on-site soils.

Respectfully submitted,
SOILS ENGINEERING, INC.

On Man Lau, M.Sc., P.E., G.E.
Engineering Manager

Attachments: Test Location Map
Double Ring Infiltration Test 1 and Test 2

Test Location Map

18483 Kennedy Jenks, Water Recharge Basins

E Ave X

Location 2

Location 1

Big Rock Siphon

N

Google Earth

Double Ring Infiltration Test 1

ASTM D3385

Project Name:	Water Recharge Basins		
Project Number:	18483	**Test Date:**	7/12/2022
Test Location:	Test Number 1 (34.4803, -117.8459)	**Tested By:**	MW

	Area (cm^2)	Depth of Liquid (cm)	Containers Vol/ΔH (cm^3/cm)		Inner Flow Rate (cm/hr)	Annular Flow Rate (cm/hr)
Inner Ring	729.66	12.07	54	**Average Reading**	16.69	16.46
Annular Space	2188.98	12.07	168.33			

Trail No		Time (hr:min)	Elapsed Time/Cumulative (min)	Flow reading				Incremental Infiltration Rate	
				Inner Reading		Annular Space			
				Reading (cm)	Flow (cm^3)	Reading (cm)	Flow (cm^3)	Inner (cm/h)	Annular (cm/h)
1	S	12:30	15	57	3051	57	9173.99	16.73	16.76
	E	12:45	15	0.5		2.5			
2	S	12:45	15	57	3051	57	9089.82	16.73	16.61
	E	13:00	30	0.5		3			
3	S	13:00	15	57	3051	57	8837.33	16.73	16.15
	E	13:15	45	0.5		4.5			
4	S	13:15	15	57	3024	57	8921.49	16.58	16.30
	E	13:30	60	1		4			

Double Ring Infiltration Test 2

ASTM D3385

Project Name:	Water Recharge Basins		
Project Number:	18483	**Test Date:**	7/13/2022
Test Location:	Test Number 2 (34.4826, -117.8469)	**Tested By:**	MW

	Area (cm^2)	Depth of Liquid (cm)	Containers Vol/ΔH (cm^3/cm)		Inner Flow Rate (cm/hr)	Annular Flow Rate (cm/hr)
Inner Ring	729.66	12.07	54	**Average Reading**	36.79	37.90
Annular Space	2188.98	12.07	168.33			

Trail No		Time (hr:min)	Elapsed Time/Cumulative (min)	Flow reading				Incremental Infiltration Rate	
				Inner Reading		Annular Space			
				Reading (cm)	Flow (cm^3)	Reading (cm)	Flow (cm^3)	Inner (cm/h)	Annular (cm/h)
1	S	11:05	7	58	3132	58	9763.14	36.79	38.23
	E	11:12	7	0		0			
2	S	11:17	7	58	3132	58	9763.14	36.79	38.23
	E	11:24	14	0		0			
3	S	11:33	7	58	3132	58	9510.65	36.79	37.24
	E	11:40	21	0		1.5			

ANTELOPE VALLEY
STATE WATER CONTRACTORS ASSOCIATION

COMMISSION MEMORANDUM

DATE: January 31, 2023 **February 9, 2023**

TO: AVSWCA Commissioners **Commission Meeting**

FROM: Mr. Peter Thompson II, General Manager

RE: ***AGENDA ITEM NO. 12 - REPORT OF GENERAL MANAGER***

Report Items:

- **Antelope Valley Water Master Meetings**
    - The Watermaster administrative budget was approved at the December 7th meeting.
    - Due to projected future budget deficits at the current administrative assessment, a special Board meeting will be held in March to discuss current and future assessments as well as potential budget cuts that could be made to close the funding gap.
    - The Hallmark Group officially took over administration duties at the January 25th Watermaster meeting.
    - There was substantial discussion at the January 25th meeting regarding larger new producers who rely on replacement water. The Watermaster Board chose to table two new producer applications to provide legal counsel time to review the applications and ensure that the language adequately stated that replacement water was not a guaranteed supply.
    - Work on the development of the Replacement Water Assessment (RWA) charge for 2023 will be delayed until AVEK completes a rate analysis study that will impact the RWA. The new target for presenting the RWA rate to the Watermaster is at their meeting in May.
- **Antelope Valley and Fremont Basin IRWMP Stakeholder Meetings**
    - Association staff continues to work with Woodard and Curran regarding both the DACI and Prop. 1 grant administration. To date, the Association has received four payments from DWR supporting the Prop1 Round 1 AVIRWM projects.
    - The AVIRWM Prop 1 Round 2 grant application was successfully submitted on January 18th.

- **Ethics AB 1234 Training**

    - Mr. Wayne Lemieux, AVSWCA attorney in rotation, has offered to provide AB 1234 training via teleconference and has provided a list of available dates. If the Commissioners are interested in this option, staff will coordinate training.

    - The alternative options are on-demand trainings offered directly through the CA Fair Political Practices Commission, Vector Solutions Online Course through ACWA/JPIA, or through CSDA on-demand webinars.

Future Agenda Items:

- **Presentation from the State Water Contractors-Energy Policy Impacts and Plans.**

    - The passage of SB 1020 requires DWR to accelerate their adoption of renewable resources. The State Water Contractors (SWC) have been working closely with DWR to develop plans and projects that will accomplish this goal and minimize the cost impacts of the switch to renewables. Staff has contacted SWC to request a presentation at the Association's meeting in April.

- **Analysis on Big Rock Creek SWP Delivery Scenarios**

    - Staff will work with State Water Contractor staff to determine delivery capacities potentially available for delivering water to a recharge project at Big Rock Creek during 50% or higher SWP allocation scenarios.

ANTELOPE VALLEY STATE WATER CONTRACTORS
Balance Sheet
For the Seven Months Ending 1/31/2023

	YTD
ASSETS	
Cash - General Fund	$150,896.00
Restricted - AVRWMG	101,802.90
Accounts Receivable	0.00
Prepaid Insurance (Premium Period 10/1 - 9/30)	1,455.32
Prepaid Expense	0.00
Total Assets	**$254,154.22**
LIABILITIES AND FUND BALANCE	
LIABILITIES	
Accounts Payable	$29,258.75
Pass-Thrugh Grant Funding	$0.00
Total Liabilities	**29,258.75**
FUND BALANCE	
Unassigned	224,895.47
Total Fund Balance	**224,895.47**
Total Liabilities and Fund Balance	**$254,154.22**

ANTELOPE VALLEY STATE WATER CONTRACTORS
Profit &Loss Statement
For the Seven Months Ending 1/31/2023

	January	YTD
Revenues:		
Contributions - Member Agency		$30,000.00
Contributions - Member Programs (USGS & CASGEM)		36,000.00
Contributions - Member Programs (Financial Analysis PSA)		
Contributions - Member Programs (Big Rock Creek)		
Contributions - Member Programs (AV Fair-Conservation Garden)		
Contributions - Non-Member Programs (USGS)		
Contributions - Others (AVRWMG)		
Contributions - Others (DACI)		24,721.26
Water Sales - Replacement Water Assessments		1,432,552.94
Miscellaneous Refund		
Interest Earnings	11.58	134.50
Total Revenue		**$1,523,408.70**
Expenditures:		
General Government		
Bank Fees	($902.50)	$5,417.50
Insurance	181.92	1,385.90
Memberships		2,147.80
Outreach		
Purchased Water		1,432,552.94
Miscellaneous		
		1,441,504.14
Public Resource		
Contract Services - Administration		5,590.98
Contract Services - USGS & CASGEM		
Contract Services - AVRWMG		
Contract Services - IRWMP 2013 Update	18,112.50	37,811.25
Contract Services - DACI	122.50	586.25
Contract Services - BIG ROCK CREEK		24,169.50
Contract Services - FINANCIAL ANALYSIS		
Contract Services - General Projects		
Contract Services - AV Fair Conservation Garden		
Contract Services - Home Show/WaterSmart Expo		
Contract Services - Rural Museum		
Contract Services - Other		
		68,157.98
Total Expenditures		**$1,509,662.12**
Change in Net Position		**$13,746.58**
Net Position - Beginning of Year		**211,148.89**

ANTELOPE VALLEY STATE WATER CONTRACTORS
Profit &Loss Statement
For the Seven Months Ending 1/31/2023

	January	YTD
Net Position - End of Year		**$224,895.47**